

Operation Manual

ULTRAPEN_{X2}[™] PTBT6 Nitrate & Temperature Pocket Tester

*For use with PTBTX2[™] App
and Your iOS[™] or Android[™] Mobile Device*



ULTRAPENx2™ PTBT6 Operation Manual
Nitrate Concentration and Temperature Pen for Use with your Mobile Device
Running the PTBTX2™ App

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INTRODUCTION

Thank you for selecting the Myron L® Company ULTRAPENx2™ PTBT6 Nitrate Pocket Tester. This instrument is designed to be accurate, fast, and simple to use in diverse water quality applications. Advanced features include:

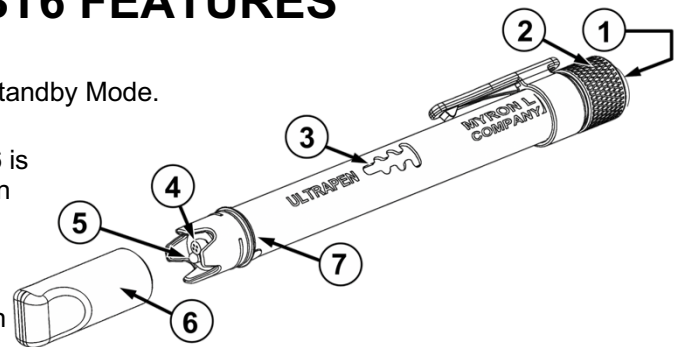
- Selectable Units for Displaying Nitrate Concentration in ppm as nitrogen (NO_3^- -N), or nitrate (NO_3^-), or in millivolt (mV)
- 1-point or 2-point Calibration Options with Choice of 4 Reference Solutions
- Proprietary ISE Sensor Design
- Built in Double Junction Reference Electrode, No Need for External Reference
- Compatible with EPA Approved Standard Method 4500- NO_3^- D
- Live or Hold Mode – User Selectable
- Rugged Design with Aircraft Aluminum Body
- Durable, Epoxy Encapsulated Electronics
- Waterproof

 Bluetooth® Enabled

ULTRAPENx2 PTBT6 FEATURES

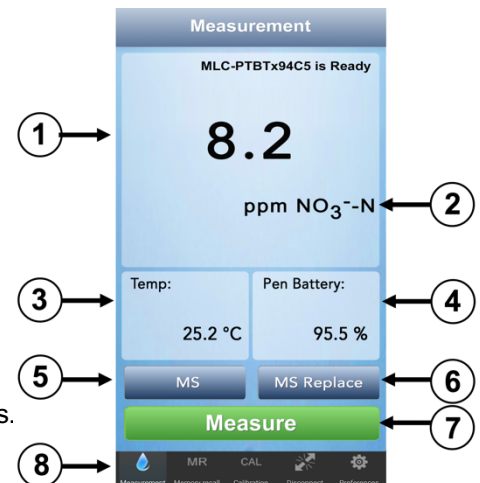
I. PTBT6

1. **PEN BUTTON** – Press to turn Ultrapen ON and place it in Standby Mode.
2. **BATTERY CAP** – Unscrew to change battery.
3. **LED INDICATOR LIGHT** – Flashes rapidly when the PTBT6 is MEASURING or once every 5 seconds when the PTBT6 is in Standby mode.
4. **ISE ELECTRODE** – Contains the Nitrate ISE membrane.
5. **THERMISTOR** – Measures temperature of sample solution.
6. **PROTECTIVE CAP** – Protects sensor from damage and can be used to hold solution when conditioning sensor.
 - See MAINTENANCE Section below for storage instructions.
 - When removing or replacing the cap, gently wiggle it back and forth while pulling / pushing. DO NOT twist!
7. **CAP STOP** – **DO NOT** push the protective cap beyond the cap stop as sensor damage may occur.



II. PTBTX2 APP MEASUREMENT SCREEN

1. **MEASUREMENT VALUE FIELD** – Displays the measured value of the solution. When the PTBT6 turns OFF, displays the message: "Ultrapen is Offline" and values gray out.
2. **UNITS OF MEASURE** – Displays nitrate units of measure.
3. **SOLUTION TEMPERATURE** – Measured temperature of the solution.
4. **PTBT6 BATTERY LEVEL** – Flashes RED when PTBT6 battery is $\leq 25\%$.
5. **MEMORY STORE BUTTON** – Tap here to record the measurement in the App's database.
6. **MEMORY REPLACE BUTTON** – Tap here to replace a previously stored measurement with data from a new measurement.
7. **MEASURE BUTTON** – Tap this to start a new measurement.
8. **FEATURE NAVIGATION BAR** – These buttons activate various App features.



III. FEATURE NAVIGATION BAR

This bar appears at the bottom of all screens. The buttons in this bar are used to navigate between the App's main functional areas.

MEASUREMENT – Returns the App to the Measurement screen.

MEMORY RECALL – Displays a list of saved measurements.

CALIBRATION – Places the App in Calibration Mode.

CONNECT – Opens the App's Bluetooth Connect / Disconnect screen. Once a PTBT6 is connected to the App the button label changes to say, Disconnect.

PREFERENCES – Opens the App's Preferences & Settings Modes, including an internet link to the full App Operation Manual (HELP).



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SENSOR CONDITIONING

If the sensor is new and/or has been stored dry, the sensor needs to be conditioned before calibration or measurement.

1. Remove the protective cap.
2. Rinse the sensor with clean water (preferably DI, RO, or distilled) and pat it dry with a clean soft lint-free cloth.
3. Fill the protective cap half-full with prepared reference solution (with Nitrate Ionic Strength Adjuster (NISA) added, See PREPARING REFERENCE SOLUTION, below).
4. Carefully put the cap back on the sensor for conditioning (use caution as excess solution may squirt out).

NOTES:

- It may take up to an hour for sensor to restore stable readings after dry storage.
- For best results, you should always condition your sensor using a prepared reference solution with a value close to the lower end of the concentration values you will be measuring.

USING THE PTBT6

STEP 1 – DOWNLOAD THE “ULTRAPEN PTBTX2” APP



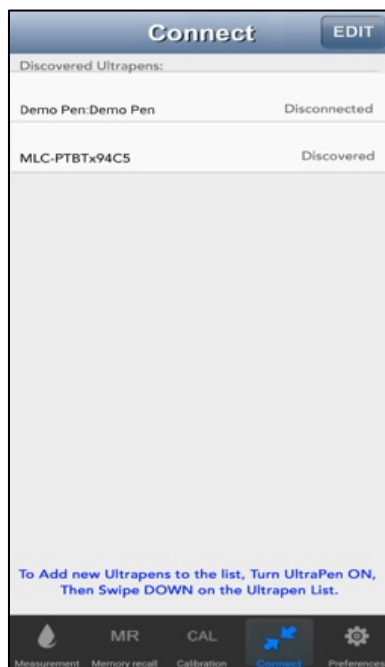
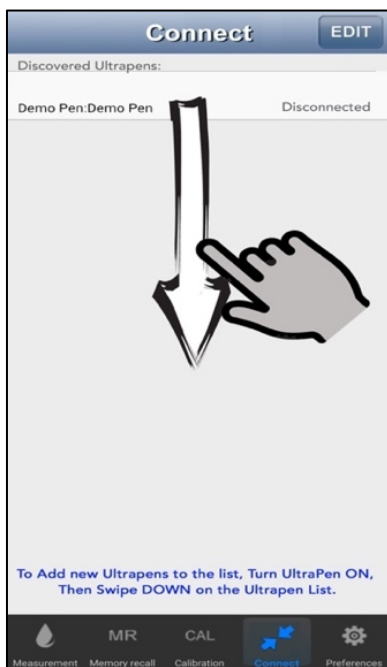
SYSTEM REQUIREMENTS

iOS device running iOS 10.0 or later.
If you are using an iPad,
search for iPhone Apps.

Android device running OS 7.0 or later.

STEP 2 – CONNECT THE PTBT6 TO THE APP

1. If the PTBT6 is OFF, press and release the PEN BUTTON to turn the PTBT6 ON and place it in Standby mode.
2. On your Device's Home Screen, tap the BLUE PTBTX2 icon to open the PTBTX2 App.
3. Tap the CONNECT button at the bottom of the App display.
 - The App will switch to the Connect Screen.



4. Swipe down on the screen. The PTBT6 will appear on the list.

5. Tap the PTBT6's name when it appears. Default: **MLC-PTBTX[Hexadecimal ID]**

6. The PTBT6 will move to the top of the list and a check mark will appear.

NOTES:

- Some Mobile Devices switch their wireless transmitters to a low power mode when their battery level gets too low.
- This could affect how easily your PTBT6 and your device connect and communicate.
- **ALWAYS** keep your Mobile Device charge level as high as possible. If it is <40%, plug your Mobile Device into a charger.

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STEP 3 – CHOOSE A MEASUREMENT PARAMETER SETTING

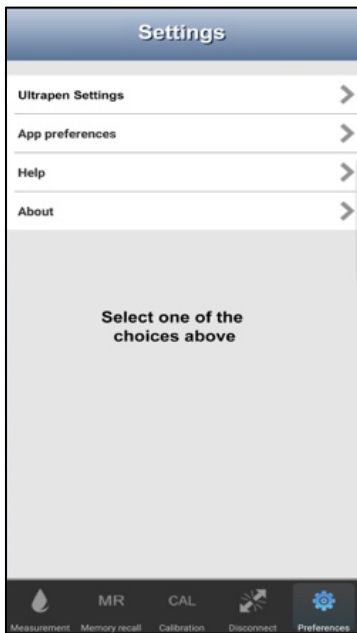
The PTBT6 allows you to select one of three different ways to display nitrate measurements:

- **NO₃⁻-N**: Displays nitrate as nitrogen in parts per million (ppm).
- **NO₃**: Displays nitrate in ppm.
- **mV**: Displays the raw signal output of the nitrate sensor in millivolt (mV).

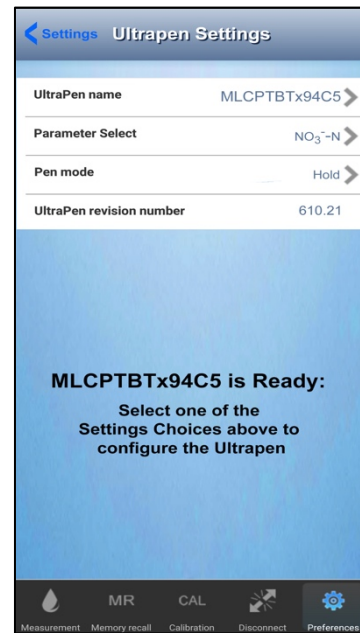
To choose which nitrate parameter to display during measurements:

1. If the PTBT6 is OFF, press and release the PEN BUTTON to turn the PTBT6 ON and place it in Standby mode.

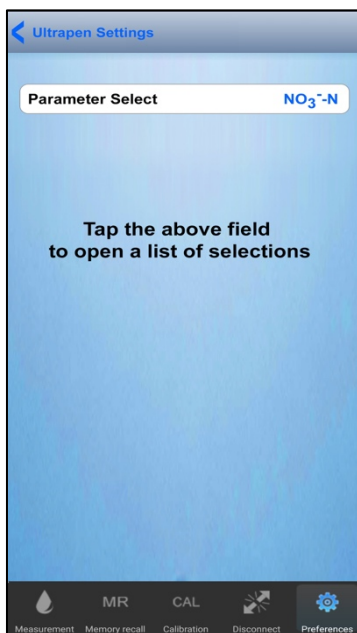
2. Tap the PREFERENCES button  in the Feature Navigation Bar.



3. Tap the line that says **Ultrapen Settings**.

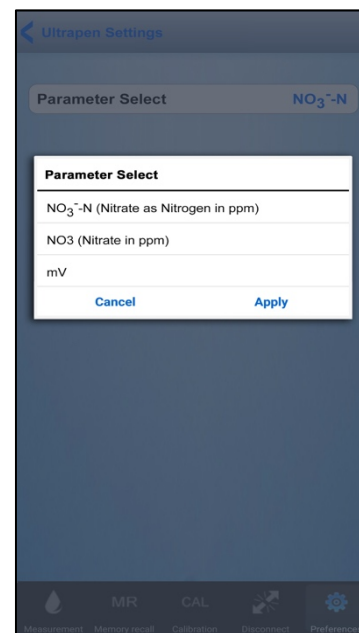


4. Tap the Parameter Select line.



5. The App will display the current parameter setting.

6. Tap the Parameter field.



7. Select the measurement parameter.

8. Tap **APPLY**. The App will update the PTBT6 parameter.

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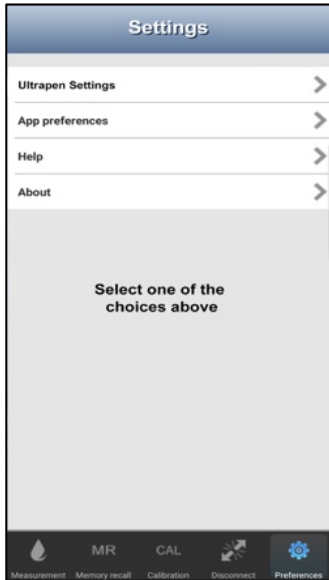
STEP 4 – CHOOSE AN ULTRAPEN MODE SETTING

The PTBT6 has two Ultrapen measurement modes:

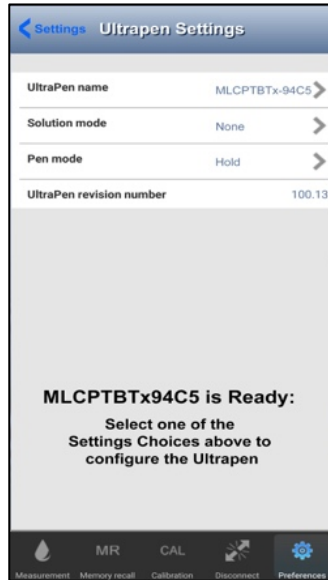
- **HOLD** mode (Default) – The PTBT6 displays measurements in real time until the measurement has stabilized, then the App displays the final reading and puts the PTBT6 into Standby mode.
- **LIVE** mode – The PTBT6 sends a series of real-time readings that are displayed continuously for up to 5 minutes after which the final reading is held on the App's display and the App places the PTBT6 into Standby mode. The user may end the LIVE mode measurement series any time prior to that by tapping the BLUE button on the App display.

To select either the LIVE or the HOLD mode:

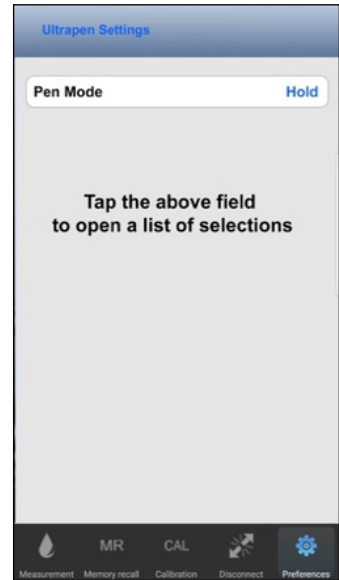
1. If the PTBT6 is OFF, press and release the PEN BUTTON to turn the PTBT6 ON and place it in Standby mode.
2. Tap the PREFERENCES button  in the Feature Navigation Bar.



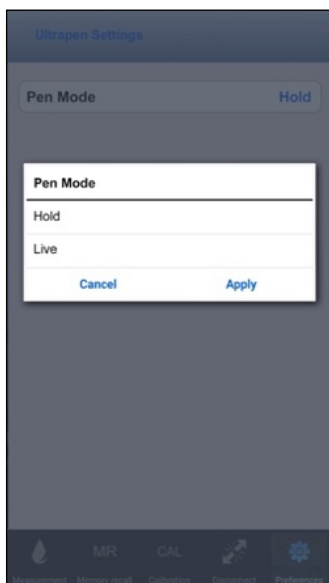
3. Tap the line that says **Ultrapen Settings**.



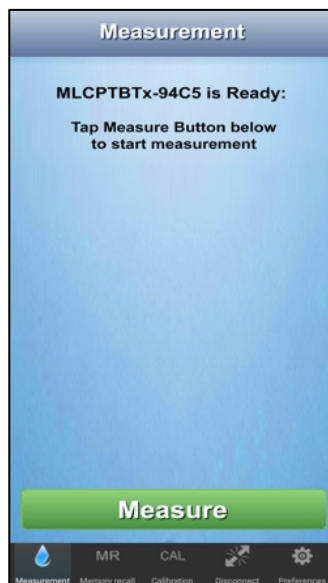
4. Tap the Pen Mode line on the screen.



5. The App will display the current mode setting.
6. Tap the Pen Mode field.



7. Select Live or Hold, then tap **APPLY**.



8. Return to the Measurement screen and tap the GREEN MEASURE button.



9. Either tap the BLUE button to manually stop LIVE mode, or it will stop by itself after 5 minutes.

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NITRATE MEASUREMENT

I. MEASUREMENT SETUP

ALWAYS perform a calibration check with reference solution, and if the reading is off more than 10%, calibrate the PTBT6. (See **CALIBRATION** section below).

USING THE PIPETTE TO DRAW SOLUTION:

1. Depress the pipette plunger to the 1st stop.
2. Place tip in Nitrate Ionic Strength Adjuster (NISA) solution and release slowly.
3. To dispense, depress pipette completely to the 2nd stop.
 - Do not contaminate the pipette tip by touching it with your fingers or setting it on a dirty surface.
 - Do not dip the pipette tip in the reference solution as this will cause cross-contamination between solutions.

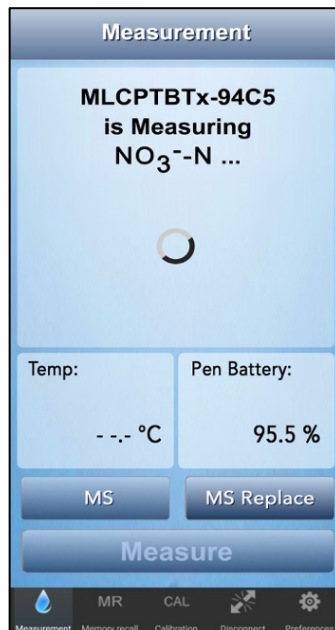
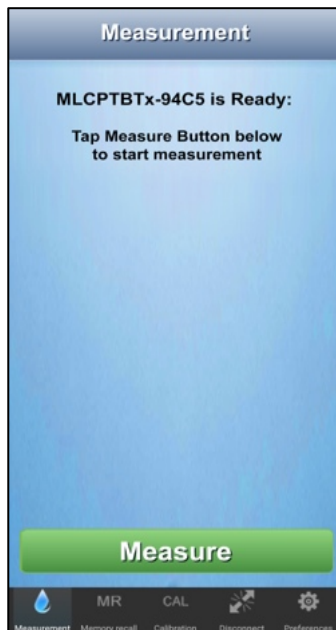
The following should **ALWAYS** be performed just prior to performing a measurement with your PTBT6:

PREPARING A SAMPLE SOLUTION:

1. Fill the graduated cylinder to the 10 mL line with the sample solution.
2. Add 200 µL of the Nitrate Ionic Strength Adjuster (NISA) solution to the graduated cylinder (using the supplied 100 µL pipette).
3. Replace the cap on the graduated cylinder and shake well to mix the prepared test solution.

II. PTBT6 HOLD MODE MEASUREMENTS

1. If the PTBT6 is **OFF**, press and release the PEN BUTTON to turn the PTBT6 ON and place it in Standby mode.
2. Tap the MEASUREMENT button  in the Feature Navigation Bar.



3. Submerge the sensor in the prepared sample solution and swirl it for several seconds to remove bubbles trapped in the sensor.
- 4 Tap the GREEN MEASURE button.
5. Hold the PTBT6 **steady** in the sample while the PTBT6 is measuring. The PTBT6's LED will flash rapidly.
 - The MEASURE button will be inactive.
6. When the PTBT6 completes the measurement the App will display the values.
 - The MEASURE button will turn GREEN and be active.

• **MS Button**

Tap to record the last measurement.

• **MS REPLACE Button**

Tap to replace data in an existing record with data from the last measurement.

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III. PTBT6 LIVE MODE MEASUREMENTS

1. If the PTBT6 is OFF, press and release the PEN BUTTON to turn the PTBT6 ON and place it in Standby mode.
2. Tap the MEASUREMENT button  in the Feature Navigation Bar.



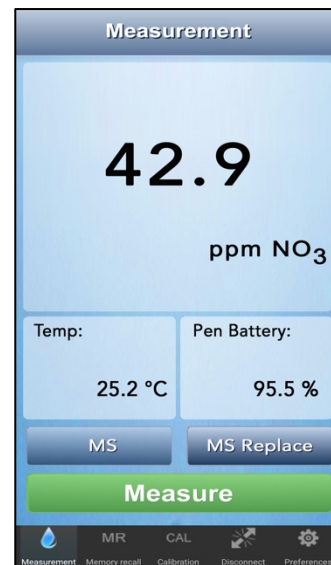
3. Submerge the sensor in the prepared sample solution and swirl it for several seconds to remove bubbles trapped in the sensor.
4. Tap the GREEN MEASURE button.



5. Hold the PTBT6 steady in the sample while the PTBT6 is measuring. The PTBT6's LED will flash rapidly.



6. When the PTBT6 stabilizes, it will begin displaying measurements.
 - a. A flashing, BLUE, LIVE mode indicator will appear in the upper right corner of the Measurement Value field.
 - b. A BLUE button will appear that allows the user to manually end LIVE mode measurements at any time.
7. Hold the Ultrapen steady in the sample solution while the LIVE mode measurement is continuing. **DO NOT SWIRL!**



8. After 5 minutes, or if the user taps the BLUE "End Live Mode" button, the Ultrapen will send its last measurement result and put itself in Standby mode.
9. The App will display the final measurement values.

MS Button

- During LIVE mode, tapping the MS button will allow you to store each new measurement.
- Once you SAVE the measurement, the App will automatically return to the LIVE mode measurement screen.

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IV. INTERFERENCE

Other anions in the sample solution may interfere with nitrate measurement, depending on the species and their relative levels of nitrate. The impact of interference ions on measurements can be expressed by the Nikolsky Equation:

$$E = Constant + \frac{2.303RT}{z_I F} \log (a + K_I a_I^{-1/z_I})$$

Where: E - the voltage sensor measures

a - the activity of nitrate

a_I - the activity of interference ion

z_I - the charge of the interference ion with sign

K_I - the selectivity coefficient of the interference ion for nitrate measurement

TABLE 1

	SO ₄ ²⁻	Cl ⁻	CH ₃ COO ⁻
K(NO ₃ ⁻ /X)	0.00016	0.007	0.0007

Generally, interference ions may cause positive errors for the measurement. The higher selectivity coefficient the interference ion has, the higher error it may cause at a given concentration. The approximate selectivity coefficients of PTBT6 for some anions are listed above. For example, if the activity of Cl⁻ is ten times higher than nitrate in the sample, Cl⁻ may cause 7% error for the nitrate measurement, while CH₃COO⁻ and SO₄²⁻ in the same ratio may only cause 0.7% and 0.05% error, respectively.

When testing samples with high interference levels, such as wastewater, chlorinated water, and soil water, the interference ions will be counted as nitrate with the coefficient factor and cause measurement errors. Some commonly existing interference ions, such as Cl⁻, Br⁻, I⁻, S²⁻, HCO₃⁻ and NO₂⁻ can be reduced by using Nitrate Interference Suppression Buffer (NISB). Add NISB at 1:1 volume ratio to all sample/standard solutions (e.g. add 5 mL NISB to 5 mL solution) in place of Nitrate Ionic Strength Adjuster (NISA) throughout the sensor conditioning, calibration and measurement.

NOTES:

- Nitrate Interference Suppression Buffer (NISB) must be purchased separately (see the ACCESSORIES section below).
- When using NISBSOL, do NOT add Nitrate Ionic Strength Adjuster (NISA). White precipitate may form in sample solution after mixing with NISBSOL, it will not affect the measurement.
- Strong interference ions such as ClO₄⁻ and SCN⁻ require their concentrations to be up to 2000x lower than nitrate in the sample to avoid high errors.

For best results when measuring solution at the extremes of the specified temperature or nitrate range allow the PTBT6 to equilibrate by submerging the sensor in the sample solution for 1 minute prior to taking a measurement.

- **ALWAYS** make sure the nitrate sensor is completely submerged in the solution being tested.
- For multiple samples, regularly perform a calibration check with reference solution between sample measurements.

V. MEASUREMENT VALIDATION METHODS

CALIBRATION CHECK:

1. Choose one standard solution within the testing range, and prepare the solution according to the measurement procedure.
2. Take a measurement using the readings in the reference solution.
 - The value should be within 10% of the expected value.
 - If not, the measurement result may not be reliable.
 - The source of error should be identified and the measurement should be redone after correction.

KNOWN ADDITION RECOVERY CHECK:

This validation method works well for validating low concentration measurements (1-60 ppm-N):

- Using concentrated standard solutions to increase the nitrate concentration in the sample by a known value, optimally doubles the measured value.
- Comparing the value with the increase in PTBT6 readings.
 - For about 10 mL sample, one spike of standard solution with the 100 µL pipette will increase the sample nitrate concentration by roughly 1% of the standard solution concentration.
 - **Example** ~1 ppm increase by one spike of 100 ppm standard solution, ~10 ppm increase by one spike of 1000 ppm standard solution.
 - See Table 2 below for more examples.

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TABLE 2

Spike References for Different Sample Concentrations for 10 mL Sample Volume (V/mL)

Measured Sample Concentration (ppm NO ₃ ⁻ -N)	×100 µL pipette	Reference Solution (ppm NO ₃ ⁻ -N)
1-3	1	100
3-9	3	100
9-20	1	1000
20-60	3	1000

- Add *n* spikes (volume increase: $V_{add}=0.1 \times n/\text{mL}$) of standard solution (C_s/ppm) to the sample solution after measurement (C_1/ppm) and swirl for mixing.
- Take the 2nd measurement (C_2/ppm) and calculate the recovery using the following equation:

$$Recovery(\%) = \frac{C_2 \times 100}{\frac{V \times C_1 + V_{add} \times C_s \times (1/(1 - D_f))}{(V_{add} + V)}}$$

Where:

Df - the dilution factor when spiking unprepared standard solutions:

- 1/51 for using NISA and ½ for using NISB.
- If adding prepared standard solutions, Df is 0.

The recovery should be within 10% of the expected value.

- If not, the measurement result may not be reliable.
- The source of error should be identified and the measurement should be redone after correction.

CALIBRATION

Myron L® Company recommends calibrating the PTBT6 before each series of tests, depending on usage.

I. GENERAL NOTES:

- Nitrate sensor should be conditioned prior to performing a calibration (see SENSOR CONDITIONING, above).
- The PTBT6 offers 1-point or 2-point calibration and is calibrated in nitrate as nitrogen (NO₃⁻ -N) using 1, 10, 100, or 1000 ppm reference solutions.
- For greatest accuracy complete a 2-point calibration, selecting the closest reference solutions in the same range as your expected test solution range (example: If you are measuring test solutions in the range of 200 to 400 ppm NO₃⁻ -N, use 100 ppm and 1000 ppm reference solutions to calibrate the PTBT6).
- Reference solutions must be prepared prior to use.
- Calibration is always done in nitrate as nitrogen (NO₃⁻ -N) even if your PTBT6 is set to measure in nitrate (NO₃). To select the optimal reference solutions and to verify calibration, see the Conversion Table below.

TABLE 3
Conversion Table

Reference Solution	Value in NO ₃ ⁻ -N	Value in (NO ₃ ⁻)
N1SOL	1 ppm	4.4 ppm
N10SOL	10 ppm	44 ppm
N100SOL	100 ppm	440 ppm
N1000SOL	1000 ppm	4400 ppm

NOTES:

- Always start with the lower calibration point first.
- For greatest accuracy, keep the temperature of the prepared reference solution(s) the same as the test solution. The temperature difference should be within ±2°C.

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II. PREPARING REFERENCE SOLUTION

NOTES on using the pipette to draw solution:

1. Depress the pipette plunger to the 1st stop.
2. Place tip in Nitrate Ionic Strength Adjuster (NISA) solution and release slowly.
3. To dispense, depress pipette completely to the 2nd stop.
 - Do not contaminate the pipette tip by touching it with your fingers or setting it on a dirty surface.
 - Do not dip the pipette tip in the reference solution as this will cause cross-contamination between solutions.

Reference solution(s) must be prepared prior to calibration. For each standard solution selected:

1. Fill a graduated cylinder to the 10 mL line with the reference solution.
2. Add 200 µL of the Nitrate Ionic Strength Adjuster (NISA) solution to the graduated cylinder (using the supplied 100 µL pipette).
3. Replace the cap on the graduated cylinder and shake well to mix the prepared reference solution.

III. VERIFYING CALIBRATION

To determine if your PTBT6 needs to be calibrated / recalibrated:

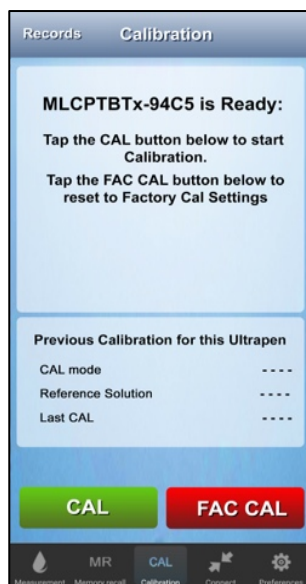
1. Make a measurement with prepared 1ppm, 10 ppm, 100, ppm or, 1000 ppm reference solution.
 - Use the reference solution that is closest in value to the expected nitrate values you will be measuring.
2. If the reading is off more than $\pm 10\%$ from the value of the reference solution, calibrate the PTBT6.
3. If the reading is still off more than $\pm 10\%$ from the value of the reference solution, perform a sensor check as defined in Section VI below.
4. If the problem persists, the sensor should be replaced.

IV. 2-POINT CALIBRATION

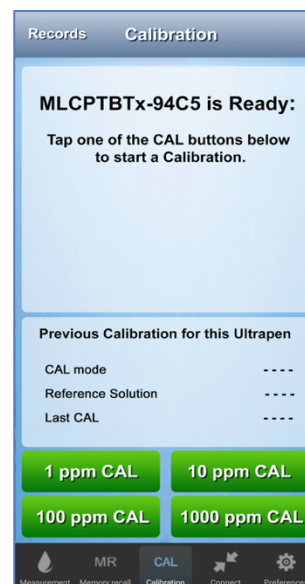
To perform a 2-point calibration you will need two prepared reference solutions, clean water (preferably DI, RO, or distilled), and a clean, dry, lint-free cloth. This example uses 100 ppm (N100SOL) and 1000 ppm (N1000SOL) reference solutions.

- **ALWAYS** do the lower value calibration point first (e.g. 100 ppm before 1000 ppm; etc.).
1. Remove the protective cap from the nitrate sensor.
 2. Rinse the sensor for about 5 seconds with clean water (preferably DI, RO, or distilled).
 3. **CAREFULLY** blot the sensor membrane with a soft, clean, lint-free cloth or tissue to remove any water drops.
 4. Dip the pen in the prepared **100 ppm** reference solution.
 - Make sure the sensor is completely submerged.
 5. Swirl it around to remove any bubbles that may have been caught in the sensor.

6. Tap the Calibration button  in the Feature Navigation Bar.



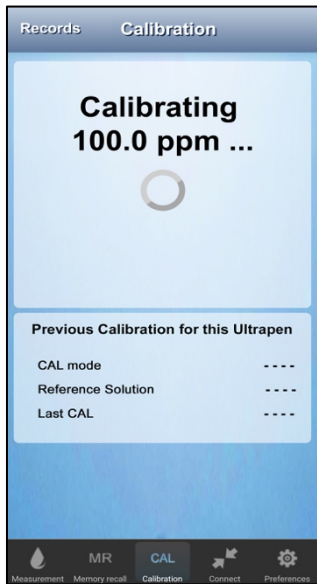
7. The Initial CAL screen will appear.
8. Tap the CAL button.



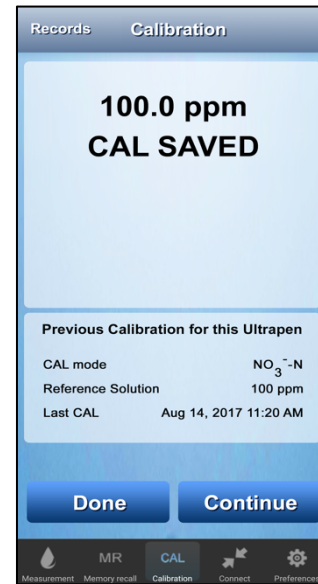
9. The PTBT6 Secondary CAL screen will appear.
10. Tap the button corresponding to the initial CAL point (100 ppm in this example).

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11. The PTBT6 will begin calibrating the initial point.
- The LED on the PTBT6 will begin to flash rapidly.
 - Hold the sensor steady while the calibration is being performed.



12. When the initial calibration point is completed, the App displays the values and saves a CAL record.
- A DONE button will appear.
 - A CONTINUE button will appear.

13. Rinse the sensor for about 5 seconds with clean water (preferably DI, RO, or distilled)

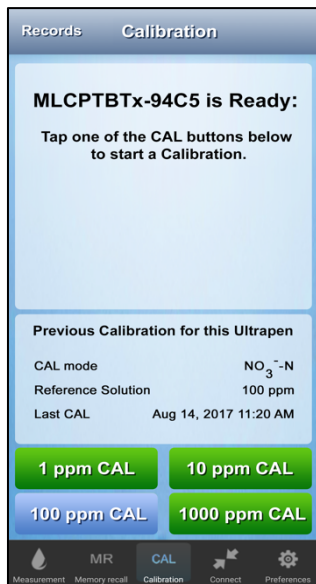
14. **CAREFULLY** blot the sensor membrane with a soft, clean, lint-free cloth or tissue to remove any water drops.

15. Dip the pen in the prepared **1000 ppm** reference solution.

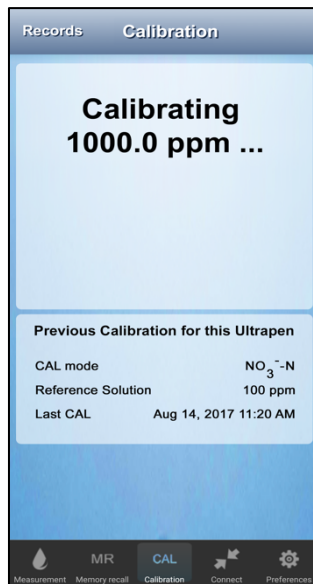
- Make sure the sensor is completely submerged.

16. Tap the CONTINUE Button.

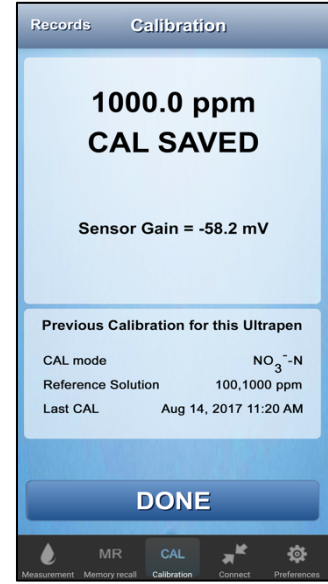
- The PTBT6 Secondary CAL screen will appear. The CAL button corresponding to the initial CAL point will be inactive.



17. Tap the button corresponding to the second CAL point (1000 ppm in this example).



18. The PTBT6 will begin calibrating the second point.
- The LED on the PTBT6 will begin to flash rapidly.
 - Hold the sensor steady while the calibration is being performed.



19. When the second calibration point is completed, the App displays a Sensor Gain value, the CAL values and updates the CAL record.
- A DONE button will appear.

20. Tap the DONE button to exit the calibration process.


NOTE: To properly interpret the Sensor Gain value, please read the Sensor Diagnostic Section below.

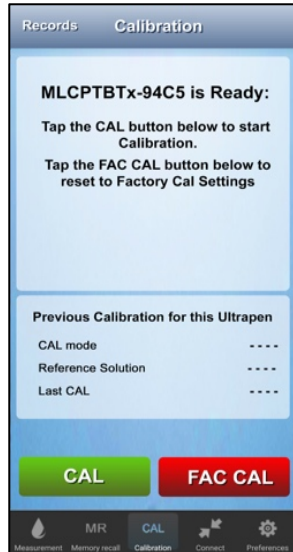
ULTRAPENx2™ PTBT6 Operation Manual

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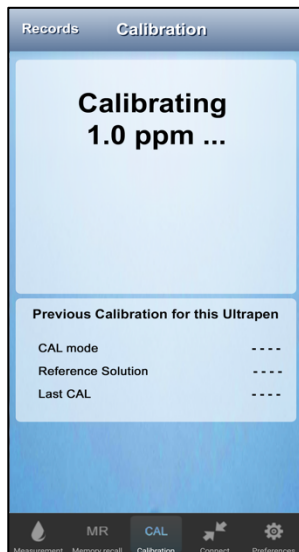
V. 1-POINT CALIBRATION

To perform a 1-point calibration you will need one prepared reference solutions, clean water (preferably DI, RO, or distilled), and a clean, dry, lint-free cloth.

- In this example the PTBT6 will be calibrated using 1 ppm (N1SOL).
1. Remove the protective cap from the nitrate sensor
 2. Rinse the sensor for about 5 seconds with clean water (preferably DI, RO, or distilled)
 3. **CAREFULLY** blot the sensor membrane with a soft, clean, lint-free cloth or tissue to remove any water drops.
 4. Dip the pen in the prepared **1 ppm** reference solution.
 - Make sure the sensor is completely submerged
 5. Swirl it around to remove any bubbles that may have been caught in the sensor.
 6. Tap the Calibration button  in the Feature Navigation Bar.

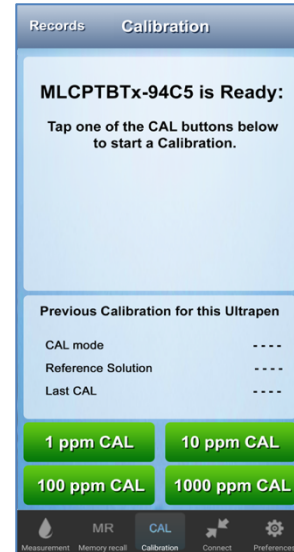


7. The Initial CAL screen will appear.
8. Tap the CAL button.

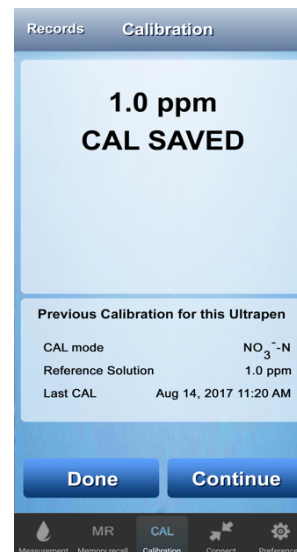


11. The PTBT6 will begin calibrating the initial point.
 - The LED on the PTBT6 will begin to flash rapidly.
 - Hold the sensor steady while the calibration is being performed.

13. Tap the DONE button to exit the calibration process.



9. The PTBT6 Secondary CAL screen will appear.
10. Tap the 1 ppm CAL button.



12. When the initial calibration point is completed, the App displays the values and saves a CAL record.
NOTE: A Sensor Gain value will NOT appear.
 - A DONE button will appear.
 - A CONTINUE button will appear.

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VI. PERFORMING A PTBT6 SENSOR DIAGNOSTIC CHECK

The Sensor Check process verifies that the nitrate sensor is functioning properly by calculating the slope of the sensor response during a 2-point calibration. Perform a Sensor Check any time:

- Measurements are not as expected.
 - If a measurement using reference solution taken immediately after calibration is not within $\pm 10\%$ of the printed value of the reference solution used.
1. To perform a diagnostic test on the PTBT6 nitrate sensor:
 2. Perform a 2-point calibration using 100 ppm as the initial CAL point and 1000 ppm final CAL point.


The expected sensor gain @ $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ should be between -50.0 mV and -62.0 mV .

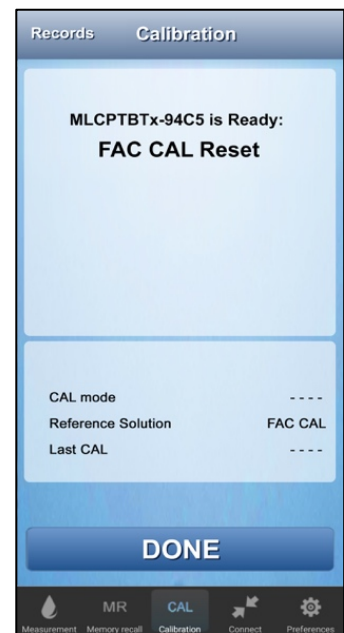
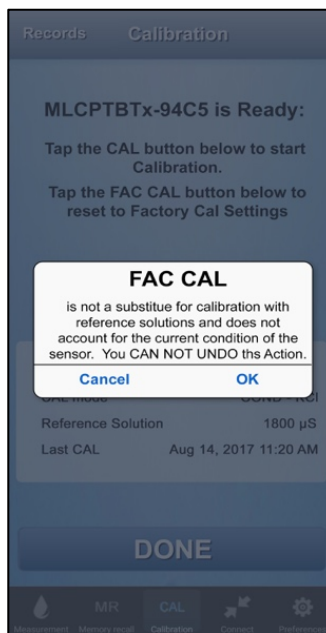
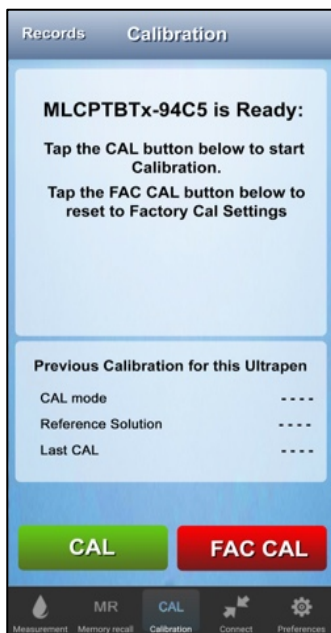
- The nitrate sensor may perform differently if the calibration is performed at temperatures outside of this range.
- If the sensor gain is outside of these limits:
- Recondition the sensor as described in the PTBT6 Operation Manual (PTBT6OM-X2).
 - Redo a 2-point calibration using 100 ppm as the initial CAL point and 1000 ppm final CAL point.
 - If the problem persists, the sensor should be replaced.

VII. FACTORY CALIBRATION RESET

The PTBT6 can be returned to factory default calibration settings using the FAC CAL function. This will erase any stored calibration adjustments and does **NOT** take the condition of the sensor or the sensor membrane into consideration.

To return your PTBT6 to factory calibration:

1. If the PTBT6 is OFF, press and release the PEN BUTTON to turn the PTBT6 ON and place it in Standby mode.
2. Tap the CALIBRATION button  in the Feature Navigation Bar.



3. The Initial CAL screen will appear.
4. Tap the FAC CAL button.
5. Tap OK to reset the PTBT6 calibration settings.
6. Tap CANCEL to leave them unchanged.
7. When the FAC CAL is completed, the App acknowledges that it is completed.
 - A DONE button will appear.
8. Tap the DONE button to exit the calibration process.

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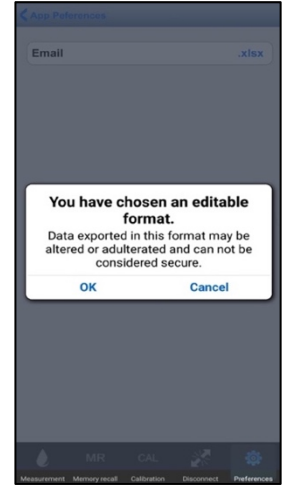
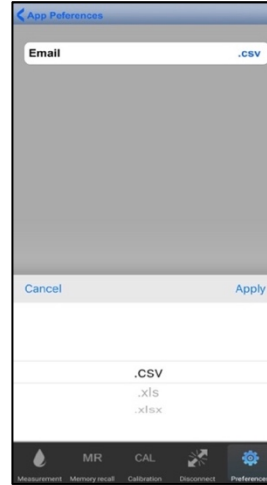
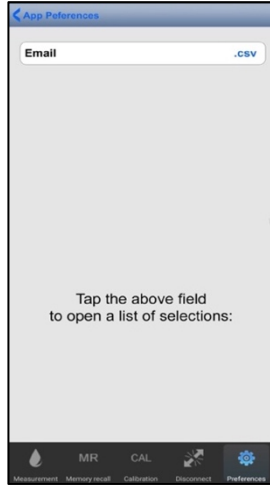
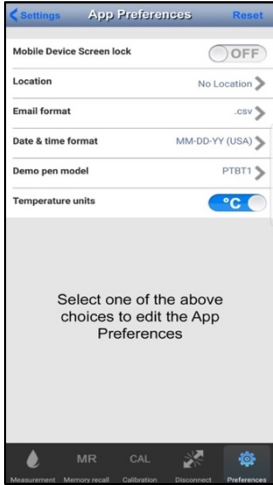
Nitrate Concentration and Temperature Pen for Use with your Mobile Device Running the PTBTX2™ App

EXPORTING DATA FILES

SELECTING AN EXPORT FORMAT


Data records can be exported from the PTBTX2 App as either .csv, .xls or .xlsx formatted files.

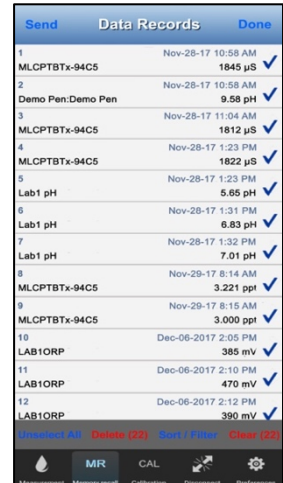
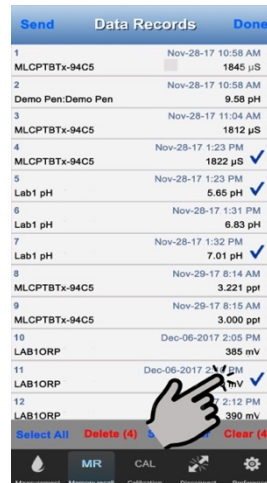
1. Tap the **PREFERENCES**  button in the Feature Navigation Bar.
2. Select App Preferences from the list that appears.



3. The main App Preferences screen will appear.
4. Tap the Email Format line.
5. The Email Format Edit screen will appear showing the current setting.
6. Tap anywhere inside the Email format field.
7. A menu will appear with the email format options.
8. Make your selection and tap APPLY.
9. A Data Security warning message will appear.
10. Tap OK to accept the new email format.

EXPORTING DATA FILES:

1. Tap the **MEMORY RECALL**  button in the Feature Navigation Bar.



2. Tap the EDIT button in the top right of the screen.
3. The Record list will switch to Edit mode.
4. If the records you want to select do not appear on the screen, swipe UP or DOWN until you find them.
5. The DELETE and CLEAR buttons will increment to show the number of records selected.
6. Tap the SELECT ALL button to select the entire list.
 - a) This selects the entire list including records not currently shown on the screen.
7. Once you have selected the records, tap the SEND button in the upper left.
8. A standard email screen for your device will appear.
 - The selected records will be automatically added to the email as an attachment in the chosen format.
 - Add email addresses and a cover letter as you normally would when sending an email on your device type.

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MAINTENANCE

NOTES:

- The nitrate sensor needs to be conditioned after dry storage (see SENSOR CONDITIONING section above).

I. ROUTINE MAINTENANCE

1. After each use **ALWAYS** rinse the nitrate sensor with DI, RO, or distilled water and then carefully blot the sensor membrane with a soft, lint-free, clean cloth or tissue to remove any water drops.
2. **ALWAYS** replace the protective cap on the nitrate sensor after each use.
3. Do not touch the ISE membrane as oil from your finger may contaminate the sensor.
4. Do not drop, throw, or otherwise strike the PTBT6 as this voids the warranty.
5. Do not store the PTBT6 in a location where the ambient temperatures exceed its operating/storage temperature limits.

II. STORAGE

- After each use **ALWAYS** rinse the nitrate sensor with clean water (preferably DI, RO, or distilled) and then carefully pat the sensor with a clean soft lint-free cloth to remove any water drops.

SHORT TERM STORAGE (≤ 3 DAYS):

- Keep the sensor in the protective cap filled half-full with prepared 100 ppm standard solution.
 - **DO NOT** store the PTBT6 with the cap filled with reference solution mixed with Nitrate Interference Suppression Buffer (NISB).
- Store the PTBT6 in a cool place.

LONG TERM STORAGE (>3 DAYS):

1. Rinse the nitrate sensor with clean water (preferably DI, RO, or distilled) and then carefully pat the sensor with a clean soft lint-free cloth to remove any water drops.
2. Rinse the protective cap with clean water (preferably DI, RO, or distilled)
3. Pat with a clean soft lint-free cloth to remove any water drops.
4. Put the protective cap on the sensor and store the PTBT6 in a cool place.

III. REPLACING OR REINSTALLING THE NITRATE SENSOR

- Follow the instructions that come with your replacement sensor.
- Only remove/replace the nitrate sensor in a CLEAN and DRY environment.

TO REMOVE THE NITRATE SENSOR:

1. Remove the protective cap by wiggling it side to side while you pull it off the PTBT6.
2. Make sure the PTBT6 (including the sensor) is clean and dry.
3. Loosen the battery tray (to allow pressure equalization).
4. Firmly grasp the sensor body and slowly pull the sensor out. DO NOT allow dust or moisture into the PTBT6 body.

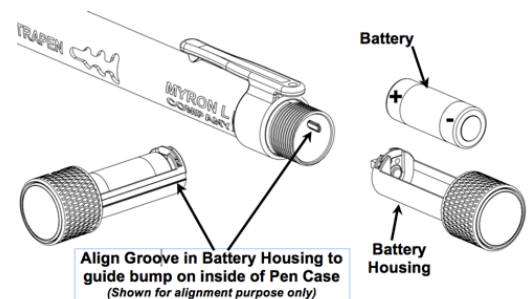
TO INSTALL A NEW NITRATE SENSOR:

1. Line up the alignment tabs on the sensor with the alignment slots on the PTBT6 unit.
2. Gently push the sensor into position.
3. Tighten the battery cap.

IV. BATTERY REPLACEMENT

When PTBT6 charge level falls below 25% immediately replace the battery with a new N type battery.

1. In a **CLEAN DRY** place unscrew the battery cap in a counter-clockwise motion.
2. Slide the cap and battery housing out of the PTBT6.
3. Remove the depleted battery from its housing.
4. Insert a new battery into the battery housing oriented with the negative end touching the spring.
5. Align the groove along the battery housing with the guide bump inside the PTBT6 case and slide the battery housing back in.
6. Screw the battery cap back on in a clockwise direction. Do not over tighten.



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TROUBLESHOOTING GUIDE

TABLE 4

Symptom	Possible Cause	Remedy
Unstable readings or slow response.	A soiled membrane or dry reference junction.	<ol style="list-style-type: none"> 1. Rinse the sensor with plenty of water. 2. Recondition by placing it in prepared 100 ppm standard solution (N100SOL) for at least one hour.
	Temperature changes, pH variation of solutions, or ambient electrical noise.	<ol style="list-style-type: none"> 1. The source should be identified and corrected.
Ultrapen stays in Standby mode (LED Flashes once every 5 seconds) and does not react when an App button is tapped, such as the CAL or Measure Button.	Timing error between the App command string and the PTBTX2 Ultrapen.	<ol style="list-style-type: none"> 1. Close the PTBTX2 App. 2. Make sure the Ultrapen is ON and in Standby mode. 3. Reopen the PTBTX2 App. 6. The App will open to the Measurement screen and automatically refresh the connection to the Connected / Paired Ultrapen.
Ultrapen goes into Standby mode before completing an operation, such as a measurement or Calibration point.	Timing error between the App command string and the PTBTX2 Ultrapen.	<ol style="list-style-type: none"> 7. Once the Connection is refreshed, a message will appear on the display stating the Ultrapen is ready. 8. Restart the original operation.
The Ultrapen cannot be paired to the App because it will not appear on the Connect / Disconnect Screen, but Device's Bluetooth is ON.	There is a connection error between the mobile device and the PTBT6.	<ol style="list-style-type: none"> 1. Close the PTBTX2 App. 2. Make sure the Ultrapen is ON and in Standby mode. 3. Check the status of the mobile device's Bluetooth feature. <ul style="list-style-type: none"> • If it is OFF, turn it ON. • If it is ON, turn it OFF, then back ON. 4. Wait for 10 seconds while the mobile device rescans for nearby Bluetooth devices. 5. Reopen the PTBTX2 App. 6. Tap the CONNECT / DISCONNECT button. 7. Swipe down on the Ultrapen list. 8. The Ultrapen should appear on the list.
	The battery of Mobile Device is getting low.	<ol style="list-style-type: none"> 1. Plug the Mobile Device into a charger. 2. Retry the connection process.
	The battery of the PTBT6 is low.	<ol style="list-style-type: none"> 1. Replace the battery in the PTBT6. 2. Retry the connection process.
App thinks the Ultrapen is "offline" but the Ultrapen is awake and operating (LED is flashing ON / OFF once per second.)	Communicating error between the App and the Ultrapen.	<ol style="list-style-type: none"> 1. Close the PTBTX2 App. 2. Wait for the Ultrapen to go into Standby mode (LED Flashes once every 5 seconds). 3. Wait an additional 2 minutes for the Ultrapen's standby mode to expire and for it to turn OFF. 4. Turn the Ultrapen ON. 5. Reopen the App. 6. The App will open to the Measurement screen and automatically refresh the connection to the Connected / Paired Ultrapen. 7. Once the connection is refreshed a message will appear on the display stating the Ultrapen is ready. 8. Restart the original operation.
I'm trying to add a GPS location but the App keeps showing me the name of an already existing location.	You are too close to an already programmed location.	<ol style="list-style-type: none"> 1. Move the GPS Services switch on the LOCATION settings screen to OFF. 2. Add the new location as a Non-GPS location.
I'm trying to select a Non-GPS Location but it won't work.	The App's GPS Services switch on the LOCATION settings screen is set to ON.	Move the GPS Services switch on the LOCATION settings screen to OFF.

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TABLE 5 (continued)

Symptom	Possible Cause	Remedy
Measurement readings are not as expected.	Sensor was not properly submerged in solution during measurement.	Repeat measurement and ensure sensor is submerged in solution prior to LED flashing quickly.
	Sensor needs conditioning.	Condition sensor (see MAINTENANCE section).
	Membrane is damaged.	Replace the sensor (see MAINTENANCE section).
	Sensor is damaged.	If cleaning sensor does not correct error, replace sensor (see MAINTENANCE section).
Measurement screen displays “Out of Range”.	Possible sensor damage.	<ol style="list-style-type: none"> 1. Perform a measurement on a known, good sample of prepared reference solution. 2. If the result is still the “Out of Range” message, replace the sensor (see MAINTENANCE section).
Error message during calibration.	Sensor was not properly submerged in solution during calibration.	Repeat calibration and ensure sensor is submerged in solution prior to LED flashing quickly.
	Improper reference solution.	Verify you are using the proper reference solution.
	Temperature out of range.	Verify temperature is within range.
	Sensor needs conditioning.	Condition the sensor (see MAINTENANCE section).
	Sensor is damaged.	If conditioning the sensor does not correct error, replace sensor (see MAINTENANCE section).

SPECIFICATIONS


TABLE 6

ULTRAPENX2 PTBT6 Measurement Types (parameters)

Parameter	Measurement
NO₃⁻-N	Displays nitrate as nitrogen in parts per million (ppm).
NO₃	Displays nitrate in ppm.
mV	Displays the raw signal output of the nitrate sensor in millivolt (mV)

TABLE 7

ULTRAPENX2 PTBT6 Performance Specifications

	Nitrate as nitrogen NO ₃ ⁻ -N	Nitrate NO ₃ ⁻	Temperature
Ranges	1-1400 ppm	4.4-6200 ppm	0-71°C / 32-160°F
Accuracy¹	±10% of the reading	±10% of the reading	± 0.1°C
Resolution	0.1 ppm	0.1 ppm	0.1°C/F
pH Range: 3 to 11 pH			
Time to Reading Stabilization: 10 - 180 seconds			
Power Consumption: Active Mode: 30 - 140 mA; Standby Mode: 2 µA			
Physical Dimensions: 17.15 cm L x 1.59 cm D or 6.75 in. L x .625 in. D			
Weight: 54 g or 1.94 oz.			
Case Material: Anodized Aircraft Aluminum with Protective Coating			
Battery Type: One N type, Alkaline 1.5 V			
Calibration reference solutions: 1, 10, 100, or 1000 ppm NO ₃ ⁻ -N			
Operating / Storage Temperature: 0-40°C / 32-104°F ²			
Mobile Device System Requirements: The PTBTX2 App requires a mobile device running either iOS 10.0 or later; or Android 7.0 or later.			
EPA Compatibility: The PTBT6 is compatible with EPA Approved Standard Method 4500-NO3-D			
Enclosure Ratings: IP67 and NEMA 6			
EN61236-1: 2006 - Annex A: 2008: Electrostatic discharge to the PTBT6 may cause it to spontaneously power ON. In this case, the PTBT6 will power OFF after several seconds.			
 WARNING! These products can expose you to chemicals including Di(2-ethylhexyl)phthalate (DEHP), which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov			
¹ Accuracy of measuring reference solutions after Temperature Controlled 2-Point Calibration with one order of concentration difference. ² For extended life of the sensor, store the PTBT6 in a cool location (5-25°C). DO NOT FREEZE!			



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ACCESSORIES

REFERENCE SOLUTIONS:

The ULTRAPENx2™ PTBT6 can be calibrated with 1, 10, 100, or 1000 ppm NO₃⁻-N Reference Solution.

Order Models:

- **N1SOL** 1 ppm NO₃⁻-N (nitrate as nitrogen) Reference Solution
- **N10SOL** 10 ppm NO₃⁻-N (nitrate as nitrogen) Reference Solution
- **N100SOL** 100 ppm NO₃⁻-N (nitrate as nitrogen) Reference Solution
- **N1000SOL** 1000 ppm NO₃⁻-N (nitrate as Nitrogen) Reference Solution

IONIC STRENGTH ADJUSTER:

Order Model: NISASOL

NITRATE INTERFERENCE SUPPRESSION BUFFER:

Order Model: NISBSOL

REPLACEMENT NITRATE SENSOR:

Order Model: RPT6

MYRON L® WARRANTY

The PTBT6, excluding the sensor & battery, has a one (1) year limited warranty. The nitrate sensor has a six (6) month limited warranty.

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