MPS Scientific

SP5000UV / SP6000UV

UV/Visible Spectrophotometer

Instruction Manual

Version 1.0.0

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1. Safety Information

Please read this manual in its entirety before operating the instrument. Following these guidelines ensures the safe use of the SP5000UV/SP6000UV Spectrophotometer.

1.1 Electrical Safety

- Do not open the device under any circumstances.
- Disconnect the device from the mains supply before carrying out maintenance work or changing fuses.
- The interior of the device contains high-voltage components — danger of electric shock.
- Do not use the device if it is damaged, especially if the main power cable is in any way damaged or defective.
- Repairs may only be carried out by service technicians from your local authorized contractual partners.
- The device must be connected to a power outlet with a protective ground connection.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1.2 Environmental Safety

- Do not allow any liquid to enter the device.
- Do not operate the device in a hazardous location or potentially explosive environment.

> ⚠ **DANGER**
> If any safety requirement cannot be met, do not operate the instrument. Contact your authorized service partner immediately.

2. Package Contents

Upon receipt, open the package and verify that all items listed below are present and undamaged. If any items are missing or damaged, contact your local authorized contractual partner immediately.

Description	Quantity
Spectrophotometer	1
Glass Cuvettes	4
Quartz Cuvettes	2
Power Cord (Euro Plug)	1
Power Cord (UK Plug)	1
Power Cord (CH Plug)	1
Instruction Manual	1
Dust Cover	1

3. Installation

3.1 Unpacking

Carefully remove the instrument from its packaging. Check all items against the packing list. If any item is missing or damaged, contact your local authorized contractual partner before proceeding.

3.2 Placement

Place the instrument carefully on a stable, level surface to ensure proper operation and to prevent vibration or accidental movement.

3.3 Connecting the Power Cord

1. Confirm that the instrument power switch is in the OFF position.
2. Insert the female end of the power cord into the power inlet of the instrument.
3. Plug the male end into a properly grounded power outlet.

> ⚠ **IMPORTANT**
> Always use a properly grounded outlet. The instrument must be connected to a power outlet with a protective ground connection.

3.4 Connecting to a Computer (Optional)

The SP5000UV connects to a computer via the USB-A port (with OTG function) on the rear panel. Plug one end of the USB cable into the instrument port and the other end into the computer.

The SP6000UV provides a dedicated USB-B (Type B, square) port for PC connection. Plug one end into the instrument USB-B port and the other end into the computer USB-A port.

> **i NOTE**
> The USB cable is an optional accessory for the PC application. It must be purchased separately and is not included in the standard instrument package.

3.5 Connecting Other Peripherals

The following ports are available on the rear panel of the instrument:

SP5000UV Rear Panel Connections

Port / Interface	Description
USB-A (×1, with OTG)	Connect USB flash drives, keyboard, mouse, Wi-Fi adapter, printer, and other peripheral devices.
Wi-Fi (optional)	Connect wirelessly to a local network for data sharing and remote access.

SP6000UV Rear Panel Connections

Port / Interface	Description
USB-A (×3)	Connect USB flash drives, keyboard, mouse, printer, and other peripheral devices.
USB-B (×1, PC)	Connect to a computer for PC-controlled operation.
RJ-45 Ethernet (×1)	Connect to a local network.
VGA (×1)	Connect an external display.
HDMI (×1)	Connect an HD external display.
Wi-Fi (optional)	Connect wirelessly to a local network.

4. Symbols and Conventions

The following symbols are used throughout this manual to alert users to important information.

Symbol / Label	Meaning
⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, may result in injury or damage to the instrument.
⚠ IMPORTANT	Indicates important information that must be followed to ensure correct instrument operation.
i NOTE	Indicates additional helpful information or tips for optimal use.

5. Specifications

5.1 General Specifications

Specification	SP5000UV	SP6000UV
Optical System	Split Beam	Split Beam
Light Source	Tungsten lamp, Deuterium lamp	Tungsten lamp, Deuterium lamp
Wavelength Range	190 – 1100 nm	190 – 1100 nm
Spectral Bandwidth	2 nm	1.5 nm
Wavelength Accuracy	±0.3 nm; 0.1 nm @ 656.1 nm	±0.3 nm; 0.1 nm @ 656.1 nm
Wavelength Repeatability	≤0.1 nm	≤0.1 nm
Wavelength Display Resolution	0.1 nm	0.1 nm
Wavelength Slew Speed	10,000 nm/min	10,000 nm/min
Wavelength Scanning Speed	20 – 4,200 nm/min	20 – 4,200 nm/min
Photometric Range	-4 – 4 A; 0 – 400 %T; 0 – 9999.9 C	-4 – 4 A; 0 – 400 %T; 0 – 9999.9 C
Photometric Accuracy	±0.002 A @ 0–0.5 A; ±0.004 A @ 0.5–1 A; ±0.3 %T	±0.002 A @ 0–0.5 A; ±0.004 A @ 0.5–1 A; ±0.3 %T
Photometric Repeatability	≤0.001 A @ 0–0.5 A; ≤0.002 A @ 0.5–1 A; ≤0.15 %T	≤0.001 A @ 0–0.5 A; ≤0.002 A @ 0.5–1 A; ≤0.15 %T
Noise	≤0.00005 A @ 0.0 A (500 nm, RMS)	≤0.00005 A @ 0.0 A (500 nm, RMS)
Drift	≤0.0003 A/h @ 500 nm (after 2 h warm-up)	≤0.0003 A/h @ 500 nm (after 2 h warm-up)
Baseline Flatness	±0.0008 A	±0.0008 A

Specification	SP5000UV	SP6000UV
Stray Light	≤0.03 %T @ 340 nm ($NaNO_2$); ≤0.05 %T @ 220 nm (NaI); ≤1 %T @ 198 nm (KCl)	≤0.03 %T @ 340 nm ($NaNO_2$); ≤0.05 %T @ 220 nm (NaI); ≤1 %T @ 198 nm (KCl)
Detector	Dual silicon photodiode	Dual silicon photodiode
Sample Holder	10 mm, 4-cell manual holder	10 mm, 4-cell manual holder

5.2 System & Interface Specifications

Specification	SP5000UV	SP6000UV
Display	8" IPS Color Capacitive Touchscreen	8" IPS Color Capacitive Touchscreen
Storage	128 GB (built-in); unlimited via USB, SD card, or network	128 GB (built-in); unlimited via USB, SD card, or network
Interfaces	USB-A ×1 (with OTG); Wi-Fi optional	USB-A ×3; USB-B ×1 (PC); RJ-45 ×1; VGA ×1; HDMI ×1; Wi-Fi optional
Power Supply	100 – 240 V AC, 50/60 Hz, 120 VA	100 – 240 V AC, 50/60 Hz, 120 VA
Dimensions (W×D×H)	456 × 360 × 185 mm	456 × 360 × 185 mm
Weight	11 kg	11 kg

6. Overview

The SP5000UV and SP6000UV are high-performance split-beam UV/Visible spectrophotometers featuring a built-in 8-inch IPS colour touchscreen computer. Both models cover a wavelength range of 190 – 1100 nm using a tungsten lamp and deuterium lamp combination. The SP6000UV offers a narrower spectral bandwidth of 1.5 nm compared to the SP5000UV's 2 nm bandwidth, providing higher spectral resolution for demanding applications.

Key design features shared by both models include:

- 1200 l/mm holographic grating with low stray light and an optimized split-beam optical system for high measurement accuracy.
- All-aluminum die-casting base and all-molded plastic shell for durability.
- Patented wavelength driving mechanism for improved wavelength accuracy, repeatability, and reduced noise.
- Built-in computer (8 GB memory / 128 GB SSD) with 8-inch IPS colour LCD touchscreen supporting 10-point capacitive touch.

- Wide sample chamber accommodating 5 – 100 mm sample holders and accessories.
- Self-calibration and preheating on start-up.
- Software fully compliant with 21 CFR requirements and GLP/GMP functions for performance and data traceability.
- Firmware upgradeable directly from USB storage.

6.1 Application Modules

Both models support the following measurement modes:

Module	Description
Photometry	Single-wavelength absorbance, transmittance, or custom coefficient measurement.
Multi-Wavelength	Simultaneous measurement at up to 20 wavelengths with custom formula support.
Kinetics	Time-based absorbance rate measurement with automatic kinetic rate calculation.
Time Scan	Continuous photometric monitoring over an unlimited duration.
Quantitation	Standard curve-based concentration measurement with multiple calibration methods.
DNA/Protein (Biological Method)	7 built-in methods plus custom calculations for nucleic acids and proteins.
Spectrum Scanning	Full spectral curve acquisition with peak detection and data processing tools.
Formula Editor	Create and store custom calculation formulas for use across modules.
Performance Verification	Verify wavelength accuracy, photometric accuracy, stray light, and resolution.
File Management	Browse, copy, rename, and delete stored data and parameter files.
User Management & Audit Trail	GLP/GMP-compliant user access control and operation logging.

7. Getting Started

7.1 Powering the Instrument On/Off

4. Turn on the main power switch located on the back of the instrument.
5. Press the Start/Stop button on the front panel to power on the instrument.

> ⚠ **IMPORTANT**
> Avoid turning the instrument on and off repeatedly in quick succession. Wait at least 30 seconds before restarting. Rapid power cycling may cause damage to electrical and mechanical systems.

7.2 Self-Check and Calibration

Before launching the software, ensure the sample chamber is empty and no objects are obstructing the light path. Double-click the UV Studio icon on the desktop to launch the application. The instrument will automatically begin a self-check and calibration sequence.

The self-check sequence includes:

- Activating the lamp and positioning the light source switching mechanism
- Positioning the filter disc
- Positioning the slit switching mechanism (if installed)
- Positioning the automatic sample holder (if installed)
- Measuring dark current
- Positioning the wavelength
- Checking energy levels
- Verifying the system baseline

After the self-check is complete, the instrument is ready for operation.

7.3 User Login

If the User Management and Audit Trail module is enabled, the User Login screen will appear after the self-check. Select your username, enter your password, and press Login to access the system.

8. General Operating Instructions

8.1 Using the Touch Screen

The entire screen is touch-enabled. To make a selection, press the screen with your fingertip, a stylus, or the blunt end of a pencil.

> ⚠ **IMPORTANT**
> Do not press the screen with sharp or pointed objects such as ballpoint pens, as this may damage the touch surface.

8.2 Using the Keyboard

The instrument provides two keyboard types:

- Numeric keypad — used to input measurement parameters and numerical values.
- Full keyboard — used to input user information, file names, and text strings.

8.3 Navigating the Interface

Action	How to Perform
Enter a module	Press the desired application icon on the main interface to open that measurement module.
Return to main interface	Press the Home button within any measurement interface.
Return to previous screen	Press the Back button within Method, Settings, Data List, or Curve List screens.
Perform blank/scan baseline	Place the reference cuvette in both channels, then press the Blank button.
Measure a sample	Place the reference in the reference channel and the sample in the measurement channel, then press Measure.
View data/curve list	Press the List button within the measurement interface.

8.4 Measurement Results Operations

Operation	Description
Open	Load a stored file, including saved data or parameters.
Save	Save current data and parameters to storage.
Print	Print the current test report.
Export to MS Word	Export the current results to Microsoft Word format.
Export to MS Excel	Export the current results to Microsoft Excel format.
Export to PDF	Export the current results to PDF format.
Delete	Delete the selected results from storage.

9. Calibration and System Settings

Select the System icon on the main interface to access calibration and system configuration options.

9.1 Calibration

Select the Calibration tab. Remove all items from the measurement channel, close the sample chamber cover, and select one of the following calibration options:

- Wavelength calibration
- System baseline calibration
- Dark current calibration

> ⚠ **IMPORTANT**
> Before performing any calibration, ensure the measurement channel is empty and the sample chamber cover is closed. Maintain this state throughout the entire calibration process.

9.2 Bandwidth Setting

Select the Bandwidth tab and choose the required bandwidth. The instrument will automatically switch to the selected bandwidth. The SP5000UV operates at a fixed 2 nm bandwidth. The SP6000UV operates at a fixed 1.5 nm bandwidth.

> ⚠ **IMPORTANT**
> After any bandwidth change or optical adjustment, the instrument must be recalibrated. Remove all samples before changing settings, then close the sample chamber.

9.3 Result Resolution

Select the Result Resolution tab and choose the number of display digits appropriate for each measurement mode.

9.4 Light Source Management

Select the Light Source tab to view the usage timing of each light source and the switching wavelength between the tungsten lamp and the deuterium lamp.

Turning a Lamp On/Off

Press the toggle icon to turn the tungsten lamp or deuterium lamp on or off individually.

> **i NOTE**
> When using only one light source for extended periods, consider turning off the unused source to conserve lamp life and reduce energy consumption.

Setting the Light Source Switching Wavelength

Press the current switching wavelength value to open the numeric keyboard. Enter the desired switching wavelength and press Confirm to save the setting.

> ⚠ **IMPORTANT**
> After modifying the light source switching wavelength, you must recalibrate the system baseline before taking measurements.

Resetting Lamp Usage Timers

After replacing a lamp, press the reset icon to clear the usage timer for that lamp (tungsten or deuterium).

> ⚠ **IMPORTANT**
> Only reset a lamp timer immediately after replacing that lamp. Do not reset timers at any other time, as this will produce inaccurate usage records.

9.5 Language Setting

Select the Language tab and choose the desired display language. Multiple languages are available.

9.6 Printer Setting

Select the Printer tab and choose the installed printer from the list of available printers.

9.7 General Settings

Select the General tab to configure the following options:

- Warm Up — Sets a warm-up period between 1 and 120 minutes before measurement begins.
- Calibrate System Baseline When Boot — Enables or disables automatic system baseline calibration on startup.

10. Measurement

> ⚠ **DANGER**

Reagents, dilution buffers, and sample materials (including nucleic acids, proteins, and bacterial cultures) may be hazardous or infectious. Always follow local laboratory safety procedures during sample preparation, measurement, and maintenance. Wear appropriate protective clothing and gloves, use disinfectants as required, and dispose of all materials in accordance with local regulations.

⚠ **IMPORTANT**
Only quartz cuvettes may be used for measurements in the UV range. Glass cuvettes are not UV-transparent and will produce inaccurate results.

Ensure cuvettes are clean and free from residue before each measurement. See Section 15 (Repair and Maintenance) for cuvette cleaning instructions.

10.1 Photometry

Photometry mode measures the absorbance (Abs), transmittance (%T), or reflectance (%R) of a sample at a single wavelength.

6. From the main interface, press the Photometry icon to open the module.
7. Press the Mode button to select the measurement mode: Abs, %T, or %R.
8. Press the Wavelength button and enter the desired measurement wavelength.
9. If Abs mode is selected, press the Coefficient button to set the coefficient K for the K×A calculation (optional).
10. Place the reference cuvette in both the measurement channel and the reference channel, then press Blank.
11. Place the sample cuvette in the measurement channel and read the result.

10.2 Multi-Wavelength

Multi-Wavelength mode measures the absorbance or transmittance of a sample at multiple wavelengths simultaneously.

12. From the main interface, press the Multi-Wavelength icon to open the module.
13. Press the Settings button to configure measurement parameters. Parameters may be saved or loaded from memory.

Parameter	Description
Photometric Mode	Three options: Abs, %T, or %R.
Wavelength	1 – 20 wavelengths; range 190 – 1100 nm.

Parameter	Description
Cycles	Number of measurement cycles (1, 2, 3, 5, 10, 20, 30, or 50). The instrument calculates the average as the final result.
Calculation Formula	Optional built-in or custom formula for direct result calculation.
Light Path Length	The internal width of the cuvette used for measurement.
Equivalent Conversion	Automatically converts measurements from different path-length cuvettes to the equivalent 10 mm value.

14. Place the reference cuvette in both channels, close the sample chamber cover, and press Blank.
15. Place the sample cuvette in the measurement channel, close the cover, and press Measure.
16. Repeat the previous step for additional samples.
17. Press the List button to view results in list mode.

10.3 Kinetics

Kinetics mode measures the rate of change of absorbance (or the absorbance change rate) over time at a specified wavelength.

18. From the main interface, press the Kinetics icon to open the module.
19. Press the Settings button to configure measurement parameters.

Parameter	Description
Measurement Mode	Two options: Kinetics or Kinetic Rate.
Wavelength	Range: 190 – 1100 nm.
Background Correction	Enables or disables background correction.
Corrected Wavelength	Background correction wavelength; range 190 – 1100 nm.
Total Time	Total sampling duration required for the measurement.
Interval	Time interval between data samples.
Delay / Derivative	Waiting time before sampling begins / time used for activity calculation.
Coefficient	Coefficient used in the activity calculation equation.
Light Path Length	The internal width of the cuvette used for measurement.
Equivalent Conversion	Automatically converts measurements to the equivalent 10 mm value.
Auto Scale	Automatically adjusts the graph coordinates to fit the data.

Parameter	Description
Y Max / Y Min	Fixed Y-axis bounds when Auto Scale is disabled.
Automatic Printing	Automatically prints curves and results after measurement is complete.
Automatic Save	Automatically saves curves and results after measurement is complete.

20. Place the reference cuvette in both channels, close the cover, and press Blank.
21. Place the sample cuvette in the measurement channel, close the cover, and press Measure.
22. Repeat the previous step for additional samples.

10.4 Time Scanning

Time Scanning mode measures changes in photometric values over time at a single wavelength.

23. From the main interface, press the Time Scanning icon to open the module.
24. Press the Settings button to configure measurement parameters.

Parameter	Description
Photometric Mode	Three options: Abs, %T, or %R.
Wavelength	Range: 190 – 1100 nm.
Total Time	Total sampling duration.
Interval	Time interval between data samples.
Light Path Length	The internal width of the cuvette.
Equivalent Conversion	Automatically converts measurements to the equivalent 10 mm value.
Auto Scale	Automatically adjusts the graph coordinates.
Y Max / Y Min	Fixed Y-axis bounds when Auto Scale is disabled.
Automatic Printing	Automatically prints results after measurement.
Automatic Save	Automatically saves results after measurement.

25. Place the reference cuvette in both channels, close the cover, and press Blank.
26. Place the sample cuvette in the measurement channel, close the cover, and press Measure.
27. Repeat the previous step for additional samples.

10.5 Quantitation

Quantitation mode measures sample concentration by establishing and using a standard curve.

Establishing a Quantitative Method

28. From the main interface, press the Quantitation icon to open the module.
29. Press the Settings button to open the Method interface, then press New to create a method and configure parameters.

Parameter	Description
Measurement	Five built-in options: single wavelength, dual-wavelength difference, dual-wavelength ratio, three-wavelength, and area. Custom formulas are also supported.
Wavelength	Range: 190 – 1100 nm.
Cycles	Number of measurement cycles (1, 2, 3, 5, 10, 20, 30, or 50).
Light Path Length	The internal width of the cuvette.
Equivalent Conversion	Automatically converts measurements to the equivalent 10 mm value.
Equation	Equation form: C=F(Abs) or Abs=F(C).
Fitting	Three polynomial fitting options: first order, second order, or third order.
Zero Intercept	When enabled, the fitting curve passes through the origin.
Calibration	Three methods: input equation coefficients, measure standard samples, or input standard sample values.
Unit	19 built-in concentration units or custom units.
Number of Standard Samples	2 – 20 standard samples (for standard sample calibration only).
Threshold	Upper and lower limits for measurement results.

Standard Curve — Method A: Input Equation Coefficients

a. Set Calibration to Input Equation Coefficient, configure other parameters, and press Start.
b. On the Input Equation Coefficient screen, press each coefficient field (K0–Kn) and enter the value.
c. Press Accept to save the method and return to the Method interface.

Standard Curve — Method B: Measure Standard Samples

d. Set Calibration to Measure Standard Samples, configure other parameters, and press Start.

e. Place the reference cuvette in both channels, close the cover, and press Blank.
f. Place each standard sample in the measurement channel, close the cover, and press Measure.
g. Repeat the previous step for all standard samples.
h. Enter the concentration value for each standard sample in the corresponding field.
i. Press Accept to save the method and return to the Method interface.

Standard Curve — Method C: Input Standard Sample Values

j. Set Calibration to Input Standard Samples, configure other parameters, and press Start.
k. Enter the Abs value and corresponding concentration value for each standard sample.
l. Press Accept to save the method and return to the Method interface.

Measuring Samples

30. Open the Quantitation module and press the Settings button.
31. Load an existing method or create a new one, then press Accept.
32. Place the reference cuvette in both channels, close the cover, and press Blank.
33. Place the sample cuvette in the measurement channel, close the cover, and press Measure.
34. Repeat the previous step for additional samples.
35. Press the List button to view results in list mode.

10.6 Biological Method

Biological Method mode measures DNA, RNA, and protein concentrations using built-in methods or custom user-defined methods.

36. From the main interface, press the Biological Method icon to open the module.
37. Press the Settings button to open the Method interface, then press New to create a method.

Parameter	Description
Measurement	Seven built-in methods: DNA-1 (260/280), DNA-2 (260/230), UV method, Lowry method, BCA method, CBB method, Biuret method.
Wavelength	Range: 190 – 1100 nm.
Coefficient	Calculation coefficient required for concentration (specific to the selected method).
Light Path Length	The internal width of the cuvette.
Equivalent Conversion	Automatically converts measurements to the equivalent 10 mm value.

Parameter	Description
Unit	19 built-in concentration units or custom units.
Threshold	Upper and lower limits for measurement results.

38. Load an existing method or create a new one, then press Accept.
39. Place the reference cuvette in both channels, close the cover, and press Blank.
40. Place the sample cuvette in the measurement channel, close the cover, and press Measure.
41. Repeat the previous step for additional samples.
42. Press the List button to view results in list mode.

10.7 Spectrum Scanning

Spectrum Scanning mode measures the photometric curve of a sample across a specified wavelength range.

43. From the main interface, press the Spectrum Scanning icon to open the module.
44. Press the Settings button and configure the following parameters:

Parameter	Description
Measurement Mode	Three options: Abs, %T, or %R.
Start Wavelength	Scan start wavelength; range 190 – 1100 nm.
End Wavelength	Scan end wavelength; range 190 – 1100 nm.
Interval	Six wavelength interval options: 0.1, 0.2, 0.5, 1.0, 2.0, or 5.0 nm.
Speed	Three scan speeds: Quick, Medium, or Slow.
Cycles	Number of scan repetitions.
Time Interval	Interval between consecutive scans.
Light Path Length	The internal width of the cuvette.
Auto Scale	Automatically adjusts the graph coordinates.
Y Max / Y Min	Fixed Y-axis bounds when Auto Scale is disabled.
Automatic Printing	Automatically prints results after the scan is complete.
Automatic Save	Automatically saves results after the scan is complete.

45. Place the reference cuvette in both channels, close the cover, and press Scan Baseline.
46. Place the sample cuvette in the measurement channel, close the cover, and press Scan Sample. The curve will be drawn after the scan.
47. Press the Zoom button to adjust the graph view as needed.

48. Press the Peak button to retrieve and mark the value at any specific point on the curve.

11. File Management

File Management allows you to view and organize all stored parameters, methods, and measurement data files.

11.1 Browsing the File List

The File Management interface displays all data files stored on the instrument. Use the Measurement Mode and Type filters to display specific file categories.

11.2 Deleting Files

49. Select the file you wish to delete.
50. Press the Delete button to remove it.

11.3 Copying Files

51. Select the file you wish to copy.
52. Press the Copy button to open the Path Selection dialog.
53. Select the destination path and press Confirm to complete the copy.

11.4 Renaming Files

54. Press the file name you wish to rename.
55. The keyboard will appear. Enter the new file name.
56. Press Confirm to save the new name.

12. User Management and Audit Trail

i NOTE
Only authorized users can access this module. Typically this includes administrators and advanced users.

12.1 GLP/GMP Options

The GLP/GMP Options section provides four compliance settings that can be enabled or disabled by an administrator:

- Automatic Data Saving — Automatically saves all measurement data.
- Disable Overwriting Data — Prevents existing data from being overwritten.
- Allow Locking System — Enables the ability to lock the system.
- Password Replacement Period — Defines how frequently passwords must be changed.

12.2 User Groups and Permissions

The system uses a three-tier management structure. Each tier is organized as a group, and all users belong to a group. Users at each level can assign permissions within their own authorization scope.

Managing User Groups

- Create a Group — Press the New button, configure permissions, and press Accept.
- Copy a Group — Select a group and press Copy to duplicate it with the same permissions. Press Accept to save.
- Edit a Group — Select a group and press Edit to modify permissions. Press Accept to save.

Managing Users

- Copy a User — Select a user and press Copy to create a duplicate with the same permissions.
- Edit a User — Select a user and press Edit to modify the username, description, or password. Press Accept to save.
- Lock/Unlock a User — Select a user and press the Lock button to temporarily disable the account. Press Lock again to re-enable it.

12.3 Audit Trail

Select the Log tab in the User Management interface to access the audit trail.

- Browse Logs — Select a username and a time range to view the operation log for one or all users.
- Print Log — Select the log entries you wish to print and press the Print button.
- Export Log — Select the log entries to export, press Export, and choose a destination path.
- Database Backup — Press Backup, select a destination path, and save a copy of the database.
- Database Recovery — Press Restore and select a previously backed-up database file to restore it.

13. Formula Editor

The Formula Editor allows you to create and manage custom calculation formulas for use in photometric measurements.

13.1 Adding a Formula

57. From the main interface, press the Formula Editor icon to open the module.
58. In the Formula List, press New to open the Formula Editor.
59. Enter the formula name, select the applicable measurement module, and enter the calculation formula.
60. Press Accept to save the formula.

13.2 Deleting a Formula

61. In the Formula List, select the formula you wish to delete.
62. Press the Delete button to remove it.

14. Performance Verification

Performance Verification confirms that the instrument's key performance indicators meet specifications.

> **i NOTE**
> Standard filters used for performance verification must be purchased separately and are not included with the instrument. Use only filters that are within their stated validity period.

14.1 Preparation

- Allow the instrument to warm up for at least 30 minutes before performing verification.
- Calibrate the dark current and system baseline before starting any verification procedure.
- Ensure all reference materials are within their stated validity period.

14.2 Wavelength Accuracy and Repeatability

Standard material: Holmium oxide solution or equivalent filter.

63. In the Performance Verification interface, select the Wavelength Accuracy tab. Configure parameters in the Settings interface and press Accept.

64. Remove all items from the measurement channel, close the sample chamber cover, and press Measure to start.
65. Follow the on-screen prompts: place the reference in the measurement channel to perform a blank, then place the standard material. Results will be displayed upon completion.

14.3 Photometric Accuracy and Repeatability

Standard material: NIST 930D or equivalent filter.

66. Select the Photometric Accuracy tab. Configure parameters in the Settings interface and press Accept.
67. Remove all items from the measurement channel, close the cover, and press Measure to start.
68. Follow the on-screen prompts to perform a blank, then place the standard material for measurement.

14.4 Stray Light Verification

Standard materials: 10 g/L NaI solution or equivalent filter (at 220 nm); 50 g/L $NaNO_2$ solution or equivalent filter (at 340 or 360 nm).

69. Select the Stray Light tab. Configure parameters in the Settings interface and press Accept.
70. Remove all items from the measurement channel, close the cover, and press Measure to start.
71. Follow the on-screen prompts to perform a blank, then place the standard material for measurement.

14.5 Resolution Verification

Standard material: Toluene-hexane solution.

72. Select the Resolution tab. Configure parameters in the Settings interface and press Accept.
73. Remove all items from the measurement channel, close the cover, and press Measure to start.
74. Follow the on-screen prompts to perform a blank, then place the standard material for measurement.

15. Repair and Maintenance

Routine maintenance keeps the instrument in optimal working condition and ensures measurement accuracy.

15.1 Daily Maintenance

Sample Chamber

After each measurement session, promptly remove all cuvettes and sample solutions from the sample chamber. Residual solution can cause mirror contamination and optical degradation. Pay particular attention to corrosive or highly volatile samples. Wipe away any solution remaining in the chamber immediately.

Instrument Surface

The instrument housing is painted. Immediately wipe away any liquid spills using a damp cloth. Do not use organic solvents to clean the housing, as they will damage the paint surface.

Cuvette Cleaning

After every measurement session or solution change, clean cuvettes thoroughly. Residue remaining on cuvette surfaces will cause measurement errors.

15.2 Troubleshooting

Problem	Possible Cause	Solution
Power on — no response	Power cord not securely connected	Check and secure the connection
Power on — no response	Fuse blown	Replace the fuse
Measurement uncertainty or instability	Sample is unstable	Stabilize the sample preparation
Measurement uncertainty or instability	Glass cuvettes used in UV range	Replace with quartz cuvettes
Measurement uncertainty or instability	Sample concentration too high	Dilute the sample
Measurement uncertainty or instability	Power supply voltage low or unstable	Check and improve the power supply
Measurement uncertainty or instability	Lamp damaged or nearing end of life	Replace the lamp
Dark current error during self-check	Sample chamber lid open during self-check	Close the lid and restart
System calibration failed	Object obstructing the light path	Remove the obstruction and recalibrate

Problem	Possible Cause	Solution
Inaccurate measurements	Cuvettes contaminated	Clean the cuvettes
Inaccurate measurements	Sample contaminated	Prepare a fresh sample
Inaccurate measurements	Cuvettes poorly matched	Use a matched set of cuvettes
Inaccurate measurements	Dark current error	Re-measure the dark current

16. Spare Parts Replacement

16.1 Replacing the Fuse

> ⚠ **DANGER**
> Switch off the power and unplug the instrument before replacing the fuse.

75. Prepare a 3 × 75 mm flat-blade screwdriver.
76. Turn off the power switch and unplug the power cord from the outlet.
77. Use the screwdriver to pry open the fuse holder on the rear panel.
78. Remove the blown fuse and insert a new fuse of the correct rating.
79. Reinstall the fuse holder into the instrument's power outlet recess.
80. Plug in the power cord and turn the power switch on.

16.2 Replacing the Lamps

> ⚠ **DANGER**
> HOT SURFACE: After switching off the instrument, wait at least 20 minutes before opening the lamp chamber. The lamps become very hot during operation and can cause burns.

Tools required: a 6 × 150 mm flat-blade screwdriver and a pair of cotton gloves.

Step 1 — Power Off

Switch off the power supply and unplug the power cord from the outlet. Wait at least 20 minutes for the light sources to cool completely before proceeding.

Step 2 — Open the Instrument Cover

Use the screwdriver to remove the four screws securing the instrument cover (two on each side). Slowly open the cover using the back edge of the instrument as a hinge. Unplug the two connectors on the interface board before fully opening the cover.

Step 3 — Open the Lamp Housing Cover

Use the screwdriver to remove the three screws securing the lamp housing cover, then remove the lamp housing cover.

Step 4 — Replace the Deuterium Lamp

Unplug the deuterium lamp connector. Unscrew the two flange screws securing the deuterium lamp and carefully remove it. Put on cotton gloves and insert the new deuterium lamp. Tighten the two flange screws and reconnect the lamp connector.

Step 5 — Replace the Tungsten Lamp

Put on cotton gloves. Carefully remove the old tungsten lamp from its holder and insert the new tungsten lamp. Do not touch the lamp bulb directly with bare hands, as skin oils will shorten lamp life.

Step 6 — Adjust the Tungsten Lamp Spot Position

Turn on the instrument power. Move the switching mirror to the calibration position and observe the tungsten lamp's incident spot. Adjust the spot to align with the centre of the entrance slit. If the spot is off-centre (left or right), loosen the two screws securing the tungsten lamp holder, reposition the holder, and tighten the screws once the spot is correctly aligned.

Step 7 — Reassemble and Complete

Reinstall the lamp housing cover and secure it with the screws. Reconnect the two interface board connectors, close the instrument cover, and fasten the cover screws. Reset the lamp usage timer for the replaced lamp (see Section 9.4). The replacement is now complete.

> **i NOTE**
> After replacing a lamp, always reset the corresponding lamp usage timer in the Light Source Management settings (Section 9.4) to ensure accurate usage records.

17. Warranty

This product is warranted to be free from defects in materials and workmanship for a period of one (1) year from the date of delivery, except for the lamps. Lamps carry a separate warranty of 1,000 hours of lamp usage time or 6 months, whichever comes first.

If a defect is found within the warranty period, the manufacturer will, at its discretion, repair, replace, or refund the purchase price of the product.

This warranty does not cover damage resulting from accident, abuse, misuse, or misapplication, or damage due to ordinary wear and tear. If required maintenance and inspection services are not performed in accordance with this manual and applicable local regulations, the warranty may be voided, except where the defect is unrelated to such non-performance.

Items being returned under warranty must be insured by the customer against possible damage or loss during transit.

17.1 Regulatory Compliance

The customer is responsible for obtaining all necessary regulatory approvals and authorizations required to operate the product in their local environment. The manufacturer will not be liable for any omission or failure to obtain required approvals, unless a refusal is directly attributable to a product defect.

18. Equipment Disposal

This equipment is marked with the crossed-out wheeled bin symbol, indicating that it must not be disposed of as unsorted municipal waste.

At the end of the product lifecycle, you are responsible for correctly disposing of the equipment by delivering it to an authorized facility for separate collection and recycling. If the equipment has been exposed to biological, chemical, or radiological contamination, you are also responsible for decontaminating the equipment prior to disposal, to protect the health and safety of persons involved in the recycling process.

For information on your nearest authorized collection point, contact the dealer from whom you originally purchased the equipment.

By disposing of this equipment correctly, you help conserve natural resources, protect the environment, and ensure that the equipment is recycled in a manner that protects human health.

Thank you for your cooperation.