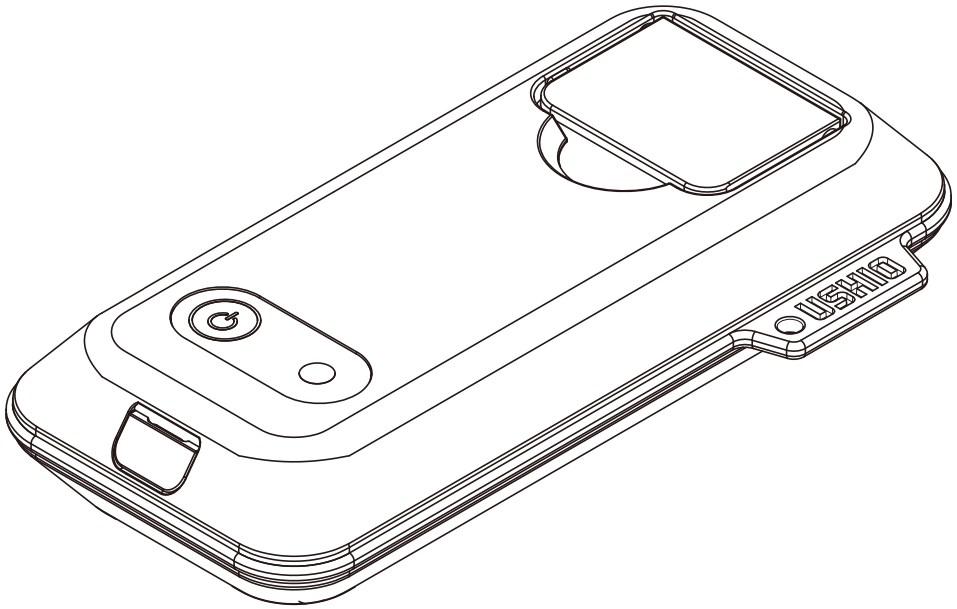
USHIO

Ushio Absorbance Photospectrometer

PiCOEXPLORER

User's Manual and Troubleshooting Guide

PAS-110



USHIO INC.

USHIO

Thank you for purchasing the PiCOEXPLORER PAS-110 Absorbance Photospectrometer. This manual contains detailed descriptions, instructions for use, and specifications of this device. Please print out and store this manual in a safe place, and refer to as needed.

SAFETY NOTES

These safety notes are intended to help you use this device properly and safely. These notes contain essential and crucial instructions that must be followed at all times. Please read and understand these notes before reading the rest of the manual and guide.

This icon indicates a possible danger of loss of life or injury.

This icon indicates a possible danger of injury to personnel or physical damage.

This icon indicates important information concerning easy-to-make mistakes that can adversely affect operation and maintenance. Not following the instructions given could result in damage to the device.

- Do not use the device near medical equipment. The radio waves emitted by wireless communication module could have an adverse effect on nearby pacemakers or electrical medical devices.
- Do not use near automatic doors, alarms, or other automatic electrical control devices. The wireless communication module could cause malfunctioning in these devices.
- Do not use any USB cables that have been damaged or deformed. Doing so could result in smoke, overheating, or fire.
- Carefully read and correctly follow the instruction in this user's manual about the use of USB cables. Replace any cable that looks defective or damaged.
- Do not wash the device with water, or disassemble or tamper with it in any way. Doing so could result in electric shock, fire, or smoke.
- When powering the device thru a USB connector, use a PC with a limited-energy circuit USB output, or an AC adapter with a limited-energy circuit used to power PCs.

HANDLING OF PHOTOSPECTROMETER

- This device is for general analytic use. It was not designed for, nor should it be used for, medical diagnostic purposes requiring very high levels of reliability and/or accuracy. USHIO INC. cannot be held responsible for any damages or liabilities resulting from the inappropriate use of this device for such purposes.
- To avoid eye injury, never look directly at the light source in the device.
- When connecting and removing the USB cable, do so carefully; do not jam the connector or yank the cord.
- Avoid dropping the unit or otherwise exposing to shocks or extreme forces.

HANDLING OF BATTERIES

- Follow all instructions of this manual on the handling and use of dry-cell batteries.
- Use only the battery type specified (AAA type). Other types may damage the unit.
- Insert batteries properly, matching the plus and minus ends to the equivalent connections inside the unit.
- When replacing batteries, always replace all 3 batteries together.
- Keep batteries out of the hands of small children.
- If the unit will not be used for some time, remove the batteries before storage. Leaking batteries can cause severe damage.

SAFETY NOTES

CAUTION	**HANDLING OF BATTERIES** ● Do not expose batteries to heat or toss into open flames. ● For the sake of the environment, dispose of used batteries responsibly and in accordance with local regulations. ● The batteries that come packaged with the unit were inserted only for device testing purposes. They may not last long; replace them as soon as possible.
CAUTION	**HANDLING OF A BLUETOOTH DEVICE** ● This is a Bluetooth low-energy compatible device. It cannot be connected with any other wireless communication protocol. ● This device has been certified as having the proper wireless system for low-power electronic communication. Do not remove the label of certification from the device. It is against the law to tamper with the device by disassembling, and/or altering operation. Doing so may result in criminal prosecution. ● This device communicates using a 2.4GHz frequency range. This range is also used by the following wireless transmitters: commercial, scientific, and medical devices and other similar devices, wireless transmitters used to detect moving object on factory lines (which require licensing), low-power wireless transmitters which do not require licensing, and amateur wireless transmitters, all of the above designated herein as “other wireless transmitters”. Before using, make sure there is no such wireless transmitter in the vicinity which could cause interference. If you find that the operation of this device near another wireless transmitter is causing interference, increase the distance between the devices or if possible, turn off the other device.
IMPORTANT	● Do not use in areas with high levels of dust, oil smoke, steam, damp, or high heat. ● If the unit gets wet or submerged in liquid, immediately turn off and consult your vendor. ● Dirt and other contaminants in the measuring chamber can cause erroneous readings. Before using, make sure the measuring chamber is clean; if not, carefully wipe away all contaminants with a cotton swab or gauze/soft cloth. ● Do not swing the device by its strap. This could damage/loosen the water-resistant packing in the device. ● Communications errors or reductions in communication speed may result when using the device in the proximity of a 2.4GHz wireless LAN. Keep the device and the communicating tablet as close to each other as possible to avoid this.

LAWS AND REGULATIONS / APPROVED STANDARDS

FCC NOTICE

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

ICES-003 NOTICE

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conformé à la norme NMB-003 du Canada.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

IC-NOTICE

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

USHIO

CONTENTS

USHIO

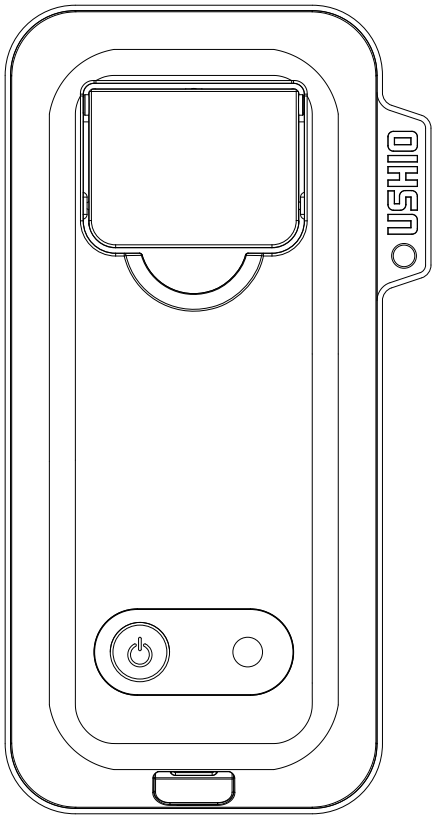
DEVICE FEATURES

- This device is a Bluetooth-enabled absorbance photospectrometer.
- Download the special app on to a Bluetooth-enabled tablet to enable wireless access to the measurements made by the photospectrometer.
- The high sensitivity yet extremely compact design of this device is the result of USHIO's breakthrough Silicone Optical Technology (SOT).
- Measurements can be made directly in a PCR tube without pipettes, eliminating worries about sample contamination.

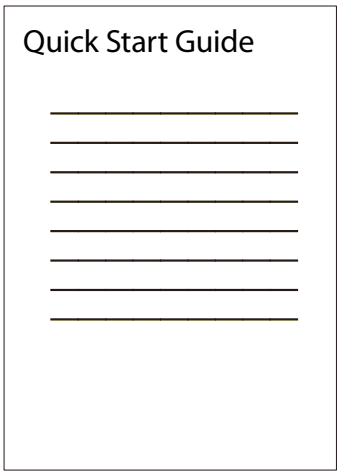
HARDWARE PACKAGE

The standard package includes:

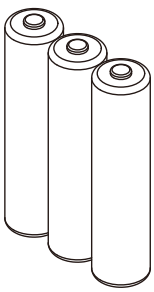
(1) PAS-110 Unit..... 1
(2) Alkaline Dry-Cell Batteries (AAA Type)..... 3
(3) Quick Start Guide (includes warranty)..... 1



PAS-110 Unit

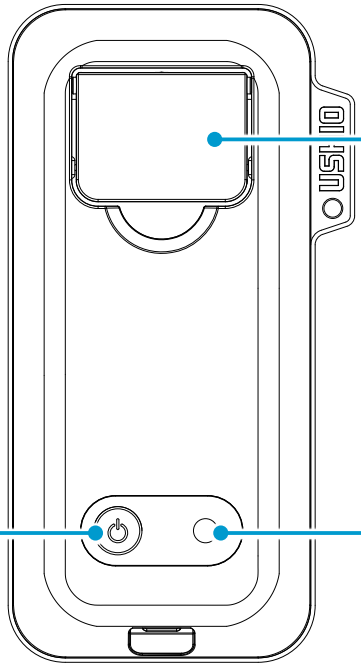


Quick Start Guide (includes warranty)



Alkaline Dry-Cell
Batteries (AAA Type)

HARDWARE COMPONENTS

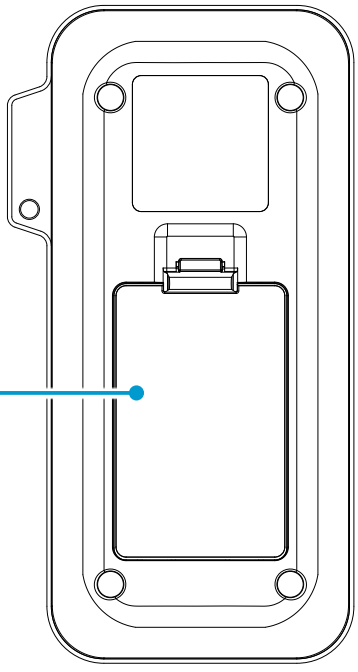


Measurement Chamber Cover
Open this cover to insert PCR tube for sample measurement (we recommend a Watson 137-211c 0.2mL tube).

Power Switch
Turns unit on and off.

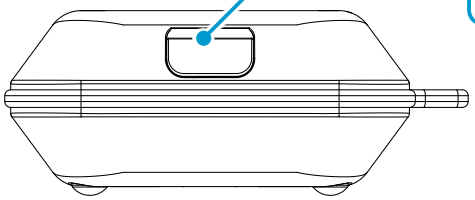
Status Light
- Steady Red: check battery level
- Steady Purple: powered and connected via Bluetooth Low Energy
- Blinking Red: Low voltage (3.4V or less*)
- Blinking Blue: measurement in progress

* Some battery types may fail without first blinking.



Battery Cover
Open to insert batteries.

USB Interface Connector (micro USB)
For connection with a USB cable. Can be used to supply power instead of batteries. Not a data communication channel.



BATTERY INSERTION

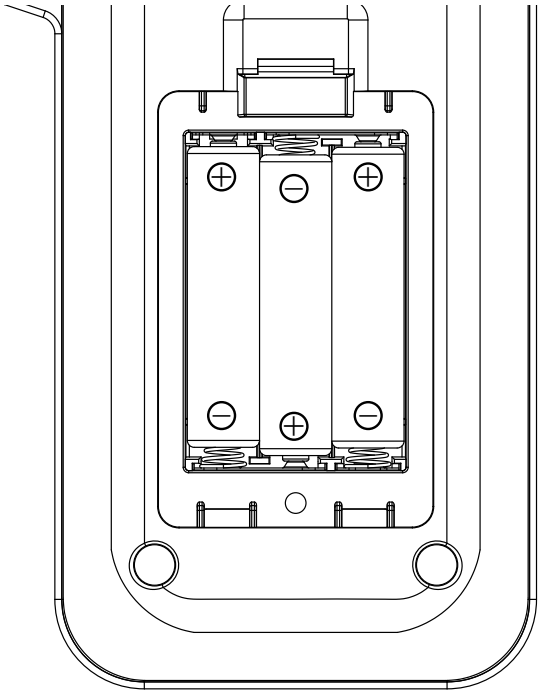
- The unit does not come with ready-to-use, fully charged batteries. If you find batteries already inserted, be aware that these are for testing purposes only, and may already be near failure.

Batteries Needed: 3 AAA Type Dry-Cell Batteries

CAUTION	Use only AAA type batteries. Use of other types may damage the unit.

Follow the 3 steps below when replacing batteries.

1. Open the battery cover on the back side of the unit.
2. Insert batteries, aligning the plus and minus (+ and -) ends of the batteries with the plus and minus markings on the inside of the battery case.
3. Close the battery cover.



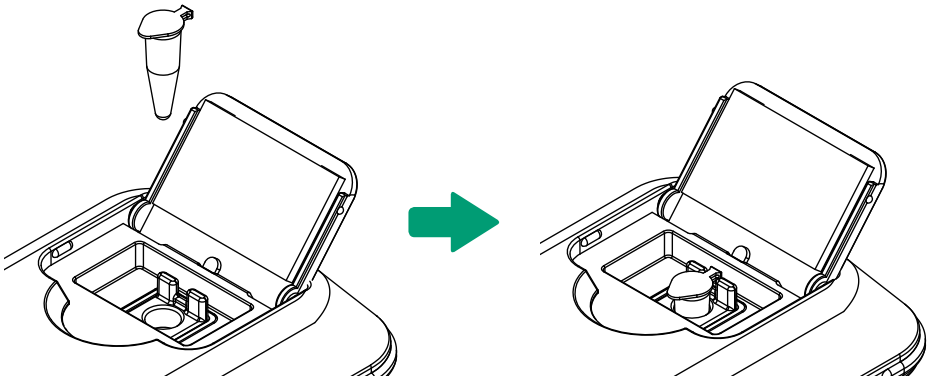
CAUTION	Make sure battery cover is securely fastened. A loose cover may allow water to seep into the unit and cause damage. Before opening the cover, wipe off any liquid on the outside to prevent seepage and possible damage.

TAKING MEASUREMENTS

CAUTION	Do not let any sample liquid from the PCR Tube spill into the unit. This could damage the optical unit.

Follow the procedure outlined below for taking basic measurement readings.

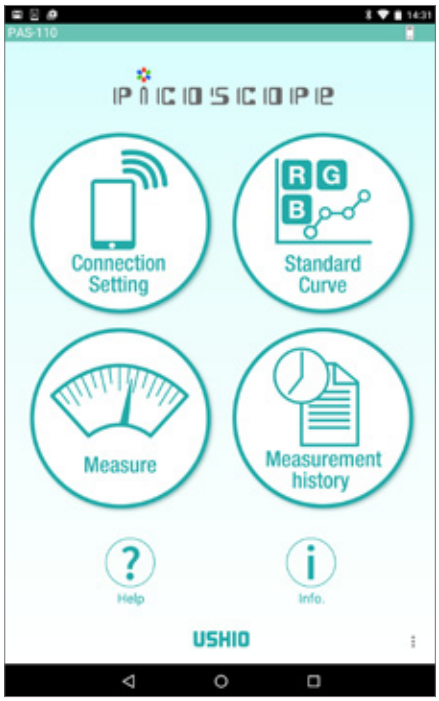
1. Turn on unit power. The status light will turn red ● .
   * If battery level falls too low, the red light will begin blinking.
2. Open the measurement chamber lid and set PCR tube into the measurement chamber. Firmly close the lid.



* Note that the tube lid connector should fit snugly between the two guide projections at the back of the chamber.

3. Launch the tablet application (PAS-110) by tapping the icon.
   (Refer to P10. 1. Using the Top Screen.)

4. Make BLE connection.
   (Refer to P11. 2. Wireless Connection.)



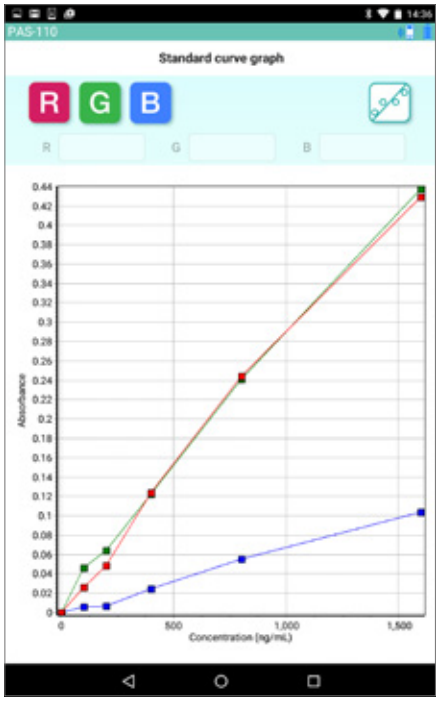
Top Screen

Connection Setting Screen

TAKING MEASUREMENTS

5. Draw a standard calibration curve.
(Refer to P13. 3. Graphing the Standard Curve)

Drawing Standard Curve Screen



Standard Curve Graph Screen

6. Measure **sample concentration.**
(Refer to P21. 4. Taking Measurements)

Concentration Measurement Screen

7. Check previous measurements.
(Refer to P23. 5. Displaying Previous Measurements)

Measurement History Screen

1. Using the Top Screen

The top screen displays the following buttons.

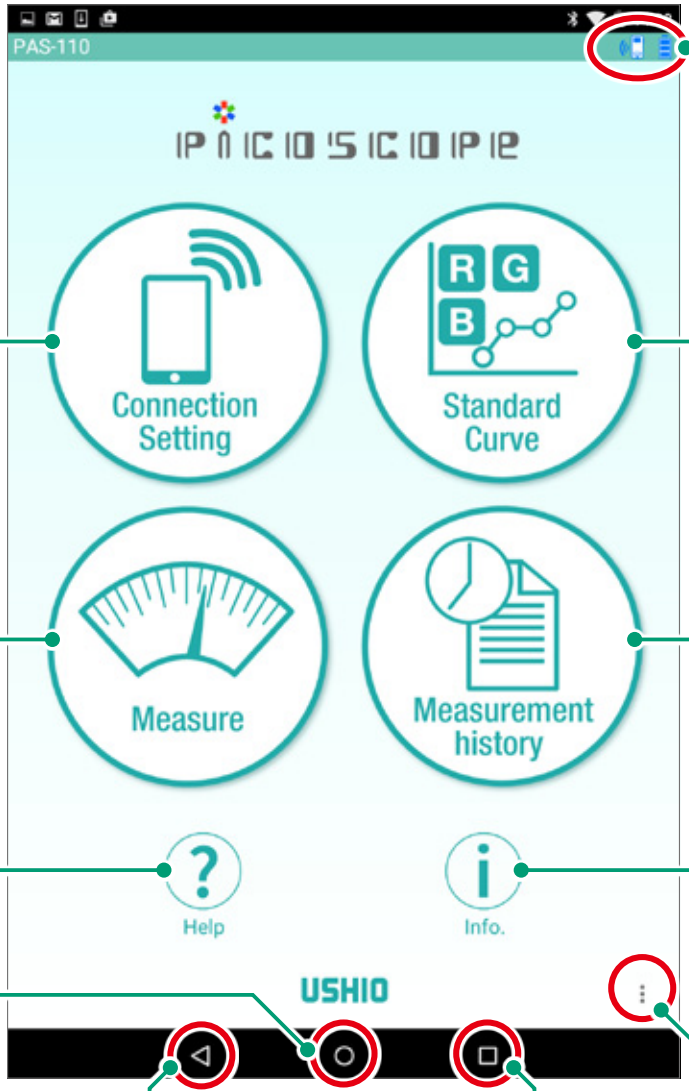


Illustration 1: Top Screen

Bluetooth Connection Status

Unconnected

Battery Voltage Level OK

Battery Voltage Level Low

Connection Setting Button

To connect to the hardware unit, goes to the connection setting screen (P11).

Draw Standard Curve Button

Goes to the Draw Standard Curve Screen to allow creation of a standard calibration curve (P13).

Measurement Button

Goes to the Measurement Screen to take measurements (P21).

Measurement History Button

Goes to the Measurement History Screen to allow inspection of previous measurements (P23).

Help Button

Goes to the Help Screen (P29).

Info Button

Goes to the Info Screen to show current device status (P26).

Home Button

Returns to the Home Screen.

Save Button

Moves to the Save Screen (P27). On this screen you can also switch display languages between English and Japanese.

Return Button

Go back to previous screen.

App History Button

2. Wireless Connection

Tap the Connection Setting Button on the top screen to move to this screen (see illustration 2-1).

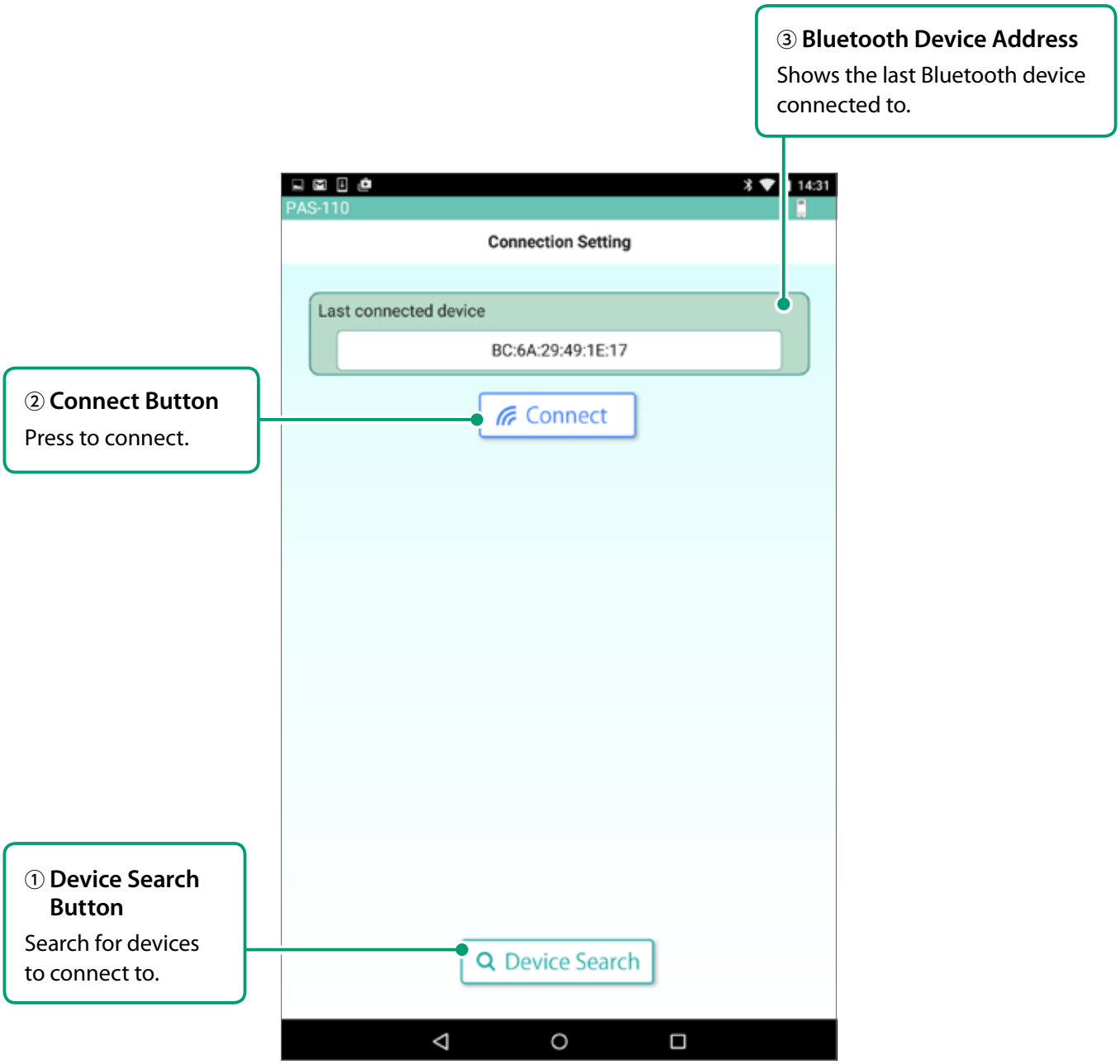


Illustration 2-1: Connection Setting Screen

TAKING MEASUREMENTS

(1) Tap Device Search Button ① to search for photospectrometer unit. If not detected, turn the photospectrometer off and on, then tap the Device Search Button again. If the photospectrometer is found, its Bluetooth device address will be displayed as shown in illustration 2-3.

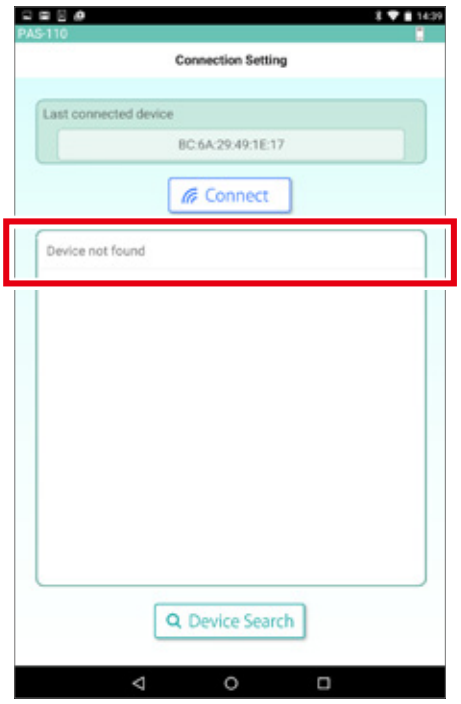


Illustration 2-2:
Device Address Not Found

Illustration 2-3:
Device Address Found

(2) Tap the device address that you wish to connect to.
The background color of the address will change, indicating selection.

(3) Tap the Connect Button ② to begin connecting.

(4) Once the connection is established, tap the Return Button to return to the top screen.

Illustration 2-4:
Device Address Selected

3. Graphing the Standard Curve

When drawing a standard curve, first prepare a set of samples of known concentration.

The procedure is as follows:

1. measure baseline data;
2. measure known concentration sample data;
3. check the results by graphing the data.

CAUTION	Before beginning the procedure, be sure to tap the Clear Button (3-4 (1)) to clear previous data. The Clear Button is labelled ① in Illustration 3-11.

Tap the Standard Curve Button on the top screen to move to the Draw Standard Curve Screen (see Illustration 3-1).

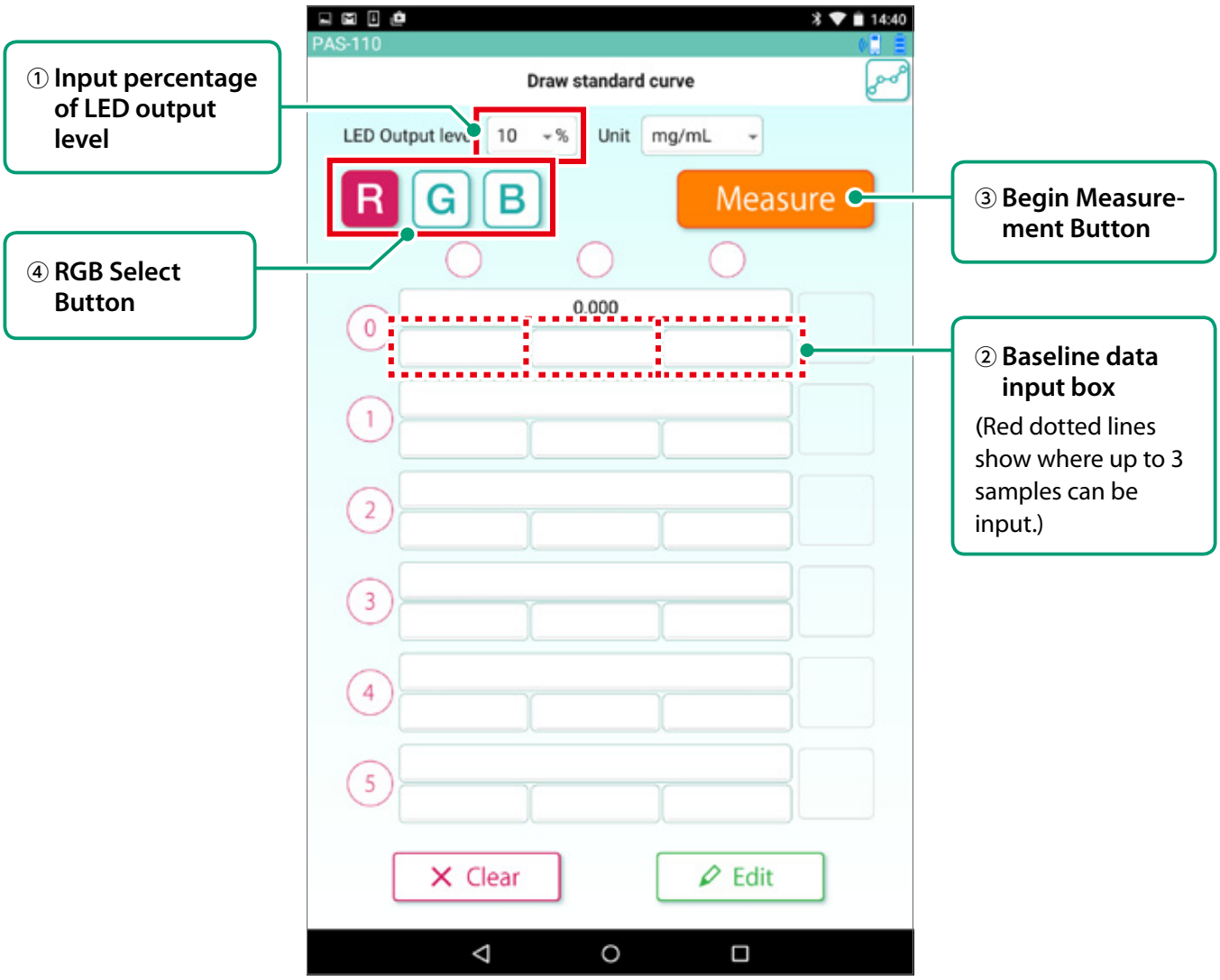


Illustration 3-1: Draw Standard Curve Screen ①

3-1. Measuring Baseline Data

(1) Set the sample to be used for baseline concentration measurement into the measurement chamber of the photospectrometer.

(2) Set the LED optical output level by entering percentages into the LED Output Level box ①. You can tap the box itself to bring up a scrolling list of percentage values. Select the value you want and tap the OK Button to confirm.

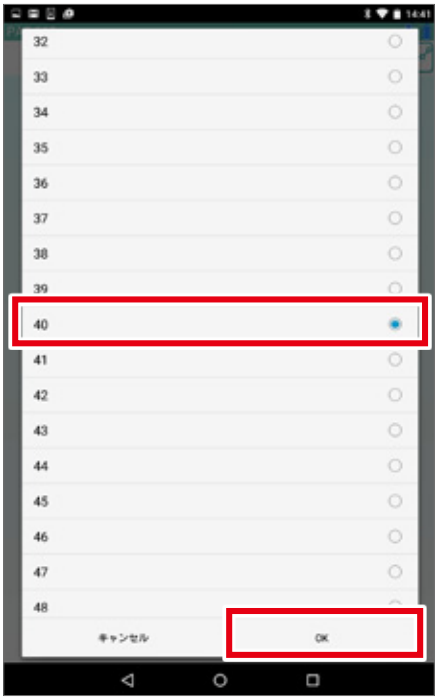


Illustration 3-2:
Scrolling list of LED output levels

(3) To begin baseline data measurement, first select a baseline data input box by tapping on it. As shown in Illustration 3-3, this will put a black outline around the box.

Illustration 3-3.
Baseline data input box selected

TAKING MEASUREMENTS

(4) Tap the Measure Button ③ to begin baseline measurement (be sure the sample is in the photospectrometer).
The measured valued will appear within the outlined box (see Illustration 3-4.)

At this time R, G, and B data are simultaneously measured. When measurement is finished, the value will be displayed in white font. This data will be used to make the graph of the curve (refer to Page 18).

Illustration 3-4:
Measured value displayed in white font

(5) Tap the RGB Select Button to check that the baseline data values for R, G, and B are not 65535. If the values show 65535, this means the measurement has saturated, and further absorbance measurements are not possible.

(6) If one of the RGB levels is saturated, return to step (2), lower the LED output level in the input box, and measure again.
If a change is made, select "Yes" when the Clear Data Confirmation Notice appears, as shown in Illustration 3-5, to clear the previous data.

(7) Once acceptable values have been obtained, the baseline measurement procedure is done.

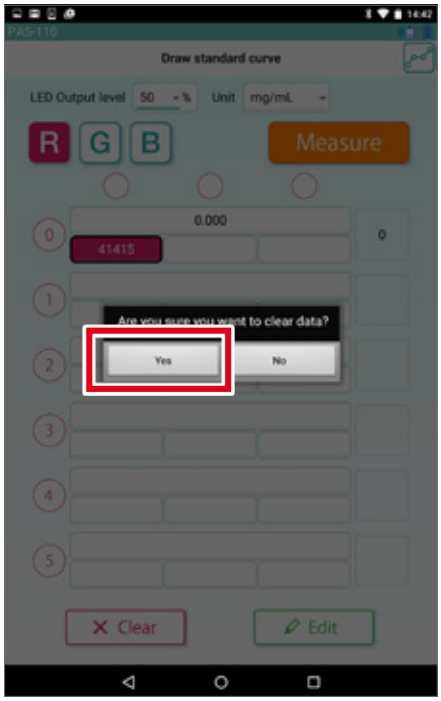


Illustration 3-5:
Data Clear Confirmation Notice

3-2. Measuring Known Concentrations

Using the same Draw Standard Curve screen (Illustration 3-6), measure a series of samples of known concentrations.

(1) Set a sample into the measurement chamber of the photospectrometer.

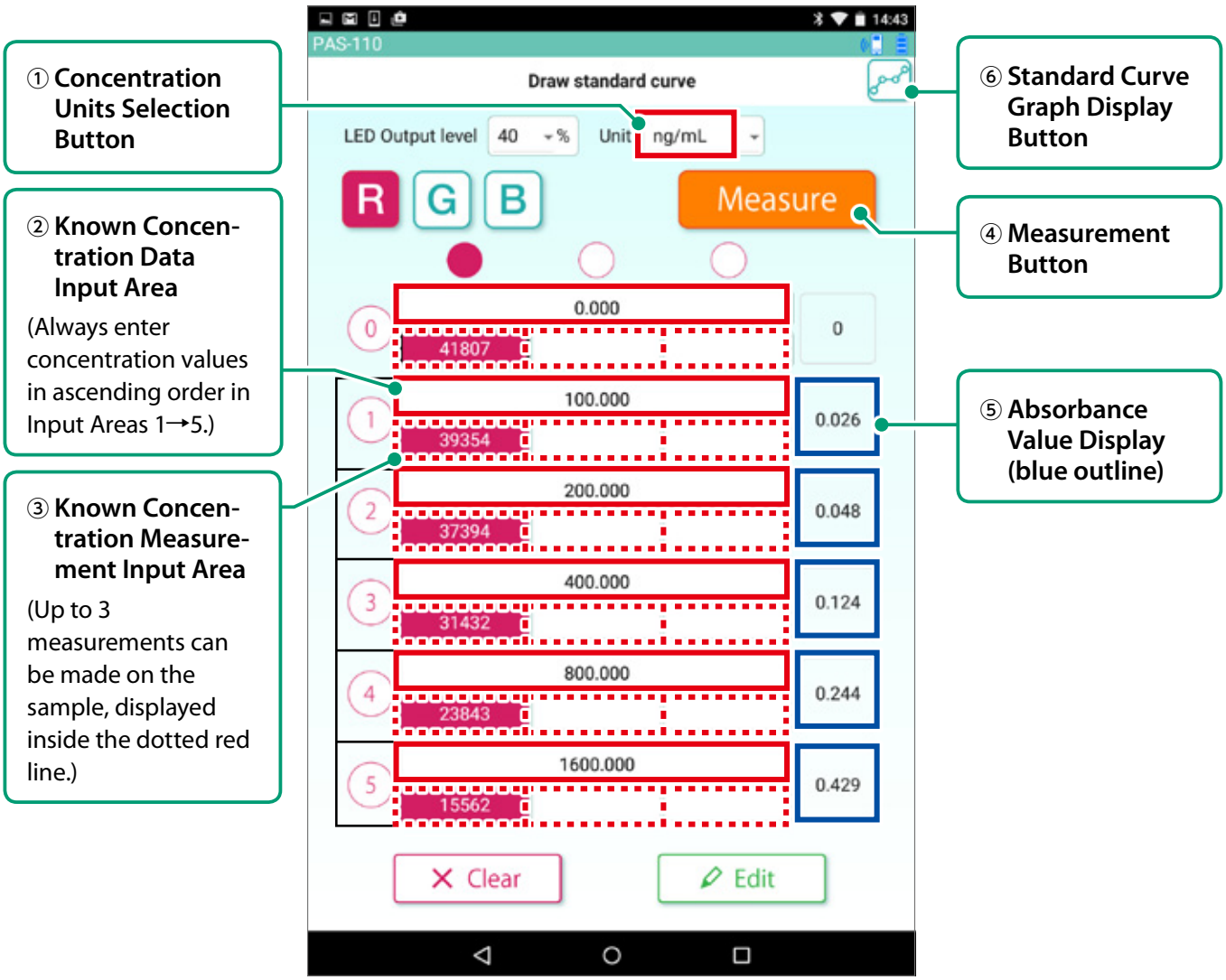


Illustration 3-6: Draw Standard Curve Screen ②

(2) Tap the Concentration Units Selection Button to choose the units in which the measurements will be made (illustration 3-7). Press OK to confirm.

Illustration 3-7:
Selection of Concentration Units

(3) Tap the Known Concentration Data Input Area ② and input the known concentration value.

(4) Tap the Known Concentration Measurement Input Area ③ to select. A black outline will be displayed.

(5) Tap the Measure Button ④ to begin measurement. The measured value will be displayed in white font.

(6) The Absorbance Value Display ⑤ will show the actual calculated absorbance.

(7) When this measurement is finished, remove the current sample in the photospectrometer, place the next sample in, return to step (1), and repeat the process.

(8) When all the samples have been measured, tap the Standard Curve Graph Display Button ⑥ and confirm the graphed results. The values displayed in white font (illustration 3-8) are the ones displayed on the standard curve (see Page 18). If you wish to a measurement from the graph, remove it by a long press on that data's display box.

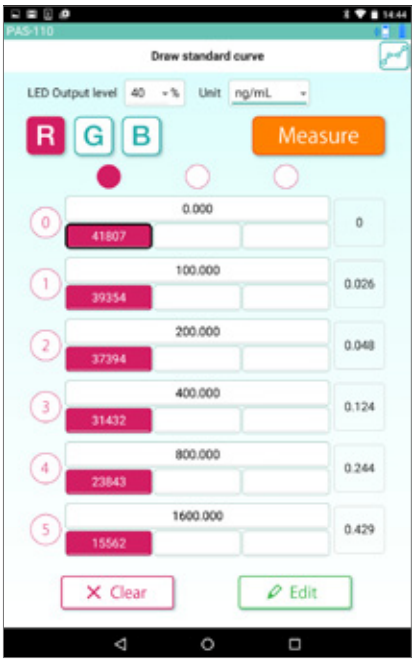


Illustration 3-8:
Results of Standard Curve Measurement Procedure

3-3. Graphing the Standard Curve

(1) When you move to the Standard Curve Graph Screen, you will see a display with the concentration on the X-axis and the absorbance on the Y-axis (Illustration 3-9).

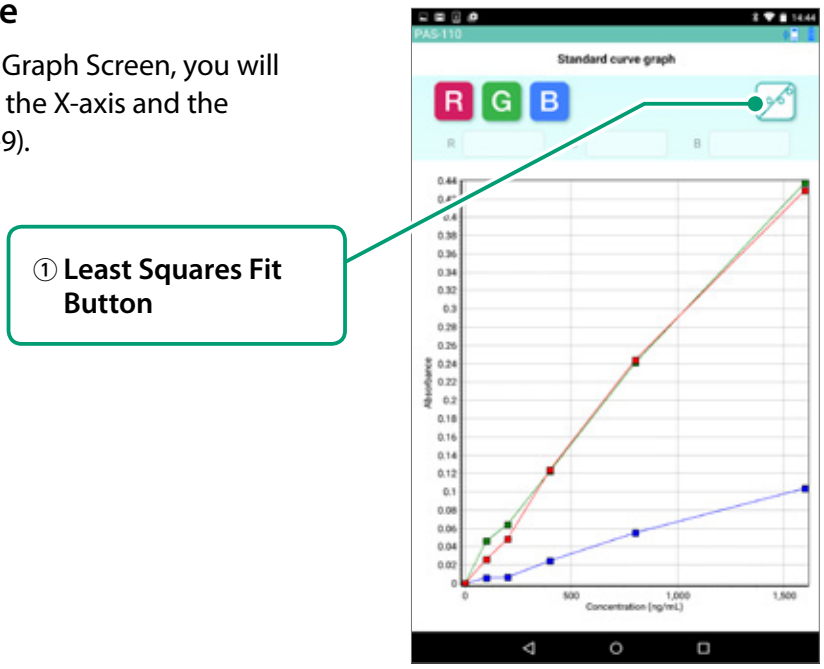


Illustration 3-9:
Standard Curve Graph Screen

(2) Tap the Least Squares Fit Button ① to fit a least squares line to the data points (illustration 3-10). The R-squared values are displayed in the R2 Value area to indicate the degree of fit between the line and the data

(3) Use the RGB Selection Button ③ to selectively display R, G, and B data points.

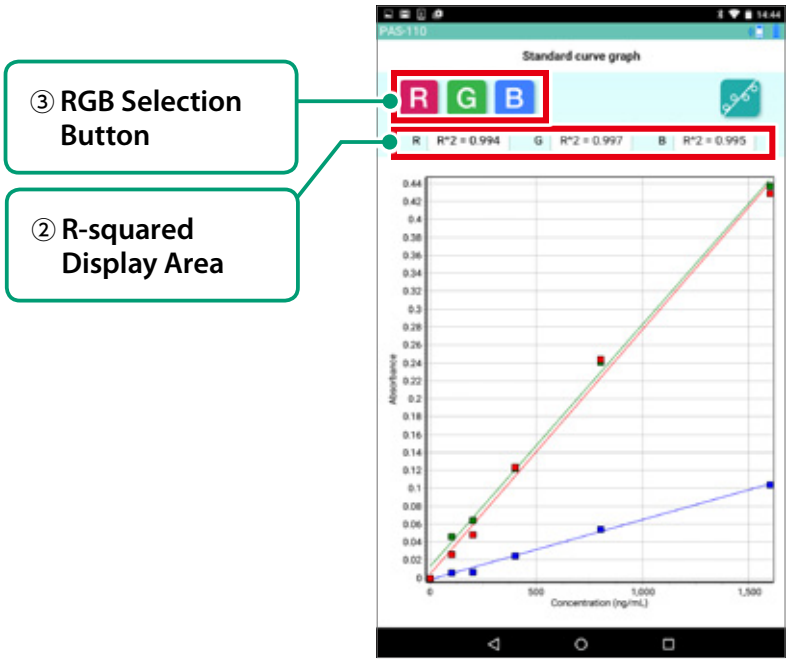


Illustration 3-10:
Fitting a Line to the Measured Data Points

3-4. Other Functions

This section describes miscellaneous functions of the app.

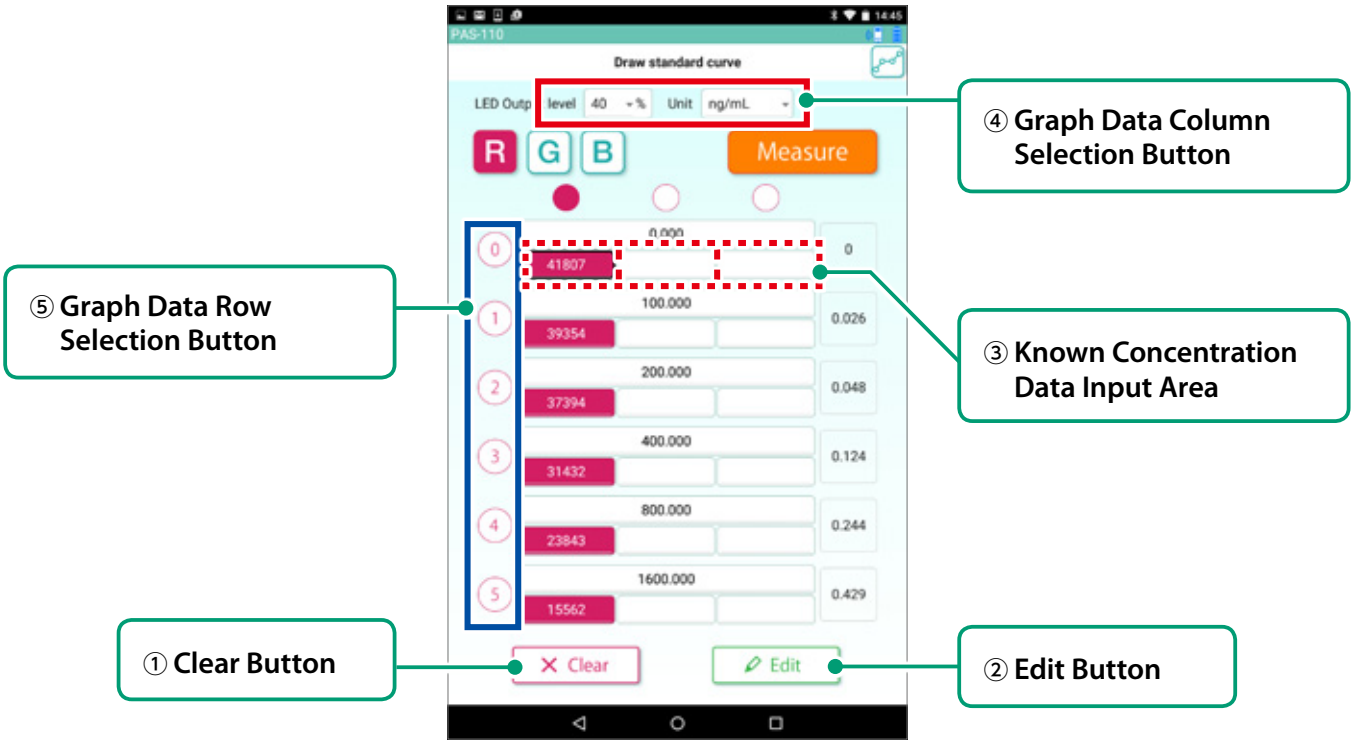


Illustration 3-11:
Draw Standard Curve Screen

(1) Data Clear Function

Tap the Clear Button ① to clear all data

(2) Data Edit Button

Tap the Known Concentration Data Input Area, then the Edit Button ② to directly edit the data values (Illustration 3-12).

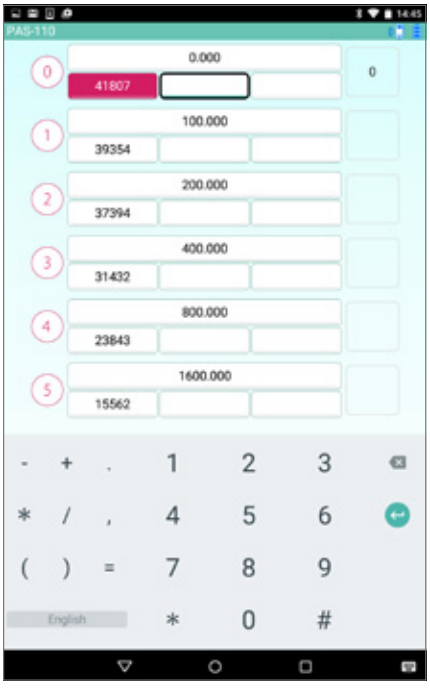


Illustration 3-12:
Directly Editing Data Values

(3) Graph Data Column Selection

Tap the Graph Data Column Selection Button ④ to select an entire column of displayed data (illustration 3-13).

Illustration 3-13:
Entire Data Column Selected

(4) Graph Data Row Selection

Tap the Graph Data Row Selection Button ⑤ to select an entire row of displayed data (illustration 3-14).

Illustration 3-14:
Entire Graph Data Row Selected

4. Taking Measurements

Tap the Measure Button on the top screen to move to the Measurement Screen (illustration 4-1).

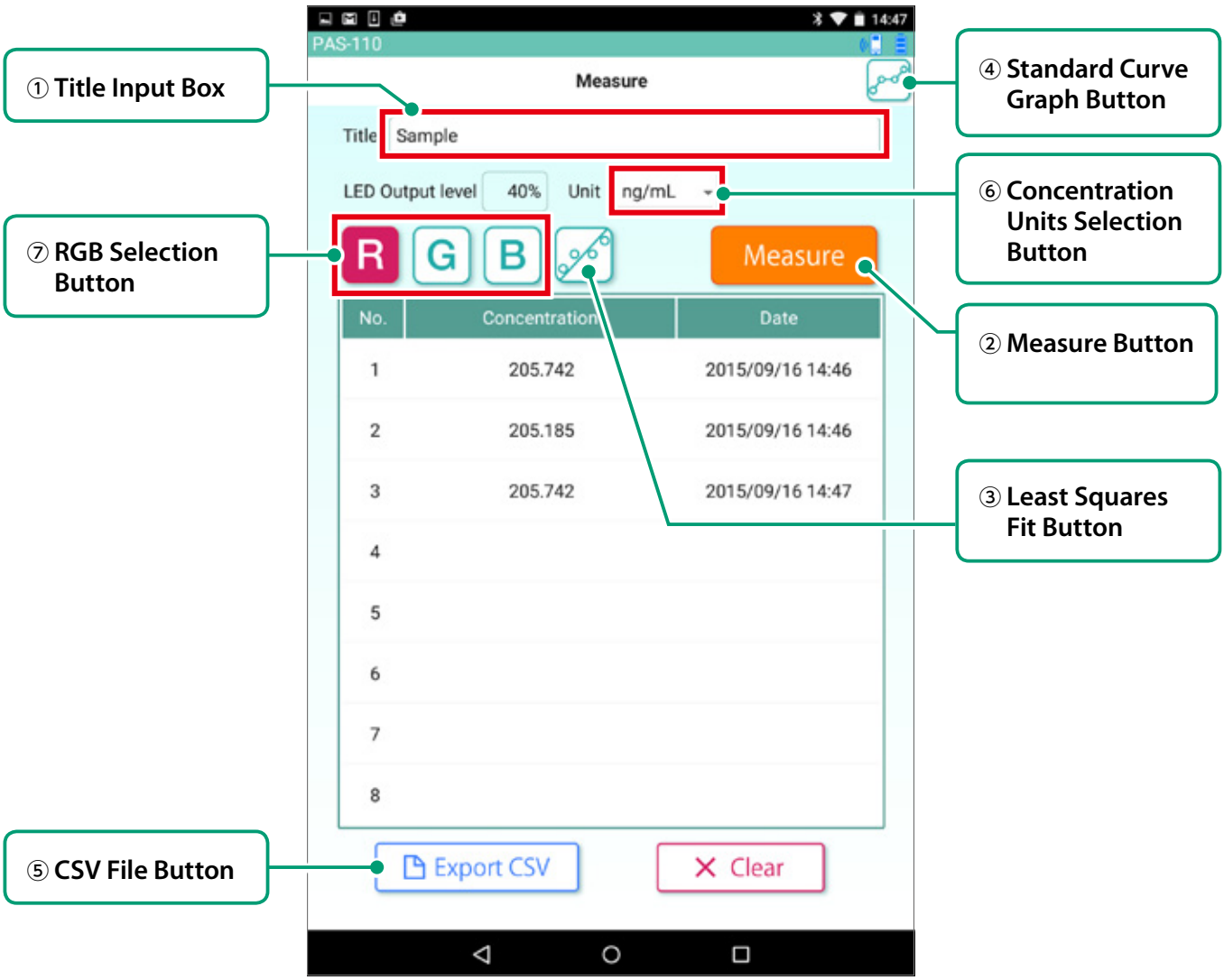


Illustration 4-1: Measurement Screen

(1) Set the sample to be measured into the measurement chamber.

(2) Enter the Title of the run into the Title Input Box ①.

(3) Tap the Measure Button ② to begin measurement. The concentration will be calculated and displayed. If calculated concentration is not within range, "Out of range" will be displayed.

(4) Tap the Least Squares Fit Button ③ to switch to the Least Squares Linear Fit Display.

(5) Tap the Standard Curve Graph Button ④ to check the data points on the standard curve graph.

(6) Tap the CSV File Button ⑤ to output the data values to a CSV file.
Refer to page 25, Saving Data (to a CSV file).
Saved data can be rechecked at any time from the History Screen.

(7) Tap the Concentration Units Selection Button, then Select RGB to display the RGB data (illustration 4-2).

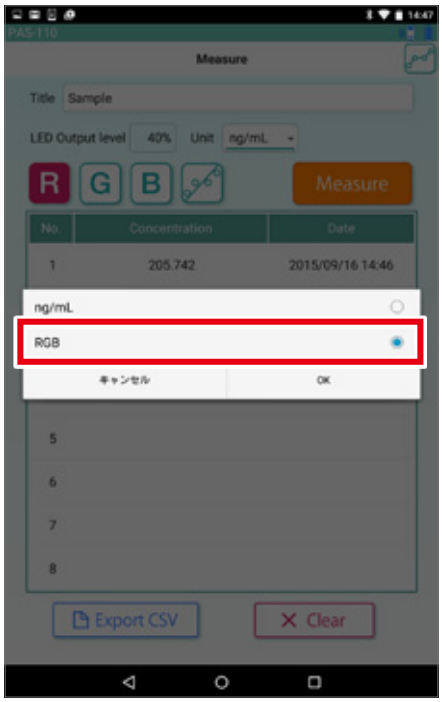


Illustration 4-2:
Concentration Units Selection

(8) Tap the RGB Selection Button ⑦ to switch between displays of R, G, and B data values (illustration 4-3).

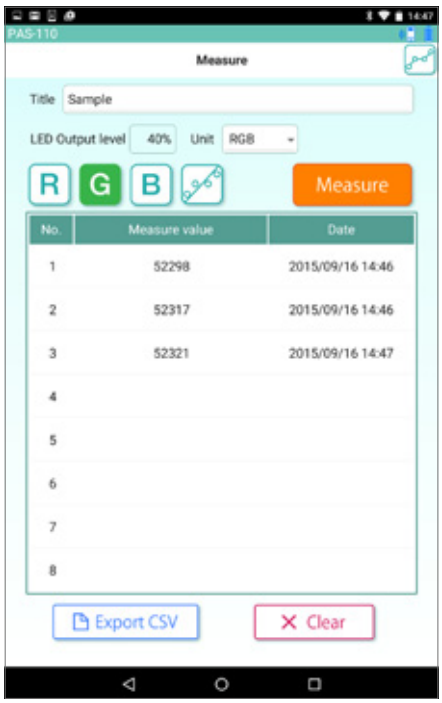


Illustration 4-3:
Example: Selected G Data Values Displayed.

5. Displaying Previous Measurements

Press the Measurement History Button on the top screen to move to the Measurement History Screen (Illustration 5-1).

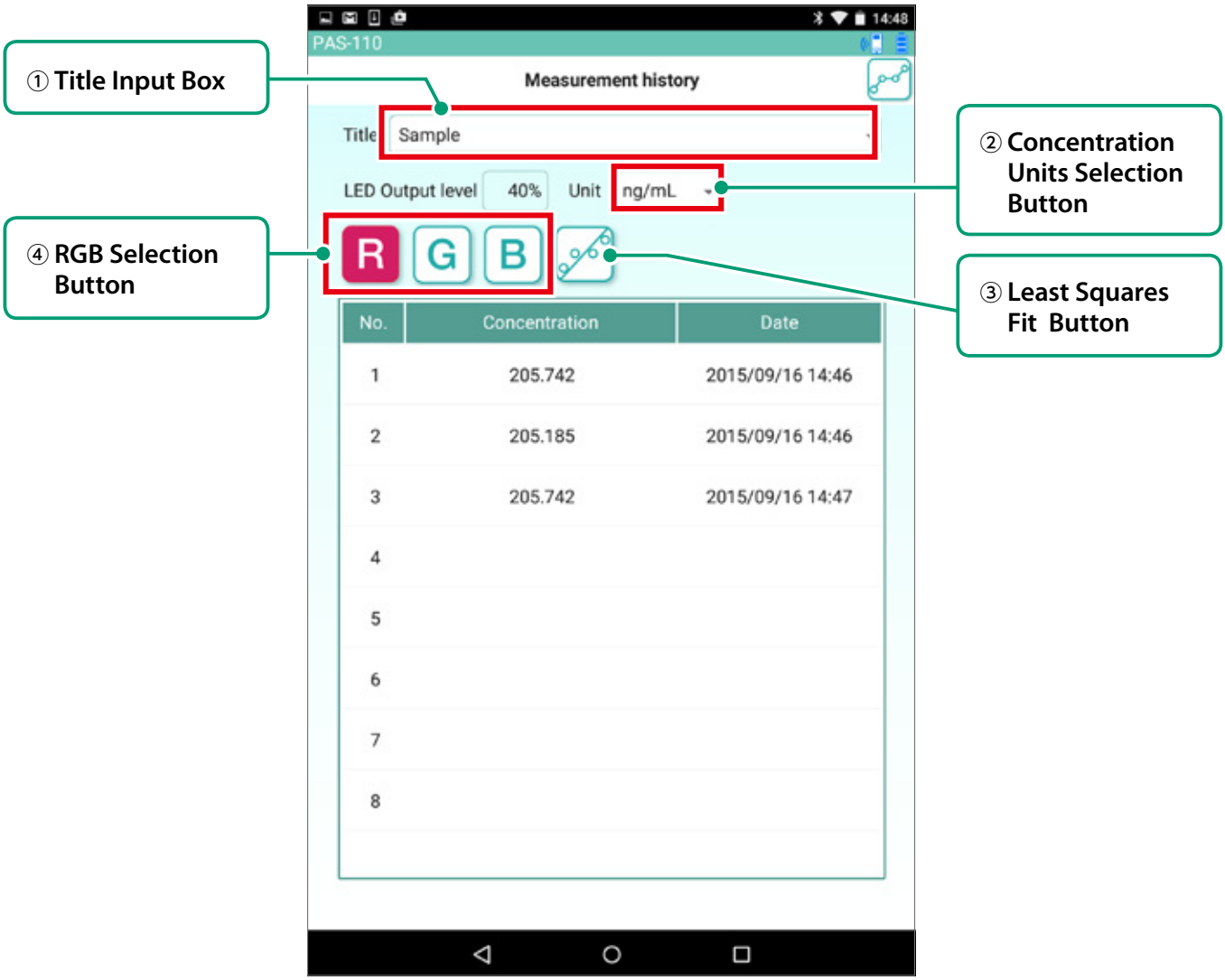


Illustration 5-1: Measurement History Screen

(1) Tap the Title Input Box ①, and select the name of a previous measurement run you wish to display.

(2) Tap the Concentration Units Selection Button and select RGB (illustration 5-1) to display the RGB sensor data for that run.

Illustration 5-2:
Concentration Units Selection

(3) Tap the Least Squares Fit Button ③ to switch to a Least Squares Linear Fit display of the data.

(4) Tap the RGB Selection Button ④ to switch between displays of R, G, and B data (illustration 5-3).

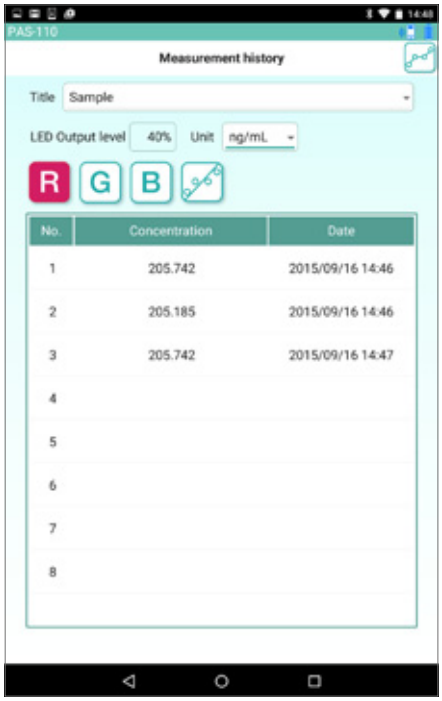


Illustration 5-3:
Display of Measurement Data

6. Saving Data (to a CSV file)

CSV files are saved by default to the following internal storage folder on the Nexus 7.
computer\Nexus 7\Internal Storage\Android\data\com.ushio.pas110\files

The CSV file format is as shown below.

Red Outline: Measurement data

Dotted Blue Outline: Standard curve data

Measurement Sample
Selected R

Color	No	Concentral	Concentral	Unit	Value	Absorbanc	LED Outpu	Sensor Ac	Temperatu	DateTime
R	1	169.662	205.742	ng/mL	37208	0.051	40	50	1459	2015/9/16 14:46
R	2	168.892	205.185	ng/mL	37226	0.05	40	50	1459	2015/9/16 14:46
R	3	169.662	205.742	ng/mL	37208	0.051	40	50	1461	2015/9/16 14:47
G	1	193.291	200.801	ng/mL	52298	0.065	40	50	1459	2015/9/16 14:46
G	2	192.706	200.257	ng/mL	52317	0.065	40	50	1459	2015/9/16 14:46
G	3	192.583	200.143	ng/mL	52321	0.065	40	50	1461	2015/9/16 14:47
B	1	123.79	193.544	ng/mL	47220	0.007	40	50	1459	2015/9/16 14:46
B	2	120.615	156.436	ng/mL	47243	0.006	40	50	1459	2015/9/16 14:46
B	3	118.131	127.406	ng/mL	47261	0.006	40	50	1461	2015/9/16 14:47

StandardCurve

Color	No	Concentral	Unit	Value1	Vali	Value1	Value2	Vali	Value2	Value3	Vali	Value3	Absorbance	LED Outpu	Sensor Ac	Temperatu	DateTime
R	0	0	ng/mL	TRUE	41807	FALSE		FALSE				0	40	50	1448.5	2015/9/16 14:46
R	1	100	ng/mL	TRUE	39354	FALSE		FALSE				0.026	40	50	1448.5	2015/9/16 14:46
R	2	200	ng/mL	TRUE	37394	FALSE		FALSE				0.048	40	50	1448.5	2015/9/16 14:46
R	3	400	ng/mL	TRUE	31432	FALSE		FALSE				0.124	40	50	1448.5	2015/9/16 14:46
R	4	800	ng/mL	TRUE	23843	FALSE		FALSE				0.244	40	50	1448.5	2015/9/16 14:46
R	5	1600	ng/mL	TRUE	15562	FALSE		FALSE				0.429	40	50	1448.5	2015/9/16 14:46
G	0	0	ng/mL	TRUE	60702	FALSE		FALSE				0	40	50	1448.5	2015/9/16 14:46
G	1	100	ng/mL	TRUE	54527	FALSE		FALSE				0.047	40	50	1448.5	2015/9/16 14:46
G	2	200	ng/mL	TRUE	52326	FALSE		FALSE				0.064	40	50	1448.5	2015/9/16 14:46
G	3	400	ng/mL	TRUE	45778	FALSE		FALSE				0.123	40	50	1448.5	2015/9/16 14:46
G	4	800	ng/mL	TRUE	34860	FALSE		FALSE				0.241	40	50	1448.5	2015/9/16 14:46
G	5	1600	ng/mL	TRUE	22164	FALSE		FALSE				0.438	40	50	1448.5	2015/9/16 14:46
B	0	0	ng/mL	TRUE	47934	FALSE		FALSE				0	40	50	1448.5	2015/9/16 14:46
B	1	100	ng/mL	TRUE	47278	FALSE		FALSE				0.006	40	50	1448.5	2015/9/16 14:46
B	2	200	ng/mL	TRUE	47216	FALSE		FALSE				0.007	40	50	1448.5	2015/9/16 14:46
B	3	400	ng/mL	TRUE	45258	FALSE		FALSE				0.025	40	50	1448.5	2015/9/16 14:46
B	4	800	ng/mL	TRUE	42242	FALSE		FALSE				0.055	40	50	1448.5	2015/9/16 14:46
B	5	1600	ng/mL	TRUE	37750	FALSE		FALSE				0.104	40	50	1448.5	2015/9/16 14:46

7. Info Screen

Tap the Info Button on the top screen to move to the Info Screen (illustration 7-1).

The Info Screen displays information on both the hardware photospectrometer and the mobile app.

Illustration 7-1: Info Screen

8. Save Screen

Tap the Save Button on the top screen to move to the Save Screen (illustration 8-1).
The Save Screen displays the Diagnostics and Function Settings Buttons.

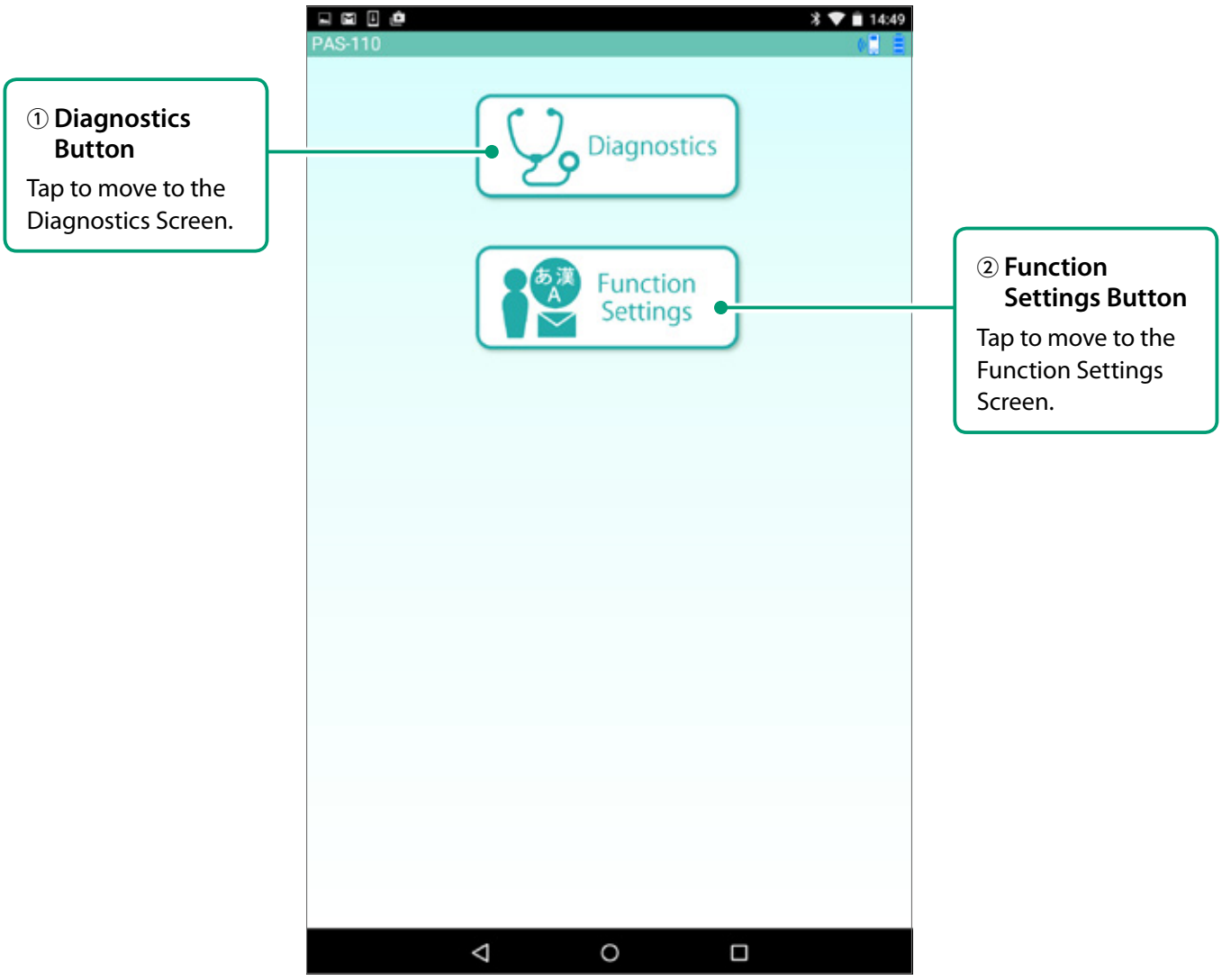


Illustration 8-1: Save Screen

OTHER SCREENS

Help

The Diagnostics Button ① is used by USHIO INC. to check device operation. Please do not use it.

Tap the Function Settings Button ② to move to the Function Settings Screen. On this screen you can switch the device language between English and Japanese (Illustrations 8-2,3).

CAUTION	Please do not change the RGB sensor accumulation time on this screen.

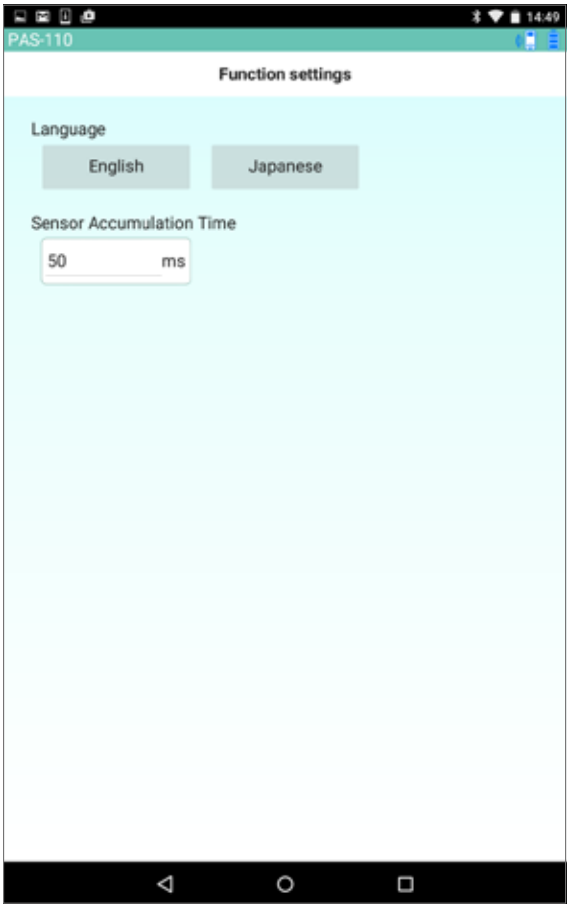


Illustration 8-2:
Function Settings Screen display set to English.

Illustration 8-3:
Function Settings Screen display set to Japanese.

9. Help Screen

Tap the Help Button on the top screen to move to the Help Screen (Illustrations 9-1,2).

This screen provides a weblink to the user's manual, troubleshooting guide, and other relevant documentation. It also provides an email address for the Picoscope Support Desk. Contact the Support Desk if you have any further questions or concerns.

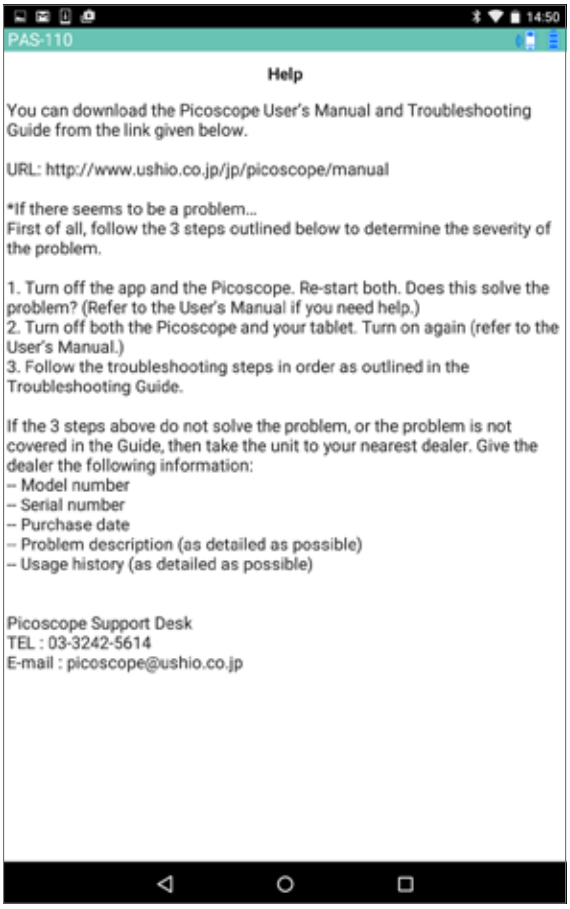


Illustration 9-1: English Help Screen

Illustration 9-2: Japanese Help Screen

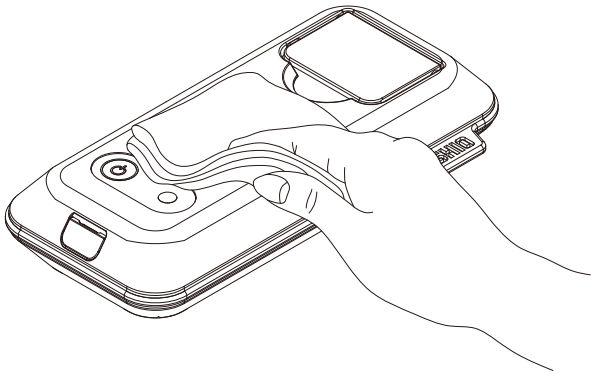
MAINTENANCE

CAUTION	Do not wipe the device with organic solvents. Make sure the battery case cover is completely closed before cleaning.

Maintenance

● Device Exterior

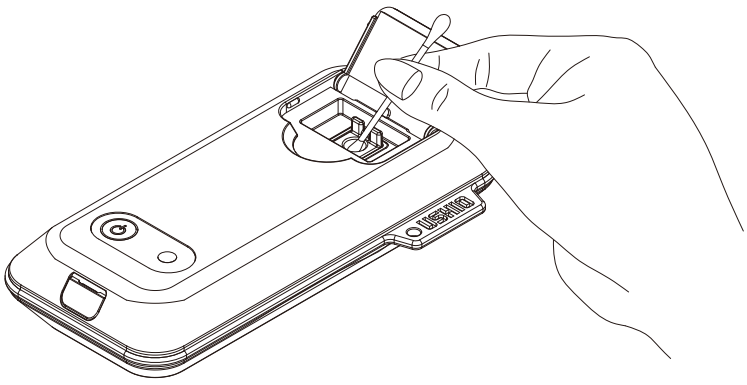
Clean the device exterior with a clean, soft cloth wetted with a weak neutral detergent solution. Lightly wipe clean, then wipe again with a clean, dry cloth to remove all excess moisture.



● Measurement Chamber

Do not use a stiff cloth to wipe the optical unit inside the chamber. Doing so can easily damage this sensitive component.

Remove dust and other contaminants from the optical unit by carefully wiping with a clean, soft cloth or cotton swab.



● Long-Term Storage

If the device will not be used for a long time, securely fasten the measurement chamber cover, and remove all batteries (refer to section on Battery Insertion). Close and lock the battery cover, and store in a secure location away from direct sunlight, dust, dirt, or high temperature or humidity.

TROUBLESHOOTING

[Problem Indicator 1] No power to unit or soon shuts off

Possible Cause	Solution
Batteries inserted incorrectly	Check batteries, re-insert correctly.
Batteries low or dead	Install fresh batteries (AAA x 3). Always change all 3 batteries together. A standard USB cable can also be used to supply power.
Electric short or malfunction	Possible damage due to shock of dropping or impact. Contact your dealer.

[Problem Indicator 2] No Bluetooth connection or connection lost

Possible Cause	Solution
Auto-Off function killed connection (No connection for 2 minutes, auto shut-off)	Press power button on device to re-establish connection.
Device and receiver too far apart	Connection best at distance of less than 10 meters. Ambient conditions may impact transmission, so try to keep device and receiver as close as possible.
Interference from another device	Electrical interference may occur due to transmission by wireless LAN, microwave, or other Bluetooth devices in the vicinity. Move device and receiver away from such devices.
Too many possible receivers nearby	Turn off power to other nearby receivers.
Physical object blocking signal between device and receiver	Relocate device and receiver or remove object.
Device address not displayed on Connection Setting Screen	Please re-scan. Refer to Page 11, 2. Wireless Connection, in User's Manual.
Software Malfunction	Turn off both device and receiver, then turn on again. Data may be lost when you do this.
Electrical short or malfunction inside device	Possible damage due to shock of dropping or impact. Contact your dealer.

[Problem Indicator 3] Can't take readings (or reading results variable)

Possible Cause	Solution
No Bluetooth connection	See "No Bluetooth Connection" section immediately above.
Bluetooth connection to other device	Re-connect to the photospectrometer.
Standard curve not correctly received	Recheck data for errors. Refer to Page 13, 3. Graphing the Standard Curve, in User's Manual.
Error message: "Please redraw standard curve"	This message displayed when there is an ambient temperature difference of ±10°C between time when curve was drawn and time of measurement. Adjust ambient temperature and restart measurement.
Screen freezes or display unstable	Turn off device and receiver, turn on again. Data may be lost when you do this.

TROUBLESHOOTING

[Problem Indicator 3] Can't take readings (or reading results variable)

Possible Cause	Solution
Dirt or contaminant in measurement chamber	Clean chamber with a clean cotton swab or gauze. Do not use alcohol or organic solvent. Refer to Page 30, Maintenance, in User's Manual.
Too little sample in tube	Sample volume of 30µl or more required.
PCR Tube not inserted correctly	Check whether lid is properly closed and no foreign objects inside chamber. Reset tube in holder. Refer to Page 8 in User's Manual.
PCR Tube dimensions do not fit holder	Switch to recommended tube size.
Device tilted	Place device on a stable, level surface (less than a 10° tilt from horizontal).
Sample concentration too strong	Adjust output strength of LEDs. (Make sure you have used correct volume and type of sample, and diluted correctly.)
Sample concentration too weak	Make sure you have used correct volume and type of sample, and diluted correctly.
Device cannot operate in current environment	Check operating parameters of device and use only in environments within the specified parameters.
Sample cannot be measured in current environment	Check specs of sample and only attempt measurement in environments within the specified parameters.
Deterioration of LED or sensor	Contact your dealer with details of how the device has been used.

Other Problem Indicators

Possible Cause	Solution
Device makes noise when tipped	Internal component may be damaged. Contact your dealer with details of how the device has been used.
Device was used or stored in environment outside specified parameters	
Liquid spilled on measurement unit	

WARRANTY AND AFTER-SERVICE

Warranty Policy

USHIO INC. warrants this device to be free from physical defects in material and workmanship for a period of 1 year from the date of the original retail purchase. If the device fails during this period, the company will replace or repair the device free of charge.

However, this warranty is void under the following circumstances:

- failure due to device usage in violation of the environmental and handling specifications and procedures outlined in the guidelines found in the User's Manual, catalog, and other relevant documentation
- failure due to device tampering or disassembly
- failure due to improper device storage
- failure due to accidental dropping or hard impact, or subjecting the device to undue pressure
- failure due to improper battery use or battery leakage

If Something Seems Wrong…

If you suspect a problem with the device, first follow these 3 simple steps:

① Turn off power to the device and turn off the app, then turn both back on.

② Turn off power to both the device and the tablet, then turn both back on.

③ Refer to the Troubleshooting Guide above, locate your problem, and see if the suggested solution solves the problem.

If the problem persists after this, or the problem indicator is not listed in the Troubleshooting Guide, contact your local dealer for help.

When contacting your dealer, be sure to provide the following information:

- Model Number
- Serial Number
- Date of Purchase
- Description of Problem (as detailed as possible)
- Usage History (as detailed as possible)

Picoscope Help Desk

TEL： 03-3242-5614
E-mail ： picoscope@ushio.co.jp

SPECIFICATIONS

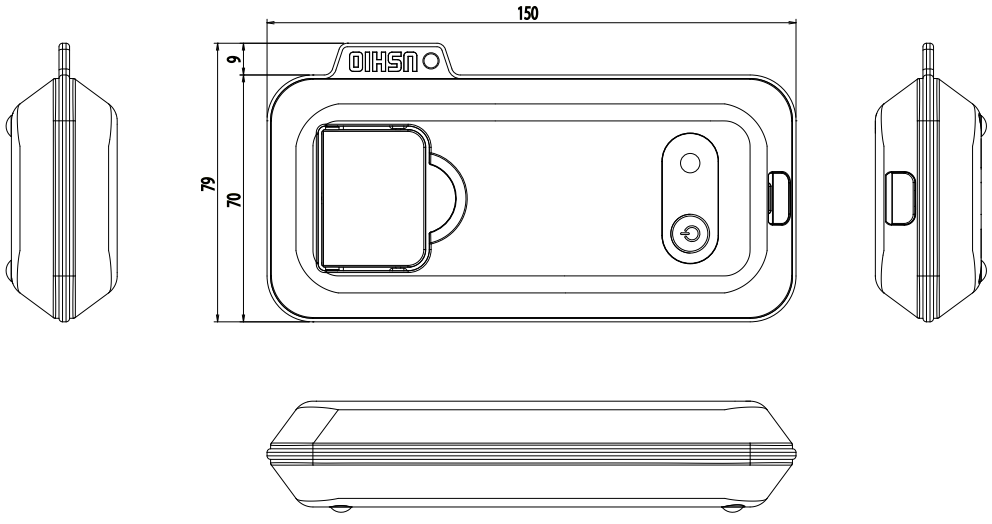
PAS-110 Hardware Unit

Dimensions		70 x 150 x 30 mm (excluding protrusions)
Weight		about 200g (including batteries)
Power		• 4.5V DC (3 AAA-type batteries) • 5V DC (micro-USB connector [1])
Battery Life		about 5 hours [2]
Usage Environment	Temperature/ Humidity	5-35 ˚C, 70% RH or less
	Altitude	2000m or less
	Installation Condition	indoor, pollution degree 2
Measurement	Total Samples	1 sample
	Time	1 second or more
	Absorbance Range	0.02 or more (Gentian violet dilute solution)
Sensor Unit	Light Source	White LED
	Detector	Color Sensor
Communication Interface		Bluetooth low energy (Bluetooth smart)
Compatible Tablet		Nexus 7 (2013)
Recommended PCR Tube		WATSON brand 137-211C 0.2mL
Minimum Sample Volume		30µL [3]

1 Use the cable to connect to a computer or other appropriate power source to power the unit without batteries (the device automatically senses the power source; this connection cannot be used to transmit data.)

2 This battery life is based on using new, fully-charged batteries. However, battery life cannot be guaranteed as different operating conditions can alter battery life drastically.

3 With a sample volume of 30µL, be sure to measure with the device tilted 10° or less from the horizontal.



DISCLAIMER

USHIO INC. will not be held responsible for any damages or liabilities resulting from the following:

- damages or liabilities resulting from use of the device not in accordance with the conditions, environments, handling, and procedures specified in the User's Manual, the catalog, or other relevant technical documentation;
- damages or liabilities resulting from repairs or alterations not performed by USHIO INC.;
- damages or liabilities resulting from the design or operation of the customer's other devices and software;
- damages or liabilities resulting from fire, storm, or other acts of God;
- secondary damages or liabilities, such as damage to other equipment, lost profits or savings, lost data, or incidental or consequential damages arising from the use of or inability to use this product;
- damages or liabilities resulting from reasons which could not have been foreseen at the time of device shipment, due to the level of technology available at that time.
- damages or liabilities resulting from usage in regions outside Japan, when such usage is not in compliance with the regulations and safety standards (such as CE, VL, CSA, among others) in effect in the region of use, without a separate agreement for such use between the user and Ushio Corporation.

USHIO INC.

1194, Sazuchi Bessho-cho, Himeji, Hyogo 671-0024