



**Model 3100-1L
One Channel
Temperature Controller**

User Manual



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L-1 Standards and Technology, Inc.
209 High Street
New Windsor, MD 21776-0729
USA
+1 410-635-3300 Phone
+1 410-635-3200 FAX
sales@L-1.biz
www.L-1.biz

Warranty

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Table of Contents

1	Overview	1
2	Parts List	2
3	Identification	3
4	Setup	5
5	Software	6
6	General Specifications	18

1 Overview

The Model 3100-1L Temperature Controller is a precision control unit which provides closed loop temperature control of Peltier thermo-electric coolers/heaters at the ± 0.001 °C level. The controller is a microprocessor based unit with an Ethernet interface which communicates through TCP/IP. The controller is optimized for use with L-1 Standards and Technology Inc.'s line of temperature controlled detectors which include silicon photodiode trap detectors, single element silicon photodiodes, InGaAs photodiodes, extended-IGA photodiodes and a 3-detector Windowed Integrating Sphere Assembly that covers from 350 nm to 2400 nm in a single device. The Model 3100 comes in 3 versions: 1L – a low power model for single detectors; 3L – three channel model to operate the detectors in the Integrating Sphere Detector, and 1H – which is a higher power single channel model used for custom temperature control applications.

The temperature controller, when sold as part of a detector package, is preconfigured to operate the detector automatically. All that is required is to connect the cabling and power the unit on. The controller will then maintain the preset temperature on the detector. If you wish to log data to a computer or change settings then an Ethernet connection is required. The temperature controller is delivered with a LabVIEW virtual instrument driver that will allow control and data logging from the controller using the customer supplied LabVIEW program.

2 Parts List

- **Model 3100-1L Temperature Controller** 1 ea
- **Model 3100 Temperature Controller One Channel Cable** 1 ea
- **Model 3100 Temperature Controller Power Supply** 1 ea
- **Manual & Software CD** 1 ea

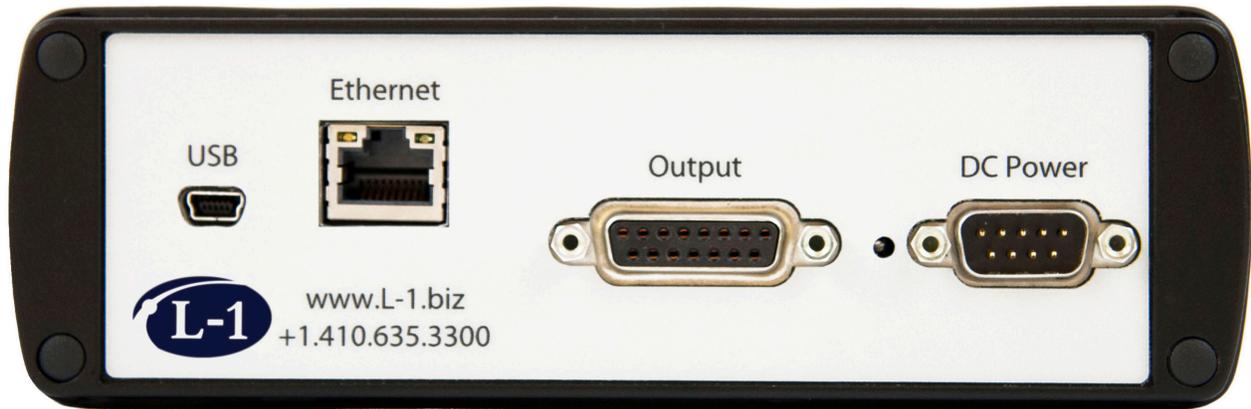
3 Identification



Model 3100-1L Front

LCD Screen

Displays the temperature set point (SetPt) and current temperature of the connected detector in degrees Celsius.



Model 3100-1L Back

USB

Not currently active. Do not use.

Ethernet

Provides connection to a computer through an Ethernet cable (not provided).

Output

Provides connection to a L-1 temperature controllable detector using the Model 3100 Temperature Controller One Channel Cable.

DC Power

Provides power using the Model 3100 Temperature Controller Power Supply.

4 Setup

NOTE

Turn off power to the temperature controller before starting the below steps.

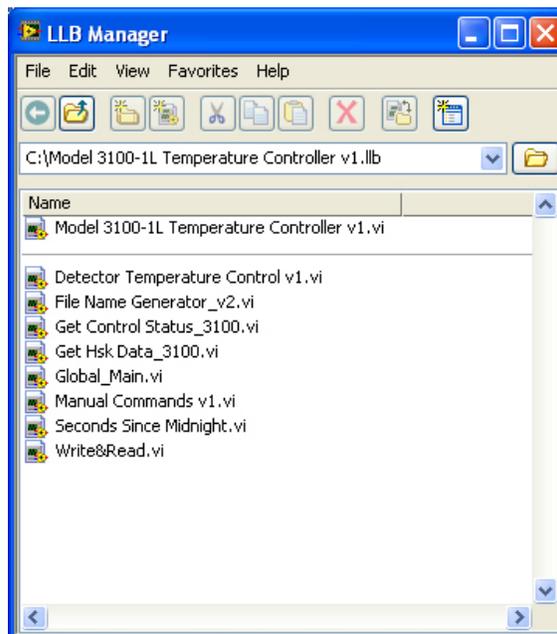
- 1 Make sure the Model 3100 Temperature Controller is turned off by unplugging its power supply.
- 2 Connect the Model 3100 Temperature Controller to a L-1 temperature controllable detector using the supplied One Channel Cable. The four pin LEMO connector of the One Channel Cable connects to the back of the detector and the DB-15 connector to the back of the temperature controller.
- 3 Power on the temperature controller by connecting the DB-9 “DC Power” connector of the power supply to the “DC Power” connector on the back of the temperature controller and then plugging the power supply into a wall outlet that provides 100-240 VAC, 50/60 Hz power. L-1 recommends using a surge protector between the equipment and the wall outlet.
- 4 The temperature controller will immediately boot up and several screens of information will appear on the LCD screen before the temperature set point and current temperature reading appears.
First Screen:
Det Temp Control
Model 3100-1L
Second Screen:
SWver1.1.1c.1t (code version; actual code version may vary)
User Name (actual user name may vary)
Third Screen:
IP Address:
10.0.1.10 (example IP address is used here; actual IP address may vary)
- 5 The final screen will provide information on the set point (temperature setting) and current temperature. The temperature controller is preprogrammed to automatically control detector temperatures at a specific set point depending on the detector type.
- 6 If a change in set point is needed or if automated recording of the temperatures is desired, connect the temperature controller to a computer using an Ethernet cable (not supplied) and use the Model 3100-1L Temperature Controller Software. Please refer to the software section of this manual for further details.

5 Software

The Model 3100-1L Temperature Controller can be controlled with computer software written in LabVIEW. Using the provided software with LabVIEW 2012 or higher, a user can modify the temperature set point, change the IP address and user name of the temperature controller, modify various parameters and record data (including temperatures) to file.

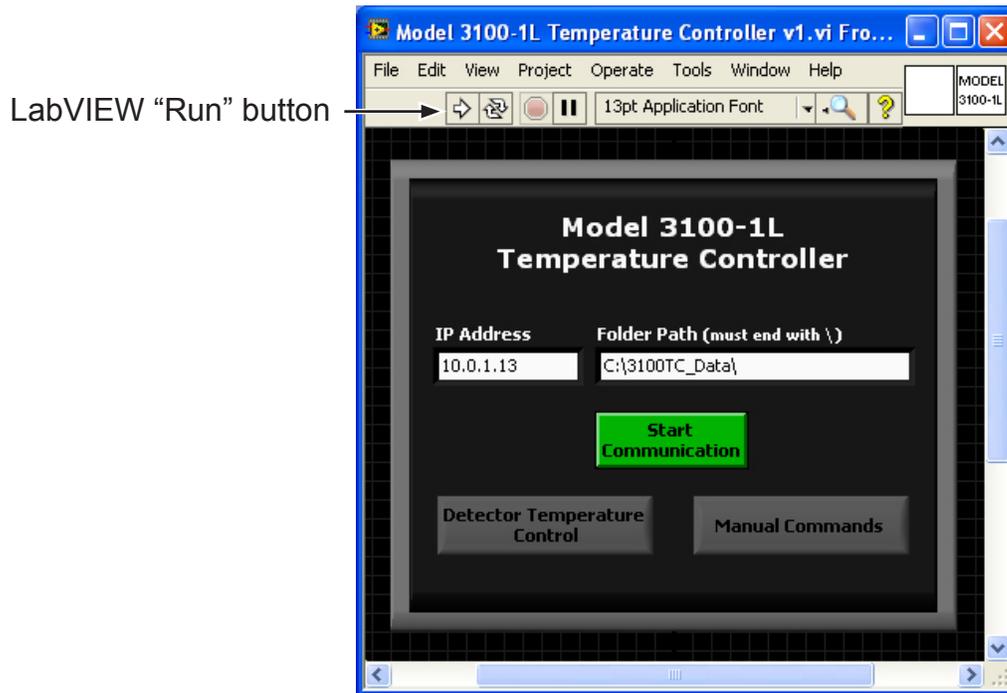
Starting the Model 3100-1L Temperature Controller Software

You must have LabVIEW 2012 or higher installed to run the provided software. Copy the Model 3100-1L Temperature Controller v1.llb from the provided CD to your computer or to a location on an accessible network. This is a LabVIEW library file that contains all the virtual instruments (vi's) needed to run the software. Double click on this .llb file and in the LLB Manager window that opens, double click the top level "Model 3100-1L Temperature Controller v1.vi" (first .vi in the list).

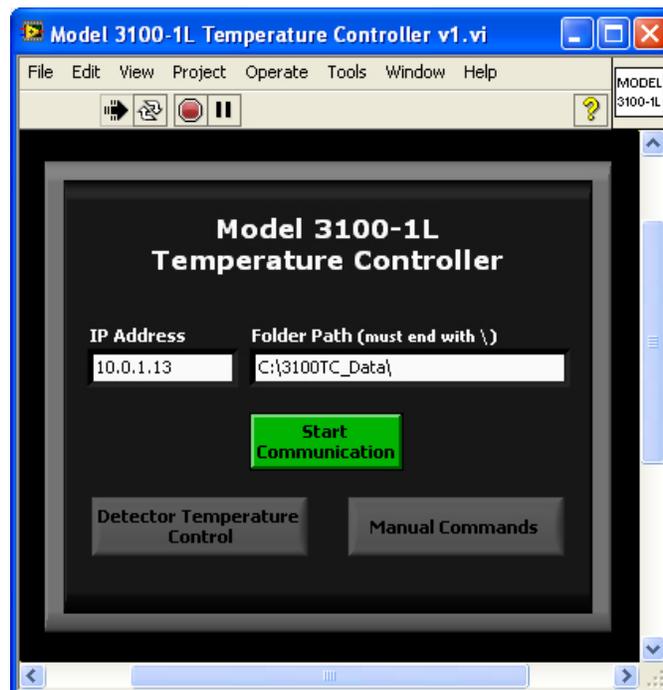


Running the Model 3100-1L Temperature Controller Software

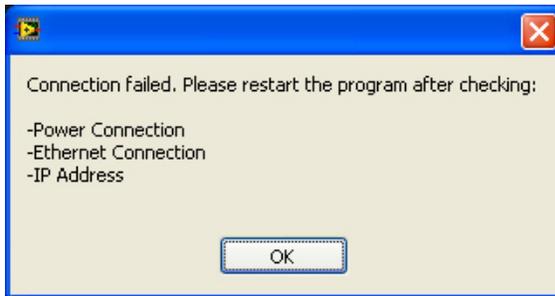
- 1 Click the *Run* button (button with the white arrow in the upper left of the screen underneath the edit menu of the software) of the Model 3100-1L Temperature Controller v1.vi. The *Run* button starts LabVIEW running.



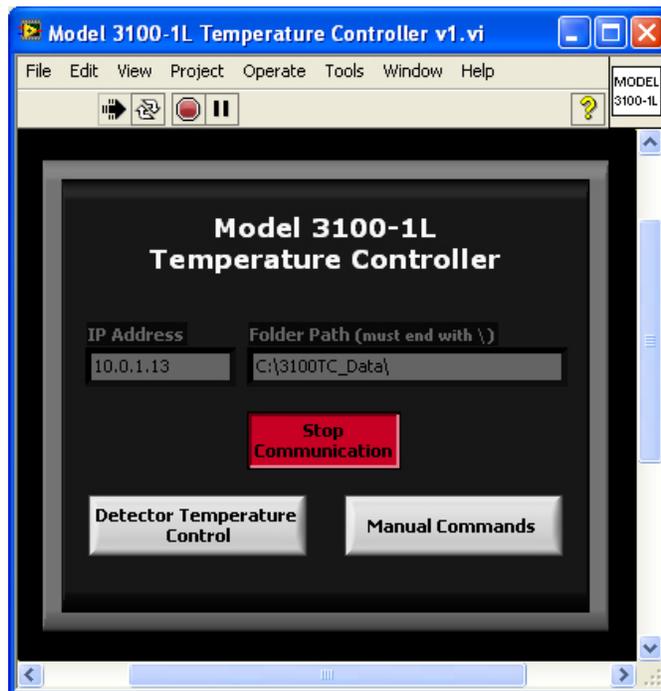
- 2 Verify the IP address on the screen and if needed, change it to match the temperature controller's IP address shown on the LCD screen during system boot up. The preset IP address of the unit is also labeled on the top of the Model 3100-1L Temperature Controller unit upon shipment.
- 3 The default folder path shown can be changed if desired. If it does not already exist, the folder will be created when the program runs.
- 4 If the Model 3100-1L Temperature Controller has just been powered on, please wait one minute after the temperature reading appears on the LCD screen before continuing to the next step to allow the unit to fully power on.
- 5 Click the green *Start Communication* button to initialize communication with the temperature controller. It may take up to 5 seconds for communication to be established.



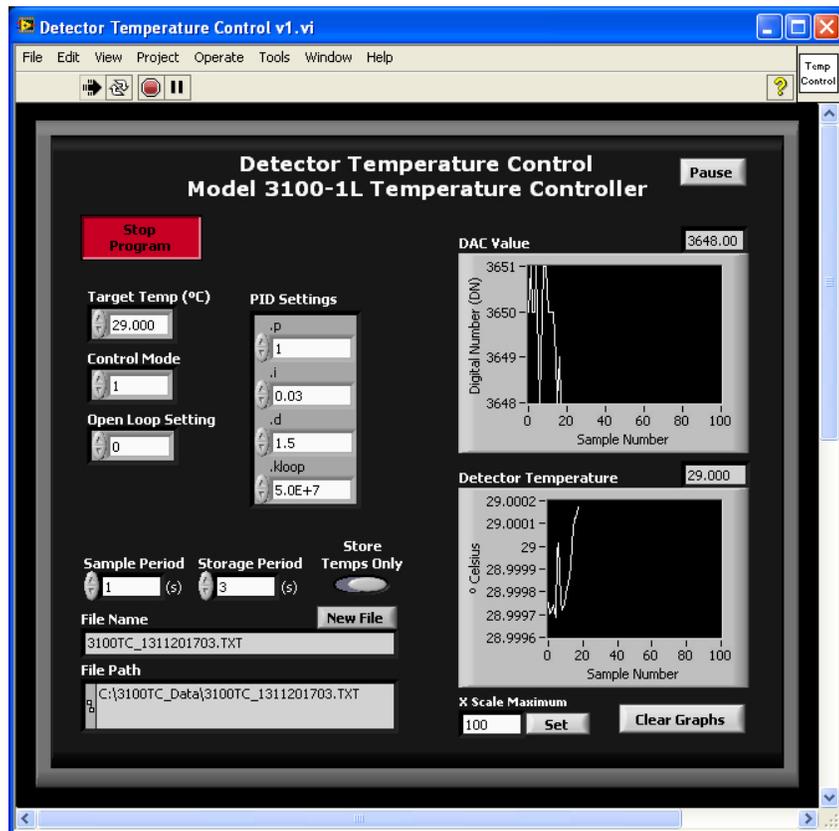
- 6 If communication fails, a pop-up window will appear stating that the connection failed and giving instructions to restart the program after checking power, Ethernet connection, and IP address. Pressing the OK button will close the pop-up window and stop the Model 3100-1L Temperature Controller v1.vi.



- 7 When communication is established, the *Detector Temperature Control* and *Manual Commands* buttons, which were unavailable during connection establishment, become available. The *IP Address* and *Folder Path* controls become unavailable as they cannot be changed after communication is established.



- 8 Clicking either the *Detector Temperature Control* or *Manual Commands* button opens the corresponding program's front panel and starts the vi and program running (Detector Temperature Control v1.vi and Manual Commands v1.vi respectively). When either of these two programs is running, the *Stop Communication* button and the program buttons are unavailable within the Model 3100-1L Temperature Controller v1.vi. To switch between these two programs, close the current program using the *Stop Program* button and then click the other program button in the Model 3100-1L Temperature Controller v1.vi.
- 9 Use the Detector Temperature Control v1.vi to monitor data and control the user adjustable parameters.



Detector Temperature Control v1.vi components:

Stop Program Button

Stops the program and closes the program window.

Pause Button

Pauses the program.

Target Temp (°C)

Sets the set point (target temperature) in degrees Celsius.
Minimum: -28.000; Maximum: 35.000.

Control Mode

If set to 0, the DAC value is set to the Open Loop Setting value.
If set to 1, the DAC value is controlled by the PID Settings.

Open Loop Setting

Sets the digital DAC value using a 16-bit digital number between 0 and 65535 which corresponds to a voltage from 0 to 5 volts. The Control Mode must be set to 0 for the DAC value to be set to the Open Loop Setting value.

PID Settings

The temperature controller DAC value can be controlled using a PID control algorithm in which the DAC setting is automatically varied based on the PID settings and the temperature error. The temperature error is the difference between the set point (target temperature) and the current detector temperature.

.p: Proportional Term

.i: Integral Term

.d: Derivative Term

.kloop: Multiplier of all Terms

Sample Period

The sample time in seconds for acquiring and graphing the data.
Default is 1 second.

Storage Period

The time in seconds for writing data to file. Default is 3 seconds.

Store Temps Only Button

Toggle this button to store all data or store temperatures only.
Default is to store temperatures only.

File Name

Name of the data file (data file is in text format; file extension .txt). An example file name is 3100TC_MC_1311011459.txt where MC stands for manual commands and the numeric code after the underscore character indicates that the year was 2013, the month was November, the day was 01, and the time in 24 hour format was 14:59 when the file was created. The file name is not displayed until it is created after the Send button is pressed for the first time. The file name cannot be changed.

New File Button

Starts a new data file and starts writing data to this new file at the next storage time. A new data file will not be created within a minute of the last file created.

File Path

The full path to the data file recorded (includes the file name). For informational purposes only. The file path cannot be changed on this screen. If you need to change what folder the data file is saved to, see step 3 in the software section of this manual.

DAC Value Graph & Digital Display

The voltage applied to the Peltier cooler in a digital number (16-bit number which corresponds to a voltage from 0 to 5 volts) is graphed and numerically displayed.

Detector Temperature Graph & Digital Display

The current detector temperature in degrees Celsius is graphed and numerically displayed.

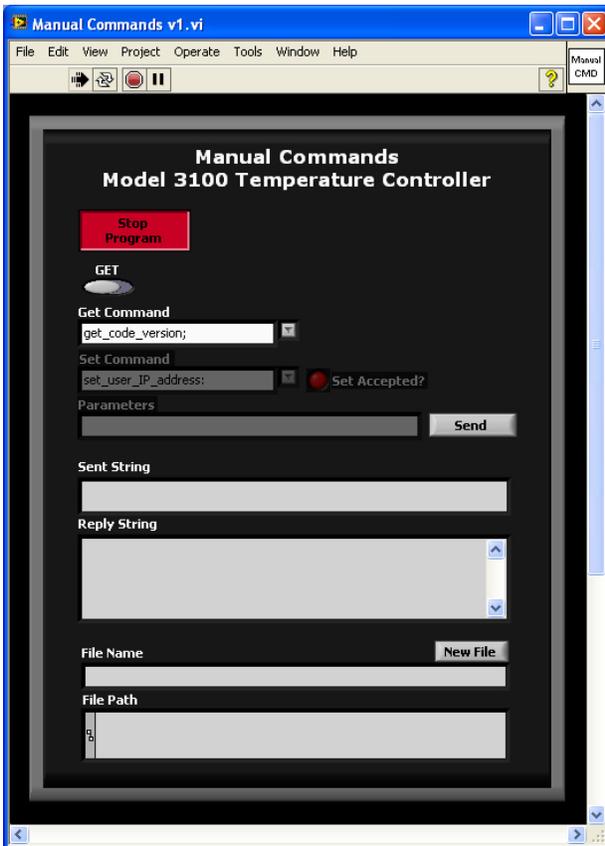
X Scale Maximum

The maximum number of data points to be graphed at any one time. Default is 100. Click the Set button to activate.

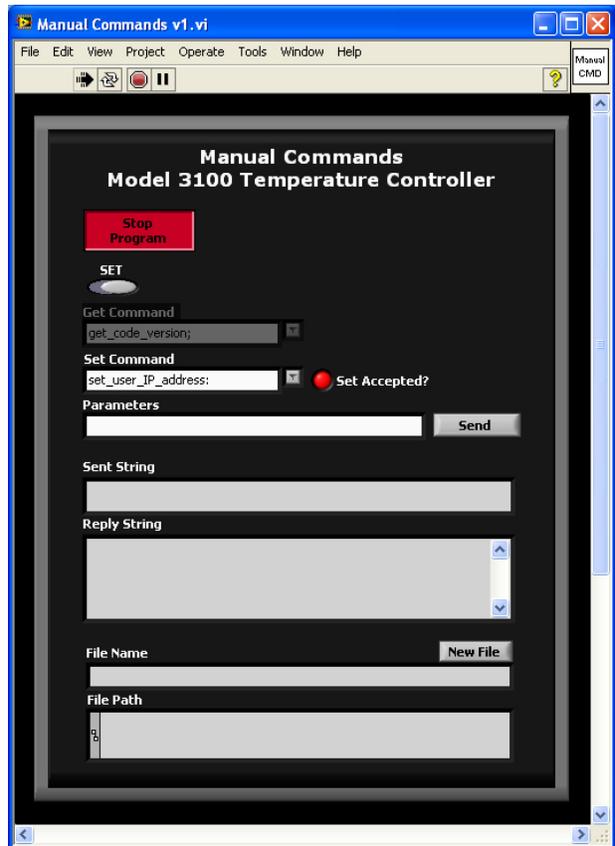
Clear Graphs Button

Click this button to clear the DAC Value and Detector Temperature graphs.

- 10 Use the Manual Commands v1.vi to send *get* and *set* commands directly to the temperature controller.



Manual Commands v1.vi showing the Get/Set toggle in the Get position.



Manual Commands v1.vi showing the Get/Set toggle in the Set position.

Manual Commands v1.vi components:

Stop Program Button

Stops the program and closes the program window.

Get/Set Toggle button

Toggle to *Get* to access the get commands and toggle to *Set* to access the set commands, parameters and set accepted light. The get and set commands are not simultaneously accessible.

Get Command

Allows selection of get commands from a drop down list. The Get/Set toggle button must be toggled to *Get* for this drop down list to be available. The get command is not sent to the temperature controller until the *Send* button is pressed.

Get Commands are:

get_code_version

Code version (example: Temp Controller PCB2024v1 Code1.1 April 2012; 117010254)

get_hsk_data

frame counter, 4 target temperatures in digital numbers, 4 detector temperatures in degrees Celsius, 4 Open Loop DAC setting values, 4 DAC voltage values

get_control_status

frame counter, 4 enable values, 4 mode type values, 4 Open Loop DAC setting values, 4 target temperatures in degrees Celsius, 4 error codes, 4 p terms of PID control, 4 i terms of PID control, 4 d terms of PID control, 4 kloop terms of PID control

get_user_data

IP address, user net mask, user name, detector type, 4 target temperatures in degrees Celsius, 4 p terms of PID control, 4 i terms of PID control, 4 d terms of PID control, 4 kloop terms of PID control

Set Command

Allows selection of set commands from a drop down list. The Get/Set toggle button must be toggled to *Set* for this drop down list to be available. The set command is not sent to the temperature controller until the *Send* button is pressed.

Set Commands are:

set_user_IP_address

format = n.n.n.n (up to 3 numbers per n; example
= 10.0.1.13)

set_user_net_mask

format = n.n.n.n (up to 3 numbers per n; example
= 255.255.255.0)

set_user_name

up to 16 characters

set_save_user_data

1 = save

Set Accepted? Light

Displays green if set command is accepted and red if set command is rejected. The Get/Set toggle button must be toggled to *Set* for this function to be available.

Parameters

Input parameters to be used with the set command that was chosen. The Get/Set toggle must be toggled to *Set* for this function to be available.

Send Button

Sends the command (and any parameters if applicable) to the temperature controller in the correct format.

Sent String

Displays the string that was sent to the temperature controller after the send button was pressed.

Reply String

Displays the string the temperature controller sends back after receiving a command.

File Name

Name of the data file (data file is in text format; file extension .txt). An example file name is 3100TC_MC_1311011459.txt where MC stands for manual commands and the numeric code after the underscore character indicates that the year was 2013, the month was November, the day was 01, and the time in 24 hour format was 14:59 when the file was created. The file name is not displayed until it is created after the *Send* button is pressed for the first time. The file name cannot be changed.

New File Button

Starts a new data file and starts writing data to this new file at the next storage time. A new data file will not be created within a minute of the last file created.

File Path

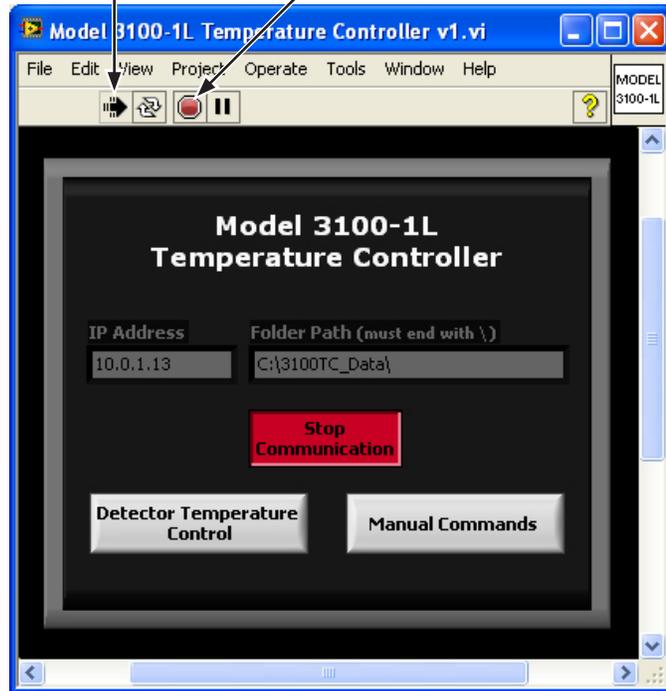
The full path to the data file recorded (includes the file name). For informational purposes only. The file path cannot be changed on this screen. If you need to change what folder the data file is saved to, see step 3 in the software section of this manual.

Stopping Model 3100-1L Temperature Controller Software

To stop the Model 3100-1L Temperature Controller Software, first, if open, stop the Detector Temperature Control v1.vi or the Manual Commands v1.vi program by pressing the *Stop Program* button and wait until the program window closes. Within the Model 3100-1L Temperature Controller v1.vi, press the *Stop Communication* button. Allow the program several seconds to disconnect with the temperature controller and stop running. Never stop any of the programs by pressing the LabVIEW *Abort* button.

LabVIEW “Run” button,
shown here running.

LabVIEW “Abort” button.
NEVER use this button to
stop the program.



6 General Specifications

Power Input:	100-240 VAC, 50/60 HZ, 1.6 A
Dimensions (without cables):	171.45 mm W x 179.39 mm D x 53.50 mm H
Weight (without cables):	860 g
Storage Environment:	0° C to 50° C Up to 80 % relative humidity, non-condensing
Operating Environment:	15° C to 40° C Up to 80 % relative humidity, non-condensing
Warranty:	All goods manufactured by L-1 shall be free from defects in material and workmanship for a period of one (1) year from the date of delivery. The purchaser is responsible for all transportation costs to and from the factory for repair. Resale products shall carry only the warranty offered by the original manufacturer.