ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Newport / ILX Lightwave LDC-3916376* at our website: ***Click HERE***

User's Guide

3.0 Amp Laser Diode Current Source Module LDC-3916338

ILX Lightwave
Photonic Test & Measurement Instrumentation

ILX Lightwave Corporation · P. O. Box 6310 · Bozeman, MT, U.S.A. 59771 · U.S. & Canada: 1-800-459-9459 · International Inquiries: 406-586-1244 · Fax 406-586-9405
E-mail: support@ilxlightwave.com
www.ilxlightwave.com

70031502_7/01

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SAFETY AND WARRANTY INFORMATION

The Safety and Warranty Information section provides details about cautionary symbols used in the manual, safety markings used on the instrument, and information about the Warranty including Customer Service contact information.

Safety Information and the Manual

Throughout this manual, you will see the words *Caution* and *Warning* indicating potentially dangerous or hazardous situations which, if not avoided, could result in death, serious or minor injury, or damage to the product. Specifically:



Caution indicates a potentially hazardous situation which can result in minor or moderate injury or damage to the product or equipment.



Warning indicates a potentially dangerous situation which can result in serious injury or death.



Visible and/or invisible laser radiation. Avoid direct exposure to the beam.

General Safety Considerations

If any of the following conditions exist, or are even suspected, do not use the instrument until safe operation can be verified by trained service personnel:

- Visible damage
- Severe transport stress
- Prolonged storage under adverse conditions
- Failure to perform intended measurements or functions

If necessary, return the instrument to ILX Lightwave, or authorized local ILX Lightwave distributor, for service or repair to ensure that safety features are maintained (see the contact information on page vi).

All instruments returned to ILX Lightwave are required to have a Return Authorization Number assigned by an official representative of ILX Lightwave Corporation. See Returning an Instrument on page v for more information.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SAFETY SYMBOLS

This section describes the safety symbols and classifications.

Technical specifications including electrical ratings and weight are included within the manual. See the Table of Contents to locate the specifications and other product information. The following classifications are standard across all ILX Lightwave products:

- Indoor use only
- Ordinary Protection: This product is NOT protected against the harmful ingress of moisture.
- Class I Equipment (grounded type)
- Mains supply voltage fluctuations are not to exceed ±10% of the nominal supply voltage.
- Pollution Degree II
- Installation (overvoltage) Category II for transient overvoltages
- Maximum Relative Humidity: <80% RH, non-condensing
- Operating temperature range of 0 °C to 40 °C
- Storage and transportation temperature of –40 °C to 70 °C
- Maximum altitude: 3000 m (9843 ft)
- This equipment is suitable for continuous operation.

Safety Marking Symbols

This section provides a description of the safety marking symbols that appear on the instrument. These symbols provide information about potentially dangerous situations which can result in death, injury, or damage to the instrument and other components.

 Caution, refer to manual	 Earth ground Terminal	 Alternating current	 Visible and/or invisible laser radiation
 Caution, risk of electric shock	 Protective Conductor Terminal	 Caution, hot surface	 Frame or chassis Terminal
 or (I) On: In position of a bistable push control. The slash (I) only denotes that mains are on.		 or (O) Off: Out position of a bistable push control. The circle (O) only denotes that mains are off.	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

WARRANTY

ILX LIGHTWAVE CORPORATION warrants this instrument to be free from defects in material and workmanship for a period of one year from date of shipment. During the warranty period, ILX will repair or replace the unit, at our option, without charge.

Limitations

This warranty does not apply to fuses, lamps, defects caused by abuse, modifications, or to use of the product for which it was not intended**.**

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for any particular purpose. ILX Lightwave Corporation shall not be liable for any incidental, special, or consequential damages**.**

If a problem occurs, please contact ILX Lightwave Corporation with the instrument's serial number, and thoroughly describe the nature of the problem.

Returning an Instrument

If an instrument is to be shipped to ILX Lightwave for repair or service, be sure to:

1. Obtain a Return Authorization number (RA) from ILX Customer Service.
2. Attach a tag to the instrument identifying the owner and indicating the required service or repair. Include the instrument serial number from the rear panel of the instrument.
3. Attach the anti-static protective caps that were shipped with the instrument and place the instrument in a protective anti-static bag.
4. Place the instrument in the original packing container with at least 3 inches (7. 5 cm) of compressible packaging material. **Shipping damage is not covered by this warranty.**
5. Secure the packing box with fiber reinforced strapping tape or metal bands.
6. Send the instrument, transportation pre-paid, to ILX Lightwave. Clearly write the return authorization number on the outside of the box and on the shipping paperwork. ILX Lightwave recommends you insure the shipment.

If the original shipping container is not available, place your instrument in a container with at least 3 inches (7.5 cm) of compressible packaging material on all sides.

Repairs are made and the instrument returned transportation pre-paid. Repairs are warranted for the remainder of the original warranty or for 90 days, whichever is greater.

Claims for Shipping Damage

When you receive the instrument, inspect it immediately for any damage or shortages on the packing list. If the instrument is damaged, file a claim with the carrier. The factory will supply you with a quotation for estimated costs of repair. You must negotiate and settle with the carrier for the amount of damage.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Comments, Suggestions, and Problems

To ensure that you get the most out of your ILX Lightwave product, we ask that you direct any product operation or service related questions or comments to ILX Lightwave Customer Support. You may contact us in whatever way is most convenient:

Phone . . . . . (800) 459-9459 or (406) 586-1244

Fax . . . . . (406) 586-9405

Email. . . . . support@ilxlightwave.com

Or mail to:

ILX Lightwave Corporation
P. O. Box 6310
Bozeman, Montana, U.S.A 59771
www.ilxlightwave.com

When you contact us, please have the following information:

Model Number: _____

Serial Number: _____

End-user Name: _____

Company: _____

Phone: _____

Fax: _____

Description or sketch of what is connected to the ILX Lightwave instrument:

_____

Description of the problem:

_____

If ILX Lightwave determines that a return to the factory is necessary, you are issued a Return Authorization (RA) number. Please mark this number on the outside of the shipping box.

You or your shipping service are responsible for any shipping damage when returning the instrument to ILX Lightwave; ILX recommends you insure the shipment. If the original shipping container is not available, place your instrument in a container with at least 3 inches (7.5cm) of compressible packaging material on all sides.

We look forward to serving you even better in the future!

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table of Contents
Module Instruction Manual

Chapter 1 Introduction to the LDC-3916338 3.0 Amp Laser Diode Current Source Module

Introduction 1
Safety Symbols and Terms 1
Product Overview 2
Installing your LDC-3916338 Laser Diode Current Source Module 2
How to Contact Customer Service 3
LDC-3916338 3.0 Amp Current Source Module Specifications 5

Chapter 2 How to Operate Your LDC-3916338 Laser Diode Current Source Module

Introduction 1
Connecting to the Laser Controller 2
Operating the Laser Current Source from the Front Panel 5
Operating a Laser in Constant Current Mode 5
Operating a Laser in Constant Power Mode 8
Conditions which will Automatically Shut Off the Laser Output 12

Chapter 3 Operating in Remote Control

Introduction 1
Remote Configuration 1
LDC-3916338 Laser Diode Current Source Command Set 1
Status Reporting 4

Chapter 4 Command Reference

Introduction 1
LDC-3916338 Device-Dependent Commands 3
LDC-3916338 Device-Command Reference 3

Chapter 5 Calibration and Troubleshooting Guide

Introduction 1
Calibration Overview 1
Local Calibration of the Laser Current Source 3
Remote Calibration of the 3916338 Current Source Module 6
Troubleshooting Guide 10

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 1 1

INTRODUCTION TO THE LDC-3916338 3.0 AMP LASER DIODE CURRENT SOURCE MODULE 1
INTRODUCTION 1
SAFETY SYMBOLS AND TERMS 1
PRODUCT OVERVIEW 2
INSTALLING YOUR LDC-3916338 LASER DIODE CURRENT SOURCE MODULE 2
Installation into LDC-3916 or LDC-3908 Laser Diode Controller Mainframe 2
HOW TO CONTACT CUSTOMER SERVICE 3
Calibration and Repair Services 3
General Shipping Instructions 3
LDC-3916338 3.0 AMP CURRENT SOURCE MODULE SPECIFICATIONS**ERROR! BOOKMARK NOT DEFINED.**
Laser Current Source Specifications 4

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 1

INTRODUCTION TO THE LDC-3916338 3.0 AMP LASER DIODE CURRENT SOURCE MODULE

INTRODUCTION

This chapter is an introduction to the LDC-3916338 3.0 Amp Laser Diode Current Source Module for the LDC-3916 or LDC-3908 LD Controller Mainframes. Contained in Chapter 1 is unpacking information, instructions on how to install and apply power, and safety considerations and instructions. It also contains some maintenance information, and specifications.

WARNING

If any of the following symptoms exist, or are even suspected, remove the LDC-3916338 Module from service. Do not use LDC-3916xxx modules until safe operation can be verified by trained service personnel.

1. *Visible damage*
2. *Severe transport stress*
3. *Prolonged storage under adverse conditions*
4. *Failure to perform intended measurements or functions*

If necessary, return the LDC-3916338 modules to ILX Lightwave for service and repair to ensure that safety features are maintained.

SAFETY SYMBOLS AND TERMS

The following safety terms are used in this manual:

- The **WARNING** heading explains dangers that could result in personal injury or death.
- The **CAUTION** heading explains hazards that could damage your instrument.
- The **NOTES** heading gives information to the user that may be beneficial in the use of the instrument and to the devices being tested.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The following symbols are used in this manual and on the instrument:

 Earth Ground and/or Protective Conductor Terminal

 Caution: Refer to accompanying documents

 Caution: Risk of Electrical Shock

 Instrument Power Off

 Instrument Power On

PRODUCT OVERVIEW

The LDC-3916338 Laser Diode Current Source Module contains one fully independent current source. The current sources provide high stability output up to a maximum drive current of 3.0 Amps, with fully redundant current limits and multiple laser protection features such as contact bounce detection, compliance voltage limit adjust, and 4-wire voltage measurement for precise laser diode forward voltage measurement.

INSTALLING YOUR LDC-3916338 LASER DIODE CURRENT SOURCE MODULE

Installation into LDC-3916 or LDC-3908 Laser Diode Controller Mainframe

If you are receiving this new module for installation into a previously purchased LDC-3916 or LDC-3908 mainframe, follow the instructions below. If your system was configured at the factory with your desired modules skip this section.

CAUTION

Static discharge can damage your new Laser Diode Current Source Module. Be certain you use proper grounding procedures before you unpack and install your controller module(s) into the LDC-3916 or LDC-3908 Mainframe.

Inspect the module for any visible shipping damage that may have occurred before inserting the module into the mainframe. Pay special attention to the copper shielding material on the back edge of the module.

Be sure that the LDC-3916 or LDC-3908 Mainframe power is off before inserting your new laser diode controller module.

Unwrap the module from the anti-static bag it was packaged in.

Insert the module into the desired slot from the rear of the LDC-3916 or LDC-3908 Mainframe. Each module is supported by two plastic card guides inside of the mainframe. Insert the module, 40-pin connector first, by lining up the edges of the module frame with the appropriate card guides (one on the top and one on the bottom). Carefully slide the module into the mainframe slot until the connector is seated. You will have to push a little harder to seat the module. The rear panel of the module should be flush with the mainframe when properly inserted. Fasten the module to the mainframe with the two screws located at the top and bottom of the module rear panel.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

HOW TO CONTACT CUSTOMER SERVICE

If you have any questions or comments related to product operation or service, please contact **Customer Support** at 1-800-459-9459 (USA and Canada) or 406-586-1244 (International); by fax at 406-586-9405; or E-mail us at SUPPORT@ILXLIGHTWAVE.COM.

Please have the following information available (if applicable):

NOTE: All ILX Lightwave modules are identified by an seven-digit serial number located on the rear panel. The first three digits are the model number; the last four identify your module specifically.

1) Product Model: _____
2) Unit Serial Number: _____
3) End user name and telephone/fax
   - Name: _____
   - Company: _____
   - Phone: _____
   - Fax: _____
4) Description/sketch of what is connected to the ILX Lightwave instrument.
5) Description of the problem.

Calibration and Repair Services

You may have to return your current source module to an ILX Lightwave facility at some time for repair, calibration or service whether it is under warranty or not. There is a charge for repairs after the warranty period has expired. Contact an ILX Lightwave service representative for shipping instructions prior to returning the instrument. Have the above information available when you call. A return authorization number will be given to you at the time of your request for repair or service. Please use this number in all communications concerning your instrument.

General Shipping Instructions

If you need to ship your LDC-3916338 Laser Diode Current Source Module back to the factory for repair, be sure that the module is packaged in an anti-static bag and an enclosure with cushioning material to prevent damage to the module during shipment (use the original shipping containers and accessories if possible). Re-install the ESD protective caps on the rear panel over the 9-pin connector. Shipping damage is not covered under warranty.

Attach to the module a copy of the completed service form above. We suggest that you insure the shipment.

Ship the module to:

UNITED STATES

ILX LIGHTWAVE CORP.
31950 E. Frontage Rd.
Bozeman, Montana 59715
PH: 406-586-1244
FAX: 406-586-9405

OUTSIDE THE UNITED STATES

Contact the local distributor.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Laser Current Source Specifications [1]

MODEL NUMBER	3916338 Single 3.0A
DRIVE CURRENT OUTPUT	
Output Current Range:	0 to 3000 mA
Setpoint Resolution:	80 µA
Setpoint Accuracy:[2]	± 0.1% of full scale
Compliance Voltage:	4.5 V (adjustable voltage limit)
Temperature Coefficient:	≤ 100 ppm/°C
Short Term Stability (1 hr.): [3]	≤ 50 ppm
Long Term Stability (24 hr.): [4]	≤ 75 ppm
Noise and Ripple: [5]	
High Bandwidth Mode:	< 36 µA rms
Low Bandwidth Mode:	< 24 µA rms
Transients:	
Operational: [6]	< 5 mA
1kV EFT / Surge: [7]	< 5 mA / < 10 mA
LASER DRIVE LIMIT SETTINGS	
Current Limit Range:	0 to 3000 mA
Current Limit Resolution:	1.025 mA
Current Limit Accuracy:	±9 mA
Voltage Limit Range:	0 to 7.5V
Voltage Limit Resolution:	0.2V
PHOTODIODE FEEDBACK	
Type:	Differential 10Ω Input, Selectable Zero Bias or 5V Reverse Bias
PD Current Range:	0 to 5000 µA
Output Stability: [8]	± 0.01%
Accuracy, Setpoint (% of FS):	± 0.1%
EXTERNAL ANALOG MODULATION	
Input : [9]	0 to 8.0 V, 50Ω
Transfer Function:	375 mA / V ± 10 %
High Bandwidth Mode, Small Signal Bandwidth: [10]	DC to 0.6 MHz
High Bandwidth Mode, Large Signal Bandwidth: [11]	DC to 0.6 MHz
Low Bandwidth Mode:	DC to 30 kHz
DRIVE CURRENT MEASUREMENT (DISPLAY)	
Output Current Range:	0 to 3000.0 mA
Output Current Resolution:	0.01 mA
Output Current Accuracy (@25°C):	± 0.07% of Full Scale
Photodiode Current Range:	0 to 5000 µA
PD Current Resolution:	0.1 µA
PD Current Accuracy (@25°C):	± 2 µA
PD Responsivity Range: [12]	0.00 to 1000.00 µA/ mW
PD Responsivity Resolution:	0.01 µA/ mW
Optical Power Range:	0.00 to 5000.0 mW
Optical Power Resolution:	100 µW
Forward Voltage Range:	0.00 to 7.5 V
Forward Voltage Resolution:	10 mV (1 mV GPIB)
Forward Voltage Accuracy: [13]	±7 mV (± 2 mV GPIB)

CURRENT SOURCE NOTES:

1. All values relate to a one-hour warm-up period.
2. Accuracy is 0.15% above 2.5 Amps after 1hr warm-up period.
3. Over any 1-hour period, half-scale output.
4. Over any 24-hour period, half-scale output.
5. Measured optically, evaluating noise intensity of a laser diode into a photodetector with 150kHz Bandwidth.
6. Maximum output current transient resulting from normal operational situations (e.g., power on-off, current on-off), as well as accidental situations (e.g., power line plug removal).
7. Maximum output current transient resulting from a 1000V power-line transient spike.
8. Maximum monitor photodiode current drift over any 30 minute period. Assumes zero drift in responsivity of photodiode.
9. Modulation input is 50Ω terminated inside the mainframe.
10. 250 mA Setpoint, 50 mA modulation current, 1Ω load. High bandwidth mode.
11. 50% modulation at mid-scale output, 1Ω load. High bandwidth mode.
12. Responsivity value is user-defined and is used to calculate the optical power.
13. Four-wire voltage measurement while driving calibration load. Specification valid for values above 10 mV.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 2 1

HOW TO OPERATE YOUR LDC-3916338 LASER DIODE CURRENT SOURCE MODULE 1
INTRODUCTION 1
CONNECTING TO THE LASER CURRENT SOURCE 2
Interlock Connections 4
Four-Wire Voltage Sense 4
Photodiode Connections 4
Grounding considerations 4
OPERATING THE LASER CURRENT SOURCE FROM THE FRONT PANEL 5
OPERATING A LASER IN CONSTANT CURRENT MODE 5
Entering the Laser Channel Setup Menu 5
Selecting the Mode of Control 6
Setting the Current Limit 6
Setting the Constant Current Value 6
Setting the Voltage Limit 6
Enabling the Modulation Input 7
Setting Photodiode Bias Voltage 7
Turning the Laser Current Source On 7
OPERATING A LASER IN CONSTANT POWER (P) MODE 8
Calculating Photodiode Responsivity Values 8
Entering the Laser Channel Setup Menu 8
Selecting the Mode of Control 8
Setting the Current Limit 9
Setting the Voltage Limit 9
Setting the Power Limit 10
Adjusting the Constant Power Setting 10
Setting the Responsivity Value (CalPD) 10
Setting the Photodiode Bias Voltage 11
Enabling the Modulation Input 11
Constant Power Mode If CalPD is Unknown 11
Turning the Laser Current Source On 11
CONDITIONS WHICH WILL AUTOMATICALLY SHUT OFF THE LASER OUTPUT 12
Laser Error Indicators 13

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 2

HOW TO OPERATE YOUR LDC-3916338 LASER DIODE CURRENT SOURCE MODULE

INTRODUCTION

This chapter introduces you to the operation of the LDC-3916338 LD Current Source's control functions. It offers instructions for connecting your lasers to the current sources. This chapter also contains step by step procedures that teach you how to operate your module in Constant Current Mode or Constant Power Mode. We recommend that you review the contents of this chapter at a minimum before operating your new LDC-3916338 Laser Diode Current Source.

LDC-3916338 SERIES CURRENT SOURCE DEFAULT CONFIGURATION

LASER CONTROLLER
- **LASER output off**
- **LAS current set point (LDI or Iset) = 50 mA**
- **LAS current limit (LIM:I or Ilim) = 150 mA**
- **LAS voltage limit (LIM:V or Vlim) = 5.0 V**
- **LAS Mode = Constant Current, low bandwidth mode (MODE:ILBW or Ilbw)**
- **Modulation off**
- **Optical power set point (MDP or Pset) = 3.0 mW**
- **Monitor responsivity (CALPD or CalPD) = 0.0 mA/mW**
- **Optical power limit (LIM:MDP or Plim) = 500 mW**
- **Monitor PD Bias off**
- **LASER STEP value = 0.1mA**
- **Monitor PD current set point (MDI or Ipdset) = 100 mA**

Table 2.1 LDC-3916338 Series Current Source Default Settings

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CONNECTING TO THE LASER CURRENT SOURCE

When connecting your laser diode or any other sensitive devices to the LDC-3916338 Laser Diode Current Source Modules, we recommend that the instrument be powered up and the **LASER** output be off. In this condition, a low impedance shunt is active across the output terminals. When disconnecting devices, it is only necessary to turn the **LASER** Output off.

It is also recommended that the connections to the LDC-3916338 Laser Diode Controller module output be made using twisted wire pairs with an earth-grounded shield (see Figures 2.1 A - D). We recommend using our CC-305S or shorter CC-315S Shielded Laser Cable which are unique twisted-pair cables with braided outer shield designed to provide the best possible rejection of most transient noise signals. The output terminals of the instrument are left floating relative to earth ground to suppress AC power-on/power-off transients that may occur through an earth-ground path. If the output circuit is earth-grounded at some point (such as through the laser package and mount), the user must be careful to avoid multiple earth grounds in the circuit. Multiple earth grounds may provide circuit paths that induce spurious currents in the photodiode feedback circuit and output leads.

NOTE

Experience indicates that should an inadvertent open circuit occur during laser operation (while the LASER is ON), your laser may be damaged by a momentary circuit break-and-remake before the final circuit break. Your new LDC-3916338 Controller Module has circuitry designed to detect open circuits and will shut the output off under most conditions. However, we recommend that cable connections to the laser be secure enough that they won't open-circuit, should they be jostled or bumped.

Use appropriately shielded cabling to reduce coupling of potentially laser damaging transients. Do not "bundle" the current source cables with other cables in your system or laboratory. See Application Note #3, "Laser Diode Protection Strategies" for more detailed discussions on connecting to your laser.

Figures 2.1 A - D show the possible configurations of connecting laser diodes and photodiodes with the LDC-3916338 Module.

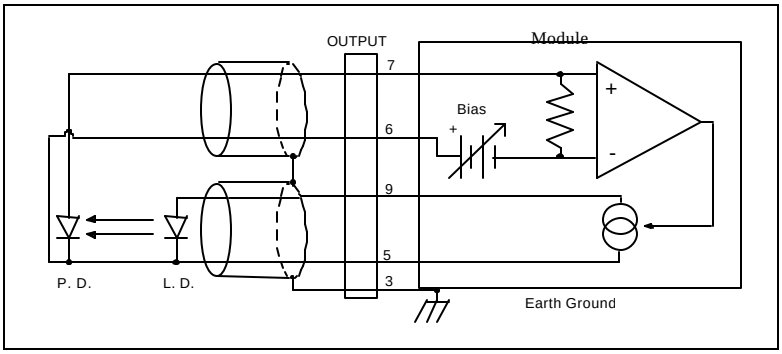


Figure 2.1 A Common Laser Cathode - Photodiode Cathode

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

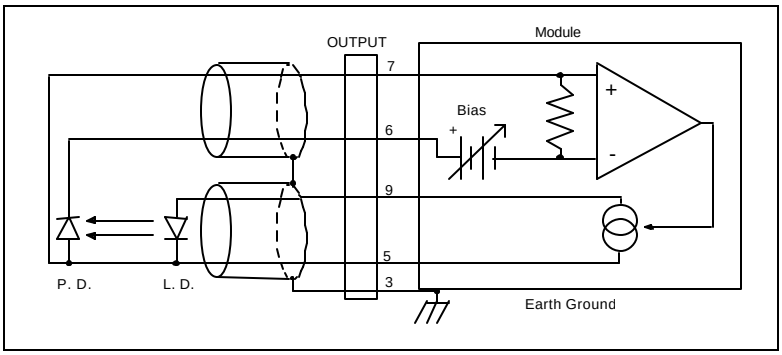


Figure 2.1 B Common Laser Cathode - Photodiode Anode

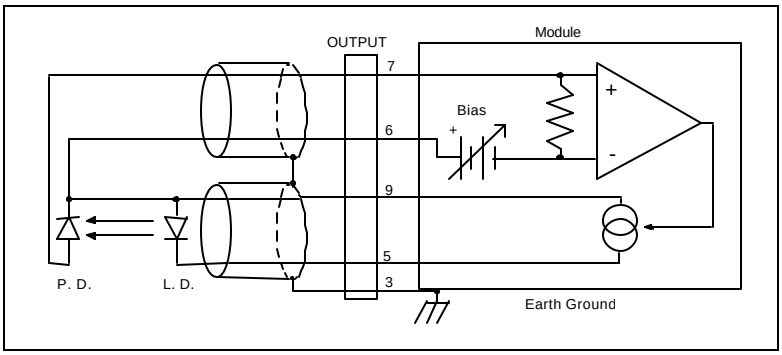


Figure 2.1 C Common Laser Anode - Photodiode Cathode

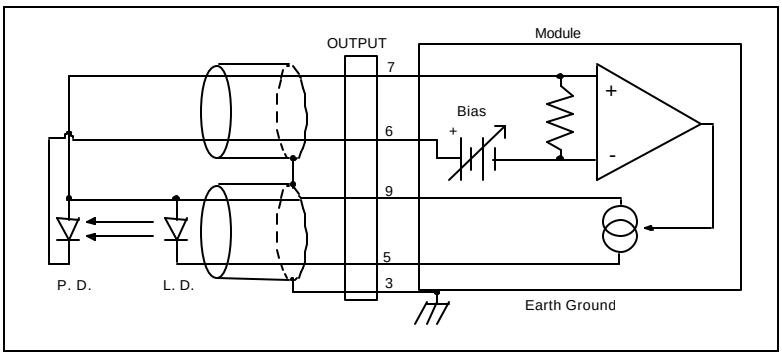


Figure 2.1 D Common Laser Anode - Photodiode Anode

The 9-pin connector on the rear panel (bottom connector) of your Current Source Module is used to connect your laser diode to the current source. There are connections provided for laser cathode and anode, photodiode cathode and anode, chassis ground, interlock, and laser forward voltage. The pin-out diagram for this connector is shown in Figure 2.2.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

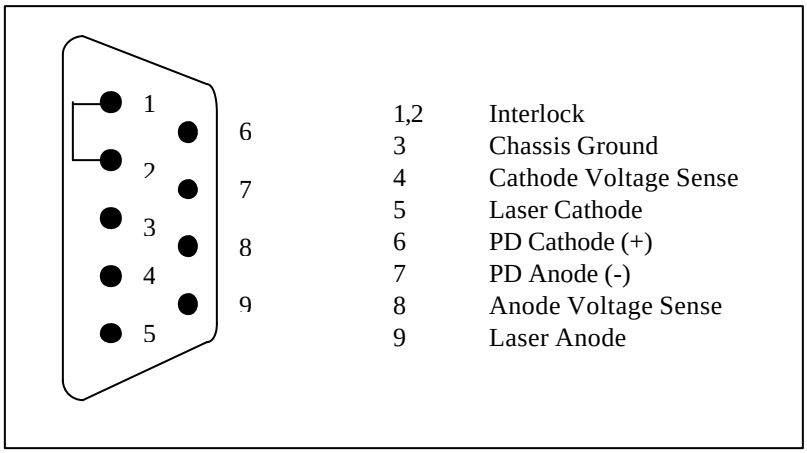


Figure 2.2 Back Panel LD Connectors

Interlock Connections

In order for the laser output to be enabled, a short must exist between the Interlock pins (pins 1 and 2) of the connector. The short can be a direct short across the pins or a switch to prevent laser operation until the switch is closed. If a short does not exist between these two pins and you attempt to turn on the LAS output, an error (E501) will be indicated on the display for the respective channel, on any of the Laser set up pages, or on the status screen; furthermore, the output will be turned off.

CAUTION

The interlock terminals on the LASER connector, pins 1 and 2, must be kept isolated from all other connections including earth ground.

Four-Wire Voltage Sense

The LDC-3916338 Module has a 4-wire voltage sense feature. The laser voltage is sensed through a pair of connections (pins 4 and 8) that is separate from the laser current drive connections (pins 5 and 9). This allows a more accurate laser voltage reading for the voltage limit feature. All four of these pins (4,5,8,9) must be connected for the module to operate. See Tech Note #TN3916-2 for more information on 4-wire Voltage Sense.

Photodiode Connections

Many laser diode modules contain an internal photodiode that monitors the back-facet emission of the laser. Usually, this photodiode is internally connected to either the laser anode or cathode.

The photodiode and laser connections to the LDC-3916338 Module are electrically isolated from ground and each other. So, if a 4-pin connection is made (no common connections) no additional jumpers are required. Figures 2.1A - 2.1D show the recommended connections and shielding for 3-pin lasers (where the common connection is internal to the device). A 4-pin laser should be connected with the same shielding as shown in Figure 2.1, but the common connection (between the photodiode and the laser) is optional.

Grounding considerations

The LASER output of the LDC-3916338 Module is isolated from chassis ground allowing either output terminal to be grounded at the user's option. Figure 2.1 shows the proper earth-ground shielding for laser diode/photodiode connections.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OPERATING THE LASER CURRENT SOURCE FROM THE FRONT PANEL

The various laser current source control parameters can be set the same for all of the channels via the **All Chnl** menu which is accessed through the **MAIN** menu. Alternatively, the laser source control parameters for each individual channel can be set independently via the **LAS** channel setup menu, which is accessed through the **CHAN** menu. You can move between multiple pages of any setup menu by pushing the up and down arrow soft keys (F3 and F4) while in the setup menu. Which parameter to adjust can be selected with the **(DISPLAY) UP/DOWN ARROW** keys. In general, the selected parameter value can be adjusted with the numeric keypad, the **ADJUST** knob, or the **(ADJUST) UP/DOWN ARROW** keys. The **ENTER** key must be pressed within three seconds after entering a numeric value with the keypad, or the value will revert to the previous value.

The DISPLAY is used to show both the set point and measured value of laser control parameters such as laser drive current (Iset and Io), laser current limit (Ilim), laser forward voltage (Vf), forward voltage limit (Vlim), mode of control (Mode), monitor photodiode current (Ipdset and Ipd), and laser optical power (Plim and Ppd). It will also display error codes, which relate to LASER operation. Error codes indicate control errors and are explained below in the section titled "LASER ERROR INDICATORS".

The following sections describe fundamentals of single channel operation for your LDC-3916338 Current Source Module's Laser Diode Current Source in two operating modes, Constant Current (I) and Constant Power (P).

NOTE

The laser current source set point may be adjusted and output may be turn on or off from the ***Status Menu****. See the* ***Mainframe Instruction Manual; Chapter 2 - How to Operate Your LDC3916/LDC3908 LD Controller*** *for more information on this and other* ***Status Menu*** *features.*

OPERATING A LASER IN CONSTANT CURRENT MODE

Suppose you have an LDC-3916338 Module and you want to run the instrument in Constant Current low bandwidth mode (Ilbw), with a set point of 150 mA, a current limit of 175 mA, and a voltage limit of 4 volts. The Ilbw mode uses a low-pass filter on the laser drive current output to significantly reduce noise. In this mode a low bandwidth modulation input may be used via the back panel MODULATION connector. Follow the instructions below, in the sequence presented, to program the current source for a single channel.

Entering the Laser Channel Setup Menu



Push the **CHAN** key to display the single channel menu. From this menu you can see the measured parameters, enter the LAS or TEC channel setup menus, or turn the LAS current source and/or TEC on and off. Use the **(ADJUST) UP/DWN ARROW** keys or the **ADJUST** knob to select the desired channel number highlighted at the top of the display. Push the DISPLAY **DOWN ARROW** soft key (F4) to enter page 1 of the laser channel setup menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Selecting the Mode of Control



Select the **Mode** parameter by pushing the **(DISPLAY) UP/DOWN ARROW** keys until the **Mode** parameter is highlighted. Repeatedly pushing the **(ADJUST) UP/DOWN ARROW** keys or turning the **ADJUST** knob will cycle through the Constant Current low bandwidth (Ilbw), Constant Optical Power (P), Constant Current high bandwidth (Ihbw), and Photodiode Current (Ipd) control modes. Set the LDC-3916338 Modules in Constant Current low bandwidth mode by selecting the **Ilbw** mode.

Setting the Current Limit



Now select the current limit (**Ilim**) parameter using the **(DISPLAY) UP/DOWN ARROW** keys. Adjust the value to 175mA. The current limit protects your laser by never allowing the laser drive current to exceed the Ilim value independent of the current set point and the controller mode (Constant Current or Constant Power).

CAUTION

Failure to set and ensure a proper Ilim value could result in laser damage.

Setting the Constant Current Value



Next, select the **Iset** parameter on the setup menu using the **(DISPLAY) UP/DOWN ARROW** keys. This parameter sets the laser current source drive value when in Ilbw or Ihbw modes. Enter 150 mA using the numeric keypad, the **ADJUST** knob, or the **(ADJUST) UP/DOWN ARROW** keys. Push the **ENTER** key to store the value in memory within three seconds after entering the value using the numeric keypad, or it will revert to the old value.

Setting the Voltage Limit



Select the voltage limit (**Vlim**) parameter and adjust it to 4 volts in the same manner as described above. The voltage limit also protects your laser by shutting off the source driver if the laser voltage exceeds the **Vlim** value. The **Vlim** value should be set slightly above the operating voltage of the laser diode to provide maximum protection.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE

There is also a laser optical power limit (Plim) safety feature explained in this manual under the section titled "OPERATING A LASER IN CONSTANT POWER MODE, P". The laser optical power limit can be disabled by setting the ***CalPD*** *value to zero on page 2 of the laser setup menu.*

Enabling the Modulation Input



Change the display to LAS p.3 of the laser setup menu to set the next parameter. Do this by pushing the **DOWN** soft key (F4) twice. The **Modulation** parameter on this page controls whether the MODULATION connector input is active or not. Select the **Modulation** parameter by pressing the **(DISPLAY) UP/DOWN ARROW** keys until the **Modulation** parameter is highlighted. Adjust the value to ON or OFF as desired with the **(ADJUST) UP/DOWN ARROW** keys or the **ADJUST** knob. Refer to the LDC-3916338 Module specifications for modulation input specifications and limitations.

Setting Photodiode Bias Voltage



The **Bias** parameter setting controls whether a 5 volt reverse voltage is supplied to the monitor photodiode or not. Set the **Bias** parameter to ON or OFF as desired.

Many laser diode modules are tested and characterized by the manufacturer with a 5 volt reverse bias on the photodiode. This bias can decrease the response time and increase the linearity and/or saturation level of the photodiode.

Turning On the Laser Current Source

Now you are ready to enable the current source output for your laser diode on this channel. You can enable this channel now or set all of the other channels first. The top soft key (F1) on any of the three pages of the LAS setup menu will toggle the laser current source on and off. You can also turn the current source on and off with the top soft key (F1) on the CHAN menu. The ON toggle has a two second delay before the current source is enabled in compliance with safety requirements.

Each single channel current source can be turned on or off independently as described above, or you can turn on all the channel sources at the same time from the **All Chnl** menu. See the LDC-3916 or LDC-3908 Mainframe Instruction Manual for more information on the all channel operation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OPERATING A LASER IN CONSTANT POWER (P) MODE

Suppose you want to operate a 3 mW laser in constant optical power at 1 mW. The LDC-3916338 Modules allow you to operate the instrument current source drivers in Constant Optical Power (P) mode. In the "P" mode, the controller drives current to the laser to reach a set power value in mW. The control loop feedback parameter is monitor photodiode current, which the controller converts to optical power via a user defined photodiode responsivity number, CalPD. If laser power changes due to internal or environmental conditions, the controller will increase/decrease the current to the laser to maintain the power set point. The following paragraphs detail the instrument configuration in Constant Power Mode.

Calculating Photodiode Responsivity Values

The photodiode responsivity, **CalPD**, is used to convert between photodiode current and optical power of the laser diode. A method to calculate the responsivity is suggested below.

1. Measure (with a calibrated detector) the output power of the laser.
2. Measure the corresponding monitor photodiode current.
3. Calculate the responsivity (CalPD) by dividing the photodiode current by the optical power noting the units required are μA/mW.

Entering the Laser Channel Setup Menu



To enter the setup menu, push the **CHAN** key, which displays the channel menu. Select the correct channel number at the top of the display by pushing the **(ADJUST) UP/DOWN ARROW** keys or turning the **ADJUST** knob. Then push the DISPLAY **DOWN ARROW** soft key (F4) to enter page 1 of the laser setup menu.

Selecting the Mode of Control



Select the **Mode** parameter by pushing the **(DISPLAY) UP/DOWN ARROW** keys until the **Mode** parameter is highlighted. Repeatedly pushing the **(ADJUST) UP/DOWN ARROW** keys or turning the **ADJUST** knob will cycle through the Constant Current low bandwidth (Ilbw), Constant Optical Power (P), Constant Current high bandwidth (Ihbw), and Photodiode Current (Ipd) control modes. Set the LDC-3916338 Series Current Source Module in Constant Optical Power mode by selecting the **P** mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setting the Current Limit



Select the laser current limit (**Ilim**) parameter by pushing the **(DISPLAY) UP/DOWN ARROW** keys until the Ilim value is highlighted with the cursor. Adjust the current limit value with the numeric keypad, the **ADJUST** knob, or the **(ADJUST) UP/DOWN ARROW** keys. If you use the numeric keypad, you must push the **ENTER** key to store the value in memory within three seconds after entering the value, or it will revert to the previous value. The current limit protects your laser by never allowing the laser drive current to exceed the **Ilim** value independent of the current set point and the controller mode (Constant Current or Constant Power).

CAUTION

Failure to set and ensure a proper Ilim value could result in laser damage.

Setting the Voltage Limit



Next, select the laser voltage limit (**Vlim**) parameter using the **(DISPLAY) UP/DOWN ARROW** keys. Adjust this value to your desired laser voltage limit. The voltage limit also protects your laser by shutting off the source driver if the laser voltage exceeds the **Vlim** value. The **Vlim** value should be set slightly above the operating voltage of the laser diode to provide maximum protection.

NOTE

*Be sure to push the **ENTER** key within three seconds after using the keypad to adjust any numeric values in the setup menus; otherwise, the value will revert to the previous setting.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setting the Power Limit



Now push the **DOWN** soft key (F4) to advance to LAS p.2 of the laser setup menu. Before the laser is enabled, the power limit for the laser under test should be set. To do this, push the **(DISPLAY) UP/DOWN ARROW** keys to select the power limit (**Plim**) parameter. Adjust this value to your desired laser optical power limit. The responsivity value (**CalPD**) must be set to the correct value for the power limit feature to work properly. This is a software limit only. The LASER output is normally turned off if this limit is reached.

Adjusting the Constant Power Setting



Use the **(DISPLAY) UP/DOWN ARROW** keys to select the power (**Pset**) parameter, and adjust the value to 1 mW. The Controller Module will divide the measured photodiode current by the **CalPD** value to calculate the laser optical power. The current source will automatically adjust the laser drive current to keep the calculated laser power at the **Pset** value.

Setting the Responsivity Value (CalPD)



The correct responsivity value (**CalPD**) must be set for the constant power mode to operate properly. To do this, select the **CalPD** parameter, and adjust it to the correct value. The **CalPD** units are µA/mW.

A method to calculate the responsivity value (CalPD) is suggested here:

- Measure (with a calibrated detector) the output power of the laser.
- Measure the corresponding monitor photodiode current.
- Calculate the responsivity (CalPD) by dividing the photodiode current by the optical power noting the units required are µA/mW.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setting the Photodiode Bias Voltage



Now push the **DOWN** soft key (F4) to display LAS p.3 of the laser setup menu. The **Bias** parameter setting controls whether or not a bias voltage is applied to the monitor photodiode. Select the **Bias** parameter and adjust it ON or OFF depending on whether you want a 5 volt reverse bias on your photodiode or not. (Many laser diode modules are tested and characterized by the manufacturer with a 5 volt reverse bias on the photodiode. This bias can decrease the response time and increase the linearity and/or saturation level of the photodiode.)

Enabling the Modulation Input



The **Modulation** parameter on the LAS p.3 setup menu controls whether the MODULATION connector input is active or not. Select the **Modulation** parameter by pressing the **(DISPLAY) UP/DOWN ARROW** keys until the **Modulation** parameter is highlighted. Adjust the value to ON or OFF as desired. Refer to the LDC-3916338 Series module specifications in chapter 1 for modulation input specifications and limitations.

Constant Power Mode If CalPD is Unknown



If you do not know the correct photodiode responsivity (CalPD) value, the LDC-3916338 Modules can still drive your laser at a constant light power. The Constant Photodiode Current (**Ipd**) mode will control the laser drive current so the monitor photodiode current remains at a constant set point. To do this, adjust the **Mode** to **Ipd** on LAS p.1 of the laser setup menu, **and** set the photodiode current (**Ipdset**) parameter on the LAS p.2 menu to your desired value. In this case, you may want to set the power limit (**Plim**) value high or set **CalPD** to zero which will disable the power limit feature. Be sure to set the **Ilim** and **Vlim** values on LAS p.1 of the laser setup menu to protect your laser.

Turning the Laser Current Source On

Now this channel is configured to operate in Constant Power Mode. The laser current source will drive the laser to the Constant Power set point and maintain closed loop control with the monitor photodiode current measurement. You can enable this channel now or set all of the other channels first. The top soft key (F1) on any of the three pages of the LAS setup menu will toggle the laser current source on and off. You can also turn the current source on and off with the top soft key (F1) on the channel menu. The ON toggle has a two second delay before the current source is enabled in compliance with safety requirements.

Each single channel current source can be turned on or off independently as described above, or you can turn on all the channel sources at the same time from the **All Chnl** menu. See the LDC-3916 or LDC-3908 Mainframe Instruction Manual for more information on all channel operation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CONDITIONS WHICH WILL AUTOMATICALLY SHUT OFF THE LASER OUTPUT

When the LASER output is off, an internal short is placed across the LASER output. The default condition for the current source output is OFF when the instrument is first powered up. With the laser output enabled, the channel or status displays should be indicating measured laser current. If the output won't function or an error code appears, check the conditions shown below or table 2.3 "LASER Error Indicators".

The following conditions will automatically force the laser current source to turn off:

1. LASER High Power Limit (Plim)
2. LASER High Voltage Limit (Vlim)
3. LASER ENABLE Interlock
4. LASER ENABLE Key Lock turned off on the front panel
5. LASER Open Circuit
6. TEC High Temperature Limit Condition

In addition, the LASER Current Limit setting (Ilim) will clip the laser drive current at the Ilim set point when the signal is being modulated. When the LASER current limit (Ilim) is reached, an ILIM warning will appear on the CHAN menu display. The current limit setting is independent of the voltage drop of the device connected to the LASER output. Furthermore, since the current limit circuitry is fully independent of the main current control, the current limit can be adjusted safely, even while the LASER output is active.

The LDC-3916338 Series Current Source Modules' response to sensing the various limits can be controlled via the GPIB interface. Most high limit responses can be set to either turn off the source or just give a limit warning through the GPIB interface. See the "LAS:ENAB:OUTOFF" command in chapter 4 of this manual for more information.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Laser Error Indicators

The LDC-3916338 Laser Diode Current Source Controllers indicate general LASER operational error conditions. When an error occurs, the Error Indicator Code will appear on the Status page, the Chan page, or the LAS Setup pages for the respective channel. The Error Indicator Code will clear if you exit any page that it appears on. The output drive will shut off when any Error occurs. Error Indicator codes are summarized in Table 2.3. Some of these errors can be disabled using GPIB: see Chapter 4 for more information.

Error Condition	Probable Cause
E501 Interlock	Interlock pins not connected properly or LASER ENABLE key lock turned off on front panel.
E503 Voltage limit or Open circuit	The laser current source or voltage measurement pins are open, or some condition caused the laser voltage to reach the limit value (Vlim).
E504 Current limit	The current limit (Ilim) was reached. This condition will cause Error Indicator Code E504 and shut down the source only when enabled through the GPIB interface; otherwise, a current limit will only clip the drive current at the Ilim value and indicate ILIM on the display.
E505 Voltage limit warning	The voltage on the laser current source is approaching the Vlim value. This condition will cause Error Indicator Code E505 and shut down the source only when enabled through the GPIB interface.
E507 Output Power Limit	Software calculated optical output power limit (Plim) was detected.
E508 TEC is off	A TEC source, such as a 3916558 or 3916545, which has been programmed to control this laser module has turned off for some reason. This condition will shut down the laser source only when enabled through the GPIB interface.
E509 TEC temperature limit	A TEC source, such as a 3916558 or 3916545, which has been programmed to control this laser module has turned off for some reason. This condition will shut down the laser source only when enabled through the GPIB interface.
E510 Tolerance event.	Out of Tolerance Status Forces LAS Output Off
E511 Hardware error	Hardware has detected an error.
E529 Output off when controller thinks it is on	Laser source is off without hardware or software indicating a reason.
E535 Mode changed while output was on.	Operating mode was changed while the laser current source was on.

Table 2.3 LASER Error Indicators

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 3 1

OPERATING IN REMOTE CONTROL **1**
INTRODUCTION 1
REMOTE CONFIGURATION 1
LDC-3916338 LASER DIODE CURRENT SOURCE COMMAND SET 1
LDC-3916338 Laser Diode Current Source Often Used Commands 3
Command Timing and Completion 4
STATUS REPORTING 4
Status Registers 4
Output Off Registers 7
Error Messages 9

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 3

OPERATING IN REMOTE CONTROL

INTRODUCTION

Everything you can do from the front panel can also be done remotely. In fact, more features and information are available through the remote interface than are available from the front panel. For example, using the Enable:Outoff command, you can set up the module so that it will turn off if it goes into current limit, and you cannot do that from the front panel. The following sections show you the fundamentals of operating your LDC-3916338 module remotely through the GPIB or RS-232 interfaces.

REMOTE CONFIGURATION

Refer to the LDC-3916 or LDC-3908 Instruction Manual Chapter 3, “Operating in Remote Control” for information concerning setup of GPIB or RS-232 remote communications. That section also describes the use of IEEE 488.2 common commands, mainframe commands, and syntax.

LDC-3916338 LASER DIODE CURRENT SOURCE COMMAND SET

The LDC-3916338 Series modules have their own module-specific command sets, separate from the commands for the LDC-3916 or LDC-3908 mainframe (see LDC-3916 or LDC-3908 Instruction Manual Chapter 3 “Operating in Remote Control”). Figure 3.1 shows all of the commands which are usable by the LDC-3916338 Series modules in conjunction with the LDC-3916 or LDC-3908.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

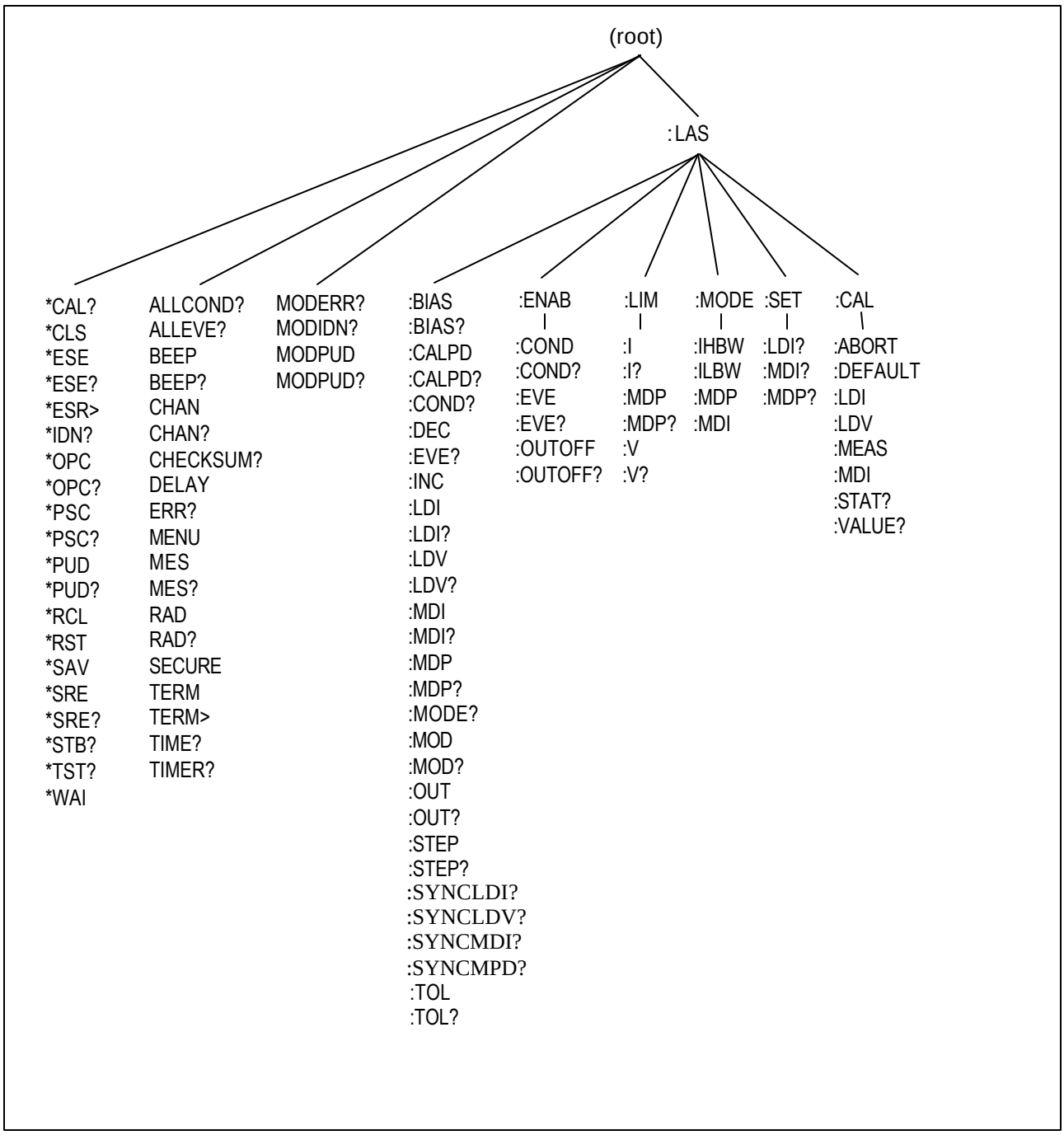


Figure 3.1 LDC-3916338 Laser Diode Current Source Command Path Structure

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LDC-3916338 Laser Diode Current Source Often Used Commands

The complete command set of the LDC-3916338 Laser Diode Current Source module contains over 100 commands that allow you to operate the module for a variety of applications. Within the command set, however, is a smaller subset of commands that will meet most of your needs; these commands are listed in Table 3.1.

LDC-3916338 Series Often Used Commands

NAME	PARAMETERS	FUNCTION
CHAN	1	Sets the channel (or ALL channels) for further commands.
ERR?	NONE	Returns "Mainframe" errors generated since the last query, followed by a binary representation of existing module errors.
MODERR?	NONE	Returns module errors generated since the last error query (to that module).
LAS:		
LAS:CALPD	1	Sets the monitor photodiode responsivity for Power mode use[1].
LAS:LDI	1	Sets the constant current source set point.
LAS:LDI?	NONE	Returns the measured output current.
LAS:LDV?	NONE	Returns the measured laser voltage.
LAS:LIM:I	1	Sets the current source limit.
LAS:LIM:MDP	1	Sets the constant optical power (from monitor PD) limit.
LAS:LIM:V	1	Sets the current source voltage limit.
LAS:MDI?	1	Returns the measured monitor PD current.
LAS:MDP	1	Sets the constant optical power set point.
LAS:MDP?	NONE	Returns the measured optical power.
LAS:MODE:IHBW	NONE	Sets the mode to constant current, high bandwidth mode.
LAS:MODE:ILBW	NONE	Sets the mode to constant current low bandwidth mode.
LAS:MODE:MDI	NONE	Sets the mode to constant photodiode current mode.
LAS:MODE:MDP	NONE	Sets the mode to constant optical power mode.
LAS:OUT	1	Used to turn the current source output on or off.
LAS:OUT?	NONE	Returns the current source output status.

Table 3.1 LDC-3916338 Series Often Used Commands

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Command Timing and Completion

All commands for the LDC-3916338 modules are sequential, except for the “LAS:OUT ON”, “LAS:INC”, and “LAS:DEC” commands. The “LAS:OUT ON” command is overlapped to allow the user to abort it via the “LAS:OUT OFF” command during a two-second interval after the output is told to be on. The “LAS:INC” and “LAS:DEC” commands are overlapped to allow the user to monitor other functions while in an automatic ramping mode.

For more information on the use of operation complete commands, such as *WAI and *OPC, refer to the LDC-3916 or LDC-3908 Instruction Manual, Chapter 3.

STATUS REPORTING

Refer to the LDC-3916 or LDC-3908 Laser Diode Controller Instruction Manual, Chapter 3 “Operating in Remote Control” for information on standard status structures, mainframe-related commands, and for understanding the Operation Complete definition.

The following sections discuss the LDC-3916338 module-dependent aspects of status reporting, including the “OUTOFF” commands and queries. The Output Off Register section also contains information on enabling the conditions which will force one of the laser current sources off.

Status Registers

The LDC-3916338 modules provide status registers which are summarized in the LDC-3916 or LDC-3908 mainframe manual. These summaries are accessed via the “ALLCOND?” and “ALLEVE?” remote queries. Refer to the LDC-3916 or LDC-3908 Instruction Manual for details on remote status reporting.

Each channel of the LDC-3916 or LDC-3908 may contribute to the “ALLCOND” and “ALLEVE” registers. For the LDC-3916338 modules, the enabled conditions of the laser current source are passed to the appropriate bit of the ALLCOND register (see Figure 3.2). Likewise, the enabled events of the current source are passed to the appropriate bit of the ALLEVE register (see Figure 3.3). By “appropriate bit” we mean the bit corresponding to the channel number: bits 0-15 correspond to channels 1-16.

For example, you may wish to have the LDC-3916 or LDC-3908 generate an interrupt to the host PC in the event the Laser current source goes into Power Limit. As Figure 3.3 shows, bit 3 of Laser's Event register will be set when the laser goes into or out of Power Limit. Enable the event by setting bit 3 in Laser's Enable Event register using the command “LASER:ENAB:EVE 8”. This allows the event to be passed to the ALLEVE register in the 3916 or 3908 mainframe. You can monitor the ALLEVE status by using the “ALLEVE?” query, and you can monitor the summary using the “*STB?” query. To generate the SRQ (interrupt) for our example, you must also set the Service Request Enable Register, e. g. “*SRE”, to allow the ALLEVE summary to generate the interrupt. See the Status Reporting section of Chapter 3 in the LDC-3916 or LDC-3908 Instruction Manual for details on status structures.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

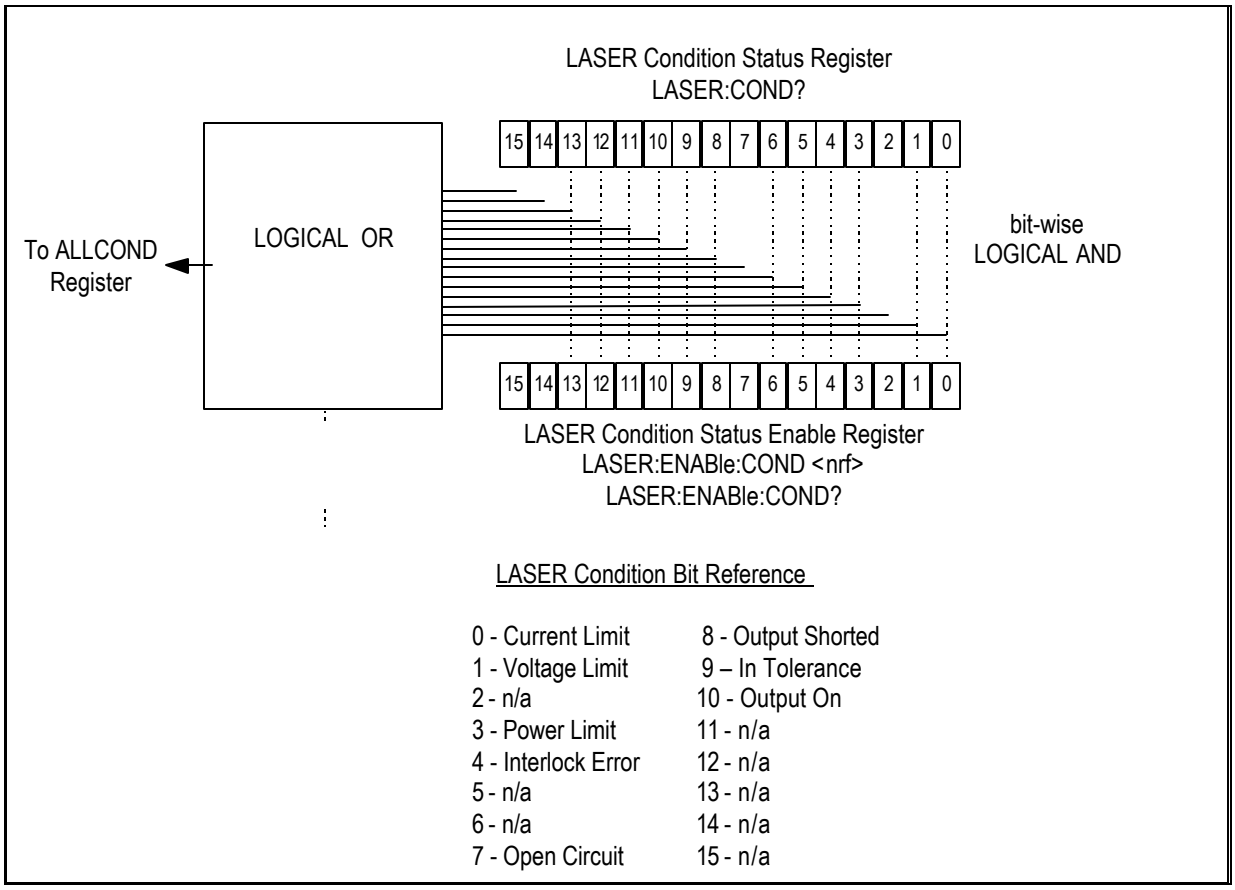


Figure 3.2 3916338 Condition Registers

If bit 1 of the condition register is set, the laser's forward voltage is near the user's Voltage Limit (VLim) setpoint. The Laser Voltage Limit condition occurs when the voltage is about 0.25 volts less than the VLim setting. When the VLim set voltage is reached, the hardware is triggered to shut the Laser output off and bit 7, Open Circuit, is set.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

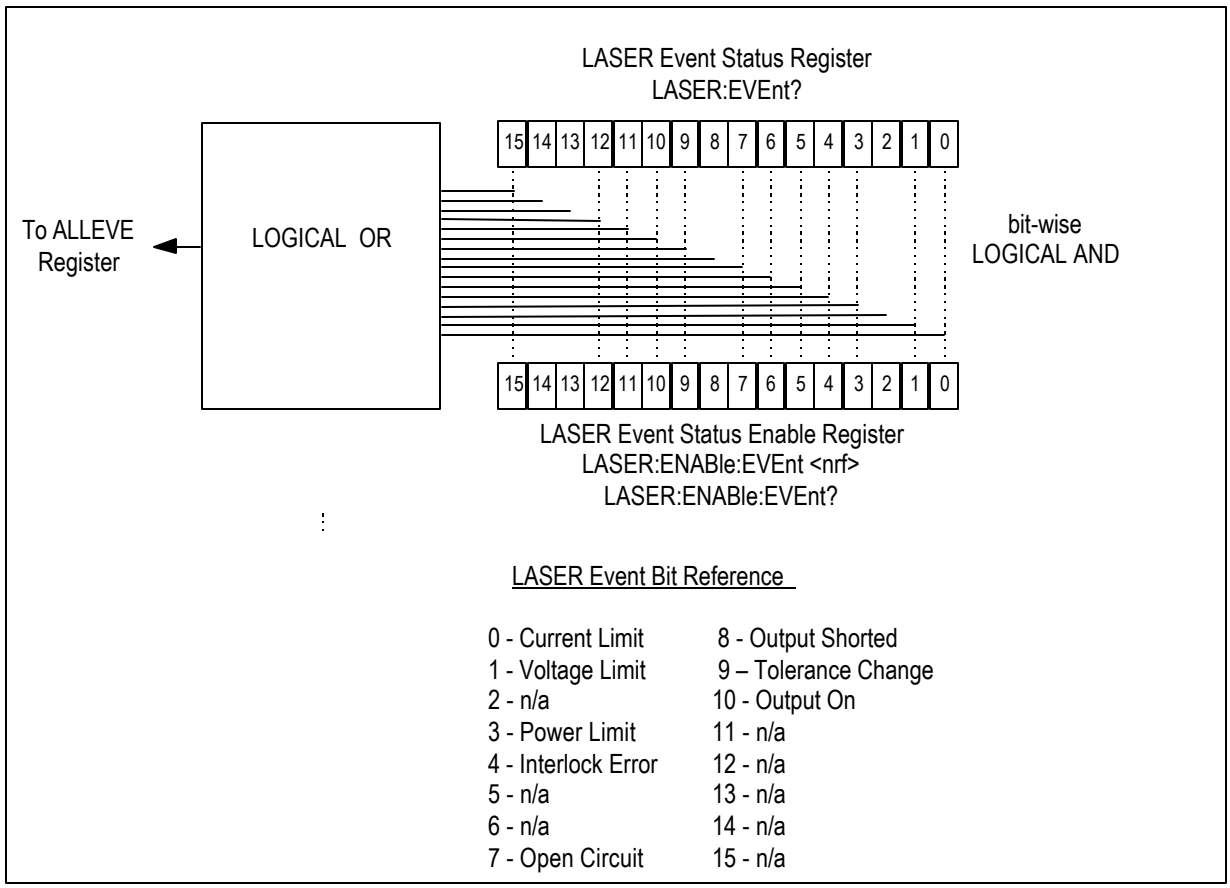


Figure 3.3 3916338 Event Registers

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Output Off Registers

The Output Off Enable Register allows you to determine which conditions and events in the LASER controller can cause the output to be turned off. This register is configured in a manner which is similar to the status reporting registers. However, the values are not reported in the Status Byte Register. This register is used by the firmware to control the output enable for the LASER. The events and conditions which may be set to cause the LASER output to be turned off are shown in Figures 3.4 and 3.5.

The default settings for these registers for an LDC-3916338 module are shown in Table 3.2. The registers take on these values at power-up, as the result of a *RST command, or when you choose "Default" from the Save/Recall menu. These settings are not affected by the *PSC (Power-On Status Clear) command.

DEFAULT SETTINGS FOR OUTPUT OFF ENABLE REGISTERS

LASER Output Off Register

Bit	Name	State
0	Current Limit	Disabled
1	Voltage Limit	Disabled
2	N/A	
3	Power Limit	Enabled
4	N/A	
5	N/A	
6	N/A	
7	N/A (see Note 1 below)	
8	N/A	
9	Out of Tolerance	Disabled
10	N/A	
11	N/A	
12	N/A	
13	N/A	
14	N/A	
15	N/A	

Table 3.2 LDC-3916338 Default Settings for Output Off Registers

Note 1: Bit 7 is Laser Open Circuit in the Laser Condition and Event registers. It is not available to disable in the Output Off Enable register because it is always active in the hardware.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

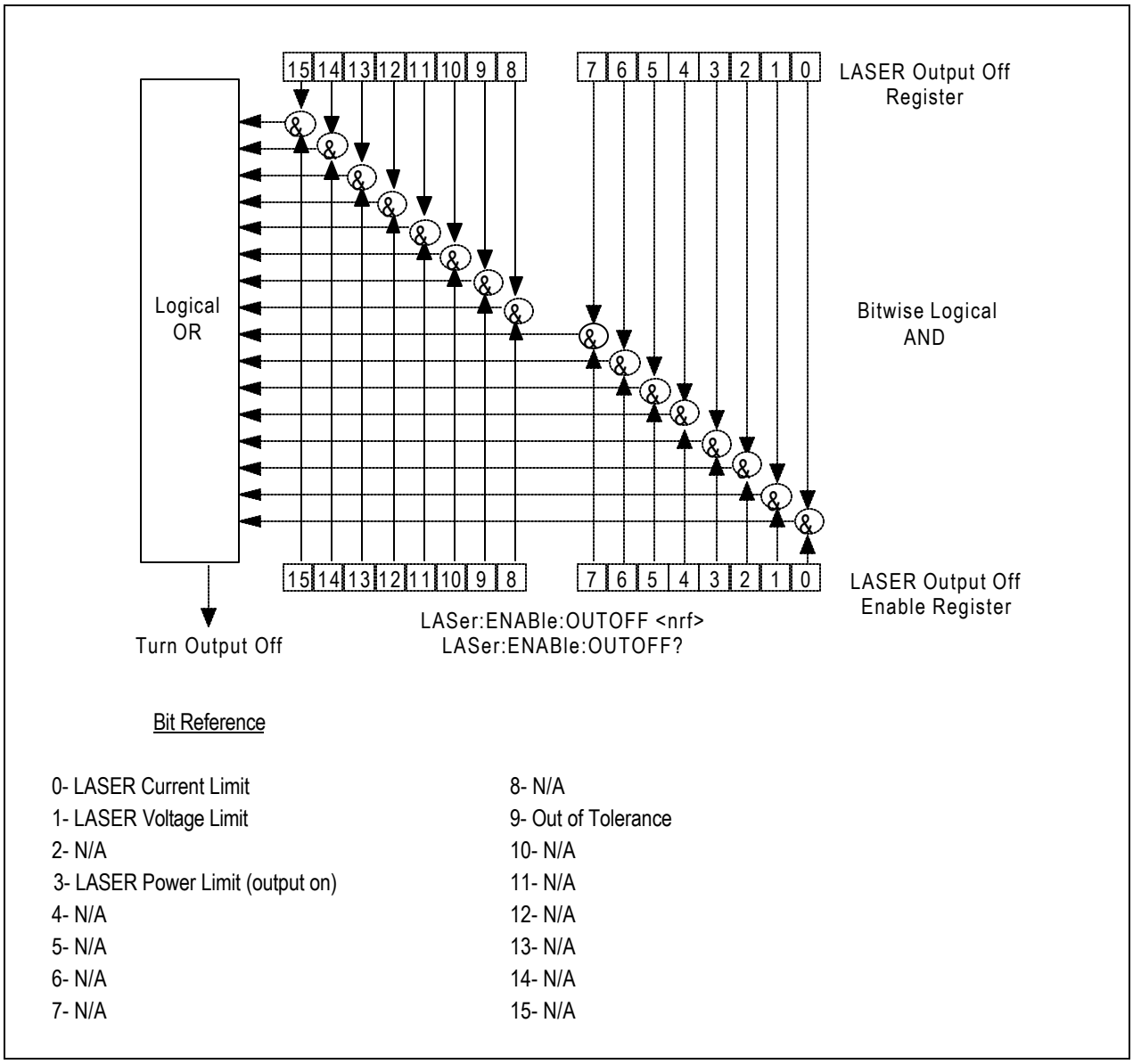


Figure 3.4 LDC-3916338 Series Laser Diode Controller LASER Output Off Register

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Error Messages

This section contains descriptions of the errors which are specific to the LDC-3916338 Series modules. These are the error codes that are returned from the “MODERR?” query. Refer to the LDC-3916 or LDC-3908 Laser Diode Controller Instruction Manual, Chapter 3, for a list of LDC-3916 or LDC-3908 mainframe error codes and descriptions (the codes returned from the “ERR?” query).

During remote operation, the recommended method for error testing is as follows. First read the system errors and module error summary with the “ERR?” query. This allows you to error check the LDC-3916 or LDC-3908 as a whole. If any module errors are present, the corresponding bit of the error summary will be set. For example, if the “ERR?” query returns “0,0001000000100000” there are errors on channels 13 and 6. Then read the module errors using the “MODERR?” query. For example, “Chan 13;Moderr?” and “Chan 6;Moderr?” queries could be sent. For more information on LDC-3916 or LDC-3908 mainframe errors, refer to Chapter 3 of the Laser Diode Controller Instruction Manual.

LDC-3916338 SERIES ERROR MESSAGES

Error Code	Explanation
E-103	Length of arbitrary block is different from expected length.
E-104	Parameter is an undefined numeric type.
E-105	Parameter has an invalid exponent.
E-106	A digit was expected in the parameter but was not found.
E-114	Specified arbitrary block length is invalid.
E-123	Command is not found.
E-126	Wrong number of parameters for command.
E-201	Parameter value out of range.
E-202	Error in conversion of parameter type.
E-203	Command is a "secure" command, but secure commands are disabled.
E-205	Expected Boolean parameter is invalid.
E-206	Error in conversion to signed 16-bit integer.
E-207	Error in conversion to unsigned 16-bit integer.
E-209	Error in conversion to unsigned 32-bit integer.
E-210	Error in conversion to floating-point number.
E-214	Response is too long to output.
E-220	Programmable User Data specification invalid.
E-221	Internal error: message undeliverable.
E-222	Set value is over range.
E-223	Set value is under range.

Table 3.3 LDC-3916338 Series Error Message Codes

(continued next page)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Error Code	Explanation
E-501	Interlock Open forces LAS output off.
E-503	LAS forward voltage exceeds Voltage Limit setting; LAS output forced off. (Open Circuit error)
E-504	LAS Current Limit forces LAS output off.
E-505	LAS forward voltage approaching Voltage Limit setting; LAS output forced off.
E-507	LAS Power Limit forces LAS output off.
E-508	A TEC source, such as a 3916558 or 3916545, which has been programmed to control this laser module has turned off for some reason. This condition will shut down the laser source only when enabled through the GPIB interface.
E-509	A TEC source, such as a 3916558 or 3916545, which has been programmed to control this laser module has turned off because it reached the temperature limit. This condition will shut down the laser source only when enabled through the GPIB interface.
E-510	Out of Tolerance Status forces LAS output off.
E-511	LAS Hardware Error forces LAS output off.
E-529	LAS Output is off, but LAS status thought it was on.
E-535	LAS Operating Mode changed while output on; LAS output forced off.
E-601	Internal error: recalled setting has incorrect checksum (settings do not match bin).
E-710	Internal error: internal sensor #1 over-temperature forces Las output off.
E-711	Internal error: internal sensor #2 over-temperature forces Las output off.
E-712	Internal error: internal sensor #3 over-temperature forces Las output off.
E-802	Calibration Measurement Entered Before Calibration was Ready.
E-803	Attempted to Enter Invalid Calibration Mode.

Table 3.3 LDC-3916338 Series Error Message Codes

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 4 1

COMMAND REFERENCE **1**
INTRODUCTION 1
LDC-3916338 DEVICE-DEPENDENT COMMANDS 3
LDC-3916338 DEVICE-COMMAND REFERENCE 3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 4

COMMAND REFERENCE

INTRODUCTION

This chapter is a guide to all of the device-dependent commands for the LDC-3916338 Laser Diode Current Source module. This chapter is divided into two parts. The first part contains an overview of the remote commands used by the LDC-3916338. The second part contains all of the LDC-3916338 commands in alphabetical order. Figure 4.1 shows the format for the device command descriptions in this chapter. The commands which emulate local (front panel) operation are denoted by the solid box next to the Local label in the upper left corner of the command description.

LDC-3916338 Device-Dependent Commands

NAME	PARAMETERS	FUNCTION
LAS:BIAS	1	Enables or disables the -5 volt photodiode bias.
LAS:BIAS?	NONE	Returns the status of the photodiode bias control.
LAS:CALPD	1	Used to set the CAL PD (monitor responsivity) constant.
LAS:CALPD?	NONE	Returns the CAL PD (monitor responsivity) constant.
LAS:CAL:ABORT	NONE	Aborts a LAS calibration.
LAS:CAL:DEFAULT	NONE	Restores all LAS calibration values to their defaults.
LAS:CAL:LDI	NONE	Enters the laser current calibration mode.
LAS:CAL:LDV	NONE	Enters the laser voltage calibration mode.
LAS:CAL:MDI	NONE	Used to enter the monitor photodiode current calibration mode.
LAS:CAL:MEAS	1	Enters a calibration value.
LAS:CAL:STAT?	NONE	Returns a value which represents the calibration status.
LAS:CAL:VALUE?	1	Used for factory calibration testing only.
LAS:COND?	NONE	Returns the value of the LASER condition register.
LAS:DEC	2	Decreases the laser set point value by one or more steps with user-programmable delay between steps.
LAS:ENAB:COND	1	Sets the enable register for LASER conditions.
LAS:ENAB:COND?	NONE	Returns the value of the LAS conditions enable register.
LAS:ENAB:EVE	1	Sets the enable register for LAS events.
LAS:ENAB:EVE?	NONE	Returns the value of the LAS event enable register.
LAS:ENAB:OUTOFF	1	Sets the enable register for LAS conditions which turn the LAS output off.
LAS:ENAB:OUTOFF?	NONE	Returns the value of the LAS outoff enable register.
LAS:EVE?	NONE	Returns the value of the LAS event register.
LAS:LDI	1	Sets the LASER constant current source set point value.
LAS:LDI?	NONE	Returns the constant current source measured value.
LAS:INC	2	Increases the laser set point value by one or more steps with user-programmable delay between steps.

Table 4.1 LDC-3916338 Device-Dependent Commands

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LDC-3916338 Device-Dependent Commands

NAME	PARAMETERS	FUNCTION
LAS:LDV?	NONE	Returns the measured laser voltage value.
LAS:LIM:I	1	Sets the LASER current source limit.
LAS:LIM:I?	NONE	Returns the LASER current source limit.
LAS:LIM:MDP	1	Sets the constant optical power (from monitor PD) limit value.
LAS:LIM:MDP?	NONE	Returns the optical power (from monitor PD) limit value.
LAS:LIM:V	1	Sets the current source's adjustable compliance voltage.
LAS:LIM:V?	NONE	Returns the value of the adjustable compliance voltage setting.
LAS:MDI	1	Sets the monitor current set point.
LAS:MDI?	NONE	Returns the monitor PD current measured value.
LAS:MDP	1	Sets the constant optical power set point
LAS:MDP?	NONE	Returns the actual monitor PD power value
LAS:MODE?	NONE	Returns the mode, I (current), IHBW (high bandwidth), P (optical power) or MDI (constant monitor current).
LAS:MODE:IHBW	NONE	Sets the mode to constant current, high bandwidth.
LAS:MODE:ILBW	NONE	Sets the mode to constant current low bandwidth mode.
LAS:MODE:MDI	NONE	Sets the mode to constant monitor current mode (regardless of CALPD value).
LAS:MODE:MDP	NONE	Sets the mode to constant optical power mode.
LAS:MOD	1	Enables or disables the channel's modulation input.
LAS:MOD?	NONE	Returns the status of the channel's modulation input.
LAS:OUT	1	Enables/disables the current source output.
LAS:OUT?	NONE	Returns the current source output status.
LAS:SET:LDI?	NONE	Returns the laser constant I (current) set point.
LAS:SET:MDI?	NONE	Returns the laser constant optical power set point.
LAS:SET:MDP?	NONE	Returns the constant P (optical power) set point.
LAS:STEP	1	Sets the laser set point step value.
LAS:STEP?	NONE	Returns the laser set point step value.
LAS:SYNCLDI?	NONE	Returns the value of the measured laser current.
LAS:SYNCLDV?	NONE	Returns the value of the measured laser voltage.
LAS:SYNCMDI?	NONE	Returns the value of the measured montor photodiode current.
LAS:SYNCMDP?	NONE	Returns the value of the measured optical power.
LAS:TOL	2	Sets the laser set point tolerance value and time period value.
LAS:TOL?	NONE	Returns the laser setpoint tolerance value and time period value.
MODERR?	NONE	Returns the error codes (up to 10) from the module.
MODIDN?	NONE	Returns identification data from the module.
MODPUD	1	Used at factory to set calibration information.
MODPUD?	NONE	Returns factory set calibration information.
STATMENU:LINE2?	NONE	Returns the name of the measurement that is displayed on line 2 of the status menu.
STATMENU:LINE2:VF	NONE	Sets line 2 of the status menu to display laser forward voltage.
STATMENU:LINE2:IPD	NONE	Sets line 2 of the status menu to display photodiode current.
STATMENU:LINE2:PPD	NONE	Sets line 2 of the status menu to display optical power.

Table 4.1 LDC-3916338 Device-Dependent Commands (Cont.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

This section contains all of the device-dependent commands for the LDC-3916338 Laser Diode Current Source, listed in alphabetical order. Sub-sections for each path are presented, listing the commands which are legal for that path. See Chapter 3 Figure 3.1 for command path tree structure.

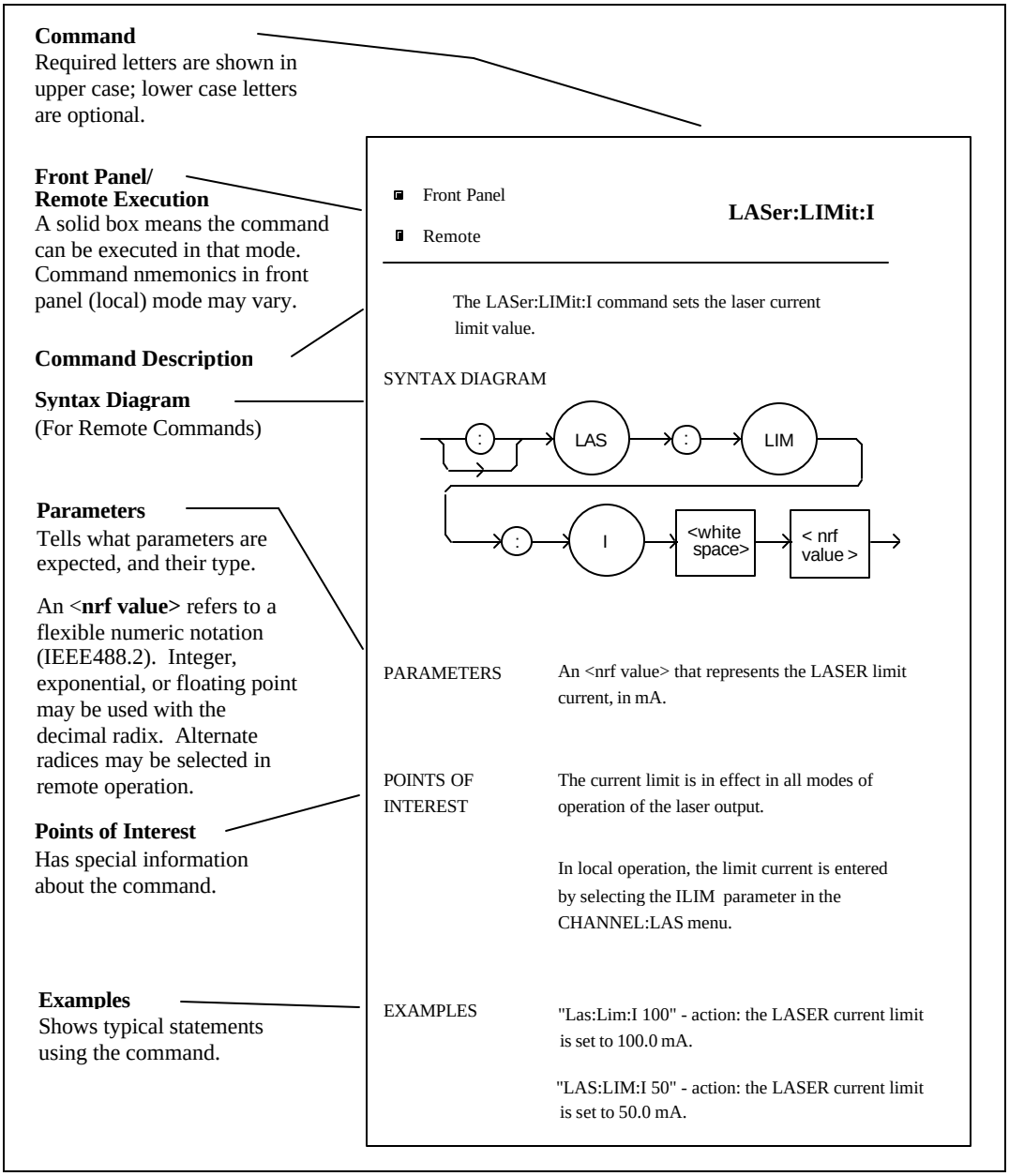


Figure 4.1 Command Description Format

LDC-3916338 DEVICE-COMMAND REFERENCE

The following pages contain a reference for the device-dependent commands of the LDC-3916338 Laser Diode Current Source. This reference contains useful information for both local and remote operation of your Laser Diode Current Source.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ Front Panel

■ Remote

LASer:

The LASer: command path is used to get to the LDC-3916338 Laser Diode Current Source commands. The following command paths may be reached from the LASer: command path.

LASer:CAL:
LASer:ENABle:
LASer:LIMit:
LASer:MODE:
LASer:SET:

The following commands may be reached directly from the LASer: command path.

LASer:BIAS	LASer:LDI	LASer:MODulation
LASer:BIAS?	LASer:LDI?	LASer:MODulation?
LASer:CALPD	LASer:LDV?	LASer:OUTput
LASer:CALPD?	LASer:MDI	LASer:OUTput?
LASer:COND?	LASer:MDI?	LASer:STEP
LASer:DEC	LASer:MDP	LASer:STEP?
LASer:EVEnt?	LASer:MDP?	LASer:TOL
LASer:INC	LASer:MODE?	LASer:TOL?

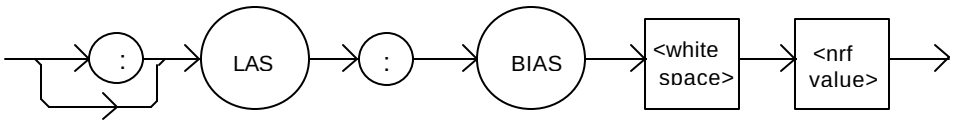
■ Front Panel

■ Remote

LASer:BIAS

The LASer:BIAS command turns the selected channel's laser photodiode bias on or off.

SYNTAX DIAGRAM



PARAMETERS An <nrf value>; 1 = on, 0 = off.

POINTS OF INTEREST When the BIAS is on, a bias of -5 volts is placed across the photodiode terminals.

EXAMPLES "LAS:BIAS ON" -action: sets the selected channel's laser photodiode bias output on.

"Las:Bias 0" -action: turns the selected channel's laser photodiode bias off.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

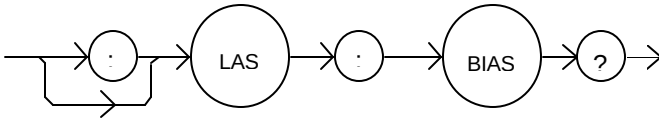
■ Front Panel

■ Remote

LASer:BIAS?

The LASer:BIAS? query returns the status of the selected laser channel's photodiode bias selection.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value>.

POINTS OF INTEREST Photodiode bias is turned off when a *RST command is issued.

EXAMPLES "Las:BIAS?" -response: 0, means that the selected channel's photodiode bias is off.

"LAS:Bias?" -response: 1, means that the selected channel's photodiode bias is enabled.

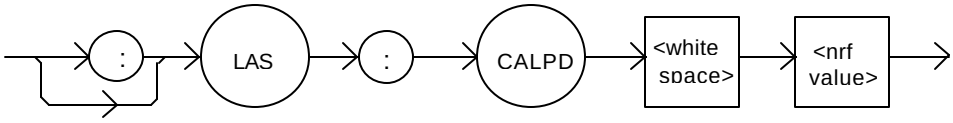
■ Front Panel

■ Remote

LASer:CALPD

The LASer:CALPD command sets the laser's photodiode feedback responsivity (the CAL PD parameter) on the selected channel.

SYNTAX DIAGRAM



PARAMETERS An <nrf value>, in microamps/milliwatt.

POINTS OF INTEREST Optical power (PPD) is calculated as the monitor photodiode current divided by this value.

EXAMPLES "LAS:CALPD 0" -action: sets the CAL PD parameter to 0.

"Laser:Calpd 1" -action: sets the CAL PD parameter to 1.00 microamp/milliwatt: a photodiode feedback current of 1 microamp will cause the P display to read 1 milliwatt.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

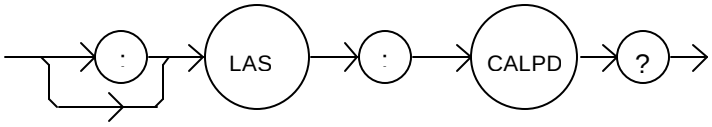
■ Front Panel

■ Remote

LASer:CALPD?

The LASer:CALPD? query returns the value of the laser's photodiode feedback responsivity (CAL PD parameter) setting for the selected channel.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value>.

POINTS OF INTEREST If this value is 0, the selected channel's monitor current/power conversion will not be done. If the mode is set to MDP, the actual set point will be forced to be (near) 0, regardless of the LAS:MDP value.

If this value is 0, the front panel P will display "-----", and no P value can be calculated.

EXAMPLES "Laser:CALPD?" -response: 0, means the selected channel's monitor current/power conversion will not be done. If the mode is set to P, the actual set point will be forced to be (near) 0, regardless of the LAS:MDP value.

"Las:CALPD?" -response: 1.1, means the selected channel is set for operation in constant P mode (if MDP mode is also selected) and the responsivity is set to 1.10 µA/mW. 1.1 µA of photodiode feedback current represents 1 mW of optical power.

■ Front Panel

■ Remote

LASer:CAL:

The LASer:CAL: command path is used to get to the selected channel's laser calibration commands.

The following commands may be reached directly from the LASer:CAL: command path.

LASer:CAL:ABORT
LASer:CAL:DEFAULT
LASer:CAL:LDI
LASer:CAL:LDV
LASer:CAL:MDI
LASer:CAL:MEAS
LASer:CAL:VALUE?

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

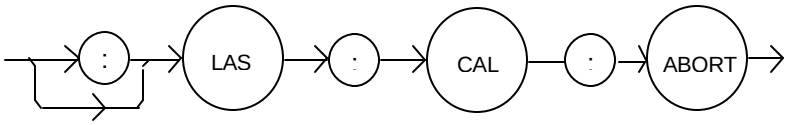
■ Front Panel

■ Remote

LASer:CAL:ABORT

The LASer:CAL:ABORT command is used to exit a Laser calibration without changing the calibration values.

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST After this command is issued it is safe to run the LDC-3916338 Laser Diode Current Source with the same calibration values used as before the LAS calibration mode was started.

This command is intended for use after a false or invalid calibration value is entered, or to exit calibration mode before any values have been entered.

EXAMPLES "Las:CAL:ABORT" -action: the LDC-3916338 Laser Diode Current Source exits calibration mode.

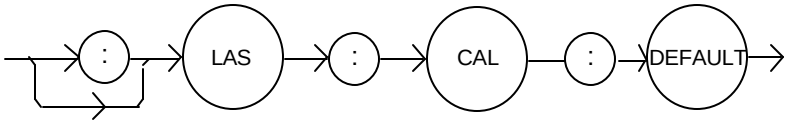
■ Front Panel

■ Remote

LASer:CAL:DEFAULT

The LASer:CAL:DEFAULT command is used to restore all of the module's LAS calibration default values.

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST This command should not be used except when normal calibration procedures and/or normal operation of the LAS functions is not possible.

After this command is issued, the LAS module will not be calibrated. Each of the prescribed calibration procedures must be redone. The default values are the starting point values which exist before factory calibration is done.

EXAMPLES "Las:CAL:Default" -action: the LDC-3916338 Laser Diode Current Source sets all of the LAS calibration values to defaults on the selected module.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

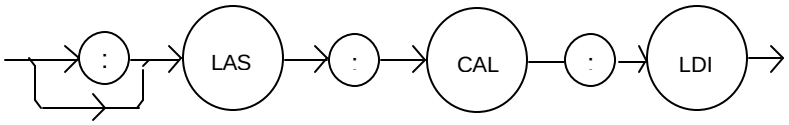
■ Front Panel

■ Remote

LASer:CAL:LDI

The LASer:CAL:LDI command is used to enter the Laser current set point, measurement, and limit calibration mode for the selected channel.

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST Since the limit circuit is the same for both high and low bandwidth modes, it is only calibrated once. Both low and high bandwidth are calibrated during this procedure.

After this command is issued, the LDC-3916338 Laser Diode Current Source will allow calibration of the current set point, measurement, and limit. This procedure is outlined in the Calibration section of the Laser module instruction manual.

EXAMPLES "Las:CAL:LdI" -action: the LDC-3916338 Laser Diode Current Source enters calibration mode for Laser current.

"Las:Cal:LDI" -action: the LDC-3916338 Laser Diode Current Source enters calibration mode for Laser current.

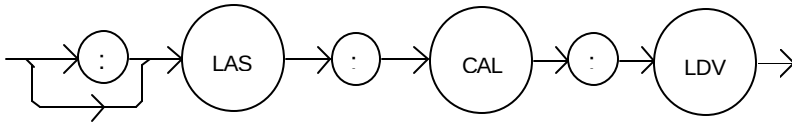
■ Front Panel

■ Remote

LASer:CAL:LDV

The LASer:CAL:LDV command is used to enter the Laser voltage measurement calibration mode for the selected channel.

SYNTAX DIAGRAM



PARAMETERS None.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

POINTS OF INTEREST

After this command is issued, the LDC-3916338 Laser Diode Current Source will allow calibration of the laser voltage measurement. This procedure is outlined in the Calibration section of the Laser module instruction manual.

The “LAS:CAL:STAT?” query may be used to determine when the unit is ready for a calibration value to be entered.

EXAMPLES

"Las:CAL:Ldv" -action: the LDC-3916338 Laser Diode Current Source enters calibration mode for Laser voltage.

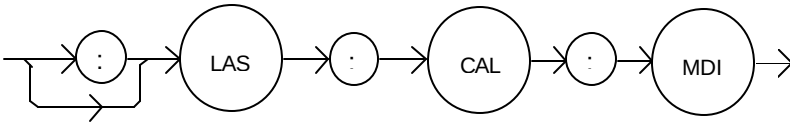
"Las:Cal:LDV" -action: the LDC-3916338 Laser Diode Current Source enters calibration mode for Laser voltage.

■ Front Panel
■ Remote

LASer:CAL:MDI

The LASer:CAL:MDI command is used to enter the Laser photodiode current calibration mode for the selected channel.

SYNTAX DIAGRAM



PARAMETERS

None.

POINTS OF INTEREST

After this command is issued, the LDC-3916338 Laser Diode Current Source will automatically enter the Laser photodiode current calibration mode for the selected channel. When the LDC-3916338 Laser Diode Current Source is ready, the user should enter true measured values. This procedure is outlined in the Calibration section of the Laser module instruction manual.

In remote operation, the LAS:CAL:STAT? query may be used to determine if the LDC-3916338 Laser Diode Current Source is ready for the user to enter a value via the LAS:CAL:MEAS command.

EXAMPLES

"Las:CAL:MDI" -action: the LDC-3916338 Laser Diode Current Source enters the Laser photodiode current calibration mode.

"Chan 1;LAS:Cal:MDI" -action: the LDC-3916338 Laser Diode Current Source enters the Laser photodiode current calibration mode for channel 1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

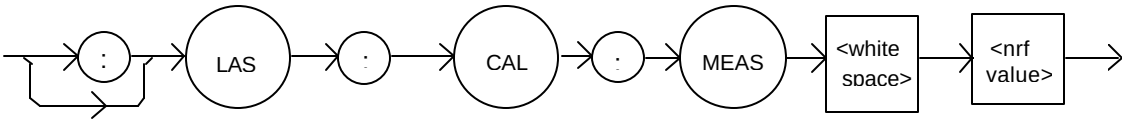
■ Front Panel

■ Remote

LASer:CAL:MEAS

The LASer:CAL:MEAS command is used to enter the Laser calibration values for the selected channel.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> which represents the calibration value expected for the present LAS calibration state.

POINTS OF INTEREST In remote operation, the LAS:CAL:STAT? query may be used to determine if the LDC-3916338 Laser Diode Current Source is ready for the user to enter a value via the LAS:CAL:MEAS command.

EXAMPLES "Las:CAL:MEAS 4.95" -action: the LDC-3916338 Laser Diode Current Source enters the value 4.95 for calibration value of the present calibration mode.

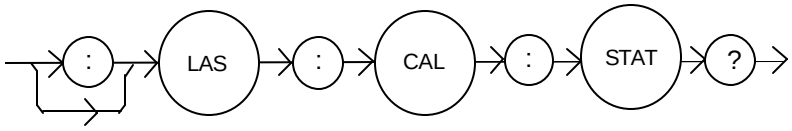
☐Front Panel

■ Remote

LASer:CAL:STATus?

The LASer:CAL:STATus? query is to determine whether the unit is ready for a calibration value and whether it is in calibration mode.

SYNTAX DIAGRAM



PARAMETERS None. The response will be an <nrf value>; 0 = Not Ready for Measurement, 1 = Ready for Measurement, 2 = Calibration Completed, and 3 = Calibration Aborted.

POINTS OF INTEREST If the calibration is aborted, the status value will remain “3” until the calibration is started again.

EXAMPLES "LAS:CAL:STAT?" -response: 1, means the LDC-3916338 Laser Diode Current Source is ready for a calibration measurement to be entered via the “LAS:CAL:MEAS” command.

"LAS:CAL:STAT?" -response: 2, means the LDC-3916338 Laser Diode Current Source has completed the LAS calibration.

"LAs:Cal:Stat?" -response: 0, means the LDC-3916338 Laser Diode Current Source is not yet ready for the LAS calibration measurement value to be entered.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

☐Front Panel

■ Remote

LASer:CAL:VALUE?

The LASer:CAL:VALUE? query is used at the factory only.

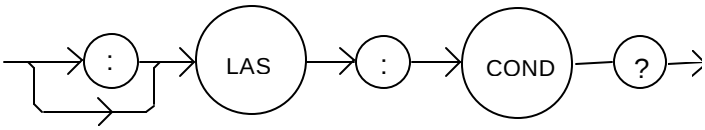
☐ Front Panel

■ Remote

LASer:COND?

The LASer:COND? query returns the value of the selected channel's Laser Condition Status register.

SYNTAX DIAGRAM



PARAMETERS None. The response is the sum of the following:

1 - Laser current limit	256 - Output is off
2 - Laser voltage limit	512 – Output In Tolerance
4 - N/A	1024 - Output is on
8 - Power limit	2048 - N/A
16 - Interlock disabled	4096 - N/A
32 - N/A	8192 - N/A
64 - N/A	16384 - N/A
128 - Open circuit	32768 - N/A

POINTS OF INTEREST The Laser conditions which are reported to the status byte and ALLCOND register are set via the LASer:ENABle:COND command (for each channel).

The Open circuit condition is only present while a Laser output is on, and when the hardware detects this condition, it will turn that Laser output off. Therefore, the Open Circuit condition is fleeting and may be missed via the LAS:COND? query. Therefore, the user should test for the Open Circuit Event via the LAS:EVEnt? query.

The Laser condition status is constantly changing, while the event status is only cleared when the event status is read or the *CLS or *RST command is issued.

NOTE

The voltage limit condition occurs as a warning when the voltage is about 0.25 volts below the VLIM setting.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

EXAMPLES "LAS:COND?" -response: 1027, means that the output is on, and the current limit and voltage limit conditions currently exist.

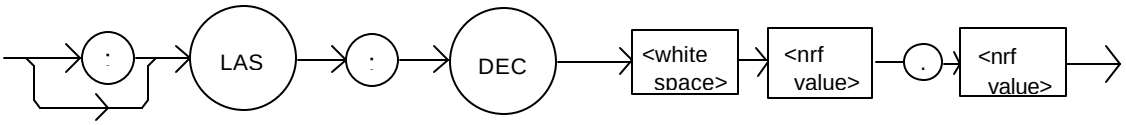
☐ Front Panel

■ Remote

LASer:DEC

The LASer:DEC command decrements the selected channel's laser constant-current set point by one or more steps. Parameters allow multiple steps to be decremented and the time (in milliseconds) between decrements to be set, respectively.

SYNTAX DIAGRAM



PARAMETERS Two <nrf values> are required. The first one represents the number of steps, and the second is the number of milliseconds between steps.

POINTS OF INTEREST The step size can be edited via the LAS:STEP command. Its default value is 1.0 mA.

The first parameter (number of steps) must be an integer between 1 and 50000.

The minimum time to complete one decrement is about 10 to 20 msec. Therefore, values for the second parameter (time between decrements) have a practical minimum of 20. The maximum number of msec is 65535.

Only the LAS:LDI set point is decremented via this command regardless of LAS:MODE setting or LAS:OUTPUT status.

EXAMPLES "LAS:STEP 0.3; LAS:DEC 1,10" -action: The laser source current set point is decremented by 0.3 mA.

"LAS:STEP 0.3; LAS:DEC 3,10" -action: The laser source current set point is decremented by 0.9 mA (0.3 mA * 3).

"LAS:STEP 0.3; LAS:DEC 3, 5000" -action: The laser source current set point is decremented by 0.3 mA, three times, with 5 seconds between decremental steps. So the Laser output is decremented a total of 0.9 mA after 10 seconds.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

☐ Front Panel

■ Remote

LASer:ENABle:

The LASer:ENABle: command path is used to get to the selected channel's laser status enable commands and queries.

The following commands may be reached directly from the LASer:ENABle: command path.

LASer:ENABle:COND	LASer:ENABle:EVEnt?
LASer:ENABle:COND?	LASer:ENABle:OUTOFF
LASer:ENABle:EVEnt	LASer:ENABle:OUTOFF?

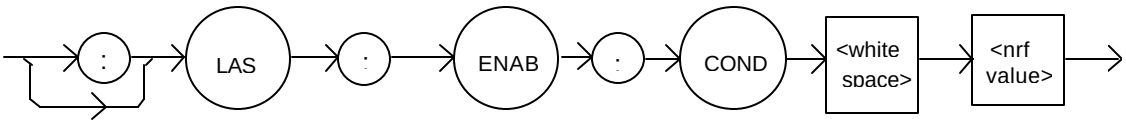
☐ Front Panel

■ Remote

LASer:ENABle:COND

The LASer:ENABle:COND command sets the selected channel's Laser Condition Status Enable register. The bits in this register determine which bits in the Condition Status register are summarized in the 3916 or 3908 status byte.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> whose sum represents the enabled bits:

1 - Laser Current Limit	256 - Output is Off
2 - Laser Voltage Limit	512 - Output In Tolerance
4 - N/A	1024 - Output is On
8 - Power Limit	2048 - N/A
16 - Interlock Disabled	4096 - N/A
32 - N/A	8192 - N/A
64 - N/A	16384 - N/A
128 - Open Circuit	32768 - N/A

POINTS OF INTEREST This register can be read using the LASer:ENABle:COND? query.

EXAMPLES "LAS:ENAB:COND 129" -action: only the Open Circuit and Current Limit conditions will be summarized in the status byte.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

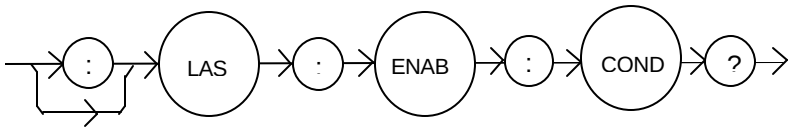
☐ Front Panel

■ Remote

LASer:ENABle:COND?

The LASer:ENABle:COND? query returns the value of the selected channel's Laser Condition Status Enable register.

SYNTAX DIAGRAM



PARAMETERS None. The response is the sum of the following:

1 - Laser Current Limit	256 - Output is Off
2 - Laser Voltage Limit	512 - Output In Tolerance
4 - N/A	1024 - Output Is On
8 - Power Limit	2048 - N/A
16 - Interlock Disabled	4096 - N/A
32 - N/A	8192 - N/A
64 - N/A	16384 - N/A
128 - Open Circuit	32768 - N/A

POINTS OF INTEREST The selected channel's enabled Laser conditions can be set by using the LASer:ENABle:COND command.

The Laser condition status can be monitored by the LASer:COND? query.

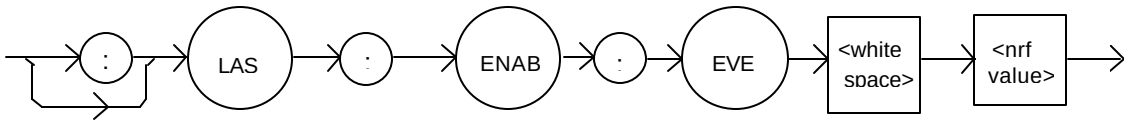
EXAMPLES "LAS:ENAB:COND?" -response: 17, means that the Current Limit and Interlock Disabled Laser conditions will be summarized in the status byte.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:ENABle:EVEnt

The LASer:ENABle:EVEnt command sets the selected channel's Laser Event Status Enable register. The bits in this register determine which bits in the Event Status register are summarized in the 3916 or 3908 Status Byte.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> whose sum represents the bits which are enabled:

1 - Laser Current Limit Changed State	256 - Output is Off Changed State
2 - Laser Voltage Limit Changed State	512 – Output Changed Tolerance State
4 - N/A	1024 - Output is On Changed State
8 - Power Limit Changed State	2048 - N/A
16 - Interlock Changed State	4096 - N/A
32 - N/A	8192 - N/A
64 - N/A	16384 - N/A
128 - Open Circuit Changed State	32768 - N/A

POINTS OF INTEREST The enabled Laser events for the selected channel can be read by using the LASer:ENABle:EVEnt? query. The selected channel's Laser event status can be monitored by the LASer:EVEnt? query.

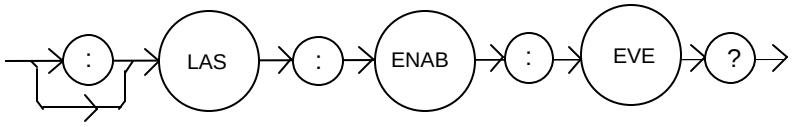
EXAMPLES "LAS:ENAB:EVENT 136" -action: only the Open Circuit and Power Limit events will be summarized in the status byte.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:ENABle:EVEnt?

The LASer:ENABle:EVEnt? query returns the value of the selected channel's Laser Event Status Enable register.

SYNTAX DIAGRAM



PARAMETERS None. The response is the sum of the following:

1 - Laser Current Limit Changed State	256 - Output is Off Changed State
2 - Laser Voltage Limit Changed State	512 - Output Changed Tolerance State
4 - N/A	1024 - Output Is On Changed State
8 - Power Limit Changed State	2048 - N/A
16 - Interlock Changed State	4096 - N/A
32 - N/A	8192 - N/A
64 - N/A	16384 - N/A
128 - Open Circuit Changed State	32768 - N/A

POINTS OF INTEREST The enabled Laser events for the selected channel can be set by using the LASer:ENABle:EVEnt command. The selected channel's Laser event status can be monitored by the LASer:EVEnt? query.

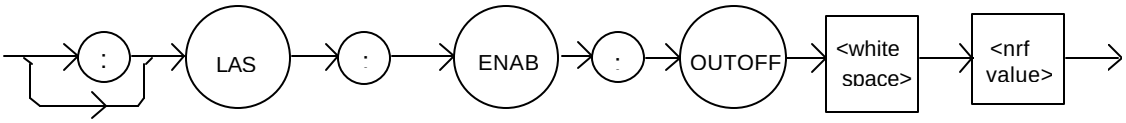
EXAMPLES "LAS:ENAB:EVE?" -response: 1040, means that the Output On Changed State and Interlock Changed State Laser events for the selected channel will be reported (in summarized form) to the status byte.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:ENABle:OUTOFF

The LASer:ENABle:OUTOFF command sets the selected channel's Laser Output Off Enable register. The bits in this register determine which conditions will cause the laser output to be automatically disabled.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> whose sum represents the enabled bits:

1 - Laser Current Limit	256 - N/A
2 - Laser Voltage Limit	512 – Output Out of Tolerance
4 - N/A	1024 – N/A
8 - Power Limit (With Output On)	2048 – N/A
16 - N/A	4096 - N/A
32 - N/A	8192 - N/A
64 - N/A	16384 - N/A
128 - N/A	32768 - N/A

POINTS OF INTEREST

The enabled Laser outoff bits for the selected channel can be read by using the LASer:ENABle:OUTOFF? query.

The default value for this register is 2056: TEC Temperature Limit, and Power Limit.

Enabling voltage limit will cause the Laser output to shut off when the voltage limit is detected, otherwise this voltage limit is a warning. The hardware will shut off (regardless of how the Laser voltage limit bit is set here) when the VLIM voltage is reached.

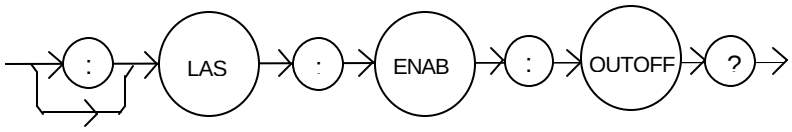
EXAMPLES "LAS:ENAB:OUTOFF 2049" -action: the TEC temperature Limit and Laser current limit conditions will cause the Laser output to be turned off.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:ENABle:OUTOFF?

The LASer:ENABle:OUTOFF? query returns the contents of the selected channel's Laser Output Off Enable register.

SYNTAX DIAGRAM



PARAMETERS None. The response is the sum of the following:

1 - Laser Current Limit	256 - N/A
2 - Laser Voltage Limit	512 – Output Out of Tolerance
4 - N/A	1024 – N/A
8 - Power Limit (With Output On)	2048 – N/A
16 - N/A	4096 - N/A
32 - N/A	8192 - N/A
64 - N/A	16384 - N/A
128 - N/A	32768 - N/A

POINTS OF INTEREST The selected channel's enabled Laser events can be set by using the LASer:ENABle:OUTOFF command. The selected channel's Laser output status can be monitored by the LASer:EVEnt? query.

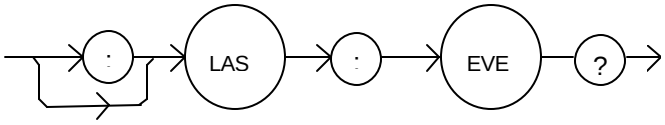
EXAMPLES "LAS:ENAB:OUTOFF?" -response: 1025, means that the selected channel's Current Limit condition and a TEC Output off condition will cause the selected channel's Laser output to be turned off.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:EVEnt?

The LASer:EVEnt? query returns the value of the selected channel's Event Status Register.

SYNTAX DIAGRAM



PARAMETERS None. The response is the sum of the following:

1 - Laser Current Limit Changed State	256 - Output Is Off Changed State
2 - Laser Voltage Limit Changed State	512 - Output Changed Tolerance State
4 - N/A	1024 - Output Is On Changed State
8 - Power Limit Changed State	2048 - N/A
16 - Interlock Changed State	4096 - N/A
32 - N/A	8192 - N/A
64 - N/A	16384 - N/A
128 - Open Circuit Changed State	32768 - N/A

POINTS OF INTEREST The events that are reported in the status byte can be set by using the LASer:ENABle:EVEnt command.

The event status is only cleared when the event status is read or by the *CLS command. The condition status, however, is constantly changing.

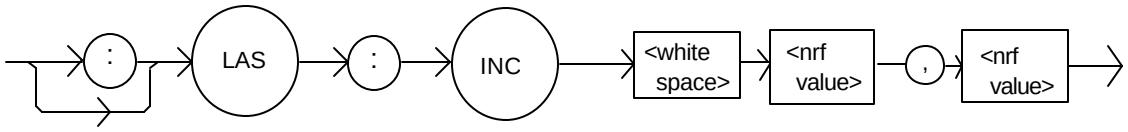
EXAMPLES "LAS:EVE?" -response: 9, the Power Limit and Current Limit conditions have changed state since the event register was last read.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:INC

The LASer:INC command increments the selected channel's laser constant-current set point by one or more steps. Parameters allow multiple steps to be incremented and the time (in milliseconds) between increments to be set, respectively.

SYNTAX DIAGRAM



PARAMETERS — Two <nrf values> are required. The first represents the number of steps, and the second is the time in milliseconds between steps.

POINTS OF INTEREST — The step size can be edited via the LAS:STEP command. Its default value is 1.0 mA.

The first parameter (number of steps) must be an integer between 1 and 50000.

The minimum time to complete one increment is about 10 to 20 msec. Therefore, values for the second parameter (time between increments) have a practical minimum of 20. The maximum number of msec is 65535.

EXAMPLES — "LAS:STEP 0.3; LAS:INC 1,10" -action: The selected channel's laser source current set point is incremented by 0.3 mA.

"LAS:OUT on; LAS:STEP 0.3; LAS:INC 3,5000" -action: The set point is incremented by 0.3 mA, three times, with 5 seconds between incremental steps (with the output on); the selected channel's Laser output is incremented a total of 0.9 mA after 10 seconds.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

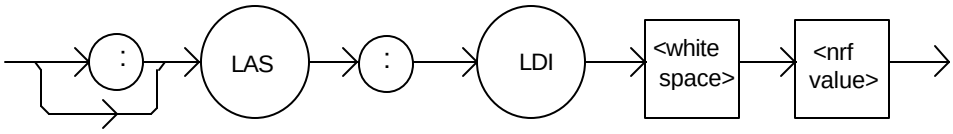
■ Front Panel

■ Remote

LASer:LDI

The LASer:LDI command sets the laser current setpoint for the selected channel.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> which represents the (laser) output current, in mA.

POINTS OF INTEREST The setpoint is the same for both low and high bandwidth output modes.

EXAMPLES "Las:LDI 400" -action: sets the selected channel's laser output current to 400.00 mA.

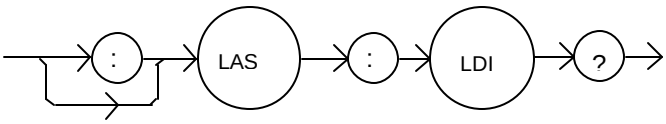
■ Front Panel

■ Remote

LASer:LDI?

The LASer:LDI? query returns the value of the measured laser current for the selected channel.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value>.

POINTS OF INTEREST Response is the selected channel's measured laser output current, regardless of LAS control mode.

This measurement is updated approximately once every 600 msec.

EXAMPLES "LAS:ldi?" -response: 30.0, means the selected channel's measured laser output current is 30.0 mA.

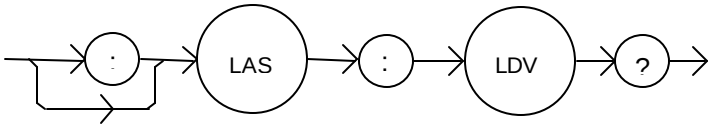
"Laser:LDI?" -response: 149.6, means the selected channel's measured laser output current is 149.6 mA.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:LDV?

The LASer:LDV? query returns the value of the selected channel's measured laser voltage.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value>.

POINTS OF INTEREST Response is the selected channel's measured laser output voltage, regardless of LAS control mode.

This measurement is updated approximately once every 600 msec.

EXAMPLES "LAS:ldv?" -response: 3.03, means the measured laser output voltage is 3.03 volts.

"Laser:LDV?" -response: 1.0, means the measured laser output voltage is 1.00 volts.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ Front Panel

■ Remote

LASer:LIMit:

The LASer:LIMit: command path is used to get to the selected channel's laser limit commands.

The following commands may be reached directly from the LASer:LIMit: command path.

LASer:LIMit:I	LASer:LIMit:MDP	LASer:LIMit:V
LASer:LIMit:I?	LASer:LIMit:MDP?	LASer:LIMit:V?

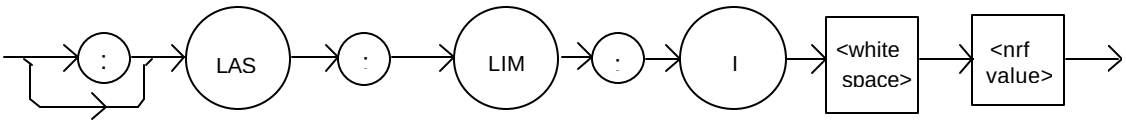
■ Front Panel

■ Remote

LASer:LIMit:I

The LASer:LIMit:I command sets the selected channel's Laser current limit value.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> which represents the selected channel's Laser limit current, in mA.

POINTS OF INTEREST The current limit is in effect in all modes of operation of the selected channel's laser output.

EXAMPLES "LAS:LIM:I 80" -action: the selected channel's Laser current limit is set to 80 mA.

":Laser:Limit:I 160" -action: the selected channel's Laser current limit is set to 160 mA.

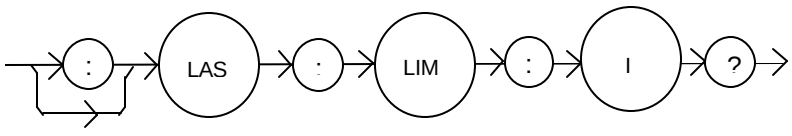
■ Front Panel

■ Remote

LASer:LIMit:I?

The LASer:LIMit:I? query returns the value of the selected channel's Laser current limit.

SYNTAX DIAGRAM



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PARAMETERS None. The response is an <nrf value>.

POINTS OF INTEREST The selected channel's current limit is valid for all modes of Laser operation.

EXAMPLES "LAS:LIM:I?" -response: 40, means the selected channel's laser current limit is 40 mA.

"Laser:LIM:I?" -response: 300, means the selected channel's laser current limit is 300 mA.

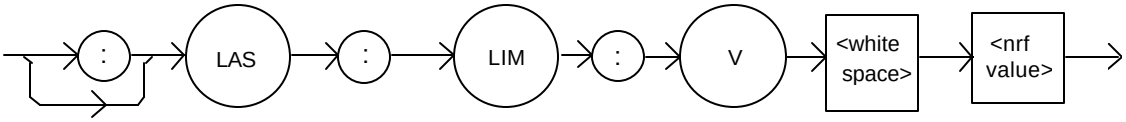
■ Front Panel

■ Remote

LASer:LIMit:V

The LASer:LIMit:V command sets the selected channel's Laser compliance voltage limit value.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> which represents the selected channel's Laser limit voltage, in volts.

POINTS OF INTEREST The compliance voltage limit is in effect in all modes of operation of the selected channel's laser output.

The range for the compliance voltage limit is 0.1 to 10.0 volts.

EXAMPLES "LAS:LIM:V 4.6" -action: the selected channel's Laser compliance voltage limit is set to 4.6 volts.

":Laser:Limit:v 6.1" -action: the selected channel's Laser compliance voltage limit is set to 6.1 volts.

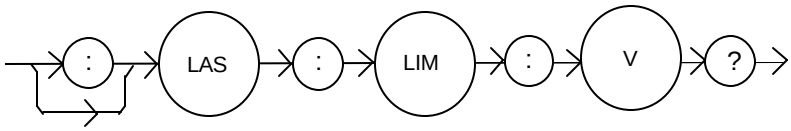
■ Front Panel

■ Remote

LASer:LIMit:V?

The LASer:LIMit:V? query returns the value of the selected channel's Laser compliance voltage limit.

SYNTAX DIAGRAM



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PARAMETERS None. The response is an <nrf value>.

POINTS OF INTEREST The selected channel's compliance voltage limit is valid for all modes of Laser operation.

EXAMPLES "LAS:LIM:V?" -response: 4.0, means the selected channel's laser current limit is 4.0 volts.

"Laser:LIM:v?" -response: 3.3, means the selected channel's laser current limit is 3.3 volts.

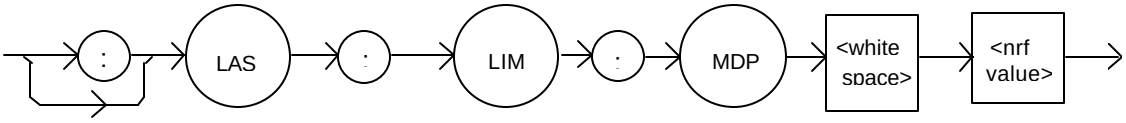
■ Front Panel

■ Remote

LASer:LIMit:MDP

The LASer:LIMit:MDP command sets the laser monitor photodiode power limit value.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> which represents the selected channel's laser monitor photodiode power limit, in mW.

POINTS OF INTEREST When constant MDP mode is used, the selected channel's output is limited (in hardware) only by the LIM I value.

The LIM MDP condition normally shuts the selected channel's Laser output off, but this can be disabled via the LASer:ENABle:OUTOFF command, bit 3.

EXAMPLES "LAS:LIM:MDP 10" -action: sets the selected channel's laser output power limit to a value which corresponds to producing 10.00 mW of PD feedback (optical) power.

"Las:Limit:MDp 5" -action: sets the selected channel's laser output power limit to a value which corresponds to producing 5.00 mW of PD feedback (optical) power.

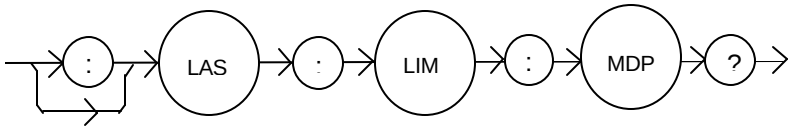
■ Front Panel

■ Remote

LASer:LIMit:MDP?

The LASer:LIMit:MDP? query returns the value of the selected channel's laser monitor PD power limit.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value>.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

POINTS OF INTEREST

The LAS:LIM:MDP is in effect for all LAS operating modes.

EXAMPLES

"LAS:LIM:MDP?" -response: 3.0, means the selected channel's monitor PD power limit is set to 3.0 mW.

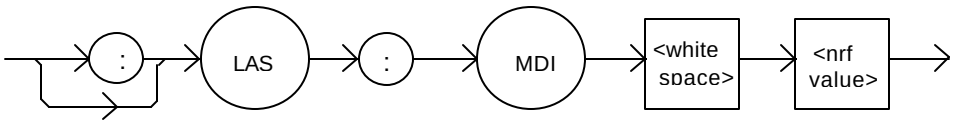
":LAS:Limit:MDP?" -response: 10.0, means the selected channel's monitor PD power limit is set to 10.0 mW.

■ Front Panel
■ Remote

LASer:MDI

The LASer:MDI command sets the value of the photodiode feedback current set point, in µA.

SYNTAX DIAGRAM



PARAMETERS

An <nrf value> which represents the selected channel's photodiode feedback current, in µA.

POINTS OF INTEREST

On the front panel, monitor diode current is referred to as IPD.

EXAMPLES

"Las:Mdi 40" -action: The selected channel's Laser output is controlled so that the photodiode feedback current remains constant at 40 µA.

"Laser:MDI 200" -action: The selected channel's Laser output is controlled so that the photodiode feedback current remains constant at 200 µA.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

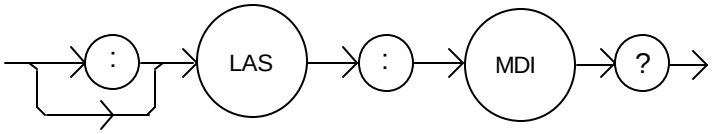
■ Front Panel

■ Remote

LASer:MDI?

The LASer:MDI? query returns the value of the selected channel's laser photodetector current measurement, in µA.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value>.

POINTS OF INTEREST The response is in µA. The response is valid, even when the unit is not in MDI mode.

This measurement is updated approximately once every 600 msec.

EXAMPLES "Las:MDi?" -response: 100.0, means 100 µA of photodetector current (from the selected channel) was measured.

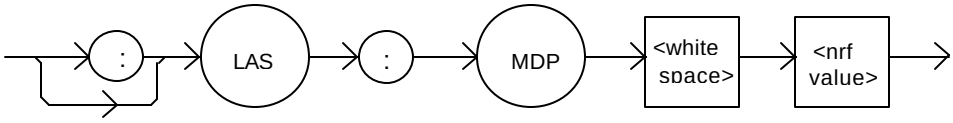
■ Front Panel

■ Remote

LASer:MDP

The LASer:MDP command sets the value of the optical power set point, in mW.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> which represents the selected channel's photodiode feedback power, in mW.

POINTS OF INTEREST If the selected channel's mode is not MDP, the LAS:MDP value will not be used.

If CALPD is 0, the measured MDP will be invalid, and the actual MDP set point would be (near) 0.

On the front panel, the monitor diode photodetector power is referred to as P.

EXAMPLES "Las:Mdp 40" -action: The selected channel's Laser output is controlled so that the photodiode feedback power remains constant at 40 mW.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

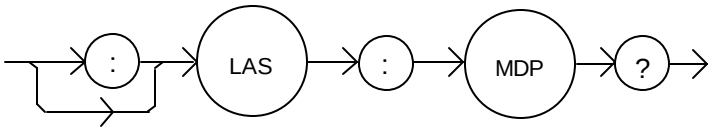
■ Front Panel

■ Remote

LASer:MDP?

The LASer:MDP? query returns the value of the selected channel's laser photodetector power measurement, in mW.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value>.

POINTS OF INTEREST The response is in mW. The response is valid, even when the unit is not in constant P mode.

This measurement is updated approximately once every 600 msec.

EXAMPLES Las:MDp?" -response: 100.0: 100 mW of photodetector power was measured on the selected channel.

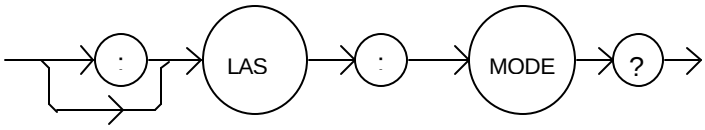
■ Front Panel

■ Remote

LASer:MODE?

The LASer:MODE? query returns the present channel's selected laser control mode.

SYNTAX DIAGRAM



PARAMETERS None. The response is character data (which represents the LAS operating mode).

POINTS OF INTEREST IHBW mode is the same as ILBW mode (low bandwidth), except that the output low bandpass filter is disabled in IHBW mode.

EXAMPLES "LAS:MODE?" -response: ILBW, means that constant I (low bandwidth current) mode is in effect for the selected channel's laser output.

":Las:Mode?" -response: MDP, means that constant P (power) mode is in effect for the selected channel's laser output.

"Las:Mode?" -response: MDI, means that constant monitor current mode is in effect for the selected channel's laser output.

"Laser:MODE?" -response: IHBW, means that IHBW (constant current, high bandwidth) mode is in effect for the selected channel's laser output.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ Front Panel

■ Remote

LASer:MODE:

The LASer:MODE: command path is used to get to the selected channel's laser mode selection commands.

The following commands may be reached directly from the LASer:MODE: command path.

LASer:MODE:IHBW
LASer:MODE:ILBW
LASer:MODE:MDI
LASer:MODE:MDP

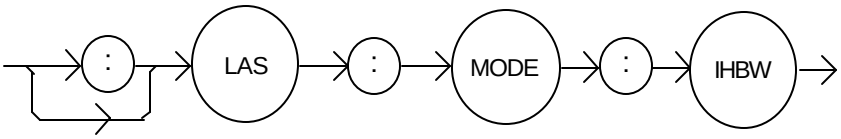
■ Front Panel

■ Remote

LASer:MODE:IHBW

The LASer:MODE:IHBW command selects laser high bandwidth constant current mode for the selected channel.

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST In high bandwidth mode the modulation bandwidth is increased.

EXAMPLES ":las:mode:ihbw" -action: enables the laser high bandwidth constant current mode for the selected channel.

"LAS:Mode:Ihbw" -action: enables the laser high bandwidth constant current mode for the selected channel.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

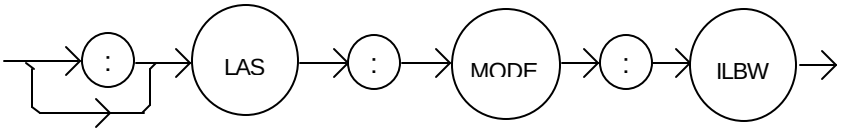
■ Front Panel

■ Remote

LASer:MODE:ILBW

The LASer:MODE:ILBW command selects laser constant current mode.

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST Constant ILBW mode (low bandwidth) enables the selected channel's output low bandpass filter.

EXAMPLES "LAS:MODE:ILBW" -action: sets the selected channel's laser output for constant I mode (low bandwidth).

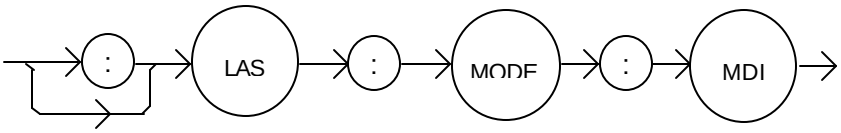
■ Front Panel

■ Remote

LASer:MODE:MDI

The LASer:MODE:MDI command selects laser constant monitor diode current mode for the present channel.

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST On the front panel, monitor diode current mode is referred to as IPD mode.

In this mode, the control set point is entered via the LAS:MDI command.

EXAMPLES "Laser:Mode:MDi" -action: sets the selected channel's laser output mode of operation to constant monitor diode current mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

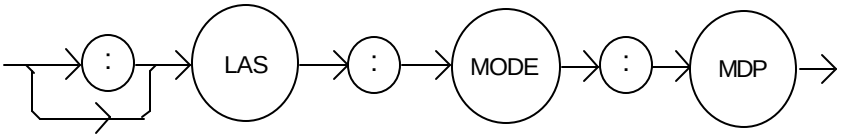
■ Front Panel

■ Remote

LASer:MODE:MDP

The LASer:MODE:MDP command selects constant optical power mode for the present channel.

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST On the front panel, photodetector power mode is referred to as P mode.

This mode of laser operation uses the monitor photodiode feedback current to maintain constant optical power. The actual set point will be a monitor current value calculated via the CALPD conversion factor. Therefore, in this mode the set point is only as accurate as the user's CALPD value.

EXAMPLES "LAS:MODE:MDP" -action: sets the selected channel's laser output mode of operation to constant optical power mode.

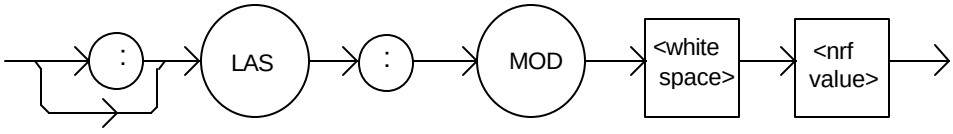
■ Front Panel

■ Remote

LASer:MODulation

The LASer:MODulation command turns the selected channel's laser modulation switch on or off.

SYNTAX DIAGRAM



PARAMETERS An <nrf value>; 1 = on, 0 = off.

POINTS OF INTEREST When the modulation switch is enabled for a channel, the laser current may be modulated by connecting a modulation signal onto the 3916's or 3908's back panel "MODULATION" connector.
The modulation bandwidth depends on the LAS operating mode and module used. Refer to Chapter 1, Laser Specifications, for more information on bandwidth specifications.

EXAMPLES "LAS:LDI 20; LAS:MODULA ON" -action: sets the selected channel's laser output current to 20 mA and then turns the selected channel's modulation switch on.

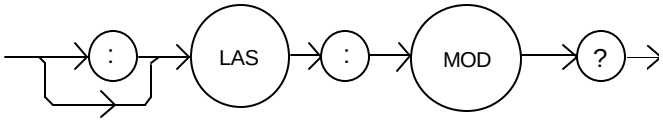
"Las:Mod 0" -action: turns the selected channel's modulation switch off.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:MODulation?

The LASer:MODulation? query returns the status of the selected laser channel's modulation switch.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value>, 1 = ON, 0 = OFF.

POINTS OF INTEREST More than one channel at a time may be modulated via the modulation signal, if desired.

EXAMPLES "Las:MODULATION?" -response: 0, means that the selected channel's modulation switch is disabled.

"LAS:MOD?" -response: 1, means that the selected channel's modulation switch is enabled. A modulating signal applied to the back panel connector will be present at the selected channel.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

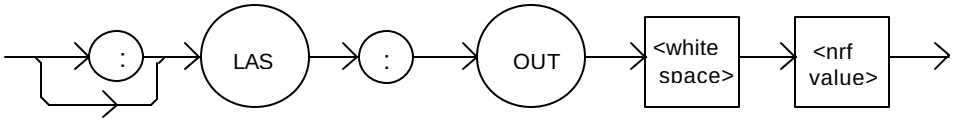
■ Front Panel

■ Remote

LASer:OUTput

The LASer:OUTput command turns the selected channel's laser output on or off.

SYNTAX DIAGRAM



PARAMETERS An <nrf value>; 1 = on, 0 = off.

POINTS OF INTEREST After the selected channel's output is turned on, it may be useful to wait until the output is fully on before performing further operations, but it is not necessary. When the LAS output is turned on, there is a two second delay before the LAS output is actually enabled. This is a safety requirement.

When a Laser output is off, an internal short is placed across the output terminals.

EXAMPLES "LAS:LDI 20; LAS:OUT ON" -action: sets the selected channel's laser output current to 20 mA and then turns the selected channel's output on.

"Las:Out 0" -action: turns the selected channel's laser output off.

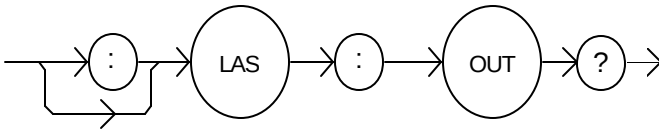
■ Front Panel

■ Remote

LASer:OUTput?

The LASer:OUTput? query returns the status of the selected channel's laser OUTPUT switch.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value>.

POINTS OF INTEREST Although the status of the switch is on, the selected channel's output may not have reached the set point value.

EXAMPLES "Las:OUT?" -response: 0, means that the selected channel's OUTPUT switch is disabled; devices may be safely disconnected or connected at the selected channel's output terminals.

"LAS:OUT?" -response: 1, means that the selected channel's OUTPUT switch is enabled, Laser output current is present for the selected channel.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ Front Panel

■ Remote

LASer:SET:

The LASer:SET: command path is used to get to the selected channel's laser set point queries.

The following commands may be reached directly from the LASer:SET: command path.

LASer:SET:LDI?
LASer:SET:MDI?
LASer:SET:MDP?

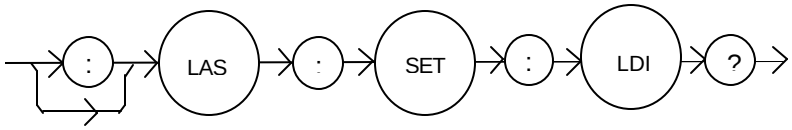
■ Front Panel

■ Remote

LASer:SET:LDI?

The LASer:SET:LDI? query returns the constant current setpoint which is used for both bandwidth modes.

SYNTAX DIAGRAM



PARAMETERS — None. The response is an <nrf value> which represents the selected channel's constant I set point value, in mA.

POINTS OF INTEREST — The LDI set point is only in effect when the LAS operating mode is IHBW or ILBW.

EXAMPLES — "LAS:SET:LDI?" -response: 50.0, means the selected channel's laser output current set point value is 50.0 mA.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

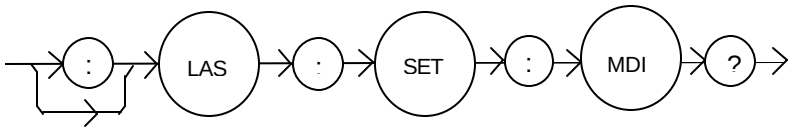
■ Front Panel

■ Remote

LASer:SET:MDI?

The LASer:SET:MDI? query returns the selected channel's laser monitor photodiode current set point value, in µA.

SYNTAX DIAGRAM



PARAMETERS — None. The response is an <nrf value> which represents the selected channel's constant IPD set point value, in µA.

POINTS OF INTEREST — The monitor photodiode current is directly proportional to the laser optical output power. Therefore, the IPD setpoint may be used to control optical output of the laser.

EXAMPLES — "las:set:mdi?" -response: 30.0, means the selected channel's laser monitor PD current setpoint is 30 µA, for use in constant MDI mode.

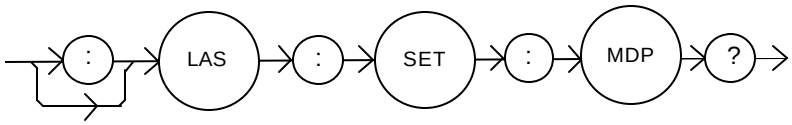
■ Front Panel

■ Remote

LASer:SET:MDP?

The LASer:SET:MDP? query returns the selected channel's laser optical power set point value, in mW.

SYNTAX DIAGRAM



PARAMETERS — None. The response is an <nrf value> which represents the selected channel's constant P set point, in mW.

POINTS OF INTEREST — This set point is used in constant MDP (P) mode only.

EXAMPLES — "LAS:Set:MDP?" -response: 10.0, means the selected channel's laser monitor PD feedback set point is 10.0 mW (CALPD > 0).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

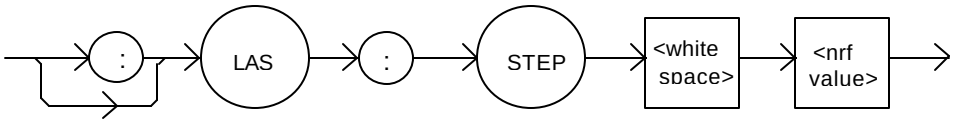
☐ Front Panel

■ Remote

LASer:STEP

The LASer:STEP command specifies the amount the current setpoint will change in response to the LASer:INC or LASer:DEC command.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> of the step amount, in the range 1.0 to 100.0. The resolution is 0.1.

POINTS OF INTEREST The step of 0.1 corresponds to 0.1 mA.

EXAMPLES "Las:ldi 20; Las:Step 10.0; Las:Inc 1,1; Las:set:i?" -action: sets the selected channel's step to 10.0 mA, so the Las:set:i? query will return a value of 30.0 mA.

"LAS:STEP 10" -action: sets the selected channel's step size to 10.00 mA.

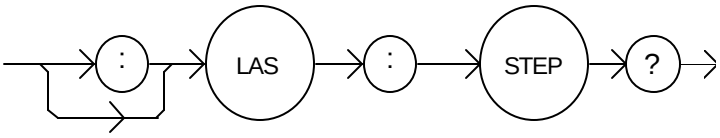
☐ Front Panel

■ Remote

LASer:STEP?

The LASer:STEP? query is used to read back the selected channel's STEP value. This value, in mA, is used by the Las:Inc and Las:Dec commands to increment or decrement the laser current setpoint.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value> of the selected channel's step amount.

POINTS OF INTEREST The step of 1 corresponds to 1.0 mA.

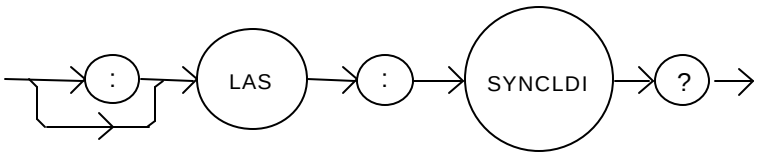
EXAMPLES "Las:Step?" -response: 1.0 means the selected channel's step size is 1.0 mA.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:SYNCLDI?

The LASer:SYNCLDI? query returns the value of the selected channel's measured laser current, in mA.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value> representing current in mA.

POINTS OF INTEREST This is a “synchronized” measurement: the measurement system is connected to the current-measure signal when this query is received. A current measurement is made, and the result is returned as the response. After the measurement is made, the measurement system returns to its normal function, switching between the various signals and measuring them.

The response time to this query is from 200 msec to 250 msec, but the measurement is made as soon as the query is received. In contrast, the laser:ldi? query returns immediately, but the measurement can be up to 600 msec old.

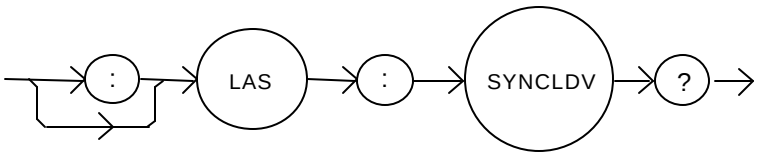
EXAMPLES "LAS:syncldi?" -response: 54.1, means the measured laser current is 54.1 mA.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:SYNCLDV?

The LASer:SYNCLDV? query returns the value of the selected channel's measured laser voltage, in volts.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value> representing voltage in Volts.

POINTS OF INTEREST

This is a “synchronized” measurement: the measurement system is connected to the voltage-measure signal when this query is received. A voltage measurement is made, and the result is returned as the response. After the measurement is made, the measurement system returns to its normal function, switching between the various signals and measuring them.

The response time to this query is from 200 msec to 250 msec, but the measurement is made as soon as the query is received. In contrast, the laser:ldv? query returns immediately, but the measurement can be up to 600 msec old.

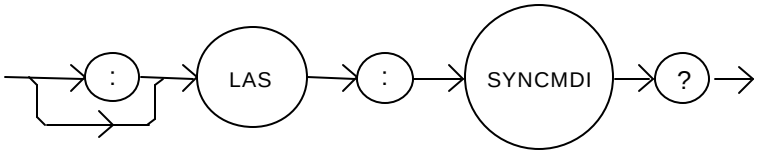
EXAMPLES "LAS:syncldv?" -response: 3.03, means the measured laser output voltage is 3.03 volts.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:SYNCMDI?

The LASer:SYNCMDI? query returns the value of the selected channel's measured monitor photodiode current in µA.

SYNTAX DIAGRAM



PARAMETERS None. The response is an <nrf value> representing current in µA.

POINTS OF INTEREST

This is a “synchronized” measurement: the measurement system is connected to the monitor current-measure signal when this query is received. The photodiode current measurement is made, and the result is returned as the response. After the measurement is made, the measurement system returns to its normal function, switching between the various signals and measuring them.

The response time to this query is from 200 msec to 250 msec, but the measurement is made as soon as the query is received. In contrast, the laser:mdi? query returns immediately, but the measurement can be up to 600 msec old.

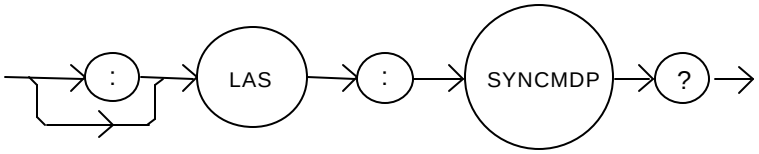
EXAMPLES "LAS:syncmdi?" -response: 145.5, means the measured photodiode current is 145.5 µA.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LASer:SYNCMDP?

The LASer:SYNCMDP? query returns the value of the selected channel's measured optical power, in mW.

SYNTAX DIAGRAM



PARAMETERS — None. The response is an <nrf value> representing optical power in mW.

POINTS OF INTEREST — Optical power is derived from photodiode current. Optical power is defined as photodiode current divided by CalPD, the photodiode responsivity.

This is a “synchronized” measurement: the measurement system is connected to the monitor current-measure signal when this query is received. The photodiode current measurement is made, optical power is calculated, and the result is returned as the response. After the measurement is made, the measurement system returns to its normal function, switching between the various signals and measuring them.

The response time to this query is from 200 msec to 250 msec, but the measurement is made as soon as the query is received. In contrast, the laser:mdp? query returns immediately, but the measurement can be up to 600 msec old.

EXAMPLES — "LAS:syncmdp?" -response: 5.5, means the calculated optical power is 5.5 mW.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

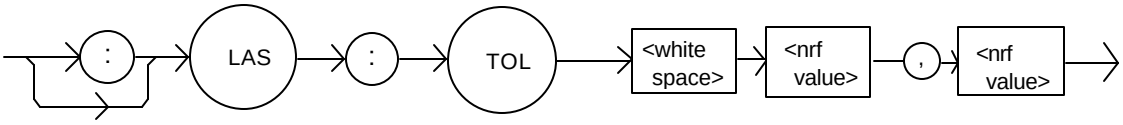
☐ Front Panel

■ Remote

LAS:TOLerance

The LAS:TOLerance command sets the selected module's laser control tolerance parameters.

SYNTAX DIAGRAM



PARAMETERS — Two <nrf values>; the first represents the measurement window, in mA, µA, or mW, depending on the laser control mode. The second parameter represents the time window, in seconds.

POINTS OF INTEREST — The range of the first parameter, the tolerance window, is 0.01 to 500.0. The units of this parameter depend on the control mode. In current mode, the units are mA, in IPD mode the units are µA. If the mode is constant power (P), the first parameter is in mW. The range of the second parameter, the time window, is 0.1 to 50.0.

The LDC-3916338 Laser Diode Current Source defaults to a tolerance of 100 mA, µA, or mW, for 5 seconds, unless changed by the LAS:TOLerance command.

WARNING: If the tolerance is set too tight, the output may never reach tolerance.

EXAMPLES — "LAS:LDI 750;LAS:TOL 0.5,1;LAS:OUT ON" -action: the laser current will be in tolerance when it is within 0.5 mA of 750.00 mA for a period of 1.0 second, at which point the In Tolerance bit in the Laser Condition Status register will be set.

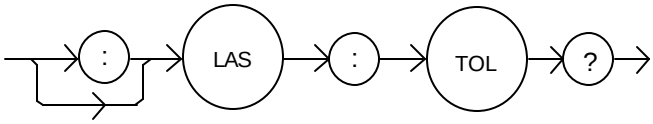
☐ Front Panel

■ Remote

LAS:TOLerance?

The LAS:TOLerance? query returns the selected module's laser control tolerance parameters.

SYNTAX DIAGRAM



PARAMETERS — None. The response is two <nrf values> representing the tolerance parameters. The first represents the tolerance window, in mA, µA, or mW, (depending on the mode). The second represents the tolerance duration, in seconds.

POINTS OF INTEREST — The laser tolerance specification is also used in the laser status event and condition registers, and may be tested by using the appropiate query.

EXAMPLES — "LAS:TOL?" -response: "0.2,1.0", means the selected module has a laser tolerance window of 0.2 mA, 0.2 µA, or 0.2 mW (depending on the mode) with a duration of 1.0 seconds.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

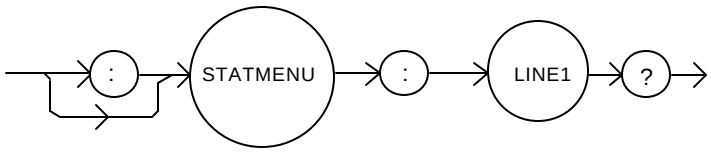
☐ Front Panel

■ Remote

STATMENU:LINE1?

The STATMENU:LINE1? query returns name of the measurement that is currently being displayed on line 1 of the status menu.

SYNTAX DIAGRAM



PARAMETERS — None. The response is character data which represents the measurement that is currently being displayed on line 1 of the selected channel's portion of the status menu.

POINTS OF INTEREST — The possible responses are 1: "LDI" laser diode current.
2: "IPD" photodiode current.
3: "PPD" optical power.
4: "VF" laser diode forward voltage.

The default condition of the status menu displays laser diode current (LDI) on line 1 and photodiode current (IPD) on line 2.

EXAMPLES — "STATMENU:LINE1?" -response: "PPD", means that optical power is selected to be displayed on line 1.

☐ Front Panel

■ Remote

STATMENU:LINE1:

The STATMENU:LINE1: command path is used to get to the selected channel's status menu display selection commands.

The following commands may be reached directly from the STATMENU:LINE1: command path.

STATMENU:LINE1:IPD
STATMENU:LINE1:LDI
STATMENU:LINE1:PPD
STATMENU:LINE1:VF

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

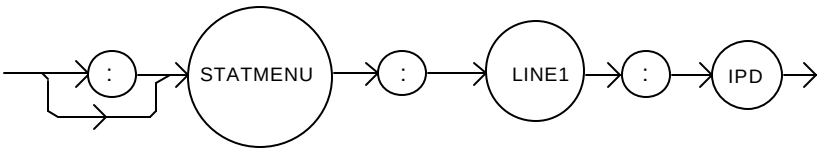
☐ Front Panel

■ Remote

STATMENU:LINE1:IPD

The STATMENU:LINE1:IPD command sets the measurement that is to be displayed on line 1 of the status menu to photodiode current (IPD).

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST The default condition of the status menu displays laser diode current (LDI) on line 1 and photodiode current (IPD) on line 2. Using this command will restore the default conditions.

EXAMPLES "STATMENU:LINE1:IPD" -response: photodiode current is displayed on line 1 of the status menu.

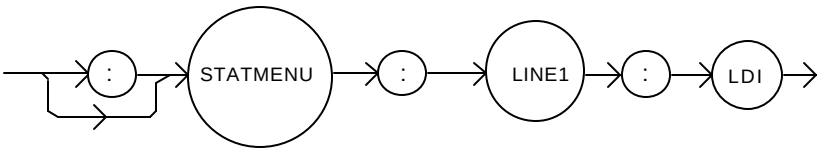
☐ Front Panel

■ Remote

STATMENU:LINE1:LDI

The STATMENU:LINE1:LDI command sets the measurement that is to be displayed on line 1 of the status menu to laser diode current (LDI).

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST The default condition of the status menu displays laser diode current (LDI) on line 1 and photodiode current (IPD) on line 2. Using this command will restore the default conditions.

EXAMPLES "STATMENU:LINE1:LDI" -response: laser diode current is displayed on line 1 of the status menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

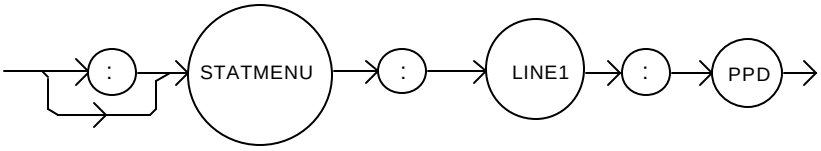
☐ Front Panel

■ Remote

STATMENU:LINE1:PPD

The STATMENU:LINE1:PPD command sets the measurement that is to be displayed on line 1 of the status menu to optical power (PPD).

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST Photodetector power is calculated via the CALPD conversion factor. The measurement is only as accurate as the user's CALPD value.

EXAMPLES "STATMENU:LINE1:PPD" -response: optical power is displayed on line 1 of the status menu.

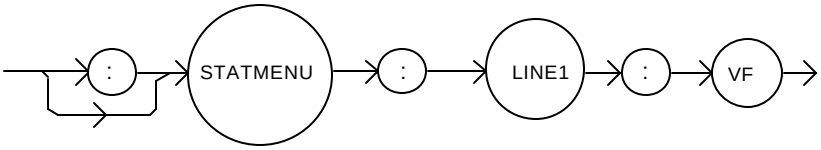
☐ Front Panel

■ Remote

STATMENU:LINE1:VF

The STATMENU:LINE1:VF command sets the measurement that is to be displayed on line 1 of the status menu to laser diode forward voltage (VF).

SYNTAX DIAGRAM



PARAMETERS None.

EXAMPLES "STATMENU:LINE1:VF" -response: laser diode forward voltage is displayed on line 1 of the status menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

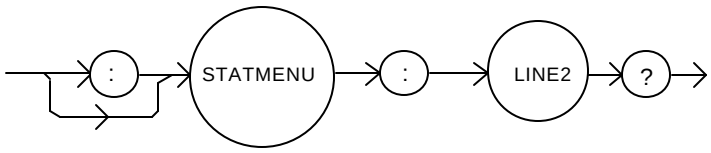
☐ Front Panel

■ Remote

STATMENU:LINE2?

The STATMENU:LINE2? query returns name of the measurement that is currently being displayed on line 2 of the status menu.

SYNTAX DIAGRAM



PARAMETERS — None. The response is character data which represents the measurement that is currently being displayed on line 2 of the selected channel's portion of the status menu.

POINTS OF INTEREST — The possible responses are 1: "IPD" photodiode current.
2: "LDI" laser diode current.
3: "PPD" optical power.
4: "VF" laser diode forward voltage.

The default condition of the status menu displays laser diode current (LDI) on line 1 and photodiode current (IPD) on line 2.

EXAMPLES — "STATMENU:LINE2?" -response: "PPD", means that optical power is selected to be displayed on line 2.

☐ Front Panel

■ Remote

STATMENU:LINE2:

The STATMENU:LINE2: command path is used to get to the selected channel's status menu display selection commands.

The following commands may be reached directly from the STATMENU:LINE2: command path.

STATMENU:LINE2:IPD
STATMENU:LINE2:LDI
STATMENU:LINE2:PPD
STATMENU:LINE2:VF

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

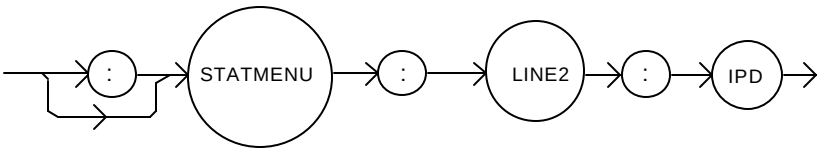
☐ Front Panel

■ Remote

STATMENU:LINE2:IPD

The STATMENU:LINE2:IPD command sets the measurement that is to be displayed on line 2 of the status menu to photodiode current (IPD).

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST The default condition of the status menu displays laser diode current (LDI) on line 1 and photodiode current (IPD) on line 2. Using this command will restore the default conditions.

EXAMPLES "STATMENU:LINE2:IPD" -response: photodiode current is displayed on line 2 of the status menu.

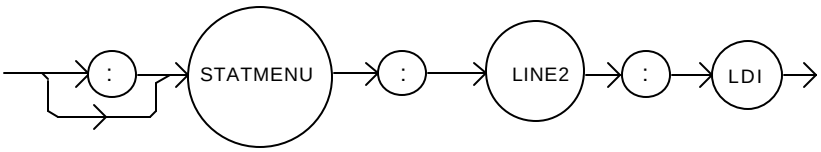
☐ Front Panel

■ Remote

STATMENU:LINE2:LDI

The STATMENU:LINE2:LDI command sets the measurement that is to be displayed on line 2 of the status menu to laser diode current (LDI).

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST The default condition of the status menu displays laser diode current (LDI) on line 1 and photodiode current (IPD) on line 2. Using this command will restore the default conditions.

EXAMPLES "STATMENU:LINE2:LDI" -response: laser diode current is displayed on line 2 of the status menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

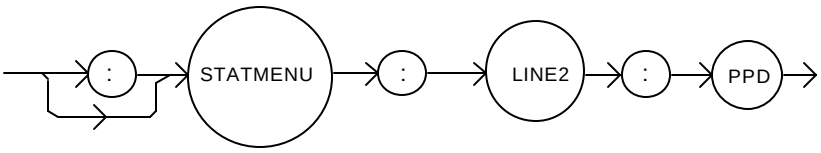
☐ Front Panel

■ Remote

STATMENU:LINE2:PPD

The STATMENU:LINE2:PPD command sets the measurement that is to be displayed on line 2 of the status menu to optical power (PPD).

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTEREST Photodetector power is calculated via the CALPD conversion factor. The measurement is only as accurate as the user's CALPD value.

EXAMPLES "STATMENU:LINE2:PPD" -response: optical power is displayed on line 2 of the status menu.

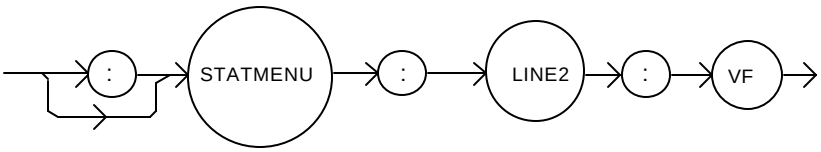
☐ Front Panel

■ Remote

STATMENU:LINE2:VF

The STATMENU:LINE2:VF command sets the measurement that is to be displayed on line 2 of the status menu to laser diode forward voltage (VF).

SYNTAX DIAGRAM



PARAMETERS None.

EXAMPLES "STATMENU:LINE2:VF" -response: laser diode forward voltage is displayed on line 2 of the status menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 5 1

CALIBRATION AND TROUBLESHOOTING GUIDE 1
INTRODUCTION 1
CALIBRATION OVERVIEW 1
Recommended Equipment 1
LOCAL CALIBRATION OF THE LASER CURRENT SOURCE 3
Current Source Calibration 3
IPD Current Calibration 4
Laser Forward Voltage Measurement Calibration 5
REMOTE CALIBRATION OF THE 3916338 CURRENT SOURCE MODULE 6
Laser Current Source Calibration 6
LDI Calibration 6
IPD Current Calibration 8
Laser Forward Voltage Measurement Calibration 9
TROUBLESHOOTING GUIDE 10

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 5

CALIBRATION AND TROUBLESHOOTING GUIDE

INTRODUCTION

This chapter describes calibration of your 3916338 Laser Diode Current Source Module. Descriptions of the required test instruments, calibration conditions, and the detailed procedures for calibration of the instrument's Laser Diode Current Sources are included. A troubleshooting guide is also offered for some of the more common failure symptoms. This chapter is divided into three major sections: Local (front panel) calibration, remote (through the GPIB Interface) calibration, and a troubleshooting guide.

CALIBRATION OVERVIEW

There are several calibrations to be performed on the current source to completely calibrate the 3916338 Module. The calibration consists of calibrating the current source, the photodiode monitor feedback ammeter, and the forward voltage measurement. The current limits are calibrated internally by the instrument, using measurements supplied by the user, as part of the calibration process.

Your 3916338 Module can be calibrated while installed in a 3916 or 3908 mainframe with the case closed. It should be calibrated every 12 months or whenever performance verification indicates that calibration is necessary, such as differences between set point and measurement display values which exceed the accuracy specification. Calibrate the instrument under laboratory conditions. We recommend calibration at 23°C ± 1.0°C. When necessary, however, the 3916338 Module may be calibrated at its intended use temperature if this is within the specified operating temperature range of 0 to 40 °C.

The 3916338 Module should be allowed to warm up for at least 1 hour before calibration.

Recommended Equipment

Recommended test equipment for calibrating the 3916338 Module is listed in Table 5.1. Equipment other than that shown in the table may be used if the specifications meet or exceed those listed.

Description	Mfg./Model	Specification
DMM	HP 3457A	DC Amps (@ 1.0 A): ±0.02 % Resistance (@ 10 Ω): 0.02 % 0.1 µA or 0.1 mV resolution

Table 5.1 Recommended Test Equipment

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

It will be necessary to connect various loads and circuits to the outputs of the module for the calibration procedure. The devices required for most of the calibration loads are listed in Table 5.2. A schematic is shown in Figure 5.1 for the photodiode calibration circuit, with the required components listed in Table 5.3.

LASER CURRENT SOURCE CALIBRATION	
Current Source Calibration	1Ω 20W resistor, low TCR
Voltage Measurement Calibration	5Ω 50W resistor, low TCR
PHOTODIODE MONITOR CURRENT CALIBRATION (See schematic in Fig. 5.1)	

Table 5.2 Required Calibration Components

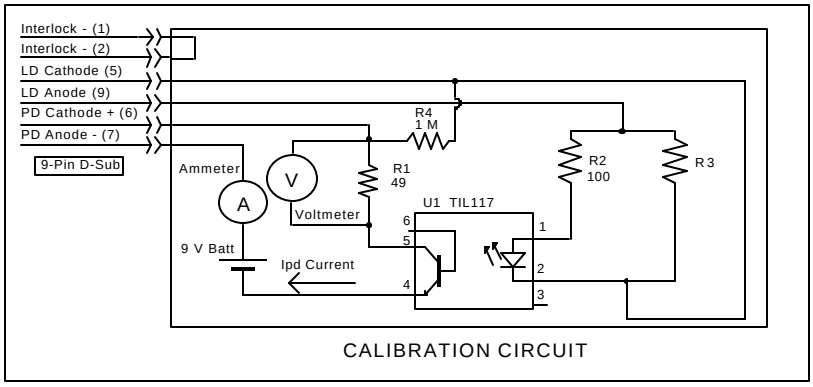


Figure 5.1 I_{PD} Calibration Circuit

COMPONENTS FOR PHOTODIODE CURRENT (I_{PD}) CALIBRATION CIRCUIT	
R1	49Ω resistor, 1% 1/4W
R2	100Ω resistor, 1%, 1/4W
R4	1.0 MΩ resistor, 1% 1/4W
R3	5Ω resistor, 1%, 10W
U1	TIL 117 opto isolator
Battery	9V Battery
Connector	9-pin D-Sub, Male

Table 5.3 Components for Ipd Calibration Circuit

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LOCAL CALIBRATION OF THE LASER CURRENT SOURCE

There are three calibration adjustments for the current source of the 3916338 Current Source Module. They are: calibration of the constant current (LDI) source, calibration of the constant light power (I_{PD}) feedback circuit, and calibration of the laser forward voltage (LDV) measurement.

Current Source Calibration

The following procedure is for calibrating the laser current source. The internal calibration procedure sets the current to two values. You must enter the exact Laser Diode current that you measure at both of these points. The internal procedure will then use this information to calibrate the current source.

a. With the output off, connect a 1 Ω, 20 W resistor across the LASER output terminals (Laser Anode, pin 9, and Laser Cathode, pin 5). Current will flow from the anode to the cathode.

b. Connect a calibrated DMM across the load resistor. You will be calculating laser current (LDI) in the following manner using Ohm's Law:

$$I = E / R$$

where E is the accurately measured voltage across the resistor, and R is the accurately measured load resistance (a 4-point probe resistance measurement is recommended). I is the calculated current in Amps.

NOTE

We recommend that the load resistor be temperature-controlled during the calibration.

Alternatively, the current may be measured directly using an ammeter with a range of at least 2 A, and accurate to ± 0.001 mA. If you use the ammeter approach, you should connect the ammeter in series with a load resistor with a nominal value of 1 W .

---

c. Enter the LDI calibration mode by pushing the **(DISPLAY) MAIN** front panel button, then the **Sys. Config** soft key, then the **Cal.** soft key, then the **Cal LAS** soft key, then the **LDI Cal** soft key. The module's LDI calibration screen will appear.

d. Press the **Start** soft key. The internal calibration procedure will turn on the output and drive the LD current to approximately 25% of full range. Allow the current to settle for at least 10 seconds.

e. Calculate or measure the actual current through the load resistor, enter that value (in mA) into the highlighted "IReal" adjust field on the screen, and press **(ADJUST) ENTER.** Do not enter more than eight characters, including the decimal point.

f. The internal cal procedure will then set the LD current to approximately 75% of full range. Allow the current to settle for at least 10 seconds.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

g. Measure the actual current, and enter that value into the **IREAL** adjust field.

After you have entered the second value, the internal cal procedure calibrates the LD current measurement circuit, the LD current source for both low and high bandwidths, and the LD current limit circuit.

IPD Current Calibration

The following procedure is for calibrating the LASER I_{PD} (photodiode monitor) measurement circuit. The internal calibration procedure sets the current to two values. You must enter the resulting I_{PD} (photodiode monitor) current that you measure at both of these points. The internal procedure will then use this information to calibrate the I_{PD} measurement circuit.

a. With the output off, connect the IPD calibration circuit, Figure 5.1, to the laser connector.

b. Connect an ammeter with at least 5000 µA range and at least ±0.1 µA accuracy as shown in Figure 5.1. This ammeter is in series with the Photodiode Anode input to the module, and directly measures the photodiode current.

c. Enter the I_{PD} calibration mode by pushing the **(DISPLAY) MAIN** front panel button, then the **Sys. Config** soft key, then the **Cal.** soft key, then the **Cal LAS** soft key, then the **IPD Cal** soft key. The module's IPD calibration screen will appear.

d. Press the **Start** soft key. The internal calibration procedure will turn on the output and drive the laser current until the PD current is approximately 15% of full range. Allow the current to settle for at least 10 seconds.

e. Use the ammeter and measure the actual photodiode current, enter that value (in µA) into the highlighted "IPDReal" adjust field on the screen, and press **(ADJUST) ENTER.** Do not enter more than seven characters, including the decimal point.

f. The internal calibration procedure will then drive the laser current until the PD current is approximately 65% of full range. Allow the current to settle for at least 10 seconds.

g. Measure the actual photodiode current, enter that value (in µA) into the highlighted "IPDReal" adjust field on the screen, and press **(ADJUST) ENTER.**

After you have entered the second value, the internal cal procedure calibrates the I_{PD} current measurement circuit and displays a "Completed" message on the screen.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Laser Forward Voltage Measurement Calibration

The following procedure is for calibrating the LASER forward voltage (LDV) measurement circuit. The internal calibration procedure sets the current to two values. You must enter the resulting forward voltage that you measure at both of these points. The internal procedure will then use this information to calibrate the LDV measurement circuit.

a. With the output off, connect a 5 Ω 50W load resistor to the LASER output terminals (Laser Anode, pin 9, and Laser Cathode, pin 5).

b. Connect a voltmeter with at least 15V range and accuracy of at least ±0.01V across the load resistor.

c. Enter the LDV calibration mode by pushing the **(DISPLAY) MAIN** front panel button, then the **Sys. Config** soft key, then the **Cal.** soft key, then the **Cal LAS** soft key, then the **LDV Cal** soft key. The module's LDV calibration screen will appear.

d. Press the **START** soft key. The internal calibration procedure will turn on the output and drive the LD current to approximately 25% of full range. Allow the current to settle for at least 10 seconds.

e. Then measure the voltage across the load resistor, enter that value (in Volts) into the highlighted "VReal" adjust field on the screen, and press **(ADJUST) ENTER.** Do not enter more than seven characters, including the decimal point.

f. The internal calibration procedure will then drive the LD current to approximately 75% of full range. Allow the current to settle for at least 10 seconds.

g. Measure the actual voltage across the load resistor, enter that value (in Volts) into the highlighted "VReal" adjust field on the screen, and press **(ADJUST) ENTER.**

After you have entered the second value, the internal cal procedure calibrates the laser forward voltage measurement circuit and displays a "Completed" message on the screen.

This ends the section on front panel (local) calibration of your current source. The next section discusses calibration through the IEEE488.2 GPIB interface.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

REMOTE CALIBRATION OF THE 3916338 CURRENT SOURCE MODULE

The 3916338 Modules can be calibrated remotely via the GPIB Interface. All of the required calibration commands are listed in Table 4.1 in Chapter 4. The procedures below are general guidelines for writing a program to calibrate your instrument.

Laser Current Source Calibration

There are three calibration adjustments for the source in the 3916338 Module. They are: calibration of the constant current (LDI) source, calibration of the laser forward voltage (LDV) measurement, and calibration of the constant light power (I_{PD}) feedback circuit.

LDI Calibration

The following procedure is for remotely calibrating the laser current sources. The module's internal calibration procedure sets the current to two values. You must measure and enter the exact Laser Diode current at both of these points. The module's internal cal procedure will then use this information to calibrate the current source.

a. With the output off, connect a 1 Ω, 20 W resistor across the LASER output terminals (Laser Anode, pin 9, and Laser Cathode, pin 5). The top 9-pin connector on the back of the module is for LAS1, and the bottom 9-pin connector is for LAS2.

b. Connect a calibrated DMM across the load resistor. You will be calculating laser current (LDI) in the following manner using Ohm's Law:

$$I = E / R$$

where E is the accurately measured voltage across the resistor, and R is the accurately measured load resistance (a 4-point probe resistance measurement is recommended). I is the calculated current in Amps.

NOTE

We recommend that the load resistor be temperature-controlled during the calibration.

Alternatively, the current may be measured directly using an ammeter with a range of at least 2 A, and accurate to ± 0.001 mA. If you use the ammeter approach, you should connect the ammeter in series with a load resistor with a nominal value of 1 W..

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

c. Enter the Laser Current Source calibration mode by sending the following command over GPIB:

LAS:CAL:LDI

d. The internal cal procedure will begin by setting the Laser output current to approximately 25% of its full range. Allow the current to settle for at least 10 seconds.

If this calibration value is to be measured and entered remotely via a GPIB controlled DMM, for example, the actual value of the current should not be entered until the cal procedure is ready to receive it.

e. Check to see if the internal cal procedure is ready for the measurement. Send the following query to the module:

LAS:CAL:STATUS?

The cal procedure is ready for a measurement if it returns the value "1". Query the status until the value that is returned is "1".

f. Enter the actual measured current in mA by sending the following command:

LAS:CAL:MEAS (*current in mA)* e.g. LAS:CAL:MEAS 267.878

NOTE

The internal cal procedure will store the actual measured value and briefly change its measurement status to "0" to indicate that it is not yet ready for another measurement. This will occur after each time a new measurement is entered.

---

g. The cal procedure will set the output current to approximately 75% of its output range. Allow the current to settle for at least 10 seconds.

h. Check to see if the internal cal procedure is ready for the measurement. Send the following query to the module:

LAS:CAL:STATUS?

The cal procedure is ready for a measurement if it returns the value "1". Query the status until the value that is returned is "1".

I. Enter the second measured current in mA by sending the following command:

LAS:CAL:MEAS (*current in mA)* e.g. LAS:CAL:MEAS 527.986

After you have entered the second measured current, the internal calibration procedure will perform the calibration for the laser current setpoint, current measurement, and current limit circuits. The cal procedure will then set the status to the value "2" to indicate that it has finished.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

IPD Current Calibration

The following procedure is for remotely calibrating the LASER I_{PD} (photodiode monitor) measurement circuit. The module's internal calibration procedure sets the current to two values. You must enter the resulting I_{PD} (photodiode monitor) current that you measure at both of these points. The module's internal cal procedure will then use this information to calibrate the I_{PD} measurement circuit. The GPIB commands use the nomenclature "MDI", which means "Monitor Diode Current", and is synonymous with "IPD".

a. With the output off, connect the IPD calibration circuit, Figure 5.1, to the laser connector.

b. Connect an ammeter with at least 5000 µA range and at least ±0.1 µA accuracy as shown in the figure. This ammeter is in series with the Photodiode Anode input to the module, and directly measures the photodiode current.

c. Enter the Laser Current Source calibration mode by sending the following command over GPIB:

LAS:CAL:MDI

d. Press the **Start** soft key. The internal calibration procedure will turn on the output and drive the laser current until the PD current is approximately 15% of full range. Allow the current to settle for at least 10 seconds.

If this calibration value is to be measured and entered remotely via a GPIB controlled DMM, for example, the actual value of the current should not be entered until the cal procedure is ready to receive it.

e. Check to see if the internal cal procedure is ready for the measurement. Send the following query to the module:

LAS:CAL:STATUS?

The cal procedure is ready for a measurement if it returns the value "1". Query the status until the value that is returned is "1".

f. Enter the measured current in µA by sending the following command:

LAS:CAL:MEAS (*current in mA)* e.g. LAS:CAL:MEAS 745.321

g. The cal procedure will then drive the laser current until the PD current is approximately 65% of full range. Allow the current to settle for at least 10 seconds.

h. Check to see if the internal cal procedure is ready for the measurement. Send the following query to the module:

LAS:CAL:STATUS?

The cal procedure is ready for a measurement if it returns the value "1". Query the status until the value that is returned is "1".

i. Enter the measured current in µA by sending the following command:

LAS:CAL:MEAS (*current in mA)* e.g. LAS:CAL:MEAS 3573.344

After you have entered the second measured photodiode current, the internal calibration procedure will perform the calibration for the photodiode current measurement circuit. The cal procedure will then set the status to the value "2" to indicate that it has finished.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Laser Forward Voltage Measurement Calibration

The following procedure is for remotely calibrating the laser forward voltage measurement circuit. The module's internal calibration procedure sets the current to two values. You must measure and enter the forward voltage at both of these points. The module's internal cal procedure will then use this information to calibrate the voltage measurement system.

a. With the output off, connect a 5 Ω, 50 W resistor across the LASER output terminals (Laser Anode, pin 9, and Laser Cathode, pin 5).

b. Connect a calibrated voltmeter across the load resistor ("plus" lead to Anode).

c. Enter the Laser voltage measurement calibration mode by sending the following command over GPIB:
LAS:CAL:LDV

d. The internal cal procedure will begin by setting the Laser output current to approximately 25% of its full range. Allow the current to settle for at least 10 seconds.

If this calibration value is to be measured and entered remotely via a GPIB controlled DMM, for example, the actual value of the current should not be entered until the cal procedure is ready to receive it.

e. Check to see if the internal cal procedure is ready for the measurement. Send the following query:
LAS:CAL:STATUS?

The cal procedure is ready for a measurement if it returns the value "1". Query the status until the value that is returned is "1".

f. Enter the measured voltage in Volts by sending the following command:
LAS:CAL:MEAS (*voltage in Volts)* e.g. LAS:CAL:MEAS 3.76

g. The cal procedure will set the output current to approximately 75% of its output range. Allow the current to settle for at least 10 seconds.

h. Check to see if the internal cal procedure is ready for the measurement. Send the following query to the module:
LAS:CAL:STATUS?

The cal procedure is ready for a measurement if it returns the value "1". Query the status until the value that is returned is "1".

i. Enter the second measured voltage in Volts by sending the following command:
LAS:CAL:MEAS (*voltage in Volts)* e.g. LAS:CAL:MEAS 11.24

After you have entered the second measured voltage, the internal calibration procedure will perform the calibration for the laser forward voltage measurement circuit. The cal procedure will then set the status to the value "2" to indicate that it has finished.

This ends the calibration guide.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TROUBLESHOOTING GUIDE

This section is a guide to troubleshooting the 3916338 Current Source Module. Some of the more common symptoms are listed here, and the appropriate troubleshooting actions are given. We recommend that the user start at the beginning of this guide. Read the symptom descriptions, and follow the steps for the corrective actions which apply. If you encounter problems which are beyond the scope of this guide, contact your ILX Lightwave customer service representative.

SYMPTOM	CORRECTIVE ACTIONS
GENERAL	
LDC-3916 Series unit will not power up	Check AC Power line voltage and power cord connection.
Power on, but outputs have been shut off. Instrument may be "locked up" or instrument resets itself.	This may occur if the instrument loses power (AC line) briefly or line voltage drops below specification. If instrument is "locked up", power it off and then on to restart.
LASER CURRENT SOURCE	
Power on, but no current output	Check Interlock pins on LASER input connector on instrument rear panel. These pins must be shorted either directly or through a switch. The front-panel Laser Enable switch should also be on. If OPEN CIRCUIT is indicated (E503), check the load connections and cable and then try again. Be sure the cable connector is securely fastened to the back of the module(s). Also check that the Voltage Limit setting is above the laser's operating voltage.
Unable to adjust output	Check the OUTPUT ON soft key. It should read ON. Check the instrument mode, the channel number, and the laser current limit.
Output current at limit, can't be lowered	If IPD or PPD mode is used, check the monitor diode (feedback) connections. Try reversing the polarity of the monitor photodiode. Also check if the photodiode bias is off. If in I_{LBW} or I_{HBW} mode, check the current set point and I LIMIT setting. Setting the output below the limit may require several turns of the adjust knob if the set point is much greater than the desired limit setting.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Output goes off intermittently	Check the interlock circuit. An intermittent interlock will turn the output off. Check that the AC power cord connection is secure. Power-line drop-outs may reset the unit and when power is restored, the output will be off.
Unable to adjust output	Make sure that the ISET adjust parameter is highlighted. Check the I LIMIT parameter; it should be set above the laser operating current. Check the VLIMIT parameter, the voltage limit should be set above the voltage condition of your laser load.
Power Mode operation has high output current, but little or no power is measured	Check the photodiode bias. If it is off, the circuit may act as an open feedback loop. Set the bias to on (5V).
Output exceeds Power Limit	It is possible via GPIB to disable turning off the output when the power limit is exceeded. Ensure that this is not the case. Default at power-up is to enable this safety feature. The “Power Limit” is not a hardware limit. It only serves as a warning that the power measurement has exceeded the limit set point.
Open Circuit Error occurs during calibration	Check load connections. Check that measuring meter does not auto-range (use non-auto-ranging modes).
Calibration is aborted unintentionally	Calibration modes will be aborted if an open circuit is detected or if entered measurements are invalid.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP