2/95

Chemistry

CMS Labcraft™

Benchtop pH/ISE Meters
Models pH 101, pH 102, pH 103
Instruction Manual

Curtin Matheson Scientific, Inc.

Table of Contents

Chapter I

General Information

Introduction

CMS Labcraft™ Models pH 101, pH 102, and pH 103 are durable, easy-to-use microprocessor-based pH meters. Used with Labcraft™ combination pH electrodes, they are designed to be reliable workhorse pH systems. These systems are ideal for busy, multi-user laboratories or plant environments. pH measurements are easy with the help of the advanced features such as autocalibration, automatic temperature compensation, choice of pH resolution and diagnostic operator assistance codes.

Models pH 101 and 102 are supplied with a gel-filled electrode (CMS No. 024-050) Model 103 comes complete with a glass-body combination pH electrode (CMS No. 024-047).

Chapter II

Instrument Description

A. Display

All three models have big, bright LED displays and pH results are displayed in the large main field. Temperature readings in °C are displayed in the main field (model pH 101) and the upper field (models pH 102 and pH 103). In model pH 103, a third display shows millivolts. The current operation mode is indicated along the right side of the display. The buffers used during the last calibration are designated by the indicators along the left side of the display. **See Figure 1.**

SET UP

Indicates that the meter is in the setup mode which is used to define or view operating parameters (Models pH 102, pH 103 only).

ATC

Indicates that an ATC probe is connected and operational. Manual Temperature Compensation is activated when the ATC symbol is not displayed.

READY

Displayed when the pH electrode signal has stabilized (all models).

° C

Temperature is displayed by pressing TEMP key (model pH 101).

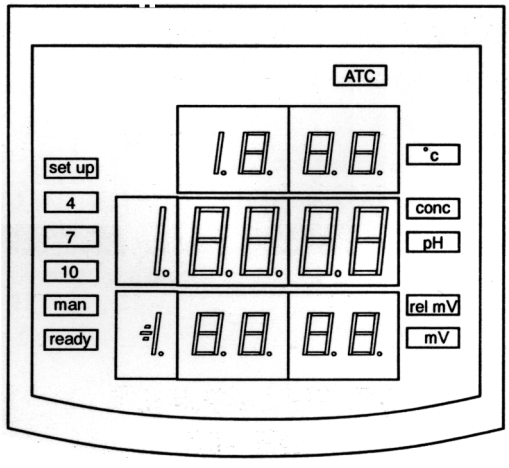

Figure 1 Faceplate of Labcraft™ pH meters

B. Keypad

The Model pH 101 meter has a 6 button keypad with tactile feedback that is used to control all meter functions. Each keypress is acknowledged by the meter via a positive feel response. Models pH 102 and pH 103 have 8 keys to control all functions.

Key	Function
	Press to select MEASURE mode.
yes	Press to accept settings or calibration points. May also be used to scroll through the set up menu without changing any parameters.
scroll (▲,▼)	May be used to initiate a change in current set up parameters. Press to cancel a change to a parameter before the parameter is entered. Also used to scroll Manual Temp settings in MEASURE mode.
print	Press to print measurement data (models pH 102 and pH 103 only).
cal	Press button to auto calibrate.
setup	Press to enter SETUP mode to change parameters and enter manual calibration buffer values.
res	Press to change display resolution (models pH 102 and pH 103 only).

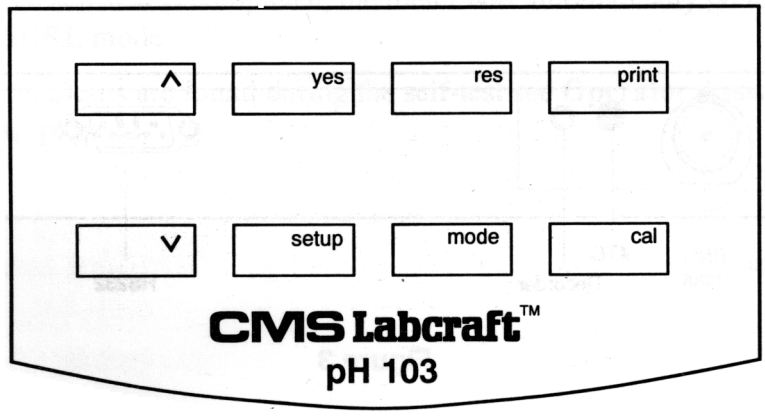

Figure 2

Chapter III

Instrument Set-Up

Power Source

All models, pH 101, pH 102 and pH 103, are designed to operate with a line adaptor (CMS No. 286-368) for 110V operation or (CMS No 286-368A) for 220V operation. Plug the line adaptor securely into the meter's power receptacle. Then plug into an appropriate wall outlet.

Electrode Connection

1. Electrode

Attach CMS Labcraft™ pH electrode, 024-050, 024-047 or other pH electrode with BNC connector to the BNC sensor input on the meter by sliding the connector onto the sensor input, then push in and turn clockwise to lock into position. Electrodes without BNC connectors may be used with a BNC adaptor. Connect reference electrodes with pin tip connectors by pushing connector directly into reference input. **See figure 3.**

2. ATC Probe

Attach CMS Labcraft™ ATC probe 024-071 or 024-072 to the ATC input by sliding the connector straight in until firmly in place.

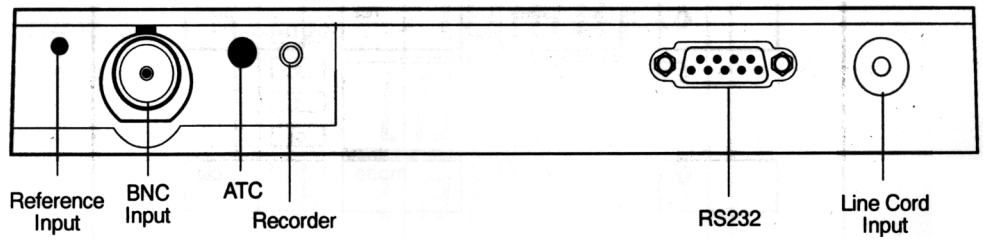

Figure 3

Chapter IV

Using the Instrument

A. Power-Up

Plug meter into an approved wall outlet via the power adaptor. The entire display (all annunciators) will be displayed for 2 seconds. Once all power-up procedures have been completed, the meter automatically advances to measure mode.

> **NOTE:** *If this is the first time the meter has been powered up, it is recommended that the Check-Out procedure be performed before using the meter for pH or ISE measurements.*

B. Instrument Check-Out Procedure

It is recommended that this procedure be performed when the meter is operated for the first time or any time that operational problems arise. This procedure verifies the proper operation of the CMS Labcraft™ meters.

1. Attach shorting cap to electrode input.
2. Plug line adapter (No. 286-368) securely into meter Line Cord Input then into an appropriate wall outlet. Quickly press the **"yes"** key (hold down for 3 seconds) to start the self-test.
3. When **"0"** appears in the lower display field, press each key once. A numeric digit will be displayed upon each keypress.
4. After the self-test is completed, the meter will automatically go to MEASURE mode.
5. If any problems are found during the self-test **see Operator Assistance Codes, page 22.**

C. SETUP Mode

Select SETUP mode by pressing **"setup"** key until SETUP lamp is lit. This mode is used to define, change or view meter operating parameters. While in the SETUP mode, the **"yes"** key is used to scroll through the menu without changing parameters and to enter new parameters into meter memory. The **"scroll"** (▲,▼) keys are used to change the settings within each function. To exit the SETUP mode, press the **"mode"** key at any time.

> **NOTE:** *If a parameter has been changed, the "yes" key must be pressed to activate change.*

The following parameters can be accessed in the SETUP mode:

Slope

The current electrode slope in meter memory will be displayed. In pH mode, the value is displayed as a percent of theoretical slope. The default setting is 100%. In ISE mode, the value is displayed in mV/decade. The default setting is 59.2 mV/decade. This function is for display purposes only. The value can not be changed in the SETUP menu. To change the slope value, perform at least a two-point calibration or set SLOPE during a one-point pH calibration. Press the **"yes"** key to advance to next menu function.

Manual Buffer Option

When the manual buffer option function is entered, the display will show STD "57d"or SET "5E7". To change the value, press **"scroll"** (▲,▼) keys. Press the **"yes"** key when the desired setting is displayed. When the "57d" option is selected, calibration may only be performed with standard buffers; pH 4.01, 7.00 and 10.01. When the "5E7" option is selected, calibration may be performed with user-defined buffers within the 0 to 14 pH range. Buffer values must be at least 1 and not more than 4 pH units apart.

Print Function (Models pH102, pH103)

The current print function setting will be displayed. The default is off, "00" and "PRT" will be displayed. To change the value, press **"scroll"** (▲,▼) keys and "01" will be displayed. Press the **"yes"** key when the desired setting is displayed.

Additional SETUP Parameters (Models pH 102 and pH 103)

1. Press the **"setup"** key. **pH (or CONC)** and **SETUP** annunciator lights will be displayed.
2. **SLP** displayed in the **TEMP** field, while the slope value is displayed in the main field. For Model pH 103 only, the slope is dependent upon the active measure mode prior to entering **"setup"** mode. (Indicated with pH or CONC annunicator.)
3. Press the **"yes"** key to proceed.
4. The current manual calibration setting (**SET** vs. **STD**) and **MAN** annunciator are displayed. If **SET** is entered, the manual calibration buffer values are entered as **P1** and **P2**. If **STD** is entered, the meter proceeds to the print mode function.
5. **PRT** is displayed in the **TEMP** field. The **pH** annunciator is not displayed. The current mode is displayed in the main field. "**00**" is print on command (by pressing the **print** key); "**01**" is print on **ready**.
6. **Date/Time Print** (Model pH 103 only): After Print function has been entered, press the **"yes"** key. **YEAR** is displayed in the mV field with the current year displayed in the main field; Use **"scroll"** (▲,▼) keys to change the year. Press the **"yes"** key to accept.

   MON is then displayed in the mV field and the month value is displayed in the Main field. Use **"scroll"** (▲,▼) keys to change the month and then press the **"yes"** key to accept the new month.

   DAY is now displayed in the mV field with the current day in the main field; Press **"scroll"** (▲,▼) keys to change day; then press **"yes"** to accept day.

   HOUR is then displayed in the mV field and current hour is displayed in the Main field; Use **"scroll"** (▲,▼) keys to set the hour, press the **"yes"** key to accept hour.

   MIN is then displayed in the mV field, and the current minute is displayed in the Main field. Use **"scroll"** (▲,▼) keys to change minute and press the **"yes"** key to accept value.
7. When all **SETUP** changes are entered and defined, unit will return to **SLOPE** function. Press **"mode"** key to return to **MEASURE** mode.

Chapter V

Calibration and Measurement of pH

Model pH 101

A. Autocalibration with Two Buffers

1. Attach the pH electrode(s) to the meter.
2. Choose either pH 4.01 and 7.00, or pH 7.00 and 10.01 buffers; whichever will bracket your expected sample range.
3. Press **"cal"** key to initiate calibration sequence. CAL is displayed for 2 seconds. Press the **"yes"** key to accept the last calibration range (7-4 or 7-10) or select one of these calibration ranges using the **"scroll"** (▲,▼) keys. Press the **"yes"** key to accept. pH 7 will be displayed (2 seconds). Place electrode in pH 7.00 buffer. Reading will be displayed and updated as calibration continues. When the READY light comes on, indicating electrode stability, press the **"yes"** key to accept.
4. pH 4 (or pH 10) will then be displayed for 2 seconds. Remove electrode from pH 7.00 buffer. Rinse with deionized water and place electrode in either pH 4.01 or 10.01 buffer (depending on calibration range that was selected). When the READY light comes on, press the **"yes"** key to accept buffer value. SLP will be displayed for 2 seconds, then the calculated slope will be displayed.
5. The annunciators for the type of calibration performed will remain lit until another calibration is performed. Remove electrode from second buffer, rinse with deionized water, and place into sample.
6. Meter will automatically go into the MEASURE mode. The READY light will come on to indicate electrode stability.
7. If using an ATC probe, the temperature-corrected pH reading is displayed.
8. Rinse electrodes, place into sample. Record pH directly from the main meter display and temperature from lower field when the READY light comes on.

B. Autocalibration with One Buffer

NOTE: *Autocalibration with one buffer can only be performed using buffer* ***pH 7.00.***

1. Follow steps 1-3 from *Autocalibration with Two Buffers,* ***see page 7.***
2. Choose the "7" calibration option. Press the **"yes"** key to accept one buffer calibration. SLP will be displayed for two seconds. 100.0 (or previous calibration slope value) will then be displayed. This value can be edited using the **"scroll "** (**▲ ,▼**) keys. Press the **"yes"** key to enter this value.
3. Meter will automatically go into the MEASURE mode, and the READY light will come on to indicate electrode stability.
4. If using an ATC probe, the temperature-corrected pH reading is displayed.
5. Rinse electrodes, place into sample. Record pH directly from the main meter display and temperature from lower field when the READY light comes on.

Model pH 102

A. Autocalibration with Two Buffers

1. Attach the pH electrode(s) to the meter.
2. Choose either pH 4.01 and 7.00, or pH 7.00 and 10.01 buffers; whichever will bracket your expected sample range.
3. Press **"cal"** key to initiate calibration sequence. CAL is displayed for 2 seconds. Press the **"yes"** key to accept the last calibration range (pH 7-4 or 7-10) or select one of these calibration ranges using the **"scroll"** key to select a range. Press the **"yes"** key to accept. The pH 7 buffer annunciator will be displayed. Place electrode in pH 7.00 buffer. Reading will be displayed and updated as calibration continues. When the READY light comes on, indicating electrode stability, press the **"yes"** key to accept.
4. The pH 4 or 10 buffer annunciator will be displayed. Remove electrode from 7.00 buffer. Rinse with deionized water, and place electrode in either pH 4.01 or 10.01 buffer (depending on calibration range that was selected). When the READY light comes on, press the **"yes"** key to accept buffer value. SLP will be displayed for 2 seconds, then the calculated slope will display.
5. The annunciators for the type of calibration performed will remain lit until another calibration is performed. Remove electrode from second buffer, rinse with deionized water, and place into sample.
6. Meter will automatically go into the MEASURE mode, and the READY light will come on to indicate electrode stability.
7. If using an ATC probe, the temperature-corrected pH reading is displayed when the READY light comes on.
8. Rinse electrodes, place into sample. Record pH directly from the main meter display and temperature from lower field.

B. Autocalibration with One Buffer

NOTE: *Autocalibration with one buffer can only be performed using buffer* ***pH 7.00.***

1. Follow steps 1-3 from *Autocalibration with Two Buffers,* ***see page 9.***
2. Choose the pH 7 calibration option. Press the **"yes"** key to accept one buffer. SLP will be displayed for two seconds. 100.0 (or previous calibration slope value) will then be displayed. This value can be edited using the scroll (▲ ,▼) keys. Press the **"yes"** key to enter this value.
3. Meter will automatically go into the MEASURE mode, and the READY light will come on to indicate electrode stability.
4. If using an ATC probe, the temperature-corrected pH reading is displayed. When using manual temperature compensation, the temperature corrected pH reading is displayed. Record reading when the READY light comes on.
5. Meter is now ready for multiple, routine measurements

C. Manual Calibration

> **NOTE:** *Manual calibration can be performed with any user-selected buffer(s). The difference between manual buffer values must be between 1 and 4 pH units.*

1. Attach electrode(s) to meter .
2. Press the **"setup"** key. Press the **"yes"** key and SET or STD is displayed. Choose the SET option and press the **"yes"** key.
3. **P1** is displayed in the top readout. Using the **"scroll"** (▲,▼) keys, set user-defined value for the first buffer and press the **"yes"** key to accept new value.
4. Repeat for second buffer value **(P2)**. Press the **"mode"** key to return to **MEASURE** mode. Press the **"cal"** key. **CAL** is displayed for 2 seconds. The last calibration buffer range will be displayed. Use the **"scroll"** (▲,▼) keys to select the **SET** option. Press the **"yes"** key to accept this calibration. **Pl** is displayed. Place electrode into the first calibration buffer. When READY light is displayed indicating electrode stability, the user defined buffer value will be displayed. Press the **"yes"** key to accept. **P2** is displayed. Repeat for second calibration buffer.
5. When the READY light comes on, press the **"yes"** key to accept buffer value. **SLP** will be displayed for 2 seconds, then the calculated slope will be displayed for two seconds.
6. Rinse electrode with deionized water, blot dry, and place in sample
7. Record reading when READY light comes on.

Model pH 103

pH Calibration Measurement

A. Autocalibration with Two Buffers

1. Attach the pH electrode(s) to the meter.
2. Choose either pH 4.01 and 7.00, or pH 7.00 and 10.01 buffers; whichever will bracket your expected sample range.
3. Press **"cal"** key to initiate calibration sequence. CAL is displayed for 2 seconds. Press the **"yes"** key to accept the last calibration range (pH 7-4 or 7-10) or select one of these calibration ranges using the **"scroll"** key to select a range. Press the **"yes"** key to accept. The pH 7 buffer annunciator will be displayed. Place electrode in pH 7.00 buffer. Reading will be displayed and updated as calibration continues. When the READY light comes on, indicating electrode stability, press the **"yes"** key to accept.
4. The pH 4 or 10 buffer annunciator will be displayed. Remove electrode from 7 buffer. Rinse with deionized water, and place electrode in either pH 4.01 or 10.01 buffer (depending on calibration range that was selected). When the READY light comes on, press the **"yes"** key to accept buffer value. SLP will be displayed for 2 seconds, then the calculated slope will displayed.
5. The annunciators for the type of calibration performed will remain lit until another calibration is performed. Remove electrode from second buffer, rinse with deionized water, and place into sample.
6. Meter will automatically go into the MEASURE mode, and the READY light will come on to indicate electrode stability.
7. If using an ATC probe, the temperature-corrected pH reading is displayed.
8. Rinse electrodes, place into sample. Record pH directly from the main meter display and temperature from lower field when the READY light comes on.

B. Autocalibration with One Buffer

NOTE: *Autocalibration with one buffer can only be performed using buffer* ***pH 7.00.***

1. Follow steps 1-3 from *Autocalibration with Two Buffers,* ***see page 13.***
2. Choose the pH 7 calibration option. Press the **"yes"** key to accept one buffer. SLP will be displayed for two seconds. 100.0 (or previous calibration slope value) will then be displayed. This value can be edited using the scroll (▲,▼) keys. Press the **"yes"** key to enter this value.
3. Meter will automatically go into the MEASURE mode, and the READY light will come on to indicate electrode stability.
4. If using an ATC probe, the temperature-corrected pH reading is displayed. When using manual temperature compensation, the temperature corrected pH reading is displayed. Record reading when the READY light comes on.
5. Meter is now ready for multiple, routine measurements

C. Autocalibration with Three Buffers

1. Press the **"cal"** key to initiate calibration sequence. **CAL** is displayed for 2 seconds. Press the **"scroll"** (▲,▼) keys until **3PT** is displayed. Press the **"yes"** key to accept. The **4** annunciator will be displayed. The absolute millivolt value of the electrode input is displayed in the lower field throughout the calibration. Place electrode in pH 4.01 buffer. Reading will be displayed and updated as calibration continues. When the READY light comes on, indicating electrode stability, press the **"yes"** key.
2. The **7** annunciator will be displayed. Rinse electrode with deionized water and place in pH 7.00 buffer. Reading will be displayed and updated as calibration continues. When the READY light comes on, indicating electrode stability, press the **"yes"** key to accept.
3. The **10** annunciator will be displayed. Remove electrode from pH 7.00 buffer. Rinse with deionized water and place electrode in pH 10.01 buffer. When the READY light comes on, press the **"yes"** key to accept.
4. **SLP** will be displayed for 2 seconds, then the calculated slope will be displayed.
5. The annunciators for the type of calibration performed will remain lit until another calibration is performed. Remove electrode from third buffer, rinse with deionized water, and place into sample.
6. Record reading when READY light comes on.

D. Manual Calibration

> **NOTE:** *Manual calibration can be performed with any user selected buffer(s). The difference between manual buffer values needs to be between 1 and 4 pH units.*

1. Attach electrode(s) to meter .
2. Press the **"setup"** key. Press the **"yes"** key and **SET** or **STD** is displayed. Choose the **SET** option and press the **"yes"** key.
3. **P1** will be displayed in the top readout. Using the **"scroll"** (▲ ,▼) key, set user-defined value for the first buffer and press the **"yes"** key to accept new value.
4. Repeat for second buffer value **(P2)**. Press the **"mode"** key to return to **MEASURE** mode. Press the **"cal"** key. **CAL** is displayed for 2 seconds. The last calibration buffer range will be displayed. Use the **"scroll"** (▲ ,▼) keys to select the **SET** option. Press the **"yes"** key to accept this calibration. **P1** is displayed. Place electrode into the first calibration buffer. When READY light is displayed indicating electrode stability, the user-defined buffer value will be displayed. Press the **"yes"** key to accept. **P2** is displayed. Repeat for second calibration buffer.
5. When the READY light comes on, press the **"yes"** key to accept buffer value. **SLP** will be displayed for 2 seconds, then the calculated slope will be displayed.
6. Rinse electrode with deionized water, blot dry, and place in sample
7. Record reading when READY light comes on.

Chapter VI

Concentration Calibration and Measurement

A. General Information

A calibration should be performed before concentration is measured. It is recommended that a two-point standard calibration be performed at the beginning of each day and every time electrodes are changed to determine the slope of the electrode. This serves the dual purpose of determining if the electrode is working properly and storing the slope value in memory. During calibration always use the most dilute standards first. The meter will automatically recognize slope (ie. will recognize anion or cation electrodes). Standards should bracket the sample range and be in the same concentration units.

Units

Any convenient concentration units can be used. For example: molarity, ppm, %, etc.

Temperature

Allow all samples and standards to reach the same temperature before measurement. No temperature compensation is needed with ISE measurement.

B. Concentration Calibration and Measurement-Model pH 103

NOTE: *Only a two-point ISE calibration is possible.*

1. Attach ISE electrode and reference electrode to meter.
2. Press the **"mode"** key until the **CONC** mode indicator is displayed.
3. Choose standards that bracket the expected sample range. For example, if you expect sample concentration to be approximately 25 ppm, select standards of 10 ppm and 100 ppm. Remember to add ISA adjuster to all samples and standards as required (See appropriate electrode manual).
4. Place electrode(s) into the lowest concentrated standard.
5. Press the **"cal"** key to initiate calibration sequence. **CAL** is displayed for 2 seconds. **P1** is displayed in the upper display field. When the READY light comes on, use the **"scroll"** (▲ ,▼) keys to set the value of standard one. Press the **"yes"** key to accept standard one value.
6. Remove electrode(s), rinse with deionized water, and place in the highest concentrated standard. **P2** is displayed in the upper display field.
7. When the READY light comes on, use **"scroll"** (▲ ,▼) keys to enter second concentration value. Press the **"yes"** key to accept standard two value. The slope will be displayed in mV/decade. While **SLP** is displayed, printout occurs if external printer is connected and print function selected (see pg. 6). Meter will automatically switch to **MEASURE** mode.
8. Remove electrode(s) from second standard, rinse, and place in sample.
9. Record reading when READY light comes on.

Chapter VII

Other Measurement Modes

A. REL mV Calibration and Measurement
Model pH 103 (only)

1. Use the **"mode"** key to select **RmV**. Press the **"cal"** key to initiate calibration sequence. **CAL** is displayed throughout the calibration. The reading will be absolute mV. When the READY light is displayed, indicating electrode stability, **0.0** will be displayed. Use the **"scroll"** (▲,▼) keys to set user-defined values, if necessary. Press the **"yes"** key to accept.
2. Value will be displayed in the mV field with the **RmV** annunciator displayed.

B. Temperature Compensation

1. Use an ATC probe (either glass body CMS No. 024-072 or epoxy-body CMS No. 024-071) for automatic temperature compensation.
2. Attach ATC probe to 3.5-mm phone jack on rear panel of any model (pH 101,pH 102, or pH 103) pH meter. See figure 3.
3. For manual temperature compensation, disconnect the ATC probe.

   For Model pH 101, press the **"temp"** key and use the **"scroll"** (▲,▼) keys to set the manual temperature value. Press the **"mode"** key to return to pH mode. This temperature will now be used for display of temperature-corrected pH values.

   For Models pH 102 and pH 103, use the **"scroll"** (▲,▼) keys in **MEASURE** mode to set the temperature to the desired value. The temperature will be displayed in the temperature field. This temperature will now be used for display of temperature-corrected pH values.
4. To return to ATC mode, attach the ATC probe to ATC jack (see Figure 3). Temperature compensation will now be automatic.

Chapter VIII

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 **"yes"** key to continue. (See Table 1 under Operator Assistance Codes). If an operator assistance code appears during self-test, check to make sure the shorting cap is securely attached, then repeat the test. If the problem persists, contact the CMS Customer Service Group at 1-800-CMS-6664.

During the self-test the meter displays the number of the test in the main field. Additional meter displays occur depending on the test being performed.

> **NOTE:** *Ensure that the shorting cap is securely attached to the meter BNC 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. Shorting cap must be plugged in for this test.
Test #4	Ground Reference	Checks the meter ground.
Test #5	Temperature Reference	Checks the ATC reference.
Test #6	Internal Reference	Checks the internal reference of the meter.

Test		Function\Display
Test #7	Keypad Test	Checks that the keypad is functioning properly. During this test all keys must be pressed at the "0" prompt. As each key is pressed a number corresponding to the key is displayed. When all keys have been pressed READY will be displayed. If no keys are pressed or there is a problem with a key the meter will recognize an error and display E-07. Press the **"yes"** key to continue.

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 all CMS Labcraft pH and pH/ISE Meters.

The meter has a self-test circuit which verifies proper electronic operation. During self-test a special series of codes, E-02 through E-07, indicates a problem with the meter hardware. Should one of these codes appear, contact CMS Customer Service Group at 1-800-CMS-6664.

Chapter IX

Operator Assistance Codes

Code	Function
E-02	RAM Check Error
E-03	Input Channel Error: ensure that the shorting cap is securely attached to the meter and repeat self-test.
E-04	Ground Reference Error
	Temperature Reference Error
	Internal Reference Error
E-07	Internal Keypad Error: Press each key while in self-test. If code persists, contact CMS Customer Service Group at 1-800-CMS-6664.

The Operator Assistance Codes E-20 through E-31 alert the user to a potential problem while calibrating or measuring. Several steps can be taken to eliminate the problem in each case. If the code persists after trying the suggested remedies, contact CMS Customer Service Group at 1-800-CMS-6664.

Code	Description	Causes / Suggestions
E-20	Out of Range	1. If this occurs when electrode is out of solution, code will disappear when electrode is returned to solution. 2. Sample may be out of range. Check system using a buffer. 3. Recalibrate system using fresh buffers. 4. Refer to electrode instruction manual for instructions on how to clean the electrode.
E-21	ABR error/ pH Autocalibration error	Electrode voltage being measured is >±0.5 pH units from the nominal value for the pH buffer. Verify buffer is pH 4.01, 7.00 or 10.01. 2. Recalibrate using fresh buffers. 3. Refer to pH electrode instruction manuals for instructions on how to clean the electrode.

NOTE: *Non-standard calibration buffers may be used only for manual calibrations.*

E-22	Calibration Standard Error	The pH values being measured are the same for two different buffers. Press any key to acknowledge. 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% Press any key to acknowledge. 2. Recalibrate using fresh buffers. 3. Refer to pH electrode instruction manual for instructions on how to clean the electrode.

E-29 Printer Error	The meter is sending information to a printer and there is no printer plugged into the meter or printer is not turned on. If a printer is being used check that the printer is properly connected.
E-31 Bad Value	A value has been entered which is not within the acceptable range for that function. 1. Press any key to acknowledge error. 2. Re-enter a new value within the allowable range. Acceptable values are as follows: **pH**: 0.000 to 14.000 **slp**: 80.0 to 120.0 **RmV**: +/- 1999.9 **CONC**: 0.000 to 19,900

Chapter X

Troubleshooting Guide

Malfunction	Possible Cause	Remedy
No Display	No power to meter	Check that meter is plugged in. Check that the proper line converter is plugged in securely.
Erratic Readings or Reading Out-of-Range	Meter or electrode failure	Follow the meter check-out procedure in this manual. Check the electrode operation by following the instructions in the instruction manual. Ensure proper electrode connection to the meter.

Chapter XI

Repair and Service

A Return Authorization Number must be obtained from CMS Customer Service Department before returning any product for in-warranty or out-of-warranty repair, replacement or credit.

Contact:

CMS Labcraft™
c/o ATI Orion Research
529 Main Street
Boston, MA 02129
1-800-CMS-6664

Chapter XII

Warranty

Laboratory instruments are warranted to be free from defects in material and workmanship for a period of twelve (12) months from the date of purchase provided when used under normal laboratory conditions and in accordance with the operating limitations and maintenance procedures in the instruction manual and when not having been subjected to accident, alteration, misuse or abuse.

Ion-selective electrodes and pH electrodes (excluding non-refillable gel electrodes) are warranted to be free from defects in material and workmanship for a period of twelve (12) months from the date of purchase by the customer .

Limitations And Exclusions:

In the event of failure within the warranty period, CMS will, at CMS's option, repair or replace product not conforming to this warranty, or will refund the purchase price of the non-conforming product. There may be additional charges, including freight, for warranty service. CMS reserves the right to ask for proof of purchase, such as the original invoice or packing slip.

Non-refillable gel electrodes are warranted to be free from defects in material and workmanship for a period of three (3) months from date of purchase by customer if the electrode fails for any reason except abuse (including breakage), provided the electrode is not used in solutions containing silver, sulfide, perchlorate, or hydrofluoric acid; or in solutions more than 1 molar in strong acid or base at temperatures above 50° C, and providing the electrode is used at room temperature (use at extreme temperatures can shorten electrode life). For service, CMS will replace product not conforming to this warranty or refund the purchase price of the non-conforming product.

THE WARRANTIES DESCRIBED ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER STATUTORY, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND ALL WARRANTIES ARISING FROM THE COURSE OF DEALING OR USAGE OF TRADE. THE BUYER'S SOLE AND EXCLUSIVE REMEDY IS FOR REPAIR OR REPLACEMENT OF THE NON-CONFORMING PRODUCT OR PART THEREOF OR REFUND OF THE PURCHASE PRICE, BUT IN NO EVENT SHALL CMS (ITS CONTRACTORS AND SUPPLIERS OF ANY TIER) BE LIABLE TO THE BUYER OR ANY PERSON FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHETHER THE CLAIMS ARE BASED IN CONTRACT IN TORT (INCLUDING NEGLIGENCE) OR OTHERWISE WITH RESPECT TO OR ARISING OUT OF THE PRODUCT FURNISHED HEREUNDER.

Representations and warranties made by any person including CMS, its representatives, and employees which alter or are in addition to the terms of this warranty shall not be binding upon CMS unless in writing and signed by one of its officers.

Chapter XIII

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, Part 15, 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 necessary to correct the interference.

> **NOTE**: *To meet FCC Compliance, CMS-supplied wall adaptors must be used with this product.*

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministere des Communications du Canada.

Chapter XIV

Ordering Information

CMS #	Description
024-037	pH 101 pH Meter, 110 V
024-038	pH102 pH Meter, 110 V
024-039	pH 103 pH Meter, 110V
024-047	Glass Combination pH Electrode
024-048	Semi-micro pH Electrode
024-049	Glass Rugged-Bulb pH Electrode
024-050	Gel Epoxy Combination pH Electrode
024-051	Gel-Epoxy Semi-micro pH Electrode
024-052	Gel-Epoxy Flask pH Electrode
024-053	Gel-Epoxy Flat-Surface pH Electrode
024-054	Calomel Combination pH Electrode
024-079	Calomel Semi-micro pH Electrode
024-055	Chloride Solid-state Epoxy Electrode
024-056	Chloride Solid-state Combination Epoxy Electrode
024-057	Fluoride Solid-state Epoxy Electrode
024-058	Fluoride Solid-state Combination Epoxy Electrode
024-060	Silver/Sulfide Solid-state, Epoxy Electrode
024-061	Silver/Sulfide Combination Electrode
024-062	Cyanide Solid-state, Epoxy Electrode
024-063	Cyanide Combination Electrode
024-064	Sodium Glass-Body Electrode
024-065	Sodium Combination Glass Electrode
024-066	Redox Epoxy Combination Electrode
024-067	Redox Glass Combination Electrode
024-068	S/J Epoxy Reference Electrode

CMS #	Description
024-069	D/J Epoxy Reference Electrode
024-078	4M KCL w/AgCL, 5 x 60 ml
024-073	4M KCL, 5 x 60 ml
024-074	Internal Filling Solution, Single-Junction Electrode
024-076	Inner Chamber Filling Solution, Double-Junction Electrode
024-077	Outer Chamber Filling Solution, Double-Junction Electrode
025-772	pH Storage Solution, 475ml
024-070	Glass Reference Electrode
024-080	pH Gel Triode w/ ATC
024-071	ATC Epoxy Probe
024-072	ATC Glass Probe
024-964	ISA 5M $NaNO_3$, 475ml
024-965	Internal Filling Solution, for Chloride Combination Electrode
024-966	Cyanide Alkaline Reagent 475ml

Chapter XV

Specifications

	Model 101	Model 102	Model 103
pH	0.00-14.00	0.00-14.00	0.000-14.000
Resolution	0.01	0.1, 0.01	0.1, 0.01, 0.001
Accuracy	+/- 0.02 (at room temp)	+/- 0.02 (at room temp)	+/- 0.02 (at room temp)
mV	NONE	+/- 1999	+/- 1999.9
Resolution	N/A	1	1
Accuracy	N/A	+/- 1 +/- 0.1% (reading)	+/- 1 +/- 0.1% (reading)
REL mV	NONE	NONE	+/- 1999.9
Resolution	N/A	N/A	0.1
Accuracy	N/A	N/A	+/- 0.2 +/- 0.05%
ATC Temp	0 - 100°C	0 - 100°C	0 - 100°C
Resolution	0.1	0.1	0.1
Accuracy	+/-1.0	+/-1.0	+/- 1.0
Concentration	N/A	N/A	0.000-19,900
Resolution	N/A	N/A	1, 2, or 3 sig. digits
Accuracy	N/A	N/A	+/- 0.05% (reading)
ATC	Auto/Manual	Auto/Manual	Auto/Manual
No. of Keys	6	8	8
Digital Interface	N/A	RS232 Output	RS232 Output
Recorder Output	NO	NO	YES
Clock	NO	NO	YES
Battery Backup	NO	NO	YES

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