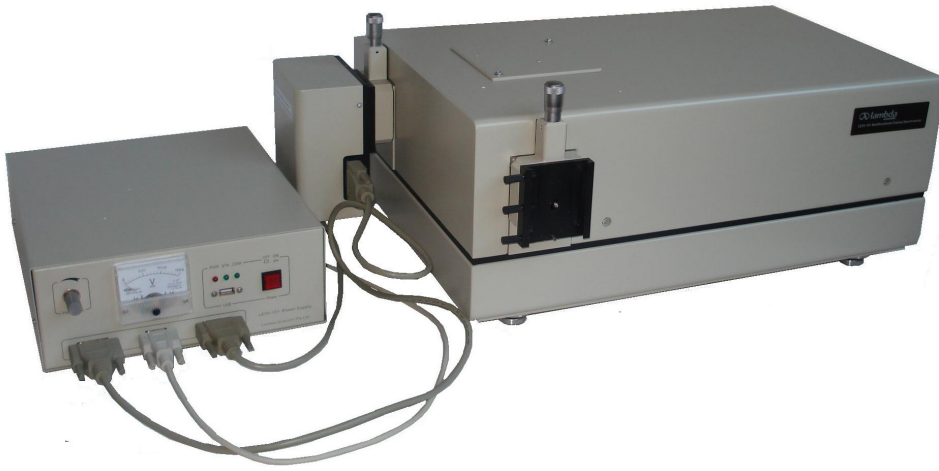


LEOI-101 Modular Multifunctional Grating Spectrometer

Instruction Manual



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1. Safety and General Information

1.1 Safety

Read the following before installing and using the instrument and its accessories. The grating spectrometer should be operated by appropriate laboratory technicians.

1.2 General

The grating spectrometer described in this manual is designed to be used by properly trained personnel in a suitably equipped laboratory. For the correct and safe use of this grating spectrometer, it is essential that laboratory personnel follow generally accepted safety procedures in addition to the safety precautions called for in this manual.

The covers on this instrument may be removed for servicing. However, the inside of the power supply unit is a hazardous area and its cover should not be removed under any circumstances.

1.3 Electrical

Before switching on the grating spectrometer, make sure it is set to the voltage of the local power supply.

The power cord shall be inserted in a socket provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor.

1.4 Warning

Any interruption of the protective conductor inside or outside the grating spectrometer or disconnection of the protective earth terminal is likely to make grating spectrometer dangerous. Intentional interruption is prohibited.

Whenever it is likely that the protection has been impaired, the grating spectrometer shall be made inoperative and be secured against any unintended operation.

1.5 Performance

To ensure that the instrument is working within its specification, especially when making measurements of an important nature; carry out performance checks with particular reference to wavelength and absorbance accuracy. Performance checks are detailed in this manual.

1.6 Radio Interference

For compliance with the EMC standards referred to in the EC Declaration of Conformity, it is necessary that only shielded cables supplied by Lambda Scientific are used when connecting the instrument to computers and accessories.

2. Working Principle and Specifications

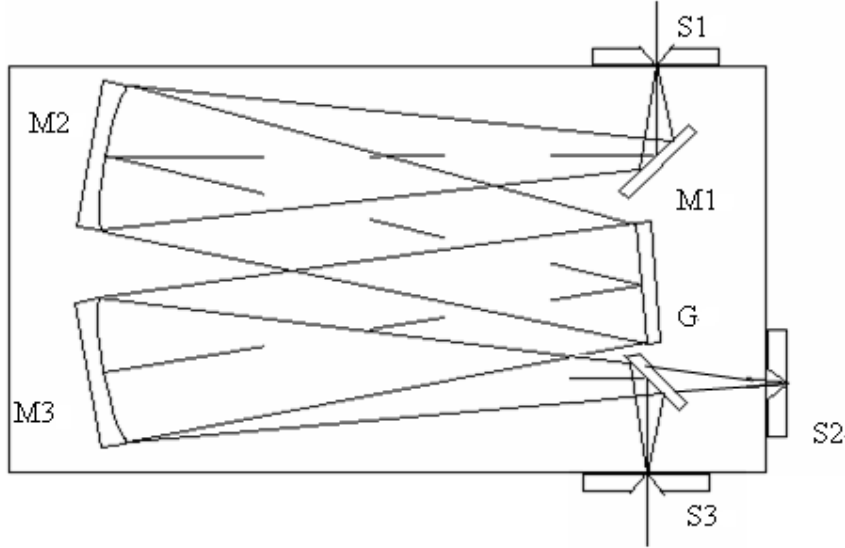


Diagram of the optical system

M₁, M₂, M₃: Mirrors

G: Grating

S₁: Entrance slit

S₂: Exit slit to PMT

S₃: Exit slit to CCD

LEOI-101 Multifunctional Grating Spectrometer consists of a grating monochromator, receiving unit, scanning system, electronic amplifier, A/D collecting unit, and computer. It integrates optics, precision mechanics, electronics, and computer technology. The above figure illustrates the C-T type optical system in the spectrometer

Both of the entrance and exit slits are vertical slits. The continuous adjustment slit width ranges from 0 ~ 2mm. The light emitted from a light source enters the entrance slit S₁. The slit S₁ is situated exactly in the focus plane of reflecting mirror M₂. The light passes through the slit S₁ becomes parallel light beam by mirror M₂, then, travels to the grating G, The parallel diffracted light beam is focused to slit S₂ or S₃ to form the image.

Note: a mirror mounted on a mechanical switch is used to redirect the light to Exit slit S₃, turn the switch to select desired exit slit.

Specifications

Monochromator	
Focal length	500 mm
Wavelength range	200 ~ 800 nm
Relative aperture	D/F = 1/7
Grating	2400 lines/mm blazed at 250 nm
Stray light	$\leq 10^{-3}$
Resolution	≤ 0.06 nm
Filter:	white 320 ~ 500 nm, yellow 500 ~ 800 nm
PMT	
Wavelength range	200 ~ 660 nm
Wavelength accuracy	± 0.2 nm
Wave length repeatability	± 0.1 nm
CCD	
Receiver cell	2048
Wavelength range	300 ~ 660 nm
Integral time	88 steps
Weight	25 kg

3.Unpacking and Installation

3.1 Packing List

Item#	Description	Qty
1	LEOI-101 Multifunctional Grating Monochromator	1
2	Power supply (or called power box)	1
3	CCD (installed with monochromator)	1
4	PMT Unit	1
5	USB cable	1
6	Filter plate	1
7	Power cord	1
8	Motor cable	1
9	Signal cable	2
10	Software (electronic version to be sent)	1
11	Instruction manual (electronic version to be sent)	1

3.2 Connecting the Instrument

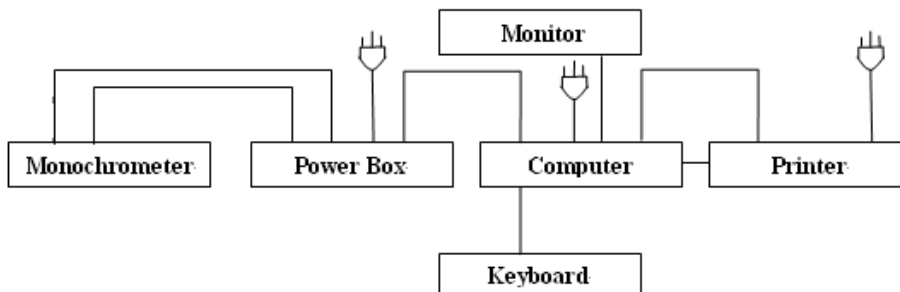
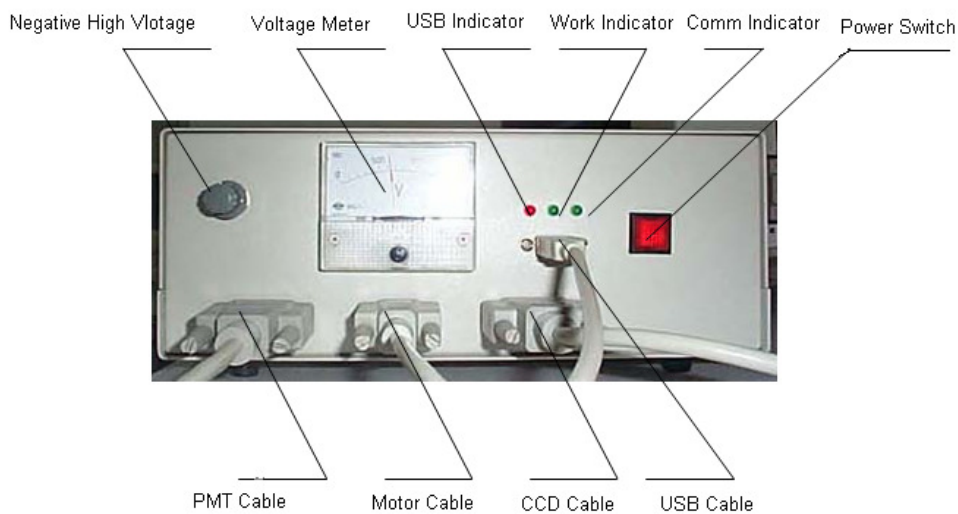
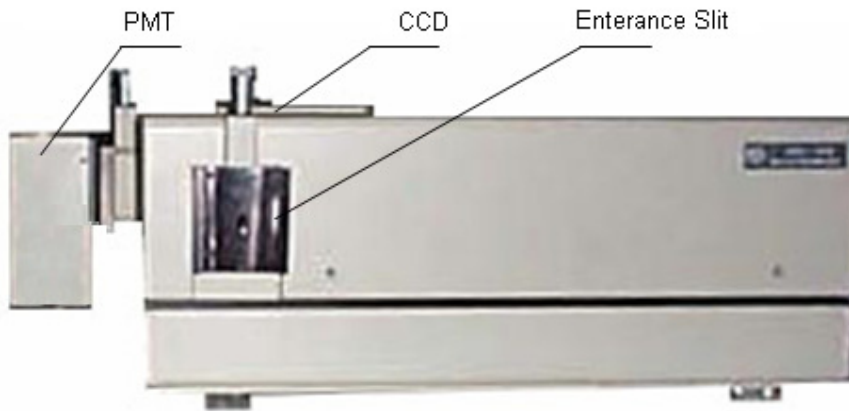
After carefully unpacking the contents, check the materials with the packing list to ensure that you have received everything in good condition.

Place the instrument in a suitable location away from direct sunlight. In order to gain the best performance from the instrument, keep it as far as possible from any strong magnetic or electrical fields or any electrical device that may generate high-frequency fields. Set up the

unit in an area that is free of dust, corrosive gases and strong vibrations.

Step 1: Use the appropriate power cord and plug into a grounded outlet.

Step 2: Refer to the following pictures and connect the instrument to a computer.



Step 3: Carefully check the connections before plug in the power source.

Step 4: Adjust the slits. The slit width will increase with clockwise adjustment of the

micrometer, and decrease with the anticlockwise adjustment of the micrometer. The slit width changes 0.5 mm from one complete turn. In order to extend the life of the slit, it is recommended that the slit width is smaller than 2 mm. The best width of the slit is remaining in the range of 0.1-0.5 mm when the instrument is not in use.

Step 5 (advanced and optional): There are two filters on the filter plate provided with the instrument, which include white filter: 320-500 nm and yellow filter: 500-660 nm. To further reduce spectral background by eliminating higher order spectrum in the measurement, the filter plate can be inserted into the slot on the side of entrance slit mount. To determine whether or not to use the plate and which filter to be used, it depends on the current parameter setting of spectral scanning range. Note, only the scanning range is totally covered by either of the two filters, the corresponding filter can be used. Otherwise, the two filters should not be used. The user can use own filters to match a required scanning ranges.

3.3 Installing the Software

3.3.1 Minimum Computer Requirements

The Windows application software runs on a PC (personal computer).

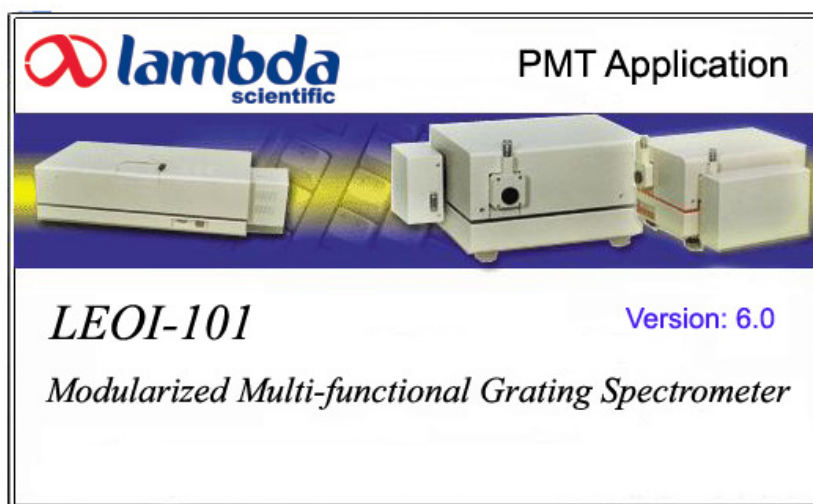
The minimum computer requirements are below

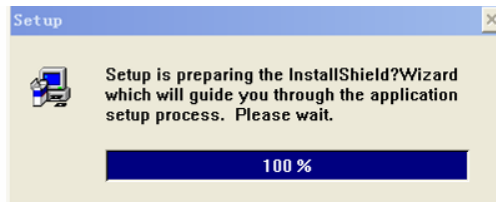
- Pentium processor with Microsoft Windows 95/Me/2000/XP
- CD-ROM drive (if installing program from CD)
- USB port

NOTE: The software won't work with a Macintosh/Apple computer.

3.3.2 Installing the Software

The software contains an installation wizard to help you install the software on your PC. Place software CD into the CD drive (if software sent electronically, copy all related files onto local computer). Open the folder of "LEOI-101 Application," double-click the icon of Setup.exe, a window is displayed.

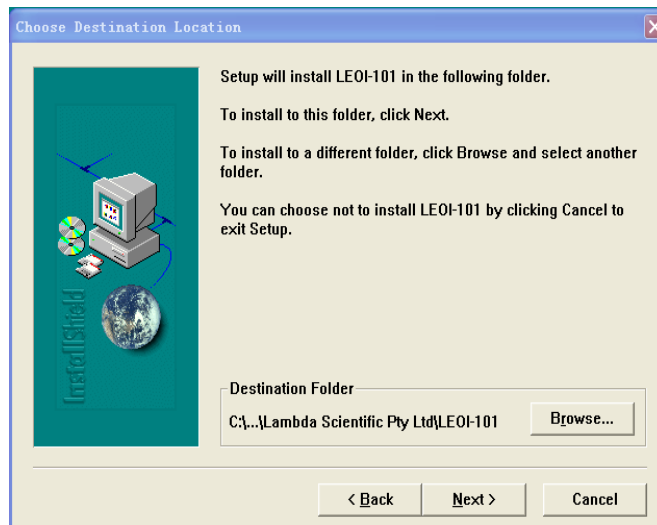




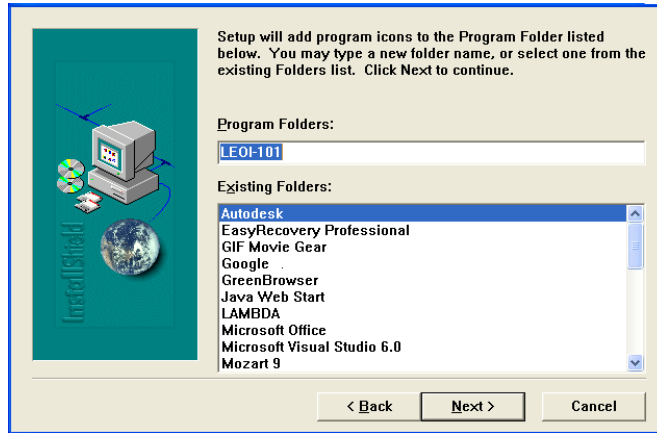
Another window is displayed.



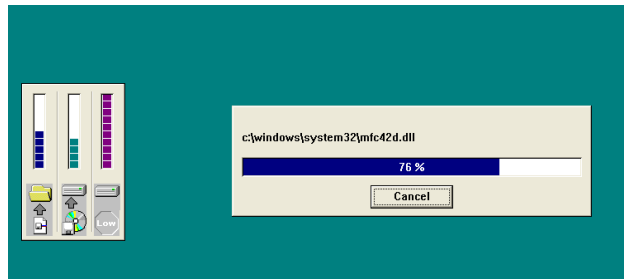
Click Next, the below window below is displayed.



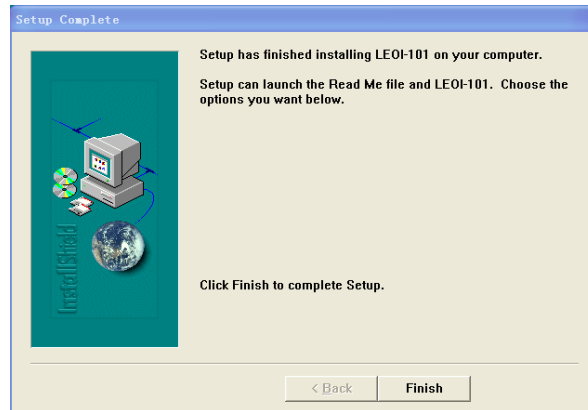
Click Browse, the program can be installed in different directory. Click Next, the set up begins.



Using the default setting, click Next; the program is being copied into the computer.



A window appears after the copying process:



Click Finish to complete and exit setup. The software now is installed successfully to the computer. A shortcut can be seen on desktop. The program can also be opened through Start->All Programs->LEOI-101 CCD or LEOI-101 PMT.

3.4 Installation of the USB driver

Step 1: Connect the instrument and computer by using a USB cable.

Step 2: Turn on the instrument, then, a new hardware USB driver installation wizard appears.

Step 3: Select the directory where the USB driver is located, e.g. X:\USB-DRIVER, follow

the instructions. The driver will be installed.

4. Using the PMT Application

4.1 Start the Software

Note:

While powered, the PMT detector must not be exposed to intense light to prevent its destruction. Never detach the PMT box from the main machine when the power is on. Always check Entrance/Exit slit widths and light source intensity prior to using the PMT Application and avoid too intense light illuminating on the PMT, starting with relatively narrow slits.

Run program from Start->All Programs->LEOI-101 PMT or double click the application on the desktop

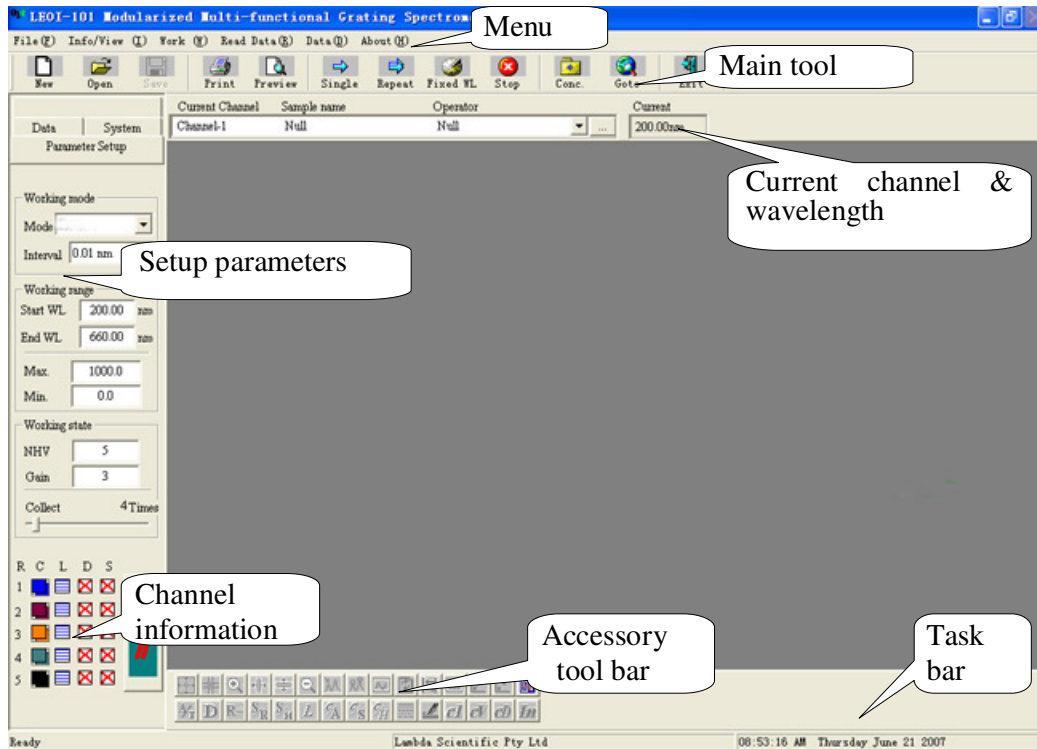
A startup screen pops up together with the main interface of the application.

Note:














Please wait while the instrument is initializing. If the application fails, please power off the instrument and the program, then restart the instrument and software. Always start the instrument before starting the application.































After initialization, you can now use the application. The main areas of the window are:



Function of menu items and toolbar

Main Menu	Sub Menu	Tool	Application
File	New		Start a new data file
	Open		Open a previously saved data file
	Save		Save data in selected channel
	Print setup		Change printer and printing options
	Print preview		Display full pages
	Print		Print current spectrum
	Exit		Exit current application
Info/View	Input information		Input user information and sample name, etc.
	Show grid		Shows gridlines
	Enhanced data points		Enhanced display of data points
	Data point		Display data points only
	Dynamic mode		Fit the coordinates while collect data
Work	Single scan		Scan from start to end of set range
	Repeat scan		Repeat scan for set number of times
	Fixed WL scan		Collect data at fixed wavelength with time as horizontal axis

	Stop		Stop scan
	Fixed point test		Measure different samples at fixed wavelength
	Concentration		Measure the concentration of samples
	Goto		Go to a desired wavelength
Read Data	Read data		Readout data on spectral lines
			Read data anywhere, on or off spectral lines
	Zoom		Zoom in on spectrum
			Horizontal zoom in on spectrum
			Vertical zoom in on spectrum
	Undo Zoom		Cancel all zoom
	Find Peak		Auto search peak and valley
			Auto search peak and valley and further select manually
	Show		Display spectrum according to the settings
	Refresh		Refresh the screen
	Left axis/Right axis		Exchange coordinates when two coordinates displayed
	Modify wavelength		Modify wavelength
Data	A/T (E)		Perform A/T conversion on selected spectrum
	Differential		Perform differential on selected spectrum
	Calculate		Perform arithmetic on selected spectrum
	Smooth		Smooth selected spectrum
			Smooth spectra manually selected on the screen
	Link spectra		Connect 2 or 3 selected spectra
	Data Interval		Change data interval
	Coordinate Setting		Change display range
	Modify Info		Modify data gathering parameters and other information
	Modify data		Modify data
	Line color		Change line color of selected spectrum
	Line type		Change line type of selected spectrum

	Clear data		Clear data in all channels
			Clear data in selected channels
			Clear spectra data manually selected on the screen
About	About application		Show software version and copyright

4.2 Introduction of the Functions

4.2.1 Basic Settings

At the center left of the application is Data, System, Parameter setup.

4.2.1.1 Parameter Setup

Set formats of collected data: Energy (E), %T, Abs, Baseline (E)

Set scan interval, 1.00 nm, 0.50 nm, 0.10 nm, 0.05 nm, 0.02 nm, and 0.01 nm available.

Set scan range, start and end wavelength, max and min value of intensity display.

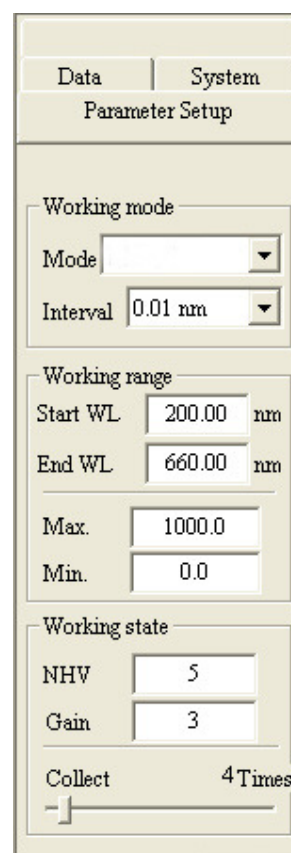
Note:

The upper and lower limits of intensity will not work in dynamic mode.

Set Negative High Voltage: This function has been replaced by a knob on the front panel of power controller. Turn the knob to set a proper value (e.g. 500) prior to run a spectral scanning.

Set Gain: Set the gain of the amplifier, eight steps available.

Set Collect (Average) Times: Set number of scans and get mean value.



4.2.1.2 System setup

Clear Modify: To set the modified wavelength back to zero.

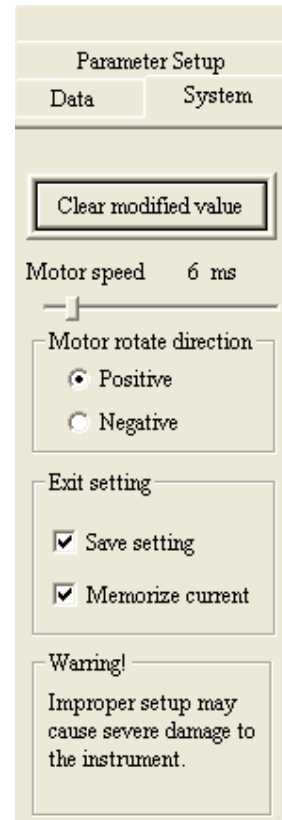
Motor speed: To set motor speed from 1 ~ 50 ms

Motor Direction: Set rotation direction of the motor.

Save current settings: Select this, the settings will be stored and import when reboot the application again.

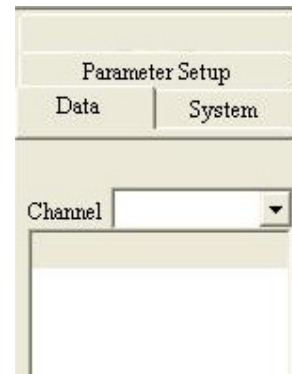
Save current wavelength: Select this, system will store current wavelength and import when reboot the application again. The application will initialize the instrument after start up if this item is not selected.

Note: The setup cannot continue without a password.
Password is not provided when not necessary. Improper setup may cause severe damage to the instrument.



4.2.1.3 Show the data in the channel

Select one channel from the pull down channel list to display the data in this channel.



4.2.2 Channel Information











R: channel 1, 2, 3, 4, and 5.


C: Color of channel


L: Line type of channel

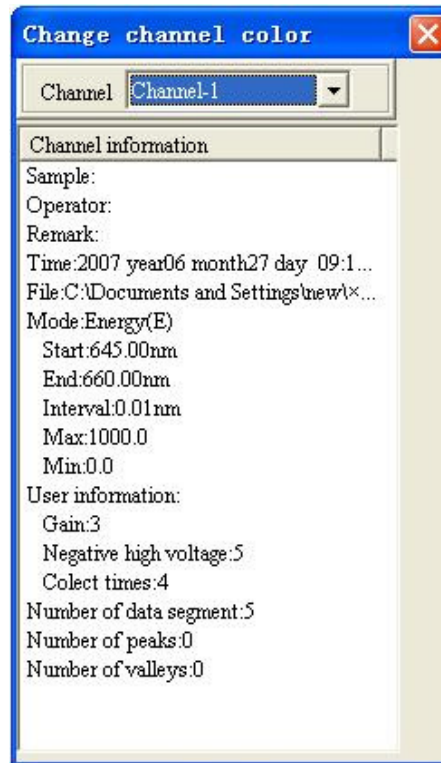
D: Data exists in the channel, no data in the channel

S: Spectrum in the channel is currently displayed or not.

R	C	L	D	S
1			<input type="checkbox"/>	<input type="checkbox"/>
2			<input type="checkbox"/>	<input type="checkbox"/>
3			<input type="checkbox"/>	<input type="checkbox"/>
4			<input type="checkbox"/>	<input type="checkbox"/>
5			<input type="checkbox"/>	<input type="checkbox"/>

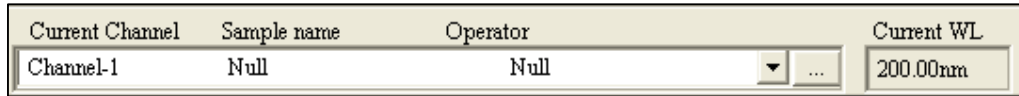


Click  a box is displayed →



4.2.3 Current Channel

Allow user to select current channel from pull down list. The right button next to it can be used to change channel information. See detail in section 4.2.6.1. System will inspect the moving of the wavelength, and display current wavelength.



4.2.4 File Management

4.2.4.1 Clear all current experiment data


Pull down menu: File→New

Toolbar: Main Toolbar→ 

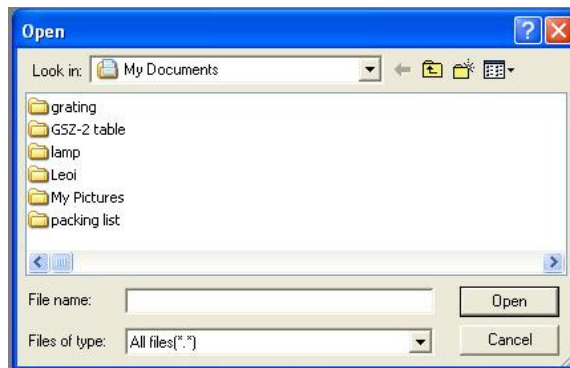
Clear all experimental data and create a new file.

4.2.4.2 Open exist data file

Pull down menu: File→Open

Main Toolbar→ 

An Open dialog box is displayed.



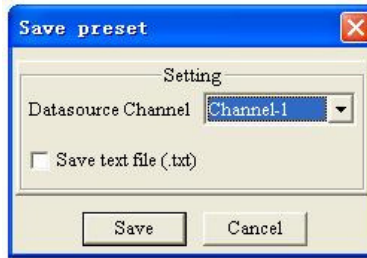
Click down arrow button to locate the data file. Select the type from the File type pull down list. If a certain data file should be opened, input the desired file name in the File name box, and click Open. Click the Cancel button to close the dialog box.

4.2.4.3 Save current data file

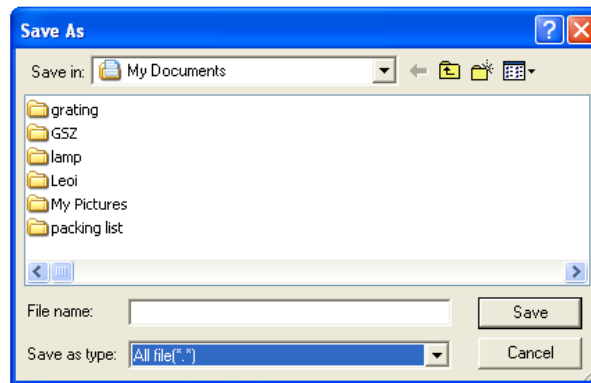
Pull down menu: File→Save

Main Toolbar→ 

A Save Preset dialog is displayed.



Select a channel in which data will be stored from Source channel list and data. Click Save text file to save the text file as well. Press Enter on the computer keyboard or click Save button, a Save as dialog is displayed.



Click the arrow button at the top of the dialog to select the channel to save the file. From the File type pull down list, select the type of the file to be saved. Type in the data file name to be saved to the File name edit box, click Enter key or Save button.

Note

If Save text file is selected in the Save Preset dialog, txt file will be saved as well. Text file can be recognized by the MATHCAD and so on data processing software's, and stored in double formats.

The data and experiment parameters are saved in one format file. The default file extension is *.g8a.

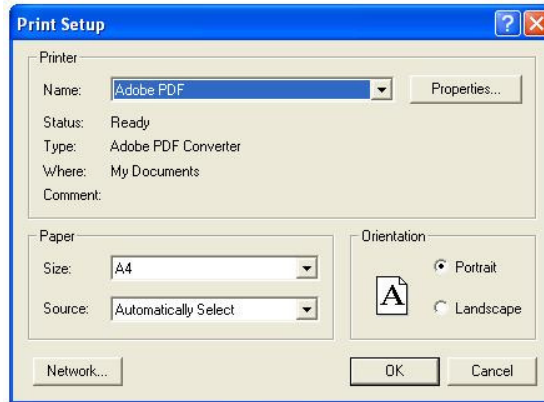
4.2.5 Print

4.2.5.1 Set up the properties and parameters of the printer

Pull down menu: File→Printer setup

Main Toolbar→

A Print Setup dialog is displayed.



From the Print setup dialog box, click Name in the Printer list to select current printer. Select paper Size, Source. From Orientation select Landscape. Click OK to save the above settings.

Note:

Landscape shall be selected for better printout.

The software will go back to default settings after reboot.

4.2.5.2 *Print preview*

Pull down menu: File→Print preview

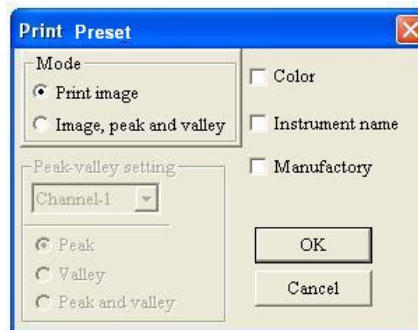
Main Toolbar→ 

Display the actual effect of the printout. Please see Printout in the section of 5.2.5.3.

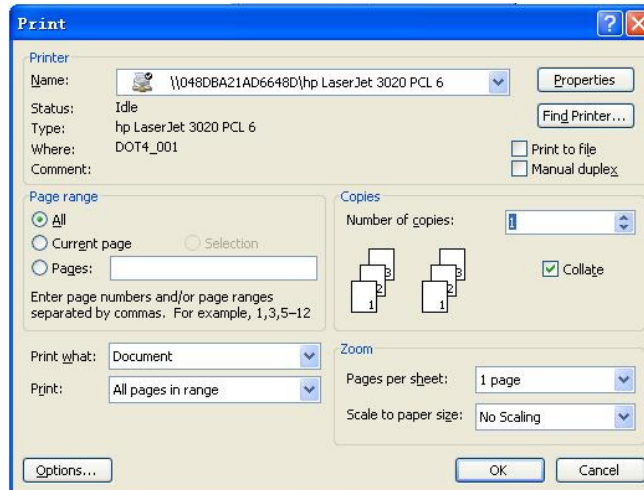
4.2.5.3 *Printout*

Pull down menu: File→Print

A Print preset dialog is displayed.



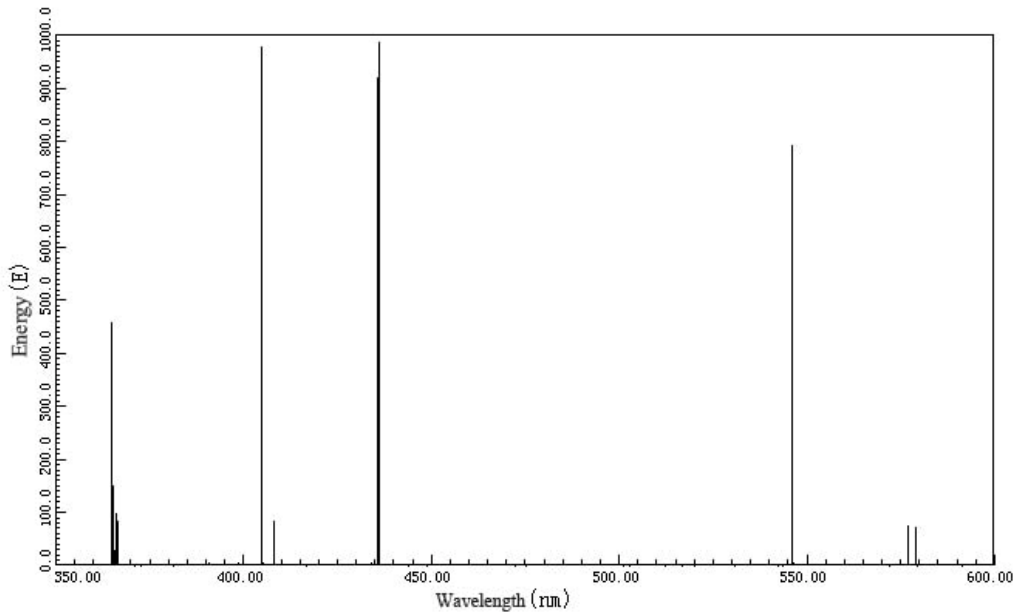
User is allowed to Print image or print the image with the peaks and valleys marked by select in print mode. Select color to print color spectrum or not for black & white spectrum. Select whether or not to print the name of the instrument and manufacturer. Click the OK, a Print dialog box is displayed.



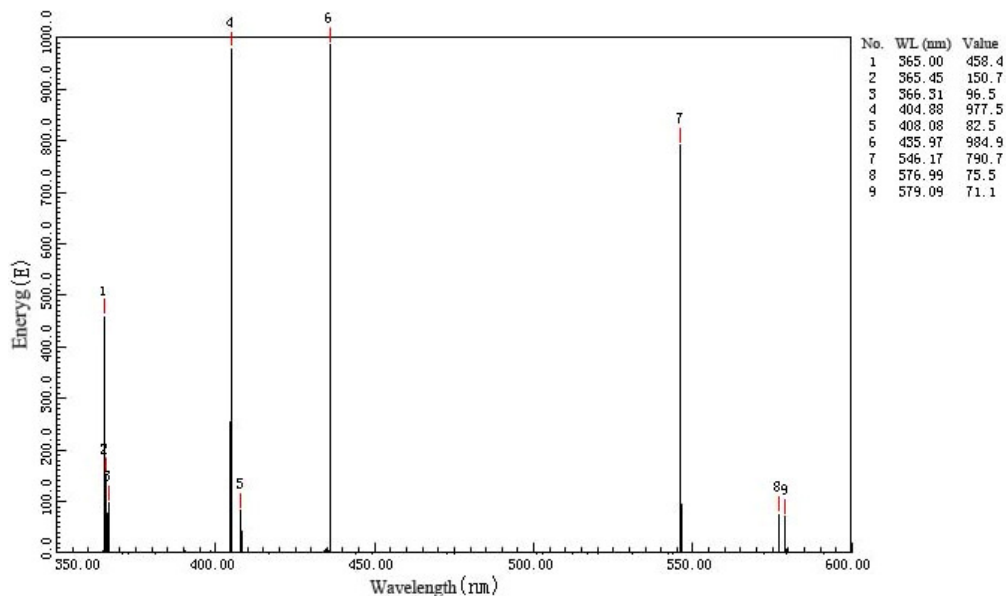
From Print area pane, Select All to print all pages or select individual pages to print. Click OK.

Note: Power on the printer prior to printing.

The following two figures are the printout of image and image with peaks and valleys marked.



Print out image



Print out with the peak and valley values

4.2.6 Info/View

4.2.6.1 Collecting information

Pull down menu: Info/View→Input info

A user information box is displayed.

Select a desired channel from Channel list. Type the Sample name, User, Remark. Then click Close button to save info entered. The info appears on the top of the workspace. If you want to revise the info, click the button at the right of the info list.

4.2.6.2 Show the gridding

Pull down menu: Info/Image→Show grid

Supplement Toolbar→

Gridlines will be showed in the workspace. The height and the width of the gridlines will be adjusted automatically along with the changing of the X, Y axis's. (The grid always coincidence with integer value.)

Reselect the item from Info/Image to hide gridlines.

4.2.6.3 Enhanced data points

Pull down menu: Info/View→Enhanced data points

Supplement Toolbar→

A circle is appeared around the data points of a spectrum. This function will be canceled when the command is reselected.

4.2.6.4 Display data points only

Pull down menu: Info/View →Data point

Supplement Toolbar→

All data points are circled with no line link these points. Reselect the command to exit this mode.

4.2.6.5 Dynamic mode

Pull down menu: Info/View→Dynamic mode

Supplement Toolbar→

In this mode, the changing of the coordinate axes will automatically fit the collected data during the scan process.


Redo the operation will exit this mode.

4.2.7 Work

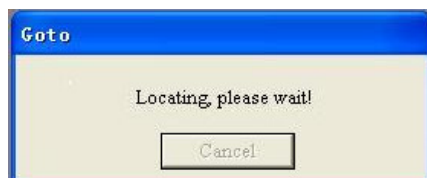
Monochromator

4.2.7.1 Single Scan

Pull down menu: Work→Single Scan

Main Toolbar→

If current wavelength is not in the range set, a wavelength goto box appears.



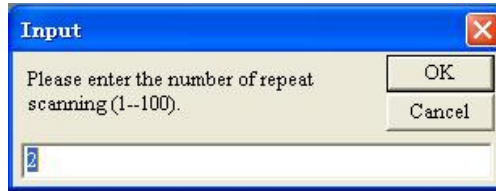
The grating is going to the start wavelength, and scan from this point. Click Cancel to cancel this scan. If current wavelength is already within the scan range, the system will continue scan from current point.

4.2.7.2 Multi-scan

Pull down menu: Work→Multiscan

Main Toolbar→

An Input box is displayed.




Input the required scan times (1~100) . Then click OK, the software will send command to scan for set number of times.

Note:
Only last scan data will be saved

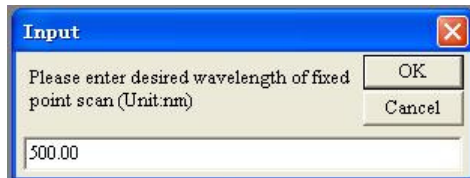
4.2.7.3 *Fixed*

wavelength scan

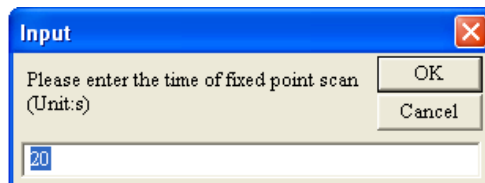
Pull down menu: Work→Fixed wavelength

Main Toolbar→

An Input dialog box is displayed.



Type the desired wavelength in the editing box. Then click OK button, another Input dialog is displayed.



Type the length of the fixed wavelength scan time. Click OK.

4.2.7.4 *Stop*

Pull down menu: Work→Stop

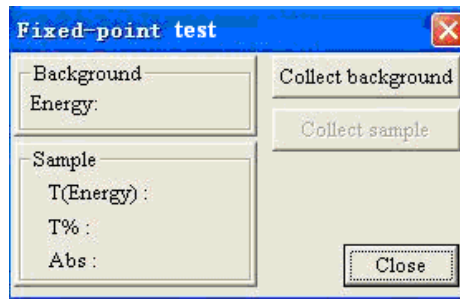
Main Toolbar→

Current scan will be terminated.

4.2.7.5 *Fixed point test*

Pull down menu: Work→Fixed point test

A Fixed point test dialog box is displayed.



Before testing the samples, place the background sample in the sample compartment or nothing as the background. Click Collect background, the background energy will be tested and saved.

Place sample to the sample compartment. Click Collect sample, the instrument will test the sample, calculate the data, then show the E, %T, Abs in the information area.

Repeat above procedure to test another sample (Repeat the two steps above to test sample with the background information) .


Click Close button to exit fixed point test.

4.2.7.6 Concentration

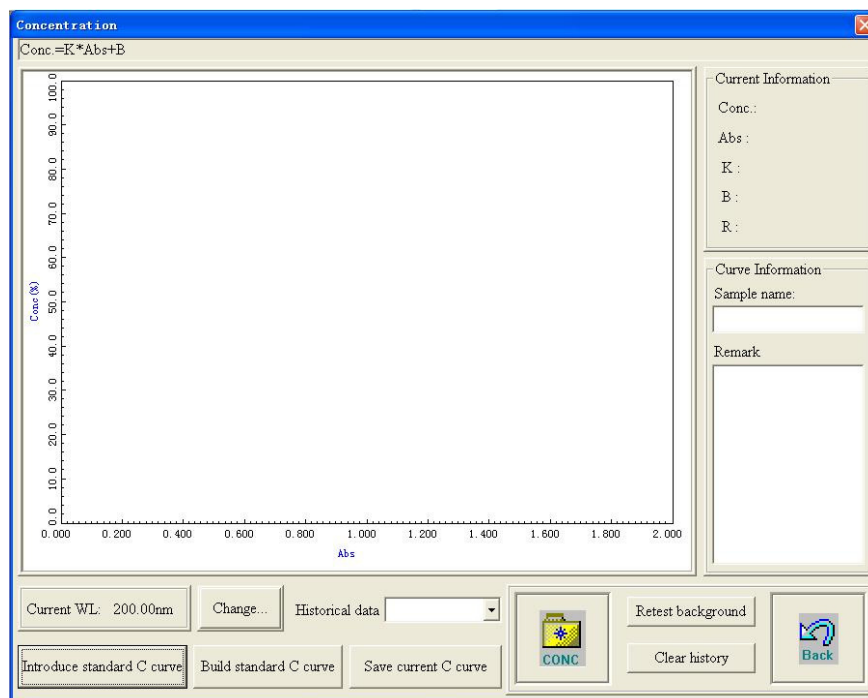
General step of concentration test:

1. Introduce or create a standard concentration curve.
2. When a standard curve is imported, retest background energy.
3. Test unknown samples.

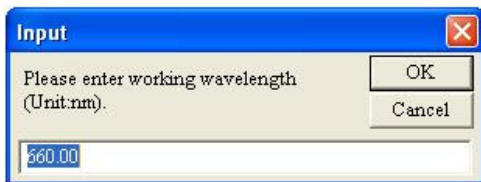
Pull down menu: Work→Conc.

Main Toolbar→

A Concentration window is displayed.



Current collection position displays current wavelength position. User is allowed to change it by clicking Change. An Input dialog is displayed.



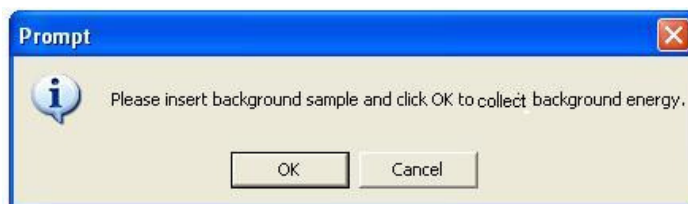
Type in desired wavelength in the edit box. Click OK and the instrument will search and go to desired wavelength position. Click Cancel button, current wavelength will not be changed.

History data list: Store individual collection data listed in testing order.

Curve info pane: Name and remarks can be modified and displayed. This information will be automatically linked with the concentration curve. When the curve is saved, this information will be saved as well.

Retest background: Test the background again. Further tests will use this test result thereafter.

Click Retest background, a box is appeared.

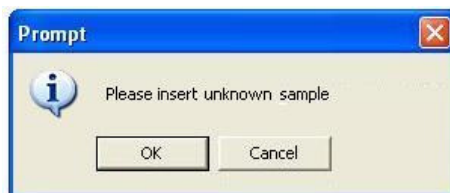


Click OK, test the background again. Click Cancel to skip the background test and return.

Clear history: Empty History data list, or clear current record from History data list.

Concentration: Test the concentration of the sample to be tested.

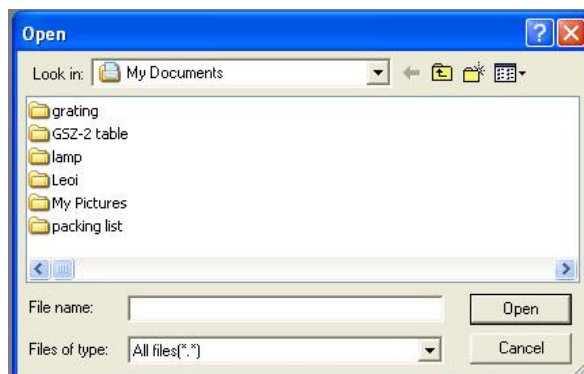
A prompt is displayed.



Click OK, the instrument will automatically test, calculate and display the concentration, absorption in the current point information area. The information will be added to history data.

Introduce Standard concentration curve: Click to introduce standard curve and use it to measure the concentration of unknown sample.

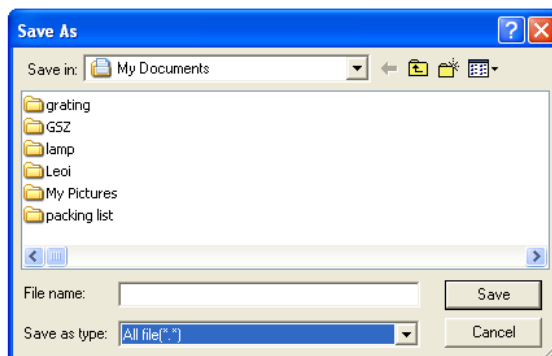
Click **Introduce standard C curve**, a dialog is displayed.



Locate desired curve and click Open.

Save current C curve

Is for saving current C curve for further use. Click the button, a dialog box appears.



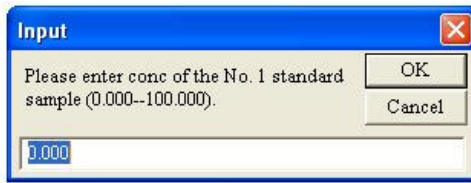
Name current file and select file type and location, then click Save.

Build standard C curve

Is for create a new C curve. This action will delete the originally stored standard curve in the system. Step 1: Click the button, a box appears.

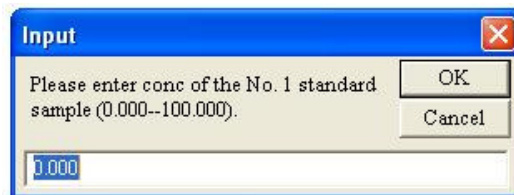


Click OK to collect background or Cancel to exit. If OK is selected, a dialog is displayed.



Step 2: Insert sample and Click OK to measure the absorption. Click Cancel to stop the test and go to step V.

Step 3: An Input dialog is displayed. Type the concentration of the standard sample, and click OK, the spectrometer will record this data point and add it to history data. And mark it in the image area at the same time. Click Cancel, and then go to step V.



Step 4: Repeat step 2 and step 3 for other samples of different concentration.

Step 5: Fit a curve according to test result of above operation. The curve and its information are displayed.

Note

The introduction of standard concentration curve and create standard concentration curve will clear all history data.

Create standard concentration curve need at least two measured concentration values.

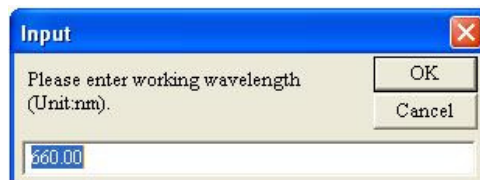
K: Slope, B: Cut; R:

4.2.7.7 Wavelength search

Pull down menu: Work→Goto

MainToolbar→

A dialog box is displayed. Type the data in the editing box, then click OK button. A box is displayed.



As soon as the box disappear automatically, current wavelength move to the place where user typed in.



4.2.7.8 Re-initialization

Pull down menu: Work→Re-initialization

4.2.8 Read Data

4.2.8.1 Read data

1. Read spectral data

Pull down menu: Read data→Read data→Spectral data

Supplement Toolbar→

In the workspace, the cursor shape changes to .

Left click the mouse in the workspace, the system will let the cursor go to the data point of the spectrum which is near the horizontal coordinate axis, and display the information of this data point in the value box.

Left click the mouse in different places, different data point information can be read. The two keys of←, → can also be used to move the cursor and get the data information. Click right button of the mouse will leave the read mode.


Note:


Using the two ←, → keys can only move the cursor to next data point.

When multi spectrum curves are shown, the closest data point to the vertical and horizontal axes will be displayed.

2. Read data anywhere

Pull down menu: Read data→Read data→data anywhere


Supplement Toolbar→

When the cursor falls into workspace, the shape of it changes to . Left click the mouse on any point in the workspace; there will be information of this point showed in the box. Using the←, →, ↑, ↓keys can also move the cursor and read information. Right click the mouse will cause exit the reading mode.


4.2.8.2 Zooming

1. Zooming in

Pull down menu: Read data→Zoom in

Supplement Toolbar→

Execute this command, the cursor moves to the center of the workspace, and the cursor shape


becomes . A red color crosshair runs through the workspace. It takes the cross of the cursor + as the center. This center has its information displayed in the readout box.

Move the cursor, the red crosshair fork also move along with the cursor. Click the mouse to select the zoom region.

2. Horizontal Zooming

Pull down menu: Read data→Zoom in→Horizontal

Supplement Toolbar→

The cursor automatically moves to the center of the workspace changes to . Click the mouse to select zoom region.

3. Vertical zooming

Pull down menu: Read data→Zoom in→Vertical

Supplement Toolbar→

The operation is similar to horizontal zoom. Please refer to above description.

4.2.8.3 Undo zoom

Pull down menu: Read data→Undo zoom

Supplement Toolbar→

Execute this command, Cancel all zooming operations.

4.2.8.4 Find Peak

1. Auto peak search

Pull down menu: Read data→Find peak→Auto peak

Supplement Toolbar→

A dialog box is displayed.

The peaks that are found are determined by criteria's that you specify.

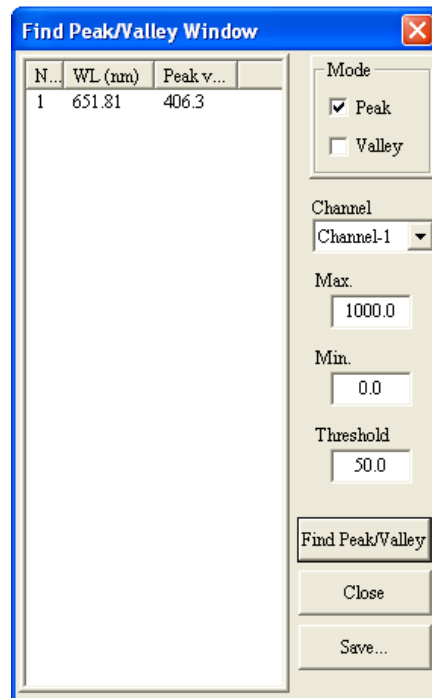
Click Search, the software will automatically find peaks and valley, and display the values of the peaks and valley's in the left list pane of the dialog box. Click Close button, the search peak dialog box will be closed, and go back to the main interface.

2. Semi auto peak search

Pull down menu: Read data→Find peak→Semiauto peak

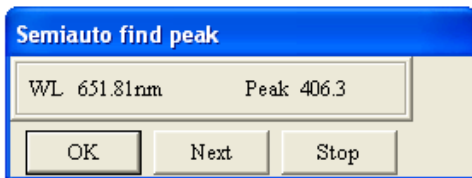
Supplement Toolbar→

A dialog box is displayed. Specify criteria's and click Search. The system will automatically



search the peaks and valleys according to the settings. After this procedure, the software asks the user to confirm every peak any valley.

In the workspace, a flash red circle mark at the peak/valley position, a dialog box is displayed at the top of the interface at the same time.



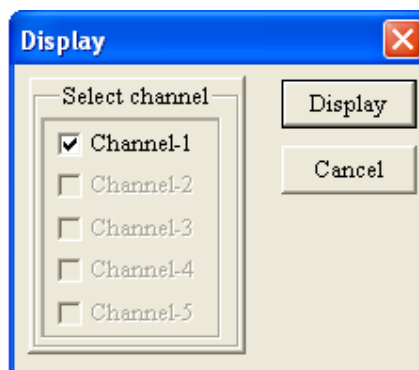
Click OK to confirm the value at this point. Click Next to ignore this point and move to the next. Click Cancel, then confirm and exit the operation.

4.2.8.5 Display

Pull down menu: Data processing→Display

Supplement Toolbar→

A dialog box is displayed.



In the left pane of select channel, only the channel that has data stored can be selected.

Click View, the spectrum of the selected channel will be displayed in the workspace. Click Cancel, the dialog box will be closed with no modification to current channel.

4.2.8.6 Refresh

Pull down menu: Read data→Refresh

Supplement Toolbar→

Execute this command to refresh the screen and redraw spectra.

4.2.8.7 Exchange of the left and right axis

Pull down menu: Read data→Left axis/right axis

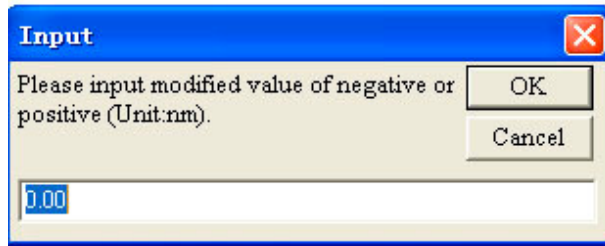
Supplement Toolbar→

When two different mode spectra displayed in the same screen at the same time, two mode scales will be shown on the left and right side of the workspace, using Left axis/right axis to change the two axes.

4.2.8.8 Modify wavelength

Pull down menu: Read data→Modify wavelength

A dialog box is displayed.



Input the modified value, click OK, the software will save the modified value and make adjustment.

Note
 Please restart the application and reinitialize the instrument after setting.
 The maximum modified value should be less than ± 50 nm.

Power failure or open the application software before power on the instrument may cause the wavelength error. If so, please check the connection and restart the instrument, then the application.

4.2.9 Data

4.2.9.1 A/T conversion

Pull down menu: Data→A/T conversion

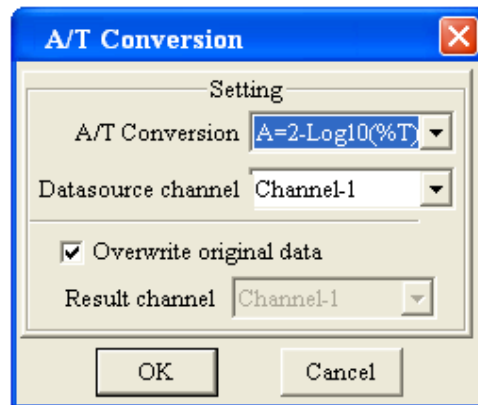
Supplement Toolbar→

A Select processing channel dialog box appears.

From the pull down list of the Source data channel, select the channel to be processed.

Select Overwrite original data or a result channel for storing result data.

Click OK, the data in the source channel is stored to the result channel and then the calculated spectrum curve is displayed in the workspace. Click Cancel to close the dialog no processing performed.



Note:
 Only %T and ABS. data can be processed.

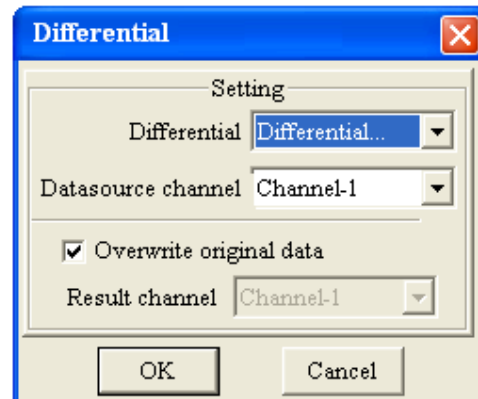
4.2.9.2 Differential

Pull down menu: Data→differential

Supplement Toolbar→

A Differential dialog is displayed.

Operation is similar to the A/T conversion, but the calculation is differential.



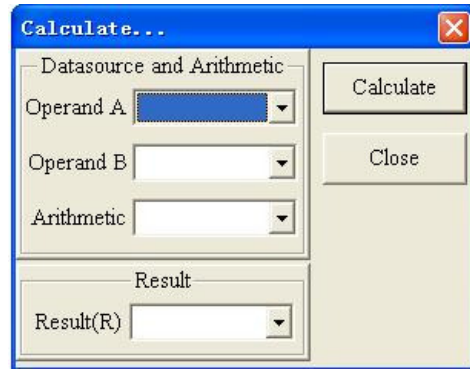
4.2.9.3 Calculations

Pull down menu: Data→Calculate

Supplement Toolbar→

A Calculate dialog box is displayed.

Select Operand A, B and Arithmetic and result channel. Click OK, results will be stored to result channel. In the mean time, the spectrum will be displayed in workspace.



4.2.9.4 Smooth

1. Smooth...

Pull down menu: Data→Smooth→Smooth selected channel

Supplement Toolbar→

A Smooth dialog box appears.

Select smooth method through the pull down list. The operation is very similar to A/T conversion.




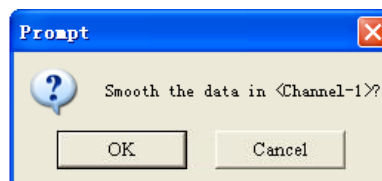
2. Smooth manual selected channel

Pull down menu: Data→Smooth→Manually selected channel

Supplement Toolbar→

A dialog box is displayed.

Select spectrum you want to smooth by clicking on the spectrum. Click OK button, the cursor changes to . Click left button of the mouse on a curve, a prompt is displayed.



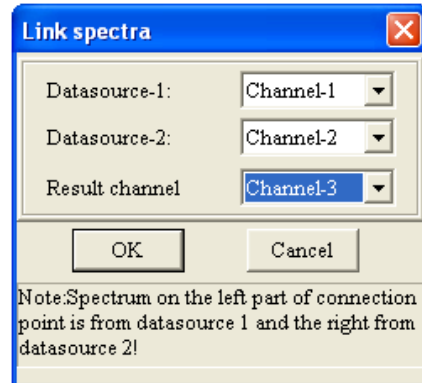
Click OK to smooth the spectrum or Cancel to reselect a spectrum.

4.2.9.5 Link curves

Pull down menu: Data→Link spectra

Supplement Toolbar→

A Link spectra dialog box is displayed.



Select the two spectra to be linked and result channel for storing linked spectra.

Click OK, the cursor moves to the center of the workspace. Using the vertex of the cursor as a benchmark, draw a vertical line through the workspace. This indicates the link point of the two spectrum

curves. Then move the mouse, the vertical line will also move along with the mouse, the corresponding coordinate's information of the cursor vertex is showing in the value pane. Move the cursor to the link point and click left button of the mouse, the two curves is linked with this point as joint position. Moreover, store the result in selected channel. At the same time, the linked curve is displayed in the workspace. Right click the mouse, the Link curves processing is canceled.

Note

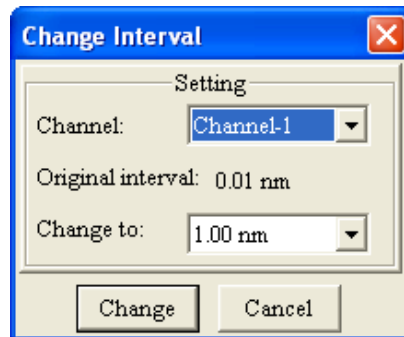
The linked curve consists of two parts, the left part of the curve from the Data source-1, while the right part of the curve from the Data source-2.

4.2.9.6 Change data interval

Pull down menu: Data→Data interval

Supplement Toolbar→

A Data interval dialog is displayed.



Select desired channel from the pull down channel list.

Original interval is displayed. After typing the desired interval in the 'change to' list, click Change.

4.2.9.7 Change variable scale

Pull down menu: Data→Coordinate Setting

Supplement Toolbar→

A Coordinate Setting dialog box is displayed.



Change variable in the editing pane, then the display area changed. Click OK button, the setting is effect. The spectrum curve will be drawn according to the new settings in the workspace.

*Star wavelength smaller than end wavelength.

Minimum value must smaller than maximum value.

4.2.9.8 Change information

Pull down menu: Data→Input information

Supplement Toolbar→

A dialog box is shown. Please refer to 5.2.6.1. for detailed operation.

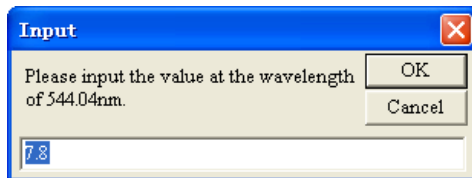
4.2.9.9 Change data

Pull down menu: Data→Change data


Supplement Toolbar→

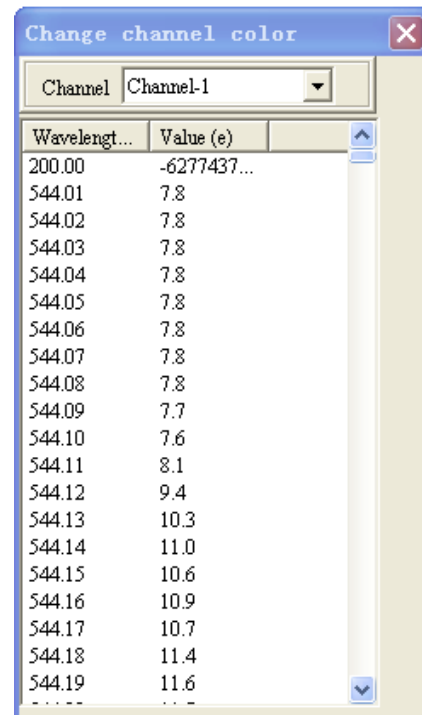
A Change data dialog is displayed.

Select a channel whose data needs to be changed from channel pull down list. The data in this channel are listed. Double click any item in the first row; an Input dialog box is displayed.



Input a new value, then Click OK. If the curve is displayed in the workspace, it will be replaced by new data.

Click  at the upper right corner of the dialog box and back to the main interface.

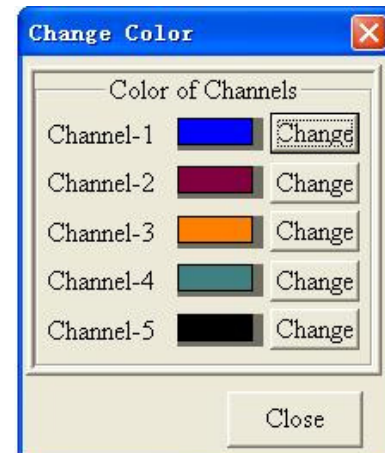


4.2.9.10 Change line color

Pull down menu: Data→Line color

Supplement Toolbar→

A Change color dialog box is displayed.



There is a curve color box after each channel. Click Change next to the right of the color box, a Color box is displayed.

Select one color from Basic color, and click OK, the color of corresponding curve stored in the channel will be changed. If the curve in the channel is viewable (Displayed in the workspace), the curve will be refreshed in new color. Click Cancel to exit Color dialog box.



4.2.9.11 Change spectral line type

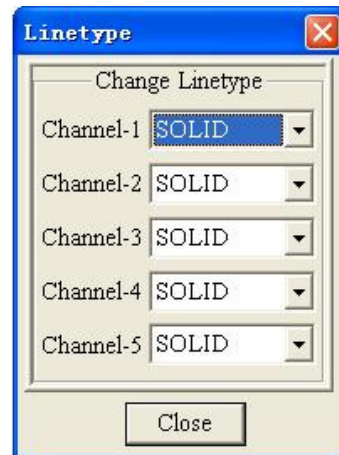
Pull down menu: Data→Line type

Supplement Toolbar→

A Line type dialog is displayed.

SOLID, DASH, DOT, DASHDOT, DASHDOTDOT available.

When user changed the line type of certain channel, the curve will be drawn again in new line type if the curve in that channel is displayed in workspace. Click Cancel to exit the dialog box.



4.2.9.12 Clear data

1. All channels

Pull down menu: Data→Clear data→All channel

Supplement Toolbar→

A dialog box is displayed.

Click OK, clear data in all channels.

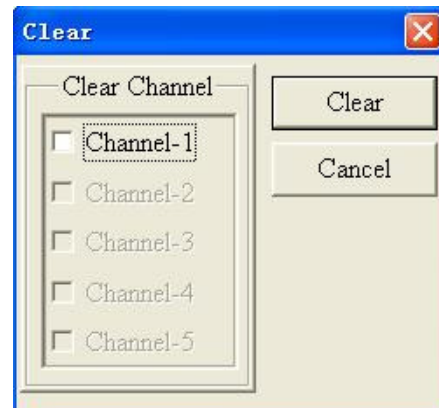
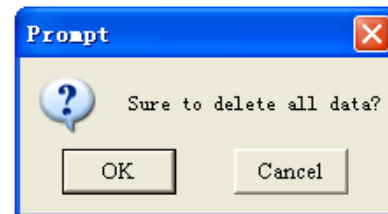
2. Selected channel

Pull down menu: Data→Clear data→Selected channel

Supplement Toolbar→

A Clear dialog box is displayed.

Select the channel from the Clear channel list. Click Clear button, the data will be removed and the image in




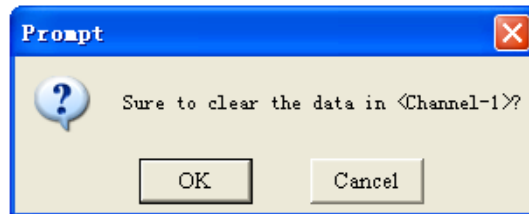
the workspace will be refreshed.

3. Manual selected channel

Pull down menu: Data→Clear data→Manual selected channel

Supplement Toolbar→

The cursor changes to  when the cursor fall into workspace. Left click on the spectrum you want to clear, a box is displayed.



Click OK to clear this curve or Cancel to reselect a channel. Right click in the workspace to undo clear data.

4.2.10 Version information

Pull down menu: About→About the spectrometer

A box is displayed showing version and copyright.

5. Using CCD Detector

5.1 Start the software

Turn the mechanical switch on the main machine to CCD side, Run program from Start->All Programs->LEOI-101 CCD or double click the application on the desktop
A startup screen pops up together with the main interface of the application.

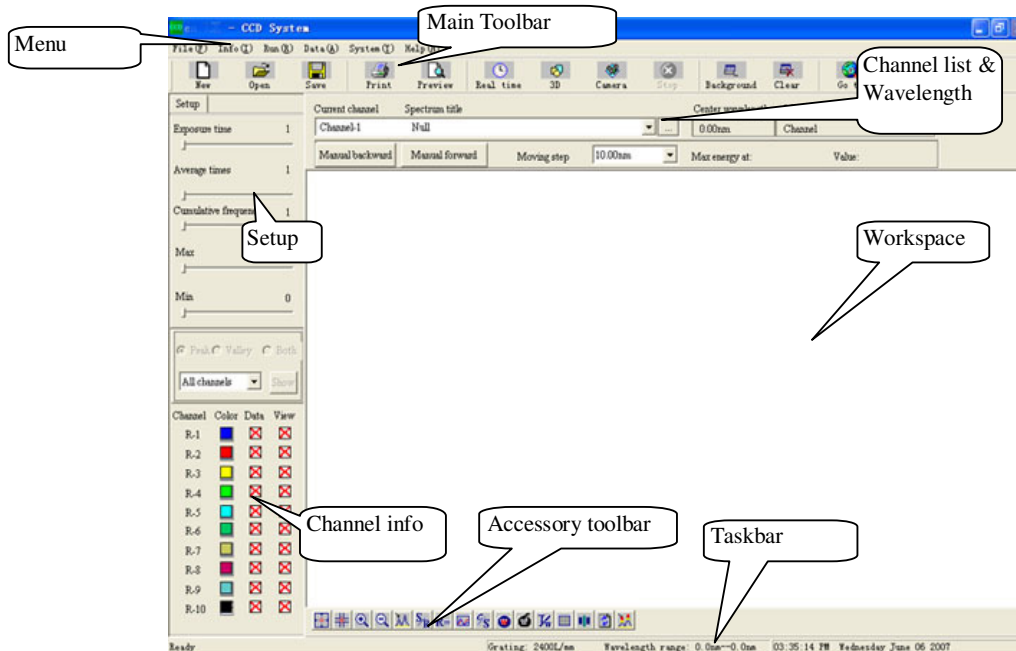


Note:

























Please wait while the instrument is initializing. If the application fails, please power off the instrument and the program, then restart the instrument and software.
Always start the instrument before starting the application.






5.2 Work Interface

The main window is displayed. The main areas of the application window are



Brief introduction of each menu and the menu item are as follows:

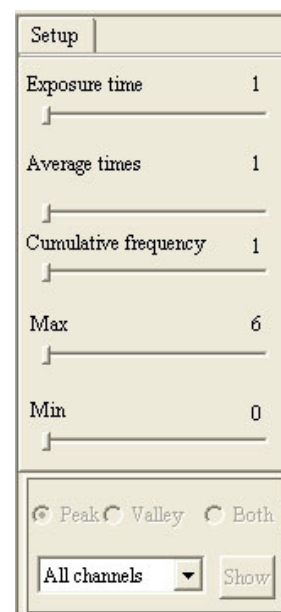
Menu	Menu item	Tool	Application
File	New		Clear all current data and create a new window
	Open		Open a previously saved data file
	Save		Save data in a channel to a file
	Print setup		Change the printer and printing options
	Print preview		Display full pages
	Print		Print current spectrum
	Exit		Exit the application
Info/view	Input info		Input user information and sample name, etc.
	Show grid		Shows gridlines
	Display wl center		Display the center position of the coordinates
Run	Real time		Real time collect data
	3D display		Dynamically display energy change of spectrum in 3D mode
	Simulate camera		Simulate effect of exposed negative film
	Stop		Stop real time collection
	Manual forward	Manual backward	move to longer wavelength direction at appointed moving step
	Manual backwards	Manual forward	Move to shorter wavelength direction at appointed moving step
	Collect background		Collect background spectrum
	Clear background		Clear background spectrum
	Go to		Go to desired wavelength
	Re-initialize		Re-initialize
	Data	Read spectral lines	
Read data anywhere			Read any data on and off spectral lines
Zoom			Zoom in on part of spectrum
Undo zoom			Cancel all zoom
Manual calibration			Calibrate wavelength with standard spectrum
Auto calibration			Calibrate wavelength with calibration equation
Channel/Wavelength			Exchange between channel mode and wavelength mode
Find Peak			Automatically find peaks according to setting
Display peaks and valleys			Mark peaks and valleys

	View Peaks/valleys value		Display peaks and valleys value
	Peak/valley/both		Display peak only or valley only or both
	Smooth		Smooth selected spectrum
	Arithmetic		Perform arithmetic on two spectra
	Display mode		Display spectrum according to the setup
	Clear data		Clear selected data
	Refresh		Refresh screen
System	Correct wavelength		Correct wavelength
	Grating		Change to desired grating
Help	About		Display version information and copyright

5.3 Parameter Setup and Channel Information

5.3.1 Setup work parameters































Exposure time:	Setup integral time of collecting spectrum (1—88 steps available)
Average times:	Average times of the spectrum data (1-10 times)
Cumulate frequency:	Accumulate time of multi collection to the spectrum (1-10 times)
Max:	Maximum value of the y coordinates displayed
Min:	Minimum value of the y coordinates displayed



5.3.2 Channel information

Display Main information of individual channel in the channel info display box:

Channel:	R-1, R-2....Represent separately 10 different channels
Color:	Click color pane to change the curve color of corresponding channel
Data:	Exist data in corresponding channel
View:	Change display property of corresponding channel (Display or not Display)

Channel	Color	Data	View
R-1			
R-2			
R-3			
R-4			
R-5			
R-6			
R-7			
R-8			
R-9			
R-10			

5.3.3 Current channel

From Current channel pull down list working channel can be selected. The application real-time inspects the moving of wavelength, and display the current center wavelength at Center wavelength prompt pane.



Note: due to the limited length of the CCD sensor, only a segment of the spectrum around the Center wavelength (about 20 to 30 nm) can be received by the CCD at once. It is needed to change the Center wavelength to acquire its corresponding spectral segment.

The “Center Wavelength” can be reduced by clicking “Manual backward” or increased by clicking “Manual forward” with step size set by “Moving step”.

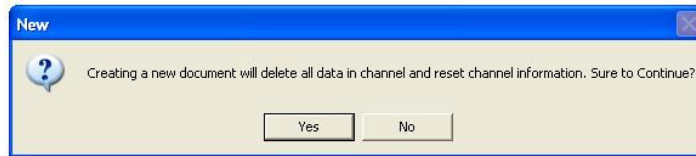
5.3.4 File management

5.3.4.1 Clear all current experiment data

Pull down menu: File→New

Main Toolbar→ 

A dialog box is displayed. Select Yes to clear all data and create a blank file or No to return.

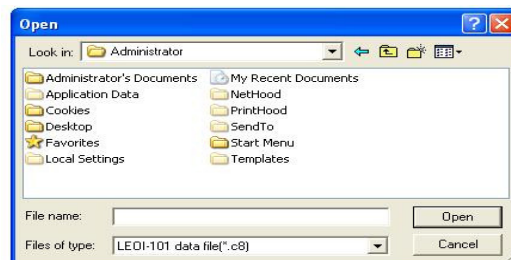


5.3.4.2 Open exist data file

Pull down menu: File→Open

Main Toolbar→ 

An Open dialog box is displayed, showing the available spectral data files. Locate the place of the data file you want to open and click Open.



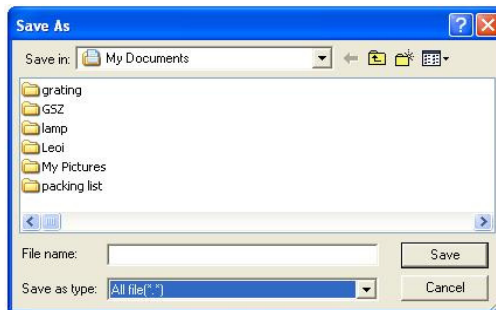
Click Cancel to close the dialog box.

5.3.4.3 Save current data file

Pull down menu: File→Save

Main Toolbar → 

A Save as dialog box is displayed.



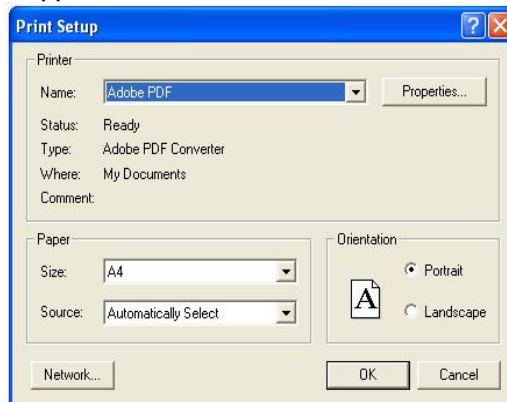
Select a file folder where the file is saved and name the file and select the file type. Press Enter or Click Save to save the data file.

5.3.5 Printout

5.3.5.1 Printer Property and setup parameters

Pull down menu: File → Print setup

A Print setup dialog box is appeared.



Select the size and source of paper through the Size and Source pull down list.

Note:
For better print layout, Landscape shall be selected.

Click OK to save these settings. (The application returns to default value after reboot.)

5.3.5.2 Print preview


Pull down menu: File → Print preview

Main Toolbar → 

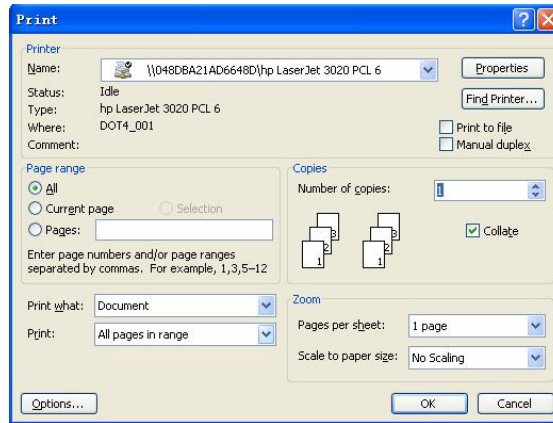
Display the actual effect on the computer screen.

5.3.5.3 Printout

Pull down menu: File→Print

Main Toolbar→

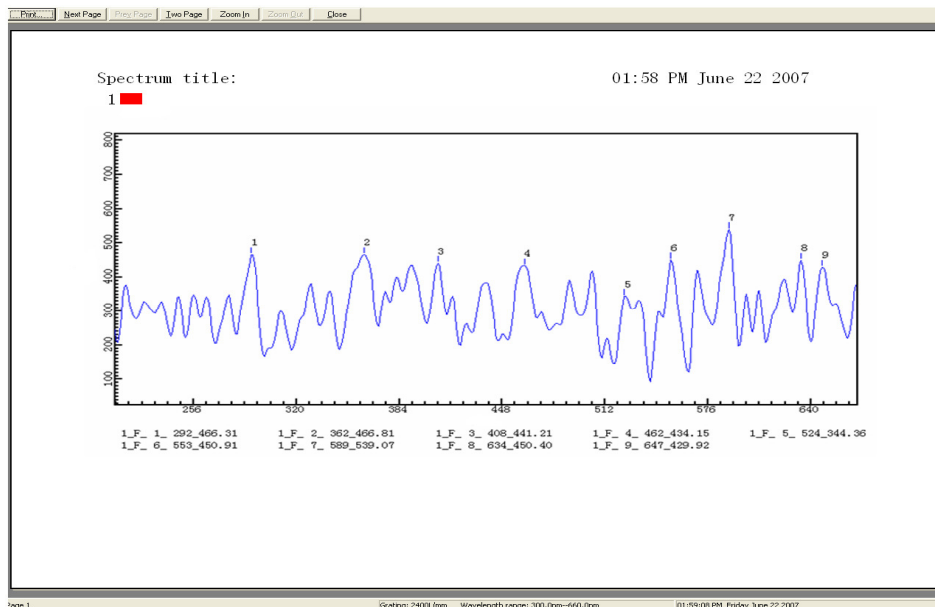
A Print dialog box is displayed.



From the print dialog box, user can select the default printer. Select All to print all pages. Click OK and the file will be printed.

Note:

Please connect and power on printer to your PC before printing.



Note: 1_F_1_292_466.32 denote channel:1 F--peak Peak number: 1 Chanel: 292 Value: 466.32

5.3.6 Information and Image

5.3.6.1 Input info

Pull down menu: Info→Input info

A dialog is displayed.



Select a channel from channel list and name the spectrum. Then click OK.

The info entered appears on the top of the workspace.



Click the button at the right of the channel list, all the input info can be revised.

5.3.6.2 Gridlines

Pull down menu: Info/Image→Show grid

Supplement Toolbar→

Gridlines will be displayed on the workspace. Height and width of the gridlines will be adjusted automatically along with the changing of the horizontal and vertical axis's. (The gridding always coincidence with the integer) .

5.3.6.3 Display center wavelength

Pull down menu: Info→Display center wavelength

Supplement Toolbar→

A vertical line appears in the middle of workspace. This line corresponds to the middle of CCD. Repeat this command will cancel the line.

5.3.7 Run

5.2.7.1 Real time collection


Pull down menu: Run→Real time

Main Toolbar→

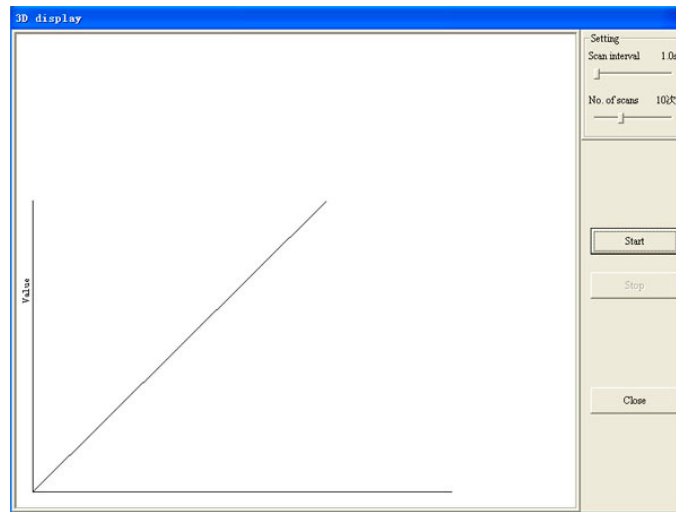
The instrument will collect data again and again and display the spectrum in 3D mode. Then save data to working channel. If data already exists in this channel, a prompt dialog is displayed to allow user to select.

5.3.7.2 3D display

Pull down menu: Run→3D display

Main Toolbar → 

A dialog box is displayed.



Set up and click Start to process 3D collection. If you want to stop, click Stop to terminate 3D collection.

Scan interval: The time interval between two collections;

Number of scans: Setup number of scans to establish the 3D graph.

5.3.7.3 *Simulate photograph*

Pull down menu: Run → Simulate camera

Main Toolbar → 

A window is displayed. Click Camera. Click Close to close the window.



5.3.7.4 *Stop*

Pull down menu: Run → Stop

Toolbar: Main Toolbar → 

Terminate the scan during the scan process.

5.3.7.5 Manual forward

Pull down menu: Run → Manual forward

You can setup the interval of the system to move the current center wavelength towards longer wavelength.

5.3.7.6 Manual backwards

Pull down menu: Run → Manual backwards

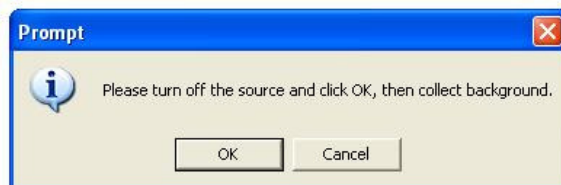
You can setup Moving step to move the current center wavelength towards the shorter wavelength.

5.3.7.7 Collect Background

Pull down menu: Run → Collect background

Main Toolbar → 

A prompt box is displayed.



Click OK to collect background spectrum. (Cleared when software closed) .

5.3.7.8 Clear background memory

Pull down menu: Run → Clear background

MainToolbar → 

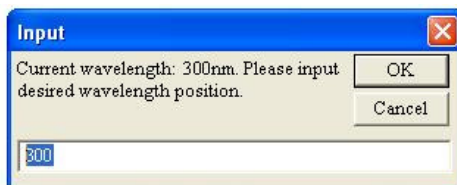
Execute this command to clear background spectrum.

5.3.7.9 Goto

Pull down menu: Run → Goto

Main Toolbar → 

An Input dialog box is displayed. Input desired wavelength in the editing box. Click OK. A prompt is displayed. When this prompt disappear, center wavelength moves to the position where user input.



5.3.7.10 Re-initialize

Pull down menu: Run→Re-initialize

The instrument will redetect spectrum of zero order and place grating back to 300 nm.


5.3.8 Read data

5.3.8.1 Read the spectrum data

1. Read the data of the spectrum

Pull down menu: Data→Read spectrum data

Supplement Toolbar→

When the cursor in the workspace, its shape changes to . Click left button of the mouse in the workspace, the cursor will be positioned to the data of the spectrum nearest the horizontal axis. The information of the data will also be displayed in the value box. Left click the mouse in different place, various data can be read. Press ←, → two keys to move the cursor and read the information of the data point. Right click to exit the read command.

Note:


Using the ←, → keys can only move the cursor to the nearest data point.

The application displays the data point nearest to the horizontal and vertical coordinates only when multi spectrum displayed.

2. Read data point anywhere

Pull down menu: Data→Read data anywhere


Supplement Toolbar→

The shape of cursor changes to . Click any point in workspace, value of that point will be displayed in a readout box. Using the ←, →, ↑, ↓ keys can also move the cursor and read the information. Right click the mouse will exit the read mode.

5.3.8.2 Expanding

Pull down menu: Data→Zoom

Supplement Toolbar→

The cursor automatically moves to the center of the workspace, and changes the shape to . Using the + as the center of the cursor draw a red crosshair all over the workspace, the information of this center point will be displayed in the value box.

Move the cursor, the red crosshair moves along with the cursor too. Left click, then the vertex of expanding area is confirmed. Move the mouse again; there will be a rectangle expanding box appeared in the workspace besides the red crosshair. Left click to confirm the other vertex of the expanding area (Right click the mouse to exit expanding). The application will enlarge the selected expanding area.

5.3.8.3 Cancel the expanding

Pull down menu: Read data→ Undo Zoom

Supplement Toolbar→

Execute this command will cancel all the zooming in operations.

5.3.8.4 Manual calibration

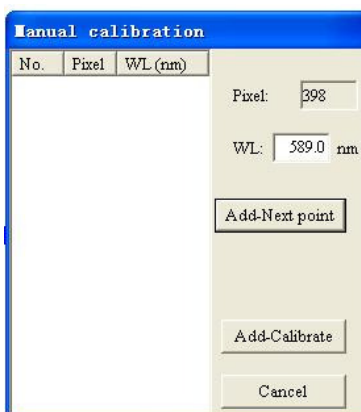
Pull down menu: Data→Manual calibrate

Supplement Toolbar→

The cursor changes in workspace. Click on a characteristic peak and a value readout box is displayed.

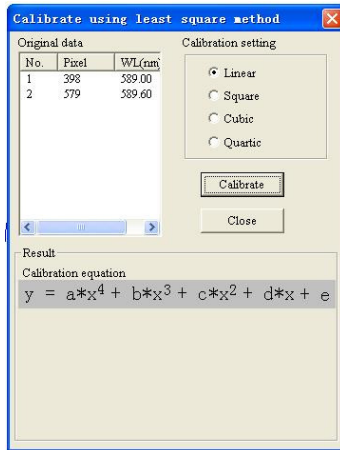


Press Enter. A Manual calibration dialog is displayed.

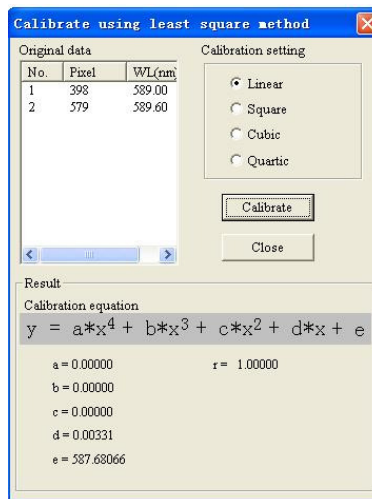


Input standard characteristic peak value. Here we input 589.0 for the current lamp is a sodium lamp. Click Add-Next point and select another characteristic peak and press Enter. Again the Manual calibration box is displayed. Input another standard characteristic peak value 589.6 and click Add-Calibrate. At least two points are needed for the calibration. A Calibrate using least square method box is displayed.

Note: Once a Calibration is done, the fitting parameters are saved. The calibration is effective for the entire instrument spectral range (i.e. 300 nm to 660 nm), so that the user can use available standard spectral lines for calibration, and there is no need to re-do calibration for new scans at different center wavelengths. However, after the calibration is done and the fitting parameters are saved, the actual center wavelength may still be some errors with the displaying value due to the instrument hardware altering. Therefore, in order to assure high wavelength accuracy, it is recommended that the user checks and corrects wavelength using a standard spectral line periodically, procedures please see Sec. 5.2.9.1.



Select Linear, Square, Cubic or Quartic and then click Calibrate, a box is displayed.



Click close to complete calibration.

5.3.8.5 Auto calibration

Pull down menu: Data→Auto calibration

Supplement Toolbar→

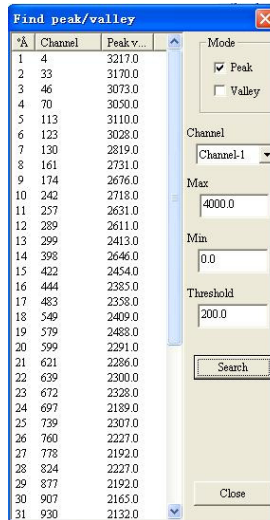
This calibration is based on the calibration equation (The error is relatively larger than manual calibration.)

5.2.8.6 Peak search

Pull down menu: Data→Peak search

Supplement Toolbar→

A dialog box is displayed.



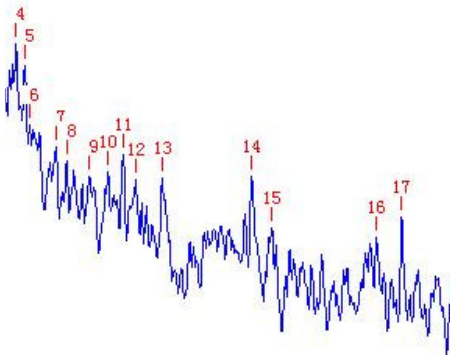
Specify criteria on spectrum located click Search.

Values of the peaks and valleys will be displayed in the left list pane of the dialog box. Click Close to exit Find peak.

5.2.8.7 Display peaks and valleys

Pull down menu: Data→Display peaks and valleys

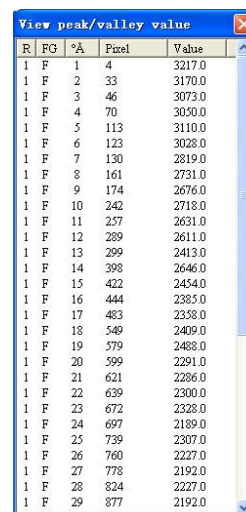
Peaks and valleys will be marked with 1, 2, 3, 4...



5.2.8.8 View peaks and valleys value

Pull down menu: Data→View peaks and valleys value

A View peak valleys values dialog is displayed.



5.2.8.9 Peak/value/Both

Pull down menu: Data→Peak/Valley/Both

This command is for setup 6.2.8.7 Display peaks and valleys. User is allowed to setup display peak, or valley or display both.

5.2.8.10 Smooth

Pull down menu: Data→Smooth...

Supplement Toolbar→

A Smooth dialog is displayed.



Select smooth method by Smooth mode list.

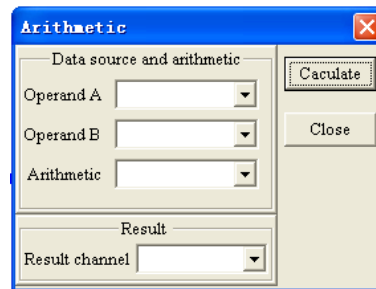
If Over cover original data is selected, then store the smoothed data to the source channel. Otherwise, spectrum will be smoothed and saved in selected result channel.

5.2.8.11 Calculate

Pull down menu: Data→Calculate

Supplement Toolbar→

A Calculate dialog box is displayed.



Select source data channels for Operand A, Operand B. Select Arithmetic method from arithmetic list and select result channel for storing the result.

Click OK, the results will be stored to result channel. In the mean time, the spectrum will be displayed in the workspace.

5.2.8.12 Display

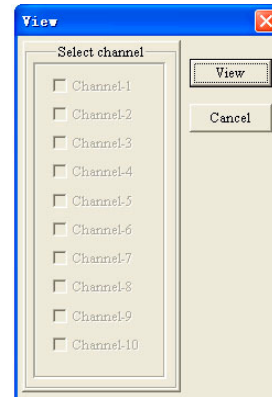
Pull down menu: Data→Display

Supplement Toolbar→

A dialog is displayed.

In the left pane of select channel, only the channel that has data stored can be selected.

Select a channel and click View, spectrum of the selected channel will be displayed in the workspace. Click Cancel, the dialog will be closed with no modification to the current channel.



5.2.8.13 Refresh

Pull down menu: Read data→Refresh

Supplement Toolbar → 

Execute this command to refresh the screen and plot the spectrum curve again

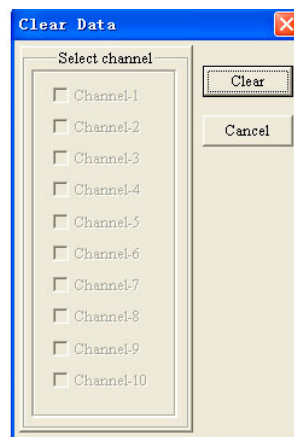
5.2.8.14 Clear data

Pull down menu: Data → Clear data → All channels

Supplement Toolbar → 

A Clear dialog box is displayed.

Select the desired data channels in which data will be removed from the Clear channel list box. Click Clear, the data will be removed and workspace refreshed.



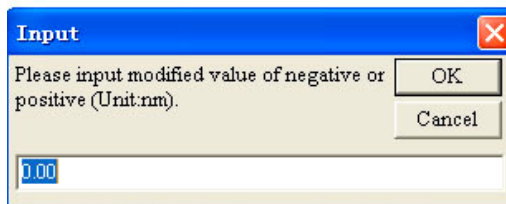
5.2.9 Read data

5.2.9.1 Modify wavelength

Pull down menu: System → Modify Wavelength

An Input dialog box is displayed.

Input the modified value. Click OK, the modified value will be saved and hardware adjusted.



Note:

- * When standard wavelength is greater than tested wavelength, input minus modified value, input plus value in opposition.
- * In order to obtain accurate modification, it is recommend closing the application software and restarting the software in the peak test process. The instrument will be initialized again.
- * The maximum modification should be less than $\pm 50\text{nm}$.
- * Power failure or open the application software in advance and then power the rest of the instrument may cause wavelength error. In this case, exit the software, and make sure the correct connections of the instrument. Initialize the instrument again.

5.2.9.2 Select grating parameter

Pull down menu: System → Grating

Select proper grating parameter according to the grating used in the experiment.

5.2.10 Change channel color

Move cursor to channel info area of the main interface and click desired color box. A Change Color box is displayed.



Next to each channel is a color box. The color box represents color of the curve. Click Change next to the right of the color block, a Color box is displayed.

Select desired color and click OK button, the corresponding curve stored in the channel changes the 4 color now. If the curve in the channel is viewable (Display in the workspace), the curve will be drawn again in new color.



5.2.11 Display version information

Pull down menu: About→CCD application

A dialog box is displayed, showing the version and company information is displayed.