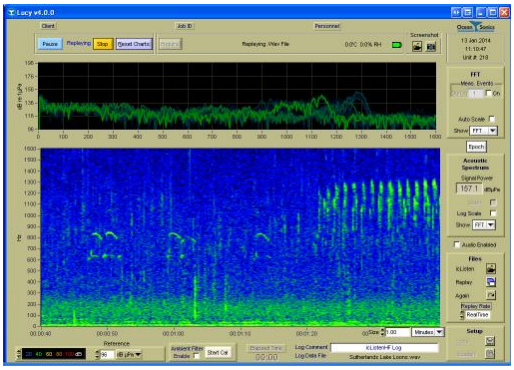
icListen HF User Guide

October 10, 2014

icListen HF Smart Hydrophones



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1 icListen Smart Hydrophones

The concept of the **icListen** Smart Hydrophone has been in development since 2005. Smart Hydrophones take the work out of gathering acoustic data in the ocean. They supply data in real units, processing it as needed before it is stored or sent to the operator.

These hydrophones are ideal for a range of passive acoustic applications, such as

- *Environmental assessments of underwater acoustic noise*
- *Monitoring for marine life, including sea mammals and spawning fish*
- *Laboratory reference hydrophone*
- *Locating sound sources, such as malfunctioning equipment, or flight data recorders*
- *Locating leaks in underwater pipes, and identifying machine noises*

Users communicate with **icListen** through a PC program called **Lucy**. **Lucy** allows users to view instrument data in real-time, replay stored data, and perform housekeeping functions, such as checking the status & configuration. Ethernet **icListen** models also contain a web interface which can be used for device configuration.

We hope you enjoy your experience with **icListen HF**, and look forward to receiving your feedback.

2 Features of icListen HF

The **icListen HF** combines high signal integrity, data storage capacity, low power and small size with the ability to process sound data in real-time.

The **icListen HF** can be used in a tethered mode, or as an acoustic data logger.

In tethered mode real-time waveform or spectral data can be continuously streamed to a host PC running the **Lucy** program.

As a data logger, the **icListen HF** can be configured using **Lucy** or its web interface, then left for extended periods under water to collect waveform or spectral data, storing it internally.

Figure 2-1: icListen HF

The amount of recording time is dependent upon the sample rate, as seen in the following table.

How Sample Rate Affects Storage Time				
Sample Rate	24 Bit Data		16 Bit Data	
	GB per day	Days with 32 GB	GB per day	Days with 32 GB
16 kS/sec	4.1	7.6	2.8	11
32 kS/sec	8.3	3.8	5.5	5.7
64 kS/sec	16.6	1.9	11.1	2.8
128 kS/sec	33.2	0.9	22.1	1.4
256 kS/sec	66.4	0.4	44.2	0.7
512 kS/sec	132.7	0.2	88.5	0.3

*icListen HF can also log 1, 2, 4 and 8 kS/sec data

Note that storage time can be increased significantly by: enabling Duty Cycle Logging to record data periodically, logging based on epoch triggers rather than logging continuously, or by storing processed power spectrum data instead of waveform data.

Waveform data is logged in the standard ".wav" format, making it accessible from a wide range of software programs. Spectral data is in a tab-separated .txt format, suitable for spreadsheet viewing. See the ***icListen Log File Formats*** document for more detailed descriptions of the log files. The **Lucy** program is ideal for viewing stored waveform or spectral data.

Spectral analysis of data is optionally performed in the instrument, and can be averaged for up to one minute to reduce the quantity of data transferred or stored.

2.1 HF – Feature Summary

- Frequency Range: 10 Hz - 200 kHz
- Low power, approximately 2 W
- Power input requirement, 24 VDC +/-15%
- Supplies real-time waveform and processed data, in tethered mode
- Processed data in tab separated spreadsheet .TXT format
- Waveform data in WAV format, with meta data stored in file header
- Monitors internal temperature and humidity
- Monitors battery charge state (as of hardware rev 2)
- Indicates startup/shutdown through buzzer patterns (as of hardware rev 2)
- Seconds can be aligned to falling edge of PPS (as of hardware rev 2)
- Time of day can be synchronized through messages encode in PPS (as of hardware rev 2)
- Maximum depth: 3500 meters
- Size: 45 mm dia., 230 mm long (excluding connector)
- Depth rating: 200 or 3500 meters

3 Quick Start – Bench Setup

It is important to test **icListen** when it is first unpacked, and before each deployment for best results.

The hydrophone works in air well enough to provide a good functional test. Arrange a work surface large enough to hold the hydrophone, cables and the PC used to run the **Lucy** software.

3.1 Checklist

1. Hydrophone to be tested (note its serial number).
2. A PC (ideally the same portable one used to deploy the hydrophone), with the **Lucy** software previously installed. Ensure the PC has a suitable data port interface for the **icListen** instrument.

3.2 Steps

1. Connect the **icListen** to the link cable, and the data link to the PC.
2. Start up the **Lucy** program on the PC.
3. Click the icListen Setup button in the lower right. In the popup window, select the Link tab and chose the appropriate connection type. To find your **icListen**, click "Find All Units". To connect double click the unit from the found units list**.**

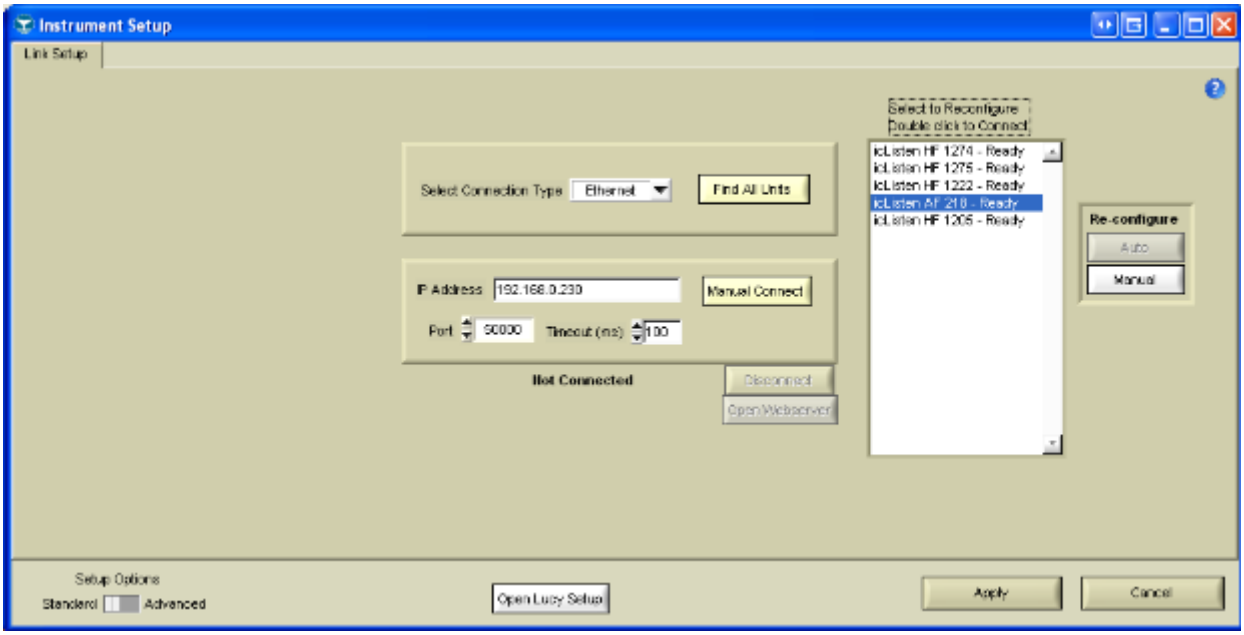

Figure 3-1: Lucy Ethernet connection display

4. Click the ‘Enquire’ button in the middle top of the display. A message to the right will display if enquire is successful. Note the serial number in the displayed message to ensure it matches the number on the hydrophone. The message also displays the sensor temperature (which may be slightly different from that outside the instrument), and the internal humidity, and indicates the battery charge state.

Figure 3-2 : Lucy status display

5. The humidity is an indication of the seal quality. A humidity reading of 50% or less is acceptable. Higher readings indicate a possible leak in the seal. Contact Ocean Sonics if the humidity is higher than 80%. Close the Setup window if it is still open.

6. Click the ‘Start’ button in the top left corner. The display should begin to show data in the charts. Gently tap the hydrophone, or whistle near it, to cause a change in the display. If the display is black/red, change the reference setting on the bottom left until blue or green is visible.

7. If a changing data display is seen, the hydrophone is ready to put in the water. Events will show up on the display approximately 1 second after they have occurred. See the following display for an example.

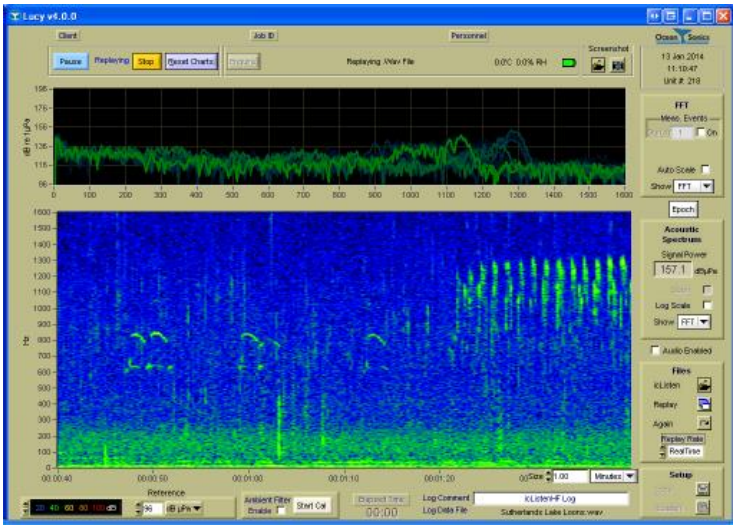

Figure 3-3: Lucy example display

4 Ocean Sonics' Lucy™ Software

The PC software used to talk to the **icListen** hydrophones is called **Lucy**. It presents data to the operator in a graphical and numerical format.

Lucy allows a user to fully configure, monitor status, and retrieve live data from **icListen**. It is also capable of logging live data as it is retrieved and later viewing and analyzing logs created either by **icListen** or **Lucy**.

The interaction of the software has been designed for field operations personnel, making it simple to use once configured.

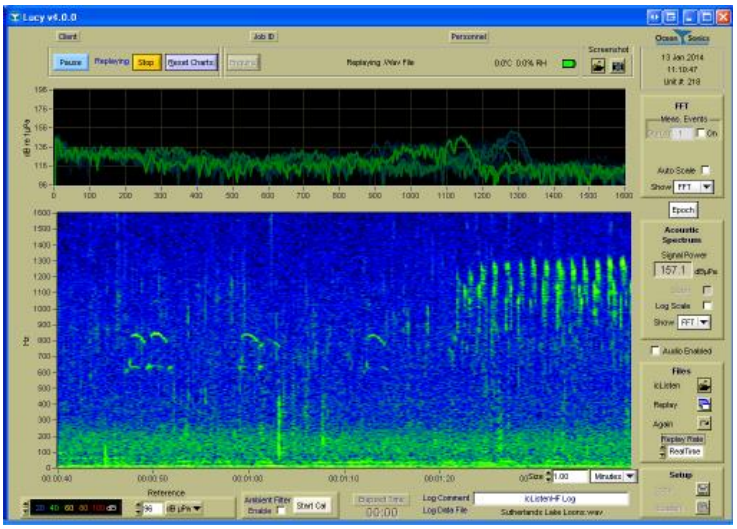

Figure 4-1: Lucy main display

Please refer to the ***Lucy User's Guide*** for instructions on operating the **Lucy** software.

5 Processing in icListen

One thing that makes **icListen** hydrophones smart is their ability to process data. Several types of processing are available to **icListen** devices, all of which add value to the data.

icListen is capable of transmitting real-time waveform data, and storing this data for later analysis as well. All **icListen** smart hydrophones can convert incoming data to power spectrum frequency data. This data can be processed in different ways, transmitted in real-time, stored, or used to trigger different effects in Epoch mode. In **icListen HF**, waveform data can either be streamed or logged. Spectrum data can be collected through a command and control channel, streamed, or logged (but not streamed and logged simultaneously).

5.1 Waveform (Time Domain) Data

Waveform data represents the raw signal detected by a hydrophone. Acoustic data is converted from analog to digital, where it can then be processed by **icListen**.

5.1.1 Real-Time Data

icListen HF is capable of transmitting real-time waveform data to users, using software such as **Lucy**. Along with the digital waveform data, **icListen** will also transmit information on how the unit was configured when the data was collected, which can be used to convert the received numbers to voltage or pressure measurements.

5.1.2 Stored WAV Data

Waveform data may also be stored by **icListen HF** in standard uncompressed WAV files. This makes data recorded by **icListen** readable by many third party sound editing programs and analysis tools, as well as by Ocean Sonics' **Lucy** software.

In addition to the waveform data, **icListen** will store additional metadata in the WAV file's LIST chunk, which can prove to be useful for analysis. For more information on the WAV file format, and the additional information provided in the LIST chunk, please refer to the ***icListen Log File Formats*** document.

Data from an **icListen HF** can be retrieved using FTP, SCP or SFTP, using a program such as FileZilla. For SFTP and SCP, the username is "icListen", the port is 22, and by default there is no password. FTP requires no user name or password. Files can also be retrieved through the "Data->Retrieve" page of the web interface. File retrieval over the web interface is available in software release 15 or newer, and FTP is available in software release 23 and newer.

5.1.3 Gain

In **icListen HF**, gain may optionally be applied to 16 bit waveform data. Applying gain affects the dynamic range of the instrument, by increasing the minimum amplitude signal which can be detected by an instrument, and decreasing the maximum amplitude signal which can be measured by the instrument. This behavior makes increasing gain desirable in quiet environments where important information could be otherwise lost, but undesirable in loud environments where data would be lost due to "clipping" of the signal if gain were applied.

icListen HF samples waveform data at 24bits, and makes use of gain to allow access to the low 8bits of data which would otherwise be lost when returning only 16bits.

5.1.4 Duty Cycling

When storing waveform data, **icListen HF** can also perform duty cycling, to reduce the amount of data logged internally. The cycle length, and active portion of the duty cycle can be configured with 1 minute resolution, and the first active phase of logging will begin when the configured start time has been reached.

5.2 Power Spectrum (FFT) Data

One of the most powerful processing features of **icListen** smart hydrophones is their ability to provide power spectrum frequency data. Looking at data in the frequency domain, rather than the time domain, provides a clearer picture of what's going on within a sound, and can dramatically reduce the storage and bandwidth requirements of an operation.

5.2.1 Real-time Data

All **icListen** models are capable of providing real-time frequency data. This data provides a clear picture of what's happening in a sound. Transmitting frequency data rather than waveform data reduces the bandwidth requirement dramatically as well, which saves on transmission costs, and improves reliability.

This data is also accompanied by information on how the unit was configured when the data was collected, as well as scaling information which can be used to convert the data from voltage to pressure measurements.

5.2.2 Stored FFT Data

icListen HF is capable of storing processed power spectrum data in tab-separated values format TXT files. These files can be read by virtually any spreadsheet or text editor program.

Storing spectrum data can provide a much more compact form of data storage than waveform data, allowing for faster data retrieval and analysis, and means that the unit can store data for longer periods of time between data retrievals.

These files also store additional sensor data (such as temperature and humidity), hardware information, and setup information, which can be used to aid in analysis. For a more in depth discussion on the TXT file format, please refer to the ***icListen Log File Formats*** document.

Data can be retrieved using FTP, SCP or SFTP, using a program such as FileZilla. Files can also be retrieved through the "Data->Retrieve" page of the web interface. For SCP and SFTP, the username is "icListen", the port is 22, and by default there is no password. FTP requires no user name or password. File retrieval over the web interface is available in software release 15 or newer, and FTP is available in software release 23 and newer.

5.2.3 Windowing

icListen makes use of the Hann window function, in order to reduce spectral leakage, when converting data from time to frequency domain.

5.2.4 FFT Processing Options

Not all applications require data to be processed in the same way. For this reason **icListen** has been designed to allow multiple options for power spectrum data processing.

5.2.4.1 Overlap

It is often useful to have some overlap in the waveform data used to compute frequency data. This helps to improve the time resolution of the resulting data, and assists in ensuring we do not miss data that may otherwise be filtered out by the Hann windowing operation. The figures below show an example waveform data set, divided into sections which are used to compute frequency data. These figures show the data used with no overlap (0%) and 50% overlap. **icListen HF** uses a 50% overlap for all spectrum data.

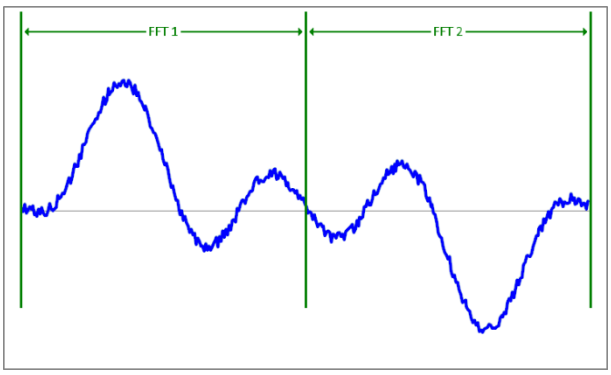

Figure 5-1: FFT's with 0% Overlap

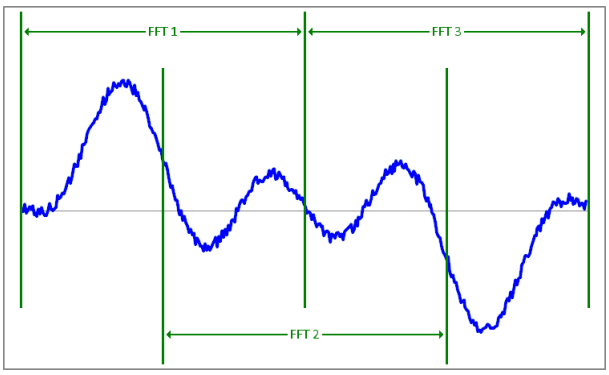

Figure 5-2: FFT's with 50% Overlap

5.2.4.2 Mean Average

This form of processing will calculate the mean average power found at each frequency, over a configurable averaging period. The averaging period is the number of FFT data sets over which the average is calculated.

The mean value for each frequency bin is calculated as follows:

$$Y_i{}^2 = \frac{1}{N}\sum_{j=0}^{N-1}\left|C_{i,j}\right|^2$$

Where:

N = Averaging Period
Y_i^2 = Signal Power of frequency bin
$C_{i,j}$ = FFT Coefficient
i = Frequency Bin Number
j = FFT Data Set Number

5.2.4.3 Peak Value Detect

Peak value detect processing keeps track of the maximum power level found at each frequency. This is done over a configurable number of FFT data sets

5.2.4.4 Filtered

This form of processing performs infinite impulse response (IIR) filtering on the power levels detected at each frequency. The type of filter used is an exponential moving average. The weighting of the average, as well as how frequently the **icListen** will transmit results are both configurable in this mode. This has the effect of smoothing new data with the previous FFT results.

The filtered data for each frequency is calculated as follows:

$$Y_{i,j}{}^2 = \frac{(N-1)\times Y_{i,j-1}{}^2 + \left|C_{i,j}\right|^2}{N}$$

Where:

N = Weighting Factor
$Y_{i,j}^2$ = Signal Power of frequency bin
$C_{i,j}$ = FFT Coefficient
i = Frequency Bin Number
j = FFT Data Set Number

5.3 Epoch Mode

In Epoch mode, **icListen** can be configured to detect specific signals in the real-time data, and perform a number of tasks based on those signals. An **icListen** can check the data for 5 independent triggers.

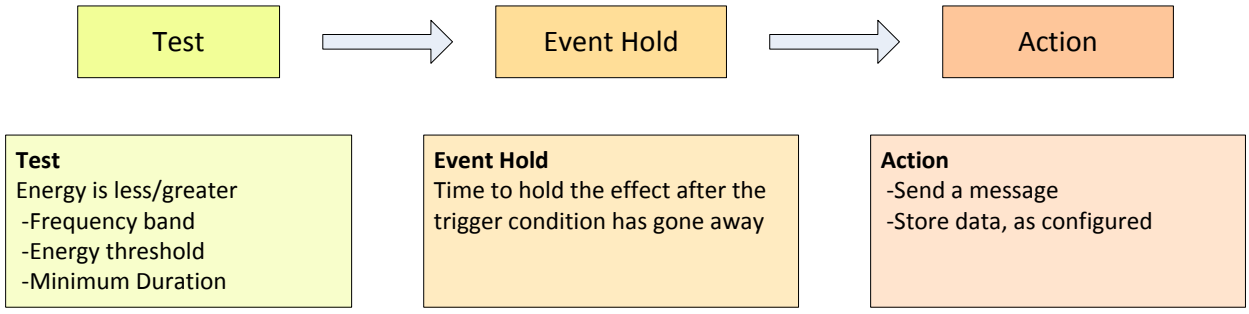

Figure 5-3: Epoch Triggers

Epoch triggers consist of 3 settings. The first setting is the signal conditions required to activate the trigger. This is called the test. Secondly there is the event hold, which is how long the action lasts after the triggering signal disappears. Finally there is the action which **icListen** takes when triggered. The actions available to **icListen HF** are: sending and logging trigger detail messages, and logging data.

icListen HF begins logging triggered data at the top of the second at which an event was detected.

Note: Different events can have different result actions.

5.4 Logging Start Time

icListen HF can be configured to start logging data at a specific date/time. Configuring a start time allows a deployment to be set up well in advance of an actual testing/monitoring session, without unwanted data being logged during this time. Until the start time has been reached, no internal logging of either waveform (WAV files) or frequency spectrum (TXT files), will be logged, but live spectrum data can still be transmitted from the instrument.

6 Additional Features of icListen

icListen also contains some additional features that can aid with troubleshooting, deployment, and operation of the device.

These features include: monitoring temperature, humidity, acceleration, and magnetic field, measuring battery charge state, wake from standby, producing buzzer patterns to indicate power up/down, time synchronization, and network device discovery options for Ethernet **icListen** devices.

6.1 Temperature and Humidity

Temperature and humidity values are continuously measured internally in all **icListen** models.

The internal temperature of an **icListen** will generally be slightly warmer than the outside temperature (more so when the unit is out of water). It is useful for determining if any temperature shocks are experienced during testing. Rapid changes in temperature can result in a DC offset being introduced to waveform data. In some cases the offset can be great enough to "clip"/"max out" the data. This effect is expected and temporary, and knowing the temperature changes that the device experienced can help in determining if this is occurring.

The relative humidity reading can be used to determine the seal quality of the instrument. A humidity reading of 50% or lower is acceptable. If the reading is higher than this, it may indicate a leak in the seal.

6.2 Acceleration and Magnetic Field

Accelerometer and magnetometer readings are available for **icListen HF**. These values can be used to monitor changes in the orientation of the instrument once it has been deployed.

6.3 Battery Monitoring

As of hardware release 2, **icListen HF** monitors the charge and state of the internal battery. This allows a user both to know when the batteries have been fully charged, estimate how long the **icListen** will run from the internal battery, and can be used to determine if there are any issues with the battery.

6.4 Wake From Standby

As of hardware release 2, **icListen** can be configured to wake from standby mode without applying external power. If this feature is activated, **icListen** will wake from standby when the shorting plug is attached, or when the auxiliary (sync) line is driven low. **icListen** will not wake if the battery level is too low for stable operation.

6.5 Buzzer Patterns

In **icListen HF** hardware release 2, a buzzer motor was added to indicate status of the unit. The buzzer patterns can be used to ensure that the device is functioning as expected. The patterns produced by **icListen** are given in the following table:

Buzzer Patterns used by icListen	
Pattern Meaning	Pattern
Unit Booting Up	1 short pulse (0.5s)
Firmware is Ready/Running	2 short pulses (0.5s each)
Unit Shutting Down	3 short pulses (0.5s each)
Error Booting Unit	1 short & 1 long pulse (0.5s and 1s), repeated 3x

*Note that the error pattern may repeat multiple times if unit is unable to boot
*The "Unit Shutting Down" pattern will also be played when a unit is powered on after the battery has been fully drained when using software release 19 or earlier.

6.6 Time Synchronization

icListen HF can be configured to synchronize its time of day to other **icListen** devices by encoding/decoding the time of day within a pulse per second (PPS). When using this feature, one **icListen** device should be set as the master (encode time), and all other connected **icListen** devices should act as slaves (decode time). This same PPS signal is used to precisely align the samples collected by all connected **icListen** units. PPS synchronization is not available on **icListen HF** hardware release 1.

icListen HF is also capable of having its time of day set over the command & control connection to the device. This can be done using Ocean Sonics' **Lucy** software or using the web interface, to synchronize to the time on your PC. This method can be used to set the time of day on the master **icListen** device when synchronizing multiple units together.

6.7 Network Discovery

In order to make finding your device on a network easier, **icListen** makes use of Ocean Sonics' Marco/Polo protocol to discover IP addresses.

A pair of programs (**Marco** and Polo), are used to discover **icListen** units on a network. **Marco** is the application used by the end user on a PC which scans the network for devices, while Polo exists on the **icListen** unit and responds to messages from **Marco**. Using **Marco**, a unit can be discovered on a local network, or through a direct connection to a device, even when not on the same subnet. **Marco** also allows the network settings of the **icListen** unit to be reconfigured.

A copy of the **Marco** software is provided on the data stick supplied with all **icListen** units. As of version 3.6, Ocean Sonics' **Lucy** software is also capable of finding **icListen HF** units using the same message protocol.

7 Logged Data Retrieval

Data logged in an **icListen HF** can be retrieved by several different methods:

FTP: As of release 23, FTP may be used to retrieve data files. FTP is the fastest method of retrieving data files. This is typically done using a program such as “FileZilla”. There is no user name or password required when using FTP.

Web Interface: As of release 15, the web interface may be used to retrieve logged data. The web interface is accessed by entering the IP address of the **icListen** into a standard web browser (such as Internet Explorer, Firefox, or Chrome). On the web page, click “Data->Retrieve” link and follow the instructions presented on the page.

SFTP/SCP: The SFTP/SCP protocols may also be used to retrieve data files. This is typically done using a program such as “FileZilla”. The login user name is “icListen”, and by default there is no password. Port 22 is used when making SFTP/SCP connections.

8 Standard Operation Procedures (SOPs)

The following procedures help to minimize the chance of human error while using **icListen**. These procedures have been designed for use with Ocean Sonics **Lucy** software.

8.1 Autonomous Data Logger Deployment

This procedure is used when deploying **icListen HF** as a data logger. In this setup, the **icListen** logs data internally, while being powered by a battery (the internal battery, or an external battery may be used).

This procedure requires access to:

- A fully charged **icListen HF**
- A PC running Ocean Sonics' **Lucy** software (v3.6 or newer), and any web browser
- An **icListen** test cable, and power adapter

Procedure:

1. Connect test cable to the PC and **icListen,** connect the power adapter to the test cable and mains power, and wait approximately 30 seconds for the **icListen** to start up.
2. Start the **Lucy** software and open the Link panel by pressing the "icListen" button in the "Setup" area of the main window.
3. Open the "Link Setup" tab.
4. Select "Ethernet" as the connection type. Use the "Find All Units" button to locate your **icListen**, and double click on it to connect.
5. Verify that the displayed serial number matches the number on the **icListen** being deployed.
6. Open the "icListen HF Setup" tab on the icListen setup panel.
7. Synchronize the time on the **icListen** using the "Sync Time" button. Check **Lucy's** status line to verify that the time sync has been performed (this is the line of text displayed beside the "Enquire" button on **Lucy's** main panel).
8. Set all waveform settings (bandwidth, data mode, log length, and duty cycling if applicable), and spectrum settings (bandwidth, log length, data mode, and processing) as required by the survey. Also set the logging delay and epoch setups as per the survey requirements. Click the apply button and check the **Lucy** status line to ensure that the setup was accepted.
9. On **Lucy**'s Link Panel click the "Open Webserver" button to open the web interface.
10. Ensure that previously recorded data on the **icListen** has been archived. Navigate to the "Operations" tab. Log in to enable the operation buttons. Press the "Clear Data" button, and accept the confirmation popup. Allow up to 5 minutes for reset and data clearing to complete. **Do not remove power until startup is completed.**
11. Navigate to the "Settings->Data Collection" tab. Verify that all data collection settings match the survey setup.
12. If the unit must be powered off before deployment, disconnect the power adapter from the test cable, and press the "Standby" button on the "Operations" tab of the web interface. Note that in order for the unit to start again, external power must be applied.
13. Disconnect the test cable from the PC and **icListen**, and connect the dummy plug or external battery to the **icListen**. **icListen** is now ready for deployment.

8.2 Autonomous Data Logger Data Recovery

This procedure is used when retrieving data from an **icListen HF** deployed as a data logger. Upon retrieval, the **icListen** should contain stored WAV and/or TXT log data.

This procedure requires access to:

- An **icListen HF** (retrieved after survey has been completed)
- A PC running Ocean Sonics' **Lucy** software (v3.6 or newer), and any web browser
- An FTP client (such as FileZilla)
- An **icListen** test cable, and power adapter

Procedure:

1. Connect the test cable to the PC and **icListen**, connect the power adapter to the test cable and mains power, and wait approximately 30 seconds for the **icListen** to start up.
2. Start the **Lucy** software and open the Link panel by pressing the "icListen" button in the "Setup" area of the main window.
3. Open the "Link Setup" tab.
4. Select "Ethernet" as the connection type. Use the "Find All Units" button to locate your **icListen**, and double click on it to connect.
5. Verify that the displayed serial number matches the number on the **icListen** being recovered to ensure you are communicating with the right unit.
6. Open the "icListen HF Setup" tab on the icListen setup panel.
7. Set 'Waveform Data Mode" and "Spectrum Data Mode" both to "Disabled". Click the apply button and check the Lucy status line to ensure that the setup was accepted.
8. Connect to the instrument using an FTP client (such as FileZilla), and navigate to the "Data" folder. No user name or password is required for login. The IP address of the instrument can be found either using Ocean Sonics' **Marco**, or **Lucy** (by clicking the "Open Webserver" button on the "Link" panel).
9. Download and archive all logged data (all "txt" and "wav" files).
10. The data on the instrument may now be cleared. On **Lucy**'s Link Panel click the "Open Webserver" button to open the web interface. Navigate to the "Operations" tab. Log in to enable the operation buttons. Press the "Clear Data" button, and accept the confirmation popup. Allow up to 5 minutes for reset and data clearing to complete. **Do not remove power until startup is completed.**
11. If the unit must be powered off for storage, disconnect the power adapter from the test cable, and press the "Standby" button on the "Operations" tab of the web interface. Note that in order for the unit to start again, external power must be applied.
12. **icListen** is now ready for storage or battery charging.

9 Care and Maintenance

To get the best performance and longest service life possible out of your **icListen**, it is important to properly care for and maintain your unit. Here are a few things which should be remembered when using your **icListen**.

9.1 Firmware Updates

Occasionally, Ocean Sonics may provide firmware updates for **icListen**.

WARNING: Applying firmware updates will cause all logged WAV and TXT data to be erased from the instrument.

Updates for **icListen HF** are applied using FTP, SCP or SFTP. Any FTP client software (such as FilzeZilla) may be used for this. When using SFTP or SCP, connect to port 22, use “icListen” as the user name, and by default there is no password. **icListen** releases prior to release 23 do not support updating through FTP. The update file will be named icListenUpdateHF###.icu (with ### replaced by the release number of the update), and may be applied using the following steps:

1. Power the icListen using the power adapter (**do not power from battery**).
2. Connect to the icListen via FTP.
3. Once connected, you should see a directory called "update". If this directory does not exist, create it. This directory name is case sensitive.
4. Upload the update ".icu" file into the "update" directory.
5. The instrument must now be reset in order for the update to take place. This can be done either using Ocean Sonics’ **Lucy** software or the web interface.
    - **Lucy:** Use the “Reset” button on the “Link Setup” tab of the icListen setup panel to reset the instrument.
    - **Web Interface:** Type the IP address of your icListen into the address bar of your web browser (Firefox, Internet Explorer, etc), and use the “Reset” button on the “Operations” page to reset the instrument.
6. Allow approximately 5 minutes for the update to complete.
7. Reconnect to the icListen via your web browser, and check that the “Release” number indicated on the home page matches the provided update. You may need to hold Ctrl and press F5 to ensure that the information displayed is not old information from your browser’s cache (the refresh button on the browser generally does not guarantee this).

9.2 File System Care

To maintain optimal performance, Ocean Sonics recommends that logging be disabled, and all files be cleared from the system when the instrument is not in use. This will prevent accidentally deploying an instrument that has no storage capacity remaining.

On the “Operations” page of the web interface, there is a “Clear Data” button. This will delete all logged files, and format the data logging partition for optimal performance. Ocean Sonics recommends using the “Clear Data” function before any major deployments where logging is to be used.

9.3 Connector Care

Ensure that the mating surfaces of the connector are fully seated before deploying the instrument. Failure to do this could result in shorted connections when the unit is placed in the water.

Never use excessive force to seat connectors. This may result in the pins being broken or bent, which could result in down time while the connectors are being replaced. If a connector is tough to get in place, lubricate the rubber parts of the connector sparingly using ***Molykote 44 Medium*** lubricant.

Never use the backshell/fastening nut to force the connector into place. This could result in damage to the connector or backshell, and may result in the connectors not being fully seated in place.

The connector should not be exposed to extended periods of heat or sunshine. Should this occur and the connectors become very dry, they should be soaked in fresh water before use.

Any accumulation of sand or mud in the female contact should be removed with fresh water. Failure to do so could result in the splaying of the female contact and damage to the O-ring seals.

Disconnect by pulling straight, not at an angle. Do not pull on the cable, and avoid sharp bends at cable entry.

9.4 Retrieval and Storage

When your **icListen** is being retrieved, it is important to rinse off the unit with fresh water. This will avoid corrosion and keep salt crystals from forming on the connectors. Failure to do this could result in the need to have the instrument serviced, to replace the connectors.

Make sure your unit is powered down by disconnecting the power adapter from the test cable, and pressing the “Standby” button on the “Operations” page of the web interface. This will help reduce running down of the battery, and accidentally logging data while in storage. Failure to do this can result in lost time while the battery is being charged, or while clearing unnecessary log files from the unit.

9.5 Long Term Storage

When storing your **icListen** for extended periods of time, there are some additional steps which should be taken to maximize the life of the internal battery.

icListen should ideally be stored between 5°C and 25°C.

9.5.1 Hardware Release 3 Storage

For long term storage, the ideal charge level of the battery is around 50%. It is recommended that before storage, your **icListen** is either charged up to approximately 50%, or left running unpowered until it drains to this level.

icListen should next be placed into standby mode, by pressing the "Standby" button, either on the "Operations" page of the web interface or on the "Link Setup" tab in **Lucy.** The power adapter must be disconnected to ensure that the icListen does not reboot.

Wait for **icListen** to indicate it has shut down (3 buzzes), and then fully insert and remove the Power Down plug supplied with your instrument. This will disconnect the battery internally until external power is reapplied.

9.5.2 Older Hardware (Release 1 and 2) Storage

Before storing your **icListen**, it is recommended that you should fully charge the internal battery, and then put the device into standby mode.

The device is put into standby mode by pressing the "Standby" button, either on the "Operations" page of the web interface, or on the "Link Setup" tab in **Lucy**. The power adapter must be disconnected to ensure that the icListen does not reboot.

9.6 Deployment

When deploying an **icListen**, it is a good idea to apply some gentle soap, such as dishwashing liquid, to the surface of the hydrophone. This will help to break the surface tension, avoiding bubbles forming on the hydrophone surface, which could have adverse effects on the signal quality.

If your **icListen** will be internally logging, make sure that the file system is ready (see *File System Care*).

9.7 Long Term Deployment

For long term deployments, contact Ocean Sonics for support.

10 Troubleshooting icListen

10.1 Instrument not communicating

- Check wiring. If externally powered, ensure power is functional using a multimeter. Re-seat plugs and connectors.
- Check data link interface on PC with another device to ensure PC interface is working.
    - Note that some computers will actually power down their network adapters when not in use, which may cause them to become unresponsive when an **icListen** is directly connected, until the computer is rebooted. Connecting the **icListen** through a network switch will avoid this issue.

10.2 I need to find out the icListen firmware version and serial number

- The instrument's serial number is printed on the side of instrument, and its carrying case.
- The firmware version and serial number can be retrieved by sending an Enquire command to **icListen**. This can be done in **Lucy** by clicking the 'Enquire' button and noting the response to the button's right, or by connecting to the unit using the "Link" panel.

Figure 10-1: Lucy status bar

- This information is also available on the "About" section of the web interface.

10.3 The information displayed on the web interface is blank or not updating

- Your web browser may be displaying the page from a cached version.
- For most browsers, holding Ctrl while pressing F5 will force all files in the cache to be discarded, and refresh the page (this is often not done when using the refresh button, or pressing F5 without holding Ctrl). Some pages on the web interface also include a "Refresh" button, which will also clear browser cache.
- If this fails you may need to manually clear all browser cache to remedy the issue (Ctrl + Shift + Delete on most browsers).

10.4 I'm starting to miss data in my icListen WAV logs

- If network usage on the instrument is heavy (can be caused by streaming/scanning data in Lucy, or activity on the web interface, FTP or SSH port), small amounts of data loss may occur. Reducing the network usage when possible during internal logging operations is advised to avoid this.

10.5 I can't connect to my Ethernet icListen's IP address

- Do not add leading 0's to any part of the IP address. Many applications will treat address fields with leading 0's as base 8 numbers instead of base 10. For example, if your address is 10.11.12.1, and you type 010.011.012.001 into your browser or **Lucy**, you will not be able to connect to the instrument (010.011.012.001 will be interpreted as 8.9.10.1).
- If this fails to fix the problem, make sure that your computer is on the same network as your **icListen**. If your icListen and computer are on separate private networks, it will not be possible to connect to it. Ocean Sonics' **Marco** or **Lucy** (v3.6 or newer) can be used to reconfigure the device's network settings to make the instrument accessible.

11 Options and Configurations

The configuration options for **icListen HF** are listed in the table.

Spec	Standard	Options
Depth	200 meters	3500 meters
Connection	Male 8-pin bulkhead	Male 10-pin bulkhead
Interface	Ethernet 100 base-T	-
Frequency	10 Hz - 200 kHz	-
Use	Tethered / Mooring with battery / Autonomous with internal battery	-

12 Wiring Tables for icListen

The following are standard pinouts used with molded cables and shorting jumpers provided by Ocean Sonics. As your application may have specific requirements, please refer to the wiring table provided with your unit. Drawings of the molded cables are available by request from Ocean Sonics.

12.1 icListen Ethernet Interface

Subconn MCBH8M	Signal Name
1	DC-
2	COM
3	TX-
4	TX+
5	RX-
6	RX+
7	DC+
8	SYNC+

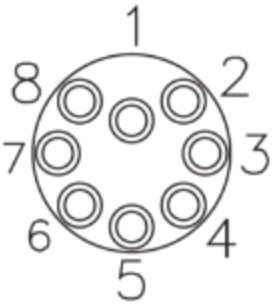

Figure 12-1: Subconn MCBH8M male face

12.2 Ethernet Cable

Subconn	Signal	Ethernet		DC Power
MCIL8F	Name	Wire Colour	RJ-45 Pin #	Connector
1	DC-	BRN	-	RING (-)
2	COM	BLU	-	RING (-)
3	TX-	GRN	6	
4	TX+	WHT/GRN	3	
5	RX-	ORG	2	
6	RX+	WHT/ORG	1	
7	DC+	WHT/BRN	-	RING (+)
8	SYNC	WHT/BLU	-	

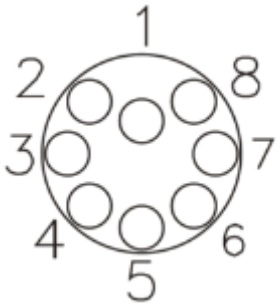

Figure 12-2: Subconn MCIL8F female face

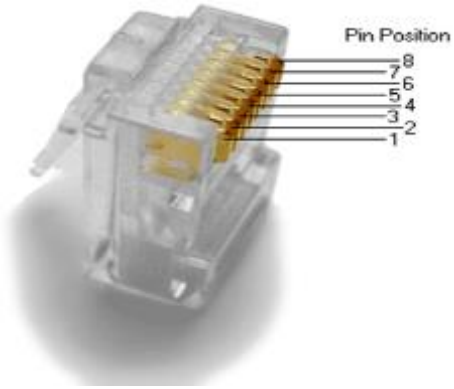

Figure 12-3: RJ-45 Pin positions

12.3 icListen HF Shorting Jumper

To run **icListen HF** in battery mode, a shorting jumper is used to indicate that the unit is running on battery, and to protect the pins on the **icListen** bulkhead connector.

Subconn Shorting Jumper		
Pin #	Circuit Name	Wire Colour
1	**A**	Not Defined
2	**A**	
3	B	
4	B	
5	C	
6	C	
7	**A**	
8	**A**	

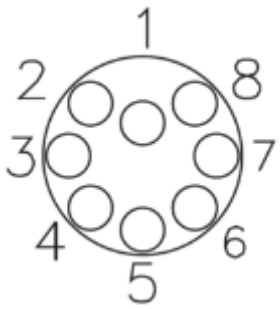

Figure 12-4: Subconn MCDC8F female face

13 Recommended Connectors

The following table lists all the connectors used by **icListen**. Please ensure you check the number of pins and the connector gender before ordering connectors or whips from another vendor.

All listed are rated to 3500 M depth.

Connection	Maker	Pins	Part #	Thread	Mate & Backshell	Dummy/Short Plug
Bulkhead - Male	**Subconn**	8	MCBH8M	$\frac{7}{16}" \times 20$	MCIL8F & MCDLSF	MCDC8F

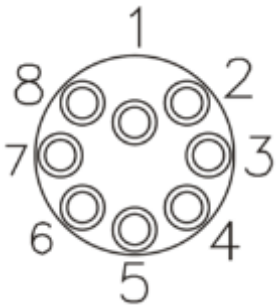

Figure 13-1: Subconn MCBH8M male face