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LDC 3700B Series

Laser Diode Controllers

Product Features

Current Sources

Low noise, high stability output

Constant current and constant power modes

Analog modulation capability of over 1 MHz

Temperature Control

High accuracy, high stability output

Low-noise bipolar output

Operational with most thermistors and IC temperature sensors

Design

GPIB/IEEE-488.2 interface

The LDC-3700B Series Laser Diode Controllers are a family of high-precision, microprocessor-based instruments that offer both laser diode current and temperature control in the same instrument.

The LDC-3714B is designed specifically for precision control of very low-power laser diodes with a 50/100 mA dual-range current source and 16 W TEC. The LDC-3724B is ideal for controlling low power laser diodes (200/500 mA current source and 16 W TEC), while the LDC-3744B is ideal for controlling medium-power laser diodes (2/4 A current, 16 W TEC).

Fast, remote operation is available on all three instruments with the standard GPIB/IEEE-488.2 interface—upgraded with the latest technology from National Instruments®. LabVIEW® instrument drivers are also available on request or can be downloaded via the ILX Lightwave web site, free of charge.



The New Standards for High-Performance Laser Diode Control

ILX Lightwave

Photonic Test & Measurement Instrumentation

LDC 3700B Series

Laser Diode Controllers

Fine Tune the Protection For Your Laser Diode

The LDC-3700B Controllers feature front panel adjustable compliance voltage, to prevent damaging voltage spikes. A new, faster output shutoff circuit provides an additional level of protection.

Intuitive Front Panels

For quick and easy operation, the front panels are divided into two major sections, TEC and LASER Control. The bright, 5-digit, green LED display is easy to read, even with laser safety goggles. The operating parameters offer a simultaneous dual display for laser current and temperature parameters.

A digital adjust knob simplifies changes, while informative error indicators add laser diode and TE module protection. Current and temperature control electronics are electrically isolated in each LDC-3700B Controller, allowing you to configure the instrument to fit your particular application.



The LDC-3714B and LDM-4407 mount: Ideal for precision control of very-low-power laser diodes.

Closed-case Calibration

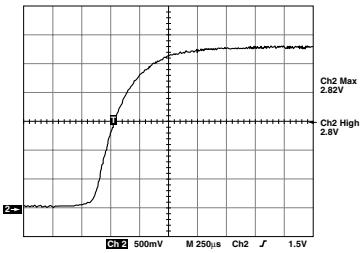
The LDC-3700B architecture simplifies routine maintenance; calibration can be performed via the front panel or the GPIB interface. Calibration data is automatically stored in nonvolatile memory.

Save and Recall Instrument Settings

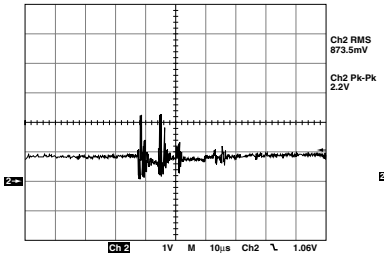
The LDC-3700B Controllers offer a unique SAVE and RECALL feature. The SAVE feature allows you to easily store all the front panel settings for any given instrument condition. The RECALL button allows you to retrieve the settings, which are stored in one of ten memory bins, at any time.

ILX Current Source Topology Provides A New Dimension in Control

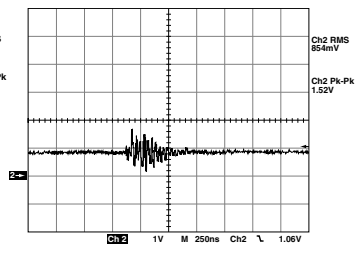
Each LDC-3700B Controller offers a low noise current source operating either in one of two constant current modes or a constant optical power mode. The proven ILX Lightwave Constant Current design delivers uncompromising laser protection with unbeatable high stability and low noise performance.



Operational turn-on transient test result



Surge response test result



EFT response test result

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A Choice Of Operation Modes Put You in the Driver's Seat

With the LDC-3700B Series Controllers, you can easily control the current to your laser diode in one of three modes:

1) constant current, CW
2) constant current, high-bandwidth
3) constant light power

The CW mode offers improved laser protection and noise performance. This low-bandwidth mode is optimized for DC operation, and supports external modulation.



The LDC-3724B and LDM-4980 mount: An unbeatable combination for controlling low- to medium-power laser diodes.

In high-bandwidth mode, the output stage supports higher frequency, external modulation suitable for dithering the laser current for power and wavelength tuning. The modulation port is implemented as a differential input, allowing the modulation control voltage and laser outputs to use different grounds.

The constant light mode provides constant optical power by using the photocurrent from the laser diode's rear-facet monitor, or an external photodiode in a feedback control loop to the laser driver current.

Control Temperature in One of Three Modes of Operation

With the LDC-3700B Series Controllers, you can easily set the temperature output to control temperature in one of three modes:

1) Constant temperature
2) Constant sensor value
3) Constant TE module current

In the constant temperature mode, you can drive your TE module to a temperature anywhere from –99°C to 199°C, depending on the TE module, load, and thermistor or IC temperature sensor selected.

The LDC-3700B also features GPIB-readable TEC voltage measurement for monitoring the power consumption of your laser diode module.

The sensor value (R) mode gives you the flexibility to drive to a certain thermistor resistance value, or to a desired AD590 current or LM335 voltage. The TE-module current mode lets you drive the output to a predetermined TE-module current setting. If the temperature sensor or TE module opens during operation, the laser diode output shuts down and the appropriate fault indicator lamp flashes.

TEC Output Limits Provide Worry-free Cooling



The LDC-3744B and LDM-4442 mount: The perfect solution for controlling medium power laser diodes.

In addition to the normal control modes, the TEC outputs of the LDC-3700B Controllers are bound by a fully independent hardware current limit that can not be exceeded in any mode of operation. The output can be bound by a high-temperature limit setting. Adjustment of either setting is easy and precise. If the limits are

LDC 3700B Series

Laser Diode Controllers

exceeded, the appropriate fault indicator lamp will flash.

Put Our Expertise to Work for You

ILX Lightwave is a recognized world leader in photonic test and measurement instrumentation. Our products are not only renowned for their reliability, quality and value, they're backed by strong after-sales support. For more information about the LDC-3700B Series Controllers and our family of photonic test and measurement instrumentation, call us today.

Specifications

GENERAL

Chassis Ground:	4 mm Banana jack
GPIB Connector:	24-pin IEEE-488.1
Power Requirements (50-60 Hz):	110–115 VAC, 220–240 VAC (+6%/–10%)
Size (HxWxD):	353 mm x 345 mm x 127 mm 13 5/8"x 13 5/16"x 5"
Weight:	10.2 kg (22.5 lbs)
Operating Temperature:	0°C–50°C
Storage Temperature:-	–40°C to 70°C
Humidity:	<90% relative, noncondensing (All instruments)
Laser Safety Features:	All instruments utilize a Keyswitch, Interlock and Output delay (Meets CDRH US21 CFR 1040.10)
LASER Display Type:	5-Digit, Green LED
TEC Display Type:	5-Digit, Green LED
Output Connectors	
Laser Drive Current:	9-pin, D-sub
TEC Control:	15-pin, D-sub
External Modulation:	Coax BNC inst. amp input

NOTES

All controllers include ILX model TS-510 calibrated 10 kΩ thermistors. Laser diode collimating lenses, and other accessories are also available. Contact an ILX Lightwave sales engineer for more information.

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In keeping with our commitment to continuing improvement, ILX Lightwave reserves the right to change specifications without notice and without liability for such changes.

ORDERING INFORMATION

LDC-3714B	Laser Diode Controller (50/100 mA Current Source, 16 W TEC)
LDC-3724B	Laser Diode Controller (200/500 mA Current Source, 16 W TEC)
LDC-3744B	Laser Diode Controller (2000/4000 mA Current Source, 16 W TEC)
CC-305S	Current Source/Laser Diode Mount Interconnect Cable
CC-306S	Current Source/Unterminated Interconnect Cable
CC-501S	TE Controller/Unterminated Interconnect Cable
CC-505S	TE Controller/Laser Diode Mount Interconnect Cable
LNF-320	Low Noise Filter
TS-510	Calibrated 10 kΩ Thermistor
TS-520	Uncalibrated 10 kΩ Thermistor
TS-523	Uncalibrated 20 kΩ Thermistor
TS-525	Uncalibrated 100 kΩ Thermistor
TS-530	Uncalibrated AD590LH IC Temperature Sensor
TS-540	Uncalibrated LM335AH IC Temperature Sensor
TSC-599	RTD Temperature Sensor Converter
RM136	Rack Mounting Kit (LDC-3714B, LDC-3724B, LDC-3744B)
UCA-350	Unipolar Heater Control Adapter
LabVIEW® Instrument Driver	

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Rev. 5/25/01

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Specifications[1]

CURRENT SOURCE [1]

MODEL NUMBER	LDC-3714B		LDC-3724B		LDC-3744B	
DRIVE CURRENT OUTPUT						
Output Current Range:	0–50 mA	0–100 mA	0–200 mA	0–500 mA	0–2000 mA	0–4000 mA
Setpoint Resolution:	1 µA	2 µA	4 µA	10 µA	40 µA	80 µA
Setpoint Accuracy:	±0.05% of FS	±0.05% of FS	±0.05% of FS	±0.05% of FS	±0.05% of FS	±0.05% of FS
Compliance Voltage:	0–10 V adjustable		0–10 V adjustable		0–10 V adjustable	
Temperature Coefficient:	<50 ppm/°C	<50 ppm/°C	<50 ppm/°C	<50 ppm/°C	<100 ppm/°C	<100 ppm/°C
Short-Term Stability (1 hr.):[2]	<20 ppm	<20 ppm	<20 ppm	<20 ppm	<20 ppm	<20 ppm
Long-Term Stability (24 hr.):[3]	<40 ppm	<40 ppm	<40 ppm	<40 ppm	<40 ppm	<40 ppm
Noise and Ripple (rms)[4]						
High Bandwidth Mode (rms):	<1.5 µA	<1.5 µA	<4 µA	<4 µA	<15 µA	<20 µA
Low Bandwidth Mode (rms):	<1.5 µA	<1.5 µA	<2 µA	<2 µA	<10 µA	<10 µA
Transients						
Operational:[5]	<2 mA	<2 mA	<3 mA	<3 mA	<4 mA	<4 mA
1 kV EFT:	<5 mA	<5 mA	<8 mA	<8 mA	<8 mA	<8 mA
Surge:[6]	<8 mA	<8 mA	<12 mA	<12 mA	<10 mA	<10 mA
COMPLIANCE VOLTAGE ADJUST						
Range:	0–10 V	0–10 V	0–10 V	0–10 V	0–10 V	0–10 V
Resolution:	50 mV	50 mV	50 mV	50 mV	50 mV	50 mV
Accuracy:	±2.5%	±2.5%	±2.5%	±2.5%	±2.5%	±2.5%
DRIVE CURRENT LIMIT SETTINGS						
Range:	1–50.5 mA	1–101 mA	1–202 mA	1–505 mA	1–2020 mA	1–4040 mA
Resolution:	0.25 mA	0.5 mA	1 mA	2.5 mA	10 mA	20 mA
Accuracy:	±0.5 mA	±1 mA	±2 mA	±5 mA	±20 mA	±40 mA
PHOTODIODE FEEDBACK						
Type: Differential	Differential	Differential	Differential	Differential	Differential	
Photodiode Reverse Bias:	0–5 V adjustable	0–5 V adjustable	0–5 V adjustable	0–5 V adjustable	0–5 V adjustable	0–5 V adjustable
Photodiode Current Range:	5 to 5000 µA	5 to 5000 µA	5–5000 µA	5–5000 µA	5–10,000 µA	5–10,000 µA
Output Stability:[7]	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
Setpoint Accuracy:	±0.05% of FS	±0.05% of FS	±0.05% of FS	±0.05% of FS	±0.05% of FS	±0.05% of FS
EXTERNAL ANALOG MODULATION						
Input: 0–10 V, 10 kΩ	0–10 V, 10 kΩ	0–10 V, 10 kΩ	0–10 V, 10 kΩ	0–10 V, 10 kΩ	0–10 V, 10 kΩ	
Transfer Function:	5 mA/V	10 mA/V	20 mA/V	50 mA/V	200 mA/V	400 mA/V
Bandwidth (3dB)						
High Bandwidth:[8]	DC to 1 MHz	DC to 1 MHz	DC to 1 MHz	DC to 1 MHz	DC to 250 kHz	DC to 250 kHz
Low Bandwidth:	DC to 15 kHz	DC to 15 kHz	DC to 15 kHz	DC to 15 kHz	DC to 10 kHz	DC to 10 kHz
TRIGGER OUTPUT						
Type: TTL	TTL	TTL	TTL	TTL	TTL	
Pulse Width:	13 µS	13 µS	13 µS	13 µS	13 µS	13 µS
Delay:12 mS	12 mS	12 mS	12 mS	12 mS	12 mS	
MEASUREMENT (DISPLAY)[9]						
Output Current Range:	0–50.000 mA	0–100.00 mA	0–200.00 mA	0–500.00 mA	0–2000.0 mA	0–4000.0 mA
Output Current Resolution:	0.001 mA	0.002 mA	0.01 mA	0.01 mA	0.1 mA	0.1 mA
Output Current Accuracy:	±0.05% FS	±0.05% FS	±0.05% FS	±0.05% FS	±0.1% FS	±0.1% FS
Photodiode Current Range:	0–5000 µA	0–5000 µA	0–5000 µA	0–5000 µA	0–10,000 µA	0–10,000 µA
Photodiode Current Resolution:	1 µA	1 µA	1 µA	1 µA	1 µA	1 µA
Photodiode Current Accuracy:	±2 µA	±2 µA	±2 µA	±2 µA	±2 µA	±2 µA
Photodiode Responsivity Range(µA/mW):[10]	0.00–1000.00	0.00–1000.00	0.00–1000.00	0.00–1000.00	0.00–1000.00	0.00–1000.00
Photodiode Responsivity Resolution:	0.01 µA/mW	0.01 µA/mW	0.01 µA/mW	0.01 µA/mW	0.01 µA/mW	0.01 µA/mW
Optical Power Range (mW):	0.00–101.00	0.00–101.00	0.00–505.00	0.00–505.00	0.00–5050.0	0.00–5050.0
Optical Power Resolution (mW):	0.01	0.01	0.01	0.01	0.1	0.1
Forward Voltage Range (V):	0.000–10.000	0.000–10.000	0.000–10.000	0.000–10.000	0.000–10.000	0.000–10.000
Forward Voltage Resolution:	1 mV	1 mV	1 mV	1 mV	1 mV	1 mV
Forward Voltage Accuracy:[11]	±2 mV	±2 mV	±2 mV	±2 mV	±2 mV	±2 mV

CURRENT SOURCE NOTES

1 All values relate to a one-hour warm-up period at room temperature, 25°C.
2 Over any 1-hour period, half-scale output.
3 Over any 24-hour period, half-scale output.
4 Measured optically, evaluating noise intensity of a laser diode into a photodetector with 150 kHz bandwidth. Request ILX Application Note #3.
5 Maximum output current transient resulting from normal operational situations (e.g., power on-off, current on-off), as well as accidental situations (e.g., power line plug removal).
6 Maximum output current transient resulting from a 1000 V power-line transient spike. Tested to ILX Lightwave Technical Standard #LDC-00196. Request ILX Application Note #3.
7 Maximum monitor photodiode current drift over any 30 minute period. Assumes zero drift in responsivity of photodiode.
8 50% modulation at mid-scale output. Higher bandwidth is possible with smaller modulation signal.
9 Displayed on LDC-37X4 mainframe front pannel “LASER” section.
10 Responsivity value is user-defined and is used to calculate the optical power.
11 Four-wire voltage measuerment. Voltage measurement accuracy while driving calibration load. Accuracy is dependent upon load used and length of cable.

LDC 3700B Series

Laser Diode Controllers

Specifications

TEMPERATURE CONTROL[1]

MODEL NUMBER	ALL MODELS	
Temperature Control Range:[2]	–99.9°C to 199.9°C	
Thermistor Setpoint Resolution and Accuracy:	Resolution	Accuracy[3]
–20°C to 20°C	0.1°C	±0.2°C
20°C–50°C	0.2°C	±0.2°C
AD590 & LM335 Setpoint:[4]		
–20°C to 50°C	0.01°C	±0.1°C
Short-Term Stability (1 hr.):[5]	±0.004°C or better	
Long-Term Stability (24 hrs.):[6]	±0.01°C	

TEC OUTPUT[7]

Output Type:	Bipolar, constant current source
Compliance Voltage:	>4 V DC
Maximum Output Current:	4.0 A
Maximum Output Power:	16 W
Current Noise and Ripple:[8]	<1 mA rms
Current Limit Range:	0–4 A
Current Limit Setpoint Accuracy:	±50 mA
Control Algorithm:	Smart Integrator, Hybrid PI

TEMPERATURE SENSOR

Types	
Thermistor:	Thermistor (2-wire NTC)
IC Temperature Sensor:	AD590/LM335
RTD Sensor:[9]	P_t100/Other 100 Ω RTD
Thermistor Sensing Current:	10/100 µA
Sensor Bias:	AD590 = 8 V, LM335 = 1 mA
Usable Thermistor Range:	25–450,000 Ω
Typical Sensor Output:[10]	
AD590 Current Output:	I(25°C) = 298.2 µA, I_t = 1 µA/K
LM335 Voltage Output:	V(25°C) = 2.73 V, V_t = 10mV/K
RTD (P_t100) Resistance:	R(25°C) = 109.73 Ω
User Calibration:	Thermistor = Steinhart-Hart IC Sensors, RTD = Two-point

TEC MEASUREMENT (DISPLAY)[11]

	Range[12]	Resolution	Accuracy
Temperature:			
10 µA Setting:[13]	–99.9°C to 199.9°C	0.01°C	±0.1°C
100 µA Setting:[14]	–99.9°C to 199.9°C	0.01°C	±0.05°C
Thermistor Resistance			
10 µA Setting:	0.00 to 450.00 kΩ	0.01 kΩ	±0.05%
100 µA Setting:	0.000 to 45.000 kΩ	0.001 kΩ	±0.05%
TE Current:	–4.000 to 4.000 A	0.001 A	±0.04 A

TEC VOLTAGE MEASUREMENT[15]

Voltage range:	–10.0 to 10.0 V
Voltage Resolution:	1 mV
Voltage Accuracy:	±30 mV[16]

TEMPERATURE CONTROL NOTES

1 All values relate to a one-hour warm-up period.
2 Software limits of range. Actual range possible depends on the physical load, thermistor type and TE module used.
3 Accuracy figures are quoted for a typical 10 kΩ thermistor and 100 µA Current setting. Accuracy figures are relative to the calibration standard. Both resolution and accuracy are dependent upon the user-defined configuration of the instrument.
4 Accuracy depends upon the sensor model selected, the cali bration standard and the user-defined configuration of the instrument.
5 Over any one-hour period, half-scale output, controlling an LDM-4412 mount @ 25°C, with 10 kΩ thermistor, on 100 µA setting.
6 Over any 24-hour period, half-scale output, controlling an LDM-4412 mount @ 25°C, with 10 kΩ thermistor, on 100 µA setting.
7 Into a one Ω load.
8 Measured at 1 A output up to 150 kHz.
9 When ordered with TSC599 RTD Temperature Sensor Converter.
10 Nominal temperature coefficients, It and Vt, apply over the rated temperature sensor range.
11 Displayed on the LDC-3700B Series front panel "TEC" Section.
12 Software limits of display range.
13 Using a 100 kΩ thermistor controlling an LDM-4412 mount over –30°C to 25°C.
14 Using a 10 kΩ thermistor, controlling an LDM-4412 mount over 0°C to 90°C.
15 Voltage measurement is available only through the GPIB inteface.
16 Voltage measurement accuracy while driving calibration load. Accuracy is dependent upon load use.

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