Quawell

Q9000 Series UV-Vis Spectrophotometer

User Manual

V1.0.1

Rev. 04-2016

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Instruction

Description

Quawell Q9000 is the micro volume UV-Visible (200-900nm) spectrophotometer. The instruments contain a powerful embedded single board computer, 7" high resolution touch screen, Windows operating system and preloaded application software. The "IntegratedOpticPath" technology allows Q9000 to measure 0.5 - 1 µL samples in about 3 seconds with a high degree of accuracy and reproducibility. Q9000C/Q9000CM have capability to make kinetic analyzes and low concentration sample measurements use cuvette measurement mode.

Advantages

- Extremely high degree of reproducibility.
- Auto-Self-Calibration at software loading.
- Only 0.5 - 1 µL samples needed.
- Less measurement time (about 3 seconds).
- Micro-volume and cuvette measurement modes.
- Support software calibrated by user.

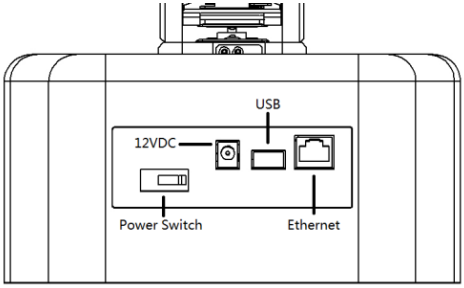
Safety Information

- DO NOT REMOVE THE COVER!
- For use only with AC ADAPTER GS60A12-P1J or provided by manufacture.
- For indoor use only.
- Always disconnect the instrument from line power before maintenance.
- Refer servicing to qualified personnel.
- Ambient operating temperature 15–35 °C, Humidity <65%, at 25–40 °C.

System On/Off

System on

- Connect the power supply that comes with the Q9000 to the connector “12 VDC” on the rear panel.
- Turn the power switch “I/O” on.
- The Q9000 will start and the “Login” screen appears on the screen.



System off

Note:	The power must be “Off” before re-start the system.

- Tap the on/off sign  to close the computer system.
- Turn the power switch off to completely shut down the instrument.

Login and Create New Account

Initial Password

Default / new Account	User name	Initial Password
Administration Account	admin	password
Guest Account		
New Account		password

- For convenience to copy or view history data, it is recommended to create individual account for each user. All account information and measurement data will be saved in the current user account.
- The initial passwords for new users are “password”. All users are required to change their password for the first time login.
- You can change the current user by tap the user name on the left corner of the main and sub menu.

Administrator Account

Note:	Please keep administrator account password at the save place. If you forget the administrator account password, the system has to be re-installed and all account information will be deleted.

Use administration account to:

- Create and delete accounts.
- Edit user account information
- Copy and delete user account measurement data.
- Change system setting.

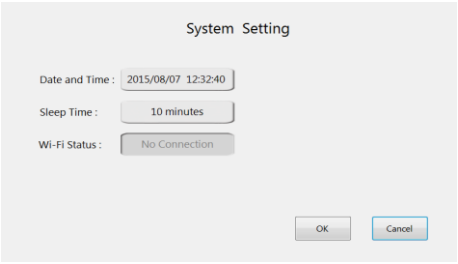
System Settings

Menus

Main menu appears after login. Tap the icon of sub menu icon to display the sub menu.

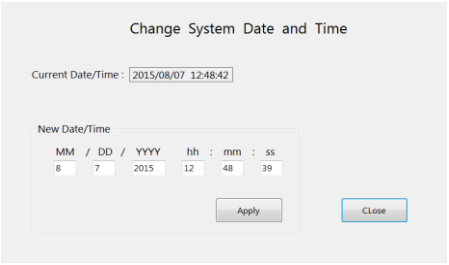
System Settings

Tap Settings in sub menu System to display the system setting screen. All users can use system setting utility.



Date and Time

Tap the “Date and Time” indicator to load the Chang System Date and Time screen. Enter the new date and time in the New Date/Time windows and tap Apply to save.



Sleep Time

Tap the “Sleep Time” indicator to load the dropdown list. Select the time for system going to save mode (default time is 30 minutes).

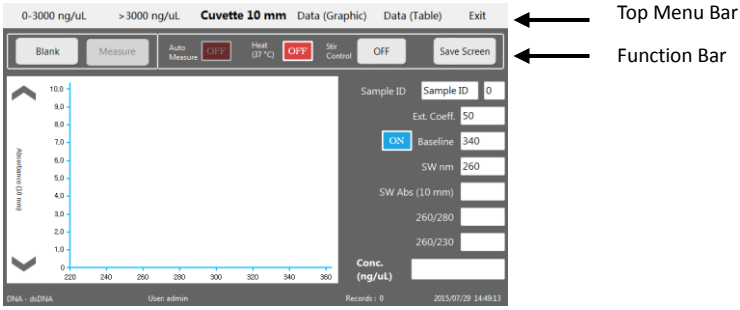
Wi-Fi

The “Wi-Fi Status” indicator enables when a Wi-Fi device connected. Tap the indicator to select a Wi-Fi connection from the dropdown list.

General Software Features

Measurement Screen Features (dsDNA)

Tap dsDNA icon in the sub menu Nucleic Acid to display the corresponding measurement screen.

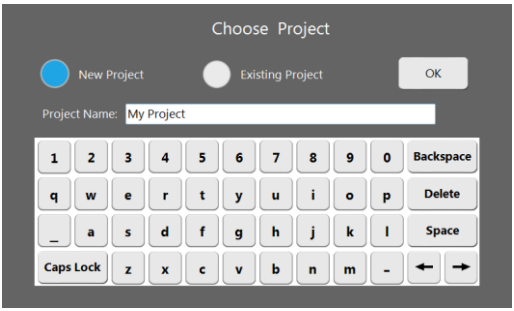


Top Menu Bar

- **0-3000 ng/uL:** Normal concentration range selection (default).
- **>3000 ng/uL:** High concentration range selection.
- **Cuvette 10 mm:** Cuvette mode selection. Tap the selection and select the cuvette pathlength from the dropdown list.
- **Data (Graphic):** Selection for the absorbance spectra display.
- **Data (Table):** Selection for the measurement data display.
- **Exit:** Exit current screen.

Function Bar

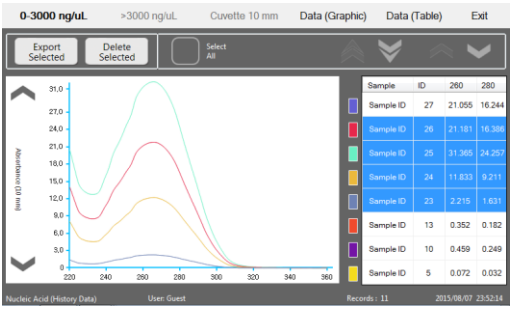
- **Blank:** Blank function button, tap to make blank measurement.
- **Measure:** Measurement function button, tap to make sample measurement.
- For the first time when you tap the Measure button, the Choose Project screen will be loaded. Input or select an existing project name, all sample measurement data will be saved automatically under the project. You can retrieve the data using View History function in sub menu Tools (refer to View History).



- **Auto Measure:** Tap the “Auto Measure” indicate box to enable/disable the auto measurement function. The function is available after blank measurement. With the indicator ON, the measurement will be completed upon the upper arm lowering.
- **Heat (37 °C):** This function is available for cuvette mode only. Tap the indicator box to enable/disable the cuvette heater. The “waiting” message appears in the screen until the cuvette holder temperature reaches to 37 °C (+/- 0.5 °C).
- **Stir Control:** This function is available for cuvette mode only. Tap the Stir Control button to on/off the function and select stir speed from the drop-down list.
- **Save Screen:** Screen capture button. The file is saved as “png”.

Data (Graphic) - Absorbance Spectra data

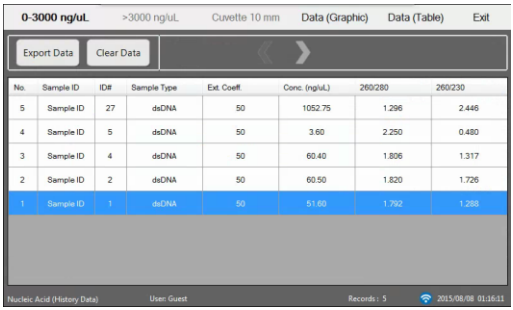
Tap Data (Graphic) on the top menu to display the absorbance spectra screen as below.



- Tap to highlight the rows in the right table to display the spectra. Multiple spectra graphs can be displayed in the different colors. The Select All function in the function bar is the quick selector for select/unselect all rows.
- **Export Selected:** The function for exporting selected rows on the table. Tap to highlight the rows, tap Export Selected function button to export the absorbance spectra in ".txt" file (refer to "Export Data" for detail).
- **Delete Selected:** The function for deleting selected rows. Tap Delete Selected button to delete the highlight rows.
- Use a spreadsheet graph function to convert export ".txt" file to graph file.

Data (Table) – Sample Measurement Data

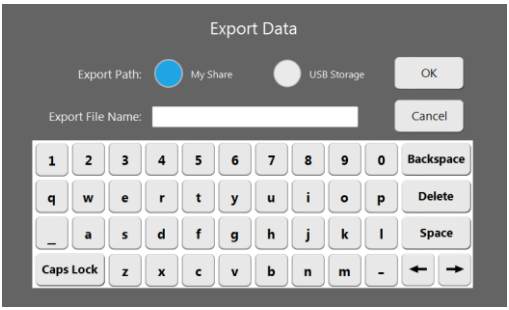
Tap Data (Table) on the top menu to display the sample measurement data table screen.



- **Export Data:** Tap Export Data button to export all data in the table (refer to "Export Data" for detail). The data will be saved as .txt file.
- **Clear Data:** Tap Clear Data button to delete all data in the table.

Export Data

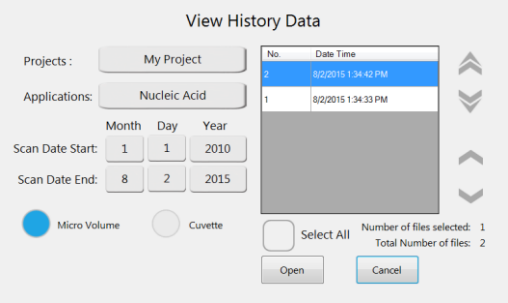
The Export Data screen appeared after you tap the export function in the Data (Graphic) or Data (Table) screen. Data exported will be saved as ".txt" file.



- **Export Path – My Share:** "My Share" is a pre-created internal path. Data saved in "My Share" path can be retrieved through Ethernet and Wi-Fi.
- **Export Path – USB Storage:** "USB Storage" is an external path available upon an external USB storage device plugin.
- **Export File Name:** Input a file name in the input field for the data you want to save and tap OK to complete data export.

Retrieve History data

The software of Q9000s automatically save the measurement data upon measurement complete. You can retrieve history data using “View History” function following the steps below:



- Tap “View History” button in submenu Tools.
- Tap “Projects” button to select the project.
- Tap “Applications” button to select the application.
- Select the period from “Scan Date Start” and “Scan Date End”.
- Tap to highlight the rows in the window.
- Tap “Open” button to load the history files.

Software update

The software version can be found on the “Above”. Please visit our website and download the new version software. We will periodically update software with new features for free downloading.

Making Measurement

Micro-volume Mode Measurement

1. Lift the upper arm, pipette 1 µL blank buffer onto the lower surface, close the arm and tap Blank button.
2. Lift the upper arm and remove the blank buffer from the upper and lower surfaces with the new soft dry wipe.
3. Pipette 1 µL samples onto lower surface, close the upper arm and tap Measure button. Remove the sample from both the upper and lower surfaces with the soft dry wipe after measurement.


Pipette blank buffer


Remove upper arm blank buffer


Remove lower arm blank buffer

Cuvette Mode Measurement

Note:	• The cuvette specification: 12.5 mm (L) x 12.5 mm (W) x 45 mm (H). • The cuvette Path length: 10, 5, 2 and 1 mm. • The optical beam is above 8.5 mm from the bottom of the cuvette. • Use quartz or UV transparent plastic cuvettes for UV region (<340 nm) region measurement.

1. Tap Cuvette 10 mm to select the cuvette path length.
2. Lift the arm and Insert a cuvette with the blank buffer, lower the arm and tap the Blank button.
3. Lift the arm and Insert a cuvette with the sample. Lower the arm and tap the Measure button.


Insert cuvette

The Best Practices

Measurement Surfaces Clean and Sample Measurement

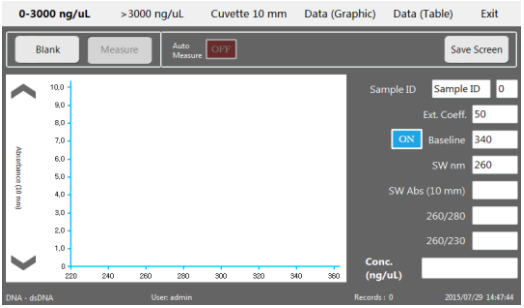
1. Use a dry lab wipe to remove the liquids from both the upper and lower surfaces immediately after each measurement.
2. Ensure the sample surfaces condition as expected (refer to “Surface Condition Check”) before measurement.
3. Ensure that the sample is homogeneous and vortex before measurement
4. Use a fresh tip to deliver each sample aliquot.
5. Use a fresh aliquot sample for each measurement.
6. Repeated measurements on the same sample aliquot may result in increasing concentration.

Surface Condition Check (dsDNA)

1. Lift the upper arm, pipette 1 µL de-ionized water onto the lower surface, close the upper arm and tap Blank button.
2. Remove the water from both surfaces use the soft dry wipe.
3. Pipette 1 µL de-ionized onto the lower surface, close the arm and tap Measure button.
4. Repeat the step 3 for 3-5 times. If you do not have absorbance between 0.04 to -0.04 at 260 nm (10 mm pathlength equivalent) and the approximately flat spectrum line, repeat from 1 to 3.

Nucleic Acid

This function is used to measure nucleic acid sample concentration and quality. Tap the sample type icon in nucleic acid submenu to load the measurement screen.



Sample Type and Extinction Coefficients (E. Coef.)

Sample type	Extinction Coefficients	Sample type	Extinction Coefficients
dsDNA	50	ssDNA	33
RNA	40	Others	Enter by user

Nucleic Acid Screen Features

- **Baseline:** Baseline is used to compensate the effects of background absorbance. The default is 340 nm.
- **SW nm:** The absorbance of wavelength in SW nm input field will be displayed in SW Abs (10 mm) window.
- **SW Abs (10mm):** The absorbance of wavelength in SW nm input field.
- **260/280:** The absorbance ratio of 260 nm and 280 nm.
- **260/230:** The absorbance ratio of 260 nm and 230 nm.
- **Conc. (ng/μL):** Sample concentration in ng/μL.

Measurement samples

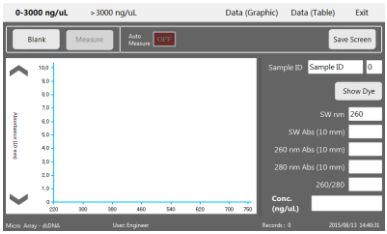
Refer to section “Making Measurement”.

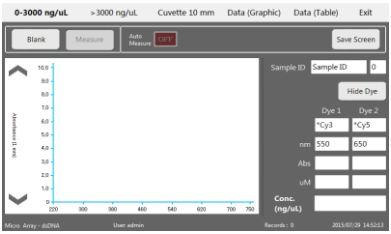
Microarray

The Microarray module analyzes fluorescently-labeled nucleic acid probes. It simultaneously measures the concentration of the fluorescent tag and the nucleic acid at appropriate wavelengths.

Microarray Screen Features

Tap the sample type icon in the submenu of microarray to display microarray measurement screen. Tap Show Dye/Hide Dye button to change the screen between the sample data and dye data screens.





Absorbance Screen

- **SW nm:** The absorbance of wavelength in SW nm input field will be displayed in SW Abs (10 mm) window.
- **SW Abs (10mm):** The absorbance of wavelength in SW nm input field.
- **260 nm Abs (10mm):** The absorbance of sample at 260 nm.
- **280 nm Abs (10mm):** The absorbance of sample at 280 nm.
- **260/280:** The ratio of absorbance at 260 nm and 280 nm.
- **Conc. (ng/µl):** The sample concentration in ng/µL.

Dye Data Screen

- Tap the Dye1/Dye2 to select the dye from the pre-defined drop down table.
- **Abs:** The absorbance of Dye1/Dye2.
- **uM:** The concentration of Dye1/Dye2 in uM.

Measurement samples

Refer to section “Making Measurement”.

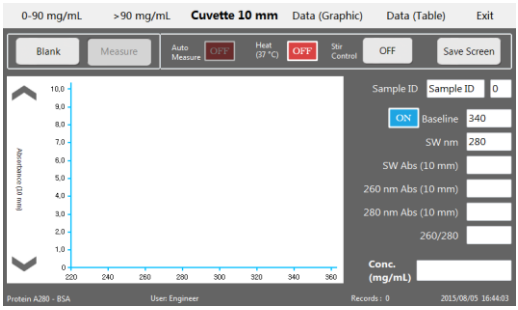
Protein A280

Sample Type and Extinction Coefficients

Sample type	Extinction Coefficient	Sample type	Extinction Coefficient
BSA"	1.5	Lysozyme	0.379
IgG	0.73	1Abs=1mg/ml	1

Protein A280 Screen Features

Tap the sample type icon in submenu Protein A280 to display the measurement screen as below.



- **Baseline:** Baseline is used to compensate the effects of background absorbance. The default is 340 nm.
- **SW nm:** The absorbance of wavelength in SW nm input field will be displayed in SW Abs (10 mm) window.
- **SW Abs (10mm):** The absorbance of wavelength in SW nm input field.
- **260/280:** The absorbance ratio of 260 nm and 280 nm.
- **260/230:** The absorbance ratio of 260 nm and 230 nm.
- **Conc. (mg/mL):** sample concentration in mg/mL.

Measurement samples

Refer to section “Making Measurement”.

Protein Assay

BCA Method

The Bicinchoninic acid (BCA) method depends on the conversion of Cu2+ to Cu+ under alkaline conditions. The Cu+ is then detected by reaction with BCA. The reaction results in the development of an intense purple color with an absorbance maximum at 562 nm.

Lowry Method

Lowry method is also based on the conversion of Cu2+ to Cu+ under alkaline conditions. The reactions result in a strong blue color that is measured at 750 nm.

Bradford Method

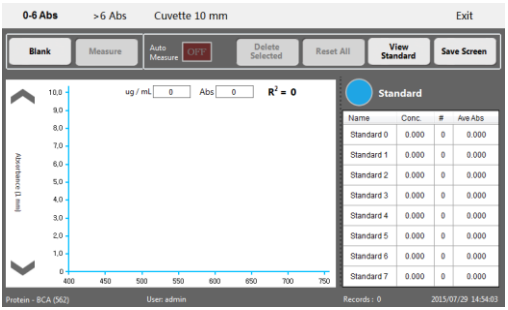
Bradford method is a common colorimetric method to determine protein concentration in a sample solution. The Bradford method of protein determination is based on the binding of a dye, Coomassie Blue G, to the protein. This binding shifts the absorption maximum of the dye from red to blue. The absorbance of the solution is measured at 595 nm and is proportional to protein concentration when compared to a standard curve.

Measurement Range

BCA	**10ug/mL-200ug/mL:** using 1:1 reagent / sample volume ratio, a minimum of 10 µL of sample and 10 µL of BCA reagent.
	200ug/mL-8mg/mL: using a 20:1 reagent / sample volume ratio, a minimum sample volume of 4 µL in 80 µL of BCA reagent.
Lowry	**200ug/mL-4mg/mL:** using a 5:1 reagent / sample volume ratio, a minimum sample volume of 20 µL and 100µL of Modified Lowry reagent
Bradford	**15ug/mL-100ug/mL:** using 1:1 reagent / sample volume ratio, a minimum of 10 µL of sample and 10 µL of Bradford reagent.
	100ug/mL-8mg/mL: using a 50:1 reagent / sample volume ratio, a minimum sample volume of 4 µL in 200 µL of Bradford reagent.

The Procedure of Protein Assay

Tap the icon of sample type to display the protein assay screen. The procedures for Protein assay are the following:



1. Generate a standard curve

1.1 Enter the standard values in the column "Conc." (Enter 0 for Standard 0).

1.2 Make blank measurement using the standard buffer.

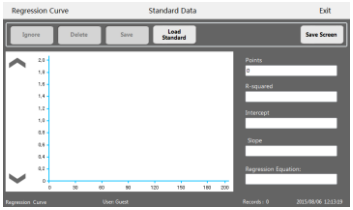
1.3 Measure the standards, up to 5 measurements for each standard can be made. The number of the measurements and the average absorbance value will be displayed in the corresponding columns “**#**” and “Ave Abs”.

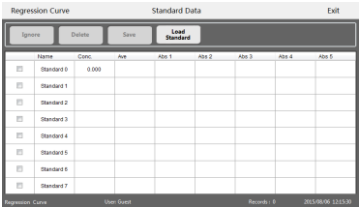
2. Edit Standard Measurements

Note:	The standard value can’t be changed after sample measurement..

2.1 Tap View Standard button to display the Regression Curve screen.

2.2 Tap Standard Data in Regression Curve screen to display Standard Data screen.





2.3 Tap individual Ads in the table, or select the complete row by tap the selector on the left of the table, use Ignore, Delete and Save button to edit the standard value. The regression curve will auto re-graph upon standard value editing.

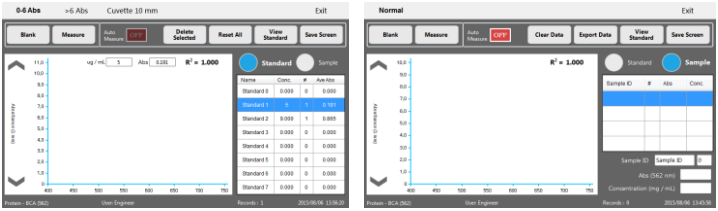
2.4 Tap Exit to close the regression curve/standard data screen.

3. Make Sample measurement

3.1 The Sample Selector spears after measuring two standards.

3.2 Tap the Sample Selector to display sample measurement screen.

3.3 Make blank and sample measurement (refer to “Make Measurement”)

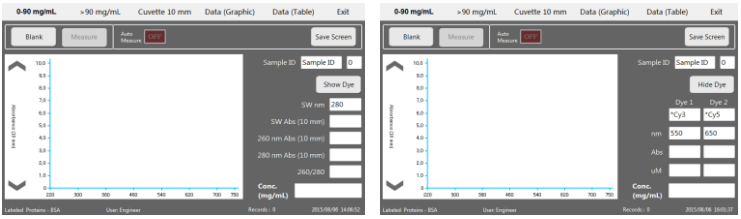


Labeled Proteins

The Labeled Proteins function will simultaneously measure both protein and fluorescent dye concentrations at appropriate wavelengths.

Label Proteins Screen Features

Tap the sample type in the submenu of Labeled Proteins to display Labeled Proteins screen. Tap Show Dye/Hide Dye to change the screen between sample absorbance and dye data screen.



Absorbance Screen

- **SW nm:** The absorbance of wavelength in SW nm input field will be displayed in SW Abs (10 mm) window.
- **SW Abs (10mm):** The absorbance of wavelength in SW nm input field.
- **260 nm Abs (10mm):** The absorbance of sample at 260 nm.
- **280 nm Abs (10mm):** The absorbance of sample at 280 nm.
- **260/280:** The ratio of absorbance at 260 nm and 280 nm.
- **Conc. (mg/mL):** The sample concentration in mg/mL.

Dye Data Screen

- Tap Dye1/Dye2 indicators to load the dye from the pre-defined drop down table.
- **Abs:** absorbance of Dye1/Dye2.
- **uM:** concentration of Dye1/Dye2 in uM.

Measurement samples

Refer to section “Making Measurement”.

UV-Vis Measurement

The Q9000/Q9000-1 can function as a general-use laboratory spectrophotometer. The UV-Vis module provides the operator with a sample absorbance measuring range from 200 to 850 nm.

UV-Vis Screen Features

Tap the UV-Vis icon in the submenu of Others to display the UV-Vis screen.

- **Baseline:** Baseline is used to compensate the effects of background absorbance. The default is 750 nm.
- **(λ1) nm:** The absorbance of wavelength in (λ1) nm input field will be displayed in the Abs (λ1) (10 mm) window.
- **Abs (λ1) (10mm):** Absorbance of 10 mm path length at (λ1) nm.

Measurement samples

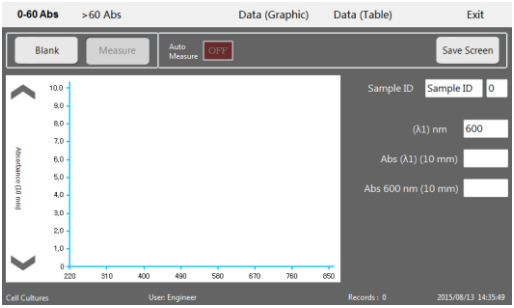
Refer to section “Making Measurement”.

Cell Cultures (OD 600)

The Q9000/Q9000-1 allows laboratories to monitor the density of suspended cell and microbial cultures by measuring their light scatter at 600 nm.

Cell Cultures Screen Features

Tap the Cell Cultures icon in the submenu Others to display the Cell Cultures screen.



- **(λ1) nm:** The absorbance of wavelength in (λ1) nm input field will be displayed in the Abs (λ1) (10 mm) window.
- **Abs (λ1) (10mm):** Absorbance of 10 mm path length at (λ1) nm.
- **Abs 600 nm (10 mm):** Absorbance of 10 mm path length at 600nm

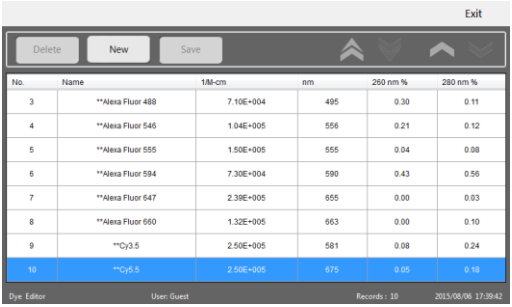
Measurement samples

Refer to section “Making Measurement”.

The predefined fluorescent dyes list

Dyes List Screen Features

Tap the Dye Editor icon in the submenu of Others to display the Dye Editor screen.



- All dyes in the table are available for both Microarray and Labeled Proteins applications.
- There are 10 of pre-defined un-editable fluorescent dyes in the table.
- Editor is available for all users.
- Refer to dye manufacture for the factors in the dye table.

Diagnostic

Diagnostic function

Diagnostic function checks the calibration of measurement path length as well as the reproducibility. For the best performance, we recommend that you run this function every six month.

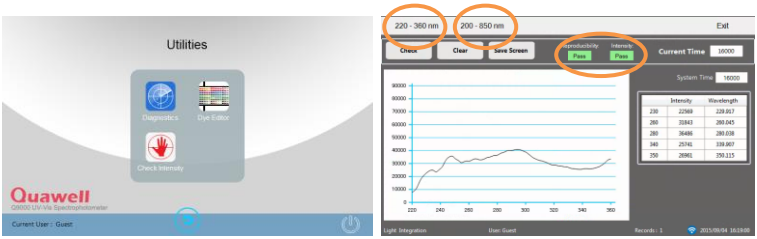
PUL101 is the standard solution required for running diagnostic function. PUL101 is available from your local distributor. Do not re-use PUL101 after open.

Procedure of Running Diagnostic

Important	• Clean the measurement surfaces with the de-ionized water carefully before start diagnostic. • Turn on the instrument and wait for 10-20 minutes before running the diagnostic function.

1. Check Intensity

Tap the icon Check Intensity to display the screen.



1.1 Select range from the top menu bar (220-360 nm / 200-850 nm).

1.2 Tap the Check button on the function bar for 3 times.

1.3 The checks are passing if the indicators of Intensity and Reproducibility are “Pass” with green color.

1.4 If the checks are failing, clean the measurement surfaces with the de-ionized water again and recheck the intensity, if the problems persist, contact your local distributor or send email to: info@quawell.com.

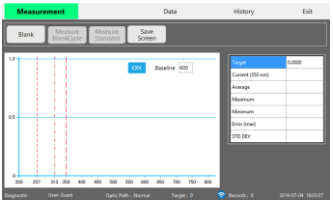
2. Measurement surfaces Condition Check

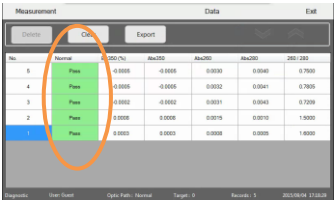
Tap the Diagnostic icon in the submenu Utilities to display the diagnostic screen.

2.1 Open the upper arm and pipette 1 µL de-ionized water on the lower surface, close the arm and tap Blank button.

2.2 Open the upper arm and remove the water from both of upper and lower surfaces with a new and dry wipe, pipette 1 µL de-ionized water on the lower surface, close the arm and tap “Measure BlankCycle” button.

2.3 Repeat last step for 5 times. Tap Data to display Data screen. If you do not have all of results as Pass (in green), clean the measurement surfaces with the de-ionized water again and start from 2.2 again.

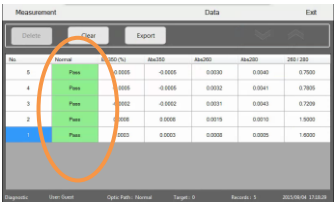




3. Measure the Standard

3.1 Open the upper arm and pipette 1 µL PUL101 onto the lower surface, close the arm and tap “Measure Standard” button. Remove the PUL101 from surfaces with a new and dry wipe.

3.2 Repeat 3.1 for 10 times. Tap Data to display Data Screen. If you see more than one “Fail” in the results, repeat diagnostic from step “2”. If the 2nd diagnostic has one “Fail” in results again, export the diagnostic data and send email with the export data to: info@quawell.com



Troubleshooting

Error Code 8001

This message appears when the intensity is lower than low end limit. Try following steps to fix this problem:

- Close the upper arm if it is in open.
- Clean the upper and lower measurement surfaces with the pure water (refer to “Making measurement”).
- Restart the system.

If these do not fix the problem, run Check Intensity utility (refer to “Check Intensity” in “Diagnostic” section).

Deviation in the Measurement Result

The problems as would cause significant deviation in liquid sample measurement system:

- Sample Overlap.
- Sample Homogeneity.
- Effect of Evaporation.
- Insufficient Sample Volume.

Maintenance

The primary Maintenance

The primary maintenance requirement of the Q9000 is to keep the measurement surfaces clean. Upon completion of a measurement, wipe the sample from the upper and lower surfaces with de-ionized water to prevent sample carryover and residue buildup.

Measurement Surfaces Clean

- Open the upper arm.
- Pipette 1 µL de-ionized water onto the lower surface.
- Close the upper arm.
- Open the upper arm and remove the water with a new and dry lab wipe.

Diagnostics

Run diagnostics function for the best performance by every six month.

Appendices

Specifications

Sample Size	0.5 - 1.5 µL
Optic Path Length	0.5, 0.25 and 0.05mm (auto selected option)*
Light Source	Xenon flash lamp
Wavelength Range	200-900 nm
Wavelength Resolution	1nm
Wavelength Accuracy	1nm
Absorbance Range	0.04 - 300 (10 mm)*
Absorbance Precision	0.002 Abs (1 mm)
Absorbance Accuracy	±2 %
Detector Type	2048 element linear silicon CCD array
Detection Limit	2 ng/µL (dsDNA)
Max Concentration	15,000 ng/µL (dsDNA)*
Measurement Cycle	~ 3 seconds
Dimensions and Weight	145 mm x 210 mm, ~ 3 kg
Operating Voltage	12 VDC
Power Consumption	15 W (operating)
Surface Construction	303 stainless steel and quartz fiber

Cuvette Mode*

Cuvette Specification	12.5 mm (L) x 12.5 mm (W) x 45 mm (H)
Path Length	10, 5, 2 and 1 mm
Optical Beam	8.5 mm from the bottom of the cuvette
Heat to Cuvette Holder	37 ± 0.5 °C
Stir Speed	130-900 RPM
Absorbance Range	0.04 - 750

Computer

Display	7" High Resolution Tough Screen
Computer	Embedded Computer
Memory	2GB DDR3 Memory
Storage	16GB Solid State Drive
Ports & Connectors	2 x USB 2.0, 1 x Ethernet (10/100/1000Mbps)
Operating System	Win 7 (32)
Wi-Fi	Option

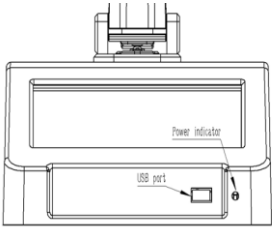
* Option

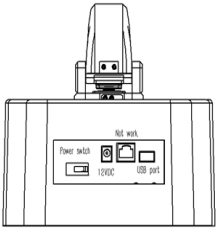
Selection Guide

	Normal Con.*	High Con. Selection*	Cuvette Heat/Stir	Embedded Comp. 7" Touch Screen
Q9000B	2-3000ng/uL			Yes
Q9000C	2-3000ng/uL		Yes	Yes
Q9000M	2-3000ng/uL	3000-15000ng/uL		Yes
Q9000CM	2-3000ng/uL	3000-15000ng/uL	Yes	Yes

*dsDNA 10mm

Front and Rear Panels





Contact information

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