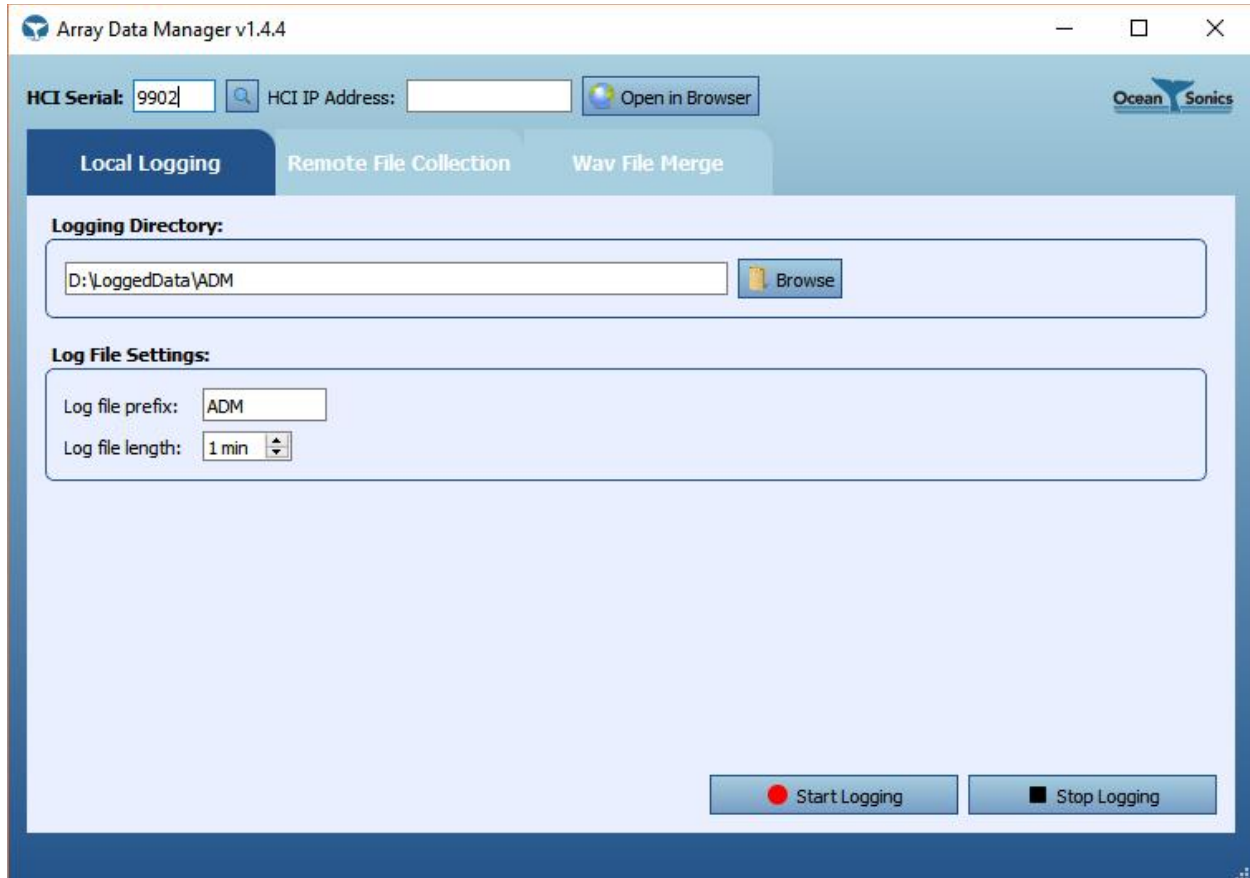


Array Data Manager 1.4.4

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1 Overview

Array Data Manager (ADM) is the desktop PC software for logging, downloading and merging data from an Ocean Sonics hydrophone array. It can connect to an array Host Control Interface (HCI) and stream multi-channel data from it when the HCI is configured to combine data from the hydrophones. When the HCI is set up to only configure the hydrophones, ADM can collect files from the array's devices using FTP, and those files can then be merged into multi-channel wav files.

1.1 The User Interface

The user interface is divided by function into three tabs. Text boxes at the top allow selecting of an HCI by serial number or IP address, and messages are displayed in the status bar on the bottom:

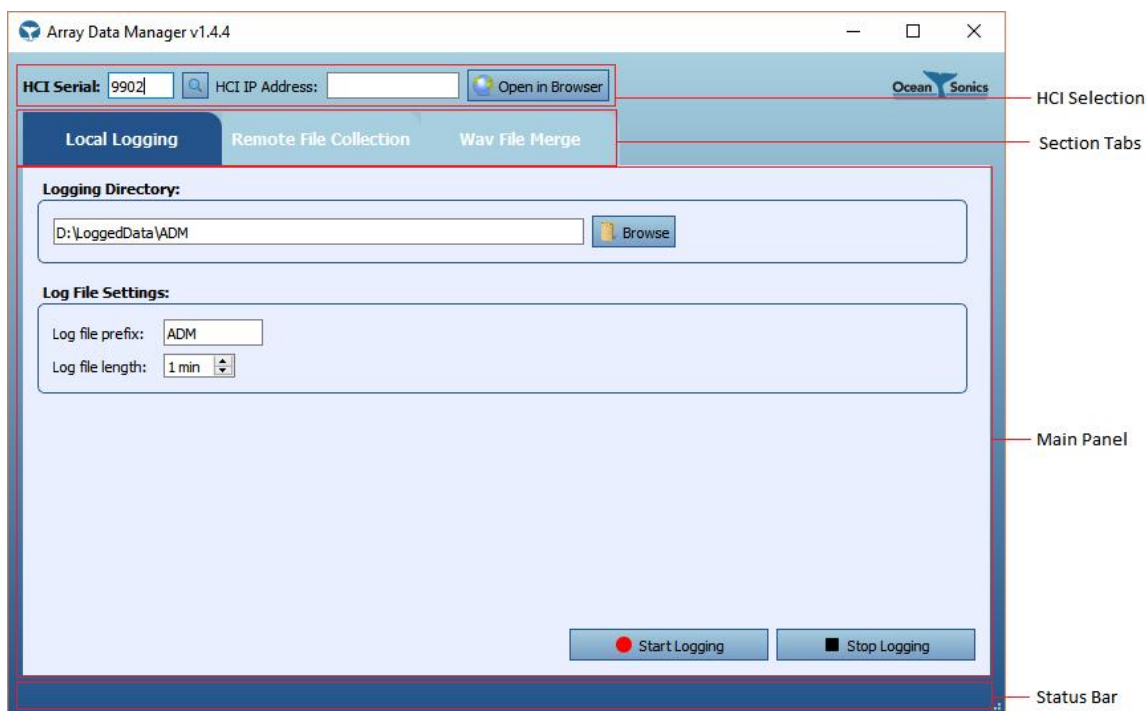


Figure 1-1: User Interface Overview

The rest of this guide describes the details of using each of these three main functions of Array Data Manager. It is divided into the following sections:

- [Section 2: HCI Selection](#): Select the HCI that controls the array.
- [Section 3: Local Logging](#): Settings and controls for logging wav data to a hard drive attached to the PC.
- [Section 4: Remote File Collection](#): Settings and controls for downloading files stored on array devices.
- [Section 5: Wav File Merge](#): Settings and controls for merging wav files collected from array devices.

2 HCI Selection

These fields select which array HCI the Array Data Manager software will connect to for Logging and Remote File Collection.

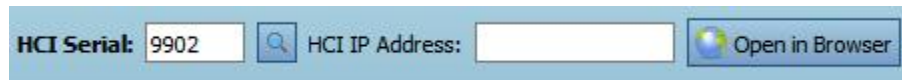




Figure 2-1: HCI Selection Area

HCI Serial: Type the serial number of the array HCI here. Click  or press Enter on the keyboard to check the network for the HCI that has this serial number. If found, the IP address of the HCI will appear in the HCI IP Address field.

HCI IP Address: This field displays the IP address of the HCI. If the IP address is known but the serial number is not, the IP can be entered here to search for the serial number. Enter the IP address and click  or press Enter on the keyboard and the serial number will appear in the HCI Serial field.

NOTE: These fields can also be used to connect to individual hydrophones for logging, but Remote File Collection is not possible when connected to a single hydrophone.

3 Local Logging

This section describes how to use Array Data Manager for logging multi-channel wav data on a connected hard drive. The wav files logged using this will contain the same number of channels as there are hydrophones currently configured on the array on its web interface. If any hydrophones on that list are not present, that channel's data will contain only zeroes.

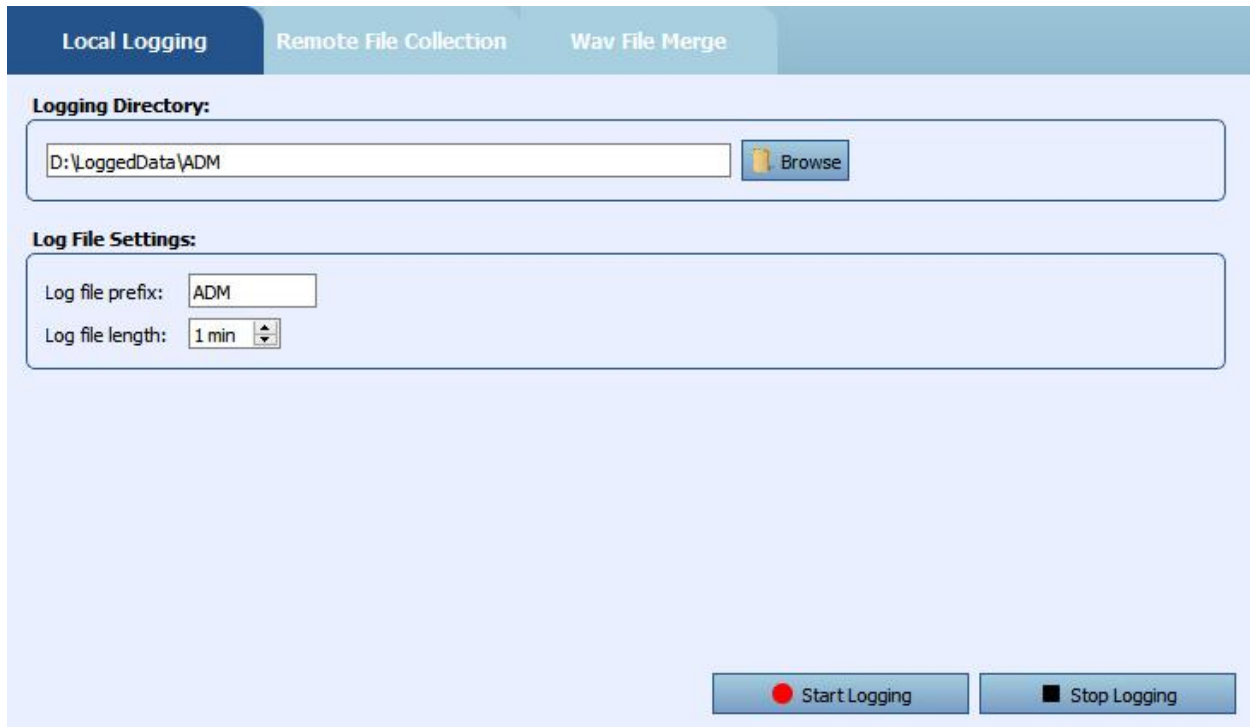


Figure 3-1 Local Logging Tab

3.1 Local Logging input fields

Logging Directory: The directory where wav data will be logged. Click the Browse button or type the directory name to select the logging directory.

Log file prefix: Text that can be added to the beginning of the name of the logged wav files.

Log file Length: The length in minutes of the files logged locally. A new file will be created each time that time interval expires.

3.2 Procedure: Log Waveform Data on a Local or USB Hard Disk

1. Select the **Local Logging** tab to display the local logging settings on the Main Panel.

2. Type the HCI serial number into the **HCI Serial** field in the HCI Selection area. Press Enter. The IP address should appear in the **HCI IP Address** field. If it does not, check network connections and configuration and try again.
3. Click the Open Browser button on the Local Logging panel to open the array configuration web page. Configure the desired channels on the array and the data collection settings.
4. Click the **Browse** button beside the **Logging Directory** field and navigate to the desired directory. This can be a USB drive or network location.
5. Type the desired **log file prefix** in the input field on the Local Logging panel.
6. Set the **log file length** using the spin box on the Local Logging panel.
7. Click the **Start Logging** button. The current logging status is displayed in the status bar.
8. Click **Stop Logging** to end the current logging session when the data collection is complete.

3.3 Log file naming

Array Data Manager creates files with names prefixed by the Log file prefix entered on the Local Logging panel, then the date and time in the format YYYYMMDD_HHMMSS. The date used is the timestamp in the wav data stream from the HCI, not the local PC time.

Format: <prefix>_<date>_<time>.wav

Example: A file started at 13:05:10 on October 1, 2016 with the prefix set to “ADM” would have the following name: **ADM_20161001_130510.wav**

3.4 Status bar messages for Local Logging

“Stream started, waiting for data...”: This means that Array Data Manager is connected to the streaming port on the HCI but the HCI has not yet sent any data.

“Current File: <file name> Length: <HH:MM:SS / Log file Len>”: Indicates how much of the current file has been logged. Each time a second of data is received from the HCI the time increases by one second. If this number stops increasing then the HCI has stopped sending data, or the stream connection is interrupted.

“Stopped.”: The Stop Logging button was pressed and the log stream was stopped.

4 Remote File Collection

Array Data Manager can search hydrophones attached to the array for wav and fft files logged in a specified time range. The files are downloaded using FTP to a directory accessible on the local PC.

The screenshot shows the 'Remote File Collection' tab in the Array Data Manager interface. It features three main sections: 'Download Directory', 'File selection criteria', and 'Download Queue'. The 'Download Directory' section has a text input field containing 'D:\LoggedData\ADM_FTP' and a 'Browse' button. The 'File selection criteria' section includes 'Start time' and 'End time' dropdown menus (set to 2016-12-08 12:58 and 2016-12-08 13:03), radio buttons for 'wav files only' (selected), 'Both wav and fft files', and 'fft (txt) files only'. A 'Find Files' button is located to the right. The 'Download Queue' section shows a table with columns for 'Remote name', 'Local name', 'Progress', and 'Type', and a 'Max Simultaneous Downloads' input set to 4. Below the table, it says 'Files queued: 0' and has a 'Cancel All' button.

Figure 4-1: Remote File Collection Tab

4.1 Remote File Collection Inputs

Download Directory: Location where files downloaded from hydrophones will be stored. Downloading a group of files also causes a “Channels File” to be generated in this directory which lists the current hydrophones connected to the array HCI. The order of the channels in this file is the same as the order of the hydrophones on the array configuration web page. This can be used later to merge downloaded files in the same order without the need to have the HCI connected.

File Selection Criteria: The settings in this sub-panel limit what files will be collected from the attached array devices. There are three settings to select files:

Start Time: Beginning of the time interval when the files were logged.

End Time: End of the time interval when the files were logged.

Wav/FFT selection: Limit which types of files to collect. This allows you to download only WAV, or only FFT files, or to download both types.

Max Simultaneous Downloads: Limits the number of files that can be downloaded at the same time. The highest setting is 10 simultaneous downloads.

4.2 Procedure: Find and Download Files from Array Hydrophones

1. Type the HCI serial number in the **HCI Serial** field on the **Local Logging** panel.
2. Select the location where files will be stored when downloaded by clicking **Browse**, and navigate to the desired location. This can be a local drive, USB drive or Network location.
3. **Select the start of the time** interval to search using the date and time selection controls.
4. **Select the end** of the search time interval.
5. Select which **type** of files to download: Wav, FFT or Both.
6. Click the **Find Files** button.
7. The if any files are found on the remote devices currently attached to the array they will be queued for download. The **download queue table** will be populated with the search results and will start downloading immediately in chronological order.
8. To stop the queue from downloading and remove all files from the queue, click the **Cancel All** button.

5 Wav File Merge

Files collected from array hydrophones can be merged together into multichannel files. The ordering of the channels in the merged file is defined in the Channels File.

The screenshot shows the 'Wav File Merge' tab in a software application. It features three tabs at the top: 'Local Logging', 'Remote File Collection', and 'Wav File Merge'. The 'Wav File Merge' tab is selected. The interface is divided into two main sections: 'Directories:' and 'Merge Settings:'.
In the 'Directories:' section, there are two text input fields. The first is labeled 'Source Directory:' and contains the path 'D:\LoggedData\ADM_FTP'. To its right is a 'Browse' button. The second is labeled 'Destination Directory:' and contains the path 'D:\LoggedData\ADM_FTP\merge', also with a 'Browse' button.
In the 'Merge Settings:' section, there is a 'Channels File:' text input field containing 'D:\LoggedData\ADM_FTP\channels_20170110_155512.json' and a 'Browse' button. Below this are two time selection fields: 'Start time:' and 'End time:'. The 'Start time:' field has a date dropdown set to '2016-12-08' and a time spinner set to '12:58'. The 'End time:' field has a date dropdown set to '2016-12-08' and a time spinner set to '13:03'. Below these is a 'File length:' field with a spinner set to '1 min'.
At the bottom right of the form are two buttons: 'Abort Merge' and 'Merge Files'.

Figure 5-1: Wav File Merge Tab

5.1 Wav File Merge Inputs

Source Directory: The location where the files to be merged are currently stored.

Output Directory: The location where the merged output file will be written.

Start/End time: The time interval of the files to merge. Files logged between these files will be selected from the source directory for merging.

File length: The length of each input file (all input files must have the same length). The output file will also have this length.

Channels File: This is a text file in JavaScript Object Notation (JSON) format that provides a list of channels for the merge. A Channels File is created when files are downloaded from the hydrophones using Remote File Collection. It is placed in the Download Directory. Alternatively, the Channels File can be created manually using a text editor. See *Appendix A: Channels File Example* for instructions and an example file.

5.2 Procedure: Merge Files Collected from Array Hydrophones

1. After wav files have been downloaded from the hydrophones, enter the desired time range into the 'Wav File Merge' section using the start time and end time selectors.
2. Select the desired channels file that defines the channels for the merged wav file. A Channels file is generated in the same location as the downloaded files each time files are downloaded using Remote File Collection. This file can be used, or different one can be selected if needed.
3. Set the file length to match the length of the files to be merged. This will also be the length of the resulting merged file.
4. Select the 'Source Directory' where the files to be merged are located, and the 'Destination Directory' where the resulting merged files will be stored.
5. Click 'Merge Files'.
6. The status of the merge process is displayed in the status bar at the bottom of the main window. The 'Abort Merge' button will become activated, and you can use it to stop the current merge process. When the merge is complete, the button will be deactivated.
7. When the merge process is complete, there will be a text log in the output directory where the merged files are stored. This shows which files were merged and shows anything that went wrong during the merge process.

6 Appendix A: Channels File Example

The format of the Channels file is the common format JavaScript Object Notation or JSON. The format for the list of channels is very simple; it is a “JSON array” which is a comma separated list of numbers all surrounded by a pair of square brackets. The following small example represents a group of four hydrophones with serial numbers from 1001-1004. This text can be edited with real serial numbers, pasted into a text file and that file can then be used as a channels file to define the channels in a Wav File Merge.

6.1 Channels File Example:

```
[1001,  
1002,  
1003,  
1004]
```

7 Appendix B: WAV File Structure

WAV files use the standard RIFF file structure, which groups the contents of the file into separate chunks. Each chunk contains a header, which contains a 4-byte string indicating the ID/type of chunk, and 32bit unsigned number indicating the size of that chunk in bytes (excluding the 8 header bytes). All chunks must be word aligned (size must be a multiple of 16bits). All data fields in WAV files are in little endian format.

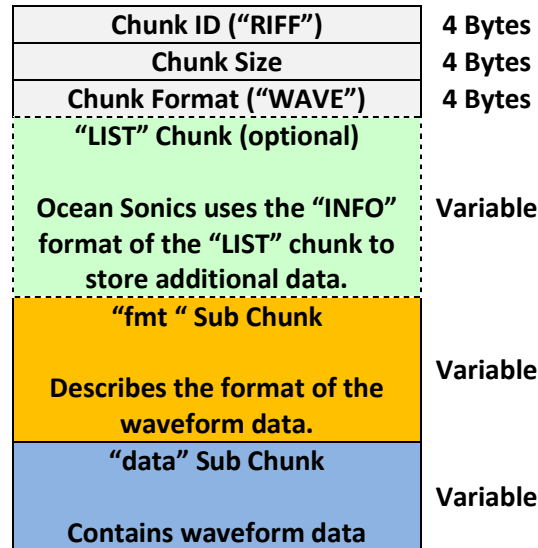


Figure 7-1: Basic WAV File Structure

Every WAV file will contain a RIFF chunk of type "WAVE". This chunk will at minimum will contain 2 sub-chunks (the "fmt" chunk, and "data" chunk). WAV files may contain additional chunks providing more information about the file. Files created by **Ocean Sonics** devices and software also contain an "INFO" type "LIST" chunk, which contains an "ICMT" sub-chunk, and in some cases "IART", "IPRD", "ICRD", "ISFT", and "INAM" sub-chunks.

7.1 “fmt” Sub Chunk

Chunk ID (“fmt”)	4 Bytes
Chunk Size	4 Bytes
Compression Code	2 Bytes
Number of Channels	2 Bytes
Sample Rate	4 Bytes
Bytes Per Second	4 Bytes
Block Alignment	2 Bytes
Bits Per Sample	2 Bytes
# of Extra Format Bytes	0/2 Bytes
Extra Format Bytes	Variable

Figure 7-2: “fmt” Sub Chunk

The “fmt” sub chunk describes the format of the waveform data in the following “data” sub chunk. The following table describes of each field in this chunk.

Table 7-1: “fmt” Sub Chunk Field Descriptions

Field	Description
Compression Code	The compression type used by the waveform data. All icListen models and software use type 1 (PCM/Uncompressed)
Number of Channels	The number of channels represented in the “data” chunk.
Sample Rate	The sample rate of the waveform data in Hz
Bytes Per Second(BPS)	This is the number of bytes of data per second (# Channels x Sample Rate x Bytes Per Sample)
Block Alignment	This value is the number of bytes per sample multiplied by the number of channels
Bits Per Sample	The number of bits per data point.
# of Extra Format Bytes	This field specifies the number of Extra Format Bytes will follow. This field does not exist for PCM/Uncompressed WAV files, and therefore does not apply to wav files produced by Array Data Manager.
Extra Format Bytes	The number and meaning of these bytes varies depending on the compression used. These bytes do not exist for PCM/uncompressed WAV files, and therefore are not present in Array Data Manger files.

The following table shows the settings for these bytes for each **icListen** Model that can store WAV files:

Table 7-2: “fmt” Sub Chunk Fields by Model

Model	Compression	Channels	Sample Rate	BPS	Alignment	Bits Per Sample
HF	1	1	Varies	Varies	3 or 2	24 or 16
AF	1	1	Varies	Varies	3 or 2	24 or 16

7.2 “data” Sub Chunk

Chunk ID (“data”)	4 Bytes
Chunk Size	4 Bytes
Data	Variable

Figure 7-3: “data” Sub Chunk

The data sub chunk contains the actual waveform data in the file, in the format described by the preceding “fmt” sub chunk.

If the data is 8-bits per data point, it is considered unsigned data. Otherwise the data is considered signed.

If the data contains more than one channel, the data is interlaced (each sample contains data from each channel). See the figure below for a stereo data example.

Chunk ID (“data”)	4 Bytes
Chunk Size (12)	4 Bytes
Left Channel	2 Bytes
Right Channel	2 Bytes
Left Channel	2 Bytes
Right Channel	2 Bytes
Left Channel	2 Bytes
Right Channel	2 Bytes

Figure 7-4: 16 bit Stereo “data” Sub Chunk example

7.3 “INFO” Chunk

Chunk ID (“LIST”)	4 Bytes
Chunk Size	4 Bytes
Chunk Format (“INFO”)	4 Bytes
Sub Chunk ID (“ISFT”)	4 Bytes
Sub Chunk Size	4 Bytes
ASCII String	Variable
Sub Chunk ID (“ICRD”)	4 Bytes
Sub Chunk Size	4 Bytes
ASCII String	Variable
Sub Chunk ID (“IART”)	4 Bytes
Sub Chunk Size	4 Bytes
ASCII String	Variable
Sub Chunk ID (“ICMT”)	4 Bytes
Sub Chunk Size	4 Bytes
ASCII String	Variable

Figure 7-5: “INFO” type “LIST” Chunk

The “INFO” chunk is a standard RIFF chunk, which may be used to add additional information to a WAV file. Array Data Manager makes use of the “IART”, “ICRD”, “ISFT”, and “ICMT” sub chunks for this purpose. Each sub chunk contains a NULL terminated ASCII string. The contents of the chunks are as follows:

IART: This field is for the “Artist” (device) that created the waveform data. Array Data Manager uses this field to indicate the device type and serial number of the array controller and each hydrophone that was used to create the data in the file. If the data was created by a single hydrophone, this will contain the information only for that hydrophone. The example below shows an IART string indicating that the file was recorded using HCI 9902 with icListen HF hydrophones 9603, 1387, and 9996.

IART Example: HCI #9902,icListen HF #9603,icListen HF #1387,icListen HF #9996

ICRD: This field is for the file “Creation Date”. This records the date and time of the first sample in the file. The string is an ISO 8601 format string: “YYYY-MM-DDThh:mm:ss+tz (ie: “2015-02-26T14:30:00+00” for February 26, 2015 at 14:30:00 UTC).

YYYY = 4 digit year

MM = 2 digit month

DD = 2 digit day

hh = 2 digit hour (24 hour format)

mm = 2 digit minute

ss = 2 digit second

tz = time zone offset (+00 = UTC, -04:30 = UTC – 4:30, etc.)

ISFT: This field is the “Software” which recorded the data. In Array Data Manager this will indicate that the data was written using **OslWavLoggerV0**.

ICMT: This field is used for additional information related to the recorded data. The information is contained in a string of values separated by ‘;’ (semicolon) characters.

The following table summarizes an example of an ICMT field containing information about a wav file with three channels:

Table 7-3: “ICMT” String Values used by Array Data Manager:

Field	Example String
Full Scale Voltage	"Vpk=3.000000"
Hydrophone Sensitivity	"V re 1uPa=, -170, -168, -165"
Humidity	"%RH=, 28.3, 24.4, 25.8"
Temperature	"deg C=, 33.6, 32.8, 33.0"
Sequence Number of First Sample in File	"Seq # =5528064"

The ICMT string that encodes the information in the table above would look like this:

"Vpk=3.000000;V re 1uPa=, -170, -168, -165;%RH=, 28.3, 24.4, 25.8;deg C=, 33.6, 32.8, 33.0;Seq # =5528064"