

Data File Descriptions and Name Conventions

1. Analog Data Files – original/unprocessed

Sensors installed at the facility that produce analog output, are acquired by our PXI National Instruments data acquisition system and stored as volts in a single file. The data acquisition system requires a voltage signal of +/- 5V and this is the range of all the data in the initial unprocessed analog data file. Common sensors that are acquired using this method include resistance wire wave gages, pressure sensors and load cells. Typically, within each trial, there will be a file with the name:

ddd.xxxx_pxin_analog_master.txt

This file contains analog sensor data with one column for each analog sensor deployed as well as some additional columns. The ***ddd*** is the Julian Day of the trial, ***xxxx*** is an internal number, and ***n*** corresponds to the PXI chassis number in use at the facility (a number from 1-3). There may also be another data file present that looks like:

ddd.xxxx_pxin_analog_off.txt.

This type of file exists if we are running a second independent PXI system to collect analog data at a different sampling frequency than the first one. All analog files are saved in near-real time to the local repository.

There are a number of header rows in the file that start with the “%” character describing conditions (metadata) that are part of the trial. Data begins after “% [Data]”. In the header, of particular interest will be the sample rate, start time and the column names which I highlighted in the example below. With regards to sample rate, we typically sample at 50 hz, but we also sample at 2Khz. Column names correspond to sensors deployed for the project as well as some other channels that are recorded. Conventions for column names and sensor names are described later in the document.

Example analog file header lines:

```
-----  
% [O.H. Hinsdale WRL Metadata]  
% FileType: DAQFile  
% ProjectName: NEESeager  
% ExperimentName: h50cm  
% DataCollectedBy: Shin  
% DAQRole: MASTER  
% DAQName: px13  
% DAQLocation: TWB Bridge  
% DAQIPAddress: 192.168.1.13  
% NEESUpload: ON  
%  
% [NEES Metadata]  
% ProjectName: NEESeager  
% ExperimentName: h50cm  
% TrialName: Trial01  
% TrialTitle: Trial 1
```

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```
% TrialDescription: Single solitary wave,
l_solitary_h50_Hh01_disp_0.37767.bin
% TrialConditions: h=50cm, H/h=0.1, Still
% TrialStatus: RECORDED
%
% [Analog Input Metadata]
% ChannelCount: 12
% DAQHardwareChannels: SC1Mod1/ai0, SC1Mod1/ai1, SC1Mod1/ai2, SC1Mod1/ai3,
SC1Mod1/ai4, SC1Mod1/ai5, SC1Mod1/ai6, SC1Mod1/ai7, SC1Mod2/ai0, SC1Mod2/ai1,
SC1Mod2/ai2, SC1Mod2/ai3
% MinVoltage: -5.000 V
% MaxVoltage: 5.000 V
% LowpassCutoffFrequency: 25.000 Hz
% SamplingMode: FiniteSamples
% SamplesPerChannel: 15000.000
% SampleTimingType: SampleClock
% SampleRate: 50.000 Hz
% SampleClockSource: /PXI1Slot4/Ctr0InternalOutput
%
% [Pulse Output Metadata]
% PulseOutputType: Frequency
% PulseIdleState: Low
% PulseTerminal: /PXI1Slot4/PFI12
% PulseDutyCycle: 0.002
% PulseFrequency: 50.000 Hz
% PulseInitialDelay: 0.000 seconds
%
% [Timing Metadata]
% StartDateTimeLocal: Thu 2010/01/21 17:53:38.291 UTC
% StartYearDayUTC: 21.7455820811
% ChannelNames: standard, wmstart, depth, wmdisp15, wmwg15, wg1, wg2, wg3,
uswg1, uswg2, uswg3, depth1
%
% [Data]
2.3494E+0      2.5918E-3      -3.7334E+0      -4.4277E+0      2.6473E-3      -
3.7857E+0      -1.5199E+0      -1.5149E+0      -1.2798E+0      4.5473E+0      -
1.5708E+0      6.2405E-1
2.3496E+0      2.2699E-3      -3.7336E+0      -4.4283E+0      3.1304E-3      -
3.7853E+0      -1.5197E+0      -1.5146E+0      -1.2830E+0      4.5452E+0      -
1.5710E+0      6.2405E-1
```

2. Digital ADV Data Files – original/unprocessed and processed/derived

The only kind of digital data that is acquired by the site National Instruments data acquisition system are Acoustic Doppler Velocimeters (ADV). See <http://www.nortekusa.com/usa/products/acoustic-doppler-velocimeters> for more information on these specialized instruments. These instruments acquire acoustic data which is delivered to an integrally housed processor which then outputs a binary file to the data acquisition system through a serial port. A typical file name for a single ADV being acquired on a serial port looks like:

ddd.xxxx_.pxin_adv_port03.raw.bin

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where *ddd* is the Julian Day of the trial, *xxxx* is an internal number, and *n* corresponded to the PXI chassis number in use at the facility (a number from 1-3). The port number is unique for each ADV. In near real-time, the ADV data is unpacked from binary to ascii, and both files are saved to the local repository. The ascii file naming convention for the resulting file is:

ddd.xxxx_.pxin_adv_port03.txt.

This file contains a similar header format as described for the analog file. Column names precede the data. Units are in m/s. Sample rate for ADV serial data is 50Hz unless specified otherwise in the header file.

3. Analog Calibration and Location Information

Calibration coefficients associated with each sensor deployed are stored in our local repository database and linked to the sensor name in the analog file. The setup information for each trial includes a line that relates the column name to its calibration coefficient as well as its physical location in the basin coordinate system. Since sensors are often deployed on moving bridges or carts in order to create a dense synoptic data set by running repeating waves, the location of each sensor is best obtained from the setup table. In other words, an initial drawing that shows how many sensors and where we deploy them, does not preclude the possibility that these sensors were moved during testing in order to obtain a denser sampling throughout the course of an experiment. Since the capability to link sensor calibration and location data to corresponding sensor names does not currently exist at the project warehouse, “.csv” files are uploaded containing this information.

4. Analog Data Processed File Names

The site utilizes the linked calibration and location information associated with sensor names to produce quick-look reports and analog files that are converted to scientific units. The quick-look reports are saved as pdf files. The automated creation of analog converted data files began in 2012. The file naming convention for these files is:

ddd.xxxx_.pxin_analog_master.converted.txt

These files contain all the original header information in the unprocessed analog file and have additional header lines that detail the calibration coefficients applied as well as the algorithms used in the calculations. These files are saved in our local repository and will be uploaded to the NEES Project Warehouse along with the unprocessed data.

5. Analog Sensor Names and Descriptions

Below is a table with common channel names that are found in the facility analog data file. These sensor naming conventions are used to link to the calibration and location information.

Besides sensors deployed specifically at the request of researchers, we collect other analog signals routinely with every experiment. These signals include acquisition of: 1) voltage standard which provides a check on the DAQ analog to digital system (“standard”); 2) one or more signals from the MTS wavemaker (name begins with “wm”); 3) facility depth and water level sensors. The first six names

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listed below are common and typical channels recorded in our analog files that are separate from sensors deployed specifically for researchers. It's important to remember that the position information for researcher deployed sensors can change as often as each trial if they are attached to mobile mounting systems, and their exactly location must be determined by obtaining the corresponding x,y,z location from the setup file (or ".csv") file.

Sensor Name	Type	Description
Facility specific sensor/channels		
standard	Voltage	Wavemaker voltage standard input for QC purposes
wmstart	Trigger	TTL trigger signal from the wavemaker
depth	Depth	TWB only - wavemaker water depth sensor
wmdisp	Displacement	Wavemaker displacement
wmwg	Displacement	Wavemaker wave gage sensor
level	Pressure	Facility deployed pressure sensor used to measure absolute water depth

Typical research deployed sensors

wg ⁿ	Displacement	Wave gage - resistance wire or cantilever
uswg ⁿ	Displacement	Ultrasonic wave gage
load ⁿ	Force	Load sensor
press ⁿ	Pressure	Pressure sensor