



POCKET COLORIMETER™ II  
ANALYSIS SYSTEMS  
INSTRUCTION MANUAL

Free Ammonia  
Monochloramine

## **Important Note**

**This manual is intended for use with the following Pocket Colorimeter™ II instrument:**

Free Ammonia/Monochloramine      Cat. No. 59530-26

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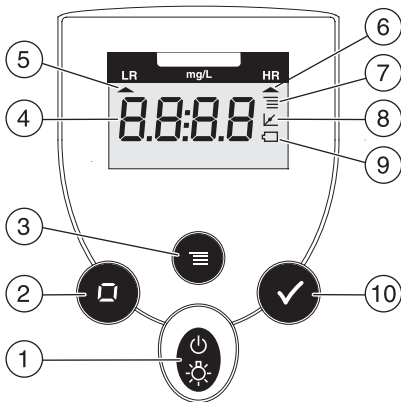
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# Instrument Keys and Display



Item	Description
1	<b>POWER/BACKLIGHT</b> Key
2	<b>ZERO/SCROLL</b> Key
3	<b>MENU</b> Key
4	Numeric Display
5	Range Indicator
6	Range Indicator
7	Menu Indicator
8	Calibration Adjusted Indicator
9	Battery Low Indicator
10	<b>READ/ENTER</b> Key

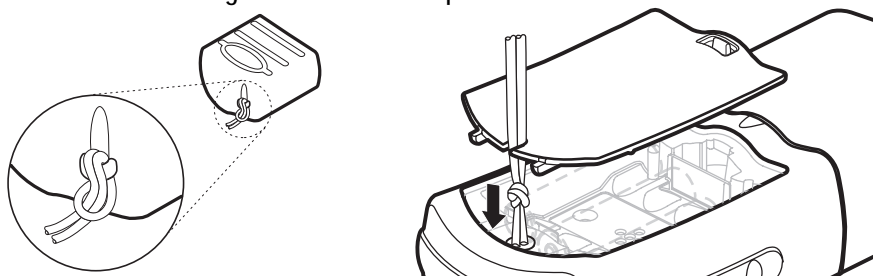
# Instrument Cap Cord

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The instrument cap for the Pocket Colorimeter™ II doubles as a light shield. Accurate measurements cannot be obtained unless the sample or blank is covered with the cap. Use the instrument cap cord to secure the cap to the body of the colorimeter and prevent loss of the cap. See [Figure 1 on page 1–7](#).

1. Loop the instrument cap cord through the ring on the cap.
2. Remove the battery compartment cover. Press the knotted end of the cord into the hole indicated by the arrow.
3. Slide the cord into the slot on the battery compartment cover. Snap the cover into place.

Figure 1      Attaching the Instrument Cap Cord







# Nitrogen, Free Ammonia and Chloramine (Mono)

(0.04–4.50 mg/L  $\text{Cl}_2$  and 0.02–0.50 mg/L  $\text{NH}_3\text{-N}$ )

Indophenol Method\*

Method 10200

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*Scope and Application: For finished chloraminated drinking water*

## Measuring Hints

- Collect samples in clean glass bottles. Results are most reliable from samples analyzed as soon as possible after collection.
- This method is intended for finished, chloraminated drinking water samples that have a measurable combined (total) chlorine disinfectant residual. Samples where the disinfectant residual has disappeared and exhibit a chlorine demand may produce low ammonia test results. Blanks and ammonia standards analyzed without a disinfectant residual must be prepared using high quality, reagent grade water.
- For more accurate chloramine results, determine a reagent blank for each new lot of reagent using deionized water in place of the sample. Subtract the reagent blank value from the final chloramine results.

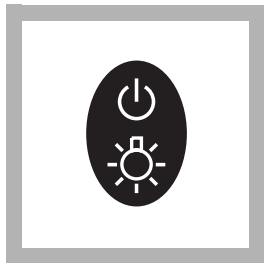
**Note:** *The Pocket Colorimeter™ II is designed to measure solutions contained in sample cells. DO NOT dip the meter in the sample or pour the sample directly into the cell holder.*

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\* U.S. Patent 6,315,950

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

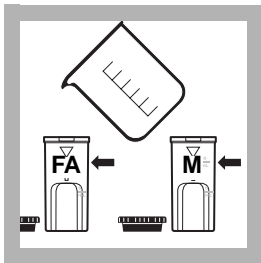
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1. Press the **POWER** key to turn the meter on.

The arrow should indicate the monochloramine channel ( $\text{Cl}_2$ ).

**Note:** See page 2–4 for information on selecting the correct channel.



2. Fill two cells with 10 mL of sample.

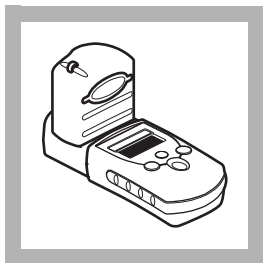
Label one cell "Free Ammonia" and one cell "Monochloramine".



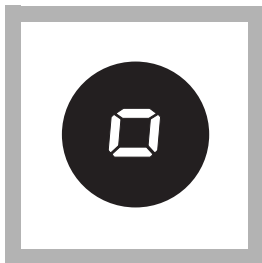
3. Place the cell for Monochloramine measurement into the cell holder.

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

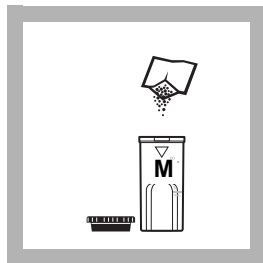
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4. Cover the cell with the instrument cap.



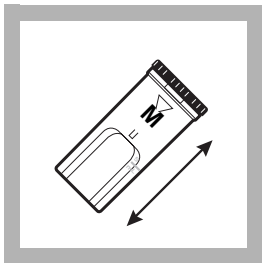
5. Press **ZERO/SCROLL**.  
The display will show  
"- - - -" then "0.00".  
Remove the cell from the  
cell holder.



6. Add the contents of one  
pillow of Monochlor F to  
the cell for Monochloramine  
measurement.

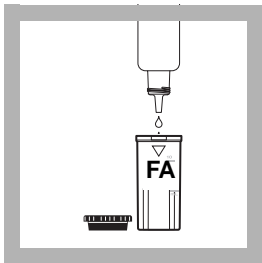
## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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**7.** Cap the cell and shake for 20 seconds to dissolve the reagent.

A green color will form if monochloramine is present.



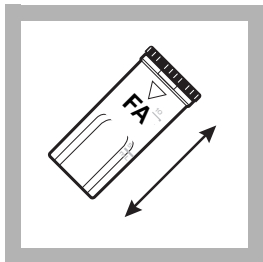
**8.** Add one drop of Free Ammonia Reagent Solution to the cell for Free Ammonia measurement.



**9.** Cap the reagent bottle to maintain reagent performance and stability.

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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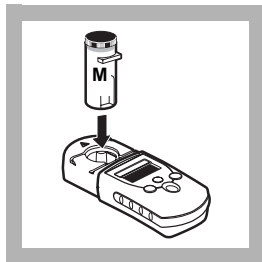
10. Cap the cell and mix.

**Note:** *If the sample becomes cloudy by the end of the reaction period, pretreat the sample and retest. See [Interferences on page 1–18](#).*



11. Wait five minutes.

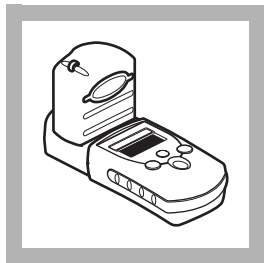
**Note:** *Color development time is dependent on sample temperature. See [Table 1](#) on [page 20](#) for correct times.*



12. Place the prepared Monochloramine sample into the cell holder.

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

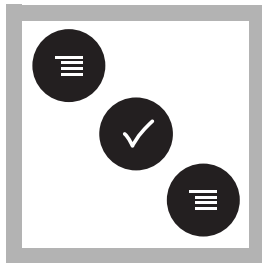
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**13.** Cover the cell with the instrument cap.



**14.** Press **READ/ENTER**.  
The results are displayed in mg/L Monochloramine (as  $\text{Cl}_2$ ).  
Leave the cell in the meter.



**15.** Change the channel.  
The arrow will indicate the free ammonia channel ( $\text{NH}_3\text{-N}$ ).

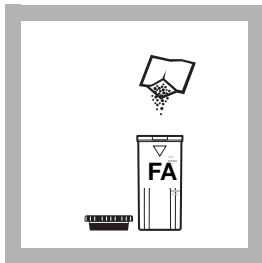
## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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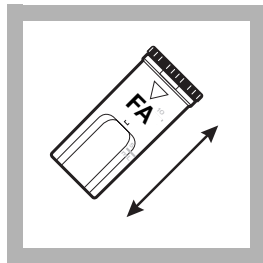
**16.** With the Monochloramine sample still in the cell holder, press **ZERO/SCROLL**. The display will show 0.00.

Remove the sample cell from the meter.



**17.** Add the contents of one pillow of Monochlor F to the cell for Free Ammonia measurement.

**Note:** *The reaction period indicated in step 11 on page 13 must be completed before the addition of Monochlor F to the cell for free ammonia measurement*



**18.** Cap and shake for 20 seconds to dissolve the reagent.

A green color will form if ammonia or monochloramine is present.

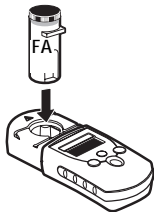
## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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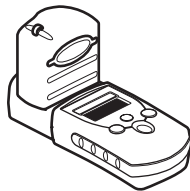


**19.** Wait 5 minutes.

**Note:** *Color development depends on sample temperature. See [Table 1 on page 1–20](#) for correct times.*



**20.** Place the prepared Free Ammonia sample into the cell holder.



**21.** Cover the cell with the instrument cover.

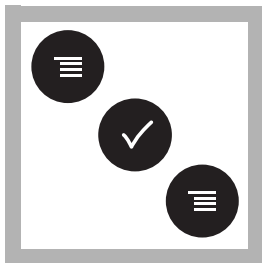


## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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**22.** Press **READ/ENTER**.  
The results are displayed in  
mg/L free ammonia as  
nitrogen ( $\text{NH}_3\text{-N}$ )



**23.** Return the meter to the  
chlorine channel for the  
next measurement.

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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### Interferences

The following do not interfere in free ammonia determination when at or below the stated concentration.

Substance	Level Tested
Aluminum	0.2 mg/L Al
Chloride	1200 mg/L Cl
Copper	1 mg/L Cu
Iron	0.3 mg/L Fe
Manganese	0.05 mg/L Mn
Nitrate	10 mg/L NO <sub>3</sub> -N
Nitrite	1 mg/L NO <sub>2</sub> -N
Phosphate	2 mg/L -PO <sub>4</sub>
Silica	100 mg/L SiO <sub>2</sub>
Sulfate	1600 ppm as CaCO <sub>3</sub>
Zinc	5 ppm Zn

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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Samples containing high levels of both Total Hardness and Alkalinity may become cloudy after the addition of the Free Ammonia Reagent Solution. If this occurs by the end of the first reaction period, the sample for Free Ammonia measurement must be pretreated as follows:

**Note:** *The sample for Monochloramine measurement does not need pretreatment.*

1. Measure 10 mL of sample into the cell for Free Ammonia measurement.
2. Add the contents of one Hardness Treatment Reagent Powder Pillow (Cat. No. 28823-46) to the sample.
3. Cap the cell and invert until the reagent is dissolved.
4. Remove the cap.
5. Continue with the analysis at step 2 using the pretreated sample as the Free Ammonia cell.

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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### Color Development Time

Test results are strongly influenced by sample temperature. **Both reaction periods in the procedure are the same and depend on the temperature of the sample.** The reaction periods indicated in the procedure are for a sample temperature of 18-20 °C (64-68 °F). Adjust both reaction periods according to Table 1.

Table 1 Reaction Period

Sample Temperature		Reaction Period (Minutes)
°C	°F	
5	41	10
7	45	9
9	48	8
10	50	8
12	54	7
14	57	7
16	61	6

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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Table 1 Reaction Period (Continued)

Sample Temperature		Reaction Period (Minutes)
°C	°F	
18	64	5
20	68	5
23	73	2½
25	77	2
> 25	> 77	2

### Accuracy Check (Monochloramine Test)

#### Standard Solutions Method

Standard solutions for monochloramine are difficult and time-consuming to prepare. Errors can occur if attention to detail is not addressed during preparation of the standards. Hach Company prepares the calibration curve under rigorous analytical laboratory conditions. Hach recommends using the factory calibration.

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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A user calibration or a user-prepared monochloramine standard may be required by a regulatory official or agency. Two options are available on the Pocket Colorimeter™ II to meet this requirement.

A monochloramine standard may be prepared and used to validate the calibration curve using the Standard Calibration Adjust feature (see page 2–13 for more information.) In addition, a user-generated calibration curve can be made and programmed into the Pocket Colorimeter™ II. See [Calibration Procedure Using Prepared Standards on page 2–17](#) for more information about preparing a full calibration curve.

### Standard Solution Preparation

1. Prepare the following monochloramine standard fresh before use.
2. Add the contents of one pillow Buffer Powder, pH 8.3 to about 50-mL of Organic Free Water in a clean 100-mL Class A volumetric flask. Swirl to dissolve the powder.
3. Using a Class A volumetric pipet, transfer 2.00 mL of Ammonia Nitrogen Standard Solution, 100 mg/L as  $\text{NH}_3\text{-N}$  into the flask.
4. Dilute to volume with Organic Free Water, cap and mix thoroughly. This is a 2.00 mg/L buffered ammonia standard.

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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5. Pipet 50.00 mL of the buffered ammonia standard into a clean 100-mL beaker with a stir bar.
6. Obtain a recent lot of Chlorine Solution Ampules, 50–75 mg/L, and note the actual Free Chlorine concentration for this lot.
7. Calculate the amount of Chlorine Solution to be added to the ammonia standard using the following equation:

$$\text{mL chlorine solution required} = \frac{455}{\text{free chlorine concentration}}$$

8. Open an ampule and use a glass Mohr pipet to add the calculated amount of Chlorine Solution slowly to the ammonia standard, while mixing at medium speed on a stir-plate.
9. Allow the monochloramine solution to mix for 1 minute after all the Chlorine Solution is added.
10. Quantitatively transfer the monochloramine solution to a clean 100-mL Class A volumetric flask. Dilute to the mark with Organic Free Water, cap, and mix thoroughly. This is a nominal 4.5 mg/L (as Cl<sub>2</sub>) monochloramine standard. Use this standard within 1 hour of preparation.

*Important Note: Because of the strong buffer used in the preparation of this standard, it cannot be used for accuracy verification of the Free Ammonia test.*

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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### Accuracy Check (Free Ammonia Test)

Dilution water is required when testing a diluted sample and preparing standard solutions. Dilution water must be free of ammonia, chlorine and chlorine demand. A convenient source is a recirculating, deionizer system with carbon filtration which produces 18 megaohm-cm water.

### Standard Additions Method

1. Measure 50 mL of sample into three 50-mL mixing cylinders.
2. Use the TenSette Pipet to add 0.3, 0.6, and 1.0 mL of Ammonium Nitrogen Standard, 10 mg/L as  $\text{NH}_3\text{-N}$  to the three samples. Mix well.
3. Analyze each spiked sample, following all steps of the Free Ammonia/Monochloramine procedure. The ammonia nitrogen concentration should increase 0.02 mg/L for each 0.1 mL of standard added.

### Standard Solution Method

Prepare a 0.20 mg/L ammonia nitrogen standard by diluting 2.00 mL of the Ammonia Nitrogen Standard Solution, 10 mg/L, to 100 mL with dilution water.

—Or—

Use a TenSette Pipet to prepare a 0.20 mg/L ammonia nitrogen standard by



## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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diluting 0.4 mL of a Ammonia Nitrogen Voluette Standard Solution, 50 mg/L as  $\text{NH}_3\text{-N}$ , to 100 mL with dilution water. Analyze the standard solution following all the steps in the Free Ammonia/Monochloramine procedure.

### Method Performance

#### Precision

In a single laboratory using a solution containing 1.59 ppm Monochloramine as chlorine plus 0.14 ppm free  $\text{NH}_3\text{-N}$  and one representative lot of reagent with the Pocket Colorimeter II, a single operator obtained a standard deviation of  $\pm 0.005$  mg/L  $\text{NH}_3\text{-N}$  for nine replicates.

#### Estimated Detection Limit

EDL = 0.04 mg/L as  $\text{Cl}_2$  and 0.02 mg/L  $\text{NH}_3\text{-N}$ .

### Standard Calibration Adjust Method

To perform a standard calibration adjustment using the Standard Solution prepared above or using an alternative concentration, see [Standard Calibration Adjust on page 2–13](#).

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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### Summary of Method

Monochloramine ( $\text{NH}_2\text{Cl}$ ) and “free ammonia” ( $\text{NH}_3$  and  $\text{NH}_4^+$ ) can exist in the same water sample. Added hypochlorite combines with free ammonia to form more monochloramine. In the presence of a cyanoferrate catalyst, monochloramine in the sample reacts with a substituted phenol to form an intermediate monoimine compound. The intermediate couples with excess substituted phenol to form a green-colored indophenol, which is proportional to the amount of monochloramine present in the sample. Free ammonia is determined by comparing the color intensities, with and without added hypochlorite.

### Safety

Good safety habits and laboratory techniques should be used throughout the procedure. Consult the Material Safety Data Sheet (MSDS) for information specific to the reagent used.

# Nitrogen, Free Ammonia and Chloramine (Mono), continued

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## Replacement Parts

### Required Reagents

Description	Quantity Required		Unit	Cat. No.
	Per Test			
Free Ammonia Reagent Set (50 tests)				
Includes: (1) 28022-99, (1) 28773-36.....				28797-00
Free Ammonia Reagent Solution.....	1 drop	4 mL SCDB		28773-36
Monochlor F Reagent Pillows .....	2 pillows	100/pkg		28022-99

### Required Apparatus

Sample Cell, 1-cm/10-mL, with cap .....	2	2/pkg	48643-02
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### Optional Reagents

Buffer, pH 8.3, Powder Pillows .....	25/pkg	898-68
Chlorine Solution, Voluette® Ampule, 50–75 mg/L .....	16/pkg	14268-10
Hardness Treatment Reagent Pillows (1 per test) .....	50/pkg	28823-46
Nitrogen Ammonia Standard Solution, 10 mg/L		
as NH <sub>3</sub> -N.....	500 mL	153-49

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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Description	Unit	Cat. No.
Nitrogen Ammonia Standard Ampule, 50 mg/L as $\text{NH}_3\text{-N}$ , 10 mL.....	16/pkg .....	14791-10
Nitrogen Ammonia Standard Solution, 100 mg/L as $\text{NH}_3\text{-N}$ .....	500 mL ....	24065-49
Water, Organic Free.....	500 mL ....	26415-49

### Optional Apparatus

Ampule Breaker Kit.....	each ....	21968-00
Beaker, 100 mL, Polypropylene .....	each .....	1080-42
Beaker, 100 mL, Glass.....	each .....	500-42H
Cylinder, 50 mL, mixing.....	each ....	20886-41
Flask, Volumetric, Class A, 100 mL.....	each ....	14574-42
Pipet Filler, Safety Bulb.....	each ....	14651-00
Pipet, TenSette®, 0.1 to 1.0 mL.....	each .....	19700-01
Pipet Tips, for 19700-01 TenSette Pipet .....	50/pkg ....	21856-96
Pipet, Mohr, Glass, 10 mL.....	each ....	20934-38
Pipet, Volumetric, Class A, 2.0 mL.....	each ....	14515-36
Pipet, Volumetric, Class A, 50.00 mL.....	each .....	14515-41
Scissors .....	each ....	28831-00

## Nitrogen, Free Ammonia and Chloramine (Mono), continued

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Description	Unit	Cat. No.
Stir Bar, Octagonal.....	each.....	20953-52
Stirrer, Magnetic .....	each.....	28812-00
Thermometer, -10 to 110 °C.....	each.....	1877-01
Wipers, Disposable Kimwipes®, 30 x 30 cm, 280/box.....	box.....	20970-01





## Section 2

# Instrument Manual








# Instrument Operation


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## Key Functions

Key	Description	Function
	<b>POWER</b>	On/Off/Backlight To turn on the backlight, turn on the instrument, then press and hold the power key until the backlight turns on. Press and hold again to turn off the backlight. This key functions the same in all instrument modes and ranges.
	<b>ZERO/SCROLL</b>	In measurement mode, sets the instrument to zero. In menu mode, scrolls through menu options. Also scrolls numbers when entering or editing a value.
	<b>READ/ENTER</b>	In measurement mode, initiates sample measurement. In menu mode, selects a menu option. When entering numbers, moves one space to the right and executes the function when the entry is complete.

## Instrument Operation, continued

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Key	Description	Function
	<b>MENU</b>	Enter/Exit the menu mode Press and hold for approximately 5 seconds to enter user-entered method mode.

### Menu Selections

Press the **MENU** key to access the menu selections.

### Switching Ranges

1. Press the **MENU** key. The display will show “SEL”. A flashing arrow indicates the current range.
2. Press the **READ/ENTER** key to toggle between ranges.
3. Press **MENU** again to accept and exit back to the measurement screen.

### Setting the Time

1. Press the **MENU** key, then press the **ZERO/SCROLL** key until the display shows a time in the “00:00” format.

2. Press **READ/ENTER**. The digit to be edited will flash.
3. Use the **ZERO/SCROLL** key to change the entry, then press **READ/ENTER** to accept and advance to the next digit. The time is entered in 24-hour format.

### Recalling Stored Measurements

1. Press the **MENU** key, then press the **ZERO/SCROLL** key until the display shows RCL. The instrument automatically stores the last 10 measurements.
2. In RCL, press **READ/ENTER** to recall the stored measurements, beginning with the most recent measurement taken. The meter stores the measurement number as 01 (most recent) through 10 (oldest), the time the measurement was taken, and the measurement value. The **ZERO/SCROLL** key allows for selection of a specific measurement by number. The **READ/ENTER** key scrolls through all stored data points.



### Battery Installation

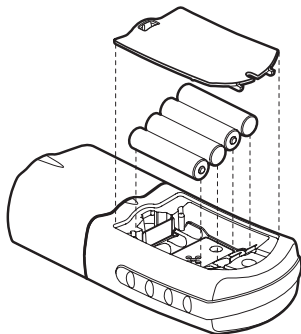
Figure 1 on page 2–7 provides an exploded view of battery installation.

1. Unhook the latch and remove the battery compartment cover. The polarities are shown on the battery holder.
2. Place the four batteries provided with the instrument in the holder as indicated and replace the battery compartment cover. The display will show the software version number (e.g., “P 1.6”) after correct battery installation.

When replacing discharged batteries, always replace the complete set of four alkaline batteries. **Rechargeable batteries are not recommended** and cannot be recharged in the instrument.

**Note:** *The Low Battery icon will appear on the display when the batteries have 10% battery life remaining. The battery icon will flash when the batteries are too low to complete measurements. See [Instrument Keys and Display on page 1–5](#).*

Figure 1      Battery Installation





# Error Codes

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When the instrument cannot perform the function initiated by the operator, an error message will appear in the display. Refer to the appropriate message information below to determine what the problem is and how it can be corrected. Resolve error messages in the order that they appear on the display. Service Centers are listed in [page 2–37](#).

## Error Messages

### 1. E-0 No Zero (User mode)

Error occurs when trying to read a standard in the user calibration mode before setting the meter to zero.

- Zero the instrument on an appropriate blank.

### 2. E-1 Ambient Light Error

There is too much light present to take a valid measurement.

- Verify instrument cap is correctly seated.
- If the problem persists, contact a Service Center ([page 2–37](#)).

## Error Codes, continued

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### 3. E-2 LED Error

The LED (light source) is out of regulation.

- Replace batteries.
- Verify LED lights up (inside the cell holder) when the **READ/ENTER** or **ZERO/SCROLL** key is pressed.
- If the problem persists, contact a Service Center ([page 2–37](#)).

*Note: When an E-1 or E-2 error occurs on a measurement, the display will show “\_.\_.” (The decimal place is determined by the chemistry.) If the E-1 or E-2 error occurs while zeroing the meter, the meter will require the user to re-zero.*

### 4. E-3 Standard Adjust Error

The value obtained on the prepared standard exceeds the adjustment limits allowed for the standard concentration, or the concentration of the standard is outside the concentration range allowed for standard calibration adjust.

- Prepare the standard and rerun according to the procedure.
- Prepare a standard at or near the recommended concentrations given in the procedure.
- Verify that the concentration of the standard has been entered correctly.



- If the problem persists, contact a Service Center ([page 2–37](#)).

### 5. **E-6 Abs Error (User mode)**

Indicates that the absorbance value is invalid, or indicates an attempt to make a curve with less than two points.

- Enter or measure the absorbance value again.
- If the problem persists, contact a Service Center ([page 2–37](#)).

### 6. **E-7 Standard Value Error (User mode)**

Standard concentration is equal to another standard concentration that is already entered.

- Enter the correct standard concentration.
- If the problem persists, contact a Service Center ([page 2–37](#)).

### 7. **E-9 Flash Error**

The meter is unable to save data.

- If the problem persists, contact a Service Center ([page 2–37](#)).

## Error Codes, continued

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### 8. Underrange—flashing number below stated test range

- Verify instrument cap is correctly seated.
- Check zero by measuring a blank. If error recurs, re-zero the instrument.
- If the problem persists, contact a Service Center ([page 2–37](#)).

Note: See [Maximum/Minimum Displayed Value on page 2–26](#) for more information.

### 9. Overrange—flashing number above stated test range

Note: *Flashing value will be 10% over the upper test limit.*

- Check for light blockage.
- Dilute and retest sample.

Note: See [Maximum/Minimum Displayed Value on page 2–26](#) for more information.

# Standard Calibration Adjust

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The Pocket Colorimeter™ II instrument is factory-calibrated and ready for use without user calibration. Use of the factory calibration is recommended unless the user is required to generate a calibration. The Standard Calibration Adjust can be used to meet regulatory requirements.

This feature allows the factory default calibration curve to be adjusted with a known standard. Use the standard described in the procedure.

1. Place a blank in the meter (in measurement mode). Press **ZERO/SCROLL**.
2. Place the reacted standard in the meter. Press **READ/ENTER**.
3. Press **MENU**, then press **ZERO/SCROLL** until the display shows “SCA”.
4. Press **READ/ENTER** to display the standard calibration adjust value.
5. Press **READ/ENTER** to adjust the curve to the displayed value. The meter will return to the measurement mode and the Calibration Adjusted icon will appear in the display window.

If an alternate concentration is used, or if a standard concentration is not given:

6. Repeat steps 1–4.

## Standard Calibration Adjust, continued

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7. Press **ZERO/SCROLL** to access the Edit function, then press **READ/ENTER** to begin editing. The digit to be edited will flash. Use the **ZERO/SCROLL** key to change the entry, then press **READ/ENTER** to accept and advance to the next digit.

When the last digit is entered, press **READ/ENTER** and the meter will adjust the curve to the value entered. The meter will return to measurement mode and the Calibration Adjusted icon will appear in the display window.

To turn off Standard Calibration Adjust (SCA):

1. Press **MENU**.
2. Press **ZERO/SCROLL** until “SCA” appears in the display.
3. Press **READ/ENTER**, then press **ZERO/SCROLL** until “Off” appears in the display.
4. Press **READ/ENTER** to turn off SCA.

*Note: Perform another standard calibration adjust to turn SCA on again.*

*Note: For meters with factory-calibrated ranges or methods, Standard Calibration Adjust (SCA) will be disabled when a user-entered method is programmed into the meter. To turn SCA back on, restore the meter to factory default calibration. See Retrieving the Factory Calibration on page 2–25.*

# User-Entered Calibration

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## Overview

The Pocket Colorimeter™ II will accept a user-prepared calibration curve. The curve can extend from 0 to 2.5 absorbance. A user-prepared calibration curve may be entered into any channel that does not contain a factory-programmed curve. These channels are labeled “abs” on instruments having a single factory calibration or are labeled “1” and “2” on the uncalibrated single wavelength instruments. Any chemistry that can be run at the instrument wavelength may be user-entered in these channels.

Using prepared standard solutions that cover the range of interest, the meter generates a calibration curve by calculating the straight-line segments between each standard entered. A calibration curve may be entered using the keypad. Factory-entered calibration curves may also be recalculated or adjusted using the same procedure.

To enter the user-entered calibration mode, press the **MENU** key and hold it down until the display shows “USER” (about 5 seconds), followed by “CAL”. Press **ZERO/SCROLL** to scroll through the options.

*Note: If the meter does not display USER followed by CAL after pressing the **MENU** key, the factory calibration cannot be modified on this channel.*

## User-Entered Calibration, continued

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- CAL—Used to enter and edit standard values and measure absorbance values, or review the existing calibration.
- Edit—Used to enter and edit standard values and absorbance values with the keypad or review the existing calibration. Used to enter a predetermined calibration curve.
- dFL—Used to return the instrument back to the default factory calibration. User-entered calibrations are stored upon exit from the calibration or edit modes.

*Note: To return to factory settings, following the instructions in [Retrieving the Factory Calibration on page 2–25](#).*

If the instrument is shut off or loses power during data entry, all edits will be lost. Automatic shut-off in user-entered calibration entry mode is 60 minutes.

### CAL and Edit Submenus

In CAL mode, standard values are entered and absorbance values are measured. In Edit mode, standard and absorbance values are entered.

- To select CAL from the User menu, press **READ/ENTER**.
- To select Edit from the User menu, press **ZERO/SCROLL** and **READ/ENTER**.

- Once in the CAL or Edit option, press the **READ/ENTER** key to navigate through each option.

Note: Press **ZERO/SCROLL** to quickly scroll through each option.

## Calibration Procedure Using Prepared Standards

**Note:** *Deionized water or a reagent blank can be used to zero during the calibration procedure. Calibrations generated with deionized water as the zero will give less accurate results if the reagent blank is significantly more turbid or colored than deionized water. Use the deionized water or the reagent blank as the zero concentration point (S0) in the following calibration procedure.*

1. Turn on the instrument and select the range to be calibrated. An arrow at the top of the display will point to the selected range. To change ranges, press the **MENU** key, then use the **READ/ENTER** key to toggle between ranges 1 and 2. Press **MENU** again to return to measurement mode.
2. Follow the procedure for the chemical method to be calibrated. Prepare a reagent blank (if needed) and a standard solution. Allow the color to develop fully.

## User-Entered Calibration, continued

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3. Insert the reagent blank or deionized water into the meter and cover with the cap. Press the **ZERO/SCROLL** key. The meter will display “- - -”, followed by “0.000”. This initializes (zeroes) the meter.
4. Press the **MENU** key and hold it down until the display shows “USER”, followed by “CAL”. Press **READ/ENTER** to enter the calibration mode.
5. In factory-calibrated meters, S0 will appear in the display.  
*Note: When recalibrating a factory-calibrated meter or range, RES (resolution) cannot be changed.*
6. In uncalibrated meters or meters with ranges labeled Abs, “RES” will appear. Press **ZERO/SCROLL** to review the current resolution (decimal placement). Press **ZERO/SCROLL** again to accept the current resolution. To change the resolution, press **READ/ENTER**, then **ZERO/SCROLL** to change the resolution. Press **READ/ENTER** to accept the new resolution. “S0” will appear on the display.
7. Press the **READ/ENTER** key again, then enter the blank value.  
*Note: Press the **READ/ENTER** key to move from digit to digit. Use the **ZERO/SCROLL** key to change the number.*
8. After completing entry of the blank value, press the **READ/ENTER** key. The display will show “A0”.



## User-Entered Calibration, continued

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9. Insert the reagent blank or deionized water into the cell holder. Cover the blank with the instrument cap.
10. Press the **READ/ENTER** key. The meter will measure and display the absorbance value for “S0”.
11. Remove the sample blank. Press the **ZERO/SCROLL** key. “S1” will appear. Press the **READ/ENTER** key, then enter the first standard value.

*Note: Press the **READ/ENTER** key to move from digit to digit. Use the **ZERO/SCROLL** key to change the number.*

12. After completing entry of the first standard value, press the **READ/ENTER** key. The display will show “A1”.
13. Insert the first reacted standard solution into the cell holder. Cover the prepared standard with the instrument cap.
14. Press the **READ/ENTER** key. The meter will measure and display the absorbance value for S1.
15. The calibration is complete with two points. If additional standards are required, press **ZERO/SCROLL** until “Add” appears on the display. Repeat steps 11–14 to enter additional standards.

## User-Entered Calibration, continued

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16. Press the **MENU** key twice to exit and accept the changes. The instrument will use this calibration to determine the displayed concentration of future sample measurements.

## Entering a Predetermined Calibration Curve

*Note: Entering a predetermined calibration curve requires at least two data pairs. Each data pair requires a concentration value and the absorbance value for the given concentration. Up to 10 data pairs may be entered. This procedure uses the Edit mode.*

1. Turn on the instrument and select the range to be calibrated. An arrow at the top of the display will point to the selected range. To change ranges, press the **MENU** key, then use the **READ/ENTER** key to toggle between ranges 1 and 2. Press **MENU** again to return to measurement mode.
2. Press the **MENU** key and hold it down until the display shows "USER", followed by "CAL". Press **ZERO/SCROLL** to scroll to EDIT. Press **READ/ENTER**.
3. In uncalibrated meters or in Abs range, "RES" will appear. Press **ZERO/SCROLL**. To change the resolution (decimal placement), press **READ/ENTER**. Press **ZERO/SCROLL** to select the new resolution, then press **READ/ENTER** to accept. "S0" will appear on the display.

## User-Entered Calibration, continued

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4. Enter the concentration value and absorbance value of the first data pair (S0, A0).
5. To enter the S0 value, press **READ/ENTER**. Use the **ZERO/SCROLL** key to select the numerical value, then press the **READ/ENTER** key to accept the entry and advance to the next decimal place. Repeat this sequence until the S0 concentration value is entered.
6. After editing the S0 value, press **READ/ENTER** to accept. "A0" will appear on the display.
7. To enter the absorbance value for S0, press the **READ/ENTER** key to go to entry mode. Use the **ZERO/SCROLL** key to select the numerical value, then press the **READ/ENTER** key to accept the entry and advance to the next decimal place. Repeat this sequence until the absorbance value for S0 is entered.
8. After entering A0, press **READ/ENTER** to accept. "S1" will appear on the display.
9. Repeat steps 5 through 8 for each standard value and absorbance value pair in the calibration curve

*Note: After A1 is entered, Add will appear in the display. If additional data pairs are to be entered, press **READ/ENTER** and continue with step 9.*

## User-Entered Calibration, continued

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10. When all the calibration data has been entered, press **MENU** twice to return to the measurement mode.

## Editing a User-entered or Factory Calibration Curve

1. Press the **MENU** key and hold it down until the display shows “USER”, followed by “CAL”. Press **ZERO/SCROLL** until EDIT appears.

*Note: If the meter does not display USER followed by CAL after pressing the **MENU** key, the factory calibration cannot be modified on this channel.*

2. Press the **READ/ENTER** key to enter Edit mode. In factory-calibrated meters, “S0” will appear in the display.

*Note: When editing a factory-calibrated meter or range, RES (resolution) cannot be changed.*

*Note: When RES or S0 appears in the display, press **ZERO/SCROLL** to quickly scroll to the data to be edited.*

3. In uncalibrated meters or in Abs range, “RES” will appear. Press **ZERO/SCROLL** to review the current resolution. Press **ZERO/SCROLL** again to accept the displayed resolution. To change the resolution (decimal placement), press

## User-Entered Calibration, continued

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**READ/ENTER.** Press **ZERO/SCROLL** to select the new resolution, then press **READ/ENTER** to accept. "S0" will appear on the display.

4. Press **READ/ENTER**. The current concentration value for S0 will appear on the display.
5. To edit the S0 value, press **READ/ENTER**. Use the **ZERO/SCROLL** key to select the numerical value, then press the **READ/ENTER** key to accept the entry and advance to the next decimal place. Repeat this sequence until the S0 concentration value is entered.
6. After editing the S0 value, press **READ/ENTER** to accept. "A0" will appear on the display.
7. To edit the absorbance value for S0, press the **READ/ENTER** key to go to entry mode. Use the **ZERO/SCROLL** key to select the numerical value, then press the **READ/ENTER** key to accept the entry and advance to the next decimal place. Repeat this sequence until the absorbance value for S0 is entered.
8. After editing A0, press **READ/ENTER** to accept. "S1" will appear on the display.
9. Repeat steps 4 through 8 for each standard value and absorbance value pair in the calibration curve.

## User-Entered Calibration, continued

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10. When all calibration data has been reviewed or edited, “ADD” will appear in the display.
11. Press **READ/ENTER** to add more calibration points, or press **MENU** twice to return to the measurement mode.

*Note: When a factory calibration curve has been edited, the “calibration adjust” icon will appear in the display.*

## Exiting the Calibration Routine

Exit the calibration routine by pressing the **MENU** key to return to measurement mode. The instrument uses the last completed user-entered calibration or the factory calibration if no user-entered calibration has been completed.

## Deleting Calibration Points

1. Select the range containing user-entered calibration points. See [Switching Ranges on page 2–4](#).
2. Press and hold the **MENU** key until “USER”, then “CAL” appears. Press **READ/ENTER**.

*Note: Calibration points can also be deleted in Edit mode.*

## User-Entered Calibration, continued

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3. Press **ZERO/SCROLL** to select the point to delete (e.g., S0 or S1 or S2). Press **READ/ENTER**.
4. The left digit will flash. Press **ZERO/SCROLL** until “dEL” appears. (“dEL” will appear after the numeral 9.)
5. Press **READ/ENTER** to delete. Repeat for all points to be deleted.  
*Note: The minimum number of valid points is two. For example, if five points have been entered, three can be deleted using this feature.*
6. Press **MENU** to return to the measurement mode.

## Retrieving the Factory Calibration

1. Select the range to restore factory default calibration. See [Switching Ranges on page 2–4](#).
2. Press and hold the **MENU** key until “USER”, then “CAL” appears.  
*Note: If the meter does not display USER followed by CAL after pressing the **MENU** key, the factory calibration cannot be modified on this channel.*
3. Press the **ZERO/SCROLL** key to find dFL.

## User-Entered Calibration, continued

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4. Press the **READ/ENTER** key to select dFL and restore the instrument to the factory default calibration.

**Note:** *For meters with factory-calibrated ranges or methods, Standard Calibration Adjust (SCA) will be disabled when a user-entered method is programmed into the meter. To turn SCA back on, restore the meter to factory default calibration.*

## Maximum/Minimum Displayed Value

In meters with absorbance (Abs) ranges, the maximum displayed value and minimum displayed value is related to the value of the standards entered in a user calibration.

Measurements that exceed the minimum or maximum standards entered in the user calibration will return a flashing number indicating “underrange” or “overrange”. See *Error Codes* (page 2–12) for more information.

### Example 1

For a calibration with the following standards:



## User-Entered Calibration, continued

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S0=0.000

S1=1.000

Maximum Displayed Value	1.000
Minimum Displayed Value	0.000

### Example 2

For a calibration with the following standards:

S0=1.00

S1=2.00

S2=4.00

Maximum Displayed Value	4.00
Minimum Displayed Value	1.00

For Hach-calibrated programs, the maximum and minimum displayed values always equal the factory-calibrated values and cannot be changed.



# Certification

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Hach Company certifies this instrument was tested thoroughly, inspected, and found to meet its published specifications when it was shipped from the factory.

The Pocket Colorimeter™ II instrument has been tested and is certified as indicated to the following instrumentation standards:

## **EMC Immunity:**

Per **89/ 336/ EEC EMC: EN 61326: 1998** (Electrical Equipment for measurement, control and laboratory use—EMC requirements). Supporting test records by Hach Company, certified compliance by Hach Company.

## **Standard(s) include:**

IEC 1000-4-2: 1995 (EN 61000-4-2: 1995) Electro-Static Discharge Immunity (Criteria B)

IEC 1000- 4- 3: 1995 (EN 61000- 4- 3: 1996) Radiated RF Electro- Magnetic Field Immunity (Criteria A)

## **Additional Immunity Standard(s) include:**

ENV 50204: 1996 Radiated Electromagnetic Field from Digital Telephones

## Certification, continued

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### (Criteria A) Radio Frequency Emissions:

Per **89/ 336/ EEC EMC: EN 61326: 1998** (Electrical Equipment for measurement, control and laboratory use—EMC requirements) “Class B” emission limits.

Supporting test records from Hach EMC Test Facility, certified compliance by Hach Company.

### Additional Radio Frequency Emissions Standard(s) include:

**EN 55022 (CISPR 22)**, Class B emissions limits.

### **Canadian Interference-causing Equipment Regulation, IECS-003, Class A:**

Supporting test records from Hach EMC Test Facility, certified compliance by Hach Company.

This Class A digital apparatus meets all requirements of the Canadian Interference-causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

**FCC Part 15, Class “A” Limits:** Supporting test records from Hach EMC Test Facility, certified compliance by Hach Company.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. The following techniques of reducing the interference problems are applied easily.

## Certification, continued

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1. Remove power from the Pocket Colorimeter instrument by removing one of its batteries to verify that it is or is not the source of the interference.
2. Move the Pocket Colorimeter instrument away from the device receiving the interference.
3. Reposition the receiving antenna for the device receiving the interference.
4. Try combinations of the above.



## GENERAL INFORMATION

At Hach Company, customer service is an important part of every product we make. With that in mind, we have compiled the following information for your convenience.





# How to Order

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## By Telephone:

6:30 a.m. to 5:00 p.m. MST  
Monday through Friday  
(800) 227-HACH (800-227-4224)

## By FAX:

(970) 669-2932 (Hach Loveland)

## By Mail:

Hach Company  
P.O. Box 389  
Loveland, Colorado 80539-0389 U.S.A.

## For order information by E-mail:

orders@www.hach.com

## Information Required:

- Hach account number (if available)
- Billing address
- Shipping address
- Your name and phone number
- Purchase order number
- Catalog number
- Brief description or model number
- Quantity

## How to Order, continued

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### Technical and Customer Service (USA only)

Hach Technical and Customer Service Department personnel are eager to answer questions about our products and their use and to take your orders. Specialists in analytical methods, they are happy to put their talents to work for you.

Call 1-800-227-4224 or E-mail [techhelp@hach.com](mailto:techhelp@hach.com).

### International Customers

Hach maintains a worldwide network of dealers and distributors. To locate the representative nearest you, send E-mail to [intl@hach.com](mailto:intl@hach.com) or call (970) 669-3050.

### In Canada

Hach Instrument Service Centre, Winnipeg, Manitoba, Canada

Telephone: (204) 632-5598; (800) 665-7635

FAX: (204) 694-5134

# Repair Service

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Authorization must be obtained from Hach Company before sending any items for repair. Please contact the Hach Service Center serving your location.

## In the United States:

Hach Company  
100 Dayton Avenue  
Ames, Iowa 50010  
(800) 227-4224 (USA only)  
FAX: (515) 232-3835

Latin America, Caribbean, Africa,  
Far East, Indian Subcontinent:  
Hach Company World Headquarters  
P.O. Box 389  
Loveland, Colorado 80539-0389 U.S.A.  
Telephone: (970) 669-3050  
FAX: (970) 669-2932  
E-mail: intl@hach.com.

## Canada:

Hach Sales & Service Canada Ltd.  
1313 Border Street, Unit 34  
Winnipeg, Manitoba R3H 0X4  
(800) 665-7635 (Canada only)  
Telephone: (204) 632-5598  
FAX: (204) 694-5134  
E-mail: canada@hach.com

Europe, the Middle East,  
or Mediterranean Africa:  
HACH Company, c/o  
Dr. Bruno Lange GmbH & CO. KG  
Willstätterstr. 11  
40549 Düsseldorf, Germany  
Telephone: +49/(0)211/52 88-0  
FAX: +49/(0)211/52 88-134

# Warranty

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Hach Company warrants this product to the original purchaser against any defects that are due to faulty material or workmanship for a period of **two years from date of shipment**.

In the event that a defect is discovered during the warranty period, Hach Company agrees that, at its option, it will repair or replace the defective product or refund the purchase price, excluding original shipping and handling charges. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable products such as chemical reagents; or consumable components of a product, such as, but not limited to, lamps and tubing.

Contact Hach Company or your distributor to initiate warranty support. Products may not be returned without authorization from Hach Company.

### Limitations

This warranty does not cover:

- damage caused by acts of God, natural disaster, labor unrest, acts of war (declared or undeclared), terrorism, civil strife or acts of any governmental jurisdiction
- damage caused by misuse, neglect, accident or improper application or installation
- damage caused by any repair or attempted repair not authorized by Hach Company
- any product not used in accordance with the instructions furnished by Hach Company
- freight charges to return merchandise to Hach Company
- freight charges on expedited or express shipment of warranted parts or product
- travel fees associated with on-site warranty repair

## Warranty, continued

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This warranty contains the sole express warranty made by Hach Company in connection with its products. All implied warranties, including without limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.

This warranty constitutes the final, complete, and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of Hach Company.

### Limitation of Remedies

The remedies of repair, replacement or refund of purchase price as stated above are the exclusive remedies for the breach of this warranty. On the basis of strict liability or under any other legal theory, in no event shall Hach Company be liable for any incidental or consequential damages of any kind for breach of warranty or negligence.