

# **SM32 Pro Software Manual**

## **Ver.234.xx**

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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.

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## 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 your USB port. (The installation should begin automatically. If not, open the cd 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 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. Accept all the defaults of the next three screens by simply pressing next through each.
  - After these steps are completed, the installer will begin copying the files into the designated folders on the system.
4. The installation is now complete. Click finish and manually restart the computer to finish installation of the software.



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## Upgrade Installation Guide

This upgrade installation guide will instruct through the installation of the SM32Pro upgrade software package. Please follow the instructions closely to complete the installation. Before beginning, read through this entire guide and be sure that the unit has been disconnected from the computer.

***Note:*** *Be sure NOT to un-install any previous version of SM32Pro before you upgrade.*

1. Insert the USB flash drive into the USB port. (The installation should begin automatically. If not, open the cd through windows explorer and click on the “setup.exe” file to begin the installation manually.)
  - In USB applications, it is recommended leaving 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 serial number. The full serial number is found on the cover of the SM32Pro.ini diskette that was included in the system package.
3. Accept all the defaults of the next three screens by simply pressing next through each.
  - After these steps are completed, the installer will begin copying the files into the designated folders on the system.
4. The installation is now complete. Click finish and manually restart the computer to finish installation of the software.

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## 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 another pointing device
- Ø Microsoft Windows® 98, 98SE, ME, NT, 2000, XP, 7, 8.0/8.1, 10

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

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

Common system packages contain the following:

- Spectrometer
- A/D board (unless a different interface was requested)
- Cable and Adapter
- 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.***

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## Introduction

SM32Pro is a Windows based operating software designed for use with SP SM series 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 buttons and features. Please refer to appropriate SM spectrometer hardware user manual for hardware installation and application information.

The SM spectrometers EEPROM contains instrument specific model information as well as wavelength calibration information. When you run the spectrometer, the data in the EEPROM will be saved as a text file type in the “Ini” file folder of the software. Users can use the saved text file to get the calibration data if necessary. Please contact Tech Support if such a file is in question.

## Software Installation

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

### ***USB flash drive Instructions:***

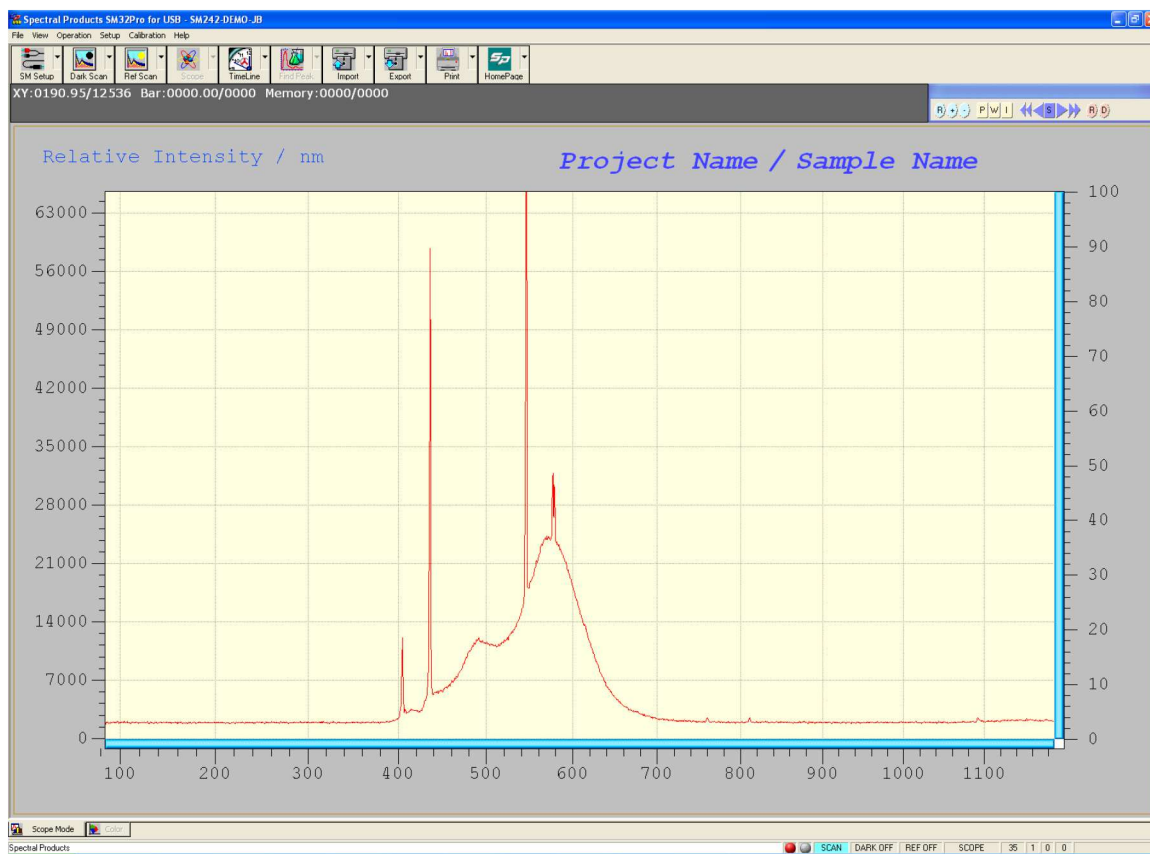
Please refer to the additional manual provided for the software installation, SM32ProInstallationManual\_USB.pdf.

## 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 for a 16-bit spectrometer is 65536 (USB version). When in Scope mode, the X-axis display is in pixel number or in wavelength number. The maximum pixel number is, for example 0 to 2048 for Sony ILX511 CCD or to 3648 for Toshiba TCD1304 CCD, or it will display the desired wavelength range.



[Example Image of Visible spectrum]

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## ***Calibration:***

\*Note: For users who would like to calibrate the unit manually.

Almost all menus are correlated to the Toolbars so only special functions are explained in this section.

### **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	346
2	313.2	464
3	365.0	565
4	404.7	642
5	435.8	702
6	546.1	909
7	696.5	1185
8	763.5	1306
9	772.4	1322
10	811.5	1392
11	912.3	1570
12	1014.0	1748
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		

**Calibration Continued...**

### Load options:

#### **Custom Cal Set:**

The wavelength calibration set that the SM32Pro utilizes for conversions between different X-axis units is the one 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, (pixels) 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.

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### 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 the ability 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, Select Custom Cal Set field and click on "Save" for the changes to be made. Click on **Apply as Default** to use this calibration set as a default.

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**Calibration Continued...****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.

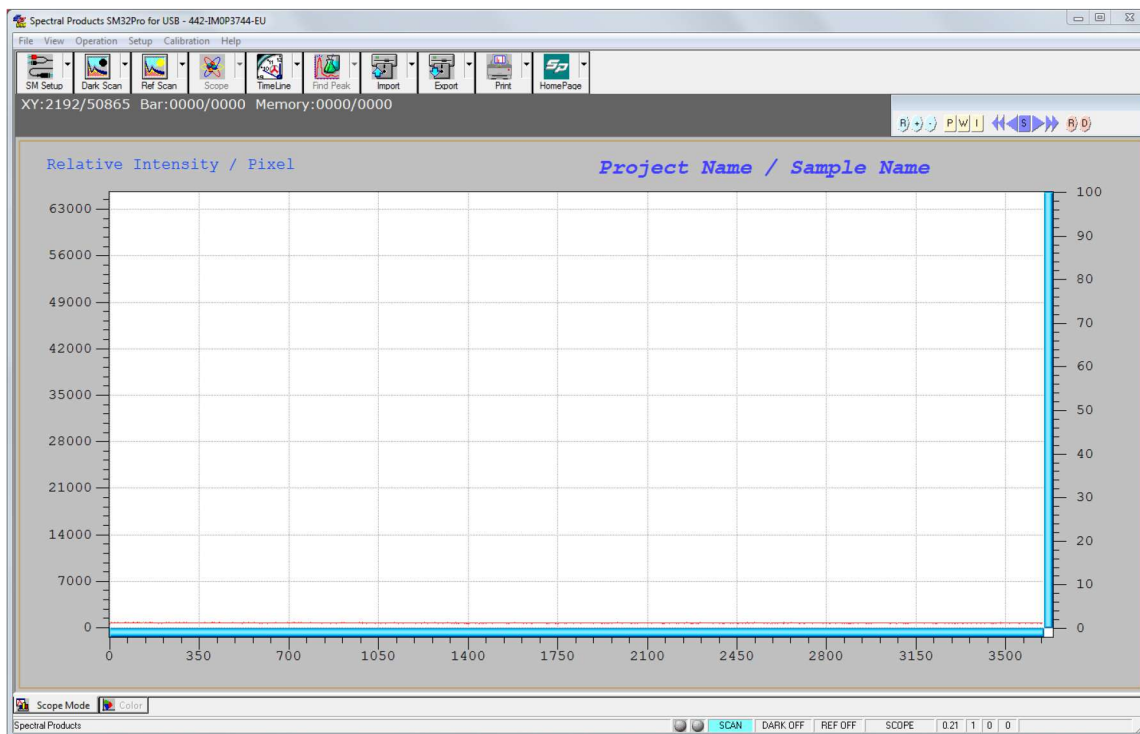
**CUSTOMIZE DIALOG BOX:**

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



## ***Main Window:***

The main window of SM32Pro software consists basically as follows: Menu Bar, Command Buttons, Graph Control Buttons, Information Display Area, Status Bar, Project and Sample Name, Quick Access Control, Graph Display Area.

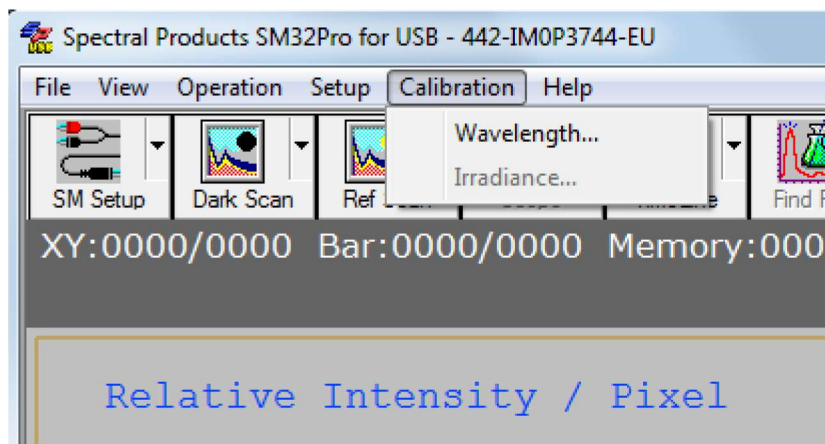


[Image of Main Window]

## **The Menu Bar**

The Menu bar consists of File, View, Operation, Setup, Calibration, 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.

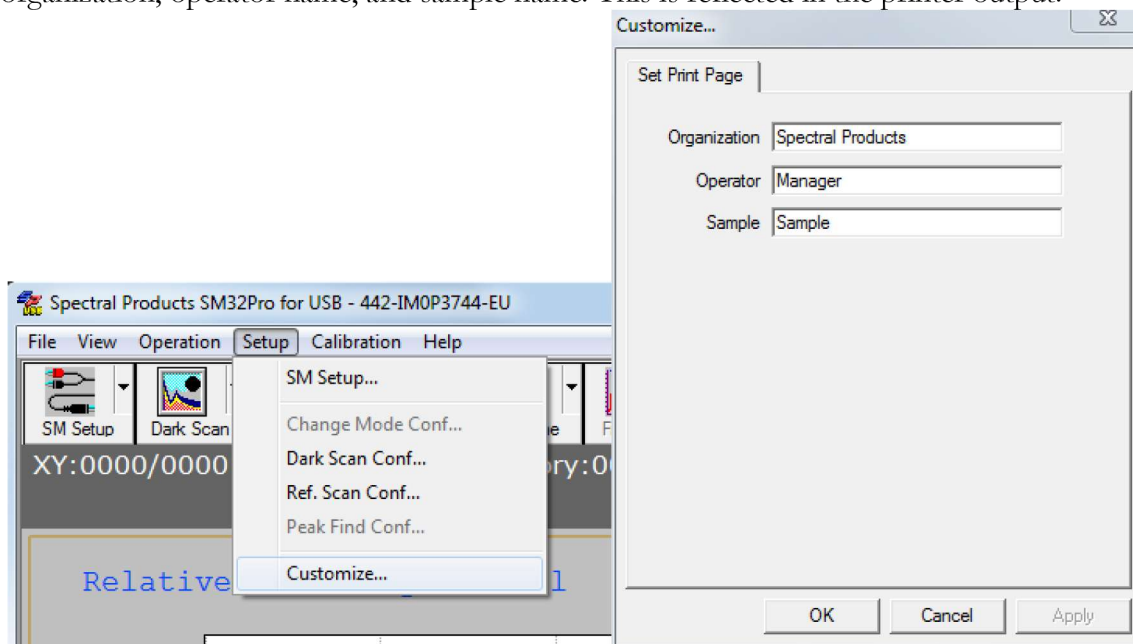
Calibration functions include wavelength and intensity calibration, and the calibration procedure will be described separately in the spectrometer calibration section, page 7.



**Tip** The wavelength calibration function is activated only by selecting Pixel Base in SM Setup and selecting Pixel in the Graph Control Button.

**Tip** The brightness calibration function is activated by performing a dark scan. See page 14 for more details regarding 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.



## Command Button Bar:

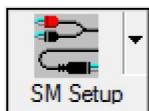
Most of the system operating functions can be realized by use of the command buttons. The command buttons are arranged as general control buttons with embedded drop-down dialog boxes, which are opened by clicking on the little arrow on the right side of the button.



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



### MENU: SETUP – SM Setup...

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

### SM SETUP DIALOG BOX:

**SCOPE MODE** ☒ **MEMORY MODE** ☐

Integration Time(ms)

Time Average(scans)

Binning Average(Pixel)

FFT Smoothing(%)

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

☐ External Trigger

0 scan(s) in memory.

Delete Memory

**Grid and Color of Background**

☒ Grid X

☒ Grid Y

☐ X Data

☐ Y Data

**Show Wavelength(nm)**

87nm - 1187nm

Start

end

Interval

Undo

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

**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 selected to set the exposure time of the detector. The **Time Average** is an average of the given number of scans. It helps to reduce the noise level. The **Binning Average** is used to reduce the noise by averaging the given number of neighbor pixels' values, which can cause some deformation of the real signal. The **FFT Smoothing** is to reduce the noise in the translated frequency domain and also can help to reduce the noise level.

When the **Pixel Base** is selected, the wavelength will be displayed in X axis by clicking "W" button on the Graph Display Control at the upper right corner of the main window. It will be supported in Scope Mode (*see also Graph Display Control Buttons below*). The **Pixel Base** displays the wavelengths on the X-axis according to 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 Wavelength 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.

Selecting the **External Trigger** box will allow you to trigger the spectrometer from an external source. The minimum external triggering available will be dependent on the integration time, the data transferring rate of the system, and the graphic display overhead time. The data transferring rate and the graphic display time depends on the computer performance (CPU speed, memory speed, and graphic card speed and so on). Generally, it takes ~10-15msec for data transferring rate, ~50-200msec for graphic display time. The lowest duty cycle for the external signal should be more than the consumption time for the data acquisition.

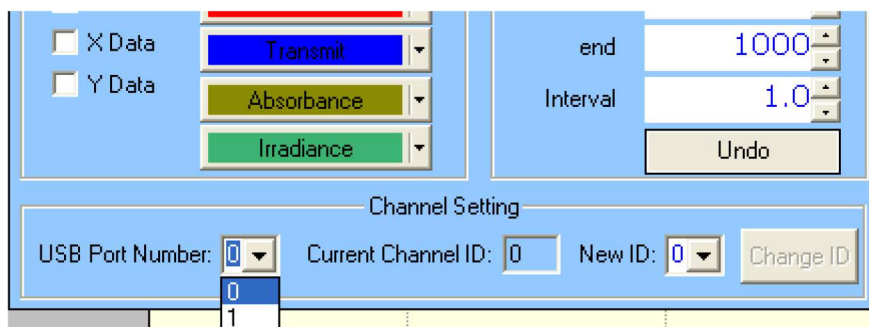
In the Grid and Color of Background pane, the color of each line and the graphic window background can be selected. The **Grid X** and/or the **Grid Y** are/is to present the scales on the coordinates. If the **X Data** and/or the **Y Data** are/is activated, the X and/or Y values will be displayed according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

<b>Tip</b>	If you press the ENTER key after inputting the numeric value in the variable input field in this dialog box, the bottom of the dialog box disappears or appears repeatedly. If you want to move the values you want to set, change the value and move to other setting option or numerical input window with the mouse. When all settings are completed, click outside the dialog box to close this box.
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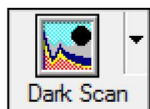
**Tip** The Start and End of Show Wavelength cannot exceed the default settings shown below the Show Wavelength options. Also, the interval must be equal to or greater than the value approximated by the first decimal place of the numeric value divided by 2048 in the wavelength range at the bottom of the character.  
In general, if the wavelength range is about 400 nm, it is 0.2 nm, if it is about 600 nm, it is 0.3 nm, if it is about 800 nm, it is 0.4 nm, and if it is about 1000 nm, it is 0.5 nm.

**Tip** When you change the other setting values beyond the setting range, the spectral data may be corrupted and distorted. The Show Wavelength interval may change to a large value such as 10.0. In this case, you can solve the problem by re-entering the appropriate interval with the appropriate number.

**For the Multi-channel user:** In the case of using the multi-channel configuration, the SM Setup dialog window will show the “Channel Setting” section. (!) **This menu is activated when two or more spectrometers are connected.** By changing the USB Port Number, you can select each channel connected. The USB Port Number will be numbered according to the order in which the USB device is interfaced with the computer.  
If you want to change the channel of the current Spectrometer, you can by setting the desired channel in the New ID and clicking the Change ID at the bottom right when it is activated.





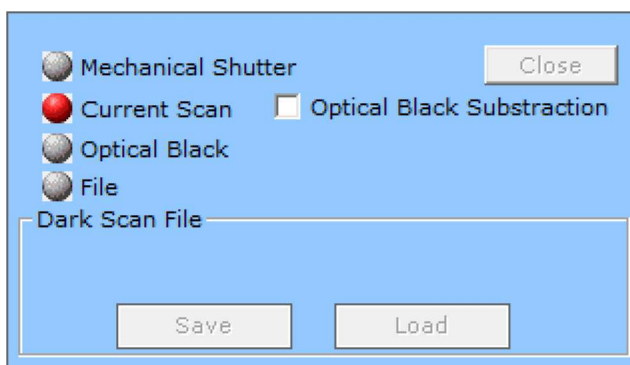


## MENU: Operation – Dark Scan/Setup – Dark Scan Conf...

It is recommended that you take a dark scan after the spectrometer integration time is changed. To initiate the DARK SCAN function, first block all light from entering the spectrometer.

**Tip** During Dark Scan – current scan, cover the light source with something like your finger when ambient light is present. There is no need to cover light source with mechanical shutter option, as the shutter inside the unit will activate.

### 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.

**Mechanical Shutter:** The dark scan will carry out using the mechanical shutter installed in the spectrometer. The user doesn't need to block the light. If you'd like to include the ambient lights when doing the dark scan by just blocking/turning off the light, you need to choose the "Current Scan".

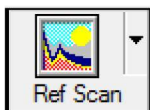
**Close:** Closes the mechanical shutter.

**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 Black:** The optical black option allows you to use the power emissions from the 32 pixels (for Sony or Toshiba CCDs) or 10 pixels (for Back-thinned CCD) not used in the collection of data, which only emit dark signal.

**Optical Black Subtraction:** When this is checked, spectral data obtained by subtracting dark data by Optical Black in real time is displayed on the screen.

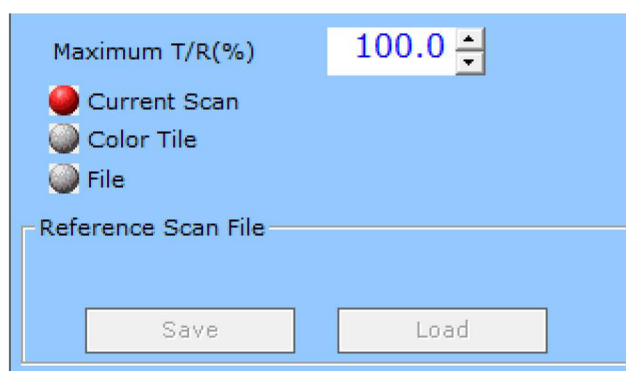
**File:** The file option allows you to load the previously saved dark data or save the current dark data.



### **MENU: Operation – Ref. Scan/Setup – Ref. Scan Conf...**

This allows a reference scan to be taken, which is used in T/R% or absorbance measurement for normalization. The drop-down 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:**



The dialog box has a light blue background. At the top, it says "Maximum T/R(%)" followed by a text box containing "100.0" and a small up/down arrow button. Below this are three radio button options: "Current Scan" (with a red circle icon), "Color Tile" (with a grey circle icon), and "File" (with a grey circle icon). Under these options is a text input field labeled "Reference Scan File". At the bottom of the dialog are two buttons: "Save" and "Load".

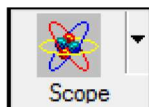
**Maximum T/R (%):** When you wish to use the current reference scan as a custom T/R rather than the default setting of 100%.

**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 dark scanning purposes.

**Color Tile:** 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 use the color tile. 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.

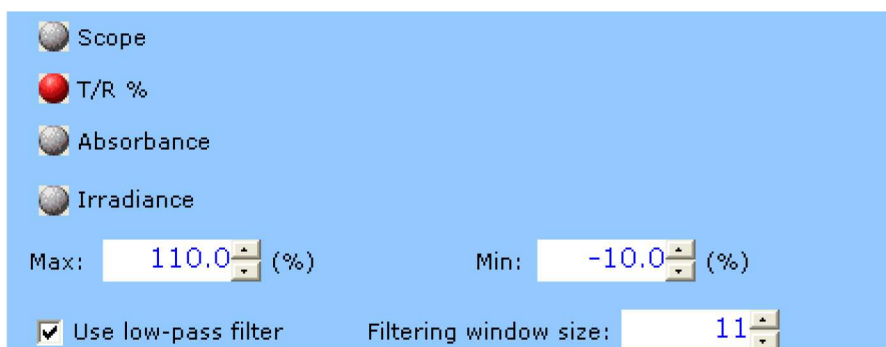
**\*NOTE:** *The reference scan is required for %T/R and absorbance measurements. Reference materials are essential for accurate measurement results to be obtained in different measurement modes and wavelength regions.*



## MENU: View – Display Mode

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 to enable a change between regular scope mode, T/R%, absorbance and irradiance modes.

## DISPLAY DIALOG BOX:



The screenshot shows a dialog box with four radio buttons: Scope (selected), T/R %, Absorbance, and Irradiance. Below these are two input fields for 'Max' (110.0) and 'Min' (-10.0), both with a '%' suffix. At the bottom, there is a checked checkbox for 'Use low-pass filter' and a 'Filtering window size' input field set to 11.

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 that is calibrated at the user's request. Note that even if switching to this irradiance mode is possible by default, the irradiance data is unreliable if the correct calibration data is not used.
Tip	If you change the integration time in the middle of the measurement, you should 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.



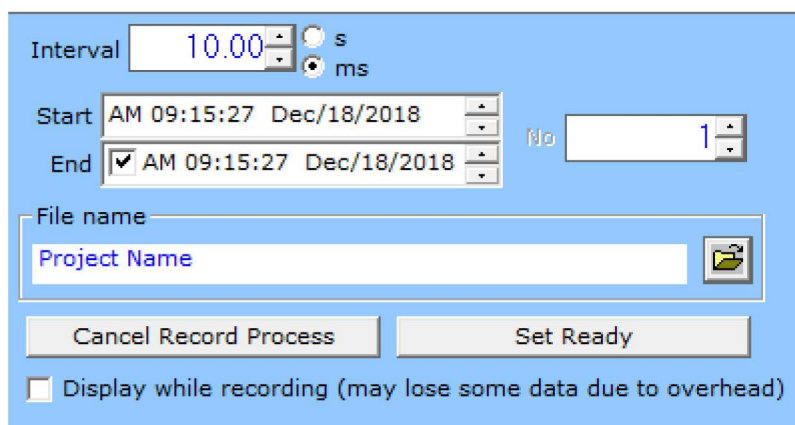


## MENU: Operation – Record...

This function 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 number 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 must 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.



### **MENU: Operation – Record – Record Conf...**

When you press the Record button, the data is automatically acquired according to the set conditions and saved as a file.

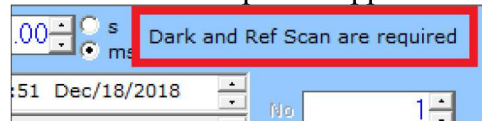
You can cancel this operation by opening the dialog box and pressing the Cancel Record Process button before the automatic data acquisition starts after the Record button appears.

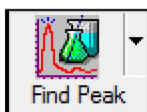
#### **Tip**

In order to apply TimeLine function, it is necessary to perform dark and reference scan first. If you did not do this, the TimeLine dialog box will appear, but note that the Record button does not appear when you press the Set Ready button. Of course, if the Integration Time value changes, you can continue to use this function only if you re-run Dark and Reference Scan.

If Dark and Ref Scan are not performed, "Dark and Ref Scan is required" appears in the

upper right corner of the dialog box as follows:

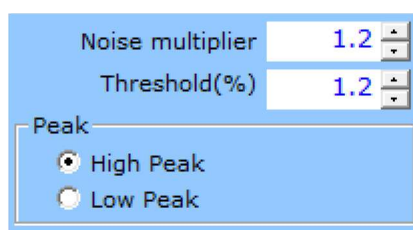




### **MENU: Operation – Peak Find/Setup – Peak Find Conf...**

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.

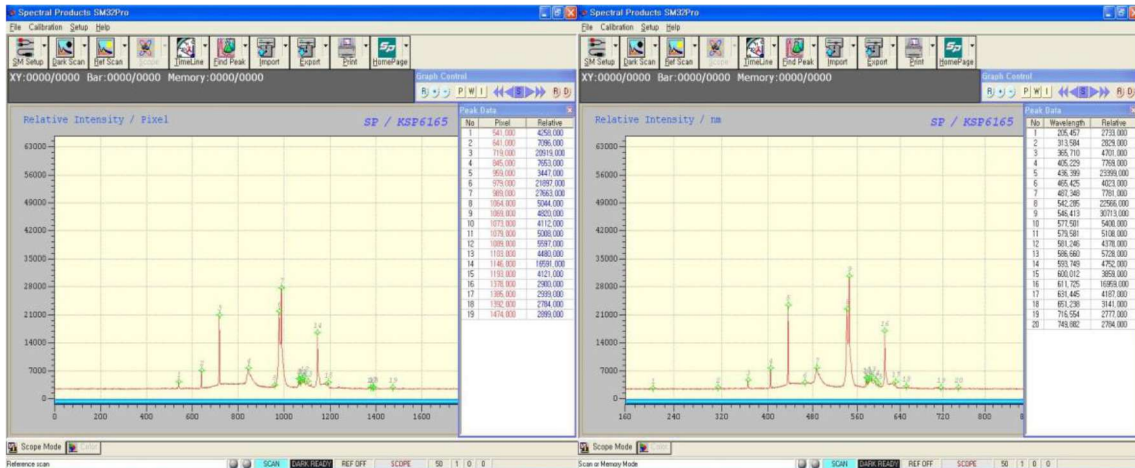
#### **FIND PEAK DIALOG BOX:**

A screenshot of the 'Find Peak' dialog box. It has a light blue background. At the top, there are two input fields: 'Noise multiplier' with a value of 1.2 and 'Threshold(%)' with a value of 1.2. Below these is a section labeled 'Peak' with two radio button options: 'High Peak' (which is selected) and 'Low Peak'.

Two parameters must be set in order to perform automatic Peak Finding function. Noise multiplier is the ratio of Peak to Noise. This value should be in the range of 0.0 ~ 10.0. The larger the value, the less sensitive it is to find the peak. Threshold (%) should be in the range of 0.0 ~ 100.0, and it will automatically detect more than a few percent of the peaks of the measurement range (0 ~ 4095 for 12bit spectrometer and 0 ~ 65535 for 16bit spectrometer). Significant automatic peak finding results can be obtained by setting the Threshold larger than the Dark Noise Level % range and setting the appropriate Noise Multiplier to the measurement conditions.

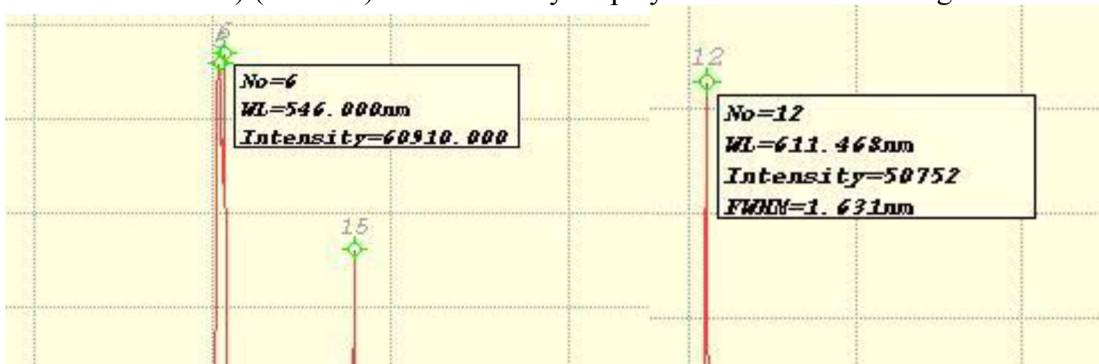
The shape of the peak is selected by choosing High Peak when looking for a convex peak (Local Maxima) such as emission spectrum (mercury lamp, etc.), and when searching for a convex valley (Local Minima).

When 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.



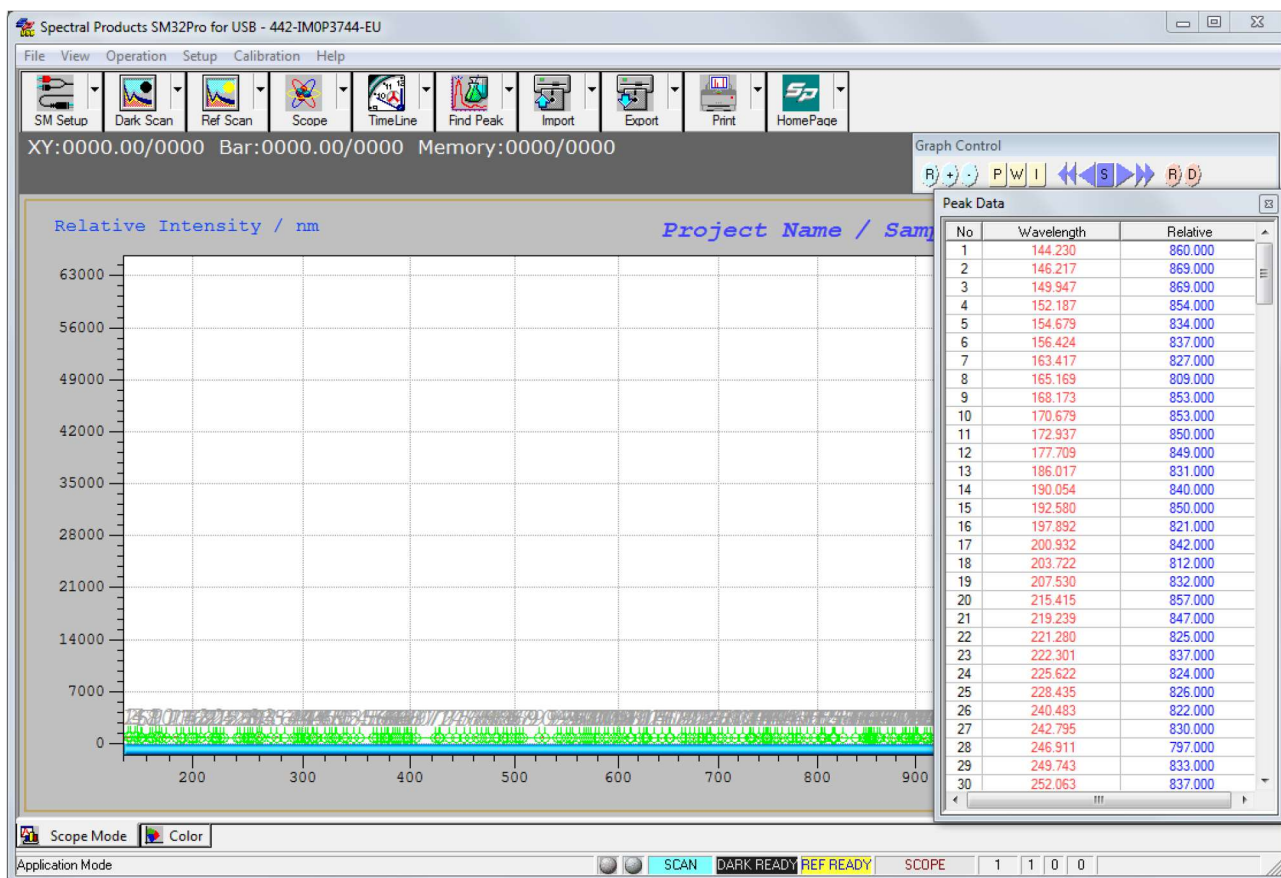
At this time, data acquisition is stopped, and the Find Peak button is selected again to go to real time measurement mode.

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



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

**Tip** If the Threshold and Noise Multiplier values in the Find Peak settings are too low, or if the intensity of the emission spectrum is too low; there will be many peaks at the dark signal level, as shown below:



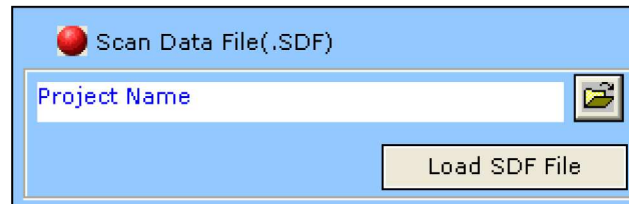
In this case, first increase the integration time or change the optical input alignment so that the intensity of the emission spectrum is sufficiently high for the entire optical measurement range. If the above problem occurs, perform the correct dark scan again for the case where the integration time does not light, then increase the setting value slightly to find the suitable solution.






### **MENU: File – Import/Load...**

This 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.



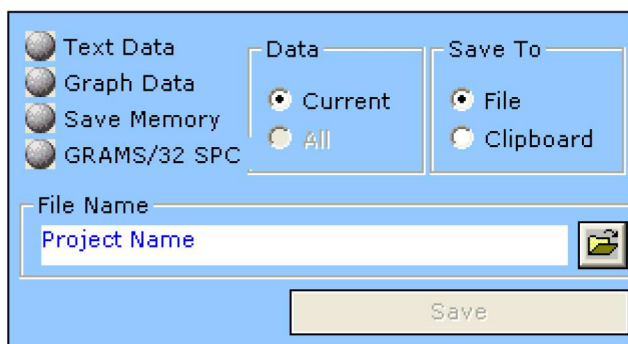
Open the Explorer window on the right, select the memory data file you want to load, and press Load SDF File button. When the corresponding data is loaded, the automatic switching from SCOPE MODE to MEMORY MODE is performed, and a plurality of data stored in the memory data is sequentially displayed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



### **MENU: File – Export/Save...**

This 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 drop-down dialog box allows different file formats to be selected.

### **EXPORT DIALOG BOX:**



**Text Data:** 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:** 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:** 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 the corresponding original wavelength data are stored together in the text data. When "WAVELENGTH MODE" is selected, the interpolated data for each wavelength and the wavelength calculated at the selected interval in "Show Wavelength" are stored.

**Tip** Since the SDF memory data file is stored in a binary format, the user cannot check the corresponding data with general word processing software.

**Tip** Data saved as Text Data cannot be imported separately from SM32Pro, but can be imported by using common word processing software or spreadsheet software such as Excel.

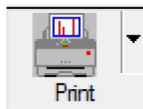
**Tip** If you use the "To Excel" function, it may take a long time to import Excel objects

according to the performance of the user's computer. Therefore, it is recommended to save the data as "Text Data".

**Tip** To use "Save Memory", memory data must be stored after performing "Dark Scan" and "Reference Scan". The "integration time" changes during memory data storage and errors can occur even if the stored memory data is mixed without measuring "Dark" and "Reference". In this case, "No Dark & Ref" appears on the bottom left of the dialog box as shown in the following figure, and the "Save" button is not activated.

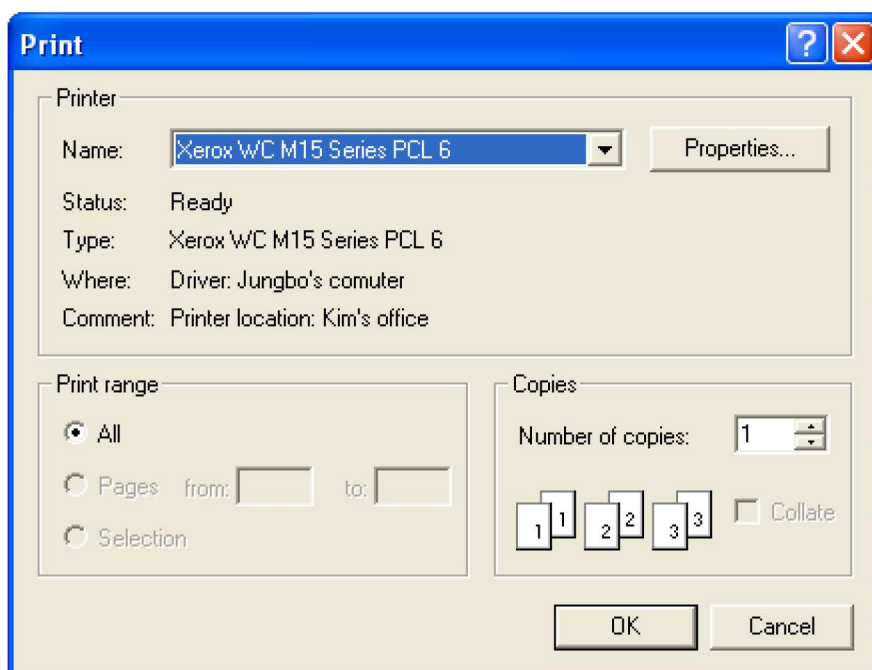






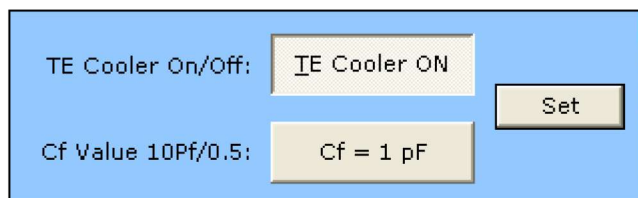
## **MENU: File – Print...**

Select to print 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.





In case of SM304, the TEC Control tab is used when using InGaAs Detector. Click on the above menu and the following dialog screen will appear:



TE Cooler On/Off:

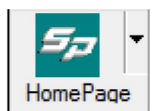
Cf Value 10Pf/0.5:

SM304 is sensitive to heat because it measures infrared region.

On top of that, TE Cooler is an abbreviation of Thermo Electric Cooler, which serves to reduce thermal noise around the CCD other than the spectrum to be measured. (It is always ON when program is executed)

Cf Value can be changed to 1pF or 10pF. By changing the value of the capacitor existing in the CCD internal amplifier, sensitivity is high when Cf = 1pF. When Cf = 10 pF, there is a correlation that the sensitivity is low and the noise being smaller.

After setting the TE Cooler or Cf Value, be sure to press Set to exit and apply the changed value.



Access Spectral Products' home page. The homepage to be accessed at this time is the US headquarters in Connecticut.

## 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.




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


-  This allows for play back of imported (recorded) spectra in a reverse sequence one frame at a time.
-  This allows for the termination of continuous play back operation.
-  This 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.
-  This 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.

**Tip** If there is copied memory data, the last data remaining even by using  is not deleted. If you want to delete all the remaining data, the Delete Memory button is activated when you switch from SM Setup to SCOPE MODE, and you can delete all memory data by pressing this button. If memory data does not exist, switching to MEMORY MODE is not possible.

## Information Display Area:

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

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

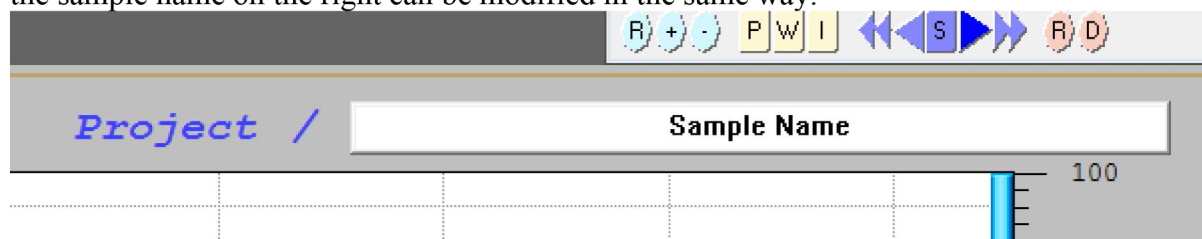
**Bar:** When the cursor bar is displayed, it indicates the position of the current cursor bar.

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

**Record:** It appears on the screen only while the Timeline's Record function is being performed. It shows how many pieces of data are stored by the current TimeLine setting.

## Project Name & Sample Name

Between the graph control button and the graph display area, the project name and sample name are displayed in blue letters. 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 and the sample name on the right can be modified in the same way.



## Status Display Bar:



The status bar provides information regarding the performed and ongoing operations. These include dark scan status, reference scan status, color measurement status, etc. After you run the dark scan, if you click the **left mouse** button on the **DARK** pane, the dark scanned data will be displayed on the graphic window as black line (**MENU: View – Disp. Dark line**). And if you click the **right mouse** button on this pane, the dark level will be subtracted from the original data (**MENU: View – Subtract Dark line**). After you run the reference scan, if you click the **left mouse** button on the **REF** pane, the reference scanned data will be displayed on the graphic window as yellow line (**MENU: View – Disp. Ref. line**). If you click the same mouse button on each pane again, the displayed signal will be back to normal.

**Tip** When DARK READY is displayed in black in Scope Mode, click the left mouse button on the mouse to change the character string with DARK DISP. The dark data is displayed on the graph along with the measurement data on the black background screen. 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.

**Tip** 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. There is no right mouse function.

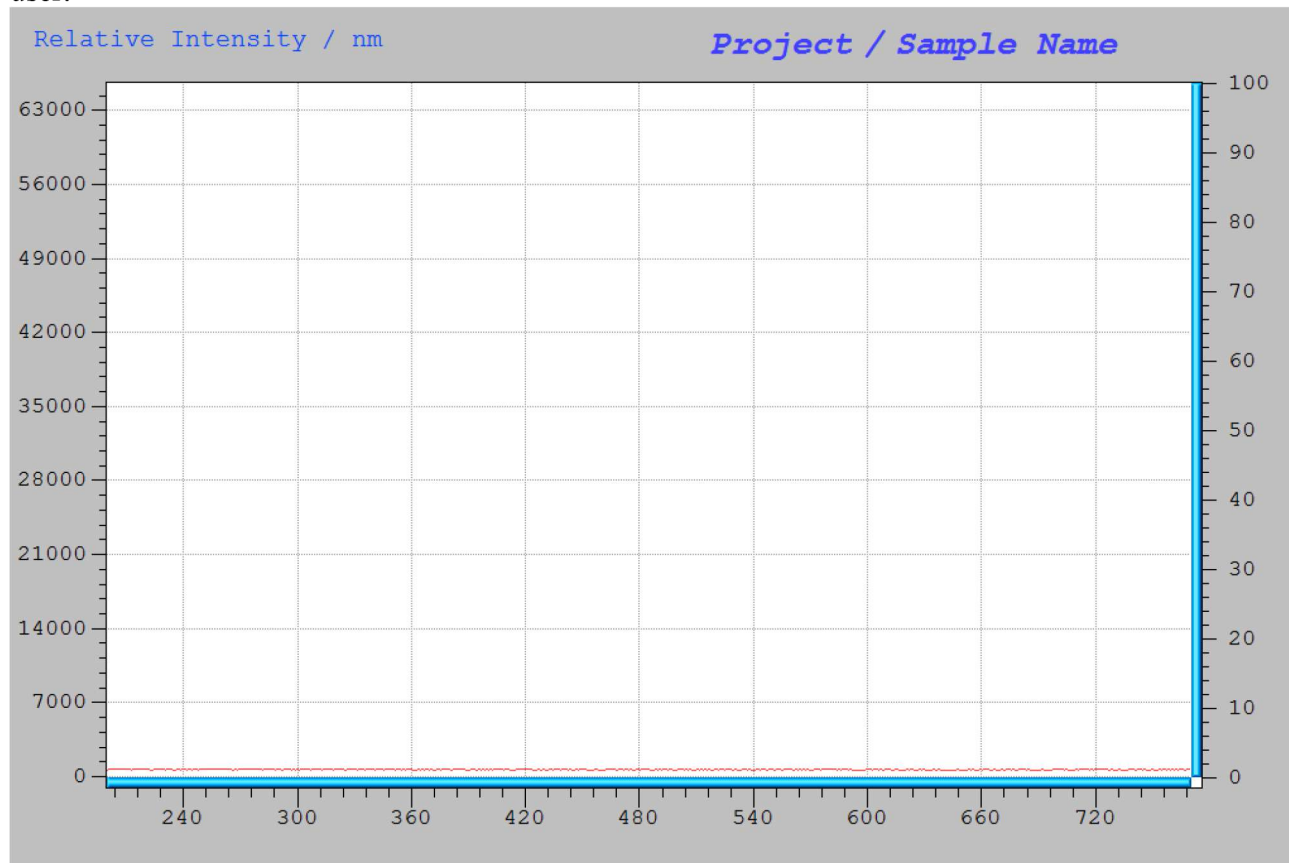
## Quick Access Controls:

1	1	0	0
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The quick access controls are located on the bottom right of the status display and provide easy adjustments to (from left to right) integration time, time average, binning, and FFT filtering settings. Press the left mouse button to increase the value and press the right button to decrease the value. The integration time, time average, and binning average are incremented by 1, but FFT Smoothing is incremented by 10 and cycled from 0 to 100.

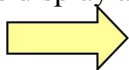
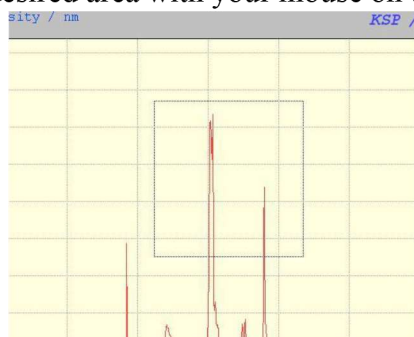
## Graphic Display Area


The graph display area is shown below, the measurement data being displayed to the user.





The X and Y axes are automatically changed according to 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 want to zoom into a specific area, click and drag the desired area with your mouse on the display area.



The enlarged screen can be controlled by using the  button of the graph control button. Clicking the right mouse button in the graph display area displays the cursor bar.



When the mouse is placed on the vertical axis of the cursor bar, left and right arrows are displayed as shown above. In this state, you can change the position of the cursor bar by moving the mouse without pressing and releasing the left mouse button. 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 information display area at the top.

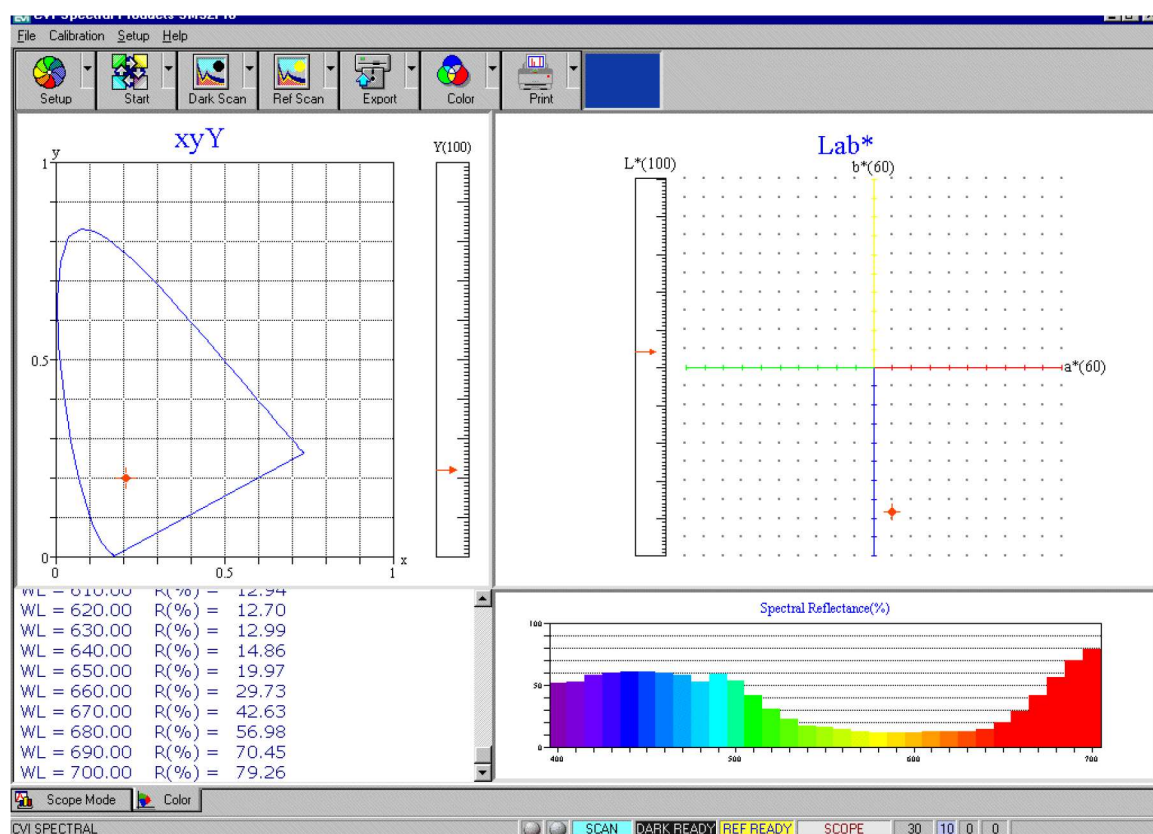
## ***Graph Sliding Bar Controls:***

There will be two sliding bar controls for vertical and horizontal scroll use when a zoom in tool is applied to the spectral display. Click on the sliding bar with the mouse pointer and hold down while sliding to view different parts of the spectrum.

## Special Function Tab:

After the dark and reference scans are performed, the Special Function Tab will have Scope and Color tabs enabled. Clicking on the Color tab will enter the color measurement mode. However, the color measurement mode will only be meaningful for spectrometers configured for **visible** wavelength coverage. To exit the Color mode, click on the Scope tab.

## Color Analysis Mode:



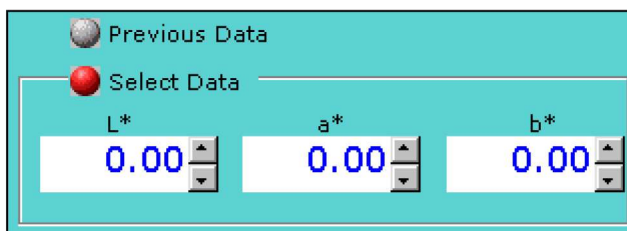
[Example Image for Visible Range]

The Color Analysis Mode, as a default, will measure and display color results in the following main screen. The Stop button may be used for obtaining a snap shot and the view of the color values.



## COLOR SETUP - CUSTOMIZE:

By use of the Customize option in the Setup menu one can customize the print report.

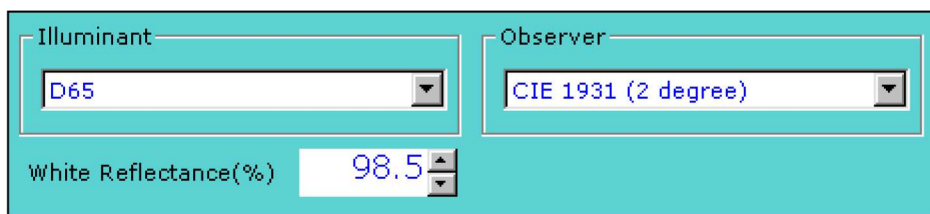


Previous Data ☐

Select Data ☒

L\* 0.00 a\* 0.00 b\* 0.00

## COLOR SOURCE DIALOG BOX:



Illuminant: D65

Observer: CIE 1931 (2 degree)

White Reflectance(%) 98.5

The drop-down dialog box on the top right of the Color command button provides options for the delta E data source. When **Select Data** is checked reference L\*a\*b\* values can be entered in the dialog box. The delta E values in the color value display window will now be the color difference between the current measurement results and the entered values. Otherwise, the delta E values displayed will represent the color difference between the current and the previous measurements.

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# Technical Support

**Tel : 949-800-7780**

**Website : [www.spectrolightinc.com](http://www.spectrolightinc.com)**

**In order to provide the best solutions to your problems, please provide the following when contacting us:**

- 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.**