OPHIR
Laser Measurement Group

StarLab

StarLab User Guide

For Quasar, USBI and Pulsar Devices

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Chapter 1 – Introduction

This guide describes the operation of the Ophir StarLab application software, which supports the following Ophir devices:

- SmartHead to USB Interface, referred to in this guide as USBI.
- Pulsar-4, Pulsar-2, Pulsar-1.
- Quasar
- Nova-II, for data-logging and log file extraction.
- Vega, for data-logging and log file extraction.

This chapter provides introductory information about the USBI, Pulsar and Quasar devices. Topics include:

- USBI, Pulsar and Quasar Overview
- Definition of Terms
- Software Features
- Technical and System Performance Specifications
- CE Compliance – USBI, Pulsar and Quasar
- FCC Compliance - Quasar

☞***Note:*** *StarLab version 1.00 supports only the Quasar device. Support for the USBI and Pulsar devices will be added into a later release of StarLab. Support for USBI and Pulsar devices is via Ophir USBI application software.*

☞***Note:*** *The only difference between the Pulsar-4 (four channel device), Pulsar-2 (two channel device), and the Pulsar-1 (one channel device) is the number of channels that each of the devices support. Throughout the guide these devices are referred to collectively as the "Pulsar". The USBI is a different single channel device, as explained below.*

☞***Note:*** *The Pulsar-4, Pulsar-2 and Pulsar-1 devices were previously known as the "USBI-4", "USBI-2" and "USBI-1" devices.*

USBI, Pulsar and Quasar Overview

The USBI, Pulsar and Quasar devices belong to Ophir's line of laser power and energy measurement instruments. Utilizing smart head technology, the devices support the complete line of Ophir thermopile, photodiode, PD10, and pyroelectric smart head detectors. Combining the proven microprocessor-based measurement technology of Ophir's Nova, Nova II, Vega and LaserStar instruments with a USB delivery to your PC, the USBI and Pulsar devices provide highly accurate measurements together with an easy-to-use graphical interface. The Quasar device provides a wireless connection to your PC using *Bluetooth*™ technology, allowing remote measurements in locations difficult to reach using a direct wire USB connection.

Some applications include:

- Peak-to-peak stability of energy pulses.
- Power drift of CW lasers over time.
- Graphical display of dB loss measured in a fiber optic cable.
- Logging energy of rapidly pulsing lasers at 1000Hz or more.

Definition of Terms

The USBI, Pulsar or Quasar instrument is referred to in this guide as the **device** or the **instrument**. The connection between the smart head detector, referred to as a **head**, the USBI, Pulsar or Quasar device, and the StarLab application running on your PC, is referred to as a **channel**. Using the StarLab system, you can view each channel's laser power and energy information. You can work with multiple channels depending on the type of device you have and the number of free USB or *Bluetooth* ports you have on your PC.

Software Features

The StarLab software features include:

- Easy configuration of measurement parameters (range, laser, etc.).
- Data logging.
- User adjustable calibration factors.
- Real time update of measurement statistics.
- Printing of graphs and data.
- Interfaces and supports data logging with Ophir's Nova-II and Vega (see *Uploading Files from the Nova-II and Vega*).

Technical and System Performance Specifications

USBI and Pulsar Specifications

The USBI and Pulsar technical and system performance specifications are described in *Table 1-1*.

Table 1-1 USBI and Pulsar Technical and System Performance Specifications

Item	USBI Specification	Pulsar Specifications
Specifications for Thermopile and Photodiode heads:		
Measurement range	Varies according to head in use. Refer to the Ophir Laser Power/Energy Measurement, at www.ophiropt.com, for full details of each individual head.	
Input range	15nA to 1.5mA in 16 ranges	15nA to 1.5mA in 16 ranges
A-to-D sampling rate	15Hz	15Hz
A-to-D resolution	17 bits plus sign (0.0009% resolution)	17 bits plus sign
Electrical accuracy	±0.25% ±20pA new; ±0.5% ±50pA after 1 year	±0.25% ±20pA new; ±0.5% ±50pA after 1 year
Electrical input noise level	500nV or 1.5pA +0.0015% of input range @3Hz	500nV or 1.5pA +0.0015% of input range @3Hz
Dynamic range	9 decades (1:10^9)	9 decades (1:10^9)
Specifications for Pyroelectric and PD10 heads:		
Measurement range	Varies according to head in use. Refer to the Ophir Laser Power/Energy Measurement, at www.ophiropt.com, for full details of each individual head.	
Input range	0 – 6v full scale	0 – 6v full scale
A-to-D sampling	4kHz	>20kHz
A-to-D resolution	12 bits no sign (0.025%)	12 bits no sign (0.025%)
Electrical accuracy	±0.25% new, ±0.5% after 1 year	±0.25% new, ±0.5% after 1 year
Electrical input noise	2mV	2mV
Logging rates, Turbo mode	2kHz every pulse	20kHz, every pulse on all 4 channels [using USB 2.0]
Logging rates, normal log mode	~ 300Hz	~ 1kHz [using USB 2.0; varies according to PC's CPU speed and number of channels running]
Log file timestamp precision	1ms (0.001s)	1us (0.001ms)
Log file timestamp resolution	~50ms	1us (0.001ms)

Item	USBI Specification	Pulsar Specifications
General Specifications:		
Analog output	0-1 Volt with 0.3mV (0.03%) resolution. 100 ohms impedance	None
Analog output accuracy	±0.4% ±2mV	N/A
Number of channels	1 channel	Pulsar-4: 4 channels Pulsar-2: 2 channels Pulsar-1: 1 channel
Dimensions (in millimeters)	91W x 156D x 39H	191W x 116D x 33H
Mass	0.425kg	0.65kg
USB specifications	• Full speed • Bus powered • High power device • One interrupt IN endpoint	• High Speed • Self powered • One interrupt IN endpoint

Quasar Specifications

The Quasar technical and system performance specifications are described in Table 1-2.

Table 1-2 Quasar Technical and System Performance Specifications

Item	Quasar Specifications
Specifications for Thermopile and Photodiode heads:	
Measurement range	Varies according to head in use. Refer to the Ophir Laser Power/Energy Measurement, at www.ophiropt.com, for full details of each individual head.
Input range	15nA to 1.5mA in 16 ranges
A-to-D sampling rate	15Hz
A-to-D resolution	12 bits plus oversampling, effective resolution approx 15 bits
Electrical accuracy	±0.25% ±20pA new; ±0.5% ±50pA after 1 year
Electrical input noise level	500nV or 1.5pA +0.0015% of input range @3Hz
Dynamic range	9 decades (1:10^9)
Specifications for Pyroelectric and PD10 heads:	
Measurement range	Varies according to head in use. Refer to the Ophir Laser Power/Energy Measurement, at www.ophiropt.com, for full details of each individual head.
Input range	0 – 6v full scale
A-to-D sampling	500Hz
A-to-D resolution	12 bits no sign (0.025%)
Electrical accuracy	±0.25% new, ±0.5% after 1 year
Electrical input noise	2mV
Logging rate, Turbo mode	No Turbo Mode provided
Logging rate, normal log mode	Up to 500Hz, every pulse. Above 500Hz, at least 300 pulses per second. [May vary according to PC CPU speed, *Bluetooth* connection quality, and *Bluetooth* adapter radio type]
Log file timestamp precision	1us (0.001ms)
Log file timestamp resolution	1us (0.001ms)
General Specifications:	
Analog output	None
Number of channels	1 channel
Dimensions (in mm)	Approx 96W x 95D x 36H
Mass	0.25kg

Item	Quasar Specifications
Battery	3x AA size, 1.8 to 2.4Ah NiMH rechargeable battery built-in
Charger Input	DC 12 to 25v, 5W
	Charge time approx 5-6 hours, automatically switches to trickle charge when battery is full
Operation between charges	~ 40 hours, thermopile and photodiode heads
	~ 20 hours pyroelectric and PD Energy heads
	~ 100 hours with no *Bluetooth* connection to PC
Bluetooth Specifications	Class 1 device
	Working Range:
	• Standard version: Up to ~30m
	• Long range upgrade: Up to ~100m in open area
LED Indicator	No PC connection – slow flashing blue LED
	Connection made to PC – long single flash of blue LED
	Connected – fast flashing blue LED
	Battery low (less than ~20% capacity) – LED flashes red
	(For more details see *Table C-1*)

CE Compliance – USBI, Pulsar and Quasar

The system, as installed on a CE compliant PC, will comply with all pertinent CE requirements relating to safety, sensitivity to interference, EMC and emissions.

FCC Compliance - Quasar

The Quasar is fully compliant with all relevant requirements for radio equipment: FCC (USA), CE (Europe), TELEC (Japan). The following section contains information required by the FCC.

FCC ID: V6XQSR

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference and
2. This device must accept interference received, including interference that may cause undesired operation.

The FCC Wants you to Know

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment to an outlet on a circuit different from that which the receiver is connected
4. Consult the dealer or an experienced radio/TV technician

FCC Warning:

Modifications not expressly approved by the manufacturer could void the user authority to operate the equipment under FCC Rules.

RF EXPOSURE WARNING:

Instructions concerning human exposure to radio frequency electromagnetic fields:

To comply with FCC Section 1.307 (b) (1) for human exposure to radio frequency electromagnetic fields, implement the following instructions:

A distance of at least 20cm between the equipment and all persons should be maintained during operation of the equipment.

Chapter 2 – Installing StarLab

This chapter provides instructions for installing the USBI, Pulsar and Quasar hardware and software. Topics include:

- Package Contents
- System Requirements
- Installing StarLab Software
- Connecting the USBI and Pulsar Devices
- Installing *Bluetooth* USB Adapter software (for Quasar)
- Connecting the Quasar device

Package Contents

Inspect the equipment container before unpacking. Evidence of damage should be noted and reported immediately.

The USBI package consists of the following items:

- Smart Head to USB Interface Unit (USBI device)
- USB cable
- Installation CD-ROM

The Pulsar package consists of the following items:

- Pulsar device
- USB cable
- Installation CD-ROM
- 12v power supply

The Quasar package consists of the following items:

- Quasar device
- Installation CD ROM
- 12v power supply
- *Bluetooth* USB Adapter for PC + CD ROM

System Requirements

To run the StarLab software, the computer system must meet certain minimum requirements. The system requirements are listed in *Table 2-1*.

Table 2-1 System Requirements

Item	Requirements
CPU	Pentium IV 2.8GHz (recommended).
System Ram	512MBytes (recommended).
Hard Disk	20MBytes (more for storing very large log files).
Operating System	Windows 2000/XP/Vista
USB Ports	**USBI:** USB 1.1 ("Full Speed") or USB 2.0 ("High Speed"). **Pulsar:** USB 2.0 (USB 1.1 will work with greatly reduced performance).
PC Accessories	• CD-ROM drive • Microsoft mouse (or equivalent) • VGA display with 1024X768 resolution (17" recommended) • **For Quasar:** *Bluetooth* USB Adapter (supplied) or built in *Bluetooth* radio

Installing StarLab Software

To install the software:

1. Start your computer.
2. Insert the CD into the CD-ROM drive.
3. The CD software should start automatically. If it does not, double-click **index.htm** from the CD-ROM drive to start the software. The main CD menu will appear.

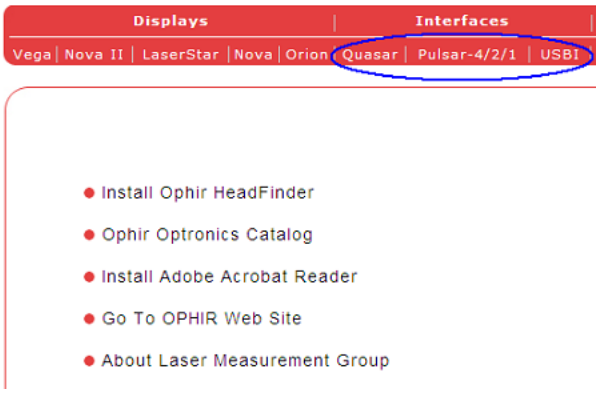


Figure 2-1 CD Main Menu

4. Under the main heading, click on the device name **USBI**, **Pulsar** or **Quasar**. The menu for that device will appear.

Figure 2-2 Pulsar device Menu

5. Click **Install StarLab Application**. The *InstallShield™ Wizard* dialog box appears. The *InstallShield™ Wizard* guides you through the installation process. At the end of the process, the StarLab icon,  appears on the desktop.

   For the USBI and Pulsar, the software installation is complete. You can now connect the USBI or Pulsar device.

   For the Quasar, the *Bluetooth* USB adapter software should be installed. Refer to section Installing *Bluetooth* USB Adapter software (for Quasar)

Connecting the USBI and Pulsar Devices

After completing the software installation, you are ready to connect the USBI or Pulsar device.

☞ ***Note:*** *The first time the USBI or Pulsar device is connected to the PC, XP or Windows should be running in Administrator mode.*

To connect the USBI or Pulsar device:

1. Connect the head to the head input on the device.

   - If you are working with the USBI device, you must connect a thermopile, photodiode, PD10, or pyroelectric head to the head input point on the device.

Figure 2-3 USBI Box, Head Connector Side

   - If you are working with the Pulsar device, you can connect up to four heads to any one of the four head input points on the device.

Figure 2-4 Pulsar Box, Head Connector Side

2. If you are using the Pulsar device, connect the 12v power cable to the main line and to the 12VDC input on the device. The POWER/LINK LED lights.

3. Connect the USB cable to the device and to the USB port of your PC. On the USBI, the LINK LED flickers momentarily, indicating USB enumeration of the device.

Figure 2-5 USBI Box, PC – USB Connector Side

Figure 2-6 Pulsar Box, 12 VDC, and PC – USB Connector Side

4. Start the StarLab application by clicking the StarLab icon  .

5. If using the Pulsar device, the StarLab application configures the device the first time it is powered up and connected to the PC. This takes approximately three seconds, during which the **Loading Pulsar** dialog box is displayed:

Figure 2-7 Loading Pulsar Dialog Box

The device is connected and ready for use.

Installing Bluetooth *USB Adapter software (for Quasar)*

In order to work with the Quasar device, in addition to the StarLab software, a *Bluetooth* radio device must be installed on the PC. This radio device may be a built-in radio inside the PC, as available on many laptops, or it may be an external USB adapter as supplied with the Quasar. This section describes the installation of the *Bluetooth* to USB adapter supplied with the Quasar.

☞ ***Note:*** *The Quasar device and StarLab software are fully tested with the* Bluetooth *adapter supplied by Ophir with the Quasar. While the StarLab software is expected to function with any* Bluetooth *radio that may be installed on the PC, for best results Ophir recommends using only the radio adapter supplied with the Quasar.*

To view instructions for installing the *Bluetooth* USB Adapter software

1. Start your computer
2. Insert the Ophir CD into the CD-ROM drive.
3. The CD software should start automatically. If it does not, double-click **index.htm** from the CD-ROM drive to start the software. The main CD menu will appear.
4. Under the main heading, click **Quasar**. The Quasar CD menu will appear.

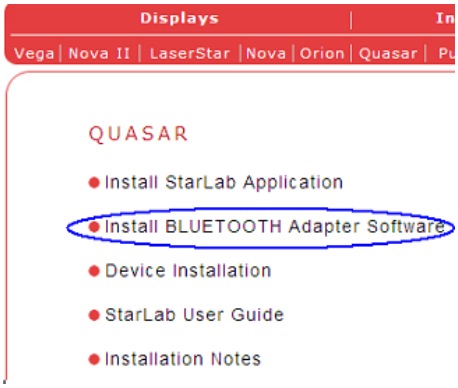


Figure 2-8 Quasar CD menu

5. Click **Install *Bluetooth* Adapter Software**. Instructions for installing the *Bluetooth* USB Adapter software will appear.

Connecting the Quasar device

After completing the StarLab software installation and the *Bluetooth* USB Adapter software installation, you are ready to connect the Quasar device.

Connecting the Quasar device

1. Connect the head to the head input on the device.

2. Switch on the Quasar by momentarily pressing the On/Off button. The blue LED flashes for approximately 2 seconds, and then blinks slowly.

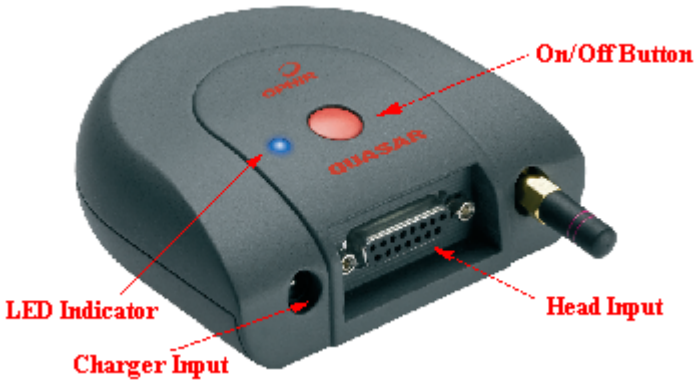


Figure 2-9 Quasar device

3. Start up the StarLab software by clicking the StarLab icon  . The first time StarLab starts up, the **Wireless Device Setup** screen is displayed.

   The circular symbol  shows StarLab is searching for Quasar devices close by.

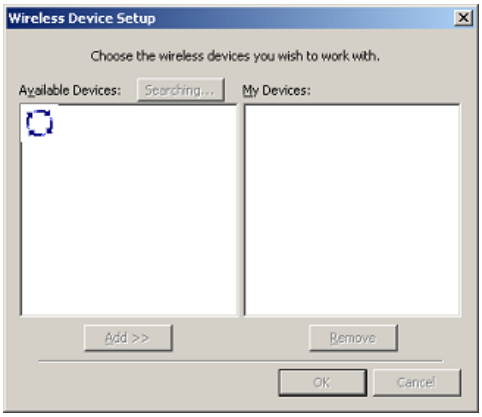


Figure 2–10 StarLab Wireless Device Setup screen

4. When StarLab finishes searching, the serial numbers of any Quasar devices found in the vicinity are listed in the "Available Devices" window of the **Wireless Device Setup** screen. Select the Quasar devices that you want to work with and click **Add**. For reference, the serial number for each Quasar is printed on a label on the under side or edge of the device.

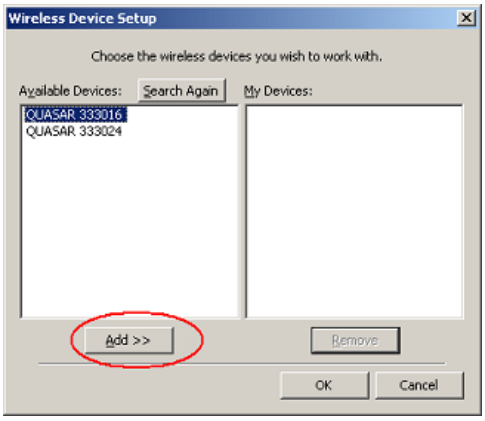


Figure 2-11 Choosing Quasar to work with

5. Click **OK**. The "Searching for wireless devices" message is displayed.

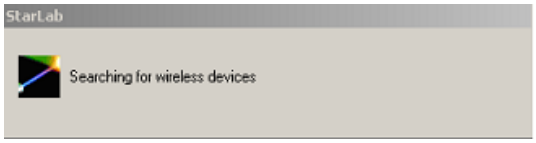


Figure 2-12 "Searching for wireless devices" message

6. The **Select Devices** screen is now displayed. Select the channel to be used by clicking in the choice box or click **Select All**. Click **OK** to activate the channel(s). For more information on using multiple channels, refer to *Chapter 8 – Working with Multiple Heads.*

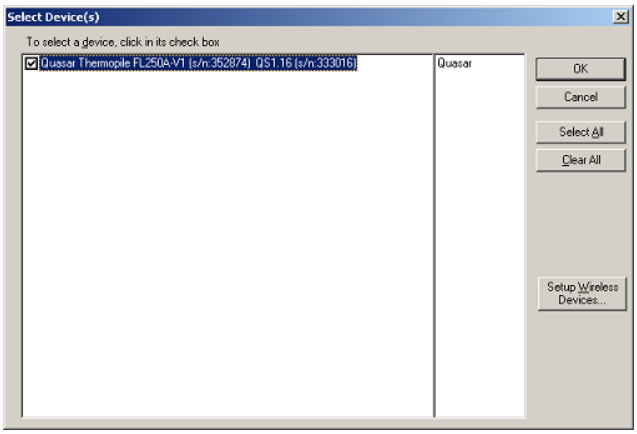


Figure 2-13 Select Devices screen

7. To search for new Quasar devices to add to the "My Devices" list, or to remove devices from the list of "My Devices", click **Setup Wireless Devices** from the **Select Devices** screen.

☞ ***Note:*** *Including unused Quasar devices in the "My Devices" list can increase the time needed to connect to active devices. It is recommended to remove unused devices from the list when they are not in use.*

☞ ***Note:*** *See also section below* Using Thermopile Head with Integral Quasar.

Chapter 3 – Getting Started

The StarLab application is used with the USBI, Pulsar and Quasar devices. The StarLab application supports the use of multiple heads and enables you to view each head's information in a separate window. Each connection between the head, the device, and the application is referred to as a channel.

☞***Note:*** *You can work with multiple devices and channels at the same time. For example, you can use two USBI or Quasar devices to work with two channels, or one Pulsar-4 device to work with one, two, three, or four channels. For each channel a separate application window appears displaying the head's information. You can use multiple USBI, Pulsar and Quasar devices to create additional channel connections.*

You can use the following instructions for understanding and operating the StarLab application. Topics include:

- Starting and Ending a StarLab Application Session
- Understanding the Application Window
- Resizing the StarLab Window
- Configuring the Display for Power Readings
- Configuring the Display for Energy Readings
- Saving Configuration Settings
- Saving Measurement Readings
- Printing Measurement Readings
- Exporting Data to a Bitmap
- Refreshing Devices when Starting the Application
- Upgrading the Device's Internal Software
- Accessing the Help Module

Starting and Ending a StarLab Application Session

To start a StarLab session:

1. From the desktop, double-click  . The StarLab application opens.

   On startup, StarLab searches for devices. If only one is found, StarLab automatically opens in full screen mode (see *Figure 3-2*) and begins operation. If more than one device is found, or more than one head on a single device, refer to *Chapter 8 – Working with Multiple Heads.*

☞***Note:*** *If the RP-USB application is already running, the StarLab application will not start. Click* ***OK*** *to close the warning box (see* Figure 3-1*) and then close the RP-USB.*

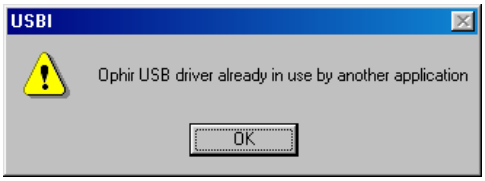


Figure 3-1 "USB driver in use" warning box

To end a StarLab session:

1. Open the **File** menu and select **Exit**. The StarLab application closes.

Understanding the Application Window

This section introduces you to the StarLab window and the right mouse button functions. The application window (see *Figure 3-2*), contains the following areas for all heads:

- The Display Area
- The Numeric Display Area
- The Graph Configuration Area
- The Statistics Area
- The Measurement Parameters Area
- The Logging Area

The specific elements displayed in these areas depend on whether a photodiode, thermopile, PD10, or pyroelectric channel is active.

☞***Note:*** *To hide the toolbar or the status bar, open the View menu and uncheck Toolbar or Status Bar respectively.*

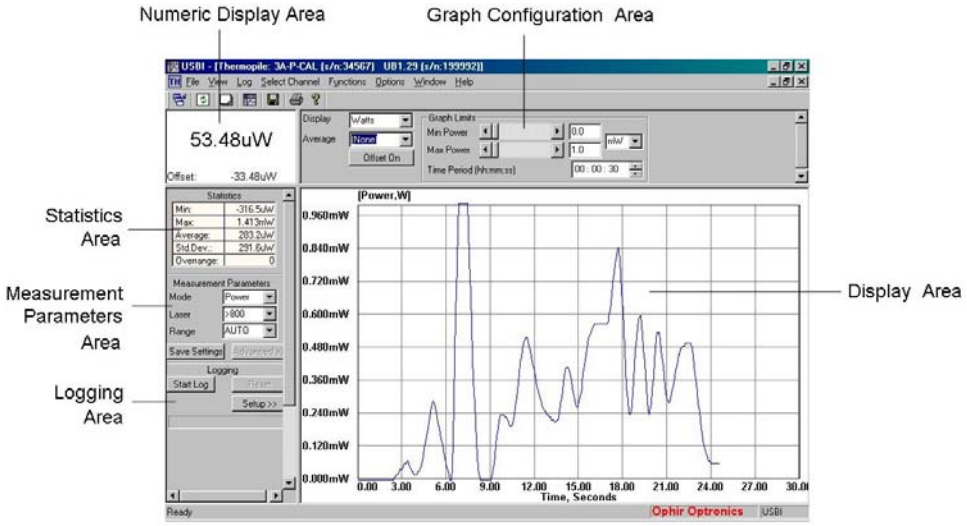


Figure 3-2 StarLab Application Window, Thermopile Head

The Display Area

The Display Area shows the measurement readings in graph form. For information on configuring the display, refer to *Configuring the Display for Power Readings* on page 22, and *Configuring the Display for Energy Readings* on page 23.

☞***Note:*** *To clear the Display Area, click*  *on the toolbar.*

The Numeric Display Area

The Numeric Display Area shows the measurement reading numerically.

The Graph Configuration Area

The Graph Configuration Area is used to configure graph display settings. For information on configuring graph display settings, refer to *Configuring the Display for Power Readings* on page 22, and *Configuring the Display for Energy Readings* on page 23.

The Statistics Area

The Statistics Area displays statistics for the current session, as the measurements are being taken. *Table 3-1* lists the statistics that are shown.

Table 3-1 The Statistics Area

Statistic	Description
Min	Displays the minimum measurement taken.
Max	Displays the maximum measurement taken.
Average	Displays the average measurement taken.
Std. Dev.	Displays the standard deviation.
Overrange	Displays the number of readings measured that were over the maximum value for the chosen range.
	When a reading is over the maximum value for the chosen range, **OVER** is displayed in the Numeric Display Area in blue. When the head is in its top range **OVER** is displayed in red to indicate that damage might occur to the head.
Readings (Thermopile heads in Energy Mode and pyroelectric and PD10 heads in power or energy modes)	Displays the total number of measurements taken.
Frequency (Pyroelectric and PD10 heads only)	Frequency at which the laser is firing.
Missing Pulses (Pulsar with Pyroelectric and PD10 heads only)	Displays the number of missing pulses detected when using External Trigger in Rising/Falling Edge mode.

The Measurement Parameters Area

The Measurement Parameters Area is used to configure measurement settings. For information on configuring measurement settings for the various types of heads, refer to *Chapter 4 – Measuring with the Thermopile Head*, *Chapter 5 – Measuring with the Photodiode Head* and *Chapter 6 – Measuring with the Pyroelectric and* PD10 Heads.

The Logging Area

The Logging Area is used to configure log file settings and to start and stop the log. For information on working with log files, refer to *Chapter 9 – Working with Log Files*.

The Right Mouse Pop-Up Menu

To access the right mouse pop-up menu:

1. Position the cursor anywhere in the StarLab window.
2. Click the right mouse button. The pop-up menu appears.

Table 3-2 lists the menu items available from the pop-up menu.

Table 3-2 The Pop-Up Menu

Menu Item	Description
Zeroing	Enables zeroing the internal circuitry of the device. For information on zeroing the instrument, refer to Zeroing the Instrument in Chapter 4 – Measuring with the Thermopile Head and Zeroing the Instrument in Chapter 5 – Measuring with the Photodiode Head. ☞ **Note:** The procedure for zeroing the instrument with pyroelectric heads is slightly different. For more information, refer to Zeroing the Instrument in Chapter 6 – Measuring with the Pyroelectric and PD10 Heads.
Exposure (Pyroelectric heads only)	Measures the total energy exposure. For more information, refer to Measuring the Total Energy Exposure in Chapter 6 – Measuring with the Pyroelectric and PD10 Heads. ☞ **Note:** The exposure menu item is not available in StarLab software version 1.00 for the Pulsar and Quasar devices.
Response (Thermopile heads only)	Enables adjusting the response factor. This optimizes the thermal response time of thermopile heads. For information on configuring the response factor, refer to Configuring the Response Factor in Chapter 4 – Measuring with the Thermopile Head.
Calibrate	Enables adjusting calibration factors. For information on calibration factors, refer to *Calibration Factors* in *Chapter 4 – Measuring with the Thermopile Head,* Adjusting Calibration Factors in Chapter 5 – Measuring with the Photodiode Head, and in Adjusting Calibration Factors in Chapter 6 – Measuring with the Pyroelectric and PD10 Heads.
Line Frequency	Enables setting power line frequency. For information on setting power line frequency, refer to Setting Line Frequency in Chapter 4 – Measuring with the Thermopile Head.
Ext Trig Control	Enables external trigger control. ☞ **Note:** The external trigger control is not relevant for the USBI, Quasar, Nova-II or Vega devices.
Turbo Mode (Pyroelectric and PD10 heads only)	Logs laser readings at an accelerated rate. For more information, refer to Using Turbo Mode in Chapter 9 – Working with Log Files.

Resizing the StarLab Window

You can resize any area of the StarLab application window.

To resize an area of the StarLab application window:

1. Click and drag the border of the area that you wish to resize.
2. Release the mouse button when you have resized the area.

To restore the StarLab window to its default size settings:

1. Click  on the toolbar. The StarLab application window reverts to its default size settings.

Configuring the Display for Power Readings

Power readings can be taken with a photodiode head, or with a thermopile or pyroelectric head in power mode. Thermopile heads in power mode and photodiode heads are configured in exactly the same way. The following sections explain the display options and how to select them.

☞***Note:*** *To take measurements in power mode when working with a thermopile or pyroelectric head, select Power from the Mode drop down list in the Measurement Parameters Area.*

Configuring Graph Limits and Time Period

To configure graph limits and time period:

1. In the Graph Configuration Area, use the **Min Power** and **Max Power** scroll bars to configure minimum and maximum power in the **Graph Limits** area.

Figure 3-3 Configuring Graph Limits and Time Period – Graph Configuration Area

2. From the **Min Power** and **Max Power** drop down list, select the power scale (nanowatts, microwatts, etc.). The graph shown in the Display Area adjusts according to your selection.

3. In the **Time Period** field, use the arrows to set the time period of the Display Area in hours, minutes, and seconds. The graph shown in the Display Area adjusts according to your selection.

Configuring the Display for Energy Readings

This section explains the display options for thermopile and pyroelectric heads in energy mode, and how to select them.

☞***Note:*** *To take measurements in energy mode when working with thermopile and pyroelectric heads, select Energy from the Mode drop down list in the Measurement Parameters Area.*

Selecting the Display Type

You can display measurement readings in histogram or bar graph format when working in energy mode.

To select the display type in energy mode:

1. From the **Display** drop down list in the Graph Configuration Area, select the desired graphic display option.

Table 3-3 describes the two available graphic display types.

Table 3-3 Energy Mode – Graphic Display Types

Display	Description
Histogram	The histogram presents a statistical analysis of all the measurements.
Bar Graph	The bar graph presents multiple readings in a single display and shows changes in measurement on a pulse-to-pulse basis, showing peak-to-peak stability.

Configuring Histogram Settings

To configure histogram settings:

1. With **Histogram** selected in the **Display** drop down list, use the **Min Energy** and **Max Energy** scroll bars to configure the minimum and maximum energy in the Graph Configuration area.

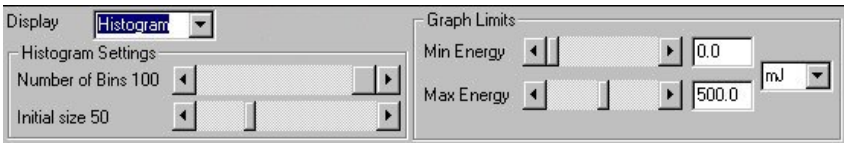


Figure 3-4 Configuring Histogram Settings – Graph Configuration Area

2. From the **Min Energy** and **Max Energy** drop down list, select the energy scale. The graph shown in the Display Area adjusts according to your selection.

3. In the **Histogram Settings** area, use the **Number of Bins** scroll bar to configure the number of bins. The graph shown in the Display Area adjusts according to your selection.

4. In the **Histogram Settings** area, use the **Initial size** scroll bar to configure the initial size. The graph shown in the Display Area adjusts according to your selection.

Configuring Bar Graph Settings

To configure bar graph settings:

1. With **Bar Graph** selected in the **Display** drop down list, use the **Min Energy** and **Max Energy** scroll bars to configure the minimum and maximum energy in the **Graph Limits** area.

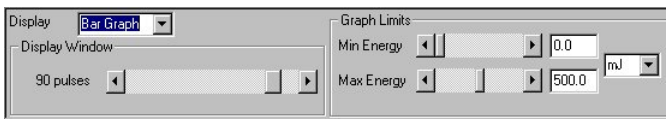


Figure 3-5 Configuring Bar Graph Settings – Graph Configuration Area

2. From the **Min Energy** and **Max Energy** drop down list, select the energy scale. The graph shown in the Display Area adjusts according to your selection.

3. In the **Display Window** area, use the scroll bar to configure the number of pulses shown in the Display Area. The graph shown in the Display Area adjusts according to your selection.

Saving Configuration Settings

StarLab provides a range of configuration and optimization options to deliver the most accurate readings. For more information on configuring and optimizing measurement settings for the various head types, refer to *Chapter 4 – Measuring with the Thermopile Head, Chapter 5 – Measuring with the Photodiode Head* and *Chapter 6 – Measuring with the Pyroelectric and PD10 Heads*.

You can save configuration settings to appear as default settings the next time you take measurements with that head. This section explains how to save your configuration settings.

Saving Configuration Settings for this Session

To save the configuration settings for the current session:

1. Click Save Settings in the Measurement Parameters Area.

Automatically Saving Configuration Settings

To automatically save the configuration settings every time you end a session:

1. Select **Preferences** from the **Options** menu. The **Preferences** dialog box appears (see *Figure 3-6*).

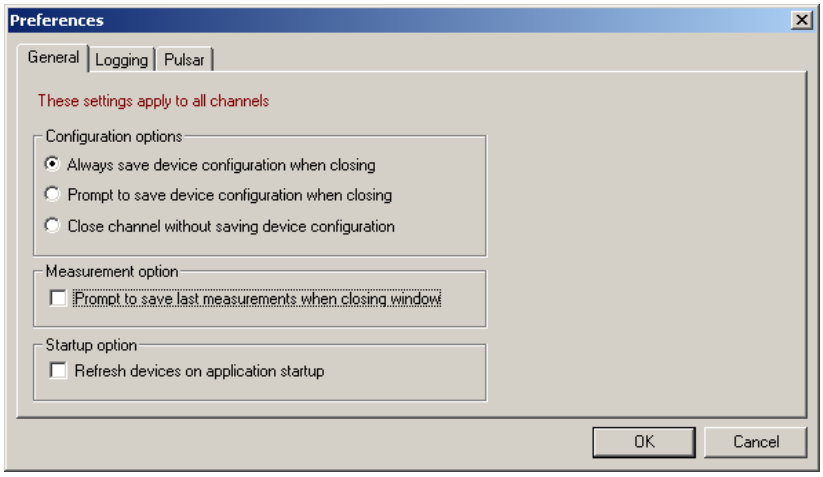


Figure 3-6 Preferences Dialog Box – Automatically Saving Configuration Settings

2. Select **Always save device configuration when closing** in the Configuration options area of the General tab.

Prompt to Save Device Configuration when Closing

To receive a prompt to save device configuration settings every time you end a session:

1. Select **Preferences** from the **Options** menu. The **Preferences** dialog box appears.

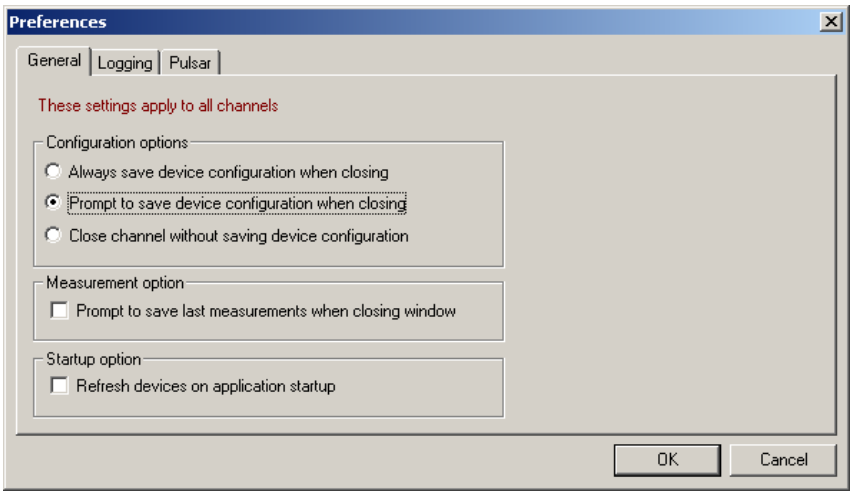


Figure 3-7 Preferences Dialog Box –
Prompt to Save Device Configuration when Closing

2. Select **Prompt to save device configuration when closing** in the Configuration options area of the General tab.

Close Channel without Saving Device Configuration

To close a channel without saving device configuration:

1. Select **Preferences** from the **Options** menu. The **Preferences** dialog box appears.

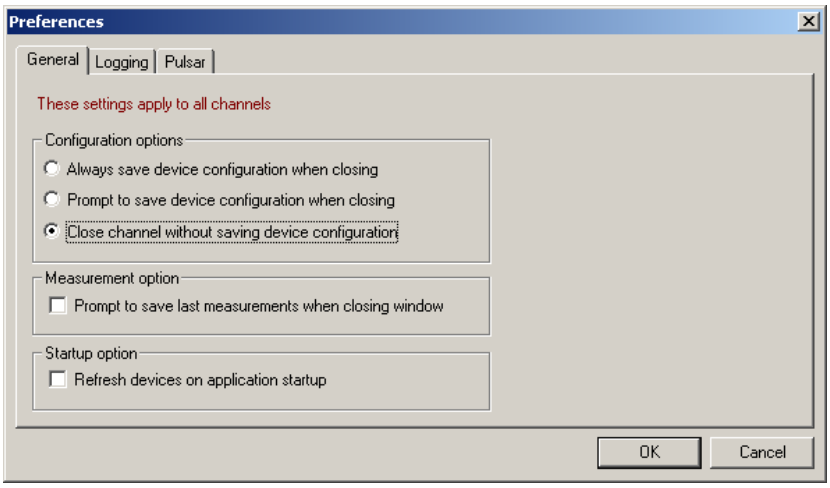


Figure 3-8 Preferences Dialog Box –
Close Channel without saving Device Configuration

2. Select **Close channel without saving device configuration** in the Configuration options area of the General tab.

Saving Measurement Readings

This section describes saving measurement readings for the session, and how to automatically receive a prompt to save readings when closing a channel window.

Saving Readings for this Session

To save measurement readings for the current session:

1. Click  on the toolbar.

   OR

   Open the **Log** menu and select **Save Last Measurements**. The **Create File** dialog box appears with the default StarLab folder open.

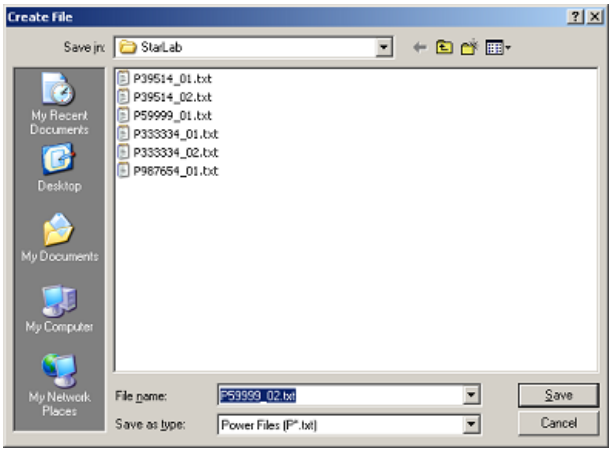


Figure 3-9 Create File Dialog Box

2. Enter the file name in the **File name** field.
3. Click **Save** to save the file to the current directory.

   OR

   Click the **Save in** drop down box and select a different directory to save the file to a directory of your choice. Then click **Save**.

☞***Note:*** *The files are saved to the default location. For information on the default location used by StarLab refer to section* Default Location for Log Files

Receiving a Prompt to Save Readings

To receive a prompt to save measurement readings every time you close a channel window:

1. Select **Preferences** from the **Options** menu. The **Preferences** dialog box appears.

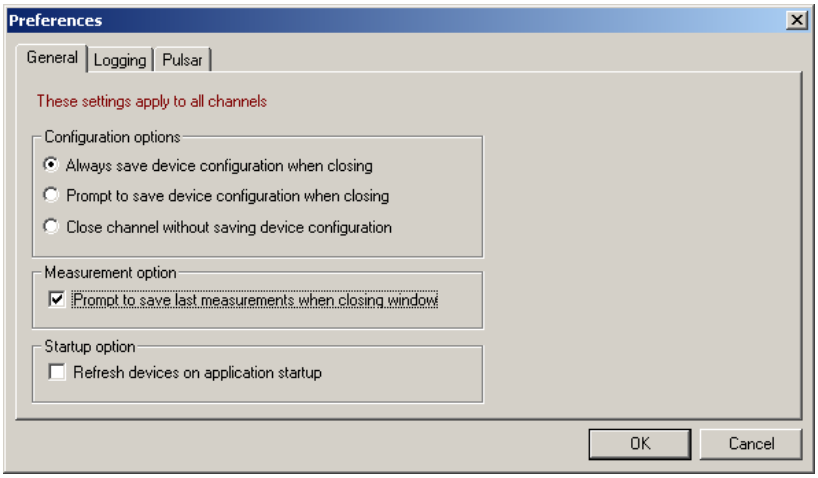


Figure 3-10 Preferences Dialog Box –
Prompt to Save Last Measurements when Closing Window

2. In the Measurement option area, select **Prompt to save last measurements when closing window** of the General tab.

3. Click **OK** to save the preference.

☞***Note:*** *This provides the user with a last opportunity to save the latest measurements taken. To set up a complete data logging session, refer to Chapter 9 – Working with Log Files.*

Printing Measurement Readings

You can print the Display Area for all types of measurements.

To print the display area:

1. Click  on the toolbar.

   OR

   Open the **File** menu and select **Print**. The StarLab display area is printed.

☞***Note:*** *The default orientation is landscape, but you can change it to portrait. The screen is adjusted to fit the orientation.*

Exporting Data to a Bitmap

You can export the Display Area data as a bitmap.

To export the data as a bitmap:

1. Open the **File** menu and select **Export to Bitmap**. The **Save As** dialog box appears with the default StarLab folder open.

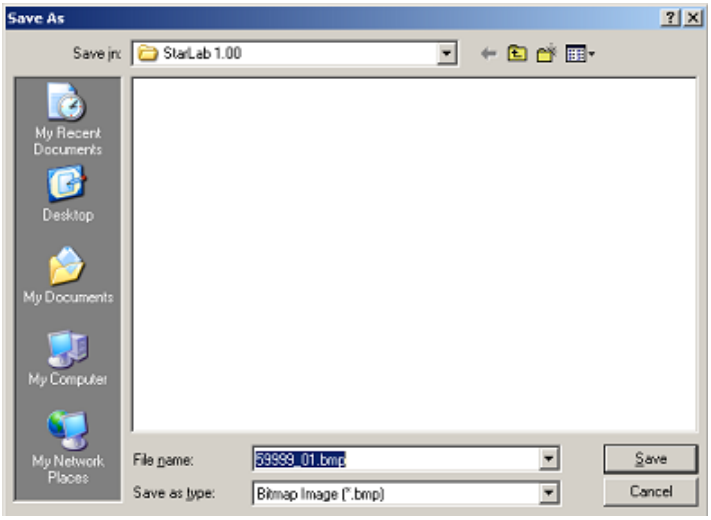


Figure 3-11 Save As Dialog Box

2. Enter the file name in the **File name** field.
3. Click **Save** to save the file to the current directory,

   OR

   Click the **Save in** drop down box and select a different directory to save the file to a directory of your choice. Then click **Save**.

Refreshing Devices when Starting the Application

StarLab allows you to automatically refresh all attached devices each time you start the application.

To refresh all attached devices on starting the application:

1. Open the **Options** menu and select **Preferences**. The **Preferences** dialog box appears, see *Figure 3-12*.

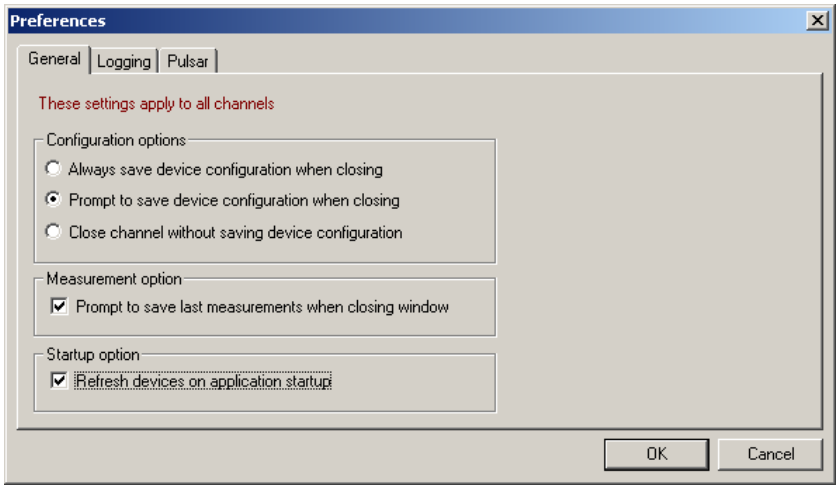


Figure 3-12 Preferences Dialog Box – Refresh Devices on Application Startup

2. Select **Refresh devices** on application startup in the Startup option area of the General tab.

3. Click **OK** to save the preference.

Upgrading the Device's Internal Software

The device's internal software must be upgraded when a newer version of the internal software is released.

☞***Note:*** *Upgrading the device's software is only relevant when using the USBI, the Quasar, the Nova-II or the Vega.*

☞***Note:*** *StarLab version 1.00 does not support software upgrade for the Quasar. The feature will be added in a later version.*

To check if your device's internal software needs upgrading:

1. Click  from the StarLab application window toolbar.

   OR

   Click the **Select Device** menu. The **Select Device(s)** dialog box appears.

   - If one of the connected devices is faulty, the following message appears beside the device name: ***Faulty Device Software - Must be Upgraded***.

   - If the device's currently installed internal software is not compatible with the latest software, the following message appears beside the device name and version number: ***Must be upgraded!***

To upgrade your device's internal software:

1. Click  from the StarLab application window toolbar.

OR

Click the **Select Device** menu. The **Select Device(s)** dialog box appears.

2. Select the channel you wish to upgrade.
3. Click **Upgrade**. The **Upgrade Device Software** dialog box appears. The latest version of the device's internal software is already selected in the **Select file** field.

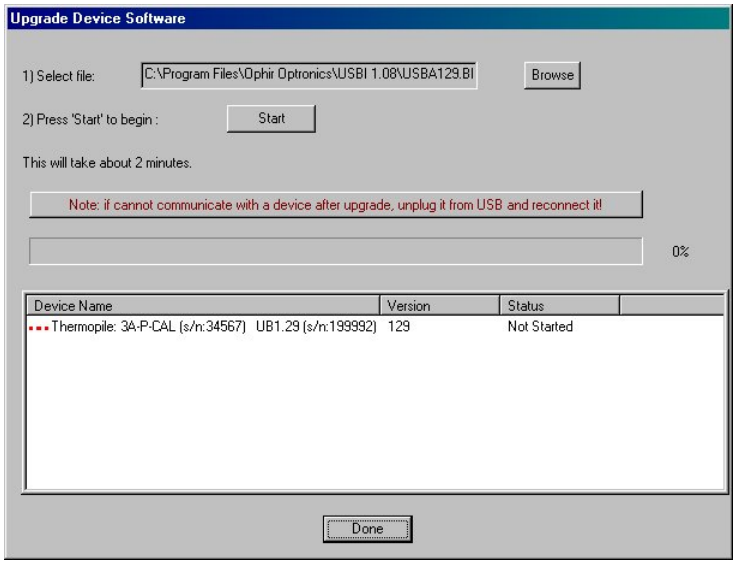


Figure 3-13 Upgrade Device Software Dialog Box

4. Click **Start**. The **Done** button becomes inactive until the upgrade is complete. The progress bar displays the status of the upgrade. The upgrade takes approximately 2 minutes per device upgraded.
5. When the upgrade is complete, click **Done**. The **Upgrade Device Software** dialog box closes.

Accessing the Help Module

StarLab application offers an easy-access Help module.

To access StarLab application's Help:

1. Click  on the toolbar.

OR

Open the **Help** menu and select **Help Topics**. The **StarLab Help** module appears.

OR

Select **StarLab Online Help** from the **StarLab** program group of the Start menu of the Windows Desktop Toolbar.

Chapter 4 – Measuring with the Thermopile Head

This chapter provides an overview of thermopile heads and instructions for taking measurements with the thermopile head. Topics include:

- Overview of Thermopile Heads
- Measurement Settings Configuration
- Configuring Measurement Settings in Power Mode
- Configuring Measurement Settings in Energy Mode
- Optimizing the Readings
- Calibration Factors
- Additional Graphical Display Options

Overview of Thermopile Heads

Ophir thermopile heads measure both power and single shot energy. When a radiant heat source, such as a laser, is directed at the absorber head aperture, a temperature gradient is created across the thermopile of the enclosed detector disc. This generates a voltage proportional to the incident power.

The instrument amplifies this signal and indicates the power level received by the head. At the same time, the signal-processing software enables the instrument to respond faster than the thermal rise time of the detector disc, reducing the response time of instrument. The energy of a single pulse is measured by digitally integrating the pulse power over time.

For a more detailed description of the principles of operation of Ophir thermopile heads, refer to the Ophir Optronics catalog, available for download from http://www.ophiropt.com.

Measurement Settings Configuration

If you are planning to repeat similar measurements, you can configure the settings for each individual head, and save them to the instrument. The saved settings become the default configuration for that channel, and are displayed every time the channel is opened.

The following sections describe how to select the measurement mode, how to configure measurement settings for thermopile heads and how to save them as the default configuration for that channel. The measurement setting fields differ for power and energy modes.

Selecting the Measurement Mode

To select the measurement mode:

1. Select **Power** or **Energy** from the **Mode** drop down list in the Measurement Parameters Area. The Thermopile screen fields displayed depend on the mode selected.

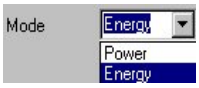


Figure 4-1 Mode Drop Down List

Configuring Measurement Settings in Power Mode

This section explains how to select the laser wavelength and configure the range and an average reading in power mode.

Selecting the Laser Wavelength

Thermopile heads have different absorption at different wavelengths. To compensate for these differences, each head has been calibrated by a laser at several wavelengths. By choosing the correct laser wavelength, the correction factor for that wavelength is automatically introduced.

To select the laser wavelength:

1. Select the laser wavelength from the **Laser** drop down list in the Measurement Parameters Area.

Figure 4-2 Laser Drop Down List

LP1 Heads

For the new LP1 family of heads, the absorption of the detector coating varies somewhat according to wavelength. The correction curve for the absorber is stored in the head EEROM. This correction curve ensures that the power reading is correct at all laser wavelengths.

To configure laser wavelengths, refer to *Configuring Laser Wavelengths* in *Chapter 5 – Measuring with the Photodiode Head*

Selecting the Range

Thermopile heads cover a wide range of powers, from microwatts to 1000s of watts, depending on the type of head in use. In order to provide accuracy at each end of the range, the electronics of the USB Interface Unit must be configured to work in a range that is most suited to your needs.

To configure the range when you know the approximate range of the expected readings:

1. Select the range from the **Range** drop down list in the Measurement Parameters Area. The instrument will configure itself according to the selected range.

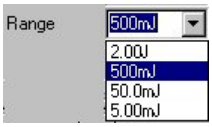


Figure 4-3 Range Drop Down List

To configure the range when the range of the expected readings is not known, or if highly varying readings are expected:

1. Select **AUTO** from the **Range** drop down list in the Measurement Parameters Area. The instrument will configure itself according to the selected range.

☞***Note:*** *AUTO instructs the instrument to configure itself in the lowest range possible that is higher than the latest readings. If the readings exceed 100% of the present range, the instrument reconfigures itself for the next higher range. If the readings fall below 9% of the present range, the instrument reconfigures itself for the next lower range after a short delay. The delay prevents an infinite range-changing loop when readings are close to the end of the scale.*

Averaging the Measurements

The thermopile head is measured 15 times a second. StarLab automatically refines your readings and applies a moving average.

When you set the channel to average mode, StarLab displays the average of the readings spanning from the last time average mode was activated, to the present. Once the time period of the average is reached, the average becomes a running average, spanning the average period backwards in time. For example, if the average period is 30 seconds, at 15 seconds, the average is over 15 seconds; at 30 seconds, the average is over 30 seconds; at 5 minutes, it is over the period from 4 minutes and 30 seconds to 5 minutes (30 seconds back from the present).

To select an average period:

1. Select the average in seconds from the **Average** drop down list in the Graph Configuration Area.

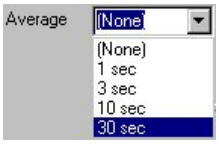


Figure 4-4 Average Drop Down List

Disabling Averaging

You can disable averaging from the **Average** drop down list.

To disable averaging:

1. Select **None** from the **Average** drop down list in the Graph Configuration Area.

Configuring Measurement Settings in Energy Mode

Laser wavelength and range are configured exactly as in power mode. This section describes the **READY** sign as well as the Energy Threshold setting, which are only available in energy mode.

Using the Ready Sign

When the instrument is ready to measure a new pulse, READY will appear in the Graph Configuration Area and flash on and off. The next pulse will automatically clear the screen, and the new value will be displayed. If you fire another pulse before **READY** appears, the reading may be inaccurate or may not be displayed.

Configuring the Energy Threshold

If the instrument is used in a noisy environment, or where high levels of background thermal radiation are present, the instrument may trigger spuriously on the noise or background radiation. It would then fail to measure the intended pulse. Since some degree of noise or background radiation is inevitable, the instrument is designed not to respond to pulses below a preset minimum level.

The minimum energy threshold is typically set to 0.3% of the full scale of the selected range. If this level is too sensitive for your particular environment, you can alter it. Do not, however, raise the threshold higher than necessary, as this will cause degradation in the accuracy of pulse measurements, approximately 4 times lower than the threshold level. Setting the energy threshold also enables you to detect the onset of a pulse.

To configure the energy threshold:

1. Select the energy threshold setting from the following options on the **Threshold** drop down list in the Measurement Parameters Area:

   - **LOW** – Use this setting if you are measuring small energies and the unit does not trigger.
   - **MED** – This is the default factory setting.
   - **HIGH** – Use this setting if the unit triggers when there is noise.
   - **OPTICAL** – Use this setting to enable the optical trigger for heads with this capability.

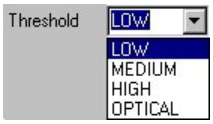


Figure 4-5 Energy Threshold Drop Down List

☞***Note 3A-P Head Users:*** *The older model of the 3A-P head has special circuitry enabling it to trigger on energy pulses of very low energy. A special photodiode trigger alerts the instrument to start integration when a pulse is received. The photodiode trigger enables the 3A-P head to react to smaller pulses than are measured by other heads that trigger on the rising thermal signal. Newer models of the 3A-P do not need the optical trigger to achieve low energy measurement and do not have this feature.*

*Selecting **OPTICAL** from the **Threshold** drop down list enables the optical trigger. In some cases, however, the optical trigger will not work, and one of the thermal trigger settings - **LOW**, **MED**, or **HIGH** should be selected. Thermal triggering on 3A-P heads is applied when:*

- The wavelength is outside the range of the photodiode, i.e. outside of 0.19 - 1.064µm.
- You are measuring the energy of a shuttered pulse of a continuous laser. In this case, the peak power is too low to trigger the photodiode.
- The instrument fails to trigger on the **OPTICAL** setting.

*When using the optical trigger, the instrument should be able to measure down to 0.1 - 0.2 mJ, depending on the wavelength. When using the thermal trigger (**LOW**, **MED**, or **HIGH**), do not attempt to measure less than about 1mJ.*

Optimizing the Readings

StarLab can be optimized to achieve the most accurate and efficient results. This section describes the most commonly used optimizations: offset, zeroing the instrument, and setting line frequency.

Applying an Offset

When there is thermal background in the environment, thermopile heads may show a non-zero power reading, even when there is no laser. For example, the display reads 0.1 Watts when the laser is blocked, and 20.5 Watts when laser power is applied. In this case, the true power is 20.5 - 0.1 = 20.4 Watts. To subtract the background, apply an offset while the laser is blocked. The display will now read zero, and the 0.1 Watt background will be subtracted from all subsequent readings. The laser power reading will be 20.4 Watts.

To apply an Offset:

1. Click Offset in the Graph Configuration Area. The **Offset** button toggles to **Offset On** when the Offset is activated. The **Offset** value is displayed under the main measurement reading in the Numeric Display Area.

To cancel the Offset:

1. Click Offset On in the Graph Configuration Area. The Offset value is cancelled.

☞***Note:*** *If you suspect that the instrument has a permanent zero offset, disconnect the head while the head is in power measurement mode. If StarLab still shows a similar reading even when the head is not connected, zero the instrument. For information on zeroing the instrument, refer to Zeroing the Instrument on page 4-37.*

Zeroing the Instrument

In the USBI, Pulsar and Quasar, all adjustments, including zeroing internal circuits, are performed from the software. This ensures simple and accurate realignment. For best performance, it is recommended to zero the instrument frequently.

For the USBI instrument:
With thermopile heads, it is necessary to zero the instrument with no head attached, and then repeat with the head attached.
With photodiode heads it is only necessary to zero with the head attached.

For the Pulsar and Quasar instruments:
With all heads, it is only necessary to zero the instrument with the head attached.

To zero the USBI instrument with NO head attached:

1. Start up the instrument with no head attached: unplug the USB cable, disconnect the head, and replace the USB cable.

2. Check that the instrument is not in an electrically noisy environment and is undisturbed.
3. When started with no head attached, the **StarLab Head Disconnected** dialog box appears.
4. Press **Zeroing**. The **Zeroing Instrument** dialog box appears.

Figure 4-6 Zeroing Instrument Dialog Box

5. Press **Start**. The zeroing begins.
6. Once zeroing is complete, press **Save** to save the zeroing.

To zero the instrument with a head attached:

1. Start up the instrument with head attached.
2. From the head control screen, click the right mouse button and select **Zeroing** from the pop-up menu, OR open the Functions menu and select **Zeroing.** The **Zeroing Instrument** dialog box appears (*figure 4-6* above)
3. Press **Start**. The zeroing begins.
4. Once zeroing is complete, press **Save** to save the zeroing.

Setting Line Frequency

You can use the line frequency feature to remove interference caused by AC electricity in the room. The USBI, Pulsar and Quasar are factory set for 50Hz. If your country uses 60Hz, you must reset the line frequency.

To set line frequency:

1. Click the right mouse button and select **Line Frequency** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Line Frequency**.

2. From the expanded menu, check one of the following options:

   - 50Hz – If you are in Europe.
   - 60Hz – If you are in the United States or Japan.

   The line frequency is set.

Calibration Factors

StarLab allows you to adjust power calibration factors, configure the response factor and adjust energy calibration factors.

Warning: *Adjusting the calibration factor makes a permanent change in the head. It is strongly recommended that before making any change to the factor, the original factory setting is recorded separately. This will make it easier to restore the value to its original setting later if needed.*

Adjusting Power Calibration Factors

The absorption of the various Ophir thermal absorbers can vary from disc to disc. Therefore, all Ophir absorbers are individually calibrated against NIST traceable standards. Ophir heads are individually laser-calibrated at several wavelengths, against a NIST calibrated standard meter. For more information on Ophir head calibration and traceability, refer to *Appendix B – Calibration, Traceability, and Recalibration.*

StarLab offers two types of calibration:

- **Overall Calibration** – Changes the calibration at all wavelengths at once. Use Overall Calibration if your head is equipped with the Ophir CAL resistor. For more information on the Ophir CAL resistor, refer to *Appendix B – Calibration, Traceability, and Recalibration*.
- **Laser Specific Calibration** – Changes the calibration at one specific laser wavelength. Use Laser Specific Calibration, unless your head is equipped with the Ophir CAL resistor.

To adjust the power calibration factor:

1. Click the right mouse button and select **Calibrate** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Calibrate**. The **Adjust Calibration Factors** dialog box appears.

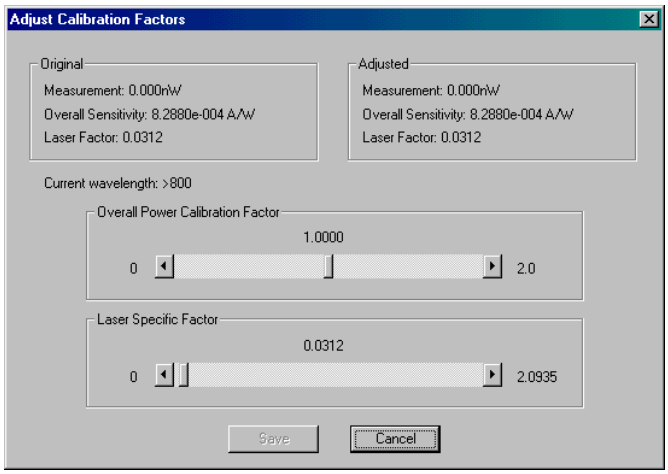


Figure 4-7 Adjust Calibration Factors Dialog Box

The **Original** area displays the original **Measurement**, **Overall Sensitivity** and **Laser Factor** fields. The **Current wavelength** is displayed beneath the **Original** area.

2. Use the **Overall Power Calibration Factor** scroll bar to attain an accurate reading in the **Overall Sensitivity** field in the **Adjusted** area.

   OR

   Enter the desired factor into the text box above the scroll bar.

☞***Note:*** *Adjusting the overall power calibration factor effects both the Measurement and the Overall Sensitivity values.*

3. Use the **Laser Specific Factor** scroll bar to attain an accurate reading in the **Overall Sensitivity** and **Laser Factor fields** in the **Adjusted** area.

   OR

   Enter the desired factor into the text box above the scroll bar.

☞***Note:*** *Adjusting the Laser Specific Factor effects both the Measurement and the Laser Factor values.*

4. Click **Save** to save the adjustment for the active channel.

Configuring the Response Factor

The response factor feature finds the optimum response time to enable an accurate reading as quickly as possible, while minimizing the risk of overshoot, (the erroneous reporting of readings above 100% of the full scale). Response factor adjustment is only possible when the head is in power mode.

To set the response factor:

1. Click the right mouse button and select **Response** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Response**. The **Response Factor** dialog box appears.

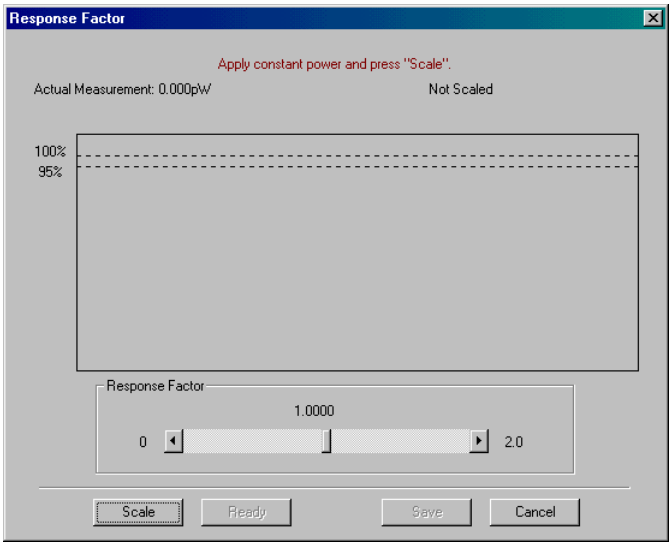


Figure 4-8 Response Factor Dialog Box

2. Use the scroll bar to adjust the response factor in the **Response Factor** area.
3. Apply constant power to the thermopile head until the graph stabilizes.
4. Click **Scale**.
5. Block the laser for several moments to allow the head to cool down.
6. Click **Ready**.
7. Unblock the thermopile head.
8. Take a second reading.

Adjusting Energy Calibration Factors

Both power and energy readings are equally affected by changes in the absorption and/or sensitivity of the thermal disc. Therefore, changing power calibration changes energy calibration proportionately. In addition, adjusting the response time of the head can also affect energy calibration. For this reason, provisions are made to adjust energy calibration without affecting power calibration.

To adjust the energy calibration factor:

1. Click the right mouse button and select **Calibrate** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Calibrate**. The **Adjust Calibration Factor** dialog box appears.

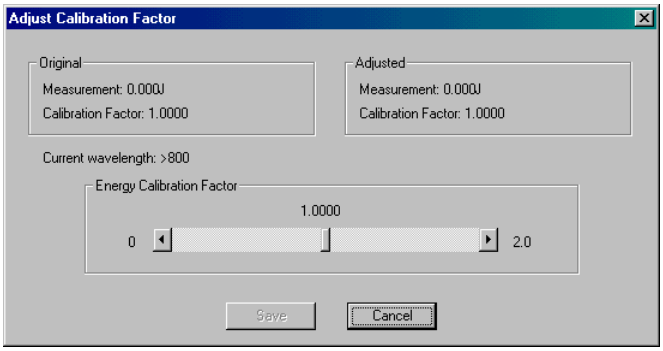


Figure 4-9 Adjust Calibration Factor Dialog Box

2. The **Original** area displays the original **Measurement** and **Calibration Factor**. The **Current wavelength** is displayed beneath the **Original** area.

3. Use the scroll bar to adjust the **Energy Calibration Factor** to attain an accurate reading in the **Calibration Factor** field in the **Adjusted** area.

4. Click **Save** to save the adjustment for the active channel.

Additional Graphical Display Options

StarLab enables you to configure and display readings in dBm scale and how to configure and apply normalization.

Displaying Readings in dBm Scale

To display readings in dBm scale for a thermopile head, refer to *Displaying Readings in dBm* Scale in *Chapter 5 – Measuring with the Photodiode Head.*

Applying Normalization

To apply normalization for a thermopile head, refer to *Applying Normalization* in *Chapter 5 – Measuring with the Photodiode Head.*

Chapter 5 – Measuring with the Photodiode Head

This chapter provides an overview of photodiode heads and instructions for taking measurements with the photodiode head. Topics include:

- Overview of Photodiode Heads
- Configuring Measurement Settings
- Optimizing the Readings
- Adjusting Calibration Factors
- Additional Graphical Display Options

Overview of Photodiode Heads

When a photon source, such as a laser, is directed at a photodiode head, a current is created proportional to the light intensity and dependent on the wavelength.

Ophir photodiode heads have a unique dual detector head containing two identical detectors, connected back to back. When a uniform signal, such as background room light, falls on the detector head, the signal from the two detectors cancels.

Conversely, when a laser beam falls on the head, it illuminates the first detector only and is detected. In this way, the head subtracts most of the background while still detecting the desired signal. In general, 98% of the background signal is eliminated. This means that the detector can be used in ordinary laboratory lighting conditions.

The instrument amplifies this signal and indicates the power level received by the head. Due to the superior circuitry of the Ophir instruments, the noise level is very low, and Ophir photodiode heads have a large dynamic range, from pico Watts to Watts.

Since many low power lasers have powers ranging from 5 to 30mW, and most photodiode detectors saturate at about 2mW, Ophir photodiode heads have a built in filter to allow the head to measure up to 30mW or more without saturation. When the additional filter is applied, the maximum power can range from 300mW to 3W. Photodiode heads saturate when the output current exceeds 1.3mA so the exact maximum power depends on the sensitivity of the detector at the wavelength used. For a more detailed description of the principles of operation of Ophir thermopile heads, refer to the Ophir Optronics catalog, available for download from http://www.ophiropt.com.

Configuring Measurement Settings

If you are planning to repeat similar measurements, you can configure the settings for each individual head, and save them to the instrument. The saved settings become the default configuration for that channel, and are displayed every time the channel is opened.

The following sections describe how to configure measurement settings for photodiode heads and how to save them as the default configuration for that channel. Configuration settings include: configuring laser wavelengths, range, average readings, and inserting/removing the filter.

Configuring Laser Wavelengths

Photodiode heads have a different sensitivity at different wavelengths. Moreover, the filters used in the head have a different transmission at different wavelengths. When you choose the correct laser wavelength, the correction factor for that wavelength is automatically introduced.

You can select which laser wavelength to work with from an editable drop down list. You can configure a maximum of six wavelengths to appear in the drop down list, to simplify changing from one laser wavelength to another. Laser wavelengths can also be modified or removed.

To select the laser wavelength:

1. Select the laser wavelength from the **Wavelength** drop down list in the Measurement Parameters Area.

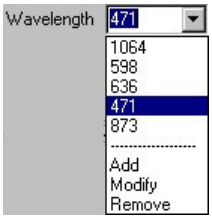


Figure 5-1 Wavelength Drop Down List

To add a laser wavelength:

1. Select **Add** from the **Wavelength** drop down list in the Measurement Parameters Area. The **Set Favorite Wavelength** dialog box appears.

☞***Note:*** *Add is only available if less than 6 wavelengths are listed in the Wavelength drop down list.*

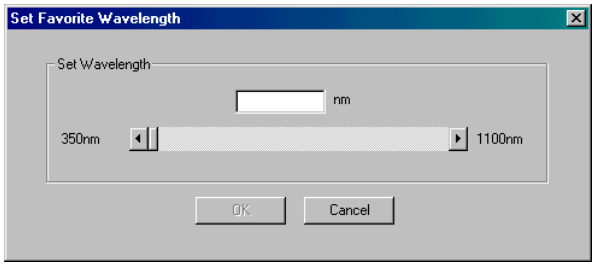


Figure 5-2 Set Favorite Wavelength Dialog Box

2. Enter the wavelength in the text box in the **Set Wavelength** area.

   OR

   Use the scroll bar or arrows to configure the new wavelength.

3. Click **OK** to save the new wavelength and close the dialog box. The new wavelength appears in the **Wavelength** drop down list.

To modify laser wavelengths:

1. Select **Modify** from the **Wavelength** drop down list in the Measurement Parameters Area. The **Modify Favorite Wavelength** dialog box appears, displaying the laser wavelength you wish to modify in the text box in the **Modify Wavelength** area.

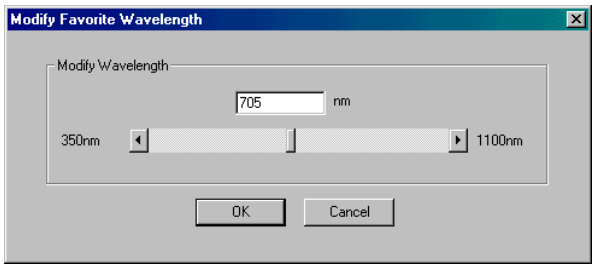


Figure 5-3 Modify Favorite Wavelength Dialog Box

2. Select the wavelength in the text box in the **Modify Wavelength** area and enter the desired wavelength.

   OR

   Use the scroll bar or the arrows to modify the wavelength.

3. Click **OK** to save the modification and close the dialog box. The modified wavelength appears in the **Wavelength** drop down list.

To remove laser wavelengths:

1. Select **Remove** from the **Wavelength** drop down list in the Measurement Parameters Area. The **Remove Favorite Wavelength** dialog box appears, displaying the wavelengths listed in the **Laser Wavelength** drop down list.

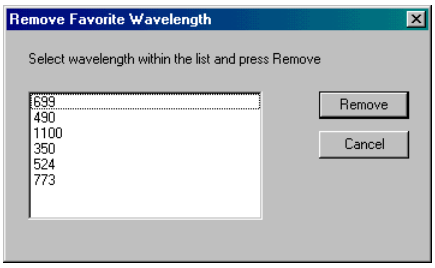


Figure 5-4 Remove Favorite Wavelength Dialog Box

☞***Note:*** *Remove is only available if more than 1 wavelength is listed in the Wavelength drop down list.*

2. Select the wavelength you wish to remove. You can only remove one wavelength at a time.

3. Click **Remove** to remove the selected wavelength and close the dialog box. The removed wavelength no longer appears on the **Wavelength** drop down list.

Filter Settings

The photodiode head is equipped with an optional filter that allows it to measure up to 300mW or more without saturating the detector. The exact maximum power is reached when the reading reaches full scale, or when the output current from the head reaches 1.3mA, whichever comes first. You can work with or without the filter, depending on which powers you wish to measure.

To configure the instrument to measure when the filter is inserted:

1. Select **In** from the **Filter** drop down list in the Measurement Parameters Area.

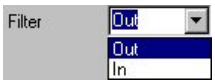


Figure 5-5 Filter Drop Down List

To configure the instrument to measure when the filter is removed:

1. Select **Out** from the **Filter** drop down list in the Measurement Parameters Area.

☞***Note:*** *Make sure to physically insert or remove the filter, according to the filter setting selected. Failure to do so will result in erroneous readings.*

Selecting the Range

To configure the range for a photodiode head, refer to *Selecting the Range* in *Chapter 4 – Measuring with the Thermopile Head*.

Averaging the Measurements

To configure an average reading for a photodiode head, refer to *Averaging the Measurements* in *Chapter 4 – Measuring with the Thermopile Head*.

Optimizing the Readings

StarLab can be optimized to achieve the most accurate and efficient results. This section describes the optimization settings available for the photodiode head: applying an offset, zeroing the instrument, and setting line frequency.

Applying an Offset

Ophir's unique dual-detector heads detect and subtract 98% of background light. The residual background signal can be removed using the Offset feature. The Offset feature subtracts background light from the signal.

For example, the display reads 0.1 µW when the laser is blocked, and 20.5 µW when laser power is applied. In this case, the true power is 20.5 - 0.1 = 20.4 µW. To subtract the background, apply an offset while the laser is blocked. The display will now read zero, and the 0.1 µW background will be subtracted from all subsequent readings. The laser power reading will be 20.4 µW.

To apply an offset:

1. Click Offset in the Graph Configuration Area. The **Offset** button toggles to **Offset On** when the Offset is activated.

   The Offset value is displayed under the main measurement reading in the Numeric Display Area.

To cancel the offset:

1. Click Offset On in the Graph Configuration Area. The Offset value is cancelled.

☞***Note:*** *If you suspect that the instrument has a permanent zero offset, disconnect the head while the head is in power measurement mode. If the instrument still shows a similar reading even when the head is not connected, zero the instrument. For information on zeroing the instrument, refer to Zeroing the Instrument in Chapter 4 – Measuring with the Thermopile Head.*

Zeroing the Instrument

To zero the instrument for a photodiode head, refer to *Zeroing the Instrument* in *Chapter 4 – Measuring with the Thermopile Head.*

☞***Note:*** *When zeroing the instrument for photodiode heads, it is unnecessary to disconnect the head. Turn the laser off instead, and cover the head.*

Setting Line Frequency

To set the line frequency for a photodiode head, refer to *Setting Line Frequency* in *Chapter 4 – Measuring with the Thermopile Head.*

Adjusting Calibration Factors

⚠ ***Warning****: Adjusting the calibration factor makes a permanent change in the head. It is strongly recommended that before making any change to the factor, the original factory setting is recorded separately. This will make it easier to restore the value to its original setting later if needed*

Photodiode detectors are inherently very linear but do vary broadly in sensitivity from wavelength to wavelength. In addition, Ophir PD300 models are equipped with both a built in and a removable filter to enable measurement of higher powers without detector saturation. The transmission of these filters depends on wavelength. The PD300 has a built in calibration adjustment for wavelength. For more information on the PD300 built in calibration adjustment, refer to *Appendix B – Calibration, Traceability, and Recalibration*. The user cannot recalibrate the whole calibration curve, but can adjust the overall calibration, which in turn adjusts all wavelengths proportionately.

To adjust the power calibration factor:

1. Click the right mouse button and select **Calibrate** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Calibrate**. The **Adjust Calibration Factor** dialog box appears.

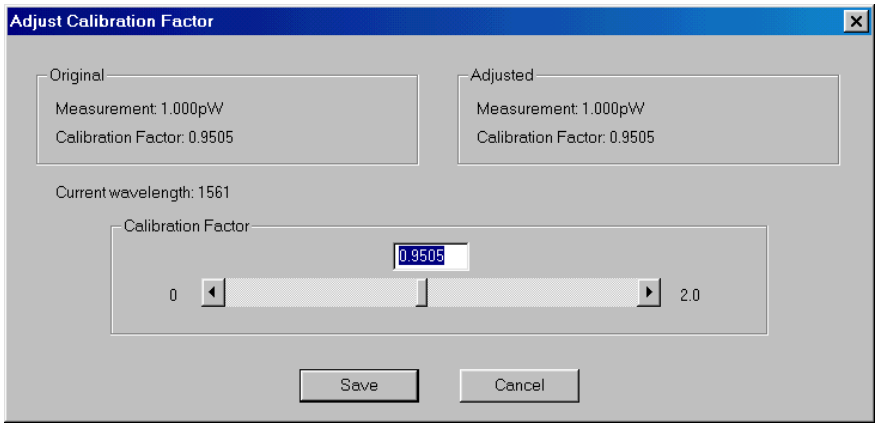


Figure 5-6 Adjust Calibration Factor Dialog Box

The **Original** area displays the original **Measurement** and **Calibration Factor**. The **Current wavelength** is displayed beneath the **Original** area.

2. Use the **Calibration Factor** scroll bar to attain an accurate reading in the **Calibration Factor** field in the **Adjusted** area.

   OR

   Enter the desired factor into the text box above the scroll bar.

☞***Note:*** *Adjusting the Calibration Factor changes the calibration of all wavelengths by the same factor.*

3. Click **Save** to save the adjustment for the active channel.

Additional Graphical Display Options

StarLab allows you to configure and display readings in dBm scale, and allows you to configure and apply normalization.

Displaying Readings in dBm Scale

StarLab allows measurements to be made in units of dBm, which are measurements in a logarithmic scale. dBm units are defined as: 10 x log (reading in mW). At 1mW the reading will be 0dBm, at 10mW it will be 10dBm, and at 100mW it will be 20dBm, etc.

To display readings in dBm scale:

1. Select **dBm** from the **Display** drop down list in the Graph Configuration Area. The Graph Limits field modifies to reflect the selection, as shown in *Figure 5-7*.

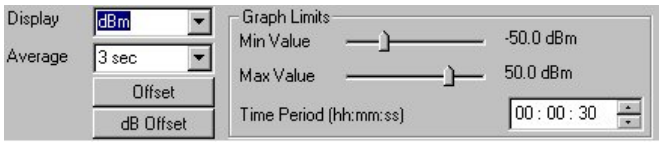


Figure 5-7 Graph Configuration Area

2. In the Graph Configuration Area, use the **Min Value** and **Max Value** pointers to select the minimum and maximum dBm values.

   The values you select are automatically displayed on the graph in the Display Area, as shown in *Figure 5-8*

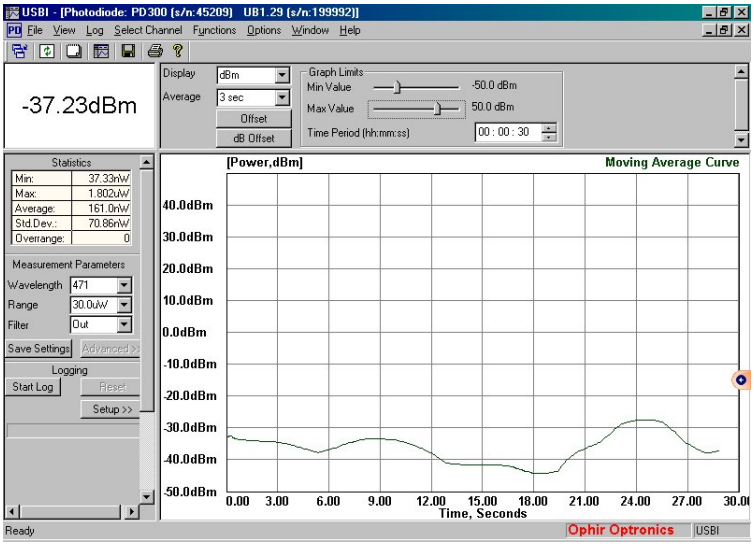


Figure 5-8 Photodiode Window Display Area in dBm Scale

Applying a dB Offset

To apply a dB offset:

3. Click 

in the Graph Configuration Area. The **dB Offset** button toggles to **dB Offset On** when the Offset is activated.

   The dB Offset value is displayed under the main measurement reading in the Numeric Display Area.

To cancel the dB Offset:

1. Click 

in the Graph Configuration Area. The dB Offset value is cancelled.

Applying Normalization

StarLab enables you to view photodiode readings in relation to a configurable baseline.

To apply normalization:

1. Select **Normalized** from the **Display** drop down list in the Graph Configuration Area. The Graph Limits field modifies to reflect the selection, as shown in *Figure 5-9.*

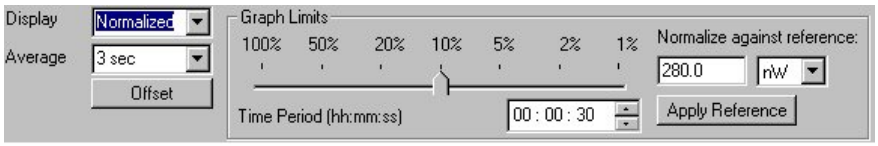


Figure 5-9 Apply Normalization Dialog Box

2. In the Graph Configuration Area, scroll the pointer to select the graph limits expressed as a percentage of the reference value. For example, if you want the graph to display ±20% around the present value, choose 20%.

3. In the **Normalize against reference** field, enter the normalization reference value and select the power scale from the drop down list. If no reference value is selected, StarLab uses the last power measured as its reference value.

4. Click **Apply Reference** to save and apply the settings to the Display Area.

Chapter 6 – Measuring with the Pyroelectric and PD10 Heads

This chapter provides an overview of pyroelectric and PD10 heads and instructions for taking measurements with these heads. Topics include:

- Overview of Pyroelectric and PD10 Heads
- Configuring Measurement Settings
- Optimizing the Readings
- Measuring the Total Energy Exposure
- Adjusting Calibration Factors
- Additional Graphical Display Options

Overview of Pyroelectric and PD10 Heads

Ophir pyroelectric heads measure both frequency and energy of pulsed lasers. When a pulsed heat source, such as a laser, is directed at the detector, a temperature gradient is created across the pyroelectric crystal mounted in the head. An electric charge is produced, which is proportional to the energy absorbed. The detector head has sophisticated circuitry unique to Ophir (patented) that determines the baseline before the pulse is received, measures the voltage after a pre-determined interval, amplifies it, and holds it for a pre-determined time.

Due to this innovative circuitry, Ophir pyroelectric heads can measure very long pulses as well as short ones; low energies as well as high energies. They can also measure at higher repetition rates than was possible before.

The device to which the head is connected converts this signal to a digital value and indicates the energy received by the head, as well as the frequency at which the laser is pulsing. Using the energy and frequency information, the StarLab application is also able to display average power.

Ophir PD10 heads differ from pyroelectric heads in that their detector is a photodiode instead of a pyroelectric crystal. They use a similar circuit to the pyroelectric heads and offer similar functionality. Therefore, throughout this guide, they are included in the generic term "pyroelectric" when referring to software and control functions, even when this is not stated explicitly.

Warning: *Before using the head for frequency or energy measurements, make sure that your laser power, energy, and energy density do not exceed the head ratings listed in the specifications table for the specific head. Otherwise, you may damage the absorber. Refer to the Ophir Laser Power/Energy Measurement, at www.ophiropt.com, for full details on each head.*

A test slide is provided with each pyroelectric head, which contains the same coating as the pyroelectric detector. (You can obtain additional slides from your supplier.) Use this slide to test the damage threshold of your laser pulses. If the laser pulses damage the slide, either enlarge the beam or lower the laser energy until no damage is detected.

To measure pyroelectric energies properly, it is important that the head is not grounded to the optical bench. Make sure that the head is isolated electrically from the ground. Each pyroelectric head is supplied with an insulating mounting post for this purpose.

Configuring Measurement Settings

If you are planning to repeat similar measurements, you can configure the settings for each individual head, and save them to the USBI, Pulsar or Quasar device. The saved settings become the default configuration for that channel, and are displayed every time the channel is opened.

The following sections describe how to select the measurement mode, how to configure measurement settings for pyroelectric heads and how to save them as the default configuration for that channel. The measurement setting fields differ for frequency and energy modes. Measurement settings include: laser wavelength, power range, diffuser, pulse width, and average reading. In addition to these measurement settings, the Pulsar device includes an external trigger.

Selecting the Measurement Mode

To select the measurement mode:

1. Select **Power** or **Energy** from the **Mode** drop down list in the Measurement Parameters Area. The pyroelectric screen fields displayed depend on the mode selected.

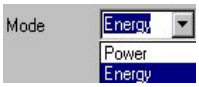


Figure 6-1 Mode Drop Down List

Configuring Laser Wavelengths

Metallic and PD10 Heads

For metallic and PD10 heads, the absorption of the detector coating varies somewhat according to wavelength. The correction curve for the absorber is stored in the head EEROM. This correction curve ensures that the power reading is correct at all laser wavelengths.

To configure laser wavelengths, refer to *Configuring Laser Wavelengths* in *Chapter 5 – Measuring with the Photodiode Head.*

Broadband (BB) Heads

Broadband (BB) heads have less variation according to wavelength. For broadband heads, fixed wavelength ranges are provided, similar to thermopile heads.

To configure laser wavelengths, refer to *Selecting the Laser Wavelength* in *Chapter 4 – Measuring with the Thermopile Head*.

Selecting the Range

Pyroelectric heads cover a wide range of energies (from tens of nanojoules to tens of joules) depending on the type of head in use. In order to provide accuracy throughout the range, the electronics of the head must be configured to work in a range that is most suited to your needs.

To configure the range when you know the approximate range of the expected readings:

1. Select the range from the **Range** drop down list in the Measurement Parameters Area. The instrument will configure itself according to the selected range.

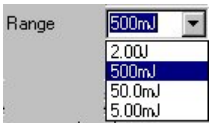


Figure 6-2 Range Drop Down List

Warning: *While measuring pulsing lasers, an erroneous energy reading will result if the energy range is not set up correctly.*

Using a Diffuser

You can add a diffuser to some pyroelectric heads. A diffuser enables the energy ranges to reach very high levels. When using a head that can have a diffuser, configure the diffuser setting in the Measurement Parameters Area.

To select whether a diffuser is in use:

1. Select whether a diffuser is in use (In) or not in use (Out) from the **Diffuser** drop down list in the Measurement Parameters Area.

Figure 6-3 Diffuser Drop Down List

When you change this setting, a dialog box appears reminding you to either insert or remove the diffuser.

☞***Note:*** *For heads that are not equipped with a diffuser, this setting is unavailable, and the heads are configured to measure in Diffuser Out mode.*

Selecting the Pulse Width

Some pyroelectric heads can be configured to measure long as well as short pulses. To accomplish this, the user must configure the head for long laser pulses or short pulses.

☞***Note:*** *If the pulse length is incorrectly set to the short setting for pulses longer than that value, the reading will be erroneously low. If it is set to the longer setting for short pulses, the reading will be correct, but noisier.*

To select a pulse width:

1. Select the pulse width from the **Pulse Width** drop down list in the Measurement Parameters Area.

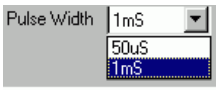


Figure 6-4 Pulse Width Drop Down List

☞***Note:*** *For heads with only one pulse width setting, the Pulse Width Drop Down list is unavailable and the head is configured to measure in its correct mode.*

Averaging the Measurements (Power Mode Only)

The StarLab application automatically refines your readings and applies a moving average. For pyroelectric heads, the StarLab application averages the number display, not the graph display.

☞***Note:*** *You can use the Moving Average feature only while working in Power mode. In Energy Mode, average measurements are displayed in the Statistics Area only.*

When you activate the StarLab application's average mode, it displays the average of the readings spanning from the last time average mode was activated, to the present. Once the time period of the average is reached, the average becomes a running average, spanning the average period backwards in time. For example, if the average period is 30 seconds, at 15 seconds, the average is over 15 seconds; at 30 seconds, the average is over 30 seconds; at 5 minutes, it is over the period from 4 minutes and 30 seconds to 5 minutes (30 seconds back from the present).

To select an average period:

1. Select the average in seconds from the **Average** drop down list in the Graph Configuration Area.

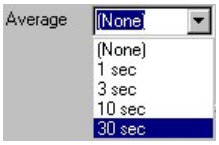


Figure 6-5 Average Drop Down List

Disabling Averaging

You can disable averaging from the **Average** drop down list.

To disable averaging:

1. Select **None** from the **Average** drop down list in the Graph Configuration Area.

Controlling the External Trigger

You can control the use of the external trigger by turning the external trigger on or off. For more information on using the External Trigger, refer to *Chapter 7 – External Triggers and Missing Pulses*.

☞***Note:*** *The External Trigger is only available for use with the Pulsar device.*

To turn the external trigger on:

1. Select **On** from the **External Trigger** drop down list in the Measurement Parameters Area.

Figure 6-6 External Trigger Drop Down List

The external trigger is turned on.

To disable the external trigger:

1. Select **Off** from the **External Trigger** drop down list in the Measurement Parameters Area. The external trigger is disabled.

☞***Note:*** *In situations where External Trigger control cannot be used for a specific head channel, the drop-down control is disabled.*

Optimizing the Readings

The StarLab application can be optimized to achieve the most accurate and efficient results. This section describes the most commonly used optimization of zeroing the instrument with the head connected.

Zeroing the Instrument

Unlike thermopile and photodiode heads, pyroelectric readings are slightly dependant on the instrument. Therefore, for the most accurate pyroelectric energy measurements, it is necessary to zero the head against the instrument with which it is being used. After this is done, the head is *conditioned* to work with that specific instrument. It is not necessary repeat this procedure unless the head will be used with a different instrument, or with a Laserstar. If this procedure is not performed, errors of up to approximately 2% may occur.

☞***Note:*** *For pyroelectric, it is necessary to leave the head connected when zeroing the instrument.*

To zero the instrument:

1. Turn off the laser.
2. Check that the instrument is not in an electrically noisy environment and is undisturbed.
3. Click the right mouse button and select **Zeroing** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Zeroing**. The **Zeroing Instrument** dialog box appears.

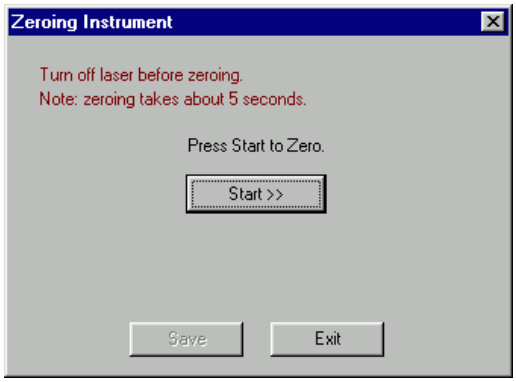


Figure 6-7 Zeroing Instrument Dialog Box

4. Press **Start**. The zeroing begins.
5. Once zeroing is complete, press **Save** to save the zeroing.

Measuring the Total Energy Exposure

For pyroelectric heads, the StarLab application has the ability to sum the total energy of a number of pulses over a given time period or number of pulses. This returns the total energy exposure over the selected period. For example, if the laser is pulsing at 30 times per second, at 1mJ per pulse, and you measure the exposure over 20 seconds, then the total exposure is 30 x 1 x 20 = 600mJ.

☞***Note:*** *The maximum exposure measurement time is one hour.*

☞***Note:*** *StarLab software version 1.00 does not support exposure with the Pulsar or Quasar devices.*

To measure the total exposure:

1. Click the right mouse button and select **Exposure** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Exposure**. The **Exposure Screen** dialog box appears.

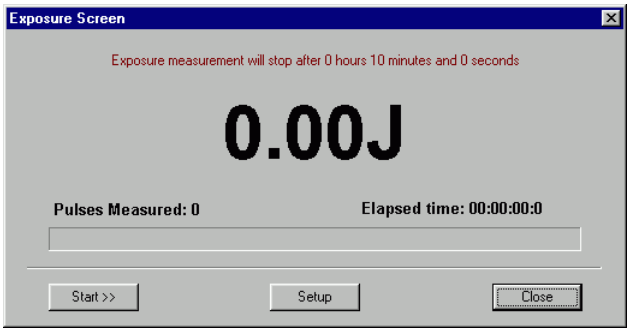


Figure 6-8 Exposure Screen Dialog Box

2. To configure when to stop taking exposure measurements, click **Setup**. The **Exposure Setup** dialog box appears.

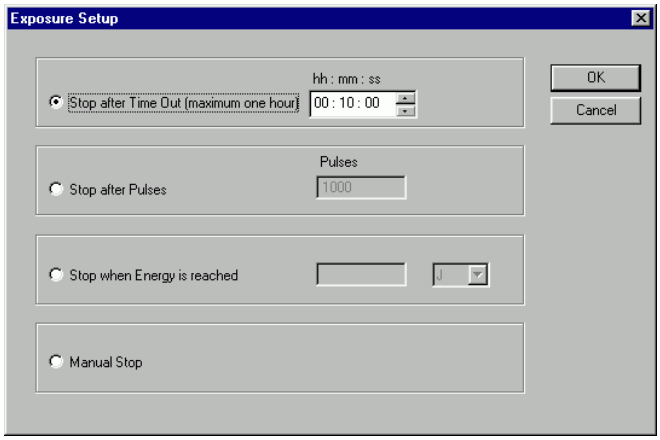


Figure 6-9 Exposure Setup Dialog Box

3. Perform one of the following:

   - Select **Stop after Time Out**, and type the stop time in the text box.
   - Select **Stop after Pulses**, and type the number of pulses in the text box.
   - Select **Stop when Energy is reached**, type the amount in the text box, and then select the unit from the drop down list.
   - Select **Manual Stop** to continue measuring the exposure until you press Stop.

4. Click **OK**. The **Exposure Setup** dialog box closes.
5. Click **Start**. For all modes except Manual Stop, the progress bar shows the continuing progress of the exposure measurements.
6. To stop the exposure measurements, click **Stop**, or wait for the exposure period to complete.
7. Click **Close** to close the **Exposure Screen** dialog box.

Adjusting Calibration Factors

Warning: *Adjusting the calibration factor makes a permanent change in the head. It is strongly recommended that before making any change to the factor, the original factory setting is recorded separately. This will make it easier to restore the value to its original setting later if needed.*

The sensitivity of the various Ophir pyroelectric sensors varies from one to another, as well as with wavelengths. Therefore, Ophir pyroelectric detectors are individually calibrated against NIST traceable standards. In addition, the calibration is corrected in the devices for different wavelengths. For more information on calibration, refer to *Appendix B – Calibration, Traceability, and Recalibration*.

☞***Note:*** *For metallic heads, when the calibration is changed at one laser wavelength, the overall calibration of all other wavelengths changes proportionately. For broadband heads, there is an option to adjust the calibration factor for all wavelengths or only for a selected wavelength.*

To adjust the energy calibration factor:

1. Click the right mouse button and select **Calibrate** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Calibrate**. The **Adjust Calibration Factor** dialog box appears.

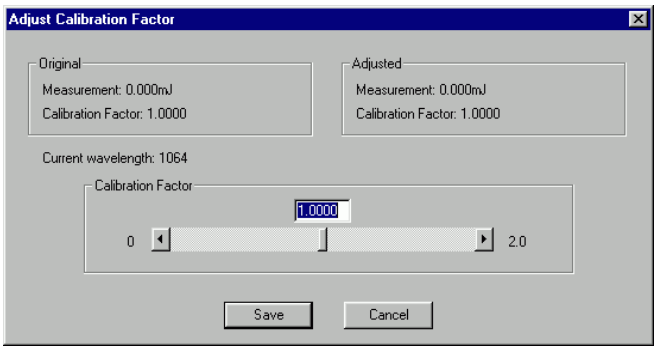


Figure 6-10 Adjust Calibration Factor Dialog Box – Metallic Head

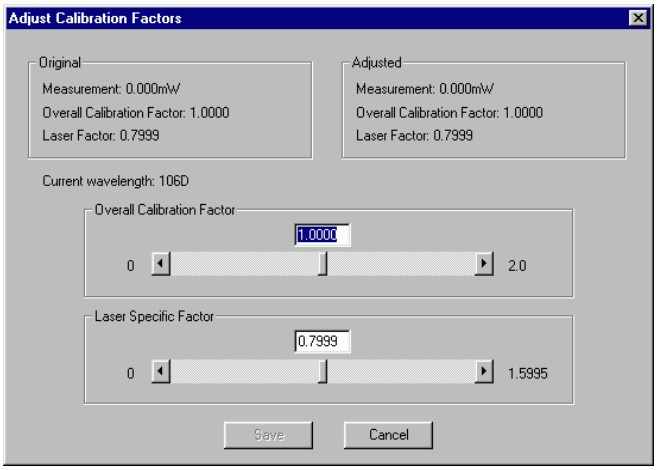


Figure 6-11 Adjust Calibration Factor Dialog Box – Broadband Head

   The **Original** area displays the original **Measurement** and **Calibration Factor**. The **Current wavelength** is displayed beneath the **Original** area.

2. Use the **Calibration Factor** scroll bar to attain an accurate reading in the **Calibration Factor** field in the **Adjusted** area.

   OR

   Enter the desired factor into the text box above the scroll bar.

3. Click **Save** to save the adjustment for the active channel.

Additional Graphical Display Options

The StarLab application enables you to configure and display readings in dBm scale and enables you to configure and apply normalization.

Displaying Readings in dBm Scale

To display readings in dBm scale for a pyroelectric head, refer to *Displaying Readings in dBm* Scale in *Chapter 5 – Measuring with the Photodiode Head.*

☞***Note:*** *You can only display reading in dBm scale while working in Power mode. This option is not available while working in Energy Mode.*

Applying Normalization

To apply normalization for a pyroelectric head, refer to *Applying Normalization* in *Chapter 5 – Measuring with the Photodiode Head.*

☞***Note:*** *You can only apply normalization for a pyroelectric head while working in Power mode. This option is not available while working in Energy Mode·*

Chapter 7 – External Triggers and Missing Pulses

This chapter provides an overview and instructions for working with External Triggers and Missing Pulses. These are supported only by the Pulsar device.

Topics in this chapter include:

- Overview of the External Trigger
- Hardware Considerations
- Configuring the External Trigger Settings
- Using the External Trigger for Input Mode
- Using the External Trigger in Output Mode

Overview of the External Trigger

The Pulsar device includes an External Trigger BNC connector, which can be used as an external trigger input or output when using energy detectors (pyroelectric or PD10 heads).

When configured as an **input**, a signal can be connected from the sync output of a laser or laser-system to the BNC connector. It can be used to detect and log missing pulses, or to lock out and ignore specific pulses or groups of pulses that are not interesting.

When configured as an **output**, the signal can be used to trigger external circuitry in sync with pulses on the head detector.

Hardware Considerations

The External Trigger **input** characteristics:

- Can be driven by any digital signal, TTL or CMOS, 3.3v or 5v logic.
- Can tolerate input voltages between 10v and -10v.
- A voltage is considered *high* when it is 2.4v or greater.
- A voltage is considered *low* when it is 0.6v or smaller.

The External Trigger **output** characteristics:

- Drives ~3.3v *high* level.
- Drives ~0v *low* level.

Configuring the External Trigger Settings

To configure the External Trigger Mode setting:

1. Click the External Trigger icon  .

   Or

   Select **Functions** from the main menu and from the sub-menu select **Trigger Configuration**.

   Or

   Right click anywhere on the screen, and select **Trigger Configuration** from the pop-up menu. The Trigger Configuration window appears.

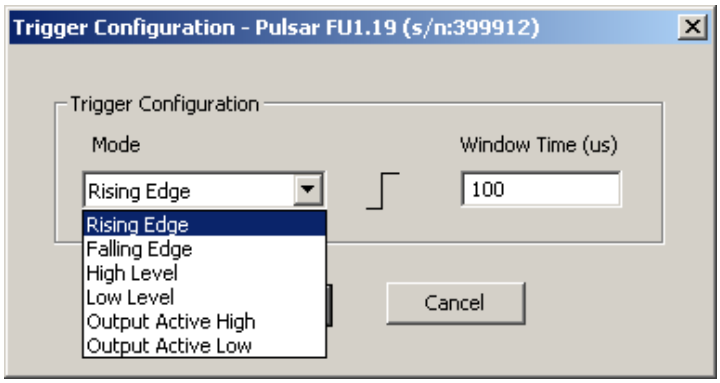


Figure 7-1 Trigger Configuration Window

2. Select the desired setting from the Mode drop-down.
3. Click **Save**. The External Trigger settings are configured.

Configuring the External Trigger Window Time

You can configure the window time for the External Trigger when using the Rising Edge or Falling Edge Trigger Configuration modes only.

Choosing the Window Time setting:

- Adjust the window time to be larger than the expected delay time between the laser pulse and the trigger signal (the trigger can be before or after the laser).
- The window time setting should be less than the laser period ("1/F", where 'F' refers to the laser frequency).

Refer to *Table 7-1* and *Figure 7-2* for more information on the Window Time.

To configure the Window Time setting:

1. In the Window Time text box, enter the desired Trigger Window time, between 1us (0.001ms) and 65535us (65.535ms).
2. Click **Save**. The Window Time setting is configured.

Using the External Trigger for Input Mode

You can set the External Trigger to use one of four available input modes: Rising Edge, Falling Edge, High Level, or Low Level.

Table 7-1 External Trigger Input Modes

Input Mode	Description
Rising Edge	• The device is sensitive to a trigger on the RISING EDGE of the input. • The trigger is valid for a pulse arriving during a window of time *before* or *after* the active (rising) edge (see *Figure* 7-2). • The inactive (falling) edge of the signal is ignored. • Missing Pulses are recorded when an External Trigger edge is received, but no pulse arrives within the Window Time before or after the active edge. • Pulses are ignored if they arrive outside the Window Time, before or after the active edge. • Multiple pulses within the Window Time are counted as one pulse.
Falling Edge	• The device is sensitive to a trigger on the FALLING EDGE of the input. • The trigger is valid for a pulse arriving during a window of time *before* or *after* the active (falling) edge (see *Figure* 7-2). • The inactive (rising) edge of the signal is ignored. • Missing Pulses are recorded when an External Trigger edge is received, but no pulse arrives within the Window Time before or after the active edge. • Pulses are ignored if they arrive outside the Window Time, before or after the active edge. • Multiple pulses within the Window Time are counted as one pulse.
High Level	• Pulses are recorded only when the input signal is at a HIGH LEVEL. • Any pulse arriving while the signal is high is counted. Any pulse arriving while the signal is low is ignored. • No Missing Pulses are recorded in this mode.
Low Level	• Pulses are recorded only when the input signal is at a LOW LEVEL. • Any pulse arriving while the signal is low is counted. Any pulse arriving while the signal is high is ignored. • No Missing Pulses are recorded in this mode.

The following figure describes the External Trigger Window Time with the Rising Edge mode selected.

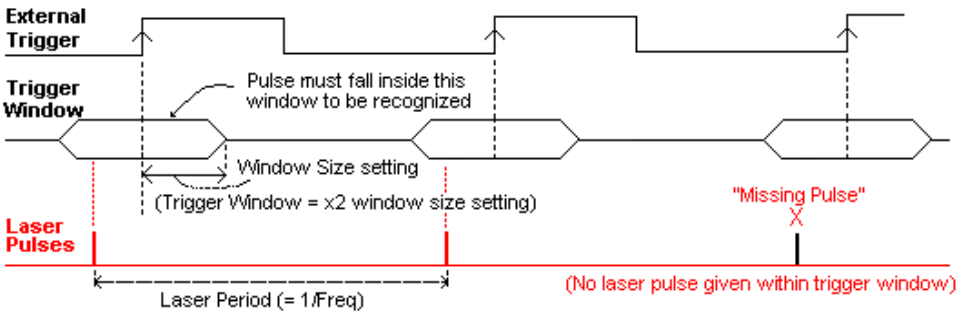


Figure 7-2 External Trigger Window Time – Rising Edge Mode

Enabling or Disabling a Channel to Work with External Trigger

Any active channel of the Pulsar can be configured to use the External Trigger, as long as the head is pyroelectric or PD10.

To enable or disable a channel:

1. In the Measurements Parameters area, in the **External Trigger** drop-down, select:
   - **On** to enable the External Trigger.
   - **Off** to disable the External Trigger.

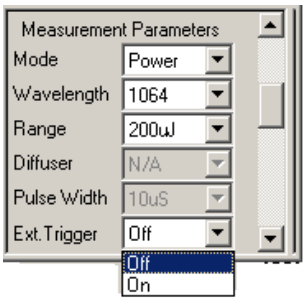


Figure 7-3 Measurement Parameters – Ext. Trigger Options

The External Trigger is enabled or disabled.

☞***Note:*** *When the External Trigger is not in use, ensure that the Ext. Trigger drop-down is set to Off. Otherwise the application may not function properly.*

Using the External Trigger in Output Mode

In addition to the input modes described in the previous section, the External Trigger BNC connector can be used as an **output** that can trigger any external circuitry. The output is a short digital pulse (10us), which occurs whenever a pulse is seen on the head detector.

☞***Note:*** *The exact timing delay between the pulse and the output signal depends on the type of head detector being used. For metallic*

pyroelectric or PD10 heads, the delay is ~5us. For Broad Band (BB) heads, the delay may be longer.

You can set the external trigger to one of two available output modes: Active High or Active Low.

Table 7-2 External Trigger Output Modes

Input Mode	Description
Active High	• Every time a pulse arrives on the head detector the output goes high for 10us and then returns back to low. • The default level of the output with no pulses is low.
Active Low	• Every time a pulse arrives on the head detector the output goes low for 10us and then returns back to high. • The default level of the output with no pulses is high.

Enabling the Active Channel for Output Control

The External Trigger mode of the device applies to all four of the device's channels at once. However, in output mode only one of the channels can be configured to drive the output at once. When the External Trigger is set for one channel, the External Trigger for all other active channels is disabled by the software.

When first entering one of the output modes, the software automatically sets the External Trigger to the lowest active channel, and disables the External Trigger drop-down for all other active channels (refer to *Figure 7-3*). For example, if Channels 1 and 2 are active on the Pulsar device, Channel 1's External Trigger drop-down is automatically set to On and the External Trigger drop-down for channel 2 is disabled.

To enable the External Trigger Output for a different channel:

1. Select **Off** in the Ext. Trigger drop-down, in the Measurement Parameters panel of whichever channel is enabled. The External Trigger drop-down for all the channels is now active.
2. Set the Ext. Trigger drop-down to **On** for the channel you want to enable. The channel is enabled.

Chapter 8 – Working with Multiple Heads

This chapter provides instructions for working with multiple heads and channels from various connected devices. Topics include:

- Connecting More than One Head
- Selecting Channels
- Viewing the List of Active Heads
- Viewing Multiple Windows

Connecting More than One Head

It is possible to attach more than one Ophir head to the PC in one of two ways: by using several single channel devices (USBI, Pulsar-1 and Quasar), or by using multiple channel devices (Pulsar-4 and Pulsar-2).

In the case of single channel USB devices (USBI, Pulsar-1) each device connects between one head and the PC. Multiple USB devices can be attached to the PC by using more than one USB port. Most PCs are equipped with between 2 and 6 USB ports. However, the USB standard specifies that up to 127 devices can be attached to one USB controller. The standard therefore defines a device called a hub. Hubs provide ports to allow multiple devices to be attached. The USBI device requires a hub that can provide power to downstream high-power devices. The Pulsar-4 (and Pulsar-2 and Pulsar-1) do not require power from the hub, but require a High Speed (USB 2.0 compliant) hub for optimum performance.

In the case of the Quasar device, a single *Bluetooth* radio adapter attached to the PC can connect to at least four Quasar devices at once. Operation with more than one radio device attached to the PC is not supported.

Using a multiple channel device (Pulsar-4 or Pulsar-2) up to four heads can be attached to the PC using a single device. Multiple heads can also be attached using a combination of these two methods.

Selecting Channels

The StarLab application allows you to work with multiple channels from various devices at the same time. The devices may be connected to many types of heads including thermopile, photodiode, pyroelectric or a combination of different head types. In addition to being able to connect the application to numerous channels at once, you can specify which of the connected channels you wish to view.

To select channels:

1. If the application is not yet open, from the desktop, double-click . The StarLab interface opens, and the **Select Device(s)** dialog box appears. If more than one head is connected to the device, then a list of connected heads will display.

   OR

   Click on the toolbar.

   OR

   Click **Select Device** from the menu bar. The **Select Device(s)** dialog box appears displaying a list of all the connected heads.

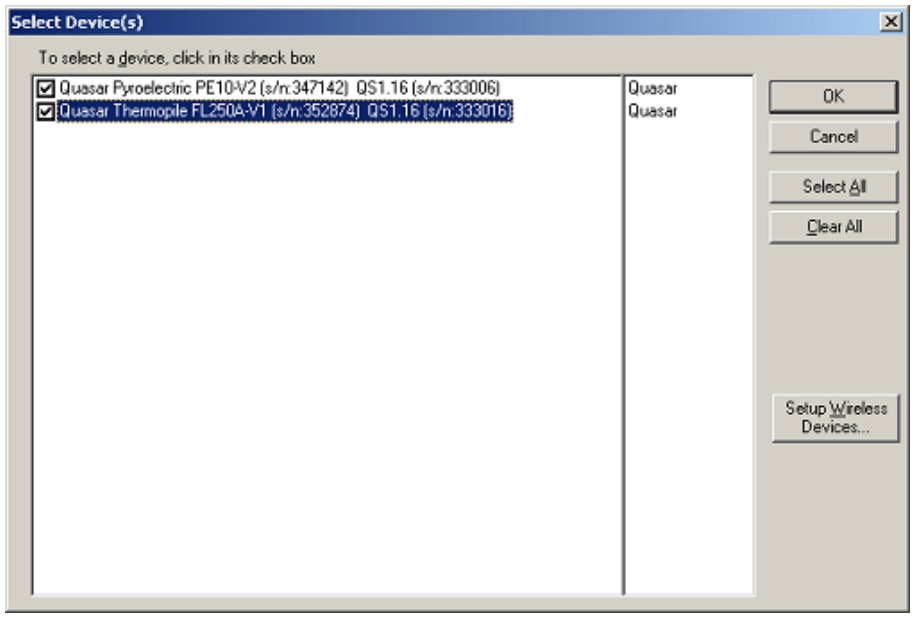


Figure 8-1 Select Device(s) Dialog Box

2. Select one or more heads with which you wish to work.

   OR

   Click **Select All** to select all the channels listed.

   OR

   Click **Clear All** to uncheck all the selected channels.

3. Click **OK** to save the selection and close the dialog box. The StarLab application will open a measurement window for each head selected.

4. With the Quasar, to add to the list of devices that StarLab recognizes, click **Setup Wireless Devices** from the Select Devices dialog box. Refer to section *Connecting the Quasar device*.

☞***Note:*** *If the software of any selected device requires upgrading, the OK button will be inactive until you have upgraded the device software. For information on upgrading device software, refer to Upgrading the Device's Internal Software in Chapter 3 – Getting Started.*

Viewing the List of Active Heads

You can view a list of all the currently active heads.

To view the list of active heads:

1. Click **Select Device** from the menu bar. The **Select Device(s)** dialog box appears, see *Figure 8-1*. The checked heads are the active heads.

   OR

   Open the **Window** menu. The active heads are listed below the line in the **Window** menu.

Viewing Multiple Windows

When working with more than one channel, you can arrange your window in several ways to view all active channel windows simultaneously.

To view multiple channel windows simultaneously:

1. Open the **Window** menu and select one of the following options:
   - **Cascade** – Cascades the channel windows one on top of the other.
   - **Tile Horizontally** – Tiles the channel windows horizontally.
   - **Tile Vertically** – Tiles the channel windows vertically.
   - **Arrange Icons** – Arranges any minimized icons at the foot of the USBI application window.

   The display refreshes automatically to reflect the selection. *Figure 8-2* shows two channel windows tiled horizontally.

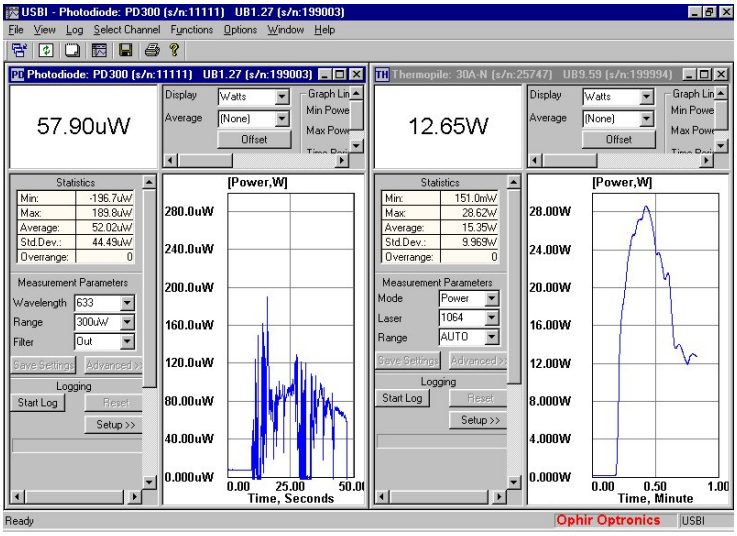


Figure 8-2 Two Channel Windows Tiled Horizontally

Chapter 9 – Working with Log Files

This chapter provides instructions for working with log files for thermopile, photodiode, and pyroelectric heads. Topics include:

- Default Location for Log Files
- Configuring Log File Settings
- Starting and Stopping the Log
- Using Turbo Mode
- Adding Notes to a Log File
- Choosing the Log File Format

Default Location for Log Files

By default, Windows XP/2000 saves log files in the application software installation directory; and Vista saves log files in Documents\StarLab (full path – C:\Users\<user>\Documents\StarLab). If the user changes the default file location, the system keeps the new default location even after reinstallation of a new version of the software.

Configuring Log File Settings

This section explains how to configure log file settings. You can log just one screen of data or you can specify the duration of the log or the number of measurements to be taken.

Logging One Screen of Data Only

To log one screen of data:

1. Click Setup >> in the Logging Area. The **Log Settings** dialog box appears.

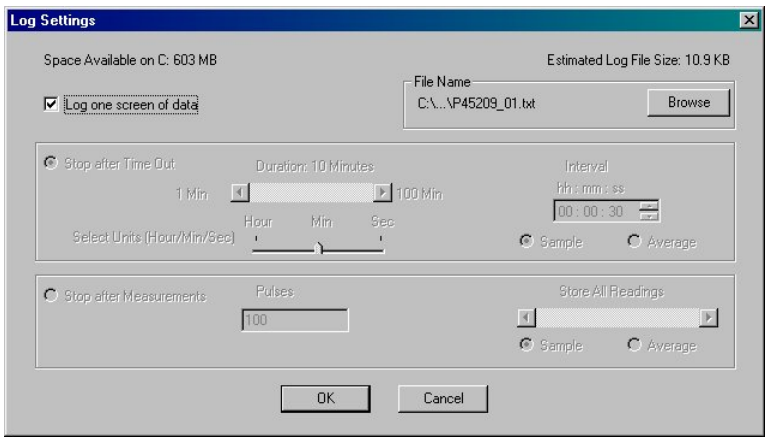


Figure 9-1 Log Settings Dialog Box – Log One Screen of Data

2. Select **Log one screen of data**.

3. Click **Browse** and select a file location to save the log data. The log data will be saved to the default file, as displayed in the **File Name** area.

☞***Note:*** *For details of the default location for log files, see section* Default Location for Log Files.

4. Click **OK** to save the log settings.

Configuring Log Duration

To configure the log duration:

1. Click Setup >> in the Logging Area. The **Log Settings** dialog box appears.

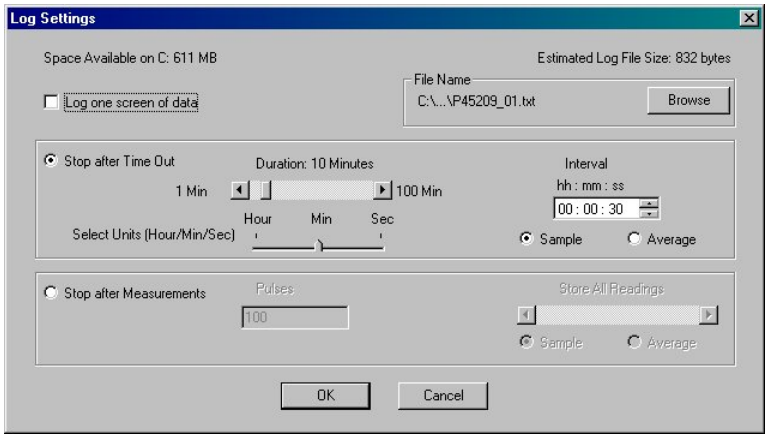


Figure 9-2 Log Settings Dialog Box – Stop after Time Out

2. Select **Stop after Time Out**.

3. In the Stop after Time Out area, use the **Select Units** pointer to select the unit of time (hours, minutes, or seconds) you wish to work with.

4. To configure the measurement interval, in the Stop after Time Out area of the **Log Settings** dialog box, use your cursor to set the hours, minutes, or seconds in the Interval field. Use the arrows to configure the measurement Interval.

   When logging power readings, a time interval can be set for measurements configured to stop after time out. The interval determines how often a measurement will be taken and added to the log.

5. Use the **Duration** scroll bar to set the log duration.

6. Select **Sample** to log one sample per interval.

   OR

   Select **Average** to log an average of all the readings in an interval.

7. Click **Browse** and select a file location to save the log data.

   OR

The log data will be saved to the default file, as displayed in the **File Name** area.

8. Click **OK** to save the log settings.

Configuring the Number of Measurements

To configure the log to end after a specified number of pulses:

1. Click Setup >> in the Logging Area. The **Log Settings** Dialog Box appears.

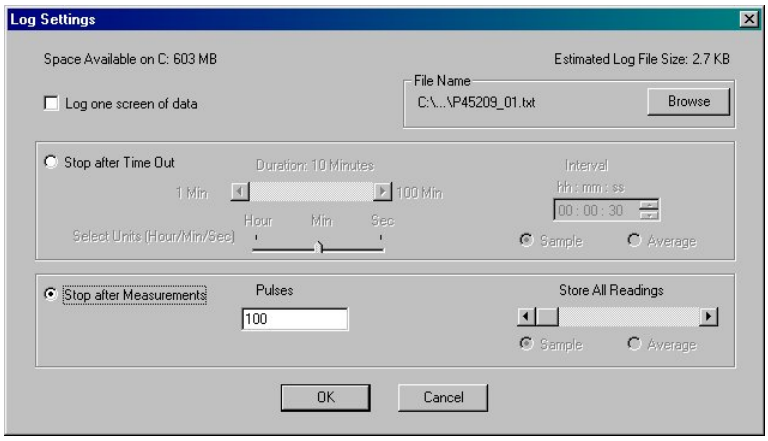


Figure 9-3 Log Settings Dialog Box – Stop after Measurements

2. In the **Log Settings** dialog box select **Stop after Measurements**.
3. In the Stop after Measurements area, enter the number of pulses you want to measure in the Pulses field.
4. In the Stop after Measurements area, drag the scroll bar to the right to set the value. As you move the scroll bar, the heading above the bar changes to **One out of # pulses**. You can choose one in 3, 10, 30, 100, 300, or 1000 pulses.

   OR

   Drag the scroll bar to the left. The heading above the bar changes to **Store all Readings**.

5. Select **Sample** to log one sample per interval.

   OR

   Select **Average** to log an average of all the readings in an interval.

6. Click **Browse** and select a file location to save the log data.

   Otherwise, the log data is be saved to the default file, as displayed in the File Name area.

7. Click **OK** to save the log settings.

Starting and Stopping the Log

This section explains how to start and stop saving data to a log file.

Starting the Log

To start the log:

1. Click Start in the Logging Area. The **Start Log** button toggles to **Pause** and a logging progress bar appears at the bottom of the Logging Area

☞***Note:*** *No changes can be made to the settings in the Measurement Parameters or Graph Configuration Areas for the duration of the log process.*

Pausing the Log

To pause the log:

1. Click Pause in the Logging Area. The **Pause** button toggles to **Reset** and the logging progress bar freezes.

Stopping the Log

To stop the log:

1. Click Reset in the Logging Area. StarLab will stop saving data to the log file. The **Pause** button toggles to **Start Log** and the logging progress bar disappears.

Using Turbo Mode

Although pyroelectric and PD10 heads can measure laser pulses fired at high frequencies, in standard logging mode the StarLab software can measure *every* pulse only when firing below a certain frequency. At higher laser frequencies, the USBI, Pulsar and Quasar are not capable of logging every pulse, but rather will log a sample of the measurements at a lower rate.

Therefore, the StarLab software provides a special log mode called Turbo Mode, which allows logging every pulse up to higher pulse rates.

☞***Note:*** *Turbo Mode always measures energy, even if the power mode is on.*

For the exact pulse rates at which every pulse can be logged using Turbo Mode, refer to *Table 1-1* and *Table 1-2*. When logging in Turbo Mode the rest of the StarLab application is unavailable.

For the USBI, Nova-II and Vega devices, Turbo mode is available only for metallic pyroelectric and PD10 heads configured for short pulse measurement.

For the Pulsar devices, Turbo Mode is always for all pyroelectric and PD10 heads, and allows synchronized data logging on all channels at the same time, by way of the micro-second resolution timestamps stored in the log files. For more information, see Choosing the Log File Format on page 78.

☞***Note:*** *For the Quasar device, Turbo Mode is not available.*

To log in Turbo mode for use with the USBI, Nova-II or Vega device:

1. Click the right mouse button and select **Turbo Mode** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Turbo Mode**. The **Turbo Mode** dialog box appears.

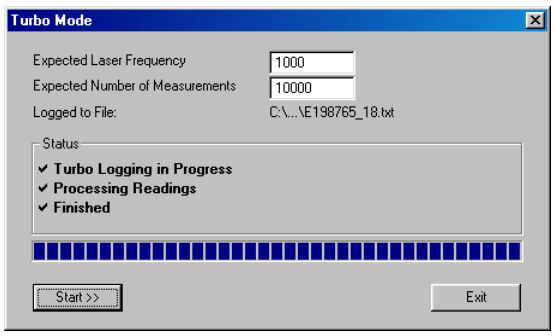


Figure 9-4 Turbo Mode Dialog Box

2. In the Expected Laser Frequency text box, type the expected laser frequency to log. This step is optional, but improves logging accuracy for some heads (for example, PE25).

3. To stop the logging at a specific number of measurements, type a number in the Expected Number of Measurements text box. Otherwise, Turbo logging continues until stopped manually.

4. Click **Start**. The Start button turns into a Stop button. If you typed a number in the Expected Number of Measurements text box, the progress bar shows the continuing progress of the logging.

   The file name of the log appears above the **Start/Stop** button. The log file is saved to the working directory of the StarLab application.

5. To stop Turbo logging, click **Stop**, or wait for the expected number of measurements to be logged.

6. Click **Exit** to close the dialog box.

To log in Turbo mode for use with the Pulsar device:

1. Click the right mouse button and select **Turbo Mode** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Turbo Mode**. The **Turbo Mode** dialog box appears displaying the active channels.

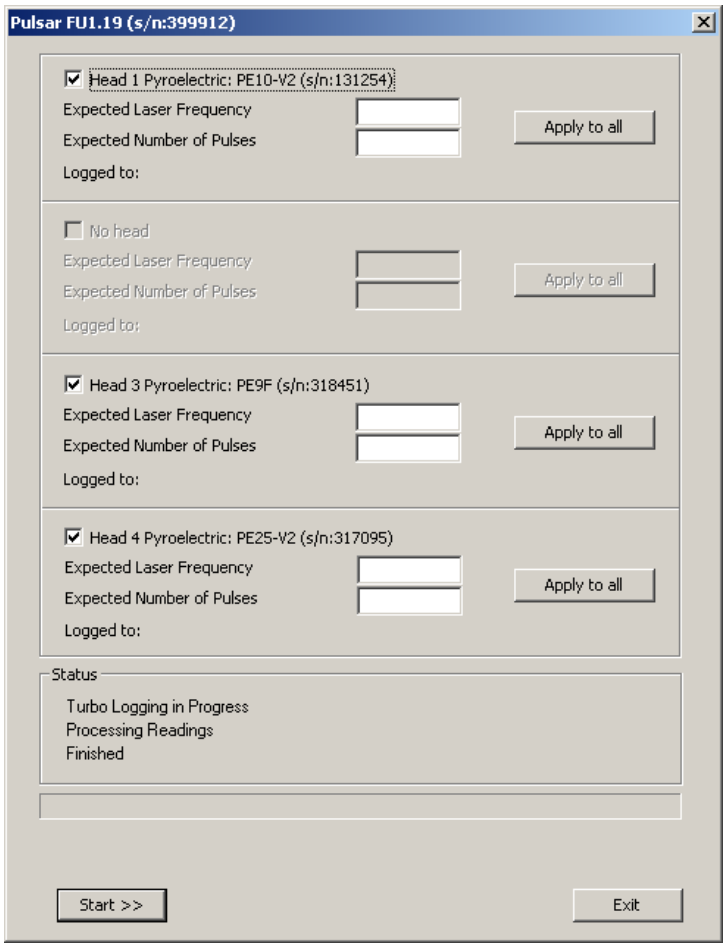


Figure 9-5 Turbo Mode Dialog Box

2. Check one or more of the heads to which you want to apply turbo mode. For each head:

   - In the Expected Laser Frequency text box, type the expected laser frequency to log. This step is compulsory, since it is used to calculate the size of the data buffer.

   - In the Expected Number of Pulses text box, type the expected or required number of pulses that are to be logged. This step is also compulsory.

     When logging a specific number of pulses with a laser that is continuously pulsing, the software stops automatically after ~10% more pulses than requested are logged.

When logging a specific number of pulses with a laser that stops after the specific number of pulses are given, the software does not stop automatically. When the laser has finished pulsing, stop logging manually, by clicking **Stop**.

To log an indefinitely large amount of data, enter a very large number in the text box, and stop logging manually by clicking **Stop**.

- Click **Apply to all** if you are entering the same information for all of the heads.

3. Click **Start**. The Start button turns into a Stop button. The progress bar shows the continuing progress of the logging.

   The file name of the log appears above the **Start/Stop** button. The log file is saved to the working directory of the StarLab application.

4. To stop Turbo logging, click **Stop**, or wait for the expected number of measurements to be logged.
5. Click **Exit** to close the dialog box.

☞ ***Note:*** *The application allocates a buffer size to collect data from all active heads at the same time. To allow for cases where different heads have different expected frequencies or expected numbers of pulses, and to allow for rounding errors in calculating the buffer size, the software sets the buffer size 10% larger than the highest expected number of pulses. Therefore, logging stops automatically after approximately 10% more than the expected number of pulses are logged on each channel. If the laser stops after a fixed number of pulses, the logging does not stop automatically, but rather must be stopped manually using the Stop button. Conversely, when using more than one head with different frequency lasers, entering too large of a value in the Expected Laser Frequency text box for one head can cause Turbo Mode to exit early without logging all the required data on each channel.*

Adding Notes to a Log File

This section describes how to add your own notes to a log file.

To add notes to a log file:

1. Open the **Log** menu and select **Notes**. The **Notes** dialog box appears.

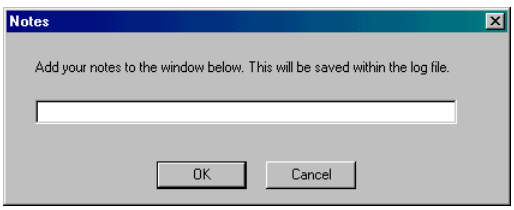


Figure 9-6 Notes Dialog Box

2. Enter a note into the text box.

3. Click **OK** to add the note to the log file.

Choosing the Log File Format

Log files are stored by the StarLab application as tab-delimited text files. Two file formats are available in the software, “Standard” and “Excel Friendly”, which differ only in the way the timestamp is recorded in the file.

Standard Format Log Files

This is the format used in older versions of the USBI application, and is retained in newer versions of StarLab for backwards compatibility. It is the default option. In this format, the timestamp is recorded as hours, minutes, seconds, and fractions of a second. For example: 12:34:56.789 (for the USBI, Nova-II or Vega devices, or with the Pulsar and Quasar devices using Thermopile and Photodiode heads), where 12 is the hours, 34 is the minutes, 56 is the seconds, and 789 is the fraction of a second. For the Pulsar and Quasar devices using Pyroelectric and PD10 heads, the timestamp appears as 12:34:56.789321, where 789321 is the fraction of a second with microsecond precision.

Excel Friendly Format Log Files

This format should be used when using Excel to process data stored in the log files. In this format, the timestamp is recorded in seconds and fractions of a second, in a manner more suited to Excel than the Standard format. For example: 45240.789 (for the USBI, Nova-II or Vega devices, or with the Pulsar and Quasar devices using Thermopile and Photodiode heads) where 45240 is the number of whole seconds (equaling 12 hours and 34 minutes), and 789 is the fraction of a second. For the Pulsar and Quasar devices using Pyroelectric and PD10 heads, the timestamp appears as 45240.789321, where 789321 is the fraction of a second with microsecond precision.

Selecting the Log File Format

1. Select **Preferences** from the Options menu. The **Preferences** dialog box appears.

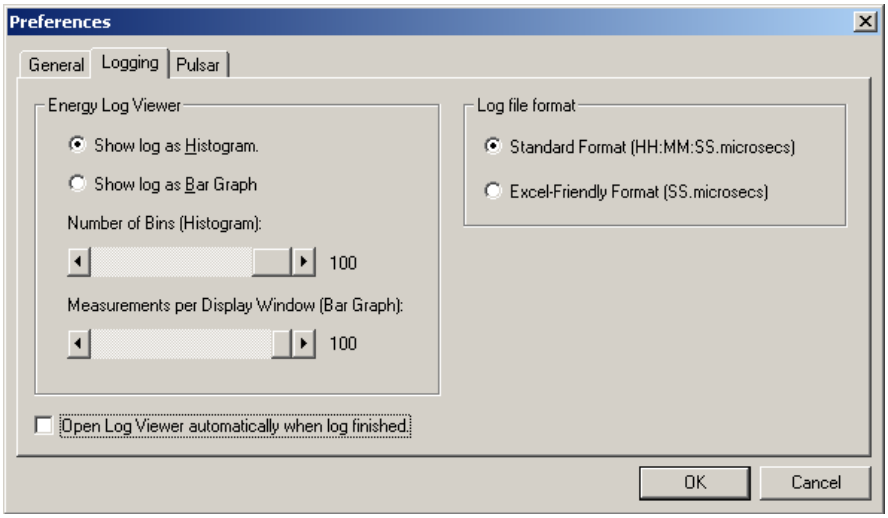


Figure 9-7 Preferences Dialog Box

2. Select the **Logging** tab.

3. In the Log file format area, select either **Standard Format** or **Excel Friendly Format**.

☞***Note:*** *With the USBI, Nova-II and Vega device, timestamps are stored in the log file with millisecond precision (three decimal places after the decimal point) and have a resolution of approximately 50ms. With the Pulsar and Quasar devices, using a pyroelectric or PD10 head, timestamps are stored in the log file with microsecond precision (six decimal places after the decimal point) and have a resolution of 1us. Using a thermopile or photodiode heads, timestamps are stored with millisecond precision.*

Chapter 10 – Viewing Log Files

Log files may be viewed graphically in the StarLab application's Log Viewer, as text in NotePad, or as a spreadsheet in Excel. This chapter provides explanations and instructions for viewing log files. Topics include:

- Accessing the Log Viewer
- Understanding the Log Viewer Window
- Using the Log Viewer for Power Readings
- Using the Log Viewer for Energy Readings
- Viewing Log Files in NotePad
- Opening Log Files in Excel

Accessing the Log Viewer

To open a log file in the StarLab application's Log Viewer:

1. Open the **File** menu and select **Open**. The **Open File** dialog box appears with the StarLab folder open.

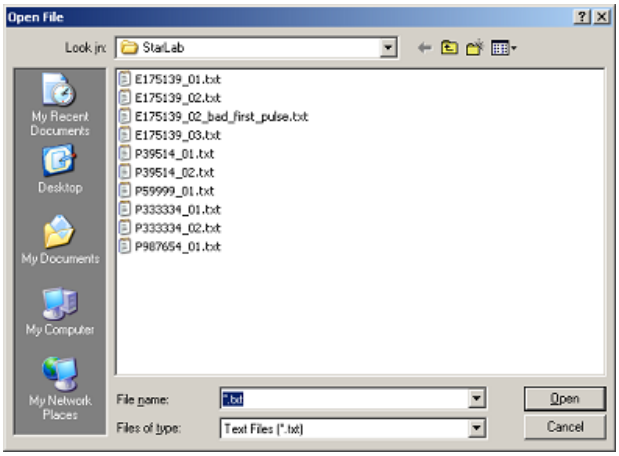


Figure 10-1 Open File Dialog Box

☞***Note:*** *For details of the default location for log files, see section* Default Location for Log Files

2. Select the required file and click **Open**. The log file opens in the StarLab application's Log Viewer.

☞***Note:*** *To close the Log Viewer, open the File menu and select Cancel.*

Understanding the Log Viewer Window

This section explains the Log Viewer window and the Log Viewer right mouse button functions. Certain elements of the StarLab application's Log Viewer window change depending on whether you are viewing power or energy readings. However, the basic layout remains the same and consists of the following areas: the Display Area, the Configuration Area, and the Statistics Area. In addition, the **Settings** menu in the Log Viewer replaces the normal **Functions** menu.

Figure 10-2 shows the Log Viewer window for photodiode head measurements.

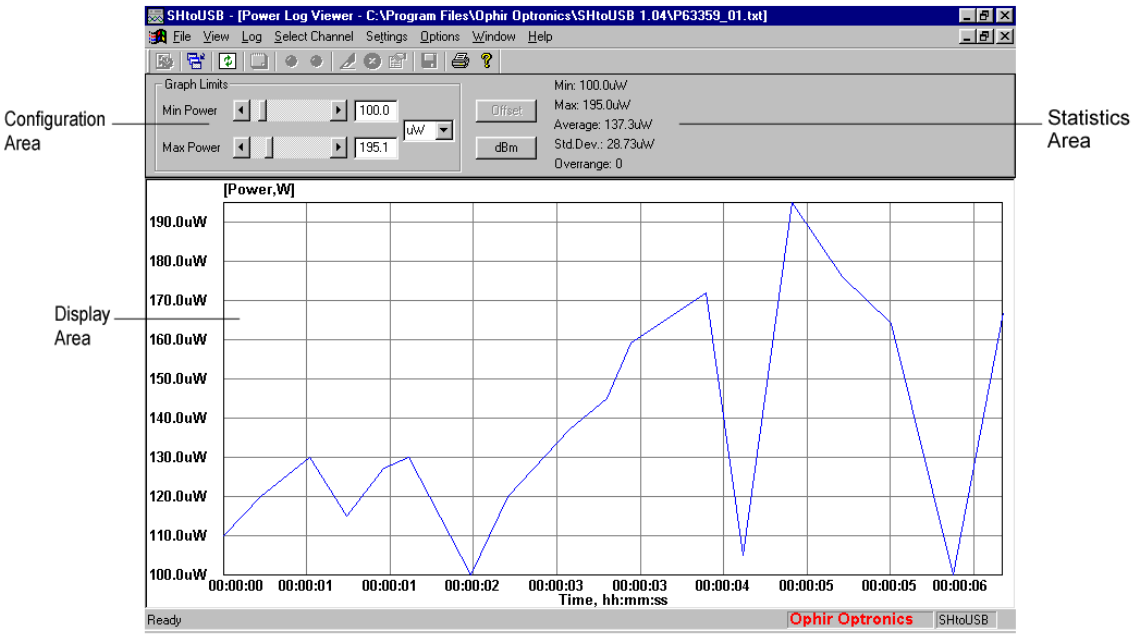


Figure 10-2 Log Viewer – Photodiode Measurements

- **The Display Area** – The Display Area shows log file data in graph form. The entire contents of a power log file data are displayed in one window, while energy log file data can span multiple windows.
- **The Configuration Area** – The Configuration Area is used to configure the log file display.
- **The Statistics Area** – The Statistics Area displays statistics for the currently displayed readings. For information on the Statistics Area, refer to *The Statistics Area* in *Chapter 3 – Getting Started.*
- **The Settings Menu** – The Settings menu enables you to zoom in and zoom out (for power readings only), and view log file information. The **Settings** menu is also available by clicking the right mouse button.

Using the Log Viewer for Power Readings

This section explains how to use the Log Viewer to view measurements taken in power mode. Tasks include configuring the graph limits of the display, applying dBm, toggling the offset, zooming in and out, and viewing log file information.

Configuring the Graph Limits

Graph limits are configured in the Configuration Area of the Log Viewer screen.

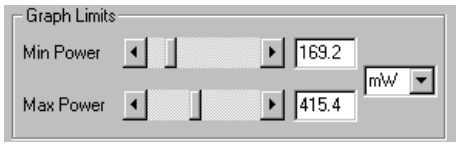


Figure 10-3 Log Viewer – Configuring Graph Limits

To configure the graph limits:

1. In the **Graph Limits** area, use the **Min Power** and **Max Power** scroll bar or the arrows to select minimum and maximum power.

   OR

   Enter the minimum and maximum power in the text boxes provided in the **Graph Limits** area.

   The graph in the Display Area adjusts itself automatically and the selected graph limits are displayed to the right of the scroll bars.

2. Select the power scale from the drop down list.

Applying dBm

The Log Viewer displays logged data in the mode (linear or dBm) in which the measurements were originally taken. Even if the measurements were taken in linear mode, dBm can be applied to the Log Viewer display.

To view the log file in dBm:

1. Click dBm in the Configuration Area of the Log Viewer window. dBm configuration settings appear in the **Graph Limits** area.

Figure 10-4 Log Viewer – Configuring Graph Limits for dBm Scale

2. Use the **Min Value** and **Max Value** pointers to select the minimum and maximum dBm values. Either drag the pointers or click to the right or left of the pointers. The graph in the Display Area adjusts itself automatically, and the selected dBm graph limits are displayed to the right of the pointers.

Toggling the Offset

The **Offset** button in the Log Viewer is used to remove an offset that was applied to the measurements in the log file, or to reapply the offset.

☞***Note:*** *If no offset was applied to the original measurements, the Offset button is not available in the Log Viewer.*

To view measurements without the offset:

1. Click Offset. The offset feature is turned off.

To reapply the offset:

1. Click Offset. The offset feature is turned on.

Zooming In and Zooming Out

The zoom feature allows you to magnify a section of the Display Area.

To zoom in:

1. Click and drag your mouse on the Display Area. A red box appears, which selects the area you wish to enlarge.
2. Release the mouse button. The selected area is enlarged.

To zoom out one level:

1. Open the **Settings** menu and select **Unzoom One Level**.

   OR

   Right-click in the selected area and select **Unzoom One Level**. The selected area returns to the size it was before it was last enlarged.

To reset the zoom:

1. Open the **Settings** menu and select **Reset Zoom**. The selected area returns to its original size.

Viewing Log File Information for Power Readings

To view information about measurements taken:

1. Open the **Settings** menu and select **Info**.

   OR

   Right-click and select **Info**. The **Log Information** dialog box appears displaying log file information.

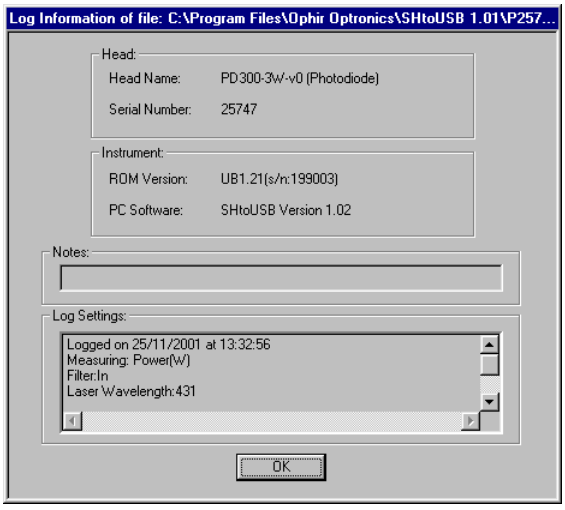


Figure 10-5 Log Information Dialog Box

2. Click **OK** to close the **Log Information** dialog box.

Using the Log Viewer for Energy Readings

This section explains how to use the Log Viewer to view energy measurements taken with the thermopile or pyroelectric head in energy mode. Tasks include configuring the histogram and bar graph settings, configuring the histogram and bar graph limits, and viewing log file information.

☞***Note:*** *The dBm, Offset, and Zoom features are not available for energy readings.*

Configuring the Histogram Settings

An energy log file can be displayed as a histogram. Histogram settings are configured in the Configuration Area.

☞***Note:*** *To configure default histogram settings, refer to Setting Log Viewer Preferences on page 86.*

To view the logged measurements as a histogram:

1. Click **Histogram** in the Configuration Area of the Log Viewer window. The histogram configuration settings appear.

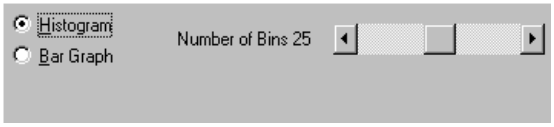


Figure 10-6 Log Viewer – Histogram Configuration Settings

2. Use the scroll bar or arrows to select the number of bins.

Configuring the Bar Graph Settings

An energy log file can be displayed as a bar graph. Bar graph settings are configured in the Configuration Area.

☞***Note:*** *To configure default bar graph settings, refer to Setting Log Viewer Preferences on page 86.*

To view the logged measurements in a bar graph:

1. Click **Bar Graph** in the Configuration Area of the Log Viewer window. The bar graph configuration settings appear.

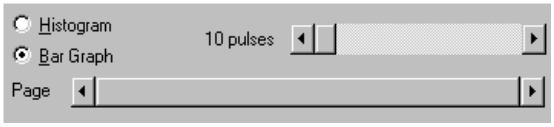


Figure 10-7 Log Viewer – Bar Graph Settings

2. Use the **pulses** scroll bar or arrows to select the number of pulses. The number of pulses selected is displayed to the left of the scroll bar and beneath the bar graph.

3. Use the **Page** scroll bar or arrows to view the previous and next pages.

Configuring Histogram or Bar Graph Limits

Graph limits are configured in the Configuration Area of the Log Viewer window.

To configure the graph limits:

1. In the Graph Limits area, use the **Min Energy** and **Max Energy** scroll bars or arrows to select minimum and maximum power.

   OR

   Enter the minimum and maximum power in the text boxes provided in the Graph Limits area. The graph in the Display Area adjusts itself automatically and the selected graph limits are displayed to the right of the scroll bars.

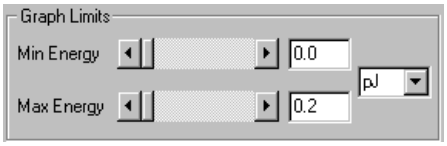


Figure 10-8 Log Viewer – Configuring Histogram or Bar Graph Limits

2. Use the drop down list to select the energy unit.

Setting Log Viewer Preferences

The default Log Viewer display for energy readings can be set in the **Preferences** dialog box.

To configure the Log Viewer to show the log as a histogram:

1. Open the **Options** menu and select **Preferences**. The **Preferences** dialog box appears.
2. Select the **Logging** tab.

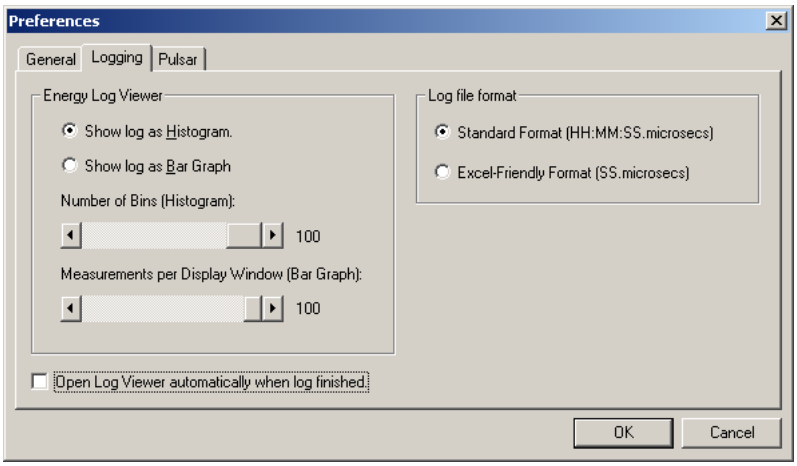


Figure 10-9 Preferences Dialog Box, Logging Tab

3. In the Energy Log Viewer area, select **Show log as Histogram**.
4. In the Number of Bins field, use the scroll bar or the arrows to select the number of bins.
5. Click **OK** to save the setting.

To configure the Log Viewer to show the log as a bar graph:

1. From the **Preferences** dialog box, with the **Log Viewer** tab selected (see *Figure 10-9*), select **Show log as Bar Graph** in the Energy Log Viewer area.
2. In the Measurements per Display Window field, use the scroll bar or the arrows to select the number of measurements per display window.
3. Click **OK** to save the setting.

Viewing Log File Information for Energy Readings

To view information about energy readings, refer to *Viewing Log File Information for Power Readings* on page 84.

Viewing Log Files in NotePad

This section explains how to view a log file in NotePad, and defines the log file entries.

Opening a Log File in NotePad

To open a log file in NotePad:

1. Open the **File** menu and select **Open File As Text**. The **Open File** dialog box appears with the USBI folder open.

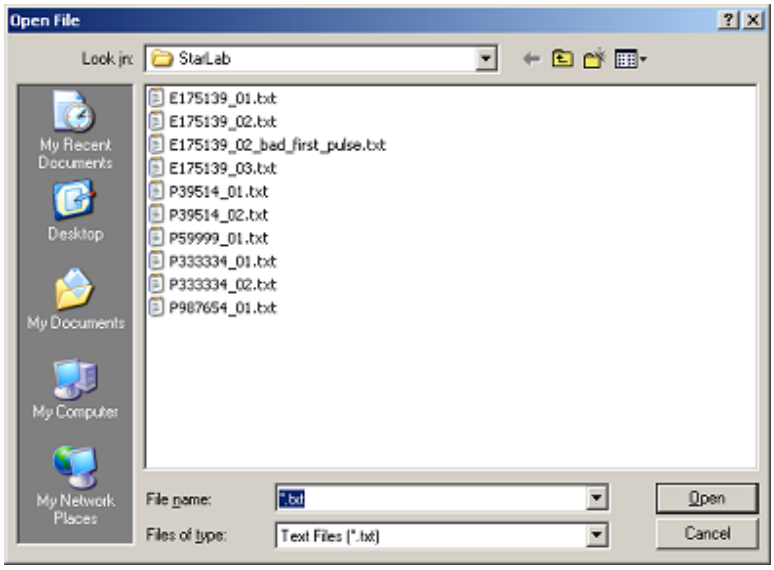


Figure 10-10 Open File Dialog Box

2. Select the directory in which the log file is stored.
3. Select the required file and click **Open**. The log file opens in NotePad.

Understanding Log File Entries

Table 10-1 lists the StarLab log file entries:

Table 10-1 Log File Entries

Log File Entry	Description
Caption	Serial number of the device, serial number of the head, and head number within the device.
Head	Head type: • TH – Thermopile head • PH – Photodiode head • PY or NJ – pyroelectric head
Head name	The name of the head.
Time	Date and time of log on.
Mode	Mode used: • Power • Energy
Units	Unit measured: • Joules • Watts
Notes	Notes added manually.
Filter (Photodiode heads only)	Filter used: • In • Out
Info: Laser Wavelength	Laser wavelength used.
Info: Range	Range used.
Info: Pulse Width	Laser pulse width used
Info: Diffuser (Pyroelectric heads equipped with Diffuser only)	Diffuser setting: • In • Out
Info: Threshold (Thermopile heads, energy mode only)	Threshold set: • LOW • MED • HIGH • OPTICAL
Info: Offset	Offset value, if set.

Log File Entry	Description
Info: Missing Pulses Detect	• On • Off ☞**Note:** This feature is only supported by the Pulsar device.
Info: dBm mode	dBm mode: • On • Off

Opening Log Files in Excel

This section explains how to open a log file using Excel, so that the log file can be processed as a spread sheet.

Opening a Log File in Stored in the "Excel Friendly" Format

For more information on log file formats, see *Choosing the Log File Format* on page 78.

To open a log file stored in Excel Friendly format from the StarLab application:

1. Select either **Open** or **Open File As Text** from the **File** menu. The **Open File** dialog box appears.
2. Select the directory in which the log file is stored.
3. Click the filename of the required file.
4. Right-click the file icon in the upper window.
5. From the pop-up menu select **Open With** – **Microsoft Office Excel** (see the following figure).

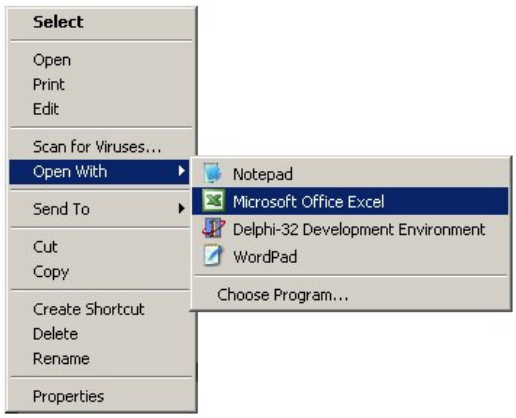


Figure 10-11 Open File Dialog Box

The log file opens.

To open a log file stored in Excel Friendly format outside the StarLab application:

1. Use the Windows Explorer to locate and select the log file.
2. Right-click on the file name, select **Open With** from the pop-up menu, and select **Microsoft Excel** from the sub menu.

   The log file opens inside Excel as a spread sheet with two active columns: Energy in joules and Timestamp in seconds.

Opening a Log File Stored in Standard Format Using Excel

A log file stored in the Standard format can also be opened using Microsoft Excel, but it is more difficult than opening a log file stored in Excel Friendly format. For more details, refer to the Microsoft Excel Help section.

To open a log file stored in Standard format:

1. From the Windows taskbar, select **Start** – **All Programs** – **Microsoft Excel** to open Microsoft Excel from Windows. Microsoft Excel opens.
2. In Excel, from the menu select **File – Open**. The **File Open** dialog box appears.
3. In the Files of Type area, select **Text files**.
4. Navigate to the directory in which the log file is located (see section *Default Location for Log Files*; by default, the StarLab application directory is under **\Program Files\Ophir Optronics**). Select the log file icon and click **Open**. The Text Import Wizard appears.

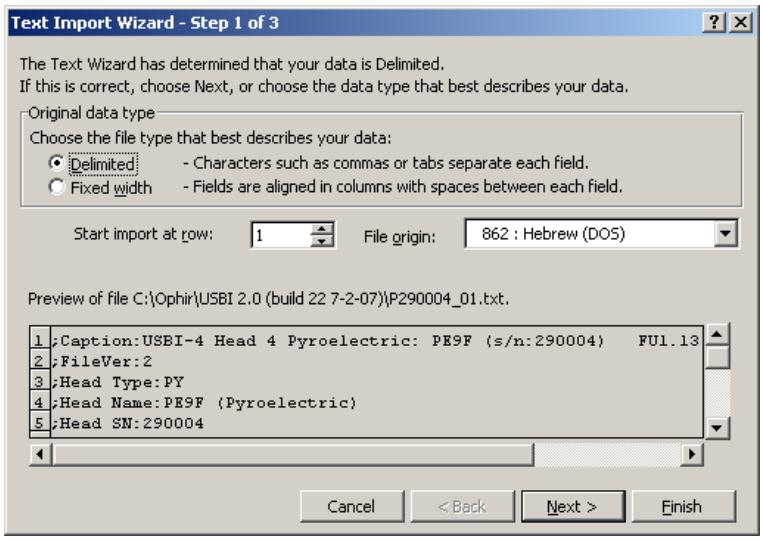


Figure 10-12 Text Import Wizard Step 1 of 3 Dialog Box

5. In the Original data type area, select **Delimited** (the default) and click **Next**. The second step of the Text Import Wizard appears.

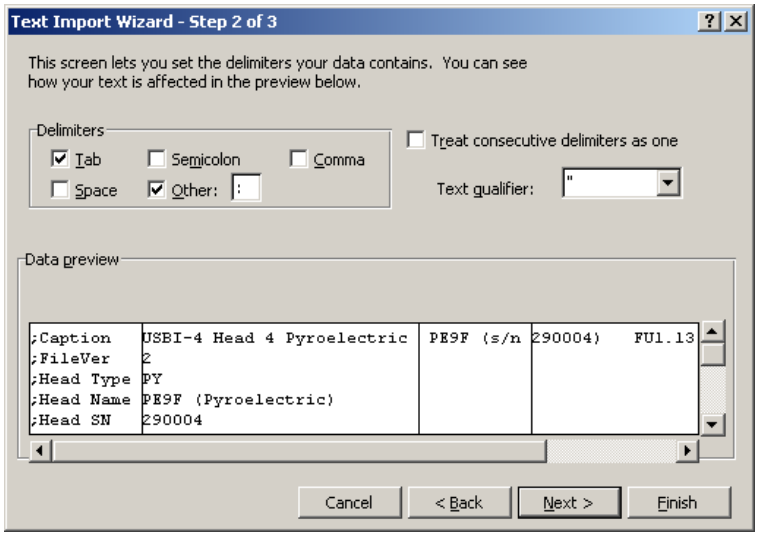


Figure 10-13 Text Import Wizard Step 2 of 3 Dialog Box

6. In the Delimiters area, check **Tab** (the default) and **Other**. In the text box to the right of **Other** enter the colon symbol (":").

7. Click **Finish**.

   The log file opens in a spread sheet, with four active columns.

   - Column A contains the energy measurements.
   - Column B contains the hours from the timestamp.
   - Column C contains the minutes from the timestamp.
   - Column D contains the seconds and fractions of a second from the timestamp.

8. If the log contains timestamps longer than 59 seconds and accurate timestamps are required:

   a. Calculate the total seconds in Column E. Apply the following formula to cell E1: "= 60*60*B1 + 60*C1 + D1".

   b. Drag the cell to any additional rows to apply the formula and calculate the total seconds for those rows.

   Accurate timestamps appear in the fifth column of the log file.

Appendix A – Toolbar Guide

The following is a brief description of each icon on the StarLab toolbar.

Table A-1 Toolbar Guide

Icon	Description
	Select Channels
	Restart the Application
	Clear the Screen
	Restore Active Window
	Store Last Measurements
	Trigger Configuration
	Upload Nova-II or Vega Files to PC
	Print
	View Help

Appendix B – Calibration, Traceability, and Recalibration

Ophir develops three main types of heads: thermopile, photodiode, and pyroelectric. Each type of head needs to be calibrated and recalibrated in a specific way.

Ophir Thermopile Heads

Ophir develops two kinds of thermopile heads – Surface Absorbers and Volume Absorbers. This section describes the range of Ophir thermopile heads.

Surface Absorbers

BB (Broadband) Absorber - A special refractory coating is used to provide high absorption from the UV through to the IR on standard, high power density, broadband monitor heads. This coating withstands very high power densities, of up to 20 kW/cm², without changing calibration. The absorption ability of this coating is above 90% for most of its range.

EX (Excimer) Absorber - The EX Absorber provides high absorption in the UV, and can withstand both the pulse energies and the average power of excimer lasers. These discs also have excellent absorption for 10.6μm and other wavelengths. Therefore, they can also be used for other types of lasers.

LP1 (long pulse) absorber - This absorber has a very high damage threshold for long pulse (ms) or continuous lasers and is therefore offered for use with high power and energy lasers. It is calibrated for the spectral range 250 – 2200nm with some heads also being calibrated for 2940nm. It is not suitable for long wavelength CO2 operation.

LP (Long Pulse) Absorber - The LP Absorber has a particularly high damage threshold for long pulse (ms), or continuous lasers and is therefore offered for use with high power heads. It is calibrated for use with the YAG laser at 1.064μm, or the CO_2 laser at 10.6μm, and absorbs about 90% at these wavelengths.

The absorption of the various Ophir absorbers as a function of wavelength is shown in *Figure B-1* on page 94.

Volume Absorbers

P (Pulse) Type Absorber - The models with the P suffix, are used with pulsed lasers, and have a special absorbing glass with an absorbance of 95 $\pm$2% over the operating range. Since the surface is glass, its reflectivity does not change even if damaged or melted locally.

HE/HE1 (High Energy) Absorber - The HE and HE1 Absorbers have a particularly high damage threshold for pulsed and repetitively pulsed lasers, of

both the short and long pulse variety. The HE and HE1 Absorbers are useful where the highest pulse energies and average powers are used.

SV Absorber - The SV Absorber is the absorber of choice for difficult applications with short pulses having both high average power density and high energy density.

The absorption of the various Ophir absorbers as a function of wavelength is shown in *Figure B-1* on page 94.

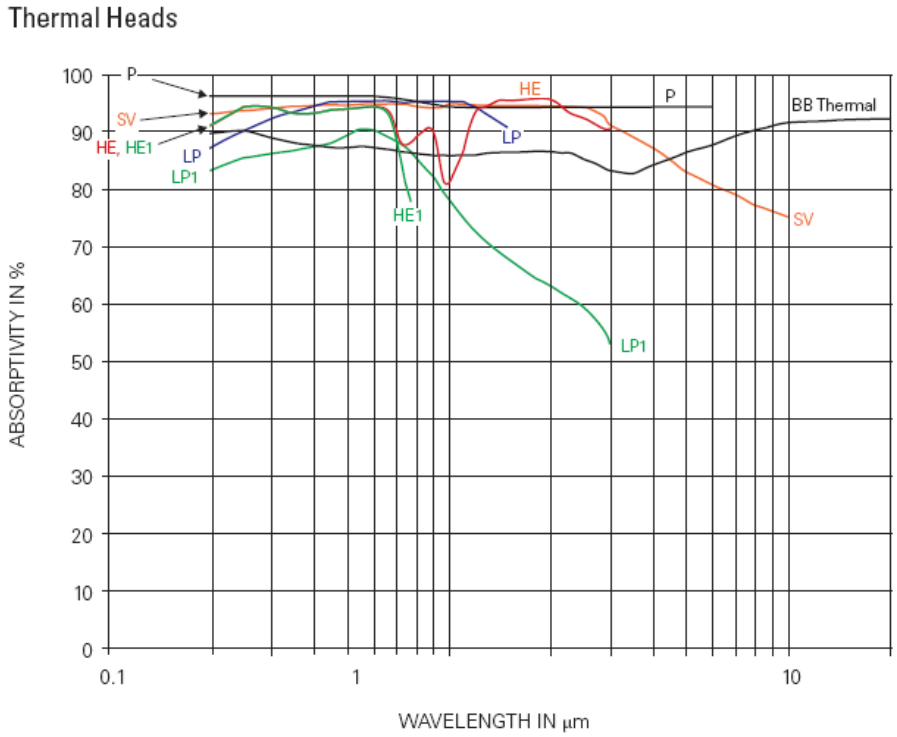


Figure B-1 Absorption of Ophir Absorbers vs. Wavelength

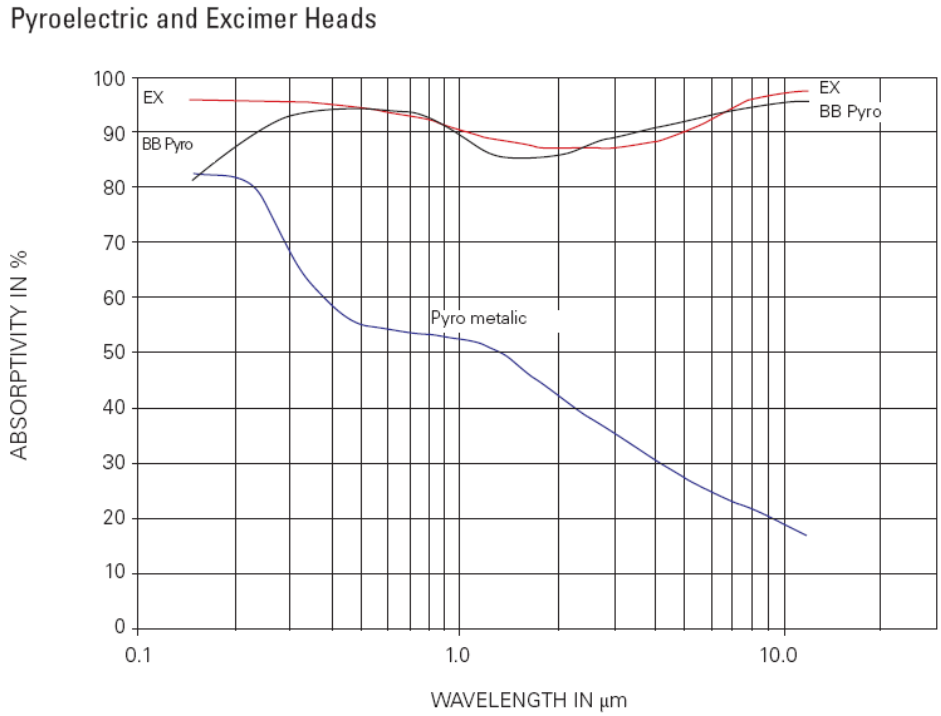


Figure B-2 Absorption vs. Wavelength of Pyroelectric and Excimer Head Absorbers

Factory Calibration of Thermopile Heads

The absorption of the various Ophir thermal absorbers can vary from disc to disc. Therefore, all Ophir absorbers are individually calibrated against NIST traceable standards. Ophir power/energy meters with the broadband or P type absorbers are individually calibrated by laser at several wavelengths against a NIST calibrated standard meter. The meter can be switched to give the exact calibration at the various wavelengths, for example, Argon, YAG, and where applicable, CO2.

The EX type detector is calibrated by measuring the ratio of absorption in the UV to that at 515nm. In both cases, the total absorption is measured using an integrating sphere. The detector is then calibrated with an argon laser and given a correction factor from this ratio.

Linearity and Accuracy of Thermopile Heads

Linearity

The linearity of most Ophir thermal detectors is specified to be 1% over the specified power range of each particular instrument, and is periodically tested by Ophir.

For models whose linearity is not tested over their entire range, samples are randomly chosen and periodically tested over their entire range. The test is performed with a high power laser that covers the entire detector range using a rear leak detector for comparison. The rear leak detector is a low power Ophir detector that has previously been tested for linearity. In all cases, the linearity of the detectors is traceable to electrical standards.

Accuracy of Calibration

Since the instruments are calibrated against NIST standards, the accuracy is generally 1% at the power level at which the calibration has been performed. This accuracy has been verified by checking the scatter of the results when several instruments are calibrated against the same standard. The maximum measurement error is less than the sum of the specified accuracy and linearity. Since the linearity is also 1%, the maximum error in measurement is generally less than 2%.

Recalibration from a Known Source of Laser Power

3A Series	1 Watt	7 Volts
10A Series	10 Watts	17 Volts
30A Series	30 Watts	35 Volts
150A Series	100 Watts	65 Volts
L250A Series	200 Watts	95 Volts
300W Series	125 Watts	65 Volts
1500W Series and above	200 Watts	95 Volts

To adjust the power calibration for one wavelength only:

1. Click the right mouse button and select **Calibrate** from the pop-up menu (see *Table 3-2*).

   OR

   Open the **Functions** menu and select **Calibrate**. The **Adjust Calibration Factors** dialog box appears.

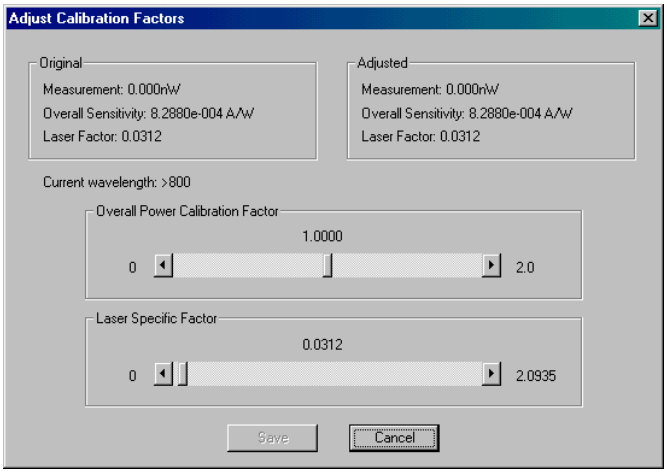


Figure B-3 Adjust Calibration Factors Dialog Box

The **Original** area displays the original **Measurement**, **Overall Sensitivity** and **Laser Factor** fields. The **Current wavelength** is displayed beneath the **Original** area, refer to Note on page 97.

2. Apply the known laser power.

3. Adjust the **Laser Specific Factor** until the **Adjusted** measurement equals the power applied to the head. Adjusting the Laser Specific Factor effects both the **Measurement** and the **Laser Factor** values.

4. Click **Save** to save the adjustment for the active channel.

☞***Note:*** *For units that have different calibration factors (e.g., CO2, YAG, or VIS), select the correct laser wavelength from the main Configuration Area before calibration. Only the calibration of the chosen laser wavelength changes.*

For more information on calibrating all wavelengths proportionately, refer to Factory Calibration of Thermopile Heads.

☞***Note:*** *Changing power calibration also changes energy calibration proportionately. However, changing the energy calibration does not change the power calibration.*

Recalibration from a Known Source of Laser Energy

Ophir heads are equipped with one overall energy calibration factor.

To recalibrate from a known source of laser energy:

1. Click the right mouse button and select **Calibrate** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Calibrate**. The **Adjust Calibration Factors** dialog box appears.

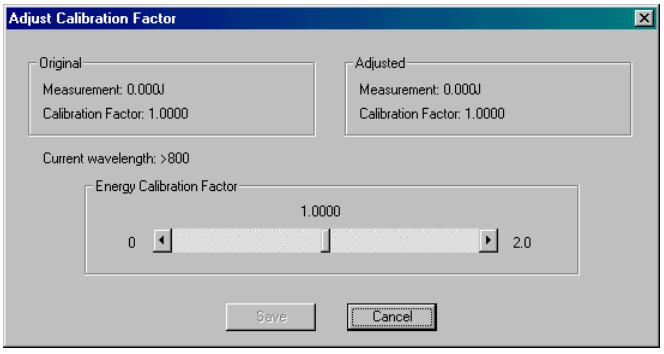


Figure B-4 Adjust Calibration Factors Dialog Box

   The **Original** area displays the original **Measurement** and **Calibration Factor** fields. The **Current wavelength** is displayed beneath the **Original** area, refer to Note on page 98.

2. Apply the known laser energy.

3. Adjust the **Calibration Factor** until the **Adjusted** measurement equals the energy applied to the head.

4. Click **Save** to save the adjustment for the active channel.

☞***Note:*** *For units that have different calibration factors (e.g., CO2, YAG, or VIS), select the correct laser in the main Configuration Area before calibration.*

☞***Note:*** *Changing energy calibration at one wavelength will affect all other wavelengths proportionately. However, changing the energy calibration will not change the power calibration.*

Ophir Photodiode Heads

This section discuses calibration of Ophir photodiode heads.

Factory Calibration of Photodiode Heads

Photodiode detectors are inherently very linear but also have a large variation in sensitivity with wavelength. In addition, the Ophir model PD300 is equipped with both a built in filter and removable filter to allow measurement of higher powers without detector saturation. These filters also have a transmission that depends on wavelength. Therefore, the PD300 has a built in calibration adjustment for wavelength.

The sensitivity of various Ophir photodiode sensors can vary from one to another as well as with wavelengths. Therefore, Ophir photodiode detectors are individually calibrated against NIST traceable standards over the entire operating range of wavelengths for both filter out and filter in. The calibration curve is normalized to the correct absolute calibration at 632.8 nm using a HeNe laser against a reference meter traceable to NIST.

The spectral sensitivity curve of the detector and the spectral transmission curve of the filters are fed into the head EEROM. This information is used to set the gain to the proper value at wavelengths other than the wavelength at which the instrument was calibrated. When the user selects his wavelength on the instrument, the correction factor for that wavelength is applied.

Linearity and Accuracy of Photodiode Heads

Since the instruments are calibrated against NIST standards, the accuracy is generally ±2% at the wavelength that the calibration has been performed. The maximum error in measurement will be less than the sum of:

calibration accuracy + linearity + inaccuracy due to errors in the wavelength curve + variations in gain with temperature

The linearity of the photodiode detector is extremely high and errors due to this factor can be ignored. *Table B-2* shows the maximum error due to the factors described here.

Table B-2 Maximum Error as a Function of Wavelength and Filter

Wavelength	Error, Filter Out				
	PD300	PD300 - 3W	PD300 - UV	PD300 - IR	3A - IS
220-250nm			±6%		
250-360nm			±3%		
360-400nm	±10%	±10%	±3%		
400-950nm	±3%	±3%	±3%		±5%
950-1100nm	±5%	±5%	±5%	±4%	±10%
1100-1700nm				±4%	
1700-1800nm				±7%	

☞***Note:*** *Add ±2% to error for filter in (±4% for PD300-UV from 220 to 300nm).*

User Recalibration

Adjusting Calibration Factors of Photodiode Heads

To adjust the power calibration factor:

1. Click the right mouse button and select **Calibrate** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Calibrate**. The **Adjust Calibration Factor** dialog box appears.

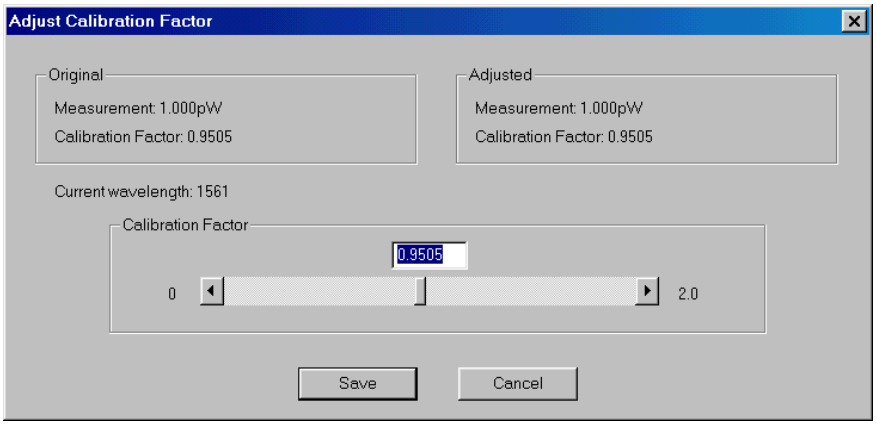


Figure B-5 Adjust Calibration Factor Dialog Box

The **Original** area displays the original **Measurement** and **Calibration Factor**. The **Current wavelength** is displayed beneath the **Original** area.

☞***Note:*** *A different wavelength can be selected in the Measurement Parameters Area.*

2. Apply the known laser power.
3. Adjust the **Calibration Factor** until the **Adjusted** measurement equals the power applied to the head.
4. Click **Save** to save the adjustment for the active channel.

☞***Note:*** *The relative readings at different wavelengths are fixed by the wavelength calibration curve stored in the head EEROM. When changing the calibration at one wavelength, the calibration at all other wavelengths changes proportionately.*

Ophir Pyroelectric Heads

This section discusses calibration of Ophir pyroelectric heads. Two types of absorber surface are used in Ophir pyroelectric measuring heads:

- **Metallic –** Metallic heads do not have a BB suffix in the head name. They have a partially reflective multi-layer metallic coating that absorbs approximately 50% of the laser pulse, refer to *Figure B-6*. The metallic coating permits very high repetition rates, up to 5000Hz, as well as relatively high damage threshold.
- **Broadband –** Broadband heads have a BB suffix in the head name. They have a broadband black absorbing coating to provide high absorptivity from the UV through the IR. This coating can withstand energy densities, up to 0.3J/cm² for short pulses and 2J/m² for long pulses, without changing calibration. The absorption of this coating is above 90% for most of its range, refer to *Figure B-6*. This coating is available for the PE50 and PE25.

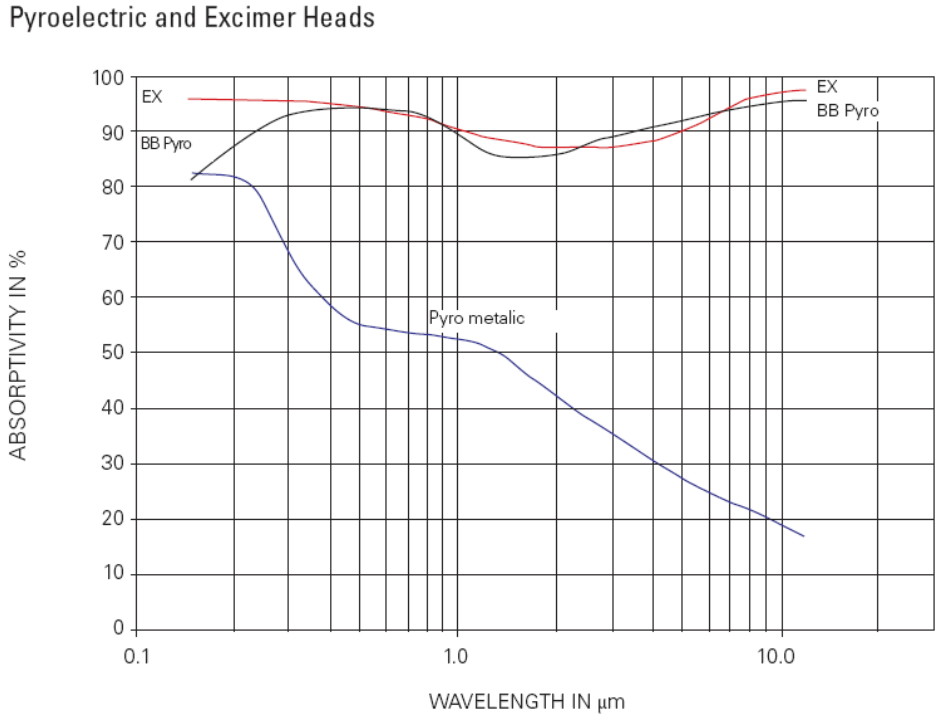


Figure B-6 Absorption of Ophir Pyroelectric Absorbers
Absorption(%) vs. Wavelength (nm)

Calibration

The sensitivity of the various Ophir pyroelectric sensors vary from one to another, as well as with wavelengths. Therefore, Ophir pyroelectric detectors are individually calibrated against NIST traceable standards. In addition, the calibration is corrected in the device for different wavelengths.

Ophir pyroelectric detectors are calibrated using a 1.06µm repetitively pulsed laser referenced to a NIST traceable thermal power meter. The average energy is set to the average power of the standard power meter, divided by the laser frequency. The metallic PE25 and PE50 heads are also calibrated with an excimer laser at 248nm to correct the rather large absorption variations in that spectral region with those heads.

The spectral absorption of the detector coating is measured spectroscopically and the absorption curve is used to correct the calibration for other wavelengths. When the user selects his wavelength in the StarLab application, the correction factor for that wavelength is applied.

Accuracy of Calibration

Since the instruments are calibrated against NIST standards, the accuracy is generally 3% at the energy level and wavelength at which the calibration has been performed. This accuracy has been verified by checking the scatter of the results when several instruments are calibrated against the same standard. The maximum error in measurement will be less than the sum of the specified accuracy, linearity, and inaccuracy due to errors in the wavelength curve. The non-linearity is approximately 2%. For error due to wavelength, refer to *Table B-3*.

In addition to the above errors, the reading of a pyroelectric head changes with frequency. The device has a built-in correction for this error. For frequencies above 50% of maximum frequency, inaccuracies in this correction can increase the total error up to 3%.

The maximum error in measurement will be less, and in general will be considerably less, than the sum of the above mentioned errors.

Table B-3 Maximum Measurement Error due to Wavelength

Wavelength	Coating Type Error	
	Broadband	**Metallic**
190 - 350nm	±2%	±2%
400 - 800nm	±2%	±2%
1064nm	0	0
2 - 3µm	±2%	±2%
10.6µm	±5%	±15%

Recalibration from a Known Source of Laser Energy

To recalibrate from a known source of laser energy:

1. Click the right mouse button and select **Calibrate** from the pop-up menu.

   OR

   Open the **Functions** menu and select **Calibrate**. The **Adjust Calibration Factor** dialog box appears.

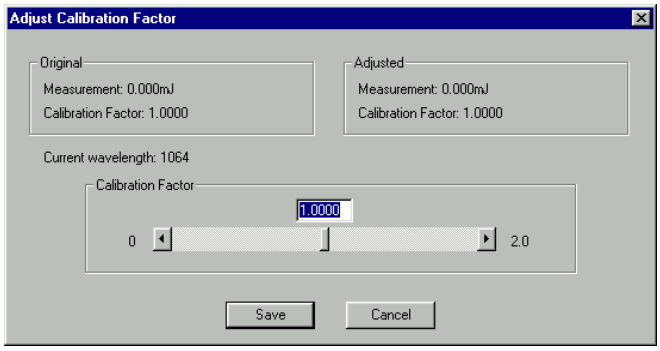


Figure B-7 Adjust Calibration Factor Dialog Box – Metallic Head

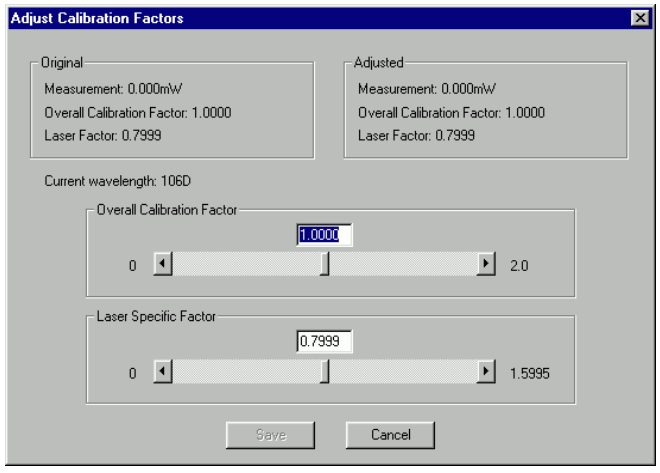


Figure B-8 Adjust Calibration Factor Dialog Box – Broadband Head

The **Original** area displays the original **Measurement** and **Calibration Factor**. The **Current wavelength** is displayed beneath the **Original** area.

☞***Note:*** *A different wavelength can be selected in the Measurement Parameters area.*

2. Apply the known laser power.
3. Adjust the **Calibration Factor** until the **Adjusted** measurement equals the power applied to the head.
4. Click **Save** to save the adjustment for the active channel.

☞***Note:*** *For metallic heads, when the calibration is changed at one laser wavelength, the overall calibration of all other wavelengths changes proportionately. For broadband heads, there is an option to adjust the calibration factor for all wavelengths or only for a selected wavelength.*

Appendix C – Getting the most from the Quasar

The Quasar device differs from the USBI and Pulsar in several ways. This Appendix gives some more details on how to use the Quasar most effectively.

Topics included in this Appendix:

- Different Quasar Models
- Switching the Quasar On and Off
- Understanding the Quasar LED Indicator
- Quasar Battery Status Indication
- Getting the Best Working Range from the Quasar
- Troubleshooting the Quasar

Different Quasar Models

The Quasar device is available in two models, a standard model (Ophir p/n 7Z01300) and an "Extended Range" (ER) upgrade option (Ophir p/n 7Z01301). See the catalog on our website (www.ophiropt.com) or on the installation CD for more details.

Figure C-1 Quasar standard model (left) and ER upgraded model

The standard model uses a short antenna, and reaches up to approximately 30m working range in an open environment. The "ER" option offers greater radio output power, along with a longer right-angle antenna for working at extended ranges. It works beyond 100m in an open environment.

See *Getting the Best Working Range from the Quasar* for more details about optimizing the working range of the Quasar.

In addition, Ophir offers several thermopile heads with an integral Quasar device mounted on the back. This option avoids having the extra wire between the Quasar unit and the thermopile head, making the device completely "wireless". For more details on using this type of Quasar, see below *Using Thermopile Head with Integral Quasar*.

Switching the Quasar On and Off

Figure C-2 Quasar device

The Quasar is switched on by momentarily pressing the red on/off button. The blue LED flashes once for approximately 2 seconds.

The Quasar is switched off by pressing and holding the red on/off button for approximately 4 seconds. The blue LED lights while the button is pressed, and is extinguished when the Quasar powers off.

Understanding the Quasar LED Indicator

The Quasar contains a single LED which indicates to the user the status of the device. Refer to *Table C-1* below.

Quasar LED Indicator Information

Status	Description	Indication
Switching On.	The Quasar is switched on by pressing the red on/off button momentarily.	Blue LED flashes once for approx. 2 seconds.
Waiting for connection.	The Quasar can be detected by any other *Bluetooth* device within range, and is waiting for a connection request.	Blue LED blinks slowly (once every 2 seconds).
Connection Established.	StarLab software has detected the Quasar and has established a connection to it.	Blue LED flashes once for approx. 2 seconds.
Connected.	The Quasar is connected to the PC and is sending data.	Blue LED blinks quickly.
Battery Low.	Battery voltage is low, below approximately 20% of its full capacity. User should connect charger.	Red LED blinks instead of blue LED, slowly or quickly in depending on connection status.
Software Upgrade.	StarLab is loading new internal software into the Quasar device, using "Upgrade" option (see *Upgrading the Device's Internal Software*)	Blue LED blinks quickly and erratically.
Software Needs Upgrading.	An error occurred while attempting to upgrade the internal software. The Quasar was switched off and on again. The software "Upgrade" must be repeated. See *Upgrading the Device's Internal Software*.	Blue LED toggles on for 1 second and off for 1 second repeatedly, to indicate an error status.
Switching Off.	The Quasar can be switched off by pressing and holding the red button for approx. 4 seconds.	While pressing down the on/off button, the Blue LED is on. When the Quasar powers down, the LED is extinguished.
Quasar Off	The Quasar has been powered off.	LED extinguished.

Table C-1 Quasar LED Indicator Information

Quasar Battery Status Indication

Understanding the Battery Status Indicator

The Quasar contains a rechargeable battery. The status of the battery can be viewed in StarLab below the logging area of the head channel screen (see *Figure C-3* below).

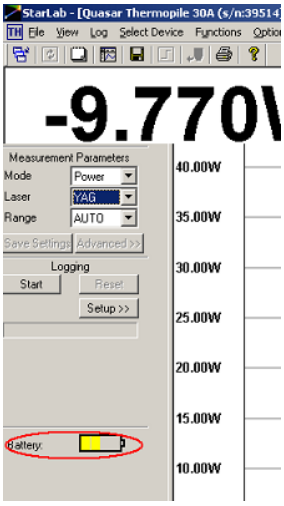


Figure C-3 Position of Battery Status in StarLab

The state of the battery is indicated by the number of segments lit in the battery logo on the screen, by the color of the segments, and by the movement of the segments. The battery status indication is approximate, and may depend on the type of head connected and on the recent charging history of the battery: whether the battery was fully charged or only partially charged.

The StarLab application software may take several seconds to update the battery status on the screen after a change occurs to the battery status, for example when the charger is inserted or removed.

Quasar Battery Status Symbols

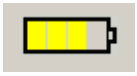
Status	Description	Picture
Battery Low	"Battery LOW" displayed in red, 1 red bar (approx. 20% battery life remains)	
Level 1	1 yellow bar	
Level 2	2 yellow bars	
Level 3	3 yellow bars	
Battery Full	4 yellow bars	
Fast Charge	Green bars progressing to right (immediately after charger inserted). See *Charging the Quasar Battery*.	
Trickle Charge	4 green bars (charger inserted, battery fully charged)	

Table C-2 Quasar Battery Status information

Charging the Quasar Battery

When the charger is first inserted, the Quasar will enter a fast-charge mode. In this mode, a fully discharged battery can be charged within approximately 5 to 6 hours. When in use, fast-charge is indicated with moving green bars on the Battery Status indicator in the StarLab application software, see *Table C-2*.

When the Quasar detects that the battery is fully charged, it reverts to a "trickle-charge" state, which keeps the battery charged even when the Quasar is in use. The "trickle-charge" is small enough not to damage the battery even when the charger is inserted for long periods. Trickle-charge is indicated with 4 fixed green bars in StarLab.

If the charger is re-inserted when the battery is already fully-charged, the Quasar will initially begin fast-charging, and after a few minutes will revert to trickle-charge.

Fast-charge and trickle-charge function in the same way when the Quasar is in use and switched on, or when the Quasar is not in use and switched off. The charger can be left plugged into the Quasar indefinitely without damaging the battery.

Getting the Best Working Range from the Quasar

The working range given by the Quasar device depends greatly on the working environment (walls, obstructions, other radio equipment or electrical disturbances in the vicinity) and on the orientation of the device relative to the receiving radio on the host PC. Here are some suggestions for getting the best range possible.

1. For the standard model, the best range is obtained when pointing the antenna towards the PC radio.
2. For the ER model, the best range is obtained when the antenna points vertically, with the Quasar flat on a table-top.
3. Best working range is obtained with direct line of site between the Quasar and radio on the host PC.
4. Walls and other nearby obstacles can cause reflections, so best results will depend very much on the local environment. The Quasar should be oriented until the best results are given in any given situation.
5. Operation should be possible through thin plaster-board walls or other similar obstacles, with reduced operating range.
6. *Bluetooth* radio transmissions are robust, using frequency hopping between 79 channels from 2.402GHz to 2.480GHz. If data is lost when using one channel, the *Bluetooth* module inside the Quasar will try to re-send the lost data on a different channel. However, interference from other radio devices using the same frequency band such as cellular phones or a WiFi internet connection may cause degradation in performance. If interference is present, the maximum data logging rate when using Pyroelectric or PD10 heads may be reduced. In addition, making the initial connection between the Quasar and the PC may be more difficult.
7. When working close to the maximum operating range, reduced data logging rates may result, in particular when using Pyroelectric or PD10 heads. To get the best possible data rate, move the Quasar closer to the PC radio.
8. When working close to the maximum operating range, the connection between the Quasar and the PC may be sporadic or difficult to establish. It is recommended to make the initial connection to the PC with the Quasar as close as possible to the PC radio, and then to move further away if necessary while operating the Quasar.

Using Thermopile Head with Integral Quasar

Several models of thermopile head are offered with an integral Quasar device mounted on the back. This option avoids having an extra wire between the thermopile head and the Quasar device, making the device completely "wireless".

See the Ophir catalog on our website (www.ophiropt.com) for more details of heads offered with this option.

When using a regular Quasar device, the serial number of both the attached head, and the Quasar device itself, are displayed in the **Select Devices** screen. The serial number of the head is displayed on the left, and the serial number of the Quasar device is displayed on the right. See below in *Figure C-4* .

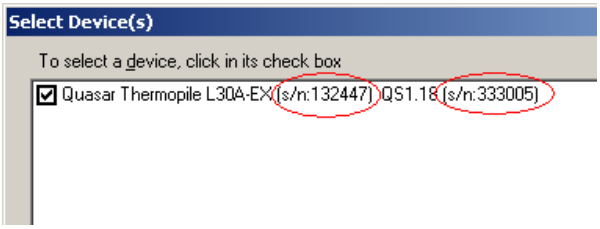


Figure C-4 Select Devices Screen

When using a thermo head with integral Quasar device, the serial number displayed on the back of the combined unit will be the serial number of the head. The Quasar device also contains an internal serial number, which is not displayed on the combined unit. This internal serial number is also displayed in the **Select Devices** screen, as it would be for a normal (non-integral) Quasar device.

Troubleshooting the Quasar

If there are problems establishing a connection between the Quasar and the PC, follow these steps to try and locate the problem.

- Bring the Quasar closer to the PC radio and try again to connect. If the connection is ok, you should work closer to the PC, or upgrade to the ER option.
- If using the *Bluetooth* USB Adapter, check that it is correctly plugged into the PC. If it is already plugged in correctly, try unplugging it and plugging it in again to refresh the control software.
- If using a built-in radio in the PC, check that it is switched on correctly. If it is already switched on correctly, try switching it off and on again to refresh the control software.
- Try closing the StarLab application and reopening it.
- Click on **Help – About** in the StarLab application, and check the software version that is installed on the PC. Check on the Ophir website (www.ophiropt.com) for the latest release software version, and if necessary upgrade to the latest version.

Appendix D – Operation with Nova-II and Vega Devices

The Nova-II and Vega are two of Ophir's measurement devices. They have the measurement capabilities of the USBI, Pulsar and Quasar devices combined with an LCD Graphic Display for stand-alone operation. The Vega has a color TFT-LCD Graphic Display, while the Nova-II has a Black and White LCD Display.

Figure D-1 Nova-II and Vega

Summary of Changes to Support Nova-II and Vega

The StarLab Application supports use with the Nova-II and Vega devices. The following features are relevant:

- Disable keypad. The Nova-II/Vega will not respond to any key press until released from its communication session with the StarLab application. The user interface of the StarLab application is unaffected, but the Nova-II/Vega key pad is disabled.

- Upgrade device. The Nova-II and Vega have different internal firmware than the USBI, Pulsar or Quasar devices. From the **Select Device(s)** dialog box, you can select Upgrade USBI, Upgrade Quasar, Upgrade NOVA-II or Upgrade Vega.

- Upload Log Files. The Nova-II and Vega can log up to ten files in their on-board memory. You can use the StarLab Application to upload these files and display the contents in the Log Viewer (see *Chapter 10 – Viewing Log Files*).

Uploading Files from the Nova-II and Vega

To upload a file from the Nova-II or Vega:

1. From the Log menu select **Upload Instrument Files**.

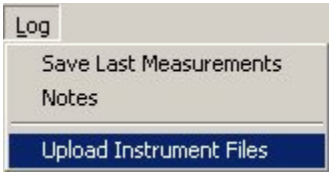


Figure D-2 Upload Instrument Files

The **Log File Selection** dialog box appears displaying all the files stored in the Nova-II or Vega device, including the number of points stored, type of file, type of head, and serial number of head with which the log was made.

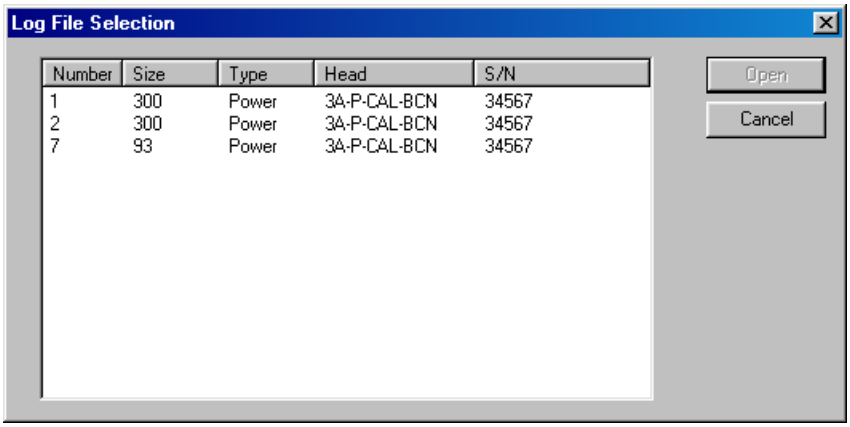


Figure D-3 Log File Selection Dialog Box

2. Select the file to upload and click **Open**. The file is uploaded and displayed in the Log Viewer.