Instruction Manual

HI 84529
TITRATABLE ACIDITY
MINITITRATOR & pH METER
for Dairy Products
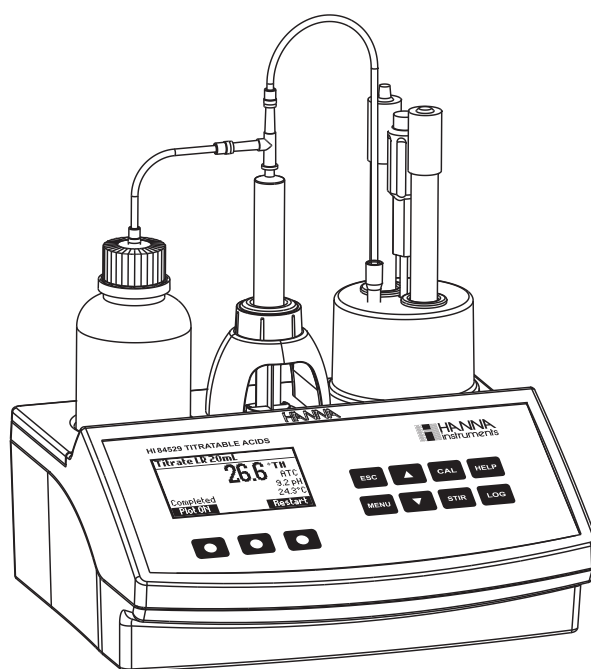
HANNA®
instruments

www.hannainst.com

Dear Customer,

Thank you for choosing a Hanna Instrument product.

Please read this instruction manual carefully before using this instrument. This manual will provide you with the necessary information for correct use of this instrument, as well as a precise idea of its versatility.

If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or view our worldwide contact list at www.hannainst.com.

TABLE OF CONTENTS

PRELIMINARY EXAMINATION

Please examine this product carefully. Make sure that the instrument is not damaged. If any damage occurred during shipment, please notify your Dealer.

Each **HI 84529** minititrator is supplied complete with:

- **HI 84529-70** Reagent Kit for titratable acidity in dairy products
- **FC 260B** pH electrode
- **HI 5315** Reference electrode
- **HI 7662-M** Temperature probe
- **HI 7072** Fill solution (30 mL)
- **HI 700640** Cleaning solution for milk deposits (2 x 20 mL)
- One capillary dropper pipette
- Two 100 mL beakers
- Tube set (aspiration tube with titrant bottle cap and dispensing tube with tip)
- Dosing Pump Valve
- 5 mL Syringe
- 1 mL Plastic Pipette
- Stir bar
- Power Adapter
- Instruction manual

Note: Save all packing material until you are sure that the instrument works correctly. Any defective item must be returned in its original packing.

GENERAL DESCRIPTION

The **HI 84529** is a low-cost easy to use, microprocessor-based automatic minititrator and pH meter designed for the rapid and accurate analysis of Total Titratable Acidity in Dairy Products. The **HI 84529** will quickly become a valuable tool by eliminating subjective factors including color indicators, errors in calculations or erratic titrant additions.

The instrument benefits from Hanna's many years of experience as a manufacturer of quality analytical instrumentation. A clear and well-designed user interface makes the instrument intuitive and simple to use.

By pressing the **Start** key in **Titrator** mode, the instrument will automatically titrate the sample to the set end point, perform all necessary calculations and display the results in the selected unit. At the end of the titration, another titration can be started by pressing the **Restart** key.

A dedicated **HELP** keys aids in setup, calibration and troubleshooting.

Other features:

- pH meter / mV meter
- Stir speed control
- Graphic mode to display the titration data
- Data can be stored using the log feature and then exported to a USB stick or transferred to a PC using the USB connection
- Log on demand for up to 400 samples (200 mV/pH measurements; 200 for titration results)
- GLP feature, to view calibration data for the pH electrode and pump

SIGNIFICANCE OF USE

Titratable acidity can be expressed in several units; % lactic acid (% l.a.), degree Soxhlet Henkel (°SH), degree Dornic (°D) or degree Thörner (°TH). Each of these units corresponds to a specific procedure used to titrate dairy products.

Soxhlet Henkel degrees (°SH) - mostly used in Central Europe exept France and the Netherlands. This value is a number of mL of 0.25N NaOH used for titration of 100 mL milk, using phenolphtalein as indicator.

Thörner degrees (°Th) - mostly used in Sweden and the CIS. This value is obtained by titrating 100 mL of milk, diluted with 2 parts of distilled water, with 0.1N NaOH, using phenolphtalein as indicator.

Dornic degrees (°D) - mostly used in Netherlands and France. This value is obtained by titrating 100 mL of milk, with N/9 (0.11 N) NaOH, using phenolphtalein as indicator.

Percent lactic acid (%l.a.) - frequently used in the UK, USA, Canada, Australia and New Zealand. This value is obtained in the same way as °D, dividing the result by 100.

The titratable acidity values will vary depending on the method used. Select Low 50 to titrate a non-diluted sample, or select Low 20 / High 20 to titrate 20 mL or 20 g samples that are diluted with twice its volume of deionized a distilled water. The **HI 84529** uses methods based on AOAC International and Standard Methods for the Examination of Dairy Products. Both of these method report titratable acidity as % lactic acid, a rough conversion factor can be used to convert the results to the other available units:

From:	To:	Divide By:
%l.a.	°SH	0.0225
%l.a.	°D	0.0100
%l.a.	°TH	0.0090

The **HI 84529** can be customized to meet the needs of any dairy analysis lab. Samples can be titrated by weight or volume, diluted or non-diluted (low range only) and titrated to a fixed pH end point that can be adjusted by the user.

SPECIFICATIONS

Titrator	Range	Low Range
		%I.a.: 0.01 to 0.20
		°SH: 0.4 to 8.9
		°D: 1.0 to 20.0
		°TH: 1.1 to 22.2
		High Range
		%I.a.: 0.1 to 2.0
		°SH: 4.4 to 88.9
		°D: 10 to 200
		°TH: 11.1 to 222.2
	Resolution	%I.a.: 0.01 (Low Range) / 0.1 (High Range)
		°SH: 0.1
		°D: 0.1 (Low Range) / 1 (High Range)
		°TH: 0.1
	Accuracy	Low Range
		± 0.01 %I.a. @ 25 °C
		High Range
		± 0.1 %I.a. @ 25 °C
	Sample size	Low Range 20: 20 mL or 20 g
		Low Range 50: 50 mL or 50 g
		High Range 20: 20 mL or 20 g
	Titration method	Acid-base titration
	Principle	End point titration
	Pump speed	10 mL/min
	Stirring speed	800 (Low Range) / 1000 (High Range)
	Log data	Up to 200 samples
pH meter	pH Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	pH Resolution	0.1 pH / 0.01 pH
	pH Accuracy	± 0.01 pH
	pH Calibration	1, 2 or 3 point calibration;
		4 available buffers (4.01, 6.00, 8.30, 10.01)
	Temperature Compensation	Manual or automatic
mV meter	mV Range	-2000.0 to 2000.0 mV
	mV Resolution	0.1 mV
	mV Accuracy	± 1.0 mV
	Log data	Up to 200 samples (pH or mV)

Temperature	Range	-20.0 to 120.0 °C (-4.0 to 248.0 °F)
	Resolution	0.1 °C
	Accuracy	±0.4 °C without probe error
Electrode	**FC 260B** pH electrode	
	HI 5315 Reference electrode	
Temperature Probe	**HI 7662-M**	
Environment	0 to 50 °C (32 to 122 °F); max 95% RH non-condensing	
Power supply	12 Vdc power adapter	
Dimensions	235 x 200 x 150 mm (9.2 x 7.9 x 5.9")	
Weight	1.9 kg (67.0 oz.)	

REQUIRED REAGENTS

Code	Description
HI 84529-50	Titrant Low Range 20
HI 84529-51	Titrant High Range 20
HI 84529-52	Titrant Low Range 50
HI 84529-55	Pump Calibration Standard

PRINCIPLE OF OPERATION

The methodology for titratable acidity in dairy products is based on neutralization reaction where the acids in the sample (i.e. lactic acid) reacts with a base (i.e. sodium hydroxide) to produce water:

$$H^+ + OH^- \rightarrow H_2O$$
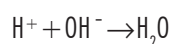
In an ideal solution, the endpoint of an acid titration corresponds stoichiometrically to the complete neutralization of the acids present.

This endpoint for this reaction can be determined visually using a color indicator (i.e. phenolphthalein), however this endpoint becomes very objective in opaque and colored samples. The **HI 84529** removes this issue by titrating to a fixed pH endpoint that can be set by the user. The **HI 84529** can be customized to meet individual needs with samples titrated by mass or by volume, in two different ranges, with diluted and non-diluted (low range only). For precise analysis the sample size, volume of titrant added and titrant concentration must be known.

The **HI 84529** Titratable Acid in Dairy Products Minititrator utilizes a simple sample preparation, a high quality dosing pump for titrant additions, potentiometric endpoint determination and instantaneous computations. To maintain the high accuracy of the minititrator a simple pump calibration is required. The pump calibration uses a known quantity of a known solution to compensate for changes in the dosing system, this procedure should be performed regularly.

# FUNCTIONAL DESCRIPTION

OVERHEAD VIEW

1) Titrant bottle
2) Liquid Crystal Display (LCD)
3) Keypad
4) Electrode holder
5) Dispensing tube
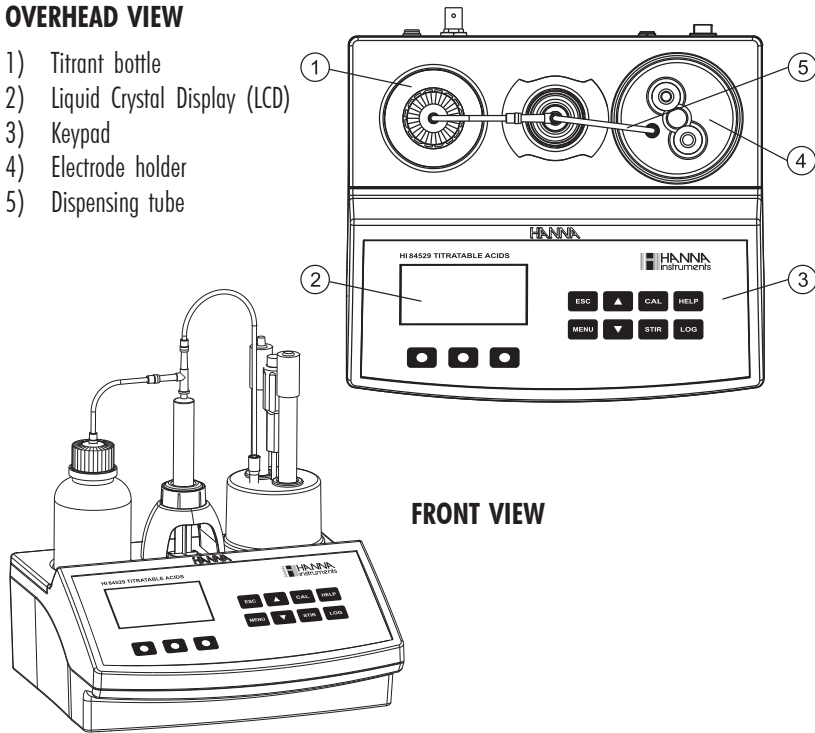
FRONT VIEW

REAR VIEW

6) Aspiration tube
7) pH Electrode
8) Temperature probe
9) Reference electrode
10) Syringe
11) Electrode holder
12) Power switch
13) USB connector (PC interface)
14) USB connector (Storage interface)
15) Power adapter
16) BNC electrode connector
17) Temperature connector
18) Reference connector
19) Titrant bottle
20) Dosing Pump Valve

8
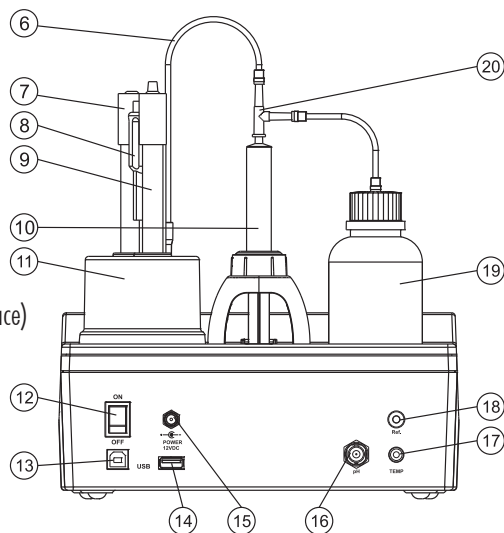
KEYPAD FUNCTION
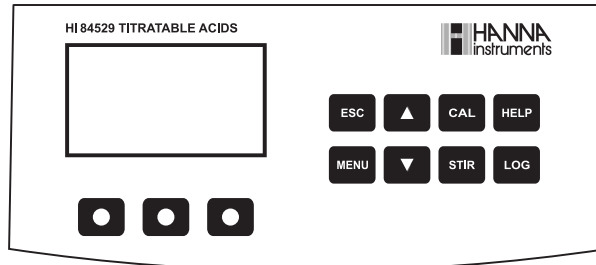
ESC - used to leave the current screen and to return either to the previous screen or to the main screen. In **Setup**, exits a parameter without changing the value.

▼/▲ - used to modify the parameters' values, to scroll the information displayed while viewing a help screen or to move between the options from the instrument's **Setup**

CAL - used to access the Electrode and Pump calibration options

HELP - used to access/exit the instrument's contextual help

LOG - used to save the current mV/pH reading in pH meter mode and the titration result

MENU - used to enter **Setup**, **Recall** or **GLP** selection menu, while instrument is in **pH** or **Titration** mode

STIR - used to start/stop the stirrer

> **Note:** The stirrer starts automatically during pump calibration and titration, it cannot be stopped by pressing **STIR** key.

GUIDE TO INDICATORS

During the instrument's operation a set of information are displayed on the LCD.

Displayed icons:

| | Stirrer on. | | Pump running. | | Unstable reading. |
| | Stirrer is not working properly. | | | | Parameter can be modified. |
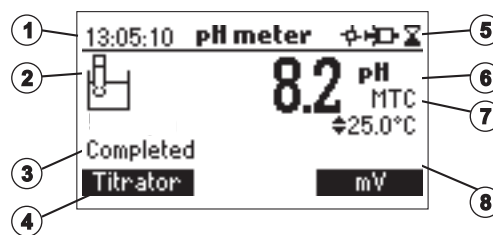
1) Current time and instrument mode information (pH meter or Titrator)
2) pH electrode condition
3) Instrument status

4) Virtual option keys
5) Stirrer and reading status
6) Main reading information
7) pH temperature compensation mode (Manual or Automatic)
8) Temperature reading

DOSING PUMP

The dosing pump is based on a valve that automatically moves the titrant between the titrant bottle and syringe when filling the syringe and between the syringe and sample when dispensing. A replaceable 5 mL plastic syringe is used to limit the amount of titrant used per test to ensure the highest possible accuracy. Before a set of titrations, it is necessary to prime the dosing system.

Note: Once titrations have been completed, the dosing system should be cleaned with deionized water using the prime feature.

TITRATOR STARTUP

This is a general outline of the steps required to perform a titration. The following topics are expanded upon in each section that follows.

• Place the instrument on a flat table. Do not place the instrument in direct sun light.
• Connect the power adapter to the instrument.
• Turn the instrument ON using the power switch on the rear panel of the instrument.
• Set up the instrument. See the "Setup Menu" section for details.
• Connect the pH electrode to the instrument.
• Connect the reference electrode to the instrument.
• Connect the temperature probe to the instrument.
• Calibrate the pH electrode.
• Connect the tubes and the valve. See the "Dosing Pump Installation" section for the procedure.
• Remove the titrant bottle cap and replace it with the bottle cap with tubes. Place the titrant bottle in the appropriate place on the titrator top.

Note: Different titrants are required based on the concentration. See "Pump Calibration Procedure" for details.

• Prime the syringe. To assure high accuracy, verify there are no air bubbles in the syringe or tubing.
• Calibrate the pump.

Note: Different volumes of standards are required based on the concentration. See "Pump Calibration Procedure" for details.

- Prepare the sample.
- Run a titration and log sample results.

SETUP MENU

The titrator's setup menu may be accessed from the main screen (meter or titrator) by pressing the **MENU** key, then **Setup**.
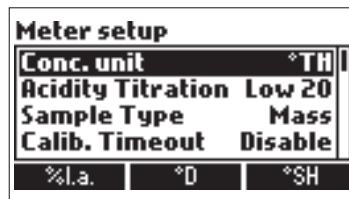
A list of setup parameters will be displayed with currently configured setting.

While in the setup menu, it is possible to modify the instrument's operation parameters. The **ARROW** keys permit the user to scroll the setup parameters.

Press **HELP** to view the contextual help.

Press **ESC** to return to the main screen.

Concentration Unit

% l.a., °SH, °D or **°TH**

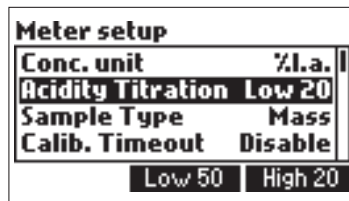Press the corresponding virtual option key to change the option.

% l.a. - % lactic acid

°SH - °Soxhlet Henkel
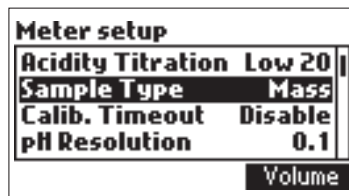
°D - °Dornic

°TH - °Thörner

Acidity Titration

Low 20, Low 50 or **High 20**

Press the corresponding virtual option key to select the desired range.
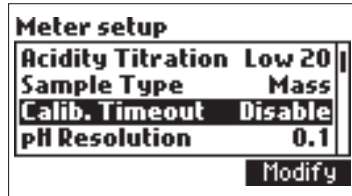
Note: Different titrants are required for each range.

Sample Type

Mass or **Volume**

Samples can be added by volume or by mass. For improved accuracy all samples should be added by mass.
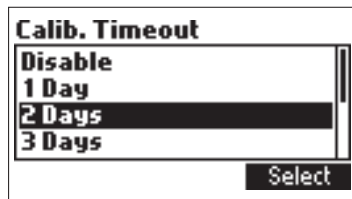
Calibration Timeout

Meter setup

Acidity Titration	Low 20
Sample Type	Mass
Calib. Timeout	**Disable**
pH Resolution	0.1
	Modify

Calib. Timeout

- Disable
- 1 Day
- **2 Days**
- 3 Days

Select

Disabled or **1 to 7 days**

This option is used to set the number of days before the pH calibration expired warning message is displayed.
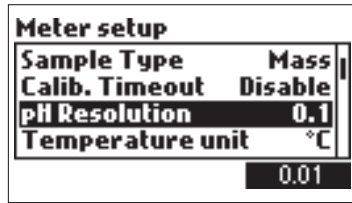
Press **Modify** to access the calibration timeout screen.

Use the **ARROW** keys to select the value.

Press **Select** to confirm or **ESC** to return to the setup menu without saving the changes.
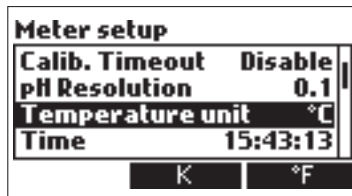
pH Resolution

Meter setup

Sample Type	Mass
Calib. Timeout	Disable
pH Resolution	**0.1**
Temperature unit	°C
	0.01

0.1 or **0.01**

Press the displayed virtual option key to change the option.

Temperature Unit

Meter setup

Calib. Timeout	Disable
pH Resolution	0.1
Temperature unit	**°C**
Time	15:43:13
K	°F

°C, **°F** or **K**

Press the virtual option key to change the option.

Time

Meter setup

Temperature unit	°C
Time	**15:43:13**
Date	2012/01/16
Key Beep	☐
	Modify
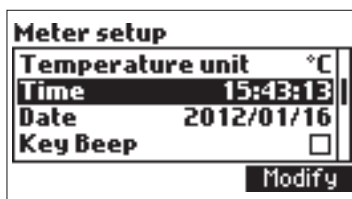
Press the **Modify** key to change the time and time format.

Time

15:33:13

hh:mm:ss 24 Hours
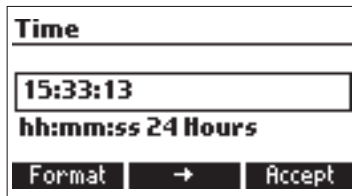
Format	→	Accept

Press **Format** to switch between 12 hour (am/pm) and 24 hour mode.

Press → to highlight the value to be modified. Use the **ARROW** keys to change the value. Press **Accept** to confirm the new value or **ESC** to return to the setup.

Date

Press the **Modify** key to change the date and date format.

Press **Format** to cycle between the available date formats.

Press → to highlight the value to be modified. Use the **ARROW** keys to change the value. Press **Accept** to confirm the new value or **ESC** to return to the setup.

Key Beep

Select **Enable** to activate or **Disable** to deactivate the Key Beep function.

If enabled, a short beep will be heard every time a key is pressed.

Error Beep

Select **Enable** to activate or **Disable** to deactivate the Error Beep function.

If enabled, a beep will be heard when an error condition occurs.
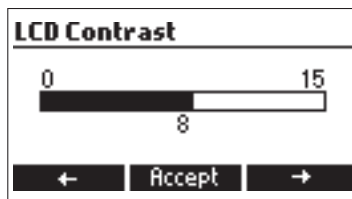
Decimal Separator

This option allows the user to select the symbol used for a decimal separator.

LCD Contrast

Meter setup

|	
Error Beep	☐
Decimal Separator	.
LCD Contrast	**8**
LCD Backlight	8
	Modify
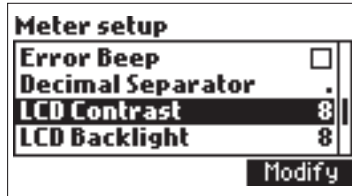
This option is used to set the display's contrast.
Press **Modify** to change the display's contrast.
The default value is 8.

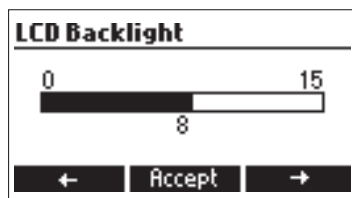**LCD Contrast**

0   15
8

| ← | Accept | → |

Use the **ARROW** keys or ← / → to increase/decrease the value.
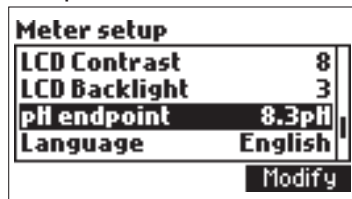Press **Accept** to confirm the value or **ESC** to return to the setup menu.

LCD Backlight

Meter setup

Decimal Separator	.
LCD Contrast	8
LCD Backlight	**3**
pH endpoint	8.3pH
	Modify
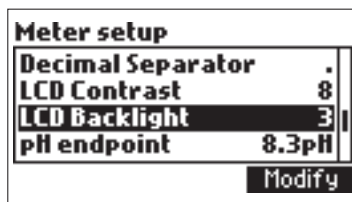
Press **Modify** to change the backlight value.
The default value is 3.

LCD Backlight
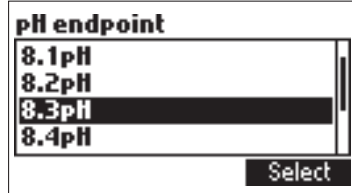
0   15
8

| ← | Accept | → |

Use the **ARROW** keys or ← / → to increase/decrease the backlight level.
Press **Accept** to confirm or **ESC** to return to the setup menu.

pH endpoint

Meter setup

LCD Contrast	8
LCD Backlight	3
pH endpoint	**8.3pH**
Language	English
	Modify

Press **Modify** to change the pH endpoint value.
The default value is 8.3 pH.

pH endpoint

8.1pH
8.2pH
8.3pH
8.4pH
Select

Use the **ARROW** keys to select the value.
Press **Accept** to confirm or **ESC** to return to the setup menu without saving the changes.

14

Language

| Meter setup	
LCD Backlight	3
pH endpoint	8.3pH
Language	**English**
Tutorial	☐
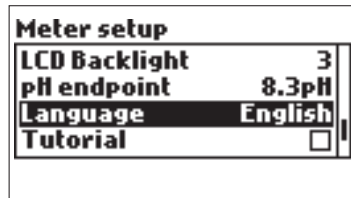
Press the corresponding virtual option key to change the option. If the selected language cannot be loaded, the previously selected language will be reloaded. If no language can be loaded at startup, the instrument will work in "safe mode". In "safe mode" all messages are displayed in English and tutorial and help information are not available.
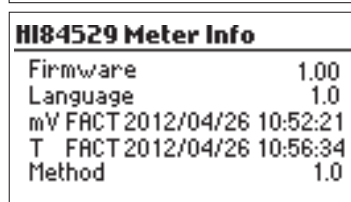
Tutorial

Meter setup	
pH endpoint	8.3pH
Language	English
Tutorial	☐
Meter Information	
	Enable
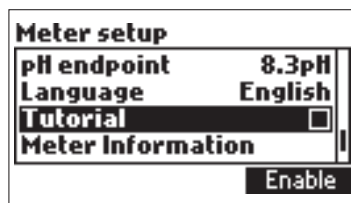
Enable or **Disable** the Tutorial. This helpful tool offers additional information during calibration and titration.

Meter Information

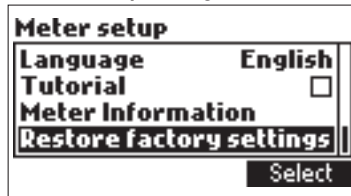| Meter setup	
Language	English
Tutorial	☐
Meter Information	
Restore factory settings	
	Select
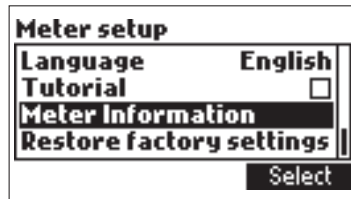
Press **Select** to view the firmware version, language version, mV factory calibration date and time and temperature factory calibration date and time.
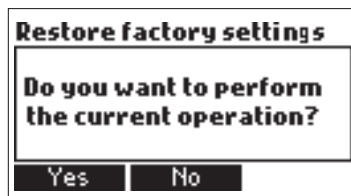
HI84529 Meter Info	
Firmware	1.00
Language	1.0
mV FACT 2012/04/26 10:52:21	
T FACT 2012/04/26 10:56:34	
Method	1.0

Press **ESC** to return to the setup menu.

Restore Factory Settings

Meter setup	
Language	English
Tutorial	☐
Meter Information	
Restore factory settings	
	Select

Press **Select** to restore the factory settings.

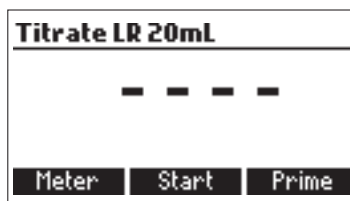| Restore factory settings |
|---|
| Do you want to perform the current operation? |
| Yes ┃ No |

Press **Yes** to confirm the restore process or **No** to return without restoring.
Press **ESC** to return to the setup menu.

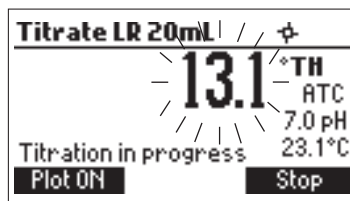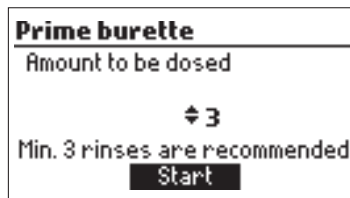# GUIDE TO DISPLAY CODES

HI84529 v1.xx

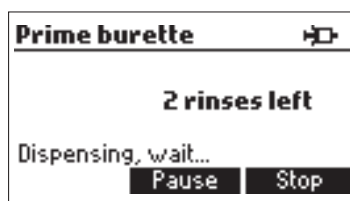This screen appears when the instrument is turned on during the initialization process.

Titrate LR 20mL

- - - -

Meter   Start   Prime

Titration screen display.

Titrate LR 20mL

13.1 °TH
ATC
7.0 pH
23.1°C

Titration in progress
Plot ON   Stop

Titration screen when a titration is in progress.

Prime burette
Amount to be dosed

≑3

Min. 3 rinses are recommended
Start

Prime burette screen.

Prime burette

2 rinses left

Dispensing, wait...
Pause   Stop

Prime burette screen when the dosing system is running.
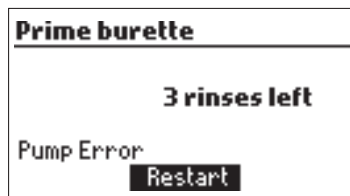
Prime burette

3 rinses left

Pump Error
Restart

This error message appears when the pump is not working properly. Check the tubing, valve and syringe. Press **Restart** to try again.

Calibration LR 20

Last Pump Calibration:
2012/02/23 14:08:09
Last Electrode Calibration:
2012/01/17 14:38:03
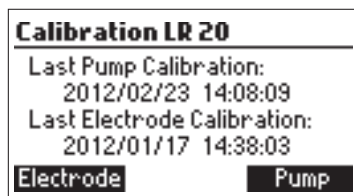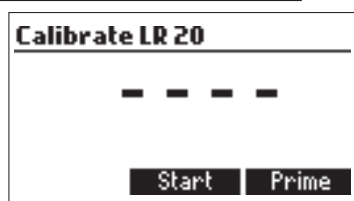
Electrode   Pump

This screen appears when the titrator is in calibration mode.
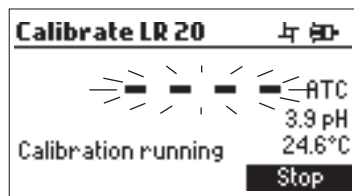
Press **Pump** to calibrate Pump.

Press **Electrode** to calibrate pH electrode.

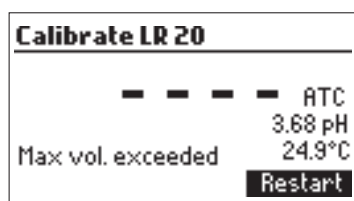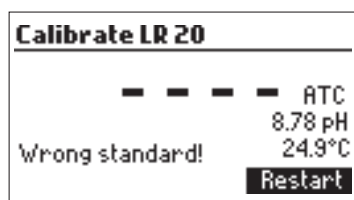## PUMP CALIBRATION MESSAGES

Calibrate LR 20

— — — —

Start   Prime

Pump calibration is initiated by pressing the **Start** key.

Calibrate LR 20

— — — — ATC
3.9 pH
24.6°C

Calibration running   Stop

This screen appears while pump calibration is in progress. Press **ESC** or **Stop** key to return to the Pump Calibration screen.

Calibrate LR 20

— — — — ATC
3.68 pH
24.9°C

Max vol. exceeded   Restart

This error message appears during pump calibration when the end point can not be reached and the maximum amount of titrant is exceeded. Check standard, electrode and/or dosing system and try again.

Calibrate LR 20

— — — — ATC
8.78 pH
24.9°C

Wrong standard!   Restart

The calibration was outside the acceptable limits. Prepare a new standard and try again.
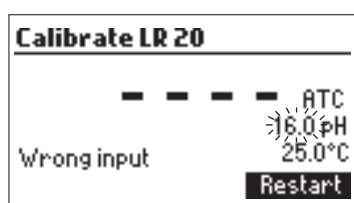
Calibrate LR 20

— — — — ATC
16.0 pH
25.0°C

Wrong input   Restart

This error message appears when the pH reading exceeds the acceptable input limits (-2.00 < pH > 16.00).

17

Calibrate LR 20

--- --- --- --- MTC
6.3 pH
Stirrer Error ⬍25.0°C
Restart

This screen appears when the stirrer is not working properly. Check the stir bar and beaker content. Press **Restart** to try again.

Calibrate LR 20

--- --- --- --- MTC
6.3 pH
Pump Error ⬍25.0°C
Restart
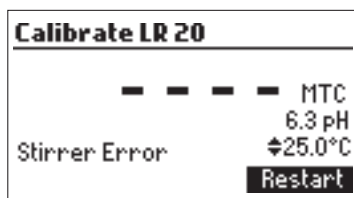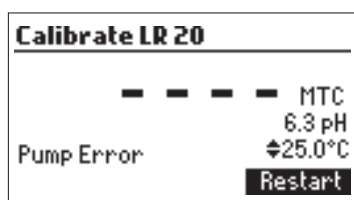
This error message appears when the pump is not working properly. Check the tubing, valve and syringe. Press **Restart** to try again.
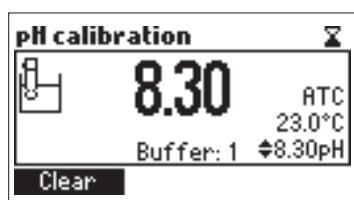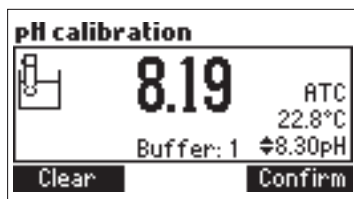
pH CALIBRATION MESSAGES

pH calibration ⏳

8.30 ATC
23.0°C
Buffer: 1 ⬍8.30pH
Clear

pH calibration mode.

pH calibration

8.19 ATC
22.8°C
Buffer: 1 ⬍8.30pH
Clear Confirm

When the reading has stabilized, press **Confirm** to accept the calibration or **Clear** to restore the default calibration.

pH calibration ⏳

14.00 ATC
22.7°C
Wrong Buffer ⬍7.01pH

The **"Wrong Buffer"** message is displayed when the pH value is outside of the acceptable range. Clean the electrode by following the Cleaning Procedure and/or check the buffer concentration before continuing the pH calibration.
Press the **ESC** key to exit pH calibration mode.

TITRATION MESSAGES

Titrate LR 20mL

--- --- --- ---

Meter Start Prime
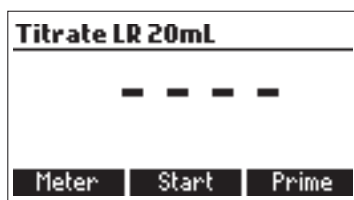
This screen is displayed when the instrument is in titration mode. Press **Start** to begin a titration, **Meter** to enter pH meter mode or **Prime** to enter into the prime function.

18

Titrate LR 20mL

26.6 °TH
ATC
9.2 pH
24.3°C

Completed
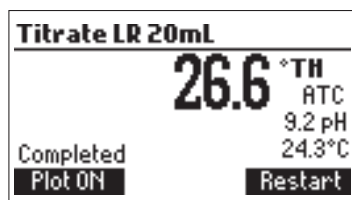
Plot ON   Restart

The titration result, expressed as concentration in selected unit, is displayed automatically at the end of the titration. Press **Restart** to start another titration or **ESC** to return to the main screen.

Titrate LR 20mL

1.0 °TH
ATC
16.0 pH
23.8°C

Wrong input

Plot ON   Restart

This error message appears when the input reading (pH or temperature) exceeds the specified limits. The pH or temperature value and concentration will blink indicating an error.

Titrate LR 20mL

40.0 °TH
ATC
11.5 pH
23.5°C

Max vol. exceeded

Plot ON   Restart

This screen appears when the sample concentration is out of range.
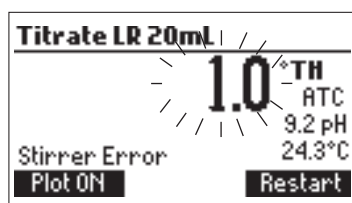
Titrate LR 20mL

1.0 °TH
ATC
9.2 pH
24.3°C

Stirrer Error

Plot ON   Restart

This screen appears when the stirrer is not working properly. Check the stir bar and beaker content. Press **Restart** to try again.

Titrate LR 20mL

1.0 °TH
ATC
9.2 pH
24.3°C

Pump Error

Plot ON   Restart
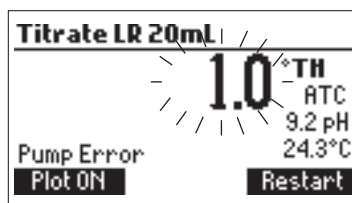
This error message appears when the pump is not working properly. Check the tubing, valve and syringe. Press **Restart** to try again.
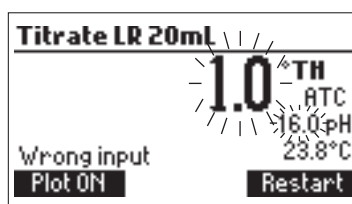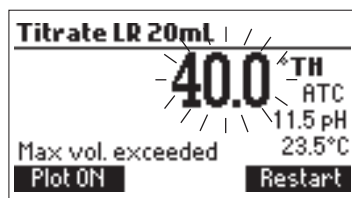
ELECTRODE PREPARATION

Remove the electrode protective cap.

DO NOT BE ALARMED IF ANY SALT DEPOSITS ARE PRESENT. This is normal with electrodes and they will disappear when rinsed with distilled/deionized water.

During transport, tiny bubbles of air may have formed inside the glass bulb. The electrode cannot function properly under these conditions. These bubbles can be removed by "shaking down" the electrode as you would do with a glass thermometer.

If the bulb is dry, soak the electrode in **HI 70300** Storage Solution for at least one hour.

Preparation of reference electrode:

- Unwrap Parafilm™ seal found over ceramic junction on inner stern of the reference electrode and discard. This is only used for shipping.
- Rinse inner stern with deionized water, making certain to wet o-ring found on the inner stern.
- Reassemble reference electrode by gently pushing the inner assembly into the outer body (from the bottom), slide spring and cap down the cable and over the top of the inner stern. Screw the cap into place.
- Unscrew and remove the fill hole plug and o-ring on fill hole spout.
- Using the dropper pipette provided, add a few drops of **HI 7072** fill solution to the electrode. Invert electrode to wet the o-ring and rinse the electrolyte chamber.

Reference Electrode

- Holding the body of the electrode gently press the cap with your thumb. This permits the fill solution to drain out of the body. Release your thumb and verify electrode returns to its original position (you may need to gently assist for this to occur).
- Fill electrode body with **HI 7072** fill solution until solution volume is just below fill hole.

Note: During measurement always operate reference electrode with the fill hole open.
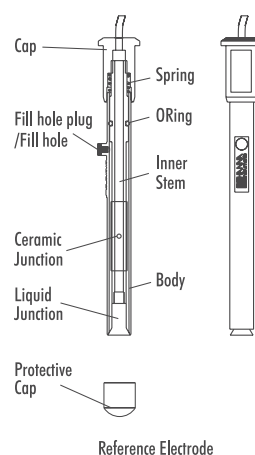
MEASUREMENT

Place pH electrode and reference electrode into electrode holder and connect the electrodes to the instrument.

Rinse the pH and reference electrodes with distilled or deionized water. Immerse the pH and reference electrodes 1.5 cm (0.6") in the sample and stir gently for a few seconds.

For a faster response and to avoid cross-contamination of the samples, rinse the electrodes with a few drops of the solution to be tested, before taking measurements.

ELECTRODE CALIBRATION PROCEDURE

It is recommended to calibrate the instrument frequently, especially if high accuracy is required. The pH range should be recalibrated:

a) Whenever the pH electrode is replaced

b) At least once a week, but daily is advised

c) After testing aggressive chemicals and after the electrode is cleaned

d) When high accuracy is required

e) If the pH calibration expired warning is displayed during measurement

Every time you calibrate the instrument use fresh buffers and clean the electrode (see page 41).

PROCEDURE

A single one, two or three-point calibration can be performed, using four predefined buffers 4.01, 6.00, 8.30 and 10.01 pH. For a single point calibration any of the four buffers may be used, 8.30 pH is recommended.

Note: The **HI 84529** will not accept other pH buffers for calibration.

• Pour small quantities of selected buffer solutions into clean beakers. For accurate calibration use two beakers for each buffer solution, the first one for rinsing the electrode and the second one for calibration.

• Put a magnetic stir bar in the beaker that will be used for calibration.

• Remove the protective cap and rinse the electrode with some of the buffer solution to be used for the first calibration point.

• Put the first beaker with calibration buffer in the beaker holder.

• Place the electrode holder on the top of the beaker and secure it by turning clockwise and press **STIR**.

• Immerse the pH electrode, reference electrode and temperature probe approximately 1.5 cm (0.6") into the buffer, paying attention not to touch the stir bar.

To enter Electrode Calibration follow the next steps:

• Press **CAL** key then **Electrode**.

• The electrode calibration screen will be displayed.

• Press **Clear** to delete the previous calibration.

1 Point calibration

• The 8.30 buffer will be selected by default. If necessary press the **ARROW** keys in order to select a different buffer value.

- The $\underline{\Sigma}$ (unstable measurement) symbol will be shown on the display until the reading becomes stable.
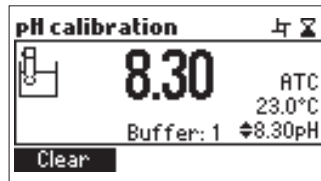
- When the reading is stable and close to the selected buffer, the $\underline{\Sigma}$ (unstable measurement) symbol will disappear and the **Confirm** key will become active.
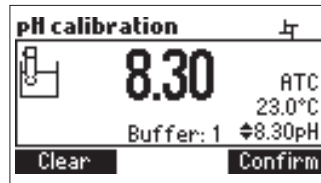
- Press **Confirm** to confirm the calibration or **ESC** to exit calibration.
- After the first calibration point has been confirmed, press **ESC** to exit without performing the second calibration point.

2 Point calibration

- The calibrated value will be shown on the display and the second expected buffer value will be displayed.

- Remove the electrode holder with electrodes from the top of the beaker.
- Place the second beaker with calibration buffer in the beaker holder. Rinse the electrodes in a beaker containing the second buffer rinsing solution.
- Place the electrode holder (with electrodes) on the top of the beaker and secure it by turning clockwise and press **STIR**.
- If necessary, press the **ARROW** keys in order to select a different buffer value.

22

- The $\sum$ (unstable measurement) symbol will be shown on the display until the reading becomes stable.
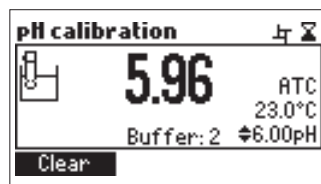- When the reading is stable and close to the selected buffer, the $\sum$ (unstable measurement) symbol will disappear and the **Confirm** key will become active.
- Press **Confirm** to confirm the calibration.
- The calibrated value will be shown on the display and the third expected buffer value will be automatically selected.
- After the second calibration point has been confirmed, press **ESC** to exit without performing the third calibration point.

3 Point calibration

- Remove the electrode holder with electrodes from the top of the beaker.
- Place the third beaker with calibration buffer in the beaker holder. Rinse the electrodes in a beaker containing the third buffer rinsing solution.
- Place the electrode holder (with electrodes) on the top of the beaker and secure it by turning clockwise and press **STIR**.
- If necessary press the **ARROW** keys in order to select a different buffer value.
- The $\sum$ (unstable measurement) symbol will be shown on the display until the reading becomes stable.
- When the reading is stable and close to the selected buffer, the $\sum$ (unstable measurement) symbol will disappear and the **Confirm** key will become active.
- Press **Confirm** to confirm the calibration. The instrument stores the calibration value and returns to calibration menu, where the date and time for the pH calibration will be updated.

Note:

- A buffer confirmed during the calibration process is removed from the list of available buffers.
- If the value measured by the instrument is not close to the selected buffer, a "**Wrong Buffer**" error message will be shown on the display.
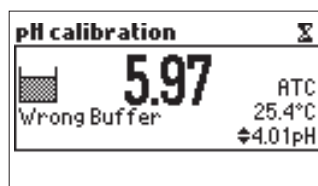

Check if the correct buffer has been used or regenerate the pH electrodes by following the Cleaning Procedure (see page 41). If necessary change the buffer or the electrode.

- If the measured offset isn't within the preset limits (±45 mV), the meter will display the message **"Buffer Contaminated"** alternatively with **"Electrode Dirty/Broken"**.
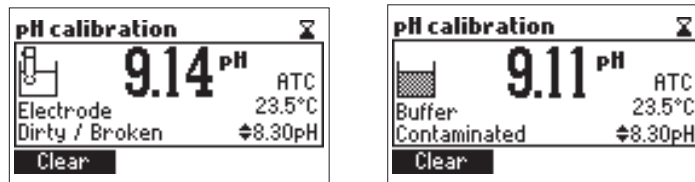
- If the computed slope isn't within the preset limits, the meter will display the message **"Wrong Slope"**. If the slope is too high the symbol ◢ will be displayed. If the slope is too low the symbol ◣ will be displayed.
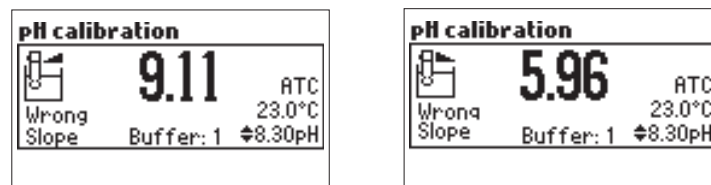
- If the **"Wrong Old Slope"** error message is displayed, an inconsistency exists between the current and the previous (old) calibration. Clear the previous calibration by pressing **Clear** and proceed with calibration from the current calibration point. The instrument will keep all the confirmed values during the current calibration.
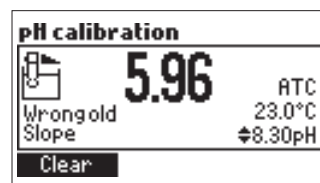
- If the temperature reading is out of the defined temperature range of the buffer (0 to 45 °C), the **"Wrong Buffer Temperature"** error message will be displayed, and the temperature symbol will blink on the display. Calibration cannot be confirmed in this situation.

24
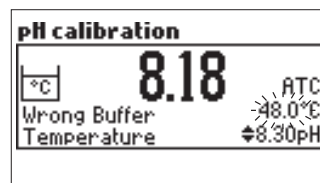
Note: • To clear a previous calibration and to return to the default value, press **Clear** at any time after entering calibration mode. If **Clear** is invoked during the first calibration point the instrument returns to the measurement mode.

• The **Clear** key is displayed only if a previous calibration exists.
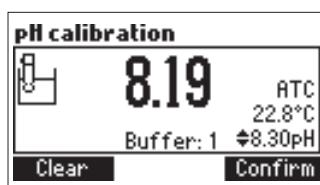
pH BUFFER TEMPERATURE DEPENDENCE

Temperature has an effect on pH. The calibration buffer solutions are affected by temperature changes to a lesser degree than normal solutions. During calibration, the instrument will automatically calibrate to the pH value corresponding to the measured or set temperature.

TEMP		pH BUFFERS			
°C	°F	4.01	6.00	8.30	10.01
0	32	4.01	6.12	8.48	10.32
5	41	4.00	6.09	8.44	10.24
10	50	4.00	6.06	8.41	10.18
15	59	4.00	6.04	8.37	10.12
20	68	4.00	6.02	8.33	10.06
25	77	4.01	6.00	8.30	10.01
30	86	4.02	5.99	8.27	9.96
35	95	4.03	5.98	8.24	9.92
40	104	4.04	5.97	8.21	9.88
45	113	4.05	5.97	8.18	9.85

During calibration the instrument will display the pH buffer value at 25 °C.

DOSING PUMP INSTALLATION

To install the dosing pump follow the procedure below:

• Extend the plunger on the 5 mL syringe to its maximum volume.

• Place the syringe in the dedicated spot on the top of the meter (1).

• Arrange the bottom of the syringe into the holder on the pump (2). Once the syringe is in place lower the barrel until it sits flush on the holder.

• Put the o-ring and syringe-fixing nut over the syringe (3) and turn clockwise to secure it in place (4).

• Place the valve on the top of the syringe (5). Ensure it fits securely.

• Insert the aspiration tube into the left side of the valve (6) and replace the titrant bottle cap with the attached cap (7).

• Insert the dispensing tube into the top of the valve (8).

Back side view
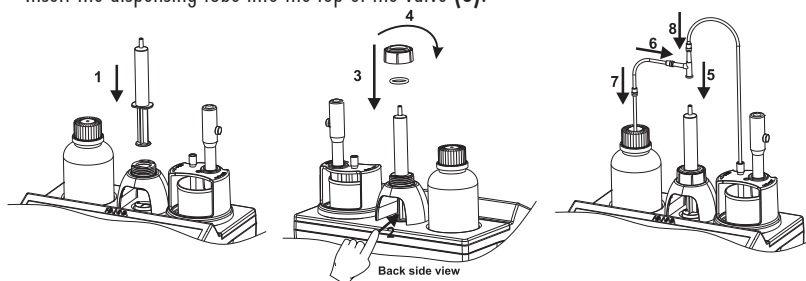
DOSING PUMP PRIME PROCEDURE

Prime cycle should be performed:

• if you notice there is no titrant in the tip

• whenever the dosing system tubes are replaced

• whenever a new bottle of titrant is used

• before starting a pump calibration

• before starting a series of titrations

The prime cycle is used to fill the syringe before starting a set of titrations.

Two rinse cycles of the syringe are shown in the figure below. The dispensing tube is connected to the top of the valve and the aspiration tube on the left side.

26
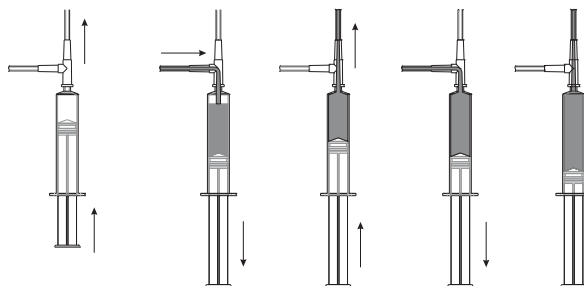
Note: • The aspiration tube must be inserted in the titrant bottle. The dosing tip must be placed over a rinse beaker.
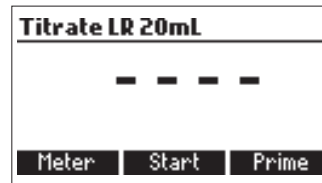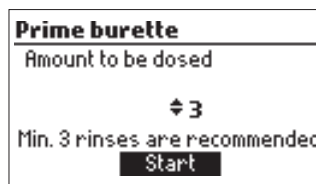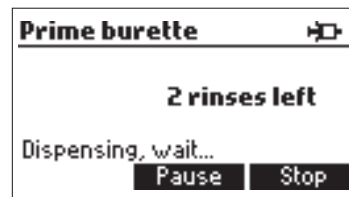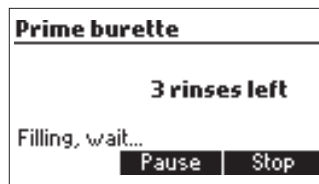
• Before starting the prime procedure, make sure you are using the appropriate titrant solution for the selected range.

```
Titrate LR 20mL

      -  -  -

Meter    Start    Prime
```

• To prime the burette, select **Prime** option from **Titration** mode.
• Adjust the rinses number by pressing the ▼ and ▲ keys and press **Start**.

```
Prime burette
 Amount to be dosed

        ⇕ 3
Min. 3 rinses are recommended
         Start
```

• The number of syringe rinses can be set between 1 and 5 (at least three rinses are recommended to ensure that the air bubbles are completely removed).

```
Prime burette

      3 rinses left

Filling, wait...
            Pause    Stop
```

```
Prime burette          ⊶⊏⊳

      2 rinses left

Dispensing, wait...
            Pause    Stop
```

• To pause the prime process press the **Pause** key; to continue press the **Continue** key. To stop the prime process press the **Stop** key.
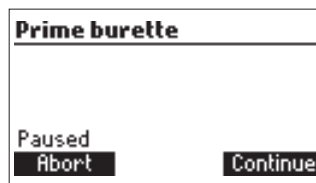
```
Prime burette



Paused
 Abort              Continue
```

Note: This error message appears when the pump is not working properly. Check the tubing, valve and syringe. Press **Restart** to try again.

```
Prime burette

      3 rinses left

Pump Error
         Restart
```

27
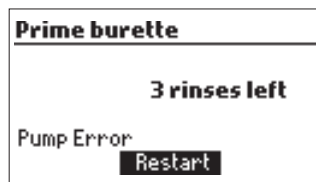
PUMP CALIBRATION PROCEDURE

The calibration of the pump must be performed every time the syringe, pump tubing, the titrant bottle or the pH electrode is changed. A pump calibration is recommended before each set of titrations, after the titrator is left idle for several hours, or once daily.

Note: A pump calibration needs to be done in the desired range and sample size. Pump calibration is independent of the sample type.
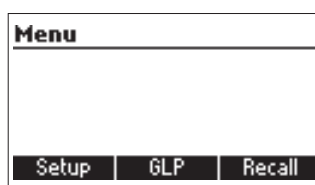
• Press **MENU**, select **Setup** and select the corresponding range according to the table below:

UNIT	Low Range 20 or 50	High Range 20
%l.a.	0.01 to 0.20	0.1 to 2.0
°SH	0.4 to 8.9	4.4 to 88.9
°D	1.0 to 20.0	10 to 200
°TH	1.1 to 22.2	11.1 to 222.2

```
Menu



  Setup  |  GLP  |  Recall
```

• Verify the electrode has been calibrated in 8.30 pH buffer.

• Ensure the pump is primed with the correct titrant for the selected range (**HI 84529-50** Low Range 20 Titrant or **HI 84529-52** Low Range 50 Titrant, **HI 84529-51** High Range 20 Titrant).
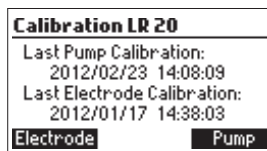
Sample preparation: Use a clean pipette add a precisely measured amount of **HI 84529-55 Calibration Standard** to a clean beaker as indicated below:

> Low Range 20 - 1 mL
> Low Range 50 - 2 mL
> High Range 20 - 10 mL
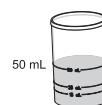
Note: Failure to use a clean pipette will result in erroneous readings.

• Fill the beaker up to the 50 mL mark with the distilled or deionized water.

• Press **CAL** key. The instrument displays the date and time of the last electrode calibration, and the last pump calibration for the selected range.

```
Calibration LR 20
Last Pump Calibration:
   2012/02/23 14:08:09
Last Electrode Calibration:
   2012/01/17 14:38:03
 Electrode            Pump
```

• Press **Pump** key.

Note: DO NOT PLACE THE TIP INTO THE CALIBRATION BEAKER, PLACE THE TIP OVER A WASTE BEAKER. A SMALL AMOUNT OF TITRANT IS DISPENSED WHEN THE PUMP RESETS.

```
Calibrate LR 20

  --  --  --  --

           Start  |  Prime
```

• Press **Start**, wait for the syringe to refill.

• Place the stir bar in the beaker and put the beaker in the minititrator top.
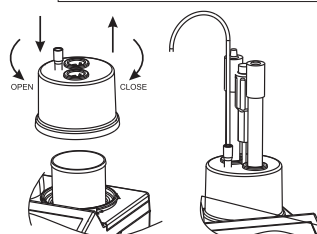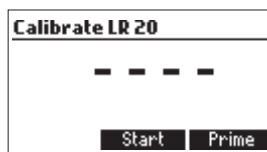
28

- Place the probe holder on the top of the beaker and secure it by turning clockwise.
- Rinse the pH electrode, reference electrode and temperature probe with deionized water and immerse them roughly 1.5 cm (0.6") into the sample. Be sure that the tip of the electrode is not hitting the stir bar. If necessary, additional distilled or deionized water can be added.
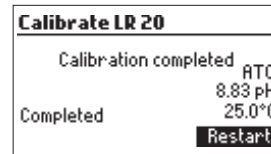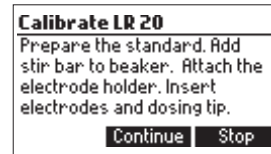
```
Calibrate LR 20
Prepare the standard. Add
stir bar to beaker. Attach the
electrode holder. Insert
electrodes and dosing tip.
    Continue    Stop
```

- Insert the dosing tip into the titrant tube sleeve. IT IS CRITICAL THAT THE TIP BE IMMERSED APPROXIMATELY 0.25 CM (0.1") INTO THE SOLUTION BEING TITRATED.
- Press **Continue** to begin the calibration and **Stop** to abort it.
- At the end of the calibration, "**Calibration Completed**" appears on display. To repeat the calibration press **Restart** or **ESC** to return to the main screen.

```
Calibrate LR 20
    Calibration completed
                       ATC
                    8.83 pH
Completed           25.0°C
                  Restart
```

Note: • If temperature probe is not connected, **Manual Temperature Compensation** is used and **MTC** appears on the right side of the screen. If **Automatic Temperature Compensation** is in use the **ATC** appears on the right side of the screen.

- If an erroneous situation is encountered during the calibration, an error message is displayed and the calibration can be restarted by pressing **Restart**. Prepare a new standard, rinse the electrode, temperature probe and dosing tip and try again.

```
Calibrate LR 20
        —  —  —  —   ATC
                    8.78 pH
Wrong standard!     24.9°C
                  Restart
```

- If the calibration doesn't complete and the max titrant volume of titrant is reached, an error message will be displayed. The calibration can be restarted by pressing **Restart.** Prepare a new standard, rinse electrode, temperature probe and dosing tip and try again.

```
Calibrate LR 20
        —  —  —  —   ATC
                    3.68 pH
Max vol. exceeded   24.9°C
                  Restart
```

- This error message appears when the pH reading exceeds the acceptable input limits ($-2.00 <$ pH > 16.00).

```
Calibrate LR 20
        —  —  —  —   ATC
                    6.0 pH
Wrong input         25.0°C
                  Restart
```

- This screen appears when the stirrer is not working properly. Check the stir bar and beaker content. Press **Restart** to try again.

```
Calibrate LR 20
        —  —  —  —   MTC
                    6.3 pH
Stirrer Error      ⇕25.0°C
                  Restart
```

- This error message appears when the pump is not working properly. Check the tubing, valve and syringe. Press **Restart** to try again.

```
Calibrate LR 20
        —  —  —  —   MTC
                    6.3 pH
Pump Error         ⇕25.0°C
                  Restart
```
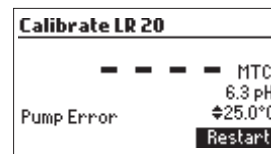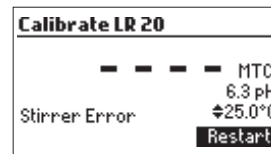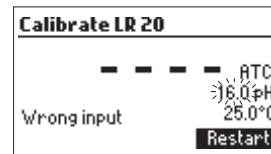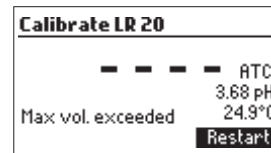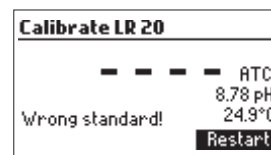
TITRATION PROCEDURE

Note: Verify that the instrument has been calibrated (pH and pump) before performing any titrations.

- Refer to "Setup Menu" (see page 12) to set up the instrument for your measurement.
- Select the corresponding measurement range: Low 20, Low 50 or High 20.
- Select the corresponding titration type: by volume or by mass.
- Ensure the pump is primed with the correct titrant for the selected range (**HI 84529-50** Low Range 20 Titrant or **HI 84529-51** High Range 20 Titrant or **HI 84529-52** Low Range 50 Titrant).

UNIT	Low Range 20 Low Range 50	High Range 50
%l.a.	0.01 to 0.20	0.1 to 2.0
°SH	0.4 to 8.9	4.4 to 88.9
°D	1.0 to 20.0	10 to 200
°TH	1.1 to 22.2	11.1 to 222.2
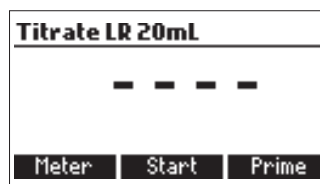
By **Mass**:

- Place a clean 100 mL plastic beaker on an analytical balance. Zero the balance.
- Add 20 ± 1 g (Low 20, High 20) or 50 ± 1 g (Low 50) to the beaker.
- Record the reading once it has stabilized.
- Remove the beaker from the balance.

By **Volume**:

- Volumetrically add 20 mL(Low 20, High 20) or 50 mL (Low 50) to a clean 100mL plastic beaker.
  Note: Failure to use a clean pipette will result in erroneous readings.
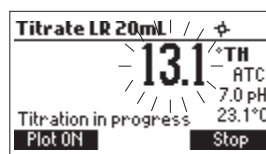
Note: DO NOT PLACE THE TIP INTO THE SAMPLE BEAKER. PLACE THE TIP OVER A WASTE BEAKER. A SMALL AMOUNT OF TITRANT IS DISPENSED WHEN THE PUMP RESETS.

- Press **Start** to begin a titration.

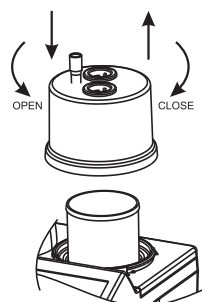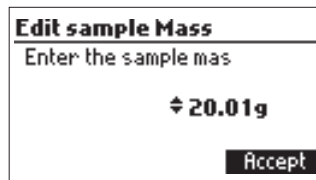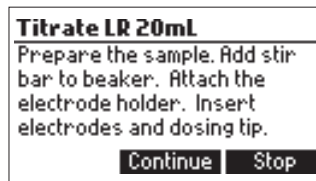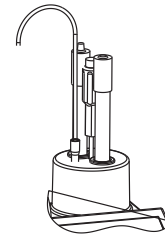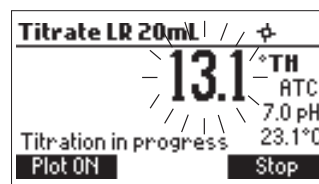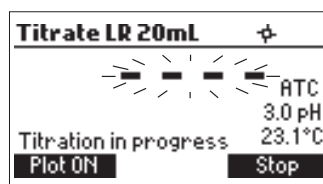- For samples by mass the "Edit Sample Mass" screen will be displayed. Use the **ARROW** keys to enter the exact sample mass then press **Accept**.

```
Edit sample Mass
 Enter the sample mas

        ⇕ 20.01g

                    Accept
```

- For 20 g and 20 mL samples add deionized or distilled water to the 60 mL mark.
- Place the stir bar in the beaker and put the beaker in the minititrator top.
- Place the probe holder on the top of the beaker and secure it by turning clockwise.
- Rinse the pH electrode, reference electrode and temperature probe with deionized water and immerse it roughly 1.5 cm (0.6") into the sample. Be sure that the tip of the electrode is not hitting the stir bar.
- Insert the dosing tip into the titrant tube sleeve. IT IS CRITICAL THAT THE TIP BE IMMERSED APPROXIMATELY 0.25 CM (0.1") INTO THE SOLUTION BEING TITRATED.

```
Titrate LR 20mL
 Prepare the sample. Add stir
 bar to beaker. Attach the
 electrode holder. Insert
 electrodes and dosing tip.
        Continue   Stop
```

- Press **Continue** to begin the titration and **Stop** to abort it.
- The instrument will continuously update the concentration on the display. The value will be displayed blinking. When the reading is under range "----" symbol appears blinking.

```
Titrate LR 20mL      ✛
    - - - -       ATC
                  3.0 pH
 Titration in progress  23.1°C
 Plot ON              Stop
```

```
Titrate LR 20mL      ✛
     13.1 °TH
                  ATC
                  7.0 pH
 Titration in progress  23.1°C
 Plot ON              Stop
```

- The titration curve can be visualized during a titration by pressing **Plot ON**. Press **Plot OFF** or **ESC** to exit this mode.

```
                          23.6°C
        13.1°TH
 Plot OFF   7.70 pH    Stop
```
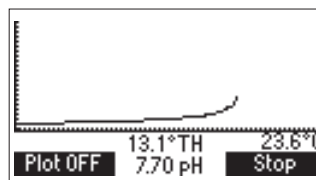
- At the end of the titration, the concentration is displayed in the selected unit. The titration curve can be viewed by pressing **Plot ON**. Press **Plot OFF** or **ESC** to exit this mode.
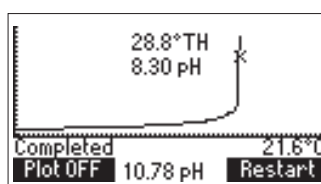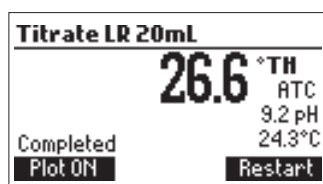
- Press **LOG** to record the concentration value and the titration curve into the instrument's memory. A message will be displayed for a few seconds indicating the amount of free log space. Up to 200 log samples can be recorded in the instrument's memory.

- Press **Restart** to begin a new titration or **ESC** to return to the titration menu.
- If the concentration exceeds the range limits (>0.01 %l.a. for **Low Range**, >2.0 %l.a. for **High Range**), the exceeded range limit will be displayed blinking. Another titration can be started by pressing **Restart**.
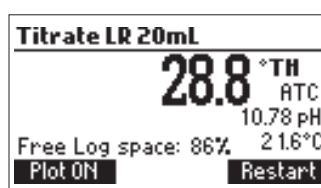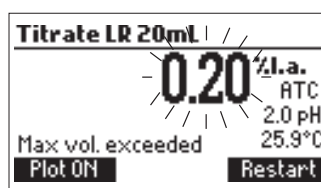

- "**Wrong input**" error message appears when the input reading (pH, temperature) exceeds the specified limits. The pH or temperature value and the concentration will blink indicating an error.
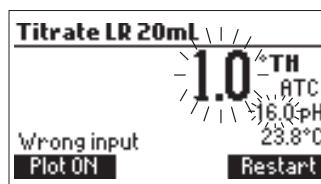
- This screen appears when the stirrer is not working properly. Check the stir bar and beaker content. Press **Restart** to try again.
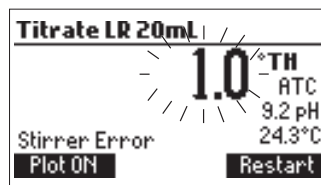
- This error message appears when the pump is not working properly. Check the tubing, valve and syringe. Press **Restart** to try again.
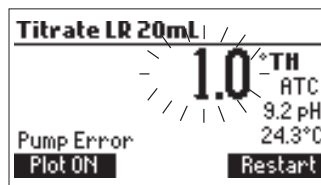
<u>TIPS FOR AN ACCURATE MEASUREMENT</u>

The instructions listed below should be followed carefully to ensure measurements are conducted with the highest possible accuracy and precision.

- IT IS CRITICAL THAT THE TIP BE IMMERSED IN THE SOLUTION BEING TITRATED (APPROXIMATELY 0.25 CM).
- Calibrate the pump prior to each series of titrations.
- Calibrate the pump if the meter is left idle for several hours.
- Analyze the sample immediately after it is obtained.
- Clean the electrode with **HI 70640** cleaning solutions specially designed for milk industry.

VIEW/DELETE TITRATOR RECORDED DATA

Press **MENU** then **Recall** to access the **Titrator** logs.
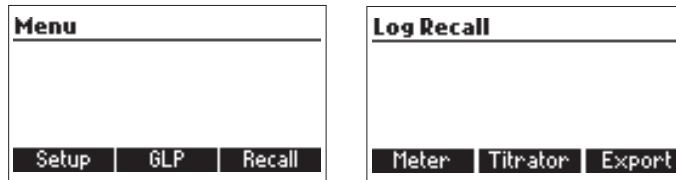
When an external USB storage device is connected, the **Export** key is displayed. It saves the meter and titrator logs in two text format files on the storage device.

Press **Meter** or **Titrator** to view the respective logs.

The instrument will display a list of all the records stored in the log.

Use the **ARROW** keys to scroll the stored records list.

If the saved concentration was out of range, the "<" or ">" symbols are displayed in front of the reading.

Press **Delete** to delete the selected record from the memory.

Press **Del.All** to delete all records.

Press **Info** to see detailed information about the highlighted record.

The selected record data and the titration curve data file name are displayed.

33

When a USB storage device is connected, the **Export** key is displayed. It saves the titration curve data as a text file on the storage device using the displayed file name.

Use the **ARROW** keys when ‡ is displayed to scroll between the log records.

Press **ESC** to return to the previous screen.

```
Record number: 2
2012/05/22          03:36:31 PM
9.8°TH                  25.0°C

6839859.txt file
   Plot        ‡
```
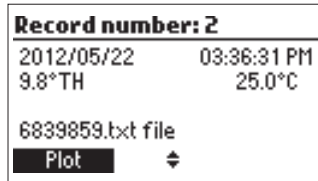
Press **Plot** to visualize the titration curve or **ESC** to return to the previous screen. On the titration curve, the end point volume and pH are displayed. The titration data (Total Titrant Volume on the x-axis and pH on the y-axis) can be scanned through with the dotted line by using the **ARROW** keys.

```
2012/05/17 11:34:32
               2.651mL
               3.39pH

28.8°TH  21.6°C    ‡   Zoom
```
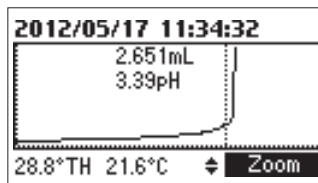
To zoom on the titration curve press **Zoom**.

If **Delete** or **Del.All** is pressed the instrument will ask for confirmation.

```
Delete Titrator log

Do you want to perform
the current operation?

  Yes       No
```

```
Delete Titrator logs

Do you want to perform
the current operation?

  Yes       No
```

Press **Yes** to delete the record or **No** to return to the previous screen.

Deleting a single record will renumber the list of records.

If the titrator log is empty, the message "**No records available!**" will be displayed.

```
Titrator

   No records available!
```

TITRATOR GLP INFORMATION

Press **MENU** then **GLP**.

```
Menu
─────────────────────────
│                         │
│                         │
│                         │
│  Setup  │  GLP  │ Recall │
```

From this screen it is possible to select the **Electrode** or the **Pump GLP**.

```
GLP
─────────────────────────
  Last Pump Calibration:
     2012/01/26 15:51:33
  Last Electrode Calibration:
     2012/02/21 11:25:01
 Electrode   Pump
```

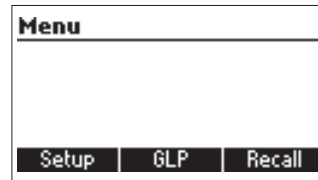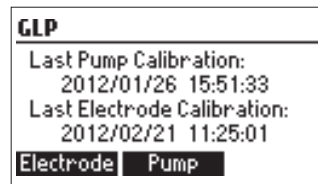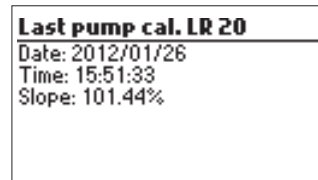Press **Pump** to view the **pump's last calibration** time, date and slope for the selected range.

```
Last pump cal. LR 20
─────────────────────────
Date: 2012/01/26
Time: 15:51:33
Slope: 101.44%
```

If a calibration hasn't been performed, the message "**Not Calibrated**" will be displayed.

```
Last pump cal. LR 20
─────────────────────────


     Not Calibrated
```
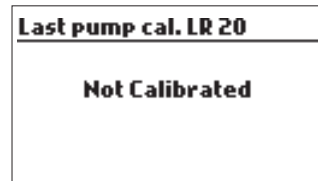
pH MEASUREMENT

The **HI 84529** can be used as a pH meter for direct measurements.

Verify that the instrument has been calibrated before taking pH measurements. Set the instrument to **pH meter**. From titrator mode press **Meter** until pH units are displayed.

If an electrode calibration hasn't been performed, or the number of days exceeds the calibration time out value set, the message "**CAL DUE**" will blink on the left side of the display (see **Calibration timeout** option in **Setup** for details).

If **CAL DUE** is displayed perform an electrode calibration.

Press **MENU** to access the instrument's menu.

Press **HELP** to view the contextual help, whenever you need additional information.

```
11:10:25   pH meter
─────────────────────────
CAL            8.2  pH
DUE                 ATC
                 22.8°C
 Titrator           mV
```

Press **STIR** to start/stop the stirrer.

Press **Titrator** to enter titration mode.

Press **CAL** to access the calibration menu.

Press **LOG** to save the current reading. A message indicating the free log space will be displayed for a few seconds.

```
11:17:23    pH meter
ΗCond
Ꮎ100%     5.34  pH
                  MTC
                 ⇕25.0°C:
Free Log space: 86%
 Titrator            mV
```
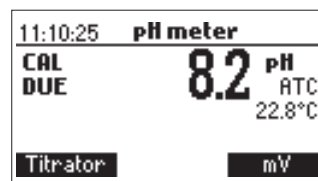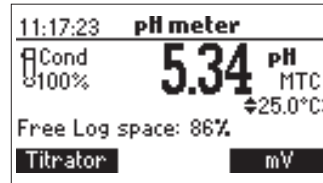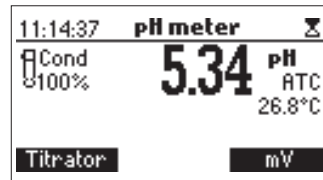
In order to take pH measurements, follow the next steps:

• Submerge the tip of the electrode (4 cm/1 1/2'') and the temperature probe into the sample to be tested and stir gently. Allow time for the electrode to stabilize. When the reading becomes stable, the ⌛ (unstable measurement) symbol will disappear.

```
11:14:37    pH meter      ⌛
ΗCond
Ꮎ100%     5.34  pH
                  ATC
                 26.8°C
 Titrator            mV
```

• If the pH reading is less than -2.00 pH or greater than 16.00 pH, the closest full-scale value will be displayed blinking.

```
11:14:37    pH meter
ΗCond
Ꮎ100%    16.00 pH
                  ATC
                 26.8°C
 Titrator            mV
```
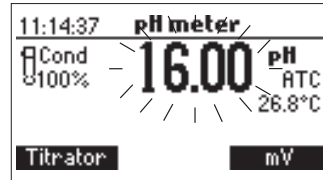
If measurements are taken successively in different samples, it is recommended to rinse the electrodes thoroughly with deionized or distilled water and then with some of the next sample to prevent cross-contamination.

The pH reading is affected by temperature. In order to have accurate pH measurements, the temperature effect must be compensated for. To use the Automatic Temperature Compensation (**ATC**) feature, connect and submerge the **HI 7662-M** temperature probe into the sample as close as possible to the electrode and wait for a few seconds. The "**ATC**" message will be shown on the display. Automatic Temperature Compensation will provide pH corrected values for the measured temperature. If Manual Temperature Compensation (**MTC**) is desired, the temperature probe must be disconnected from the instrument.

The default temperature of 25 °C (77 °F) or the last temperature reading will be displayed, preceded by the symbol ⇕ and the "**MTC**" message.

The temperature can be adjusted with the **ARROW** keys (from -20.0 to 120.0 °C).

VIEW/DELETE RECORDED pH DATA

Press **MENU** key while in pH meter screen then **Recall** to access the meter logs.
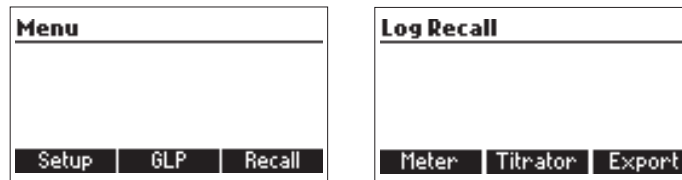
When an external USB storage device is connected, the **Export** key is displayed. It saves the meter and titrator logs in two text format files on the storage device.

Press **Meter** or **Titrator** to view the respective logs.

A list of records is stored in the pH log.

If the saved mV/pH measurements are out of range, the "<" or ">" symbols are displayed in front of the reading.

Use the **ARROW** keys to scroll the list of records.

Press **Delete** to delete the selected record.

Press **Del.All** to delete all the records.

Press **Info** to see detailed information about highlighted record.

Use **ARROW** keys when ⬍ is displayed to scroll between the records.

Press **ESC** to return to the previous screen.

If **Delete** or **Del.All** is pressed the instrument will ask for confirmation.
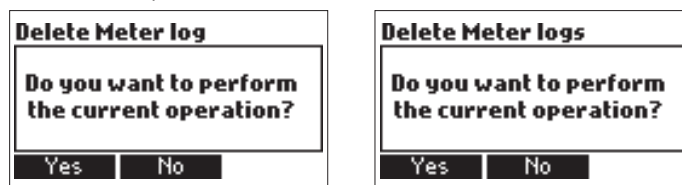
Press **Yes** to delete the record or **No** to return to the previous screen without deleting.

Deleting a single record will renumber the list of records.

If the pH log is empty, the message "**No records available!**" will be displayed.

```
Measure

     No records available!

```
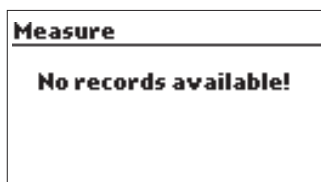
pH METER GLP INFORMATION

The pH meter GLP screen displays the pH calibration data.

To view this information press **MENU** key while in pH meter mode then **GLP**.

Press **Electrode** to view information regarding electrode calibration.

```
Last Electrode Calibration
Date: 2012/05/22        8.30
Time: 16:15:03          6.00
Cal Expire: Disabled    4.01
Offset: -0.9mV
Slope: 100.0%
Electrode Condition: 100%
```
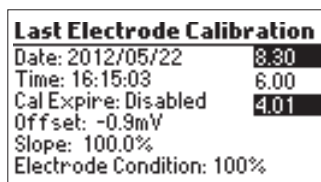
The following items are included in electrode GLP: the time and date of the last calibration, offset, slope, electrode condition, calibration timeout and the calibration buffers. The buffers displayed in video inverse mode are from the previous calibration.

If a calibration hasn't been performed, the message "**Not Calibrated**" will be displayed.

```
Last Electrode Calibration

       Not Calibrated

```
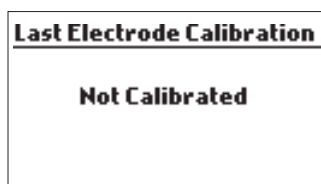
PC INTERFACE AND DATA TRANSFER

Data stored on the meter with the **LOG** function during pH/mV measurement and titrations can be transferred from the meter to a **USB stick** using the **Export** function from the log recall menu. Two text files are transferred on the USB stick. These files can be used for further analysis on a PC.

The logged data can also be transferred from the instrument to the PC using a USB cable. Connect the USB cable and the following screen will be displayed.

```
Generate log text files

   Select the logging data to be
   converted in text file

 Meter  | Titrator |  Plot
```
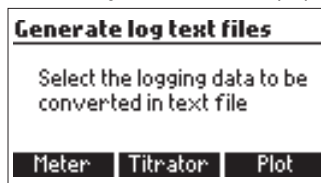
Press **Meter** to generate the text file with Meter log data.
Press **Titrator** to generate the text file with Titrator log data.
Press **Plot** to generate the text files with Titration Plots.
The generated files are now visible and can be used for further analysis.
If the instrument has no logged Meter or Titrator records, the PC connected screen is displayed.

PC connected...
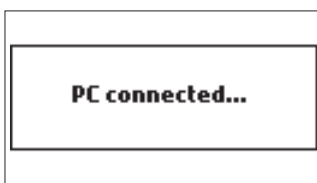
TROUBLESHOOTING GUIDE

SYMPTOMS	PROBLEM	SOLUTION
Slow response/excessive drift.	Dirty pH or reference electrode.	Soak the electrode tip **HI 70640** solution for 30 minutes and follow the cleaning procedure. Refill reference electrode with new fill solution.
Reading fluctuates up and down (noise).	Clogged/dirty junction. Low electrolyte level (reference electrode). Cable connection.	Clean the pH electrode. Refill reference electrode with fresh fill solution. Check cable connection to meter and verify protective cap is off.
While in pH reading mode, -2.00 or 16.00 pH is displayed blinking.	Reading out of range.	Check cable connection to meter and verify protective cap is off. Check the quality of the sample. Clean the electrodes. Refill with fresh fill solution.
The meter does not accept the pH buffer solution for calibration.	Broken pH or reference electrode.	Follow the electrode cleaning procedure. If the error persists replace the electrode or contact the vendor.
The pump calibration can't be performed.	Broken pump tubing. Wrong or contaminated pump calibration solution. Broken pH electrodes.	Verify tubing, valve, syringe are intact and solution passes when pump is primed and no air bubbles are present. Check the pump calibration solution. Verify electrodes are calibrated. Prepare another standard, prime the pump and restart the calibration.

SYMPTOMS	PROBLEM	SOLUTION
The temperature probe is connected, but the meter displays "**MTC**".	Broken temperature probe.	Replace temperature probe.
After a titration the following is displayed blinking: Low Range: 0.20 %l.a., 8.9 °SH, 20.0 °D or 22.2 °TH. High Range: 0.1 %l.a., 4.4 °SH, 10 °D or 11.1 °TH.	Broken electrode. Instrument not calibrated. Wrong sample. Concentration out of range.	Check/clean the electrodes. Recalibrate the instrument (pump and pH). Use care during sample preparation. Check sample size and permitted range.
At startup, the meter displays the HANNA logo permanently.	One of the keys is stuck.	Check the keyboard or contact the vendor.
"**Error xx**" message is displayed.	Internal error.	Power off the meter and then power it on again. If the error persists, contact the vendor.
"**Stirrer error**" message is displayed at the end of pump calibration or titration.	Check the stir bar and beaker content.	If the error persists, contact the vendor.
Non-spinning stirrer icon blinking in pH calibration and meter mode.	Check the stir bar and beaker content.	If the error persists, contact the vendor.
"**Pump error**" message is displayed.	Check the tubing, valve and syringe.	If the error persists, contact the vendor.
At startup the meter displays "**Methods corrupted**".	The method file was corrupted.	Contact the vendor.

ELECTRODE CONDITIONING AND MAINTENANCE

STORAGE PROCEDURE

To assure a quick response time, the glass bulb should be kept moist and not allowed to dry out. Replace the solution in the protective cap with a few drops of **HI 70300** or **HI 80300** Storage Solution. The **HI 5313** Reference may be stored with its black cap and Fill hole covered. Rinse and refill before using. Follow the Preparation Procedure on page 20 before taking measurements.

Note: NEVER STORE THE pH ELECTRODE IN DISTILLED OR DEIONIZED WATER.

PERIODIC MAINTENANCE

Inspect the electrodes and the cables. The cable used for connection to the instrument must be intact and there must be no points of broken insulation on the cable or cracks on the electrode stem or bulb. Connectors must be perfectly clean and dry. If any scratches or cracks are present, replace the electrode. Rinse off any salt deposits with distilled/deionized water.

pH CLEANING PROCEDURE

- *General*   Soak in Hanna **HI 7061** or **HI 8061** General Cleaning Solution for approximately ½ hour.
- *Milk deposits*   Soak in Hanna **HI 70640** Cleaning Solution for milk deposits for approximately ½ hour (pH half cell only).
- *Protein*   Soak in Hanna **HI 7073** or **HI 8073** Protein Cleaning Solution for 15 minutes.

IMPORTANT: After performing any of the cleaning procedures, rinse the electrode thoroughly with distilled or deionized water and soak the electrode in **HI 70300** or **HI 80300** Storage Solution for at least 1 hour before taking measurements.

REFERENCE ELECTRODE CLEANING

- Drain the old fill solution, rinse with a few drops of **HI 7072** solution, drain, then refill with **HI 7072** solution.
- Do not use an electrode if crystallized salts are visible inside the electrode. Drain electrode, disassemble and rinse internal body with deionized water. Reassemble and refill with fresh fill solution.
- The internal chamber of this electrode is gell filled. If the electrode has been left dry for long periods of time the gel may be dehydrated and stable measurements may not be obtainable. Disassemble electrode and soak internal assembly in **HI 7072** fill solution. Verify the ceramic is wetted by the fill solution. Warming the solution slightly (50 °C) before soaking will hasten this process. Permit the electrode to cool completely while immersed in this solution.

41

ACCESSORIES

REAGENTS

HI 84529-50	Titrant solution for Low Range 20 (120 ml)
HI 84529-51	Titrant solution for High Range 20 (120 ml)
HI 84529-52	Titrant solution for Low Range 50 (120 ml)
HI 84529-55	Pump Calibration Standard (230 mL)

pH CALIBRATION SOLUTIONS

HI 7004M	Buffer solution pH 4.01 (230 mL)
HI 70060M	Buffer solution pH 6.00 (230 mL)
HI 70083M	Buffer solution pH 8.30 (230 mL)
HI 7010M	Buffer solution pH 10.01 (230 mL)

ELECTRODES

FC 260B	pH electrode
HI 5315	Reference electrode
HI 7662-M	Temperature probe

ELECTRODE FILL SOLUTION

HI 7072	Reference electrode fill solution (4 x 30 mL)

ELECTRODE STORAGE SOLUTION

HI 70300L	Storage Solution, 500 mL bottle

CLEANING SOLUTIONS

HI 70640L	Cleaning solution for remaining milk deposits (500 mL)
HI 70641L	Cleaning and disinfecting for dairy products (500 mL)
HI 70642L	Cleaning solution for remaining cheese deposits (500 mL)
HI 7077L	Electrode cleaning solution for oils (500 mL)

OTHER ACCESSORIES

HI 70500	Tube set with cap for titrant bottle, tip and valve
HI 71005/8	115 Vac to 12 Vdc, 800 mA
HI 71006/8	230 Vac to 12 Vdc, 800 mA
HI 731319	Stir bar (10 pcs., 25 x 7 mm)
HI 740036P	100 mL plastic beaker (10 pcs.)
HI 740037P	20 mL plastic beaker (10 pcs.)
HI 740236	5 mL Syringe for minititrator
HI 920013	PC Connection Cable

WARRANTY

HI 84529 is guaranteed for two years against defects in workmanship and materials when used for it's intended purpose and maintained according to instructions. Electrodes and probes are guaranteed for six months. This warranty is limited to repair or replacement free of charge.

Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered. If service is required, contact your dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the problem. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Technical Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packed for complete protection. To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

RECOMMENDATION FOR USERS

Before using this product, make sure that it is entirely suitable for your specific application and for the environment in which it is used.

Operation of this instrument may cause unacceptable interferences to other electronic equipment, thus requiring the operator to take all necessary steps to correct interferences.

Any variation introduced by the user to the supplied equipment may degrade the instrument's EMC performance.

To avoid damages or burns, do not put the instrument in microwave ovens. For your and the instrument's safety, do not use or store the instrument in hazardous environments.

HANNA®
instruments