

## **SPECTRAL PRODUCTS**

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**SM32Pro for  
SM301  
Ver2.12**

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## **Warranty and Liability**

This SM product is warranted against defects in material and workmanship for a period of one year from the date of shipment. During the warranty period, Spectral Products will, without charge, repair or replace, at its discretion, the defective product or component parts.

For warranty service or repair, this product must be returned to a service facility designated by Spectral Products (SP). For products returned under warranty, the Buyer shall prepay shipping charges (including shipping charges, duties, and taxes for products returned to SP from another country), and SP will pay for shipping charges to return the product to the Buyer.

This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations, modifications or repairs, if the serial number is altered, defaced or removed, the improper or inadequate maintenance by the Buyer, Buyer-supplied software or interfacing, or improper site preparation or maintenance. No other warranty is expressed or implied. SP shall not be liable for any consequential damages, including without limitation, damages resulting from loss of use, as permitted by law.

## Quick Start Installation Guide

This quick start guide will instruct you through the installation of the SM32Pro software package. Please follow the instructions closely to complete the installation. Before beginning, read through this entire guide.

1. Insert the SM installation USB flash drive into the appropriate USB port. (The installation should begin automatically. If not, open the USB flash drive through windows explorer and click on the “**setup.exe**” file to begin the installation manually.)
  - In USB applications, it is recommended to leave the unit disconnected from the computer until the software has been installed and the system has been rebooted.
2. The first screen displayed requires you to input the user name, company name, and/or serial number. The full serial number is found on the unit or on the calibration certificate included in the data package provided by SP.
3. Follow the guides that installation software provides.
4. The installation is now complete. Click finish and manually restart the computer if needed.
5. Copy and paste the ini file for the unit into the folder where the SM32Pro is installed., if SP provides the ini file separately and ask to do so.
  - Some Windows OS may need to set the exe file (SM32ProForSM301.exe) to “Run this program as an administrator” to avoid the permission issue.
6. After plugging in the spectrometer, confirm the computer recognizes the drivers properly. It may take several minutes.

# System Requirements

Check that your computer meets the minimum requirements for the SM32Pro system.

## ***Requirements for the Hardware***

Ø One free slot or port of appropriate type to insert board or connection to the spectrometer

## ***Requirements for the Software***

- Ø Any IBM compatible computer with a 486 processor or higher (Pentium 100 or higher is strongly recommended)
- Ø A hard drive with at least 50 MB free space
- Ø A USB port
- Ø A VGA or compatible display
- Ø 16 MB RAM (32 MB recommended)
- Ø A mouse or other pointing device
- Ø Microsoft Windows® NT, 2000, XP, 7, 8/8.1, or 10

## ***Check System Package Contents***

Check that your SM system package contains all of the required components.

Common system packages contain the following:

- Spectrometer
- Power supply
- Any accessories ordered

***\*Note: Package contents may vary from unit to unit and order to order. If you have any questions about the contents of your package, please contact the support team referred to in the back of this manual.***

## Introduction

SM32Pro for SM301 is a Windows based operating software program designed for use with SP SM301 and SM301-EX spectrometers. SM32Pro is a true 32-bit application and optimized for SM spectrometer operation control, data acquisition, data manipulation, graphic display, and other features. This user manual will cover the software installation and the various function controls and features.

The “SM32ProForSM301v5.ini” file, which is provided together with the SM32Pro, contains instrument specific model information as well as wavelength calibration information. Substitution of the file by inappropriate format may result in a failure in operation. Please contact Tech Support if such a file is in question.

## Software Installation

### ***Before You Start:***

It is recommended that the user review the SM spectrometer hardware user manual first to get familiar with the hardware involved. All customers are advised to pay extra attention to the voltage and other electrical ratings associated with the SM spectrometer products to avoid any unnecessary equipment damage.

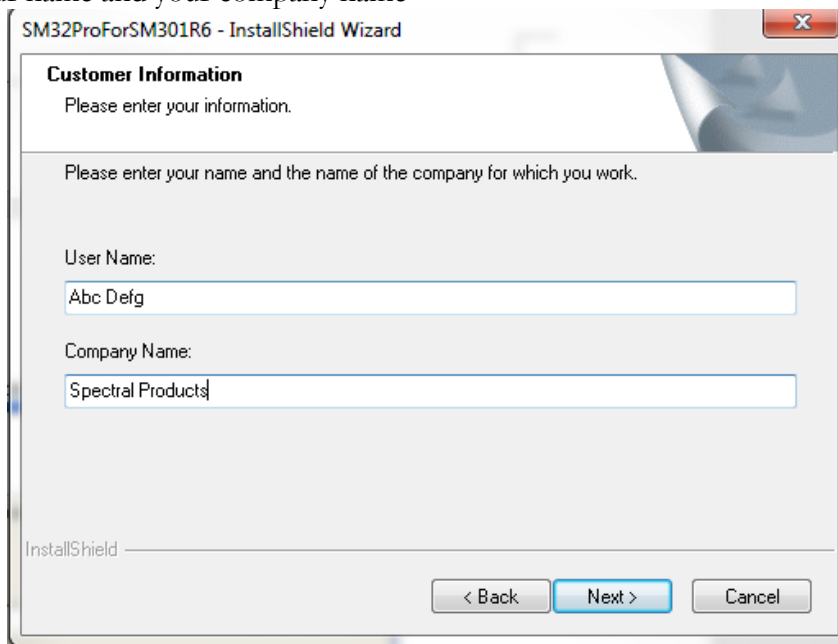
The following section will describe the SM32Pro software installation procedures. It is recommended that the operating software be installed prior to the hardware installation.

### ***Software CD Installation:***

1. Insert the SM32Pro installation USB flash drive into the computer USB port.
2. When prompted, choose a proper Windows OS version.



3. Enter your name and your company name



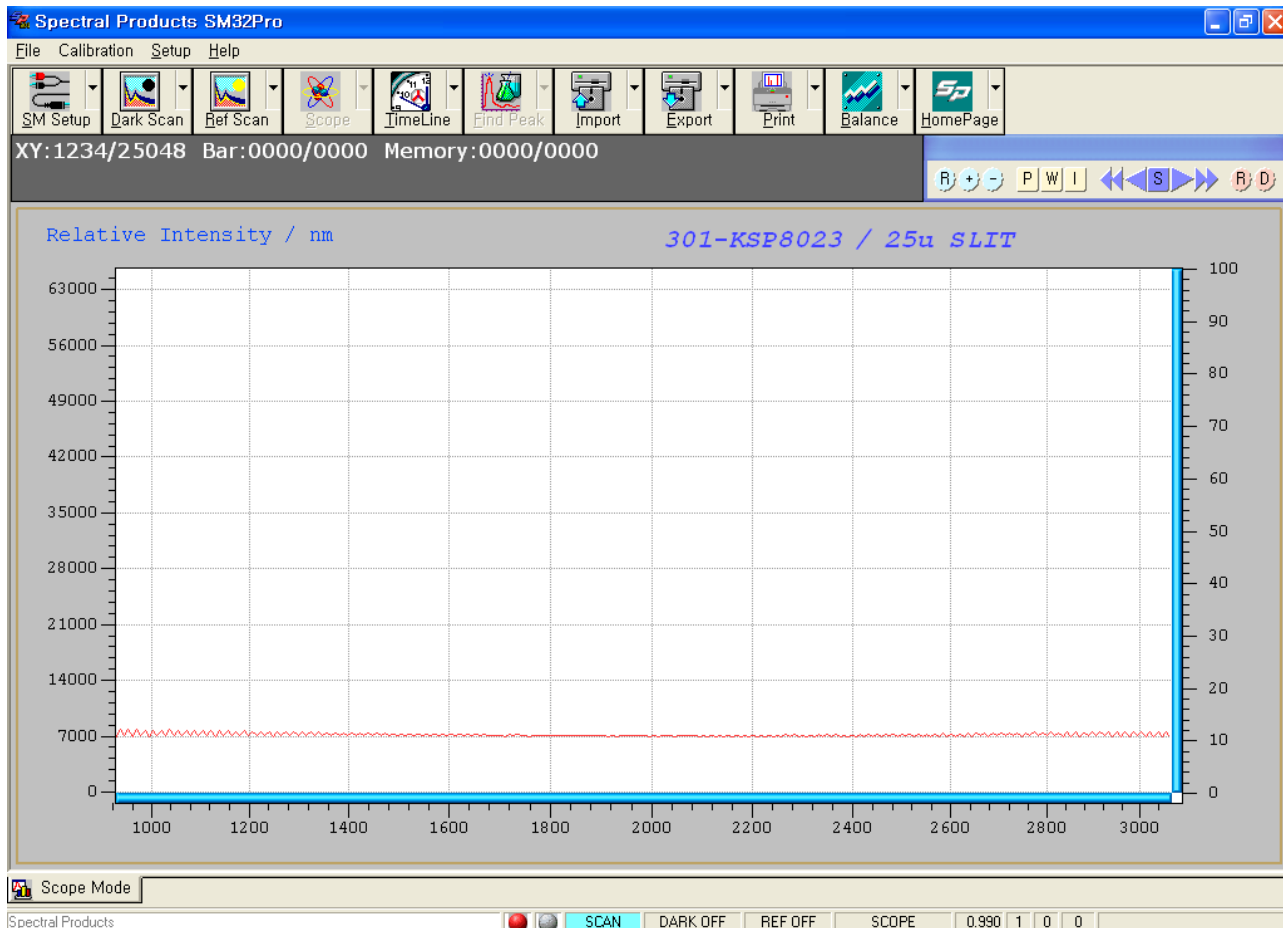
4. Follow each installation step as guided.
5. Copy and paste the ini file for the unit into the folder where the SM32Pro is installed., if SP provides the ini file separately and ask to do so
6. ***If the setup program for SM32Pro wasn't launched automatically***, you can launch it by running the "Setup.exe" from the appropriate device driver folder on the SM installation USB flash drive. (See quick setup installation guide, the 1<sup>st</sup> step)
7. Some PC or Windows may ask you to reboot the computer after the installation. In this case, rebooting is strongly recommended.
8. After the software installation is finished, power up the spectrometer, plug the USB cable into your computer and follow Windows hardware installation wizard to finish the hardware driver installation. The installation USB flash drive may need to stay in the USB port for some computers (especially AMD CPU computers).
9. If no problem happened during the hardware installation, you can run the SM32Pro.

## Getting to Know SM32Pro

### Main Screen:

The main screen consists of a menu bar, command buttons bar, cursor value and timeline recording display area, graph control buttons bar, project and sample information area, status display area, quick access controls, and a graphic display area.

The graphic display chart consists of two Y scales as well as an X-axis. The Y-axis on the left displays a relative intensity scale in A/D counts in Scope mode while the right Y-axis is defaulted to percentage. The maximum counts shown on the left Y-axis is 65535 (16-bit). When in Scope mode, the X-axis display is in pixel number or in wavelength number.



### Menu Bar:

The main menu consists of File, Calibration, Setup, and Help. When you select the Exit menu of the file, the software is terminated. You can check the software version information by selecting About SM32Pro in Help.

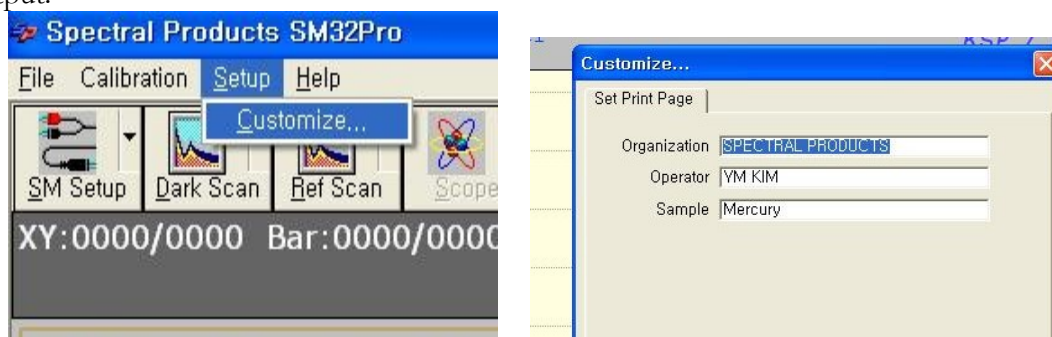
Calibration functions include wavelength and intensity calibration, and the calibration procedure will be described separately in the spectrometer calibration instructions.





Tip	The wavelength calibration function is activated only when you select Pixel Base in SM Setup and select Pixel in the Graph Control Button.
Tip	The Irradiance calibration function is not activated for the current SM301/SM301-EX series. Please contact SP if it is needed.
Tip	The brightness calibration function is activated by performing a dark scan.

If you select Customize from the Setup menu, the Customize dialog box appears, listing the organization, operator name, and sample name. This is reflected in the printer output.



## CALIBRATION - WAVELENGTH:

Custom wavelength calibration is supported by use of the Calibration tool in Calibration->Wavelength. This menu is activated only under the “pixel” mode.

**NOTE:** Only the advanced users who have a calibration light source are recommended using this menu.

## CALIBRATION DIALOG BOX:

Custom wavelength calibration is achieved via the use of the Calibration dialog box. The dialog box consists of a text-editing table for wavelength and pixel value entries, and five different options for loading existing as well as future calibration sets or templates. In calibration mode, all other spectrometer control functions are still supported in the background.

### Refresh for Find Peak:

This command button allows the peak finder to update. This is useful when different calibration reference sources are involved in the procedure.

No	Wavelength(nm)	Pixel
1	253.7	460
2	313.2	577
3	365.0	678
4	404.7	753
5	435.8	813
6	546.1	1019
7	577.0	1076
8	579.1	1080
9	696.5	1294
10	763.5	1414
11	811.5	1498
12	1014.0	1853
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		

Load options:

### Custom Cal Set:

The wavelength calibration set that the SM32Pro utilizes for conversions between different X-axis units is labeled as Custom Cal Set. When the Custom Cal Set check box is selected, the display window lists the known wavelength values and corresponding pixel numbers in a tabular format.

Use the Select Custom Cal Set drop down list to highlight the desired wavelength calibration set and then click **Load** to bring the values into the table for adding or subtracting any custom pixel to wavelength reference lines.

**Auto Peak Data:**

Upon entering the Calibration mode, Peak Finder is automatically started. To use these peak values to generate a new calibration set, select the Auto Peak Data option and click on **Load**. The pixel values that correspond to the found peaks will be copied into the Pixel column for further editing.

The matching known wavelength values can be manually typed into the corresponding cell in the Wavelength column, or click on the Wavelength cell and use the drop down list to select wavelengths from the built-in wavelength database which is comprised of known lines for an HgAr lamp.

**Cal Data Base:**

This option allows the known wavelength database to be brought into the Wavelength column. Choose a desired wavelength from the Select Data Source drop down list and click on **Load** for the data to be imported.

**Factory Default Set:**

This option allows the import of the factory created calibration set into the calibration-editing table. Click on **Load** to make the imported data effective.

**New Cal Set:**

Selecting this option and then clicking **Load** clears the calibration editing table for use to create a new custom calibration set. Wavelengths can be either typed in manually or selected by use of the drop down list as described earlier.

After the creation of the new calibration set type in the desired name into the Select Custom Cal Set field and click on “Save” for the changes to be made. Click on **Apply as Default** to use this particular calibration set as a default.

**CALIBRATION - IRRADIANCE:**

Custom irradiance calibration is supported by use of the Calibration tool in Calibration->Irradiance. This menu is activated only under the “pixel” mode and after taking the dark scan.

**NOTE:** SP facilitates the irradiance calibration of the unit. Please contact SP to do the irradiance calibration.

**SETUP - CUSTOMIZE:**

By using the Customize option in the Setup menu, one can customize the print report.

**CUSTOMIZE DIALOG BOX:**

The Organization name, Operator name and Sample name can be custom changed to be included on the print report.

## Command Button Bar:

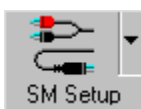
Most of the system operating functions can be realized by use of the command buttons. The command buttons are arranged as general control buttons with embedded pull down dialog boxes, which are opened by clicking on the little arrow on the right side of the button.



**Ti** The Scope button is activated when Dark Scan and Ref Scan are performed, and Find Peak is  
**p** activated when Dark Scan is performed.

## Command Buttons and Dialog Boxes

**\*NOTE:** After working with any dialog boxes described in this or later sections, simply click outside of the dialog box for changes to be effective and to exit.



The SM Setup function allows you to change operating parameters for the spectrometers. Clicking the top right arrow can activate the pulldown dialog boxes.

### SM SETUP DIALOG BOX:

**SCOPE MODE** ☒ **MEMORY MODE** ☐

Integration Time(ms)

Time Average(scans)

Binning Average(Pixel)

FFT Smoothing(%)

☐ External trigger Mode

**PIXEL BASE** ☒ **WAVELENGTH BASE** ☐

**Data Control**

☐ Raw Data ☒ Baseline Correction

Gain

Offset

Delete Memory

**Grid and Color of Background**

☒ Grid X

☒ Grid Y

☐ X Data

☐ Y Data

**Show Wavelength(nm)**

☒ Show Wavelength(nm)

1388nm - 5063nm

Start wavelength (nm)

End wavelength (nm)

Interval (nm)

**SCOPE MODE** is the default-operating mode, which enables the live updating of the measurements.

**MEMORY MODE** will be entered automatically when a play back operation is performed. The play back of recorded spectra can be achieved by using the **Import** command

button. To exit the repeating play back of recorded spectra, the user needs to use this dialog box to change from **RECORD MODE** back to **SCOPE MODE**.

The **Integration Time** is to set the exposure time of the detector. The **Time Average** is to average the given number of scans. It helps to reduce the noise level. The **Binning Average** is also used to reduce the noise by averaging the given number of neighbor pixels' values. The larger the value, the more gentle the data is, but the data is distorted. In general, when there is a spectrum having a narrow bandwidth, data is severely distorted. In the case of a continuous wavelength light source having a wide bandwidth, the noise may be reduced. The **FFT Smoothing** is to reduce the noise in the translated frequency domain. As Binning Average increases, the spectrum of the form with narrow bandwidth is distorted. In general, dark noise can be significantly improved in continuous wavelength light sources with wide bandwidth.

When the **Pixel Base** display mode is selected, the wavelength display in X-axis will be supported in Scope Mode (*see also Graph Display Control Buttons* below) by clicking the “W” button on the Graph Display Control at the upper right corner of the main window. The **Pixel Base** displays the wavelengths on the X-axis per the detector pixels corresponded in appropriate modes. The wavelength increment is the actual wavelength difference between two adjacent detector pixels.

When **Wavelength Base** is enabled, the customized wavelength range can be set up in the extended dialog box (by clicking the green arrow button). The **Show Wavelength(nm)** can be enabled in this base. The **start** wavelength, the **end** wavelength and the wavelength **interval** can be set up after activating the **Show Wavelength(nm)**. Those values must be located within the real full wavelength range shown right under the **Show Wavelength(nm)** button.

When **External Trigger** is checked, the program will wait until the external trigger signal is received. Once an external trigger mode is received properly, the program will update the data to display. It will go back to the regular real time mode when this **External Trigger** is unchecked again. Please refer to the External Trigger mode manual for more details.

**Data Control:** You can set whether or not to apply baseline correction to the data output to the Main Graph. If you check Raw Data, raw data without any correction applied is output on the graph, and if you check Baseline Correction, baseline correction is applied to the output data and output on the graph. When calculating the baseline correction, Gain and Offset can be set, and the following calculation is applied.  
$$(\text{RawData} - \text{DarkData}) * \text{Gain} + \text{Offset}$$

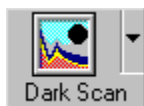
In the Grid and Color of Background pane, the color of each line and the graphic window background can be selected. The **Grid X** and/or the **Grid Y** are/is to present the scales on the coordinates. If the **X Data** and/or the **Y Data** are/is activated, the X and/or Y values will be displayed per the mouse pointer position on the graphic window.

Tip	If you enter a value in the variable input field in this dialog box and press the enter key, the bottom of the dialog box disappears or appears repeatedly. If you want to move the values you want to change, change the value and move to other setting option or numerical input window with mouse. When all settings are completed, click mouse outside the dialog box to close this box.
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Tip	The Start and End of Show Wavelength cannot exceed the default settings shown below the Show Wavelength character. Also, the interval should be equal to or greater than the value obtained by dividing the wavelength range of the lower half of the character by 2048 by the first decimal place. Generally, if the wavelength range is about 400 nm, the interval may be set to 0.2 nm, 0.3 nm for 600 nm, 0.4 nm for 800 nm, and 0.5 nm for 1000 nm.
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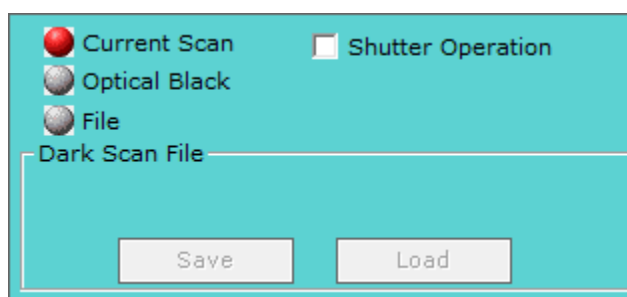
Tip	If we change the other setting values beyond the setting range, if the spectral data is crashed and displayed, the Show Wavelength interval may change to a large value such as 10.0. In this case, the problem can be solved by re-entering it as a number.
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Tip	DarkData is measured during Balance work or Dark Scan work, and if DarkData is not measured, raw data is output on the graph even if Baseline Correction is checked.
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The Dark Scan function allows you to perform a dark scan. When you click the button, the internal shutter operates to create a dark condition and acquire Dark data. After the acquisition is completed, the shutter is opened again.

## DARK SCAN DIALOG BOX:



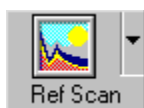
**\*NOTE:** *The dark scan is required for %T/R, absorbance, and irradiance measurements. Reference dark materials are essential for accurate measurement results to be obtained in different measurement modes and wavelength regions. Running the reference scan is recommended once the dark scan was done.*

**Current Scan:** The current scan option is provided to take a dark scan from the current data that is being collected. This dark data can be saved for future dark scanning purposes.

**Optical Blank:** The optical blank option allows you to use the power emissions from the 32 pixels not used in the collection of data, which only emit dark signal. *The current PbS/PbSe arrays don't have any optical blank pixels so this function was deactivated.*

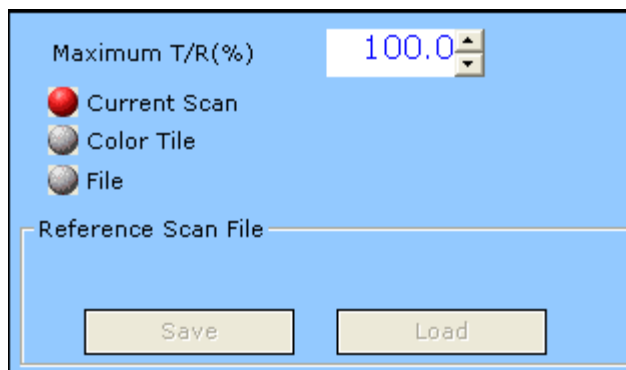
**File:** The file option allows you to load the previously saved dark data or save the current dark data.

**Shutter Operation:** This check box is to set whether to use the mechanical shutter or not when executing the Dark Scan. If this option is checked, the mechanical shutter in the spectrometer will block the input light, run the base line correction and then do the Dark Scan. If this option is not checked, the software will run the Dark Scan as it is. The user must block the light. This option is to include any ambient “white noise” as a dark reference data.



This allows a reference scan to be taken, which is used in T/R% or absorbance measurement for normalization. The pulldown dialog box supports several reference scan data sources, from current reference scan, or from a previously saved reference scan data file.

#### REFERENCE SCAN DIALOG BOX:



**Maximum T/R (%):** When you wish to use the current reference scan as a custom T/R rather than the default setting of 100%, you can change this value between 0% and 100%.

**Current Scan:** The current scan option is provided to take a reference scan from the current data that is being collected. This reference data can be saved for future reference scanning purposes.

**Color Time:** If you chose the **Color Tile** option, the color tile options for **Set Calibration** and **Load Color Tile** will appear in this dialog box. To use the color tile reference scan, you first must set the calibration of the specific color tile you wish to use as your reference. Once that is done, the text on the **Reference** button will read **Save Tile**, you will click on this to save the tile calibration as the name you have inputted into the box titled **Project Name**. When you wish to use the calibrated tile as a reference you will choose the calibration for the color tile you wish to use then click on the **Load Color Tile** option. It is now ready to be used. This function is used as a substitute for a white reference scan.

**File:** The file option allows you to load the previously saved reference data or save the current reference data.

**\*NOTE:** *The reference scan is required for %T/R and absorbance measurements. Reference materials are essential for accurate measurement results to be obtained in different measurement modes and wavelength regions.*



This indicates the current measurement/display being displayed. The button is enabled only after the dark and reference scans are taken. Click on the button when it is enabled to change between regular scope mode, T/R%, absorbance and irradiance modes.

## DISPLAY DIALOG BOX:

The “**Scope**” mode shows the signals read by each CCD pixel in 16-bit scale.

The “**T/R %**” mode shows the transmittance or reflectance of samples based on the “dark scan” which represents 0% T or R and the “reference scan” which represents 100% T or R.

The “**Absorbance**” mode shows the absorption converted from the transmittance, where  $A = 1/\log(1/T)$ .

The “**Irradiance**” will not appear if the unit wasn’t calibrated at SP and/or doesn’t have a proper calibration data file. If “**Irradiance**” is chosen, the irradiance options for absolute or relative measurements and the distance will appear to the right of the selections. There are two kinds of irradiance measurements. The **Absolute Irradiance** needs to be calibrated by using a calibrated light source which should be done at SP. **Distance**, is the distance from the light source to the unit, and **Relative Irradiance** needs the calibrations spectrum of the light source, and the color temperature of the light source.

The **Max/Min** setting is for scaling the y-axis in each mode.

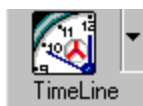
For more detailed information about how to use the absolute irradiance in this software, please refer to the additional manual provided along with this main manual.

The “**Use low-pass filter**” is for smoothing data and the “**Filtering window size**” is for the total pixel number for applying the low-pass filter. Each pixel’s value will be replaced by the average of the neighbor pixels’ given by this window size in the low-pass filter.

Tip	The Irradiance mode is only available for spectroscopy calibrated at the user's request. Note that even if switching to this irradiance mode is possible by default, the irradiance data is not reliable if the correct calibration data is not used.
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Tip	If you change the integration time in the middle of the measurement, you must perform the dark and reference scan again. If you do not perform a dark and reference scan again, important functions will be unavailable or disabled.
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This allows for configurations for automatic sequential spectrum recording at specified time intervals and to specified data files. The pull down dialog box allows for the entry of starting time, ending time, and recording time interval in milliseconds (ms) or seconds (s).

You can choose the duration you want to collect the data by using the time duration function, or by choosing the actual amount of scans you wish to acquire.

### TIMELINE DIALOG BOX:

The **Timeline** button will become **Ready** after all timeline recording parameters are set. Click on the **“Set Ready”** button to start the timed recording process to record spectra within the set duration as shown in the timeline dialog box. The “Cancel Record Process” will cancel the process.

After the start of the Timeline recording the **Ready** button will now be the **Stop** button. Click on the button during recording process to terminate the recording.

The **“interval”** is for the interval between each spectrum. It has to be larger than the integration time. Considering the overhead time for data process which varies depending on the computer performance like CPU/memory speed it needs to be large enough to obtain each spectrum at the same time interval.

The **“Start”** and the **“End”** time setting is for setting the recording period. Instead of giving the end time, you can give the total number of the spectra to be recorded by un-checking the **“End”** time and set the desired **“No”** (number) setting.

If you select the **“Display while recording”**, the spectrum will be displayed while recording. The overhead time for displaying spectrum data is usually much larger than the data transferring time from CCD to computer memory. So you have to set the **“interval”** time long enough (like >200msec) not to lose any spectrum and get the periodic spectra.

**\*NOTE:** The progress of the recording process is updated in the data display area just above the graph display area if the **“Display while recording”** is not selected.



This allows for the spectral peaks and peak values to be found and displayed. After the peaks are identified, cross hair cursors will appear as you mouse over the peaks. The peak values will be displayed in the **Peak Data** display window.

There are two user configurable parameters in the Find Peak pull down dialog box, which are used by the auto peak finder for peak search. The Peak/Noise Ratio is a value between 0.0 and 10.0 at an increment of 0.1. The higher the ratio the less sensitive the peak finder will be. The Threshold (%) can be set between 0.0 and 100.0.

### FIND PEAK DIALOG BOX:

Noise multiplier 2.0

Threshold (%) 2.0

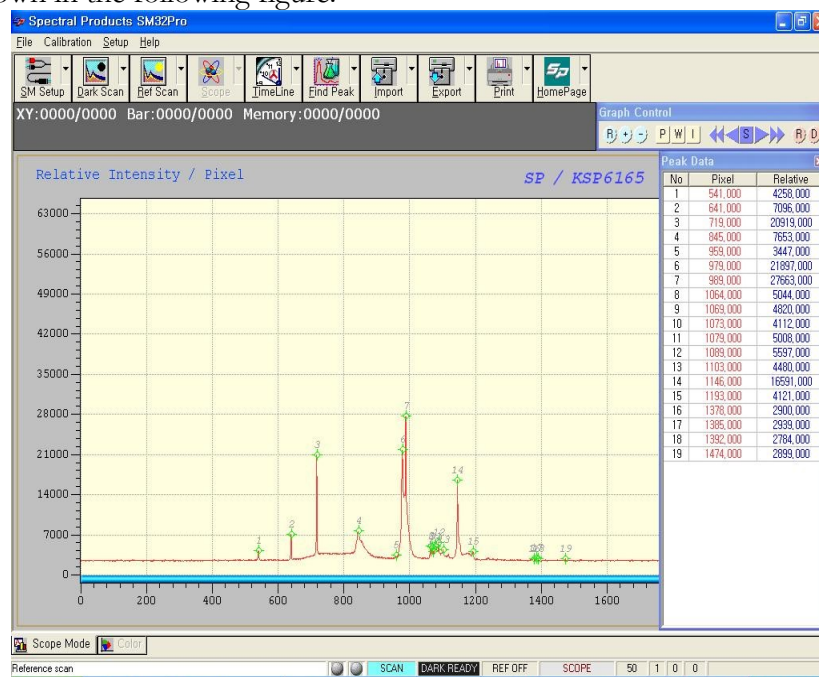
Peak

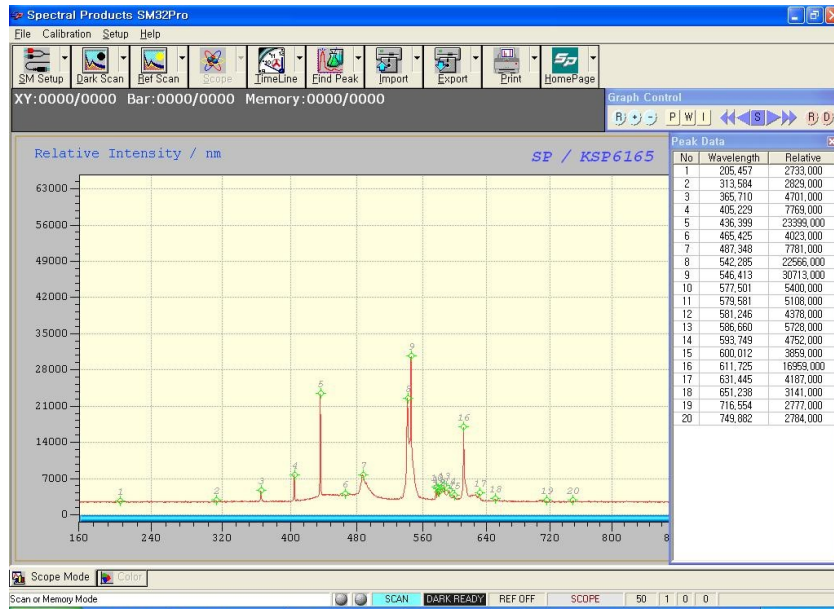
☒ High Peak

☐ Low Peak

Peak is selected as **High Peak** when looking for a convex peak (Local Maxima) above the emission spectrum (such as a mercury lamp), and **Low Peak** when finding a convex valley (Local Minima).

If you press the Find Peak button, the pixel or wavelength recognized as peak and the corresponding intensity value are displayed as peak points and data table on the graph screen as shown in the following figure.





To go to the real-time measurement again, just click the Find Peak button again.

When the mouse is moved to the point indicated by the peak on the graph after the peak is detected, information about the corresponding peak point is displayed as shown in the following figure. When the **wavelength mode** is set in SM Setup, the peak order, peak wavelength, and the peak intensity will be displayed. In the **pixel mode**, the optical resolution (Full Width at Half Maximum) (FWHM) is additionally displayed as shown on the right.



To measure the emission spectrum bandwidth (FWHM), it is necessary to perform this function in wavelength mode to confirm the FWHM value.

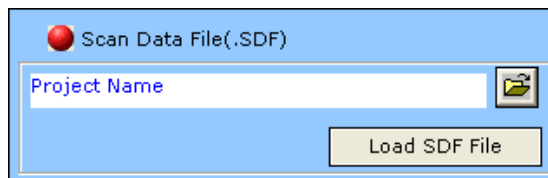
In addition to the peak find, a cursor bar tool is provided. Right click anywhere in the graphics display area and a cross cursor bar will appear with the cross point intercepted by the spectral curve. The cross-point values will be displayed in the middle of the display area.

To change the cursor bar position simply place the mouse pointer to the vertical cursor until the pointer changes, which indicates that the cursor bar is now selected to be moved. Left click the mouse button and drag the cursor to where you desire it. You can also move the cursor bar by pressing the left or right arrow keys on the keyboard. Right click in the graphic display area to exit the cursor bar tool.



Allows for import of previously saved data to be displayed or processed in the current application. This uses a simple dialog box comprised of 2 sections, the **file box**, and the **load** button.

## IMPORT DIALOG BOX:

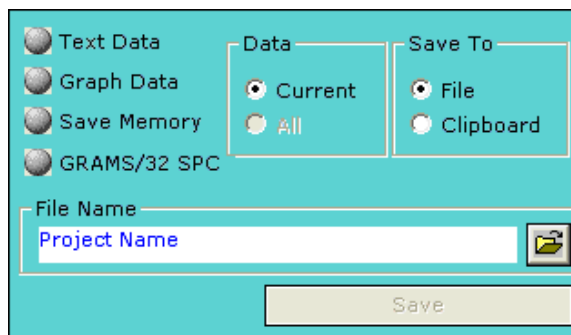


Open the Explorer window on the right and select the memory data file you want to load, then press the Load SDF File button. When the corresponding data is loaded, the automatic switching from SCOPE MODE to MEMORY MODE is performed, and a plurality of data stored in the corresponding memory data is sequentially displayed on the screen at a high speed. To observe each data, press the stop button S of the graph control button described later, and then press the desired control button to observe the respective data. At this time, the usage in MEMORY MODE is valid. (See "4, Graph Control Buttons and Memory Modes")



Allows export of spectral data to another program via OLE, to an excel file, binary data file, or to a text data file in an ASCII format. The pull-down dialog box allows different file formats to be selected.

## EXPORT DIALOG BOX:



**Text Data:** When this option is chosen, use the File control button to bring up the file name dialog box for the entry of file name. The text data files will have the **.txt** extension. The data values in the file are separated by a space between any pair of data. Data pairs are separated by carriage returns. When the data is exported to an ASCII file, it is set up in a 3 column, tabular format for Pixel, Wavelength, and Intensity.

**Graph Data:** When this option is chosen, use the File control button to bring up the file name dialog box for the entry of file name. The graph data files will be saved in BMP format with the **.bmp** extension.

**Save Memory:** This option is available only when you save the scanned data using the “**R**” button for recoding on the “**Graph Control**” dialog located at the upper right corner of the main window. Please refer to the Graph Control Buttons section below. When this option is chosen, use the File control button to bring up the file name dialog box for the entry of the file name. The file name will be assigned an extension of **.sdf** for the binary data file format. And it can be reloaded by the “**Import**”.


**GRAMS/32 SPC:** When this option is chosen, use the File control button to bring up the file name dialog box for the entry of file name. The data will be saved in GRAMS/32 SPC file format with the **.spc** extension.

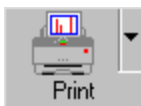
Tip	If PIXEL MODE is selected in SM Setup, pixel and its corresponding original wavelength data are stored together in text data. If WAVELENGTH MODE is selected, interpolation is performed for the wavelength calculated at the interval interval selected in Show Wavelength and for each wavelength. The interpolated data is stored. Therefore, considering the use of interpolated or original data, the appropriate MODE must be selected before exporting the text data.
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Tip	Since the SDF memory data file is stored in binary form, the user can not check the corresponding data with general word processing software.
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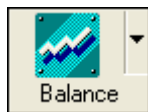
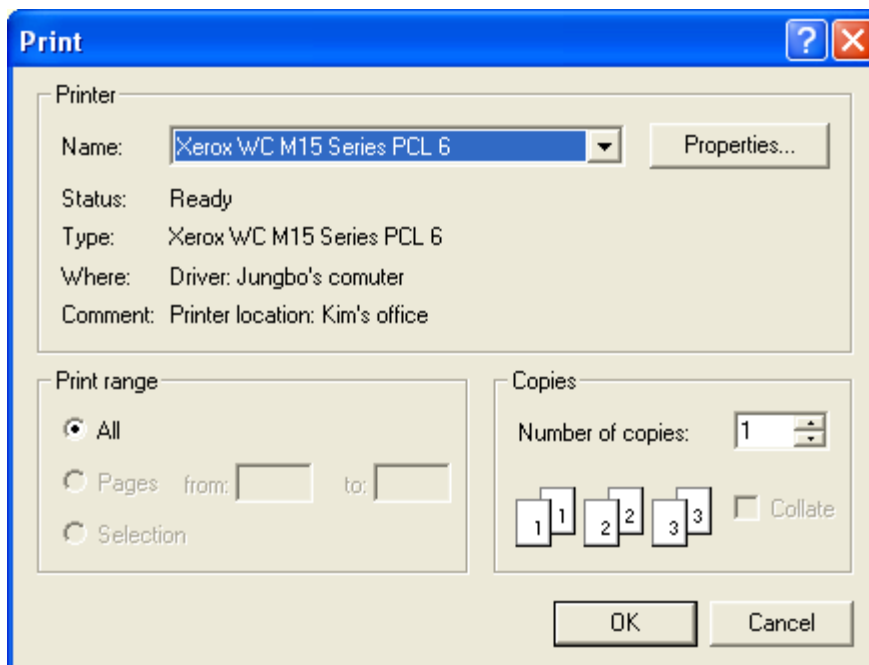
Tip	Data saved as text data cannot be imported separately from SM32Pro and can be imported by using common word processing software or spreadsheet software such as Excel.
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Tip	If you use To Excel function, it may take a long time to import Excel object per the performance of your computer. Therefore, it is recommended to save the data in Text data and execute Excel and import the corresponding text data.
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Tip	<p>To use <b>Save Memory</b>, memory data must be stored after performing dark and reference scan. When the memory data is saved, the integration time changes, and even if the stored memory data is mixed without the dark and reference measurement, the problem occurs. In this case, as shown in the following figure, No Dark &amp; Ref appears in the lower left corner of the dialog box, and the Save button is not activated.</p> 
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Allows for printing of the active spectrum. More specific data such as sample source, slit, name, and project name are included in the printout, as well as the peak values for the graph that was printed. These items can be set in the customize option in the program.



The detector should be balanced once at least, before doing the real optical measurements. It is also required to be done whenever the integration time was changed. Balancing the detector is used for setting a stable base line. Without this “balancing”, the signal shown on the graph window is not reliable. The pull-down dialog box allows setting the TE Cooler On/Off option and the Charge of the Capacitor.

When you click the button, the internal shutter operates to create a dark condition and acquire Dark data. After the acquisition is completed, the shutter is opened again.

## BALANCE DIALOG BOX:

The TE Cooler can be turned on or off with selecting the **TE Cooler ON/TE Cooler OFF**. When the TE Cooler was on with no problem, the **TE Cooler Power** indicator will turn to “Green”. If the TE Cooler turns off, the indicator will turn to “Gray”. Once the TE Cooler becomes stabilized, the **TE Cooler Stable** indicator will turn to “Green”. If you change the **TE Cooler Temperature**, the **TE Cooler Stable** indicator will turn to Gray and turn back to Green when it’s stabilized. If there’s any potential problem occurs during the TE Cooling process, the **TE Cooler Error** indicator will turn to “Red”. And if the potential problem becomes the real problem, this indicator will stay “Red”. If not, it will turn back to “Gray”.

The user can define the target temperature of the TE Cooler by putting the target temperature at the “**TE Cooler Temp. (deg C)**” and clicking the “**Apply**” button. The available TE Cooler temperature is from -20 deg Celsius to +20 deg Celsius and the default value is “-10 deg Celsius”. Depending on the ambient temperature, the user may need to adjust this temperature. At cool ambient condition, the user can lower the TE Cooler temperature, which will make the signal more stable, and vice versa. If the TE Cooler temperature was set too low comparing to the ambient temperature, the TE Cooler may fail

to reach the target temperature and then it will turn off automatically and give the “**TE Cooler Error**” message.

The **TE Cooler Temperature Offset Indicator (mC)** shows how much the temperature on the TE Cooled detector offset from the target TE Cooler temperature. It has to be stay at the middle of the indicating bar with small offset temperature. It is not the “real value” but just a theoretical value based on the feedback information from the TE Cooler. When the TE Cooler turns off, it may give some unrealistic negative/positive values.

The **TE Cooler Power Indicator (W)** shows the currently consuming power of the TE Cooler and can be a good indicator about how well the TE Cooler temperature was set for the current ambient temperature. If it shows too high, it means the TE Cooler temperature was set too low comparing with the ambient temperature, and vice versa. The ideal maximum consumption power is 10W but if it becomes over 5W and stay for a while then the TE Cooler will turn off with error. Empirically, it is recommended setting the TE Cooler temperature to make this **TE Cooler Power Indicator** at 1W around (+/-30%).

The capacitor charge value for balancing the detector can be set by choosing the value from the **Charge Capacitor** combo box. 1pF, 4pF, 7pF, 10pF, 11pF, 14pF, 17pF and 20pF are available. For noise purposes, it would be desirable to make the sample capacitor larger, but that might result in an unacceptable loss of signal during the charge sharing. The default value is 7pF for PbSe array detector and 10pF for PbS array detector.

The Global Skim selection is to set whether to use global dark current subtraction or not. The default is “**Without Global Skim**” and it is strongly recommended to use this one in general situation. Using “**With Global Skim**” will add a small amount of noise to the overall pixel noise. The “**With Global Skim**” option is provided for the cases where the per pixel correction (balancing) circuits within the readout integrated circuit cannot converge properly due to too high of detector dark current which is rarely encountered and only happens with extremely low impedance detectors or very high operating temperatures with extended integration times. If any of this case happens and it’s needed to use the Global Skim, “**Auto Global Skim**” is strongly recommended although it takes much longer time for the balancing.

When the **TE Cooler Stable** indicator turns to “Green”, the “**Balancing**” button will be activated. Then the user can start the detector (dark) balancing by clicking this button. The mechanical shutter in the spectrometer will be automatically block the input light. After the balance, the result (test signal) will be shown in the graphic panel in this window and it should be close to FLAT. If there are some strange/large peaks or valleys in the result curve, this means that at some pixels the dark level conditions were over their tolerances. In this case, you should redo the balance after changing the “charge capacitor” value and/or integration time until you get the result curve close to FALT.

At the bottom of the TEC Monitor you can monitor the status of the TEC device.

**ITEC** – a voltage related to the current in the TE element

**TMON** – a voltage that provides temperature stability information

**VTEC** – a voltage related to the voltage across the TE element

**VREF** – the internal reference voltage for the TE controller

**\*NOTE:** *Before doing the real optical measurements, this Balancing must be executed at least once. The spectrum signal without the balancing is not the real data. Also, whenever any parameter like integration time is changed, it should be executed*



*to balance the detector in the dark condition again. The internal shutter will be closed to block any input light to make the dark condition when the Balance begins and then opened when it ends, automatically.*

## **Graph Control Buttons**

The Graph Control Bar is a convenient utility that puts all of your necessary graph controls at your fingertips.



### **ZOOMING CONTROLS:**



The Zoom control buttons provide zoom Reset (**R**), stepped Zoom In (+), and stepped Zoom Out (-) controls. Flexible Zoom In can also be achieved by left clicking and holding the mouse button and dragging to draw a Zoom In view window inside the graphic display area around the interested portion. Clicking the R button does a Complete Zoom Out. After a graph is zoomed in, two sliding bars will appear for vertical and horizontal scroll control use. Move the mouse pointer to any of the sliding bars until the pointer changes to a double arrow. Click and hold down the left mouse button and slide to view desired spectral display area in the graph.

**\*NOTE:** In addition to the zoom buttons, simply using the mouse pointer can perform zoom in. To do so, left click, drag and draw a rectangular view window around the interested area in the graph.

### **X AXIS UNIT CONTROLS:**

The display control buttons allow for the selection of spectra to be displayed in pixel (**P**), wavelength in nm (**W**) or inverse centimeters (**I**).

The **W** and **I** display modes apply in T/R% and absorbance measurement modes only if the **Wavelength Base** is selected in SM Setup Dialog Box.

When **Pixel Base** is chosen in the SM Setup Dialog Box, the **W**, wavelength display mode will also be available in Scope measurement mode.





### **PLAY BACK CONTROLS:**




The play back control buttons provide functions when importing and playing back recorded spectra.




Allows for continuous frame-to-frame play back of imported (recorded) spectra in a reverse sequence.

-  Allows for play back of imported (recorded) spectra in a reverse sequence one frame at a time.
-  Allows for the termination of continuous play back operation.
-  Allows for play back of imported (recorded) spectra in a sequence as recorded one frame at a time. In non-recording mode, this button allows a snap spectral shot to be taken each time when there is a click on it.
-  Allows for continuous play back of imported (recorded) spectra in a sequence as recorded. In non-recording mode (Scope Mode) this button serves as a resume button for continuous acquisition operation.

## RECORDING CONTROL BUTTONS:

 The **R** control will save the current spectrum into memory. The maximum allowable number of spectra to be saved is dependent on the available memory size.

After the manual recording of desired spectra, the **Export** dialog box may be used to assign a file name for the recorded memory files. Thus, the files may be later imported for play back purposes.

 The **D** control allows the current displayed spectrum to be deleted from memory manually.

## ***Information Display Area:***

XY:0000/0000 Bar:0000/0000 Memory:0000/0000

The display area is located on top of the graphic display and is used for display of mouse pointer positions on X and Y axes in the current spectrum (top left), cursor bar values (middle), timeline recording progress (bottom left), and memory usage (top right). Please also see Peak Finder and Timeline recording, for more information.

**XY:** Indicates the position of the cursor currently on the graph display area.

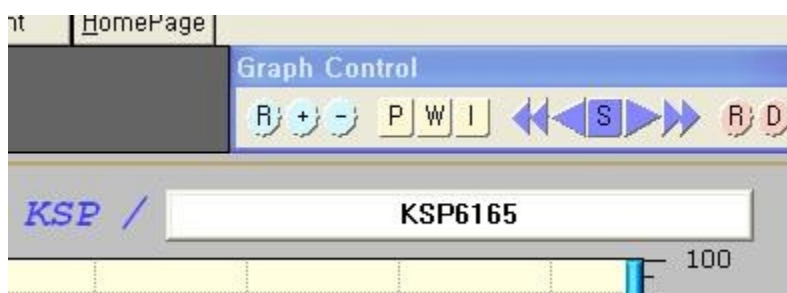
**Bar:** When the cursor bar is displayed, it indicates the position of the current cursor bar.

**Memory:** The right side shows the total number of memory data currently loaded or stored, and the left side shows the order of memory data displayed in the current graph display area in MEMORY MODE.

**Record:** It only appears on the screen while the Timeline's Record function is running, showing how much data is being stored by the current Timeline configuration.

## Project and Sample Names:

Between the graph control buttons and the graph display area, the project name and sample name are displayed in blue text. When you right-click the mouse, the following modifying mode appears. You can complete the modification by right-clicking on the light gray area surrounding the graph display area. Both the project name on the left side and the sample name on the right side can be modified in the same way.



## Status Display Bar:

At the bottom of the software there is the following status display window:



The red Boolean button on the left flickers when data is acquired in real time, and is not flickered when the data is not acquired (when the screen is stopped or the interface is interrupted and hardware cannot read the data). The third column to the right of the Boolean monitors the TEC Status in real time. It outputs On/Off, Heating/Cooling and Unstable/Stable status in order. DARK READY is displayed in black when performing dark scan, and REF READY is displayed in yellow when performing reference scan. The current measurement mode is displayed on the right side of the REF READY, and the four types of values on the right side show the setting variable values displayed on the left side of the SM Setup dialog box. The integration time, time average, binning average, and FFT smoothing are shown in order.

Tip	DARK READY appears in black in Scope Mode, then click the left mouse button on the mouse to change the string to DARK DISP. The dark data on the graph is displayed on the black background screen together with the measurement data. Clicking the right mouse button on the mouse will display the current measurement data minus the Dark data in real time. This function is the same as Dark Subtraction in the Dark Scan dialog box.
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Tip	
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	In Scope Mode, when REF READY is displayed in yellow, click the left mouse button on the mouse to change the string to REF DISP. On the graph, the reference data is displayed on the yellow background screen together with the measurement data. The right mouse button function does not exist.
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Tip	When TEC is On, the operation status and the stabilized status will be displayed.
	When the cooling is stabilized: <span>TEC On</span> <span>Cooling</span> <span>Stable</span>
	When it is still stabliing process: <span>TEC On</span> <span>Heating</span> <span>Instable</span>

## ***Quick Access Controls:***

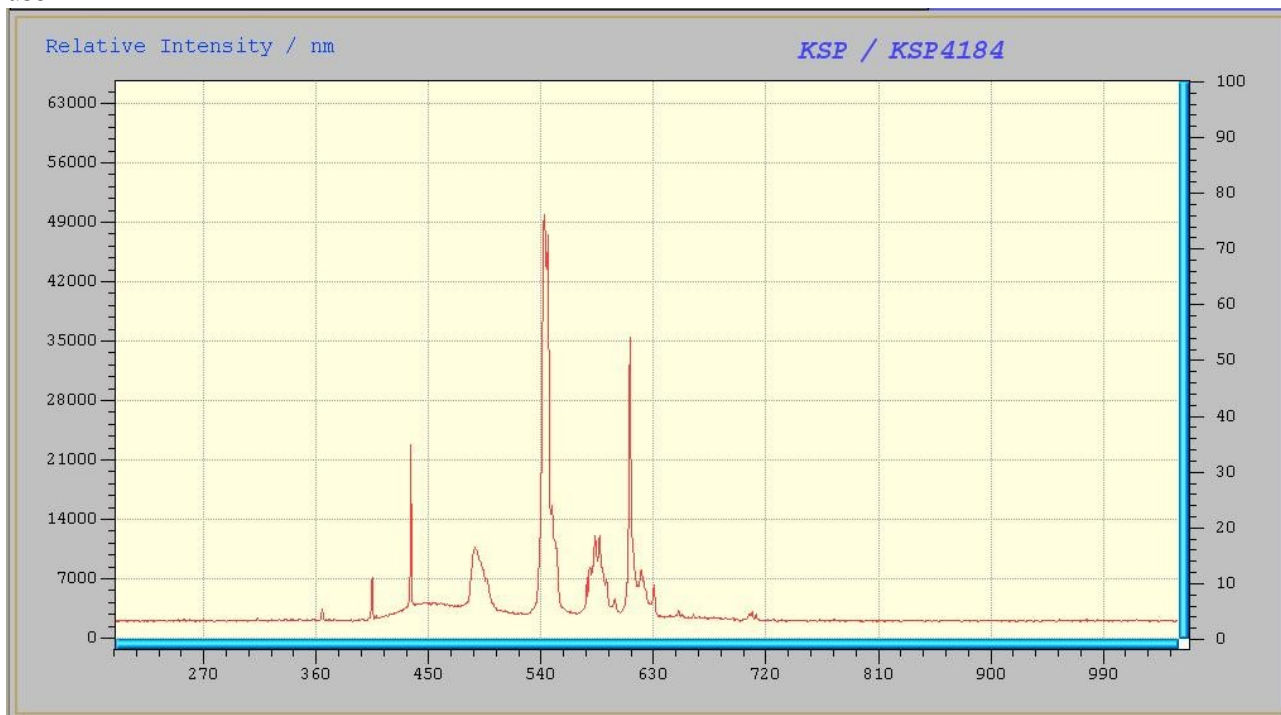
The four setting values on the right side of the status display can be changed immediately by hovering the mouse and pressing the right button and left button.



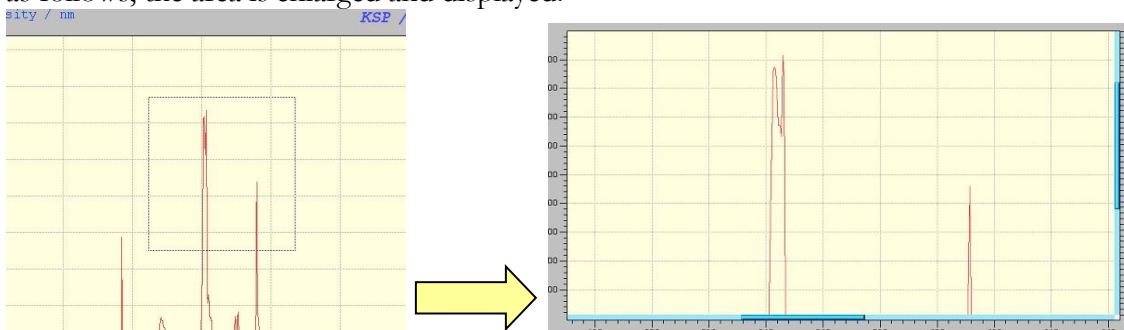
Put the mouse on each corresponding part, press the left button of the mouse to decrease the value, and press the right button to increase the value. The integration time, time average, and binning average are incremented by 1, but FFT Smoothing is incremented by 10 and cycled around 0 and 100.


## Graph Sliding Bar Controls:

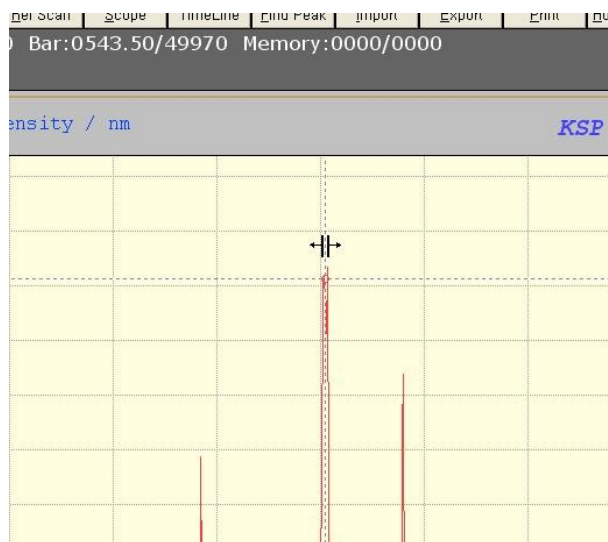
In the graph display area as shown below, the measurement data is displayed to the user.



The X and Y axes are automatically changed per the measurement mode and the display unit, and the Y side on the right side is an axis obtained by dividing the entire display value into 100 parts. If you drag the area you want to enlarge on the screen with the mouse as follows, the area is enlarged and displayed.



The enlarged screen can be controlled by using the  button of the graph control button.



When the right mouse button is clicked in the graph display area, when the mouse with cursor bar is placed on the vertical axis of the cursor bar, left and right arrows that can be moved as shown above are displayed. In this state, you can change the position of the cursor bar by moving the mouse. The horizontal axis of the cursor bar automatically indicates the corresponding Y value, and the XY axis value of the cursor bar is displayed in real time in the bar portion of the upper information display area.

## Technical Support

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To help us serve you most efficiently, please collect some information for us before you call:

1. A detailed description of your problem
2. The specific error or error message you received
3. Your system information;
  - a. Software version
  - b. Version of Windows (98, ME, 2000, NT, XP, etc.)
  - c. Unit Serial Number

Our technical staff can be most effective if you are sitting at the computer while consulting technical support.