

HAMAMATSU

MINI SPECTROMETER

EVALUATION BOARD

C14465

Instruction Manual

For your safety / 为了你的安全

This is Class I system provided by the IEC 61010-1 standards (Safety requirement for measurement, control, and electrical system testing). For operating this system correctly and safely, please follow the following safety notes before operating this system. Our company will not take any responsibility and guarantee about the trouble caused by use in contradiction to these attentions.

这是由 IEC61010-1 标准(测量, 控制和电气系统测试的安全要求)提供的 I 类系统。为了正确、安全地操作本系统, 请在操作本系统前遵循以下安全注意事项。 本公司对使用中出现的故障不承担任何责任和保证。

 DANGER/危险	Indicates an imminently hazardous situation which if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations. 用于警示紧急的危险情形, 若不可避免, 将会导致人员死亡或严重的人身伤害。这一信号词仅限于在最极端的情况下使用。
 WARNING/警告	Indicates a potentially hazardous situation which if not avoided, could result in death or serious injury. 用于警示潜在的危险情形, 若不可避免, 可能会导致人员死亡或严重的人身伤害。
 CAUTION/注意	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It is permitted for property damage only accidents. 用于警示潜在的危险情形, 若不可避免, 可能会导致人员受到轻微或中等伤害。 这一信号词仅允许在发生财产损失事故的情况下使用。

Introduction / 概述

Thank you very much for purchasing mini spectrometer C14465.

This manual describes features of this equipment, installation, wiring method, operation method, software etc. Please read this manual carefully before use and use correctly.

非常感谢您购买迷你光谱仪 C14465。本手册介绍了本设备的特点、安装、接线方法、操作方法、软件等。请仔细阅读本手册，然后正确使用。

Before using this system / 在使用这个系统之前

■This product is intended for use in general electronic equipment (Measurement equipment, office equipment, information and communications equipment, home appliances, etc.). Do not use this demonstration product for special purposes (Nuclear control equipment, Aerospace equipment, Medical equipment and Transport equipment that directly affect human life, disaster prevention and safety equipment, etc.) that require extremely high reliability and safety, except as described in the individual product documentation. In order to use this demonstration product correctly and safely, make sure to follow the safety notices below when operating this demonstration product. Hamamatsu Photonics is neither responsible nor liable for damages caused by using this demonstration product contrary to the safety notices.

本产品适用于一般电子设备（测量设备、办公设备、信息通信设备、家用电器等）。除非个别产品文档中另有说明，否则请勿将本产品用于需要极高可靠性和安全性的特殊用途（核控制设备、航空航天设备、直接影响人类生命的医疗设备和运输设备、防灾和安全设备等）。为了正确、安全地使用本产品，操作产品时请务必遵守以下安全注意事项。对于违反安全注意事项使用本产品所造成的损害，Hamamatsu Photonics 不负任何责任。

■Please unpack the packing of this equipment, and confirm the included item. Please contact our company without operating when the equipment is missing or is damaged.

请打开这个机器的包装，确认一下里面的东西。当设备丢失或损坏时，请联系我们公司，不要操作。

■The content of this book might change without a previous notice by improving the performance and the function in the future.

这本书的内容可能会在没有事先通知的情况下通过改进性能和功能而改变。

■Please do not reprint or do not reproduce the content described in this book without our permission.

未经作者许可，请勿转载或复制本书中描述的内容。

■If this book is lost or damaged, please claim it to our company or our branch immediately.

如果这本书丢失或损坏，请立即向本公司或本分公司索赔。

Included Items

Board connection cable	1
C10988MA-01,C11708MA evaluation board(C14465-01)	1
C10988MA-01,C11708MA sensor board(C14465-02)	1
CD-ROM	1

Caution / 注意事项

■In case an abnormality has occurred / 在发生异常情况时

Do not use this product if smoke, unusual odor, abnormal noise, or heat is generated during operation. Continuing operation may cause a fire or electrical shock. In this case, immediately turn off the PC (personal computer) connected to this product, and then unplug the USB cable. After making sure that the abnormal condition has disappeared, contact our sales office. Never attempt to repair this product yourself since it can be dangerous.

如果操作过程中出现烟雾、异味、异常噪音或发热情况，请勿使用本产品。继续操作可能会引发火灾或触电。在这种情况下，请立即关闭连接本产品的 PC（个人电脑），然后拔下 USB 线。确认异常情况消失后，请与我们的销售办公室联系。

切勿尝试自行维修本产品，因为这样做可能十分危险。

■Please do not add vibrations and shock waves / 请不要加入震动和冲击波

By adding excessive vibrations and shock waves components may get damaged or irregularity of the adjustment may cause fire or electric shock.

通过加入过多的振动和冲击波部件可能会损坏或不规则的调整可能会引起火灾或触电。

■Please connect to the compatible hardware / 请连接到兼容的硬件

This product is designed to connect to the USB ports of personal computers and the packaged USB cable. Using a voltage other than the specified supply voltage can cause a fire or electric shock.

本产品设计用于连接个人计算机的 USB 端口和包装内的 USB 线。使用不符合规定的电源电压会引起火灾或触电事故。

■Please do not disassemble it / 请不要拆卸

Please do not disassemble this system. System modification may cause abnormality in system which will cause fire or electric shock.

请不要拆卸这个系统。系统改造可能导致系统异常，引起火灾或触电。

■Please do not put water or foreign particles in internal part of system /

请勿将水或异物放入系统内部

When flammable item, metal and water enter in internal part it causes fire or electric shock. 当易燃物品、金属和水进入内部时，会引起火灾或触电。

■Damage to cords / 电线损坏

Do not scratch, damage, modify, or place heavy objects on top of cords. Doing so can break cords and cause electric shock or fire.

切勿刮伤、损坏、改造电线或在电线上放置重物。这样做可能会损坏电线，并导致触电或引发火灾。

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Warning / 警告

Please read the following precautions before use and use it correctly.
使用前请阅读以下注意事项并正确使用。

■This system is a precision optical device. **Please do not apply excessive vibrations and shock. Please avoid storage or operation in lot of outside dust, wet environment, high temperature, high humidity.**

该系统是一种精密光学器件。请不要过度震动和冲击。请避免在室外灰尘多、潮湿、高温、高湿的环境中存放或操作。

■While maintaining it, please do not use organic solvent such as thinner, acetone. Please wipe it with soft cloth. **Provided that as mentioned above to avoid damage of internal optical component, please take care in such a way that there is no need to do maintenance.**

保养时请不要使用稀释剂、丙酮等有机溶剂。请用软布擦拭。如上述所述，为避免内部光学元件损坏，请以无需维修的方式加以注意。

■Please install software on personal computer(PC) according to ([Software license agreement](#)). **Please do not connect PC and this system before installing software on PC.** There is possibility that software don't get installed properly.

请根据 ([软件许可协议](#)) 在个人电脑上安装软件。在 PC 上安装软件之前请不要连接 PC 和本系统。软件可能无法正常安装。

■Power to this system will be supplied through USB port of PC. According to USB standard, 1port could not supply power more than 5V-500mA. Therefore, **if you connect multiple devices via a hub port, please consider the use of hubs and power supply type.**

该系统的电源将通过 PC 的 USB 端口提供。根据 USB 标准，一个端口不能提供超过 5V-500mA 的电源。因此，如果您通过集线器端口连接多个设备，请考虑使用集线器和电源类型。

■While working with feature of PC such as power saving mode, screen saver, there are models exist which stops power supply from USB port of PC to the outside. In such a case, In case of spectrometer is stopped by stopping power supply, PC may cause inconvenience to the operation of this equipment when you return to resume the power supply from power-saving screen saver mode. Therefore while using this in this type of PC, **disable the functionalities like screensaver and power-saving features etc.**

(For PC configuration features, please refer to your local PC manual.)

In addition, the CD-ROM included with this evaluation software to be installed on PC, when you start this software, it is possible to switch to the PC settings temporarily.

在 PC 的节电模式、屏保等功能上，也存在着从 PC 的 USB 接口向外停止供电的模式。在这种情况下，如果光谱仪停止供电，当您从节电屏幕保护模式恢复供电时，PC 可能会给设备的运行带来不便。因此，在这种类型的 PC 上使用时，**禁用屏幕保护程序和省电功能等功能。**（有关 PC 配置功能，请参阅您的本地 PC 手册。）

另外，本评测软件附带的 CD-ROM 要安装在 PC 上，当您启动本软件时，可以暂时切换到 PC 设置。

■This equipment is sensitive to light in the spectrometer image sensor.

Data obtained from PC is an A/D conversion value for the analog output of each pixel.

Data save for each pixel in the evaluation software which is to be installed

by included CD-ROM is A / D conversion value. Please accept in advance.

Please refer details of [\(Guidelines for saved text data\)](#) to get a response of wavelength and each pixel of the image sensor.

该设备对光谱仪图像传感器中的光敏感。从 PC 获得的数据是每个像素的模拟输出的 A/D 转换值。

要安装的评估软件中每个像素的数据保存包含的 CD-ROM 是 A/D 转换值。请提前受理。

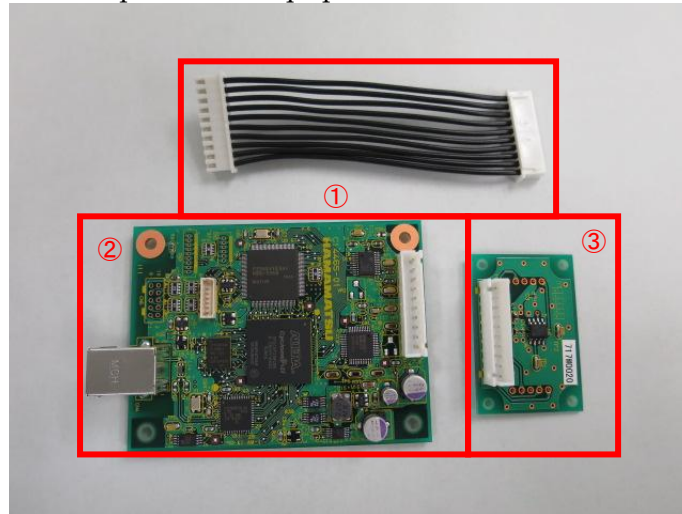
请参阅 [\(保存文本数据的指南\)](#) 的详细信息，以获得波长和图像传感器的每个像素的响应。

overview

Mini-spectrometer C14465 is an evaluation board to drive C10988MA-01,C11708MA and to take the data into PC.

Name and description of each part

Name and description of each part of this equipment.



(1) Board Connection Cable

This cable is used to connect C10988MA-01,C11708MA evaluation circuit and C10988MA-01,C11708MA sensor board.

Length including connector part is about 8cm.

(2) C10988MA-01,C11708MA Evaluation Board (C14465-01)

It is a board which handles electric signals from C10988MA-01,C11708MA. It is connected to PC using USB connector (B Receptacle) and USB cable.

(3) C10988MA-01,C11708MA sensor board (C14465-02)

This board will receive electrical signal. The terminal of C10988MA-01,C11708MA is inserted into through hole of board. It is connected to evaluation board using board connection cable which is included.

Specification of the product

A. Specifications

Structure

Parameter	Specification	Unit
Weight	Evaluation board : 29 Sensor board : 6	g
Dimensions	Evaluation board : 80×60 Sensor board : 43.6×29.8	mm
Interface	USB2.0	—
USB Connector	B type	—
Length of the cable	80	mm

Absolute maximum ratings

(Ta=25°C, unless otherwise noted)

Parameter	Value	Unit	Note
Supply voltage	4.75 to 5.25	V	
Operating temperature range	+5 to +40	°C	No dew condensation
Storage temperature range	-20 to +70	°C	No dew condensation

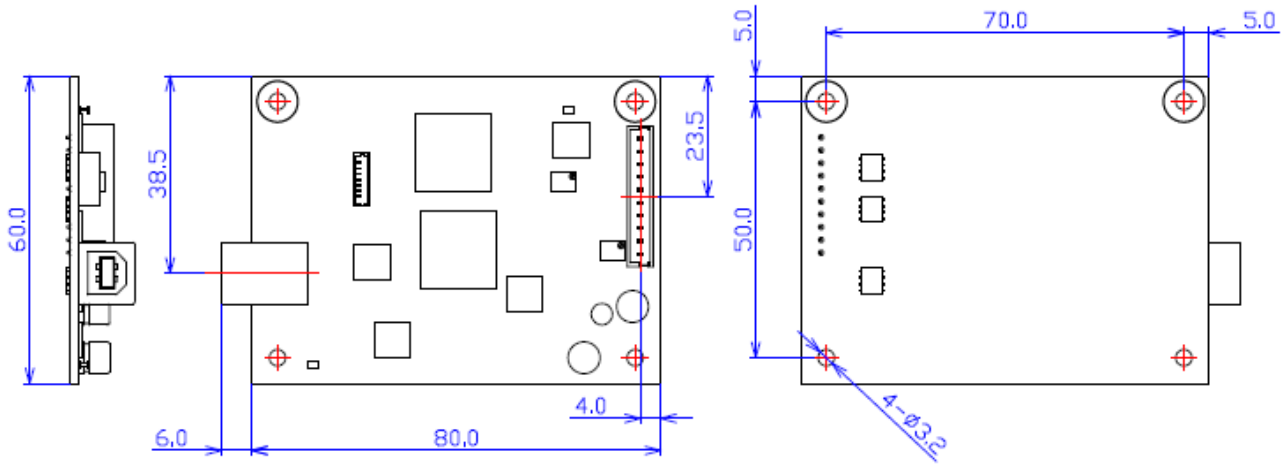
Electrical characteristics

(Ta=25°C, unless otherwise noted)

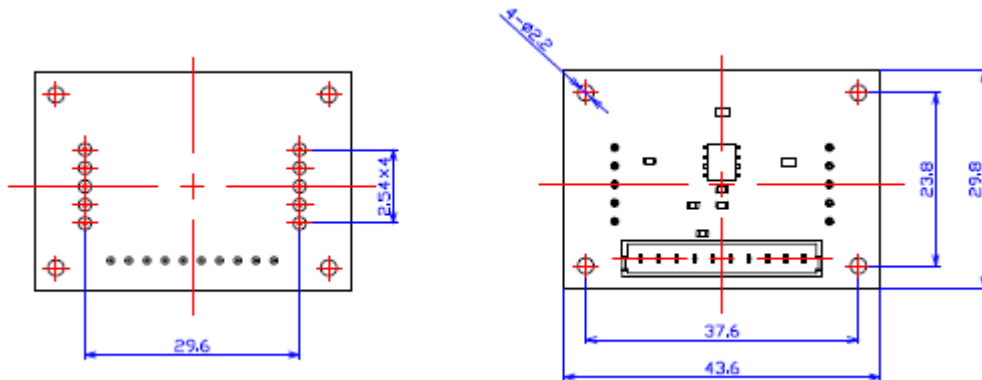
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Spectrum head drive frequency	f(CLK)	-	800	-	KHz
video signal rate	Vr	-	200	-	KHz
Current consumption	Ic	180	200	250	mA
Integration time	Tint	5	—	10,000	msec
A/D conversion	—	—	16	—	bit

Dimensional outlines(Unit:mm)

C10988MA-01,C11708MA evaluation board(C14465-01)



C10988MA-01,C11708MA sensor board(C14465-02)



Software installation

Software installation

Note) Please install software in PC according to ([Software license agreement](#)) agreement.

Note) Please install evaluation software by log in by the user which has administrator authority.

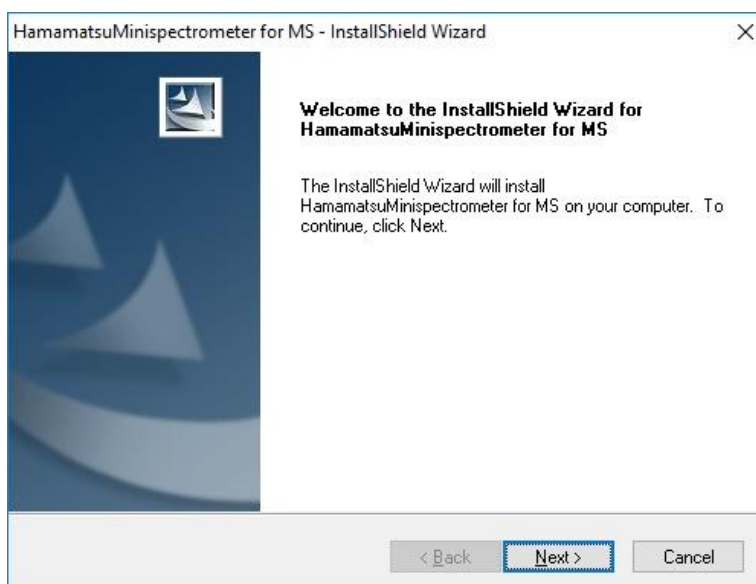
Software installation procedure is shown below. Please be sure to install according to the following procedure.

(1) Insert provided CD-ROM in CD-ROM drive. (Please do not connect the mini spectrometer with PC before installing software.)

(2) When original CD-ROM of the evaluation software is inserted in CD-ROM drive, the installation will start automatically if the automatic execution of CD is effective. In case of automatic execution of CD is not effective, after inserting CD-ROM, click [Start Menu] -> [Run specified file], input [*drive*:¥Setup.exe] (drive is CD-ROM drive. If CD-ROM drive is D drive then [D:¥Setup.exe]) and then click [OK].

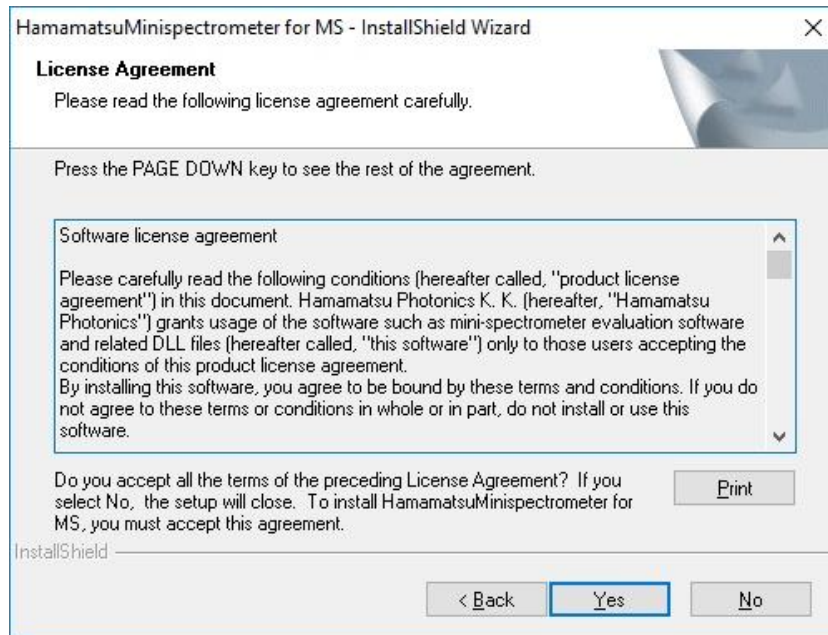
(3) Start the installer.

Click [Next (N)].



(4) When the license agreement screen appears, read through the contents carefully. If you accept the agreement, click [Yes].

NOTE: You may not install this software unless you accept the terms of the license agreement.

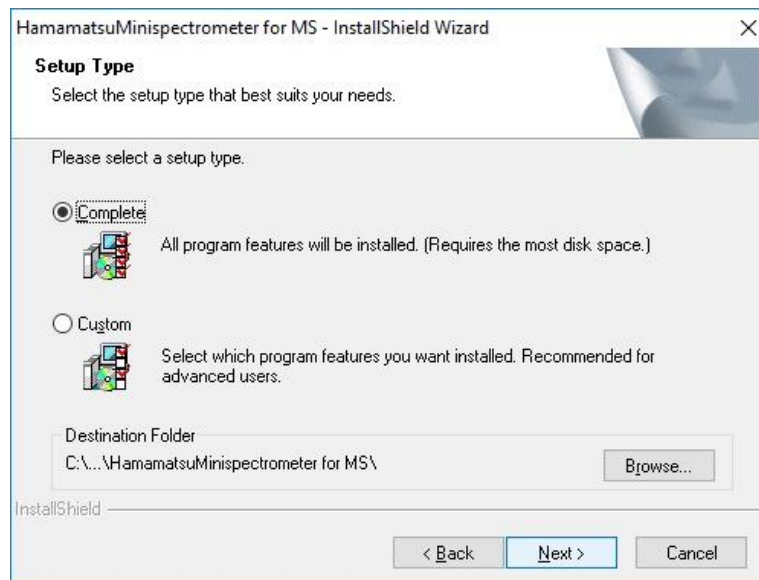


(5) Select the components you want to install.

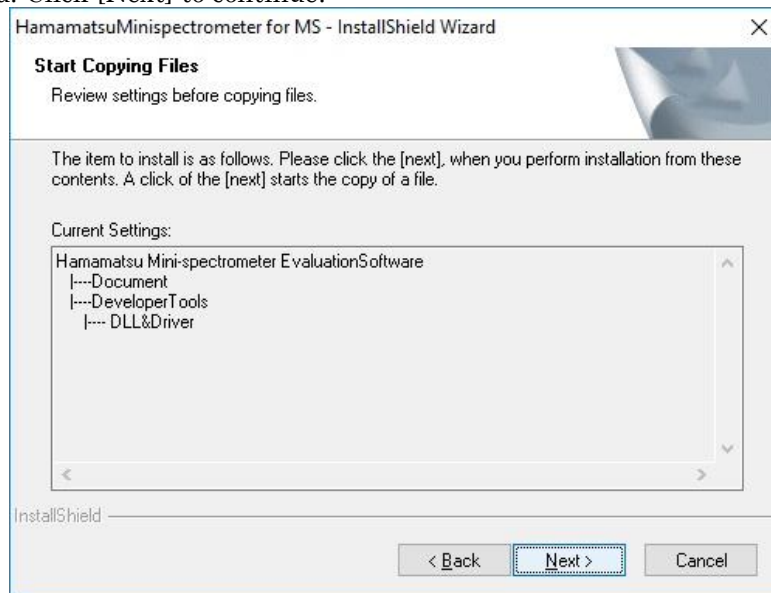
Selecting "Complete" install all components contained on the CD-ROM.

Selecting "Custom" allows you to select the components to install.

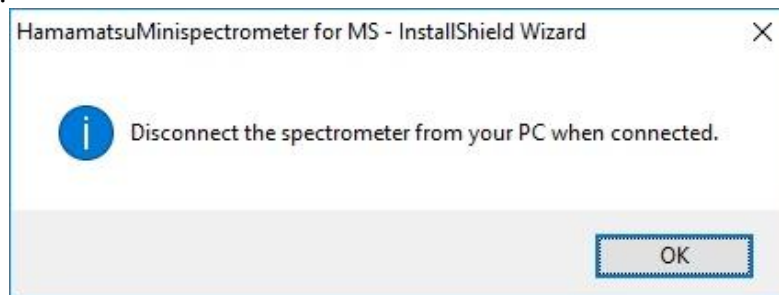
Select "Complete" in most cases.



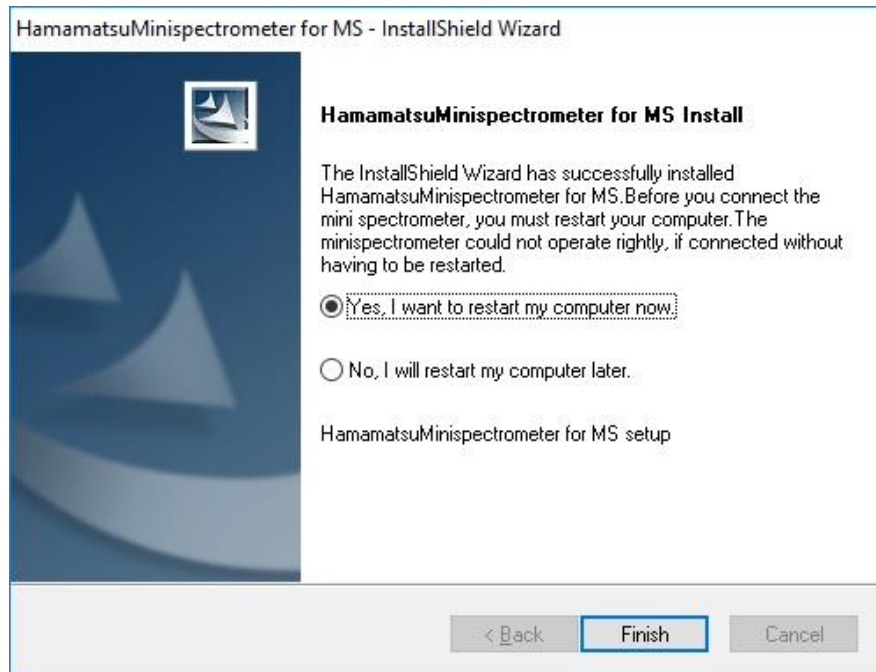
(6) This confirmation screen appears before you start copying files. It shows a list of the components that will be installed. Click [Next] to continue.



(7) If the mini-spectrometer is connected to the PC, disconnect the mini-spectrometer from the PC and then click [OK]..



(8) The message of the installation completion will display.
Click [Finish] button.



(9) Please take out CD-ROM from CD-ROM drive of PC.

Next installation of device driver will be installed.

- * If you connect two or more mini-spectrometers to the PC, repeat the same procedure to install the device driver for each mini-spectrometer.

- * If you re-connect mini-spectrometer to the another USB port of PC, repeat the same procedure to install the device driver through each USB port.

When the mini-spectrometer is connected with PC, the driver is automatically installed.
Next, install the device driver.

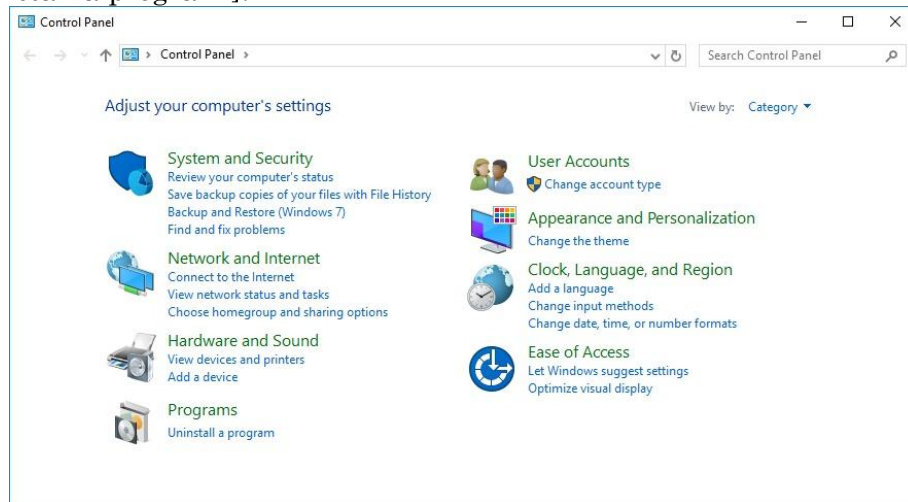
Software uninstallation

The uninstallation of software deletes all installed components.

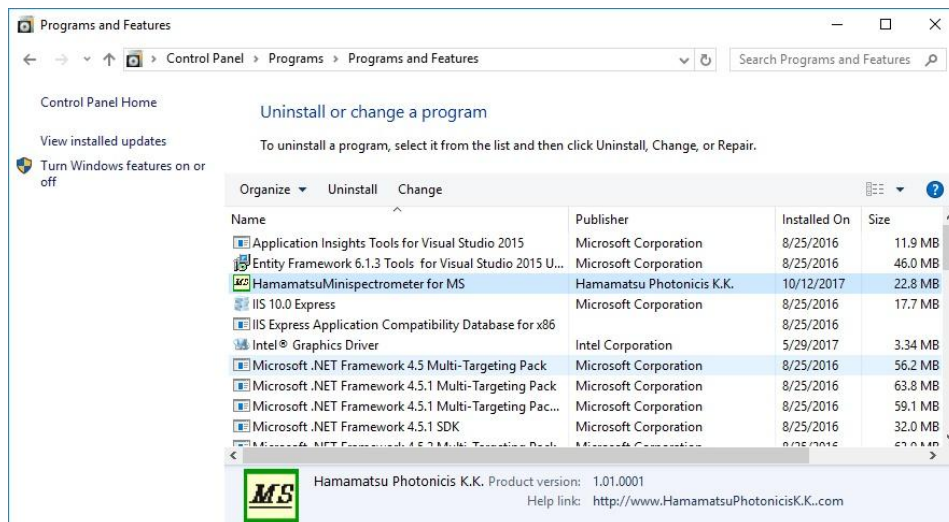
Method of software uninstallation is described below. Please follow the procedure only in the following order while uninstalling software. (When software is uninstalled; the device driver is also uninstalled.)

(1) Click [Start], then select [Settings] > [Control Panel] to open the Control Panel.

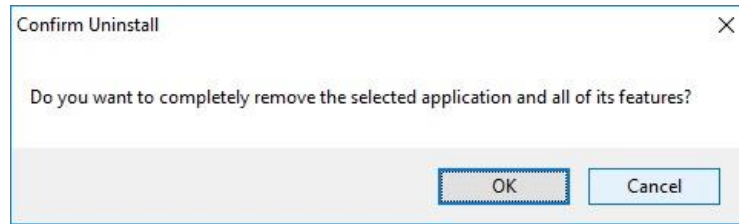
(2) Click [Uninstall a program].



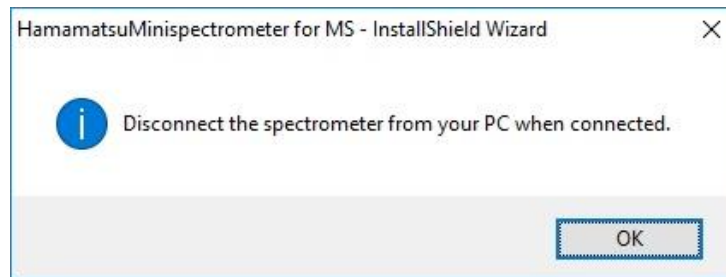
(3) Select [[Hamamatsu Minispectrometer for MS] in [Programs and features] . Click [Uninstall]



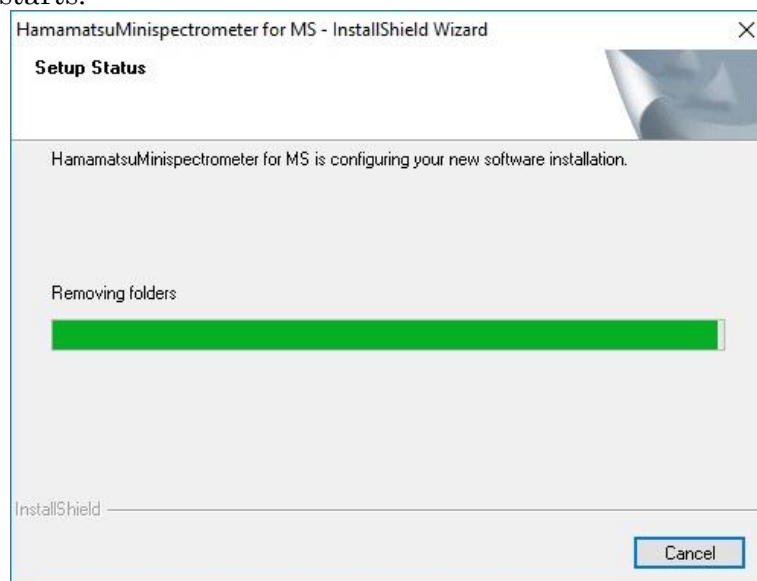
(4) Uninstallation Confirmation screen will be displayed.
Click [OK].



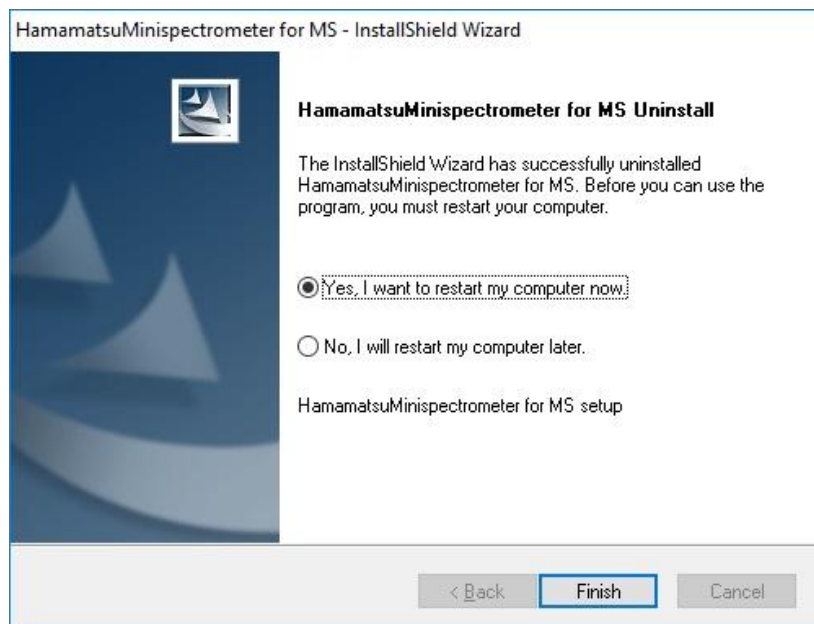
(5) If the mini-spectrometer is connected to the PC, disconnect it from the PC and click [OK].



(6) Uninstallation starts.



(7) The following screen appears asking if you want to restart the PC. Select [Yes, I want to restart my computer now] and click [Finish].



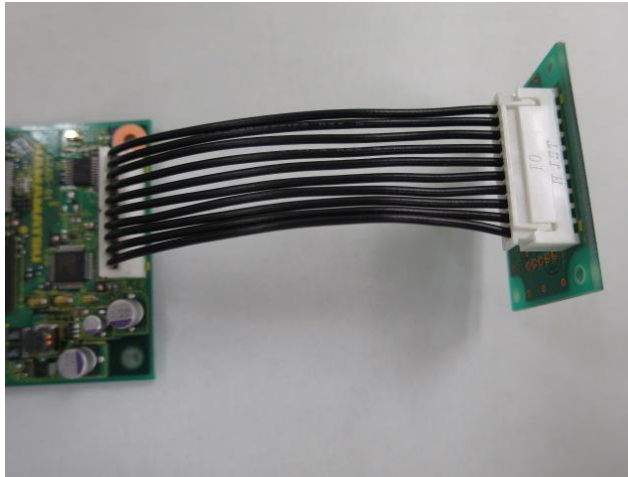
Instrument connection

It explains the procedure of instrument connection.

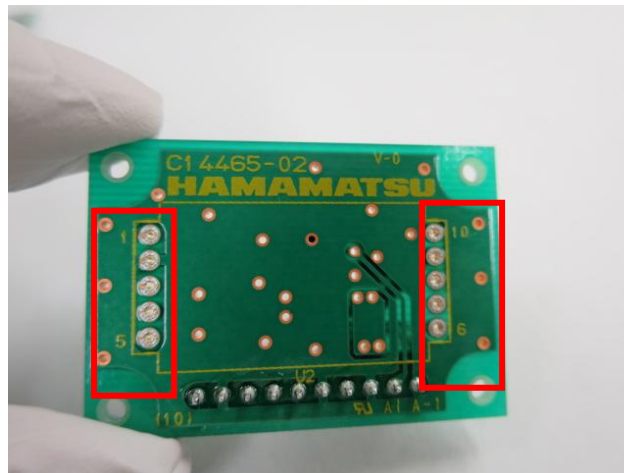
Mini spectroscope which outputs the resulting spectrum of input light to be measured is connected to PC through optical fiber cable and the USB cable. It is necessary to supply the power supply from the external source to drive this machine.

■Connection procedure

(1) Evaluation board (C14465-01) and sensor board (C14465-02) is connected using board connection cable.



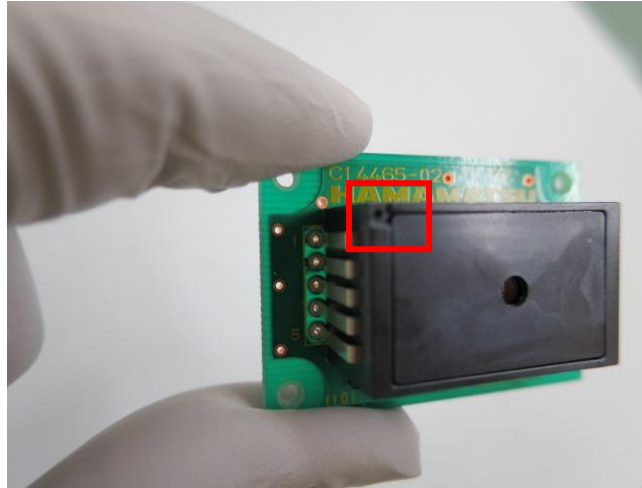
(2) Check the silk number and through hole which is shown in blue frame of the sensor board (C14465-02).



(3) Index mark of C10988MA-01,C11708MA shown in blue frame picture is matched to the silk number 1 and terminal of C10988MA-01,C11708MA is inserted.

Please use plug in and plug out count of sensor board less than or equal to 30 times.

If the plug in and plug out count exceeds than fixed count, then it might become difficult for C10988MA-01,C11708MA to fix to the sensor board.



(4) B plug of the USB cable is connected to the USB connector of the evaluation board.



(5) A plug of the USB cable is connected to the USB port of PC that starts Windows.



(6) Measurement software is start up in PC.

* In initial setting, the provisional coefficient of (C10988-MA-01) is contained.

Please use it after setting up the Wavelength calibration coefficient factor attached to each sensor (C10988MA-01, C11708MA) to be used.

Please refer ([Wavelength calibration coefficient edit screen](#)) for detailed information.

* While disconnecting equipment please follow the steps of connection in reverse order.

* We are not using board connection cable of different length. If you want to use board connection cable of different length which is self produced, then use “Nylon connector 5480-10 manufactured by MOLEX Company” connector.

If the length of cable is too long, then characteristics of C10988MA-01,C11708MA is not evaluated fully.

*** Connection Warning**

C10988MA-01,C11708MA is precision optical equipment.

Please do not detach C10988MA-01,C11708MA while driving C14465.

It will cause C10988MA-01,C11708MA and C14465 to fail.

* 连接警告

C10988MA-01,C11708MA 是精密光学设备。

C10988MA-01、C11708MA 请勿在驾驶 C14465 时分离。

它将导致 C10988MA-01,C11708MA 和 C14465 失败。

Evaluation software

Outline

□ What is the evaluation software?

Our mini spectrometer (Thereafter it is as mini spectrometer) is used by connecting with PC through USB2.0 interface. Various operations of the mini spectrometer are done from PC, and the measured data is also transmitted on PC.

Evaluation software is free software which is designed to do basic operations of mini spectrometer easily.

Measurements can be done used by minispectrometer by using this evaluation software.

In the evaluation software, real time graph drawing of data acquisition and measured data, data saving etc functionality is provided.

Evaluation software is subjected to mini spectrometer C14465. Other Mini-spectrometer made of our company are off the subject.

Evaluation software is used for basic operation of mini spectrometer.

□ System requirements for evaluation software

Evaluation software has been confirmed to work in the following system. However, operation in other environments cannot be guaranteed.

OS	Microsoft(R) Windows 7 32bit, 64bit Microsoft(R) Windows 8 32bit, 64bit Microsoft(R) Windows10 32bit, 64bit
Monitor	XGA(1024×768) and above

It is necessary to use PC with the above-mentioned system requirements condition to operate the evaluation software. There is no other special requirements, but we recommend that use PC with the higher performance CPU, memory etc.

This software HMSEvaluation.exe runs on WOW64 32-bit emulation mode, if the Windows7 is capable of 64bit

Evaluation software function list

The function list of the evaluation software is shown as follows.

● Measurement Mode

This software provides four kinds of measurement modes that is Monitor mode measurement, Measure mode measurement, Dark mode measurement, Reference mode measurement. The feature of each measurement mode is described below.

Mode	Use to:	Features
Monitor Mode	Monitor measurement data without saving it.	Graphically displays "pixel count vs. A/D output count" data in real time.
		Graphically displays "wavelength vs. A/D output count" data in real time.
		Can not save measurement data
		Performs dark subtraction.
		Displays reference data.
		Measurement scan number can not be set, no limit for scan number.
Measure Mode	measurement mode to save measurement data	Graphically displays "pixel count vs. A/D output count" data in real time.
		Graphically displays "wavelength vs. A/D output count" data in real time.
		Save measurement data
		Performs dark subtraction.
		Displays reference data.
		Specifies the number of measurement scans
Dark mode	Acquire data to perform dark subtraction	"pixel count vs. A/D output count" data in real time is not displayed graphically.
		"wavelength vs. A/D output count" data in real time s not displayed graphically.
		Saves measurement data.
		Specifies the number of measurement scans
Reference mode	Measurement mode to acquire reference data.	"pixel count vs. A/D output count" data in real time is not displayed graphically.
		"wavelength vs. A/D output count" data in real time s not displayed graphically.
		Saves measurement data.
		Specifies the number of measurement scans.

● Calculation function

This software provides the following arithmetic functions.

Functions	Features
Dark subtraction function	It is possible to display the subtracted value of the dark reference pixel from the measuring data
Reference data measurement and display	Measures reference data and displays it graphically.
Gauss fitting function	Gaussian function fits the data within the specified range

- Limitations

There are limitations in measurements.

Item	Limitations
Number of measurements (Number of stored data)	Within 1-5000 times
Integration time	Within range 5-100000msec(Specified by 1msec)
Gain	High/Low
Average count (Average count per measurement)	Within 255 times

- Save measurement data

The data acquired in the Measure mode measurement can be saved.

Functions	Features
csv file format save	Readable in Microsoft Excel

Evaluation software screen layout

Describes the layout of the evaluation software.

□ Main screen

Main screen is displayed data and information, measurement operations, and setting dialogs are called.

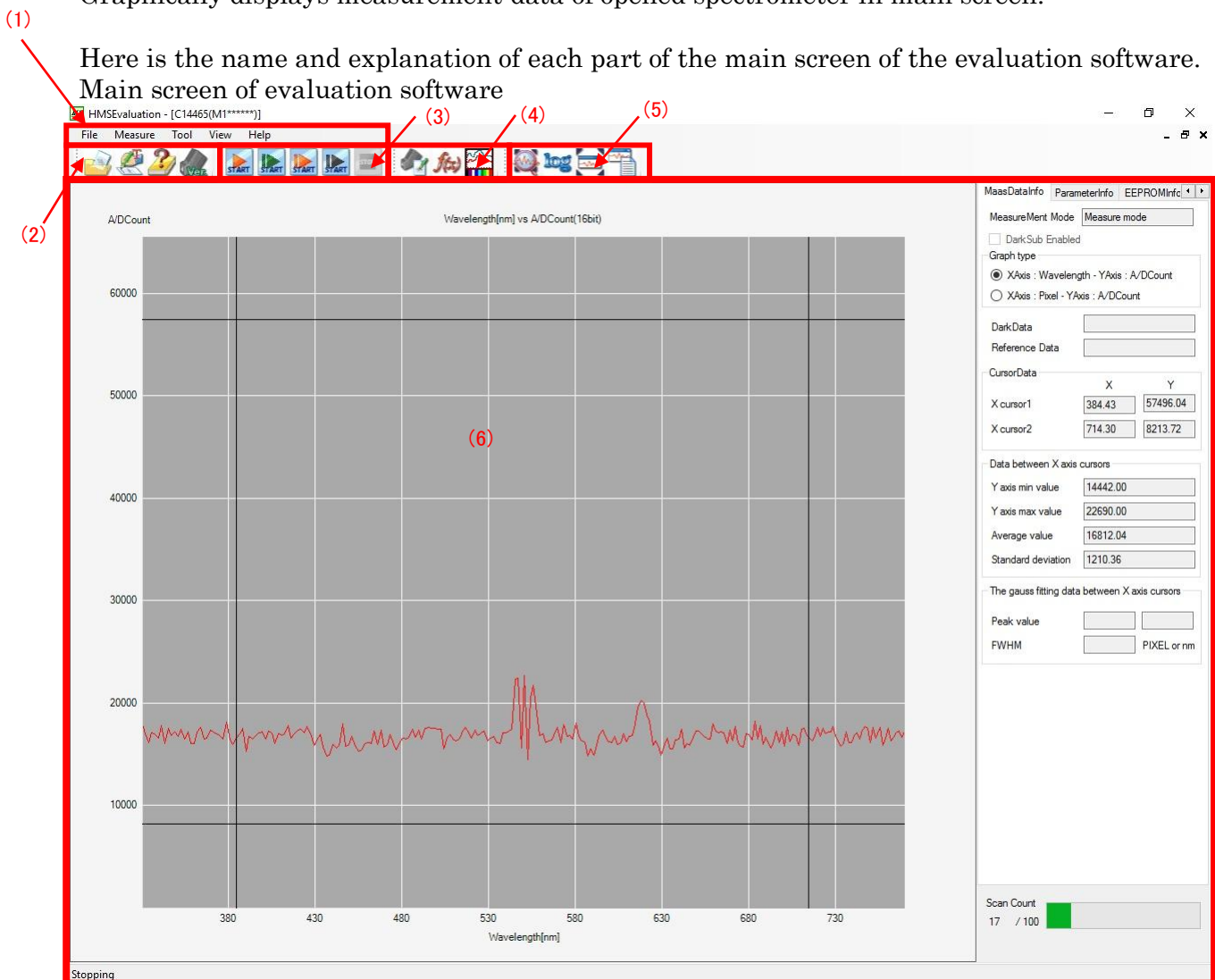
Main screen is displayed after boot of evaluation software and after completion of [\(Wavelength calibration coefficient display screen\)](#)

Main screen has main menus and various toolbars.

There is ▼ next to various toolbar icons. It is possible to execute it by selecting one from among two or more several similar commands. Please select it from the list displayed by clicking ▼. Various toolbars are changed in floating state by dragging them.

Moreover, show/hide of various toolbars can be set through [View] of main menu.

Graphically displays measurement data of opened spectrometer in main screen.



(1) Main Menu

Main menu contains [File], [Measurement], [Tool], [View], [Help]. Meaning of each item is described below.

Menu	Command	Use to:	Toolbar button	
File	Read data file	Load dark data and reference data files.	Main Toolbar	
	Save text data	Saves acquired measurement data	Main Toolbar	
	Save image data	Save displayed image.	Main Toolbar	
	Close Application	Closes Application		—
Measurement	Start monitor measurement	Starts monitor measurement	Measurement Toolbar	
	Start measure measurement	Starts measure measurement	Measurement Toolbar	
	Dark measurement	Start dark measurement	Measurement Toolbar	
	Reference measurement	Start reference measurement	Measurement Toolbar	
	Stop measurement	Stops measurement	Measurement Toolbar	
Tool	Parameter setting	The measurement parameter is set.	Function Toolbar	
	Operation	Use operation function	Function Toolbar	
	Wavelength calibration coefficient	Edit wavelength calibration coefficient	Function Toolbar	
	Auto zoom	Uses auto zoom	Graph Toolbar	
	Return to initial display	The graph display area is returned to the initial state.	Graph Toolbar	
	Vertical axis logarithm display	Converts Vertical axis to logarithm display	Graph Toolbar	
	Graph information	Display graph information	Graph Toolbar	
View	Main toolbar display	Show/Hide of the main toolbar is specified.		—
	Measurement toolbar display	Show/Hide of the measurement toolbar is specified.		—
	Toolbar display	Show/Hide of the toolbar is specified.		—

	Window toolbar display	Show/Hide of the window toolbar is specified.		—
	Graph toolbar display	Show/Hide of the graph toolbar is specified.		—
Help	System information/Setting Display	Displays system information/ Setting	Main Toolbar	
	Version information...	Displays version information	Main Toolbar	

(2) Measurement Toolbar

It contains Start/Stop Icon menu.



(3) Function Toolbar

It contains icon menus of parameter setting, operation setting and wavelength calibration coefficient setting.



(4) Main Toolbar

It contains icon menu of data read, data save, help.



(5) Graph Toolbar

Icon menu of graph movement, expansion/ contraction, Y axis logarithmic display is used.

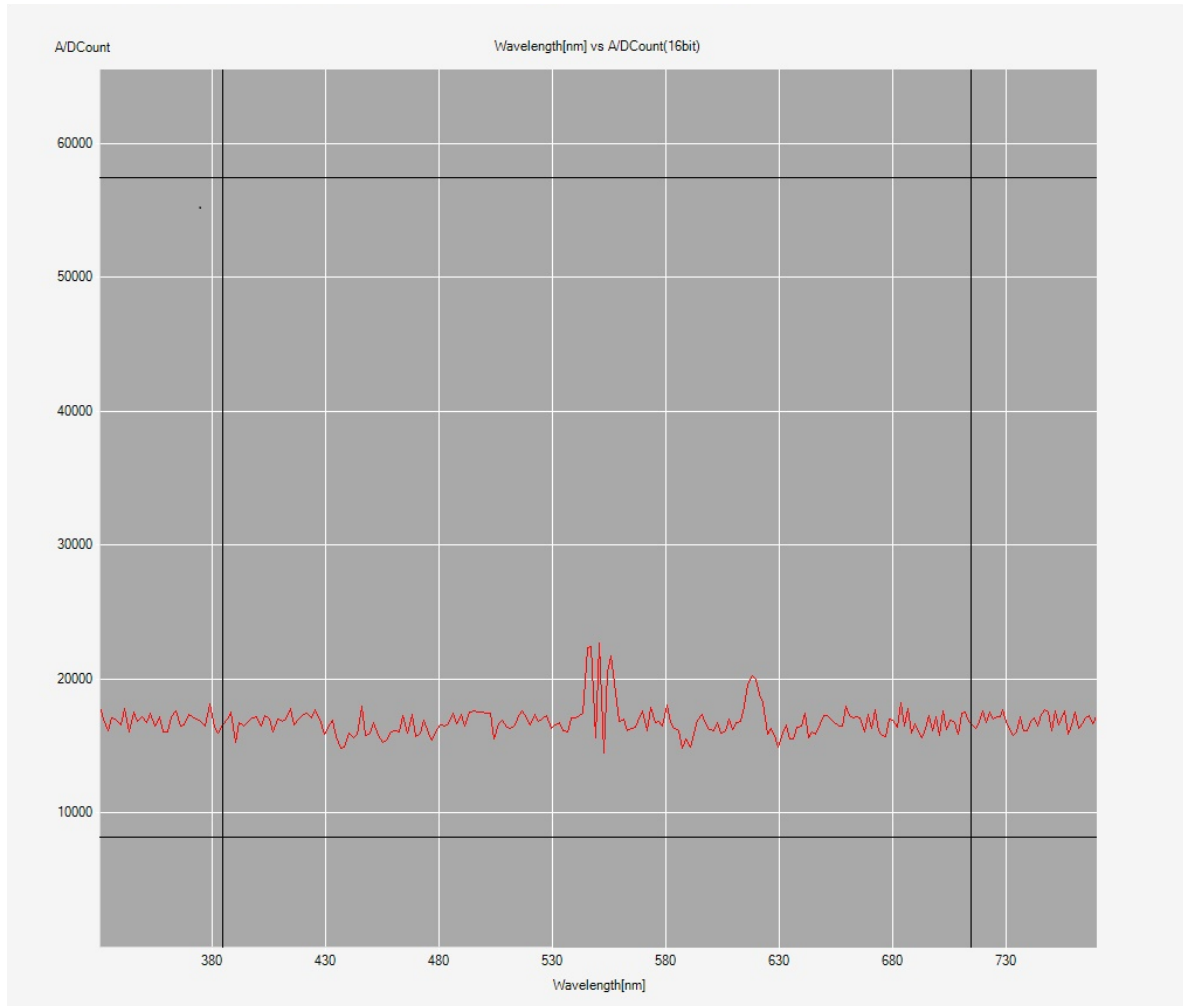


(6) Graph Window

It shows measurement data graph and various data.

○Graph

Graph shows raw data retrieved from image sensor. The horizontal axis represents the wavelength of the sensors, or pixels and the vertical axis represents the image sensor output A / D count values. ScanCount below the graph displays the number of measurements from start.



- Various data

Displayed by selecting the tab of right area in graph for the data.

- Measurement data information

It displays horizontal axis changes of displayed graph and measurement data information.

The screenshot shows the 'Measurement data information' panel with the following sections and values:

- MaasDataInfo** (selected tab):
 - MeasureMent Mode: Measure mode
 - ☐ DarkSub Enabled
 - Graph type:
 - ☒ XAxis : Wavelength - YAxis : A/DCount
 - ☐ XAxis : Pixel - YAxis : A/DCount
 - DarkData: [Empty field]
 - Reference Data: [Empty field]
 - CursorData:

	X	Y
X cursor1	384.43	57496.04
X cursor2	714.30	8213.72
 - Data between X axis cursors:

Y axis min value	14442.00
Y axis max value	22690.00
Average value	16812.04
Standard deviation	1210.36
 - The gauss fitting data between X axis cursors:

Peak value	[Empty field]	[Empty field]
FWHM	[Empty field]	PIXEL or nm

Annotations with red arrows:

- Horizontal Display can be selected from sensor pixel and wavelength. (Points to the 'XAxis : Pixel' radio button)
- Shows cursor position value. (Points to the 'Y' value of X cursor1)
- Shows value between cursors. (Points to the 'Y axis max value' field)
- When operation function Gauss fitt waveform is selected, it displays approximated values to Gaussian curve. (Points to the 'FWHM' field)

Parameter information

Displays the set measurement parameters.

MaasDataInfo	ParameterInfo	EEPROMInfo
Scan Count	100	
Average Count	1	
Integration Time[msec]	100	
Gain	Low	

EEPROM information

Recorded information is displayed to EEPROM of corresponding spectrometer

ParameterInfo	EEPROMInfo	CaliCoefficient
Vendor	Hamamatsu Photonics-KI	
Product	C11351	
SerialNumber	0001	
FirmwareVer	1.00.0003	
UnitID	M1*****	

Calibration Coefficient	
A0	3.284292761E+002
B1	1.881877850E+000
B2	-2.417594209E-004
B3	3.164288779E-007
B4	-1.545793091E-008
B5	3.290982859E-011

Wavelength calibration coefficient information

Wavelength calibration coefficient

which is to be stored and

Wavelength calibration of EEPROM is compared and displayed.

EEPROMInfo	CaliCoefficient	GraphOption
Calibration Coefficient		
Application		
A0	3.284292761E+002	
B1	1.881877850E+000	
B2	-2.417594209E-004	
B3	3.164288779E-007	
B4	-1.545793091E-008	
B5	3.290982859E-011	
EEPROM		
A0	3.284292761E+002	
B1	1.881877850E+000	
B2	-2.417594209E-004	
B3	3.164288779E-007	
B4	-1.545793091E-008	
B5	3.290982859E-011	

Graph Option
Graph setting can be changed.

CaliCoefficient

GraphOption

◀▶

Plot Option

Data to plot

MeasureData

▼

Line color

..

Line Style

Solid

▼

Line width

1

▼

Title and label

Title

Wavelength[nm] vs A/DCount

X Caption

Wavelength[nm]

Y Caption

A/DCount

□ Wavelength calibration coefficient display screen

Wavelength calibration coefficient display screen displays number calibration coefficients which are to be used in evaluation software.

This is displayed immediately after evaluation software starts.

Here is the explanation of each part name of Wavelength calibration coefficient display screen.

WavelengthCalibrationCoefficient (1)	
A0	+3.284292761e+002
B1	+1.881877850e+000
B2	-2.417594209e-004
B3	+3.164288779e-007
B4	-1.545793091e-008
B5	+3.290982859e-011

Edit... (2) OK (3)

(1)Wavelength calibration coefficient

Wavelength calibration coefficient of current evaluation software is displayed in read only

(2)Edit button

[\(Wavelength calibration coefficient edit screen\)](#) is displayed when edit button is pressed.

(3)OK button

[\(Main screen\)](#) is displayed and main screen is closed when OK button is pressed.

□ Wavelength calibration coefficient edit screen

It is the screen where wavelength calibration coefficient is edited.

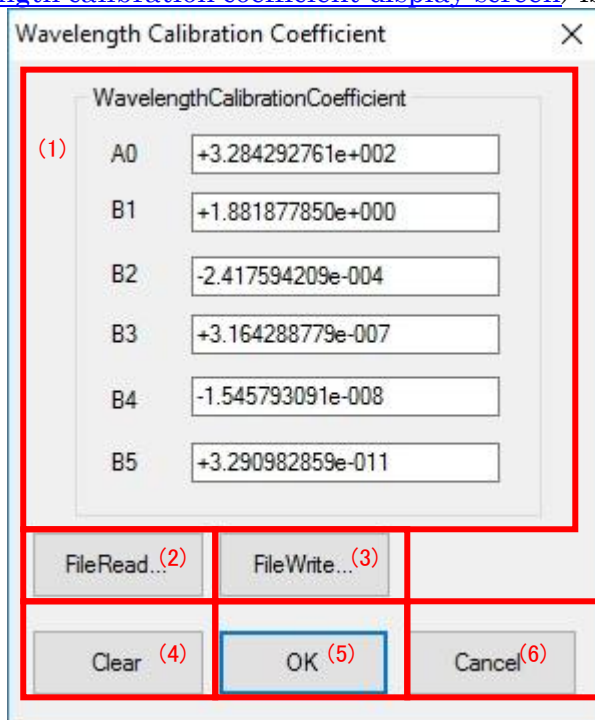
As a method of displaying this screen, press edit button on ([Wavelength calibration coefficient](#)

[display screen](#)) or click  of [Function toolbar] or select [Tool]→[Calibration coefficient] from main menu of main screen.

Here is the explanation of each part name of 2 type of screen as screen composition is different according to display method.

*To prevent incorrect input, (3)[File Write] is recommended to be executed when this screen is started first.

Wavelength calibration coefficient edit screen is displayed when edit button of ([Wavelength calibration coefficient display screen](#)) is pressed.



WavelengthCalibrationCoefficient	
(1) A0	+3.284292761e+002
B1	+1.881877850e+000
B2	-2.417594209e-004
B3	+3.164288779e-007
B4	-1.545793091e-008
B5	+3.290982859e-011

FileRead... (2) FileWrite... (3)

Clear (4) OK (5) Cancel (6)

(1)Wavelength calibration coefficient

Wavelength calibration coefficient of current evaluation software is displayed.

Wavelength calibration coefficient can be edited by inputting numeric value.

(2)FileRead

Wavelength calibration coefficient file is read and displayed in A0-B5 edit boxes.

Please refer ([Read wavelength calibration coefficient](#)) for detailed information.

(3)FileWrite

Wavelength calibration coefficient file of edit box of A0-B5 is written in wavelength calibration coefficient file.

Please refer ([Write wavelength calibration coefficient file](#)) for detailed information.

(4)Clear

Clears A0-B5 edit boxes.

(5)OK

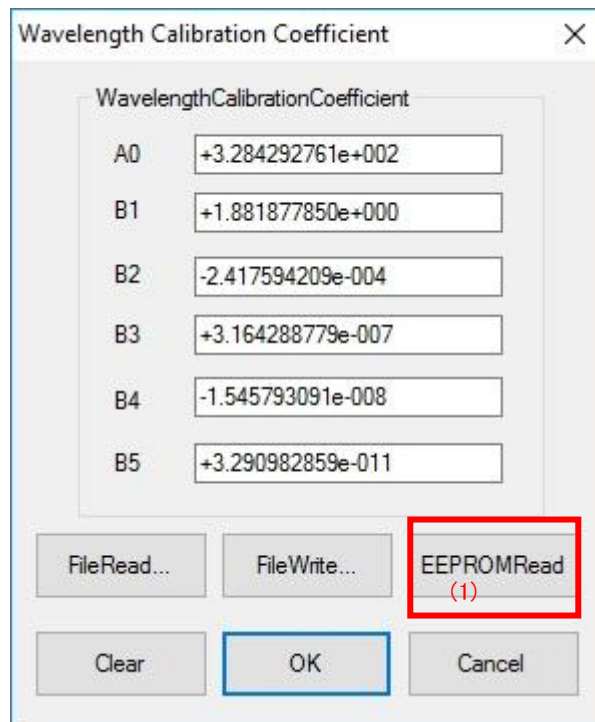
Determines wavelength calibration coefficient, closes main screen and returns to [\(wavelength calibration coefficient display screen\)](#)

(6)Cancel

Main screen is closed and returned to [\(wavelength calibration coefficient display screen\)](#) without changing wavelength calibration coefficient.



This screen can be displayed by clicking  of [Function Toolbar] or by selecting [Tool]→[Wavelength calibration coefficient] from main menu of main screen.



WavelengthCalibrationCoefficient	
A0	+3.284292761e+002
B1	+1.881877850e+000
B2	-2.417594209e-004
B3	+3.164288779e-007
B4	-1.545793091e-008
B5	+3.290982859e-011

FileRead... FileWrite... EEPROMRead (1)

Clear OK Cancel

Wavelength calibration coefficient, FileRead, FileWrite, Clear function will be the same as on [\(Wavelength calibration edit screen\)](#). EEPROM read button is displayed in main screen.

(1) EEPROM Read

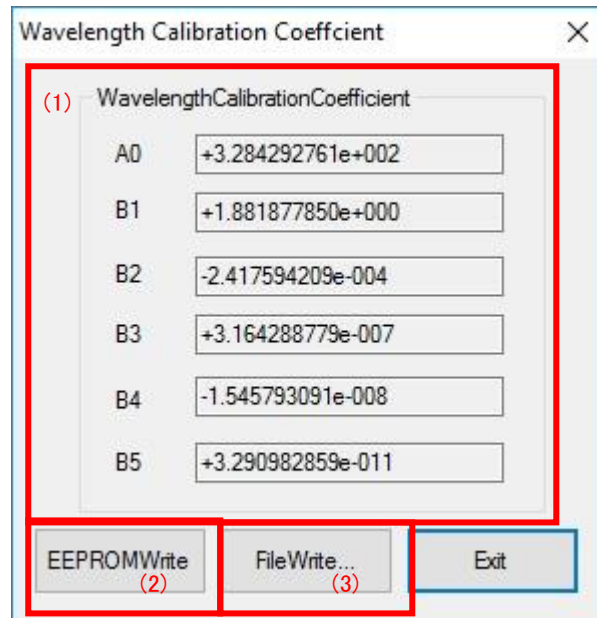
Wavelength calibration coefficient value of EEPROM of spectrometer is read and displayed in A0-B5 edit boxes.

□ Wavelength calibration coefficient write screen

Wavelength calibration coefficient write screen is a screen which writes to current EEPROM or wavelength calibration coefficient file.

It is displayed at the end of [\(Main Screen\)](#).

Here is the explanation of each part name of Wavelength calibration coefficient write screen.



(1)Wavelength calibration coefficient

Wavelength calibration coefficient of current evaluation software is displayed in read only.

(2)EEPROMWrite button

Wavelength calibration coefficient of edit box of A0-B5 is written in EEPROM of spectrometer.

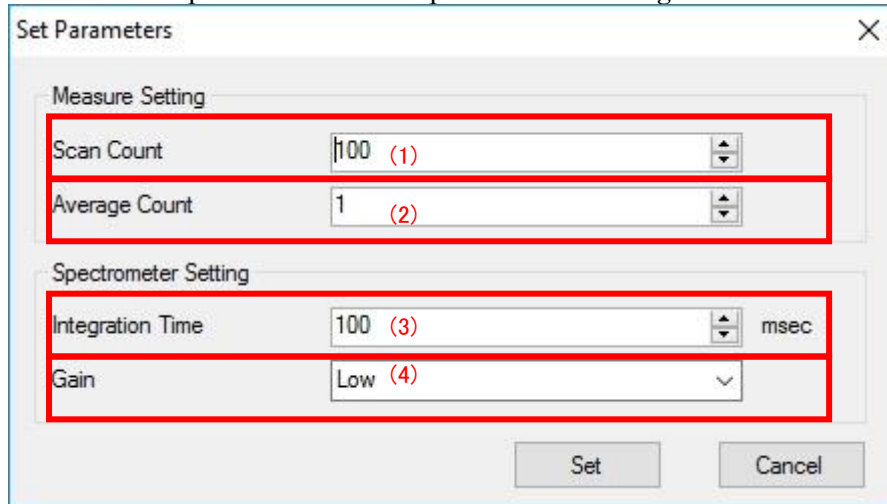
(3)FileWrite button

Wavelength calibration coefficient of edit box of A0-B5 is written in wavelength calibration coefficient file.

Please refer [\(Write wavelength calibration coefficient file\)](#) for detailed information about wavelength calibration coefficient file write.

□ Parameter setting screen

Parameter setting screen is used to set operating parameters of spectrometer. In measurement stopped condition, this screen can be displayed by clicking  of [Function Toolbar] or by selecting [Tool] → [Parameter setting] from main menu of main screen. Here is the explanation about each part and name of parameter setting screen.



(1) Measurement count

Specifies measurement count of measure measurement. Possible range of measurement count is 1-5000. The numerical value can be increased and decreased by clicking a right arrow. It is also possible to input the numerical value directly by keyboard.

(2) Average count

The evaluation software will display one profile (spectrum data) after averaging the data over the specified number of scans.

Specify the averaging count in the range from 1 to 255.

You can select the desired count from the drop-down list of the combo box that appears by clicking the small down arrow (▼).

(3) Exposure Time

Specify the accumulation time in the range from 5 msec to 10000 msec, in 1 msec steps. You can select the desired time from the drop-down list of the combo box that appears by clicking the small down arrow (▼). You can also directly enter a desired time from the keyboard, even if it is not listed in the combo box

(4) Gain

Select the gain (High or Low) from the drop-down list.

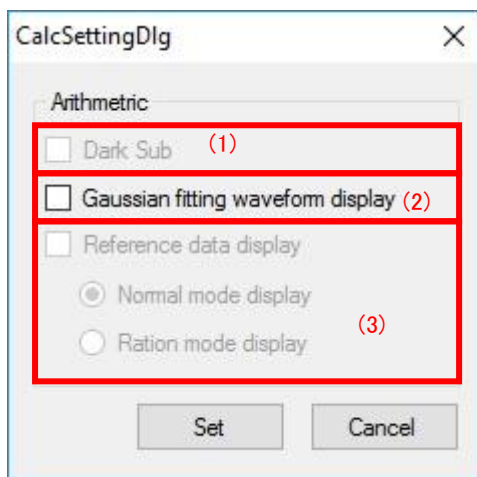
Some mini-spectrometer models do not have the gain adjustment function, so this is disabled.

□ Operation function screen

Operation function screen is used to set useful operation function for measurement.

This screen can be displayed by clicking *f(x)* of [Function Toolbar] or by selecting [Tool] → [Operation] from main menu of main screen. This screen has dark subtraction and gauss fitting function and reference data display function (Normal display, Ratio display). Select the required function by adding check mark.

Please refer [\(Operation function\)](#) for the details of operation function.



(1)Dark Function

Dark function is available by adding check mark to 'Dark subtraction'.

(2)Gauss fitt waveform

Graph also displays measurement data and gauss fitting data simultaneously by adding check mark to 'Gauss Fitting Waveform Display'mode.

(3)Reference function

Comparison display of reference function is available by adding check mark to 'Reference Data Display'. Graph also displays measurement data and reference data simultaneously by selecting normal mode.

Reaction of measurement data and reference data is displayed by selecting ratiomode.

Measurement Mode

This evaluation software provides two modes of measurements.

This topic describes measurement mode introduction, characteristic of measurement mode and explains how to use them.

□ Monitor mode measurement

Monitor mode will display only measured data graph without storing data in memory.

If you want to see output in real time graph or want to observe long time output, this mode is suitable.

Measurement procedure:

- Startup procedure

To start measurement click  of [Measurement Toolbar] or select [Measure]→[Start Monitor mode] from main menu of main screen.

- Stop procedure

To stop measurement click  from [Measurement Toolbar] or select [Measure]→[Stop Monitor mode] from main menu of main screen.

□ Measure Mode measurement

Measure mode displays measured data and stores that data in memory. This mode is suitable in the cases like you want to see output value in real time graph and also want to analyze data after measurement. Once the measurement data stored in the memory, data is stored temporarily at the time of evaluation software ends.

Measurement procedure:

- Startup procedure

Click  from [Measurement Toolbar] or select [Measure]]→[Start measure mode]

- Stop procedure

Automatically stops after reaching specified measurement count. It is also possible to stop measurement before reaching the specified number of scans.

To stop measurement click  or select [Measure]→[Stop measurement] from main menu of main screen. In that case data measured up to that point is valid data.

□ Dark mode measurement

The dark subtraction function becomes available after measuring dark data in Dark mode. We strongly recommend that you measure this dark data just after this evaluation software starts.

When the integration time or gain setting is changed, the dark data also varies. So you must measure new dark data again when using the dark subtraction function.

Measurement Procedure:

- Start method

Click the  button on the Measurement toolbar or select "Start Dark mode" from the "Measure" menu in the main window.

- . Stop method

Dark measurement automatically stops when the specified scan count is reached. But you can stop the measurement any time before the specified scan count is reached. To stop the

measurement, click the  button or select "Stop" from the "Measure" menu in the main window. The data that has been measured up to that point will be effective. Dark data will then be created by averaging the obtained data.

□ Reference mode measurement

This mode allows you to measure reference data that is used as comparison criterion. After measuring this reference data, both measurement data and reference data can be displayed. When the integration time*1 or gain*2 setting is changed, the measurement conditions vary as well. So you must measure the new reference data again when using the reference data.

Measurement Procedure:

- . Start method

Click the  button on the measurement toolbar or select "Start Reference mode" from the "Measure" menu in the main window.

- . Stop method

Measurement automatically stops when the specified scan count is reached. But you can stop the measurement any time before the specified scan count is reached. To stop the

measurement, click the  button or select "Stop" from the "Measure" menu in the main window. The data that has been measured up to that point will be effective. Reference data will then be created by averaging the obtained data.

Graph operations

Zooming, logarithm display, and the position movement display, etc. of the graph displayed in graph window can be processed. This topic describes characteristic of graph operations and explains how to use them.

The graph operation can be done by the tool item [Graph toolbar] or main menu of a main screen.



Graph toolbar

□ Graph cursor movement

Two graph cursors (sampling lines) are provided on each of the X and Y axes. Using these graph cursors, you can check the data on the cursors or specify the area to perform arithmetic operations. The graph cursor information is displayed in the "Graph Information " dialog box.

□ Zooming

The detailed observation of part of waveform requires a function which will enlarge the certain part of graph. For that purpose this software provides several features of zoom.

[Window Zoom]

The window zoom enlarges an area specified with the mouse.

The rectangle of the alternate long and short dash line which will appear if a mouse is moved where the right button of a mouse is clicked on Graph Window is adjusted with a mouse, and the expansion range is specified.

[Auto Zoom]

An auto zoom is automatically adjusts range of vertical axis of graph to minimum and maximum range.

Click  of [graph Toolbar] or select [Tool]→[Auto Zoom] from main menu of main screen.

□ Vertical axis logarithm display

Vertical axis display changes to logarithm display.

Click  of [Graph Toolbar] or select [Tool]→[Log Scale] from main menu of main screen.

□ Reset graph display to initial state

Graph modified by [Zoom], [Move position], etc is returned to initial state.

Click  of [Graph Toolbar] or select [Tool]→[Reset Graph] from main menu of main screen.

□ Graph information

Show graph information.

Click the  button on the Graph toolbar or select "Graph information" from the "Tool" menu in the main window.

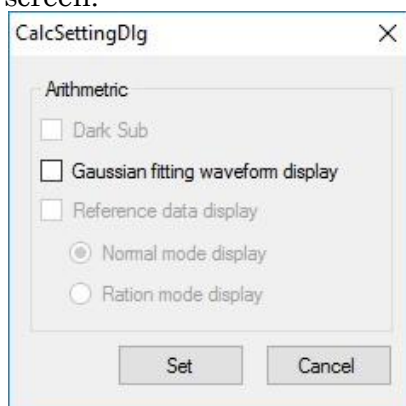
Operation Function

This evaluation software uses several operation function during measurement. This topic describes how to use operation function provided by this evaluation software.

Following operation function is used by this evaluation software.

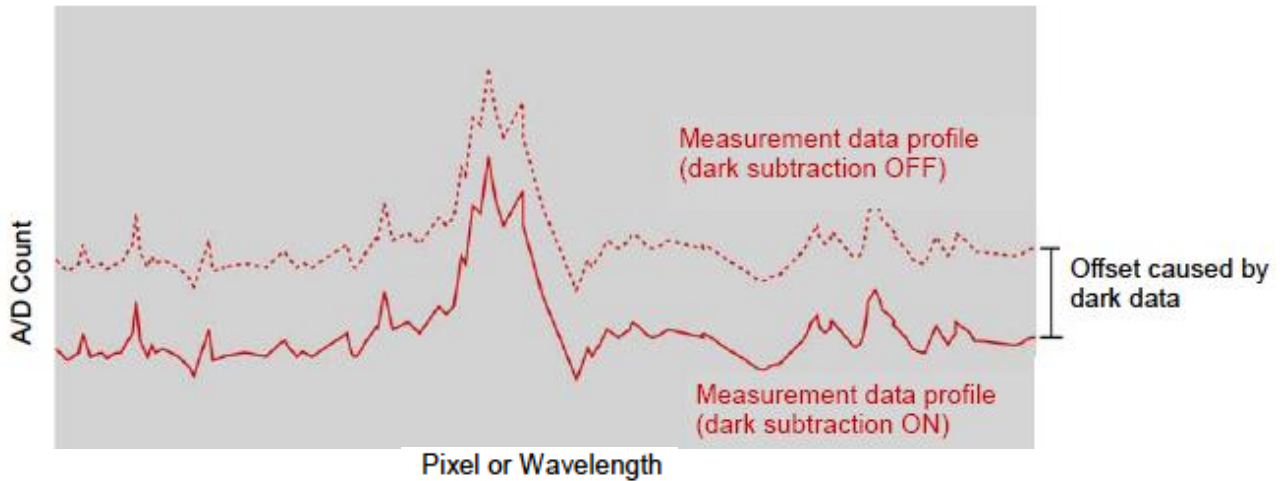
Function name		Function detail
Dark subtraction		Subtracts dark data (acquired beforehand) from the currently measured data. This function is not available if dark data has not yet been acquired. This function is not available if dark data has not yet been acquired.
Reference data display	Normal mode display	Displays reference data along with the currently measured data. This function is not available when reference data has not yet been acquired.
	Ratio mode display	Displays the ratio of the measurement data (transmittance, reflectance) to reference data. This ratio is calculated as follows: $\text{Currently measured data profile} / \text{Reference data profile} \times 100$ This function is not available if reference data has not yet been acquired.
Gaussian fit waveform display		Fitting is performed by gauss function for the area enclosed by cursor. Shows current measurement profile with fitting result.

Operation function setting is done by following screen. Select [Tool]→[Operation] from main menu of main screen to get this screen.



□ Dark subtraction

It is a function which subtracts dark offset from a present measurement profile by using the sensor dark reference pixel value. Please select following offset according to dark.

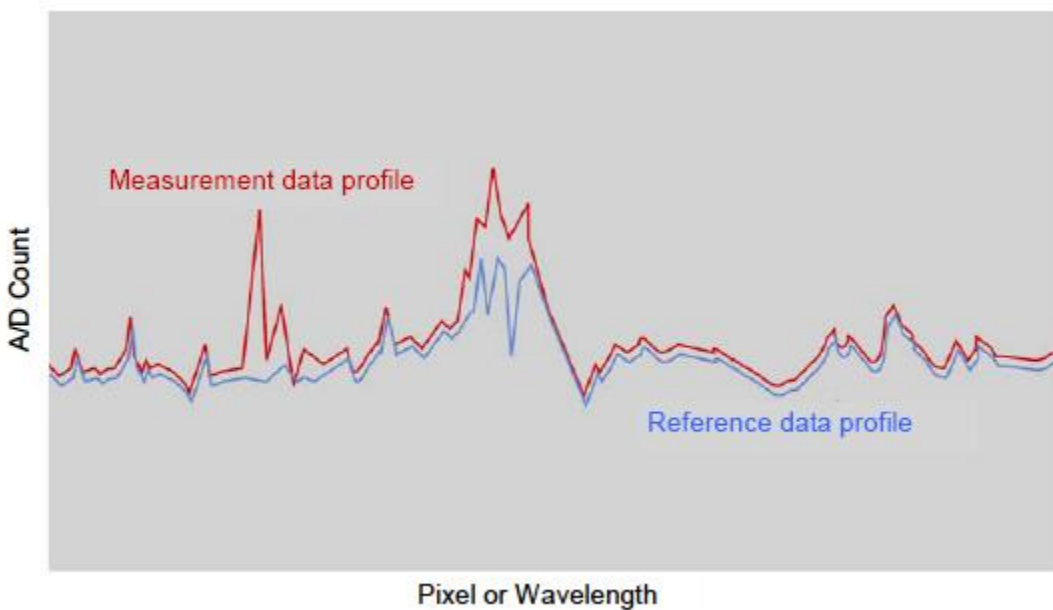


□ Displaying Reference data

This function displays the currently measured data profile along with premeasured reference data profile. There are two methods for reference data display: Normal mode display and ratio mode display

[Normal mode display]

Displays reference data and measurement data simultaneously. An example is shown below. The blue plot represents the reference data profile and the red plot represents the currently measured data profile. The reference data profile is shown in blue on the actual software display. This function is useful for comparing currently measured spectrum data with reference data to see how it changes.

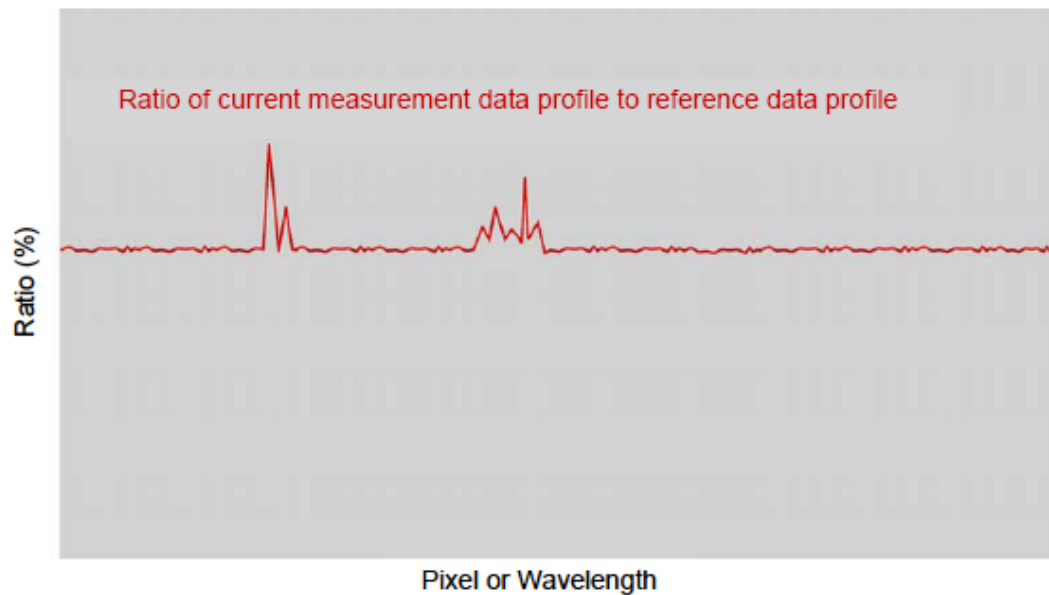


[Ratio mode display]

Displays a data profile indicating the ratio of current measurement data profile (transmittance or reflectance) to reference data profile. This ratio profile is defined as follows:

Ratio profile = Currently measured data profile / Reference data profile $\times$ 100 [%]

The ratio mode display is useful for checking the transmission or reflection ratio versus the reference data. The graph below shows a ratio profile created from the profile data shown above in the normal mode.



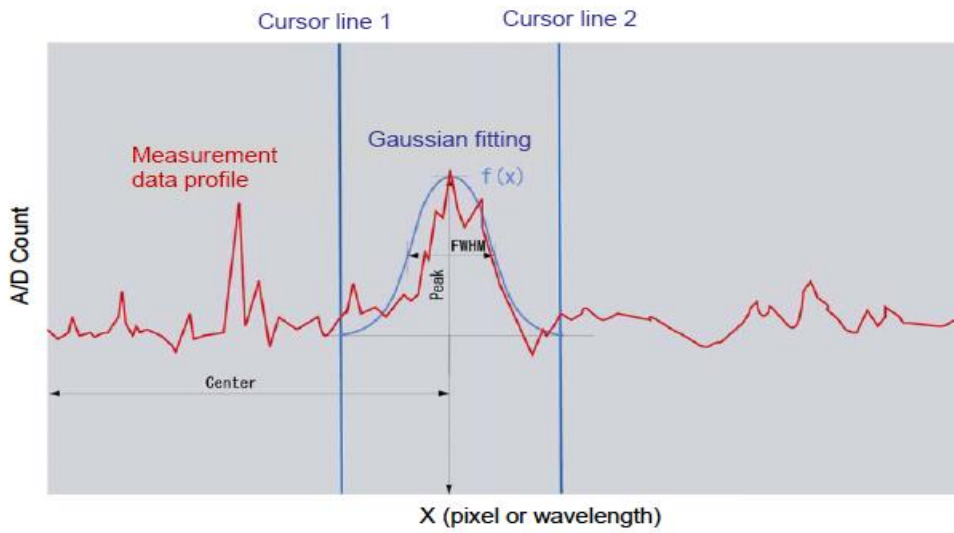
□ Waveform Display

Fitting is performed by gauss function for the area enclosed by cursor and Shows current measurement profile with fitting result. The following Gauss functions are used for the fitting.

$$f(x) = C_0 + C_1x + C_2 \exp \left\{ - \left(\frac{x - C_3}{C_4} \right)^2 \right\}$$

Here, C_0 - C_4 is a coefficient obtained by the fitting. x shows the value of a horizontal axis(pixel or wavelength) in the graph.

This function is used to get exact peak position from the spectrum retrieved by measurement. The following figure shows an example. In figure, red color shows current measure profile and blue color shows gauss fit results based on measured profile data enclosed by a cursor. When graph fit is effective, acquired gauss fit data is displayed on 'Measure data information' tab time to time.



Save Measurement data

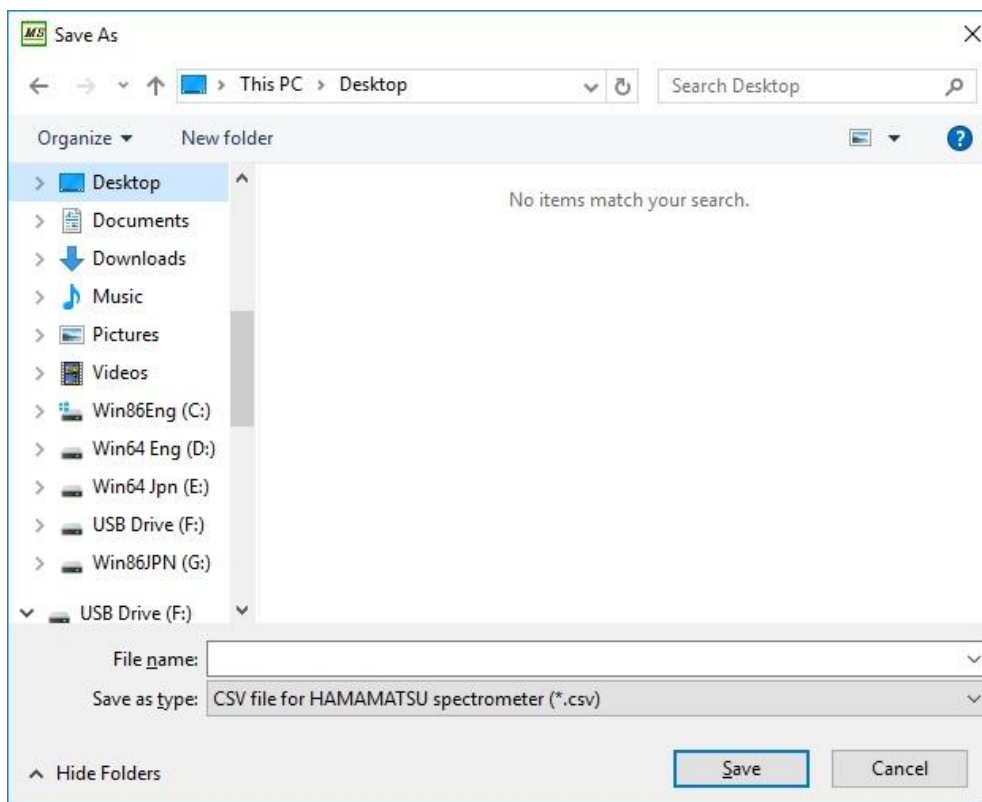
This evaluation software can save measurement data as a text data in a file. Here is the explanation about data save method, format and important points.

□ Save Text data

In measure measurement, acquired measure data can be saved as text data in a file. Text data can be saved in CSV format which can be read in Microsoft excel also, so it is easier to perform processes like reading stored data in excel, graphing, carrying out operations etc.

Click  of [Main Toolbar] or select [File]→[Save Data File] from main menu of main screen.

Please set name and place of file to save in File Dialog and then click [Save(S)] button.



□ Text data Types

There are 3 types of text data to be saved Measure, Dark, Reference.

These are stored in the CSV file format.

File name specified in File name box	File name	File is created when:	Contents
<i>File_name</i>	<i>File_name.csv</i>	If you have data	Measure data
	<i>File_name_dark.csv</i>	If you have dark data	Dark measure data
	<i>File_name_ref.csv</i>	If you have reference data	Reference measure data

Example: If you save all data under a file name of "test" after making measurements in Dark, Reference and Measure modes.

The following 3 files are created.

File name	Content
test.csv	Measure data
test_dark.csv	Dark measure data
test_ref.csv	Reference measure data

File data format is given below.

The 14th row in each CSV file indicates the pixel number or wavelength, depending on which was selected as the horizontal axis data form. Each item in the CSV file is set to the value of each data acquisition.

```

ModelNo= xxxxxxxx LF
SerialNo=xxxxxxxx LF
Date=xxxx/xx/xx xx:xx:xx LF
ExposureTime=x LF
Gain=x LF
WavelengthConversionFactorA0=x LF
WavelengthConversionFactorB1=x LF
WavelengthConversionFactorB2=x LF
WavelengthConversionFactorB3=x LF
WavelengthConversionFactorB4=x LF
WavelengthConversionFactorB5=x LF
AverageCount=x LF
DataNum=x LF
    pixel ,      Average,  1 ,      2      3      4      ...  MAX_SCAN-1 , MAX_SCAN  LF
      1,        XXX ,   XXX , XXX , XXX , XXX , ...  XXX ,           XXX      LF
      2,        XXX ,   XXX , XXX , XXX , XXX , ...  XXX ,           XXX      LF
      3,        XXX ,   XXX ,      XXX , XXX , ...  XXX ,           XXX      LF
      ...      ...      ...      ...      ...      ...  XXX ,           XXX      LF
    255,        XXX ,   XXX , XXX , XXX , XXX , XXX , XXX ,           XXX      LF
    256        XXX ,   XXX , XXX , XXX , XXX , XXX , XXX ,           XXX      LF

```

Item	Meaning
ModelNo	Type name
SerialNo	Serial number
Date	File save date
ExposureTime	Accumulation time
Gain	Gain Value
WavelengthConversionFactorA0-B5	Wavelength conversion Coefficient
AverageCount	Average count
DataNum	Measurement count

※XXX...Acquired A/D count in measurement
 ※MAX_SCAN...Scan count number set by user
 ※LF...Linefeed

□ Guidelines for saved text data

This spectrometer configured as light receiving image sensor of multiple optical devices at grating spectrometer. This mini-spectrometer uses a multi-element (256 valid pixels) linear image sensor that detects a spectrum formed by the grating..Therefore acquired data becomes A/D conversion value for each pixel of image sensor.

Each corresponding pixel and wavelength of image sensor is shown in the following approximation formula using 5 degrees.

$$wavelength[nm]=A0+B1pix+B2pix^2+B3pix^3+B4pix^4+B5pix^5$$

Note)Pix is arbitrary pixel(1-) of the image sensor.

Moreover, in this case it is not necessary that calculated value is integer value. Considering only the values calculated by the simple approximation, please note that there will be some difference in values compared to known values of emission.

While saving data, each coefficient of a0-a5 is recorded in measurement parameter file.

Read measurement data file

In previously measured evaluation software, stored text data file is read for the reference and can be displayed in respective graph.

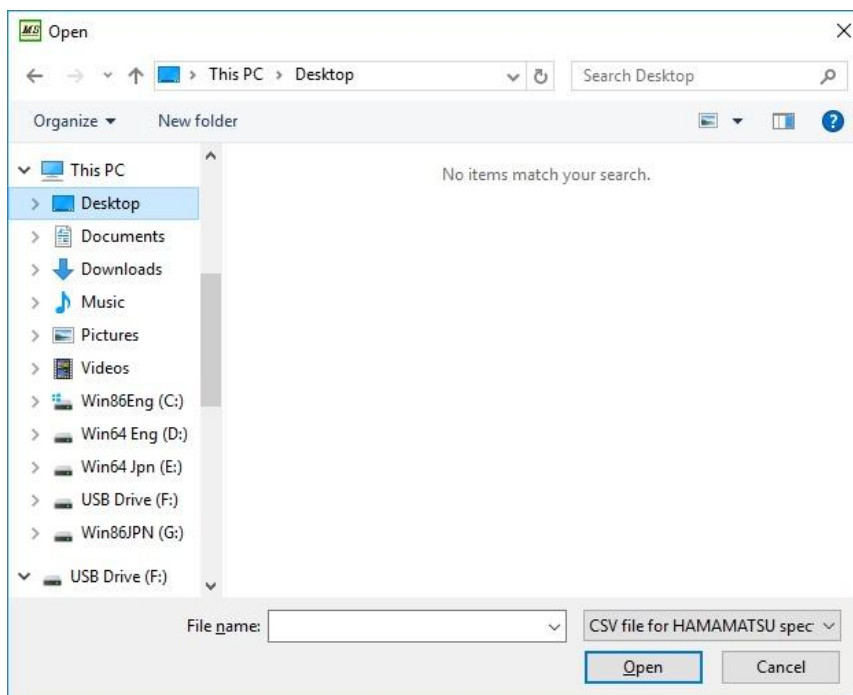
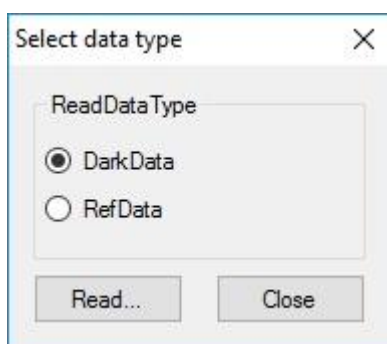
□ Loadable data type

You can load text data files with an extension ".csv" that contain data measured with the evaluation software and then saved in a CSV format.

□ Reading method of measurement data file

Please click  of [Main Toolbar] or select [File]→[Load Data File] from main menu of main screen.

Please set name and place of file to read in File Dialog and then click [Open(O)] button.

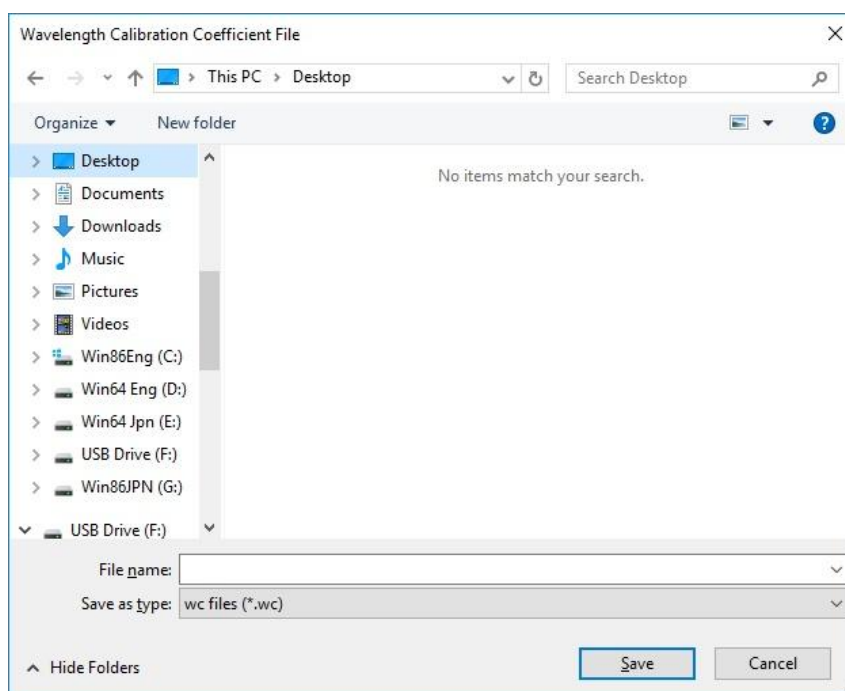


Write wavelength calibration coefficient file

In this evaluation software, you can save the wavelength calibration coefficient in text file. Here is the explanation about method for saving wavelength calibration coefficient data in text file, format and important notes.

- Method for saving wavelength calibration coefficient data
Wavelength calibration coefficient of evaluation software can be saved as text data in file. Extension of wavelength calibration coefficient is .wc and saved in INI file format.

Please click 'FileWrite' button of [\(Wavelength calibration coefficient edit screen\)](#). or click 'FileWrite' button of [\(Wavelength calibration coefficient write screen\)](#). The following dialog box then appears. Select the location to store, file name and click the [Save (S)] button.



Wavelength calibration coefficient data format is as follow.

```
[Setting]
A0=+6.000000000e+000
B1=+5.000000000e+000
B2=+4.000000000e+000
B3=-3.000000000e+000
B4=-2.000000000e+000
B5=-1.000000000e+000
```

A0-B5 Wavelength calibration coefficient data

Read wavelength calibration coefficient

Previously stored wavelength calibration coefficient file can be read.

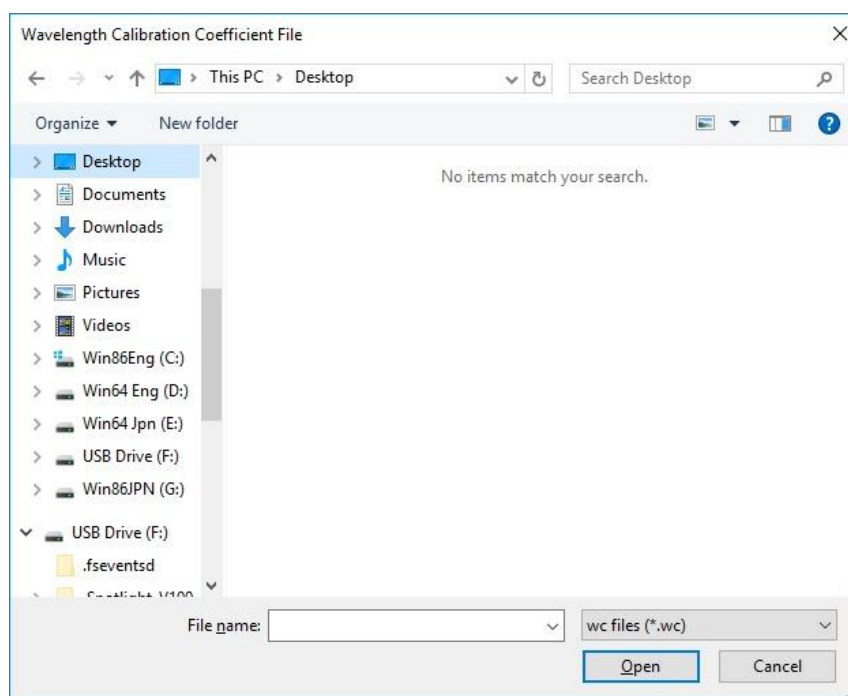
☐ Read data type

You can load wavelength calibration coefficient data files with an extension ".wc" that contain with the evaluation software

☐ Read wavelength calibration coefficient

Please click 'File write' button of [\(Wavelength calibration coefficient edit screen\)](#).

The following dialog box then appears. Select the file name to be read, and click the [Open] button.



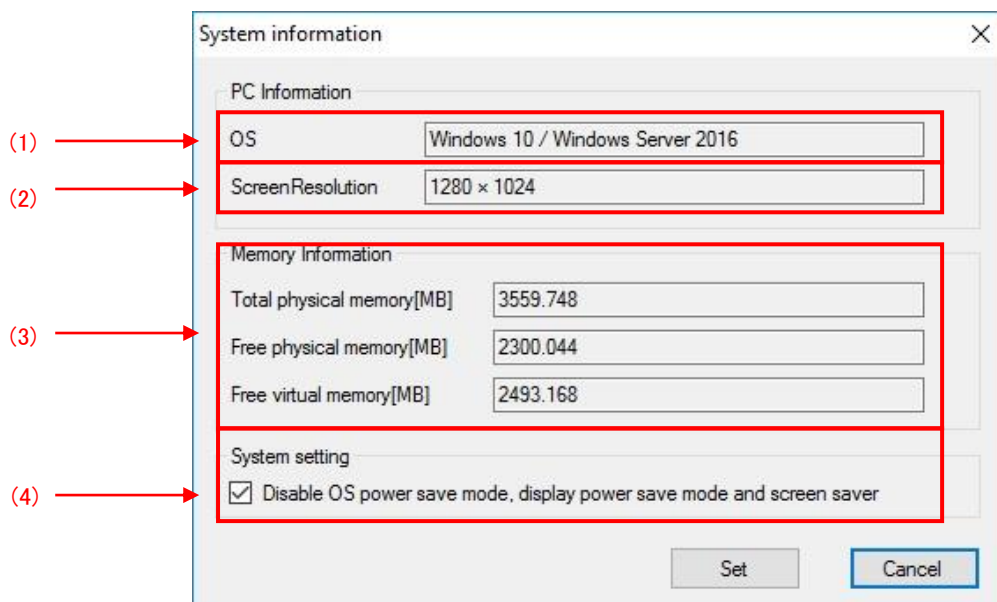
Other operations

□ Help

Help displays PC system information and settings, software version of driven spectrometer.

System information and settings

Please click  of [Main Toolbar] or select [Help]→[System information/settings] from main menu of main screen. It will show System information and settings screen.



[System information of displayed PC]

(1) OS

Version of OS(Operation system)is displayed.

(2)Resolution

Displays currently set resolution of monitor.

For this evaluation software XGA(1024×768) or more is recommended.

(3)Memory

Physical memory implementation

This shows actual loaded memory to PC.

Free space of physical memory

This shows available free space of physical memory.

Virtual memory space

This shows available free space of virtual memory.

[You can set the PC setting]

(4) Disable power save mode

Disable power save mode, screen saver mode and monitor power save mode

Select this check box when you want to disable the power save mode of the PC.

Selecting this check box disables the power scheme settings you made in the "Power

Options Properties" dialog box that appears by clicking "Start" > "Control Panel" >

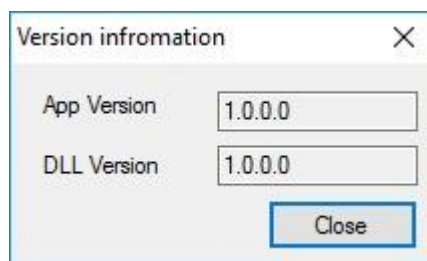
"Power Options".

When PC power save mode is activated, the power to the USB port might be interrupted depending on the PC model. This will cause errors in the mini-spectrometer operation since it operates from the USB bus power. In particular, if using a laptop PC to continuously operate the mini-spectrometer, select the above check boxes as needed to enable the power save modes.

The power scheme settings and power supply method to the USB differ depending on the PC model. Refer to the PC user manual to verify them.

□ Version Information

Please check  of [Main Toolbar] or select [Help]→[Version Information...] from main menu of main screen. Screen will be displayed as shown below.



The information displayed is as below:

[App Version]	Software version of mini spectrometer.
[DLL Version]	DLL version of mini spectrometer.

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Release Notes

Revision date	Revision	Revision details
October, 2017	-	First issue
December 10, 2025	A	Addition of Chinese text to the caution/warning notice

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