

Salt Water Aquaculture



Test Kit Instruction Manual

Code 3635-05

 **LaMotte**®



This booklet provides step-by-step detailed instructions for the Code 3635-05 test kit. It is important to review these instructions thoroughly before attempting to perform the tests by the short-form instructions contained in the case lid.

To order individual reagents or test kit components, use the specified code number.

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SAFETY/ TESTING HINTS / REAGENT CARE



*Reagent is a potential health hazard. **READ SDS:**
lamotte.com. **Emergency information:**
Chem-Tel USA 1-800-255-3924
Int'l, call collect, 813-248-0585



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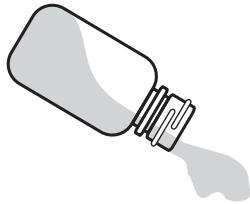


Tightly close all reagent containers immediately after use. Be sure not to interchange caps and pipets from different containers.

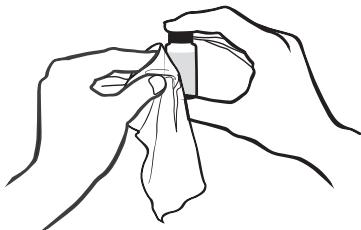


Avoid prolonged exposure of equipment and reagents to direct sunlight. Protect reagents and components from extreme heat and cold.

Wipe up any reagent chemical spills, liquid or powder, as soon as they occur. Refer to label and SDS for proper reagent disposal.



Use care when dispensing or handling all reagents. Some reagents also may cause permanent stains if spilled.



ANALYTICAL TECHNIQUE

1. Clean glassware is a must for accurate results. Thoroughly rinse test tubes before and after each test. Caps and stoppers should also be cleaned after each use.
2. Use test tube caps or stoppers, not your fingers, to cover test tubes and flasks during shaking or mixing.
3. When adding sample to calibrated test tube, be sure vial is filled to the appropriate mark. The bottom of the liquid [meniscus] should be level with the desired mark. [Fig. 1]
4. When dispensing reagents from bottles filled with dropper plug and cap, be sure to hold bottle vertically and gently squeeze to dispense the appropriate number of uniform drops. [Fig. 2]
5. For those reagents to be added with the screwcap pipet assemblies enclosed, remove polyseal cap on bottle and replace with the screwcap pipet. NOTE: Place the polyseal caps back on the reagent bottles for longer periods of storage. Be sure that both pipet assemblies and polyseal caps are thoroughly cleaned before placing on bottles to avoid contamination.
6. When dispensing reagents from pipets, hold pipet vertically to assure uniform drop size. This is extremely important when performing drop count titrations. [Fig. 3]
7. To fill pipets, squeeze rubber bulb and immerse into reagent. Release bulb to fill. [Fig. 4]
8. To accurately dispense powdered reagents with spoon, tap spoon on edge of reagent container to remove excess reagent. [Fig. 5]
9. When performing tests that include Octa-Slide 2 Comparators, the comparator should be positioned between the operator and non-direct sunlight. This allows the light to enter through the light-diffusing screen at the back of the comparator for optimum color comparison.

Fig. 1



Fig. 2

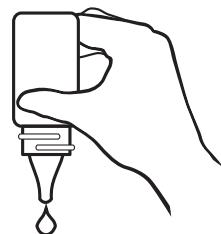


Fig. 3

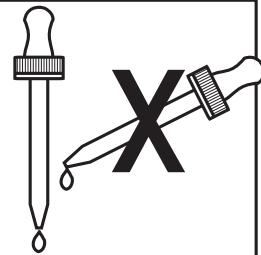
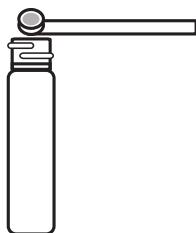


Fig. 4

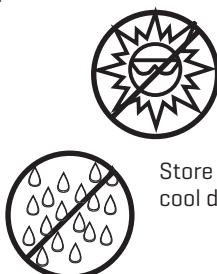


Fig. 5



GENERAL SAFETY PRECAUTIONS

1



Store the test kit in a cool dry area.

2



Read all instructions and note precautions before performing the test procedure. Read all Safety Data Sheets [SDS]. SDS are available at www.lamotte.com.

3

Read the labels on all reagent bottles. Note warnings and first aid information. Reagents marked with a * are considered possible health hazards.



4



Keep all equipment and reagent chemicals out of the reach of young children.

5

Avoid contact between reagent chemicals and skin, eyes, nose, and mouth.



6

Wear safety glasses when performing test procedures.



In the event of an accident or suspected poisoning, immediately call the Poison Center phone number in the front of your local telephone directory or call a physician. Additional information for all LaMotte reagents is available in the United States, Canada, Puerto Rico, and the US Virgin Islands from Chem-Tel by calling 1-800-255-3924.

For other areas, call 813-248-0585 collect to contact Chem-Tel's International access number. Each reagent can be identified by the four digit number listed on the upper left corner of the reagent label, in the contents list and in the test procedures.



TEST METHODS



USE OF THE OCTA-SLIDE 2 VIEWER

DILUTIONS

The calibrated test tubes [0106] included in this kit may be used to perform dilutions for the Ammonia Nitrogen and Nitrite Nitrogen tests. Distilled or deionized water is needed to perform dilutions.

The following table provides a quick reference guide for dilutions of various proportions. Once the dilution is prepared, use this diluted sample to perform the test, and multiply the result by the dilution factor to obtain the actual concentration.

Sample Size	Distilled Water to Bring to 10 mL	Dilution Factor
5.0 mL	5.0 mL	2
2.5 mL	7.5 mL	4

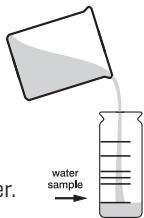
TITRIMETRIC: DIRECT READING TITRATOR

In a titrimetric method, titrating solution (or titrant) is added to a treated sample until a color change occurs. The volume of titrant required to reach this endpoint is proportional to the concentration of the factor being tested. Direct Reading Titrators provide results directly in the appropriate concentration for the test—no counting of drops, no calculations.

The Titrator consists of a plastic barrel, a plastic plunger, and a plastic adapter tip. The adapter tip reduces the size of the drops that are dispensed, increasing the precision of the test results. DO NOT remove the plunger or adapter tip from the Titrator.

1

Fill the test tube to the appropriate line with sample water.



2

Add reagents as specified in the instructions for the individual test method. Cap with the special test tube cap. Mix by swirling gently.



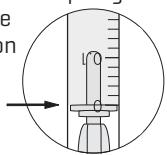
3

Depress the Titrator plunger to expel air. Insert Titrator into the plastic fitting of the titrating solution bottle and invert.



4

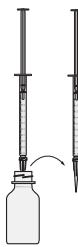
To fill Titrator, slowly withdraw the plunger until the bottom of the plunger is opposite the zero mark on the scale.



NOTE: If small air bubbles appear in the barrel, expel them by partially filling the barrel and pumping the titration solution back into the reagent container. Repeat until bubble disappears.

5

Turn the bottle right-side-up and remove the Titrator.



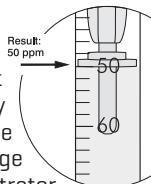
6

Insert the Titrator into the center hole of the test tube cap. While gently swirling tube, add titrating solution one drop at a time until the desired color changes occur.



7

Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel.



8

When testing is complete, discard titrating solution in Titrator. Rinse Titrator and titration tube thoroughly.



TEST PROCEDURES

INTRODUCTION

Proper control of water quality is an essential part of successful aquaculture operation. Immediate test results provided by on-site water analysis equipment can confirm a healthy environment, or give early warning signals for required treatment.

1. Develop a routine testing schedule.
2. Keep records! Historical data is extremely important if treatments are required. Note environmental conditions, fish activity, feeding habits, etc.
3. Observe fish to note any particular behavior or feeding rates, as this may be a sign of stress.
4. Stable characteristics, such as alkalinity and hardness, do not have to be tested as frequently as ones that fluctuate, such as ammonia nitrogen, nitrite nitrogen, pH, dissolved oxygen and temperature. Keep in mind that these factors fluctuate throughout the day and in some cases are interdependent.
5. Be alert to sudden changes in one factor, as it may be a clue to perform further analysis.



Alkalinity

DESCRIPTION	CODE
BCG/MR Indicator	2311-PG-E
*Alkalinity Titration Reagent B	*4493DR-H
Test Tube, 5-10-12.9-15-20-25 mL, glass, w/cap	0608
Direct Reading Titrator, 0-200 Range	0382



*Reagent is a potential health hazard. **READ SDS:**

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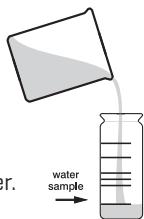
To order individual reagents or test kit components, use the specified code number.

The Direct Reading Titrator is calibrated in terms of total alkalinity expressed as parts per million (ppm) Calcium Carbonate [CaCO₃]. Each minor division on the Titrator scale equals 4 ppm CaCO₃.

ALKALINITY TEST PROCEDURE

1

Fill the test tube [0608] to the 5 mL line with the sample water.



2

Add 4 drops of BCG-MR Indicator [2311-PG].



3

Cap and mix. Solution will turn blue-green.



4

Fill Direct Reading Titrator [0382] with *Alkalinity Titration Reagent B [4493DR].



5

Insert the Titrator into the center hole of the test tube cap.



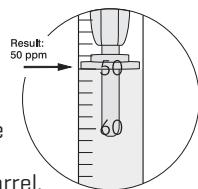
6

While gently swirling the tube, slowly press the plunger to titrate until blue-green color changes to pink.



7

Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record Total Alkalinity as ppm Calcium Carbonate [CaCO₃].



NOTE: If the plunger tip reaches the bottom line on the scale [200 ppm] before the endpoint color change occurs, refill the Titrator and continue the titration.

When recording the test result, be sure to include the value of the original amount of reagent dispensed [200 ppm].

Ammonia Nitrogen

DESCRIPTION	CODE
*Salicylate Ammonia #1	*3978LWT-G
*Salicylate Ammonia #2	*3979WT-G
Salicylate Ammonia #3	3982WT-G
Test Tube, 2.5-5-10 mL, plastic, w/cap	0106
Octa-Slide 2 Viewer	1101
Ammonia Nitrogen Octa-Slide 2 Bar, 0-2.0 ppm, Salt Water	3441-01-SW

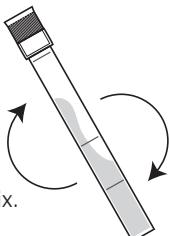
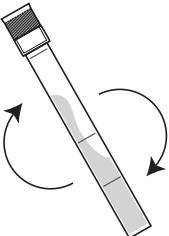
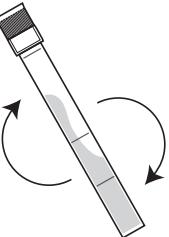
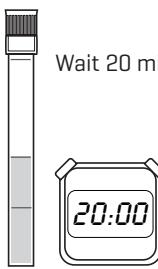
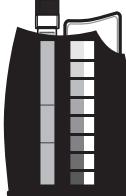


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AMMONIA NITROGEN TEST PROCEDURE

1  Insert Ammonia Nitrogen Octa-Slide 2 Bar [3441-01-SW] into the Octa-Slide 2 Viewer [1101].	2  Fill a test tube [0106] to the 5 mL line with the water sample.	3  Add 10 drops of *Salicylate Ammonia #1 [3978WT].
4  Cap and mix.	5  Add 7 drops of *Salicylate Ammonia #2 [3979WT].	6  Cap and mix.
7  Wait 1 minute.	8  Add 7 drops of Salicylate Ammonia #3 [3982WT].	9  Cap and mix.
10  Wait 20 minutes.	11  Insert test tube into Octa-Slide 2 Viewer. Hold the Viewer so that non-direct light enters through the back.	12  Match sample color to a color standard. Record as ppm Ammonia Nitrogen.

Calculations:

To express results as Ammonia [NH₃]:

$$\text{Ammonia (NH}_3\text{)} = \text{ppm Ammonia Nitrogen (NH}_3\text{-N)} \times 1.2$$

To express results as Ammonium [NH₄⁺]:

$$\text{Ammonium (NH}_4^+\text{)} = \text{ppm Ammonia Nitrogen (NH}_3\text{-N)} \times 1.3$$

Ammonia in water occurs in two forms: toxic unionized ammonia (NH_3) and the relatively non-toxic form, ammonium ion (NH_4^+). This test method measures both forms as ammonia-nitrogen ($\text{NH}_3\text{-N}$) to give the total ammonia-nitrogen concentration in water. The actual proportion of each compound depends on temperature, salinity, and pH. A greater concentration of unionized ammonia is present when the pH value and salinity increase.

1. Consult the table below to find the percentage that corresponds to the temperature, pH and salinity of the sample.
2. To express the test result as ppm Unionized Ammonia Nitrogen ($\text{NH}_3\text{-N}$), multiply the total ammonia-nitrogen test result by the percentage from the table.
3. To express the test result as ppm Ionized Ammonia Nitrogen ($\text{NH}_4^+\text{-N}$), subtract the unionized ammonia nitrogen from the total ammonia-nitrogen.

pH	10°C		15°C		20°C		25°C	
	FW1	SW2	FW	SW	FW	SW	FW	SW
7.0	0.19		0.27		0.40		0.55	
7.1	0.23		0.34		0.50		0.70	
7.2	0.29		0.43		0.63		0.88	
7.3	0.37		0.54		0.79		1.10	
7.4	0.47		0.68		0.99		1.38	
7.5	0.59	0.459	0.85	0.665	1.24	0.963	1.73	1.39
7.6	0.74	0.577	1.07	0.836	1.56	1.21	2.17	1.75
7.7	0.92	0.726	1.35	1.05	1.96	1.52	2.72	2.19
7.8	1.16	0.912	1.69	1.32	2.45	1.90	3.39	2.74
7.9	1.46	1.15	2.12	1.66	3.06	2.39	4.24	3.43
8.0	1.83	1.44	2.65	2.07	3.83	2.98	5.28	4.28
8.1	2.29	1.80	3.32	2.60	4.77	3.73	6.55	5.32
8.2	2.86	2.26	4.14	3.25	5.94	4.65	8.11	6.61
8.3	3.58	2.83	5.16	4.06	7.36	5.78	10.00	8.18
8.4	4.46	3.54	6.41	5.05	9.09	7.17	12.27	10.10
8.5	5.55	4.41	7.98	6.28	11.18	8.87	14.97	12.40

¹ Freshwater data from Trussel [1972].

² Seawater values from Bower and Bidwell [1978]. Salinity for Seawater values = 34 ppt at an ionic strength of 0.701 m.

FOR EXAMPLE:

A fresh water sample at 20°C has a pH of 8.5 and the test result is 1.0 ppm as Total Ammonia-Nitrogen.

1. The percentage from the table is 11.18% [or 0.1118].
2. 1 ppm total Ammonia-Nitrogen \times 0.1118 = 0.1118 ppm Unionized Ammonia-Nitrogen
3. Total Ammonia-Nitrogen $\quad\quad\quad$ 1.0000 ppm
Unionized Ammonia-Nitrogen $\quad\quad\quad$ - 0.1118 ppm
Ionized Ammonia-Nitrogen $\quad\quad\quad$ = 0.8882 ppm

Carbon Dioxide

DESCRIPTION

CODE

*Phenolphthalein Indicator, 1%	*2246-E
Carbon Dioxide Reagent B	4253DR-H
Direct Reading Titrator, 0-50 Range	0380
Test Tube, 5-10-12.9-15-20-25 mL, glass, w/cap	0608



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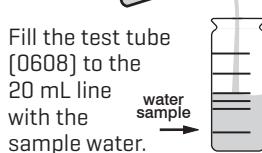


To order individual reagents or test kit components, use the specified code number.

The Direct Reading Titrator is calibrated in terms of carbon dioxide expressed as parts per million [ppm] free CO₂. Each minor division on the Titrator scale equals 1.0 ppm CO₂.

1

NOTE: For best results, test a freshly obtained sample, and avoid splashing or prolonged contact with air.



2

Add 2 drops of *Phenolphthalein Indicator, 1% [2246]. If sample turns red, no free carbon dioxide is present. If sample is colorless, proceed to Step 3.



3

Fill Direct Reading Titrator [0380] with Carbon Dioxide Reagent B [4253DR].



4

Insert the Titrator into the center hole of the test tube cap.



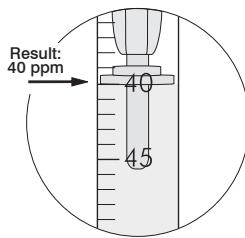
5

While gently swirling the tube, slowly press the plunger to titrate until a faint pink color develops and persists for 30 seconds.



6

Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record as Carbon Dioxide.



NOTE: The Titrator is calibrated in terms of carbon dioxide expressed as ppm Free CO₂. Each minor division on the Titrator scale equals 1.0 ppm CO₂.

Dissolved Oxygen

DESCRIPTION	CODE
*Manganous Sulfate Solution	*4167-G
*Alkaline Potassium Iodide Azide Reagent	*7166-G
*Sulfuric Acid, 1:1	*6141WT-G
Sodium Thiosulfate, 0.025N	4169-H
*Starch Indicator Solution	*4170WT-G
Direct Reading Titrator, 0-10 Range	0377
Test Tube, 5-10-12.9-15-20-25 mL, glass, w/cap	0608
Pipet, plain, plastic, w/cap	0392
Water Sampling Bottle, 60 mL, glass	0688-DO



*Reagent is a potential health hazard. **READ SDS:**

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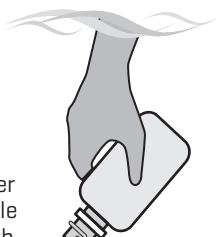
The Titrator is calibrated in terms of Dissolved Oxygen expressed as ppm Dissolved Oxygen. Each minor division on the Titrator scale equals 0.2 ppm Dissolved Oxygen.

DISSOLVED OXYGEN TEST PROCEDURE

Part 1 - Collecting the Water Sample

1

Rinse the Water Sampling Bottle [0688-DO] with the sample water.



2

Tightly cap the bottle, and submerge it to the desired depth.

3

Remove the cap and allow the bottle to fill.



4

Tap the sides of the bottle to dislodge any air bubbles.



5

Replace the cap while the bottle is still submerged.



6

Retrieve the bottle and make sure that no air bubbles are trapped inside.

Part 2 - Adding the Reagents

NOTE: Be careful not to introduce air into the sample while adding the reagents.

1



Remove the cap from the bottle.

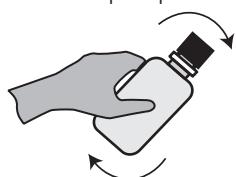
2



Immediately add 8 drops of *Manganous Sulfate Solution [4167] and add 8 drops of *Alkaline Potassium Iodide Azide [7166].

3

Cap the bottle and mix by inverting several times. A precipitate will form.



4



Allow the precipitate to settle below the shoulder of the bottle.

5

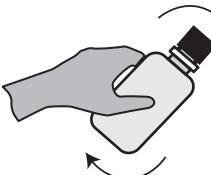


Add 8 drops of *Sulfuric Acid, 1:1 [6141WT].

6

Cap and gently invert the bottle to mix the contents until the precipitate has totally dissolved.

The solution will be clear yellow to orange if the sample contains dissolved oxygen.

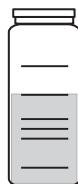


NOTE: At this point the sample has been "fixed" and contact between the sample and the atmosphere will not affect the test result. Samples may be held at this point and titrated later.

Part 3 - The Titration

1

Fill the titration tube [0608] to the 20 mL line with the fixed sample. Cap the tube.



2

Depress plunger of the Titrator [0377].



3

Insert the Titrator into the plug in the top of the *Sodium Thiosulfate, 0.025N [4169] titrating solution.



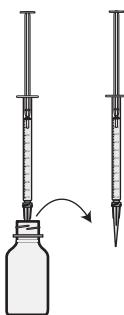
4

Invert the bottle and slowly withdraw the plunger until the large ring on the plunger is opposite the zero [0] line on the scale.



5

Turn the bottle upright and remove the Titrator.



NOTE: If the sample is a very pale yellow, go to Step 9.

continued ...

6

Insert the tip of the Titrator into the opening of the titration tube cap.



7

Slowly depress the plunger to dispense the titrating solution until the yellow-brown color changes to a very pale yellow. Gently swirl the tube during the titration to mix the contents.

8

Carefully remove the Titrator and cap. Do not disturb the Titrator plunger.



9

Add 8 drops of *Starch Indicator Solution (4170WT). The sample should turn bluish purple.



10

Cap the titration tube. Insert the tip of the Titrator into the opening of the titration tube cap.



11

Continue titrating until the color disappears and the solution becomes colorless.

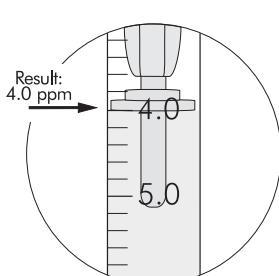


NOTE: If the plunger ring reaches the bottom line on the scale (10 ppm) before the endpoint color change occurs, refill the Titrator and continue the titration. Include the value of the original amount of reagent dispensed (10 ppm) when recording the test result.

12

Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record as ppm Dissolved Oxygen. Each minor division on the Titrator scale equals 0.2 ppm.

NOTE: When testing is complete, discard the titrating solution in the Titrator. Rinse Titrator and titration tube thoroughly. DO NOT remove plunger or adapter tip.



Nitrate Nitrogen

DESCRIPTION

	CODE
*Mixed Acid Reagent	*V-6278-J
*Nitrate Reducing Reagent	*V-6279-C
Spoon, 0.1 g, plastic	0699
Test Tube, 2.5-5-10 mL, plastic, w/cap	0106
Dispenser Cap	0692
Octa-Slide 2 Viewer	1101
Nitrate Nitrogen Octa-Slide 2 Bar, 0.25-10.0 ppm	3109 -01



*Reagent is a potential health hazard. **READ SDS:**

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To order individual reagents or test kit components, use the specified code number.

NOTE: Place Dispenser Cap [0692] on *Mixed Acid Reagent [V-6278]. Save this cap for refill reagents.

1



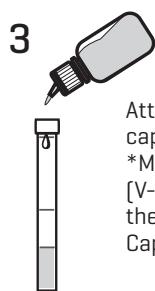
Insert Nitrate-Nitrogen Octa-Slide 2 Bar [3109-01] into Octa-Slide2 Viewer [1101].

2



Fill a test tube [0106] to the 2.5 mL line with the water sample.

3



Attach dispenser cap [0692] to the *Mixed Acid Reagent [V-6278]. Fill tube to the 5mL line. Cap and mix.

4



Wait 2 minutes.

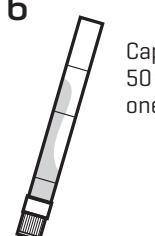


5



Use the 0.1g spoon [0699] to add 0.1g of *Nitrate Reducing Reagent [V-6279].

6



Cap and invert 50-60 times for one minute.

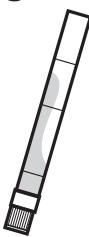
7



Wait 10 minutes.

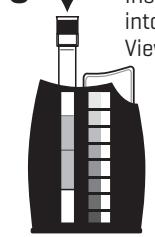


8



Cap and invert one time before inserting test tube into Octa-Slide2 Viewer [1101]. Hold the Viewer so that non-direct light enters through the back.

9



Insert test tube into Octa-Slide2 Viewer [1101].

10

Match sample color to color standard. Record results as ppm Nitrate Nitrogen [$\text{NO}_3\text{-N}$].

Conversion: $\text{ppm Nitrate-N} [\text{NO}_3\text{-N}] \times 4.4 = \text{ppm Nitrate} [\text{NO}_3]$

Nitrite Nitrogen

DESCRIPTION

CODE

*Mixed Acid Reagent	*V-6278-J
*Color Developing Reagent	*V-6281-D
Spoon, 0.1 g, plastic	0699
Test Tube, plastic, w/cap	0106
Dispenser Cap	0692
Octa-Slide 2 Viewer	1101
Nitrite Nitrogen Octa-Slide 2 Bar, 0.05-0.8 ppm	3437-01



*Reagent is a potential health hazard. **READ SDS:**

lamotte.com. **Emergency information:**

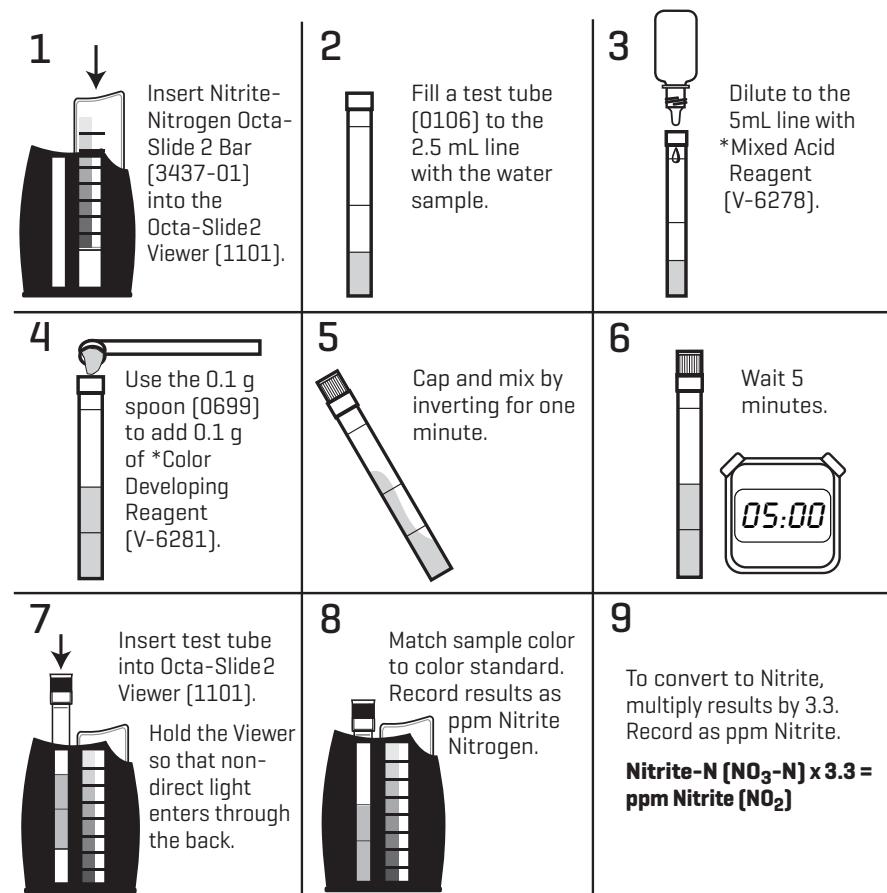
Chem-Tel USA 1-800-255-3924

Int'l, call collect, 813-248-0585



To order individual reagents or test kit components, use the specified code number.

NOTE: Place Dispenser Cap [0692] on *Mixed Acid Reagent [V-6278-J]. Save this cap for refill reagents.



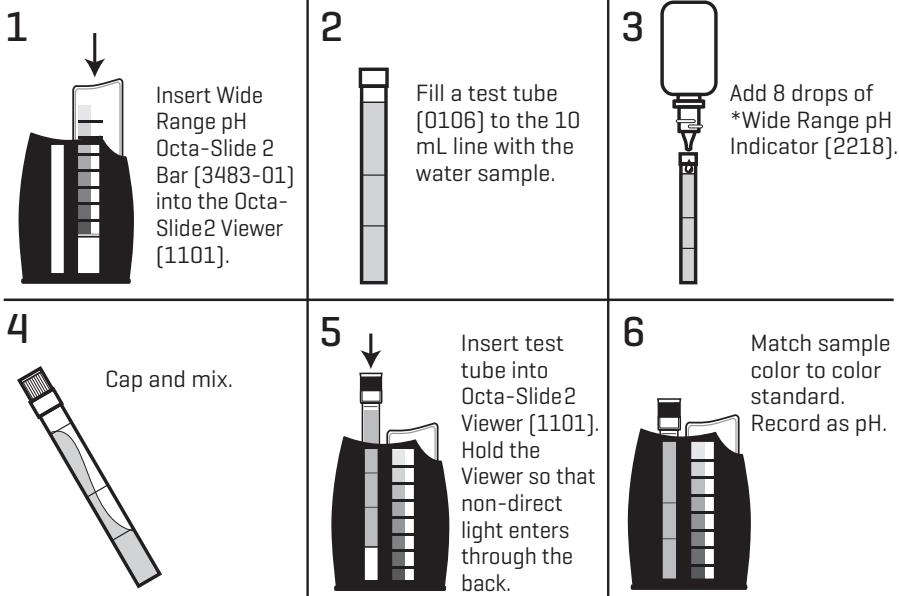
DESCRIPTION	CODE
*Wide Range Indicator	*2218-G
Test Tube, plastic, w/cap	0106
Octa-Slide 2 Viewer	1101
Wide Range pH Octa-Slide 2 Bar, 5.0-10.0	3483-01



*Reagent is a potential health hazard. **READ SDS:**
lamotte.com. **Emergency information:**
 Chem-Tel USA 1-800-255-3924
 Int'l, call collect, 813-248-0585



To order individual reagents or test kit components, use the specified code number.



Salinity

DESCRIPTION	CODE
*Salinity Indicator Reagent A	*7460-E
*Salinity Titration Reagent B	*7461-H
Demineralizer Bottle	1151
Test Tube, 5-10-12.9-15-20-25 mL, glass, w/cap	0608
Direct Reading Titrator, 0-20 Range	0378
Direct Reading Titrator, 0-1.0 Range	0376



*Reagent is a potential health hazard. **READ SDS:**
lamotte.com. **Emergency information:**
Chem-Tel USA 1-800-255-3924
Int'l, call collect, 813-248-0585



To order individual reagents or test kit components, use the specified code number.

Demineralizer Bottle (Code 1151)

The Demineralizer Bottle will be used to treat your salinity sample before titrating. It is partially filled with an ion exchange resin containing an indicator to show when the exchange resin has been exhausted. The indicator will change from dark green to yellow amber at which point the resin should be replaced.

Instructions For Use

1. Remove cap and fill bottle with water to be demineralized.
2. Recap, make sure spout is closed, and shake vigorously for 30 seconds.
3. Open spout, invert bottle, and gently squeeze to dispense the demineralized water.
4. This is your salinity titration sample.

Care and Storage

1. Do not add sample water above 100°F to demineralizer bottle.
2. Store bottle filled with enough water to cover resin completely.

The Titrator is calibrated in terms of Salinity expressed as ppt Salinity. Each minor division on the Titrator scale equals 0.4 ppt Salinity.

SALINITY TEST PROCEDURE

1

Fill the test tube [0608] to the 10 mL line with the treated water sample.



2

Fill the 1.0 mL Direct Reading Titrator [0376] to the 0 mark with sample water. Wipe off excess water.



3

Dispense 0.5 mL of sample water into test tube by depressing plunger until tip is at 0.5 mark. Discard remaining sample in Titrator.



4

Add 3 drops of *Salinity Indicator Reagent A [7460] to test tube.



5

Cap and gently swirl to mix. Sample will turn yellow.



6

Fill Direct Reading Titrator [0378] with *Salinity Titration Reagent B [7461].



7

Insert the Titrator into the center hole of the test tube cap.



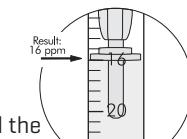
8

While gently swirling the tube, press the plunger to add Salinity Titration Reagent B until yellow color changes to pink-brown.



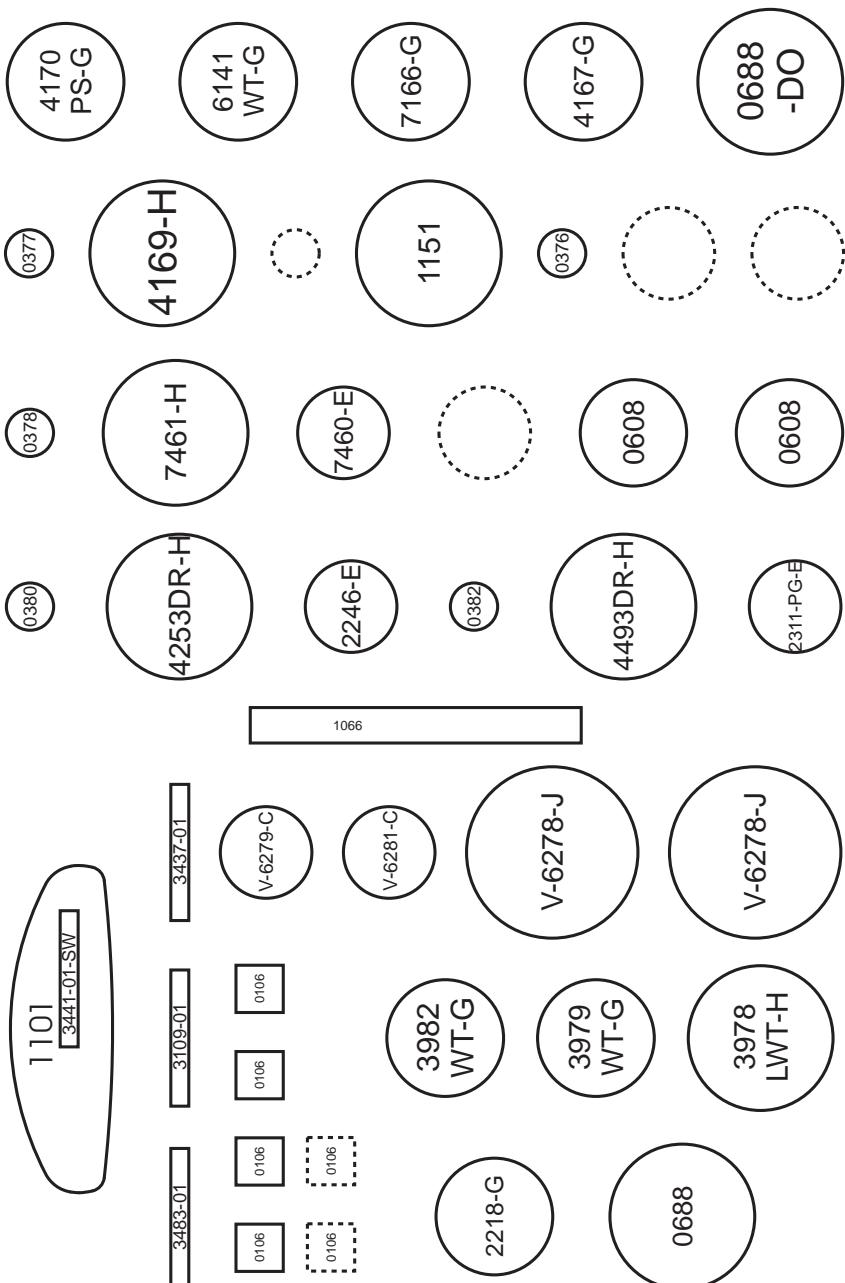
9

Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record as ppt salinity.



Note: Each Titration Division = 0.4 ppt Salinity

3635-05



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