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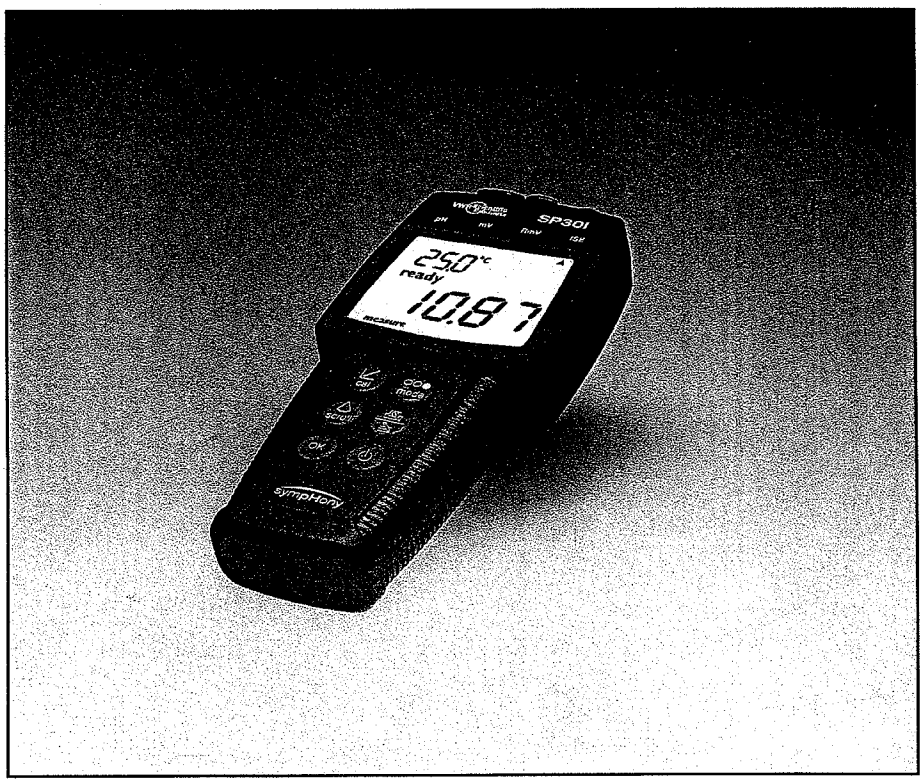
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VWR Scientific Products

Supplying the Tools for Discovery

VWR Models SP20, SP21, SP30I

Portable pH/ISE Meters Instruction Manual



14002-708

sympHony

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Chapter I
General Information

Introduction

The SympHony Series of waterproof portable meters includes VWR SympHony Models SP20 pH, SP21 pH and SP30I pH/ISE meters. These robust waterproof meters are, battery-operated, microprocessor based and are ideal for measurements in the field, plant or laboratory. They are designed for easy operation as well as durability and reliability.

The VWR SympHony Series of waterproof portable meters have been designed to meet IP67 specifications (International Protection with ratings of 6 and 7). IP67 is an internationally recognized standard describing the requirements for dust tight and waterproof systems.

The VWR SympHony Model SP20 pH portable meter with pH gel epoxy electrode (VWR Cat. No. 14002-700) features simultaneous display, automatic calibration up to three points, Automatic Temperature Compensation (ATC), manual buffer calibration, and auto-buffer recognition.

The VWR SympHony Model SP21 pH portable meter is available with 3-in-1 pH/Temperature electrode (VWR Cat. No. 14002-704). The VWR SympHony Model SP21 pH portable meter has all the features of the VWR Model SP20 in addition to the RS232 interface with data-logging capabilities.

The VWR SympHony Model SP30I pH/ISE portable meter is also available with 3-in-1 pH/Temp electrode (VWR. Cat. No.14002-708). The VWR SympHony Model SP30I pH/ISE portable meter has all the features of the VWR SympHony Model SP21 in addition to the expanded capabilities for ISE measurements up to 5-point ISE calibration.

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Chapter II
Instrument Description

Display

The VWR SympHony waterproof portable meters have large custom LCD displays. All models display pH, mV, RmV and ISE results (Model SP30I only) in the main field along with temperature readings in degrees Celcius (°C) in the top left corner. The current mode is indicated along the top measurement mode of the display. The buffer indicators will be displayed on the right of the main field, indicating the buffer(s) used when the calibration was last performed.

Display	Function
Setup	Indicates meter is in the setup mode, which is used to define or view, operating parameters.
Calibrate	Lit when meter is in the calibration mode.
Measure	Lit when meter is in the measure mode.
Ready	Displayed when the electrode signal has stabilized.
Battery	Displayed when the battery is low and needs to be replaced.

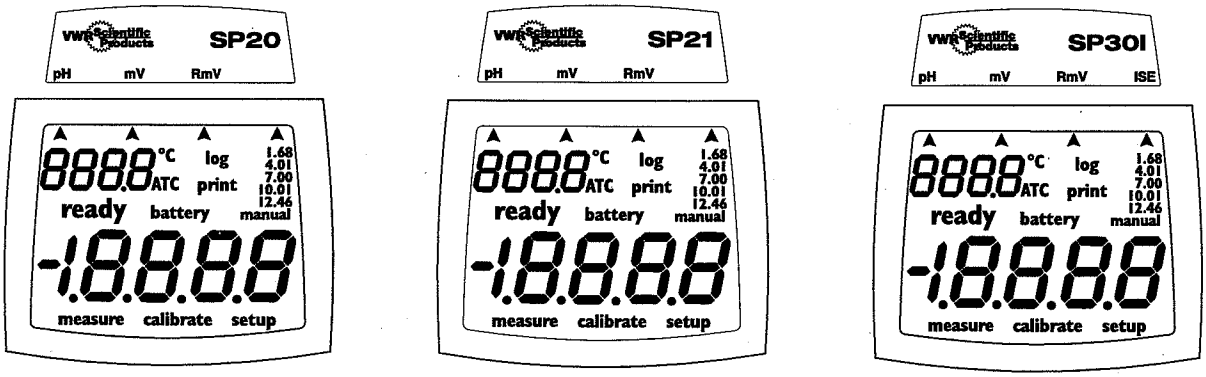


Figure 1
Model SP20, SP21, SP30I Displays

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Display	Function
Manual	Lit in manual temperature input screen in setup, and in measure mode if manual buffer input was used during the last calibration.
ATC	Lit when automatic temperature compensation is activated.
pH	Indicates meter in pH mode.
mV	Indicates meter in millivolt mode.
RmV	Indicates meter is in the Relative millivolt mode.
ISE	Indicates meter is in the ISE mode (Model SB30I only).
Print	Lit during printing.
Log	Lit when data stored in datalog.
1.68, 4.01, 7.00, 10.01, 12.46	Indicates which auto-buffers where used in last calibration.

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Keypad

The VWR SympHony Model SP20 pH waterproof portable meter has a 5-button membrane keypad to control all functions of the meter. The VWR SympHony Models SP21 pH and SP30I pH/ISE waterproof portable meters have a 6-button membrane keypad to control all functions of the meter.

Keypad	Function
cal	Press to initiate a calibration.
mode	Press to select operating mode: MEASURE, pH, mV, RmV, ISE (Model SP30I only), SETUP
print/log	Press to print on demand (Models SP21 and SP30I only).
power	Press to turn meter on or off
OK	Press to accept setting or calibration points. May also be used to scroll through the SETUP menu without changing any parameters.
scroll	Used to edit values. May also be used to initiate a change in the current SETUP parameter.

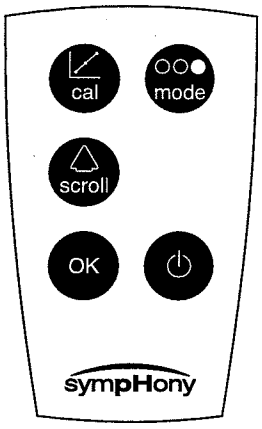
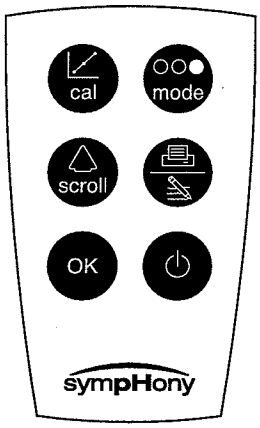


Figure 2
Model SP20 Keypad



Model SP21, SP30I Keypad

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Chapter III
Meter Setup

Power Source

The SympHony Series of waterproof portable meters are designed to operate on either four AA alkaline batteries, or four AA lithium batteries. When using an alkaline battery, the estimated battery life is 150 hours of continuous operation or 6 months if meter is not in use. For longer life a lithium battery can be used for 300 hours of continuous use or 12 months of battery life if meter is not in use. The battery indicator will illuminate when the battery needs replacing. To prevent loss of data in the field or plant turn meter off if the low battery signal comes on. It is recommended that the battery is checked and replaced regularly prior to field use.

These waterproof portable meters can also be used with line adapter (VWR Cat. No. 14002-754) for 110V operation.

Battery Installation

1. Open battery compartment by removing the two screws on the battery door. (See **Figure 3** below).
2. Carefully place the batteries into the battery compartment making sure that the correct polarity of the battery is aligned.
3. Replace the battery compartment cover making sure that the cover is screwed back tightly.

NOTE: After replacing the batteries, it is recommended a calibration be performed.

Battery Compartment: Accepts four AA cell batteries, either alkaline or lithium.

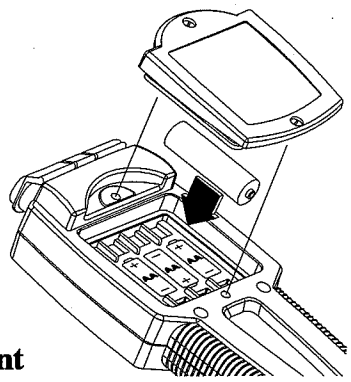


Figure 3
Battery Compartment

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Connection

Electrode

Attach VWR pH electrode or other pH electrode with BNC connector in the meter by sliding the BNC connector onto the sensor input. Push in and turn clockwise to lock into position. Connect ion selective electrodes in the same manner for VWR SympHony Model SP30I pH/ISE meter.

> ***NOTE:*** *Electrodes without the BNC connectors may be used with a BNC adapter.*

ATC probe

(VWR Cat. No. 14002-806 Epoxy or VWR Cat. No.14002-808 Glass)

Attach the ATC probe to the ATC connector by aligning the connector and then push the connector straight in until firmly in place.

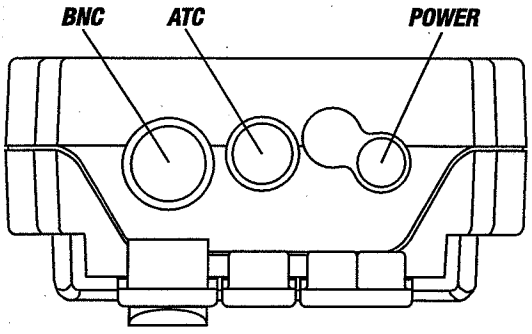
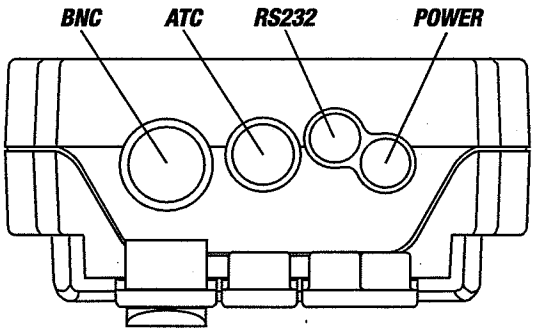


Figure 4
Model SP20 connectors



Model SP21, SP30I connectors

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Chapter IV
Using the Instrument

Power Up

1. Press the ⏻ key to turn the meter on.
2. Main field will display VWR SympHony meter model and immediately advances to the pH measure mode.

   NOTE: *If this is the first time meter has been powered up, it is recommended that the* ***Instrument Check Out Procedure*** *be performed before using meter for any measurements.*

3. Press the mode key to switch to desired mode function.

Instrument Check Out Procedure

It is recommended that the **Instrument Check Out Procedure** be performed once the meter is received and at any time operation problem arises. This procedure verifies the proper operation of the VWR SympHony Portable pH and pH/ISE meters.

1. Attach the shorting cap to the meter.
2. Press and hold the OK key while pressing the ⏻ key to start the self-test. The meter will display the software revision and then automatically performs electronic and hardware diagnostic tests. (See **Self-Test** section for more detailed information).
3. When "0" displays in the main field, press each key once in any order, including the ⏻ key. A numeric digit will be displayed upon each keypress.
4. After the self-test is completed, the meter will automatically shut off. To restart the meter, press the ⏻ key.
5. If any problem arises during the self-test, an error code will be displayed. (See **Operator Assistance Codes** section).

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Setup Mode

Press the mode key to access the **setup** mode.

> *NOTE: Pressing the mode key after each setup screen will escape to the measure mode.*

Slope Display, S-1

Main display will show the current average pH slope value, and **setup** will appear underneath the slope. **S-1** will be displayed in the temperature field.

> *NOTE: Slope cannot be changed in this display. To change slope, perform at least a two-point calibration, for automatic slope determination or a one-point calibration for manual slope input.*

Temperature Setup, S-2

The main display will show the default temperature of 25.0 or last manual temperature setting entered. **S-2** will be displayed in the temperature field.

- If ATC probe is connected, the ATC indicator will be displayed in the display and **S-2** will be skipped in setup.
- If manual temperature compensation is desired, disconnect the ATC probe. To edit this value, press the scroll key to change each digit and press the OK key after each digit to accept. Continue until all digits have been set.
- Press the mode key to escape to pH measure mode or the OK key to continue to next setup function.

Resolution Setup, S-3

Resolution can be setup by pressing the scroll key between 0.0, 0.00, and 0.000 (for VWR Model SP21 and SP30I). Press the OK key to accept and continue to the next setup function.

Auto Shutoff, S-4

(For VWR SympHony Model SP20 Only)

Auto shutoff feature can be turned off by scrolling to 00. Auto Shutoff on (01) is the default. Press the OK key to accept and return to the beginning of the setup procedure, **S-1**.

To escape the setup mode and return to the measure mode, press the mode key.

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Print Setup, S-4

(For VWR SympHony Models SP21 & SP30I Only)

"Print" will be displayed. The default is manual print (00); user must press print key for printing. Autoprint "01"prints when "ready" lights comes on. Use the scroll key to select. Press the OK key to accept and continue to the next setup function.

Datalog Setup, S-5

(For VWR SympHony Models SP21 & SP30I Only)

"log" will be displayed on the main display. Datalog off (00) is the default; manual datalog (01) logs whenever print key is pressed. Autolog (02) logs automatically when "ready" light comes on. Use the scroll key to select the desired function. Press OK key to accept and continue to the next setup function.

TABLE 1:

PRINT / LOG OPTIONS	PRINT (S-4)	LOG (S-5)	PRESSING PRINT / LOG KEY
Print Manual / Log Manual	Manual (00)	Manual (01)	Prints and log data
Print Ready / Log Ready	Ready (01)	Ready (02)	Prints nothing
Print Manual / Log Ready	Manual (00)	Ready (02)	Prints data
Print Ready / Log Manual	Ready (01)	Manual (01)	Log data only
Print Manual / Log Off	Manual (00)	Off (00)	Prints data
Print Ready / Log Off	Ready (01)	Off (00)	Prints nothing

Press the OK key to proceed to the next step or press the mode key to escape to the pH measure mode.

Datalog Print Setup, S-6

(For VWR SymPhony Models SP21 & SP30I Only)

This setup allows printing of datalog. Both "Pront and "log" will show on the main display. Print datalog of (00) is the default, or choose (01) to turn the print datalog on. (See Table 1 for more print options).

Press the OK key to send datalog to a printer or a computer. After printing, the display will show "00" again.

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Datalog Clear Setup, S-7

(For VWR SympHony Models SP21 & SP30I Only)

To clear data in datalog, scroll to "01" and press the OK key. Log will be cleared. Display will revert to default, "00", indicating datalog clearing is complete.

> *NOTE: Once log is cleared, data cannot be retrieved. It is highly recommended to print log before it is cleared.*

Press the mode key to escape to the pH measure mode.

Auto Shutoff, S-8

(For VWR SympHony Models SP21 & SP30I Only)

Auto shutoff feature can be turned off by scrolling to 00. Auto shutoff on (01) is the default. Press the OK key to return to the beginning of the setup function, **S-1**.

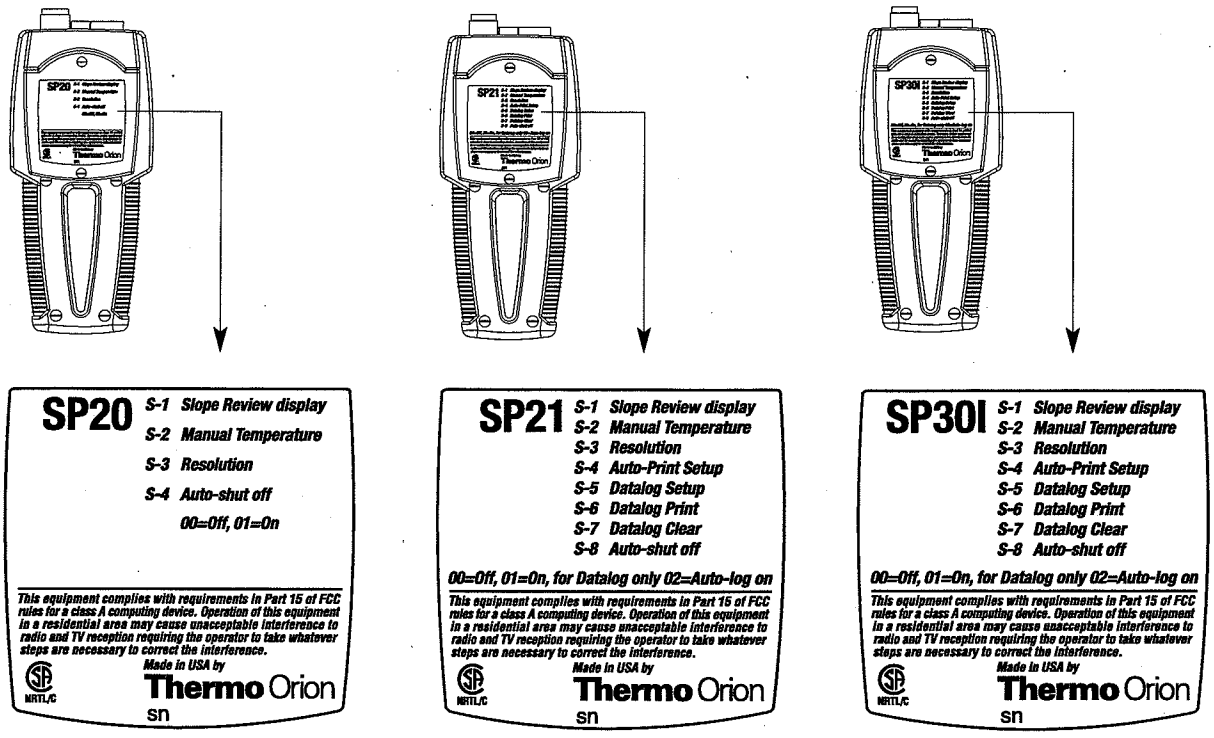


Figure 5
Model SP20, SP21, SP30I Setup Modes

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Chapter V
pH Calibration and Measurement

Buffer calibration should be performed before pH of a sample is measured. It is recommend that a two buffer calibration, using buffers that bracket the expected sample range, be performed at the beginning of each day to determine the slope of the electrode. This serves the dual purpose of determining if the pH system and storing the slope value in the meter memory are working properly. VWR SympHony Models SP20, SP21 and SP30I pH and pH/ISE portable meters feature autocalibration when using standard buffers, 1.68, 4.01, 7.00 and 10.01, 12.46 as well as manual calibration when non-standard buffers are required.

Autocalibration

Autocalibration is a feature of VWR SympHony Models SP20, SP21 and SP30I pH and pH/ISE portable meters that automatically recognizes the standard buffers 1.68, 4.01, 7.00 and 10.01, 12.46 within range ± 0.5 pH units. During each calibration, press the OK key when the "ready" indicator is lit, showing electrode stability, is displayed in the main field. If using the automatic temperature compensation with the ATC probe, the meters will automatically calibrate to the temperature corrected buffer value.

Results greater than ± 0.5 pH units from the theoretical value will trigger an operator assistance code if the OK key is pressed. If the scroll key is pressed, it becomes a Manual Calibration. For best results, it is recommended that an ATC probe be used. If an ATC probe is not used, all samples and buffers should be at the same temperature.

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Autocalibration with Two or Three Buffers

1. Attach electrode to the meter. If using an ATC probe (recommended), attach probe to meter.
2. Place pH electrode and ATC probe into the first pH buffer, (pH 7.00 is recommended).
3. Turn unit on by pressing the ⏻ key. Wait 2 seconds. Press the mode key until annunciator is at pH mode.
4. Select calibration mode by pressing the cal key; "calibrate" indicator will be displayed in lower field. Main field will display the slope previously used for a few seconds and then will show "P1" in the temperature display indicating that the first point buffer calibration is ready to be performed.
5. When "ready" light comes on, press OK key to accept pH value. Display will remain frozen for 2 seconds.
6. "P2" will then be displayed, flashing in the temperature field. Rinse pH electrode with deionized water. Place pH electrode into second buffer (pH 1.68, 4.01, 10.01, or 12.46 buffer).
7. When "ready" light comes on, press the OK key to accept pH value. Display will remain frozen for 2 seconds.
8. "P3" will be displayed and flashes. At this step, two-point calibration and slope can be obtained by pressing the mode key. Slope will then flash on the main field.
9. For a three-point calibration, rinse the pH electrode. Place electrode into the third buffer (pH 1.68, 4.01, 10.01, or 12.46 buffer).
10. When the "ready" light comes on, press the OK key to accept pH value. Display will freeze for 2 seconds.
11. Main field will show slope, flashing for the three-point buffer calibration. When using models SP21 and SP30I, "Print" will appear indicating that slope is being printed out.
12. Meter will automatically advances to the measure mode. Rinse electrode and place into sample. Temperature and pH will be displayed. Icons for the buffers used in the calibration will light up.

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Autocalibration with One Buffer

1. Attach electrode to the meter. If using an ATC probe (recommended), attach probe to meter.
2. Place pH electrode and ATC probe into the pH buffer.
3. Turn unit on by pressing the ⏻ key. Wait 2 seconds. Press the mode key until annunciator is at pH mode.
4. Select calibration mode by pressing the cal key; "calibrate" indicator will be displayed in lower field. Main field will display the slope previously used for a few seconds and then will show "P1" at the temperature display indicating that the first point buffer calibration is ready to be performed.
5. When "ready" light comes on, press the OK key to accept pH value. Display will remain frozen for 2 seconds.
6. When "P2" appears at the temperature display, press the mode key.
7. Main display will show slope, flashing, for the one-point calibration. Edit the slope by pressing the scroll key and press OK key to accept each digit. When using models SB21 and SB30I, print icon will appear indicating that slope is being printed out.
8. Meter will automatically advances to the measure mode. Rinse electrode and place into sample. Temperature and pH will be displayed. Icon for the buffer used in the calibration will light up.

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Manual pH Calibration

1. Press mode key until the pH mode annunciator is displayed.
2. Place the pH electrode into the first pH buffer (pH 7.00 is recommended).
3. Press the cal key once; "calibrate" indicator will be displayed at the lower field. Main display will show previous slope for a few seconds and will show "P1".
4. The "ready" indicator will come on and values will change to autobuffer if an autobuffer is recognized. At this step, press the scroll key to edit the value of the buffer.
   - A positive or negative value can be set by pressing the scroll key and then the OK key to accept. Enter the value of the standard by scrolling each digit with the scroll key. Accept the digit by pressing the OK key. Toggle between the OK key and the scroll key to set each digit.
5. Press the OK key when desired value is obtained. "P2" will appear at the temperature display, indicating for the second buffer.
6. Rinse pH electrode and place into the second pH buffer.
7. When "ready" indicator appears in the main field, press the OK key.
8. If a two-point pH calibration is desired, press the mode key to obtain the slope when "P3" is displayed in the main field. If a three-point pH calibration is desired, follow steps 4 to 7, then press the OK key for the three-point slope.
9. Slope will be displayed for a few seconds. Record data. (If using Model SB21 or SB30I and the print setup is on, the meter will print calibration data automatically.)
10. Meter will then automatically advance to the measure mode. Rinse electrode and place into sample. Wait for the meter to display "ready" and then record pH values. "Manual" will be displayed indicating non-standard buffers were used during calibration.

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Printing of Calibration Data

To print calibration data, press the cal key then press the key. The last calibration in memory will be sent to the printer.

Millivolt Measurements

To measure samples in the millivolt mode:

1. Turn the meter on by pressing the key.
2. Press mode key to access "mV" mode, annunciator will be displayed in the display field.
3. Main field displays millivolt voltage of the electrode with the temperature display showing current temperature if an ATC is being used.

To measure samples in the Relative millivolt mode:

1. Turn the meter on by pressing the key.
2. Press mode key twice to access "RmV" mode, annunciator will be displayed in the display field.
3. Main field displays millivolt voltage of the electrode along with the temperature display showing current temperature if an ATC is being used.
4. Press the cal key to initiate calibration.
5. Calibrate annunciator will light, and main field will display absolute mV. When stable reading is achieved, zero will flash. If the value is acceptable, press the OK key to accept; if the value is to be set at another number, press the scroll key to edit each digit. Press the OK key to confirm each digit.
6. Then press the OK key to accept the value.

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Chapter VI
ISE Concentration Calibration and Measurement (Model SP30I Only)

General Information

Calibration should always be performed before concentration is measured. It is recommended that at least a two-point standard calibration be performed at the beginning of each day and every time electrodes are changed to determine the slope for the electrode. Calibration serves the dual purpose of proving that the electrode is working properly and storing the slope value in memory. During calibration, always use the most dilute standard first. The meter will automatically recognize slope (i.e. will recognize anion or cation electrode). Standards should always bracket the sample range and be in the same concentration units. The VWR SympHony Model SP30I pH/ISE benchtop meter offers up to 5-point ISE calibration.

Units

Any convenient concentration unit can be used. For example: Molarity, ppm, %, etc.

Temperature

For best results, allow all samples and standards to reach the same temperature before measurement. An ATC probe is highly recommended for reading temperature of samples and standards.

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Multipoint ISE Concentration Calibration and Measurement

The following instructions allow for a two to five point ISE concentration calibration.

NOTE: Always calibrate with the lowest concentration first and work up to the higher concentration.

1. Attach the ISE electrode to the meter. Power up the meter by pressing the ⏻ key. Temperature will display current temperature if an ATC is attached.
2. Press mode key until the ISE indicator is displayed.
3. Place the ISE electrode into the first standard.
4. Press the cal key once. The calibration annunciator will be displayed. Main display will show the slope previously used for a few seconds. "P1" will appear at temperature display. When "ready" icon comes on set the concentration standard, by pressing the △ scroll key to edit the value.
   - Location of the decimal point can be changed by pressing the △ scroll key and then the OK key to accept. Enter the value of the standard by scrolling each digit with the △ scroll key. Accept the digit by pressing the OK key. Toggle between the OK key and the △ scroll key to set each digit.
5. Press the OK key to accept value. Display will remain frozen for 2 seconds. Temperature display will show "P2" indicating that the system is ready for the second standard. Place the electrode in the second standard and wait for the ready. To set the concentration standard value, press the △ scroll key.
   - Location of the decimal point can be changed by pressing the △ scroll key and then the OK key to accept. Enter the value of the standard by scrolling each digit with the △ scroll key. Accept the digit by pressing the OK key. Toggle between the OK key and the △ scroll key to set each digit.

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6. Press the OK key to accept value. Display will remain frozen for 2 seconds. Temperature display will show. "P3" will be displayed indicating that the system is ready for the third standard.

   - For 2-point ISE concentration calibration, press the mode key. Slope will be displayed in the main display. This will end the calibration and will automatically advance to the ISE measure mode. Rinse the ISE electrode thoroughly and place into the sample. Record data when the "ready" icon lights up indicating reading is stable.
   - To continue to the third ISE concentration calibration, rinse the ISE electrode thoroughly and place into the third standard. Go to step 7.

7. The value of the third standard will be displayed in the main field. To set the concentration of standard value, press the scroll key.

   - Location of the decimal point can be changed by pressing the scroll key and then the OK key to accept. Enter the value of the standard by scrolling each digit with the scroll key. Accept the digit by pressing the OK key. Toggle between the OK key and the scroll key to set each digit.

8. Press the OK key to accept value. Display will remain frozen for 2 seconds.

9. Press the mode key to obtain slope for 3-point ISE concentration calibration. Slope will be displayed in the main field. Meter will automatically switch to ISE measure mode. Rinse the ISE electrode and place into the sample. Record data when "ready" indicator is on.

10. For the fourth and the fifth concentration calibration, rinse the ISE electrode and follow the procedure for the second and the third ISE calibration.

11. Press mode key once after each concentration calibration point to display slope value on the main field.

12. Main display will show slope and the print icon will be lit while the meter prints out current data after each calibration.

13. Meter will proceed to the ISE measure mode automatically after calibration. Rinse electrode and place into sample. Sample concentration and temperature will be displayed in main field. Record data when "ready" indicator is on.

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One Point ISE Concentration Calibration and Measurement

1. Attach the ISE electrode to the meter. Power the meter on by pressing the ⏻ key. Temperature will display current temperature if an ATC is connected.
2. Press mode key until the ISE annunciator is displayed.
3. Place the ISE electrode into the first standard.
4. Press the cal key once. Calibrate annunciator will be displayed. Main display shows the slope previously used for a few seconds.
5. The "ready" indicator will light up. "P1" will appear at temperature display. To set the concentration of standard value, press the scroll key.
   - Location of the decimal point can be changed by pressing the scroll key and then the OK key to accept. Enter the value of the standard by scrolling each digit with the scroll key. Accept the digit by pressing the OK key. Toggle between the OK key and the scroll key to set each digit.
6. Press the OK key to accept value. Display will remain frozen for 2 seconds. Temperature display will show "P2" indicating that the system is ready for the second standard.
7. Press mode key once to accept 1-point concentration calibration. Main display will show the slope.
8. Press the OK key to accept the slope or press the scroll key to edit by scrolling each digit with the scroll key and then accepted by pressing the OK key.
9. If meter is setup for printing, main display will show slope and the print icon indicating that current data is being printed out. The meter will automatically proceed to the ISE measure mode.
10. Rinse the electrode and place into sample. Sample concentration and temperature will be displayed.

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Chapter VII
Self-Test

During the self-test the meter will display various codes corresponding to the section of the instrument being checked. If any problems are found, an operator assistance code corresponding to the test that failed will be displayed. Note the code and press the OK key to continue. (See **Table 2** in the **Operator Assistance Codes** section). If the problem persists, contact VWR Help Line at 1-800-VWR-SUPP.

During the self-test, the meter displays TEST in the main field and the number of the test "7E57" in the lower field. Other meter displays occur depending on the test being performed.

> ***NOTE:*** *Ensure that the shorting cap is securely attached to the meter sensor input prior to self-test.*

Test		**Function/Display**
Test #1	Segment Display	Checks meter display. Ensures that all segments are lit.
Test #2	RAM Check	Verifies the proper operation of the Random Access Memory.
Test #3	External Input	Checks the electrode input channel. The shorting cap must be plugged in for this test.
Test #4	Internal Check	Internal function test.
Test #5	Internal Reference	Checks the internal reference in the meter.
Test #6	Ground Reference	Checks the meter ground.
Test #7	Keypad Test	Checks for the proper functioning of the keypad. During this test all keys must be pressed at the "0" prompt. Press each key in any order. As each key is pressed, a number corresponding to each keypress is displayed. When all keys have been pressed, "ready" will be displayed. If no keys are pressed or there is a problem with the functioning of the key, the meter will recognize an error and display E-07. To escape, press the OK key to continue.

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Test		Function/Display
Test #8	EEPROM Test	Checks that the non-volatile memory used for data and system storage is functioning properly.
Test #9	Hardware Calibration Test	Checks that the instrument has a valid hard ware calibration.
Test #10	Autoshutoff Test	Checks the meter auto shutoff feature. The meter will shut down at this test. To restart the meter, press the ⏻ key.

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Chapter VIII

Using Models SP21 and SP30I Meters with Printers and Computers

The VWR SympHony Models SP21 and SP30I waterproof portable pH and pH/ISE meters can send information to a printer or other serial peripheral using the RS232 output. The meter can be used with either computers or printers by pressing the  key manually to print specific data point(s).

The following information can be used to interface the meter to your printer or computer.

Baud rate: 1200.

Eight data bits, no parity.

One start bit, one stop bit.

METER	PRINTER
RXD	
TXD	RXD
SIG GND	SIG GND

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Chapter IX
Operator Assistance Codes

Operator Assistance Codes are used to inform the user of an out-of-range value or meter problem. The following tables outline the operator assistance codes available in Models SP20, SP21 and SP30I waterproof portable pH and pH/ISE meters.

These meters have a self-test circuit, which verifies proper electronic operation. During self-test procedure, a special series of codes, E-02 through E-10 indicating an individual problem with the meter hardware. See **Table 2.** If any of these codes appear, contact VWR Help Line at 1-800-VWR-SUPP.

Table 2	**Self-Test Operator Assistance Codes**
E-02	RAM Check Error
E-03	Input Channel Error: ensure that the shorting cap is securely attached to the meter and repeat the self-test.
E-04	Internal Check
E-05	Internal Reference Error
E-06	Ground Test Error
E-07	Internal Keypad Error: Press each key while in the self-test. If code persists, contact VWR Help Line.
E-08	EEPROM Test
E-09	Hardware Calibration Check
E-10	Instrument Shutdown Error

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The Operator Assistance Codes E-20 through E-31 alerts the user to a potential problem while calibrating or measuring samples or standards. Several steps can be taken to eliminate the problem. See **Table 3**. If the code still persists after attempting the suggested remedies, contact VWR Help Line at 1-800-VWR-SUPP.

Table 3

E-20	Out of Range	1. If this error occurs when electrode is out of solution, code will disappear when electrode is returned to solution. 2. Be sure pH electrode(s) is firmly connected to the meter. 3. Sample may be out of range. Check sample concentration or expiration date. 4. Recalibrate using fresh buffers. 5. Refer to pH electrode instruction manual for instructions on how to clean the electrode.
E-21	ABR error/pH Autocalibration errors	Electrode voltage being measured is >± 0.5 pH units from the nominal value for the pH buffer and if the OK key is pressed. 1. Press OK key to acknowledge error. 2. Verify buffer; pH 1.68, 4.01, 7.00, 10.01 or 12.45. 3. Recalibrate using fresh buffers. 4. Refer to pH electrode instruction manual for instructions on how to clean the electrode.
E-22	Calibration Standard Error	The pH values being measured are the same for two different buffers. 1. Press OK key to accept. 2. Check that two different buffers are being used and that the correct one is being measured. 3. Recalibrate using fresh buffers.
E-23	Bad Slope	pH electrode slope not in the range of 80% to 120% 1. Press OK key to accept. 2. Recalibrate using fresh buffers. 3. Refer to pH electrode manual cleaning procedure.

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Table 3 cont.

E-26	Datalog Full	The datalogger is full and cannot store any more. points. A maximum of 100 points may be stored. turned on. 1. Transfer data to a printer or computer see Setup S-6 2. Clear the data from memory, see Setup S-7. Once data is cleared additional points may be stored.
E-32	Auto Blank Error	The meter is unable to calculate a blank value. This error occurs during a 3 or more point calibration when one solution has been defined as zero concentration and the actual concentration of the blank is substantially greater than three times of the standard concentration of the third calibration point (sorted from the lowest concentration). 1. Check to make sure electrodes were placed in the proper standards and blank solution and recalibrate. 2. Repeat calibration using fresh blank and standards 3. Recalibrate using two standards of known concentration other than zero.

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Chapter X
Troubleshooting Guide

Malfunction	Possible Cause	Remedy
No Display	No power to meter	Press the ⏻ key.
		Check to ensure battery is inserted correctly and polarity signs are aligned properly. Replace batteries if operating on battery power.
		If operating on-line power, check that the proper line converter is plugged in securely.
		The auto shutoff feature on the meter may have turned meter off. The auto shutoff will automatically shut off the meter if no keys have been pressed within 20-30 minutes.
Erratic Readings or Reading Out of Range	Meter or electrode failure.	Follow the Instrument Check-Out Procedure in this manual.
	Improper Electrode Connection.	Check the electrode operation by following the instructions in the pH electrode instruction manual.
		Ensure correct electrode connection.

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Chapter XI
Repair and Service

A Return Authorization Number must be obtained from VWR Help Line before returning any product for in-warranty or out-of-warranty repair, replacement or credit.

West Chester, PA 19380
Telephone: 1-800-VWR-SUPP

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Chapter XII
Notice of Compliance

WARNING: This meter may radiate radio frequency energy if not installed and used properly (in strict accordance with the manufacturer's instructions) and may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a commercial environment. Operation of the meter in a residential area may cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

> ***NOTE:*** *To ensure compliance with the Class A FCC limits, a battery or a VWR-supplied wall adaptor must be used this product.*

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conformé á la norme NMB-003 du Canada.

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Chapter XIII
Ordering Information

VWR #	Description
14002-700	Model SP20 pH meter w/gel pH, 110V
14002-702	Model SP20 pH meter only, 110V
14002-704	Model SP21 pH/mV meter w/gel 3 in 1 pH, 110V
14002-706	Model SP21 pH/mV meter only, 110V
14002-708	Model SP30I pH/mV/ISE meter w/gel 3 in 1 pH, 110V
14002-701	Model SP30I pH/mV/ISE meter only, 110V
14002-720	Field Case for SympHony Portable Meters
14002-754	Line Adapter, 110V
14002-758	RS232 Cable for SympHony Meters
14002-764	pH Gel Epoxy Combination Electrode
14002-778	pH Gel 3-in-1 Electrode
14002-806	ATC epoxy temperature probe
14002-808	ATC glass temperature probe

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Chapter XIV
Specifications

	MODEL SP20	MODEL SP21	MODEL SP30I
Range:			
pH	- 2.00 to 19.99	- 2.000 to 19.990	- 2.000 to 19.990
mV	± 1600.0	± 1600.0	± 1600.0
Rel. mV	± 1999.9	± 1999.9	± 1999.9
ISE	N/A	N/A	0.000 to 1999.9
Temperature (°C)	- 5 to 105	- 5 to 105	- 5 to 105
Resolution:			
pH	0.01/0.1	0.001/0.01/0.1	0.001/0.01/0.1
mV	0.1	0.1	0.1
Rel. mV	0.1	0.1	0.1
ISE	N/A	N/A	0.1
Temperature	0.1 °C	0.1 °C	0.1 °C
Relative Accuracy:			
pH	± 0.02	± 0.002	± 0.002
mV	± 0.2	± 0.2	± 0.2
Rel. mV	± 0.2	± 0.2	± 0.2
Temperature	± 0.1 °C	± 0.1 °C	± 0.1 °C

Display: Custom LCD

Inputs: BNC, (3.5 mm) ATC, power

Outputs: RS232 (SP21 and SP30I meters only)

Power Requirements:

Four AA cell batteries, lithium or alkaline, or line adapter for 110 VAC, 50/60 Hz wall outlet.

Environmental Requirements:

5 to 45 °C, 5 to 85% relative humidity, non-condensing

Case: Dust, splash and chemical resistant

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