

*From the Mountains to the Estuary:  
From the Schoolyard to the Bay*

## Meaningful Watershed Experiences for High School Students



With grant support from the  
NOAA Bay Watershed Education Training (B-WET) Program



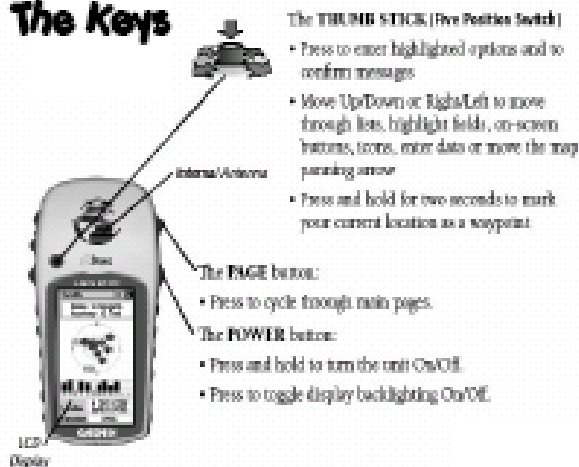
In partnership with:



# Appendix

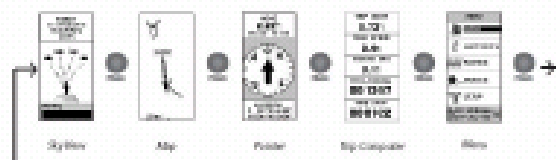
# Garmin eTrex Legend Basics

## The Keys

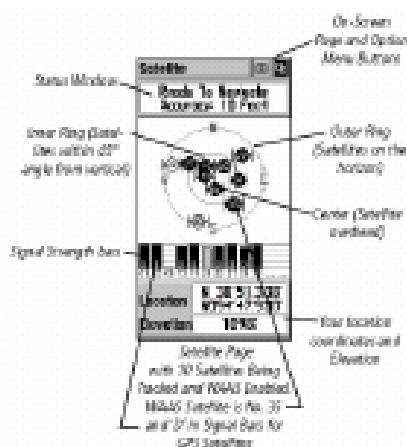


## Display Screens

Use the **PAGE** button on the top right of the receiver to switch between the different screens.

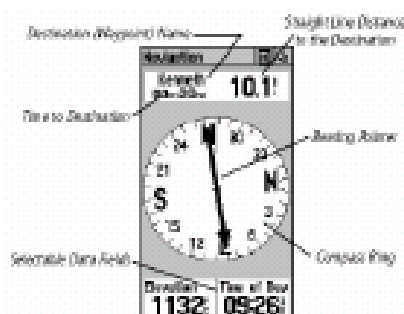


## Satellite Page



The dark bars show the satellites you are "locked" on. You need at least 3 bars to use the receiver.

## Pointer Page Basics



Go in the direction the arrow is pointing to move towards your waypoint or landmark.

**NOTE:** You must be moving in order for the GPS unit to determine where you are and which way you are moving.

## Marking a Waypoint (Location)

1 – Press and hold the THUMB STICK until the MARK WAYPOINT screen appears with the guy holding a flag.



2 – Your waypoint is automatically assigned a three-digit number. To change the name of the waypoint, use the THUMB STICK button to highlight its name. Use the THUMB STICK to select the new name for the waypoint.

3 – When you are done, use the THUMB STICK to highlight the OK button and press the THUMB STICK button once.

## Finding a Waypoint (Location)



1 - Use the PAGE button to find the main menu. Use the THUMB STICK to go to the FIND option and press the same button to select this option.

You can also press the bottom left button on the receiver to go directly to the Find screen.



3 - Select WAYPOINTS by pressing the THUMB STICK button.

4 - Choose NEAREST on the next menu.



5 - Select the waypoint you want using the THUMB STICK button.



6 - Use the THUMB STICK button to select GOTO at the bottom of the screen.

Remember ...  
You must be moving  
in order for the  
receiver to keep track  
of your location!






7 - Use the navigation screen to help you locate your destination. You need to move in the direction of the large arrow. When you get close to your destination, an "Arriving at Destination" message will be displayed.

## **Getting Started with Vernier Probeware**

### **Using the Vernier LABQUEST and sensors**

#### **FOR PRACTICE getting started:**




##### **To COLLECT DATA**

1. Ensure stylus is securely connected
2. To power on **LABQUEST**, press the silver button at the top left 
3. Connect the temperature sensor to one of the 4 available ports at the top (CH1, CH2, CH3, CH4) – *(these will be the ports we use for the other sensors – Turbidity, Dissolved Oxygen, pH, & Conductivity)*
4. Notice the temperature display on the screen
5. Press the Collect button  just below the screen. Data collection will begin, and a graph will show your data being plotted in real time.
6. Notice that the screen changed to a graph and is collecting data over time (lower right corner)
7. Press the Collect button  again to stop data collection.

##### **To ANALYZE THE DATA YOU COLLECTED**

1. After data collection (above), use the stylus to tap a point on your graph
2. Notice (1) the lines to the x and y axes; (2) the circle around the point you chose, and (3) the readings at the right of your graph – these are the x and y readings for the point you chose
3. You can make adjustments to the cursor location by using the left and right cursor keys on the keypad below the screen. Notice how the circle and lines move and the numbers at the right side change – these are the new points you are moving to.

##### **To COLLECT ADDITIONAL DATA**



1. To start a second data collection run, tap the file  cabinet in the upper right corner. You should now see Run 2 displayed with a blank graph.
2. Press the Collect button  just below the screen. Data collection will begin, and a graph will show your data being plotted in real time.
3. Press the Collect button  again to stop data collection.

##### **SAVING YOUR DATA**



1. To save your data, tap **File** with the stylus
2. In the drop down menu, tap **Save**
3. The screen will change to a file list and allow you to type your filename (you will see **untitled** in the Name bar)
4. Using the stylus, tap in the Name bar 
5. A keyboard will appear → → →
6. Using the back arrow,  delete **untitled** and type the name of your file ("Rob's Temp Data")

**To TURN OFF LABQUEST, HOLD DOWN POWER  BUTTON FOR 3 SECONDS**

### Using the Vernier LABQUEST WITH THE TEMPERATURE SENSOR



1. To power on LABQUEST, press the silver button at the top left
2. Connect the temperature sensor to one of the 4 available ports at the top (CH1, CH2, CH3, CH4)
3. *Notice the temperature display on the screen*
4. Put stainless steel portion of temperature sensor into water you want to measure
  - a. **DO NOT completely submerge the temperature sensor, the plastic part is NOT waterproof**
5. Press the Collect button  just below the screen. Data collection will begin, and a graph will show your data being plotted in real time.
6. *Notice that the screen changed to a graph and is collecting data over time (lower right corner)*
7. Press the Collect button  again to stop data collection.
8. Refer to SAVING, VIEWING, & UPLOADING YOUR DATA to save, review, & upload your data.
9. **WHEN YOU ARE FINISHED WITH THE TEMPERATURE SENSOR:**
  - a. Carefully unplug it from the LABQUEST port and return it to its plastic storage bag.

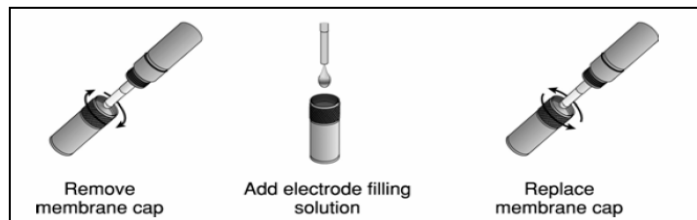
### Using the Vernier LABQUEST WITH THE PH SENSOR

1. **Before you turn on LABQUEST**, remove the storage bottle from the pH sensor by unscrewing the lid, removing the bottle, and sliding the lid off of the blue sensor.
2. With distilled water, thoroughly rinse the lower (blue) section of the sensor, especially the bulb.
  - a. **DO NOT completely submerge the pH sensor, the handle is NOT waterproof**
3. To power on LABQUEST, press the silver button at the top left
4. Connect the pH sensor to one of the 4 available ports at the top (CH1, CH2, CH3, CH4)
  - a. *Notice the pH display on the screen*
5. Put the blue portion of the pH sensor into the solution you want to measure
  - a. **DO NOT completely submerge the sensor, the handle is NOT waterproof**
6. Press the Collect button  just below the screen. Data collection will begin, and a graph will show your data being plotted in real time.
7. *Notice that the screen changed to a graph and is collecting data over time (lower right corner)*
8. Press the Collect button  again to stop data collection.
- 9.
10. Refer to SAVING, VIEWING, & UPLOADING YOUR DATA to save, review, & upload your data.
11. **WHEN YOU ARE FINISHED WITH THE PH SENSOR:**
  - Carefully unplug it from the LABQUEST port
  - Rinse the blue sensor with distilled water.
  - Slide the bottle lid onto the sensor (blue portion). Put the sensor into the storage bottle just until the bottom is submerged in the storage solution.

- **DO NOT store the sensor in distilled water. It should ONLY be stored in the storage bottle with a special solution**
- Screw the lid onto the storage bottle.
- Return the sensor and storage bottle to the equipment box.

### Using the Vernier LABQUEST WITH THE **DISSOLVED OXYGEN (DO) SENSOR**



1. **Before you turn on LABQUEST**, remove the blue protective cap from the tip of the probe and discard - **DO NOT replace protective cap after 1<sup>st</sup> use**
2. Unscrew the membrane cap from the tip of the sensor.
3. Using a pipet, fill the membrane cap with **1 mL of DO Electrode Filling Solution**.
4. Carefully thread the membrane cap back onto the sensor.
5. Place the sensor into a container filled with about 100 mL of distilled water.
  - a. **DO NOT completely submerge the DO sensor, the handle is NOT waterproof**
6. **You must warm-up the Dissolved Oxygen for 10 minutes before using it**
7. Leaving the sensor in the water, power on LABQUEST, (press the silver button at the top left)
8. Connect the Dissolved Oxygen sensor to one of the 4 available ports at the top (CH1, CH2,...)
  - a. Notice the DO display on the screen (mg/L)
  - b. **DO NOT use the dissolved oxygen sensor at the same time (in the same solution) as any other sensor (it is best to use the dissolved oxygen sensor by itself)**
9. Leave the sensor in the water and connected to LABQUEST interface with the data collection program running for **10 minutes**. The sensor **must stay connected at all times** to keep it warmed up. *If disconnected for a few minutes, it will be necessary to warm up the probe again.*
10. After 10 minutes, you are now ready to collect data.
11. Place the sensor into the water being tested (submerge 4–6 cm, less than the length of your index finger). **DO NOT completely submerge the DO sensor, the handle is NOT waterproof**
12. Gently stir the sensor in the water sample. **To get accurate readings, there must always be water flowing past the probe tip when you are taking measurements.**
  - a. **IF the sensor is left still in calm water, the DO readings will be inaccurate** (and appear to be dropping)
13. Press the Collect button  just below the screen. Data collection will begin, and a graph will show your data being plotted in real time.
14. Notice that the screen changed to a graph and is collecting data over time (lower right corner)
15. Press the Collect button  again to stop data collection.
16. Refer to **SAVING, VIEWING, & UPLOADING YOUR DATA** to save, review, & upload your data.



**17. WHEN YOU ARE FINISHED WITH THE DO SENSOR:**

18. Carefully unplug it from the **LABQUEST** port
19. Rinse the sensor with distilled water.
20. Slide the bottle lid onto the sensor. Put the sensor into the storage bottle ½ filled with distilled water. Ensure the sensor tip (membrane) is submerged in the distilled water.
21. Screw the lid onto the storage bottle.
22. Return the sensor and storage bottle to the equipment box.

**Using the Vernier LABQUEST WITH THE TURBIDITY SENSOR**

1. To power on **LABQUEST**, press the silver button at the top left
2. Ask your teacher if the sensor is already calibrated. If it's not, **STOP** - ask for help to calibrate it – go to **CALIBRATING TURBIDITY SENSOR** before continuing (it should be calibrated before use) (*see back of this page*)
3. Connect the Turbidity sensor to one of the 4 available ports at the top (CH1, CH2,...)
  - a. *Notice the Turbidity display on the screen (NTU)*
4. Put the water sample into the empty bottle (cuvette) – fill it to the top of the line (the **meniscus should be at the top of the line for every measurement**)
5. Screw the lid on the bottle
6. Turn it upside down four (4) times to mix anything that settled to the bottom (**DO NOT SHAKE** – shaking will produce air bubbles that will affect turbidity reading)
7. Wipe the outside with a lint-free cloth or tissue
8. Holding by the lid, insert into the Turbidity Sensor - **\*\*align the mark on the bottle (black triangle) with the mark on the sensor (white triangle) - \*\*these marks must be aligned whenever a reading is taken**
9. Monitor the turbidity value on **LABQUEST** - **because particles will settle, turbidity readings should be taken soon after bottle is placed in the sensor**
10. Press the Collect button  just below the screen. Data collection will begin, and a graph will show your data being plotted in real time.
11. *Notice that the screen changed to a graph and is collecting data over time (lower right corner)*
12. Press the Collect button  again to stop data collection.
13. Refer to **SAVING, VIEWING, & UPLOADING YOUR DATA** to save, review, & upload your data.
14. **WHEN YOU ARE FINISHED WITH THE TURBIDITY SENSOR:**
  - a. Carefully unplug it from the **LABQUEST** port
  - b. Rinse the sample bottle (cuvette) with distilled water.
  - c. Screw the lid back on, and return the sensor and bottle to the equipment box.

**CALIBRATING TURBIDITY SENSOR**




**To CALIBRATE sensor before using** (should be calibrated before 1<sup>st</sup> use)

1. Connect the Turbidity sensor to one of the 4 available ports at the top (CH1, CH2,...)
2. *Notice the Turbidity display on the screen (NTU)*
3. Get the bottle (cuvette) containing the Turbidity Standard (**STABLCAL FORMAZIN STANDARD**)



4. Turn it upside down four (4) times to mix anything that settled to the bottom (**DO NOT SHAKE** – shaking will produce air bubbles that will affect turbidity reading)
5. Enter Calibration routine of **LABQUEST** – with sensor connected, tap *Sensors*, then *Calibrate*, and choose *Turbidity*
6. Holding the standard bottle (cuvette) by the lid, insert into turbidity sensor - **\*\*align the mark on the bottle (black triangle) with the mark on the sensor (white triangle) - \*\*these marks must be aligned whenever a reading is taken**
7. Close the lid
8. On the **LABQUEST**, enter *100* in the *NTU* block in the top left
9. Remove the bottle from the Turbidity Sensor
10. **For the 2<sup>nd</sup> Calibration point**, fill the empty bottle (cuvette) with distilled water
11. The meniscus should be at the top of the line for every measurement
12. Screw the lid on the bottle
13. Wipe the outside with a lint-free cloth or tissue
14. Holding by the lid, insert into the Turbidity Sensor
15. On the **LABQUEST**, enter *0* (zero) in the *NTU* block in the top left
16. You are now ready to collect turbidity data

#### **Using the Vernier LABQUEST WITH THE CONDUCTIVITY SENSOR**

1. To power on **LABQUEST**, press the silver button at the top left
2. Connect the conductivity sensor to one of the 4 available ports at the top (CH1, CH2,...)
  - a. *Notice the conductivity ( $\mu\text{S}/\text{cm}$ ) display on the screen*
3. Using distilled water, rinse the end of the sensor
4. Insert the sensor into the sample to be tested – be sure the opening is completely submerged
  - a. ***DO NOT completely submerge the conductivity sensor, the handle is NOT waterproof***
5. Be sure the *Range* switch is set to \_\_\_\_\_
6. Gently stir the sensor in the water sample
7. Wait for the reading on **LABQUEST** to stabilize – this should take less than 10 seconds
 
8. Press the Collect button  just below the screen. Data collection will begin, and a graph will show your data being plotted in real time.
  - a. *Notice that the screen changed to a graph and is collecting data over time (lower right corner)*
9. Press the Collect button  again to stop data collection.
10. Refer to **SAVING, VIEWING, & UPLOADING YOUR DATA** to save, review, & upload your data.
11. **WHEN YOU ARE FINISHED WITH THE CONDUCTIVITY SENSOR:**
  - Carefully unplug it from the **LABQUEST** port
  - Rinse the conductivity sensor with distilled water
  - Blot it dry using a paper towel or lab wipe and return it to its storage box.

## **SAVING, VIEWING, & UPLOADING YOUR DATA**

### **Saving your data**

1. To save your data, tap **File** with the stylus
2. In the drop down menu, tap **Save**
3. Tap the stylus in the **Name** bar where you see **untitled**
4. Using the stylus with the keyboard use the **back arrow** to delete **untitled** and type the name of your file, then tap **Save**.
5. IF you are adding data to an existing file, tap that filename and then tap **Overwrite** – this will add your new data set to the file.

### **Viewing your data**

1. You can view all data in one file on one graph.
2. Using the stylus, tap **Run 1** (or Run \_\_) in the upper right corner.
3. You will get a drop down menu with a list of your data runs (Run 1, Run 2, Run 3,...) and **All Runs**.
4. Using the stylus, **Either** tap the data run you want to view **or** tap **All Runs** to view all data on one graph

### **Uploading your data to a computer**

1. On **LABQUEST** open the file you want to transfer
  - a. Power on **LABQUEST**, press the silver button at the top left
  - b. With the stylus, tap (select) *File* and tap (select) *Open*
  - c. Tap (select) the file you want to open, then tap (select) *Open*
2. On your computer, open **LOGGER LITE**
3. Connect the **LABQUEST** USB cable to your computer, then to **LABQUEST**
4. You should see a pop-up window that indicates: *Remote Data Available – Remote data have been detected. Would you like to retrieve the data now?*
5. Select **Yes**
6. Select *Retrieve remote data into the current file* select **Ok**
7. On your computer, Save your file (select *File*, then *Save As*, then name your file and select **Save**)
8. You can now manipulate your data on your computer

## ***Our Watershed in Jeopardy***

Please visit <http://school2bay.pbworks.com/High-School> for access to associated powerpoint presentation.