

Initial setting Guide for SM32Pro for SM301

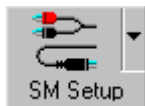
1. Introduction

In case of SM301/SM301-EX, not like other SM series spectrometers, after installing the software, the user needs to check some parameters on the software before measuring data.

2. Check Points before measuring real data

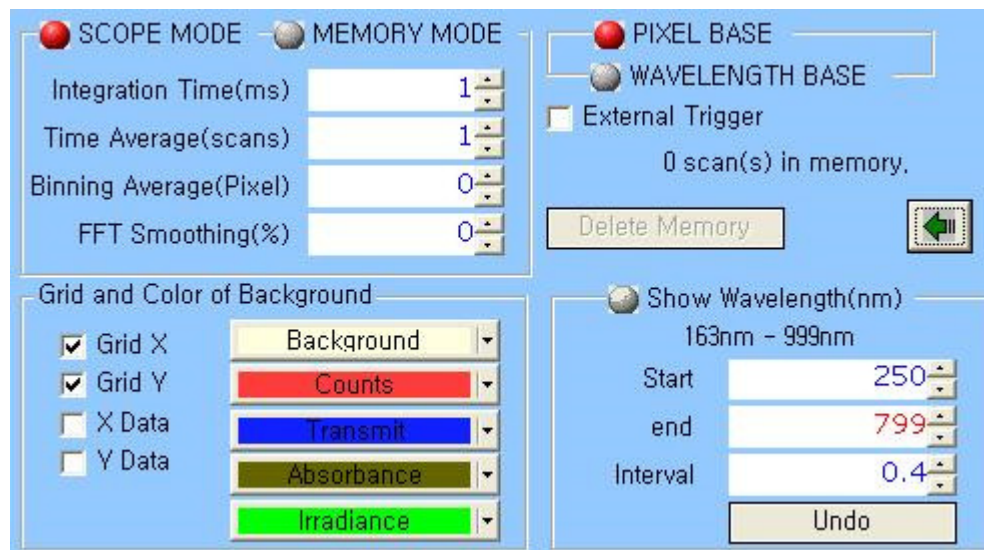
When running the software at first, the user should check the two important settings/configurations. In the **SM Setup**, the user should set proper values as to show the spectral data as needed. The **Balance** has to be done first before measuring the real data and whenever any setting is changed.

2-1. SM Setup



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 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**.

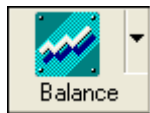
The **Integration Time** is to set the exposure time of the detector. It can be up to 200msec but we'd recommend <50msec at max starting from 1msec. The **Time Average** is to average the given number of scans. It helps to reduce the noise level. It would make the data reading slow but doesn't distort any spectral signal unless the data changes per time. The **Binning Average** is also used to reduce the noise by averaging the given number of neighbor pixels' values. The larger the value, the gentler 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. If you'd like to show the spectral data from the whole detector pixels, the **PIXEL BASE** display mode has to be selected.

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.

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.

2-2. Balance of detector pixels



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 or other configuration value 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 recommended 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 4pF or 7pF for PbSe array detector and 7pF or 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



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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.

3. Run SM32Pro

Once you finish the Balance, the base line should be at ~7000 counts. In case of PbSe detector, the detector material itself has Piezo-electric property. Because the material resistance keeps changing as the current keeps flowing, the base line of the detector keeps drifting per time. Users can notice this that after balancing the base line goes up slowly as time goes by. Before measuring an important data, Balancing is strongly recommended. PbS doesn't have this issue but the base line becomes "noisier" after a certain time, then "Balancing" is recommended.

4. Technical support

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Website: <http://www.spectralproducts.com>
Email: support@spectralproducts.com

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.