radiant

X series

User Manual

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Introduction

The Radiant X4 was designed to give hobbyists an affordable laser power meter for measuring the output of laser devices. The laser power meter uses a backlit liquid crystal display to show output readings without setup, and has USB connectivity for real time graphing.

The included USB interface and data logging software that supports Windows, Mac and Linux, the Radiant X4 allows the user to connect their computer for custom real time graphing under many common protocols. The graphs can then be exported as an image or CSV file for import into other programs.

Safety

This power meter is intended for use with lasers; follow all relevant optical and electrical safety precautions for your laser when using this power meter. You are responsible for following the governing standard in your country to provide the necessary safety training for yourself. Do not operate this power meter without protective eyewear suitability rated for the wavelength(s) and power of your laser.

Guidelines

- Never focus the laser on the sensor.
- Never touch the sensor surface.
- Never use moist air (such as your breath) on the sensor to remove dust.
- Never turn on the laser power meter without the sensor head attached.
- Never use the laser power meter on an electrically conductive surface.

- Always use compressed air to remove dust from the sensor area.
- Always defocus high power lasers

Taking accurate readings

- Never touch the sensor while it is measuring a laser.
- Never use the laser power meter around devices that emit strong electromagnetic noise.
- Never mount the sensor in an enclosure.
- Never use the laser power meter in a room with moving air.
- Never take readings on the edge of the sensor area.
- Never take extended readings of high power lasers.

- Always check that the entire laser beam is on the sensor area.
- Always use a non-thermally conductive tool to change the position of the sensor.
- Always place the laser being measured 20-30cm away from the sensor.

Specifications

Power supply: 5V USB
Sensor area: 225mm^2
Cooling: Conduction
Power range: 1mW to 3700mW (10mW minimum recommended)
Resolution: 100μW
Response time (0-95%): 25s
**Spectral range:** 400nm to 2000nm

Features

- Radiant LightSpeed data logging interface software (Windows)
- Peregrine data logging interface software (Windows, Mac, Linux)
- Software zeroing
- 3700mW maximum power
- 1mW min power (10mW recommended)
- 100μW resolution
- Peak detection
- Multiple data stream protocols
- Rich menu system with Ellipsis-X firmware

Radiant X4 I/O

Front

There are four buttons on the front of the Radiant X4, from left to right they are:

- Enter
- Zero/Down
- Reset/Up
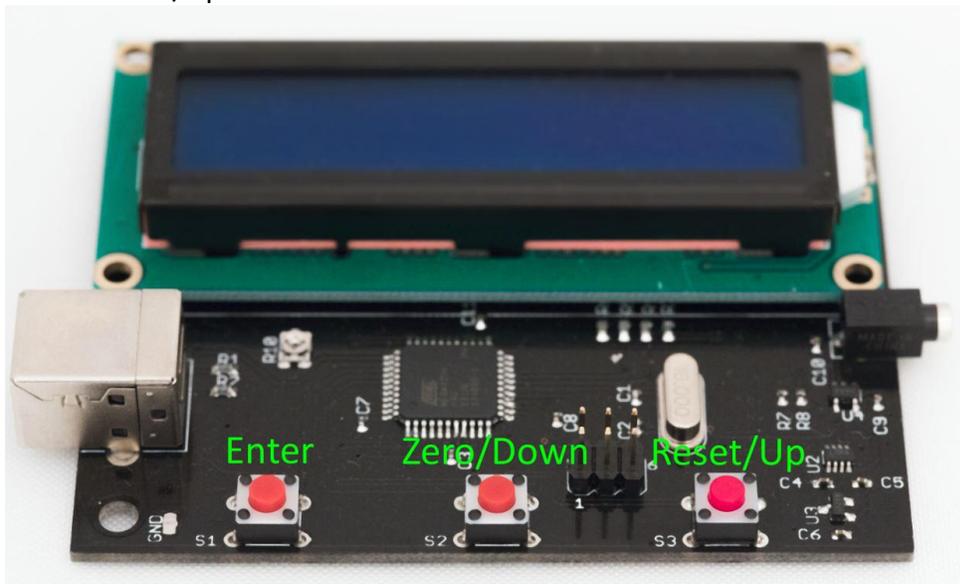
Right side

On the right side of the Radiant X4 there is the sensor input.
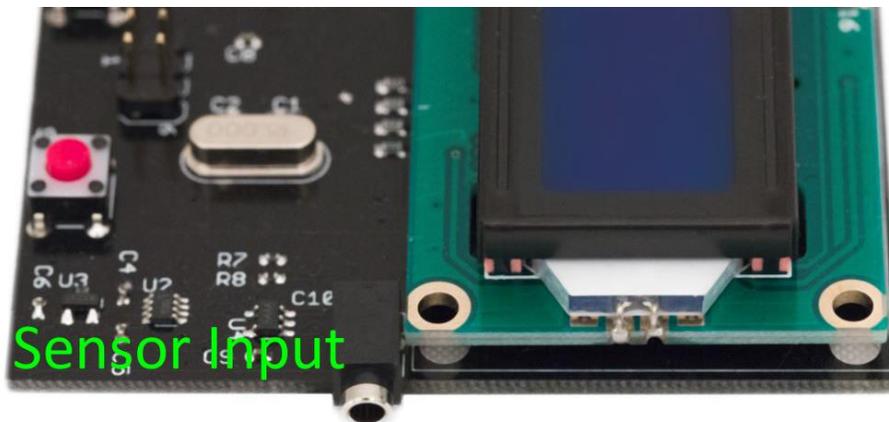
Left side

On the left side of the Radiant X4 there is the USB power input, the USB port is also used to send data to the PC for datalogging.

Sensor

The raised square on the sensor is the active sensor area.
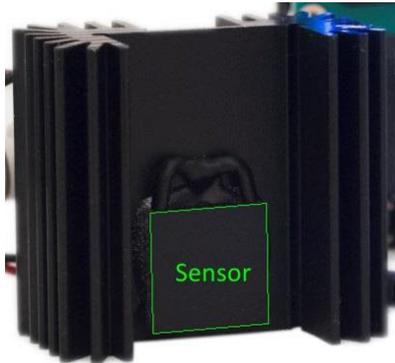
Operation instructions

Quick Start

To start using your Radiant X4 first connect the sensor to the meter, then connect it to USB power.

After the reading on the meter has stabilized press and hold the **zero** button, your meter will now read **0.0mW.**

Press and hold the **reset** button to reset the peak power reading.

Defocus the laser beam, place the laser 20-30cm away from the sensor, turn the laser on and start your power reading. Ensure that the entire laser beam is on the sensor area.

Menu

To access the menu, press and hold the **enter** button.

Press the Up and Down buttons to scroll through the options. Press the **enter** button to edit an option. Press **enter** again to exit the option.

Backlight
- Change the backlight brightness

Splash Screen
- Turn the splash screen on or off at start up.

Datastream
- Change the output Datastream of the meter
  - **Simple –** For use with programs such as stamp plot pro
  - **Radiant –** For use with Radiant LightSpeed
  - **OpenLPM –** For use with Peregrine

Exit
- Return to the power reading

Radiant LightSpeed data logging
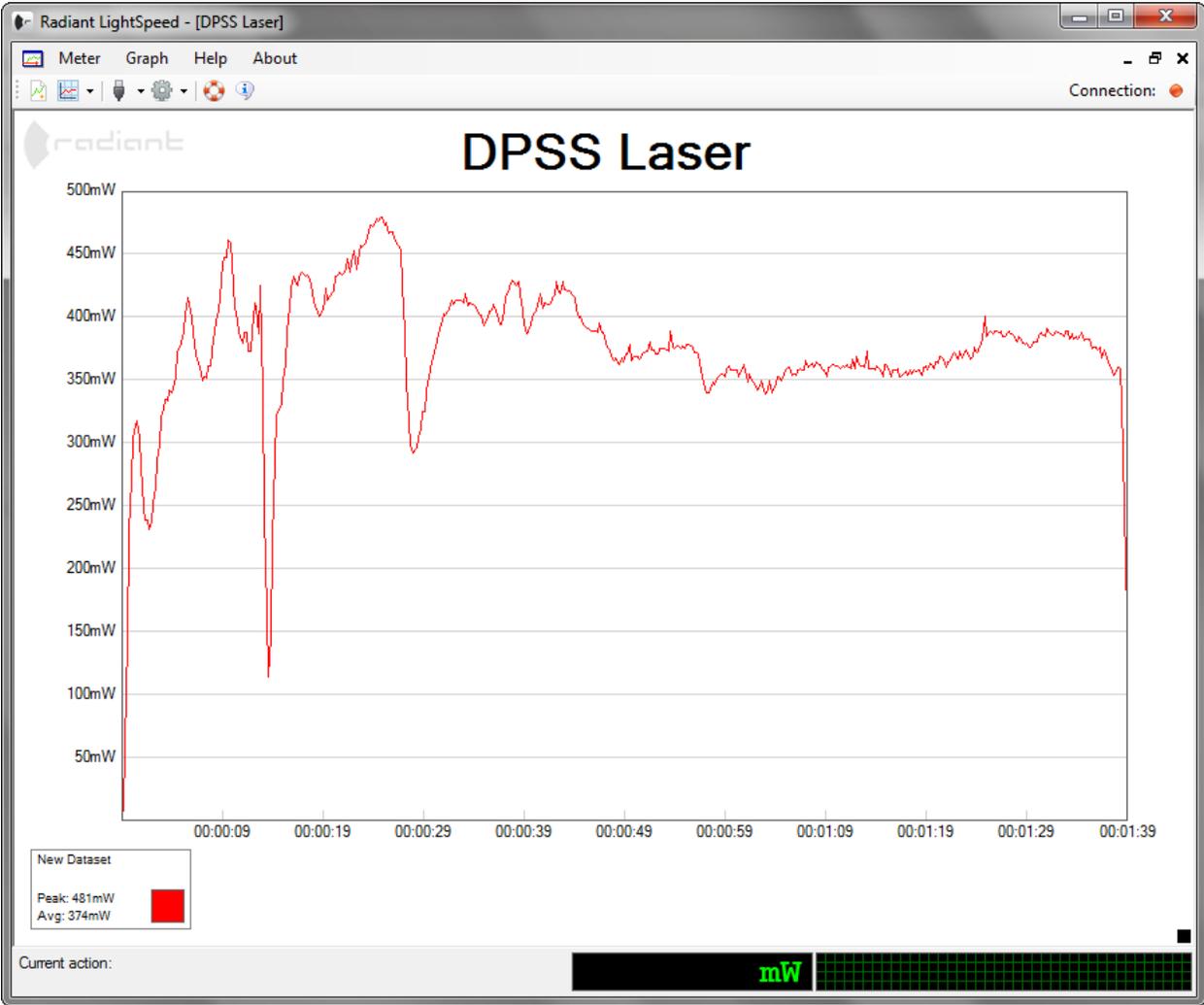
Connecting your Meter

To start graphing you must first plug in your Radiant laser power meter and open LightSpeed.

In the LightSpeed menu bar, click on "Meter", then "Connection", then "Connect", and choose your connected meter from the list.
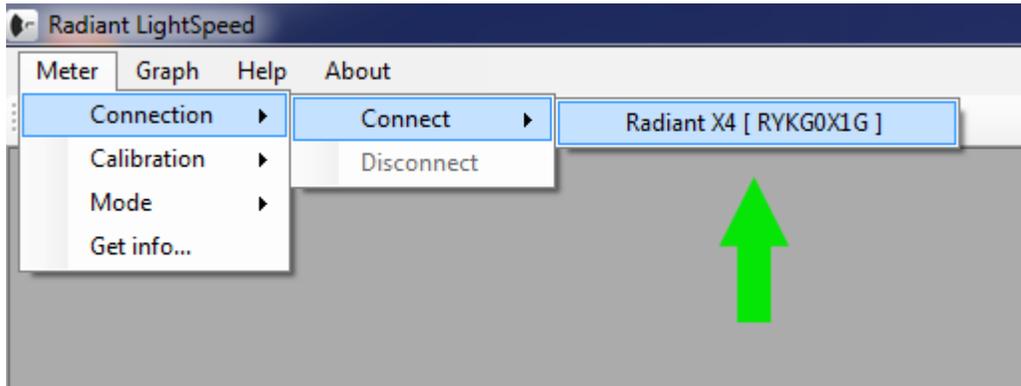
Your meter will now be connected; you can verify that it is connected by looking at the current reading that is shown in the bottom right hand corner of the main LightSpeed window.
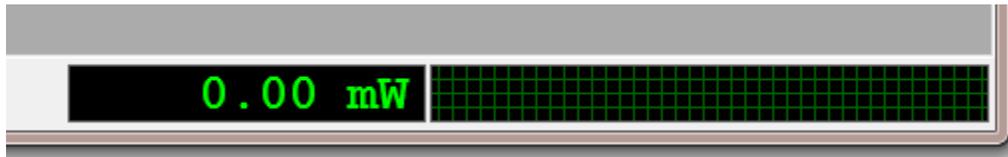

The reading should now be **0.00mW**, if the reading is anything other than 0.00mW you need to zero the meter.

Zeroing the Meter

Depending on where you are operating the meter, different amounts of ambient head can register and will affect the reading. The best possible stable and accurate readings will be achieved in an environment away from nearby heat sources and air currents.   Be sure the meter sensor is placed where it will not be affected.   The non-zeroed current reading should be stable.
Before graphing you need to verify the meter is zeroed.   Zeroing brings the meter to a baseline reading of 0.00mW so the reading is accurate.

Click on "Meter" from the menu bar, then "Calibration", then "Zero Input".
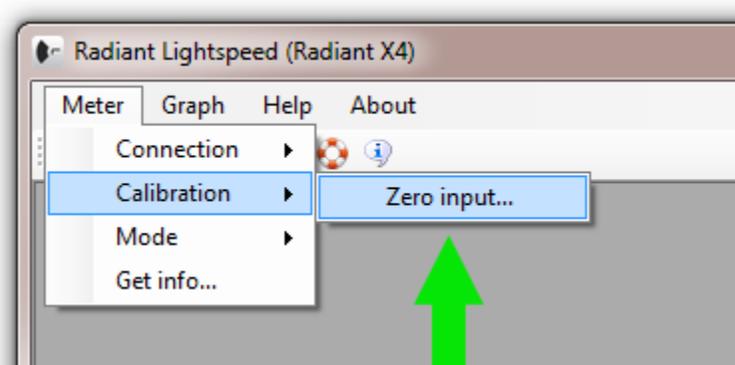
The current reading should now be within 0.1mW of **0.00mW**

Graphing Laser Power

To create a new graph in LightSpeed, click **Graph** on the menu bar, and then click **New graph**.
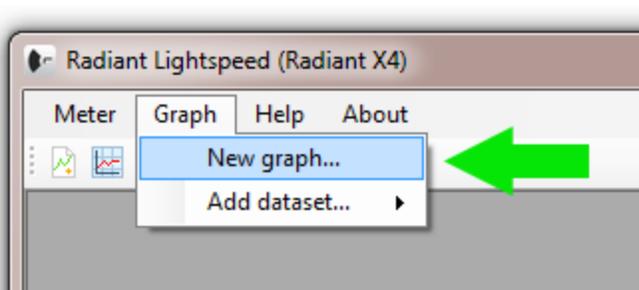
Give your graph a title and click **Accept**
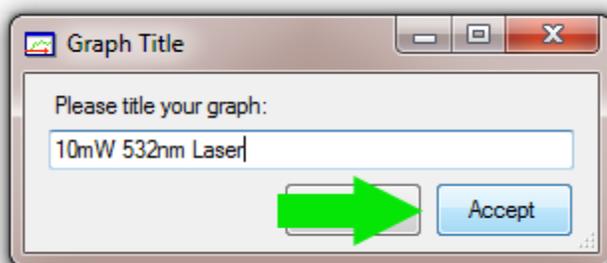
The graph is now setup and ready for data from the meter.

To start graphing from your meter, click on the **Graph** menu item, then **Add dataset…**, then **From meter…**
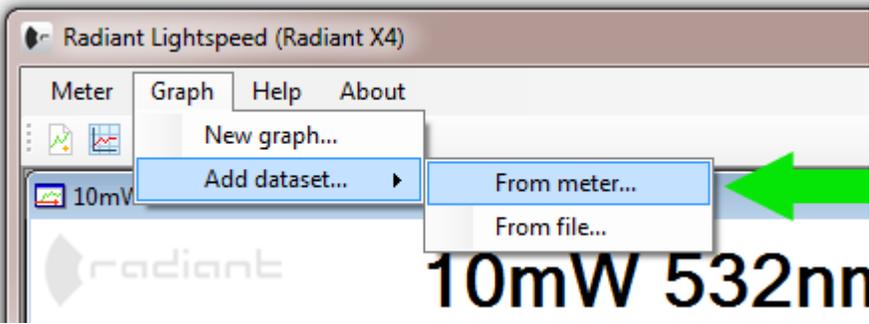
The New Dataset window will now open. Give the dataset a name, approximate maximum power, duration of time, and the amount of power to start the graph at.
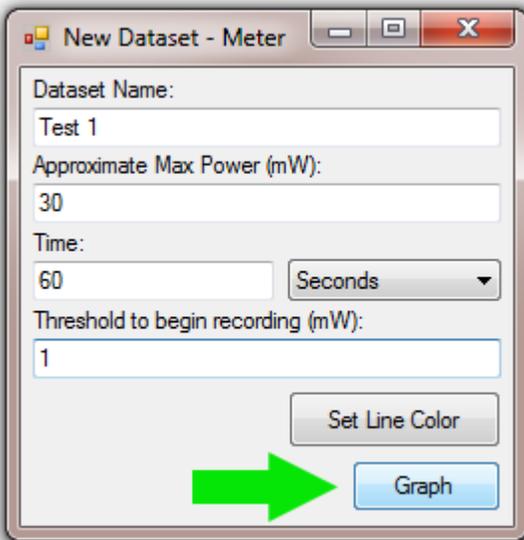
Saving Graphs to Pictures

To save your graph to a picture file right-click on the graph and select **Save image**.
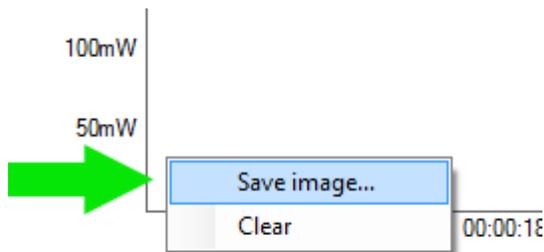
Browse to a location to save your image, then click **Export**.

Device Information

To access information about the connected laser power meter click on the **Meter** menu item then click on **Get info…**
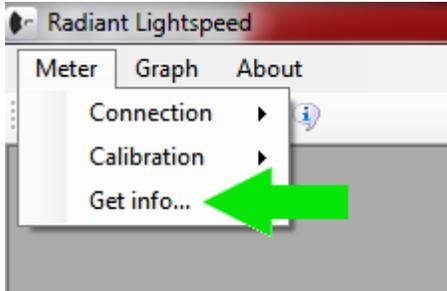
A window will pop up with the **Manufacturer**, the **Device Name**, the **Serial Number**, the **Firmware Version**, and the **Hardware Version**.
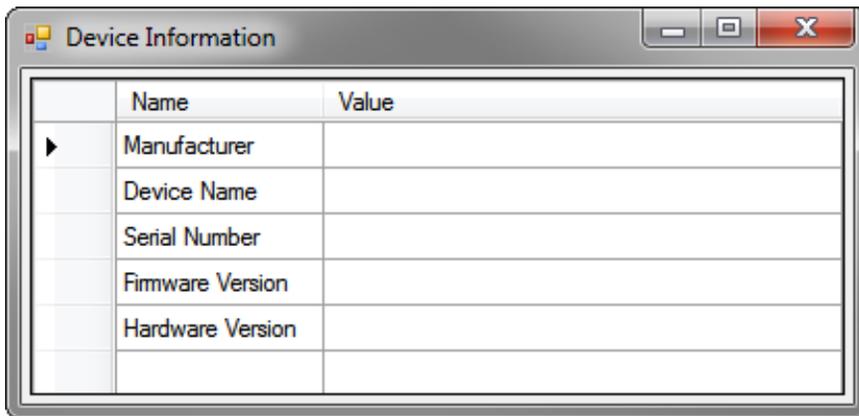
Peregrine data logging
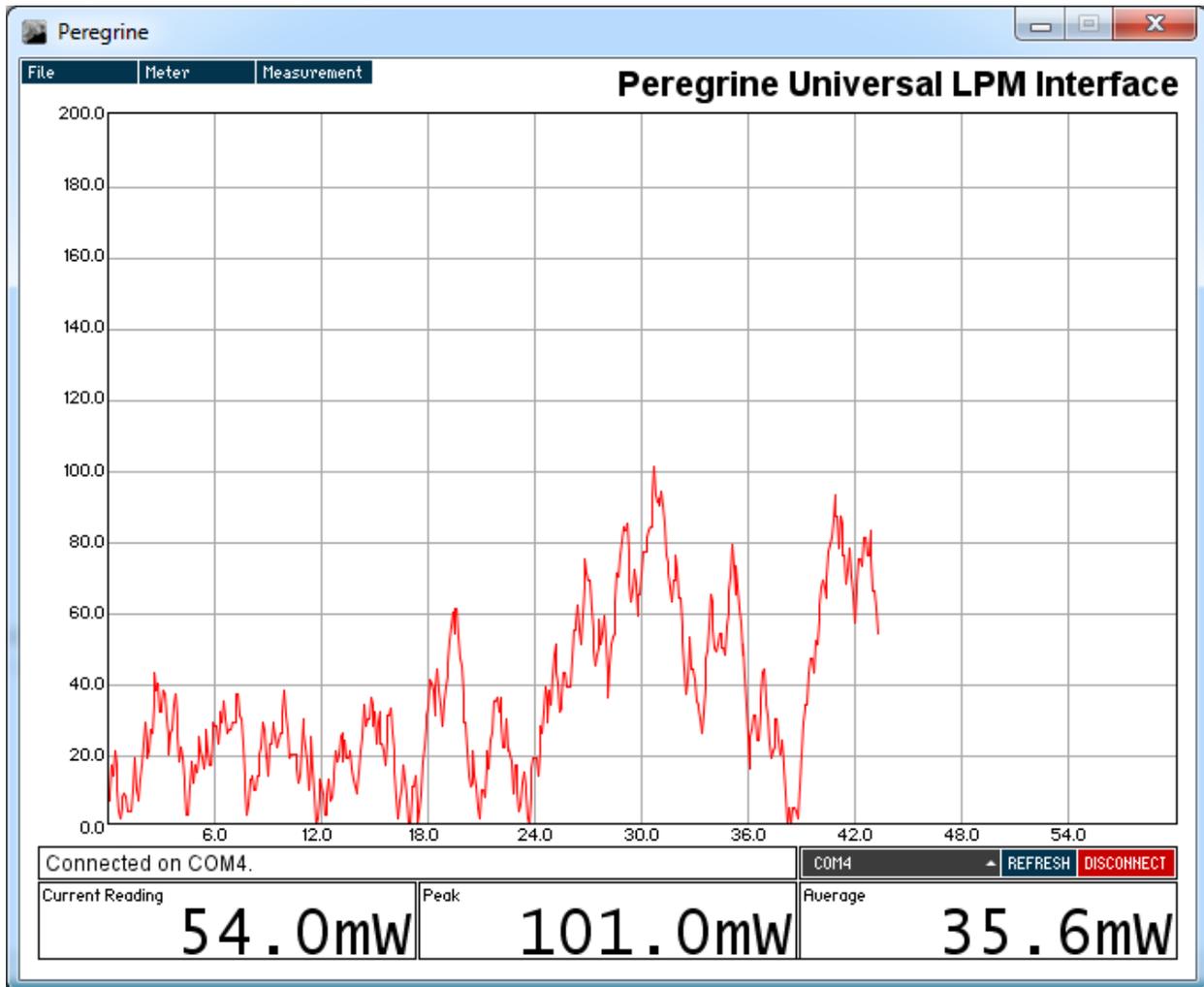
Introduction

Peregrine is a fully featured data logger utility, designed to work with any currently available hobbyist LPM. It gives Windows users the choice between the data logger bundled with their LPM or Peregrine - leaving them free to use whichever program better suits their needs. It also allows Mac OSX users an option that does not involve buying a Windows computer just for LPM data logging, running a VM, or emulating a Windows runtime environment - and Peregrine is a purpose-built utility, not a catch-all serial terminal. The Linux version of Peregrine brings LPM data logging to various distributions of Linux.

Peregrine allows developers to build LPM's that are compliant with one of current protocol standards and not have to worry about developing a brand new data logging program.

Legal

Peregrine is open-source. It is released under the GNU GPL v3. A good, plain English explanation can be found on Wikipedia. Basically, if you have modified Peregrine and want to distribute it, the source should be available and also distributed under the GNU GPL v3.

Supported platforms

Supported Operating Systems
- Windows (The 32-bit build works on both 32-bit and 64-bit systems.)
- Mac OS X
- Linux

Supported Protocols
- Simple
  - *To support even the most basic LPM data logging.*
  - ARGMeter
  - ARGraph
- OpenLPM
  - *Any OpenLPM compliant device.*
  - Rubicon
  - **Radiant X-4**
- Kenometer
  - Kenometer USB
  - Kenometer Pro
- LaserBee
  - LaserBee I, IX, II
  - LaserBee USB
  - DL-Module

The recommended protocol for the Radiant X-4 is OpenLPM. The protocol selected must match the protocol selected in the serial interface menu on the Rubicon.

Features
- Basic auto ranging graphing functionality
- Monitoring mode, a 60-second rolling window of laser power readings
- Timed measurements
- Export of a graph
- Export of a dataset
- Configurable data protocol
- Configurable baud rate
- Interactive graph for viewing particular values, local peaks, and local averages
- Built-in serial monitor for developers

Interface and Menus

Serial
- Available devices are listed in the dropdown menu on the main window.
- To refresh the list of devices, press the "Refresh" button.
- To connect, press the "Connect" button.
- Baud rate can be changed in the "Meter" menu.

File Menu

- Export / Graph Image - Render and save an image of the current dataset. This option is only available when a timed measurement is completed.
- Export / Dataset - Output the dataset from the previous completed timed measurement to a CSV file.
- Exit - Exits Peregrine

Meter Menu

- Data stream - Use this menu to specify the input data formatting that your LPM uses.
- Baud - Use this menu to specify the bitrate of the serial connection to the LPM; this must be selected before connecting.

Measurement Menu

- New - Open the dialogue window to start a new timed measurement.
- Monitor - Go into monitor mode to view a rolling 60-second window of laser power.
- Stop - Cancels graphing.

Instructions

- To connect to your laser power meter, select the device from the dropdown on the main window, and ensure the baud rate (Meter -> Baud) is properly set, and then press connect. If Peregrine alerts that it is receiving malformed packets, make sure the desired data stream protocol (Meter -> Data stream) is set.
- Peregrine defaults into monitor mode, where it just displays whatever readings are streaming off the meter.
- To begin a timed measurement, select that option from the measurement menu (Measurement -> New), fill in the fields, then press "Start" to begin.
- Whenever there is data displayed in the graphing area, it is possible to hover the mouse over the graphing area to examine specific readings. The cursor snaps to the data point nearest the time value represented by the mouse position. The "Current Reading" field changes to "Selected Reading," and the reading turns the color that was configured for the line.
- It is also possible to drag the mouse over a time range to examine the local average and local peak. Similar to the operation of the cursor, the field labels and color will update with new captions and a new color. When used in monitor mode, the selection box remains stationary at the times originally specified by the user, but will auto range to accommodate the power values in the range.
- When a timed measurement is complete, a graph or dataset may be saved.

Configuration

The configuration file is named **Peregrine.conf** and is located in the /data/ folder.

- Environment.GUI.Graph.MouseoverEffects - true / false - Enables or disables graph mouse over effects.
- Comm.Serial.Baud - Fill in one of the standard baud rates here, corresponding with the list of options in Peregrine
- Comm.Serial.Protocol - The desired datastream formatting.

- Comm.Serial.Autorefresh - true / false - Allows automatic refreshing of the serial port list.
- Environment.Threading - true / false - Implements threading for data and graph export.
- Developer.Serial.Debugger - true / false - Enables or disables Peregrine's built-in serial debugger.
- Developer.Environment.Debugger - true / false - Enables or disables debug mode.
- Depending on what release you have, there might be more options present in your configuration file.   Export.Graph.Height - NOT IMPLEMENTED
- Export.Graph.StrokeWidth - NOT IMPLEMENTED

Notes

- The software version number is located in the title bar when Peregrine starts.
- The graphing area does not auto range below 0mW. This gives a much cleaner looking graph output.
- The option for importing a dataset was intentionally omitted, so as to prevent data from being tampered with then re-exported as a graph image.
- The CPU usage can be very high due to system configuration and the number of cores. This is an idiosyncrasy of Java when doing a lot of rendering and is unavoidable with a cross-platform data logger.
- Mac users may experience a system crash if they disconnect the LPM while it is connected to Peregrine. This appears to be a system flaw.

Installation

Please make sure you first have the most recent version of Java installed! (Link)

User instructions

Just open the appropriate compiled program directory and directly run the program!

Developer instructions

- Download Processing from here: Processing.org
- To compile and run Peregrine version 2.0b7 is recommended.
- Once you've downloaded and run Processing, move the Peregrine sketch folder (it contains all of the source files, in addition to the folders that contain the compiled programs) into your Processing sketch folder, probably in your Documents folder.
- You can open the sketch from there!

Contact

Need Help? Contact Us!
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