

Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedure for Basic use and Maintenance of Design Analysis ® Data Loggers and Peripheral Equipment.

Version 1.0

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## Environmental Assessment Program

### Standard Operating Procedure for Basic Use and Maintenance of Design Analysis Data Loggers and Peripheral Equipment.

#### **1.0 Purpose and Scope**

1.1 This document is the Environmental Assessment Program (EAP) Standard Operating Procedure (SOP) for Operation of Design Analysis (DA) Data Loggers and Peripheral Equipment.

#### **2.0 Applicability**

2.1 This procedure is to be followed during Freshwater Monitoring Unit (FMU) stream gaging station visits where DA Data Loggers and DA Peripheral Equipment are used. DA H-350XL® and H-500XL® are the most common type of data loggers the FMU utilizes in their Data Collection Platforms (DCP's) for stream flow gaging. DCP's that have DA equipment may also use an H-222SE® or H-222® GOES radio and an H-355® Gas bubbler. (H-355® bubblers are only compatible with H-350XL® data loggers).

#### **3.0 Definitions**

- 3.1 PDA- Personal Digital Assistant (FMU uses various models of Hewlett-Packard @iPaq)
- 3.2 FMU – Freshwater Monitoring Unit
- 3.3 GOES – Geostationary Operational Environmental Satellites
- 3.4 LED- Light Emitting Diode
- 3.5 PCMCIA or IDE/ATAPI flash card – Industry standard for downloading station data.
- 3.6 NESDIS-National Environmental Satellite, Data, and Information Service
- 3.7 NOAA – National Oceanographic and Atmospheric Administration
- 3.8 USGS – United States Geological Survey
- 3.9 DCP – Data Collection Platform
- 3.10 LRGS – Local Readout Ground Station

#### **4.0 Personnel Qualifications/Responsibilities**

4.1 Personnel referencing this document should have at minimum a basic understanding of how data loggers, telemetry radios, and SDI-12 type sensors and equipment operate as well as an understanding of general FMU policies and procedures. Experience working in areas with difficult terrain and carrying heavy equipment is also beneficial. No special certifications are required for users of this equipment.

## **5.0 Equipment, Reagents, and Supplies**

- 5.1 PCMCIA IDE/ATAPI Type Flash Card or adapter card for PDA use and logger downloading.
- 5.2 Personal Digital Assistant (PDA); a Hewlett-Packard® I-Paq is the FMU standard issue PDA.
- 5.3 Personal Flotation Device (PFD) — Approved PFDs are required for all personnel working in or near bodies of water.
- 5.4 Station Padlock Keys
- 5.5 Write in the Rain field notebook w/station visit stream gage logger notes (Appendix D).
- 5.6 Hand tools — A tool box for minor repairs and parts replacement is required on all field trips.
- 5.7 Appropriate desiccant for application. (loose or in packet form depending on type of equipment)
- 5.8 Emery Paper / Small wire brush (for cleaning battery terminals)
- 5.9 Multi-meter (for verification of battery voltage)
- 5.10 Spare 12 volt 80 amp hour (Ah) batteries may be needed. Determine station voltage via GOES archive data and decide if replacement batteries will be necessary for the stations you will be visiting.

## **6.0 Summary of Procedure**

- 6.1 Trip Preparation
  - 6.1.1 Before you prepare to embark you must check all station transmissions in the GOES archive to determine battery voltages at each station and how many batteries to pack. Pick up a station priority list and ratings from the Basin Lead or Principal Investigator (P.I.) for the WRIA's you plan to visit.
  - 6.1.2 Prepare a field/float plan before embarking which can be found on the Ecology Sharepoint site at:  
<http://ecywblcyadxd0/sites/eap/Field%20Schedules/Forms/AllItems.aspx>
  - 6.1.3 Load all necessary equipment needed for you field excursion. (see appendix C for packing list)
- 6.2 Upon Arrival at Station:
  - 6.2.1 Visually inspect exterior of station house and equipment for damage, wear or any hazards that may cause personal harm (i.e. bees, wasps, poisonous plants, etc.).

- 6.2.2 Using FMU keys open station house and inspect the station interior as described above taking care to avoid hazards.
- 6.2.3 Visually verify that power is being supplied to the logger via the **BATTERY INDICATOR/MONITOR LED or POWER LED** located on the front face of the logger.
- 6.2.3.1 The Power light flashes on and off to show that the logger is receiving proper +12V power. If the power source has failed or provides less than +10V, the power light will stop flashing.
- 6.2.4 Press the **ON / OFF** Key to access menu options.  
**Note:** If the logger does not respond when you press a key, it may be in the process of measuring. Wait a few seconds and try again. To save power, the logger display will turn off automatically after **five minutes** of inactivity.
- 6.2.4.1 Use the arrow keys to scroll down to desired menu options screen. Options include Sensor Input Setup, Output Options, Data Options, Scan Setup, System Setup, System Status, and Accessory Setup. Choose appropriate option for desired task. Appendix A describes the specific functions of each menu.
- 6.2.4.2 **Note:** The various items under each Menu option may vary depending on the Firmware version in each machine. We do not automatically update firmware at each of our stations, however as equipment is repaired or replaced it will have the latest firmware option installed. We may encounter versions from 1.15 up to and including 3.00 as of November 2009
- 6.2.5 Record the date, time, stage, water and air temperature readings. Record battery voltage as described in the station visit SOP (Myers, 2009). These data are typically displayed when first powering up the data logger. These readings also may be obtained in the Data Options menu under View Current File (this data would have been recorded during the last scan, for an instantaneous reading you may press the **Enter** button or the **Exterior Side** button and this will force a scan which will not be recorded on the data file.) Do not force a scan that may interrupt a timed scan, allow a minimum of two minutes before a timed scan.
- 6.2.6 Data is usually downloaded during scheduled site visits. Downloading the *.NEW file* is done in the *Data Options* menu. Insert PCMCIA card in slot on logger face, scroll down and select *Download .NEW*. Press **Enter** to download the file. It is NOT necessary to turn scanning off to download. However, be sure to allow plenty of time between scans to avoid interrupting a timed scan. Upon completion you will then be asked to erase the *.NEW file*. Press the Enter button to complete that task. Complete data downloads are usually done at or near the end of each water year and erased from logger files to clear all internal data. Scanning and GOES must be turned off to erase *All Int. Data*. Erasing the *All Int. Data File* does not affect the station configuration files in any way.

- 6.2.7 Sites that are using multiple probes such as turbidity, dissolved oxygen, nutrient, and ISCO® Compositor samplers are typically downloaded when sample bottles are collected (this is determined by the project lead or principal investigator. These stations require *All Int. Data files* to be completely downloaded and files are erased more frequently (frequency is determined by project lead) due to the large amount of data recorded in the logger. See appropriate SOP's for further details on multiple probe use and maintenance.
- 6.2.8 Check system status from the *System Status* menu. Record average, minimum and maximum battery voltage, along with the number of system resets, then reset the status screens when prompted. Battery replacement (if needed) will most likely be determined by these readings. See Battery replacement procedure in appendix B.
- 6.2.9 Next open the *System Setup* menu and check the logger time. Logger clock time should be set to Pacific Standard Time (PST). A handheld GPS units or an atomic watch is recommended for obtaining the correct time. The time is set by pressing the Enter button while in this screen, then setting the correct time and pressing Enter again to save corrected setting.
- 6.2.10 After checking the logger time, access the *Output Options* menu. Select from the drop-down menu *GOES Options* and locate the GOES time. Time must be set at Greenwich Mean Time (GMT) and must be accurate to the second in order to align satellite transmissions in the appropriately selected fifteen second window. (see Appendix A for a description of how to sync GOES time) Any deviation from this could result in a failed transmission not only at this site, but potentially at multiple other sites nationwide NOAA, NESDIS, and USGS also use the GOES satellite system.
- 6.2.11 While still in the output options menu, verify that Logging and Log .NEW are on. (in loggers with newer firmware, a WITH headers, WITHOUT headers, or OFF option may be seen rather than a specific ON/OFF function still present in older firmware).
- 6.2.12 View Scanning to verify time to next scan is something less than 15 minutes and the time of next scan is correct. Wait until timed scan is complete and verify in the current data file that the scan was successful and that the data was logged.

### 6.3 Field troubleshooting and DCP servicing for DA platforms

- 6.3.1 A set of quick reference sheets for troubleshooting and performing basic maintenance of the DA DCP's have been appended for easy referencing. Appendix B discusses troubleshooting options and appendix A references different functional controls and commands for DA DCP's.

## 7.0 Records Management

- 7.1 After collection of downloaded data you must transfer the collected data to the appropriate Principal Investigator or Basin Lead. Upload the collected files to the temporary flow folder found at: H:\FLOWS\Projects\TEMPFLOW on the FMU shared

H: drive. It is also customary to send an e-mail to the Basin Lead indicating that you have finished your field excursion and have collected data for them. Then turn in any field forms and notes to the appropriate PI or Basin Lead at their desk following your return from the field.

## **8.0 Quality Control and Quality Assurance Section**

8.1 Routine inspections and repair (or notification of need for repair) is necessary to ensure quality of collected data. It is up to you to be thorough with your observations and quick with your repairs or notifications otherwise loss of data or station failure may occur.

## **9.0 Safety**

9.1 All field staff must understand and comply with the Environmental Assessment Program (EAP) safety manual (2006) with extra emphasis on sections; (1-15, 1-19, 1-23, 1-35, 1-37, 2-17, 2-45)

9.2 All field staff must also possess the proper, up to date safety equipment approved by the SHU safety officer and understand its complete operation.

## **10.0 References**

10.1 Design Analysis Associates, Inc. 2007. WaterLog® Series Owner's Manual Revision: 1.17. Models (H-350XL and H-500XL). Design Analysis Assoc. Inc. 75West 100 South Logan, UT 84321 USA.

10.2 Butkus, Steven. 2005. Quality Assurance Monitoring Plan – Stream Flow Gaging Network. Environmental Assessment Program, Washington State Department of Ecology. Publication No. 05-03-204.

10.3 Environmental Assessment Program, 2006. Environmental Assessment Program Safety Manual.

10.4 Myers, Jason. 2009. Standard Operating Procedure for Stream Hydrology Site Visits. Environmental Assessment Program, Washington State Department of Ecology. Document available at: <http://www.ecy.wa.gov/programs/eap/quality.html>

10.5 Shedd, James R. 2009. Standard Operating Procedure for Measuring and Calculating Discharge. Environmental Assessment Program, Washington State Department of Ecology. Document available at: <http://www.ecy.wa.gov/programs/eap/quality.html>

## **11.0 Appendices**

## Appendix A

### Basic Menu Options:

**Sensor Input setup:** Can be used to program Analog, digital or SDI Sensors. It is commonly used to set stage for bubbler system and pressure transducers.

**Output Options:** Used to configure or change Logging and GOES options.

**Data Options:** Used for viewing logged values and downloading both the .NEW files and Data files to the PCMCIA card. This option can then be used for erasing files after downloads are completed.

**Scan Setup:** This is used for turning scanning on and off, adjusting scan rate, and verifying scanning is at the correct time (Typically scanning is set at 15 minute intervals).

**System Setup:** This is used to set date, logger time (PST), station ID, syncing GOES time when applicable, system configuration options, function options (example: water & air temp probe setup), basic setup (example: language interpreter for user defined programs outside of the normal use of data logger), and firmware updates. Use of most other system setup functions is not necessary.

**System Status:** This screen shows current station battery voltage, min and max voltage, any system resets, stat screens are reset in this location and should be reset at each visit. (Record these values per Site Visit SOP specification.) This screen also shows the firmware version in use.

**Accessory Setup:** Used to control accessories such as the H355® Gas Bubbler system.

**NOTE:** The various items under each Menu option may vary depending on the Firmware version in each machine. We do not automatically update firmware however as equipment is repaired or replaced it will have the latest firmware option installed. We may encounter versions from 1.15 up to and including 3.00 as of Nov. of 2009

### Peripheral Equipment:

#### GOES radios:

FMU may have one of two GOES radios on the DCP an H-222SE ® and the newer version H-222 ®. Both of these units utilize a GPS antenna to set the GOES time in order to transmit data in their respective predetermined 15 second window.

The H-222SE may be set to Auto Sync (GPS to GOES), or Sync Disabled (if Syncing is disabled GOES time must be manually set). Note: auto sync is typically disabled due to time offset problems experienced with these older radios and GPS antennas. You may also manually set the GOES time if GPS is not functioning correctly. (hand held GPS units or an atomic watch will give the correct time) GOES time is in GMT which is PST +8 hours or DST+7 hours. The H-222 utilizes a Trimble Dome type GPS antenna and the Sync Time Now or manual syncing GOES time with this radio is not an option. This unit typically auto-syncs quickly upon powering up station and has been accurate and

reliable. If this unit does not acquire a GOES time within a full scan period there is a reset button inside the radio that may be pushed and this will generally cause the unit to sync, however if it does not, syncing may be disabled and GOES time may be entered manually. If this occurs contact the appropriate service personnel for further troubleshooting and repair or replacement whichever may be required.

The operation, settings and adjustments are controlled by the data loggers on the DCP. Settings and adjustments are located in the two following areas.

**System Setup Menu for Time syncing (H222SE®).**

Output Options menu is used to set GOES mode. Note: GOES mode must be set to TIMED for timed transmissions to take place. This menu is also used for manually setting GOES time, GOES address, GOES offset, GOES channel and amount of scans per transmit.

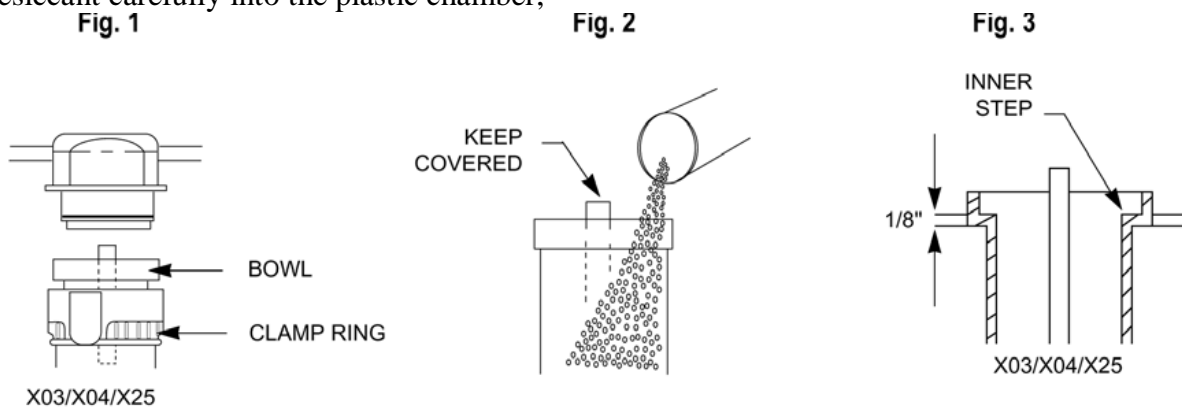
There are no adjustments or settings to be made on either of these two radios.

**H355® Gas Bubbler:**

The H355® gas bubbler is specifically designed for use with the H350XL® Datalogger. Bubble rate, purging, and timed purge settings are located and adjusted in the Accessory setup menu. This bubbler also utilizes a clear plastic desiccant chamber to remove moisture from the system. The FMU operated DCP use a model X03 desiccant chamber for our DCP's.

The desiccant used is a loose granulated silicone based color changing material. The color changes from blue to pink as it becomes saturated with moisture. The servicing required for this type of unit is as follows: The XO3 model should have any air pressure released prior to removing clamp ring if used on a pressurized system. Note: Typical H355 system is not pressurized, it operates by pulling air through the desiccant chamber into the air intake in the bottom of the H355.

Loosen the clamp ring and remove the desiccant chamber from the top housing. Pour out expired desiccant into a suitable container to be returned to shop for drying and re-use. Cover the opening of the metal center air tube of the desiccant chamber with your finger. Pour desiccant carefully into the plastic chamber,



*Figs. 1,2,3 © Courtesy of Design Analysis Associates, INC. 2009*

refilling desiccant chamber to approximately one half inch below the inner step with blue (dry) desiccant and tap or shake to settle desiccant (Figs. 1, 2 and 3). Make sure that the inner shoulder of the plastic chamber (where the screen and gasket sit) is wiped free of desiccant. If this surface is not clear and clean the cap will not re-fit into place, making re-assembly difficult or impossible. Replace bowl and bowl guard and clamp ring onto unit. Be sure clamp ring has securely locked into place. Replace chamber onto bracket.

### **H-310 Submersible Pressure Transducer**

Figure at right is a Design Analysis® submersible pressure transducer used for water level and temperature monitoring. This unit also measures water temperature. It utilizes an SDI-12 data link for communications with the data logger.

Each unit is packaged with a predetermined length of polyethylene vented cable. The technician installing the instrument must determine if the length of cable is adequate for their specific installation.



Photo courtesy of Design Analysis Associates Inc.

The H-310 utilizes 3 small desiccant packs contained in a dry air connection box. The desiccant packs contain a color indicator. When the indicator strip on the pack is blue the desiccant packs are dry and ready for deployment. If the indicator strip is pink the desiccant pack needs to be removed and replaced with dry (blue) packs.

When installed the instrument and cables should be protected from direct sunlight including the polyethylene cable. The pressure transducer must not be allowed to freeze as this will damage the pressure membrane making unit inoperable. For further information on setup, wiring, configuration and operation of this instrument refer to the owner's manual.

## Appendix B

### Basic and Minor Troubleshooting of DA DCP Units.

*This reference page can be useful for identifying servicing issues that may arise while performing routine site visits at DA DCP sites. It is however, not a substitute for the operators' manual or a trained service professional. Care should be taken when attempting troubleshooting to avoid personal injury and to not damage or alter the DCP. If it appears that the DCP requires advanced maintenance, refer to the basin lead or service technician for assistance.*

**Problem:** Logger will not power up/display on screen.

**Follow these instructions in the order they appear to properly diagnose and repair the DCP.**

**Possible cause/solution:**

1. Check battery voltage at the battery terminals using a multi-meter. If voltage is less than 11.0V, replace battery. (Refer to the following sections for more details on battery changing).
2. If battery is ok: Check voltage where battery leads attach to the DCP at the terminal strip with a multi-meter. If no voltage is read, check and replace fuse if broken or burned out.
3. Verify the connections at logger and at battery terminals are good and verify voltage at the green wiring block which presses into the base of the data logger.
4. If voltage is OK, as a last resort, detach, then re-attach the green block from the logger, this will possibly trigger a logger restart causing the station to then display. (\*\* note: Stations with multiple peripheral sensors (ex. Turbidity, DO, Nitrate, etc) may require the extra sensors to be detached and re-attached one at a time to correct a non-display problem or to isolate a problem sensor). This should only be done with the Basin lead or Supervisors knowledge and prior approval.

**Battery Change out:**

Disconnect power lead at the in-line fuse holder. Remove the old battery; install new battery into battery box. If working on a DCP with an H-355 gas bubbler, take care to not damage the RS-485 com cable with the battery box (Fig. 1). The plug is very fragile and will render the DCP inoperable if damaged. Before attaching leads, check to see that they are clean and free of corrosion. If not, clean both battery terminals and wire terminal ends using either a wire brush or emery cloth. Attach leads with the appropriate wing nuts and spray corrosion inhibitor on battery terminal ends when finished installing.

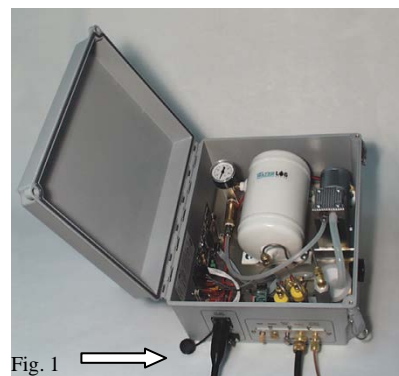


Fig. 1

Inspect the fuse for damage to internal filament (Fig. 2). Replace if filament is broken and clean the fuse if needed. Re-install the fuse into the fuse holder and power up machine.



Fig. 2

After powering up the DCP you must check that the logger and GOES time are both correct, that scanning is turned on, and view current data file. The data file will most likely read (NOW NOW NOW) on the logger screen until the DCP scans and collects its next data set.

Problem: Still no display on DCP.

Possible solution:

The logger may need repair or replacement. Contact the principal investigator, basin lead or supervisor and report the problem. Do not attempt any further troubleshooting as this may damage instrumentation and void the warranties.

Telemetry Transmission Problems: Not receiving transmissions from station in the mainframe.

Probable causes/solutions: GOES Mode may be set to OFF, (should be set at TIMED)

If GOES mode is timed and the station is still not reporting a signal:

The station may have a low battery voltage, scanning may be turned off, or it could have a GOES time error (ex. 00:00:00, or out of timed transmission window). These problems can usually be alleviated by replacing batteries, turning scanning back on or resetting a valid GOES time if needed.

If the solutions discussed above do not solve the problem some other possibilities may include: possible power loss between the terminal strip and GOES radio, parity errors in the data stream, or overlapping GOES radio transmissions. In some instances, a damaged or misaligned GOES antenna or signal beam obstructions (branches, tree trunk, building, etc.) could be influencing transmissions as well. Please notify the appropriate qualified personnel to repair or replace damaged or misaligned equipment.

Random Transmissions may be sent and verified by the principal investigator or basin lead in the office through the LRGS or EDDN field message retrieval website. To send a Random transmission (XMT): Go to *Output Options* in the logger menu. Select *GOES Options* and scroll down to *Random Transmissions*. Set the correct Random Channel & Baud Rate and then select a minimum of three source options (example Date, Time, Stage).

Next, scroll to the *Send Random Transmit* option and press enter. The screen will display if the transmission was sent. If everything above appears to be ok, there is confirmed data to send, and the random transmission is verified ok as sent on the screen, yet the message is not received there may be a problem that requires logger repair or replacement. Contact the principle investigator, basin lead, or supervisor and report the problem. Do not attempt any further troubleshooting as this may damage instrumentation.

### Download problems:

Problem: Station will not download to card or card error is displayed.

### Possible causes/solutions:

A corrupted PCMCIA Card may result in an inability to download station data. The only way to solve this issue is to replace the card. Another possible cause may be that the internal data card in the logger is worn, loose, dirty or damaged and not making good contact with PCMCIA card. The PCMCIA card may need to be removed and reinstalled and possibly even flexed lightly back and forth after re-installing to make good contact.

Another possible downloading problem you may encounter is no *.NEW* file found. This may occur after a logger has had all of its internal data erased (end of water year, new or replaced logger etc.) and this is the first download following. Simply download Internal Data but do not erase. Typically after a total download the logger will automatically start a fresh file but until that has been downloaded a *.NEW* has not been started.

(Some newer versions of Firmware allow the operator to start a *NEW* file at any time.) Verify that *Log .NEW* has been turned on in the logger programming. If this does not repair the issue, notify the principle investigator, basin lead and/or the repair technician and have them advise you how to continue.

Problem: Current data not displaying on Current Data File

### Probable causes/solutions:

There are numerous possibilities that can cause this. The logger may have not scanned since the last download, scanning may be turned off, a forced scan may have interrupted a timed scan, time to next scan may be wrong (MUST be less than 15 minutes), next scan at the wrong time (the last two items are usually corrected by turning scanning off, waiting a minute or so and then turning scanning back on). This typically resets scanning to the correct HH:MM:SS

The current data file after turning scanning off will most likely read (*NOW NOW NOW*). This is because there is no current scanned data to report after turning scanning off and back on. After the DCP has a chance to take a complete scan, a good data string should appear. Verify logger clock is set correctly to PST, (time may drift on logger clocks so they should be checked at each visit)

**Note:** some older versions of firmware do not always display current data after a download. If the logger is not displaying a current data file, scanning and logging settings may be confirmed by downloading the *.NEW* file again and verifying last scans on a laptop or PDA.

Problem: Incorrect Stage or excessive bounce.

Probable causes/solutions:

The following may be possible causes for stage fluctuation:

***Slant pipe or terminal end damage-*** The slant pipe may have moved, damaged or may have not been tightly secured. Inspect, document and report any damages and shifted or worn out anchoring devices to the principle investigator or basin lead as soon as you can.

***O-line leaks-*** When present, leaks are usually found at the O-line connection fitting on the bottom of the H-355 Bubbler on the DCP platform and may be loose due to station vibration or expansion/contraction from varying temperatures.

Test the fitting for leaks by spraying the fitting connection with SNOOP or another type of appropriate leak detection solution. If a leak is confirmed or suspected, re-tightening the brass compression nut ***slightly*** may alleviate this problem. Over-tightening may damage the bubbler unit. If there is sufficient length the o-line may be cut off and new compression fittings installed.

The O-line/terminal end may have been damaged, obstructed or plugged causing a leak in the system. (Purging the line may be a simple solution to incorrect stage readings). Be sure to verify that the RS-485 wire connector from logger to H355 Gas Bubbler has not been disconnected or damaged.

Station repairs may have required the slant pipe to be moved or reconfigured and secured in a different location, making it necessary to adjust stage. Contact the principle investigator or basin lead and verify that a stage adjustment is needed before attempting. Stage adjustment is accomplished in the *Sensor Input setup* menu. You must manually determine stage via the PGI and then set the logger to match.

***Excessive stage bounce*** may occur due to certain water conditions and may be minimized by adjusting the stage scan averaging time from 001 up to 010. It is not recommended except under extreme conditions and prior principle investigator or basin lead approval, to set averaging higher than 010.

A bubble chamber attached to the terminal end may help to control or alleviate stage bounce problems. (The bubble rate is typically set at 50-60 BPM unless a bubble chamber is installed and then it is set at 30 BPM). A bubble line test may be done to test the o-line for any noise issues and to test stability. Refer to the operators' manual for correct procedures regarding this option.

# Appendix C

## Vehicle and Equipment Checklist

### Standard Vehicle Equipment:

*This equipment should be present anytime the vehicle is used.*

- o Cell Phone and Charger

### Vehicle Folder containing

- o Mileage Logs
- o Emergency Information
- o Fuel Card
- o Maps

### Safety Equipment

- o First Aid Kit
- o MUTCD compliant Safety Vests (2)
- o CG Approved PFD (1 per person)
- o PFD CO<sub>2</sub> Refill
- o Road Cones
- o Signs
- o Hard Hats (2)
- o Orange Strobe

### Tools / Other

- o Mechanic's Toolbox
- o Shovel
- o Loppers/Clippers/Machete
- o Tire Chains
- o 2- 150 ft. Ropes
- o Spare Key
- o Jack, jack handle, adequate spare
- o Flashlight
- o Lighter
- o Electrical Tool Box
- o Pens
- o Pencils
- o Note Paper
- o Flagging Tape
- o Orange Spray Paint
- o Spare Bucket

### Standard Flow Gear

#### Flow Box:

- o Weighted Tape for Tape Down
- o Tag Line
- o 300 ft. Transect Tape
- o Line Clamps
- o Swiffer Kit w/ Cables and Fans
- o Swiffer Meter
- o Bridge Depth Sounding Correction Sheets (2/10, 6/10, 8/10's)
- o Survey Pins and Hammer
- o Flow Tracker
- o Wading rod
- o Laser Level
- o Stadia Rod

- o Thermistor
- o Spare Batteries for All Devices
- o Battery Chargers
- o Discharge Measurement Sheets

### Station Visit

- o Station Visit Data Flash Card
- o Multi-meter
- o Logger Menu Flow Chart
- o Desiccant
- o Station Key
- o USGS key
- o Other Keys as needed
- o Appropriate DCP Batteries

### ADCP Gear

- o ADCP Unit
- o PDA (CHECK BATTERY STATUS )
- o SD card for PDA
- o Tow Ropes and Carabiners
- o ADCP Data Sheet

### Bridge Gear (If Needed)

- o Lead Flow Weights, all sizes
- o Bridge Board
- o T-bar
- o Reel w/ Swiffer Cable

### 3-Wheel Crane

- o Reel
- o Crane Assembly

### 4-Wheel Crane

- o HS Meter Box
- o Props
- o Meter Body w/Fiber-Fin
- o Cleaning Soln.
- o Lubricant
- o Reel
- o Crane Assembly/Boom
- o Counterweights
- o Wheel Chocks

### Personal Equipment

- o Water
- o Food
- o Dry Clothes
- o Rain Gear
- o Sunscreen
- o Gloves
- o Waders/Hip Boots
- o Up to Date Ratings Sheets
- o Maps/Station Directions
- o Notebook w/ Extra Data Sheets

### Decontamination Equipment

- o To Be Determined
- o

## Appendix D



Washington State Department of Ecology

### EAP-FMU Stream Gauge Logger Notes

Sta. Name \_\_\_\_\_

Sta. No. \_\_\_\_\_ Party \_\_\_\_\_

DATE					
TIME (PST)					
LOGGER					
STAFF					
WIRE WEIGHT					
CHECK BAR					
TAPE DOWN					
CORR. FACTOR					
CORRECTED TD					
TD RP ELEVATION:					
CORRECTED td					
-WS ELEV@TD					
LASER: STADIA ROD READING					
- WATER SURFACE, ROD READING					
= DIFFERENTIAL, LASER TO WATER SFC					
LASER BEAM ELEVATION					
- DIFFERENTIAL					
= STAGE					
WATER TEMP				ELEVATION	READING
THERMISTER			LL RM1		
AIR TEMP			LL RM2		
THERMISTER			LL RM3		

ECY 070-183 (Rev. 7/08)

Batt V \_\_\_\_\_ Min \_\_\_\_\_ Max \_\_\_\_\_

Reset Stats Y/N                      Batt replaced Y/N

GOES Time OK Y/N

Data downloaded Y/N              .NEW file erased Y/N

Desiccant condition \_\_\_\_\_ Changed Y/N

CSG checked Y/N

HWM \_\_\_\_\_ ft on stick + Ref Elev \_\_\_\_\_ ft

= HWM Elev \_\_\_\_\_ ft.              Cleaned Y/N

Added cork Y/N

Remarks: \_\_\_\_\_  
\_\_\_\_\_  
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