Data Handler

DH4

User's Guide

The user's guide is an evolving document. If you find sections that are unclear, or missing information, please let us know. Check our website periodically for updates.

WET Labs, Inc.
PO Box 518
Philomath, OR 97370
(541) 929-5650
wetlabs@wetlabs.com

Attention!

Return Policy for Instruments with Anti-fouling Treatment

WET Labs cannot accept instruments for servicing or repair that are treated with anti-fouling compound(s). This includes but is not limited to tri-butyl tin (TBT), marine anti-fouling paint, ablative coatings, etc.

Please ensure any anti-fouling treatment has been removed prior to returning instruments to WET Labs for service or repair.

DH-4 Warranty

This unit is guaranteed against defects in materials and workmanship for one year from the original date of purchase. Warranty is void if the factory determines the unit was subjected to abuse or neglect beyond the normal wear and tear of field deployment, or in the event the pressure housing has been opened by the customer.

To return the instrument, contact WET Labs for a Return Merchandise Authorization (RMA) and ship in the original container. WET Labs is not responsible for damage to instruments during the return shipment to the factory. WET Labs will supply all replacement parts and labor and pay for return via 3rd day air shipping in honoring this warranty.

Shipping Requirements for Warranty and Out-of-warranty Instruments

1. Please retain the original shipping material. We design the shipping container to meet stringent shipping and insurance requirements, and to keep your meter functional.

2. To avoid additional repackaging charges, use the original box (or WET Labs-approved container) with its custom-cut packing foam and anti-static bag to return the instrument.
   - If using alternative container, use at least 2 in. of foam (NOT bubble wrap or Styrofoam “peanuts”) to fully surround the instrument.
   - Minimum repacking charge for ac meters: $50.00.

3. Clearly mark the RMA number on the outside of your shipping container and on all packing lists.

4. Return instruments using 3rd day air shipping or better: do **not** ship via ground.

WET Labs®

Table of Contents

1. Getting Started

The Data Handler (DH-4) and its associated software, WET Labs Host, controls four, six or eight input-output ports for a variety of serial or analog instruments, providing for the simultaneous collection, time stamping, storage and merging of data streams from all of the ports.

Depending on the capabilities of the host computer, output from one to all of the instruments can be viewed in real time through the host software.

The DH-4 (data logger) is delivered with the following components:

- Test cable
- Dummy plugs with lock collar for each bulkhead connector
- This user's guide
- Custom Configuration Sheet
- WET Labs Host software on CD
- WET Labs File Archive Processing (WAP) software on CD
- WAP User's Guide

1.1 Install Host Program

Insert the WET Labs Host software CD into the host computer and copy the contents to a desired location on the host computer. The WAP software may also be installed at this time. Refer to the WAP User's Guide for details on using this data processing software.

1.2 Verify Electrical Functionality

We recommend following the steps below to verify the system's electrical functionality when you first receive your DH-4. You will need the following items:

- A clean, solid lab table or work bench.
- A multimeter.
- The DH-4.
- Test cable (includes terminations for an RS-232 connection into a host computer, power leads that connect to a power supply, and a connector to the DH-4).
- Any meter(s) that will be used with the DH-4.
- A 12–15 volt power supply.
- A computer with WL Host installed.

1.2.1 Check Test Cable Voltage:

1. Connect the power leads to a 12–15 volt power supply (safe operating range). The black lead is the V+ lead. Use a multimeter to check the input power before connecting the cable to the instrument.

2. With the power supply turned on, touch the multimeter ground probe to socket 1 on the test cable connector. Connect the "hot" probe to pin 4 (the pin directly opposite from pin 1). You should measure 12–15 volts across these two pins.

3. Turn the power supply off.

1.3 Verify System Operation

1. If necessary, attach the test cable power leads to a stable power source that supplies 12–15 VDC. Make sure the polarity is correct before switching on the power supply.

2. Connect the RS-232 connector to the desired serial port of the host PC.

   Note that if your instrument is sending data in the RS-485 format, an RS-485 to RS-232 converter is required to allow proper operation.

WARNING!

Power input on this unit is diode-protected from reverse polarity power-up, but this is not 100 percent insurance against damaging the meter, nor will it protect it from over-voltage.

3. Plug the submerged (wet) end of the test cable into the DH-4.

   Applying electrical grade silicone spray or an equivalent to the rubber base of the instrument bulkhead connector makes the plug insertion easier and provides greater assurance of a good seal. Do **NOT** use stopcock greases or products like WD-40. These will cause de-lamination of the rubber from the metal surface of the bulkhead connector. Use a connector lock ring if one is available.

Tips

- Refer to the Custom Configuration Sheet that ships with your DH-4 for a summary of factory configuration settings.
- The Configuration Sheet in Appendix A refers to the example setup used in this manual.

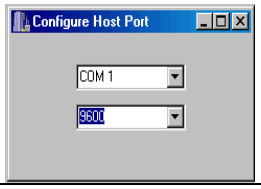
4. Ensure the DH-4 is connected to the host computer and power supply as above.

5. Connect any additional meter(s) to the DH-4. It may help to refer to the Custom Configuration Sheet that ships with each DH-4: when possible, configurations settings specific to your system are set at the factory and documented on the Custom Configuration Sheet.

6. Start WET Labs Host program.

7. Turn on power to the DH-4.

8. The first time WET Labs host is started, the program screen will be mostly empty, with only a Configure Host Port window appearing.



9. Input the COM port and the baud rate (default 9600). The red backgrounds will turn white. Close the window. Both time indicators on the left of the window (Host Status and Logger Status) will increment, indicating the DH-4 and PC are communicating.

10. Go to the Modes pull-down menu and select Profile Logging.

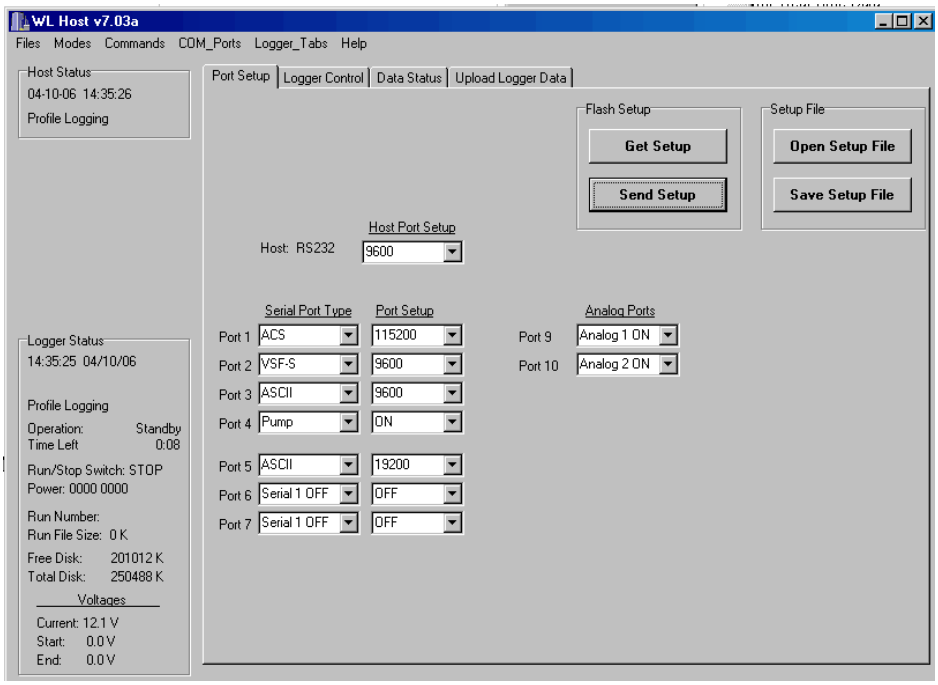
11. Go to the now-visible Port Setup tab and press Get Setup to load the logger's settings into the Host program.

12. Review the Serial Port Type, associated Port Setup baud rate, Analog Ports, and Pump Ports settings. These settings can also be found on the Custom Configuration Sheet that ships with your data logger. See Reference section 5.1 for details about Port Setup options.

Note

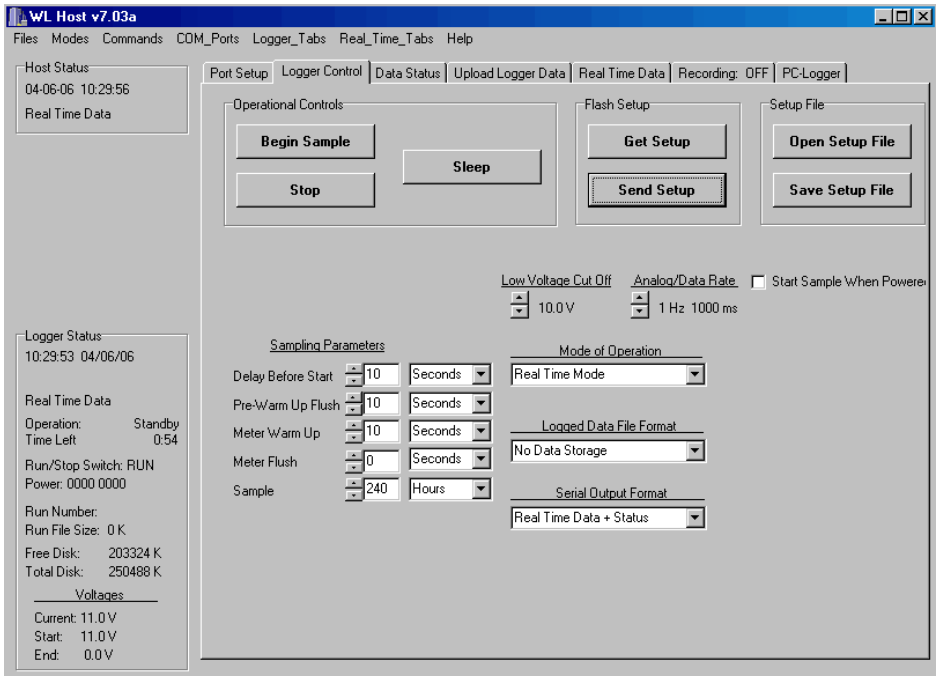
For purposes of illustration in this user's guide, WET Labs Host software runs the following:

- Host Port: DH-4
- Port 1: ac-s
- Port 2: *ECO* VSFS, Volume Scattering Function Meter with *Bio-wiper*™
- Port 3: CTD
- Port 4: Pump
- Port 5: *ECO* FLNTUS, fluorometer-turbidity sensor with *Bio-wiper*™



Port Setup tab settings

13. Select the Logger Setup tab to view the factory-set logger control settings. Refer to section 5.2 for details on Logger Control configuration options.

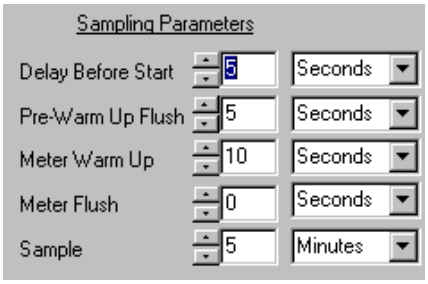


Logger Control tab settings

14. To save these settings on the host computer: Select the Save Setup Files button and in the resulting window, name the setup and click OK. This will allow you to retrieve the factory settings in the future.

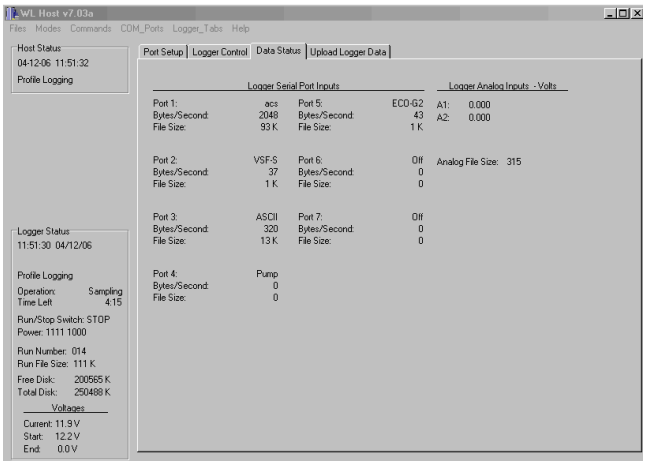
15. There are two options to verify that the meters connected to DH-4 are functional and communicating. Option 1 allows checking multiple meters. Option 2 tests one meter at a time, but also provides baud rate information.

- **Option 1**: test multiple meters
  In the Logger Control tab select Begin Sample. Sampling begins with the program cycling through the preset sampling parameters. For example, there will be 5 seconds for Delay Before Start and Pre-Warm Up Flush, and 10 for Meter Warm-Up before the system begins active sampling for 5 minutes.



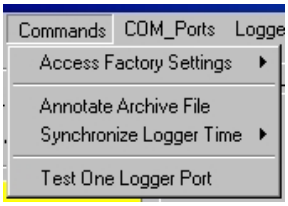
  Select the Data Status tab. The status of each port is displayed. Depending on the operation the data logger is performing, either the Bytes/Second and/or the File Size will increment. While the logger is performing a pre-sampling warm-up or flush operation, only the bytes/second will increase. When sampling begins, the file size will increment as well.

Return to the Logger Control tab and select Stop.

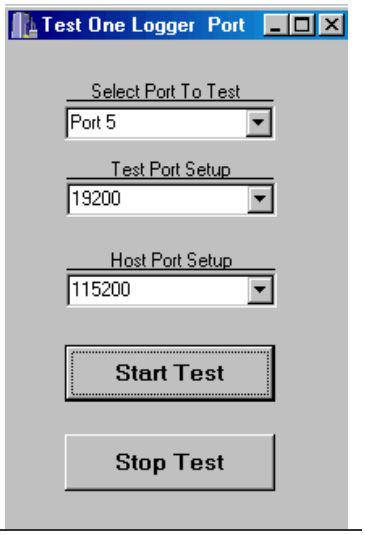


- **Option 2:** test a single meter

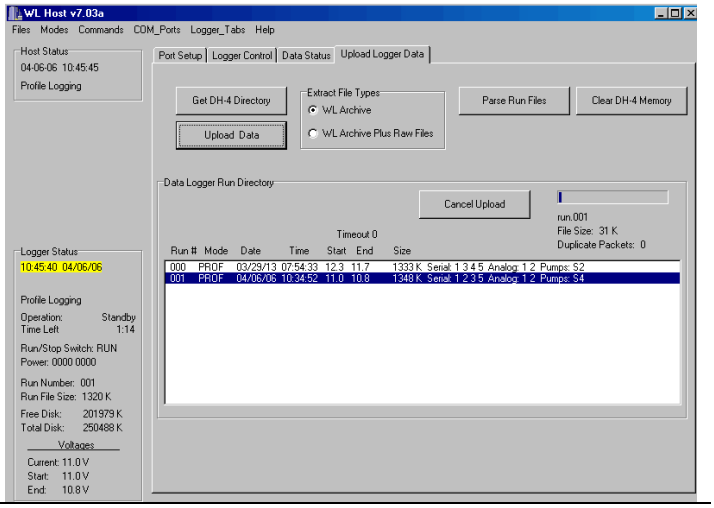
  Select Commands/Test One Logger Port



a. Select the data port (and thus instrument) you wish to test.
b. Select the instrument's baud rate.
c. Select the host computer's baud rate.
d. Select Start Test. The Real_Time Data window appears, showing scrolling data.
e. Select Stop Test when communication is verified.



16. To upload and save the test run from above, select the Upload Logger Data tab, then Get DH-4 Directory. Select a Run # to upload, then select Upload Logger Data. Choose a location to store the data. The upload status bar indicates file size and status of upload progress.



17. Select Clear DH-4 Memory to erase the data from the DH-4.

18. Exit the program by selecting Exit under the File menu.

Tip: We highly recommend you experiment with changing and retrieving settings to get a feel for the flexibility of the host software before deploying your system.

2. Setting Operational Modes

WET Labs Host can operate in several modes. Which you choose, of course, depends on your application. This section describes setup for the three most frequently used modes of operation:

1. **Profile Logging Mode**—typically used to assess a column of water, with the logger and other instruments moving vertically through the column.

2. **Moored Logging Mode**—typically used for stationary deployments. WET Labs host provides settings options for low power, or "sleep" intervals, as well as flushing options. Data is stored at the logger.

3. **Real Time Output**—similar to profiling, but no data is stored to the logger; it is sent directly to a host PC. Selecting the appropriate settings to save data in WET Labs Host are critical in this mode.

Less frequently used, and requiring an advanced understanding of WET Labs Host software:

- *Analog Output—Transmits ASCII data from analog meters in real time.*
- *Advanced Logging/Output—Used only for custom instrument configurations, or when a combination of modes is required.*

2.1 Profiling Mode

This subsection details the steps and selections to execute a profile for the example system listed below:

- Host Port: DH-4
- Port 1: ac-s
- Port 2: *ECO* VSFS, Volume Scattering Function Meter with *Bio-wiper*™
- Port 3: CTD
- Port 4: Pump
- Port 5: *ECO* FLNTUS, fluorometer-turbidity sensor with *Bio-wiper*™

When possible, configuration settings specific to your system are set at the factory. The Custom Configuration Sheet that ships with your DH-4 represents a hard-copy summary of the DH-4's flash settings as they appear in the host program's setup windows.

2.1.1 Changing or Verifying Configuration Settings

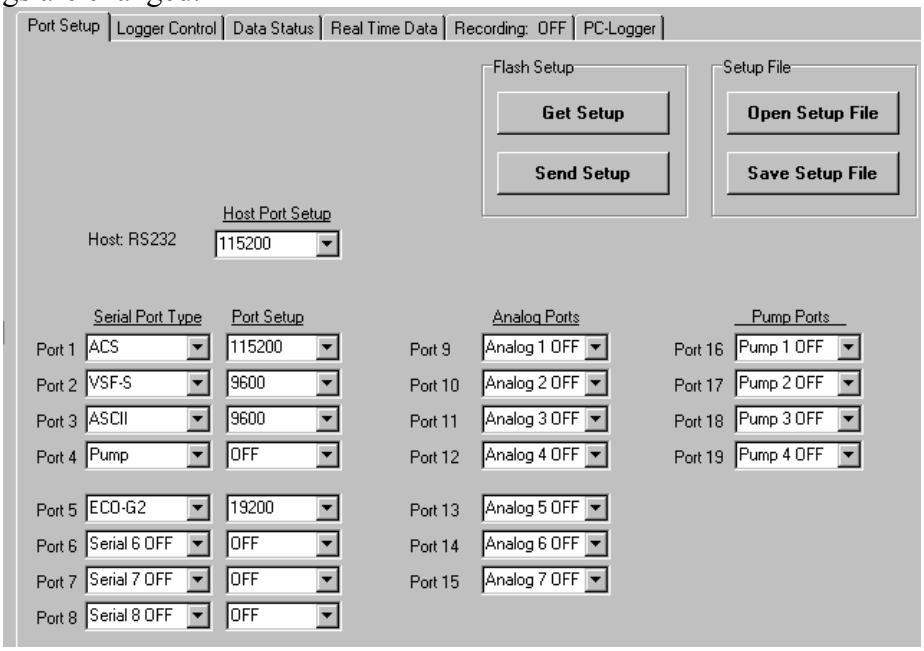
Supply power to the DH-4. Start the host program. Select COM port and baud rate (default: 9600). Select Profile Logging from the Modes menu.

Port Setup tab:

1. Load configuration settings using one of the options below:
   - To retrieve the DH-4's current configuration, select Get Setup.
   - To load configuration settings saved to the host PC, select Open Setup File, select the desired file, then select Send Setup to send those settings to the DH-4.

- To load factory default settings, go to the Commands pull-down menu, then Access Factory Settings > Load Default Flash Setup. These are also available on the Custom Configuration Sheet that ships with your DH-4.

2. If necessary, change the settings under the Serial Port Type, Port Setup, and Analog Port options. Note that Setup Not Current will appear on a yellow banner on the status portion of the host program window if any settings are changed.



Sample Port Setup tab settings for profiling mode

Logger Control tab:

1. Check the Low Voltage Cut Off setting. Set to the highest value of the minimum voltage requirement for all the meters being used. For example, if you're deploying an ac-9 (min. requirement 10.0 V), and an ECO fluorometer (min. requirement 7.5 V), set the Low Voltage Cut Off to 10.0 V.

2. Check Analog/Data Rate setting. Set to the fastest meter's data rate. For example, if you're deploying an ac-s (8 Hz), ac-9 (6 Hz), and an ECO fluorometer (1 Hz), set the Sample Rate to 8 Hz.

   If the logger is being used with meters whose total output is more than 1024 bytes of data per sample, set the Analog/Data Rate higher than the meter data rate to prevent data loss. For example, if the total output is 2500 bytes/second, set the logger to at least 3 Hz.

Tip

Set the rate of data acquisition to the fastest meter's data rate.

ac-s meters:	4 or 8 Hz
ac-9 meters:	6 Hz
ECO meters:	1 Hz
Analog meters:	1 Hz

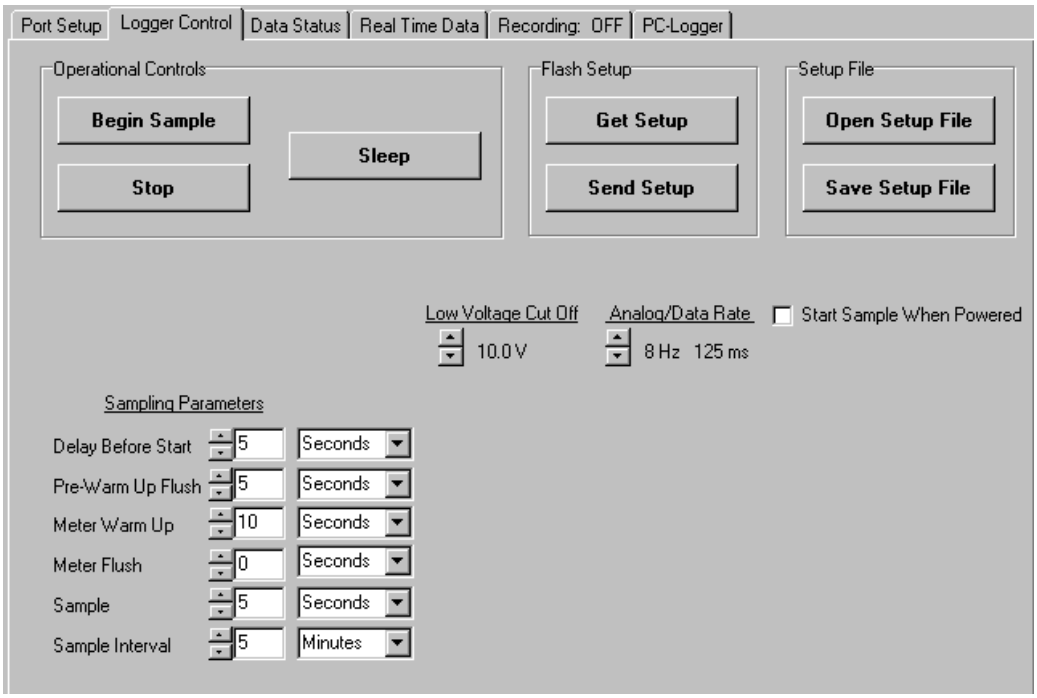
If your system uses analog meters:

Each analog bulkhead on the DH-4 can optionally support two analog channels. Therefore, each analog bulkhead has two analog definitions in the DH-4 host program. (Analog 1 and Analog 2 correlate with analog bulkhead 1, Analog 3 and Analog 4 correlates to analog bulkhead 2, etc.)

To use both channels on a given bulkhead, there must be a Y cable that originates from the DH-4 bulkhead and terminates at each of the supported instruments. If a Y cable is not available, each analog port will only support one analog device at the odd numbered Analog ID (Analog Bulkhead 1 = Analog 1, Analog Bulkhead 2 = Analog 3, etc.)

3. When the desired settings are input: Select Send Setup to send the configuration settings to the DH-4's flash memory. To save the configuration settings to the host computer, select Save Setup File.

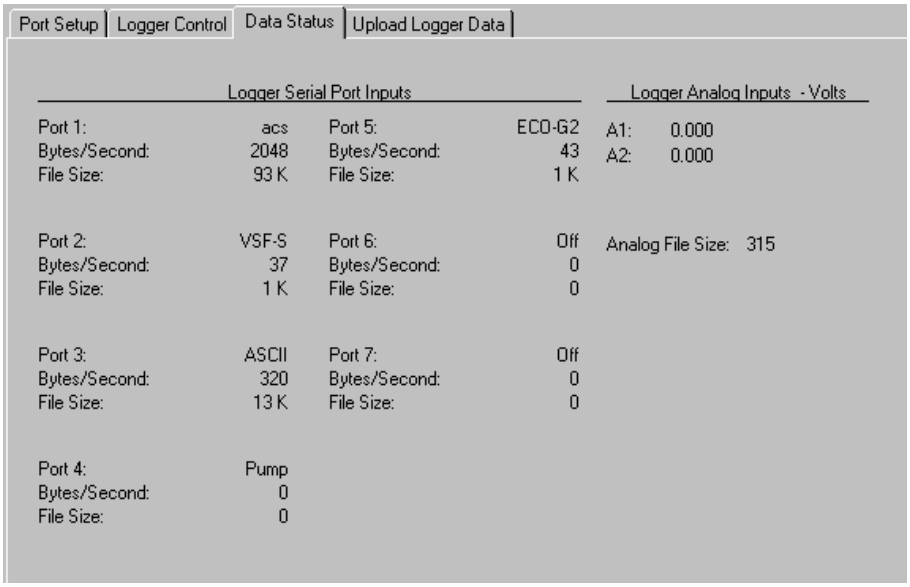
4. To begin sampling, select the Begin Sample button.



Sample Logger Control tab settings for profiling mode

2.1.2 Tracking Incoming Data

Select the Data Status tab to display the current data status of all meters. Refer to Reference section 5.3 for details of what each status line represents.



Viewing Data Status tab, profiling mode

To stop the sample, press Stop at the Logger Control tab.

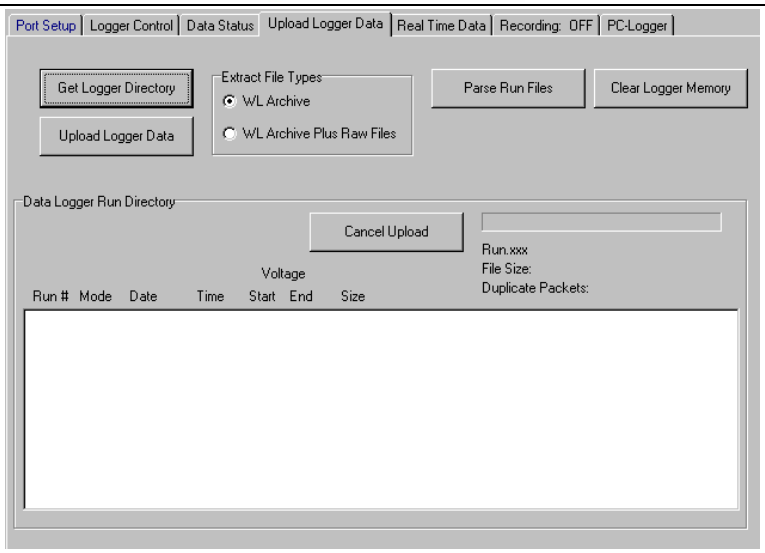
2.1.3 Uploading Data

1. Go to the Port Setup tab and press Get Setup to ensure the most recent flash settings are loaded.

2. Under the Logger Port Setup combo box, choose the fastest data rate that the host cable and COM port can support. Three-meter cables can run at 115,200 baud.

3. Press Send Setup to send the baud rate change to the data logger. The logger will change to the meter's baud rate and the host program will follow suit. There will be a brief pause as the logger and PC change their baud rates.

   Occasionally, the logger and PC will lose track of each other while the baud rate change is occurring. This will be indicated by a red background for baud rate. Press Send Setup again. It may be necessary to toggle power to the data logger if re-sending the command doesn't synchronize baud rates.



Upload Logger Data in profiling mode

4. At the Upload Logger Data tab, select Get DH-4 Directory to retrieve all the DH-4 file information.

5. Select one or more of the runs that appear in the Data Logger Run Directory. In the example above run 001 will be uploaded.

6. Select WL Archive from the combo box. This will create a data file that combines the data from the selected files.

7. Select the runs to be uploaded, then select Upload Data to upload them. The status section will update while uploading is occurring.

8. Selecting Cancel Upload will stop data upload. If multiple runs have been selected, you will be prompted to cancel all uploads or individual run uploads.

2.1.4 Clearing DH-4 Memory

Caution!
Once "Clear DH-4 Memory" is pressed, the data is not retrievable.

WARNING!
Turning off the data logger while memory clearing is in progress WILL result in a corrupted data logger file system.

To clear the DH-4 memory, select the Clear DH-4 Memory button in the Upload Logger Data tab (above).

2.2 Moored Mode

This subsection details the steps and selections to execute a moored operation for the example system listed below:

- Host Port: DH-4
- Port 1: ac-s
- Port 2: *ECO* VSFS, Volume Scattering Function Meter with *Bio-wiper*™
- Port 3: CTD
- Port 4: Pump
- Port 5: *ECO* FLNTUS, fluorometer-turbidity sensor with *Bio-wiper*™

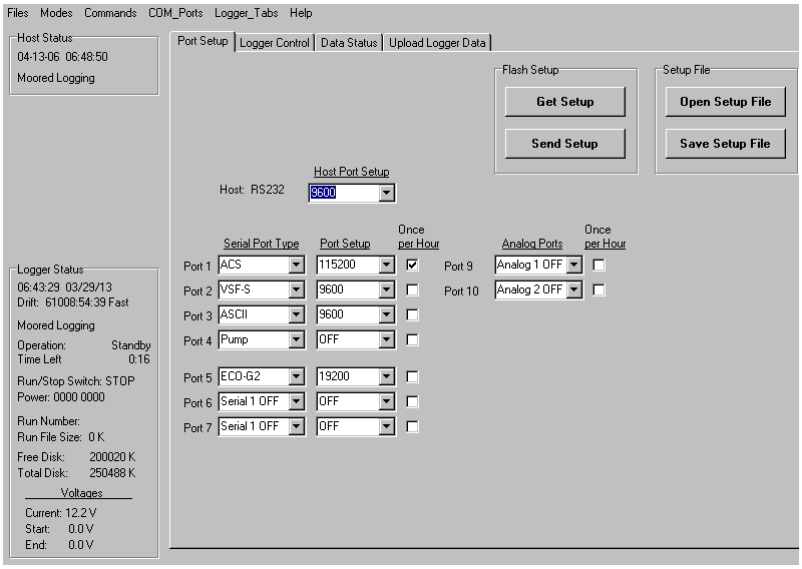
When possible, configuration settings specific to your system are set at the factory. The Custom Configuration Sheet that ships with your DH-4 represents a hard-copy summary of the DH-4's flash settings as they appear in the host program setup windows.

2.2.1 Moored Logging Configuration Settings

Supply power to the DH-4; start the WET Labs Host program. Select COM port and baud rate (default: 9600). Select Moored Logging from the Modes menu.

Port Setup tab:

1. Load configuration settings using one of the options below:
   - To retrieve the DH-4's current configuration, select Get Setup.
   - To load configuration settings saved to the host PC, select Open Setup File, select the desired file, then select Send Setup to send those settings to the DH-4.
   - To load factory default settings, go to the Commands pull-down menu, then Access Factory Settings > Load Default Flash Setup. Note that these are also available on the Custom Configuration Sheet that ships with your DH-4.
2. If necessary, change the settings under the Serial Port Type, Port Setup, Analog Port options. Note that Setup Not Current will appear on a yellow banner on the status portion of the host program window if any settings are changed.
3. Check the Once Per Hour checkbox to allow instruments with a high current draw to run only during the first sample period after the beginning ("top") of the hour. This allows you to obtain several samples per hour from instruments with lower current draws without the power penalty of instruments with a high current draw.



Sample Port Setup settings for moored mode

Logger Control tab:

1. Check the Low Voltage Cut Off setting. Set to the highest value of the minimum voltage requirement for all the meters being used. For example, if you're deploying an ac-9 (min. requirement 10.0 V), and an ECO fluorometer (min. requirement 7.5 V), set the Low Voltage Cut Off to 10.0 V.

2. Check Analog/Data Rate setting. Set to the fastest meter's data rate. For example, if you're deploying an ac-s (4 or 8 Hz), ac-9 (6 Hz), and an ECO fluorometer (1 Hz), set the Sample Rate to 8 Hz.

   If the logger is being used with meters whose total output is more than 1024 bytes of data per sample, set the Analog/Data Rate higher than the meter data rate to prevent data loss. For example, if the total output is 2500 bytes/second, set the logger to at least 3 Hz.

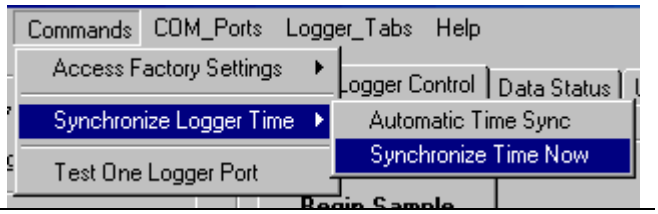
Tip Set the rate of data acquisition to the fastest meter's data rate.

ac-s meters:	4 or 8 Hz
ac-9 meters:	6 Hz
ECO meters:	1 Hz
Analog meters:	1 Hz

If your system uses analog meters:
Each analog bulkhead on the DH-4 can optionally support two analog channels. Therefore, each analog bulkhead has two analog definitions in the DH-4 host program. (Analog 1 and Analog 2 correlate with analog bulkhead 1, Analog 3 and Analog 4 correlates to analog bulkhead 2, etc.)

To use both channels on a given bulkhead, there must be a Y cable that originates from the DH-4 bulkhead and terminates at each of the supported instruments. If a Y cable is not available, each analog port will only support one analog device at the odd numbered Analog ID (Analog Bulkhead 1 = Analog 1, Analog Bulkhead 2 = Analog 3, etc.)

3. Commands drop down menu: Synchronize the DH-4 and host PC clocks. Select Synchronize Logger Time, then Synchronize Time Now.

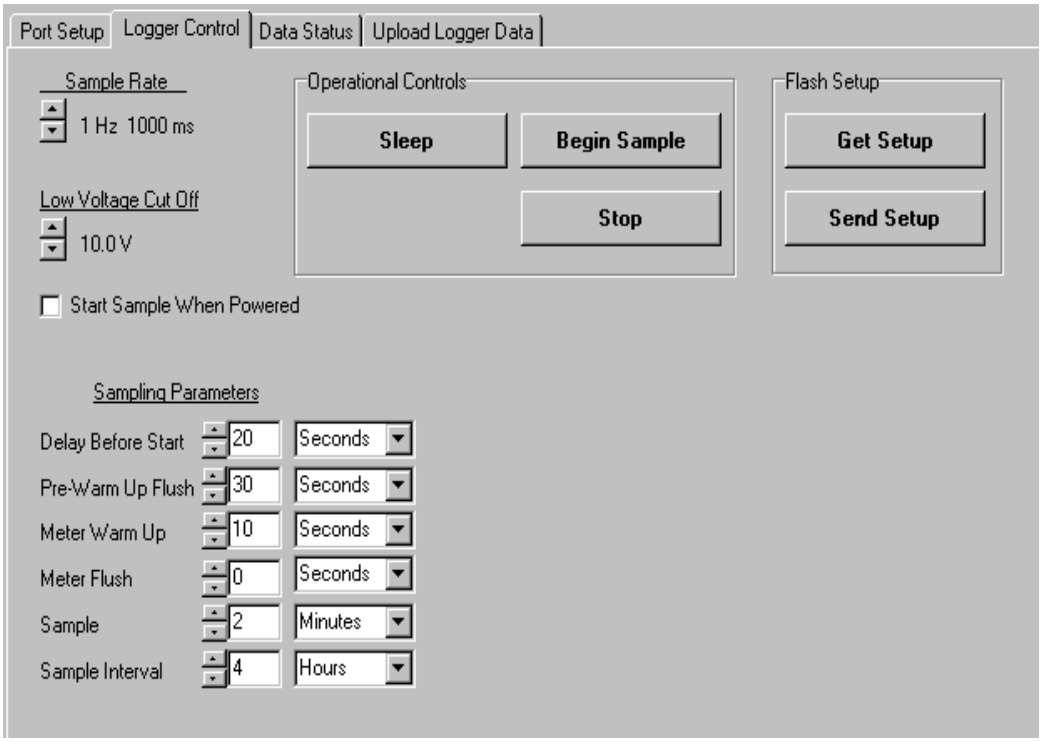


Note

Turning on "Automatic Time Sync" will prevent you from seeing the DH-4 clock drift and should not be used for moored applications.

4. When the desired settings are input: Select Send Setup to send the configuration settings to the DH-4's flash memory. To save the configuration settings to the host computer, select Save Setup File.

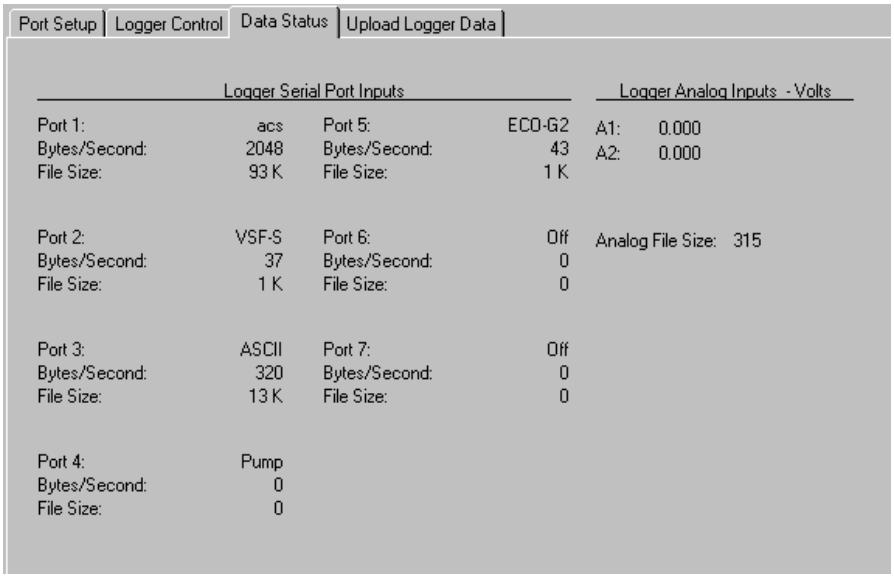
5. To begin sampling, select the Begin Sample button.



Sample Logger Control settings for moored mode

2.2.2 Tracking Incoming Data

Select the Data Status tab to display the current data status of all meters. See Reference section 5.3 for details of what each status line represents.



Viewing Data Status tab in moored mode

To stop the sample, press Stop at the Logger Control tab.

2.2.3 Uploading Data

1. Go to the Port Setup tab and press Get Setup to ensure the most recent flash settings have been loaded from the data logger.

2. Under the Logger Port Setup combo box, choose the fastest data rate that the host cable and COM port can support. Three-meter cables can run at 115,200 baud.

3. Press Send Setup to send the baud rate change to the data logger. The logger will change to the meter's baud rate and the host program will follow suit. There will brief pause as the logger and PC change their baud rates.

   Occasionally, the logger and PC will lose track of each other while the baud rate change is occurring. This will be indicated by a red background for baud rate. Press Send Setup again. It may be necessary to toggle power to the data logger if re-sending the command doesn't synchronize baud rates.

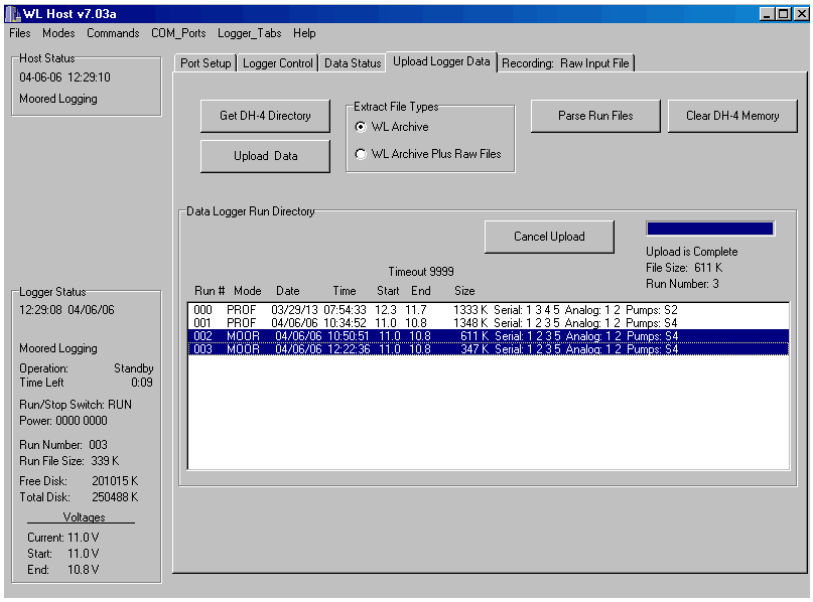
4. At the Upload Logger Data tab press Get DH-4 Directory to retrieve all the DH-4 file information.

5. Select one or more of the runs that appear in the Data Logger Run Directory. In the example below, runs 002 and 003 will be uploaded.

6. Select WL Archive from the combo box. This will create a data file that combines the data from the selected files.

7. Select the runs to be uploaded, then select Upload Data to upload them. The status section will update while uploading is occurring.

8. Selecting Cancel Upload will stop data upload. If multiple runs have been selected, you will be prompted to cancel all uploads or individual run uploads.



Sample Upload Data in moored mode

2.2.4 Clearing DH-4 Memory

Caution!
Once “Clear DH-4 Memory” is pressed, the data is not retrievable.

WARNING!
Turning off the DH-4 while memory clearing is in progress WILL corrupt its file system.

To clear the DH-4 memory, select the Clear DH-4 Memory button in the Upload Logger Data tab (above).

2.3 Real-time Mode

Because data is not saved by either an individual instrument or the DH-4 in this mode, it is critical to set up WET Labs Host software so that all data is sent to the host PC.

This subsection details the steps and selections to execute a real-time operation for the example system listed below:

- Host Port: DH-4
- Port 1: ac-s
- Port 2: *ECO* VSFS, Volume Scattering Function Meter with *Bio-wiper*™
- Port 3: CTD
- Port 4: Pump
- Port 5: *ECO* FLNTUS, fluorometer-turbidity sensor with *Bio-wiper*™

When possible, configuration settings specific to your system are set at the factory. The Custom Configuration Sheet that ships with your DH-4 represents a hard-copy summary of the DH-4's flash settings as they appear in the host program setup windows.

2.3.1 Setting Configurations

1. Supply power to the DH-4; start the WET Labs Host program.

2. Select COM port and baud rate (default is 9600).

3. Select Real Time Data from the Modes menu.

Port Setup tab:

1. Load configuration settings using one of the options below:
   - To retrieve the DH-4's current configuration, select Get Setup.

   - To load configuration settings saved to the host PC, select Open Setup File, select the desired file, then select Send Setup to send those settings to the DH-4.

   - To load factory default settings, go to the Commands pull-down menu, then Access Factory Settings > Load Default Flash Setup. Note that these are also available on the Custom Configuration Sheet that ships with your DH-4.

2. Select Host Port Setup baud rate. Though the default is 9600, data in this mode is coming through the DH-4 directly to the PC from each instrument. A much faster data rate, such as 115200, is recommended to prevent a bottleneck or error messages.

3. If necessary, change the settings under the Serial Port Type, Port Setup, and Analog Port options. Note that Setup Not Current will appear on a yellow banner on the status portion of the host program window if any settings are changed.

Port Setup for Real Time mode

Logger Control tab:

1. Check the Low Voltage Cut Off setting. Set to the highest value of the minimum voltage requirement for all the meters being used. For example, if you're deploying an ac-9 (min. requirement 10.0 V), and an ECO fluorometer (min. requirement 7.5 V), set the Low Voltage Cut Off to 10.0 V.

2. Check Analog/Data Rate setting. Set to the fastest meter's data rate. For example, if you're deploying an ac-s (8 Hz), ac-9 (6 Hz), and an ECO fluorometer (1 Hz), set the Sample Rate to 8 Hz.

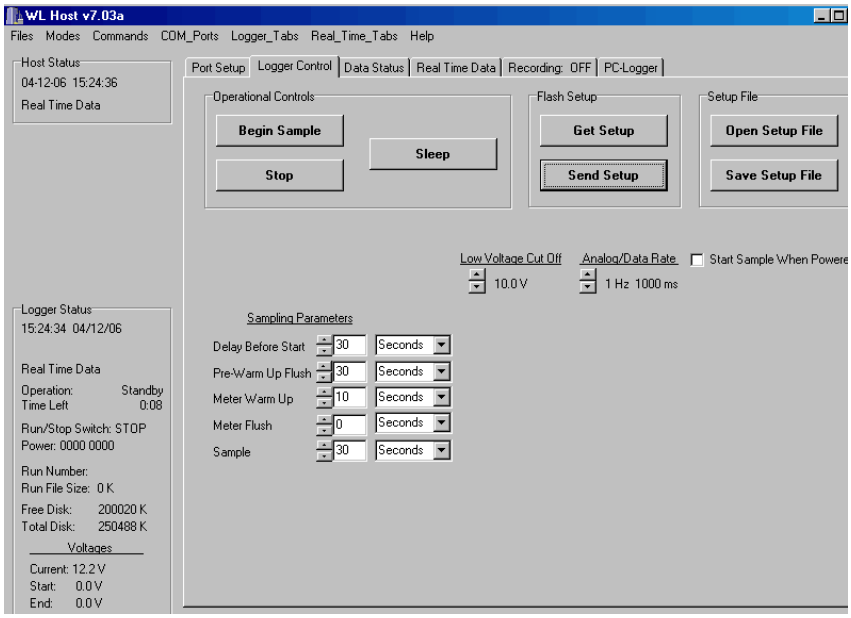
   If the logger is being used with meters whose total output is more than 1024 bytes of data per sample, set the Analog/Data Rate higher than the meter data rate to prevent data loss. For example, if the total output is 2500 bytes/second, set the logger to at least 3 Hz.

Tip	Set the rate of data acquisition to the fastest meter's data rate.	ac-s meters: 4 or 8 Hz ac-9 meters: 6 Hz ECO meters: 1 Hz Analog meters: 1 Hz

If your system uses analog meters:
Each analog bulkhead on the DH-4 can optionally support two analog channels. Therefore, each analog bulkhead has two analog definitions in the DH-4 host program. (Analog 1 and Analog 2 correlate with analog bulkhead 1, Analog 3 and Analog 4 correlates to analog bulkhead 2, etc.)

To use both channels on a given bulkhead, there must be a Y cable that originates from the DH-4 bulkhead and terminates at each of the supported instruments. If a Y cable is not available, each analog port will only support one analog device at the odd numbered Analog ID (Analog Bulkhead 1 = Analog 1, Analog Bulkhead 2 = Analog 3, etc.)

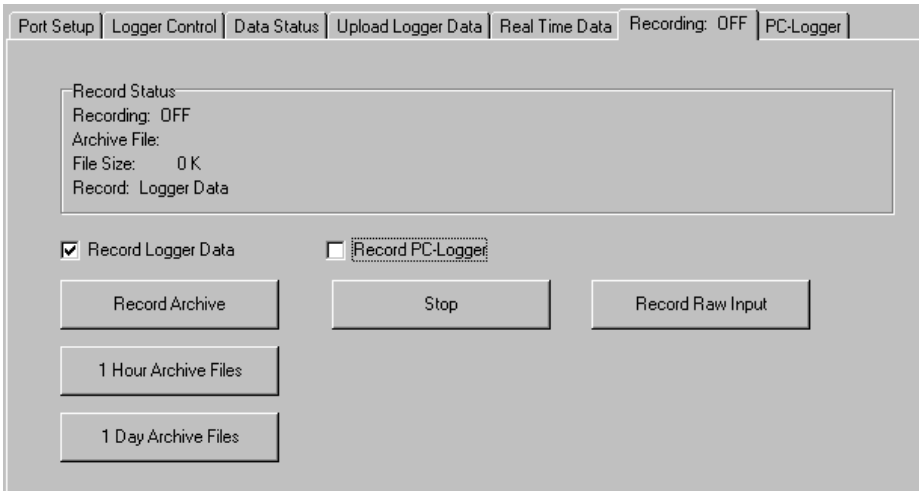
5. When the desired settings are input: Select Send Setup to send the configuration settings to the DH-4's flash memory. To save the configuration settings to the host computer, select Save Setup File.



Logger Control for Real Time mode

2.3.2 Saving Files in Real-time

1. Select the Recording: OFF/ON tab.



Recording: OFF/ON

2. Check Record Logger Data and Record PC-Logger boxes. All real time data being received by the PC via the DH-4 will be recorded.

3. Choose one of the three record buttons and enter a file name and location.
   - Record Archive—Records an archive file until the Stop button is pressed. To make the file name compatible with the file extraction program WAP, use a single word file name without any spaces and a 3 digit file extension where the extension runs from 000-999.
     This option is recommended for recording data while profiling.
     Example:
     CruiseOne.001 is acceptable.
     CruiseOne.dat is not recommended.
     Cruise One.001 is not acceptable.

   - 1 Hour Archive Files—Creates a new archive file at the start of each hour appending a 2 digit year, Julian date, and hour on the end of the file name. To make the file name compatible with the file extraction program WAP, use a single file name without any extensions. This option is recommended for recording data during towed or flow-through operations.

     Example: If the user enters the file name CruiseOne at 7:05 pm on January 17, 2004, the host will create a file named CruiseOne04_17.019. If the Host is still recording at 8:00 pm, the Host will close the existing file and create a new file named CruiseOne04_17.020.

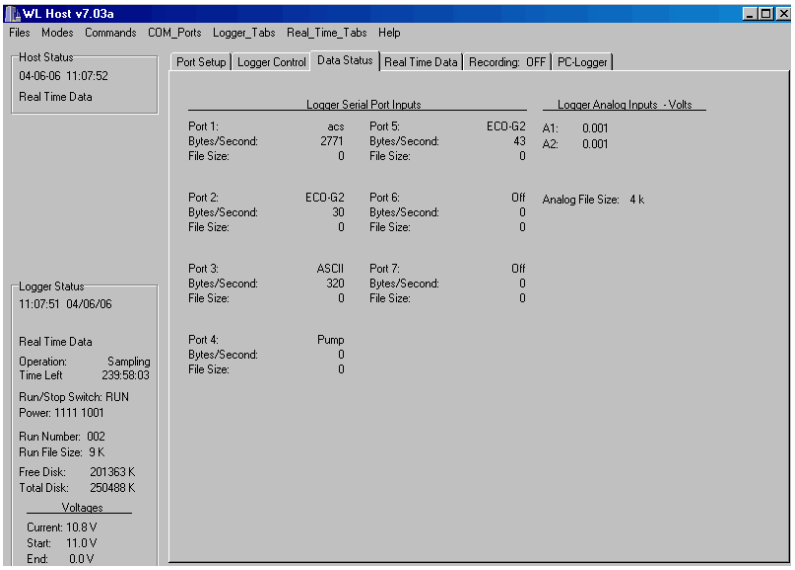
   - 1 Day Archive Files—Creates a new archive file at the start of each new day appending a 2 digit year and Julian date to the end of the file name. This option is recommended for recording data during moored operations.

     Example: If the user enters the file name CruiseOne on January 17, 2004, the Host will create a file named CruiseOne04.017.

4. To begin sampling, select the Begin Sample button at the Logger Control tab.

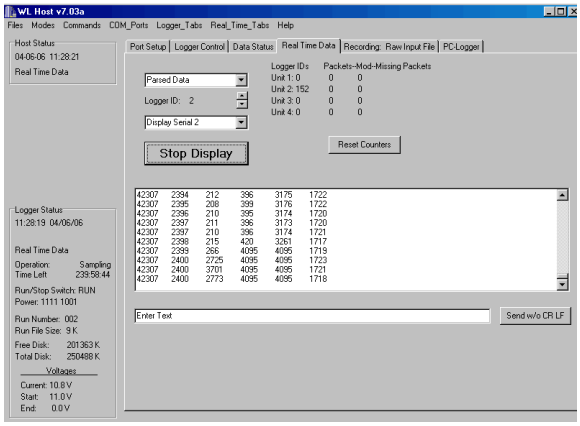
2.3.3 Viewing Data

Select the Data Status tab to display the current status of all serial and analog meters. Refer to section 5.3 for details of what each status line represents.



Sample Data Status for real-time mode

Incoming data can also be viewed in the Real Time Data tab, though with the exception of ASCII data, it will appear as gibberish until extracted.



Real Time Data tab (*incoming ASCII ECO data shown*).

To stop the sample, press Stop at the Recording: OFF/ON tab. The data file will be saved to the chosen location on the host PC.

3. Reference: Status Displays

This section describes the functions of the various buttons, selectable options, and status indicators of the WET Labs Host Program and is designed to be used primarily as a reference section. Functionally, the program is divided into tabs for logger setup and data collection, with additional options available from the pull-down menus at the top of the screen. Note that depending on the operational mode you've chosen, not all tabs will be visible.

The Setup Status banner in the upper left hand corner of the host program indicates whether the parameters on the Port Setup and Logger Control tabs contain the same values that the logger is currently using.

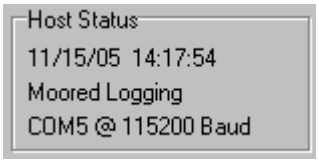
3.1 Setup Status

If a yellow Setup is Not Current banner is visible, the host may not contain the same settings that the logger does. To get the current logger settings, press the Get Setup button on either the Port Setup or Logger Control tabs.

If the yellow status banner is not visible, the host and the logger have matching parameters for the Port Setup and Logger Control settings.

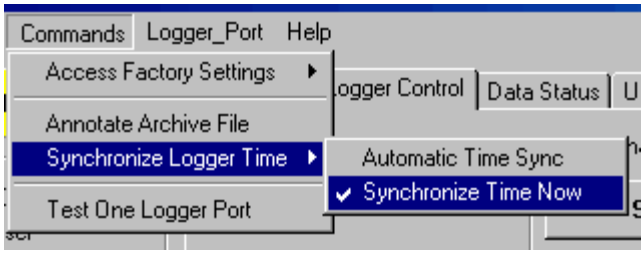
3.2 Host Status

- Time and Date: Displays the time and date of the host PC and the data logger. The host program automatically updates the time if the data logger is in standby mode and Automatic Time Sync is turned on.
- Mode: Displays the operating mode of the host: Moored Logging, Profile Logging, Real Time Output, Analog Output, Advanced Logging/Output.
- Communication: Displays the Host COM port being used and the baud rate. Note that if the COM has a red background, the Logger is not communicating with the host. If the baud rate background is red, it is incorrect.



3.3 Logger Port Setup

- COM port selector: Determines from which COM port the host computer can communicate with the Logger.
- Baud rate selector: Determines at which baud rate the host and logger communicate.



3.4 Logger Status

- Time and date coming from the DH-4. Can be synchronized with the host PC.

- Operational mode indicator. Matches the Host Status operation indicator as long as setup is current.

- **Operation:** Shows the operation the DH-4 is currently performing:
  Stand By—Waiting for a command.
  Delay—A delay at the start of a data collection sequence before the meter warm up.
  Pre-flush—System pumps flush meters prior to warm-up. Data is not stored.
  Warm Up—Selected meters are powered to reach a stable operating temperature. Data is not stored. The auxiliary pump is not in operation.
  Flush—Selected meters are powered, and the auxiliary pump is powered to flush out the meter passages. Data is not stored.
  Sample—The data collection segment of the sample sequence. All selected meters and pumps will be on. Data will be logged if logging has been selected. Data will be transmitted if Real Time Data has been selected.

- **Time Left**: Shows the actual time remaining in each operation described above. During Standby, this is elapsed time since the standby operation began.

- **Run/Stop Switch**: Optional magnetic actuator switch that controls logic. Note that if power is applied to the logger it will become fully active regardless of the switch's position. Status indicators:
  RUN—actuator plug inserted. Logger will begin sampling.
  STOP—actuator plug removed. DH-4 will terminate the current sample.
  Disabled—DH-4 is ready to receive commands.

- **Power**: Indicates which relays 1–8 have been turned on. This is primarily a factory debug display.

- **Run File Size**: Indicates the current file size of collected data.

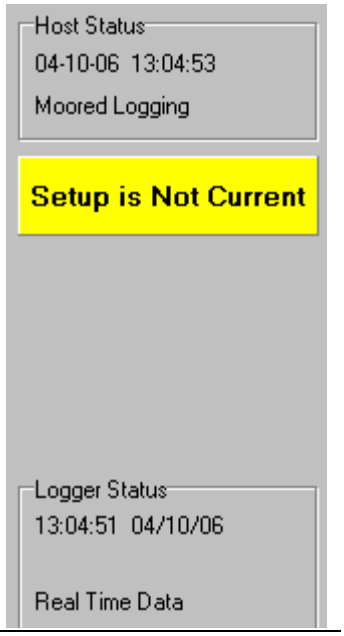
- **Free Disk**: Indicates the amount of flash disk space in Kbytes that is unused. The data logger can use all but the last 200 Kbytes of this flash disk for data storage.

- **Total Disk**: Indicates the total flash disk size in Kbytes. This shows the used and unused space. All but the last 200 Kb of the flash disk are available for data storage.

- **Voltage**:
  Current—displays existing voltage and is updated once per second.
  Start—displays the voltage at the start of the most recent sample.
  End—displays the voltage when the last sample was ended.

If the modes under the Host Status and the Logger Status are not the same, the yellow Setup is Not Current banner will be visible. Press Send Setup to change the loaded status to the Host Status. Press Get Setup to retrieve the Logger status.

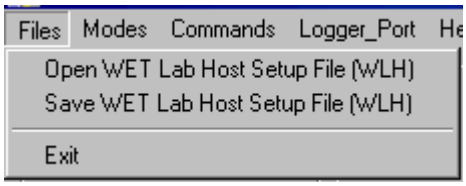
For example, selecting Send Setup will change logger status to moored. Selecting Get Setup will change the host to Real Time.



4. Reference: Pull-down Menus

The five pull-down menus in WET Labs Host are shown below.

4.1 Files

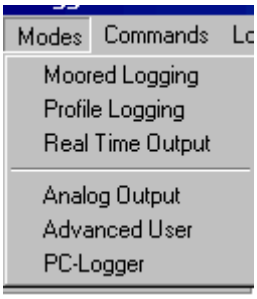


Open Host Setup File: Opens a saved WL Host setup file.

Save Host Setup File: Saves a WL Host program setup configuration. (Particularly useful for saving settings for both moored and profiling operation.) File will be saved in the directory the host program is installed in.

Exit: Closes the host program, automatically saving the existing (currently selected) configurations in a file named last.wlh.

4.2 Modes



Moored Logging: for use with moored applications.

Profile Logging: for use with profiling applications.

Real-time Output: for use when no data will be stored on the logger, but rather sent directly to a host PC in real time.

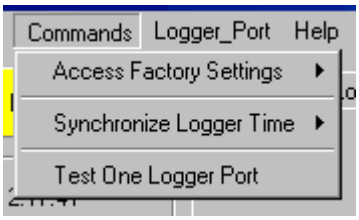
Analog Output: use to sample and transmit ASCII data from a set of analog meters in real time. If any digital/serial meters are to be used, use Real Time Mode.

Advanced User: Use for deployments where a combination of moored and profile settings are desired.

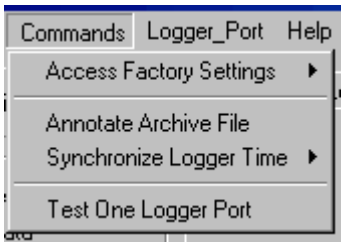
PC-Logger: for use when data will be sent to the host PC instead of the data logger.

4.3 Commands

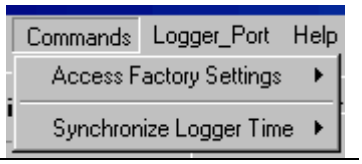
When Moored or Profile modes are selected, the options at right are available.



When Real Time and Advanced User modes are selected, the options shown at right are available.



When Analog Output mode is selected, the options at right are available.



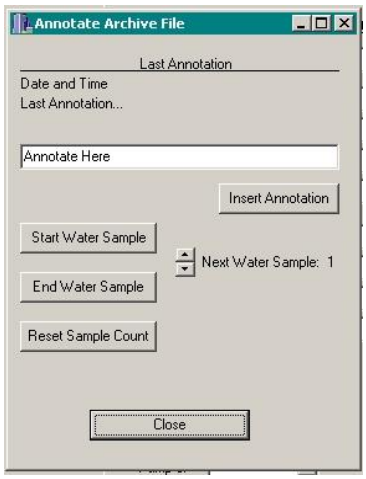
4.3.1 Access Factory Settings >

The options under this submenu are primarily used for WET Labs personnel for troubleshooting or de-bugging and should be disregarded.

- **Reset to Monitor**: Exits the host program and allows the user to access low level functions.
- **Change Logger ID:** Allows changing the default data logger at port 2 to another port number.
- **Show Analog Calibration**: View calibration settings for analog instruments. This window can also be used for troubleshooting with WET Labs personnel.
- **Show Hardware Configuration**: View hardware configurations for all instruments.
- **Load Default Flash Setup:** Resets the DH-4 configuration settings to those shipped from the factory.
- **Write Debug File**, **Add Pad:** Used by WET Labs personnel for debugging.

4.3.2 Annotate Archive File

This allows you to add notes about a given run. These are inserted into the archive file as ASCII text in logger ID 1, Port 9. Enter the text to be stored in the Annotate Here box. Select Insert Annotation to add user-entered text to the archive file.



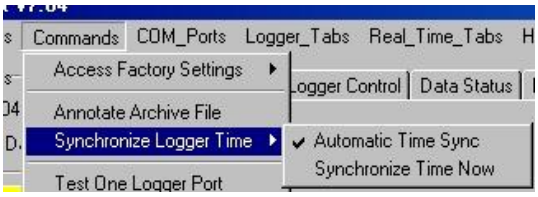
Select Start Water Sample to input the time and date the water sample started.

Select End Water Sample to input the end time.

Water sample annotations may also be incremented or decremented by clicking on the up arrows next to Next Water Sample.

Select Reset Sample Count to return the count to 1.

4.3.3 Synchronize Logger Time >



Automatic Time Sync will constantly update the data logger's time while it's connected to a host and **not** sampling and should be used to keep the logger and the host PC clocks synchronized.

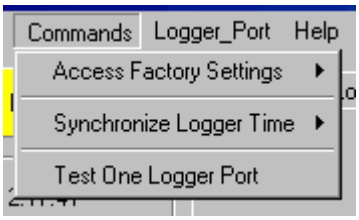
Synchronize Time Now will synchronize the data logger to the current host PC time.

Note

Turning on Automatic Time Sync will prevent you from seeing the logger clock drift and should not be used in Moored Mode.

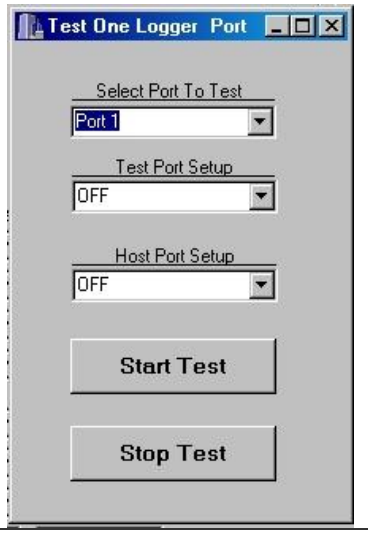
4.3.4 Test One Logger Port

Allows you to test that a meter is properly connected and communicating with the host. Serial ports 1–8 or analog ports may be tested at a user-selected baud rate.



To test a port:

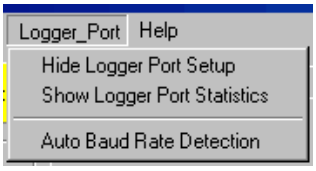
1. Select the data port (and thus instrument) you wish to test.
2. Select the instrument's baud rate.
3. Select the host computer's baud rate.
4. Select Start Test. The Real_Time window appears, showing scrolling data.
5. Select Stop Test when communication is verified.



4.4 Logger_Port

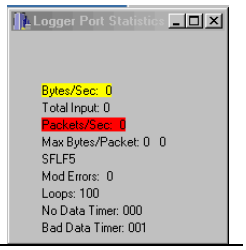
Show/Hide Logger Port Setup

Displays or minimizes the Logger Port Setup in the status area of WL Host.



Show Logger Port Statistics

Troubleshooting, debugging screen for factory use.



Auto Baud Rate Detection

If checked, the Host software automatically checks that the Host PC and DH-4 baud rate match.

5. Reference: Window Tabs

There are seven tabs associated with all aspects of operating the data logger for various types of deployments. Note that depending on the operating mode you've chosen, not all tabs will be available.

Visible tabs for each operating mode:

Moored Logging

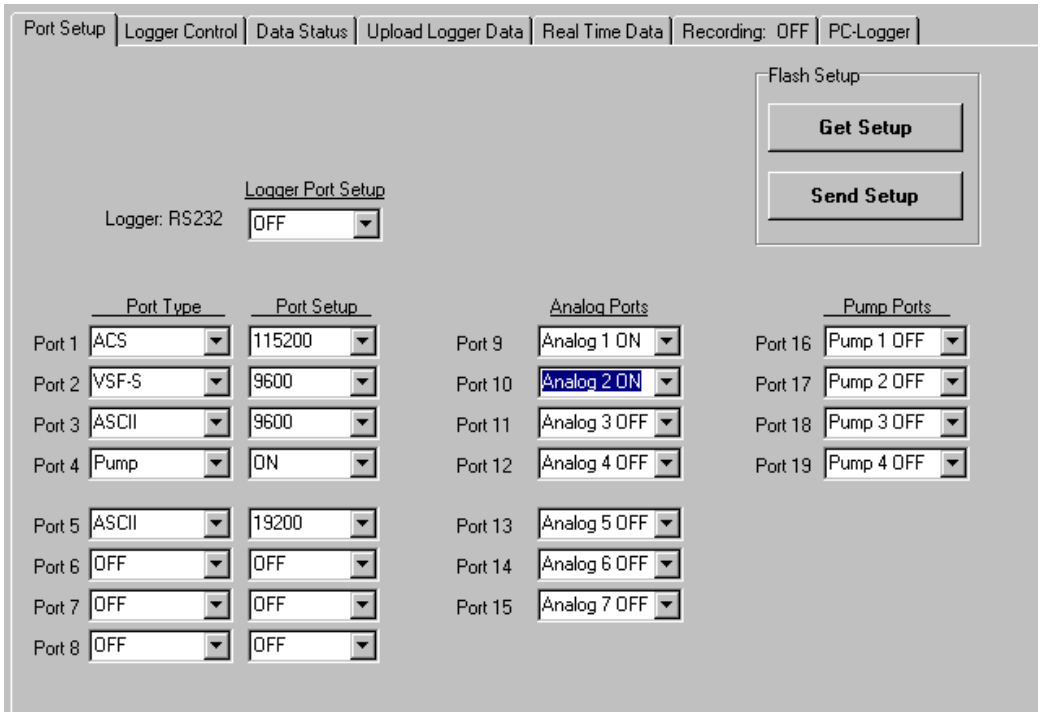
Profile Logging

Real Time Output

Analog Output

Advanced User

5.1 Port Setup



5.1.1 Logger Port Setup

Selectable baud rate for the host port-to-DH-4 connection. Default is 9600.

5.1.2 Port Type

Refer to the data logger-specific configuration sheet to identify which bulkhead connector is associated with each serial port for your specific data logger. Except where noted, all serial ports are powered during the warm up, flush, and sample segments of a run. Serial ports may be powered during pre-flush if the port is selected as a pump.

OFF—The port will not be powered, nor will any data be accepted from this port during data sampling.

AC9—Any data is accepted by this port. The port will be turned off if the voltage drops below 10.0V. Baud rate: 19200.

AC-S—Any data is accepted by this port. This port will be turned off if the voltage drops below 9.5 V. This allows a sample to continue while protecting the ac-s from damage. Baud rate: 115200.

ASCII—ASCII data that is terminated with <Carriage Return><Line Feed> (CR LF) will be accepted by this serial port. Baud rates: 600–115200.

Binary—All data will be accepted by this serial port. The serial port type has no restrictions on the format of the data that it receives, making it a good initial selection when setting up new meters. Baud rates: 600–115200.

ECO-G2—This port will accept <CRLF>-terminated data and recognizes the "close shuttered shutdown" command used by the 2nd generation ECO meters. This allows the meter to close its bio-wiper before the DH-4 removes power during moored deployments. Baud rate: 19200.

GPS—Accepts NMEA-0183 data format GPRMC. Baud rate: 4800.

Pump—This port will provide power for pump operation during the flush and sample segments of the data collection. If pre-flush is selected, this port will be powered throughout the sample sequence, including pre-flush and warm-up. No data will be processed from this port.

Remote Host—This port provides power and data to telemetry equipment. When the DH-4 is either in standby or sample mode, the DH-4 will power this port and transmit data out the port.

SBE 37-SM—The data logger will query the SBE-37SM every 4 seconds, at which point the SBE's data will be retrieved. The SBE 37-SM must be logging data and be "sleeping" between samples. Baud rate: 9600.

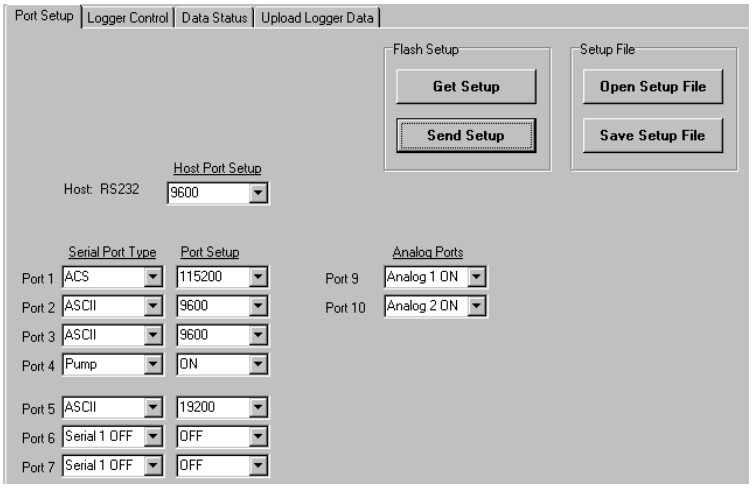
VSF-S—This type will accept ASCII data from the first generation of ECO meters such as the VSF and DFL. Additionally, at the end of the sample segment the ECO-G1 "close shutter" command will be sent to the meter. Baud Rate: 9600.

WL-Test—Used by WET Labs personnel and not available to the user.

Wake/Binary—At the warm-up cycle, the logger will send a 500 ms "break" command to "wake" meters that are self-powered (internal batteries). The logger reads all data.

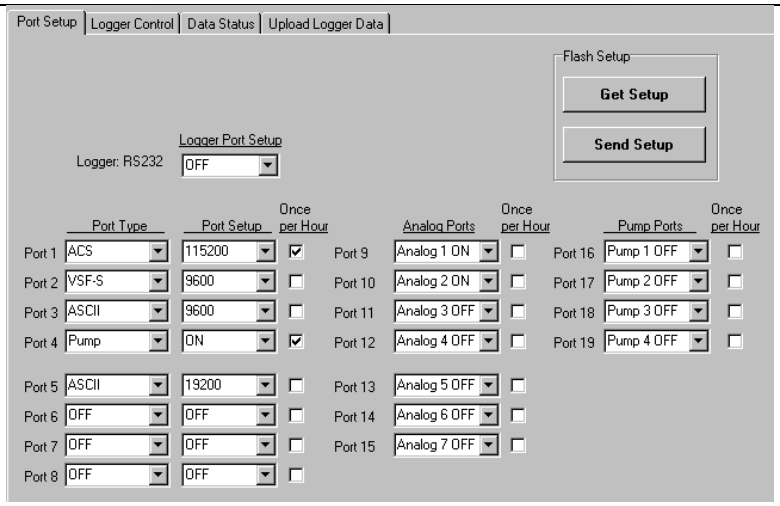
5.1.3 Port Setup

Under the Port Setup column, select the required baud rate for use with the meter selected under the Serial Port Type. All ports setups will have setups of 8 data bits, no parity bits, and 1 stop bit with the exceptions of "4800,7,E,1" and "9600,7,E,1," which will have setups of 7 data bits, an even parity bit, and 1 stop bit.



5.1.4 Once Per Hour (Moored Mode)

This option is used during moored deployments so that instruments with a high current draw will run only during the first sample period after the beginning ("top") of the hour. This allows the user to obtain several samples per hour from instruments with lower current draws, without the power penalty of the instrument with high current draw. This checkbox is only available under the Moored Logging operation mode.



5.1.5 Analog Ports

The data logger has the capability of accepting data from up to seven analog instruments depending on the configuration of the data logger (see your instrument-specific configuration sheet).

Note that each analog bulkhead on the DH-4 has the optional capability of supporting two analog channels. Therefore, each analog bulkhead has two analog definitions in the DH-4 host program. (i.e. Analog 1 and Analog 2 correlate with analog bulkhead 1, Analog 3 and Analog 4 correlates to analog bulkhead 2, etc.).

To use both channels on a given bulkhead, there must be a Y cable that originates from the DH-4 bulkhead and terminates at each of the supported instruments. If a Y cable is not available, each analog port will only support one analog device at the odd numbered Analog ID (i.e. Analog Bulkhead 1 = Analog 1, Analog Bulkhead 2 = Analog 3, etc.).

Analog port options:
Off—This port will not be powered, nor will any data be accepted from this port during sampling.
Analog On—This port will be powered and will accept an analog input during the data collection. Unless otherwise noted in the data logger's User's Guide, the input range is 0–5 V.
Pump On—This port will provide power to a pump during the flush and sample segments of data collection. This port will not process any data during the run.

5.1.6 Pump Ports

The data logger can accept data from up to four pumps, depending on the configuration of the data logger. Refer to the Custom Configuration Sheet that ships with each DH-4 to identify which bulkhead connector is associated with each pump port for your specific data logger.

Pump port options:
Off—This port will not be powered, nor will any data be accepted from this port during sampling.
Pump On—This port will provide power to a pump during the flush and sample segments of data collection. This port will not process any data during the run.

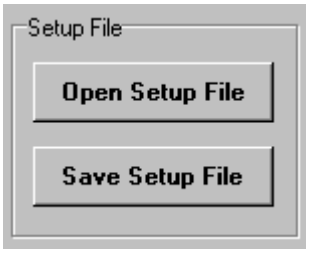
5.1.7 Flash Setup

Get Setup will retrieve the setup currently stored on the data logger. All the setup parameters will be filled in, and the Setup Status Banner will indicate that the setup is current.

Send Setup will send the currently displayed setup to the data logger. The logger will read the setup and echo the setup back to the host program. The host will then set the status banner to indicate the setup is current.

It is not necessary to press Send Setup for each setup parameter that is changed. Change all the setup fields to match the desired data logger setup, and then press the Send Setup button.

Caution
Pressing the *Send Setup* button will cause any currently running data collection operation to terminate.



Save Setup File stores settings on the host PC.

Open Setup File retrieves configuration settings that have been saved to the host PC using Save Setup File.

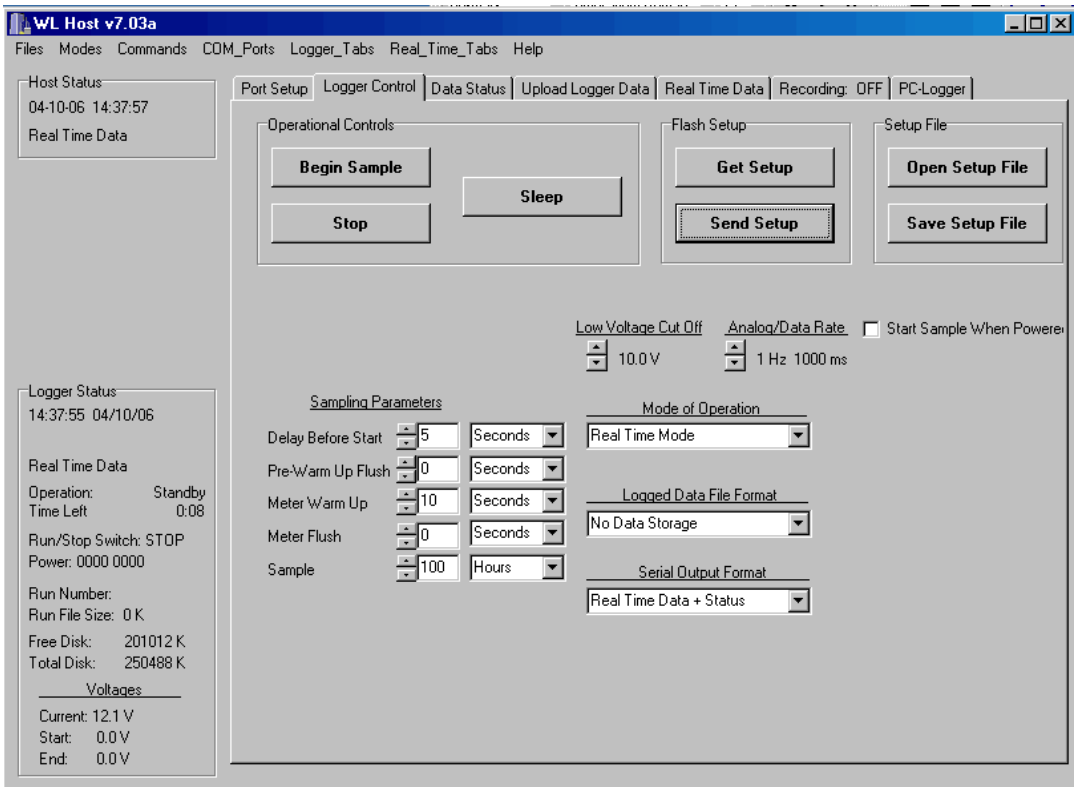
Tip

Get and Send Setup send configuration settings to the DH-4's flash memory; Open and Save WL Host Setup File save settings to the host PC.

To ensure the desired settings are saved, use Save WL Host Setup File to save settings to the host PC, then open the saved file using the Open WL Host Setup File. Select Send Setup to copy the file from the PC to the DH-4.

5.2 Logger Control

The Logger Control tab shown below has all of the options available for Advanced User Mode. Note that not all options apply to all modes of operation.

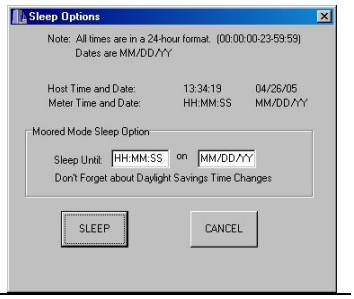


5.2.1 Operational Controls

Begin Sample will start the sequence setup currently stored in the data logger. Note that if you have changed settings, you must press Send Settings to load the new settings into the logger. Use the Get Setup and Send Setup buttons to verify the desired setup is in the data logger.

Stop: Press to halt operations on the data logger and enter a stand-by mode.

Sleep: **(Moored Mode only)** Causes a pop-up menu to appear with the option to Sleep Until—Sleep until the specified date and time and then start the sample sequence.



5.2.2 Flash Setup and Setup File Buttons

Refer to section 5.1.6 for description of these controls.

5.2.3 Low Voltage Cut Off

Sampling will stop if the input voltage to the data logger drops below the specified voltage. This is selectable from 6.5 to 14.0 volts.

Note that if your system includes an ac meter and you select either ACS or AC9 from the Serial Port Type in the Port Setup tab, the port will automatically turn off if voltage falls below 9.5.

5.2.4 Analog/Data Rate

Determines the speed at which analog data is transmitted and also selects the time interval for serial data packets. The selectable range is from 1 to 10 Hz, which equals sample intervals of 1000–100ms.

Tip Set the rate of data acquisition to the fastest meter's data rate.

ac-s meters:	4 or 8 Hz
ac-9 meters:	6 Hz
ECO meters:	1 Hz
Analog meters:	1 Hz

5.2.5 Start Sample When Powered

When Start Sample When Powered is checked, The meter will proceed immediately to Delay Before Sample when power is applied to the data logger. It is not necessary to select Begin Sample.

When a DH-4 is powered up and Start Sample When Powered was selected when the DH4 was turned off, the DH-4 will automatically start the programmed sample sequence after a four-second delay.

If the logger is being used with meters that output more than 1024 bytes of data per sample, set the Analog/Data Rate higher than the meter's sample rate to prevent data loss. For example, if a meter outputs 2500 bytes/second and samples at 1 Hz, set the logger to at least 3 Hz.

5.2.6 Sampling Parameters

Delay Before Start—An estimate of the amount of time required to remove the host cable and replace it with a dummy plug, and place the instrument suite in position for a drop. Enter a time longer than the deployment of the data logger assembly is expected to take, or the data logger may start the meter and pump for data collection while the data logger assembly is still on the deck, or in the air. Selectable in seconds, minutes, hours from 0–60.

Pre-Warm Up Flush—Useful for moored applications, where it may be desirable to set a longer flush cycle prior to meter warm-up.

Meter Warm Up—The amount of time the selected meters will be powered prior to meter flush time. This time is used to allow the instruments to stabilize electronically. During this time period the meter(s) are powered, but the pumps are not powered, and data from the meters is collected and displayed, but not stored. A warm-up time of 2–3 minutes is recommended. Valid warm up times range from 0–10 minutes. The total warm up time for the meters is the sum of the warm up time and the flush time. Selectable in seconds, minutes, hours from 0–60.

Meter Flush—The amount of time desired to flush the selected meters sample tubes of air bubbles and debris. During this time period, both the selected meters and the auxiliary pumps are powered, and data is collected but not stored. A time period of 10–30 seconds is recommended. Selectable flush times are 0–120 seconds.

Sample—The length of time required for the data sample profile or periodic moored sample. During this time period, the data logger will power selected meters, the auxiliary pumps, and will collect and store data from the meters. Selectable in seconds, minutes, hours from 0–300.

Sample Interval (moored mode only)—The interval of time between samples. Selectable in seconds, minutes, hours.
WET Labs meters have minimal warm up times that the data logger will adhere to.
All ac-9 and SAFire meters are given a minimum warm up time of 10 seconds. If the sum of the warm up and flush times does not equal or exceed 10 seconds, the warm up time will be increased until 10 seconds is reached.

When a setup is sent to the data logger, it will review the meter types, select the longest warm up time required, and apply that warm up time to the setup. This means the user setting may be overridden.

Caution

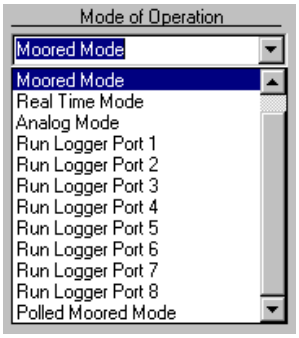
The data logger does not receive the profile parameters until the *Send Setup* button is selected. You must press the *Send Setup* button to change the data logger profile parameters or the last saved profile parameters will be used.

Caution

Selecting the *Send Setup* button will cause the data logger to halt any current operation.

5.2.7 Mode of Operation

The data logger has five operating modes that are accessible from the Advanced User mode (right).



The last known mode the data logger was using will be shown under Mode of Operation.

Profile Mode

Profile Mode is used to determine the "profile" of the water column. While profiling, the data logger will perform one data collection cycle (delay before start, pre-warm-up flush, warm-up, flush, and sample), and then stand by for further commands from the host.

Moored Mode

To determine variances in the ocean environment at a single location over a long period of time, the data logger is placed in moored mode. While moored, the data logger will perform one data collection cycle (as in the profile mode), then go into a low power "sleep" for a preprogrammed period of time. When the period of time has expired, it will perform a second cycle (starting with warm up), and then return to a low power sleep. This cycle will be repeated until

- battery supply is exhausted,
- onboard data storage is filled, or
- the data logger is retrieved and power is removed.

Real Time Mode

Real-time data logging is used to sample an area of water while the data logger and associated instruments are towed. As the name implies, data is not logged, but sent directly to a host PC. The instruments sample either continuously or intermittently depending on the preprogrammed setup.

Analog Mode

Selecting Power Analog Ports will power all the analog ports that have been selected on the Logger Setup tab after a minimum 5-second delay. An ASCII data stream will be output from the data logger, but the data will not be recorded.

Run Logger Port # (Serial #1 through 8)

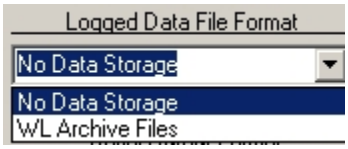
Selecting one of these options will power only the instrument selected after a minimum 5-second delay. Data will be output but not recorded. Using these options will reset the operational setup for the Host.

Polled Moored Mode

Selecting this mode allows an external controller (PC, other programmable controller, or WL Host program) to interactively control the DH-4 while collecting a single data file over an extended period of time. This is useful when the desired sampling routine is subject to change because of external influences such as tides, available power, storms, etc.

5.2.8 Logged Data File Format

The data logger has two data collection options that are available from the Advanced User mode.



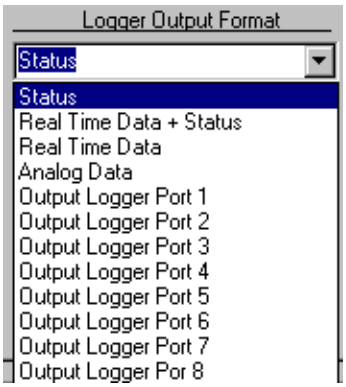
If **No Data Storage** is selected, data will be collected, but not stored. This allows the user to collect data for a length of time that exceeds the on-board memory capacity. This is useful if collecting data via a sea cable or larger capacity data logger, such as ac-9 Plus.

If **WL Archive Files** is selected, the data will be collected in 100 ms packets and stored in the standard WET Labs Archive File format. These files contain timing information that allows the WET Labs Archive Processing program (WAP) to merge the data in a time coherent manner. See Appendix B for a description of the WL Archive file format.

Please note: the timing information in the WET Labs Archive File format contains a significant amount of overhead that can consume a large amount of the data logger's flash disk. This is particularly true of slow baud rate instruments that have a small record spread out over a larger period of time. For example, while collecting data from a CTD meter running at 1200 baud, the data logger may end up adding 20 bytes of overhead to just 10 bytes of data collected over the 100 ms time interval. The file will contain more timing information than data. The overhead usage on fast, "burst-mode" instruments is not as significant, as few hundred bytes of data may be collected in the 100 ms interval. In this case, the overhead may be reduced to only 10–20 percent of the data file. For more information on this option, refer to the WET Labs Archive File Processing User's Guide.

5.2.9 Logger Output Format

There are several options for data output for the data logger (right). Under all options, the normal data logger status will be transmitted until the sample segment is reached. When the sample segment is reached the output format and host baud rate may change according to the output format option selected.



Status: Shows the overall data logger system operation in a binary format, suitable for display using the data logger Host program.

Real Time Data + Status: Outputs all the real time data and the logger status.

Real Time Data: Outputs all the real time data.

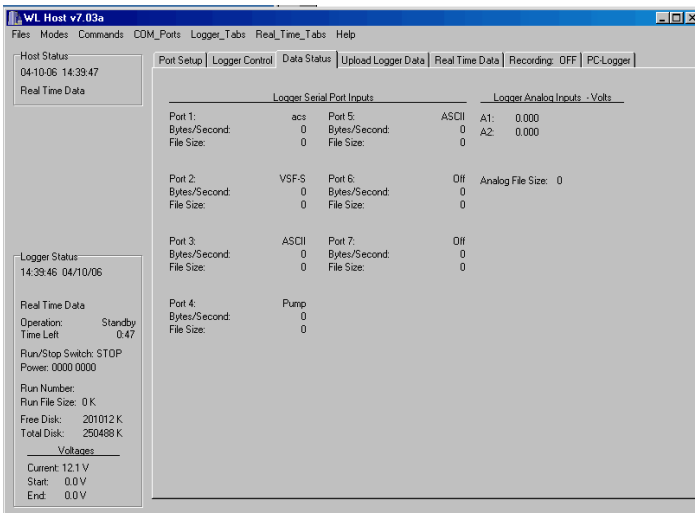
Analog Data: The host port baud rate will be unchanged and an ASCII record with all the analog measurements will be transmitted.

Output Serial X (Serial 1–8) **Data**: Outputs the data from the selected port during
the sample. The host port baud rate will be changed to match the baud rate of the serial port selected.

Regardless of the output selected, the data from all the instruments selected will be recorded in the format specified in Logged Data File Format box.

5.3 Data Status

The Data Status tab provides real-time status information about each of the ports as sampling progresses.



The following information is available for Ports 1–8 under Logger Port Inputs:

1. Port ID#: Port is OFF, or shows the port type selected.

2. Bytes/Second: the number of bytes received in one second. Increments during pre-sampling and active sampling.

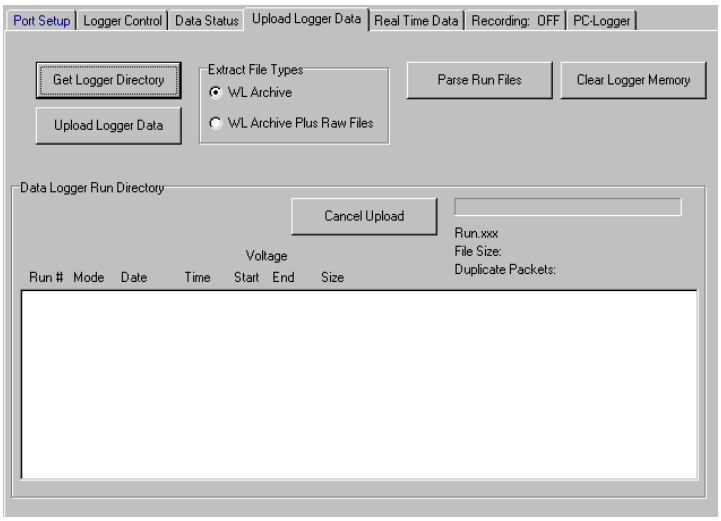
3. File Size: Shows the size of the data file actively being generated by the meter. This is only correct if the Host is left connected to the data logger during data collection.

The Logger Analog Inputs—Volts provides a real-time view of analog data being sent to the data logger. Data is stored as a time-stamped ASCII file in table format.

Analog File Size: Shows the approximate amount of memory used for analog data.

5.4 Upload Logger Data

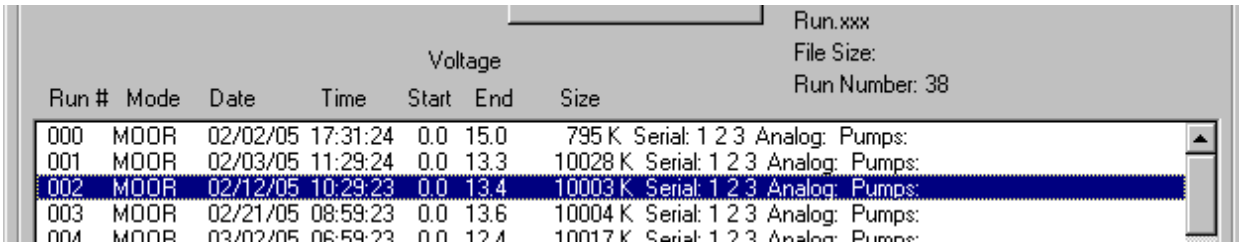
The Upload Logger Data tab allows you to extract sampling data from the data logger or to upload (save) and extract data from the data logger.



Selecting **Get Logger Directory** will retrieve the run directory from which you may select one or more runs to upload. This can ONLY be performed with the data logger in standby mode.

Selecting **Upload Logger Data** will result in a window that allows you to name and save the file to which data will be saved.

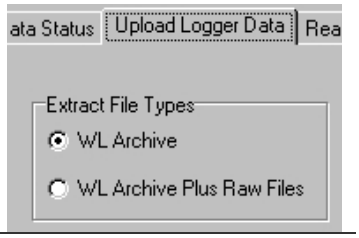
Each data logger run directory contains the information listed below.



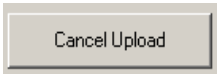
Run #	000 to 999.
Mode (of operation)	Either Prof (Profiling) or MOOR (Moored)
Date	The date the run was started.
Time	The time of day the run was started.
Start/End	The measured supplied voltage at the start and end of the run.
Size	Total file size including all the data files and file overhead.
Serial	The serial port numbers (1–8) of any serial port that was active during the run.
Analog	The analog port number (1–7) of any analog port that was active during the run.
Pumps	The pump port number (1–4) of any pump port that was power during the run.

Extract WL Archive Files creates a file that combines the data from the files selected to view together.

Extract WL Archive Plus Raw Files will create individual files for each meter, as well as creating the archive file. The individual files do not contain any timing information.



Cancel Upload will stop data upload. If multiple runs have been selected, you will be prompted to cancel all uploads or individual run uploads.



Parse Run Files extracts already uploaded Run files (those stored on the host PC).

Clear Logger Memory will clear the logger's flash memory.

WARNING!
Turning off the data logger while memory clearing is in progress WILL result in a corrupted data logger file system.

Caution!
Once "Clear DH-4 Memory" is pressed, the data is not retrievable.

Once the memory clearing process has started, the status will change to Clearing Memory with a red background. Data is stored in the data logger using flash

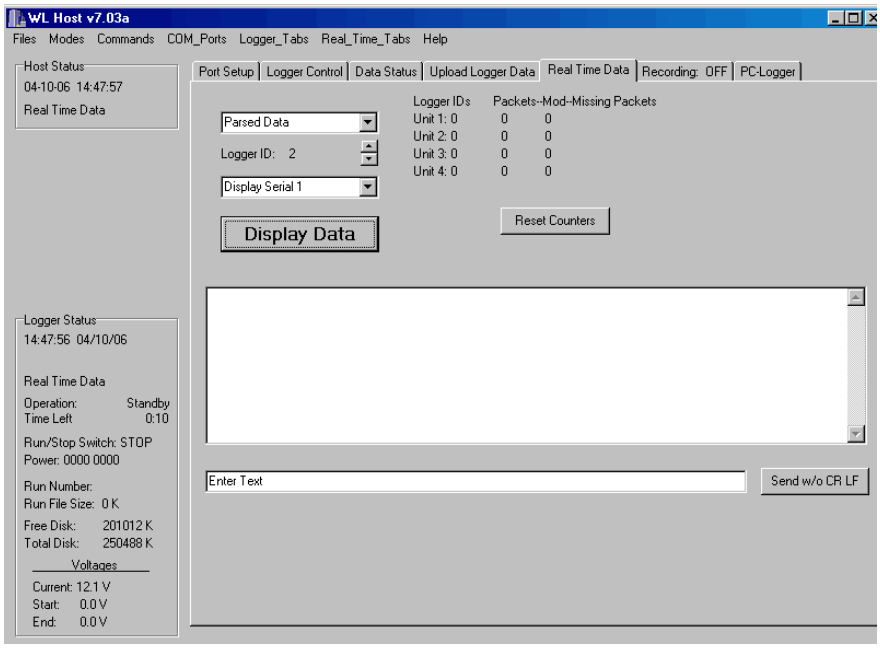
memory. Depending on the amount of data stored, the number of runs recorded, and the flash memory size, clearing data may take several minutes. The status for the data logger must return to the Standby state before any further actions are taken with the data logger. This includes turning the data logger off.

If, after clearing the logger's memory using the Clear Logger Memory button, the values for Free Disk and Total Disk are not zero, it will be necessary to clear the logger's memory in a terminal program.

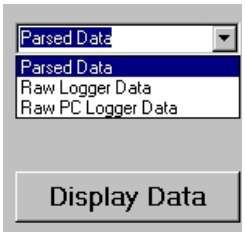
1. In WL Host, select Commands/Access to Factory Settings/Reset to Monitor. The resulting window will ask if you are sure you want to cease operations and exit to monitor program. Select Yes.
2. Start a terminal program with settings at 9600 baud, 8 data bits, 1 stop bit, parity, none. Press Enter to display C: prompt.
3. Type "format," press Enter. The resulting message "Formatting this drive will erase all its data. Are you sure?" Type "Y." Type "app" then Enter.
4. Exit the terminal program, restart WL Logger Host and verify Free Disk and Total Disk are both 0.

5.5 Real Time Data

The Real Time Data tab is visible when in Real Time Output, Analog Output, or Advanced Logging/Output modes.



The top combo box allows selecting Parsed Data, Raw Logger Data, or Raw PC Data for output in the display area.

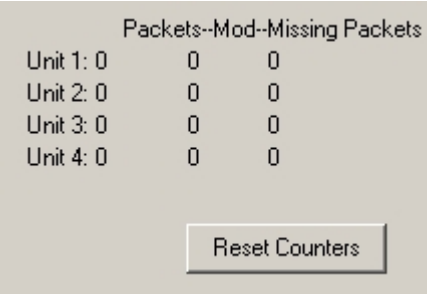


Display Data enables the output. Note that after it is selected, the button changes to Stop Display.

The Packets-Mod-Missing Packets indicates:

- The number of DH-Mux packets received by the host PC for each Mux Unit ID
- The number of mod errors detected for each Mux Unit ID
- The number packets lost when the last mod error was detected.

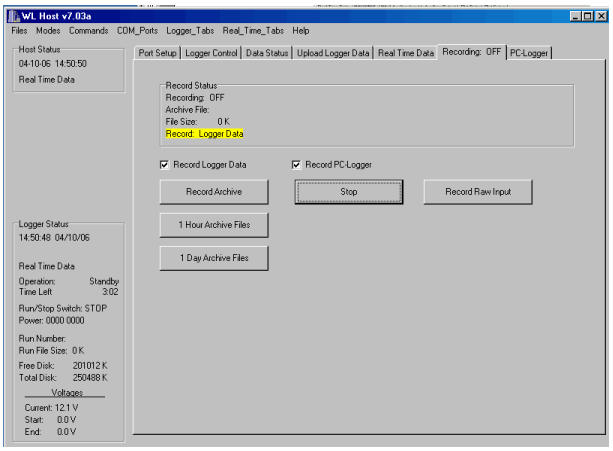
This provides the user a method of monitoring the reliability of the Logger data links.



Reset Counters allows you to reset the Packets-Mod-Missing Packets to zero.

You can send commands directly to a data logger with or without a line break by entering them into the box shown below. To send commands directly to a specific meter, select Test One Logger Port under the Commands menu, then enter the command text. Entering "break" will stop communication.

5.6 Recording: OFF/ON



Record Status

Recording: Indicates whether data is being saved to an archive file on the host computer. It does not apply to the logger. Display is OFF or ON.

Archive File: Filename to which the collected data is being saved.

File Size: Size of file being saved. File size is updated every second.

Record: Indicates that the data is coming from either the data logger or a PC Logger as set up in the PC Logger tab. The appropriate checkbox must be checked as well. If the two are not in agreement, a yellow background will appear. If there is no communication, the background will be red.

Record Logger Data and Record PC Logger: Checking these boxes enables the user to determine what data is being recorded to the archive file.

If Record Logger Data is checked, all the real time data being received by the host from the DH-4 on the logger port will be recorded.

If Record PC Logger is checked and one or more Record PC Logger COM ports have been configured and are receiving data, the COM Port data will be saved in the archive file and will be given a Mux ID = 1.

Record Archive allows you to create a file that only contains the data from check sum verified DH-Mux records.

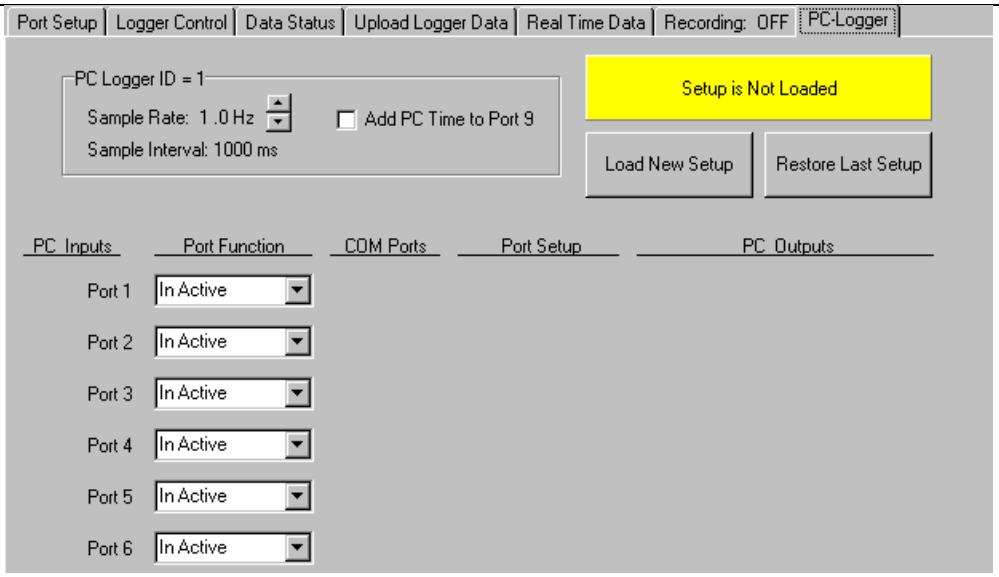
1 Hour Archive Files allows you to save data in one hour increments. Data will be time-stamped by the host computer in one-hour-long files.

1 Day Archive Files allows you to save data in 24-hour increments. Data will be time-stamped by the host computer in 24-hour-long files.

Record Raw Input: Factory use. Records raw data with no processing whatsoever.

5.7 PC-Logger

Options under this tab allow you to collect real-time data from individual instruments using the host PC as a "virtual" data logger (depending on the number of available serial ports it has) while the logger is transmitting real-time data. The data from both the logger and the host PC are collected in the same archive file under the Recording tab.

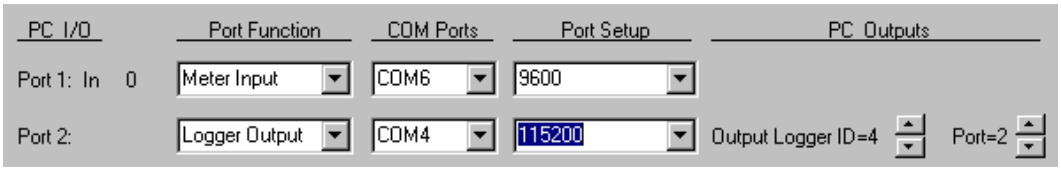


PC Logger ID: This value is hard-coded into the data logger's or deck box's firmware.

Deck Rate: Selectable at 1.0, 2.0, 3.0, 3.6, 6.1, 9.1, and 18.2 Hz.

PC Input (1–6): Allows you to select a COM port and the appropriate baud rate for non-submerged data loggers.

Port Function: Each PC Logger (COM) port can be configured as Meter Input or Logger Output.



- If a port is selected as Meter Input, the data will save only to the host PC ("virtual logger"), be given a Logger ID=1, and assigned a Port ID according to its position on the list of available ports. The user will need to select an available COM port and the port's baud rate.

- If a port is selected as Logger Output, the user must select the COM port, the data rate, and the data source. The data source can be any of the input data streams and is identified by the Logger ID (1=PC Logger, 2=DH-4) and the Ports 1–8.

6. Hardware

The typical DH-4 has the following external connections:
1. Host port/Power input
2. Serial input
3. Serial input
4. Serial input
5. Serial input
6. Battery input

If your configuration varies from this, refer to the Custom Configuration Sheet at the back of this manual.

6.1 Specifications

Mechanical

Size	7 x 4.1 (17.8 x 10.4 cm)
Pressure housing	acetal co-polymer
Weight	4 lbs (1.8 kg) in air; 0.6 lbs (0.3 kg) in water Deep unit: 5.7 lb (2.6 kg) in air; 2.3 lbs (1 kg) in water
Rated depth	500 or 5000 m
Temperature range	0–30 deg C

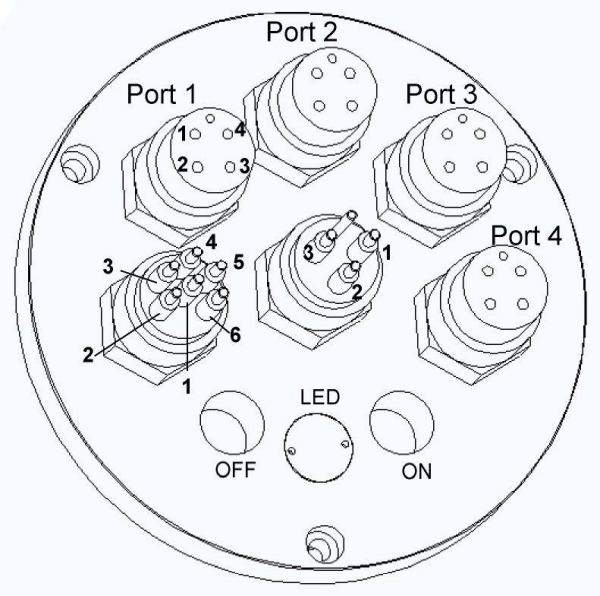
Electrical

Input	7–18 VDC
Current draw	0.6 watts @ 12V nominal
Sleep	70 µAmp (max)
Max power	3 Amp @ input voltage
Sample rate	6 scan/sec., nominal
Host interfaces	RS-232, RS-422

Data Handling

Serial data input	1–8 ports, RS-232
Analog input	0–5V
Analog input resolution	12 bit A/D
Baud rates	300–115.2K
Data transfer	binary
Memory	64 Mb minimum

6.2 Standard DH-4 Connector Configuration



DH-4 connectors

Sea/Test Cable Connector Pin Function	
1	Ground
2	RS-232 (RX)
3	N/C
4	V +
5	RS-232 (TX)
6	N/C

Serial Connector Socket Function	
1	Ground
2	V +
3	RS-232 (RX)
4	RS-232 (TX)

Battery Connector Pin Function	
1	Ground
2	V +
3	N/C

6.2.1 Optional Status LED

An optional LED indicates which of the current operating segments the data logger is in when the user is either not using the host program for status or the user is not in a position to view the host program.

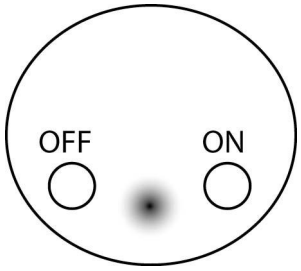
Regardless of how the data logger is started, the Status LED will flash according to the following sequences.

Delay:	One second on, four seconds off
Pre-Warm Up Flush:	One quick flash (50 ms) per second
Warm Up:	Two quick flashes per second
Flush:	Continuous quick flashes
Sample:	One flash (100 ms) every second
Sleep	Status LED is off

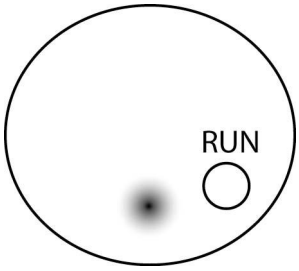
6.2.2 Magnetic Switch

Some WET Labs data loggers are equipped with a magnetic switch. This is a logic/control switch, not a power switch for the data logger. Applying power to the data logger will cause the data logger to become fully active, regardless of the magnetic switch's position.

WET Labs uses two different nomenclatures, providing the same utility, for its data loggers:



older version



newer version

ON (older) or RUN (newer)—Placing the magnetic actuator in the data logger's RUN or ON position tells the data logger that start has been selected. If the other steps identified in Section 5 have been followed, a data sample will begin.

OFF (older) or actuator removed—Removing the actuator from the ON or RUN position tells the data logger to terminate the current sample if (and only if) the magnetic switch was used to initiate the sample. The actuator does not need to be placed in an OFF position to terminate the sample; simply removing the actuator from the ON or RUN position will provide this function. The OFF position was merely an actuator holder and is not found on all data loggers.

6.3 Standard Data Format

6.3.1 Battery.000

The file battery.000 is used to log the battery voltage once per minute or once per moored sample interval if the sample interval is less than once per minute.

The battery file is also used to log any time periods that the low voltage cut-off has been exceeded (thus shutting down a sample cycle) and to log if/when the 8-volt limit was reached, placing the DH-4 into long-term low power sleep.

The battery file has the following format:

```
10/26/98  21:59:42  12.1
10/26/98  22:01:43  12.1
10/26/98  22:03:43  12.0
10/26/98  22:05:43  12.0
10/26/98  22:07:43  12.0
10/26/98  22:09:43  12.0
10/26/98  22:11:43  12.0
```

6.3.2 WET Labs Instrument Files

The DH-4 reads, performs basic validations, and stores all valid data records for all the WET Labs meter. For ac-9s, this includes performing start-to-end packet length and check sum validations. For *ECO* meters, this includes finding <CR> and <LF> at the end of each record.

6.3.3 Non-WET Labs Instruments

In both profile and moored modes, the DH-4 will attempt to read and store all data from a non-WET Labs instrument No attempt is made to validate the data. While WET Labs cannot guarantee the DH-4 will be able to read the data from all non-WET Labs instruments, the DH-4 will have a high rate of success providing there is at least a 50 ms pause between data records.

6.4 Maintenance

Built for field deployment, the DH-4 requires minimal maintenance. Following these simple recommendations will assure longer instrument life.

- After a field deployment of the DH-4, thoroughly rinse the instrument prior to storage.
- Towel-dry the pressure housing.
- Install dummy plugs on all bulkhead connectors.

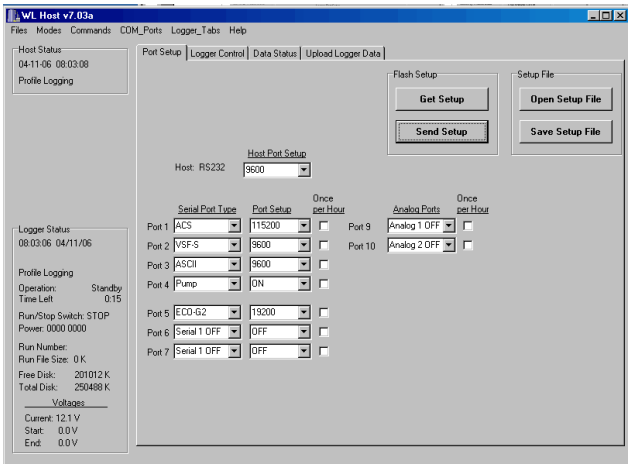
Appendix A: Configuration Worksheets

Each DH-4 and ac-9 Plus ships with a Custom Configuration Sheet to assist in understanding the meter's initial setup and configurations.

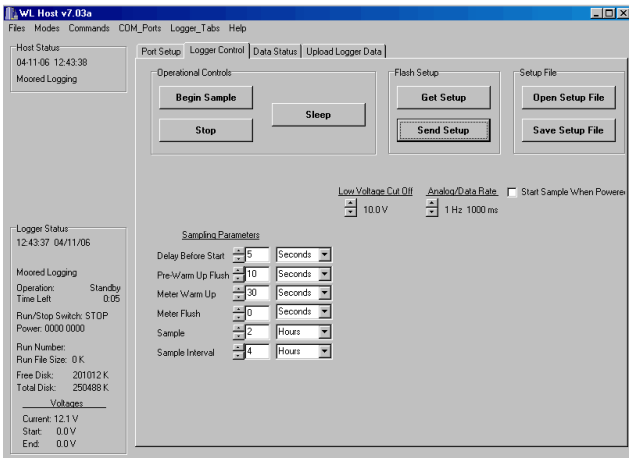
Sample Worksheet

Below is a sample of a configuration sheet using a sample system consisting of a DH-4, an ac-s, an ECO-VSFS, a CTD, pump, and ECO-FLNTUS.

Configuration settings in the Port Setup and Logger Control tabs may be more easily tracked by using the worksheet. The worksheet also helps to organize post-processing in WET Labs Archive Program (WAP).



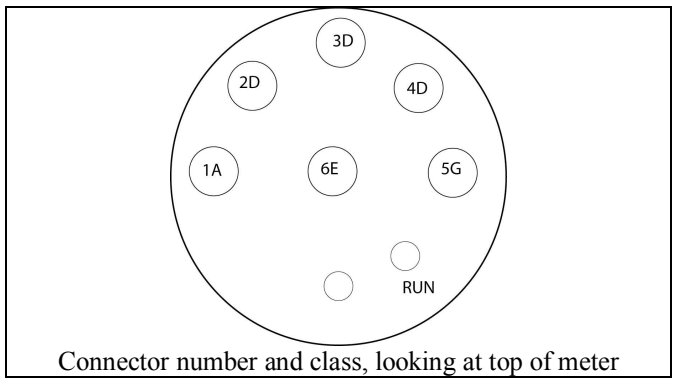
Port Setup tab



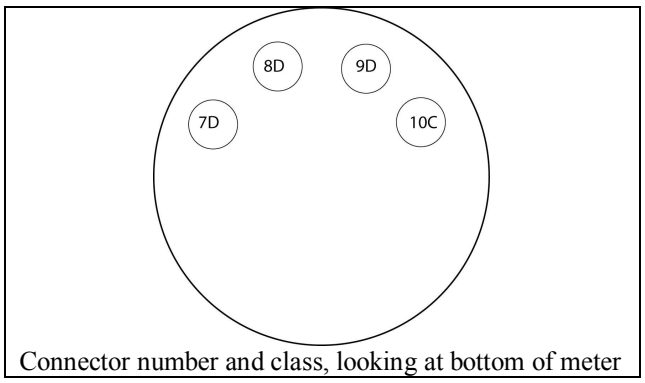
Logger Control tab

Installed Software and Firmware

Software version:	7.06	**Firmware version:**	7.03a



Connector number and class, looking at top of meter



Connector number and class, looking at bottom of meter

Port Setup and Logger Control Tab Settings

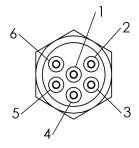
Hardware		WL Host Software					Instrument
DH-4 Bulkhead		Required for Port Setup			Required for Logger Control		Type and S/N (For reference)
# (clockwise from host)	Class	Serial Port #	Serial Port Type	Port Setup	Min. Volts	Analog/Data Rate	
Connector 1:	A		Host Port				DH-4 xxx
Connector 2:	D	1	ac-s	115200	10	8 Hz	ac-s xxx
Connector 3:	D	2	ASCII	9600	7.5	1 Hz	VSFS xxx
Connector 4:	D	3	ASCII	9600		1 Hz	CTD
Connector 5:	G	4	--	--		--	pump
Connector 6:	E	--	--	--		--	battery
Connector 7:	D	5	ECO-G2	19200		1 Hz	FLNTU xxx
Connector 8:	D	6	ASCII	19200		1 Hz	BB9 xxx
Connector 9:	D	7	--	--			--
Connector 10:	C	9	--	--			--
		10		--			

Sampling Parameters Settings from Configuration Sheet

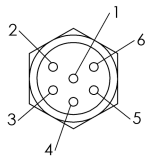
WL Host Logger Control Settings			
Sampling Parameters		Other setup parameters	
Delay before start	5 sec	Low Voltage Cutoff (minimum operating V from table above. Use highest value)	10.0 V
Pre-warm up flush	10 sec	Analog/Data Rate (from table above. Use fastest meter's data rate.)	8 Hz
Meter warm-up	30 sec		
Meter flush	0		
Sample	2 hrs		
Sample interval	4 hrs		

Bulkhead Connector Definition Diagrams

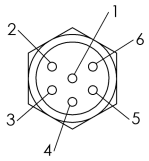
Connector Class A (Host)

Pin	Function	Diagram
1	Ground	 MCBH-6-MP
2	RS-232 RX	
3	RS-422 Y	
4	V+ (10–18 DC)	
5	RS-232 TX	
6	RS-422 Z	

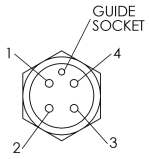
Connector Class B (Single Analog)

Socket	Function	Diagram
1	Ground	 MCBH-6-FS
2	Analog signal 1	
3	Analog 1 ground	
4	N/C	
5	N/C	
6	N/C	

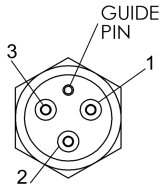
Connector Class C (Dual-channel Analog)

Socket	Function	Diagram
1	Ground	 MCBH-6-FS
2	Analog signal 1	
3	Analog 1 ground	
4	V+ (10–18 DC)	
5	Analog signal 2	
6	Analog 2 ground	

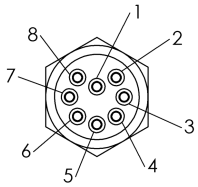
Connector Class D (Serial)

Socket	Function	Diagram
1	Ground	 MCBH-4-FS
2	V+ (10–18 DC)	
3	DH4 RS-232 RX	
4	DH4 RS-232 TX	

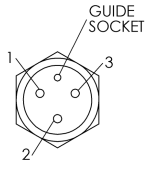
Connector E (Battery)

Pin	Function	Diagram
1	Ground	
2	V+ (10–18 DC)	
3	N/C	

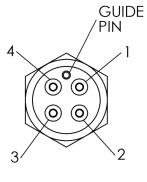
Connector F (8-pin Host)

Pin	Function	Diagram
1	Ground	 MCBH-8-MP
2	RS-232 RX	
3	RS-422 Y	
4	V+ (10–18 DC)	
5	RS-232 TX	
6	RS-422 Z	
7	RS-422 A	
8	RS-422 B	

Connector G (Pump)

Socket	Function	Diagram
1	Ground	 MCBH-3-FS
2	V+ (10–18 DC)	
3	N/C	

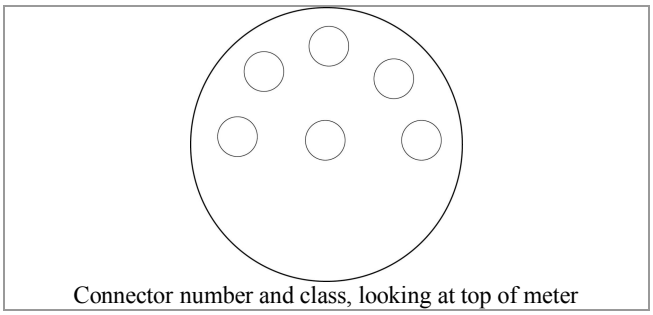
Connector H (Deep LED/Switch)

Pin	Function	Diagram
1	LED (-)	 MCBH-4-MP
2	Switch (+)	
3	LED (+)	
4	Switch (+)	

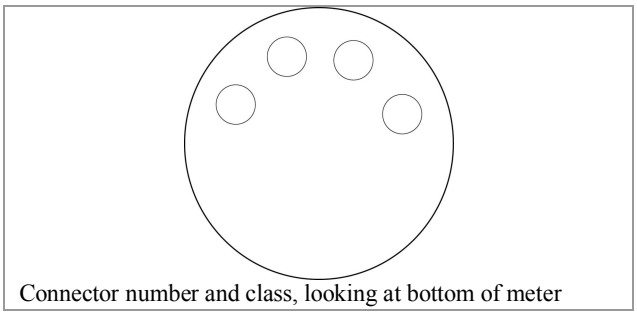
Blank Custom Configuration Worksheet

The blank worksheet below is provided as an aid in the setup of additional or replacement meters connected to the DH-4.

Date:	**Software version:**
Factory-set mode:	**Firmware version:** 7.03



Connector number and class, looking at top of meter



Connector number and class, looking at bottom of meter

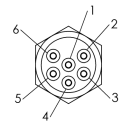
Hardware		**WL Host Software**					**Instrument**
DH-4 Bulkhead		**Required for Port Setup**			**Required for Logger Control**		**Type and S/N (For reference)**
# (clockwise from host)	Class	Serial Port #	Serial Port Type	Port Setup	Min. Volts	Analog/Data Rate	
Connector 1:	A		Host Port				
Connector 2:	D	1					
Connector 3:	D	2					
Connector 4:	D	3					
Connector 5:	G	4					
Connector 6:	E	--					
Connector 7:	D	5					
Connector 8:	D	6					
Connector 9:	D	7					
Connector 10:	C	9 10					

WL Host Logger Control Settings			
Sampling Parameters		**Other setup parameters**	
Delay before start		Low Voltage Cutoff (minimum operating V from table above. Use highest value)	
Pre-warm up flush		Analog/Data Rate (from table above. Use fastest meter's data rate.)	
Meter warm-up			
Meter flush			
Sample			
Sample interval			

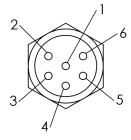
The table below lists supported meters, their data type and rate. See Section 5.1.2 for details.

Port type	Data type	Rate	Port type	Data type	Rate
ac-9	AC-9	19200	GPS	GPS	4800
ac-s	AC-S	115200	Hydroscat-2 and -6	ASCII	9600
C-Beta	ASCII	9600	LISST-100 and -100-TS	ASCII	9600
Depth	ASCII	9600	PH meter	Analog	
DH4	DH4-Mux	115200	Output port	Remote-host	
ECO (G2)	ASCII	19200	SAFire	Binary	19200
ECO (G1)	VSF-S	9600	Satlantic	Binary	
FRRF/FRRF-TS	ASCII		Voltage	Analog	
CTD-SBE37 and 49	ASCII	9600	WL Flow	ASCII	9600
CTD-SBE23 and 43	Analog	N/A	WETStar	Analog	9600
CTD-SBE37SM	SBE37-SM	9600			
CTD-SD204 (SAIV)	ASCII	9600			

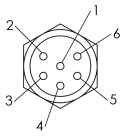
Connector Class A (Host)

Pin	Function	Diagram
1	Ground	
2	RS-232 RX	
3	RS-422 Y	
4	V+ (10–18 DC)	
5	RS-232 TX	
6	RS-422 Z	

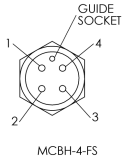
Connector Class B (Single Analog)

Socket	Function	Diagram
1	Ground	
2	Analog signal 1	
3	Analog 1 ground	
4	N/C	
5	N/C	
6	N/C	

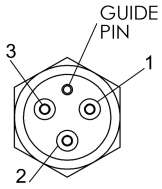
Connector Class C (Dual-channel Analog)

Socket	Function	Diagram
1	Ground	
2	Analog signal 1	
3	Analog 1 ground	
4	V+ (10–18 DC)	
5	Analog signal 2	
6	Analog 2 ground	

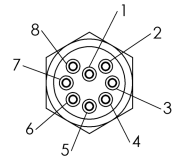
Connector Class D (Serial)

Socket	Function	Diagram
1	Ground	
2	V+ (10–18 DC)	
3	DH4 RS-232 RX	
4	DH4 RS-232 TX	

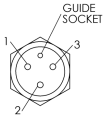
Connector E (Battery)

Pin	Function	Diagram
1	Ground	
2	V+ (10–18 DC)	
3	N/C	

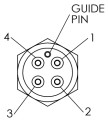
Connector F (8-pin Host)

Pin	Function	Diagram
1	Ground	
2	RS-232 RX	
3	RS-422 Y	
4	V+ (10–18 DC)	
5	RS-232 TX	
6	RS-422 Z	
7	RS-422 A	
8	RS-422 B	

Connector G (Pump)

Pin	Function	Diagram
1	Ground	
2	V+ (10–18 DC)	
3	N/C	

Connector H (Deep LED/Switch)

Pin	Function	Diagram
1	LED (-)	
2	Switch terminal	
3	LED (+)	
4	Switch terminal	

Appendix B: Real-Time Data Format

The data logger format consists of sequence binary data packets that incorporate a packet time stamp, data from all ports for the current time interval, and a packet check sum to allow validation on the receiving end. The header and Check Sum bytes are stripped off each packet before it is saved as a WET Labs Archive file.

The DH-Mux packet format is:

Function	Size (bytes)	Default/Range of values	
Header	2	0x0808	Always
Destination	1	0x01	Always
Packet Type	1	0x00-0x01	0x00=pre 6.0, 0x01=6.07 and later
Sender	1	0x00-0x04	0x02—Used for time corrections
Modulus	1	0x00-0xFF	Increments by 1 each packet
Data Length	2	0x00-0x0960	0–1024
Time	4		Packet time in ms or 100^{th}/second
Channel 1 Size	2		Number of bytes from Serial 1
Channel 2 Size	2		Number of bytes from Serial 2
Channel 3 Size	2		Number of bytes from Serial 3
Channel 4 Size	2		Number of bytes from Serial 4
Channel 5 Size	2		Number of bytes from Serial 5
Channel 6 Size	2		Number of bytes from Serial 6
Channel 7 Size	2		Number of bytes from Serial 7
Channel 8 Size	2		Number of bytes from Serial 8
Analog Size	2		Number of bytes from all Analog Ports
Data	0-1024	Data laid out in order Channel 1–8 + analog	
Pads	4	'####'	Pad characters
Check Sum	2		Summation of all bytes from Header-Data

Note: the archive file packet is the same as the real-time format except the Header and Check Sum are not present.

Appendix C: File Handling

The data logger ships with the following file types:

- .wlh: wet labs host, the factory-set defaults for the host program software
- .lst: logger setup file, containing the instrument settings for the data logger firmware
- .plt: plot setup files
- .hdw: hardware setup files
- .alg: analog setup files

The .wlh and .lst file extensions are typically the only types used. When you press Get Setup in the host program, you are loading a .lst file with the logger's last saved settings. You may overwrite those settings by changing configurations in the host software and pressing Send Setup, thus changing the firmware. If you choose to save those configurations, pressing Save Setup File will save the file as a .wlh file. This can be retrieved at a later date by selecting Open Setup File. When you select Get Setup, the last configurations sent to the logger will be used.

If you do not need to change the factory default settings, you need only select Get Setup each time you use the data logger.

Revision History

Revision	Date	Revision Description	Originator
A	3/9/00	Release v. 7 host software (S/N 020 and above) (DCR 33)	D. Romanko
B	3/26/01	Add ASCII Archive Files to host software data options (DCR 100)	D. Romanko
C	1/2/02	Correct pinouts for v.7 (DCR 174)	S. Mole
D	5/6/04	Update user's guide and software (DCR 387)	D. Romanko
E	10/14/04	Correct class D connector pin-out and ac-9 data rate (DCR 434)	A. Barnard
E1, E2, E3	4/28/05, 11/21/05, 6/12/06	Updates to reflect v. 7.03, 7.06 software	M. Levin, D. Stahlke, H. Van Zee
E5	6/19/06	Finalize software updates (DCR 501) (pending approval)	D. Romanko, D. Stahlke, H. Van Zee
E6	4/2/12	Correct graphic of battery connector pinout (DCN 792)	C. Orrico, H. Van Zee