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OOIBase32
Spectrometer Operating Software
Operating Instructions

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Table of Contents

1 OOIBase32 Introduction

The following sections provide information about OOIBase32 and the availability of program updates.

Product Overview

OOIBase32 Spectrometer Operating Software (OOIBase32) is Ocean Optics' next generation of operating software, is user-customizable, and is compatible with all Ocean Optics spectrometers. OOIBase32 is a 32-bit advanced acquisition and display program that provides a real-time interface to a variety of signal-processing functions for Windows 95/98/ME/NT/2000/XP users.

OOIBase32 enables you to perform spectroscopic measurements such as absorbance, reflectance, and emission. You can control all system parameters, collect data from up to eight spectrometer channels simultaneously, and display the results in a single spectral window. Additionally, you can perform complex acquisition procedures such as reference monitoring and time acquisition experiments.

Free Updates

You can obtain free updates to the OOIBase32 software by visiting the following web address:

http://www.oceanoptics.com/technical/softwaredownloads.asp

Right-click on **OOIBase32™ Spectrometer Operating Software** and select **Save Target As…** to download the executable to your machine. Once downloaded, double-click on the file to install OOIBase32.

2 Configuring OOIBase32

The following sections will guide you in configuring your OOIBase32 software and your Ocean Optics hardware components.

Note: If you are using a USB-based spectrometer, do NOT connect the spectrometer to the PC until you install the OOIBase32 software. Follow the instructions contained in this section *in order* to properly connect and configure your system.

Connecting an A/D Converter to the PC

If your hardware configuration requires you to connect an external A/D Converter to the PC, consult the operating instructions for your particular model of A/D Converter for instructions on properly configuring the equipment for use with OOIBase32. Currently supported A/D Converter models include:

- ADC1000-USB
- ADC1000-ISA
- ADC2000-PCI

Ocean Optics has discontinued the A/D Converters on the list below. The OOIBase32 software still supports the use of these products:

- ADC500
- DAQ-700
- SAD500

To use one of these models, consult version 1.0 of the *OOIBase32 Spectrometer Operating Software Manual* for specific instructions on connecting these models, or consult the operating instructions for the A/D Converters directly.

Note: When using a USB-based spectrometer (such as the USB2000 or HR2000), you do not need to perform this step. Proceed to the *Installing OOIBase32* section.

There may be A/D Converter models manufactured after the publication of this manual that do not appear in this document. Consult the manual for your A/D Converter for specific instructions, or contact Ocean Optics Technical Support.

Install OOIBase32

Once you configure your A/D Converter, you can install the OOIBase32 software. Follow the steps below to install the software:

1. Close all other applications running on the PC.
2. Start the OOIBase32 installation process.

   Installing from CD

   Note: These instructions apply to Software and Technical Resources CDs published after April 2003.

a. Insert the Software and Technical Resources CD containing the OOIBase32 software. The CD interface automatically launches.

b. Click on **Install Ocean Optics Software**.

c. Click on **OOIBase32 Operating Software**. The installation process will begin.

Installing from the Web

a. Go to **http://www.oceanoptics.com/technical/softwaredownloads.asp**.

b. Right-click on **OOIBase32™ Spectrometer Operating Software** and select **Save Target As…** to download the executable to your machine.

c. Double-click on the downloaded file. The installation process begins.

3. Click the **Next** button at the Welcome screen. The Read Me File screen appears.
4. Read the Read Me file and click the **Next** button. The Choose Destination Location screen appears.
5. Click the **Browse** button to customize your installation location, or click the **Next** button to proceed. The Backup Replaced Files screen appears.
6. Click the **Yes** button to back up replaced files (OOIBase32 prompts you for a backup location), or click the **No** button to proceed. The Select Program Manager Group screen appears.
7. Select a program manager group, and then click the **Next** button. The Start Installation screen appears.
8. Click the **Next** button to begin installation. The OOIBase32 Platinum password screen appears.
9. Enter your OOIBase32 Platinum password here, if necessary. Otherwise, click the **OK** button to start the install of the free version of OOIBase32. The Spectrometer Disk dialog box appears.
10. Click the **Yes** button if you have a spectrometer configuration diskette and want to specify a configuration file. Otherwise, click the **No** button to continue the installation.
11. Click the **Finish** button when the installation completes.
12. Click the **OK** button to restart your computer.

You have now installed the OOIBase32 software.

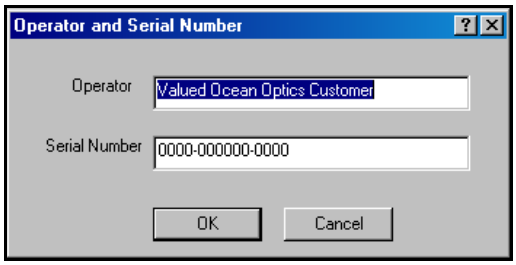
Configuring OOIBase32 and your Hardware

Once your system restarts, you can begin to configure OOIBase32. Configuration of OOBase32 is a multi-part process. In the following pages, each section details the various configuration processes.

Follow the steps below to configure OOIBase32 and your hardware:

To start the configuration process, double-click the OOIBase32 icon or launch OOIBase32 from the Start menu.

Operator and Serial Number

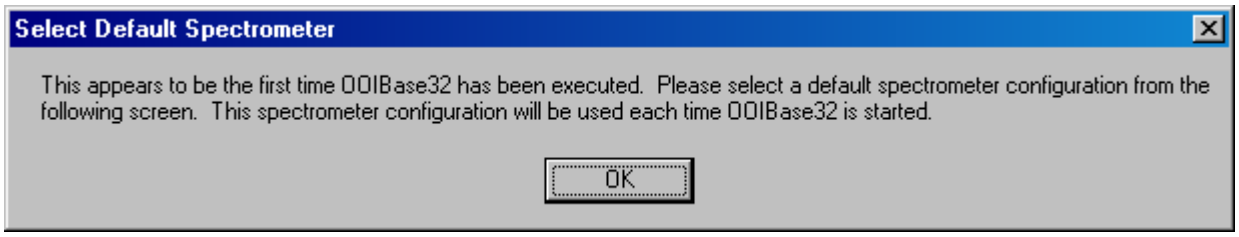


This dialog box prompts your to enter a user name and serial number, which OOIBase32 places in the header of certain data files. You can change this information later by selecting **Edit | Settings** from the menu, and then selecting the Registration tab.

Since OOIBase32 is free software, it requires no serial number for installation. You can leave the field as is.

Default Spectrometer Configuration File

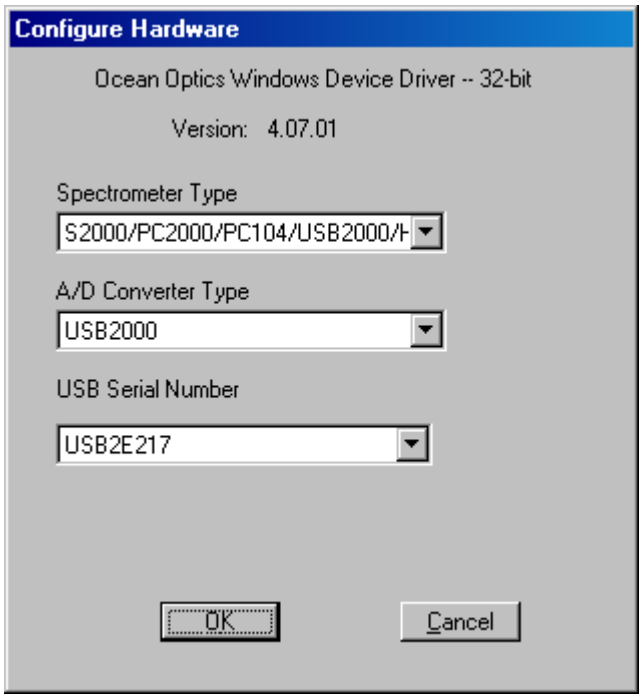
The following message box appears:



Click the **OK** button. A dialog box opens, prompting you to identify a default spectrometer configuration file.

1. Navigate to the OOIBase32 installation directory.
2. Choose the file with the .SPEC extension. The serial number of your spectrometer precedes this file (for example, A1B234.spec).

Configure Hardware



1. Select your spectrometer type from the Spectrometer Type drop-down menu.
2. Select the appropriate A/D converter for your spectrometer from the A/D Converter Type drop-down menu.

> **Note**: When using a non-USB A/D converter, you will need to set additional parameters on this screen to properly configure your A/D converter. Consult the documentation for your A/D converter hardware for specific instructions.

3. Configure the appropriate information based on your spectrometer and A/D converter type (options that appear after you make the A/D Converter Type selection) and click the **OK** button.

OOIBase32 stores your configuration information, and the OOIBase32 software will run. You will not need to re-enter this information the next time you start OOIBase32.

Spectrometer Configuration

You now need to configure your sampling system in OOIBase32. Perform the steps below to configure OOIBase32 and your sampling system:

1. Select **Spectrometer | Configure** from the OOIBase32 menu. The Spectrometer Configuration screen appears.
2. Select the **Wavelength Calibration** tab. OOIBase32 should automatically load the coefficients for each spectrometer channel in your system from the .SPEC file you specified. If OOIBase32 did not load these values, manually enter the calibration values provided on the Wavelength Calibration Data Sheet.
3. Highlight each installed channel by clicking the appropriate radio button, and then check the **Enabled** box for each installed spectrometer channel.
4. Select the **A/D Interface** tab and ensure that the values entered on this tab match the values you entered in the Configure Hardware screen described in the previous section. Modify if necessary.
5. Select the **Detector Linearity** tab and verify that OOIBase32 has loaded the intercept and coefficients from the .SPEC file.
6. Click the **OK** button to save the data and close the Spectrometer Configuration screen.

Upon exiting OOIBase32, the software stores this configuration information in a spectrometer configuration file named [your serial number].SPEC. Upon restart, OOIBase32 will load this as the default .SPEC file. You can change the name of this file by selecting **Spectrometer | Save Configuration As** from the menu and changing the name of the saved .SPEC file.

You should see a dynamic trace line displayed in the graph window of OOIBase32. This indicates that you have properly configured the software and that it is acquiring data.

OOIBase32 Settings

You can now configure some important OOIBase32 operation parameters:

1. Select **Edit | Settings** from the OOIBase menu. The OOIBase32 Settings screen appears.
2. Customize any parameters in the tabs on this screen. Available options include saving, opening, printing, sound, and default settings. More information on this screen is available later in this document.
3. Click the **OK** button to save your customized settings.

You have now customized OOIBase32. You can repeat these steps at any time to change the customization settings.

Configure Data Acquisition

You must now configure your data acquisition parameters. Follow the steps below:

1. Select **Spectrum | Configure Data Acquisition** from the menu. The Configure Data Acquisition screen appears.
2. Select the **Basic** tab and configure the integration time, averaging, and boxcar smoothing values.
3. Select the **External Trigger** tab and configure your external triggering mode and data save option, if necessary.
4. Select the **Strobe** tab and configure external strobe events, if necessary.
5. Click the **OK** button to save these settings and exit the Configure Data Acquisition screen.

You can find more information on these options later in this document.

Configure Sampling Optics

Once you configure OOIBase32, you must configure the components in your sampling system. Due to the variety of sampling optics available from Ocean Optics, please consult the operating instructions for your individual optical components.

Getting Help

Comprehensive on-line assistance is available from the Help option in the menu. This help system provides information on all buttons, options, items, and dialog boxes in OOIBase32.

If you find that you still need assistance after consulting this manual and the on-line help system, contact our Technical Support department.

3 File Menu Functions

This section details the various options and functions available from the File menu in OOIBase32.

Where applicable, each section contains the associated toolbar icon below the section heading. Click on these icons in OOIBase32 to perform the described function.

New Spectrum Window (Ctrl+N)

 - General Functions Toolbar

Select this menu option to create a new spectrum window in the OOIBase32 graph display area. This performs the same function as **File | New**.

You can also access this option via shortcut by pressing the CTRL and N keys simultaneously or by clicking the **New** icon in the General Functions toolbar.

New

Select this menu option to create a new spectral window for displaying spectral data. Graphs appear in scope mode by default. All active channels in a spectral window share the same data acquisition parameters.

To display a specific channel in a separate spectral window, follow the steps below:

1. Open a new spectral window.
2. Select **Spectrometer | Configure** from the menu.
3. Select the **Wavelength Calibration** tab.
4. Select or deselect the **Channel Enabled** option for the channel you wish to display.
5. Create different parameters for the new spectral window, such as a different integration time.

Remember that one spectral window can operate with up to 8 channels and 8 overlays.

Open

Selecting the **Open** menu option displays a dialog box that allows you to open (under the **Files of Type drop-down option**) Processed Spectra, Grams/32 SPC Files, or All Files. To open specific file types, select **File | Open** from the menu, and then choose dark, sample dark, reference, sample, processed, or experiment data files.

When you open a data file and the acquisition parameters of the file do not match the file currently open, a warning box allows you to change the acquisition parameters, ignore the disparity between the parameters, or cancel the opening of the data file.

Dark

A dark spectrum is a spectrum taken with the light path blocked.

Select **File | Open | Dark** to select and open one or more dark spectra.

Sample Dark

A sample dark spectrum is a spectrum taken in time normalized mode with the integration time set to that of the sample spectrum.

Select **File | Open | Sample Dark** to select and open one or more sample dark spectra.

Reference

A reference spectrum is a spectrum taken with the light source on and a blank in the sampling region.

Select **File | Open | Reference** to select and open one or more reference spectra.

Sample

A sample spectrum is a spectrum taken while in scope mode with the sample in the sampling region.

Select **File | Open | Sample** to select and open one or more sample spectra.

Processed

 - General Functions Toolbar

Processed spectra are spectra taken while in scope, absorbance, transmission, or relative irradiance mode. You can take these spectra after taking dark and reference spectra. When selecting a processed spectrum, the active spectral window goes into snapshot mode and data acquisition stops. To resume acquisition, select the snapshot icon from the Spectrum Controls toolbar.

Select **File | Open | Processed** to select and open one or more processed spectra.

Experiment

Opening an experiment loads the stored dark, reference, sample, and processed spectra, along with all overlays and acquisition parameters in the experiment

Select **File | Open | Experiment** to select and open a complete set of acquisition and processing parameters for the active spectral window.

Close

Select **File | Close** to immediately close the active spectral window. OOIBase32 does not prompt you to save acquisition parameters or the spectra.

Save

This menu option allows you to save different types of data in a variety of file types (including Processed Spectra, Grams/32 SPC Files, or All Files - available under the **Files of Type** option in the Save dialog box).

To save specific file types, select **File | Save** from the menu. OOIBase32 saves all active channels in the spectral window.

Note: You can name saved spectra automatically by enabling the **Autoincrement Filenames** function. If you do not enable the Autoincrement Filenames function, a save file dialog box will open every time you instruct OOIBase32 to save data.

The following sections detail the types of data you can save:

Dark

A dark spectrum is a spectrum taken with the light path blocked.

Select **File | Save | Dark** from the menu to save a dark spectrum.

Sample Dark

A sample dark spectrum is a spectrum made in time normalized mode with the integration time set to that of the sample spectrum.

Select **File | Save | Sample Dark** from the menu to save a sample dark spectrum.

Reference

A reference spectrum is a spectrum taken with the light source on and a blank in the sampling region.

Select **File | Save | Reference** to select and open one or more reference spectra.

Sample

A sample spectrum is a spectrum taken while in scope mode with the sample in the sampling region.

Select **File | Save | Sample** to select and open one or more sample spectra.

Processed

 - General Functions Toolbar

Processed spectra are spectra taken while in scope, absorbance, transmission, or relative irradiance mode. You can take these spectra after taking dark and reference spectra.

Select **File | Save | Processed** to select and open one or more processed spectra.

Experiment

Saving an experiment saves the stored dark, reference, sample, and processed spectra, along with all overlays and acquisition parameters in the experiment

Select **File | Save | Experiment** to save the complete set of acquisition and processing parameters for the active spectral window.

Autoincrement Filenames

The Autoincrement Filenames option allows you to name and save spectra automatically when you click the Save command in OOIBase32. Select **File | Autoincrement Filenames | Enabled** to enable this feature.

When you enable this feature, choosing any save command automatically saves all spectra in the spectral window and names the file with a base name and numerical index you specify.

The following table illustrates a sample file name structure:

Test	The base name that you specified.
00012	A sequential numerical index beginning from a user-specified number.
Master	The spectrometer channel name, which OOIBase32 automatically adds to the filename.
Irradiance	The file extension, which OOIBase32 automatically adds to the filename. In this instance, it indicates that OOIBase32 saved the data while in relative irradiance mode.

In this example, the specified values result in an autoincremented filename of Test.00012.Master.Irradiance.

Note: If you do not enable the Autoincrement Filenames function, a save file dialog box will open every time you choose a save command.

Enabled

Select **File | Autoincrement Filenames | Enabled** to enable (or disable, if already checked) the autoincrement filenames function.

Show Name

Select **File | Autoincrement Filenames | Show Name** to enable the Show Name option. When you enable both this option and the Autoincrement Filenames option, the filename of the next saved file will display in the title bar of OOIBase32.

Configure

The **File | Autoincrement Filenames | Configure** option displays a dialog with the following parameters:

Base Name

Select **File | Autoincrement Filenames | Base Name** to open the **Autoincrement Filename Properties** dialog box. This screen allows you to set the base name for autoincremented files.

Starting Index

Select **File | Autoincrement Filenames | Starting Index** to open the **Autoincrement Filename Properties** dialog box. This screen allows you to set the starting index for autoincremented files. For example, if you enter “1” here, the number in the saved filename will appear as 00001. The next saved file will have 00002 in the filename, etc.

Print

 - General Functions Toolbar

You can choose to print graphs in color or black and white by configuring the printing page of the **OOIBase32 Settings** dialog box. By default, OOIBase32 disables background images during printing.

Select **File | Print** from the menu to print a graph. Alternately, you can click the Print icon in the General Functions toolbar.

Print Preview

Select **File | Print Preview** from the menu to preview the graphical spectra before printing.

Print Setup

Select **File | Print Setup** from the menu to select and configure a printer for printing graphical spectra.

Exit

Select **File | Exit** from the menu to exit OOIBase32. The software will not prompt you for an exit confirmation. Alternately, you can click the top right X box of the application's display window.

4 Edit Menu Functions

This section details the various options and functions available from the Edit menu in OOIBase32.

Where applicable, toolbar icons associated with the function appear below the section heading. Click on these icons in OOIBase32 to perform the described function.

Copy Spectral Data

Copied spectral data is in tab-delimited format and includes wavelength and intensity information as well as an optional header to allow for easy identification of the spectrometer channel or overlay. You can copy and paste spectral data directly into applications such as Microsoft Excel.

All Spectrometer Channels

Select **Edit | Copy Spectral Data | All Spectrometer Channels** to copy spectral data to the clipboard for all active spectrometer channels and overlays in a spectral window.

Selected Spectrometer Channels

Select **Edit | Copy Spectral Data | Selected Spectrometer Channels** to copy spectral data for specific channels or overlays in a spectral window. Check the channels and overlays you want copied to the clipboard in the **Select Spectrometer Channels to Copy** dialog box.

Copy Graphical Spectra (Ctrl+C)

 - General Functions Toolbar

You can paste graphical spectra data (the data as graphed) into any application that accepts a Windows metafile (Microsoft Word and Excel, for example).

Click on the Copy Spectra icon or select **Edit | Copy Graphical Spectra** to copy graphical spectra to the Windows clipboard**.**

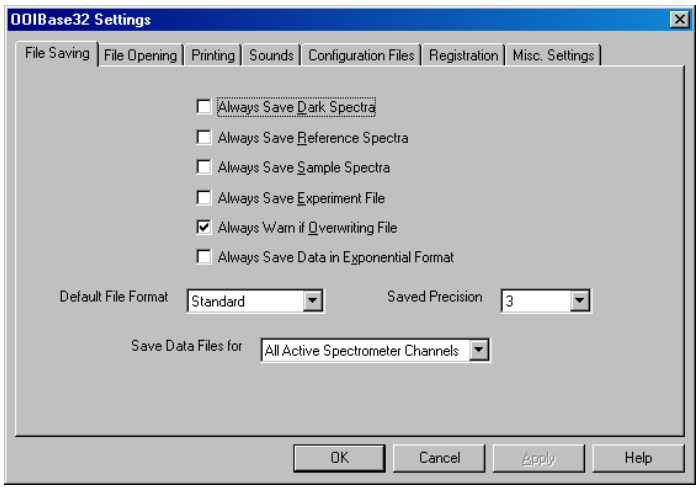
Settings

The Settings option brings up the **OOIBase32 Settings** screen, which allows you to configure many aspects of the operation of OOIBase32.

Select **Edit | Settings** to access this screen. After making changes, click the **Apply** button to save the changes and then the **OK** button to close the OOIBase32 Settings screen. Click the **Cancel** button to exit without saving changes.

File Saving

This tab provides options for saving files.



Available options include:

Always Save Dark Spectra

Enable this function to automatically save a dark spectrum each time you save a processed spectrum.

Always Save Reference Spectra

Enable this function to automatically save a reference spectrum each time you save a processed spectrum

Always Save Sample Spectra

Enable this function to automatically save a sample spectrum each time you save a processed spectrum.

Always Save Experiment File

Enable this setting to save the experiment configuration file each time you save a processed spectrum.

Always Warn if Overwriting File

Enable this setting to receive a warning when OOIBase32 attempts to overwrite a data file.

Always Save Data in Exponential Format

Enable this setting to list spectral data (not graphical data) in an exponential format (OOIBase32 uses an ‘e’ as the exponential separator).

Default File Format

Select an option to specify one of three ways that OOIBase32 can save spectral data:

1. **No Header** - An ASCII file, tab delimited, without a header
2. **Standard** - An ASCII file, tab delimited, with a header (recommended)
3. **Grams/32** – A GRAMS/32® -compatible SPC file

Saved Precision

Select a value from 0 to 10 decimal places to specify the precision of the spectral data.

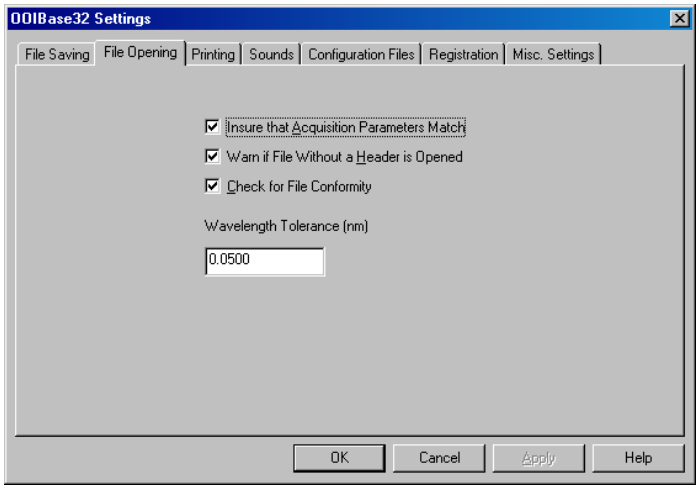
Save Data Files for

Select how you want to save data: All active spectrometer channels, or selected spectrometer channels only.

If you choose to save for selected channels, a dialog box will prompt you to specify the channels each time you save spectral data.

File Opening

This tab provides options for opening data files.



Available options include:

Insure that Acquisition Parameters Match

Enable this function to present a warning box when you attempt to open a file that has different acquisition parameters than the file currently in use.

Warn if File Without a Header is Opened

Enable this function to present a warning box when you attempt to open a data file without a header.

Check for File Conformity

Enable this function to display a warning box if any parameter mismatches exist between the file you are attempting to open and the file currently open.

Wavelength Tolerance (nm)

Specify the tolerance (in nanometers) of the difference in wavelengths between the files you open and the spectrometer configuration currently in use.

Note: Use this option only if you select the **Insure that Acquisition Parameters Match** and **Check for File Conformity** boxes.

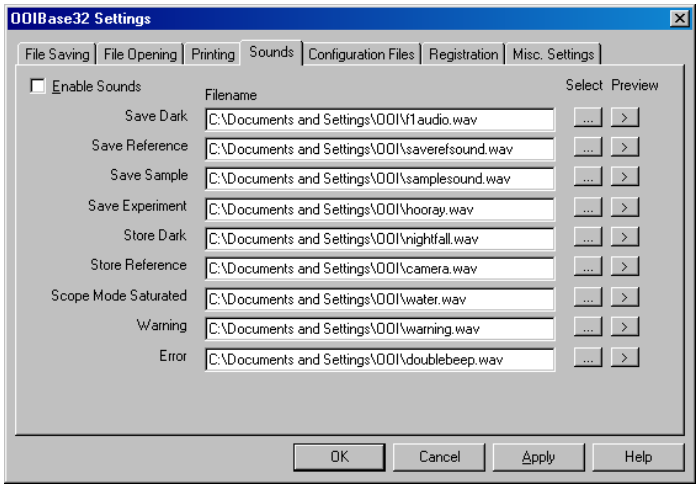
Printing

This tab specifies whether the graph window prints in black and white or color.

Select the **Printing in Black and White only** box to restrict color printing.

Sounds

This tab allows you to specify sound files that trigger upon various program and spectroscopic events.



Available options include:

Enable Sounds

Check this box to enable sound events in OOIBase32. You must already have one or more .WAV files to use this option. OOIBase32 does not come with any .WAV files.

The **Filename** text box displays the name and directory of the selected .WAV file.

The **Select** button next to each option brings up a file navigation dialog box, which allows you to select a .WAV file for each option.

The **Preview** button next to each option allows you to listen to the selected .WAV file before applying the changes to the Sounds tab.

You can specify sounds for the following events:

- Save Dark
- Save Reference
- Save Sample
- Save Experiment
- Store Dark
- Store Reference
- Scope Mode Saturated – Alerts you when the scope mode signal becomes saturated while you are in other modes

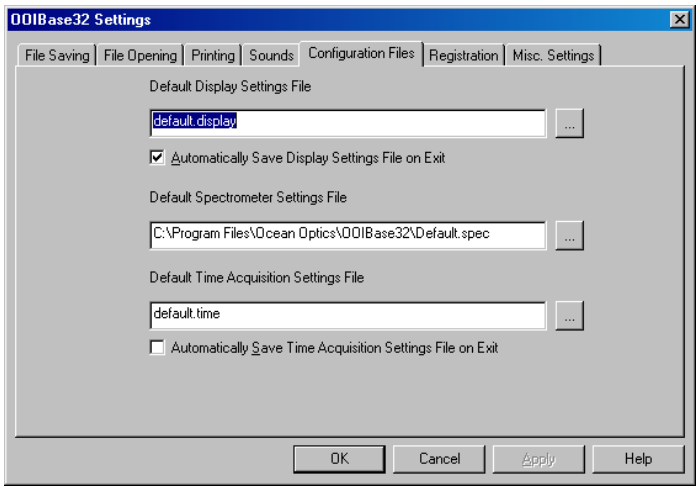
(Continued)

- Warning
- Error

Click the **Apply** button to save changes made in this tab.

Configuration Files

This tab allows you to configure default setting files in OOIBase32.



Available options include:

Default Display Settings

The display file contains settings such as trace color, trace width, graph scale, etc.

Specify the path to and the name of the **.display** file you want to load when OOIBase32 starts or a new spectral window opens. Alternately, click on the ellipsis button to navigate to the **.display** file you want.

Automatically Save Display Settings File on Exit

Check this box to automatically save any display changes to your default display settings file when OOIBase32 exits or a closes a spectral window.

If you want to save new display settings but do not want to enable this option, select **View | Display Property Files | Save Display Settings** from the menu.

Default Spectrometer Settings File

The spectrometer settings file contains settings such as the A/D interface, wavelength calibration, etc.

Specify the path to and the name of the **.spec** file you want to load when OOIBase32 starts or a new spectral window opens. Alternately, click on the ellipsis button to navigate to the **.spec** file you want.

Default Time Acquisition Settings File

The time acquisition settings file contains all of the time acquisition parameters.

Specify the path to and the name of the **.TimeParameters** file you want to load when OOIBase32 starts or a new spectral window opens. Alternately, click on the ellipsis button to navigate to the **.TimeParameters** file you want.

Automatically Save Time Acquisition Settings File on Exit

Check this box to automatically save any time acquisition settings changes to your default time acquisition settings file when OOIBase32 exits or closes a spectral window.

If you want to save time acquisition settings but do not wish to enable this option, select **Time Acquisition | Configure | Save Parameters** from the menu.

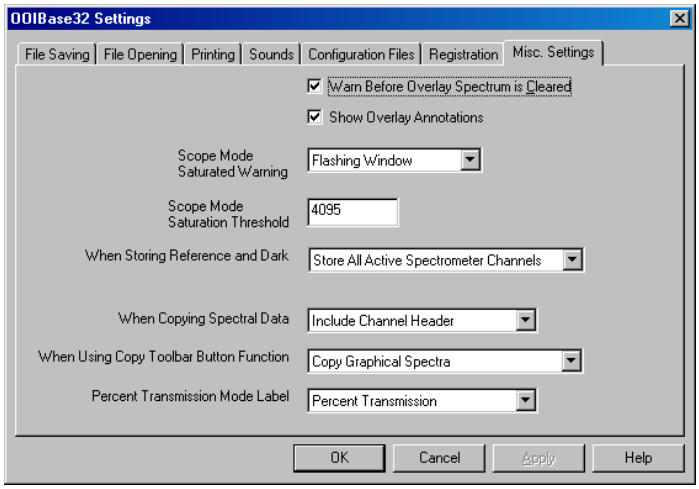
Registration

This tab allows you to enter an **Operator** name and the software **Serial Number**. OOIBase32 includes these entries in the header of certain data files.

When you run OOIBase32 for the first time, you must specify this information. This tab allows you to change the information you specified during setup

Misc. Settings

This tab allows you to configure a variety of options, including:



Warn Before Overlay Spectrum is Cleared

Enable this setting to receive a warning prompt before clearing an overlay spectrum.

Show Overlay Annotations

Enable this option to display any annotations saved with the overlay spectrum file on the graph window of OOIBase32.

Scope Mode Saturated Warning

Specify the warning method used when the scope mode signal saturates the detector. This warning appears when you are in other modes, such as the absorbance mode.

To choose a warning sound for scope mode saturation, see the **Sounds** tab information.

Scope Mode Saturation Threshold

Specify a scope mode intensity threshold value from 0 to 4095 (0-65535 for the NIR Spectrometer). This option is only functional if you selected a Scope Mode Saturated Warning method.

The value you enter is the intensity at which the saturation warning will appear.

When Storing Reference and Dark

Specify whether OOIBase32 stores dark and reference spectra for all enabled spectrometer channels or for selected channels only.

When Copying Spectral Data

Specify if you want to include a header in your spectral data files.

When Using Copy Toolbar Button Function

Specify the function of the copy icon on the General Functions toolbar. Options include:

- **Copy Graphical Spectra** - The data as graphed
- **Copy Spectral Data for All Channels** – Copies the spectral data for all channels in the spectrometer system (storing the data as numerical values)
- **Copy Spectral Data for Selected Channels** - Copies the spectral data for selected channels in the spectrometer system (storing the data as numerical values). When you enable this option, OOIBase32 will prompt you to specify the channels from which to save data.

The default function of the copy icon is **Copy Graphical Spectra**.

Percent Transmission Mode Label

Select the axis label to reflect the type of Transmission mode measurement you wish to take. OOIBase32 displays the label you select on the vertical axis of the graphed spectrum.

Note: OOIBase32 can make both transmission and reflection measurements while in the transmission mode, as the mathematics required to calculate transmission and reflection measurements are identical.

Select **Percent Transmission** or **Percent Reflection** as your vertical axis label when you are in the transmission mode. OOIBase32 displays the label you select on the vertical axis of the graphed spectrum when you are in Transmission mode.

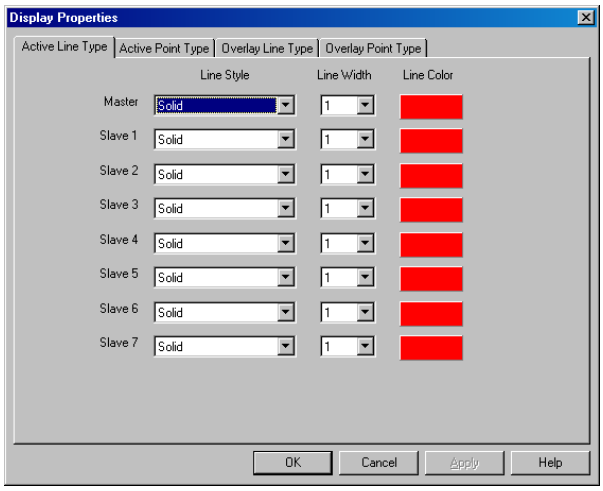
5 View Menu Functions

This section details the various options and functions available from the View menu in OOIBase32.

Where applicable, toolbar icons associated with the function appear below the section heading. Click on these icons in OOIBase32 to perform the described function.

Display Properties

Select **View | Display Properties** to bring up the Display Properties screen. This screen allows you to specify how OOIBase32 displays spectra.



The following sections detail the various tabs on the Display Properties screen:

Active Line Type

These settings allow you to set the design of the line connecting the data points in an active spectrum.

The **Line Style** sets the style, the **Line Width** sets the pixel width, and the **Line Color** sets the color of the line. Click on each drop-down menu or color box to set these options.

Active Point Type

These settings allow you to configure the points representing each pixel in an active spectrum.

The **Point Style** sets the style (circle, square, triangle, etc.), the **Point Size** sets the size (in relative units), the **Fill Pattern** sets the pattern (solid, crosshatch, etc.), and the **Fill Color** sets the color of the points. Click on each drop-down menu or color box to set these options.

Overlay Line Type

These settings allow you to set the design of the line connecting the points in an overlay spectrum.

The **Line Style** sets the style, the **Line Width** sets the pixel width, and the **Line Color** sets the color of the line. Click on each drop-down menu or color box to set these options.

Overlay Point Type

These settings allow you to configure the points representing each pixel in an overlay spectrum.

The **Point Style** sets the style (circle, square, triangle, etc.), the **Point Size** sets the size (in relative units), the **Fill Pattern** sets the pattern (solid, crosshatch, etc.), and the **Fill Color** sets the color of the points. Click on each drop-down menu or color box to set these options.

Display Property Files

These options allow you to store and retrieve display settings for use in OOIBase32.

Save Display Settings

This option saves the currently selected display settings to the disk. By default, these files have a **.display** extension. After saving the file, you can designate it as the default display settings file, which OOIBase32 loads when starting or opening a new spectral window.

Select **View | Display Property Files | Save Display Settings** to save the display settings.

Restore Display Settings

This option retrieves the previously saved display settings from the disk.

Select **View | Display Property Files | Restore Display Settings** to load the saved display settings.

Spectrum Scale

These options allow you to adjust the scale of the data displayed in the graph window in OOIBase32.

Autoscale

 - Graph Scale Toolbar

This option adjusts the scale of the spectrum displayed in the current spectral window so that it fills the display vertically.

Click on the Autoscale icon or select **View | Spectrum Scale | Autoscale**.

Set Scale

 - Graph Scale Toolbar

This option allows you to specify the minimum and maximum limits of both the wavelength and amplitude axes.

Click on the Set Scale icon or select **View | Spectrum Scale | Set Scale**.

Unscale

 - Graph Scale Toolbar

This option resets the spectrum scale.

Click on the Unscale icon or select **View | Spectrum Scale | Unscale** from the menu.

Background Image

These options allow you to configure the appearance of a background image in the graph window of OOIBase32.

Visible

This option enables or disables the display of a bitmap file in the background of the spectral window in OOIBase32.

Select **View | Background | Visible**.

Select Bitmap

This option allows you to choose a background picture to display as a background image in the graph window of OOIBase32.

Select **View | Background Image | Select Bitmap** and navigate to the Windows bitmap (bmp) file you wish to use as a background picture in the spectral window.

Set Graph Background Color

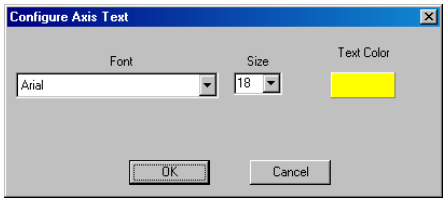
This option allows you to choose a background color for the spectral window.

Select **View | Set Graph Background Color**.

Set Axis Text Properties

This option allows you to choose a color for text in the spectral window.

Select **View | Set Axis Text Properties** from the menu. The Configure Axis Text dialog box appears.

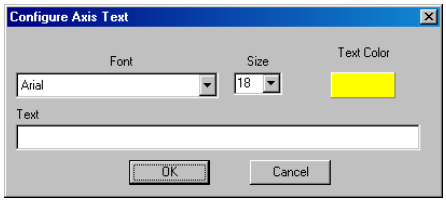


Specify the Font, Size, and Text Color for the axis text via the drop-down menus and color box on the Configure Axis Text dialog box.

Set Graph Title

This option allows you to configure the text and appearance of a graph title in OOIBase32.

Select **View | Set Graph Title** from the menu. The Configure Axis Text dialog box appears.

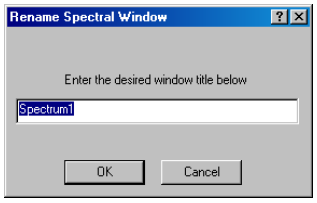


Specify the Font, Size, and Text Color for the axis text via the drop-down menus and color box on the Configure Axis Text dialog box. Then, enter the title of your graph in the Text box and click the **OK** button.

Rename Spectral Window

This option allows you to choose a display name for your data displayed in the spectral window. The software uses this name to refer to specific spectrum windows (when using OOIBase32 Platinum version).

Select **View | Rename Spectral Window** from the menu. The Rename Spectral Window dialog box appears.



Enter a name for your spectral window in the **Enter the desired window title below** box and click the **OK** button.

Cursor

These options enable you to specify cursor display properties in OOIBase32.

Enabled

 - Cursor Controls Toolbar

This option enables or disables the display of a vertical cursor for the spectral window.

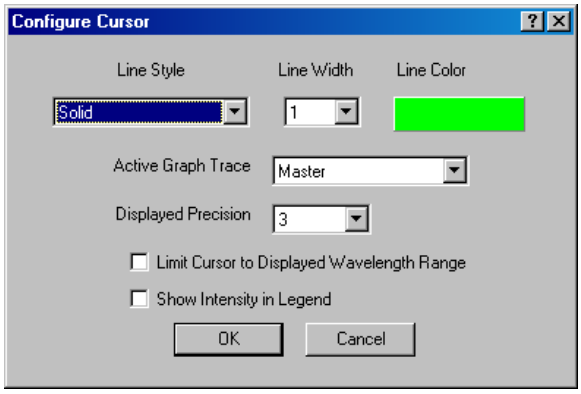
Click on the Toggle Cursor icon or choose **View | Cursor | Enabled**.

Configure

 - Cursor Controls Toolbar

This option configures the cursor's style, width, and color. You can also assign the cursor to a spectrometer channel and set a precision value for the cursor's position.

Click on the Configure Cursor icon or select **View | Cursor | Configure**. The Configure Cursor dialog box opens.



The following table details Configure Cursor options:

Configure Cursor Option	Description
Line Style	Sets the style of line for the cursor (dotted, dashed, etc.)
Line Width	Width of the cursor line in pixels
Line Color	Sets the color of the displayed cursor
Active Graph Trace	Specifies the spectrometer channel associated with the displayed cursor
Displayed Precision	Sets the precision of the data to the specified number of decimal points
Limit Cursor to Displayed Wavelength Range	Restricts the cursor to the wavelengths displayed in the graph window.
Show Intensity in Legend	Displays the intensity at the current cursor location in the legend on the graph window.

Grid

These options allow you to configure the appearance of a grid in the graph window of OOIBase32.

Enabled

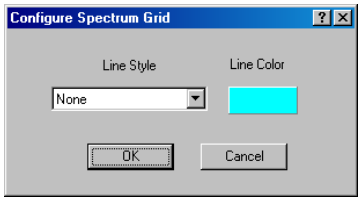
This option enables or disables the display of a grid in the spectral window.

Select **View | Grid | Enabled**.

Configure

This option allows you to configure the grid's style and color.

Select **View | Grid | Configure**. The Configure Spectrum Grid dialog box appears.



Specify the style of line and the color of the grid in the Configure Spectrum Grid dialog box, and then click the **OK** button.

Legend

These options allow you to configure the appearance of the legend in the graph window of OOIBase32.

Enabled

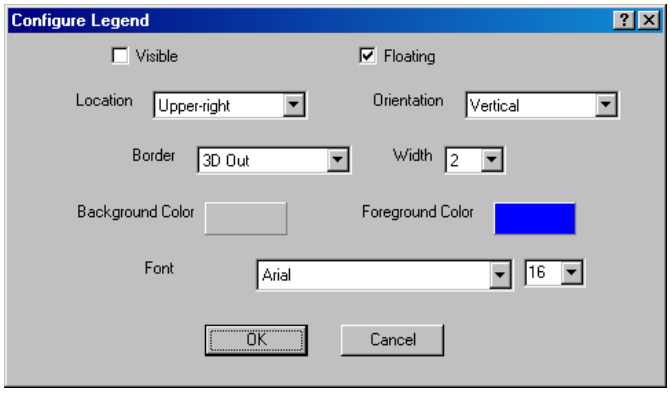
This option enables or disables the display of the legend in the spectral window.

Select **View | Legend | Enabled**.

Configure

This option allows you to configure the legend's position, orientation, appearance, style, and color.

Select **View | Legend | Configure**. The Configure Legend dialog box appears.



The table below details the various options in the Configure Legend dialog box:

Configure Legend Option	Description
Visible	Determines whether or not OOIBase32 displays the legend in the graph window
Floating	Determines graph size in relation to legend. When unchecked, OOIBase32 resizes the graph to accommodate a legend. When checked, the graph size does not change
Location	Specifies the location of the legend in relation to the graph window
Orientation	Determines the orientation of the legend (horizontal or vertical)
Border	Determines the type of border surrounding the legend
Width	Determines the width of the configured border
Background Color	Determines the background color of the legend
Foreground Color	Determines the foreground (text) color of the legend
Font Options	Determines the font type and size of the text in the legend

Show Overlay Filename

This option enables or disables the display of the overlay filename (when you specify an overlay) in the legend displayed in the spectral window.

Select **View | Legend | Show Overlay Filename**.

Main Status Bar

This option enables or disables the display of the Main Window Status Bar in OOIBase32.

Select **View | Main Status Bar**.

6 Overlay Menu Functions

This section details the various options and functions available from the Overlay menu in OOIBase32.

Where applicable, toolbar icons associated with the function appear below the section heading. Click on these icons in OOIBase32 to perform the described function.

Select to add overlay

This option enables you to display or clear data in one of the eight overlay slots for each spectral window.

To open a spectrum as an overlay, select **Overlay | X – Select to add overlay** from the menu (where X represents the number of the overlay you wish to open. A dialog box prompts you to navigate to a saved spectrum file. You must have some previously saved spectrum files to open an overlay.

To clear an overlay, select **Overlay | X**, where X represents the number of the overlay you wish to clear. You may also choose the **Clear All** option (described below) to clear all overlay files from the spectral window.

Note: To configure OOIBase32 to present a warning before clearing an overlay, select **Edit | Settings** from the menu and choose the **Misc. Settings** tab. Once there, check the **Warn Before Overlay Spectrum is Cleared** box.

Clear All

This option clears all displayed overlays in the current spectral window.

Select **Overlay | Clear All**.

7 Spectrometer Menu Functions

This section details the various options and functions available from the Spectrometer menu in OOIBase32.

Where applicable, toolbar icons associated with the function appear below the section heading. Click on these icons in OOIBase32 to perform the described function.

Configure

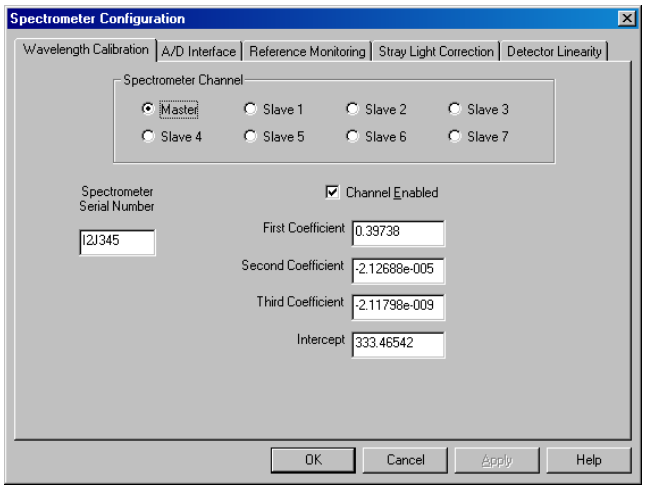
 - Spectral View Mode Toolbar

This option opens the **Spectrometer Configuration** dialog box. This dialog box provides the ability to configure your spectrometer. It includes parameters for wavelength calibration, A/D converter interfacing, reference monitoring, stray light correcting, and detector linearity correction.

OOIBase32 loads the information contained in the Spectrometer Configuration dialog box as part of the default spectrometer file.

Note: The parameters set in this dialog box apply only to a designated spectral window. Each spectral window may have a different spectrometer configuration.

Select **Spectrometer | Configure** from the menu. The Spectrometer Configuration dialog box opens.



Wavelength Calibration Tab

The Wavelength Calibration tab allows you to enter or change the serial number of your spectrometer and the wavelength calibration coefficients of each spectrometer channel.

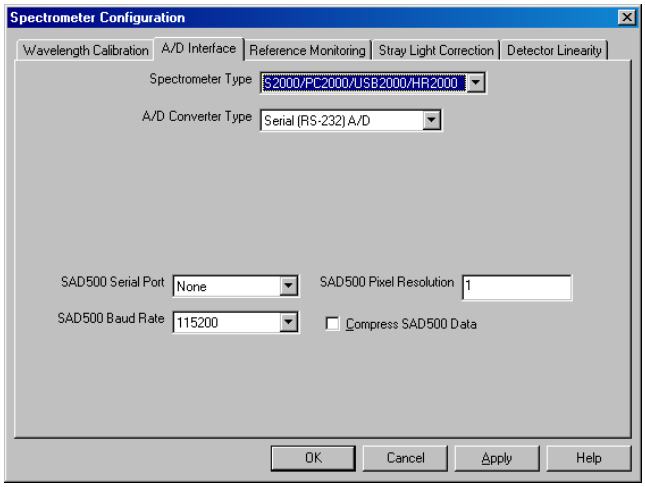
When using a USB-based spectrometer or A/D interface, the coefficients for the spectrometer will automatically load as part of the spectrometer configuration file. For all other spectrometers, you will need to manually enter these values from the Wavelength Calibration Data Sheet that accompanied your spectrometer.

The Wavelength Calibration tab contains the following options:

Option	Description
Spectrometer Channel	Specifies the spectrometer channel for which these modifications will apply
Spectrometer Serial Number	Serial number of the spectrometer on the channel selected in the Spectrometer Channel section
Channel Enabled	Specifies whether or not the channel specified in the Spectrometer Channel section will acquire data
First Coefficient	First wavelength coefficient (provided on the Wavelength Calibration Data Sheet that came with the spectrometer). Applies to the spectrometer selected in the Spectrometer Channel section
Second Coefficient	Second wavelength coefficient (provided on the Wavelength Calibration Data Sheet that came with the spectrometer). Applies to the spectrometer selected in the Spectrometer Channel section
Third Coefficient	Third wavelength coefficient (provided on the Wavelength Calibration Data Sheet that came with the spectrometer). Applies to the spectrometer selected in the Spectrometer Channel section. If your Wavelength Calibration Data Sheet does not contain a third coefficient, enter 0 here
Intercept	Specifies the wavelength intercept of the spectrometer selected in the Spectrometer Channel section

A/D Interface Tab

The A/D Interface tab of the Spectrometer Configuration dialog box allows you to set the hardware parameters for your spectrometer.



The table below contains a description of all options available from this tab. Not all options are available for all hardware types.

Option	Description
Spectrometer Type	Specifies the type of spectrometer in use
A/D Converter Type	Specifies the type of A/D converter in use (if any)
Interrupt Request (IRQ)	Specifies the IRQ number for the A/D converter in use, if applicable
Base Address (I/O Range)	Specifies the Base Address of the A/D converter in use, if applicable. Use the same values as specified by the switches on your A/D board
S1024DW Offset	Adjusts the baseline signal by the specified value Some S1024DW Spectrometers have a negative baseline. This does not affect data since OOIBase32 references all data from the same baseline. However, if you wish to modify the baseline so that all obtained data is positive, enter a value here to offset the baseline of the S1024DW. This option is only available if you select the S1024DW as the Spectrometer Type
SAD500 Serial Port	Specifies the COM port on the PC used to communicate with the SAD500 A/D converter. This option is only available if you select Serial (RS-232) A/D as the A/D Converter Type
SAD500 Baud Rate	Specifies the communication speed at which the SAD500 A/D converter operates. This option is only available if you select Serial (RS-232) A/D as the A/D Converter Type
SAD500 Pixel Resolution	Specifies the pixel resolution of the SAD500 A/D converter. Enter a value of 1-500 in this field. It specifies that the SAD500 will transmit every nth pixel of the spectrometer to the PC. You will need to determine the appropriate pixel resolution through experimentation. Higher pixel resolution values result in increased communication speed, as the SAD500 transmits fewer pixels to the PC. Note that the transfer of one complete spectra requires approximately 0.4 seconds when communicating at 115,200 baud. If you need your information faster than this, increase the pixel resolution or enable data compression. This option is only available you select if Serial (RS-232) A/D as the A/D Converter Type
Compress SAD500 Data	Specifies whether or not you have enabled data compression. The data compression feature maximizes the amount of data transferred over the serial connection. This option is only available if you select Serial (RS-232) A/D as the A/D Converter Type
USB Serial Number	Specifies the serial number of the USB device that OOIBase32 will use. This option is only available when using a USB-based spectrometer or A/D interface

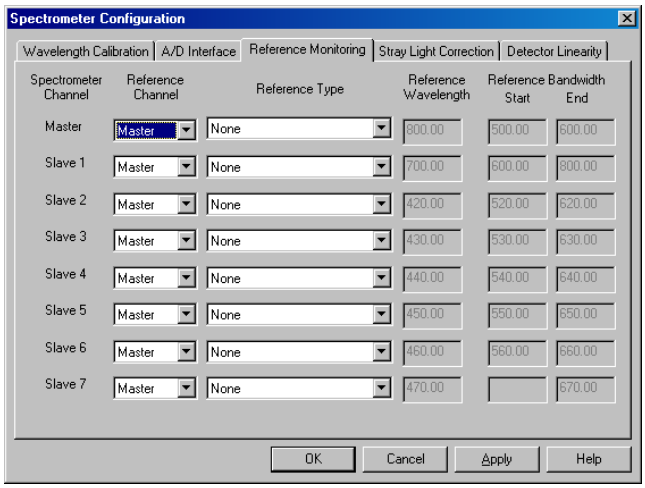
Reference Monitoring Tab

The Reference Monitoring tab of the Spectrometer Configuration dialog box allows you to monitor a reference for variations in spectral intensity based on light source and system drift.

Over time, the detected light from a source fluctuates or drifts. There are two types of drift: Spectrally **uniform** and spectrally **non-uniform**. The drift associated with a tungsten lamp is often spectrally uniform, but the drift associated with a deuterium lamp is not.

For extended experiments, you will achieve optimal results if you take frequent reference spectra. If this is not possible, however, you can choose to monitor your light source and instruct OOIBase32 to correct for any drift that might occur. OOIBase32 can perform a traditional, dual-beam type of reference monitoring with a two-channel system (using Wavelength-by-Wavelength reference monitoring). If you have a single-channel system, however, OOIBase32 can still correct for drift by offering two kinds of reference monitoring: Integrated Intensity and Single Point.

Note: If your reference is in a region that has low scope mode intensity, you will introduce noise into the corrected sample spectrum. Increase signal averaging to increase the S:N. For the best results, make sure that the scope mode intensity of the region or wavelength that you are using as your reference is at least 15% of the peak intensity.



The following sections explain each monitoring option:

Wavelength-by-Wavelength

The Wavelength-by-Wavelength option requires a minimum of two spectrometer channels in your system, both configured for the same wavelength range. This method can correct for both uniform and non-uniform drift.

To monitor a reference using the Wavelength-by-Wavelength option:

Hardware Configuration

1. Attach a bifurcated fiber to the light source.
2. Attach one leg of the bifurcated fiber to the reference spectrometer channel.
3. Attach the second leg to the sample.
4. Attach another fiber from the sample to the second spectrometer channel.

   One spectrometer channel looks at the reference while the other looks at the sample. You must view both channels in the same spectral window.

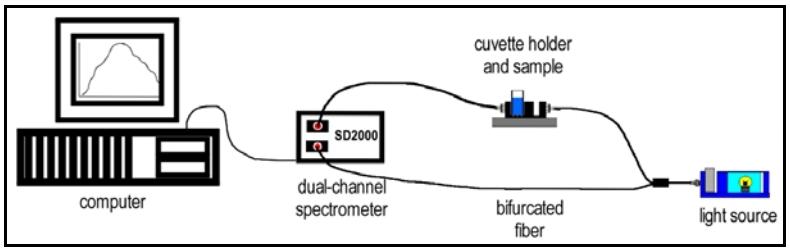
Software Configuration

1. Open OOIBase32 and select **Spectrometer | Configure.**
2. Select the **Reference Monitoring** tab.
3. Locate the channel (in the Spectrometer Channel section) that you will use for your experiment.
4. Select the Reference Monitoring tab and select a **Reference Channel**.
5. Select **Wavelength-by-Wavelength** under Reference Type.
6. Store a dark and a reference spectrum of the sample in scope mode.

Note: You must perform Step 6 *after* configuring reference monitoring.

7. Change to the appropriate spectral view mode in OOIBase32 (or stay in scope mode).

OOIBase32 now will automatically correct for drift and reflect any correction in the spectral window.



Typical Wavelength-by-Wavelength Reference Monitoring Setup

Integrated Intensity

If you cannot perform the dual-beam type of reference monitoring, you can use the Integrated Intensity method. However, this method is only effective if the drift from the detected light is uniform. Use this option instead of the Single Point option if you can afford to use as your reference an *area* of the wavelength region versus a single wavelength point.

Use the Integrated Intensity option if the following is true:

- You do not have two spectrometer channels identically configured
- The drift of the light source is uniform
- Your sample has a non-absorbing wavelength region

Perform the steps below to monitor a reference using the Integrated Intensity option:

Hardware Configuration

1. Attach a fiber from the light source to the sample.
2. Attach a fiber from the sample to the spectrometer.

Software Configuration

1. Open OOIBase32 and select **Spectrometer | Configure.**
2. Select the **Reference Monitoring** tab.
3. Locate the channel (in the Spectrometer Channel section) that you will use for your experiment.

(Continued)

4. Select the Reference Monitoring tab and select a **Reference Channel**.
5. Select **Integrated Intensity** under Reference Type.
6. Choose the **Start** and **End** for the **Reference Bandwidth**.

   The software will use the wavelength area between these two points as the monitoring region. You must know if the region you choose as the reference area is in a non-absorbing region of the sample (during absorbance measurements) or is in the 100% transmission or reflectivity region of the sample (during transmission or reflection measurements).
7. Store a dark and a reference spectrum of your sample while in scope mode.

   Note: You must perform Step 7 *after* configuring reference monitoring.
8. Change to the appropriate spectral view mode in OOIBase32 (or stay in scope mode).

OOIBase32 now will automatically correct for drift and reflect any correction in the spectral window.

Single Point

If you cannot perform the dual-beam type of reference monitoring, you can use the Single Point method. However, it is only possible for the software to correct for drift using this option if the drift from the detected light is uniform. Choose this option over the Integrated Intensity option only if you cannot afford to use as your reference an *area* of the wavelength region and must monitor a single wavelength point.

Use the Single Point option if:

- You do not have two spectrometer channels identically configured
- The drift of the light source is uniform
- You cannot afford to sample a wavelength area and must monitor a non-absorbing wavelength region

To monitor a reference using the Single Point option:

Hardware Configuration

1. Attach a fiber from the light source to the sample.
2. Attach a fiber from the sample to the spectrometer.

Software Configuration

1. Open OOIBase32 and select **Spectrometer | Configure.**
2. Select the **Reference Monitoring** tab.
3. Locate the channel (in the Spectrometer Channel section) that you will use for your experiment.
4. Select the Reference Monitoring tab and select a **Reference Channel**.
5. Select **Single Point** under Reference Type.
6. Specify the **Reference Wavelength** point to monitor.

   You must know if the wavelength point you choose as the reference point is in a non-absorbing region of the sample (during absorbance measurements) or is in the 100% transmission or reflectivity region of the sample (during transmission or reflection measurements).

   (Continued)

7. Store a dark and a reference spectrum of your sample while in scope mode.

Note: You must perform Step 7 *after* configuring reference monitoring.

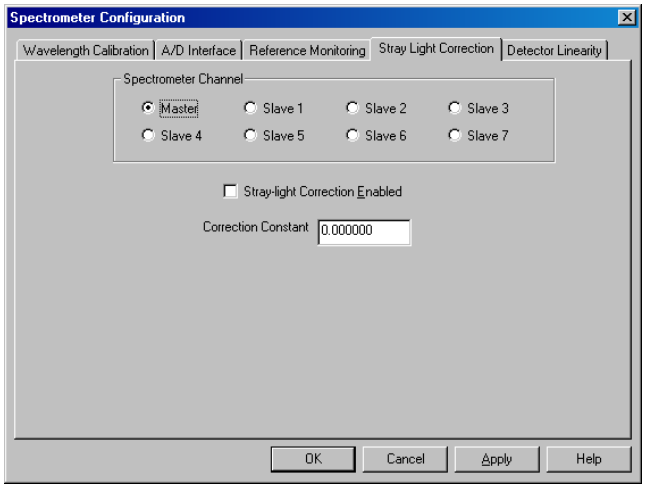
8. Change to the appropriate spectral view mode in OOIBase32 (or stay in scope mode).

OOIBase32 now will automatically correct for drift and reflect any correction in the spectral window.

Stray Light Correction Tab

The Stray Light Correction tab allows you to enable or disable the stray light correction feature and to enter the stray light correction constant for each spectrometer channel.

Stray light is light the spectrometer detects at a wavelength or wavelengths other than those at which the spectrometer *should* detect light. All spectrometers experience the effects of stray light. When you enable the stray light correction feature, the **Correction Constant** reduces every pixel's intensity to compensate for the total amount of stray light in the spectrometer.

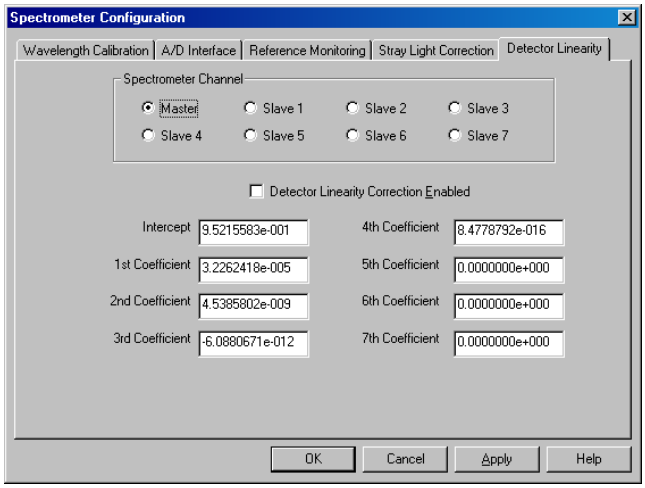


The table below details the options available in the Stray Light Correction tab:

Option	Description
Spectrometer Channel	Specifies the spectrometer channel for which modifications on the Stray Light Correction tab apply
Stray-light Correction Enabled	Enables or disables the stray light correction feature of OOIBase32
Correction Constant	Contains a variable used by OOIBase32 to reduce the intensity of each pixel in the spectrometer.

Detector Linearity Tab

The Detector Linearity tab allows you to enable or disable the detector linearity correction and to enter the correction coefficients for each spectrometer channel in your system.



When using a USB2000 or HR2000 Spectrometer, the software automatically populates the values in the Detector Linearity tab from the information on the spectrometer EEPROM chip.

For all other devices, you must run the OOINLCorrect program available at the following address:

http://www.oceanoptics.com/technical/softwaredownloads.asp.

When you run OOINLCorrect, the software prompts you to update your driver files and default spectrometer configuration file. At this prompt, specify the configuration file that accompanied the spectrometer you are using. OOINLCorrect will obtain the Detector Linearity information from this file and load these values into OOIBase32 automatically.

You will still need to manually enable the detector linearity correction feature.

Contact Ocean Optics Technical Support for assistance, if necessary.

Open Configuration

This option allows you to open a file containing saved spectrometer configuration parameters.

Select **Spectrometer | Open Configuration**. A dialog box prompts you to navigate to the configuration file you wish to open.

After selecting the file, a message box opens asking if you would like to make the selected configuration file the default configuration file. Select **Yes** or **No**. You can save multiple configuration files and switch easily among them.

Save Configuration As

This option allows you to save the current spectrometer configuration parameters. After you name and save the file, you can make the saved file the default configuration file. OOIBase32 will load that file each time the software starts or a new spectral window opens.

Select **Spectrometer | Save Configuration As** to access this option.

8 Spectrum Menu Functions

This section details the various options and functions available from the Spectrum menu in OOIBase32.

Where applicable, toolbar icons associated with the function appear below the section heading. Click on these icons in OOIBase32 to perform the described function.

Store Dark

 - Spectrum Controls Toolbar

This option stores a dark spectrum for all enabled spectrometer channels in a spectral window (unless you manually configure the **When Storing Reference and Dark** option on the **Misc. Settings** tab of the OOIBase32 Settings dialog box, which stores the dark spectrum for the selected spectrometer channels). Block the light path to the sample, and then take the dark spectrum.

You must store a dark spectrum before the software can calculate absorbance, transmission, and relative irradiance spectra. This command merely stores a dark spectrum in temporary memory. You must use the **File | Save | Dark** command to permanently save the dark spectrum to disk.

Click on the Store Dark icon or select **Spectrum | Store Dark** from the menu.

Store Reference

 - Spectrum Controls Toolbar

This option stores a reference spectrum for all enabled spectrometer channels in a spectral window (unless you manually configure the **When Storing Reference and Dark** option on the **Misc. Settings** tab of the OOIBase32 Settings dialog box, which stores the reference spectrum for the selected spectrometer channels). Take a reference spectrum with the light source on and a blank in the sampling region.

You must store a reference spectrum before the software can calculate absorbance, transmission, and reflection spectra. This command merely stores a reference spectrum in temporary memory. You must use the **File | Save | Reference** command to permanently save the reference spectrum to disk.

Click on the Store Reference icon or select **Spectrum | Store Reference** from the menu.

Snapshot

 - Spectrum Controls Toolbar

This option halts data acquisition and takes a snapshot of the activity in the spectral window.

This option also places OOIBase32 in Snapshot mode, which allows you to obtain single exposures of the activity in the spectral window by clicking the Single Exposure icon (described below).

Click on the Snapshot icon or select **Spectrum | Snapshot** from the menu.

Single Exposure

 - Spectrum Controls Toolbar

This option reactivates data acquisition, and acquires and displays a single spectral acquisition. It is only active when OOIBase32 is in Snapshot mode (described above).

Click on the Single Exposure icon or select **Spectrum | Single Exposure** from the menu.

Emergency Reset

 - Spectrum Controls Toolbar

This option resets all acquisition parameters for the active spectral window.

In some cases, a chosen set of acquisition parameters could take an extremely long time to complete a spectral acquisition (for example, a 10,000 msec integration time with 1000 averages). Selecting this command sets the integration time to 100 msec, acquires one average, and turns off spectral smoothing and external triggering.

Click on the Emergency Reset icon or select **Spectrum | Emergency Reset**.

Global

Store Global Dark

 - Global Functions Toolbar

This option stores the current spectra as dark spectra for **all** spectral windows in OOIBase32.

Take the dark spectrum with the light source off or with the light path blocked. You must save a dark spectrum before the computer can make the calculations of absorbance, transmission, and relative irradiance spectra. Additionally, you must use the **Save Dark** command to permanently save the dark spectrum to disk.

Click on the Store Global Dark icon or select **Spectrum | Global | Store Global Dark**.

Store Global Reference

 - Global Functions Toolbar

This option stores the current spectra as reference spectra for **all** spectral windows in OOIBase32.

Take a reference spectrum with the light source on and a blank in the sampling region. You must save a reference spectrum before the computer can make the calculations of absorbance, transmission, and reflection spectra. Additionally, you must use the **Save Reference** command to permanently save the reference spectrum to disk.

Click on the Store Global Reference icon or select **Spectrum | Global | Store Global Reference**.

Global Snapshot

 - Global Functions Toolbar

This option freezes the data acquisition for **all** spectral windows in OOIBase32 and allows you to continue to view a single set of spectra.

Click on the Global Snapshot icon or select **Spectrum | Global | Global Snapshot**.

Global Emergency Reset

 - Global Functions Toolbar

Use this command to reset all acquisition parameters for **all** spectral windows in OOIBase32.

In some cases, a chosen set of acquisition parameters could take an extremely long time to complete a spectral acquisition (for example, a 10,000 msec integration time with 1000 averages). Selecting this command sets the integration time to 100 msec, acquires one average, and turns off spectral smoothing and external triggering.

Click on the Global Emergency Reset icon or select **Spectrum | Global | Global Emergency Reset**.

Configure Data Acquisition

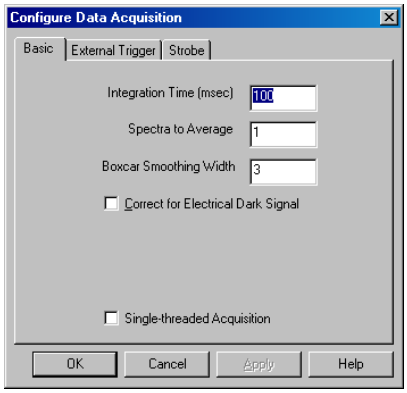
 - Spectrum Controls Toolbar

This option opens the Configure Data Acquisition dialog box. This dialog box allows you to configure aspects of the data acquisition process.

You can access basic parameters (such as integration time or averaging) and advanced parameters (such as strobe control and triggering) through this dialog box.

Basic Tab

The Basic tab allows you to configure basic data acquisition parameters.

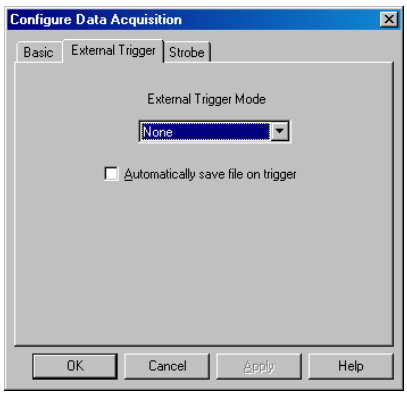


This tab contains the following options:

Option	Description
Integration Time (msec)	Specifies the integration time (or A/D conversion frequency for an S1000 or S2000BT) of the spectrometer, which is analogous to the shutter speed of a camera. The higher the integration time, the longer the detector "looks" at the incoming photons. If your Scope Mode intensity is too low, increase this value. If the intensity is too high, decrease the value. Adjust the integration time so that the greatest amount of light that you anticipate for your application causes a signal of about 3500 counts. While watching the graph trace, adjust the integration time until the signal intensity level is approximately 3500 counts. The integration time specified controls enabled spectrometer channels in the active spectral window.
Spectra to Average	Specifies the number of discrete spectral acquisitions that the OOIDRV32 device driver accumulates before OOIBase32 receives a spectrum. The higher the value, the better the signal-to-noise ratio (S:N). The S:N will improve by the square root of the number of scans averaged.
Boxcar Smoothing Width	Sets the boxcar smoothing width, a technique that averages across spectral data. This technique averages a group of adjacent detector elements. A value of 5, for example, averages each data point with 5 points to its left and 5 points to its right. The greater this value, the smoother the data and the higher the signal-to-noise ratio. If the value entered is too high, a loss in spectral resolution will result. The S:N will improve by the square root of the number of pixels averaged.
Correct for Electrical Dark Signal	Enables or disables the correction of the spectral data for electrical dark signal. The first 24 pixels in the spectrometer, while producing an electrical signal, do not respond to light. This option subtracts the average value of these first 24 pixels from the entire spectrum.
Single-threaded Acquisition	Enables or disables the multi-threaded acquisition feature of OOIBase32. When you disable this option, the acquisition of spectral data occurs in a separate thread, allowing for the processing of user input. When enabled, the acquisition and user-interface occur in the same thread, which prevents the processing of user input during the time OOIBase32 is acquiring the scan. You should always leave this option unchecked unless otherwise instructed.

External Trigger Tab

The External Trigger tab contains options that allow you to configure your sampling system to acquire data when triggered by an external source.



This tab contains the following options:

Option	Description
External Trigger Mode	Sets the external trigger mode of the spectrometer. Available options include None (free running), Software (integration time controlled by software settings), Synchronization (integration time controlled by frequency of triggers), and Hardware (hardware fixed or jumpered integration time).
Automatically save file on trigger	Enables or disables the saving of processed data with each external trigger. If you disable the Autoincrement Filenames feature, OOIBase32 displays a File Save dialog box with each trigger.

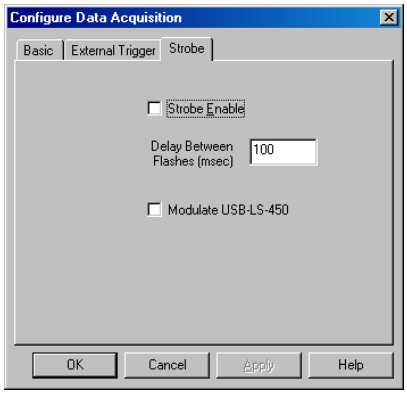
View the External Triggering Options manual for specific triggering configuration instructions. This manual is available at the following web address:

http://www.oceanoptics.com/technical/externaltriggering.pdf

It is also available on the Ocean Optics Software and Technical Resources CD.

Strobe Tab

The Strobe tab contains options that allow you to configure the strobing features of OOIBase32 and your strobe-compatible light source.



This tab contains the following options:

Option	Description
Strobe Enable	Enables or disables the spectrometer strobe control function. This function toggles the S0 line of the spectrometer.
Delay Between Flashes (msec)	Sets the delay, in milliseconds, between strobe signals sent out of the spectrometer. This parameter only has an effect when using an ADC1000/ADC1000-USB/ADC2000-PCI A/D converter.
Modulate USB-LS-450	Enables or disables the modulation of the LED in the USB-LS-450 light source. This option performs the same function as the Modulate LED option in the USB-LS-450 toolbar.

Scope Mode

 - Spectral View Mode Toolbar

This command switches the current spectral window into Scope Mode.

The signal graphed in Scope Mode is the raw voltage coming out of the A/D converter. This spectral view mode provides complete control of signal processing functions before taking absorbance, transmission, reflection, and relative irradiance measurements. This mode reflects the intensity of the light source, the reflectivity of the grating and mirrors in the spectrometer, the transmission efficiency of the fibers, the response of the detector, and the spectral characteristics of the sample.

Use Scope Mode when configuring your setup, adjusting the integration time, and taking dark and reference scans.

Click the Scope Mode icon or select **Spectrum | Scope Mode**.

Scope Mode Minus Dark

 - Spectral View Mode Toolbar

This command switches the current spectral window into Scope Mode, and subtracts the stored dark spectra from each spectrometer channel before OOIBase32 displays it.

See the description of Scope Mode (above) for more information.

Click the Scope Mode icon or select **Spectrum | Scope Mode Minus Dark**.

Absorbance Mode

 - Spectral View Mode Toolbar

This command switches the current window into Absorbance Mode. You must first store a dark and reference spectra in Scope Mode before you can access Absorbance Mode.

OOIBase32 uses an equation to determine the concentration of a species in solution (illustrated below). The software uses this equation to evaluate each pixel on the detector and produce the absorbance spectrum:

$$A_\lambda = -\log_{10}\left(\frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda}\right)$$

…where *S* is the sample intensity at wavelength λ, *D* is the dark intensity at wavelength λ, and *R* is the reference intensity at wavelength λ..

The concentration of a species in a solution directly affects the absorbance of the solution. This relationship, known as Beer's Law, is:

$$A_\lambda = \varepsilon_\lambda c \ell$$

…where *A* is the absorbance at wavelength λ, ε_λ is the extinction coefficient of the absorbing species at wavelength λ, *c* is the concentration of the absorbing species and ℓ is the optical path length of the absorption.

Click the Absorbance Mode icon or select **Spectrum | Absorbance Mode** to enter Absorbance Mode.

Transmission Mode

 - Spectral View Mode Toolbar

This command switches the current window into Transmission Mode. This is also the spectral processing mode used for reflection spectroscopy, as the math necessary to compute reflection is identical to that required for transmission. You must first store a dark and reference spectra in Scope Mode before you can access Transmission Mode.

OOIBase32 calculates the transmission of a solution using the following equation:

$$\%T_\lambda = \frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda} \times 100\%$$

…where S_λ is the sample intensity at wavelength λ, D_λ is the dark intensity at wavelength λ, and R_λ is the reference intensity at wavelength λ.

Click the Transmission Mode icon or select **Spectrum | Transmission Mode** to enter Transmission Mode.

Relative Irradiance Mode

 - Spectral View Mode Toolbar

This command switches the current window into Relative Irradiance Mode.

Before you can access Relative Irradiance Mode, you must take a reference spectrum in Scope Mode of a blackbody of known color temperature. Additionally, you must obtain a dark spectrum by removing the fiber from the reference lamp and preventing light from entering it.

Relative irradiance spectra are a measure of the intensity of a light source relative to a reference emission source. OOIBase32 calculates relative irradiance using the following equation:

$$I_\lambda = B_\lambda \left(\frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda} \right)$$

…where B_λ is relative energy of the reference calculated from the color temperature, S_λ is the sample intensity at wavelength λ, D_λ is the dark intensity at wavelength λ, and R_λ is the reference intensity at wavelength λ..

Click the Relative Irradiance Mode icon or select **Spectrum | Relative Irradiance Mode** to enter Relative Irradiance Mode.

Specular Reflection Mode

 - Spectral View Mode Toolbar

This command switches the current window into Reflection Mode. This is also the spectral processing mode used for transmission spectroscopy, as the math necessary to compute transmission is identical to that required for reflection.

You must take a dark and reference spectra in Scope Mode before you can access Specular Reflection Mode.

OOIBase32 calculates the reflection of a solution using the following equation:

$$\%T_\lambda = \frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda} \times 100\%$$

…where S_λ is the sample intensity at wavelength λ, D_λ is the dark intensity at wavelength λ, and R_λ is the reference intensity at wavelength λ.

Click the Specular Reflection Mode icon or select **Spectrum | Specular Reflection Mode** to enter Specular Reflection Mode.

Script-defined Custom Mode

 - Spectral View Mode Toolbar

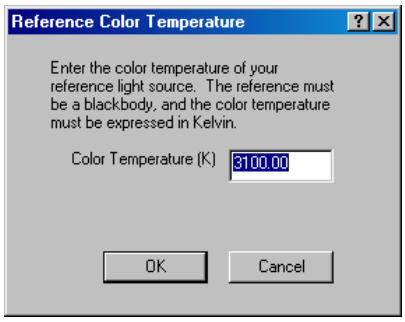
This mode is only available in OOIBase32 Platinum. Contact an Ocean Optics Application Specialist for more information on OOIBase32 Platinum.

You can find more information about OOIBase32 Platinum at the following web address:

http://www.oceanoptics.com/products/ooibase32plat.asp

Reference Color Temperature

This command opens a Reference Color Temperature dialog box, which allows you to enter the color temperature (in Kelvin) of your reference lamp.



You must enter the color temperature to use Relative Irradiance Mode.

Select **Spectrum | Reference Color Temperature**.

Configure Standard Correction

This function is currently under development.

Take Log of Vertical Scale

This command enables or disables the presentation of spectral data on a logarithmic vertical scale.

When you enable this feature, OOIBase32 takes the base-10 logarithm of the spectral intensities and affects both the plotted and stored spectral data.

Select **Spectrum | Take Log of Vertical Scale**.

Time Normalized Intensity

The Time Normalized Intensity Mode is useful in experiments where the reference and sample scans cannot use the same integration times due to detector saturation from the reference or the sample.

In this mode, you can use one integration time for the reference spectra and a different integration time for sample spectra. The software normalizes the data as a function of time. However, in order for this processing technique to produce valid spectral data, you must store separate dark spectra for each integration time used.

Enable

This option enables or disables the Time Normalized Intensity Mode.

Select **Spectrum | Time Normalized Intensity | Enable.**

Enable this option **before** storing any spectra.

Store Reference Dark

This option stores a reference dark spectrum for all enabled spectrometer channels in the active spectral window while in time normalized intensity mode. Take the reference dark spectrum with the light path blocked and with the integration time set to the value used when acquiring the reference spectra.

You must store a reference dark spectrum before OOIBase32 can calculate absorbance, transmission, and relative irradiance spectra in the Time Normalized Intensity Mode.

Select **Spectrum | Time Normalized Intensity | Store Reference Dark.**

Store Sample Dark

This option stores a sample dark spectrum for all enabled spectrometer channels in the active spectral window while in time normalized intensity mode. Take the sample dark spectrum with the light path blocked and with the integration time set to the value used when acquiring the sample spectra.

You must store a sample dark spectrum before OOIBase32 can calculate absorbance, transmission, and relative irradiance spectra in the Time Normalized Intensity Mode.

Select **Spectrum | Time Normalized Intensity | Store Sample Dark**.

Store Reference (Ctrl+R)

This option stores a reference spectrum for all enabled spectrometer channels in a spectral window while in time normalized intensity mode. Take this spectrum with the light source on and a blank in the sampling region.

You must store a reference spectrum before OOIBase32 can calculate absorbance, transmission, and reflection spectra in the Time Normalized Intensity Mode.

Select **Spectrum | Time Normalized Intensity | Store Reference**.

9 Time Acquisition Menu Functions

This section details the various options and functions available from the Time Acquisition menu in OOIBase32.

Where applicable, toolbar icons associated with the function appear below the section heading. Click on these icons in OOIBase32 to perform the described function.

Time acquisition experiments track processes, perform kinetic analyses, and monitor spectral events as a function of time. You can collect spectral data as a function of time from up to six single wavelengths (designated as Channels A through F) and up to two mathematical combinations of these wavelengths (designated as Combinations 1 and 2). You can acquire data in any mode.

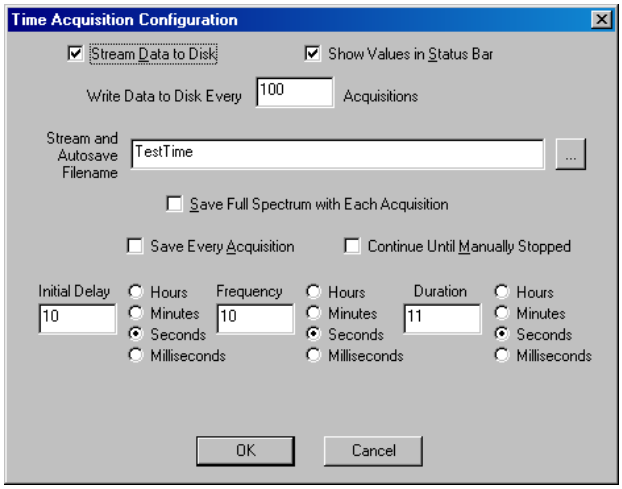
Follow the instructions in the sections that follow to configure OOIBase32's Time Acquisition functions:

Configure

The Time Acquisition | Configure option brings up a sub-menu with options that allow you to configure a variety of aspects for your time acquisition experiments.

Configure Acquisition

This option opens the **Time Acquisition Configuration** dialog box. This dialog box allows you to configure and establish the parameters for OOIBase32's time acquisition processing.



Available options on the Time Acquisition Configuration dialog box include:

Option	Description
Stream Data to Disk	Forces OOIBase32 to write the time acquisition data to disk during the time acquisition process. The software writes data at the frequency defined by the Write Data to Disk Every X Acquisitions setting.
Show Values in Status Bar	Displays the time acquisition values in the status bar during the time acquisition. These values replace the display of the cursor values.

(Continued)

Option	Description
Write Data to Disk Every X Acquisitions	Sets the number of discrete time acquisitions to perform before the software streams data to the disk. The smaller this number, the more frequently OOIBase32 will write the data to disk. You can enhance time acquisition performance by making this number larger and thus reducing the number of times the software writes data to the disk
Stream and Autosave Filename	Defines the filename of the time acquisition stream file or the auto-incremented files saved (when you enable the Save Full Spectrum with Each Acquisition option).
Save Full Spectrum with Each Acquisition	Saves the complete spectral data for each enabled spectrometer channel at each time interval in the time acquisition experiment.
Save Every Acquisition	Configures the time acquisition to store data for every spectral acquisition. OOIBase32 will ignore the value in the Frequency setting when you enable this option.
Continue Until Manually Stopped	Configures the time acquisition to continue to store data until you manually stop the process with either the **Stop** button on the Time Acquisition toolbar or the **Time Acquisition | Stop** command from the menu. OOIBase32 will ignore the Duration setting when you enable this option.
Initial Delay	Determines the initial delay for a time acquisition. OOIBase32 introduces this delay after you initiate the time acquisition with the **Start** button on the Time Acquisition toolbar or the **Time Acquisition | Start** command from the menu. Select the **Hours**, **Minutes**, **Seconds,** or **Milliseconds** from the check boxes immediately to the right of the entry to specify the time units of the initial delay period.
Frequency	Determines the frequency of the data collection in a time acquisition. Numerous parameters determine how rapidly OOIBase32 can acquire data (integration time, number of scans averaged, video performance, computer speed, etc.). This entry controls the delay between acquisitions. The software stamps data from a time acquisition with a time accurate to 1 millisecond. Select the **Hours**, **Minutes**, **Seconds,** or **Milliseconds** from the check boxes immediately to the right of the entry to specify the time units of the frequency variable. OOIBase32 will ignore the Frequency setting when you enable the Save Every Acquisition option.
Duration	Determines the length of the data collection in a time acquisition. Select the **Hours**, **Minutes**, **Seconds,** or **Milliseconds** from the check boxes immediately to the right of the entry to specify the time units of the duration variable. OOIBase32 will ignore the Duration setting when you enable the Continue Until Manually Stop option.

Select **Time Acquisition | Configure | Configure Acquisition** to access this dialog box.

Configure Time Channels

The Configure Time Channels option allows you to configure time channels for a time acquisition process.

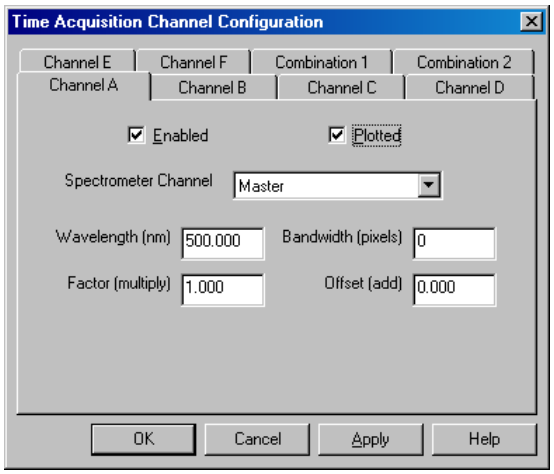
You can collect spectral data as a function of time from up to 6 single wavelengths (designated as Time Channels A through F) and up to two mathematical combinations of these wavelengths (designated as Time Channel Combinations 1 and 2).

Select **Time Acquisition | Configure| Configure Time Channels** to access the Time Acquisition Channel Configuration dialog box.

Time Channels A Through F

These tabs allow you to configure a time acquisition process for a single wavelength.

Select one of the **Channel** tabs to modify information for that channel.



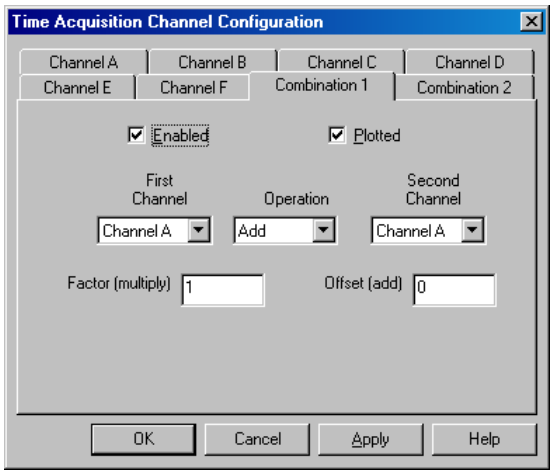
The following options are available from the Channel tabs on the Time Acquisition Channel Configuration dialog box:

Option	Description
Enabled	Enables the time acquisition calculation for the channel. Time acquisition will not acquire data for this channel if you uncheck this box.
Plotted	Instructs the system to plot the time acquisition data in a spectral window. Each channel or combination of channels for a time acquisition means that you have one less overlay available in the same spectral window as the time acquisition process. If you specify Channel A for the time acquisition, Overlay 1 will not be available in the spectral window. If you specify Channel B for the time acquisition, Overlay 2 will not be visible, etc.
Spectrometer Channel	Determines the spectrometer channel to use for the time acquisition.
Wavelength (nm)	Determines the wavelength (in nm) to use for the time acquisition
Bandwidth (pixels)	Determines the bandwidth (in pixels) that the system will average around the analysis wavelength in a time acquisition.
Factor (multiply)	Contains a multiplicative factor that OOIBase32 will apply to time acquisition data before it plots or stores the data.
Offset (add)	Contains an additive constant that OOIBase32 will apply to the time acquisition data after it applies the factor and before it plots or stores the data.

Time Channels Combination 1 and 2

These tabs allow you to configure a time acquisition process for a combination of two time channels.

Select one of the **Combination** tabs to modify information for that combination.



The following options are available from the Combination tabs on the Time Acquisition Channel Configuration dialog box:

Option	Description
Enabled	Enables the time acquisition calculation for the combination.
Plotted	Instructs OOIBase32 to plot the time acquisition data in a spectral window. Each channel or combination of channels for a time acquisition results in one less Overlay being available in the same spectral window as the time acquisition process. If you specify Combination 1 for the time acquisition, Overlay 1 will not be available in the spectral window. If you specify Combination 2 for the time acquisition, Overlay 2 will not be visible.
First Channel	Specifies the first time acquisition channel for the time Combination 1.
Operation	Specifies the mathematical operation to perform on both the First Channel and the Second Channel to produce the time acquisition Combination 1 data.
Second Channel	Specifies the second time acquisition channel for the time Combination 1.
Factor (multiply)	Contains a multiplicative factor that OOIBase32 will apply to time acquisition data before it plots or stores the data.
Offset (add)	Contains an additive constant that OOIBase32 will apply to the time acquisition data after it applies the factor and before it plots or stores the data.

Restore Parameters

This option opens a dialog box that prompts you to navigate to and open a file with the complete set of saved time acquisition parameters, including the configuration settings for all time channels

You must have previously saved a set of time acquisition parameters in order to restore them. See the Save Parameters section below.

Select **Time Acquisition | Configure | Restore Parameters** to access the Restore Parameters dialog box.

Save Parameters

This option saves a complete set of time acquisition parameters, including the configuration settings for all time channels. After saving this file, you may designate the saved parameters file as the default parameters for all future time acquisition experiments.

Select **Time Acquisition | Configure | Save Parameters** to access the Save Parameters dialog box.

Activate Time Acquisition

 - Time Acquisition Toolbar

This option activates Time Acquisition Mode.

Note: This function only places OOIBase32 in Time Acquisition Mode. It does not start data acquisition. You must click the Start icon or select **Time Acquisition | Start** to begin data acquisition.

Click on the icon or select **Time Acquisition | Activate Time Acquisition**.

Start

 - Time Acquisition Toolbar

This option starts the time acquisition process. OOIBase32 enables this option once you activate Time Acquisition Mode.

If you configured the software to stream data to disk, OOIBase32 opens the data file at this point. Once you start time acquisition, you can pause it, stop it, or permit it to run for the previously defined duration

Click on the start icon or select **Time Acquisition | Start**.

Pause

 - Time Acquisition Toolbar

This option pauses the time acquisition process. OOIBase32 enables this option once you begin the time acquisition process.

If you defined a specific duration for the time acquisition process in the Time Acquisition Configuration dialog box, the acquisition will pause until you disable the pause option. If the duration expires during the paused state, the process terminates and OOIBase32 saves all collected data.

It is possible to pause a time acquisition process and change the parameters without losing any previously stored data

Click on the start icon or select **Time Acquisition | Pause**.

Stop

 - Time Acquisition Toolbar

This option stops the time acquisition process. OOIBase32 enables this option once you begin the time acquisition process.

You can stop a time acquisition at any point during the acquisition. If you specified to stream data to disk, OOIBase32 saves any collected data.

Click on the start icon or select **Time Acquisition | Stop**.

Suspend Graph Display

 - Time Acquisition Toolbar

This option suspends the graph display during a time acquisition process. OOIBase32 enables this option once you begin the time acquisition process.

Depending on your computer, OOIBase32 can spend up to 90% of software processing time calculating and drawing the graph. When you suspend the display, you allow OOIBase32 to collect data at a higher frequency.

Click on the start icon or select **Time Acquisition | Suspend Graph Display**.

Save Data

This option saves the data from a time acquisition process. It saves all time acquisition data currently shown in the spectral window. This function is not the same as streaming data to the disk, and OOIBase32 saves only the last 2048 time acquisitions.

OOIBase32 stores the data in a tab-delimited ASCII file, with time data arranged in columns. The first column is a time stamp for each acquisition and is in seconds.

Click on the start icon or select **Time Acquisition | Save Data** to access this option.

10 Other Menu Functions

This section details the various options and functions available from other menus in OOIBase32 not previously detailed in this manual.

Where applicable, toolbar icons associated with the function appear below the section heading. Click on these icons in OOIBase32 to perform the described function.

Script Menu Functions

The Script menu in OOIBase32 is only active in the OOIBase32 Platinum version of the software. Contact an Ocean Optics Application Specialist for more information on OOIBase32 Platinum.

You can find more information about OOIBase32 Platinum at the following web address:

http://www.oceanoptics.com/products/ooibase32plat.asp

Window Menu Functions

The Window menu functions allow you to configure how OOIBase32 displays multiple windows.

Function	Description	Example
Cascade	This option arranges all spectral windows in a horizontally overlapping design. Select **Window | Cascade**.	
Tile Horizontally	This option stacks all spectral windows on top of one another. Select **Window | Tile Horizontally**.	
Tile Vertically	This option arranges all spectral windows side by side. Select **Window | Tile Vertically**.	

Arrange Icons

This command arranges all iconic windows.

Select **Window | Arrange Icons**.

Help Menu Functions

The Help Menu contains links to the online help system, as well as information regarding your installation of OOIBase32 and other system information.

Contents

This option displays the contents page of the OOIBase32 help file.

Select **Help | Contents**.

Index

This option displays the index page of the OOIBase32 help file.

Select **Help | Index**.

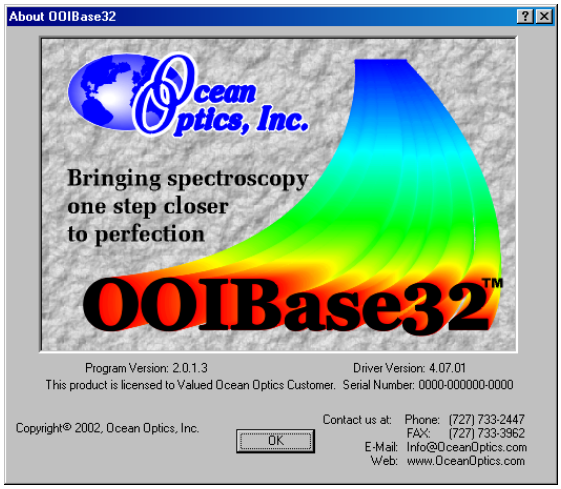
Always on Top

This option instructs OOIBase32 to display the OOIBase32 help file on top of all other displayed windows on the screen.

Select **Help | Always on Top**.

About OOIBase32

This command displays the About OOIBase32 dialog box.



This dialog box contains the following information:

- Program version number
- OOIBase32 driver version
- Copyright information
- Contact information

Select **Help | About OOIBase32**.

11 Experiment Tutorials

The following sections contain information on conducting sample experiments using the USB2000 Spectrometer and OOIBase32.

For information on experiments with Ocean Optics spectrometers other than the USB2000, consult the operating instructions for your particular spectrometer model.

Preparing for Experiments

Follow the steps below to configure the USB2000 and OOIBase32 for experiments:

1. Verify that you have correctly installed the USB2000, installed OOIBase32, and configured the light source and other sampling optics.
2. Open the OOIBase32 application, select **Spectrometer | Configure** from the menu bar, and double-check that **A/D Interface** settings are correct.
3. Check your spectrometer setup configurations in OOIBase32:

   Locate the Wavelength Calibration Data sheet that came with the USB2000. Select **Spectrometer | Configure** from the menu and choose the **Wavelength Calibration** page. Ensure the First Coefficient, Second Coefficient, Third Coefficient and Intercept correspond to those of the system.
4. Adjust the acquisition parameters using the **Acquisition Parameters** dialog bar or select **Spectrum | Configure Data Acquisition** from the menu.

   If you followed the previous steps and started OOIBase32, the spectrometer is already acquiring data. Even with no light in the spectrometer, OOIBase32 should display a dynamic trace in the bottom of the graph window. If you allow light into the spectrometer, the graph trace should rise with increasing light intensity. This indicates that you correctly installed the software and hardware.

Once you install the hardware, configure the software, and establish your sampling system, you are ready to take measurements.

This section details five types of experiments:

- Absorbance
- Transmission
- Reflection
- Relative irradiance
- Time Acquisition

The type of measurement you will take determines the configuration of the sampling optics for your system. Furthermore, your choice of reference and data analysis determines how the OOIBase32 presents the results.

Note: For each measurement, you must first take a reference and dark spectrum. After you take a reference and a dark spectrum, you can take as many measurement scans as needed. However, if you change any sampling variable (integration time, averaging, smoothing, fiber size, etc.), you must store a new dark and reference spectrum.

Application Tips

If the signal you collect is saturating the spectrometer (intensity greater than 4000 counts), you can decrease the light level on scale in scope mode by:

- Decreasing the integration time
- Attenuating the light going into the spectrometer
- Using a smaller diameter fiber
- Using a neutral density filter with the correct optical density

If the signal you collect has too little light, you can increase the light level on scale in scope mode by:

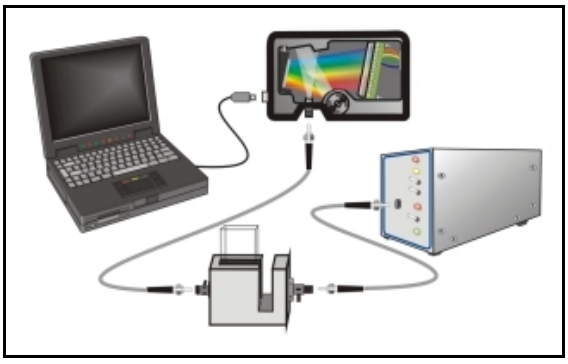
- Increasing the integration time
- Using a larger diameter fiber
- Removing any optical filters

Absorbance Experiments

Absorbance spectra are a measure of how much light a sample absorbs. For most samples, absorbance relates linearly to the concentration of the substance. OOIBase32 calculates absorbance (A_λ) using the following equation…

$$A_\lambda = -\log_{10}\left(\frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda}\right)$$

…where S_λ is the sample intensity at wavelength λ, D_λ is the dark intensity at wavelength λ, and R_λ is the reference intensity at wavelength λ.



Typical absorbance setup: The light source (far right) sends light via an input fiber into a cuvette in a cuvette holder (bottom center). The light interacts with the sample. The output fiber carries light from the sample to the spectrometer (top center) connected to the PC (far left).

Absorbance is also proportional to the concentration of the substance interacting with the light (this is known as Beer's Law). Common absorption applications include the quantification of chemical concentrations in aqueous or gaseous samples.

Follow the steps below to take an absorbance measurement using OOIBase32:

1. Place OOIBase32 in scope mode by clicking the scope mode icon on the toolbar or selecting **Spectrum | Scope Mode** from the menu bar.
2. Ensure that the entire signal is on scale. The intensity of the reference signal should peak at about 3500 counts. If necessary, adjust the integration time until the intensity is approximately 3500 counts.
3. Place a sample of the solvent into a cuvette and take a reference spectrum. You must take a reference spectrum before measuring absorbance.

   Note: Do not put the sample itself in the path when taking a reference spectrum, only the solvent.

   Click the **Store Reference** spectrum icon on the toolbar or select **Spectrum | Store Reference** from the menu bar to store the reference. This command merely stores a reference spectrum in memory. You must select **File | Save | Reference** from the menu bar to permanently save the spectrum to disk.
4. Block the light path to the spectrometer. Then, take a dark spectrum by clicking the **Store Dark Spectrum** icon on the toolbar or by selecting **Spectrum | Store Dark** from the menu bar. This command merely stores a dark spectrum in memory. You must select **File | Save | Dark** from the menu to permanently save the spectrum to disk.

   Note: If possible, do not turn off the light source when taking a dark spectrum. If you must turn off your light source to store a dark spectrum, allow enough time for the lamp to warm up again before continuing your experiment. After the lamp warms up again, store a new reference (Step 3).

   You must take a dark spectrum before measuring absorbance.
5. Put the sample in place and ensure that the light path is clear. Then, take an absorbance measurement by clicking on the **Absorbance Mode** icon on the toolbar or selecting **Spectrum | Absorbance Mode** from the menu. To permanently save the spectrum to disk, click the **Save** icon on the toolbar or select **File | Save | Processed** from the menu bar.

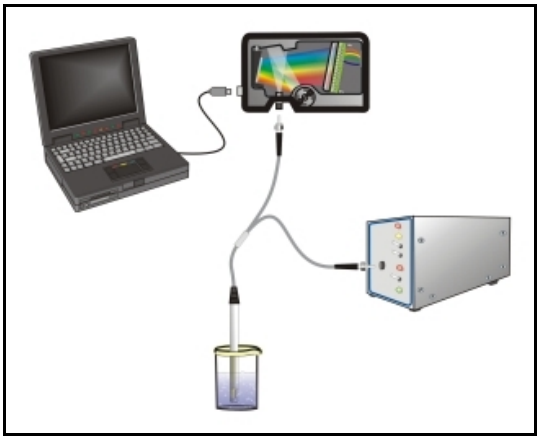
   Note: If you change any sampling variable (integration time, averaging, smoothing, fiber size, etc.), you must store a new dark and reference spectrum.

Transmission Experiments

Transmission is the percentage of energy passing through a sample relative to the amount that passes through the reference. Transmission Mode can also display the portion of light *reflected* from a sample, since transmission and reflection measurements use the same mathematical calculations. We express transmission as a percentage ($\%T_\lambda$) relative to a standard substance (such as air). OOIBase32 calculates $\%T_\lambda$ (or $\%R_\lambda$) with the following equation…

$$\%T_\lambda = \frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda} \times 100\%$$

…where S_λ is the sample intensity at wavelength λ, D_λ is the dark intensity at wavelength λ, and R_λ is the reference intensity at wavelength λ.



Typical transmission setup: The light source (far right) sends light via the input leg of a transmission probe into a container (bottom center). The light interacts with the sample. The output leg of the transmission probe carries the information to the spectrometer (top center), which transmits the information to the PC (far left).

Common transmission applications include measuring light through solutions, optical filters, optical coatings, and other optical elements (such as lenses and fibers).

Perform the following steps to take a transmission measurement using OOIBase32:

1. Place OOIBase32 in scope mode by clicking the **Scope Mode** icon on the toolbar or by selecting **Spectrum | Scope Mode** from the menu bar.
2. Ensure that the entire signal is on scale. The intensity of the reference signal should peak at about 3500 counts. If necessary, adjust the integration time until the intensity is approximately 3500 counts.
3. Place a sample of the solvent into a cuvette and take a reference spectrum. You must take a reference spectrum before measuring transmission.

   Note: Do not put the sample itself in the path when taking a reference spectrum, only the solvent.

   Click the **Store Reference** spectrum icon on the toolbar or select **Spectrum | Store Reference** from the menu bar to store the reference. This command merely stores a reference spectrum in memory. You must select **File | Save | Reference** from the menu bar to permanently save the spectrum to disk.
4. Block the light path to the spectrometer. Then, take a dark spectrum by clicking the **Store Dark Spectrum** icon on the toolbar or by selecting **Spectrum | Store Dark** from the menu bar. This command merely stores a dark spectrum in memory. You must select **File | Save | Dark** from the menu to permanently save the spectrum to disk.

   Note: If possible, do not turn off the light source when taking a dark spectrum. If you must turn off your light source to store a dark spectrum, allow enough time for the lamp to warm up again before continuing your experiment.

   You must take a dark spectrum before measuring transmission.
5. Put the sample in place and verify that the light path is clear. Then, take a transmission measurement by clicking the **Transmission Mode** icon on the toolbar or selecting **Spectrum | Transmission Mode** from the menu bar. To save the spectrum to disk, click the **Save** icon on the toolbar or select **File | Save | Processed** from the menu bar.

   Note: If you change any sampling variable (integration time, averaging, smoothing, fiber size, etc.), you must store a new dark and reference spectrum.

Reflection Experiments

Reflection is the return of radiation by a surface, without a change in wavelength. Reflection can be:

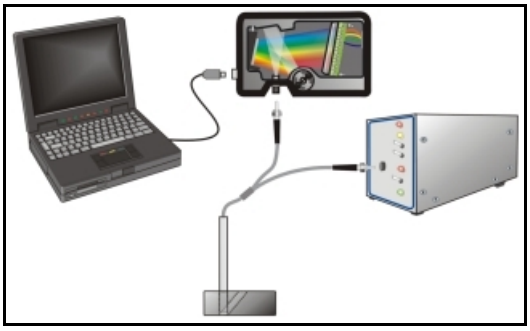
- Specular (the angle of incidence is equal to the angle of reflection)
- Diffuse (the angle of incidence is not equal to the angle of reflection)

Every surface returns both specular and diffuse reflections. Some surfaces may return mostly specular reflection, while others may return mostly diffuse reflection. Specular reflection increases proportionately with the amount of gloss on a surface.

We express reflection as a percentage ($\%R_\lambda$) relative to the reflection from a standard reference substance…

$$\%R_\lambda = \frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda} \times 100\%$$

…where S_λ is the sample intensity at wavelength λ, D_λ is the dark intensity at wavelength λ, and R_λ is the reference intensity at wavelength λ.



Typical reflection setup: A light source (far right) sends light via the input leg of a reflection probe onto a sample (bottom center). A reflection probe holder holds the probe in either a 90 or 45-degree angle from the surface. The output leg of the reflection probe carries light from the sample to the spectrometer (top center) connected to the PC (far left).

Common reflection applications include measuring the properties of mirrors and coatings. Other applications include measuring the visual properties of the color in paints, plastics, and food products.

Perform the following steps to take reflection measurements using OOIBase32:

1. Place OOIBase32 in scope mode by clicking the **Scope Mode** icon on the toolbar, or by selecting **Spectrum | Scope Mode** from the menu bar.
2. Ensure that the entire signal is on scale. The intensity of the reference signal should peak at about 3500 counts.
3. Take a reference spectrum with the WS-1 Diffuse Reflectance Standard or the STAN-SSH High-reflectivity Reference Standard. You must take a reference spectrum before measuring reflection.

(Continued)

Click the **Store Reference** spectrum icon on the toolbar or select **Spectrum | Store Reference** from the menu bar to store the reference. This command merely stores a reference spectrum in memory. You must select **File | Save | Reference** from the menu bar to permanently save the spectrum to disk.

4. Block the light path to the spectrometer. Then, take a dark spectrum by clicking the **Store Dark Spectrum** icon on the toolbar or by selecting **Spectrum | Store Dark** from the menu bar. This command merely stores a dark spectrum in memory. You must select **File | Save | Dark** from the menu to permanently save the spectrum to disk.

Note: If possible, do not turn off the light source when taking a dark spectrum. If you must turn off your light source to store a dark spectrum, allow enough time for the lamp to warm up again before continuing your experiment.

You must take a dark spectrum before measuring transmission.

5. Put the sample is in place and ensure that the light path is clear. Then, take a reflection measurement by clicking on the **Transmission Mode** icon on the toolbar or selecting **Spectrum | Transmission Mode** from the menu bar (since the mathematical calculations used to calculate transmission and reflection are identical). To save the spectrum to disk, click the **Save** icon on the toolbar or select **File | Save | Processed** from the menu bar.

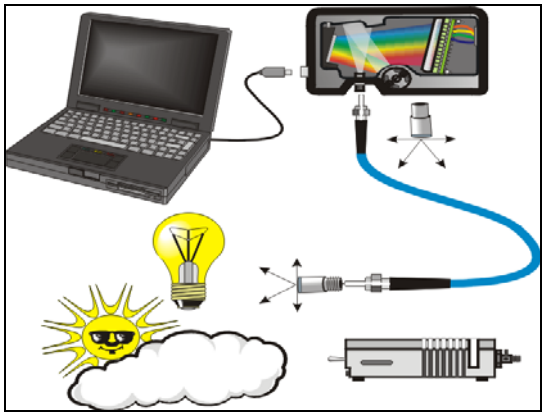
Note: If you change any sampling variable (integration time, averaging, smoothing, fiber size, etc.), you must store a new dark and reference spectrum.

Relative Irradiance Experiments

Irradiance is the amount of energy at each wavelength emitted from a radiant sample. In relative terms, it is a comparison of the fraction of energy the sample emits and the energy the sampling system collects from a lamp with a blackbody energy distribution (normalized to 1 at the energy maximum). OOIBase32 calculates relative irradiance with the following equation…

$$I_\lambda = B_\lambda \left(\frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda} \right)$$

…where B_λ is the relative energy of the reference (calculated from the color temperature) at wavelength λ, S_λ is the sample intensity at wavelength λ, D_λ is the dark intensity at wavelength λ, and R_λ is the reference intensity at wavelength λ.



Typical relative irradiance setup: Use a light source with a known color temperature (such as the LS-1 or LS-1-LL (lower right) to take a reference spectrum. The light to measure (lower left) accumulates through a CC-3 Cosine Corrector (or FOIS integrating sphere) into an input fiber, which carries the light information to the spectrometer. The spectrometer then transmits the information to the PC, which compares the measured spectra against the reference spectrum, thus removing wavelength-dependent instrument response from the measurement.

Common applications include characterizing the light output of LEDs, incandescent lamps, and other radiant energy sources such as sunlight. Relative irradiance measurements also include fluorescence measurements, which measure the energy given off by materials excited by light at shorter wavelengths.

Perform the following steps to take a relative irradiance measurement using OOIBase32:

1. Place OOIBase32 in scope mode by clicking the **Scope Mode** icon on the toolbar, or by selecting **Spectrum | Scope Mode** from the menu bar.
2. Ensure that the entire signal is on scale. The intensity of the reference signal should peak at about 3500 counts.

   Note: You must use a light source that is a blackbody of known color temperature.

3. In the **Reference Color Temperature** dialog box, enter the color temperature of the light source (in Kelvin) and click the **OK** button.
4. Take a reference spectrum using a light source with a black body of a known color temperature, such as the LS-1.

   Click the **Store Reference** spectrum icon on the toolbar or select **Spectrum | Store Reference** from the menu bar to store the reference. This command merely stores a reference spectrum in memory. You must select **File | Save | Reference** from the menu bar to permanently save the spectrum to disk.
5. Block the light path to the spectrometer. Then, take a dark spectrum by clicking the **Store Dark Spectrum** icon on the toolbar or by selecting **Spectrum | Store Dark** from the menu bar. This command merely stores a dark spectrum in memory. You must select **File | Save | Dark** from the menu to permanently save the spectrum to disk.

   Note: If possible, do not turn off the light source when taking a dark spectrum. If you must turn off your light source to store a dark spectrum, allow enough time for the lamp to warm up again before continuing your experiment.

(Continued)

You must take a dark spectrum before measuring relative irradiance.

6. Position the fiber at the light source you wish to measure. Then, choose the **Irradiance** mode icon on the toolbar or select **Spectrum | Relative Irradiance Mode** from the menu bar.
7. Click the **Save** icon on the toolbar or select **File | Save | Processed** from the menu bar to save the spectrum to disk.

Note: If you change any sampling variable (integration time, averaging, smoothing, fiber size, etc.), you must store a new dark and reference spectrum.

Time Acquisition Experiments

OOIBase32 allows you to perform time acquisition experiments. Time acquisition experiments track processes, perform kinetic analyses, and monitor spectral events all as a function of time. You can collect, as a function of time, spectral data from up to six single wavelengths (known as Channels A through F) and up to two mathematical combinations of these wavelengths (known as Combinations 1 and 2). Additionally, you can acquire data in any mode (transmission, absorbance, etc.).

Follow the steps below to perform a time series experiment in OOIBase32:

1. Enter scope mode and store a reference spectra and dark spectra.
2. Choose the measurement mode (absorbance, transmission, etc.) and select **Time Acquisition | Configure | Configure Time Channels** from the menu bar to access the Time Acquisition Channel Configuration screen.

Proceed to the Configuring the Time Acquisition Channel Configuration Screen section below.

Configuring the Time Acquisition Channel Configuration Screen

1. Perform the following steps on the Time Acquisition Channel Configuration screen:
    a. Select **Enabled** to set the time acquisition calculation for the wavelength. The time acquisition process will not calculate data if you do not select this option for at least
    b. Select **Plotted** to see a real-time graph of the acquired data in a spectral window.
    c. Select a **Spectrometer Channel** for the time acquisition process
    d. Specify the analysis wavelength in the **Wavelength (nm)** box.
    e. Specify the number of pixels around the analysis wavelength to average in the **Bandwidth (pixels)** box.
    f. Select a multiplicative factor to apply to the data before plotting or storing. Then, select an additive constant or offset to apply to the data. OOIBase32 applies the additive constant or offset after applying the factor but before plotting or storing data.

    The equation for the Factor and Offset functions is:
    Results = (Factor * Data) + Offset
2. Configure a time acquisition process for the second single wavelength (if desired). Select the Channel B page and repeat Steps 1-3 for Channel B.

(Continued)

To configure a time acquisition process for the third, fourth, fifth, and sixth single wavelengths, select the Channel C, Channel D, Channel E, and Channel F pages, respectively, and set the necessary parameters.

3. Configure a time acquisition process for a combination of two time channels (if desired) by selecting **Combination 1**.

   Perform the steps below to configure a combination:

   a. Select **Enabled** to set the time acquisition calculation for the wavelength.

   b. Enable **Plotted** to see a real-time graph of the acquired data in a spectral window.

   c. Specify Time Channel A through F for the First Channel.

   d. Select the mathematical operation to produce the data for Combination 1.

   e. Specify Time Channel A through F for the Second Channel.

   f. Select a multiplicative factor to apply to the data before plotting or storing. Then, select an additive constant or offset to apply to the data. OOIBase32 applies the additive constant or offset after applying the factor but before plotting or storing data.

      The equation for the Factor and Offset functions is:
      Results = (Factor * Data) + Offset

4. Configure a time acquisition process for the Combination 2 page, if desired. This page is virtually identical to the Combination 1 page, with the exception that you can choose Combination 1 for the first or second channel in Combination 2.

5. Click the **Apply** button to apply the changes, and then click the **OK** button to close the Time Acquisition Channel Configuration screen.

Proceed to the Configuring the Configure Acquisition Screen section below.

Configuring the Time Acquisition Configuration Screen

1. **Select Time Acquisition | Configure | Configure Acquisition** from the menu bar to open the Time Acquisition Configuration screen.

2. Enable **Stream Data to Disk** to save time acquisition data.

3. Enter a value in the **Write Data to Disk Every X Acquisitions** box to set the frequency for data saves. OOIBase32 saves data more frequently if the number is smaller, or less frequently if the number is larger. Entering a large number enhances the performance of the time acquisition process.

   Note: At specified time intervals, OOIBase32 stores data into time acquisition channels or combination channels. OOIBase32 can plot the data in a spectral window, or stream the data to disk, or both. OOIBase32 can display up to 2048 acquisitions in a spectral window. If OOIBase32 collects more than 2048 acquisitions, it only displays the last 2048. To store more than 2048 acquisitions, you must stream the data to disk.

   Writing data to the disk is a slow process (relative to the speed of some spectral acquisitions) and causes a decrease in system performance. However, writing data to disk more frequently gives a larger margin of safety.

4. Enable **Show Values in Status Bar** to see the time acquisition values in the status bar. These values replace the cursor values.

   (Continued)

5. Name the **Stream Filename** for the time acquisition process. Clicking on the ellipsis to the right of this box opens a file save dialog box, allowing you to navigate to a designated folder.

   Enable **Save Every Acquisition** to store data for every spectral acquisition during a time acquisition process (optional).

   Note: OOIBase32 has options to either store data for each acquisition, or to collect data only after a specified delay. Several factors affect the minimum time acquisition frequency, including integration time, number of spectrometer channels, samples averaged, and computer speed. If you instruct OOIBase32 to store data every 100 milliseconds, the delay between data acquisitions will be 100 milliseconds or more, depending on your experimental configuration. OOIBase32 spends a large amount of time calculating, rendering, and displaying the spectra in a spectral window. You can suspend the graph display, which greatly improves the performance of OOIBase32.

6. Enter an **Initial Delay** to set the delay preceding the time acquisition process. Keep in mind that the delay countdown does not begin until you start the time acquisition process. Be sure to select Hours, Minutes, Seconds, or Milliseconds immediately to the right of the initial delay entry.
7. Enter a value to set the **Frequency** of the data collected in a time acquisition process. OOIBase32 stamps data from a time acquisition with a time accurate to one millisecond. Be sure to select Hours, Minutes, Seconds, or Milliseconds immediately to the right of the frequency entry. You can enable the **Save Every Acquisition** box to store the acquisitions that occur at this frequency. See Step 6 for more information.
8. Enter a value to set the **Duration** for the entire time acquisition process. Be sure to select Hours, Minutes, Seconds, or Milliseconds to the right of the duration entry. Click the **OK** button to close the Time Acquisition Configuration dialog box. Then, enable **Continue Until Manually Stopped**, which instructs OOIBase32 to store data until you manually stop the acquisition process (optional).

Appendix A: Toolbar Index

The following section contains information on the options available from the various dockable toolbars in OOIBase32.

To enable or disable the General Functions or Global Functions toolbars, right-click in the gray area directly below the menu bar and above the sunken toolbars above the spectral window. The following pop-up menu appears:

To enable or disable the display of the other various toolbars, right click in the gray area above the spectral window and below the menu bar or General Functions or Global Functions icons (if docked below the menu bar). The following pop-up menu appears:

Enable or disable the check box next to each menu option to view or hide that menu.

General Functions

This toolbar contains shortcuts to options available from the **File** menu and **Help** menu in OOIBase32.

The table below details the options available in the General Functions toolbar:

Icon	Function	Description
	Open	Opens a new spectral window.
	Open a Processed Spectrum	Opens a processed spectrum and displays the data in the spectral window.
	Save Processed Spectrum	Saves the processed spectra to disk.
	Copy	Copies the current spectra to the clipboard.
	Print	Prints the currently displayed spectra.
	Help	Opens the OOIBase32 help system.

Platinum Functions

These options are only available in the OOIBase32 Platinum version. Consult the help system of OOIBase32 Platinum for more information.

Global Functions

This toolbar contains shortcuts to options available from the **Spectrum | Global** menu in OOIBase32.

The table below details the options available in the Global Functions toolbar:

Icon	Function	Description
	Store Global Dark	Take a dark spectrum used by **all** spectral windows.
	Store Global Reference	Take a reference spectrum used by **all** spectral windows.
	Global Snapshot	Take a snapshot and freeze data acquisition on **all** spectral windows.
	Global Emergency Reset	Reset the acquisition parameters for **all** spectral windows.
	Kick Start	Restart the acquisition loop without resetting any acquisition parameters.

Acquisition Parameters

This toolbar contains variables that control the data acquisition functions in OOIBase32.

The table below details the options available in the Acquisition Parameters toolbar:

Option	Description
Integ. Time (msec)	Specifies the integration time (or A/D conversion frequency for an S1000 or S2000BT) of the spectrometer, which is analogous to the shutter speed of a camera. The higher the integration time, the longer the detector "looks" at the incoming photons. If your Scope Mode intensity is too low, increase this value. If the intensity is too high, decrease the value. Adjust the integration time so that the greatest amount of light that you anticipate for your application causes a signal of about 3500 counts. While watching the graph trace, adjust the integration time until the signal intensity level is approximately 3500 counts. The integration time specified controls enabled spectrometer channels in the active spectral window.
Average	Specifies the number of discrete spectral acquisitions that the OOIDRV32 device driver accumulates before OOIBase32 receives a spectrum. Signal-to-noise ratio will improve by the square root of the number of scans averaged.

(Continued)

Option	Description
Boxcar	Sets the boxcar smoothing width, a technique that averages across spectral data. This technique averages a group of adjacent detector elements. A value of 5, for example, averages each data point with 5 points to its left and 5 points to its right. The greater this value, the smoother the data and the higher the signal-to-noise ratio. If the value entered is too high, a loss in spectral resolution will result. The S:N will improve by the square root of the number of pixels averaged.
Flash Delay (msec)	Sets the delay, in milliseconds, between strobe signals sent out of the spectrometer. This parameter only has an effect when using an ADC1000 A/D card.
Strobe/Lamp Enable	Enables or disables the spectrometer strobe control function. This function toggles the S0 line of the spectrometer.
Correct for Electrical Dark	Enables or disables the correction of the spectral data for electrical dark signal. The first 24 pixels in the spectrometer, while producing an electrical signal, do not respond to light. This option subtracts the average value of these first 24 pixels from the entire spectrum

Spectrum Controls

This toolbar contains shortcuts to options available from the **Spectrum** menu in OOIBase32.

The table below details the options available in the Acquisition Parameters toolbar:

Icon	Function	Description
	Store Dark	This option stores a dark spectrum for all enabled spectrometer channels in a spectral window. Block the light path to the sample, and then take the dark spectrum.
	Store Reference	This option stores a reference spectrum for all enabled spectrometer channels in a spectral window. Take a reference spectrum with the light source on and a blank in the sampling region.
	Snapshot	This option halts data acquisition and takes a snapshot of the activity in the spectral window.
	Single Exposure	This option reactivates data acquisition, and acquires and displays a single scan. It is only active when OOIBase32 is in Snapshot mode.
	Configure Data Acquisition	This option opens the Configure Data Acquisition dialog box. This dialog box allows you to configure aspects of the data acquisition process.
	Emergency Reset	This option resets all acquisition parameters for the active spectral window.

Cursor

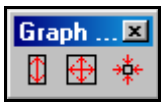
This toolbar contains shortcuts to options available from the **View | Cursor** menu in OOIBase32, as well as shortcuts to cursor control operations.

The table below details the options available in the Cursor Controls toolbar:

Icon	Function	Description
	Toggle Cursor	Enables or disables the display of a vertical cursor for the spectral window.
	Cursor Peak Left	Moves the cursor to the next left peak.
	Cursor Big Left	Moves the cursor 25 pixels to the left.
	Cursor Left	Moves the cursor 1 pixel to the left.
	Cursor Right	Moves the cursor 1 pixel to the right.
	Cursor Big Right	Moves the cursor 25 pixels to the right.
	Cursor Peak Right	Moves the cursor to the next right peak.
	Configure Cursor	Opens the Configure Cursor dialog box.

Graph Scale

This toolbar contains shortcuts to options available from the **View | Spectrum Scale** menu in OOIBase32.



The table below details the options available in the Graph Scale toolbar:

Icon	Function	Description
	Autoscale	Autoscale the graph to fit the spectral window.
	Set Scale	Set the scale of the graph.
	Unscale	Return graph to default scale.

Spectral View Mode

This toolbar contains shortcuts to options available from the **Spectrum** menu in OOIBase32.

The table below details the options available in the Spectral View Mode toolbar:

Icon	Function	Description
	Subtract Dark Spectrum	This command switches the current spectral window into Scope Mode, and subtracts the stored dark spectra from each spectrometer channel before OOIBase32 displays it.
	Scope Mode	This command switches the current spectral window into Scope Mode.
	Absorbance Mode	This command switches the current window into Absorbance Mode.
	Transmission Mode	This command switches the current window into Transmission Mode.
	Relative Irradiance Mode	This command switches the current window into Relative Irradiance Mode.
	Specular Reflection Mode	This command switches the current window into Specular Reflection Mode.
	Script-defined Custom Mode	This mode is only available in OOIBase32 Platinum version.
	Configure Spectrometer	Opens the Spectrometer Configuration dialog box.

Time Acquisition

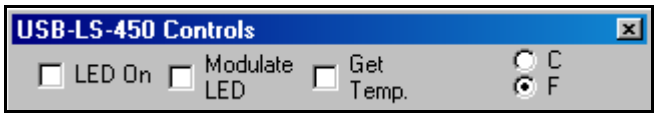
This toolbar contains shortcuts to options available from the **Time Acquisition** menu in OOIBase32.

The table below details the options available in the Time Acquisition toolbar:

Icon	Function	Description
	Activate Time Acquisition Mode	Places OOIBase32 in Time Acquisition Mode.
	Start Time Acquisition	Starts the time acquisition process.
	Pause Time Acquisition	Pauses the time acquisition process.
	Stop Time Acquisition	Stops the time acquisition process.
	Suspend Graph Updates	Suspends the graph display during a time acquisition process.

USB-LS-450

This toolbar contains shortcuts to options available from the **Spectrum | Configure Data Acquisition** menu in OOIBase32, as well as options specific to the USB-LS-450 light source.



The table below details the options available in the USB-LS-450 toolbar:

Option	Description
LED On	Turns the LED in a USB-LS-450 on or off.
Modulate LED	Enables or disables the modulation of the LED in a USB-LS-450.
Get Temp.	Enables or disables the temperature readings with each spectral acquisition.
C/F	Determines the units of temperature returned by the USB-LS-450.

NIR512

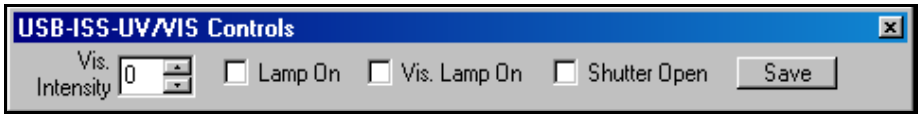
This toolbar contains OOIBase32 options specialized for use with the NIR spectrometer.

The table below details the options available in the NIR512 toolbar:

Option	Description
TEC On	Turns the thermo-electric cooler in the NIR Spectrometer on or off.
Det. Temp. Set Point	Specifies the target temperature of the detector (in degrees Celsius) in the NIR Spectrometer. You must enable your selection with the **Set** button (below)
Set	Sets the value you entered in the Det. Temp. Set Point box into memory. The cooler in the NIR will operate until the detector reaches this temperature.
Current Det. Temp	Displays the current temperature of the detector (in degrees Celsius) in the NIR Spectrometer.

USB-ISS-UV/VIS

This toolbar contains OOIBase32 options specialized for use with the USB-ISS-UV/VIS Integrated Sampling System.



The table below details the options available in the USB-ISS-UV/VIS toolbar:

Option	Description
Vis. Intensity	Controls the intensity of the lamp in the USB-ISS-UV/VIS that emits visible light. The valid range of this control is 0-63 (0 = 0% intensity, 63 = 100% intensity).
Lamp On	Controls the state of the lamp in the USB-ISS-UV/VIS.
Vis. Lamp On	Controls the state of the lamp in the USB-ISS-UV/VIS that emits visible light.
Shutter Open	Controls the state of the shutter on the USB-ISS-UV/VIS.
Save	Saves the values that you configure in this toolbar to the EEPROM in the USB-ISS-UV/VIS device. When you restart the program, OOIBase32 will automatically load these saved values from the USB-ISS-UV/VIS.

Appendix B: Toolbar Buttons Quick Reference

The following table contains information on all buttons available in all OOIBase32 toolbars:

Icon	Function	Description
	Open	Opens a new spectral window.
	Open a Processed Spectrum	Opens a processed spectrum and displays the data in the spectral window.
	Save Processed Spectrum	Saves the processed spectra to disk.
	Copy	Copies the current spectra to the clipboard.
	Print	Prints the currently displayed spectra.
	Help	Opens the OOIBase32 help system.
	Store Global Dark	Take a dark spectrum used by all spectral windows.
	Store Global Reference	Take a reference spectrum used by all spectral windows.
	Global Snapshot	Take a snapshot and freeze data acquisition on all spectral windows.
	Global Emergency Reset	Reset the acquisition parameters for all spectral windows.
	Kick Start	Restart the acquisition loop without resetting any acquisition parameters.
	Store Dark	This option stores a dark spectrum for all enabled spectrometer channels in a spectral window. Block the light path to the sample, and then take the dark spectrum.
	Store Reference	This option stores a reference spectrum for all enabled spectrometer channels in a spectral window. Take a reference spectrum with the light source on and a blank in the sampling region.
	Snapshot	This option halts data acquisition and takes a snapshot of the activity in the spectral window.
	Single Exposure	This option reactivates data acquisition, and acquires and displays a single scan. It is only active when OOIBase32 is in Snapshot mode.
	Configure Data Acquisition	This option opens the Configure Data Acquisition dialog box. This dialog box allows you to configure aspects of the data acquisition process.
	Emergency Reset	This option resets all acquisition parameters for the active spectral window.
	Toggle Cursor	Enables or disables the display of a vertical cursor for the spectral window.
	Cursor Peak Left	Moves the cursor to the next left peak.
	Cursor Big Left	Moves the cursor 25 pixels to the left.
	Cursor Left	Moves the cursor 1 pixel to the left.
	Cursor Right	Moves the cursor 1 pixel to the right.
	Cursor Big Right	Mo ves the cursor 25 pixels to the right.
	Cursor Peak Right	Moves the cursor to the next right peak.

(Continued)

Icon	Function	Description
	Configure Cursor	Opens the Configure Cursor dialog box.
	Autoscale	Autoscale the graph to fit the spectral window.
	Set Scale	Set the scale of the graph.
	Unscale	Restores the graph to the default scale.
	Subtract Dark Spectrum	This command switches the current spectral window into Scope Mode, and subtracts the stored dark spectra from each spectrometer channel before OOIBase32 displays it.
	Scope Mode	This command switches the current spectral window into Scope Mode.
	Absorbance Mode	This command switches the current window into Absorbance Mode.
	Transmission Mode	This command switches the current window into Transmission Mode.
	Relative Irradiance Mode	This command switches the current window into Relative Irradiance Mode.
	Specular Reflection Mode	This command switches the current window into Specular Reflection Mode.
	Script-defined Custom Mode	This mode is only available in OOIBase32 Platinum version.
	Configure Spectrometer	Opens the Spectrometer Configuration dialog box.
	Activate Time Acquisition Mode	Places OOIBase32 in Time Acquisition Mode.
	Start Time Acquisition	Starts the time acquisition process.
	Pause Time Acquisition	Pauses the time acquisition process.
	Stop Time Acquisition	Stops the time acquisition process.
	Suspend Graph Updates	Suspends the graph display during a time acquisition process.

Appendix C: File Formats

There are several types of files created by OOIBase32. You can choose to view and edit any of these tab-delimited ASCII files with any text editor (such as Notepad).

The various types of files created by OOIBase32 include:

- Spectral Data Files
- Experimental Parameters Files
- Display Properties Files
- Spectrometer Configuration Files
- Time Acquisition Parameters Files
- Time Acquisition Data Files and Stream Files
- Grams/32 SPC Files

The following sections contain descriptions of each file's format, as well as the format for data that the software copies to the clipboard (Copied Data Clipboard Format).

Spectral Data Files

A Spectral Data File contains two parts:

- A header that contains all the data acquisition and processing parameters in effect when the OOIBase32 wrote the data file
- A list of tab-delimited spectral data

The information provided in a Spectral Data File includes the date and time OOIBase32 saved the file, the name of the user, and the software serial number specified in the Registration page of the OOIBase32 Settings dialog box. A Spectral Data File also includes the Spectrometer Channel used to report the data, the integration time (in milliseconds), spectra averaged, and boxcar smoothing width. The file also contains the status of the correct for electrical dark algorithm, the status of the dual-beam reference, and the reference channel used when OOIBase32 saved the file.

The following data is an example of a Spectral Data File.

```
OOIBase32 Version 2.0.1.3 Data File
++++++++++++++++++++++++++++++++++
Date: 10-08-2003, 17:22:13
User: Valued Ocean Optics Customer
Spectrometer Serial Number: ABC123
Spectrometer Channel: Master
Integration Time (msec): 100
Spectra Averaged: 1
Boxcar Smoothing: 3
Correct for Electrical Dark: Disabled
Time Normalized: Disabled
Dual-beam Reference: Disabled
Reference Channel: Master
Temperature: Not acquired
Spectrometer Type: S2000
ADC Type: USB2000
Number of Pixels in File: 2048
```

```
Graph Title:
>>>>>Begin Spectral Data<<<<<
333.47  0.000
333.86  261.000
334.26  259.000
334.66  258.000
335.05  259.000
335.45  266.000
335.85  267.000
336.25  264.000
336.64  263.000
337.04  265.000
337.44  260.000
337.83  265.000
338.23  260.000
338.63  263.000
339.02  266.000
339.42  267.000
339.82  268.000
340.21  269.000
340.61  260.000
341.01  266.000
341.40  266.000
```

Experimental Parameters Files

An Experimental Parameters File contains all of the acquisition parameters necessary to conduct an experiment, such as integration time (in milliseconds), the delay between flashes (in milliseconds), boxcar smoothing width, and spectra averaged. The file also notes if you enabled the correct for electrical dark (1 if enabled, 0 if disabled) and the type of triggering used (0 for no trigger, 1 for software trigger, 2 for synchronization or 3 for hardware trigger). The file also includes the view mode (Scope, Absorbance, Transmission, or Irradiance) and color temperature (in Kelvin) of the reference lamp for irradiance measurements.

The information provided in an Experimental Parameters File includes settings information such as the active display settings file and the spectrometer configuration file in use when OOIBase32 saved the experiment. Additional information includes data about each spectrometer channel in your setup. The file notes whether or not you enabled each channel (1 if enabled, 0 if disabled), and whether or not you stored a dark or reference spectra (1 if stored, 0 if not stored). The file also names the saved files of the dark, reference, and sample spectra.

An example of an Experimental Parameters File follows:

```
[Acquisition Parameters]
Integration Time=100
Flash Delay=100
Boxcar=3
Averages=1
Correct Dark=0
External Trigger=0
Time Normalized=0
Color Temperature=3100.000000000000000
ADC1000Rotation=0
View Mode=Scope Mode
[Settings]
Display File=default.display
Spectrometer File=C:\Program Files\Ocean Optics\OOIBase32\Default.spec
[Autosave]
Enabled=0
BaseFilename=OOIBase32DataFile
Index=0
[Overlay0]
Active=0
Filename=
[Overlay1]
Active=0
Filename=
[Overlay2]
Active=0
Filename=
[Overlay3]
Active=0
Filename=
[Overlay4]
Active=0
Filename=
[Overlay5]
Active=0
Filename=
[Overlay6]
Active=0
Filename=
```

```
[Overlay7]
Active=0
Filename=
[Channel0]
Enabled=1
Dark Stored=0
Reference Stored=0
Sample Dark Stored=0
Dark Filename=
Reference Filename=
Sample Filename=
Sample Dark Filename=
[Channel1]
Enabled=0
Dark Stored=0
Reference Stored=0
Sample Dark Stored=0
Dark Filename=
Reference Filename=
Sample Filename=
Sample Dark Filename=
[Channel2]
Enabled=0
Dark Stored=0
Reference Stored=0
Sample Dark Stored=0
Dark Filename=
Reference Filename=
Sample Filename=
Sample Dark Filename=
[Channel3]
Enabled=0
Dark Stored=0
Reference Stored=0
Sample Dark Stored=0
Dark Filename=
Reference Filename=
Sample Filename=
Sample Dark Filename=
[Channel4]
Enabled=0
Dark Stored=0
Reference Stored=0
Sample Dark Stored=0
Dark Filename=
Reference Filename=
Sample Filename=
Sample Dark Filename=
[Channel5]
Enabled=0
Dark Stored=0
Reference Stored=0
Sample Dark Stored=0
Dark Filename=
Reference Filename=
Sample Filename=
Sample Dark Filename=
```

```
[Channel6]
Enabled=0
Dark Stored=0
Reference Stored=0
Sample Dark Stored=0
Dark Filename=
Reference Filename=
Sample Filename=
Sample Dark Filename=
[Channel7]
Enabled=0
Dark Stored=0
Reference Stored=0
Sample Dark Stored=0
Dark Filename=
Reference Filename=
Sample Filename=
Sample Dark Filename=
```

Display Properties Files

A Display Properties File contains the parameters used when drawing a spectrum. It names the screen origin of the window, as well as its size. Next, it lists the RGB color value for the spectral window background, the RGB color value for the axes and labels, whether or not OOIBase32 displays a background bitmap (1 if displayed, 0 if not displayed) and the filename of the background bitmap selected. The file also contains numerous values for the X- and Y-axes, such as the minimum and maximum *Autoscale* values of both the X- and Y-axes, the minimum and maximum *displayed* values on the X- and Y-axes and the title associated with the Y-axis.

The file also includes the parameters set for the cursor. The file tells you if the cursor was active (1 if active, 0 if not active), the pixel location of the cursor, the spectral trace in control of the cursor, and if OOIBase32 displayed the cursor location in the status bar (1 if displayed in the status bar, 0 if it is not). As with the cursor properties, the file also contains the properties set for the graph trace. These properties include the line style, fill pattern, RGB color values, and width of the graph trace and graph points.

The list below contains the numbers that correspond to patterns and styles specified in a Display Properties File.

Line Pattern	Fill Pattern	Point Style
0=None	0=None	0=None
1=Solid	1=Solid	1=Dot
2=Long Dash	2=25%	2=Box
3=Dotted	3=50%	3=Triangle
4=Short Dash	4=75%	4=Diamond
5=Long-Short-Long Dash	5=Horizontal Stripe	5=Star
6=Dash Dot	6=Vertical Stripe	6=Vertical Line
	7=45° Stripe	7=Horizontal Line
	8=135° Stripe	8=Cross
	9=Diagonal Hatch	9=Circle
	10=Cross Hatch	10=Square
		11=Inverted Triangle
		12=Diagonal Cross
		13=Open Triangle
		14=Open Circle
		15=Open Diamond

An example of a Display Properties File follows:

```
[WindowPlacement]
WindowPlacement=0,1,-1,-1,-4,-23,-6,-25,1020,656
[GraphSettings\Trace0]
LinePattern=2
FillPattern=2
LineColor=255
LineWidth=1
PointStyle=1
PointColor=255
PointSize=0
[GraphSettings\Trace1]
LinePattern=2
FillPattern=2
LineColor=255
LineWidth=1
PointStyle=1
PointColor=255
PointSize=0
```

<<<repeats for all traces>>>

```
[GraphSettings]
BackgroundColor=0
ForegroundColor=65535
BackgroundBitmapActive=0
BackgroundBitmapFilename=
YAxisMax=4100.000000000000000
YMax=3524.857177734375000
XAxisMax=1039.618973309745100
XMax=1039.618973309745100
YAxisMin=0.000000000000000
YMin=0.000000000000000
XAxisMin=333.465423583984370
XMin=333.465423583984370
YTitle=Intensity (counts)
CursorActive=1
CursorPixel=1024
CursorActiveTrace=0
LimitCursorToDisplay=0
CursorInStatusBar=1
GridActive=0
PercentPan=10.000000000000000
PercentZoom=10.000000000000000
[Cursor]
LinePattern=2
LineColor=65280
LineWidth=1
CursorDisplayPrecision=3
[Grid]
LinePattern=4
Width=1
LineColor=16776960
[Legend]
Visible=1
Position=17
ForegroundColor=16711680
BackgroundColor=12632256
Border=1
BorderWidth=2
Orientation=1
FontName=Arial
FontSize=16
OverlayShowFilename=1
Floating=1
ShowCursorIntensity=0
[AxisFont]
Name=Arial
Size=18
[HeaderFont]
Name=Arial
Size=18
Color=65535
[Annotation]
DefaultFontName=Arial
DefaultFontSize=16
DefaultFontColor=65535
```

Spectrometer Configuration Files

The Spectrometer Configuration File contains all the settings for your spectrometer and A/D interface. This file is the most important type of file in OOIBase32 as it controls how your spectrometer communicates with your computer.

The Spectrometer Configuration File contains extremely important information, such as the type of spectrometer and A/D converter in use. It includes the serial number of the spectrometer, the interrupt request of the A/D converter, the base address (I/O range) of the A/D converter, the serial port number for a SAD500, and the pixel resolution of the SAD500 serial port.

The most important line in a Spectrometer Configuration File is the **Initialized** line. This line indicates if you have previously operated the spectrometer successfully. It reads **Initialized = 1** if you have successfully operated the spectrometer, **Initialized = 0** if there is a problem. This file also includes the first and second wavelength calibration coefficients (and a third if you own a spectrometer manufactured after July 1999), and the wavelength calibration intercept.

The following table contains a list of the additional functions included in a Spectrometer Configuration File:

NLEnabled	1 if detector linearity correction enabled, 0 if not enabled
SLEnabled	1 if you enabled stray light correction, 0 if disabled
SLConstant	Stray light constant applied
NLCoefs	Detector linearity correction coefficients
ChannelEnabled	1 if spectrometer channel enabled, 0 if not enabled
ReferenceChannel	Reference spectrometer channel used in reference monitoring, 0 for Master, 1 for Slave 1, etc.
ReferenceType	Type of reference monitoring applied, 0=none, 1=single point, 2=wavelength-by-wavelength, 3=integrated intensity
ReferenceWavelength	Reference wavelength, used in single point reference monitoring
ReferenceBandwidthStart	Starting wavelength of the integrated intensity for reference monitoring
ReferenceBandwidthEnd	Ending wavelength of the integrated intensity for reference monitoring
ReferenceBandwidthPixel	Spectrometer pixel of the reference wavelength used in reference monitoring (for single-point reference monitoring)
ReferenceBandwidthStartPixel	Spectrometer pixel of the starting integrated intensity wavelength used in reference monitoring
ReferenceBandwidthEndPixel	Spectrometer pixel of the ending integrated intensity wavelength used in reference monitoring

The following is an example of a Spectrometer Configuration File:

```
[General]
OOIBase32 Version=2.0.1.3
OOIDrv32 Version=4.07.01
SpectrometerType=S2000
ADCType=USB2000
SerialNumber=
SpectrometerSubType=0
IRQ=7
BaseAddress=768
SerialPort=0
SerialPortResolution=1
Initialized=1
ADC1000ChannelRotation=0
```

```
PCICardID=0
DisplayLimitedRange=0
S1024DWOffset=0.000000
SAD500Compression=0
SerialPortBaudRate=6
USBSerialNumber=
ScopeModeSaturationThreshold=4095.000000000000000
[Channel0]
WLFirst=0.397382
WLSecond=-2.126880e-005
WLThird=-2.117980e-009
WLIntercept=333.465424
NLEnabled=0
SLEnabled=0
SLConstant=0.000000e+000
NLCoef0=9.521558e-001
NLCoef1=3.226242e-005
NLCoef2=4.538580e-009
NLCoef3=-6.088067e-012
NLCoef4=8.477879e-016
NLCoef5=0.000000e+000
NLCoef6=0.000000e+000
NLCoef7=0.000000e+000
ChannelEnabled=1
DisplayStart=500.000000
DisplayEnd=777.945801
DisplayStartPixel=429
DisplayEndPixel=1205
ReferenceChannel=0
ReferenceType=0
ReferenceWavelength=800.000000
ReferenceWavelengthPixel=1351
ReferenceBandwidthStart=500.000000
ReferenceBandwidthStartPixel=426
ReferenceBandwidthEnd=600.000000
ReferenceBandwidthEndPixel=723
```

<<<repeats for all channels>>>

Time Acquisition Parameters Files

The Time Acquisition Parameters File contains all of the information and parameters specified for a time acquisition process. The file includes the preference for streaming all data to disk (1 if stream data to disk, 0 if not), the filename specified if data streams to disk, and the preference for saving every acquisition or using a delay between acquisitions (1 if save every acquisition, 0 if use delay).

The file specifies the initial delay after the start of the time acquisition and the unit of time for the delay. It specifies how frequently the data is collected and the unit of time for the frequency. It also specifies the duration of the time acquisition process and the unit of time for the duration.

Also included is the preference for acquiring data until manually stopped), the preference for showing values in the status bar (1 if values shown, 0 if not), and the log frequency or number of acquisitions before data is streamed to disk.

For each time channel (Channels A through F) used, the file lists the channel state (1 if enabled, 0 if not enabled). Then the file lists the Wavelength selected, the Pixel for the selected wavelength, the bandwidth for the current analysis wavelength, the multiplicative factor specified, the additive offset specified, and if the data is plotted (1 if displayed, 0 if not displayed). Finally, the file contains the name of the chosen spectrometer channel (Ocean Optics has not enabled the Rate Only and Rate Bandwidth functions in this release of OOIBase32).

For each time channel combination (Combinations 1 and 2) used, the file lists the channel state (1 if enabled, 0 if not enabled), the multiplicative factor specified, and the additive offset specified. Then the file lists the first and second time channels for the combination calculation (A through F and Combo 1). Finally, the mathematical operation is specified -- add, subtract, multiply or divide the results of the two time channels. (Ocean Optics has not enabled the Rate Only and Rate Bandwidth functions in this release of OOIBase32.)

The following is an example of a Time Acquisition Parameters File:

```
[Acquisition Parameters]
StreamDataToDisk=0
Filename=TestTime
SaveEveryAcquisition=0
InitialDelay=10
LogFrequency=100
SaveFullSpectrum=0
InitialDelayUnit=Seconds
Frequency=10
FrequencyUnit=Seconds
Duration=11
DurationUnit=Seconds
ContinueUntilManuallyStopped=0
ShowValuesInStatusBar=1
[ChannelA]
Enabled=0
Wavelength=500.000000000000000
Pixel=429
Bandwidth=0
Factor=1.000000000000000
Offset=0.000000000000000
Plotted=0
RateOnly=0
RateBandwidth=0
SpectrometerChannel=Master
[ChannelB]
Enabled=0
Wavelength=500.000000000000000
```

```
Pixel=429
Bandwidth=0
Factor=1.000000000000000
Offset=0.000000000000000
Plotted=0
RateOnly=0
RateBandwidth=0
SpectrometerChannel=Master
[ChannelC]
Enabled=0
Wavelength=500.000000000000000
Pixel=429
Bandwidth=0
Factor=1.000000000000000
Offset=0.000000000000000
Plotted=0
RateOnly=0
RateBandwidth=0
SpectrometerChannel=Master
[ChannelD]
Enabled=0
Wavelength=500.000000000000000
Pixel=429
Bandwidth=0
Factor=1.000000000000000
Offset=0.000000000000000
Plotted=0
RateOnly=0
RateBandwidth=0
SpectrometerChannel=Master
[ChannelE]
Enabled=0
Wavelength=500.000000000000000
Pixel=429
Bandwidth=0
Factor=1.000000000000000
Offset=0.000000000000000
Plotted=0
RateOnly=0
RateBandwidth=0
SpectrometerChannel=Master
[ChannelF]
Enabled=0
Wavelength=500.000000000000000
Pixel=429
Bandwidth=0
Factor=1.000000000000000
Offset=0.000000000000000
Plotted=0
RateOnly=0
RateBandwidth=0
SpectrometerChannel=Master
[Combo1]
Enabled=0
Factor=1.000000000000000
Offset=0.000000000000000
RateOnly=0
```

```
RateBandwidth=0
FirstChannel=A
SecondChannel=A
Operation=Add
[Combo2]
Enabled=0
Factor=1.000000000000000
Offset=0.000000000000000
RateOnly=0
RateBandwidth=0
FirstChannel=A
SecondChannel=A
Operation=Add
```

Time Acquisition Data Files and Stream Files

The first column of a time acquisition data or stream file contains the time stamp, in seconds, of each acquisition. OOIBase32 stamps data from a time acquisition with a time accurate to 1 millisecond. These time stamps represent the time lapse after clicking on the time acquisition start icon or selecting **Time Acquisition | Start** from the menu. Subsequent columns contain the wavelengths and combination wavelengths selected in the Configure Time Channels dialog box. All data is in a tab-delimited format.

Time (sec)	Channel A	Channel B	Combo 1
1.020	42.000	41.333	40.727
1.053	42.000	42.000	41.818
1.083	47.000	42.333	41.545
1.114	48.000	41.333	41.636
1.156	43.000	42.000	40.000
1.186	40.000	42.000	42.363
1.217	42.000	40.666	41.363

Grams/32 SPC Files

OOIBase32 can save and open data files in the Galactic Software GRAMS/32® SPC file format. You can obtain details on this file format from: http://www.galactic.com/galactic/data/spcfile.htm. OOIBase32 can only open SPC files originally saved in OOIBase32.

Copied Data Clipboard Files

OOIBase32 can copy spectral data directly to the Windows clipboard. For further data analysis, paste this data into a variety of applications, including Microsoft Excel. The software arranges the data in columns, with the wavelengths and spectral intensities for each selected spectrometer channel in adjacent columns. An optional header identifies each tab-delimited column. The following is clipboard data formatting:

Master WL	Master Data	Slave1 WL	Slave 1 Data
179.22	0.000	328.49	0.000
179.60	0.000	328.87	0.000
179.98	0.025	329.25	1.002
180.36	0.029	329.62	1.026
180.73	0.032	330.00	1.035
181.11	0.038	330.38	1.042

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