TOC Operation Manual

Contents

Chapter 1 Introduction

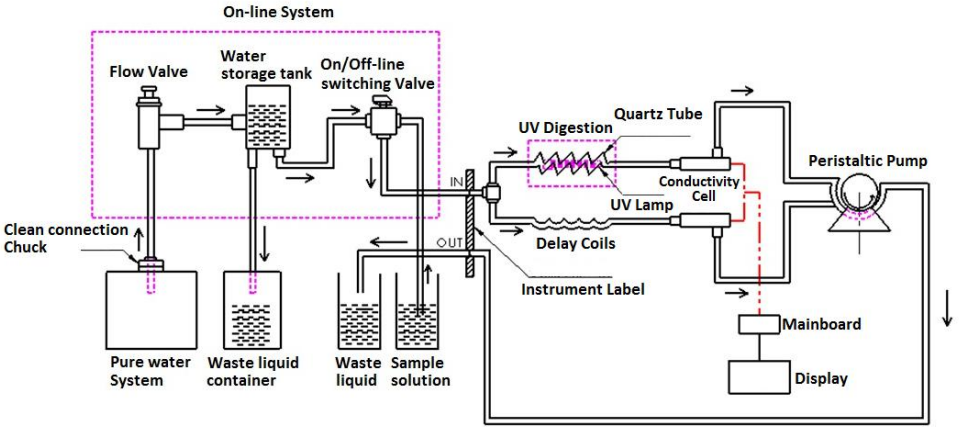
TOC is a total Organic Carbon measurement instrument with high performance and reliability. It is running based on the principle of conductivity method, and can measure TOC in water samples with concentration from 1ug/L to 1000 ug/L. It can be operated simply, with low maintenance cost and without any chemical reagent. Neither special training nor professional chemical knowledge is required for operator.

TOC complies with the requirements of FDA 21, CFR, Part 11 on electronic data integrity, electronic signatures, audit tracking. It also can meet the whole requirements of GMP for computerized system validation.

1.1 Measurement Principle

The organics in water samples can be oxidized to carbon dioxide under ultraviolet UV rays. And the conductivity detection technology is used to measure the carbon dioxide. User can calculate the total organic carbon (TOC) concentration by measuring the total inorganic carbon (TIC) concentration in the water sample without oxidation, and measuring the total carbon (TC) concentration in the water sample after oxidation. The difference value between the total carbon and the total inorganic carbon is the concentration of total organic carbon, as the formula of TOC = TC - TIC.

Measuring Principle Diagram:



(Figure 1.1)

1.2Performance and features

✧ With the ultraviolet catalytic oxidation method, neither catalyzator nor carrier gas is required.

✧ Buzzing alarm function can prevent misoperation and protect the instrument when the value exceeding the setting range.

✧ Auto-sampler is optional.

✧ Complies with the requirements of GMP for computerized system validation.

✧ Complies with the requirements of FDA 21, CFR, Part 11 for electronic data integrity, electronic signatures, and audit tracking.

✧ Complies with the requirements of USP 32-643 for system suitability.

✧ No need to add acid, oxidant or any gas, and no additional cost for routine maintenance.

✧ Design for deionized water measurement with TOC concentration less than 1.0ppm.

✧ Mass storage, 8GB capacity, and no limitation for storage time.

✧ With fast detection speed, no more than 3 min for each measurement.

✧ With small volume, light weight, low energy consumption, and is convenient to carry.

✧ With 7 inch colorful touch screen, and friendly operation interface.

✧ Available to view history records according to the detection date, with clear history files and data.

✧ With data copying function of U disc, all the data in one day can be copied out according to the date, and is convenient for data export and backups.

✧ Equipped with compact bluetooth printer for fast printing and easy operation.

1.3Application

TOC analyzer with conductivity method can be used to measure the total organic carbon content in pure water, deionized water and injection water in pharmaceutical industry. It is also used to detect TOC in ultra-pure water in semiconductor industry, power plant, scientific research institution and laboratory.

It is used to check cleanness during cleaning confirmation process in the pharmaceutical and biochemical areas. It's also used for on-line monitoring at water producing system in pharmaceutical industry, ultra-pure water producing system and chip technology process in semiconductor industry, and deionized water producing process in power plant.

1.4 Technical Specifications

Power Supply	220 V ± 22 V, 50 Hz ± 1 Hz, 100 W
Room Temperature	10 ℃~ 40℃,±5 ℃/d
Relative Humidity	≤ 85%
Dimensions	440*220*300mm
Measurement Range	1ug/L -1000 ug/L
Error Tolerance	±5 %
Reproducibility	≤ 3 %

1.5 Packing List

No.	Item	Unit	Qty	Note
1	TOC Analyzer	set	1	
2	Power Cable	pc	1	
3	Bluetooth Printer	set	1	
4	Print Paper	pc	3	
5	Cross Screw	pc	1	
6	UV Lamp	pc	1	
7	Peristaltic Pump Tube	pc	1	
8	On-line Water Intake Device	set	1	
9	Drain Tube	pc	1	
10	Online Water Clamp Accessories	set	1	Optional
11	Shaft Position Screw M4	pc	3	
12	Sampling Capillary Tube with Joint	set	2	
13	Fuse	pc	2	
14	Manual	pc	1	
15	Software	pc	1	U disc
16	USB Cable	pc	1	

Chapter 2 Installation

2.1 Preparation before Installation

2.1.1 Power System

A well grounding should be prepared, and a three-hole socket is required.

2.1.2 Space Requirements

(1) The experimental platform should meet the requirements as following: length ≥ 1200 mm, width ≥ 800 mm, height 700 mm ~ 800 mm, which can bear at least 30 kg weight.

(2) Keep less than 150cm between the rear of the instrument and the power socket to connect power. Reserve the computer and printer location on the right side of the instrument host; reserve the autosampler position on the left side of the instrument host.

2.1.3 Environment Requirements

(1) Be far away from strong electromagnetic interference.

(2) The room temperature should be in the range of 10 ℃~ 40℃, and its change should be less than ±5 ℃ per day.

(3) The relative humidity should be no more than 85%.

2.2 Unpacking and Pipeline Connecting

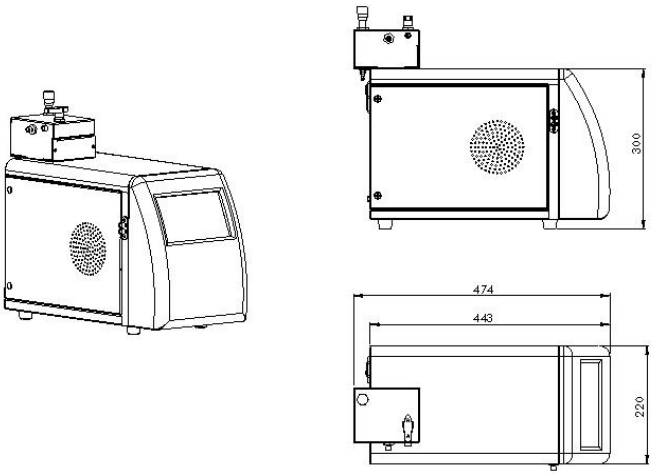
2.2.1 Unpacking

TOC uses carton packing with special foam inside. Please keep the carton with inner special foam properly for later use.

Please check the accessories according to packing list and make sure they are completely well. Please contact us in time if you have any questions.

2.2.2 Outlook and Dimensions

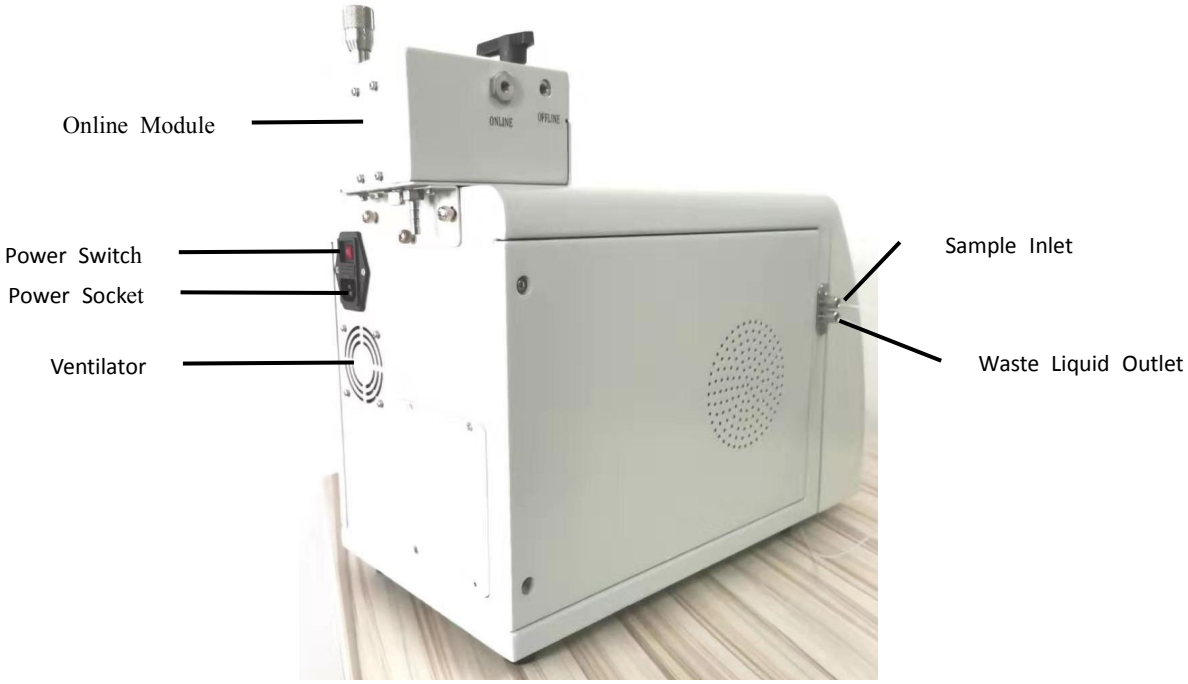
The diagram of outlook and dimensions is as following (Figure 2.1):



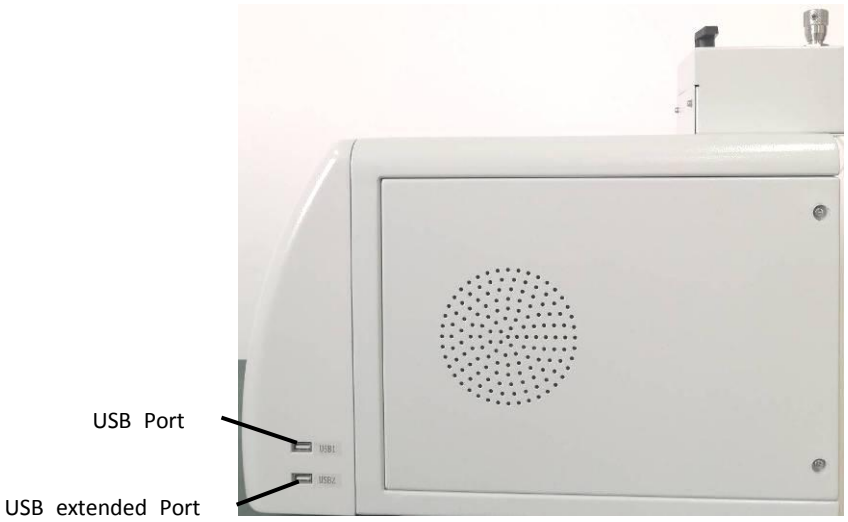
(Figure 2.1)

2.2.3 Connection Ports

The diagram for external connection ports of TOC is as following (Figure 2.2, Figure 2.3):



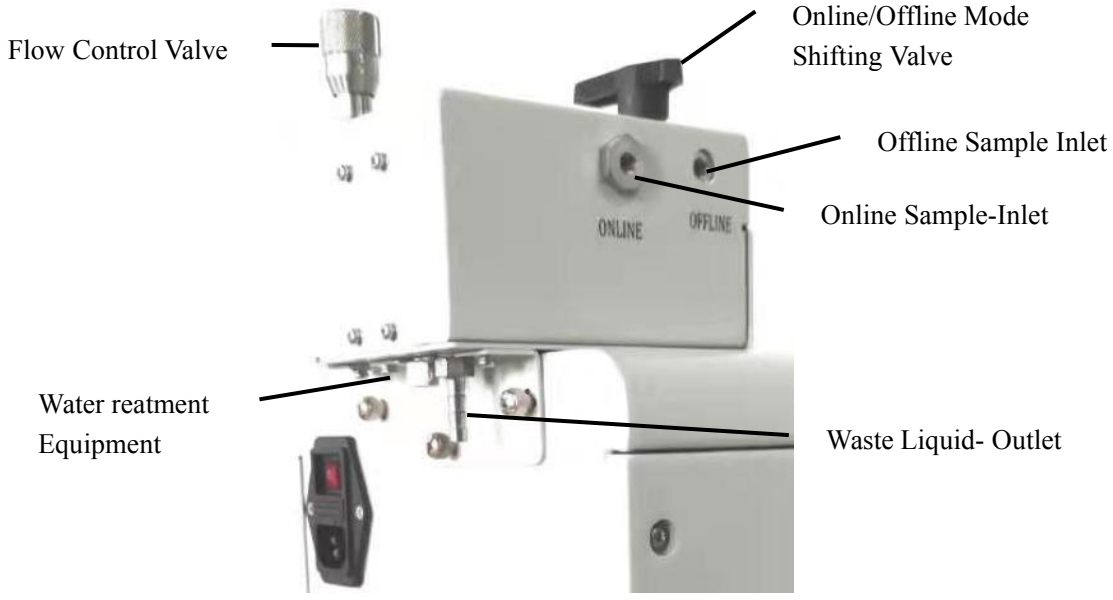
(Figure 2.2)



(Figure 2.3)

2.2.4 Online Module

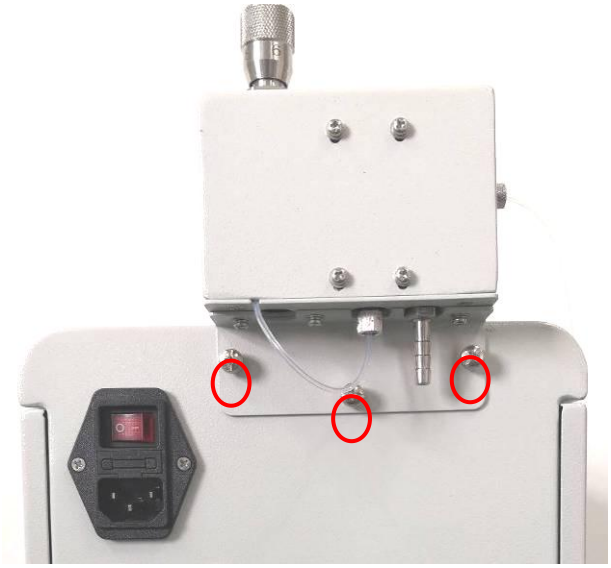
2.2.4.1 Online Module Introduce (Figure 2.4)



(Figure 2.4)

2.2.4.2 Online Module Installation

Align screw holes and fix three screws (Figure 2.5).



(Figure 2.5)

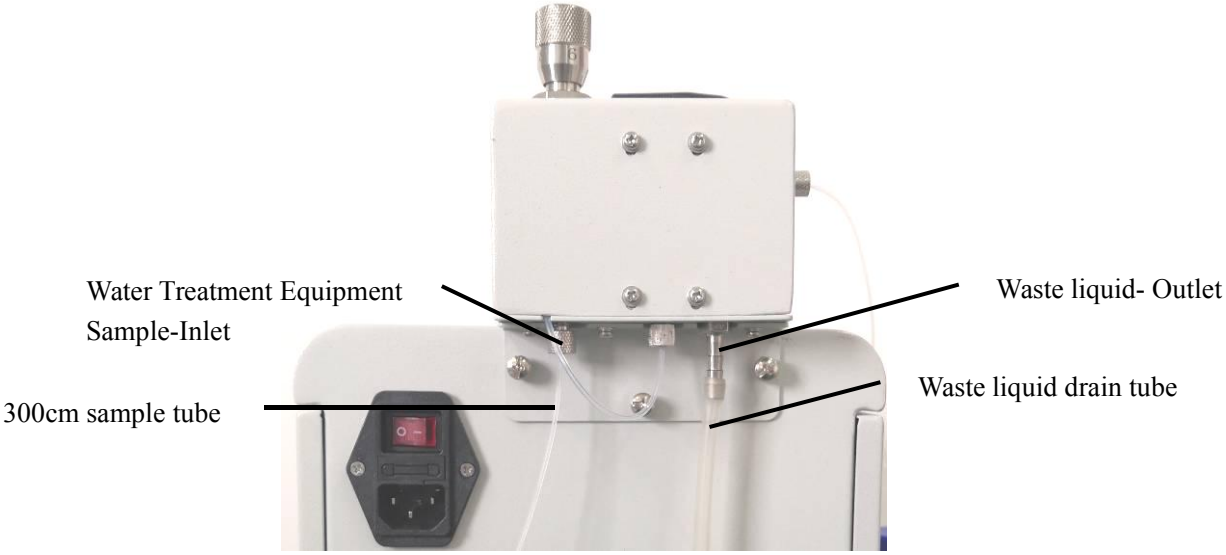
2.2.4.3 Tube Connection for Online Module

1) Unscrew sample inlet on the instrument shown as Figure 2.6, take out 40cm sample tube from the spare parts and fix one end to the instrument sample inlet and the other end to the online module sample inlet shown as Figure 2.7.

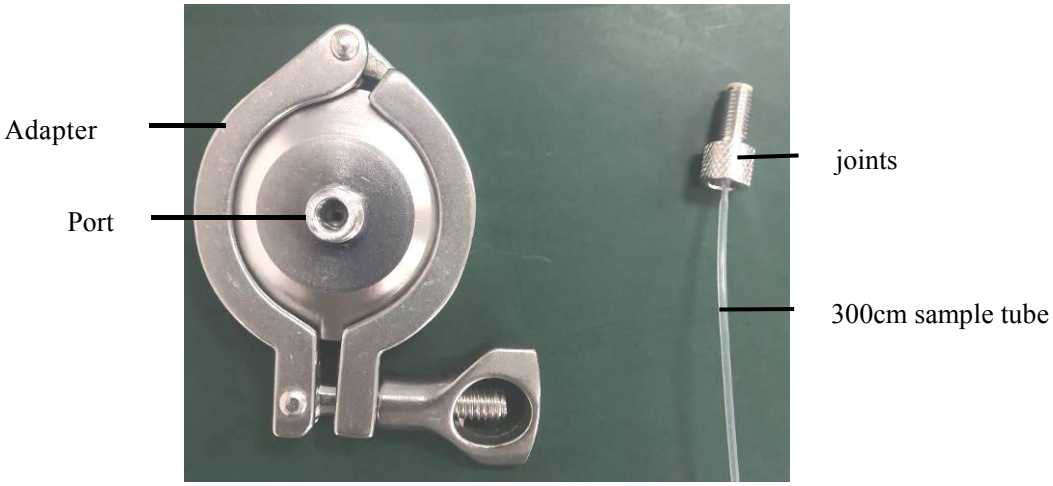
(Figure 2.6)

(Figure 2.7)

2)Take out 300cm sample tube and fix with one end to the water treatment equipment inlet on the online module and the other end to the connection port of the water treatment equipment (Figure 2.8), and meanwhile connect water liquid tube to the waste liquid outlet(Figure 2.9).



(Figure 2.8)



(Figure 2.9)

Note：Connect sample tube of online module and sample tube joints of the water treatment equipment. Joints for the sample tube is standard spare parts, shown as Figure 2.9, its diameter is：50.5mm. Joints size is：1/4-28 screw threads . If sample tube joints size is special for water treatment equipment, please inform us, we can customize for the user.

2.3 Experimental Methods

2.3.1 Instrument Calibration

2.3.1.1 Calibration Purpose

For first use or periodic calibration can reduce zero drifting, minimize effect by different sensors so as to improve instrument accuracy and reduce span drifting.

2.3.1.2 Calibration Period

Calibration period can be set according to use conditions. It is recommended to calibrate every 6 months. If test data shows large deviation, it is recommended to do calibration again exclude other influence factor.

2.3.1.3 Calibration Water Preparation

Zero Calibration Water： zero calibration water shall be purified water whose TOC is less than 100 μg/L and conductivity is less than 1uS/cm(25℃).

Note： Zero calibration water shall be used immediately after preparation. It shall be sealed and it is not allowed to store in beaker or any other open container. If keeping water with low TOC in the air for more than one hour, TOC value will change due to carbon dioxide in the air.

Sucrose Solution： Weight GR sucrose 0.2377g, dissolve in water and transfer to 1000ml volumetric flask and add water to 1000ml, so the TOC concentration of this solution is 100mg/L.

Use this as stock solution, or user can preparation stock solution of other concentration.

Calibration Solution: Dilute stock solution separately to prepare 200 μg/L、500 μg/L、1000 μg/L sucrose solution as calibration solution. Dilution water shall be zero calibration water.

Note： Sucrose must be dried to constant weight under 105 ℃(221 ° F) before preparation.

2.3.1.4 Calibration Procedure

Calibration procedure please refer to Chapter 3.6.

2.3.2 System Suitability Test

2.3.2.1 System Suitability Standards

This instrument system suitability can be tested according to requirements in the US pharmacopoeia 《USP643》.

2.3.2.2 PT Solution Preparation

Sucrose PT solution： Dilute stock solution to get 500 μg/L sucrose PT solution. Dilution water shall be zero calibration water .

1,4-benzoquinon PT solution： Weight 1,4-benzoquinon 0.1501g and dissolve into purified water and transfer into 1000ml volumetric flask, add water to 1000ml. So the TOC concentration of this solution is 100mg/L. Use this as stock solution, or user can preparation stock solution of other concentration. Dilute this stock solution to get 500 μg/L 1,4-benzoquinon with zero calibration water as dilution water.

2.3.2.3 System Suitability Test Methods

Measure TOC zero calibration water, sucrose PT solution and 1,4-benzoquinon separately, and record TOC value. Calculate according to below formula, and TOC response efficiency show in percentage shall be 85%~115%.

$$\frac{r_{ss} - r_w}{r_s - r_w} \times 100$$

r_w is response value of zero calibration water.

r_s is response value of sucrose PT solution.

r_{ss} is response value of 1,4-benzoquinon PT solution.

Chapter 3 Instrument Operation

3.1 Login

1) Switch on the power and enter the Initializing interface (Figure 3.1),it takes about 5s to enter welcome interface (Figure 3.2). Input six digits password and click "Login >>", the default login password is 123456, and user can modify the password in the "System Setting" interface after login.

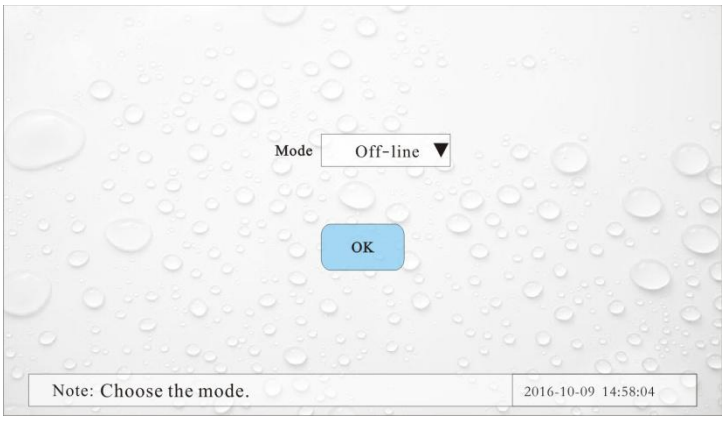
(Figure 3.1)

(Figure 3.2)

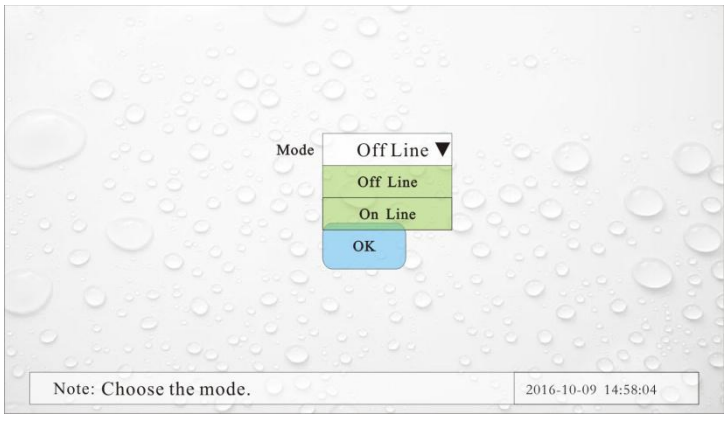
2) Then, enter the login interface (Figure 3.3). Input the user name and company name. The system can remember the last entry information, so as to avoid repeated input. Click "OK" after the confirmation of user information.

(Figure 3.3)

3)Then, enter the mode selection interface (Figure 3.4). There are two modes for chosen (Fig. 3.5): Off-line and On-line. Choose the operation mode as you need and click “ OK ” to confirm.



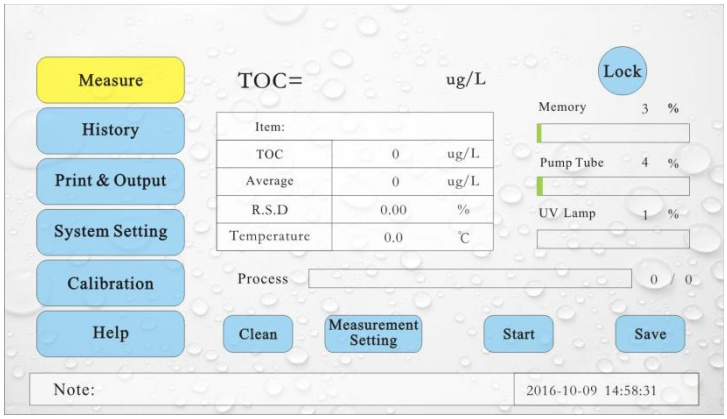
(Figure 3.4)



(Figure 3.5)

3.2 Off-line Mode

Following is the main interface of Off-line Mode (Figure 3.6)



(Figure 3.6)

(1) On the left are menu buttons that include " Measure ", " History ", " Print & Output ", " System Setting ", " Calibration " and " Help ". User can change operation interface freely when the system is not under measurement status.

(2) At the bottom shows the prompting message and time information.

(3) In the middle is the measurement table of Off-line Mode, and there display the relevant data such as "Item", "TOC", "Average", "RSD" and "temperature" in turn. The measuring result will be shown in bold above the table.

(4) Under the table is the measurement processing bar, and on its right shows current measurement times and total measurement times.

(5) Right beside the table are processing bars of using status for Memory, Pump Tube and UV Lamp which shows in percentage. Please replace consumables before its service life is running out and restart its processing bar of using status by setting the service life in the system setting interface.

Following are the introductions of functions with buttons in the measurement interface:

Lock : Click this button when the system is not under measurement status, the main interface will be locked and it will switch to the welcome interface. User needs to input the login password again if he (or she) wants to enter the system again.

Clean : This button is special for pipeline cleaning, and it will enter the cleaning operation interface (Figure 3.7). A completely cleaning for the pipeline should be done after high concentration sample measurement or after a long time not in use.

(Figure 3.7)

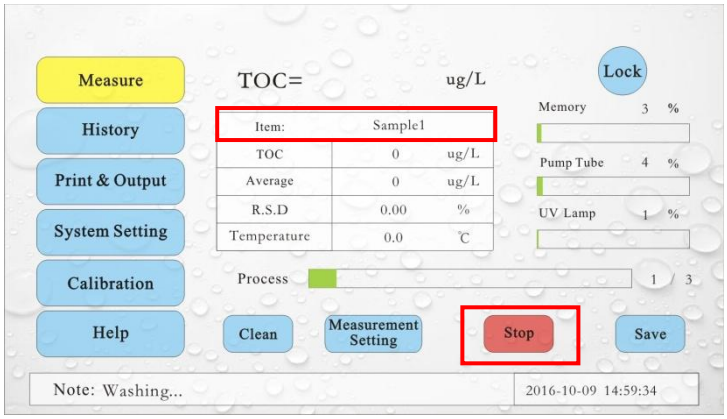
In cleaning operation interface, user can set the cleaning speed from 2000 to 8000, set the cleaning times from 1 to 50. The peristaltic pump can be controlled by clicking "Start" or "Stop". Click "Exit" to return to the measurement interface.

Measurement Setting: Click "Measurement Setting" to enter the measurement setting interface (Figure 3.8). User should input the item (the sample name), cleaning times from 0 to 50, and measuring times from 1 to 50. However, the system provide default parameters, user can modify the parameters as necessary. Click "Finish&Save" to save the setting and return to the measurement interface. Otherwise, click "Cancel" to cancel the setting and return to the measurement interface.

(Figure 3.8)

Start: After completing the setting, click " Start " to begin the measurement and the button will be switched to " Stop " (Figure 3.9)

. Only the button " Stop " is operable, other operations are not allowed among measuring process. The cleaning operation and sample measuring will be done successively according to the setting parameters. A measuring result also will be shown in the cleaning process, however it won't be saved. All the sample measuring data will be saved automatically after completing the measurement.

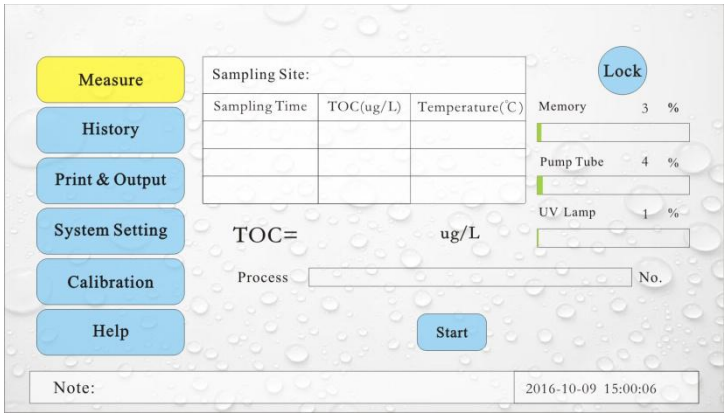


(Figure 3.9)

Save : The data won't be saved automatically when user click " Stop " during measuring process. If user wants to save the data, just click " Save ".

3.3 On-line Mode

Following is the main interface of On-line Mode (Fig. 3.10). In this interface, the menu buttons, the button " Lock ", the processing bars of using status for consumables, the prompting message and temporal information, and the measurement processing bar are the same as described in Off-line Mode. However, right side of the measurement processing bar is current records.

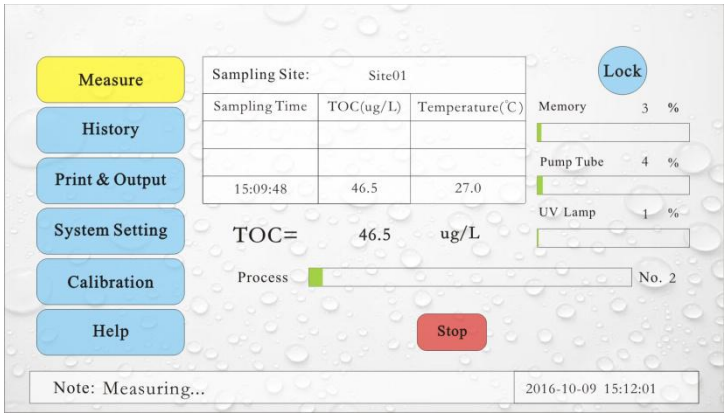


(Figure 3.10)

In the middle of the On-line Mode measurement interface, it shows the sampling site on the top. Click in the digital area so that to set the sampling site (Fig. 3.11). The latest measuring data and time are shown in the table, and the current measuring result in bold type is shown below the table.

(Figure 3.11)

Click " Start " to begin measurement and the button will be switched to " Stop " (Fig. 3-12). A cleaning operation will be done at first, the sample will be measured and data will be recorded successively. Only the button " Stop " is operable, other operations are not allowed among measuring process. The file to be saved will be named according to the time when users click " Start ".



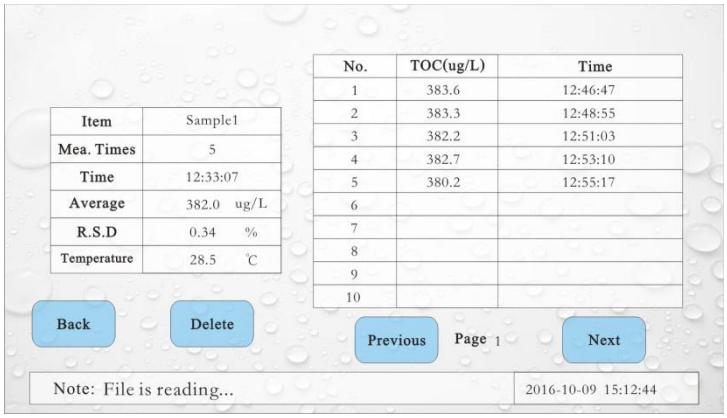
(Figure 3.12)

3.3 History Records

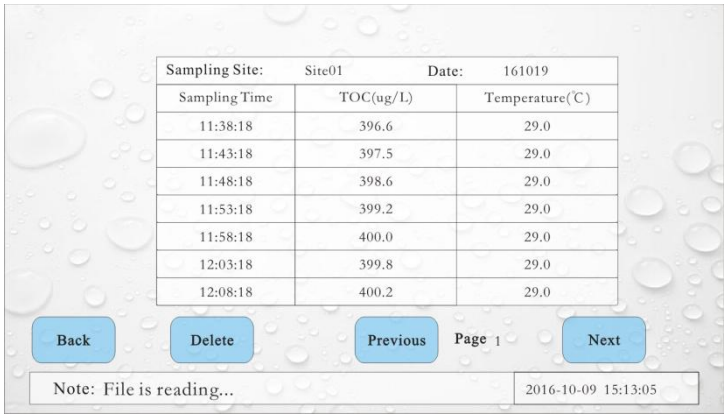
Click "History" to enter the history records interface (Figure 3.13) when the system is not under measurement status.

(Figure 3.13)

(1) Input the measuring date in history records interface, click "Search" and the files will be listed in the table. Click "Previous" or "Next" to view other data. Click the file in the column to review detailed data. Click the file in the column to review detailed data. Following are the measurement files of Off-line Mode and On-line Mode (respectively shown in Fig. 3.14 & Fig. 3.15).



(Figure 3.14)

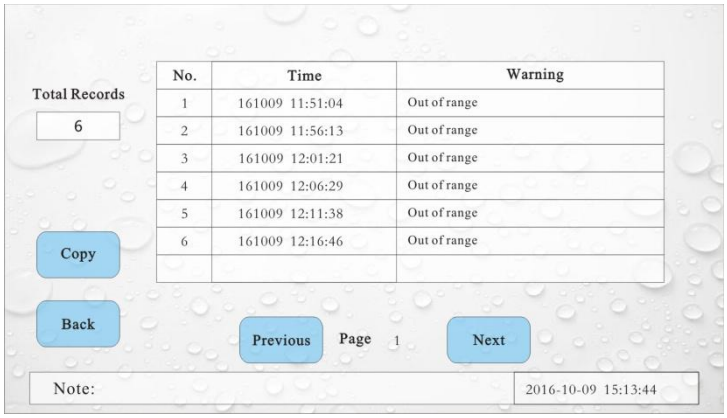


(Figure 3.15)

(2) For Off-line Mode, the history records include the file name, measuring times, measuring time, the average value, RSD and other recorded data. There are 10 pieces of information in a page. User can review other data by clicking " Previous " or " Next ". Click " Back " to return to the main interface of history records.

(3)For On-line Mode, the history records include the sampling site, the total records, and recorded data. There are 10 pieces of information in a page. User can review other data by clicking " Previous " or " Next ". Click " Back " to return to the main interface of history records.

(4) Click " Warning Records " to enter the warning records interface (Fig. 3.16).The contents of the warning records are messages for those out of range or exceeding the alarm settings. User can click " Copy " to copy the warning records to U disc. Click " Previous " or " Next " to review other warning records. Click " Back " to return to the main interface of history records.



(Figure 3.16)

3.4 Print & Output

Click " Print & Output " to enter the print and output interface (Figure 3.17) when the system is not under measurement status.

(Figure 3.17)

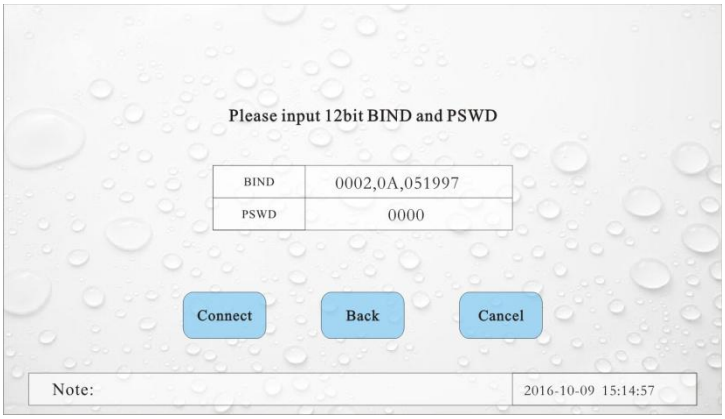
(1) The operation is similar to history records interface operation. Input the measuring date above the table, and click " Search ", so that the files will be listed in the table. Click " Previous " or " Next " to review other data.

(2) Connect U disc to the instrument, and click " Copy Files ". All files saved in the measuring date will be automatically copied to the U disc, be stored in a folder named with the date. For example, 161020 means October 20, 2016. If a same named folder exists, the system will show that there is an error. Then, delete the folder first and copy the files later.

(3)Switch on the bluetooth printer power, wait a minute, select the target file, click " Print " to print the file(Figure 3.18).

(Figure 3.18)

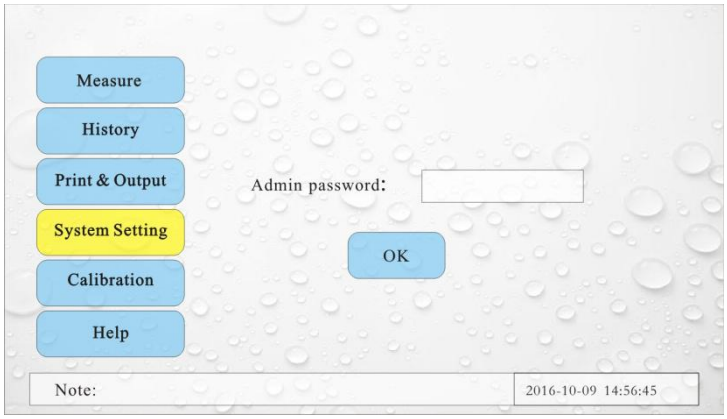
Note： When the message shows "please set the printer in the printer setup interface", Click " Printer Setting " to enter the printer setting interface (Figure 3.19). Input the BIND code and the PSWD code with the same format as defaults. For the BIND code and the PSWD code of the printer, please refer to instructions of the printer. Make sure the setting is right and then click " Connect ". It may cost one or two minutes for connecting to a Bluetooth printer, please be patient for the waiting. If the connecting fails, please check the settings and make sure it is right, and connect again. Click " Back " after successful connection, and the system will keep the connected status until exiting the print and output interface. Click " Cancel ", or exit the print and output interface to disconnect the Bluetooth.



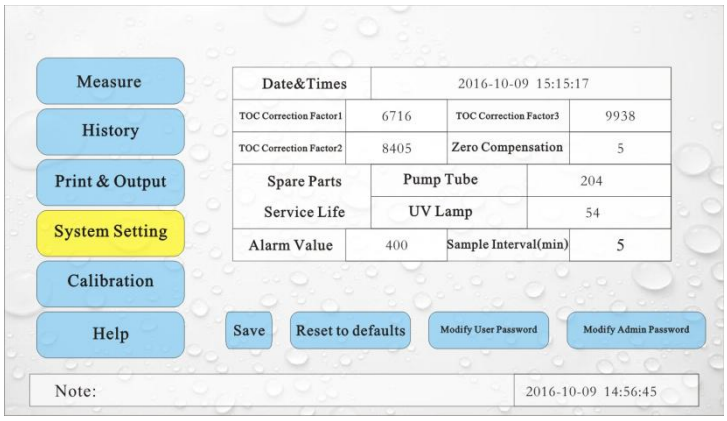
(Figure 3.19)

3.5 System Setting

Click “ System Setting ” to enter the system setting login interface (Figure 3.20)when the system is not under measurement status. Input the password to enter the system setting interface (Figure 3.21), the default admin password is 00000001. User can modify the password in the “System Setting” interface . User can set up basic parameters of the instrument.



(Figure 3.20)



(Figure 3.21)

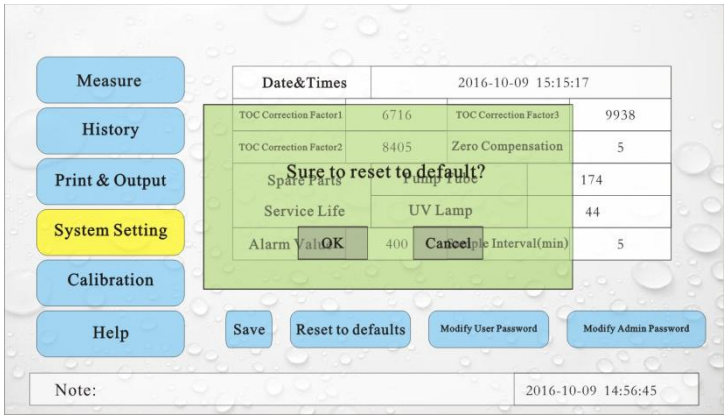
(1) Click “Date & Times” in the right column, and user can set up the date and time for the system.

(2) Click other items in the right column, and set up the relevant parameter. Among the parameters, the settings of “Zero Compensation” and “TOC Correction Factor” depend on the calibration result. Parameters of “Pump Tube” and “UV Lamp” show running hours, and each should be reset to zero when replacing with a new one. “Alarm Value” and “Sample Interval” are set for On-line Mode. During the running of

On-line Mode, the buzzer will alarm when the measuring result exceeds the alarm value, and the alarm message will be recorded.

(3) Click “ Save ” after setting up the parameters.

(4) If user wants to reset the parameters to defaults, just click “ Reset to defaults ” and later click “ OK ” to confirm (Figure 3.22).



(Figure 3.22)

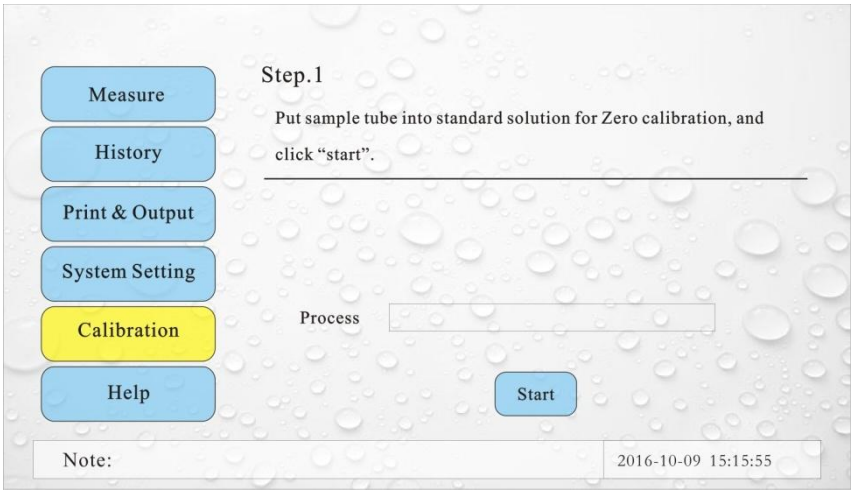
(5) If user wants to modify the login password, click “ Modify User Password ” to enter the password modifying interface (Figure 3.23). And if user wants to modify the admin password, click “ Modify Admin Password ” to enter the same password modifying interface .

(Figure 3.23)

3.6Calibration

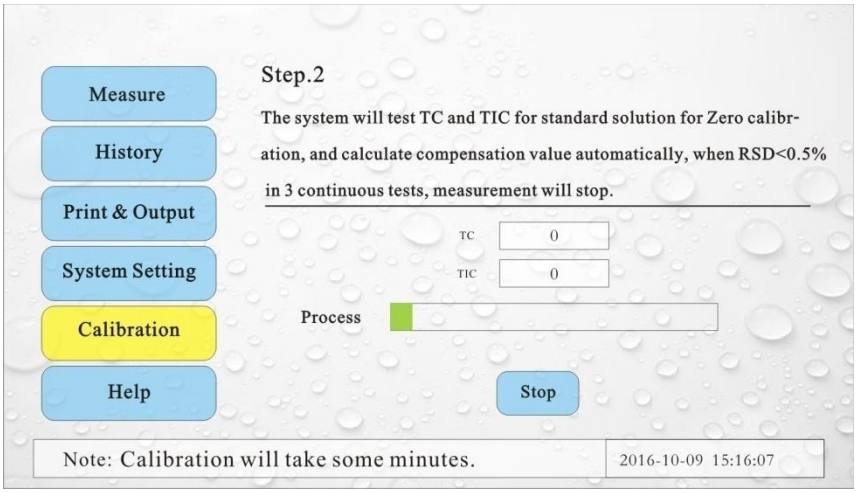
There are 16 steps for calibration. Please calibrate the instrument step by step according to the prompts.

1)Click “ Calibration ” to enter the calibration interface (Figure 3.24) when the system is not under measurement status.



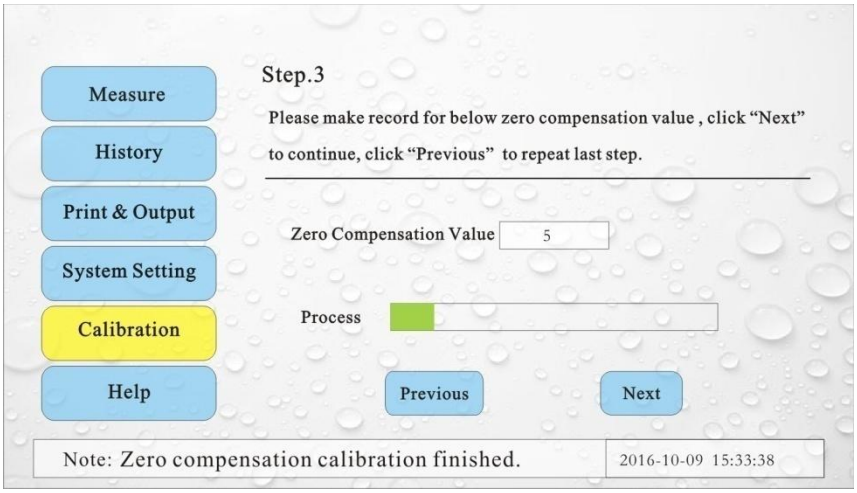
(Figure 3.24)

2)According to the prompt, put the sampling tube into the blank solution (zero calibration solution), and click “ Start ”, the system will measure the total carbon (TC) and the total inorganic carbon (TIC) of the blank solution (zero calibration solution), and calculate the compensation value automatically. The measurement will stop automatically when each RSD value of TC and TIC is less than 0.5% for all three times measurements (Figure 3.25). Zero calibration usually costs about 20 minutes, and it may need more time if some high concentration samples have been measured lately or the instrument has not been used for a long time. Each measurement result will be displayed instantly, and it’s convenient for observation. If user wants to stop the calibration, just click “ Stop ”.



(Figure 3.25)

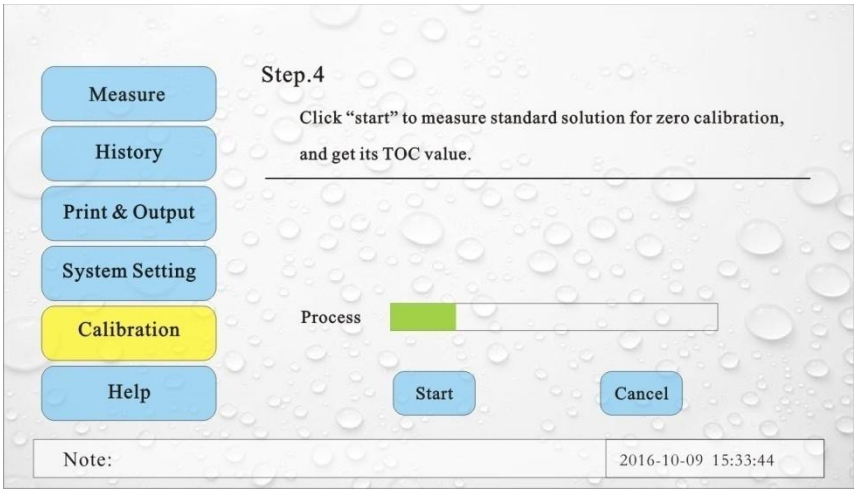
3)The zero compensation value is obtained from the mean value of three measurements for total carbon deducting the mean value of three measurements for total inorganic carbon. It will be calculated automatically and displayed on the screen (Figure 3.26).



(Figure 3.26)

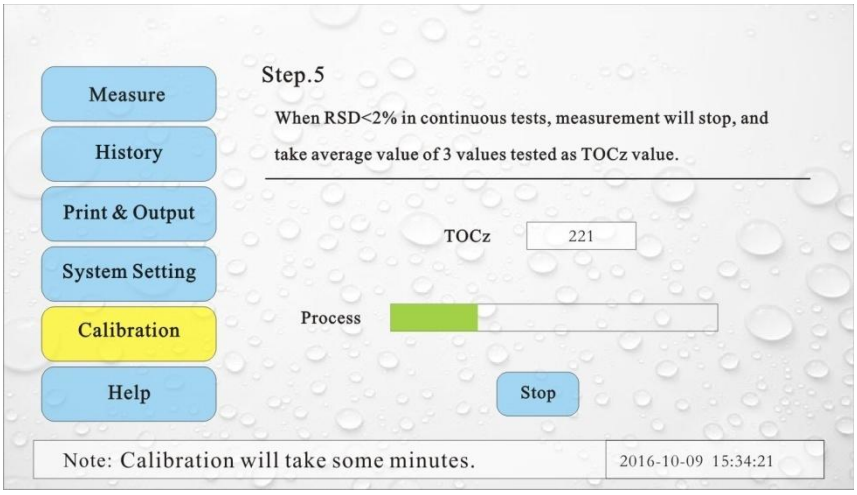
4)Please record the zero compensation value and input the value in relevant column in the system setting interface after completing the calibration. Click " Next " to continue the calibration, otherwise click " Previous " to repeat last step.

Click " Start " to continue the calibration without removing the sampling tube from the blank solution (zero calibration solution), and measure to get its TOC value (Figure 3.27). User can click " Cancel " to cancel the calibration.



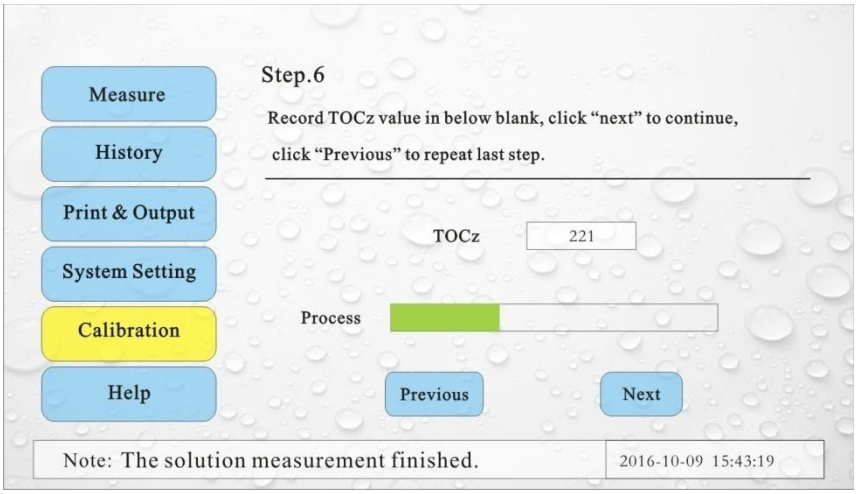
(Figure 3.27)

5)The TOC value of blank solution (zero calibration solution) will be displayed on the screen (Figure 3.28). The measurement will stop automatically when the RSD value of three measurements is less than 2%, and the mean value is recorded as TOCz. User can click “ Stop ” to stop the calibration.



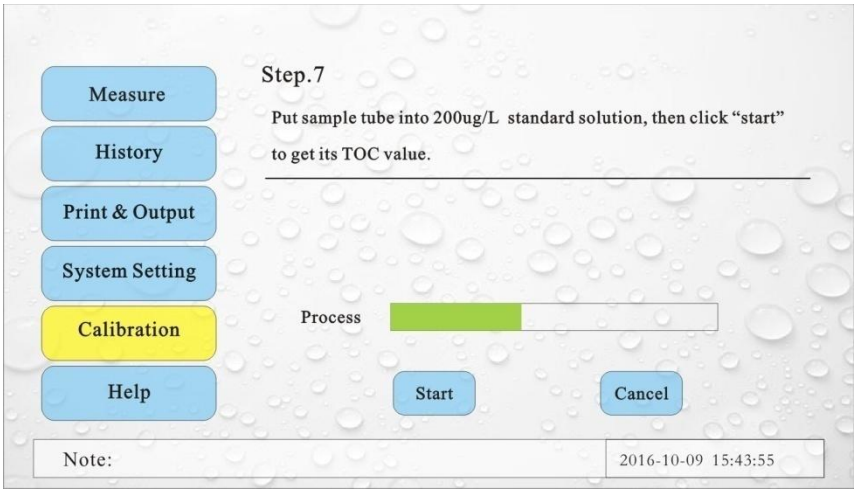
(Figure 3.28)

6)The TOCz value is shown as following (Figure 3.29). Record the TOCz value for later calculation. Click “ Next ” to continue the calibration, otherwise click “ Previous ” to repeat last step.



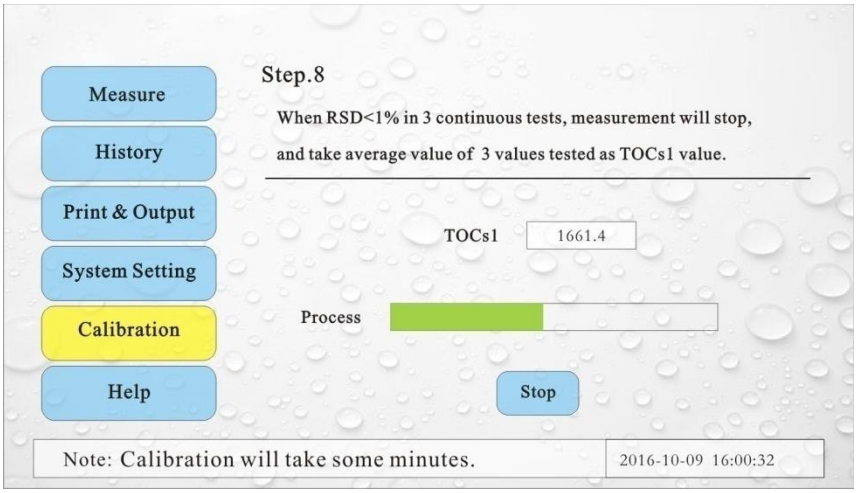
(Figure 3.29)

7)Then, put the sampling tube into the sucrose standard solution with a concentration of 200ug/L, click “ Start ” to continue the calibration (Figure 3.30), and measure the standard solution to get its TOC value. User can click “ Cancel ” to cancel the calibration.



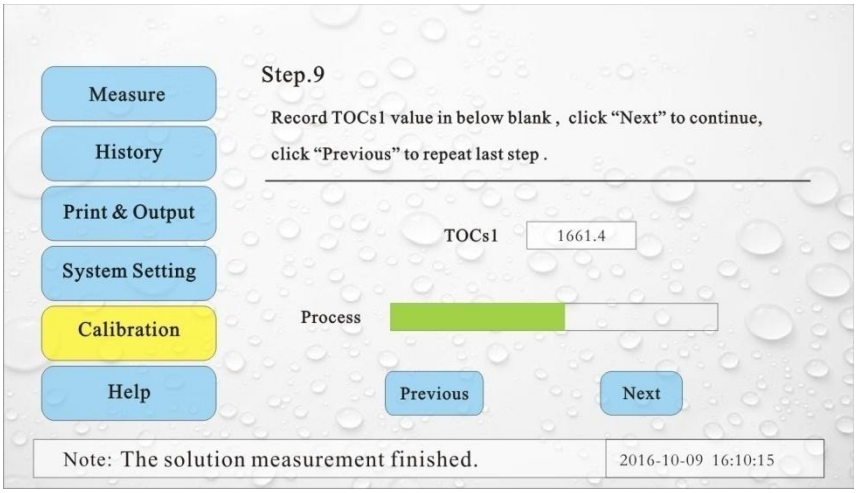
(Figure 3.30)

8)The TOC value of 200ug/L sucrose solution will be displayed on the screen (Figure 3.31). The measurement will stop automatically when the RSD value of three measurements is less than 1%, and the mean value is recorded as TOCs1. User can click " Stop " to stop the calibration.



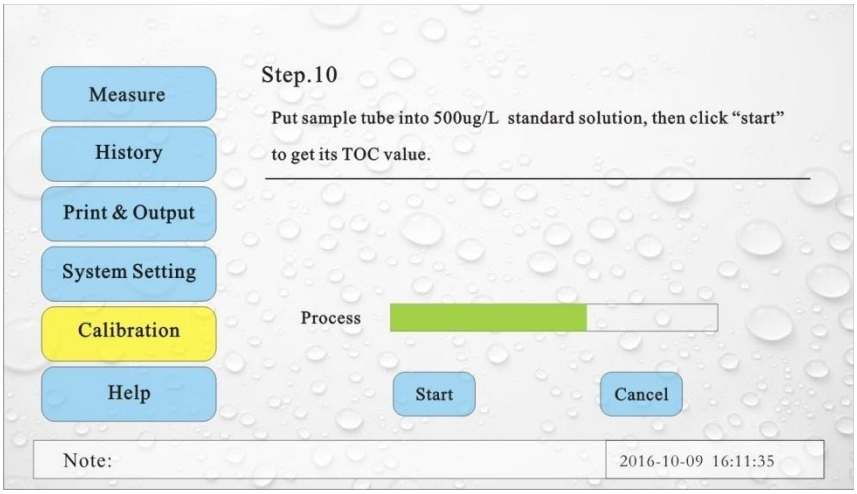
(Figure 3.31)

9)The TOCs1 value is shown as following (Figure 3.32). Record the TOCs1 value for later calculation. Click " Next " to continue the calibration, otherwise click " Previous " to repeat last step.



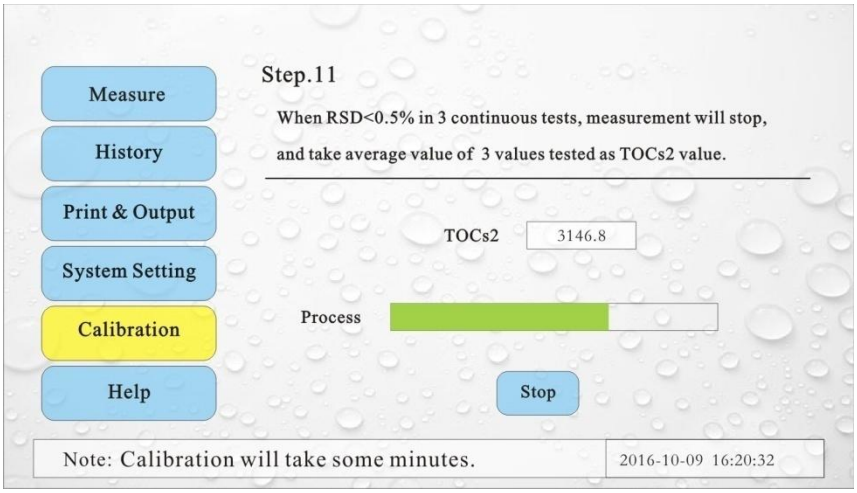
(Figure 3.32)

10)Then, put the sampling tube into the sucrose standard solution with a concentration of 500ug/L, click " Start " to continue the calibration (Figure 3.33), and measure the standard solution to get its TOC value. User can click " Cancel " to cancel the calibration.



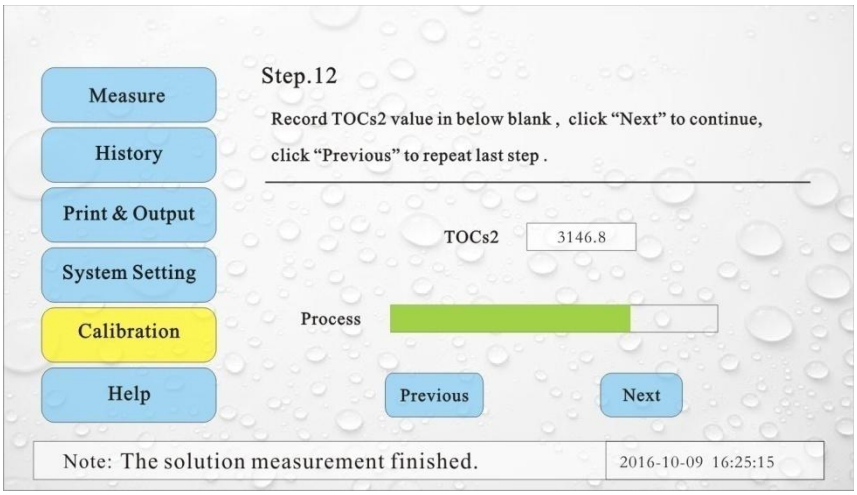
(Figure 3.33)

11)The TOC value of 500ug/L sucrose solution will be displayed on the screen (Figure 3.34). The measurement will stop automatically when the RSD value of three measurements is less than 0.5%, and the mean value is recorded as TOCs2. User can click " Stop " to stop the calibration.



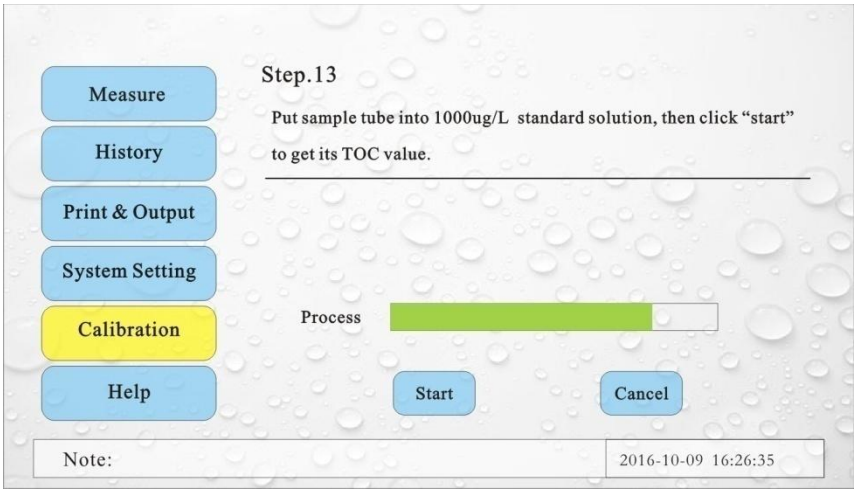
(Figure 3.34)

12)The TOCs2 value is shown as following (Figure 3.35). Record the TOCs2 value for later calculation. Click " Next " to continue the calibration, otherwise click " Previous " to repeat last step.



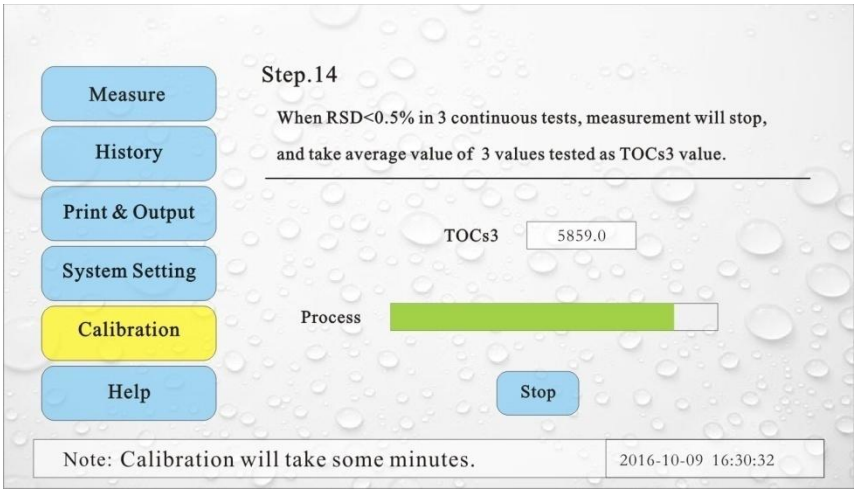
(Figure 3.35)

13)Then, put the sampling tube into the sucrose standard solution with a concentration of 1000ug/L, click " Start " to continue the calibration (Figure 3.36), and measure the standard solution to get its TOC value. User can click " Cancel " to cancel the calibration.



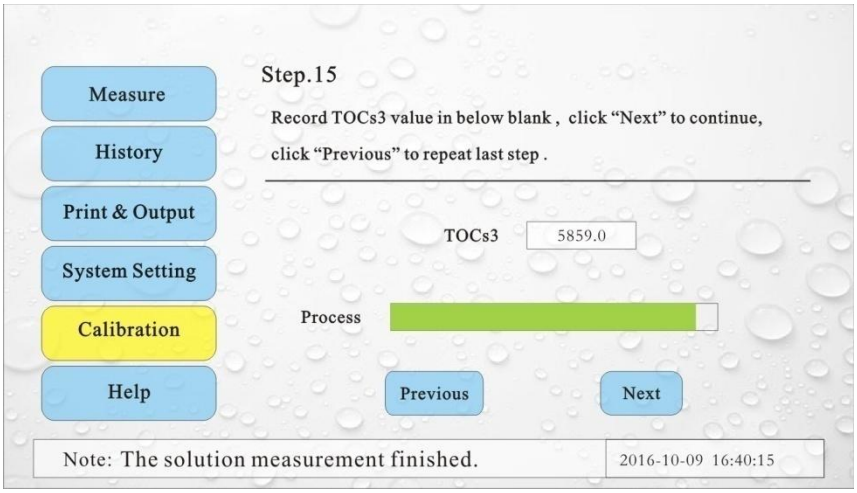
(Figure 3.36)

14)The TOC value of 1000ug/L sucrose solution will be displayed on the screen (Figure 3.37). The measurement will stop automatically when the RSD value of three measurements is less than 0.5%, and the mean value is recorded as TOCs3. User can click " Stop " to stop the calibration.



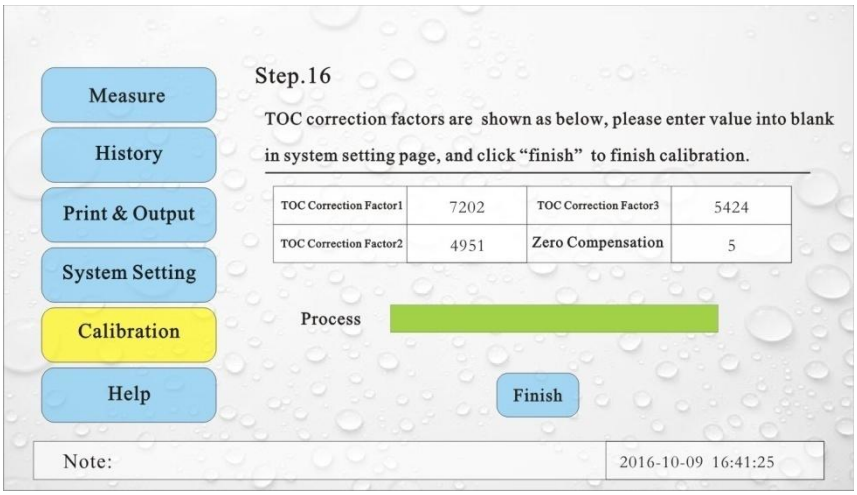
(Figure 3.37)

15)The TOCs3 value is shown as following (Figure 3.38). Record the TOCs3 value for later calculation. Click " Next " to continue the calibration, otherwise click " Previous " to repeat last step.



(Figure 3.38)

16)The correction factor of TOC is calculated automatically. The TOC correction factor will be displayed on the screen (Figure 3.39).



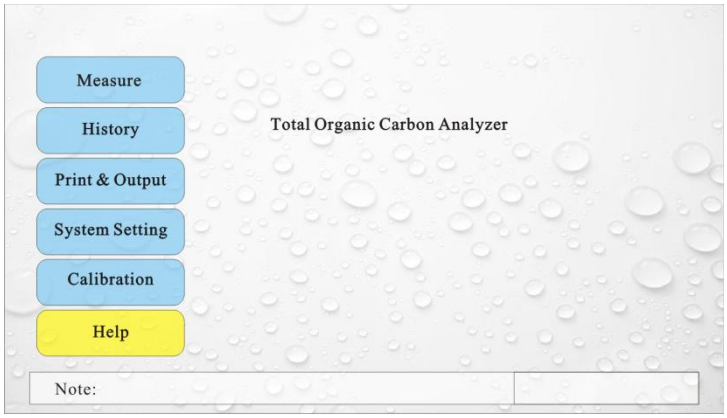
(Figure 3.39)

Record the value and later input the value in relevant column in the system setting interface. Click "Finish" to end the calibration.

At last, input the zero compensation value and TOC correction factor in the system setting interface, and click "Save" to complete the whole calibration.

3.7Help

Click "Help" to enter the help interface (Figure 3.40) when the system is not under measurement status.


Measure
History
Print & Output
System Setting
Calibration
Help
Total Organic Carbon Analyzer
Note:

(Figure 3.40)

Chapter 4 Software Operation

4.1 Software Installation

4.1.1 Installation Notes

(1)Operation System shall be Windows7 SP1 or later version

(2)Pre-install Office2007 or later version which includes Access

(3)PDF Reader with printing function is required.

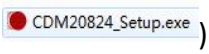
(4)At least 2 disks are required, usually C disk and D disk by default. Please put installation file in D disk and make sure it is authorized, otherwise you have to open the software by right clicking and login as admin.

Note：32bit and 64bit installation file is different, please check your system version first.

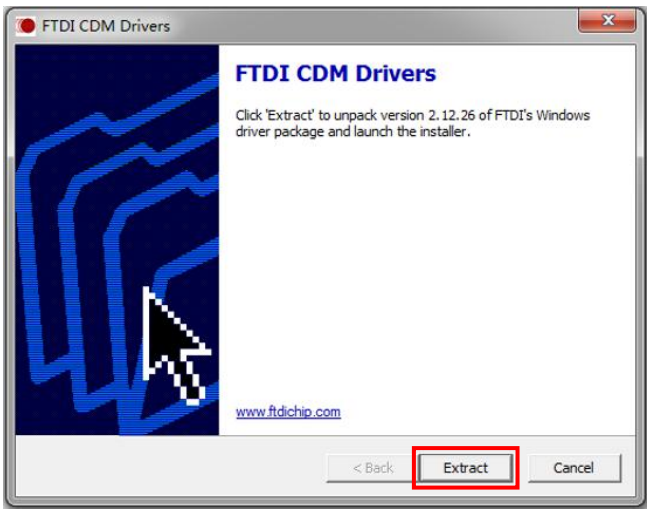
4.1.2 Windows7 Driver Installation and Port Modification Procedure

4.1.2.1 USB Driver Installation

1)Open USB driver installation file according to Windows version (64 bit file 

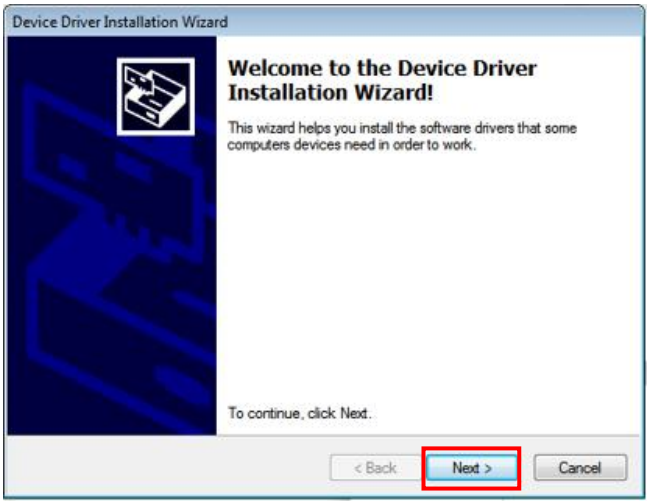
and 32 bit file 

) and click "Extract"(Figure 4.1).



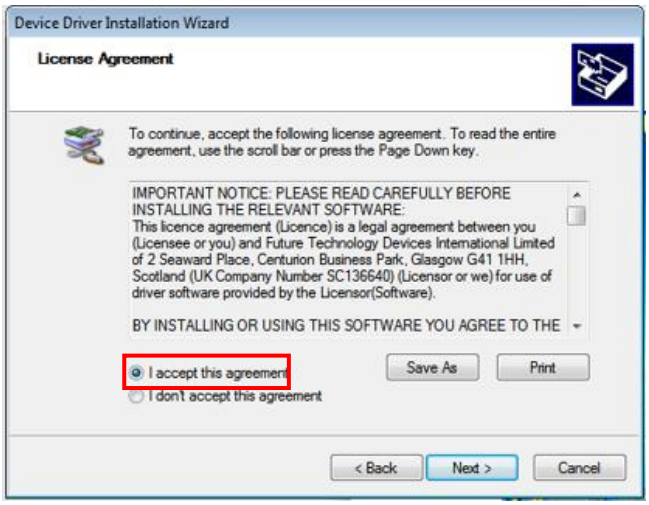
(Figure 4.1)

2)Click " Next"(Figure 4.2).



(Figure 4.2)

3)Click " I accept this agreement" and click "Next"(Figure 4.3).



(Figure 4.3)

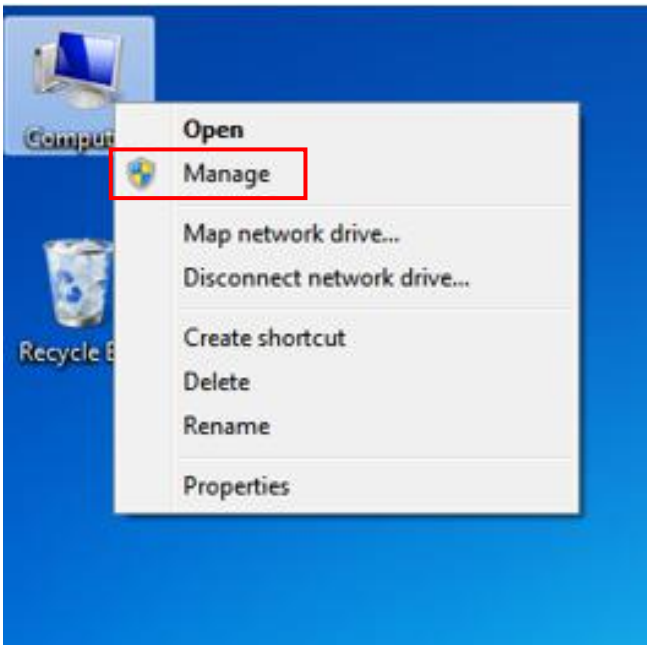
4)Click "Finish" to complete installation(Figure 4.4).

(Figure 4.4)

4.1.2.2 Communication Port Modification

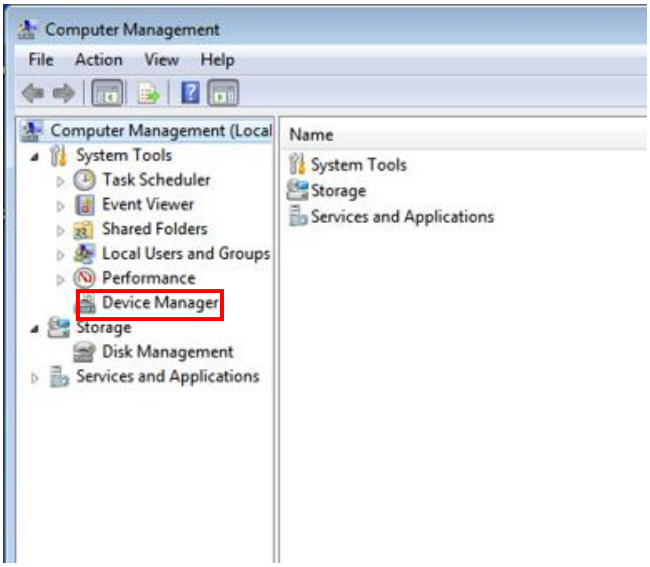
1) Connect instrument and computer by USB cable and turn on the instrument.

2)Right click "Computer" and choose "Manage"(Figure 4.5).



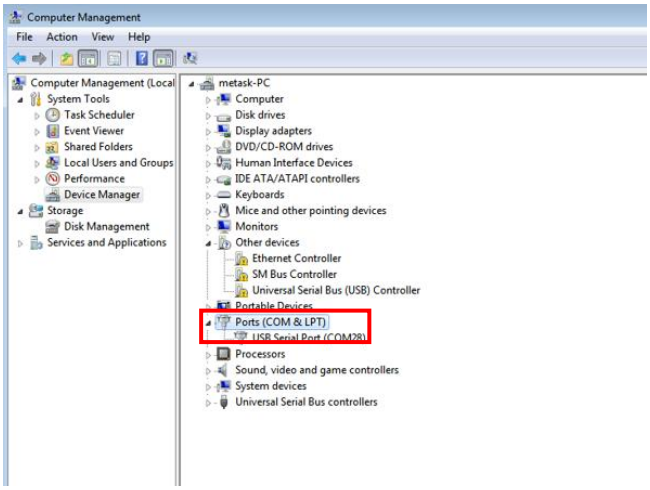
(Figure 4.5)

3)Choose " Device Manager" on the left column.(Figure 4.6)



(Figure 4.6)

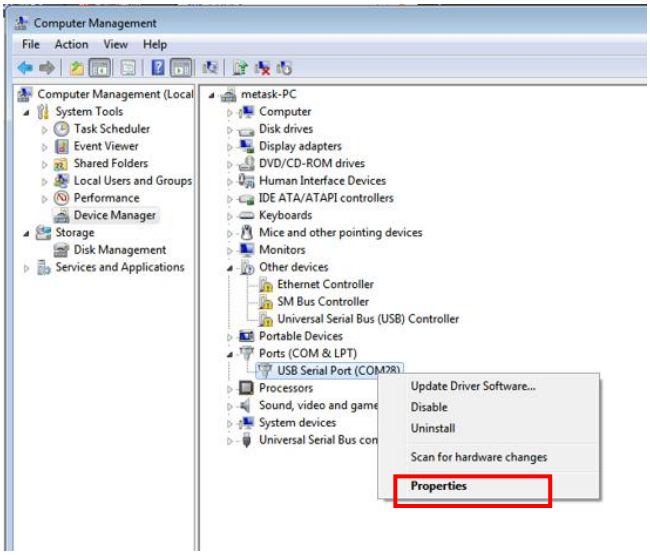
4)Choose Ports(COM and LPT)and check port (Figure 4.7).



(Figure 4.7)

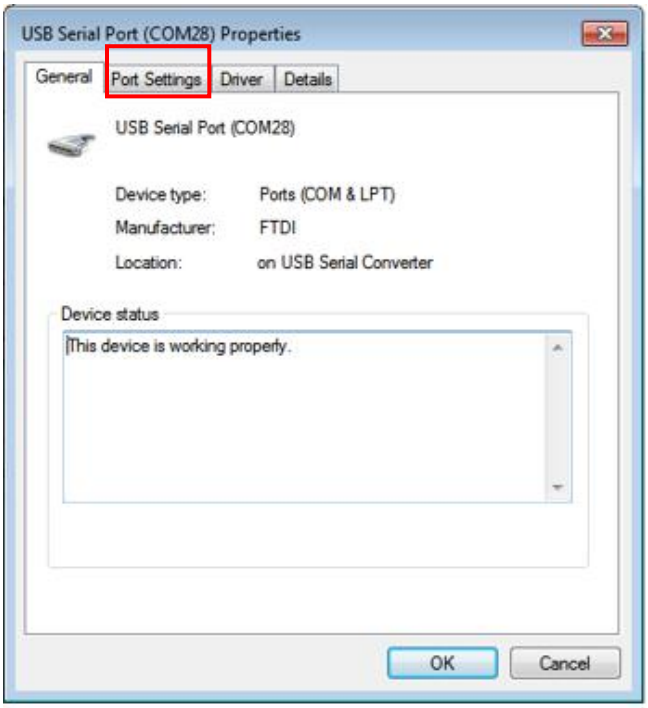
Note：Port type is USB Serial Port. Other ports are not for instruments connection.

5)Right click "USB Serial Port". Choose "Properties" in right click menu(Figure 4.8).



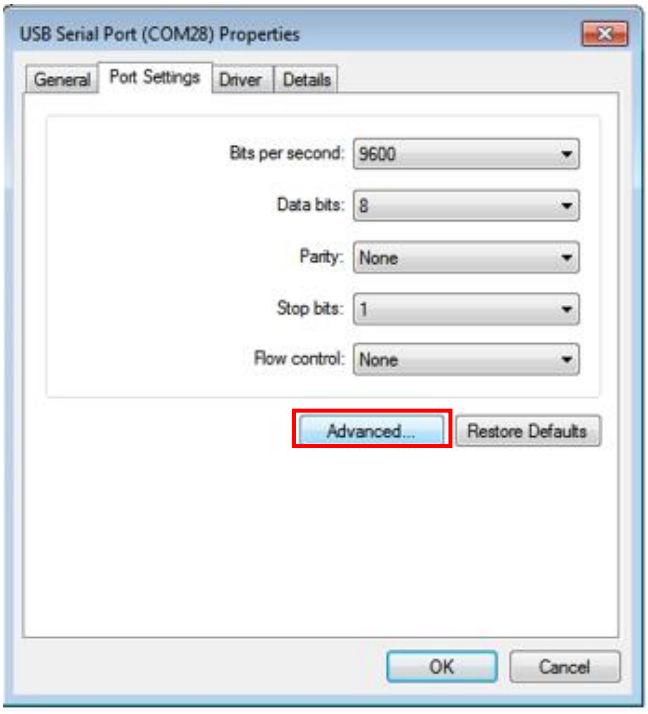
(Figure 4.8)

6)Choose "Port Setting"(Figure 4.9).



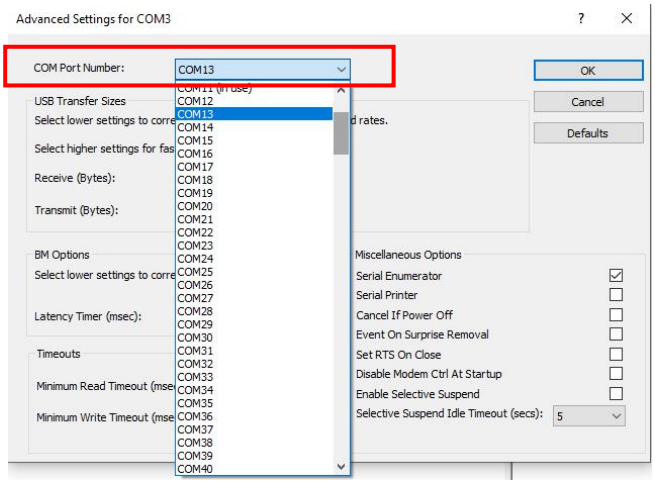
(Figure 4.9)

7)Choose "Advanced"(Figure 4.10).



(Figure 4.10)

8)Change "COM Port" to "COM13"， and press "OK"(Figure 4.11) to finish the setting.



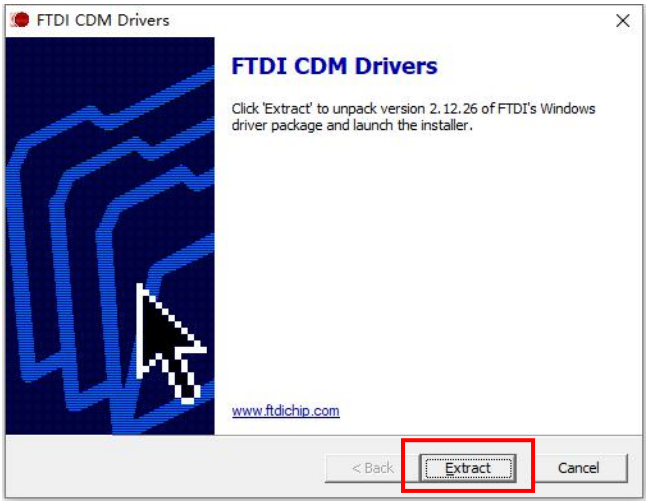
(Figure 4.11)

Note: Port modification procedure is same as instrument when user change user auto-sampler port. Instrument com port is COM13. Auto-sampler port is COM12. Instrument must be power on when modifying the port.

4.1.3Windows 10 Driver Installation and Communication Port Modification

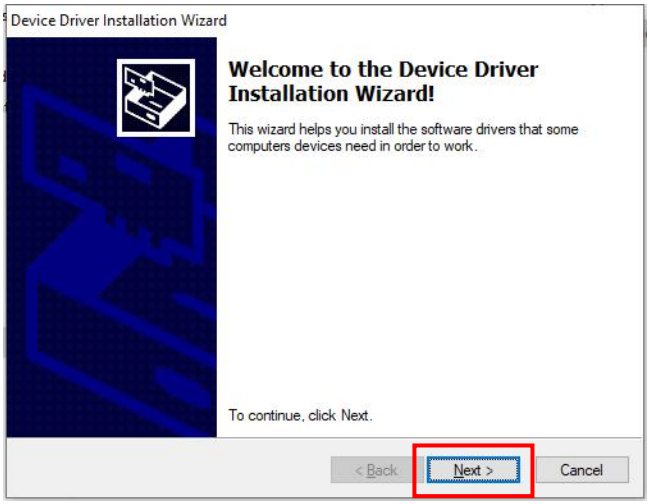
4.1.3.1USB Drivers Installation

1)Open USB driver installation file according to Windows version (64 bit file CDM21226_Setup and 32 bit file CDM20824_Setup.exe) and click "Extract"(Figure 4.12).



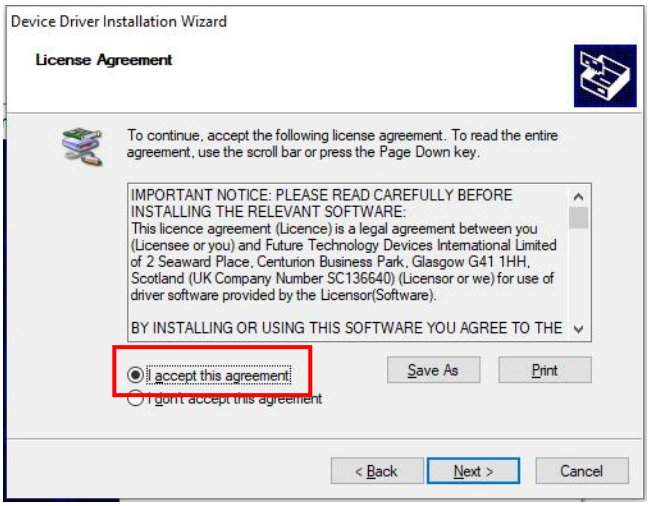
(Figure 4.12)

2)Click "Next"(Figure 4.13).



(Figure 4.13)

3)Choose "I accept this agreement"， and click "Next"(Figure 4.14).



(Figure 4.14)

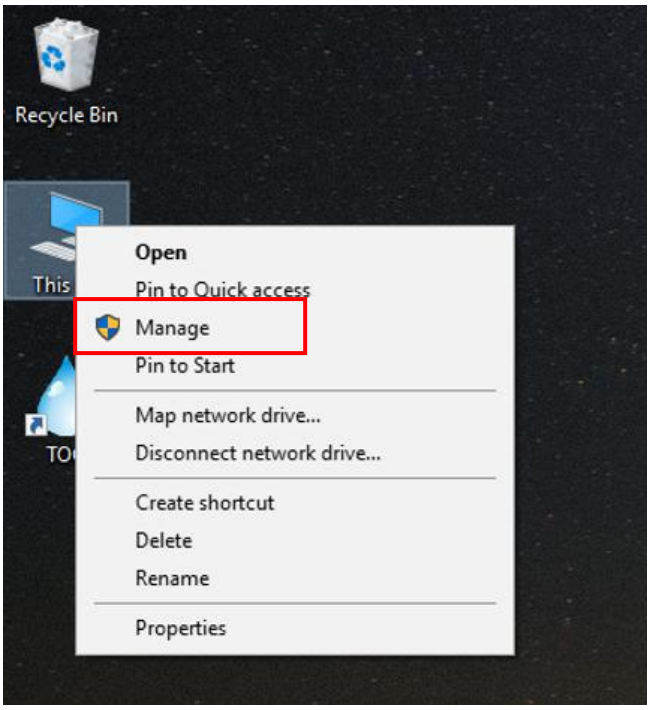
4)Click " Finish" to complete the installation (Figure 4.15).

(Figure 4.15)

4.1.3.2 Communication Port Modification

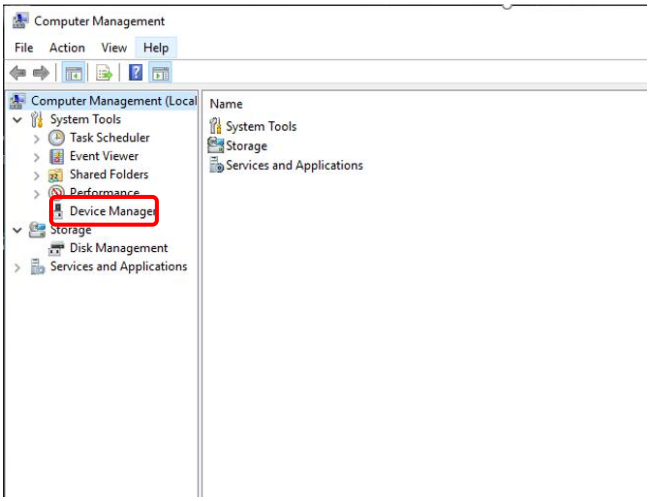
1)Connect instrument and computer by USB cable and turn on the instrument.

2)Right click " this computer" and choose "Manage" (Figure 4.16).



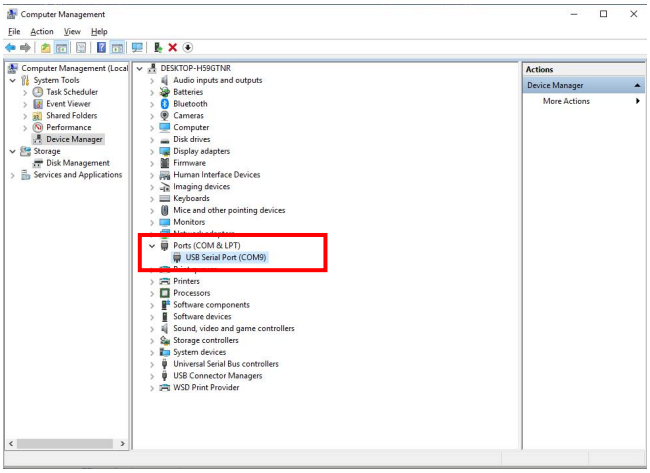
(Figure 4.16)

3)Choose " Device Manager" on the left column. (Figure 4.17).



(Figure 4.17)

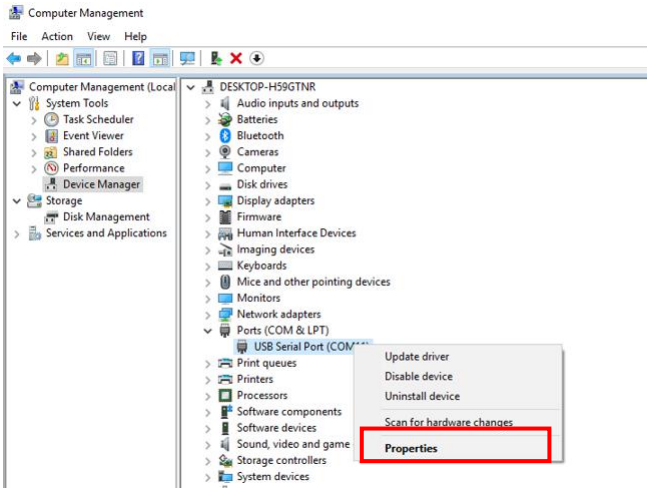
4) Choose "Port(COM and LPT)" and check port (Figure 4.18).



(Figure 4.18)

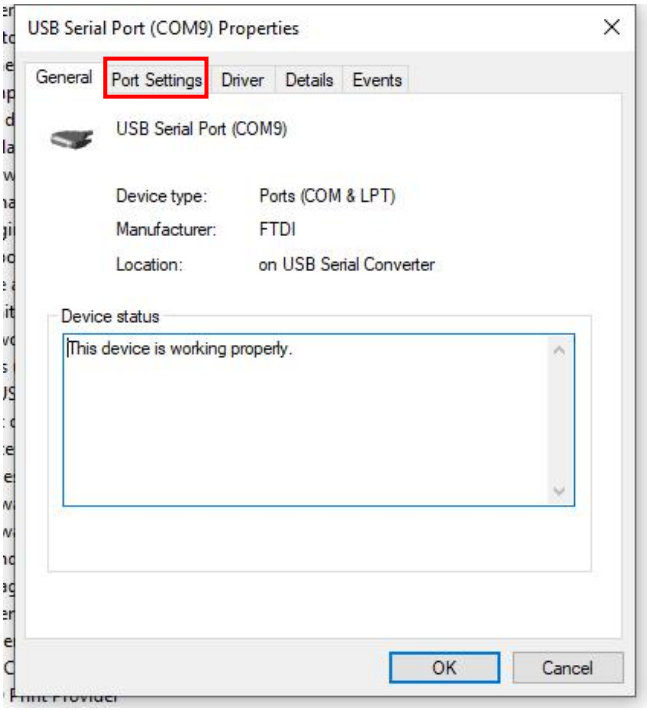
Note：Port type is USB Serial Port. Other ports are not for instruments connection.

5)Right click "USB Serial Port". Choose "Properties" in right click menu(Figure 4.19).



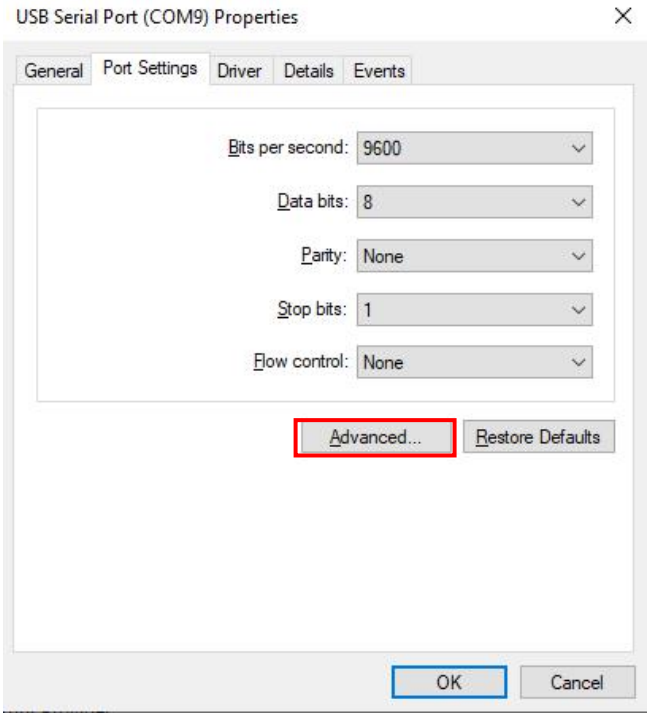
(Figure 4.19)

6)Choose "Port Setting"(Figure 4.20).



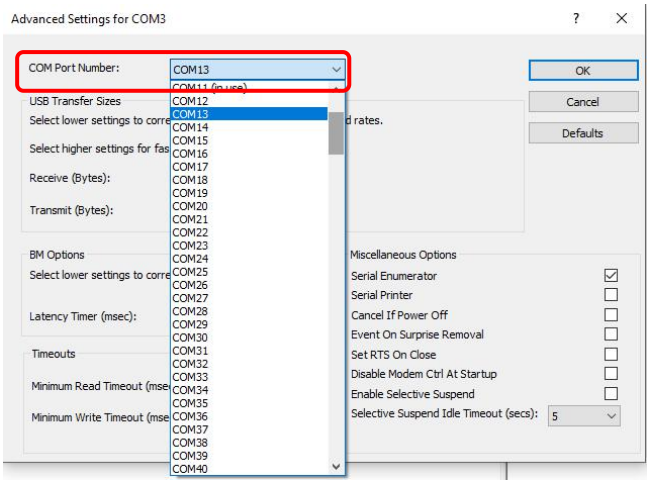
(Figure 4.20)

7)Choose "Advanced"(Figure 4.21).



(Figure 4.21)

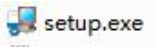
8)Change "COM Port" to "COM13"， and press "OK"(Figure 4.22) to finish the setting.



(Figure 4.22)

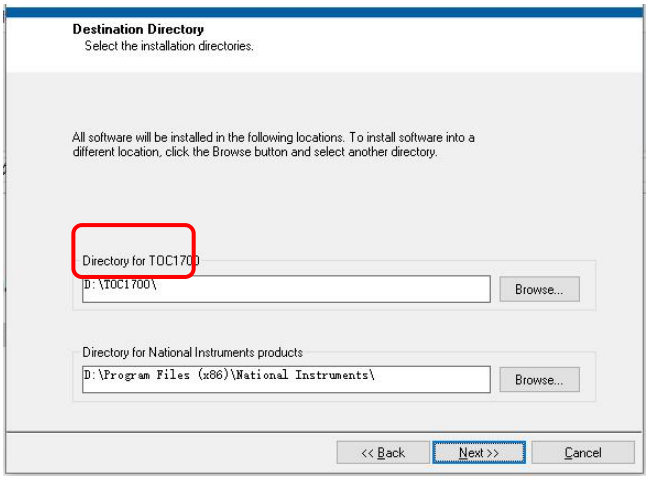
Note: Port modification procedure is same as instrument when user change user auto-sampler port. Instrument com port is COM13. Auto-sampler port is COM12. Instrument must be power on when modifying the port.

4.1.4 Software Installation

1) Open software file and double click 

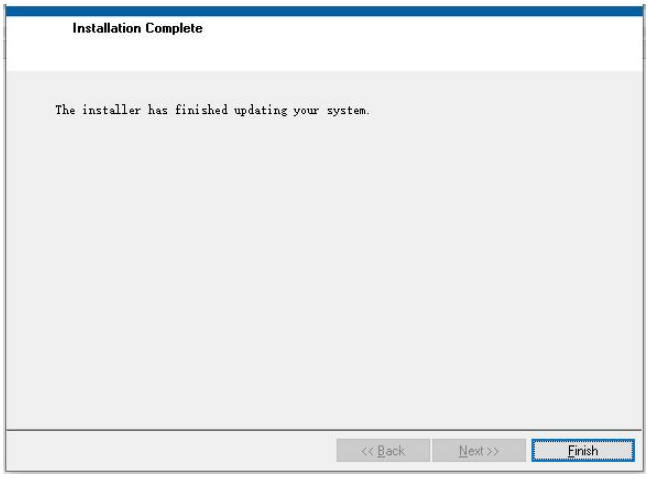
to start installation.

2) Change TOC-1500 directory from C disk to D disk and click "Next"(Figure 4.23).



(Figure 4.23)

3)Click Next until installation completed (Figure 4.24).



(Figure 4.24)

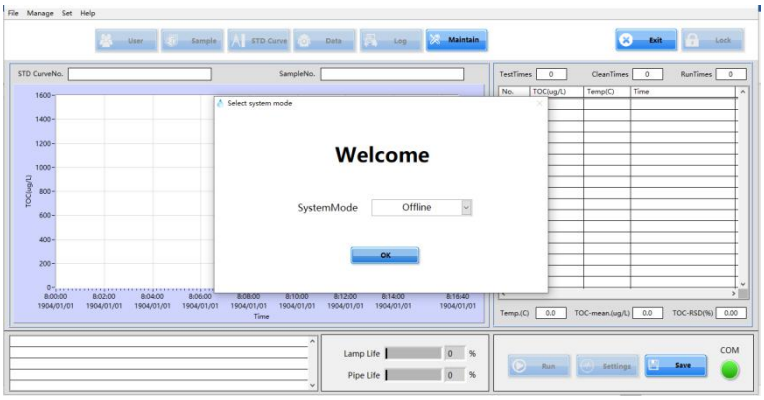
4)Software installation finished and shortcut will show on the desktop" 

".

4.2 Software Log in

1)Double click shortcut" 

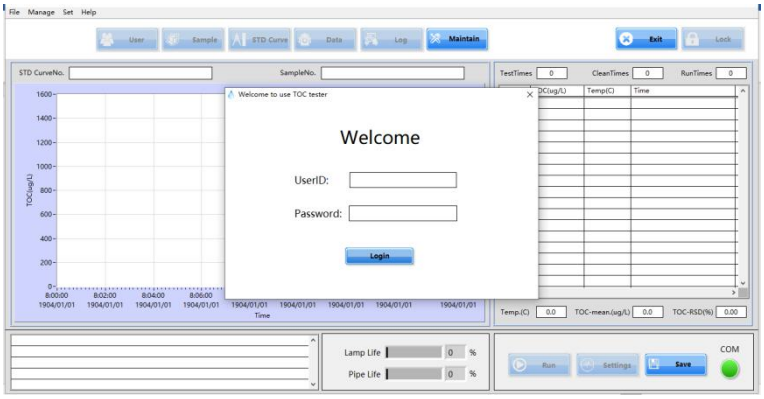
" to enter software interface (Figure 4.25).



(Figure 4.25)

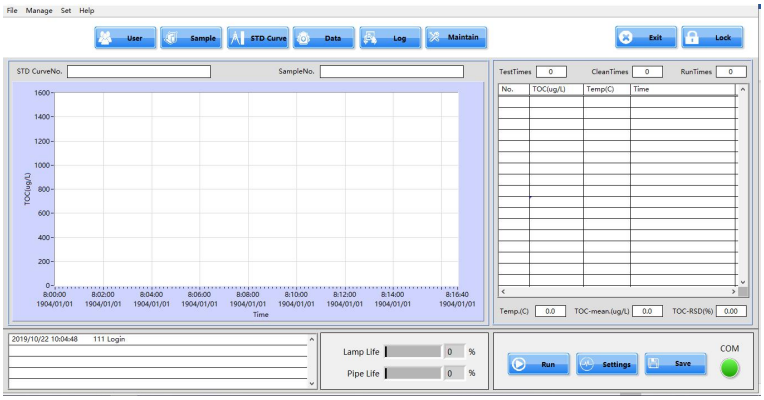
Note: When using the software for the first time, it will enter user login interface. Please refer to Chapter 5 User Management Interface Instruction.

2)There are 3 modes on the software: offline, offline+ auto-sampler, online. Please choose mode according to application, and click OK to enter user log in interface. (Figure 4.26).



(Figure 4.26)

3)Input user ID and password which has already registered to log in. (For user registration, please refer to Chapter 5 User management Interface instructions, shown as (Figure 4.27).



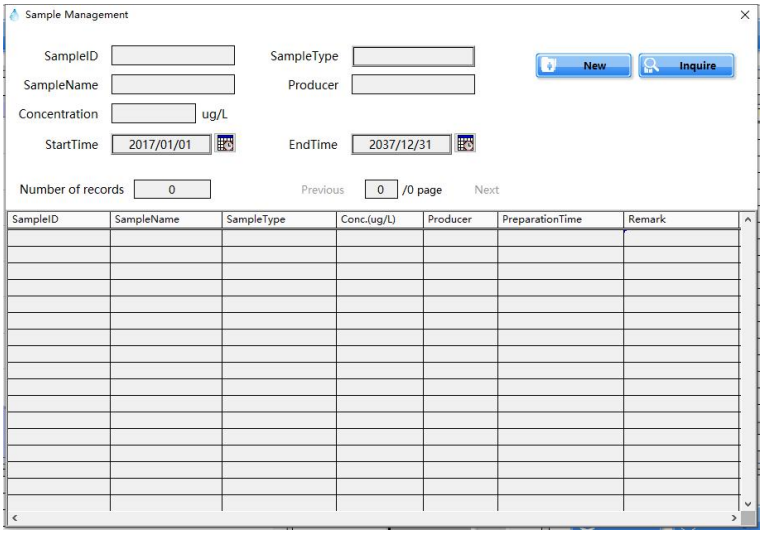
(Figure 4.27)

4.3 Software Operation

4.3.1 Sample Registration

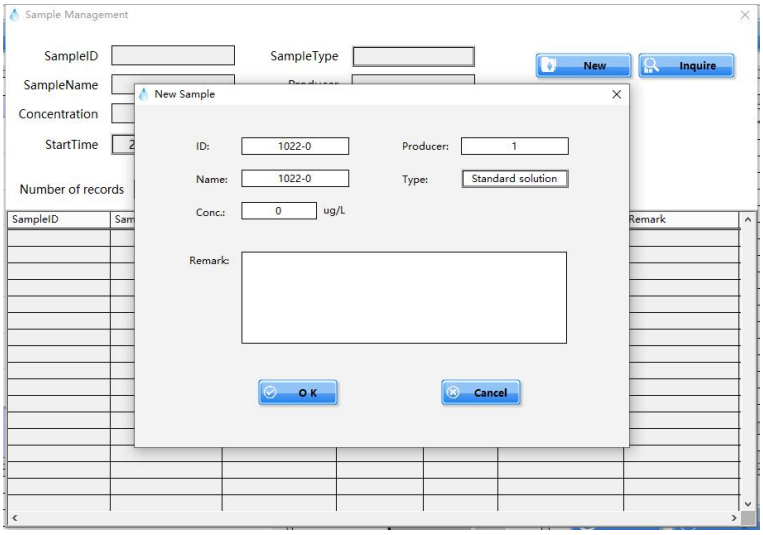
1) Click 

on the software to enter "Sample Management" interface Figure 4.28.



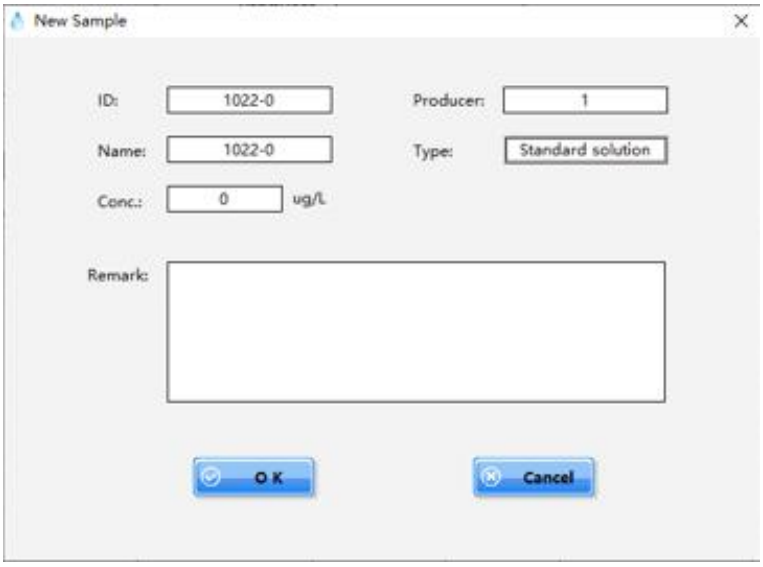
(Figure 4.28)

2)Click  on sample management interface to enter interface shown as Figure 4.29.



(Figure 4.29)

3)Input sample information on the blank (Remark is optional) shown as Figure 4.30.



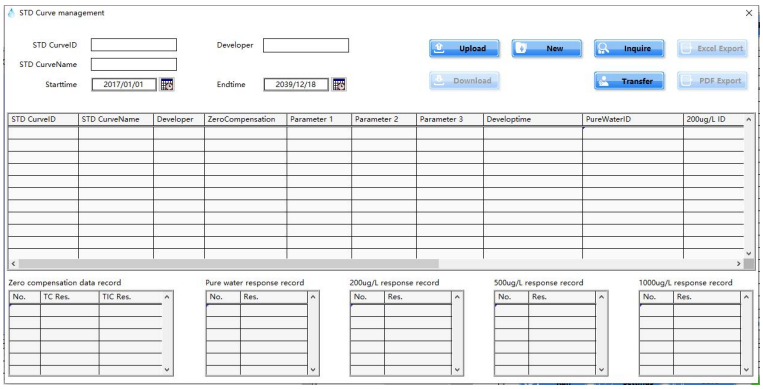
(Figure 4.30)

Note: Standard Solution and Sample Solution are all required to be registered on this interface, otherwise it is impossible to start measurement.

4.3.2 Standard Curve Management

Click 

to enter "standard curve management" interface, shown as Figure 4.31.



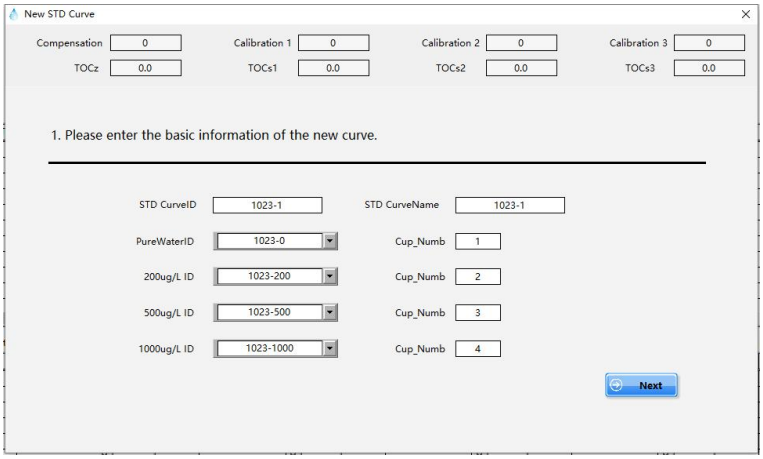
(Figure 4.31)

4.3.2.1 Set up New Standard Curve (with auto-sampler)

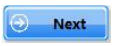
Note: Due to the standard sample susceptible to pollution, this method is not recommended.

1) Click 

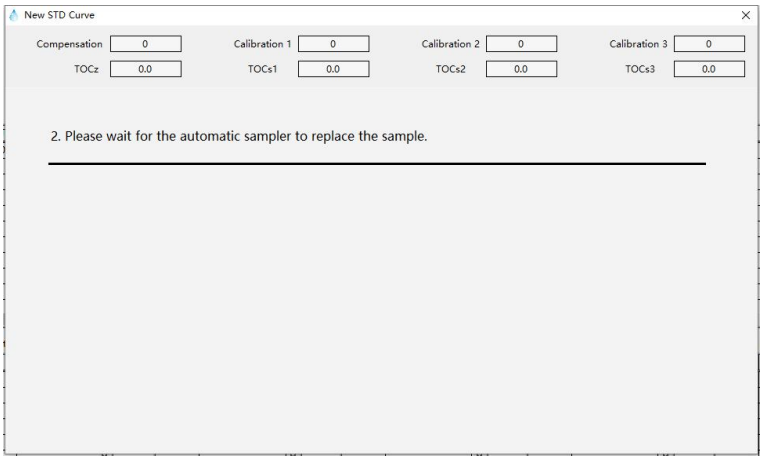
to enter "New Standard Curve" interface shown as Figure 4.32. Input standard curve ID, standard curve Name, Pure Water ID, 200 μ g/L sucrose ID, 500 μ g/L sucrose ID, 1000 μ g/L sucrose ID and all samples correspondent CUP number in the auto-sampler. All sample solution ID must be pre-registered in "Sample Registration", otherwise it is impossible to set up new standard curve.



(Figure 4.32)

2)Click 

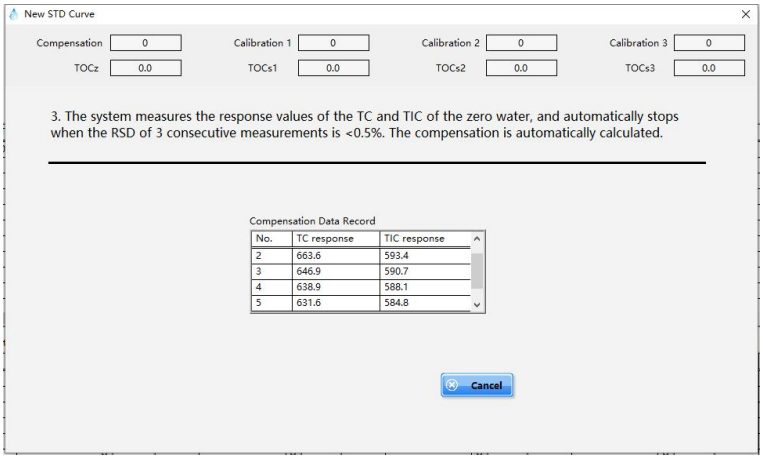
to enter interface shown as Figure 4.33. Auto-sampler will move to the cup number that registered in Step 1 and then sample needle will insert into the vial.



(Figure 4.33)

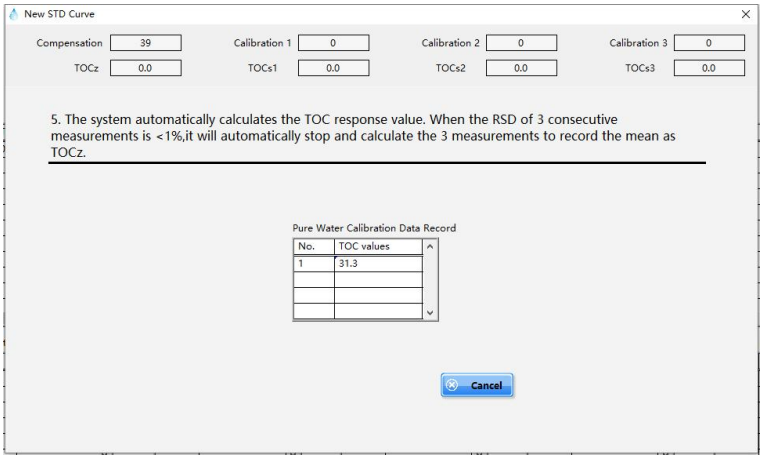
3)After moving to the right cup number position, auto-sampler will start measure sample shown as Figure 4.34. The TC and TIC values of the zero calibration water will be recorded in the table. The software will calculate the compensation value automatically when each RSD value of three continuous measurements respectively

for TC value and TIC value is lower than 0.5%, and the compensation value will be shown on top. User can click Cancel to cancel the calibration procedure anytime.



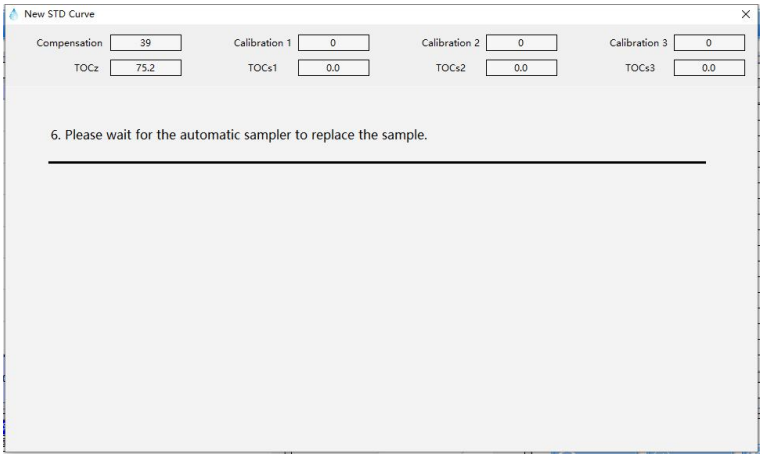
(Figure 4.34)

4)After obtaining the compensation value, click to enter interface Figure 4.35. The instrument starts to introduce samples. The system will calculate the mean value of three measurements and shown as "TOCz" on top when the RSD value of three measurements is less than 2%.User can click Cancel to cancel the calibration.



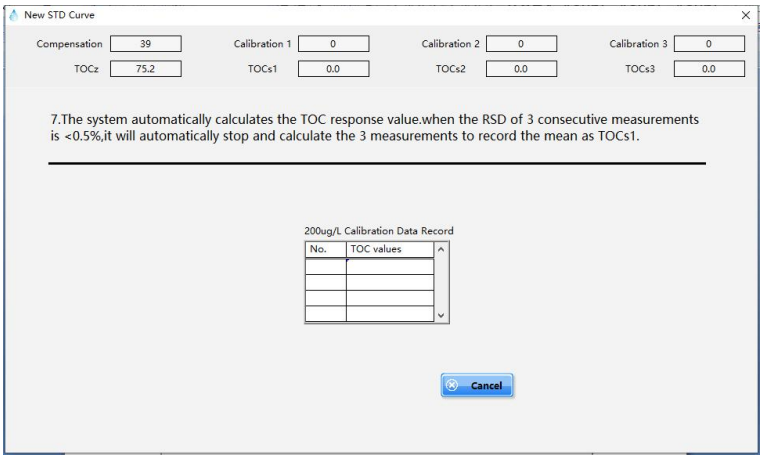
(Figure 4.35)

5)After obtaining TOCz value, the system will enter interface shown as Figure 4.36. Auto-sampler will move to 200 μ g/L sucrose cup number and insert sample needle into sample vial.



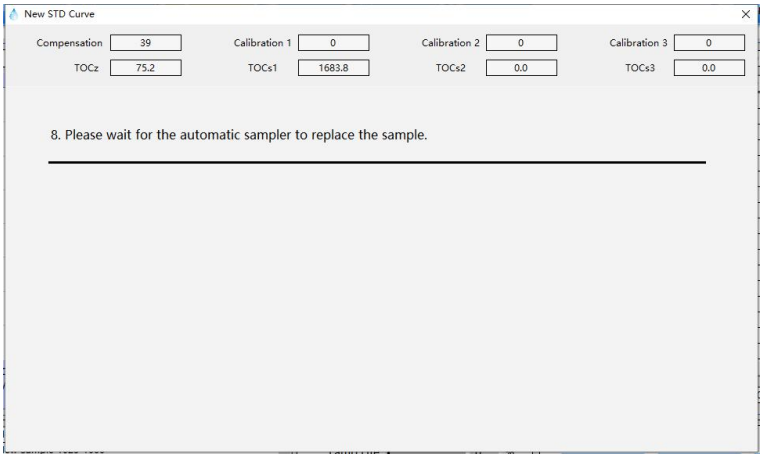
(Figure 4.36)

6)After shifting to the right cup number, the instrument starts to introduce sample and enter interface shown as Figure 4.37. TOC value of 200 μg/L sucrose solution will be recorded in the table. The system will calculate the mean value of three measurements and shown as "TOCs1" on top when the RSD value of three measurements is less than 1%.User can click  to cancel the calibration.



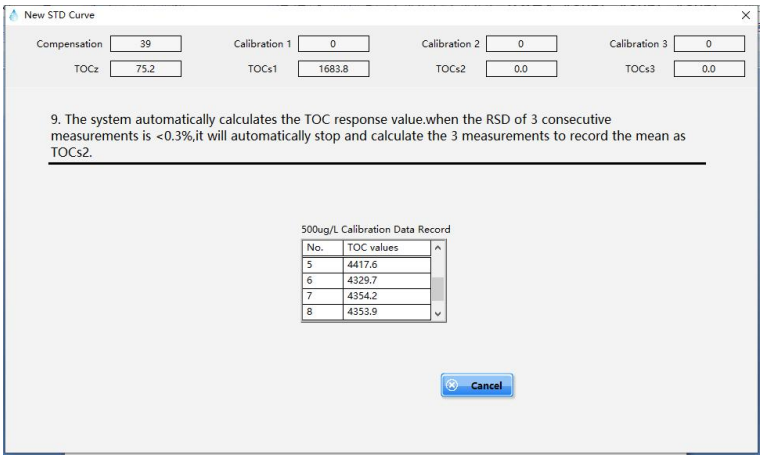
(Figure 4.37)

7)After obtaining TOCs1, the system will enter interface shown as Figure 4.38. Auto-sampler will move to 500 μg/L sucrose cup number and insert sample needle into sample vial.



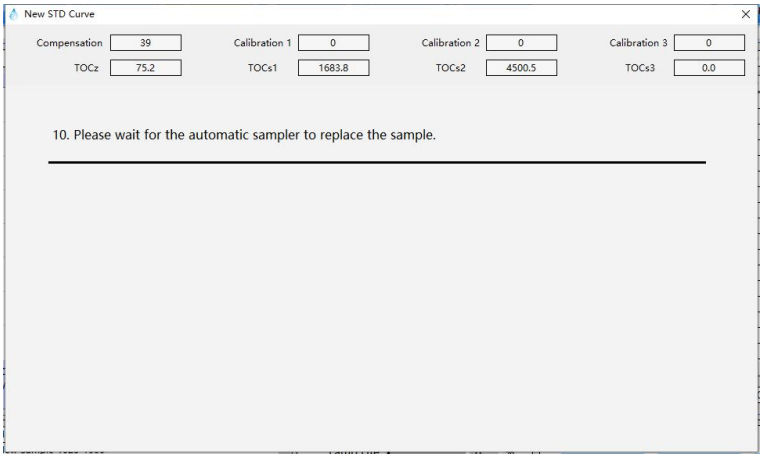
(Figure 4.38)

8)After shifting to the right cup number, the instrument starts to introduce sample and enter interface shown as Figure 4.39. TOC value of 500 μ g/L sucrose solution will be recorded in the table. The system will calculate the mean value of three measurements and shown as "TOCs2" on top when the RSD value of three measurements is less than 0.5%.User can click Cancel to cancel the calibration.



(Figure 4.39)

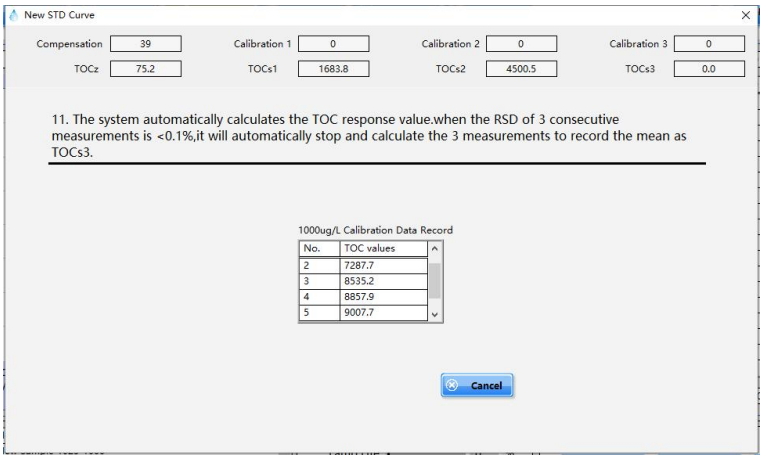
9)After obtaining TOCs2, the system will enter interface shown as Figure 4.40. Auto-sampler will move to 1000 μ g/L sucrose cup number and insert sample needle into sample vial.



(Figure 4.40)

10)After shifting to the right cup number, the instrument starts to introduce sample and enter interface shown as Figure 4.41. TOC value of 1000 μ g/L sucrose solution will be recorded in the table. The system will calculate the mean value of three measurements and shown as "TOCs3" on top when the RSD value of three measurements is less than 0.5%.User can click 

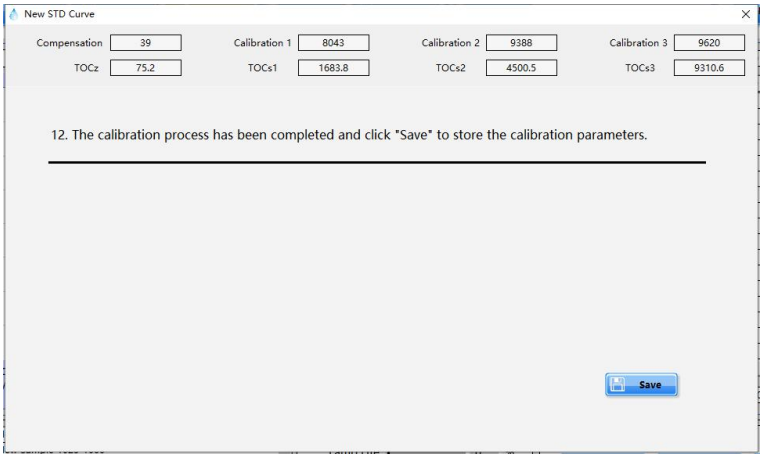
to cancel the calibration.



(Figure 4.41)

11)After obtaining TOCs3 value, if there a prompt shows "Calibration parameter data is abnormal, please recalibrate!", this mean calibration failed and user has to do calibration again. If system enters interfaces shown as Figure 4.42 and calculate automatically to get correction factor 1, 2, 3, then click 

to save all parameters and finish calibration.

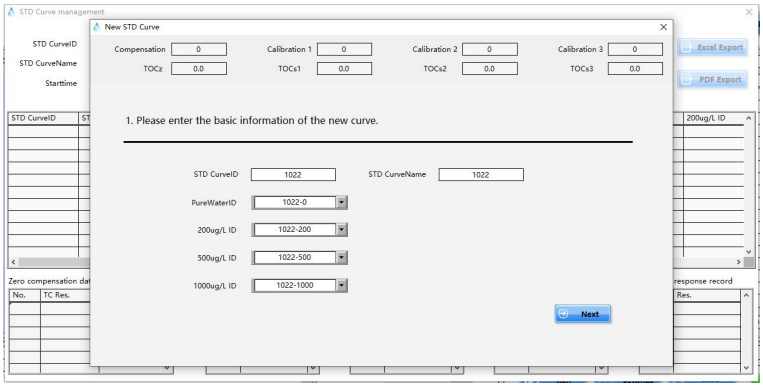


(Figure 4.42)

4.3.2.2 Set up New Standard Curve (manual sample introduce)

1) Click 

to enter "New Standard Curve" interface shown as Figure 4.43. Input standard curve ID, standard curve Name, Pure Water ID, 200 μg/L sucrose ID, 500 μg/L sucrose ID, 1000 μg/L sucrose ID and all samples correspondent CUP number in the auto-sampler. All sample solution ID must be pre-registered in "Sample Registration", otherwise it is impossible to set up new standard curve.

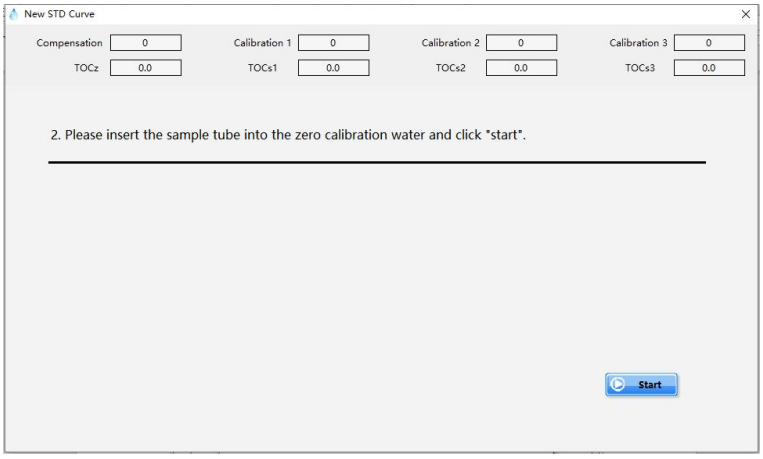


(Figure 4.43)

2)Click 

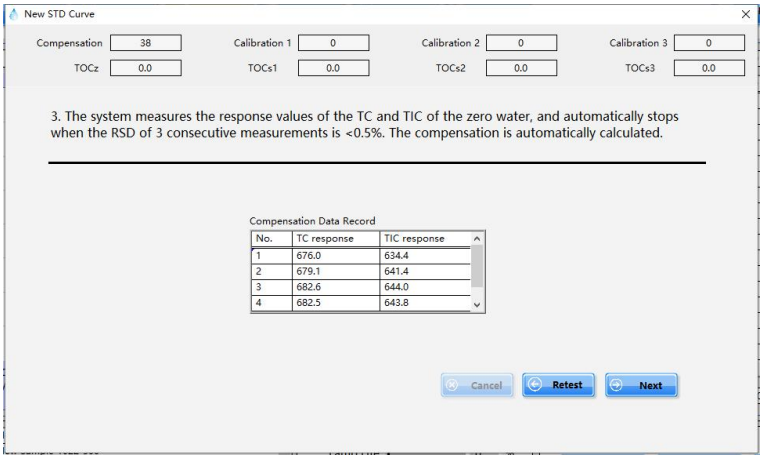
to enter interface shown as Figure 4.44. Insert sample tube into zero calibration water (pure water) and click 

.



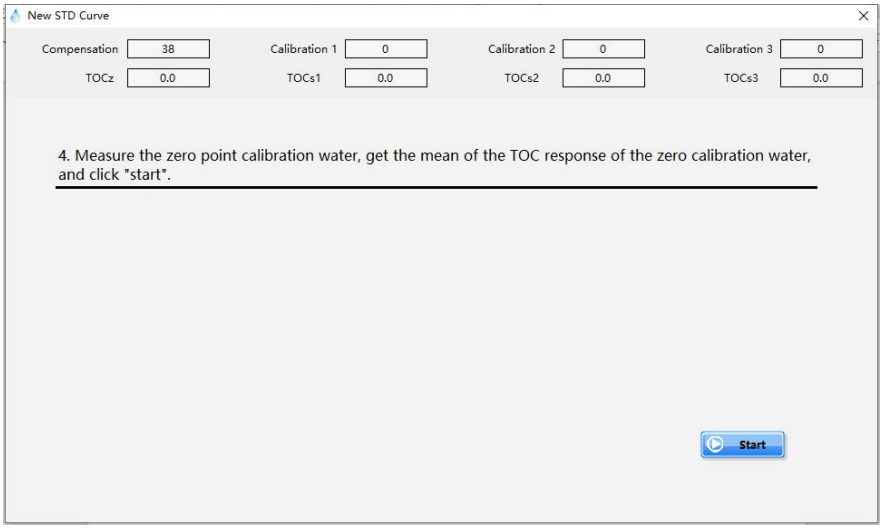
(Figure 4.44)

3)The instrument starts to introduce sample shown as Figure 4.45. The TC and TIC values of the zero calibration water will be recorded in the table. The software will calculate the compensation value automatically when each RSD value of three continuous measurements respectively for TC value and TIC value is lower than 0.5%, and the compensation value will be shown on top. User can click Cancel to cancel the calibration procedure anytime and click Retest to restart calibration.



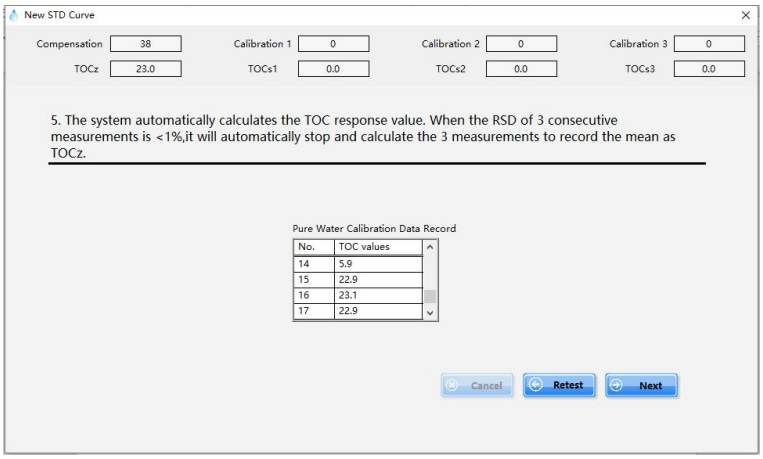
(Figure 4.45)

4)After obtaining the compensation value, click Next to enter interface shown Figure 4.46 and click Start according to the prompt.



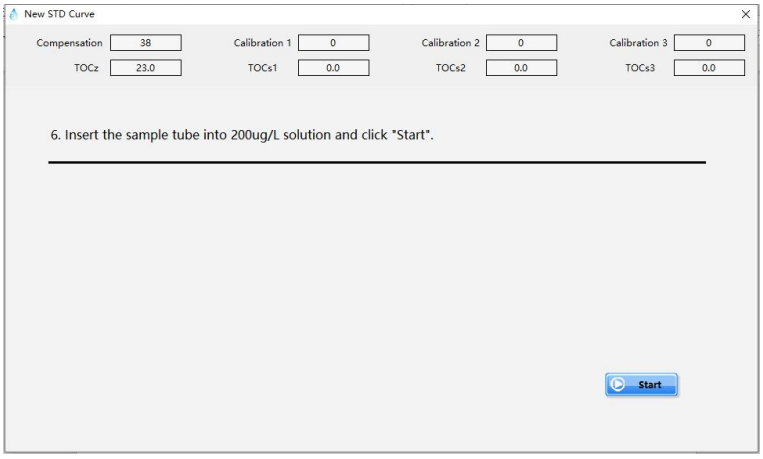
(Figure 4.46)

5)The instrument starts to introduce sample and enter interface shown as Figure 4.47. TOC Value of zero compensation water will be recorded in the table. The system will calculate the mean value of three measurements and shown as "TOCz" on top when the RSD value of three measurements is less than 2%.User can click Cancel to cancel the calibration and click Retest to restart the calibration.



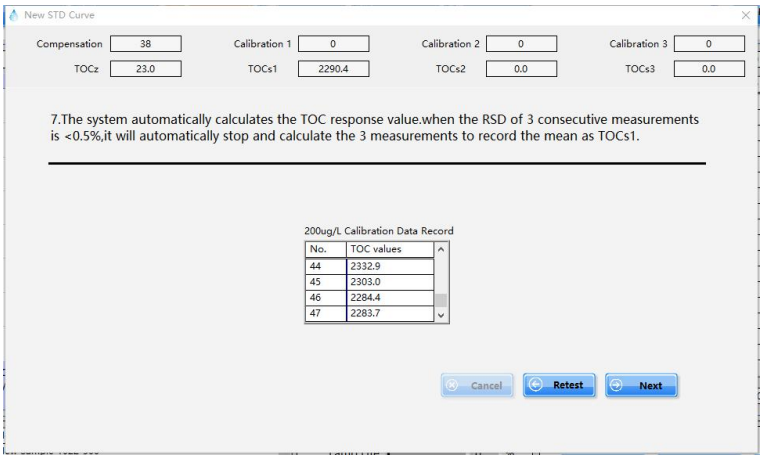
(Figure 4.47)

6) After obtaining TOCz value, click Next to enter interface shown as Figure 4.48. Operate according to the prompt, and insert sample tube into 200 μg/L sucrose solution and click Start.



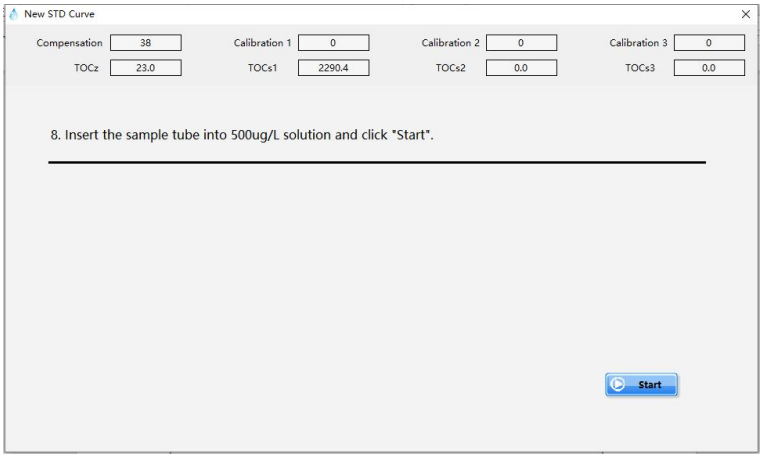
(Figure 4.48)

7)The instrument starts to introduce sample and enter interface shown as Figure 4.49. TOC value of 200 μg/L sucrose solution will be recorded in the table. The system will calculate the mean value of three measurements and shown as "TOCs1" on top when the RSD value of three measurements is less than 1%.User can click Cancel to cancel the calibration and click Retest to restart the calibration.



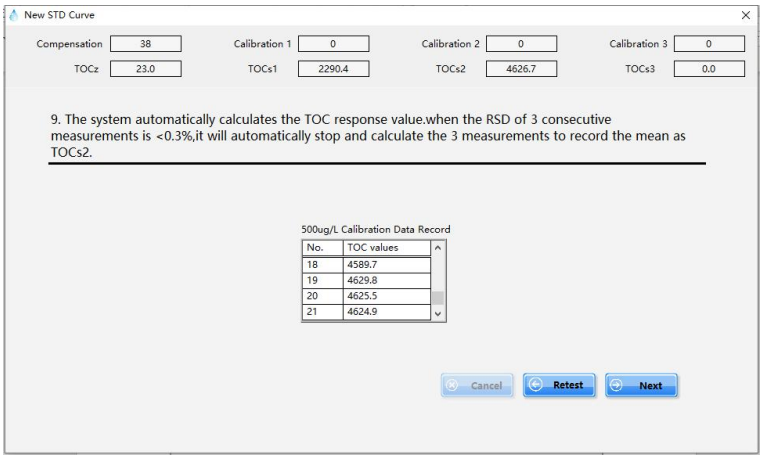
(Figure 4.49)

8)After obtaining TOCs1, the system will enter interface shown as Figure 4.50. Insert sample tube into 500 μg/L sucrose solution and click Start.



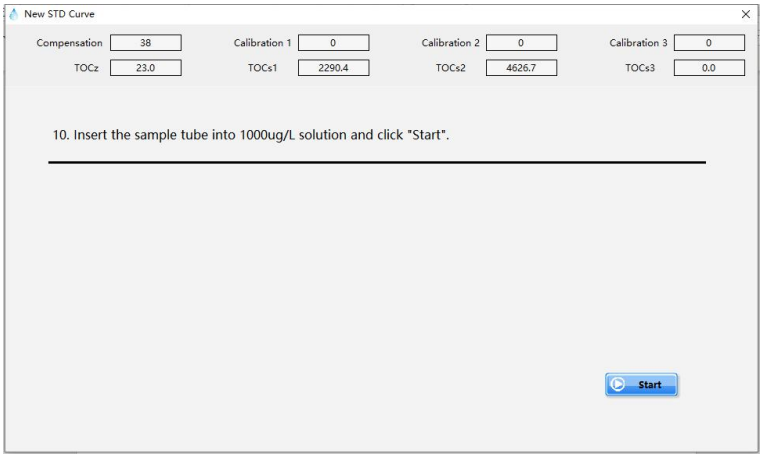
(Figure 4.50)

9)The instrument starts to introduce sample and enter interface shown as Figure 4.51. TOC value of 500 μg/L sucrose solution will be recorded in the table. The system will calculate the mean value of three measurements and shown as "TOCs2" on top when the RSD value of three measurements is less than 0.5%.User can click Cancel to cancel the calibration and click Retest to restart the calibration.



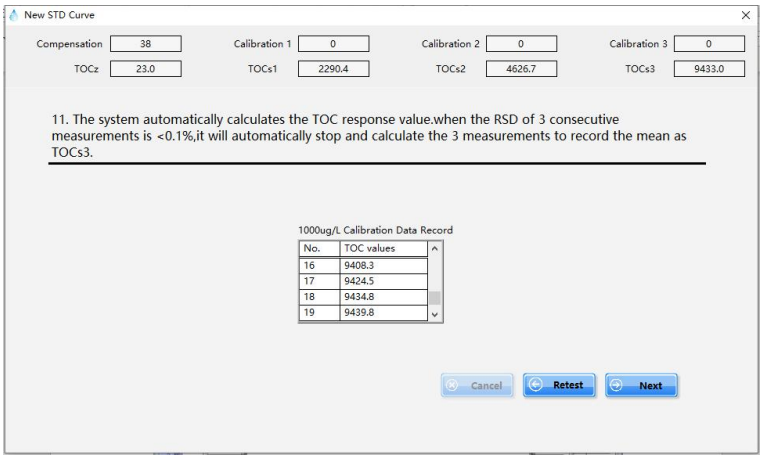
(Figure 4.51)

10)After obtaining TOCs2, the system will enter interface shown as Figure 4.52. Insert sample tube into 500 μg/L sucrose solution and click Start.



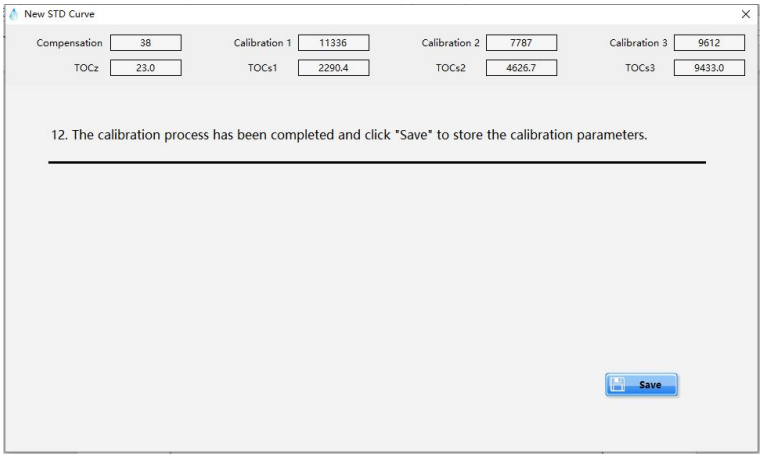
(Figure 4.52)

11)The instrument starts to introduce sample and enter interface shown as Figure 4.53. TOC value of 1000 μ g/L sucrose solution will be recorded in the table. The system will calculate the mean value of three measurements and shown as "TOCs3" on top when the RSD value of three measurements is less than 0.5%. User can click Cancel to cancel the calibration and click Retest to restart the calibration.



(Figure 4.53)

12)After obtaining TOCs3 value, click next to enter interface shown as Figure 4.54. Meanwhile the system will calculate automatically to get correction factor 1, 2, 3, then click Save to save all parameters and finish calibration.

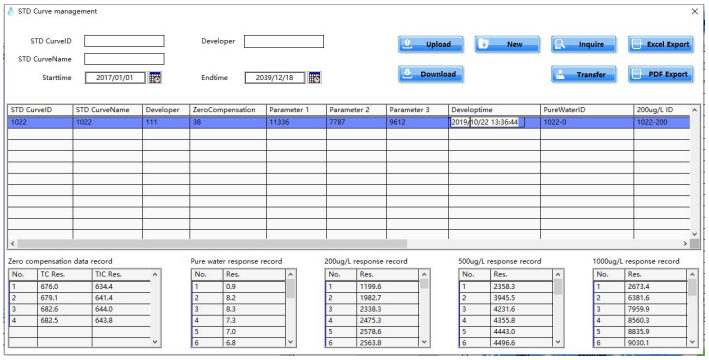


(Figure 4.54)

4.3.2.3 Load Standard Curves

1) Input inquire information on "Standard Curve Management" interface (Inquire information including "Std. Curve ID"、"Std. Curve Name"、"Developer"、"Starttime"、"Endtime" etc.), click 

and all qualified information will list in the table (Figure 4.55).



(Figure 4.55)

2)Double click standard curve and click 

to load the standard curve.

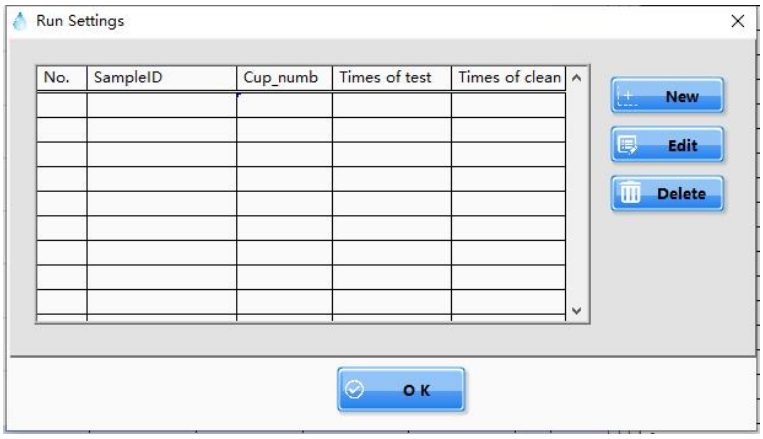
Note：New standard curves can be loaded referring to 4.3.2.3, and there is no need to set up new one every time. It is recommended to set up new standard curve every 6 moths or when the measurement data is not correct.

4.3.3 Measurement

4.3.3.1 Offline+ Auto-sampler mode measurement

1) After loading the standard curve, click 

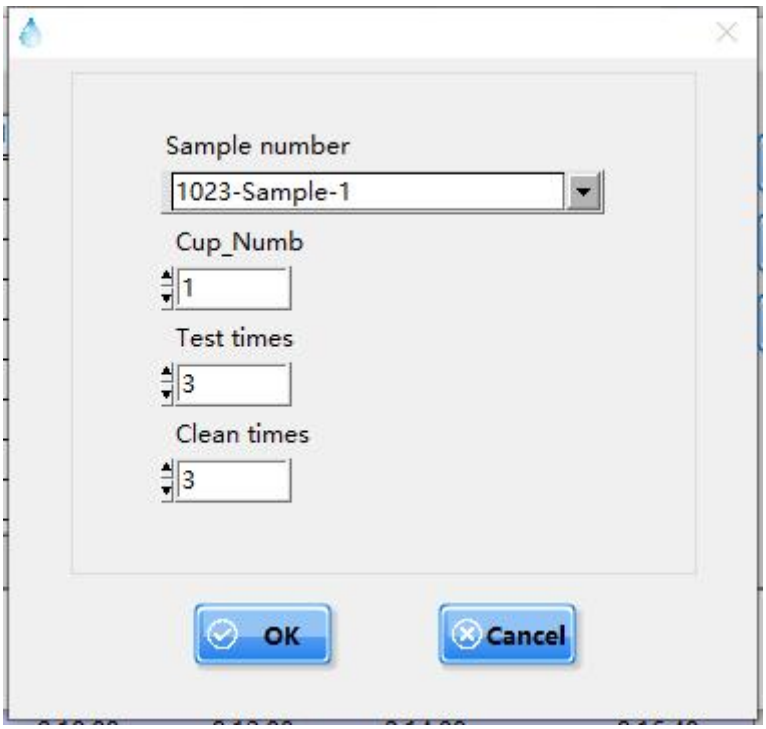
to enter" Run Settings" interface Figure 4.56.



(Figure 4.56)

2) Click 

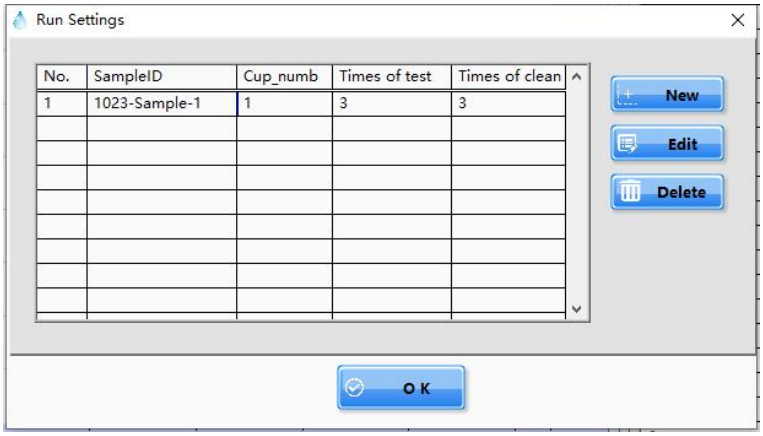
to enter interface shown as Figure 4.57 and start measurement procedure according to requirements.



(Figure 4.57)

3)The interface will show as Figure 4. 58 after setting. After setting, click 

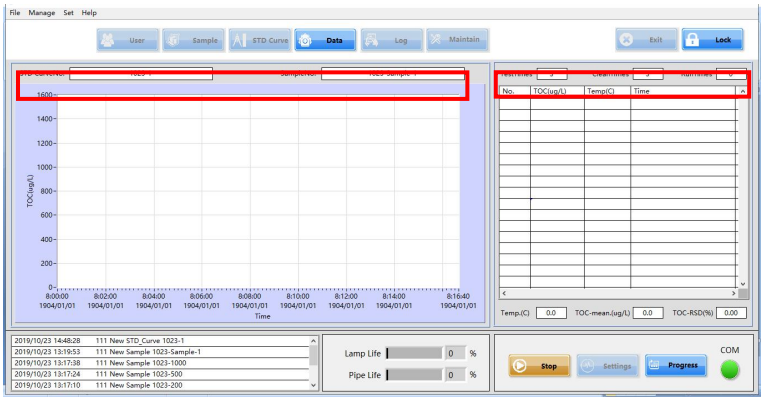
.



(Figure 4.58)

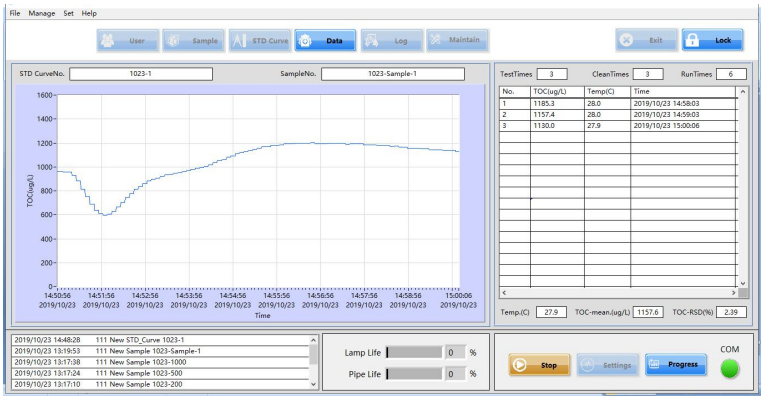
4)Return back to main interface and click 

, auto-sampler will move to the cup number set in step 3, and insert sample needle into sample vial. Measurement times and cleaning times will show on the right column. On top of the graph will show current standard curve ID and sample name.(Figure 4.59).



(Figure 4.59)

When measuring the sample, TOC concentration will show as graph in real time; When running, system will do cleaning first which will take around 120s for one cleaning. User can check if cleaning is complete by the stability of the graph. When run times is ⩾ cleaning times, this means instrument starts measurement. The system will introduce one sample every 60s,record on current table and calculate mean value of TOC and RSD value automatically. When run times equals to the sum of test times and cleaning times, this means test finished. All data in the table will be recorded in the database Figure 4.60.



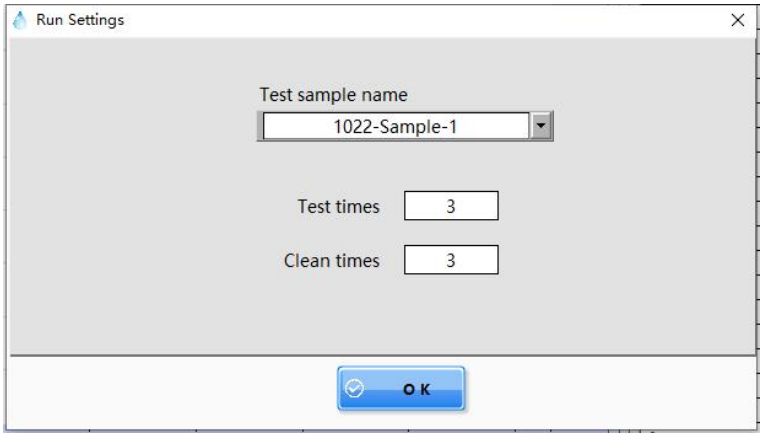
(Figure 4.60)

After finishing all tests on the list, the auto-sampler will return back to position 1. After that, "Stop" button will change to "Run".

4.3.3.2 Offline Measurement

1)After loading the standard curve, click 

to enter "Run Setting " interface (Figure 4.61).

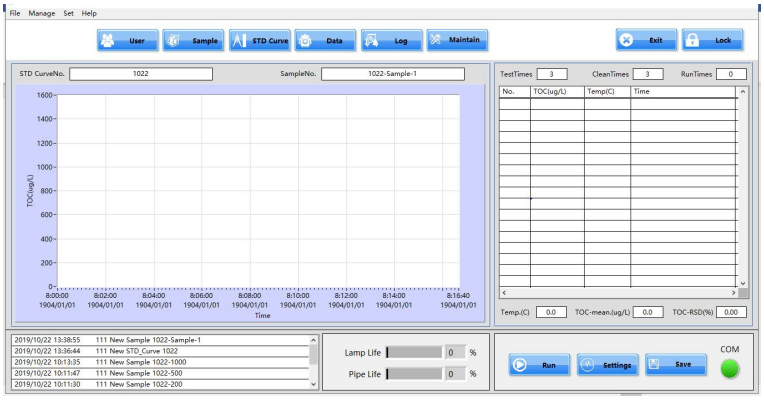


(Figure 4.61)

2)Choose test sample name, set test times and clean times, and then click 

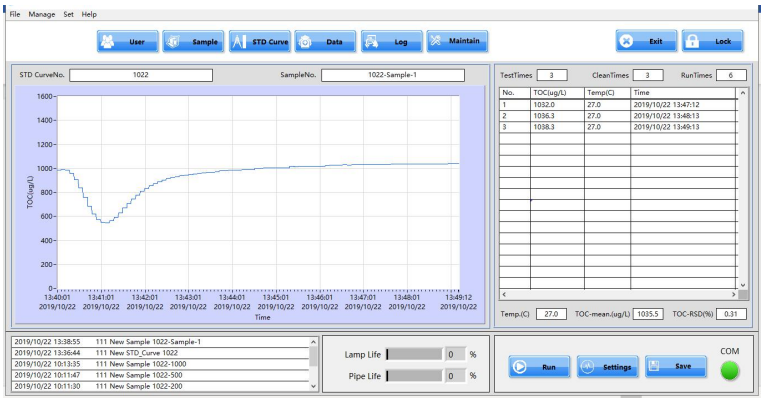
.

3)Return to interface, click run, all set test times and clean times will be shown on the right column. Current loaded standard curve ID and sample name will be shown on top of the graph.(Figure 4.62).



(Figure 4.62)

When measuring the sample, TOC concentration will show as graph in real time; When running, system will do cleaning first which will take around 120s for one cleaning. User can check if cleaning is complete by the stability of the graph. When run times is ⩾ cleaning times, this means instrument starts measurement. The system will introduce one sample every 60s,record on current table and calculate mean value of TOC and RSD value automatically. When run times equals to the sum of test times and cleaning times, this means test finished. All data in the table will be recorded in the database Figure 4.63.

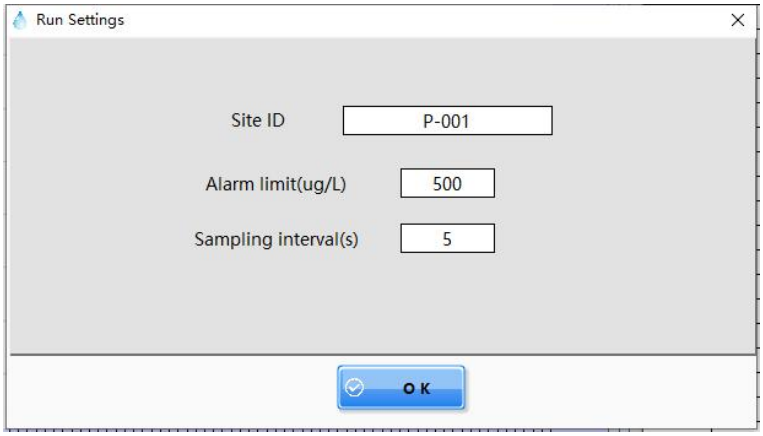


(Figure 4.63)

4.3.3.3 Online Measurement

1) After loading the standard curve, click 

to enter "Run Settings" interface(Figure 4.64).



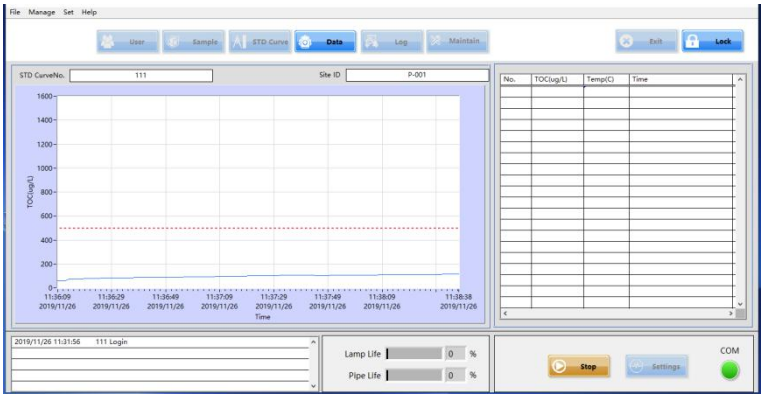
(Figure 4.64)

2)Set site ID, alarm limit and sampling interval, and click 

to return back to main interface.

3)Click 

to start measurement shown as Figure 4.65.



(Figure 4.65)

TOC concentration of Site ID will be shown as graph in real-time; Site ID will show on top of the graph. Alarm limit will show as red graph. Right column shows sample data according to sampling interval. Click 

to stop sample introduction.

Chapter 5 Software

5.1 Software Main Interface

5.1.1 Main Interface Introduction

：Click buttons to enter correspondent interface.

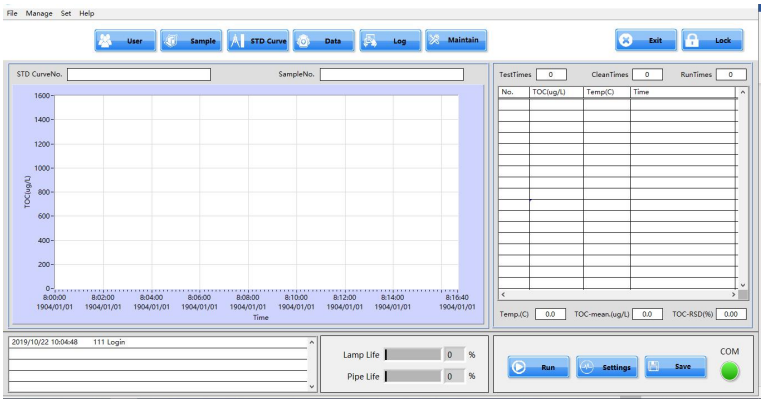
：Exit software and log out.

：After setting all parameters, click run, and it will change to 

.

：Lock the screen and after locking, only logged-in account and admin can unlock.

5.1.2 Main Functions(Figure 5.1)

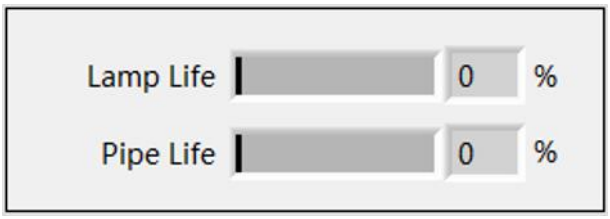


(Figure 5.1)

(1)Spare parts service life(Figure 5.2)

UV lamp and Peristaltic pump pipe life bar are used for monitoring its service life.

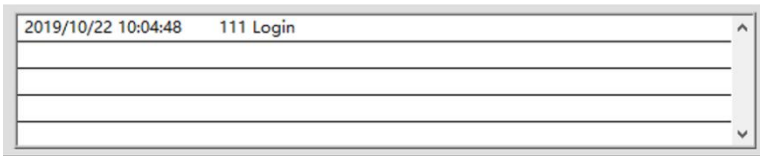
Life bar will show using percentage according to using time.



(Figure 5.2)

(2)Log Database (Figure 5.3)

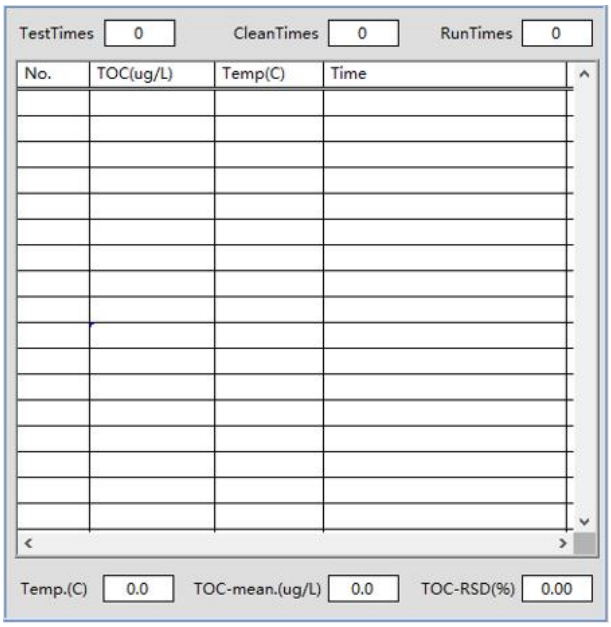
It will show operations and alarm information. All the information in the log will be recorded in log database.



(Figure 5.3)

(3)Data Column (Figure 5.4)

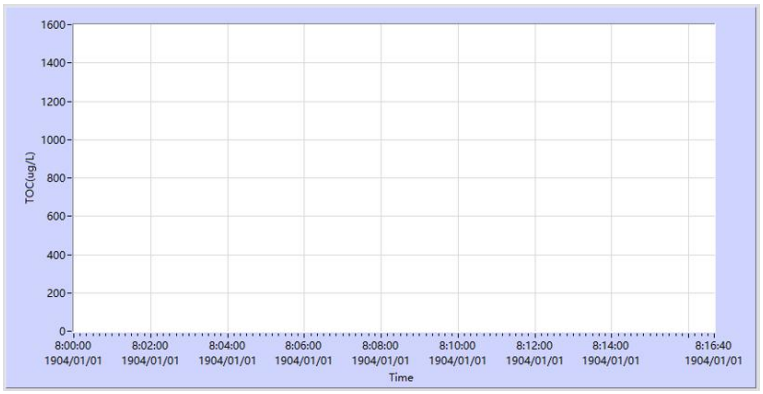
TOC of current testing samples will be shown in the table.



(Figure 5.4)

(4)Run Graph(Figure 5.5)

When measuring samples, TOC concentration will show as graph in real-time; Alarm limit will show in red graph. When TOC concentration of samples exceed alarm limit, the instrument will beep for warning.



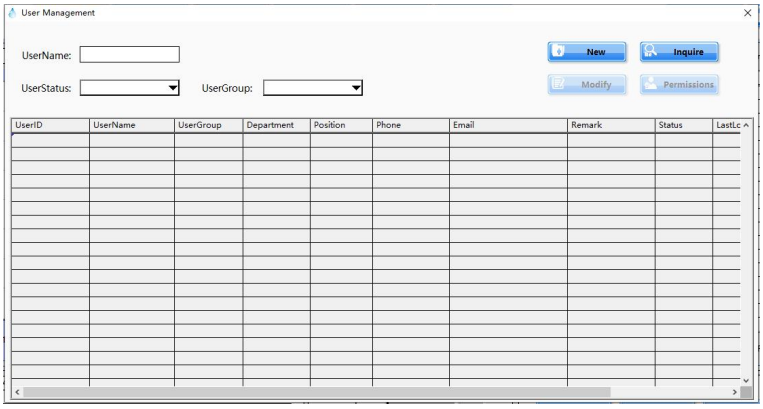
(Figure 5.5)

5.2 Management Interface

5.2.1 User Management Interface

Click 

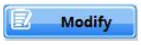
to enter user management interface (Figure 5.6).



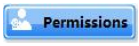
(Figure 5.6)

User can input "User Name"、"User Status"、"User Group" information and click inquire to check user information.

：Click to enter set up new user interface.



：Click to enter user information modification interface.



：Click to user permission interface.

：Inquire user information and all qualified information will displayed in list table.

5.2.1.1 New User Registration and Modification

New User Registration

1)Click 

on user management interface to enter " User information registration and modification" interface (Figure 5.7).

2)Input "User ID"、"User Name"、"Password".

3)Click 

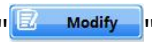
after filling in the information, and a prompt will appear and show "Successful operation！ " to confirm that the registration is successful.

4)Click " back" and newly registered user information will show in the list automatically.

User Information Modification

1)Input "User Name"、"User Status"、"User Group " information and click 

, all qualified user information will display in the list.

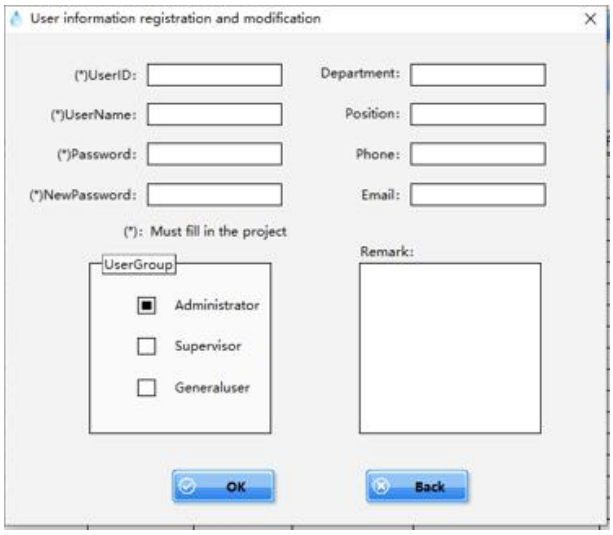
2)Choose user information that needs to be modified in the list and click" 

"to enter interface shown as "Figure 5.7.

3)Information modification.

4)Click Ok after information modification finished, and a prompt will appear and show "Operation Successfully" to confirm that the modification is successful.

5)Click" Back" and new modified user information will show in the user management interface.



(Figure 5.7)

Note：

(1)Admin shall pay attention to user group when registering a new user, different user group has different operation authority.

(2)When registering/modifying user information, information marked with(*) is necessary.

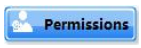
(3)User information modification requires authorization.

(4)Users that haven't registered in this interface will not be able to use this software.

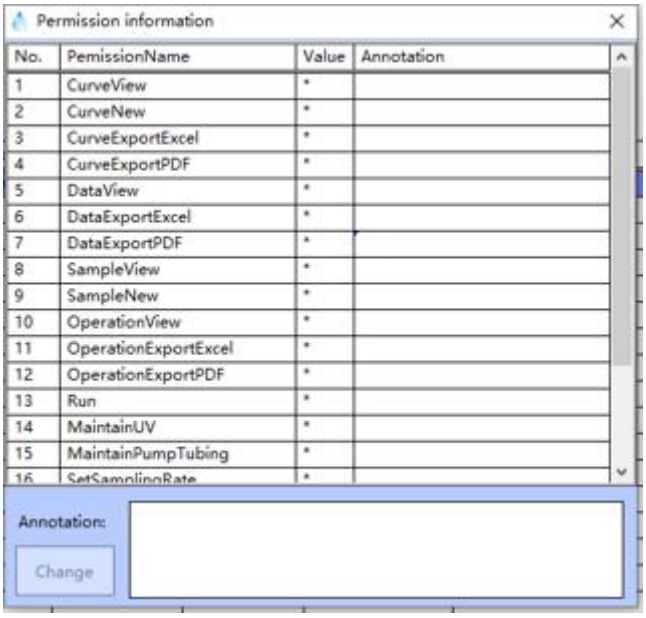
5.2.1.2 Permission Information Interface

1) Input "User ID"、"User Status"、"User Group" information and click 

,all qualified information will display in the list.

2) Double click user information in the list, and click 

to enter "Permission Information" interface (Figure 5.8); Admin can change value in the list to modify permission.



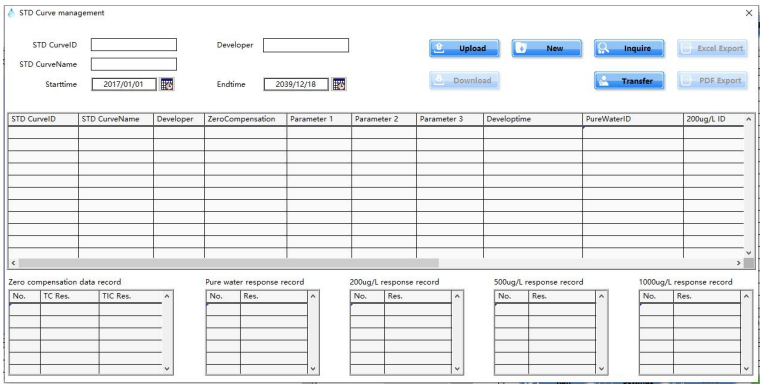
(Figure 5.8)

Note： Buttons with gray means that no permission for this operation(Figure 5.8). "Value" column will show"X"； Admin can open or close permission according to user requirements.

5.2.2 Standard Curve Management Interface

Click 

on the main interface to enter standard curve management interface(Figure 5.9).



(Figure 5.9)

Input "Std Curve ID"、"Std Curve Name"、"Developer"、"Starttime"、"Endtime" choose "Inquire " to check standard curve information.

：Export chosen standard curve data in the list in Excel format.

：Export chosen standard curve data in the list in PDF format.

：Click to enter new standard curve setting up interface.

：Inquire standard curve by information and all qualified information will display in the standard curve list.

：Load chosen standard curve in the list.

：Upload current standard curve from TOC instrument programming.

：Write down chosen standard curve data into instrument programming.

The procedure for setting up new standard curve and loading standard curve has been demonstrated in Chapter 4.3.2. For detailed operation, please refer to above chapter.

Excel/PDF Export Standard Curve

1)Click 

to input inquire information and all qualified information will display in the list.

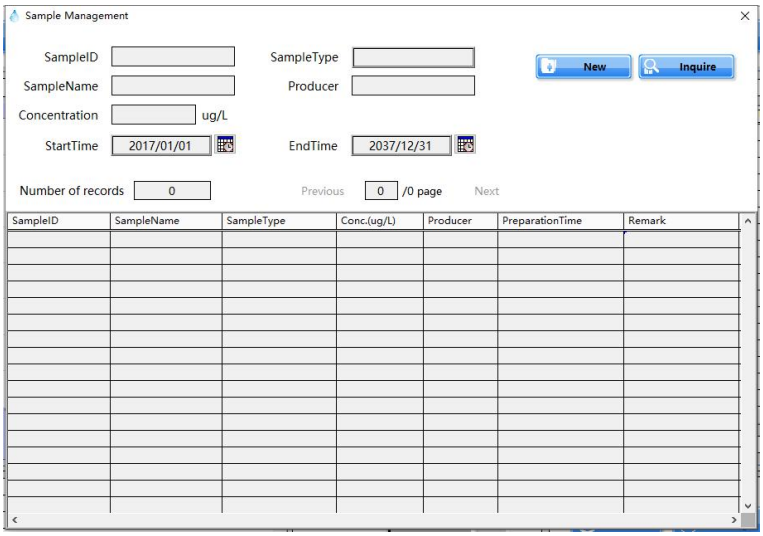
2)Click standard curve that needs to be exported.

3)Click Excel Export / PDF Export to export standard curve data.

Note：Standard Curve setup and export operation will be recorded in the log.

5.2.3 Sample Management Interface

Click Sample on the main interface to enter sample management interface (Figure 5.10).



(Figure 5.10)

Input "Sample ID"、"Sample Name"、"Concentration"、"Sample Type"、"Producer"、"StartTime"、"Endtime" information and click "inquire " to check sample information.

New：Click to enter Sample Registration interface.

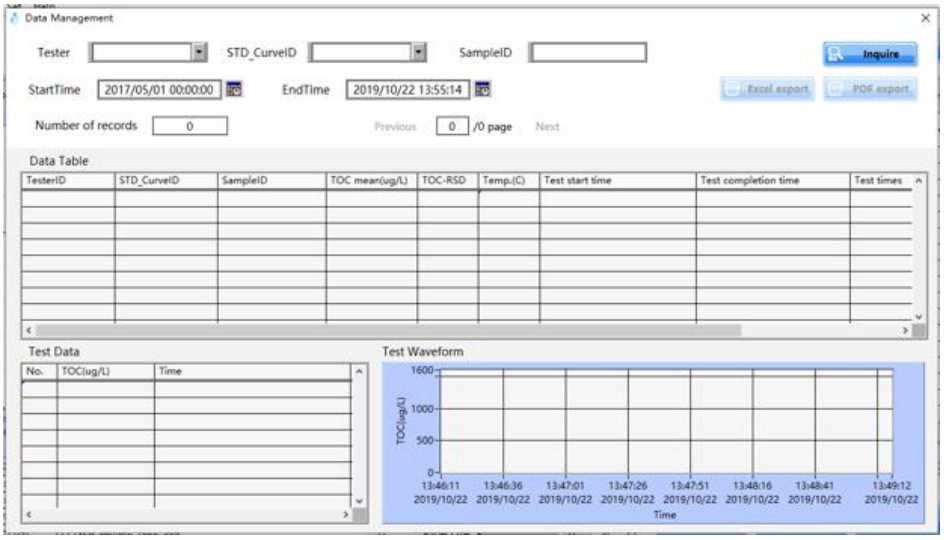
Inquire：Click to inquire sample information and all qualified sample information will display in the list.

Note：Sample registration procedure has been demonstrated in Chapter 4, please refer to that chapter for detailed information.

Sample registration and inquiry operation will be recorded in the log.

5.2.4 Data Management Interface

Click Data to enter data management interface (Figure 5.11).



(Figure 5.11)

Input "Tester"、"Std. Curve ID"、"Sample ID"、"Starttime"、"Endtime" and click "Inquire" to check test data.

：Click to inquire information and all qualified information will display in the list.

：Export chosen data report in Excel format.

：Export chosen data report in PDF format.

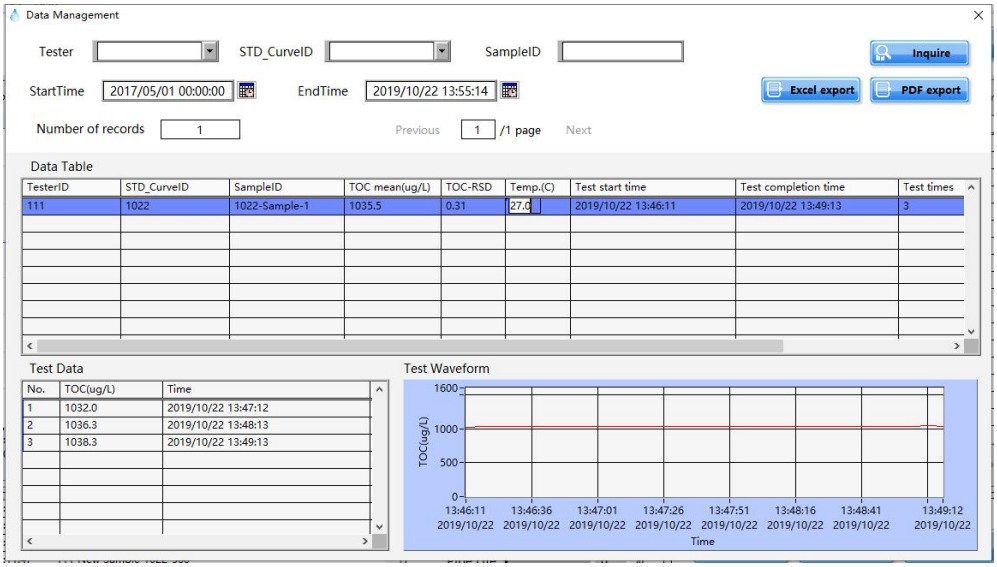
Note：User can set "waveform start" and "waveform end" time in online mode and check sample TOC graph during setting time to monitor the changes of sample TOC concentration.

Data Inquire

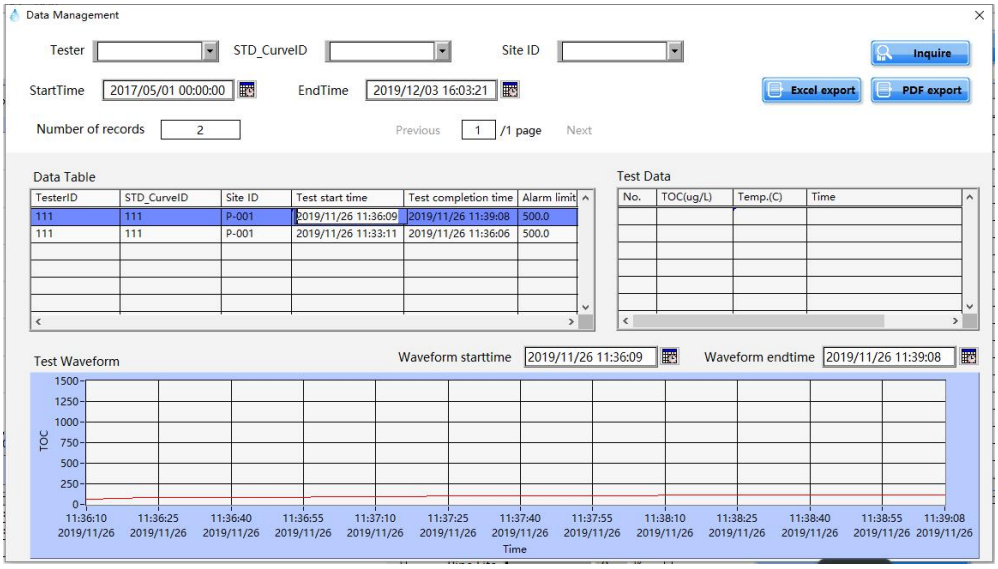
Input inquire requirements and click 

to search all the qualified data records. All the records will display in the list. "Numbers of Records" will show numbers of all qualified data. User can check all records by clicking "Previous" and "Next" , or input page number to check.

Click one record in the list, and the test records and graph will show in the table. Offline data inquire(Figure 5.12)； Online data inquire (Figure 5.13).



(Figure 5.12)



(Figure 5.13)

Data Export

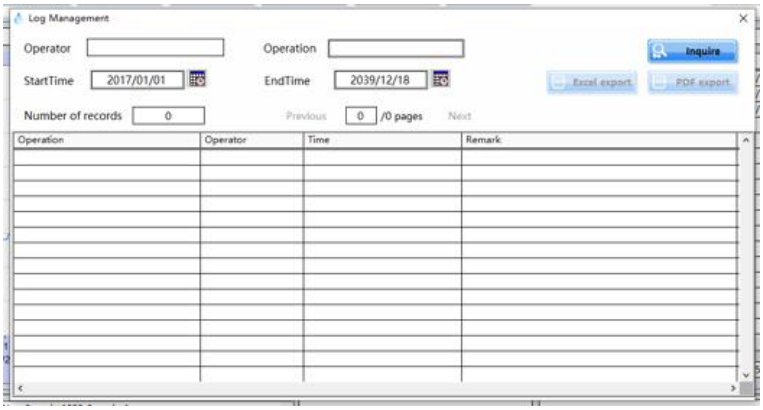
1)Refer to "Data Inquire" step to inquire data.

2)Double click data that needs to be exported in the list.

3)Click Excel export / PDF export to save.

5.2.5 Log Management Interface

Click Log to enter log management interface (Figure 5.14).



(Figure 5.14)

User can input "Operator"、"Operation"、"StartTime"、"Endtime" information and Click "Inquire" to check log data.

Inquire：Inquiry log file, and all qualified data will display in the list.

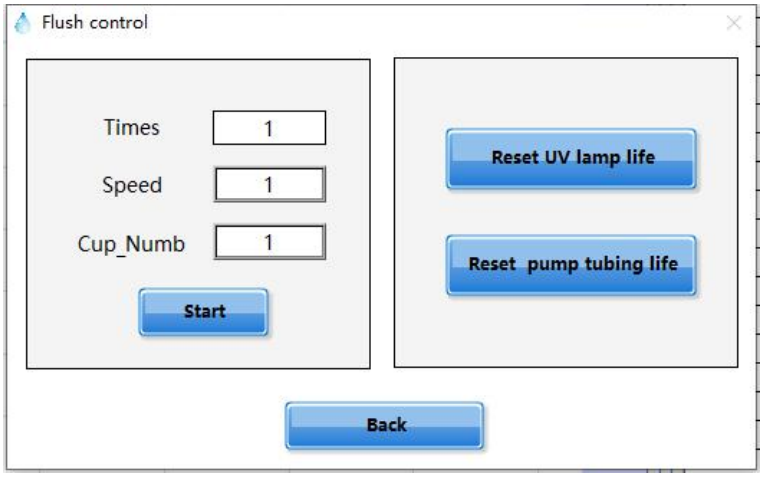
Excel export：export log file in excel format.

PDF export：export log file in PDF format.

Note： Data in the log cannot be deleted or modified, it contains most operation records of the user.

5.2.6 Maintenance Interface

Click Maintain in offline+auto-sampler mode to enter Maintenance management interface (Figure 5.15).



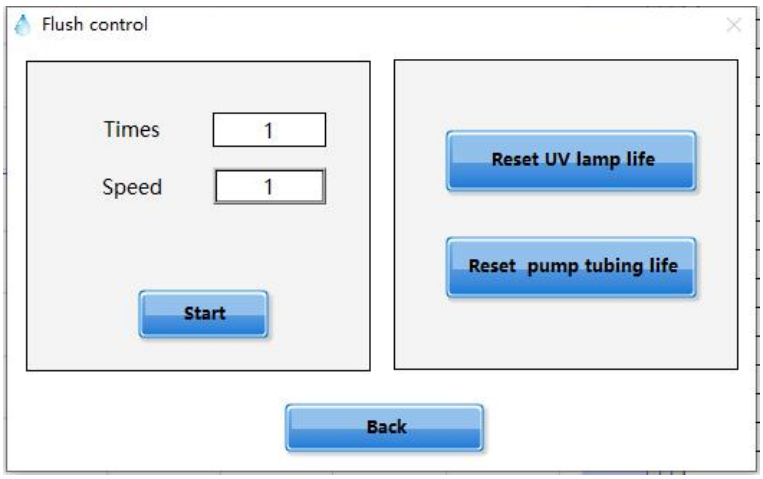
(Figure 5.15)

User can set "Times"、"Speed"和" Cup Number " and click 

to start clean. One time cleaning takes around 1 minute.

Click 

at both offline and one line mode to enter flush control interface.(Figure 5.16).



(Figure 5.16)

User can set "Flush times" and "flush speed"， click 

to start clean, it takes one minute to clean.

：After changing UV lamp. Please reset UV lamp life.

：After changing pump, please reset pump tubing life.

Chapter 6 Troubleshooting

6.1 Troubleshooting

No.	Trouble	Cause	Troubleshooting
1	No display when switching on the power.	1) The fuse is burned. 2) Power disconnection.	1) Change the fuse. 2) Check the power supply and power cord, make sure that the power supply is OK and the power cord is connected well.
2	Unstable readings (the two times reading of the same water sample varies widely), or big errors.	1) Bubbles in the conductivity cell. 2) Sample tube blocked.	1) Inhale some air into the sample tube, and eliminate the little bubble together with the large bubble. 2) Check the sample tube and clean with purified water.
3	Values are too low	UV Lamp exhaustion.	Replace a new UV Lamp.
4	Touch screen no response	System halted.	Restart the instrument
5	Buzzer Alarm	1) Reading out of range. 2) Parameter setting exceeding alarm value. 3) Circuits failure.	1) Check the water sample. 2) Reset the parameter. 3) Seek for professional maintenance.
6	Abnormal sampling, abnormal waste liquid draining	1) Pipeline blocked. 2) Peristaltic pump tube damaged.	1) Check the sample tube and waste liquid tube. 2) Change the peristaltic pump tube.

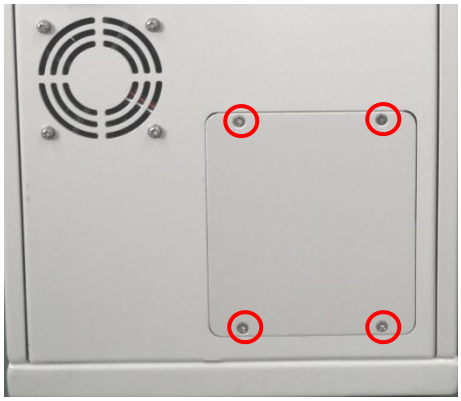
6.2Replace Supplies

6.2.1 Replace the UV Lamp

The service life of the UV lamp is 5000 hours. Please replace the lamp in time.

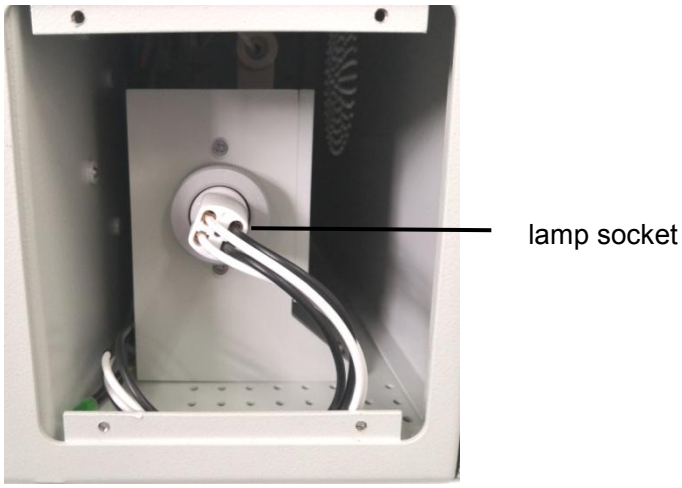
Following are the steps of lamp replacement:

1) Remove the rear plate of the instrument (Figure 6.1).



(Figure 6.1)

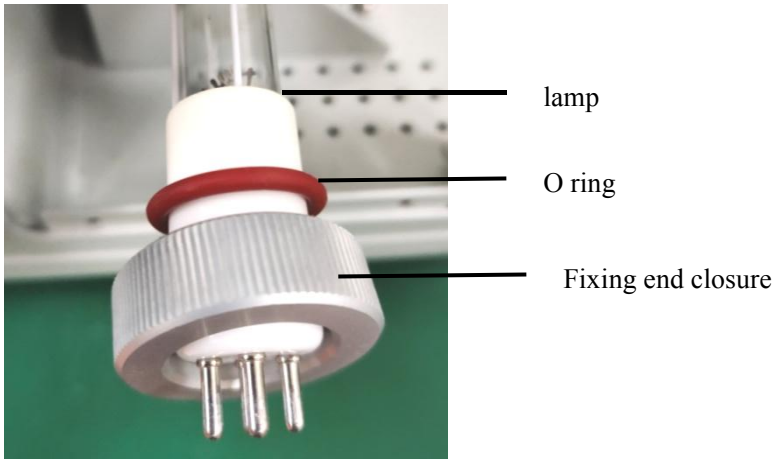
2) Pull out the lamp socket (Figure 6.2)(Figure 6.3).



(Figure 6.2)

(Figure 6.3)

3) Detach the fixing end closure, O ring, and UV lamp successively (Figure 6.4).



(Figure 6.4)

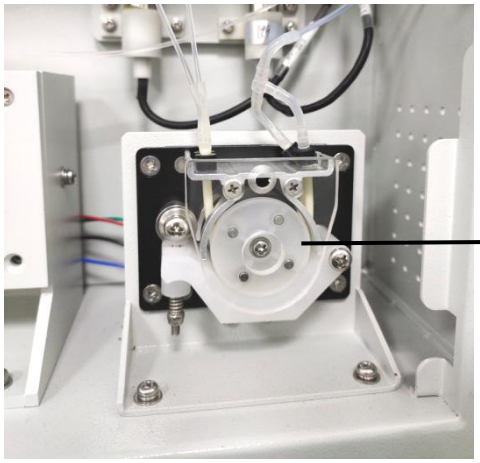
4) Replace with a new lamp, and reassemble the parts again.

6.2.2 Replace the Peristaltic Pump Tube

The service life of the peristaltic pump tube is 5000 hours. Please replace the tube in time.

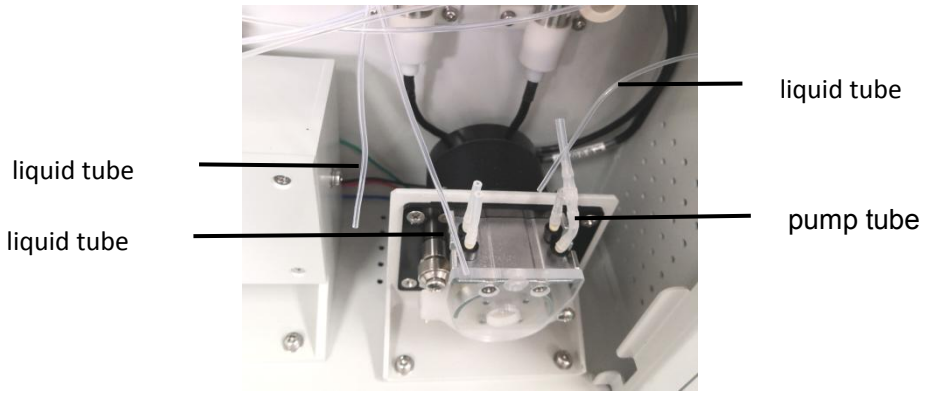
Following are the steps of peristaltic pump tube replacement:

1) Remove the left plate of the instrument, and find the peristaltic pump in the lower right corner (Figure 6.5).



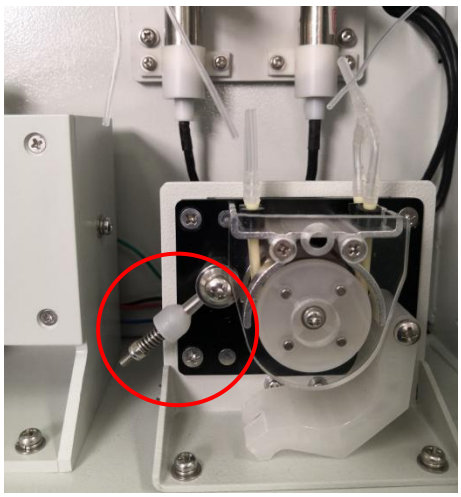
(Figure 6.5)

2) Remove the liquid tube from the pump tube (Figure 6.6).



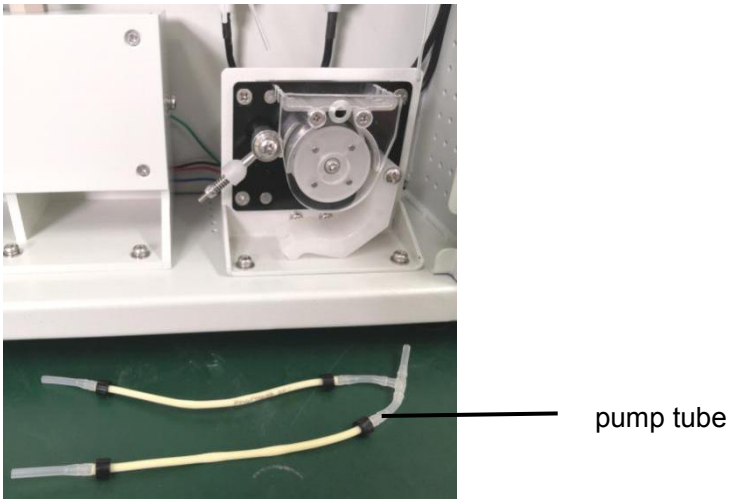
(Figure 6.6)

3) Remove the pressure valve of the peristaltic pump (Figure 6.7).



(Figure 6.7)

4) Replace the pump tube and close the pressure valve, then fix the left plate to complete the replacement. (Figure 6.8).



(Figure 6.8)

Chapter 7 Maintenance

7.1 Consumables Replacement

User can buy the UV lamp and peristaltic pump tube from our company. The UV lamp is a dual wavelength UV Lamp with wavelengths of 185nm and 254nm. The peristaltic pump tube is specialized and wear-resistant with good quality and stability.

In following table, a reference for service lives of the consumables is listed.

Spare Parts	Service Life
UV Lamp	5000 hours
Peristaltic Pump Tube	5000 hours

The service life of each spare part is automatically calculated by the software of the instrument.

It starts timing when switching on the power, and stops timing when switching off the power, that ensures accurate running time of each consumable.

For replacements of the UV lamp and the peristaltic pump tube, please refer to chapter6.2.1 and chapter 6.2.2.

7.2Notes

(1) A syringe filter is necessary when the water sample contains insoluble particles, and the membrane pore should be less than 60μm.

(2) Water samples with much too high TOC concentration (>1000ppb) are not suitable to measure. And water samples with strong acid, alkali or high salt are forbidden (Conductivity>5.1uS/cm). For them might cause damage to the instrument.

(3) The sampling tube should be below the liquid level when sampling. The tube mouth should be at the bottom of the solution, and it should be kept in purified water after switching off the power. The liquid in the tube should be drained off if

user does not use the instrument for over 5 days, and use film to seal the tube mouth to avoid contamination.

(4) The detection will be affected once some bubble existing in the tube. Please use purified water to rinse the tube until the bubbles completely eliminated.

(5) If the waste liquid can't be drained from the tube when the instrument is running normally, that means there is something blocks the tube or some air in the tube. Check the tube and make sure it's unblocked.

(6) Please wait at least 3 minutes to switch on the power again after switching off the power.

(7) Please keep the package carefully so that it can be reused for well protection during shipping when the instrument needing return to service.

7.3Obligation

The obligation and the length of warranty period are determined by the contract terms. Any operation deviated from the manual guidance may cause damage and the warranty is limited. The damage of wearing parts and fragile parts caused by wrong operation is out of the obligation.