



1200

COLORIMETER

.....



**Instruction
MANUAL**



LaMOTTE COMPANY

PO Box 329 • Chestertown • Maryland • 21620 • USA

800-344-3100 • 410-778-3100 • 410-778-3101
fax 410-778-6394 • www.lamotte.com

TABLE OF CONTENTS

GENERAL INFORMATION

Packaging and Delivery	4
General Precautions	4
Safety Precautions	4
Limits of Liability	4
Specifications	5
Parts & Accessories	6
EPA Compliance	7
Warranty	7
CE Statement	7

CHEMICAL TESTING

Water Sampling for Chemical Analysis	8-9
Filtration	9
An Introduction To Colorimetric Analysis.	10-11
Reagent Blank	11
Colorimeter Tubes	11
Sample Dilution Techniques & Volumetric Measurement.	12
Interferences.	13
Stray Light Interference	13

GENERAL OPERATING INFORMATION

Overview.	14-15
The Keypad and Display	16
Testing Tips	17

CALIBRATION PROCEDURE 18-19

ANALYSIS PROCEDURE 20-21

AVAILABLE TEST KITS 22

TROUBLESHOOTING GUIDE 23

RS232 PORT. 24

MAINTENANCE OF THE 1200

.	25
Replacing the Battery	25
Repairs.	25

GENERAL INFORMATION

PACKAGING & DELIVERY

Experienced packaging personnel at LaMotte Company assure adequate protection against normal hazards encountered in transportation of shipments. After the product leaves the manufacturer, all responsibility for safe delivery is assured by the transportation company. Damage claims must be filed immediately with the transportation company to receive compensation for damaged goods.

Should it be necessary to return the instrument for repair or servicing, pack the instrument carefully in a suitable container with adequate packing material. A return authorization number must be obtained from LaMotte Company by calling 1-800-344-3100 or faxing 1-410-778-6394. Attach a letter with the authorization number to the shipping carton which describes the reason for the return. This information will enable the service department to make the required repairs more efficiently.

GENERAL PRECAUTIONS

Read the instruction manual before attempting to set up or operate this instrument. Failure to do so could result in personal injury or damage to the instrument.



The 1200 Colorimeter should not be stored or used in a wet or corrosive environment. Care should be taken to prevent water from wet colorimeter tubes from entering the colorimeter light chamber.

NEVER PUT WET TUBES IN THE COLORIMETER.

SAFETY PRECAUTIONS

Read the label on all reagent containers. Some labels include precautionary notices and first aid information. Certain reagents are considered hazardous substances and are designated with a * in the instruction manual. Material Safety Data Sheets (MSDS) are supplied for these reagents. Read accompanying MSDS before using these reagents. Additional emergency information for all LaMotte reagents is available 24 hours a day from the Poison Control Center listed in the front of the phone book. Be prepared to supply the name and four digit LaMotte code number found on the container label or at the top of the MSDS. LaMotte reagents are registered with POISONDEX, a computerized poison control information system available to all local poison control centers.

LIMITS OF LIABILITY

Under no circumstances shall LaMotte Company be liable for loss of life, property, profits, or other damages incurred through the use or misuse of their products.

SPECIFICATIONS

Instrument Type	Single wavelength, direct reading colorimeter
Measurement Wavelengths:	420 nm, 460 nm, 510 nm, 530 nm, 570 nm or 605 nm
Readable Resolution:	Determined by test factor
Photometric Precision:	±0.001 Absorbance Unit
Range:	0 - 2.00 absorbance units
Display:	3 ½ digits
Response Time:	2 seconds
Warm-up Time:	Not required
Lamp:	LED
Detector:	Silicon Photodiode
Sample:	10 mL in capped tube
Sample Chamber:	Accepts 25mm diameter flat-bottomed tubes (capped)
Power Source:	Battery Operation: 9 Volt Alkaline
Line Operation:	120V/60Hz, 220V/50Hz, with available adapter
Size (L X W X H):	8.5 x 16.2 x 6.7 cm, 3.4 X 6.4 X 2.6 inches
Shipping Weight:	11 oz (312 g) meter only
Serial Interface:	RS232, 8 pin mDIN, 9600b, 8, 1, n

PARTS & ACCESSORIES

Included in the Model 1200 Colorimeter Kit :

1200 Colorimeter

Colorimeter tubes, set of 6

Water Sample Collecting Bottle

Reagent System

Optional Accessories

AC Adapter, 110V/60Hz	Code 1773
-----------------------	-----------

AC Adapter, 220V/50Hz	Code 1774
-----------------------	-----------

Colorimeter Tubes, set of 6	Code 0290-6
-----------------------------	-------------

EPA COMPLIANCE

The 1200 Chlorine Colorimeter is an EPA Accepted instrument. EPA Accepted means that the instrument meets requirements for colorimeters as found in test procedures that are approved for the National Primary Drinking Water Regulations (NPDWR) or National Pollutant Discharge Elimination Systems (NPDES) compliance monitoring programs. EPA Accepted instruments may be used with approved test procedures without additional approval.



WARRANTY

This instrument is guaranteed to be free from defects in material and workmanship for one year from original purchase date. If within that time the instrument is found to be defective, it will be repaired without charge except for transportation costs. The guarantee does not cover batteries.



This guarantee is void under the following circumstances: operator negligence, improper application, and unauthorized servicing.

CE COMPLIANCE

The 1200 Colorimeter has been independently tested and has earned the European CE Mark of Compliance for electromagnetic compatibility and safety.



DECLARATION OF CONFORMITY

Application of Council Directives:	89/336/EEC
Standards to which Conformity Declared:	EN55022, EN50082-1, EN60950
Manufacturer's Name:	LaMotte Company
Manufacturer's Address:	802 Washington Avenue PO Box 329 Chestertown, MD 21620
Importer's Name:	Reagecon Diagnostics Ltd
Importer's Address:	13 A/D Shannon Free Zone Shannon, Co. Clare, Ireland
Type of Equipment:	Water Quality Meters
Model Number:	2020/1200
Year of Manufacture:	1997

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directives and Standards.

Chestertown, Maryland _____

Place

3-19-97 _____

Date

James K. Thurnbauer

Signature

James K. Thurnbauer _____

Name

V.E. Director of Research & Development
Position

NOTE: The device complies to the product specifications for the Low Voltage Directive when furnished with the 220V A/C Adapter (Code 1774).

CHEMICAL TESTING

WATER SAMPLING FOR CHEMICAL ANALYSIS

Taking Representative Samples

The underlying factor to be considered for any type of water sampling is whether or not the sample is truly representative of the source. To properly collect a representative sample:

- u Sample as frequently as possible.
- u Collect a large sample or at least enough to conduct whatever tests are necessary.
- u Make a composite sample for the same sampling area.
- u Handle the sample in such a way as to prevent deterioration or contamination before the analysis is performed.
- u Perform analysis for dissolved gases such as dissolved oxygen, carbon dioxide, and hydrogen sulfide immediately at the site of sampling. These factors, as well as samples for pH, cannot be stored for later examination.
- u Make a list of conditions or observations which may affect the sample. Other considerations for taking representative samples are dependent upon the source of the sample. Taking samples from surface waters involves different considerations than taking samples from impounded and sub-surface waters.

Sampling of Open Water Systems

Surface waters, such as those found in streams and rivers, are usually well mixed. The sample should be taken downstream from any tributary, industrial or sewage pollution source. For comparison purposes samples may be taken upstream and at the source of the pollution before mixing.

In ponds, lakes, and reservoirs with restricted flow, it is necessary to collect a number of samples in a cross section of the body of water, and where possible composite samples should be made to ensure representative samples.

To collect samples from surface waters, select a suitable plastic container with a tight fitting screw cap. Rinse the container several times with the sample to be tested, then immerse the container below the surface until it is filled to overflowing and replace the cap. If the sample is not to be tested immediately, pour a small part of the sample out and reseal. This will allow for any expansion. Any condition which might affect the sample should be listed.

Sub-surface sampling is required to obtain a vertical profile of streams, lakes, ponds, and reservoirs at specific depths. This type of sampling requires more sophisticated sampling equipment.

For dissolved oxygen studies, or for tests requiring small sample sizes, a Water Sample Bottle (LaMotte Code 1060) will serve as a subsurface or in-depth sampler. This weighted device is lowered to the sampling depth and allowed to rest at this depth for a few minutes. The water percolates into the sample chamber displacing the air which bubbles to the surface. When the bubbles cease to rise, the device has flushed itself approximately five times and it may be raised to the surface for examination. The inner chamber of the sampling device is lifted out and portions of the water sample are carefully dispensed for subsequent chemical analysis.

A Snap-Plunger Water Sampler (LaMotte Code 1077) is another “in-depth” sampling device which is designed to collect large samples which can be used for a multitude of tests. Basically, this collection apparatus is a hollow cylinder with a spring loaded plunger attached to each end. The device is cocked above the surface of the water and lowered to the desired depth. A weighted messenger is sent down the calibrated line to trip the closing mechanism and the plungers seal the sample from mixing with intermediate layers as it is brought to the surface. A special drain outlet is provided to draw off samples for chemical analysis.

Sampling of Closed System

To obtain representative samples from confined water systems, such as pipe lines, tanks, vats, filters, water softeners, evaporators and condensers, different considerations are required because of chemical changes which occur between the inlet and outlet water. One must have a basic understanding of the type of chemical changes which occur for the type of equipment used. Also, consideration should be given to the rate of passage and retaining time for the process water.

Temperature changes play an important part in deciding exactly what test should be performed. Process water should be allowed to come to room temperature, 20–25°C, before conducting any tests.

When drawing off samples from an outlet pipe such as a tap, allow sample to run for several minutes, rinsing the container several times before taking the final sample. Avoid splashing and introduction of any contaminating material.

FILTRATION

.....

When testing natural waters that contain significant turbidity due to suspended solids and algae, filtration is an option. Reagent systems, whether EPA, Standard Methods, LaMotte or any others, will generally only determine dissolved constituents. Both EPA and Standard Methods suggest filtration through a 0.45 micron filter membrane, to remove turbidity, for the determination of dissolved constituents.** To test for total constituents, organically bound and suspended or colloidal materials, a rigorous high temperature acid digestion is necessary.

**LaMotte offers a filtering apparatus: Syringe Assembly (Code 1050) and Membrane Filters, 0.45 micron (Code 1103).

AN INTRODUCTION TO COLORIMETRIC ANALYSIS

Most test substances in water are colorless and undetectable to the human eye. To test for their presence we must find a way to “see” them. The LaMotte colorimeter can be used to measure any test substance that is itself colored or can be reacted to produce a color. In fact a simple definition of colorimetry is “the measurement of color” and a colorimetric method is “any technique used to evaluate an unknown color in reference to known colors”. In a colorimetric chemical test, the intensity of the color from the reaction must be proportional to the concentration of the substance being tested. Some reactions have limitations or variances inherent to them that may give misleading results. Many such interferences are discussed with each particular test instruction. In the most basic colorimetric method the reacted test sample is visually compared to a known color standard. However, accurate and reproducible results are limited by the eyesight of the analyst, inconsistencies in the light sources, and the fading of color standards.

To avoid these sources of error, a colorimeter can be used to photoelectrically measure the amount of colored light absorbed by a colored sample in reference to a colorless sample (blank).

White light is made up of many different colors or wavelengths of light. A colored sample typically absorbs only one color or one band of wavelengths from the white light. Only a small difference would be measured between white light before it passes through a colored sample versus after it passes through a colored sample. The reason for this is that the one color absorbed by the sample is only a small portion of the total amount of light passing through the sample. However, if we could select only that one color or band of wavelengths of light to which the test sample is most sensitive, we would see a large difference between the light before it passes through the sample and after it passes through the sample.

A colorimeter passes a white light beam through an optical filter which transmits only one particular color or band of wavelengths of light to the photodetector where it is measured. The difference in the amount of colored light transmitted by a colorless sample (blank) and the amount of colored light transmitted by a colored sample is a measurement of the amount of colored light absorbed by the sample. In most colorimetric tests the amount of colored light absorbed is directly proportional to the concentration of the test factor producing the color and the path length through the sample. However, for some tests the amount of colored light absorbed is inversely proportional to the concentration.

The choice of the correct optical filter and therefore the correct color or wavelength of light is important. It is interesting to note that the filter that gives the most sensitive calibration for a test factor is the complementary color of the test sample. For example, the Nitrate-Nitrogen test produces a pink color proportional to the nitrate concentration in the sample (the greater the nitrate concentration, the darker the pink color). A green filter is used since a pinkish-red solution absorbs mostly green light.

The 1200 Colorimeter has been specially calibrated to read test results directly in parts per million (ppm) of the test factor. The sensitivity of the response has been maximized by using a specific, complementary light source for each test.

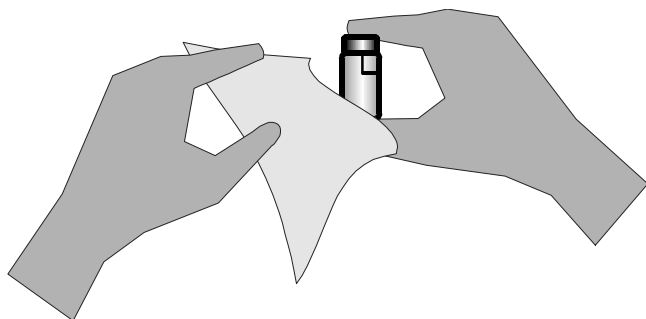
REAGENT BLANK

Some tests will provide greater accuracy if a reagent blank is determined, to compensate for any color or turbidity resulting from the reagents themselves. A reagent blank is performed by running the test procedure on 10 mL of demineralized water. Use sample water to zero the meter. Insert the reagent blank in the colorimeter chamber and select READ. Note result of reagent blank. Perform the tests on the unknown as described. Subtract results of reagent blank from all subsequent test results.

COLORIMETER TUBES

The handling of the colorimeter tubes is of utmost importance. Scratches, fingerprints and water droplets on the tube or inside the light chamber can cause stray light interference leading to inaccurate results. It is imperative that the tubes and light chamber be clean and dry. The glassware must be clean and defect-free. Scratches and abrasions will permanently affect the accuracy of the readings. Tubes can be acid washed periodically. After a tube has been filled and capped, it should be held by the cap and the outside surface should be wiped with a clean, lint-free absorbent cloth until it is dry and smudge-free. Handling the tube only by the cap will avoid problems from fingerprints. Always set the clean tube aside on a clean surface that will not contaminate the tube.

Variability in the geometry and quality of the glassware is the predominate cause of variability in results. Orientation of the tube in the chamber will greatly affect the test results. To obtain the most accurate results, the tubes must be positioned so that the index line on the tube is aligned with the arrow-shaped index mark molded into the housing in front of the light chamber. This will ensure that the most accurate results are obtained.



SAMPLE DILUTION TECHNIQUES & VOLUMETRIC MEASUREMENTS

If a test result using the 1200 Colorimeter gives an *ERR* (over range) message, the sample must be diluted. Then the test should be repeated to obtain a reading which is in the concentration range for the test. (Note: This is not true for colorimetric determination of pH.)

Example:

Measure 5 mL of the water sample into a graduated cylinder. Add demineralized water until the cylinder is filled to the 10 mL line. The sample has been diluted by one-half, and the dilution factor is therefore 2. Perform the test procedure, then multiply the resulting concentration by 2 to obtain the test result.

The following table gives quick reference guidelines on dilutions of various proportions. All dilutions are based on a 10 mL volume, so several dilutions will require small volumes of the water sample. Graduated pipets should be used for all dilutions.

Size of Sample	Deionized Water to Bring Volume to 10 mL	Multiplication Factor
10 mL	0 mL	1
5 mL	5 mL	2
2.5 mL	7.5 mL	4
1 mL	9 mL	10
0.5 mL	9.5 mL	20

If the above glassware is not available, dilutions can be made with the colorimeter tube. Fill the colorimeter tube to the 10 mL line with the sample then transfer it to another container. Add 10 mL volumes of demineralized water to the container and mix. Transfer back 10 mL of the diluted sample to the colorimeter tube and follow the test procedure. Continue diluting and testing until a reading, which is in the concentration range for the test, is obtained. Be sure to multiply the concentration found by the dilution factor (the number of total 10 mL volumes used).

Example:

10 mL of sample is diluted with three 10 mL volumes of demineralized water; the dilution factor is four.

INTERFERENCES

LaMotte reagent systems are designed to minimize most common interferences. Each individual test discusses interferences unique to that test. Be aware of possible interferences in the water being tested.

The reagent systems also contain buffers to adjust the water sample to the ideal pH for the reaction. It is possible that the buffer capacity of the water sample may exceed the buffer capacity of the reagent system and the ideal pH will not be obtained. If this is suspected, measure the pH of a reacted distilled water reagent blank using a pH meter. This is the ideal pH for the test. Measure the pH of a reacted water sample using the pH meter. If the pH is significantly different from the ideal value, the pH of the sample should be adjusted before testing.

Interferences due to high concentration of the substance being tested, can be overcome by sample dilution (see page 12).

STRAY LIGHT INTERFERENCE

Stray light interference can be minimized by always zeroing the meter and reading a sample with the lid closed. Turbidimetric determinations (i.e. sulfate) are most likely to exhibit a stray light interference. Colorimetric tests are less likely to have this problem unless the samples are turbid. If sample turbidity is causing a stray light interference, filtration may be needed.

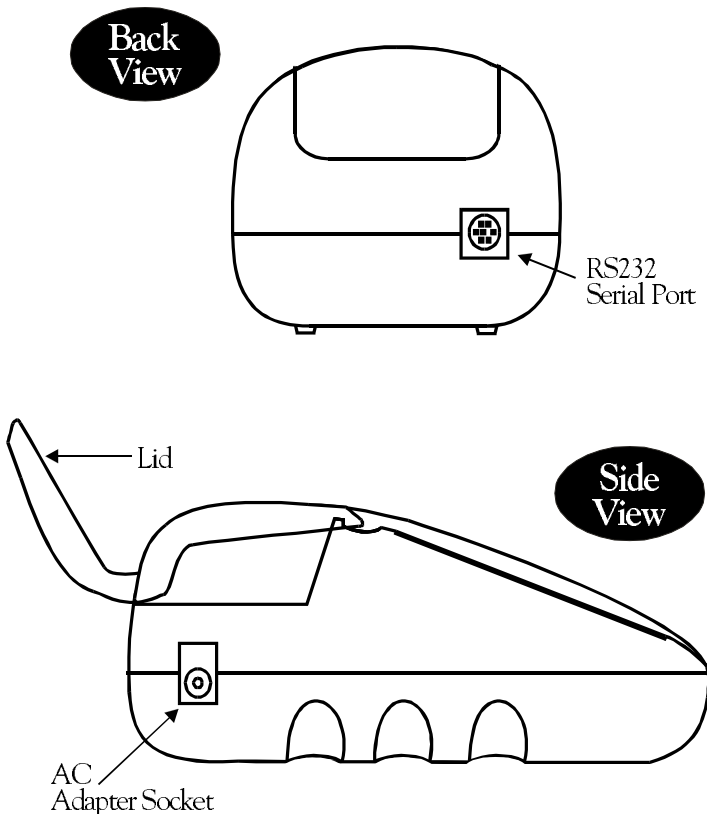
GENERAL OPERATING INFORMATION

OVERVIEW

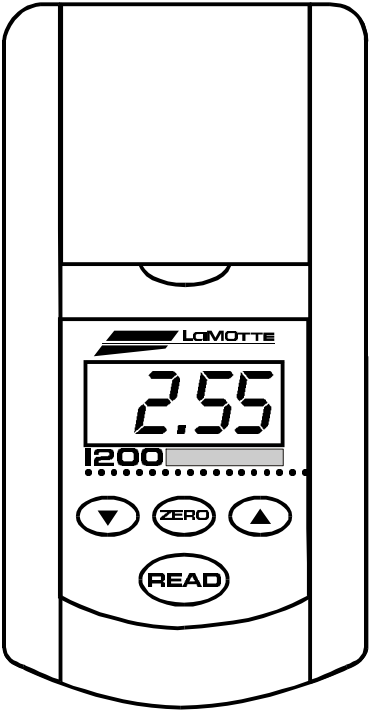
The Model 1200 Colorimeter is a portable, microprocessor controlled, direct reading colorimeter. The microprocessor enables factory programmed calibrations to optimally match non-linear curves. The auto zero feature eliminates the need to dial in the zero manually. A sealed keypad controls the operation. The large display presents measurements in ppm concentration and indicates low battery warnings. The 1200 will turn off automatically after 5 minutes to prolong battery life. This will not affect the user calibration and the meter will not have to be re-zeroed. The calibration and the last zero reading will be stored in memory.

The 1200 is supplied with a 9 volt alkaline battery. An optional AC power adapter is available.

A RS-232 serial port on the back of the meter allows an interface of the colorimeter with a computer for real time data acquisition and data storage using the PC. This port also allows an interface with a RS-232 serial printer.



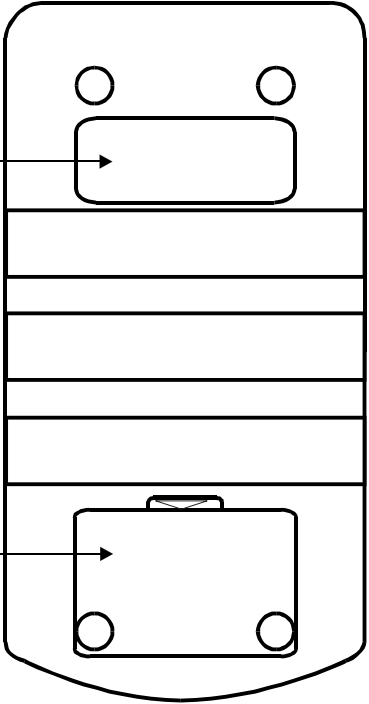
**Top
View**



**Bottom
View**

Serial Number

Battery Compartment



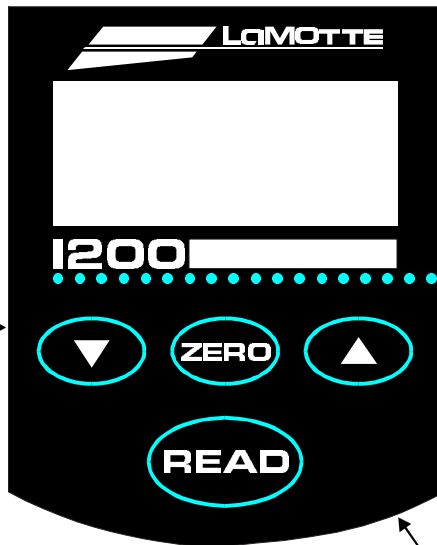
THE KEYPAD and DISPLAY

The DISPLAY:

- When the **READ** button is first pushed, a number will be briefly displayed that indicates the software version number.
- A walking dash (-) will be displayed when reading is taking place.
- *ELR* (blank) will be displayed after the **ZERO** button has been pushed and held for 2 seconds. If the **ZERO** button is released while *ELR* is displayed, a zero or blank reading will be taken.
- *CLL* (calibrate) will be displayed after the zero button has been pushed and held for 5 seconds. If the **ZERO** button is released while *CLL* is displayed, the calibration mode will be entered as indicated by a flashing display.
- *OFF* will be displayed after the **READ** button has been held down for 2 seconds. The meter will turn off when the button is released.
- *E_{r1}* will be displayed when the battery voltage is very low.
- *E_{r2}* will be displayed when concentration is over range.
- *E_{r3}* will be displayed when the bulb has burned out.
- **BAT** will be displayed when the battery voltage is getting low. Readings are reliable. Replace battery as soon as possible.

See
**TROUBLE
SHOOTING
GUIDE**
page 23

The DOWN ▼
ARROW will
DECREASE
the
numerical value of
the display.



The UP ▲
ARROW will
INCREASE
the
numerical
value of the
display.

The **READ** button is used to turn the meter ON and to take readings. Pressing the button for 2 seconds will cause the meter to display OFF. Releasing the button when OFF is displayed turns the meter OFF.

The **ZERO** button is used to zero the meter and for calibration procedures.

TESTING TIPS

1.



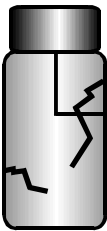
Samples should be collected in a clean glass or polyethylene container.

2.

Samples should be analyzed as soon as possible after collection.



3.



Discard tubes that are badly scratched.

4.



Observe the shelf-life recommendations for reagents.

5.



Protect reagents and components from extreme heat and cold.

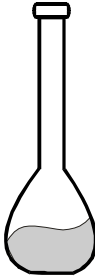
6.

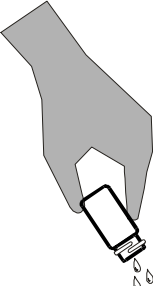


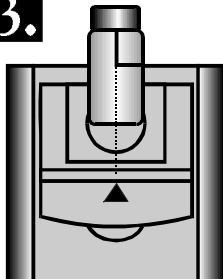
Never put wet tubes in colorimeter.

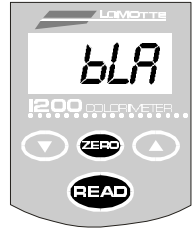
CALIBRATION PROCEDURE


The 1200 has been pre-calibrated. Recalibration of the 1200 by the user is not required. However, a procedure to standardize the calibration (shown below) should be performed to obtain the most accurate readings.

1.  Prepare standard solutions to be tested.

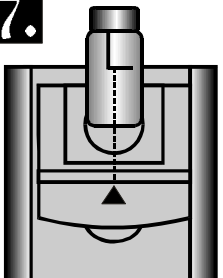
2.  Rinse and fill a colorimeter tube (0290) to the 10 mL line with standard solution. Cap and wipe dry.


3.  Insert the tube into the chamber, being sure to align the index line with the arrow on the meter. Close the lid. This tube is the blank or zero.

4.  Push the **READ** button to turn the meter on. Press the **ZERO** button and hold it for 2 seconds until **bLr** is displayed. Release the button to take a zero reading (0 ppm).

5.  React a standard that is in the range of the reagent system, and similar to the expected range of the sample. Follow the individual test procedure.

6.  Wipe the tube clean with a lint-free cloth.

7.  Insert the tube into the chamber, being sure to align the index line with the arrow on the meter. Close the lid.

8.  Push the **READ** button. If the displayed value is not the same as the value of the reacted standard (within the specification limits), continue with the calibration procedure.

9.

Push and hold the **ZERO** button for 5 seconds until **CAL** is displayed. Release the button. The display will flash. Adjust the display with the **▲** and **▼** buttons until the value of the standard is displayed.

10.


Push the **ZERO** button again to memorize the calibration. The 1200 display will stop flashing. Calibration is complete.

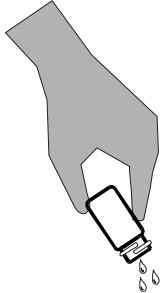
11.

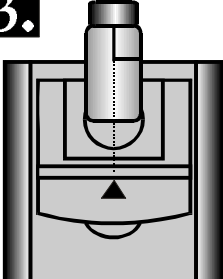
Turn the unit off by holding the **READ** button down for at least 2 seconds, or proceed to measure the test samples following the procedure on page 20.


- u The 1200 can be calibrated with two prepared standards. The concentrations of the standards should be chosen from the low and high ends of the range of the meter. The low standard must be less than 5% of over range. To calibrate the meter with two standards, follow steps 1-11 of the calibration procedure for one reacted sample. Repeat steps 1-11 of the calibration procedure with the second reacted standard.
- u The calibration procedure should be followed as often as required by regulations and laws for compliance monitoring.
- u To reset the calibration to the factory calibration: with the meter off, hold down the **t** and push **READ**. The meter will turn on and the calibration will be reset.


ANALYSIS PROCEDURE

1.  Fill the Water Sample Collecting Bottle (0688) with sample water. This will be used to dispense sample water for the tests.

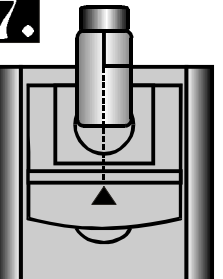
2.  Rinse and fill a colorimeter tube (0290) to the 10 mL line with sample water. Cap and wipe dry.


3.  Insert the tube into the chamber, being sure to align the index line with the arrow on the meter. Close the lid. This tube is the blank or zero.

4.  Push the **READ** button to turn the meter on. Press the **ZERO** button and hold it for 2 seconds until **bLA** is displayed. Release the button to take a zero reading (0 ppm).

5.  React a sample following the individual test procedure.

6.  Wipe the tube clean with a lint-free cloth.

7.  Insert the tube into the chamber, being sure to align the index line with the arrow on the meter. Close the lid.

8.  Push the **READ** button. The concentration in ppm will be displayed within 2 seconds.

9.



The 1200 will turn off automatically 5 minutes after the last button push. To turn the meter off manually, hold the **READ** button for 2 seconds. Release the button when *OFF* is displayed.

Note

If *Er2* is displayed, the concentration is over range. The sample must be diluted and re-tested. See page 12.

AVAILABLE TEST KITS

TEST FACTOR	ORDER CODE/MODEL	RANGE (PPM)	DETECTION LIMIT	TEST METHOD (# OF REAGENTS)
Ammonia Nitrogen	3680-01 DC 1200-NH	0-5.00	0.05	Nessler (2)
Bromine	3672-01 DC 1200-BR	0-7.00	0.05	DPD Tablets (1)
Chlorine (Free & Total)	3670-01 DC1200-CL	0-4.00	0.05	DPD Tablets (2)
Chlorine (Free & Total)	3670-01-LI DC1200-CL-LI	0-4.00	0.05	DPD Liquid (3)
Chlorine Dioxide	3671-01 DC1200-CLO	0-7.00	0.05	DPD with Glycine Solution (2)
Copper	3673-01 DC1200-CO	0-8.00	0.03	Diethyldithiocarbamate (1)
Fluoride	3674-01 DC1200-FL	0-2.00	0.03	Aliizarin-Zirconyl (2)
Iron	3681-01 DC1200-FE	0-4.00	0.25	1-10 Phenanthroline (2)
Manganese	3682-01 DC1200-MN	0-0.90	0.01	PAN (3)
Molybdenum	3676-01 DC1200-MO	0-50.0	0.5	Thioglycolate (3)
Nitrate Nitrogen	3677-01 DC1200-NA	0-3.00	0.05	Cadmium Reduction (2)
Ozone	3678-01 DC1200-OZ	0-0.40	0.04	Indigo Blue (3)
Phosphate	3679-01 DC1200-PLR	0-3.00	0.07	Ascorbic Acid (2)
Sulfate	3683-01 DC1200-SU	0-100.0	1.0	Barium Chloride (1)

Test kit includes 1200 meter and reagent system.

TROUBLESHOOTING

PROBLEM	CHECK	ACTION
Meter won't turn on	Battery	Replace
	AC Adapter	Plug in
	AC Wall Outlet	Verify power source
	Contact LaMotte for Return Authorization	Return to LaMotte for repair
Suspect Calibration	Check calibration with standards	Use new standards
	Verify standard concentration	Run test with alternative reagent system
	Verify with another meter	Check other meter calibrations
	Check tube alignment	Re-align tube
	Check sample tubes for dirt and scratches	Check, clean and/or replace if necessary
	Check to see if internal meter components are wet	Always dry tubes before inserting. Examine chamber for visible moisture.
	Contact LaMotte for Return Authorization	Return for calibration check
<i>Er1</i>	Very low battery	Change battery
<i>Er2</i>	Over range	Dilute sample
<i>Er3</i>	Burnt out bulb	Call LaMotte
BAT	Low battery	Change battery

RS232 PORT

The 1200 Colorimeter may be interfaced with any IBM compatible computer using an Interface cable (Code 27359-04). The meter may also be interfaced with an RS-232 serial printer, using an appropriate cable and setting the printer configuration to the output below.

Output: RS232 compatible, asynchronous serial, 9600 baud, no parity, 8 data bits, 1 stop bit.

Computer Connection: RS232-(27359-04) interface connection, 8 pin mDIN/9 pin F D-submin.

Pin out:

5	RS-232 TxD
3	RS-232 RxD
4, 6, 8	Digital ground

MAINTENANCE

REPLACING THE BATTERY

The LaMotte 1200 uses a standard 9-volt alkaline battery that is available worldwide. The battery compartment is located on the bottom of the case. To replace the battery:

1. Open the battery compartment lid.
2. Remove the battery and disconnect the battery from the polarized plug.
3. Carefully connect the new battery to the polarized plug and insert it into the compartment.
4. Close the battery compartment lid.

REPAIRS

If it is necessary to return the instrument for repair, telephone LaMotte Company at 1-800-344-3100 or fax 1-410-778-6394 for a return authorization number.



LaMOTTE COMPANY

PO Box 329 • Chestertown • Maryland • 21620 • USA

800-344-3100 • 410-778-3100 • 410-778-3101
fax 410-778-6394 • www.lamotte.com