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# SM2XX USB Spectrometer

## LabVIEW Library Manual



Version 1.2



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## *Basic VI for USB Spectrometer*

Basic VIs and DLLs can be used to operate the USB spectrometer.

1. cviTestCard.vi
2. cviSetIntEx.vi
3. cviSetInt.vi
4. cviTriggerReadEx.vi
5. cviCloseEx.vi
6. CVIDBUSB.DLL

The CVIDBUSB.DLL can be found at C:\Program Files\WCVI Spectral Products\WSM32Pro\ folder. To use above VI files by LabVIEW, please copy this DLL file to the same folder in which you put the above VIs. *All above VIs and CVIDBUSB.DLL should be located at same folder.*

All 5 basic VI files use the functions included in CVIDBUSB.DLL

In previous version (ver1.1), the intensity vs CCD pixels can be seen through an “*Intensity Graph*”. In LabVIEW, and in current version (ver1.2), the intensity vs Calibrated Wavelength is obtained through “*X-Y Graph*” in LabVIEW. Additional VI files have been added for this purpose as follows.

1. Calibration.vi
2. SM32Lab.ini


SM32Lab.ini includes only pixel and wavelength calibration values. A more detailed explanation follows in the next chapter.

## VI Interface

### 1. cviTestCard.vi





Test resource of USB interface.

	Terminal Name	Type	Function
Input	N/A	N/A	Not Available
Output	TestResult		If test result for USB resource is OK, return zero or positive value

### 2. cviSetIntEx.vi



Initialize USB port and call this VI **once** in the first stage and should not call again before finishing the program. If you want to change the integration time of the CCD after using cviSetIntEx.vi in first initialization stage, you must use the next VI (cviSetInt.vi). **Don't use cviSetIntEx.vi again to change integration time!!** This is used only once in first initialization procedure.

	Terminal Name	Type	Function
Input	IntegrationTime		Initialize Integration Time of CCD (Once!!)
Output	NewIntegrationTime		After initialization was over, return set integration time value



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### 3. cviSetInt.vi



As mentioned above, changing integration time of CCD at any time is done by using cviSetInt.vi.

*The following VI (cviTriggerReadEx.vi) cannot change the integration time value!. (Don't confuse IntegrationTime input of cviTriggerReadEx.vi with this Integration Time input of cviSetInt.vi !! )*

	Terminal Name	Type	Function
Input	IntegrationTime	I32	Change Integration Time of CCD whenever you want to.
	Trigger Mode	I32	Select Trigger Mode 0 : Free Run    1 : Software Trigger    2 : Hardware Trigger If you create control directly from this input connector, Text ring is made automatically, and then you can select easily
Output	SetIntegrationTime	I32	Return new integration time value changed.

### 4. cviTriggerReadEx.vi



Read 16bit intensity value (Converted to Digital from Analog Voltage) from CCD once. Reading these values continuously is done by using loop functions (for example, while, loop) Use the **current integration time value for input**. This input is not used for changing integration time of the CCD. This is for error-check only. Always check current integration time and **whenever calling cviTriggerReadEx.vi, current integration time value for input must be used**.



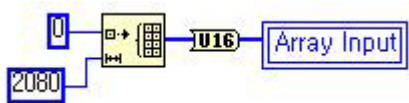
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	Terminal Name	Type	Function
Input	IntegrationTime	<b>I32</b>	<b>Current</b> Integration Time Value
	ArrayInput	<b>U16</b>	Temporary one-dimensional 2048-element array ( Unsigned Integer 16bit ) make this array for this purpose only. And this array should meet above condition necessarily.
Output	Intensity	<b>U16</b>	Acquired one-dimensional intensity array. ( 2048-element and unsigned integer 16bit ) This array values are used as acquired intensity data
	PixelNumberResult	<b>I32</b>	Return "2080" if error does not happen

[ Note1 ]

For ArrayInput, one-dimensional unsigned integer array temporarily and then use **Initialize Array** Function in LabVIEW as following diagram before USB initialization. Use this temporarily-made array for ArrayInput, an error message and program end will result. If this situation arises, remove USB cable from spectrometer and then hook up again, then initialize USB port again, and then use of this VI again correctly. You may see the same error again if this procedure is not followed!!





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## 5. cviCloseEx.vi



Whenever you finish application program, call this VI. cviCloseEx.vi reset all initialized values.

	Terminal Name	Type	Function
Input	N/A	N/A	Not Available
Output	N/A	N/A	Not Available

## 6. Calibration.vi



To view intensity vs wavelength graph, know the pixel-wavelength calibration data of your spectrometer. Call this VI, File Open Dialog Box opens, and choose SM32Lab.ini. Then this VI returns one-dimensional calibration wavelength array to the output. If the SM32Lab.ini was made correctly, call this VI for auto-calibration. ***To use this VI correctly for the spectrometer, make the following SM32Lab.ini (or other name.ini is OK.) first!!***

	Terminal Name	Type	Function
Input	N/A	N/A	Not Available
Output	Pixel-WL Array	[DBL]	Return one-dimensional 2048-element calibration array

## 7. SM32Lab.ini

After installing SM32Pro Software CD, open SM32Pro.ini at C:\Program Files\WCVI Spectral Products\SM32Pro\ folder. And check the calibration part as follows.



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**BoardSerial=200-URS0628**

```
[Cal 1]
Date=05/14/2002 18:34:39
Name=TYR2009
PointCount=10
Data 1=2537;315
Data 2=3132;471
Data 3=3650;606
Data 4=4047;706
Data 5=4358;785
Data 6=5461;1058
Data 7=5770;1134
Data 8=5791;1139
Data 9=6965;1422
Data 10=7635;1580
BaseAddress=768
IntegrationTime=35
```

In above example, the number of calibration data in total is 10 and each part describes wavelength ( $\text{\AA}$ ) and pixel number. To make SM32Lab.ini for LabVIEW application program, create new SM32Lab.ini file by notepad software, and copy above calibration part to SM32Lab.ini. And then modify these values as follows. (This initial file doesn't have to have the same name as "SM32Lab.ini". This is the default name for our calibration VI, use another name (for example CAL.ini is ok), then choose that initial file when dialog box opened)

12	
3650	164
4047	368
4078	384
4358	525
4916	802
5461	1068
5770	1217
5791	1227
6965	1788
7067	1836
7273	1934
7384	1987

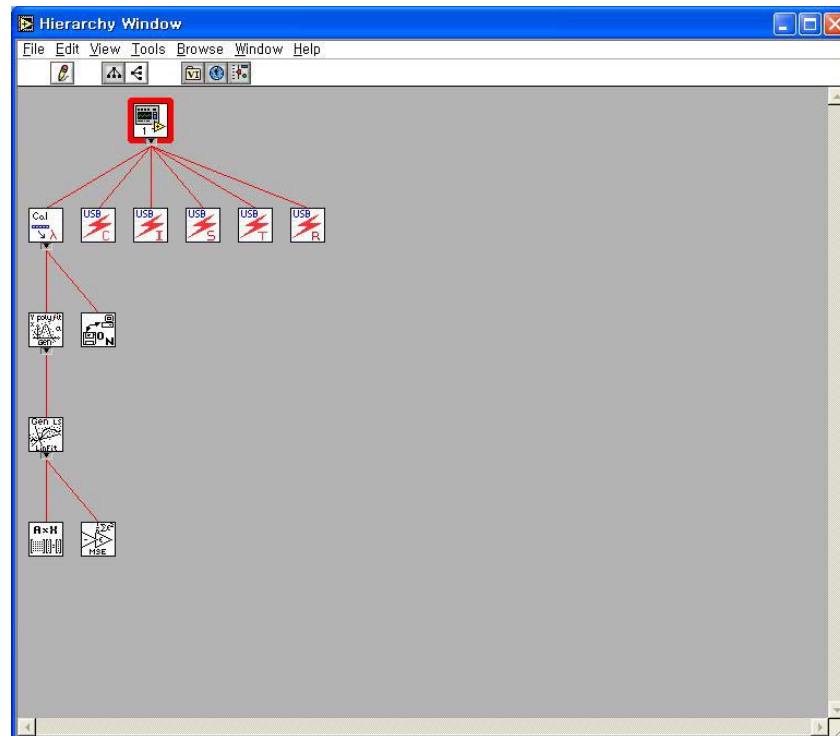
Knowledge of all hierarchy and correct usage of all VIs for one complete application program, confer the SM240USBDEMO(ver1.2).vi and Help menu inside LabVIEW.

The following diagram is a hierarchy of SM240USBDEMO(Ver1.2).vi.



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## Data Acquisition Procedure

