Model 5700-30
Model 5700-80

Laser Diode Drivers

User's Manual

Newport®
Experience | Solutions

EU Declaration of Conformity

We declare that the accompanying product, identified with the CE mark, complies with requirements of the Electromagnetic Compatibility Directive, 2004/108/EC and the Low Voltage Directive 73/23/EEC.

Model Numbers: 5700-30, 5700-80

Year CE mark affixed: 2008

Type of Equipment: Electrical equipment for measurement, control and laboratory use in industrial locations.

Manufacturer: Newport Corporation

1791 Deere Avenue
Irvine, CA 92606

Standards Applied:

Compliance was demonstrated to the following standards to the extent applicable:

BS EN61326-1: 2006 “Electrical equipment for measurement, control and laboratory use – EMC requirements”.

This equipment meets the CISPR 11:2006+A2 Class A Group 1 radiated and conducted emission limits.

BS EN 61010-1:2001, 2nd Edition “Safety requirements for electrical equipment for measurement, control and laboratory use”.

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Warranty

Newport Corporation warrants that this product will be free from defects in material and workmanship and will comply with Newport's published specifications at the time of sale for a period of one year from date of shipment. If found to be defective during the warranty period, the product will either be repaired or replaced at Newport's option.

To exercise this warranty, write or call your local Newport office or representative, or contact Newport headquarters in Irvine, California. You will be given prompt assistance and return instructions. Send the product, freight prepaid, to the indicated service facility. Repairs will be made and the instrument returned freight prepaid. Repaired products are warranted for the remainder of the original warranty period or 90 days, whichever first occurs.

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First printing 2008

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Newport Corporation
1791 Deere Avenue
Irvine, CA, 92606
USA

Part No. 90021078 rev A

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Service Information

This section contains information regarding factory service for the source. The user should not attempt any maintenance or service of the system or optional equipment beyond the procedures outlined in this manual. Any problem that cannot be resolved should be referred to Newport Corporation.

Technical Support Contacts

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Newport Corporation Calling Procedure

If there are any defects in material or workmanship or a failure to meet specifications, promptly notify Newport's Returns Department by calling 1-800-222-6440 or by visiting our website at www.newport.com/returns within the warranty period to obtain a **Return Material Authorization Number (RMA#)**. Return the product to Newport Corporation, freight prepaid, clearly marked with the RMA# and we will either repair or replace it at our discretion. Newport is not responsible for damage occurring in transit and is not obligated to accept products returned without an RMA#.

E-mail: rma.service@newport.com

When calling Newport Corporation, please provide the customer care representative with the following information:

- Your Contact Information
- Serial number or original order number
- Description of problem (i.e., hardware or software)

To help our Technical Support Representatives diagnose your problem, please note the following conditions:

- Is the system used for manufacturing or research and development?
- What was the state of the system right before the problem?
- Have you seen this problem before? If so, how often?
- Can the system continue to operate with this problem? Or is the system non-operational?
- Can you identify anything that was different before this problem occurred?

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1 Safety Precautions

1.1 Definitions and Symbols

The following terms and symbols are used in this documentation and also appear on the Models 5700-30 and 5700-80 Laser Diode Drivers where safety-related issues occur.

1.1.1 General Warning or Caution

Figure 1 General Warning or Caution Symbol

The Exclamation Symbol in the figure above appears on the product and in Warning and Caution tables throughout this document. This symbol designates that documentation needs to be consulted to determine the nature of a potential hazard, and any actions that have to be taken.

1.1.2 Electric Shock

Figure 2 Electrical Shock Symbol

The Electrical Shock Symbol in the figure above appears throughout this manual. This symbol indicates a hazard arising from dangerous voltage. Any mishandling could result in irreparable damage to the equipment, and personal injury or death.

1.1.3 European Union CE Mark

Figure 3 CE Mark

The presence of the CE Mark on Newport Corporation equipment means that this instrument has been designed, tested and certified as complying with all applicable European Union (CE) regulations and recommendations.

1.1.4 Alternating voltage symbol

Figure 4 Alternating Voltage Symbol

This international symbol implies an alternating voltage or current.

1.1.5 On

Figure 5 On Symbol

The symbol in the figure above represents a power switch position on the Models 5700-30 and 5700-80 Laser Diode Drivers. This symbol represents a Power On condition.

1.1.6 Off

Figure 6 Off Symbol

The symbol in the figure above represents a power switch position on the Models 5700-30 and 5700-80 Laser Diode Drivers. This symbol represents a Power Off condition.

1.1.7 Fuses

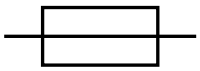

Figure 7 Fuse Symbol

The symbol in the figure above identifies the fuse location on the Models 5700-30 and 5700-80 Laser Diode Drivers.

1.1.8 USB

Figure 8 USB Symbol

The symbol in the figure above identifies the USB connector location on the Models 5700-30 and 5700-80 Laser Diode Drivers.

1.1.9 Frame or Chassis

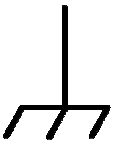

Figure 9 Frame or Chassis Terminal Symbol

The symbol in the figure above appears on the Models 5700-30 and 5700-80 Laser Diode Drivers. This symbol identifies the frame or chassis terminal

1.1.10 Waste Electrical and Electronic Equipment (WEEE)

Figure 10 WEEE Directive Symbol

This symbol on the product or on its packaging indicates that this product must not be disposed of with regular waste. Instead, it is the user responsibility to dispose of waste equipment according to the local laws. The separate collection and recycling of the waste equipment at the time of

disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For information about where the user can drop off the waste equipment for recycling, please contact your local Newport Corporation representative. See Section 11 for instructions on how to disassemble the equipment for recycling purposes.

1.1.11 Control of Hazardous Substances

Figure 11 RoHS Compliant Symbol

This label indicates the products comply with the EU Directive 2002/95/EC that restricts the content of six hazardous chemicals.

1.2 Warnings and Cautions

The following are definitions of the Warnings, Cautions and Notes that are used throughout this manual to call your attention to important information regarding your safety, the safety and preservation of your equipment or an important tip.

	**WARNING** **Situation has the potential to cause bodily harm or death.**

	**CAUTION** **Situation has the potential to cause damage to property or equipment.**

NOTE

Additional information the user or operator should consider.

1.2.1 General Warnings

Observe these general warnings when operating or servicing this equipment:

- Heed all warnings on the unit and in the operating instructions.
- Do not use this equipment in or near water.

- This equipment is grounded through the grounding conductor of the power cord.
- Route power cords and other cables so that they are not likely to be damaged.
- Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp lint-free cloth.
- Lockout all electrical power sources before servicing the equipment.
- To avoid fire hazard, use only the specified fuse(s) with the correct type number, voltage and current ratings as referenced in the appropriate locations in the service instructions or on the equipment. Only qualified service personnel should replace fuses.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- Qualified service personnel should perform safety checks after any service.
-

1.2.2 General Cautions

Observe these cautions when operating this equipment:

- If this equipment is used in a manner not specified in this manual, the protection provided by this equipment may be impaired.
- To prevent damage to equipment when replacing fuses, locate and correct the problem that caused the fuse to blow before re-applying power.
- Do not block ventilation openings.
- Do not position this product in such a manner that would make it difficult to disconnect the power cord.
- Position the equipment so that access to the mains disconnect On/Off switch is readily available.
- Use only the specified replacement parts.
- Follow precautions for static sensitive devices when handling this equipment.
- This product should only be powered as described in the manual.
- There are no user-serviceable parts inside the Models 5700-30 and 5700-80 Laser Diode Drivers.
- Adhere to good laser safety practices when using this equipment.

1.2.3 Summary of Warnings and Cautions

The following general warning and cautions are applicable to this instrument:

WARNING

Before operating the Models 5700-30 and 5700-80 Laser Diode Drivers, please read and understand all of Section 1.

WARNING

Do not attempt to operate this equipment if there is evidence of shipping damage or you suspect the unit is damaged. Damaged equipment may present additional hazards to you. Contact Newport technical support for advice before attempting to plug in and operate damaged equipment.

WARNING

To avoid electric shock, connect the instrument to properly earth-grounded, 3-prong receptacles only. Failure to observe this precaution can result in severe injury.

WARNING

Before cleaning the enclosure of the Models 5700-30 and 5700-80 Laser Diode Drivers, the AC power cord must be disconnected from the wall socket.

CAUTION

There are no user serviceable parts inside the Models 5700-30 and 5700-80 Laser Diode Drivers. Work performed by persons not authorized by Newport Corporation will void the warranty. For instructions on obtaining warranty repair or service, please refer to Section 9.

1.3 Location of Labels and Warnings

1.3.1 Rear Panel

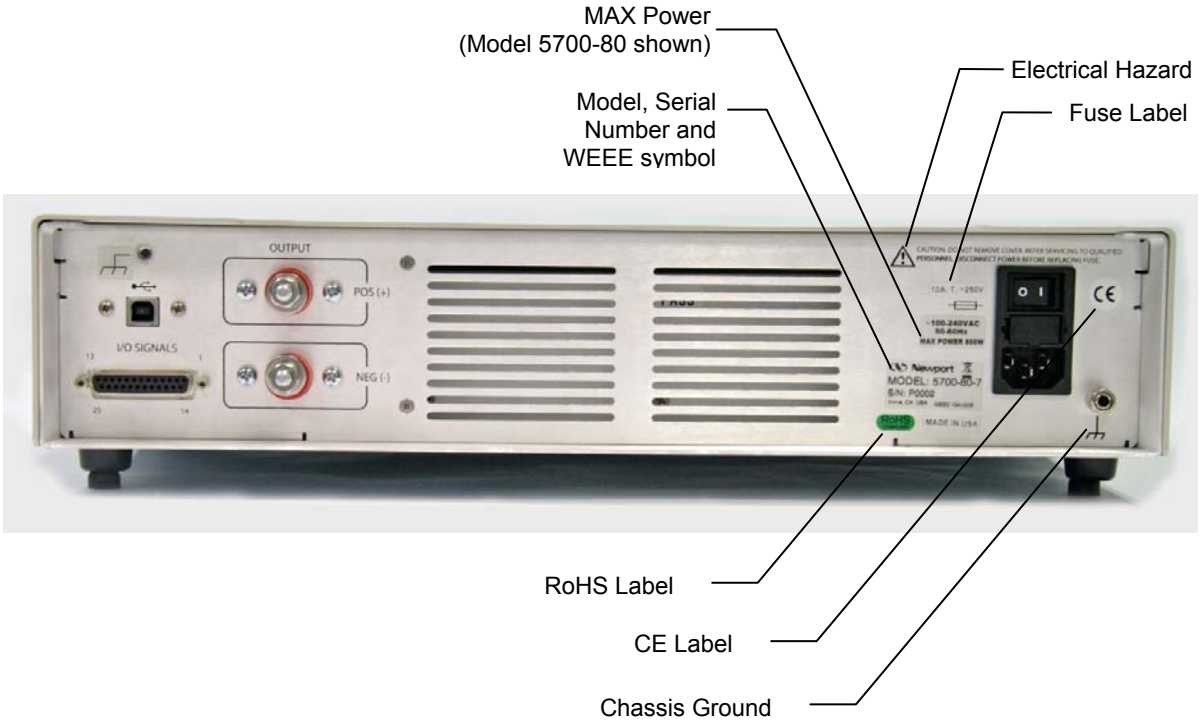

Figure 12 Rear Panel labels and warnings

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2 General Information

2.1 Introduction

Models 5700-30 and 5700-80 are laser diode drivers that offer reliable, high output power at a competitive price.

Intuitive front panel controls make these instruments extremely simple to use.

Comprehensive laser diode safety features and user safety have been thoroughly analyzed and designed into every Laser Diode Driver, complying with CE and CDRH standards. Refer to Section 1, Safety Precautions for more details.

At the beginning of the turn-on sequence, after a short delay, the output current ramps to the preset operating level. The current limit setting is fully independent.

Additional Features

- USB Interface
- Fully independent current limit

2.2 Specifications

	5700-30	5700-80
Output Current		
Range [A]	0 – 30	0 – 80
Resolution [A]	0.01	0.02
Accuracy [%FS]	±0.25	±0.25
Noise/Ripple (mA rms)[1]	< 10	< 40
Compliance Voltage		
Range [V]	5	7.5

[1] Measured optically with the following Newport components: BWA-series laser diode, 819C-series integrated sphere and 918D-SL-OD3 detector.

Current Limit		
Range [A]	0 – 30.03	0 – 80.08
Resolution [A]	0.01	0.02
Accuracy [%FS]	±0.25	±0.25
Pulse Width		
Range [ms]	0.05 – 9999.5	0.05 – 9999.5
Resolution [ms]	0.01	0.01
Risetime [ms][2]	0.25 typ.	0.36 typ.
Maximum Pulse Overshoot [%FS]	1	1
Trigger Input		
Type	Positive edge trigger	Positive edge trigger
Signal Input	TTL or 5V CMOS	TTL or 5V CMOS
Input Circuit	680-ohm pull-up to +5V	680-ohm pull-up to +5V
Trigger Output		
Type	Positive logic. Open collector with 1.5kΩ pull-up to +5V and maximum 8 mA sink capability	
Analog Control Input		
Range [V]	0 – 10	0 – 10
Input Impedance [kΩ]	25	25
Accuracy [%FS]	±0.25	±0.25
Current Monitor		
Range [V]	0 – 10	0 – 10
Transfer Function [A/V]	3	8
Output Impedance [Ω]	100	100
Accuracy [%FS]	±0.8	±0.8
Voltage Monitor (Output Terminals)[3]		
Range [V]	0 – 5	0 – 7.5
Transfer Function [V/V]	1	1
Output Impedance	100	100
Accuracy [%FS]	±4.2	±4.2
Voltage Monitor (Anode - Cathode Sense Inputs)		
Range [V]	0 – 5	0 – 7.5
Transfer Function [V/V]	1	1

[2] Measured on a 50 mΩ resistor load.

[3] For precise I-V measurements, use the Voltage Monitor on the Anode-Cathode Sense Inputs. See Sections 4.1.6 and 4.3.8.

Output Impedance	100	100
Accuracy [%FS]	±0.4	±0.4
Measurement Display		
Output Current Range [A]	0 – 30	0 – 80
Output Current Resolution [A]	0.01	0.02
Output Current Accuracy [%FS]	±0.3	±0.3
Forward Voltage Range [V]	0 – 5	0 – 7.5
Forward Voltage Resolution [V]	0.01	0.01
Forward Voltage Accuracy [%FS]	±0.3	±0.3

Table 1 General Specifications

Environmental Specifications

Voltage Requirements	110/220 VAC, 50/60Hz
Power Requirements	MAX POWER = 300W, 5700-30; 800W 5700-80
Chassis Ground	4 mm banana jack
Size (H x W x D) [in. (mm)]	3.47 (88.14) x 19.00 (482.60) x 12.24 (310.89)
Mainframe Weight [lb (kg)]	10.8 (4.9) (5700-30), 13.9 (6.3) (5700-80)
Operating Temperature	0°C to 40°C (<90% humidity non-condensing)
Storage Temperature	-30°C to + 60°C (<90% humidity non-condensing)
Relative Humidity, Storage	<90% humidity non-condensing
Altitude	<3000 meters (10000 feet)
Installation Category	II
Pollution Degree	2
Use Location	Indoor use only
Laser Safety Features	Output On/Off keyswitch, interlock, output delay (meets CDRH US21 CFR 1040.10, and IEC 60825-1)
I/O Signals	25-pin female D-sub
Output Terminals	Copper alloy studs and nuts with #1/4-20 thread

Table 2 Environmental Specifications

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3 Getting Started

3.1 Unpacking and Handling

It is recommended that the Models 5700-30 and 5700-80 Laser Diode Drivers be unpacked in a lab environment or work site. Unpack the system carefully; small parts are included with the instrument. Inspect the box carefully for loose parts. You are urged to save the packaging material in case you need to ship your equipment in the future.

3.2 Inspection for Damage

The Models 5700-30 and 5700-80 Laser Diode Drivers are carefully packaged at the factory to minimize the possibility of damage during shipping. Inspect the box for external signs of damage or mishandling. Inspect the contents for damage. If there is visible damage to the instrument upon receipt, inform the shipping company and Newport Corporation immediately. Carefully open the box and save the shipping material for later use.

WARNING

Do not attempt to operate this equipment if there is evidence of shipping damage or you suspect the unit is damaged. Damaged equipment may present additional hazards to you. Contact Newport technical support for advice before attempting to plug in and operate damaged equipment.

CAUTION

The user is advised to save the packaging material in case the unit has to be shipped to a different location. The packaging material is specially designed to protect the unit during shipping.

3.3 Available Models

5700-30	30A, 5V Laser Diode Driver
5700-80	80A, 7.5V Laser Diode Driver

3.4 Parts List

The following is a list of parts included with the Models 5700-30 and 5700-80 Laser Diode Drivers:

1. Start Up Guide (Hardcopy).
2. CD with Software Drivers and Utilities, User's Manual, Start Up Guide.
3. D-sub connector with interlock jumper.
4. A pair of keys for the safety keyswitch.
5. IEC320 AC line cord with a NEMA 5-15P connector.

If you are missing any parts or have questions about the parts you have received, please contact Newport Corporation.

3.5 Choosing and Preparing a Suitable Work Surface

The Models 5700-30 and 5700-80 Laser Diode Drivers may be placed on any reasonably firm table or bench during operation. The unit may be mounted in a standard 19-inch rack provided that the primary support for the unit is a shelf within the rack. DO NOT RACK-MOUNT THE UNIT USING ONLY THE FRONT PANEL EARS.

3.6 Electrical Requirements

Before attempting to power up the unit for the first time, the following precautions must be followed:

WARNING

To avoid electric shock, connect the instrument to properly earth-grounded, 3-prong receptacles only. Failure to observe this precaution can result in severe injury.

- Have a qualified electrician verify the wall socket that will be used is properly polarized and properly grounded.
- Provide adequate distance between the Models 5700-30 Series and 5700-80 Series Laser Diode Drivers and adjacent walls for ventilation purposes. Do not let any other equipment blow hot air towards the Laser Diode Drivers. Verify the correct rated fuses are installed according to the fuse marking on the rear panel.
- The output cables, which connect the laser diode to the Models 5700-30 or 5700-80, must have the proper gauge according to the user application. The Models 5700-30 and 5700-80 can output high current, so it is recommended the cables to be 4 AWG for the 5700-80 model and 8 AWG for the 5700-30 model with a PVC jacket of minimum 105 ºC rating. The user should check the local applicable codes for proper cable size and connections to ensure personal safety and system reliability.

3.7 Power Supplies

AC power is supplied through the rear panel AC power entry module connector that provides in-line transient protection and RF filtering. The power entry module also contains the mains power switch and the instrument's fuses.

WARNING

To avoid electric shock, connect the instrument to properly earth-grounded receptacles only. Failure to observe these precautions can result in fire, severe injury or death.

WARNING

To avoid electric shock, the appropriate fuses for the AC input power voltage must be installed in the instrument. Only qualified service personnel should replace fuses. Failure to observe these precautions can result in fire, severe injury or death.

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4 System Operation

⚠	**WARNING** **Before operating the Models 5700-30 and 5700-80 Laser Diode Drivers, please read and understand all of Section 1.**

4.1 Front Panel

The front panel of the Models 5700-30 and 5700-80 Laser Diode Driver is designed for easy operation. Seven distinct areas, each with a specific set of related functions, and a control knob are located on the front panel, as shown in Figure 13 below.

Figure 13 Front Panel Layout (5700-80 shown)

4.1.1 Control Switch

The Control Switch places the unit in Remote control mode. Each unit can operate in either Remote or Local control mode. In Remote control mode the instrument assumes that the USB interface has complete command control and thus the front panel Output ON switch, the Control pushbutton switch and the Control knob are ignored in that mode. Remote control mode prevents a user from changing settings or turning on the instrument output while under PC Remote control. The instrument is automatically placed in remote mode when the Newport Laser Diode Driver Application is launched and a USB cable is connected between the PC and the driver rear panel. The PC can return the instrument to Local control by sending the explicit Local command (see command section). The return to Local control mode cannot be done with the control switch.

4.1.2 OUTPUT ON Switch and Indicator

The switch will activate the ON LED and allow current flow to the laser diode after an approximately 3 second delay. Current will not flow unless the laser diode is correctly connected, the "LASER ENABLE" key switch is activated, and the interlock pins, pin 1 and 13 or pin 1 and 14 of the DB-25 I/O Signals Connector (located on the rear panel) are shorted together.

4.1.3 ERROR Indicator LED

The following conditions will cause the red ERROR LED and its protection circuitry to activate, automatically shutting off the output:

a. An open circuit in the laser diode package or cabling.

b. The forward voltage drop of a laser diode (or series arrangements of multiple diodes) exceeds the user set voltage limit, usually based on the product's compliance voltage specification.

c. Laser diode oscillation causing current to exceed the previously set current limit value.

d. Certain external transient events that could damage the laser.

4.1.4 LIMIT Indicator LED

A soft limit occurs when the output current gradually exceeds a preset value, clamping the current flow at that level and causing the LIMIT LED to blink until the threshold is no longer exceeded.

ERROR LED	LIMIT LED	CONDITION
ON	ON	(Key switch in ON position) AND ((Rear panel Interlock de-asserted) OR (Rear panel External Disable asserted) OR (Compliance voltage exceeded) OR (Hard limit condition asserted))
BLINKING	BLINKING	Firmware download progress incomplete
OFF	BLINKING	Soft limit condition asserted by circuitry
OFF	OFF	No error condition detected

Table 3 Error and Limit LED Status Definition

4.1.5 Laser Enable

This key switch is a safety feature. The unit's output current cannot be turned on, unless the key switch is turned on. The various Local and Remote control mode settings can be modified when the unit is powered up and the key switch is OFF, but attempts to enable output current via the USB interface or the Output ON switch will be rejected and an error message will be displayed. The key may only be removed in the OFF position.

4.1.6 Display Section

There are two front panel 4 digit green LED arrays. They show current in Amps and voltage in Volts. Pressing the current pushbutton switch repeatedly, cycles through display values as described below. Display modes can be toggled when the output is either ON or OFF or the unit is in Remote or Local Mode.

SETPOINT Display

This mode allows setting diode current levels with the control knob before actually turning on the output. The current setpoint corresponds to output laser diode current.

LIMIT SET Display

This mode allows setting diode current limit level with the control knob.

LD CURRENT Display

This readout measures actual current flow in Amps to the laser diode. The current level will drop to zero when the output is OFF.

FORWARD VOLTAGE Display

This readout measures the laser diode forward or compliance voltage. The current level will drop to zero when the output is OFF.

The Laser's forward voltage (V_f) is normally sensed at output terminals on the driver. It is not the actual V_f of the laser, the difference being the voltage drop in the cables due to the laser current.

Use the Anode and Cathode voltage sense inputs on the DB-25 I/O Signals Connector (located on the rear panel) to monitor the actual voltage across the laser diode. Note that it is necessary to send the HWCONFIG command via USB in order for the controller to monitor and display actual laser diode forward voltage on the front panel and via USB commands query.

4.1.7 Control Knob

Located on the right side of the front panel, this knob is used to set the appropriate drive current when the display is in either SETPOINT or LIMIT SET modes.

4.2 Rear Panel

The Model 5700-30 and 5700-80 rear panel has the OUTPUT terminals, I/O Signals connector, USB connector, and the AC power entry module.

Figure 14 Rear Panel

4.2.1 AC Power Switch

When AC power is turned on, the unit starts up in a default configuration with the OUTPUT off and the display in the SETPOINT mode. The power switch is part of the AC power entry module located on the right side of the instrument rear panel.

4.2.2 USB Interface

The instrument is designed to communicate with standard USB Host interfaces. The connector on the rear panel is a standard USB-B (Full-Size, Device).

4.2.3 Output Terminals

Connections to the laser diode are made with a pair of power studs with 1/4-20 thread. 1/4-20 nuts are supplied with the unit to match the output studs.

4.2.4 Chassis GND

This 4 mm banana jack is connected to chassis ground. It's intended to be used as an additional earth ground connection for the Laser Diode Driver enclosure.

4.2.5 AC Power Cord

All units are designed for 90-264VAC, 50/60 Hz operation. As such, they are rated for operation at 100VAC, 120VAC, 220VAC, and 240VAC mains voltages and 50 and 60 Hz mains frequency.

The line cord supplied with each unit should be plugged only into a properly grounded outlet to prevent electrical shock in the event of an internal short circuit to the metal cabinet. The detachable line cord should be connected to the IEC320 connector on the power entry module.

4.2.6 Fuses

The correct fuses must be installed into the fuse holder that is part of the AC power entry module. Please check the fuse label on the rear panel, before installing new fuses (see Figure 12).

WARNING

To avoid electric shock, the appropriate fuses for the AC input power voltage must be installed in the instrument. Only qualified service personnel should replace fuses. Failure to observe these precautions can result in fire, severe injury or death.

4.2.7 I/O Signals Connector

This DB-25 female connector provides access to various analog and digital input/output signals, as well as the instrument interlock signal. The signal pin assignments for this connector are shown in Table 4 below. Detailed information on these signals is provided in Section 4.3.

Pin No.	Name	Descriptions
1	Interlock+ (Input)	Additional safety. +5V (Digital) Pull Up. Can be connected to pins 13 or 14.
2	Fault (Output)	+5V TTL-Level Output
3	TTL (Input)	Used with gating and trigger features. +5V (Digital) Pull Up
4	TTL (Output)	Used with gating and trigger features. +5V TTL-Level Output
5	Output Disable (Input)	Low TRUE. Behaves similar to front panel ON button. +5V (Digital) Pull Up
6	Anode Sense (Input)	Differential Analog Input. Monitors LD voltage. Works in conjunction with pin 19.
7	Reserved	
8	Current Monitor (Output)	Differential Analog signal proportional to output current. Level 0-10V (into 10K load)
9	Voltage Monitor (Output)	Differential Analog signal equal to the compliance voltage. Level 0-Max Compliance Voltage (into 10K load)
10	Analog Control (Input)	Differential Analog signal. MPU sampled LD current setpoint command. Level 0 - 10V Analog, 10Hz (max) input. Requires USB command to activate.
11	Reserved	
12	Reserved	
13	Interlock (Return)	Digital Ground
14	Interlock (Return)	Digital Ground
15	Fault (Return)	Digital Ground

16	TTL Input (Return)	Digital Ground
17	TTL Output (Return)	Digital Ground
18	Output Disable (Return)	Digital Ground
19	Cathode Sense (Input)	Differential Analog Input. Monitors LD voltage. Works in conjunction with pin 6.
20	Reserved	
21	Current Monitor Output (Return)	Differential Analog Output.
22	Voltage Monitor Output (Return)	Differential Analog Output.
23	Analog Control Input (Return)	Differential Analog Input.
24	Reserved	
25	Chassis Ground	Chassis Ground

Table 4 I/O Signals Connector Pin Assignments

4.3 I/O Signals

The rear panel I/O Signals Connector provides several signals for remotely controlling and monitoring the Models 5700-30 and 5700-80 Laser Diode Drivers.

There are three different grounds – the Chassis Ground, the Digital Ground, and the Analog Ground. The Analog Ground and the Digital Ground are isolated within the Models 5700-30 and 5700-80. The Analog Ground is not available to the user. All the analog inputs and outputs are differential, with a return that is quasi-isolated from the Analog Ground.

The Chassis Ground is also isolated from the Analog Ground and Digital Ground. The Chassis Ground and Digital Ground are available to the user on the back panel DB-25 female connector. Although it is not required, these grounds may be connected together externally provided ground loops are not introduced. Such ground loops will degrade the performance of the unit and can result in damage to a connected laser diode. Because the USB interface is referenced to digital ground, users should be especially careful not to introduce a ground loop through an externally-connected computer, which usually connects the Digital Ground to Chassis Ground.

The best approach is to have the chassis ground connected in one single point in a system, so that currents between the grounds are avoided. This is not always practical. For example, if the user chooses to connect one of the laser diode leads to the Chassis Ground and has a generator connected to the Laser Diode Driver TTL input, the generator will connect the TTL ground (Digital Ground) to the Chassis Ground. This will result in two connections to Chassis Ground with the potential of having a ground loop. In this case, the user should connect all the external equipment to the same power strip, so that all chassis grounds are connected as close as possible to one single Chassis

Ground point. Also, the Laser Diode leads should be disconnected from Chassis Ground.

4.3.1 Interlock+

The Interlock+ signal is a TTL-Level input referenced to the unit's Digital Ground. Internally, this signal is connected to a +5V supply through a 680 Ω resistor and the photodiode of an optical isolator integrated circuit. This signal must be externally connected to digital ground, or the unit will not supply output drive current. For convenience, digital ground is located on two other connector pins – these are named "Interlock (Return)" in Table 4.

4.3.2 Fault

The Fault signal is a TTL-Level output referenced to the unit's Digital Ground. When a fault condition is detected, the unit will internally pull this signal to about +5V using a 1.5Kohm resistor. When a fault condition is not detected, the unit will sink up to 8 milliamperes to Digital Ground. For convenience, digital ground is located on another connector pin named "Fault (Return)" in Table 4.

4.3.3 TTL Input

The TTL Input signal is a TTL-Level input referenced to the unit's Digital Ground. The signal is internally pulled to about +5V via a 680 ohm resistor in series with the photodiode of an optical isolator integrated circuit. This signal is used for the GATED, TRIGGERED, RETRIG pulse modes as described in Section 7.7. This signal should be left unconnected unless GATED, TRIGGERED, or RETRIG pulse modes are specifically needed.

For convenience, digital ground is located on another connector pin named "TTL Input (Return)" in Table 4.

4.3.4 TTL Output

The TTL Output signal is a TTL-Level output referenced to the unit's Digital Ground. This signal is driven by an open-collector transistor output internally pulled to +5V via a 1.5 kohm resistor. The functionality of this signal is described in Section 7.7

For convenience, digital ground is located on another connector pin named "TTL Output (Return)" in Table 4.

4.3.5 Output Disable

The Output Disable signal is a TTL-Level input referenced to the unit's Digital Ground. The signal is internally pulled to about +5V via a 680 ohm resistor in series with the photodiode of an optical isolator integrated circuit. The unit will not supply output drive current if this input is LOW (pulled to digital ground). The unit will supply output drive current if this input is driven to +5V and all other conditions, such as the keyswitch being in the ON position, are met. This pin may be left unconnected ─ the unit will behave as if this signal was being driven to +5V. For convenience, digital ground is located on another connector pin named "Output Disable (Return)" in Table 4.

4.3.6 Cathode Sense / Anode Sense

The Cathode Sense and Anode Sense signals are a differential analog input loosely coupled to the unit's Analog Ground.

Normally, the unit will measure and monitor the voltage drop at the rear panel output terminals using connections within the instrument, but this measurement will not reflect the actual voltage drop across the user's laser diode due to the voltage drop in the wiring between the unit and the user's laser diode.

The Cathode Sense and Anode Sense signals are provided so that the unit can measure and monitor the voltage drop across the laser diode. To select these signals for voltage sensing, rather than the Model 5700-30 or 5700-80 output terminals, the unit must be commanded by an external computer to select these signals via the USB interface. (See the HWCONFIG command in Section 5.5)

These signals may be left unconnected if they are not selected.

4.3.7 Current Monitor Output / Current Monitor Output (Return)

The Current Monitor Output and Current Monitor Output (Return) signals are a differential analog output loosely coupled to the unit's Analog Ground. These signals allow the user to monitor the Model 5700-30 and 5700-80 output current using an oscilloscope or similar instrument. The output range is 0 to 10 V, which corresponds to the output current range of 0 to Maximum Current.

4.3.8 Voltage Monitor Output / Voltage Monitor Output (Return)

The Voltage Monitor Output and Voltage Monitor Output (Return) signals are a differential analog output loosely coupled to the unit's Analog Ground. These signals allow the user to monitor the voltage across the user's laser diode using an oscilloscope or similar instrument. The default is to report the voltage at the Models 5700-30 and 5700-80 output terminals. Alternatively,

the voltage across the Cathode Sense / Anode Sense signals will be reported if this has been previously selected by a command received via USB interface. The output range is 0 to the Maximum Compliance Voltage.

4.3.9 Analog Control Input / Analog Control Input (Return)

The Analog Control Input and Analog Control Input (Return) signals are a differential analog input loosely coupled to the unit's Analog Ground. These signals allow the user to control the Model 5700-30 and 5700-80 output current using a voltage source. The range is 0 to 10 V, which corresponds to the output current range of 0 to Maximum Current. The user can set the unit in Analog Control Mode by sending the LASer:MODE 5 command (Section 5.5). In Analog Control Mode, as the input voltage increases, the output current increases. Although one can adjust the input voltage between 0 and 10 V, the output current cannot increase past the set limit.

4.3.10 Chassis Ground

For convenience, the Models 5700-30 and 5700-80 have another chassis ground which is presented near the Output terminals.

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5 Computer Interfacing

5.1 General Guidelines

The Model 5700-30 and 5700-80 Laser Diode Drivers have a USB interface to receive commands from and send responses to a host PC. The commands supported by the driver can be divided into the following two categories: commands that cause the driver to take a desired action, and commands (queries) that return a stored value or state of the driver.

Query commands must end with a question mark (?). It is recommended that when a query command is sent, the response to that command from the driver be read before issuing any other command.

Set commands, on the other hand, are used to configure/setup the driver for a desired mode of operation. These commands take at least one parameter. The subsequent sections in this chapter detail the communication protocols supported by the driver.

5.2 Computer Interface Terminology

Listed below are the key abbreviations and concepts used in the command reference section of this manual.

5.2.1 <…> Delimiting Punctuation

For the purposes of this manual, any string enclosed by <…> is considered to be a command, a string or numerical argument. The punctuation <…> is used to symbolize the typographic limits of the command, string or argument in question.

5.2.2 <CR> Carriage Return

The ASCII encoded byte 13 in decimal. (0D hex)

5.2.3 <LF> Line Feed

The ASCII encoded byte 10 in decimal. (0A hex)

5.2.4 (;) Semicolons

Semicolons are used to separate commands within a single transmission (concatenation).

5.2.5 Command Termination

All the commands sent to the driver must be terminated by a <CR><LF> sequence.

5.2.6 Response Termination

All the responses from the driver are terminated by a <CR><LF> sequence.

5.3 Driver Operation Mode

The Laser Diode Driver supports two modes of operation: LOCAL and REMOTE. The driver will be in LOCAL mode, by default, following a power reset. In this mode, output current setpoint and output current limit can be adjusted by turning the knob on front panel of the driver. Output can be turned ON and OFF by pressing the output switch. Please refer the "System Operation" chapter for a detailed description on how to accomplish these tasks. When the driver is in REMOTE mode, knob control is disabled; output current setpoint and other settings can be adjusted only by issuing appropriate commands from a host PC. The CONTROL LEDs indicate whether the driver is in LOCAL or REMOTE mode.

By default, the driver enters REMOTE mode when it receives any command through USB communication interface. It can be setup to enter this state on any set command only by setting the appropriate bit in configuration register (refer "HWCONFIG" command). The driver can be put back in LOCAL mode by issuing "LOCAL" command or by pushing the CONTROL switch 3 seconds after no communication activity.

5.4 USB Communication

The driver is designed to communicate with a host PC via a standard USB interface. Before connecting the driver to the USB interface the user should install the application included in the software CD that accompanies the Laser Diode Driver. The application automatically installs the right USB drivers. Communication can be done through this interface by using the application or by developing software in the user's preferred programming language. The software CD contains communication drivers and example programs in the following programming languages: LabVIEW and C#.NET

5.5 Commands and Queries

There are two types of device commands: commands that cause the instrument to take a desired action, and queries that return a stored value or state of the instrument. Queries must end with a question mark (?), while commands may require parameter(s) to follow:

LASer:LIMit:I 50.00

For example, the value "50.00" in the command **LASer:LIMit:I 50.00**, sets the laser current limit at 50.00. 0 below summarizes all the commands and

queries supported by the instrument. The command/query MUST contain all of the letters shown in upper-case; lower-case letters in the commands are optional, and may be used for clarity.

The commands may be sent to the instrument in either upper or lower case or in any combination. For example, the following commands are equal:

LASer:LIMit:I 50.00

LAS:LIM:I 50.00

las:LIM:I 50.00

Las:Lim:I 50.00

COMMAND EXECUTION:

The controller interprets the commands in the order they are received and execute them sequentially. If a set of commands have to be executed closer to each other, these commands can be sent to the controller simultaneously by creating a command string with semicolon (;) used as a command separator. The command string length should not exceed 50 characters. In the example shown below, a command string was created with semicolon separating 5 queries. The controller responds to this command string with a response that has 5 values using a comma (,) as a separator.

COMMAND STRING:

LAS:OUT?;LAS:SET:I?;LAS:I?;LAS:LDV?

INSTRUMENT RESPONSE:

0,45.0,0.0,0.00

COMMAND TERMINATION:

All commands sent to the instrument must be terminated by <Carriage Return><Line Feed>.characters. All responses sent out by the instrument are terminated by the same characters.

NOTE

For compatibility, some commands have optional entries; such as **LASer:LDI**, which can also be **LASer:I**. Options are shown in 0 as parenthesis; such as **LASer:LDI (I)**. After 0, each command and query is detailed.

Command Syntax	Command Description	Remarks
***IDN?**	Identification string query	
***RCL**	Recall settings	Restore instrument to setup state stored in its non-volatile local memory
***RST**	Reset instrument	
***SAV**	Save instrument's settings	Save instrument's current settings in its non-volatile local memory
***STB?**	Status Byte Query	Returns "error message available" status
ADDRess	Controller USB address set	
ADDRess?	Controller USB address query	
ERRors?	Error code query	
ERRSTR?	Error string query	
HWCONFIG	Hardware configuration set	
HWCONFIG?	Hardware configuration query	
LOCAL	Return to local mode	
ONDELAY	Output turn-on delay set	
ONDELAY?	Output turn-on delay query	
LASer:ANLG:IN?	Analog input voltage query	
LASer:COND?	Laser condition query	
LASer:I	Laser current set point	
LASer:I?	Measured laser current query	
LASer:LDV?	Measured forward voltage query	Same as compliance voltage
LASer:LIMit:I	Laser current limit set	
LASer:LIMit:I?	Laser current limit set query	
LASer:LIMit:LDV	Laser forward voltage limit set	
LASer:LIMit:LDV?	Laser forward voltage limit query	
LASer:LIV:COUNT?	LIV characterization samples query	
LASer:LIV:ENable	LIV characterization enable state set	
LASer:LIV:ENable?	LIV characterization enable state query	
LASer:LIV:GETMEAS?	LIV characterization get measurements	
LASer:LIV:SETUP	LIV characterization parameters setup	
LASer:LIV:SETUP?	LIV characterization parameters query	
LASer:MAX:I?	LDD output current rating query	
LASer:MAX:LDV?	LDD forward voltage rating query	
LASer:MODE	LDD operation mode set	
LASer:MODE?	LDD operation mode query	
LASer:OUTput	Laser output enable/disable	
LASer:OUTput?	Laser output enable status query	
LASer:PULse:ENable	LDD pulse mode enable state set	
LASer:PULse:ENable?	LDD pulse mode enable state query	
LASer:PULse:FREQuency	LDD pulse frequency set	
LASer:PULse:FREQuency?	LDD pulse frequency query	
LASer:PULse:MODE	LDD pulse operation mode set	
LASer:PULse:MODE?	LDD pulse operation mode query	
LASer:PULse:WIDth	LDD pulse width set	
LASer:PULse:WIDth?	LDD pulse width query	
LASer:RAMP:I	Sets the output current ramp parameters	
LASer:RAMP:I?	Output current ramp parameters query	
LASer:SET:I?	Laser current set point query	
LASer:TTL:MODE	LDD TTL pulse out operation mode set	
LASer:TTL:MODE?	LDD TTL pulse out operation mode query	

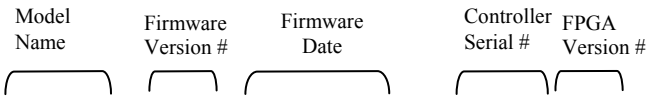
Table 5 Command Summary

*IDN?

Description Identification string query.

Syntax ***IDN?**

Remarks This query will cause the instrument to return an identification string. Note that the model name returned by the Model 5700-30 will be "5700-30". Similarly, the model name returned by the Model 5700-80 will be "5700-80".



NEWPORT XXXX vYYY mm/dd/yy, SNZZZZ FFF

*RCL

Description Recall command.

Syntax ***RCL value**

Argument	Value	Description
Value	0	Restores factory default settings
	1	Restores last saved settings

Remarks The recall command restores the instrument to the one of the two setup states saved in the driver's non-volatile local memory. The parameters that can be restored are:

1. USB address
2. Hardware configuration register value
3. Current ramp settings
4. Current limit setpoint
5. Forward voltage limit setpoint
6. Current setpoint

See Also ***RST**, ***SAV**

*RST

Description Reset command.

Syntax ***RST**

Remarks The reset command performs a soft reset of the instrument.

See Also ***RCL**

*SAV

Description Save command.

Syntax ***SAV value**

Argument	Value	Description
Value	0	Reserved
	1	Saves current settings to settings

Remarks The save command stores the current state of the instrument in non-volatile local memory. This state is then recalled by using the ***RCL** command.

When the instrument is in "LOCAL" control mode, the instrument's firmware checks for any change in current and current limit setpoints once every 5 seconds. If any one of these two parameters is found to be different from what has already been saved in the instrument's non-volatile local memory, it automatically initiates the save settings process.

The auto-save feature is disabled when the instrument is in "REMOTE" control mode. Parameters are saved only when this command is issued.

The parameters that can be saved are:
1. USB address
2. Hardware configuration register value
3. Current ramp settings
4. Current limit setpoint
5. Forward voltage limit setpoint
6. Current setpoint

See Also ***RCL**

*STB?

Description Status Byte Register query.

Syntax ***STB?**

Remarks The Read Status Back query allows the programmer to read the Status Byte Register.

Response	Description	
Status Byte Register	bit 0	Reserved
	bit 1	Reserved
	bit 2	Reserved
	bit 3	Reserved
	bit 4	Reserved
	bit 5	Reserved
	bit 6	Reserved
	bit 7	Error Message Available

ADDRess

Description USB address command.

Syntax **ADDRess** value

Remarks The **ADDRess** command sets the instrument USB address. After changing USB address, the communication with the instrument has to be re-initialized. This can be accomplished by calling "InitSystem" function in the DLL available in the CD provided with the instrument.

Argument	Value	Description
Value	*0*	*Reserved*
	1 to 31	*Valid USB address range*

See Also **ADDRess?**

ADDRess?

Description USB address query.

Syntax **ADDRess?**

Remarks The **ADDRess** query returns the controller's USB address.

Response	Description
address	*USB address of instrument*

See Also **ADDRess**

ERRors?

Description Error query.

Syntax **ERRors**?

Remarks This query returns a single error number that corresponds to an error occurred since the last query. This command also clears the read error from the error buffer. Refer to Appendix A for a list of error codes generated by the DRIVER

Response	Description
Error code	*Error code number per Appendix A, 0 if no errors*

See Also **ERRSTR?**

ERRSTR?

Description Error string query.

Syntax **ERRSTR**?

Remarks This query returns a single error code along with the corresponding error text string that occurred since the last error query. Refer to Appendix A for a list of error codes and strings generated by the DRIVER.

Response	Description
Error code, "text"	Error code and text for error code as per chapter, 0 if no errors

See Also **ERRors?**

HWCONFIG

Description Hardware configuration register command.

Syntax **HWCONFIG** *value*

Remarks This command sets the hardware configuration register. Please refer the table below for a description of the various bits in this register.

Argument	Value	Description
Value	*Integer*	*Valid values are between 0 and 127*

Bit #	Meaning	Remarks
0	Remote mode	0* = switch to remote mode when any command is received over USB interface 1 = switch to remote mode only when any set command is received over USB interface Switching from remote to local mode is achieved when "LOCAL" command is received over USB interface
1	Ramp output current	0* = Ramp up output current from existing to new setpoint in remote mode 1 = Do not ramp up output current; just set the value
2	10 ms data rate	0 = Measurements are averaged over 500 ms period 1 = Measurements are not averaged. Raw data of 10 ms interval can be downloaded via USB for fast LIV measurements
3	Reserved	
4	Reserved	
5	Laser Diode Forward voltage monitor	0* = The unit displays the voltage across the output terminals 1 = The unit displays the Laser Diode Anode to Cathode Sense voltage
3	Reserved	
4	Reserved	

* indicates factory default setting.

See Also **HWCONFIG?**

HWCONFIG?

Description Hardware configuration register query.
Syntax **HWCONFIG?**

Remarks This query returns the instrument's hardware configuration register.

Response	Description
Value	*Hardware configuration register setting*

See Also **HWCONFIG**

LOCAL

Description Return to local mode.
Syntax **LOCAL**

Remarks This command returns the instrument to local mode after being placed in remote mode by USB communication interface. The instrument can also be returned to local mode by pressing the "LOCAL" control switch on the front-panel of the instrument, after 3 seconds of communication inactivity.

See Also **None**

ONDELAY

Description Laser turn on delay command.
Syntax **ONDELAY** *time*

Remarks This command controls the laser turn on delay. This is the amount of time between the moment the laser on command is received and the moment the output is actually energized. This setting is also used when a laser is commanded to turn on by pushing the OUTPUT button on front panel of instrument when it is in local control mode.

Argument	Value	Description
Time	*Integer*	*Time, in milliseconds. Valid values are between 3000 and 60000*

See Also **ONDELAY?, LAS:OUT, LAS:OUT?**

ONDELAY?

Description Laser turn on delay query
Syntax **ONDELAY?**

Remarks This command returns the laser turn on delay time.

Response	Description
Value	*Time, in milliseconds*

See Also **ONDELAY, LAS:OUT, LAS:OUT?**

LASer:ANLG:IN?

Description Analog control input voltage query.
Syntax **LASer:ANLG:IN?**

Remarks This command returns the analog control input voltage.

Response	Description
Value	*Input voltage, in Volts*

See Also **LASer:MODE, LASer:MODE?**

LASer:COND?

Description Laser condition status register query.
Syntax **LASer:COND?**

Remarks This command returns the laser condition status register.

Response	Description
Value	*Laser condition status*

Bit #	Meaning	Remarks
0	Output current limit	0 = Hard limit not reached; 1 = Hard limit reached
1	Compliance voltage limit	0 = Limit not reached; 1 = Limit reached
2	Reserved	
3	Reserved	
4	Remote interlock	0 = Grounded; 1 = Floating
5	Output disable	0 = False; 1 = True
6	Key-switch state	0 = Key in OFF position; 1 = Key in ON position
7	Open circuit	0 = No fault; 1 = Fault condition
8	Reserved	
9	Reserved	
10	Output current state	0 = Disabled; 1 = Enabled
11	Output current enable delay timer (3 sec)	0 = Expired; 1 = Not Expired
12	Output current ramp state	0 = Steady (output current is at desired setpoint) 1 = Ramping
13	Reserved	
14	ADC Failure	0 = no failure; 1 = failure occurred
15	Power Supply Failure	0 = no failure; 1 = failure occurred

See Also **LASer:MODE, LASer:MODE?**

LASer:I

Description Laser current set point command.

Syntax **LASer:I** *current set point*

Remarks Sets the laser's constant current set point.

Argument	Value	Description
current set point	*Float*	*Laser driver output in Amps. Valid values are between 0 and current rating of the instrument.*

See Also **LASer:I?, LASer:SET:I?**

LASer:I?

Description Measured laser current query.

Syntax **LASer:I?**

Remarks The **LASer:I?** query returns the value of the measured laser current.

Response	Description
measured current	*Measured laser current in Amps*

See Also **LASer:I, LASer:SET:I?**

LASer:LDV?

Description Measured forward voltage query.

Syntax **LASer:LDV?**

Remarks The **LASer:LDV?** query returns the measured forward voltage.

If bit #5 in hardware configuration register is set to 0, this command returns the voltage at the output terminals of the instrument. If this bit is set to 1, this command returns the load voltage present at anode/cathode sense inputs of DB-25 pin I/O signals connector.

Response	Description
measured voltage	*Laser diode forward voltage in Volts*

See Also **HWCONFIG, HWCONFIG?**

LASer:LIMit:I

Description Laser current limit set command.

Syntax **LASer:LIMit:I** *current limit*

Remarks The **LASer:LIMit:I** command sets the laser current limit value.

Argument	Value	Description
current limit	*Float*	*Current limit in Amps. Valid values are between 0 and 1% above the current rating of the instrument.*

See Also **LASer:LIMit:I?, LASer:MAX:I?**

LASer:LIMit:I?

Description Laser current limit set query.

Syntax **LASer:LIMit:I?**

Remarks The **LASer:LIMit:I?** query returns the value of the laser current limit.

Response	Description
current limit	*Current limit in Amps*

See Also **LASer:LIMit:I**

LASer:LIMit:LDV

Description Laser forward voltage limit set command.

Syntax **LASer:LIMit:LDV** *voltage limit*

Remarks The **LASer:LIMit:LDV** command sets the laser forward voltage limit value.

Argument	Value	Description
voltage limit	*Float*	*Voltage limit in Volts. Valid values are between 0 and 1% above the forward voltage rating of the instrument.*

See Also **LASer:LIMit:LDV?, LASer:MAX:LDV?**

LASer:LIV:COUNT?

Description LIV characterization samples query.

Syntax **LASer:LIV:COUNT?**

Remarks The **LASer:LIV:COUNT?** query returns the number of measurements taken since the last time LIV characterization was enabled. Each measurement set consists of laser current setpoint, measured laser current, forward voltage and analog control input voltage values.

See Also **LASer:LIV:SETUP, LASer:LIV:ENable, LASer:LIV:GETMEAS?**

LASer:LIV:Enable

Description LIV characterization enable state set.

Syntax **LASer:LIV:ENable** *enable state*

Remarks The **LASer:LIV:ENable** command turns the LIV characterization process ON or OFF.

Argument	Value	Description
enable	0	OFF
	1	ON

See Also **LASer:LIV:SETUP, LASer:LIV:COUNT?, LASer:LIV:GETMEAS?**

LASer:LIV:ENable?

Description LIV characterization enable state query.

Syntax **LASer:LIV:ENable?**

Remarks The **LASer:LIV:ENable?** query returns the status of LIV characterization process.

Response	Value	Description
enable	0	OFF
	1	ON

See Also **LASer:LIV:SETUP, LASer:LIV:COUNT?, LASer:LIV:GETMEAS?**

LASer:LIV:GETMEAS?

Description Get LIV characterization measurements.

Syntax **LASer:LIV:GETMEAS?**

Remarks The **LASer:LIV:GETMEAS?** query returns the measurements taken since the last time the LIV characterization process was enabled. Each measurement set consists of four

comma delimited values: laser current setpoint, measured laser current, forward voltage, and analog control input voltage.

When the instrument receives this command from a host PC, it attempts to transfer all measurements taken to the PC. The instrument expects a PC based application to read all the measurements before sending any new commands to it. Each measurement set is terminated by the response terminator (<CR><LF>), while an "End of data" string is used to signify the transfer of all measurements. The instrument sends a "No new data" string in case the PC attempts to read measurements faster than they were commanded to be taken.

See Also **LASer:LIV:SETUP, LASer:LIV:ENable, LASer:LIV:GETMEAS?**

LASer:LIV:SETUP

Description LIV characterization parameters setup.

Syntax **LASer:LIV:SETUP** *nn1,nn2,nn3,nn4*

Remarks The **LASer:LIV:SETUP** command sets the LIV characterization parameters. When the LIV characterization process is turned ON, the instrument increases/decreases the output current based on these setup parameters. The start current, end current and desired number of measurements are used to determine the current step size. The output current is increased/decreased by the above determined step size, at the beginning of every dwell time period. A new measurement is performed at the end of each dwell period. The LIV characterization process is turned OFF automatically once all the measurements have been collected.

Note that the laser current ramp feature is suspended during LIV characterization process.

Argument	Value	Description
nn1	*Float*	*Start current in Amps. Valid values are between 0 and current rating of the instrument.*
nn2	*Float*	*End current in Amps. Valid values are between 0 and current rating of the instrument.*
nn3	*Integer*	*Number of measurements to be taken. Valid values are between 1 and 100.*
nn4	*Integer*	*Dwell time (ms) before taking a new measurement. Valid values are between 10 and 60000 milli-seconds.*

See Also **LASer:LIV:COUNT?, LASer:LIV:ENable, LASer:LIV:GETMEAS?**

LASer:LIV:SETUP?

Description LIV characterization parameters query.

Syntax **LASer:LIV:SETUP?**

Remarks The **LASer:LIV:SETUP?** query returns the LIV characterization parameters.

Response	Description
Start current	*Start current in Amps*
End current	*End current in Amps*
Number of measurements	
Dwell Time	*Dwell time in milli-seconds*

See Also **LASer:LIV:COUNT?, LASer:LIV:ENable, LASer:LIV:GETMEAS?**

LASer:MAX:I?

Description Instrument current rating query.

Syntax **LASer:MAX:I?**

Remarks The **LASer:MAX:I?** query returns the instrument's current rating value.

Response	Description
current rating	*Current rating in Amps*

See Also **LASer:LIMit:I, LASer:LIMit:I?**

LASer:MAX:LDV?

Description Instrument forward voltage rating query.

Syntax **LASer:MAX:LDV?**

Remarks The **LASer:MAX:LDV?** query returns the instrument's forward voltage rating value.

Response	Description
voltage rating	*Voltage rating in Volts*

See Also **LASer:LIMit:LDV, LASer:LIMit:LDV?**

LASer:MODE

Description Laser mode of operation command.

Syntax **LASer:MODE** *mode*

Remarks **The LASer:MODE** command selects the instrument's operation mode. The instrument always returns to "constant current mode" following a power reset.

Argument	Value	Description
mode	*0*	*constant current mode*

1-4	*reserved*
5	*analog control*

See Also **LASer:MODE?**

LASer:MODE?

Description Laser operation mode query.

Syntax **LASer:MODE?**

Remarks The **LASer:MODE?** query returns the selected laser operation mode.

See Also **LASer:MODE**

LASer:OUTput

Description Laser enable output command.

Syntax **LASer:OUTput** *enable*

Remarks The **LASer:OUTput** command turns the laser output on or off.

Argument	Value	Description
enable	0	off
	1	on

See Also **LASer:OUTput?**

LASer:OUTput?

Description Laser enable output query.

Syntax **LASer:OUTput?**

Remarks The **LASer:OUTput?** query returns the status of the laser output.

Response	Value	Description
enable	0	off
	1	on

See Also **LASer:OUTput**

LASer:PULse:Enable

Description Laser pulse output enable command.

Syntax **LASer:PULse:ENable** *enable*

Remarks The **LASer:PULse:ENable** command turns the laser pulse output on or off. By default, the pulse output is enabled. Using this command to disable the pulse modes will result in shutting off the unit's output current EVEN in the ALWAYS ON pulse mode.

Argument	Value	Description
Enable	0	off
	1	on

See Also **LASer:PULse:ENable?**

LASer:PULse:ENable?

Description Laser pulse output enable query.

Syntax **LASer:PULse:ENable?**

Remarks The **LASer:PULse:ENable?** query returns the status of the laser pulse output.

Response	Value	Description
enable	0	off
	1	on

See Also **LASer:PULse:ENable**

LASer:PULse:FREQuency

Description Laser pulse output frequency command.

Syntax **LASer:PULse:FREQuency** *frequency*

Remarks The **LASer:PULse:FREQuency** command sets the laser pulse output frequency. Please note that the instrument disables the pulse output momentarily, if it was enabled, when this command is received.

The default pulse output frequency is 1000 Hz.

Argument	Value	Description
frequency	*Float*	*Frequency in Hertz. Valid values are between 0.1Hz and 1000 Hz*

See Also **LASer:PULse:FREQuency?**

LASer:PULse:FREQuency?

Description Laser pulse output frequency query.

Syntax **LASer:PULse:FREQuency?**

Remarks The **LASer:PULse:FREQuency?** query returns the laser pulse output frequency.

Response	Description
frequency	*Frequency in Hertz.*

See Also **LASer:PULse:FREQuency**

LASer:PULse:MODE

Description Laser pulse mode of operation command.

Syntax **LASer:PULse:MODE** *mode*

Remarks **The LASer:PULse:MODE** command selects the instrument's pulse operation mode. The instrument always returns to "always ON" following a power reset. If the pulse out is disabled using LASer:PULse:ENable command, the unit's output current will be shut off EVEN in the ALWAYS ON pulse mode.

Argument	Value	Description
mode	*0*	*always ON*
	1	*gated*
	2	*free run*
	3	*triggered*
	4	*re-triggered*

See Also **LASer:PULse:MODE?, LASer:PULse:ENable**

LASer:PULse:MODE?

Description Laser pulse operation mode query.

Syntax **LASer:PULse:MODE?**

Remarks The **LASer:PULse:MODE?** query returns the selected laser pulse operation mode.

See Also **LASer:PULse:MODE**

LASer:PULse:WIDth

Description Laser pulse output width command.

Syntax **LASer:PULse:WIDth** *width*

Remarks The **LASer:PULse:WIDth** command sets the laser pulse output width. Please note that the instrument disables the pulse output momentarily, if it was enabled, when this command is received.

The default pulse output width is 0.50 ms.

Argument	Value	Description
width	*Float*	*Width in milliseconds. Valid values are between 0.50ms and 9.9995sec.*

See Also **LASer:PULse:WIDth?**

LASer:PULse:WIDth?

Description Laser pulse output width query.

Syntax **LASer:PULse:WIDth?**

Remarks The **LASer:PULse:WIDth?** query returns the laser pulse output width.

Response	Description
width	*Width in milliseconds*

See Also **LASer:PULse:WIDth**

LASer:RAMP:I

Description Laser current ramp settings command.

Syntax **LASer:RAMP:I** *step size, delay*

Remarks Sets the laser's current ramp settings. If bit #1 in hardware configuration register is cleared (default) and the instrument is in REMOTE control mode, the output current is ramped up from the present current set point to the new set point based on these settings. If this bit is set or if the instrument is in LOCAL control mode or if the new set point is lower than the present set point, no current ramping is performed.

The default settings are: step size = 1.5 Amps and delay = 0.02 sec.

Argument	Value	Description
step size	*Float*	*Step size in Amps. Valid values are between 0 and current rating of the instrument.*
delay	*Float*	*Delay in seconds. Minimum delay is 0.01sec.*

See Also **LASer:RAMP:I?, HWCONFIG, HWCONFIG?**

LASer:RAMP:I?

Description Measured laser current ramp settings query.

Syntax **LASer:RAMP:I?**

Remarks The **LASer:RAMP:I?** query returns the laser current ramp settings.

Response	Description
step size	*Step size in Amps.*
delay	*Delay in seconds.*

See Also **LASer:RAMP:I, HWCONFIG, HWCONFIG?**

LASer:SET:I?

Description Laser constant current set point query.

Syntax **LASer:SET:I?**

Remarks The **LASer:SET:I?** query returns the constant current set point.

Response	Description
current set point	Current set point in A

See Also **LASer:I**

LASer:TTL:MODE

Description Laser TTL pulse output mode of operation command.

Syntax **LASer:TTL:MODE** *mode*

Remarks **The LASer:TTL:MODE** command selects the instrument's TTL pulse output operation mode. The instrument always returns to "enable output" following a power reset.

Argument	Value	Description
mode	*0*	*output LOW*
	1	*output HIGH*
	2	*enable output*
	3	*pulse signal monitor*
	4	*track TTL IN*

See Also **LASer:TTL:MODE?**

LASer:TTL:MODE?

Description Laser TTL pulse output operation mode query.

Syntax **LASer:TTL:MODE?**

Remarks The **LASer:TTL:MODE?** query returns the selected laser TTL pulse output operation mode.

See Also **LASer:TTL:MODE**

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6 Software Application

6.1 Overview

The Model 5700-30 and 5700-80 Laser Diode Drivers have a USB interface to support communication between the driver and a host PC. The Newport Laser Diode Driver Application is designed to demonstrate this driver capability; it allows users to control the functions of the driver from a PC.

The installation files for this software application and the USB drivers required for USB communication can be found on the CD that accompanies the product.

6.2 Connection

When the Newport Laser Diode Driver Application is launched, it will automatically detect the presence of Laser Diode driver on the USB bus and start communicating with it. If there is more than one driver on the USB bus, the application is capable of communicating with up to 31 drivers. This can be done, provided the users ensure that each of these drivers has a unique USB address. Users can accomplish this by placing one driver at a time on the USB bus, using the software to change the driver's USB address from 2 (default) to a desired value and saving the new address in the driver's non-volatile flash memory.

The figure below shows the software communicating with an LED driver at USB address 2 (default).

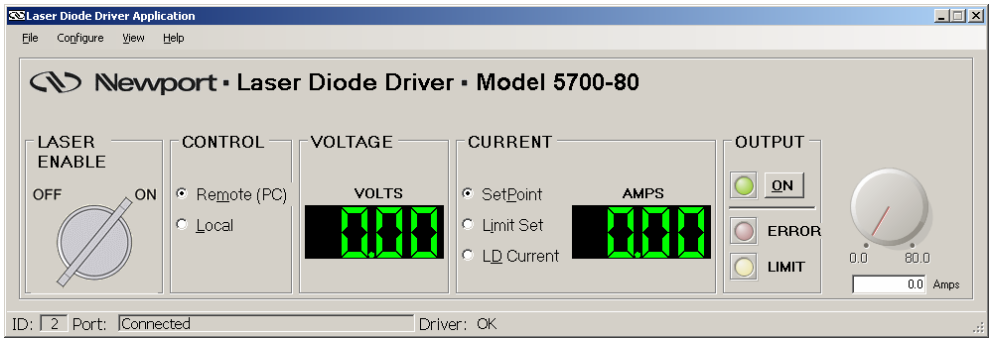

Figure 15 Application Front Panel

If the application does not detect the presence of any LED driver on the USB bus, the application front panel will look like the figure below:

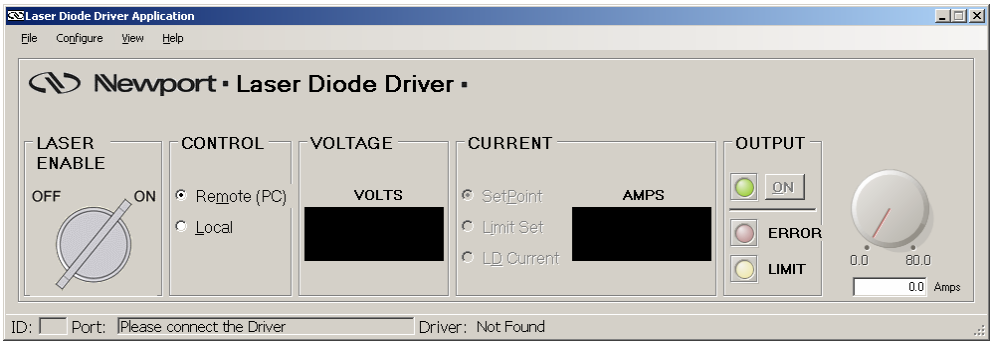

Figure 16 Application front panel without Laser Diode Drivers connected to PC over USB.

If there is more than one laser diode driver on the USB bus, users can switch communication between various drivers by doing the following:

1. Click on View menu and check the Terminal Command Window sub-menu to view the Terminal window.
2. Make sure the "Control Mode" is set to "Remote (PC)"
3. Select the desired laser diode driver from "USB ID:" drop-down menu.

6.3 General Usage

The Newport Laser Diode Driver Application provides a convenient GUI (Graphical User Interface) access to some of the key functions of the driver. For instance, the application's front panel supports the following controls:

1. Knob control: This control mimics the real knob on the driver's front panel. It allows the user to adjust the output current Setpoint or Limit Set (maximum current allowed). Note that the maximum current allowed should not exceed the current rating of the laser diode in use.
2. Control Mode: The radio buttons provided allow the users to select between "Local" and "Remote (PC)" operation modes. When the application is launched, it will automatically put the driver in Remote operation mode. All the menu and terminal window features are accessible to users only when the driver is in this mode.
3. Output ON: This LED mimics the real Output ON LED on the driver's front panel.
4. Output Error: This LED mimics the real Output Error LED on the driver's front panel.
5. Output Limit: This LED mimics the real Output Limit LED on the driver's front panel.

6. Laser Enable Switch: This indicator shows the present status of the real Laser Enable switch on the driver's front panel.

All the functions supported by the LED driver can be accessed through a "Terminal Command Window" as shown below.

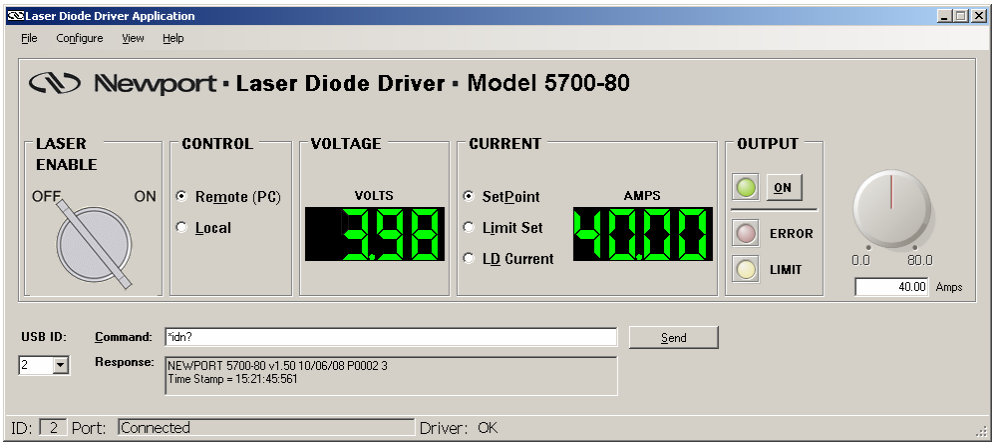

Figure 17 Application front panel with Terminal Command Window

Users can access this window by clicking on the View menu and checking the Terminal Command Window menu choice. This window is comprised of a USB ID (USB address) drop-down list, a Command text box, a Send button, and a Response text box.

The USB ID drop-down list allows the user to select which driver (if more than one is connected) to communicate with.

The Command text box is where the user enters ASCII commands. When a character is typed in the Command text box, the Auto-Complete list box is temporarily displayed. It contains a list of the commands that the user may enter into the Command text box. Pressing the Tab key or double-clicking a command will place the command into the Command text box. These commands can be sent to the driver by clicking the Send button or pressing the Enter key while the cursor is in the Command text box. The application will automatically read any response from the driver and display it in the Response textbox, if it detects that a query command was sent to the driver. It also provides a time stamp of the last query transaction for user convenience.

6.4 Menu Structure

The Configure menu has additional property settings, including options for current ramp settings. Users can adjust the current step size and the delay time between steps to obtain the desired output current ramp rate. Note that the output current is applicable only when the Laser Diode Driver is in "REMOTE" mode, and the desired output current is higher than the present

output current. Refer “LAS:RAMP:I” and “HWCONFIG” command descriptions for further details in this regard.

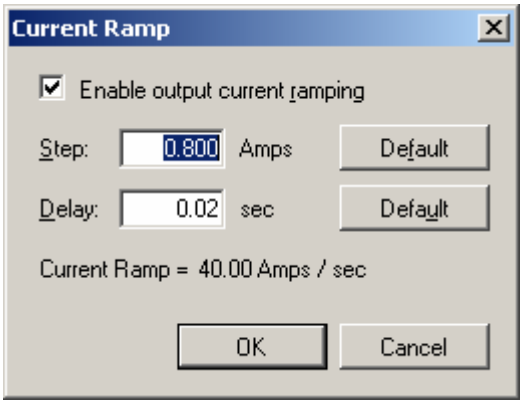

Figure 18 Current Ramp Window

Click on Help | User’s Manual menu to open this manual installed on your PC during the software installation process.

Click on Help | Newport Website menu to open Newport’s webpage and access the latest software / firmware / sample programs / user’s manuals / application notes and other information related to this product.

Click on Help | About menu to open an About window as shown below.

Click on File | Download Laser Diode Firmware and follow the on-screen instructions to download firmware to the Laser Diode Driver.

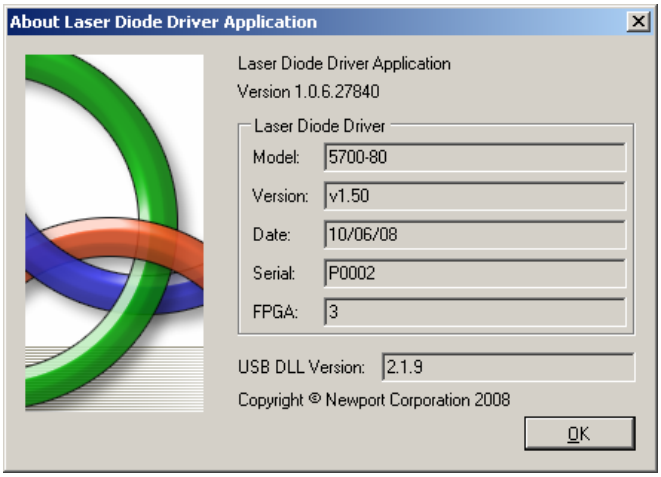

Figure 19 Application About Window

This window contains information about the application, Laser Diode Driver, and USB DLL used for USB communication with a host PC. To Exit the application go to the File menu and select Exit.

7 Principles of Operation

7.1 Introduction

Features of the Models 5700-30 and 5700-80 Laser Diode Drivers include:

- High-stability, low noise design
- Internal PWM source
- External trigger and enable inputs
- External analog control input
- QCW (pulse) mode
- Fault detection
- Current and voltage limiting
- LIV characterization

CAUTION

Although ESD (electrostatic discharge) protection is designed into the driver, operation in a static-free work area is recommended.

Operating procedures of the Models 5700-30 and 5700-80 Laser Diode Drivers include safe handling procedures for laser diodes, various types of laser diode packages, how to make the connections, and how to ground a laser diode.

7.2 Laser Diode Handling Precautions

Laser diodes are extremely sensitive to static discharge and guidelines should be followed at all times when handling laser diodes:

a. All operators must have a properly grounded wrist strap before handling any laser diode.

b. All soldering iron tips must be properly grounded.

c. All related test and assembly equipment must be properly grounded

Laser diodes are extremely sensitive to electrostatic discharge since they can only withstand a maximum reverse voltage of 2 to 3V across their leads and no more than the maximum rated current in the forward direction.

NOTE

Always follow the manufacturer's instructions for removing and handling laser diodes.

NOTE

Always follow the laser diode manufacturer's specifications for maximum temperatures and soldering times.

CAUTION

Before connecting the laser diode to the unit, be sure that the ENABLE key switch is in the OFF position. Before turning on the laser output, be sure that the current limit and voltage compliance limit has been correctly set.

NOTE

The cable connections to the laser must be secure to avoid an open circuit, should they be jostled or bumped. Should an open circuit occur during laser operations, the laser output will normally be turned off automatically.
Special circuits in the laser driver are present for detecting intermittent contacts and connections. These circuits detect the abrupt change in current that occurs when the output circuit is opened, and the 5700-30 or 5700-80 will generate an error. Experience indicates that should an open circuit occur during laser operation, the laser may be damaged. Therefore, secure cabling is important.

Electrostatic discharge (ESD) is the primary cause of laser failure. In order to optimize immunity from radiated or conducted electromagnetic energy, e.g., static discharge, adhere to the following guidelines for the laser diode:

- Use anti-static wrist straps (grounded with 1 MΩ resistor), anti-static floor coverings, grounded soldering irons, and grounded work areas. Ionized air blowers are also recommended.
- Short laser diode leads whenever the laser is transported or stored.
- Recess the laser diode inside a metal shielded enclosure, such as a laser diode mount, recessed at least ¼" with the minimum aperture necessary to allow beam exit (less than 0.125").

- If industrial loads are switched in or near your laboratory, use isolation transformers and/or a surge suppressor power strip with your laser current source.
- Isolate your laser current driver with a surge suppresser when using a common line with laboratory power supplies, soldering irons, or other electronic instruments. Avoid using such devices on the same surge suppresser as your laser source.
- Make sure all the cables to the laser diode are securely fastened. Avoid "bundling" current source cables with other cables in your laboratory.
- Set current and voltage limits to appropriate levels, following the laser diode manufacturer's recommendations (or to just above the expected operating current). Suggestions include setting the compliance voltage no more than 10% above V_f, and setting the current limit at or below the maximum operating current of the laser diode.
- Avoid ground loops. Do not ground the LDD cable shield to a grounded enclosure in which you mount the laser diode.

Additional precaution must be taken when soldering leads of a laser diode. Excess heat from soldering damages the laser facet. Care must be taken to provide a heat sink between the laser diode and the leads during soldering.

7.3 Grounding the Laser Diode

The outputs of the Models 5700-30 and 5700-80 are quasi-isolated from earth (chassis) ground. Isolating the laser diode case avoids damaging the device from multiple ground loop potentials, AC transients or static discharge. It is strongly recommended that a single point ground scheme be established. (See also Section 4.3). This will help minimize noise, transients, and ground loop hazards. This ensures higher spectrum noise and electrostatic discharges being directed to ground while avoiding a direct galvanic connection between the laser diode and chassis.

If you have additional questions about your earth grounding method contact a Newport Corporation applications engineer.

7.4 Laser Safety Features

7.4.1 Conditions Which Can Automatically Shut Off the Laser Output.

- Laser Open Circuit[3]
- Laser Short-circuit[1]
- Laser Compliance Voltage Limit
- Laser Hard Current Limit
- Keyswitch being turned OFF

[3] This condition will always shutdown the laser output, and cannot be disabled.

- IO Signals Connector Interlock signal becoming disconnected
- IO Signals Connector Output Disable signal being grounded

7.4.2 Turn On Delay

The Models 5700-30 and 5700-80 are CDRH Compliant with a programmable turn on delay, normally minimum 3 seconds. See the ONDELAY command in Section 5.5 for more information on this topic.

7.4.3 Keyswitch Interlock

The keyswitch, located on the front panel of the Models 5700-30 and 5700-80, will shut off, or not allow to be turned on, the laser output while in the OFF position, per CDRH requirements.

7.4.4 Interlock

The Interlock and Interlock Return signal pins on the rear panel's IO Signals connector must be connected together, external to the unit, to complete the circuit and allow the laser operation.

7.4.5 Output Disable

The Output Disable signal on the rear panel's IO Signals connector must be open-circuit, or driven to a TTL HIGH level, to allow the laser operation. The Models 5700-30 and 5700-80 will not drive output current if this signal is pulled down to unit's Digital Ground.

7.5 Operating Modes

The Models 5700-30 and 5700-80 operate in one of two modes – CW or EXTERNAL ANALOG CONTROL. Following power-up, the unit always will be in CW mode. The user may then change to EXTERNAL ANALOG CONTROL mode using the LAS:MODE command via the USB interface. See Section 5.5 for more information on this command. It is not possible to change the operating mode from the front panel of the unit.

Operating mode is not retained in the unit at power down. This means that the unit will always power up in CW operating mode with the output disabled.

It is not possible to enable the output circuitry using the Analog Control input signal when the Interlock signal, key switch, Output Disable signal, etc., are disabling the output circuitry.

7.5.1 CW Mode

In CW Mode, the output current will be enabled whenever the key switch is closed, the rear-panel IO Signals Connector's Interlock pin is grounded, and the output is enabled via the USB interface or the front panel OUTPUT switch. (For safety, there actually is a three second delay between all of these conditions being met and the current output commencing). The amount of output current is the lesser of the Setpoint and the current limit, subject to some slew-rate limiting to avoid overshoots.

7.5.2 EXTERNAL ANALOG CONTROL Mode

External Analog Control Mode functions almost identically to CW Mode, except that the output current is the lesser of the amount requested via the rear-panel IO Signals Connector's Analog Control input pin and the current limit.

The analog control input takes a voltage range of 10V. Each 100 mV represents 1% of the driver's maximum operating current, which gives a range of 0% at 0V to 100% at 10V. In other words, the value of the Setpoint is ignored.

The analog control input is digitally sampled at a 100 Hz rate; the user must not attempt to drive this input with a signal containing any appreciable energy above 50 Hz.

WARNING

The analog control input should not be used to implement a safety interlock because it does not have a 3-second safety delay before enabling the output circuitry.

7.6 Pulse Modes

The Models 5700-30 and 5700-80 operate in one of five "pulse modes" – ALWAYS ON, GATED, FREE RUN, TRIGGERED, and RETRIG.

Following every power-up, the unit always starts in ALWAYS ON pulse mode and the Laser Pulse Output Enabled. The user may then change to one of the other pulse modes using the LAS:PULSE:MODE command via the USB interface. See Section 5.5 for more information on this command. Using the LAS:PUL:EN command (See Section 5.5) to disable the pulse modes will result in shutting off the unit's output current EVEN in the ALWAYS ON pulse mode. It is not possible to change the pulse mode selection or pulse enable state from the front panel of the unit.

Pulse mode selections are not retained in the unit at power down; i.e., the other pulse modes must be reselected every time the unit is powered down. This means that the unit will always power up in ALWAYS ON pulse mode, but with the output disabled.

The GATED, TRIGGERED, and RETRIG pulse modes utilize the TTL Input signal, pin 3 on the rear panel IO SIGNALS connector. When driven to +5V or not connected, the TTL Input signal is in a "HIGH" logic state. The TTL Input signal is assumed to be LOW when it is pulled down, or connected, to digital ground. The significance of these logic states will be explained in the GATED (Section 7.6.1), TRIGGERED (Section 7.6.2), and RETRIG (Section 7.6.3) pulse mode descriptions.

Prior to operating in TRIGGERED, RETRIG, or FREE RUN pulse mode, two parameters must be supplied to the instrument via the external USB computer interface – the Pulse Duration and the Pulse Frequency. The firmware within the Models 5700-30 and 5700-80 units will determine the Pulse Repetition Period by calculating the reciprocal of the requested Pulse Frequency. For reliable operation, the Pulse Duration must be less than the Pulse Repetition Period. See the LAS:PUL:WIDTH and LAS:PUL:FREQ command descriptions in Section 5.5.

It is not possible to enable the output circuitry using the TTL Input signal if the Interlock signal, key switch, Output Disable signal, etc., are disabling the output circuitry.

7.6.1 GATED Pulse Mode

In GATED pulse mode, the output circuitry will be enabled when the TTL Input signal is HIGH. In CW operating mode, the amount of output current is the lesser of the setpoint and the current limit, subject to some slew-rate limiting to avoid overshoots. In EXTERNAL ANALOG CONTROL operating mode, the amount of output current is the lesser of the externally commanded current and the current limit, subject to some slew-rate limiting to avoid overshoots. In both operating modes, the output circuitry will be disabled when the TTL Input signal is LOW. Pulse Duration and Pulse Frequency settings are ignored in this mode.

A timing diagram for GATED pulse mode is shown in Figure 20

GATED MODE SHOULD NOT BE USED TO IMPLEMENT A SAFETY INTERLOCK BECAUSE IT DOES NOT HAVE A 3-SECOND SAFETY DELAY BEFORE STARTING TO OUTPUT CURRENT.

Figure 20 GATED Pulse Mode Timing Diagram.

7.6.2 TRIGGERED Pulse Mode

In TRIGGERED pulse mode, a rising edge (LOW-to-HIGH transition) on the TTL Input signal starts two timers – the Pulse Duration Timer and the Pulse Repetition Period Timer. Both timers stop after their preprogrammed time

interval has elapsed. After they stop, both timers reload their preprogrammed timer intervals in preparation for the next rising edge on the TTL Input signal; i.e., it is not necessary for the external computer to download these values for each pulse.

When the Pulse Duration Timer is running in CW operating mode, the unit will output current -- the amount of output current is the lesser of the setpoint and the current limit, subject to some slew-rate limiting to avoid overshoots. When the Pulse Duration Timer is running in EXTERNAL ANALOG CONTROL operating mode, the unit will output current -- the amount of output current is the lesser of the externally commanded current and the current limit, subject to some slew-rate limiting to avoid overshoots. In both operating modes, the unit will not output current when the Pulse Duration Timer is stopped.

Once the timers have started, it is not possible to restart either timer until after the Pulse Repetition Period Timer has expired. Thus, the Pulse Duration Timer sets the width of the instrument's output current pulse and the Pulse Repetition Period Timer sets the maximum frequency. The resulting duty cycle is the ratio between the time programmed into the Pulse Duration Timer and the time programmed into the Pulse Repetition Period Timer.

A timing diagram for TRIGGERED pulse mode is shown in Figure 21.

TRIGGERED MODE SHOULD NOT BE USED TO IMPLEMENT A SAFETY INTERLOCK BECAUSE IT DOES NOT HAVE A 3-SECOND SAFETY DELAY BEFORE STARTING TO OUTPUT CURRENT.

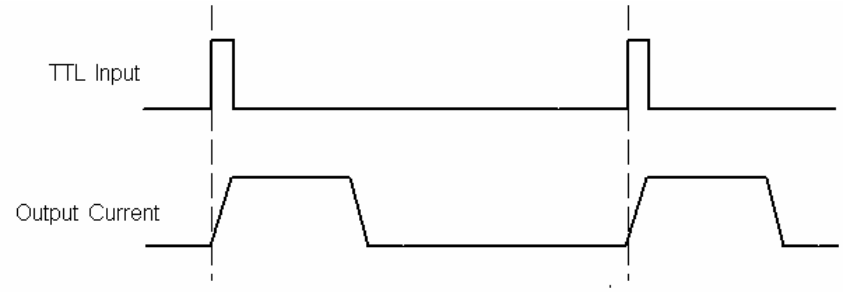

Figure 21 TRIGGERED Pulse Mode Timing Diagram.

7.6.3 RETRIG Pulse Mode

RETRIG pulse mode is the same as TRIGGERED pulse mode EXCEPT that a rising edge (LOW-to-HIGH transition) on the TTL Input restarts the two timers at their preprogrammed intervals even if the Pulse Repetition Period has not elapsed since the last rising edge. Thus, a pulse will be "stretched" when a rising edge occurs on the TTL Input signal while the Pulse Duration timer is running.

A similar case can occur when the Pulse Duration timer has stopped but the Pulse Repetition Period timer is still running. Under this circumstance, a rising edge on the TTL Input signal will restart both timers and thereby cause the unit to immediately output current even if the Pulse Repetition Interval has not elapsed since the last TTL Input signal rising edge.

A timing diagram for RETRIG pulse mode is shown in Figure 22.

TRIGGERED MODE SHOULD NOT BE USED TO IMPLEMENT A SAFETY INTERLOCK BECAUSE IT DOES NOT HAVE A 3-SECOND SAFETY DELAY BEFORE ENABLING THE OUTPUT CIRCUITRY.

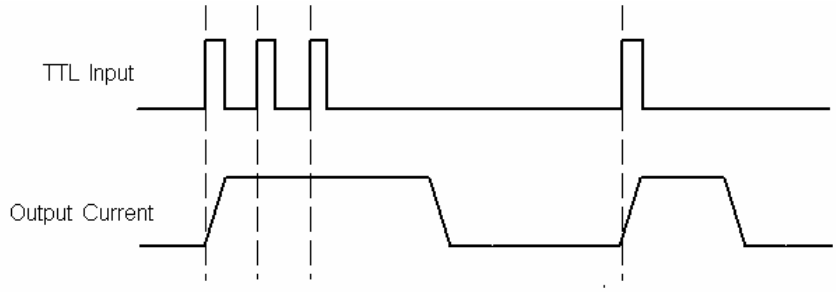

Figure 22 RETRIG Pulse Mode Timing Diagram.

7.6.4 FREE-RUN Pulse Mode

FREE-RUN pulse mode operates similar to TRIGGERED pulse mode, EXCEPT that the TTL Input signal is ignored. Instead, the Pulse Duration Timer and the Pulse Repetition Period Timer reload and restart automatically when the Pulse Repetition Period Timer expires. Thus, the Pulse Duration Timer sets the width of the instrument's output current pulse and the Pulse Repetition Period Timer sets the output current pulse repetition frequency.

7.7 TTL Output Modes

The TTL Output signal on the rear panel IO Signals connector allows the user to monitor certain states of the Models 5700-30 and 5700-80, or to control or trigger external measurement equipment. This output operates one of five modes – LOW, HIGH, ENABLE OUTPUT MONITOR, PULSE MONITOR, and TTL INPUT MONITOR.

Following power-up, the unit always will be in ENABLE OUTPUT MONITOR TTL output mode. The user may then change to one of the other TTL output modes using the LAS:TTL:MODE command via the USB interface. See Section 5.5 for more information on this command. It is not possible to change the operating mode from the front panel of the unit.

Operating mode is not retained in the unit at power down.

7.7.1 LOW TTL Mode

In LOW TTL mode, the open-collector output pulls the TTL Output signal to Digital Ground.

7.7.2 HIGH TTL Mode

In HIGH TTL mode, the open-collector output is floated and the 1.5 kohm resistor pulls the TTL Output signal to +5V.

7.7.3 ENABLE OUTPUT MONITOR TTL Mode

In ENABLE OUTPUT MONITOR TTL mode, the TTL Output signal indicates when the unit is outputting current or is capable of doing so without the normal 3-second safety delay.

Normally, the TTL Output signal will be HIGH when the unit is supplying current to a laser diode and LOW when the unit is not. There are two exceptions to this. One exception is when output current is enabled, but it is blocked because the unit is between pulses in GATED, TRIGGERED, RETRIG, and FREE RUN pulse modes. The other exception is when output current is enabled but the unit is in EXTERNAL ANALOG CONTROL operating mode and the Analog Control input signal on the rear-panel IO Signals Connector is driven to ground. In these exceptions, the TTL Output signal will be HIGH to indicate that the unit is capable of supplying output current without the normal 3-second safety-delay.

7.7.4 PULSE MONITOR TTL Mode

In PULSE MONITOR mode allows the user to synchronize external instrumentation to the output current pulses when the unit is in GATED, TRIGGERED, RETRIG, or FREE RUN pulse mode.

When the output current is enabled in these modes, TTL Output signal will be HIGH when unit is supplying current and LOW when it is not. The state of the TTL Output signal is not specified in ALWAYS ON pulse mode; it is also not specified if the output current is disabled.

7.7.5 TTL INPUT MONITOR TTL Mode

In TTL INPUT MONITOR TTL mode, logic level present on the TTL Input signal is buffered and output on the TTL Output signal.

7.8 LIV Characterization

NOTE

For fast LIV characterization, with measurements every 10 ms, use HWCONFIG command to set bit 2 of the configuration register to 1.

The Models 5700-30 and 5700-80 support a data acquisition engine that enables users to perform LIV characterization with relative ease. The users can define their desired start and end output current values, number of measurements and the dwell time at each current step. Once the LIV characterization process is enabled, the unit starts to increase/decrease the output current based on these setup parameters. At every current step it measures and stores internally the following four (4) parameters: current setpoint, measured current, forward voltage and analog control input voltage. The unit is capable of storing up to 100 such measurement sets. Users can retrieve these measurements from the unit via USB interface for further analysis. The unit is designed to take a measurement every 10 ms. By default, the data is averaged over a period of 500 ms, which is suitable for most applications. If the user needs to perform fast LIV characterizations, the raw data taken at every 10 ms can be made available via USB. For this, the user needs to set bit 2 in the configuration register to 1. By default, this bit is 0. (See the HWCONFIG command in Section 5.5)

By measuring analog control input voltage at the same time as current setpoint, measured current and forward voltage, the unit enables users to truly synchronize measurements from instruments such as power meter or temperature controller with laser diode current and voltage values. For instance, users can supply voltage that represents photodiode current or thermopile voltage from a power meter to the analog control input to determine current versus optical power characteristics of a laser diode.

Note that when the LIV characterization process is enabled, the laser output is not turned ON automatically, if it is in an OFF state. This feature allows users to simulate LIV characterization process with the output turned OFF.

A typical command sequence to setup and initiate an LIV characterization process is as follows:

HWCONFIG 4	*Set the configuration register for fast data measurements*
LAS:LIV:SETUP 0.0,100.0,100,100	*Set Start current = 0.0A; End current = 100.0A; Number of measurements (same as current steps) = 100; Dwell time before each measurement = 100ms.*
LAS:OUT 1	*Turn laser output ON, if it is in OFF state.*
LAS:LIV:EN 1	*Wait for ONDELAY timer to expire before starting LIV characterization process.*
LAS:LIV:COUNT?	*Query the number of measurements taken. Wait until the number of measurements is one (1) more than the desired number.*

LAS:LIV:GETMEAS? *Read the measurements from the unit. Issue this command once, and read responses from the unit repeatedly until the unit responds with "End of data" string.*

7.9 Models 5700-30 and 5700-80 Setup

7.9.1 Using the Interlock Feature

Like the front panel key switch, the interlock feature is a contact closure that must be made to enable the output current. Electrically it is completely separate from the key switch.

The loop between pins 1 and 14, or pins 1 and 13, of the rear panel I/O SIGNALS connector can be removed as a relay contact or safety switch that disables the output drive circuit when opened. When the interlock loop is closed again, pushing the front panel OUTPUT switch will resume current flow after an approximately 4 second soft-start sequence. The switch or relay contact should be electrically isolated from all other external circuits and earth ground.

7.9.2 Rack Mounting Models 5700-30 and 5700-80 Units

Models 5700-30 and 5700-80 include built-in rack mounting ears. Due to the weight of these instruments it is recommended that a rack tray be used. After tightening the screws the unit may be slid into a 19" rack and secured to the side rails.

7.9.3 Models 5700-30 and 5700-80 Operation Checklist

The following step-by-step procedure should be followed when operating a Model 5700-30 or 5700-80 Laser Diode Driver:

a. Verify that the proper line voltage outlet is available. All units are designed for operation at 90-264 VAC, 50/60 Hz. As such, they are rated for operation on 100, 120, 220, 240 VAC, 50/60 Hz AC mains power.

b. Verify the correct rated fuses are installed according to the fuse marking on the rear panel.

c. Verify that the interlock feature has been enabled. Pins 1 and 14, or pins 1 and 13, of the CONTROL connector must be shorted before the unit will allow the output current to flow to the laser diode.

d. Connect the USB interface to a computer when remote operation is desired.

e. Turn the unit on and allow it to warm up.

f. Set the LIMIT set point using the front panel control knob.

g. Select SETPOINT display mode and set output current level using the front panel control knob.

h. Set the front panel KEYSWITCH to the ON position, push the OUTPUT front panel switch, and toggle front panel display to the select the desired readout.

NOTE

Newport Corporation is not in any way responsible for any damage to any device used in conjunction with the Models 5700-30 and 5700-80 products.

8 Tips and Techniques

8.1 Introduction

This section explains operational details of the Model 5700-30 and 5700-80 laser diode drivers and provides application examples.

8.2 Laser Limits

The laser driver has several limits to protect the laser diode from damage. The limits include current and compliance voltage.

8.2.1 Current Limit

The current limit is actually two limit circuits:

- The first circuit maintains the current limit by not allowing the drive current to exceed the limit's set point. This form of limiting is called the **soft limit**, and does not affect the operation of the laser except to limit the drive current.
- The second circuit monitors the actual current drive and, if that exceeds the limit set point, shuts down the output. This form of limit is called the **hard limit**. The laser will always be shut down on a hard limit.

8.2.2 Voltage Limit

A special limiting circuit prevents overdriving the Laser Diode voltage. When the voltage limit is reached, the output current is shut off to prevent damage to the laser diode.

8.2.3 Operating at or Near Io and Vcomp Limits

Because of the sensitivity of the limit circuits, operating at or near the limit unless necessary is not recommended. AC line transients, RF interference, or static can be enough to trigger these limits. Triggers for hard limits and voltage compliance limits vary, but can include the following:

- Static discharges, which may cause enough noise to trigger the circuit.
- Turning on the laser when its set point is at or near the limit. Turning on the output with the set point at the limit can cause a small overshoot in the drive current, which the limit circuitry may pick up as a hard limit and shut down the laser.

8.3 External Analog Control

External analog control allows external control of the laser operating current. By supplying an input voltage, the operator can set the operating current anywhere within the full range of the laser controller, although the output will still be limited by the current limit.

The analog control input takes a voltage range of 10V. Each 100 mV represents 1% of the driver's maximum operating current, which gives a range of 0% at 0V to 100% at 10V.

8.3.1 Using the Analog Control Input as the Set Point

It is possible to fully control the laser set point through the analog control input by setting laser driver unit into this analog control mode via USB command (i.e., LAS:MODE command, see Section 5.5) The analog input voltage can then be ranged from 0V to 10V to give the full range of current output. Note, however, that the current limit is still active, and will not allow the current to exceed the current limit. Also note that the laser diode driver reverts back to normal CW mode (i.e., it's no longer in Analog Control Mode) after a system reset or power cycle.

8.3.2 Grounding Considerations when using the Analog Control Input

Most signal generators and oscilloscopes have a BNC output that is connected to earth ground. This is not a problem as long as the laser anode or cathode is not also connected to earth ground. However, in many systems, it is. When it is, the following must be considered:

When the anode is tied to earth ground, this effectively connects earth ground to up to +15V DC referred to Analog Ground. When the BNC on the control source is connected to the instrument input, it biases the Analog Control Input and the control signal range is reduced. Thus, it may appear that the analog control input is not working properly. Therefore, it is recommended that the laser diode leads be disconnected from the earth ground.

8.4 Grounding a Laser Diode

The laser outputs are isolated from earth (chassis) ground. Isolating the laser diode case avoids damaging the device from multiple ground loop potentials, AC transients, or static discharge. Since test equipment probes, signal sources, and package mounts are often partially earth grounded, it is often necessary to also bond the device case to earth ground. It is strongly recommended that a single point ground scheme be established, specifically at the binding post. This will help minimize noise, transients, and ground loop hazards. Be sure to include any signal generators in your ground circuit.

If you have additional questions about your earth grounding method, contact a Newport applications engineer.

8.5 V_f Measurements

The Laser's forward voltage (V_f) is normally sensed at output terminals on the driver. It is not the actual V_f of the laser, the difference being the voltage drop in the cables due to the laser current.

Use the Anode and Cathode voltage sense inputs on the I/O Signals connector (located on the rear panel) to monitor the actual voltage across the laser diode. Note that it is necessary to send the HWCONFIG command via USB (see Section 5.5) in order for the controller to monitor and display actual laser diode forward voltage on the front panel and via USB commands query.

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9 Maintenance and Service

WARNING

There are no user serviceable parts inside the Models 5700-30 and 5700-80 Laser Diode Drivers. Work performed by persons not authorized by Newport Corporation will void the warranty.

9.1 Enclosure Cleaning

WARNING

Before cleaning the enclosure of the Models 5700-30 and 5700-80 Laser Diode Drivers, the AC power cord must be disconnected from the wall socket.

The source enclosure should only be cleaned with a mild soapy water solution applied to a damp lint-free cloth. Do not use an acetone or alcohol solution; this will damage the finish of the enclosure.

9.2 Obtaining Service

The Models 5700-30 and 5700-80 Laser Diode Driver contains no user serviceable parts. To obtain information regarding factory service, contact Newport Corporation or your Newport representative. Please have the following information available:

1. Instrument model number (on the rear panel)
2. Instrument serial number (on rear panel or bottom of enclosure)
3. Description of the problem.

If the instrument is to be returned to Newport Corporation, you will be given a Return Number, which you should reference in your shipping documents. Please fill out a copy of the service form, located on the following page, and have the information ready when contacting Newport Corporation. Return the completed service form with the instrument.

9.3 Service Form

Newport Corporation
U.S.A. Office: 800-222-6440
FAX: 949/253-1479

Name _____ **Return Authorization #**_____
(Please obtain RA# prior to return of item)

Company _____
(Please obtain RA # prior to return of item)

Address _____ _____Date _____

Country _____ Phone Number _____

P.O. Number _____ FAX Number _____

Item(s) Being Returned:

Model # _____ Serial # _____

Description _____

Reason for return of goods (please list any specific problems):

_____

_____

_____

_____

_____

10 Appendix A – Error Messages

10.1 Introduction

The communication errors can be retrieved with the following commands: ERR? or ERRSTR?. The descriptions of the returned errors are detailed in the next sections.

10.2 Error Description

A description of error codes and corresponding error strings generated by the Laser Diode Driver is given below:

Error Code	Error String	Description
0	NO ERROR	No error exists in the error buffer
116	SYNTAX ERROR	This error is generated when the DRIVER receives a command that cannot be processed. Some typical causes: a. Using ASCII characters outside of a string constant that are not defined by the command language syntax. b. Missing space between a set command and parameter. c. Missing "?" character in case of query
126	WRONG # OF PARAMS	This error is generated when the DRIVER is unable to process a command due to a mismatch between the number of parameters received and the number of parameters required for the command.
200	REMOTE MODE	This error is generated when the user pushes the CONTROL or OUTPUT buttons on front-panel of the DRIVER.
201	VALUE OUT OF RANGE	This error is generated when the DRIVER is unable to process a command because the parameter value received is out of range of the acceptable values for the command.
202	ANALOG CONTROL MODE	This error is generated when the DRIVER receives "LASer:I" command while it is in "analog control" mode of operation.
203	PULSE WIDTH	This error is generated when the DRIVER receives either "LASer:PULse:FREQuency" or "LASer:PULse:WIDth"

	EXCEEDS PERIOD	commands with parameter settings that violate the following constraint: pulse width must be less than pulse period (1/frequency).
501	REMOTE INTERLOCK ASSERTED	This error is generated when output current is disabled due to remote interlock assertion.
502	HARD CURRENT LIMIT EXCEEDED	This error is generated when output current is disabled due to actual current exceeding the current limit set point.
503	OPEN CIRCUIT	This error is generated when output current is disabled due to open circuit condition.
505	FORWARD VOLTAGE LIMIT EXCEEDED	This error is generated when output current is disabled due to actual forward voltage exceeding the forward voltage limit set point.
537	LIV MEASUREMENTS IN PROGRESS	This error is generated when user attempts to issue “LAS:LIV:SETUP” or “LAS:LIV:ENable 1” commands when LIV characterization process is already turned ON.
902	KEY ENABLE OFF	This error is generated when output current is disabled due to keyswitch being set to OFF position.
908	ADC READY FAILED	This error is generated when output current is disabled due to ADC failure. Power cycle the DRIVER to clear the error condition.
910	POWER SUPPLY FAILED	This error is generated when output current is disabled due to power supply failure. Power cycle the DRIVER to clear the error condition.
917	OUTPUT DISABLE PIN ASSERTED	This error is generated when output current is disabled due to output disable pin assertion.

11 Appendix B – Disassembly Instructions

NOTE

These disassembly instructions are intended only for recycling at the end of the product lifetime.

For troubleshooting or servicing, users should contact the local Newport Corporation representative. There are no user serviceable parts inside the equipment.

Attempting to self-service the unit will void the warranty.

11.1 Disassembly instructions

Figure 23 shows an exploded version of the 5700-30 and 5700-80 Laser Diode Drivers.

For recycling purposes, only, the disassembly steps are as follows:

1. Make sure the unit power cord is removed from the AC outlet.
2. Remove any other cables: signal I/O cable, current output cables, USB cable, and ground cable.
3. Remove the side screws for the cover.
4. Remove the front panel knob and the keyswitch.
5. Remove the front cover.
6. Remove the screws for the front panel.
7. Remove the front panel.
8. Remove the PCBs from the front panel.
9. Remove the screws from the rear panel.
10. Remove the rear panel.
11. Remove the PCB from the rear panel and the power switch.
12. Remove the lateral screws and the top bar from the chassis.

13. Remove the lateral screws from the power supply.
14. Remove the power supply from the chassis.
15. Remove the feet from the chassis.

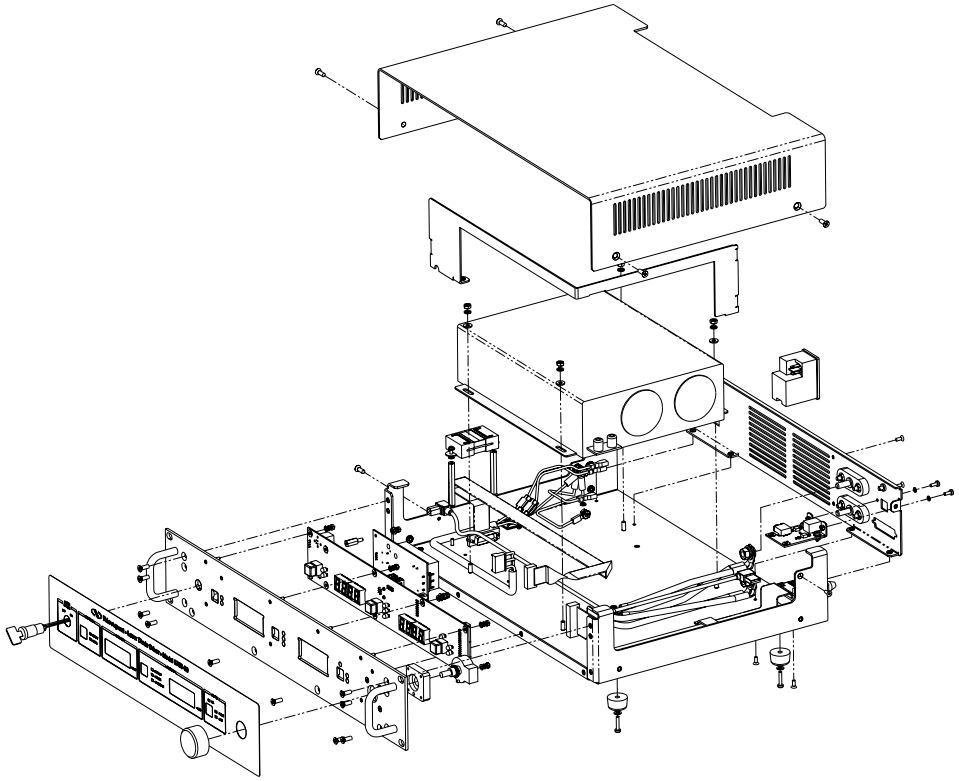

Figure 23 Disassembled 5700-30, 5700-80 Model

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