



2020t/i BLE

Turbidity Meter
Medidor de Turbidez
Turbidimètre



Use only Code 0260 tubes.



Utilice únicamente
tubos con código
0260.

Utilisez uniquement
des éprouvettes
code 0260.



Code/Código 1974-T/1974-I

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Refer to the **Quick Start Guide** for simplified Calibration and Analysis procedures.
 Refer to the **Testing Guide** for detailed Calibration and Analysis procedures for improving the accuracy of low range turbidity measurements.

GENERAL INFORMATION

■ PACKAGING AND DELIVERY

Experienced packaging personnel at LaMotte Company assure adequate protection against normal hazards encountered in transportation of shipments.

After the product leaves LaMotte Company, 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.

■ GENERAL PRECAUTIONS

READ THE INSTRUCTION MANUAL BEFORE ATTEMPTING TO SETUP OR OPERATE THE METER. Failure to do so could result in personal injury or damage to the meter. The meter should not be used or stored in a wet or corrosive environment. Care should be taken to prevent water from wet tubes from entering the meter chamber.

■ NEVER PUT WET TUBES IN THE METER.

■ SAFETY PRECAUTIONS

*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



Ensure that the protection provided by this equipment is not impaired. Do not install or use this equipment in a manner that is not indicated in this manual.

■ 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 - 2020t/j BLE

Mode	Nephelometric	Ratiometric	Attenuation
Unit of Measure 2020t BLE	NTU, ASBC, EBC	NTU, NTRU, ASBC, EBC	NTU, AU, ASBC, EBC
Unit of Measure 2020i BLE	NTU, FNU, ASBC, EBC	NTU, FNUR, ASBC, EBC	NTU, FAU, ASBC, EBC
Range	0-100 NTU/FNU 0-1,750 ASBC 0-25 EBC	0-1,000 NTRU/FNUR 0-17,500 ASBC 0-250 EBC	0-2,000 AU/FAU 0-70,000 ASBC 0-1,000 EBC

Resolution	0–10.99 NTU/FNU: 0.01 NTU/FNU, 11.0–100.0 NTU/FNU: 0.1 NTU/FNU	0–10.99 NTRU/FNRU: 0.01 NTRU/FNRU, 11.0–109.9 NTRU/FNRU: 0.1 NTRU/FNRU, 110–1000 NTRU/FNRU: 1 NTRU/FNRU	0–2000 AU/FAU: 1 AU/FAU
Accuracy	0–2.5 NTU/FNU: ±0.05 NTU/FNU, 2.5–100 NTU/FNU: ±2%	0–2.5 NTRU/FNRU: ±0.05 NTRU/FNRU, 2.5–100 NTRU/FNRU: ±2%, 100–1000 NTRU/FNRU: ±3%	0–2000 AU/FAU: ±10 AU/FAU or 6% whichever is greater
Detection Limit	0.05 NTU/FNU	0.05 NTRU/FNRU	10 AU/FAU
Reproducibility	0.02 NTU/FNU or 1%	0.02 NTRU/FNRU or 1%	1%
Range Selection	Automatic		
Light Source	2020t BLE: Tungsten lamp 2300 °K ±50 °K, 2020i BLE: IR LED 860 nm ±10 nm, spectral bandwidth 50 nm		
Detector	2020t BLE: Photodiode, centered at 90° and 180°, maximum peak 400–600 nm 2020i BLE: Photodiode, centered at 90° and 180°		
Response Time	<2 seconds		
Signal Averaging	Yes		
Sample Chamber	Accepts 25 mm flat-bottomed test tubes		
Sample	10 mL in capped tube		
Display	Graphic Liquid Crystal Display with Backlight		
Software	Auto Shutoff: 5, 10, 30 min, disabled Calibration: Field adjustable, blank and 1 point Data Logging: 500 points		
Firmware	Internet updatable (New tests, new calibrations, etc.) USB connection to Windows® PC required.		
Languages	English, Spanish, French, Portuguese, Italian, Chinese, Japanese (Kana), Turkish		
Temperature	Operation: 0–50 °C; Storage: -40–60 °C		
Operation Humidity Range	0–90 % RH, non-condensing		
Altitude	Up to 2000 m		
Use	Indoor and outdoor		
Pollution Degree	2		
Auto Shut-off	5, 10, 30 min, disabled		
Power Source	USB wall adapter, USB computer connection or Lithium ion rechargeable battery		
Battery	Charge Life: Approximately 380 tests with backlight on to 1000 tests with backlight off. (Signal averaging disabled). Battery Life: Approximately 500 charges.		
Electrical Ratings	Rated voltage 5V  , Rated power of input current (1.0A) at mini-USB input port		
Data Logger	500 test results stored		
Waterproof	IP67 with USB port plug in place.		
Dimensions	[W x L x H] 8.84 x 19.05 x 6.35 cm; 3.5 x 7.5 x 2.2 inches		

Certifications	EZ-BLE™ PRoC™ Module	FCC (USA):	FCC ID: WAP200
	CYBLE-022001-00 RF Radio:	Industry Canada [IC] Certification	7922A-200
		CE [European R & TTE]:	2014/S3/EU
		MIC [Japan]:	005-101007
		KC [Korea]:	MSIP-CRMCyp-2001
	EMC	EU:	2014/53/EU EN 61326-1, EN 300 328
		UKCA	
		US:	FCC CFR 47 Part 15, subpart B
		CAN:	ICES-003
		AS/NSZ:	CSPR 22
Safety	EU:	EN 61010-1	
	AS/NSZ:	differences	
	US/Canadian:	UI/CSA 61010-1	
	RoHS	2011/65/EU + [EU] 2015/863	
Weight	362 g, 13 oz (meter only)		
USB Interface	mini B		

■ STATISTICAL & TECHNICAL DEFINITIONS RELATED TO PRODUCT SPECIFICATIONS

Method Detection Limit (MDL): “The method detection limit [MDL] is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.”¹ Note that, “As Dr. William Horwitz once stated, ‘In almost all cases when dealing with a limit of detection or limit of determination, the primary purpose of determining that limit is to stay away from it.’”²

Accuracy: Accuracy is the nearness of a measurement to the accepted or true value.³ The accuracy can be expressed as a range, about the true value, in which a measurement occurs [i.e. ±0.5 ppm]. It can also be expressed as the % recovery of a known amount of analyte in a determination of the analyte [i.e. 103.5 %].

Resolution: Resolution is the smallest discernible difference between any two measurements that can be made.⁴ For meters this is usually how many decimal places are displayed. [i.e. 0.01]. Note that the resolution may change with concentration or range. In some cases the resolution may be less than the smallest interval, if it is possible to make a reading that falls between calibration marks. A word of caution, that resolution has very little relationship to accuracy or precision. The resolution will always be less than the accuracy or precision but it is not a statistical measure of how well a method of analysis works. The resolution can be very, very good and the accuracy and precision can be very bad! This is not a useful measure of the performance of a test method.

Repeatability: Repeatability is the within-run precision.⁵ A run is a single data set, from setup to clean up. Generally, one run occurs on one day. However, for meter calibrations, a single calibration is considered a single run or data set, even though it may take 2 or 3 days.

Reproducibility: Reproducibility is the between-run precision.⁶

Detection Limit (DL): The detection limit [DL] for the 2020t/i BLE is defined as the minimum value or concentration that can be determined by the meter, which is greater than zero, independent of matrix, glassware, and other sample handling sources of error. It is the detection limit for the optical system of the meter.

¹ CFR 40, part 136, appendix B

² Statistics in Analytical Chemistry: Part 7 – A Review, D. Coleman and L Vanatta, American Laboratory, Sept 2003, P. 31.

³ Skoog, D.A., West, D. M., Fundamental of Analytical Chemistry, 2nd ed., Holt Rinehart and Winston, Inc, 1969, p. 26.

⁴ Statistics in Analytical Chemistry: Part 7 – A Review, D. Coleman and L Vanatta, American Laboratory, Sept 2003, P. 34.

⁵ Jeffery G. H., Basset J., Mendham J., Denney R. C., Vogel's Textbook of Quantitative Chemical Analysis, 5th ed., Longman Scientific & Technical, 1989, p. 130.

⁶ Jeffery G. H., Basset J., Mendham J., Denney R. C., Vogel's Textbook of Quantitative Chemical Analysis, 5th ed., Longman Scientific & Technical, 1989, p. 130

■ CONTENTS & ACCESSORIES

	2020t BLE Kit EPA Version/ Code 1974-T	2020i BLE Kit ISO Version/ Code 1974-I
Contents	Code	Code
2020t/i BLE Turbidimeter		
0 NTU Standard, 60 mL	1480	1480
1 NTU Standard, 60 mL	1441	
10 NTU/FNU Standard, 60 mL	1442	1447
100 FNU Standard, 60 mL		1444
Water Sample Bottle, 60 mL	0688	0688
Test Tubes, with Caps	0260 [6]	0260 [6]
Cable, USB	1720-01	1720-01
USB Wall Adapter	1721	1721
2020t/i BLE Manual	1974-BLE-MN	1974-BLE-MN
2020t/i BLE Quick Start Guide	1974-BL-QGE	1974-BLE-QG
2020t/i BLE Testing Guide	1974-BLE-TG	1974-BLE-TG

Warning: Only use the USB Cable [1720-01] that is supplied with the kit. Make no substitutions.

Accessories	
Code	Description
0260-6	Test tubes, with Caps
1446	1 FNU Standard, 60 mL [ISO]
1443	100 NTU Standard, 60 mL [EPA]
3-0038	Replacement Chamber
0943	Syringe, 60 mL, plastic
2-2097	Filters, 0.1 micron, Pack of 50
5-0132	Car Charger
5-0067	BLE Mobile Printer

A 4000 NTU Formazin standard that is compatible with the LaMotte 2020t/i BLE is available at www.gfschemicals.com.

■ EPA COMPLIANCE

The 2020t BLE meter meets or exceeds EPA design specifications for NPDWR and NPDES turbidity monitoring programs as specified by the USEPA method 180.1.

■ ISO COMPLIANCE

This 2020i BLE meter meets or exceeds ISO design criteria for quantitative methods of turbidity using optical turbidimeters as specified by ISO 7027.

■ COMPLIANCE

The meter has earned the European CE Mark and UKCA Mark of Compliance for electromagnetic compatibility and safety. The Declaration of Conformity for the 2020t/i BLE colorimeter is available at www.lamotte.com.

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.

Note: 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 interferences in which case the user will be required to correct the interference at his own expense. Protection provided within the system may be impaired if the device is used in a manner for which it is not intended.

■ IP67 COMPLIANCE

The 2020t/i BLE meets IP67 standards for protection against dust and immersion only when the USB port plug is in place. Documentation is available at www.lamotte.com.

■ WARRANTY

LaMotte Company warrants this instrument to be free of defects in parts and workmanship for 2 years from the date of shipment. Keep the proof of purchase for warranty verification. If it should become necessary to return the instrument during or the warranty period, contact our Technical Service Department at 1-800-344-3100 or 1-410-778-3100, ext. 3 or softwaresupport@lamotte.com for a return authorization number or visit www.lamotte.com for troubleshooting help. The sender is responsible for shipping charges, freight, insurance, and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. LaMotte Company specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental, or consequential damages. LaMotte Company's total liability is limited to repair or replacement of the product with a new or refurbished meter as determined by LaMotte Company. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

DEVICE CONNECTION

The meter supports connections to a Windows based PC over USB [Code 1720-01].

■ COMPUTER CONNECTION

USB Type A, USB mini B, Order Cable Code 1720-01

■ CONNECTING VIA USB

Using the provided USB cable, the meter can be connected to a Windows based PC. Before connecting a meter via USB, download and install the free WaterLink Connect 2 Windows application from <http://softwarecenter.lamotte.com>.

■ CONNECTING VIA BLUETOOTH

The meter uses Bluetooth Low Energy technology to allow communication between the meter and the BLE Mobile Printer [Code 5-0067] only. The meter will automatically connect to the nearest Bluetooth enabled printer. Barriers to wireless signals can reduce the range of wireless devices. The meter will work best if there are no walls between it and the receiving device.

■ WATERLINK CONNECT 2

The meter may be interfaced with any Windows-based 64-bit computer by using the LaMotte WaterLink Connect 2 program and a USB cable. The program will store test information and results in a local database and allow for exporting this data to a comma separated value (CSV) file. The meter will send the following data: name of test, sample value, sample units, time/date stamp, and meter name. To download WaterLink Connect 2 go to <http://softwarecenter.lamotte.com/>. Select "WaterLink Connect 2 FREE Download".

FIRMWARE UPDATES

Occasionally, the firmware in the meter will require updates. To do so:

1. Download and install the WaterLink Connect 2 application for Windows at <http://softwarecenter.lamotte.com/>.
2. Plug meter into the computer with the provided USB cable [1720-01 only] and launch WaterLink Connect 2 application from the Start Menu.
3. A prompt will appear if firmware updates are available. Select Update. Testing and data transfer will not be possible until firmware has been updated.

For assistance contact Software Support at 1-800-344-3100 option 2.

BATTERY/AC OPERATION

The 2020t/i BLE may be operated on battery power using a USB wall adapter or USB computer connection. If using the meter as a bench top unit, use the wall adapter if possible to extend the battery life. The meter will remain on when the USB adapter is used.

To charge the lithium ion battery with the wall adapter, plug the smaller end of the USB cable [USB mini B connector] into the meter and the larger end of the USB cable [USB type A connector] into the wall adapter. Plug the wall adapter into an AC outlet. Reinsert the rubber USB port plug after charging. Failure to insert the USB port plug when the meter is not connected to a computer by USB or actively charging by USB could result in damage to internal components.

To charge the battery from a computer, plug the smaller end of the USB cable [USB mini B connector] into the meter and the larger end of the USB cable [USB Type A connector] into a USB port on a computer. Reinsert the USB port plug after charging. Failure to insert the USB port plug when the meter is not connected to a computer by USB or actively charging by USB could result in damage to internal components.

The battery icon will show no bars and flash when the unit first turns on. Then the indicator will indicate the battery status by showing 0, 1, 2, 3, or 4 bars. It will take 6 hours to fully charge a low battery. The battery icon will flash when the battery is charging. The battery icon will show four bars and stop flashing when it is fully charged. The charging circuit will automatically switch to a float charge when the battery is fully charged. The charger may remain connected. Some computers will NOT supply power to their USB ports during standby operation. The wall adapter will charge the unit continuously. Storing the meter above ambient room temperature will decrease the battery charge more quickly than storage at room temperature. If the meter does not turn on, it means that the battery is at a very low charge. Charging the battery with the wall adapter in this state may take up to 10 hours. At low temperatures, approaching 0 °C, the battery will charge more slowly. It will not charge at all below 0 °C.

The battery icon will show no bars and continuously flash if the battery is getting low but the unit will still operate normally. A "Low Battery" message on the status bar of the display will replace the time when the battery voltage is too low for proper operation and accuracy may be degraded. A "Shutdown Low Batt" message on the display will appear for a few seconds before the power is switched off when the battery is too low to operate the unit. When the battery icon simultaneously flashes bars 1 and 2 followed by bars 3 and 4, it is an indication that the battery is damaged and technical support should be contacted.

To extend the life of the battery:

- Shut down the unit with the power switch when not taking measurements or use the power save option to have the unit automatically turn off after 5 minutes.
- Store the unit at a moderate temperature.
- Fully charge the battery before storing the unit for extended periods of time.
- Fully charge the battery at least once per year. Failure to do so may result in a permanently drained battery.
- Limit backlight use. The unit consumes three times the normal power when the backlight is on. Set the backlight time option to 10 seconds or select "Button Control" and keep the backlight off.

Battery replacement: The lithium-ion battery used in this unit should last for many years with normal use. When it no longer powers the unit long enough to meet testing requirements it should be replaced. Contact LaMotte Company by phone [1-800-344-3100] or email [tech@lamotte.com] for more information.

TURBIDITY

■ WHAT IS TURBIDITY?

Turbidity is an optical property that results when light passes through a liquid sample and is scattered by particulate matter. The scattering of light results in a change in the direction of the light passing through the liquid. If the turbidity is low, the particles may be invisible to the naked eye and much of the light will continue in the original direction. As the quantity of particles increases in samples with greater turbidity, the light strikes particles in solution and is scattered backward, sideways and forward. Light scattered by the particles allows the particles in the solution to be “seen” or detected just as sunlight allows dust particles in the air to be seen. At high concentrations, turbidity is perceived as cloudiness, haze or an absence of clarity. Turbidity is not specific to the types of particles in the sample. The particles may be suspended or colloidal and can have inorganic, organic or biological origins. In drinking water, turbidity may indicate a treatment problem or signal conditions with an increased risk of gastrointestinal diseases. Because pathogens such as *Cryptosporidium* and *Giardia* cause measurable amounts of turbidity, turbidity monitoring can hold the key to assuring adequate water filtration. In 1998, the EPA published the IESWTR [interim enhanced surface water treatment rule] mandating turbidities in combined filter effluent should read at or below 0.3 NTU. By doing so, the EPA hoped to achieve a 2 log [99%] removal of *Cryptosporidium*. There is presently consideration to lower this to 0.1 NTU. The trend has been to check the calibration of on-line turbidimeters used to monitor drinking water with hand-held field units. The optical design and low detection limit of the 2020t/i BLE allows very accurate readings for such calibrations. Drinking water that is turbid is not always harmful to human health but does impart an unpalatable appearance.

Turbidity in environmental waters reduces the amount of beneficial sunlight that reaches submerged aquatic vegetation, raises surface water temperature, buries eggs and bottom dwelling creatures, and can carry sediment and pesticides through the water system.

■ HOW IS TURBIDITY MEASURED?

Turbidity is measured by detecting and quantifying the scattering of light in a solution. The amount of light that is scattered is influenced by particulate properties of color, shape, size and reflectivity. Turbidity can be measured by various methods including visual methods and instrumental methods. Visual methods are more suitable for samples with high turbidity. Instrumental methods can be used for samples with turbidity at all levels.

Examples of visual methods are the Secchi Disk method and the Jackson Candle method. The Secchi Disk method is often used in natural waters. A Secchi Disk with black and white quadrants is lowered into the water until it can no longer be seen. It is then raised until it can be seen again. The average of these two measurements is known as the “Secchi Depth”. The Jackson Candle method uses a long glass calibrated tube placed over a standardized candle. Water is added or removed from the tube until the candle flame becomes indistinct. The height of the water in the tube is measured with a calibrated scale and is reported as Jackson Turbidity Units (JTU). The lowest level of turbidity that can accurately be determined with this method is about 25 JTU.

Instrumental methods for measuring turbidity involve a combination of detection angles and light sources to optimize accuracy in various samples and to meet regulatory requirements. The 2020t BLE and 2020i BLE turbidimeters offer the option of three calibration curves for measuring turbidity that is based on the characteristics of the sample.

In the nephelometric mode, which is the default mode, the detector that is located 90-degrees from the light source measures the scattered light from a light beam passing through a sample. In the 2020t BLE, this configuration and the tungsten lamp, with a color temperature of 2,200–3,000 °K, meet the requirements of EPA method 180.1. The 2020i BLE, which has an IR LED light source at 860 nm, uses the 90-degree detector to meet the requirements of the ISO 2027 Standard. The ISO compliant light source provides extended lifetime and better precision and accuracy of turbidity readings on colored samples and samples with high turbidity. The nephelometric mode is best used for meeting regulatory requirements on samples, such as drinking water, that are in the range of 0.00 to 40.00 Nephelometric Turbidity Units (NTU) for the 2020t BLE or 0.00 to 10.00 Formazin Nephelometric Units (FNU) for the 2020i BLE. A signal averaging option improves the stability of readings on low turbidity samples.

The ratiometric mode is typically used for natural waters and storm waters, or other

samples in the 0 – 1000 NTU/FNU range, to minimize interference from color in the sample. The ratiometric mode takes readings from both the 90-degree detector and the 180 degree detector. Results are reported as Nephelometric Turbidity Ratio Units [NTRU, 2020t BLE] or Formazin Nephelometric Ratio Units [FNRU, 2020i BLE].

In the attenuation mode, the detector is located 180-degrees from the light source. It measures the attenuation of the light beam due to absorption and scatter. This mode is best used to measure samples with high turbidity levels in the range of 40 – 2000 Attenuation Units [AU, 2020t BLE] or Formazin Attenuation Units [FAU, 2020i BLE].

■ TURBIDITY UNITS

Traditionally, turbidimeters designed for use in the United State were made to the specifications of EPA Method 180.1. This method defined the NTU, nephelometric turbidity unit, as a unit that measured turbidity in the range of 0 – 40 NTU using a nephelometer. According to the EPA a nephelometer was a turbidimeter that measures turbidity with a 90° detector. If a sample had a turbidity that was greater than 40 NTU, a dilution was necessary to bring the sample into the 0 – 40 NTU range. Today, many turbidimeters have additional detectors which increase the range of the turbidity measurement, eliminate interferences and generally improve the performance. Currently, many turbidimeters are capable of measuring above 40 NTU by using detectors other than a 90° detector. Even though they may use a 180° detector, which does not meet the definition of a nephelometer, the results are often be reported as NTU.

Since the position of the detector and the light source is important information to include when reporting and comparing turbidity results, there has recently been an effort by the ASTM to use turbidity units which include this information. For EPA compliant meters, measurements made with a 90° degree detector and an incandescent white light source are reported as Nephelometric Turbidity Units [NTU]. When an attenuation measurement is made with a 180° detector, using the same light source, the results are reported as Attenuation Units [AU]. If a ratio of the measurements from both detectors is used to calculate the turbidity, the results are reported in Nephelometric Turbidity Ratio Units [NTRU].

ISO Method 7027, which specifies an 860 nm light source, reports results in four turbidity units. When the 90° degree detector is used, the results are reported as Formazin Nephelometric Units [FNU]. With an attenuation measurement made with a 180° detector, the results are reported as Formazin Attenuation Units [FAU]. And results that are a ratio of measurements from the two angles are reported in Formazin Nephelometric Ratio Units [FNRU]. It is also possible to report the readings from each of the three ISO modes in Nephelometric Turbidity Units [NTU].

It should be noted that all units are numerically equivalent if the meters are calibrated to formazin. The units differentiate which detector and light source was used to make the measurement. For example, 1 NTU = 1 AU = 1 NTRU = 1 FNU = 1 FAU = 1 FNRU. Each turbidity calibration mode has a default unit:

Nephelometric Mode: NTU [2020t BLE] or FNU [2020i BLE]

Ratiometric Mode: NTRU [2020t BLE] or FNRU [2020i BLE]

Attenuation Mode: AU [2020t BLE] or FAU [2020i BLE]

The meter will permit the user to choose to report results in any of the other available calibration units [NTU, FNU, AU, FAU, NTRU or FNRU] other than the default unit. It also allows the brewing industry to check process water in the nephelometric mode and choose to have results reported in American Society of Brewing Chemists (ASBC) or European Brewery Convention (EBC) units.

Acronyms	Definitions	Notes	Regulatory Method
NTU	Nephelometric Turbidity Units	Incandescent white light between 400 and 600 nm, 90° detection, 2020t BLE	EPA 180.1
FNU	Formazin Nephelometric Units	IR LED (usually) 860 nm, bandwidth less than 60 nm, 90° detection, 2020i BLE	ISO 7027
AU	Attenuation Units	Incandescent white light between 400 and 600 nm, 180° detection, 2020t BLE	Not applicable

FAU	Formazin Attenuation Units	IR LED (usually) 860 nm, bandwidth less than 60 nm, 180° detection, 2020i BLE	ISO 7027
NTRU	Nephelometric Turbidity Ratio Units	Incandescent white light between 400 and 600 nm, 90° and 180° detection, 2020t BLE	EPA 180.1
FNRU	Formazin Nephelometric Ratio Units	IR LED (usually) 860 nm, bandwidth less than 60 nm, 90° and 180° detection, 2020i BLE	Not applicable
ASBC	American Society of Brewing Chemists	2020t/i BLE	Not applicable
EBC	European Brewery Convention	2020t/i BLE	Not applicable

For more information see ASTM D7726-4 Standard Guide for the Use of Various Turbidimeter Technologies for the Measurement of Turbidity in Water.

■ TAKING TURBIDITY WATER SAMPLES

Clean plastic or glass containers may be used for turbidity samples. Ideally, samples should be tested soon after collection and at the same temperature as when collected.

■ SAMPLE DILUTION TECHNIQUES

If a test result is out of the range of the meter, as indicated by an over range message on the display, the sample must be diluted and retested. The following table gives quick reference guidelines for dilutions of various proportions.

Amount of Sample	Deionized Water to Bring Final 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

All dilutions are based on a final volume of 10 mL, so several dilutions will require small volumes of the water sample. Graduated pipets should be used for all dilutions. If volumetric glassware is not available, dilutions can be made with the colorimeter tube. Fill the tube to the 10 mL line with the sample and then transfer it to another container. Add 10 mL volumes of deionized water to the container and mix. Transfer 10 mL of the diluted sample to the colorimeter tube and follow the test procedure. Repeat the dilution and testing procedures until the result falls within the range of the calibration. Multiply the test result by the dilution factor. For example, if 10 mL of the sample water is diluted with three 10 mL volumes of deionized water, the dilution factor is four. The test result of the diluted sample should be multiplied by four.

SETUP MENU

■ FACTORY DEFAULT SETTINGS

Settings that have user options have been set at the factory to default settings.

The factory default settings are:

Turbidity Calibration Curve	Nephelometric [N]
Turbidity Units	Default
Turbidity Measurement	Turbidity-No Blank [NB]
Averaging	Disabled
Logging	Enabled
Power Save	5 minutes
Backlight Time	10 seconds
Bluetooth Power	Disabled

Bluetooth Timeout	15 minutes
Language	English
Looping Menu	Enabled

■ TURBIDITY OPTIONS

Three calibration curves are available: Nephelometric, Ratiometric and Attenuation. For the 2020t BLE, Nephelometric is the default calibration curve and the available units are NTU, NTRU, ASBC and EBC. For the 2020i BLE, Nephelometric is the default calibration curve and the available units are FNU, NTU, FNRU, ASBC and EBC for the 2020i BLE.

The 2020t BLE in Nephelometric mode with the default NTU units should be used for testing public drinking water for compliance with the EPA 180.1 rule.

Once a calibration curve and turbidity units have been selected, they will remain selected until the calibration curve and turbidity units are changed by performing the following procedures.

SELECTING A TURBIDITY CALIBRATION CURVE

Three calibration curves are available: Nephelometric, Ratiometric and Attenuation. The default calibration curve is Nephelometric. The calibration curve should be chosen that suits the type of sample being tested.

Drinking Water	0 – 100 NTU/FNU	Nephelometric Mode 90° Detector
Drinking Water Natural Water Storm Water Colored Samples	0 – 1000 NTU/NTRU/FNRU	Ratiometric Mode 90° and 180° Detectors
High Turbidity Samples	0 – 2000 NTU/AU/FAU	Attenuation Mode 180° Detector

Ratiometric methods typically minimize color interference.

The 2020t BLE in Nephelometric mode with the default NTU units should be used for testing public drinking water for compliance with the EPA 180.1 rule.

The Nephelometric mode will be used in the example. To change the calibration curve:

<p>1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.</p>	<p style="text-align: center;">Main Menu</p> <p>Measure Menu</p> <p>Setup Menu</p>
	<p style="text-align: right;">12:00:00 p 1/500 </p>
<p>2. Press  to scroll to Setup Menu.</p>	<p style="text-align: center;">Main Menu</p> <p>Measure Menu</p> <p>Setup Menu</p>
	<p style="text-align: right;">12:00:00 p 1/500 </p>

3. Press ENTER to select Setup Menu .	Setup Menu
	Turbidity Options Auto Calibration Set Clock Logging 12:00:00 p 1/500 

4. Press ENTER to select Turbidity Options .	Turbidity Options
	Turbidity Calibration Turbidity Units Averaging 12:00:00 p 1/500 

5. Press ENTER to select Turbidity Calibration .	Turbidity Calibration
	Nephelometric NTU Ratiometric NTRU Attenuation AU 12:00:00 p 1/500 

6. Scroll to the desired calibration option.	Turbidity Calibration
	Nephelometric NTU Ratiometric NTRU Attenuation AU 12:00:00 p 1/500 

NOTE: Stabcal® standards below 50 NTU should not be used to calibrate the 2020t/i BLE. The diluent has a different refractive index than traditional formazin standards and will affect the results.

7. Press ENTER to save the selection. The screen will display Storing... for about 1 second and return to the Turbidity Options menu. Press EXIT to return to a previous menu.	Turbidity Options
	Turbidity Calibration Turbidity Units Averaging 12:00:00 p 1/500 

SELECTING TURBIDITY UNITS

The results for each calibration curve will be reported in the default units for that calibration curve unless different units are chosen. The default unit is shown after the calibration curve name. The default units are:

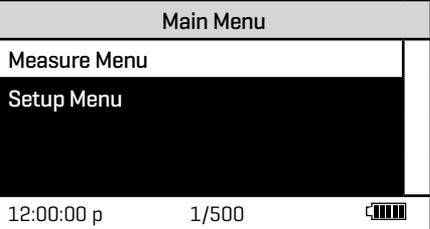
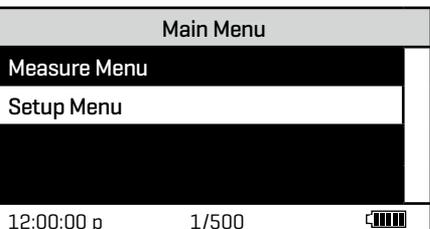
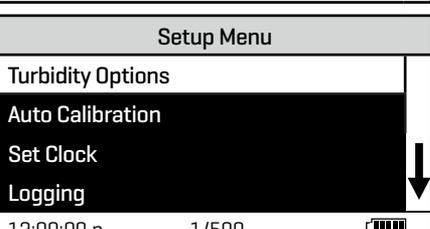
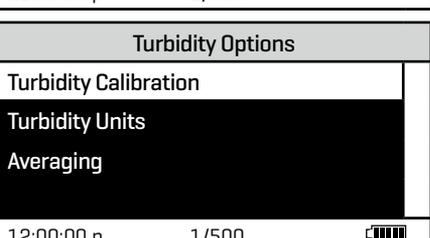
	Calibration Curve	Default Unit
2020t BLE	Nephelometric	NTU [Nephelometric Turbidity Units]
	Ratiometric	NTRU [Nephelometric Turbidity Ratio Units]
	Attenuation	AU [Attenuation Units]
2020i BLE	Nephelometric	FNU [Formazin Nephelometric Units]
	Ratiometric	FNRU [Formazin Nephelometric Ratio Units]
	Attenuation	FAU [Formazin Attenuation Units]

It is possible to choose to have the results reported in an alternative unit instead of the default unit for each mode. When ASBC [American Society of Brewing Chemists] and EBC [European Brewery Convention] units are desired the Nephelometric calibration curve should be used.

For the 2020t BLE, the available units are: NTU, NTRU, AU, ASBC, EBC

For the 2020i BLE, the available units are: FNU, NTU, FNRU, FAU, ASBC, EBC

NTRU, AU, FNU, FNRU and FAU are numerically equivalent to NTU. The units differentiate which detector and light source was used to make the measurement. See page 10 for the definition of turbidity units.

<p>1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.</p>	
<p>2. Press  to scroll to Setup Menu.</p>	
<p>3. Press  to select Setup Menu.</p>	
<p>4. Press  to select Turbidity Options.</p>	

5. Press  to scroll to Turbidity Units .	Turbidity Options		
	Turbidity Calibration		
	Turbidity Units		
	Averaging		
	12:00:00 p	1/500	

6. Press  to select Turbidity Units .	Turbidity Units		
	Default Units		
	NTU		
	ASBC		
	EBC		
12:00:00 p	1/500		

7. Press  or  to scroll to the desired units.	Turbidity Units		
	Default Units		
	NTU		
	ASBC		
	EBC		
12:00:00 p	1/500		

8. Press  to save the selection. The screen will display Storing... for about 1 second and return to the Turbidity Options menu. Press  to return to a previous menu.	Turbidity Options		
	Turbidity Calibrations		
	Turbidity Units		
	Averaging		
	12:00:00 p	1/500	

AVERAGING

The averaging option allows the user to average multiple readings. This option will improve the accuracy of samples with readings that may tend to drift with time. When the two, five or ten measurement option has been selected the final average is displayed. The default setting is Disabled. To change the setting:

1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.	Main Menu		
	Measure Menu		
	Setup Menu		
	12:00:00 p	1/500	

2. Press  to scroll to Setup Menu .	Main Menu
	<div style="background-color: black; color: white; padding: 2px;">Measure Menu</div> <div style="background-color: white; color: black; padding: 2px;">Setup Menu</div> <div style="background-color: black; color: white; padding: 2px;"> </div>
	12:00:00 p 1/500 

3. Press  to select Setup Menu .	Setup Menu
	<div style="background-color: black; color: white; padding: 2px;">Turbidity Options</div> <div style="background-color: black; color: white; padding: 2px;">Auto Calibration</div> <div style="background-color: black; color: white; padding: 2px;">Set Clock</div> <div style="background-color: white; color: black; padding: 2px;">Logging</div>
	12:00:00 p 1/500 

4. Press  or  to scroll to Turbidity Options .	Setup Menu
	<div style="background-color: black; color: white; padding: 2px;">Turbidity Options</div> <div style="background-color: black; color: white; padding: 2px;">Auto Calibration</div> <div style="background-color: black; color: white; padding: 2px;">Set Clock</div> <div style="background-color: black; color: white; padding: 2px;">Logging</div>
	12:00:00 p 1/500 

5. Press  to select Turbidity Options .	Turbidity Options
	<div style="background-color: white; color: black; padding: 2px;">Turbidity Calibration</div> <div style="background-color: black; color: white; padding: 2px;">Turbidity Units</div> <div style="background-color: black; color: white; padding: 2px;">Averaging</div>
	12:00:00 p 1/500 

6. Press  to scroll to Averaging .	Turbidity Options
	<div style="background-color: black; color: white; padding: 2px;">Turbidity Calibration</div> <div style="background-color: black; color: white; padding: 2px;">Turbidity Units</div> <div style="background-color: white; color: black; padding: 2px;">Averaging</div>
	12:00:00 p 1/500 

7. Press  to select Averaging .	Averaging
	<div style="background-color: white; color: black; padding: 2px;">Disabled</div> <div style="background-color: black; color: white; padding: 2px;">2 Measurements</div> <div style="background-color: black; color: white; padding: 2px;">5 Measurements</div> <div style="background-color: black; color: white; padding: 2px;">10 Measurements</div>
	12:00:00 p 1/500 

8. Press  or  to scroll to the desired option.	Averaging
	Disabled 2 Measurements 5 Measurements 10 Measurements 12:00:00 p 1/500 

9. Press  to save the selection. The screen will display Storing... for about 1 second and return to the Turbidity Options menu. Press  to return to a previous menu.	Turbidity Options
	Turbidity Calibration Turbidity Units Averaging 12:00:00 p 1/500 

NOTE: When the Averaging option is enabled, more time will be required to display a reading and more power will be used.

■ AUTO CALIBRATION

Auto Calibration will calibrate the meter to 1, 10 or 100 NTUs or FTUs depending on which Calibration Curve is chosen. The Auto Calibration feature can be used for environmental testing of natural waters or samples with moderate amounts of turbidity when less precision is required. Auto Calibration is not as accurate as a manual calibration. It should not be used for compliance monitoring. Follow the manual Calibration procedure for compliance testing.

■ SETTING THE CLOCK

1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.	Main Menu
	Measure Menu Setup Menu 12:00:00 p 1/500 

2. Press  to scroll to Setup Menu .	Setup Menu
	Measure Menu Setup Menu 12:00:00 p 1/500 

3. Press  to select Setup Menu . Press  to scroll to Set Clock .	Setup Menu
	Turbidity Options Auto Calibration Set Clock Logging 12:00:00 p 1/500  

<p>4. Press ENTER to select Set Clock. The year is displayed. Press ▲ or ▼ to scroll to the appropriate character. Press ENTER to select the character. The month, day, hour, format hour, minute, second, AM/PM will be displayed. Repeat for each.</p>	<div style="background-color: #cccccc; text-align: center; padding: 2px;">Set Time</div> <div style="background-color: black; color: white; text-align: center; padding: 10px;">Year: 2022</div> <div style="display: flex; justify-content: space-between; padding: 2px;"> 12:00:00 p 1/500 </div>
---	---

<p>5. Press ENTER to select the final character. The time and date will be saved and the screen will return to the Setup Menu.</p>	<div style="background-color: #cccccc; text-align: center; padding: 2px;">Setup Menu</div> <div style="background-color: black; color: white; padding: 5px;"> Turbidity Options Auto Calibration Set Clock Logging </div> <div style="display: flex; justify-content: space-between; padding: 2px;"> 12:00:00 p 1/500 </div>
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■ LOGGING DATA

The default setting for the data logger is enabled. The meter will log the last 500 data points. The counter in the center bottom of the display will show how many data points have been logged. The display will show 500+ when the data logger has exceeded 500 points and the data points are being overwritten.

<p>1. Press and briefly hold ⏻ to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.</p>	<div style="background-color: #cccccc; text-align: center; padding: 2px;">Main Menu</div> <div style="background-color: black; color: white; padding: 5px;"> Measure Menu Setup Menu </div> <div style="display: flex; justify-content: space-between; padding: 2px;"> 12:00:00 p 1/500 </div>
---	---

<p>2. Press ▼ to scroll to Setup Menu.</p>	<div style="background-color: #cccccc; text-align: center; padding: 2px;">Main Menu</div> <div style="background-color: black; color: white; padding: 5px;"> Measure Menu Setup Menu </div> <div style="display: flex; justify-content: space-between; padding: 2px;"> 12:00:00 p 1/500 </div>
--	---

<p>3. Press ENTER to select Setup Menu.</p>	<div style="background-color: #cccccc; text-align: center; padding: 2px;">Setup Menu</div> <div style="background-color: black; color: white; padding: 5px;"> Turbidity Options Auto Calibration Set Clock Logging </div> <div style="display: flex; justify-content: space-between; padding: 2px;"> 12:00:00 p 1/500 </div>
---	---

4. Press  to scroll to Logging .	Setup Menu
	<div style="background-color: black; color: white; padding: 5px;"> Turbidity Options Auto Calibration Set Clock Logging </div> <div style="display: flex; justify-content: space-between; align-items: center; padding: 5px;"> 12:00:00 p 1/500  </div>

5. Press  to select Logging .	Logging
	<div style="background-color: black; color: white; padding: 5px;"> Display Test Log Logging Enabled Logging Disabled Erase Log </div> <div style="display: flex; justify-content: space-between; align-items: center; padding: 5px;"> 12:00:00 p 1/500  </div>

6. Press  to scroll to Display Test Log .	Logging
	<div style="background-color: black; color: white; padding: 5px;"> Display Test Log Logging Enabled Logging Disabled Erase Log </div> <div style="display: flex; justify-content: space-between; align-items: center; padding: 5px;"> 12:00:00 p 1/500  </div>

7. Press  to display the last data point and the time that it was logged. Press  to print the test log.	Record Number 8
	<div style="background-color: black; color: white; padding: 5px;"> Turbidity WB [N] 105.7 FNU 11:11:23A 25-Nov-2022 </div> <div style="display: flex; justify-content: space-between; align-items: center; padding: 5px;"> 12:00:00 p 1/500  </div>

8. Press  or  to scroll through the data points in the log.	Record Number 9
	<div style="background-color: black; color: white; padding: 5px;"> Turbidity WB [R] 95.4 NTU 11:11:23A 25-Nov-2022 </div> <div style="display: flex; justify-content: space-between; align-items: center; padding: 5px;"> 12:00:00 p 1/500  </div>

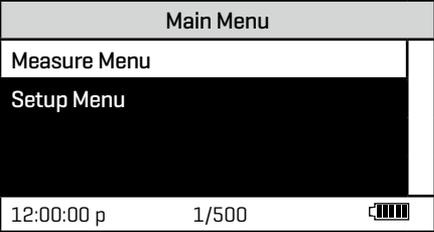
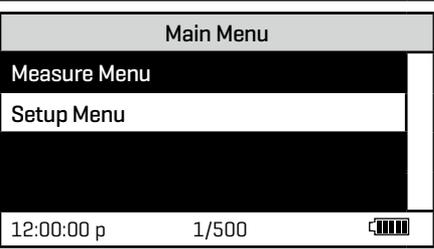
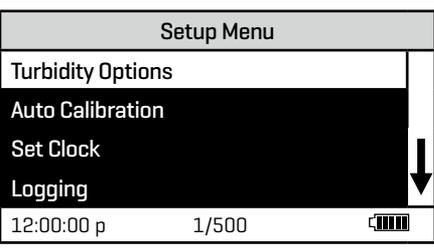
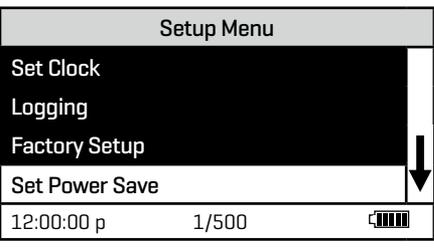
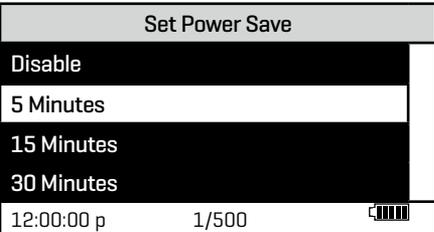
9. Press  to return to the Logging menu. Press  or  to scroll to disable the logging options or erase the log. Press  to select the option. The screen will display Storing... for about 1 second and return to the Logging Menu .	Logging
	<div style="background-color: black; color: white; padding: 5px;"> Display Test Log Logging Enabled Logging Disabled Erase Log </div> <div style="display: flex; justify-content: space-between; align-items: center; padding: 5px;"> 12:00:00 p 1/500  </div>

■ FACTORY SETUP

The Factory Setup menu is used in the manufacturing of the meter. This menu is not for use by the operator in the field.

■ SETTING POWER SAVE

The power saving Auto Shutoff feature will turn the meter off when a button has not been pushed for a set amount of time. The default setting is 5 minutes. To change the setting:

<p>1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.</p>	
<p>2. Press  to scroll to Setup Menu.</p>	
<p>3. Press  to select Setup Menu.</p>	
<p>4. Press  to scroll to Set Power Save.</p>	
<p>5. Press  to select Set Power Save.</p>	

6. Press  or  to scroll to desired setting.	Set Power Save
	Disable 5 Minutes 15 Minutes 30 Minutes 12:00:00 p 1/500 

7. Press  to save the selection. The screen will display Storing... for about 1 second and return to the Setup Menu .	Setup Menu
	Set Clock Logging Factory Setup Set Power Save 12:00:00 p 1/500 

■ SETTING THE BACKLIGHT TIME

The backlight illuminates the display for enhanced viewing. If Button Control is chosen the backlight button on the key pad will act as an on/off switch and the backlight will remain on or off when the meter is being used. When one of the other settings – 10, 20 or 30 seconds – is chosen, the display will be illuminated for the specified amount of time after any button is pressed. As a precaution, the backlight will not illuminate during turbidity measurements to avoid interference from stray light.

NOTE: The backlight feature uses a significant amount of power. The longer the backlight is on, the more frequently the battery will have to be charged if the USB/Wall Charger is not being used.

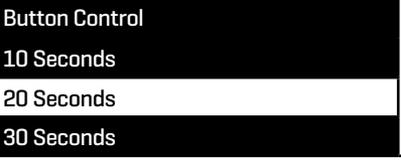
1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.	Main Menu
	Measure Menu Setup Menu 12:00:00 p 1/500 

2. Press  to scroll to Setup Menu .	Main Menu
	Main Menu Setup Menu 12:00:00 p 1/500 

3. Press  to select Setup Menu .	Setup Menu
	Turbidity Options Auto Calibration Set Clock Logging 12:00:00 p 1/500 

4. Press  to scroll to Set Backlight Time .	Setup Menu
	

5. Press  to select Set Backlight Time .	Set Backlight Time
	

6. Press  or  to scroll to desired setting.	Set Backlight Time
	

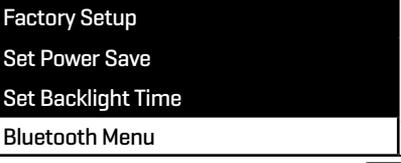
7. Press  to save the selection. The screen will display Storing... for about 1 second and return to the Setup Menu .	Setup Menu
	

■ BLUETOOTH MENU

ENABLING BLUETOOTH POWER

Bluetooth wireless technology allows communication between the meter and a BLE Mobile Printer [Code 5-0067] only. Bluetooth Power must be enabled to use the BLE Mobile Printer [Code 5-0067]. When Bluetooth Power is enabled, the Bluetooth icon will flash next to the battery icon on the bottom line of the display.

If the Bluetooth feature is not being used to connect to the printer, Bluetooth Power should be disabled to conserve the battery life. The default Bluetooth Power setting is disabled.

1. From the Setup Menu , press  or  to scroll to Bluetooth Menu .	Setup Menu
	

<p>2. Press ENTER to select Bluetooth Menu.</p>	<table border="1"> <thead> <tr> <th colspan="2">Bluetooth Menu</th> </tr> </thead> <tbody> <tr> <td>Bluetooth Power</td> <td></td> </tr> <tr> <td>Bluetooth Mode</td> <td></td> </tr> <tr> <td>Set BT Timeout</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </tbody> </table>	Bluetooth Menu		Bluetooth Power		Bluetooth Mode		Set BT Timeout		12:00:00 p	1/500 
Bluetooth Menu											
Bluetooth Power											
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Disable Bluetooth											
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Bluetooth Power											
Enable Bluetooth											
Disable Bluetooth											
12:00:00 p	1/500 										
<p>6. Press ENTER to select the option. Bluetooth Power must be enabled to use the BLE Mobile Printer (Code 5-0067). The screen will display Storing... for about 1 second and the meter will return to the Bluetooth Menu. A flashing  P symbol will indicate that Bluetooth is enabled.</p>	<table border="1"> <thead> <tr> <th colspan="2">Bluetooth Menu</th> </tr> </thead> <tbody> <tr> <td>Bluetooth Power</td> <td></td> </tr> <tr> <td>Bluetooth Mode</td> <td></td> </tr> <tr> <td>Set BT Timeout</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500  </td> </tr> </tbody> </table>	Bluetooth Menu		Bluetooth Power		Bluetooth Mode		Set BT Timeout		12:00:00 p	1/500  
Bluetooth Menu											
Bluetooth Power											
Bluetooth Mode											
Set BT Timeout											
12:00:00 p	1/500  										

SETTING THE BLUETOOTH MODE

A Bluetooth connection is available only for the BLE Mobile Printer (Code 5-0067).

<p>1. From the Setup Menu, press  or  to scroll to Bluetooth Menu.</p>	<table border="1"> <thead> <tr> <th colspan="2">Setup Menu</th> </tr> </thead> <tbody> <tr> <td>Factory Setup</td> <td></td> </tr> <tr> <td>Set Power Save</td> <td></td> </tr> <tr> <td>Set Backlight Time</td> <td></td> </tr> <tr> <td>Bluetooth Menu</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </tbody> </table>	Setup Menu		Factory Setup		Set Power Save		Set Backlight Time		Bluetooth Menu		12:00:00 p	1/500 
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12:00:00 p	1/500 												
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Bluetooth Mode													
Mobile Device													
BT Printer													
12:00:00 p	1/500 												
<p>5. Press  or  to scroll to BT Printer.</p>	<table border="1"> <thead> <tr> <th colspan="2">Bluetooth Mode</th> </tr> </thead> <tbody> <tr> <td>Mobile Device</td> <td></td> </tr> <tr> <td>BT Printer</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </tbody> </table>	Bluetooth Mode		Mobile Device		BT Printer				12:00:00 p	1/500 		
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BT Printer													
12:00:00 p	1/500 												
<p>6. Press . The screen will display Storing... BT Setup... for about 1 second and the meter will return to the Bluetooth Menu.</p>	<table border="1"> <thead> <tr> <th colspan="2">Bluetooth Menu</th> </tr> </thead> <tbody> <tr> <td>Bluetooth Power</td> <td></td> </tr> <tr> <td>Bluetooth Mode</td> <td></td> </tr> <tr> <td>Set BT Timeout</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </tbody> </table>	Bluetooth Menu		Bluetooth Power		Bluetooth Mode		Set BT Timeout		12:00:00 p	1/500 		
Bluetooth Menu													
Bluetooth Power													
Bluetooth Mode													
Set BT Timeout													
12:00:00 p	1/500 												

SETUP BLUETOOTH PRINTING

A Bluetooth connection is available for the BLE Mobile Printer (Code 5-0067).

1. From the Setup Menu , press  or  to scroll to Bluetooth Menu .	<table border="1"><thead><tr><th colspan="3">Setup Menu</th></tr></thead><tbody><tr><td>Factory Setup</td><td></td><td></td></tr><tr><td>Set Power Save</td><td></td><td></td></tr><tr><td>Set Backlight Time</td><td></td><td></td></tr><tr><td>Bluetooth Menu</td><td></td><td></td></tr><tr><td>12:00:00 p</td><td>1/500</td><td></td></tr></tbody></table>	Setup Menu			Factory Setup			Set Power Save			Set Backlight Time			Bluetooth Menu			12:00:00 p	1/500	
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Bluetooth Power																			
Enable Bluetooth																			
Disable Bluetooth																			
12:00:00 p	1/500																		

6. Press ENTER to select Enable Bluetooth .	Bluetooth Menu		
	Bluetooth Power		
	Bluetooth Mode		
	Set BT Timeout		
	12:00:00 p	1/500	

7. Press or to scroll to Bluetooth Mode .	Bluetooth Menu		
	Bluetooth Power		
	Bluetooth Mode		
	Set BT Timeout		
	12:00:00 p	1/500	

8. Press ENTER to select Bluetooth Mode .	Bluetooth Mode		
	Mobile Device		
	BT Printer		
	12:00:00 p	1/500	

9. Press or to scroll to BT Printer .	Bluetooth Mode		
	Mobile Device		
	BT Printer		
	12:00:00 p	1/500	

10. Press ENTER to select BT Printer . The meter is now ready to connect with a Bluetooth printer. When the meter is available for the Bluetooth connection the Bluetooth printer icon next to the battery icon will flash.	Bluetooth Menu		
	Bluetooth Power		
	Bluetooth Mode		
	Set BT Timeout		
	12:00:00 p	1/500	

11. Turn on the Bluetooth printer. Within a few seconds it will connect to the meter. If the Bluetooth printer connection to the meter is successful the Bluetooth printer icon will remain on and no longer flash.

SET BLUETOOTH TIMEOUT

The Bluetooth Timeout can be set to allow the Bluetooth feature to be on to allow data to be sent to the Bluetooth printer and then turn off after a specified amount of time.

1. From the Setup Menu , press  or  to scroll to Bluetooth Menu .	Setup Menu
	<div style="background-color: black; color: white; padding: 5px;">Factory Setup</div> <div style="background-color: black; color: white; padding: 5px;">Set Power Save</div> <div style="background-color: black; color: white; padding: 5px;">Set Backlight Time</div> <div style="background-color: white; color: black; padding: 5px;">Bluetooth Menu</div> <div style="background-color: black; color: white; padding: 5px;">12:00:00 p 1/500 </div>

2. Press  to select Bluetooth Menu .	Bluetooth Menu
	<div style="background-color: white; color: black; padding: 5px;">Bluetooth Power</div> <div style="background-color: black; color: white; padding: 5px;">Bluetooth Mode</div> <div style="background-color: black; color: white; padding: 5px;">Set BT Timeout</div> <div style="background-color: black; color: white; padding: 5px;">12:00:00 p 1/500 </div>

3. Press  or  to scroll to Set BT Timeout .	Bluetooth Menu
	<div style="background-color: black; color: white; padding: 5px;">Bluetooth Power</div> <div style="background-color: black; color: white; padding: 5px;">Bluetooth Mode</div> <div style="background-color: white; color: black; padding: 5px;">Set BT Timeout</div> <div style="background-color: black; color: white; padding: 5px;">12:00:00 p 1/500 </div>

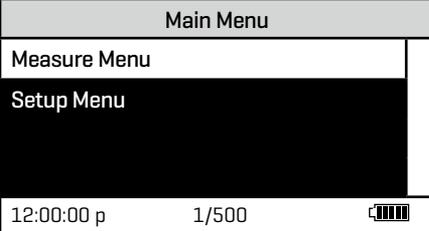
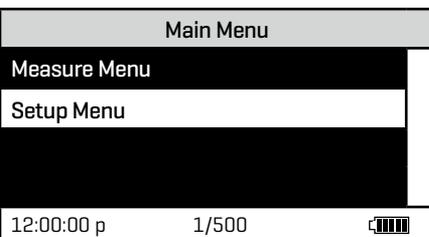
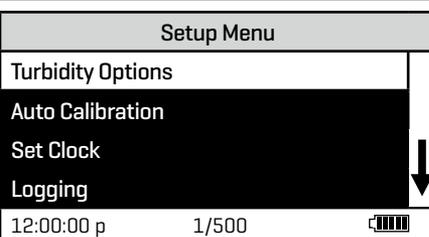
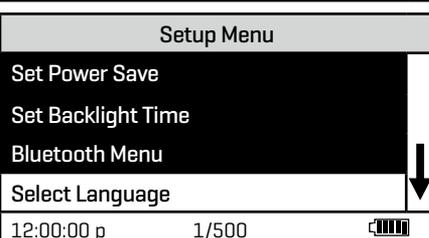
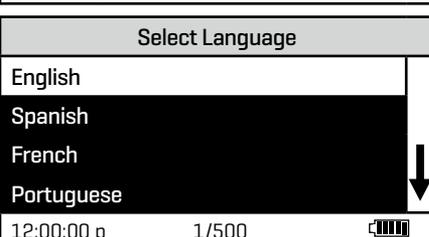
4. Press  to select Set BT Timeout .	Set BT Timeout
	<div style="background-color: white; color: black; padding: 5px;">15 minutes</div> <div style="background-color: black; color: white; padding: 5px;">5 minutes</div> <div style="background-color: black; color: white; padding: 5px;">30 Seconds</div> <div style="background-color: black; color: white; padding: 5px;">Disable</div> <div style="background-color: black; color: white; padding: 5px;">12:00:00 p 1/500 </div>

5. Press  or  to scroll to desired option.	Set BT Timeout
	<div style="background-color: white; color: black; padding: 5px;">15 minutes</div> <div style="background-color: black; color: white; padding: 5px;">5 minutes</div> <div style="background-color: black; color: white; padding: 5px;">30 Seconds</div> <div style="background-color: black; color: white; padding: 5px;">Disable</div> <div style="background-color: black; color: white; padding: 5px;">12:00:00 p 1/500 </div>

6. Press  . The screen will display Storing... for about 1 second and the meter will return to the Bluetooth Menu .	Bluetooth Menu
	<div style="background-color: black; color: white; padding: 5px;">Bluetooth Power</div> <div style="background-color: black; color: white; padding: 5px;">Bluetooth Mode</div> <div style="background-color: white; color: black; padding: 5px;">Set BT Timeout</div> <div style="background-color: black; color: white; padding: 5px;">12:00:00 p 1/500 </div>

■ SELECTING A LANGUAGE

There are eight languages available in the 2020t/i BLE: English, Spanish, French, Portuguese, Italian, Chinese, Japanese [Kana], and Turkish.

1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.	 <p>Main Menu</p> <p>Measure Menu</p> <p>Setup Menu</p> <p>12:00:00 p 1/500 </p>
2. Press  to scroll to Setup Menu .	 <p>Main Menu</p> <p>Measure Menu</p> <p>Setup Menu</p> <p>12:00:00 p 1/500 </p>
3. Press  to select Setup Menu .	 <p>Setup Menu</p> <p>Turbidity Options</p> <p>Auto Calibration</p> <p>Set Clock</p> <p>Logging</p> <p>12:00:00 p 1/500 </p>
4. Press  to scroll to Select Language .	 <p>Setup Menu</p> <p>Set Power Save</p> <p>Set Backlight Time</p> <p>Bluetooth Menu</p> <p>Select Language</p> <p>12:00:00 p 1/500 </p>
5. Press  to select to Select Language .	 <p>Select Language</p> <p>English</p> <p>Spanish</p> <p>French</p> <p>Portuguese</p> <p>12:00:00 p 1/500 </p>

<p>6. Press  or  to scroll to desired language.</p>	<div style="background-color: #cccccc; text-align: center; padding: 2px;">Select Language</div> <div style="border: 1px solid black; padding: 2px;"> <p>English</p> <p style="background-color: black; color: white; padding: 2px;">Spanish</p> <p>French</p> <p>Portuguese</p> </div> <div style="text-align: right; margin-top: -10px;"></div> <div style="display: flex; justify-content: space-between; font-size: small; margin-top: 5px;"> 12:00:00 p 1/500  </div>
<p>7. Press  to select desired language. The screen will momentarily display, Storing... for about 1 second and return to the Setup Menu.</p>	<div style="background-color: #cccccc; text-align: center; padding: 2px;">Options Menu</div> <div style="border: 1px solid black; padding: 2px;"> <p>Set Clock</p> <p>Set PWR Save</p> <p>Set Backlight Time</p> <p style="background-color: black; color: white; padding: 2px;">Select Language</p> </div> <div style="text-align: right; margin-top: -10px;"></div> <div style="display: flex; justify-content: space-between; font-size: small; margin-top: 5px;"> 12:00:00 p 1/500  </div>

■ SETTING THE LOOPING MENUS

Looping menus incorporate a looping feature which allows the user to quickly reach the last choice in the menu from the first choice. In a looping menu the last choices in the menu are above the first choice and scrolling upward moves through the menu in reverse order. Scrolling downward moves through the menu from the first choice to the last and the menu starts over following the last choice. Menu choices can be reached by scrolling in either direction. The feature called **Looping Menu** can be turned on and off in the **Setup Menu**. The default setting is enabled.

CALIBRATION & ANALYSIS

■ CALIBRATION

TURBIDITY STANDARDS

Only use AMCO or formazin standards with the 2020t/i BLE. StablCal® standards below 50 NTU should not be used to calibrate the 2020t/i BLE. The diluent used in the StablCal® standards has a different refractive index than traditional formazin standards and will affect the results. The concentration of the calibration standard should be similar to the expected concentrations of samples that will be tested. The standard should never be poured from the tube back into the bottle. The standards will not have the same turbidity value in all three modes.

The following standards are available from LaMotte Company:

Mode Units	Nephelometric [N]	Nephelometric [N]	Ratiometric [R]	Ratiometric [R]
Meter	2020t BLE	2020i BLE	2020t BLE	2020i BLE
Code 1480	0 NTU	0 FNU	0 NTRU	0 FNRU
Code 1441	1 NTU	-	1 NTRU	-
Code 1446	-	1 FNU	-	1 FNRU
Code 1442	10 NTU	-	10 NTRU	-
Code 1447	-	10 FNU	-	10 FNRU
Code 1444	-	100 FNU	-	100 FNRU

Standards may vary slightly from lot to lot for the ratiometric mode. Standard values for the nephelometric mode and ratiometric mode are located on the standard bottle label. **Use the value on the turbidity standard bottle label as the target value when manually calibrating the meter in the nephelometric mode and the ratiometric mode.** Standards for calibration in the attenuation mode should be prepared from Formazin. A 4000 NTU Formazin standard that is compatible with the LaMotte 2020t/i BLE is available at www.gfschemicals.com.

CALIBRATION

TUBES

Use turbidity tubes [0260] that are free of scratches and imperfections in the light zone between the bottom of the tube and the fill line. Discard scratched tubes. When reading very low turbidity samples, do not use tubes or caps that have been used previously with high turbidity samples. See page 57 for additional information.

TURBIDITY CALIBRATION PROCEDURE

The default calibration curve is nephelometric as indicated by [N] in the Menu bar. The default units are NTU [2020t BLE] and FNU [2020i BLE]. Other calibration curve options are ratiometric and attenuation. The ratiometric calibration curve is indicated by [R] and the attenuation calibration curve is indicated by [A]. A user calibration should be performed for each mode with standards that are appropriate for the meter and range.

For the most accurate results, a user calibration should be performed over the smallest range possible. **Use a calibration standard that, along with the blank, brackets the range of the samples that will be tested.** For example, if the samples that are to be tested are expected to be below 1 NTU, more accurate results will be obtained by calibration with a blank and a 1 NTU standard as opposed to a blank and a 10 NTU standard.

The number of measuring ranges for each mode varies.

The 2020t/i BLE should only be used with Code 0260 tubes. Using other tubes will result in less accurate readings.

Mode	Nephelometric [N]	Ratiometric [R]	Attenuation [A]
Ranges	0-11 NTU/FNU 10-110 NTU/FNU	0-11 NTRU/FNRU 10-110 NTRU/FNRU 100-510 NTRU/FNRU 500-1000 NTRU/FNRU	0-1010 AU/FAU 1000-2000 AU/FAU

Each range can be calibrated with one point per range plus a blank. New calibration points will replace old calibration points independently for each range. If one range is recalibrated, the meter will retain the existing calibration data for the other ranges. It is recommended that the meter be calibrated for each range that will be used. The value of the standards chosen for the calibration should not be at the extremes of the ranges. The meter is auto-ranging and will automatically select the appropriate range for the sample being tested. It is recommended that the meter be calibrated daily.

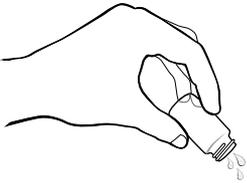
A 2020t BLE in the nephelometric mode with NTU standards will be used in the following examples.

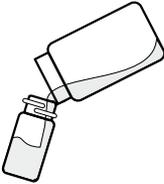
<p>1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.</p>	Main Menu	
	<p>Measure Menu</p> <p>Setup Menu</p>	
	12:00:00 p	1/500 

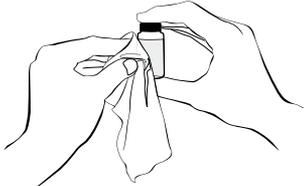
<p>2. Press  to select Measure Menu.</p>	Measure Menu [N]	
	<p>Turbidity - No Blank</p> <p>Turbidity - With Blank</p>	
	12:00:00 p	1/500 

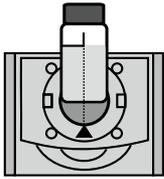
<p>3. Press ▼ to scroll to Turbidity - With Blank.</p>	<p>Measure Menu [N]</p>
	<div style="border: 1px solid black; padding: 5px;"> <p>Turbidity - No Blank</p> <p>Turbidity - With Blank</p> </div>
	<p>12:00:00 p 1/500 </p>

<p>4. Press ENTER to select Turbidity - With Blank.</p>	<p>Turbidity WB [N]</p>
	<div style="border: 1px solid black; padding: 5px;"> <p>Scan Blank</p> <p>Scan Sample</p> </div>
	<p>12:00:00 p 1/500 </p>

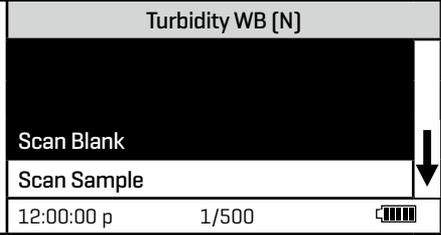
<p>5. Rinse a clean tube [0260] three times with the blank. If samples are expected to read below 1 NTU the meter should be blanked with a 0 NTU Primary Standard or prepared turbidity-free (<0.1 NTU) water. For the most accurate results, use the same tube for the blank and the sample.</p>	
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<p>6. Fill the tube to the fill line with the blank. Pour the blank down the inside of the tube to avoid creating bubbles. Cap the tube.</p>	
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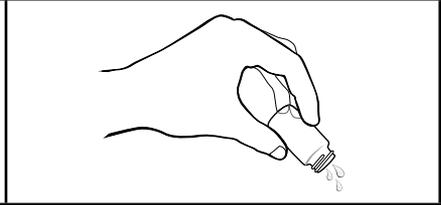
<p>7. Wipe the tube thoroughly with a lint-free cloth.</p>	
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<p>8. Open the meter lid. Insert the tube into the chamber. Align the index line on the tube with the index arrow on the meter. Close the lid.</p>	
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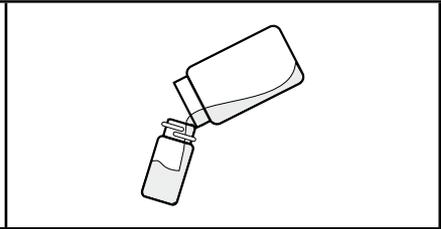
9. Press **ENTER** to select **Scan Blank** and scan the blank. The screen will display **Scan Blank** and **Blank Done** for about 1 second and then return to the **Turbidity - With Blank Menu**.



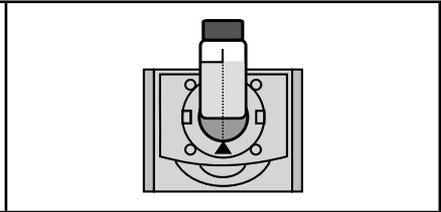
10. Rinse a clean tube [0260], or the same tube, three times with the turbidity standard.



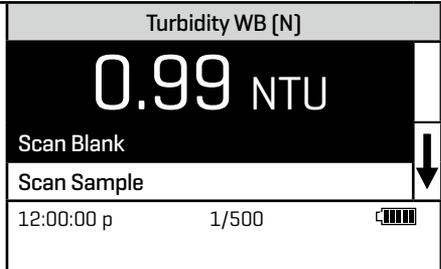
11. Fill the tube to the fill line with the turbidity standard. Pour the standard down the inside of the tube to avoid creating bubbles. Cap the tube.



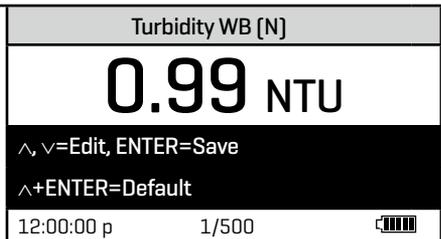
12. Open the meter lid. Insert the tube into the chamber. Align the index line on the tube with the index arrow on the meter. Close the lid.



13. Press **ENTER** to select **Scan Sample** and scan the standard. The screen will display **Scan Sample** and **Sample Done** for about 1 second. The result will appear on the screen. "Overrange" will be displayed if the reading is out of range. Dilute the sample or select a mode that is appropriate for the range of the sample.



14. Press **ENTER** to select **Calibrate**. A reverse font (light background with dark characters) will appear to indicate that the reading can be adjusted.



<p>15. Press  or  to scroll to the concentration of the standard, 1.00 in the example. Use the value on the turbidity standard bottle label as the target. Note: The allowable adjustment is $\pm 25\%$.</p>	<p>Turbidity WB [N]</p> <p>1.00 NTU</p> <p><small>^, v=Edit, ENTER=Save</small></p> <p><small>^+ENTER=Default</small></p> <p>12:00:00 p 1/500 </p>
--	--

<p>16. Press  to save the calibration. Press  and  to revert to the default factory calibration. The meter will momentarily display Storing... and return to the Turbidity-With Blank menu. The calibration has now been saved and the meter can be used for testing. The standard should never be poured from the tube back into the bottle.</p>	<p>Turbidity WB [N]</p> <p>1.00 NTU</p> <p>Scan Sample </p> <p>Calibrate</p> <p>12:00:00 p 1/500 </p>
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NOTE: For the greatest accuracy during the calibration procedure, be sure that after the meter is blanked and the blank is scanned as a sample, the reading is 0.00. If not, reblank the meter and scan the blank again until it reads 0.00. When scanning the calibration standards as the sample, scan the calibration standard three times removing the tube from the chamber after each scan and reinserting the tube in the chamber with the same orientation. The readings should be consistent. Use the last consistent reading to calibrate the meter. If the readings are not consistent, avoid using an aberrant reading to calibrate the meter.

■ AUTO CALIBRATION

Auto calibration will calibrate the meter to 1, 10, or 100 NTUs or FTUs depending on which Calibration Curve is chosen. The Auto Calibration feature can be used for environmental testing of natural waters or samples with moderate amounts of turbidity when less precision is required. Auto Calibration is not as accurate as a manual calibration. It should not be used for compliance monitoring. Follow the manual Calibration procedure for compliance testing.

<p>1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.</p>	<p>Main Menu</p> <p>Measure Menu</p> <p>Setup Menu</p> <p>12:00:00 p 1/500 </p>
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<p>2. Press  to scroll to Setup Menu.</p>	<p>Main Menu</p> <p>Measure Menu</p> <p>Setup Menu</p> <p>12:00:00 p 1/500 </p>
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3. Press ENTER to select Setup Menu .	Setup Menu
	Turbidity Options Auto Calibration Set Clock Logging 12:00:00 p 1/500 

4. Press ENTER to select Turbidity Options .	Turbidity Options
	Turbidity Calibration Turbidity Units Averaging 12:00:00 p 1/500 

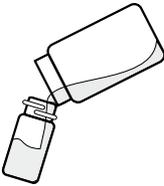
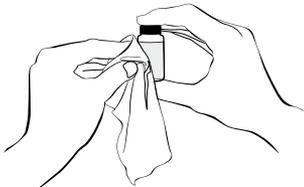
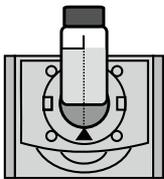
5. Press ENTER to select Turbidity Calibration .	Turbidity Calibration
	Nephelometric NTU Ratiometric NTRU Attenuation AU 12:00:00 p 1/500 

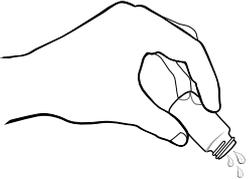
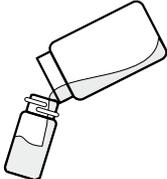
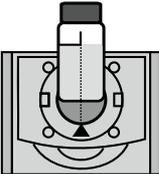
6. Scroll to the desired calibration option.	Turbidity Calibration
	Nephelometric NTU Ratiometric NTRU Attenuation AU 12:00:00 p 1/500 

NOTE: Stabcal® standards below 50 NTU should not be used to calibrate the 2020t/i BLE. The diluent has a different refractive index than traditional formazin standards and will affect the results.

7. Press ENTER to save the selection. The screen will display Storing... for about 1 second and return to the Turbidity Options menu.	Turbidity Options
	Turbidity Calibration Turbidity Units Averaging 12:00:00 p 1/500 

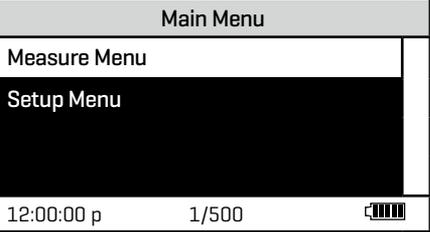
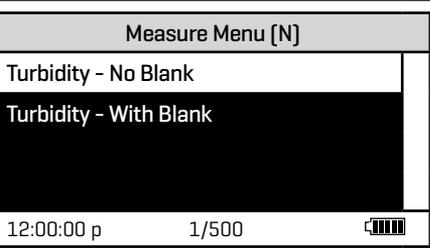
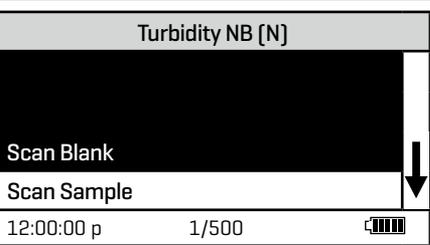
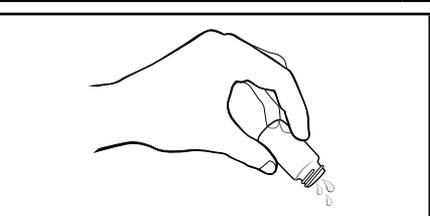
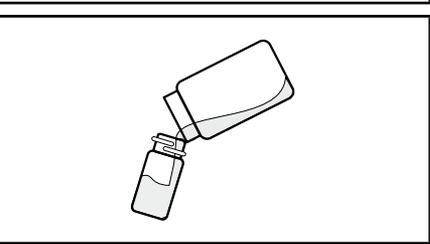
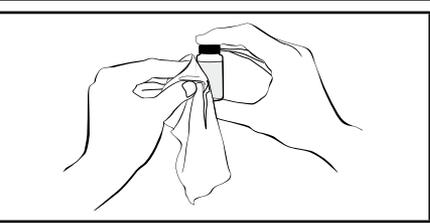
<p>8. Press  to scroll to Turbidity Units. Press  to select Turbidity Units.</p>	<table border="1"> <thead> <tr> <th colspan="2">Turbidity Units</th> </tr> </thead> <tbody> <tr> <td>Default Units</td> <td></td> </tr> <tr> <td>NTU</td> <td></td> </tr> <tr> <td>ASBC</td> <td></td> </tr> <tr> <td>EBC</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </tbody> </table>	Turbidity Units		Default Units		NTU		ASBC		EBC		12:00:00 p	1/500 
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<p>9. Press  or  to scroll to the desired units.</p>	<table border="1"> <thead> <tr> <th colspan="2">Turbidity Units</th> </tr> </thead> <tbody> <tr> <td>Default Units</td> <td></td> </tr> <tr> <td>NTU</td> <td></td> </tr> <tr> <td>ASBC</td> <td></td> </tr> <tr> <td>EBC</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </tbody> </table>	Turbidity Units		Default Units		NTU		ASBC		EBC		12:00:00 p	1/500 
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<p>10. Press  to save the selection. The screen will display Storing... for about 1 second and return to the Turbidity Options menu.</p>	<table border="1"> <thead> <tr> <th colspan="2">Turbidity Options</th> </tr> </thead> <tbody> <tr> <td>Turbidity Calibration</td> <td></td> </tr> <tr> <td>Turbidity Units</td> <td></td> </tr> <tr> <td>Averaging</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </tbody> </table>	Turbidity Options		Turbidity Calibration		Turbidity Units		Averaging		12:00:00 p	1/500 		
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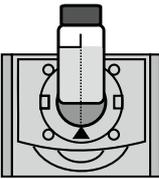
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<p>18. Open the meter lid. Insert the tube into the chamber. Align the index line on the tube with the index arrow on the meter. Close the lid.</p>													
<p>19. Press  to select Scan Blank and scan the blank. The screen will display Scan Blank and Blank Done for about 1 second and then return to appropriate calibrate menu.</p>	<table border="1"> <thead> <tr> <th colspan="2">Calibrate 1.0 [N]</th> </tr> </thead> <tbody> <tr> <td>Scan Blank</td> <td></td> </tr> <tr> <td>Scan Sample</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </tbody> </table>	Calibrate 1.0 [N]		Scan Blank		Scan Sample		12:00:00 p	1/500 				
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<p>20. Rinse a clean tube (0260), or the same tube, three times with the turbidity standard.</p>																			
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<p>24. Press ENTER to select Scan Sample and scan the standard. The screen will display Storing... for about 1 second and then return to the Auto Calibration screen. The calibration is now saved and the meter can be used for testing. The standard should never be poured from the tube back into the bottle.</p>	<table border="1"> <thead> <tr> <th colspan="3">Auto Calibration</th> </tr> </thead> <tbody> <tr> <td>Reset</td> <td></td> <td></td> </tr> <tr> <td>Calibrate 1.0</td> <td></td> <td></td> </tr> <tr> <td>Calibrate 10.0</td> <td></td> <td></td> </tr> <tr> <td>Calibrate 100.0</td> <td></td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500</td> <td></td> </tr> </tbody> </table>	Auto Calibration			Reset			Calibrate 1.0			Calibrate 10.0			Calibrate 100.0			12:00:00 p	1/500	
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<p>25. Press EXIT two times to return to the Main Menu. Select Measure Menu to begin testing. Or scroll to and select Reset to return to the factory calibration settings.</p>	<table border="1"> <thead> <tr> <th colspan="3">Main Menu</th> </tr> </thead> <tbody> <tr> <td>Measure Menu</td> <td></td> <td></td> </tr> <tr> <td>Setup Menu</td> <td></td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500</td> <td></td> </tr> </tbody> </table>	Main Menu			Measure Menu			Setup Menu			12:00:00 p	1/500							
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ANALYSIS WITHOUT BLANKING

To obtain the most accurate results the meter should be blanked before measuring a sample. The blanking step is not as critical for samples above 10 NTU. The meter should always be blanked before reading samples below 10 NTU.

<p>1. Press and briefly hold  to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the Main Menu will appear.</p>	
<p>2. Press ENTER to select Measure Menu.</p>	
<p>3. Press ENTER to select Turbidity - No Blank.</p>	
<p>4. Rinse a clean tube [0260] three times with the sample.</p>	
<p>5. Fill the tube to the fill line with the sample. Pour the sample down the inside of the tube to avoid creating bubbles. Cap the tube.</p>	
<p>6. Wipe the tube thoroughly with a lint-free cloth.</p>	

<p>7. Open the meter lid. Insert the tube into the chamber. Align the index line on the tube with the index arrow on the meter. Close the lid.</p>	
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<p>8. Press ENTER to select Scan Sample and scan the sample. The screen will display Scan Sample and Sample Done for about 1 second. The result will appear on the screen. Press ▲ or ▼ to scroll to Print. Press ENTER to print to the BLE Mobile Printer [Code 5-0067].</p>	<table border="1"> <tr> <th colspan="2">Turbidity NB [N]</th> </tr> <tr> <td style="text-align: center; font-size: 2em;">10.22</td> <td style="text-align: right;">NTU</td> </tr> <tr> <td>Scan Blank</td> <td style="text-align: right;">↓</td> </tr> <tr> <td>Scan Sample</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </table>	Turbidity NB [N]		10.22	NTU	Scan Blank	↓	Scan Sample		12:00:00 p	1/500 
Turbidity NB [N]											
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■ ANALYSIS WITH BLANKING

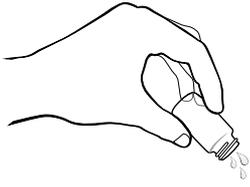
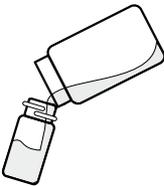
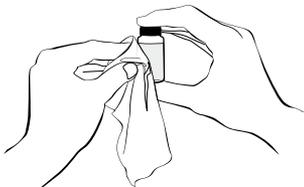
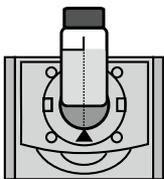
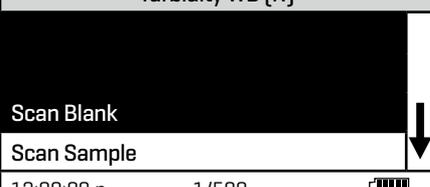
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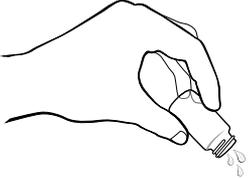
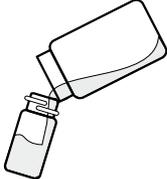
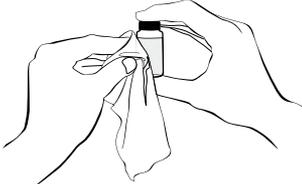
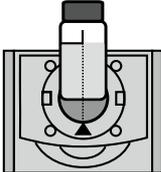
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<p>2. Press ENTER to select Measure Menu.</p>	<table border="1"> <tr> <th colspan="2">Measure Menu [N]</th> </tr> <tr> <td>Turbidity - No Blank</td> <td></td> </tr> <tr> <td>Turbidity - With Blank</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </table>	Measure Menu [N]		Turbidity - No Blank		Turbidity - With Blank		12:00:00 p	1/500 
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<p>3. Press ▼ to scroll to Turbidity - With Blank.</p>	<table border="1"> <tr> <th colspan="2">Measure Menu [N]</th> </tr> <tr> <td>Turbidity - No Blank</td> <td></td> </tr> <tr> <td>Turbidity - With Blank</td> <td></td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </table>	Measure Menu [N]		Turbidity - No Blank		Turbidity - With Blank		12:00:00 p	1/500 
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Turbidity - No Blank									
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12:00:00 p	1/500 								

ANALYSIS WITH BLANKING

<p>4. Press ENTER to select Turbidity - With Blank.</p>	<p style="text-align: center;">Turbidity WB [N]</p> 
<p>5. Rinse a clean tube [0260] three times with the blank. If samples are expected to read below 1 NTU the meter should be blanked with a 0 NTU Primary Standard or prepared turbidity-free [<0.1 NTU] water. For the most accurate results, use the same tube for the blank and the sample.</p>	
<p>6. Fill the tube to the fill line with the blank. Pour the blank down the inside of the tube to avoid creating bubbles. Cap the tube.</p>	
<p>7. Wipe the tube thoroughly with a lint-free cloth.</p>	
<p>8. Open the meter lid. Insert the tube into the chamber. Align the index line on the tube with the index arrow on the meter. Close the lid.</p>	
<p>9. Press ENTER to select Scan Blank and scan the blank. The screen will display Scan Blank and Scan Done for about 1 second and then return to the Turbidity - With Blank menu.</p>	<p style="text-align: center;">Turbidity WB [N]</p> 

<p>10. Rinse a clean tube [0260], or the same tube, three times with the sample.</p>											
<p>11. Fill the tube to the fill line with the sample. Pour the standard down the inside of the tube to avoid creating bubbles. Cap the tube.</p>											
<p>12. Wipe the tube thoroughly with a lint-free cloth.</p>											
<p>13. Open the meter lid. Insert the tube into the chamber. Align the index line on the tube with the index arrow on the meter. Close the lid.</p>											
<p>14. Press ENTER to select Scan Sample and scan the sample. The screen will display Scan Sample and Scan Done for about 1 second. The result will appear on the screen. "Overrange" will be displayed if the reading is out of range. Dilute the sample or select a mode that is appropriate for the range of the sample. Press ▲ or ▼ to scroll to Print. Press ENTER to print to the BLE Mobile Printer [Code 5-0067].</p>	<table border="1"> <thead> <tr> <th colspan="2">Turbidity WB [N]</th> </tr> </thead> <tbody> <tr> <td colspan="2" style="text-align: center; font-size: 2em;">0.99 NTU</td> </tr> <tr> <td colspan="2">Scan Blank</td> </tr> <tr> <td colspan="2">Scan Sample</td> </tr> <tr> <td>12:00:00 p</td> <td>1/500 </td> </tr> </tbody> </table>	Turbidity WB [N]		0.99 NTU		Scan Blank		Scan Sample		12:00:00 p	1/500 
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0.99 NTU											
Scan Blank											
Scan Sample											
12:00:00 p	1/500 										

NOTE: The meter will remember the last scanned blank reading. It is not necessary to scan a blank each time the test is performed. To use the previous blank reading, instead of scanning a new one, scroll to Scan Sample and proceed. For the most accurate results, the meter should be blanked before each test and the same tube should be used for the blank and the sample.

■ DILUTION PROCEDURE

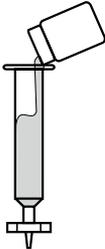
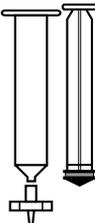
If a sample is encountered that is more than 2000 NTU or FNU, a careful dilution with 0 NTU/ FNU or very low turbidity water will bring the sample into an acceptable range. However, there is no guarantee that halving the concentration will exactly halve the NTU or FNU value. Particulates often react in an unpredictable manner when diluted.

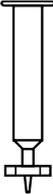
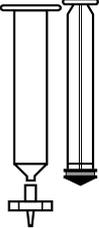
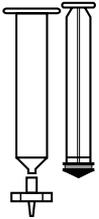
TURBIDITY-FREE WATER

The definition of low turbidity and turbidity-free water has changed as filter technology has changed and nephelometric instruments have become more sensitive. At one time turbidity-free water was defined as water that had passed through a 0.6 micron filter. Now 0.1 micron filters are available and higher purity water is possible. Water that has been passed through a 0.1 micron filter could be considered particle free and therefore turbidity free, 0 NTU water. Turbidity is caused by scattered light. Therefore, low turbidity water is water without any particles that scatter a measurable amount of light. But water that passed through a 0.1 micron filter may still have detectable light scatter with modern instruments. This light scattering can be the result of dissolved molecules or sub-micron sized particles that can not be filtered out of the water. Because there may still be a small amount of scattered light from dissolved molecules, high purity water is often called low turbidity water and assigned a value of 0.01 or 0.02 NTU. However, because this water is used as a baseline to compare to sample water, the difference between the sample and the low turbidity or turbidity-free water will be the same whether it is called 0.00 NTU or 0.02 NTU. For design simplicity the 2020t/i BLE uses the term turbidity-free water and the value of 0.00 NTU.

■ PREPARATION OF TURBIDITY-FREE WATER

A 0 NTU/FNU Standard [Code 1480] is included with the meter. Turbidity-free water for blanking the meter and dilution of high turbidity samples can also be prepared. The preparation of turbidity-free water requires careful technique. Introduction of foreign matter will affect the turbidity reading. A 0.1-micron membrane filter should be used. When using an apparatus consisting of a filter, filter holder and syringe, the filter, filter holder and syringe must be conditioned by forcing at least two syringes full of deionized water through the filtering apparatus to remove foreign matter. The first and second rinses should be discarded. Turbidity-free water may be stored in the dark at room temperature in a clean glass bottle with a screw cap and used as required. The storage container should be rinsed thoroughly with filtered deionized water before filling. The water should be periodically inspected in bright light for foreign matter.

<p>1. Remove the plunger from the syringe. Attach a filter to the bottom of the syringe.</p>	
<p>2. Pour approximately 50 mL of deionized water into the barrel of the syringe. Insert the plunger. Exert pressure on the plunger to slowly force the water through the filter. Collect water in the clean storage container. Rinse walls of the container then discard this rinse water.</p>	
<p>3. Remove the filter from the syringe. Remove the plunger from the barrel. [This step is required to prevent rupturing the filter by the vacuum that would be created when the plunger is removed.]</p>	

<p>4. Replace the filter and repeat step 2 for a second rinse of the syringe and storage container.</p>	
<p>5. Remove the filter from the syringe. Remove the plunger from the barrel. Replace the filter and fill the syringe with approximately 50 mL of deionized water. Filter the water into the storage container and save this turbidity-free water.</p>	
<p>6. Repeat Step 5 until the desired amount of turbidity-free water has been collected.</p>	

■ 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. Gently mix sample by inverting before taking a reading but avoid introducing air bubbles.
4. For the most precise results, follow the recommended procedure for wiping a filled tube before placing it in the meter chamber. Invert tube very slowly and gently three times to mix the sample. Surround the tube with a clean, lint-free cloth. Press the cloth around the tube. Rotate the tube in the cloth three times to assure that all areas of the tube have been wiped. Place tubes in the chamber with the same orientation each time.
5. Discard tubes that have significant scratches and imperfections in the light pass zones. [Central zone between bottom and fill line].
6. When reading very low turbidity samples, do not use tubes or caps that have been used previously with high turbidity samples.
7. Use the averaging option for low level measurements of turbidity.
8. The meter should be placed on a surface that is free from vibrations. Vibrations can cause high readings.
9. Turbidity readings will be affected by electric fields around motors.
10. Carbon in the sample will absorb light and cause low readings.
11. Excessive color in a sample will absorb light and cause low readings. The user should verify if a certain level of color will cause a significant error at the level of turbidity being tested. Use of the Ratiometric calibration curve is recommended for highly colored samples.
12. Observe shelf life recommendations for turbidity standards.
13. Do not use silicone oil on tubes when testing turbidity with the 2020t/i BLE.
14. When testing at low concentrations use the same tube for the blank and the sample.

15. Always insert tube into the meter chamber with the same amount of pressure and to the same depth.
16. Occasionally clean the chamber with a damp lint-free wipe, followed by a Windex® dampened wipe. A clean chamber and tubes are essential for reliable results.
17. For the greatest accuracy during the calibration procedure, be sure that after the meter is blanked and the blank is scanned as a sample, the reading is 0.00. If not, reblank the meter and scan the blank again until it reads 0.00. When scanning the calibration standards as the sample, scan the calibration standard three times removing the tube from the chamber after each scan. The readings should be consistent. Use the last consistent reading to calibrate the meter. If the readings are not consistent, avoid using an aberrant reading to calibrate the meter.
18. Calibrate the meter daily.
19. Calibrate the meter with a standard that is closest to the expected range of the sample being tested. For example, if the sample is expected to be less than 1.0 NTU, calibrate with a 1.0 NTU standard and a blank (0 NTU standard). If the sample is expected to be around 2 NTU also calibrate with the 1.0 NTU standard but if the sample is expected to be around 8 NTU calibrate with a 10 NTU standard. If the sample is expected to be over 30 – 40 NTU it is recommended that the meter be calibrated with a 100 NTU standard.
20. To maintain a consistent lamp temperature, do not turn the meter on and off when analyzing samples.

TROUBLESHOOTING GUIDE

■ TROUBLESHOOTING

PROBLEM	REASON	SOLUTION
"Blank?"	Sample is reading lower than the blank.	With samples of very low concentration reblank or record as zero. On samples of higher concentration reblank and read again.
 Flashing	Low battery. Readings are reliable.	Charge battery or use USB wall/ computer charger.
"Low Battery"	Battery voltage is very low. Readings are not reliable.	Charge battery or use USB wall/ computer charger.
"Shut Down Low Batt" Shut Down	Battery is too low to operate the unit.	Charge battery or use USB wall/ computer charger.
"Over range"	Sample is outside of acceptable range.	Dilute sample and test again.
"Error1"	High readings with 90° and 180° detectors.	Dilute sample by at least 50% and retest.
Unusually large negative or positive readings when performing calibration	Incorrect standards used to calibrate meter.	Use fresh 0.0 standard in clean tube. Recalibrate meter.
Trouble connecting to Bluetooth device	Bluetooth not enabled Too many Bluetooth devices near the meter	Enable Bluetooth Have only one Bluetooth device near the meter
Trouble connecting to computer by USB	Broken connection	Press and hold power button for 1 second
Results not printing	Printer not on The meter will only print to the BLE Mobile Printer [Code 5-0067]. The Bluetooth Pairing option is not set correctly.	Turn printer on Connect to the BLE Mobile Printer [Code 5-0067]. See Setup Bluetooth Printing.

■ STRAY LIGHT

The accuracy of readings on the 2020t/i BLE should not be affected by stray light. Make sure

that the sample compartment lid is always fully closed when taking readings. The backlight will interfere with turbidity readings. The meter will temporarily disable the backlight while turbidity measurements are being taken.

GENERAL OPERATING INFORMATION

■ OVERVIEW

The 2020t/i BLE is a portable, microprocessor controlled, direct reading nephelometer. Turbidity is measured directly according to EPA Method 180.1 or ISO Method 7027, or is calculated ratiometrically by using a combination of the two measurements. It has a graphical liquid crystal display and six button keypad. These allow the user to select options from the menu driven software, to directly read test results or to review stored results of previous tests in the data logger. The menus can be displayed in eight languages.

The 2020t/i BLE uses a state of the art, multi-detector optical configuration that assures long term stability of calibrations, high precision and accuracy and low detection limits. All readings are determined by digital signal processing algorithms, minimizing fluctuations in readings and enabling rapid, repeatable measurements. The microprocessor and optics enable a dynamic range and auto-ranging over several ranges. Energy efficient LED light sources are used for ISO turbidity. EPA turbidity uses a tungsten filament light source that meets or exceeds EPA specifications and is designed for a uniform light spot image and stable output.

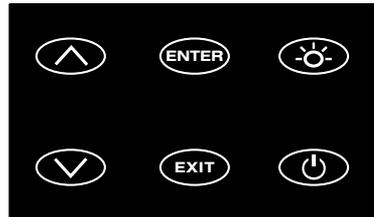
A USB wall adapter, USB computer connection or lithium battery powers the 2020t/i BLE.

GENERAL OPERATING INFORMATION

The operation of the 2020t/i BLE is controlled by the menu driven software and user interface. A menu is a list of choices. This allows a selection of various tasks for the 2020t/i BLE to perform, such as, scan blank and scan sample. The keypad is used to make menu selections that are viewed on the display.

■ THE KEYPAD

	This button will scroll up through a list of menu selections.
	The button is used to select choices in a menu viewed in the display.
	This button controls the backlight on the display.
	This button will scroll down through a list of menu selections.
	This button exits to the previous menu.
	This button turns the meter on or off.



■ THE DISPLAY & MENUS

The display allows menu selections to be viewed and selected. These selections instruct the 2020t/i BLE to perform specific tasks. The menus are viewed in the display using two general formats that are followed from one menu to the next. Each menu is a list of choices or selections.

The display has a header line at the top and a footer line at the bottom. The header displays the title of the current menu. The footer line displays the time, the data logger status and the battery status. The menu selection window is in the middle of the display between the header and the footer.

The menu selection window displays information in two general formats. In the first format only menu selections are displayed. Up to 4 lines of menu selections may be displayed. If more selections are available they can be viewed by pressing the arrow buttons  and  to scroll the other menu selections into the menu selection window. Think of the menu selections as a vertical list in the display that moves up or down each time an arrow button   is pressed. Some menus in the 2020t/i BLE are looping menus. The top and bottom menu choices are connected in a loop. Scrolling down past the bottom of the menu will lead to the top of the menu. Scrolling up past the top of the menu will lead to the bottom of the menu.

Header	Menu Title
Main Selection Window	First Choice
	Second Choice
	Third Choice
	Another
Footer	12:00:00 p 1/500 

And Another

And So On

A light colored bar will indicate the menu choice. As the menu is scrolled through, the light colored bar will highlight different menu choices. Pressing the **ENTER** button will select the menu choice that is indicated by the light colored bar.

In the second format the menu choice window takes advantage of the graphical capabilities of the display. Large format graphic information, such as test results or error messages or the LaMotte logo is displayed. The top two lines of the display are used to display information in a large, easy to read format. The menus work in the same way as previously described but only two lines of the menu are visible at the bottom of the display.

Header	Menu Title
Message or Result Window	Result or Message
Main Selection Window	Another
	And Another
Footer	12:00:00 p 1/500 

And So On

Last Choice

As described previously, the **EXIT** button allows an exit or escape from the current menu and a return to the previous menu. This allows a rapid exit from an inner menu to the main menu by repeatedly pushing the **EXIT** button. Pushing  at any time will turn the 2020t/i BLE off.

The display may show the following messages:

	Battery Status
	More choices are available and can be viewed by scrolling up and/or down through the display.
Header	Identifies the current menu and information on calibration curves and reagent systems if applicable.
Footer	In the data logging mode the number of the data point is displayed and the total number of data points in the memory will be shown. The footer also shows current time and battery status

■ NEGATIVE RESULTS

There are always small variations in readings with analytical instruments. Often these variations can be observed by taking multiple readings of the same sample. These normal variations will fall above and below an average reading. Repeated readings on a 0.00 turbidity sample might give readings above and below 0.00. Therefore, negative readings are possible and expected on samples with concentrations at or near zero. This does not mean there is a negative concentration in the sample. It means the sample reading was less than the blank reading. Small negative readings can indicate that the sample was at or near the detection limit. A large negative reading, however, is not normal and indicates a problem. Some instruments are designed to display negative readings as zero. In this type of instrument, if the meter displayed zero when the result was actually a large negative

number there would be no indication that a problem existed. For this reason, the 2020t/i BLE displays negative numbers for turbidity.

■ TUBES AND CHAMBERS

The 2020t/i BLE uses specific tubes [Code 0260]. These tubes have been annealed to reduce irregularities in the glass. This reduces tube to tube variation and results in more accurate readings. Only Code 0260 tubes should be used with this meter.

The handling of the tubes is of utmost importance. Tubes must be clean and free from lint, fingerprints, dried spills and significant scratches, especially the central zone between the bottom and the sample line.

Scratches, fingerprints and water droplets on the tube can cause stray light interference leading to inaccurate results when measuring turbidity. Scratches and abrasions will affect the accuracy of the readings. Tubes that have been scratched in the light zone through excessive use should be discarded and replaced with new ones.

Tubes should always be washed on the inside and outside with mild detergent prior to use to remove dirt or fingerprints. The tubes should be allowed to air-dry in an inverted position to prevent dust from entering the tubes. Dry tubes should be stored with the caps on to prevent contamination.

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. It is imperative that the tubes and light chamber be clean and dry. The outside of the tubes should be dried with a clean, lint-free cloth or disposable wipe before they are placed in the meter chamber.

Tubes should be emptied and cleaned as soon as possible after reading a sample to prevent deposition of particulates on the inside of the tubes. When highly accurate results are required, reduce error by designating tubes to be used only for very low turbidity and very high turbidity testing.

Variability in the geometry of the glassware and technique are the predominate cause of variability in results. Slight variations in wall thickness and the diameter of the tubes may lead to slight variations in the test results. To eliminate this error the tubes should be placed in the chamber with the same orientation each time.

Chambers which have been scratched through excessive use should be discarded and replaced with a new one.

MAINTENANCE

■ CLEANING

Clean the exterior housing with a damp, lint-free cloth. Do not allow water to enter the light chamber or any other parts of the meter. To clean the light chamber and optics area, point a can of compressed air into the light chamber and blow the pressurized air into the light chamber. Use a cotton swab dampened with Windex® window cleaner to gently swab the interior of the chamber. Do not use alcohol; it will leave a thin residue over the optics when dry.

■ RETURNS

Should it be necessary to return the meter, pack the meter carefully in a suitable container with adequate packing material. A return authorization number must be obtained from LaMotte Company by calling 800-344-3100 [US only] or 410-778-3100, faxing 410-778-6394, or emailing tech@lamotte.com. Often a problem can be resolved over the phone or by email. If a return of the meter is necessary, attach a letter with the return authorization number, meter serial number, a brief description of problem and contact information including phone and FAX numbers to the shipping carton.

■ METER DISPOSAL

Waste Electrical and Electronic Equipment [WEEE]

Natural resources were used in the production of this equipment. This equipment may contain materials that are hazardous to health and the environment. To avoid harm to the environment and natural resources, the use of appropriate take-back systems is recommended. The crossed out wheeled bin symbol on the meter encourages the use of these systems when disposing of this equipment.



Take-back systems will allow the materials to be reused or recycled in a way that will not harm the environment. For more information on approved collection, reuse, and recycling systems contact local or regional waste administration or recycling services.



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