Quick Start Guide:

Keysight Technologies B1500A automated temperature control of a Lake Shore Vertical Field (VF) Probe Station

I. Introduction

Before you begin, read and understand the user manuals for your Lake Shore probe station, Keysight B1500A, as well as the Keysight EasyEXPERT™ software.

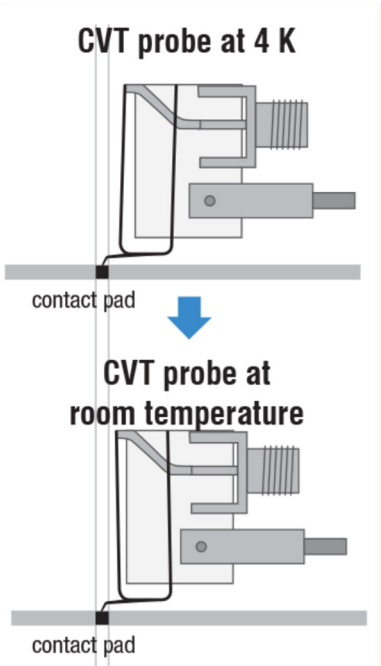

Figure 1: ***Probe movement (exaggerated for emphasis)***

II. Probes

Automated temperature control requires use of Lake Shore's patented CVT probes.

- During a variable temperature measurement, these probes compensate for probe arm thermal expansion.
- Refer to the table below to determine the maximum temperature range of the automated measurement for your station and choice of probe. To extend the temperature range of measurement, stop the automated measurement at the range limit, lift and re-land the probes, and continue the automated measurement.

	**CPX CPX-VF CPX-HF CPX-VF**	**TTPX EMPX-HF FWPX RX-6.5K CRX-4K CRX-EM-HF**
ZN50R-CVT-25-W	Δ400 K	Δ150 K
ZN50R-CVT-10-W	Δ200 K	Δ100 K
ZN50R-CVT-25-BECU	Δ200 K	Δ100 K

Table 1: ***Temperature range per probe station model using CVT probes***

III.EasyEXPERT™ Driver for the Model 336 Temperature Controller

Set the following settings in the EasyEXPERT™ software to control the Lake Shore Model 336 temperature controller.

1. **Model 336 GPIB Address:** Set the GPIB address for the Model 336 temperature controller.

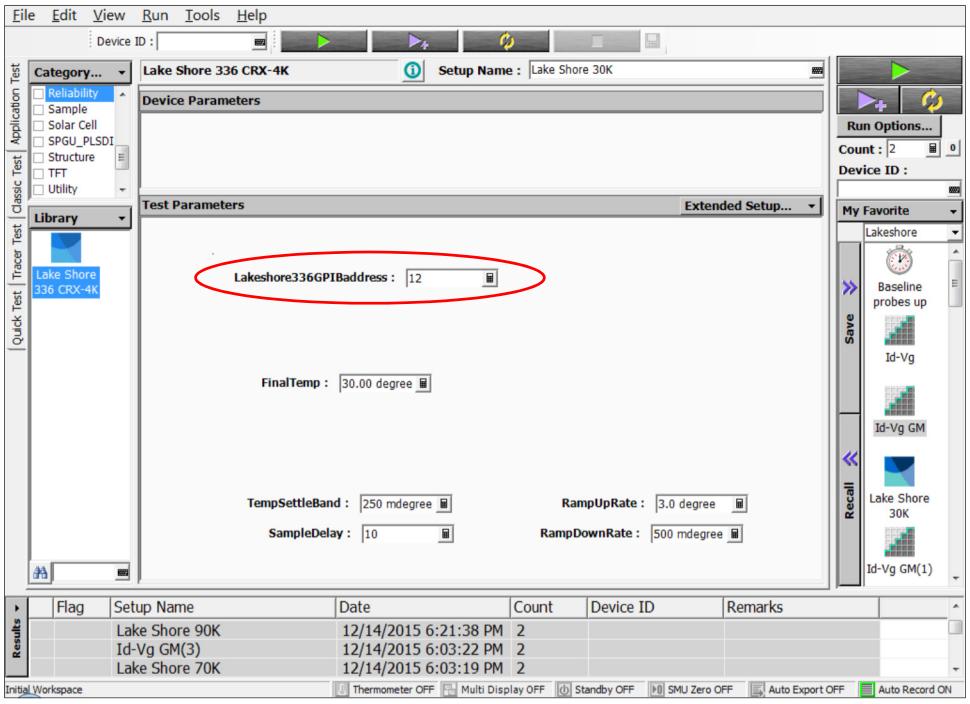

Figure 2: ***Model 336 GPIB address***

2. **Final Temperature:** Set the Model 336 temperature controller to read temperature in Kelvin (K).

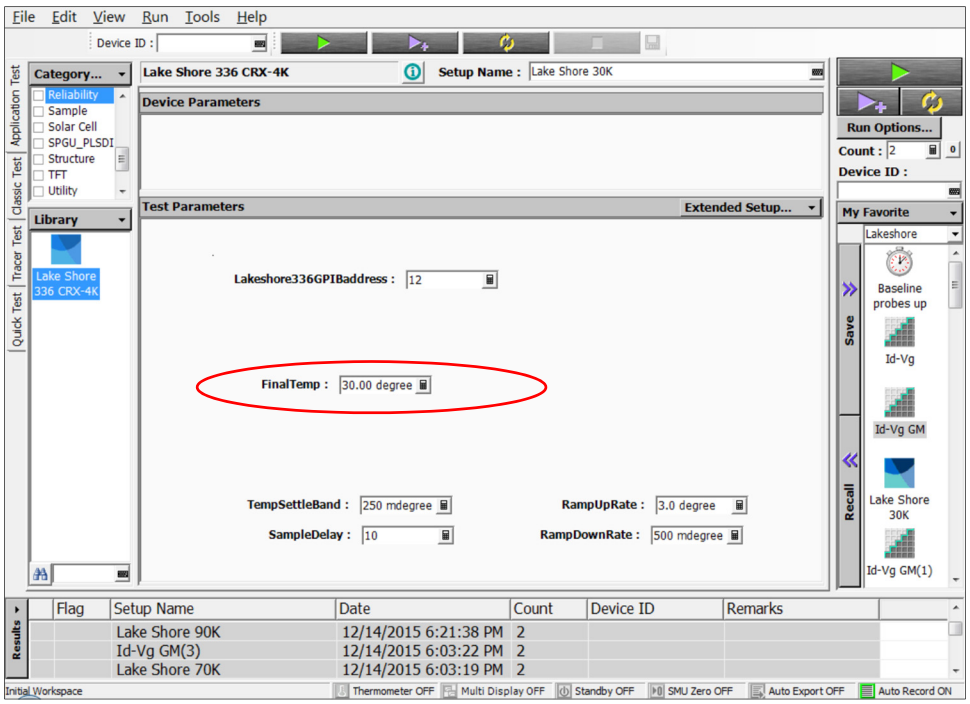

Figure 3: ***Final temperature***

3. **Ramp Rates:** Set ramp rates to improve the stage control as well as the lag in probed device temperature. Ramp rates (in degree/min) are the rate that the temperature controller increases or decreases the sample stage setpoint.

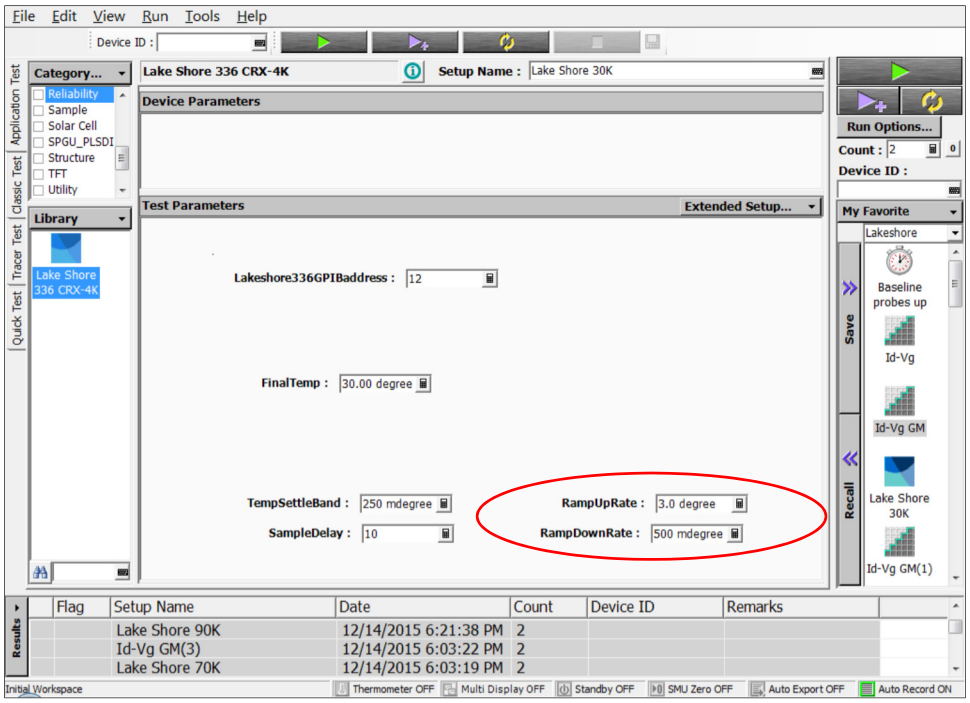

Figure 4: ***Ramp rates***

4. **Temperature Settle Band:** The stage temperature is considered stable when an approximately 30 s long string of temperature readings are within the range "FinalTemp" ±"TempSettleBand". Too narrow of a settle band may cause the program to timeout and stop.

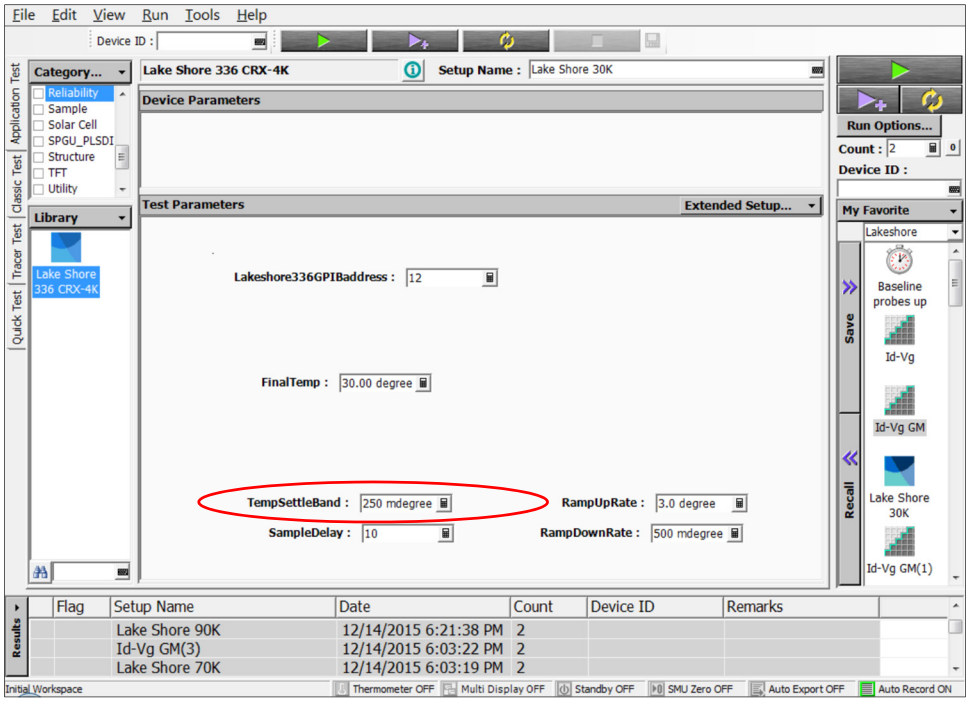

Figure 5: ***Temperature settle band***

5. **Sample Delay:** Once the stage has stabilized, the program will wait for the “SampleDelay” time (in minutes) before completing and releasing control back to the B1500A. This wait time allows the device to come into complete thermal equilibrium with the stage and probes.

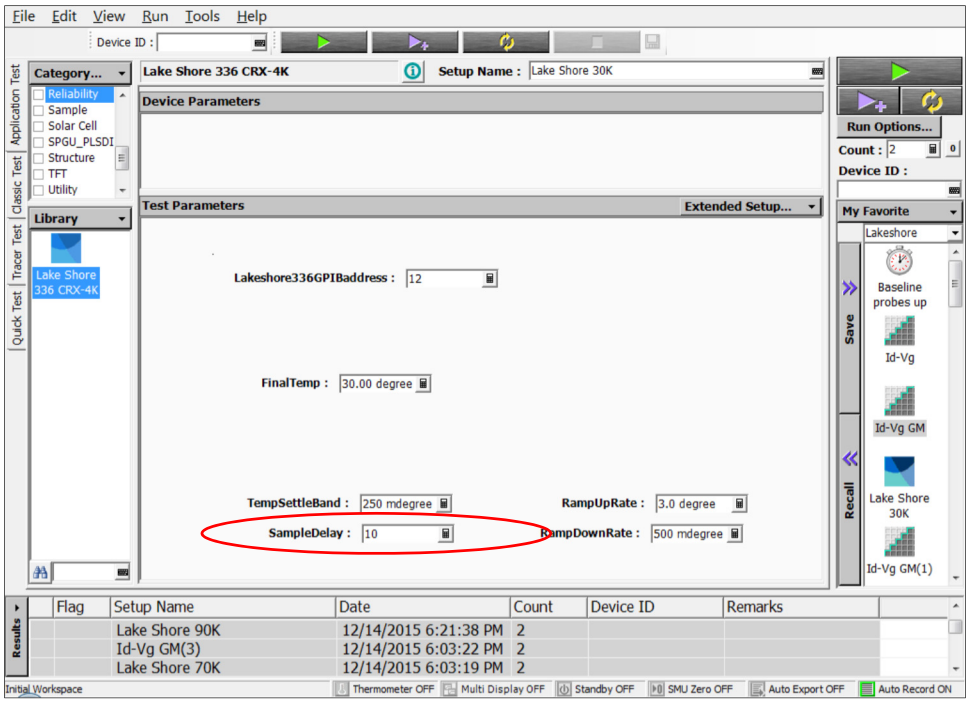

Figure 6: ***Sample delay***

Operation:

1. The temperature ramps to the setpoint.
2. PID control parameters are embedded in the driver and tuned for each model of the Lake Shore probe station.
3. The driver checks that the stage temperature has settled.
4. The device waits for the thermalization wait time.
5. The driver releases control for device measurement.

IV. EasyEXPERT™ Driver for the Model 625 Superconducting Magnet Power Supply

Set the following settings in the EasyEXPERT™ software to control the Lake Shore Model 625 superconducting magnet power supply.

1. **Model 625 GPIB Address:** Set the GPIB address for the Model 625 magnet power supply.

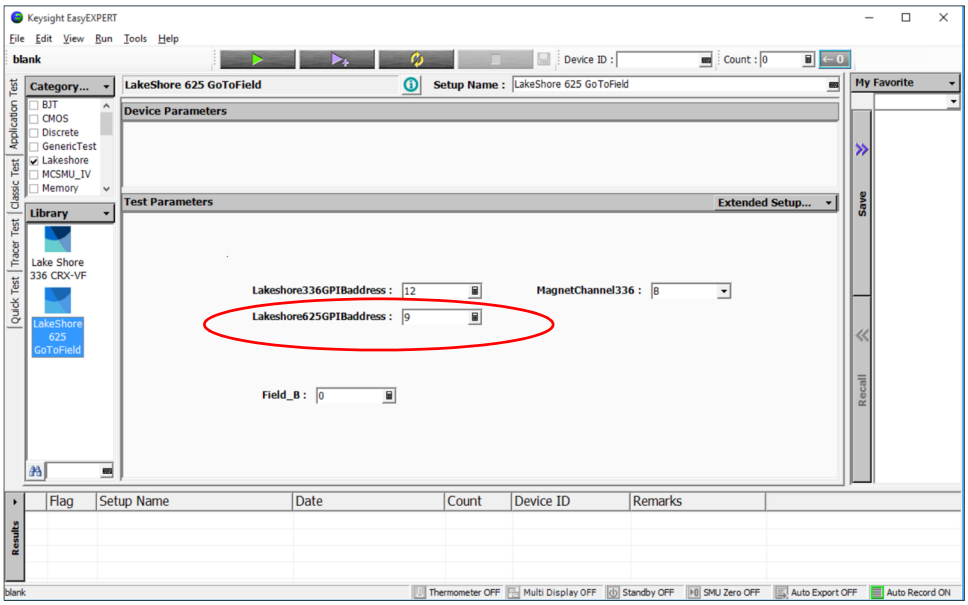

Figure 7: ***Model 625 GPIB address***

2. **Field:** Set the Model 625 magnet power supply to the desired field, in Tesla (T).

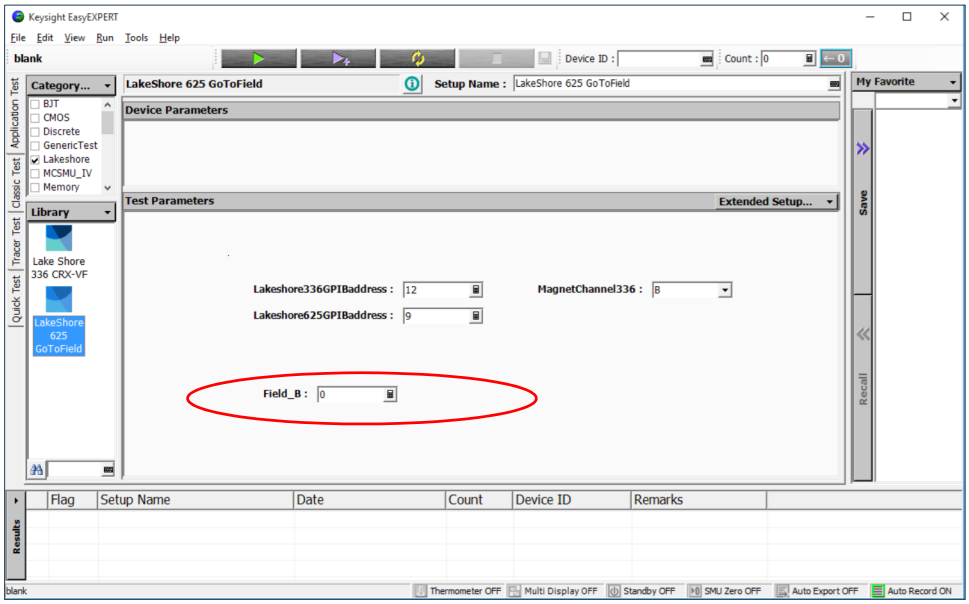

Figure 8: ***Field***

3. **GPIB Address for the Model 336:** The GPIB address for the Model 336 temperature controller that is monitoring the magnet temperature. This should be the same address as used for the sample stage control. During field control, the driver will monitor the magnet temperature to ensure the magnet stays below 5.5 K.

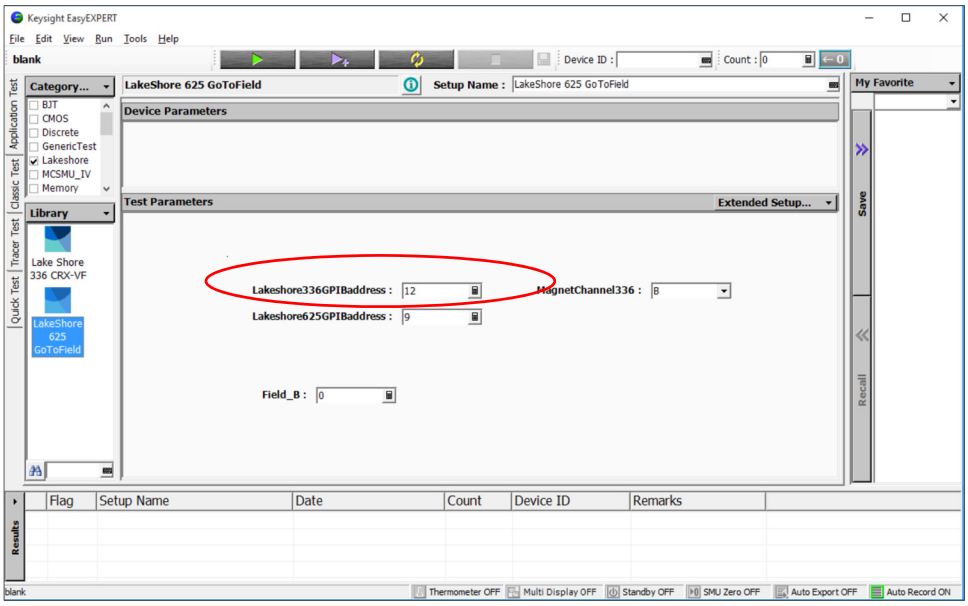

Figure 9: ***Model 336 GPIB address***

4. **Magnet Channel:** Active channel on the Model 336 temperature controller which is monitoring the magnet temperature. Depending on probe station configuration, this will be channel B or C.

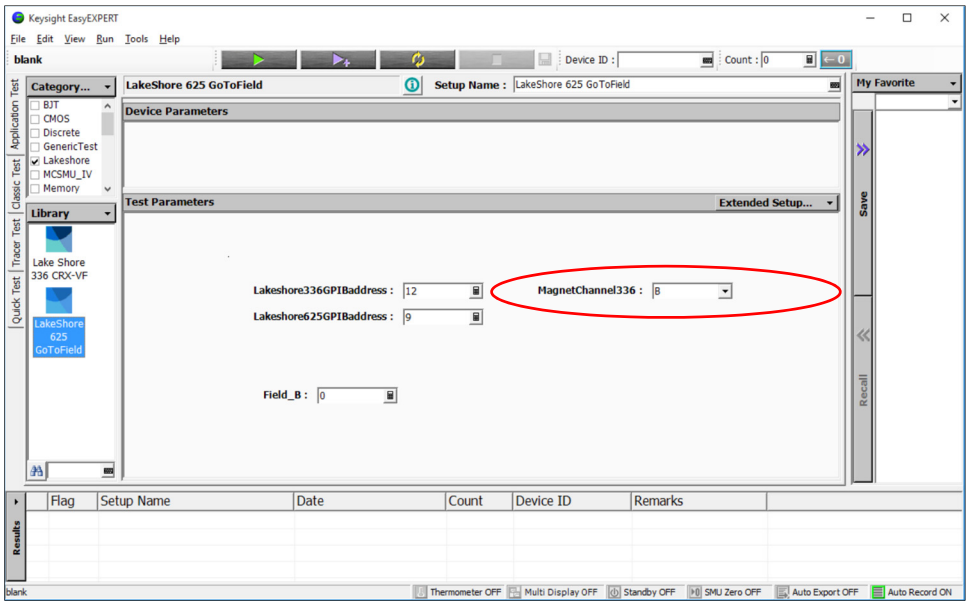

Figure 10: ***Magnet Channel***

V. EasyEXPERT™ Quick Test

The Quick Test is a fast and easy way to build an automated, variable temperature device measurement.

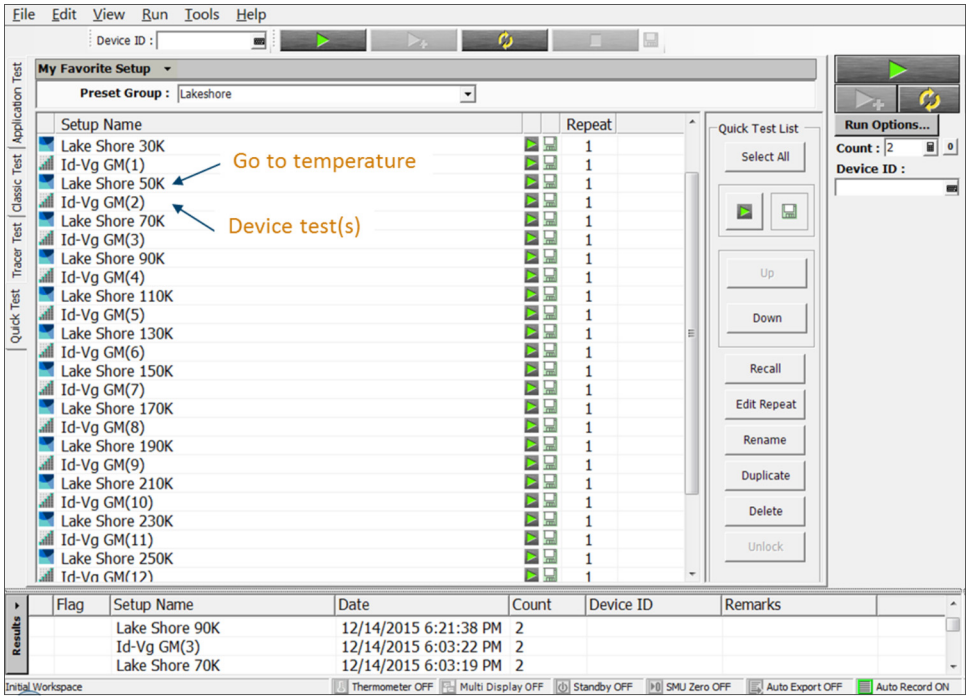

Figure 11: ***Quick Test***

To build a Quick Test:

1. On the Model 336 driver screen, change the setpoint and other parameters as necessary.
2. Create a unique Setup Name.
3. **Save** the test. The test will be saved under **My Favorite**.

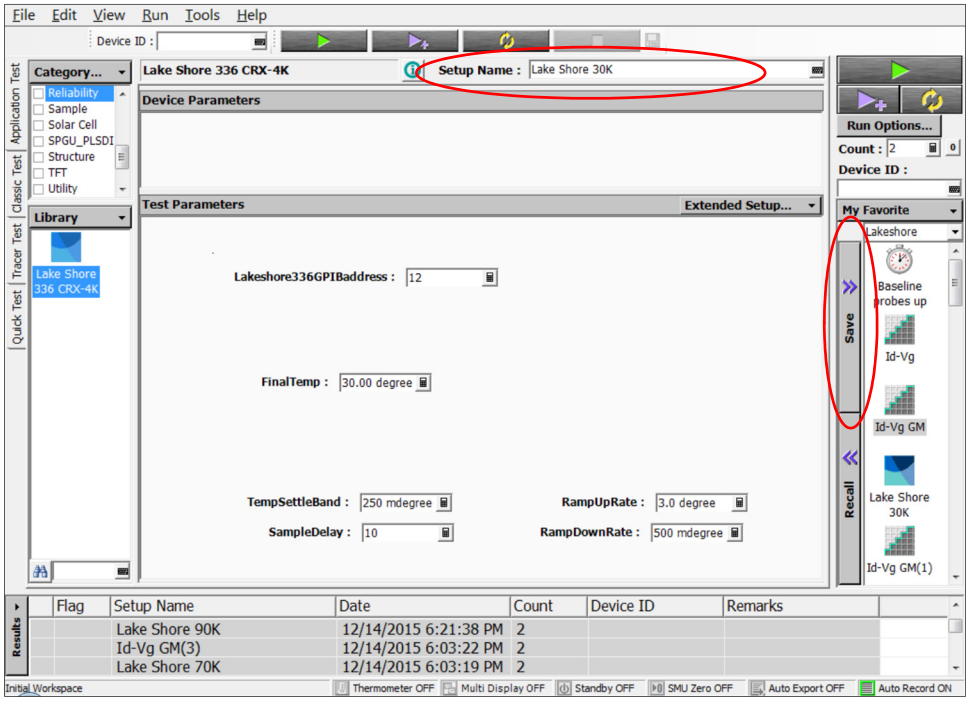

Figure 12: ***Building a Quick Test***

4. Use the Quick Test list tools to build your quick test protocol from the elements saved to **My Favorite**.

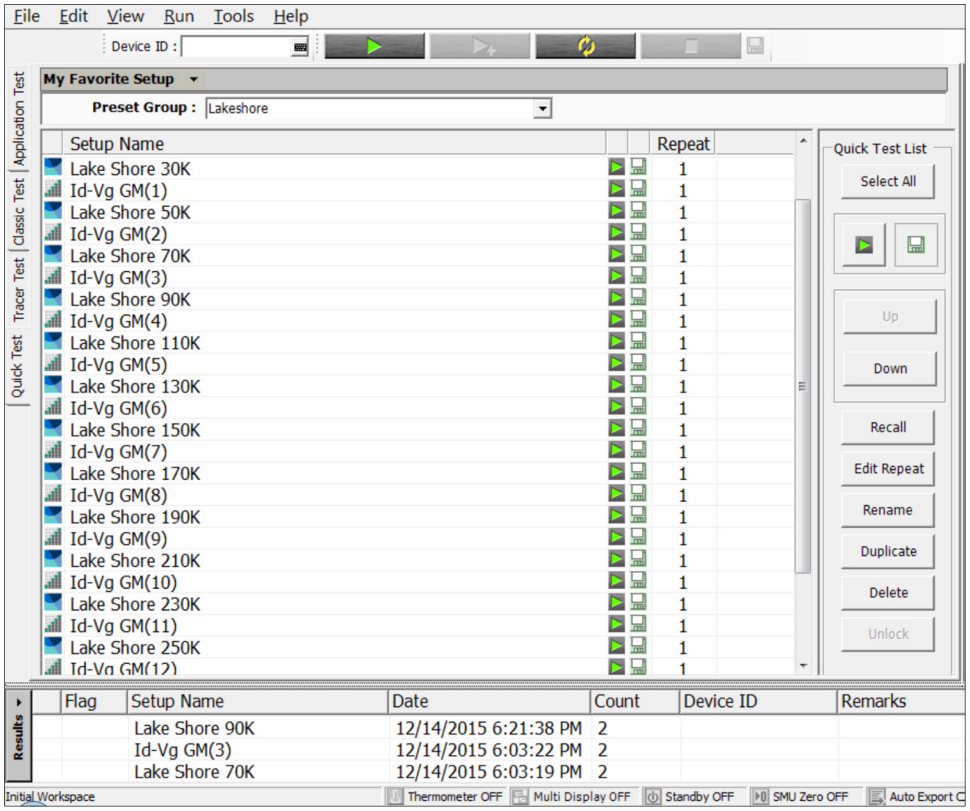

Figure 13: ***Quick Test list***

VI. Service

The most direct and efficient means of contacting Lake Shore is to complete the online service request form at http://www.lakeshore.com/service/Pages/default.aspx. Provide a detailed description of the problem and the required contact information. You will receive a response within 24 hours, or the next business day in the event of weekends or holidays.

To contact Systems Service by mail or telephone:

Lake Shore Cryotronics, Inc.
575 McCorkle Blvd.
Westerville, Ohio 43082 USA
Phone: 614-891-2243 (option 6)
Fax: 614-818-1608
e-mail: sysservice@lakeshore.com