dh4151202

Data Handler (DH4)

User manual

12/2015, Edition A

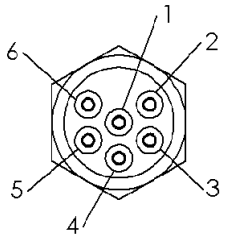
Table of Contents

Section 1 Specifications

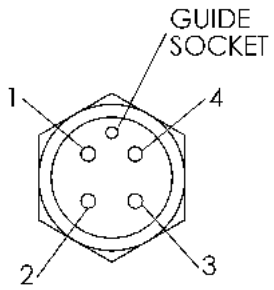
1.1 Mechanical

Pressure housing	10.4 cm x17.8 cm
Depth rating	500 m; deep: 5000 m
Temperature range	0–30 °C
Weight in air	1.8 kg, 0.3 kg; deep: 2.6 kg, 1 kg

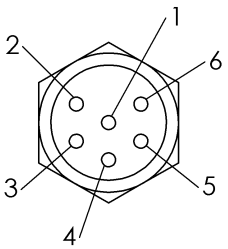
1.1.1 Standard bulkhead connector

Contact	Function	MCBH-6-MP connector
1	Ground	
2	RS232 RX	
3	Reserved	
4	Voltage in	
5	RS232 TX	
6	Reserved	

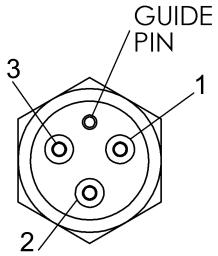
1.1.2 Serial connector

Contact	Function	MCBH-4-FS connector
1	Ground	
2	Voltage in	
3	RS232 RX	
4	RS232 TX	

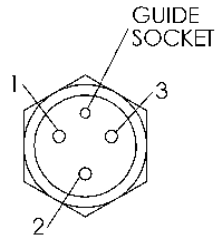
1.1.3 Analog external data port connector

Contact	Function		MCBH-6-FS connector
	1 analog	2 analog	
1	Ground		
2	Analog 1		
3	Analog 1 ground		
4	Voltage in		
5	No connect	Analog 2	
6	No connect	Analog 2 ground	

1.1.4 Battery connector

Contact	Function	MCBH-3-MP connector
1	Ground	
2	Voltage in	
3	No connect	

1.1.5 Pump connector

Contact	Function	MCBH-3-FS connector
1	Ground	
2	Voltage in	
3	No connect	

1.2 Electrical

Input	7–15 VDC
Current draw, typical	0.6 W @ 12V
Current draw, low power	70 µA
Current draw, maximum power	3 A

1.3 Communications

Serial input	4, 6, or 8 ports, RS232 (RS485 optional)
Analog input	5 V
Analog input resolution	12 bit
Baud rates	600–115200 baud
Data transfer	binary
Data storage	1 Gb

Section 2 Setup

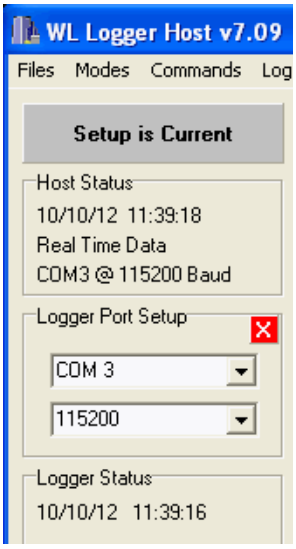
The Data Handler (DH4), or "logger" controls from four to eight input-output ports for serial or analog sensors. The logger collects, time-stamps, saves, and merges the data from the sensors that are connected to each of its ports.

2.1 Functional check

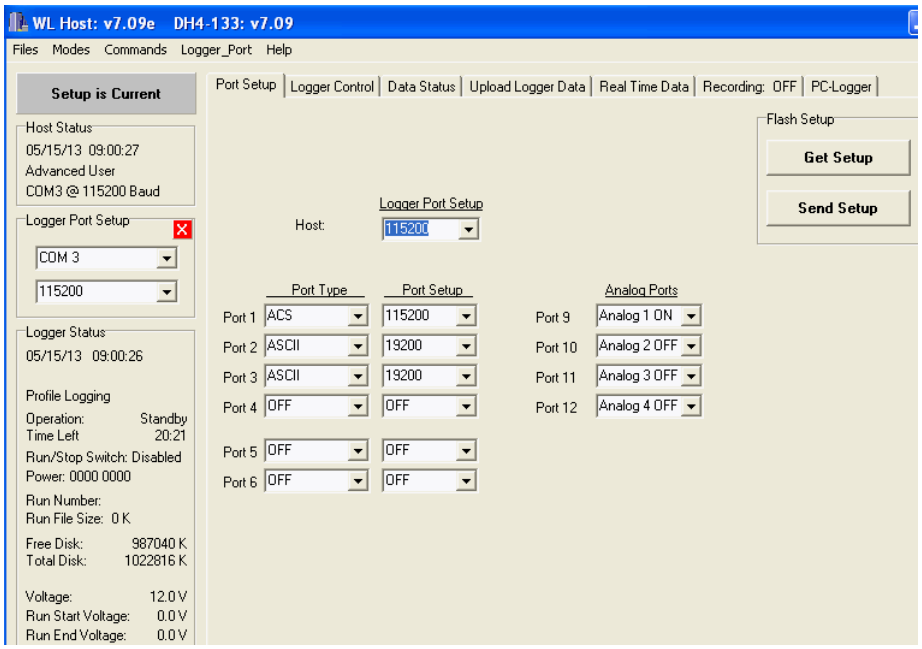
Make sure that the logger and the sensors connected to it operate correctly before deployment. To do this check, the user needs the items listed below:

- a clean work bench
- the DH4 logger
- the test cable for the logger
- the other sensors that will be deployed with the logger
- the cables that connect the other sensors to the logger
- a regulated power supply
- a PC
- the manufacturer-supplied CD
- the Custom Configuration page (also on the CD).

1. Make sure that all connectors and cables are lubricated before they are connected.
2. Copy the manufacturer-supplied "WETLabs" folder to the PC.
   This folder has the host software and the folder structure to keep all of the data files organized.
3. Connect the test cable to the PC, the "host" port of the DH4, and the power supply.
4. Connect each of the sensors that will be deployed with the logger to the logger.
   Make sure that if a pump is used, it must be in enough water so that it does not pull in air when power is supplied to the system.
5. Open the "WETLabs" folder.
6. Start the "WLHost" software.
7. Supply power to the logger.
8. Select the COM port and the baud rate if necessary. Note that the COM port can be different for each PC.



9. Go to the **Modes** menu.
10. Select *Advanced User*.
11. Push **Get Setup**.
    The manufacturer's setup, or the last setup stored in the logger, shows in the *Port Setup* tab.

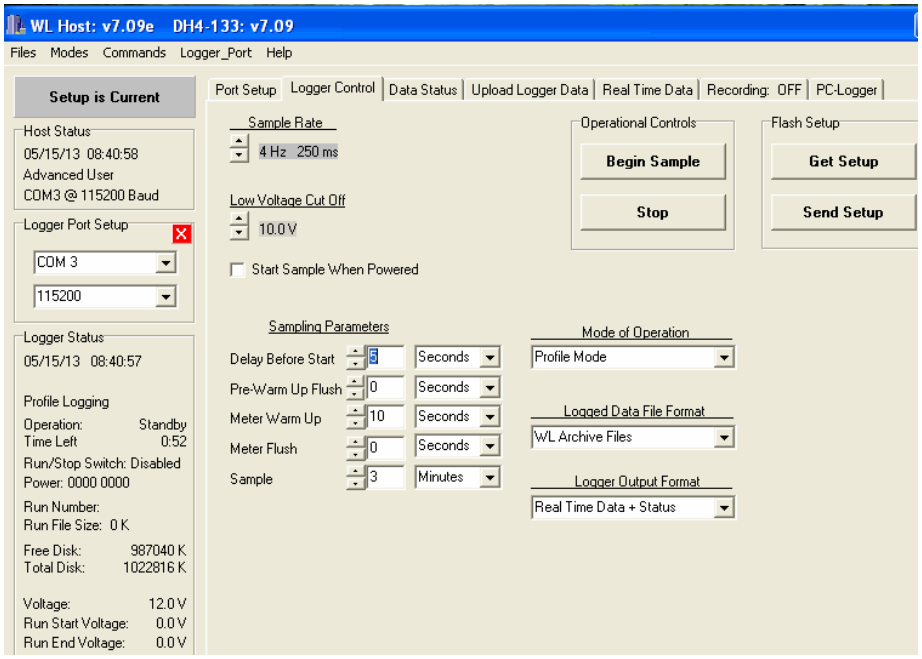


12. Refer to the example setup below throughout this user manual.

Table 1 Example data logger system

Connector port	Logic port	Type of port	Baud rate of port	Sensor	Description
1	—	logger (host)	115200	DH4	data logger connected to PC
2	1	ac-s	115200	ac-s	spectrophotometer
3	2	ASCII	19200	*ECO* 3-parameter	532, 650 nm scattering, chlorophyll
4	3	ASCII	19200	*ECO* 2-parameter	chlorophyll-NTU sensor
9	9	Analog	—	WETStar	chlorophyll fluorometer

13. Go to the *Logger Control* tab.



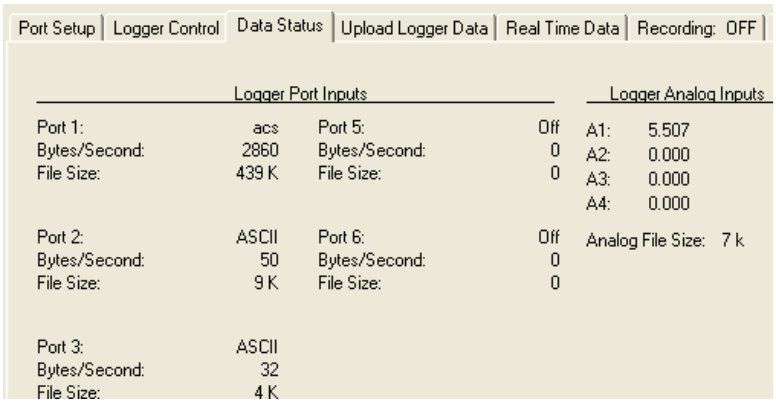
14. Make sure that the "Sample" time is long enough to check that the data from all the sensors connected to the logger is correct. Three to five minutes is sufficient.

15. Make sure that the value in the drop-down menu under the Logged Data File Format menu shows "WL Archive Files."
16. Make sure that the value in the drop-down menu under the Logger Output Format shows "Real Time Data + Status."
17. Push **Send Setup**.
    The yellow **Setup is not Current** changes to a gray **Setup is Current.**

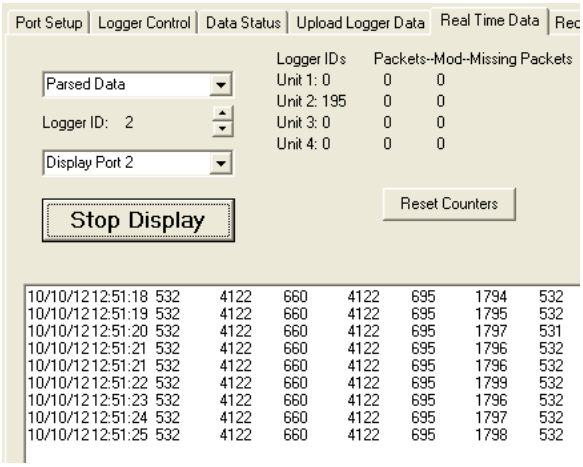
2.2 Data output

Make sure that the setup is current and all the necessary parameters are entered into the fields in the *Port Setup* and *Logger Control* tabs. Make sure that power is supplied to the logger to test the output and functionality of each of the sensors connected to the logger.

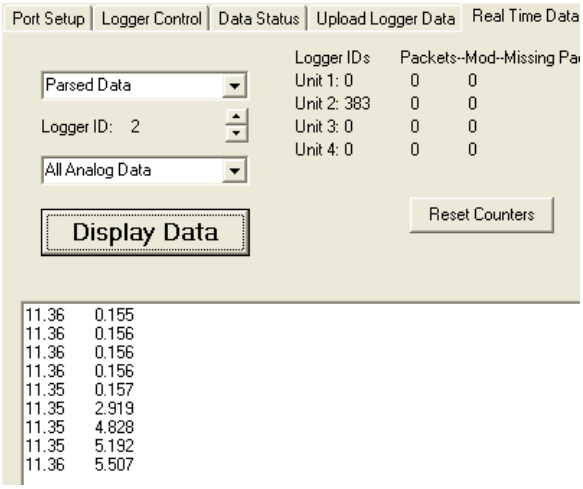
1. Push **Begin Sample** in the *Logger Control* tab.
2. Go to the *Data Status* tab to make sure the file size of the collected data of each of the sensors increases.



3. Go to the *Real Time Data* tab.
4. Make sure the data being collected is readable and useful.
   Note that the ac-s sensor has binary output and is not human-readable. If a sensor has an incorrect baud rate, the file size in the *Data Status* tab will increase, but the data collected is not useful.
5. Select *Display Port 2* in the drop-down menu.
6. Push **Start Display**.



   Data from the example *ECO* three-parameter sensor shows in the window.
7. Push **Stop Display**.
8. Select *Display All Analog Data* in the drop-down menu.
9. Push **Start Display**.



The first column is the input voltage. The second column is the sensor output in VDC. Note that the last line shows the sensor's maximum output.

Data from the example analog fluorometer shows in the window.

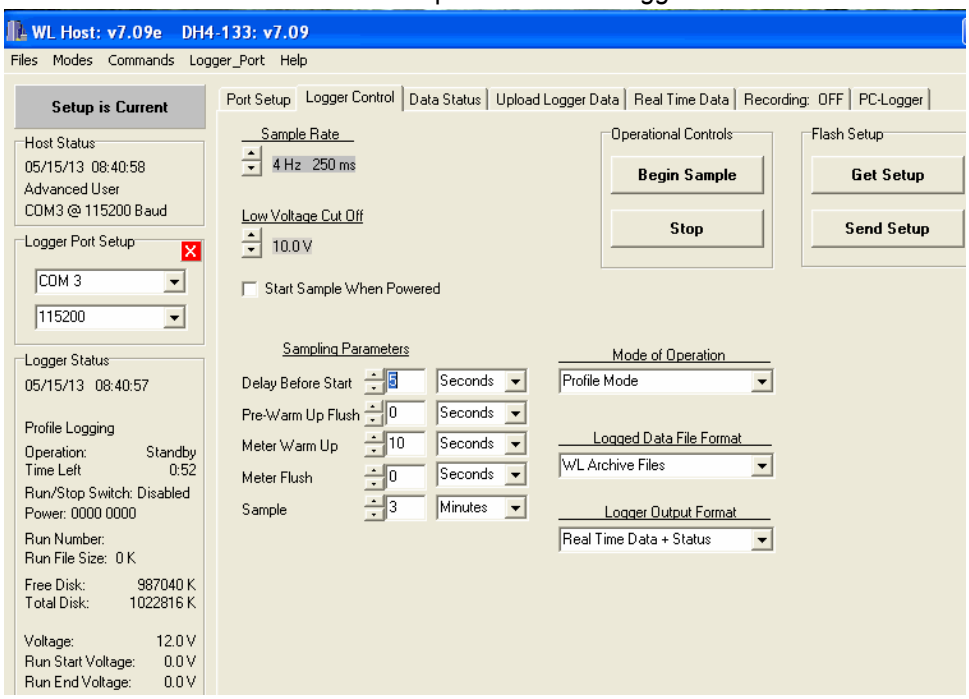
10. Push **Stop Display**.
11. Let the logger collect data for a minute or two.
12. Go to the *Logger Control* tab and push **Stop**.
    The logger goes to standby mode.

The logger operates in a profile or moored mode.

- **Profile**: The logger and connected sensors move vertically through a column of water.
- **Moored**: The logger and connected sensors operate in one place.

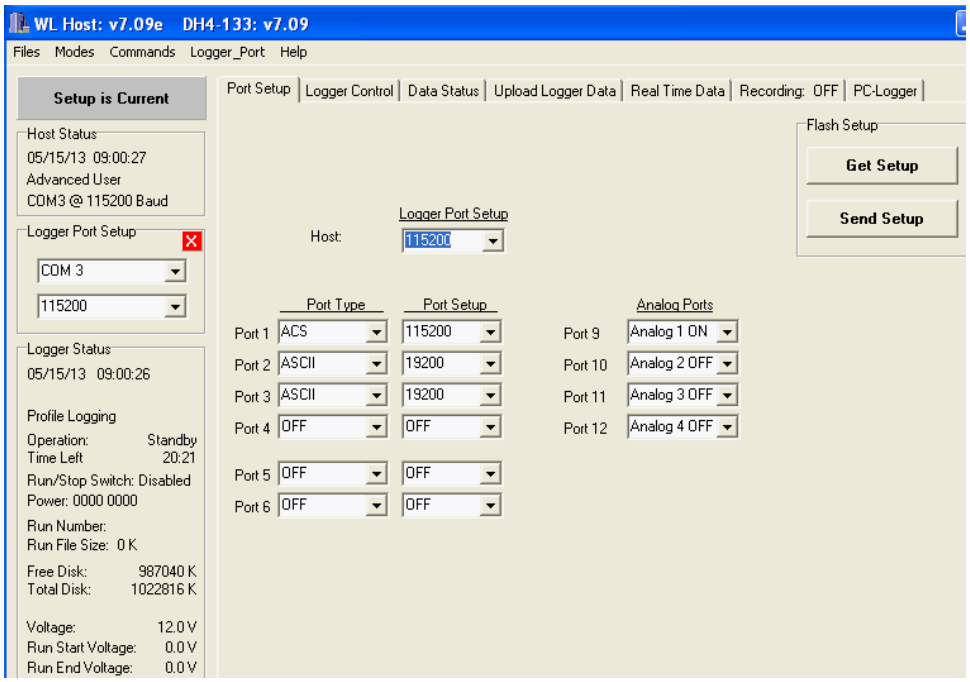
Real Time, Analog Output and *PC-Logger* are less frequently used modes. An advanced understanding of the software is necessary to use these modes of operation.

1. Supply power to the logger if it is not already on.
2. Refer to steps 1–10 in the section on "Functional check on page 5" if necessary.
3. Make selections about operation in the *Logger Control* tab.



The example Logger Control tab shows Profile Mode.

4. Select "Profile Mode" or "Moored Mode" from the Mode of Operation pull-down menu.
5. Make sure that the Sampling Parameters will work with the planned deployment.
6. Make sure that the Low Voltage Cut Off is set high enough to supply power to the system sensor that requires the most power, generally 10.0 V.
7. Make sure that the Sample Rate is set to get data from the sensor that has the fastest data acquisition rate.
   If one sensor acquires data at 1 Hz and another at 8 Hz, set the data acquisition rate to 8 Hz.
8. Go to the *Port Setup* tab.

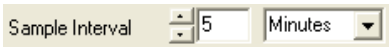


9. Enter the Port Type and Port Setup values for the sensors connected to the logger.

Table 2 Accepted port types and descriptions

Logger port	Description
OFF	The port gets no power. This port does not accept any data.
ac9	The port turns off if the power drops below 10.0 V. This port accepts any data. Baud rate: 19200.
acs	The port turns off if the power drops below 9.5 V. This port accepts any data. Baud rate: 115200.
ASCII	This port accepts data that is terminated with <Carriage Return><Line Feed> (CRLF). Baud rate: 600–115200.
Binary	This port accepts all data. Baud rate: 600–115200.
ECO-G2	This port allows the *ECO* to close its Bio-wiper before the power is turned off. This port accepts <CRLF> data. Baud rate: 19200.
GPS	This port accepts NMEA-0183 data in a GPRMC format. Baud rate: 4800.
Pump	This port supplies power to the pump for the flush, the pre-flush, warm-up, and the data collection modes of operation. Select pre-flush to send power to the pump port for all modes of operation. This port does not accept data.
Remote Host	This port supplies power during the standby and sample modes of operation and sends data to telemetry equipment.
SBE37-SM	This port gets the data from the 37-M every 4 seconds if the 37-M is set up to log data and go to a low power mode when it is not in data collection mode. Baud rate: 9600.
VSF-S	This port accepts ASCII data from older *ECO* sensors such as the DFL. The port sends a "close shutter" command to the sensor. Baud rate: 9600.

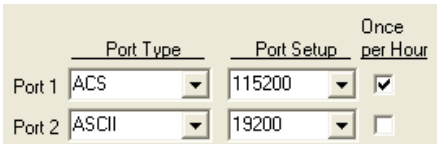
10. Make sure that any analog sensor ports on the system are turned on.
11. The "Moored Mode" setup is similar to the "Profile Mode." There are three additional selections that the user can make for moored operations.
    a. Select "Moored Mode" from the drop-down menu.
    b. Enter or select the total time between samples in the variable boxes.



c. Push **Sleep.** A new window shows so that the user can set the time that the logger starts to operate.

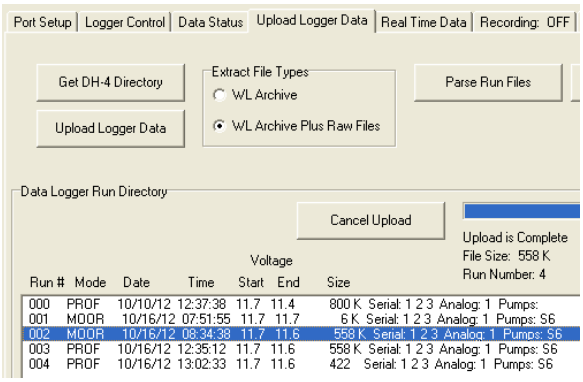
d. Enter the time and the date.

e. Put a check in the box so that sensors that use more power will only collect data once per hour.

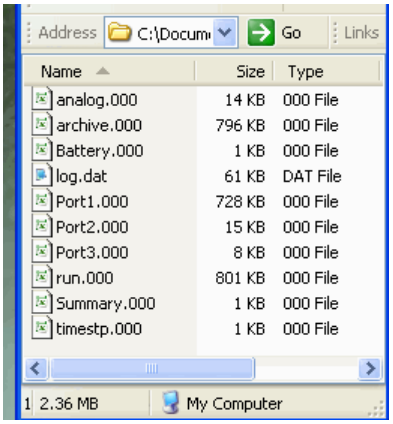


12. Push **Send Setup**.
The values from the *Port Setup* tab are stored in the logger.

1. Make sure that power is supplied to the logger and that it is in standby mode.
2. Go to the *Upload Logger Data* tab.



3. Push **Get DH-4 Directory**.
   Data stored in the logger is shown in the *Data Logger Run Directory* area of the tab.
4. Select the file to upload from the logger to the PC.
5. Push **Upload Logger Data**.
   A new window opens.
6. Go to the manufacturer-supplied "Archive Files" folder in the "Wetlabs > WAP" folder on the PC.
   A new window opens.
7. Push **Save.**
8. Open the folder to see the files.



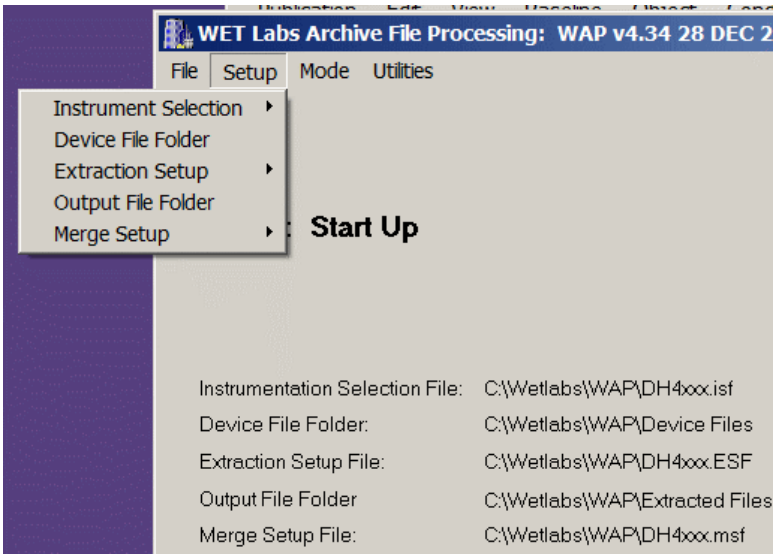
   Use MS Excel® or Notepad® to look at the files. Note that the "Port1.000" file is binary ac-s data and is not human-readable until it is processed by the WET Labs File Archive Processing (WAP) software.
9. To erase the selected files stored on the logger, push **Clear Logger Memory**.

Section 5 Process data from logger

Use the WET Labs Archive File Processing (WAP) software to process the data stored in the logger. The data collected by each sensor connected to the logger is saved into one file in the logger. Use WAP to divide the one large file into a different file for each sensor, and process that data from counts or binary output to data that humans can read and use ("processed" data).

5.1 Set up WAP software on PC

Use the manufacturer-supplied folders for the files that the WAP software uses when it processes the data from the logger. The folders will help keep the files of data organized. Use the manufacturer-supplied setup files to complete the initial setup for the WAP software to process the data collected by the DH4. These files apply the corrections, calibration, and device file information to the data from a specific sensor. The user can put together, or merge, data from different sensors.
Refer to the section Functional check on page 5 for details on how to set up folders. The WAP software main window has the information shown below when the folders and files are fully set up.

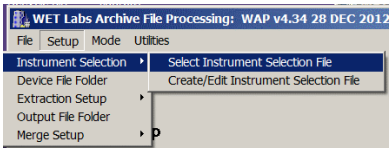


1. Start the WAP software.
2. Go to the **Setup** menu, then select *Device File Folder*.
3. In the next window, select the manufacturer-supplied "Device Files" folder in the "Wetlabs > WAP" folder.
   Make sure the "Device File" folder shows in the window. Push twice to select the folder.
4. Push **Done**. It may be necessary to make the window larger to see this button.
   The selected file path shows on the WAP main window next to "Device File Folder."
5. Go to the **Setup** menu, then select *Output File Folder*.
6. In the next window, select the manufacturer-supplied "Extracted Files" folder in the "Wetlabs > WAP" folder.
   Make sure the "Extracted File" folder shows in the window. Push twice to select the folder.
7. Push **Done**.

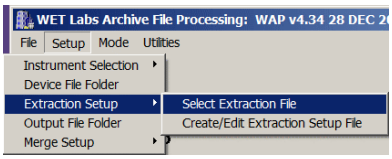
The selected file path shows on the WAP main window next to "Output File Folder."

8. Set up the WAP files to process the data. The "xxx" in the "DH4xxx" file name is the serial number of the DH4 logger.

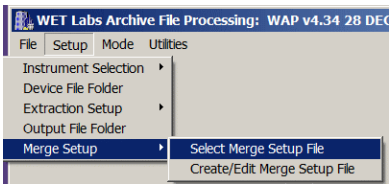
   a. Go to the **Setup** menu, then select *Instrument Selection* >*Select Instrument Selection File*. In the next window, select the "DH4xxx.isf" file in the "Wetlabs > WAP" folder.



   b. Go to the **Setup** menu, then select *Extraction Setup* > *Select Extraction File*. In the next window, select the "DH4xxx.esf" file in the "Wetlabs > WAP" folder.



   a. Go to the **Setup** menu, then select *Merge Setup* > *Select Merge Setup File*. In the next window, select the "DH4xxx.msf" file in the "Wetlabs > WAP" folder.

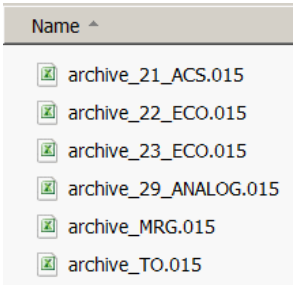


The folders to store the data that is merged and the files to process this data are complete.

5.2 Verify data from sensors

Look at the files on the logger to make sure that there is data stored from each sensor that is connected to the logger. Note that the data from the ac sensor is binary and is not human-readable.

1. If necessary, start the WAP software.
2. Go to the **Setup** menu and select *Extraction Setup*, then *Create/Edit Extraction Setup File*.
3. If necessary, select "Individual Files Only" in the Output area of the **Extraction Setup File** window.
4. Go to the **File** menu and select *Save As*. It is not necessary to save another file.
5. Close the **Extraction Setup File** window.
6. Push **Extract to Engr**.
7. In the next window, go to the "Wetlabs > WAP > Archive Files" folder. Select the file named "archive.xxx."
   The WAP software makes a new file for each sensor that is connected to the logger. The file names are "archive_nn_sensor type.xxx" where "nn" is the identification number applied by the WAP software.



The main window shows "Status: Done with Engr Extraction." The files are saved to the location shown to the right of the "Output File Folder" in the WAP main window. next to "Last Extracted Archive File:" shows the location on the PC of the saved files.

8. Look at one or more of the archive_nn_sensor type.xxx" files to make sure that the data looks correct.

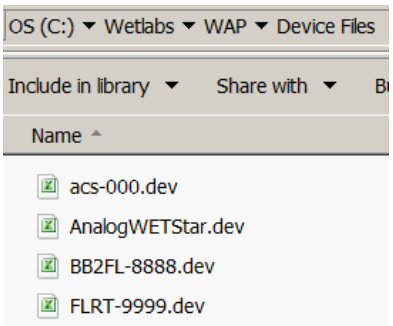
5.3 Change WAP setup files

The user can change the manufacturer-supplied values in the WAP files below to change the way that the data is processed.

- .isf—Instrument Selection File
- .esf—Extraction Setup File
- .msf—Merge Setup File.

The user needs to get or make a device file for any sensor with data to process in WAP, so the software can apply calibration information for the data from that sensor.

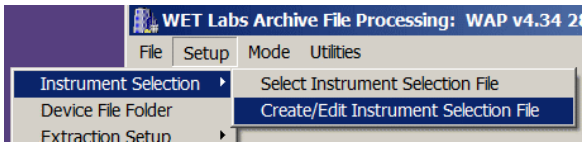
Save the device files in the "Wetlabs > WAP > Device Files" folder.



5.3.1 Instrument Setup File (*.isf)

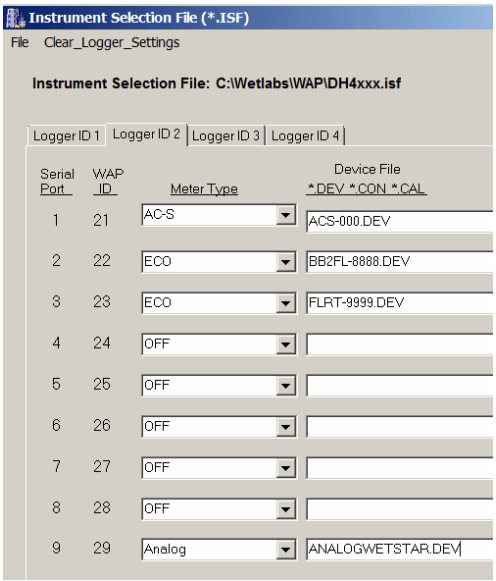
WAP uses the *.isf to apply the sensor-specific calibration and device file information for each sensor.

1. Start the WAP software if necessary.
2. Go to the **Setup** menu and select *Instrument Selection* > *Create/Edit Instrument Selection File*.



A window with the tab *Logger ID 2* shows.

3. Select the Meter Type from the drop-down menu for each of the sensors connected to the logger.

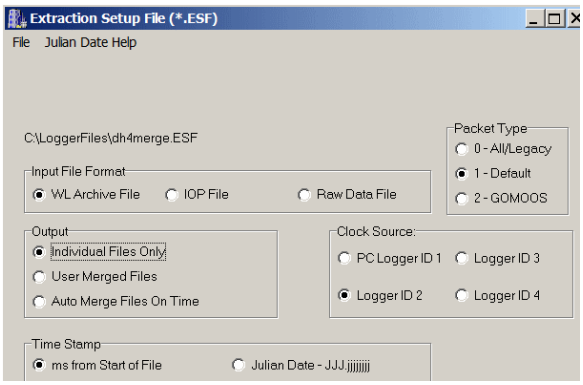


4. Enter the file name of the sensor's device file from the manufacturer-supplied "Wetlabs > WAP > Device Files" folder on the PC.
5. Go to the **File** menu and select *Save As*.
6. Select the "DH4xxx.isf" file where xxx is the DH4 serial number, and push **Save** to save it in the "Wetlabs" folder.

5.3.2 Extraction Setup File (*.esf)

Make an Extraction Setup File so that the WAP software has the necessary values such as the kind of file, the kind of data, and a time stamp, to process the data from the sensors connected to the logger.

1. Go to the **Setup** menu and select *Extraction Setup > Create/Edit Extraction Setup File*.
2. Select the values shown below:
   a. Select "WL Archive File" in the Input File Format area.
   b. Select "1 - Default" in the Packet Type area.
   c. Select "Individual Files Only" in the Output area.
   d. Select "Logger ID 2" in the Clock Source area.
   e. Select "ms (milliseconds) from Start of File" in the Time Stamp area.



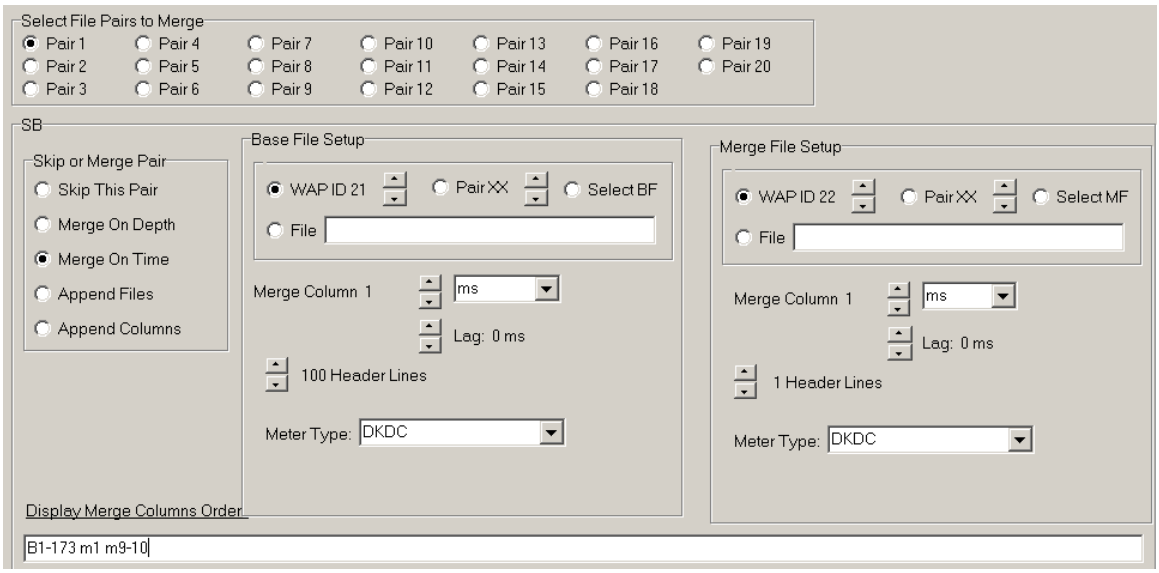
3. Go to the **File** menu and select *Save As*.
4. Make a name for the .esf file and push **Save** to save it in the "Logger" folder.
5. Close the Extraction Setup File window.

6. Push **Extract to Engr**.
7. Select the "archive.xxx" file from "Wetlabs > WAP > Archive Files" (where xxx = logger file number that was downloaded), then push **Open.**
   The software makes "archive_nn_acs.xxx" (where nn is the WAP identification number) for each sensor.

5.3.3 Merge Setup File (*.msf)

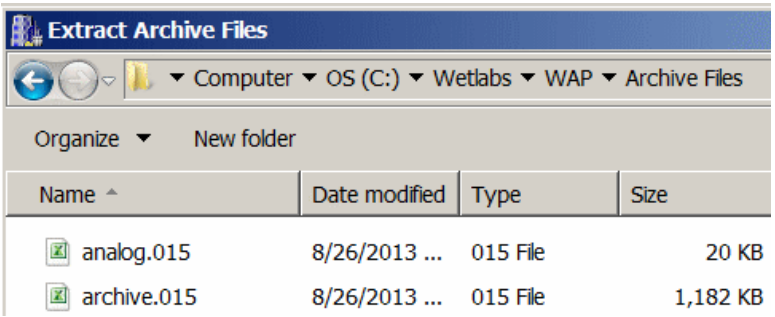
The .msf aligns data from multiple sensors by time or depth. Merge data files two at a time from a "base" file and a "merge" file. The result is a merged file named "pair.xx" where xx = number of the pair. A data file or a pair of data files can be added to a base pair. In the example below, "pair.01" is acs and ECO Triplet data. A "pair.02" can be pair. 01 plus the data from another sensor.

1. Go to the **Setup** menu and select *Merge Setup File* > *Create/Edit Merge Setup File*. Note that the WAP software will open the file that shows on the main window of the WAP software.

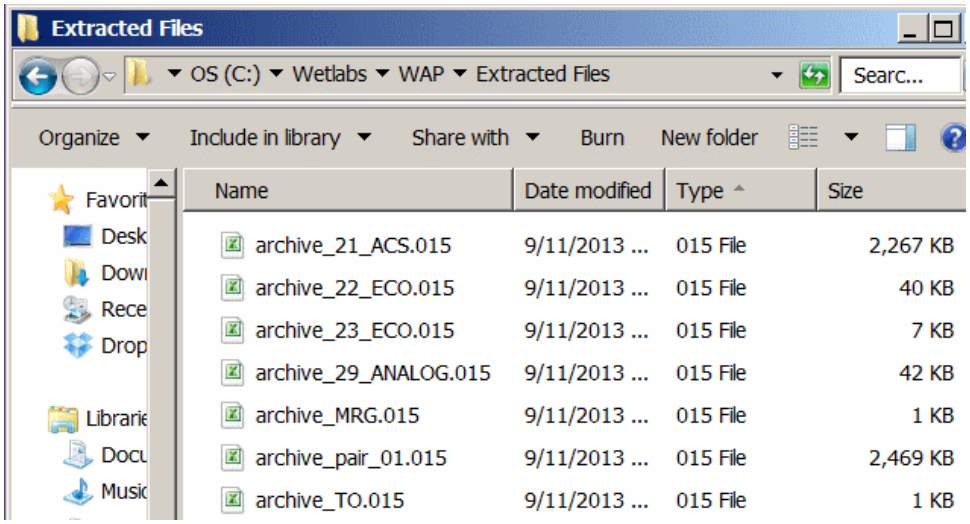


2. In the Select File Pairs to Merge area, select "Pair 1."
3. In the Skip or Merge Pair area, select either "Merge on Time" or "Merge on Depth."
4. In the Base File Setup area:
   a. Select the WAP ID of the first sensor for the pair.
   b. Select the value for Merge Column 1 to either dbars, milliseconds, or Julian Days.
   c. Select the number of header lines. Look at the "archive_nn_sensor type.xxx" file. Open the device file of the sensor and count the number of lines, or rows, that come before the data. The ac-s sensor in this example has 100 header lines.
   d. The "Meter Type" is "DKDC" (Don't Know, Don't Care.)
5. Do the same steps in the Merge File Setup area for the second sensor of the pair.
6. In the Display Merge Columns Order area, enter the number of columns of data to merge from the "base" and the "merge" files.
   In the example above, the "base" file is WAP ID 21, the acs. It has a total of 173 columns of data. The "merge" file is WAP ID 22, an ECO Triplet that has 10 columns of data.
   B1–173 = all acs data gets merged.
   m1 m9–10 = columns 1, 9, and 10 of the Triplet data gets merged.
7. Go to the **File** menu, then *Save As* and select the .msf file in the "Wetlabs" folder.
8. Go to the **Setup** menu and select *Extraction Setup File* > *Create/Edit Extraction Setup File*.

9. In the Output area, select "User Merged Files."
10. Go to the **File** menu and select *Save As*. It is not necessary to make another file.
11. Close the **Extraction Setup File** window.
12. If **Extract to Engr** is not available, push **Reset Status**.
13. Push **Extract to Engr**.
    The files that WAP processes are saved in the "Extracted Files" folder, or the location on the PC shown at "Output File Folder" in the WAP main window.
14. Go to "Wetlabs > WAP > Archive Files" folder. Select the "archive.xxx" file



    The **Status:** will show "Done with Extraction" when WAP completes the operation.
15. Look at the "Wetlabs > WAP > Extracted Files."
    The "archive_nn_sensor type.xxx" files are overwritten and there are three new files. The "archive_pair_01.015" is the file that results from the merge operation.



16. Open the "archive_pair_01.015" file. In this example, the file has all the acs data and column 1 (the Triplet time stamp in ms), 9 (the Triplet scattering data at 660 nm) and 10 (the Triplet chlorophyll data in µg/L) merged into one file. Note that only the last five acs wavelengths are shown below.

FM	FN	FO	FP	FQ	FR	FS	FT
a741.4	a744.9	a748.6	a752.0	a755.5	Time(ms)	bb(660)	CHL(ug/l)
-0.50038	-0.54242	-0.58393	-0.55175	-0.54731	1000	0.882436	20.625
-0.50038	-0.54242	-0.58393	-0.55175	-0.54731	1000	0.882436	20.625
-0.50038	-0.54242	-0.58393	-0.55175	-0.54731	1750	0.882436	20.6125
-0.50038	-0.54242	-0.58393	-0.55175	-0.54731	1750	0.882436	20.6125
-0.50038	-0.54242	-0.58393	-0.55175	-0.54731	1750	0.882436	20.6125
-0.50038	-0.54242	-0.58393	-0.55175	-0.54731	1750	0.882436	20.6125
-0.50038	-0.54242	-0.58393	-0.55175	-0.54731	2750	0.882436	20.625

6.1 Bulkhead connector maintenance

⚠CAUTION

Do not use WD-40® or petroleum-based lubricants on bulkhead connectors. It will cause damage to the rubber.
Damaged connectors can cause a loss of data and additional costs for service.
Damaged connectors can cause damage to the sensor and make it unserviceable.

Examine, clean, and lubricate bulkhead connectors at regular intervals. Connectors that are not lubricated increase the damage to the rubber that seals the connector contacts. The incorrect lubricant will cause the bulkhead connector to fail.

1. Apply isopropyl alcohol (IPA) as a spray or with a nylon brush or lint-free swab or wipes to clean the contacts.
2. Flush with additional IPA.
3. Shake the socket ends and wipe the pins of the connectors to remove the IPA.
4. Blow air into the sockets and on the pins to make sure they are dry.
5. Use a flashlight and a magnifying glass to look for:

Cracks, scratches, or other damage on the rubber pins or in the sockets.	
Any corrosion.	 
Separation of the rubber from the pins.	
Swelled or bulging rubber pins.	

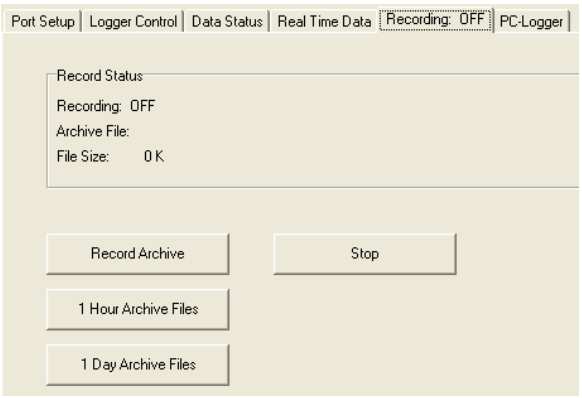
6. Apply a small quantity of 3M™ Spray Silicone Lubricant (3M ID# 62-4678-4930-3) to the pin end of the connector. Make sure to let it dry.
7. Connect the connectors.
8. Use a lint-free wipe to clean any unwanted lubricant from the sides of the connectors.

Section 7 Reference

7.1 Real-time operation mode

Data collected in real-time is sent to the PC. No data is saved by either the individual sensor or the logger.

1. Refer to the setup steps in the section on Operation on page 9.
2. Change the "Mode of Operation" to "Real Time Mode" at the *Logger Control* tab.
3. Go to the *Recording:OFF/ON* tab.



4. For real-time profile operation, push **Record Archive**.
   Data is saved on the PC until the user pushes **Stop**.
5. For real-time towed or flow-through operation, push **1 Hour Archive Files**.
   A new data file is saved at the start of each hour. A two-digit year, Julian date and hour are appended to the file name.
   For example, If the user makes a file called CruiseOne at 7:05 pm on January 17, 2004, the software will make a file called CruiseOne04_17.019. If data is still being saved to the host PC at 8:00 pm, it will make a new file called CruiseOne04-17.020.
6. For real-time moored operation, push **1 Day Archive Files**.
   A new data file is saved at the start of each new day as in the example for **1 Hour Archive Files**.
7. Make a location on the PC to store the file.
8. Make the file name compatible with the WAP file extraction software.
   - Use a single-word file name with no spaces.
   - Use a three-digit extension from 000–999.

   For example: CruiseOne.001.
9. Push **Save**.
10. Deploy the system.
11. Go to the *Logger Control* tab and push **Begin Sample**.

7.2 Status displays

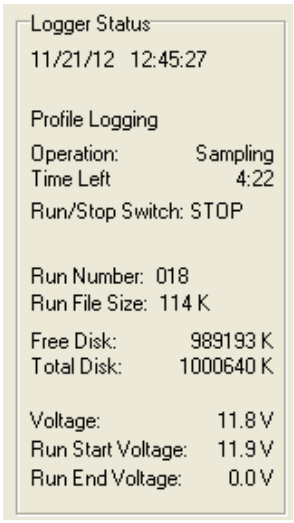
The **Setup is Not Current** area is yellow when the values in the logger are not the same as the PC. The background of the Host Status, the Logger Port Setup, and the Logger Status areas is red when the PC and the logger values are not the same.

These areas are gray when the values agree.

1. Push **Get Setup** to send the values from the logger to the PC.
2. Push **Send Setup** to send the values from the PC to the logger.
3. The user can show or hide the Logger Port Setup area from the **Logger_Port** menu.

7.2.1 DH4 status

The information in the Logger Status area shows the status of the logger operations.



"Operation:" Shows the operation that the logger is doing.

- *Standby*—The logger can accept commands.
- *Delay*—The pause before the logger warm-up operation.
- *Pre-flush*—Any pumps connected to the system flush the sensors.
- *Warm-up*—Power is supplied to sensors that need a stable internal temperature to operate.
- *Flush*—Any pumps connected to the system flush the sensors.
- *Sample*—All selected sensors will be on. Data is collected.
- *End of Run*—Data collection is complete.

"Time Left:" Shows how much time remains for each operation. When the logger is in *Standby*or *End of Run*, this count increases.

"Run/Stop Switch:"

- *RUN*—The plug is inserted. The logger collects data.
- *STOP*—The plug is removed. The logger stops data collection.
- *Disabled*—The logger can get commands.

"Power:" Used only by the manufacturer.

"Run Number:" Numbers increase until the user erases the data stored in the logger.

"Run File Size:" The size of the data files stored in the logger.

"Free Disk:" The capacity of unused flash disk space available in the logger. There is a 200 Kb buffer.

"Total Disk:" The capacity of the flash disk in the logger. There is a 200 Kb buffer.

"Voltage:"

- Current—shows the voltage to the logger. Updates once per second.
- Start—shows the voltage to the logger at the start of data collection.
- End—shows the voltage to the logger at the end of data collection.

7.3 Setup selections

Use the **Modes** and **Commands** menus to set up the logger for various modes of data collection, to synchronize the time, and to test a single port.

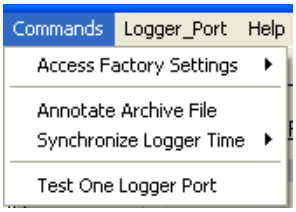
7.3.1 Modes of operation

The logger has six modes of operation. *Moored* and *Profile* are the most commonly used.

- *Moored logging*: the logger and the sensors connected to it stay in one place in the water column.
- *Profile logging*: the logger and the sensors connected to it move up or down in the water column.
- *Real-time output*: data is collected and stored on the PC, not the logger. Use *Real-time output* mode to send ASCII data from sensors with digital output.
- *Analog output*: data is collected and sent in an ASCII format from analog sensors in real-time.
- *Advanced user*: the logger can be set up for a combination of moored and profile operations.
- *PC-logger*: data is collected and sent to the PC, not the logger.

7.3.2 Commands menu

Additional setup options are available in the **Commands** menu.



Access Factory Settings is reserved for use by the manufacturer.

Annotate Archive File:

- Add notes about a specific file of data the "Annotate Here" area, then push **Insert Annotation**. Notes are added to the archive file as ASCII text in logger ID 1, Port 9.
- Push **Start Water Sample** to enter the time that a water sample started.
- Push **End Water Sample** to enter the time that a water sample ended.
- Push the up or down arrow in "Next Water Sample:" to change the water sample count.
- Push **Reset Sample Count** to set the count to 1.

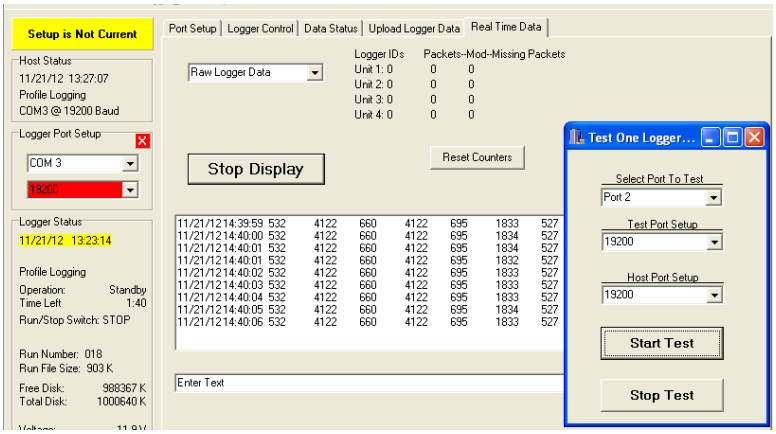
Available for **Advanced User** and **Real-time** modes of operation.

Synchronize Logger Time: Synchronize the internal clocks of the logger and the PC. The manufacturer recommends that the user turn off the "Automatic Time Sync" when in a moored mode of operation.

- Available for all modes of operation.

Test One Logger Port: Test a single sensor to make sure that it is working correctly.

- Available for Moored, Profile, Real Time, and Advanced User modes of operation.

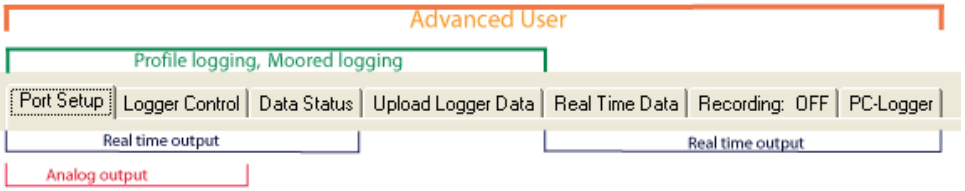


Test a port:

1. Select the port to test from the drop-down list.
2. Select the baud rate of the sensor to test from the drop-down list.
3. Select the baud rate of the PC from the drop-down list.
4. Push **Start Test**. Data displays in the *Real Time Data* tab

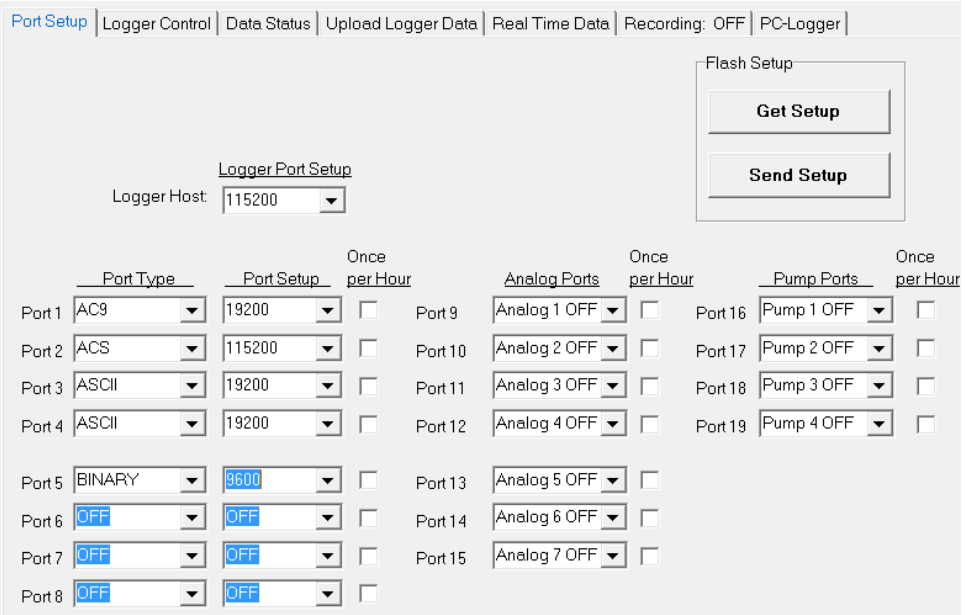
7.4 Operations tabs

There are seven operations tabs in the host software. Not all are available for all modes of operation.



7.4.1 Port setup tab

The Port Setup tab lets the user select the type of sensor, the communication rate for that sensor, and analog and pump options that the DH4 supports.



Logger Port Setup

The default setting from the manufacturer is 115200.

Port Type

Type	Baud rate	Port description
OFF	N/A	No power supplied to port. No data is accepted.
ac9	19200	Accepts any data. Port turns off if voltage is < 9.5.
acs	115200	Accepts any data . Port turns off if voltage is < 9.5.
ASCII	600–115200	Accepts ASCII data that ends with <CR><LF>.
Binary	600–115200	Accepts all data.
ECO	19200	Accepts data that ends with <CR><LF>. The Bio-wipers on ECO sensors close before power is removed on moored deployments.
GPS	4800	Accepts NMEA-0183 GRPMC data format.
Pump	N/A	Provides power to the pump for flush and data collection. If "Pre-flush" is selected, the port has power throughout the data collection sequence, from pre-flush and warm-up.
Remote host	N/A	Provides power and data to telemetry equipment. When the logger is in standby mode or data collection mode, this port sends data.
SBE 37-SM	9600	Gets data from the sensor every 4 seconds when the sensor is set up to save data and be in a low power mode between measurements.
VSF-S	9600	Accepts data from older ECO sensors. The Bio-wipers on ECO sensors close before power is removed on moored deployments.
WL-Test	N/A	Used by the manufacturer for troubleshooting.
Wake/Binary	N/A	The logger sends a 500 ms "break" command to "wake" sensors that have internal batteries. All data is accepted.

Port Setup

Standard port setup is 8 data bits, no parity, 1 stop. The other setting is 7 data bits, one even parity, 1 stop (4800 and 9600 baud).

Once Per Hour (Moored mode only)

Put a check in the box next to sensors with a high current draw. They will operate once per hour at the beginning of the hour. The user can operate sensors with lower current draw more frequently and thus save battery power.

Analog Port

Analog 1 OFF	No power supplied to port. No data is accepted.
Analog 1 ON	Accepts analog data, 0–5 V.
Pump ON	Accepts data from up to 4 pumps. Refer to the Custom Configuration Sheet to see analog and pump configurations for a specific logger.

Each analog bulkhead on the logger can optionally operate two analog sensors. For instance, "Analog 1" and "Analog 2" in the Port Setup will operate two analog sensors. The user must use a "Y" cable from the logger to the two analog sensors to use this option.

Flash Setup

Push **Get Setup** to get the settings that are saved in the logger. All of the setup parameters will show in the software and the "Setup Status" area will show that the setup is current.

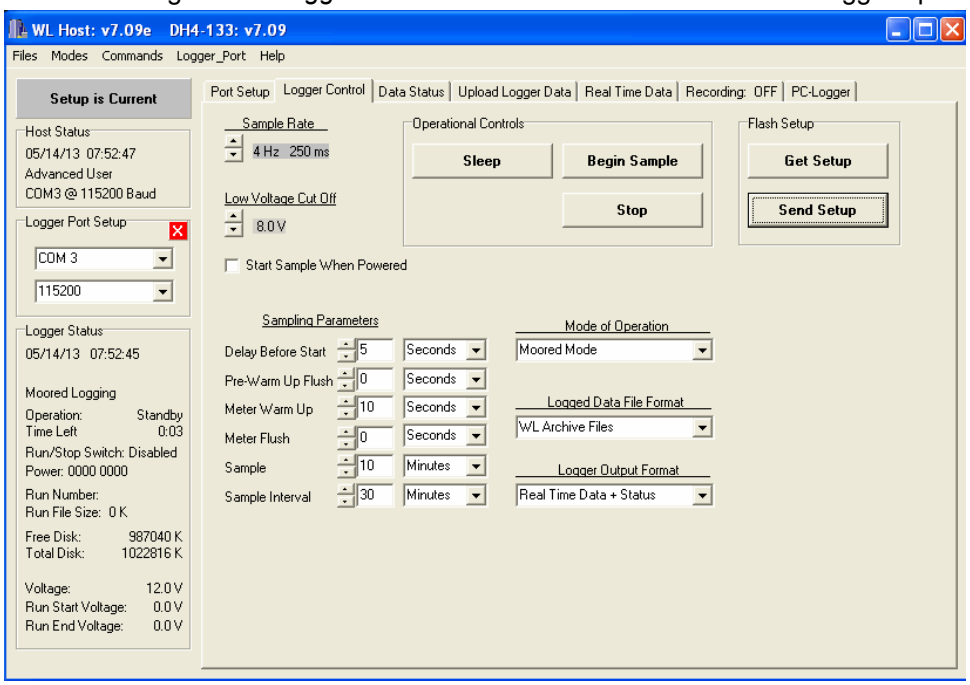
NOTICE

Data collection will stop if the user presses **Send Setup** while the logger is in operation to collect data.

Push **Send Setup** to send selected settings to the logger. It is not necessary to push **Send Setup** for every parameter that is changed. The user can make all of the necessary changes and press **Send Setup** when finished.

7.4.2 Logger control tab

Settings in the *Logger Control* tab let the user select how the logger operates.



Sample Rate

Select the speed at which data is sent and the time interval for packets of RS232 data. The range is 1–20 Hz, which is equal to 1000–50 ms. Select the data rate to the fastest sensor that is connected to the logger:

- ac-s = 4 or 8 Hz
- ac-9 = 6 Hz
- ECO and analog = 1 Hz

Low Voltage Cutoff

NOTICE

If the system has an ac sensor selected in the Port Type of the *Port Setup* tab, that port automatically turns off if the input voltage falls below 9.5 V.

The logger stops operation if the input voltage falls below the selected voltage.

"Start Sample When Powered"

Put a check in this box so that the logger starts the "Delay Before Start" operation when power is supplied. It is not necessary to push **Begin Sample**. If this box had a check in it when the logger was last turned off, it will start the saved data collection setup after a four-second delay.

Sampling Parameters

Delay before start	Select the time necessary to prepare the logger and connected sensors for deployment. Make the estimate longer than deployment, so that the system (and pumps) do not start before it is submerged.
Pre warm-up flush	An optional that is useful for moored operation.
Sensor warm up	Flush the sensors before the warm-up cycle. The manufacturer recommends 2–3 minutes. Select from 0–10 minutes.
Sensor flush	The time to flush the selected flow paths of selected sensors. The sensors and their pumps have power. Data is collected but it is not saved. The manufacturer recommends 10–30 seconds. Select from 0–120 seconds.
Warm-up and Sensor flush must be a minimum of 10 seconds. The logger overrides the user-selected values if they are not sufficient for the selected sensor.	
Sample	The length of time necessary for data collection. During this time the logger supplies power to the selected sensors and pumps, and collects and saves the data from them. Select 0–300 seconds, minutes, or hours.
Sample interval (moored mode)	The length of time between data measurements.

Modes of Operation

Profile	The logger does one data collection cycle (see above) and then waits for the next command from the host.
Moored	The logger does one data collection cycle then goes to a low power mode for a pre-selected length of time. When that "Sample Interval" is done, the logger does another cycle of data collection. This continues until the battery is dead, the memory is full, or the logger is retrieved and power is removed.
Real time	Use this setting when the logger and system sensors are towed. Data is sent directly to a PC, not saved by the logger. Sensors operate as set up in the Sampling Parameters area.
Analog	The selected analog sensors are supplied power after a minimum 5-second delay. The collected data is in ASCII and is not saved by the logger.
Run logger #	The selected sensor is supplied power after a minimum 5-second delay. The collected data shows in the *Real Time Data* tab. It is not saved by the logger.
Polled moored	Lets another external controller control the logger. A single data file is collected over an extended length of time.

Logged Data File Format

"No Data Storage" lets the user collect more data than the logger can store. This helps when a sensor with more memory is connected to the logger.

"WL Archive Files" lets the user collect data in 100 ms packets and save them in the WET Labs Archive File format. These files have timing information so that the WET Labs Archive Processing (WAP) program can merge the collected data by time.

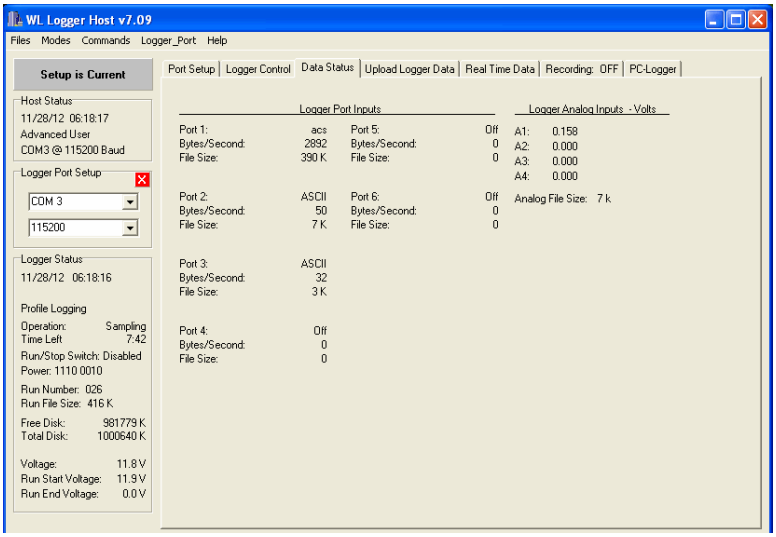
The timing information uses a significant quantity of memory. Sensors that operate a slow baud rates have a small quantity of data that is spread out over a longer length of time. A CTD that operates at 1200 baud can have twice as much timing information as data.

Logger Output Format

Status	Shows the data logger system operation in a binary format.
Real time data + status	Shows the real time data and the logger status.
Real time data	Shows all of the real time data.
Analog data	Shows an ASCII data format and sends all analog measurements.
Output serial *X* data	Shows the data from the selected port. The baud rate of the logger port changes to match the baud rate of sensor.

7.4.3 Data status tab

The *Data Status* tab shows real-time information about each of the sensors connected to the DH4 during operation.



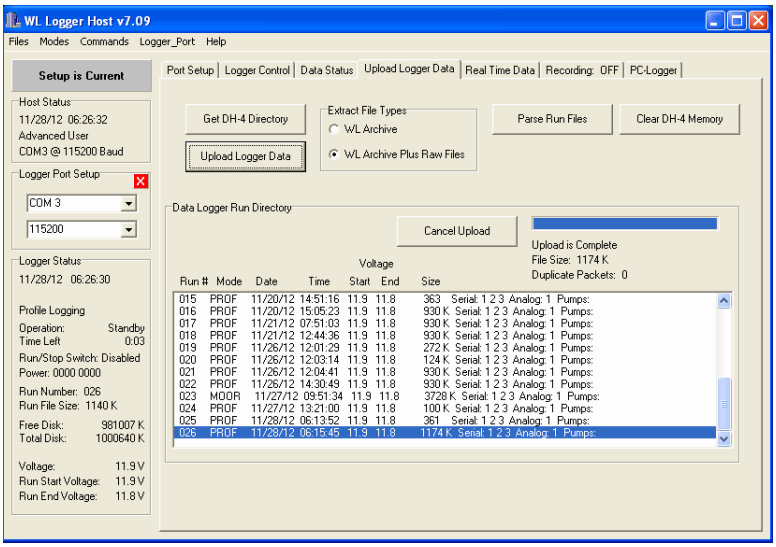
1. "Port" 1–8 shows the type of sensor connected to the port or is OFF.
2. "Bytes/Second" shows the number of bytes transmitted per second.
3. "File Size" shows the size of the data file from the connected sensor. Note that the DH4 must be connected to the PC.
4. "A1–A4" shows the analog data. This data is stored as a time-stamped ASCII file in a table format.
5. "Analog File Size" shows the approximate amount of the DH4 memory that is used by the analog sensors that send data to it.

7.4.4 Upload logger data tab

⚠CAUTION

Do not turn power to the logger off until the memory is cleared or the file system will be damaged.

The user can save the data collected by the DH4 to a PC and can also extract that data.



- Push **Get Logger Directory** to see the data files stored in the DH4.
- Select one or more files to save to the PC.

- Select "WL Archive" in the Extract File Types area to make a file that combines the data from the selected files to view together.
- Select "WL Archive Plus Raw Files" to make a file for each of the sensors connected to the DH4.
- Push **Upload Logger Data** to enter a file name and location on the PC to save the logger data.
- Push **Cancel Upload**to stop data storage to the PC.

Each file stored in the DH4 has the information below.

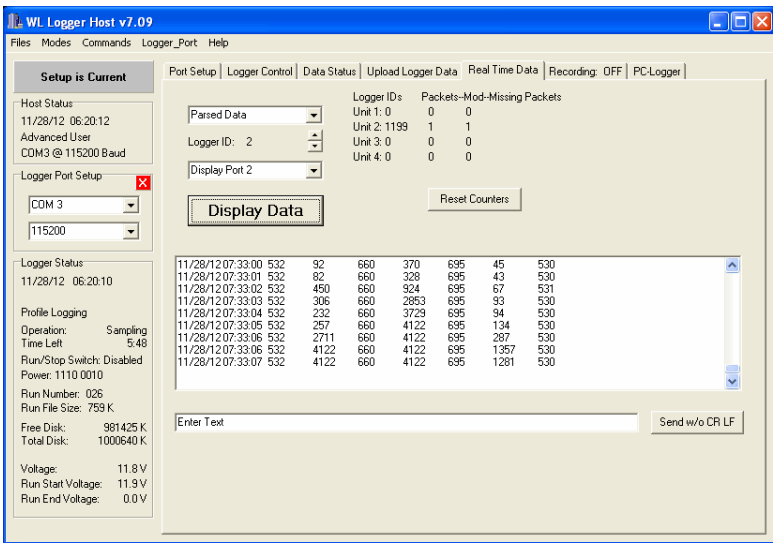
- **Run #**: 000 to 999.
- **Mode**: Prof (Profiling) or MOOR (moored)
- **Date**: The date that the data collection started.
- **Date**: The date the data collection started.
- **Time**: The time the data collection started.
- **Start/End**: The amount of voltage supplied at the start and end of the data collection.
- **Size**: The total file size, which includes data and file "overhead."
- Serial: The serial port number from 1–8 of any serial sensor that collected data.
- Analog: The analog port number from 1–7 of any analog sensor that collected data.
- Pumps: The pump port number from 1–4 of any pump that operated during data collection.

Push **Parse Run Files** to separate the archive, summary, ... files from a ".run" file that has been stored on the host PC. It does the same operation that Upload Logger Data does from the DH4. The user can download files and still separate them without using DH4 memory.

Push **Clear Logger Memory** to clear the data logger memory. This make take several minutes if the files to be erased are large.

7.4.5 Real time data tab

This tab shows when the user selects either the *Real Time Output*, *Analog Output*, or the *Advanced User* mode of operation.

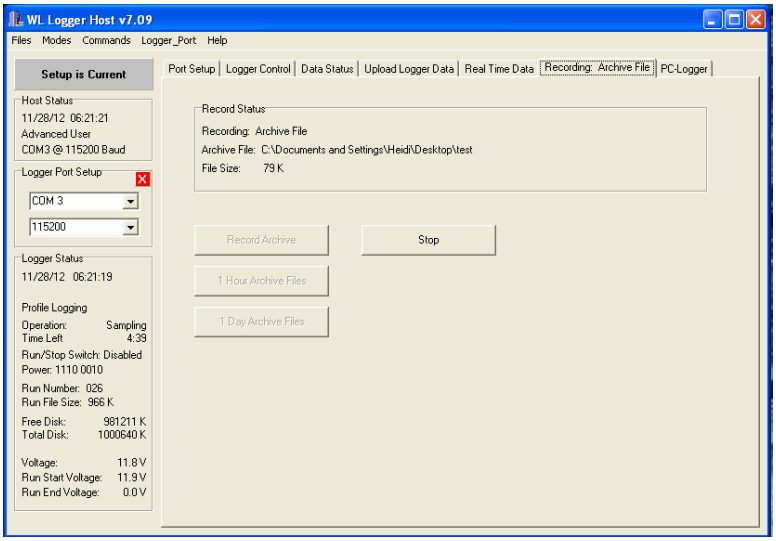


- Select *Parsed Data* to see the data collected from a specific sensor that has been stored on the PC.
- Select *Raw Logger Data* to see the data collected from all of the sensors that are connected to the logger.
- Select Raw PC data to see the data collected from all of the sensors that are connected to the logger that has been stored on the PC.

Push **Display Data** to start the from the selection above. Push **Stop Display** to stop the data.

7.4.6 Recording: OFF/ON tab

This tab lets the user save data on the PC.

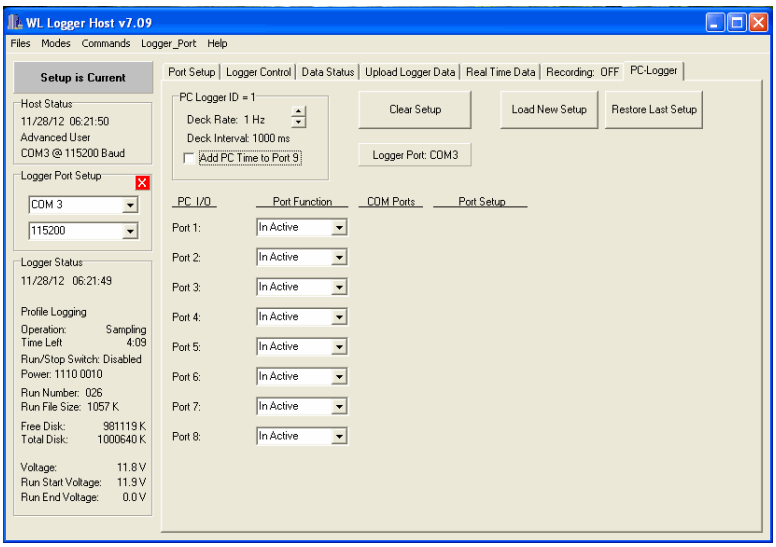


- Push **Record Archive** and select or make a filename on the PC. Data from the logger is saved at that location until the user pushes **Stop**.
- Push 1 Hour Archive Files to save data to the PC in increments of one hour.
- Push 1 Day Archive Files to save data to the PC in increments of 24 hours.

The Record Status area gives information about the data that is saved to the PC, which includes the location and the size of the file saved to the PC.

7.4.7 PC-logger tab

The user can use the PC as a logger if the PC has enough serial ports. The PC collects data while the DH4 logger transmits data in real-time. The data from the logger and the PC are collected in the same user-specified file.



Section 8 General information

Revised editions of this user manual are on the manufacturer's website.

8.1 Warranty

This sensor is warranted against defects in materials and workmanship for one year from the date of purchase. The warranty is void if the manufacturer finds the sensor was abused or neglected beyond the normal wear and tear of deployment.

8.2 Service and support

The manufacturer recommends that sensors be sent back to the factory annually to be cleaned, calibrated, and for standard maintenance.
Refer to the website for FAQs and technical notes, or contact the manufacturer for support at:

support@wetlabs.com

Do the steps below to send a sensor back to the manufacturer.

1. Contact the manufacturer for a Return Merchandise Authorization (RMA).
   Note: *The manufacturer is not responsible for damage to the sensor during return shipment.*
2. Remove all anti-fouling treatment from the sensor before sending it back to the manufacturer.
   Note: *The manufacturer will not accept sensors that have been treated with anti-fouling compounds for service or repair. This includes tri-butyl tin, marine anti-fouling paint, ablative coatings, etc.*
3. Use the sensor's original ruggedized shipping case to send the sensor back to the manufacturer.
4. Write the RMA number on the outside of the shipping case and on the packing list.
5. Use 3rd-day air to ship the sensor back to the manufacturer. Do not use ground shipping.
6. The manufacturer will supply all replacement parts and labor and pay to send the sensor back to the user via 3rd-day air shipping.

8.3 Waste electrical and electronic equipment

Electrical equipment that is marked with this symbol may not be disposed of in European public disposal systems. In conformity with EU Directive 2002/96/EC, European electrical equipment users must return old or end-of-life equipment to the manufacturer for disposal at no charge to the user. To recycle, please contact the manufacturer for instructions on how to return end-of-life equipment, manufacturer-supplied electrical accessories, and auxiliary items for proper disposal.

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