Agilent 3200C Conductivity Meter
电导率仪

Operating Guide
用户手册

Agilent Technologies

Notices

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CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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Tools and Components needed for Installation

Agilent Technologies provides the following tools and accessories necessary for installation:

- Electrode Holder (G4389A)
- Conductivity Probe, for example, C5111 Conductivity Probe (5190-3994)
- Power Adaptor (5185-8389)
- Conductivity Diagnostic Tool (5185-8391)
- ATC Temperature Diagnostic Tool (5185-8390)

Installation of the 3200C Conductivity Meter

Open the 3200C Conductivity Meter shipping case. Remove the meter, electrode holder, and other accessories.

Installation of electrochemical probes

1 Place the electrode holder near the meter and move the arm into position. Use the thumbscrews shown in Figure 1 to secure the arm in place.

Thumbscrew

Thumbscrew

Cable tabs

Thumbscre

Electrode fixture

Thumbscrew

Base

Thumbscrew
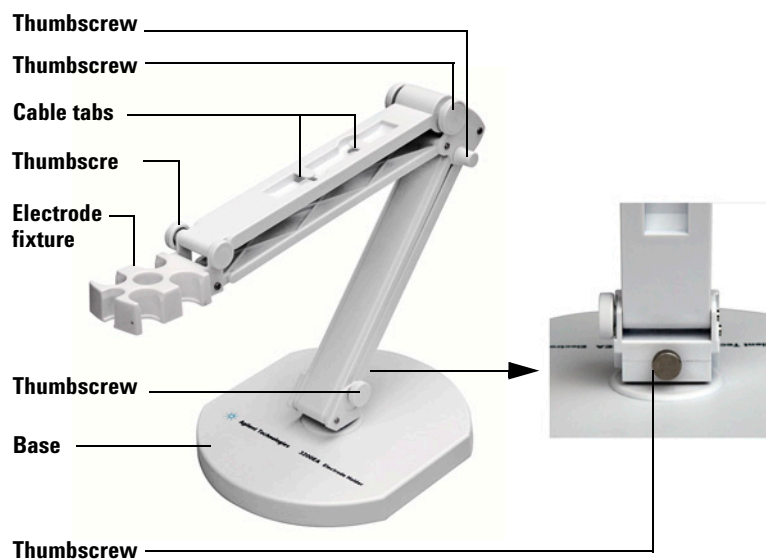
Figure 1   The electrode holder

2 Clip the conductivity probe and ATC probe into the electrode fixture shown in Figure 1.

3 Route the electrode cable as shown Figure 2.

Probes

Meter
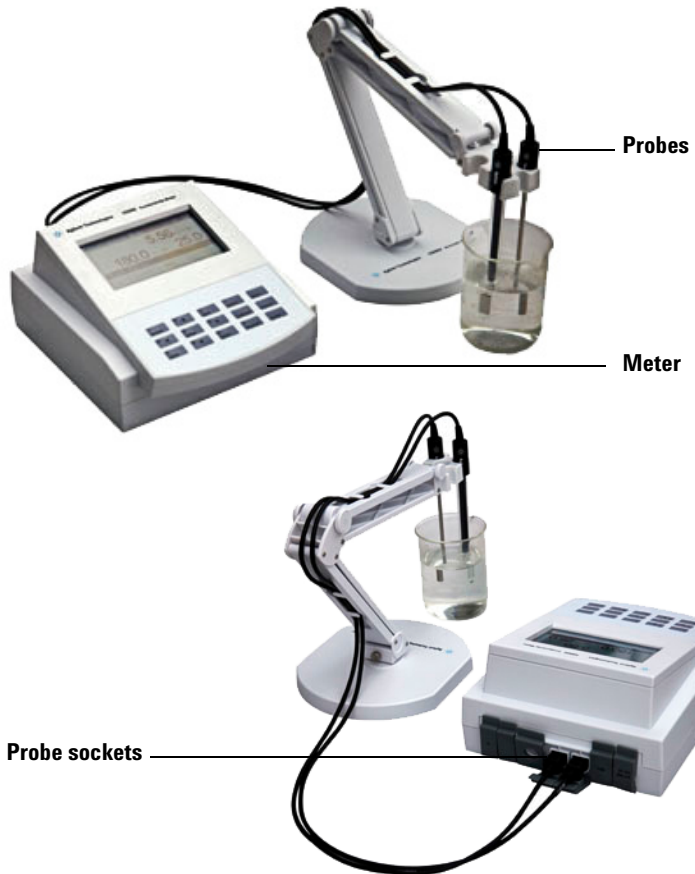
Probe sockets

Figure 2   Installed meter and probes

4 Locate the conductivity and ATC probe sockets on the back of the meter. Plug the C5111 conductivity probe (5190-3994) connector and ATC probe (5190-3998) connector into the sockets on the rear of the meter. See Figure 3.

Ground

ATC probe socket

Conductivity probe socket

USB

Power (DC 9V 800mA)
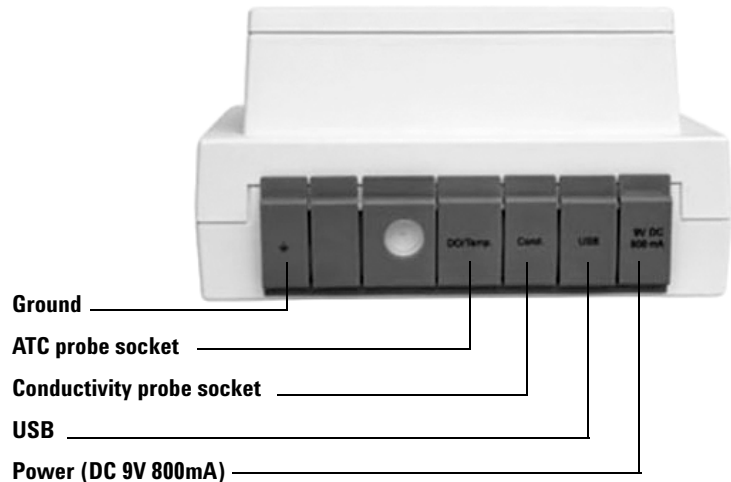
Figure 3   The back view of the 3200C Conductivity Meter

Installing the power adapter

A universal power adapter is included with the 3200C. The power adapter operates at 100–240 VAC, 1 A, 50/60 Hz. The output from the power adapter is 9 VDC 1 A.

CAUTION	Do not use any other power adapter with the 3200C.

1 The power adapter includes several outlet adapters. Choose the appropriate outlet adapter for the power outlets in your country.

2 Slide the outlet adapter on to the two metal prongs on the power adapter. A click will be heard when the plug is properly engaged. See Figure 4.

Figure 4   Assembling the power adapter

3 Connect the power adapter cord to the power socket on the back of the meter. See Figure 3 on page 11.

Installing the ground line

The meter provides a ground line, but it is not necessary to install it during measurement. Sometimes, equipment such as a constant temperature bath can be a source of interference, leading to unstable readings. In order to shield from an electromagnetic field, the ground line must be installed to avoid electrical leaking. To shield the wire, connect one terminal with the meter, and the other terminal with the source of interference.

2
Operation

This section describes the operation of the 3200C Conductivity Meter. There are five major steps to measure conductivity with the meter:

- Meter setup ("Setup" on page 24)
- Prepare the conductivity probe ("Prepare Probes" on page 35)
- Set or calibrate the cell constant ("Calibrate" on page 36)
- Set the temperature coefficient ("Temperature Coefficient (Set Temp Coef)" on page 42)
- Measure conductivity ("Perform a Measurement" on page 43)

In each phase of operation, the LCD displays the current state of the meter.

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Introduction

Where to Find Information

This document describes how to install, operate, maintain, and troubleshoot the 3200C Conductivity Meter.

Before operating your meter, be sure to read the meter installation and operation information.

Agilent customer portal

Agilent also provides customized information for the products you own through a customer portal. This web service provides many customizable services as well as information related directly to your Agilent products and orders. Log onto the portal at **http://www.agilent.com/chem**.

Definition of Terms

Cell constant

The cell constant of a pair of platinum sheets is the ratio of distance between the two sheets to the area of each sheet. The ratio is measured in cm^{-1}.

TDS factor

The Total Dissolved Solids (TDS) factor is the factor to convert conductivity to TDS.

Temperature coefficient

The temperature coefficient is the % change of conductivity with temperature in %/°C.

R

R indicates the reading is stable and ready to be taken. During calibration, it means the data is stable and locked. Whether the reading is stable is determined by what you set in **Set Condition**.

Press **[Measure]** key to unlock. Before next point calibration, please unlock. During measurement, in auto-lock mode, it means the data is stable and locked. In the other two modes, it indicates the data is stable but not locked, press **[Measure]** key to unlock.

Proper Use

To avoid common safety issues:

• Ground the meter using the ground line connected to the back of the meter.

• The meter can be used continuously for a long time. After each measurement, soak the conductivity probe in distilled water. If an electrode is out of use for more than 6 hours, rinse and store it in a protective container.

• Improper positioning of the conductivity probe can result in abnormal measurements. When immersing the conductivity probe in a sample solution, place the conductivity probe in a location where the solution can flow freely around the probe.

| CAUTION | Do not expose to corrosive gas. Keep the sockets on the back of the meter clean and dry. Do not allow contact with acid, alkaline, or salt solutions. |

| CAUTION | Only use the power adapter included with the meter. |

Features

The Agilent 3200C Conductivity Meter is a state-of-the-art and customer-friendly benchtop analytical instrument, which is designed for highly accurate measurements of conductivity, resistivity, TDS, and salinity in aqueous solutions. It can also measure purity of water and the salinity (NaCl) of sea water in a desalination process. The meter can measure temperature and conductivity simultaneously.

3200C Conductivity Meter features include:

• Measurement of conductivity, resistivity, TDS, salinity, and temperature

• Auto temperature compensation, auto-calibration, auto-range, and auto-frequency switch over the entire measuring range

• User calibrated cell constants or TDS factors

• A clear dot-matrix LCD display

• GLP norm for conductivity, TDS, and salinity including recorded operator numbers, operation history, calibration data, and 800 sets of measurement data

• The ability to view, output, and delete stored data

• Three measuring modes to meet the needs of various users:
  • Continuous Mode
  • Timed Reading (Timed Reading Mode)
  • Auto-Lock Reading (Auto-Lock Reading Mode)

• Have stability prompt **R** for the operation

• USB PC connectivity with available communication software

• Power-off protection. When the meter is manually or automatically shut off, the stored measuring data, calibration data, and setting parameters will not be lost

• Support the annual check prompt function

• A back-lit design that can be used to take measurements in a dark environment

• A durable key pad

Specifications

Measuring range	
Conductivity	0.000 µS/cm–2000 mS/cm
Resistivity	5.00 Ωcm–100.0 MΩcm
TDS	0.000 mg/L–1000 g/L
Salinity	0.00–80.0ppt
Temperature	-5.0–110.0 °C
Accuracy	
Temperature resolution	0.1 °C
Conductivity	±0.5% (FS)
Resistivity	±0.5% (FS)
TDS	±0.5% (FS)
Salinity	±0.1 ppt
Normal working conditions	
Environmental temperature	0–40 °C
Relative humidity	<=85%
Power supply	Power adaptor UE15WCP1-090100SPA
Power input	100–240 VAC, 1 A
Power output	9 VDC, 1 A
Size	(length × width × height, mm): 190 × 190 × 105
Weight	about 1 kg

CAUTION   Do not use where nearby vibrations will affect the performance. Do not use if corrosive gas is in the air. Do not use near strong electromagnetic fields.

Physical overview

The Agilent 3200C Conductivity Meter is composed of a meter and a probe system. The probe system contains a conductivity probe and an ATC probe held by the electrode holder. See Figure 5, Figure 6, and Figure 7.

Electrode holder

Display screen

Keypad

Meter

Conductivity probe

ATC probe

Figure 5   The meter, electrode holder, and probes

Display screen

Keypad

Figure 6   The front view of the 3200C Conductivity Meter

Ground
ATC probe socket
Conductivity probe socket
USB
Power (DC 9V 800mA)
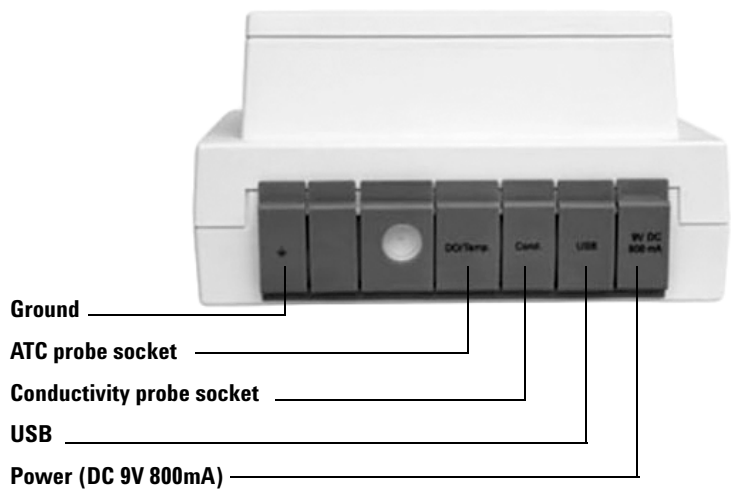
Figure 7   The back view of the Agilent 3200C Conductivity Meter

The Display

The left side of the screen shows current system time and the right side shows the current measuring mode, parameter, cell constant, and temperature coefficient.
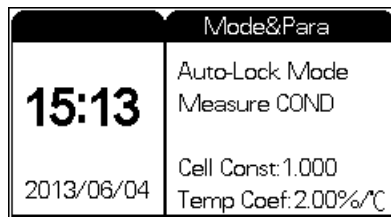
Figure 8   The display

During operation, the display shows the working condition and current meter settings.

The Keypad

The keypad has 15 keys. All keys have double functions except for **[Enter]**, **[Cancel]**, and **[On/Off]**. Functionality automatically changes based on context. Key functions are listed in the Table 1 on page 21:
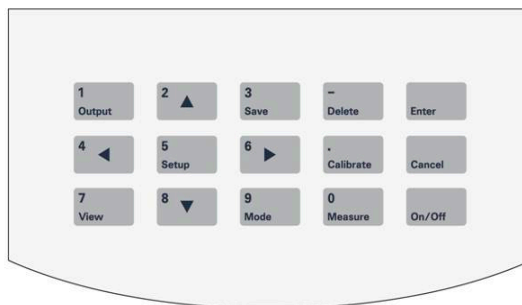
Figure 9   Keypad

Uses for the 3200C Conductivity Meter

Conductivity is a measure of a material's ability to conduct an electric current. The meter measures the conductivity of solutions with high accuracy. When equipped with a probe with the proper cell constant, the conductivity meter can measure the conductivity of ultra pure water.

Users can select different probes each with a different cell constant to match the expected conductivity of samples to be measured. Refer to the final packing list for the probes that are shipped.

Instrument Control

The 3200C Conductivity Meter is usually controlled by the keypad. Most keys have two functions. Functionality automatically changes based on context. Key functions are listed in the Table 1:

Table 1   Keypad functions
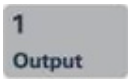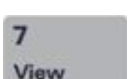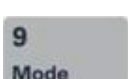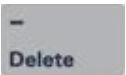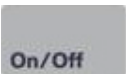
Button	Function 1	Function 2
1 Output	Type the number **1**.	Output data when viewing stored or calibrated data.
2 ▲	Type the number **2**.	Move the selection cursor upward when selecting.
3 Save	Type the number **3**.	Store measurement data.
4 ◀	Type the number **4**.	Move the selection cursor left when selecting.
5 Setup	Type the number **5**.	Opens the Setup menu and also is used as a general "select" button.
6 ▶	Type the number **6**.	Move the selection cursor right when selecting.
7 View	Type the number **7**.	View stored or calibrated data.
8 ▼	Type the number **8**.	Move the selection cursor down when selecting.
9 Mode	Type the number **9**.	Switch the display window or parameter when measuring.
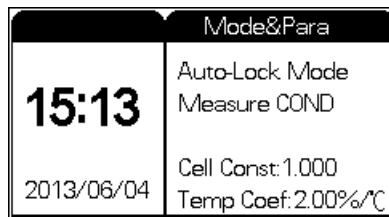
Table 1   Keypad functions

Button	Function 1	Function 2
0 Measure	Type the number **0**.	Begin measurement.
. Calibrate	Type a decimal point.	Calibrate probe.
– Delete	Type a negative number.	Delete the data being viewed.
On/Off	Meter power switch.	

Alternately, the 3200C Conductivity Meter can be controlled through a computer. For how to connect to a computer and how to use data collecting software (the software is optional), refer to installation help in the DVD shipped with the meter.

Turn on the Meter

1 Press [**On/Off**] to turn on the meter. When the meter is powered on, the display shows the Agilent logo, the meter model, and other information.

2 After the self-check is completed, the display shows the initial state. See Figure 10. The left side shows the system time. The right side shows the setting: measuring mode, parameter, cell constant, and temperature coefficient.

```
┌─────────────────────────────┐
│              ▼ Mode&Para     │
├──────────┬──────────────────┤
│          │ Auto-Lock Mode   │
│  15:13   │ Measure COND     │
│          │                  │
│          │ Cell Const:1.000 │
│2013/06/04│ Temp Coef:2.00%/℃│
└──────────┴──────────────────┘
```

Figure 10   The initial state

Setup
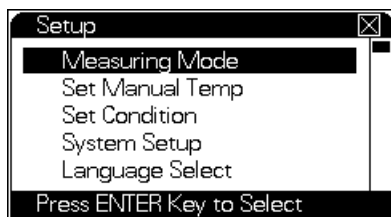
Figure 11   The setup screen

Measuring Mode

This meter supports three measuring modes including Continuous Mode, Timed Reading Mode, and Auto-Lock Reading Mode.

To set the measuring mode:

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 11.

2 Use the directional arrow keys to navigate to **Measuring Mode**.

3 Press [**Enter**] to select **Measuring Mode**. If you need to go back after selecting a menu item, press [**Cancel**] to exit.

4 The **Measuring Mode** screen displays **Parameters** on the left and **Modes** on the right. See Figure 12. Check marks indicate the current selections in use.
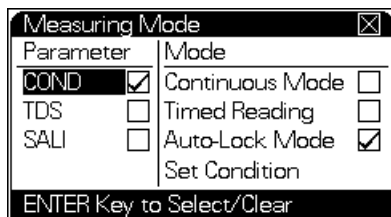
Figure 12   Select a measuring mode

5 Choose a parameter to display on the initial screen during measurement. Use the arrow keys to highlight the desired parameter and press **[Setup]** to select it. A check appears next to the selected parameter. During measurement, you can still view, save and print the other two parameters. See "To view other parameters while measuring" on page 47. The parameter choices are conductivity, total dissolved solids (TDS), and salinity.

6 Use the arrow keys to highlight the desired mode and press **[Setup]** to select it. See "Descriptions of the modes" on page 25 for more information. A check appears next to the selected mode.

7 Press **[Enter]** to save the new setup, exit Setup, and return to the initial state. Press **[Cancel]** to exit Setup without saving changes and return to the initial state.

The new parameters and measuring mode are displayed as shown in Figure 13.
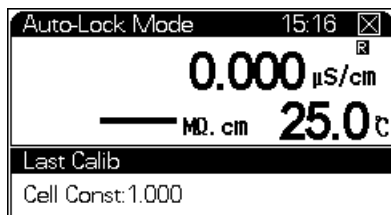
Figure 13 Measuring mode displayed

Descriptions of the modes

Continuous Mode   The meter will simply continue measuring, calculating, and displaying the data. It is up to the user to manually save data or end the measurement.

This is the most frequently used measuring mode. When measurement begins, the meter continuously measures, calculates, and displays the results. You can view the calibrated parameter, calibrate the probe, save, or print results at any time during measurement. To end a measurement, press **[Cancel]** followed by **[Enter]**.

Timed Reading   The meter will automatically save measurement data periodically while measuring.

When you select Timed Reading, specify a time interval from 1 to 5940 seconds. The default time interval is 600 seconds.

When measurement begins, the meter calculates and displays results as it normally does. When the set interval time elapses, the meter automatically stores the data and continues measuring. Data is constantly recorded at the specified time interval.

If the USB interface is connected to a PC with the Data Printing Software installed, the meter can print the data.

Read about Auto Delete before using this mode. See "Descriptions of the System Setup settings" on page 30.

To end a measurement run, press **[Cancel]** followed by **[Enter]**.

Auto-Lock Mode   The meter will stop measuring when recorded values stabilize enough to fall within a set precision and length of time.

Before performing a measurement in Auto-Lock reading mode, set the Auto-Lock conditions (see "Set Condition" on page 28). When the measurement begins, the meter automatically measures, calculates, and displays the results. Once the measurements meet the preset Auto-Lock condition, the measurement finishes and the screen locks with the final readings.

You can view the calibrated parameter, calibrate the probe, save, or print results at any time during measurement. After measurement, you can save and print the results. Press **[Cancel]** to exit measuring mode or press **[Measure]** to begin the next measurement.

The default measuring mode is Auto-Lock mode. You can modify this as required.

Set Manual Temp

If the meter is connected to an ATC probe, the probe will supply a temperature value for the meter. If an ATC probe is not connected to the meter, the user must enter a temperature value manually.

NOTE   If the measuring parameter is set to **SALI**, the meter uses a temperature of 18 °C.

To set the manual temperature:

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 11 on page 24.

2 Use the directional arrow keys to navigate to **Set Manual Temp**.

3 Press [**Enter**] to select **Set Manual Temp** or press [**Cancel**] to exit.

4 The Set Manual Temp screen appears on the display. See Figure 14.
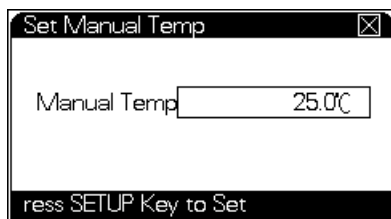
Figure 14   Set Manual Temp

5 With the Manual Temp value highlighted, press [**Setup**] to edit the value.

6 Use the numeric keys to enter a temperature.

7 Press **[Enter]** to save the new setup, exit, and return to the initial state. Press **[Cancel]** to exit without saving changes.

Set Condition

Use Set Condition to specify Auto-Lock parameters when measuring in the Auto-Lock measuring mode. An Auto-Lock measurement ends when all measured parameters meet the conditions set. For example, if the condition of **Conductivity** is set to 1.0%, when the measured conductivity holds stable within a 1.0% tolerance for the set Auto-Lock time interval, the measurement ends and the screen locks displaying the final reading.

To set the conditions:

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 11 on page 24.

2 Use the directional arrow keys to navigate to **Set Condition**.

3 Press [**Enter**] to select **Set Condition** or press [**Cancel**] to exit.

4 The **Set Condition** screen appears on the display. See Figure 15.
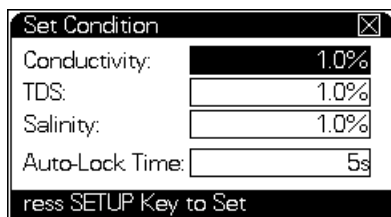
Figure 15   The Set Condition screen

5 Use the arrow keys to select a condition to edit. Press [**Setup**] to edit the value.

6 Enter the desired value. The Auto-Lock time has a range of 1–200 seconds.

7 Press **[Enter]** to save the new setup, exit, and return to the initial state. Press **[Cancel]** to exit without saving changes.

System Setup

The System Setup screen is where the user sets the time on the system clock, sets the calibration interval, and enters the information for the Good Laboratory Practices (GLP) standard.

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 11 on page 24.

2 Use the directional arrow keys to navigate to **System Setup**.

3 Press [**Enter**] to select **System Setup** or press [**Cancel**] to exit.

4 The **System Setup** screen appears on the display. See Figure 16.

Figure 16   The System Setup screen

5 Use the arrow keys to select a value to edit. Press [**Setup**] to edit the value.

6 Enter the desired value. See "Descriptions of the System Setup settings" on page 30 for more information.

7 If needed, edit the system date and time. To modify the date and time:

   a Use the arrow keys to highlight the Time field shown in Figure 16 on page 29 and press **[Setup].**

   b The **Set Date & Time** screen opens. This screen displays the current year, month, day, hour, minute, and second (see Figure 17). Press the arrow keys to highlight the proper cell, then press **[Setup]** to select it.
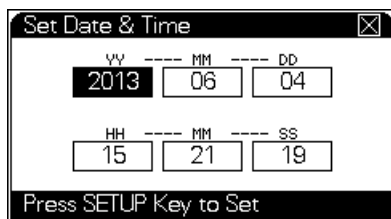
Figure 17   The Set Date & Time screen

   c Enter the correct value using the numeric keys and press [**Enter**].

   d Once all changes are made, press [**Enter**] to save the settings and return to the **System Setup** screen.

8 Once all of the system settings are made, press **[Enter]** to save the new setup, exit, and return to the initial state. Press **[Cancel]** to exit without saving changes.

Descriptions of the System Setup settings

Calib Interval is the number of hours between the calibration messages that the Meter periodically displays as a reminder to recalibrate the probe. The meter begins counting the interval time from the end of the previous calibration. When the calibration interval has elapsed, the meter displays a popup window to remind the user to recalibrate the probe. A **Calib Interval** value of **0** disables this function.

Operator No is a three-digit number from 000–200 used to identify the person operating the meter. The **Operator No** is recorded every time the meter saves data.

When stored data reaches the meter's memory limit **Auto Delete** allows you to automatically overwrite the oldest data with new data. If **Auto Delete** is not enabled, the meter does not save new data when its memory is full. For example, the meter supports storing up to 800 sets of data. When you want to store the 801st set of data, if **Auto Delete** is on, meter will delete the first set of data and store the 801st data. If **Auto Delete** is disabled, the new data will not be stored.

CAUTION   If **Auto Delete** is disabled, data could be lost.

Language Select

This meter supports Chinese and English languages.

1 From the initial state, press [**Setup**]. The setup screen appears. See Figure 11 on page 24.

2 Use the directional arrow keys to navigate to **Language Select**.

3 Press [**Enter**] to select **Language Select** or press [**Cancel**] to exit.

4 The **Language Select** screen appears. Use the arrow keys to choose either **Chinese** or **English** and press [**Enter**].

Auto Power Off

The meter can power off automatically after a set time period. To set the **Auto Power Off** time:

1 From the initial state, press **[Setup]**. The setup screen appears. See Figure 11 on page 24.

2 Use the directional arrow keys to navigate to **Auto Power Off**.

3 Press **[Enter]** to select **Auto Power Off** or press **[Cancel]** to exit.

4 The **Auto Power Off** screen appears. Enter a power off time from 10–480 minutes. Enter a time of 0 to disable **Auto Power Off**.

5 Press **[Enter]**.

When the **Auto Power Off** time elapses after the start of a measurement, the meter shuts down.

Set up the buzzer

If the buzzer affects use, it can be closed. Press **[Setup]** to choose.

> **CAUTION**   Some special prompts will still activte buzzer.

Set up annual check prompt

The meter allows you to select **Close** or **1 or 12 months in advanced**. If the user initiates this function, the meter will make judgement after self-check when turn on. If the condition is met, it will prompt. Press **[Setup]** to choose.

Set Default

Use **Set Default** to reset the meter to is original factory settings.

1 From the initial state, press **[Setup]**.

2 Use the directional arrow keys to navigate to **Set Default**.

3 Press **[Enter]** to select **Set Default** or press **[Cancel]** to exit.

4 The **Set Default** screen appears on the display. Press **[Enter]** to restore the meter to the original factory settings.

Table 2   Default values for meter parameters

Parameter	Default value
Cell constant calibration data	One standard solution.
	Standard Value: 1408 µS/cm Measured Value: 1408 µS/cm Calibration temperature: 25.0 °C Default cell constant: 1.000
TDS calibration data	One standard solution.
	Standard Value: 704 mg/L Measured Value: 704 mg/L Calibrated temperature: 25.0 °C Default TDS coefficient: 0.500
Temperature coefficient	2.00%/°C
manual temperature	25.0 °C
measuring mode	Auto-Lock
Timed Reading Mode interval	600 seconds
Calib Interval	message disabled (0 hours)
Operator No	000

Table 2 Default values for meter parameters

Parameter	Default value
Auto Delete	Enabled
Auto-Lock Set Condition	conductivity 1.0% TDS 1.0% salinity 1.0%
Auto-Lock time	7 s
Auto Power Off	Disabled (0 minutes)
Buzzer	Open
Annual check prompt	Closed
Auto delete	Open

Prepare Probes

Perform this procedure when using a new probe, or when using a probe that has been in storage for a long time.

1 Submerse the measuring tip in absolute ethanol for 1 minute.

2 Repeat step 1 twice with fresh absolute ethanol each time.

3 Rinse the measuring tip thoroughly with DI water.

4 Soak the measuring tip in DI water for 1 hour.

5 Connect the probe to the meter. See "Installation of electrochemical probes" on page 9.

6 Begin measuring. After finishing the measurement, clean the measuring tip with the proper method for cleaning the test solution used.

CAUTION	Avoid damaging platinum black coating on the C5111 Conductivity probe during cleaning.

7 Calibrate the cell constant. See "To set or calibrate the cell constant (Cell Const)" on page 36. The cell constant of each probe is printed on the label. However, transportation, prolonged storage, and extended use may change the cell constant to some degree.

8 Before use, ensure there is no precipitate on the platinum sensing sheets. Ensure there is no corrosion on the platinum sensing sheets or chemical reaction in solution with platinum.

9 If there is unusual performance during measurement or you suspect an error in measurement, see Chapter 3, "Troubleshooting and Maintenance" to diagnose the problem.

Calibrate

To set or calibrate the cell constant (Cell Const)

The cell constant for each probe was calibrated and printed on the probe label before shipping. However, transportation, storage, and continued use may change the cell constant to some degree. Recalibrate the conductivity probe before measurement.

One-Point calibration

1 In order to calibrate, you need to make a standard solution. Read the printed cell constant from the label. Use Table 3 to find the suitable KCl concentration of the standard solution.

Table 3   Concentration of Standard Solution based on cell constant

Cell constant (cm^{-1})	0.01	0.1	1	10
KCl concentration (mol/L)	0.001	0.01	0.01 or 0.1	0.1 or 1

2 Use the concentration found inTable 3 to find the weight (g) of KCl per liter of DI water (Table 4) and prepare the standard solution. For example, to prepare a concentration of 0.1 mol/L, add 7.4365 g of KCl to 1 L of DI water.

Table 4   Composition of Standard Solution

Concentration (mol/L)	Concentration of KCl in g/L (20 °C)
1	74.2457
0.1	7.4365
0.01	0.7440
0.001	Dilute 0.01 mol/L solution from 100 mL to 1 liter

3 If the meter is connected to a conductivity probe without an ATC probe, the meter will use the manual temperature (see "Set Manual Temp" on page 27) value as current temperature. Conductivity is displayed without temperature compensation. You are recommended to manually set temperature to 25 °C.

4 Rinse the conductivity probe with distilled or DI water.

5 Soak the conductivity probe in the standard solution. The temperature of the standard solution must be the same as current temperature.

6 Press [**Calibrate**].

7 Select **Cell Const**.

8 The **Calibration** screen appears. (see Figure 18).
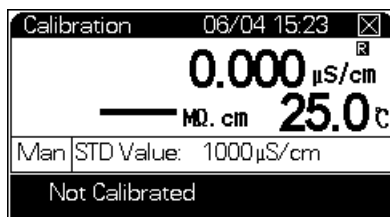
Figure 18   The Calibration screen

9 Press **[Setup]** to enter a Standard Solution Value (STD Value). Type the standard value listed in Table 5 for the corresponding solution concentration and temperature.
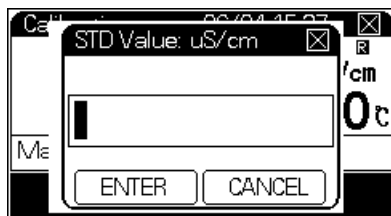
Figure 19 The Standard Solution Value

Table 5 STD Value (μS/cm)

	15.0 °C	**18.0 °C**	**20.0 °C**	**25.0 °C**	**35.0 °C**
1 mol/L	92120	97800	101700	11310	131100
0.1 mol/L	10455	11163	11644	12852	15353
0.01 mol/L	1141.1	1220.0	1273.7	1408.3	1687.6
0.001 mol/L	118.5	126.7	132.2	146.5	176.5

10 Once the reading is stable, and **R** appears, press **[Enter]**. The meter will calculate and set the new cell constant.

11 The calibration is done. Press **[Cancel]** to return to the initial screen.

Two-Point Calibration

When measuring a solution with high conductivity (>10 mS/cm), perform a two-point calibration.

1 Prepare two standard solutions. Standard solutions with high conductivity should have similar chemical composition to sample solution.

2 Calibrate the cell constant as described in "One-Point calibration" on page 36.

3 Press **[Measure]** to begin the second point calibration. Press **[Enter]** to end the first calibration.

NOTE   Do not press **[Cancel]** to avoid exiting calibration.

4 Put the conductivity probe into the second standard solution.

5 Once the reading is stable, and **R** appears, press **[Enter]**. The meter will automatically calculate and set the two-point calibration.

6 The calibration is done. Press **[Cancel]** to return to the initial screen.

Manually enter a cell constant

1 While performing a measurement, press **[Setup]**.

2 select **Cell Const** and press **[Enter]**.

3 The meter displays a popup window. Enter the cell constant given on the probe label.

NOTE   Manually entering a cell constant will overwrite a previous cell constant calibration.

To Set or Calibrate the TDS Factor

Manually enter the TDS factor

1 While measuring, press [**Setup**] and select **Set TDS Factor**. Press [**Enter**]

2 The meter displays a popup window. Enter the TDS factor according to your actual need.

Calibrate the TDS factor

1 Calibrate the meter with a conductivity standard solution. Select a proper standard solution according to the nature and measuring range of the sample. (The relationship between conductivity and the TDS of the standard solution is shown in Table 6).

Table 6   Relationship Between Conductivity and TDS of the Standard Solution

Conductivity	TDS standard value		
(µS/cm)	KCl (mg/L)	NaCl (mg/L)	442 (mg/L)
23	11.6	10.7	14.74
84	40.38	38.04	50.0
447	225.6	215.5	300
1413	744.7	702.1	1000
1500	757.1	737.1	1050
2070	1045	1041	1500
2764	1382	1414.8	2062.7
8974	5101	4487	7608
12880	7447	7230	11367
15000	8759	8532	13455
80000	52168	48384	79688

NOTE   The value listed in the form is the one at 25°C.

442 indicates 40% Na_2SO_4, 40% $NaHCO_3$, 20% NaCl.

2   While measuring, press **[Setup]** and select **cell constant**.

3   Set the cell constant to the value written on the conductivity probe label, or recalibrate the conductivity probe to obtain a new cell constant.

4   Press **[Mode]** and use directional arrow keys to select **TDS Measuring mode**.

5   Press **[Calibrate]** and select **TDS Factor**. Press **[Enter]** to enter Calibration mode as shown in Figure 20.
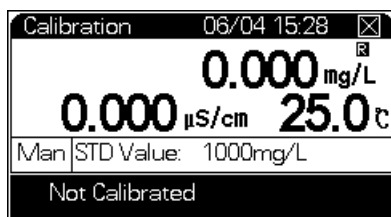
Figure 20   Calibration mode

6   Rinse the conductivity probe with distilled water or DI water.

7   The temperature of the calibration solution must be 25.0 ± 0.1 °C. Soak the conductivity probe in the standard solution

8   Press **[Setup]**.

9   Select **STD Value** and then press **[Enter]**.

10 Enter an STD value given in Table 6 on page 40.

11 When the readings become stable, press **[Enter]**.

12 The meter automatically calculates and sets a new TDS factor.

13 Calibration is finished. Press **[Cancel]** to exit.

Temperature Coefficient (Set Temp Coef)
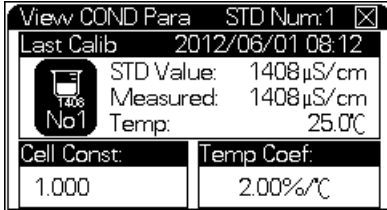
Temperature affects the accuracy of conductivity measurement. When you set the temperature coefficient, the meter automatically compensates for the temperature while measuring.

1 While measuring, press **[Setup]** and select **Temp Coef**. Press **[Enter]**.

2 The meter displays a popup window. Input the new temperature coefficient.

To view current temperature coefficient:

1 From the initial screen, press **[View]**.

2 Select **View COND Para** and press **[Enter]**. The meter displays the **View COND Para** screen. See Figure 21.

The user can view current calibration data including cell constant and temperature coefficient. Usually the user doesn't need to setup the temperature coefficient. The default temperature coefficient is 2.00%/°C.

Figure 21   The View COND Para screen

Perform a Measurement

During measurement, make sure the tip of the probe is completely submersed in the solution. Place the probe in a location where the solution can flow freely around the measuring tip. To measure ultra pure water, install the conductivity probe in a sealed container with ultra pure water flowing through. The flow rate should be not too high.

Choose the correct probe

Before measuring, choose the proper conductivity probe. Refer to Table 7 on page 43 when choosing a conductivity probe. There are two kinds of conductivity probes with cell constant K=1.0:

• Platinum black - the platinum sheet has a platinum black coating.

• Bright - the platinum sheet does not have a platinum black coating. The Bright probe is suitable for wider measurement range (2 to 3000 µS/cm).

If conductivity is $\geq$ 3000 µS/cm, the measurement may not be as accurate. To measure high conductivity, use a conductivity probe with a high cell constant.

When conductivity is $\geq$ 200.00 mS/cm, use a conductivity probe with cell constant = 5 or 10.

When conductivity is $\geq$ 500.00 mS/cm, use a conductivity probe with cell constant = 10.

Table 7   Conductivity Range and Corresponding Cell Constant

Conductivity range	Resistivity range (Ω-cm)	Recommended cell constant (cm^{-1})
0.000–19.99 µS/cm	20.00 M–50.0 k	0.01
0.20–200 µS/cm	5.00 M–5.00 k	0.1
2.000–20 mS/cm	500–5	1.0
20.00–200 mS/cm	50–5	10

To measure conductivity

1 Calibrate the meter if necessary. See "Calibrate" on page 36.

2 From the initial state display, press **[Setup]** and select a measuring mode and the COND parameter. See "Measuring Mode" on page 24.

3 Press **[Measure]** to start a measurement according to the selected mode. See Figure 22. The upper area of the screen shows the current measuring mode and system time. The central area of the screen shows conductivity, resistivity and temperature.
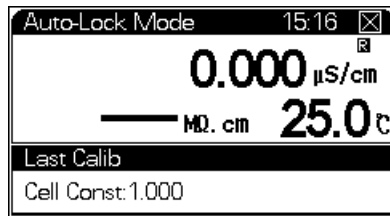
Figure 22   Measuring conductivity

Measurement methods and displays change with different measuring modes to some extent.

4 During a measurement, you can recalibrate the cell constant and setup parameters.

5 After a measurement, press [**Save**] to save data. Press [**Output**] to print data. Press [**Cancel**] to end measurement.

NOTE   When measuring conductivity and TDS with an ATC probe connected to the meter, the measurement will be temperature-compensated into the corresponding value at 25.0 °C according to the set temperature coefficient.

When measuring salinity with an ATC probe connected to the meter, the measurement will be temperature-compensated into the corresponding value at 18.0 °C according to the set temperature coefficient.

If no ATC probe is connected, the measurement is given without temperature compensation.

To measure resistivity

In the conductivity measuring mode, the meter displays both conductivity and resistivity. You can measure resistivity directly in the conductivity measuring mode. See '"To measure conductivity" on page 44'.

To measure temperature

In any measuring mode, the meter displays the current temperature of the solution. See "To measure conductivity" on page 44.

To measure TDS

Measure TDS from the initial state

1 Select a proper conductivity probe before measuring TDS. The selection principle is the same as the selection of a conductivity probe.

2 Set corresponding cell constant. See "To set or calibrate the cell constant (Cell Const)" on page 36.

3 Set the temperature coefficient. See "Temperature coefficient" on page 14.

4 Set the TDS factor. See "To Set or Calibrate the TDS Factor" on page 40.

5 To skip steps 2 through 4, recalibrate conductivity probe.

6 Once the TDS parameters have been set, you can measure TDS directly from the initial state.

Measure TDS using the TDS Measuring Mode

1 Set the TDS parameter with **Setup Measuring Mode**. See "Measuring Mode" on page 24.

2 For a description of display, measuring procedure, and operation in TDS measurement, see "To measure conductivity" on page 44.

3 After measurement, press [**Save**] to save data,. Press [**Output**] to output measuring data. press [**Cancel**] to end measurement.

To measure salinity

Measure salinity from the initial screen

1 Select a proper conductivity probe before measuring Salinity. See "Choose the correct probe" on page 43.

2 Set the corresponding cell constant. See "To set or calibrate the cell constant (Cell Const)" on page 36.

3 Set the salinity parameters. See "Measuring Mode" on page 24. Now you can measure salinity directly from the initial screen.

Measure salinity using the Salinity Measuring Mode

1 Set the salinity parameter with **Setup Measuring Mode**. See "Measuring Mode" on page 24.

2 For a description of display, measuring procedure, and operation in salinity measurement, see "To measure conductivity" on page 44.

3 After measurement, press **[Save]** to save data,. Press **[Output]** to output measuring data. press **[Cancel]** to end measurement.

To view other parameters while measuring

During a measurement, the user still can view other parameters not currently in use without changing the measuring mode. For instance, while measuring with the **Cond** parameter, a user can view, save, and print other parameters such as **TDS** and **SALI**.

1 While performing a measurement, press **[Mode]** to conveniently view other parameter values. The screen display highlights the measuring window as shown in Figure 23.
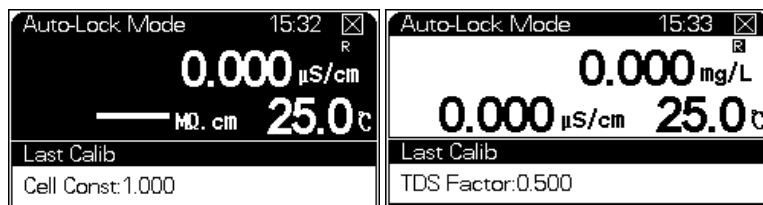

Figure 23   Viewing parameters while measuring

2 Press **[4/◀]** or **[6/▶]** to switch the view to TDS, salinity, resistivity, conductivity, and so on.

3 If you do not press a key for a few seconds, the meter will automatically exit from viewing mode and return to the regular initial screen.

Manage Data

To save data

The Agilent 3200C Conductivity Meter can save 800 sets of conductivity, TDS, and salinity data. The procedure to save data varies with different measuring modes.

- In continuous mode and Auto-Lock reading mode, press [**Save**] to save data when readings become stable.

- In timed reading mode, you can still save data manually, but the meter automatically saves measuring data at a fixed periodic time interval. See "Measuring Mode" on page 24.

To delete data

You can delete individual data entries or delete all data at once.

1 In either the initial screen or while measuring, press [**View**].

2 Select the data and press [**Delete**].

To output data

Please see the "Appendix II EcPRINT Operating Guide" on page 73.

To view data

The Agilent 3200C Conductivity Meter allows you to view parameters such as the last calibration data and current parameter. It also allows you to set the parameter directly and view saved data. The meter stores data according to the parameter measured. All saved data meets GLP standards. The meter can store 200 sets of conductivity, TDS, or salinity data.

1 In the initial state, press [**View**].

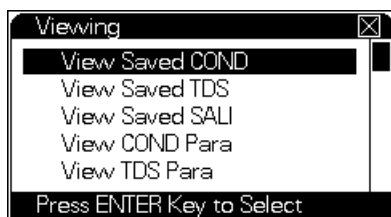**2** Navigate to the type of data to view and press [**Enter**]. See Figure 24.

Figure 24   View Data

To View Saved Cond

To view conductivity data, select **View Saved COND**.

1 In the initial state, press **[View]**.

2 Use the arrow keys to highlight **View Saved COND**.

3 Press **[Enter]**.

4 The display is shown in Figure 25. The upper area displays the current viewing mode and actual storage amount. Each page can display up to 8 saved data. The display format varies with different viewing modes. The data displayed includes time and operator No.

The meter provides three sorting modes: all data, according to No. or time. Press **[Setup]** to enter, press arrow key to choose view mode, press **[Setup]** to modify No. or time, press **[Enter]** to confirm.

Figure 25   View saved data

5 Press the arrow keys to view the saved data.

6 Press **[Output]** or **[Delete]** to print and delete data. (First connect meter with PC.)

View conductivity parameter

1 In the initial state, press [**View**].

2 Use the arrow keys to highlight **View COND Para**.

3 Press [**Enter**].
    The display is shown in Figure 26. The upper area displays
    last calibration data. The bottom area displays current
    conductivity parameter including cell constant and
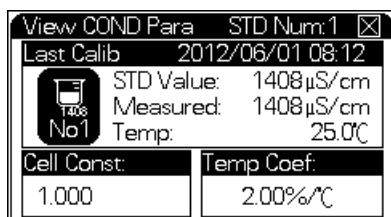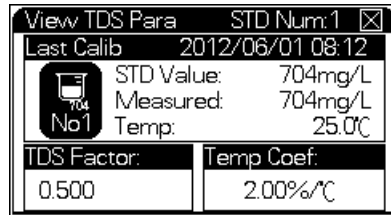   temperature coefficient

Figure 26   View conductivity parameters

View TDS parameter

1 In the initial state, press **[View]**

2 Use the arrow keys to highlight **View TDS Para**.

3 Press **[Enter]**. The display is shown is Figure 27.
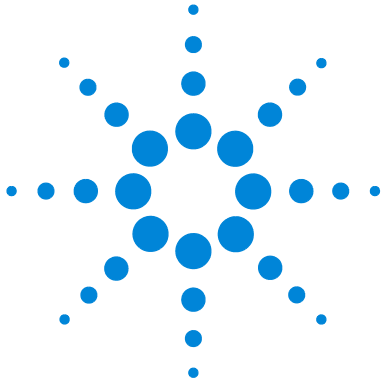

Figure 27   View TDS parameter

To Turn off the 3200C Conductivity Meter

After using the meter, press [**Save**] to save data. Press [**On/Off**] for more than 3 seconds to turn off the meter.

When not in use, all probes should be soaked in distilled water. If the meter is out of use for a long time:

• Disconnect the power adaptor from power cable to avoid damaging power adaptor and the meter.

• Keep the socket of the meter clean and dry. Avoid contact of the socket with acid, alkaline and salt solution.

• Keep the input terminal of the meter (connector of probe) clean and dry. If the probe has been exposed to high humidity or water, wipe the cable interface of the probe with dry gauze or Kimwipe.

• When the conductivity probe will be out of use for a short time, soak it in DI water. If the probe will be out of use for 6 hours or longer, rinse it with DI water and store it in a protective bottle.

3
Troubleshooting and Maintenance

This chapter describes how to verify whether the meter is working properly and how to maintain the meter.

Agilent Technologies

Troubleshooting the 3200C Conductivity Meter

Table 8 lists common problems, possible causes, and how to resolve them.

Note that improper operation of the conductivity probe will lead to abnormal readings. During measurement, soak the probe tip completely in solution.

Table 8   3200C troubleshooting

Number	Failure mode	Failure cause	Solutions
1	No display after meter starts up. The display is not lit up.	**1** Power adaptor is not installed correctly. **2** The power supply does not meet with the requirements. **3** The power adaptor is damaged. **4** The power socket has poor contact. **5** The LCD is damaged (After start up for a few minutes, the user can hear a buzzing sound after pressing **[On/Off]** key, but there is no display on LCD.)	**1** Reconnect. **2** Use the required power supply. **3** Replace the power adaptor. **4** Ensure there is a good contact. **5** Contact Customer Service.
2	Display is dim.		**1** Check the power adapter.
3	No buzzing when pressing key	**1** You may have pressed invalid keys under the current setup. **2** The buzzer has been damaged. **3** The buzzer is set as closed.	**1** The buzzer only sounds when you press a valid key.
4	No response when pressing key	**1** You may have pressed invalid keys under the current setup. **2** The key has been damaged.	**1** Press the valid key for operation.
5	Meter does not display 25 °C when ATC probe is not connected with meter.	When the meter is not connected with an ATC probe, the meter will automatically switch to manual temperature setting.	Manually input the correct solution temperature.

Table 8   3200C troubleshooting (continued)

Number	Failure mode	Failure cause	Solutions
6	The reading does not stabilize.	1 The electrode has been damaged or aged. 2 There is strong electrical signal interference source nearby (electrical leaking, strong electro-magnetic field, etc.).	1 Replace the electrode. 2 Remove the electrical signal interference source. Lift the beaker to a higher position to avoid electrical leaking. Shield from the electromagnetic field. Use the ground line shipped with the meter. Connect one terminal to the meter and the other terminal to the interference source.
7	Severe drift during conductivity measurement.	Probe tip contaminated.	Clean the probe.

General Troubleshooting Procedure

Many factors may affect measurement, including the electrode, the standard solutions used to calibrate electrode, the sample solution, the temperature during measurement, incorrect operation, and so forth. When the measured results are significantly different from what was expected, first determine whether the meter itself or factors other than the meter caused the error. Follow the suggestions described below to diagnose the problem. Since there are multiple measuring methods, you will need to diagnose the meter based on your application.

Diagnose whether the errors are caused by the meter hardware, electrode calibration, parameters, the sample solution, solution preparation, buffer solutions used for calibration, or other causes.

For factors other than the meter, compare measurement results between known solutions. Put the electrode in different standard solutions. Based on the comparison, judge whether the deviation resulted from the electrode, the solution, or something else.

Check the temperature measurement

Because temperature measurements are required for all measurement, always ensure temperature measuring is functioning well.

1 Connect the meter with the ATC temperature diagnostic tool (5185-8390) shipped with the meter.

2 Turn on the meter and begin measuring.

3 With the ATC temperature diagnostic tool connected, the meter should display a temperature reading between 49.0 to 51.0 °C. If yes, the meter is correctly measuring temperature. If the meter displays a temperature reading significantly different from 50 °C, there is a problem with the meter. Contact Agilent service.

Check the conductivity measurement

1 Disconnect the conductivity probe.

2 Connect the meter with the conductive diagnostic tool (5185-8391) shipped with the meter.

3 Turn on the meter and disconnect the ATC probe.

4 At the initial state, set the manual temperature to 25 °C.

5 Check the cell constant. If it is about 1.000, then go to next step. If not, set the cell constant to 1.000. (**View Last COND Calib**).

6 Begin measuring conductivity. The meter should display a resistance value of 9.00–11.00 kΩ and a conductivity value of 90.00–110.00 µS/cm. If so, the meter is functioning properly. If the value deviates significantly from these values, there is a hardware problem with the meter. Contact the customer service department.

Restore factory default settings

If other troubleshooting does not solve the problem, you can restore the meter to the factory default settings. This clears all user calibrations and settings so that you can verify whether an erroneous calibration or setting is the cause of the problem. After restoring the factory default settings, retest the meter.

To restore factory defaults (Set Default)

Select **Set Default** from the initial setup display to restore all parameters to the factory default settings.

Meter Self-Diagnostics and Messages

The meter supports self-diagnosis, which can find some common errors caused by meter, probe, solution, or operation. It deals with these errors differently according to their severity.

There are two levels of severity: **Severe system errors** hinder further use of the meter or make the meter unable to finish necessary tasks. In this case, replacement or maintenance of the meter is required.

Minor errors, which are prompts or warnings, are caused by various reasons and can be corrected in several ways. However, you must pay attention to these errors to ensure measurement integrity and reliability. If you ignore these error messages the operation can continue.

Severe errors

When severe errors occur in the meter, the meter will shut down and display an error message similar to Figure 28. In this case, the only operation that can be performed is to turn off the meter.
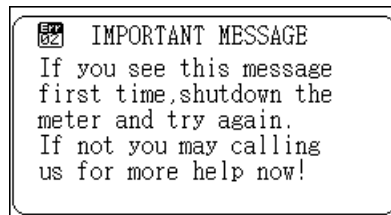


```
⌗  IMPORTANT MESSAGE
If you see this message
first time,shutdown the
meter and try again.
If not you may calling
us for more help now!
```

Figure 28   Severe errors

Error warning

Error warnings indicate improper electrode installation, solution problems, and electrode setup during use. Read these error warnings carefully. Proper maintenance and operation will reduce errors.

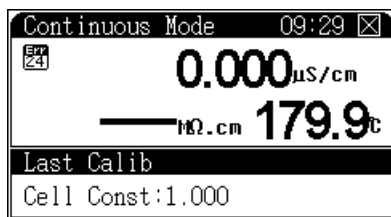Figure 29 shows an example error warning that temperature is out of range.

Figure 29   Error warning

is the error warning icon. The icon includes the error code.

> **NOTE**   This table describes all error messages which may occur in use. These error messages have different definition for different meters.

Table 9   Error warning codes

Code	Description	Solution	Memo
00	Conductivity measuring module error	Contact Customer Service.	Serious error
01	DO measuring module error	Contact Customer Service.	Serious error
02	Temperature measuring module error	Contact Customer Service.	Serious error
03	Data storage error	Contact Customer Service.	Serious error
20	Potential is out of range	Replace electrode.	−1999.9 to 1999.9 mV
21	pH/pX is out of range	Replace electrode.	−3.000 to 21.000 pH

Table 9   Error warning codes (continued)

Code	Description	Solution	Memo
22	Conductivity is out of range	Replace probe and solution.	0 to 2000 mS/cm
23	Resistivity is out of range	Replace probe and solution.	0 to 100 MΩ• cm
24	Temperature is out of range	Replace electrode and decrease solution temperature.	−6.0 to 120.0 °C
25	DO electric current is out of range	Replace probe.	0 to 4000 nA
26	pH electrode slope is out of range	Replace electrode and recalibrate it.	80 to 120 %
27	Failed to recognize pH buffers	Replace electrode, setup proper buffer group and replace buffers.	
28	Temperature of pH buffer is out of range	Cool or heat buffer.	
29	Calibrate the same buffer repeatedly	Replace the buffer.	Due to incorrect operation
30	Number of pH buffers exceeds maximum.	Remove one or more buffers from the group.	5 buffers at most
31	pH buffers conflict with each other	Remove one or more buffers with overlapping pH values.	
32	The data storage is full.	Overwrite the previous data and store new data.	Do not delete all data
33	The internal clock has a low battery.	Set time manually.	
34	Number of customer-defined ions exceeds maximum	Delete one or more unnecessary customer-defined ions.	
35	The maximum ion mode number stored	Delete some storage data of certain ion mode.	

Maintenance

This section describes how to maintain and store the probe.

Probe cleaning

General electrode cleaning includes inorganic cleaning, organic cleaning, grease cleaning, and protein precipitation cleaning. The type of cleaning needed depends on the contaminants and the probe. After one or more cleaning procedures, rinse the outside of the probe with distilled water.

Probe storage

Soak the measuring tip with distilled water or deionized water for temporary storage.When the electrode is not used for a long time, put the electrode back in the box and store it a dry place at ambient temperature.

Consumables and Ordering Information

Order No.	Model and Name	Description
G4388A	3200SA Stirrer	Electrode holder and magnetic stirrer : combined to stir solution with stable and precise speed with a large adjustable range.
G4389A	3200EA Electrode Holder	It is used to fix different probes.
G4390A	Software Package	3200C Conductivity Meter can communicate with computer after this software package is installed (including software).
5185-8389	Power Adaptor	100–240VAC, 1A, 50/60Hz
G4388-27000	Stirring Bar	It is used with stirrer.
5190-3994	C5111 Conductivity Probe	Glass, K=1, platinum black, Measuring range: 2–20000 µS/cm
5190-3995	C5112 Conductivity Probe	Glass, K=1, bright, Measuring range: 2–3000 µS/cm
5190-3996	C5113 Conductivity Probe	Glass, K=0.1, bright, Measuring range: 0.05–200 µS/cm
5190-3998	T7111 ATC Probe	Stainless Steel body, Measuring range: 0–100 °C
5185-8390	ATC temperature diagnostic tool	Temperature diagnostication
5185-8391	Conductivity diagnostic tool	Conductivity diagnostication

Log onto the portal at http://www.agilent.com/chem for detail information. For new purchase, contact distributors of Agilent Technologies or log on the Agilent official website.

Appendix I EcFWUPDATE Operating Guide

Agilent Technologies

Overview

The EcFWUPDATE tool allows a PC to update the firmware on an Agilent electrochemical instrument. Using the PC USB port, the software can load new firmware into the internal program memory of the instrument.

Install the Software

This program is supported on the following operating systems:

- 32 bit Windows 7
- 32 bit Windows XP, Service pack 3

Install EcFWUPDATE

1 Download the EcFWUPDATE.ZIP file from this Agilent website:
http://www.chem.agilent.com/en-US/Support/Downloads/Utilities/Pages/default.aspx.

2 Unzip the EcFWUPDATE.ZIP file to a temporary directory.

3 From the temporary directory location, double-click the EcFWUPDATE.EXE file and follow the instructions provided on the software setup wizard to complete the installation of the EcFWUPDATE program.

The USB driver must be installed before running this program.

Install the USB driver

Install the provided USB driver on a PC to allow communication with the instrument. If this driver was previously installed for EcPRINT please skip this procedure.

1 Run **CP210xVCPInstaller.exe** which is located in the temporary directory used for unzipping the EcFWUPDATE.ZIP file.

2 With the instrument powered off, connect the USB cable (provided with the instrument) from the instrument port labeled USB to a USB port on the PC.

3 Power on the instrument.

4 Open the device manager on the PC to view the newly installed USB driver labeled **Silicon Labs CP210x USB to UART Bridge (COMX)**, where **X** is the communication port number. This label indicates that the USB driver has been properly configured for the instrument.

The port number must be in the range of 1 to 16. If the port number shown is outside this range, double-click on the driver label to open the properties dialog, then click on the **Port Settings** to bring up the **Advanced Settings** dialog, and select a valid port number from the **COM Port Number** drop-down.

▷ 🖥 Monitors
▷ 🖳 Network adapters
◢ 🖷 Ports (COM & LPT)
     🖷 Communications Port (COM1)
     🖷 ECP Printer Port (LPT1)
     🖷 Intel(R) Active Management Technology - SOL (COM4)
     🖷 Silicon Labs CP210x USB to UART Bridge (COM12)
▷ 🔲 Processors
▷ 🔊 Sound, video and game controllers
▷ 🖳 System devices

5 Record this USB communication port number (12 in this example) for configuration of the EcFWUPDATE software.

Configure the USB port

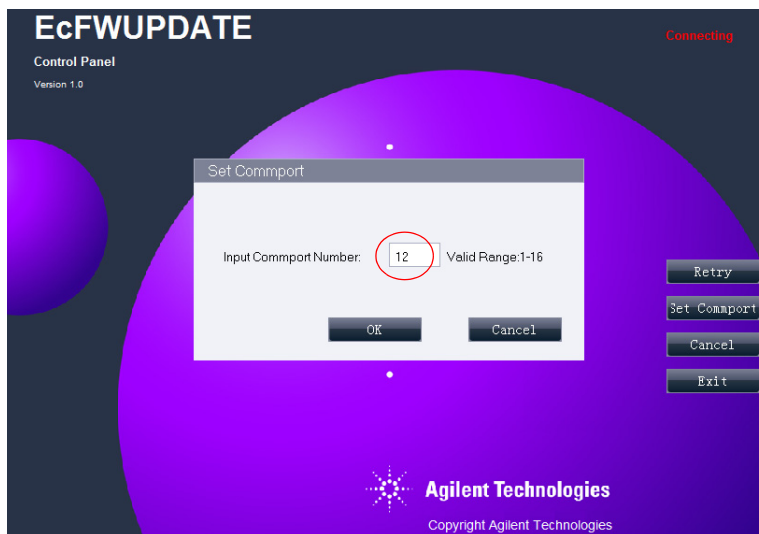This procedure assigns the previously recorded USB port number to the EcFWUPDATE program.

1 Double-click the EcFWUPDATE icon on the PC desktop to start the program. Initially the PC screen displays **Connecting instrument...**.
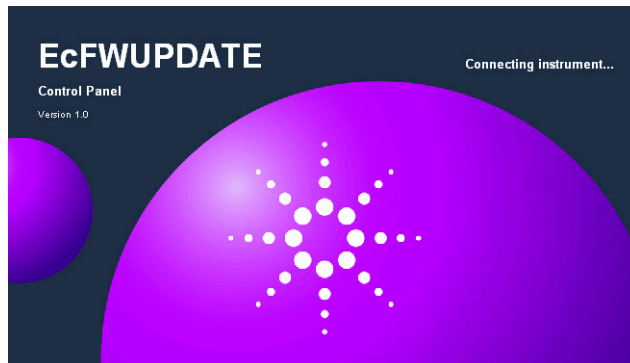
A **connecting error!** message displays because the port number is not yet configured.
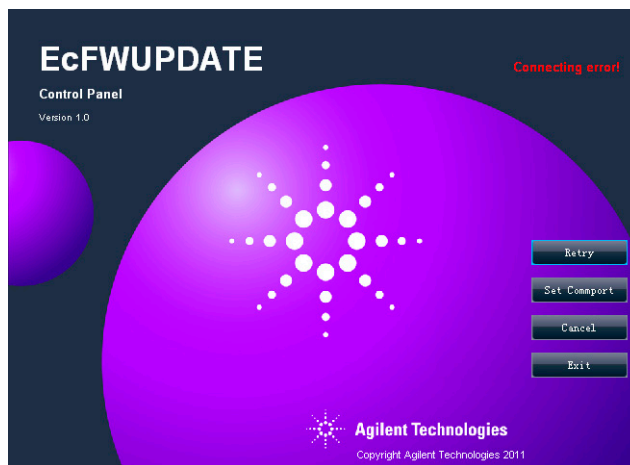
2 Click **Set Commport** to display the **Set Commport** dialog.

3　Enter the previously recorded communication port number (12 in this example) and click **OK**.

4　Click **Retry** and the EcFWUPDATE software should now connect to the instrument and display the instrument type, and firmware version number.

5　A prompt displays if an update is required.

6　Click **Cancel** to exit or click **OK** to update the firmware now. See the next section on "Run the Program" and continue with step 2.

Run the Program

Configure the USB port before running the software.

1 Double-click the EcFWUPDATE icon [icon] on the PC desktop to start the program.

When the instrument communicates with the EcFWUPDATE software, it displays the program user interface window with recent data readings in the data display area.

Instrument type ———

File name of firmware ———

Update status ———

Operating menu ———

Operating steps ———
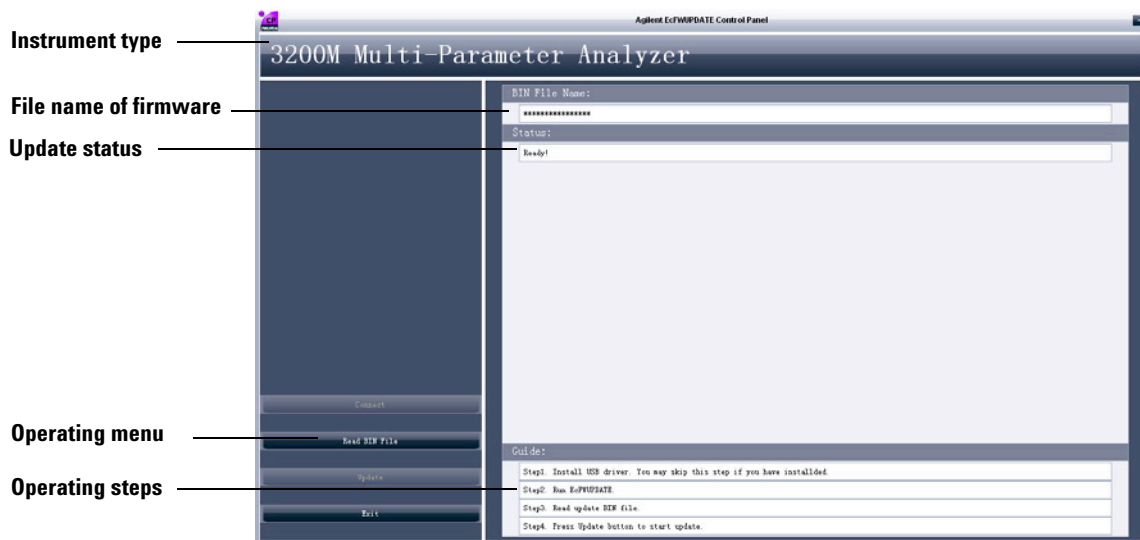
2 Click **Read BIN File** to select the latest firmware file.

The firmware files are named as follows where *x.00* is the version number:

3200P_ISP_V*x.00*.Bin, for 3200P pH meter

3200C_ISP_V*x.00*.Bin, for 3200C Conductivity Meter

3200D_ISP_V*x.00*.Bin, for 3200D Dissolved Oxygen Meter

3200I_ISP_V*x.00*.Bin, for 3200I Ion Meter

3200M_ISP_V*x.00*.Bin, for 3200M Multi-Parameter Analyzer

File name of firmware
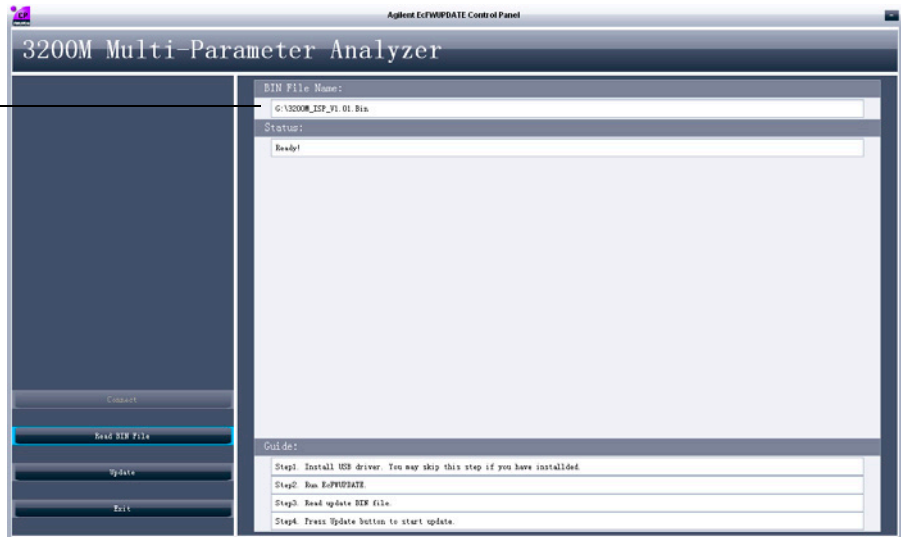
3 Click **Update** to update the firmware.
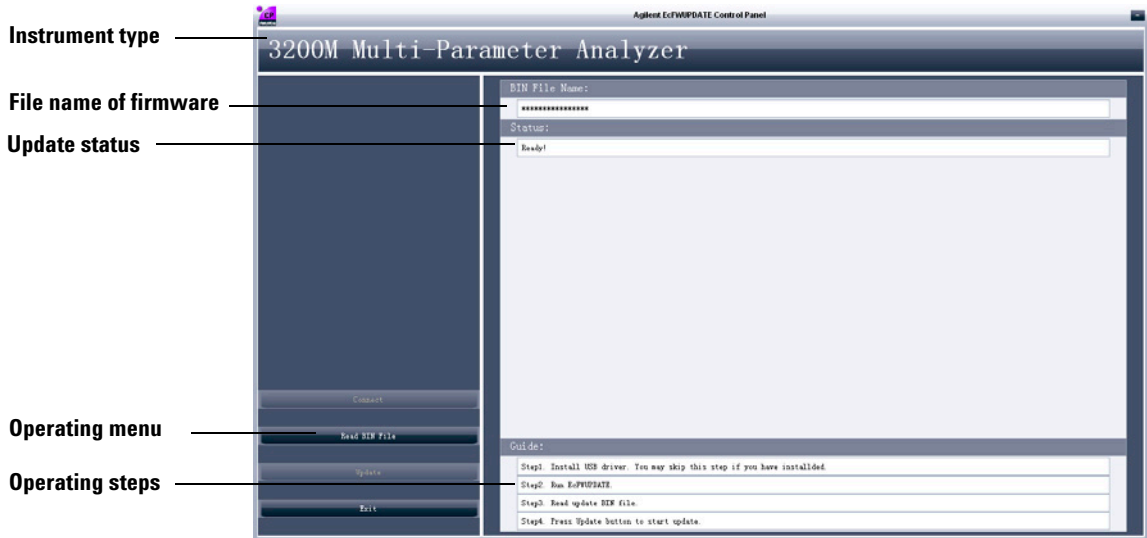

Update time

Update status
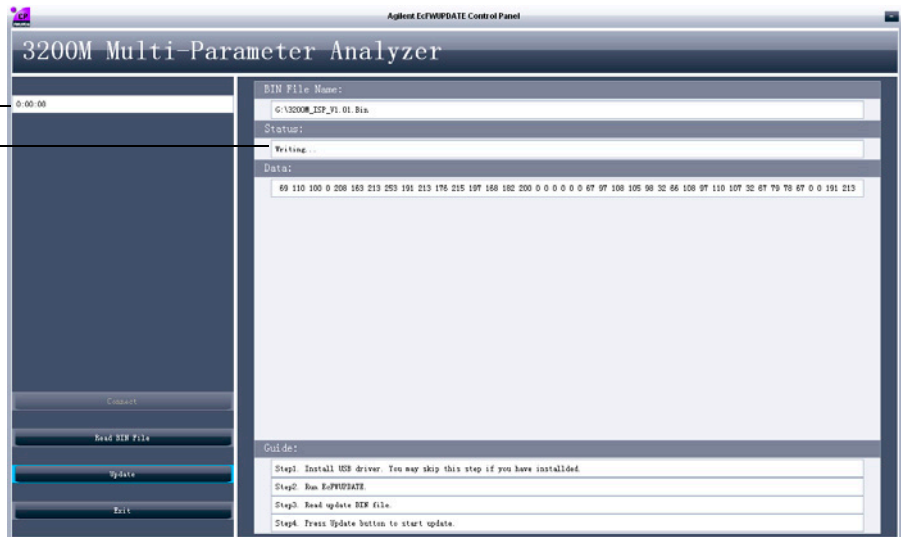
When the firmware update is complete, the following message displays.
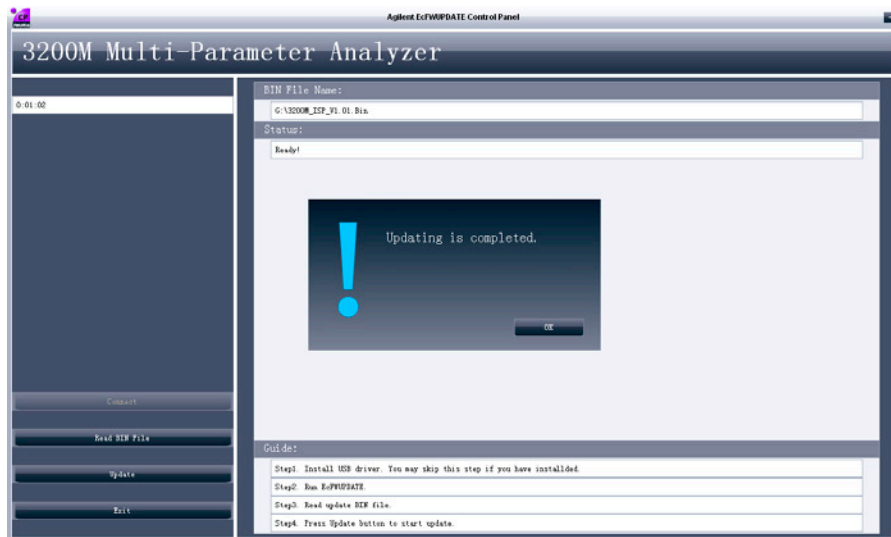
4 Click **Exit** to exit the program.

User Interface Reference

The software interface is composed of 5 parts:

- Instrument type
- File name of firmware (.BIN)
- Update status
- Operating menu
- Operating steps

Cancel

Click **Cancel** to cancel the connection.

Exit

Click **Exit** to exit the EcFIRMWARE program.

Connect (2nd try)

Click **Retry** to attempt to connect the instrument.

Appendix II EcPRINT Operating Guide

Agilent Technologies

Overview

The EcPRINT software allows a PC to communicate with an Agilent electrochemical instrument through a USB port. The instrument sends acquired data to the PC for viewing, printing, and saving the data to a PC storage device.

Install the Software

This program is supported on the following operating systems:

- 32 bit Windows 7
- 32 bit Windows XP, Service pack 3

Install EcPRINT

1 Download the EcPRINT.ZIP file from this Agilent website: http://www.chem.agilent.com/en-US/Support/Downloads/ Utilities/Pages/default.aspx.

2 Unzip the EcPRINT.ZIP file to a temporary directory.

3 From the temporary directory location, double-click the EcPRINT.EXE file and follow the instructions provided on the software setup wizard to complete the installation of the EcPRINT program.

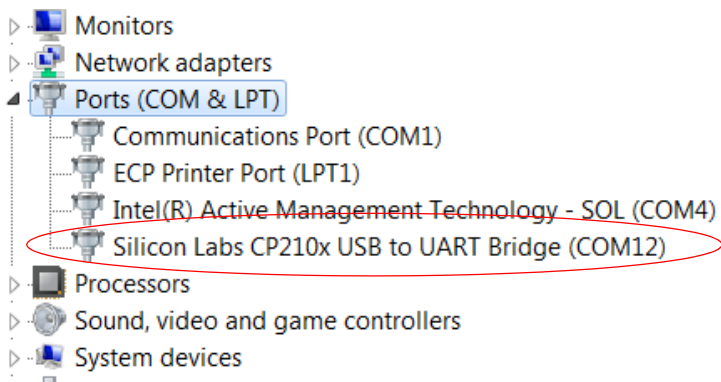The USB driver must be installed before running this program.

Install the USB driver

Install the provided USB driver on a PC to allow communication with the instrument. If this driver was previously installed for EcFWUPDATE please skip this procedure.

1 Run **CP210xVCPInstaller.exe**, which is located in the temporary directory used for unzipping the EcPRINT.ZIP file.

2 With the instrument powered off, connect the USB cable (provided with the instrument) from the instrument port labeled USB to a USB port on the PC.

3 Power on the instrument.

4 Open the device manager on the PC to view the newly installed USB driver labeled **Silicon Labs CP210*x* USB to UART Bridge (COM*X*)**, where *X* is the communication port number. This label indicates that the USB driver has been properly configured for the instrument.

The port number must be in the range of 1 to 16. If the port number shown is outside this range, double-click on the driver label to open the properties dialog, then click on the **Port Settings** to bring up the **Advanced Settings** dialog, and select a valid port number from the **COM Port Number** drop-down.

5 Record this USB communication port number (12 in this example) for configuration of the EcPRINT software.

Configure the USB port

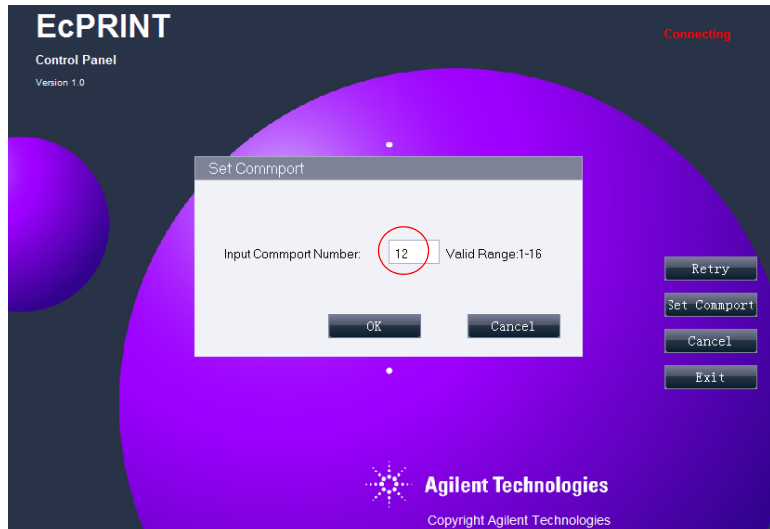This procedure assigns the previously recorded USB port number to the EcPrint program.

1 Double-click the EcPRINT icon on the PC desktop to start the program. Initially the PC screen displays **Connecting instrument...**.
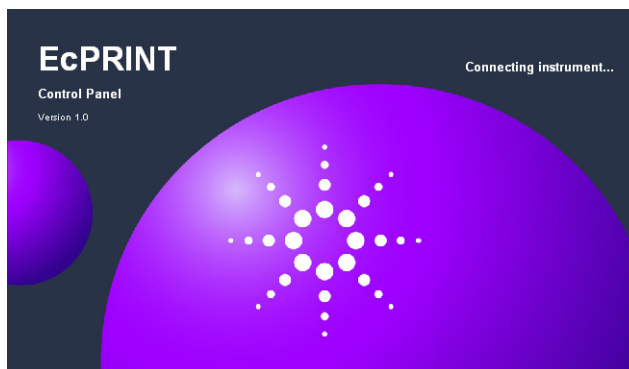
A **connecting error!** message displays because the port number is not yet configured.
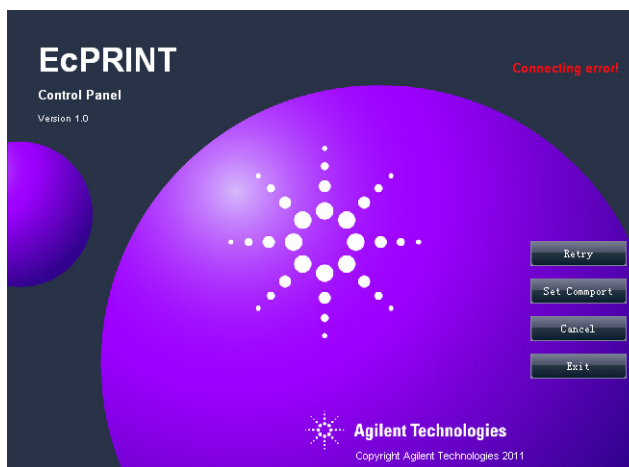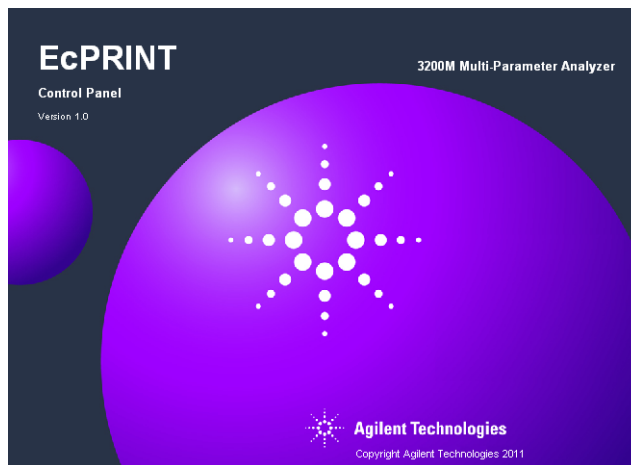
2 Click **Set Commport** to display the **Set Commport** dialog.

3 Enter the previously recorded communication port number (12 in this example) and click **OK**.

4 Click **Retry** and the EcPRINT software should now connect to the instrument and display the name of the instrument that is connected. The EcPRINT software user interface window is then displayed.
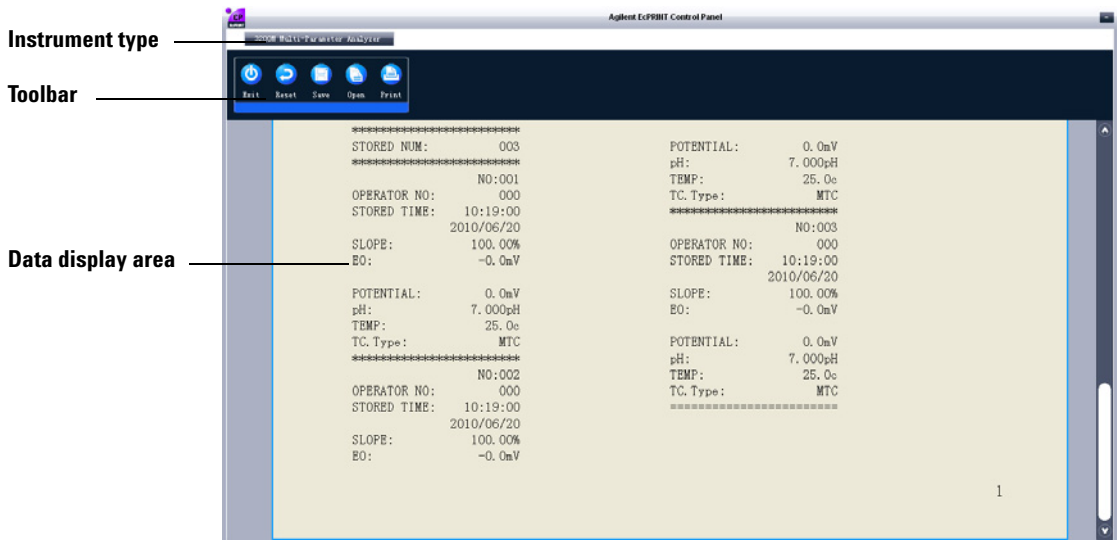
Run the Program

Configure the USB port before running the software.

1 Double-click the EcPRINT icon ![icon] on the PC desktop to start the program.

When the instrument communicates with the EcPRINT software, it displays the program user interface window with recent data readings in the data display area.

2 Press ![View 7] on the instrument keypad to enter the review status. This mode allows you to view the last calibration result or saved data.

3 Press ![Output 1] on the instrument keypad to transfer the data displayed in the data display area of the instrument to the PC and display it in the EcPRINT user display.
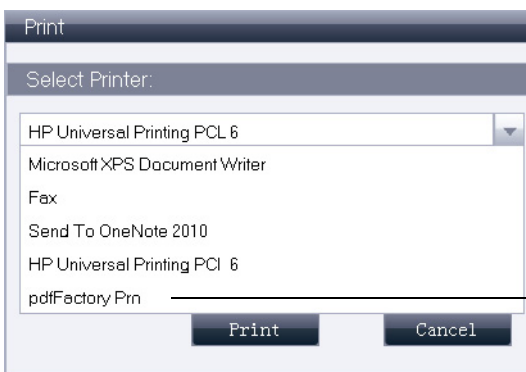
4 Click **Print** on the EcPRINT toolbar and the **Print** dialog displays.
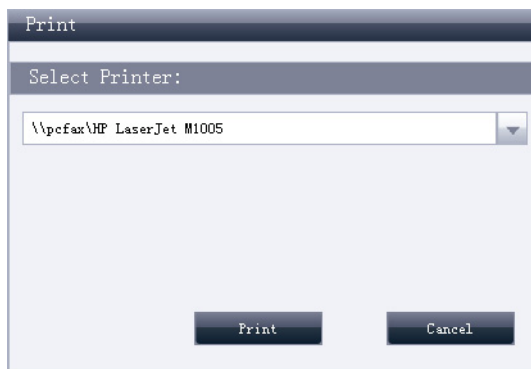
5 Select a printer and click **Print**.

The displayed instrument data is sent to the selected printer.

If a PDF printer is installed, you may select it to convert the data to a PDF file.

Select PDF printer, to convert the data to PDF format.

6 To optionally save this data to an ECP file, click **Save** on the EcPRINT toolbar. This saved data can only be used with the EcPRINT program.

7 To optionally load a previously saved ECP data file, click **Open** on the EcPRINT toolbar to load the saved (.ECP) data file into the data display area for viewing or printing.

User Interface Reference
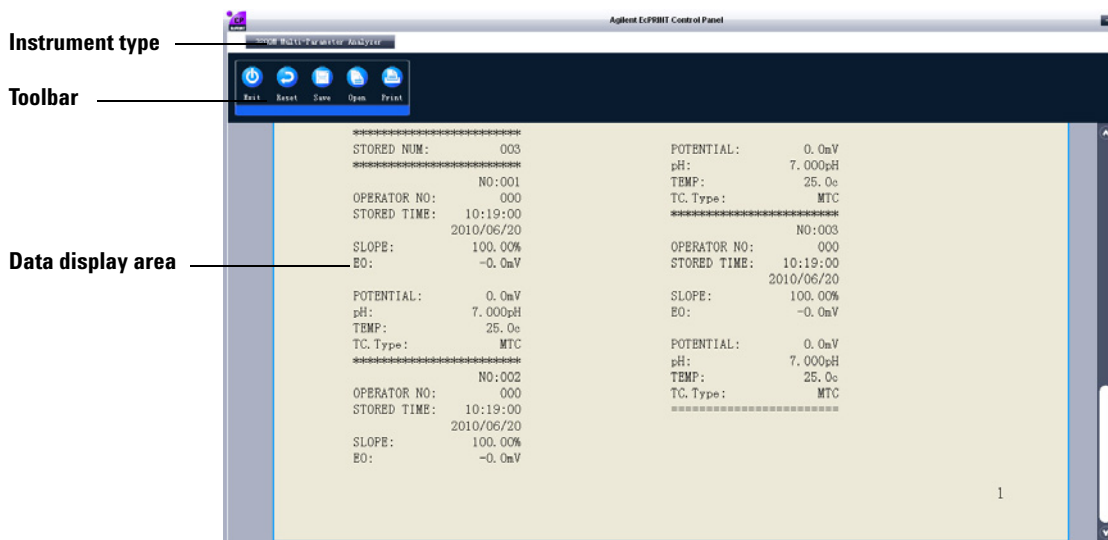
The software interface is composed of 3 parts:

- Instrument type
- Toolbar
- Data display area

Instrument type

Displays the Agilent electrochemical instrument type.

Toolbar

Exit	exits the EcPRINT program
Reset	clears all output data
Save	saves the data as an ECP file
Open	opens the saved data ECP file
Print	sends the output data to a specified printer

Data display area

Displays instrument data output when the instrument's **Output** button is pressed, and also displays data from ECP data files loaded into the EcPRINT program.
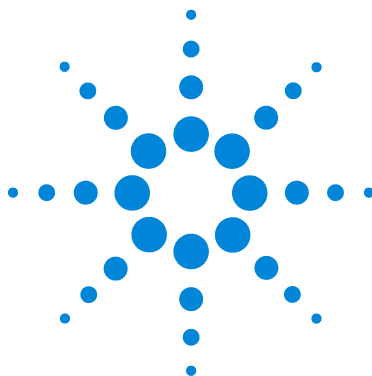
Agilent 3200C
电导率仪

用户手册

Agilent Technologies

声明

担保说明

安全声明

小心

小心提示表示存在危险。提醒您注意某个操作步骤、某项操作或类似问题，如果执行不当或未遵照提示操作，可能会损坏产品或丢失重要数据。只有完全理解并符合指定的条件时，才可以忽略小心提示的要求继续进行操作。

警告

警告提示表示存在危险。提醒您注意某个操作步骤、某项操作或类似问题，如果执行不当或未遵照提示操作，可能会导致人身伤害或死亡。只有完全理解并符合指定的条件时，才可以忽略警告提示的要求继续进行操作。

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3200C 型电导率仪安装指南

本安装过程，要求使用随 3200C 型电导率仪附带的配件。

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安装所需的工具和部件

Agilent 提供安装所需的专业工具和附件，如下：

- 电极支架 (G4389A)
- 电导电极，如 C5111 Conductivity Probe (5190-3994)
- 电源适配器 (5185-8389)
- 电导检测插头 （5185-8391）
- ATC 温度诊断插头 （5185-8390）

3200C 型电导率仪安装

打开 3200C 型电导率仪包装，取出电导率仪、电极支架以及相关附件。

电极支架的安装
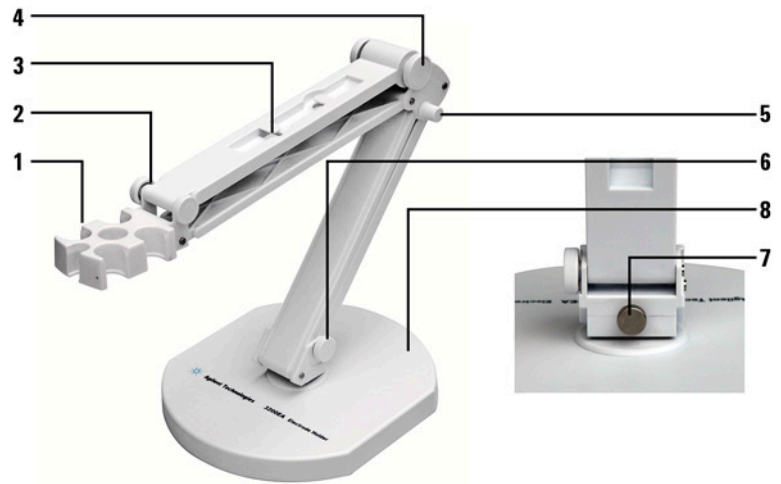
1. 电极插孔

2. 紧固螺母

3. 电极线固定孔

4. 紧固螺母

5. 紧固螺母

6. 紧固螺母

7. 紧固螺母

8. 底座

电极的安装

在电导率仪的背面找到电导电极接口、温度电极接口，然后，分别将电导电极（如 C5111 Conductivity Probe, 5190-3994）、温度电极（5190-3998）插入相应接口内，并将电极线夹在电极支架边缘固定孔中。

电源适配器的安装

仪器随机提供电源适配器。请注意，本适配器只适用于本仪器，不建议使用于其他类型的仪器。我们也不建议使用其他类型的电源适配器。

本电源适配器适用于以下电源：100 ～ 240VAC， 1A， 50/60Hz。

对应不同地区的电源，电源适配器提供多种转接插头，用户请正确选择合适的电源插头，然后按照图示将电源插头安装到适配器底座上，听到"啪"的一声表示已经安装到位。

接地线的安装

仪器随机提供接地线，但是接地线在测量过程中不是必须安装的。有时电极和被测溶液组成的测量部分会受到某些设备的干扰（如恒温槽等设备），从而引起跳字，影响测量，此时必须将测量部分屏蔽，并安装接地线，消除干扰。当仪器受到干扰时，将接地线一端连接仪器，另一端连接比如恒温槽的外壳等。

获得更多信息

有关更多信息，请参阅：

- 3200C 型电导率仪操作指南，以获得和熟悉日常操作说明。
- 电极操作指南，以获得电极使用和维护说明。

2
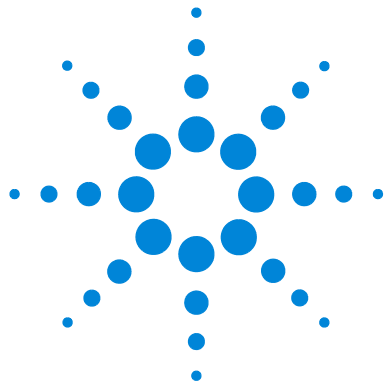
3200C 型电导率仪操作指南

此文档提供对组成 3200C 型电导率仪的各个组件的概述。

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简介

在哪里可以获得相关信息

除此文档之外， Agilent 还提供了其他相关说明，描述如何安装、操作和维护 3200C 型电导率仪及其故障排除。

使用电导率仪之前，请确保已阅读 3200C 型电导率仪安装指南和操作指南。使用电导率仪时最常见的安全问题有：

- 如果选用非原机配备电源适配器可能会发生不必要的安全问题。
- 必须有良好的接地。
- 防止腐蚀性气体侵入。
- 仪器的插座必须保持清洁、干燥，切忌与酸、碱、盐溶液接触。
- 仪器可供长期稳定使用。测试完样品后，所用电极应浸放在蒸馏水中，如果使用间隔大于 6 小时或长期储存，建议洗干净后放入空的保护瓶中存放。
- 电导电极的不正确使用常引起仪器工作不正常。应将电导电极浸入测量溶液中。电导电极放置点应注意避免安装在 " 死 " 角。

Agilent 客户门户网站

Agilent 建立了一个客户门户网站，可为您所拥有的产品提供相关自定义信息。通过该 Web 服务，您可以使用多种自定义服务以及与 Agilent 产品和订单直接相关的信息。该门户网站的登录地为 http://www.agilent.com/chem。

术语解释

电极常数：又称电导池常数，电极片之间的距离与电极片面积之比。通常用 cm^{-1} 表示。

TDS 转换系数：电导率与 TDS 的换算系数。

温度系数: 温度每变化1℃引起的电导率变化量，通常用%/℃表示。

用户手册

R 标记：表示读数稳定。标定过程中，表示数据已稳定并锁定，用户可以读取、保存数据。判定数据稳定与否的条件为设定的平衡条件。按"测量"键可以解锁。每次标定前，请先解锁。测量过程中，表示数据已稳定，用户可以读取、保存数据。在平衡测量模式时，出现 R 标记，数据将锁定。按"测量"可以解锁。

3200C 型电导率仪的特点

3200C 型电导率仪是一台新颖、实用的实验室分析仪器，适用于实验室精确测量水溶液的电导率、电阻率、总溶解固态量 (TDS)、盐度值，也可用于测量纯水的纯度与温度，以及海水淡化处理中的含盐量的测定。其主要特点为：

- 支持测量电导率、电阻率、总固态溶解物（TDS）、盐度值、温度值。
- 在全量程范围内，具有自动温度补偿、自动校准、自动量程、自动频率切换等功能。
- 具有标定功能，用户可以标定电极常数或 TDS 转换系数。
- 采用点阵式液晶，显示清晰，外形美观。具有良好的人机界面，操作方便。
- 支持 GLP 规范：
- 仪器要求设置操作者编号并记录
- 记录并允许查阅、打印标定数据；
- 支持贮存符合 GLP 规范的测量数据电导率、TDS、盐度各 800 套。
- 允许查阅、打印、删除贮存的测量数据。
- 支持三种测量模式：连续测量模式、定时测量模式和平衡测量模式，可以满足用户的不同测量需要。
- 仪器在测量状态下，具有稳定提示标志，便于用户操作。
- 具有 USB 接口，配合专用的通信软件，可以实现与 PC 的连接。
- 具有断电保护功能，在仪器使用完毕关机后或非正常断电情况下，仪器内部贮存的测量数据、标定数据以及设置的参数不会丢失。
- 仪器支持自动关机功能。
- 仪器支持年检功能。

- 仪器支持恢复默认数据功能；支持自诊断，可以诊断仪器是否正常工作。
- 带有背光设计，可以在阴暗的环境下使用。
- 采用新型材料 PC 面板，轻触按键设计，可靠性好，寿命长。
- 仪器具有固件升级功能，当仪器有功能性的拓展或者软件本身存在 bug 时，可以使用本功能更新。

3200C 型电导率仪的主要技术性能

3200C 型电导率仪的主要技术性能包括测量范围、分辨率、电子单元基本误差、仪器正常工作条件以及外形尺寸和重量。

1 测量范围

- 电导率：0.000μS/cm ～ 2000mS/cm ；
- 电阻率：5.00Ω.cm ～ 100.0MΩ.cm ；
- TDS：0.000 mg/L ～ 1000g/L ；
- 盐度：0–8.0% ；
- 温度：-5.0–110.0 ℃。

2 分辨率

- 温度：0.1 ℃。

3 电子单元基本误差

- 电导率 : ±0.5％(FS) ；
- 电阻率 : ±0.5％(FS) ；
- TDS: ±0.5％(FS) ；
- 盐度 : ±0.1％；
- 温度 : ±0.1 ℃。

4 仪器正常工作条件

- 环境温度 : (0 ～ 40) ℃；
- 相对湿度 : 不大于 85％；
- 供电电源：电源适配器 （5185-8389，输入：100-240VAC，1A ；输出：9VDC， 1A）；
- 周围无影响性能的振动存在；
- 周围空气中无腐蚀性的气体存在；
- 周围除地磁场外无其他影响性能的电磁场干扰。

5 外形尺寸 (长 × 宽 × 高， mm)：190×190×105

6 重量 (kg)：约 1kg。

使用电导率仪的方法

电导率仪是适用于精密测量各种液体介质的仪器设备，主要用来精密测量液体介质的电导率值。当配以相应常数的电极时可以精确测量高纯水电导率。电导率是以数字表示溶液导电能力的物理量。

使用电导率仪测量溶液电导率值需要 5 个主要步骤。它们是：

1 功能设置

2 电导电极的准备

3 电导电极的电极常数设置或者标定

4 温度系数的设置

5 电导率的测定

此过程期间，会显示来自 3200C 型电导率仪的状态消息，而且可以通过操作键盘相对应的按键更改用户的参数设置。3200C 型电导率仪由电子单元和电极系统组成，电极系统由电导电极、温度电极构成。（一切以实际的装箱单为准。用户可以按照实际需要选配其他常数的电导电极）。

本文档的下面几页将描述此过程的每个部分。
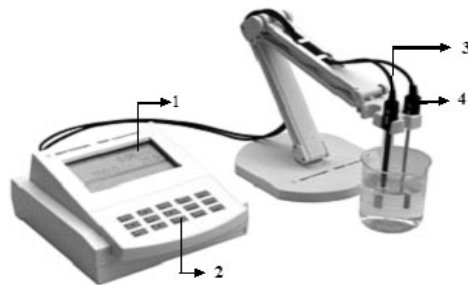
1. 显示屏

2. 按键

3. 电导电极

4. 温度电极

3200C 型电导率仪的前视图

1. 显示屏   2. 按键

3200C 型电导率仪的后视图

1. 接地	4.USB 接口
2. 温度电极接口	5. 电源接口
3. 电导电极接口	

操作盘

操作盘由显示屏和操作键盘组成。

显示屏

显示屏可显示 3200C 型电导率仪上目前正在执行的活动和工作状态。仪器正确连接电源后，按 "On/Off" 键打开仪器，仪器将显示公司名称、仪器型号、版本号等信息，并开始系统自检，完成后进入仪器的起始状态，仪器的起始状态显示如图，其中显示屏左面显示当前的系统时间；右面为当前设置好的测量模式、测量参数以及当前电极常数、温度系数。

操作键盘

3200C 型电导率仪有 15 个操作按键，分别为：1/ 输出键、 2/ ▲键、3/ 贮存键、4/◀ 键、5/ 设置键、6/▶ 键、7/ 查阅键、8/ ▼键、9/ 模式键、0/ 测量键、·/ 标定键、-/ 删除键、确认键、取消键、开/ 关键等。除确认键、取消键外，其余都为双功能键，分别介绍如下。

1/ 输出键：输入数字 "1"；在查阅贮存数据或标定数据时输出贮存数据或标定数据；

2/ ▲键、4/◀ 键、8/ ▼键、6/▶ 键：输入数字 "2"、"4"、"8"、"6"；方向键，用于选择菜单等；

3/ 贮存键：输入数字"3"；测量时贮存测量结果；

5/ 设置键：输入数字"5"；在不同的操作情况下设置不同的功能；

7/ 查阅键：输入数字"7"；查阅贮存数据或标定数据；

9/ 模式键：输入数字"9"；测量状态下用于切换显示窗口或参数；

0/ 测量键：输入数字"0"；开始测量；

·/ 标定键：输入小数；标定电极；

-/ 删除键：输入负数；清除全部输入；在查阅贮存数据时可以删除贮存的数据。
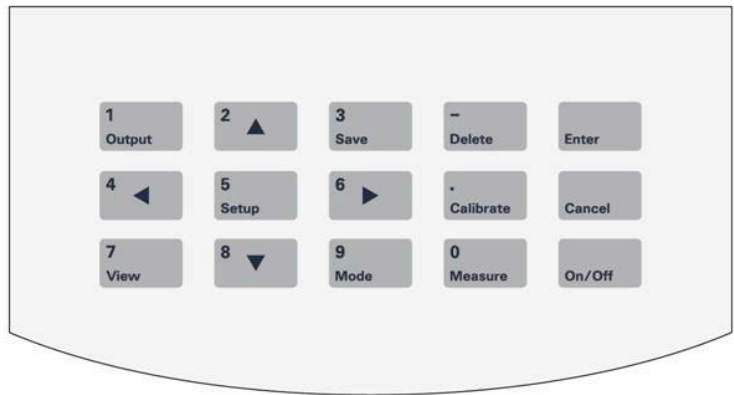
开 / 关键：打开或者关闭仪器。

操作基本知识

本节描述使用 3200C 型电导率仪时可以执行的任务。

概述

操作电导率仪涉及下列任务：

- 启动 3200C 型电导率仪。
- 功能设置。请参阅 " 起始状态下的功能设置 "。
- 电极常数的设置或标定。请参阅 " 电极常数的设置或标定 "。
- 温度系数的设置。请参阅 " 温度系数的设置方法 "。
- 电极准备。请参阅 " 电极的准备 "。
- 电导率的测量。请参阅 " 电导率的测量方法 "。
- 电阻率的测量。请参阅 " 电阻率的测量方法 "
- 温度的测量。请参阅 " 温度的测量方法 "
- TDS 转换系数的设置或标定。请参阅 "TDS 转换系数的设置或标定 "。
- TDS 的测量。请参阅 "TDS 测量方法 "。
- 盐度的测量。请参阅 " 盐度的测量方法 "。
- 数据贮存功能。请参阅 " 数据贮存功能 "。
- 数据删除功能。请参阅 " 数据删除功能 "。
- 数据输出功能。请参阅 " 数据输出功能 "。
- 数据查阅功能。请参阅 " 查阅功能 "。
- 关闭 3200C 型电导率仪。请参阅 " 关闭 3200C 型电导率仪 "。

仪器控制

3200C 型电导率仪通常直接由操作按键控制。

启动 3200C 型电导率仪

首先要正确地安装和维护电导率仪。开机前，须检查电源是否接妥，应保证仪器良好接地。电极的连接须可靠，防止腐蚀性气体侵袭。仪器插入电源后，按 "On/Off" 键开机。

起始状态下的功能设置

仪器的起始状态显示如图 1，其中左面显示有当前的系统时间；右面为当前设置好的测量模式、测量参数、以及当前使用的电极常数和温度系数值。

```
┌─────────────────────────┐
│              模式&参数   │
├──────────┬──────────────┤
│          │ 平衡测量模式 │
│  15:29   │ 测量电导率   │
│          │              │
│          │ 电极常数: 1.000 │
│2013/07/11│ 温度系数: 2.00%/℃ │
└──────────┴──────────────┘
```

图 1

在起始状态，按"设置"键可以设置"设置测量模式"、"设置手动温度"、"设置平衡条件"以及"系统设置"、"语言设置"、"设置电极常数"、"设置温度常数"、"TDS转换系数"、"设置自动关机"、"设置提示音"、"设置年检提示"、"恢复默认设置"。按确认键选择，仪器显示设置菜单，显示如图 2。
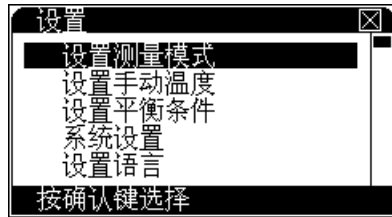

图 2

用户可以按方向键选择合适的菜单项，按"确认"键选择相应的功能模块；按"取消"键退出功能菜单选择。"设置测量模式"：设置当前的测量模式（连续测量模式、定时测量模式、平衡测量模式）以及测量参数；"设置手动温度"：如果仪器不接温度电极，可以使用手动温度值；"设置平衡条件"：设置平衡测量模式下的平衡条件；"系统设置"：设置系统时间、GLP选项；"设置语言"：支持中、英文版本；"设置自动关机"：仪器具有自动关机功能，用户可以设置自动关机时间；"恢复默认设置"允许用户恢复出厂参数设置，方便仪器自诊断。

"设置提示音"：允许设置按键时蜂鸣器提示音是否打开。

"设置年检提示"：允许设置年检提示，如果符合设置的年检时间和提示条件，则提示用户。

设置测量模式

仪器支持三种测量模式，包括连续测量模式、定时测量模式、平衡测量模式。
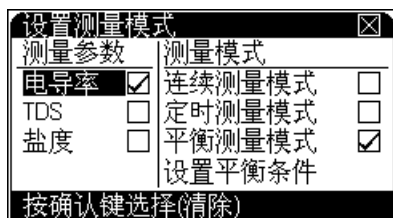
图 3

用户选择了相应的参数以及测量模式后，下次测量时即可按照当前设置情况进行测量。

在实际测量中，虽然用户选择了某个测量参数，仪器仍然允许用户随时查看其他参数值。譬如，用户选择电导率这个参数，在测量时，用户还是可以随时查看、存贮、打印其它参数值，如 TDS、盐度等。

在起始状态下，按"设置"键，再按"确认"键后，即可设置测量模式，显示如图 3，

其中左面为测量参数列表，包括电导率、TDS、盐度；右面为测量模式列表，包括连续测量模式、定时测量模式、平衡测量模式；显示"√"的表示为当前选中的测量参数或者测量模式；突出显示的表示可操作的当前项；按方向键移动到合适的项目后，按"设置"键选择（或清除）当前项目。按"确认"键，仪器自动保存当前的所有设置，返回上级菜单；按"取消"键仪器放弃当前设置返回上级菜单。图 4 即为选择测量参数后进入正式测量界面。

图 4

为了方便用户随时查看各个模块里面其它的参数值，仪器设置了一个特别的查看功能。在测量状态下，按"模式"键，仪器即突出显示测量窗口，如图 5，重复按 "4/◀" 或 "6/▶" 键，可以查看其他测量参数，比如，当前测量窗口为电导测量模块，当前测量参数为电导率，则重复按 "4/◀" 或 "6/▶" 键时，仪器会在 TDS、盐度、电阻率、电导率之间来回切换。查看结束，如果用户在几秒钟内没有继续按键，仪器会自动退出查看状态。

平衡测量模式 15:39 ⊠ R 0.000 µS/cm ———— MΩ.cm 25.0℃ 前次标定 电极常数: 1.000	平衡测量模式 15:40 ⊠ R 0.000 mg/L 0.000 µS/cm 25.0℃ 前次标定 转换系数: 0.500

图 5

连续测量模式

这是最常使用的一种测量模式，开始测量后，仪器始终连续测量、计算和显示测量结果，用户在测量期间可以查阅测量参数、标定电极、贮存或打印测量结果等等，测量结束，用户按"取消"键并"确认"后退出测量模式。

定时测量模式

定时测量模式是为了方便用户检测需要而设置的，比如需要定时30 分钟检测电导数据，则用户可以选择这种定时测量模式，开始测量后，仪器会自动测量、计算和显示测量结果，到用户设定的时间间隔时，仪器自动贮存测量数据，然后开始下一次测量。按"取消"键并"确认"后可以退出定时测量模式。

如果用户选择定时测量模式，需要设置定时间隔，时间间隔 1-5940秒，默认间隔为 600 秒。

平衡测量模式

用户首先应该设置好平衡条件（详见"设置平衡条件"），开始测量后，仪器自动测量、计算并显示测量结果，一旦测量符合设定好的平衡条件，本次测量即结束。

在测量过程中，用户可以查阅测量参数、标定电极等。测量结束后，用户可以贮存、打印测量结果；按"取消"键退出测量状态，或者选择按"测量"键开始下一次测量。

仪器默认设置为平衡测量模式，用户可根据需求更改测量模式。

设置手动温度

温度电极插口如果连接有温度电极时，仪器自动采用温度电极的温度值，反之，仪器采用用户设定的手动温度值作为当前的温度值（盐度测量时始终按 18 ℃ 补偿，不以用户设定手动温度为准）。按"设置"键，选择"设置手动温度"项，按"确认"键，仪器即进入手动温度设置模块。如图 6 按"设置"键修改手动温度值。用户按照实际需要，输入手动温度值即可。

```
┌──────────────────────────────┐
│ 设置手动温度              ☒  │
│                              │
│                              │
│  手动温度│       25.0℃    │  │
│                              │
│                              │
│ 按设置键设置                 │
└──────────────────────────────┘
```
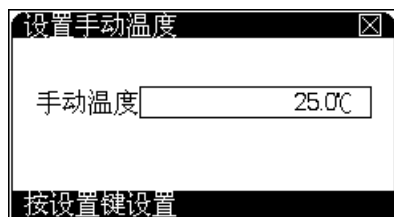
图 6

设置平衡条件

平衡条件对应平衡测量模式，设置各测量参数的平衡条件，图 7 显示电导率的平衡条件即为 1.0%，当电导率测量值在 7s 时间内的变化量小于测量值的 1.0% 范围时即认为本次测量有效。

当用户选择平衡测量模式进行测量时，如果仪器在设定的平衡时间内所有测量都符合平衡条件，则本次测量结束。平衡时间只对平衡测量模式有效，以秒 (s) 为单位，范围 1 ～ 200 秒。
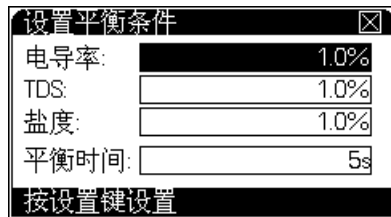
图 7

系统设置

系统设置包括 GLP 规范设置、电极标定提示间隔、系统时间等。按 " 设置 " 键，选择 " 系统设置 " 项，按 " 确认 " 键，仪器即进入系统设置模块，如图 8 所示。

按方向键移到至相应项后按 " 设置 " 键即可修改相应的参数值。修改完毕，按 " 确认 " 键退出设置状态。

" 电极标定间隔 " 是指仪器提示用户标定电极的时间间隔，仪器会自动计算前一次标定至今的时间，如果已经超过用户设定的标定时间间隔，仪器即弹出提示窗口，提示用户注意重新标定电极，电极标定间隔以小时 (h) 为单位 （设置零值将关闭该功能）。

操作者编号是一个三位数的编号，编号范围为 000 ～ 200，仪器所有的操作记录都包含有操作者编号。

图 8

小心	自动删除贮存数据功能是指当贮存数据量达到仪器最大的贮存量时是否允许自动覆盖，重复贮存。比如，仪器允许贮存测量数据各 800 套，当贮存第 801 套数据时，如果自动删除贮存数据功能打开则仪器自动将第 801 套数据存入第一个数据的位置，即从头开始贮存，望用户注意！如果用户没有选择自动功能，则仪器会提示用户是否选择从头开始贮存。

"设置系统时间"，移动至时间项，按"设置"键即可设置时间。显示如图 9，窗口显示当前时间，包括"年"、"月"、"日"、"时"、"分"、"秒"。

如果用户需要修改时间，按方向键移动光标至需要修改的时间项，按"设置"键，并输入相应时间值。

例如用户需要设置当前的月份时，可按如下方法操作：按方向键移动光标至"月"项，按"设置"键，仪器弹出输入窗口，用户按照当前月份输入，输入完毕按"确认"键退出输入窗口。同理，可修改其他时间项，等所有的时间项修改完毕，按"确认"键即完成最后的设置，按"取消"键退出系统时间设置模块。

图 9

语言设置

本仪器支持中英文版本供用户选择。在仪器起始状态下，按"设置"键选择"语言设置"后确认，用户即可选择中文或者英文版本。

设置自动关机

本仪器支持自动关机功能，允许用户设置关机时间。自动关机时间为 10 ～ 480min，当仪器运行到设定的自动关机时间时，仪器将强制关机。设置零值，可以关闭自动关机功能。

恢复默认设置

由于某些操作或者使用上的原因，可能会导致测量参数的改变，利用此功能可以恢复至默认值。在仪器起始状态，按"设置"键选择"恢复默认设置"项并确认后，即可恢复默认设置值。执行此功能后的具体参数如下：

- 修改电极常数标定数据至默认
  - 标液数为 1 个；
  - 具体的标液数据为
  - 标称值：1408 uS/cm,
  - 测量值：1408 uS/cm ,
  - 标定温度：25.0 ℃。
  - 此时默认电极常数为 1.000。
- 修改 TDS 标定数据至默认
- 标液数为 1 个；
- 具体的标液数据为
  - 标称值：704 mg/L,
  - 测量值：704 mg/L ,
  - 标定温度：25.0 ℃
  - 此时默认 TDS 转换系数为 0.500。
- 设置温度补偿系数至默认 2.00%/ ℃
- 设置手动温度为 25.0 ℃；
- 设置测量模式为平衡测量模式；
- 设置定时测量模式的定时间隔为 600 秒；
- 关闭标定间隔提示功能；
- 允许数据从头覆盖；
- 设置操作者编号为 000 ；
- 设置平衡测量模式下的电导率、 TDS、盐度等平衡条件为 1.0% ；
- 设置平衡测量模式下的平衡时间为 7s ；
- 设置自动关机时间为 0，即关闭自动关机功能；
- 蜂鸣器提示音打开；
- 年检提示关；
- 自动删除打开。

设置提示音

仪器允许用户设置按键时蜂鸣器提示音是否打开。用户如果觉得蜂鸣器的提示音影响使用，可以选择关闭。按" 设置 "键，选择" 设置提示音 "后，按" 确认 "键即可进入选择。
注意：仪器对应某些特别提示时，仍然会以蜂鸣器提示的形式提醒用户。

设置年检提示

对于有些用户可能需要设置一定的年检时间，仪器可以提供本功能。仪器允许用户选择关闭年检提示或提前 1-12 个月提示，如果用户打开年检提示功能，仪器在开机完成自检后，会进行判断，如果符合用户设置的年检时间和提示条件，则提示用户。按" 设置 "键，选择" 设置年检提示 "后，按" 确认 "键即可进入选择。

电极常数的设置或标定

电极准备

1 首次使用或长时间储存后，电极的测量端在无水乙醇中浸泡1分钟。用新鲜的无水乙醇重复上述操作两次以上。用去离子水充分清洗电导电极，然在去离子水中浸泡 1 小时以上。

2 连接仪器和电极，参考仪器操作说明书。

3 完成一次测量后，根据测量样品的性质选择合适的清洗方法。

小心	在清洗的过程中，避免 C5111 电导电极铂黑层的损坏。

4 使用前根据仪器说明书的描述标定电极常数。通常每支电导电极在出厂前已标有电极常数值。但是，运输和长期储存会改变电极常数值。使用一段时间后电极常数也可能会发生改变。

5 电导电极使用前，应确认样品是否会沾污铂金片或镀铂黑铂金片，同时确认样品是否会与铂金片或镀铂黑铂金片发生化学反应。

6 电极使用中发现异常情况，请按下列步骤查找原因。电导测试中有三个主要因素：电导仪，电导电极，溶液。

   a 电导仪
     参考仪器说明书

   b 电导电极
     参考电导电极说明书清洗章节。

   c 溶液
     如果电导电极和电导仪在标准溶液中正常工作，但在样品中不工作，就需要检查样品中是否有快速粘污铂敏感元件的物质。检查电导电极、标准溶液和样品溶液是否达到温度平衡。

电极常数的设置或标定

通常每支电导电极都标有电极常数值，用户只需要按电极标签标示的常数值设置后就可正常测量。用前根据仪器说明书的描述标定电极常数。通常每支电导电极在出厂前已标有电极常数值。但是，运输和长期储存会改变电极常数值。使用一段时间后电极常数也可能会发生改变。如果用户需要自己标定，可以按照以下步骤重新标定电极常数，本仪器支持两点标定，如果用户需要测量高电导 (大于 10mS/cm) 溶液，则建议用户使用两点标定。

根据电极常数，选择合适的 1 到 2 种标准溶液 (见表 1)、配制方法
(见表 2)，标准溶液与电导率值关系表 (见表 3)；

1 将电导电极接入仪器，断开温度电极 (仪器不接温度电极)，仪
器则以手动温度作为当前温度值，此时仪器所显示的电导率值
是当前手动温度下电导率值，推荐手动设置温度为 25 ℃；

2 用蒸馏水清洗电导电极；

3 将电导电极浸入标准溶液中；

4 控制溶液温度恒定为当前手动温度下；

5 按"标定"键选择"标定电极常数"项并确认后进入电极常数标定
状态 （如图 10）；

图 10

6 按"设置"键设置标准溶液的标称值，输入表3中相应的数据，即
当前标准溶液相应温度下的电导率值，如图 11 所示；

图 11

7 待仪器读数稳定出现 "R" 标记后，按下"确认"键，仪器即自动计
算出新的电极常数值，标定结束；按 " 取消 " 键，仪器终止电
极常数标定。
若接通温度电极，无论手动温度输入多少，此时仪器所显示的

电导率值是补偿到 25 ℃的电导率值。按表 3 输入相应的数据，也应该是 25 ℃的电导率值。

8 如果用户需要测量高电导溶液，建议采用两点标定方法来标定电极，首先配置两种标准溶液，其中高电导标液尽量选择接近样品溶液电导率值。先按照前面方法标定电极常数，按确认键结束后，不能按 " 取消 " 键退出标定，而是将电极放入另一高电导标液按 " 测量 " 键开始再次标定，等仪器读数稳定后按 " 确认 " 键，仪器自动计算电极常数，标定结束。按 " 取消 " 键退出标定。

表 1　　标定电极常数的 KCI 标准溶液

电极常数 (cm^{-1})	0.01	0.1	1	10
KCI 溶液近似浓度 (mol/L)	0.001	0.01	0.01 或 0.1	0.1 或 1

表 2　　标准溶液的组成

近似浓度 (mol/L)	质量浓度 KCI(g/L) 溶液 (20 ℃空气中)
1	74.2457
0.1	7.4365
0.01	0.7440
0.001	将 100mL 0.01mol/L 的溶液稀释至 1 升

表 3　　KCI 溶液近似浓度及其电导率值 (单位：µS/cm) 关系

温度 近似浓度 (mol/L)	15.0 ℃	18.0 ℃	20.0 ℃	25.0 ℃	35.0 ℃
1	92120	97800	101700	111310	131100
0.1	10455	11163	11644	12852	15353
0.01	1141.4	1220.0	1273.7	1408.3	1687.6
0.001	118.5	126.7	132.2	146.5	176.5

通常有二种方法可以得到电极常数值：一种用电导标准溶液重新标定，标定结束仪器会自动计算电极常数（方法如上所述）；另一种就是直接设置电极常数值：在测量状态下，按"设置"键，选择设置电极常数项并确认后，仪器弹出输入窗口，用户按照实际电极标签标示的电极常数值输入即可。

小心	这二种方法只能选一种，如果前一次是通过标定得到电极常数值，现在用户直接输入电极常数，则仪器会删除前一次的标定数据，望用户注意。

温度系数的设置

仪器需要精度测量时，温度会影响电导率的测量准确性，此时需要设置温度系数。在仪器的测量状态下，按"设置"键选择设置温度系数项并确认后，仪器会弹出输入窗口，输入新的温度系数即可。

另外，在仪器的起始状态下，按"查阅"键，选择"查阅电导参数"后按"确认"键，主机显示如图 12，用户可以查阅上次的标定数据，包括当前的电极常数以及温度系数值。

通常用户无需设置温度系数，仪器默认的温度系数为 2.00%/ ℃。

查阅电导参数	标液数:1	☒
前次标定	2012/06/01 08:12	
No1	标称值:	1408μS/cm
	测量值:	1408μS/cm
	温度值:	25.0℃
电极常数:	温度系数:	
1.000	2.00%/℃	

图 12

电导率的测量方法

在测量电导率前应首先选择合适的电导电极，选择原则如下（可参照表 4）：电极常数为 1.0 的电导电极有 " 光亮 " 和 " 铂黑 " 二种形式，镀铂电极习惯称作铂黑电极；两者相比较而言，光亮电极适用的测量范围为 2 ~ 3000μS/cm，超过 3000μS/cm 测量误差较大。测量高电导率时，一般采用高电极常数的电导电极，当电导率 ≥ 200.00mS/cm 时，必须采用电极常数为 5 或 10 的电极；当电导率 ≥ 500.00mS/cm 时，必须采用电极常数为 10 的电极。

表 4   电导率范围及对应电极常数推荐表

电导率范围	电阻率范围 ($\Omega \cdot cm$)	推荐电极常数 (cm^{-1})
0.000 ~ 19.99 μS/cm	20.00M ~ 50.0K	0.01
0.20 ~ 200 μS/cm	5.00M ~ 5.00K	0.1
2.000 ~ 20 mS/cm	500 ~ 50	1.0
20.00 ~ 200 mS/cm	50 ~ 5	10

在仪器的起始状态下，如果有电导率测量参数则直接按 " 测量 " 键即可开始测量，否则按 " 设置 " 键选择测量模式并选择电导率测量参数即可 (详见**设置测量模式**)，显示如图 13。其中显示屏上方显示有当前的测量模式、系统时间；测量主窗口显示当前的电导率以及对应的电阻率和温度值。

图 13

测量和显示方法会随不同的测量模式而略有不同。在测量过程中，用户可以重新标定电极、设置测量参数等；测量结束后，用户可以按 " 贮存 " 键，存贮测量数据；按 " 输出 " 键输出测量数据；按 " 取消 " 键结束测量。

小心	在测量电导率及 TDS 时，温度电极接上，仪器自动按设定的温度系数将电导率补偿到 25.0 ℃时的值；温度电极不接，仪器显示待测溶液未经补偿的原始电导率值。

在盐度测量时，温度电极接上，仪器自动将盐度补偿到 18.0 ℃时的值；温度电极不接，仪器显示待测溶液未经补偿的盐度值。

电阻率的测量方法

在电导率测量状态下，仪器将直接显示当前的电导率以及电阻率值，用户可以直接测量电阻率。具体操作参见电导率的测量章节。

温度的测量方法

在任何测量状态下，仪器将直接显示当前溶液的温度值。具体操作参见电导率的测量章节。

TDS 转换系数的设置或标定

通常有二种方法可以得到 TDS 转换系数值：一种就是直接设置 TDS 转换系数值。在测量状态下，按 " 设置 " 键，选择设置 TDS 转换系数项并确认后，仪器弹出输入窗口，用户按照实际需要，输入新的 TDS 转换系数即可。另一种用电导标准溶液重新标定，标定结束仪器会自动计算新的 TDS 转换系数，标定方法如下所述：

先根据被测溶液的性质及测量范围，选择合适的标准溶液（电导率与 TDS 标准溶液关系表参见表 5）标定操作方法如下：

1　设置正确的电极常数值：在测量状态下，按 " 设置 " 键选择设置电极常数项，按照实际使用的电导电极标签标示的常数值设置；或者通过重新标定电导电极常数值。完毕后，按 " 模式 " 键再重复按 "4/◀" 键 (或 "6/▶" 键) 使仪器进入 TDS 测量状态；

2　按 "标定" 键选择标定 TDS 转换系数项并确认后，进入标定状态，如图 14。

图 14

3　用蒸馏水清洗电导电极；

4　将电导电极浸入标准溶液中，控制溶液温度恒定为：
　（25.0±0.1）℃；

5　按 " 设置 " 键选择设置标称值项并确认后，输入表 5 中相应的数
　据，即当前标准溶液的 TDS 值；

6　待仪器读数稳定后，按下 " 确认 " 键，仪器即自动计算出新的
　TDS 转换系数值，标定结束；按 " 取消 " 键，仪器将终止 TDS
　转换系数标定。

表 5　　电导率与 TDS 标准溶液关系

电导率 (µS/cm)	TDS 标准值 KCl (mg/L)	NaCl (mg/L)	442 (mg/L)
23	11.6	10.7	14.74
84	40.38	38.04	50.5
447	225.6	215.5	300
1413	744.7	702.1	1000
1500	757.1	737.1	1050
2070	1045	1041	1500
2764	1382	1414.8	2062.7
8974	5101	4487	7608
12880	7447	7230	11367
15000	8759	8532	13455
80000	52168	48384	79688

备注：表中列出的值为 25 ℃时情况下的值；
442 表示 40%Na_2SO_4、 40%$NaHCO_3$、 20%NaCl。

TDS 的测量方法

在测量 TDS 前需要选择合适的电导电极，选择原则同测量电导率时电导电极的选择原则。确定电导电极后，设定合适的电极常数、温度系数以及 TDS 转换系数。或者重新对电导电极进行标定。

在仪器的起始状态下，如果用户已经选择了 TDS 测量参数，则可直接开始测量，否则由设置测量模式选择 TDS 测量参数后进行测量（详见设置测量模式），其显示、测量过程以及操作请参见电导率测量章节。测量结束以后，用户可以按"贮存"键，存贮测量数据；按"输出"键输出测量数据；按"取消"键结束测量。

盐度的测量方法

测量盐度前同样需要选择合适的电导电极，选择原则同测量电导率时电导电极的选择原则。确定电导电极后，设定合适的电极常数。在仪器的起始状态下，如果用户已经选择了盐度测量参数，则可直接开始测量，否则可由设置测量模式选择盐度测量参数后进行测量（详见设置测量模式）。其显示、测量过程以及操作请参见电导率测量章节。测量结束以后，用户可以按"贮存"键，存贮测量数据，按"取消"键结束测量。

数据贮存功能

本仪器支持贮存电导率、TDS、盐度各 800 套测量数据，超过 800 套时将允许从头开始存贮。在不同的测量模式下，数据贮存方式有所不同，在连续测量模式和平衡测量模式，用户需等待测量结果稳定后按"贮存"键来手动存贮测量数据；在定时测量模式时，仪器按照设定的定时间隔，自动定时贮存测量结果，当然用户也可以手动贮存结果。具体的测量操作方法参见前面相关章节。

数据删除功能

仪器支持贮存测量数据，也支持删除测量数据功能。对于某些因操作不当、或其他原因造成的不确定测量结果，用户可以逐个删除或者全部删除。仪器只有在查阅存贮数据状态下才能完成该操作。具体操作方法如下：通常在仪器的起始状态下或者测量状态下，按"查阅"键选择查阅相应存贮数据，进入查阅贮存数据后，按"删除"键，选择相应操作即可。

数据输出功能

如果用户需要输出当前的测量数据、上次标定数据或者已存贮的数据，可使用 EcPRINT 软件，具体请参见附录 2。

数据查阅功能

3200C 型电导率仪允许用户查阅当前的测量参数，包括上次的标定数据和当前使用参数等；允许用户直接修改测量参数；允许查阅存贮数据。在仪器的起始状态，按 " 查阅 " 键，并选择相应选项即可查阅、修改测量参数和查阅存贮数据 （图 15）。
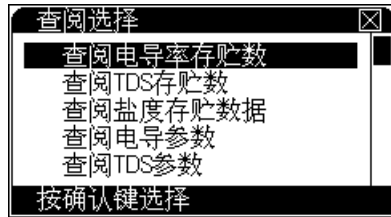
图 15

查阅贮存数据

仪器按照测量参数存贮数据，所有存贮数据支持 GLP 规范。仪器允许存贮电导率、TDS、盐度值等符合 GLP 规范的测量数据各 800 套。

在仪器起始状态，按"查阅"键，选择"查阅电导率存贮数据"显示如图 16，其中显示屏上方显示当前查阅模式以及实际的存贮数；每页最多可显示 8 个存贮数据，显示情况随不同查阅模式而而异，主要包括存贮时间、操作者编号等。用户按方向键查看每个存贮数据。此时，如果用户需要打印、删除存贮数据，分别按"输出"（首先通过 USB 连接线连接 PC）、"删除"键选择相应操作。查阅 TDS 存贮数据和盐度存贮数据方法同"查阅电导率存贮数据"。

仪器提供 3 种贮存方式：全部数据、按时间、按编号。按"设置"键进入查阅模式，用户可根据需求按方向键选择查阅方式，按"设置"键修改编号或时间，设置完毕按"确认"键即显示所需的数据。

图 16

查阅测量参数

在仪器的起始状态下，按"查阅"键，选择"查阅电导参数"后，按"确认"键即可查阅电导参数，显示如图 17，其中上方为上次的标定数据；下面为当前电导的参数值，包括电导常数以及温度系数。

图 17

在仪器的起始状态下，按 " 查阅 " 键，选择 " 查阅 TDS 参数 " 后，
按 " 确认 " 键即可查阅电导测量参数，显示如图 18。

图 18

如果用户需要打印当前的参数数据，可通过 USB 连接线连接 PC，
打开数据打印软件，按 " 输出 " 键即可打印标定数据。请参阅打印
输出功能。

关闭 3200C 型电导率仪

用户使用完毕，如果需要存贮数据请确保已按 " 贮存 " 键保存，此
时按仪器的 "On/Off" 键 3 秒以上关闭仪器。测试完样品后 , 所用电
极应浸放在蒸馏水中。如果仪器长期不用，请注意：

1 断开电源，以免损坏电源适配器并间接损坏仪器，给您带来不
必要的损失！

2 仪器的插座必须保持清洁、干燥，切忌与酸、碱、盐溶液接触。

3 仪器的输入端 (测量电极的接口) 必须保持干燥清洁。在环境湿
度较高的场所使用过，应用干净纱布擦干。电极接口。

4 电导电极短期不使用时，建议将电极铂金片浸泡于去离子水
中。如果使用间隔大于 6 小时或长期储存，建议洗干净后放入
空的保护瓶中存放。

更正问题

1 接通电源后,若显示屏不亮,应检查电源适配器是否有电压输出。

2 电导电极的不正确使用常引起仪器工作不正常。在测量过程中，应使电导电极完全浸入溶液中。电导电极放置在溶液中时应避免放置在"死"角。对于高纯水的测量，须在密闭流动状态下测量，流速不宜太高。

3 仪器必须有良好的接地，防止腐蚀性气体侵入。

4 若上述各种情况排除后,仪器仍不能正常工作,则与有关部门联系。

3

3200C 型电导率仪故障排除

此文档提供仪器基本故障解决方法，如果在使用过程中，仪器出现故障，可根据本文档排除故障。

仪器基本故障以及解决办法

编号	故障项目	故障原因	解决办法
1	仪器开机不显示	电源适配器安装有问题 使用的电源与要求的不一致 电源适配器损坏 电源插座接触不良 可能液晶损坏（开机一段时间后，按"On/Off"键能听到蜂鸣声，但液晶始终无显示）	按说明书重新安装 请使用仪器要求的电源 更换电源适配器 保证接触良好 联系代理商
2	按键无蜂鸣声	按下了无效的按键。 蜂鸣器损坏 蜂鸣器设置为关	选择有效的按键操作 联系代理商 更改设置为开
3	按键无响应	按下了无效的按键 按键损坏	选择有效的按键操作 联系代理商
4	仪器不连接温度电极时不显示 25.0 ℃	仪器不连接温度电极时，仪器自动使用设置的手动温度值。	设置手动温度至 25.0 ℃。
5	测量时跳字严重，甚至无法正常测量	电极已损坏，或过保质期 周围有强干扰信号存在	更换电极 隔开测量溶液与干扰源，比如抬高测量溶液的烧杯；用仪器随机提供的接地线连接，一头连接仪器，一头连接干扰源的外壳。
6	电导测量时漂移严重	由于电极表面有杂质吸附，电极不干净引起	清洗电导电极

仪器自诊断操作指导

仪器在使用过程中，有很多因素会影响测量结果，包括测量使用的电极、标定电极常数的标准溶液、样品溶液、测量时的温度、操作或者使用不当等等，当出现测量结果与预想的结果值相差甚远时，为了更好地快速判断是仪器本身还是仪器以外的因素导致测量误差，可以参照本操作指导进行简单的自诊断。

仪器的温度诊断

仪器连接随机提供的 ATC 温度诊断工具（5185-8390），开机，进入测量状态，此时仪器显示的温度值在 49.0 ～ 51.0 ℃左右，则表示仪器的温度测量正常。如果偏差很大，则表示仪器硬件有问题，请联系相关部门。

仪器的电导测量诊断

断开测量电极，将随机提供的电导诊断工具（5185-8391）连接仪器；开机，断开温度电极，将手动温度设置为 25.0 ℃；查阅当前的电极常数值，如果在 1.000 左右则可进行后面的检测，否则请将电极常数设置为 1.000 (在 " 查阅电导参数 " 功能里面设置)。

进入测量状态，此时仪器显示的电阻值应该在 9.0 ～ 11.0kΩ 左右，电导率为 90.0 ～ 110.0μS/cm 左右，表示仪器硬件功能正常；如果偏差很大，则说明硬件有问题，请联系相关部门。

按照上述方法可简单判断是仪器本身硬件错误、测量的电极常数值错误、测量温度值错误等情况引起，还是电极以外的测量因素导致测量误差。对于仪器以外的原因，用户可以使用类比办法，将电极放置在相近浓度的标准溶液和样品溶液中，查看测量的电导率，类比判断是电极本身，还是溶液的问题，抑或是其他原因。事实上，对于高电导的测量以及超纯水的测量，对电极的要求、测量条件会苛刻得多，测量的准确度会下降，这是比较正常的。

仪器自诊断相应代码与说明

本仪器支持自诊断功能，能诊断出常规的由于仪器本身、电极本身、溶液本身、或者操作本身而导致的一些错误。针对不同错误的严重程度，仪器予以区别对待和处理，通常仪器分为二大类错误，一类是严重的系统错误，这类错误将直接影响仪器的进一步使用，无法完成必要的工作，而不得不做更换、维修等处理；另一类错误较为轻微，属于提示、警告之类。这些错误由多种原因导致，同样可以有多种方法解决、应对，用户必须重视这些警告，才能保证测试数据的完整性、可靠性。当然，用户可以暂时忽略这些警告和提示，而不影响仪器的使用。

严重错误

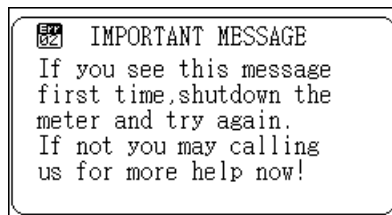仪器发现严重错误时，将直接停机，并提示错误，此时用户除了关机外无法再进行任何操作。仪器的错误提示如图。

图 19

警告错误

用户在使用过程中，由于电极本身、溶液本身或者操作本身等原因导致错误警告的出现，用户应重视这些错误信息，仔细阅读操作提示，并严格按照仪器说明书、电极说明书操作、保养和使用，将错误减少到最少。
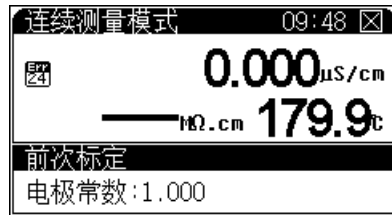
图示即为仪器测量时，由于温度超出测量范围而出现的错误警告。

图 20

为错误警告标志，数字表示错误代码，具体见下表的描述。注意：下表内容为多参数所有错误号的描述，对应不同的仪器，用户查看相关内容即可。

表 6　　错误警告代码表

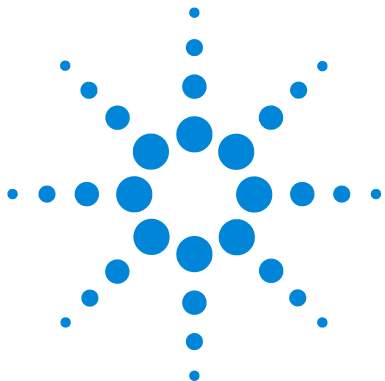| NO	代码	描述	解决办法	备注
1	00	电导测量模块错误	联系代理商	严重错误
2	01	溶解氧测量模块错误	联系代理商	严重错误
3	02	温度测量模块错误	联系代理商	严重错误
4	03	数据存贮错误	联系代理商	严重错误
5				
6				
7	20	电位超出量程	更换电极	-1999.9~1999.9mV
8	21	pH/pX 超出量程	更换电极	-3.000~21.000pH
9	22	电导率超出量程	更换电极、更换溶液	0~2000mS/cm
10	23	电阻率超出量程	更换电极、更换溶液	0~100Mohm.cm
11	24	温度超出量程	更换电极、降低溶液温度	-6.0~120.0 ℃
12	25	溶解氧电流超量程	更换电极	0~4000nA
13	26	pH 电极斜率超范围	更换电极、重新标定	80~120%
14	27	无法识别 pH 标液	更换电极、设置合适的标液组、更换标液	
15	28	pH 标液温度超范围	降低标液温度	
16	29	重复标定同一种标液	更换标液	操作错误导致
17	30	选择的 pH 标液数已最大	先清除某个标液	最大标液数 5 个
18	31	pH 标液相互有重叠	先清除某个相邻标液	
19	32	到达最大存贮数据	可选择覆盖后，从头存贮	不删除全部数据
20	33	时钟电池电压过低	手动设置时间	
21	34	超出最大用户自定义离子数	删除不必要的离子	
22	35	超出某个离子模式下的最大存贮数据量	删除某个离子模式下的部分存贮数据	

4
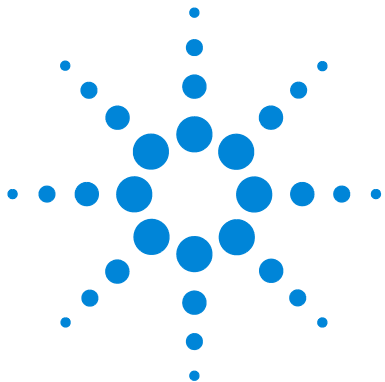
电极的保养、维护和贮存

本节描述相关电极的保养、维护和贮存信息。

电极的清洗

对应不同的电极污染程度和污染物性质，电极的一般清洗方法，包括无机物清洗、有机物清洗、油脂类清洗、蛋白质沉淀清洗等等。通常进行一种或两种以上清洗后，用蒸馏水清洗电极的外部，如此重复 2-3 次。

电极的储存

电导电极短期不使用时，建议将电极铂金片浸泡于去离子水中。如果使用间隔大于 6 小时或长期储存，建议洗干净后放入空的保护瓶中存放。

5

3200C 型电导率仪耗材信息

此文档提供 3200C 型电导率仪的耗材信息，内容包括订货号，名称和描述。

订货号	型号名称	描述
G4388A	3200SA 型搅拌器	将电极支架和磁力搅拌器组合，能在较大范围内对溶液进行稳定和精密的搅拌
G4389A	3200EA 型电极支架	用来安装各种不同电极的固定装置
G4390A	软件包	在计算机上安装软件包可实现仪器与计算机通讯（含软件）
5185-8389	电源适配器	100~240VAC，1A，50/60Hz
G4388-27000	搅拌棒	搅拌器配套用
5190-3994	C5111 型电导电极	玻璃，常数 K=1、铂黑，测量范围 2-20000μS/cm
5190-3995	C5112 型电导电极	玻璃，测量范围 2-3000μS/cm
5190-3996	C5113 型电导电极	玻璃，常数 K=0.1、光亮，测量范围 0.05-200μS/cm
5190-3998	T7111 温度电极	不锈钢外壳，测量范围 0–100 ℃
5185-8390	ATC 温度诊断工具	温度诊断
5185-8391	电导诊断工具	电导诊断

备注：Agilent 建立了一个客户门户网站，可为您所拥有的产品提供详细的相关信息。该门户网站的登录地为 http://www.agilent.com/chem。

如需购买，请与安捷伦经销商联系或者登陆安捷伦官方网站。

附录 1：EcFWUPDATE 操作说明书

Agilent Technologies

概述

EcFWUPDATE 是 Agilent 电化学仪器的固件升级软件。通过仪器 的 USB 接口，软件可以将仪器的新版本固件文件升级到仪器的存储器中。

软件安装

该程序支持以下操作系统：

- 32 位的 Windows 7
- 32 位 Windows XP Service Pack 3

安装 EcFWUPDATE

1 从安捷伦公司网站
   **http://www.chem.agilent.com/en-US/Support/Downloads/
   Utilities/Pages/default.aspx** 下载 **EcFWUPDATE.ZIP** 软件包。

2 将软件包 **EcFWUPDATE.ZIP** 解压到一个临时文件夹。

3 双击 **EcFWUPDATE.EXE** 并根据软件安装向导完成软件安装。

   在使用 EcFWUPDATE 软件之前必须安装 USB 驱动软件。

安装 USB 驱动程序

必要时，需安装 USB 驱动软件将计算机的 USB 口模拟成 RS232 接口。如果已经安装过驱动程序，请跳过这一步。

1 运行随本软件一起提供的 USB 驱动程序
   CP210xVCPInstaller.exe (包含在 **EcFWUPDATE.ZIP** 软件包中)。

2 断开仪器电源，用 USB 连接线 (随仪器附带) 将仪器连接到计算机的一个 USB 接口。

3 打开仪器电源。

4 进入计算机设备管理器，在 " 端口 " 一 栏中可以看到已安装的 USB 串口设备， **Silicon Labs CP210x USB to UART Bridge (COMX)**, 表示 USB 驱动程序已经正确安 装，可以正常使用。 **X** 为通讯端口号。

这个模拟的通讯口必须在 1 到 16 之间。如果通讯口号不在此范围，双击这个通讯口打开 "**Property**"（属性）对话框，点击 "**Port Settings**"（端口设置），然后点击 "**Advanced Settings**"（高级），打开高级设置对话框，并从 "**COM Port Number**"（COM 端口号）下拉列表中选择合适且未被占用的端口号。
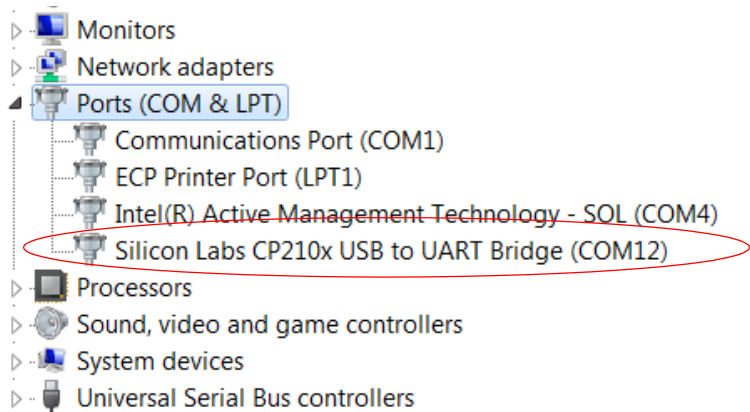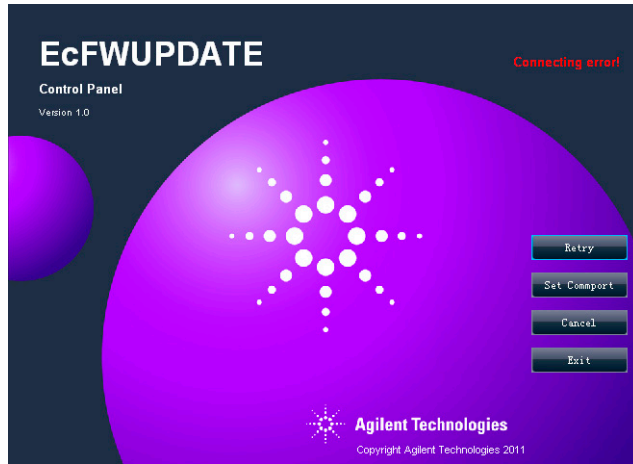

5 记录此通讯口号 （图例中 12 为通讯口号）。

设置通讯口

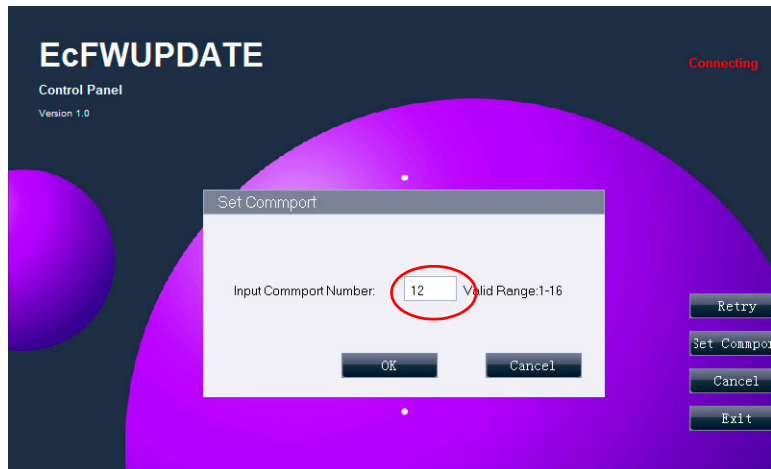这一章节中将把"安装 USB 驱动程序"过程中记录的 USB 端口号的分配给 EcFWUPDATE 程序。

1 双击桌面上图标 ，开始运行 EcFWUPDATE 软件，软件将显示 **"Connecting instrument..."**, 如下图所示。
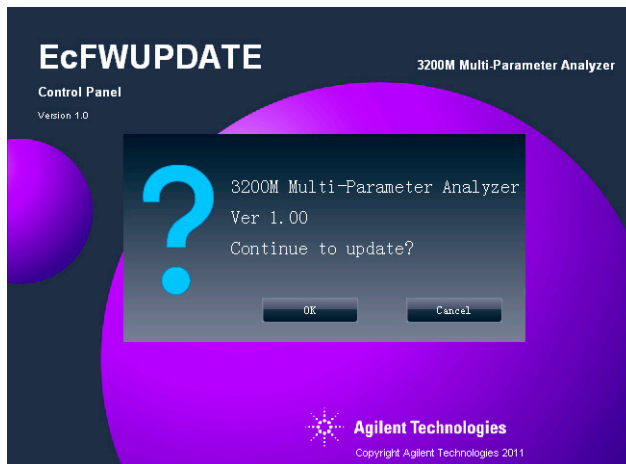
由于通讯口还没有设置，软件将显示 "**Connecting error!**" 错误信息。

2 点击按钮 "**Set Commport**" 重新进行端口设置，如下图所示。

3 输入 " 安装 USB 驱动程序 " 过程中记录的 USB 端口号，点击按钮 "**OK**"。

4 点击 "**Retry**"，软件将连接仪器并显示仪器类型和固件版本号。

5 系统将提示版本升级信息。

6 点击 "**Cancel**" 退出或者点击 "**OK**" 来升级固件信息。参照下一
章 " 软件运行 " 并从第 2 步开始

软件运行

在使用软件之前，需要先设置 USB 通讯口。

1 双击桌面上图标 ![icon]，开始运行 EcFWUPDATE 软件。当
   仪器正确联机后， EcFWUPDATE 软件将显示仪器窗口，如
   下图所示。

连接的仪器名称 — 3200M Multi-Parameter Analyzer

升级固件文件名 — BIN File Name:
                ****

软件运行状态 — Status:
              Ready!

操作按钮区 — Read BIN File

操作步骤 — Guide:
          Step1. Install USB driver. You may skip this step if you have installded.
          Step2. Run EcFWUPDATE.
          Step3. Read update BIN file.
          Step4. Press Update button to start update.
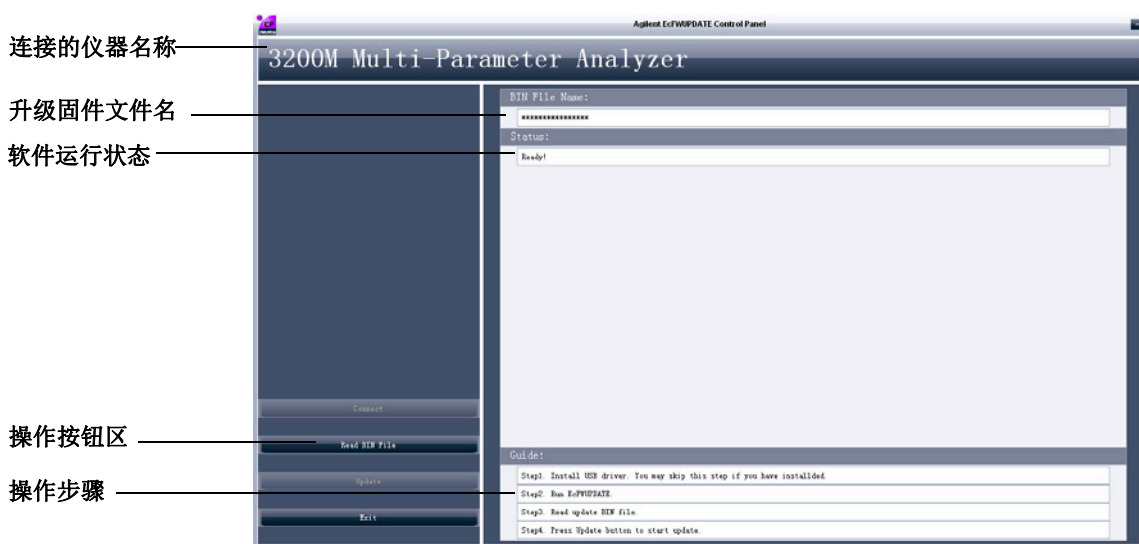
2 点击按钮 "**Read BIN File**" 并选择最新的固件文件 （包含在
   EcFWUPDATE.ZIP 中）最新的固件文件名如下，其中 **x.00** 为固
   件的版本号。

   3200P 请选择 3200P_ISP_Vx.00.Bin

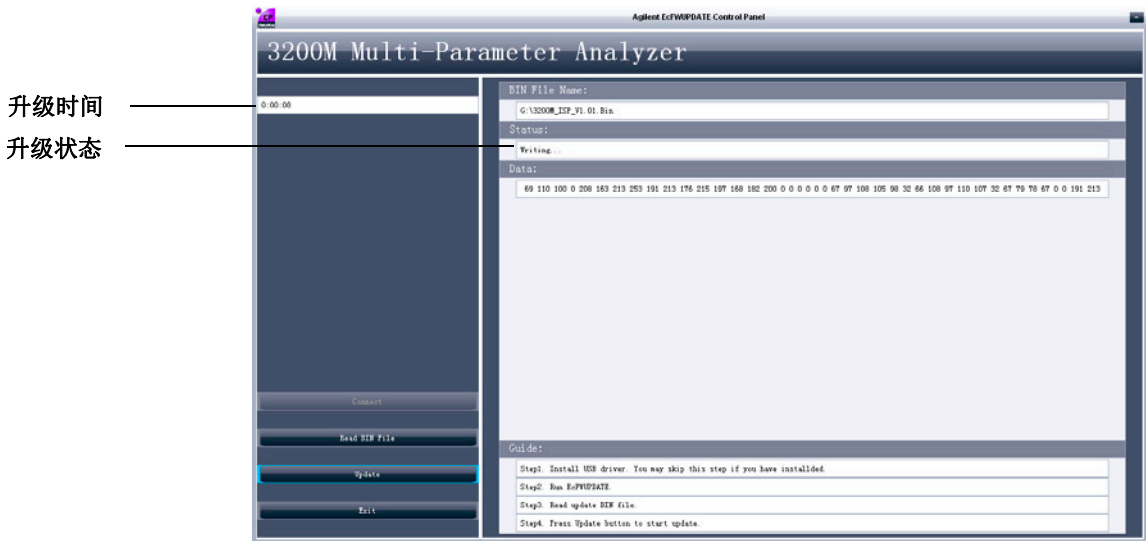   3200C 请选择 3200C_ISP_Vx.00.Bin

   3200D 请选择 3200D_ISP_Vx.00.Bin

   3200I 请选择 3200I_ISP_Vx.00.Bin
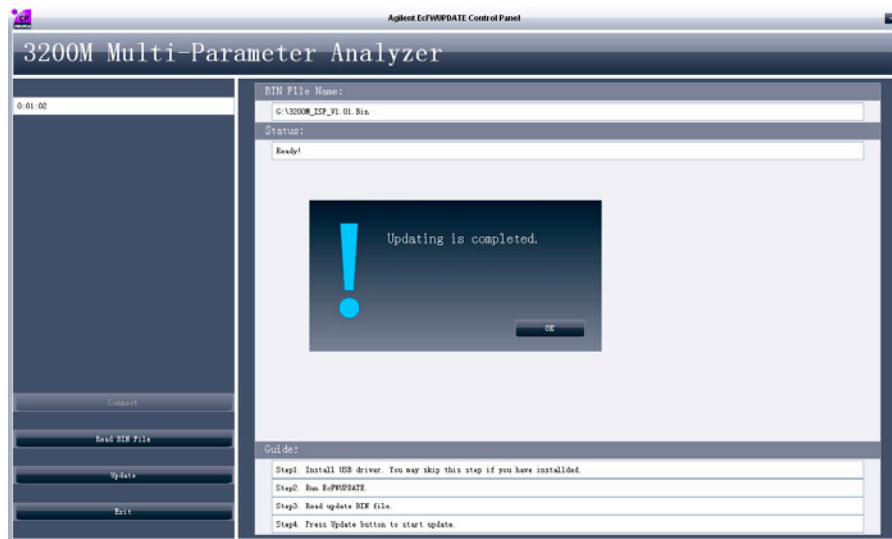
   3200M 请选择 3200M_ISP_Vx.00.Bin
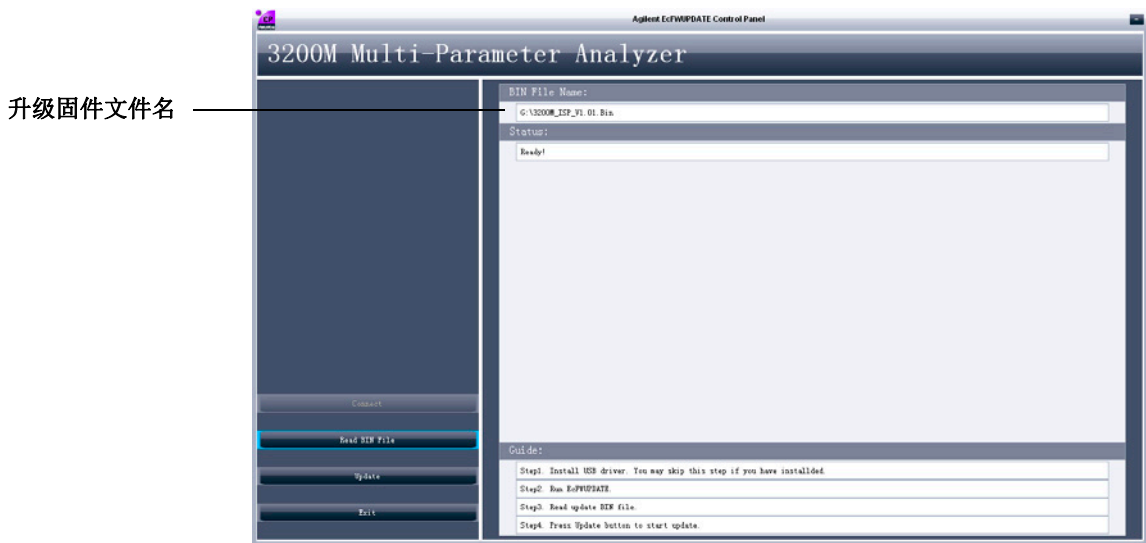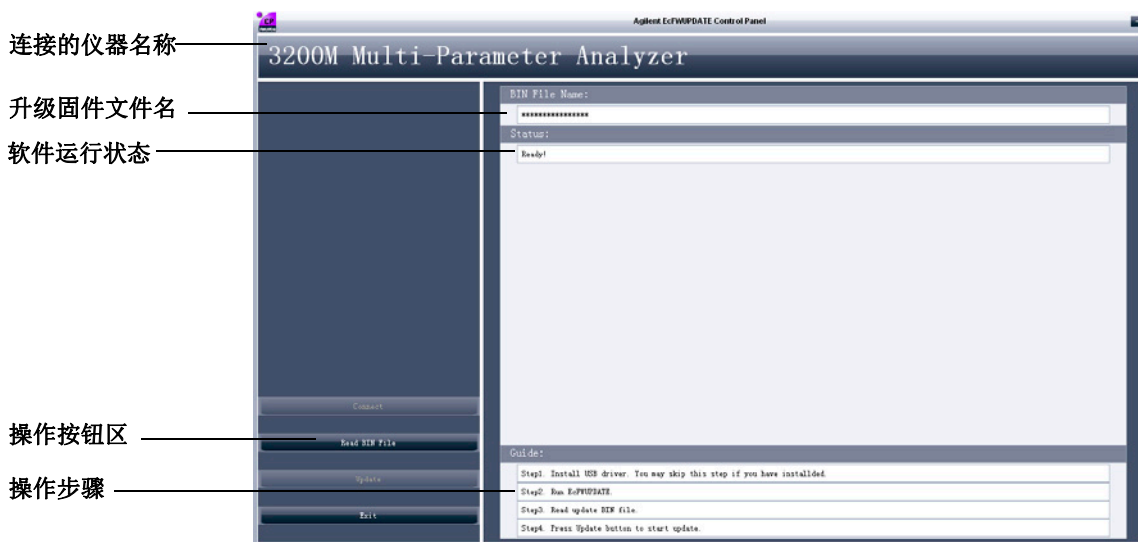
升级固件文件名

3 点击按钮 "**Update**" 进行升级，如下图所示。

升级时间

升级状态

固件升级完成后，系统将显示下图：

4 点击 "**Exit**" 退出固件升级。

软件界面

连接的仪器名称 ——————

升级固件文件名 ——————

软件运行状态 ——————

操作按钮区 ——————

操作步骤 ——————

软件界面主要有以下 5 个部分：

- 连接的仪器名称
- 升级固件文件名
- 软件运行状态
- 操作按钮
- 操作步骤

取消

点击按钮 "**Cancel**" 取消连接。

退出

点击按钮 "**Exit**" 退出。

连接 （重新联机）

点击 "**Retry**" 再重新连接。

附录 2：EcPRINT 操作说明书

Agilent Technologies

概述

EcPRINT 是 Agilent 电化学仪器的打印软件。通过仪器的 USB 接口，软件可以接收仪器输出的数据，可通过 PC 浏览、打印或保存数据。

软件安装

该程序支持以下操作系统：

- 32 位的 Windows 7
- 32 位 Windows XP Service Pack 3

安装 EcPRINT

1 从安捷伦公司网站 **http://www.chem.agilent.com/en-US/Support/Downloads/ Utilities/Pages/default.aspx** 下载 **EcPRINT.ZIP** 软件包。

2 将软件包 **EcPRINT.ZIP** 解压到一个临时文件夹。

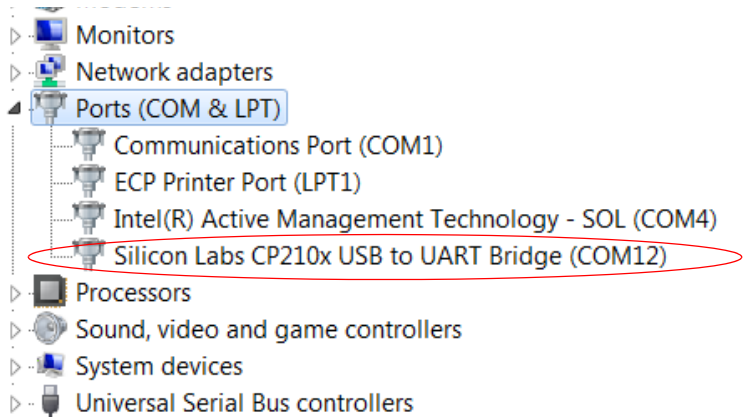3 双击 **EcPRINT.EXE** 并根据软件安装向导完成软件安装。

在使用 EcPRINT 软件之前必须安装 USB 驱动软件。

安装 USB 驱动程序

必要时，需安装USB驱动软件将计算机的 USB 口模拟成 RS232 接口。如果已经安装过驱动程序，请跳过这一步。

1 运行随本软件一起提供的 USB 驱动程序 **CP210xVCPInstaller.exe** (包含在 **EcPRINT.ZIP** 软件包中)。

2 断开仪器电源，用 USB 连接线 (随仪器附带) 将仪器连接到计算机的一个 USB 接口。

3 打开仪器电源。

4　进入计算机设备管理器，在 " 端口 " 一 栏中可以看到已安装的 USB 串口设备， **Silicon Labs CP210x USB to UART Bridge (COMX)**，表示 USB 驱动程序已经正确安 装，可以正常使用。 X 为通讯端口号。

这个模拟的通讯口必须在 1 到 16 之间。如果通讯口号不在此范围，双击这个通讯口打开 **"Property"**（属性）对话框，点击 **"Port Settings"**(端口设置)，然后点击 **"Advanced Settings"**（高级），打开高级设置对话框，并从 **"COM Port Number"**（COM 端口号）下拉列表中选择合适且未被占用的端口号。

> ▷ 🖥 Monitors
> ▷ 🖳 Network adapters
> ▲ 📟 Ports (COM & LPT)
> 　　📟 Communications Port (COM1)
> 　　📟 ECP Printer Port (LPT1)
> 　　📟 Intel(R) Active Management Technology - SOL (COM4)
> 　　📟 Silicon Labs CP210x USB to UART Bridge (COM12)
> ▷ 🔲 Processors
> ▷ 🎧 Sound, video and game controllers
> ▷ 🖳 System devices
> ▷ 📇 Universal Serial Bus controllers
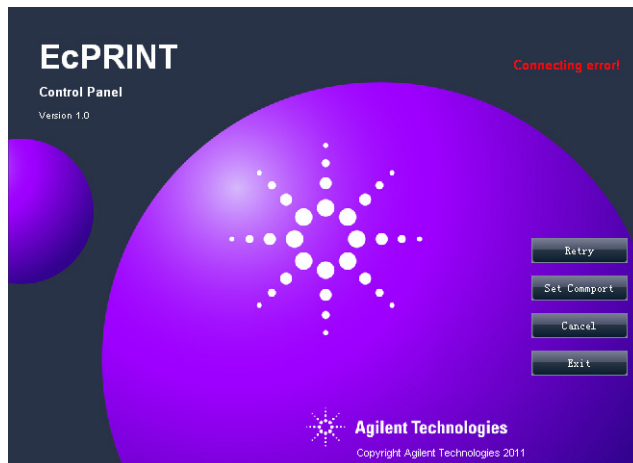
5　记录此通讯口号 （图例中 12 为通讯口号）。

设置通讯口

这一章节中将把"安装 USB 驱动程序"过程中记录的 USB 端口号的分配给 EcPRINT 程序。

1 双击桌面上图标 ，开始运行 EcPRINT 软件，软件将显示 "**Connecting instrument...**", 如下图所示。
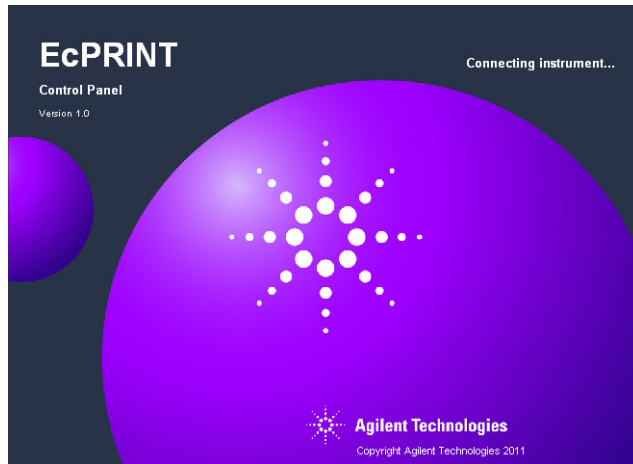
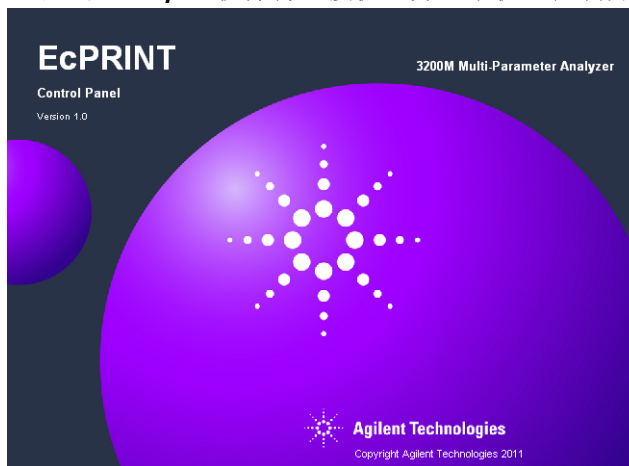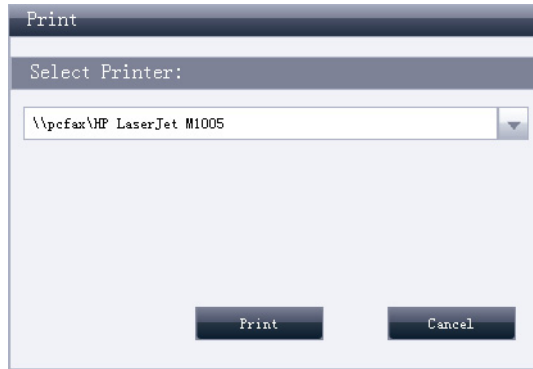
由于通讯口还没有设置，软件将显示 "**Connecting error!**" 错误信息。

2 点击按钮 "**Set Commport**" 重新进行端口设置，如下图所示。

3 输入 "安装USB驱动程序" 过程中记录的USB端口号，点击按钮 "**OK**"。

4 点击 "**Retry**"，软件将连接仪器并显示仪器控制界面。

软件运行

在使用软件之前，需要先设置 USB 通讯口。

1 双击桌面上图标 ，开始运行 EcPRINT 软件。当仪器正确联机后， EcPRINT 软件将显示仪器窗口，如下图所示。

仪器名称

工具条

数据显示区

2 在仪器面板上按 键，可以进入查看数据状态，可以查看上次校正结果或已保存的数据。

3 在仪器面板上按 键，软件能够接收仪器输出的数据，并按打印格式进行显示。

4 点击 ZcPRINT 软件工具条按钮 "**Print**"，显示打印数据对话框。
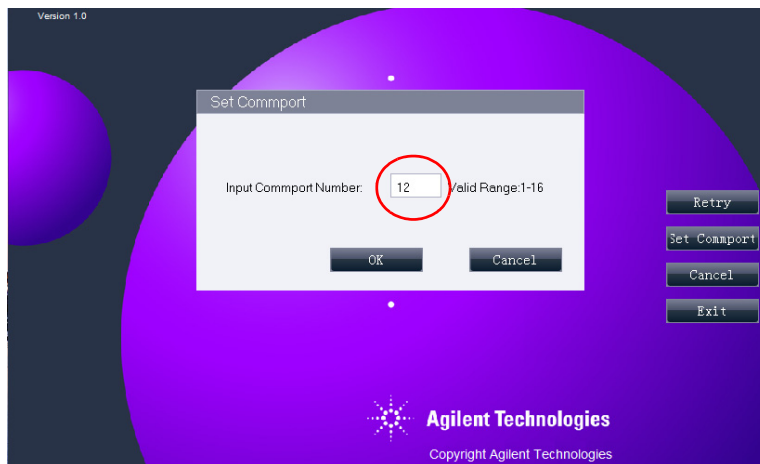
5 选择一个打印机，点击按钮 "**Print**" 进行打印。

如果计算机安装了 PDF 打印机，可将数据转为 PDF 格式保存。如下图所示。
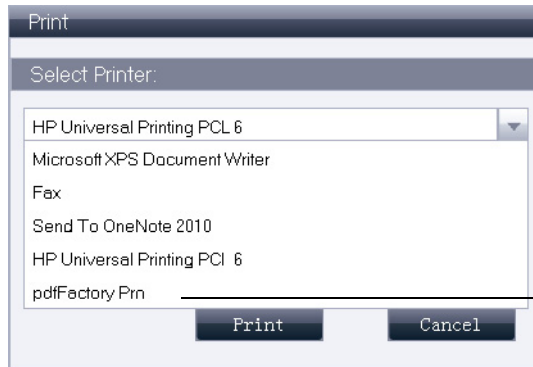
选择 PDF 打印机，将数据转为 PDF 格式保存

6 要保存此数据为 ECP 格式的文件，单击工具条上 "**Save**" 按钮。保存的数据只能用 EcPRINT 软件读取。

7 要加载以前保存的 ECP 的数据文件，单击 EcPRINT 工具条上按钮 "**Open**"，加载 ECP 格式数据文件，并可以在数据显示区域查看或打印数据。

软件界面

软件界面主要有以下 3 个部分：

- 仪器名称
- 工具条
- 数据显示区

仪器名称

显示所连接的仪器名称。

工具条

Exit　　　退出

Reset　　　清除全部输出数据

Save　　　保存数据，格式为 ECP

Open　　　打开保存的数据文件 （ECP 格式）

Print　　　打印输出数据

数据显示区

实时显示当按仪器上 **"Output"** 按钮时输出的数据或从 ECP 文件读取的数据。

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