

Logging and Transmitting Ancillary Battery Voltages for NWLON Stations

Procedure Number: SOP #6.3.2.1.14

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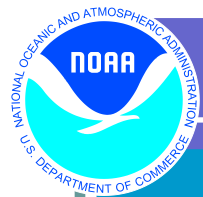
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Approved By: MSCS (Measurement System Configuration Subcommittee)

1. **Title:** Logging and Transmitting Ancillary Battery Voltages for NWLON Stations
2. **Purpose:** CO-OPS NWLON stations typically employ a minimum of three batteries to ensure there is enough power to properly run both data collection platforms (DCPs) and associated equipment. Presently, station DCP configurations only allow for the logging, transmission, and monitoring of two of those battery voltages. This SOP will show how the pump box battery (and any ancillary batteries) can be connected to the analog boards and ingested by Xpert data loggers, allowing their voltages to be transmitted via GOES and ultimately inserted into the database, and monitored by CORMS.
3. **Background/History:** A typical NWLON station consists of two DCPs (primary and redundant) and a pump box that pressurizes the bubbler tube for the redundant pressure sensor. As a result, the standard NWLON configuration uses a separate battery and solar panel for each of the major pieces of equipment, totaling three batteries. The DCP batteries have always been logged and transmitted (using the GOES flag > and DPAS code L) because internal battery logging was built into the Sutron DCPs. Recent testing has shown that it is relatively easy to connect the third pump box battery (as well as any extra batteries) to any of the analog boards with a simple voltage divider. The voltage divider allows the extra battery voltages to be brought into the analog boards at a safe voltage and logged in the either of the DCPs similar to the primary and redundant battery voltages.

Based on CO-OPS current encoding/decoding scheme, the GOES flag for the ancillary battery voltages will use “=” and can be ingested via PORTS tag with the DPAS code “M”. With this ingestion scheme, voltage values from up to nine ancillary batteries can be transmitted via GOES or polling with no updates to the current CO-OPS ingestion software.

The ingestion of these ancillary battery voltages and plotting of the data on Diagtool will allow labs, field crews, and contractors (with Diagtool access) to more easily troubleshoot potential issues and identify charging problems before there is a loss in data.



4. **Scope/Applicability:** FOD, CIL, and SIL

5. **Main Processes:** Several steps are required to connect an ancillary battery to the DCP and update the Xpert unit for logging/transmitting the data. The following steps outlined are specifically for logging and transmitting pump box battery voltages, but can be used for other ancillary batteries as well:

- A. A voltage dividing cable should be requested from CIL/SIL along with the appendable battery setup file (SSF) "PBAT.ssf".
- B. Connect the voltage dividing cable to the pump box battery (or other ancillary battery) using the circular crimp connections on one end of the cable.
- C. Connect the voltage dividing board on the other end of the cable to pins 9 and 10 on the analog 1 board (AIO1) for pump box batteries (CH5 will be the default for pump box batteries).
- D. Transfer the "PBAT.ssf" to the primary Xpert unit using the Xterm software.
- E. Append the "PBAT.ssf" to the current SSF and save the file with the proper station name (using "Save As").
- F. Update the NOSGOESFormat file to include the new PBAT sensor. This can be done remotely by CIL/SIL as needed. Otherwise, the new sensor line should be inserted in the NOSGOESFormat file above the primary Battery "BAT".
- G. Request that COET update the database configuration for the station to ingest M1 data. If multiple ancillary batteries are connected, the designations M2 through M9 should be used in ascending order.

Once these steps are completed, the system is ready to start transmitting pump box battery voltages. Ancillary battery voltage data (M1,M2, etc...) should be immediately available in the raw GOES messages, and will plot on Diagtool once COET has updated the database configuration.

6. **Detailed Sub-Processes/Checklists:**

- A. Use a typical equipment request form to request a voltage dividing cable.
NOTE: Please make sure to specify the approximate length of the cable if the distance between the pump box battery (or other ancillary battery) and the DCP1 AIO2 board is expected to be greater than 5 feet.

**Chesapeake Instrument Lab
Equipment Request Form**

672 Independence Parkway
Chesapeake, VA 23320
Phone: (757)842-4400 Fax: (757)436-9292

Station Name	Station Number	Date Submitted	Date Required	Date of Site Visit
CIL	99999211	Dec 17, 2018	Jan 17, 2019	Jan 21, 2019

Name: Task Manager:

Address:

City: State: Zip Code:

Item	Quantity	Notes (type, cable length, etc.)
Voltage Dividing Cable	1	5ft to stretch from pump battery to DCP1 AIO2

Figure 1. Typical CIL/SIL Equipment Request Form.

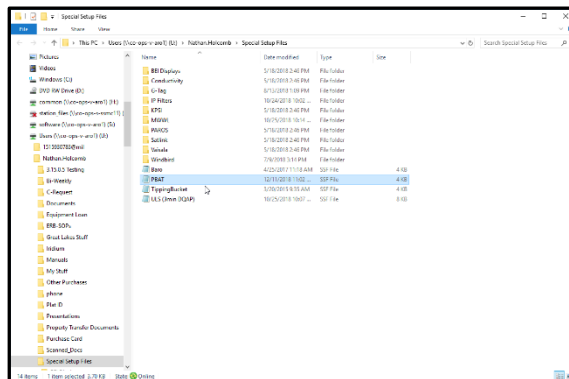


Figure 2. Appendable “PBAT.ssf” Setupfile.

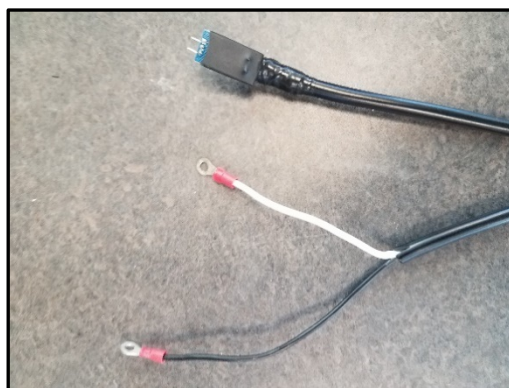


Figure 3. Primary Components of Voltage Dividing Cable - Circular crimps and voltage dividing board.

Although the cables can be made in the field if necessary, it is preferred that one of the labs complete the build-out of the cables in a controlled environment.

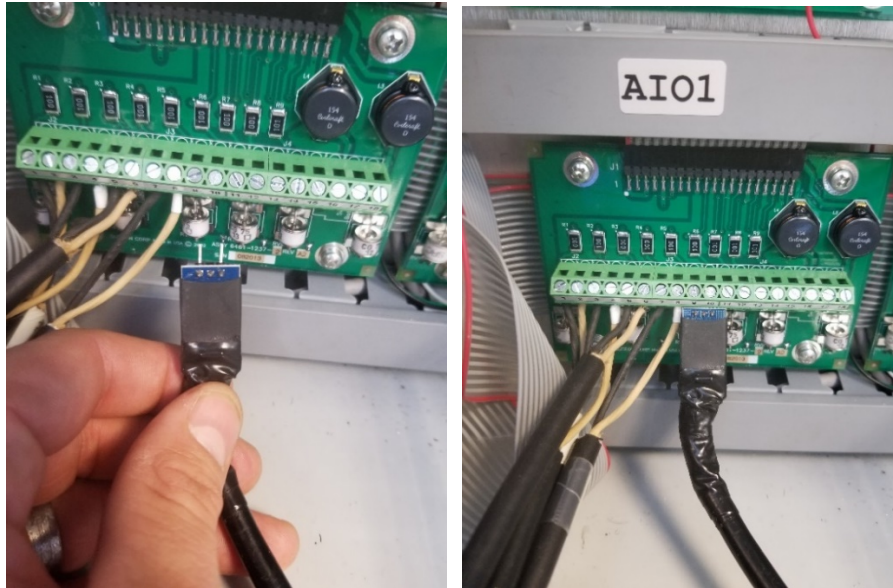
It should also be noted that the file name may differ slightly if you are connecting an ancillary battery other than the pump box, and have requested an updated setup file from SIL/CIL.

- B. Connect the voltage dividing cable to the pump box battery (or other ancillary battery) using the circular crimp connections on one end of the cable.



Figure 4. Circular crimps from voltage dividing cable have been connected to battery. Note that the pumpbox battery should typically have the following components already connected: Pumpbox power cable, IP power cable, & charging output cable from ASC solar voltage regulator

- C. Connect the voltage dividing board on the other end of the cable to pins 9 and 10 on the analog 1 board (AIO1) for pump box batteries (CH5 will be the default for pump box batteries). Other ancillary batteries should use CH5 (pins 9 and 10) on AIO2. The wires running from the battery should be on the underside of the voltage dividing board to ensure the board is oriented correctly.



Figures 5&6. Confirming voltage dividing board is properly oriented (LEFT) and inserting the pins from the voltage dividing board into pins 9 and 10 on the AIO1 board (RIGHT).

- D. Transfer the “PBAT.ssf” to the primary Xpert unit using the Xterm software.
- i. Open the file transfer window (click “File Transfer” button in top right corner of Xterm) and locate the “PBAT.ssf” file on your computer. Highlight and transfer the file onto the Xpert unit.

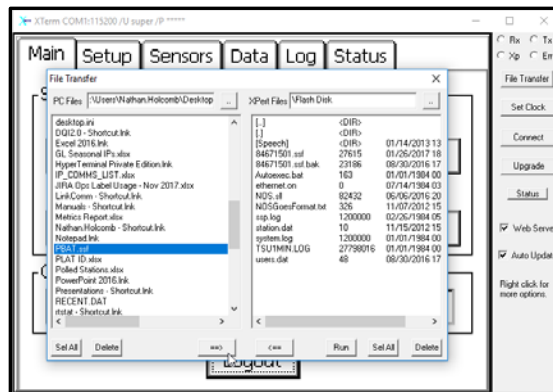


Figure 6. Located “PBAT.ssf” file on the computer using the File Transfer Window.

- ii. Ensure “PBAT.ssf” is now available on the Flash Disk. Check to make sure the file size and date match with what is on your computer.

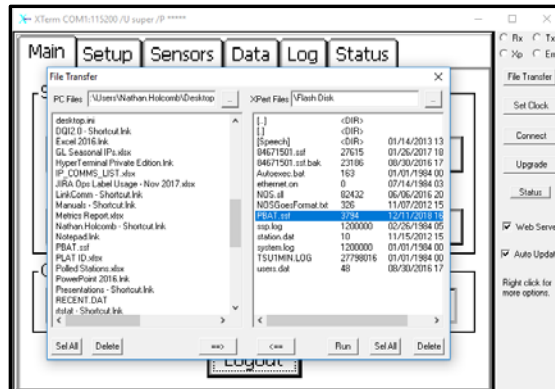


Figure 7. Confirm “PBAT.ssf” has been transferred to the Xpert and the file size/date matches with what I have listed on the computer.

- E. Append the “PBAT.ssf” to the current SSF on DCP1 and save the file with the proper station name (this can be done doing a “Save As”).
 - i. Under the “Setup” tab, scroll down and expand the “Setup Files” dropdown menu. Select “Append” from the drop down menu and click the Append button. When prompted select the setup file “PBAT.ssf” and click OK. The hourglass should come up until the file is finished appending.

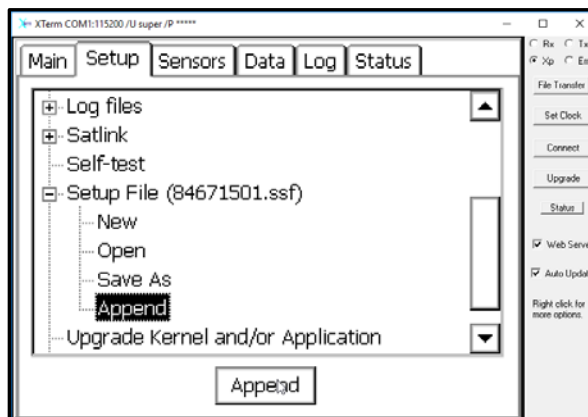


Figure 8. Select Append from the drop down menu under Setup File and click the Append button.

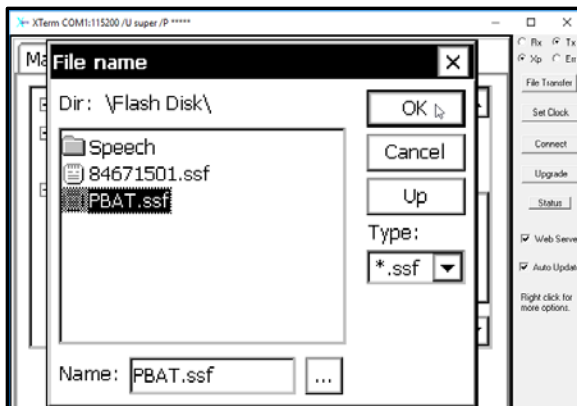


Figure 9. Select the “PBAT.ssf” file and click the OK button.

- ii. To ensure the PBAT sensor was added pull up the sensor tab and scroll to the bottom of the sensor list. Confirm the PBAT sensor is available and listed on the proper channel and analog board (AIO1 CH:5, if it is the pumpbox battery).

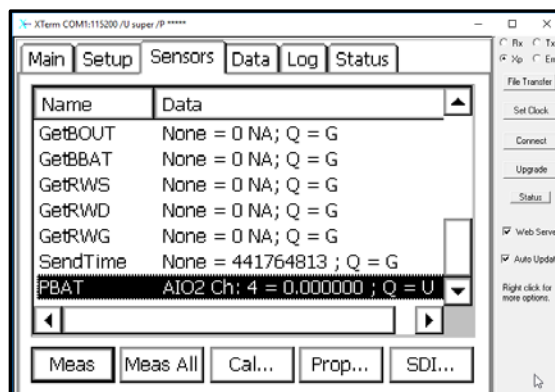
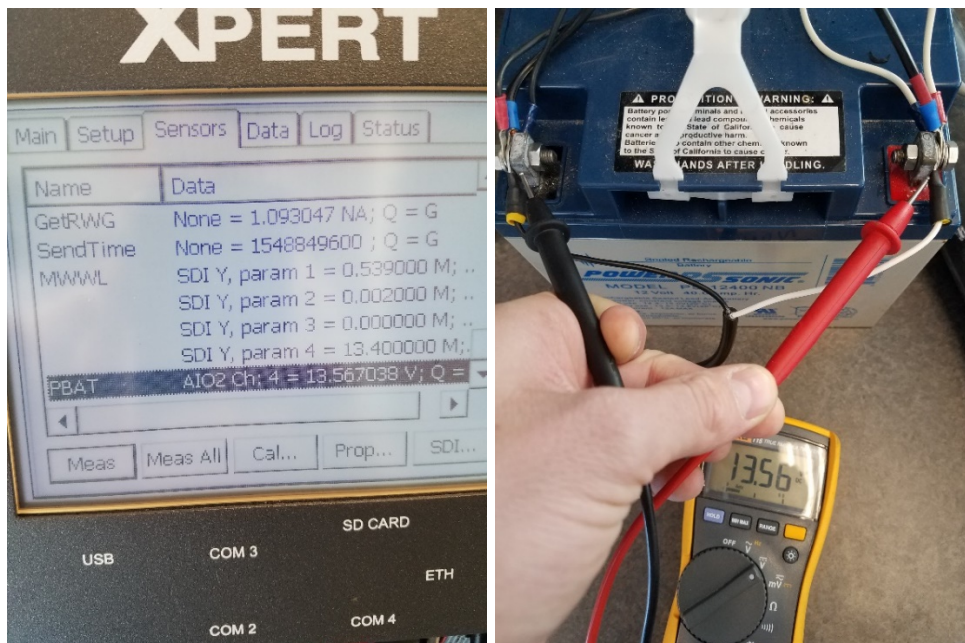


Figure 10. Confirming the PBAT sensor is available and setup on the correct analog board and channel.

- iii. After highlighting the sensor, click the Measure button. Using a voltmeter, check the voltage at the pumpbox battery and compare it to the measured value on the Xpert. The values should be within 0.1 volts.



Figures 11&12. Taking a measurement from the Xpert unit (LEFT) and comparing it with the voltmeter on the ancillary battery (RIGHT).

- F. Update the NOSGOESFormat file to include the new PBAT sensor. This can be done remotely by CIL/SIL as needed. Otherwise, the new sensor line should be inserted in the NOSGOESFormat file above the primary Battery “BAT”.

```

Sequence #,Description, DPAS Code, Flag, log label, #ST, #RR, Format, Aux1, Aux2, Aux3, Aux4/Header=#
1,Aquatrak,A1,1,PWL,10,3,TAQUATRAK3,PSIG,POUT,AQT1,AQT2
2,MWWL,Y1,8,MWWL,10,3,MSO3,MWSTD,MWOUT
3,Pwindbird,C1,3,PWS,1,3,WSWDG,PWD,PWG
4,Air Temp,D1,4,AT,1,3,SVS
5,Water Temp,E1,5,WT,1,3,SVS
6,Barometer,F1,6,BP,1,3,BAROM
7,PBAT,M1,=,PBAT,1,3,SV
8,BAT,L1,<,BAT,1,3,SV
9,Backup,B1,2,BWL,10,3,MSO3,BSIG,BOUT
10,Rwindbird,C1,3,RWS,1,3,WSWDG,RWD,RWG
11,BBAT,L1,<,BBAT,1,3,SV
  
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Figure 13. Example of Typical NOSGOESFormat.txt with the PBAT sensor added.

- G. Request that COET update the station configuration to ingest M1 data. If multiple ancillary batteries are connected the designations M2 through M9 should be used in ascending order. Please note the corresponding batteries and their designations in the notes section for each battery on ESITE: Example – M1 is Pumpbox and IP Battery

7. Management/Responsibility: CIL and SIL are responsible for maintaining this SOP.