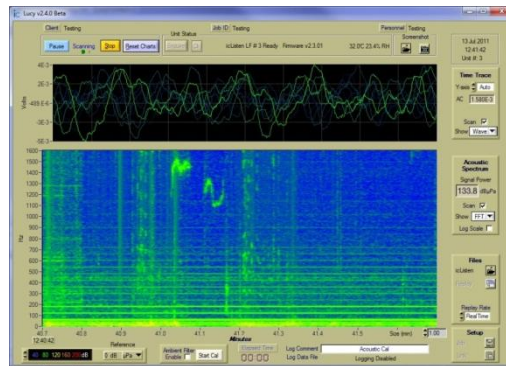


icListen Operations Guide

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icListen Smart Hydrophones



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1 Overview

This guide covers the use, care, troubleshooting and wiring of the **icListen** Smart Hydrophone.

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** Smart Hydrophones through a PC program called **Lucy**. This program lets users view instrument data in real-time, retrieve and play stored data, and perform housekeeping functions, such as check status & configuration.



Figure 1-1: icListen Family

We hope you enjoy your experience with your **icListen** product, and look forward to receiving feedback on your experience using it.

2 Features of icListen

2.1 LF – Low Frequency

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

The **icListen LF** 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 acquired by a PC running the **Lucy** program.

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

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



Figure 2-1: icListen LF

How Sample Rate Affects Storage Time		
Sample Rate	MB per day	Days with 32 GB
250 S/sec	65	492 (16 months)
500 S/sec	130	246 (8 months)
1000 S/sec	259	123 (4 months)
2000 S/sec	518	61 (2 months)
4000 S/sec	1037	30 (1 month)

Note that storage time can be increased significantly by using event detection to record data periodically, or when certain conditions are detected.

Waveform data is logged in the standard “.wav” format, making it accessible from a wide range of software programs. Spectral data is in .FFT format, detailed in the **icListen Log File Formats** document. 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 to reduce the quantity of data transferred or stored.

2.2 LF – Feature Summary

- Frequency Range: LF, 0.01 to 1600 Hz, can be extended to 6400 Hz
- Low power, less than 100 mW. Can be battery powered
- Supplies real-time data when connected to a PC
- Event detection, up to 5 bandwidth configurable triggers
- Supports real-time communications through a radio
- Stores up to 32GB in autonomous mode
- Can process data in real time.
- Data Format: Waveform in .WAV format. Processed in .FFT format (detailed in the **icListen Log File Formats** document).
- Maximum depth: 3500 meters
- Interfaces - RS232/RS485, USB or Ethernet
- Flexible power input requirement for Ethernet and RS232/RS485: 12 - 24 Vdc.
 - USB requires: 5 Vdc.
- Small size, 42 mm dia. by 250 mm long (1.65" by 9.8")



Figure 2-2: icListen LF

2.3 HF – High Frequency

The **icListen HF** is the newest Smart Hydrophone. It 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 Smart Hydrophone can be configured using **Lucy**, then left for extended periods under water to collect waveform or spectral data, storing it internally.

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



Figure 2-3: icListen HF

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	7.7	2.8	11.5
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

*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, or by storing processed FFT data.

Waveform data is logged in the standard “.wav” format, making it accessible from a wide range of software programs. Spectral data is in .txt format, suitable for spreadsheet viewing. It is detailed in the **icListen Log File Formats** document. 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.

2.4 HF – Feature Summary

- Frequency Range: HF, 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 spreadsheet .TXT format
- Waveform data in WAV format, with meta data stored in file header
- Maximum depth: 3500 meters
- Size: 45 mm dia., 230 mm long (excluding connector).
- Depth rating: 200 or 3500 meters



Figure 2-4: icListen HF

3 Quick Start – Bench Setup

It is important to test the Smart Hydrophone 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. Start up the **Lucy** program on the PC.
2. Connect the **icListen** to the link cable, and the data link to the PC.
3. Click the Link Setup button in the lower right. In the popup window, select the appropriate Connection Type. If using RS232/RS485 or USB select Auto Connect to search for the connected **icListen**. If using Ethernet, enter the IP address* of the connected **icListen**. When successful, close the window. For Ethernet units, **icListen LF** uses port 23 for communications, and **icListen HF** uses port 50000.

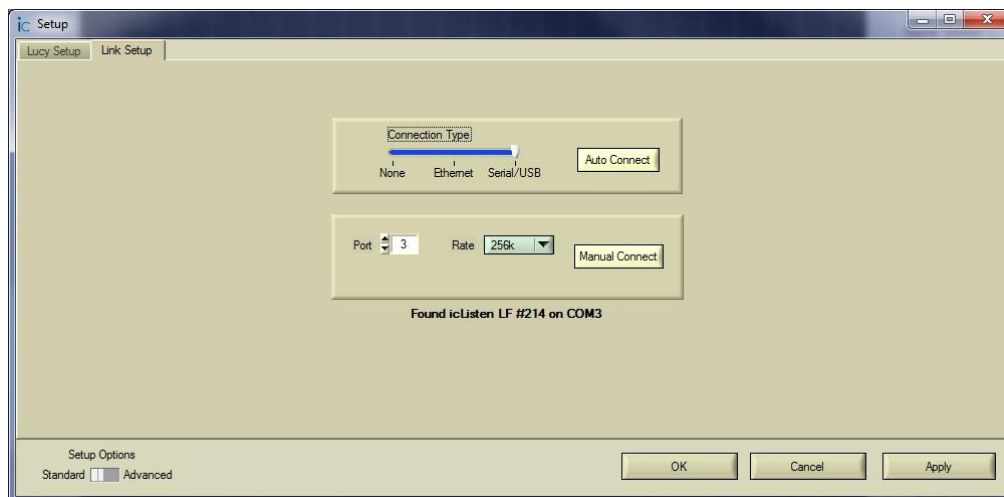


Figure 3-1: Lucy USB/RS232 connection display

* The IP address of the instrument must be known. **icListen** units are configured to acquire an IP address using DHCP by default, and therefore must be connected to a network running a DHCP server. Contact Ocean Sonics if you need assistance to determine your IP address.



Figure 3-2: Lucy Ethernet connection display

4. Click the 'Enquire' button in the middle top of the display. A message to the right will display in black if enquire is successful, or red otherwise. 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.

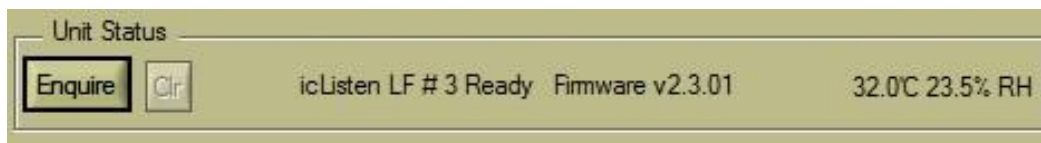


Figure 3-3 : Lucy status display

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.

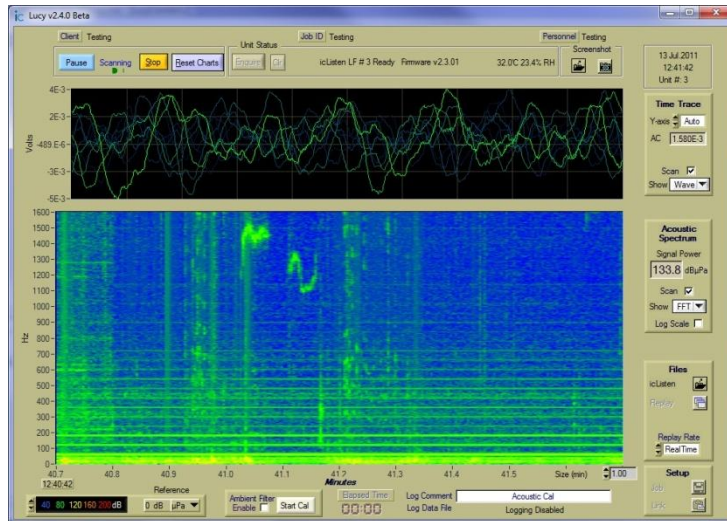


Figure 3-4: Lucy example display

*Note that if the Enquire button returns a red message, there may be a link problem. Check that connections to the hydrophone and PC are correct. If the instrument requires external power (RS-232 or Ethernet) ensure power is supplied to the instrument. See the 'Troubleshooting' section for more if the problem persists.

4 Using the Lucy™ Software

4.1 Overview

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

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

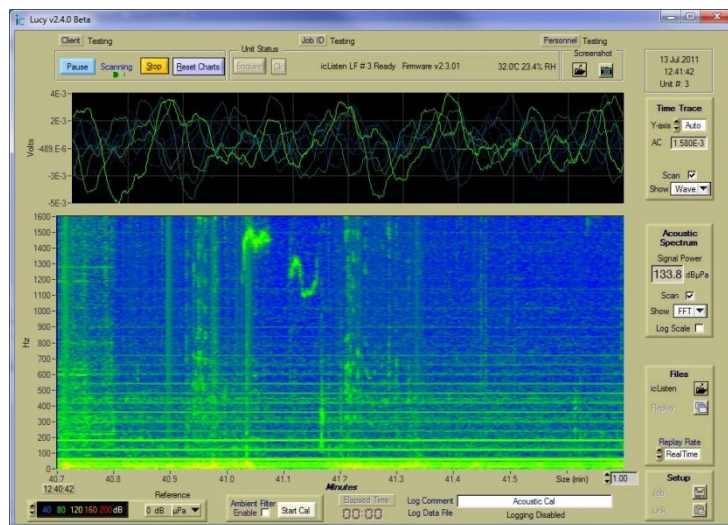


Figure 4-1: Lucy main display

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.

Some **icListen** models are capable of transmitting real-time time series data, and storing this data for later analysis as well. All **icListen** smart hydrophones are capable of converting 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 be either streamed or logged, while spectrum data can be collected through command and control, but not streamed, while logging.

5.1 Time Series (Waveform) 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 LF and **icListen HF** are 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, as well as scaling information 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 LF** and **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 Instrument Concepts' **Lucy** software.

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

Data from an **icListen HF** is retrieved using the SCP or SFTP protocols on port 22, using a program such as FileZilla. The username is "icListen", and by default there is no password. Files may be retrieved from **icListen LF** over the communications channel using Instrument Concepts' **Lucy**.

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 also dramatically reduce the storage and bandwidth capacity requirements of an operation.

5.2.1 Real-time Data

All **icListen** models are capable of providing real-time FFT data. This data provides a clear picture of what's happening in a sound. Transmitting FFT 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 LF is capable of storing processed power spectrum data in files of type .FFT. This is a binary file format, similar to the WAV file format used for time series data.

icListen HF is capable of storing processed power spectrum data in tab separated variable 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 time series data, allowing for faster data retrieval and analysis. It also reduces the storage capacity requirements, and means that the unit can store data for longer periods of time between data retrievals.

In addition to the spectrum data, both file formats also store additional information, such as temperature and humidity, which can be used to aid in analysis. For more information on the .FFT and .TXT file types, please refer to the **icListen Log File Formats** document.

Data from an **icListen HF** is retrieved using the SCP or SFTP protocols on port 22, using a program such as FileZilla. The username is "icListen", and by default there is no password. Files may be retrieved from **icListen LF** over the communications channel using Instrument Concepts' **Lucy**.

5.2.3 Windowing

In order to reduce aliasing, a window is applied, when converting data from time series to frequency. **icListen** makes use of a Hann window for this purpose.

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 Sliding Window

It is often useful to have some overlap in the waveform data used to compute frequency data. The technique used to accomplish this is called using a sliding window. 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%), 50% overlap, and 75% overlap.

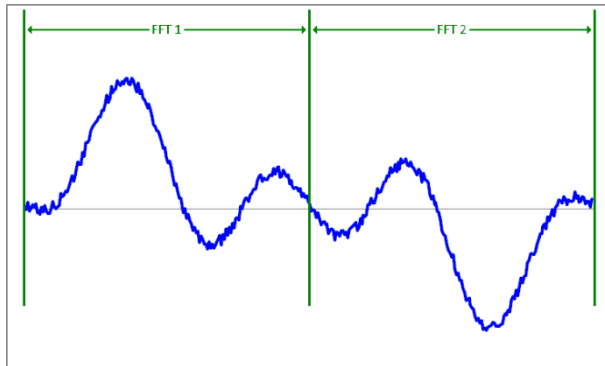


Figure 5-1: Sliding Window (0% overlap)

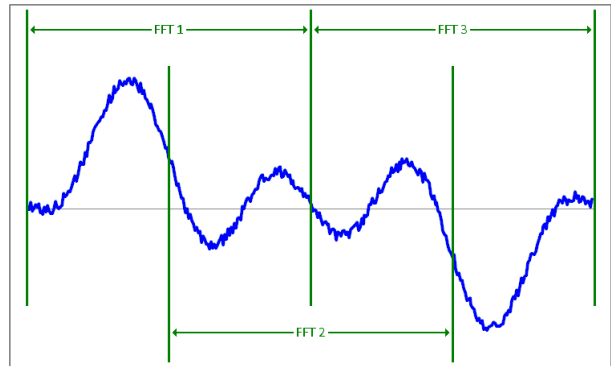


Figure 5-2: Sliding Window (50% overlap)

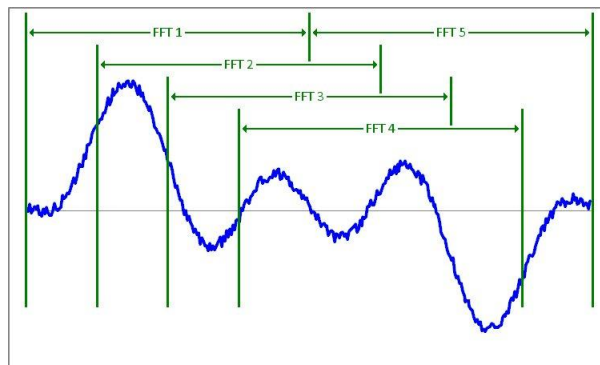


Figure 5-3: Sliding Window (75% overlap)

A sliding window can be used in combination with mean, peak value, and filtered processing. When combined with these processing options, the sliding window is performed first, and the other processing option is performed on the resulting data. **icListen HF** uses a 50% overlap for all spectrum data, while **icListen LF** allows the overlap to be adjusted.

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:

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

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 can be configured to be done over a set number of FFT data sets, or configured to reset the detected peak value only when data is retrieved from the unit. For **icListen HF**, this must be configured as a set number of FFT data sets (reset when retrieved mode is not available).

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 the previous few FFT results.

The filtered data for each frequency is calculated as follows:

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

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

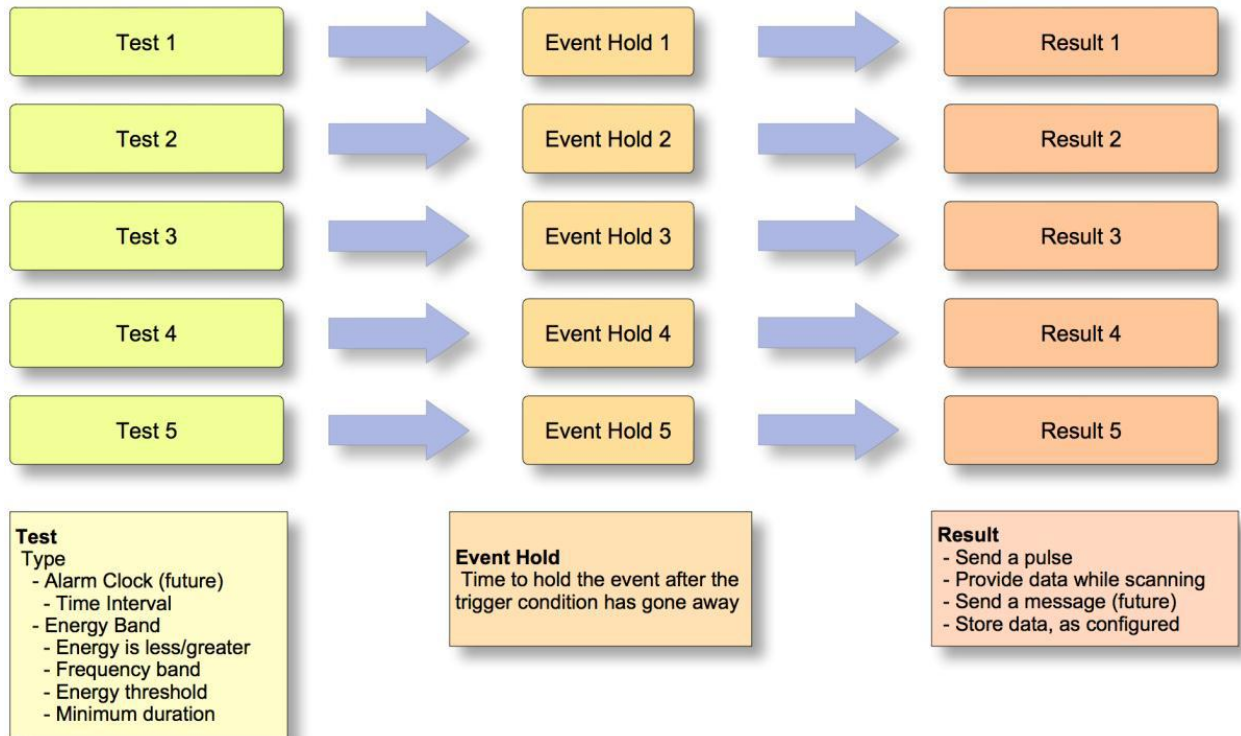


Figure 5-4: Epoch Triggers

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 hold, which is how long the action lasts after the triggering signal disappears. Finally there is the resulting action, which is the action **icListen** takes when triggered. The action can consist of sending a signal pulse, logging data, or preparing data to send when scanned.

Note: Different events can have different result actions.

5.4 Delay and Duty Cycling

While internally storing time series (WAV) data, **icListen HF** can be configured to conserve storage space by introducing a delay before logging begins, and by duty cycling the logging after it has begun.

Configuring a delay allows a deployment to be set up well in advance of an actual testing/monitoring session, without unwanted data being logged during this time. Delay is set as the number of minutes from the current time, before logging is to begin.

Duty cycling the logging activity is useful when the application can make use of sampled time series data, rather than continuous logging. The recording/idle times for the cycle are adjusted in minutes. **icListen** will begin the recording phase of the cycle as soon as the delay has expired. After the cycle has begun, the unit will continue to record using this cycle until the configuration is changed.

6 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**.

6.1 Firmware Updates

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

The firmware for **icListen LF** is updated over the command and control communications channel, and can be done using Instrument Concepts' **Lucy**. For more detail on this update procedure, please refer to the *Lucy User's Guide*.

Updates for **icListen HF** are applied using the SCP or SFTP protocols. The unit should be connected to using port 22, with the user name "icListen", and no password by default. Programs such as Filezilla may be used for this. The update file will be named icListenUpdate###.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 run from battery).
2. Connect to the icListen via SFTP or SCP on port 22. The login is "icListen", and by default there is no password.
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. Disconnect from the icListen SFTP/SCP connection.
6. Connect to the icListen via a web browser, by entering the IP address into the address bar.
7. Once on the web page, go to the "Settings" page.
8. Click the "Powerdown/Reset" button, and confirm that you want to reboot.
9. Wait approximately 5 minutes for the update to complete.
10. 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 page is not old information from your browser's cache (the refresh button on the browser generally does not guarantee this).

6.2 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.

For **icListen LF**, files can be cleared by deleting them using the file system interface provided by **Lucy**.

icListen HF is capable of storing data collected at much higher sample rates than **icListen LF**, so an additional “Clean Data Partition” function has been implemented in order to maintain optimal logging performance. The cleaning function can be accessed via the web interface. This function deletes all logged files, and formats the data logging partition for optimal performance. If the cleaning function is not used, the file system will become less efficient over time, and data loss during logging may eventually result (the efficiency can be recovered by using the “Clean Data” function). For this reason, Ocean Sonics recommends using the “Clean Data” function before any major deployments where logging is to be used.

6.3 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.

For **icListen LF**, if your unit is battery powered by using a shorting plug, ensure the shorting plug has been disconnected from the unit after retrieval. For **icListen HF**, make sure your unit is powered down by fully inserting the Power Down plug, then removing it. These steps will avoid running down the battery, or possibly logging data while in storage. Failure to do this will not damage the unit but could result in lost time while the battery is being recharged, or while clearing or retrieving unnecessary log files from the unit.

6.4 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.

6.5 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 data, make sure that the file system is ready (see *File System Care*).

6.6 Long Term Deployment

For long term deployments, contact Ocean Sonics for support.

7 Troubleshooting icListen

7.1 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.
- If using RS-232 option, ensure baud rate is correct, or use the auto-detect option in **Lucy**. If the cable was wired up or modified, ensure that the TX and RX lines are not reversed.

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

- 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. This also shows the instrument temperature and internal humidity.



Figure 7-1: Lucy status bar

- Note that if the instrument is not working, the instrument's firmware version number is not accessible (the version shipped is printed on the test results provided with the unit). The instrument's serial number is printed on the side of instrument, and its carrying case.

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

- Your web browser may be using cached versions of either the html files, or the included javascript/css files.
- Hold Ctrl and press F5 in your browser. This will force all files in the cache to be discarded, and then refreshes the page (this is often not done when using the refresh button, or pressing F5 without holding Ctrl).

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

- Over time, as files are logged and deleted on any file system, the efficiency of writing to that file system decreases. The efficiency can be recovered by proper formatting of that file system.
- Use the "Clean Data Partition" button, on the **icListen HF** web server to format the data logging partition for optimal performance. WARNING: Make sure all logged data is backed up from **icListen** before performing this action, as it erases all logged data on the instrument.

7.5 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 10.10.10.1, and you type 010.010.010.001 into your browser or **Lucy**, you will not be able to connect to the instrument (they will treat 010.010.010.001 as 8.8.8.1).

8 Functional Block Diagram

The drawing below shows the **icListen LF** key functions. The Blocks on the left of the diagram represent connector functions. Not all interface functions are available on all instruments.

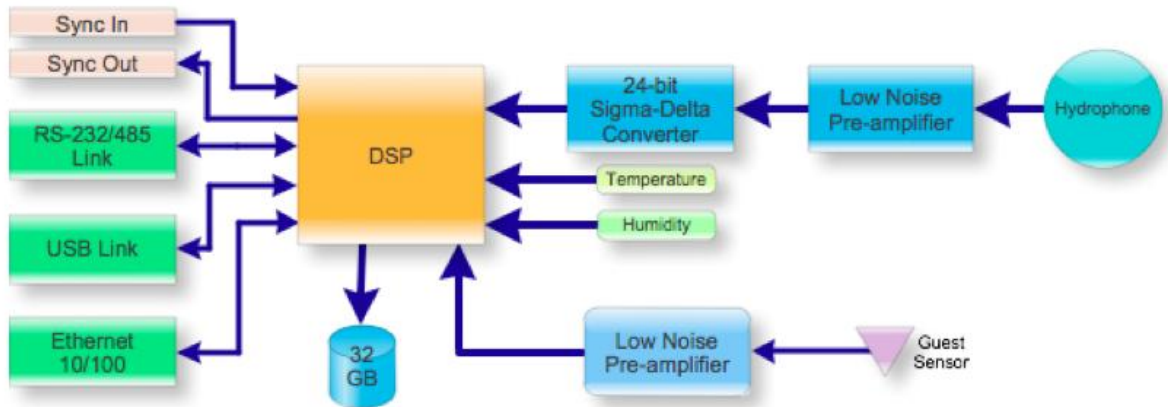


Figure 8-1: Functional block diagram

9 Instrument Performance

- The charts on the following pages show the frequency and noise response of the **icListen LF** instrument at the 250Hz and 4000Hz sample rates. The first chart shows a conventional voltage and ADC count response versus frequency, over the bandwidth of the instrument.
- The second chart shows the instrument dynamic range, as a function of the maximum signal and the measurement noise floor.

9.1 Response at 4000 Samples/sec

The following charts show the **icListen LF** performance, for its default sample rate of 4000 Samples/sec. Note that the bandwidth at this sample rate is 1600 Hz.

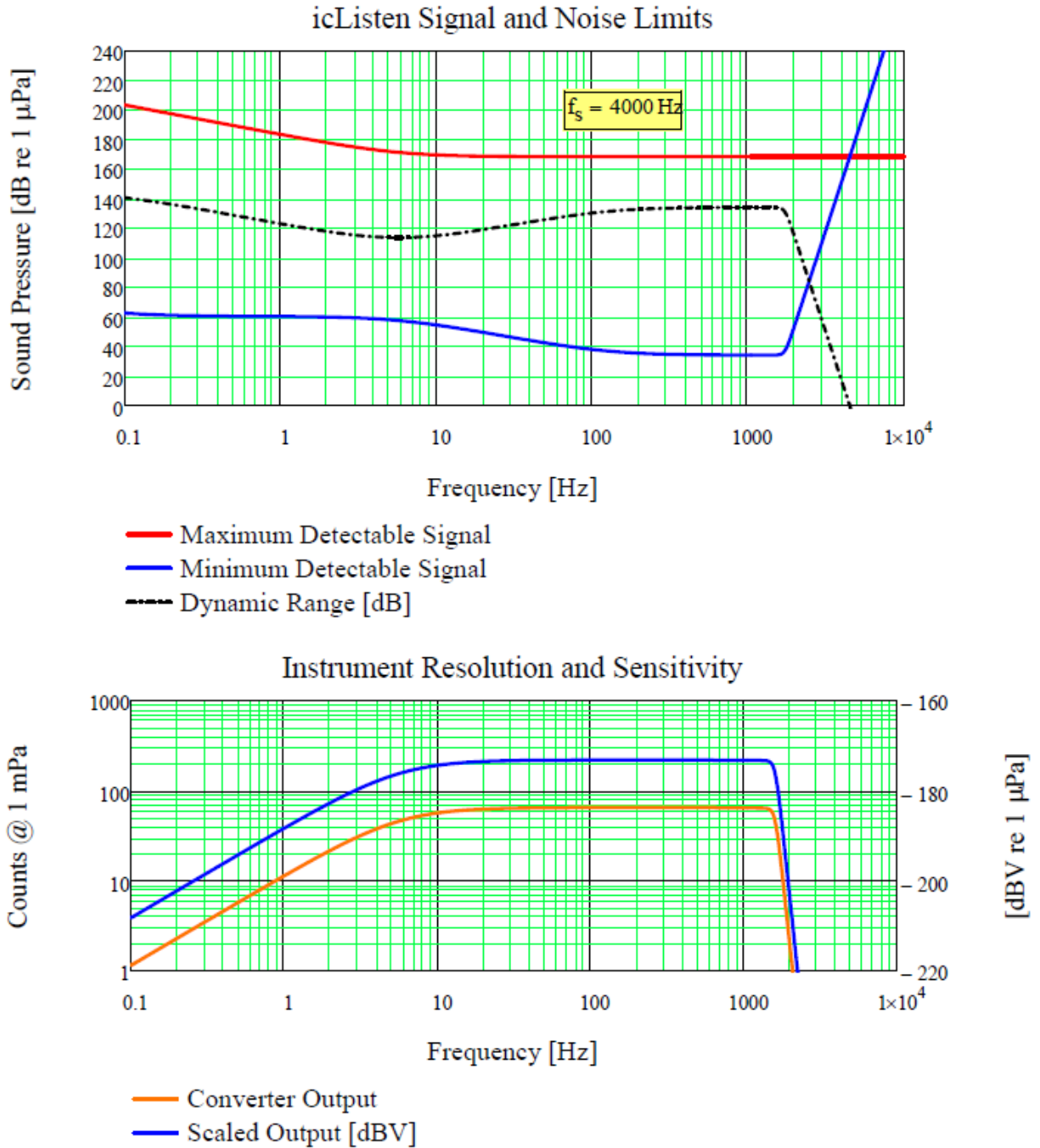


Figure 9-1: Noise response at 4 kHz sample rate

9.2 Response at 250 Samples/sec

The following charts show the **icListen LF** performance for its default sample rate of 250 Samples/sec. Note that the bandwidth at this sample rate is 100 Hz.

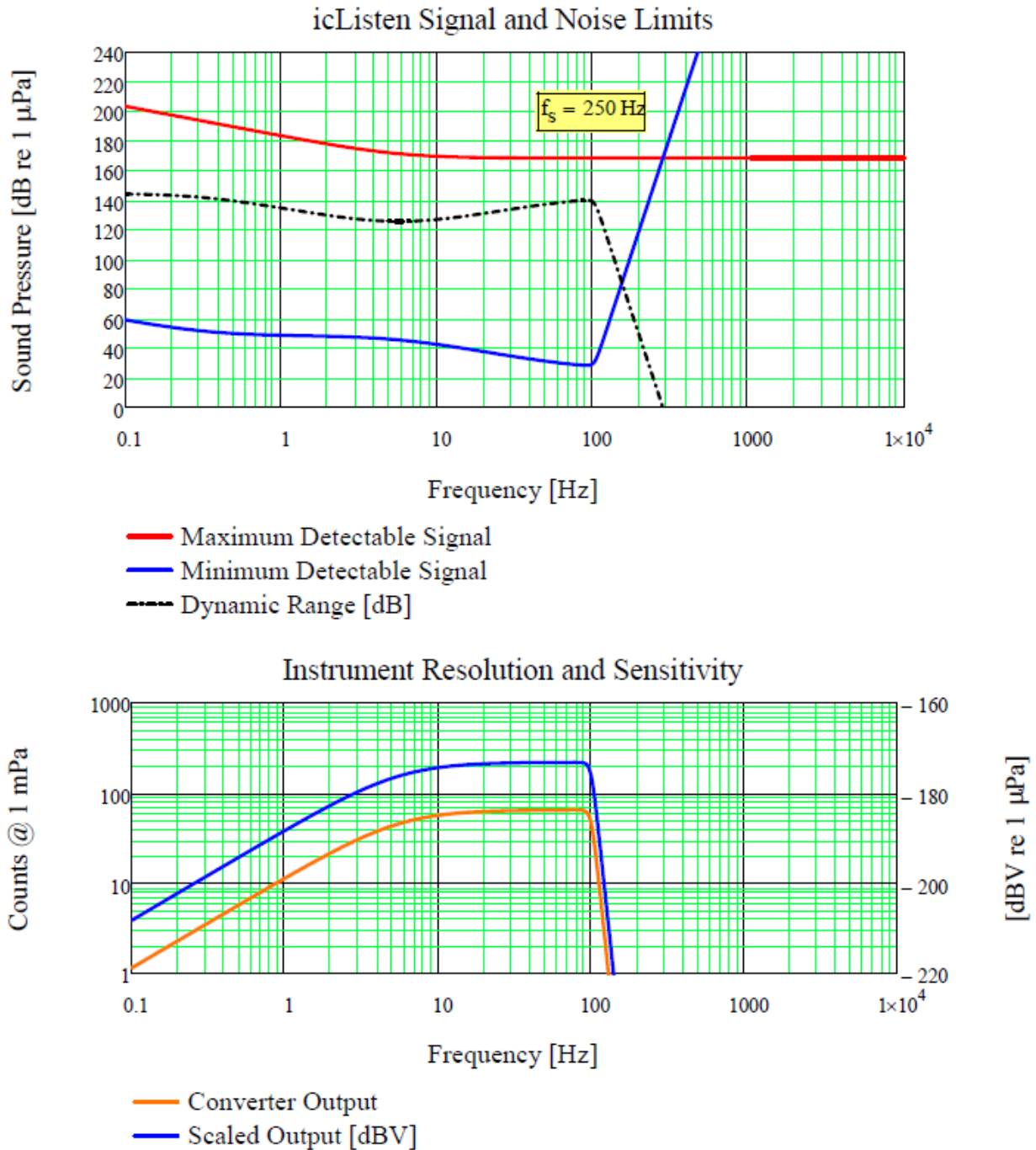


Figure 9-2: Noise response at 250 Hz sample rate

10 Options and Configurations

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

Spec	Standard	Options
Depth	200 meters	3500 meters
Connection	Male 8-pin bulkhead	-
Frequency	1 Hz - 1600 Hz	0.01 Hz to 100 Hz, 1Hz – 6400Hz
Use	Tethered / Mooring with battery	Autonomous with internal battery

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

Spec	Standard	Options
Depth	200 meters	3500 meters
Connection	Male 8-pin bulkhead	-
Frequency	0.5 kHz - 100 kHz	-
Use	Tethered / Mooring with battery	-

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	Serial (RS-232, RS-422, RS-485) Analog Guest Sensor
Frequency	10 Hz - 200 kHz	-
Use	Tethered / Mooring with battery	-

11 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.

11.1 icListen LF USB Interface

Subconn	Signal
MCBH8M	Name
1	GND
2	VBAT-
3	VCC
4	VBAT+
5	DM
6	DP
7	SYNC-
8	SYNC+

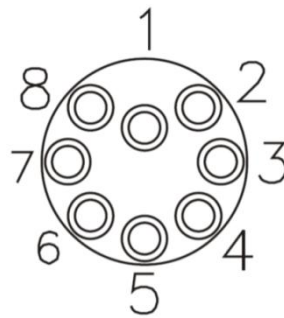


Figure 11-1: Subconn MCBH8M male face

11.2 icListen HF USB Interface

Subconn	Signal
MCBH8M	Name
1	
2	SYNC-
3	VCC
4	GND
5	DM
6	DP
7	
8	SYNC+

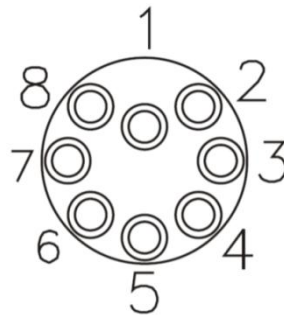


Figure 11-2: Subconn MCBH8M male face

11.3 icListen HF Ethernet Interface

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

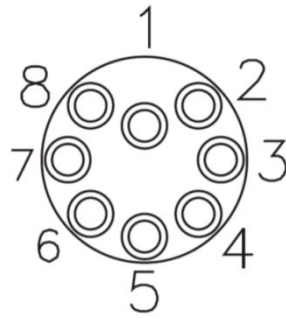


Figure 11-3: Subconn MCBH8M male face

11.4 icListen LF USB Cable

Subconn	Signal	USB Cable	
		Wire Colour	USB Pin #
1	GND	BLK	4
2	VBAT-	-	-
3	VCC	RED	1
4	VBAT+	-	-
5	DM	WHT	2
6	DP	GRN	3
7	SYNC-	-	-
8	SYNC+	-	-

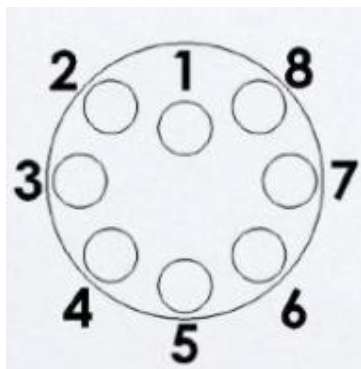


Figure 11-4: Subconn MCIL8F female face

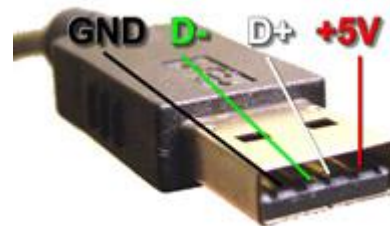


Figure 11-5: USB pin positions

11.5 USB cable to icListen LF w/battery and sync

Subconn	Signal	Whip	USB		Charger		Sync
MCIL8F	Name	Colour	Wire Colour	USB Pin #	Splice Colour	Pin	Pigtail Colour
1	GND	RED/BLK	BLK	4	-	-	-
2	VBAT-	BRN/WHT	-	-	BLK/WHT	TIP	-
3	VCC	BRN	RED	1	-	-	-
4	VBAT+	RED	-	-	BLK	RING	-
5	DM	BLU	WHT	2	-	-	-
6	DP	BLU/WHT	GRN	3	-	-	-
7	SYNC-	YEL/BLK	-	-	-	-	ORG
8	SYNC+	YEL	-	-	-	-	YEL

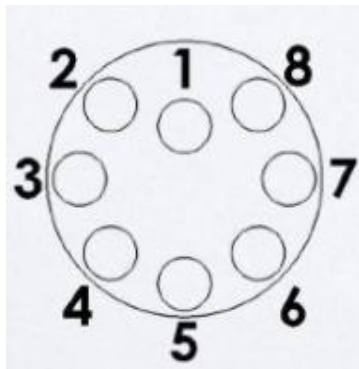


Figure 11-6: Subconn MCIL8F female face



Figure 11-7: USB pin positions



Figure 11-8: Charger connector

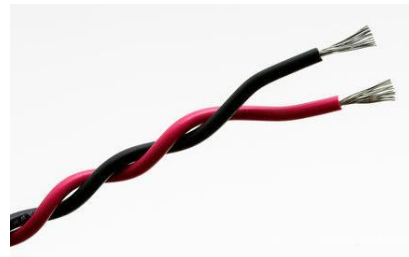


Figure 11-9: Sync wires

11.6 icListen LF Ethernet Interface

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

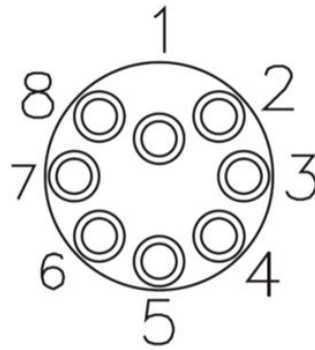


Figure 11-10: Subconn MCBH8M male face

11.7 Ethernet Cable

Subconn	Signal	Ethernet	
		Wire Colour	RJ-45 Pin #
1	DC-	BRN	8
2	SYNC-	WHT/BRN	7
3	TX-	GRN	6
4	TX+	WHT/GRN	3
5	RX-	ORG	2
6	RX+	WHT/ORG	1
7	DC+	BLU	4
8	SYNC+	WHT/BLU	5

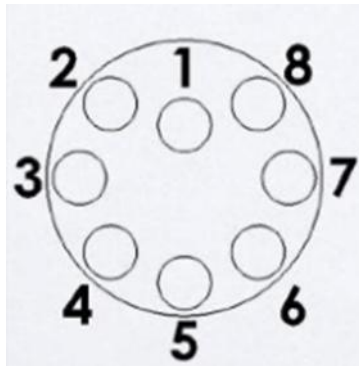


Figure 11-11: Subconn MCIL8F female face

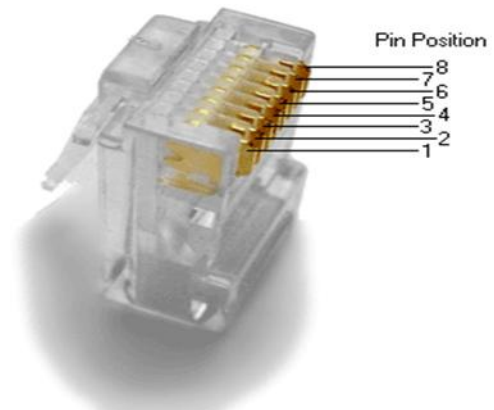


Figure 11-12: RJ-45 Pin positions

11.8 Shorting Jumper

To run **icListen LF** in battery mode, a shorting jumper is used to connect the power pins to the battery voltage.

Subconn Shorting Jumper		
Pin #	Circuit Name	Wire Colour
1	A	BRN
2	A	WHT/BRN
3	B	GRN
4	B	WHT/GRN
5	C	ORG
6	C	WHT/ORG
7	D	BLU
8	D	WHT/BLU

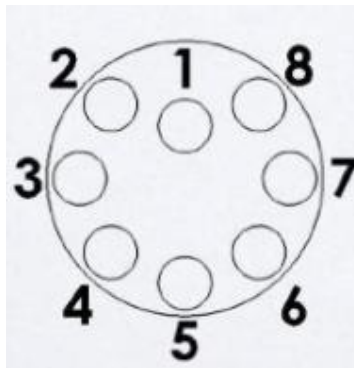


Figure 11-13: Subconn MCDC8F female face

12 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	$\frac{7}{16}$ " x 20	MCIL8F & MCDLSF	MCDC8F
Bulkhead - Male	Subconn	12	MCBH12M	$\frac{1}{2}$ " x 20	MCIL12F & DLSAF	MCDC12F
Bulkhead - Male	Impulse	4	MCBH-4-MP	$\frac{7}{16}$ " x 20	MCIL-4-FS & MCDLS-F	MCDC-4-F
Bulkhead - Male	Impulse	8	MCBH-8-MP	$\frac{7}{16}$ " x 20	MCIL-8-FS & MCDLS-F	MCDC-8-F

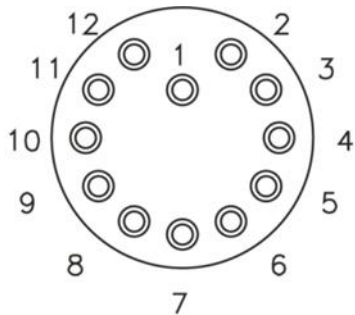


Figure 12-1: MCBH12M male face

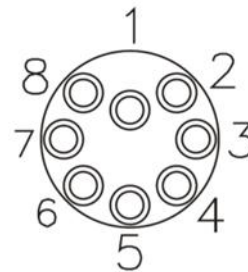


Figure 12-2: Subconn MCBH8M male face