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06 DLD 903

HIGH POWER DIODE LASER ARRAY DRIVER

USER MANUAL

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TABLE OF CONTENTS

1 INTRODUCTION 1-1

1.1 Copyright and Manual Notice 1-1

1.2 SUMMARY DESCRIPTION 1-2

1.3 User Safety 1-2

1.4 LASER RADIATION DANGER 1-4

DIODE LASER DAMAGE WARNING 1-5

1.5.1 Grounded Power Supply 1-5
1.5.2 Line Voltage Selection and Fusing 1-5
1.5.3 Ventilation 1-5
1.5.4 Servicing 1-6
1.5.5 FCC Compliance 1-6
1.5.6 Important Information for the Diode Laser Arrays 1-7

2 PERFORMANCE SPECIFICATIONS 2-1

2.1 Current Source 2-1

2.1.1 CONSTANT CURRENT MODE 2-2
2.1.2 CONSTANT POWER MODE 2-3
2.1.3 X100 CURRENT AMPLIFIER MODE 2-4
2.1.4 CURRENT LIMIT (All modes) 2-5
2.1.5 TURN-ON/OFF TIMES (All modes) 2-5
2.1.6 OUTPUT CABLE 2-5
2.1.7 INPUTS 2-6
2.1.8 MONITOR OUTPUTS 2-6
2.1.7 DISPLAY METER 2-7
2.1.10 GENERAL AND ENVIRONMENTAL 2-7
2.1.11 SAFETY 2-8

FUNCTIONAL DESCRIPTION 3-1

3.1 Introduction 3-1

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Front Panel **3-2**
3.2.1 Power 3-2
3.2.2 Mode 3-3
3.2.3 Display 3-4
3.2.4 Adjust 3-5
3.2.5 Status LEDs 3-6
3.2.6 LASER ON 3-8
3.2.7 OUTPUT 3-9
3.2.8 INPUTS 3-10
3.2.9 MONITOR OUTPUTS 3-12

REAR PANEL **3-13**
3.3.1 INPUT POWER 3-13
3.3.2 VOLTAGE SELECTION/FUSING 3-13
3.3.3 SAFETY INTERLOCK CONNECTOR 3-13

4 SETUP AND INSTALLATION 4-1

4.1 Factory Default Settings **4-2**

4.2 System Operation **4-2**

4.3 Connecting the Diode Laser **4-3**
4.3.1 Making the Connection 4-3

4.4 Constant Current Operation and Current Modulation **4-4**
4.4.1 Constant Current Mode Operation 4-5

4.5 Constant Power Operation **4-7**
4.5.1 Constant Power Mode Operation 4-8

4.6 x100 Amplifier Mode **4-10**
4.6.1 X100 Amplifier Mode Operation 4-10

4.7 Parallel Operation of Drivers **4-12**
4.7.1 Set-up 4-12
4.7.2 Parallel Mode Operation 4-13

5 APPENDICES 5-1

5.1 Warranty **5-1**

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5.1.1 Service and Repair 5-1
5.1.2 Failure Analysis Questionnaire 5-1

Sales / Service and Technology Support 5-3

5.2 Accessory Products 5-3

6 INDEX 5

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Table of Contents

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1.1
1.2
1.3

CHAPTER ONE

1 INTRODUCTION

1.1 COPYRIGHT AND MANUAL NOTICE

This manual describes the operation of the 06 DLD 903 Precision Diode Laser Driver.

Melles Griot Inc. reserves the right to make changes to this manual and to the equipment described herein without notice. Melles Griot Inc. has made considerable efforts to ensure that the information in this manual is accurate and complete. However, Melles Griot Inc. will not be liable for any technical or editorial errors or omissions made herein or the incidental, special, or consequential damages of any nature resulting from the furnishing of this manual, or operation and performance of equipment in connection with this manual.

Melles Griot retains copyright to the contents of this manual. Purchasers of the Melles Griot product described herein may make up to two copies of this manual for use in conjunction with the equipment. No other copying for any purpose is allowed without the express written permission of Melles Griot Electro-Optics, Boulder, Colorado.

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1.2 SUMMARY DESCRIPTION

The 06 DLD 903 is a High Current Diode Laser Driver intended for use with linear and with stacked high power laser diode arrays.

It is a low noise, high current source with current limiting.

The unit can be used to drive diode lasers requiring up to 65A of operating current, in both current and power stabilized modes of operation.

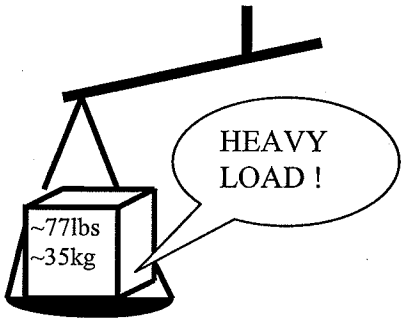
The output is floating (±10V from instrument ground), permitting case grounding of the diode laser.

Analog modulation frequency range is DC to >2 kHz (-3dB).

The unit may be operated as a x100 current amplifier.

Two or more units may be paralleled for increased drive capability.

1.3 USER SAFETY



WARNING! Heavy Equipment

USE EXTREME CARE WHEN HANDLING THIS UNIT

If you do not use extreme care you could seriously injure yourself &/or others, &/or damage the unit

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1.3
1.4

- Melles Griot accepts no responsibility whatsoever for any personal injury incurred due to handling of this unit.
- If you cannot accept this condition of use, please return the unit to Melles Griot for a full refund.
- Any Warranty is voided if there is evidence of damage due to handling.

NOTE
The driver alone weighs approximately 77 pounds (35 kg).

The driver as shipped in its package weighs 90 pounds (41 kg).

Use appropriate lifting techniques

It can be safely lifted by the front handles only.

The left-hand side is heavier than the right hand side.

Care and caution must be used when standing the driver on its rear panel feet. The feet are intended only as a convenience during handling and the *driver should not be left unattended in this position.* A unit in this position can be easily overbalanced and can cause damage or be damaged.

WARNING! ***Output Power:*** ***The driver is designed to safely drive appropriate laser diodes and laser diode arrays. It can deliver up to 65A at a voltage up to 10V. This is sufficient to cause fire and/or meltdown in inappropriate loads or loads which are not adequately heatsunk. It is the user's responsibility to ensure that the driver output can be safely handled by the load. Melles Griot Inc. accepts no responsibility under any circumstances for any consequences of inappropriate use of this driver.***



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1.4 LASER RADIATION DANGER

WARNING! Damage to the human eye can occur. When a laser is being operated, never direct the beam or even a weak reflection of it towards an eye. To adjust the alignment of the laser beam and optical components, use an infrared sensitive card, viewer, or vidicon camera to follow the beam. Warning labels are attached to diode laser drivers and laser heads in compliance with CDRH regulations. One of these labels is reproduced below for familiarity:



WARNING! This driver is capable of driving Class 4 lasers. The output of such a laser is sufficient to ignite a fire in a combustible material.

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1.5 DIODE LASER DAMAGE WARNING

WARNING! Diode lasers can be damaged or completely destroyed by small amounts of static electricity or sharp transient currents. Once a laser is correctly connected to the diode laser driver, it is very well protected against accidental damage, provided the system is operated according to this manual. IF the following instructions are not closely followed, there is a high probability of destroying a diode laser even before the system is properly running. This is particularly true for operators with little or no prior experience working with diode lasers. Never connect or disconnect the driver to the laser with the driver switched on.



1.5.1 Grounded Power Supply

To minimize shock hazards, the driver must be connected to an electrical ground. The driver is equipped with a three-conductor AC power cable that must be plugged into an approved three-contact electrical outlet.

1.5.2 Line Voltage Selection and Fusing

The driver is compatible with 100, 120, 140, 200, 220 and 240VAC (50-60Hz) supplies (all Voltages ±10%). The driver is shipped with fuse sets *but without the fuses installed.* Check that the operating voltage is correctly set and the appropriate fuses are installed before attempting to connect it to line voltage. There is a third fuse in the voltage selector. It must be removed to change the line voltage.

The fuses (all 250V) are: 100, 120, 140 VAC 10.0 Amp

200, 220, 240 VAC 5.0 Amp



WARNING! For continued protection against fire, replace line fuses only with fuse of specified type and rating.

1.5.3 Ventilation



WARNING! The ventilation holes and the fan port on the rear must be unobstructed for proper cooling. A minimum spacing of 20 cm (8 inches) behind the driver is required.

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1.5.4 Servicing

Dangerous voltages exist inside the driver, even with the power switched off. Only qualified personnel should remove the cover. There are no user replaceable parts inside the driver.

1.5.5 FCC Compliance

This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with the instruction 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, which are designed to provide reasonable protection against 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 own expense, will be required to take whatever measures may be required to correct the interference.

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:

1. THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE.

2. THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

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1.5.6 Important Information for the Diode Laser Arrays

Important Information about the 06DLD903 Array Driver

WARNING! When driving diode laser arrays in series, NEVER short out one of the arrays. If this is done, the other arrays will see an overcurrent and may damage the arrays.



The driver is compatible with 100, 120, 140, 200, 220 and 240VAC (50-60Hz) supplies (all Voltages ±10%). The driver is shipped with fuse sets *but without the fuses installed.* Check that the operating voltage is correctly set and the appropriate fuses are installed before attempting to connect it to line voltage. There is a third fuse in the voltage selector which is always a 10 amp IEC127 Sheet V fuse. It must be removed to change the line voltage.

The two main fuses (all 250V) are:

100, 120, 140 VAC10 Amp, 5x20 mm, IEC127 Sheet V
(Littlefuse part number 215.010)

200, 220, 240 VAC5 Amp, 5x20 mm, IEC127 Sheet V
(Littlefuse part number 215.005)

WARNING! For continued protection against fire, replace line fuses only with fuse of specified type and rating.

WARNING! This product has a high inrush current when power is first applied. Use of incorrect fuses can cause nuisance blowing. Always check that the correct fuse type and value is installed before operation.



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CHAPTER TWO

2 PERFORMANCE SPECIFICATIONS

Specifications are subject to change without notice.

Unless otherwise stated, performance specifications apply one hour after warm-up at fixed output current.

2.1 CURRENT SOURCE

Operational Modes:

- Constant Current
- Constant Power
- x100 Current Amplifier
- Parallel Operation

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2.1.1 CONSTANT CURRENT MODE

Voltage Compliance	0 to 10 VDC @ 60 A 0 to 9.0 VDC @ 65 A Floating ±10V with respect to chassis ground
Output Current Range	<0.1 to 60 A @ 10 V Compliance <0.1 to 65 A @ 9.0V Compliance
Output Current Resolution	0.01 A
Output Current Temperature Coefficient	≤100 ppm/°C
Current Noise -Typical. - Max. - Max.	<10 mA rms, 0-20 kHz 20 mA rms, 0-20 kHz 30 mA rms, 0-1 MHz
Accuracy: Preset Current versus Actual Current	±(1% of reading + 0.2) A
Modulation Range	±32.5 A Additive
Modulation Bandwidth	DC to >2 kHz (-3dB) @ ± 30 A
Mod. Transfer Function	5 A/V
Overshoot: Current Duration	5% of set value <1 ms

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2.1.2 CONSTANT POWER MODE

Voltage Compliance	0 to 10 VDC @ 60 A 0 to 9.0 VDC @ 65 A Floating ±10V with respect to chassis ground
Output Current Range	<0.1 to 60 A @ 10 V Compliance <0.1 to 65 A @ 9.0 V Compliance
Photocurrent Range	0.1 to 10 mA
Photocurrent Resolution	0.01 mA
Accuracy: Preset Photocurrent versus Actual Photocurrent	±(2% of reading + 0.05) mA
Modulation	Not Applicable
Bandwidth of Constant Power Response	DC to 15 Hz (-3dB)
Overshoot: Duration	≤5 ms

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2.1.3 X100 CURRENT AMPLIFIER MODE

Voltage Compliance	0 to 10 VDC @ 60 A 0 to 9.0 VDC @ 65 A Floating ±10V with respect to chassis ground
Output Current Range	<0.1 to 60 A @ 10 V Compliance <0.1 to 65 A @ 9.0 V Compliance
Input Current Range	0 to 650 mA
Amplification	x100
Amplification Accuracy	±(1% + 0.05) A
Output Current Range	0 to 65 A
Output Current Resolution	0.01 A
Output Current Temperature Coefficient	≤100 ppm/°C
Current Noise Typ. Contribution: Max. Contribution:	<10 mA rms, 0-20 kHz 20 mA rms, 0-20 kHz 30 mA rms, 0-1MHz
Overshoot (without limit) Current Duration	 5% of set value <1 ms

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2.1.4 CURRENT LIMIT (All modes)

Set Point Range	0.25 to 65 A
Set Point resolution	0.01 A
Set Point accuracy	±(1% + 0.2) A
Temperature Coefficient	<300 ppm/°C

2.1.5 TURN-ON/OFF TIMES (All modes)

Turn-On Time	20ms
Turn-Off Time	
LASER ON Switch	<50µs
Power Switch or Line Fault	<100µs

2.1.6 OUTPUT CABLE

(06 DLH 011 accessory, purchased separately)

Connector	AMP 208484-1
Connector Crimp Pins	AMP 66261-1
Connector Crimp Tool	AMP 90382-2 Type F 12-16
Cable Length	1 m (40 inches)
Cable Impedance	<10 mΩ (Round trip total)
	6mΩ typical
Cable Termination:	
Anode and Cathode	#8 ¼" Stud Ring Terminals
Chassis Ground	#12 ¼" Stud Ring Terminals

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2.1.7 INPUTS

External Driver Input	4 pin (+ shield) DIN floating
Maximum Current	650 mA (Internal self-resetting fuse)
I/O Transfer Function	100 A/A to output
Accuracy	±2%
Input Impedance	<3 Ω
Photodiode Input	5 pin (+ shield) DIN floating
Maximum Current	+10 mA
Accuracy	±(2% + 0.05) mA
Input Impedance	<10 Ω
Current Modulation	Grounded BNC
I/O Transfer Function	5 A/V, up to ±6.5 V
Accuracy	±5%
Input Impedance	>100 kΩ

2.1.8 MONITOR OUTPUTS

Laser Current Monitor	Grounded BNC
Transfer Function	0.1 V/A
Accuracy	±(2% of reading + 0.2) A
Photodiode Current Monitor	Grounded BNC
Transfer Function	1 V/mA
Accuracy	±(2% of reading + 50) µA
Output Voltage Monitor	Grounded BNC
Transfer Function	1 V/V
Accuracy	±(2% of reading + 0.2) V

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2.1.9 DISPLAY METER

4 Digit LED Selectable Display	Current Limit A Current Preset A Output Current A Output Voltage V Photodiode Preset mA Photodiode mA
Output Current Display Accuracy	±(2% of reading + 0.2) A
Photocurrent Display Accuracy	±(2% of reading + 0.05) mA

2.1.10 GENERAL AND ENVIRONMENTAL

Size: (inches) (mm) (Depth includes handles and feet)	17 W x 5.25 H x 22.5 D 432 W x 133 H x 572 D
Weight: 06 DLD 903 Driver 06 DLH 011 Driver Output Cable Driver plus cable, boxed and shipped	 77 lbs (35kg) 2 lb (1kg) 90 lbs (41 kg)
Power Requirements (Line voltage settable from rear panel)	100, 120, 140 VAC @ 10 A or 200, 220, 240 VAC @ 5 A 48-66 Hz 1200 VA max.
Temperature	0 to 70°C, storage 5 to 40°C, operating

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2.1.11 SAFETY

The unit meets all applicable US & CE requirements.	
It complies with:	
Laser Safety	CFR 1040.1
	EN 60825-1
EMC Compliance	
Generic Emissions Std.	EN 50081-1
Generic Immunity Std.	EN 50082-1
Product Safety	UL1262
	EN 61010-1

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CHAPTER THREE

3 FUNCTIONAL DESCRIPTION

3.1 INTRODUCTION

The 06 DLD 903 is a High Current Diode Laser Driver intended for use with single and serially connected high power laser diode arrays.

The driver uses a 50/60 Hz transformer with a choke input filter to provide quiet conversion to DC. A "Buck" type switching regulator element followed by a linear stage delivers the output current. It has the ability to deliver up to 65 Amps into a short circuit or a 10-V load. A 1-A internal preload allows output current adjustment down to 0-A.

3.1
3.2

Before operating the driver, the user must become familiar with the switches, indicators, and input/output ports. The function and operation of most of these is fairly self-explanatory from the labeling. However, caution is recommended to avoid the costly mistake of damaging a diode laser.

WARNING! Output Power. The driver is designed to safely drive appropriate laser diodes and laser diode arrays. It can deliver up to 65A at a voltage up to 10V. This is sufficient to cause fire and/or meltdown in inappropriate loads or loads which are not adequately heatsunk.

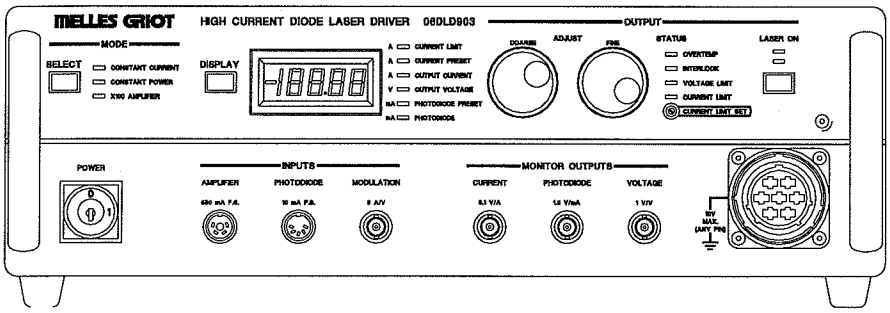


It is the user's responsibility to ensure that the driver output can be handled safely by the load. Melles Griot Inc. accepts no responsibility under any circumstances for any consequences of inappropriate use of this driver.

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3.2 FRONT PANEL

Functions/Controls/Connections



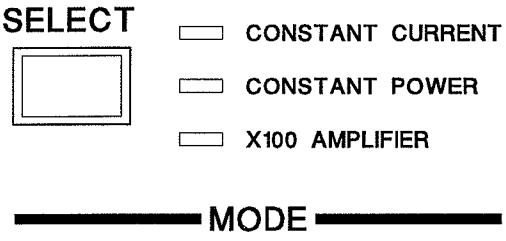
3.2.1 Power

AC Power is controlled by a keyswitch. When unit is turned on:

- The laser will be off.
- The display will come up and display Current Limit.
- The mode will be Constant Current.

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3.2.2 Mode



Selectable Modes are:

- Constant Current
- Constant Power Control
- x100 Amplifier

The Mode button is a momentary switch:

The unit cannot be changed from one mode to another while the laser is on. If the user attempts to do this, nothing will happen. First turn off the laser.

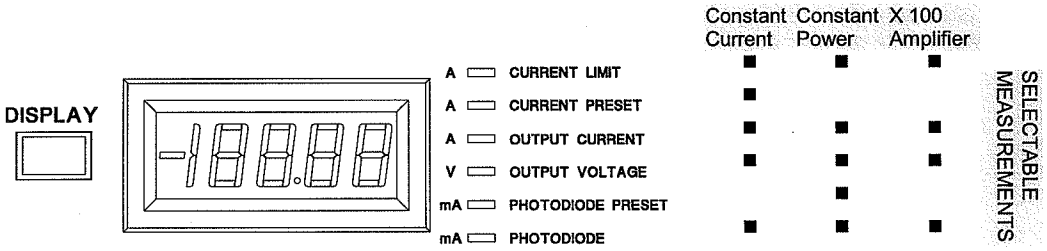
CONSTANT CURRENT MODE.
Delivers a constant current at 0 to 65 A into the laser.

CONSTANT POWER MODE
A transimpedance amplifier picks up the photodiode current and compares it with the Photodiode Current Preset. The power control loop adjusts the output to maintain a constant optical power by maintaining a constant monitor photodiode current. Should the laser age to the point where excessive current is required to maintain constant power, the current limit will be engaged and the output optical power from the laser will no longer be held constant.

X100 AMPLIFIER
The unit produces an output current that is 100 times the current at the CURRENT input.

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3.2.3 Display



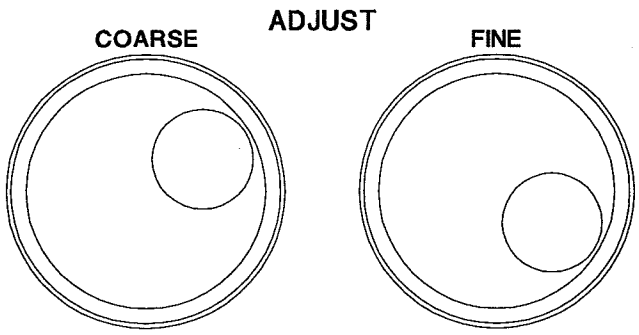
A four digit yellow LED display with momentary push-button selection of the measurement to be displayed. The update rate of the display is ~2.5 Hz. Available measurements are:

Current Limit (A)	Output Voltage (V)
Current Preset (A)	Photodiode Preset (mA)
Output Current (A)	Photodiode (mA)

- Flashing Display: The derated operation area (between 60 to 65A when greater than 9V) has been reached for the current set. The 4 digit display will flash, alternating between the reading and '+1999'
- The display will flash for one minute. It will extinguish if the set current is turned down to lie within the derated operation area.
- If this is not done, the laser will be turned off after one minute has elapsed.

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3.2.4 Adjust



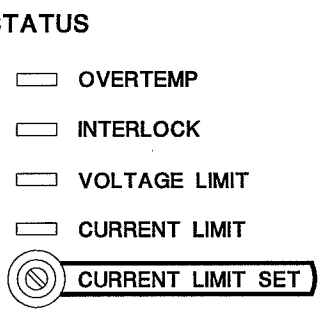
Coarse and fine control knobs adjust the laser set current or the photodiode monitor set current to the desired level.

- **Coarse:** Ten turns with a mode dependent range of 0 to 65 A or 0 to 10mA.
- **Fine:** Single turn with a mode dependent range of 1 A or 0.15 mA.

The CURRENT SET can be preset to a higher level than the CURRENT LIMIT, but if the laser is then turned on, the current limit LED will illuminate and the display will "rail" at the current limit setting.

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3.2.5 Status LEDs



Status LEDs will stay illuminated until the fault clears and the LASER ON key is pressed.

The laser will not be restarted under any fault or shut-down conditions.

OVERTEMP

- Constant illumination - The driver's internal temperature limit has been exceeded

The internal driver temperature is monitored. If the temperature exceeds the design limit, a yellow OVERTEMP indicator will illuminate, the laser current output will be turned off and the LASER ON indicators will extinguish

As the heatsink(s) cools back to acceptable temperatures, the yellow OVERTEMP indicator will extinguish but the output current will not be restored until the LASER ON switch is depressed and the laser is turned on again.

INTERLOCK

- Constant illumination - The interlock contact is open.

If an open interlock is detected, the yellow INTERLOCK LED will illuminate, and the LASER ON indicators will extinguish. The laser does not need to be turned on again for the LED to extinguish.

VOLTAGE LIMIT

- Constant illumination - The voltage compliance limit has been reached. i.e. cable or laser open circuit &/or high impedance

If the voltage limit is reached, the yellow VOLTAGE LIMIT LED will illuminate, and the LASER ON indicators will extinguish. The VOLTAGE LIMIT LED will remain illuminated until the problem is addressed and the laser is turned on again.

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CURRENT LIMIT

- *Constant or intermittent illumination* - The current limit has been engaged.

Indicates engagement of the limiter by illuminating a yellow LED.

Engagement of the limit does <u>not</u> turn the laser off

If all LEDs are illuminated, this means that there is an internal fault. It will not be possible to power up the laser. Contact Melles Griot to arrange for return of the unit for repair. (See Appendices)

CURRENT LIMIT SET

A front panel accessible 10-turn potentiometer that sets the CURRENT LIMIT.

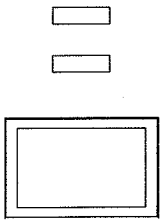
If the user attempts to adjust the limit when the laser is running, the laser will turn off and the LASER ON indicators will extinguish

If CURRENT LIMIT is selected under DISPLAY, the display will indicate the currently set value of the limit.

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3.2.6 LASER ON

LASER ON



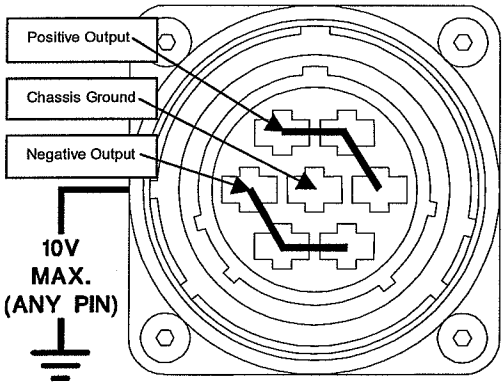
The LASER ON output control is a momentary push-button. It is used to switch the laser on and off. The LASER ON green LED indicators associated with the Output switch will blink for three seconds after the switch is depressed. After the three second delay, current will be released to the laser and the dual redundant Laser On LEDs will change from blinking to continuously on.

When the Output is pressed again, the laser is turned off immediately (fall-time to off is <50-µs typical, 100 µs max.). The LED display will remain at same setting, so if the display was showing Laser Current, the display will go to 00.00 (± offset).

The upper LED is software controlled while the lower LED is directly linked to the output circuit. If either LED stays on, a fault condition is indicated, but the laser may still be energized and laser safety precautions still apply. Recheck all connections and then attempt to restart the laser.

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3.2.7 OUTPUT



A circular connector (AMP 208485-1) is provided on the front panel of the driver for the laser current output.

The 06 DLH 011 output cable accessory consists of a mating connector and a one meter long cable with #8 ¼" Stud Ring Terminals for connecting to the laser anode and cathode; a #12 ¼" Stud Ring Terminal terminates the chassis ground lead.

The output current is floating. Both the anode and the cathode of the laser are required to be within ± 10 VDC of driver chassis ground.

Additional 06 DLH 011 cable assemblies may be purchased. See Section 5.4

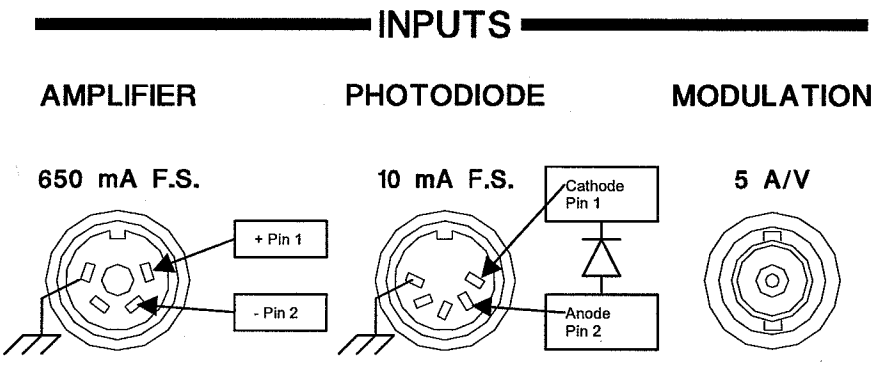
The supplied output cable ends are color coded to minimize the possibility of reversed polarity operation.

- Red Sleeve = Positive - Connect to Laser Anode
- Black Sleeve = Negative - Connect to Laser Cathode
- Green Sleeve= Ground - Connect to either, or leave disconnected

If the cable colors are mixed up, the driver and/or the laser can be damaged.

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3.2.8 INPUTS



AMPLIFIER
The amplifier input transfer function is 100A/A, i.e. a gain of x100

A 4 pin (plus shield) DIN connector is provided. Facing the driver, pins are numbered from 1 to 4 going clockwise.

The +ve input, Pin 1, accepts positive current only. (See figure above)

The -ve input, Pin 2, connects to the external driver return.

The amplifier input shield is grounded to the driver chassis ground.

PHOTODIODE
The photodiode maximum input is 10mA.

A 5 pin (plus shield) DIN connector is provided. Facing the driver, pins are numbered 1,4,2,5,3 going clockwise.

This transimpedance amplifier input provides a reverse voltage of zero volts.

Pin 1; connects to the cathode of the photodiode. (See above)

Pin 2; connects to the anode of the photodiode.

The monitor photodiode input is floating. The photodiode cathode and anode must be within ± 10 VDC of the driver chassis ground.

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MODULATION

The modulation input transfer function is 5A/V

The modulation provided is additive. The output current to the laser is:

Laser Current Preset + (Input Modulation Voltage x 5 A/V)

The modulation voltage is clamped to between -6.5 V & +6.5 V.

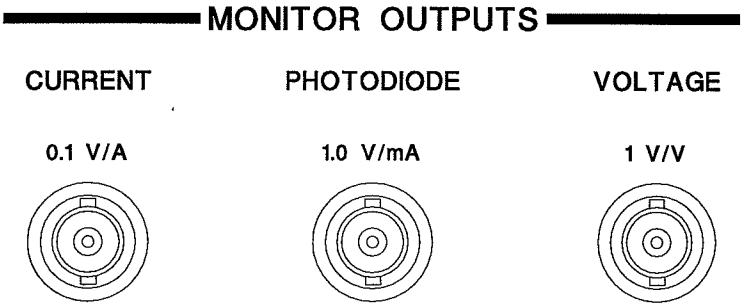
A grounded BNC input is provided. The outer conductor of the BNC is modulation ground. The center conductor is modulation (+).

Modulation of the laser current is possible *only* in the Constant Current Mode. It is *not* possible in Constant Power Mode or Amplifier Mode.

The laser current can be modulated up to the full ±30 A at up to 3 kHz. It may be modulated at higher frequencies at lower % modulation.

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3.2.9 MONITOR OUTPUTS



Connections to Monitor Output BNCs should be to a ≥100-kΩ load.

CURRENT
BNC output, outer grounded to the driver chassis ground.It monitors the output current at a transfer function of 0.1V/A.

PHOTODIODE
BNC output, outer grounded to the driver chassis ground.

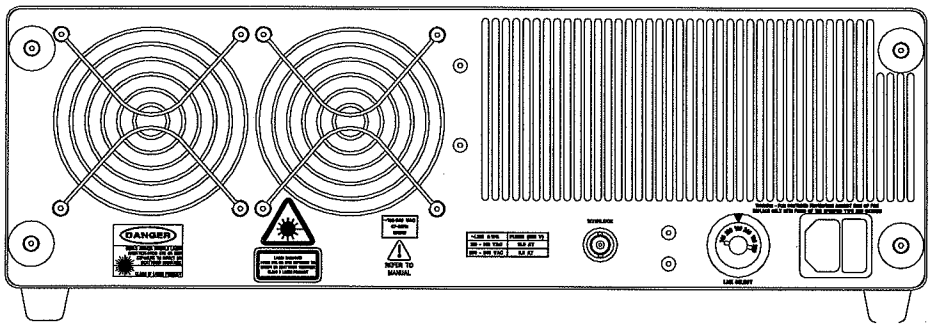
It monitors the Photodiode Current at a transfer function of 1V/mA.

VOLTAGE
BNC output, outer grounded to the driver chassis ground.

It monitors the Output Voltage at a transfer function of 1V/V.

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3.3 REAR PANEL



3.3.1 INPUT POWER

A conventional power entry module is provided, together with filtering that meets European CE Mark requirements.

3.3.2 VOLTAGE SELECTION/FUSING

The driver is compatible with 100/120/140 and 200/220/240 VAC (47-63 Hz) supplies. The driver is shipped without fuses installed. Check that the driver operating voltage is correctly set, LINE SELECT, with the appropriate fuses installed before attempting to connect it to line voltage.

3.3.3 SAFETY INTERLOCK CONNECTOR

The INTERLOCK BNC connector allows the user to turn the laser off remotely in compliance with CDRH regulations. The Interlock must be shorted for the laser to work.

During normal operation, the connection is grounded by the shorting plug. Removing the shorting plug turns the laser off.

The laser will not restart automatically when the short is restored; the LASER ON button must be pressed.

An external interlock circuit must have an impedance <100 Ω when shorted and >100 kΩ when open.

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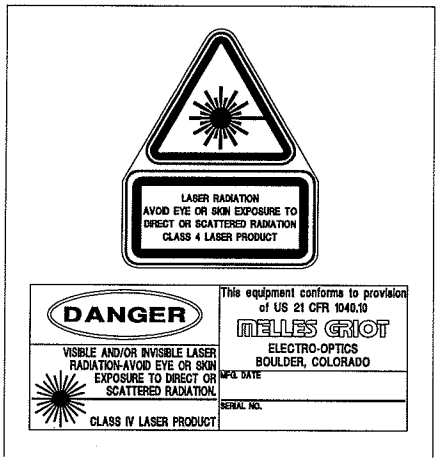
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CHAPTER FOUR

4 SETUP AND INSTALLATION

This section describes how to correctly set-up the diode laser driver for operation.

DANGER! The radiation emitted by a diode laser may cause severe damage to the human eye. When a laser is being operated, never direct the beam or even a weak reflection of it towards an eye. To adjust the alignment of the laser beam and optical components, use an infrared sensitive card, viewer, or vidicon camera to follow the beam. Warning labels are attached to diode laser drivers and laser heads in compliance with CDRH regulations. One of these labels is reproduced below for familiarity:



4.1
4.2

WARNING! Diode lasers can be damaged or completely destroyed by small amounts of static electricity or sharp transient currents. Once a laser is correctly connected to the diode laser driver, it is very well protected against accidental damage, providing the system is operated according to this manual. However, unless the following instructions are closely followed, there is a high probability of destroying a diode laser even before the system is properly running. This is particularly true for operators with little or no prior experience working with diode lasers. Never connect or disconnect the driver to the laser with the driver switched on.

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4.1 FACTORY DEFAULT SETTINGS

The default configuration on power-up is CONSTANT CURRENT MODE

4.2 SYSTEM OPERATION

The driver can operate diode lasers and laser array assemblies requiring up to 65A at up to 10V. (See Figure 3.4/1) The unit's four operating modes are:

1. **Constant Current Mode:** Constant current is supplied to the diode laser. Output power of the laser will change as its temperature changes. External Current modulation is possible.
2. **Constant Power Mode:** The laser is driven so that its output power remains constant. A laser monitor photodiode is required.
3. **x100 Current Amplifier Mode:** The output current is 100 times the input current.
4. **Parallel Operation:** Two or more drivers are operated in parallel.

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4.3 CONNECTING THE DIODE LASER

This section assumes the use of an 06 DLH 011 cable. If you have made up your own cable or changed the output termination of the 06 DLH 011, it is suggested that you generate your own version of section 4.3.1 for future reference and tape it into this manual.

WARNING! - Before handling a diode laser, you must take adequate anti-static precautions. To safeguard against electrostatic discharge from the body or clothing, an operator should always be grounded through a high resistance (1MΩ) when handling a diode laser.
Do not touch the window of a diode laser. Dirt or scratches on the surface of the glass will reduce the output power and distort the far-field irradiance distribution. If the window becomes dirty, gently clean it with a lint-free lens tissue and optical grade ethanol.



4.3
4.4

- Red Sleeve = Positive - Connect to Laser Anode
- Black Sleeve = Negative- Connect to Laser Cathode
- Green Sleeve = Ground - Connect to either, or leave disconnected

If the cable colors are mixed up, the driver and/or the laser can be damaged.

4.3.1 Making the Connection

1. Connect the cable to the laser, taking care to connect the positive (red) connector to the laser anode and the negative (black) connector to the laser cathode. ***Connection errors may irreversibly damage the laser.***

2. The driver chassis ground connection is provided as a grounding option for ancillary equipment. This connection may also remain unconnected or be connected to the cathode or anode termination. (But not to both!).

3. With the driver powered down, i.e. the key in the POWER keyswitch is vertical, connect the output cable to the laser drive connector on the front panel of the diode laser driver. SCREW THE CONNECTOR TIGHT, TO THE POINT AT WHICH YOU FEEL THE STOP.

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4.4 CONSTANT CURRENT OPERATION AND CURRENT MODULATION

In this mode, the driver supplies a constant current level regardless of any impedance changes in the diode laser. Unless the laser is temperature stabilized, the output power will fluctuate slightly due to thermal drift, which changes the threshold point of the diode laser. Constant current is a useful mode for controlling the laser as a simple source of coherent light and for evaluating the optical performance characteristics of a diode laser.

An analog voltage can be applied to the driver to modulate the operating current delivered to the diode laser. The total current delivered to the laser is the algebraic sum of the current set point value from the front panel and the current generated by the modulation voltage.

E.g. If 10 A was set via front panel control in the low current range, and a +2.0 VDC signal was applied to the modulation input (approx. 5 A/V), the current delivered to the laser would be 20 A.



WARNING! ***The current limit is the only means for independently limiting the output current when external modulation is used. Always set the current limit before using/connecting an external modulation signal.***

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4.4.1 Constant Current Mode Operation

1. Verify that the key in the POWER keyswitch is vertical and that the LASER ON LEDs are *not* illuminated. Connect the diode laser to the driver as per section 4.3. Then use the keyswitch to turn on the driver.

> ***WARNING! Output Power. The driver is designed to safely drive appropriate laser diodes and laser diode arrays. It can deliver 65A at a voltage from 0 to 10V. This is sufficient to cause fire and/or meltdown in inappropriate loads or loads which are not adequately heatsunk.***



It is the user's responsibility to ensure that the driver output can be handled safely by the load. Melles Griot Inc. accepts no responsibility under any circumstances for any consequences of inappropriate use of this driver.

2. The turn-on setting for the MODE should be CONSTANT CURRENT. If not already engaged, press the MODE button and set to CONSTANT CURRENT mode. i.e. Press until this LED is illuminated.

3. Press the DISPLAY button to select CURRENT LIMIT if not already selected. Adjust the CURRENT LIMIT trimpot to the desired limit, which should be below the diode laser manufacturer's maximum current rating (if available) or ≤5% above the recommended operating current for the anticipated temperature.

4. Press the DISPLAY button to select CURRENT PRESET. ADJUST the current to the desired level, which should be at or below the diode laser manufacturer's recommended operating current for the anticipated temperature of operation. With a new set-up it is prudent to set the CURRENT PRESET to zero initially and then gradually increase it after the laser has been turned on.

5. Connect a monitor photodiode to the PHOTODIODE INPUT if so desired. See INPUT & PHOTODIODE in Section 3.2.

6. *CHECK steps 1) to 5) ... High Power Diode Laser Assemblies are expensive.*

7. Press the LASER ON button. The top LED will flash for 3 seconds and then power will be applied to the laser. If a 'fault' condition is detected, the appropriate STATUS LED will illuminate and the appropriate action will be taken. (Sec. 3.2.5)

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8. Monitoring. The actual laser OUTPUT CURRENT, laser OUTPUT VOLTAGE and monitor PHOTODIODE current can be displayed on the 4 digit LED DISPLAY or externally monitored through the MONITOR BNC connectors on the front of the unit. Normally users select OUTPUT CURRENT as the displayed parameter.

9. The operating current can be varied by selecting CURRENT PRESET, under DISPLAY, and then adjusting the current. It cannot go above the CURRENT LIMIT. If an attempt is made to do so, the CURRENT LIMIT, STATUS LED will illuminate.

10. Power Down. To turn off the system, follow the instructions below exactly for maximum protection against diode laser damage.

    1) Remove current to the diode laser by pressing the LASER ON key.

    2) If so desired, remove power to the driver by rotating the keyswitch counter-clockwise.

    3) If power to the driver is interrupted, the output is protected against transients that might harm the laser.

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4.5 CONSTANT POWER OPERATION

In this mode, a driver servo loop controls the operating current to the diode laser such that the monitor current is held constant. Constant power mode prevents changes in the diode laser's optical output power, (such as those due to ambient temperature changes or aging).

WARNING! The CURRENT LIMIT is the only means for independently limiting the output current. Always set the CURRENT LIMIT in CONSTANT POWER MODE before using/connecting an external photodiode. If the driver sees no monitor photodiode input, or if the photodiode polarity is reversed, the driver will immediately ramp the laser drive current to the current limit.



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4.5.1 Constant Power Mode Operation

1. Verify that the key in the POWER keyswitch is vertical and that the LASER-ON LEDs are *not* illuminated. Connect the diode laser to the driver as per section 4.3. Then use the keyswitch to turn on the driver.



WARNING! Output Power. The driver is designed to safely drive appropriate laser diodes and laser diode arrays. It can deliver 65A at a voltage from 0 to 10V. This is sufficient to cause fire and/or meltdown in inappropriate loads or loads which are not adequately heatsunk.

It is the user's responsibility to ensure that the load can safely handle the driver output. Melles Griot Inc. accepts no responsibility under any circumstances for any consequences of inappropriate use of this driver.

2. The turn-on setting for the MODE is CONSTANT CURRENT. If not already engaged, press the MODE button and set to CONSTANT POWER mode i.e. Press until this LED is illuminated.

3. Press the DISPLAY button to select CURRENT LIMIT. Adjust the CURRENT LIMIT trimpot to the desired limit, which should be below the diode laser manufacturer's maximum current rating (if available) or ≤5% above the recommended operating current for the anticipated temperature of operation.

4. Connect a monitor photodiode to the PHOTODIODE INPUT. See INPUT & PHOTODIODE in Section 3.2.

5. Press the DISPLAY button to select PHOTODIODE PRESET. ADJUST the PHOTODIODE PRESET to the desired level, which should be such that the laser current will remain at or below the diode laser manufacturer's recommended operating current for the temperature of operation.

6. With high power diode lasers, the photodiode is frequently external to the laser assembly. If the relationship between laser current and photocurrent is not known, establish this relationship at low current levels before proceeding further.

7. *CHECK steps 1. To 5. ... High Power Diode Laser Assemblies are expensive!*

8. Press the LASER ON button. The LED will flash for 3 seconds and then power will be applied to the laser. If a 'fault' condition is detected, the appropriate STATUS LED will illuminate and the appropriate action will be taken. (Sec. 3.2.5)

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9. Monitoring. The actual laser OUTPUT CURRENT, laser OUTPUT VOLTAGE and monitor PHOTODIODE current can be displayed on the 4 digit LED DISPLAY or externally monitored through the MONITOR BNC connectors on the front of the unit. Normally users select OUTPUT CURRENT as the displayed parameter.

10. Power Down. To turn off the system, follow the instructions below exactly for maximum protection against diode laser damage.

    1) Remove current to the diode laser by pressing the LASER ON key.

    2) If so desired, remove power to the driver by rotating the keyswitch counter-clockwise.

    3) If power to the driver is interrupted, the output is protected against transients that might harm the laser.

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4.6 X100 AMPLIFIER MODE



WARNING! The current limit is the only means for independently limiting the output current when external control is used. Always set the current limit before using/connecting an external control signal.

In this mode, the driver operates as a slave under the control of an external master. The drive current to the diode laser is 100 times greater than the input current.



WARNING! The current limit is the only means for limiting the output current when operating in X100 AMPLIFIER mode. Always set the current limit before using the driver in this mode.

4.6.1 X100 Amplifier Mode Operation

1. Verify that the key in the POWER keyswitch is vertical and that the LASER ON LEDs are *not* illuminated. Connect the diode laser to the driver as per section 4.3. Then use the keyswitch to turn on the driver.



WARNING! Output Power. The driver is designed to safely drive appropriate laser diodes and laser diode arrays. It can deliver 65A at a voltage from 0 to 10V. This is sufficient to cause fire and/or meltdown in inappropriate loads or loads which are not adequately heatsunk.

It is the user's responsibility to ensure that the load can safely handle the driver output. Melles Griot Inc. accepts no responsibility under any circumstances for any consequences of inappropriate use of this driver.

2. The turn-on setting for the MODE is CONSTANT CURRENT. If not already engaged, press the MODE button and set to x100 AMPLIFIER mode i.e. Press until this LED is illuminated.

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3. Press the DISPLAY button to select CURRENT LIMIT. Adjust the CURRENT LIMIT trimpot to the desired limit, which should be below the diode laser manufacturer's maximum current rating (if available) or ≤5% above the recommended operating current for the anticipated laser operating temperature.

4. Connect the master current driver output to the x100 AMPLIFIER INPUT BNC. The transfer function is 100A/A.

5. Connect a monitor photodiode to the PHOTODIODE INPUT if so desired. See INPUT & PHOTODIODE in Section 3.2.

6. *CHECK steps 1) to 5) ... High Power Diode Laser Assemblies are expensive!*

7. Press the LASER ON button. The LED will flash for 3 seconds and then power will be applied to the laser. If a 'fault' condition is detected, the appropriate STATUS LED will illuminate and the appropriate action will be taken. (Sec. 3.2.5)

8. Monitoring. The actual laser OUTPUTCURRENT, laser OUTPUT VOLTAGE and monitor PHOTODIODE current can be displayed on the 4 digit LED DISPLAY or externally monitored through the MONITOR BNC connectors on the front of the unit. Normally users select OUTPUT CURRENT as the displayed parameter.

9. Power Down. To turn off the system, follow the instructions below exactly for maximum protection against diode laser damage.

   1) Remove current to the diode laser by pressing the LASER ON key.

   2) If so desired, remove power to the driver by rotating the keyswitch counter-clockwise.

   3) If power to the driver is interrupted, the output is protected against transients that might harm the laser.

4.6
4.7

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4.7 PARALLEL OPERATION OF DRIVERS

Parallel operation of multiple driver units offers output currents greater than 65A for higher current diodes.

- Only the following drivers can be paralleled:
  - Melles Griot 06 DLD 903
  - OptoPower PS 6510
- Any paralleled driver can be operated in any mode.
- Parallel operation does *not* imply master/slave operation. Parallel merely implies parallel. All drivers will operate on an equal footing.

4.7.1 Set-up

This section assumes the use of 06 DLH 011 cables. If you have made up your own cables or changed the output termination of the 06 DLH 011, it is suggested that you generate your own version of this section for future reference and tape it into this manual.

Connect all driver output leads of the same polarity together using the supplied cables. DO NOT CONNECT LEADS OF DIFFERENT POLARITY TO THE SAME

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