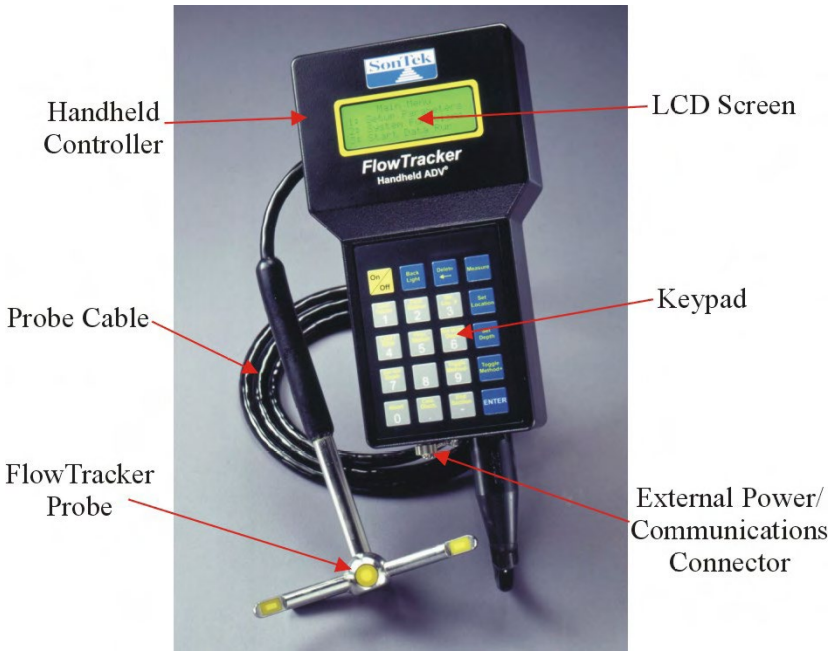
Appendix 4.6.1-1 - Using the FlowTracker1



Note: See section 4.6.1 Method 1: Discharge section (Mid-section method) protocol for how to conduct a safety assessment and set up a transect site prior to using the FlowTracker1.

1. Set up the FlowTracker1 (see SonTek website for illustration and more details).

Assemble metric wading rod and attach the metal FlowTracker Probe to the rod base tightly, using the screw provided. Ensure probe does not wiggle when gentle pressure is applied. Mount the head unit to the top of the wading rod and ensure cable is secure and not tangled.

2. Power on and main menu

Press the yellow power button to turn on the Flow Tracker. Confirm the date and time on the instrument are correct.

When prompted, press Enter to view the Main Menu. You should not have to change anything under '1. Setup Parameters' which contains information on units, language, etc.

To check your battery percentage, press 2 for 'System Functions'. Press Enter once to scroll down the page and then press 5 for 'Battery Data.' If you are satisfied with your battery level, press Enter to exit the Battery Data screen. From the 'System Functions' menu, press 0 to exit and return to the main menu.

When you are ready to start a flow measurement, press 3 'Start Data Run'.

3. Create your file name.

From the main menu, select 3 'Start Data Run'. On the Data File Name menu, press 1 to enter a file name. This name should be something that will make the file easy to find when downloading (e.g., name of the stream and the month, such as "Cook.May"). Press 2 to enter a file name extension (optional).

Press 9 'Accept name' when you are ready.

On the next menu, press 1 to input the site name. This should be the name of the stream you are measuring. Press Enter when ready.

On the main menu, press 2 to input the Operator. Press enter when ready.

On the main menu, press 9 'Start' when you are ready to move into the water.

Note: You will see a note pop up "Press QC Menu (button 8) at any time for gauge data." You can press Enter to bypass this screen.

4. Perform Automatic QC Test

The Automatic QC Test is also known as the Beam Check and tests the function of the probe. Follow the on-screen instructions and press Enter when ready to start. The instrument will check several parameters over the next few seconds and will tell you if the check passed or failed.

5. Select starting edge.

Stand downstream of the FT1 at either right bank or left bank.

Use button 4 to toggle between LEW and REW (Left Edge Wetted or Right Edge Wetted) depending on which side you choose to start. It will appear on your screen under 'Loc'.

Use the blue 'Set Location' button to enter your place (in metres) on the measuring tape. When done, press Enter.

When you have inputted your starting edge data, press 2 for 'Next Station'.

6. Note the starting edge depth.

If the starting edge is dry, depth is "0". If there is some water depth at the edge, measure the depth by placing the wading rod firmly on the streambed as close to the edge as possible, and reading the notch at which the water rises to off the side of the rod*. If needed, review Appendix 4.6.1 for a guide to interpreting metal wading rod depths.

Enter the depth (in m) for the edge. Toggle between Left Bank or Right Bank. Keep Correction Factor as "1". Proceed by pressing 2 for "Next Station"

** <u>Note:</u> the FT1 requires units entered in m. Make sure to use the correct unit conversion if measuring depth in cm (i.e., 1 cm = 0.01 m).*

7. Add the first station information.

Using the panel widths estimated when preparing your ***transect*** in Step 4, Move the FT1 to the desired location on the ***transect*** tape and align your wading rod with the tape value for the first panel. The probe will be slightly offset to the right of the rod.

Press the blue 'Set Location' button. Enter the value (in m) from the ***transect*** tape as the "Location". When done, press Enter.

Press the blue 'Set Depth' button. Enter the "Depth" (in m) as read from your wading rod while placed firmly on the streambed. When done, press Enter.

Note: Do not move the wading rod after the depth and location have been entered.

The FT1 will not use the inputted depth to determine which ***velocity*** method to use. You must manually change the method based on the depth. Panels shallower than 75 cm use the 0.6 method, and panels deeper than 75 cm use the 0.2/0.8 method (Figure 9 – pg. 33).

- Change the velocity method by pressing the blue 'Method +' button. Cycle through the options, (shown under the Station in the top left corner), until you find the 0.6 or 0.2/0.8 method you require.

8. Adjust the rod height, and prepare to take measurement

Adjust the height of the probe in the water to its proper position. Squeeze the handle and slide the rod up/down to align the numbers on the probe rod with the blue numbers on the wading rod.

Use the measured water depth to determine which numbers align. Examples:

- At 8 cm (0.08 m) depth, align the 0 with the blue 8.
- At 15 cm (0.15 m) depth, align the 1 with the blue 5.
- At 42 cm (0.42) depth, align the 4 with the blue 2.

Use the bubble level on the wading rod to hold the wading rod vertical.

Ensure the probe is stable, is away from any underwater objects (rocks, logs, etc.), and is aligned with the ***transect*** tape (do not move the probe to a different angle from the tape to better angle into the direction of streamflow*).

** Note: the **velocity** angle may jump around if flow is not laminar and perpendicular to the probe. The **velocity** angles along the **transect** are a condition of the site and can only be changed through site selection or slight clearing of any rocks and sticks along the streambed, which would need to be done prior to starting a measurement. Do not adjust the angle of the probe during measurement in order to improve the **velocity** angle, unless it is obvious that the probe is out of line with the **transect** tape as a result of the way the instrument is being operated.*

9. Take panel measurement.

Once the wading rod and probe are in place, press the blue 'Measure' button. The minimum measurement interval is 30 seconds. Keep yourself and the instrument still for the entire 30 seconds. The screen will flash when the measurement is finished.

10. Review the measurement.

When the FT1 has finished the panel measurement, review the results and any warnings or errors. Review Appendix 4.6.1 for a list of possible measurement errors, and how to interpret errors. Press Enter when ready.

If the measurement is acceptable, select 1 for 'Accept'. This will take you to the next station. if there were several Warnings that require fixing, and you would like to repeat your measurement, press 2 for 'Repeat'.

11. Continue adding stations until you reach the other edge of the stream.

Repeat steps 7 through 10 to add more panels across the wetted width of the stream.

When you are at the ending edge of the stream, press the grey 'End Section' button. A note will show up asking you to confirm. Press the grey 'End Section' button again.

Note: This end procedure is different from that of the FT2. For the FT1, you must 'End Section' before you can input the location of the ending edge.

The FT1 will allow you to review your data and any QC warnings. Compare the measurement panels to ensure they meet the required specifications. Press Enter to move through the data review pages.

If a panel has more than 10% ***discharge*** and you are able to fit another ≥10 cm wide panel between it and the next nearest panel, select 2 'Do not end section'. This will add in another station. Adjust the Location using the blue 'Set Location' button . Follow steps 7 through 10 to take another measurement.

It is best practice to have all stations < 10% ***discharge***; however, some sites and stream conditions will prevent this. If you have selected the best possible ***transect*** location, mitigated all boundary issues and added as many 10 cm panels as possible, but are still seeing panels with >10% discharge, it is okay to end the measurement.

When all changes have been made and you are ready, press 1 for 'End Section'.

12. Input the ending edge.

Record the Ending Edge location (in m) along the transect by using the blue 'Set Location' button. Record the depth of water at the edge, or "0" if the bank is dry. Change the to Left Edge or Right Edge as needed using the grey 4 button to toggle between LEW/REW. Keep the correction factor set to 1.0.

When ready, press the grey 'Calculate Discharge' button. Press it again to confirm.

13. Review discharge summary.

Review the final discharge for the measurement. Press Enter to cycle through the other data: uncertainty, number of stations, min, max, mean width, area, depth, SNR, temperature, file name, etc.

- ☐ Note the total ***discharge*** (m^3/s) on the field data sheet.

13. End measurement.

When you are ready, press 0 to 'Exit'. This will save the file and return you to the Main Menu. Power the head unit off by pushing and holding the yellow Power button for three seconds.

Disassemble and store the FT1 in the carrying case. If the probe is still damp, leave the case open to prevent mildew/mold growth.