Chapter 1

GENERAL INFORMATION

1.1 Introduction

This manual contains operation and maintenance information for the 3722 Low Power Laser Diode Controller and optional Model 1231 GPIB/IEEE-488.2 Interface. If you want to get started right away, read Chapter 2, which covers Operation, first.

In the following chapters there are three areas of discussion, one for functions which are common to both the TEC and the LASER controller, one for the functions which pertain to the TEC controller only, and one for functions which pertain to the LASER current source only.

1.2 Product Overview

The 3722 Low Power Laser Diode Controller is a combination current source/temperature controller. The current source provides a high stability output with a fully redundant current limit and multiple laser protection features. The built-in temperature controller can work with most thermistors and TE modules to deliver precision laser temperature control over a wide range of temperatures. And, the 3722's fast, sophisticated GPIB option lets you automate your experiment.

1.3 Available Options and Accessories

Options and accessories available for the 3722 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)	132
Temperature Controlled Laser Diode Mount	4412
Current Source/Laser Diode Mount Interconnect Cable	303
Temperature Controller/Laser Diode Mount Interconnect Cable	505
Calibrated 10 Kohm Thermistor	510
Uncalibrated 10 Kohm Thermistor	520
Uncalibrated AD590LH IC Temperature Sensor	530
Uncalibrated LM335AH IC Temperature Sensor	540

Other Laser Diode Mounts and Thermistor models are available. Please contact ILX Lightwave for information on additional options for your applications.

1.4 Specifications

The specifications for the LDC-3722's laser diode current are found in Section 1.4.1, the specifications for the LDC-3722's temperature controller are found in Section 1.4.2, and the general specifications are found in Section 1.4.3.

1.4.1 Laser Current Source Specifications

Current Source	200 mA Range	500 mA Range
Set Point Resolution:	14 bit	14 bit
Set Point Accuracy:	±4 mA	±10 mA
Compliance Voltage (user-adjustable):	1 to 5 V	1 to 5 V
Temperature Coefficient:	<100 ppm/°C	<1[illegible]0 ppm/°C
Stability[1], for 10 min.:	<10 ppm,	<1[illegible] ppm
Stability[1], for 24 hours:	<50 ppm	<5[illegible] ppm
Noise and Ripple[2]		
High Bandwidth Mode:	<5 uA	<1[illegible] uA
Low Bandwidth Mode:	<1 uA	<2 [illegible]A
Noise Density, @ 50/60 Hz:	<20 nA/rt Hz	<5[illegible] nA/rt Hz
Worst Case Transients:	<5 mA	<5 [illegible]mA
Photodiode Feedback		
Range:	1 to 5000 uA	1 to 5000 uA
Output Stability[3]:	±0.1%	±0.1%
Accuracy:	±2 uA	±2 uA
Bias Voltage:	5 V reverse bias	5 V reverse bias
Laser Drive Current Display		
Output Current Resolution:	0.01 mA	0.01 mA
Output Current Accuracy @ 25°C:	±2% of full scale	±2% of full scale
Photodiode Current Range:	0 - 5000 uA	0 - 5000 uA
Photodiode Current Resolution:	1 uA	1 uA
Photodiode Current Accuracy:	±2 uA	±2 uA
Responsivity Range:	0 - 600.00 uA/mW	0 - 600.00 uA/mW
Responsivity Resolution:	0.01 uA /mW	0.01 uA/mW

1 Stability specifications are measured at half-scale output, after a one hour warm-up period.

2 Noise and ripple are measured across 50 ohm load, at 100 mA output, with a high input impedance rms millivoltmeter which has a 10 Hz to 10 MHz bandwidth.

3 Specified values are a percent of nominal. Constant power mode stability specification assumes zero drift in detector responsivity.

Laser Drive Current Display (Cont.)

Optical Power Range:	0 - 200.00 mW	0 - 200.00 mW
Output Power Resolution:	10 uW	10 uW
Temperature Coefficient:	<100 ppm/°C	<100 ppm/°C
Type:	5-digit green LED	5-digit green LED

Current Limit Setting

Range:	0 - 200 mA	0 - 500 mA
Resolution:	1 mA	2.5 mA
Accuracy:	±2 mA	±5 mA

Analog Mod./Voltage Control

Input:	Differential	Differential
Transfer Function:	20 mA/V	50 mA/V
Transfer Function Accuracy:	±5% of full scale	±5% of full scale
Bandwidth[1] (3 db):	DC to 100 KHz	DC to 100 KHz

1.4.2 Temperature Controller Specifications

TEC Output[2]

Output Type:	Bipolar constant current source
Compliance Voltage:	4 Volts at 4 Amps
Maximum Current Output:	4 Amps
Maximum Output Power[3]:	16 Watts typical
Current Limit Control Range:	0 to 9999 mA, ±20 mA
Current Limit Accuracy:	±50 mA
Ripple/Noise[4]:	<1 mA

Temperature Control

Temperature Range[5]:	-99°C to +150°C -20°C to +70°C with typical 10 K thermistor.

1 Bandwidth is specified for 50% modulation.

2 Output current and power are rated into a 1 ohm load.

3 Higher output powers can be accomodated by using an external booster. Contact ILX Lightwave for further information.

4 Broadband noise (10 Hz to 10 MHz) is measured at 1 Amp output current.

5 Temperature control range depends primarily on the type of thermistor and TE module used. The range can be extended higher and lower by selecting appropriate components. See Appendix B for more details.

Resolution and Accuracy[1]:	Temperature	Resolution	Accuracy
	-20°C	±0.1°C	±0.2°C
	0°C	±0.1°C	±0.2°C
	20°C	±0.1°C	±0.2°C
	50°C	±0.2°C	±0.2°C

LM335 Setting Accuracy:	±0.2°C
AD590 Setting Accuracy:	±0.2°C
Short Term Stability[2]:	±0.005°C or better, over 10 minutes
Long Term Stability:	±0.01°C or better, over 24 hours
Sensor Type:	2-wire thermistor, AD590 current type, or LM335 voltage type
Usable Thermistor Range:	25 ohms to 450 Kohms, typical
LM335 Voltage:	V(25°C) = 2980 mV, V_T = 10 mV/K over rated sensor range
LM335 Bias:	1 mA
AD590 Current:	I(25°C) = 298.2 uA, I_T = 1 uA/K over rated sensor range
AD590 Bias:	+8 VDC
Thermistor Sensing Current:	10 uA or 100 uA (user selectable)
Temperature Calculation Methods:	AD590 or LM335 calibrated with two-point method. Thermistors are calibrated by storing three constants of the Steinhart-Hart equation, listed below, in internal non-volatile memory.
Thermistor:	$1/T = (C1 * 10^{-3}) + (C2 * 10^{-4})(\ln R) + (C3 * 10^{-7})(\ln R)^3$.
LM335:	T = C1 + C2 * (V / (10 mV/K) - 273.15)
AD590:	T = C1 + C2 * (I / (1 uA/K) - 273.15)

TEC Display

Display Type:	5-digit green LED display
Maximum Current Reading:	1.0 Amps, 10.0 Amps with a current booster
Maximum Temp. Reading:	199.9°C
Current Resolution:	0.001 Amps
Current Display Accuracy	±0.01 Amps
Temperature Resolution:	0.1°C
Temperature Display Accuracy:	±0.5°C
Thermistor Resistance Resolution:	0.01 Kohms, at 10 uA setting 0.001 Kohms, at 100 uA setting
Thermistor Resistance Display Accuracy:	±0.05 Kohms, at 10 uA setting ±0.005 Kohms, at 100 uA setting

1 Accuracy figures quoted are typical for a 10 K ohm thermistor and 100 uA source current setting. Accuracy figures are relative to calibration standard. Both resolution and accuracy are dependent on the user defined configuration of the instrument.

2 Short term temperature stability is a strong function of the thermal environment of the thermistor and TE module. Room air currents in particular can easily cause fluctuations of 0.1°C in an exposed mounting configuration.

1.4.3 General LDC-3722 Specifications

Connectors

Photodiode Monitor and Current Source Connectors:	9-pin D-connector, banana jacks for LASER output, BNC for photodiode input
External Modulation Input:	BNC connector, instrumentation amplifier input
Temperature Controller:	15-pin D-connector, banana jacks for TEC output and thermistor input

Optional GPIB

Meets ANSI/IEEE Std 488.1-1987
Meets ANSI/IEEE Std 488.2-1987

General

Size:	5.7" x 12.6" x 17.0" 145 x 320 x 432 mm
Weight:	<18 lbs (8.2 kg)
Power Requirements:	90 - 110 VAC, 110 - 130 VAC, 210 - 230 VAC, or 230 - 250 VAC, 50 - 60 Hz
Temperature:	0 to +50°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.)