LDC 3700C Series

Laser Diode Controllers

Product Features

- Laser diode current source with integrated 32W temperature controller
- Three models available with up to 4A laser drive current
- USB remote interface
- GPIB/IEEE-488 remote interface
- High stability, low noise laser current source operating in constant power or constant current modes.
- Analog modulation capability to 1MHz
- 4-wire laser forward voltage measurement and adjustable voltage limit
- Temperature controller compatible with thermistor, IC, and RTD temperature sensors
- Temperature stability of ±0.004°C
- TE voltage measurement

The LDC-3700C Series Laser Diode Controllers are an industry-leading family of high performance, microprocessor-based instruments that offer a high stability, low noise current source with an integrated 32W temperature controller specifically designed for controlling the current and temperature of laser diodes. These controllers are known throughout the industry for their reliability, precision, and ease-of-use.

Three models cover a wide range of low to medium power laser diode testing and control applications. The LDC-3714C and 3724C are targeted specifically for precision control of low to medium power laser diodes with dual range current sources of 50/100mA and 200/500mA respectively. For higher power laser diodes, the LDC-3744C provides a dual range current source of 2/4A. All three models come with an integrated 32W temperature controller.

Independent power supplies for laser and TE current provide clean, isolated power for laser protection and stability. All of ILX Lightwave's proven laser diode protection strategies including slow start, adjustable current limit and compliance voltage, intermittent contact protection, and output shorting relays are incorporated into each model.

The Standard for High Performance Laser Diode Control

ILX Lightwave
Laser Diode Instrumentation & Test Systems

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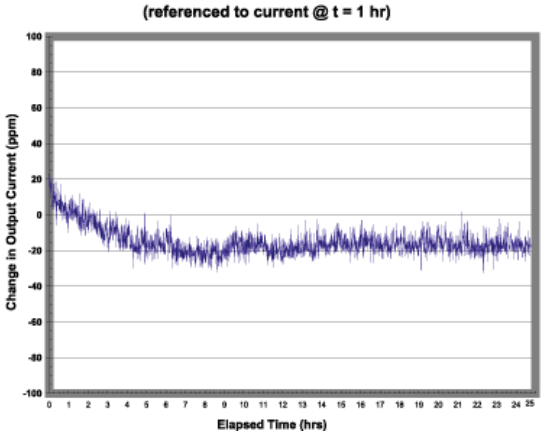
Remote instrument operation in an R&D or production environment is available through a USB or GPIB/IEEE-488 interface. A trigger output is provided for integration into an automated measurement system where the TTL level output indicates a current step change for initiation of a measurement. For virtual instrument programming, LabView® instrument drivers can be downloaded from the ILX website.

High Stability, Low Noise Laser Control

Laser diodes act as a gain medium. Small drive current fluctuations due to noise and drift are amplified optically. Because of this, a controller with a low noise and stable output is required to ensure stable optical output. The LDC-3700C Series of controllers make this possible.

Each LDC-3700C Controller offers a precision 16-bit current source with 0.05% accuracy. Careful attention to design delivers as low as 20ppm stability and 1.5µA of noise so component measurements can be made with confidence



Output Current Stability of the LDC-3700C Series

Fine Tuned for Protection of Your Laser Diode

The LDC-3700C Controllers provide all of ILX Lightwave's laser diode protection features such as independent current limits, slow start turn-on, isolated laser and temperature control power supplies, and adjustable compliance voltage. A feature not found in most laser diode controllers - fast output shut-off - provides an additional level of protection from intermittent contacts between the laser diode and the current source. These protection features all work in conjunction with all instrument modes of operation, providing worry-free, fail safe control of your laser diode.

A Choice of Laser Current Control Modes

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

- Constant current, low bandwidth
- Constant current, high bandwidth
- Constant optical power

The constant current, low bandwidth mode offers improved laser protection and noise performance and is optimized for DC operation. This mode supports external modulation up to 15kHz.

In constant current high bandwidth mode, the output stage supports higher modulation frequencies up to 1MHz for dithering the laser current for power and wavelength tuning. For laser protection, the modulation input is implemented as a differential input, allowing the modulation control voltage and laser outputs to use different grounds.

The constant power mode provides constant optical power operation of your laser diode by using the photocurrent from its rear facet photodiode or from an external photodiode measuring front facet light in a feedback control loop to the current source.

Precision Temperature Control

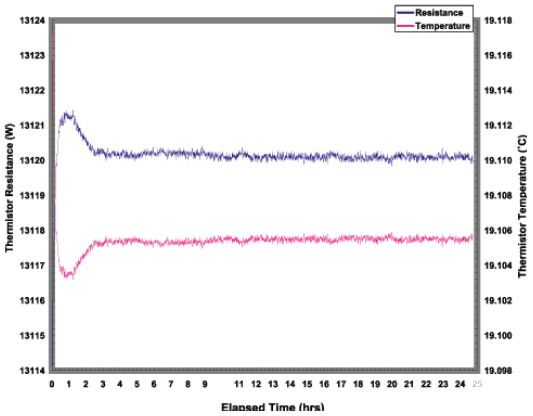
The LDC-3700C Series Controllers include an integrated precision 32W temperature controller for quick temperature response of the laser diode's chip temperature. For precise wavelength control during component testing, the LDC-3700C Series' control algorithm maintains temperature with a stability of 0.004°C.

Sixteen-bit control and measurement allows you to set temperature with 0.01°C resolution with a measurement accuracy of 0.05°C (with a calibrated

sensor). In addition, the LDC-3700C series supports TEC forward voltage measurement for monitoring the total power consumption of your laser diode module.

Wide Temperature Control Range

These controllers offer extended temperature control from -100°C to 199.9°C with a choice of thermistor, IC, or RTD temperature sensors. Temperature can be controlled in one of three modes: constant temperature, constant sensor, or constant TE current.



Temperature Control Stability of an LDC-3724C

As an added precaution, if the temperature sensor or TE module circuit should open during operation, the laser diode current source output will be shut off and the appropriate fault indicator LED will illuminate.

In addition to the normal control modes, the TEC output of the LDC-3700C Controllers is bounded by a fully independent hardware current limit to protect the laser diode's internal TE module. These limits cannot be exceeded in any mode of operation. The controller can also be bounded by a high temperature limit setting.

Ease of Operation

Divided into two sections, TEC and LASER, the front panel offers quick, easy operation and information display without confusing multi-layer menus. Each bright, 5-digit, green LED display is easy to read from a distance, even with laser safety goggles. Each channel is directly addressable from the front panel "adjust" section with LASER and TEC parameters and modes easily selected or adjusted through discrete pushbuttons and a rotary digital encoder.

Save and Recall Instrument Settings

For multiple instrument test configurations, the LDC-3700C Controllers offer a SAVE and RECALL feature. The SAVE function allows you to store all the front panel settings for any given instrument condition. The RECALL function allows you to retrieve any of the saved conditions at any time. This saves time in instrument re-configuration for different production runs or R&D experiments.

Simplify Routine Maintenance

The LDC-3700C architecture simplifies routine maintenance; calibration of the laser current source and TE controller can be performed via the front panel or through USB or the GPIB/IEEE-488 interface, without opening the instrument up or manual adjustments. A calibration mode is entered through unique push button combinations or remote commands, and all calibration data is easily entered via the front panel, USB or GPIB. Calibration data is automatically stored in on-board non-volatile memory.

Put Our Expertise to Work

ILX Lightwave is a recognized world leader in Laser Diode Instrumentation and Test Systems. Our products are not only renowned for their reliability, quality, and value, they're backed by industry-leading after-sales support. For more information about the LDC-3700C Series Controllers and our complete family of Laser Diode Instrumentation and Test Systems, call us today or visit us at www.ilxlightwave.com.

LDC 3700C Series

Laser Diode Controllers

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Specifications

GENERAL

Chassis Ground:	4mm Banana jack
GPIB Connector:	IEEE-488
USB Connector:	Type B
Power Requirements (50-60Hz):	100-120 VAC (±10%), 220–240 VAC (±10%)
Size (HxWxD):	127mm x 353mm x 345mm 5in x 13.4in x 16.3in
Weight:	
LDC-3714/24C	10.2kg (22.5lbs)
LDC-3744C	11.3kg (25lbs)
Operating Temperature:	0°C to 40°C
Storage Temperature:-	–40°C to 70°C
Humidity:	<90% relative, noncondensing
Laser Safety Features:	All instruments utilize a Keyswitch, Interlock and Output delay (Meets US 21 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, female
TEC Control:	15-pin, D-sub, female
External Modulation:	BNC
Chassis Ground:	4mm Banana jack

NOTES

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

LabVIEW® is a registered trademark of National Instruments.

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-3714C	Laser Diode Controller (50/100mA Current Source, 32W TEC)
LDC-3724C	Laser Diode Controller (200/500mA Current Source, 32W TEC)
LDC-3744C	Laser Diode Controller (2000/4000mA Current Source, 32W 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
LDM-4982	DIL Laser Diode Mount
LDM-4982M	Mini-DIL Laser Diode Mount with TE-550 Case Temperature Control
LDM-4984	Butterfly Laser Diode Mount
LDM-4984RF	Hi-Frequency Butterfly Laser Diode Mount
LDM-4986	Connectorized Laser Diode Mount
LDM-4407	Temperature-Controlled TO-Can Laser Diode Mount
LDM-4412	Temperature-Controlled Laser Diode Mount with Collimating Lens
TS-510	Calibrated 10kΩ Thermistor
TS-520	Uncalibrated 10kΩ Thermistor
TS-523	Uncalibrated 20kΩ Thermistor
TS-525	Uncalibrated 100kΩ 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-3714C, LDC-3724C, LDC-3744C)
UCA-350	Unipolar Heater Control Adapter
LabVIEW® Instrument Driver	

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

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

ILX Lightwave
Laser Diode Instrumentation & Test Systems
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LDC 3700C Series

Laser Diode Controllers

Specifications[1]

LASER CURRENT SOURCE

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

CURRENT SOURCE NOTES

1 All values after a one-hour warm-up period at room temperature, 25°C.
2 Over any one-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 150kHz bandwidth.
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 1000V power-line transient spike. Tested to ILX Lightwave Technical Standard #LDC-00196.
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 Responsivity value is user-defined and is used to calculate the optical power.
10 Four-wire voltage measuerment. Voltage measurement accuracy while driving calibration load. Accuracy is dependent upon load used and length of cable.

LDC 3700C Series

Laser Diode Controllers

Specifications[1]

TEMPERATURE CONTROL

MODEL NUMBER	ALL MODELS	
Temperature Control Range:[2]	–100°C to 199°C	
Thermistor Setpoint:	–100°C to 199°C	
Resolution and Accuracy	Resolution	Accuracy[3]
–20°C to 20°C:	0.1°C	±0.2°C
20°C to 50°C:	0.2°C	±0.2°C
AD590 & LM335 Setpoint[4]		
–20°C to 50°C:	0.1°C	±0.1°C
Short-Term Stability (one-hour):[5]	±0.004°C or better	
Long-Term Stability (24-hours):[6]	±0.01°C	

TEC OUTPUT[7]

Output Type:	Bipolar, constant current source
Compliance Voltage:	>8V DC
Maximum Output Current:	4.0A
Maximum Output Power:	32W
Current Noise and Ripple:[8]	<1mA rms
Current Limit	
Range:	0–4A
Setpoint Accuracy:	±50mA
Control Algorithm:	Smart Integrator, Hybrid PI

TEMPERATURE SENSOR

Types	
Thermistor:	2-wire NTC
IC Temperature Sensor:	AD590/LM335
RTD Sensor:[9]	Pt 100/Other 100Ω RTD
Thermistor Sensing Current:	10/100µA
Sensor Bias:	AD590=8V, LM335=1mA RTD=0.8mA[9]
Usable Thermistor Range:	25–450,000Ω
Typical Sensor Output[10]	
AD590 Current Output:	I(25°C)=298.2µA, I_t=1µA/K
LM335 Voltage Output:	V(25°C)=2.73V, V_t=10mV/K
RTD (Pt100) Resistance:	R(25°C)=109.73Ω
User Calibration:	Thermistor=Steinhart-Hart IC Sensors, RTD=Two-point

TEC MEASUREMENT (DISPLAY)

	Range[11]	Resolution	Accuracy
Temperature:			
10 µA Setting:[12]	–100.0°C to 199.9°C	0.01°C	±0.1°C
100 µA Setting:[13]	–100.0°C to 199.9°C	0.01°C	±0.05°C
Thermistor Resistance			
10 µA Setting:	0.00 to 450.00kΩ	0.01kΩ	±0.05%
100 µA Setting:	0.000 to 45.000kΩ	0.001kΩ	±0.05%
TE Current:	–4.000 to 4.000A	0.001A	±0.04A

TEC VOLTAGE MEASUREMENT[14]

Voltage Range:	–10.0 to 10.0V
Voltage Resolution:	1mV
Voltage Accuracy:	±30mV[15]

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 10kΩ thermistor and 100µA 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 calibration standard, and the user-defined configuration of the instrument.
5 Over any one-hour period, half-scale output, controlling an LDM-4412 mount at 25°C, with 10kΩ thermistor, on 100µA setting.
6 Over any 24-hour period, half-scale output, controlling an LDM-4412 mount at 25°C, with 10kΩ thermistor, on 100µA setting.
7 Into a 1Ω load.
8 Measured at 1A over bandwidth of 10Hz to 10MHz
9 When ordered with TSC599 RTD Temperature Sensor Converter.
10 Nominal temperature coefficients, I_t and V_t, apply over the rated temperature sensor range.
11 Software limits of display range.
12 Using a 100kΩ thermistor controlling an LDM-4412 mount over –30°C to 25°C.
13 Using a 10kΩ thermistor, controlling an LDM-4412 mount over 0°C to 90°C.
14 Voltage measurement is available only through USB or the GPIB inteface.
15 Voltage measurement accuracy while driving calibration load. Accuracy is dependent upon load use.

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