

Troubleshooting Guide to VRAP Water Quality Monitoring Meters



**New Hampshire Department of Environmental Services
Volunteer River Assessment Program (VRAP)**

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<http://des.nh.gov/organization/divisions/water/wmb/vrap/index.htm>

Turbidity: LaMotte 2020 Turbidity Meter (Range: 0.00 – 1100 NTU)		
Problem/Error Code	Probable Cause	Probable Remedy
<ul style="list-style-type: none"> ■ No Display 	<ul style="list-style-type: none"> ■ Battery not in place ■ Battery not in correct polarity ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Insert battery ■ Check battery polarity ■ Replace battery
<ul style="list-style-type: none"> ■ Suspect Calibration 	<ul style="list-style-type: none"> ■ Calibration standards are contaminated ■ Misaligned calibration standard vial ■ Dirty/scratched calibration standard vial ■ Internal meter components are wet 	<ul style="list-style-type: none"> ■ Use new standards ■ Re-align calibration standard vial ■ Check, clean, and/or replace calibration standard vial if necessary ■ Always dry calibration standard vial before inserting. Examine chamber for viable moisture
<ul style="list-style-type: none"> ■ Erroneous Readings 	<ul style="list-style-type: none"> ■ Measurement was taken with lid open 	<ul style="list-style-type: none"> ■ Close lid and read again
<ul style="list-style-type: none"> ■ Er 1 	<ul style="list-style-type: none"> ■ Very low battery 	<ul style="list-style-type: none"> ■ Change battery
<ul style="list-style-type: none"> ■ Er 2 	<ul style="list-style-type: none"> ■ Expired 1.0 NTU standard will not allow for calibration 	<ul style="list-style-type: none"> ■ Replace 1.0 NTU standard and recalibrate
<ul style="list-style-type: none"> ■ Er 3 	<ul style="list-style-type: none"> ■ Misaligned sample vial ■ Burnt out bulb 	<ul style="list-style-type: none"> ■ Re-align sample vial ■ Return meter to NHDES
<ul style="list-style-type: none"> ■ BAT 	<ul style="list-style-type: none"> ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Change battery

Turbidity: LaMotte 2020e Turbidity Meter (Range: 0.00 – 2000 NTU)

Problem/Error Code	Probable Cause	Probable Remedy
■ No Display	<ul style="list-style-type: none"> ■ Battery not in place ■ Battery not in correct polarity ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Insert battery ■ Check battery polarity ■ Replace battery
■ Suspect Calibration	<ul style="list-style-type: none"> ■ Calibration standards are contaminated ■ Misaligned calibration standard vial ■ Dirty/scratched calibration standard vial ■ Internal meter components are wet 	<ul style="list-style-type: none"> ■ Use new standards ■ Re-align calibration standard vial ■ Check, clean, and/or replace calibration standard vial if necessary ■ Always dry calibration standard vial before inserting. Examine chamber for viable moisture
■ Erroneous Readings	<ul style="list-style-type: none"> ■ Measurement was taken with lid open 	<ul style="list-style-type: none"> ■ Close lid and read again
■ Meter Freezes	<ul style="list-style-type: none"> ■ Lid was opened when reading was being taken 	<ul style="list-style-type: none"> ■ Close lid and read again
■ Err 1	<ul style="list-style-type: none"> ■ Very low battery 	<ul style="list-style-type: none"> ■ Replace battery
■ Err 2	<ul style="list-style-type: none"> ■ 1.0 NTU standard not reading within acceptable range and therefore will not allow for calibration 	<ul style="list-style-type: none"> ■ Re-calibrate using fresh 1.0 NTU standard
■ Err 3	<ul style="list-style-type: none"> ■ Meter cannot be calibrated with a zero sample 	<ul style="list-style-type: none"> ■ Calibrate meter with a sample other than zero
■ Err 4	<ul style="list-style-type: none"> ■ Processing error 	<ul style="list-style-type: none"> ■ Scan sample again
■ Err 5	<ul style="list-style-type: none"> ■ No blank reading. <i>(The meter has never been blanked for this test factor)</i> 	<ul style="list-style-type: none"> ■ Blank meter
■ Err 6	<ul style="list-style-type: none"> ■ Internal mathematical error 	<ul style="list-style-type: none"> ■ Re-blank the meter and re-scan the sample
■ Low Battery	<ul style="list-style-type: none"> ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Change battery

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 variations will fall above and below an average readings. Repeated readings of an 0.00 sample may 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 readings was less than the blank readings. Small negative readings can indicate that the sample was at or near the detection limit. This is a normal variation that results in a negative reading. 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 exists. For this reason, the 2020 displays negative numbers.

pH: Orion 210A pH Meter

Problem/Error Code	Probable Cause	Probable Remedy
<ul style="list-style-type: none"> ■ No Display 	<ul style="list-style-type: none"> ■ Batteries not in place ■ Batteries not in correct polarity ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Insert battery ■ Check battery polarity ■ Replace batteries
<ul style="list-style-type: none"> ■ E-20 (Out of Range) 	<ul style="list-style-type: none"> ■ Out of range pH, mV, Rel mV 	<ul style="list-style-type: none"> ■ If this occurs when electrodes are out of solution, error code will disappear when electrodes are returned to solution ■ Verify electrodes are properly connected to meter ■ Ensure that fresh standards are being used ■ Re-calibrate using fresh buffers or standards ■ Check that the ATC probe is connected properly ■ If problem continues contact NHDES to arrange for return of meter. The probe will likely need replacing.
<ul style="list-style-type: none"> ■ E-22 (Calibration Standard Error) 	<ul style="list-style-type: none"> ■ The millivolts (mV) being measured are the same for two different standards or buffers 	<ul style="list-style-type: none"> ■ Press any key to acknowledge ■ Check that two different standards or buffers are being used and that the correct one is being measured ■ Use fresh standards or buffers and repeat the last calibration point or entire calibration
<ul style="list-style-type: none"> ■ E-23 (Bad Slope) 	<ul style="list-style-type: none"> ■ <i>pH electrode slope is not in the range of 92% to 102%</i> 	<ul style="list-style-type: none"> ■ Press any key to acknowledge ■ Repeat calibration using fresh buffers ■ Clean electrodes and refill reference electrode
<ul style="list-style-type: none"> ■ Unstable Reading 	<ul style="list-style-type: none"> ■ Insufficient reference electrolyte in electrode ■ Broken electrode ■ Dirty electrode 	<ul style="list-style-type: none"> ■ Fill electrode with reference electrolyte ■ Replace electrode ■ Clean the electrode ■ Recalibrate the meter with the cleaned probe

pH: Oakton pH 11 Meter

Problem/Error Code	Probable Cause	Probable Remedy
<ul style="list-style-type: none"> ■ No Display 	<ul style="list-style-type: none"> ■ Battery not in place ■ Battery not in correct polarity ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Insert battery ■ Check battery polarity ■ Replace batteries
<ul style="list-style-type: none"> ■ Err. Annunciator 	<ul style="list-style-type: none"> ■ Wrong keypad input <i>(wrong input in selective mode)</i> 	<ul style="list-style-type: none"> ■ Release key. Select valid operations depending on mode
<ul style="list-style-type: none"> ■ Secondary display toggles continuously between Calibration Buffer Values; ■ Electrode Icon blinks and Err. Annunciator lights up 	<ul style="list-style-type: none"> ■ Incorrect buffers used ■ Contaminated buffer solution 	<ul style="list-style-type: none"> ■ Check if the right buffer was selected ■ Use fresh buffer solutions
<ul style="list-style-type: none"> ■ Battery Icon Lights Up 	<ul style="list-style-type: none"> ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Replace battery
<ul style="list-style-type: none"> ■ Unstable Reading 	<ul style="list-style-type: none"> ■ Insufficient reference electrolyte in electrode ■ Broken electrode ■ Dirty electrode 	<ul style="list-style-type: none"> ■ Clean the electrode probe ■ Recalibrate the meter with the cleaned probe. If problem continues contact NHDES to arrange for return of meter. The probe will likely need replacing.
<ul style="list-style-type: none"> ■ Meter Unresponsive to Key Press 	<ul style="list-style-type: none"> ■ “Hold” mode in operation ■ Internal program error 	<ul style="list-style-type: none"> ■ Cancel “Hold” mode ■ Reset all internal programs by re-inserting battery

Dissolved Oxygen/Temperature: YSI 95 (Range: -5 – 45 C, 0 - 500 % Sat, 0 - 50 mg/l)

Problem/Error Code	Probable Cause	Probable Remedy
<ul style="list-style-type: none"> ■ No Display 	<ul style="list-style-type: none"> ■ Batteries not in place ■ Batteries not in correct polarity ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Insert batteries ■ Check battery polarity ■ Replace batteries
<ul style="list-style-type: none"> ■ Instrument will not Calibrate 	<ul style="list-style-type: none"> ■ Membrane fouled/damaged ■ Probe anode fouled/dark 	<ul style="list-style-type: none"> ■ Replace membrane cap and KCL solution ■ Clean anode. Please contact NHDES before attempting to clean the silver anode as incorrect procedures can ruin the probe.
<ul style="list-style-type: none"> ■ Readings are Inaccurate 	<ul style="list-style-type: none"> ■ Calibration altitude value is incorrect ■ Probe not in 100% water saturated air during calibration procedure ■ Membrane fouled/damaged 	<ul style="list-style-type: none"> ■ Recalibrate with correct calibration altitude value ■ Moisten with sponge and place in calibration chamber with probe and recalibrate ■ Replace membrane cap and KCL solution
<ul style="list-style-type: none"> ■ LO BAT 	<ul style="list-style-type: none"> ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Replace batteries
<ul style="list-style-type: none"> ■ Main Display reads “OVER” 	<ul style="list-style-type: none"> ■ Probe current too high to calibrate 	<ul style="list-style-type: none"> ■ Check calibration values and procedures. ■ Replace membrane cap and KCL solution, wait ½ hour and recalibrate.
<ul style="list-style-type: none"> ■ Main Display reads “Undr” 	<ul style="list-style-type: none"> ■ Probe current too low to calibrate 	<ul style="list-style-type: none"> ■ Check calibration values and procedures. ■ Replace membrane cap and KCL solution, wait ½ hour and recalibrate.
<ul style="list-style-type: none"> ■ Readings on Main Display Don’t Change 	<ul style="list-style-type: none"> ■ Meter is in “Recall” mode 	<ul style="list-style-type: none"> ■ Press MODE button to return to normal operation

Dissolved Oxygen/Temperature: YSI 85 (Range: -5 – 65 C, 0-200 % Sat, 0 - 20 mg/l)

Problem/Error Code	Probable Cause	Probable Remedy
<ul style="list-style-type: none"> ■ No Display 	<ul style="list-style-type: none"> ■ Batteries not in place ■ Batteries not in correct polarity ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Insert batteries ■ Check battery polarity ■ Replace batteries
<ul style="list-style-type: none"> ■ Instrument will not Calibrate 	<ul style="list-style-type: none"> ■ Membrane fouled/damaged ■ Probe anode fouled/dark 	<ul style="list-style-type: none"> ■ Replace membrane cap and KCL solution ■ Clean anode. Please contact NHDES before attempting to clean the silver anode as incorrect procedures can ruin the probe.
<ul style="list-style-type: none"> ■ Readings are Inaccurate 	<ul style="list-style-type: none"> ■ Calibration altitude value is incorrect ■ Probe not in 100% water saturated air during calibration procedure ■ Membrane fouled/damaged 	<ul style="list-style-type: none"> ■ Recalibrate with correct altitude value ■ Moisten with sponge and place in calibration chamber with probe and recalibrate ■ Replace membrane cap and KCL solution
<ul style="list-style-type: none"> ■ LO BAT 	<ul style="list-style-type: none"> ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Replace batteries
<ul style="list-style-type: none"> ■ Main Display reads “OVER” 	<ul style="list-style-type: none"> ■ Probe current too high to calibrate 	<ul style="list-style-type: none"> ■ Check calibration values and procedures. ■ Replace membrane cap and KCL solution, wait ½ hour and recalibrate.
<ul style="list-style-type: none"> ■ Main Display reads “Undr” 	<ul style="list-style-type: none"> ■ Probe current too low to calibrate 	<ul style="list-style-type: none"> ■ Check calibration values and procedures. ■ Replace membrane cap and KCL solution, wait ½ hour and recalibrate.
<ul style="list-style-type: none"> ■ Readings on Main Display Don’t Change 	<ul style="list-style-type: none"> ■ Meter is in “Recall” mode 	<ul style="list-style-type: none"> ■ Press MODE button to return to normal operation

Specific Conductance: YSI 30 (Range: -5 – 95 C, 0 - 200,000 $\mu\text{S}/\text{cm}$)

Problem/Error Code	Probable Cause	Probable Remedy
■ No Display	<ul style="list-style-type: none"> ■ Batteries not in place ■ Batteries not in correct polarity ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Insert batteries ■ Check battery polarity ■ Replace batteries
■ Readings are Inaccurate	<ul style="list-style-type: none"> ■ Calibration is required ■ Cell is contaminated ■ Readings are not temperature compensated 	<ul style="list-style-type: none"> ■ Return meter to NHDES for recalibration. This cannot be done in the field as the calibration solution must be at 25° ■ Clean cell with DI water and Kimwipes. If more thorough cleaning is needed return meter to NHDES. ■ Specific Conductance, mode should be on “flashing C”
■ LO BAT	<ul style="list-style-type: none"> ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Replace batteries
■ Main menu reads “Undr”	<ul style="list-style-type: none"> ■ This generally occurs when trying to measure very cold water. 	<ul style="list-style-type: none"> ■ Reference temperature should be adjusted from 25°C. Contact NHDES
■ Readings on Main Menu Display Don’t Change	<ul style="list-style-type: none"> ■ Meter is in “Recall” mode 	<ul style="list-style-type: none"> ■ Press MODE key to return to normal operation

Specific Conductance: YSI 85 (Range: -5 – 65 C, 0 - 200,000 $\mu\text{S}/\text{cm}$)

Problem/Error Code	Probable Cause	Probable Remedy
■ No Display	<ul style="list-style-type: none"> ■ Batteries not in place ■ Batteries not in correct polarity ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Insert batteries ■ Check battery polarity ■ Replace batteries
■ Readings are Inaccurate	<ul style="list-style-type: none"> ■ Calibration is required ■ Cell is contaminated ■ Readings are not temperature compensated 	<ul style="list-style-type: none"> ■ Return meter to NHDES for recalibration. This cannot be done in the field as the calibration solution must be at 25° ■ Clean cell with DI water and Kimwipes. If more thorough cleaning is needed return meter to NHDES. ■ Specific Conductance, mode should be on “flashing C”
■ LO BAT	<ul style="list-style-type: none"> ■ Low battery voltage 	<ul style="list-style-type: none"> ■ Replace batteries
■ Main menu reads “Undr”	<ul style="list-style-type: none"> ■ This generally occurs when trying to measure very cold water. 	<ul style="list-style-type: none"> ■ Reference temperature should be adjusted from 25°C. Contact NHDES
■ Readings on Main Menu Display Don’t Change	<ul style="list-style-type: none"> ■ Meter is in “Recall” mode 	<ul style="list-style-type: none"> ■ Press MODE key to return to normal operation