Laserglow Technologies

Instruction Manual

LCS-0532 Low-Cost DPSS Laser System

Laserglow Part Number: C53100XSX

Summarized Product Description

LCS-0532-TSD-00100-10 Standard
532nm Low-Cost DPSS Laser System
Output: >100mW
FDA-Compliant

Stability: <10% RMS/4 Hrs.

Product may not be exactly as shown

General Product Specifications

Nominal Wavelength	532 nm
Nominal Power	100 mW
Divergence	<1.2 mrad
Output Type	CW
Laser Source Type	DPSS
Safety Class	IIIb
MPE*	2.55 mW/cm^2
NOHD**	58.9 m
Min. Goggle Rating	OD 2+ @ 532 nm

Laboratory Testing Data

Serial Number	15090544
Average Output Power	163.6 mW
Power Stability	6.034%

* Maximum Permissible Exposure at the cornea, calculated according to IEC 60825-1. Values are approximated based upon product specifications and assumed maximum exposure duration of 100 s.

**Nominal Ocular Hazard Distance estimate based upon nominal power and assumed maximum exposure duration of 100 s.

Detailed Specifications

For a complete specification sheet containing all available information for this model, please visit:

http://www.laserglow.com/specsheets/C53100XSX.php

Similar Products

For information regarding similar products please visit:

http://www.laserglow.com/C53

Notice

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Introduction

Thank you for purchasing the LCS-0532 low-cost laser module from Laserglow. This laser module is designed to provide a stable and reliable light source for a wide range of scientific and industrial applications. This laser consists of two parts, the laser head and the power supply. Both are packed inside a protective carrying case which can be used when storing or transporting the laser. This manual contains complete instructions on how to set up and operate your laser, descriptions of all features, and some troubleshooting tips. If after reading this manual you still have questions about the safe and proper operation of your laser, please contact us and we would be happy to assist you. Our contact information is listed at the bottom of this page.

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Section 1: Safety Information

READ THIS FIRST

STORE THIS WARNING WITH THE LASER AT ALL TIMES

WARNING:

This is a Class IIIb laser device. The laser radiation emitted from the aperture is considered to be an acute hazard to the eyes and may be hazardous to the skin. Do not shine the beam directly into a person's eyes from any range.

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

Exposure to the eyes from direct or reflected laser radiation may cause temporary or permanent eye damage.

Laser safety goggles are required for all persons who may be exposed to direct, reflected or collateral laser radiation. Appropriate laser safety goggles may be purchased from Laserglow Technologies.

This laser may cause damage to some surfaces and may be capable of starting a fire if directed at a flammable material.

Keep laser devices away from children.

Additional optics may increase the eye, skin and fire hazard posed by this laser device. This includes, but is not limited to: camera lenses, magnifying glasses, eyeglasses, telescopes, binoculars, etc.

Do not direct the beam at any occupied or moving vehicles. (Aircraft, boats, cars, etc.) Interference with the operation of a vehicle is a criminal offense in most countries.

Directing the beam at a reflective surface may result in accidental exposure. Beware of shiny or reflective surfaces within the beam path. (Windows, mirrors, etc.)

It is the owner's responsibility to ensure that all operators of this device are familiar with all laws and safety procedures relevant to this device.

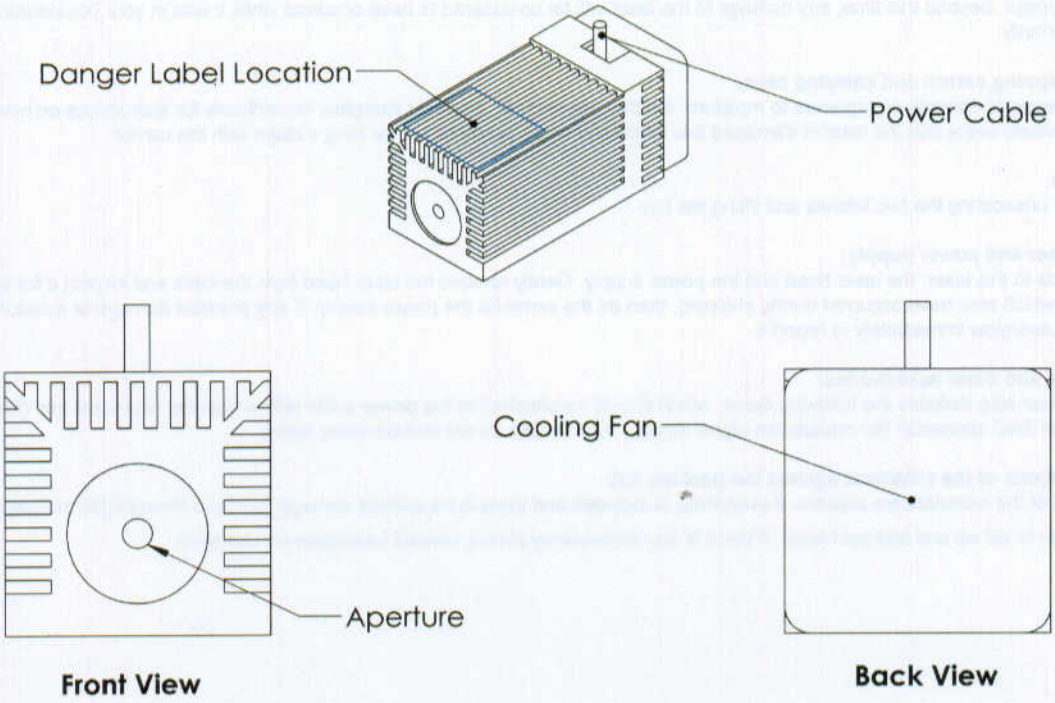
By operating this device, you agree that you have read and understood your local regulations relating to the ownership and use of laser devices within this classification.

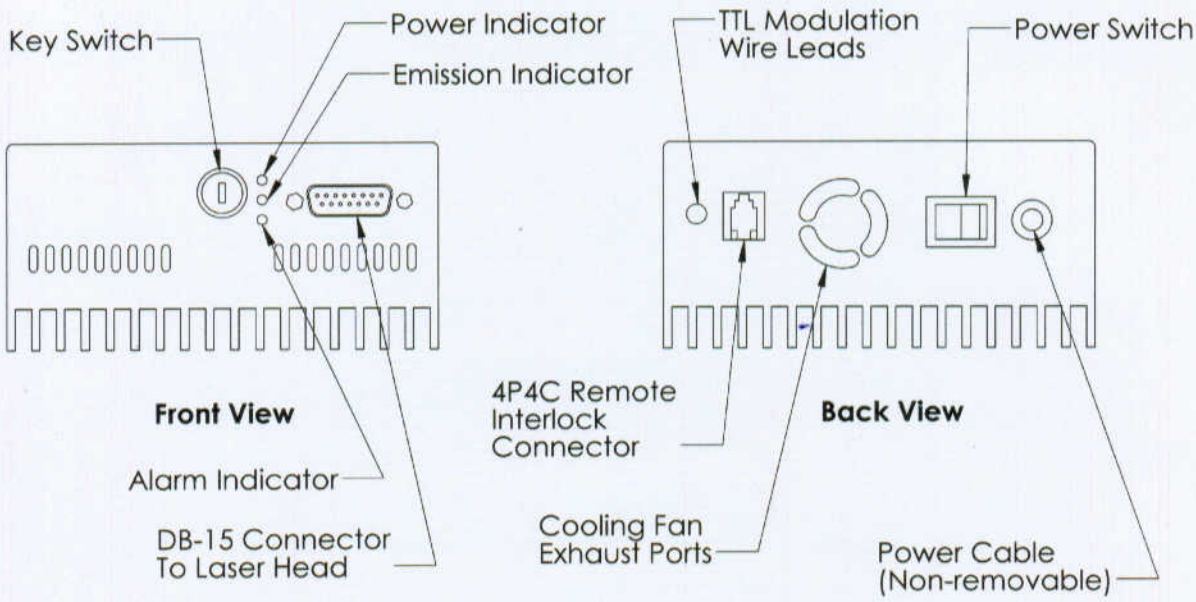
If you have any more questions or concerns regarding the safe and proper operation of our products please contact us.

Figure 1: Danger Label

Figure 1: This danger label is attached to the laser, and must remain on the laser at all times. If the danger label becomes damaged or is removed, contact Laserglow to receive a replacement label at no cost.

Section 2: Product Diagram





Section 3: Unpacking and Inspection

This laser was shipped to you in a foam-lined carrying case to protect it from damage during storage and transit. However, unexpected things can occur during shipping, so it is important to inspect and test your laser as soon as it arrives. Claims for shipping damage must be made within 7 days of receipt. Beyond this time, any damage to the laser will be considered to have occurred while it was in your possession, which may void your warranty.

1. Inspect the shipping carton and carrying case:
Look for obvious signs of damage or exposure to moisture. If either are present, contact Laserglow immediately for instructions on how to proceed. In the unlikely event that the laser is damaged this information may be important for filing a claim with the carrier.

2. Open the case:
Open the case by unsecuring the two latches and lifting the top.

3. Unpack the laser and power supply:
There are two parts to this laser: the laser head and the power supply. Gently remove the laser head from the case and inspect it for any physical damage which may have occurred during shipping, then do the same for the power supply. If any physical damage or moisture is present, contact Laserglow immediately to report it.

4. Check for keys and other accessories:
If required, your laser also includes the following items, which should be attached to the power cable with a twist-tie: one small key (for the power supply), one BNC connector (for modulation signal input). OEM models do not include these items.

5. Check the contents of the shipment against the packing list:
Make sure that all of the materials are present. If everything is included and there is no evident damage, proceed through this manual for instructions on how to set up and test your laser. If there is any discrepancy please contact Laserglow immediately.

Section 4: Setting Up Your Laser

Do not plug in the laser until instructed to do so. Failure to follow proper set-up procedures may result in exposure to hazardous levels of laser radiation. Permanent eye damage, personal injury, property damage, fire, or even death may result from the misuse of this device. Read through the entire procedure first to ensure that you understand what is required, then come back to this point and perform the steps in order. If at any point you are unclear about how to proceed, contact us and we will gladly assist you.

It is best to test the laser before connecting it to any additional equipment that you may be using. This way, you can check for problems and familiarize yourself with the operation and control of the laser before introducing extra variables.

1. Mount the laser head:
The laser head uses a cooling fan to dissipate heat, so make sure that the laser is used in a well-ventilated area. If you run the laser for a long period of time in a small enclosed space it may overheat.

When first setting up the laser head, ensure that it is pointed at a safe target. Depending on the power level, this laser may be capable of starting a fire or causing personal injury, so always point the laser at a non-flammable and non-reflective target. The laser should be mounted so the beam will not be at eye level, and no person will be able to accidentally intersect the beam path.

You may secure the laser head to a surface using the mounting holes on the laser head. (See drawing for hole location.) These holes will accept an M4x0.7 screw.

2. Attach the power supply:
Once the laser head is mounted to a suitable surface, connect the power supply to the laser head using the DB-15 connector. Using a Phillips head screwdriver, secure the two screws on the DB-15 connector to ensure a solid connection. The power supply is air-cooled, so it does not require any additional heat-sinking. Do not mount the power supply inside an unventilated enclosure or it may overheat.

3. Check all switches and safety features:
The laser should not be plugged into any power source at this time. Complete the following steps to ensure that the laser is in a safe, inactive state before you connect the power cord. Failure to do so may result in exposure to hazardous levels of laser radiation.

1. On the front of the power supply: Ensure that the key is not inserted into the key switch, and that the switch is in the "OFF" position. (Vertical)
2. On the back of the power supply: Ensure that the black power switch is set to "OFF".
3. On the back of the power supply: Ensure that nothing is connected to the modulation input wires on the back of the power supply. (Red and black wire pair.)
4. On the back of the power supply: Check that the safety interlock is in place. This interlock is a 4P4C connector. If you require a safety lockout for this laser, the setup for the interlock is as follows:
    - Pins 1 and 2 form one circuit.
    - Pins 3 and 4 form a separate circuit.
    - Break either circuit to deactivate the laser.
    - Once either circuit is broken, the laser will go into an "alarm" state and the "alarm" light on the front of the power supply will turn on. You must turn the key switch off and on again to reset the laser and return to normal operation.

Section 5: Operation

Power Up Sequence

1. Ensure that everybody who is within the Nominal Ocular Hazardous Distance (NOHD) is wearing appropriate laser safety goggles or is otherwise protected from the laser emission. Failure to do so may result in exposure to hazardous levels of laser radiation. The wavelength and recommended Optical Density (OD) level for the goggles are noted on the front page of these instructions. Suitable laser safety goggles can be purchased from Laserglow. Please contact us for more details.
2. Inform everybody in the area that you are about to activate the laser, and that they should take the necessary safety precautions, according to your organization's safety protocols.
3. Insert the power cable into a grounded 85-264 VAC outlet.
4. On the back of the power supply, flip the black power switch to the "ON" position. The "power" indicator light on the front of the power supply should turn on at this time.
5. Check once more to ensure that the beam path is clear and the laser is pointed at a safe target.
6. Insert the key into the switch on the front of the power supply. Turn the key to the "ON" position. (Horizontal) After a 3 second delay, the "laser" indicator light on the front of the power supply should illuminate. The laser is now active.
7. You should now allow the laser to run for the specified warmup period. This will allow the various internal components of the laser to reach a thermal equilibrium, and will provide you with the best possible power stability.
8. Once the laser has warmed up it is ready for use.

Power Down Sequence

1. On the front of the power supply: Turn the safety key to the "OFF" position and remove it from the switch. The laser should turn off as soon as you do this.
2. On the back of the power supply: Turn the black power switch to the "OFF" position.
3. It is recommended that you unplug the laser from the electrical outlet when not in use, to eliminate the possibility of accidental activation by an untrained user or damage to the power supply from an electrical surge.

Modulation and Controls

Electronic modulation

On the back of the power supply is a set of wire leads which will accept an electronic modulation signal. The modulation input will allow you to pulse the laser at a specified frequency or turn it on and off remotely. The modulation input signal is created using a function generator, or similar equipment. (These are sold separately. Contact us for more information about compatible function generators.) The behavior of the modulation circuit is explained below:

This laser features TTL+ modulation

- This modulation mode allows you to turn the laser on and off, but does not allow you to control the output power.
- This laser will accept a 0-5 VDC signal via the modulation input wires.
- The laser will be off when the signal is below 1.0 V and will turn on above this voltage.
- The actual trigger voltage varies slightly, so for the best results we recommend using a 0-5 V square wave input.
- The maximum frequency at which the laser will cycle is 10 kHz.
- The duty cycle of the input signal can be anywhere between 0-100%.
- If the duty cycle is very low, the laser may not have time to fully power up before the end of the pulse, and the observed output power may be lower than expected. Please reference the rise time for this laser in the specification sheet.
- If the duty cycle is very high, the laser may not have time to fully discharge before the next cycle begins. This will result in output that does not completely extinguish between cycles. Please reference the fall time for this laser in the specification sheet.
- If you will be using the laser with a specific modulation routine it is best to warm up the laser with this routine running. This will allow all of the internal components to reach a thermal equilibrium in the modulated state.
- If there is nothing connected to the modulation input the laser will run continuously.

Section 6: Troubleshooting

If you are experiencing trouble with your laser, please check if the symptom is listed in this guide. Many common problems can be solved without requiring a return. If you need further assistance, please contact us. Do not attempt to disassemble or repair your laser, as this may void your warranty.

Problem	Possible Cause	Solution
"Power" indicator light does not turn on.	Laser is not receiving electricity or is not turned on.	Ensure that the laser is plugged in. Check that the outlet is producing electricity. Make sure the power switch on the front of the power supply is turned to the "ON" position.
"Laser" indicator light does not come on and laser does not emit.	Key switch is not turned to "ON" position.	Insert the safety key into the switch on the front of the power supply and turn it to the "ON" position. The power supply has a 3-second delay before the "laser" indicator ight turns on and emission begins.
"Laser" indicator light does not come on, laser does not emit, "alarm" indicator light is on.	Safety interlock circuit is open and has triggered the "alarm" state.	Ensure the safety interlock circuit is closed. Turn the key switch OFF and back ON again. The alarm state should clear and the laser will emit after the normal delay.
"Laser" indicator light turns on, but laser does not emit.	Laser head is not firmly connected to the power supply.	Check that the cable between the laser head and power supply is firmly connected. Both screws on the connector should be tightened to ensure a reliable connection.
	The safety interlock is not installed or the circuit is open.	Remove and reinsert the safety interlock connector on the back of the power supply. If you have connected the circuit to a sensor or switch of some kind, check the circuit for continuity using a multimeter. The laser will only operate when this circuit is closed.
	The modulation input is causing the laser to remain inactive.	Remove anything which is attached to the modulation input. (The wire leads on the back of the power supply.) See "Section 5: Operation: Modulation and Controls" for instructions on how to properly deliver a modulation signal to your laser.
Laser output power is unstable or appears to flicker.	Laser temperature is outside of the specified operating temperature range.	Ensure that the ambient temperature is within the laser's specified operating temperature range. (See specification sheet.)
	Laser is not properly ventilated.	Air-cooled lasers require adequate ventilation to disperse their heat. Increase ventilation around the laser head and power supply.
	Laser has not been sufficiently warmed up.	The laser may be unstable when first activated, which is why a warm-up period is specified. You must run the laser for the specified warm-up period to allow the internal components to reach thermal equilibrium. If you intend to run the laser at reduced power or with some modulation routine applied, you should warm up the laser in this state.
Laser beam profile is irregular or not as specified.	Laser is operating in a different transverse mode than specified.	Some lasers will output in a different transverse mode when operated at temperatures outside of the operating temperature range. Ensure that the ambient temperature is within the specified range.
	Output lens is dirty.	Follow the lens cleaning procedure in the "Maintenance" section of this manual.

Section 7: Maintenance

Laserglow's laboratory lasers are solid-state laser devices which require very little maintenance. Depending on the cleanliness of your environment these tasks may be required with some regularity, or never at all. Inspect the laser and power supply regularly to ensure there is no buildup of debris or dust on the output lens or in the cooling system. If you notice any buildup or experience performance issues (laser becomes unfocused, cooling fan makes noise, etc.) then maintenance may be required.

Cleaning the Output Lens

NOTE: Certain models of laser do not have a user-accessible output lens. If this is the case and your laser is experiencing problems, please contact us for assistance.

Depending on the operating environment, it is possible that some dust may accumulate on the output lens of the laser. This will result in a laser beam which is poorly focused or which has a "speckled" appearance. Cleaning the lens does involve some risk, since a scratch in the lens would necessitate a repair. For this reason, it is best if you attempt the most gentle cleaning techniques first, progressing to the more invasive techniques only if the problem is not resolved. At each step, make note of the pattern of speckles and the overall appearance of the laser beam. If this pattern changes after cleaning it means that you are having an effect and should continue with the current technique rather than advancing to the next one. Note that cleaning the lens in any other way will void your warranty and may irreparably damage the laser lens.

NEVER USE tissue paper, paper towel, facial tissues, etc. The wood fibers in these products can damage the coatings on the lens. NEVER USE cleaning solutions other than those explicitly mentioned here. The lens coatings are delicate and can be damaged by common cleaning products. NEVER touch the lens or other optics with your fingers as oil from your skin can contaminate and damage the coatings. Failure to follow these warnings can result in damage to your laser which will not be covered by warranty.

1. **Compressed air:** You can use a can of clean compressed air to try to blow the dust off of the lens without making physical contact with the lens itself. These are commonly used to clean computer keyboards and can be purchased at any office supply store. These usually have a long tube or nozzle attached to them. Carefully insert this tube a few mm into the aperture of the laser to blow air over the lens. Be careful not the touch the lens with this tube. Hold the can upright or it may produce some liquid which can leave deposits on the lens.
2. **Microfiber cloth:** If there are deposits on the lens that cannot be removed with compressed air, you can try using a microfiber lens cloth to gently wipe the output lens. To access this lens, unscrew the knurled section of the aperture tube. The lens may be clear and round, or your laser may have a blue-tinted square IR filter installed on the output aperture. Either way, this is where dust and debris may accumulate and interfere with the laser beam. GENTLY wipe the lens with a clean microfiber lens cloth and check if this improves the beam quality.
3. **Microfiber cloth and lens cleaning solution:** If a cleaning solution is required use ONLY a specifically-designed lens cleaning solution. (Available from camera stores or optics companies.) Use a very small amount, and wipe the lens only with a microfiber lens cloth.

If these steps fail to improve the quality of the beam please contact us for further assistance.

Cleaning the Cooling Fans

If the laser is run for extended periods of time in an environment containing dust, there may be some buildup on the cooling fans (either on the power supply or in the laser head itself, depending on model). Some laser heads also have a set of ridged heat sinks which can become dusty. This will impede cooling and may adversely affect the performance of the laser. Simply use a can of clean compressed air to blow the dust off of the fans and heat sinks, or if the buildup is severe you can use a vacuum cleaner to remove it without contaminating your work area.

Replacing the fuse

Certain models of lasers have a fuse in the power supply. If this fuse burns out, we have provided a replacement for you.

- **Unplug the laser from the power source before proceeding.**
- Locate the fuse cover on the back of the power supply. Using a flat-head screwdriver turn the fuse cover counterclockwise to open.
- Replace the fuse with a new one and then replace the cover. Ensure that the replacement fuse is identical to the old one to avoid damaging your laser. (Same type and amperage.)

Section 8: Accessories and Options

The most popular accessories for model C53100XSX are shown below. For additional details regarding these or other accessories please see our website or contact us directly.

Part Number	Description	
 AGF5327XX	LSG-532-NF-7 Fit-Over Safety Goggles 532nm Output: OD 7+ at 190-532 nm CE Certified. Full Details: www.laserglow.com/AGF	
 TBK	Complete optics kits with breadboard mounting hardware. External modulators, variable attenuators, free-space fiber launch systems. Full Details: www.laserglow.com/TBK	
 ACALBLCSX	Carrying Case-101 Lab/OEM - C or D/OEM or FDA. Full Details: www.laserglow.com/ACA	Included With Laser

Section 9: Warranty Information

LIMITED PRODUCT WARRANTY:
Laserglow Technologies ("Laserglow") warrants that this product is guaranteed to operate within the stated specifications, free from defects in materials and workmanship, for a period of six (6) months from the date of delivery.

BEFORE RETURNING ANY ITEM FOR SERVICE, PLEASE CONTACT LASERGLOW TO RECEIVE A RETURN AUTHORIZATION (RA) NUMBER. ITEMS RETURNED WITHOUT AN RA NUMBER MAY INCUR DELAYS OR ADDITIONAL FEES.

LASERGLOW'S PLEDGE TO CORRECT PROBLEMS UNDER WARRANTY:
At its option, Laserglow will either repair or replace the in-warranty defective unit without charging the customer for costs of repair or replacement. When parts or products are replaced under warranty the replaced items will automatically become property of Laserglow. Once an item has been repaired or replaced under warranty, the repaired or replacement item assumes the remaining period of warranty based on the original date of delivery, plus the period of time during which the laser was out of the customer's possession. Within North America only, and within the first 30 days of the warranty period, Laserglow will cover the cost of shipping the defective item back to Laserglow and the cost of shipping the repaired/replacement item to the customer. After 30 days, or for overseas shipments, the customer will cover the cost of shipping the defective item back to Laserglow and Laserglow will cover the cost of shipping the repaired/replacement item to the customer. Where Laserglow covers the cost of shipping, the carrier and method of shipping will be at Laserglow's discretion. Items returned to Laserglow as warranty issues, which upon inspection are deemed not to have any defect, will incur a diagnosis service charge of $119.

NOT COVERED UNDER THIS WARRANTY:
This warranty will become void if any of the following conditions are met:

- The product has been modified or tampered with in any way.
- The product has been dropped or subjected to shock in excess of 100 G.
- The product has been exposed to water, any liquid, or condensing atmospheric humidity.
- The unit was powered from a source other than those which are specified in the instruction manual.
- The unit was operated in an area with ambient temperature outside of the operating temperature range, as stated in the product specifications and instruction manual.
- The serial number or other identifying marks are removed.
- Ownership of the product has changed. (This warranty is not transferable.)
- The warranty period has expired.

NEITHER THIS WARRANTY NOR ANY OTHER WARRANTY OR GUARANTY, EXPRESSED OR IMPLIED STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL EXTEND BEYOND THE WARRANTY PERIOD. NO RESPONSIBILITY IS ASSUMED FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING, WITHOUT LIMITATION, DAMAGES RESULTING FROM PRODUCT MALFUNCTION, INACCURACY, OR MATHEMATICAL INACCURACY OF THE PRODUCT SPECIFICATIONS. NOTHING IN THIS WARRANTY AFFECTS YOUR STATUTORY RIGHTS.

OTHER BENEFITS (NON-WARRANTY) THAT ARE ACCORDED TO YOU BY LASERGLOW:

10% Replacement/Upgrade Credit: At any time, for the lifetime of the product, you may return the product to us in any condition, functional or not, for a trade-in credit equal to 10% of the original purchase price or 10% of the current retail price, whichever is less. The new product which you select must be of equal or greater value than the trade-in product, based on the value used to calculate the 10% credit amount.

Out-of-Warranty Repairs: The cost of any out-of-warranty repair will be $80/hr for labor, plus materials.

Rebuild/Complete Product Refurbishment: The cost of a complete rebuild or refurbishment of an out-of-warranty product will be no more than 60% of the current retail price.