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 LDP-3811* at our website: *Click HERE*

LDP-3811
LASER DIODE PRECISION PULSED SUPPLY

INSTRUCTION MANUAL

Manual Part No. 70002403

ILX Lightwave Corporation
31950 East Frontage Road
P. O. Box 6310
Bozeman, Montana, U.S.A 59771

(406) 586-1244
Fax: (406) 586-9405
www.ilxlightwave.com

Copyright © 1992, 1993, 1997, 1999 ILX Lightwave Corporation, All Rights Reserved

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 we will repair or replace the unit, at our option, without charge.

Limitation

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 merchantibility 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 notify ILX Lightwave Corporation and thoroughly describe the nature of the problem and give the serial number.

Returning an Instrument

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

- Obtain a return authorization number from the factory.
- Attach a tag to the instrument identifying the owner and indicating the required service or repair. Include the instrument serial number (the model number followed by a sequenced four digit number on the rear panel).
- Attach the anti-static protective caps which were shipped with the instrument and put the instrument in an appropriate poly bag.
- Place the instrument in the original packing container with at least 3 inches (75mm) of compressible packaging material. **Shipping damage is not covered by this warranty.**
- Secure the instrument with strapping tape or metal bands.
- Send the instrument, transportation pre-paid to ILX Lightwave, referencing the return authorization number. We suggest that you insure the shipment.

If the original shipping container is not available, place your instrument in a container which will insure at least 3 inches (75mm) of compressible packaging material on all sides.

Repairs will be 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 / PROBLEMS ?

In order to get the most out of your ILX Lightwave product, we ask that you direct any product operation or service related questions or comments to **Customer Support** at 406-586-1244 (fax 406-586-9405). When calling, please have the following information on hand (if applicable):

1) Product _____

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

We look forward to serving you better in the future!

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

Table of Contents

CHAPTER 1 - GENERAL INFORMATION

1.1 Introduction 1-1
1.2 Product Overview 1-1
1.3 Available Options and Accessories 1-1
1.4 Specifications 1-1
1.4.1 Laser Current Source Specifications 1-1
1.4.2 General LDP-3811 Specifications 1-3
1.5 Your Comments 1-3

CHAPTER 2 - OPERATION

2.1 Introduction 2-1
2.2 Installation 2-1
2.2.1 AC Power Considerations 2-1
2.2.2 Tilt-Foot Adjustment 2-1
2.2.3 Rack Mounting 2-1
2.3 Power-Up Sequence 2-2
2.4 Introduction to the LDP-3811 Front Panel 2-2
2.4.1 Front Panel Familiarization 2-3
2.4.1.1 General Functions 2-4
2.4.1.2 MODE Functions 2-4
2.4.1.3 OUTPUT Function 2-4
2.4.2 GPIB Section 2-5
2.4.3 ADJUST Section 2-5
2.4.4 MODE Section 2-5
2.4.4.1 MODE SELECT 2-6
2.4.4.2 MODE Indicators 2-6
2.4.4.3 Continuous Wave (CW) Mode 2-6
2.4.4.4 Constant Duty Cycle Percent (CONST %) Mode 2-6
2.4.4.5 Constant Pulse Repetition Interval (CONST PRI) Mode 2-6
2.4.4.6 External Trigger (EXT TRIG) Mode 2-7
2.4.5 DISPLAY Switch Section 2-7
2.4.5.1 DISPLAY Indicators and Switches 2-7
2.4.6 PARAMETER SETUP Section 2-7
2.4.6.1 PARAMETER SETUP SELECT Switch 2-8
2.4.6.2 SET Switch 2-8
2.4.6.3 LIM Parameters 2-8
2.4.6.4 SAVE and RECALL Parameter Functions 2-9
2.4.6.5 RANGE Selection 2-10
2.4.7 Error Indicators 2-10
2.5 Back Panel Controls and Connections 2-11
2.5.1 The OUTPUT Connectors 2-12
2.5.2 Connecting to Your Laser 2-12
2.5.3 Laser Diode Connections and Shielding 2-12
2.5.4 TRIGGER Connectors 2-13
2.5.5 GPIB Connector 2-13
2.5.6 KEYLOCK Switch 2-13
2.5.7 AC Power Entry Module and Fuse 2-14
2.5.8 Chassis Ground 2-14

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

2.6 General Operating Procedures 2-14
2.6.1 Warm-up and Environmental Considerations 2-14
2.6.2 Pulse Mode Operation 2-14
2.6.3 CW Mode Operation 2-15
2.6.4 TRIGGER OUT Operation 2-16

CHAPTER 3 - COMMAND REFERENCE

3.1 Introduction 3-1
3.2 Overview of the 3811 Command Set 3-1
3.2.1 Substitute Parameter Names 3-2
3.2.2 Compound Command Structure 3-2
3.3 Common Commands 3-4
3.4 3811 Device-Dependent Commands 3-5
3.4.1 Command Paths 3-6
3.4.2 3811 Device-Command Reference 3-7
(Listed in alphabetical order by path.)
3.5 Error Messages 3-42
3.6 3811 Programming Examples 3-42

CHAPTER 4 - GPIB/IEEE.2 REMOTE OPERATION

4.1 Introduction 4-1
4.1.1 Preparation For Bus Control 4-1
4.2 Getting Started with GPIB 4-2
4.2.1 Overview of the 3811 Syntax 4-2
4.2.2 Using Commands with Parameters 4-3
4.3 Common Commands and Queries 4-3
4.3.1 *CAL? 4-4
4.3.2 *CLS? 4-4
4.3.3 *DLF? 4-4
4.3.4 *ESE 4-4
4.3.5 *ESE? 4-5
4.3.6 *ESR? 4-6
4.3.7 *IDN? 4-6
4.3.8 *IST? 4-6
4.3.9 *OPC 4-6
4.3.10 *OPC? 4-7
4.3.11 *PRE 4-7
4.3.12 *PRE? 4-8
4.3.13 *PSC 4-8
4.3.14 *PSC? 4-8
4.3.15 *PUD 4-9
4.3.16 *PUD? 4-9
4.3.17 *RCL 4-9
4.3.18 *RST 4-10
4.3.19 *SAV 4-10
4.3.20 *SRE 4-10
4.3.21 *SRE? 4-11
4.3.22 *STB? 4-11
4.3.23 *TST? 4-11
4.3.24 *WAI 4-12
4.4 Advanced Programming 4-12
4.4.1 Path Specification 4-12
4.5 Error Messages 4-13

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

4.6 ANSI/IEEE-488.2 Definitions 4-13
4.6.1 Syntax Diagrams....4-13
4.6.2 White Space....4-14
4.6.3 Power-on Conditions....4-14
4.6.4 <nrf value> 4-14
4.6.5 <PROGRAM MESSAGE TERMINATOR>....4-15
4.6.6 <PROGRAM MESSAGE UNIT SEPARATOR>....4-15
4.6.7 <PROGRAM HEADER SEPARATOR> 4-15
4.6.8 <compound command program header>....4-16
4.6.9 <PROGRAM DATA> (Parameters) 4-16
4.6.10 <ARBITRARY BLOCK PROGRAM DATA>....4-17
4.6.11 <PROGRAM DATA SEPARATORS> 4-17
4.6.12 Default Parameters 4-17
4.7 Status Reporting 4-18
4.7.1 Event and Condition Registers....4-18
4.7.2 Operation Complete Definition....4-18
4.7.3 Command Timing and Completion....4-20
4.8 Output Off Register....4-20
4.9 Input Buffer and Output Data 4-21
4.10 Remote Interface Messages 4-22
4.10.1 Interface Function Subsets 4-22
4.10.2 3811 Remote Messages....4-22
4.10.3 Non-Supported Remote Interface Messages 4-23

CHAPTER 5 - MAINTENANCE

5.1 Introduction 5-1
5.2 Calibration Overview....5-1
5.2.1 Recommended Equipment 5-1
5.2.2 Environmental Considerations....5-2
5.2.3 Warm-Up 5-2
5.3 Local Operation Current Source Calibration 5-2
5.4 Remote Operation Current Source Calibration 5-3
5.5 Fuse Replacement 5-4
5.6 Line Voltage Selection....5-4
5.7 Disassembly....5-5

CHAPTER 6 - TROUBLESHOOTING

6.1 Introduction 6-1
6.2 Troubleshooting Guide 6-1

Index v

Appendix A - Error Messages
Appendix B - Quick Start

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

List of Figures

2.1 3811 Front Panel 2-3
2.2 3811 MODE Section 2-5
2.3 3811 DISPLAY Switch Section 2-7
2.4 3811 PARAMETER SETUP Section 2-8
2.5 Error Indicators 2-10
2.6 3811 Back Panel 2-11
2.7 Back Panel 9-Pin OUTPUT Connector 2-12

3.1 Command Description Format 3-5
3.2 3811 Command Path Structure 3-6

4.1 Standard Event Status Register/Standard Event Status Enable Register 4-5
4.2 Parallel Poll Response Handling Data Structure 4-7
4.3 Service Request Enable Register 4-11
4.4 White Space Syntactic Diagram 4-14
4.5 <PROGRAM MESSAGE TERMINATOR> Syntax Diagram 4-15
4.6 <PROGRAM MESSAGE UNIT SEPARATOR> Syntax Diagram 4-15
4.7 <PROGRAM HEADER SEPARATOR> Syntax Diagram 4-15
4.8 <compound command program header> Syntax Diagram 4-16
4.9 <compound query program header> Syntax Diagram 4-16
4.10 <ARBITRARY BLOCK PROGRAM DATA> Syntax Diagram 4-17
4.11 <PROGRAM DATA SEPARATOR> Syntax Diagram 4-17
4.12 LDP-3811 Status Reporting Schematic Diagram 4-19
4.13 3811 Output Off Register 4-21

5.1 Power Line Voltage Selection 5-5

List of Tables

2.1 3811 Default Settings 2-2
2.3 Error Indicators 2-10

3.1 Substitute Parameter Names 3-2
3.2 3811 Device-Dependent Commands ..... 3-3 to 3-4

4.1 State of the 3811 After *RST 4-18
4.2 3811 Interface Function Subsets 4-22
4.3 3811 Allowable GPIB Interface Messages 4-22
4.4 Non-Supported Interface Messages for the 3811 4-23

5.1 Recommended Test Equipment 5-1
5.2 Fuse Replacement 5-4

A.1 Error Code Classifications A-1
A.2 3811 Error Message Codes ..... A-1 to A-2

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

Chapter 1

GENERAL INFORMATION

1.1 Introduction

This manual contains operation and maintenance information for the 3811 Laser Diode Precision Pulsed Supply and optional Model 1231 GPIB/IEEE-488.2 Interface. If you want to get started right away, read Appendix B, Quick Start, first. Chapter 2 has a section for quick familiarization of the 3811 front panel, and also provides an in-depth operation reference.

1.2 Product Overview

Specifically designed to drive low power diodes, the LDP-3811 is a microprocessor controlled current source which can operate in CW mode or precision pulse mode. This instrument offers a dual range of 200/500 mA output, programmable Pulse Width, Duty Cycle, and Pulse Repetition Interval (period). Laser diode protection was designed into the instrument with programmable current limits for both ranges, error indication and protection, and power line transient protection. Remote control of the instrument is offered with the GPIB/IEEE-488.2 interface option. To close the loop with other lab measurement instruments, the LDP-3811 can send and receive a TTL level compatible trigger.

1.3 Available Options and Accessories

Options and accessories available for the 3811 include the following:

DESCRIPTION	MODEL NUMBER
GPIB/IEEE-488.2 Interface	1231
Rack mount flange kit (enables installation into a standard 19 inch wide rack)	124
Current Source/Laser Diode Mount Interconnect Cable	303

1.4 Specifications

The specifications for the LDP-3811 current source are found in Section 1.4.1, and the general specifications are found in Section 1.4.2.

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

1.4.1 Laser Current Source Specifications[1]

Pulse Amplitude	
Range:	0-200 mA/0-500 mA, floating[2]
Resolution:	10 uA
Accuracy: [3]	±0.5% FS
Temperature Coefficient:	<100 ppm
Compliance Voltage:	≥25 V
Overshoot:	
50 mA ≤ I < I_{max}	< ±5%
I < 50 mA	< ±2 mA
CW Current Output	
Range:	0-200 mA/0-500 mA floating
Resolution:	10 uA
Accuracy:	±0.5% FS
Temperature Coefficient:	<100 ppm/°C
Stability, for 10 min.: [4]	<100 ppm
Stability, for 24 hours: [5]	<200 ppm
Compliance Voltage:	≥25 V
Noise and Ripple:	<200 uA rms
Display	
Maximum Readings:	505.0 mA, 6.500 mSec, 100.0%
Resolution:	0.1 mA, 0.1 uSec, 0.01%
Accuracy @ 25°C:	±0.5% FS
Type:	4-digit green LED
Pulse Width	
Range:	0.1 to >1000 uSec
Resolution:	100 nSec
Accuracy:	10 nSec ±0.01% of reading
Pulse Rise/Fall Time: [6]	<25 nSec
Pulse Repetition Interval (PRI)	
Range:	1 to >1000 uSec
Resolution:	100 nSec
Accuracy:	20 nSec ±0.01% of reading
Trigger Output	
Type:	TTL
Jitter:	5 nSec
Delay:	40 nSec ±10 nSec
Trigger Input	
Type:	TTL
Jitter:	100 nSec
Delay:	200 nSec ±20 nSec

1 All specifications measured after a one hour warm-up period at 25°C.
2 Grounding the laser diode cathode degrades pulse performance.
3 Measured after a 2 μsec settling time.
4 Over any 10 minute interval, half scale output.
5 Over a 24 hour period, half scale output.
6 Measured from 10% to 90% points at half scale output.

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

1.4.2 General LDP-3811 Specifications

Connectors

Current Source Connectors:	9-pin D-Sub and BNC connectors
External Trigger Input:	BNC connector
External Trigger Output:	BNC connector
Chassis Ground Post:	Banana-type
(Optional GPIB):	488.1-1987 standard

Optional GPIB

Meets ANSI/IEEE Std 488.1-1987
Meets ANSI/IEEE Std 488.2-1987
(For GPIB device specifications see Chapter 4, GPIB/IEEE-488.2 Remote Operation)

General

Size:	3.5" x 8.4" x 10.6" 88 mm x 212 mm x 269 mm
Weight:	<5.2 kg
Power Requirements:	90 - 105 VAC, 105 - 125 VAC, 210 - 230 VAC, or 220 - 250 VAC, 50 - 60 Hz
Temperature:	0 to +40°C operating -40 to +70°C storage
Humidity:	<95% relative humidity, non-condensing

1.5 Your Comments

Our goal is to make the best laser diode instrumentation available anywhere. To achieve this, we need your ideas and comments on ways we can improve our products. We invite you to contact us at any time with your suggestions. (See the third cover page.)

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

Chapter 2

OPERATION

2.1 Introduction

This chapter describes how to install, adjust, and operate the LDP-3811. It is divided into five sections covering introduction, installation, familiarization and adjustment of the 3811, warm-up and environmental considerations, and normal operating procedures.

Section 2.4.1 gives an overview of the 3811's front panel features, and it presents a guide to quickly familiarize the user with the front panel operations.

Appendix B, Quick Start, is intended for users who wish to begin operation right away. It contains the minimum information required to safely drive a laser diode with the 3811.

2.2 Installation

Installation procedures and considerations are covered in Sections 2.2.1 - 2.2.3.

2.2.1 AC Power Considerations

The 3811 can be configured to operate at nominal line voltages of 100, 120, 220, or 240 VAC. Normally, this is done at the factory and need not be changed before operating the instrument. However, check to be sure that the voltage printed on the back panel of the instrument matches the power-line voltage in your area. Refer to Chapter 6 Maintenance if it is necessary to reconfigure the input voltage range.

WARNING

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

2.2.2 Tilt-Foot Adjustment

The LDP-3811 has front legs that extend to make it easier to view the LED displays. To use them, place the 3811 on a stable base and rotate the legs downward until they lock into position.

2.2.3 Rack Mounting

The LDP-3811 may be rack mounted by installing a rack mount flange on either side of the enclosure. All rack mount accessory kits contain detailed mounting instructions. Refer to Section 1.3 for applicable rack mount accessory part numbers.

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

2.3 Power-Up Sequence

With the LDP-3811 connected to an AC power source, pressing the POWER switch will supply power to the instrument and start the power-up sequence.

During the power-up sequence, the following takes place. For about 3 seconds a lamp test is conducted. During the lamp test all indicators light up for about 3 seconds, and all of the 7-segment displays indicate "8".

Then, a self-test is performed to ensure that the 3811's hardware and software are communicating. If the 3811 cannot successfully complete this test, an error message of E512 will be displayed. See Appendix A for an explanation of error messages.

After this test, the 3811 will display its firmware version number for three seconds. Then the 3811 is configured to the state it was in when the power was last shut off.

The user may choose to "clear" the parameters that appear by recalling "BIN 0" either manually (see Section 2.4.6.4) or through the GPIB (see Section 4.3.17). When "BIN 0" is called, the front panel will be in the following state:

3811 DEFAULT CONFIGURATION

GPIB mode in LOCAL via front panel, or in REMOTE via GPIB
PARAMETER SETUP is not selected
LIM 200 (200 mA range) = 200 mA
LIM 500 (500 mA range) = 500 mA
OUTPUT off
MODE = CONST % (constant duty cycle %)
Pulse Width (PW) = 0.1 uSec
Pulse Repetition Interval (PRI) = 1.0 uSec
Duty Cycle % = 10.0%
Display showing current (in mA)
RANGE in 200 mA setting
Set Point = 0 mA
RECALL BIN number = 0
STEP value = 0.01 mA

Table 2.1 3811 Default Settings

2.4 Introduction to the LDP-3811 Front Panel

The LDP-3811 front panel contains displays and controls for the OUTPUT controller hardware. Each of the labeled areas on the front panel (i.e. GPIB, PARAMETER SETUP, MODE, or OUTPUT), and the display and adjustment sections of the front panel, is described in a separate subsection in this chapter.

Generally, the controls are simple to operate. The setup parameters, however, are intentionally a bit harder to use so that their values are not inadvertently changed.

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

Note: Section 2.4.1 gives a quick introduction to the front panel functions by briefly describing the switches and indicators.

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

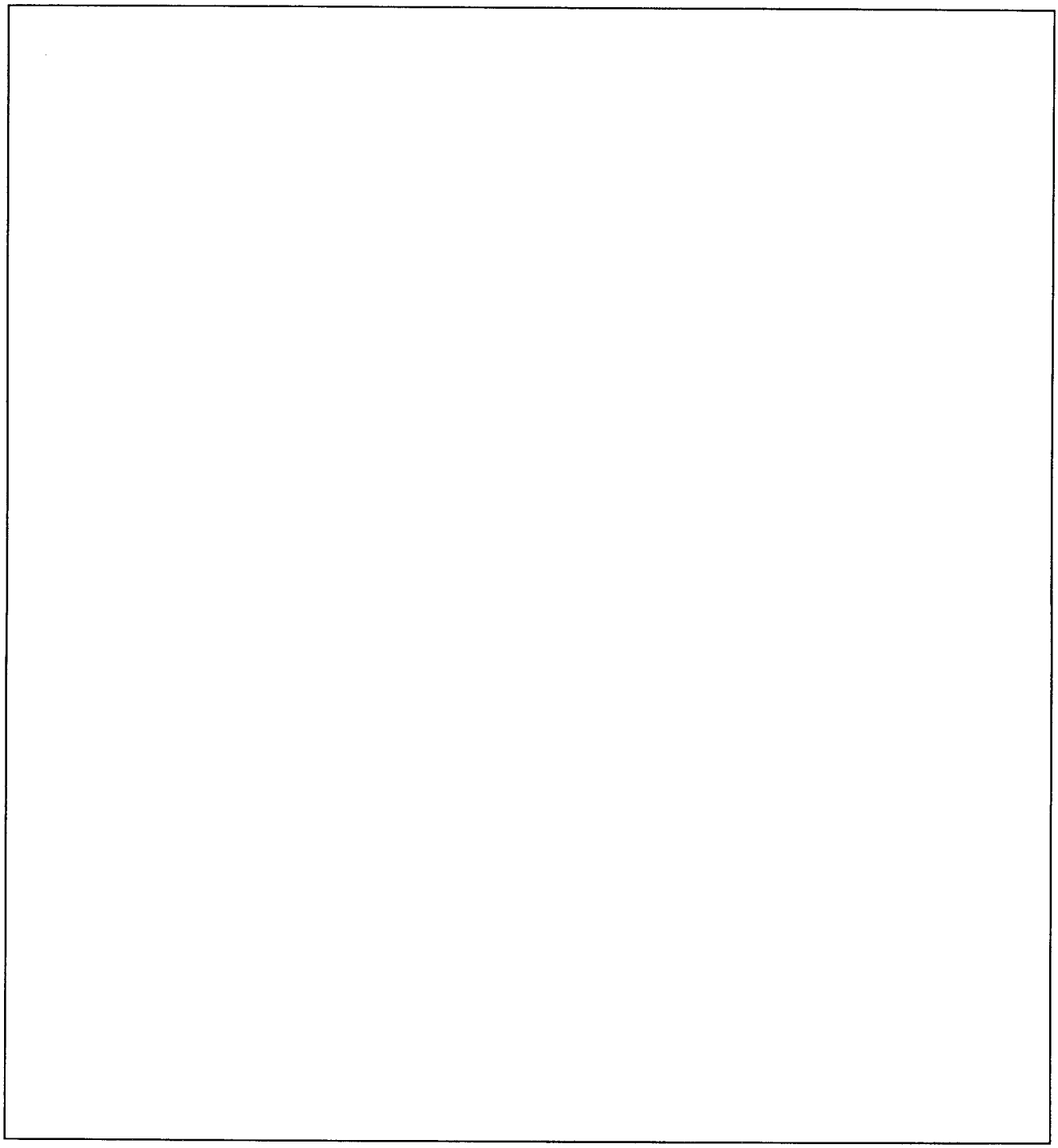


Figure 2.1 3811 Front Panel

2.4.1 Front Panel Familiarization

Refer to Figure 2.1 for the following discussions of the 3811 front panel sections. The key words are in bold type for easy identification.

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

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

2.4.1.1 General Functions

The **GPIB section** is used when the optional remote GPIB operations are implemented. (For more information, see Section 2.4.2).

The **POWER switch** is used to power-up and power-down the 3811.

The ADJUST knob, used for entering values, is the large knob on the 3811 front panel. (For more information, see Section 2.4.3). To the left of the ADJUST knob are the display switches, **I**, **PW**, and **DUTY CYCLE% / PRI**. These switches select which parameter is to be displayed on the 3811's digital display. (For more information, see Section 2.4.5).

The **PARAMETER SETUP section** contains the RANGE selection. Pressing the (PARAMETER SETUP) SELECT switch will cycle through the parameters. The (PARAMETER SETUP) SET switch is used to enter the SET mode for changing parameter values. (For more information, see Sections 2.4.6.1 and 2.4.6.2).

The **SAVE** and **RECALL** parameter functions are used to quickly configure the 3811 parameters to user-determined preset values. (For more information, see Section 2.4.6.4).

When the 3811 is powered-up, the parameters will automatically be restored to the same values that were present at the last power-down. Furthermore, all of the saved setups will be "remembered", and easily recalled.

2.4.1.2 MODE Functions

When the **MODE SELECT** switch is pressed and held in for 3 seconds, the MODE indicator will flash. Then, when the switch is released, the MODE will then switch between CW and Pulse modes. If the switch is pressed for less than 3 seconds and then released, the MODE will either stay on CW or cycle to the next Pulse MODE, in a round-robin fashion.

2.4.1.3 OUTPUT Function

When the **(OUTPUT) ON** switch is pressed, and the indicator is lit, the laser drive current will be enabled. After a delay of 2 seconds, the OUTPUT current will be turned on to the set point value. During the 2 second delay, and whenever the OUTPUT is on (indicator lit), the I (drive current) display shows the measured value.

When the OUTPUT is off, the I (drive current) display shows the measured current value until the ADJUST knob is turned. When the ADJUST knob is turned while the I indicator is lit and the OUTPUT is off, the I display shows the set point current. The set point will remain on the I display for three seconds after the ADJUST knob is released.

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

NOTE - These conditions will automatically shut off the OUTPUT:

1. Interlock Open (Pins 1 and 2 on the 9-pin D-sub OUTPUT connector)
2. KEYLOCK switch in "disabled" position
3. Laser Drive Current Voltage Limit/Open Circuit (While Output On)
4. Change of MODE or RANGE
5. At RECALL of a pre-configured state
6. Laser Drive Current Source Failure

2.4.2 GPIB Section

The GPIB section is located next to the POWER switch at the left side of the 3811 front panel (see Figure 2.1).

The GPIB section contains the LOCAL/ADR switch and the REMOTE indicator. The functions of the indicator and switch are related to GPIB operations, as described below.

The **LOCAL/ADR switch** is used for several functions. When the 3811 is in REMOTE mode, pressing the LOCAL switch returns the 3811 to LOCAL control mode unless the Local Lockout state has been activated by the host computer. (Local Lockout disables all 3811 front panel switches until this condition is changed by the host computer.) When the unit is in LOCAL mode, pressing the LOCAL/ADR switch causes the GPIB address to be displayed, e.g. "-01-", and the GPIB address may be changed by turning the ADJUST knob while also pressing the (PARAMETER SETUP) SET switch. The usable GPIB address range is 0 - 30.

The **REMOTE indicator** is lit when the 3811 is in GPIB remote mode. When the 3811 is put in Local Lockout Mode by the host computer, the REMOTE indicator will flash at a 1 Hz rate to indicate that the front panel is completely disabled by Local Lockout.

2.4.3 ADJUST Section

The ADJUST section is located on the right side of the 3811 front panel. It consists of the ADJUST (control) knob. The **ADJUST knob** is used to change the set points, enter parameter values, enter the GPIB address, or enter instrument calibration data.

2.4.4 MODE Section

The (MODE) SELECT switch determines which mode is used for the output of the current source. One of the following may be selected at one time: Continuous Wave (CW); or one of three pulsed modes, Duty Cycle % (CONST %), Pulse Repetition Interval (PRI), or External Trigger (EXT TRIG) mode.

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

Figure 2.2 3811 MODE Section

2.4.4.1 MODE SELECT

The **(MODE) SELECT** switch is used to select one of the four available operating modes, Continuous Wave (CW), Constant Duty Cycle % (CONST %), Constant Pulse Repetition Interval (CONST PRI), or External Trigger (EXT TRIG). When a mode is selected, the corresponding LED becomes lit.

To switch from CW to a PULSE mode, or vice versa, the (MODE) SELECT switch should be held in for three seconds. After the (MODE) SELECT switch is held in for three seconds, the present MODE indicator will begin to flash. If the (MODE) SELECT switch is released before three seconds, the MODE will either stay in CW mode (if already there) or cycle to the next PULSE mode. Whenever the (MODE) SELECT switch is pressed, the OUTPUT is forced off.

2.4.4.2 MODE Indicators

The **CW indicator** becomes lit when the 3811 is in the Continuous Wave (DC) mode. When CW mode is selected, the laser drive current output is controlled to the laser drive current (I) set point value.

2.4.4.3 Continuous Wave (CW) Mode

During operation in CW mode, the PW and DUTY CYCLE % / PRI display switches are disabled. When this mode is selected, the display will automatically return to displaying the laser drive current, (I).

2.4.4.4 Constant Duty Cycle Percent (CONST %) Mode

During operation in Constant Duty Cycle (CDC) Percent mode, the Pulse Width and/or Duty Cycle Percent may be edited. The actual PRI (Pulse Repetition Interval) will automatically be adjusted to create the desired Duty Cycle, independent of the PRI setting. When the DUTY CYCLE % / PRI display switch is pressed, the display will show Duty Cycle Percentage.

The duty cycle, pulse width and pulse repetition interval have the following relationship:

$$CDC = (PW / PRI) * 100$$

In CONST % mode, if a new Pulse Width is selected, the CDC value may be forced to change (due to the limited resolution of PW and PRI). The set point Duty Cycle % will be adjusted automatically to match the actual. For example, if CDC was 11.00%, and PW was then set to 0.1 uSec, CDC would be forced to 10.00% because PRI cannot be less than 1.0 uSec. Likewise, if the Duty Cycle % is changed, the 3811 will automatically allow only valid Duty Cycle % values (based on the present PW value) to be selected.

2.4.4.5 Constant Pulse Repetition Interval (CONST PRI) Mode

During operation in Constant Pulse Repetition Interval (PRI) mode, the Pulse Width and/or Pulse Repetition Interval may be edited. When the DUTY CYCLE % / PRI display switch is pressed, the display will show the Pulse Repetition Interval. The minimum PRI is automatically limited to the existing PW value.

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

In this mode, adjusting the Pulse Width will cause the actual Duty Cycle % to be adjusted automatically, independent of the constant Duty Cycle % setting.

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

2.4.4.6 External Trigger (EXT TRIG) Mode

During operation in External Trigger mode, the Pulse Width may be edited. The DUTY CYCLE % / PRI switch is disabled in this mode. The Pulse Repetition Interval and Duty Cycle % are not used. Instead, the repetition interval is determined by the rate at which the trigger is fired via a TTL signal at the back panel TRIGGER IN connector.

The output trigger pulse width is the same as the Pulse Width (PW) value.

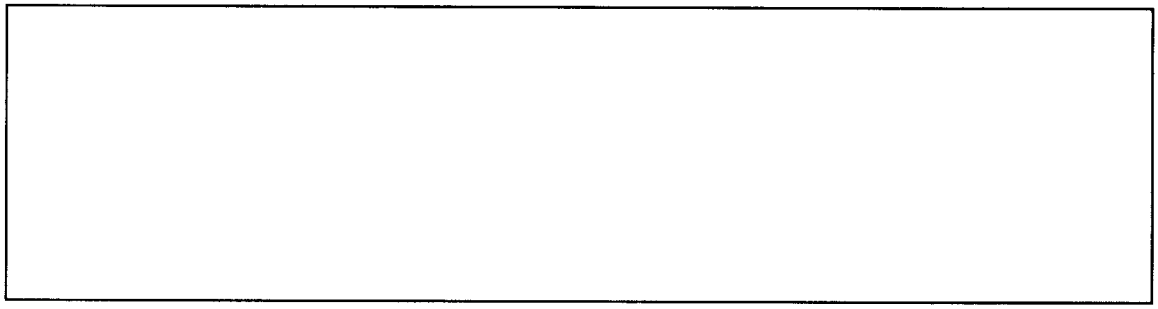


Figure 2.3 3811 DISPLAY Switch Section

2.4.5 DISPLAY Switch Section

The DISPLAY switch section is used to select the laser drive current (I), pulse width (PW), pulse repetition interval (DUTY CYCLE % / PRI) when in CONST PRI mode, or duty cycle percent (DUTY CYCLE % / PRI) when in CONST % mode.

2.4.5.1 DISPLAY Indicators and Switches

Pressing the **I switch** causes the laser drive output current to be displayed. Normally, the display will show measured laser drive output current, in mA. If the ADJUST knob is turned, or the I switch is pressed, the display will show the laser drive current set point value, in mA. The **I indicator** becomes lit when laser drive current is displayed.

Pressing the **PW switch** causes the output pulse width to be displayed, if the 3811 is in CONST %, CONST PRI, or EXT TRIG mode. If the 3811 is in CW mode, the PW switch is disabled. The **PW indicator** becomes lit when pulse width is displayed.

Pressing the **DUTY CYCLE % / PRI switch** causes the PRI (pulse repetition interval) or duty cycle percentage to be displayed, if the 3811 is in CONST PRI or CONST % mode, respectively. If the 3811 is in CW or EXT TRIG mode, the DUTY CYCLE % / PRI switch is disabled. The **DUTY CYCLE % / PRI indicator** becomes lit when PRI or duty cycle % is displayed.

2.4.6 PARAMETER SETUP Section

The following sections describe the function and form of the PARAMETER SETUP Selections.

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

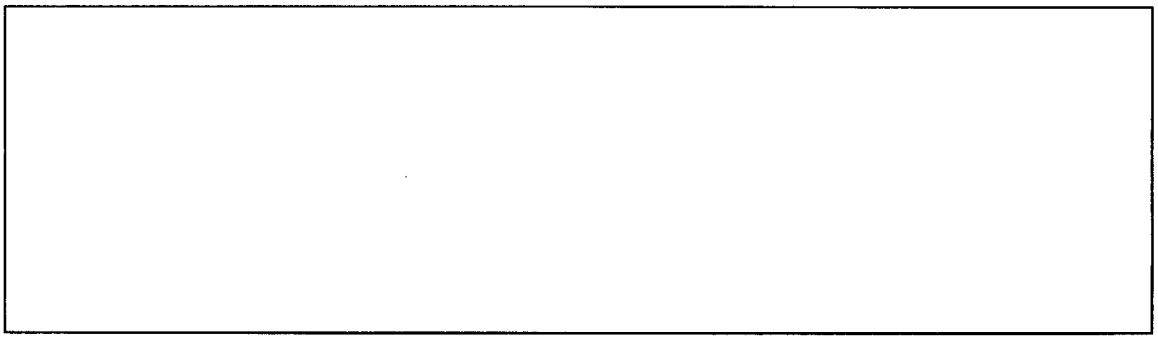


Figure 2.4 3811 PARAMETER SETUP Section

2.4.6.1 PARAMETER SETUP SELECT Switch

The **(PARAMETER SETUP) SELECT switch** is used to select the laser drive current limit (LIM), SAVE and RECALL, and RANGE parameters. When these parameters are selected, their present value will be displayed on the digital display. The selected parameter may be edited by then pressing the SET switch.

When the (PARAMETER SETUP) SELECT mode is first entered, the LIM 200 indicator becomes lit, and the 3811 displays the current limit value for the 200 mA range, in mA. If the (PARAMETER SETUP) SELECT switch is released, the select mode continues for three seconds, during which the selected parameter remains displayed, and SET mode may be entered. After three seconds, the 3811 reverts to the state which existed before the (PARAMETER SETUP) SELECT mode was entered.

If the (PARAMETER SETUP) SELECT switch is pressed repeatedly, successive parameter values are displayed, and the appropriate parameter indicator LED becomes lit. The order of parameters when cycling through the parameter list is LIM 200, LIM 500, SAVE, RECALL, RANGE, then back to LIM 200, and so on.

To quickly cycle through the parameters, press and hold the (PARAMETER SETUP) SELECT switch and turn the ADJUST knob. This allows fast parameter cycling in either direction.

2.4.6.2 SET Switch

The **SET switch** is used to enter SET mode, where parameter values are stored into non-volatile memory.

If the **SET switch** is pressed while the 3811 is in SELECT mode, the 3811 will enter SET mode. While the SET switch is held in, the selected parameter value can be changed by turning the ADJUST knob. The new parameter value is stored in non-volatile memory when the SET switch is released.

2.4.6.3 LIM Parameters

The LIM parameters are used to set the absolute upper limit for laser drive current output. There are two limit settings, one for the 200 mA range, LIM 200, and another for the 500 mA range, LIM 500. The LIM value which is in effect depends on the RANGE selection. Only one LIM (and one RANGE) is in effect at any time. However, either LIM can be set while operating in either RANGE.

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

During operation, when the LIM current limit is reached, the **LIM indicator** will flash.

If the optional GPIB is implemented, the LIM current limit condition may be used to turn the laser drive current output off via the ENABle:OUTOFF command.

The **LIM 200 indicator** becomes lit when the laser current limit for the 200 mA range is displayed.

The **LIM 500 indicator** becomes lit when the laser current limit for the 500 mA range is displayed.

The laser drive current limit (LIM) setting is independent of the voltage drop of the device connected to the laser drive current output, and therefore, no dummy load is required for precise adjustment of the current limit. The current limit can be adjusted safely, even while the OUTPUT is on.

2.4.6.4 SAVE and RECALL Parameter Functions

The SAVE and RECALL parameter functions are used to store and retrieve 3811 parameter configurations for future use. For example, a specific test setup may be saved for later use, and then another setup may be used presently. Then, whenever the user desires to perform the specific test, its setup may be simply recalled. This saves setup time, and it reduces the chance of setup error for tests which are repeated periodically.

Refer to Figure 2.4 for the discussion of the SAVE and RECALL parameters.

Non-volatile memory is used for saving the instrument parameters. When a save operation is performed, all of the parameters which are currently in effect on the 3811 are stored. The user selects a "bin" number (1 - 10) for saving the parameters. Then, when that "bin" number is recalled, the 3811 parameters are reconfigured to the previously stored values.

To enter the SAVE/RECALL mode, first press the **(PARAMETER SETUP) SELECT switch** until the SAVE or RECALL parameter is selected, and the 3811 displays the SAVE or RECALL "bin" number. To adjust the "bin" number, press the SET switch and turn the ADJUST knob. When the SET switch is released, the "save" or "recall" operation is performed, and then the 3811 reverts to its former state.

The **SAVE indicator** becomes lit when the 3811 is displaying a save bin number. The "bin" number is displayed as a number in the range 1 - 10. "Bin" 0 holds the reset (default) parameters.

The **RECALL indicator** becomes lit when the 3811 is displaying a recall "bin" number. The "bin" number is displayed as a number in the range 0 - 10. "Bin" 0 is reserved for the reset (default) parameters.

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

2.4.6.5 RANGE Selection

The RANGE selection sets the laser diode current source output range, 200 mA or 500 mA. When a RANGE is selected, the appropriate current limit, LIM 200 or LIM 500, will be in effect.

The RANGE selection is made by pressing the **(PARAMETER SETUP) SELECT switch** until the RANGE parameter is selected. When the RANGE parameter is selected, the present RANGE indicator, 200 or 500, will flash. To change the RANGE, press the SET switch and turn the ADJUST knob until the desired range is shown on the digital display. When the SET switch is released, the range which was last selected on the display will be enabled, and the present setup will be stored in non-volatile memory.

During 3811 operation, the enabled laser drive current output RANGE indicator is always lit.

2.4.7 Error Indicators

The 3811 error indicators are shown in Figure 2.5. The functions of the most common 3811 errors are shown in Table 2.2. The entire error code listing for the 3811 is given in Appendix A.

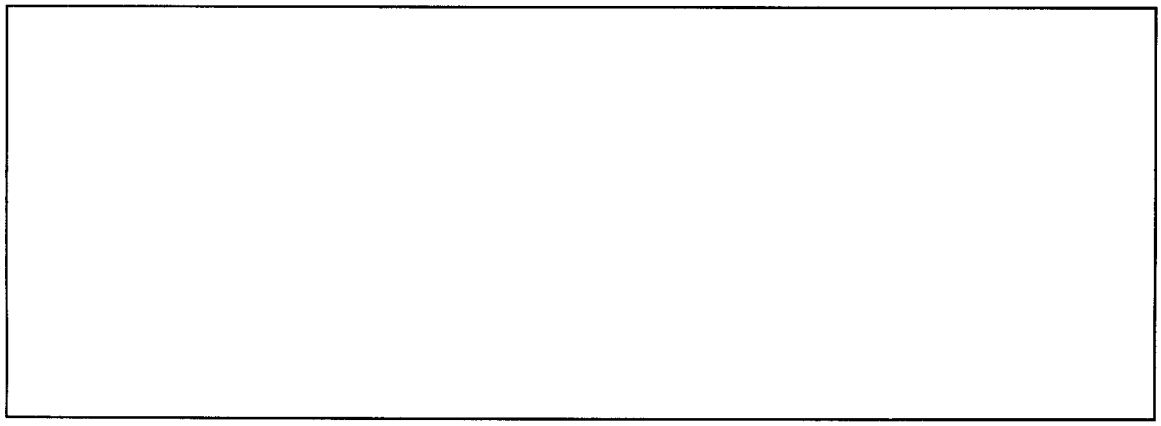


Figure 2.5 Error Indicators

ERROR INDICATORS

Error Condition	Action
Interlock Open	OUTPUT off, ERROR light flashes, E501 message displayed for 3 seconds
KEYLOCK disabled	OUTPUT off, ERROR light flashes, E522 message displayed for 3 seconds
Open circuit/ Voltage limit	OUTPUT off, ERROR light flashes, E530 message displayed for 3 seconds.
Current limit	LIM 200 or LIM 500 light flashes

Table 2.2 Error Indicators

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

When an error condition occurs, the error light will stay lit until the error is corrected. In the case of a Voltage Limit/Open Circuit error, the error light will stay lit until the OUTPUT has been turned on and the error has been corrected. The error message will appear on the display for three seconds. If the OUTPUT is turned on and an error condition still exists, the error message will be displayed again for three seocnds.

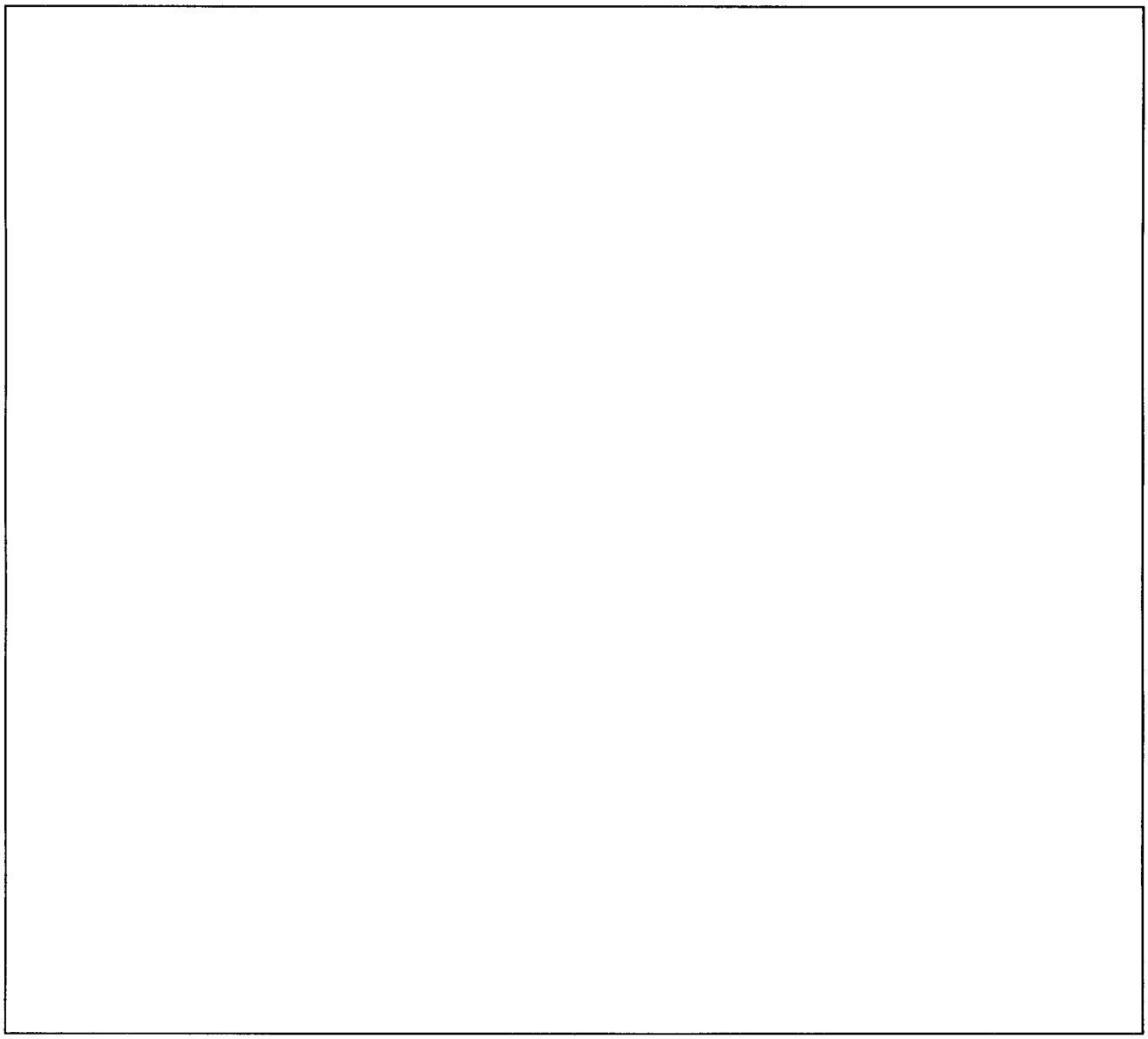


Figure 2.6 3811 Back Panel

2.5 Back Panel Controls and Connections

Refer to Figure 2.6 for the following discussions of back panel controls and connectors.

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

2.5.1 The OUTPUT Connectors

An auxiliary 9-pin d-sub connector is used for input and output connections, as shown by the pin-out diagram of Figure 2.7.

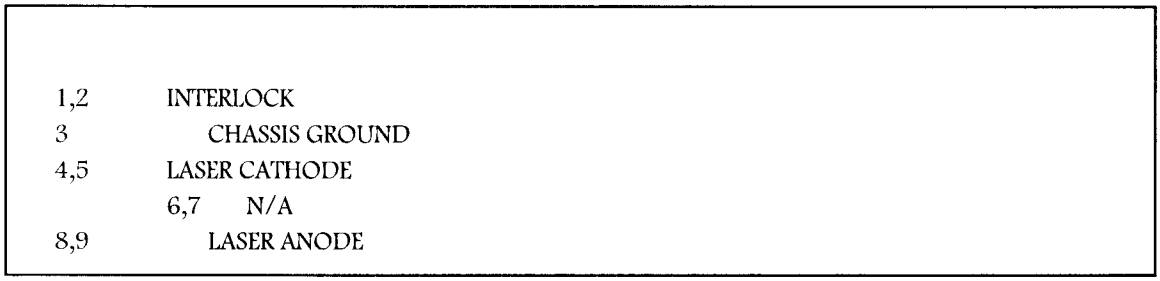


Figure 2.7 Back Panel 9-Pin OUTPUT Connector

2.5.2 Connecting to Your Laser

When connecting laser diodes and other sensitive devices to the 3811, we recommend that the 3811 be powered-up and the 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 OUTPUT off.

Pins 4 and 5 of the back panel OUTPUT connector are the negative output, and pins 8 and 9 are the positive output current connections (see Figure 2.7). These pins are jumpered to provide greater contact area for the output connections. This is done to reduce the risk of an open output connection due to a loose connector. Thus, the output is made safer for laser diodes.

NOTE - Whenever external connections are made to the output at pins 4 and 5, and 8 and 9, these connector leads must be jumpered as shown in Figure 2.7 to ensure the greatest laser diode safety.

NOTE - Pins 1 and 2 must be jumpered (interlock) in order to turn the laser drive current OUTPUT on.

We also recommend the use of the 9-pin D-sub connector, rather than the BNC connector, whenever possible. The 9-pin connector is safer to use, especially when operating in CW mode.

2.5.3 Laser Diode Connections and Shielding

IMPORTANT

Before turning on the laser drive current OUTPUT, be sure that the current limit (LIM) has been correctly set.

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

IMPORTANT

The cable connections to the laser must be secure enough that they won't open-circuit, should they be jostled or bumped. Should an open circuit occur during laser operation, the OUTPUT will be turned off (ON LED unlit) automatically.

Experience indicates that should an open circuit occur during laser operation (while the OUTPUT is ON), the laser may be damaged by a momentary circuit break-and-remake before the final circuit break. Therefore, secure cabling is very important.

It is recommended that the connections to the 3811 OUTPUT be made using twisted wire pairs with an earth-grounded shield. The output terminals of the 3811 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 OUTPUT leads.

2.5.4 TRIGGER Connectors

The **(TRIGGER) OUT and IN connectors** are BNC type. They are located just above the OUTPUT connectors on the back panel. The OUT trigger signal has the same pulse width and repetition interval as the OUTPUT signal, but at TTL level. This signal is available whenever the 3811 is in one of the three Pulse modes of operation.

The IN trigger signal can be used to fire an OUTPUT pulse from the 3811 when it is in EXT TRIG mode. The trigger signal should be at TTL level, and the 3811 will be triggered on a rising edge (transition from low to high).

2.5.5 GPIB Connector

The **GPIB connector** is located at the top center of the back panel. The 3811 GPIB connector meets IEEE-488.1 specifications. The interface specifications are listed in Table 4.2.

2.5.6 KEYLOCK Switch

The **KEYLOCK switch** is located at the lower center of the 3811's back panel. This switch must be in the ENABLED position to operate the 3811. Otherwise, the 3811 OUTPUT will be disabled.

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

2.5.7 AC Power Entry Module and Fuse

The AC Power Entry Module and fuse are located at the right side of the 3811's back panel. The 3811 must be connected to a properly rated AC source in order to operate. The fuse should only be replaced with the same value fuse, as indicated on the 3811's back panel.

2.5.8 Chassis Ground

For your convenience, a chassis ground post connector is located on the 3811's back panel, next to the OUTPUT connectors.

2.6 General Operating Procedures

The following sections present some guidelines for operation, as well as some common operating procedures. Remote operations are discussed in Chapter 4.

2.6.1 Warm-up and Environmental Considerations

Operate the LDP-3811 at an ambient temperature in the range of 0 to +50 °C. Storage temperatures should be in the range of -40 to +70 °C. To achieve rated accuracy, let the LDP-3811 warm up for at least 1 hour before use.

2.6.2 Pulse Mode Operation

You can operate the LDP-3811 in several modes, Continuous Wave (CW), Constant Duty Cycle (CONST %), Constant Pulse Repetition Interval (CONST PRI), or External Trigger (EXT TRIG) mode.

For Constant Duty Cycle % mode, follow Steps a - h. Instructions for the other Pulse operating modes are included after Step h.

a.Plug the LDP-3811 into an AC power source supplying the correct voltage for your unit (refer to the back panel for the correct ratings).

b.Turn the back panel KEYLOCK switch to the ENABLE position. Turn on the 3811 power by pressing the front panel POWER switch. To achieve rated accuracy, let the LDP-3811 warm up for at least 1 hour before use.

The OUTPUT stage will be off at power-up and the unit will automatically configure its parameters to the state which existed when the power was last shut off.

The laser drive current output range will be indicated by the corresponding LED in the RANGE section of the front panel.

c.Press the SELECT switch (in the PARAMETER SETUP section) and check the setting of LIM 200 or LIM 500 to insure that it is compatible with the laser (or other device) you are using. If you need to adjust the limit, press the SET switch and turn the ADJUST knob.

If the laser drive current output RANGE needs to be changed, press the SELECT switch until the present RANGE indicator starts to flash. Then, press the SET switch and turn the ADJUST knob to change

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

the RANGE.

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

If a pre-configured setup is to be recalled, use the RECALL feature (see Section 2.4.6.4) and then recheck the parameter settings for confirmation.

d.Connect the laser (or other output device) to the back panel OUTPUT connector.

Press the I switch and check the set point (operating) current. If the set point requires changing, turn the ADJUST knob again until the desired value is displayed.

e.Select the mode, CONST % in this case, by pressing the MODE switch as needed.

f.Set the Pulse Width by pressing the PW switch and then turning the ADJUST knob. Then set the Duty Cycle Percent by pressing the DUTY CYCLE % / PRI switch and then turning the ADJUST knob.

g.Turn the OUTPUT on by pressing the ON switch. After a 2 second delay, the 3811 will automatically drive the laser to the set point current.

While the OUTPUT is on, the laser drive current set point and limit may be changed. Also, the pulse width and/or duty cycle percentage may be edited. If the pulse width is changed, the duty cycle percentage may be automatically altered, if required (due to the limitations of the resolution of the PW and PRI values, see Section 2.4.4.4 for more information).

If the MODE of operation is changed, the OUTPUT will be forced off.

h.When the 3811 is powered off, the state of the unit at power-down is saved in non-volatile memory.

For operation in Constant Pulse Repetition Interval (CONST PRI) mode, follow the above procedure, with the following changes.

i.In Step e, select CONST PRI mode. In Step f, set the PRI (instead of the duty cycle) by pressing the DUTY CYCLE % / PRI switch and then turning the ADJUST knob.

For operation in External Trigger (EXT TRIG) mode, follow the above procedure, with the following changes.

j.In Step d, also connect a TTL-level trigger source to the TRIGGER IN connector on the back panel of the 3811. A positive-going TTL level signal will be used to initiate each output pulse from the 3811.

In Step e, select EXT TRIG mode. In Step f, adjust PW only. Duty cycle adjustment is disabled in EXT TRIG mode. Ignore Step i.

2.6.3 CW Mode Operation

This example is for Continuous Wave (CW) mode. The other operating modes follow similar procedures, and details of their operation are described in Section 2.6.2.

a.Plug the LDP-3811 into an AC power source supplying the correct voltage for your unit (refer to the back panel for the correct ratings).

b.Turn the back panel KEYLOCK switch to the ENABLE position. Turn on the 3811 power by pressing the front panel POWER switch. To achieve rated accuracy, let the LDP-3811 warm up for at least 1 hour before use.

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

The OUTPUT stage will be off at power-up and the unit will automatically configure its parameters to the state which existed when the power was last shut off.

The laser drive current output range will be indicated by the corresponding LED in the RANGE section of the front panel.

c.Press the SELECT switch (in the PARAMETER SETUP section) and check the setting of LIM 200 or LIM 500 to insure that it is compatible with the laser (or other device) you are using. If you need to adjust the limit, press the SET switch and turn the ADJUST knob.

If the laser drive current output RANGE needs to be changed, press the SELECT switch until the present RANGE indicator starts to flash. Then, press the SET switch and turn the ADJUST knob to change the RANGE.

If a pre-configured setup is to be recalled, use the RECALL feature (see Section 2.4.6.4) and then recheck the parameter settings for confirmation.

d.Connect the laser (or other output device) to the back panel OUTPUT connector.

Press the I switch and check the set point (operating) current. If the set point requires changing, turn the ADJUST knob again until the desired value is displayed.

e.Select the CW mode. If the 3811 is presently in a PULSE mode, press and hold in the (MODE) SELECT switch until the present mode LED indicator begins to flash. (This switch holding procedure is also used to return to Pulse mode from CW mode.)

f.Turn the OUTPUT on by pressing the ON switch. After a 2 second delay, the 3811 will automatically drive the laser to the set point current.

While the OUTPUT is on, the laser drive current OUTPUT set point and Limit may be changed. The pulse width and/or duty cycle percentage can not be edited in CW mode (except via remote operation).

If the mode of operation is changed, the OUTPUT will be forced off.

g.When the 3811 is powered off, the state of the unit at power-down is saved in non-volatile memory.

2.6.4 TRIGGER OUT Operation

The OUT trigger signal is available whenever the 3811 is operated in a PULSE mode. The OUT trigger signal has the same pulse width as the OUTPUT signal, but at TTL level. To use the OUT trigger, connect the device which is to be triggered (from the 3811) to the 3811's back panel OUT (BNC) connector. Then operate the 3811 in any PULSE mode, as described in Section 2.6.2.

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

Chapter 3

COMMAND REFERENCE

3.1 Introduction

This chapter is a guide to the syntax and usage of the various device-dependent commands for the 3811. It contains a reference section for all of the device-dependent commands, including those which may only be accessed via remote operation. Therefore, it is of primary interest to users who wish to utilize the GPIB option.

This chapter is divided into two parts. The first part contains an overview of the remote commands and syntax used by the 3811. If you are not interested in remote operation, skip Sections 3.2 and 3.3.

The second part contains all of the 3811 commands in alphabetical order. Figure 3.1 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. The error messages which may be displayed on the 3811 front panel are listed in Appendix A.

A short BASIC program example for remote operation of the 3811 is given in Section 3.6.

The common GPIB (ANSI/IEEE-488.2) commands which are supported by the 3811 are described in Chapter 4.

The following syntax terms are frequently used in this reference:

<white space> refers to ASCII characters (such as Space Bar) which are used as specific separators in the command syntax

<nrf value> refers to the IEEE-488.2 standard for numeric format notation. It is a generic label which means either integer, floating point, scientific notation number representation may be used.

For more information on terminology, see Section 4.6.

3.2 Overview of the 3811 Command Set

There are two types of device "commands", commands --which do not return anything, and queries --which return a stored value or state of the instrument. Queries must be terminated with a question mark (?), while commands may require a parameter(s) to follow.

"DIS 1"

For example, the "1" in the command "DIS 1", enables the 3811 display, while a "0" would disable (blank) the display. Table 3.1 (Section 3.2.1) contains the allowed substitute mnemonics for 1 and 0.

This command emulates the front panel operation of (1) selecting the display section, and (2) turning it on.

Most of the commands which emulate the front panel operation are just as intuitive (see Table 3.2). In Table 3.2 the required letters for each command are shown. Section 3.4 contains a detailed account of each command and tells which are also supported by front panel operations. In Section 3.4, each command is spelled out with the required letters in upper case and the optional letters in lower case. The optional letters may be used to improve program readability.

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

3.2.1 Substitute Parameter Names

For clarity in programming, the (Boolean) values of one and zero may also be represented by the appropriate substitute parameter names, as shown in Table 3.1.

SUBSTITUTE PARAMETER NAMES

SUBSTITUTE NAME	VALUE
ON	1
OFF	0
OLD	1
NEW	0
TRUE	1
FALSE	0

Table 3.1 Substitute Parameter Names

The ON parameter name could be used in place of the 1 in the example in Section 3.2 as follows:
"DIS ON"

3.2.2 Compound Command Structure

Many of the 3811 remote commands require a compound structure. This is done to distinguish between different commands of the same type.

The compound command structure is similar to a directory path structure, as found in DOS. For example, commands which deal with the 3811's current limit have the path "LIM:", as in the command to set the current limit for the 200 mA output range to 150.0 mA,

"LIM:I200 150"

This structure is illustrated in Figure 3.2. Table 3.2 lists all of the 3811's device-dependent commands, with the full path shown for each command and a brief explanation of its usage. For more information, see Section 3.4.

Section 3.4 presents a more detailed look at the 3811 device-dependent commands, including syntax diagrams, and example usage.

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

NAME	NUMBER OF PARAMETERS EXPECTED	FUNCTION
CAL:LDI	NONE	Used to initialize the laser drive current calibration cycle.
CAL:LDI?	NONE	Returns the ready state for entering the laser drive current calibration value.
CDC	1	Used to set the constant duty cycle percentage value.
CDC?	NONE	Returns the actual duty cycle percentage.
COND?	NONE	Returns the value of the Condition register.
DEC	NONE	Used with STEP command to decrement the laser drive current set point value by one step.
DELAY	1	Used to create a delay in the execution of further commands.
DIS	1	Turns the display on or off.
DIS?	NONE	Returns the display message or value.
DIS:CONST	NONE	Sets the display to show Duty Cycle % or PRI.
DIS:CONST?	NONE	Returns on/off status of the DUTY CYCLE %/PRI switch.
DIS:LDI	NONE	Sets the display to show laser drive current.
DIS:LDI?	NONE	Returns on/off status of the I display switch.
DIS:PW	NONE	Sets the display to show Pulse Width values.
DIS:PW?	NONE	Returns on/off status of PW display switch.
ENAB:COND	1	Sets the enable register for Conditions.
ENAB:COND?	NONE	Returns the value of the Conditions enable register.
ENAB:EVE	1	Sets the enable register for Events.
ENAB:EVE?	NONE	Returns the value of the Event enable register.
ENAB:OUTOFF	1	Sets the enable register for Conditions/Events which turn the OUTPUT off.
ENAB:OUTOFF?	NONE	Returns the value of the Outoff enable register.
ERR?	NONE	Returns errors generated since the last query.
EVE?	NONE	Returns the value of the Event register.
INC	NONE	Used with STEP command to increment the laser drive current set point value (see DEC command).
LDI	1	Used to set the laser drive current set point value.
LDI?	NONE	Used to return the laser drive current measured value (measured about every 200 mS).
LIM:I200	1	Used to set the laser drive current limit value for the 200 mA range.
LIM:I200?	NONE	Used to return the laser drive current limit value for the 200 mA range.
LIM:I500	1	Used to set the laser drive current limit value for the 500 mA range.
LIM:I500?	NONE	Used to return the laser drive current limit value for the 500 mA range.
MES	1	Used to enter a string of 16 ASCII bytes.
MES?	NONE	Returns a previously stored ASCII message.

Table 3.2 3811 Device-Dependent Commands

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

NAME	NUMBER OF PARAMETERS EXPECTED	FUNCTION
MODE?	NONE	Returns the mode, CW (continuous wave), PRI (constant pulse repetition interval), DUTY (constant duty cycle %), or EXT (external trigger)
MODE:CDC	NONE	Sets the 3811 to CDC (constant duty cycle) mode.
MODE:CW	NONE	Sets the 3811 to CW (continuous wave) mode.
MODE:EXT	NONE	Sets the 3811 to EXT (external trigger) mode.
MODE:PRI	NONE	Sets the 3811 to PRI (constant pulse repetition interval) mode.
OUT	1	Same action as setting the OUTPUT switch on/off.
OUT?	NONE	Returns the OUTPUT switch status.
PRI	1	Sets the constant pulse repetition interval (PRI) value, in uSec.
PRI?	NONE	Returns the present pulse repetition interval value, in uSec.
PW	1	Sets the 3811 pulse width, in uSec.
PW?	NONE	Returns the 3811 pulse width value, in uSec.
RAD	1	Used to set the radix type for numerical data. Decimal, binary, and hexadecimal are allowed.
RAD?	NONE	Used to return the radix type for numerical data. Decimal, binary, and hexadecimal are allowed.
RAN	1	Used to set the laser drive current output range.
RAN?	NONE	Returns the laser drive current range.
SECURE	1	To be used by authorized service personnel only, to gain access to protected data.
SET:CDC?	NONE	Returns the duty cycle percentage (CDC) set point.
SET:LDI?	NONE	Returns the laser drive current set point, in mA.
SET:PRI?	NONE	Returns the pulse repetition interval (PRI) set point, in uSec.
STEP	1	Used to set the Step value for use with DEC or INC commands. Defaults to a step of 1.00 (mA). Range is 0.01 - 99.99.
STEP?	NONE	Returns the Step value.
TERM	1	Sets the program message terminator.
TERM?	NONE	Returns the program message terminator.
TIME?	NONE	Returns the elapsed time since the 3811 was last powered up.
TIMER?	NONE	Returns the elapsed time since the timer was last reset.

Table 3.2 3811 Device-Dependent Commands (Cont.)

3.3 Common Commands

Another type of command is the "common command". These commands are common to instruments which support the ANSI-IEEE-488.2 standard and are not necessarily reflected by front panel operations. Some of the common commands are useful for advanced programming techniques, such as generating service requests. However, common commands are not necessary for remote operation, and the beginning programmer may chose to ignore them entirely. The common commands for the 3811 are documented in Chapter 4.

Two common commands which are reflected by front panel operations are *SAV and *RCL. These commands remotely perform the same operations as when the SAVE and RECALL parameters are changed during Local (front panel) operation.

3.4 3811 Device-Dependent Commands

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

This section contains all of the device-dependent commands for the 3811, listed in alphabetical order. Sub-sections for each path are presented, listing the commands which are legal for that path. See Figure 3.2 for command path tree structure. All of the 3811's common commands and queries are listed in Section 4.3. The lower level remote interface messages are also listed in Chapter 4.

Command Path:Name. Required letters are shown in upper case, lower case letters are optional.

Front Panel/Remote Execution. A solid box means the command can be executed in that mode. Command mnemonics in front panel (local) mode may vary.

Command Description

Syntax Diagram (For Remote Commands)

Parameters Tells what parameters are expected, and their type.

An **<nrf value>** refers to a flexible numeric notation (IEEE-488.2). Integer, exponential or floating point may be used with the decimal radix. Alternate radixes may be selected in remote operation.

Points of Interest. Has special information about the command.

Examples. Shows typical statements using the command.

Figure 3.1 Command Description Format

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

3.4.1 Command Paths

The 3811 device-dependent commands are structured into tree format (see Figure 3.2). Each of the legal paths is listed below, followed by its list of path options, each of which is followed by the commands themselves.

It is recommended that the first-time user begin learning the commands by using the full path notation. Once the user is familiar with the commands, he or she may wish to take advantage of the shortcuts allowed for command paths (see Section 4.4).

(root)

(com. cmds)							
*CAL?	CDC	:CAL	:DIS	:ENAB	:LIM	:MODE	:SET
*CLS	CDC?						
*DLF	COND?						
*ESE	DEC	:LDI	:CONST	:COND	:I200	:CDC	:CDC?
*ESE?	DELAY	:LDI?	:CONST	:COND?	:I200?	:CW	:LDI?
*ESR?	DIS		?	:EVE	:I500	:EXT	:PRI?
*IDN?	DIS?		:LDI	:EVE?	:I500?	:PRI	
*IST?	ERR?		:LDI?	:OUTOF			
*OPC	EVE?		:PW	F			
*PRE	INC		:PW?	:OUTOF			
*PRE?	LDI			F?			
*PSC	LDI?						
*PSC?	MES						
*PUD	MES?						
*PUD?	MODE?						
*RCL	OUT						
*RST	OUT?						
*SAV	PRI						
*SRE	PRI?						
*SRE?	PW						
*STB?	PW?						
*TST?	RAD						
*WAI	RAD?						
	RAN						
	RAN?						
	SECURE						
	STEP						
	STEP?						
	TERM						
	TERM?						
	TIME?						
	TIMER?						

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

Figure 3.2 3811 Command Path Structure

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

3.4.2 3811 Device-Command Reference

The following pages contain a reference for the device-dependent commands of the 3811. This reference contains useful information for both local and remote operation of the 3811.

References to the front panel labels are capitalized in the following reference pages (as is done throughout this manual). Therefore, a reference to the MODE section refers to the same-labeled switch area of the 3811.

In some references, parentheses are used to signify the labeled area for a particular switch or LED indicator on the front panel. For example, (MODE) SELECT refers to the switch labeled "SELECT" in the MODE section of the 3811 front panel.

The commands may include any combination of upper and lower case valid letters, as shown in the command examples in the following pages. For example, "LIm:i200 100", "lim:I200 100", and "LIM:i200 100" are all equivalent.

The required letters of a command are capitalized and the optional valid letters are in lower case in the headings of the command descriptions in the following pages. For example, the command heading "LIMit:I200" has the required letters, "LIM:I200", but allows the use of "LIMIT:I200" for clarity.

The following syntax terms are frequently used in this reference:

<white space> refers to ASCII characters (such as Space Bar) which are used as specific separators in the command syntax.

<nrf value> refers to the IEEE-488.2 standard for numeric format notation. It is a generic label which means either integer, floating point, scientific notation number representation may be used.

ANSI/IEEE-488.2 defined terms are indicated by the <> brackets. For more information on terminology, see Section 4.6.

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

■ Front Panel
■ Remote

CAL:

The CAL: command path is used to get to the 3811's Laser Drive Current calibration commands.

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

CAL:LDI
CAL:LDI?

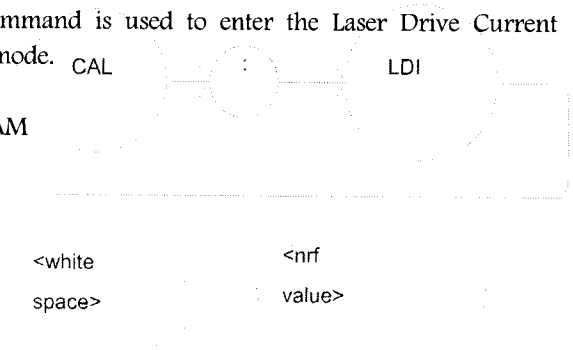
POINTS OF INTERESTThe proper test equipment and test fixtures should be set up in order for these commands and queries to work.

■ Front Panel
■ Remote

CAL:LDI

The CAL:LDI command is used to enter the Laser Drive Current (set point, measurement, and limit) calibration mode.

SYNTAX DIAGRAM



PARAMETERS None.

POINTS OF INTERESTAfter this command is issued, the 3811 will allow calibration of the current set point, measurement, and limit. This procedure is outlined in Section 6.4.

The calibration defaults to the selected current range setting. Therefore, it is necessary to select the desired output current range (200 or 500 mA) before performing the calibration for that range.

In local operation, calibration mode is entered by simultaneously pressing the LOCAL/ADR and (MODE) SELECT switches.

The CAL:LDI? query may be used to determine if the 3811 is ready for the user to enter the correct value (in mA) via the LDI command.

EXAMPLES"CAL:LDI" -action: the 3811 enters calibration mode for Laser Drive Current.

"Cal:Ldi" -action: the 3811 enters calibration mode for Laser Drive Current.

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

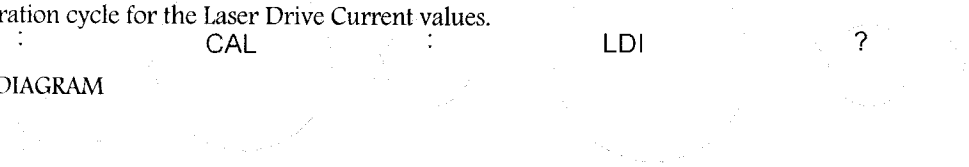
☐ Front Panel

■ Remote

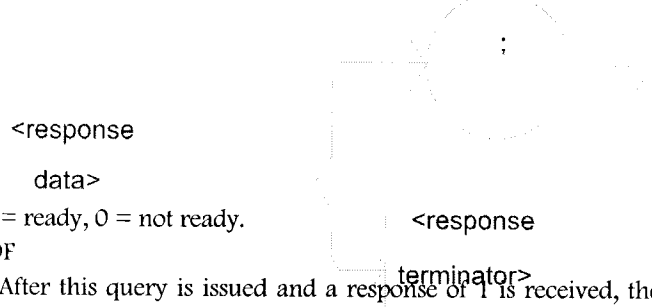
CAL:LDI?

The CAL:LDI? query is used to determine that the 3811 is ready for a value to be entered during the CAL:LDI calibration cycle for the Laser Drive Current values.

SYNTAX DIAGRAM



PARAMETERS None. The response will be in the form:



-where 1 = ready, 0 = not ready.

POINTS OF INTEREST After this query is issued and a response of 1 is received, the 3811 will be ready for the user to enter a value via the LDI command (see Section 6.4).

EXAMPLES "CAL:LDI?" -response: 1, means the 3811 is ready for the user to enter a value (in mA) via the LDI command.

"Cal:LDI?" -response: 0, means the 3811 is not yet ready for the user to enter a Laser Drive Current value (because it is busy with internal operations which don't require user input, or an error has occurred).

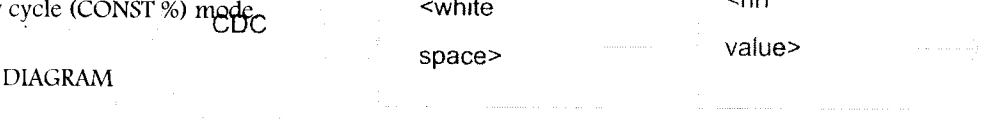
■ Front Panel

■ Remote

CDC

The CDC command is used to set the value of the Constant Duty Cycle, as a percentage, for use in constant duty cycle (CONST %) mode.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> which represents the constant duty cycle set point, as a percentage.

POINTS OF INTEREST This value may be set remotely only when in constant duty cycle mode (CONST %). In all other modes the value is ignored, but no error is generated.

In local operation, this parameter can only be set while operating in constant duty cycle (CONST %) mode.

CDC is related to PW and PRI as follows: CDC = (PW/PRI) * 100

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

The set CDC value is restricted to valid values based on the present PW (and the resolution of the PW and PRI parameters).

In local operation, valid CDC values are calculated and displayed automatically when CDC is edited. However, in remote mode, if an invalid CDC value is entered, the 3811 will set the CDC to the closest valid CDC value and generate error #201. Therefore, in remote operation it is recommended that CDC set point values be compared to the desired value (via the SET:CDC? query), and that the error queue be checked periodically (via the ERR? query).

The range of values of CDC is 0.01 - 100.00 %.

EXAMPLES"CDC 40.0" -action: The constant duty cycle set point is set to 40.00%.

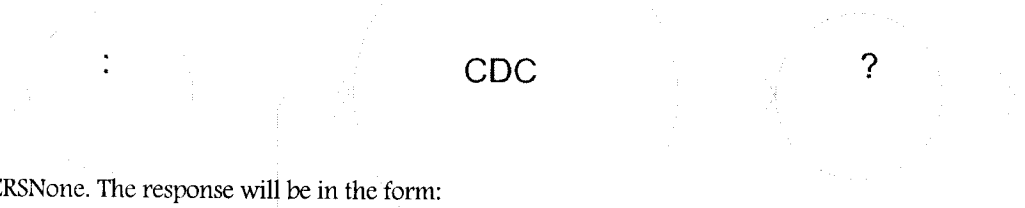
"Cdc 20; Set:cdc?" -returns: 20.5, means that although the constant duty cycle set point is initially set to 20.00%, 20.50% is the closest valid duty cycle (based on the present PW value).

☐ Front Panel
■ Remote

CDC?

The CDC? query returns the value of the actual duty cycle, as a percentage.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:

<response data>

-where the response is an <nrf value>.

<response terminator>

POINTS OF INTERESTThe response is in percent.

The actual CDC value is not valid when in external trigger mode.

The actual CDC value is usually different than the SET:CDC value, unless the 3811 is in constant CDC (CONST %) mode.

In local operation, the CDC displayed is always the actual value.

When CONST % mode is entered, if the set point CDC value is invalid for the present PW value, the set point CDC value is automatically changed to the closest valid value (based on the present PW and the resolution of the PW and PRI parameters). The actual CDC value is then set to the set point CDC value.

EXAMPLES"cdc?" -response: 90.6 means the actual duty cycle is 90.60%.

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

☐ Front Panel
■ Remote

COND?

The COND? query returns the value of the status condition register.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:

;

<response data>

-where the response is the sum of the following: <response terminator>

1 - Laser Drive Current Limit
2 - Voltage Limit/Open Circuit
4 - N/A
8 - N/A
16 - Interlock Open
32 - KEYLOCK Disabled
64 - N/A
128 - N/A
256 - N/A
512 - N/A
1024 - Output On/Off State
2048 - Ready for Calibration Data State
4096 - Calculation Error
8192 - Hardware Error
16384 - Software Error
32768 - N/A

POINTS OF INTERESTThe conditions which are reported to the status byte are set via the ENABle:COND command.

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

EXAMPLES"COND?" -response: 1025, means that the laser drive current limit and output on conditions currently exist.

☐ Front Panel
■ Remote

DEC

The DEC command decrements the selected laser control mode set point by one step.

SYNTAX DIAGRAM



PARAMETERSNone.

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

POINTS OF
INTEREST The decremental amount is one step. The step size can be edited via the STEP command, its default value is 0.01 mA.

Measurements are not automatically taken with each DEC step. Therefore, the user must issue a measurement query to update a measurement value.

The minimum time to complete one decrement is about 10 to 20 mSec.

EXAMPLES"STEP 30; DEC" -action: The Laser Drive Current set point is decremented by 30.00 mA.

"STEP 3.3; DEC" -action: The Laser Drive Current set point is decremented by 3.30 mA.

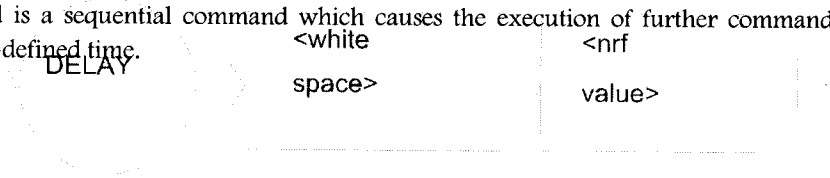
"Step 1.03; Dec; Dec" -action: The Laser Drive Current set point is decremented twice by 1.03 mA, for a total decrease of 2.06 mA.

☐ Front Panel
■ Remote

DELAY

The DELAY command is a sequential command which causes the execution of further commands to be delayed by a user-defined time.

SYNTAX DIAGRAM



PARAMETERS An <nrf value> which represents the delay time, in milliseconds.

POINTS OF
INTEREST The Operation-Complete flag is held false until the delay period elapses in between a series of commands.

This command is useful for creating delays based on the instrument clock, instead of having the host computer create a delay loop (which may be inefficient use of the host's CPU).

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

EXAMPLES"DELAY 500" -action: Further commands and queries are not executed until 0.5 seconds have elapsed from the time this command is executed.

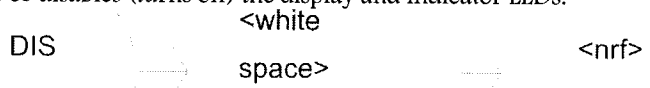
"Ldi 22;Delay 2000;Ldi?" -actions: The laser drive current is set to 22.00 mA, then the 3811 waits for 2.0 seconds before measuring and returning the measured output current.

☐ Front Panel
■ Remote

DISplay

The DISplay command enables or disables (turns off) the display and indicator LEDs.

SYNTAX DIAGRAM



PARAMETERS1 = on, 0 = off.

POINTS OF INTERESTWhen the display is enabled, the value displayed will depend on the present mode of operation. When the display is disabled, it contains a blank message.

When the display is disabled, all of the LEDs on the front panel will also be disabled. This command is useful when it is necessary to work in a dark environment.

EXAMPLES "DIS ON" -action: display is enabled.

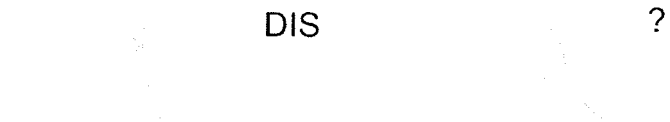
"DISp 0" -action: display is disabled, blank.

■ Front Panel
■ Remote

DISplay?

The DISplay? query returns the value shown on the display.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:

-where the response data is a string.

POINTS OF INTEREST Returns the actual string from the output buffer to the display. If the display is disabled, it returns " ".

In local operation, the display is queried by visually reading the display value.

EXAMPLES"DIS?" response: "99.9" means the value on the display is 99.9.

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

"DISp?" -response: " 0.6" means the value on the display is 0.6.

"Disp?" -response: "E501" means there is a E501 error message on the display (which means: interlock open --output off).

■ Front Panel
■ Remote

DISplay:

The DISplay: command path is used to get to the 3811's display commands.

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

DISplay:CONST
DISplay:CONST?
DISplay:LDI
DISplay:LDI?
DISplay:PW
DISplay:PW?

■ Front Panel
■ Remote

DISplay:CONST

The DISplay:CONST command activates the DUTY CYCLE%/PRI display and sets the front panel switch accordingly.

SYNTAX DIAGRAM : DIS : CONST

PARAMETERSNone.

POINTS OF INTERESTEffects the display only, not the laser drive current mode of operation.

This command has no effect when the 3811 is in CW or EXT mode.

In local operation, pressing the DUTY CYCLE%/PRI switch has the same effect as issuing this command remotely.

EXAMPLES"Mode:PRI; Display:Const" -action: sets the 3811 to constant PRI mode and activates the display to show the PRI set point value.

"Mode:CDC; Dis:CONST" -action: sets the 3811 to constant duty cycle mode and activates the display to show the duty cycle percentage set point value.

■ Front Panel
■ Remote

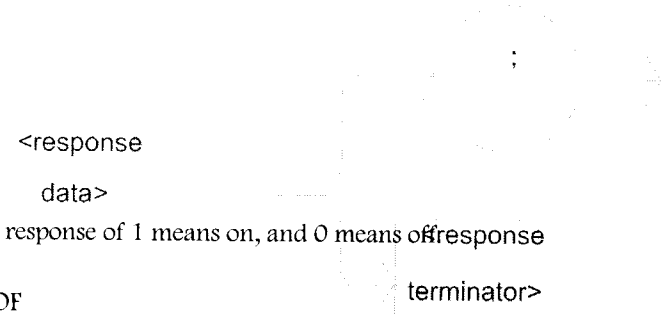
DISplay:CONST?

The DISplay:CONST? query returns the status of the DUTY CYCLE % / PRI switch.

SYNTAX DIAGRAM DIS : CONST ?

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

PARAMETERSNone. The response will be in the form:



-where a response of 1 means on, and 0 means off

POINTS OF INTERESTThe display will not show the duty cycle or PRI set point, even when the switch status is 1 (on), if the 3811 display is disabled.

In local operation, the status of the DUTY CYCLE % / PRI switch is determined by visually inspecting the LED (lit = on).

EXAMPLES"DIS:Const?" -response: 0, means the DUTY CYCLE % / PRI switch is not activated.

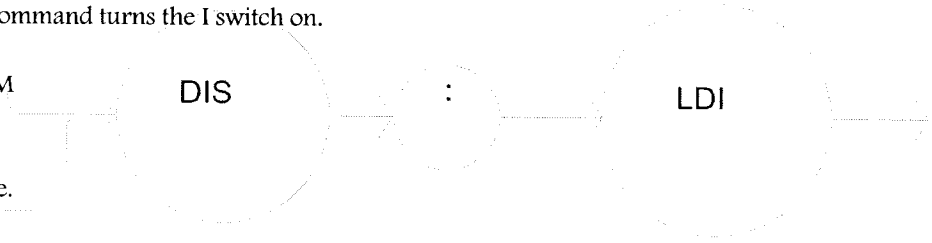
"Display:const?" -response: 1, means the DUTY CYCLE % / PRI switch is activated.

■ Front Panel
■ Remote

DISplay:LDI

The DISplay:LDI command turns the I switch on.

SYNTAX DIAGRAM



PARAMETERSNone.

POINTS OF INTERESTIn local operation, the I display will show the laser drive current set point when the I switch is pressed or the ADJUST knob is turned. Otherwise, the measured laser drive current is displayed.

In local operation, the LDI display is activated by pressing the I switch.

EXAMPLES"DIS:LDI" -action: activates the I switch and sets the display to show laser drive current.

"Disp:Ldi" -action: activates the I switch and sets the display to show the laser drive current.

■ Front Panel
■ Remote

DISplay:LDI?

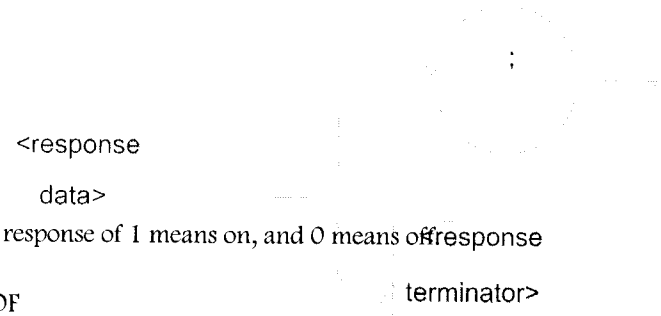
The DISplay:LDI? query returns the status of the I switch.

SYNTAX DIAGRAM



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

PARAMETERSNone. The response will be in the form:



-where a response of 1 means on, and 0 means off

POINTS OF INTERESTThe display will not show the laser drive current, even when the switch status is 1 (on), if the 3811 display is disabled.

In local operation, the status of the I switch is determined by visually inspecting the I switch LED (lit = on).

EXAMPLES"DIS:LDI?" -response: 1, means the I switch is activated.

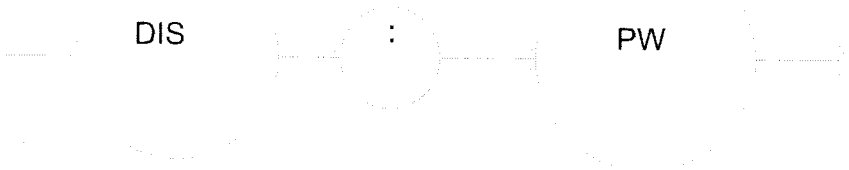
"display:ldi? -response: 0, means the I switch is not activated.

■ Front Panel
■ Remote

DISplay:PW

The DISplay:PW command activates the pulse width display and sets the front panel switch accordingly.

SYNTAX DIAGRAM



PARAMETERSNone.

POINTS OF INTERESTEffects the display only, not the laser drive current mode of operation.

This command has no effect when the 3811 is in CW mode.

In local operation, pressing the PW switch has the same effect as issuing this command remotely.

EXAMPLES"Mode:PRI; Display:Pw" -action: sets the 3811 to constant PRI mode and activates the display to show the pulse width (PW) value.

"Mode:CW; Dis:PW" -action: sets the 3811 to continuous wave mode, but the display changes to show LDI (not PW) because the pulse width value is not used in CW mode.

■ Front Panel
■ Remote

DISplay:PW?

The DISplay:PW? query returns the status of the PW switch.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:

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

;

<response data>

-where a response of 1 means on, and 0 means off<response terminator>

POINTS OF INTERESTThe display will not show the pulse width, even when the switch status is 1 (on), if the 3811 display is disabled.

In local operation, the status of the PW switch is determined by visually inspecting the LED (lit = on).

EXAMPLES"DIS:PW?" -response: 0, means the PW switch is not activated.

"Display:PW?" -response: 1, means the PW switch is activated.

☐ Front Panel
■ Remote

ENABle:

The ENABle: command path is used to get to the 3811's status enable commands.

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

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

☐ Front Panel
■ Remote

ENABle:COND

The ENABle:COND command sets the condition status enable register of the operations for summary (in bit 3 of the status byte) and generation of service requests.

ENABLE COND

SYNTAX DIAGRAM

<white space> <nrf value>

PARAMETERSAn <nrf value> whose sum represents the enabled bits:

1 - Laser Drive Current Limit
2 - Voltage Limit/Open Circuit
4 - N/A
8 - N/A
16 - Interlock Open
32 - KEYLOCK Disabled
64 - N/A
256 - N/A
512 - N/A
1024 - Output On/Off State
2048 - Ready for Calibration Data State
4096 - Calculation Error
8192 - Hardware Error
16384 - Software Error

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

128 - N/A 32768 - N/A

POINTS OF
INTERESTThe enabled or disabled conditions can be read by using the ENABle:COND? query.

The condition status can be monitored by the COND? query. If any of the enabled conditions are true, bit 3 of the status byte register will be set.

The enable registers normally retain their values at power-up (as they were at the last power-down) unless the power-on status clear flag is set true (see *PSC, Chapter 4).

EXAMPLES"ENAB:COND 129" -action: enables the status condition register so that the Voltage Limit/Open Circuit and Laser Drive Current Limit conditions will be summarized in the status byte (bit 3).

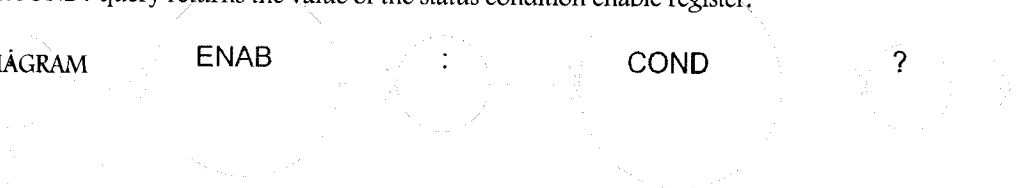
"Enable:Cond #H7C33" -action: enables the status condition register so that any and all of the above conditions will be reported in the status byte register (bit 3).

☐ Front Panel
■ Remote

ENABle:COND?

The ENABle:COND? query returns the value of the status condition enable register.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



-where the response is the sum of the following: <response terminator>

1 - Laser Drive Current Limit 256 - N/A
2 - Voltage Limit/Open Circuit 512 - N/A
4 - N/A 1024 - Output On/Off State
8 - N/A 2048 - Ready for Calibration Data State
16 - Interlock Open 4096 - Calculation Error
32 - KEYLOCK Disabled 8192 - Hardware Error
64 - N/A 16384 - Software Error
128 - N/A 32768 - N/A

POINTS OF
INTERESTThe enabled conditions can be set by using the ENABle:COND command.

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

EXAMPLES"ENAB:COND?" -response: 18, means that the Voltage Limit/Open Circuit and Interlock Open conditions will be reported (in summarized form) to the status byte (bit 3).

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

"Radix Hex; Enable:Cond?" -response: #H2001, means that the Laser Drive Current Limit and Hardware Error conditions will be reported (in summarized form) to the status byte (bit 3).

☐ Front Panel
■ Remote

ENABle:EVEnt

The ENABle:EVEnt command sets the status event enable register of the LAS operations. These events are summarized in bit 2 of the status byte register.

SYNTAX DIAGRAM



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

1 - Laser Drive Current Limit
2 - Voltage Limit/Open Circuit
4 - N/A
8 - N/A
16 - Interlock State Changed
32 - KEYLOCK State Changed
64 - N/A
128 - N/A
256 - N/A
512 - N/A
1024 - Output On/Off State Changed
2048 - Operational for Measure Queries
4096 - Calculation Error
8192 - Hardware Error
16384 - Software Error
32768 - N/A

POINTS OF INTERESTThe enabled events can be read by using the ENABle:EVEnt? query. The Event status can be monitored by the EVEnt? query.

The enable registers normally retain their values at power-up (as they were at the last power-down) unless the power-on status clear flag is set true (see *PSC, Chapter 4).

EXAMPLES"ENAB:EVENT 17" -action: enables the status Event register so that the Laser Drive Current Limit and Interlock State Changed events will be reported (in summarized form) to the status byte (bit 2).

"Enable:Event #H7C33" -action: enables the status Event register so all of the above events will be reported (in summarized form) to the status byte (bit 2).

☐ Front Panel
■ Remote

ENABle:EVEnt?

The ENABle:EVEnt? query returns the value of the status Event enable register.

SYNTAX DIAGRAM



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

PARAMETERSNone. The response will be in the form:

<response data>

-where the response is the sum of the following: <response terminator>

1 - Laser Drive Current Limit	256 - N/A
2 - Voltage Limit/Open Circuit	512 - N/A
4 - N/A	1024 - Output On/Off State Changed
8 - N/A	2048 - Operational for Measure Queries
16 - Interlock State Changed	4096 - Calculation Error
32 - KEYLOCK State Changed	8192 - Hardware Error
64 - N/A	16384 - Software Error
128 - N/A	32768 - N/A

POINTS OF INTERESTThe enabled events can be set by using the ENABle:EVEnt command. The event status can be monitored by the EVEnt? query.

EXAMPLES"ENAB:EVE?" -response: 1040, means that the Output on/off state change and Interlock State Changed events will be reported (in summarized form) to the status byte register (bit 2).

"Radix Hex; Enab:Eve?" -response: #H7C33, means that all of the above events will be reported (in summarized form) to the status byte register (bit 2).

☐ Front Panel
■ Remote

ENABle:OUTOFF

The ENABle:OUTOFF command sets the status outoff enable register for the operations (things which will turn the Laser Drive Current output off). ENAB OUTOFF

SYNTAX DIAGRAM

<white space> <nrf value>

PARAMETERSAn <nrf value> whose sum represents the enabled bits:
1 - Laser Drive Current Limit
(all other bits are N/A)

POINTS OF INTERESTThe enabled Outoff bits can be read by using the ENABle:OUTOFF? query.

The factory default value for this register is 0.

EXAMPLES"ENAB:OUTOFF 1" -action: enables the status Outoff register so that the Laser Drive Current Limit condition will cause the Laser Drive Current output to be turned off.

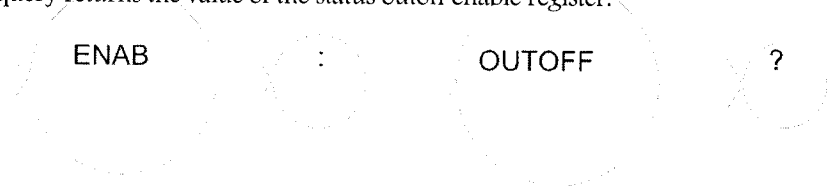
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

☐ Front Panel
■ Remote

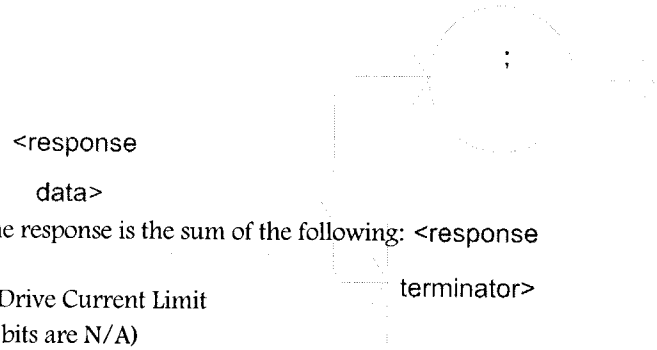
ENABle:OUTOFF?

The ENABle:OUTOFF? query returns the value of the status outoff enable register.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



-where the response is the sum of the following: <response terminator>

1 - Laser Drive Current Limit
(all other bits are N/A)

POINTS OF
INTERESTThe enabled events or conditions which are used to turn the laser drive current output off can be set by using the ENABle:OUTOFF command. The laser drive current output status can be monitored by the OUT? or COND? query.

EXAMPLES"ENAB:OUTOFF?" -response: 0, means that the Laser Drive Current Limit condition will not cause the Laser Drive Current output to be turned off.

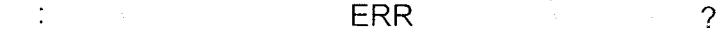
"ENAB:OUTOFF?" -response: 1, means that the Laser Drive Current Limit condition will cause the Laser Drive Current output to be turned off.

☐ Front Panel
■ Remote

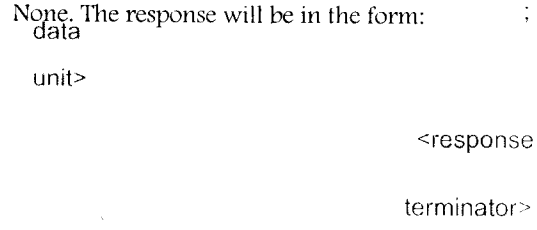
ERRors?

The ERRors? query returns a list of command, execution, and device errors which have occurred since the last ERRors query. These errors are indicated by a number which corresponds to the type of error which occurred. See Appendix A for error code information.

SYNTAX DIAGRAM



PARAMETERS None. The response will be in the form:



where each <response data unit> consists of an error code value.

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

POINTS OF
INTEREST The response data will be a list of the current errors. The errors are represented by numbers and are separated by commas. A response of 0 indicates that no errors were reported. The response data is sent as character data.

EXAMPLES"ERR?" -response: 0, means no errors reported.

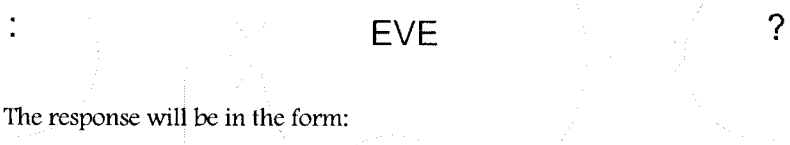
"Errors?" -response: 201, means that the <PROGRAM DATA> (command parameter) value out of range error was reported since the last ERRors? query.

☐ Front Panel
■ Remote

EVEnt?

The EVEnt? query returns the value of the status event register.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



<response data>

-where the response is the sum of the following: <response terminator>

1 - Laser Drive Current Limit	256 - N/A
2 - Voltage Limit/Open Circuit	512 - N/A
4 - N/A	1024 - Output On/Off State Changed
8 - N/A	2048 - Operational for Measure Queries
16 - Interlock State Changed	4096 - Calculation Error
32 - KEYLOCK State Changed	8192 - Hardware Error
64 - N/A	16384 - Software Error
128 - N/A	32768 - N/A

POINTS OF
INTERESTThe events which are summarized in bit 2 of the status byte can be set by using the ENABle:EVEnt command.

Any bits set in the event status are cleared when the event status is read or when the *CLS command is issued, whereas the condition status bits reflect the continually updated state and are not effected by any query.

EXAMPLES"EVE?" -response: 1025, means that the Output On/Off State Changed and Laser Drive Current Limit events occurred since the last EVE? query.

"Radix Hex; Laser:Event?" -response: #H22, means that the KEYLOCK State Changed and Voltage Limit/Open circuit event has occurred since the last EVEnt? query.

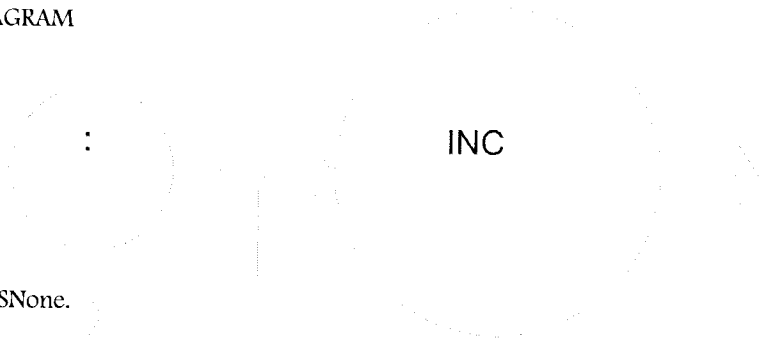
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

☐ Front Panel
■ Remote

INC

The INC command increments the laser diode current set point by one step.

SYNTAX DIAGRAM



PARAMETERSNone.

POINTS OF INTEREST The step size can be edited via the STEP command, its default value is 0.01 mA.

Measurements are not automatically taken with each INC step. Therefore, the user must issue a measurement query to update a measurement value.
The minimum time to complete one increment is about 10 to 20 mSec.

EXAMPLES"STEP 30; INC" -action: The Current set point is incremented by 30.00 mA.

"STEP 3.33; INC" -action: The Current set point is incremented by 3.33 mA.

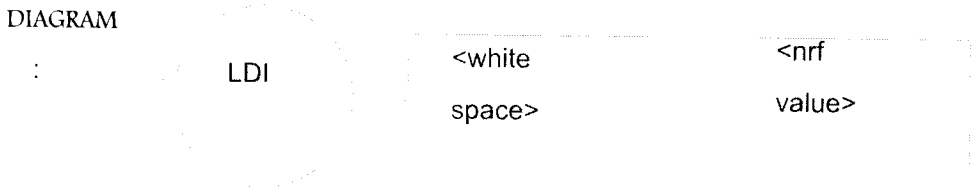
"Step 3; Inc;Inc;Inc" -action: The Current set point is incremented by 3.00 mA, three times. So the Laser Drive Current output is incremented a total of 9.00 mA.

■ Front Panel
■ Remote

LDI

The LDI command sets the Laser Drive Current set point.

SYNTAX DIAGRAM



PARAMETERSAn <nrf value> which represents the Laser Drive Current, in mA.

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

POINTS OF
INTERESTSet point is the same for both low and high Laser Drive Current ranges.

If the 3811 is in CAL:LDI calibration mode, this command is used to enter the measured Laser Diode Current (in mA) to calibrate the Laser Diode Current measurement.

In remote mode the resolution is 0.01 mA.

EXAMPLES"LDI 40" -action: sets the Laser Drive Current to 40.00 mA.

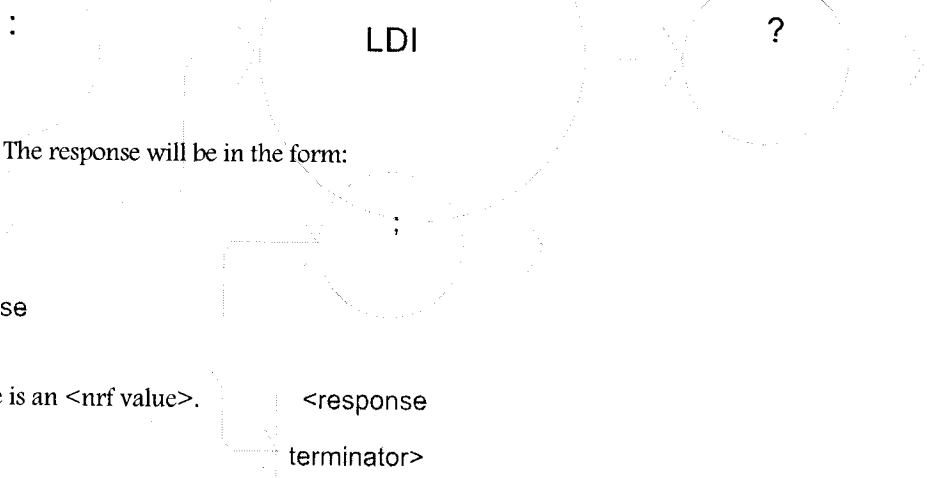
"ldi 100.0" -action: sets the Laser Drive Current to 100.00 mA.

■ Front Panel
■ Remote

LDI?

The LDI? query returns the value of the measured Laser Drive Current.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:

-where the response is an <nrf value>.

POINTS OF
INTERESTResponse is the measured Laser Drive Current output current, for either low or high Laser Drive Current ranges.

In remote mode the resolution is 0.01 mA.

EXAMPLES"ldi?" -response: 30.0, means the measured Laser Drive Current is 30.00 mA.

■ Front Panel
■ Remote

LIMit:

The LIMit: command path is used to get to the 3811's limit commands and queries.

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

LIMit:I200
LIMit:I200?
LIMit:I500
LIMit:I500?

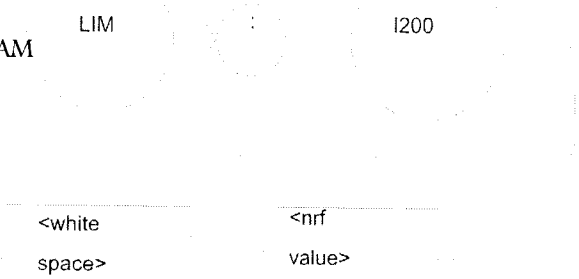
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ Front Panel
■ Remote

LIMit:I200

The LIMit:I200 command sets the Laser Drive Current limit value for the 200 mA range.

SYNTAX DIAGRAM



PARAMETERSAn <nrf value> which represents the 200 mA range limit current, in mA.

POINTS OF INTERESTThe Laser Drive Current limit is in effect in all modes of operation of the laser output, while in the 200 mA range.

The LIM I200 limit may be edited while operating the 3811 in either output range.

EXAMPLES"LIM:I200 50" -action: the Laser Drive Current limit, for the 200 mA output range, is set to 50.0 mA.

":Limit:I200 60" -action: the Laser Drive Current limit, for the 200 mA range, is set to 60.0 mA.

■ Front Panel
■ Remote

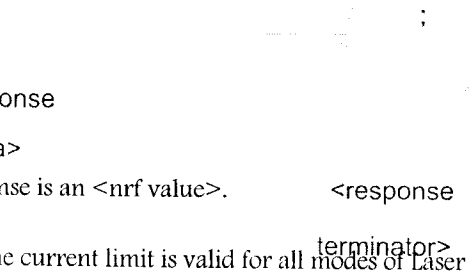
LIMit:I200?

The LIMit:I200? query returns the value of the Laser Drive Current limit for the 200 mA range.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



-where the response is an <nrf value>.

POINTS OF INTEREST The current limit is valid for all modes of Laser operation, while in the 200 mA range.

EXAMPLES"LIM:I200?" -response: 40.0, means the Current limit is 40.0 mA.

"lim:I200?" -response: 50.0, means the Current limit is 50.0 mA.

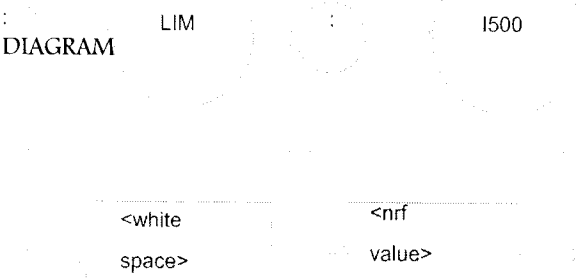
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ Front Panel
■ Remote

LIMit:I500

The LIMit:I500 command sets the laser drive current limit value for the 500 mA range.

SYNTAX DIAGRAM



PARAMETERSAn <nrf value> which represents the 500 mA range limit current, in mA.

POINTS OF INTERESTThe current limit is in effect in all modes of operation of the laser output, while in the 500 mA range.

The LIM I500 limit may be edited while operating the 3811 in either output range.

EXAMPLES"LIM:I500 50" -action: the Laser Drive Current limit, for the 500 mA output range, is set to 50.0 mA.

"Limit:I500 400" -action: the Laser Drive Current limit, for the 500 mA range, is set to 400.0 mA.

■ Front Panel
■ Remote

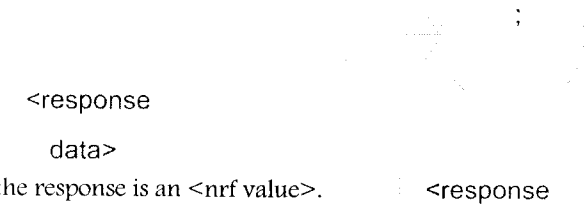
LIMit:I500?

The LIMit:I500? query returns the value of the laser drive current limit for the 500 mA range.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



-where the response is an <nrf value>.

POINTS OF INTEREST The laser drive current limit is valid for all modes of Laser operation, while in the 500 mA range.

EXAMPLES"LIM:I500?" -response: 40.0, means the Current Limit is 40.0 mA.

"LIM:I500?" -response: 500.0, means the Current Limit is 500.0 mA.

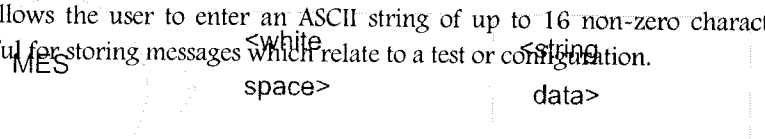
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

☐ Front Panel
■ Remote

MESSage

The MESsage command allows the user to enter an ASCII string of up to 16 non-zero characters. This command may be useful for storing messages which relate to a test or configuration.

SYNTAX DIAGRAM



PARAMETERS An ASCII string which is 1 - 16 bytes in length.

POINTS OF INTEREST The message may contain any ASCII character, but will be terminated when a NULL terminator character is received. If the message has less than 16 bytes, the software will fill the remaining message space with the space character. After 16 bytes have been entered, the software will null-terminate the string.

EXAMPLESMESSAGE "This is a test." -action: The string, "This is a test. " will be stored in non-volatile memory.

Mes "Test 3" -action: The string, "Test 3 " will be stored in non-volatile memory.

☐ Front Panel
■ Remote

MESSage?

The MESsage? query returns the previously stored message. This message will always be 16 bytes long and enclosed in quotes. The message is entered via the MESsage command.

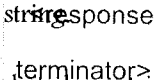
SYNTAX DIAGRAM:



PARAMETERS None. The response will be in the form:



-where the <response data> is a 16-byte long string.



POINTS OF INTEREST The response data will be a 16-byte long string. If there is no previously stored message, the response will be " ", all spaces.

EXAMPLES"MES?" -response: "Test 3 ", means the previously stored message was "Test 3".

"Message?" response: "This is a test. ", means the previously stored message was "This is a test."

■ Front Panel

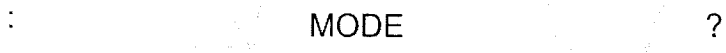
MODE?

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

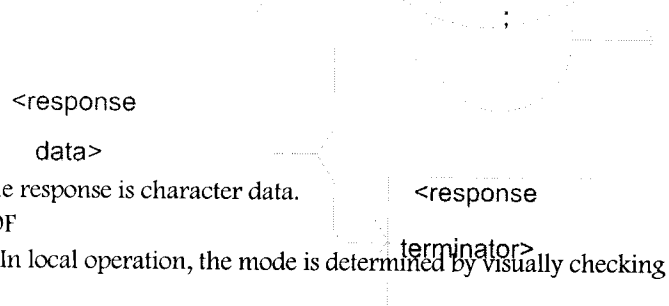
■ Remote

The MODE? query returns the selected laser control mode.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



-where the response is character data.

POINTS OF INTERESTIn local operation, the mode is determined by visually checking the MODE indicators.

EXAMPLES"MODE?" -response: CW, means that Continuous Wave mode is in effect for the Laser Drive Current output.

"Mode?" -response: CDC, means that (CONST %) Constant Duty Cycle (pulsed) mode is in effect for the Laser Drive Current output.

"Mode?" -response: EXT, means that External Trigger (pulsed) mode is in effect for the Laser Drive Current output.

"MOde?" -response: PRI, means that (CONST PRI) Constant Pulse Repetition Interval (pulsed) mode is in effect for the Laser Drive Current output.

■ Front Panel

■ Remote

MODE:

The MODE: command path is used to get to the 3811's laser mode selection commands.

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

MODE:CDC
MODE:CW
MODE:EXT
MODE:PRI

■ Front Panel

■ Remote

MODE:CDC

The MODE:CDC command selects laser (CONST %) constant duty cycle (pulsed) mode.

SYNTAX DIAGRAM



PARAMETERSNone.

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

POINTS OF
INTERESTThis command has the same effect as selecting CONST % mode on the 3811 front panel.

In this mode, when the pulse width (PW) is edited, the pulse repetition interval is automatically adjusted to match the desired duty cycle percentage. However, if the pulse width is such that the desired duty cycle cannot be achieved (due to the resolution of the pulse on/off times) the duty cycle set point will be changed automatically.

EXAMPLES"mode:cdc" -action: enables the laser constant duty cycle (pulsed) mode.

"Mode:CDC" -action: enables the laser constant duty cycle (pulsed) mode.

■ Front Panel
■ Remote

MODE:CW

The MODE:CW command selects Continuous Wave mode.

SYNTAX DIAGRAM



PARAMETERSNone.

POINTS OF
INTERESTThis command has the same effect as selecting CW mode on the 3811 front panel.

In this mode, the pulse circuit is turned off.

EXAMPLES"mode:cw" -action: enables the (CW) Continuous Wave (for laser drive current) mode.

■ Front Panel
■ Remote

MODE:EXT

The MODE:EXT command selects External Trigger (pulsed) mode.

SYNTAX DIAGRAM



PARAMETERSNone.

POINTS OF
INTERESTThis command has the same effect as selecting EXT TRIG mode on the 3811 front panel.

In this mode, the laser drive current output pulse is fired whenever a TTL level input signal is received via the TRIGGER IN (BNC) connector on the 3811 back panel.

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

EXAMPLES"mode:ext" -action: enables the External Trigger (pulsed) mode.

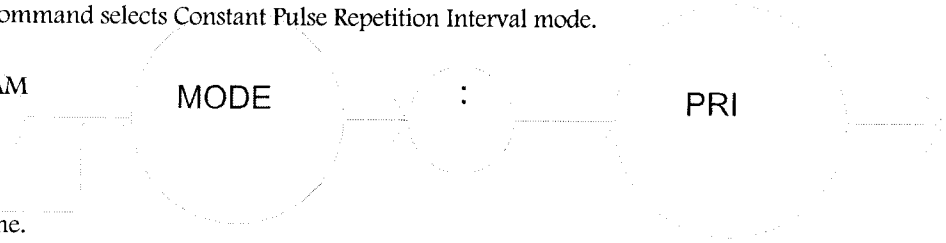
"Mode:EXT" -action: enables the External Trigger (pulsed) mode.

■ Front Panel
■ Remote

MODE:PRI

The MODE:PRI command selects Constant Pulse Repetition Interval mode.

SYNTAX DIAGRAM



PARAMETERSNone.

POINTS OF
INTEREST This command has the same effect as selecting CONST PRI mode on the 3811 front panel.

In this mode, the laser drive current Pulse Repetition Interval is constant. However, the PRI value cannot be set less than the PW value.

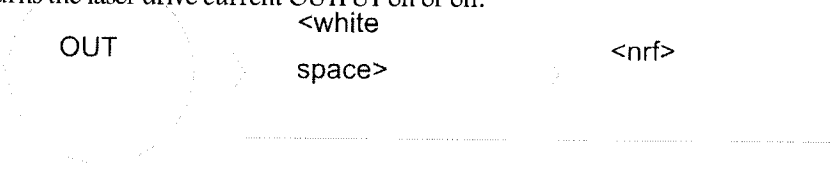
EXAMPLES"MODE:PRI" -action: sets the Laser Drive Current output for Constant Pulse Repetition Interval (pulsed) mode.

■ Front Panel
■ Remote

OUTput

The OUTput command turns the laser drive current OUTPUT on or off.

SYNTAX DIAGRAM



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

POINTS OF
INTERESTAfter the OUTPUT is turned on, it is useful to wait until the output is stable before performing further operations (see the DELAY command). The 2 second delay and slow-start circuit in the 3811 requires about 2.5 seconds before the OUTPUT settles (within specification) to a non-zero set point value.

When the Laser Drive Current output is off, it is safe to connect or disconnect devices to the OUTPUT terminals.

EXAMPLES"LDI 20; OUT ON" -action: sets the Laser Drive Current to 20.0 mA and then turns the OUTPUT on.

"Out 0" -action: turns the Laser Drive Current OUTPUT off.

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

■ Front Panel
■ Remote

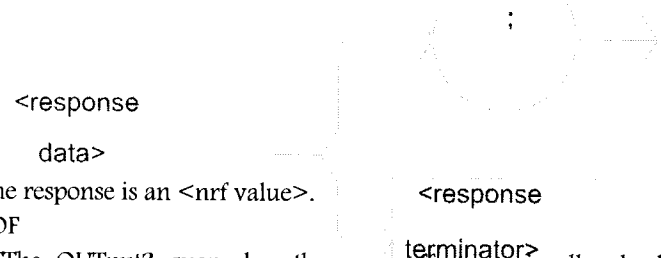
OUTput?

The OUTput? query returns the status of the Laser Drive Current OUTPUT.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



-where the response is an <nrf value>.

POINTS OF INTERESTThe OUTput? query has the same effect as visually checking the front panel OUTPUT ON indicator. The OUTPUT current may not be activated, even though the response is 1, due to the 2 second OUTPUT on delay.

EXAMPLES"OUT?" -response: 0, means that the Current OUTPUT is "off".

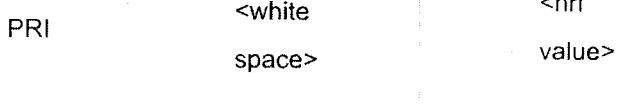
"OUT?" -response: 1, means that the Current OUTPUT switch is "on".

■ Front Panel
■ Remote

PRI

The PRI command is used to set the value of the Pulse Repetition Interval, in uSec, for use in constant PRI mode.

SYNTAX DIAGRAM



PARAMETERSAn <nrf value> which represents the pulse repetition interval, in uSec.

POINTS OF INTERESTThis value may be set remotely only while in constant PRI mode. In all other modes the value is ignored, but no error is generated.

In local operation, this parameter can only be set while operating in constant PRI mode.

The set PRI value is limited to be greater or equal to the present PW value. If a value for PRI is entered which is less than the present PW value, it will be automatically adjusted to equal PW.

The range of values of PRI is 1.0 - 6500.0 uSec.

EXAMPLES"PRI 400" -action: The PRI is set to 400.0 uSec.

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

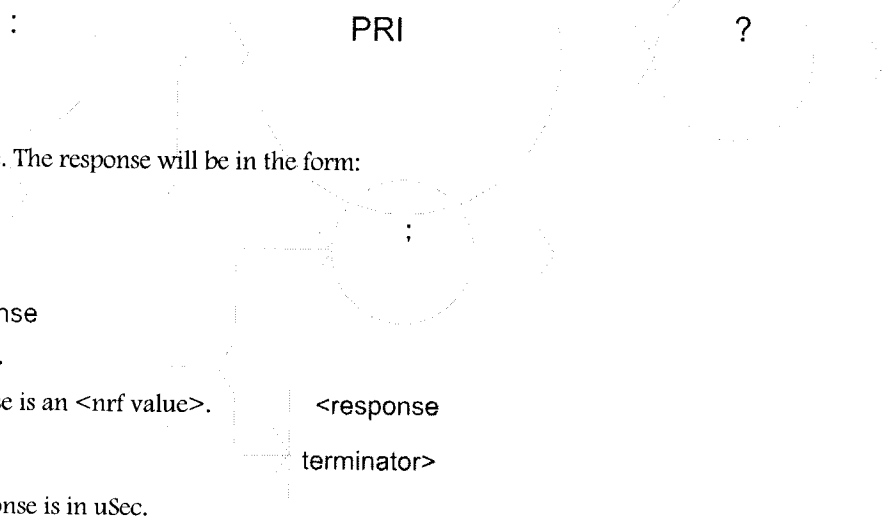
"PW 200; PRI 100" -action: The pulse width is set to 200.0 uSec, then the PRI is set to 200.0 uSec (since it cannot be less than PW).

☐ Front Panel
■ Remote

PRI?

The PRI? query returns the value of the actual pulse repetition interval, in uSec.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:

-where the response is an <nrf value>.

POINTS OF INTERESTThe response is in uSec.

The actual PRI value is not valid when in external trigger mode.

The actual PRI value is usually different than the SET:PRI value, unless the 3811 is in constant PRI mode.

EXAMPLES"pri?" -response: 90.6 means the actual pulse repetition interval is 90.6 uSec.

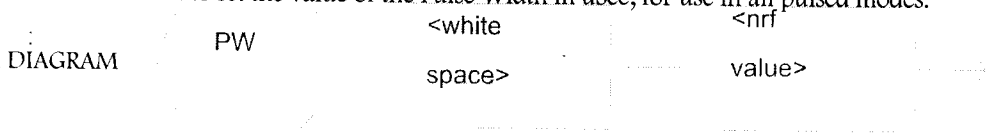
"PRI?" -response: 120.2 means the actual pulse repetition interval is 120.2 uSec.

■ Front Panel
■ Remote

PW

The PW command is used to set the value of the Pulse Width in uSec, for use in all pulsed modes.

SYNTAX DIAGRAM



PARAMETERSAn <nrf value> which represents the pulse width, in uSec.

POINTS OF INTERESTIn local operation, this parameter can not be set while operating in CW mode.

The PW value is limited to be less than or equal to the present PRI value. If a value of PW is entered which is greater than the present PRI value, it will be automatically adjusted to equal PRI.

Editing the PW value may change the constant duty cycle percentage (due to the resolution of the pulse

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

width and pulse repetition interval parameters).

The range of values of PW is 0.1 - 6500.0 uSec.

EXAMPLES"PW 400" -action: The PW is set to 400.0 uSec.

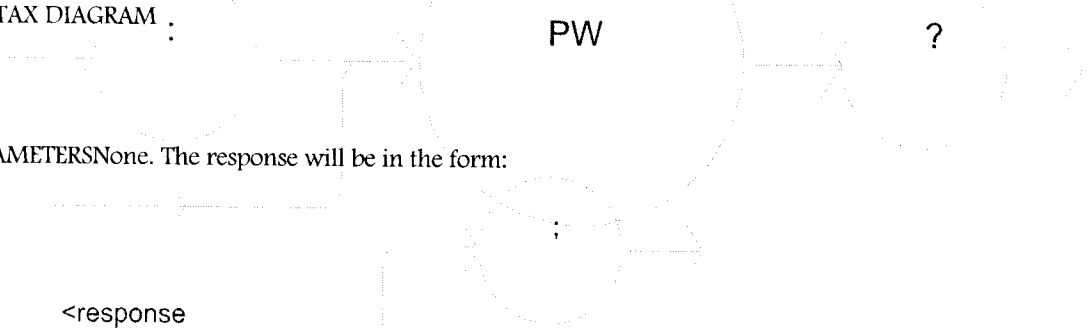
"MODE:PRI; PRI 200; PW 400" -action: PRI mode is selected. The pulse repetition interval is set to 200.0 uSec, then the PW is also set to 200.0 uSec (since it cannot be greater than the actual PRI).

■ Front Panel
■ Remote

PW?

The PW? query returns the value of the pulse width, in uSec.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:

-where the response is an <nrf value>.

POINTS OF INTERESTThe response is in uSec.

The pulse width is limited to be less than or equal to the present (actual) PRI value.

EXAMPLES"pw?" -response: 90.6 means the pulse width is 90.6 uSec.

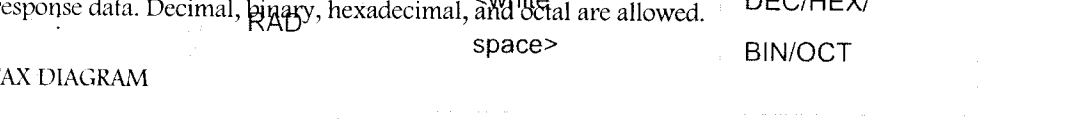
"PW?" -response: 1200.9 means the pulse width 1200.9 uSec.

☐ Front Panel
■ Remote

RADix

The RADix command allows the programmer to select the radix type for status, condition, and event query response data. Decimal, binary, hexadecimal, and octal are allowed.

SYNTAX DIAGRAM



PARAMETERS Character program data is expected, as shown above.

POINTS OF INTEREST DECimal is the default type. Only the first three letters of the words decimal, hexadecimal, binary, or octal are required.

When the RADIX is selected, all status, condition, and event queries will return values in the new radix.

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

In the cases where the radix is not DECimal, the flexible numeric type <nrf value> (as shown in the Command Reference diagrams) will be replaced by HEX, BIN, or OCT representation.

All of the above radixes may be used to enter program data at any time, without the need for issuing the RADix command. The proper prefix must also be used with Hex (#H), binary (#B), or octal (#O).

This command may be useful for setting up status reporting blocks. The bit-wise status representation may be more easily read in BIN, or HEX.

EXAMPLES "RAD dec" -action: the decimal radix is selected.

"rad hex; *ESR?" -action: the hexadecimal radix is selected; -response: #H80, means power-on was detected.

"RADIX BIN" -action: the binary radix is selected.

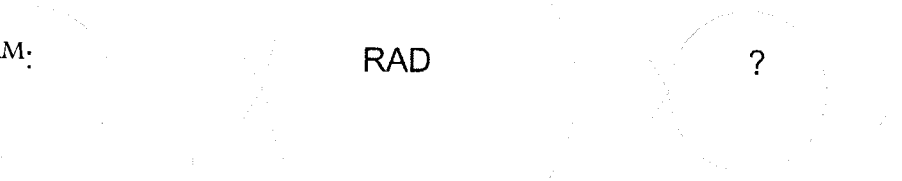
"rad octal" -action: the octal radix is selected.

☐ Front Panel
■ Remote

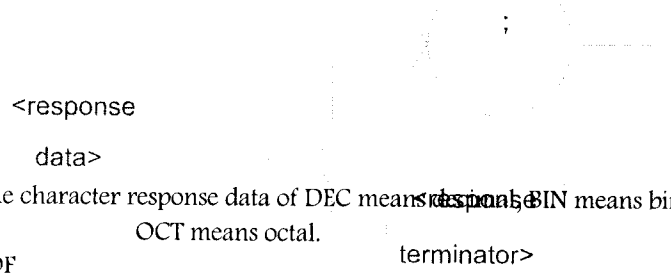
RADix?

The RADix? query allows the programmer to determine which radix type for status, condition, and event query response data is currently selected. Decimal, binary, octal, and hexadecimal are allowed.

SYNTAX DIAGRAM:



PARAMETERSNone. The response will be in the form:



-where the character response data of DEC means decimal, BIN means binary, HEX means hexadecimal, and OCT means octal.

POINTS OF INTEREST DEC is the default type. The 3811 defaults to this radix at power-up.

The RADix command is used to select the desired radix. Once it is changed, the new radix will remain in effect until the power is shut off or a new RADix command is issued.

EXAMPLES"RAD?" -response: Dec, means the selected radix is decimal.

"rad?" -response: Hex, means the selected radix is hexadecimal.

"RADIX?" -response: Oct, means the selected radix is octal.

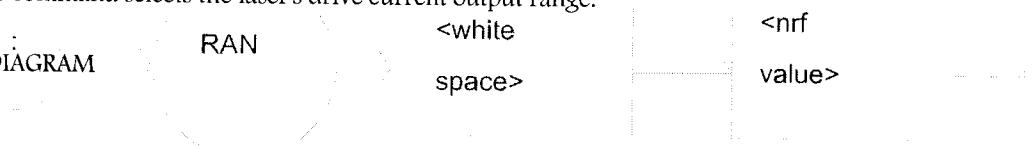
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ Front Panel
■ Remote

RANge

The RANge command selects the laser's drive current output range.

SYNTAX DIAGRAM



PARAMETERSAn <nrf value>; 200 = 200 mA, 500 = 500 mA range.

POINTS OF INTERESTThis range setting effects the Laser Drive Current OUTPUT range only.

The Laser Drive Current OUTPUT should be "off" when this command is issued. If the Laser Drive Current OUTPUT is "on" when this command is parsed, the 3811 will generate error #515, and the range will not be changed.

EXAMPLES"RAN 200" -action: sets the laser drive current range to 200 mA.

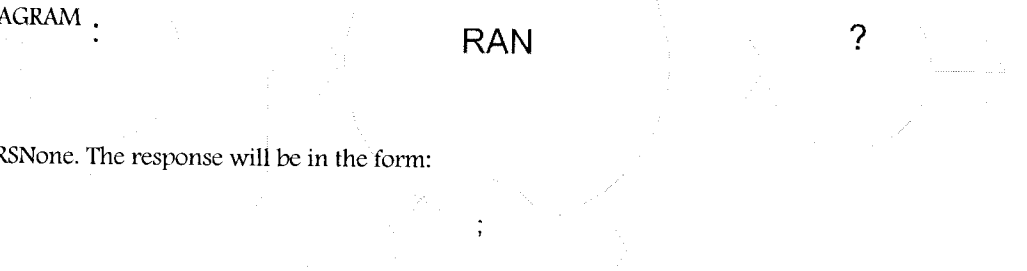
"Laser:Range 500" -action: sets the laser drive current range to 500 mA.

■ Front Panel
■ Remote

RANge?

The RANge? query returns the value of the Laser Drive Current range.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:

-where the response is an <nrf value>; 200 means 200 mA, and 500 means 500 mA range.

POINTS OF INTERESTThe resolution and accuracy of the laser limit current are dependent on the Laser Drive Current range.

EXAMPLES"RAN?" -response: 200, means the Laser Drive Current output current range is 200 mA.

":Range?" -response: 500, means the Laser Drive Current output current range is 500 mA.

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

☐ Front Panel
■ Remote

SECURE

The SECURE command allows the service technician access to the protected user data command, *PUD, which is a common command. This data is normally changed only at the factory, and therefore the SECURE command is not needed by the user.

■ Front Panel
■ Remote

SET:

The SET: command path is used to get to the 3811's laser set point queries.

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

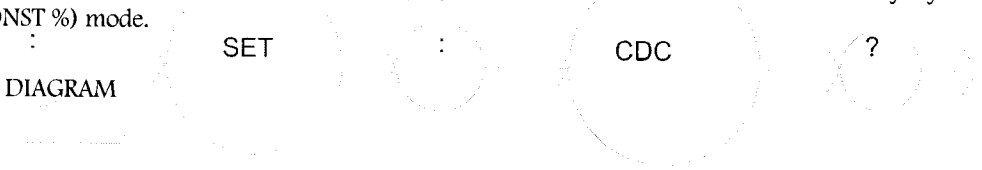
SET:CDC?
SET:LDI?
SET:PRI?

■ Front Panel
■ Remote

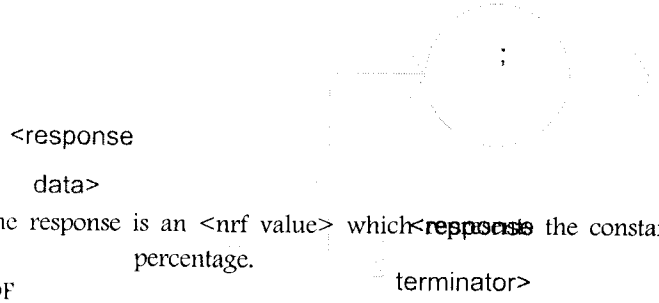
SET:CDC?

The SET:CDC? query returns the constant duty cycle value which is used in Constant Duty Cycle Percent (CONST %) mode.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



-where the response is an <nrf value> which the constant duty cycle set point value, as a percentage.

POINTS OF INTEREST The set point value does not change when the Laser Drive Current output mode is changed.

The actual duty cycle percentage may vary from the set point. If a (set point) value of CDC is entered which is not valid (due to the present PW and the limitation of CDC based on the resolution of PW and PRI), the CDC value will automatically be adjusted to the closest valid value. For more information, see the CDC command.

EXAMPLES"SET:CDC?" -response: 50.0, means the constant duty cycle set point is 50.00%.

"set:cdc?" -response: 12.01 means the constant duty cycle set point is 12.01%.

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

■ Front Panel
■ Remote

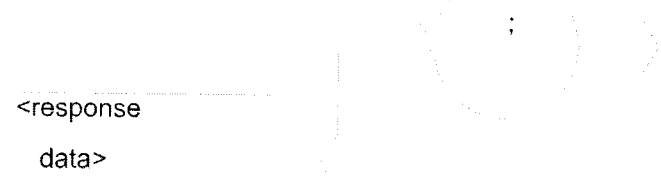
SET:LDI?

The SET:LDI? query returns the laser drive current set point value which is used for both output ranges.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



-where the response is an <nrf value> which represents the Laser Drive Current set point value, in mA.

POINTS OF INTEREST The set point value does not change when the Laser Drive Current range is changed, unless it is over the limit for the new range. In that case, it would be changed to the limit value of the selected range.

EXAMPLES"SET:LDI?" -response: 50.0, means the Laser Drive Current set point value is 50.00 mA.

"set:Ldi" -response: 120.0 means the Laser Drive Current set point value is 120.00 mA.

■ Front Panel
■ Remote

SET:PRI?

The SET:PRI? query returns the Constant Pulse Repetition Interval set point value which is used in CONST PRI mode.

SYNTAX DIAGRAM



PARAMETERSNone. The response will be in the form:



-where the response is an <nrf value> which represents the constant pulse repetition interval set point value, in uSec.

POINTS OF INTEREST The set point value does not change when the Laser Drive Current output mode is changed.

EXAMPLES"SET:PRI?" -response: 50.0, means the PRI set point (for constant PRI mode) is 50.0 uSec.

"set:pri?" response: 120.3 means the PRI set point (for constant PRI mode) is 120.3 uSec.

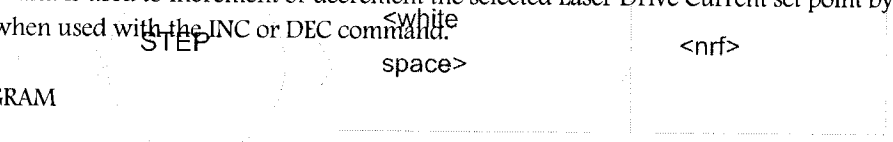
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

☐ Front Panel
■ Remote

STEP

The STEP command is used to increment or decrement the selected Laser Drive Current set point by the given amount, when used with the INC or DEC command.

SYNTAX DIAGRAM



PARAMETERSA value of the step amount, in the range 0.01 to 99.99 (mA).

POINTS OF INTERESTThe step of 1 corresponds to 1.00 mA.

EXAMPLES"ldi 20; Step 1; Inc; set:ldi?" -action: sets the step to 1.0 mA, so the set:ldi? query will return a value of 21.00 mA.

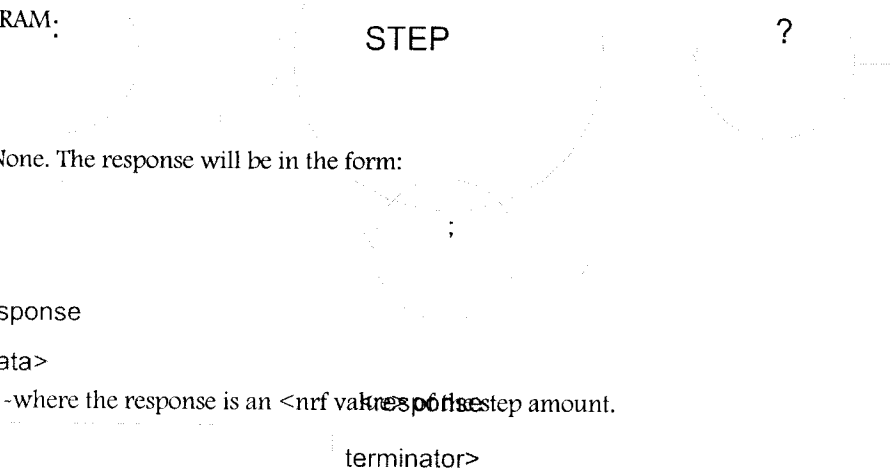
"STEP 10" -action: sets the step size to 10.00 mA.

☐ Front Panel
■ Remote

STEP?

The STEP? query is used to read back the STEP value. This value is used to increment or decrement the Laser Drive Current set point by the given amount, when used with the INC or DEC command.

SYNTAX DIAGRAM:



PARAMETERSNone. The response will be in the form:

-where the response is an <nrf value> of the step amount.

POINTS OF INTERESTThe step of 0.01 corresponds to a step of 0.01 mA. A step of 99.9 means 99.90 mA.

EXAMPLES"Step?" -response: 1.0 means the step size is 1.00 mA.

"STEP?" -response: 1E-01 means the step size is 0.10 mA.

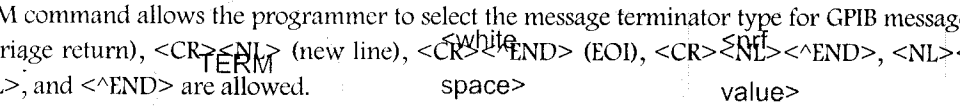
☐ Front Panel
■ Remote

TERM

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

The TERM command allows the programmer to select the message terminator type for GPIB messages. <CR> (carriage return), <CR><NL> (new line), <CR><^END> (EOI), <CR><NL><^END>, <NL><^END>, <NL>, and <^END> are allowed.

SYNTAX DIAGRAM



PARAMETERSAn <nrf value>, where 0 = <CR><NL><^END>, 1 = <CR><NL>, 2 = <CR><^END>, 3 = <CR>, 4 = <NL><^END>, 5 = <NL>, and 6 = <^END>.

POINTS OF INTEREST

<CR><NL><^END> (0) is the default type. This is not truly the IEEE-488.2 specification. However, the <CR> character is ignored as <white space> by the IEEE-488.2 specification, so this terminator may be used with other IEEE-488.2 compliant instruments. (The <CR> has been left in our default terminator due to its historical usage).

Setting the terminator to anything other than number 4, <NL><^END> puts the 3811 out of compliance with the IEEE-488.2 specification. However, the other options are given here to allow compatibility with GPIB drivers which do not meet IEEE-488.2 specification.

Use of terminator number 3 is especially risky with other devices which comply with IEEE-488.2 specification. This is because the <CR> character is ignored, treated as <white space>. Therefore, if number 3 terminator is used, other IEEE-488.2 devices may wait indefinitely for message termination and "hang up" the GPIB.

EXAMPLES"TERM 5" -action: the <NL> (new line) terminator is selected. The 9072 will terminate a message with the <NL> character.

"Term 4" -action: the <NL> (new line) <^END> (EOI) terminator is selected. The 9072 will terminate a message with the <NL><^END> characters, in succession, and in that order.

☐ Front Panel

■ Remote

TERM?

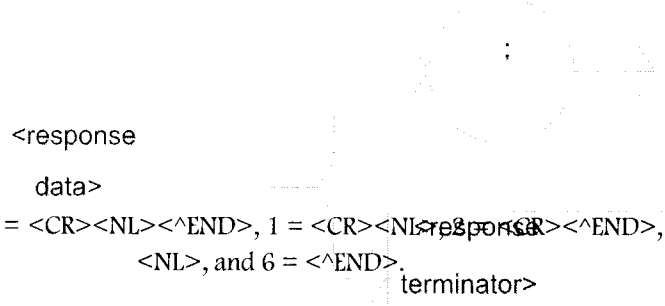
The TERM? query allows the programmer to determine which program message terminator is currently selected. <CR> (carriage return), <CR><NL> (new line), <CR><^END> (EOI), <CR><NL><^END>, <NL><^END>, <NL>, and <^END> are allowed.

SYNTAX DIAGRAM



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

PARAMETERSNone. The response will be in the form:



POINTS OF INTEREST <CR><NL><^END> (number 0) is the default type.

Use of any terminator, other than number 4, removes the 3811 from strict compliance with IEEE488.2 standards.

Although the <CR> is recognized as <white space> by the IEEE-488.2 standard, it is used as a possible terminator in order to be compatible with GPIB products which do not meet IEEE-488.2 specification.

EXAMPLES"Term?" -response: 0, means the selected program message terminator is the <CR><NL><^END> characters, in succession, in that order.

"TERM?" -response: 2, means the selected program message terminator is the <CR><^END> characters, in succession, and in that order.

☐ Front Panel

■ Remote

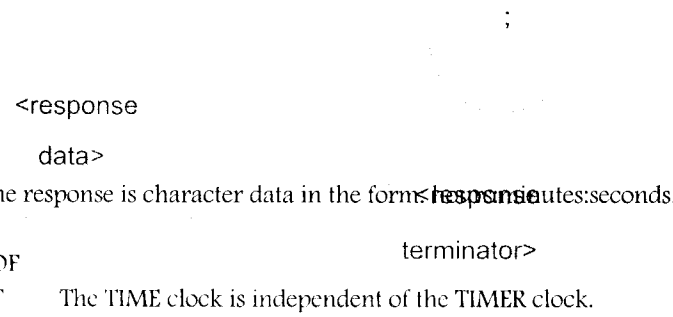
TIME?

The TIME? query allows the programmer to determine how much time has passed since the 3811 was last powered up.

SYNTAX DIAGRAM:



PARAMETERSNone. The response will be in the form:



POINTS OF INTEREST The TIME clock is independent of the TIMER clock.

The clock "turns over" after about 1193 hours.

EXAMPLES"Time?" response: 0:01:02.36, means that 1 minute and 2.36 seconds have passed since the

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

3811 was powered up.

"TIME?" -response: 0:32:00.76, means that 32 minutes and 0.76 seconds have passed since the 3811 was powered up.

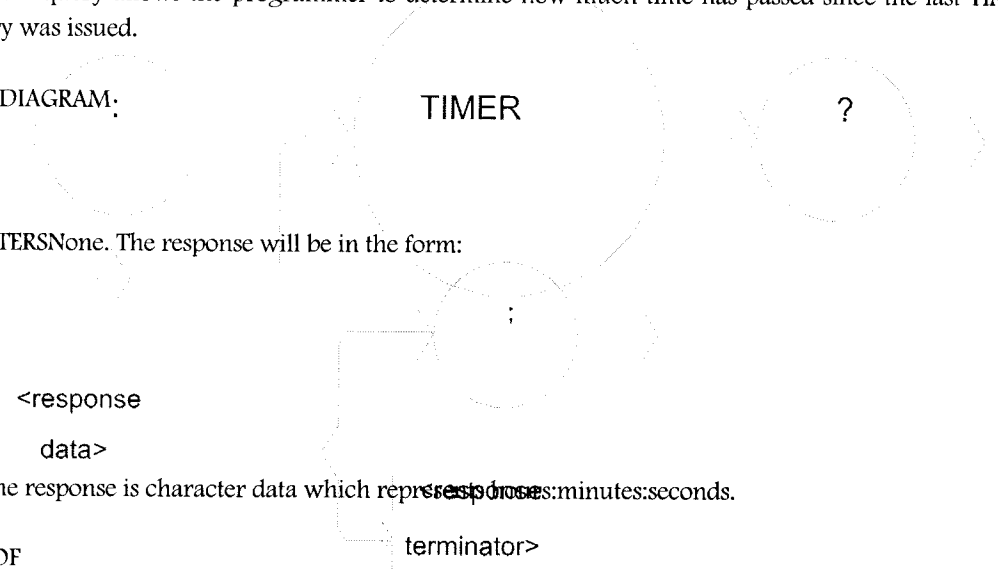
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

☐ Front Panel
■ Remote

TIMER?

The TIMER? query allows the programmer to determine how much time has passed since the last TIMER? query was issued.

SYNTAX DIAGRAM:



PARAMETERSNone. The response will be in the form:

-where the response is character data which represents hours:minutes:seconds.

POINTS OF INTEREST Each time the TIMER? query is issued, the timer is reset to 0 and the elapsed time since the last TIMER? query is returned.

The timer counter is initially set at power-up, the same as the TIME? counter. So the first time the TIMER? is issued its response will be the same as if a TIME? query's response.

The clock "turns over" after about 1193 hours.

EXAMPLES"Timer?" -response: 0:02:00.31, means the 3811 has been on for 2 minutes and 0.31 seconds since the last TIMER? query was issued.

"TIMER?" -response: 0:00:12.03, means the 3811 has been on for 12.03 seconds since the last TIMER? query was issued.

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

3.5 Error Messages

Error messages may appear on the display when error conditions occur in the 3811.

In remote operation, the current error list can be read by issuing the "ERR?" query. When this is done, a string will be returned containing the previously unread error messages (up to ten) which are currently in the error message queue.

Appendix A contains an explanation of the error messages which may be reported by the 3811 on the display or via remote operation.

3.6 3811 Programming Examples

This section is intended as a simple example of programming the 3811 over the GPIB. The first short examples contain sections of a BASIC program. These examples are not complete programs, and therefore cannot be used by themselves. However, they illustrate the simplicity of programming the 3811, and show some possible uses of its features. The initialization of variable and files has been omitted for simplicity.

The following BASIC programming example, Example Program 3.1, exercises the constant duty cycle mode of the 3811, and it demonstrates the DELAY, and STEP commands. This example assumes the use of a subroutine for "talking to" the 3811 over the GPIB.

```
210 CMD$ = "Mode:CDC;PW 2;CDC 5" : GOSUB 1000          'Set CDC mode, PW 2 uSec, duty cycle 5%
220 CMD$ = "Step 1" : GOSUB 1000                       '1.00 mA step
230 CMD$ = "LDI 40; Output ON" : GOSUB 1000                    'Start laser current at 40.00 mA
240 FOR X=1 TO 10                                              'Step laser current from 40 to 50 mA
250   CMD$ = "Delay 2000; Inc" : GOSUB 1000                    'Wait 2 seconds between each step
260 NEXT X                                                             'and increment LDI by 1.00 mA
```

Figure 3.3 Step and Delay Example Program

The following BASIC programming example, Example Program 3.2, demonstrates the use of the PW, CDC and SET:CDC? commands. This program example assumes the use of a subroutine for talking to the 3811 over the GPIB.

```
300 CMD$ = "Mode:CDC; PW 50" : GOSUB 1000      'Set CDC mode, pulse width 50.0 uSec
310 CMD$ = "Output OFF" : GOSUB 1000           'Output off
320 CMD$ = "Ran 200; Lim:I200 100" : GOSUB 1000    'Set output range to 200 mA, limit to 100 mA
330 CMD$ = "Output ON" : GOSUB 1000            'Turn output on
340 CMD$ = "CDC .05"                                   'Set duty cycle to 0.05%
350 CMD$ = "SET:CDC?" : GOSUB 1000                     'Check the set point to see if it is changed
360 INPUT#2,PS                                         'Input the set point
370 PRINT P$                                           'Print the actual set point to the screen
```

Figure 3.4 Constant Duty Cycle Example Program

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

Chapter 4

GPIB/IEEE-488.2 REMOTE OPERATION

4.1 Introduction

When the model 1231 GPIB/IEEE-488.2 interface is installed and the instrument is connected to a host computer, the LDP-3811 can be used as a remotely controlled laser diode pulsed current source.

In remote operating mode, the 3811 offers all of the features accessible from the front panel and some additional features which can only be accessed via the interface bus. In remote mode you have access to commands for functions not found on the front panel. Additional functions include the STEP command (which automatically increments or decrements the laser drive current set point by a user-defined step value), 5-digit resolution of laser diode current values, and control of the conditions which cause the OUTPUT to be shut off.

The model 1231 GPIB/IEEE-488.2 interface allows GPIB/IEEE-488.2 bus control of the LDP-3811. Information can also be read by the host computer and printed or stored. Other features include:

* A concise and straight-forward command set
* Full talk/listen capability
* Full serial poll capability, with SRQ
* Full local/remote capability including LOCAL LOCKOUT
* Meets ANSI/IEEE-488.2-1987 standards

This chapter is a guide to the syntax and usage of the various IEEE/488.2 common commands available for the 3811. It also includes advanced programming tips for remote use with the device-dependent commands, hardware diagrams, and other information relating to remote operation.

This chapter is divided into three parts. The first part has the information for using the GPIB with the 3811. It also has sections for each common GPIB (ANSI/IEEE-488.2) command which is supported by the 3811. The second part contains information on advanced programming techniques and status reporting.

The third part contains information on remote interface messages; these low-level messages are generally transparent to the user.

4.1.1 Preparation for Bus Control

To use the LDP-3811 remotely, you will need to install an IEEE-488 interface adapter in your host computer. These adapters and support software are available from several manufacturers and can be installed in most computers. This manual assumes that you have a basic knowledge of the GPIB/IEEE-488 interface bus and how to use it for instrument control. This chapter also assumes that you are familiar with the controls on the LDP-3811. Review Chapter 2 if you need more details on how to operate the LDP-3811.

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

The talk and listen addresses on the 3811 are identical. This GPIB address is read locally by pressing the LOCAL/ADR switch and reading the display. To set the GPIB address, press and hold in the SET switch while displaying the GPIB address. Turn the ADJUST knob until the desired address value is displayed, then release the SET switch. The new GPIB address will then be stored in non-volatile memory. The allowable address range is 0 - 30 for primary GPIB addressing. It is not normally possible to exceed this range. However, if the GPIB address were to somehow exceed 30, it would not "hang up" the bus. Extended GPIB addressing is not implemented on the 3811.

4.2 Getting Started with GPIB

This section is intended as a quick guide to the GPIB syntax and commands used by the 3811. The 3811's unique (device-dependent) commands are described in Chapter 3.

4.2.1 Overview of the 3811 Syntax

Generally, a command or query is entered (spelled) as shown in Table 3.1. The command/query MUST CONTAIN all of the letters which are shown in upper case in Figure 3.2 and Table 3.1. However, the 3811's command parser is NOT CASE SENSITIVE so upper or lower case may be used in any combination. The lower case letters shown with the commands in Section 3.4 are optional letters, and may be used for clarity. For example, the following commands are equal, and only the first three letters "DIS" are required, while the other letters, "play" are optional,

"DIS 1", "DISPLAY 1", and "DisP 1".

The syntax of the 3811 commands follows the rules laid out in the IEEE-488.2 standard. Colons (:) indicate the start of a new command path, while semicolons (;) indicate a separation of commands within a command string. A leading semicolon on a command may be used to return the 3811 command parser to the command path root (see Figure 3.2).

Spaces or white space (see Section 4.6.2 for a definition of white space) may be placed anywhere in a command string (after the command header or query question mark), and a single space must be used to separate the command (header) from the first parameter (or program data). The following examples show valid syntax for commands with the 3811:

"MODE:CDC; Pw 1.0; CDC 25; Ldi 50; OUT 1"
":DIS 1; :set:ldi?;
"limit:i200 40"
"display:ldi"

The following are examples of invalid syntax for the 3811. These command strings would produce an erroneous result, as explained:

"MODE CDC" -Missing colon, MODE? expected
"MODE:CDC;CDC 25" -Second "CDC" command is still under the "MODE:" path, so the 3811 generates an "unexpected parameter error". This could be fixed by using the form, "MODE:CDC; :CDC 25".

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

"MODE:LDI DEC" -Missing semicolon, DEC command generates an error
"DIS ?" -Space not allowed before question mark, DIS command expected.
"LDI33;dis?" -Space missing between LDI command and the parameter value, 33.
"Disply" -Optional letters must follow the correct order. Therefore, "Dis", "Disp", "Displ", "Displa", or "Display" are equivalent.

4.2.2 Using Commands with Parameters

Some commands expect a parameter. For example, if the duty cycle set point is to be entered, the command could be "CDC 30". This would set the 3811's duty cycle 30.00% for use in constant duty cycle mode. If a single parameter is expected, it should follow the command with at least one space between the command and the parameter.

The nominal value for on/off parameters is 1 = on, 0 = off. For example, the command:

"Display 1" -turns the 3811's display on, and

"Display 0" -turns the 3811's display off.

The words "on" and "off" may be substituted in the above example:

"Display On" -turns the 3811's display on, and

"Display OFF" -turns the 3811's display off.

For more information on parameter name substitutions, see Section 3.2.1.

A query has no space between the mnemonic and the question mark, as in:

"LDI?"

The 3811 uses a terminator of <CR><NL><^END> (carriage return, new line, EOI). In almost all cases, these terminators are automatically inserted by the host (user's) computer or GPIB driver. For more information, see Section 4.6.5 or the IEEE-488.2 standard definition.

4.3 Common Commands and Queries

This section contains a list of the common commands and queries which are supported by the 3811. The common commands and queries are distinguished by the * which begins each mnemonic. The common commands and queries are listed in alphabetical order, and a brief description of their functions is given. For more information on these commands, refer to an ANSI/IEEE 488.2-1987 standards reference.

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

4.3.1 *CAL?

This is the calibration query. When it is sent, the 3811 performs the A to D calibration procedure. After this query is sent, the 3811 responds with a message indicating that calibration has been completed successfully or unsuccessfully. A response of 0 means no errors, any other number means an error in calibration was detected.

An auto-calibration is performed each time the 3811 accumulates 10 minutes of inactive time since the last auto-calibration.

The syntax for the *CAL? query is:



4.3.2 *CLS

This is the Clear Status command. It is used to clear the status event registers. It may be used, for example, to clear the Event Status Register, the Standard Event Status Register, and the Error Queue before enabling SRQ generation from instrument events. The syntax for the *CLS command is:



4.3.3 *DLF

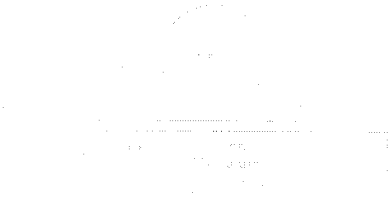
This is the Disable Listener Function command. It is used to cause the 3811 to cease being a listener. The syntax for the *DLF command is:



4.3.4 *ESE

This is the Standard Event Status Enable command. This command enables the Standard Event Status Register to update bit 5 of the status byte. The Structure of the Standard Event Status Enable Register and Standard Event Status Register are shown in Figure 4.1. The contents of these two registers is logically ANDed then the bits are ORed to get the Event Summary Bit message.

The syntax for the *ESE command is:



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

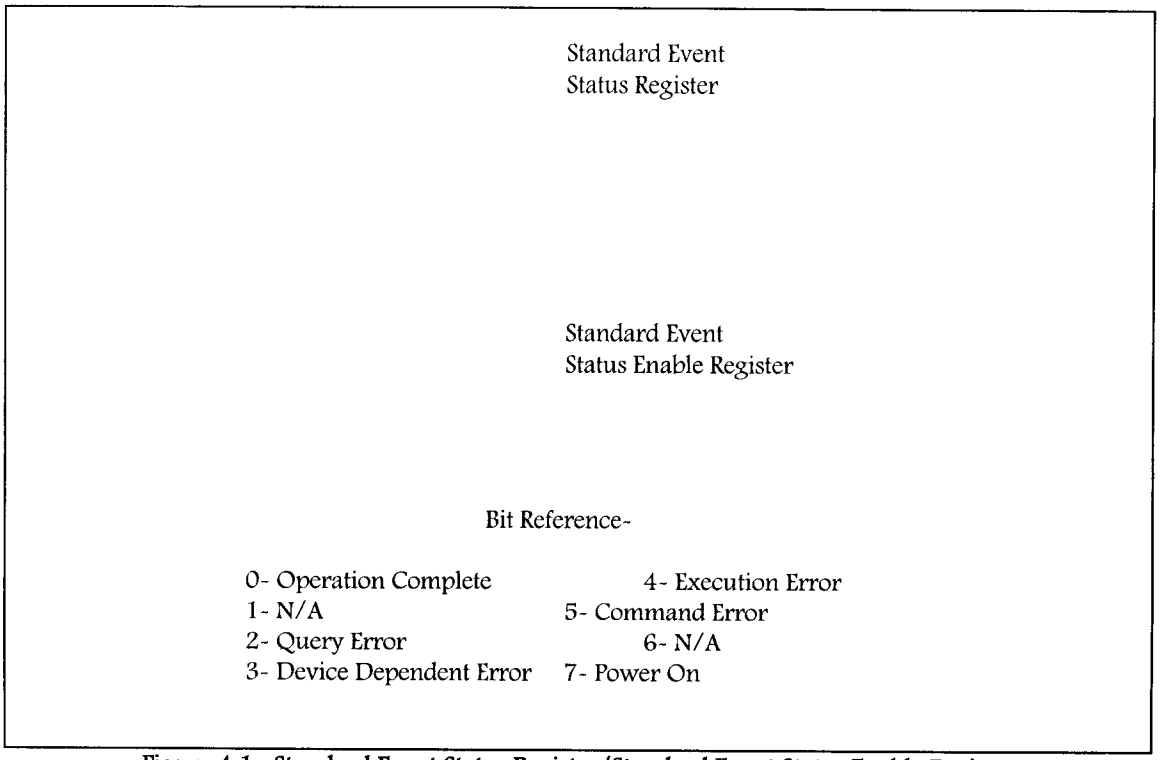


Figure 4.1 Standard Event Status Register/Standard Event Status Enable Register

Setting bit 0 allows the user to poll or generate SRQ from any overlapped commands after any previous operations are completed. This may be useful for ensuring that an operation, such as OUTPUT on, is complete before a measurement is made. Although this could be performed without using service requests, an interrupt-driven program makes more efficient use of the GPIB than polling or waiting (*WAI) routines. (See also Section 4.7.2).

4.3.5 *ESE?

This query will cause the 3811 to return the value of the Standard Event Enable Register. This allows the user to determine which status bits can set the summary bit (bit 5) in the status byte register. The response will be the sum of all of the enabled bits, as represented in Figure 4.1.

The syntax for the *ESE? query is:

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

4.3.6 *ESR?

This query will cause the 3811 to return the value of the Standard Event register. This allows the user to determine which type of error has occurred, for example. The value of the response will be the sum of the bits as represented in Figure 4.1.

The syntax for the *ESR? query is:



4.3.7 *IDN?

This query will cause the 3811 to return the following identification string:
ILX,LDP-3811,(7-digit serial number),(2-digit software version number). This identifies the specific device for the user. The manufacturer, model, serial number, and version number are listed in order.

The syntax for the *IDN? query is:



4.3.8 *IST?

The Individual Status query allows the user to read the current state of the IEEE-488.1 'ist' local message in the 3811. The response is a 1 or 0. A '1' indicates that the message is true, and a '0' indicates that the message is false.

The syntax for the *IST? query is:



4.3.9 *OPC

The *OPC command causes the 3811 to generate the operation complete message in the Standard Event Status Register when all pending overlapped commands have been completed.

The syntax for the *OPC command is:



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

4.3.10 *OPC?

This query places an ASCII character 1 into the 3811's Output Queue when all pending operations have been finished. (See also Section 4.7.2)

The syntax for the *OPC? query is:



4.3.11 *PRE

This is the Parallel Poll Register Enable command. It sets the parallel poll register enable bits for the format required by the 3811 in order that it may participate in parallel polling from the controller. The syntax of this command is:



where- the value of the data must round off to an integer value between 0 and 65535

the value of the data corresponds to the sum of all of the enabled bits desired for parallel polling (see Figure 4.2).

The Parallel Poll Enable Register is ANDed with the Status Byte Register. This result is ORed to form the ist (individual status) local message, as seen in Figure 4.2.

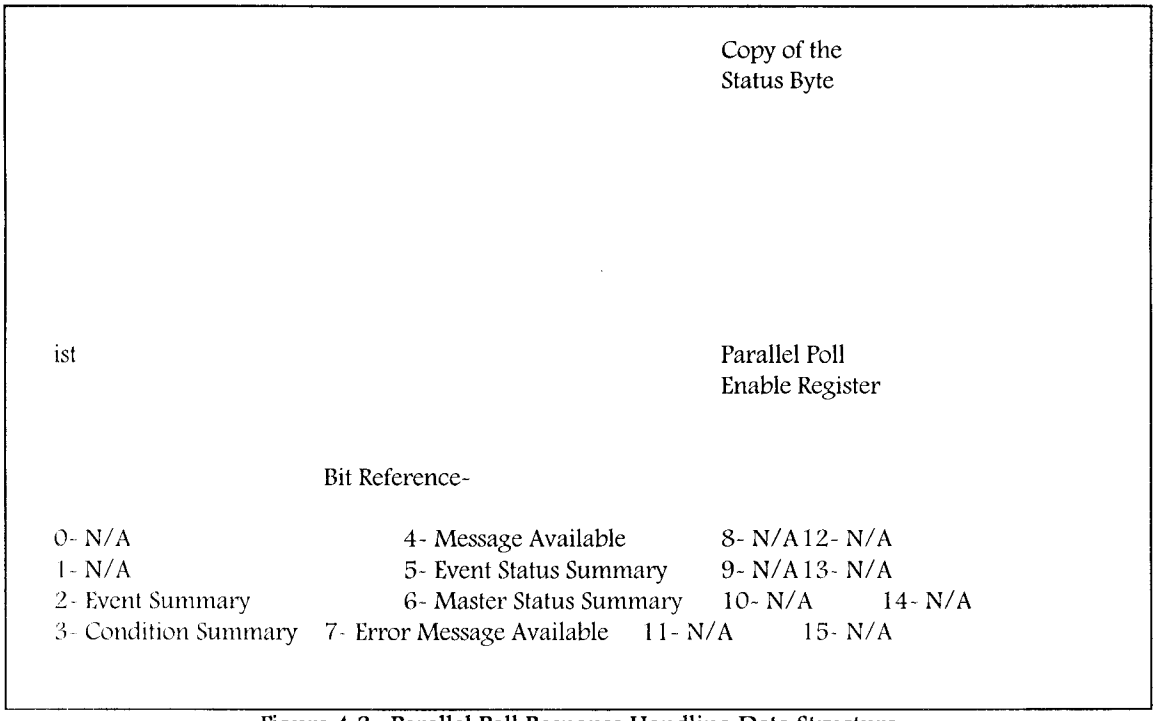


Figure 4.2 Parallel Poll Response Handling Data Structure

4.3.12 *PRE?

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

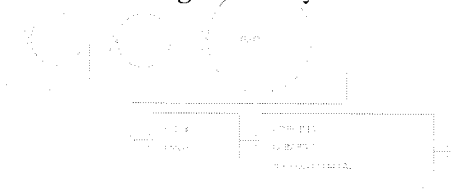
This query allows the programmer to determine the contents of the Parallel Poll Enable Register. The response will be the sum of the register bits, as represented in Figure 4.2.

The syntax for the *PRE? query is:



4.3.13 *PSC

The Power-on Status Clear command controls the automatic power-on clearing of the Service Request Enable Register, the Standard Event Status Enable Register, the Event Status Enable Register, the Condition Status Enable Register, and the Parallel Poll Enable Register. The syntax for this command is:



where- a value which rounds to an integer value of 0 means the power-on-status-clear flag of the 3811 is set FALSE, therefore disallowing SRQ (interrupts) to be asserted after power-on.

a value which rounds to any non-zero integer value between -32767 and +32767 means the power-on-status-clear flag of the 3811 is set TRUE, therefore allowing SRQ (interrupts) to be asserted after power-on.

When the "*PSC 1" command is sent, the 3811 will clear the above-mentioned enable registers (set them all to 0) at power-up. This may be done to avoid any undesirable service requests after a power on/off cycle of the 3811.

The factory default value for this bit is 0, Power-on Status Clear is disabled. Therefore, the values of the enable registers are restored from their condition at the last power-down when a power-up occurs.

4.3.14 *PSC?

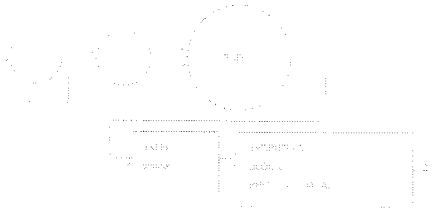
The Power-on Status Clear Query allows the programmer to query the 3811's power-on-status-clear flag. A response of 0 means that the Standard Event Status Enable Register, Service Request Enable Register, the Event Status Enable Register, the Condition Status Enable Register, and the Parallel Poll Enable Register will retain their values when power is restored to the 3811. A returned value of 1 indicates that the registers listed above will be cleared when power is restored to the 3811. The syntax for this query is:

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

4.3.15 *PUD

The Protected User Data command stores data unique to the 3811, such as calibration date, serial numbers, etc. This data is protected by restricted entry ("SECURE <nrf>" command) and is usually only entered at the time of service or calibration.

This data is a fixed size of 18 bytes. The syntax of the *PUD command is:



-where the user's input (unique data) is exactly 18 bytes.

4.3.16 *PUD?

The Protected User Device query allows the user to retrieve the contents of the *PUD storage area. The response is the contents of the unique data which was last entered. The syntax of the *PUD? query is:



The initial (factory set) response value of the *PUD? query is:

#218nnnnnnnvvMMDDYYABC

-where the response is <ARBITRARY BLOCK RESPONSE DATA>: nnnnnnn represents the 7-digit serial number, vv represents the software version number, MMDDYY represents the date of calibration (month, day, year), and ABC represents the initials of the calibrating technician.

4.3.17 *RCL

The *RCL (Recall) command restores the 3811 to the setup state which is in its local memory (Bin 0 - 10). The following criteria are restored when the *RCL command is given:

1. The 3811 is in the parameter state which was last stored in that bin.
2. The OUTPUT is off.

The syntax for the *RCL command is:



-where the value must round-off to an integer between 0 and 10. A value of 0 means the recalled state shall be the same as that of a *RST command (see Table 4.1). Up to 11 different stored recall states can be used. Ten of these recall states (1 - 10) are saved by using the *SAV command.

4.3.18 *RST

The *RST (Reset) command performs a device reset. This has the same effect as *RCL 0 (see Table 4.1), but additionally the 3811's OCIS and OQIS idle states are set with the *RST command.

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

The Operation Complete Command Idle State (OCIS) is the state which the 3811 is in when it is no longer waiting for any operation to complete, after an *OPC command has been executed.

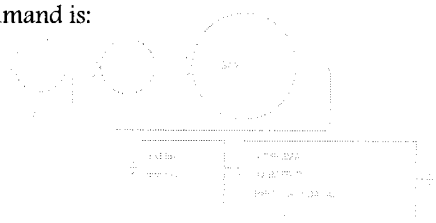
The Operation Complete Query Idle State (OQIS) is the state which the 3811 is in when it is no longer waiting for any operation to complete, after an *OPC? query has been executed.

These idle states allow the 3811 to complete its reset process (and have no operations pending) before continuing with any other commands after the *RST is executed.
The syntax for the *RST command is:



4.3.19 *SAV

The Save command stores the current state of the 3811 in non-volatile local memory. A particular state is then recalled by using the *RCL recall command (see Section 4.3.17). There are 10 unique states which can be stored. The syntax of the *SAV command is:



-where the value must round off to an integer between 1 and 10. The rounded integer value corresponds to a unique saved state which can be recalled by using the same value with the *RCL command.

4.3.20 *SRE

The Service Request Enable command sets the Service Request Enable Register bits to allow the 3811 to generate the user-selectable service requests. The syntax of the *SRE command is:



-where the value of the numeric data rounds off to an integer between 0 and 255. The value of the numeric data corresponds to the bits enabled (see Figure 4.3)

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

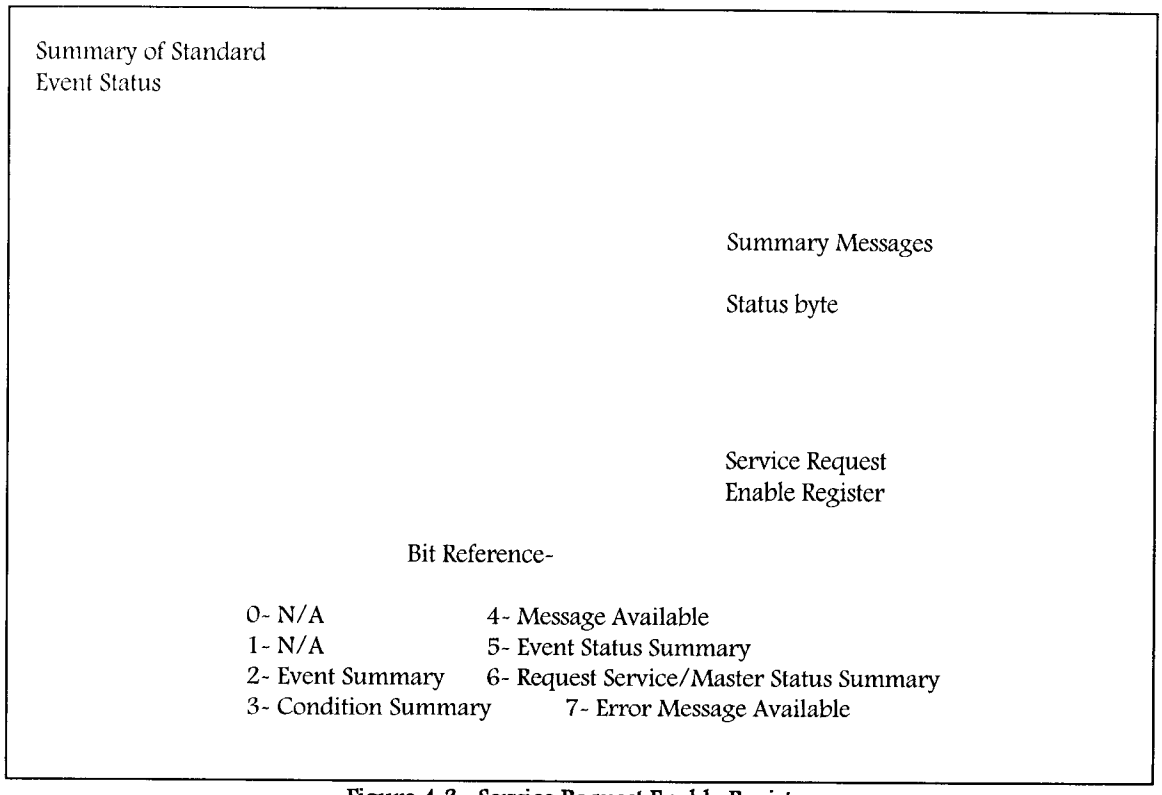


Figure 4.3 Service Request Enable Register

4.3.21 *SRE?

The Service Request Enable query allows the user to determine the current contents of the Service Request Enable Register. When this query is made, the response is the binary integer value of the contents of the register (see Figure 4.3). The syntax of the *SRE? query is:

4.3.22 *STB?

The Read Status Back query allows the programmer to read the status byte and Master Summary Status bit. The response to this query is an integer value of the contents of the Status Byte Register, where bit 6 represents the MSS (Master Summary Status) bit and not the RQS message (see Figure 4.3). The syntax of the *STB? query is:

4.3.23 *TST?

The Self-Test query causes an internal self-test and returns a response when the self-test is complete. The syntax of the TST? query is:

The response is <DECIMAL NUMERIC RESPONSE DATA>, where the value of the response is 0 if the self-test completes with no errors. If the response is a value other than 0, the self-test was not completed or it was completed with errors detected.

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

4.3.24 *WAI

The Wait-to-Continue command prevents the 3811 from executing any further commands until the No-Operation-Pending flag is true. This allows the programmer to make the 3811 wait for the completion of an operation before continuing. For more information on the operation complete (OPC) flag, see section 4.7.2.

The syntax for the *WAI command is:



4.4 Advanced Programming

Once you have become familiar with the command syntax and structure, you may take advantage of some programming shortcuts which are available. Due to the "tree-walking" capabilities of the 3811 software, the user may elect to write command strings without constantly repeating the entire command path for each command.

4.4.1 Path Specification

The first command in the string must have its entire path entered. But once a path level is reached, other commands which are at the same level (or higher level) may then be entered without repeating the path. To accomplish this, the semicolon (;) must be used to separate the commands in the string, as usual. However, the command following the semicolon need not specify its full path, if the same path which was previously written out could be used for the new command.

For example, the following legal command string could be used to (1) set the 3811 display to the laser drive current and then (2) set the display for the constant duty cycle set point value:

"DIS:LDI; CDC"

The path "DIS:" is "remembered" by the 3811 software in this case. If the "CDC" command were not found at this level, the software would walk back to the "root" level and search for a "CDC" command. If the command is not found, an error message will be generated. (In this case, if there were no "DIS:CDC" command the 3811 software would try to execute the "CDC" command and would generate an error because there was no parameter value given.)

Care must be taken to avoid errors which are caused by trying to implement commands from the wrong path or level. For example, the following command string was intended to (1) read back the set point duty cycle percentage and (2) read back the measured laser drive current:

"SET:CDC?; LDI?"

Instead, the 3811 would return the set point duty cycle percentage and the laser drive current set point. When the "LDI?" is encountered, the software will first search for that command at its present level. Since it finds it there the SET:LDI? query will be executed. If this command did not exist at this level, the software would search down to the "root" level and find and execute the intended command, "LDI?".
In order to ensure the proper command is executed for the example above, the following command string should have been issued:

"SET:CDC?; :LDI?"

The use of the colon forces the search for the "LDI?" query to begin at the root level, and thus the desired effect is achieved.

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

If you are not sure of the path level of a command, refer to the 3811 Command Path Structure diagram, Figure 3.2. For this discussion, the root level is the highest level, and moving down the diagram (Figure 3.2) decreases the level.
Once the software has "walked" to a lower path level, it remains at that level when it receives the next command.

The only exception to the rule described above is when common commands are used. In that case, the software remembers which level the user was at before the common command was found, and it returns to that same level after finding and executing the common command. Therefore the following command string is legal:

"DIS:CDC; *SAV 1; LDI"

Here, (1) the display is set to show the set point duty cycle percentage, (2) the present setup is stored in "bin" 1, and (3) the display is set to show the laser drive current.

4.5 Error Messages

Error messages may appear on the 3811 display when error conditions occur which force the output off or reflect hardware errors in the 3811.

In remote operation, the current error list can be read by issuing the "ERR?" query. When this is done, a string will be returned containing (up to 10 of) the error messages which are currently in the error message queue.

Appendix A contains an explanation of the error messages which may be reported remotely by the 3811.

4.6 ANSI/IEEE-488.2 Definitions

The following sections contain the relevant definitions for syntax diagrams and syntax elements for the 3811 commands, as defined by the IEEE-488.2 standard. A complete listing of that standard is not practical here, but these definitions are applicable to the remote operation of the 3811.

4.6.1 Syntax Diagrams

The syntax diagrams in Section 3.4 show the most complete form of command construction, but they don't show every possible construction. Some of the other possibilities which are not shown in the syntax diagrams of Section 3.4 are discussed in Section 4.4, Advanced Programming. These syntax diagrams conform to the ANSI/IEEE-488.2-1987 standard, and the terminology presented here reflects that standard.

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

The oval (or round) shape contains a terminal syntactic element. These represent a basic function, such as a single ASCII character, which cannot be divided.

Rectangles contain non-terminal syntactic elements. These represent elements which are expandable to a diagram of terminal syntactic elements. However, they are presented as a unit for clarity or emphasis.

Lines and arrows indicate correct paths through the syntax diagram. A reverse line around an element indicates that the element may be repeated indefinitely. A forward arrow around an element indicates that the element may be omitted.

4.6.2 White Space

White space is defined by the syntactic diagram shown in Figure 4.4, where <white space character> is defined as a single ASCII-encoded byte in the range 00-09, 0B-20 (0-9, 11-32 decimal). This range includes the ASCII control characters, carriage return, and the space, but excludes the newline character.

In most practical programming situations, the space character (space bar) would be used as white space. White space is generally used for separating other syntactic elements. White space is processed by the 3811 without interpretation.

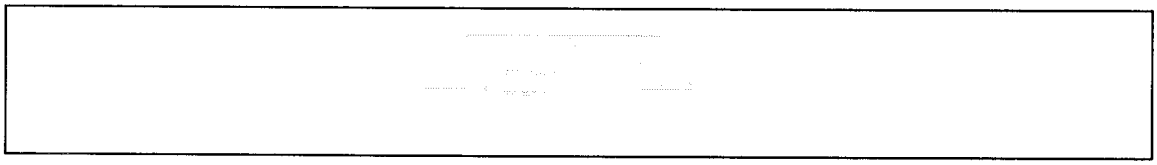


Figure 4.4 White Space Syntactic Diagram

4.6.3 Power-on Conditions

At power-on, the 3811 complies with the ANSI/IEEE Std 488.2-1987 requirements. It will initialize the setup parameters to be the same as when the power was last shut down. However, the OUTPUT will be off at power-up. The default conditions may be recalled by using the *RST command. The default conditions are outlined in Section 4.6.12.

4.6.4 <nrf value>

The symbol, <nrf value>, refers to the flexible numeric representation, as defined by the IEEE-488.2 standard. All this means is that numbers may be represented in one of three forms, integer, floating point, or engineering/scientific notation. For example the number "twenty" can be represented by an ASCII string of:

20 or +20,
20.0 or +20.0,
2.0E+1 or +2.0E+1 or 2.0e+1 or +2.0e+1

These three forms are denoted, NR1, NR2, and NR3, respectively, by the IEEE-488.2 standard. For more information on the precise syntax of these definitions, refer to the IEEE-488.2 standard.

4.6.5 <PROGRAM MESSAGE TERMINATOR>

When you send a command using the standard format, the host computer (or GPIB driver) usually puts a <CR><NL><^END> (carriage return-line feed-EOI) on the data bus following the command string. The IEEE-488.2 standard requires either <NL><^END>, <NL>, or <^END> as an acceptable <PROGRAM MESSAGE TERMINATOR>, while the <CR> is treated as <white space> (ignored). The 3811 will accept any

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

<PROGRAM MESSAGE TERMINATOR> shown in Figure 4.5. The 3811 terminates its responses with a <CR><NL><^END> (unless the user changes the terminator via the TERM command).

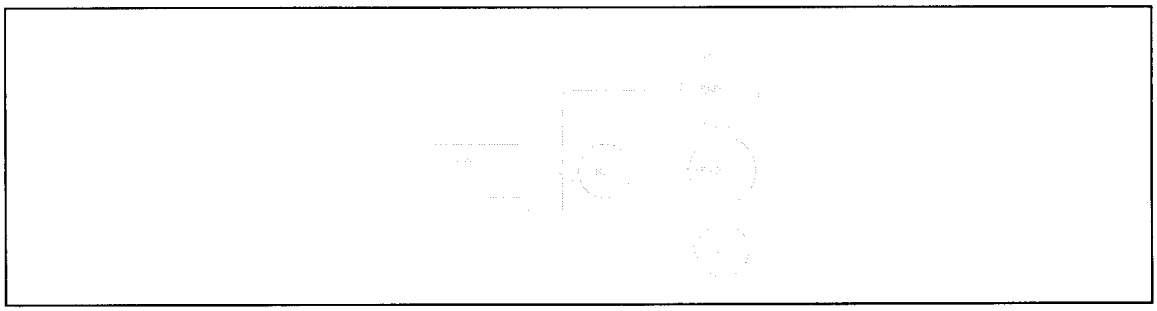


Figure 4.5 <PROGRAM MESSAGE TERMINATOR> Syntax Diagram

If you encounter problems with GPIB communications with the 3811, refer to your GPIB driver manual for the exact syntax of the output terminator.

4.6.6 <PROGRAM MESSAGE UNIT SEPARATOR>

A <PROGRAM MESSAGE UNIT SEPARATOR> is used to separate sequential <PROGRAM MESSAGE UNIT> elements (commands) from one another within a <PROGRAM MESSAGE>. The syntax for a <PROGRAM MESSAGE UNIT SEPARATOR> is shown in Figure 4.6.

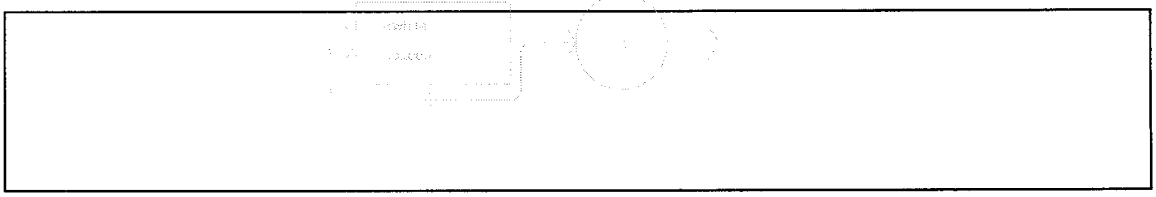


Figure 4.6 <PROGRAM MESSAGE UNIT SEPARATOR> Syntax Diagram

4.6.7 <PROGRAM HEADER SEPARATOR>

The <PROGRAM HEADER SEPARATOR> separates the <COMMAND PROGRAM HEADER> (3811 command) from the <PROGRAM DATA> (first parameter after the command). In the case of the 3811, a single white space must be used to separate the command from the first parameter. Note however, commands may be compounded, see Section 4.6.8.

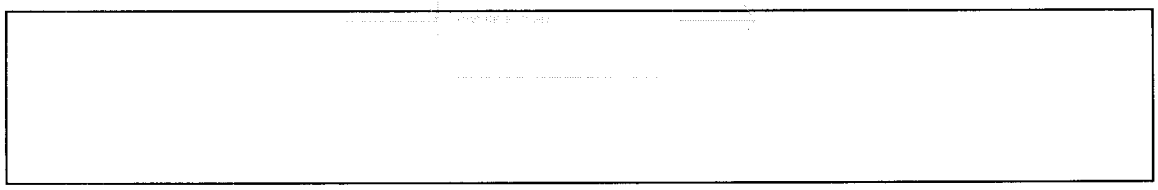
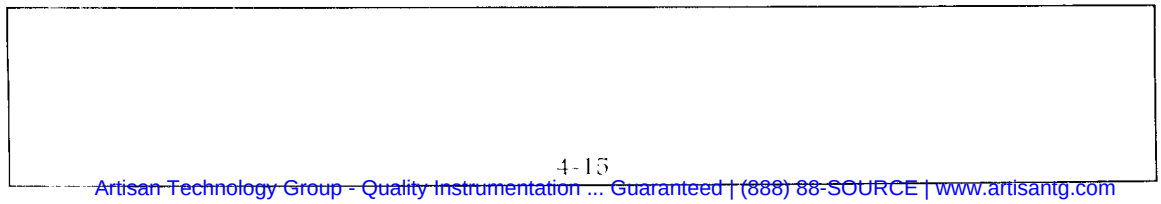


Figure 4.7 <PROGRAM HEADER SEPARATOR> Syntax Diagram

4.6.8 <compound command program header>

A <compound command program header> is a compound command heading which may be followed by <program data> (parameters). The 3811 command structure is a tree, as shown in Figure 3.2. A compound command or <compound command program header> determines the proper command by following a path from the root node. This is similar to determining a path for a file by starting with the root directory and listing the intermediate subdirectories. The syntax for a <compound command program header> is shown in Figure 4.8. The syntax diagram for a <compound query program header> is shown in Figure 4.9.



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

Figure 4.8 <compound command program header> Syntax Diagram

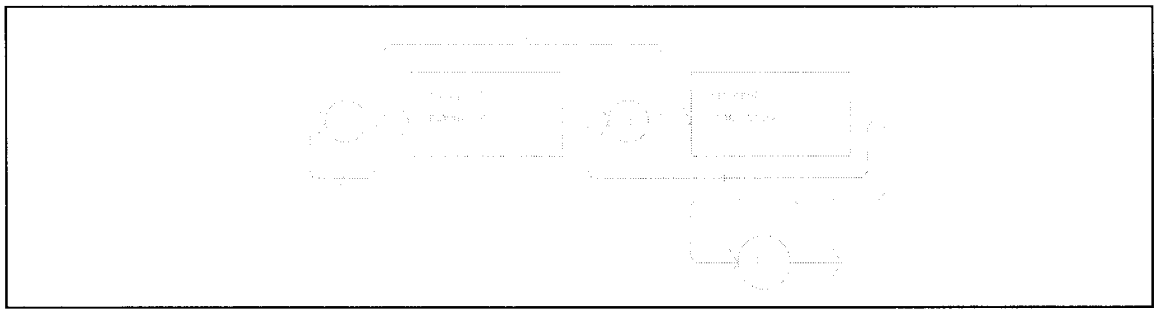


Figure 4.9 <compound query program header> Syntax Diagram

A <program mnemonic> is a command or command path identifier. For example, the <PROGRAM MESSAGE> "DISplay:LDI" consists of the command "LDI" and the path identifier "DISplay." All of the legal <compound command program headers> may be traced by starting from the root node of the command structure and moving down by levels to paths, and finally to the command (see Figure 3.2).

A <PROGRAM MESSAGE TERMINATOR> causes the next command search to begin at the root node. A leading colon (:) on a <PROGRAM MESSAGE UNIT> will cause the 3811 to begin searching for the command at the root node. Otherwise (after a semicolon), the 3811 will first search the most recently used node for the command. It will continue to search the command tree until it finds a legal command path, by searching each previously used node up to the root. If no legal path is found, the 3811 will generate an error message. For more information on creating and using 3811 commands, see Section 4.4, Advanced Programming.

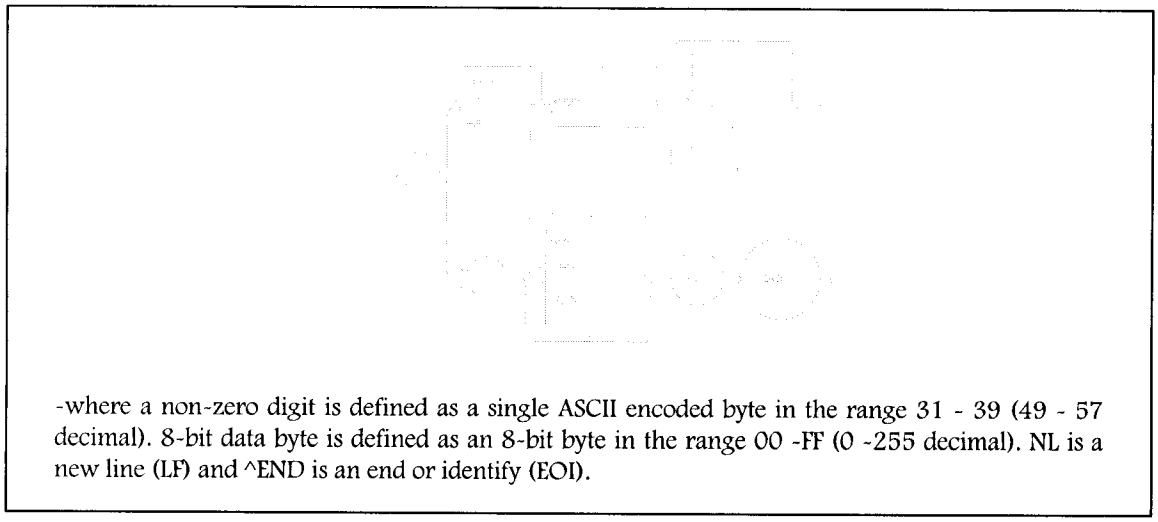
4.6.9 <PROGRAM DATA> (Parameters)

Parameters (and other <PROGRAM DATA>) may be entered after a command in a <PROGRAM MESSAGE UNIT>. The <COMMAND PROGRAM HEADER> (command) and first <PROGRAM DATA UNIT> (parameter) must be separated by a <PROGRAM HEADER SEPARATOR> (white space), see Section 4.6.6.

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

4.6.10 <ARBITRARY BLOCK PROGRAM DATA>

This element allows any 8-bit bytes (including extended ASCII) to be transmitted in a message. The syntax for an <ARBITRARY BLOCK PROGRAM DATA> element is:



-where a non-zero digit is defined as a single ASCII encoded byte in the range 31 - 39 (49 - 57 decimal). 8-bit data byte is defined as an 8-bit byte in the range 00 -FF (0 -255 decimal). NL is a new line (LF) and ^END is an end or identify (EOI).

Figure 4.10 <ARBITRARY BLOCK PROGRAM DATA> Syntax Diagram

This element is used only with a *PUD command to the 3811.

4.6.11 <PROGRAM DATA SEPARATORS>

When there is a list of <PROGRAM DATA UNITS> (parameters) following a <PROGRAM HEADER SEPARATOR> (white space), the <PROGRAM DATA UNITS> must be separated with a <PROGRAM UNIT SEPARATOR>. The syntax diagram for a <PROGRAM UNIT SEPARATOR> is shown in Figure 4.11.

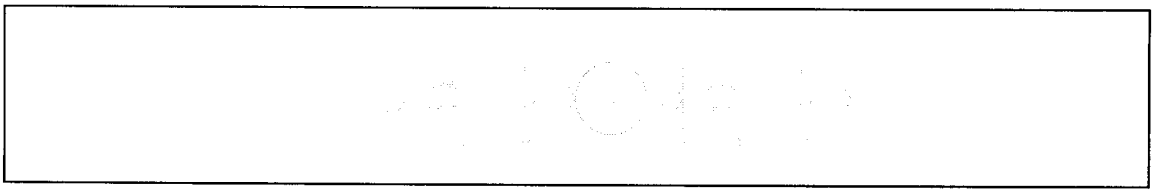


Figure 4.11 <PROGRAM DATA SEPARATOR> Syntax Diagram

4.6.12 Default Parameters

There are no default values for omitted parameters. If a command is expecting a parameter and none is entered, an error will be generated.

However, if a reset is performed via a *RST command (or a RCL 0 command), the following parameters will be set to the default state shown in Table 4.1.

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

3811 CONFIGURATION AFTER *RST
GPIB mode in LOCAL via front panel, or in REMOTE via GPIB PARAMETERS not selected LIM 200 (200 mA range) = 200 mA LIM 500 (500 mA range) = 500 mA OUTPUT off MODE = CONST % (constant duty cycle %) Pulse Width (PW) = 0.1 uSec Pulse Repetition Interval (PRI) = 1.0 uSec Duty Cycle % = 10.0% Display showing current (in mA) RANGE in 200 mA setting Set Point = 0 mA RECALL BIN number = 0 STEP value = 0.01

Table 4.1 State of the 3811 After *RST

4.7 Status Reporting

Figure 4.12 shows the status reporting scheme of the 3811. Each of the registers which may be accessed by a command or query has the appropriate command or query written above or below the register representation. For example, the Condition Register may be queried via the laser controller "COND?" query, as shown by its register heading in Figure 4.12.

The condition or event registers are logically ANDed with their respective enable registers. These bits are then logically ORed to form a summary message in the status byte for that particular register.

4.7.1 Event and Condition Registers

The Event Registers are used to report events which occur during the operation of the 3811. Events differ from conditions in that events signal an occurrence once, and are not reset until the Event Register is queried or the 3811 is powered off. Conditions reflect the current state of the device, and therefore may change many times during operation. Querying a Condition Register does not change its contents.

The 3811 contains Event and Condition Registers for laser drive current controller operations. It also contains the Standard Event Status Register which reports events for general operation of the 3811. The Standard Event Status Register conforms to the IEEE-488.2 standard.

4.7.2 Operation Complete Definition

Note that bit 0 of the Standard Event Status Register contains the status of the Operation Complete flag (see *OPC, Section 4.3.9). Enabling this bit via the *ESE command allows the user to update bits of the status byte. Then, if the SRE mask has bit 5 set, and the user issues an *OPC command, an SRQ will be issued upon completion of the currently processed commands. This may be used to initiate service request routines which depend on the completion of all previous commands.

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

Figure 4.12 LDP-3811 Status Reporting Schematic Diagram

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

Operation Complete on the 3811 is defined as:

1) The controller, which is updating the current source hardware, is idle.

2) No NVRAM (non-volatile) memory write cycles are in progress.

3) A new current measurement is available.

4) No calibration routines are running.

5) The OUTPUT is off, or the OUTPUT is on and the output-on delay has finished (OUTPUT current is enabled).

4.7.3 Command Timing and Completion

This section describes, for each device-dependent command, whether that command is performed in an overlapped or sequential manner. In other words, it states whether the next command may begin while this command is being executed, or if the next command must wait until this command is completed before its execution begins. The conditions for setting the operation complete flag are given in Section 4.7.2.

All 3811 device-dependent commands are executed in an overlapped manner, and the operation complete flag is set after the conditions outlined in Section 4.7.2 have been satisfied.

The *WAI (common command) is an example of a sequential command which forces the next command to wait until the no-operation-pending flag is true. This is essentially the same as waiting for the OPC flag to become true, because the no-operations-pending flag is used to set the OPC flag (bit 0 of the Standard Event Status Register).

In normal operation, the overlapped commands execute faster than would appear by querying the OPC flag. This is due to the nature of the non-volatile memory storage process. Commands which change the status of the instrument limits, or change its mode or current range, step value, or status enable registers, will not have their OPC flag set until all current writing to non-volatile memory has been completed. This is done to ensure that the OPC flag is never set prematurely. However, in most cases, the individual operation will be completed immediately.

The speed of writing to non-volatile memory (NVRAM) is slow compared to processor speed, and the new information (to be written) is placed on a queue to reduce the processor overhead for non-volatile storage operations. However, the new information (i.e. new parameter value) is buffered and is essentially stored as soon as the command which created it is parsed. Therefore, even though the OPC flag may not be set immediately after a new parameter value is created, the new value is stored for all intents and purposes, and command throughput is not directly related to the OPC rate.

Whenever there is any output (response) data in the Output Queue, bit 4 is set in the Status Byte Register. Whenever there is any error message in the Error Queue, bit 7 is set in the Status Byte Register.

4.8 Output Off Register

The Output Off Enable Register allows the user to determine which conditions and events in the controller will cause the laser drive current OUTPUT to be turned off. This register is configured in a manner which is similar to the status reporting register. However, its output is not reported in the Status Byte Register. Rather, it goes to the hardware which

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

controls the output switching. The events and conditions which may be set to cause the laser drive current OUTPUT to be turned off are shown in Figures 4.13.

The default (factory) setting for this register is 0, Current Limit does not shut the OUTPUT off. This setting is not effected by the *PSC (Power-On Status Clear) command.

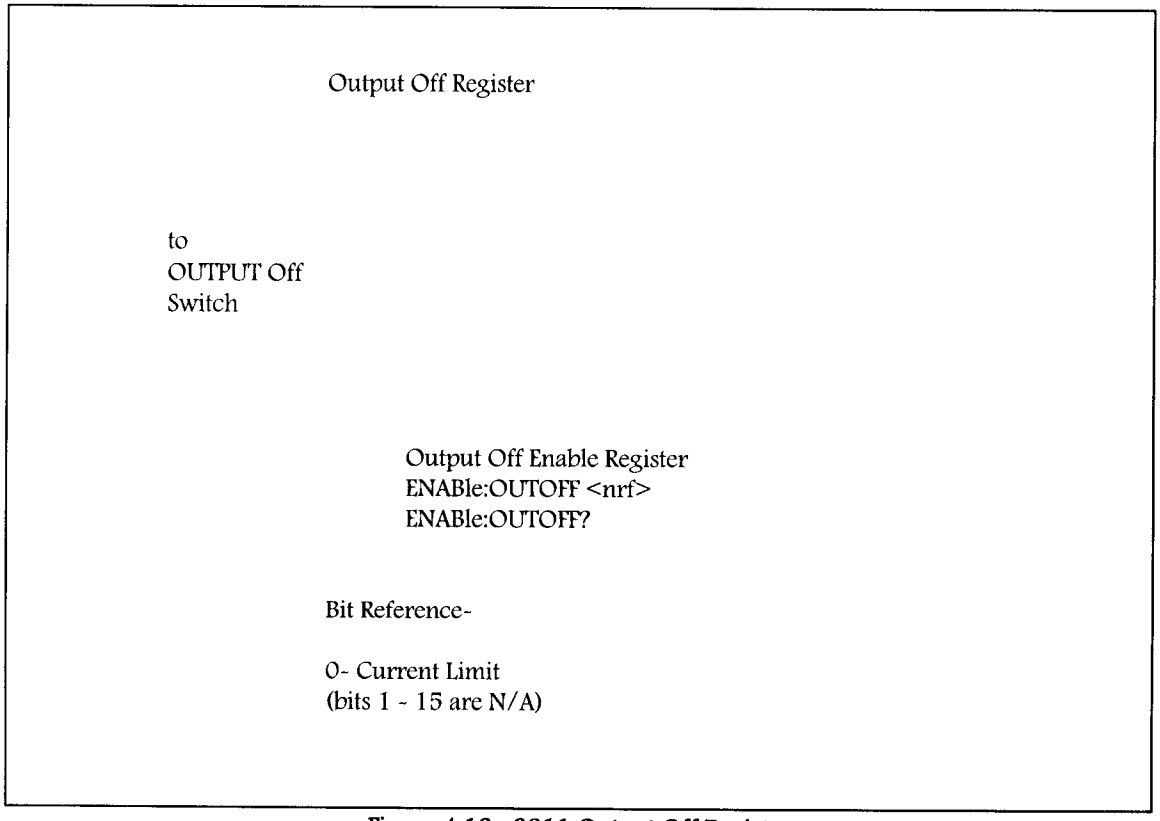


Figure 4.13 3811 Output Off Register

4.9 Input Buffer and Output Data

The Input buffer of the 3811 is 80 bytes. However, the user's <PROGRAM MESSAGE> may be longer.

The output (response) data of the 3811 is sent in blocks of up to 80 bytes in length. It is sent using high speed DMA within the 3811, but may be of indefinite length. Although some commands have a definite length response, such as the MESsage? query, the response length is indefinite because the 3811 will respond to multiple queries in a single response output. The user may enter as many queries as desired in a single input message, and the 3811 will respond to all of them in the same output message, if possible. For example, the user may enter the following command:

"Mes?; Rad?; LDI?; Err?"

The response may appear in this manner:

"TEST1 ,DEC,25.0,0"

All query responses are evaluated at the time the query is parsed, and not at the time the response message is sent. In most cases this does not create a problem since the time between parsing a query and sending its response is small, unless the GPIB controller takes a long time to request the response.

4.10 Remote Interface Messages

The following sections are intended as a reference for using the 3811 with the GPIB option when an understanding of the lower level interface messages is required. These sections deal with the remote

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

interface messages which are available with the 3811, and they contain a list of the Interface Function subsets. This information is generally not required by the user unless there is a question of compatibility of the 3811 with a specific controller. A list of interface messages which are not supported by the 3811 is shown in Section 4.10.3. These messages will be ignored by the 3811.

The interface messages listed in this chapter are handled by the 9914 GPIB interface IC and the 80C188 processor in the 3811, and are transparent to the higher level commands. However, they may be explicitly used in some GPIB programs. A list of the 3811's allowable interface messages is shown in Section 4.10.2.

4.10.1 Interface Function Subsets

Table 4.2 contains the remote Interface Function Subsets which are supported by the 3811. For more information, see the ANSI/IEEE-488.1-1987 standard.

3811 INTERFACE FUNCTION SUBSETS

SH1	Source Handshake - complete compatibility
AH1	Acceptor Handshake - complete capability
T6	Talker Functions
L4	Listener Functions
SR1	Service Request - complete capability
RL1	Remote Local Function - complete capability
PP0	Remote Configuration Parallel Poll - no capability
DC1	Device Clear - complete capability
DT0	Device Trigger - no capability
C0	Controller Function - no capability
E1, E2	Three-state bus drivers with automatic switch to open collector during Parallel Poll

Table 4.2 3811 Interface Function Subsets

4.10.2 3811 Remote Messages

The following list contains GPIB remote messages which are compatible with the 3811 GPIB driver.

3811 ALLOWED GPIB INTERFACE MESSAGES

ACG	GTL	OTA	PPR3	REN	SRQ
ATN	IDY	PCG	PPR4	RFD	STB
DAB	IFC	PPC	PPR5	RQS	TAG
DAC	LAG	PPE	PPR6	SCG	UCG
DAV	LLO	PPD	PPR7	SDC	UNL
DCL	MLA	PPR1	PPR8	SPD	UNT
END	MTA	PPR2	PPU	SPE	

Table 4.3 3811 Allowable GPIB Interface Messages

4.10.3 Non-Supported Remote Interface Messages

Table 4.4 contains GPIB interface messages which are known to be incompatible with the 3811. Other interface messages which do not appear in Section 4.10.2 may also be incompatible with the 3811.

NON-SUPPORTED INTERFACE MESSAGES FOR 3811

EOS	MSA	NUL
GET	OSA	TCT

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

Table 4.4 Non-Supported Interface Messages for the 3811

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

Chapter 5

MAINTENANCE

5.1 Introduction

This chapter describes how to maintain the LDP-3811. Included are sections covering calibration, fuse replacement, line voltage selection, and disassembly.

WARNING

THE SERVICE PROCEDURES DESCRIBED IN THIS CHAPTER ARE FOR USE BY QUALIFIED PERSONNEL. POTENTIALLY LETHAL VOLTAGES EXIST WITHIN THE LDP-3811. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY OF THE PROCEDURES DESCRIBED IN THIS CHAPTER UNLESS YOU ARE QUALIFIED TO DO SO.

QUALIFIED SERVICE PERSONNEL ARE REQUIRED TO WEAR PROTECTIVE EYEGLASSES AND ANTI-STATIC WRIST BANDS WHILE WORKING ON THE LDP-3811 CIRCUIT BOARDS.

CAUTION! HIGH VOLTAGES ARE PRESENT ON AND AROUND THE PRINTED CIRCUIT BOARDS OF THE LDP-3811.

5.2 Calibration Overview

The 3811 should be calibrated every 12 months or whenever performance verification indicates that calibration is necessary.

All calibrations can be done with the case closed. The instrument is calibrated by changing the internally stored digital calibration constants.

5.2.1 Recommended Equipment

Recommended test equipment for calibrating the 3811 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. If your 3811 is equipped with the model 1231 GPIB/IEEE-488.2 interface refer to Section 5.4 for calibration procedures using the GPIB.

RECOMMENDED TEST EQUIPMENT

Description	Mfg./Model	Specification
DMM	Fluke 8840A	DC Amps (@ 1.0 A): ±1 % Resistance (@ 10 ohms): 0.02%
Resistor		50 Ohm, 15 W

Table 5.1 Recommended Test Equipment

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

5.2.2 Environmental Conditions

Calibrate this instrument under laboratory conditions. We recommend calibration at 23°C ± 1.0°C. When necessary, however, the LDP-3811 may be calibrated at its intended use temperature if this is within the specified operating temperature range of 0 to 50°C.

5.2.3 Warm-Up

The LDP-3811 should be allowed to warm up for at least 1 hour before calibration.

5.3 Local Operation Current Source Calibration

The following procedure is for calibrating the 200 and 500 mA current source ranges. This procedure is for local (front panel) operation. See Section 5.4 for remote calibration of the current source ranges. The 3811 uses a 2-point calibration procedure.

a. Connect the 3811 to the appropriate AC source. Turn the power on and allow the 3811 to warm up for at least one hour. Turn the KEYLOCK switch to the ENABLED position.

b. Set the laser drive current range as desired. For best results the appropriate current limit (LIM I200 or LIM I500) should be set to full scale (200 or 500 mA).

1. NOTE - The LIM I200 must be set greater than or equal to 33.1 mA and LIM I500 must be set greater than or equal to 82.6 mA for the calibration to work. If these conditions are not met, error #516 will be generated.

2. Connect a precision ammeter (DMM) in series with a 50 ohm, 15 W resistor across the OUTPUT terminals.

c. Enter the calibration mode by pushing the (GPIB) LOCAL and (MODE) SELECT switches at the same time. The display will be blank for a few seconds, and then it will indicate the output current in mA. The output current will be set to 90% of the limit value.

d. Measure the OUTPUT current with the precision ammeter.

e. Press and hold in the SET switch and turn the ADJUST knob until the display indicates the same current as measured in Step d. Release the SET switch to store the new value into non-volatile memory.

f. After the SET switch is released, the 3811 will set the OUTPUT to a value of 30.0 or 75.0 mA (for 200 or 500 mA ranges, respectively). Repeat steps d and e for this lower calibration point. After the SET switch is released the 3811 will return to its former state, before calibration.

g. Repeat this procedure for the other current range.

If an error occurs during calibration, i.e. the interlock connections are opened, the 3811 will exit calibration mode without changing the calibration values. If this happens, fix the error and repeat the calibration procedure.

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

5.4 Remote Operation Current Source Calibration

The following procedure is for calibrating the 200 and 500 mA constant current source ranges via remote (GPIB) operation. See Section 5.3 for local calibration of the current source ranges. The 3811 uses a 2-point calibration procedure.

a. Connect the 3811 to the appropriate AC source. Turn the power on and allow the 3811 to warm up for at least one hour. Turn the KEYLOCK switch to the ENABLED position.

b. Set the current range as desired via the "RAN" command. Connect a precision ammeter (DMM) in series with a 50 ohm, 15 W resistor across the OUTPUT terminals. For best results set the appropriate current limit (LIM I200 or LIM I500) to full scale (200 or 500 mA) via the "LIM:I200 200" or "LIM:I500 500" command.

NOTE - The LIM:I200 must be set greater than or equal to 33.1 mA and LIM:I500 must be set greater than or equal to 82.6 mA for the calibration to work. If these conditions are not met, error #516 will be generated.

c. Enter the calibration mode by issuing the "CAL:LDI" command.

d. After a 5 second delay, issue the "CAL:LDI?" query. If the 3811 returns "1", it is ready to continue the calibration procedure. If the 3811 returns "0", it is not ready. In that case repeat step d until a "1" is returned.

The "DELAY 5000" command may be used to create the delay. The delay is needed to allow for the CDRH required OUTPUT on delay. The OUTPUT current does not flow until 2 seconds after the OUTPUT is turned on, for safety reasons. An additional 0.5 seconds is required for the slow-start circuit of the 3811 to stabilize the OUTPUT current to the set point.

If the 3811 returns "0" after the "CAL:LDI?" query, it is recommended that the user check for errors by issuing the "ERR?" query. If any errors have occurred during the calibration process, the 3811 will abort the calibration process. Therefore, any response other than "0" to the "ERR?" query should be handled before continuing restarting the calibration procedure.

e. With the DMM set up (as outlined in step b) input the measured OUTPUT current (as an <nrf value>, in mA) via the "LDI <nrf value>" command.

The measured value of the current should not be entered until the 3811 is ready to receive it.

The 3811 will be ready to receive the current value when, after a "CAL:LDI?" query is sent, the response from the 3811 is "1".

After the "LDI" value is entered, the "*OPC?" query may be used to determine when the calibration sequence is done. However, the "*OPC", or "*WAI" command, or "*OPC?" query should not be issued until after the expected "LDI" value is entered, or the system will "hang". This happens because the 3811 will wait indefinitely for an input, yet not allow any input until the calibration is finished.

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

f. Once the actual current value is entered via the "LDI" command, the new calibration value will be stored into non-volatile memory. The "OPC?" query may be used (after the "LDI" value is sent) to determine when the calibration is completed.

The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the *OPC command.

g. Repeat steps e and f for the lower calibration value (a 2-point calibration is done). After the lower calibration point value is entered via the "LDI" command, the 3811 will return to the state it was in prior to calibration.

h. Repeat this procedure for the other current output range.

If an error occurs during calibration, i.e. the interlock connections are opened, the 3811 will exit calibration mode without changing the calibration values. Error events may be retrieved via the "ERR?" query, as explained in Step d. If an error happens during calibration, fix the error and repeat the calibration procedure.

5.5 Fuse Replacement

The fuse is accessible from the back panel of the 3811. Before replacing the fuse, turn power off and disconnect the line cord. Use only the fuses indicated below in Table 5.2.

FUSE REPLACEMENT

Line voltage	Fuse Replacement
90 - 110 VAC	0.5 Amp, 3AG, Slow Blow
108 - 132 VAC	0.5 Amp, 3AG, Slow Blow
198 - 242 VAC	0.25 Amp, 3AG, Slow Blow
216 - 264 VAC	0.25 Amp, 3AG, Slow Blow

Table 5.2 Fuse Replacement

5.6 Line Voltage Selection

Line voltage selection is made by installing jumpers according to Figure 5.1. Normally these jumpers are factory preset. When necessary, however, they may be moved to accommodate new line voltage conditions. You must remove the 3811 bottom cover to access the jumpers on the power supply.

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

Carefully remove the jumpers and then install them in the new position, as shown in Figure 5.1.

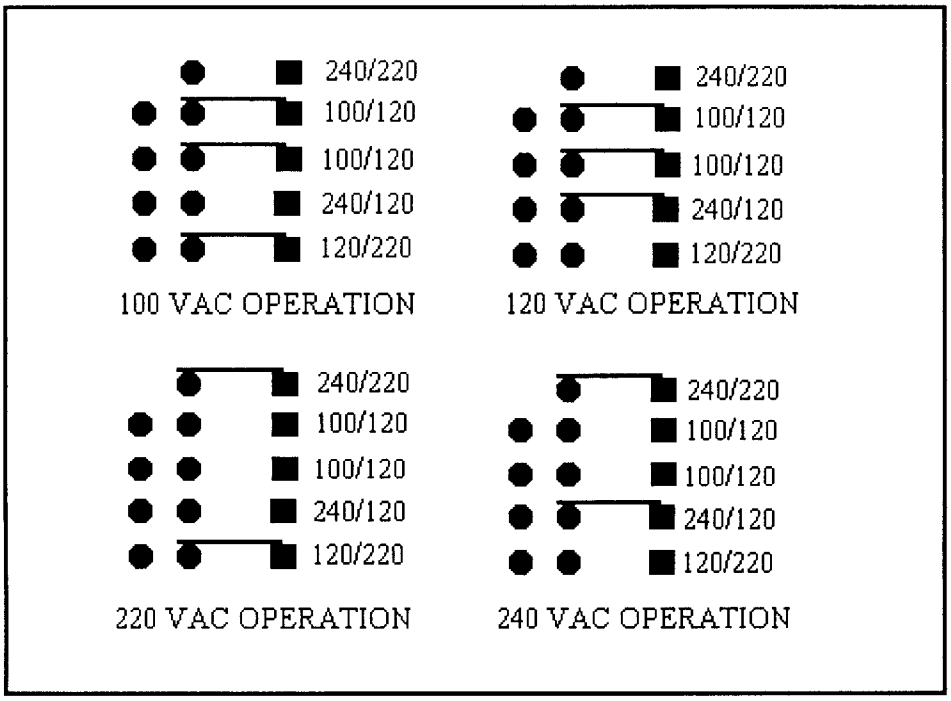


Figure 5.1 Power Line Voltage Selection

5.7 Disassembly

The top and bottom covers of the LDP-3811 may be removed by extracting the countersunk screws on the sides of the instrument near the back panel. After these screws are out, slide either cover towards the rear of the instrument and then pull it up and off.

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

Chapter 6

TROUBLESHOOTING

6.1 Introduction

This chapter is intended to be used as a guide when the 3811 does not perform as expected. It is not a service manual, but rather a guide to alleviating basic problems which may arise during 3811 operation.

6.2 Troubleshooting Guide

If you have difficulty while operating the 3811, refer to the symptoms listed here. Some of the common causes and corrective actions for these symptoms are listed in this section.

SYMPTOMS	CAUSES and CORRECTIVE ACTIONS
3811 will not power up	Check the power cord to make sure that it is properly connected. Check the fuse for integrity and proper rating.
OUTPUT does not stay on	Check the display for error messages when the (OUTPUT) ON switch is pressed "on". "E501" indicates an open interlock (pins 1 and 2 of the 9-pin, d-sub OUTPUT connector must be shorted together). "E522" indicates a disabled KEYLOCK switch. "E530" indicates that the laser drive current (OUTPUT) connections were open or that a voltage limit condition occurred while the OUTPUT was on. In order to clear the "E530" message form the display, the user must first correct the problem, then turn the OUTPUT back on. A voltage limit condition may be the result of attempting to drive a relatively high current through a relatively high impedance load. For example, attempting to drive 500 mA through a 100 ohm load requires a compliance voltage of 50 volts. The 3811 is specified to have a compliance voltage of just greater than 25 volts. Thus, the voltage limit condition would probably exist. If GPIB (remote) operation is used, the user should be aware that the conditions which force the OUTPUT off may be changed by the user via the "ENAB:OUTOFF" command. If this command is issued, the current limit (LIM) condition may cause the OUTPUT to be turned off.

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

SYMPTOMS	CAUSES and CORRECTIVE ACTIONS
Duty Cycle set point is not constant	The 3811 may force the Duty Cycle (CDC) set point to change to a valid value when and if the Pulse Width (PW) is changed. This is necessary because the resolution of the "on" and "off" times of the Pulse cycle dictate the resulting duty cycle. A resolution of 0.1 uSec for PW and PRI is the limiting factor. Adjust the Pulse Width (PW) first, then edit the Duty Cycle (CDC). When editing PW (in CDC mode) it may be necessary to check the CDC set point to see if it has changed. Then, if it has changed, adjust the PW and reset CDC, as necessary.
Duty Cycle display does not show all possible values	The 3811 automatically adjusts the display to show only valid duty cycle (CDC) values, based on the present Pulse Width (PW). This is necessary because the resolution of the "on" and "off" times of the Pulse cycle dictate the resulting duty cycle. A resolution of 0.1 uSec for PW and PRI is the limiting factor. Adjust the Pulse Width (PW) first, then edit the Duty Cycle (CDC).
Setting Duty Cycle remotely gets wrong results	This may happen because the resolution of the "on" and "off" times of the Pulse cycle dictate the resulting duty cycle. A resolution of 0.1 uSec for PW and PRI is the limiting factor. Therefore, if a value for Duty Cycle (CDC) is entered which is not valid (given the present Pulse Width), the 3811 will automatically adjust the CDC set point to the nearest valid value. Therefore, it is recommended that the user query the CDC set point via the "SET:CDC?" query after issuing the "CDC" command. This allows the user to determine if some adjustment is required.
Calibration does not begin	If the error message "E516" is displayed (or returned remotely via the "ERR?" query) it indicates that the laser drive current limit (LIM) is set too low for the present range. It is recommended that the laser drive current limits be set to full scale for the respective output range for calibration.
Error light flashing but no apparent error	Error messages are only displayed for three seconds. After that, the error light will remain flashing until the error is corrected. In the case of a voltage limit/open circuit error, the error light will remain flashing until the error is corrected and the OUTPUT is again turned on. This is done because the act of turning the OUTPUT off would otherwise remove that error condition. If the error light flashes and the message is missed, and turning the OUTPUT on does not restore the error message, it means that there was an intermittent voltage limit/open circuit condition.
OUTPUT is turned off, but no apparent error	An error condition occurred which turned the OUTPUT off, but the error was corrected before the user read the message. This most likely is caused by an intermittent open in the interlock connection.

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

ATTENTION!

THE FOLLOWING PAGES CONTAIN INFORMATION FOR GETTING YOUR LDP-3811 SYSTEM UP AND RUNNING QUICKLY.

Place this section (Appendix B) in the back of this manual, 3811 Instruction Manual.

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

Appendix B

QUICK START

Installation

Check to be sure that the voltage printed on the back panel of the instrument matches the power-line voltage in your area. Connect the 3811 to the proper AC power receptacle and turn the back panel KEYLOCK switch to the "ENABLED" position and turn the front panel POWER switch "on" (LED lit).

WARNING

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

Setup the OUTPUT Parameters

Press the SELECT switch (in the PARAMETER SETUP section) once or twice to view the LIM 200 or LIM 500 limit (select the limit for the output range you plan to use). Then, press and hold in the SET switch and turn the adjust knob to select a limit value which is compatible with the laser (or other device) you are using. When the SET switch is released, the new limit value will be stored, and the instrument state will change to the indicated range.

If you wish to use the 500 mA output range, press the (PARAMETER SETUP) SELECT switch again until the 200 mA RANGE LED flashes. Then, press the SET switch and turn the adjust knob to change ranges. The selected range value will be shown on the digital display. When the SET switch is released, the new range will be stored and the 3811 will change to the selected range. After the output range and limit are stored, turn the front panel ADJUST knob to change the set point (operating) current. Three seconds after turning the ADJUST knob, the display will return to showing the measured current.

Initialize Test Mode Parameters

CONST % (Constant Duty Cycle) is the default mode. CONST % mode allows the user to adjust the pulse width (PW) while maintaining a constant duty cycle percentage. CONST PRI (Constant Pulse Repetition Interval) mode allows the user to adjust the pulse width while maintaining a constant pulse period. CW (Continuous Wave) mode disables pulsing.

If you wish to change modes press the (MODE) SELECT switch. To switch between Continuous Wave (CW) mode and any PULSE mode, hold the (MODE) SELECT switch in until the present mode LED starts to flash. Release the switch, and the MODE will change. To toggle around the PULSE modes, press the (MODE) SELECT switch momentarily.

In any PULSE mode, the Pulse Width is set by pressing the PW switch and then turning the adjust knob. Pulse width (and PRI, in CONST PRI mode) will be displayed in either uSec or mSec, using the appropriate unit

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

enunciator.

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

In CONST % mode, set the duty cycle by pressing the DUTY CYCLE % / PRI switch and then turning the front panel adjust knob. Valid duty cycles are automatically determined by the PW selected (and are based on the resolution of the 3811 pulse circuit on/off times).

In CONST PRI mode, set the PRI by pressing the DUTY CYCLE % / PRI switch and then turning the front panel adjust knob.

External Trigger (EXT) mode operation is discussed in Chapter 2, Operation.

Connect to the Laser

Connect the laser (or other device) to the back panel BNC connector or 9-pin, D-Sub OUTPUT connector. Be sure that the device is connected properly, with the polarity as shown on the 3811 back panel, or refer the pin-out for the 9-pin connector.

NOTE - The interlock (pins 1 and 2 on the 9-pin, D-Sub OUTPUT connector) MUST be connected or the OUTPUT will not be enabled.

Turn the OUTPUT on by pressing the ON switch. After a 2 second delay, the 3811 will automatically drive the laser to the set point current (waveform, etc.).

While the OUTPUT is on, the laser drive current OUTPUT set point and limit may be changed. Also, the pulse duration may be edited (if in a PULSE mode). If the pulse width is changed, the duty cycle percentage may be automatically altered, if required (due to the limitations of the resolution of the PW and PRI values).

If the mode of operation is changed, the OUTPUT will be forced off.

Saving Changes

When the 3811 is powered off, the state of the unit at power-down is saved in non-volatile memory. For information on saving additional setups, see section 2.4.6.4.

More Information

The user should read Chapter 2, Operation, to become familiar with all of the features of the 3811. Section 2.4.1 is useful for a quick familiarization of the 3811 front panel. Remote operation is discussed in Chapters 3 and 4 of this manual.

1,2Interlock
3Chassis Ground
4,5Laser Cathode
6,7N/A

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

8,9 Laser Anode

9-Pin OUTPUT Connector

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