WET Labs Archive File Processing

User's Guide

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Draft

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1. WAP Overview

The WET Labs Archive Processing program (WAP) provides primary processing of the data in WET Labs archive files.

This primary processing consists of extracting time-stamped raw data from the archive files and applying calibration coefficients to the data for all WET Labs instruments and selected instruments from other manufacturers. Secondary data processing such as data binning, sanity checks on data, statistical analysis, etc. is not provided by WAP.

WAP can process archive files created by ac-9 Plus, DH-4, DH-4 Host Program, M-Pak-3, and SMODAPS.

WAP uses three types of files:

- The **Instrument Selection File (ISF)** is used to select the instruments for each "channel" of data and matches the appropriate device or calibration files with the instruments.
- The **Extraction Setup File (ESF)** is used to define how to process the archive file.
- **The Merge Setup File (MSF)** (optional) is used to program WAP to apply time and/or depth adjustments to processed data and to combine/re-order the data from one or more of the "channels" of data into single files.

2. Example Setup

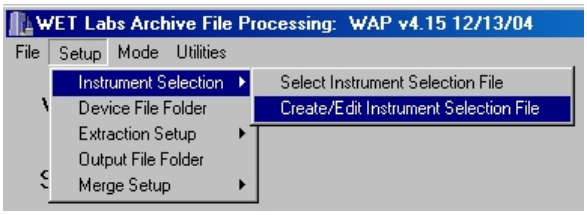
This section provides an example for using WAP to process data generated by an ac-9, an ECO scattering sensor, and a Sea-Bird CTD.

2.1 Create the Instrument Selection File

If necessary, save raw data files as engineering units ("processed files"). Show raw data file examples

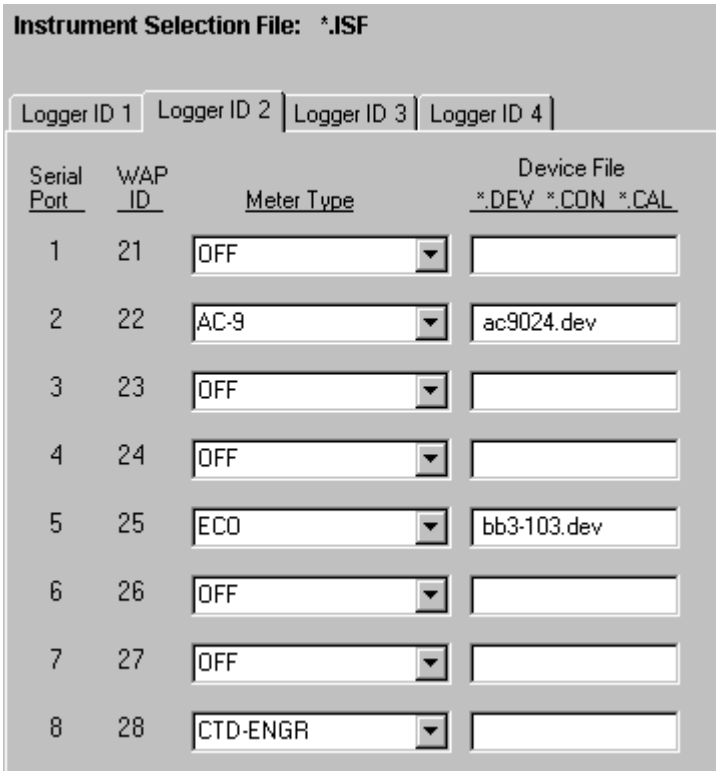
1. Start the WAP program.

2. Under Setup, select Instrument Selection > Create/Edit Instrument Selection File.



3. Select the Meter Type and enter a device file name if one is required.

Note:
The terms Logger ID, MUX ID, and DH-Mux ID are all equivalent and may be found on different versions of WET Labs host programs.

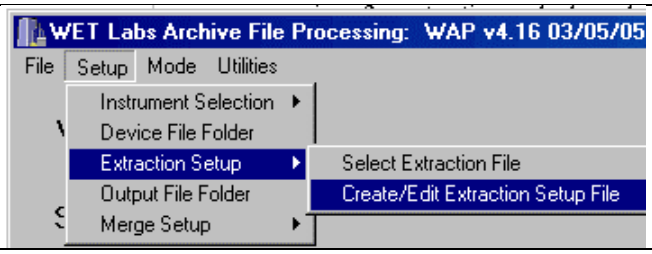


After each of the Meter Type and Device File entries have been completed, save the settings in an ISF file. Saving the ISF file will fill in the Instrument Selection File line on the main WAP window. This ISF file will be used during subsequent file extractions.

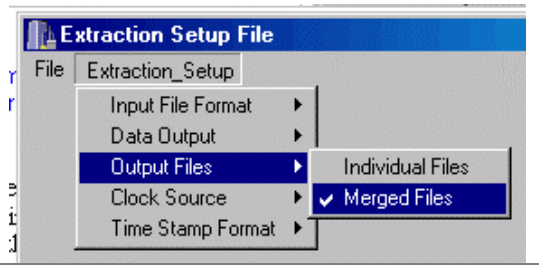
2.2 Create the Extraction Setup File

Setting up extraction files results in files that will be displayed in engineering units, or "processed data."

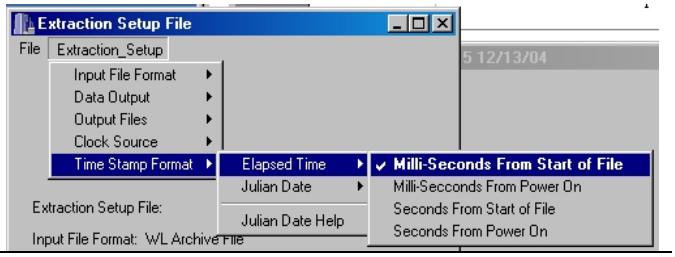
Under Setup, select Extraction Setup > Create/Edit Instrument Selection File.



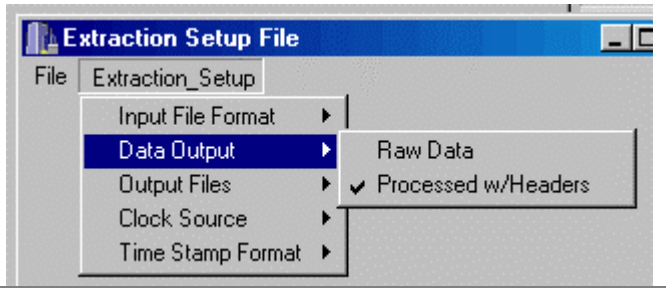
From the resulting Extraction Setup File window, select Extraction_Setup, Output Files > Merged Files.



Go to Extraction_Setup, select Time Stamp Format > Elapsed Time > Milli-Seconds from Start of File.



Go to Extraction_Setup, select Data Output > Processed w/Headers.



2.2.1 Sample "Processed" Data Files

ac-9

```
2600    0.62804  0.61504  0.14513  7.52419  7.12301  7.02498  1.25039  1.24923  1.17039  6.19652  6.22054  5.75855  1.13390
        1.07629  1.00037  7.17689  6.88197  7.07497   3.96    0.000000 0.000    43.0000  0.000000
3050    0.66094  0.57697  0.06595  6.85335  7.37558  8.05059  1.02998  0.93085  0.80378  9.28372  9.83258  7.10722  0.79776
        0.79690  0.81861  9.98000  9.43011  8.37696   3.96    0.000000 0.000    43.0000  0.000000
3480    0.60887  0.58491  0.16188  7.20626  7.37290  7.57167  1.26688  1.21685  1.08207  6.89666  7.07310  5.89578  1.06300
        0.91202  0.81686  8.14388  8.68476  8.79523   3.96    0.000000 0.000    43.0000  0.000000
3910    0.49669  0.43695 -0.05309 8.73048  9.50047  9.96003  1.08022  1.08776  1.20345  8.95776  13.73172 7.72406  1.18698
        1.11328  0.94896  8.71584  6.78011  6.10000   3.96    0.000000 0.000    43.0000  0.000000
```

CTD

```
Time(ms) Pressure Temp(C)  Conduct  Salinity
0        0.153000 2.596200 0.092870 0.810700
0        -0.084000        2.076400 0.000060 0.000000
100      -0.082000        2.074200 0.000060 -0.000000
100      -0.087000        2.072300 0.000060 -0.000000
200      -0.084000        2.070600 0.000050 -0.000100
300      -0.077000        2.068900 0.000040 -0.000100
300      -0.083000        2.067500 0.000040 -0.000100
```

ECO BB3

```
Time(ms) Beta(470)        BetaP(470)       bbP(470) bb(470)  Beta(530)        BetaP(530)       bbP(530) bb(530)
         Beta(650)        BetaP(650)       bbP(650) bb(650)
500      0.000223 -0.000043        -0.000297        0.001608 0.000164 0.000006 0.000039 0.001183 0.000280 0.000215
         0.001485 0.001967
900      0.000211 -0.000055        -0.000382        0.001523 0.000135 -0.000023        -0.000158        0.000986
         0.000995 0.000929 0.006423 0.006904
1400     0.000050 -0.000217        -0.001497        0.000408 0.000114 -0.000044        -0.000306        0.000838
         0.000718 0.000652 0.004510 0.004992
```

2.3 Create Merge Setup Files

Creating merged files allows you to select and combine outputs from various meters into a single file.

A sample worksheet based on the three example meters is shown below. The numbers on column heads correspond to the area of the WAP window the information comes from.

Processed files may be merged on time or depth. In the following example, merged on time, the CTD file (WAP ID 28) will be merged with the ac-9 file (WAP ID 22). This will result in pair 01, which will then be merged with the BB data (WAP ID 28).

1	2	3	4	--
WAP ID	**# Header rows**	**Total # data columns**	**Merge column #**	**Columns to display (from #3)**
22	31	24	1	1–20
25	1	13	1	2–13
28	1	5	1	2–5

1 WAP ID This ID number is assigned to each extraction setup file (see section 2.2)

2 and 3 # Header rows and data columns

2 Header rows (WAP ID 22, ac-9) *(not all columns of data are shown).*

Row 1	WetView ver 99.0A										1/1/2000 00:00:00 Create By WAP v4.XX												
2	AC9 Absorption and Attenuation Meter																						
3							294				; Serial number												
4							2 ; structure version number																
5	Reserved																						
6							0		0		; Depth calibration												
7							19200				; Baud rate												
8							0.25				; Path length (meters)												
9							26				; number of temperature calibration bins												
10																12.74631	13.38563	14.42027	15.48011	16.46771			
11	a650			Blue				7.8769								0.0002	0.00015	0.00026	0.0008	0.00117			
12	a676			Green				7.81458								-0.0009	-0.00017	0.00087	0.001	0.0005			
13	a715			Brown				7.27705								0.00049	0.00054	0.00014	0.00089	0.00204			
14	c510			Red				7.70774								-0.00047	-0.00018	0.00001	0.0001	0.00036			
15	c532			Magenta				7.68331								0.00142	0.00175	0.002	0.0024	0.00273			
16	c555			Black				7.73036								-0.00134	-0.00115	-0.00094	-0.00071	-0.00044			
17	a412			LtBlue				7.49791								-0.01051	-0.00973	-0.00865	-0.00734	-0.00632			
18	a440			LtGreen				7.76846								-0.01083	-0.00984	-0.00833	-0.00681	-0.00553			
19	a488			Yellow				7.95599								-0.00185	-0.00135	-0.0009	-0.00043	-0.00018			
20	c650			Blue				7.51281								-0.003	-0.00247	-0.00186	-0.00127	-0.00083			
21	c676			Green				7.39467								-0.00011	-0.00002	0.00002	-0.00009	-0.00007			
22	c715			Brown				6.56831								-0.0078	-0.00715	-0.00653	-0.00594	-0.00529			
23	a510			Red				8.00108								-0.00259	-0.00217	-0.00162	-0.00129	-0.00112			
24	a532			Magenta				8.00835								-0.00005	0.00046	0.00068	0.00117	0.00159			
25	a555			Black				8.03699								-0.0026	-0.0024	-0.00189	-0.00155	-0.00163			
26	c412			LtBlue				7.23282								-0.00249	-0.00147	-0.00036	0.00081	0.00136			
27	c440			LtGreen				7.4856								-0.00845	-0.00738	-0.00585	-0.00458	-0.00328			
28	c488			Yellow				7.68282								-0.00069	-0.00022	0.00015	0.00051	0.00095			
29							0.0035		0.004	0.015		0.02				0.015	0.02	2500	2000	1000			
30							0				; auxilliary capabilities												
31							1				; aquisition bin size												

3 Data columns (ac-9)

2600	0.62804	0.61504	0.14513	7.52419	7.12301	7.02498	1.25039	1.24923	1.17039	6.19652	6.22054	5.75855	1.1339	1.07629	1.00037	7.17689	6.88197	7.07497	3.96	0	0	43	0
3050	0.66094	0.57697	0.06595	6.85335	7.37558	8.05059	1.02998	0.93085	0.80378	9.28372	9.83258	7.10722	0.79776	0.7969	0.81861	9.98	9.43011	8.37696	3.96	0	0	43	0

2 Header row (WAP ID 28, CTD)

Time (ms)	Pressure	Temp(C)	Conduct	Salinity

3 Data columns (CTD)

0	0.153	2.5962	0.09287	0.8107
0	-0.084	2.0764	0.00006	0
100	-0.082	2.0742	0.00006	0
100	-0.087	2.0723	0.00006	0

2 Header row (WAP ID 25, BB meter)

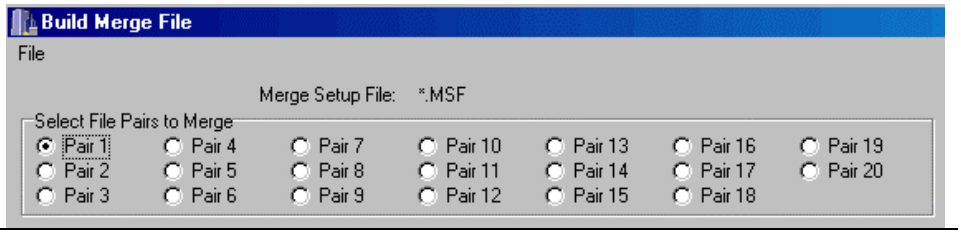
Time(ms)	Beta(470)	BetaP(470)	bbP(470)	bb(470)	Beta(530)	BetaP(530)	bbP(530)	bb(530)	Beta(650)	BetaP(650)	bbP(650)	bb(650)

3 Data columns (BB meter)

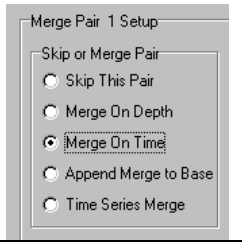
500	0.000223	-0.000043	-0.000297	0.001608	0.000164	0.000006	0.000039	0.001183	0.00028	0.000215	0.001485	0.001967
900	0.000211	-0.000055	-0.000382	0.001523	0.000135	-0.000023	-0.000158	0.000986	0.000995	0.000929	0.006423	0.006904
1400	0.00005	-0.000217	-0.001497	0.000408	0.000114	-0.000044	-0.000306	0.000838	0.000718	0.000652	0.00451	0.004992
1700	-0.000112	-0.000378	-0.002611	-0.000706	0.000135	-0.000023	-0.000158	0.000986	-0.000034	-0.000099	-0.000686	-0.000204

1. Select Setup: Merge Setup > Create/Edit Instrument Selection File to create a new Merge Setup File.

2. Select Pair 1. These will be the first files merged.

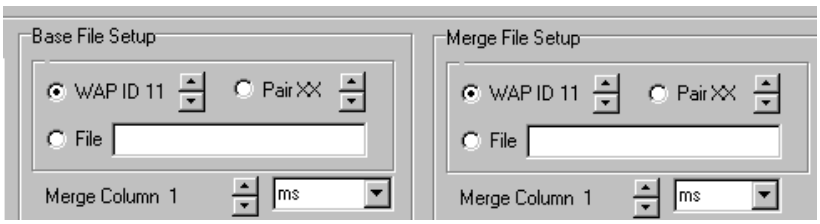


3. Select Merge On Time. The Base File Setup and the Merge File Setup boxes will appear (see below).



4 Merge Column

4. In the Merge Column areas under Base File Setup and Merge File Setup, use the arrows to ascend or descend to the first column of data you wish you to merge (typically column 1). Automatically saves?



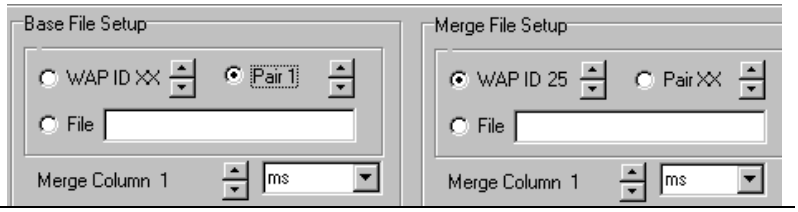
Use the sample worksheet below to help configure the second part of the merge: The ac-9 and CTD files are merged to create Pair 01. The BB file is then merged into Pair 1, forming Pair 02.

	1	4	1	4	5
Pair	**Base File Setup WAP ID**	**Merge Column #**	**Merge File Setup WAP ID**	**Merge Column #**	**Display Column Order**
01	22	1	28	1	b1–20, m2–5
02	Pair 01	1	25	1	b1–24, m2–13

1 Base and Merge File Setup

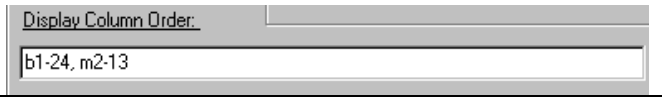
4 Merge Column

Select Pair 1 as the Base File.
Select WAP ID 25 (BB meter) as the file to merge.



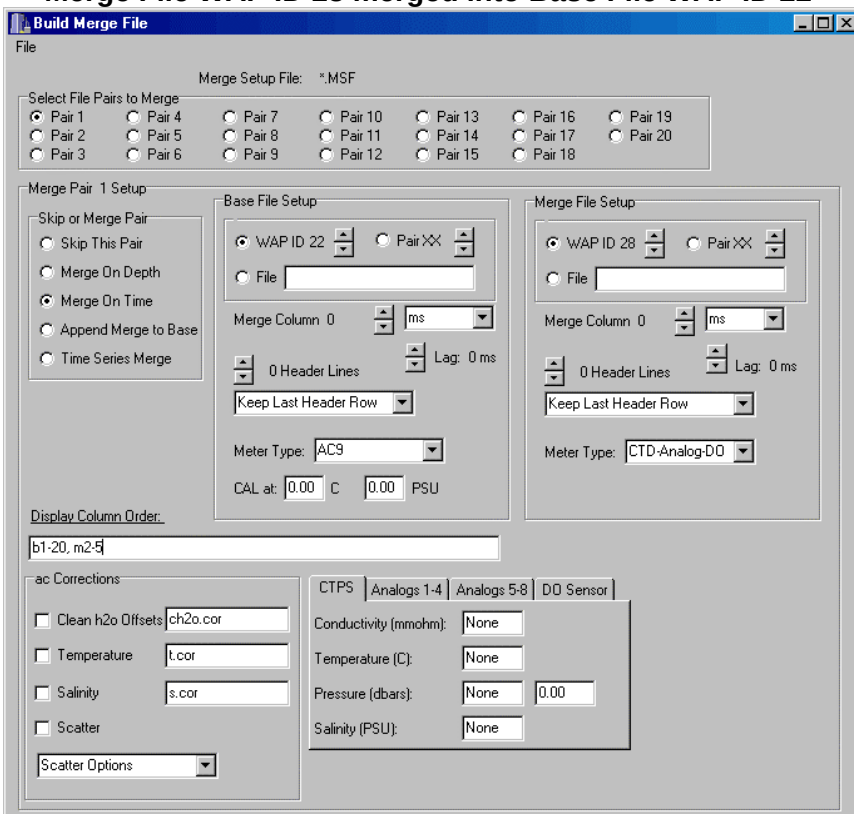
5 Display Column Order

Pair 01: Command to display columns 1–20 of the ac-9 data, followed by columns 2–5 of the merged CTD data.
Pair 02: Command to display 20 columns of ac-9 data, 4 columns of CTD data, followed by 12 (2–13) columns of merged BB data.

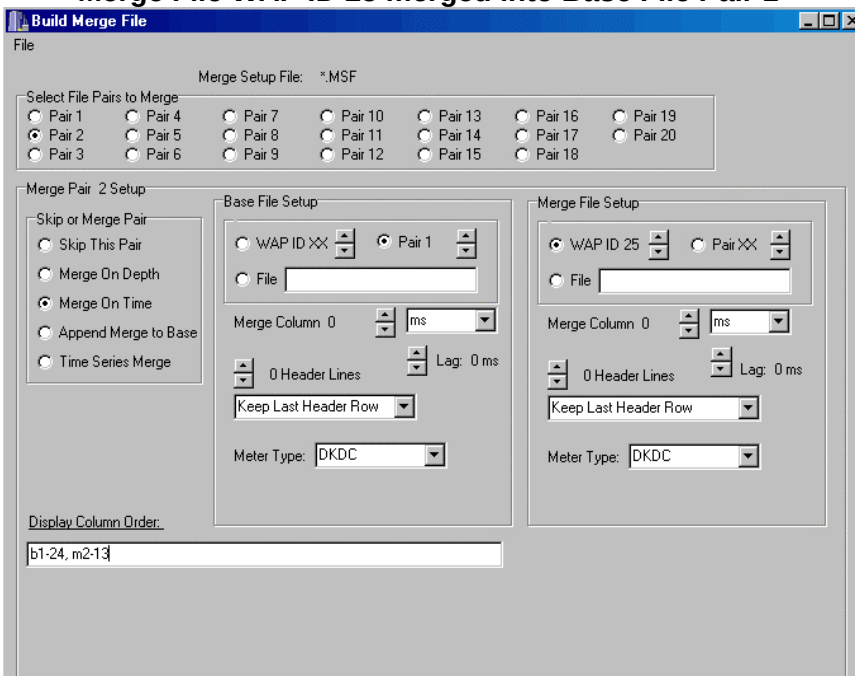


The figures below show all of the selections for merging to pair 01 and then 02, with details following.

Merge File WAP ID 28 merged into Base File WAP ID 22



Merge File WAP ID 25 merged into Base File Pair 1



1. Set the Lag in milliseconds for both the Base and Merge files. (0 ms is perfectly acceptable.) A positive lag will cause a record to be merged later than file time indicates. For example, if a lag is set to 1000 ms, a record collected at 2500 ms will be processed and labeled as 3500 ms.

2. Identify how many rows of header information (column 2 of the first worksheet) the base file and the merge files have and set the Header Lines for both accordingly.

3. Select whether you want to keep the last header line as column headers in the merged file or whether you want to discard all header lines.

4. Select the Display order for each merge record. The details regarding the usable parameters are defined below.

5. If you are merging on time, you can still apply a depth offset to the output records by (a) identifying a base or merge column as the depth under the CTPS / Pressure setting, (b) placing a HAD in the second location on the CTPS pressure setting line, (c) in the output string, place “iPres” (insert Pressure) as an output item.

6. Select File/Save As to save the Merge Setup as a file.

2.3.1 Example Merged Files

ac-9 and CTD

```
Time(ms) a650__   a676__   a715__   c510__   c532__   c555__   a412__   a440__   a488__   c650__   c676__   c715__
         a510__   a532__   a555__   c412__   c440__   c488__   I-Temp   Pressure Temp(C)  Conduct  Salinity
2600.000000       0.628040 0.615040 0.145130 7.524190 7.123010 7.024980 1.250390 1.249230 1.170390 6.196520
         6.220540 5.758550 1.133900 1.076290 1.000370 7.176890 6.881970 7.074970 3.960000 -0.075000
         2.081300 0.000170 0.000600
3050.000000       0.660940 0.576970 0.065950 6.853350 7.375580 8.050590 1.029980 0.930850 0.803780 9.283720
         9.832580 7.107220 0.797760 0.796900 0.818610 9.980000 9.430110 8.376960 3.960000 -0.088000
         2.093100 0.000190 0.000800
3480.000000       0.608870 0.584910 0.161880 7.206260 7.372900 7.571670 1.266880 1.216850 1.082070 6.896660
         7.073100 5.895780 1.063000 0.912020 0.816860 8.143880 8.684760 8.795230 3.960000 -0.078000
         2.098700 0.000200 0.000900
```

ac-9, CTD, and BB3

```
Time(ms) a650__   a676__   a715__   c510__   c532__   c555__   a412__   a440__   a488__   c650__   c676__   c715__
         a510__   a532__   a555__   c412__   c440__   c488__   I-Temp   Pressure Temp(C)  Conduct  Salinity
         Beta(470)         BetaP(470)         bbP(470) bb(470)  Beta(530)         BetaP(530)         bbP(530) bb(530)
         Beta(650)         BetaP(650)         bbP(650) bb(650)
2600.000000       0.628040 0.615040 0.145130 7.524190 7.123010 7.024980 1.250390 1.249230 1.170390 6.196520
         6.220540 5.758550 1.133900 1.076290 1.000370 7.176890 6.881970 7.074970 3.960000 -0.075000
         2.081300 0.000170 0.000600 -0.000025         -0.000291         -0.002011         -0.000106
         0.000121 -0.000037         -0.000257         0.000888 0.000056 -0.000009         -0.000066
         0.000416
3050.000000       0.660940 0.576970 0.065950 6.853350 7.375580 8.050590 1.029980 0.930850 0.803780 9.283720
         9.832580 7.107220 0.797760 0.796900 0.818610 9.980000 9.430110 8.376960 3.960000 -0.088000
         2.093100 0.000190 0.000800 -0.000050         -0.000316         -0.002182         -0.000277
         0.000107 -0.000051         -0.000355         0.000789 0.000052 -0.000013         -0.000091
         0.000390
```

3. Reference

3.1 Instrument Selection File (ISF)

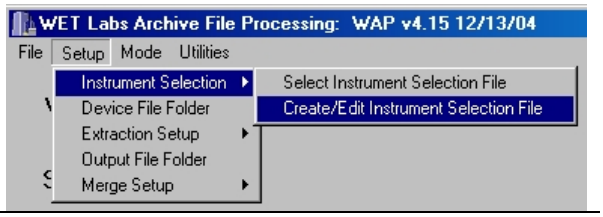
An Instrument Selection File (ISF) is used to tell WAP how the data from every channel is going to be processed. The file includes information regarding meter type and the meter's respective calibration or device files. WAP can process an archive file with data from up to 4 independent loggers.

3.1.1 Create or Modify an Existing ISF

To create a new ISF or modify an existing ISF, enter information as described below.

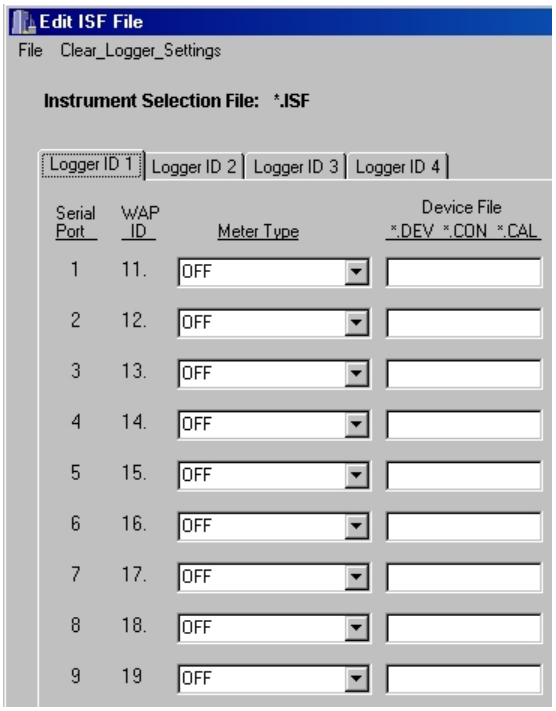
1. Start the WAP program.

2. Under Setup, select Instrument Selection > Create/Edit Instrument Selection File.



Logger ID Tabs and Settings

In the resulting window there are 4 tabs labeled Logger ID 1–Logger ID 4. These correspond to the Logger or MUX IDs associated with each WET Labs data logger when the data logger is configured. The Logger ID is embedded in each data packet of every archive file.



Note:
The terms Logger ID, MUX ID, and DH-Mux ID are all equivalent and may be found on different versions of WET Labs host programs.

If multiple data loggers were used in the creation of an archive file, each data logger must have a unique Logger ID.

- Logger ID 1 is the default ID for the DH-4 Host Program, the SMODAPS Deck Unit, and M-PAK 3's (Dave, check this), and early versions of the DH-4 and ac-9Plus.

- Logger ID 2 is the default ID for Version 5.xx and newer DH-4, ac-9Plus, and SMODAPS sub units.

- Logger ID 3 and Logger ID 4 are optional IDs for DH-4 and ac-9Plus.

- **Serial Port 1–9**

The Serial Port column consists of numbers 1–9. These numbers correspond to a mix of serial data and analog data channels from the various data loggers. Each WET Labs data logger will have up to 8 serial data ports and 0–7 analog ports.

On the DH-4, M-PAK 3, and the SMODAPS, Mux Ports 1–8 correspond to the WAP Serial Ports 1–8. If the DH-4 or M-PAK 3 has analog data, it will be identified as Serial Port 9 on WAP.

On the ac-9 Plus, Serial Port 1 is the ac-9 data. Serial Ports 2–4 (Hey Dave, check how many serial Ports the ac-9Plus has) are the external serial ports 1–3. If the ac-9Plus has analog data, it will be listed as Serial Port 9 on WAP.

- **WAP ID**

The WAP ID column contains the numbers 11–19, depending on which Logger ID tab is currently selected. The tens digit (1x, 2x, 3x, and 4x) represents the Logger ID; the ones digit (x1, x2 … x8, x9) represents the Serial Port.
For example:
WAP ID 23 indicates the data is from Logger ID 2, the 3rd serial port.
WAP ID 39 indicates that the data is from Logger ID 3, the analog port.

As WAP processes each archive file, a single data file will be created for each instrument. The WAP ID associated with each instrument will be embedded in the extracted output file name to help identify which instrument's "channel" you are looking at. (Hey Dave, a bit clumsy …an example??)

- **Meter Type**

Each "channel" of data has a Meter Type selection. WAP will alter the way it processes the data (data verification, time stamps, conversion to engineering units) according to which meter type is selected. See Appendix C, WAP Meter Types, for a complete description of each meter.

- **Device File**

Each "channel" of data has a device file selection that is used to convert data from its "raw" state, as collected, to "processed," or engineering units. Device file selections are dependent on the Meter Type selected. See Appendix C: WAP Meter Types, WAP Meter Types, for a complete description of each meter.

Device files are typically listed as *.dev for WET Labs instruments, *.con for Sea-Bird CT an CTD meters, and *.cal for Satlantic instruments.

3. Select the Logger ID tab that matches the Logger ID used to create the archive file.

4. For each "channel" of data collected, select the Meter Type and enter a device file name if one is required. (See Appendix B for device file requirements for each meter type.)

Note that if a Meter Type is selected (not set to OFF), an output file will be created whether or not a meter is physically present.

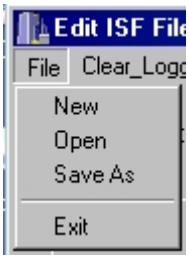
If you do not wish to process data from one or more channels, leave the meter selection OFF.

5. If multiple data loggers were used in an archive file, repeat steps 3 and 4 for each data logger.

6. After all the Meter Type and device file entries have been completed, save the settings in an ISF file.

   Saving the ISF file will fill in the Instrument Selection File line on the main WAP window. This ISF file will be used during subsequent file extractions.

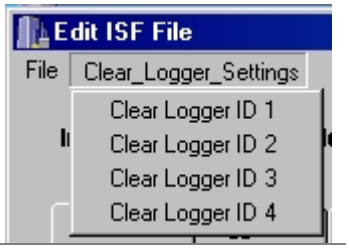
3.1.2 File Menu Options



- New: clears all 4 Logger ID tabs, enabling the user to start with a clean ISF slate.
- Open: open and load an existing ISF. This is used to review or modify a previously saved ISF.
- Save As: saves all the current settings for all 4 Logger ID tabs for all Meter Types and device file entries.
- Exit: closes the Edit ISF File window without saving the current ISF settings.

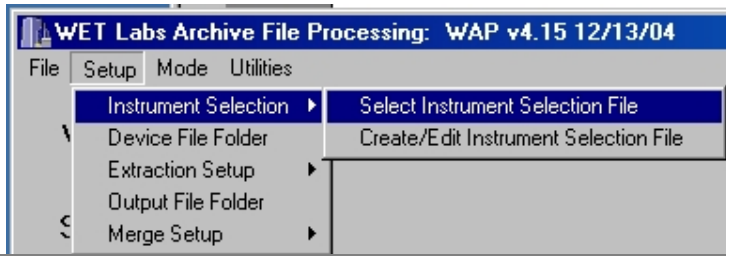
3.1.3 Clear Logger Settings

Clear Logger ID 1–Clear Logger ID 4 can be used to erase the Meter Types and device file selections for respective Logger ID tabs. This may come in handy when modifying existing ISF files.



3.1.3 Select an Existing ISF

Selecting an ISF will fill in the Instrument Selection File line on the main WAP window. This file type will be used during subsequent file extractions.



3.2 Extraction Setup File (ESF)

The Extraction Setup menu items are used to configure how WAP is going to process each data file.

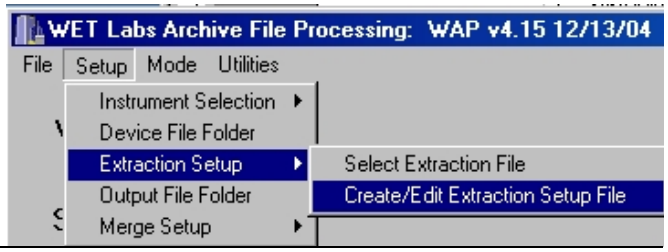
✓*Tip* Since getting WAP set up to run to a successful completion usually takes several iterations of setup and extraction, WET Labs strongly recommends the user extracts the data to raw files to verify that the data for each meter seems to have been recorded correctly.

✓*Tip* It is recommended that two ESF files be created for each archive file data set: one for raw data extraction and one for processing the data to engineering units. The raw data ESF file can be used to see that the data is being correctly recorded by the data logger being used. The processed ESF file can then be used to extract and process the data to engineering units.

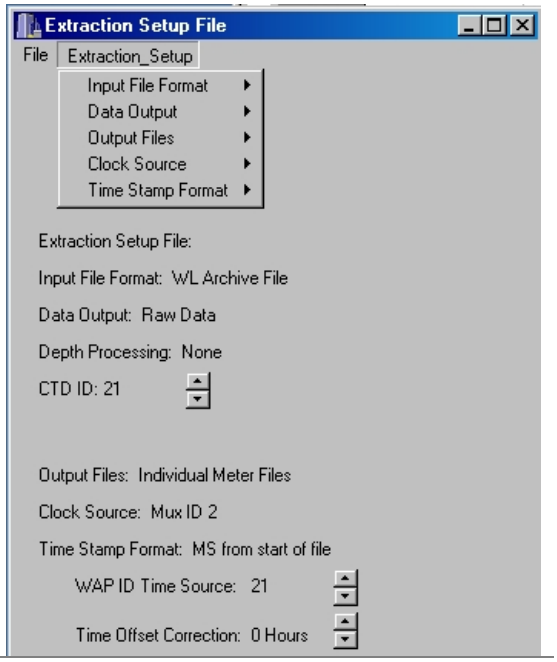
To create a new ESF or modify an existing one, enter information as described below.

1. Start WAP.

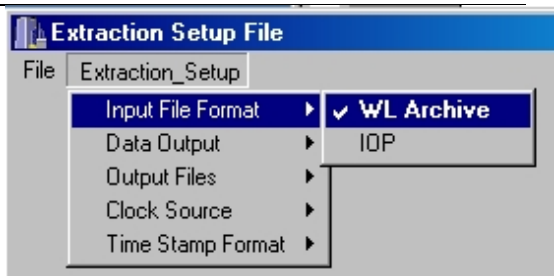
2. Under Setup, select Extraction Setup > Create/Edit Extraction Setup File.



3. Determine, enter, and save if desired the following settings.
   - Input File Format
   - Data Output
   - Output Files
   - Clock Source
   - Time Stamp Format

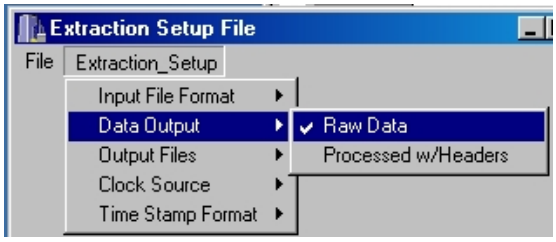


- **Input File Format**
  Indicates the file format WAP will process. The usual and default setting is WL Archive—WET Labs Archive File—the standard archive file for ac-9+, DH-4, M-PAK3, and SMODAPS. The IOP file setting is a non-standard file and is not used by most users.

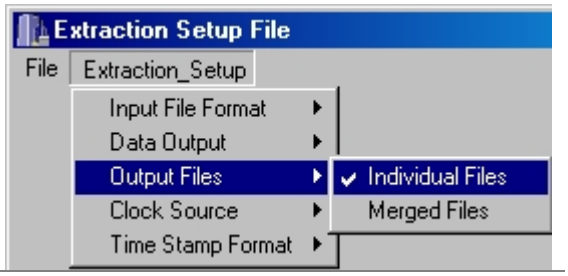


- **Data Output**
  If WAP is set to output raw data, no data conversion will be performed on the extracted data, and the resulting files will be archived raw. Where possible, WAP will perform minimal data checking for selected instruments to validate the raw data packets before saving the data. To get byte-for-byte, "pure" raw data without any data checking, use the Binary option under Meter Type in the ISF options.

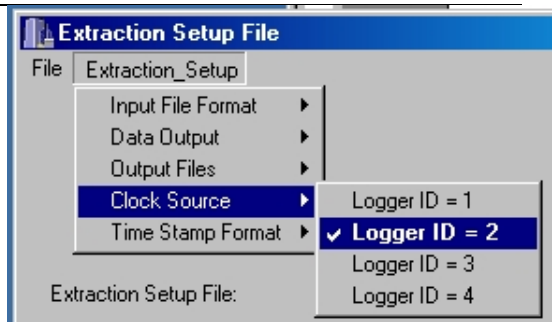
  When WAP is set to output processed data, it will attempt to convert each channel according to the meter type and device file selected under ISF options.



- **Output Files**
  WAP will stop processing after extracting each channel of data, or will proceed to data merging. If Merged Files is selected, the user must set up a Merge Setup File to direct that processing.

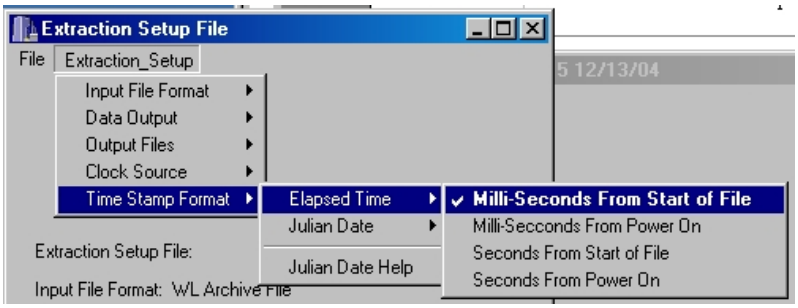


- **Clock Source**
  Identifies which Mux or Logger ID records are to be used as the time source for the entire archive file. When data is recorded in a single logger configuration, this is usually set to Logger ID = 2, the factory default setting. If no records are found using ID 2, try the other IDs.

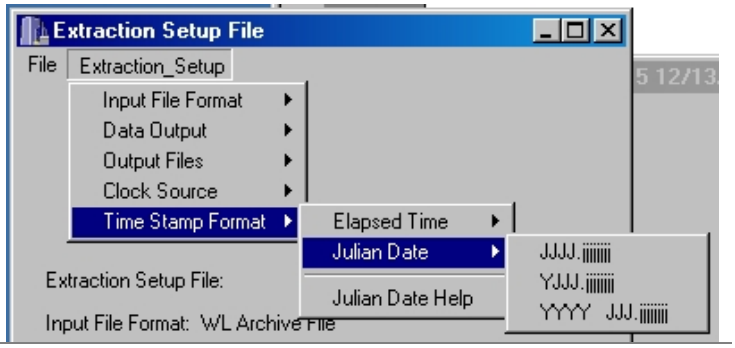


Note:
The terms Logger ID, MUX ID, and DH-Mux ID are all equivalent and may be found on different versions of WET Labs host programs.

- **Time Stamp Format**
  Time stamps for each processed record can be in milliseconds, seconds, or Julian Date. Please use milliseconds.

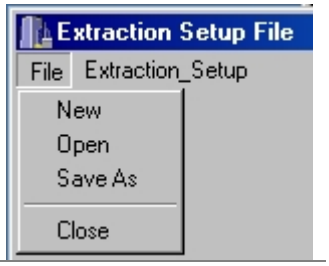


If you choose Julian Date as a time stamp, select a format from the Time Stamp Format > Julian Date > menu.



3.2.1 File Menu Options

- New: clears any existing extraction settings; replaces them with program defaults.
- Open: opens and loads a previously saved ESF.
- Save As: saves all the current settings in an ESF.
- Close: closes the ESF Setup File window. A prompt will appear if any changes have been made to ESF settings.



3.3 Merge Setup File (MSF)

The Merge Setup File is used to control the WAP merging process. This data merging occurs at the end of the archive file extraction process and is used to (a) process analog data recorded in CTD records or WET Labs loggers (such as DH-4 or ac-9 Plus), and (b) create files that contain the data from multiple instruments that is time/depth aligned.

WAP file merging is executed as series of sequential file merges performed on two files at a time. The merge routines sequentially step through pairs of files, with each step resulting in a merged file called pair.xx. Each step can build upon the previously created pairs. For example, if the first merged pair contains data from an ac-9 and a CTD, the second merged pair could add in the data from a second ac-9, creating a merged file with two ac-9s and a CTD.

Each pair of files consists of a "base" file and a "merge" file. The base is used to determine the time or depth resolution for the merged pair.

At the basic level, the user

- Selects a pair of files to merge
- Identifies whether the files will be merged using depth or time
- Identifies the depth or time columns in the base and merge files
- Sets the time or depth corrections for both the base and merge file (if any)
- Selects how many lines of header information is in the file
- Sets up special ac meter data processing (specific sections below)
- Identifies analog channels and their corresponding device files
- Formats the output records.

3.3.1 Merge Setup File Creation

To create a Merge Setup File:

1. Select File/Merge Setup/Create/Edit Merge Setup File from the main menu. A Build Merge File window will appear.
   - To create a new MSF file, select File /New from the Build Merge File window.
   - To edit an existing MSF file, select File/Open from the Build Merge File window.

2. Select a file pair (1–20) to configure. Pair 1 will be the first file merged. Pair 20 will be the last. Note that you cannot proceed unless a pair is selected.

3. Select Merge On Depth or Merge On Time in Skip or Merge Pair box. This will cause Base File Setup and the Merge File Setup boxes to appear.

4. Select the Extracted Channel, Merged Pair, or File for both the base file and merge file. The Extracted Channel corresponds to the IDs listed in the ISF file. The Merged Pair is 1–19 and is a file from a previously set up merged pair. File is an ASCII file from that has been processed from non-WET Labs programs.

5. Set the Merge Column for both the Base and Merge files that corresponds to the depth or time columns (whichever you are merging on).
   - If you are merging on **time**:
     Enter a lag in ms for both the Base and Merge files. (0 ms is perfectly acceptable.) A positive lag will cause a record to be merged later than file time indicates. For example, if a lag is set to 1000 ms, a record collected at 2500 ms will be processed and labeled as 3500 ms.
   - If you are merging on **depth**:
     Enter a Height Above Datum (HAD) for both the Base and Merge Files. (0 cm is perfectly acceptable.) The datum point is usually the CTD pressure sensor location. If a measurement surface of inlet tube is located above the datum point (or pressure sensor), the height will be subtracted off the depth measurement. For example, if a sensor is located 50 cm above the CTD pressure sensor, the data from that sensor

6. Identify how many rows of header information the base file and the merge files have and set the Header Lines for both accordingly.

7. Select whether you want to keep the last header line as column headers in the merged file or whether you want to discard all header lines.

8. If one of the meters is an ac-9 or ac-s:
   - Select ac9 as the meter type. Otherwise, leave the meter type as DKDC (Don't Know, Don't Care). Selecting a meter as ac9 will enable the user to perform clean water, temperature, salinity, and scattering corrections. See the appropriate sections below for details.

9. Select the Display order for each merge record. The details regarding the usable parameters are defined below.

10. If you are merging on time, you can still apply a depth offset to the output records by (a) identifying a base or merge column as the depth under the CTPS / Pressure setting, (b) placing a HAD in the second location on the CTPS pressure setting line, (c) in the output string, place "iPres" (insert Pressure) as an output item.

11. Repeat steps 2–10 until all the merged pairs have been defined.

12. On the menu, select File/Save As to save the Merge Setup as a file.

Note

In practice, setting up a complex MSF will take several iterations to get all the correct column selections and merge options set correctly. It is recommended that the user only attempt to set up one or two pairs of files at a time, making sure they are correct before setting up additional pairs that may be dependent on earlier merges.

3.3.2 Merge Data Files

A number of file types are created/used during the ASCII Data File merging process. Those files types are:

***_RMG.xxx**: During the extraction process, (executed from the File Extraction tab), a file is created called *_MRG.xxx, where * is the extraction ISF file name, and xxx is the run number. This *_MRG.xxx file is contains the file name information from each extraction that is needed to perform the data merging.

Example: SC.ISF (for Summer Cruise) is used to extract SCDF.030 (for Summer Cruise Data File Number 30). The extraction process will create a file call SC_MRG.030 that will contain a list of all the files as identified by SC.ISF

***.msf**: A Merge Setup File is created on the "Merge Setup" tab of the WAP program. This file contains blueprint on how the data files listed in and *_EXT.XXX file will be merged.

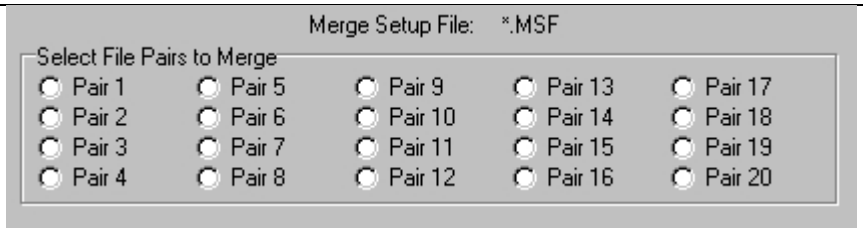
pair files: During the merging process, files called isf_pair_yy.xxx will be created where ini is the ISF file name, yy is the archive file data channel or port, and xxx is the run number from the original archive file number. There will be one file for each pair of files merged. Currently, all the pair files are overwritten every time a merge is performed, so they must be save or renamed if the same files are to be merged using a different set of parameters.

Device Files: A number of device files may be used in WAP's merge procedure to provide further data processing of analog data. The instruments WAP can currently process and example device files are found in the appendix.

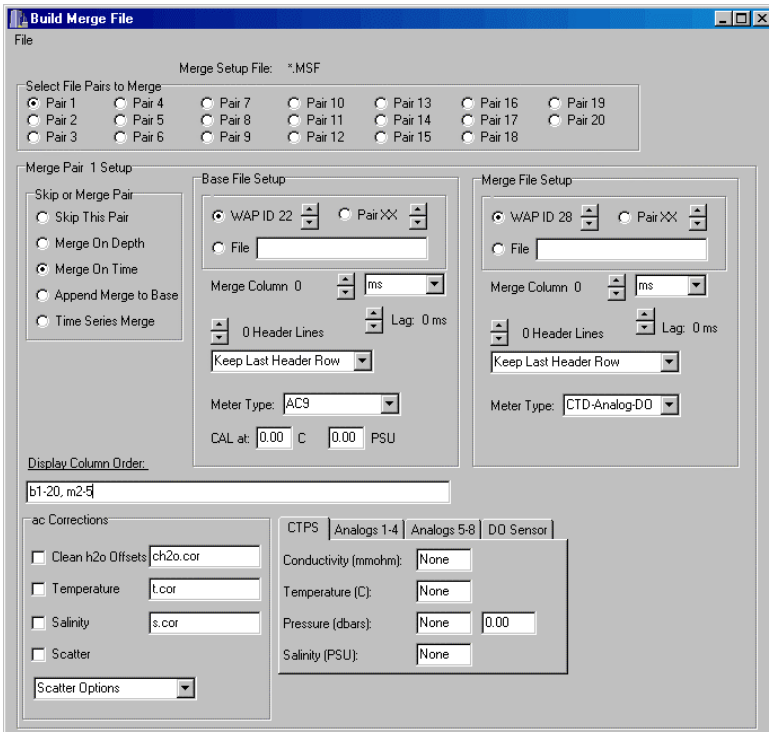
Temperature and Salinity Correction Files: Data for the ac-9 (and to some extent the HiStar) may be scatter-corrected for temperature and salinity (for the ac-9 only). The default values for the temperature and salinity corrections (as listed in the ac-9 manual) may be used, or the user may list temperature and salinity correction files. The file formats are shown in the Appendix.

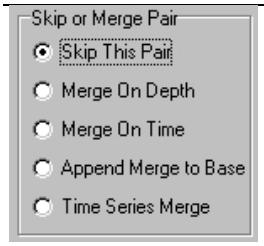
3.3.3 Merge Setup Controls

Select File/ Pairs To Merge will select a file pair to be displayed in the Merge Pair XX Setup box. If the parameters for a pair are displayed, they can be changed. Starting with Pair 1, define the files you want to work with, and what processing you want done to them. Once a pair has been selected, its merge parameters will be displayed and may be changed.



As each pair is selected, the bottom portion of the program display will show the pair selected for display, and all its current parameters.





The **Skip or Merge** box determines whether and how the two data files will be merged.

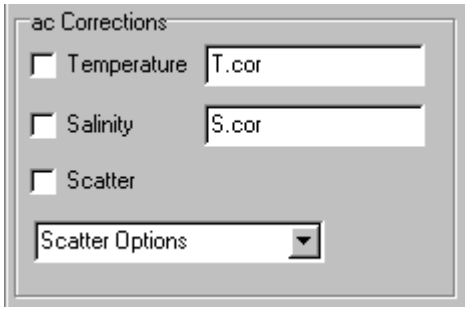
If Skip this Pair is selected, WAP ignores any all other parameters within the Merge Pair XX Setup group box and proceeds to the next pair.

If Merge On Depth is selected, WAP will merge the base and merge data files based on the depth columns identified under the Depth Column XX of the Base File Setup and Merge File Setup.

If Merge On Time is selected, WAP will merge the base and merge data files based on the time columns identified under the Time Column XX of the Base File Setup and Merge File Setup.

Append Merge to Base (*not tested as of this revision*) is selected to append two files together without performing any other merge processing. This is useful to "pre-pend" a header file to the a data file. If this option is selected, the entire "base" file will be copied to the "pair" file, followed by entire "merge" file.

Time Series Merge: not yet functional.



If a meter type of ac-9 is selected in either the Base File Setup or Merge File Setup boxes, the ac Corrections is used to determine what absorption or scatter corrections will be applied to the ac meter data.

Note: these corrections may only be applied to the WETView-compatible data files generated by WETView or during the archive file extraction process of WAP. Once a record order has been altered by a merge, applying the ac Corrections will result in erroneous data.

Selecting Temperature causes the temperature corrections, as found in the file listed in the t.cor edit box, to be applied to the ac data. If the file listed in the t.cor edit box is not found or it the file format is not correct, data merging will be halted

Selecting Salinity causes the salinity corrections, as found in the s.cor edit box, to be applied to the ac data. If the file listed in the s.cor edit box is not found or if the file format is not correct, data merging will be halted.

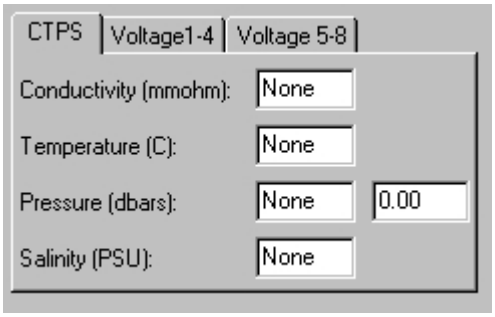
Selecting Scatter causes 1 of 3 scatter corrections to be applied to the ac data. The three scatter options are the same as the listed in the ac-9 manual:

1. **Base Wavelength Subtraction** using a715 as the absorption wavelength being subtracted.
2. **(c-a)%** where a percentage of the c–a measurement is used as the scattering correction.
3. **Zaneveld Method** listed in the ac-9 manual.

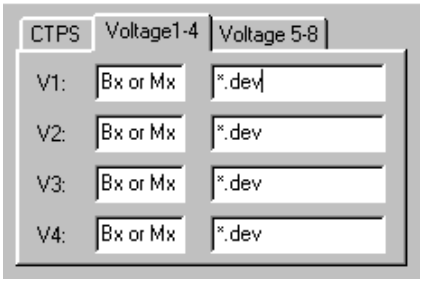
Note: By selecting either the temperature or salinity absorption correction, you must specify the Cal temperature or salinity in the appropriate Base File Setup or Merge File Setup.

3.3.4 Parameter Identification

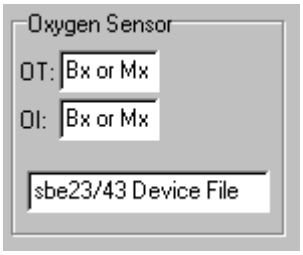
Parameters that are required for performing further calculations in the merge process are defined by the CTPS/Voltage tabs or in the Oxygen Sensor box.



Conductivity, temperature, and pressure are used to calculate the water salinity, density, and sigma-t for inclusion in the Display Order listed below. To select a column as conductivity, temperature, pressure, or salinity, place the column number as Bx for a Base File column or Mx for a Merge File Column in the appropriate edit field. Columns for both the Base and Merge files start with column 1.

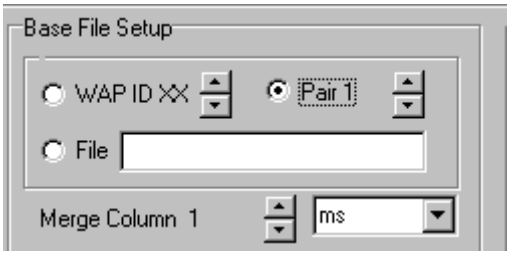


Raw voltages from analog meters may be converted to the appropriate units for C-Stars, pH, FLF, LSS, WETStars, through a simple scale and offset conversion. Again, on the Voltage 1-4 or Voltage 5-8 tab, use either Bx or Mx to select the column. Additionally, you need to place analog meter's device file in the correct edit box. Analog meter device files are listed in Appendix x.



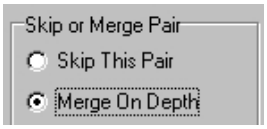
To process data from either the SB23 or SBE43 oxygen sensors, place the oxygen temperature column in the OT edit box (Bx or Mx) for both the SBE23 and SBE43 and place the oxygen current column in the OI edit box (again Bx or Mx) for the SBE23. You will also need to place the oxygen sensor device file in the bottom edit box of the Oxygen Sensor group. The oxygen sensor format should conform to the file format specified in the Appendix.

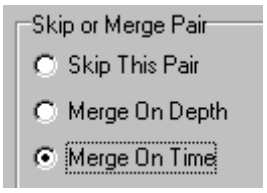
Each file in the pair of files to be merged is either considered the base file or the merge file. The data rate and merge units (depth or time) are determine by the data rate or units of the base file.



Base File Setup defines the setup parameters for the base file in each pair.

3.3.5 Depth, Time and Offset Merge Parameters





The data from the Base and Merge files can either be merged based on depth or time. The choice of depth or time merging is selected by the Skip or Merge Pair group box described earlier. You need to identify the depth column if you will be merging on depth.

You need to identify the time column if you will be merging on time. You may choose to identify both the depth and time column to provide a better picture of the data format.

Depth data must be specified as dbars

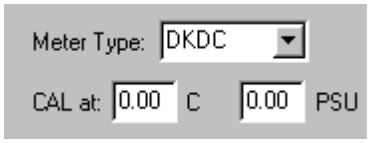
Time data must be specified as milliseconds.

The Offset edit box may be used to apply either a time or depth offset to either the base or merge file data. The units of the offset must be compatible with the merge type selected in the “Merge or Skip” box: if you are merging on depth, the offset must be specified as cm or meters. If you are merging on time, the offset must be specified as ms or seconds.

For the offset, meters and dbars are considered the same since the error between dbars and meters on an instrument cage is essentially zero.

For depth offsets, a positive number is considered above the datum point. A positive time offset is a lag or a time delay.

3.3.6 ac Meter Parameters



Meter Type identifies what type of meter created the data file. This is required only to correctly apply the ac corrections to the data. The corrections options are DKDC (Don't Know, Don't Care), ac-9, and CTD-Analog-DO.

Cal at xx.x C x.xx PSU define the temperature and salinity that the ac meter was calibrated at. WET Labs' calibrations are performed in clean water (0 PSU) and at a temperature listed in the ac meter's .cal file.

A meter type must be specified if you are performing any ac meter corrections. The temperature must be specified if you are performing a temperature absorption correction. Salinity must be specified you are performing a salinity correction.

3.3.7 File Header Parameters

XX Header Lines identifies how many lines of header information are present. This must be set for every file.

There are two options on how to process the header information:

- Discard All Header Lines will not keep any header information.
- Keep Last Header Line will use the last line of header information as column headers.

Note: ac-9s have 31 lines of header information. CTD files processed by WAP have 1 line of header information.

Display Column Order defines the format of how the merged will appear in the pair data file.

Both the base and merge files start with column 1.

Bxx will cause base data column xx to be output in the merged record.
Bxx–yy will cause base data columns xx through yy to be output in the merged record.
Mxx will cause the merge data column xx to be output in the merged record.
Mxx-yy will cause the merge data columns xx through yy to be output in the merged record.

iCond will insert the current value for conductivity as specified by the CTPS tab.
iTemp will insert the current value for temperature as specified by the CTPS tab.

iPres will insert the current value for pressure as specified by the CTPS tab.
iSal will insert the current value for salinity as specified by the CTPS tab.

iVx will insert the processed value for Voltage X, where X is 1–8.

iSBE23 will calculate and insert the current value of the SBE 23 oxygen sensor as its analog channels and device file are identified in the Oxygen Sensor group box.

iSBE43 will calculate and insert the current value of the SBE 43 oxygen sensor as its analog channel and device file are identified in the Oxygen Sensor group box.

iDens will calculate and insert the value for density based on the conductivity, temperature, conductivity or salinity as identified by the CTPS tab.
iSig will calculate and insert the value for Sigma-T based on the conductivity, temperature, conductivity or salinity as identified by the CTPS tab.

iZERO will cause a column of zeros to be inserted into the merged output record.
iNINES will cause a column of 9999.0's to be inserted into the merge output record.

4. Archive File Processing

1. Place all the required device files in the folder that contains the archive files that are going to be processed.

2. Start the WAP program.

3. Select File/Extraction Setup/Select Extraction File menu option.

4. Select File/Instrument Selection/Select Instrument Selection File menu option.

5. Select the Device File Folder option to select the folder that contains the device and calibration files listed in the ISF file. This folder should also contain any ac-meter correction files that are going to be used during data merging.

6. Select File/Merge Setup/Select Merge Setup File menu option.

7. Press the Extract button on the main screen and then select the file to be extracted.

   The selected file will be processed according the extraction, instrumentation, and merging options that had been selected in the .ESF, .ISF, and .MRG files. The extracted and processed files will be saved in the same folder that archive file was selected from.

   At this point, another archive file may be selected for processing by repeating Step 6.

8. When all the archive files have been processed, select File/Exit on the main menu to exit the WAP program. Using this option instead of the X-box in the upper right hand corner will cause the WAP program to save the current settings so WAP can reload them the next time the program is started.

Appendix A: Merge File Worksheets

WAP ID	Total # data columns	# Header rows	Merge column (time or depth)	Columns to display (from #2)

Pair	Base File Setup WAP ID	Merge Column #	Merge File Setup WAP ID	Merge Column #	Display Column Order

Appendix B: ASCII Data Processing

WAP can process most meters with CR-LF terminated ASCII output files. The ASCII meters are selected in Instrument Selection File (ISF) and are classified as:

1. **Analog**: raw voltage measurements for analog meters such as C-Stars or WETStars but are not limited to WET Labs meters.

2. **CTD_ENGR**: CT and CTD meters that have calibrated engineering unit data as their output. These include, but are not limited to, meters from FSI and Seabird's SBE19Plus, SBE37, and SBE49.

3. **ECO**: All WET Labs ECO series meters, including all fluorometers, scatter meters, and turbidity sensors.

4. **MISC_ASCII**: All other meters that the output is calibrated or that can be processed using linear calibration coefficients.

Meter device files have three sections:

1. header lines
2. meter-specific settings
3. output record definitions.

Blank lines are ignored. Lines beginning with ":" are considered comment lines and are also ignored.

1. Header Lines

The device file header contains two lines:

- Line 1 is the meter name / identification and the meter S/N.
- Line 2 is the file creation or modification date.

2. Meter-Specific Settings

Some meters require additional information to be set to process their data. These settings are made after the header lines and before the output record definitions.

CTD meters require that the line …

ISCTD=YES … be present.

If a file is for a moored CT meter, a fixed depth can be entered into the processed record using …

FIXED-DEPTH=XXX.X … where XXX.X will be used as the pressure column.

For ECO BB scatter meters, the user may alter default settings used in the scatter calculations. These settings and their defaults are:

Fixed-Salinity=ss.ss	Default is 32.0 PSU
Water=Pure	Default is SEA
Theta=x.xxx	Default is 2.0042035 radians = 117 Degrees
XFactor=x.x	Chi: Default = 1.1

3. Output Record Definition

Each field or column of an ASCII output record must be identified so WAP knows how to process (or skip) it. The data definition section begins with the number of columns in the data record and ends with the end of the file.

Each column is defined by a record in the device file that (a) identifies what type of data it is, (b) which column it is found in, (c) parameters used to process the data, and (d) an optional column heading.

Each tab or space delimited field is considered a column regardless of whether the data is numeric or alphanumeric.

For the definitions below:

Sig = Raw Signal Count
V = Voltage
Ref = Reference Count
RV = Reference Voltage
N is a column number starting with column 1
SF = Scale Factor
OF = Offset
CL is a Column Label used for the output column header
SWL = Signal Wave Length – Wavelength of LED
DWL = Display Wave Length – Not used by WAP
DC = Dark Count Voltage

The first line of the Output Record Definition section is:
COLUMNS=N

Fields ignored / not processed by WAP:

Date=N	Numeric date or DD/MM/YY format
Time=N	Numeric time or HH:MM:SS format
Ref=N	A reference value
DKDC=N	Don't Know Don't Care
N/U=	Not Used
Reference=	Same as Ref=

The following measurement types use x = (Sig-OF) * SF and are initialized using the form:

Signal=N SF OF CL where CL is optional	
DKFOL	Don't Know Find Out Later—Used to process meters that WAP is does not recognize.
CHL	Fluorescence due to chlorophyll (ug/l)
Phycoerythrin	Fluorescence due to phycoerythrin (ug/l)
Uranine	Fluorescence due to uranine dye (PPB)
Rhodamine	Fluorescence due to rhodamine dye (PPB)
CDOM	Fluorescence due to CDOM
LSS	Light Scattering Sensor
NTU	Turbidity Sensor

The following measurement types use x = Sig*SF + OF and are initialized using the form:

Signal=N SF OF CL where CL is optional	
iTemp	Raw Internal Temperature Measurement–C
xTemp	Raw External Temperature Measurement–C
PRES	Raw Pressure Measurement

Calibrated CTD measurements are identified with:

Signal=N CL	
Temperature	Assumed to be C
Conductivity	Mmohms
Pressure	Pressure in dbar ~= meters for shallow depths
Depth	Depth in meters
Salinity	in PSU
Volts	Raw voltage measurement

ECO VSF meters use the form:

Signal=N SF OFF CL	
B100	Blue wavelength measurements for ECO VSF at 100 degrees
B125	Blue wavelength measurements for ECO VSF at 125 degrees
B150	Blue wavelength measurements for ECO VSF at 150 degrees
G100	Green wavelength measurements for ECO VSF at 100 degrees
G125	Green wavelength measurements for ECO VSF at 125 degrees
G150	Green wavelength measurements for ECO VSF at 150 degrees
R100	Red wavelength measurements for ECO VSF at 100 degrees
R125	Red wavelength measurements for ECO VSF at 125 degrees
R150	Red wavelength measurements for ECO VSF at 150 degrees

ECO BB measurements will result in four columns of data as defined in the ECO BB user's guides. WAP requires the BB signal to follow the form:

Lambda=N SF OF SWL DWL

Analog Meter Data

Analog ENGR0, where raw data is used as calibrated

ENGR0=N CL x = Raw - use raw output as calibrated output

Analog ENGR1, apply x = (V-OF) * SF

Signal=N SF OF CL

ENGR1= Generic Output
WETSTAR= WET STAR ug/l

Analog ENGR2, apply x = (V-DC) / (RV-DC)

Signal=N RV DC CL

ENGR2= Generic Output
CSTAR= %transmissivity
CSTAR10= m^{-1} for 10 cm CSTAR
CSTAR25= m^{-1} for 25 cm CSTAR

Analog ENGR3, apply x = Sig * SF + OF

ENGR3=N SF OF CL

Appendix C: WAP Meter Types

This Appendix lists all the meter types available in the Edit ISF File window.

Off

Description	WAP will ignore all data for that channel.
Device File Requirements	None

aBeta

Description	
Raw Data Processing	WAP will identify and save CR LF terminated ASCII records. This file is suitable for processing with Hobilabs software.
Engineering Units	WAP will identify and save CR LF terminated ASCII records. This file is suitable for processing with Hobilabs software. aBeta files can be depth merged in WAP using the discrete Extract, Process, and Merge Procedure – (Dave – add that procedure somewhere).
Device File Requirements	None

AC-9

Description	
Raw Data Processing	WAP will checksum validate each ac-9 data packet, saving all valid packets.
Engineering Units	WAP will checksum validate each ac-9 data packet and will apply device file offsets and internal temperature corrections, creating a WET View compatible *.DAT ASCII data file that does not contain reference values. This ac-9 option is used to create an output record with a uniform width data file suitable for additional data processing.
Device File Requirements	WET Labs ac-9 device file is required for both raw data processing and for conversion to engineering units

AC-9 w/Reference

Description	
Raw Data Processing	WAP will checksum validate each ac-9 data packet, saving all valid packets
Engineering Units	WAP will checksum validate each ac-9 data packet and will apply device file offsets and internal temperature corrections, creating a WETView- compatible *.DAT ASCII data file that does contain reference values on every 10 lines of data. This ac-9 option may be used to help the user perform 1 in 10 binning by keying on the extended length reference records.
Device File Requirements	WET Labs ac-9 device file is required for both raw data processing and for conversion to engineering units.

AC-S

Description	
Raw Data Processing	WAP will checksum validate each ac-s data packet, saving all valid packets.
Engineering Units	WAP will checksum validate each ac-a data packet and will apply device file offsets and internal temperature corrections, creating a WETView 7- compatible *.DAT File.
Device File Requirements	WET Labs ac-s device file is required for both raw data processing and for conversion to engineering units.

Analog

Description	
Raw Data Processing	WAP will identify and save <CR LF>-terminated ASCII records.
Engineering Units	WAP will identify <CR LF>-terminated ASCII records, apply calibration coefficients as defined in the Appendix A, and create a tab-delimited ASCII file with time stamps for each record.
Device File Requirements	An ASCII device file is required for both raw data processing and for conversion to engineering units.

ASCII

Description	
Raw Data Processing	WAP will identify and save <CR LF>-terminated ASCII records
Engineering Units	WAP will identify and save C<CR LF>-terminated ASCII records. (For processing ASCII data to engineering units, see the Misc_ASCII meter type.)
Device File Requirements	None.

Time + ASCII

Description	
Raw Data Processing	WAP will identify and save <CR LF>-terminated ASCII records.
Engineering Units	WAP will identify <CR LF>-terminated ASCII records and save each record with a time stamp at the start of each record. (For processing ASCII data to engineering units, see the Misc_ASCII meter type.)
Device File Requirements	None.

ASCII + Time

Description	
Raw Data Processing	WAP will identify and save <CR LF>-terminated ASCII records
Engineering Units	WAP will identify <CR LF>-terminated ASCII records and save each record with a time stamp at the end of each record. (For processing ASCII data to engineering units, see the Misc_ASCII meter type.)
Device File Requirements	None.

BBP

Description	
Raw Data Processing	(Not Available in V4.xx)
Engineering Units	(Not Available in V4.xx)
Device File Requirements	None.

Binary

Description	Save binary data in its native form
Raw Data Processing	WAP will save every byte of data recorded in the archive file for this "channel." Use **Hex_Output** to view binary data as human-readable ASCII output.
Engineering Units	Same as Raw Data Processing
Device File Requirements	None.

cBeta

Description	Same as aBeta.
Raw Data Processing	Same as aBeta
Engineering Units	
Device File Requirements	None.

CTD-ENGR

Description	(Hey dave, we need a better description … of what ctd-engr is …)
Raw Data Processing	WAP will identify and save <CR LF>-terminated CT and CTD records.
Engineering Units	WAP will identify and process <CR LF>-terminated CT and CTD records, saving the data as tab delimited ASCII. Each record will start with a time stamp. If both temperature and conductivity are present in the raw data and salinity is absent, WAP will calculate the salinity and append it to the record.
Device File Requirements	An ASCII data processing device file (CTD parameters) is required for both raw data processing and for conversion to engineering units.

DMM 22-812

Description	
Raw Data Processing	WAP will identify and checksum validate DC V and DC mV records from a Radio Shack digital multimeter (DMM 22-812), convert the data to ASCII, and output the data as a time-stamped, tab-delimited ASCII record.
Engineering Units	WAP will identify and checksum validate DC V and DC mV records from a Radio Shack digital multimeter, DMM 22-812, convert the data to ASCII, and output the data as a time-stamped, tab-delimited ASCII record.
Device File Requirements	None.

ECO

Description	
Raw Data Processing	WAP will identify and save <CR LF>-terminated ECO records.
Engineering Units	WAP will identify <CR LF>-terminated ECO records, apply calibration coefficients as defined in the Appendix A, and create a tab-delimited ASCII file with time stamps for each record.
Device File Requirements	An ASCII device file (ECO parameters) is required for both raw data processing and for conversion to engineering units.

FRRF

Description	
Raw Data Processing	(Not Available in V4.xx)
Engineering Units:	(Not Available in V4.xx)
Device File Requirements	None.

FRRF add TS

Description	
Raw Data Processing	(Not Available in V4.xx)
Engineering Units	(Not Available in V4.xx)
Device File Requirements	None.

GPS

Description	
Raw Data Processing	WAP will identify and save valid GPS records that conform to NMEA-0183 GGA, GLL, or RMC record types
Engineering Units	WAP will identify valid GPS records that conform to NMEA-0183 GGA, GLL, or RMC record types, and save the data in time-stamped, tab- delimited ASCII records
Device File Requirements	None.

GPS-GGA

Description	
Raw Data Processing	Same as GPS but only GGA records will be processed.
Engineering Units	Same as GPS but only GGA records will be processed.
Device File Requirements	None.

GPS-GLL

Description	
Raw Data Processing	Same as GPS but only GLL records will be processed.
Engineering Units	Same as GPS but only GLL records will be processed.
Device File Requirements	None.

GPS-RMC

Description	
Raw Data Processing	Same as GPS but only RMC records will be processed.
Engineering Units	Same as GPS but only RMC records will be processed.
Device File Requirements	None.

GPS-RMC-AO

Description	GPS-NMEA-0183 RMC records with an alternate output.
Raw Data Processing	Same as GPS, but only RMC records will be processed.
Engineering Units	WAP will identify valid GPS records that conform to NMEA-0183 RMC format and save the data in tab-delimited files as DDMMYY HHMMSS Latitude Longitude
Device File Requirements	None.

Hex Output

Description	Output binary data as human readable hex ASCII
Raw Data Processing	WAP will convert every byte of binary data into two bytes of hex ASCII. Each line of output will start with a time stamp and end with <CR LF>. Every two bytes of ASCII data will be separated by a space. After every 20 bytes of ASCII data (or 10 binary) an extra space will be added to enhance readability. Use **Binary** to retain the data's native form.
Engineering Units	Same as Raw Data Processing.
Device File Requirements	None.

Hydroscat-2 and Hydroscat-6

Description	
Raw Data Processing	Not functional in V4.xx
Engineering Units	Not functional in V4.xx
Device File Requirements	

LISST-100, LISST-100 add TS

Description	Process data from the Sequoia LISST-100Raw Data Processing: WAP will record the LISST-100 data, starting with the "{" header.
Engineering Units	Same as for Raw Data Processing
Device File Requirements	None.

Misc_ASCII

Description	Perform data processing on the ASCII output for miscellaneous instrumentation.
Raw Data Processing:	WAP will identify, validate, and save <CR LF>-terminated ASCII records.
Engineering Units	WAP will identify and validate <CR LF>-terminated ECO records, apply calibration coefficients as defined in the Appendix A, and create a tab-delimited ASCII file with time stamps for each record.
Device File Requirements	An ASCII device file (Misc ASCII parameters) is required for both raw data processing and for conversion to engineering units.

Safire

Description	Perform data processing for WET Labs SAFire instrument.
Raw Data Processing	WAP will checksum validate each SAFire data packet, saving all valid packets.
Engineering Units	WAP will checksum validate each SAFire data packet, apply device file offsets and internal temperature corrections, and create a tab-delimited ASCII data file. Each line of output will be terminated with a <CR LF>.
Device File Requirements	WET Labs SAFire device file is required for both raw data processing and for conversion to engineering units.

SAIV SD-204

Description	Process data from an SAIV SD-204 CTD.
Raw Data Processing	WAP will read and save valid SD-204 data records.
Engineering Units	WAP will read and validate SD-204 data records, saving the data with a time stamp, pressure, temperature, and conductivity (if present). If salinity is not present, WAP will calculate the salinity from the temperature and conductivity, appending it to the end of the record. Each line of output will be terminated with a <CR LF>.
Device File Requirements	None.

Satlantic

Description	
Raw Data Processing	
Engineering Units	
Device File Requirements	

SBE-16

Description	Raw Hex ASCII data from a SBE-16 CT meter.
Raw Data Processing	WAP will read and save all valid SBE-16 data records
Engineering Units	WAP will read and validate SBE-16 data records, converting the raw data to engineering units, saving the data with a time stamp as temperature, conductivity, and salinity. Each line of output will be terminated with a <CR LF>.
Device File Requirements	A Seabird SBE16 *.CON file is required for converting the raw data to engineering units.

SBE19

Description	Raw Hex ASCII data from a SBE-19 CTD meter.
Raw Data Processing	WAP will read and save all valid SBE-19 data records.
Engineering Units	WAP will read and validate SBE-19 data records, converting the raw data to engineering units, saving the data with a time stamp as pressure, temperature, conductivity, salinity and converted analog measurements. Each line of output will be terminated with a <CR LF>.
Device File Requirements	A Seabird SBE19 *.CON file is required for converting the raw data to engineering units.

SBE19Plus-Raw

Description	Raw hex ASCII data from an SBE-19 Plus CTD meter.
Raw Data Processing	WAP will read and save all valid SBE-19 Plus data records.
Engineering Units	WAP will read and validate the SBE-19 Plus hex ASCII data records, converting the raw data to engineering units, saving the converted data with a time stamp as pressure, temperature, conductivity, salinity and all converted analog measurements. Each line of output will be terminated with a <CR LF>.
Device File Requirements	A Seabird SBE19Plus *.CON file is required for converting the raw data to engineering units.

SBE21

Description	Raw hex ASCII data from a SBE-21 CT meter, with or without a remote temperature sensor and up to 4 voltage measurements.
Raw Data Processing	WAP will read and save all valid SBE-21 Plus data records.
Engineering Units	WAP will read and validate the SBE-21 hex ASCII data records, converting the raw data to engineering units, saving the converted data with a time stamp as temperature, conductivity, salinity, remote temperature and all converted analog measurements. Each line of output will be terminated with a <CR LF>. If one or more analog measurements are being made, the remote sensor must be turned on for WAP to process the data.
Device File Requirements	A Sea-Bird SBE21 *.CON file is required for converting the raw data to engineering units.

SBE25

Description	Raw hex ASCII data from a SBE-25 CT meter, with or without a remote temperature sensor and up to 4 voltage measurements.
Raw Data Processing	WAP will read and save all valid SBE-25 Plus data records.
Engineering Units	WAP will read and validate the SBE-25 hex ASCII data records, converting the raw data to engineering units, saving the converted data with a time stamp as temperature, conductivity, salinity, remote temperature and all converted analog measurements. Each line of output will be terminated with a <CR LF>. If one or more analog measurements are being made, the remote sensor must be turned on for WAP to process the data.
Device File Requirements	A Sea-Bird SBE25 *.CON file is required for converting the raw data to engineering units.

SBE25-Modaps

Description	Raw hex ASCII data from a SBE-25 CT meter, with or without a remote temperature sensor and up to 4 voltage measurements.
Raw Data Processing	WAP will read and save all valid SBE-25 Plus data records.
Engineering Units	WAP will read and validate the SBE-25 hex ASCII data records, converting the raw data to engineering units, saving the converted data with a time stamp as temperature, conductivity, salinity, remote temperature and all converted analog measurements. Each line of output will be terminated with a <CR LF>. If one or more analog measurements are being made, the remote sensor must be turned on for WAP to process the data.
Device File Requirements	A Sea-Bird SBE25 *.CON file is required for converting the raw data to engineering units.

SBE32 Carousel

Description	Raw hex ASCII data from a SBE-232 CT meter, with or without a remote temperature sensor and up to 4 voltage measurements.
Raw Data Processing	WAP will read and save all valid SBE-32 Plus data records.
Engineering Units	WAP will read and validate the SBE-32hex ASCII data records, converting the raw data to engineering units, saving the converted data with a time stamp as temperature, conductivity, salinity, remote temperature and all converted analog measurements. Each line of output will be terminated with a <CR LF>. If one or more analog measurements are being made, the remote sensor must be turned on for WAP to process the data.
Device File Requirements	A Sea-Bird SBE232 *.CON file is required for converting the raw data to engineering units.

WL-Flow

Description	
Raw Data Processing	
Engineering Units	
Device File Requirements	

XASCII

Description	
Raw Data Processing	
Engineering Units	
Device File Requirements	

XMF

Description	
Raw Data Processing	
Engineering Units	
Device File Requirements	

Revision History

Revision	Date	Revision Description	Originator
A	3/14/00	New document (DCR 39)	D. Romanko
B	7/11/00	Provide additional .TOS file handling explanation (DCR 44)	D. Romanko
C	3/20/01	Update data handling capability and add appendices (DCR 96)	D. Romanko
D	5/30/02	Revise document (DCR 134)	D. Romanko
E	6/5/02	Correct Voltage Scaling reference in Appendix E (DCR 227)	D. Romanko
E1	1/11/05	Draft—update to reflect software interface upgrades	D. Romanko
E2	4/15/05	Draft2—updates	D. Romanko, H. Van Zee