Tip Biosystems

User Manual V1.0.1

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Company Information

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Declaration of conformity for the Photopette® (Bio/Cell)

This is to certify that Photopette® conforms to the requirement of the following directives:

2014/35/EU	Low Voltage Equipment Safety Directive
2004/108/EC	EMI/EMC Directive
IEC 60529	Protection Class IP20

Standards to which conformity is declared, where relevant, are as follows:

IEC/EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements.
EN61326-1:2012	Electromagnetic compatibility- generic emission standard electrical equipment for measurement, control and laboratory use.
IEC 62133 and UN38.3	Battery certification and transport test
FCC ID: *PVH0950*	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.
IEC62471	LEDs are tested against this standard and is classified accordingly.

Subject to change and approval at the time of launch of product.

Contents

Introduction

Photopette®   Photopette® is a handheld fixed-wavelength photometer for rapid, on-spot analysis. It works together with a smartphone or computing device using a dedicated application which connects via a Bluetooth™ link for taking measurements and data-transfer. It is a mobile, simple to use UV/VIS photometer instrument with a unique measurement tip (CuveTip™) coupled to a detector for accurate and precise measurement.

Both the Photopette® Bio and Cell are able to measure in small sample volume (45µl), without any sample lost. Due to its small footprint, Photopette® can conduct tests in a very small space setting such as a fume hood.

The mobile device through an application such as Photopette® App, performs all the calculations for a measurement. The App is designed for using different pre-programmed Application Types with a high degree of flexibility and accessibility.

Photopette Models

PB501 – Photopette® Bio

PC502 – Photopette® Cell

Manual Guide

Overview   This user guide describes how to operate the Photopette® device.

User documentation   The guides listed below are available with the Photopette® device.

Guides
Photopette® User Manual V1.0 (this manual)
Photopette® Quick Start
Photopette® Brochure

Text and keyboard convention   Text and keyboard conventions used in the *Photopette® User Manual* are listed below.

Convention	Use
Bold	Bold Text indicates user action. For example – click **Run**.
»	Right arrow symbol » indicates a menu choice, and separates successive commands you execute or select from a drop-down or shortcut menu. For example: Select **Settings** »**Measurement Types**.

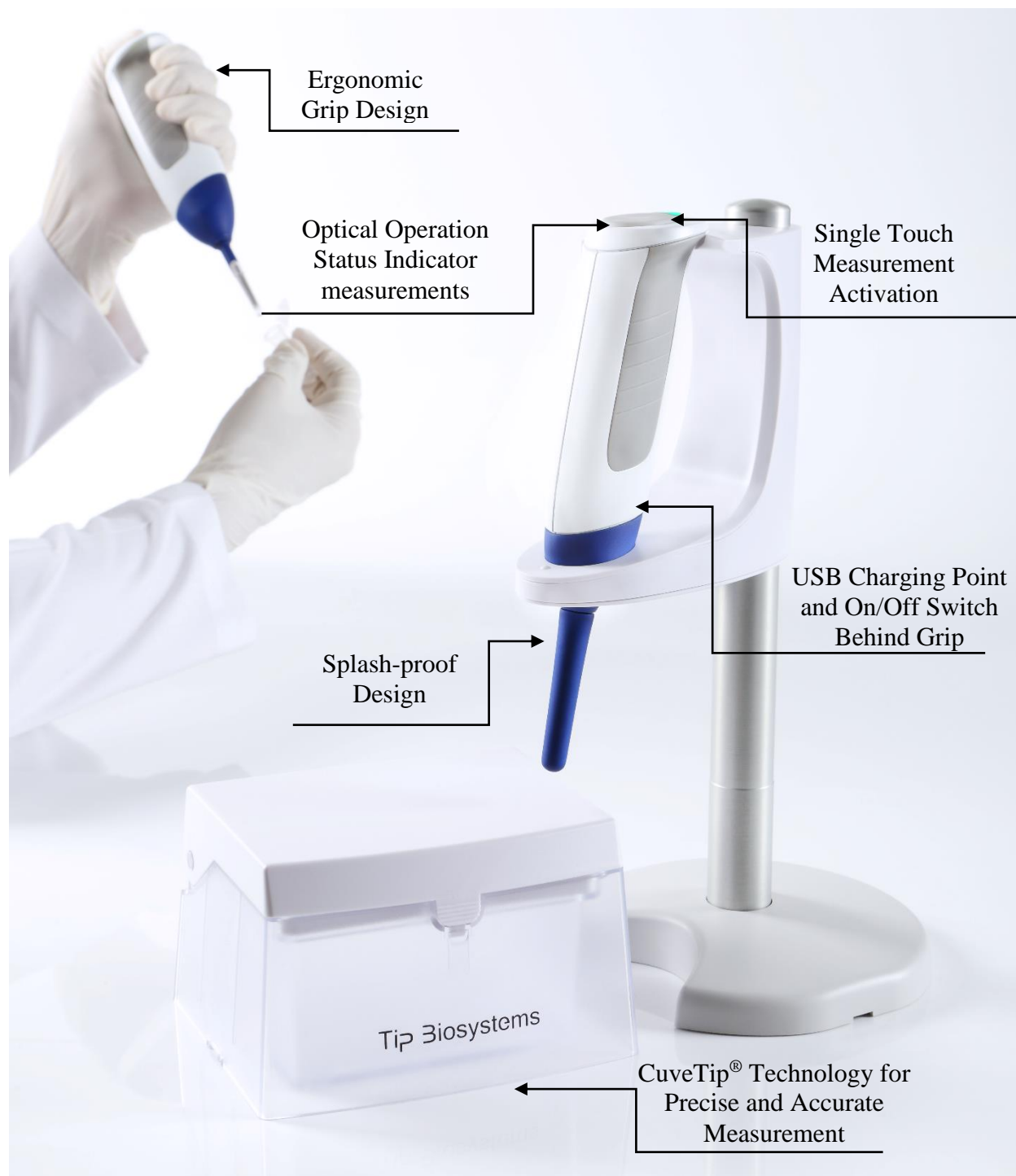**User attention words**   Two user attention words appear in *Photopette® User Manual* documentation. Each word implies a particular level of observation or action as described below.

NOTES: Provides information that may be of interest or help but is not critical to the use of the product.

IMPORTANT! Provides information that is necessary for proper instrument operation, accurate installation, or safe use of a chemical.

Photopette® Bio/Cell

Ergonomic
Grip Design

Optical Operation
Status Indicator
measurements

Single Touch
Measurement
Activation

USB Charging Point
and On/Off Switch
Behind Grip

Splash-proof
Design

Tip Biosystems

CuveTip® Technology for
Precise and Accurate
Measurement

Device Operation

MicroUSB charging port: flip open the cover and connect the cable.

On/Off button
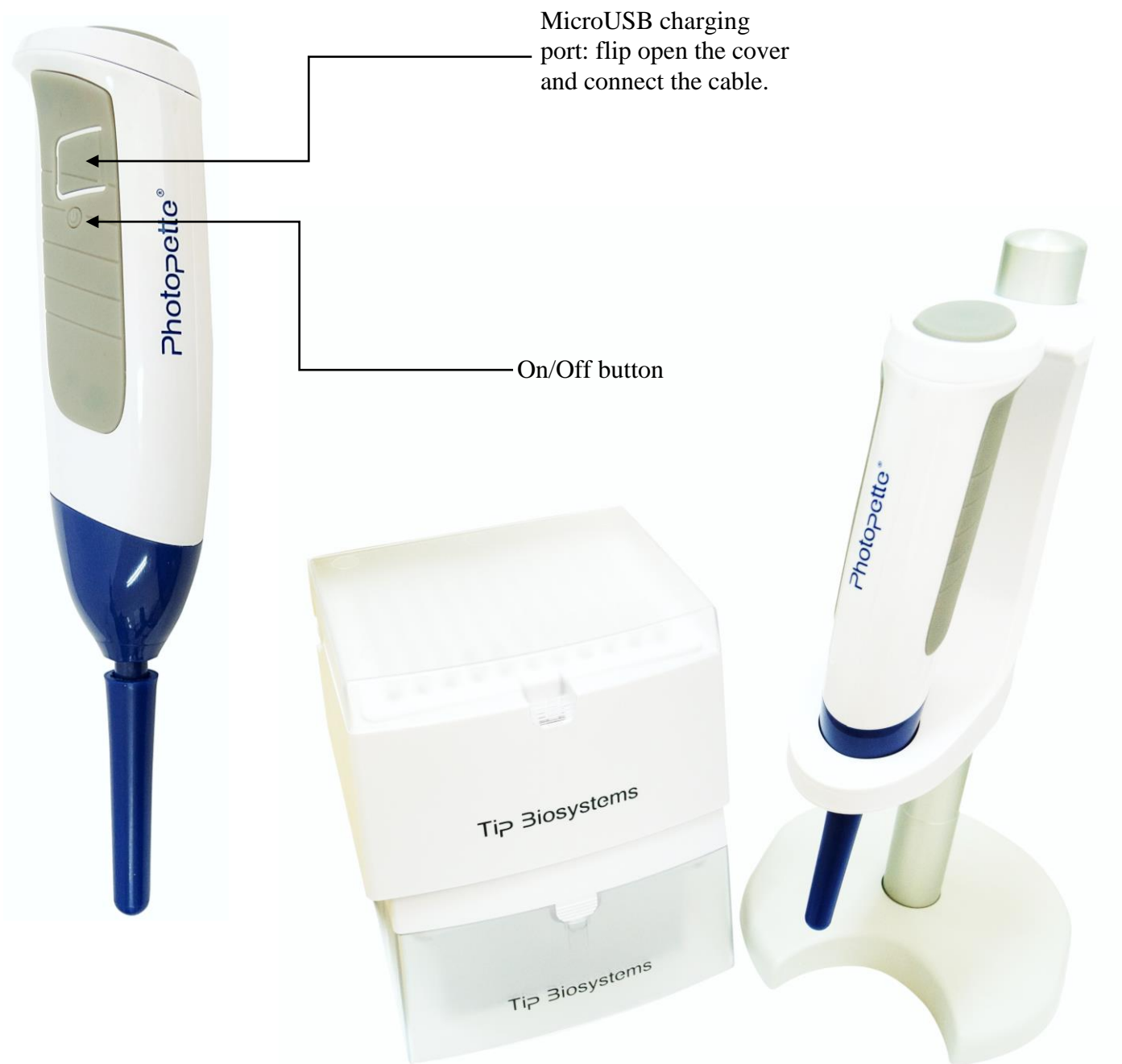
Accessories

Standard Accessories – Connecting Cable

The provided USB cable is meant for charging the Photopette® Device. Photopette® can be charged by connecting to a standard USB port capable of providing a current of 300 mA and above. A standard USB smartphone charger or a USB port on a computer/laptop is capable to supply such current.

Standard Accessories – Standard Solutions

Depending on the application type and product subscription, your Photopette® may arrive together with standard solutions which can be used for quality control and maintenance purposes.
NOTES: Proper storage and handling procedures should be followed while handling and storage of standard solution. Expired or poorly stored standard solutions should not be used for testing or quality assurance purposes.

IMPORTANT! Please read the Material Safety Data Sheet carefully prior to using this product.

Connectivity

Bluetooth

Photopette® connects to smart devices using Bluetooth™ BLE 4.0 using iOS™ and Android™ apps.

Photopette® Technical Specification

Device Specification

Interface/Connectivity	Bluetooth® BLE 4.0
Technology	Handheld fixed-wavelengths LED photometer with Ambient Light Compensation System
Measurement Time	Within 2 seconds per measured wavelength.
Warm up time	None
Lifetime (light-source)	More than 500,000 measurements per wavelength
Photopette® Bio **(Product Code: PB501)**	**Wavelengths:** 260 nm; Accuracy = ± 2 nm; Photometric Range = 0.10 A ~ 3.00 A 280 nm; Accuracy = ± 2 nm; Photometric Range = 0.10 A ~ 3.00 A 600 nm; Accuracy = ± 2 nm; Photometric Range = 0.10 A ~ 3.00 A
Photopette® Cell **(Product Code: PC502)**	**Wavelengths:** 340 nm; Accuracy = ± 2 nm; Photometric Range = 0.10 A ~ 3.00 A 570 nm; Accuracy = ± 2 nm; Photometric Range = 0.10 A ~ 3.00 A 600 nm; Accuracy = ± 2 nm; Photometric Range = 0.10 A ~ 3.00 A
Photometric Precision	± 0.02 A at 1 A
Photometric Resolution	0.01 A
Power Rating	Battery Model: UR18650F-TBS Battery Type: Lithium Ion Battery Rating: DC 5V (Charging), DC 3.7V (Internally Powered), 2500mAH 25,000 measurements and/or 6 days standby on a single charge Auto power-saver mode when not in use
Dimensions and Weight	Fits within 202 mm x 47 mm x 42 mm; Weight = 160 g approx.
Sterilization and Cleaning	-Easy Sterilization with Ethanol wipes. -Water and dust resistant housing -Resistant to mild acids and solvents.

Environmental Specification

Recommended Operating Condition	22 °C at 30% RH
Operating Temperature range	0 to 50 °C at 70% RH (non-condensing)
Operating Humidity range	30-80% RH (non-condensing)
Storage/Transport Temperature/ Humidity range	-20 to 50 °C at 30-80% RH (non-condensing)

CuveTip™

Product Variations	Sterile CuveTips™;
	Product Code: CV401S
	Standard CuveTips™;
	Product Code: CV401
Storage Conditions	Cool, dry place with storage temperature of -20 °C to 50 °C
Analyte Temp (max)	60° C for 10 sec

Chemical Compatibility

Soap solution	+
Hydrochloric acid 36%	+
Sulphuric acid 40%	+
Acetic acid > 99%	+
Nitric acid 65%	+
Caustic soda solution 50%	+
Ammonia solution 33%	+
Methanol	+
Ethanol	+
Isopropanol	+
Acetone	+
Butanone	+
Benzaldehyde	o
Methylene chloride	−

n-Pentane	–
Heptane	–
Toluene	–
Hexane	–
Naphtha	–
Oleic acid	–

+ Resistant; o Limited-resistance; – Non-resistant

Shelf-life   1 year for UV-enhanced Sterile CuveTips™

2 years for Standard CuveTips™

Disposal

To be recycled as other plastics

Features and specifications are subject to change without notice.

Setup

Safety Information

Before commencing installation of the unit, please familiarize yourself with setup and operating procedures highlighted in this product guide. It is highly recommended that you go through all the warning labels and symbols on your instrument and their meaning. Improper use may cause personal injuries or damage other assets and the instrument.

Please read the complete user manual prior to use.

Do not open the device as this can expose the operator to high voltage, UV radiations and may damage delicate fiber optics.

IMPORTANT! Risk of UV light exposure device is used without CuveTips™.

Do not use damaged cables, accessories and another peripheral with your Photopette®.

Do not expose Photopette® to strong magnetic, electrical fields, water, chemicals or any type of liquid as heavy rain or moisture.

Do not put the device into fire, as it may swell or explode (battery). Do not store or use near any type of heat source, especially temperature above 60°C or in an explosive atmosphere.

The device should be switched-off during transportation. The on/off button has to be protected during transportation from turning on itself caused by shock or vibration.

Biological samples may contain or have potential to transmit infectious disease. Be aware of the health hazard presented by such samples and wear appropriate protective equipment. Handle such samples with the greatest care and according to applicable regulatory and organization.

NOTE: Do not spill any biological samples on instrument components. If spill occurs, disinfect the instrument immediately following the laboratory protocols and the cleaning instruction of the instrument.

Disposal must be carried out in accordance with local environmental regulations for waste disposal.

Unpacking, Installation and Positioning

Check the contents of the package against delivery note. If any shortages are discovered, inform your supplier immediately.

Inspect the instrument for any signs of damage caused in transit. If any damage is discovered, inform your supplier immediately.

Ensure your installation site conforms to the environmental conditions for safe operation: indoor use or outdoor environment.

NOTE: Do not expose your Photopette® near liquids, chemicals, rain, moisture or dusty environments.

If the device is subjected to extreme temperature changes, it may necessary to allow the instrument to equilibrate. Turn the device off and then on again once thermal equilibrium has been established (~2-3 hours).

Avoid direct sunlight as it may bleach parts of the instrument and can cause damage plastic parts.

Please contact original supplier immediately if technical or sample handling difficulties are experienced.

NOTE: The instrument's and the accessories warranty will be void if this equipment is used in a manner not specified, or in environmental condition not suitable for safe operation. It may also adversely influence the working of the system.

Photopette Stand Installation

The Photopette stand is designed of 3 parts, the baseplate, the metal stand bar and the Photopette holder. To install, screw the metal stand bar into the base plate, then slide the Photopette holder onto the metal stand bar.

The Photopette holder is height adjustable and has a lower stop position.

The Photopette stand base plate can be connected to the CuveTip Box and the tip disposal box with the supplied clamps.

Safety Labels

Symbols	Name	Description
	UV Light caution (RG1)	Do not look directly into the distal part of the tip. This is to prevent contact with the UV light.
	Read Manual before use	User should read the user manual before use of the device so as to be aware of the precautions and proper handling of the device.
	Do not dispose in bin	Electronics are not to be disposed into the bin, this could harm the environment. Devices are to be disposed properly into electronic recycling bin at designated locations.
	Caution sign	To alert user to the relevant safety labels on the device.

Safety labels are subjected to addition and change without any notice.

Servicing Instruction

There is no servicing required for Photopette® Device. Refer to user manual before use and full demo and training will be done upon delivery of devices.

Risk that might affect service personnel	May get exposed to UV light from the device
Protective measures for above risk	Proper service training and necessary safety labels
Verification of safe state	Not required

Application Installation

Platform and compatibility	1. iPhone®, iPad® or iPod® with minimum iOS 9. 2. Android phone and tablets with minimum Android 4.3 3. Photopette Application https://play.google.com/store/apps/details?id=com.tipbiosystems.noellay.photopette https://itunes.apple.com/app/id1161616983
Connectivity	• Internet connection with ability to download at least 25 MB App[1].
NOTES:	• Photopette® Application can be downloaded through App Store®. • User will log in using the credentials to be a registered user. This allows user to be eligible for warranty coverage for device. • User will receive a confirmation email upon signing up and a notice of warranty highlighting the expiry date will be provided in the email. • Subsequently, user can start using the Application for their measurements.

The Photopette® Application is available for free download in the Play Store® and App Store®

Please ensure there is an established internet connection on the mobile phone before downloading the application.

The device can only run using our Application available on App Store®. It is not compatible with other applications.

Measurement data is stored locally in the smart-devices' database and can be exported to .csv file format. It is highly recommended to frequently backup the data from the Photopette® application.

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[1] *This limit may change depending on the functionality of the app.*

Sample Measurement Basics

1. Select a method depending on your sample and set the parameter for the measurement.
2. Ensure the device is wipe clean with 70% ethanol or isopropanol.
3. Use vortexer to mix your sample to achieve homogeneous sample.
4. Insert the CuveTip™ into the tip of the device. Ensure it sits tightly on the stem.
5. Select a measurement and select an Auto Zero for reference measurement.

NOTE: Do not overfill the sample vial. This is to prevent samples from seeping in from the top of the sample vial.

NOTE: Check the chemical compatibility chart for the compatibility of the sample solvent or solution you are using. The information is available in the annexure of this manual and on the technical information of the website. Please contact us at support@tipbiosystems.com if your solvent of your sample is not listed on the chart.

Sample Handling Tips

- It is important to mix or vortex every sample right before measurement, if needed, to ensure homogeneity.
- The minimum volume that can be used for sample measurement is 45 µl and can be reuse if it is inserted into the tip cavity using a micropipette.
- Proper fitting of the CuveTip™ is important to ensure accurate measurement.
- In most cases, a laboratory clean wipe is sufficient to clean the device.
- Please avoid touching the tip of the device.

Battery Operation

The device runs on rechargeable lithium-ion batteries on both Photopette™ Bio/Cell. The batteries can be operated for approximately 8 hours within a normal usage i.e. 20-30 measurement per hour. The device has a charging indicator LED at the top button. The charging indicator will change to green once it is fully charged. When the battery gets low there will be an alert on the application to charge. Once it is below 10% there will be a beeping sound. At this status, it is still possible to use the device for another one hour. However, it is recommended to charge the battery at this status. If the battery is not charged there will be a second warning message when the battery is empty and several beeping sounds before the instrument is automatically shut down within 10 seconds.

The battery is standard Lithium-ion battery with a lifespan of about 500 full charging cycles. Subsequently, the capacity and operation time of the battery may vary. A fully charge battery will self-discharge over a time of 30-40 days. After this time recharging of the battery is necessary. Charging time for an empty battery is 5 hours.

NOTE: If Photopette shuts down during a measurement process, the data of the last measurement will be still retained in the dataset.

Application Usage Overview

Photopette® Application

Main Features   Measurement Setting
                           Measurement
                           Dataset page
   Setting

NOTE: User should set **Measurement Setting** before starting measurements. The user can view their measurements by dataset names in **Datasets page**. In Datasets page, user can also rename datasets, delete datasets, and share datasets.

User can test device performance, change languages (currently English, Chinese and German only) and read About in in **Setting page**.

The Photopette® App has a set of pre-programmed applications according to the type of wavelengths present in the device. To select an Application type, go to measurement type to see a list of Application types user can use.

Buttons
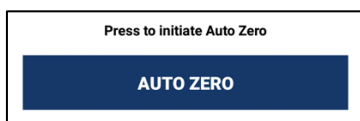
Prior to any sample measurement at the start of a new method, an auto zero measurement of either water or the buffer of the samples is required to give the Photopette a reference of what zero should be. It is recommended to re-apply the blank and measure it as a sample to ensure the graph of the blank spectra is flat.

To initiate the scan of the sample, press the measurement button, the data will be stored in the Dataset until the method is exited at this time the user is able to share or delete the existing datasets.

Basic Operation

Error Dialogs

| Error #	What does it mean?	What can I do?
A1, M1	The detected signal exceeds the saturation limit of the detector. This error may appear when measuring in very bright environments.	Move to a location with reduced ambient light or try to block ambient light before retaking the measurement.
A2, M2	Photopette seems to experience some technical difficulties.	Restart the device and perform the Self-Test. If the problem is still present, please contact your local distributor for support.
A3, M3	Photopette did not detect any CuveTip placed on the device. This error may also occur if the measurement is performed on a highly absorbing sample.	Ensure the CuveTip is placed properly on the device. When measuring on a highly absorbing sample, this warning can be ignored.
A4	Photopette automatically compensates for ambient light up to a certain threshold. Close to the threshold, accuracy of the auto-zero might be reduced as fewer data points are available for the compensation. You can still choose to continue your measurements.	Move to a location with reduced ambient light or try to block ambient light before retaking the measurement.
A5	Photopette automatically compensates for ambient light up to a certain threshold. It seems there are fewer data points available for the compensation than usual. You can still choose to continue your measurements.	Please verify device performance via the Self-Test. If the error re-occurs, try changing to a location with reduced ambient light.
A6, M4	Photopette did not detect any CuveTip placed on the device. This error may also occur if the measurement is performed on a highly absorbing sample. You can still choose to continue your measurements.	Ensure the CuveTip is placed properly on the device. When measuring on a highly absorbing sample, this warning can be ignored.

Measurement Setting

User should set Measurement Setting before measurement process. This allows the device to store the required settings for the measurements.

Measurement Settings:
- Selecting Device
- Selecting Measurement Type
- Selecting Dataset
- Auto Photo Capturing
- Auto Measurement
- Battery Level

Selecting Device
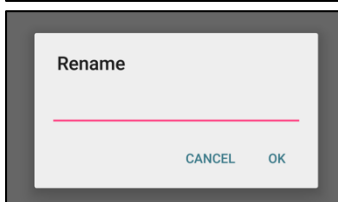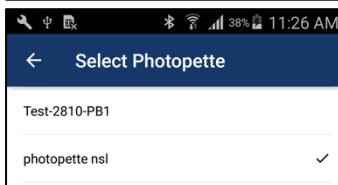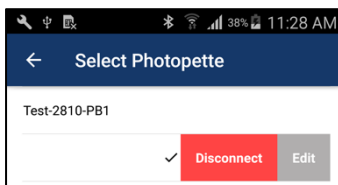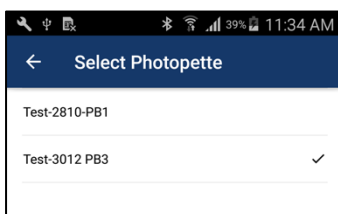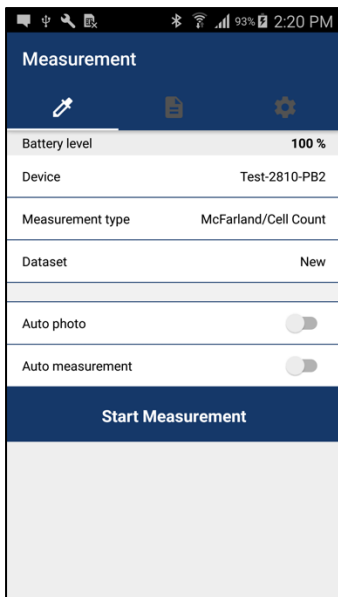
Before start measurement, most important thing to do is to connect with the Photopette® device.

Users must **ON** Bluetooth connection in their device in order to connect with the Photopette® device.

1. Connecting with Photopette™ Device *(Figure 4.1) from the Application*
   a. **Measurement Setting** » **Device**
   b. Available Photopette® devices is listed
      Select the correct Device listed.
   c. If connection successful, device will make 3 beeping sound and note the tick mark on right side of connected device name.

2. Renaming Photopette® Device
   a. User can rename photopette device by swiping device name view.
   b. By right swiping device name view, it will come out **Edit** button and **Disconnect** button. (Disconnect button is only available for connected device.)
   c. Please click **Edit** button and fill in proper name at "Rename" window.
   d. Click **OK** and user can see device name already change.
   e. For subsequent connection, the user can see a personalised name on their device. This will help in identifying and differentiating multiple devices.

Selecting Measurement Types
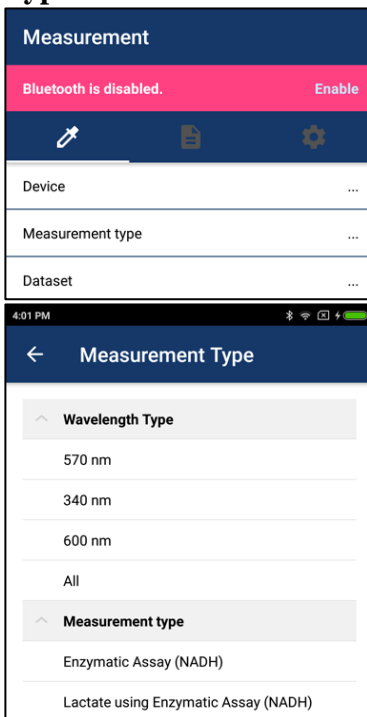
In **Measurement Setting** » **Measurement Type**

| Select Option	-Wavelength Type
	-Application Type

NOTES:	If user choose one application type, one or more wavelength that corresponding to this application type will be measured.
	For instance,
	If user chooses ssDNA, 260 nm and 280 nm wavelength will be measured.
	According to Measurement type that user choose, selectable datasets will be different.

Selecting Datasets
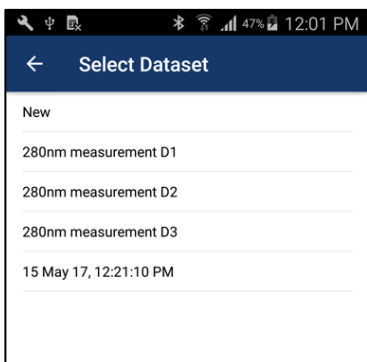
To store measurement information, the user needs to select a dataset first.

Select **Measurement Setting** » **Dataset**

Select Option	- New
	- Existing Datasets

| NOTES:	If user select **New** Dataset, new dataset will be created to save measurement information.
	If user select one of existing dataset, information will be appending on information of selected dataset.
	User can see existing datasets with same measurement type that user choose.

Auto Photo Capturing

If user would like to automatically capture photo on measurement time, **Auto photo** should be enabled.

Auto Measurement
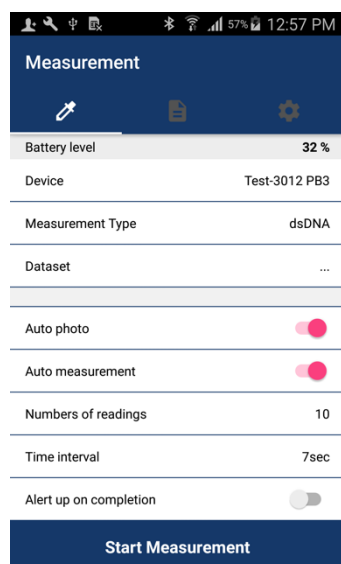
If user would like to automatically measure, please enable

Measurement Setting » **Auto measurement** *(Figure 4.3)*

User can see 3 additional settings by enabling Auto measurement.

1. Numbers of Reading

2. Time Interval

3. Alert me when done

NOTES:	Please choose appropriate time interval depending on number of wavelength that want to measure and auto photo.
	Time Interval = No of wavelength *2 + Auto Photo
	For instance, if user choose dsDNA, 260nm and 280nm will be measured. So, time interval is 4sec.
	If auto photo is On, application will need 3 more sec to take photo automatically. So, final time interval needed is 7sec.

Battery Level

Please check battery level often. If battery is lower than 40%, please recharge in order to ensure proper measurement.

Using Trigger Button on Photopette Device

Activating Trigger Button

Instructions
1. Click once in Setting to start measurement
2. Click for auto zero and you can hear beep sound of measurement event.
3. Click for warning/dialog dismissal.
4. Click for final measurement.
5. User can view Transmittance and Absorbance value on measurement screen.
6. For additional measurement, click once.

IMPORTANT:	Please click and listen beep sound of recognition. Continuous clicking will result many measurements.
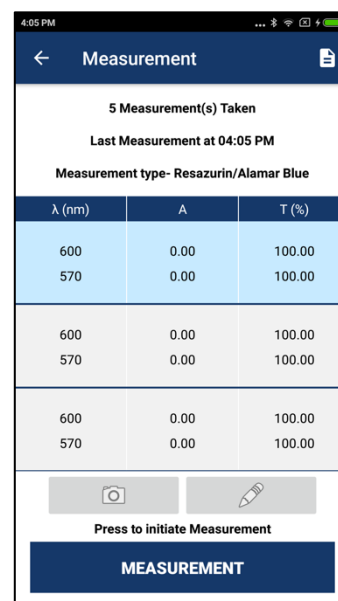
Measurement Screen

Measurement Screen Functions
1. Taking Photo
2. Adding Note
3. New Measurement
4. Cancel Auto Measurement
5. View Measurement Results

Components
1. Measurement Count
2. Last measurement time
3. Photo/Notes Button
4. Measurement/ Cancel Button
5. Measurement Result Table
6. Back Button
7. Dataset button

1. **Taking Photo**   Click **Photo** [📷] and capture photo before measurement start.

> **NOTE:**   If user enable **Auto Photo** or **Auto Measurement** in Setting, **Photo** button in measurement screen will be disabled.

2. **Adding Note**   Click **Notes** [✏️] and add note before measurement start.

> **NOTE:**   If user enables **Auto Measurement** in Settings, **Notes** button in measurement screen will be disabled.

3. **New Measurement**   User can repeat measurement manually by clicking Measurement after a measurement finished.

> **NOTE:**   If user enable **Auto Measurement** in Setting, **Measurement** button in measurement screen will not be seen.

4. **Cancel Auto Measurement**   User can cancel auto measurement anytime by clicking **Cancel** on Measurement Screen.
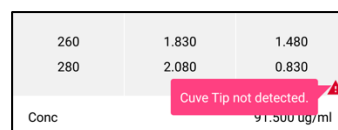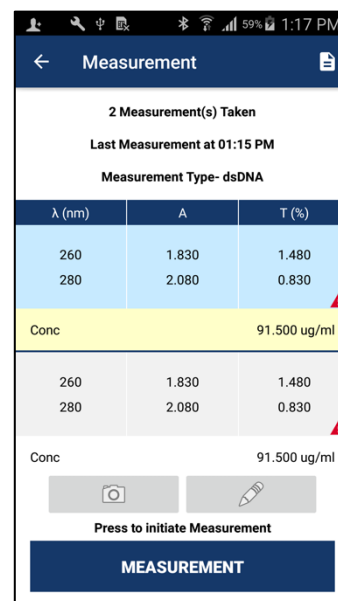
5. **View Measurement Results**   Transmittance and Absorbance result will be shown in every measurement.

Concentration result will be shown for some application type only.

Warning icon will be shown for measurement accuracy.

User can click Warning icon and see what is warning.

Datasets

All measurement result will be stored in a dataset.

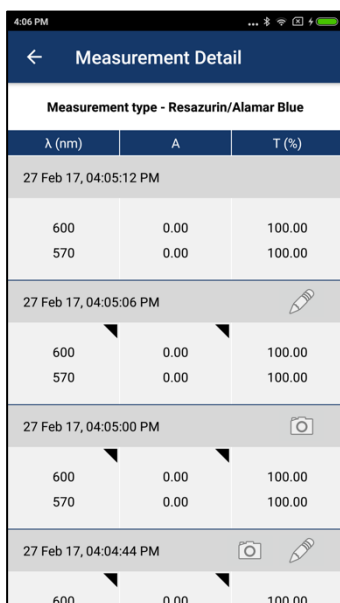|	
Dataset Functions	1. View Dataset List 2. View Detail Measurement 3. Rename Dataset 4. Share/Delete Datasets
1. View Dataset List	Select **Datasets** from navigation bar. Datasets list that user measured will be shown.

NOTE:	Auto Dataset name is Measurement Time DD MMM YY, hh:mm:ss AM/PM.

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2. View Measurement Details

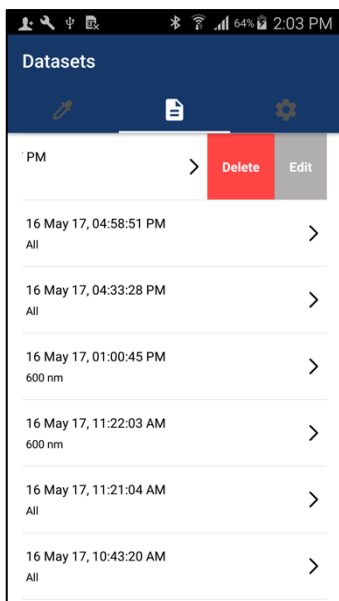Select **Datasets** details by clicking

Measurement Detail Information:

- Measurement Date and Time

- Measurement Type

- Wavelength

- Absorbance value

- Transmittance

- Concentration (if available)

- Photo (Enable if photo is available)

- Notes (Enable if note is available)

- Warning (if available)

3. Rename Dataset

1. User can rename dataset by swiping a dataset view.
2. By right swiping a dataset view, it will come out **Delete** button and **Edit** button.
3. Please click **Edit** button and fill in proper name at "Rename" window.
4. Click **OK** and user can see device name already change.

After rename complete, the user can see a customised dataset name. This will help in identifying and differentiating multiple datasets.

4. Share/ Delete datasets
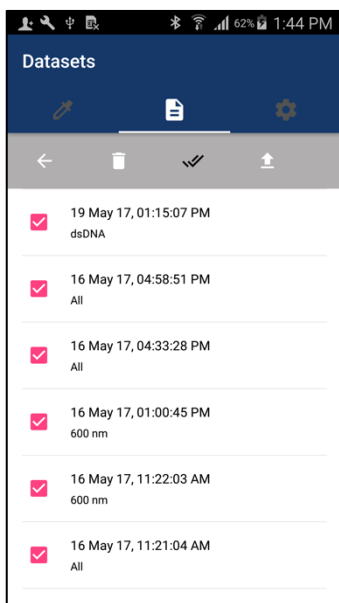
User can share/delete datasets with 2 options:
1. Share/Delete All Datasets
2. Share/Delete two or more datasets

Android
1. Share/Delete All Datasets
Long press a dataset to appear toolbar

Click **Tool bar » Select All**

For Share datasets, Click **Tool bar » Share**
Two Share Options will appear:
1. Email
2. Google Drive

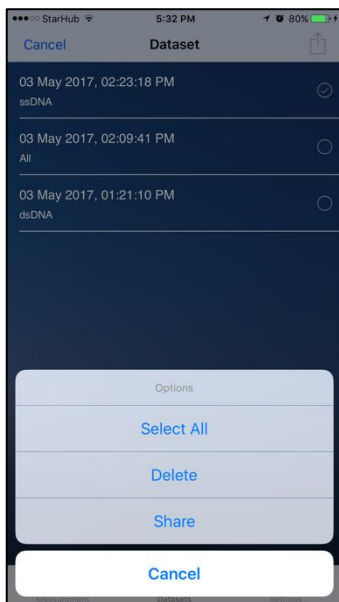For Delete datasets, Click **Tool bar » Delete**

2. Share/Delete one or more datasets

Long press a dataset to appear checkbox
Select dataset item that should be deleted or shared.
Click **Tool bar » Share or Delete**
Selected datasets can be shared or delete.

iOS

3. Share/Delete All Datasets

Long press a dataset or click [icon] to appear check boxes

Click [icon] , user will see Select all, Delete and Share options.

For Share datasets, Click [icon] **» Share**
Two Share Options will appear:
3. Email
4. Google Drive

For Delete datasets, Click [icon] **» Delete**

4. Share/Delete one or more datasets

Long press a dataset to appear checkbox
Select dataset item that should be deleted or shared.

Click [icon] **» Share or Delete**
Selected datasets can be shared or delete.

NOTE:	Dataset CSV format file will be exported to google drive/email.
	If user would like to deselect all from **Select All**, just click **Deselect** on top bar.

Setting

Setting page offers additional features that does not connected with measurement process.

Setting

User can perform 3 features in Setting.
1. Self-Test
2. Change Language
3. About

Self-Test
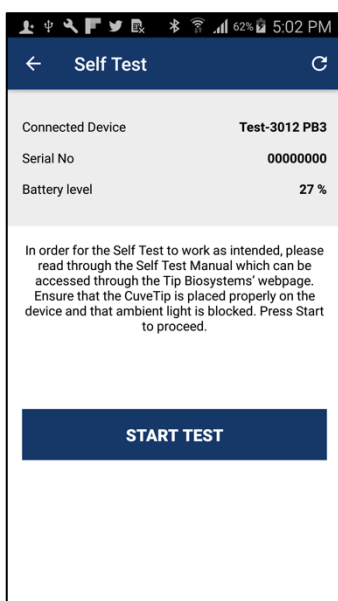
Self-Test allow users to test device performance by themselves. User can follow step by step guideline that prompt on app and can get device condition as a final result. The following information are shown default in Self-Test:
1. Connected Device Name
2. Serial Number
3. Battery Level

NOTE: Self-Test can only perform app is connected with Photopette device.

Change Language
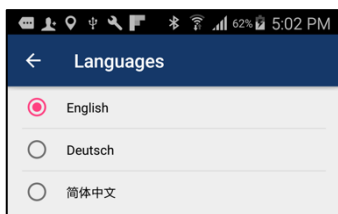
User can change 3 languages in Change Language.
1. English (Default)
2. Simplified Chinese
3. German

NOTE: By changing language, all text inside app will show according to changed language.

About

1. App Version
2. Firmware Version
3. Date of Release
4. Legal Disclaimer
5. Limited Warranty
6. Copyright
7. Limitation of Liability

NOTE: Item 2. Firmware Version is only shown when device is connected with Photopette app.

To view Item 4,5,6,7 Select About » Read Legal Disclaimer

Documentation and Support

Obtaining Support

Technical support   For any technical questions, please contact us via email – **support@tipbiosystems.com**

Limited Product Warranty   Tip Biosystems Pte Ltd and/or its affiliate(s) warrant their products as set forth in the Tip Biosystems' General Terms and Conditions found on Photopette Application About Page.

If you want to know more, please contact Tip Biosystems Pte Ltd at **http://www.tipbiosystems.com**

Photopette® Applications

Nucleic Acid - DNA/RNA

Measurement of DNA and RNA concentration and determination of DNA and RNA purity can be done by the measurement of absorbance at the wavelength of 260 nm and 280 nm.

In the iOS application, under the **Measurement Type**, select the nucleic acid category (DNA or RNA).

Calculations

Example:

A DNA sample has an absorbance reading of 0.4. The concentration is calculated as:
0.4 * 50 = 2 µg/ml

Nucleic Acids	Concentration (µg/ml) per A_{260} Unit
ds DNA	50
ss DNA	33
ss RNA	40

Table 1: Calculations for nucleic acid concentration

Purity of	A_{260}/A_{280} Ratio
DNA	~ 1.8 (approximate value)
RNA	~ 2.0 (approximate value)

Table 2: Calculations for determination of nucleic acid purity

For purity check of nucleic acid, a ratio of A_{260}/A_{280} is used.

A ratio lower than 1.8 for DNA and a ratio lower than 2.0 for RNA indicates presence of contamination. However, the A260/A280 ratio is only an indication of purity rather than a precise answer.

NOTE: Small changes of the pH of the solution will affect the 260/280 ratio. Acidic solution will under represent the 260/260 ratio (0.2-0.3) and basic solution will over represent the ratio.

NOTE: It is important to check for the pH of a sample measured on our instrument as acidic and basic solutions will vary the absorbance value.

Direct Protein

In the iOS application, under the Measurement Type, select the Direct Protein.

Total protein concentration can be determined by the measurement of absorbance at 280 nm. This is a simple and quick way of quantification and the protein sample is recoverable.

Proteins absorbs light at 280 nm, primarily the aromatic amino acids (tryptophan and tyrosine), and the disulfide bonds (S-S bonds) in the protein sequence. The amount of light absorbs by the protein is dependable on the chemical composition of the protein – the number and type of amino acids. Protein absorption is also affected by the protein structure. Therefore, conditions such as temperature, pH ionic strength, and presence of detergents can affect the absorption of the proteins.

Calculations

To compute the concentration of a purified protein solution, the formulas are given as:

1. A_{260}/A_{280} Ratio: To check for a pure protein, the A_{260}/A_{280} Ratio is approximately about 0.58.

2. To eliminate the presence of nucleic acids in the protein sample, the protein concentration can be estimated according to Warburg and Christian formula:

   Concentration (mg/ml) = $(1.55 \times A_{280}) - (0.76 \times A_{260})$

3. For better calculation of proteins:

   Protein concentration (mg protein or peptide per ml) = $(A280 \times DF \times MW) / \varepsilon$

   Where A_{280} is the absorbance of the solution at 280 nm in a 1-cm cell

   DF is the dilution factor

   MW is the molecular weight of the protein/peptide

   ε is the molar extinction coefficient of each chromophore at 280 nm

Cell Viability - Resazurin/Alamar Blue™

Tip Biosystems offers the measurement of the reduction of resazurin to resofurin. In this cell viability assay, the resazurin exhibits an absorption peak at 600 nm and the resofurin at 570 nm wavelengths. An alternate wavelength measurement for absorption peak is available at 630 nm.

Resazurin is an indicator dye which incorporates an oxidation-reduction (REDOX) indicator that changes color in response to the chemical reduction of growth medium of the growing cells. The bioassay can be used to establish proliferation or relative cytotoxicity. The toxicity of related novel agents can be predicted by comparing its baseline data against the baseline data of the known *in-vivo* toxicity.

Turbidity is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are present but undissolved. Determining Turbidity of an aqueous solution is a frequently used procedure to estimate the quality of water. Turbidity is determined by measuring the optical density (OD) at 600 nm since light is scattered rather than absorbed. Careful mixing of the suspension is required before each measurement is taken.

Turbidity - A calibration graph can be plotted using Turbidity 4000 NTU Calibration Standard – Formazin from Sigma Aldrich (Product number TURB4000). The turbidity of the test solution is then determined by substituting the OD value in the equation of the straight line that is determined from the calibration graph.

Turbidity – McFarland for Cell Count

The number of cells in a sample can be estimated by measuring the OD of the cells suspended in a liquid. A calibration curve from the absorbance of known cell density is plotted and the absorbance of the unknown cell density is compared against the calibration curve. This is a quick way to determine the number of bacteria in a sample. The OD value may differ when different type of cells is used. Therefore, the calibration curve can only be used for the same type of cell.

McFarland Standards are usually labelled as 0.5 to 10. They can be made in the lab by preparing a 1% anhydrous $BaCl_2$ and 1% solution of H_2SO_4 and mix both solutions at specified volumes and ratios. Commercially available latex beads suspensions are also available.

A calibration graph is plotted from the OD of the McFarland Standards. The turbidity of the test solution is then determined by substituting the OD value in the equation of the straight line that is determined from the calibration graph.

Bradford Assay

In the iOS application, under the Measurement Type, select the Bradford Assay. The Bradford Assay is used to determine protein concentrations. The Bradford reagent contains the Brilliant Blue G dye which will form a colored complex with the protein in the solution. The linear concentration range is 0.1 – 1.4 mg/ml of protein, using BSA (bovine serum albumin) as the standard protein and Bradford reagent (Product number B6916) from Sigma-Aldrich. A standard curve is generated using serial dilutions of known BSA concentrations. An unknown concentration of a protein can be determined by comparing against the standard curve.

Other Applications

Other applications are available as Application Notes for downloading at Tip Biosystems Pte Ltd webpage www.tipbiosystems.com. For applications not listed in this manual or at Tip Biosystems's webpage please contact our application specialist at support@tipbiosystems.com

Troubleshooting

The Photopette® calibration test is performed with the standard solutions provided in the package. If the instrument passes the self-calibration test, the application will reflect the outcome. If the device does not pass the test, an alert will appear on the application along with the message explaining the reason for the failed test along with the recommended solution.

If the ok button is selected, the window is closed and the home screen will be shown with an error message at the top. The error message is also shown on top of all other screen and all performed measurements including the saved files of those measurements. If the self-calibration test fails, please contact the support@tipbiosystems.com.

Assistance

The assistance includes off-site support, report a problem, software maintenance and legal as function to help with any technical issues or questions that may arise with the Photopette®.

Report Problem

The Application will send bug error reporting automatically to our Software Developer in case there is any problem or the application crashes. Else other related problems can be emailed to the above email accordingly.

Maintenance

Download the software update file from Tip Biosystems main download page. Remember to save all data before updating the application. Please ensure that your mobile device has enough storage and is connected to Wi-Fi before commencing Application download.

Warranty

Tip Biosystems Pte Ltd guarantees that the product supplied has been thoroughly tested to ensure that it meets its published specification. The warranty included in the conditions of supply is valid for 12 months and is valid only if the product has been used according to the instructions supplied.

Tip Biosystems Pte Ltd or your supplier can accept no liability of loss or damage arising from the faulty or incorrect use of this product.

Each device will come with a Certificate of Performance where upon assembly, all the default configuration will be stated on the certificate.

Cleaning and General Care

Switch off the Photopette® and disconnect the power cord prior to external cleaning. Use a soft wet cloth or dry microfiber cloth to clean all external surfaces. A mild liquid detergent may be used to remove stubborn marks.

Approved disinfectant solutions include: Apesin disinfection spray (Tana Chemi GmbH), Incidin Liquid & Inciddin Foam (Ecolab), and Lysoformin Spezial (Lysoform Dr. Hans Roseman GmbH).

NOTE: Observe all necessary precautions if dealing with hazardous samples or solvents.