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Series 532
Air-Cooled Ion Lasers
Operating Manual

This manual covers the following lasers and laser systems:

532-A-A01	**532-BS-A01**	**532-MA-A03**	**532-MBS-A03**	**532-VS-A02**
532-A-A02	**532-BS-A02**	**532-MA-A04**	**532-MBS-A04**	**532-VS-A03**
532-A-A03	**532-BS-A03**	**532-MAP-A01**	**532-MGS-A01**	**35 LAS 450**
532-A-A04	**532-GS-A04**	**532-MAP-A02**	**532-MGS-A02**	**35 LAS 550**
532-AP-A01	**532-BS-A04**	**532-MB-A01**	**532-MGS-A03**	**35 LAS 010**
532-AP-A02	**532-GS-A01**	**532-MB-A02**	**532-MGS-A04**	**35 LAP 321**
532-B-A01	**532-GS-A02**	**532-MB-A03**	**532-MVS-A01**	**35 MAP 321**
532-B-A02	**532-GS-A03**	**532-MB-A04**	**532-MVS-A02**	
532-B-A03	**532-MA-A01**	**532-MBS-A01**	**532-MVS-A03**	
532-B-A04	**532-MA-A02**	**532-MBS-A02**	**532-VS-A01**	

Manufactured by

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NOTICE: This manual contains specifications, descriptions, and drawings for air-cooled ion lasers manufactured by Melles Griot.

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Series 532-AP line-tunable laser head



Introduction

Congratulations on your purchase of a Melles Griot Series 532 air-cooled argon-ion laser system. These laser systems represent the state of the art in air-cooled laser design, providing high output power, low noise, and long plasma tube life. These systems are available in both OEM and laboratory configurations, and come in a wide range of output power. Systems can be configured to simultaneously produce a wide variety of wavelengths, or can be tailored for a specific line. Line-tunable systems are also available.

Because of the many possible options and combinations of laser head and power supply, Series 532 lasers are usually purchased as components (i.e., laser head and power supply have different part numbers and are sold separately). Packaged systems (i.e., laser head and power supply sold as a set under a single part number) are available, and are designated by a 35 LA(X) or 35 MA(X) part number.

The Series 532 systems use an external, kinematically mounted high-conductivity resonator design to ensure operational stability and performance in any orientation.

Series 532 argon-ion lasers produce output in the violet to green spectral region. Power supplies for the Series 532 lasers have been redesigned to improve performance and efficiency. Not only do the laser systems represented in this manual have the best power-factor correction of any equivalent system, but also they meet all relevant U.S. and European electrical and emission standards and proudly display the CE mark.

Finally, your new system is protected by the comprehensive Melles Griot warranty and our worldwide service organization.

About this manual

This manual contains all the information needed to get your Series 532 laser system up and running and to avoid inadvertent damage to the system or accidental injury to the operator. Please read chapters one through four completely before attempting to operate the laser system, and carefully heed all cautionary notes. If you have any questions or comments about this manual or the laser system itself, please call your local sales or service office (see Appendix E), or contact the factory at (760) 438-2131 and ask for customer service.

The structure of this manual

Chapter 1, *For Your Safety*, discusses the safety issues involved with laser devices in general and high-voltage high-current ion lasers in particular. Chapter 2, *Initial Installation*, describes the steps needed to safely unpack, inspect, and set up the system. Chapter 3, *System Description*, presents an overall view of how the system operates, and describes the function of each accessible control, indicator, and connector. Chapter 4, *Operating Your System*, contains a detailed, step-by-step procedure for operating the system to achieve the best possible results. Chapter 5, *In Case of Difficulty*, discusses the most common problems that occur during setup and operation and suggests possible solutions.

This manual also contains several appendices. Appendix A details the specifications of the Series 532, including outline and mounting drawings of the critical components. Appendix B describes the main options and accessories that are available for the laser systems. Appendix C discusses the special requirements faced by OEM manufacturers when mounting the laser into another piece of equipment. Appendix D describes the compliance criteria met by the laser system and shows facsimiles of various required logotypes and labels. Finally, Appendix E describes the comprehensive Melles Griot warranty and gives the contact information for our worldwide service and support organization.

Conventions used in this manual

Throughout this manual you will find information that is separated from the regular text by lines and labeled by an icon in the margin. Lasers are potentially dangerous devices, and some of this information is vital for your safety. The significance of the notations is explained below.



Ion lasers are high-voltage high-current devices. Improper use can expose the operator or others to potentially lethal voltages. The "Hazard" icon, represented by a triangle with a lightning bolt, identifies precautions needed to avoid *electrical* injury or damage to the equipment.



The Series 532 lasers are Class IIIb devices (as determined by the Center for Devices and Radiological Health of the Federal Drug Administration), and the skin and eyes may be damaged if exposed to the laser beam. The "Caution" icon, represented by a triangle with laser burst, identifies precautions needed to avoid *optical* injury to anyone in the area.



The "Note" icon, represented by a triangle with an exclamation point, indicates information that is particularly important to the optimum performance of the laser system or information about the procedure or topic under discussion.

The following acronyms are used in this manual:

CDRH	Center for Devices and Radiological Health
cw	continuous wave
FCC	Federal Communications Commission
IEC	International Electrotechnical Commission
LED	light-emitting diode
OEM	original equipment manufacturer

The following abbreviations and symbols are used in this manual:

″	inch
°C	degrees centigrade
µrad	microradian
A	amp (ampere)
ac	alternating current
c	speed of light
cm	centimeter
dc	direct current
DVM	digital voltmeter
Hz	Hertz (cycles per second)
in.	inch
kg	kilogram
lb	U.S. pound
MHz	megahertz
mm	millimeter
mrad	milliradian
mW	milliwatt
nm	nanometer
p-p	peak-to-peak
V	volt
Vac	volts ac
Vdc	volts dc

To designate the controls, indicators, and connectors in this manual, the following conventions are used:

Hardware labels:	These are written as they appear on the hardware (e.g., if a control is labeled "POWER" on the hardware, it will be called the POWER control in this manual; if it is labeled "Power" on the hardware, it will be referred to as the Power control).
Item names:	Controls, connectors, and other items that do not have labels will be referred to by initial capitals (e.g., Laser Emission Indicator).

For Your Safety

Introduction

Please read this chapter carefully before installing or operating your laser. It includes important safety information about your laser system.

This chapter includes information about:

- Safety features built into the Series 532 laser system
- Safety instructions to follow to avoid accidental electrical shock
- Safety instructions to follow to avoid accidental beam exposure
- References on laser safety.

1.1 Safety features

Because your safety is paramount, your new Series 532 ion laser has many built-in safety features to help ensure that the laser emits light only when you want it to and only when you have determined that conditions are safe for it to do so. An On/Off key switch controls all power to the system and prevents unauthorized access. An emission indicator on the laser head glows whenever power is applied to the system and laser emission is possible. To prevent accidental exposure to the laser beam, there is, at minimum, a 35-second delay between the time the key switch is turned to the "On" position and laser emission occurs. A safety interlock system prevents the laser from operating unless all cables are properly connected, and remote interlock connections are provided that can be configured to shut the laser off if a laboratory door or an instrument access panel is inadvertently opened. Finally, a solid manual shutter is provided that can block all laser radiation in an emergency.



All maintenance or service requiring access to the interior of the laser or power supply must be performed by an authorized Melles Griot representative.

Please keep in mind, however, that these built-in features will not protect you or your equipment if you do not adhere to the specific precautions and instructions delineated in this manual.

With any ion laser system there are two major safety issues—electrical safety and laser safety. Hazard, safety and warning labels affixed to the system are shown in Appendix D, *Compliance Information.*

1.2 Electrical safety

The Series 532 ion lasers are high-current devices that operate at potentially lethal voltages. Consequently, all service requiring access to the interior of the laser head or power supply must be performed by a qualified Melles Griot technician. There are no user-serviceable parts or

controls inside the protective housings of the laser or power supply, and the laser system must *never* be operated with the covers removed.



The laser head and power supply both contain circuits that operate at high voltage. THESE VOLTAGES CAN BE LETHAL. Refer any service requiring access to the inside of the laser head or power supply to your nearest Melles Griot authorized representative.

- DO NOT disconnect the protective ground terminal on the power supply ac line cord.
- DO NOT use a grounding adapter to plug the power supply into a two-wire outlet. Have a grounded three-wire outlet installed by a qualified electrician.
- DO NOT attempt to defeat the interlocks (see Laser Emission Control Devices in Appendix D).
- ALWAYS ensure that the power supply input voltage matches the voltage available in your location.
- ALWAYS ensure that the connector safety collars are installed on the laser cable connectors at both the power supply and the laser head before connecting the system to the main service.
- ALWAYS disconnect the power to the power supply before connecting or disconnecting the cable between the laser head and the power supply.

1.3 Laser safety

Laser light can be hazardous if it comes in contact with the skin or the eye, causing burns, eye damage, and even blindness. The Series 532 laser systems (laser head plus appropriate power supply) are designed to meet all of the requirements of 21CFR1040.1 as set out by the U.S. Food and Drug Administration, Center for Devices and Radiological Health (CDRH). The systems are also designed to comply with applicable European norms (see Appendix D)



Series 532 ion laser systems are classified as CDRH Class IIIb/IEC Class 3B devices, indicating that they are capable of producing skin or eye damage if used improperly.

Never look into the laser beam, with or without appropriate safety goggles. Permanent eye damage or blindness may result!

Keep all parts of the body and reflective materials out of the beam path as well.

The Series 532 lasers systems should not be operated unless all appropriate safety precautions are taken. These include, but are not limited to:

- Providing enclosed paths for laser beams whenever possible.

- Wearing appropriate approved laser safety glasses when working around a functioning laser device.
- Designating a controlled area specifically for laser operation. Access to this area should be limited to those individuals who have been instructed in the safe operation of lasers.
- Posting warning signs in conspicuous locations near the laser area.
- Setting up laser equipment so that the beam is not at eye level.
- Setting up a target covered with flat black paint or other anti-reflective coating and using shields as necessary to prevent strong reflections from going beyond the area where the laser is being used.

Adjustments, use of controls, or performance of procedures other than those specified in this manual may result in exposure to hazardous laser radiation.

For more information on laser safety, the following sources are available:

- *Safe Use of Lasers* (Z136.1), published by:
  The American National Standards Institute (ANSI)
  11 West 42nd Street
  New York, NY 10036
  Tel: (212) 642-4900
- *A Guide for Control of Laser Hazards*, published by:
  The American Conference of Governmental and Industrial Hygienists (ACGIH)
  1330 Kemper Meadow Drive
  Cincinnati, OH 45240
  Tel: (513) 742-2020
- *Laser Safety Guide*[*], published by:
  The Laser Institute of America
  12424 Research Parkway, Suite 125
  Orlando, FL 32826
  Tel: (407) 380-1553.

[*] Also available from Melles Griot.

Initial Installation

Introduction

This chapter includes information about:

- Unpacking the Series 532 laser system
- Inspecting the system for damage and completeness
- Connecting the components of the system.

2.1 Unpacking your system

Retain the shipping container. Especially designed to protect the laser system during shipment, it should always be used to ship the system to Melles Griot for service.



Save the original shipping boxes! Melles Griot cannot honor the warranty for improperly packaged equipment.

Immediately upon receipt of your Melles Griot Series 532 ion laser, inspect the packaging for obvious signs of damage. The laser's packaging is quite substantial and will protect the equipment from normal shipping stresses. If, however, the packing cartons are significantly damaged and you suspect damage has occurred to one of the components, file a claim with the shipper and have a representative from the shipper present when the unit is unpacked.

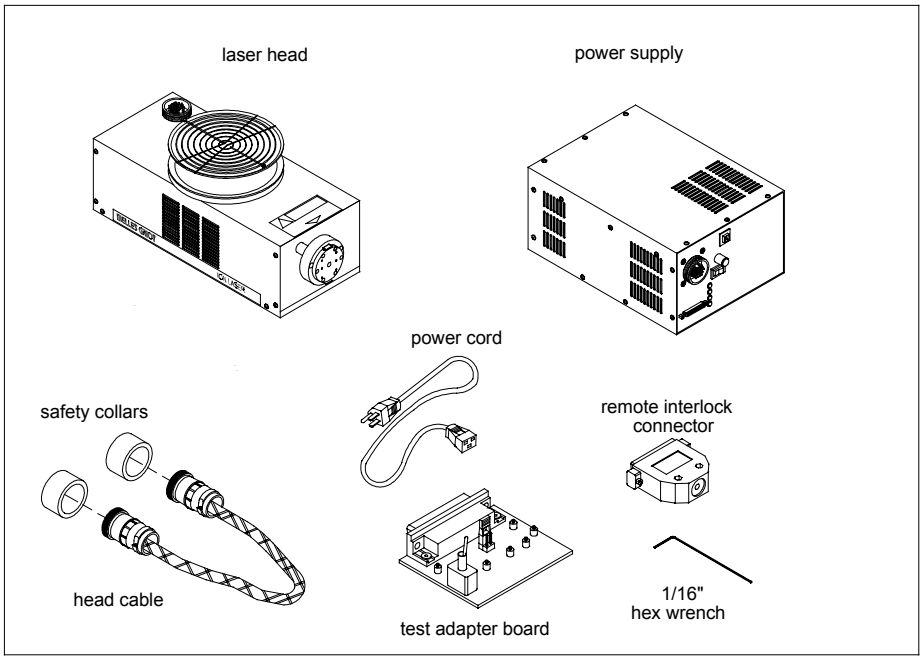
When unpacking the laser system, look for dents, scratches and other obvious signs of damage to the components. If any damage is evident, immediately file a claim with the shipper and contact your nearest Melles Griot representative. *Melles Griot will arrange for repair without waiting for the claim settlement.*

2.2 Identifying components

The following components, along with any options, should always be included in your shipment. (A diagram of the hardware components is shown in figure 2-1.)

1. *Series 532 ion laser head.* There are several variations and cooling options, some of which are shown in figure 2.2. Check the factory label on the laser head and the final test data sheet to determine that you have received the correct unit and wavelength options.
2. *Model 170 or Model 176 power supply.* Check the setup label on the back of the unit to verify that you have that the power supply has been calibrated at the factory for the correct line input voltage.
3. *Power cord.* Make sure that the correct plug has been provided for your ac receptacle.

Figure 2-1
Hardware included with Series 532 laser systems



Note

The appearance of the laser head and power supply may be different than that shown in figure 2-1 depending upon the options ordered (e.g., remote cooling.

4. *Head cable.* This connects the laser head (item 1) to the power supply (item 2).
5. *Safety collars* (2) *and setscrews* (6). These collars slide over and secure the connectors at each end of the laser cable (item 4).
6. *Test adapter board.* This small printed circuit board plugs into the power supply remote connector. It provides access to several diagnostic test and measurement points and permits easy changeover from light-control mode to current-control mode.
7. *Remote interlock connector.* This connector may be wired to turn the laser on and off with a remote relay contact.
8. *Test data sheet.* This document shows the laser performance and quality checks at the factory, prior to shipment.
9. *Operator's manual.*
10. *Keys (two sets).* These are used to operate the power supply.
11. *1/16" Allen key.* This is provided as a convenience for attaching the safety collars to the laser cable connectors on the power supply and laser head.

In addition to the items mentioned above, which should be included in every shipment, the following accessories may have been ordered. For more information about these accessories, see Appendix B.

- Remote cooling option
- Remote control interface box
- RS232 interface box.

Please call your Melles Griot representative if you have any questions about the options or components supplied with this laser system.

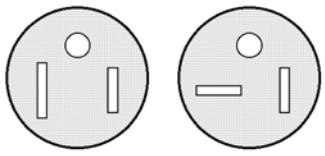
2.3 Connecting the components

The following steps will guide you through the process of connecting the components. *Do not connect the ac power cable to the power supply until instructed to do so in step 8.* If you experience difficulty in identifying any of the controls mentioned below, please review the following chapter, *System Description.*

Note

Series 532 ion lasers require a 20-A single-phase power source. A standard 20-A circuit with no other significant power load is usually sufficient. If there is any other equipment connected to the circuit, or if the electrical circuit is rated at less than 20 A, the line voltage may drop enough to prevent stable operation of the laser. The best way to ensure adequate power is to use a dedicated 20-A circuit to supply the laser system.

Note for U.S. customers only! If you ordered a system configured for a 115-Vac source, the unit is provided with the standard 20-A/115-V connector shown. If your receptacle does not accept this connector, it is either a 15-A circuit, or the receptacle is incorrect and should be replaced.



Polarized 115-VAC Plugs

Note

If you have purchased the remote cooling option, refer to Appendix B for further instructions.

1. Connect laser cable to the HEAD P1 connector on the power supply. This cable has the same 22-pin round connector at each end and can be installed in either direction.
2. Run the safety collars over the laser cable and attach one to the connector at the power supply using three setscrews and the 1/16" Allen key provided with the system.
3. Connect the free end of the laser cable to the laser head. Attach the safety collar to the connector at the laser head using the remaining three setscrews.
4. Check to see that the AC POWER rocker switch on the power supply is in the O (off) position and that the key switch is turned to OFF.
5. Slide the aperture shutter to the closed position (the green strip is not visible) before attempting to start the laser.
6. Attach the Remote Interlock Connector, to the REMOTE P2 connector on the power supply. Make sure that the two jumper wires on the Remote Interlock Connector are in place. (Alternatively, the test adapter board can by connected to the REMOTE P2 connector in place of the Remote Interlock Connector.)



Before connecting the ac power to the power supply make sure that the power rating on the supply and the connector supplied with the system are appropriate for your location.

7. Check that the airflow is not restricted into the air input or fan exhaust areas for both the power supply and laser head. A minimum of 25-mm clearance is required around these areas.
8. Connect the ac power cord to the power supply and plug it into the power receptacle.
9. Look at the indicator lights on the front of the power supply. The following lights should be glowing:
    - AC CONNECTED (green)
    - SAFETY INTERLOCK OPEN (red)
    - BEAM INTERLOCK OPEN (red).

    If the above indicators do not light, please refer to Chapter 5, *In Case of Difficulty*, or contact your factory service representative.
10. Disconnect the ac power cord from the power receptacle and proceed to the next chapter.

System Description

Introduction

This chapter describes the overall operation of the Series 532 laser system and gives a functional description of all user-accessible controls, indicators and connectors.

This chapter includes information about:

- The properties of a laser
- Light control vs current control
- The function of controls, indicators, and connectors.

3.1 Laser properties

The term "laser" was coined from the acronym for light amplification by stimulated emission of radiation. The theory behind the laser is beyond the scope of this manual, but it is important to identify the basic properties of lasers in general, and ion lasers in particular.

General laser properties

All lasers produce intense beams of light that are *monochromatic*, *coherent*, and *highly collimated*. The wavelength (color) of the laser light is extremely pure (monochromatic) when compared to other sources of light, and all of the photons (energy) that make up the laser beam have a fixed phase relationship (coherence) with one another. This causes the light to form a beam with a very low rate of expansion (highly collimated) that can travel over great distances, or can be focused to a very small spot with a brightness that can approximate that of the sun. Because of these properties, lasers are used in a wide variety of applications in all walks of life.

Argon-ion-laser properties

Ion lasers produce light primarily in the visible region of the spectrum. The most common ion lasers are the argon-ion laser and the krypton-ion laser. These lasers produce many wavelengths, but typically, the most important argon-ion wavelengths are 458 nm (violet), 488 nm (blue), and 514 nm (green). The most important krypton-ion wavelengths are 647 nm (red) and 568 nm (yellow). In some systems, argon and krypton gases are mixed to produce a laser with all four primary colors.

Large argon-ion and krypton-ion lasers are relatively inefficient and require adequate cooling. Large lasers must be water cooled, but small

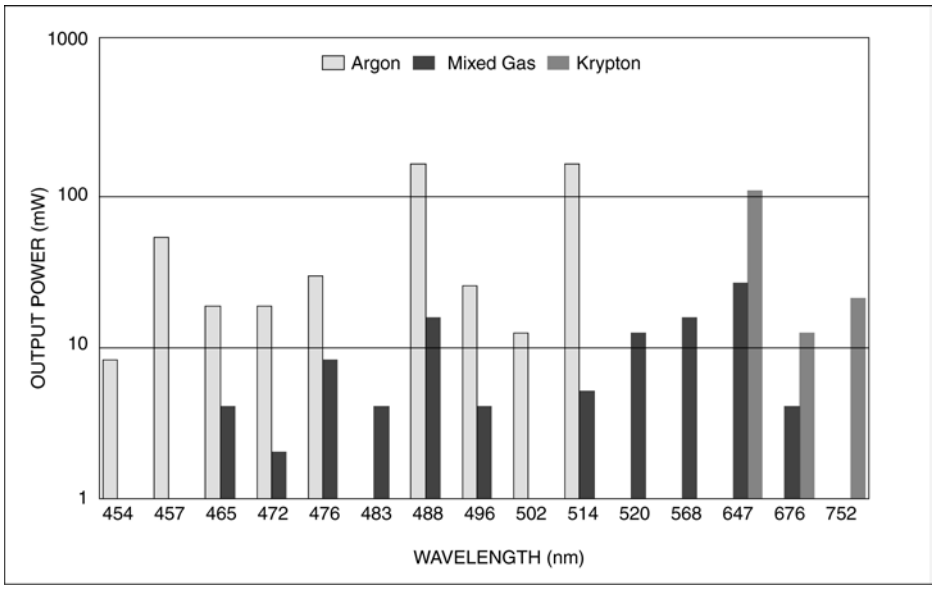
devices developed by Melles Griot, such as the Series 532 argon-ion lasers, are cooled by forced air.

Output Wavelengths

The available wavelengths and output powers of argon, krypton, and mixed gas (krypton/argon) lasers are shown in figure 3-1. The laser cavity mirror configuration determines which wavelength(s) are present in the output beam. With broadband cavity mirrors, all (or most) of the available wavelengths will be present in the output beam. With narrowband mirrors, output can be limited to a single fixed wavelength (e.g., the 647-nm krypton line). By combining the high-reflecting mirror with a dispersing prism, the laser may be tuned from one wavelength to another by rotating the mirror/prism assembly. The 532-AP and 532-MAP lasers are tunable, as are the 35 LAP and 35 MAP laser systems.

Figure 3-1

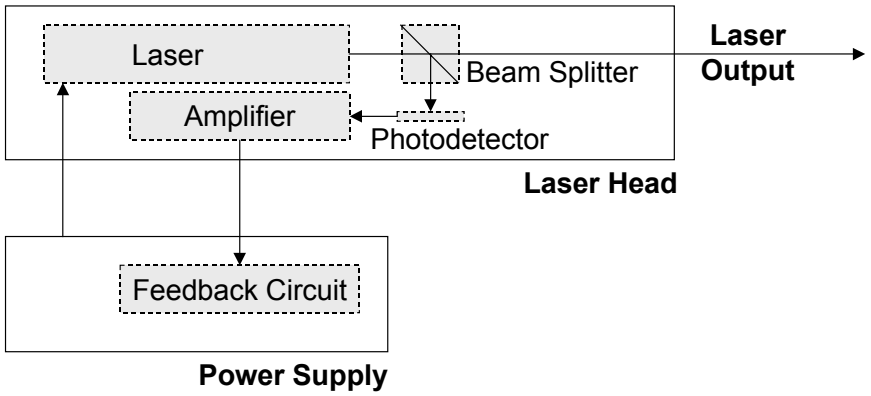
Output power vs wavelength for air-cooled ion lasers



Light control vs current control

Ion lasers normally operate in the cw (continuous wave) mode, making them very amenable to light control. With light control, as illustrated in figure 3-2, the laser output beam is monitored by a feedback circuit that controls the laser-tube current. A decrease in light output is offset by an increase in the tube current, and vice versa, maintaining the light output at a preset value. In current control, the tube current is kept constant at all times, and the light output is allowed to vary. In addition to keeping the light output constant, light control dramatically reduces high-frequency beam noise, particularly in the region below 10 kHz.

Figure 3-2
Block diagram of light-control circuit



In their standard configuration, the Series 532 lasers operate in light-control mode and will maintain a constant, user-variable output power until the end of the laser-tube life. If current control is desired, this can be achieved by using the test adapter board, or by adjusting the wiring in the Remote Interlock Connector (see section 4.2).

Tube life considerations

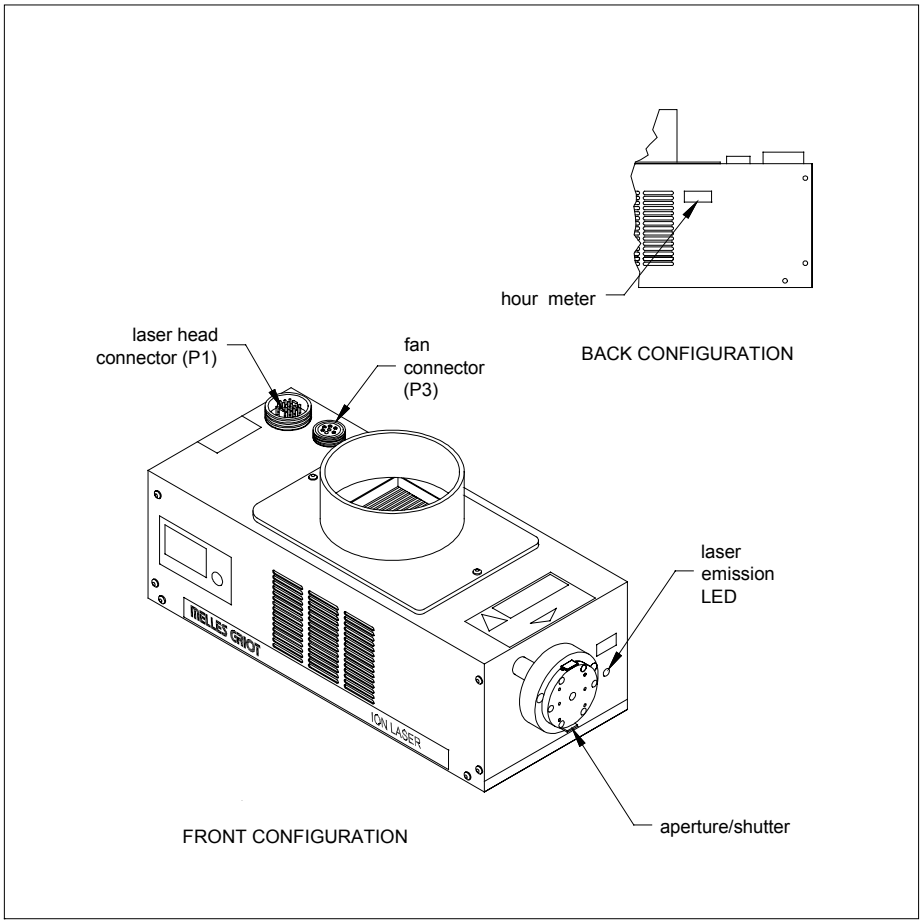
Air-cooled Series 532 ion laser tubes are sealed devices with no replaceable parts. Consequently, output power will decline over time due to gas depletion, optical contamination, and other factors. End-of-life is defined as that point where the laser no longer performs to specified power specifications. Tube life is highly (and inversely) dependent upon the average operating current of the system. For maximum tube life, the laser should always be operated at the lowest output power consistent with your application.

3.2 Controls, indicators, and connectors

In this section, every operator-accessible control, indicator, and connector is described. The components are grouped by category (laser head, power supply, test adapter board), but within each category, the controls are listed in alphabetical order.

Laser head (see figure 3-3)

Figure 3-3
Layout of controls, indicators, and connectors on the laser head



Note

Melles Griot manufactures a wide variety of laser head configurations to match specific customer and OEM needs. Although the controls are the same on all laser heads, the locations may not be located as shown in figure 3-2. For example, the Laser Head Connector (P1) may be located on the back, side, or top of the unit.

Laser Head Connector (P1): This round, 22-pin male connector, located on the back panel of the laser head, is attached, through the laser cable, to the HEAD P1 connector on the power supply.

Fan Connector (P3): This connector attaches to the fans mounted on the cover of the laser head. If the remote cooling option is used (see Appendix B) the remote cooling plug is attached here.

Hour Meter: This hour meter is operational whenever the AC POWER switch on the power supply is in the | (on) position.

Laser Emission Indicator: This yellow/green compound LED indicator, located on the front of the laser head, glows whenever the ON/OFF/START key switch on the power supply is in the ON position.

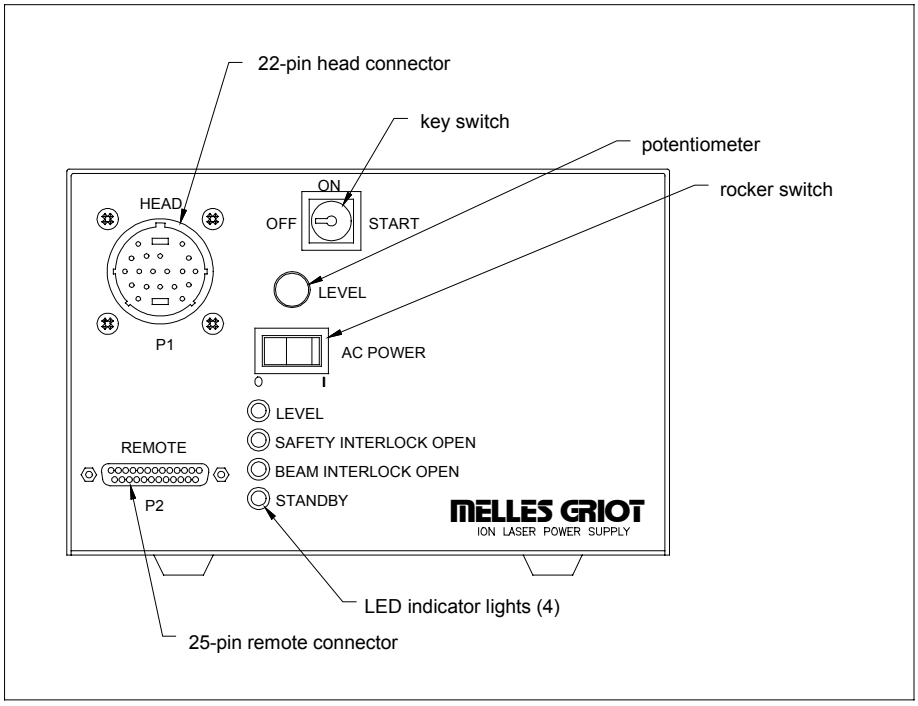
Laser Aperture Shutter: This mechanical slide shutter physically blocks the laser beam in the closed position. When the shutter is open, a green stripe is clearly visible.

Power supply (see figure 3-4)

Note

Series 532 laser heads can be used with either of two power supplies, the model 170 and model 176. The model 170 features an alternating-current cathode filament supply; the 176 has a direct-current cathode filament supply. Complete systems (i.e., product numbers 35 LA(X) and 35 MA(X)) are shipped with the model 170 power supply.

Figure 3-4
Layout of controls, indicators, and connectors on the power supply



AC CONNECTED (indicator): This green LED indicator glows whenever the power supply is attached to its ac power source.

AC POWER (rocker switch): This rocker switch, which directly switches the ac line, must be in the | (on) position for the system to operate. When it is in the O (off) position, all power is removed from the laser system. After the laser has been operating, this switch must never be turned off until the laser has completely cooled down and the laser and power supply fans have turned off.

BEAM INTERLOCK OPEN (indicator): This is one of two interlock circuits in the Series 532 laser system. It will not allow high voltage to be applied to the laser tube unless the laser cable is firmly in place, the cooling fans are connected, and pins 1 and 3 on the REMOTE P2 connector are shorted. If the interlock connections are broken, then

restored, the laser will automatically begin lasing as soon as its 35-second warm-up cycle has been completed.

HEAD P1 (connector): This round, 22-pin male connector is attached, through the laser cable, to the Laser Cable Connector on the laser head.

LEVEL (potentiometer knob): This control sets the laser output power level (in light control) or the laser current level (in current control).

Line (connector): This connector provides ac power to the power supply.

OFF/ON/START (key switch): This switch controls the system. In the OFF position, no power can be applied to the laser. In the ON position, power is applied to the cathode, cooling fans, and control circuitry, but the laser will not start. To start the laser, this switch must be turned to the momentary START position to initiate the start sequence. After approximately 35 seconds, lasing will commence.

REMOTE P2 (connector): This 25-pin connector provides diagnostic information and is used for remote operation. For the laser to operate, pin 1 must be shorted to pin 3, and pin 19 must be shorted to pin 21. The remote interlock connector provided with the systems is set up to short these pins correctly.

SAFETY INTERLOCK OPEN (indicator): This is one of two interlock circuits in the Series 532 laser system. It enables the master power relay and will not allow the system to operate unless the laser cable is firmly in place, the cooling fans are connected, the laser head cover is in place, and pins 19 and 21 on the REMOTE P2 connector are shorted. If the interlock connections are broken, then restored, the laser will have to repeat its 35-second warm-up cycle before lasing can occur.

STAND BY (indicator): This yellow LED glows whenever the laser is in the standby (reduced-current) mode. (Standby mode is available only when using the test adapter board).

Test adapter board (see figure 3-5)

The controls and indicators on the test adapter board are operational when the board is plugged into the REMOTE P2 connector on the power supply.

5.1V REF. (test point): This test point accesses the logic control voltage of the laser system with respect to the COM test point.

COM (test point): These two test points access the power supply common bus.

CURRENT (test point): This test point accesses a calibrated dc voltage that is proportional to laser-tube current. The calibration factor is 0.1 Vdc per ampere of tube current with respect to the COM test point.

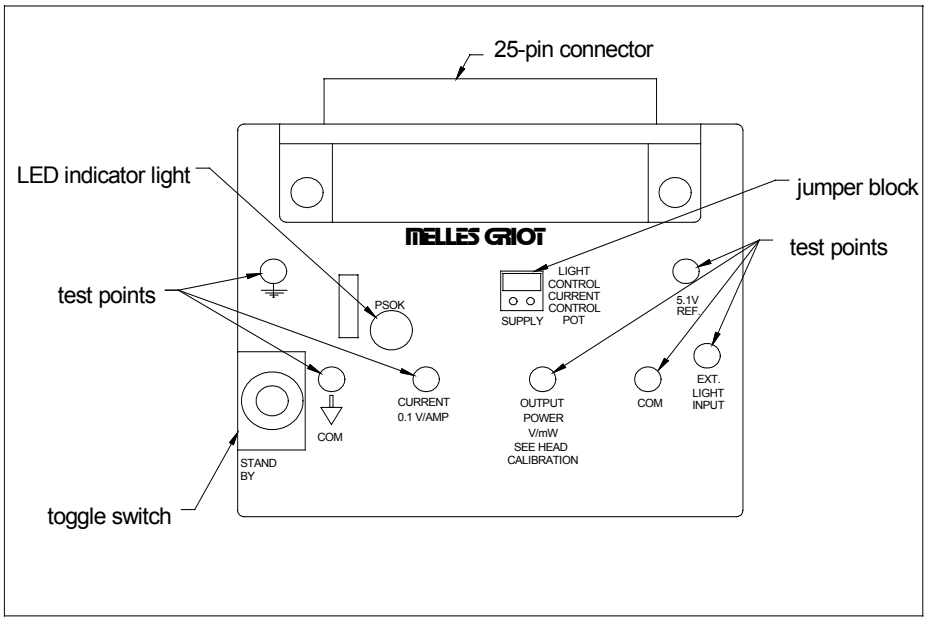
EXT. LIGHT INPUT (test point): This test point is for service purposes only.

Ground (test point): This test point accesses chassis ground.

LIGHT CONTROL/CURRENT CONTROL (jumper block): Moving the jumper switches the laser system from light control to current control.

Figure 3-5

Layout of controls, indicators, and connectors on the test adapter board



OUTPUT POWER (test point): This test point accesses a calibrated dc voltage (with respect to the COM test point) that is proportional to laser output power. The calibration factor is noted on the final test data sheet included with the system.

PSOK (indicator): This LED glows to indicate that power supply voltages have stabilized and that power is being sent to the laser head.

STANDBY (switch): Putting this switch in the STANDBY position places the system in standby mode, which uses less current and prolongs tube life. When the laser is in standby mode, the yellow STAND BY indicator on the front panel of the power supply is lit.

Operating Your System



Always observe the safety precautions outlined in Chapter 1, *For Your Safety*

Introduction

You are now ready to turn on your laser system. The paragraphs below will guide you through the steps required to operate your Series 532 ion-laser system.

This chapter includes information about:

- Turning on the laser system
- Changing output power and operating current
- Switching between light-control and current-control modes
- Measuring output power and laser-tube current.

4.1 Quick start

The following procedure assumes that the laser has been set up as described in chapter 2, section 2.3, *Connecting the components*.



If you have purchased the remote cooling option, refer to Appendix B for further instructions.

1. Plug the system into the appropriate power receptacle.
2. Look at the indicator lights on the front of the power supply. The following lights should be glowing:
   - AC CONNECTED (green)
   - SAFETY INTERLOCK OPEN (red)
   - BEAM INTERLOCK OPEN (red).

   If the above indicators do not light, please refer to section 5, *In Case of Difficulty*, or contact your factory service representative.
3. Slide the Aperture Beam Block Shutter on the laser head to the open position (with green stripe visible), being certain to observe all of the cautions described in chapter 1, *For Your Safety*.



Never turn the AC POWER switch off until the laser has cooled down and the fans have stopped running.

4. Push the AC POWER rocker switch to the | (on) position.
5. Turn the OFF/ON/START key switch clockwise to START. On the power supply, the BEAM INTERLOCK and SAFETY INTERLOCK lights should extinguish and the cooling fans on both the laser head and power supply will operate. On the laser head, the cathode (visible through vent-holes in the laser head cover) should begin to glow and the Laser Emission Indicator light and Hour Meter should be lit.
6. After approximately a 35-second delay (to allow the cathode to warm up), the main power supply relay will close, and laser emission will occur.

7. Adjust the output power to the desired value by turning the LEVEL potentiometer knob on the front panel of the power supply.
8. To turn the laser off, turn the key switch to the OFF position. The laser head and power supply fans will continue to operate. After the laser has cooled (about 2 minutes), the fans will shut off automatically—then the AC POWER switch may be turned off.

4.2 Switching between light control and current control



To maximize tube life, always operate the laser at the lowest output power consistent with the application.

As shipped, the Series 532 laser systems are configured to operate in the light-control mode. The configuration is determined by external jumpers on the REMOTE P2 connector of the power supply. If pins 12 and 7 are shorted, the system operates in light control. If pins 13 and 6 are shorted, the system operates in current control.

The system can be switched from light-control mode to current-control mode either by reconfiguring the jumpers in the Remote Interlock Connector provided with the system, or by inserting the test adapter board (see figure 3-4) into the REMOTE P2 connector and switching the LIGHT CONTROL/CURRENT CONTROL jumper from LIGHT CONTROL to CURRENT CONTROL. Since current-control mode is used primarily for diagnostic purposes, using the test adapter board is usually the preferred method.

4.3 Measuring tube current and output power

It is occasionally useful to measure the tube current and power output of the Series 532 ion laser in order to set output power, verify performance, or to obtain diagnostic information. This can easily be accomplished by plugging the test adapter board into the REMOTE P2 connector on the power supply. To make these measurements, you will need an accurate digital voltmeter and a set of test leads with the appropriate clips.

Procedure for measuring tube current and output power

1. Make sure that the ON/OFF/START key switch is in the OFF position.
2. Remove the Remote Interlock Connector from the REMOTE P2 connector on the power supply, and replace it with the test adapter board.
3. Power up the system as described in section 4.1.
4. Locate the CURRENT, COM, and OUTPUT POWER test points on the test adapter board (refer to figure 3-5).
5. With the digital voltmeter, measure the tube current by observing the voltage between the CURRENT and COM test points. The calibration factor for this set of test points is 0.1 V per ampere of tube current.



Always turn the laser off before changing between light-control and current-control modes.

6. With the digital voltmeter, measure the output power by observing the voltage between the OUTPUT POWER and COM test points. The calibration factor is noted on the test data sheet shipped with the unit.

The current and output power of the laser can be measured in either the light-control mode or the current-control mode. The mode may be changed by switching the LIGHT CONTROL/CURRENT CONTROL jumper from LIGHT CONTROL to CURRENT CONTROL and repeating steps 1 through 6 above.

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In Case of Difficulty

Introduction

There are no user serviceable parts in the laser or power supply. The Series 532 ion lasers are reliable and require virtually no maintenance throughout their expected life. When problems do occur, particularly during initial setup and evaluation, they often are the result of improper mounting or connection.

If a problem occurs with the system itself, it must be fixed by an authorized Melles Griot service representative or returned to a Melles Griot service center.

This chapter includes information about:

- A checklist for common problems
- Instructions for localizing more serious problems
- Information needed before contacting the factory.

5.1 Common setup problems

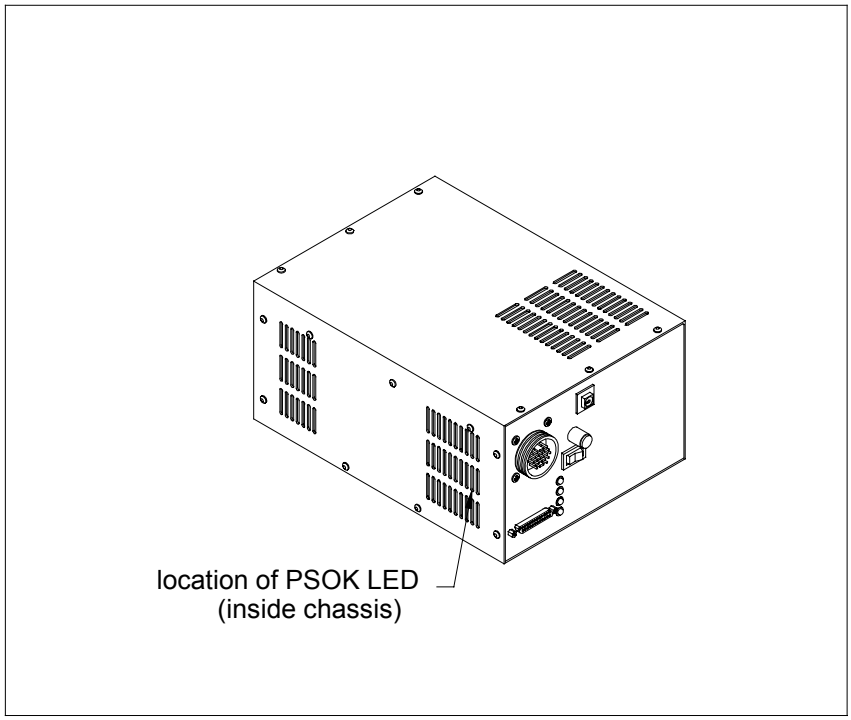
The following list of instructions is designed to identify the common causes of problems that occur during setup and operation.

- Verify that ac power is connected to the power supply.
- Verify that the aperture shutter is open.
- Check to see if any part of the device where the laser is installed could be blocking the beam.
- Verify that the cable between the power supply and the head is connected properly by disconnecting each end and reconnecting it.
- Verify that the test adapter board or remote interlock connector is plugged securely into the REMOTE P2 connector.
- Check for restricted airflow to the head or power supply fans.
- Verify that uncooled exhaust air from the head or power supply fans cannot recirculate directly into the intake area of either fan.

5.2 Localizing the problem

If you were unable to locate the problem using the list above, the next step is to localize the problem to either the power supply or the laser head. Locate the Laser Emission Indicator on the rear left side of the laser head, and the green PSOK light on the Test Adapter Board. If the test adapter board is not available or cannot be plugged into the REMOTE P2

Figure 5-1
Location of PSOK light in power supply



connector on the power supply, use the PSOK LED located inside the power supply case (see figure 5-1).

Using the startup procedure described in Chapter 4, observe the red and green LEDs, then refer to the chart below:

Figure 5-2
Selection table for localization

		PSOK Indicator in Power Supply or on Test Adapter Board	
		On	**Off**
Laser Emission Indicator on Laser Head	**On**	Problem in **Laser Head**	Problem in **Power Supply**
	Off	Green LED defective	No ac power to Power Supply

It is beyond the scope of this manual to isolate the problem any further. If you are still experiencing difficulties, contact the Melles Griot sales and service office for immediate help (see Appendix E for a location near you).

5.3 Reporting information

Please have the following information ready for the Melles Griot customer representative:

- Laser head and power supply model numbers and serial numbers
- Approximate purchase date and hours in service
- Accessories, options, or modifications installed
- All information from the laser head data label
- Symptoms of the malfunction and a list of any steps already taken to solve the problem.

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Specifications

A1 Series 532 argon laser output specifications

Fixed output argon-ion laser heads

Model	Wavelength (nm)	Power Min (mW)	Beam Diameter (mm)	Beam Divergence (mm)	M^2	Noise (p-p) <100 kHz/ <1 MHz
532-VS-A01	457	2	0.70 ± 5%	1.0 ± 5%	1.2	4% / 5%
532-VS-A02	457	5	0.70 ± 5%	1.0 ± 5%	1.2	4% / 5%
532-VS-A03	457	10	0.70 ± 5%	1.0 ± 5%	1.2	4% / 5%
532-BS-A01	488	5	0.72 ± 5%	1.0 ± 5%	1.2	2% / 3%
532-BS-A02	488	15	0.72 ± 5%	1.0 ± 5%	1.2	2% / 3%
532-BS-A03	488	25	0.72 ± 5%	1.0 ± 5%	1.2	2% / 3%
532-BS-A04	488	50	0.72 ± 5%	1.0 ± 5%	1.2	2% / 3%
35 LAS 450	488	50	0.72 ± 5%	1.0 ± 5%	1.2	2% / 3%
532-GS-A01	514	5	0.70 ± 5%	1.1 ± 5%	1.2	3% / 5%
532-GS-A02	514	15	0.70 ± 5%	1.1 ± 5%	1.2	3% / 5%
532-GS-A03	514	25	0.70 ± 5%	1.1 ± 5%	1.2	3% / 5%
532-GS-A04	514	50	0.70 ± 5%	1.1 ± 5%	1.2	3% / 5%
35 LAS 550	514	50	0.70 ± 5%	1.1 ± 5%	1.2	3% / 5%
532-A-A01	457–514	10	0.66 ± 5%	1.1 ± 5%	1.2	4% / 6%
532-A-A02	457–514	25	0.66 ± 5%	1.1 ± 5%	1.2	4% / 6%
532-A-A03	457–514	50	0.66 ± 5%	1.1 ± 5%	1.2	4% / 6%
531-A-A04	457–514	100	0.66 ± 5%	1.1 ± 5%	1.2	4% / 6%
35 LAS 010	457–514	100	0.66 ± 5%	1.1 ± 5%	1.2	4% / 6%
532-B-A01	488	10	0.66 ± 5%	1.1 ± 5%	1.2	4% / 6%
532-B-A02	488	25	0.66 ± 5%	1.1 ± 5%	1.2	4% / 6%
532-B-A03	488	50	0.66 ± 5%	1.1 ± 5%	1.2	4% / 6%
532-B-A04	488	75	0.66 ± 5%	1.1 ± 5%	1.2	4% / 6%
532-MVS-A01	457	5	0.90 ± 5%	2.4 ± 5%	multimode	3% / 4%
532-MVS-A02	457	10	0.90 ± 5%	2.4 ± 5%	multimode	3% / 4%
532-MVS-A03	457	20	0.90 ± 5%	2.4 ± 5%	multimode	3% / 4%
532-MA-A01	457–514	25	0.94 ± 5%	2.4 ± 5%	multimode	3% / 4%
532-MA-A02	457–514	50	0.94 ± 5%	2.4 ± 5%	multimode	3% / 4%
532-MA-A03	457–514	100	0.94 ± 5%	2.4 ± 5%	multimode	3% / 4%
532-MA-A04	457–514	200	0.94 ± 5%	2.4 ± 5%	multimode	3% / 4%
532-MB-A01	488	25	1.00±5%	2.6 ± 5%	multimode	2% / 3%
532-MB-A02	488	50	1.00±5%	2.6 ± 5%	multimode	2% / 3%
532-MB-A03	488	100	1.00±5%	2.6 ± 5%	multimode	2% / 3%
532-MB-AO4	488	200	1.00±5%	2.6 ± 5%	multimode	2% / 3%
532-MBS-A01	488	25	1.30±5%	2.6 ± 5%	multimode	3% / 4%
532-MBS-A02	488	50	1.30±5%	2.6 ± 5%	multimode	3% / 4%
532-MBS-A03	488	100	1.30±5%	2.6 ± 5%	multimode	3% / 4%
532-MBS-A04	488	150	1.30±5%	2.6 ± 5%	multimode	3% / 4%
532-MGS-A01	514	10	1.00±5%	2.6 ± 5%	multimode	2% / 3%
532-MGS-A02	514	25	1.00±5%	2.6 ± 5%	multimode	2% / 3%
532-MGS-A03	514	50	1.00±5%	2.6 ± 5%	multimode	2% / 3%
532-MGS-A04	514	100	1.00±5%	2.6 ± 5%	multimode	2% / 3%

Tunable output argon-ion laser heads

Model	Wavelength (nm)	Power Min (mW)	Beam Diameter (mm)	Beam Divergence (mm)	M^2	Noise (p-p) <100 kHz/ <1 MHz
532 AP-A01	457	5	1.0 + 5%	1.0 ± 5%	1.2	6% / 10%
	465	4	1.0 + 5%	1.0 ± 5%	1.2	4% / 6%
	472	3	1.0 + 5%	1.0 ± 5%	1.2	4% / 6%
	477	7	1.0 + 5%	1.0 ± 5%	1.2	3% / 5%
	488	**20**	**1.0 + 5%**	**1.0 ± 5%**	**1.2**	**4% / 6%**
	496	6	1.0 + 5%	1.0 ± 5%	1.2	3% / 4%
	502	1	1.0 + 5%	1.0 ± 5%	1.2	5% / 7%
	514	**23**	**1.0 + 5%**	**1.0 ± 5%**	**1.2**	**4% / 6%**
	529	*	—	—	—	—
532-AP-A02 and **35 LAP 321**	457	10	1.0 + 5%	1.0 ± 5%	1.2	6% / 10%
	465	9	1.0 + 5%	1.0 ± 5%	1.2	4% / 6%
	472	8	1.0 + 5%	1.0 ± 5%	1.2	4% / 6%
	477	15	1.0 + 5%	1.0 ± 5%	1.2	3% / 5%
	488	**40**	**1.0 + 5%**	**1.0 ± 5%**	**1.2**	**4% / 6%**
	496	14	1.0 + 5%	1.0 ± 5%	1.2	3% / 4%
	502	4	1.0 + 5%	1.0 ± 5%	1.2	5% / 7%
	514	**42**	**1.0 + 5%**	**1.0 ± 5%**	**1.2**	**4% / 6%**
	529	*	—	—	—	—
532-MAP-A01	457	8	1.8 ± 5%	1.8 ± 5%	multimode	4% / 6%
	465	6	1.8 ± 5%	1.8 ± 5%	multimode	4% / 6%
	472	5	1.8 ± 5%	1.8 ± 5%	multimode	4% / 6%
	477	11	1.8 ± 5%	1.8 ± 5%	multimode	4% / 6%
	488	**30**	**1.8 ± 5%**	**1.8 ± 5%**	**multimode**	**4% / 6%**
	496	9	1.8 ± 5%	1.8 ± 5%	multimode	5% / 7%
	502	2	1.8 ± 5%	1.8 ± 5%	multimode	5% / 7%
	514	**35**	**1.8 ± 5%**	**1.8 ± 5%**	**multimode**	**4% / 6%**
	529	*	—	—	—	—
532-MAP-A02 and **35 MAP 321**	457	15	1.8 ± 5%	1.8 ± 5%	multimode	4% / 6%
	465	14	1.8 ± 5%	1.8 ± 5%	multimode	4% / 6%
	472	12	1.8 ± 5%	1.8 ± 5%	multimode	4% / 6%
	477	23	1.8 ± 5%	1.8 ± 5%	multimode	4% / 6%
	488	**60**	**1.8 ± 5%**	**1.8 ± 5%**	**multimode**	**4% / 6%**
	496	21	1.8 ± 5%	1.8 ± 5%	multimode	5% / 7%
	502	6	1.8 ± 5%	1.8 ± 5%	multimode	5% / 7%
	514	**63**	**1.8 ± 5%**	**1.8 ± 5%**	**multimode**	**4% / 6%**
	529	*	—	—	—	—

Notes:

1. *Model numbers listed in bold type denote lasers that are sold only as complete systems (laser and power supply). The remaining model numbers denote laser heads that are sold separately from the power supply. Performance characteristics for these laser heads are based on using a Melles Griot 170B-XXXB power supply.*
2. *Specifications for tunable lasers are guaranteed only for the 488-nm and 514-nm lines (in bold type). Remaining values are nominal and presented only for information. The 529-nm line may or may not be present.*

A2 Common specifications

Beam Characteristics

Mode spacing (fixed wavelength systems):	469 MHz
Mode spacing (tunable systems):	435 MHz
Polarization:	Linear (vertical ± 5%) with >250:1 extinction ratio
Pointing Stability:	< 30 μrad/°C
Power Stability:	± 0.5% over a 2-hour period

General Characteristics

Warm-up time (from cold start):	< 15 minutes
Recovery from standby mode:	1.0 msec
Cooling:	Forced Air
Operating ambient temperature:	5°C to 40°C
Storage temperature:	–30°C to 60°C
Relative humidity (operating)	0-90% noncondensing

Electrical Characteristics

Voltage (specified at time of purchase):	100, 120, 200, 208, 220, 230, or 240 Vac ± 10%
Frequency:	47–63 Hz, single phase
Current:	20 A @ 115 Vac or 10 A @ 230 Vac

Weight

Laser head:	XXX kg (XX lbs.)
Power supply:	2.72 kg (6.0 lbs.)

A3 Dimensions

Figure A-1

Dimensions of basic fixed-wavelength laser head

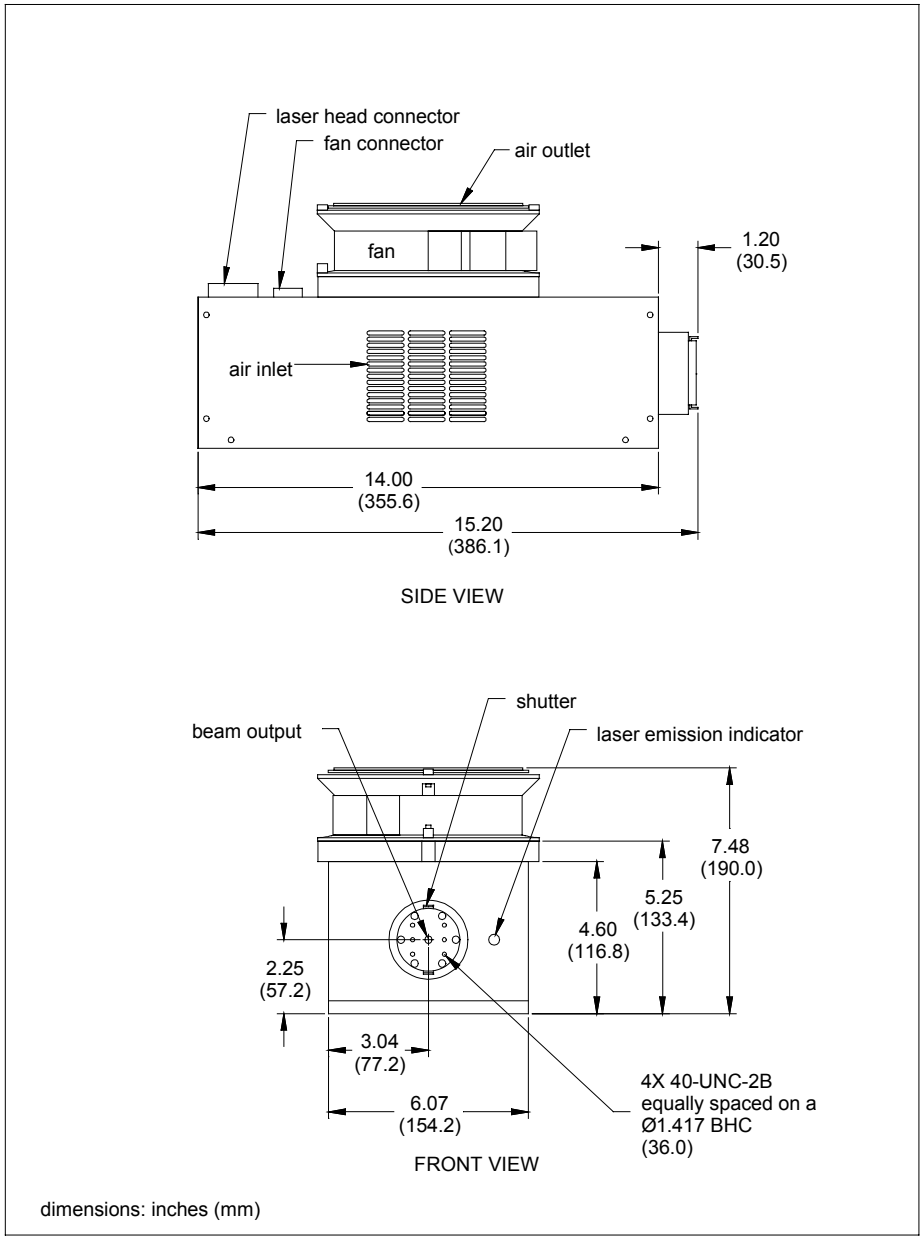


Figure A-2
Dimensions of basic tunable-wavelength laser head

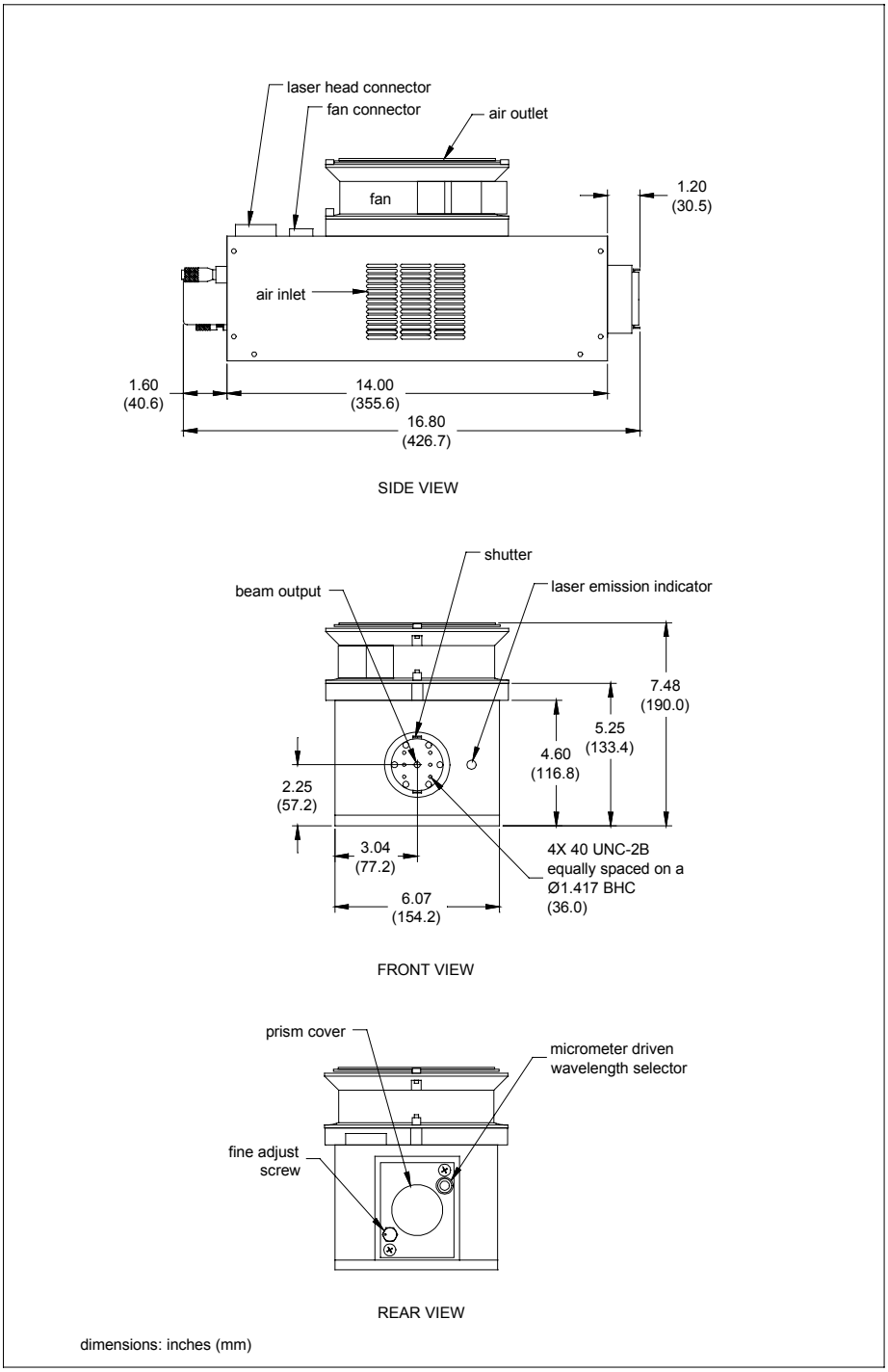


Figure A-3
Dimensions of cooling configurations

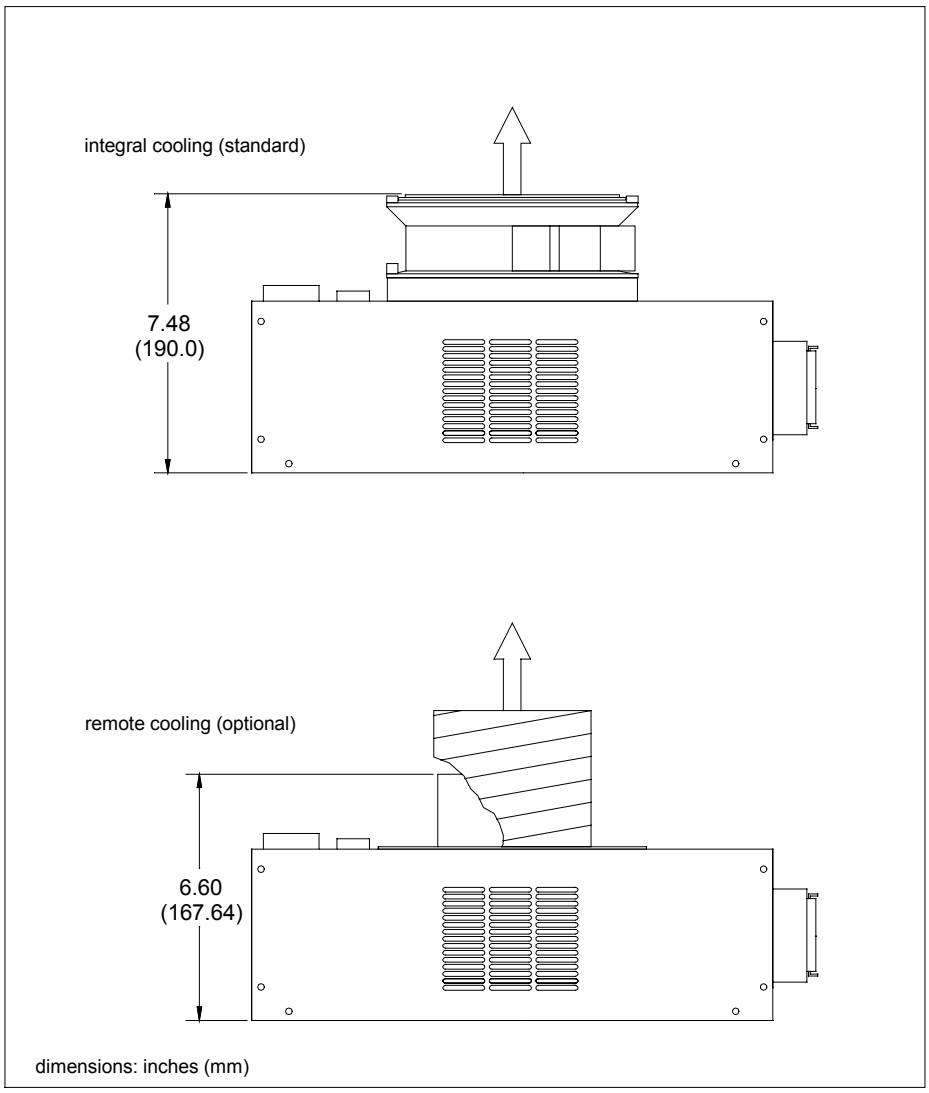
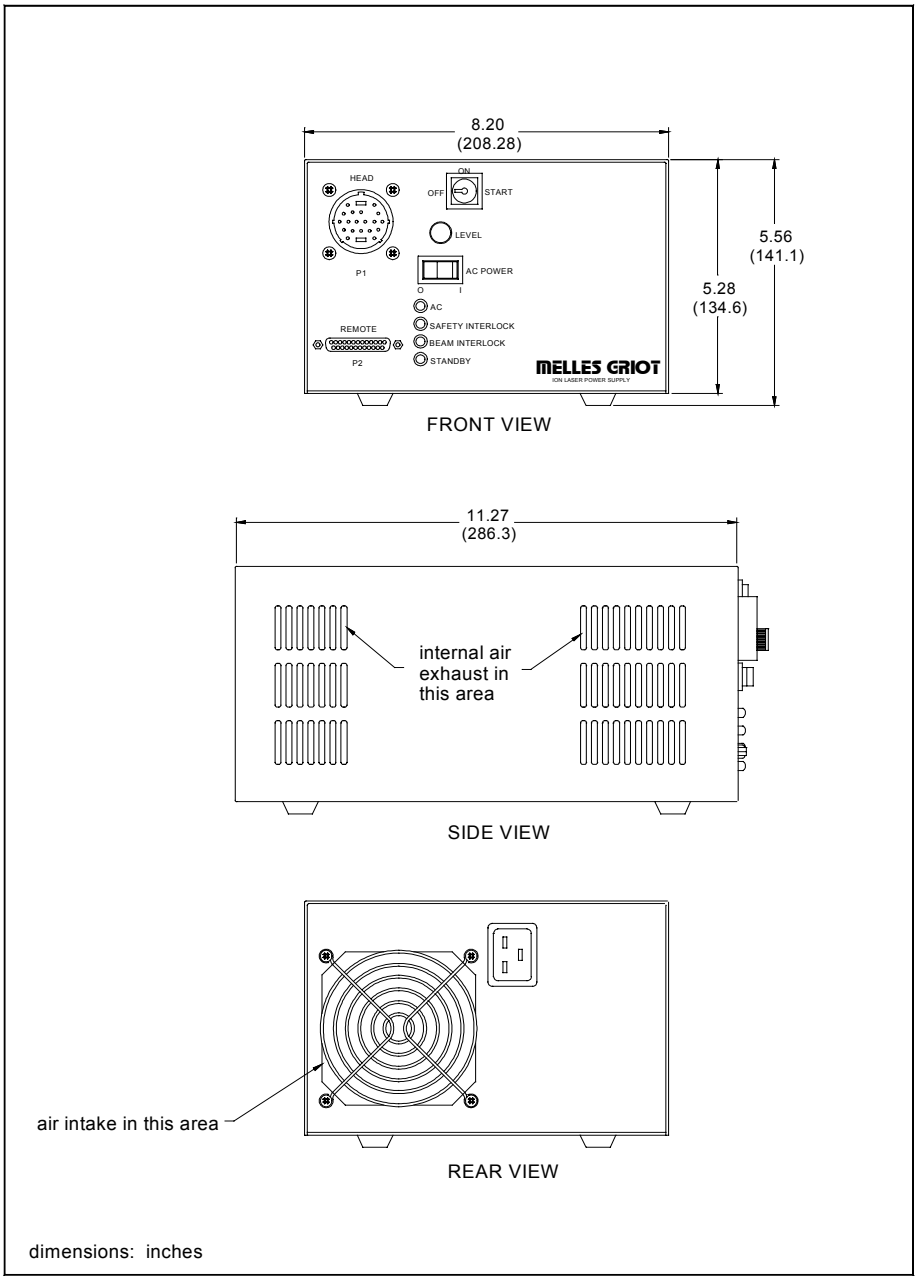


Figure A-4

Dimensions of power supply models 170 and 176



Options and Accessories

There are a variety of options and accessories available for Series 532 ion laser systems. In addition to the parametric options described in Appendix A, *Specifications*, a remote cooling option is available. Available accessories include an RS-232 interface and a remote control module. These options and accessories are discussed below.

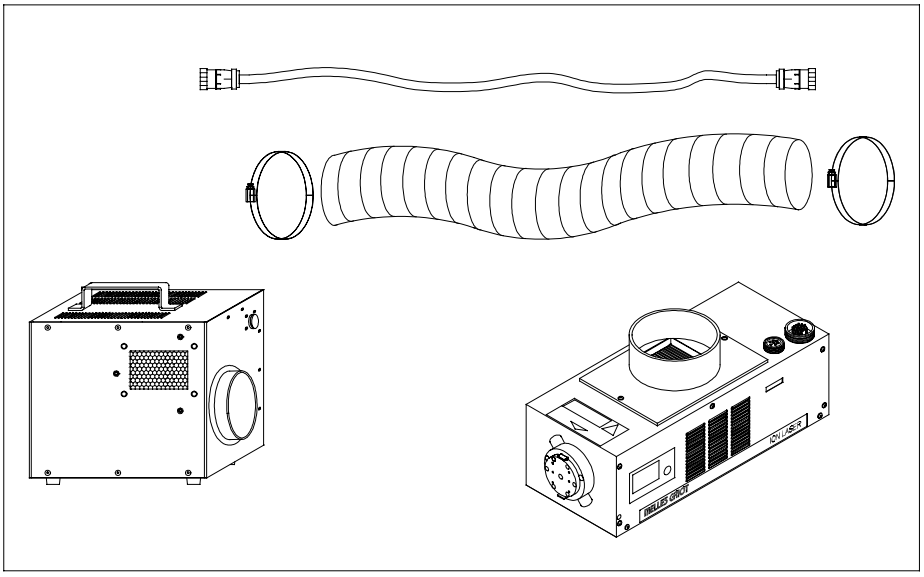
B1 Remote cooling option

The remote cooling option shown in figure B-1 comprises an air plenum attached to the laser head in place of the standard cooling fan, a flexible, 10-foot-long cooling duct, a centrifugal cooling fan mounted in a protective housing, two hose clamps, and a fan cord extension cable.

The top-exhaust plenum

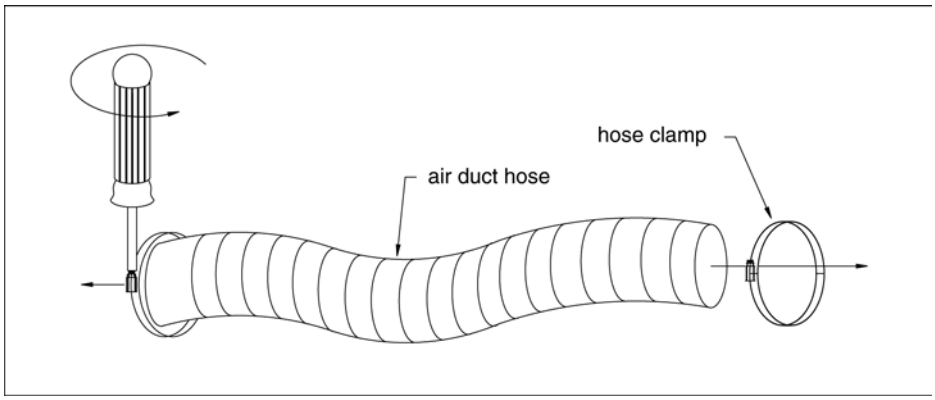
The instructions below assume that the laser head is delivered with a top-exhaust plenum already attached to the laser cover.

Figure B-1
Components of remote cooling package

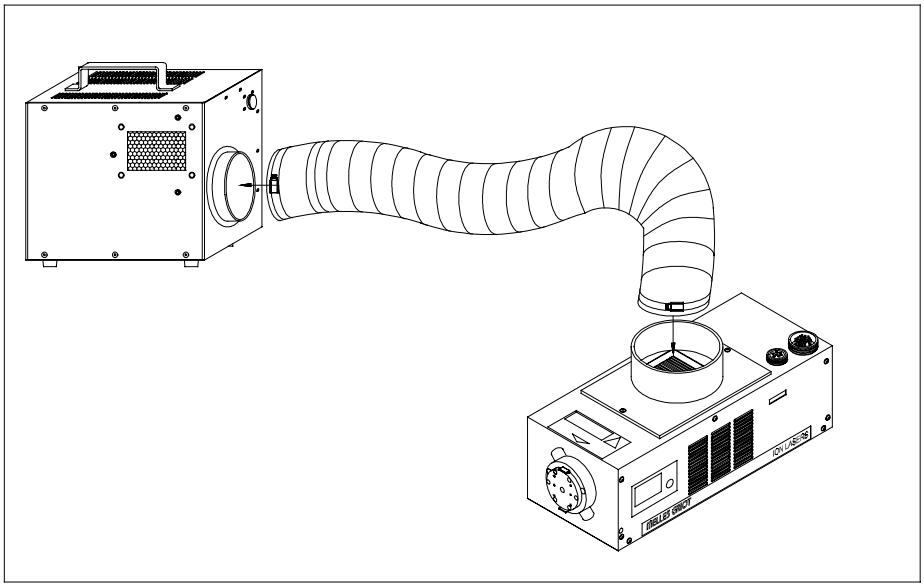


The following procedure outlines the steps needed to install the remote cooling option with a standard plenum.

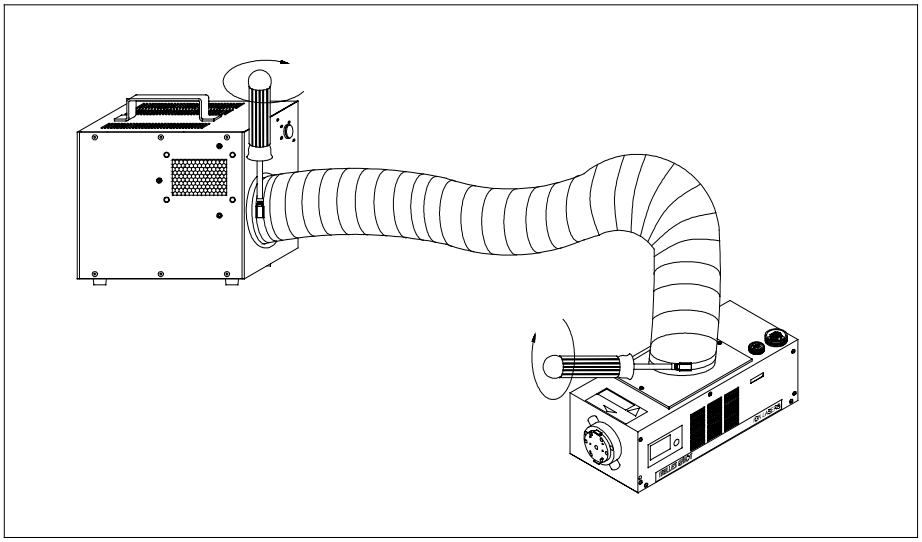
1. Open the hose clamps with a flat-bladed screwdriver and place one on each end of the air duct.



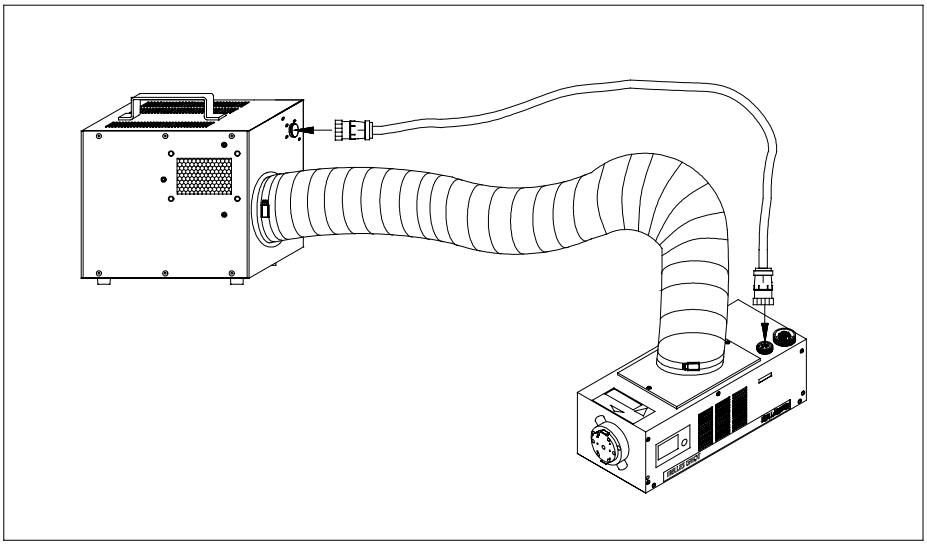
2. Mount the air duct onto the laser head and the cooling fan plenum as shown below.



3. Tighten the hose clamps



4. Connect the fan cable to the laser head and the cooling fan connector by turning the cable's connector ring clock-wise until the ring snaps in place.



B2 Remote control and monitor

The remote control and monitor unit from Melles Griot, shown in figure B-2, allows the user to control the Series 532 ion laser up to six feet away from the laser head. The unit plugs directly into the REMOTE P2 connector and provides the following controls and functions:

- Key switch for turning the laser on or off
- Mode selection—Operate or Standby
- Laser power display in milliwatts
- Current display in amperes
- Output power and current adjustment.

B3 RS-232 Interface

Figure B-3
IRC 232 Remote interface Module



The Model IRC 232 Remote Interface Module from Melles Griot provides communication between the Series 532 ion laser and an IBM PC-compatible computer through an RS232 interface. The computer may then be used to:

- Operate the laser
- Select laser on or laser standby states
- Select laser shutdown sequence
- Select and adjust the laser's optical power setting
- Select and adjust the laser's current setting.

Operating parameters are displayed while laser is in operation. Other features include:

- Output power scale factor selection
- Operating hours display (can be reset)
- User-selected, operating parameters that can be logged into a file at timed intervals
- User-defined, timed operating sequence; including on-standby-off-on continuous cycling of the laser.

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Mounting and OEM Considerations

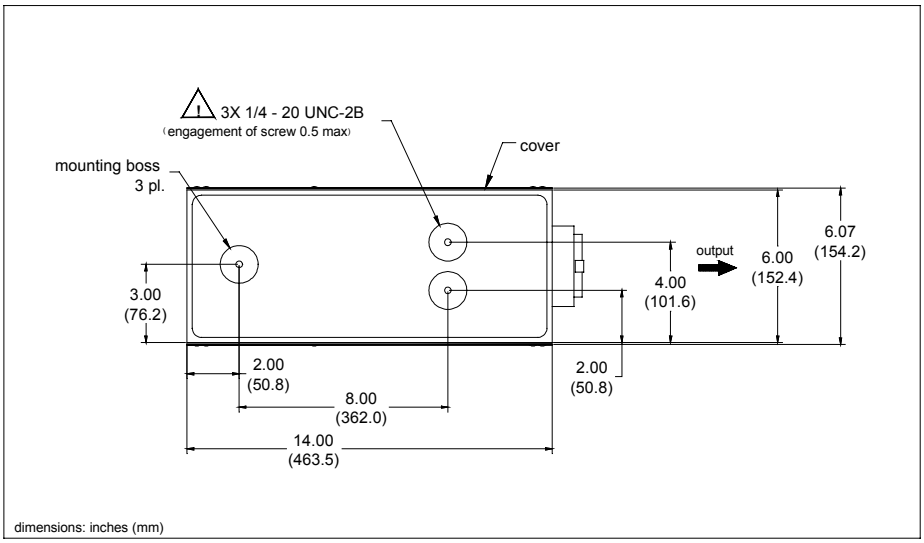
Series 532 ion laser systems can be used as stand-alone laser sources or can be incorporated into another system for resale as an OEM device. This appendix discusses some specific issues that are of importance to the OEM manufacturer.

C1 Mounting considerations

The base plate of the laser head is shown in figure C-1. Use only the designated mounting points to insure proper kinematic isolation.

Figure C-1

Base-plate mounting points for Series 532 laser head (fixed wavelength version shown)



Melles Griot ion-laser laser heads may be mounted in any orientation. Mount the laser head to a flat surface and use mounting hardware that threads no further than ⅜ inch into the base plate. Torque all screws equally to avoid stress and misalignment of the laser system.

C2 Cooling considerations

For reliable operation, Series 532 ion lasers require an adequate flow of cool air. To ensure proper air flow, there must be a minimum of ½-inch clearance between the air intake and exhaust ports and any obstructing surface. A full inch or more of clearance is preferred.

The temperature of the air entering the air intake ports must never exceed 40° Centigrade. Take care to ensure that hot air from the exhaust port is not recirculated into the air intake ports.

C3 Compliance considerations

As stand-alone systems, all 35 L(XX) and 35 M(XX) lasers, and Series 532 ion laser heads combined with a model 170, 171, or 176 power supply, meet all of the regulatory requirements for Class IIIb and Class 3B laser systems required by 21 CFR 1040.10 and IEC 825-1:1994 respectively. Once the laser is incorporated into another piece of equipment, *it becomes the responsibility of the equipment manufacturer or integrator to make sure that the overall device conforms to the applicable regulations and norms.* This includes, but is not limited to:

- Providing a protective housing that prevents human access to the laser and to collateral radiation that, during operation, exceeds the limits of Class I (Class 1), except where necessary to perform the product function. In no case should humans be exposed to radiation in excess of the applicable MPE (maximum permissible exposure) during normal operation.
- Providing safety interlock(s) at that portion of the protective housing which, when removed for operation or maintenance, would allow human access to radiation. Such interlocks shall be equipped with an approved switch (or with redundant switches). Panels that are for service access only need not be interlocked, but shall be removable only with the use of a tool. Thumb wheels, wing nuts, and slotted screws are not permissible.
- Providing an aperture label, either at or near the beam exit, that indicates where the beam exits the protective housing. An example of such a label is:

AVOID EXPOSURE

LASER RADIATION IS EMITTED FROM THIS APERTURE

- Providing housing label(s) so that all panels or covers designed to be removed during operation for maintenance are interlocked and labeled:

DANGER

LASER RADIATION WHEN OPEN AND INTERLOCK DEFEATED. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

- Providing that all covers designed to be removed for service and are not interlocked are labeled:

DANGER
LASER RADIATION WHEN OPEN. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

- Installing warning logotypes, as follows:

  For Class IIIb (Class 3B) laser systems, ensure that the proper DANGER label, appropriate to the Series 532 ion laser, has been applied outside, in the operator's unobstructed view (and where the operator is not required to be exposed to the laser beam to read it).

  For a Class I (Class 1) system, ensure that a Warning Logotype label is installed in plain sight (when the cover is open) at service personnel's eye level. If the Warning Logotype label on the Series 532 ion laser is obscured by the system configuration, an additional label should be displayed prominently for service personnel. These labels should be located inside the protective housing.

- Installing certification and identification labels as follows: name and address of manufacturer, date (spelled out), model and serial numbers, and a statement of compliance to 21 CFR Subchapter J, IEC 825-1-1994, or both. (For examples of these labels, please refer to Appendix D of this manual.)

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Compliance Information

D1 Radio-frequency emission compliance

This equipment generates, uses, and can radiate radio-frequency energy. If it is not installed and used in accordance with this manual, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, and European norms EN55011:1994, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in residential areas is likely to cause interference, in which case, the user, at his or her own expense, will be required to take whatever measures may be necessary to correct the interference.

D2 Laser safety warnings

The following labels are required by the U.S. Food and Drug Administration, Center for Devices and Radiological Health (CDRH) as well as by the international standard, IEC 825-1:1994. Figures D-1 and D-2 show the location of these labels on the Series 532 ion laser system.

Figure D-1

Warning logotypes and manufacturing labels for Series 532 laser heads



643 MODEL	POWER AND WAVELENGTH
532-A	300mW MAXIMUM AT 457 - 514nm
532-B	250mW MAXIMUM AT 457 - 514nm
532-MB	450mW MAXIMUM AT 457 - 514nm
532-BS	150mW MAXIMUM AT 457 - 514nm
532-MBS	350mW MAXIMUM AT 457 - 514nm
532-GS	150mW MAXIMUM AT 457 - 514nm
532 MGS	350mW MAXIMUM AT 457 - 514nm
532 VS	50mW MAXIMUM AT 457 - 514nm
532 MVS	100mW MAXIMUM AT 457 - 514nm
532-AP	150mW MAXIMUM AT 457 - 514nm
532 MAP	200mW MAXIMUM AT 457 - 514nm
35 LAS 450	150mW MAXIMUM AT 457 - 514nm
35 LAS 550	150mW MAXIMUM AT 457 - 514nm
35 LAS 010	200mW MAXIMUM AT 457 - 514nm
35 LAP 321	100mW MAXIMUM AT 457 - 514nm
35 MAP 321	200mW MAXIMUM AT 457 - 514nm

Figure D-2
Location of warning labels on the laser head

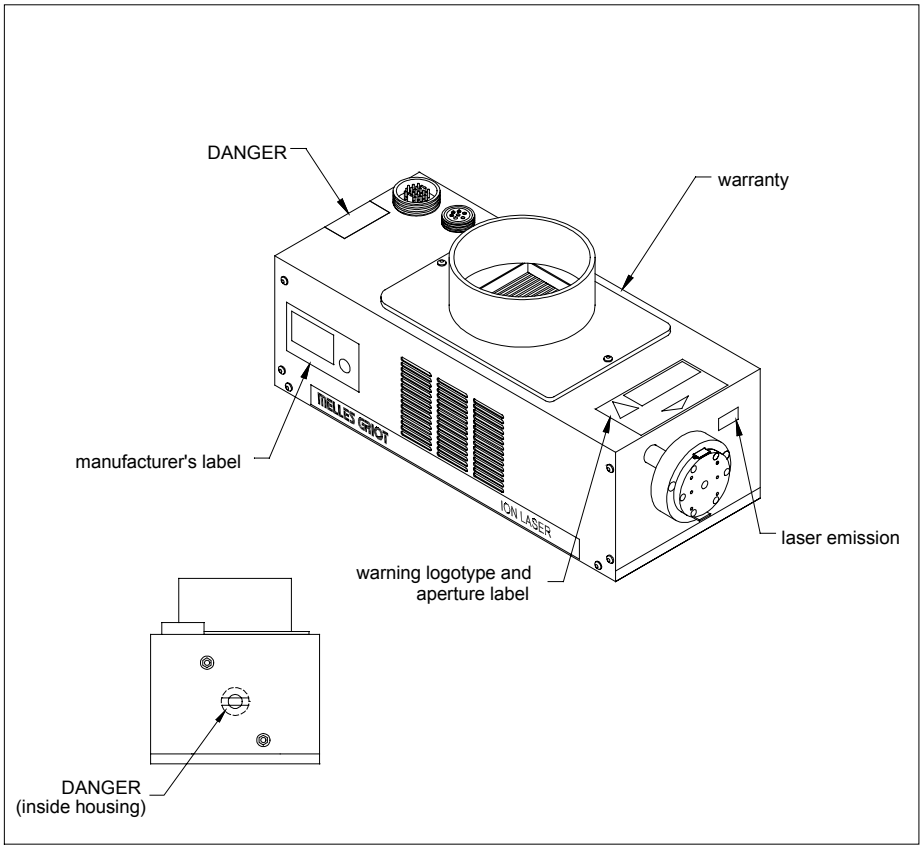
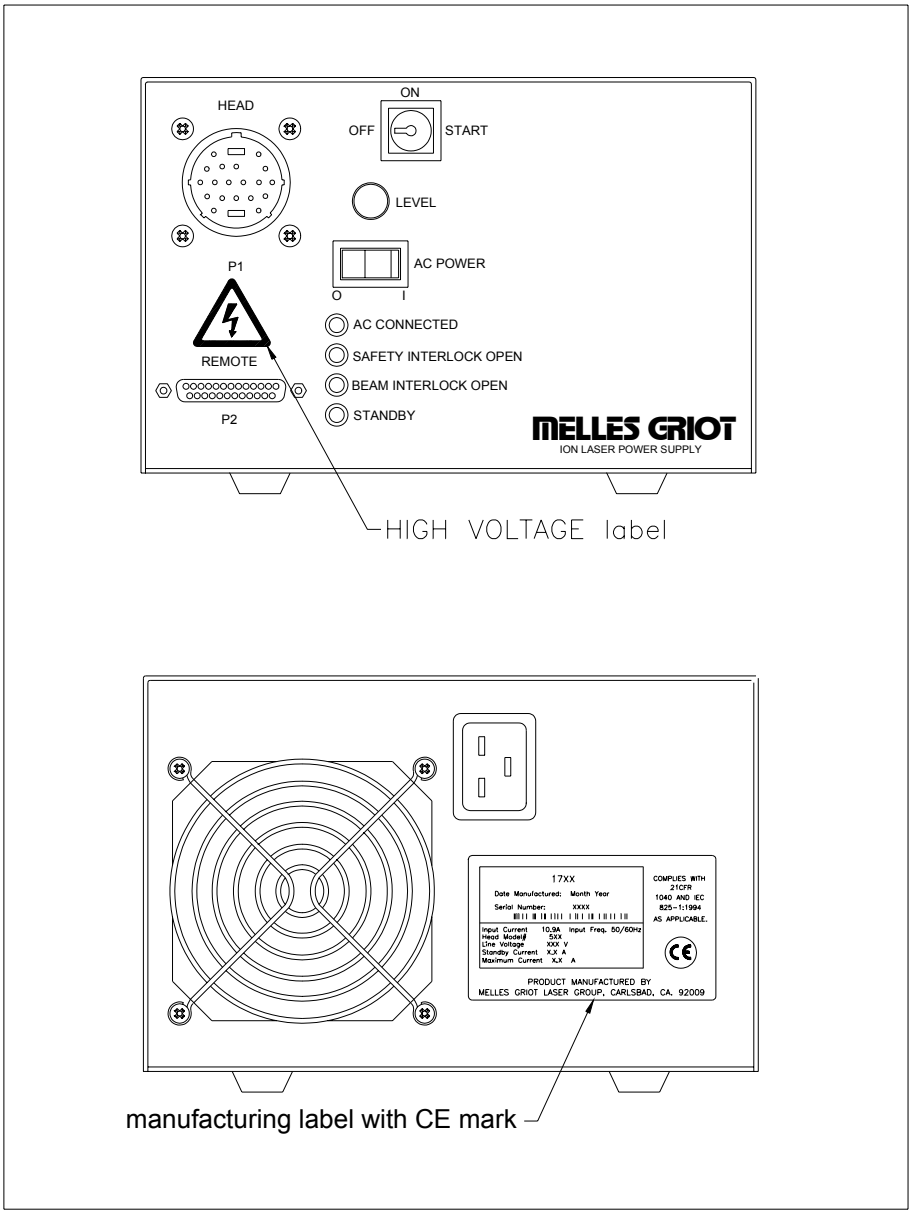


Figure D-3
Location of warning labels on the power supply



D3 Laser emissions and fusing

The following is general emission data on the Series 532 air-cooled ion lasers.

Laser medium:	Argon gas
Emission duration:	Continuous
Full beam diameter:	0.6 mm to 1.0 mm
Full beam divergence:	1.0 mrad to 5.0 mrad
Operating wavelengths:	454 nm to 529 nm
Maximum output power:	500 mW

The following fuses, located in the power supply, are to be replaced only by Melles Griot service personnel.

F101, F102: IEC127, TIAL/250V
F103, F104: 3AG Ceramic FB 20A/250V
F201: 3AG Ceramic FB 15A/250V

Service, Support, and Warranty

Series 532 ion lasers contain no user-serviceable parts but, depending upon usage rate, should give years of trouble-free service. Nonetheless, if you should experience problems, Melles Griot is committed to providing the best possible support and service

E1 Sales and service Offices

To find an authorized Melles Griot service facility near you, contact the nearest Melles Griot office, listed before, or contact the factory at (760) 438-2131.

United States of America

2051 Palomar Airport Road, 200
Carlsbad, California 92009
Phone: (800) 645-2737 (Toll Free)
(760) 438-2131
Fax: (760) 438-5208
E-mail: sales@carlsbad.mellesgriot.com

Canada

18 Antares Drive, Suite 104
Nepean, Ontario K2E 1A9
Phone: (800) 267-3497 (Toll Free)
(613) 226-5880
Fax: (613) 226-5885
E-mail: sales@canada.mellesgriot.com

Denmark

See Sweden and Denmark

France

12 Avenue Jean Bart
78960 Voisons Le Bretonneux, France
Phone: (01) 3012-0680
Fax: (01) 3060-0851
E-mail: info.france@mellesgriot.com

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Fax: (06251) 840622

E-mail: mellesgriotgmbh@csi.com

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Pine Building 3F, 3-11-2 Shibuya
Shibuya-ku, Tokyo 150
Phone: (03) 3407-3614
Fax: (03) 3486-0923
E-mail: sales@mgkk.com

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6900 AG Zevenaar
Phone: (0316) 333041
Fax: (0316) 528187
E-mail: sales_mgbv@compuserve.com

Singapore

994 Bendemeer Road #06-05
Kallang Basin Industrial Estate
Singapore 339943
Phone: 392-5368
Fax: 392-5508
E-mail: mgspore@signet.com.sg

Sweden and Denmark

Box 7071, Måttbandsvägen 12
S-187 12 Täby
Phone: (08) 630-8950
Fax: (08) 630-0745
E-mail: info.nordic@mellesgriot.com

United Kingdom

St. Thomas Place
Cambridgeshire Business Park
Ely, Cambridgeshire, England
Phone: (01353) 654500
Fax: (01353) 654555
E-mail: info.europe@mellesgriot.com

E2 Warranty

All Melles Griot 35 L(XX) and 35 M(XX) ion laser systems and Series 532 ion lasers, unless otherwise specified, are covered by the comprehensive warranty described below. Special warranty terms for OEM manufacturers may be negotiated on a case by case basis.

Basic Warranty

Melles Griot warrants the Series 532 ion laser to be free from defects in materials and workmanship, hereinafter called the "Nonconformity," for a period of twelve (12) months from date of shipment. Notwithstanding the preceding, output power and other operating parameters for argon lasers will be warranted for a maximum of 2000 operating hours. (Longer operating hour warrantees may be available to OEM customers depending upon the operating parameters of the laser in the OEM system.) These warranties do not apply to systems that Melles Griot determines, upon inspection, to have failed, or have become defective or unworkable due to abuse, mishandling, misuse, alteration (unless approved in writing by Melles Griot, negligence, improper installation, use which is not in accordance with the information and precautions described in this operator's manual, or other causes beyond the control of Melles Griot.

This warranty does not apply to any products or components not manufactured by Melles Griot.

EXCEPT FOR THE FOREGOING WARRANTY, MELLES GRIOT SPECIFICALLY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.

Buyer shall notify Melles Griot of any nonconformity during the warranty period, obtain a return authorization for the nonconforming products, and return the nonconforming products, freight prepaid, to a facility designated by Melles Griot, along with a written statement describing the nonconformity. The sole and exclusive obligation assumed by Melles Griot under this warranty is to use reasonable commercial efforts to repair, replace, or refund the purchase price for any products that are returned to Melles Griot as set forth above and which are determined, at the reasonable discretion of Melles Griot, to be nonconforming product.

Products that are repaired or replaced within the warranty period are warranted only for the remaining unexpired portion of the original warranty period. However, the warranty period does not include the time period between when Melles Griot receives the nonconforming products and when Melles Griot returns the repaired or replacement products to Buyer. Buyer agrees that the foregoing provisions constitute the sole and exclusive remedies available to Buyer for breach of warranty by Melles Griot with respect to the products.

IN NO EVENT WILL MELLES GRIOT BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO, LOSS OF ANTICIPATED PROFITS OR BENEFITS, EVEN IF MELLES GRIOT HAS BEEN INFORMED OF THE POSSIBILITY THEREOF IN ADVANCE. IN NO CASE WILL THE AGGREGATE RELIABILITY OF MELLES GRIOT BE GREATER THAN THE PURCHASE PRICE PAID BY BUYER TO MELLES GRIOT FOR THE PRODUCTS THAT ARE THE SUBJECT OF BUYER'S CLAIM.

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