

High power laser diode DRIVER for DPSS lasers
ALTx10A-2TEC-LCD (OEM version)

1.4.0 version firmware



[2008]

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1. FEATURES

- **Extremely high efficient laser diode (LD) current source- more than 96% at 8A (max. 10A)**
- Laser diode voltage limit feature.
- Soft start feature.
- **Two channel high efficient TEC driver. Max. 4A each**
- For smooth temperature stabilization - adjustable parameters to avoid temperature oscillations.
- Over temperature protection for laser diode.
- Interlock, external start/stop, internal pulse generator.
- **Remote control via USB.**
- High reliability.
- Constant optical power mode.
- Extremely low heat dissipation. **Capable to work fanless**
- Very compact. Size 119mm(with DB15 socket 128mm) x 51mm x 20mm

2. APPLICATIONS

- Specially designed for solid state laser system control and monitor.
- *OEM.*



3. CHARACTERISTICS

Parameter	Value
Power supply voltage	+4.5V to +5.5V
Laser diode current source current range	+0.4A to +10A
Laser diode current increment/decrement step	0.004A
Laser diode voltage limit range	1.5V to 3V
Laser diode voltage limit increment/decrement step	0.001V
NTC (thermoresistor) value	10 kOhm
TEC driver current	to 4A*

* Max current flow via TEC is determined by its voltamperic characteristics. In case of 5V power supply and voltage drop in driver and TEC wires, voltage close to TEC can achieve maximum 4V. For best TEC performance it is recommended to use TEC with max voltage from 2V to 4V (17 or 31 couples).

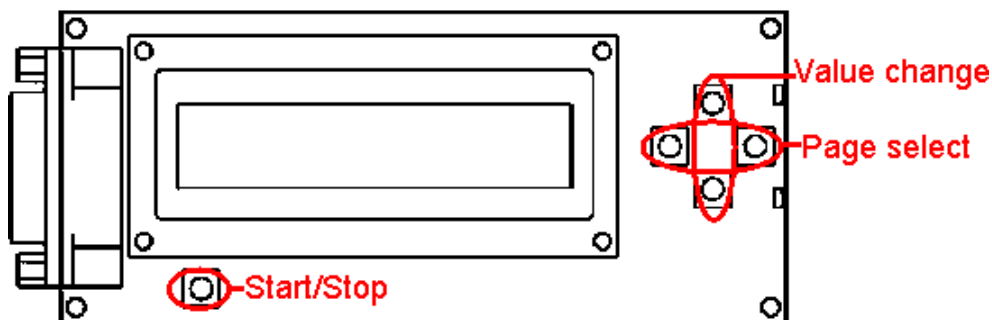
4. ABSOLUTE RATINGS

Parameter	Min value	Max value
Power consumption (LD-2.5V@10A & 2TECx4V@4A)		60 W
Storage temperature	0°C	+70°C
Operating temperature (air or case pad temperature)	+15°C	+40°C
Temperature of separate board elements		+80°C

5. IMPORTANT

- **Board is not protected against long term over voltage! Negative voltage can damage board!**
- **Red input power wire is always positive (+5V) other wire is ground (GND)!**
- **We recommend to use only original power supply!**
- TEC driver stabilizes laser diode or crystal temperature only by cooling.
- There is no fuses on board. If necessary add fuse serially on laser diode power wire. Use very fast fuse.
- For OEM version: Air flow is necessary in any case, but you should know that air flow gives lower temperature changes and this gives better output power stability, and protects driver from emergency over heating turn off.

6. LCD MENU CONTROL



Menu view	Comments
Current: 8.504 A Voltage: 2.321 V	Laser diode current monitoring. Accuracy 0.004A Laser diode voltage measured on board. It's always greater value than near laser diode.
LD:35.0C 2.089 A Xt: Not detected	Laser diode temperature and measured current value crossing TEC. Crystal temperature and measured current value crossing TEC. If NTC (termoresistor) is not connected you will see 'Not detected' message
1. LD temp. ctrl. . Set temp.: 35.0 C	Temperature setting for laser diode. 0.1 C accuracy. Range: 10.0 C to 50.0 C
2.Xtal temp. Set temp.: 20.0C	Temperature setting for crystal. 0.1 C accuracy. Range: 5.0 C to 50.0 C
3. Current ctrl . Set I: 8.500 A	Current setting for laser diode. Accuracy 0.004 A. Range: 0.400A to 10.000A
4. Voltage limit Set U: 2.799 V	Voltage limit for laser diode. Accuracy 0.001 V. Range: 1.500V to 3.000V. This value always must be greater than laser diode operating voltage in case of voltage drop in wires.
5. LD TEC Param1 Set P1: 5	Temperature stabilization speed parameter. Range 1 to 20. For slower temperature stabilization set greater value. This is necessary then temperature oscillating. For most of standart systems should fit 5 or similar value.
6.Limit LD TEC Current : 2.8A	Current limiting for laser diode TEC. Range 1.0A to 4.0A. Strongly recommended to limit TEC max current to avoid overloading of main power supply.
7.Xt TEC Param 1 Set P1: 5	Temperature stabilization speed parameter. Range 1 to 20. For slower temperature stabilization set greater value. This is necessary then temperature oscillating. For most of standart systems should fit 5 or similar value.
8.Limit Xt TEC Current : 2.8A	Current limiting for crystal TEC. Range 1.0A to 4.0A. Strongly recommended to limit TEC max current that not to overload main power supply.
9.Two unipolar TEC drivers	This page is to select TEC driving mode "Two unipolar TEC " or "Single bipolar TEC driver".

10. Cooling when LD is off: no	If set “no” then TEC drivers works only then LD is turned on. If set “yes” TEC start to work all the time after first LD start.
11. Soft start *ON OFF	Laser diode soft start means that current will be increased step by step from zero to set value. We recommend always use this function to avoid damage to laser diode and increase lifetime.
12. Int. trigger Single shoot	Driver have internal pulse generator. Output is on 7 pin in DB-15 connector. Then selected “Single shoot” on every pressing “Down” button 7 pin transmit 500us positive pulse. Also user can select constant pulse generation 1kHz, 2KHz, 5KHz, 10KHz and 20kHz.
13. PCB board temp.: 28.9 C	This page show driver’s internal NTC temperature. Max temperature can be achieved 75C. At 75C driver stops
14. Op.pwr.1364mW Feedback disabl.	Laser diode driver can show optical power 1mV at 14 pin in DB-15 connector equals 1mW. Driver supports constant optical power mode. This mode is for compensation optical power drift. This function works at software level. Program can change current to get closer to selected value, but not more than selected current value in page “3”. Value select using “Up” and “Down” buttons. “0mW” equals disabled feedback.
15. 7 pin act as Pulse generator	7 pin in DB-15 connector can be used for several task: Pulse generator, external start/stop, interlock. When selected “extrn. start/stop” driver starts then 7 pin is connected to GND (9 or 10 pin) and stops then circuit is open. When selected “interlock” LDD can’t be started when interlock is open (7 pin not connected to GND(9 or 10pin)). This function is to stop operating Laser by opening circuit 7 pin disconnecting from GND)

7. LASER DIODE DRIVER OPERATING LOGICS

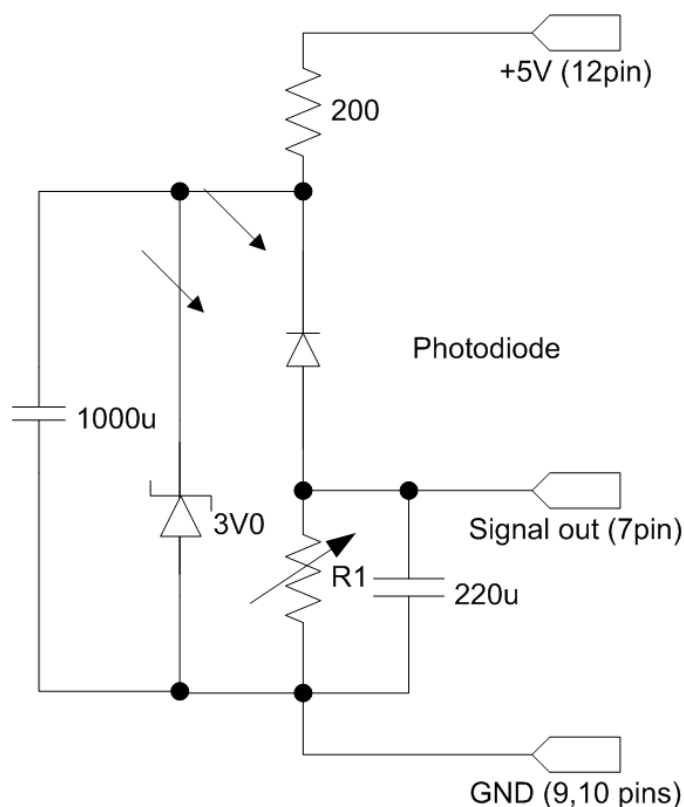
- Laser diode driver will not run if LD NTC is not detected
- Laser diode driver will not run if LD temperature is higher by 3 degree that selected temperature. Firstly it will cool down LD temperature then will start LD.
- If LD temperature becomes higher by 5 degrees than selected temperature LD will be turned down and showed message “ LD temperature out of range”
- Red LED means that LD is slow started or already working.
- Green LED: blinking shows that electronics is working, green LED freezes for a second when displays message.

8. RECOMENDATIONS

- Don't use large bolt type NTC. Use small and fast respond time NTC to avoid temperature oscillations.
- NTC recommended to put between LD and TEC.

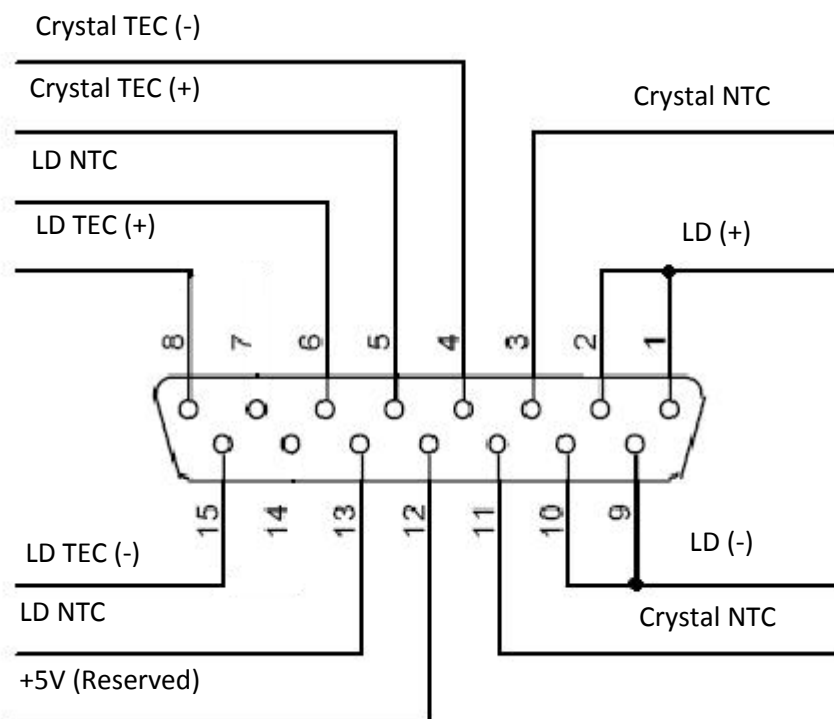
9. OPTICAL POWER MEASUREMENT USING PHOTODIODE

LDD supports constant optical power mode. This function is for optical power drift compensation. Constant optical mode is organized at software level. Optical power is checked and LD current adjustment applied 1000 times per second. Feedback can be organized using analog optical power meter or photodiode. Below are shown optical feedback schematics using photodiode. R1 variable resistor to adjust scale $1\text{mV}=1\text{mW}$. R1 recommended value range $200\Omega - 10\text{ k}\Omega$. To enable feedback user have to set value greater then 0 in menu page "14".



R1 – potentiometer to adjust photodiode sensitivity

10.D-SUB15 PINOUT



Pin	Name	Description
1,2	LD+	Laser diode anode
3	Crystal NTC	Second NTC 10kΩ for laser crystal
4	Crystal TEC(-)	Laser crystal peltier element negative wire
5	Crystal TEC(+)	Laser crystal peltier element positive wire
6	LD NTC	Laser diode NTC 10kΩ
7	PulseGen/interlock	User selectable pulse generator or interlock
8	LD TEC (+)	Laser diode peltier element positive wire
9,10	LD (-)	Laser diode catode
11	Crystal NTC	Second NTC 10kΩ for laser crystal
12	+5V (100mA)	+5V for optional external electronics
13	LD NTC	Laser diode NTC 10kΩ
14	Optical Feedback	For photodiode or optical power meter
15	LD TEC (-)	Laser diode peltier element negative wire

11. THREE WAYS TO GET BI-DIRECTIONAL REGIME

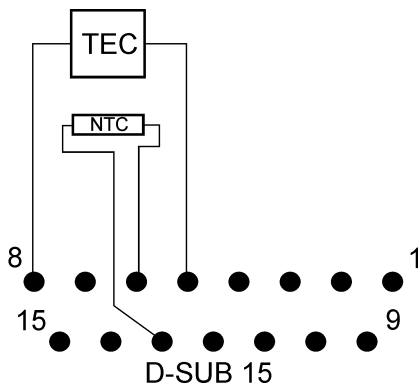


Figure 1. Single bi-directional TEC

This mode support single bidirectional TEC and it is selectable in '9' menu page by pressing "up" button ("Single bipolar TEC driver"). Then you turn on this mode "XI" channel automatically disables. In zero page TEC are indicated as 'LD' TEC.

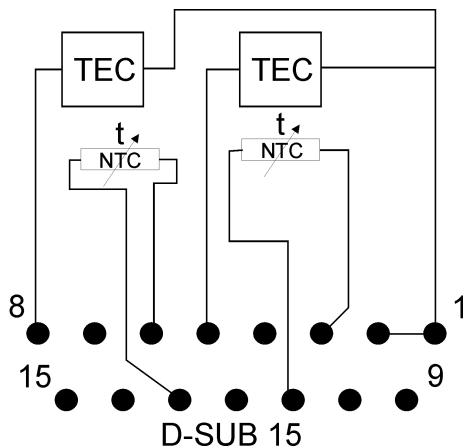


Figure 2. Two bi-directional TEC drivers

This mode supports two bidirectional TEC using LD channel power. At this mode laser diode can't be used. User in LDD menu page '9' have to select mode named "Two unipolar TEC drivers". At page '3' have to set current 4-8amps and at page '4' set 1.5-2.5Volts. For example if in page '4' is set 1.5Volts this means that heating max voltage is 1.5Volts, for cooling $4.5 - 1.5 = 3$ volts. This rule is for both TEC channels.

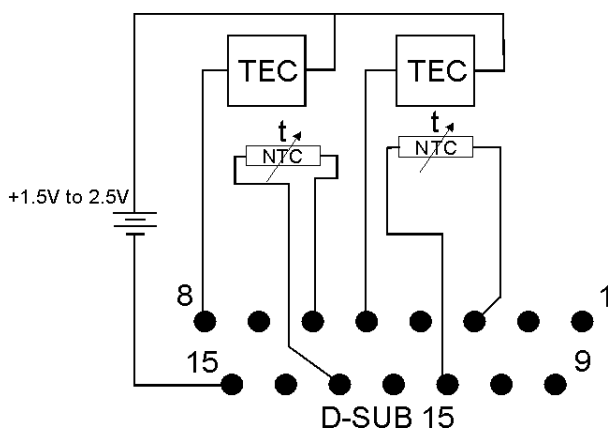
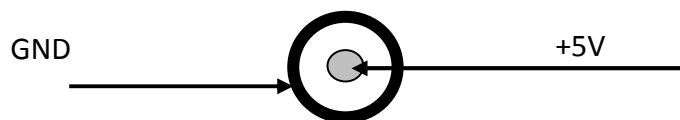


Figure 3. Two bi-directional TEC drivers using external power supply schematics.

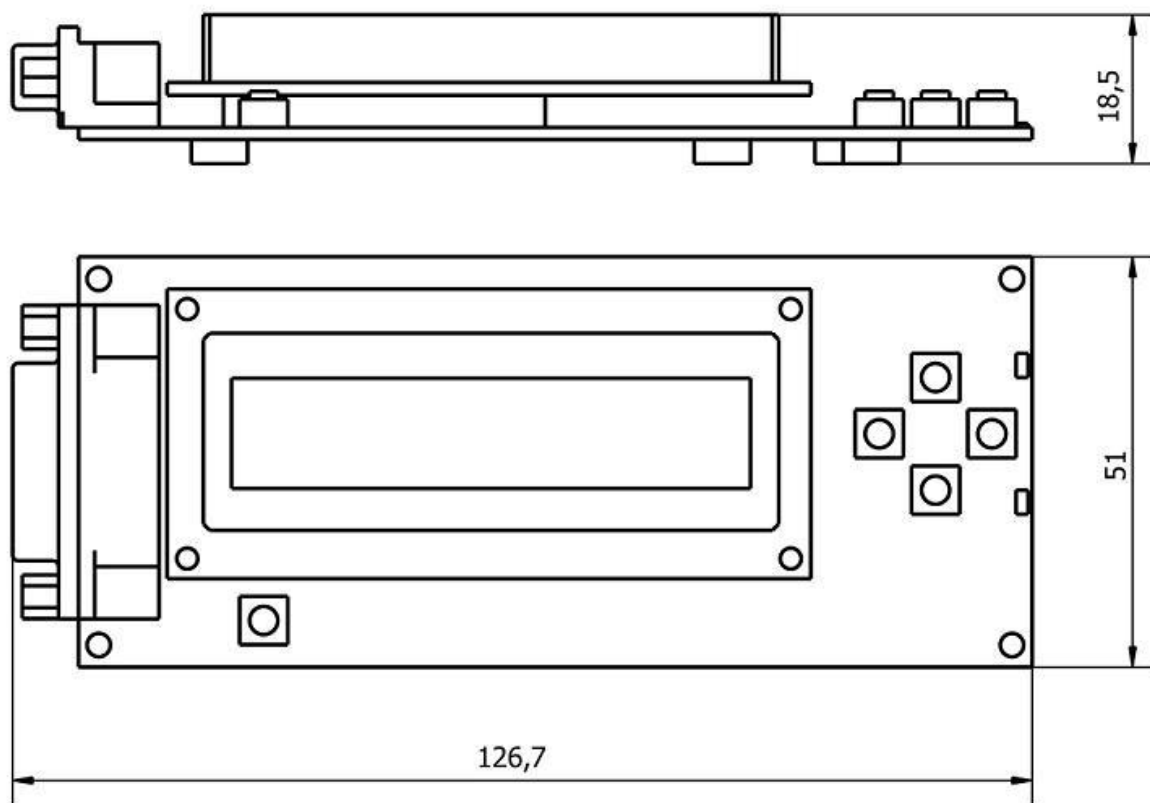
This mode support two bidirectional TEC using external power. User in LDD menu page '9' have to select mode named "Two unipolar TEC drivers". If external's power supply voltage for TEC's is 1.5Volts this means that heating max voltage is 1.5Volts, for cooling $4.5 - 1.5 = 3$ volts. This rule is for both TEC channels.

External power supply for TEC have to be capable to pass current to both directions otherwise TEC driver will be capable to heat only.

12. POWER SUPPLY JACK



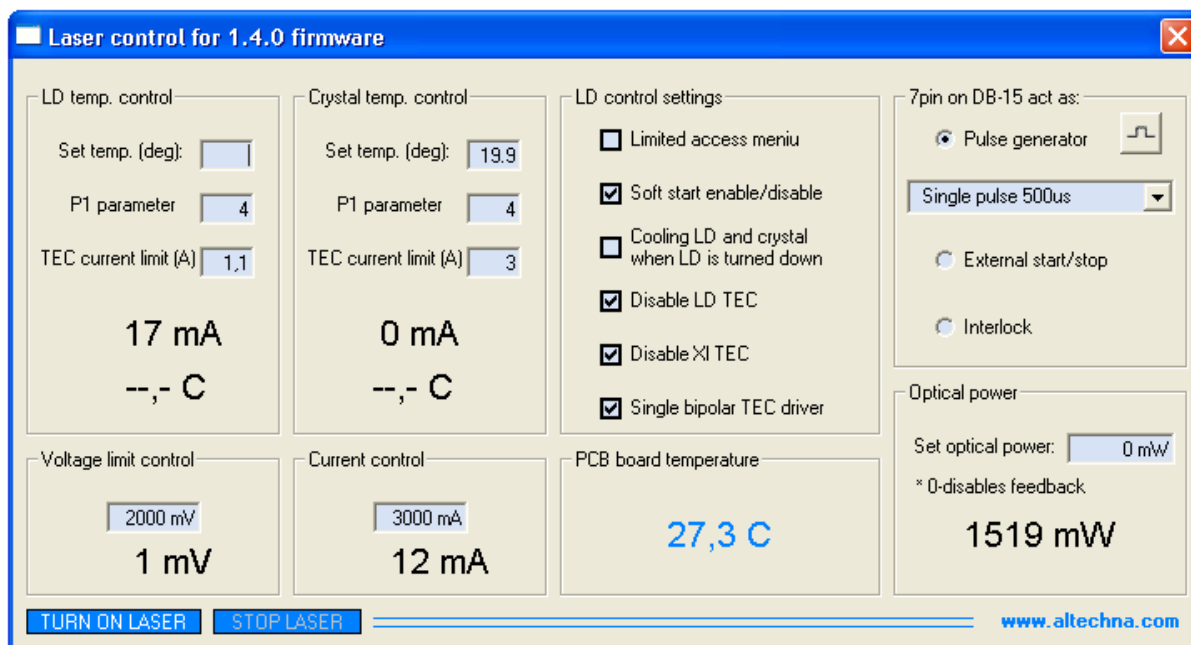
13. MECHANICAL DATA



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Software manual



After changing each value press Enter to commit the change

Dialog Box	Comments
- Current control — <input type="text" value="1500 mA"/>	Current setting for laser diode. Accuracy 0.004 A. Range: 0.400A to 10.000A
- Voltage limit control — <input type="text" value="2000 mV"/>	Voltage limit for laser diode. Accuracy 0.001 V. Range: 1.500 V to 3 V. This value always must be greater than laser diode operating voltage in case of voltage drop in wires.
LD temp. control — Set temp. (deg): <input type="text" value="25"/> P1 parameter <input type="text" value="4"/> TEC current limit (A) <input type="text" value="1,5"/>	Temperature setting for laser diode. 0.1 C accuracy. Range: 10.0 C to 50.0 C Temperature stabilization speed parameter. Range 1 to 20. For slower temperature stabilization set greater value. This is necessary then temperature oscillating. For most of standard systems should fit 5 or similar value. Current limiting for laser diode TEC. Range 1.1A to 4A.
- Crystal temp. control — Set temp. (deg): <input type="text" value="30"/> P1 parameter <input type="text" value="4"/> TEC current limit (A) <input type="text" value="1,5"/>	Temperature setting for crystal. 0.1 C accuracy. Range: 5.0 C to 50.0 C Temperature stabilization speed parameter. Range 1 to 20. For slower temperature stabilization set greater value. This is necessary then temperature oscillating. For most of standart systems should fit 5 or similar value. Current limiting for crystal TEC. Range 1.1A to 4A. Strongly recommended to limit TEC max current that not to overload main power supply.

Driver install manual

Windows Drivers and Installation Instructions

Before you connect your LDD driver to a computer running windows, you must install its drivers by following these steps:

1. Download this driver: [win_cp2102_drivers.zip](#) (293k zip)
2. **IMPORTANT:** You must extract the files in *win_cp2102_drivers.zip* into a temporary directory. DO NOT attempt to double-click or run any of the files until you have extracted them.
3. Open the temporary directory and run PololuUSBInstaller.exe. The “Install Driver” dialog will open.
4. Browse to the directory in which you would like the driver to be installed and click “Install”.
5. In Windows XP, a “Software Installation” dialog will appear twice, warning you that this driver has not been tested by Microsoft and recommending you stop the installation; click “Continue Anyway” both times. If you are running Vista, you will get similar warnings that you can safely ignore.
6. When the installation is complete, a “setup” dialog that says, “Installation Successful” will appear; click “OK”.

Windows Vista users: your computer should automatically install the necessary drivers when you connect a LDD driver, in which case no further action from you is required.

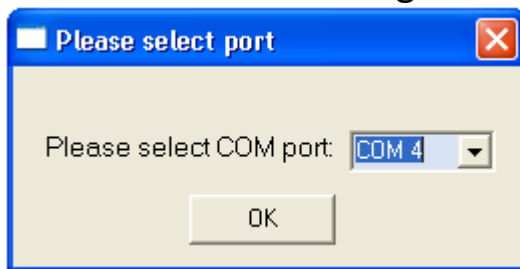
Windows XP users: follow steps 7-10 for each new device you connect to your computer.

7. Connect the LDD driver device to your computer’s USB port. Your computer will detect the new hardware and open the “Found New Hardware Wizard”.
8. Select the automatic software installation option. If it asks whether it can search for the drivers using Live Update, give it permission. If multiple drivers are found, you will be prompted to “select the best match for your hardware” from a list. Select the one for the Pololu USB-to-Serial Adapter.
9. The “Hardware Installation” dialog will appear, warning you that this driver has not been tested by Microsoft and recommending that you stop the installation; click “Continue Anyway”. The installation should then complete; click “Finish”.
10. You will have to repeat steps 8 and 9 again (you have to install one driver for the USB device and another for the serial device). After that, you are ready to use your LDD driver
11. If you now go to your computer’s device manager and expand the “Ports (COM & LPT)” list, you should see “Pololu USB-to-Serial Adapter” as one of the COM ports.

Some software will not allow connection to higher COM port numbers. If you need to change the COM port number assigned to your USB adapter, you can do so using the Windows device manager. Bring up the properties dialog for the “Pololu USB-to-Serial Adapter” COM port and click the “Advanced...” button in the “Port Settings” tab. From this dialog you can change the COM port assigned to your device.

Software install manual

1. Run Setup.exe
2. Follow setup instructions
3. After installation while starting this program for a first time you will be prompted to give COM port number, you can obtain it in Windows device manager window (Pololu USB-to-Serial Adapter)



4. You are ready to use LDD software