

Ludlum Lumin Calibration Software Manual

August 2021

Version 1.2.0.15 and above

Ludlum Lumic Calibration Software Manual

August 2021

Version 1.2.0.15

Calibration Wizard

Version 1.0.5 or Higher

Plateau Wizard

Version 1.0.3 or Higher

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Getting Started

General Description

The Ludlum LUMIC Calibration Software is a useful software tool that allows reading and writing of many important parameters in Ludlum instruments via a USB (Universal Serial Bus) port. Compatible Ludlum instruments include the Model 3000, 3001, 3002, 3019, 3276, 30, 35, 79, and may include others. Instrument parameters may be loaded or saved to files, and an instrument parameter report may be printed. Current readings or measurements may be streamed from the instrument and viewed.

Two “wizard” features include a gamma exposure/dose calibration routine that can lead the user through calibration steps, and a plateau feature, which once initial settings are input, automatically records data at different detector voltages, giving the user valuable information that can be helpful in determining correct voltage operation.

Note: For the Model 3000 series, the wizards require firmware version N20 or higher.

Software Prerequisites

Microsoft .Net 4.5 comes installed on most machines by default.

Minimum Requirements

- **Supported Operating Systems:** Windows 7 and higher (32-bit and 64-bit versions).
- Computer with Intel or compatible 1 GHz or faster processor (2 GHz or faster is recommended).
- Minimum of 256 MB of RAM (1 GB or more is recommended).
- 1 GB of free hard disk space.

Installation

Run the installer MSI from the installation CD and follow the on-screen prompts to install the LMI LUMIC Calibration software.

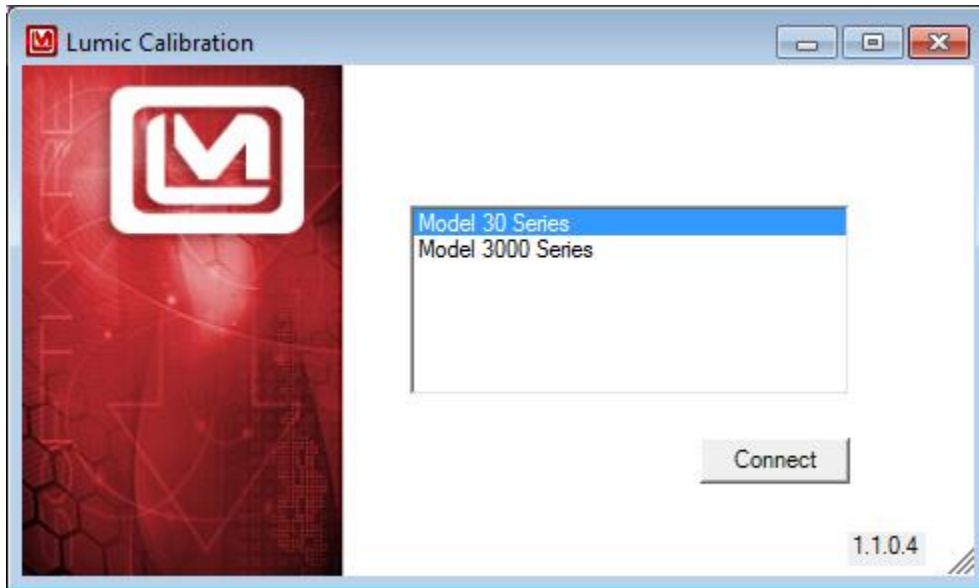
The default installation location on 64-bit machines is: “C:\Program Files (x86)\Ludlum Measurements, Inc\Ludlum LUMIC Calibration”.

On 32-bit machines, the default location is: "C:\Program Files\Ludlum Measurements, Inc\ Ludlum Lumeric Calibration".

How to use software

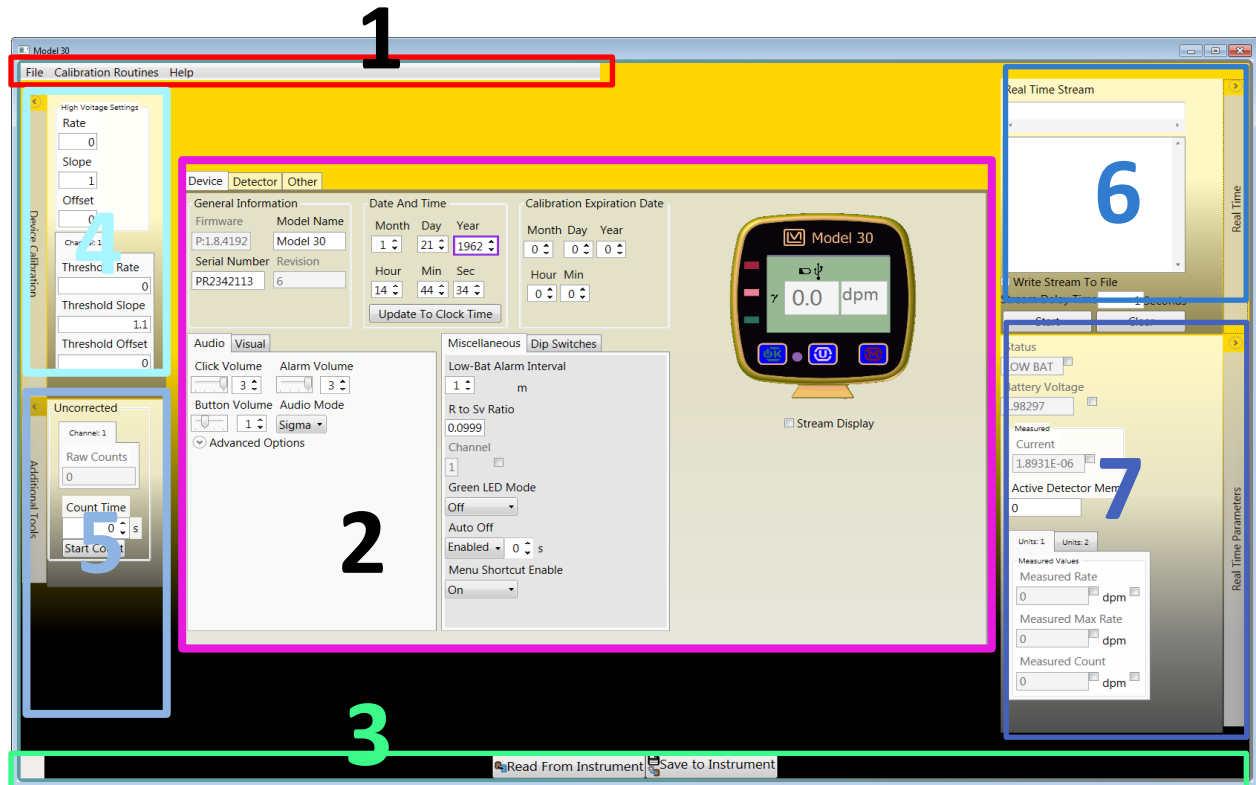
Instrument Connection Screen

This window shows currently connected Ludlum instruments belonging to the Model 3000 series (3000, 3001, 3002, 3019, 3276) or the model 30 family (30, 35, 79). By clicking on an instrument name, and then clicking Connect, the program will begin communication with the instrument.



Instrument Main Window

When a particular instrument is chosen (in the previous step), a loading bar is shown while all the instrument's parameters are loaded into the computer. Once the loading bar completes, you will be taken to the instrument main window. In this screen there are seven main features.

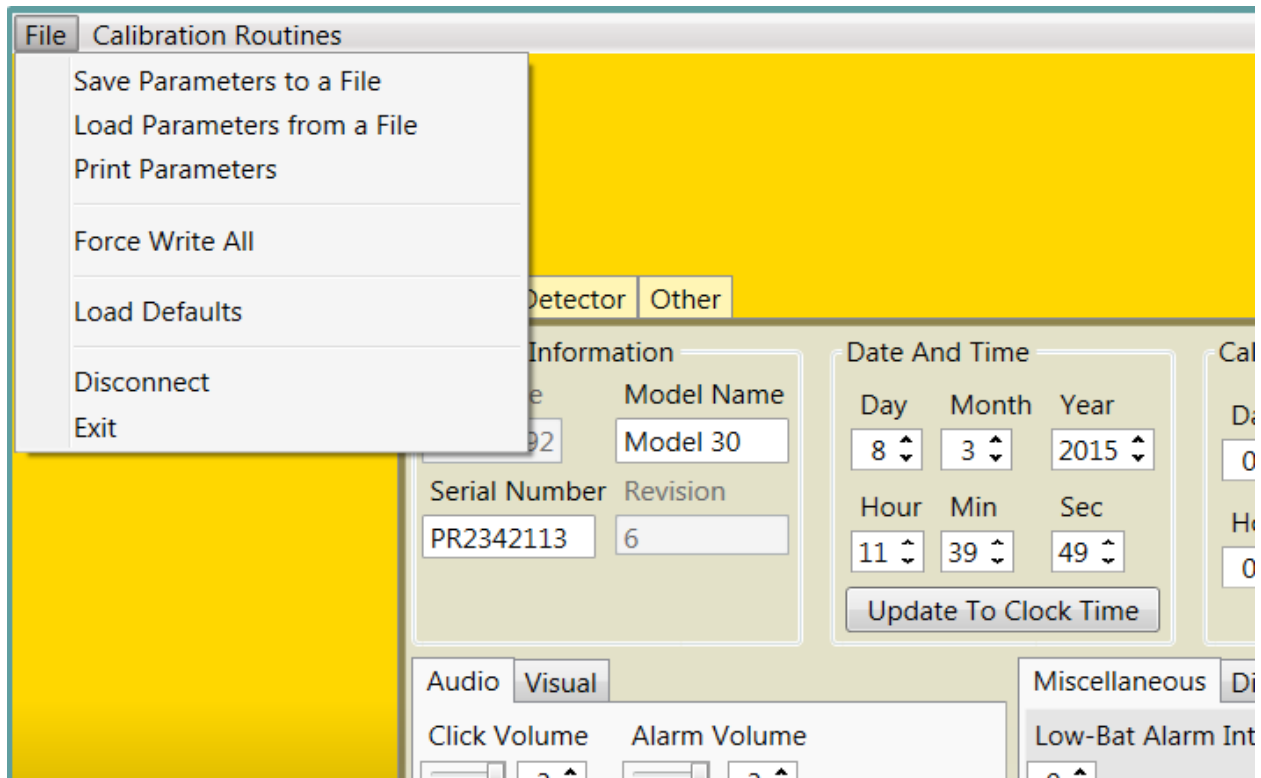


- The Main Toolbar #1
- The Instrument Parameter Tabs Control #2
- The Status Bar below #3
- Toolbars on the sides.
 - Device Calibration #4
 - Additional Tools #5
 - Real Time #6
 - Real Time Parameters #7

The Main Tool Bar

The main tool bar consists of two menu choices – “File” and “Calibration Routines.” Clicking on a menu item will expand the menu, showing all options contained within.

File



The “File” menu contains seven options to select from:

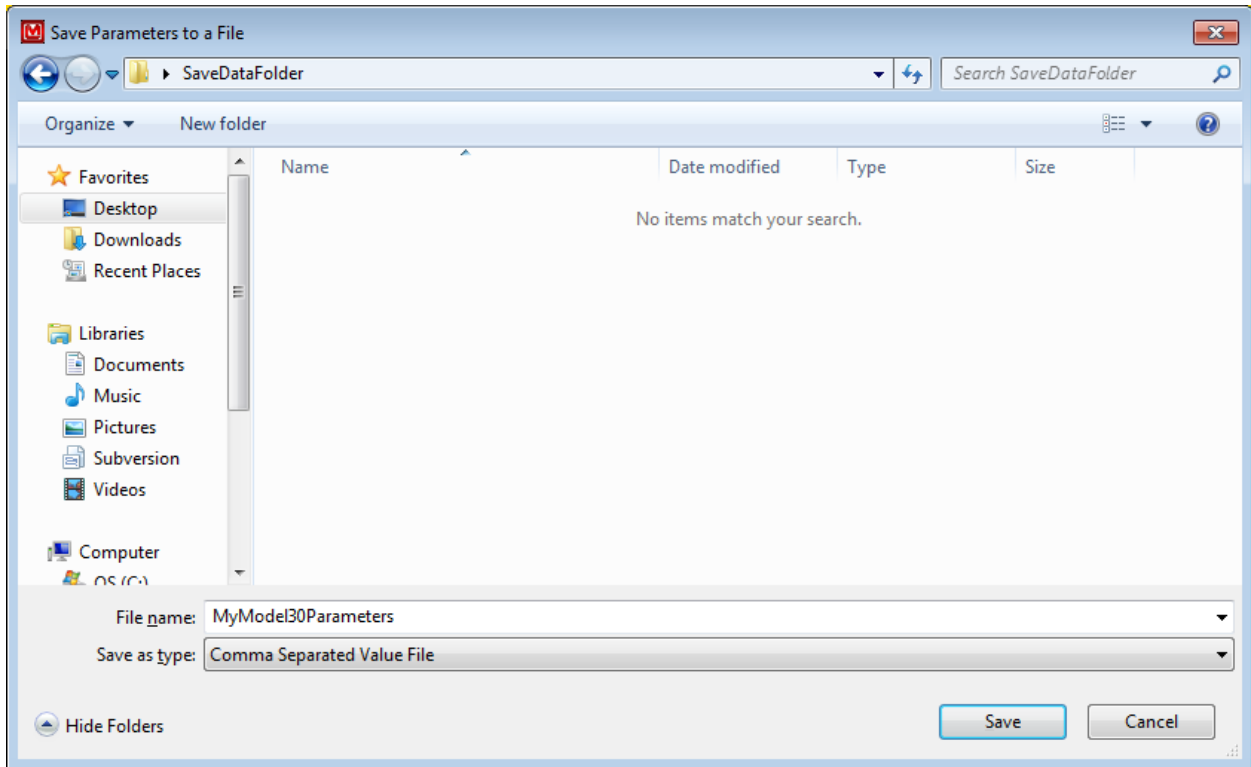
- Save Parameters to a File
- Load Parameters from a File
- Print Parameters
- Force Write All
- Load Defaults
- Disconnect
- Exit

Save Parameters to a File

This option allows you to save your current Instrument settings to a “CSV” (Comma Separated Value) file.

This can later be loaded back onto your instrument by clicking the “Load Parameters from a File” menu option.

By clicking on the “Save Parameters to a File” option, the software will open up a Dialog window.



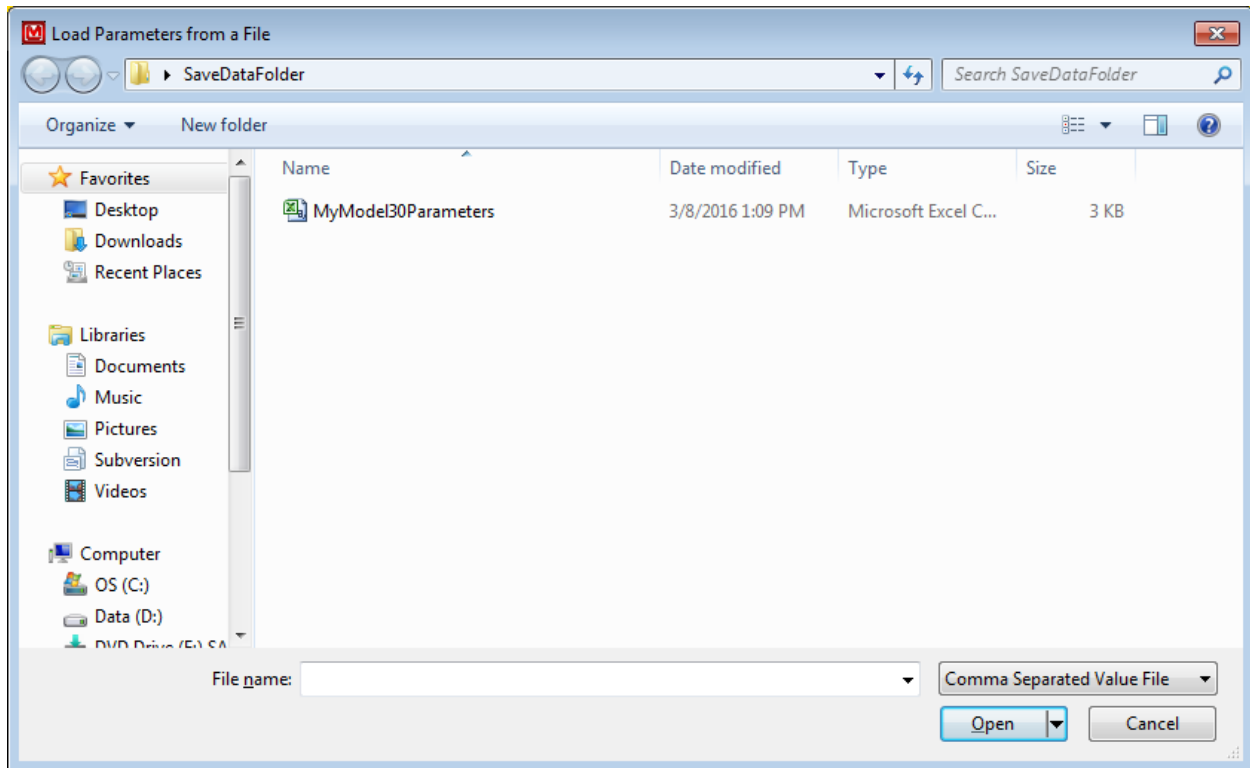
Then you can enter your own name for the file and choose the destination to save the software. Once the Save button is clicked, your parameters will be saved to the location you chose, or by default wherever you last saved a file.

Load Parameters from a File

This option allows you to Load Instrument settings from a “CSV” (Comma Separated Value) file.

Make sure you only use CSV files that have previous instruments’ data contained. Otherwise, this option will not load any parameters.

By clicking on the “Load Parameters from a File” option, the software will open up a Dialog window.



This will show previously saved CSV files. Please select a CSV that was made by this program only. Once a CSV file is highlighted, click the Open button in the bottom right corner to load parameters from the file back to the instrument. This will automatically load all data from the Save file into the instrument. If the Save file was edited and some values went beyond bounds, it will reject only the out-of-bound settings.

Note: Any values that are not writeable, but have changed since the last “Read From Instrument,” will cause an error message to appear.

Print Parameters

This option prints all the parameters from the instrument (not including parameters relevant to logging data).

Force Write All

Normally the program only tries to write values that have changed; however, if it is ever necessary to write all values once more, this button can be pressed to make the software force write all parameters.

Note: Any values that are not writeable, but have changed since the last “Read From Instrument,” will cause an error message to appear. For example, the last measured rates, Device Ambient Temperature, Firmware, etc.

Load Defaults

Every instrument has a built-in set of default parameters (see specific Instrument Manual for a list of these parameters). By clicking this option, the instrument will set all of its parameters to default and reset itself. You will need to reconnect to the device afterwards.

This will clear all instrument data. Please be sure this is what you want to do.

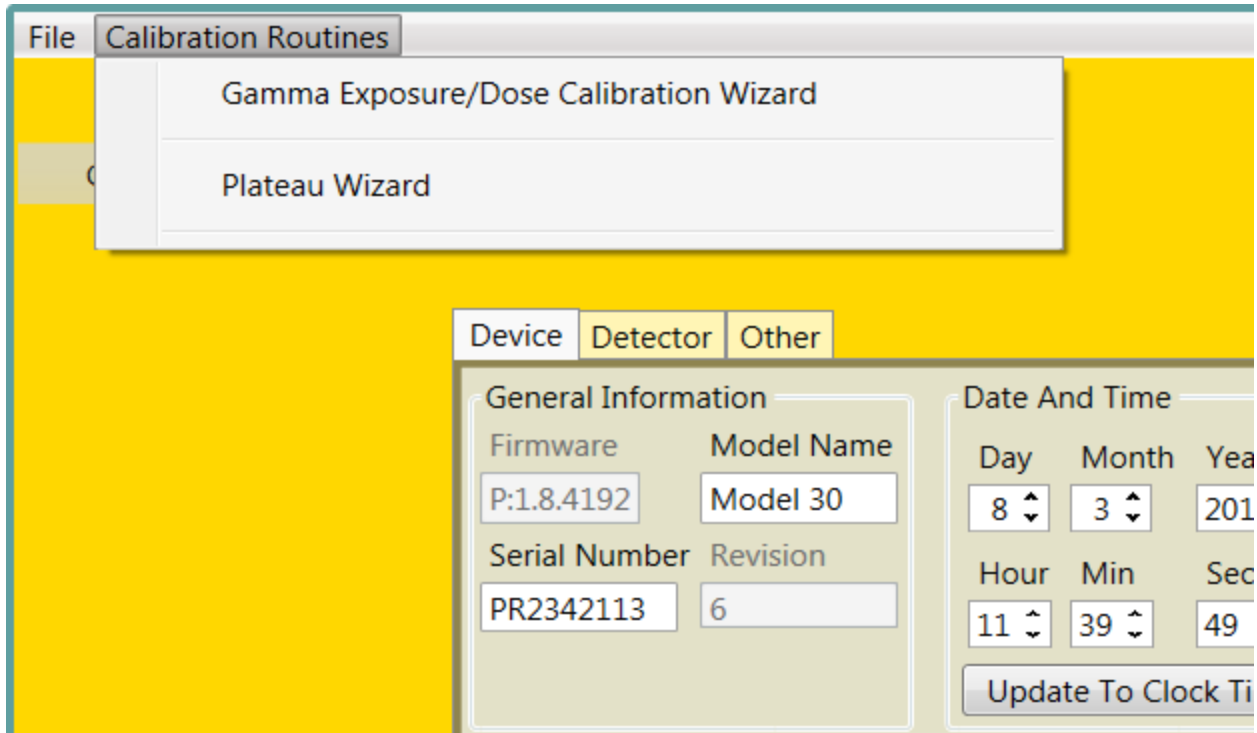
Disconnect

This option disconnects you from the current device and takes you back to the Instrument Connection screen.

Exit

This option ends the software and closes all connections.

Calibration Routines



The Calibration Routines tab includes two options – “Gamma Exposure/Dose Calibration Wizard” and “Plateau Wizard.”

Gamma Exposure/Dose Calibration Wizard

Selecting this option will open a window that takes you through a detector calibration.

Detector Calibration

How to Calibrate an Instrument

1. Set the Fields as needed.
2. Click the Start button.

- i) Place the detector at the indicated field.
 - ii) Click the Take Reading button.
 - iii) When prompted, click the Continue button.
 - iv) Repeat as needed.
3. Review the Calculated Coefficient Settings.
 4. Click Send.

Detector Calibration Setup

	Model Number	Serial Number
Detector	Demo Detector	123456
Instrument	Demo Instrument	987654

Active Detector	1
Count Rate Units	cps
R To Sv Conversion Factor	0.0106

Fields	Intensity	Count Time (Sec.)	Enabled
Low	200 mR/hr	6	<input checked="" type="checkbox"/>
High	8 R/hr	6	<input checked="" type="checkbox"/>
Extreme	800 R/hr	6	<input checked="" type="checkbox"/>

Close Start

Screen Description

Section 1:

Model: the Model information as reported by the Instrument. The detector's Model may be blank. This does not affect the procedure.

Serial Number: the Serial Number as reported by the Instrument. The detector's Serial Number may be blank. This does not affect the procedure.

Section 2:

Active Detector: the currently selected Detector Settings or Detector. This is not shown if the instrument does not support storing multiple Detector Settings or Detectors.

Count Rate Units: the units the Count Rate is displayed in.

R to Sv Conversion Factor: Different radiation sources may have a different conversion from Roentgens (Exposure Rate) to Sieverts (Dosage Equivalent). This conversion is only used if you choose a Sievert Field Intensity. The default is 0.0106 (appropriate for ¹³⁷Cs calibrations).

Section 3:

Fields: the name of each Field to test.

Intensity: the intensity (in either Roentgens or Sieverts) of the field.

Count Time (Sec): the amount of time to take a reading in this field, in seconds.

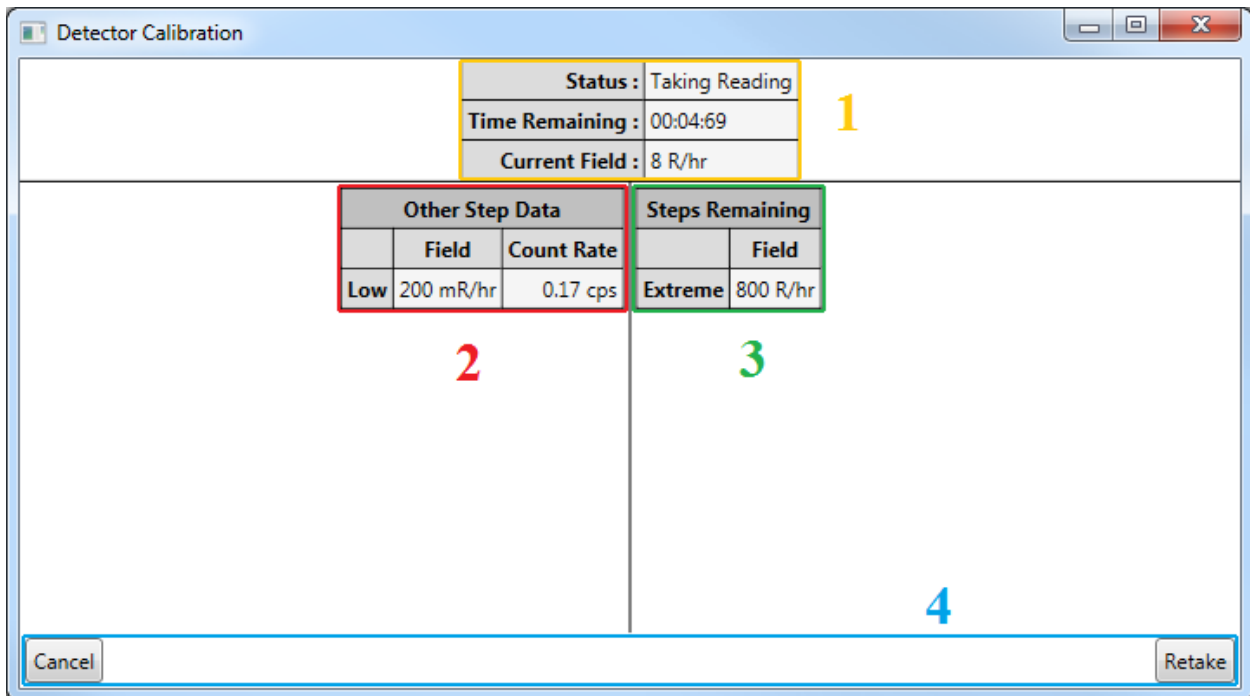
Enabled: If available, this allows you to skip taking a reading at the given field, at the cost of the related coefficient always being calculated as zero.

Section 4:

Close: Clicking this button will close the Wizard.

Start: Clicking this button will start the Detector Calibration Wizard. If any of the necessary information is invalid, error text will appear next to it and describe what is potentially wrong.

Detector Calibration Reading



Screen Description

Section 1:

Status: the current status of the reading.

Time Remaining: the time remaining to finish the current reading.

Current Field: the current Field Strength.

Section 2:

This section displays any readings that were previously taken for this calibration. If there hasn't been any readings taken previously, then this section does not appear.

Section 3:

This section displays any readings that have yet to be taken. If there are no more steps to be taken, then this section does not appear.

Section 4:

Cancel: Clicking this button will cancel the current Field Reading and return you to either the Setup Screen or Results Screen as appropriate.

Retake: Clicking this button will restart the current reading.

Detector Calibration Results

		Field	Count Rate
Retake	Low	200 mR/hr	0.17 cps
Retake	High	8 R/hr	0.33 cps
Retake	Extreme	800 R/hr	0.50 cps

	Constant	
Calibration Constant	855e01	C/R
Dead Time Constant	4843199.2	µSec.
Series Constant	108e-02	

Recalculate Print Send

Close Setup

Screen Description

Section 1:

This section displays a summary of the taken readings. You may click the “Retake” button to retake that Field, and only that Field.

Section 2:

This section displays the calculated coefficients and allows you to modify them if need be.

Section 3:

Recalculate: Clicking this button will reset the Coefficients to the originally calculated values.

Print: Clicking this button will print the information.

Send: Clicking this will send the coefficients to the device. If the coefficients are invalid, error text will display and explain what seems to be wrong.

Section 4:

Close: Clicking this will close the Wizard.

Setup: Clicking this will return the Wizard to the Setup Screen, allowing you to retake the Detector Calibration for this instrument.

Plateau Wizard

Selecting this option will open a window that will lead you through a plateau procedure, which is commonly done to find the desired operating voltage for a particular detector. This procedure involves taking measurements with the detector at different voltages. The measurements at each voltage may include no radiation source (just background radiation), and/or one or more radiation sources. For example, a typical plateau for a scintillator detector might involve taking data from 600 to 1000 Vdc and measure background radiation and a radiation source ^{241}Am .

The criteria for determining the desired operating voltage is up to the user, so this Plateau Wizard merely automates the measurement process.

Plateau Procedure

How to take a plateau

1. Set the Fields as needed.
2. Add, remove, or edit the sources as needed.
3. Click the Start button.
4. Move all sources out of the range of the detector.
5. Click the Ok button.
 - a. Position the indicated Source appropriately.
 - b. Click the Ok button.
 - c. Repeat.
6. Review the Readings to find the optimal High Voltage.
7. Either Click on the row with the optimal High Voltage, or type in the desired High Voltage.
8. Click the Send button.

Plateau Procedure Setup

The screenshot shows the 'Plateau Procedure' window with the following components and callouts:

- 1:** 'Clear All' button at the top right.
- 2:** A table containing instrument and detector information.
- 3:** 'Detector Preset' dropdown menu.
- 4:** A table defining channel settings for Alpha and Beta.
- 5:** A large form area containing various procedure parameters.
- 6:** A small table within the 'Source(s)' field showing a single source entry.
- 7:** 'Start' and 'Cancel' buttons at the bottom right.

Instrument	Model	Serial Number
Demo Instrument		123456
Detector	Demo Detector	987654

Detector Preset: 1

Channel(s)	Threshold	Window
Alpha	700 mV	800 mV
Beta	500 mV	600 mV

Order Number	Demo-1								
Customer	Demo LLC								
Starting High Voltage	500								
Ending High Voltage	600								
Voltage Increment	50								
Background Count Time (Sec.)	6								
Distance to Source	Surface								
Initial Voltage Settling Time (Sec.)	6								
Increment Voltage Settling Time (Sec.)	1								
Notes	Some Notes.								
Source(s)	<table border="1"> <thead> <tr> <th>Name</th> <th>ID</th> <th>Activity</th> <th>Count Time (Sec.)</th> </tr> </thead> <tbody> <tr> <td>Demo</td> <td>123</td> <td>1.23 R/hr</td> <td>1</td> </tr> </tbody> </table>	Name	ID	Activity	Count Time (Sec.)	Demo	123	1.23 R/hr	1
Name	ID	Activity	Count Time (Sec.)						
Demo	123	1.23 R/hr	1						

Start Cancel

Screen Descriptions

Section 1:

Clear All: Clicking this button will clear out all of the fields except source information.

Section 2:

Model: the model information as reported by the Instrument. The Detector's Model may be blank. This does not affect the Procedure.

Serial Number: the Serial Number as reported by the Instrument. The Detector's Serial Number may be blank. This does not affect the Procedure.

Section 3:

Detector Preset: the currently selected Detector Settings or Detector.

Section 4:

Channel: the name of the Channel.

Threshold: the minimum voltage value for a pulse to be counted.

Window: the maximum voltage value for a pulse to be counted, if present.

Section 5:

Order Number: the Order Number to help identify this specific plateau procedure. This can be left blank.

Customer: the Customer identifier to, again, help identify this specific plateau procedure. This can be left blank.

Starting High Voltage: the lowest (and initial) High Voltage which to test.

Ending High Voltage: the highest (and final) High Voltage which to test. This value must be higher than the Starting High Voltage.

Voltage Increment: the amount the High Voltage will change per step. This must be divisible by the difference of the Starting and Ending High Voltages. For example, 20 would be a valid value for 500 and 600 (which would make the steps 500, 520, 540, 560, 580, and 600), but 30 would not be a valid value (which would make the steps 500, 530, 560, 590, and either 600 or 620).

Background Count Time (Sec): the amount of time to take the background readings for each step.

Distance to Source: This is a note to indicate the distance between source and detector while taking a reading.

Initial Voltage Setting Time (Sec): this is the amount of time the Plateau Procedure should wait before starting each first step to allow the voltage to settle. If an instrument attempts to start taking readings before the voltage has settled, it might read false values.

Increment Voltage Setting Time (Sec): This is the amount of time the Plateau Procedure should wait between each step to allow the voltage to settle. If an instrument attempts to start taking readings before the voltage has settled, it might read false values.

Notes: This field allows the user to record extra information. Common notes tend to be the length of the cable between the Instrument and the Detector or the specific location the plateau was taken.

Source(s): This is the list of sources the Procedure will use to display the plateau. See Section 6 for details.

Section 6:

'+' Button: Clicking this button will add a new Source to the list.

Name: the name of the Source.

ID: the ID of the source.

Activity: the reading of the source.

Count Time (Sec): the amount of time, in seconds, to take a reading from the source for each step.

'-' Button: Clicking this button will remove this Source from the list.

Section 7:

Start: Clicking this button will start the Plateau Procedure. If any of the necessary information is invalid, error text will appear next to it and describe what is potentially wrong.

Cancel: Clicking this button will close the Wizard.

Plateau Procedure Readings

The screenshot shows the 'Plateau Procedure' software interface. It includes a table for detector and HV settings, a status and time remaining section, a central 'PLATEAU CHART' table, and a bottom section for selecting HV and control buttons.

Detector	Original HV	Current HV
Demo Detector: 987654	750	750

Status: Done
Time Remaining: 0:00:00:00:0

Switch

PLATEAU CHART

High Voltage	Alpha Background	Beta Background	Alpha Demo (1.23 R/hr)	Beta Demo (1.23 R/hr)
500	0	0	6	3
550	2	1	8	4
600	4	2	10	5

Selected HV - Click on row to select HV: 550 Send

Print Chart Extend Plateau Pause Restart Cancel Close

Section 1:

Detector: This is the currently connected detector.

Original High Voltage: the High Voltage value the device had before the beginning of the Plateau Procedure.

Current HV: This is the current High Voltage.

Section 2:

Current Status: This is the current status of the Plateau Procedure.

Time Remaining: This is amount of time remaining for the current activity, such as taking a reading.

Section 3:

Switch: Clicking this button will switch the view of the plateau data between a chart and a graph.

Plateau Chart: This is the data gathered during the Plateau Procedure. It is displayed as either a table (the Plateau Chart) or a line graph (the Plateau Graph). You can click on a row in the Plateau Chart to easily select a desired High Voltage.

Section 4:

Selected High Voltage: This is the value of the high voltage to send to the device.

Send High Voltage: Clicking this button will send the Selected High Voltage to the device.

Section 5:

Print Chart: Clicking this button will print out the current Plateau Chart data.

Extend Plateau: Clicking this button will make the Plateau run for one additional step.

Pause: Clicking this button will pause the current Plateau reading.

Restart: This button returns the user to the Setup screen if you need to change the parameters.

Cancel: This button cancels the currently running Plateau Procedure.

Close: This button closes the Plateau Wizard.

The Instrument Parameter Tabs Control

This tab is where the bulk of the parameters are located, unless the parameter runs the risk of needing to be seen no matter what tab you are on. Please note any field you edit must be tabbed, or you must click on Save. If you do not, the field will not save the new value.

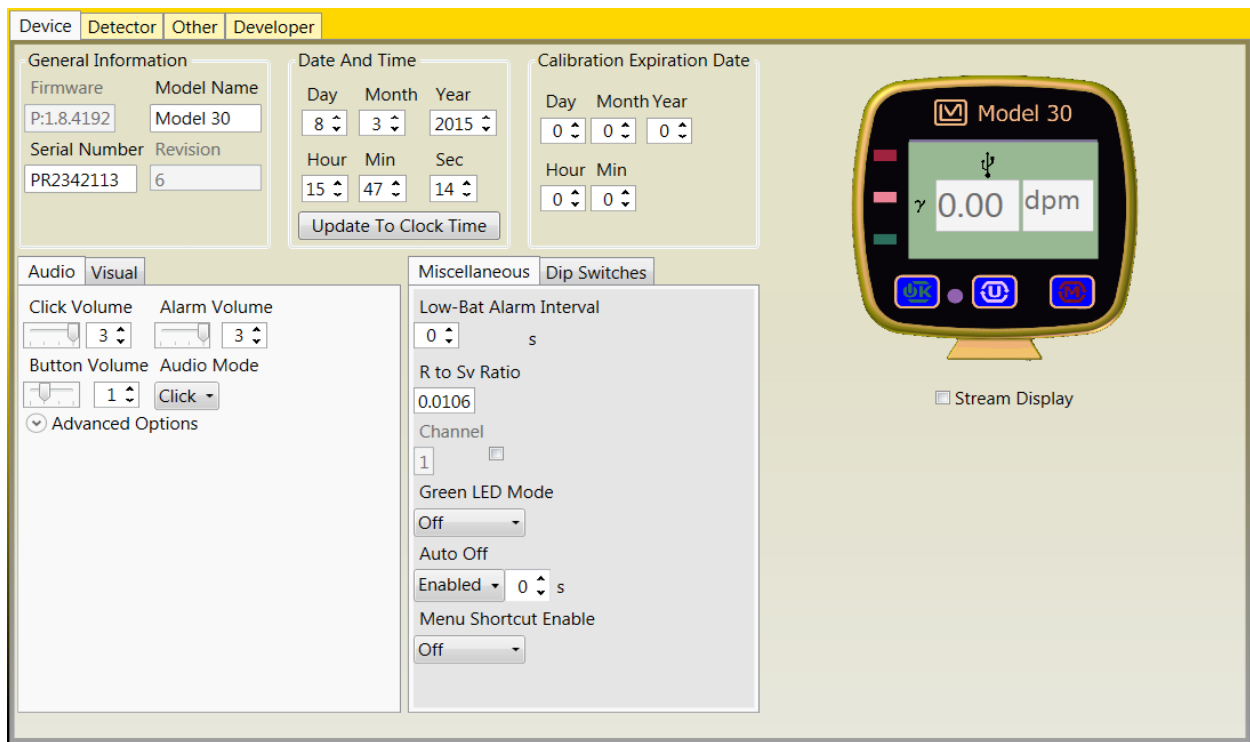
This control can be broken up into four groups, one of which is a special case.

- Device
- Detector
- Other
- Developer

Device

This contains most parameters that focus on the device only. It also contains a picture of the current device.

(On the Model 30 family) this picture is clickable and acts like a remote screen to the device. See the following figure.



Detector

This tab focuses on parameters that deal with a detector. This can show multiple of its own tabs, depending on how many detectors are available on the current instrument. In each detector tab the user can set calibration correction factors, Minimum Display, Maximum Display, High Voltage, and Threshold. The user may also select the Response rate, available modes and available units. See the following figure.

Device | Detector | Other | Developer

Detector: 1

Detector Settings

Serial Number: test1
Model:

Channel: 1

Constants

Calibration Value: 108000000 108 E06 counts/R

Dead Time Correction: 233 μ s

Dead Time Correction Second Order: 0.0005 500 E-06

Misc

Threshold: 35 mV

Efficiency 4pi: 100 %

Loss of Count Time: 0 s

General

High Voltage: 504 V

Response Rate: Auto Slow s

Enabled Units: 2 Units

Overload: 0 μ A

Count Time: 10 s

Modes

Rate: On

Max Rate: On

Count: On

Unit: 1 | Unit: 2

Icon: gamma

Units for Ratemeter

Rate Units: dpm

Rate Min Exp: 0.00

Rate Max Value: 999 None dpm

Rate Alarm: 0 None dpm

Rate Alert: 0 None dpm

Units for Count

Count Units: dpm

Count Min Exp: 0.00

Count Alarm: 0 None dpm

Count Alert: 0 None dpm

Other

If a special request has been made for a custom firmware and software has not been updated to match the request, a custom parameter can be found here (see specific instrument manual for operational instructions). If no custom parameters are available, this tab will hide itself.

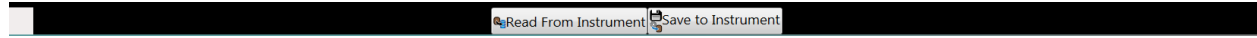
Device | Detector | Other | Developer

Parameter	Value	Enable Real Time
Device Auto Response Rate Slow MaxTm	60	<input type="checkbox"/>
Device Auto Response Rate Fast MaxTm	98	<input type="checkbox"/>

Developer

This tab is only available in Developer mode, please read section on Developer mode, starting on page 24.

Status Bar



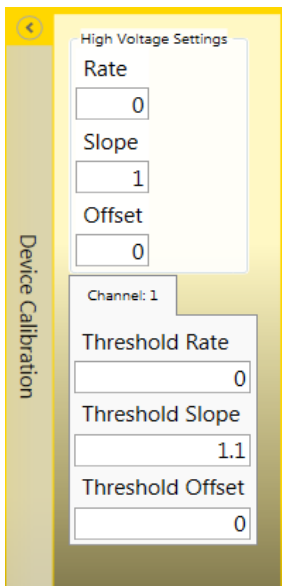
The status bar contains only three things. It contains the current software state i.e. (Loading, Reading, Writing, Streaming), the “Read from Instrument” button, and the “Save to Instrument” button.

Read from Instrument

Clicking this button will retrieve all the parameters from the instrument. Please do not unplug the instrument during this process. The loading bar will appear until the process is complete and all parameters are read from the instrument and loaded to the screen.

Save to Instrument

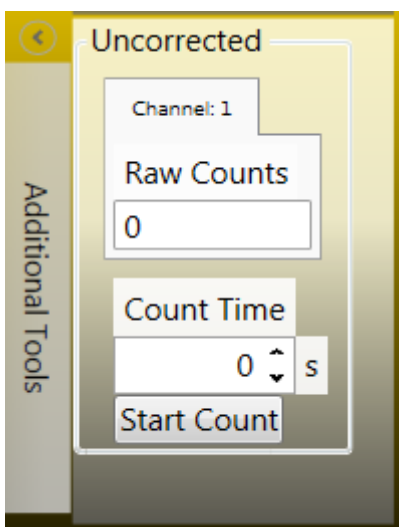
Clicking this button will Save all the changed parameters from computer to the instrument. Please do not unplug the instrument during this process.



Other Toolbars

Device Calibration

This toolbar contains variables used to calibrate the device. Some example parameters are High Voltage Rate, Slope, and Offset. (These parameters are not available through the device menu)



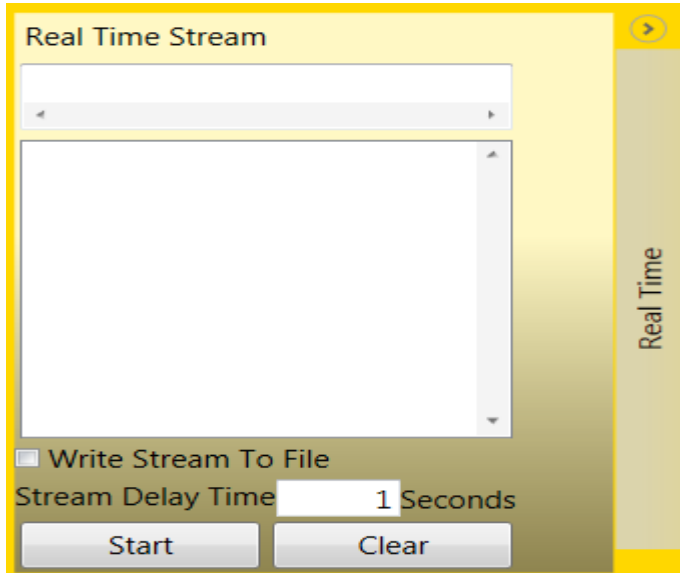
Additional Tools

Some tools might be needed across tabs, like the ability to take counts. This toolbar contains extra tools that don't quite fit anywhere else.

Real Time

This toolbar contains the real-time streaming options as well as the Start button.

In this window you can see two text fields; these are used to record real-time streaming data and their headers.



Stream Delay Time

This field sets the real-time stream delay. The larger this number is, the longer before the instrument pushes an update, and vice versa. Currently this parameter can be set from 1-12 seconds, but will be displayed as 1000-12000 (ms) in a saved file.

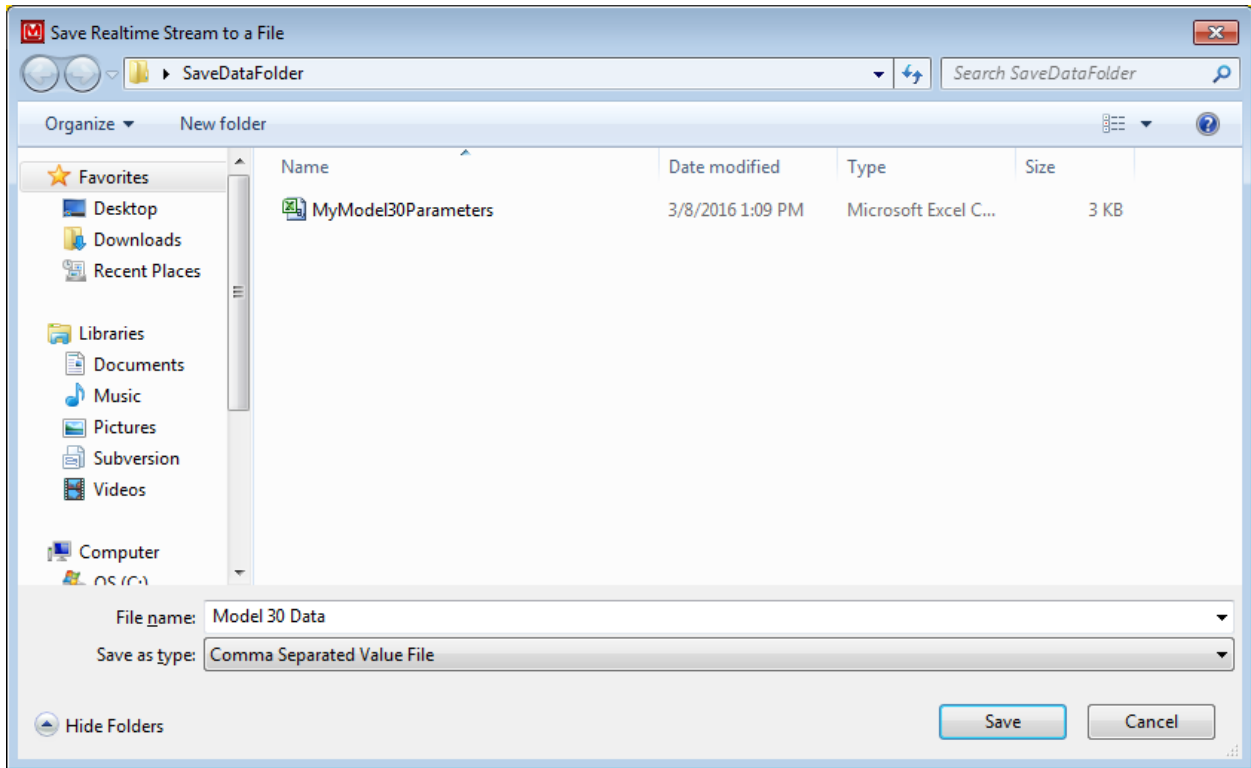
Start Button

The start button starts the instrument's streaming of selected parameters (please see Real Time Parameters). At least one parameter must be selected, and the maximum amount of parameters that can be selected at one time is eight.

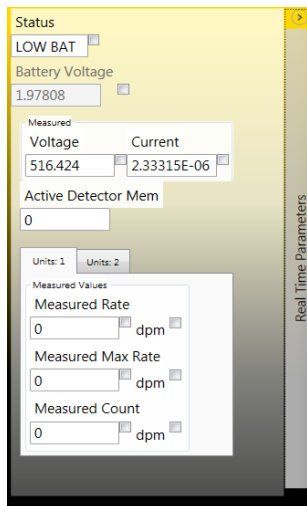
Clear Button

The clear button removes all data, not the headers, from the text field in the real-time stream toolbar.

If the checkbox “Write Stream to File” is checked and the start button is clicked, this brings up a dialog box allowing you to name and select the location of the CSV file of the real-time stream data.



Once the file is selected, the streaming will start.



Real-Time Parameters

This toolbar contains most parameters that can be streamed. There are some exceptions, but almost all parameters that are streamable are located here. The checkbox beside each parameter with no label enables this parameter for streaming. Only eight parameters can be selected at a given time.

Developer Mode

This is a special mode only meant for the most advanced user. Usually unless told by a Ludlum employee, you should not access this mode. However, under extreme circumstances this mode made be required.

To run the program in this mode, you must send the command argument “Developer” as you launch the exe.

There are two ways to set up the program to run in Developer Mode.

Method 1

This method is mainly used for a temporary launch of Lumeric in developer mode.

Open a command prompt and go to the directory of the Lumeric Software. By Default, the command should be this.

For a windows 64-bit machine

```
Cd "C:\Program Files (x86)\Ludlum Measurements, Inc\Ludlum Lumeric Calibration"
```

For a windows 32-bit machine

```
Cd "C:\Program Files\Ludlum Measurements, Inc\Ludlum Lumeric Calibration"
```

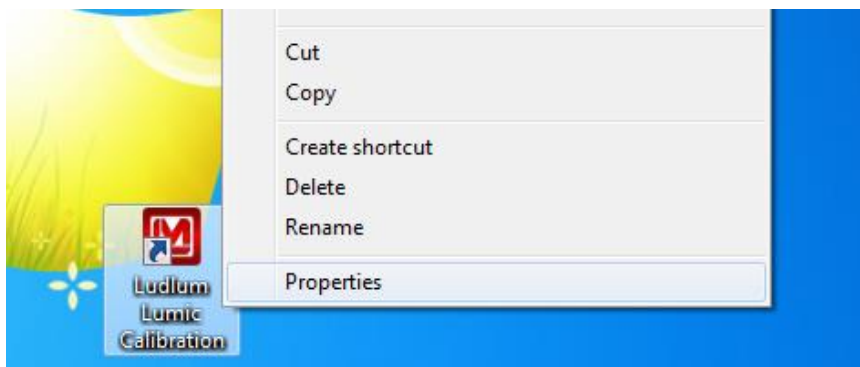
Next, launch the program with the command argument

```
Lumeric_Launcher.exe Developer
```

Method 2

First, find the desktop or start menu shortcut.

Next, right-click on the icon to bring up the menu. You most likely will not have as many options as shown. Then, select properties.



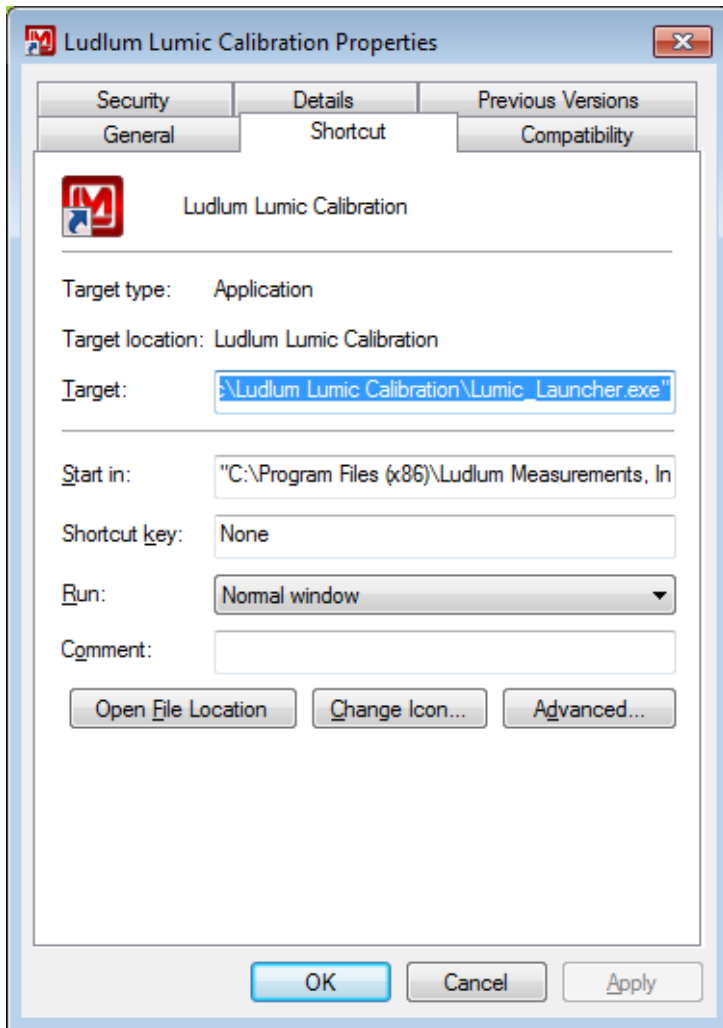
A new window like the one shown is opened. Now, look at the target field.

At the end of this field, add the word "Developer."

For my machine a 64-bit Windows, the full line of code would look something like this.

"C:\Program Files (x86)\Ludlum Measurements, Inc\Ludlum Lumeric Calibration\Lumic_Launcher.exe"
Developer

"C:\Program Files\Ludlum Measurements, Inc\Ludlum Lumeric Calibration\Lumic_Launcher.exe"
Developer



Click Apply and then Okay, and close the properties window. Then, click the same shortcut, and it should **ALWAYS** start the program in Developer mode.

Troubleshooting

Missing .Net Framework

DotNet Framework comes with most standard Windows desktops. However, if for some reason while installing or after installation, you are still missing .NetFramework, please go to MSDN and download 4.5 Framework for your machine.

No devices showing up

1. Check to make sure everything is properly connected.
2. If that is correct, check to see if Microsoft Windows is still installing the drivers for the instrument. This may take a few moments. (If you have multiple new instruments on a daily basis, FAQ question, "Calibration on different devices," may speed this up.
3. Make sure the instrument is on, and if it is, try turning it off and then on again.
4. Change USB cable.
5. Check USB driver. Sometimes while installing the driver, you may run into an issue, i.e. power shuts off, instrument unplugged, Windows update, etc. This may cause your driver to become corrupt, and the instrument will no longer show in Lumic. To check for this issue, follow these steps.
 - a. Unplug all other instruments. Plug in and turn on the instrument.
 - b. Open "Device Manager."
 - c. Expand the Human Interface Devices drop-down menu. ***If you can see your instrument's family name, i.e. Model 3000, Model 30, under the Human Interface Device Section, then Issue 5 is the cause. If you cannot, please call Ludlum Measurements.***
 - d. Right-click on appropriate family name instrument and select uninstall.
 - e. Let Windows uninstall the driver and it should auto-reinstall the Instrument.
 - f. When Windows shows the driver has been installed successfully, re-open Lumic and see if menu is still empty.

If none of the above solves your issue, please feel free to call Ludlum Measurements.

Calibration on different devices – first plug in

If your computer is running Windows 7 or higher, when a new device is connected to your computer, Windows may spend up to 15 minutes searching for the drivers through Windows update. This is unnecessary and time consuming if you are plugging in different new instruments. In order to avoid this, we need to change some system settings on handling drivers.

Windows 7

- Click Start, right-click "Computer," and choose Properties.
- In the Tasks list, click Advanced System Settings.
- On the System Properties dialog box, click the Hardware tab, and then click Windows Update Driver Settings.
- Then select "only if not found on local machine."

Windows 8 and 10

Unfortunately for Windows 8 (and higher), you only get the choice of using Windows Update always or never, which is even less helpful.

- Search for "Change device install" in the Windows 8 Start menu and select "change device installation settings."
- In answer to the question "do you want Windows to download driver software" choose "no, let me choose what to do," then select "never" and save changes.