

SGW-731 Automatic Abbe Refractometer

Operation Instructions

Table of Contents

I. APPLICATIONS	2
II. SPECIFICATIONS	3
III. WORKING PRINCIPLES	4
IV. OPERATION INSTRUCTIONS	5
V. MAINTENANCE	16
VI. COMPLETE SET OF INSTRUMENT	17
VII. AFTER SALES SERVICE AND GUARANTEE.....	18
VIII. APPENDIX	19

I. Applications

The SGW-731 automatic Abbe refractometer can measure the mass fraction (Brix) of transparent, refractive index n_D and translucent liquid sucrose solution, glucose, F42 fructose syrup, and F55 fructose syrup, but also the solid content of juices, vegetables, soft drinks and canned products and user-defined polynomial measurement units. It has a thermostatic control function, using a sapphire prism. The color touch screen is user-friendly. It can perform automatic measurement, with fast speed and good reproducibility. It has the temperature correction, USB, U disk storage and printing functions (the printer is optional). The instrument is compact, built with a variety of industry standard and user-defined measurement units.

The Refractive index is an important optical constant of a substance, which facilitate to understand the optical properties of a substance. The instrument can measure a variety of solution mass fraction (Brix) (0-95%, equivalent to the refractive index of 1.333-1.531). Therefore instrument can be used in a wide range, including oil industry, oil and fat industry, pharmaceutical industry, paints industry, food industry, daily chemical industry, sugar industry , geological survey and other relevant factories, schools and scientific research organizations.

II. Specifications

Measurement range (n_D): 1.30000-1.70000

Indicator error (n_D): ± 0.0002

Resolution(n_D): 0.00001

Reading range of sucrose solution mass fraction (Brix): 0-100%

Error (Brix): $\pm 0.1\%$

Resolution (Brix): 0.01%

Temperature display range: 0-90°C

Weight: 4KG

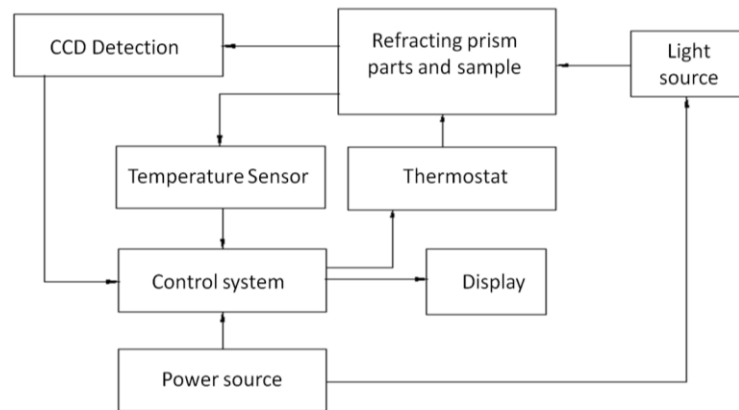
Dimensions: 345mm×245mm×165mm

Power supply: 220V~240V, 50Hz \pm 1Hz

Output interface: RS232, USB, U drive

III. Working Principles

1. Schematic Diagram of Principles



2. Working Principles

The automatic Abbe refractometer performs the measurement of transparent or translucent substance following the principle of measuring the refractive index of the critical angle. The line array CCD is used for detecting the image, which is sent to the computer system for data processing to determine the line dividing the brightness and darkness, that is, the position of the critical angle. Then figures show the refractive index or Brix of the test sample.

IV. Operation Instructions

1. Instrument Interface Overview

Before turning on the instrument, make sure the prism surface is clean and the shell is covered well. Figure 1 is the screen after the power is turned on. Click the center of the screen, and the instrument starts preheating, as shown in Figure 2.



Figure 1



Figure 2

Caution! If the glass surface of the test dish is not fully cleaned before powering on, it will cause measurement errors! If the test dish contains liquid, the machine will prompt warning, as shown in Figure 3 and 4.

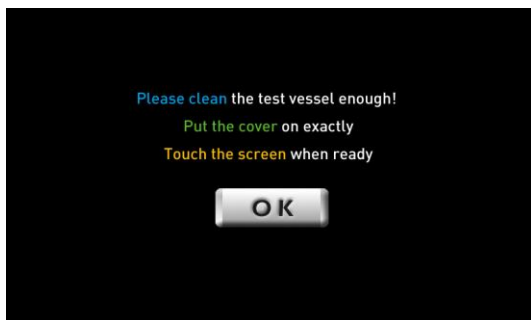


Figure 3

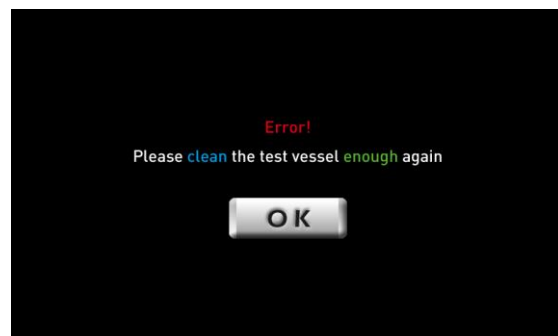


Figure 4

If the instrument is finished with preheating, it enters waiting page, as shown in Figure 5.

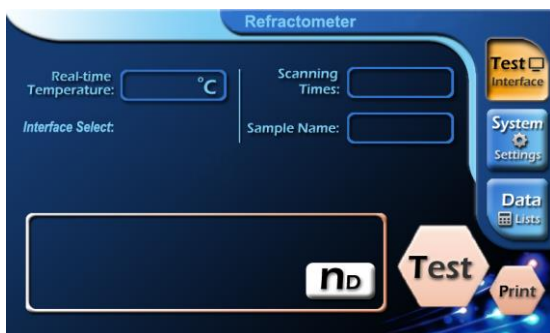


Figure 5



Figure 6

Press "Test" key to enter test page, and see Figure 6. When the test is complete, see Figure 7.



Figure 7



Figure 8 (Edit scan times)

As shown in Figure 5, on the test page, press "scan times", and "sample name", and the corresponding settings can be entered. See Figure 8, Figure 9.

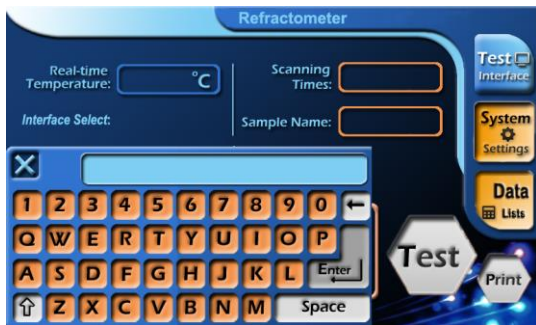


Figure 9 (Enter scan times)

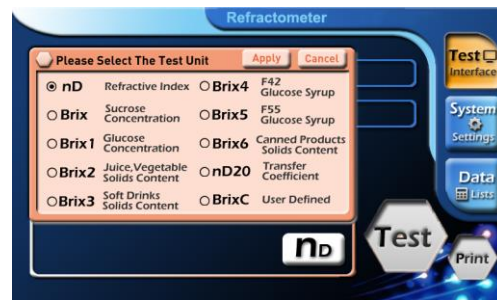


Figure 10

There are more than 10 display parameter options, for example, under the display of nD to modify: press "nD" and Figure 10 page will appear.

(1) Press nD, Brix, Brix1, Brix2, Brix3, Brix4, Brix5 or Brix6, the corresponding display option will be displayed. See Figure 10, Figure 11, Figure 12, Figure 13, Figure 14, Figure 15, Figure 16 and Figure 17.

3

(2) If BrixC and nD20 is selected, user can enter customized coefficient. See Figure 18 and Figure 19.

(3) When the selection is complete, press "Apply" to confirm. See Figure 20 and Figure 21, Figure 22, Figure 23, Figure 24, Figure 25, Figure 26, Figure 27, Figure 28.

(4) Press "Cancel" to cancel the selection, and the system restores the original selections.

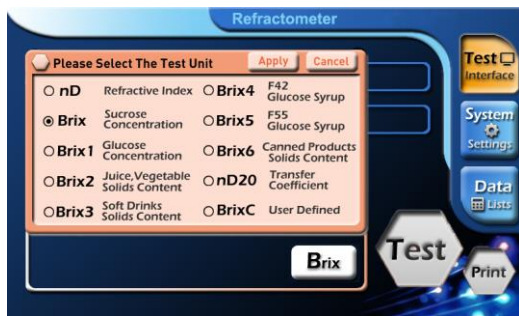


Figure 11

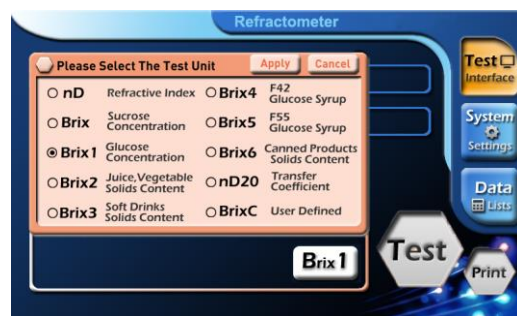


Figure 12

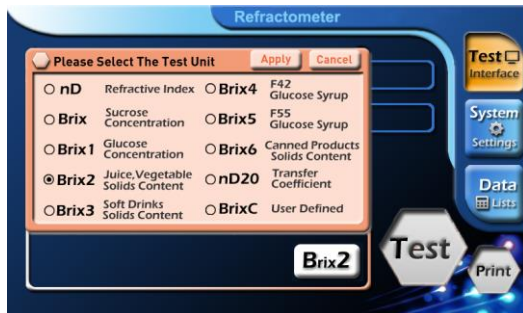


Figure 13

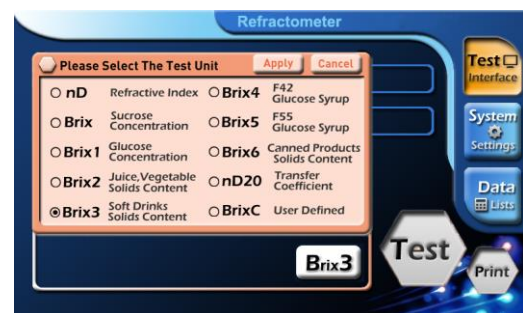


Figure 14

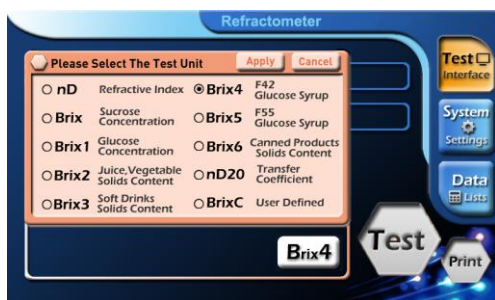


Figure 15

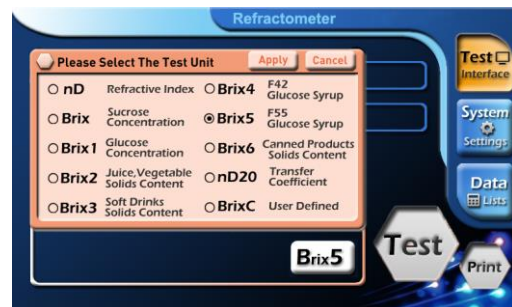


Figure 16

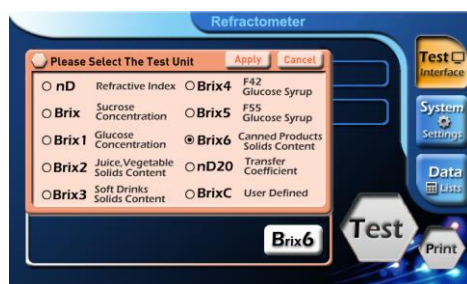


Figure 17

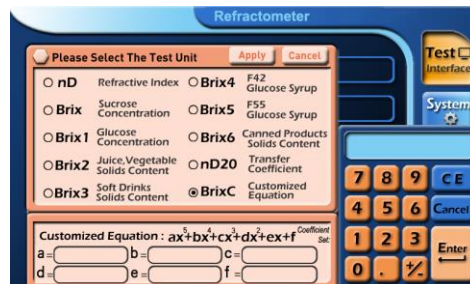


Figure 18

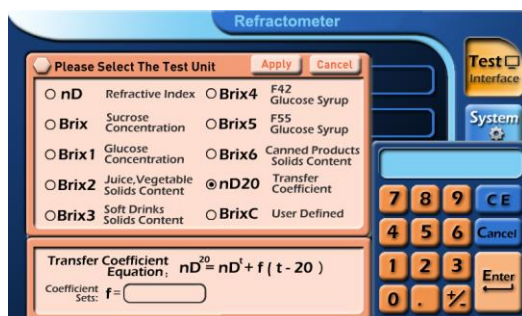


Figure 19



Figure 20

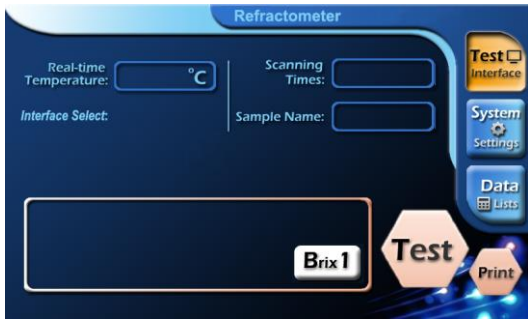


Figure 21

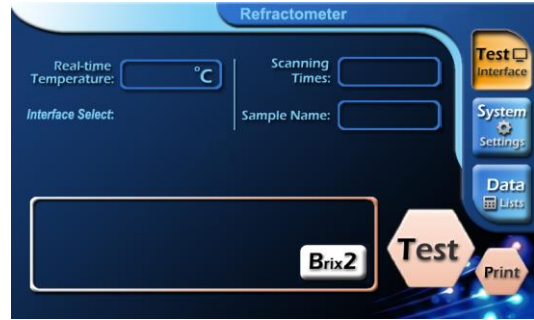


Figure 22

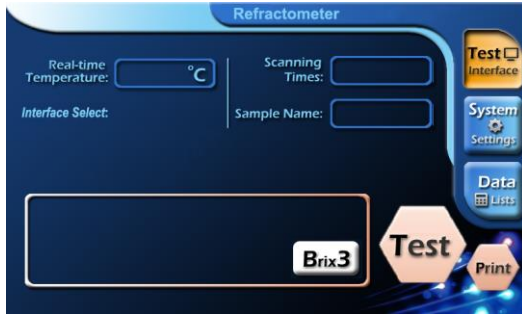


Figure 23

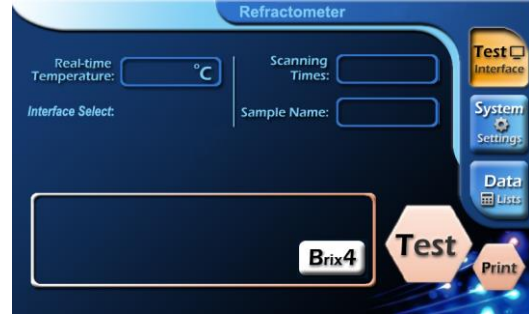


Figure 24

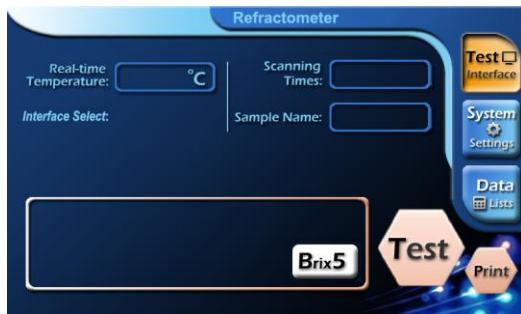


Figure 25

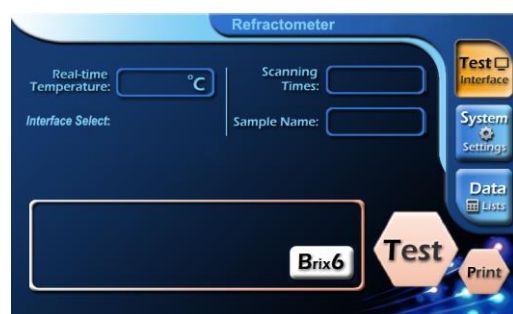


Figure 26

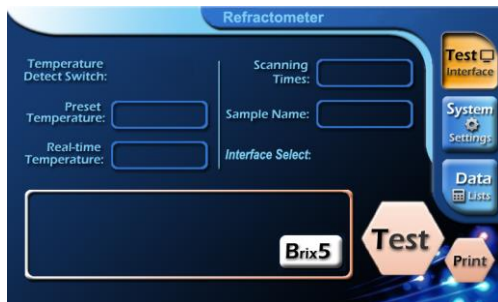


Figure 27

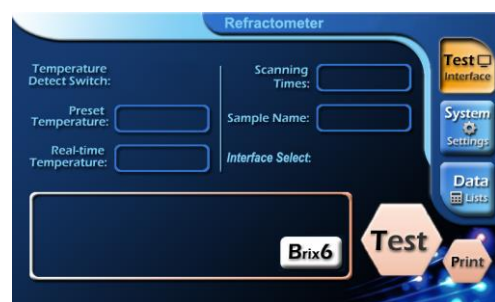


Figure 28

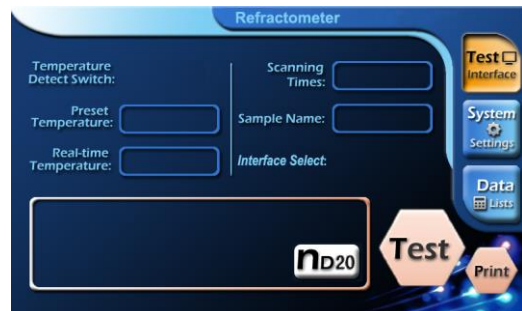
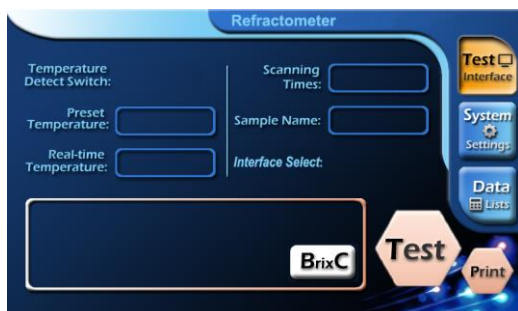


Figure 29

Figure 30

When user press "Test" key and sample is absent, the system will alert, see Figure 31. If the sample exceeds the measurement range, the system will also alert, see Figure 32.

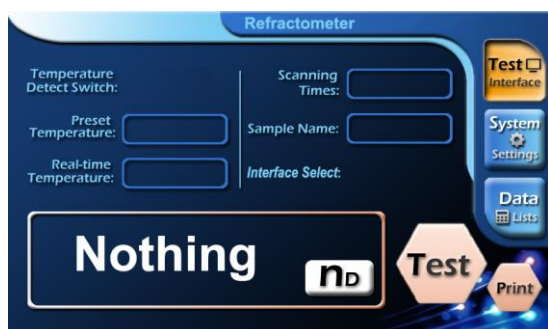


Figure 31

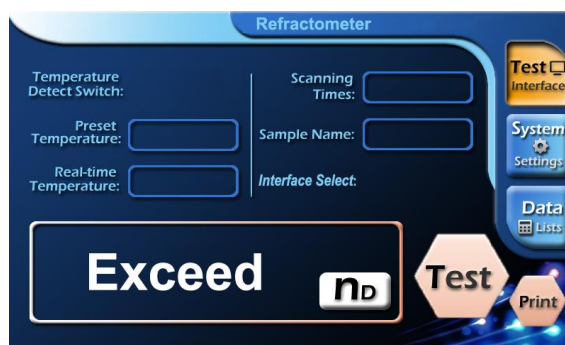


Figure 32

In order to ensure the accuracy of the sample, when the ambient temperature change exceeds 2°C, instrument will alert, see Figure 33 and Figure 34. Press the "OK" button, the instrument returns to the System Settings page. System Settings page can be seen in Figure 35. When user wishes to return to the purchase state, press "Restore Factory Settings" button, see Figure 36. Press "YES" to confirm the restore factory settings; press "NO" to abort restore the factory settings.

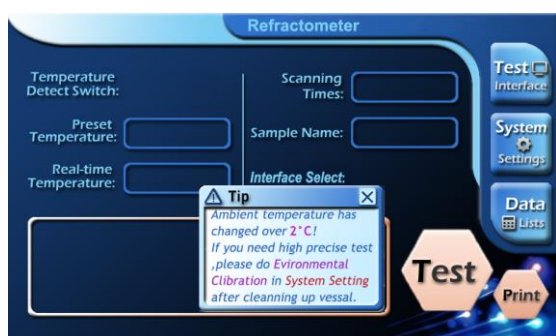


Figure 33

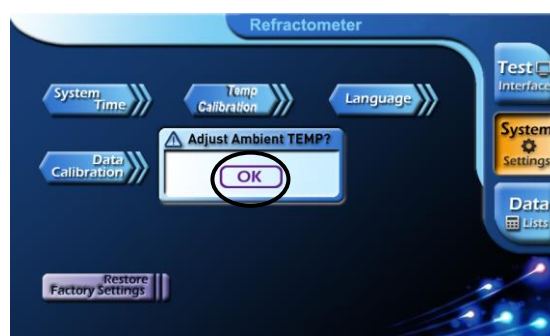


Figure 34



Figure 35

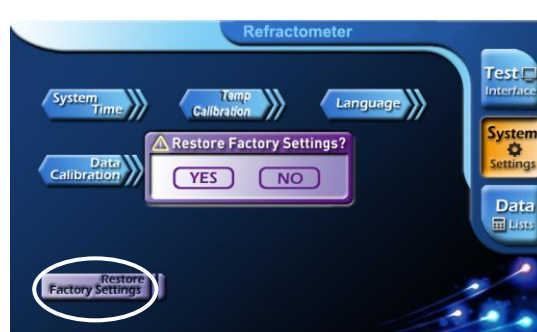


Figure 36

To modify the system time, press the "System Time" button, see Figure 37. Enter the time in the page shown in Figure 37.



Figure 37



Figure 38

Press the "environmental correction" button, the instrument returns to the start state. According to their own standard sample, users can press the "Data Calibration" button to calibrate data, see Figure 38.

- (1) Data calibration: first, place the sample to be calibrated; then enter the page shown in Figure 39, click the standard value column, and it appears a keyboard. Enter your standard value in the standard value field; press the "Apply" button to confirm.
- (2) Before the instrument left the factory, it was calibrated with standard samples and inspected qualified. It is not recommended for users to use this function.
- (3) If the instrument is abnormal after the user used this function, press "Restore Factory Settings" button to restore the factory settings.



Figure 39

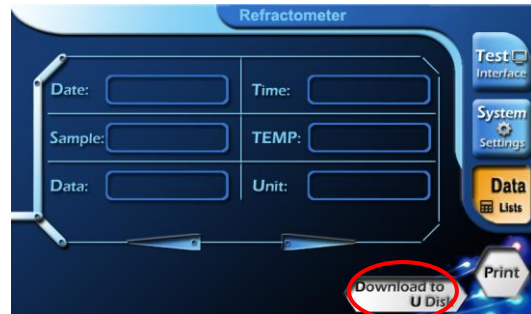


Figure 40

Data list: See Figure 40. Press "U disk download" button to save the data to U disk, see Figure 41.

If the saved file already exists, it will ask whether to overwrite, see Figure 42. Press "YES" to confirm, or "NO" to quit.

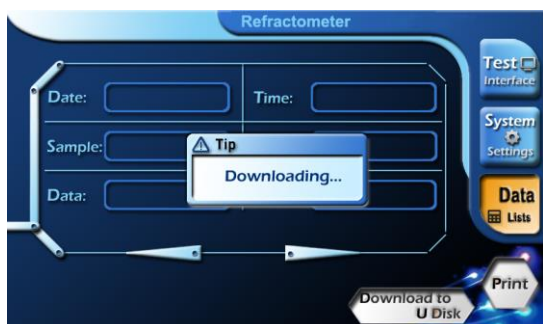


Figure 41

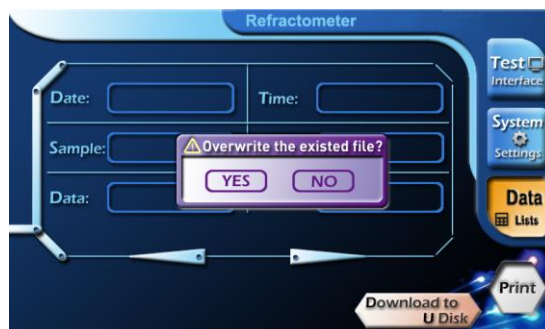


Figure 42

When the download is complete, it will ask whether to clear the history, see Figure 43. Press "YES" to confirm, or "NO" to quit.

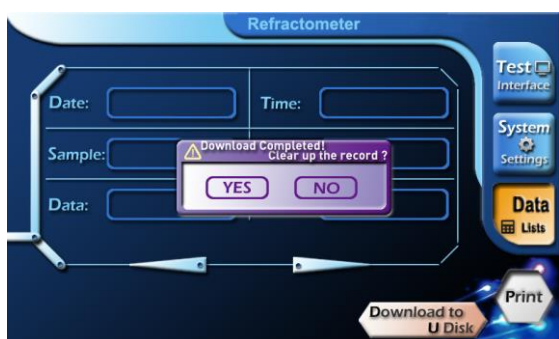


Figure 43

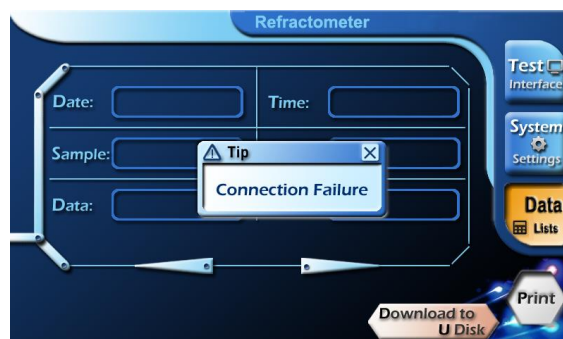


Figure 44

When U disk is not inserted or other reasons causing U disk connection failure, the instrument will alert, see Figure 44.

2. Thermostatic Control Setting Method

First, click the corresponding rectangle of the temperature to be set, it turns yellow as shown in Figure 45, then click the yellow rectangle and it appears the page as shown in Figure 46. Enter the desired temperature values. After pressing Enter, press test monitoring key to return to the measurement page, as shown in Figure 47. Press the corresponding rectangle of the thermostat switches, switching "off" to "on", as shown in Figure 48. It indicates that the thermostat switch is turned on. After the real-time temperature reaches the set temperature, it can perform the required measurement.

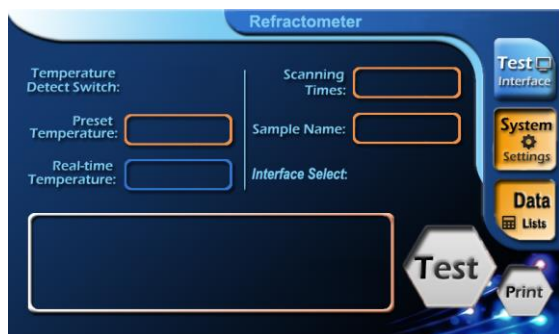


Figure 45



Figure 46

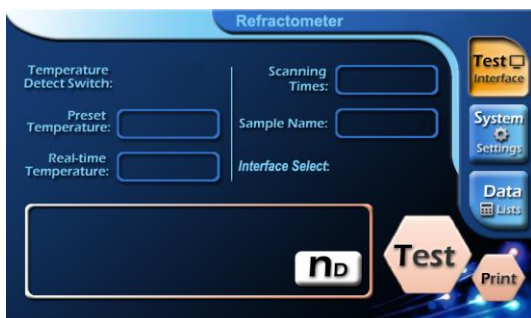


Figure 47

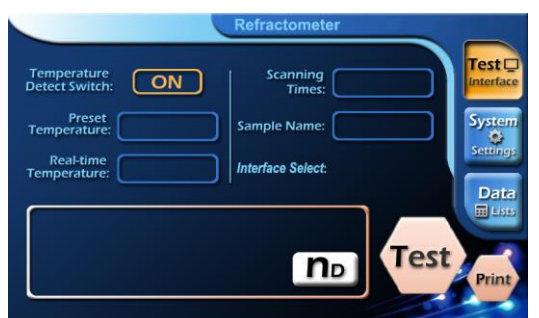


Figure 48

3. Measurement Methods

- (1) Under room temperature: Open the shell, pour into the liquid to be measured, and reach a depth of 3 to 5 mm or more, and then cover the shell, it can be measured. Press test button, the refractive index of the liquid or percentage of sugar solution can be read from the display area.

Note: Before measuring any sample, the glass surface of sample pool should be wiped clean. If there is residual from the previous sample, the measurement accuracy will be affected.

- (2) Under constant temperature: first, users must wait for the temperature reaching the set value, otherwise, it can't be accurately measured. **If measuring below the set temperature, there might be condensate mist on the prism surface. It should be wiped clean before measuring, otherwise it will affect the measurement accuracy!** When the instrument reaches the set temperature, open the shell, drop the liquid to be measured until the depth reaches 3 to 5 mm or more, and then cover the shell. Wait for a period of time (1 to 3 minutes) until the liquid temperature control and instrument's temperature control are balanced, then conduct measurement. Press

test button, the refractive index of the liquid or percentage of sugar solution can be read from the display area.

Before measuring any sample, the glass surface of sample pool should be wiped clean. If there is residual from the previous sample, the measurement accuracy will be affected. When measuring under the temperature control, if the sample has been placed for a little too long, due to the evaporation of liquid, the measurement accuracy will be affected.

NOTE: If the temperature of measured liquid and the instrument is unbalanced, there will be difference between the displayed temperature and the actual temperature of the liquid device. It's necessary to wait for reaching temperature balance, to ensure that the refractive index of liquid can be accurately measured at this temperature,.

4. Using Communication Software

(1) Establish communication between Instrument and PC:

Hereinafter, "PC" refers to personal computer installed windows XP operating system; "instrument" means the instrument.

Connection with a hardware-related considerations:

Hardware Connection Precautions:

- a) Before both PC and the instrument are turned on, USB communication cable should be safely connected;
- b) The appropriate hardware drivers must be installed on the host computer. First, direct the path to the CD provided by the factory, designate the "Driver" folder and run VCPDriver_V1.1_Setup.exe. After connecting the USB communication cable and turning on the power, the PC display shows " Found new hardware". Under the guidance of new hardware installation wizard, the PC automatically completes the installation. If it can't automatically complete the installation, select manual installation instead, that is, in a given path, find the driver, and direct the path to the CD provided by the factory, designate "Driver" folder, select stmcdc.inf, then click "Next" until the hardware driver installation is complete.

(2) Operation of Communication Software:

- a) Test results can be displayed on, stored in and printed by PC. The communication software must be installed. Installation methods: double-click "setup Figure" icon in the "SETUP" folder in user's CD.
- b) After the installation is double-clicked, it forms the "Figure" icon. The communication software will be started.
- c) Before transferring test data each time, users can enter relevant information (either in English or Chinese) in the lower middle part of the window.
- d) After the round of testing, press the "send" button to upload the test results, and the PC can generate a single-page sheet! The software can generate the maximum of 1,000 sheets.
- e) Buttons and Menu Commands:
 - a) After the communication port is selected, showing the "Accept" button and is grayed out. Only when the key is grayed out, the PC communication port is enabled and at wait state. So, when performing certain menu commands, the button is disabled, if there is a need to upload data, be sure to click on the button again, so that the gray-out state will change into wait state.
 - b) Be sure to connect and turn on the printer, and ensure the printing function is normal, then click "Print" button, otherwise it will lose all the uploaded data. If the command can be executed normally, it can print out all currently displayed data in exactly the same content and form. If you need to print another page form, click the pull-down button and call out the required forms, then print. Click "Printer Settings" from the drop-down submenu of "Preferences", you'll see two windows, select the horizontal or vertical printing, and the scale factor of zoom in or out (less than 1 or greater than 1).
 - c) Click "Save Figure and Exit", to save the currently displayed page sheet in the single-page Figure in the same form, and then exit. NOTE: Other page sheet will be abandoned.
 - d) Click "Open" button, this software can only open the saved * .dat format files. NOTE: when the command is executed, all data sheets which have been uploaded will immediately overwrite by the open data file.

- e) "Exit Without Save": without any operation, exit the software.
- f) Other commands and restrictions on the drop-down menu:
 - "Save Data": save all the uploaded data in the *.dat class file which are named by users, and clear all existing data sheets.
 - "Open File", "Save Figure Exit", "Print Results" and "Exit" four commands are exactly the same as the corresponding button in the window. See above relevant descriptions;
 - "Add Data": add all existing data of saved sheets to * .dat format files you specify, and right behind the current data!
 - "Export to Excel Exit": Export all the data of data sheets which has been uploaded, into the Excel spreadsheet files which were named by uses, and then exit.

V. Maintenance

To ensure the precision of the instrument and prevent damage, the following maintenance items are for your reference:

- (1) The instrument shall be operated in dry and ventilated room, away from water sources to avoid damp.
- (2) Before and after using instrument or replacing samples, the user must wipe the work surface of the sample cup on the refractometer.
- (3) When measuring corrosive liquids, it should be timely to do cleaning work, prevent erosion damage. The instrument must be cleaned after be operated.
- (4) The test sample should be free of rigid impurities. It is strictly prohibited to measure highly corrosive samples for the instrument.
- (5) The instrument should be kept clean and free of oil hand touches. If there is dust on the surface of optical prism, it should be wiped with advanced suede or long fiber cotton if available. If the surface is stained with grease, it should be wiped with alcohol ether mixture.
- (6) The plastic part of the instrument should be prevented from damages of corrosive samples.
- (7) The instrument should be covered with a plastic cover or placed in the box when it's not in use.
- (8) It's not allowed for users dismantle the instrument. In case of any operation failures, it should be promptly repaired.

VI. Complete set of Instrument

(see the Packing list)

VII. After Sales Service and Guarantee

- (1) We follow three guarantees for product(s): "repair, replace or return", i.e., repair or replace the defective products, or refund the original purchase price.
- (2) We provide twelve-month warranty from the date of invoice for product(s).
- (3) Our warranty does cover the damages caused by manual operations which fail to follow the instructions.

VIII. Appendix

Appendix-1 Method for Obtaining More Accurate Measurement Data

Because the refractive index of all kinds of liquid is related to temperature. if users can pay attention to the following aspects, it can help them get more accurate measurement data.

- (1) Before measuring the test sample, it should be placed with test device in the same indoor environment more than six hours (preferably overnight) to ensure the temperature of sample is identical to the room temperature. In this way, when the test sample was placed in the dish, it will not change due to temperature changes.
- (2) During the process of test, keep the room temperature, and make sure the temperature variation is less than 1°C. If the temperature is higher than room temperature by two degrees when turning on the instrument, to ensure the measurement accuracy, restart the instrument after the test dish is carefully cleaned or press the ambient correct key.
- (3) If the sample is temporarily taken from the external, due to temperature difference, there must be a gradual process to room temperature. During this time, place the test sample on the dish, and the resulting data will be gradually increased or decreased. It is recommended that users delay to read the measured values, waiting for data to stabilize before making the value, then the data is more accurate.
- (4) For the more volatile liquid, the third approach above is inappropriate and should use the first method, and complete the test as soon as possible.
- (5) Under thermostatic control conditions, it's important to consider the condensation of water vapor from the air causing the sample to be measured to be diluted while cooling; while the temperature increasing, it's important to consider the evaporation of water on the measurement sample. Therefore, if the measurement time is too long, it will affect accuracy.
- (6) **Finally, to stress it again, before any one test, the test dish must be carefully cleaned, make sure the surface does not have any residual liquid, otherwise it will affect test accuracy!**

Appendix-2

The refractive index of distilled water

Temp °C	Refractive (n_D)	Temp °C	Refractive (n_D)	Temp °C	Refractive (n_D)
18	1.33316	23	1.33270	28	1.33217
19	1.33308	24	1.33260	29	1.33205
20	1.33299	25	1.33250	30	1.33193
21	1.33289	26	1.33239	31	1.33182
22	1.33280	27	1.33228	32	1.33170

11