

Instruction Manual

High Power, High Speed, High Current Laser Diode Driver/Power Supply

Models: LD-1500A/3000A



**This manual contains Operating, Safety, and
Maintenance information and subjects to change without notice.**



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1.1 GENERAL

High Power, High Speed, High Current Laser Diode Driver/Power Supply, LD-1500A/3000A are designed to drive a laser diode in CW , QCW (Quasi Continuous Wave), Normal Pulse and Super Pulse mode. High power laser diode driver LD-1500A/3000A achieves QCW high power up to **20KW**, and a **fast rise time of 30 ns, high peak current of 350A** in Super Pulse mode. Special made stripline enables the distance from the unit to a laser diode 1m (standard), or 2m (optional) keeping the rise time of 30ns & the minimum pulse width of 200ns.

1.2 DESCRIPTION

The high current, high power laser diode drivers LD-1500A/3000A uses a high frequency PWM-switching to convert AC input power to a desirable DC output voltage. **The magnet components weigh only 14OZ (400g, LD-1500), or 28OZ (800g, LD-3000)** due to Lic's unique magnet core and high frequency power conversion technologies accumulated in house for the past 23 years. Our double switching technology enabled a high power/accurate output voltage tracking and a fast switching at the same time. The high-speed semiconductor switches located in the output pass controls the pulse width from 200ns with the rise time of 30ns and pulse repetition rate to the 50KHz, which are generated internally, or by external input.

High power pulse laser diode driver, LD-1500A/3000A can generate a high peak pulsed current called **Super Pulse** in pulse mode. Lic engineering is the original development company for the Super Pulse from early 1980's in medical CO2 laser applications. Using the same pulse switching technologies used for these CO2 laser products, Lic engineering achieved the Super Pulse capability in Laser Diode applications too.

To minimize the switching loss at a high peak current and high repetition rate, the rise time of the switching devices are reduced to their limit. If however, the customer does not want such a high peak current, simply switching the mode SW. to Normal Pulse can disable it.

The high-speed, high power laser diode driver of LDC-120/250 is an optional unit to enhance the output pulse characteristics to the maximum of **800 picoseconds** rise time, 1.5ns pulse width, & **900V/250A** (LDC-250) high voltage and high current. This unit contains a precise **(40ppm/C)** internal PWM-pulse generator and can be used as **a high current pulse generator as well as a high-speed pulse generator.**

1.3 SPECIFICATIONS of High QCW Laser Diode Driver LD-1500A/3000A

1.3.1 AC INPUT

100V, 120V, 208V, 220V, 230V: +/- 10%, Single and Three phase, 47-63Hz.
Note: Other voltage ranges are also available by request.

1.3.2 OUTPUT POWER

1500W Continuously in CW mode:	LD-1500A
3000W Continuously in CW mode:	LD-3000A
20KW in QCW mode:	Both LD-1500A and LD-3000A

1.3.3 MAX. OUTPUT VOLTAGE

Up to 170V (User selectable)

1.3.4. OUTPUT CURRENT

Up to 120A in QCW

0-60A: in CW

High Peak Current up to 350A: in Pulse mode

1.3.5 OUTPUT POLARITY

Positive(Standard).

1.3.6 OUTPUT RISE TIME

Less than 30-200 ns (depends on output condition)

1.3.7 MAXIMUM REPETITION RATE

In Normal Pulse & Super Pulse: 50KHz

In QCW mode, the pulse rate is limited by the average power and the current droop specified.

1.3.8 MINIMUM PULSE WIDTH

200 ns (External pulse)

2-3us (Internal Clock)

1.3.9 PULSE DUTY

0-100%

1.3.10 LOW FREQUENCY RIPPLE CURRENT

Less than 1% at rated 60A/120A

1.3.11 EFFICIENCY

Greater than 80%

1.3.12 LINE or LOAD REGULATION

+/- 2% for 20% change

1.3.13 PROTECTION CIRCUIT

Over Current Protection Circuit:

Protects the unit against (1) direct or indirect output short condition, (2) Any electrical disturbances induced by external or internal noises, (3) Overload caused from improper load.

Most of Lic's products are equipped with (1) Primary over current, and (2) Secondary over current protection circuit. When the protection circuit detects these fault conditions, the unit will be shut off instantaneously, sending FAULT signal to external.

Over & Reverse Voltage Protection:

The unit is equipped with protection devices against over voltage or reverse voltage output.

Over temperature protection:

Detects a base temperature on which main switching devices and other power semiconductors are mounted. When the protection circuit detects these fault conditions, the unit will be shut off instantaneously, sending FAULT signal to external.

Note:

To restart the power supply from the fault condition, use RESET signal. Refer to RESET signal at SECTION 1.4.4 for detail.

1.3.15 OPERATING TEMPERATURE

Ambient temperature: +10 to 40C

1.3.16 OUTPUT CONNECTORS

Main Output: AMP.7TWC8W8SMP3V4R

External Control: D-sub 15 Pin

1.3.17 CURRENT MONITOR

CW: 5mV/A, BNC 50 Ohm (Oscilloscope side must be terminated with a 50ohm to receive a right waveform).

1.3.17 EXTERNAL PULSE INPUT

BNC 50 Ohm

1.3.18 DIMENSIONS (LxWxH inch)

LD-1500/3000: 14.0 (L) x 10.0(W) x 6.5 (H) inch

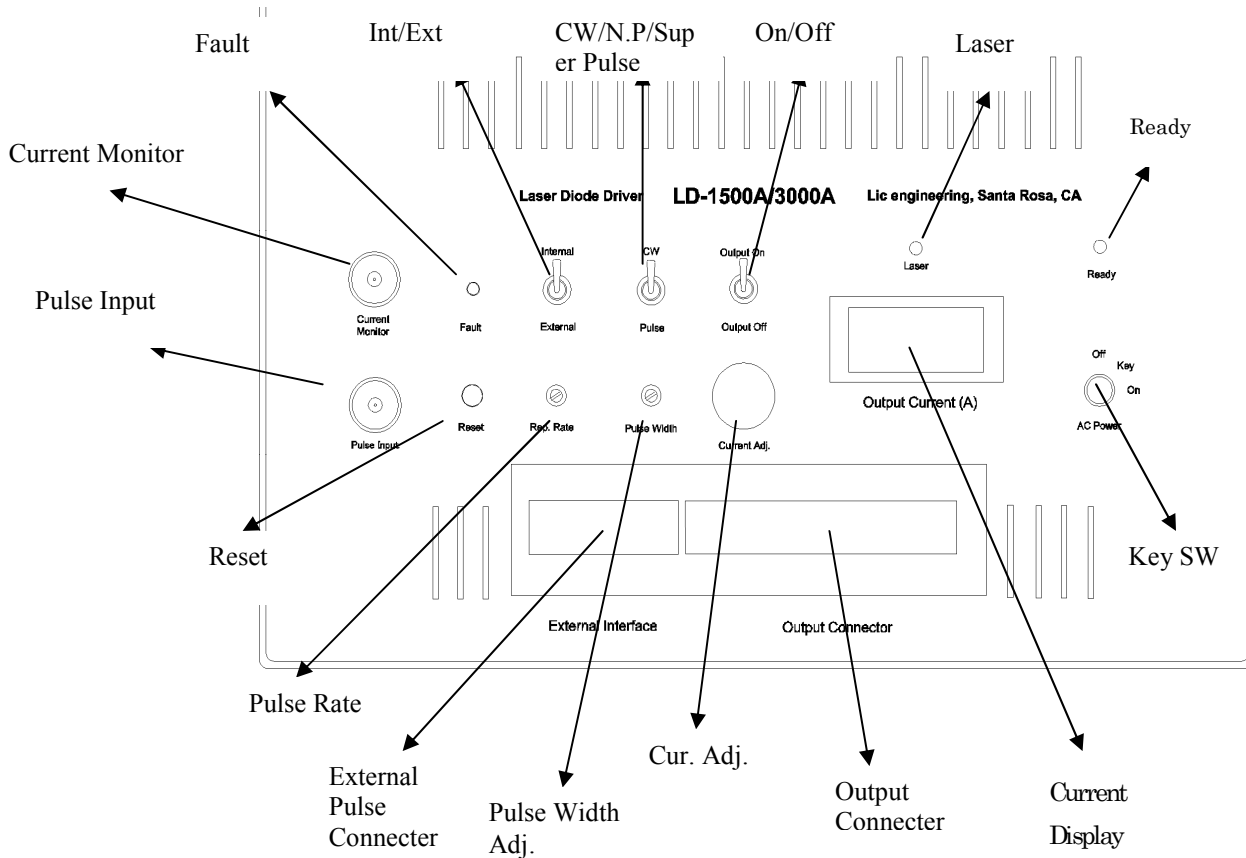
1.4.19 WEIGHT (Lb.)

LD-1500: 17.5 lb
LD-3000: 19.5 lb

1.4 FRONT PANEL & SIGNALS



Front Panel of LD-1500



1.5 EXPLANATION OF FRONT PANEL & SIGNALS

1.5.1 Key SW

Turn the unit on. At Key position, the unit stands for ready condition. At this position the output is not appeared even turning Output On/Off Sw. to On position. At On position the unit is in the normal operating mode.

1.5.2 Ready indicator (Yellow)

Indicates the unit is ready for operation.

1.5.3 Laser indicator (Blue)

Indicates the unit outputs the current to the load.

1.5.4 Output On/Off

Turning the output current on, or off.

1.5.5 CW/N.P/Super Pulse

Switch the mode in CW, Normal Pulse, or Super Pulse.

If the user does not want high peak current at the beginning of the pulse, set the mode SW. to N.P (normal pulse) position.

For QCW unit, the mode is always in Pulse Mode regardless of the mode SW. position.

1.5.6 Internal/External

Switch the pulse input either Internal generator, or external pulse input. Do not change this SW. while the unit is running.

1.5.7 Fault indicator(Red)

Indicates the unit is in fault condition. This means that Over Current, or, Over Temperature protection is activated.

1.5.8 Current Monitor

Output current monitor terminal. 50 ohm BNC output. The attenuation ratio is 5mV/A.

Note *): The oscilloscope side have to terminate with a 50 ohm to receive a correct waveform of the current.

1.5.9 Pulse Input

The external pulse input with a 50ohm BNC. The internal pulse generator has only 1-2us of the minimum pulse width. To reduce the pulse width, use this input. The minimum pulse width is 200ns.

1.5.10 Reset

Push this SW to recover to a normal operating condition, after the Fault is activated.

1.5.11 Pulse Rate Adj.

The pulse rate of the internal clock is adjusted by this. The maximum rate is limited to 50KHz.

1.5.12 Pulse Width Adj.

The pulse width of the internal clock is adjusted by this. The minimum pulse width of the internal clock is limited to 1-2us. The external trigger input extends the narrower pulse width of 200ns.

1.5.13 Current Adj.

Output current is adjusted by this knob. This knob is a 10 turn volume so that you can make a fine adjustment by watching the display panel. To minimize an over shoot at the first edge of the current, the internal circuit is automatically tracking to the setting output level while the CUR. ADJ. knob is adjusted.

1.5.14 Current Display

LCD monitor to indicate the 3 digits output current in amp. This display indicates a real load current but not a setting current.

For QCW unit, this indicator shows the setting output voltage instead of real load current.

1.5.15 External Interface

To control the unit externally, use this interface. The connector is Sub-D connector 15pins.

Each signals are optically isolated and explained in the following section.

1.5.16 Output Connector

To connect a load to the unit, a special made strip line is used. This strip line is designed to carry a high current with a high speed without destroying the high rise time pulse shape. One side of the strip line is just open to the load to connect by soldering. The other side of the stripline is terminated with AMP AMP.7TWC8W8SMP3V4R female connector.

1.6 External Control Signals

Lic's laser diode power supply can be controlled by either a front panel of the unit, or by External Signals. External Signals are optically isolated from an internal main AC line or GND line connected to system ground (earth GND). The unit uses an isolation amplifier to receive an analog input of CUR. ADJ. signal

The control signals are 0-10V **active-high logic plus 0-10V analog signal** as described below:

- Connector: D-sub 15P male

1,9	Cur.Adj.	0-10V Analog Input signal to control output current
2,10	Ext.Start	10V Input signal enables output current either ON or OFF
3,11	Ext.Key	10V Input signal enables power supply either ON or OFF
4,12	Ready	Open Collector output signal indicates power supply is ready for output
5,13	Laser	Open Collector output signal indicates output current is flowing
6,14	Fault	Open Collector output signal indicates the unit is in fault condition
7,15	CW/Pulse	10V input signal to activate CW or PULSE mode
8	FG	Common isolated GND

Note:

The first numbers (1,2,3,4,5,6,7) are positive inputs, and the later numbers (9,10,11,12,13,14,15) are the return (FG).

2.0 **INSTALLATION**

2.1 **GENERAL**

After unpacking, general inspection and preliminary checkout procedures should be performed to ensure that the unit is in proper working order. If it is determined that the unit has been damaged, the carrier should be notified immediately. Contact Lic directly:

Lic engineering
3735 Coffey Ln.
Santa Rosa, CA 95403 USA
Tel: (707) 575 8821
Fax: (707) 526 3905
email: info@LicEngine.com

2.2 **INSPECTION**

Check for damage incurred during shipment as follows:

1) Inspect unit case for cracking, bending, and other obvious signs of damage.

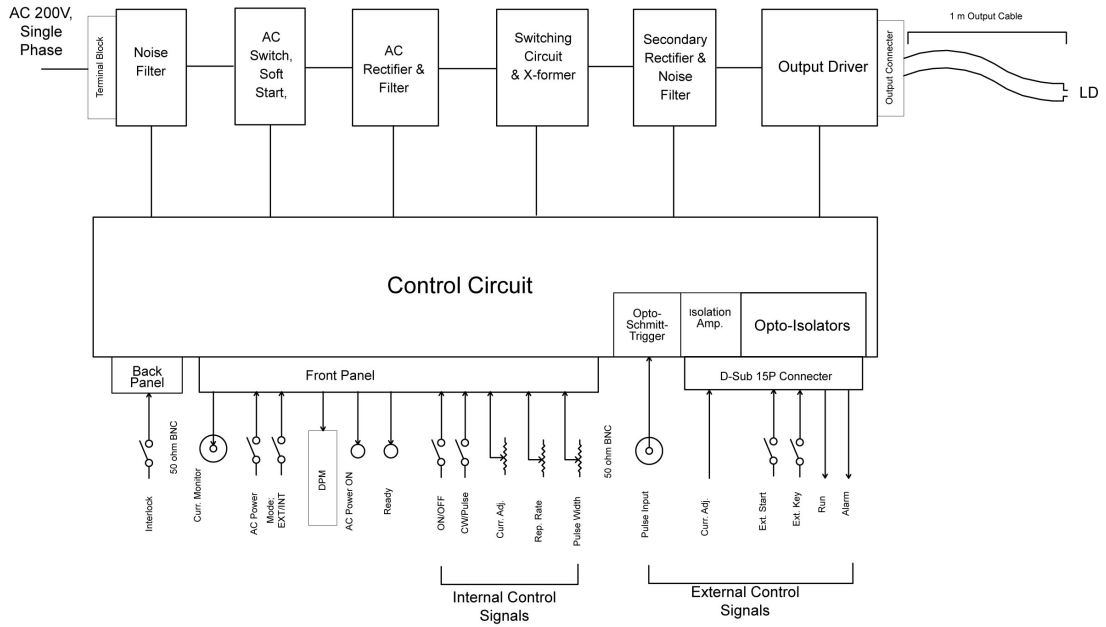
2.3 **OUTPUT STRIPLINE CONNECTIONS**

Connect the stripline to the load (Laser Diode) using a soldering iron.

Do not use any extra wires to connect between the strip line and a Laser Diode.

Using such extra wires will increase a rise and fall time dramatically.

2.4 **BLOCK DIAGRAM OF THE UNIT**



Block Diagram
LD-1500A/3000A

2.5 AC LINE CONNECTION

Confirm AC GND(Earth GND) is connected to the power supply GND.
Confirm that AC line voltage is proper for the unit ordered, and AC power to the unit is still off. The standard center voltages are:

100/115/208/220, Single phase, +/- 10%

3.0 OPERATION

3.1 PREPARATION

3.1.0 PRECAUTION

- 1). Shut off the unit
Do not shut off AC line voltage while the power supply is running. This could cause damage to the power supply.
- 2). Confirm that Current Adj. is set to adequate level before turning Output SW. ON
- 3) Don't change Internal/External SW. while the unit is running.

3.2 STARTING IN CW/PULSE MODE

3.2.1 WITH USING INTERNAL CLOCK

STEP 1. TURN THE KEY SW. TO ON POSITION

Turn AC power of the power supply on.
Confirm READY will come on in 10-30 seconds.

Note: In READY position, the unit is ready to output, but the key should be ON position to send the real output.

STEP 2. GRADUALLY INCREASE CURRENT ADJ.

STEP 3. CONFIRM OUTPUT VOLTAGE (QCW unit only)

Confirm the output voltage is adequate level before turning on the output ON/OFF SW.. **The display shows a setting voltage instead of load current.**

STEP 4. TURN OUTPUT ON/OFF SW. ON

For QCW unit, the setting voltage is slightly changed after the load current flowed. Adjust the voltage, if necessary.

STEP 5. ADJUST LOAD CURRENT

Watching Current Display, gradually increase Cur. Adj.
In Pulse mode, the average load current is displayed in the LCD panel.

3.2.2 WITH USING EXTERNAL CLOCK

- STEP 1. CONNECT ALL THE SIGNAL THROUGH D-SUB CONNECTOR**
Refer to the previous page for a pin assignment.
Turn AC power of the power supply on.
- STEP 2. TURN THE KEY SW. TO ON POSITION**
Confirm READY will come on in 10-30 seconds.
Note: In READY position, the unit is sending READY signal to external. To activate the unit, the key should be ON position to
- STEP 3. SEND CONTROL SIGNALS THROUGH D-SUB CONNECTOR**
Confirm CUR.ADJ. signal is set to zero before sending the signals.
EXT.KEY, EXT.START, & CW/PULSE signals should be sent to activate the unit.
- STEP 4. SEND & ADJUST CUR. ADJ. SIGNAL**
Watching Current Display, gradually increase Cur. Adj. signal
In Pulse mode, the average load current is displayed in the LCD panel.

4.0 MAINTENANCE

4.1 GENERAL

Lic's laser power supply contains potentiometers that are set at Lic's factory. Do not try to adjust these potentiometers. **There are no user-serviceable parts in Lic's products.**

IF USER ATTEMPTS TO OPEN, ADJUST, MODIFY, OR REPAIR THE PRODUCTS, THEN LIC ENGINEERING CAN NO LONGER BE RESPONSIBLE FOR THE SAFE OPERATION OF THE UNIT, AND THE WARRANTY SHALL BE IMMEDIATELY VOID.

4.2 CAUTION

- 1). DO NOT ALLOW THE UNIT TO BE IN OPEN CIRCUIT.
- 2). DO NOT ALLOW THE UNIT TO BE SHORT CIRCUIT.
- 3). DO NOT ATTEMPT TO OPEN, MODIFY OR ADJUST ANY PARTS OF THE POWER SUPPLY.
- 4). DO NOT MECHANICALLY SHOCK.
- 5). KEEP WATER OR MOISTURE FROM THE UNIT EXCEPT IN-/OUTLET OF THE UNIT.
- 6). DO NOT MISUSE, OVERUSE, OR ABUSE THE UNIT.

4.3 TROUBLE SHOOTING

4.3.1 NOT READY SIGNAL COMES ON

CAUTION:

IF READY DOES NOT ON APPEAR WITHIN 60 SECONDS AFTER TURNING ON AC POWER OF THE UNIT, SWITCH AC POWER OFF IMMEDIATELY TO AVOID DESTROYING INTERNAL COMPONENTS.

- 1). Confirm that LASER and POWER signals stay at ground level.
- 2). Check all signal conditions including DC power line.

4.3.2 FAULT COMES ON

- 1). Check if Cur. Adj. is not set at the maximum. In certain case the first edge of the peak current is detected by an over current protection circuit.

4.3.3 OUTPUT DOES NOT APPEAR

- 1). Confirm READY is active, On/Off SW. is on, and Cur. Adj. signal has certain voltage levels.
- 2). Check Remote Interlock terminal(back side of the unit) is shorted.

4.3.4 ODORS OR UNUSUAL SOUNDS

If odors or unusual sounds are detected, turn AC Power off immediately. Contact Lic.

Note:

The power supply may produce certain sounds in Pulse mode. This is because a repetition rate of input pulse is in an audible frequency range and strong pulse currents mechanically vibrate magnetic components in the unit. Such sounds are normal and not harmful to the unit.

Even in CW mode, the power supply may produce small sounds at very low current caused by a pulsing current (discontinued current).

5.0 **WARRANTY**

5.1 **WARRANTY**

Lic engineering warrants its products against all defects in materials and workmanship to the original using purchaser for a period of one year from the date of delivery to the original purchaser.

During this period, Lic engineering will repair or replace its products if defective free of charge. This warranty applies only when the products are properly installed, maintained and used for the intended purpose, and only to the original purchase/user of the products, and only so long as the products are used in the country to which it was originally shipped by Lic engineering, or by an authorized distributor.

Any shipping charge incurred shall be paid by the purchaser/user of the products.

This warranty is null and void if the user attempts to service the products (other than performing the maintenance described in the Instruction Manual), or if service is performed by people who are not trained and authorized to do so by Lic engineering.

THE EXPRESS WARRANTY ABOVE IS THE SOLE WARRANTY OBLIGATION OF LIC ENGINEERING AND THE REMEDY PROVIDED ABOVE IS IN LIEU OF GUARANTEES, OR WARRANTIES--ORAL OR WRITTEN, EXPRESS OR IMPLIED-- INCLUDING WITHOUT LIMITATION WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

LIC ENGINEERING HAS NO LIABILITY WHATSOEVER FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE ARISING OUT OF ANY DEFECT, IMPROPER USE, OR UNAUTHORIZED SERVICE OR REPAIR.

5.2 **RETURN OF THE UNITS**

Prior to return of a unit, or any portion thereof, Lic must be consulted to avoid unnecessary shipping.

If return of the units are deemed necessary, a Return Authorization Number "RAN" will be assigned. This number must be recorded on the outside of the shipping container.

Contact:

Lic engineering
3735 Coffey Lane
Santa Rosa, CA, USA
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Fax: (707) 526 3905
email: info@LicEngine.com