Current Drift in the LDC500

Rev B. Revised Oct 2012

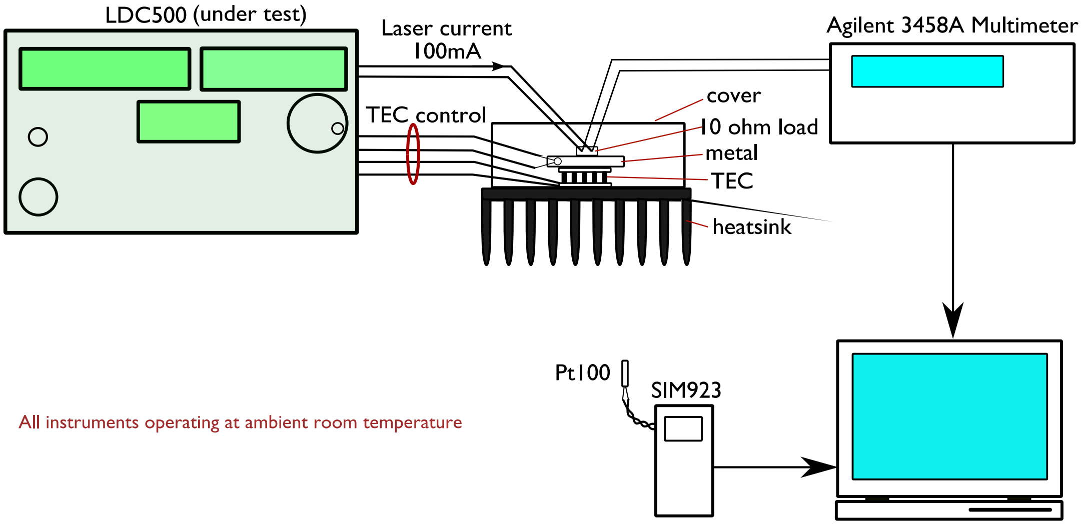


Figure 1: LD Current Thermal drift test setup

A key specification for any laser diode driver is thermal drift, which is the relative change in laser current per degree Celsius change in ambient temperature. Absolute stability in laser diode current in turn translates to better optical performance, including wavelength and intensity stability. Thermal drift in the output current is caused by such factors as internal heating of electronic circuits during turn-on and as loads change, and by changes in room temperature or airflow, typically due to building heating and air conditioning.

For the LDC500 series controllers, extreme attention to design details has resulted in a remarkably low value for this specification: <10ppm/°C.

This note describes how to measure the thermal drift of a laser diode driver, and compares the results of the LDC500 with that of a competitor.

The test setup is shown in Figure 1. All instruments are on a lab bench exposed to ambient room temperature—no thermal test chamber is used.

An ultra-stable, precision 10Ω resistor was used as the LDC500 laser driver's load. This resistor, which itself was specified with a 5ppm/°C temperature coefficient of resistance, was thermally stabilized at 25.0°C by the TEC controller. The LDC500 output was set to full output at 100mA. The 10Ω load converted the output current into a voltage, which was measured with a voltmeter. The room temperature was monitored with a 100Ω platinum RTD, measured using a SIM923 temperature monitor. After a one-hour warm up period, the test started and ran for 24 hours.

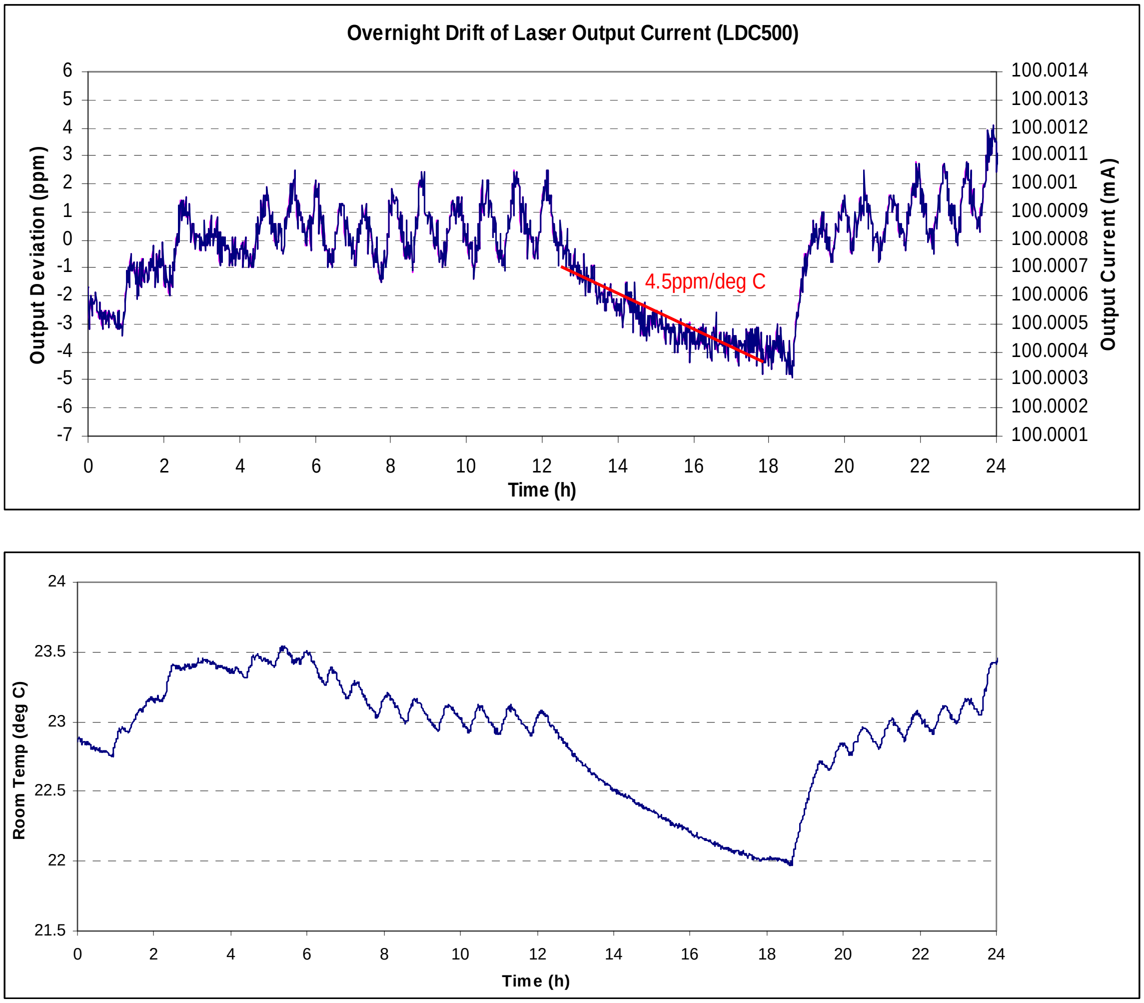
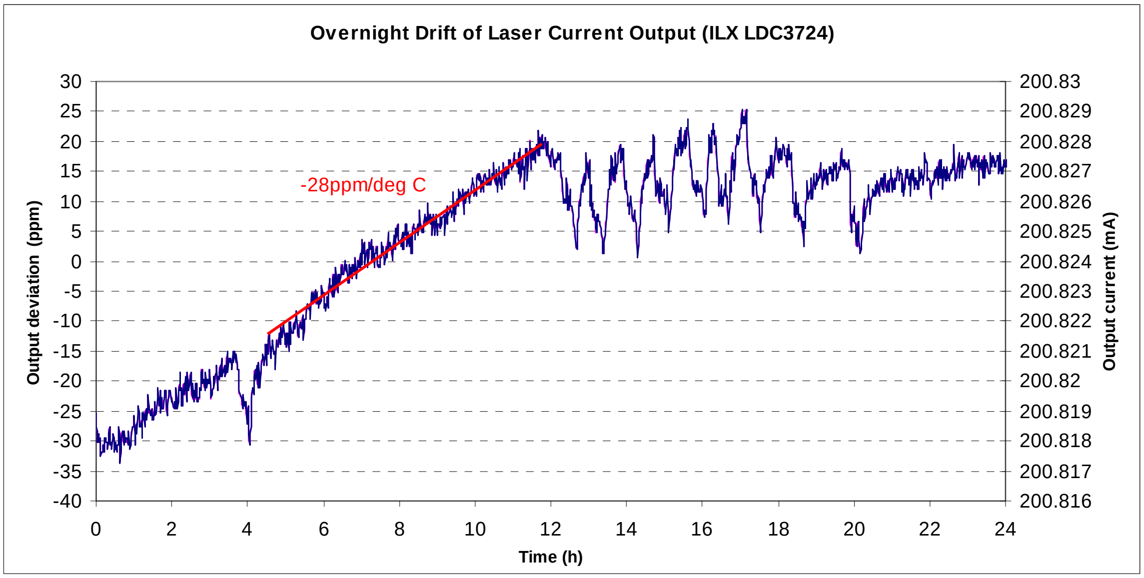


Figure 2: Thermal drift of the SRS LDC500 laser current output

The test results for the LDC500 are shown in Figure 2. The upper panel shows the LDC500 output current, while the lower panel shows the corresponding room temperature. Notice the temperature oscillations, corresponding to the building air conditioning cycling on and off. The extended period of cooling from hours 12 through 18 correspond to overnight. Looking at the overnight period, we can observe a 4.5ppm/°C temperature coefficient for the LDC500 unit under test.

A same test was performed on a competitor's laser diode driver as described in the next page.



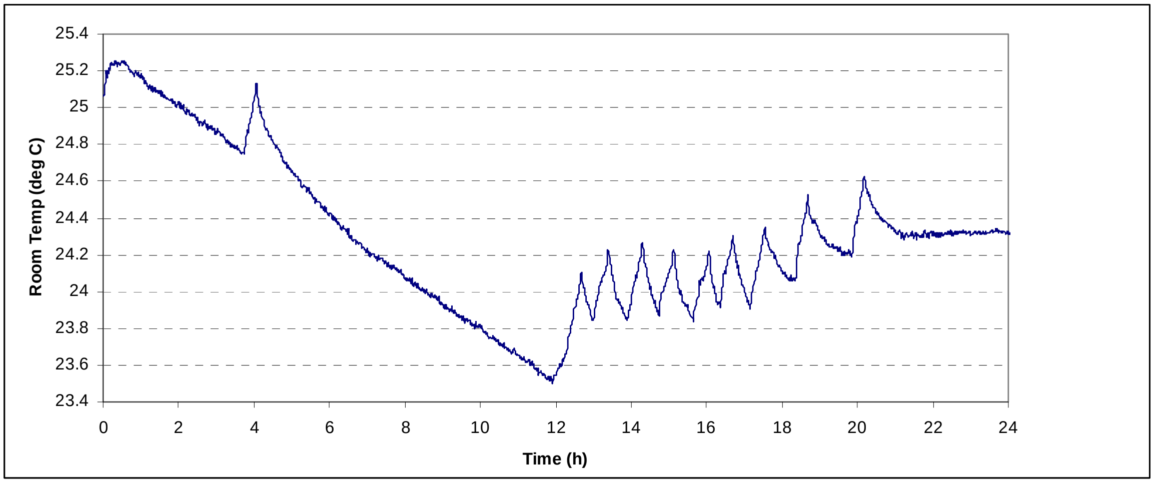


Figure 3: Thermal drift of competitor's laser current output

The LDC500 was replaced with a competitor's laser diode driver. After a one-hour warm up, the test restarted and ran for 24 hours.

The results are shown in Figure 3. Again, focusing on the overnight period of uniform cooling, we see the competitor's laser diode driver shows a −28ppm/°C temperature coefficient, more than 6-fold worse than the Stanford Research Systems instrument.