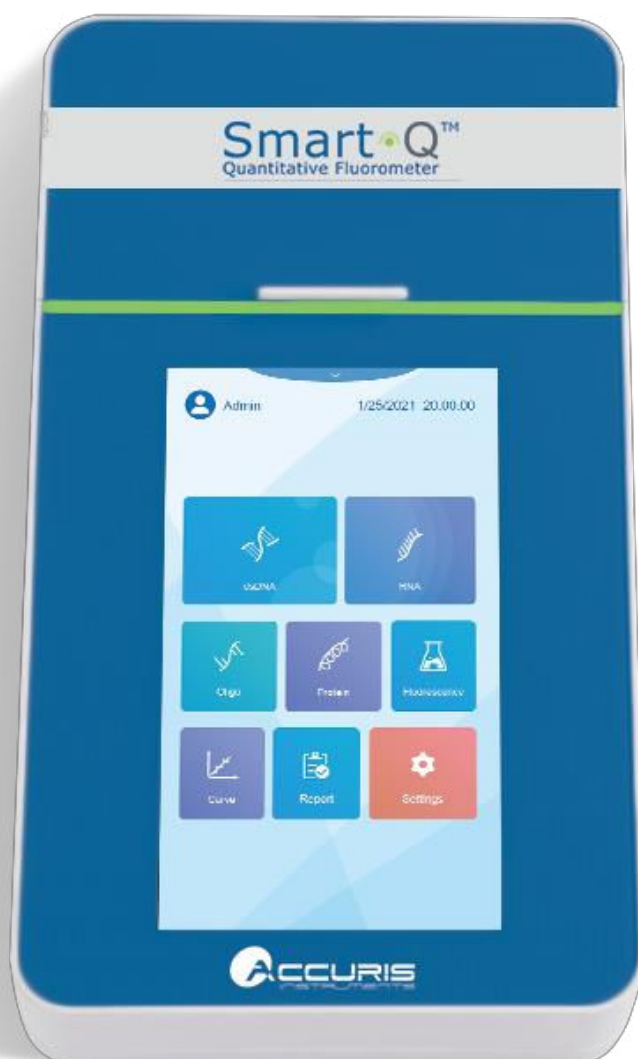


Operation Manual

V1.1

Smart•Q™ 100

Quantitative Fluorometer



This Product is for Research Use Only



Thank you for purchasing the Smart-Q™ 100 Fluorometer. This manual details the instrument's features, specifications, as well as complete operating instructions; please read it carefully prior to operation. Keep this user manual for later use.

Important:

Please keep the box and packaging material for this instrument. If service is required, the box will be needed to ship the instrument to our Service Department.

Initial Inspection

Please inspect the instrument as well as all included accessories when you first open the packaging. If you find anything damaged or missing, please contact Benchmark Scientific or your local distributor immediately.

BENCHMARK SCIENTIFIC / ACCURIS INSTRUMENTS

PO Box 709

Edison, NJ 08818

USA

Phone: 908-769-5555

Website: www.benchmarkscientific.com/ www accuris-usa.com

Email: info@benchmarkscientific.com / info@accuris-usa.com

Safety Warning and Guidelines

1. Important information for safe use

Users should have a clear understanding of how to use this instrument before operation, please read this manual carefully prior to operation.



NOTICE: Please review this manual in its entirety before operating the Smart-Q™ 100.



For Research Use Only. This instrument is not a medical device and is not intended to be used for clinical testing.

2. Operation and Maintenance

The operation and maintenance of the instrument should comply with the basic guidelines and warnings below. Incorrect operation or maintenance will have detrimental effects on the life, performance, and safety features of the instrument.



This instrument is for indoor use only and conforms to I class B type common equipment of standard GB9706.1.



CAUTION: Biological Contamination

All samples used with this instrument, including quality control samples, calibration samples, and components should be considered infectious and treated with caution. Always wear gloves and appropriate safety gear for protection.



The instrument should not be disassembled by the end user unless under the guidance of Benchmark's Service Department.



The instrument should only be installed in an environment with standard room temperature, low dust, low humidity, and away from direct sunlight, electromagnetic interference, and heat sources.



Always power off the instrument when you are finished using it. Unplug the power cord and cover the instrument with a cloth or plastic sheet to prevent excessive dust from entering the housing.



Unplug the instrument immediately if any of the following occur, and contact Benchmark Scientific's Service Department:

- Liquid enters the Instrument.
- The instrument is dropped or the outer shell damaged.
- The functions of the instrument have obviously changed.

3. Maintenance

The instrument housing should be cleaned regularly using a soft, damp cloth.

To clean the touchscreen, disconnect the power cable, and clean the touchscreen with a soft cloth lightly moistened with LCD cleansing detergent. Take care not to use excessive force as this can damage the touchscreen. Do not use abrasive cleaning solutions or material to prevent the touchscreen from getting scratched.

To disinfect the instrument, disconnect the power cable and use a soft cloth lightly moistened with 70% ethanol, 70% isopropanol, or 10% bleach (0.6% sodium hypochlorite). Take care so that the cleaning solution does not enter the power inlet, the sample port, or the USB drive ports.

4. Transportation and Storage Requirements

Ambient temperature: 10°C ~ 40°C

Relative humidity: ≤ 70%

Place in a well-ventilated room, away from corrosive gas.

Table of Contents

| | |
|--|----|
| Chapter 1 Introduction | 1 |
| Chapter 2 Specifications | 2 |
| 1. Required Installation Environment | 2 |
| 2. Specifications..... | 2 |
| Chapter 3 Instrument Overview | 3 |
| Chapter 4 Installation | 4 |
| 4.1 Initial Check | 4 |
| 4.2 Installation Conditions..... | 4 |
| 4.3 Operating Conditions | 4 |
| Chapter 5 Software Introduction | 6 |
| 5.1 Instrument Startup | 6 |
| 5.2 Main Menu Interface | 6 |
| 5.3 dsDNA Interface..... | 7 |
| 5.3.1 dsDNA Interface..... | 8 |
| 5.3.2 Calibration Curve Interface | 9 |
| 5.3.3 Sample Measurements..... | 9 |
| 5.3.4 Molarity Calculator | 10 |
| 5.3.5 Normalization Calculator..... | 11 |
| 5.4 Fluorescence Interface | 12 |
| 5.5 Working Solution Calculation Settings..... | 13 |
| 5.6 Standard Curve Interface..... | 14 |
| 5.6.1 New Standard Curve | 14 |
| 5.6.2 Curve Management | 16 |
| 5.7 Reports Interface | 16 |
| 5.8 User Management Interface | 17 |
| 5.9 Settings Interface..... | 18 |

| | | |
|--|--------------------------------|-----------|
| 5.9.1 | System Settings Interface..... | 18 |
| 5.9.2 | Upgrade Interface | 19 |
| 5.9.3 | Maintenance Interface | 19 |
| Chapter 6 Troubleshooting | | 20 |

Chapter 1 Introduction

The Smart-Q™ 100 Fluorometer is used for the precise quantitation of nucleic acids and proteins in microliter volumes via fluorescent detection. Under conditions of low concentrations of molecules, concentration values are linear to fluorescence intensity. Thus, unknown samples can be quantitatively analyzed. Reagent kits with fluorescent dye, buffer, and standards are available from Accuris or your local distributor.

Key Features and Benefits:

- 7-inch color LCD touch screen display, easy to operate
- Fast and accurate detection of DNA, RNA and proteins (< 6 sec)
- Low sample consumption, only 1-20µL of sample is needed for accurate quantification
- Data storage for up to 10,000 sample records
- Sample data can be printed or exported via USB drive
- Customized sample standard curve
- Reagent calculator to assist with volume determinations
- Auto sleep function for power-saving

Chapter 2 Specifications

1. Required Installation Environment

Environmental Temperature: 10°C~40°C

Relative Humidity: ≤ 70%

Input Voltage: 24 VDC 2A

2. Specifications

| | |
|------------------------------|--|
| Model | Smart-Q™ 100 Fluorometer |
| Display | 7.0-inch, color touch screen |
| Dynamic Range | 5 orders of magnitude |
| Light Source | Blue LED Red LED |
| Excitation Wavelength | Blue: 460 ± 20nm Red: 625 ± 20nm |
| Emission Wavelength | Green: 525 – 570nm Red: 670 – 725nm |
| Stability | ≤ 1.5% |
| Detector | Photodiodes (300-1000nm) |
| Measurement Speed | ≤ 5 seconds |
| Calibration type | 2–3-point standard |
| Consumable type | 0.5mL optically clear tube |
| Input Voltage | 24 VDC 2A |
| Dimensions (WxDxH) | 16.1 x 28.7 x 6.1cm / 6.34 x 11.30 x 2.40in. |
| Weight | 1.6kg / 3.5lbs |

Chapter 3 Instrument Overview

This chapter provides an overview of the physical characteristics of the Smart-Q 100. When using the instrument for the first time, please read this chapter carefully to familiarize yourself with all the parts.

Front/Side:

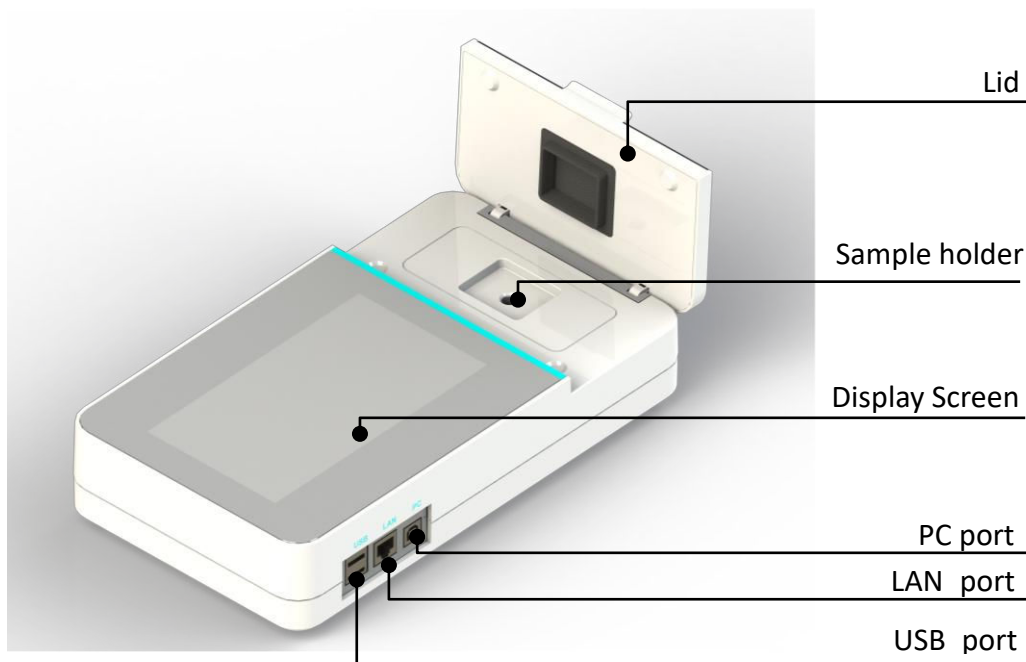


Fig 3.1.01 Front/Side View

Back:

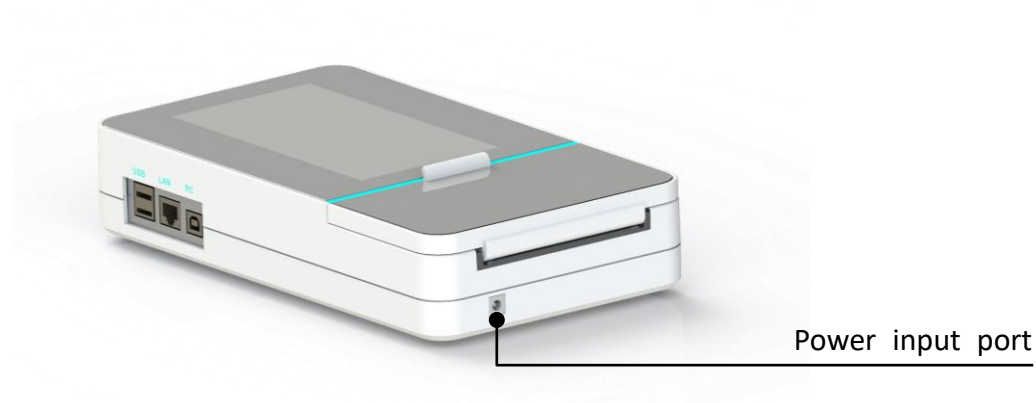


Fig 3.1.02 Rear View

Chapter 4 Installation

4.1 Initial Check

Each Smart-Q 100 has been factory-inspected prior to shipping. Please refer to the included packing list to ensure that all items are included. Contact Accuris or your local distributor if there are any signs of damage to the packaging upon receipt.

Carefully check the instrument's appearance and housing for cracks, damage, or deformation.

4.2 Installation Conditions

Install the instrument on a clean, dry, and level surface in a well-ventilated room away from corrosive agents

Installation Steps

1. Carefully remove the instrument from its packaging and place it onto a stable worktable. Remove all plastic and tape.
2. Unpack the 24V 2A power adapter and plug it into the socket on the back of the instrument. Then connect another side to an AC100~240V power outlet.
3. Turn on the power. The instrument will start to self-check after powering on.

4.3 Operating Conditions

The Smart-Q 100 uses 0.5ml fluorescent PCR tube to test samples.

Sample test steps:

- ① Insert the 0.5mL tube with sample or standards into sample holder.
- ② Close the lid; Click the measurement button on the interface to perform a measurement.

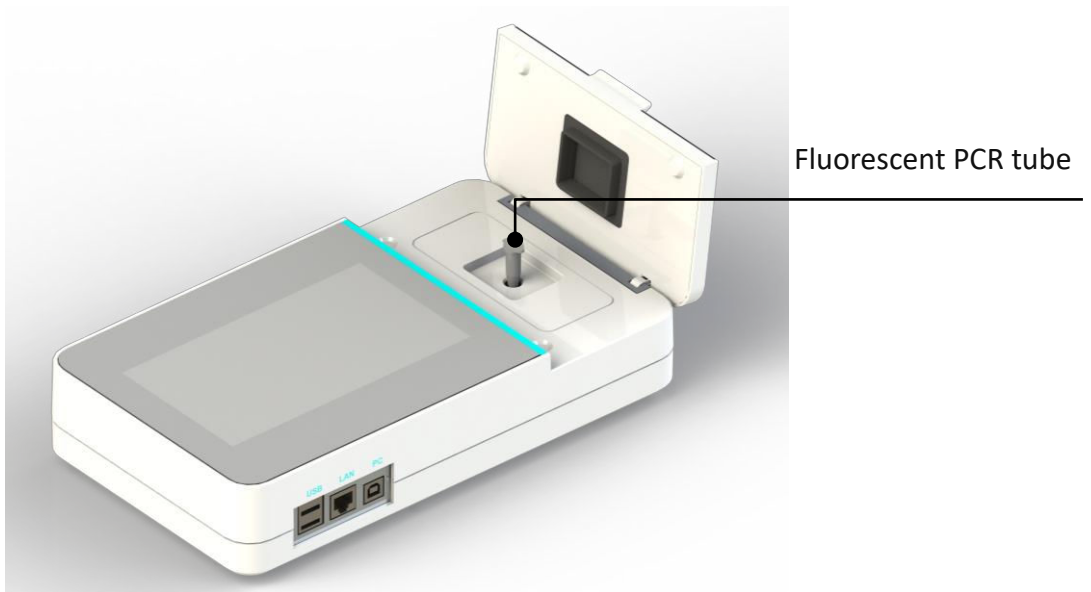


Fig 4.3.01 Instrument Operation Diagram

Chapter 5 Software Introduction

5.1 Instrument Startup

Power the instrument on. Upon start-up, the instrument will perform a self-check (Fig. 5.1.01). After the self-check, the Login Interface will be displayed (Fig. 5.1.02).

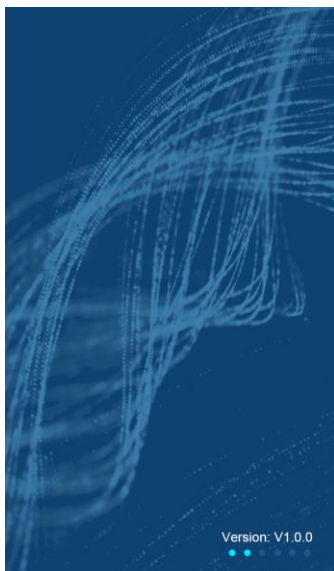


Fig 5.1.01 Self-check

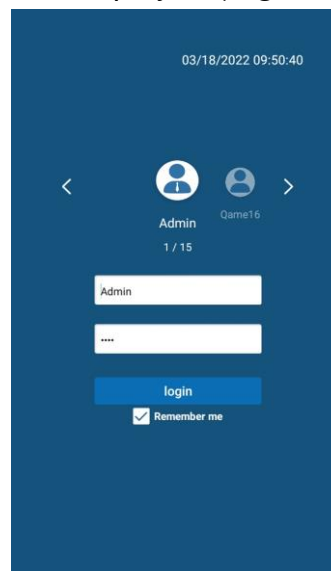


Fig 5.1.02 Login Interface










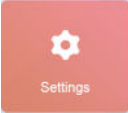
5.2 Main Menu Interface

After entering the user-specific password (**Admin password is set by default to “0000”**), the Main Menu Interface will be displayed (Fig. 5.2.01).




Fig 5.2.01 Main Menu Interface

Table 5-1 Main Menu Interface Operations

| Name | Function |
|---|--|
|  | Select to manage account settings or to switch between users. |
|  | Select to view the working solution calculator |
|  | Select to enter the dsDNA Interface |
|  | Select to enter the RNA Interface |
|  | Select to enter the Oligo Interface |
|  | Select to enter the Protein Interface |
|  | Select to enter the Fluorescence Interface |
|  | Select to enter the Standard Curve Interface |
|  | Select to view a list of the most recent protocols created/run |
|  | Select to enter the settings interface |

5.3 dsDNA Interface

Note: As the interface of dsDNA, RNA, Protein, Oligo are identical, Only the dsDNA Interface is described in detail in this manual.

From the Main Menu Interface, click  to enter the dsDNA Interface. Three test types are available for selection: dsDNA: High Sensitivity, dsDNA: Broad Range, & 1x dsDNA (**Fig. 5.3.01**).

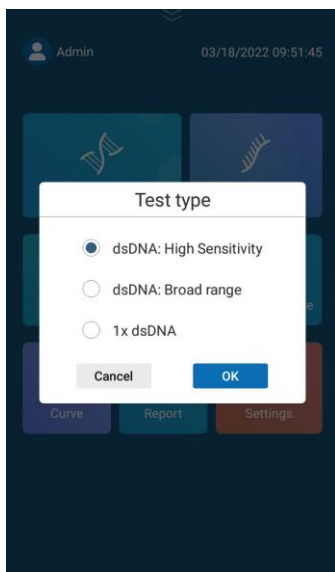


Fig 5.3.01 dsDNA test type



Fig 5.3.02 dsDNA test

5.3.1 dsDNA Interface

Select the test type and click “OK” to enter next interface.

The following takes *dsDNA: High Sensitivity* as an example.

The specific functions are as follows:

Curve name (dsdnaCurve02): Select an available standard curve.

Sample name (S1): Input the sample name.

Unit (ng/μL): Select the appropriate units: ng/μL, ng/mL, μg/μL, μg/mL, mg/mL.



: Click to enter the Calibration Curve Interface (see Chapter 5.3.2).



: Click to print all current protocol test data.



: Click to perform a sample measurement.



: Click to modify the protocol name.


Volume(μl) (10): Set the volume of the original sample, range 1~20μL.

Original Conc.: Calculated concentration of the original sample.

RFU (Relative Fluorescence Units): Calculated fluorescence value of the original sample.

5.3.2 Calibration Curve Interface

Prior to sample measurements, a calibration curve must be created using the standards that are typically included with a quantification kit. Only 2 standards are required to form the calibration curve.

Enter the dsDNA testing interface. Click the  button and select “Calibration” to create the calibration curve (**Fig. 5.3.03**).

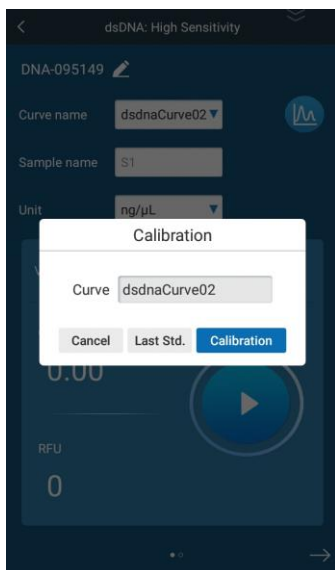


Fig 5.3.03 Curve Cal.



Fig 5.3.04 First Cal. point

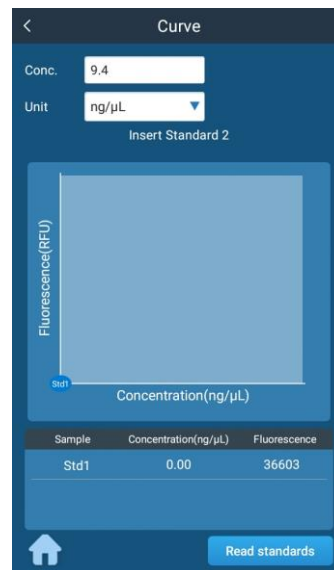



Fig 5.3.05 Second Cal. point

For each assay, you have the choice to run new standards, or to use values from the previous calibration to calibrate the assay. If a calibration has been carried out recently, the last set data can be selected; If recalibration is required, select the  button to perform the calibrate.

Enter the calibration interface, enter the known concentration value for each standard, and press “Read Standards” to perform measurements of the standards. After both standards have been read, select “Save” to save the calibration data.

5.3.3 Sample Measurements


After generating the calibration curve, input the original volume of the sample that was added to the tube and click  to perform a measurement. After measurement, the original concentration and RFU of the sample will be displayed. Swipe right to view data from multiple samples within the same run. Click the name of the sample to modify the sample’s name.



Fig 5.3.06 Testing interface

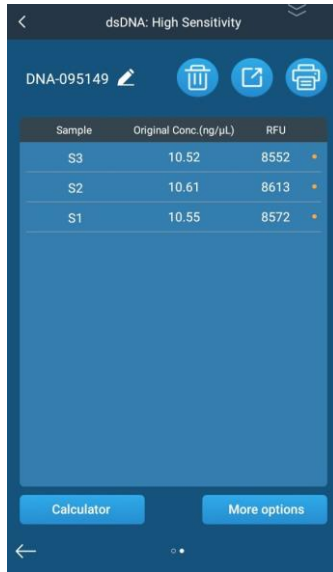


Fig 5.3.07 Test Report



Fig 5.3.08 Modify sample name

- : Delete selected test results.
- : Export all result of current testing.
- : Print all result of current testing.



: Click to enter the Molarity/Normalization Calculator Interface.



: Click to enter the options interface. The reagent kit number and sample ID can be adjusted in this interface.

5.3.4 Molarity Calculator

Click and select the “Molarity” tab to enter the Molarity interface.

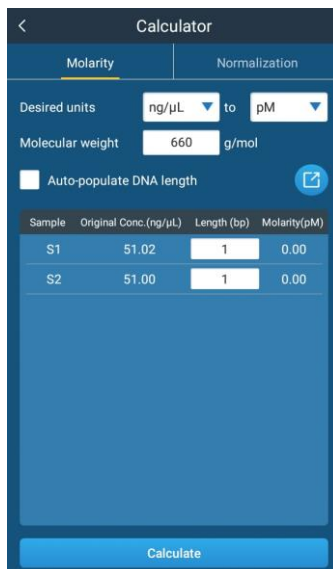


Fig 5.3.09 Molarity/Normalization Calculator Interface

Desired units to

Select the conversion units: ng/μL, ng/mL, μg/μL, μg/mL, mg/mL.

After selecting the conversion units, select the units: M, mM, μM, nM, pM.

Molecular weight g/mol

Input the molecular weight; the default value for dsDNA is set to 660g/mol.

Length (bp)
 Auto-populate DNA length

Input the DNA length, when “Auto-populate DNA length” is enabled, all lengths will be automatically filled in according to the length of the first sample.

Note: The Molarity/Normalization Calculator Interface can only be selected one sample measurements have been performed.

5.3.5 Normalization Calculator

Select the Normalization tab to enter the Normalization calculator interface (**Fig. 5.3.10**). In this interface, choose the type of Normalization (for example: molarity, concentration, and/or weight), and set the final sample molarity and volume. Click “Calculate” to enter the results interface (**Fig. 5.3.11**).

Calculator

Molarity | Normalization

Calculator

Final sample concentration

Final sample volume

Calculate

Fig 5.3.10 Normalization Interface

Calculator

Final concentration: 1.0 ng/μL. Final volume: 200.0 μL

Filling list | Conc. ratio | Initial Conc.

| Sample | Add sample(μL) | Add buffer(μL) |
|--------|----------------|----------------|
| S1 | 3.92 | 196.08 |
| S2 | 3.92 | 196.08 |

Fig 5.3.11 Results Interface

The Filling List tab shows the required sample and buffer volume to be added to achieve the desired final sample concentration within the final sample volume. On the Conc. Ratio interface, if a secondary dilution is required, the dilution ratio and the

concentration after dilution will be displayed (**Fig. 5.3.12**). The Initial Conc. interface shows the concentration of the original sample (**Fig. 5.3.13**). Click “Export” to export current data to an inserted USB drive.

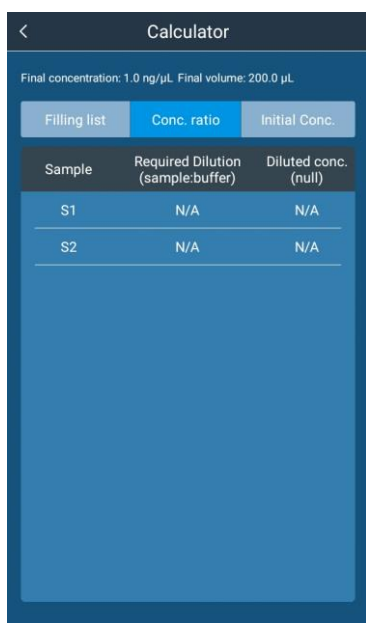



Fig 5.3.12 Secondary Dilution



Fig 5.3.13 Initial Concentration of Sample

5.4 Fluorescence Interface

From the Main Menu Interface, select  to enter the Fluorescence interface. Three test types are available for selection: Blue 470nm, Red 635nm, & Blue & Red (**Fig. 5.4.01**).

Note: The Fluorescence interface does not require the generation of a calibration curve.

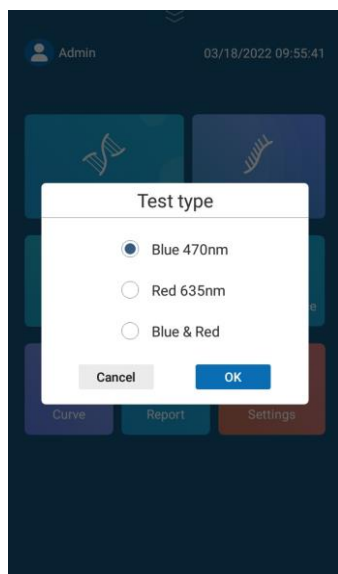


Fig 5.4.01 Fluorescence Test Type

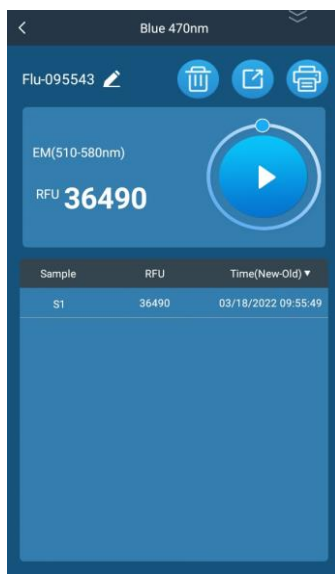


Fig 5.4.02 Blue 470nm Channel

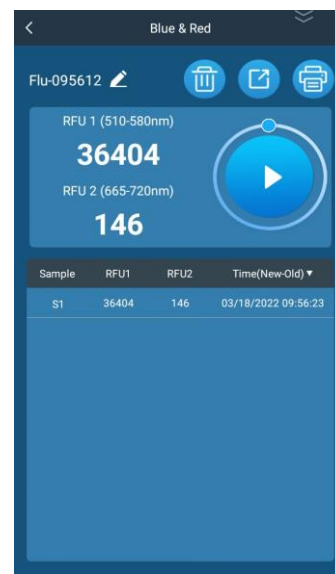




Fig 5.4.03 Blue & Red Channels

Test Types: Blue 470nm and Red 635nm are single excitation wavelength tests, whereas Blue & Red is a dual-wavelength test (**Fig 5.4.03**).

The Blue 470nm interface is identical to the Red 635nm interface. Click  to begin a sample measurement. After measurement, the RFU of the sample will be displayed (**Fig. 5.4.02**). Data can be deleted, exported, or saved via the icons found at the upper right corner of the display.

5.5 Working Solution Calculation Settings

Click and drag down the  button to view the Working Solution Calculator (**Fig. 5.5.01**). This interface allows for the calculation of the total working solution volume required based on dye-to-buffer ratios. Input the number of samples and standards required and select “Done”. The calculated volumes for “Dye”, “Buffer”, & “Total volume” will be displayed based on the set numbers of samples and standards. Select “Include Overage” to account for 1 extra tube in the calculation.

Detection Range Calculator: From the Working Solution Calculator interface, swipe right to enter the Detection Range Calculator (**Fig. 5.5.02**). Here, the assay type, units, and original sample volume can be adjusted, and a detection range will be displayed after clicking “Done”.



| Results | | |
|--------------|------|----|
| Dye | 17 | μL |
| Buffer | 3383 | μL |
| Total volume | 3400 | μL |

Fig 5.5.01 Working Solution Calculator



| Range | Sample Concentration(ng/μL) |
|---------------|-----------------------------|
| Extended low | 0.01 - <0.02 |
| Core | 0.02 - 10 |
| Extended high | >10 - 12 |

Fig 5.5.02 Detection Range Calculator

5.6 Standard Curve Interface

From the Main Menu Interface, click  to enter the Standard Curve Interface (**Fig. 5.6.01**).

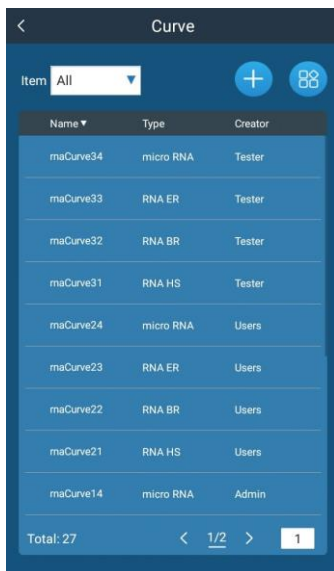


Fig 5.6.01 Standard Curve Interface



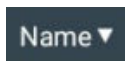
: Select the sample type (dsDNA, RNA, Oligo, Protein).



: Create a new standard curve.



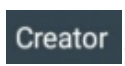
: Delete, import, or export the standard curve.



: Sort the list in alphabetical order.




: Sort the list by type of assay.



: Sort the list by creator name.

5.6.1 New Standard Curve

Click the  icon to create a new standard curve. The New Curve Selection Box will be displayed, with adjustable values for sample type, assay type, and curve name (**Fig. 5.6.02**). Once the values have been adjusted/set, click “OK” to enter the New Standard Curve Interface (**Fig. 5.6.03**).

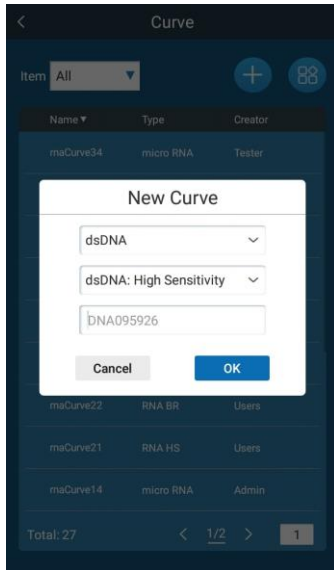


Fig 5.6.02 New Curve Selection Box

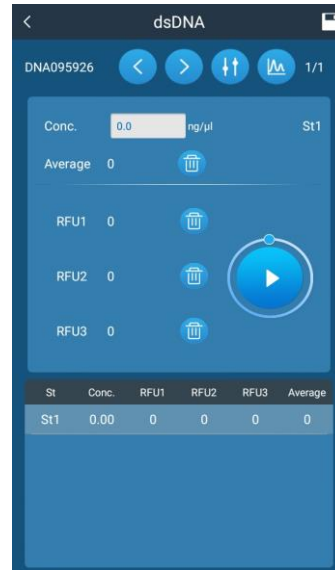


Fig 5.6.03 New Standard Curve Interface



: Highlight the previous standard.



: Highlight the next standard, or to add an additional standard.



: View Parameter Settings (EX / EM wavelengths + concentration units).



: Plot the obtained sample data points to a curve.



: Delete RFU1/RFU2/RFU3 data or to delete the standard itself.



: Perform standard sample measurement.

Note: *At least 5 standards are required to create the standard curve. For each standard, the average RFU value taken from 3 readings is used for curve generation.*

5.6.2 Curve Management

From the Standard Curve Interface Click  to enter Curve Management Interface (Fig. 5.6.04).

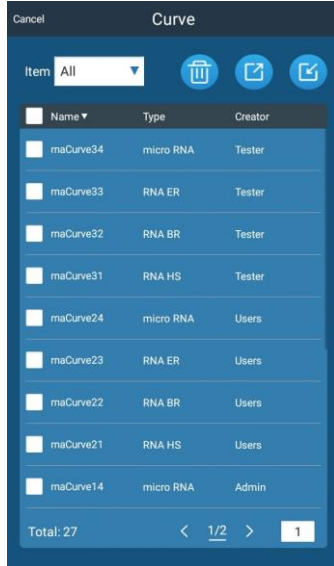


Fig 5.6.04 Curve Management Interface

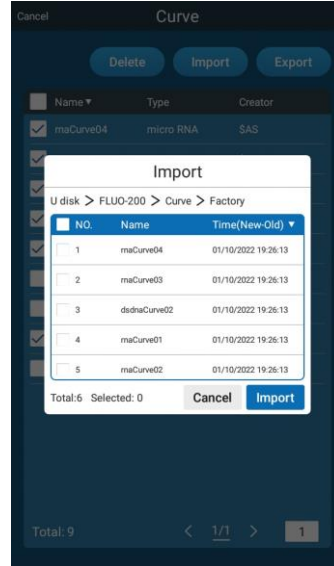




Fig 5.6.05 Importing Curve(s)



: Delete the selected curve.

: Export the selected curve(s) to a USB drive (Fig 5.6.04).

: Import curve(s) from a USB drive to the instrument (Fig. 5.6.05).

5.7 Reports Interface


In the main interface, click  to enter the Reports Interface (Fig. 5.7.01). Input keywords in the search box to quickly find the required report (Fig 5.7.02).



Fig 5.7.01 Reports Interface



Fig 5.7.02 Quick Search

Click on a report to view its saved data (**Fig. 5.7.03**). Click on the sample from the row to view the detailed sample report (**Fig. 5.7.04**).

DNA-090433

- Test type : 1x dsDNA
- Volume : 10.0µL
- Operator : Admin
- Excitation : Blue
- Time : 03/15/2022 09:04:33
- Standard curve : dsdnaCurve11
- Creator : Admin
- Standard 1 : Conc.3.00ng/µL RFU 3.3
- Standard 2 : Conc.9.00ng/µL RFU 9.9
- Calibration time : 03/15/2022 10:04:24

| Sample | Original Conc.(ng/µL) | RFU |
|--------|-----------------------|-----|
| S1 | 1.10 | 1.3 |
| S2 | 1.20 | 1.4 |
| S3 | 1.30 | 1.5 |
| S4 | 1.40 | 1.6 |
| S5 | 1.50 | 1.7 |
| S6 | 1.60 | 1.8 |
| S7 | 1.70 | 1.9 |
| S8 | 1.80 | 2 |

Calculator Delete Export

Fig 5.7.03 Saved Report Data

DNA-090433

S1 Info.

Original concentration :1.10ng/µL

Sample RFU value :1.3

Molarity calculation Info.

Desired unit :ng/µL->nM

Molecular weight :660

Length(bp) :6000

Molarity :3.00nM

Normalization calculation Info.

Final concentration :1.00ng/mL

Final volume :200µL

Add sample :1.09µL

Add buffer :198.91µL





Required Dilution :1:5


Diluted concentration :183.33ng/mL


Concentration :1100.00ng/mL

Fig 5.7.04 Detailed Sample Report

5.8 User Management Interface

From the Main Menu Interface, select the  icon from the upper left corner of the display. The following icons will be displayed:   

 : User Settings: Administrators can manage user accounts by adding, deleting, or modifying the user name / password. Non-Administrators can only change their own passwords in this interface.

 : Switch User: Return to the Login Interface to switch to a different user.

5.9 Settings Interface

Click  in the main interface to enter the Settings Interface (**Fig. 5.9.01**).

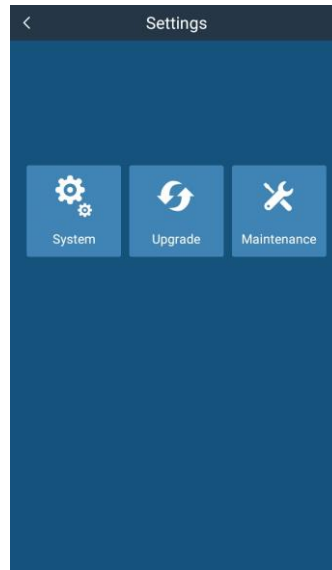


Fig 5.9.01 Settings Interface



System Settings



Upgrade



Maintenance

5.9.1 System Settings Interface

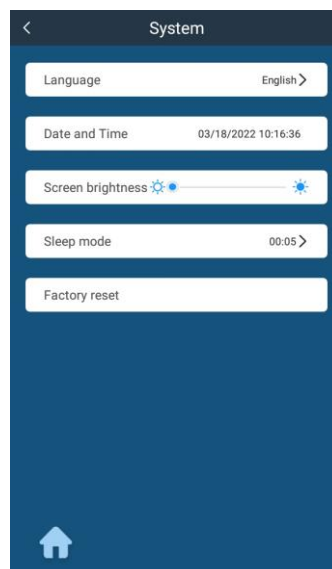



Fig 5.9.02 System Settings

Click  to enter system settings (**Fig. 5.9.02**):


Language: Select English, or Chinese.

Date and Time: Set the system date and time.

Screen Brightness: Adjust the screen brightness.

Sleep Mode: Turn the automatic sleep mode on or off and adjust time required to initiate Sleep Mode.

5.9.2 Upgrade Interface

From the Main Menu Interface, click  to enter the Upgrade Interface (**Fig 5.9.03**). The versions of the software and firmware will be displayed. To make updates, insert a USB drive with the relevant update files and select the “>” next to either the software or firmware version number.

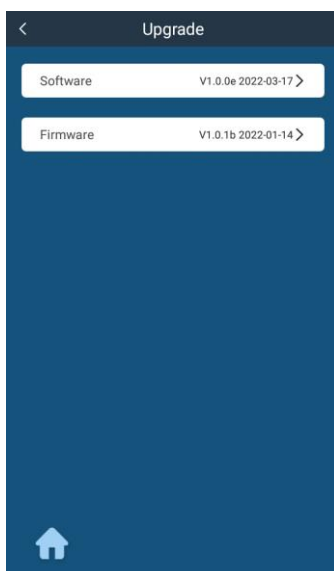



Fig 5.9.03 Upgrade interface

5.9.3 Maintenance Interface

From the Main Menu Interface, click  and input the password to enter the Maintenance Interface. This is only available for authorized service procedures. Contact Accuris Instruments or your local distributor for details.

Chapter 6 Troubleshooting

| No. | Issue | Analysis | Solutions |
|-----|-----------------------------------|---|---|
| 1 | No display after turning on power | Power not reaching the instrument | Check the power supply; Check whether the plug is loose. |
| 2 | Light source not visible | Light source failure; Module poor contact | Check the power; Check whether the module is loose, if loose Contact Accuris Instrument or your local distributor |
| 3 | Measurement not stable | PCR tube isn't in place | Check the PCR tube and press it in place |
| 4 | Measurement not accurate | Standard curve is not accurate; Instrument detection is drifting | Check standard solution and reset standard curve; Calibrate standard curve |

Quantification Kits and Detection Tubes



| | |
|----------------------|---|
| NS1020-HS-100 | High Sensitivity DNA Quantification Kit, 100 assays |
| NS1020-BR-100 | Broad Range dsDNA Quantification Kit, 100 assays |
| NS1020-T | 0.5mL Fluorescence Detection Tubes, pack of 250 |