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icListen User Guide

V2022.1

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Congratulations on your purchase of an icListen Smart Hydrophone. Ocean Sonics is dedicated to your success. We want to ensure you collect the best data possible and that you get everything out of your data that you need. This user guide will help you navigate how to most effectively use your hydrophone, from basic set up and configuration through complex deployments.

Ocean Sonics recommends that you review the entire user guide before you begin using your hydrophone. If you have any questions that are not answered in this document, please do not hesitate to contact us for clarification.

With the purchase of every hydrophone, Ocean Sonics offers an *Introduction to icListen* training course. This is an hour long session with an Ocean Sonics team member that will get you comfortable using your icListen Hydrophone and help fast track your ocean sound data collection projects.

Many of the deployments featured in this guide use additional Ocean Sonics tools and accessories. If you are interested in purchasing these tools, or if you would like to know if they are useful for your data collection needs, contact our technical sales team.

To request your *Introduction to icListen* training course, or if you need assistance of any kind, please contact:

Support@OceanSonics.com

For any other inquiries please contact:

Sales@OceanSonics.com

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Contents

Introduction

The icListen Smart Hydrophone combines high signal integrity, data storage capacity, low power, and small size with the ability to process sound data in real time. This guide provides comprehensive information on how to configure and use your hydrophone in the field as well as its maintenance and care. It also links directly to many other relevant documents on our website (these will either open or download based on your browser settings). All referenced documents are also provided on the thumb drive provided with your hydrophone.

The icListen is an ethernet based device. This allows the hydrophone to connect to networks, stream data, and be easily integrated into multi-device platforms. The icListen contains on-board memory enabling it to be used as a fully autonomous device providing storage and real-time streaming for both waveform and spectral data.

Hydrophones manufactured before February 2022 contained up to 256GB of memory. After that date the standard memory became 512GB. To determine how much memory you have go to the **ABOUT** page in the hydrophone web interface (See "About Page" on page 15).

The hydrophone will operate for up to 8 hours using the internal rechargeable battery. Optional battery packs can also be used to extend deployment time.

The amount of recording time available is dependent upon the sample rate as shown below.

Sample Rate (kS/sec)	24 Bit Data	
	GB per day	**Days with 512 GB**
16	4.5	113
32	8.6	58
64	16.9	30
128	33.5	15
256	66.7	7.5
512	133	3.5

Note that the storage time can be increased significantly by enabling *Duty Cycle Logging* to record data periodically, or by storing only processed FFT data. Waveform data is logged in the standard ".wav" format, making it accessible from a wide range of software programs.

Spectral analysis of data can be performed by the icListen and can be averaged for up to one minute to reduce data volume. The data is provided in .txt format, suitable for spreadsheet viewing and further analysis. Full details are available in the *icListen Log File Formats* document.

Ocean Sonics provides a Microsoft Windows application, Lucy, which can be used to configure the icListen (it performs all the functions of the web interface described in this User Guide) and provides additional sound recording and data analysis capabilities. Lucy can stream real-time audio and spectral data, provide real-time sound analysis and record icListen data to a computer. Replay functions are available to review recorded spectral FFT files and waveform data.

Each icListen comes with a 30-day trial of the Lucy application. For full details on how to install and use Lucy please see the *Lucy Software User Guide.*

Compatibility

This User Guide (V2022.1) applies to all models of the icListen hydrophone running version 40.0 firmware. To determine your current firmware version go to the **ABOUT** page in the hydrophone web interface (See "About Page" on page 15).

If you are running an older version of the firmware it is highly recommended that you update it. Instructions for doing so are in "Firmware" on page 41.

This release of icListen firmware is compatible with Lucy v4.3.8 and up, and Marco 2.0 and up. It is also compatible with most third party FTP/SFTP/SCP clients, SSH clients, and web browsers. The web interface requires javascript to be enabled in your browser for full functionality. Logged waveform (WAV) data can also be viewed/edited by audio editing software capable of dealing with uncompressed PCM WAV files.

Here are some free third party programs recommended by Ocean Sonics for use with your icListen:

Audacity
    Free open source audio recording and editing software.

FileZilla
    Free open source FTP client.

PuTTY
    Free SSH client.

Firmware Version 40 Release Notes

New

On the hydrophone Home Page we now display the orientation and heading of the hydrophone, both graphically and numerically. This is derived from the data supplied by built-in magnetometers and accelerometers.

All hydrophones purchased in 2020 or later will support this feature. Many older units will also support it, but it is not guaranteed. If you do not see tilt and heading information on your hydrophone home page, or in Lucy, that means that the hydrophone in question does not support this capability.

See "Home Page" on page 13 for full details.

Improved

A number of changes to the web interface to simplify set up and use of your hydrophone.

- Usable memory capacity is now included on the About page. The default memory provided with an icListen is now 512GB.

- Data deletion is now managed from the Data Retrieval page and removed from Operations.

- Advanced settings have been removed from the Data Collection settings page to prevent unintentional errors. Please contact Ocean Sonics support if you need access to these.

- When non-recommended settings are in use a reset button is now available, enabling restoration of recommended settings in one easy step. See   for full details.

Getting Started with your icListen

Included with your icListen

Your icListen ships in a rugged custom-designed carrying case to protect it when not in use and during transportation. A number of accessories are included as shown below. It is important to test the icListen when it is first unpacked and before each deployment for best results. A functional test can be performed in-air prior to deployment.
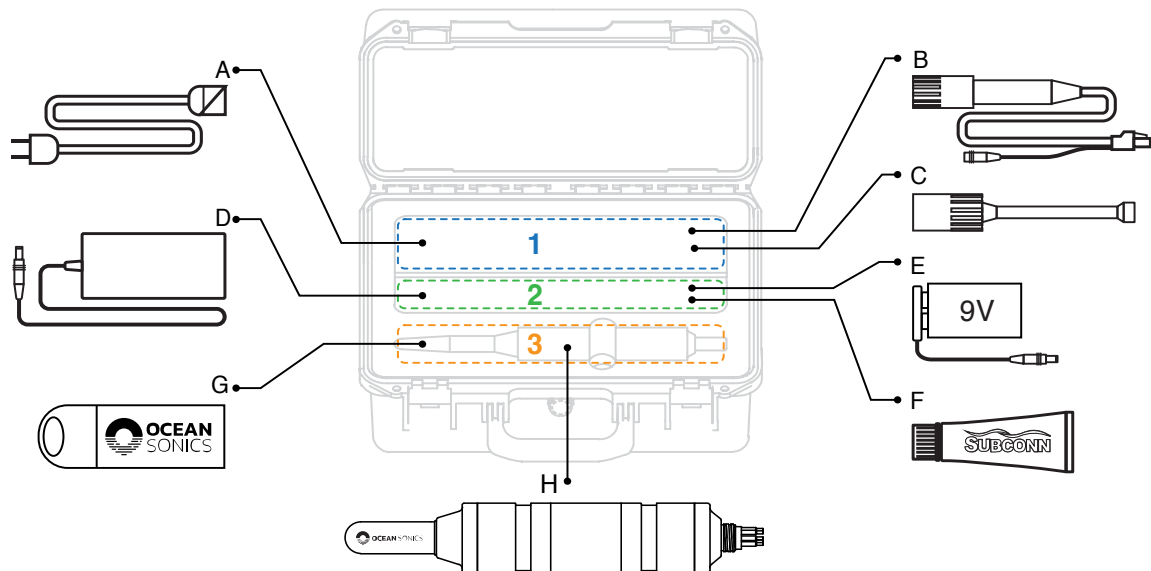
1
A) Power Cord
B) Test Cable
C) Shorting Plug

2
D) Power Adapter
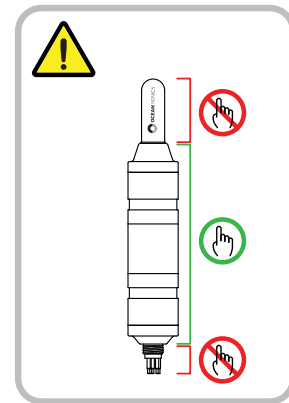**E)** Power Down Tool
F) Lubricant

3
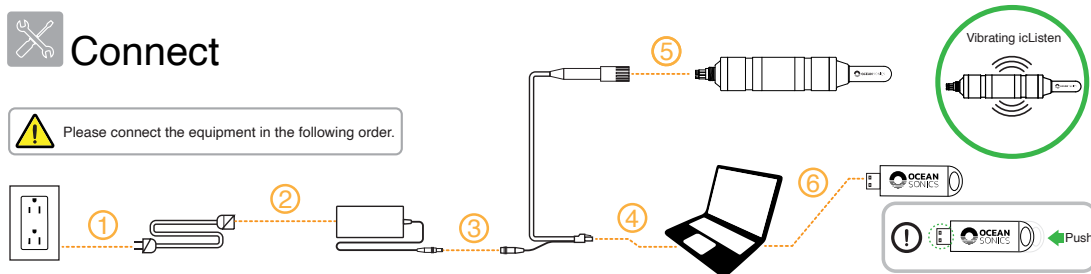**G)** USB Drive
H) icListen Smart Hydrophone

> **Note**
>
> When picking up the instrument ensure it is handled by the body. Do not handle the hydrophone by the element or connectors.

Step 1: Connect Cables

1. Plug the power cord into a wall outlet.

2. Connect the power cord to the power adapter.

3. Connect the power adapter barrel connector to the matching test cable connector.

4. Connect the test cable ethernet connector to a computer ethernet port.

5. Connect the test cable hydrophone connector to the icListen.
    a. Line up the holes in the connector and the pins on the icListen.
    b. Mate the connector and pins. See "Connector Care" on page 42 for more information on mating connectors.
    c. The hydrophone will buzz once, then double buzz.

6. Insert the Ocean Sonics USB drive into a USB port on your computer.

Step 2: Setup the icListen

Ocean Sonics provides a Windows application, *Marco,* to find your icListen on your network and connect to it via your default web browser.
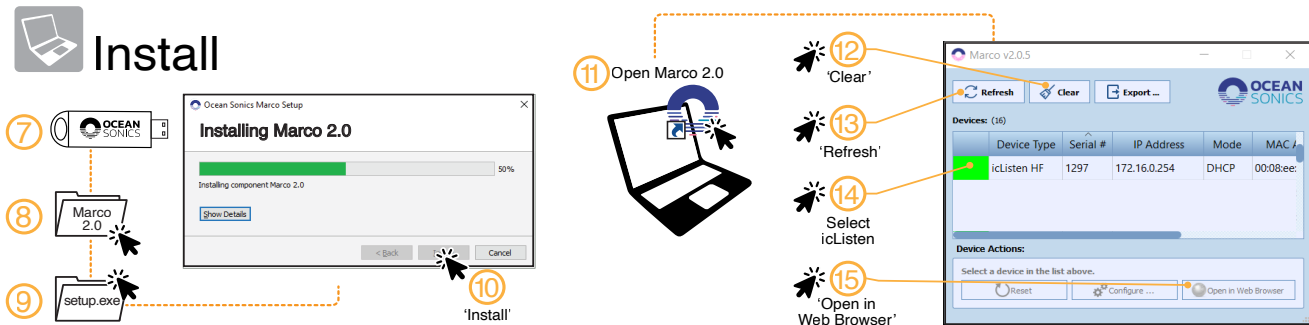
Install Marco

7. Open the USB drive folder on your computer.

8. Navigate to and open the *Marco* Folder.

9. Double click on the setup file to run the setup executable.

10. Follow the Setup instructions to Install *Marco*.

Open the icListen web interface

11. Open the *Marco* Application.

12. Click on the Clear button to erase any previous information stored in *Marco*.

13. Click Refresh to find all hydrophones on your network.

14. Click on the icListen you would like to control.

15. Click Open in Web Browser. You should now see the icListen home page.

Step 3: View and record real-time data
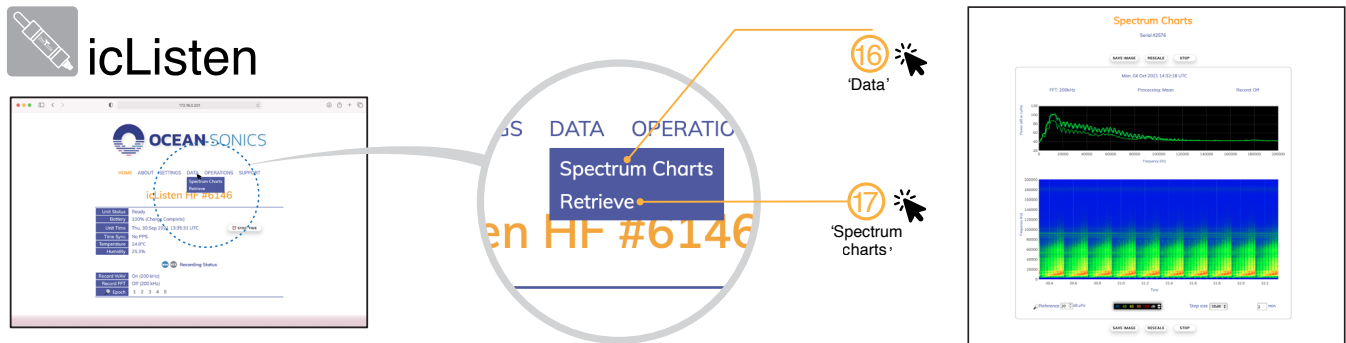
View Live Data

16. On the web interface click the **Data** Tab.

17. Click Spectrum Charts.

Setup icListen Data Collection

18. On the web interface, click the **Settings** Tab > Data Collection

    Set the options as desired and click "Apply". All settings and options are explained in "Settings - Data Collection" on page 16.

    To ensure recorded files have proper time stamps, set the date and time on the Operations Tab.

    Hydrophone Time > SYNC TIME.

Powering your icListen

Operating Power

The icListen can be operated continuously when connected to an external power source as described in "Getting Started with your icListen" on page 5. The acceptable voltage range is 18-30V DC.

The icListen will operate for up to 8 hours from its fully charged internal battery. When external power is disconnected the unit will draw power from the battery until it is depleted. External power can be re-applied at any time to operate the unit and recharge the battery.

Recent models of the icListen (Hardware release 5 or later) can also be powered by -12 V DC. If your icListen has the distinctive silver cone between the sensor and the body, as shown here, then -12V operation is supported. The hardware release version is also reported on the "About" page on the icListen web interface.

Note that when operating at -12V, if the power is removed the unit will turn off - it will NOT continue to operate under battery power.

Power Off

It is important to turn the unit off between deployments and for long term storage. If powering at -12V this is accomplished by simply removing power. In all other cases you must use the **Power Down Tool** supplied in the case and follow this procedure:

1.   Turn off any recording on the hydrophone.

2.   Unplug the barrel connector of the power adapter to remove the power supply.
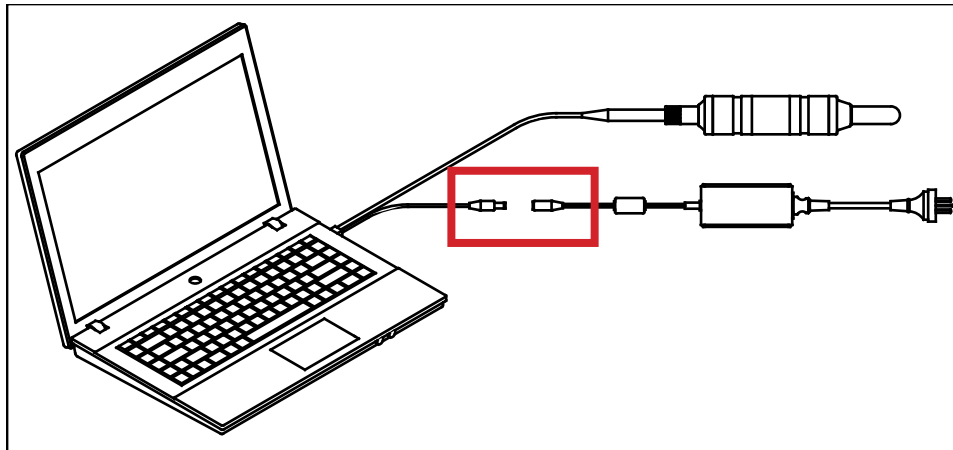
3.   Put the hydrophone into **Standby** mode.

Using the web interface or **Lucy** software, select the **Standby** option under **Operations**. The hydrophone will buzz three times.
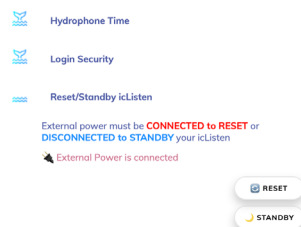
Web Interface

Lucy

4. Plug the **Power Down Tool** (-9v battery) barrel connector into the power barrel connector on the test cable for 1-2 seconds **then remove.** (Do not leave the Power Down Tool plugged into the test cable attached to the hydrophone as it can drain the battery on the Power Down Tool.)

The hydrophone is now turned off.
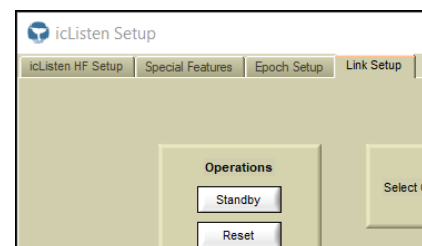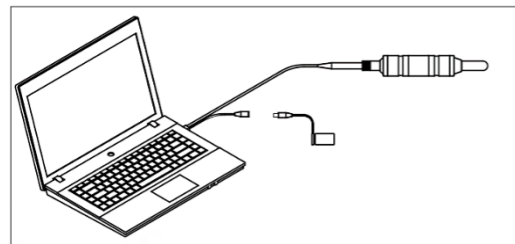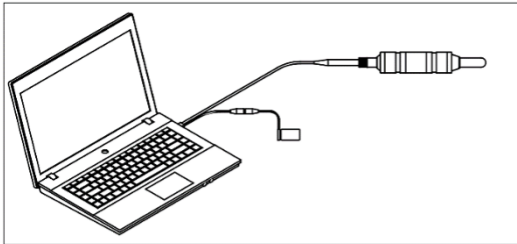
Notes

- If the icListen is powered down for 3 or more weeks, the hydrophone's internal clock time will reset to January 1, 2010.

- In older units the time will automatically reset to January 1, 2010 after each power down.

- The battery charge will be reset and a lower battery charge (up to 20%) is expected when the unit is re-powered, the charge percentage will be accurate at full charge.

Standby Mode

Standby Mode is a low power mode which can extend battery life to 5 days. Settings will be remembered, and recording (if enabled) will continue when woken from Standby Mode.

Charging the icListen

To charge the icListen, connect the hydrophone to a power outlet using the test cable. If fully depleted, the hydrophone will require approximately 8 hours to regain a full charge.

- The icListen can remain plugged into a power source during use.

- Only use the charger supplied by Ocean Sonics to charge the instrument. If you require another charger please contact Ocean Sonics.

- Store the icListen with batteries at 40% - 60% charge. See "Battery Care" on page 44 for more information.

Buzzer Patterns

The icListen uses buzzer patterns as a tactile aid in understanding its status.

icListen Buzzer Patterns	
Pattern	Meaning
1 short pulse (0.5s)	Unit Booting Up
2 short pulses (0.5s each)	Firmware is Ready/Running
3 short pulses (0.5s each)	Unit Shutting Down
1 short & 1 long pulse (0.5s and 1s), [three times]	Error Booting Unit

Notes

- The error pattern may repeat multiple times if the unit is unable to boot.

- Any patterns not listed could be the result of patterns being prematurely cut off by low battery charge.

icListen Web Interface

Whether connected directly to a laptop or via wi-fi with a Launch Box, the icListen Web interface is where you can review the status of the hydrophone, configure all of its settings, view data in real time, and manage your recordings.

Home Page

When you first connect to the hydrophone you arrive at the **Home** page which provides summary status information including serial number, current operating conditions, recording status and, if supported by the hydrophone, current orientation.

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icListen HF #6243

Unit Status	Ready
Battery	95% (Not Charging)
Unit Time	Thu, 19 May 2022 17:32:08 UTC
Time Sync	No PPS
Temperature	19.6°C
Humidity	7.5%

🛡 SYNC TIME

WAV FFT **Recording Status**

Record WAV	Off (200 kHz)
Record FFT	Off (200 kHz)
🔍 Epoch	1 2 3 4 5
Tilt	127°

If a GPS or PPS signal is present and the hydrophone is set to "Sync In" (see "Settings - Special Features" on page 23) the hydrophone will determine time from it. If no signal is present you can manually synchronize the time with that of a laptop by clicking on the SYNC TIME button. More information can be found in "Set Date and Time" on page 26

Epoch refers to 5 user customizable triggers for recording. These are described in detail in "Advanced Settings" on page 20. Their status is reported on this page and colour coded as follows.

No Signal, Event Inactive

Signal Present, Event Inactive

Signal Present, Event Active

No Signal, Event Active

Hydrophone orientation is displayed as Tilt (deviation from vertical) as determined by a built-in accelerometer.

All hydrophones purchased in 2020 or later will support this feature. Many older units will also support it, but it is not guaranteed. If you do not see tilt information on your hydrophone Home Page, or in Lucy, that means that the hydrophone in question does not support this capability.

Units equipped with an accelerometer will also have a magnetometer. Readings from both sensors are updated continuously and this raw data is provided in all recorded WAV files. For more information on how to access this data please refer to the *icListen Log File Formats* document.

About Page

This page provides information on the hardware and firmware versions being used on the hydrophone, current IP address, MAC Address, hydrophone sensitivity, and usable memory capacity.

HOME   **ABOUT**   SETTINGS   DATA   OPERATIONS   SUPPORT

About

Serial #6243

Device Information

Firmware Release	40.0
Hardware Release	7
IP Address	172.16.0.147
MAC Address	00:08:EE:11:A1:2D
Hydrophone Sensitivity	-177.1 dBV re µPa
Memory Capacity	255 GB

Settings Page

This page has four subsections which control data collection, event triggered recording, special feature settings, and detailed network settings.

Settings - Data Collection

The icListen hydrophone can record acoustic data in two formats, Waveform (.wav) and Spectrum FFT (.txt) and has an internal memory for data storage. *Lucy* can also be used to record data on a computer.

Waveform Data   Acoustic time series data. Uncompressed audio, in a standard waveform (.wav) file. The files can be reviewed in any software compatible with .wav files.

Spectrum (FFT) Data   Processed Fast Fourier Transform (FFT) data stored in text (.txt) files. To view spectrum (FFT) files, replay the data in Lucy or open the data in a spreadsheet. Detailed information on Spectrum (FFT) files can be found in the *icListen Log File Formats* document.

Data Collection Settings

Serial #1387

APPLY

Waveform Data	Spectrum (FFT)
Max Waveform Frequency	**Max Spectrum Frequency**
12.8 kHz (32 kS/s)	12.8 kHz (32 kS/s)
Waveform Files	**Spectrum Files**
Mode Logging Off	Mode Logging Off
File Length 1 Min(s)	Max Log Length 1 Min(s)
Duty Cycle Recording	**Spectrum Processing**
Cycle Time 1 Min(s)	Mode Mean
Log Data Time 1 Min(s)	Update Rate 1/2 sec
	Accumulations Per Result 32

☐ Enable Delay

Max Waveform Frequency & Spectrum Frequency

The Max Frequency drop down menus provide the options for data collection sampling rates. Max Frequency refers to the bandwidth of the recording, giving the highest frequency that is recorded by the hydrophone at each sampling rate. The sampling rate is given in kilo-samples per second (kS/s). Available sampling rates for icListen HF and AF models are:

icListen HF	icListen AF
400 Hz (1 kS/s)	400 Hz (1 kS/s)
800 Hz (2 kS/s)	800 Hz (2 kS/s)
1600 Hz (4 kS/s)	1600 Hz (4 kS/s)
3200 Hz (8 kS/s)	3200 Hz (8 kS/s)
6400 Hz (16 kS/s)	6400 Hz (16 kS/s)
12.8 kHz (32 kS/s)	12.8 kHz (32 kS/s)
25 kHz (64 kS/s)	
50 kHz (128 kS/s)	
100 kHz (256 kS/s)	
200 kHz (512 kS/s)	

Waveform & Spectrum Files

Mode: Available settings are: Logging Off (no recording), Logging On (continuous recording), or Epoch (event triggered recording). When recording in Epoch Mode, go to **Settings** > Epoch, to complete set up. This is described in "Advanced Settings" on page 20.

File Length/ As data is recorded to memory it will be divided into sequential files of Max Log Length: the specified length. The maximum supported file size is 1GB which limits the amount of time an individual file can store. For example, at the maximum sample rate of 512 kS/s, 11 minutes is the max time that can be stored in a single file. If you try to set a number higher than the maximum for a given sample rate the interface will alert you and provide the maximum available time.

Duty Cycle Recording

This option is available for waveform data collection only and provides the ability to record for a specific length of time at regular intervals,

Cycle Time: The time between each recording start.
Log Data Time: The duration of each recording

For example, you can record for 2 minutes (Log Data Time) in every 10 minute period (Cycle Time. If no Duty Cycle is required, leave the Cycle Time and Log Data Time as 1.

Epoch Mode and Duty Cycle Recording provide for flexible data collection, optimizing the storage capacity of the hydrophone.

Spectrum Processing

The icListen processes incoming real-time sound data using FFT to create a visual representation in the frequency domain (Spectrum Charts). Our FFT processing has the following attributes:

- Window Type: Hann

- Fixed Window Size: 1024

- FFT Overlap: 50%

- FFT Data Processing Modes: Mean, Peak or Filtered (IIR). These are explained in detail below.

- Spectrum (FFT) files: tab-separated values in text (.txt) file format

- Sound pressure values displayed on Web Browser as dB re 1 µPa. Calculated values are reported as SPL rms (root mean square).

The Spectrum (FFT) data is recorded in a tab-delimited text file format (.txt). The FFT files can be opened by any application that supports this format (See: FFT Data Processing below). The data can also be replayed using *Lucy*, providing detailed waterfall spectral displays and analysis.

Storing spectrum data can provide a compact form of data storage, allowing for faster data retrieval and analysis. The FFT files also store sensor data (temperature and humidity), hardware information, and setup information useful in processing data.

The available Spectrum processing settings are:

Modes

Mean: This is the default. The mean average power found at each frequency, over a configurable averaging period (Update rate). Optimal for most deployments, ex. recording soundscapes, marine mammal observation, etc

Peak: The maximum power level found at each frequency, over a configurable time period (Update rate). Optimal for recording impulsive events, events with short duration or peak sound pressure levels. Examples include pile driving, leak detection, odontocete echolocation clicks.

Filtered: Infinite impulse response (IIR) filtering on the power levels detected at each frequency. This has an exponential moving average which has the effect of smoothing new data with the previous FFT results.

Update Rate

How often power levels are calculated. Power levels are recorded for each update in the FFT file. Default: ¼ second update rate.

Accumulations per Result

The number of FFT data sets used to calculate recorded power level at each frequency bin. Based on sampling rate and update rate. With a fixed window size, a lower sampling rate offers better frequency resolution per bin.

Enable Delay

The start time of the recording can be set to a date and time in the future. Ensure the time is set correctly on the icListen prior to enabling a delay (See).

Click APPLY to send the settings to the device and start recording.

Advanced Settings

With Firmware Release 40 advanced settings are no longer available on this page, but can be set using Lucy. If you requires access to them directly on the hydrophone please contact support.

Note that use of the PAMGuard plug-in with a hydrophone can also result in non-standard settings being in effect.

If non-recommended settings have been set this page now displays a warning to that effect and provides a "Reset Settings" button to restore them to default values.

Data Collection Settings

Serial #6243

APPLY

⚠ Recommended settings have been changed

RESET SETTINGS 🔍

Clicking the magnifying glass will pop up a window showing what the default settings are.

Note: Recommended settings may have been changed through Lucy software or the PAMGuard plug-in

Recommended Settings

Data Format   `24 bit Little Endian ⌄`

Gain   `0 dB ⌄`

Reference Level (dBV)   `-120`

In the Waveform data tab:

- The recommended setting for "Data Format" is "24 bit little endian"
- The recommended setting for "Gain" is "0dB"

In the Spectrum tab:

- The recommended setting for "Reference Level" is "-120"

Click the "Reset Settings" button to re-apply recommended settings

Settings - Epoch

The icListen can be configured to detect specific signals in real-time data. Five independent triggers can be set, each with a unique trigger signal and unique actions based on that signal. These actions can include recording waveform data, recording spectrum FFT data, sending messages over an epoch channel, or simply logging the event in a text file (EpochLog. txt).

Epoch Settings 🔍

Serial #6146

APPLY   CLEAR ALL

Enable	Trigger						Record			
	Frequency (Hz)		Test	Threshold (dB µPa)	Duration	Pre Event	Post Event (s)	WAV	FFT
	Min	Max			(Wave: up to 3 s) (Spectrum: up to 32 s)				
1	☐			> ⇕					☐	☐
2	☐			> ⇕					☐	☐
3	☐			> ⇕					☐	☐
4	☐			> ⇕					☐	☐
5	☐			> ⇕					☐	☐

Epoch mode can increase the relevance of collected data by recording only specifically triggered events. During continuous recording, epoch event detections can mark events for later data analysis.

It is recommended that baseline data be collected at a deployment site to help guide the setup of the epoch triggers for optimal results.

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Special Feature Settings 🔍

Serial #6146

APPLY

Synchronisation 🔍

Sync PPS	Sync In - Falling Edge * ⇕
Sync Time	☑ Decode time from PPS

Wake From Standby 🔍

Wakeup	☐ Enable

Synchronization | The icListen can synchronize to other icListen hydrophones using a PPS signal or to a GPS signal in the deployment setup. The default synchronization is Sync in - Falling Edge. This allows hydrophones to synchronize to a PPS source such as an icLink or a GPS.

icListen hydrophones can self-synchronize when they are cabled together by using a connection cable, a PPS sync bus, a Smart cable, an icLink or an Ocean Sonics Battery Pack. For bigger separations, the icListen can use GPS to synchronize all units.

Wake from Standby | The icListen can be set to wake from Standby mode using the shorting plug supplied with each device. This eliminates the need to apply external power and can reduce battery power usage between setup and deployment.

Settings - Network

This page provides details on the network settings of your hydrophone and allows you to configure how an IP address is set.

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Network Settings

Serial #6146

Current Settings

Name	**icListen HF**
IP Address	172.16.0.201
Network Mask	255.255.0.0
Default Gateway	172.16.0.1
MAC Address	00:08:EE:10:E9:A5
Link Speed	100 Mbps / Full Duplex
FTP Port	21 (TCP)
SFTP/SCP/SSH Port	22 (TCP)
Command & Control Port	50000 (TCP)
WAV Data Stream Ports	51678 (TCP), 51676 (UDP)
FFT Data Stream Ports	51679 (TCP), 51677 (UDP)
Epoch Message Port	51680 (TCP)
Status Stream Port	51681 (TCP)

Update Network Settings

💡 Changing the network settings will close all active network connections

Address Type	DHCP ⬍ ☐ Disable Gateway
Static IP Address	172 . 16 . 0 . 201
Subnet Mask	255 . 255 . 0 . 0
Default Gateway	172 . 16 . 0 . 1

UPDATE

The default Address Type defaults to DHCP which means that the hydrophone is obtaining an IP address automatically from a DHCP server on the network - usually a Launch Box or a router. In cases where no DHCP server is available, direct connection to a laptop in the field for example, an IP address can be set manually.

As the hydrophone and host change locations the host computer may no longer be able "find" the hydrophone. To rectify this situation, use the *Marco* application as described in

Network scanner applications are readily available on all platforms (Win, Mac, IOS, Android,...) and will also be able to locate a hydrophone on your network in most situations. In the event they cannot, *Marco* must be used.

Data Page

This page has two subsections which allow viewing of data in real time, and data management and retrieval.

Data - Spectrum Charts

Two charts are displayed on this page. The top one continuously displays power levels at each frequency while the lower is a standard waterfall display showing power levels by frequency over time. Recording status, FFT recording bandwidth and processing method are also displayed. The reference level, step size, and time represented by the width of the window can be modified, individual images can be saved, and the display stopped/restarted.

Data can also be streamed using *Lucy* or PAMGuard with the icListen PAMGuard Plug-in installed. See the *Lucy Software User Guide* and *PAMGuard plug-in Quick Start Guide* for details.

Data - Retrieve

This page provides memory usage status, and the ability to search, sort, download, and delete files.

All files recorded on the icListen are listed and can be filtered by date and type, or searched by name.

The Download button will download selected files to your browsers download directory. If multiple files are chosen, the files will first be zipped and then downloaded. This method is not recommended when downloading many files. For large amounts of data, Ocean Sonics recommends Lucy, FTP file transfer (The Filezilla ftp client is provided on the icListen USB stick) or the Ocean Sonics Array Data Manager program.

All logged data can be cleared from the hydrophone by clicking the "Delete All Data" button at the bottom of the page.

Retrieve

Serial #1387

No password is set

Files	5
Used	2 GB (1%)
Free	126 GB
Capacity	128 GB

[Year ▼] [▼] [▼] [All ▼] [**DISPLAY**]

[10 ▼] rows   Search: [File name(s)]   [**DOWNLOAD**]

☐	**File Name** ▼	**Modified Time (UTC)** ⇕	**Size**
☐	SBW1387_20220505_000300.wav	00:03:20	2MB
☐	SBW1387_20220505_000200.wav	00:03:00	5MB
☐	SBW1387_20220505_000100.wav	00:02:00	5MB
☐	SBW1387_20220505_000000.wav	00:01:00	5MB
☐	SBW1387_20220504_235907.wav	00:00:00	5MB

1 to 5 of 5 entries   Previous   **1**   Next

How to delete hydrophone data:

- All data will be **PERMANENTLY** deleted
- Recovery of deleted data is **NOT** supported
- Ensure power stays connected until the startup sequence has finished
- Click "Delete all data" button below
- The icListen will automatically restart, deleting all the logged data
- Allow up to 5 minutes for this process to complete

🔊 External Power is connected

[✖ **DELETE ALL DATA**]

Operations Page

This page allows you to perform common operational tasks.

Set Date and Time

The icListen uses UTC date and time in the file name for each recorded wav and FFT file. The time should be checked and set prior to each deployment. If using a GPS or PPS signal in the deployment, the unit time will be set and synchronized by this signal. If no GPS signal is present you can manually synchronize the time with that on a laptop by clicking on **Hydrophone Time** and then the SYNC TIME button.

Operations

Serial #6146

No password is set

≋   **Hydrophone Time**

Set icListen's clock to your computer time

Current Hydrophone Time:
Thu, 30 Sep 2021 14:26:30 UTC
Current PC Time:
Thu, 30 Sep 2021 14:26:07 UTC

🛡 SYNC TIME

Reset/Standby icListen

To reset the icListen ensure it is connected to power and click the RESET button. To put it into standby ensure it is disconnected from power, and click the STANDBY button.

Login Security

A password can be set to protect settings and data. Setting a password does not immediately prevent access - you must go to one of the Settings pages, or the Data Retrieve page, where you will now see a LOG OUT button. Clicking it will prevent any settings changes or data deletion until a successful login is performed. Data can be downloaded from the hydrophone without providing a password.

Password protection can be removed by clicking Apply with the password fields blank.

Deployment Considerations

It is important to ensure that your hydrophone is deployed in a safe and reliable manner to prevent damage to the instrument and ensure high quality data. This section provides information on basic deployment considerations and describes a number of possible deployment configurations.

Rope Deployment Line

When lowering the icListen over the side of a dock or a vessel, a rope should be attached to the hydrophone to avoid placing stress on the connector and prevent equipment loss. A rope can be tied around the body of the hydrophone with secured hitch knots e.g., clove or constrictor. Cable ties or tape can be used to secure the rope in place if needed. The

cable should only be used as a secondary line if the rope fails. Deploying the hydrophone with only a cable can weaken or break the connector.

Guards

Guards are highly recommended for deployments where there is a possibility of the sensor being damaged during deployment or recovery.

Cable Bend Radius

Ensure you know the bend radius of each cable

and follow the appropriate guidelines. Exceeding the bend radius of a cable will damage the internal connections and can cause permanent or intermittent connection loss. See the *Maintenance, Storage and Cable Care* guide for full instructions.

Protect Connector Pins

During autonomous deployments, the shorting plug should be used to ensure the pins on the connector are protected from the ocean environment. For cabled deployments, the connection between cables should be properly seated and locking sleeves secured.

Electrical Grounding

It is important to ensure that the hydrophone and any connected equipment are properly grounded during deployment. Ocean Sonics equipment is designed specifically to ensure this. If 3rd part equipment is part of your deployment care must be taken to ensure that it too is fully and properly grounded. Failure to do so could lead to poor data quality and, in extreme cases, be hazardous to the operator.

If you are unsure how to assess this we recommend having your deployment reviewed by a qualified electrician familiar with underwater equipment installation.

Pre-Deployment Testing

Ensure all equipment is fully charged and working before going out for field deployments. Practicing setting up the icListen with any other equipment (such as a laptop) before the deployment will minimize issues, reduce setup time and ensures that recording is working correctly. Ensure you test in EXACTLY the same way you will be using the equipment in the field. You can then be confident in your ability to record high quality data and know you are getting the best results possible.

Real-Time Deployment Scenarios

The icListen was designed to stream and listen to data in real time. A variety of deployment options are described below.

Directly Cabled to a PC

A directly cabled deployment is the simplest method for streaming real-time acoustic data to your computer. The hydrophone is connected directly to a computer with an ethernet cable.

A common issue with this configuration when a Windows laptop is running on battery power is that the ethernet port may be turned off by the operating system to conserve power, severing the connection to the hydrophone. Typically this happens after a period of network inactivity. If it is impractical to keep the laptop connected to power we recommend disabling power management on your ethernet card. Follow these steps to do this on Windows 10.

- Open Control Panel

- Select "Network and Internet", then "Network and Sharing Center"

- Select "Change adapter settings" from the menu on the left

- Select Ethernet from the list of possible interfaces. This presents the Ethernet Properties window.

- Select the "Networking" tab and click the "Configure" button

- Select the "Power Management" tab

- Ensure the "Allow the computer to turn off this device to save power" option is unchecked and click "OK".

These steps may differ depending on your specific hardware configuration and version of your operating system. Please consult the detailed help files for your machine or an IT professional if additional instructions are required.
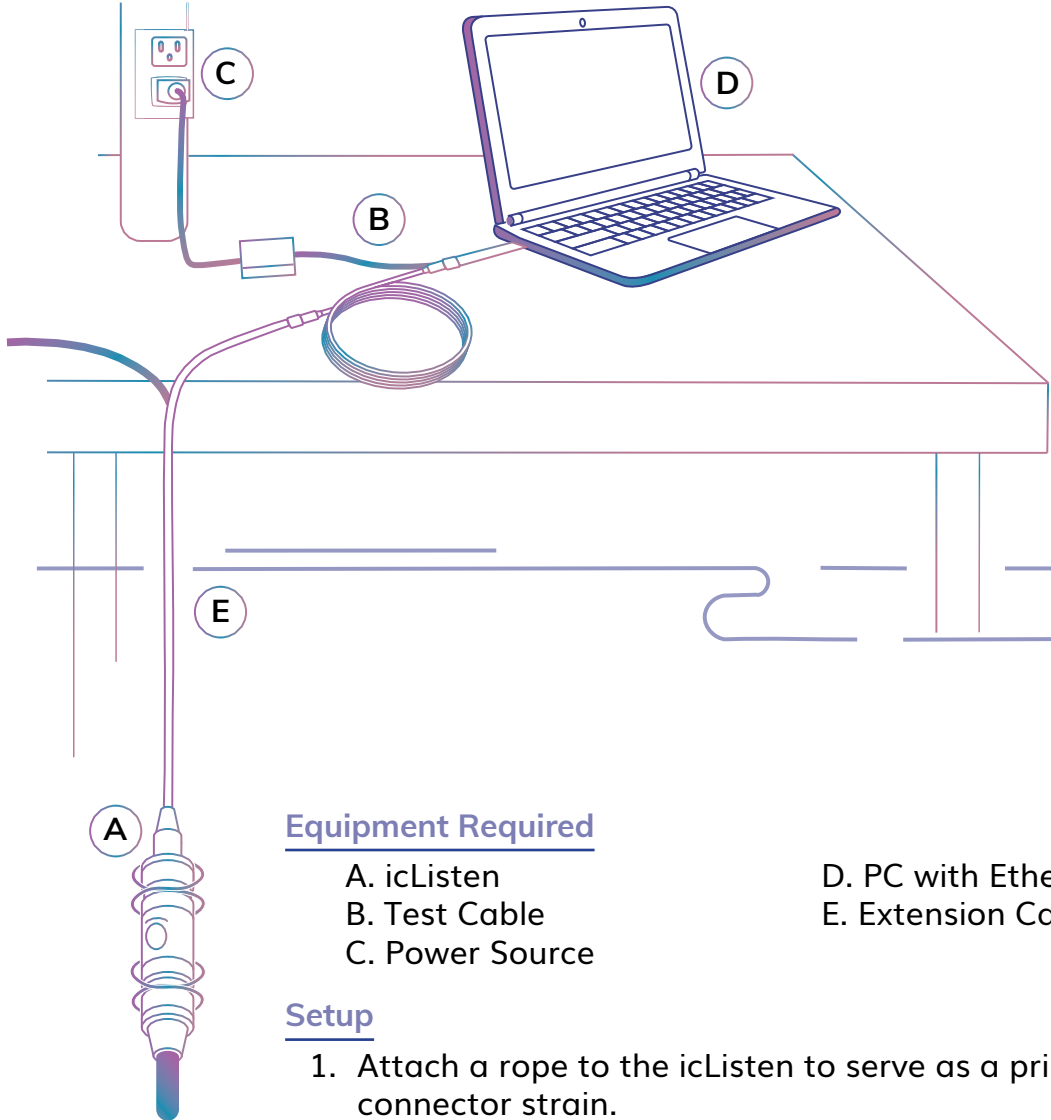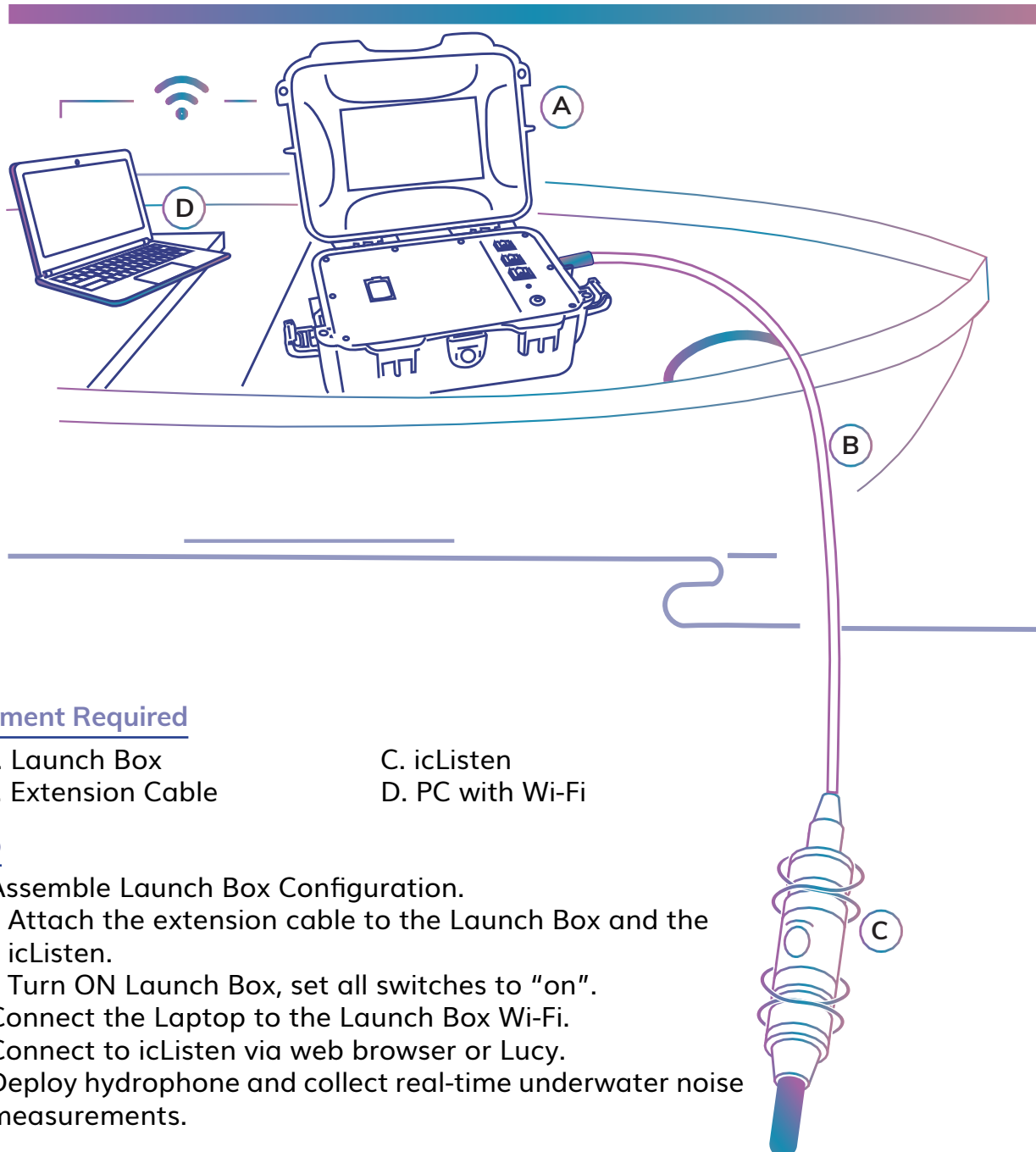
Equipment Required

A. icListen   D. PC with Ethernet Port
B. Test Cable   E. Extension Cable (Optional)
C. Power Source

Setup

1. Attach a rope to the icListen to serve as a primary line and reduce connector strain.
2. Follow "Getting Started with your icListen" on page 5 to connect and setup for deployment.
3. To extend the cable length, use an extension cable between the icListen and test cable.
4. Deploy the hydrophone in the water.
5. Stream the real-time data to your computer. To record real-time data on your computer, use Lucy's Data Collection (See Lucy Reference Guide).

Using a Launch Box

The Launch Box eliminates the direct connection from the hydrophone to the PC. This gives the user freedom to transport their laptop up to 30 meters away from the Launch Box and continue to stream the data in real time through the Launch Box Wi-Fi. The Launch Box can extend icListen battery life up to 40 hours (24 hours when using wi-fi & GPS), provides GPS position logging and GPS time synchronization. See the **_Launch Box User Guide_** for additional information.
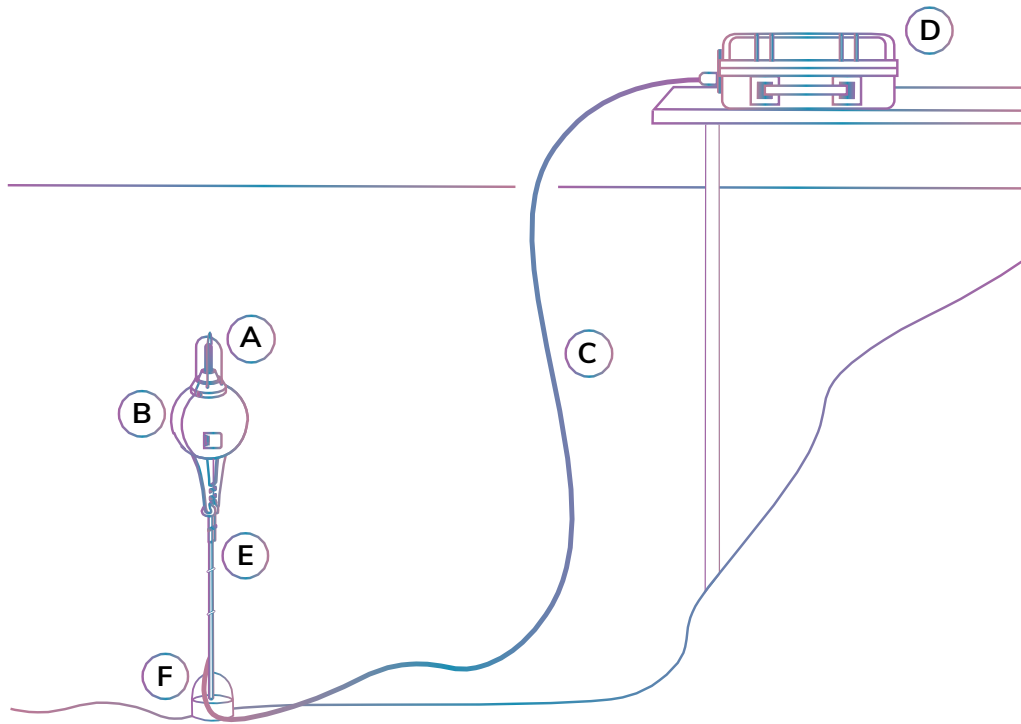

Equipment Required

A. Launch Box
B. Extension Cable
C. icListen
D. PC with Wi-Fi

Setup

1. Assemble Launch Box Configuration.
    a. Attach the extension cable to the Launch Box and the icListen.
    b. Turn ON Launch Box, set all switches to "on".
2. Connect the Laptop to the Launch Box Wi-Fi.
3. Connect to icListen via web browser or Lucy.
4. Deploy hydrophone and collect real-time underwater noise measurements.

Float Collar

The icListen hydrophone can be deployed mid-water column using a float collar. The float collar can be used in a real time cabled or autonomous deployment.
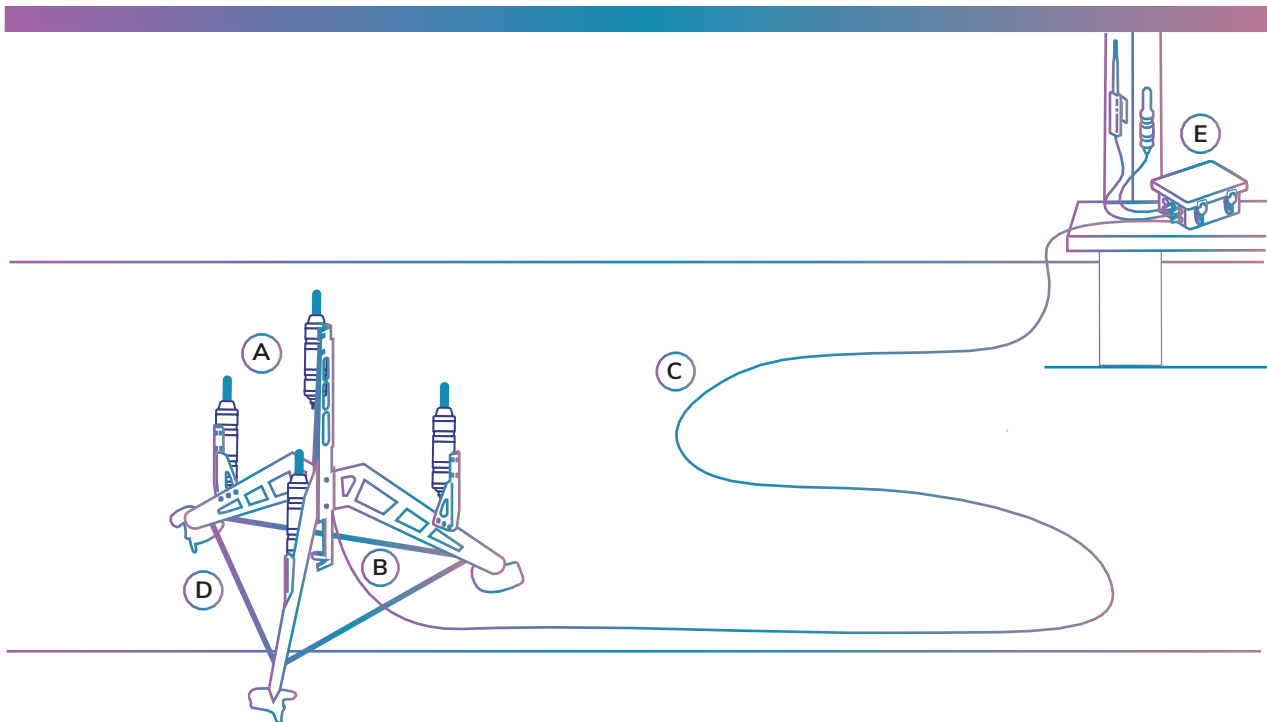

Equipment Required

A. icListen with guard
B. Float Collar
C. Extension Cable (at least 2x water depth)
D. Launch Box or Test Cable
E. Rope
F. Weight / Anchor (5-10 kg kettle bells)

Setup

1. Insert the icListen into the float collar with the cable attached.
2. Close and secure the float collar for deployment.
3. Use a cable tie to secure the cable to the float collar. Tape can be used around the metal of the float collar or the cable itself to reduce possible damage to the cable.
4. Tie off the end of the rope to the float collar.
5. Run the rope from the float collar to the anchor and tie off the rope at the required height above the sea floor.
6. Use cable ties to attach cable to rope between float collar and weight.
7. Deploy equipment and collect real-time data.

Tripod

An Ocean Sonics tripod can be used with 1-4 icListen hydrophones. The tripod allows users to set up the spacing between hydrophones (up to 1 meter) for localization of sound sources. The hydrophone(s) can be cabled to shore and connected to a launch box, computer, or hydrophone hub (HCI). The tripod can also be deployed with a battery pack.

Equipment Required

A. icListen(s)
B. Smart Cable
C. Extension Cable (at least 2x water depth)

D. Tripod
E. HCI*

* Optional substitutions for the HCI include a Test Cable or Launch Box.

Setup

1. Attach the hydrophones to the smart cable.
2. Attach the hydrophones to the tripod using cable ties.
3. Connect the smart cable to the extension cable.
4. Deploy Tripod, ensuring it remains in an upright position upon reaching the bottom. Weights can be added to the tripod to ensure it will remain stable and in an upright position.
5. Lay down cable while returning to shore location.
6. Plug the end of the cable into the launch box, HCI or computer depending on your setup.

Autonomous Deployment Scenarios

Stand Alone

The icListen has an internal battery and memory which enables it to be deployed as a stand-alone unit. It will record up to 8 hours of data at the maximum sampling rate (512 kSps | 200 kHz bandwidth. An Ocean Sonics Battery Pack can extend a stand-alone deployment up to 3 months.
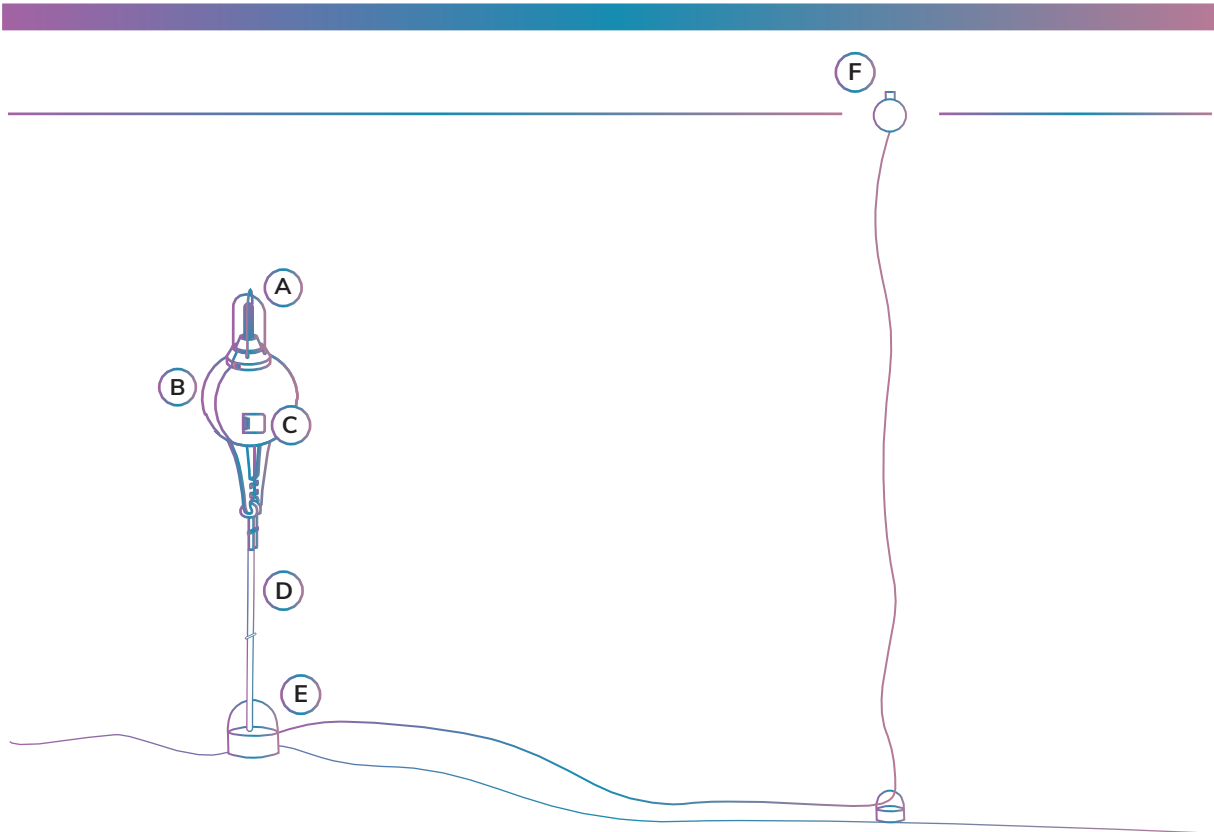
Equipment Required

A. icListen with optional guard
B. Float Collar
C. Shorting Plug

D. Rope
E. Anchor/Weights
F. Surface Float

Deployment Notes

- For best sound data, do not connect the surface float directly to the hydrophone, this causes noise and movement from the surface to be recorded by the icListen.

- Use a second weight and a surface float to decouple the noise from the surface. Increase the length of the rope to add a second weight at least 1 meter from the first weight and attach the surface float to the secondary weight.

- Ensure the hydrophone's battery is at 100% before deployment.

- Attach the shorting plug to protect the icListen connector.

- The rope length from the second weight to the surface float must be greater than the depth of the deployment location.

With a Battery Pack

A battery pack can extend deployment time by providing power to a hydrophone for up to 3 months. The battery pack can be easily integrated into a mooring setup using the Ocean Sonics Battery Pack Cage.

Equipment Required

A. icListen   D. Rope
B. Battery Pack   E. Anchor
C. Battery Pack Cage   F. Floats

Note: An acoustic release can be used to retrieve a mid-water mooring deployment.

Setup

1. Prepare the battery pack and icListen for deployment. (See Battery Pack User Guide)
2. Place the battery pack and icListen in the battery pack cage for a mooring deployment.
3. Deploy the battery pack and hydrophone for up to 3 months.
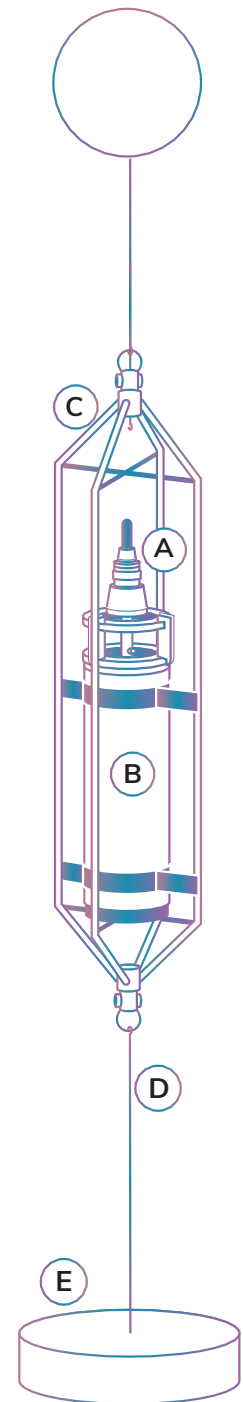
On a Buoy

The Ocean Sonics buoys are designed for drifting coastal deployments. These buoys can provide power and streaming capabilities over various distances. The buoys are specifically designed to ensure the best acoustic recordings possible. Buoys can optionally have rechargeable batteries, GPS recording and synchronization, and Wi-Fi or Radio. For more information on setup and deployment see Wi-Fi Buoy User Guide.

Equipment Required

A. Ocean Sonics Buoy*
B. icListen
C. Extension Cable

D. icListen Hydrophone Cage
E. Weight

* With associated ropes, heave plates, & shackles needed for buoy deployment
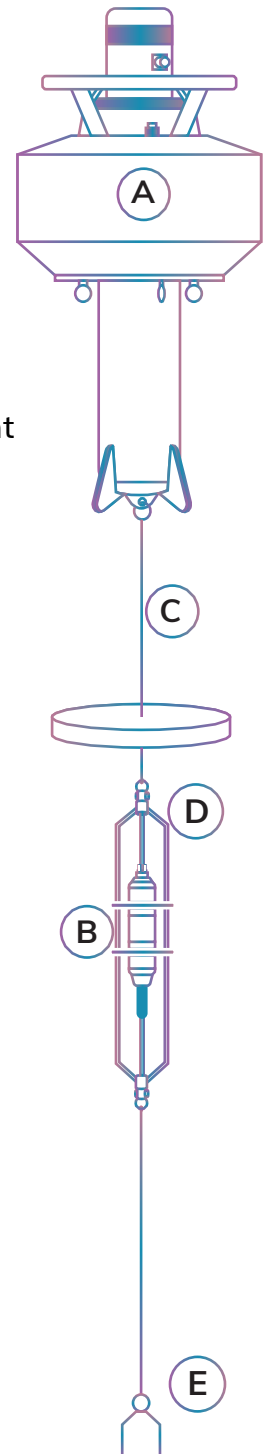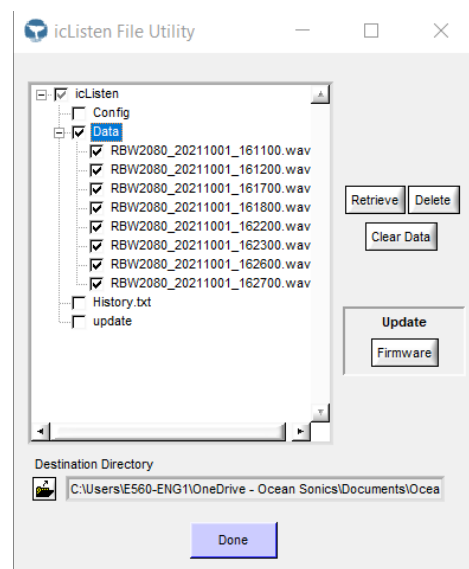
Data Retrieval

The icListen has 512GB of internal memory for storing recorded data. This data can be retrieved using the web interface ("Data - Retrieve" on page 25), Lucy, or through FTP/SCP using an FTP client such as FileZilla. Note: FTP requires no username or password. For SCP, the username is "icListen", the port is 22, and by default there is no password.

For small amounts of data, the hydrophone web interface can be used to download the files. For large amounts of data, Ocean Sonics recommends Lucy, FTP file transfer (The Filezilla ftp client is provided on the icListen USB stick) or the Ocean Sonics Array Data Manager program.

Data Retrieval using Lucy

1. Open Lucy.
2. Connect to icListen.
3. Click icListen icon in Files panel.
4. Select Files to download by checking boxes next to files.
5. Choose Destination Directory.
6. Click Retrieve.
7. Files may take a few minutes to download, and at any point during the process, the file retrieval can be canceled. Canceling will not harm the files in the unit.
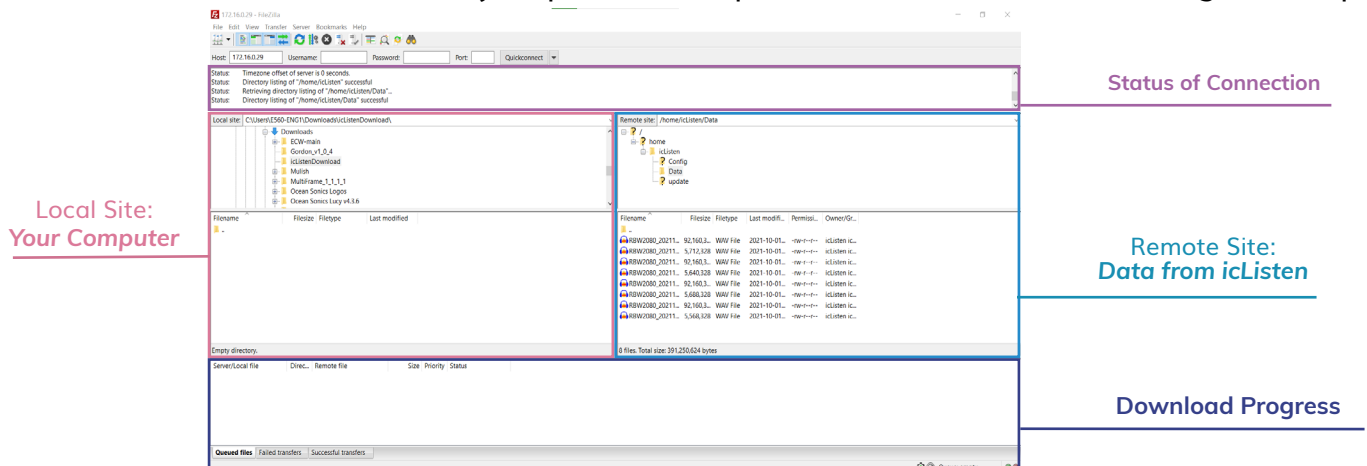
1. Obtain the IP address of your icListen from the web interface or Marco as described in "Open the icListen web interface" on page 7

2. Launch Filezilla and enter this IP address in the Host field.
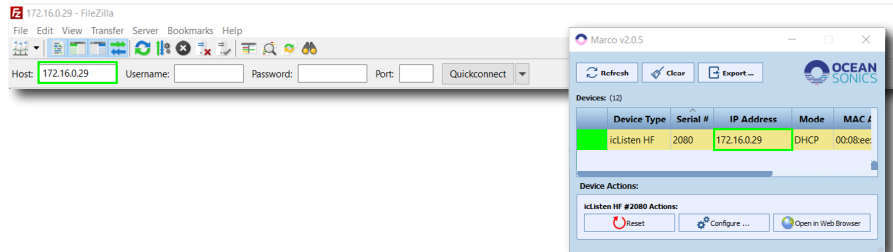
3. Click Quickconnect.

4. FileZilla will connect to the hydrophone and open the icListen folders in the right hand pane.

5. Open the **Data** folder to display the files saved on icListen [.wav and .txt]
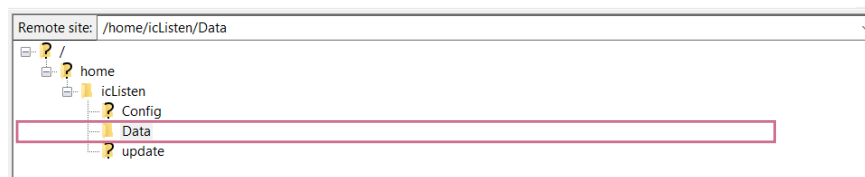
6. Under **Local Site** (your computer) choose the location and folder where you want the icListen data to be saved. This can be the computer or a storage device attached to the computer.

7. Select Files from hydrophone to download. Either drag and drop selected files into a folder location in the left pane or right-click selected files and choose to download.

Maintenance and Storage

All maintenance and storage guidelines should be followed to ensure your icListen is always operating at its best. This will help extend the life of the instrument and maintain the quality of the data.

Firmware

Ocean Sonics periodically releases firmware updates for its hydrophones containing new features and bug fixes. It is highly recommended that your icListen be kept up to date with the latest firmware release.

To determine your current firmware version go to the **ABOUT** page in the hydrophone web interface (See "About Page" on page 15).

The latest version of the firmware can be found on the **Ocean Sonics Resources** website.

Updates can be applied using FTP, SFTP, or SCP. 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.

While applying this update, take care not to interrupt the power to the instrument. Ensure that all necessary log files are retrieved from the instrument before applying an update, as they will be erased during the update process . Files may be retrieved using a web browser, or an FTP, SFTP, or SCP client (such as FileZilla) as described in "Data - Retrieve" on page 25.

Perform the following steps to update your icListen:

- Obtain the update ".icu" file from the **Ocean Sonics Resources** website.

- Power the icListen using the power adapter (do not power from internal battery).

- Connect to the icListen via FTP, SFTP or SCP.

- Once connected, you should see a directory called "update". If this directory does not exist, create it. This directory name is case sensitive.

- Upload the update ".icu" file into the "update" directory.

- The instrument must now be reset in order for the update to take place. This can be done through the web interface, or using Lucy.

    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.

Allow approximately 5 minutes for the update to complete then revisit the **ABOUT** page to verify the update was successful.

Cleaning

- Rinse hydrophone with fresh water after every deployment.

- This will avoid corrosion and keep salt crystals from forming on the connectors. Failure to do this could result in increased servicing to replace connectors.

- Clean element with warm soapy water.

- Clean hardened biological build-up by soaking the hydrophone in a 50/50 water and 0.5 ppm acetic acid (white vinegar) solution and clean with a soft toothbrush.

- Any accumulation of sand or mud in the connectors should be removed with spray-based contact cleaner (isopropyl alcohol) or fresh water.

- Failure to clean connectors can result in the splaying of the female connector and damage to the O-ring seals.

Connector Care

- Apply lubricant (Molykote 44 Med.) to all connectors before connecting to hydrophone.

- If connectors are not properly lubricated connections may not seat correctly.

- Ensure that mating surfaces of the connectors are fully seated before deployment. Failure to do so could result in shorted connections underwater.

- 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.

- Never use the back shell/fastening nut to force the connector into place. This could result in damage to the connector or back shell 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 dry, they should be soaked in fresh water before use.

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

- The connector is not stress tolerant and should never be placed under load. The hydrophone should not be suspended by the cable and no tension should be on the connector during the deployment. Always provide sufficient strain relief with additional ropes or cables.

- Disconnect the cable by pulling straight on the connector. Do not pull at an angle and do not pull on the cable. Avoid sharp bends at cable entry.

Storage

- Store the unit in original case and out of direct sunlight.

- Charge the unit above 40% and Power Down prior to storage (See: Battery Care below).

- Store the unit between 0°C - 60°C. Ideal temperature storage is between 5°C - 25°C.

- Ensure the unit is not subjected to vibration (constant or periodic) during storage.

If storing the icListen hydrophone for more than 3 weeks follow all storage instructions and perform File System and Battery Care as follows.

File System Care

- Ocean Sonics recommends logging be disabled.

- Clear all files from the hydrophone when the instrument is not in use. This will prevent accidentally deploying an instrument that has no storage capacity remaining.

- Ocean Sonics recommends using the "Clear Data" function (see) before long term storage or before any major deployments where logging is to be used.

Battery Care

Store the unit at 40 – 60% battery charge. To do this remove the power adapter and wait until the hydrophone is between 40-60% charge. Put the unit into standby mode and use the power down tool.

Note: If powered down for more than 3 weeks the icListen will lose the date and time. When turned on after storage, it is recommended the hydrophone is charged for 24-48 hours to recharge all components and maintain accurate time keeping and functionality.
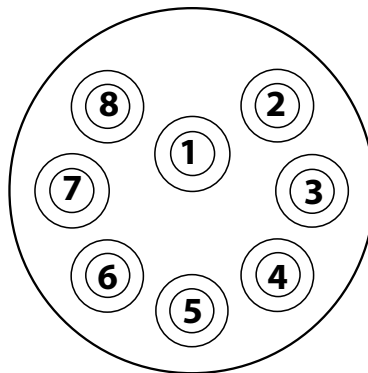
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icListen Servicing

No internal maintenance is required on the icListen. Opening the instrument will void all warranty.

It is recommended that the hydrophone is serviced by Ocean Sonics after 18-24 months of use. Servicing can include re-calibration, functional tests, updating firmware and replacing the memory card and batteries when needed.

icListen Connector Information

The icListen Ethernet Interface is as follows:

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

Subconn MCBH8M male face