G1600A Capillary Electrophoresis Troubleshooting
Peltier Temperature Control Issues
Detailed Peltier Temp Control Module Troubleshooting

General Troubleshooting Procedures and Checks

Correct operation of the Peltier temperature control system is based on interlocking relationships between the electrical and mechanical parts of the system. Symptoms can vary based on specific failures, or combinations of failures.

A logical series of checks can be used to help isolate the specific cause of any of the following symptoms:

- Inability to heat and/or cool.
- Inability to achieve upper and/or lower temperature limits.
- Unstable temperature, or permanent TEMP NOT READY.
- Slow heating and/or cooling.
- Illegal temperature readings on the cassette icon.
- Uncontrollable heating or cooling.

Check the following important points and functions, in the order in which they are given, until the problem is found.

- Is the desired temperature within specifications?
  Check the specifications.

- Are all TDR cables securely connected, and in the correct connector?

- Is the lamp/Peltier hot-side cooling fan running, and blowing air from the front of the instrument to the rear of the instrument?
  If not:
  - Turn the fan around.
  - Replace the fan.
NOTE

If the fan is not running, high temperatures can be achieved and controlled. Low temperatures cannot be reached due to lack of heat dissipation from the hot-side. When hot-side temperature (Temp sensors function) reaches 80 °C, error EL5303 CASSETTE TEMPERATURE RISED TOO HIGH is set. Also, the total area under the top cover becomes very warm, which may be harmful to the DAD optical unit.

- Is the TDR green LED on when the instrument is on?
  - If not:
    - Check the TDR 8 A fuse.
    - Check that +30 VSB is present at the cable connected to TDR J3.

NOTE

There is no specific instrument error message to indicate the loss of +30 VSB at this point in the circuit.

- Check that the 20-pin ribbon cable at TDR J1 is secure.

NOTE

If the 20-pin ribbon cable is not secure, the following additional symptoms are possible:

- cassette icon reads 102.1 °C.
- error EL 5303 CASSETTE TEMP RAISED TOO HIGH
- both cold-side and hot-side (Temp sensors function) read 102.1.

- Check the 8 A fuse on the CE motherboard

NOTE

If this fuse is open, the following additional symptoms are possible:

- The application of capillary High Voltage is not possible.

- Is the peltier air blower (and temperature power) disabled/enabled by opening/closing the top cover?
  - Do this:
    - Open the top cover; the top cover icon should indicate “open” and the Peltier air blower should stop.
    - Close the top cover; the top cover icon should indicate “closed” and the DAD
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The calibration routine should be done.

- After a successful calibration, the air blower should start again.

**NOTE**

If the top cover cannot be sensed correctly:

- Check the function of the front cover Status board.

  - Check for correct front cover/top cover alignment.
  
  - Try a new EMS board G1600-66511.

Any failure of the DAD calibration routine, such as CASSETTE NOT RECOGNIZED, will inhibit the air blower (and temperature power) until the calibration failure is corrected. Also, in order to enable the air blower, the DAD calibration must be initiated by the top cover. Doing a manual calibration using the DAD icon will not enable the air blower.

- Does the resistance across the Peltier device (red/black wires at TDR J4, disconnected) read between 1 and 12 ohms at ambient temperature?

  If not:
  
  - Check the pins on the connector.
  
  - Replace the Peltier device (order G1600-60004).

**NOTE**

Resistance is in the order of Mohms at hot or cold temperatures, but drops rapidly as the Peltier device approaches ambient temperature. Resistance across the Peltier is very sensitive to temperature.

- Is Peltier power being applied at TDR J4?

  If not:
  
  - Can the detector calibration routine be successfully done after opening/closing the top cover?
  
  - Is the TDR green LED on?
  
  - Is the Peltier device resistance correct?

- Try another HVT board G1600-66502.

- Do the temperature sensors at J5, 6, 7 each measure (disconnected) about 1080 ohms
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at ambient temperature?

If not, replace the Peltier device (order G1600-60004).

NOTES

If J7 (cold-side) is open or disconnected, error El 5303 CASSETTE TEMP RAISED TOO HIGH is set. Cold-side temp (Temp sensors function) reads 102.1. TDR J4 power is disabled, Peltier air blower is not disabled. The cassette icon reads ok.

If J6 (air) is open or disconnected, the cassette icon reads 102.1. The Peltier air blower and TDR J4 power are not disabled.

If J5 (hot-side) is open or disconnected, error EL 5303 CASSETTE TEMP RAISED TOO HIGH is set. Hot-side temp (Temp sensors function) reads 102.1. TDR J4 power is disabled, Peltier air blower is not disabled. The cassette icon reads ok.

Are all wires arranged correctly?

Try a new TDR board G1600-66503.

**Temp Control Module Troubleshooting by Symptom**

Below is a list of specific symptom.

Select your symptom from the ones listed below and try the recommended actions in the order in which they are given.

**Symptom:** Electropherograms indicate the possibility of loss of temperature control, or temperature entirely, in the capillary. The main screen cassette icon shows temperature control to be normal. Heating and cooling seem to be functioning normally. The top cover is sensed as closed. Instrument status shows all is normal. Opening/closing the top cover initiates a successful DAD calibration.

Check that the Peltier air blower is running.

If not:

- Make sure the air blower cable is connected at TDR J2.
- Make sure 20 pin ribbon cable TDR J1 is ok.
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- Replace air blower.

  - Try a new capillary.

  **Symptom:** TDR green LED is not on when the instrument is on.

- Check the continuity of the +30 VSB circuit from the main power supply to the TDR board.

  **Symptom:** Cannot reach the desired below-ambient cassette temperature.

  A permanent TEMPERATURE NOT READY has been displayed for at least 20 minutes. No error conditions are displayed. Above-ambient temperatures can be reached and controlled correctly.

- Make sure the desired temperature is within specifications, as given in “Specifications” on page 11.

- Make sure the Lamp/Peltier hot-side cooling fan is running, and blowing air from the front of the instrument to the rear of the instrument.

- Generally check system performance.

  **Symptom:** Cannot heat or cool the cassette

  No response to temperature commands in either direction. Permanent temperature not ready state. No error conditions are displayed.

- Make sure that opening/closing the top cover initiates a successful DAD calibration.

- Generally check system performance.

  **Symptom:** Error EL 5303 Cassette Temp Raised too High is set.

- Make sure the Lamp/Peltier hot-side cooling fan is running, and blowing air from the front of the instrument to the rear of the instrument.

  If not:
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- Turn the fan around, or replace the fan.
  - Check the J5 and J7 temp sensors.
  - Replace the HVT board.
  - Replace the TDR board.

**Symptom:** Slow heating or cooling

Slower than 3 degrees/min to achieve desired setpoint. Setpoint is within specification.

- Make sure all the wiring in the area of the TDR board is routed correctly.
- Generally check system performance.

**Symptom:** Illegal or unusual temperature readings on the main screen cassette icon.

- Check the Peltier AIR temp sensor at TDR J6.

**NOTE**

If this sensor is disconnected or open, the cassette icon will read 102.1 °C.

- Try a new HVT board G1600-66502.

**NOTE**

If the A/D circuits of the HVT board are defective, it is most likely that several or all measurements displayed on the main screen will appear defective.