TECH NOTE

Typical Temperature Stability of the LDT-5500B Laser Diode Temperature Controller

OVERVIEW

This technical note reviews the temperature stability of the LDT-5525B and LDT-5545B Thermoelectric Temperature Controllers.

MEASUREMENT SET UP

An LDT-5500B and an LDM-4984 Butterfly Laser Diode Mount with TE-550 Case Temperature Control were placed inside a temperature controlled oven. The oven was set to maintain a constant ambient temperature of 25°C.

A 14-pin butterfly laser diode with internal temperature control was loaded in the mount. The mount was temperature controlled to 25°C by the LDT-5500B. The resistance of the internal thermistor was recorded by an Agilent 34901A 20-Channel MUX inserted into an Agilent 34970A Data Acquisition/Data Logger Switch Unit.

The measurement setup is shown in Figure 1.

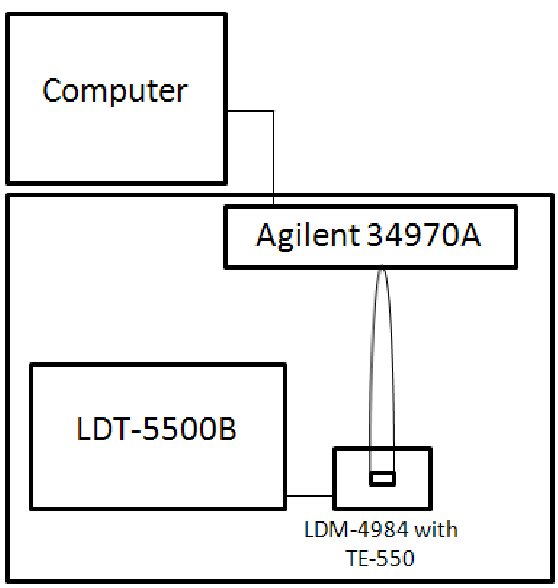

Figure 1: The setup to measure the temperature stability of the LDT-5525B and the LDT-5545B.

TEST PROCEDURE

The resistance of the internal thermistor of the laser diode was recorded every ten seconds for 25 hours. The resistance data was averaged to eliminate noise. The first hour of the test was the warm up period of the LDX-5525B.

The resistance, in ohms, was then converted to temperature, in °C, with use of the Steinhart-Hart equation and the nominal Steinhart-Hart constants listed below.

$$C_1 = 1.125 \times 10^{-3}$$

$$C_2 = 2.347 \times 10^{-4}$$

$$C_3 = 8.55 \times 10^{-8}$$

The procedure was repeated for the LDT-5545B.

RESULTS

In Figure 2 through Figure 5 are graphs of the temperature stability of the LDT-5525B and the LDT-5545B. The horizontal black lines represent the bounds of the specification tolerances.

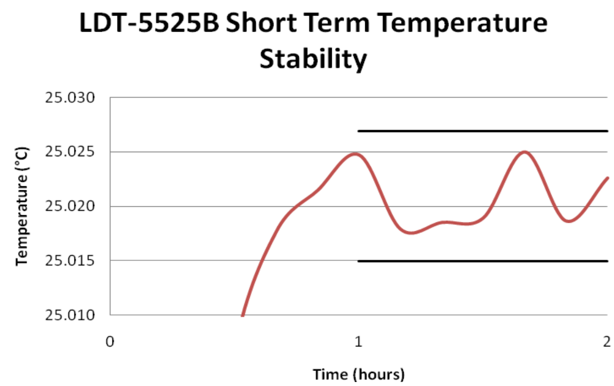

Figure 2: The short term temperature stability of the LDT-5525B during the one hour warm up period and the first hour of the long term temperature stability test.

Figure 2 shows a graph of the temperature stability data of the LDT-5525B during the recommended one hour warm up and the second hour. The importance of allowing the instrument to warm up to the stability of the temperature output is apparent from the graph. The temperature at 0 hours is 25.89°C, which is too low to be displayed on the graph.

After only 40 minutes of warming up, the temperature is stable to within 0.006°C.

Figure 3 shows the temperature stability of the output of the LDT-5525B over a 24 hour period. The temperature becomes increasing stable with time.

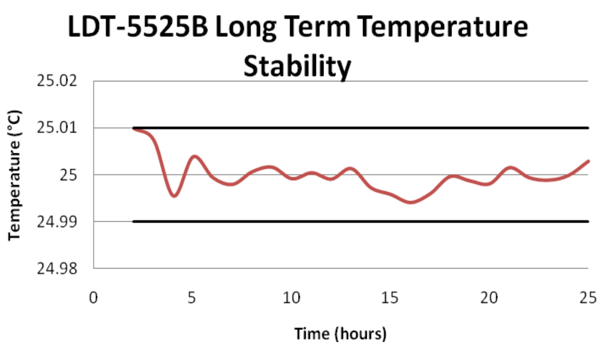

Figure 3: The long term temperature stability of the LDT-5525B after a one hour warm up period.

Similar to Figure 2, the first hour of temperature stability data for the LDT-5545B demonstrates the importance of allowing the instrument to warm up.

After less than 20 minutes of warming up, the temperature output of the LDT-5545B is stable to within 0.006°C.

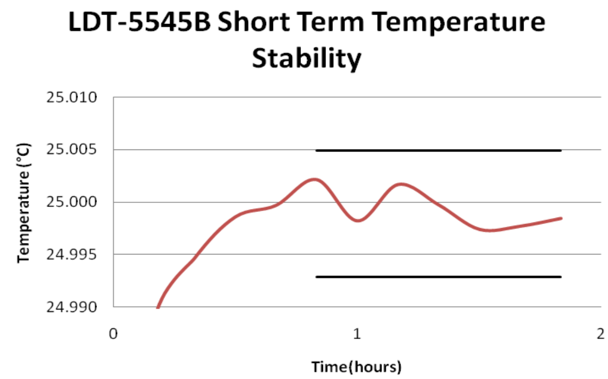

Figure 4: The short term temperature stability of the LDT-5545B during the one hour warm up period and the first hour of the long term temperature stability test.

Figure 5 shows the twenty four hour temperature stability of the LDT-5545B. The stability of the output is well within the specified tolerance.

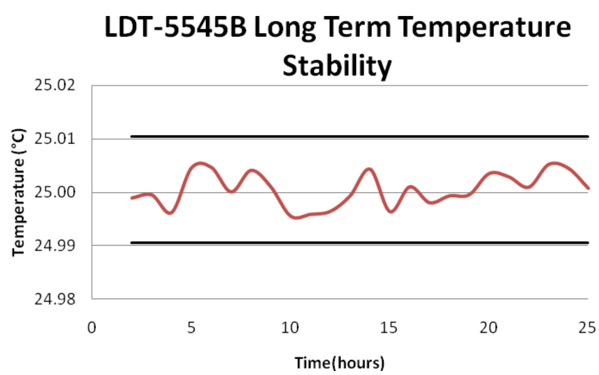

Figure 5: The long term temperature stability of the LDT-5545B after a one hour warm up period.

CONCLUSION

Both models of the LDT-5500B specify that the temperature output is stable for one hour to within 0.006°C and stable to within 0.01°C for twenty four hours. This experiment was conducted in a temperature controlled oven so the results may vary in an uncontrolled environment.