56 Sparta Avenue • Newton, New Jersey 07860
(973) 300-3000 Sales • (973) 300-3600 Fax
www.thorlabs.com

# TL1550-B - February 24, 2016

Item # TL1550-B was discontinued on February 24, 2016. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

## INTUN SERIES TUNABLE LASERS

- **Center Wavelengths: 1320 and 1550 nm**
- **Instantaneous Linewidth of 150 kHz**
- **Continuous Mode-Hop Free Tuning**


**TL1300-B**
(Digitally Controlled)


SM1 Compatible Thread on the Output Port and Mounting Holes

Hide Overview

## OVERVIEW

### Features

- Continuously Tunable Lasing from 1270 - 1370 nm or 1520 - 1630 nm
- Collimated Free-Space Output Beam
- Instantaneous Linewidth of 150 kHz
- USB 2.0 Interface
- SM1 (1.035"-40) and 30 mm Cage System Compatible
- Suitable for Spectroscopy and Interferometry

| Item # | TL1300-B | TL1550-B |
|---|---|---|
| **Wavelength** | 1320 nm | 1575 nm |
| **Optical Power** | >20 mW | >20 mW |
| **Tuning Range** | >100 nm | >110 nm |
| **Tuning Speed Continuous** | 0 - 50 nm/s | 0 - 50 nm/s |
| **Spectral Linewidth** | 150 kHz* | |
| **Fine Tune Resolution** | 0.1 pm | 0.2 pm |

* Measurement at 1 ms

Thorlabs' INTUN Tunable Lasers are designed for demanding applications such as spectroscopy. With two models spanning the wavelength range from 1270 - 1630 nm, this family covers the widest spectral range of any of our tunable products. These truly continuously tunable lasers are optimized for step and measurement applications, offer mode-hop-free operation, and have a convenient USB 2.0 interface.

**Fiber-Coupled Option**
We are currently developing a fiber-coupled version of the INTUN laser, which will be available in the coming months.

INTUN tunable lasers have an external cavity design (ECL) to enable a wide mode-hop free tuning range. All lasers in the INTUN family have reduced spontaneous emission to further improve the laser performance. The INTUN has an SM1 (1.035"-40)-compatible thread on the output port and mounting holes for our 30 mm cage system to provide direct compatibility with our optomechanical equipment. The output is a collimated free-space beam. In addition, INTUN lasers have the ability to lock the wavelength to an external wavelength reference such as a gas cell or a frequency comb. This product is a complete turnkey solution without the need for additional electronic boxes. Contact Sales-TQE@thorlabs.com for more information.

All INTUN lasers have means to lock to an external reference clock if ultra high stability is needed. Also, all models have a digital wavelength control input that can be used to modulate and fine tune the wavelength.

We also offer a tunable laser kit which covers additional wavelengths ranging from 770 nm to 1950 nm. Click here for more information.

Hide Specs

SPECS

## Laser Specifications

All values are typical unless otherwise specified.

| Item # | | TL1300-B | TL1550-B |
|---|---|---|---|
| **Center Wavelength** | | 1320 ± 10 nm | 1575 ± 10 nm |
| **Optical Power** | | >20 mW | >20 mW |
| **Tuning Range** | | 100 nm (min) | 110 nm (min) |
| **Tuning Speed Continuous** | | 0 - 50 nm/s | 0 - 50 nm/s |
| **Wavelength Resolution** | Controlled Mode | 12 Bits of Wavelength Range (Approx. 25 pm) | |
| | Free Step Mode | 0.5 pm | 1 pm |
| | Fine Tune Mode | 0.1 pm | 0.2 pm |
| **Wavelength Repeatability** | | 10 pm | |
| **Absolute Wavelength Accuracy** | | ± 50 pm | |
| **Wavelength Stability (1h/24hr)** | | ± 4 pm / ± 20 pm | |
| **Power Resolution** | | 25 µW | |
| **Spectral Linewidth** | | <150 kHz* | |
| **Effective Linewidth** | | 1.5 MHz | |
| **Coherence Control** | | 1 GHz or 2 GHz | |
| **Side Mode Suppression Ratio (SMSR)** | | 45 dBc min | |
| **Signal To Source Spontaneous Emission Ratio (SSE)** | | 40 dB/nm (45 dB/nm Typical; 70 dB/nm Fiber Coupled) | |
| **Signal To Source Spontaneous Emission Ratio (STSSER)** | | 25 dB (>65 dB Fiber Coupled) | |
| **Relative Intensity Noise (RIN)** | | -140 (dB/Hz) | |
| **Optical Output** | | Free-Space Collimated Beam | |
| **Polarization Extinction Ratio (PER) at Output** | | 16 dB | |
| **Laser Classification** | | 3R | |

* Measurement Time <1 ms.

## Electrical and Interface Specifications

| Parameter | INTUN-B |
|---|---|
| **DC Input** | +48 V/20 W |
| **Analog Modulation Input** | 2 $V_{p-p}$ |
| **Analog Wavelength Output** | 0 - 4 V |
| **Electrical Connectors** | |
| **DC Input Voltage** | Rear Panel Socket |
| **Digital Status** | 0 - 5 V |
| **Interlock** | DB9 |
| **Communications** | USB 2.0 |
| **Analog Inputs** | BNC |
| **General** | |
| **Operating Temperature Range** | 15 to 30 °C |
| **Operating Humidity** | 85% Relative Humidity @ 30 °C |
| **Storage Temperature/Humidity** | -20 to 60 °C<br>Noncondensing Environment |
| **Dimensions** | 242 mm x 87 mm x 142 mm |

Hide Applications

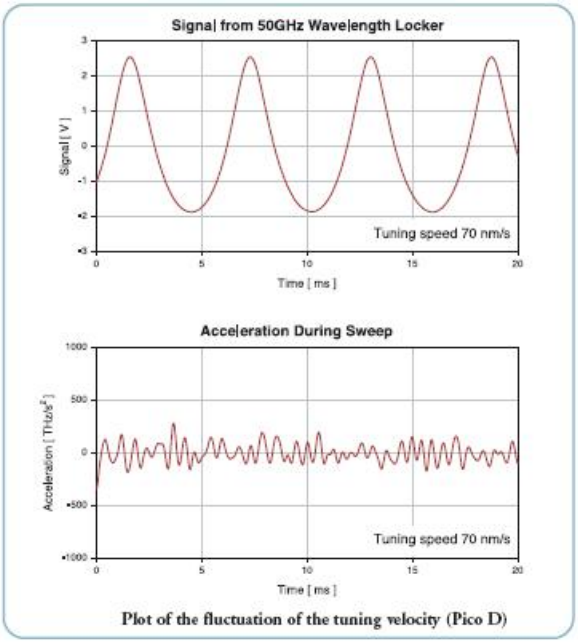
APPLICATIONS

## Applications

- Characterization of Optical Components
- Spectroscopy
- Polarization Measurements
- Real-Time Process Monitoring
- General R&D Heterodyning

### Heterodyne and Interferometry

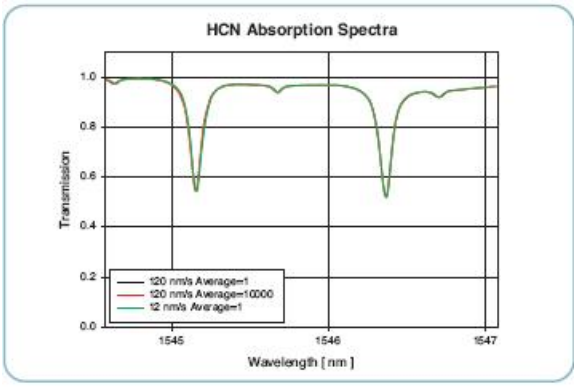
Optical Heterodyne and Interferometry are some of the new important measurement techniques that benefit from Thorlabs continuously tunable lasers. Requirements for these high precision measurements include smooth continuous tuning, high accuracy, low noise, and narrow line width. The patented motor design enables a highly constant tuning speed. The constant sweep speed (low acceleration) makes these lasers suitable for interferometric and heterodyne measurements. The acceleration during sweep (variation in the tuning speed) is measured using a wavelength locker (low finesse Etalon). The wavelength locker signal provides evenly spaced peaks (clock) in the frequency space (k-space). There are several methods to acquire data which enables the calculation of the tuning speed and the acceleration. One method is to use the k-space clock to determine the tuning speed and the time fluctuations of the k-space clock to determine the tuning speed variations (acceleration). In the figure below we have used, in addition to the k-space clock, the knowledge of the finesse of the Etalon to improve the time resolution of the measurement. When using the knowledge of the finesse, the time resolution of the measurement of the tuning speed and acceleration is limited to the sampling frequency rather than the k-space clock.




Plot of the fluctuation of the tuning velocity (Pico D)

### Spectral Monitoring

The ECL tunable lasers provide an outstanding building block in spectral measuring and monitoring. The waveform shows an HCN (Hydrogen Cyanide) scan using Thorlabs ECL Technology.




For more information, please contact our Tech Support Team.

Hide Software

## SOFTWARE

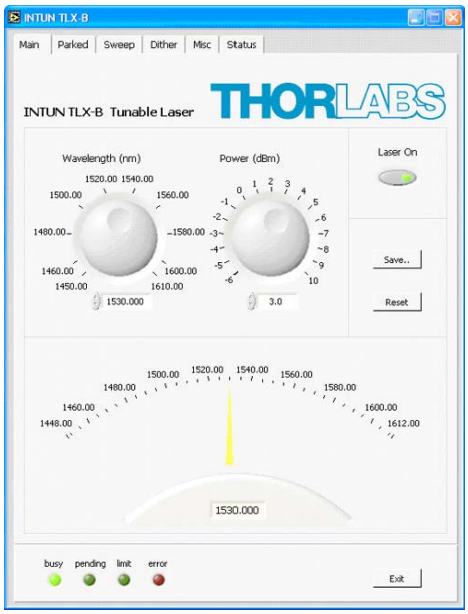
The **INTUN-B** model comes with a LabVIEW™ software package that enables the user to control the laser via a computer. The software package contains a standalone graphical user interface, (GUI), and drivers that can be run from within Labview. The GUI will be installed as an exe file along with required LabVIEW™ RTE, a LabVIEW™ functions library (freeware), accessed from the Windows™ start menu.

With the user interface you can set the optical power and wavelength in the Main tab. In the Parked tab you can tune the wavelength in three different modes, which allows you to reach high wavelength accuracy. In the Sweep tab

you can tune between two different wavelengths with a desired tuning speed. In the Dither tab you can control the digital dither function or choose the external analog dither. In the Status tab the status signals are shown. Note that the laser will remember its instructions and will continue with its task even if the computer is disconnected. Below is a screen shot of the graphical user interface.

It is also possible to make your own specific control programs for the laser. A set of LabVIEW drivers is included on the CD and is also available on Thorlabs homepage. Dynamic link library drivers (DLL) are available upon request. Also, a USB 2.0 interface manual is available upon request and contains all information needed to control the laser from any programming language.

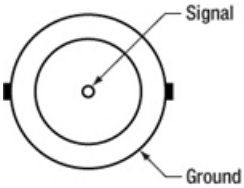
All communication to the laser is done via USB 2.0.




Hide Pin Diagrams

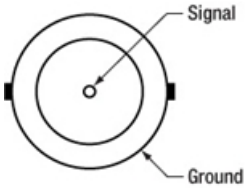
## PIN DIAGRAMS

### Modulation Input
### BNC Female



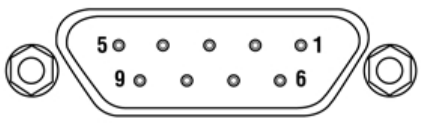

Modulation input for analog optical power modulation. Maximum signal amplitude is 2 $V_{P-P}$.

### Wavelength Output
### BNC Female




Analog output signal representing the actual wavelength. The output amplifier is 0 to 4 V. The load should have an impedance of 10 kΩ or higher.

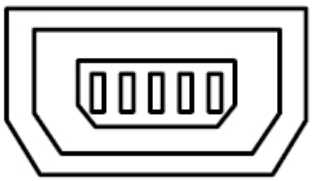
### Interlock
### DB9 Female




| Pin | Description |
|---|---|
| 1 | Connected to Pin 1* |
| 2 | Connected to Pin 2* |
| 3-9 | Not Used |

*For laser safety purposed, this option interlock exists. Unless Pins 1 and 2 are shorted, the laser power will be off. A mounted DB9 connector with shorted pins is included, but can be removed and replaced with the users own switch.

### Computer Connection
### USB Mini-B



USB Type Mini-B to Type A Included

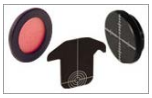
Hide Laser Safety

LASER SAFETY

## Laser Safety and Classification

Safe practices and proper usage of safety equipment should be taken into consideration when operating lasers. The eye is susceptible to injury, even from very low levels of laser light. Thorlabs offers a range of laser safety accessories that can be used to reduce the risk of accidents or injuries. Laser emission in the visible and near infrared spectral ranges has the greatest potential for retinal injury, as the cornea and lens are transparent to those wavelengths, and the lens can focus the laser energy onto the retina.

### Safe Practices and Light Safety Accessories





- Thorlabs recommends the use of safety eyewear whenever working with laser beams with non-negligible powers (i.e., > Class 1) since metallic tools such as screwdrivers can accidentally redirect a beam.
- Laser goggles designed for specific wavelengths should be clearly available near laser setups to protect the wearer from unintentional laser reflections.
- Goggles are marked with the wavelength range over which protection is afforded and the minimum optical density within that range.
- Laser Barriers and Blackout Materials can prevent direct or reflected light from leaving the experimental setup area.
- Thorlabs' Enclosure Systems can be used to contain optical setups to isolate or minimize laser hazards.
- A fiber-pigtailed laser should always be turned off before connecting it to or disconnecting it from another fiber, especially when the laser is at power levels above 10 mW.
- All beams should be terminated at the edge of the table, and laboratory doors should be closed whenever a laser is in use.
- Do not place laser beams at eye level.
- Carry out experiments on an optical table such that all laser beams travel horizontally.
- Remove unnecessary reflective items such as reflective jewelry (e.g., rings, watches, etc.) while working near the beam path.
- Be aware that lenses and other optical devices may reflect a portion of the incident beam from the front or rear surface.
- Operate a laser at the minimum power necessary for any operation.
- If possible, reduce the output power of a laser during alignment procedures.
- Use beam shutters and filters to reduce the beam power.
- Post appropriate warning signs or labels near laser setups or rooms.
- Use laser sign lightboxes if operating Class 3R or 4 lasers (i.e., lasers requiring the use of a safety interlock).
- Do not use Laser Viewing Cards in place of a proper Laser Barrier or Beam Trap.

### Laser Classification

Lasers are categorized into different classes according to their ability to cause eye and other damage. The International Electrotechnical Commission (IEC) is a global organization that prepares and publishes international standards for all electrical, electronic, and related technologies. The IEC document 60825-1 outlines the safety of laser products. A description of each class of laser is given below:

| Class | Description | Warning Label |
|---|---|---|
| 1 | This class of laser is safe under all conditions of normal use, including use with optical instruments for intrabeam viewing. Lasers in this class do not emit radiation at levels that may cause injury during normal operation, and therefore the maximum permissible exposure (MPE) cannot be exceeded. Class 1 lasers can also include enclosed, high-power lasers where exposure to the radiation is not possible without opening or shutting down the laser. |  |
| 1M | Class 1M lasers are safe except when used in conjunction with optical components such as telescopes and microscopes. Lasers belonging to this class emit large-diameter or divergent beams, and the MPE cannot normally be exceeded unless focusing or imaging optics are used to narrow the beam. However, if the beam is refocused, the hazard may be increased and the class may be changed accordingly. |  |
| 2 | Class 2 lasers, which are limited to 1 mW of visible continuous-wave radiation, are safe because the blink reflex will limit the exposure in the eye to 0.25 seconds. This category only applies to visible radiation (400 - 700 nm). |  |
| 2M | Because of the blink reflex, this class of laser is classified as safe as long as the beam is not viewed through optical instruments. This laser class also applies to larger-diameter or diverging laser beams. |  |
| 3R | Lasers in this class are considered safe as long as they are handled with restricted beam viewing. The MPE can be exceeded with this class of laser, however, this presents a low risk level to injury. Visible, continuous-wave lasers are limited to 5 mW of output power in this class. |  |
| 3B | Class 3B lasers are hazardous to the eye if exposed directly. However, diffuse reflections are not harmful. Safe handling of devices in this class includes wearing protective eyewear where direct viewing of the laser beam may occur. In addition, laser safety signs lightboxes should be used with lasers that require a safety interlock so that the laser cannot be used without the safety light turning on. Class-3B lasers must be equipped with a key switch and a safety interlock. |  |
| 4 | This class of laser may cause damage to the skin, and also to the eye, even from the viewing of diffuse reflections. These hazards may also apply to indirect or non-specular reflections of the beam, even from apparently matte surfaces. Great care must be taken when handling these lasers. They also represent a fire risk, because they may ignite combustible material. Class 4 lasers must be equipped with a key switch and a safety interlock. |  |
| All class 2 lasers (and higher) must display, in addition to the corresponding sign above, this triangular warning sign | |  |

Hide Part Numbers

| Part Number | Description | Price | Availability |
|---|---|---|---|
| TL1300-B | Customer Inspired!INTUN Tunable Laser, 1320 nm CWL, >20 mW | $21,934.00 | Lead Time |
| TL1550-B | Customer Inspired!INTUN Tunable Laser, 1550 nm CWL, >20 mW | $21,934.00 | Lead Time |