

Lasiris™ Magnum II Laser

INSTRUCTION MANUAL

Version 10

*Updated: April 2008
STKR # 990-0014*

CAUTION NOTE

PLEASE READ THE ENTIRE MANUAL BEFORE ATTEMPTING TO OPERATE YOUR LASER. **OPERATING LASIRIS LASERS USING PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.**

AVOID EXPOSURE TO DIRECT OR SCATTERED RADIATION FROM THE LASER.

It is extremely important to follow laser safety rules and wear appropriate protective eyewear when working around these lasers. As a general rule, you should avoid eye or skin exposure to direct or scattered radiation from these lasers.

All laser safety-warning labels are provided on the Unit and comply with 21 CFR 1040.10 pursuant to the radiation control for the health and safety act of 1968.

All Magnum II lasers are in full compliance with the United States CDRH and the European IEC 60825-1 laser Safety Regulations.

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

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1. StockerYale's Lasiris™ Products

Your Lasiris product is the result of extensive research and development, and customer feedback. All instructions should be read prior to operating the laser to ensure its proper operation, and more importantly, to ensure the safety of its users.

From the "eye safe" design of our built-in mechanical shutter and integrated focus adjustment, to the uniform line intensity distribution, your Lasiris structured laser light generator has been developed with the end-user in mind. The Magnum II laser features high quality glass optics and a rugged housing to maximize the laser's reliability. To ensure longer lifetime, all diode lasers have undergone a burn-in period and a final quality control check before shipment.

Should you have any comments or suggestions regarding a StockerYale product or service, please do not hesitate to contact us. We can be reached at (514) 685-1005, or at 1-800-814-9552, or by fax at (514) 685-3307.

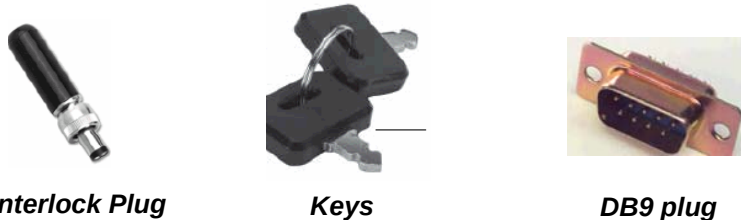
Thank you for your support!

2. Incoming Inspection

Immediately upon receipt of your product, examine the packaging material and contents for shipment damage. Report any such instance to your receiving department or shipping company.



Figure 1: Magnum II laser (side profile and back panel)



Interlock Plug

Keys

DB9 plug

Figure 2: Magnum II standard accessories included in the shipment

The shipment should contain the following items:

- One (1) laser unit (Fig. 1)
- One (1) interlock plug with shortened contacts for remote safety operation (Fig. 2).
- Two (2) keys for activating the keylock switch (Fig. 2).
- One (1) wired DB9 Plug for Modulation and Monitoring signals (Fig. 2).

If any of these items are missing, please contact your StockerYale representative immediately, or contact directly the laser division of StockerYale by calling (514) 685-1005 or 1-800-814-9552. Please have your product invoice information available.

3. Magnum II User Interface

NOTE

Any reference in this manual to the “on” and “off” positions of the *Main Switch* or *Key Switch*, refer to the corresponding I/O button in the “I” (on) and “O” (off) positions respectively.

The Magnum II high power laser line generator has two options:

- Standard – contains the laser diode, the optical assembly and the power supply in a single integrated unit
- Separate driver (SD option) – contains the laser diode and the optical assembly in one unit and the laser driver with laser cable in a separate unit

Laser Beam Panel

The laser beam aperture is located on the laser beam panel (Fig. 3) of the Magnum II. This section is the front panel of the Magnum II Standard option and the front panel of the Laser Head unit of the Separate Driver option.

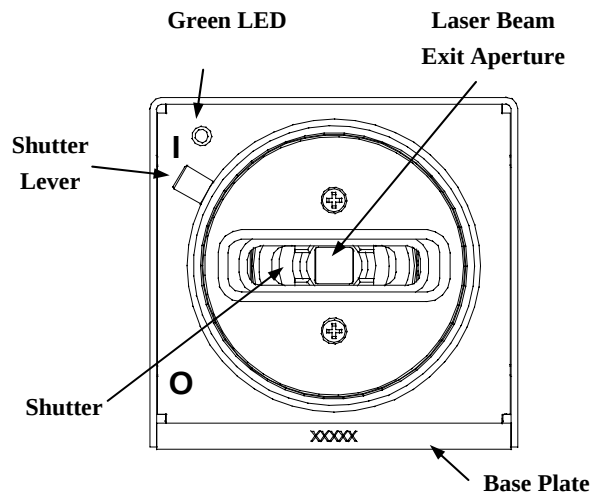


Figure 3: The laser beam exit aperture view of the Magnum II (Standard and Separate Driver options)

3.1.1 Laser Beam Output

The Magnum II generates a beam via its exit aperture (Fig. 3).

3.1.2 Shutter

The shutter should be kept closed when the laser is not in use (Fig. 3). Before turning the power ON, the shutter should be opened (shutter lever in the upper position towards “I”). Likewise, the shutter should be closed (shutter lever in the lower position towards “O”) after turning the power of the unit OFF. The shutter should only be used to shut the laser beam off in emergency situations and only for very short periods of time. The high power beam generated by the Magnum II could permanently damage the shutter if it is kept closed for more than a few seconds.

3.1.3 Green LED

When the green LED is ON, this indicates that a laser beam is being generated via the exit aperture.

3.2 Control Panel

Both Magnum II options have the same control panel (Fig. 4). It is located at the back panel of the Magnum II Standard option and the back panel of the Laser Driver unit of the Separate Driver option.

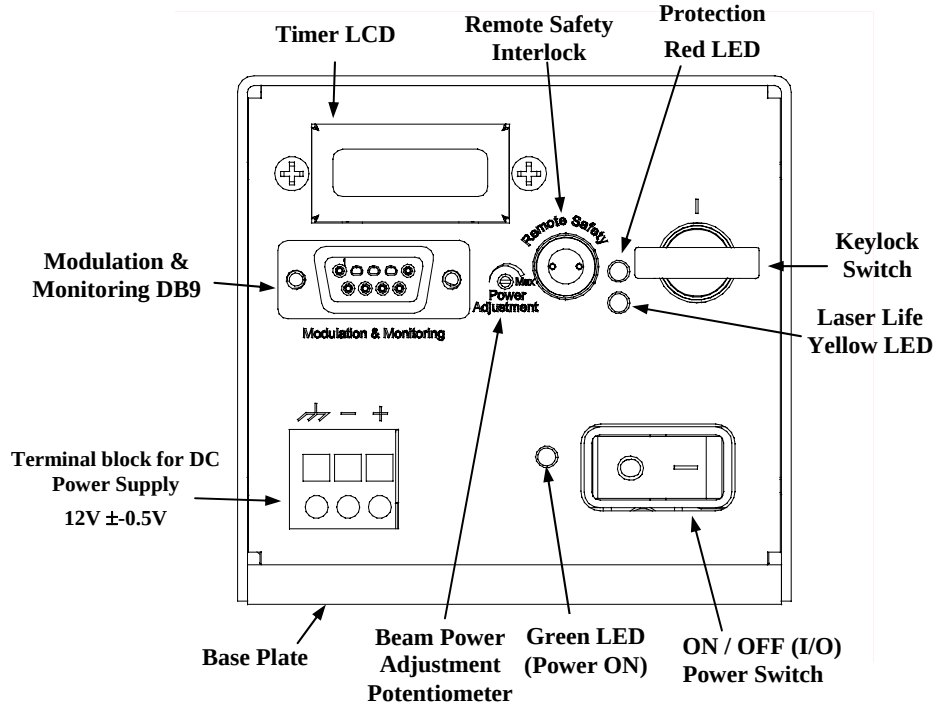


Figure 4: The control panel of the Magnum II

3.2.1 DC Power Supply Connector (Terminal Block)

The shielded cable (two 20 AWG wires + shield) of the power supply should be connected to the terminal block, taking into consideration the polarity.

The shield must be connected to the ground (earth) of the power supply.

In the absence of a strong EMI environment, the shield can be connected to the minus (-) terminal of the power supply.

3.2.2 Power Switch

Pressing the power switch towards the "I" position will turn the Magnum II ON.

3.2.3 Green Power LED

The green LED will light up when the Magnum II is ON.

3.2.4 Remote Safety Interlock Connector

The Magnum II is provided with a plug that has two pins connected together.

- If the customer does not use the remote safety function, they must not remove the interlock plug (provided by StockerYale).
- To use the remote safety interlock, the two pins of the plug must be connected to remote contacts (relay or mechanical contacts on a door, for example). Neither of these two pins should be connected to any external voltage or ground level otherwise, the laser could be easily damaged, even after disconnecting the wires.
- When the interlock plug wires are disconnected, the laser will stop lasing, the TEC circuit will continue to maintain a constant diode temperature and the red LED indicator will turn ON.

3.2.5 Keylock Switch

- If the key is removed or is in the OFF position (horizontal), the laser will stop lasing, but the TEC circuit will continue to maintain a constant diode temperature. The red LED indicator will turn ON.

3.2.6 Protection Indicator (Red LED)

There are three ways in which the protection indicator (red LED) can be activated:

- The two wires of the remote safety interlock are not connected together.
- The key is removed or is in the OFF position.
- Laser diode temperature is not within the accepted range: 20°C to 30°C for the Magnum II (Standard option).

3.2.7 Laser Diode Life Indicator (Yellow LED)

The yellow LED is used only if your laser was built to function in the standard APC control mode (Constant Power control mode). It is not used if the laser was built in the optional ACC control mode (Constant Current control mode).

After turning the unit ON, the yellow LED will remain ON until the keylock switch is turned ON and the diode temperature is stabilized within the acceptable range.

If the yellow LED is *still active* after turning the keylock switch ON, this means that the laser diode is weakening and can no longer reach its initial maximum optical output power. You may continue using the unit until the diode is close to the end of its lifetime.

3.2.8 Time Lapse Counter (Timer) LCD

The LCD displays the operating time (in hours) of the Magnum II, from the time the laser was first activated.

The internal counter records the total time (in hours) during which the Magnum II is ON.

3.2.9 Modulation and Monitoring Connector (DB9)

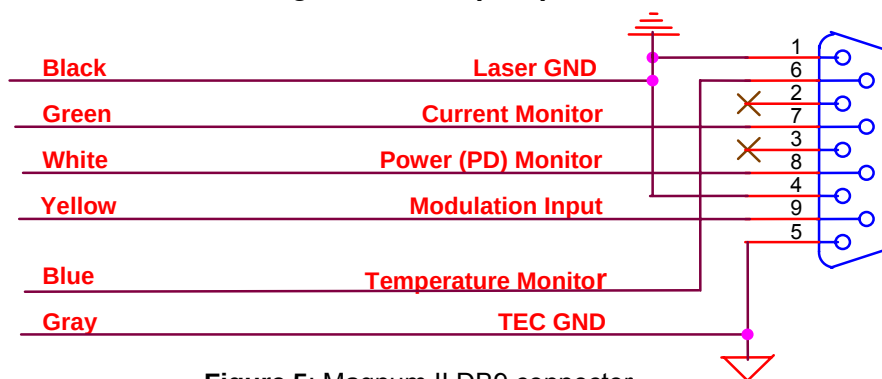


Figure 5: Magnum II DB9 connector

Magnum II users can use the DB9 plug provided by StockerYale (Fig. 2 & Fig. 5) or use their own DB9 plug. This connector is used for the modulation of the output optical power and also for monitoring the main parameters of the laser:

- **Modulation input:** The external modulation signal should be applied between pin 9 – signal, and pin 4 – ground (Fig. 5).
- **Laser current monitoring output:** The monitoring voltage of laser diode current is available between pin 7 – signal, and pin 1 – ground (Fig. 5). By default, the value in mV or Volts is approximately equal to the diode current value in mA or Amperes. However, even if the scaling factor is not accurate, the voltage is proportional to the laser current.
- **Beam power monitoring output:** The monitoring voltage of laser diode beam power is available between pin 8 – beam, and pin 1 – ground (Fig. 5). By default, the value in mV or Volts is approximately equal to the laser output power value in mW or Watts. However, even if the scaling factor is not accurate, the voltage is proportional to the current of the monitoring photodiode.
- **Laser diode temperature monitoring output:** The monitoring voltage of laser diode temperature is available between pin 6 – signal, and pin 5 – ground (Fig. 5). The temperature monitoring voltage comes from a NTC thermistor; it is not proportional to the temperature in °C (see Fig. 6 below).
- If a single ground connection is used for all monitoring signals (i.e. single ended inputs in the acquisition system), either pin 1 or pin 5 of the DB9 connector should be used. If pin 1 is selected, the current and power monitoring voltages will be accurate, whereas the temperature monitoring will be slightly inaccurate.

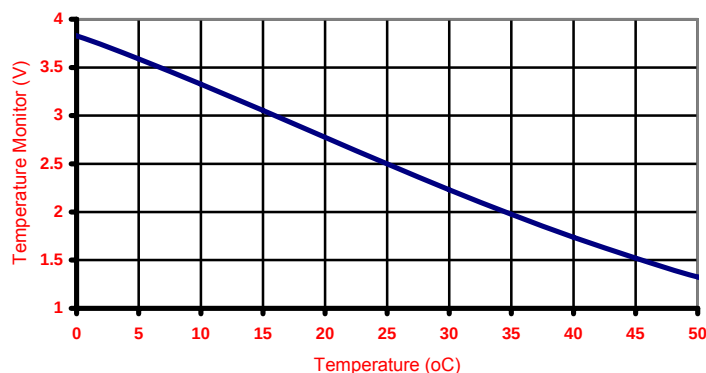


Figure 6: Temperature monitoring voltage vs. temperature

3.3 Separate Driver (SD) Option: Additional Panels

The Separate Driver option of the Magnum II has a Laser Head unit as well as a Laser Driver unit. The Laser Driver includes a laser cable with a connector permanently attached to it for connecting up to two units (Fig. 7).

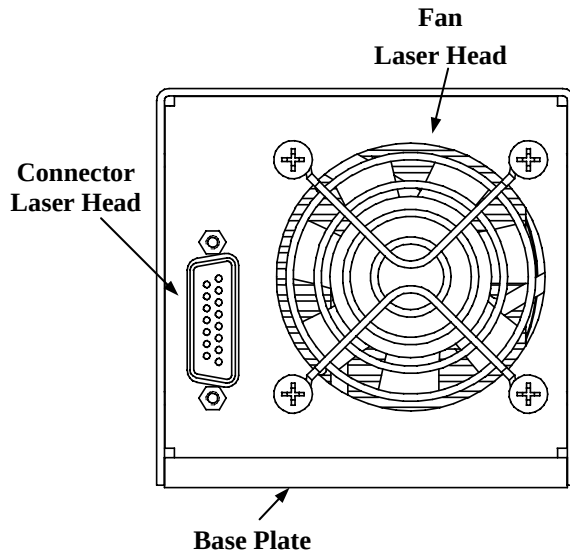


Figure 7a: Magnum II Separate Driver option (back panel of the Laser Head)

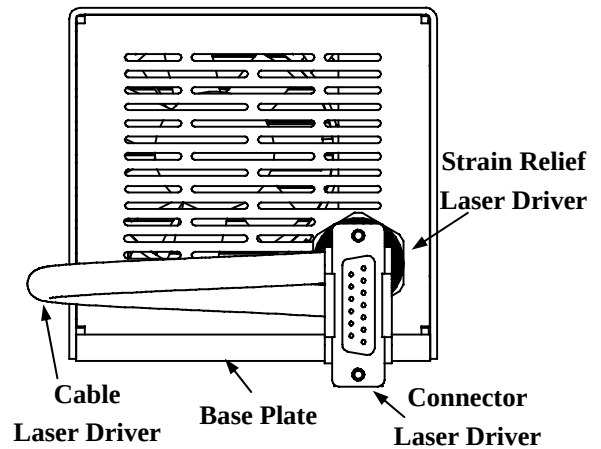


Figure 7b: Magnum II Separate Driver option (front panel of the Laser Driver)

4. Laser Operation

WARNING!

The laser light emitted by this unit may be in the Infrared area of the electromagnetic spectrum. The laser light may not be visible to the human eye. Use extreme caution at all times when laser is in use.

The output power of this laser device is high enough to cause permanent damage to the human eye. You should wear appropriate laser safety goggles at all times when the laser is operational.

Hazardous radiation exposure will result if the shutter is opened while the laser is on.

4.1 Installation

Mounting

The mounting holes of the Magnum II laser (Standard and Separate Driver options) are conveniently located beneath the laser (Fig. 8) for proper installation on to a support.

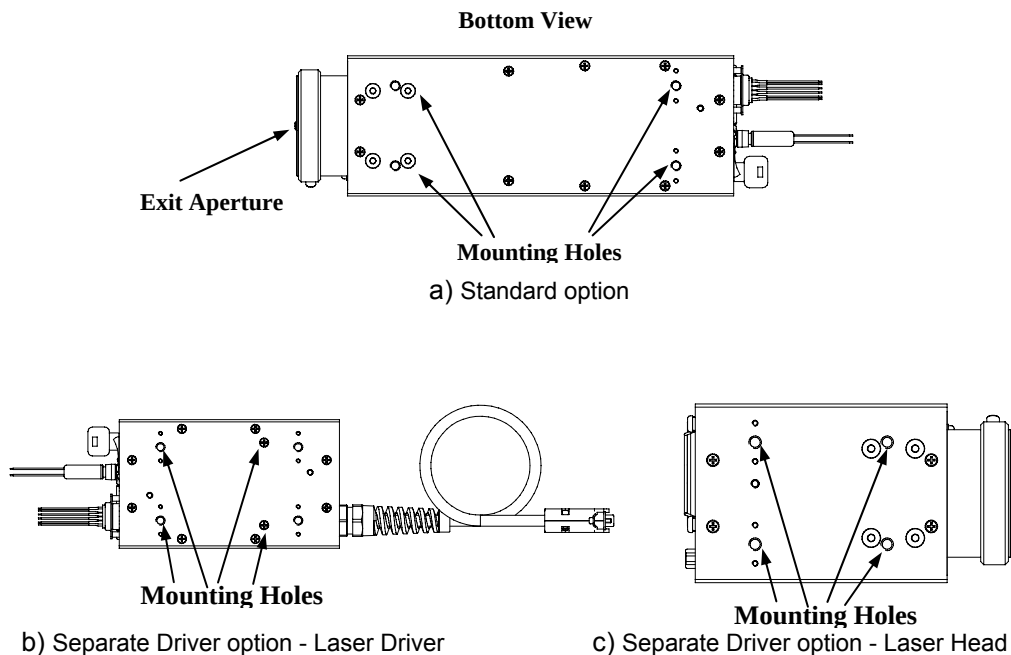


Figure 8: Magnum II mounting holes

Please ensure that the Magnum II support is made of electrically and thermally conductive materials.

It is mandatory to connect the units of Magnum II Separate Driver before switching ON the power. It is also mandatory to switch the Magnum II Separate Driver OFF before disconnecting the units. Proceeding otherwise will permanently damage the laser diode. Such damage is not covered by our warranty.

Ventilation

- The fan should not be obstructed to ensure proper ventilation of the Magnum II laser.
- Operate the laser in an environment with normal ventilation.

4.2 Power Supply Requirements

StockerYale can provide the required power supply. If the power supply is provided by the customer, please ensure that the following guidelines are followed:

The DC power supply must fulfill the requirements specified on the Magnum II datasheet (please visit our website).

- It is preferable to have the power cable shield connected to the earth of the main AC outlet, via the DC power supply.
- Ensure that the power supply is CE certified.

The laser is protected against over-voltage and a calibrated internal fuse is used to protect the Magnum II against over-current. However, it is strongly recommended to supply the unit with a 12.0 ± 0.5 VDC source at 3A minimum for lasers <2W and 6A minimum for lasers ≥ 2 W.

4.3 Operating Modes

The Magnum II laser has several modes of operation:

- **CW mode:** In this mode, the laser beam power is constant. Its value can be adjusted by the beam adjusting potentiometer located on the control panel (Fig. 4). The Magnum II with positive modulation (options –RT and –RS) requires a +5VDC signal at the modulation input to generate a continuous beam. With negative modulation (standard option –S and option –T), the modulation input must be connected to GND or left unconnected to generate a continuous beam.
- **Linear Modulation:** In this mode, the beam power depends almost linearly on the modulation voltage. The curves in Fig. 9.a briefly explain this modulation type. There are two types of linear modulation:
 - **Positive modulation:** A +5VDC voltage at the modulation input gives the maximum beam power. A 0VDC voltage on the modulation input gives no optical power (0 mW). Any voltage between 0.8V and +4.2V applied at the modulation input will generate a beam with a power level directly proportional to the voltage at the modulation input.
 - **Negative modulation:** A 0VDC voltage at the modulation input gives the maximum beam power. A +5VDC voltage at the modulation input gives no optical output power (0 mW). Any voltage between 0.8V and +4.2V applied at the modulation input will generate a beam with a power level inversely proportional to the voltage at the modulation input.
- **TTL Modulation:** In this mode, the beam power is controlled by a TTL signal at the modulation input. The optical output power can be either 0mW or the maximum. TTL

modulation can also be either positive or negative. The curves in Fig. 9.b explain this modulation type.

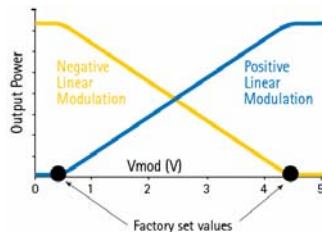


Figure 9a: Linear modulation

Standard Option -S
Option -RS

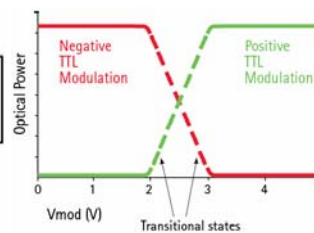


Figure 9b: TTL modulation

Option -T
Option -RT

4.4 Turning the Unit ON

WARNING!

The modulation signal cannot be used as a safety feature.

A potential danger may occur if an external voltage is used to switch the laser beam from the modulation BNC port (In standard lasers: 5V to turn the laser OFF and 0V or floating to turn the laser ON). As indicated in this manual, laser energy can be emitted only if the main power switch and the key switch are both ON and the remote control connector is shorted. The potential problem occurs only if the BNC signal is in the OFF position when the laser beam is powered ON. As a result, a single flash of laser energy may be emitted (milliseconds duration) a few seconds after the last item in the turn-on sequence is activated.

Note: main power switch, key switch, and the remote control connector each operate properly to prevent all access to laser energy when in the ON position. It is only when these items are activated and the modulation BNC port is turned OFF that this extra pulse might be emitted.

Do not place any flammable objects directly in front of the free, non-extended beam (without the line generating optics). The high power beam could cause objects to ignite.

The shutter must be open in order to emit a laser beam onto your target.

Once the laser is properly connected to the power supply, follow the instructions to operate it:

- The Interlock Plug (provided by StockerYale or by the customer) should be inserted and the key must be in the keylock switch (OFF position).
- Turn the power supply ON.
- Turn the power switch of the unit ON.
- The power LED (green) on the rear panel will light up.
- The protection LED (red) on the rear panel will light up.
- The life LED (yellow) on the rear panel will light up (APC mode lasers only).

CW Operating Mode

- Magnum II lasers with positive modulation (reverse synchro) require +5VDC voltage at the modulation input (pins 9 and 1 of the DB9 connector).

- Magnum II lasers with negative modulation (direct synchro) emit light if the modulation wire is or is not connected to the ground slot.
- Turn the Keylock Switch ON (vertical position) and wait for a few seconds.
- The protection LED indicator (red) will turn OFF and the laser will turn ON.
The red LED can stay ON and the laser can stay OFF for a few seconds until the TEC stabilizes the diode temperature to the set point (25°C in standard lasers).
- The laser diode life LED indicator (yellow) will turn OFF. However if it stays ON (meaning that the laser diode has weakened and is nearing depletion), the laser will still work until the laser diode is fully consumed.
- The green LED on the front panel will light up if the unit emits a laser beam.

Modulation mode

Apply the modulation signal between pins 9 (signal) and 1 (GND) of the DB9 connector on the control panel:

- For the linear modulation option, the signal can be either analog or pulsed and can have any value within the 0V to 5V range.
- For the TTL modulation units, the signal must have TTL type voltage levels (0V or 5V).
- For the positive modulation option, a 0V signal will produce 0 mW of laser output (no beam), while a 5V signal will produce the maximum output power.
- For the negative modulation option, a 0V signal will produce the maximum output power, while a 5V signal will produce 0 mW of laser output (no beam).

4.5 Maximum Output Power Adjustment

You can adjust the maximum output power level of your Magnum II laser. The limit has been set to its maximum value at the factory. If you would like to decrease this value, simply use a flat screwdriver to reduce the upper limit of the output power by turning the power adjustment potentiometer counterclockwise (Fig. 4). To return the power to its original setting, simply turn the potentiometer clockwise until it clicks. Note: you can not increase the output power above the factory-set limit.

4.6 Operating Environment

The Magnum II laser is suitable for indoor and outdoor use and operates normally when the following environmental conditions are met:

- Altitudes of up to 2000 m;
- Temperature range: from –35°C to +45°C for most models;
- For temperatures up to 31°C, the maximum relative humidity (RH) could be up to 80%. Above 31°C, the accepted RH decreases linearly from 80% to 50% (at 40°C).

Magnum II lasers contain a built-in heat sink and a thermoelectric cooler to minimize the heat build-up. Should the laser become too hot, the unit is designed to temporarily shut down. Full laser operation will resume only once the laser returns within normal operating temperature range. This feature is intended to provide the longest lifetime and highest reliability.

The laser support should have good thermal conductive properties in order to efficiently dissipate the heat generated by the laser.

The fan should not be obstructed to allow proper ventilation. In addition, it is suggested that you operate the laser in an environment in which there is normal aeration.

All Lasiris lasers are designed with ESD protection. However, prolonged or repeated exposure to electrostatic charges should be avoided.

A series of tests determined that the Magnum II laser belongs to Category II with respect to *over-voltage*, and Degree 2 with respect to *pollution*.

5. Servicing the Magnum II Laser

As a general rule, please use caution around all laser products. Lasers are extremely bright light sources, some invisible to the eye. Never point a laser beam into your, or any other person's eyes; permanent damage to the retina can occur!

W A R N I N G! Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure and will void the product warranty. Magnum II lasers fall in the CRDH class IIIb or class IV category depending on output power, wavelength and fan angle. These structured light devices meet this certification only as fully assembled units. Please use extreme caution when performing the servicing work. Never look directly into the laser beam. StockerYale will not be held liable for any injuries caused by product misuse.

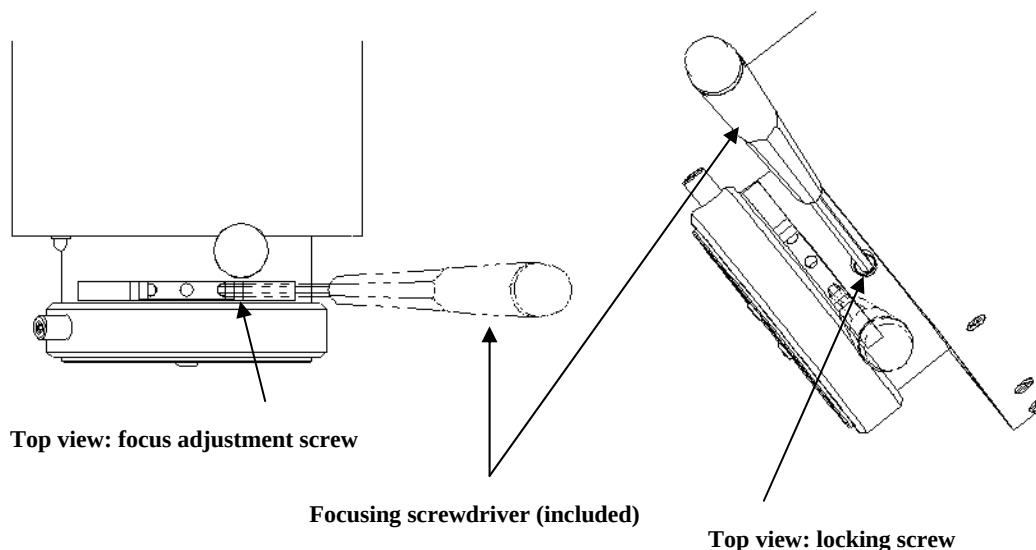
Each Magnum II laser is a self-contained unit. As such, the only necessary service and maintenance steps are as follows:

5.1 Optics and Focusing

At long ranges, high power laser diodes can sometimes produce beam profiles that are far from Gaussian in shape. As a result, the beam can sometimes exhibit an "M" shaped longitudinal profile with a large gap. In such cases, it is difficult to extend the beam into a very uniform line. At StockerYale, we match each diode with a custom-made Powell lens to optimize the line uniformity.

Lasiris Magnum II lasers include a built-in focus adjustment mechanism. To change the focus at a specified working distance, follow these instructions:

- 1- Loosen the **locking screw**. This will release the pressure on the focusing optics, allowing the collimator to be moved.
- 2- Turn the **focus adjustment screw** clockwise or counter clockwise to obtain the desired focus at your working distance.
- 3- Re-tighten the **locking screw**. Do not over-tighten.
- 4- Your image should now keep the focus at the required target distance.



NB: Obtaining the smallest possible focus requires specialized equipment to monitor the line thickness during adjustment. It is not possible to adjust the best focus without proper equipment. At StockerYale, our qualified personnel use state-of-the-art beam analysis equipment to focus the beam to your specifications.

5.2 Cleaning the Optics of your laser

If the laser pattern becomes fuzzy or unclear, please check the following:

- Verify if the optical components have been contaminated.
 - o Turn the unit OFF.
 - o Keep the shutter open.
 - o Direct a visible light beam towards the exit aperture of the unit at a non-normal incidence. A flashlight with a narrow spot could be used as a light source.
 - o Look at the exit optical surface; dust particles or any other contaminants are easily visible.
 - o If the optical components have become contaminated, the best option is to try to remove visible contamination by blowing dry air across the exit surface. Make sure that the air product is oil-, moisture-, and contaminant-free.
 - o If blowing air fails to remove the contaminants, gently wipe the glass surface with an optical-grade swab lightly saturated with isopropyl alcohol. The swab should be moved in one direction only, preferably from top to bottom. Never swipe it back in the opposite direction. **Please perform this type of cleaning only after non-contact methods have failed.**
- Check if the image is properly focused (if not, please follow the focusing instructions in section 5.1).

6. Safety

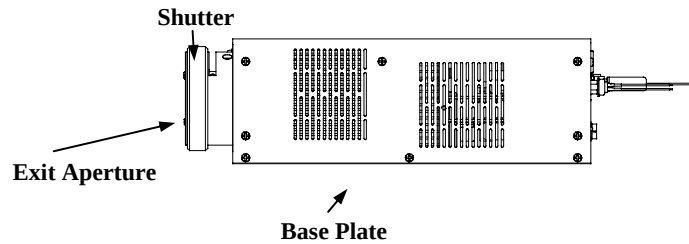


Figure 10: Magnum II – side view

WARNING!

The laser light generated by this unit may be in the infrared region of the electromagnetic spectrum, hence it may not be visible by the human eye. Use extreme caution when laser is in use at all times.

The output power of this laser device is high enough to cause permanent damage to the human eye. You should wear appropriate laser safety goggles at all times, especially when the laser is generating a beam.

Hazardous radiation exposure might result if the shutter is opened while the laser is on.

6.1 Classification

Lasers are classified according to the output power and the wavelength of a laser beam in a particular setup, according to the United States Center for Devices & Radiological Health (CDRH) - document 21 CFR 1040.10. The International Electrotechnical Commission (IEC) has a similar document: 60825-1, 2nd edition, 2007-03. The protocol for classification described herein is a general outline of the procedures. In actual practice, the settings can differ depending on the laser. Call us for details at 1-800-814-9552 or at (514) 685-1005 during regular business hours, between 09:00 a.m. and 17:00 EST.

The longitudinal profile of the laser beam is verified in the factory using a specialized instrument. The laser beam (either as a raw beam or as a modified beam) is aimed onto a 7 mm aperture located at the appropriate distance away from the laser. A photo-detector is placed just behind the aperture and sends its electrical signals to a computer-monitored equipment that records the *highest* output power level of the laser beam. In the case of a line laser, the entire line is scanned to find the highest output power.

With conventional Gaussian line generators, it is generally the hot central spot that causes its safety rating to go up one class (e.g., from CDRH Class II to IIIa). Our patented optics produce a line of uniform intensity that does not have a hot spot at the center. Therefore, a Lasiris non-Gaussian laser line can offer a safer level of exposure, in addition to more light and uniform illumination transmitted towards the object.

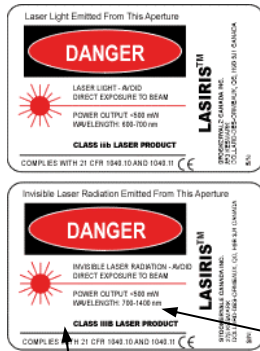
Magnum II lasers are tested prior to shipping to determine which class they belong to, and to provide CDRH and IEC classification. Please consult us, or CDRH regulation 21 CFR 1040.10 and IEC standard 60825-1, 2nd edition, 2007-03 to understand the conditions required to classify a Lasiris laser. The safety labels are affixed on top of the laser, close to the aperture.

6.2 CDRH Classification

Our Magnum II lasers can comply with CDRH classification and fall within different safety classes depending on output power, wavelength and fan angle. According to CDRH 21CFR1040.10 regulations, they can be classified either as Class IIIB or as Class IV devices.

Warning / ID / Aperture Labels

Statement indicating that the laser light is emitted from the aperture.
Warning statement follows.



Class IIIB - "Danger"

- Visible laser light between 5.0 and 500 mW –
- Invisible laser light less than 500 mW -

High-power visible lasers and infrared (IR) lasers. Considered dangerous to the human retina if exposed. This includes looking directly into a reflection from a specular (mirror-like) surface. Normally, Class IIIB lasers will not produce a hazardous diffuse reflection. At higher levels of the class, these lasers can produce skin hazards. Compliance is given on lasers that have a keylock box and remote interlock (both integrated also in the Magnum II). It is important to follow laser safety rules and wear appropriate protective eyewear when working around these lasers.

CDRH laser class is located here.

Statement confirming whether or not the laser product is CDRH compliant. These items are printed on the bottom of all of our stickers.

Power output and wavelength details are located here.

Trademark, date, company address, serial number, and electronic option code are printed on the right side of all of our stickers.

Class IV - "Danger"

- Visible and invisible laser light between 500 mW and 5 W -

These lasers or laser systems produce a hazard not only from direct or specular reflections, but may also produce hazardous diffuse reflections. Such lasers might produce significant skin hazards as well as fire hazards. It is important to follow laser safety rules and wear appropriate protective eyewear when working around these lasers.

StockerYale and the United States Department of the Food & Drug Administration (CDRH) have jointly developed several safety features for the proper use of our laser products.



6.3 IEC Classification

Our Magnum II lasers can comply with IEC regulation (please mention it at the time of order if it is required) and fall within different safety classes depending on the output power, wavelength and fan angle. According to IEC 60825-1 regulations, they can be classified as Class 3B or Class 4.

Warning / ID / Aperture Labels

IEC laser class and statement confirming that the user should avoid exposure to beam.



Class 3B

Considered dangerous to your retina if exposed, including exposure when looking directly into a reflection from a specular (mirror-like) surface. Normally, lasers from this class will not produce a hazardous diffuse reflection. At higher levels of this class, these lasers can be skin hazards. It is important to follow laser safety rules and **wear appropriate protective eyewear** when working around these lasers.

Class 4

Identified as the highest class of laser radiation according to IEC. Radiation within this class is very dangerous, and viewing of the diffuse reflection might be unsafe. The beams of class 4 lasers are capable of setting fire to materials onto which they are projected. It is important to follow laser safety rules and **wear appropriate protective eyewear** when working around these lasers.

6.4 Compliance Requirements

Compliance is obtained once the laser meets the criteria established by the CDRH or the IEC. Although Lasiris lasers come standard with CDRH classification, some custom-made lasers may not include the safety features required by the class. However, our lasers are always classified into a safety class, i.e., CDRH Class IIIb or IV, and IEC Class 3B or 4, regardless of compliance qualification. **Lasers do not need to include all the required safety features unless the end-user requires it to do so. It is the responsibility of the manufacturer of the system using on OEM product to make sure that its system includes all the required safety features to comply with CDRH regulations. Please mention it at the time of placing an order.**

CDRH Requirements	IEC Requirements
Class IIIb 1. Laser radiation emission indicator (LED turning on when the laser is powered) 2. Beam attenuator (a shutter) 3. Warning/ID/Aperture label affixed (sticker on the laser with all the required information) 4. Instruction manual 5. Removable Keylock-actuated master control preventing lasing when removed 6. Remote Interlock connector that prevents lasing when removed 7. Laser radiation emission indicator that turns on prior to lasing (LED that lights up 5-10 seconds before the laser lights up) 8. On/Off Switch Class IV 1. All items mentioned for Class IIIb above 2. Manual reset mechanism	Class 3B and 4 1. Laser radiation emission indicator (audible signal or LED turning on when the laser is powered) 2. Beam attenuator (a permanently attached shutter, beam stop or switch) 3. Warning/ID/Aperture label affixed (sticker on the laser with all the required information) 4. Instruction manual 5. Removable Keylock-actuated master control preventing lasing when removed 6. Remote Interlock connector that prevents lasing above Class 1M or 2M when removed 7. Manual reset mechanism for class 4

6.5 Protecting Devices

There are three protecting devices for your Magnum II laser:

1. Shutter: The protective mechanism at the front of the optical head can be used as a beam blocker if the laser is left ON (Fig. 1).
2. Keylock Switch (Manual Reset)
 - If the key is removed or if it is in the OFF position (horizontal), no laser beam will be emitted from the device, but the TEC circuit will continue to maintain a constant diode temperature.
 - If the key is in the ON position (vertical), the interlock connector is inserted or its contacts are shortened, and the unit is ON, a laser beam will be emitted from the device.
3. Remote Safety Interlock connector

The Interlock connector is located on the back panel of the Magnum II. The unit will not generate a beam until the contacts of the interlock connector are shortened. This means that the Interlock connector could be used two ways:

 - **For General Use:** Simply insert the interlock plug supplied with the unit into the interlock connector for normal laser operation. The beam will automatically shut off if the interlock plug is not in the interlock connector.
 - **For Interlock System:** When the interlock circuit is opened, the laser beam will automatically shut off. This feature could be used in a laboratory environment, when the contacts are connected to the pins of a door contact switch. The laser will shut off when the door is opened.

7. Product Warranty and Repair

7.1 Product Warranty

The Magnum II laser is guaranteed to be free from material & manufacturing defects for a period **one (1) year** from the date of shipment, except for the laser diode that is covered for a period of **six months**. Should a product fail during this period, StockerYale will, at its discretion, repair or replace the damaged unit. Repaired or replacement units will be covered for the remainder of the original equipment warranty period. The warranty does not apply to the units examined by StockerYale that are found to have failed due to abuse, acts of God, mishandling, alteration, improper installation or negligence.

7.2 Product Repair

Each Lasiris laser has been designed to exhibit proper mechanical and temperature stability. As such, no user serviceable parts are located inside the laser. **Please do not attempt to take apart the assembly. Any such action will void the product warranty.**

In the event that you should experience a product failure, please contact the factory at 1-800-814-9552 or at (514) 685-1005 during regular business hours, between 09:00 a.m. and 17:00 EST for a Return Material Authorization number (**RMA** number). This number is necessary to track your product repair accurately and efficiently. Once you have been issued an RMA number, please make sure this number appears on any packing material sent with the laser. Also, make sure that the RMA number is clearly written on the outer side of your shipping container.

There are three steps to take when you return a unit for repair:

1. Obtain a Return Merchandise Authorization number (RMA #).
2. Fill in the RMA card (found on next page).
3. Pack the unit properly and ship the unit to the correct address:

StockerYale Canada
275 Kesmark
Montreal, Quebec
H9B 3J1
CANADA

IMPORTANT: Please note that all parcels originating from outside of Canada must include a declaration for customs with the following information:

- Full description of contents
- Quantity
- Unit Price (original value)
- Total Value
- The following statement: *"Goods of Canadian Origin being returned for repair; value for custom purpose only".*

The Return Merchandise Authorization Card can be found on the following page.

8. Return Merchandise Authorization (RMA) card

Ship to:

StockerYale Canada Inc.
275 Kesmark
Montreal, Quebec
Canada H9B 3J1

Type of Unit returned: ☐ Lasers ☐ Phase Masks ☐ Diffracting Optics ☐ Other

Serial # _____

REPORTED MALFUNCTION: _____

FROM: _____

ADDRESS: _____

CITY / STATE: _____ ZIP: _____

RMA #

Please cut on dotted line and affix to package

IMPORTANT: Please note that all parcels originating from outside of Canada must include a declaration for customs with the following information:

- Full description of contents
- Quantity
- Unit Price (original value)
- Total Value
- And the following statement: **Goods of Canadian Origin being returned for repair; value for custom purposes only**

9. Appendix A – Magnum II Specifications

FOR TECHNICAL SPECIFICATIONS AND MECHANICAL DIAGRAMS, PLEASE VISIT OUR WEBSITE FOR THE MOST UP-TO-DATE MAGNUM II DATASHEET:

<http://www.stockeryale.com/lasers/>

Optical & Environmental specifications

- Power: 250 mW to 4 W
- Wavelength: 680 nm, 810 nm, custom
- Intensity distribution: Uniform (non-Gaussian) lengthwise, Gaussian widthwise
- Standard Fan angles: 10°, 15°, 20°, 30°, 40°, 45°, 55°, 60°, 75° (10° and 15° not available on 4 W models)
- Line thickness (focus): User adjustable
- Bore sighting: <3 mrad (collimated)
- Wavelength drift: Maximum ± 1 nm over entire operating temperature range
- Operating temperature: -35°C to +45°C for most models
- Storage temperature: -40°C to +60°C

Electrical specifications

- Power supply voltage: 12 VDC ± 1 VDC; An adapter is available to supply the unit from 110/240 VAC line
- Power supply current: 3 A to 6 A depending on laser power
- Built-in protections: Entire product: ESD, over-voltage up to 35V, reverse polarity of power supply. Laser diode: over-heating, over-current
- Laser diode operating temperature: 25° C $\pm 0.1^\circ$ C (adjusted in factory)
- Max. beam power: User adjustable (trim potentiometer on the back panel)
- Beam modulation: External, through a DB-9 connector on the back panel

Linear modulation

- Option S: Signal: DC to 10 KHz pulsed signal, linear for amplitude 0.8 V to 4.5 V. Option: modulation slope adjusted in factory (see *Modulation Graphs*).
- High speed: 100 KHz frequency (code "100K")

TTL modulation

- Option T: TTL voltage compatible signals; rise / fall times < 10 μ s; 10 KHz maximum frequency
- High Speed: Same as option T, but with 100 KHz frequency (code "100K")