EzCube
Fluorometer

BRFP-0300

Operation Manual

Ver 1.0

BLUE-RAY BIOTECH

Table of Contents

1. Safety Precautions

Before using the **EzCube** for the first time, please read this entire Operation Manual carefully. To guarantee problem free, safe operation of the **EzCube**, it is essential to take note of the following section.

1.1 Intended Use

EzCube is a fluorometer with three optional fluorescence channels: blue, red and green. It can detect the intensity of dye signals in fluorescence quantitative assays to achieve precise nucleic acid sample quantification.

This instrument is intended to be used only by trained personnel to perform solution analyses and research. It is assumed that the user is familiar with and has a working knowledge, of all the laboratory procedures used in fluoroscopic analysis.

1.2 General Instrument Safety

⚠ **PHYSICAL INJURY HAZARD.** The use of this instrument in a manner not specified by Blue-Ray Biotech may result in personal injury or damage to the instrument.

1.2.1 Transportation and Storage

This instrument should not be exposed to temperatures less than – 25 or more than 60°C and relative humidity should be within 20 - 80% (non-condensing).

1.2.2 Installation and Operation

Power	I/P 100-240VAC, O/P 12VDC, 3
Overvoltage category	II
Temperature	10 - 40°C
Relative humidity	20 - 80 % (noncondensing)
Altitude	Up to 2,000 m (6,500 ft.)
Place of operation	For indoor use only
Pollution level	2

1. Do not use the fluorometer in a potentially explosive environment or with chemicals that might cause an explosion.
2. Use only the manufacturer's original power supply adaptor.
3. Make sure the power source conforms to the required power supply specifications.
4. To avoid electric shock, make sure the instrument is plugged into a grounded electrical outlet.
5. Operate the instrument in a place where the power disconnecting switch is easy to access.
6. Avoid placing the instrument in direct sunlight.

7. Install the instrument in a location free of excessive dust.
8. Choose a level, flat and stable surface capable of bearing the weight of the instrument.
9. Keep the instrument at least 5 cm away from any wall or corner.
10. Do not allow water or any foreign object to enter the various openings of the instrument.
11. Please keep the sample chamber cover closed when the instrument is not in use.

1.2.3 Cleaning, Decontaminating, and Servicing the Instrument

Before using a cleaning or decontamination method other than those recommended by Blue-Ray Biotech, verify with us that the proposed method will not damage the equipment. Unplug the power cable before cleaning, servicing, or replacing the fuses. Repairs should be carried out by authorized service personnel only.

1.2.4 Instructions for Removal from Use, Transportation, or Disposal

Do not dispose of this product as unsorted municipal waste. Follow local municipal waste ordinances for proper disposal provisions to reduce the environmental impact of waste electrical and electronic equipment (WEEE).
European Union Customers: Call your local Blue-Ray Biotech Distributor's Customer Service office for equipment pick-up and recycling.

1.3 Chemical Waste Safety

1.3.1 Chemical Waste Hazard

⚠ **HAZARDOUS WASTE.** Refer to Material Safety Data Sheets (MSDSs) and local regulations for handling and disposal.

2. General Description

The EzCube fluorometer is a benchtop instrument with an intuitive touch screen. Precise fluorescence quantification assays can be done on samples as small as 1µl in a few seconds. The instrument is equipped with three fluorescent channels and offers users the choice of several diverse applications. The USB-A port allows data to be exported to a flash drive.

2.1 Features

- Each of the three fluorescent channels has an LED source
- Fast detection time, < 7 seconds
- The large LCD touch panel enhances visibility and is easy to use.
- Stand alone, no PC required
- The instrument is robust and has a modern design
- A simple and easy-to-use graphical interface
- Multiple built-in applications
- Automatic creation of operating history

2.2 Product Overview

Figure 1. Front View

Table 1. Detailed Description - Front View

Part Name	Function
Cover	The cover must be closed when sample measurement is made.
Sample Chamber	Only 0.5 mL thin wall PCR tube can be used.
7” Touch Panel	The high-resolution (1280×800) capacitive touch color LCD displays the status of the system and allows full control of the device.
USB-A Port	Insert a USB flash drive in FAT/FAT32 format to output data.

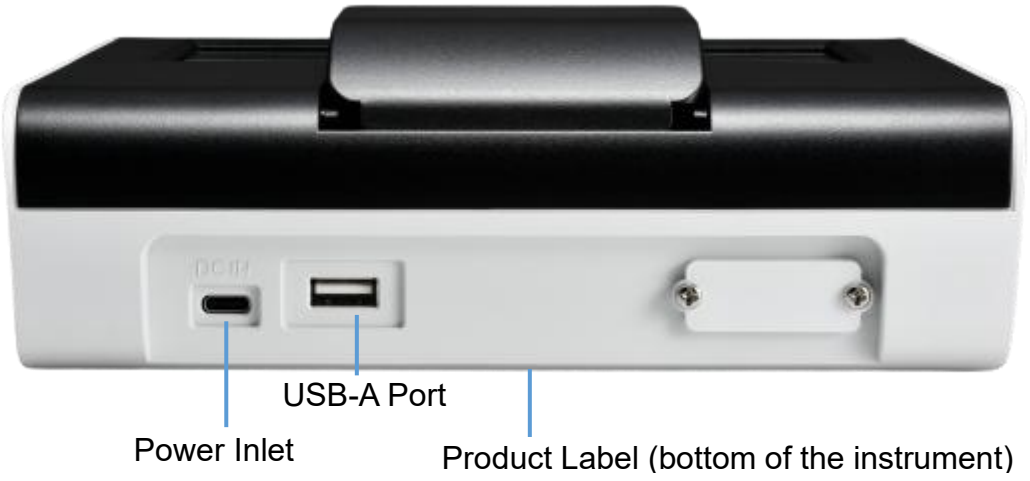


Figure 2. Back View

Table 2. Detailed Description - Back View

Part Name	Function
Power Inlet	Power supply connection.
USB-A Port	USB flash drive port (FAT/FAT32 format) for data output.
Product Label	Has the product name, model, serial number, power specification, and other important information.

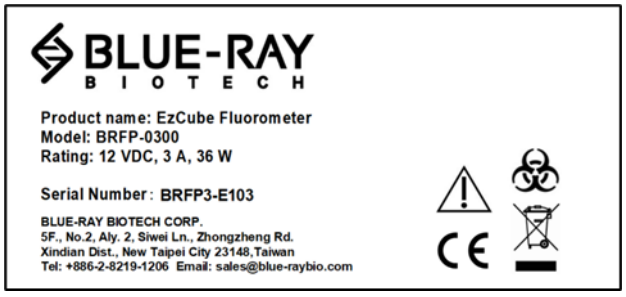


Figure 3. Product Label

Table 3. Detailed Descriptions of Symbols on the Product Label

Symbols	Description
	Indicates that you should operate with caution and read the manual for more information before use.
	Indicates the presence of substances that may be hazardous to humans, animals, plants, or the environment based on biological activity.
	CE Mark.
	**Do not dispose of this product as unsorted municipal waste.** Follow local municipal waste ordinances for proper disposal provisions to reduce the environmental impact of waste electrical and electronic equipment (WEEE).

3. Getting Started

3.1 Unpacking

Open the **EzCube** package and remove all the EPE foam and the plastic bags. Confirm that all the following items are included:

- EzCube x 1
- Quick Operation Guide x 1
- Certificate of Conformance x 1
- Type C power cord with 4 adaptor plugs (US/EU/UK/Australia) x 1

If any items are missing, damaged, or any incorrect items are included in the package, please contact your local Blue-Ray Biotech distributor or sales representative immediately.

3.2 Initial Operation

Place the instrument on a steady, flat and level benchtop. Make sure there is at least 5 cm between the device and any wall or other device. Check that the power source is compatible with the fuse rating input. Plug the power cord into the socket on the back of the instrument (Figure 2) and into a mains outlet.

When the **EzCube** is powered on, the LCD display will show the boot screen, start initiation progress. Then "EzCube" will be displayed (Figure 4). Tap the " EzCube" icon to log into the **Main Menu** (Figure 5) and start the operation.

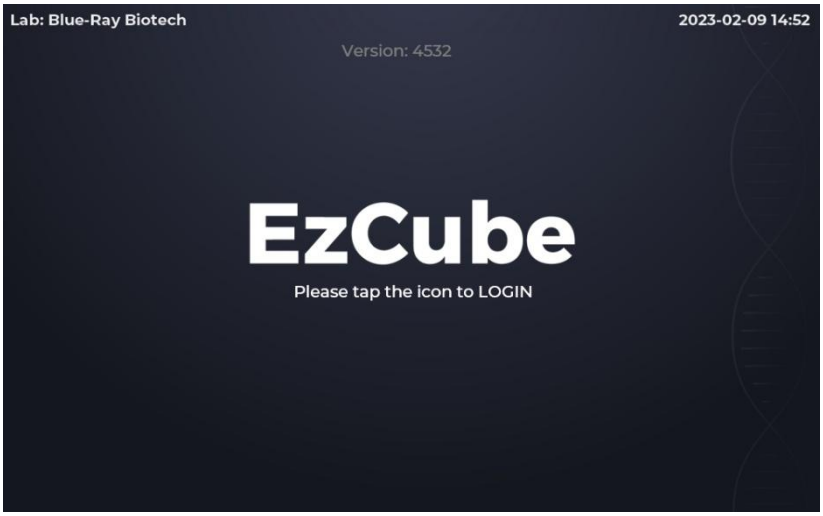


Figure 4. EzCube Home Page

Note
1. EzCube can only be used with the supplied power cord, please do not use it with any other product.
2. Please unplug the instrument when it is not in use.

3.3 Main Menu

There is information on the **Main Menu which** indicates the status of the EzCube. Please refer to Figure 5 and Tables 4 and 5 for detailed descriptions.

Tap " EzCube " again on the **Main Menu** to log out.

Figure 5. Main Menu Overview

Table 4. Detailed descriptions of the seven applications shown on the Main Menu

Icon	Application	Description
	dsDNA	Quantifies dsDNA samples using a standard curve.
	ssDNA	Quantifies ssDNA samples using a standard curve.
	RNA	Quantifies RNA samples using a standard curve.
	microRNA	Quantifies microRNA samples using a standard curve.
	Protein	Quantifies protein samples using a standard curve.
	Fluorometer	Measures sample RFU using a selected excitation filter.
	Calculator	Calculates the required volume of fluorescent dyes and buffers for sample preparation.

Table 5. Detailed description of the three tools and settings on the Main Menu

Icon	Function	Description
	**System**	System setting.
	**History**	Duplicate protocol setting / View previous results.
	**User**	User folder management.

3.4 Basic Operation

3.4.1 Application Screen

The application screen has three sections; there is a display interface for each different application.

- Information Tab (see Figure 12 and Table 6)
- Data Information Report Area
- Functions Icons (see Table 7)

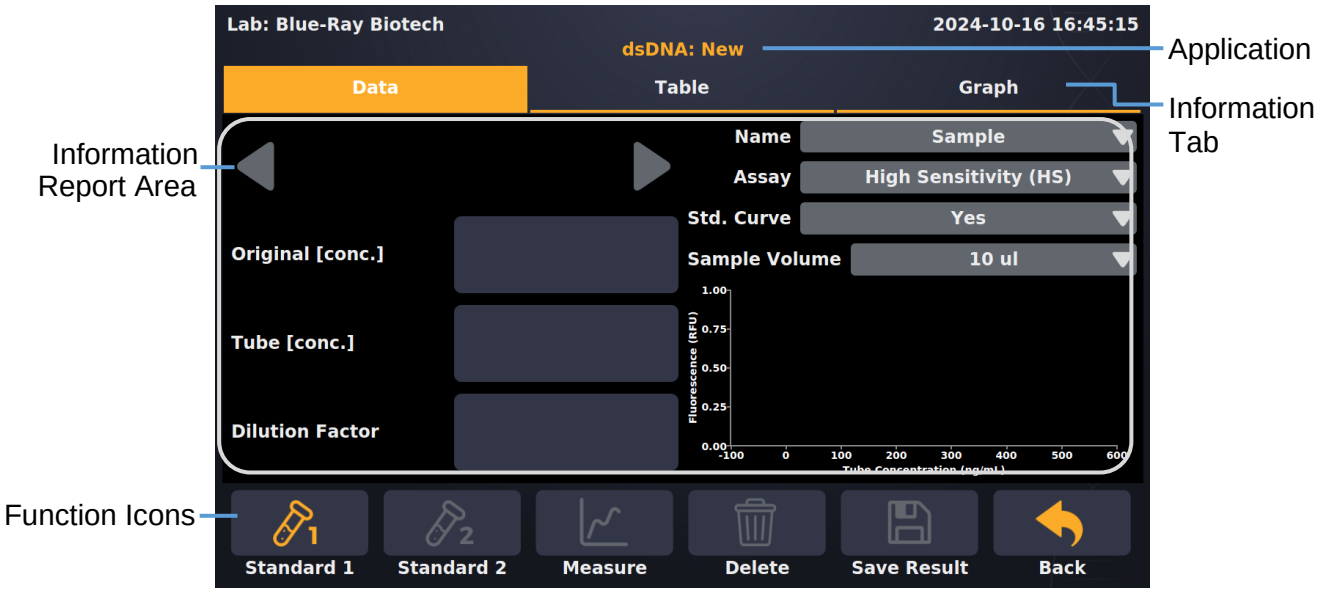


Figure 12. Application Screen

Table 6. Detailed description of the Information Tab Page

Tab Page	Description
Data	This section shows the sample data and setting information details.
Table	The section shows the total samples data report.
Graph	This page displays the graphics results. The horizontal axis is the **Tube Concentration (ng/ml)** and the vertical axis is **Fluorescence (RFU)**.

Table 7. Detailed description of the Function Icons

Icon	Function	Description
	**Standard 1**	Only available when calibration is needed. This is the first point of the standard.
	**Standard 2**	Only available when calibration is needed. This is the second point of the standard.
	**Standard 3**	Only available when calibration is needed. This is the third point of the standard. (Only used for the Protein application).
	**Measure**	Sample measurement.
	**Delete**	To delete sample measurement data. Note: Standard measurement data cannot be deleted, but it can be overwritten.
	**Save Result**	Save the result.
	**Back**	Return to the previous page.

4. Performing Assays

4.1 dsDNA, ssDNA, RNA, microRNA, Protein

These applications will quantify the DNA, RNA, microRNA and Protein samples base on the inbuilt standard curves.

4.1.1 Overview of Screen Features

The information tab bar has three tab pages:

- Data
- Table
- Graph

4.1.2 Data Tab Page

Figure 13 shows the data tab page of the Nucleic Acid application, Table 8 shows the details.

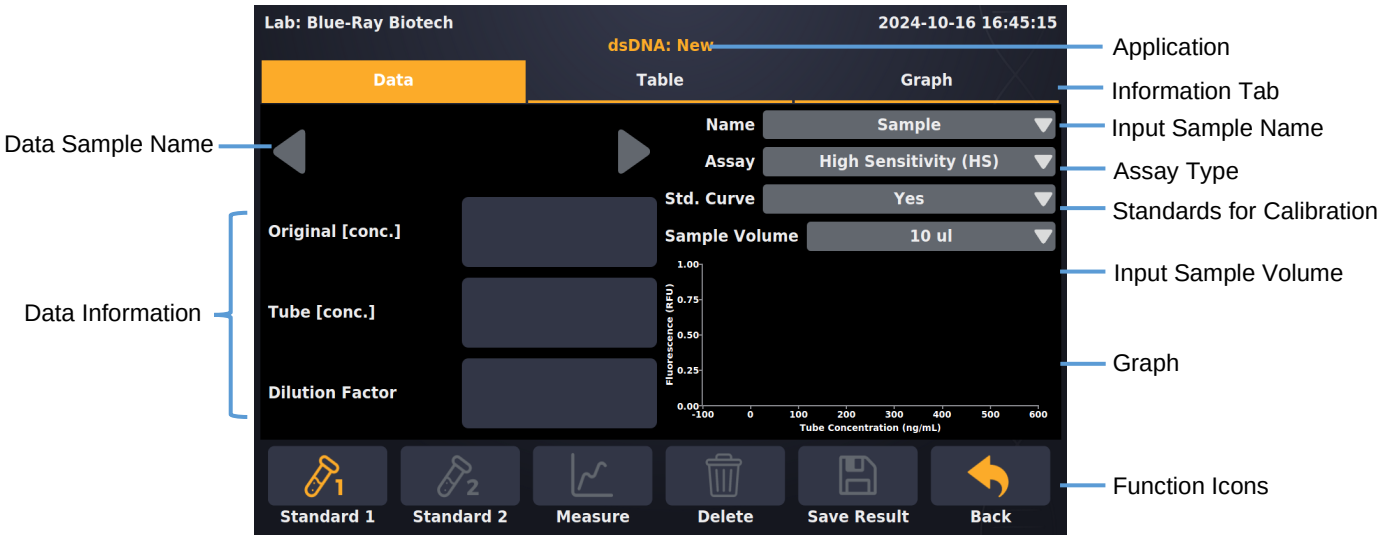


Figure 13. dsDNA Application -- Data Tab Page

Table 8. Detailed ddescription for the Data Tab Page of dsDNA, ssDNA, RNA, microRNA and the Protein Application

Item	Description
Original [conc]	The concentration of the original sample. Tube [conc] multiplied by dilution factor, the unit is **ng/μl**.
Tube [conc]	The concentration of the sample in the tube, the unit is **ng/ml**.
Dilution Factor	Determined based on the added sample volume. For a 200 μl final volume assay, a 10 μl sample will have a dilution factor of 20.
Name	The sample name can be entered here. The default is “Sample”.

	Note: “Blank, Sample” cannot be used as a sample name.
Assay	Assay Type. **dsDNA**: High Sensitivity (HS) and Broad Range (BR) **ssDNA** **RNA**: High Sensitivity (HS), Broad Range (BR) and Extended Range (XR) **micro RNA** **Protein**
Std Curve	You have the option to either perform a new calibration for each assay by running new standards **(select YES)**, or utilize the values from the previous calibration **(select Last Read)**.
Sample volume	Select the sample volume in the tube. The range is from **1 - 20 µl**.

4.1.3 Table Tab Page

The table tab page will show all the data results (Figure 14). To delete data, tap the **[x]** column,  **Delete** will become functional. Tap the **Sample** column to edit the sample name.

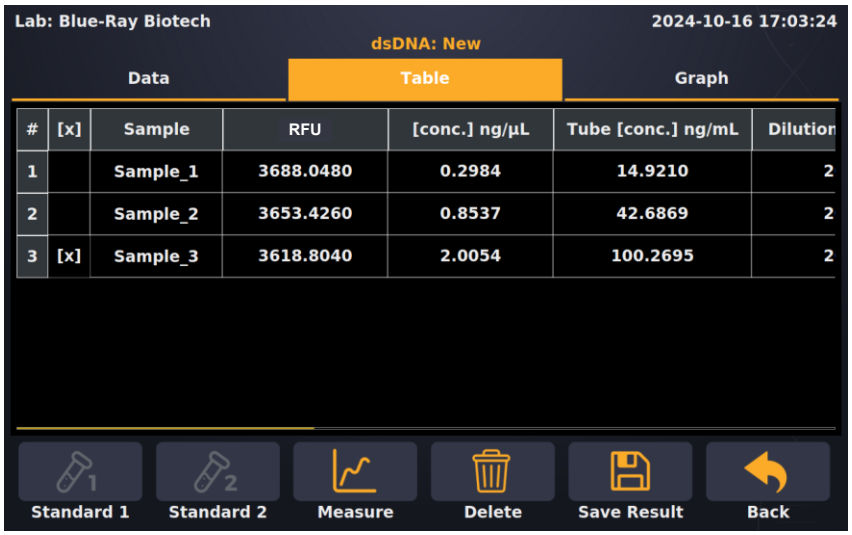


Figure 14. dsDNA Application -- Table Tab Page

4.1.4 Graph Tab Page

The graph tab page displays the in-tube concentration graph for the measured samples (Figure 15). Select more than **1** sample in the **[√]** column of the **Graph Tab Page** to overlay the graph. The table in the **Graph Tab Page** can be moved sideways to show more columns.

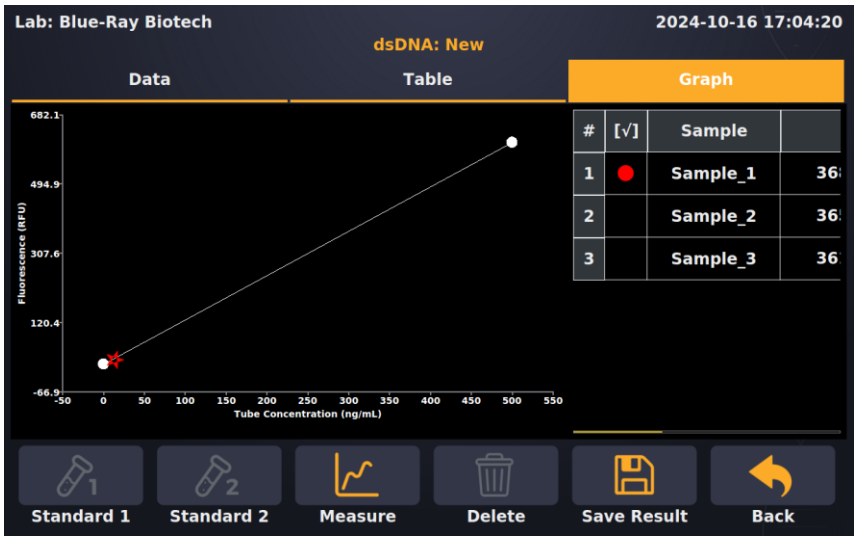
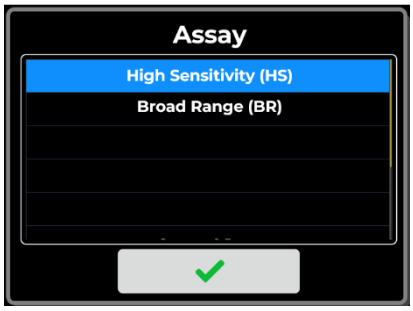


Figure 15. dsDNA Application -- Graph Tab Page

4.1.5 Quantify dsDNA, ssDNA, RNA microRNA and Protein Samples

1. Tap dsDNA, ssDNA, RNA, microRNA, or Protein on the Main Menu to enter an application.
2. Select the correct **Assay** type based on the kit.



3. You have the option to either perform a new calibration by running new standards **(select YES)**, or utilize the values from the previous calibration **(select Last Read)**.
4. Enter the **Sample Volume** loaded into the tube, 1 – 20 µl.
5. Perform a new calibration (skip this step if a previously established standard curve is to be used):
   a. Insert standard #1 into the sample chamber, close the cover and tap **Standard 1**.
   b. Insert standard #2 into the sample chamber, close the cover and tap **Standard 2**.
   c. (For Protein assay only) Insert standard #3 into the sample chamber, close the cover and

tap  **Standard 3**.

d. When the standard curve has been established, a curve will appear in the lower right corner of the chart, and the  **Measure** icon will illuminate.

Note
1. Label the tube lids and not the side of the tube because this can interfere with the sample reading. 2. Make sure the cover is properly closed when taking the reading.

6. Enter the sample name in the **Name** bar (optional) or it will be numbered automatically.
7. Input the test sample volume in the **Sample Volume** bar.
8. Insert the sample into the sample chamber, close the cover and tap  **Measure**.
9. If the value is out of detection range, it will display “too high” or “too low”.

4.2  Fluorometer

The user can select the excitation light source to be used to read the fluorescence of the sample. Green, yellow and far-red emission channels for the blue LED, far-red emission channel for the red LED, yellow and far-red emission channels for the green LED. The reading is in raw fluorescence units (RFU).

Table 9. The excitation and emission filters for the three LED light channels

LED	Excitation filter	Emission filter
Blue	430 - 495 nm	Green, 510 - 580 nm
Red	600 - 645 nm	Far-red, 665 - 720 nm
Green	490 - 535 nm	Yellow, 554 - 650 nm

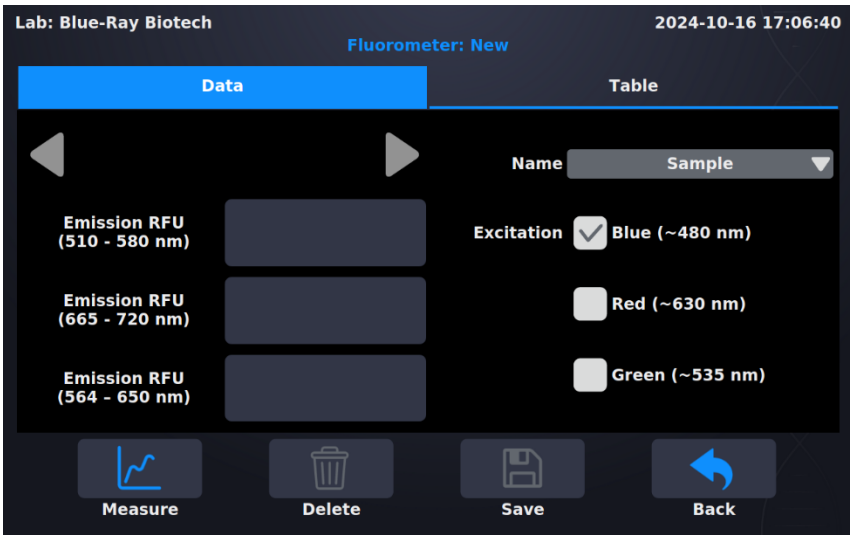


Figure 16. Fluorometer Application

4.2.1 Overview of Screen Features

The information tab bar has two tab pages:

- Data
- Table

4.3 Calculator

Some kits include concentrated fluorescent dyes or buffers that need to be diluted in specific ratios to create working solutions for sample and standard preparation. The functionality of this calculator enables precise determination of the necessary volumes of each fluorescent dye and buffer.

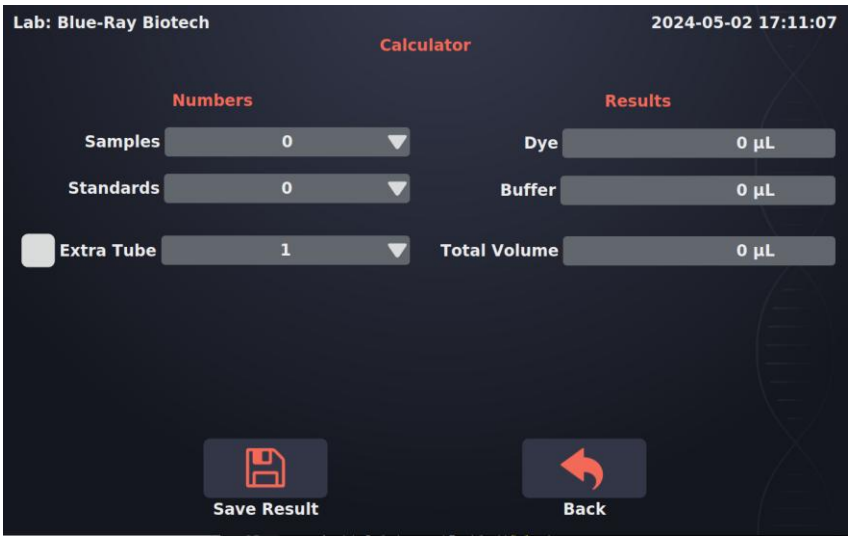


Figure 17. Calculator Application

4.4 Save Result

Tap **Save Results**, the **User Menu** will be displayed as shown in Figure 18 and then the saving destination can be selected.

1. **Save results to a flash drive:**

   Insert a formatted (**FAT/FAT32**) flash drive into the USB-A port on the front of the EzCube; the flash drive icon will pop up, tap it and enter the file name. Once the result has been saved successfully, a message, "**Report has been saved**" will appear. For details, please refer to Section 7.5 Using a Flash Drive as a User Folder.

2. **Save result in system:**

   Choose an existing user folder or create a  **New User**. For details, please refer Section 7.1 Creating a New User Folder.

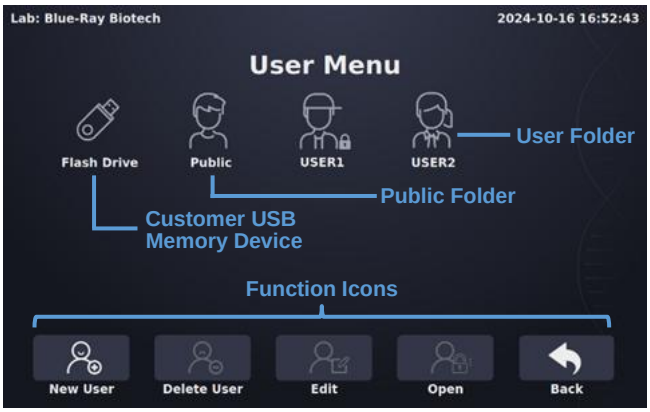


Figure 18. User Menu Overview

5. System Menu

Tap on the  **System** icon on the main menu to enter the **System Menu** as shown in Figure 19 below. Users can adjust several parameters or settings for the EzCube.

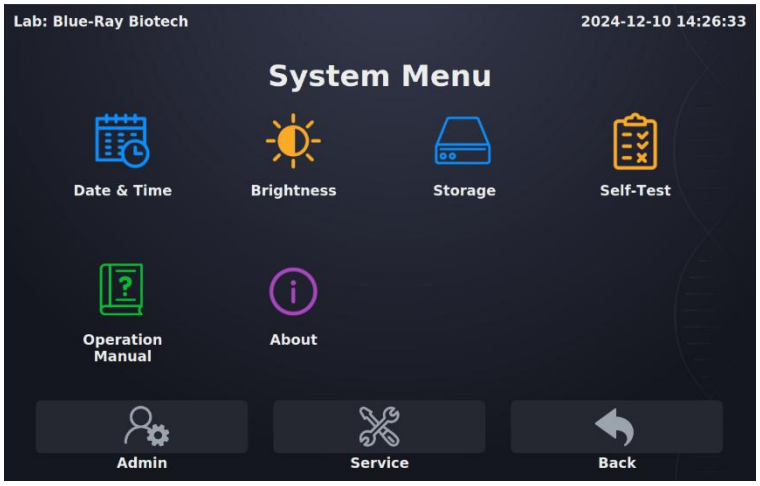


Figure 19. System Menu Overview

5.1 Date and Time

The date and time setting of the EzCube can be changed from here.

5.2 Brightness

Brightness of the display panel can be adjusted to suit the environmental lighting.

5.3 Storage

This function shows the total used and remaining memory space on the EzCube internal memory.

5.4 Self-Test

Users can do an EzCube system self-test. Keep the cover closed and do not lift it during the test.

5.5 Operation Manual

Scan the QR code to download the operation manual.

5.6 About

This icon will give a list of the basic information of EzCube. This includes the system version, the

initialization data, and calibration dates.

5.7 Admin

The default Administrator password is “**0000**”. The administrator has the right to alter all the settings as described below.

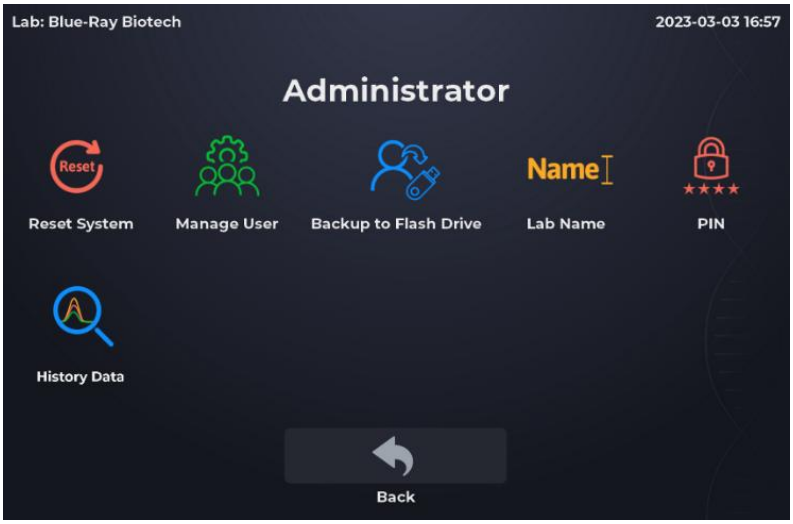


Figure 20. Administrator Menu Overview

5.7.1 Reset System

Reset the EzCube to the default setting.

5.7.2 Manage User

Allows entry to the **User Menu** where the administrator has the rights to **Delete User** or **Clear All**.

5.7.3 Back Up to Flash Drive

When a flash drive is inserted, the icon will change to a blue color and can be used to back up all user data.

5.7.4 Lab Name

The Lab Name, which appears in the top left corner of every page, can be changed.

5.7.5 PIN

Change the admin password; up to 8 characters. Once setup is completed, go back to the main menu and tap the EzCube icon to update the password.

5.7.6 History Data

The administrator has the rights to delete/copy/view **History Files**.

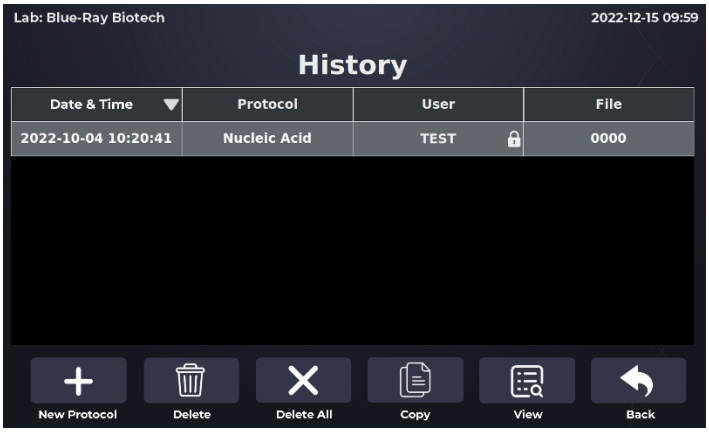


Figure 21. History Data Overview

5.8 Service

Only authorized service personnel have the password allowing entry to Service Mode to carry out any necessary maintenance and repairs.

6. History

Both saved and unsaved results will be recorded here, including the results stored in the flash drive. Tap on the **History** icon on the main menu to enter the **History** list information screen. If the results do not fit on one page, slide up or down on the screen to check the rest. The maximum number of records is **300**. If this number is exceeded, the latest record will overwrite the oldest. A sample screen is shown in Figure 22 below.

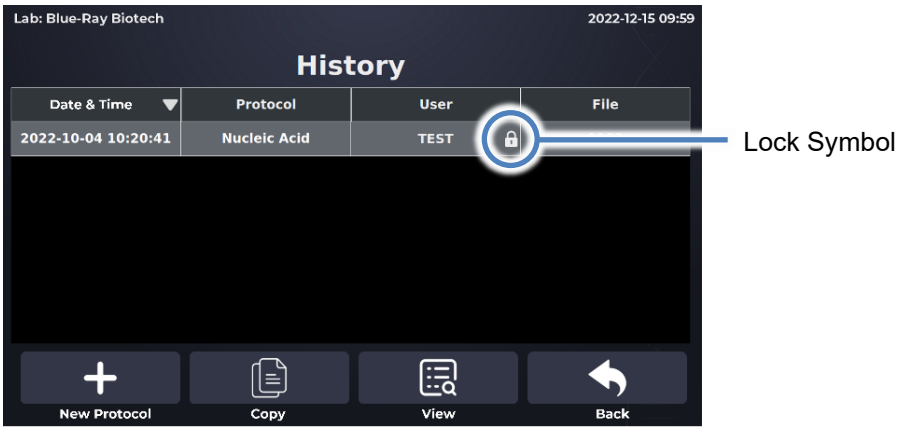


Figure 22. History List Overview

The lock symbol on the lower right corner of the user column indicates that the folder is password protected. However, records will remain in the history list even after they have been deleted.

Should a user fail to save a result, autosave will be executed. The user column will display "AutoSave," and the file column will show a system-defined name.

When a result is saved to a flash drive, the user column will display "Flash Drive," and the name displayed in the file column will be user-defined.

The function icons on the lower part of the screen allow users to duplicate the result settings to a new protocol or copy/view the results.

6.1 Duplicating Protocol Setting

Select the saved results with the protocol setting you want to duplicate. Tap on the **New Protocol** to duplicate the protocol settings. The new protocol will have the same settings as the original, but they can be modified if necessary.

6.2 Copying a Result

Select a result and tap  **Copy** to copy. If the result is from a password-protected user folder, you will be requested to input the password. Input the password and tap  to confirm or tap  to abort. If the password is entered correctly, the report will then open. If the password is entered incorrectly, the following warning message will pop up: ”**This is not the correct password, please try again**”. Tap  to return to the password input screen and enter the correct password.

6.3 Viewing a Result

To view the details of a result, tap on the record to select and highlight it. You can then tap for a second time or tap on the  **View** to open it. If the result is from a password-protected user folder, you will be requested to input the password. Input the password and tap  to confirm the password or tap  to abort the operation. If the password is entered correctly, the report will then open. If the password is entered incorrectly, the following warning message will pop up: ”**This is not the correct password, please try again**”. Tap on  return to the password input screen and enter the correct password.

7.  User Menu

Tap on the  **User** on the main menu to enter the **User Menu**. A sample screen is shown in Figure 23 below.

Figure 23. User Folder Overview

All results can be stored in the user folders. The **User Menu** contains an unlocked public folder in which the results can be freely viewed. Ten user folders can be fully displayed on one page. If there are more than ten in the system, scroll up or down the screen to see the other pages.

Users can utilize the function icons on the lower part of the screen to **create, delete, edit** and **open** the user folders. The **Back** icon is used to return to the main menu. The details of the icon function are described below.

7.1 Creating a New User Folder

Tap on the icon  **New User** to create a new User folder. Input the user folder name and choose one of the head shot icons (8 different icons are available (Figure 24)), and then enter a password (optional). If the user folder has a password, a lock symbol  will appear in the lower right corner of the folder icon (see Figure 23).

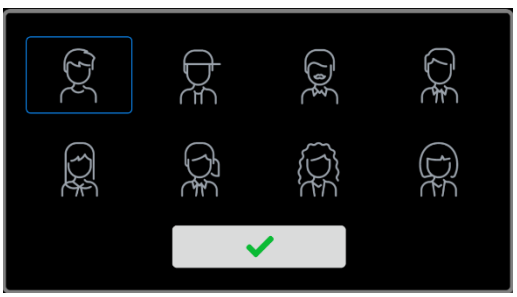


Figure 24. Head Shot Icon

7.2 Deleting a User Folder

Tap on the folder icon to select and highlight the folder, then tap on the  **Delete** to delete it. You may have to enter a password if the folder is password-protected. The screen will prompt: "**Are you sure you want to delete the folder with a report inside?**" Tap on  to confirm. Tap on  to cancel.

7.3 Viewing a User Folder

Tap on the folder icon to select and highlight it. You can tap again or tap  **Open** to open it. If the folder is password-protected, you will be requested to input the password. Input the password and tap  to confirm the password or tap  to cancel. If the password is entered correctly, the folder will then be opened. If the password is entered incorrectly, the following warning message will pop up: "**This is not the correct password, please try again**". Tap  to the password input screen and enter the correct password.

7.4 Editing a User Folder

To edit the properties of a user folder, tap on the folder icon to select and highlight the folder, then tap on the  **Edit** to edit it. Users can change the folder name and password (optional) or change the head shot icon. Tap on  to store and finish editing.

7.5 Using a Flash Drive as a User Folder

To use a **USB flash drive** as a **User Folder**, insert the flash drive (**FAT/FAT32** formatted) into the front USB-A port, the  icon will pop up. (This may take a moment, depending on the flash drive specs.). The saved file format will be a **.csv** file that can be opened with Excel. The flash drive can also be used to transfer the EzCube results to a computer.

8. Maintenance

Please avoid spilling liquid on the instrument, especially sample chamber. Liquid may damage the internal components of the EzCube and interfere with detection performance. Use a dry cloth to keep it clear of dust and any other residue that comes with the regular operation of the instrument.

8.1 Cleaning the EzCube

Use a clean dry cloth and a fine spray of 75% ethanol or isopropanol, or a 0.5% sodium hypochlorite solution (a freshly prepared 10-fold dilution of commercial bleach) to gently wipe the surface of the instrument.

Note:
Always disconnect the power cord before cleaning or decontaminating the instrument.

8.2 Annual Maintenance

For optimal performance, it is recommended to conduct an annual system verification to check the LED light intensity. Please contact your local Blue-Ray Biotech distributor for this service.

9. Troubleshooting

Problem	Cause	Action
The display is off even when the power is switched on	Power is not reaching the system.	Check power source voltage.
	Power cord is not plugged into the socket properly.	Reconnect the power cord.
	Faulty Power adaptor.	Change the power cord.
The display goes off	Faulty backlight.	Return the EzCube for service.
	Faulty LCD panel.	Return the EzCube for service.
Display is too dark or bright	Display brightness is not adjusted properly.	Adjust Display Brightness Potentiometer.
Error message appears	Refer to **Section 9.1 Error Messages.**	Check the nature of the error and take the suggested action.

9.1 Error Messages

Message	Cause	Action
System Information No SD Card	SD card signal not received for one second.	Insert the SD card.
Error Message 1 ERR_ FW_ABNORMAL	MCU Electronic module Board problem.	Reboot the EzCube.
Error Message 2 ERR_ HW_ABNORMAL	MCU Electronic module Board problem.	Reboot the EzCube.
Error Message 3 ERR_ UART_NO_ANSWER	ARM Electronic module Board problem.	Reboot the EzCube.
Error Message 4 ERR_ UART_WRONG_ANSWER	ARM Electronic module Board problem.	Reboot the EzCube.
Error Message 5 ERR_ UART_WRONG_COMMAND	ARM Electronic module Board problem.	Reboot the EzCube.
Error Message 6 ERR_UART_TRANSMIT_OVERFLOW	ARM Electronic module Board problem.	Reboot the EzCube.

If the same error message appears repeatedly after rebooting the unit, please return the instrument for service.

Appendix A: Technical Specifications

Dynamic range	Five orders of magnitude
Measurement Time	Seven seconds / sample
Light sources	Blue LED (max - 480 nm) Red LED (max - 630 nm) Green LED (max - 535 nm)
Excitation filters	Blue (430 - 495 nm) Red (600 - 645 nm) Green (490 - 535 nm)
Emission filters	Green (510 - 580 nm) Far-red (665 - 720 nm) Yellow (564 - 650 nm)
Detectors	Photodiodes; measurement capability from 320 – 1,100 nm
Tube type	0.5 mL polypropylene thin wall PCR tubes
Operating System	Custom Linux based OS
Display	7” touch screen, 1,280 x 800 TFT-LCD
Connectivity	USB-A port x 2 (Data output)
Dimensions (W x D x H)	196 mm x 248 mm x 68 mm (7.7 x 9.8 x 3.4 in.)
Weight	1 kg (2.2 lb.)
Glove Compatibility	All common lab gloves
Internal Storage	32 GB flash memory
Operating Voltage	Input: 100-240 VAC, 50/60 Hz; Output: 12 VDC, 3 A
Certification	CE

Specifications are subject to change without prior notice.

Appendix B: CE Declaration

CE

BLUE-RAY BIOTECH CORP.

5F, No. 2, Aly 2, Siwei Ln, Zhongzheng Rd,
Xindian Dist, New Taipei City 231,
Taiwan (ROC)

Declaration of Conformity
Product Name: EzCube Fluorometer
Model Names: BRFP-0300
All models comply with the following European standards:

EMC: EN IEC 61326-1. EN IEC 61326-2-6

Safety: EN 61010-1 and EN 61010-2-081

The units conform to these standards to the best of my knowledge and belief.

Name: **Jimmy Kuo**
Position: Quality Assurance Manager
Issue Date: 2023.12.30

Appendix C: Order Information

Cat No.	Description
BRFP-0300	EzCube Fluorometer (Blue, Red and Green)
BRQK011-010000 (T00-FPBR00-00)	EzQuant 1x dsDNA HS Quantification Kit (100 Assays)
BRQK020-010000 (T00-FPBR01-00)	EzQuant ssDNA Quantification Kit (100 Assays)
BRQK031-010000 (T00-FPBR02-00)	EzQuant RNA HS Quantification Kit (100 Assays)
BRQK011-050000 (T00-FPBR04-00)	EzQuant 1x dsDNA HS Quantification Kit (500 Assays)
BRQK100-050000 (T00-FPBR03-00)	0.5 ml Thin Wall PCR Tube

Blue-Ray Biotech Corp

5F, No. 2, Aly 2, Siwei Ln, Zhongzheng Rd, Xindian Dist, New Taipei City 231, Taiwan (ROC).

www.blue-raybio.com

P/N: 401-FPBR00-10