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Updated on January 2, 2018 for App Version 2.2.8

1 Overview

Echo Meter Touch app with an Echo Meter Touch Ultrasonic Module allows you to listen to, record, and identify bats with your Apple iPad, iPhone, or iPod Touch. The Echo Meter Touch offers exclusive features and unprecedented ease-of-use for a handheld bat detector.

Echo Meter Touch Ultrasonic Modules are available from www.wildlifeacoustics.com/products/echo-meter-touch

This guide is available for printing at:
www.wildlifeacoustics.com/support/documentation

1.1 Echo Meter Touch Ultrasonic Modules

The app is compatible with the original Echo Meter Touch Ultrasonic Module as well as the upcoming Echo Meter Touch 2 and Echo Meter Touch 2 Pro Modules.

Echo Meter Touch (original)

The original Echo Meter Touch was released in 2014 and discontinued in early 2017.



Echo Meter Touch 2

Echo Meter Touch 2 (\$179) is intended for nature enthusiasts and batting hobbyists.



Echo Meter Touch 2 Pro

The Echo Meter Touch 2 Pro (\$349) is designed for bat professionals and features a higher quality microphone, adjustable gain, higher sample rate, as well as advanced settings.



1.2 App Features

Listen to bat echolocations in real time

Echo Meter Touch translates bat echolocations into frequencies that are audible to humans using two technologies.

Wildlife Acoustics' patented Real Time Expansion (RTE) allows you to listen to bats in real time with unparalleled fidelity. RTE maintains the timing and tonality of the original echolocations.

Heterodyne (HET) listening is also available, for those accustomed to that way of hearing bats. Manual and automatic tuning is available.

View the echolocations on a spectrogram

A real-time spectrogram shows the frequencies and timing of the echolocations. Scroll back in time and zoom in on previous "bat passes."

See most likely bat species in real time

The Auto ID feature analyzes the echolocation calls and shows the two most likely bat species matches in real time. In North America, a portrait of each bat taken by renowned bat expert Merlin Tuttle will be shown as well. This is the same technology used in our professional Kaleidoscope Pro Bat Auto Identification software. Currently, the app can identify 29 species in North America, 25 in Europe and 57 in the neotropics. For more

information on Kaleidoscope and a full list of species, visit our website.

AUTO-ID FINE PRINT: Because bats vary their echolocation calls in response to a wide variety of needs, no automated call identification can achieve 100% accuracy in species identification. Nevertheless, in the hands of well-trained experts, bat detector recordings can be used to identify many species, providing invaluable discoveries. The Echo Meter Touch allows high quality recording suitable for analysis by experts. The built-in Auto-ID feature also suggests the two most likely bat species for each recording, for the enjoyment of enthusiasts hoping to learn more about bats. These automated identifications, though largely accurate, should not be relied on as a basis for scientific research. Auto-ID is intended for use in analyzing recordings of single bats in free flight in low clutter environments. Recordings of roost emergence, multiple or captive bats, bats in high clutter environments, or bat social calls are not suitable for Auto-ID. In addition, the Auto-ID feature does not include every possible bat for each of the covered regions. Therefore, if a bat that is not included is recorded, it will be identified by the app as a species with a similar echolocation call type. In North America, there are seven species included in the species list that do not have classifiers. They are included so as to allow the user to learn about every species that occur in their state.

Record to WAV files

Use triggered recording to automatically save bat passes to full spectrum WAV files for analysis on a computer or to view on your iOS device. Or use manual record mode to control start and stop of recording. View the recording spectrogram and add voice or text notes. Listen to the recording using RTE, HET, or traditional Time Expansion Playback (playback at fractional speed to make the ultrasound audible).

See your path and recording locations

View your path, including recording locations in satellite or road map view. View identified species codes directly on the map. Go to the recording's spectrogram from the map view. Transfer to your computer to view in Google Earth. Your iOS device must have GPS capability or you must use a Bluetooth GPS receiver for this functionality.

NOTE: This feature requires an iPad or iPhone with a GPS capability or a Bluetooth GPS receiver.

Transfer recordings to your computer

The Echo Meter Touch can transfer full spectrum WAV recordings to your computer over a wireless network or cabled through the iTunes software. Using Wi-Fi, the app bundles the recordings in a .zip folder and allows download by entering a URL in any web browser.

Share recordings via email or MMS messaging

You can share recordings via email or MMS messaging and import and open files that have been shared with you.

1.3 App Version History

See the app version history by navigating to the Echo Meter Touch app in the app store on your iOS device and scroll down to Version History.

1.4 Leave Feedback or Review the App

Please contact us with any suggestions, issues, questions, or comments. We are always looking for ways to improve the app for you. Tap **Email Feedback** on the Information page of the app to send your feedback.

If you like the app, please let others know by selecting **Review this App** from the Information page.

2 Using Echo Meter Touch

This section describes how to use the Echo Meter Touch app to monitor bats.

NOTE: The display examples in this guide were composed on iPhone in portrait orientation. You can also view the app in landscape mode. On iPad, there are minor differences in layout due to the larger display size. In addition, the app supports Apple's Split View which allows you to display two apps on an iPad's screen at the same time. You can view Echo Meter Touch at the same time as another app, for example a GPS app, a weather app, or a notes app.

2.1 Connecting the Ultrasonic Module

The Echo Meter Touch Ultrasonic Modules sense ultrasonic signals, digitize the signal, and transmit the ultrasonic data to the iPad, iPhone or iPod Touch.

Plug an Ultrasonic Module into the Lightning connector of your iOS device and you can immediately start listening to, recording, and identifying bats.

1. Plug the Ultrasonic Module into the Lightning connector of your iOS device.
2. The iOS device asks you to open the Echo Meter Touch app if it is not already open.

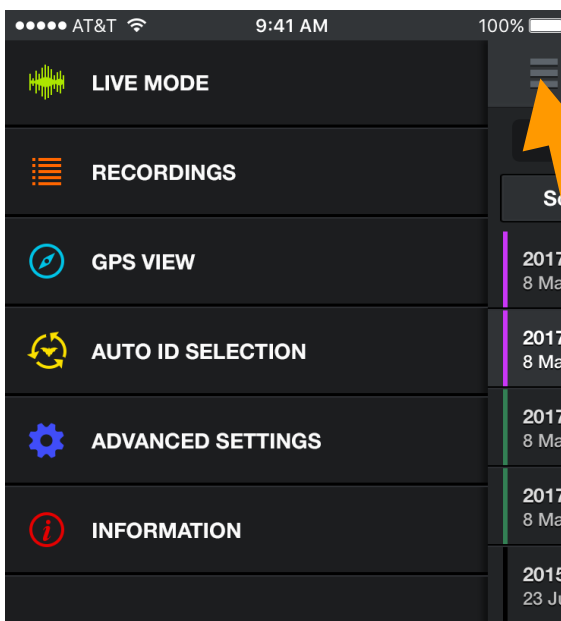


3. Press the START button to begin streaming the ultrasonic data.

NOTE: The module should be pointed in the general direction of the bats which requires the iOS device to be turned upside down as shown above.

2.2 Navigating the app

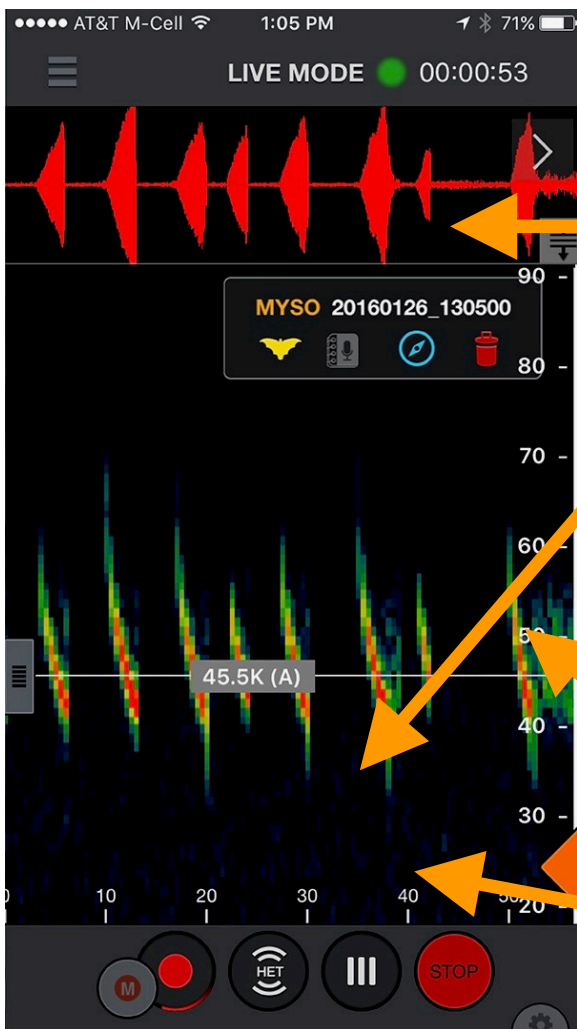
To navigate through the app, press the main menu symbol. You can go to other sections of the app while still hearing and recording bats. You can even continue to monitor and record bats in the background while using other apps.



The main menu symbol

2.3 Monitoring in Live Mode

In **LIVE MODE**, ultrasonic data is streamed to your iPhone or iPad. The frequency and duration of the bat echolocation calls are visually represented in a scrolling spectrogram.



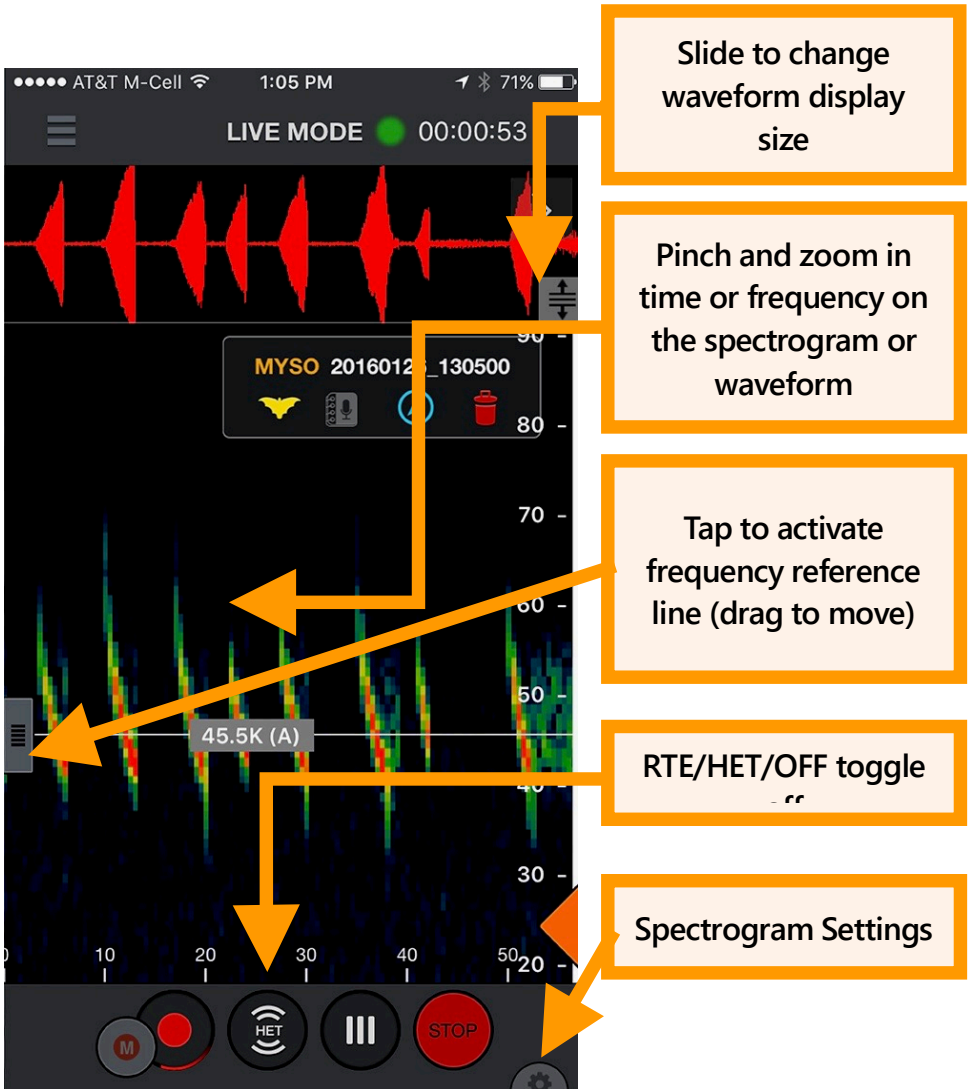
Waveform

Spectrogram

Frequency scale in
kHz

Time scale in
milliseconds

In **LIVE MODE** you can scroll back and zoom into portions of the scrolling spectrogram. After scrolling back in time, a "Return to real-time" button appears at the top right of the screen; press to jump forward to real-time. You can scroll back in time through up to 10 minutes of history. The app will intelligently reduce the history if the iOS device is nearly full. A frequency reference line allows viewing a specific frequency.

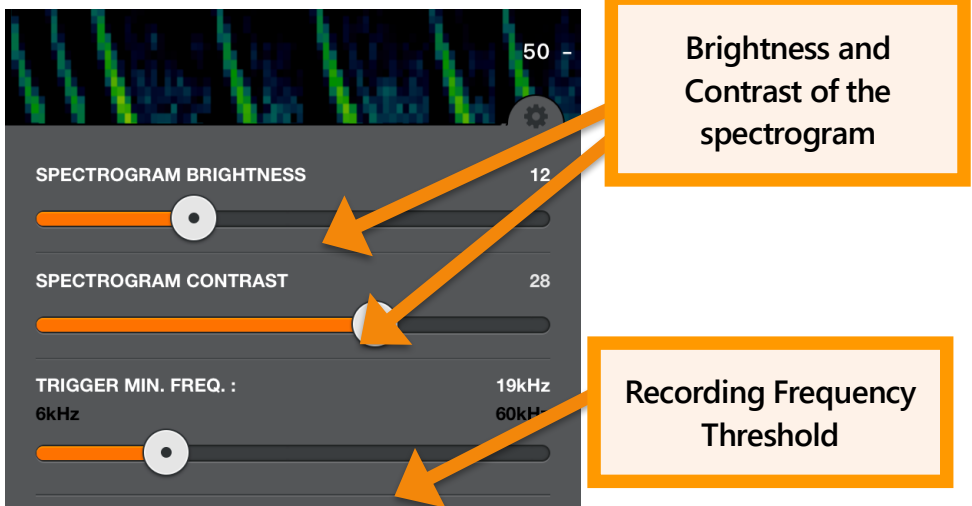


You can listen to bats using Wildlife Acoustics patented Real Time Expansion (RTE) or Heterodyne (HET). RTE translates the ultrasonic sounds to a range that is audible to humans by taking tiny snippets of the sound and slowing it down. Since there is quite a bit of space in between bat echolocation calls relative to the length of the call, the space in between is used to play back the slowed down call. When in HET mode, double tap the grey frequency reference control to go into auto-het mode. This will constantly tune to the frequency with the most energy above the

Trigger Minimum Frequency setting (see below) or a minimum of 10 kHz for EMT1 and EMT2 Pro or 16 kHz for EMT2. Just drag the grey slider on the left side to manually tune.

A bandpass filter is implemented based on the zoom level of the frequency axis in all listening modes. If you zoom in frequency, you will only hear the frequencies visible on the screen. If there is a quite a bit of low frequency noise, or the recorder is picking up its own output, you can zoom such that the noise is not seen on the screen and filter for a cleaner sound. You can also filter out the higher frequency noise of the EMT2 if you do not have very high frequency bats.

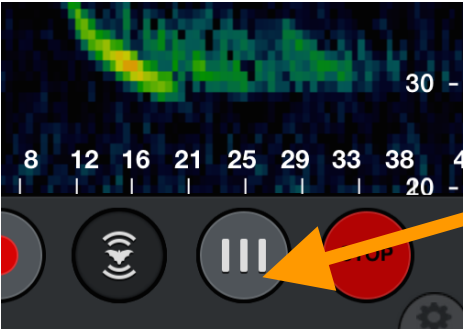
Tap the **Settings** icon to open the spectrogram settings panel. Here you can adjust the brightness and contrast of the spectrogram as well as adjust the minimum frequency to trigger a recording. In portrait orientation, it appears as shown; in landscape orientation it appears at the top right of the screen.



In Compressed mode, the Echo Meter Touch only shows spectrograms containing ultrasonic signals. The spectrogram does not scroll unless there is a signal such as bat echolocations. In Expanded mode, the spectrogram scrolls in real time. Use this mode to examine the timing between previous bat

echolocations. Because the signals scroll too quickly, this mode is not recommended for monitoring.

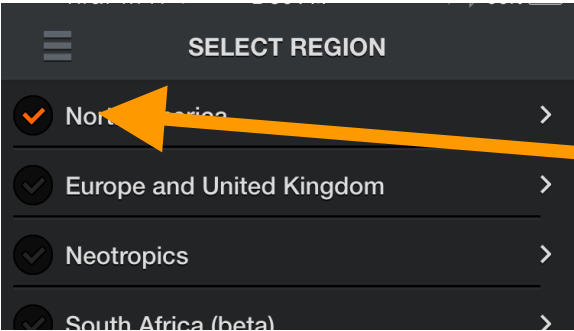
Tap the **STOP** button to stop streaming data and put the Ultrasonic Module into a low-power state. Press **START** to resume.



Toggle between
Compressed and
Expanded Mode
(Expanded shown)

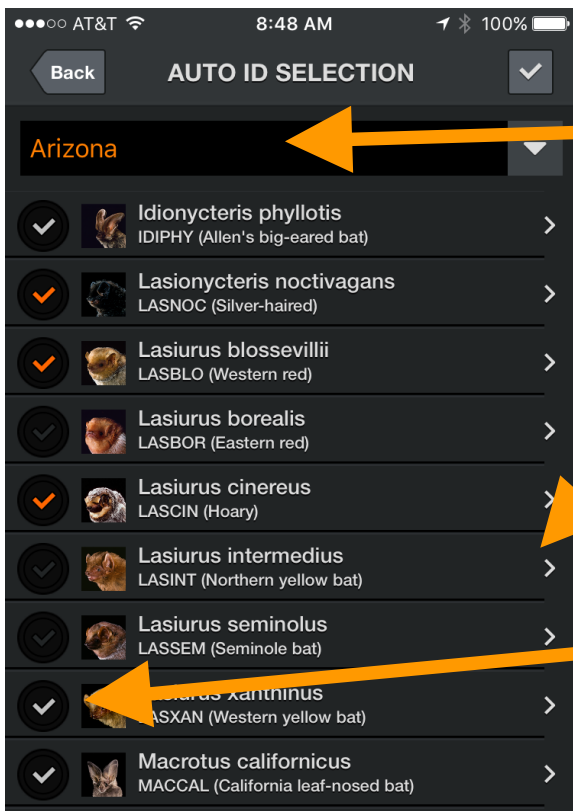
2.4 Configuring Auto-ID

Enter Auto ID mode to view a list of available regions. Current regions are North America, Europe and United Kingdom, and Neotropics. There is also a South African region that is in beta. Check a region to select all bats in that region. Tap a region to learn more about the species and to select only bats in your area.



Select region

A dropdown menu allows you to easily select only bats in your North American state or Canadian province.



Use dropdown to select only bats in your area for most accurate results

Tap a species to learn more about the species or view the Merlin Tuttle portrait.

Grey checks indicate the species is in your area but the app can't yet identify it.

After you select the bats to identify, you can automatically identify them in **LIVE MODE**.

2.5 Recording in Live Mode

There are two methods of initiating a recording; using triggers and manually. Using triggered recording, a recording is triggered only when bat activity is detected and is ended when there is no activity or 15 seconds have elapsed, whichever comes first. As long as recording is turned on, the device records automatically when bats are present, even when the app is running in the background. There is also a small manual record button which you can use to initiate a recording. This can be used on its own or while triggered recording is activated if the trigger misses something. When you press the manual button, a recording starts 5 seconds back in time and continues until you hit the button again or 15 total minutes is reached. The NOISE filter will

not act on manual recordings and Auto-ID will only run in real time if the length is under 60 seconds.

During triggered recording, the Trigger Minimum Frequency, in the Spectrogram **Settings panel**, should be set as high as possible but lower than any expected bat echolocation. For North America and the UK, 12 kHz works well. Lower frequency signals will not initiate a recording. The Threshold can be set between 6 kHz and 60 kHz.

During recording, animation appears around the **Record** button. A white outline forms around the recording on the spectrogram when a recording is in process. In addition, a glowing red orb appears on all title bars in the app when recording is activated and glows green when a recording is triggered. The duration of the current recording is shown to the right of the orb. Using triggered recording, the duration of the current session is shown and using manual recording, the duration of the current recording is shown. At the conclusion of the recording, a label shows the filename. Tap appropriate icon in the label to:

- Identify the species of bat automatically, or override the species tag.
- Append voice or text notes to that recording.
- Navigate to the recording location in GPS view.
- Delete the recording.

Recordings with no bat detected are automatically tagged as "NOISE" and automatically deleted. You can choose to not auto-delete NOISE files in the **Advanced Settings** screen.

Using triggered recording, each time you press the Record button a session is started. The session is concluded when you toggle recording off. Each session is given a distinctive color bar in the recording List and as a path in GPS View. An option in the **Advanced Settings** screen organizes sessions into nightly sessions (noon to noon) regardless of the number of times

recording is stopped and started. Each nightly session exports in its own folder with its own KML file.

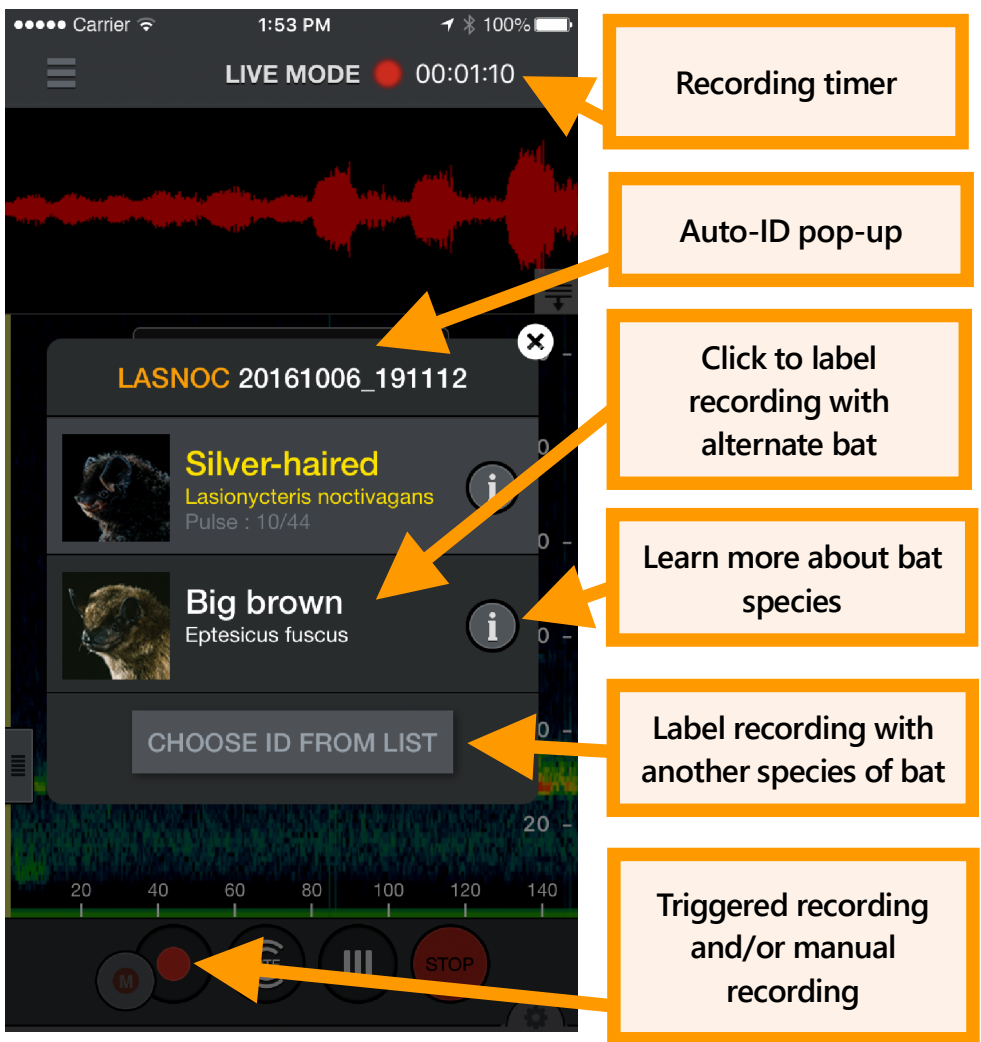
Using manual recording, the app automatically uses nightly session mode for those recordings so as to avoid making a folder for every recording.

The recording timer at the top of the screen starts at the beginning of triggered recording session. Or at the beginning of a manual recording. If a manual recording is made during a triggered recording session, then after the manual recording is over, the timer returns to the elapsed time for the triggered session rather than restarting.

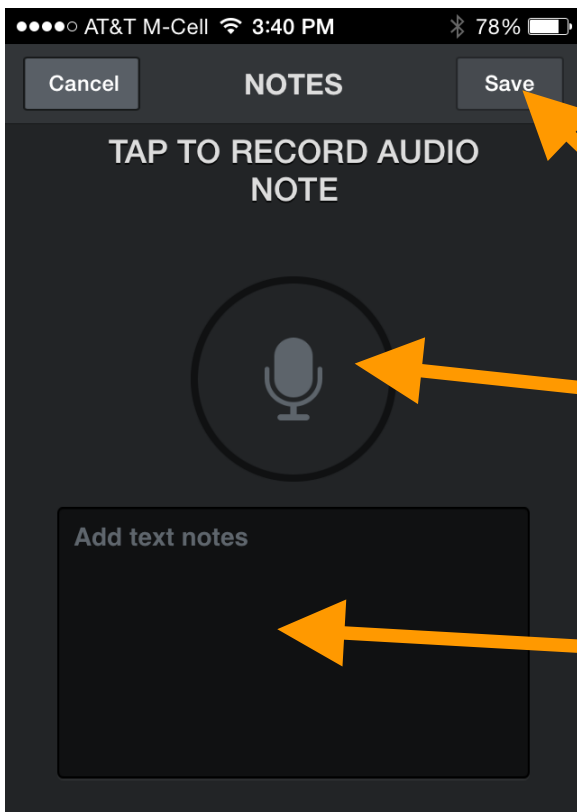
The top two bat's scientific and common names appear in the Auto-ID pop-up, which is shown for 10 seconds after identification. This is not intended to ID two species of bats that might appear simultaneously in a recording, though it might in some circumstances. It is intended to give more information in order to help you make the best ID possible and also to allow you to see common confusions so you can learn the ID's limitations. You can select the runner-up species on the Auto-ID pop-up to immediately tag the recording with that bat instead of the front-runner. Click on the "i" icon to learn more about that species. If you know that both species are incorrect, select "CHOOSE ID FROM LIST" to label the recording with any other selected species of bat. The Auto-ID pop-up also shows the ratio of echolocation calls of the top bat to the total detected calls. This helps give a sense of confidence in the identification.

You can also run ID on one or all recordings from the recording list or while viewing spectrograms from the icon in the recording label. Each recording takes a second or two to identify. If Real Time ID is set on, the app will not be able to trigger for a couple seconds following a recording while ID takes place. The species code or No_ID is assigned as a prefix to the recording name. You can rerun Auto-ID if you should choose to select different bat

species to ID. In addition, from the recording you can choose another label from your selected bat species by pressing the yellow bat in the recording label.



Tap the recording label icon to open the **NOTES** page. Voice and text notes are saved as metadata in the recording so they can be transferred with the recording to a computer.



Save Note

Record voice note:
tap to start and stop

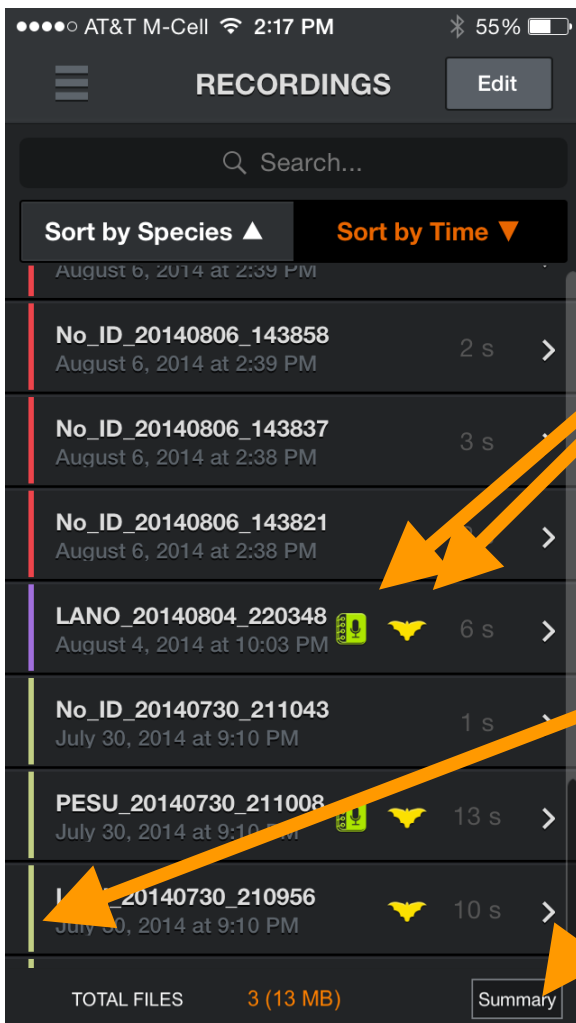
Write text note

2.6 The Recording List

Here you can see a list of all of your recordings. The list can be sorted by Time or Species. The latter is useful to sort by species for identified recordings or to sort out noise or NO_ID recordings.

Tapping again will reverse the sort order. Tap on a recording in the list to view the spectrogram or leave notes. If you are monitoring and recording in the background you will be advised that you are leaving Live Mode.

Tap the **Edit** button at the top right to delete recordings, transfer recordings to your computer via Wi-Fi, share recordings or identify the bat species in the recordings. Press a box to individually 'check it' in the list. You can select multiple recordings from the list by checking the box of any recording, then pressing and holding the checkbox of any recording above or below. This will check all boxes in between.

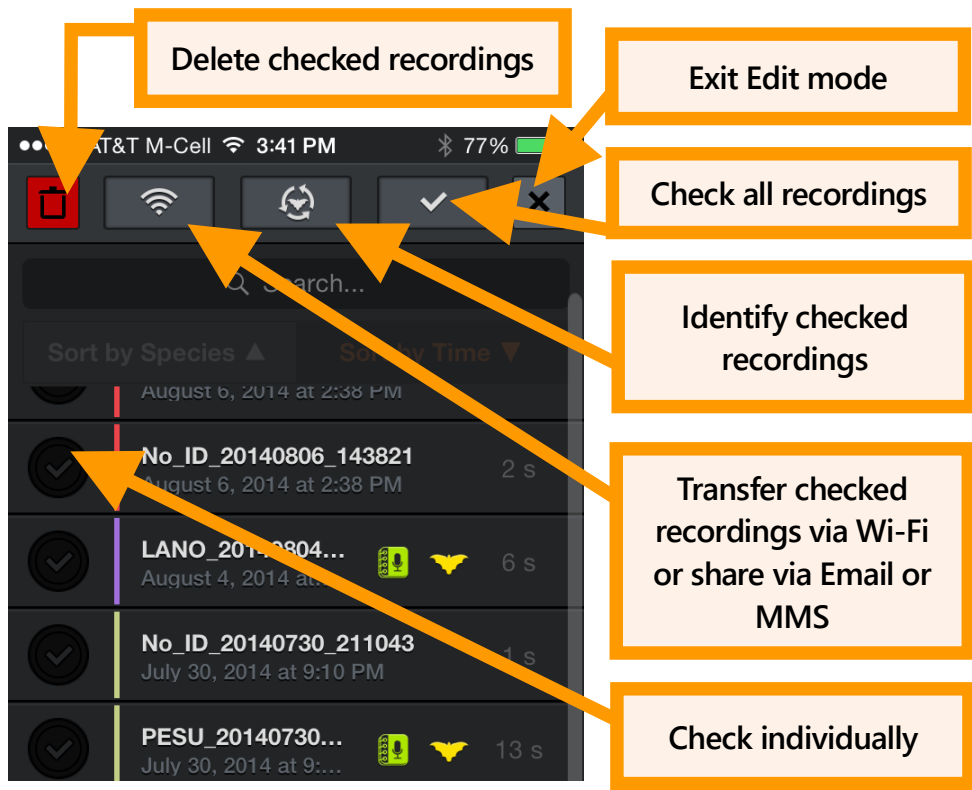


Icons indicate recordings with voice or text notes and recordings with an identified species

Colored recording session identifier

Show summary pop-up

Press the Summary button to show a pop up screen with the number of recordings with each identified species, NO_IDs, and the NOISE files. This will summarize all recordings if none are checked, or a subset if only some have been selected with the checkboxes.



The app has a limit of 10,000 recordings and recordings will need to be transferred or deleted to activate recordings once that limit has been reached.

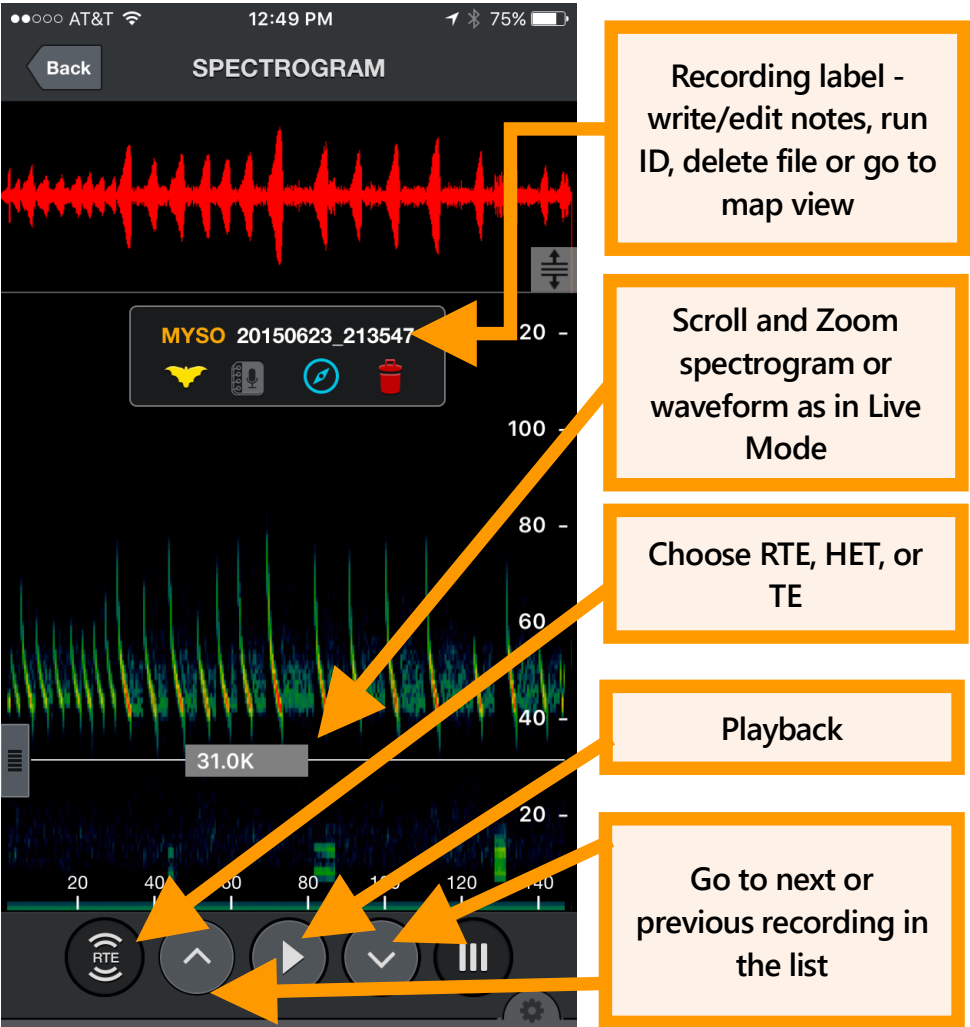
2.7 Viewing Spectrograms of Recordings

Tap a recording from the Recordings list or from GPS view to view the spectrogram of the recording, leave a voice or text note, identify the bat, and listen to the recording. You can listen using RTE, (HET), or Time Expansion (TE) playback. Use TE to play the recording at a slow speed that renders ultrasound into audible sound. In compressed view, you will only hear visible signals during playback, not the space in between echolocations. For HET and RTE, the playback occurs on all samples as though expanded view is selected, whether in compressed or expanded view. This lets you hear exactly how the bat would have sounded in live mode. As in Live Mode, heterodyne can be tuned automatically or manually.

Press the up or down buttons to go to the next or previous recording in the recording list. The order of the recordings will match the sorting chosen in the list. Colored vertical bars at the beginning of each recording show the corresponding recording session and match the color shown in the recording list as well as the path in GPS view.

You can filter the audio for better fidelity as in Live Mode by zooming to only the frequencies of interest.

Spectrograph settings are available as in **LIVE MODE**.



2.8 GPS View

In **GPS VIEW**, you can see the locations of recordings and species ID and the track of your recording session on a map. Each recording session is shown with a different path color. NOISE files are not shown in GPS view.

A KML file is generated and stored with the session recordings in the session folder. If any recording from a recording session is transferred via Wi-Fi, a KML file will be included in the session folder with all recording's waypoints shown. You can also download the files through iTunes as described in this User Guide. KML files can be opened directly in Google Earth to show the recording locations, species IDs and recording path



Toggle between map and satellite views

Tap to go to recordings

Zoom or scroll map view

Center and follow mode

The **zoom to current location** triangle in the lower right of the GPS view zooms to your current location and scrolls the map as you move. The blue dot indicates it is in auto-scroll mode. If you scroll away from your location, the dot turns gray and auto-scroll turns off.

2.9 Advanced Settings Screen

The Advanced Setting is accessible from the main menu. It can only be opened if an Echo Meter Touch 1 or Echo Meter Touch 2 Pro is connected to your iOS device. Default settings are used when the app is used with an Echo Meter Touch (non-Pro). Settings are as follows:

Audio Division Ratio

Adjusts how the RTE sounds in **Live Mode** and how RTE and TE sound on a previously made recording. 1/10 is higher pitch and 1/20 is lower.

Default: 1/20

Nightly Sessions Mode

Set to **ON** to organize sessions into nightly sessions (noon to noon) regardless of the number of times recording is stopped and started. Each nightly session exports in its own folder with its own KML file.

Using manual recording, the app automatically uses nightly session mode for those recordings so as to avoid making a folder for every recording.

Default: OFF

Save Noise Files?

Recordings with no bats detected are automatically tagged as "NOISE". You can choose whether to save these files or automatically delete them.

Default: OFF

Real-Time Auto ID

If **ON**, Auto-ID will run immediately after concluding a recording and the Auto-ID pop-up will be displayed.

Default: ON

Real-Time Auto ID Sensitivity

Adjusts how conservative the ID results will be. On **SENSITIVE**, more bats will be identified even if the algorithm is less confident of the result. On **ACCURATE**, only bats in which the algorithm is very confident will be shown. **BALANCED** is in between.

Range: SENSITIVE, BALANCED, ACCURATE

Default: SENSITIVE

Trigger Sensitivity

Adjusts the recording trigger sensitivity level. High is extremely sensitive and maximizes detection, but will also trigger from other noises resulting in NOISE files. Low will only trigger on stronger signals that are likely to be able to be identified. Medium is somewhere in between the two extremes. The trigger only applies to signals that are higher in frequency than the **Trigger Minimum Frequency** setting in the **Spectrogram Settings** panel.

Range: LOW, MEDIUM, HIGH

Default: MEDIUM

Trigger Window

The recording continues for this amount of time after the last signal that satisfies the trigger. (The recording is also truncated when it reaches the maximum recording duration set by **Max Trigger Length**.) Set the trigger window setting long enough to avoid a recording that ends after one echolocation call. For

example, if bat echolocation calls occur every 0.5 seconds and trigger window is 0.1 seconds, you would get a new trigger with every single echolocation call.

NOTE: Some standards describe a specific recording trigger window as a bat pass.

Values: 1 to 15 seconds in 1-second increments

Default: 3 seconds

Max Trigger Length

You can specify the maximum length (time duration) of recordings to comply with file size restrictions of your analysis software or to fulfill a specific recording protocol or definition of a bat pass.

Values: 1 second to 60 seconds in 1-second increments

Default: 15 seconds

Gain (Echo Meter Touch 2 Pro only)

The Echo Meter Touch 2 Pro has configurable gain. The HIGH setting roughly corresponds to the gain on the Echo Meter Touch 1 and the SM4BAT FS set to the default 12dB level. This can be useful for recording very distant or quiet bats. MEDIUM corresponds to the gain on the Echo Meter Touch or the 0dB gain setting on the SM4BAT FS and is a good setting for general recording. The LOW setting is 12 dB lower than MEDIUM and is useful for recording hand released bats or any other situation where the bats are close or loud.

Range: LOW, MEDIUM, HIGH

Default: MEDIUM

Sample Rate (Echo Meter Touch 2 Pro only)

The sample rate on the Echo Meter Touch 2 Pro can be set to 256k or 384k. 256k will record up to 128kHz which is sufficient for

all North American and European bats. 384k will record up to 192kHz but will use proportionately more storage for recordings.

Default: 256k

2.10 Restore Defaults

Press the **Restore Defaults** button at the bottom of the **Information** screen to restore the following to defaults: zoom level, spectrogram settings and advanced settings. It also unselects all bats on the AUTO-ID SELECTION screen.

3 Recordings

This section describes the format of the recordings, how to transfer them to or from a computer, and how to share them with others.

3.1 Filenames for Recordings

Recordings use the following naming convention:

ID_YYYYMMDD_HHMMSSWAV

ID

The first three letters of the species and the first three letters of the genus for recordings that have been identified, No_ID if Echo Meter Touch was unable to identify the recording or NOISE if the no bats are detected in the recording.

YYYYMMDD_HHMMSS

The full timestamp including the year, month, day, hour, minute, and second when the recording started.

3.2 Metadata Tags for Recordings

Values for the attributes listed below are stored as metadata in your recordings.

Some of the metadata information is visible in the available Kaleidoscope software. Kaleidoscope software has the ability to add further metadata relating to analysis of the recording.

Device Name

The Name of the iOS device as set in Settings→General→About→Name.

Device Model

Displays **Echo Meter Touch** and the App version number.

Timestamp

The date and time when the recording started.

GPS Coordinates

The location of the Echo Meter Touch when the recording started.

Voice and Text Notes

Any voice or text notes that were added by a user.

3.3 Sharing Recordings via Email or Text Message

Recordings can be shared via Email or MMS text messaging via iMessage.

1. Tap the **Edit** button at the top right to make the edit bat appear.
2. Select one or more recordings (up to 20MB total).
3. Tap the **Share** button and select **Email** or **MMS**. A message composition window opens.

Shared recordings can be imported into the app.

1. Press and hold the recording attachment in the email or text message.
2. Select the **Echo Meter Touch** app. The recording is imported into the app.

NOTE: iMessage is not compatible with high sample rate WAV files natively so the file is actually sent as an EMOUCH file and then converted back to a WAV file upon import.

All imported files must have been recorded using Echo Meter Touch app (as opposed to another bat recorder) and will be stored in a session folder called **Imported Files**. Imported files have a white session color in the recording list.

3.4 Backing Up Recordings

If you have iCloud backup activated on your iOS device, the recording will be backed up to that service. If you have many recordings this will use up a lot of your storage. If it exceeds your plan, you will get a pop-up warning that says "Not Enough Storage". If this is a problem, go to the Settings app then iCloud->Storage-->Manage Storage and click on appropriate back up in the BACKUPS section. From there you can turn off Echo Meter Touch backups. Press "Show All Apps" if you don't see it listed. If you are not sure if you use iCloud backup, go to Settings-->iCloud and see if Backup shows "On" or "Off".

Recordings will also be backed up if you back up you iOS device through iTunes.

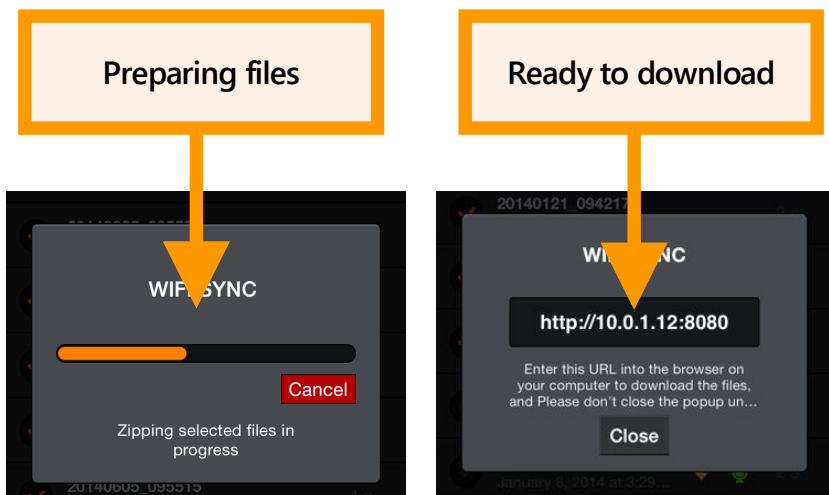
Using one of these two strategies is advised since all your recordings can be lost if the app is accidentally deleted or if your iOS device breaks.

3.5 Transferring Recordings to a Computer

Recordings can be transferred to your computer via Wi-Fi or through a USB cable using iTunes.

Using Wi-Fi

1. Tap the **Edit** button at the top right to make the edit bat appear.
2. Select one or more recordings.
3. Tap the **Share** button and select **Wi-Fi** to compress all the recordings into one or more transfer files (not to exceed 1GB).
4. A short URL with an IP address and port appears.
5. Type the address exactly as shown into any web browser on any computer on the same wireless network.
6. A page appears where you can download the recordings.



Using iTunes

Recordings can also be transferred to your computer using iTunes software on a Mac or PC via a Lightning-to-USB cable (charging cable that comes with the iOS device).

1. Download and install Apple iTunes software on your computer.
2. Plug the iOS device into the computer using the charging cable.
3. Select the attached device by clicking on the small iOS icon that will appear in the menu bar.
4. Select File Sharing in the side tab.
5. Select Echo Meter Touch app.
6. Select the recording sessions you want to transfer and press the Save to button to select a destination.

3.6 Importing Recordings using iTunes

You can import recordings and/or session folders into the app through iTunes. This is useful if you need to switch to a new iOS device or you want to share a whole session with a friend.

1. On your computer, create a folder named "import".

NOTE: "import" must be all lower case.

It doesn't matter where this folder resides as long as you can find it. Copy all session folders and/or independent recordings that you wish to import into your EMT device into this folder. Note that the files must not be inside a .zip file. If they were exported them from another EMT device, you must first unzip them.

2. Close the EMT app and connect the device to your computer using a lightning to USB cable.
3. Open iTunes on the computer. Choose your iOS device and select **Apps** from the sidebar. Wait until all app screens are loaded.
4. Scroll to the bottom and find the **File Sharing** section and choose the **Echo Meter**.

- 5. Drag and drop the "import" folder that you created above into the box labeled **Echo Meter Documents**.
- 6. On the iOS device, launch the Echo Meter Touch app. This will automatically import all of the session folders and recordings into the app on your device and they can then be found in the recordings list.

3.7 Analysis Software

Use the free Kaleidoscope Viewer to create a spreadsheet file showing your recording’s meta-data and notes and view spectrograms of your bat recordings on a computer. Upgrade to Kaleidoscope Pro to add automatic classification of bats. You can also use third party bat analysis software for your Echo Meter Touch recordings.

4 Specifications

4.1 Physical

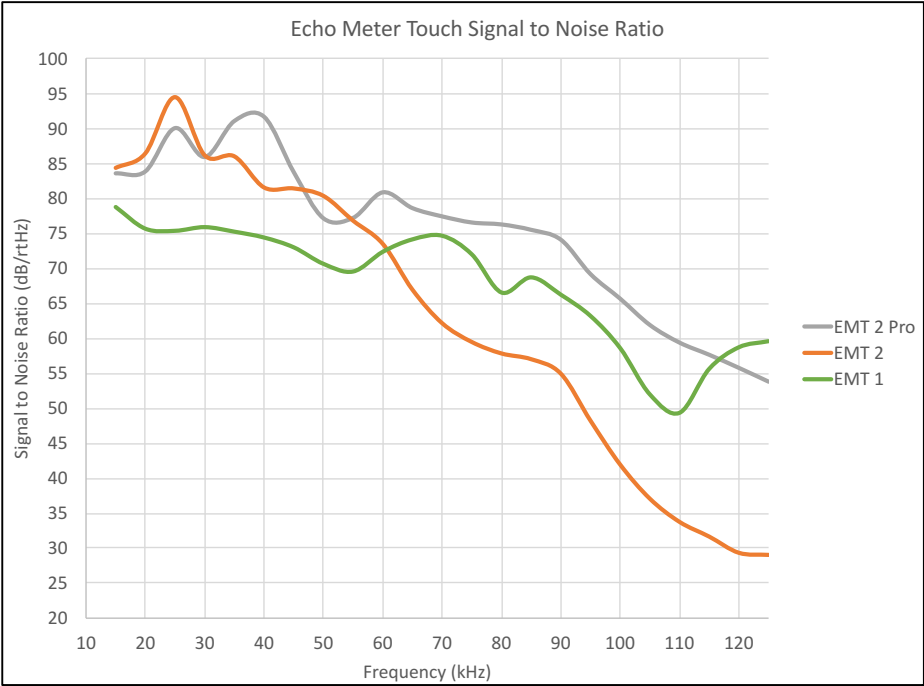
	Echo Meter Touch (original)	Echo Meter Touch 2 and 2 Pro
Length w/o Lightning:	1.8 inches (46 mm)	1.4 inches (35mm)
Width:	1.9 inches (48 mm)	1.9 inches (48 mm)
Thickness:	0.47 inches (12 mm)	.3-.6 inches(7-16mm)
Weight:	1.1 ounces (31 g)	0.7 ounces (20g)
Material:	Anodized Aluminum	Polycarbonate/ABS
Environmental:	Weather resistant but avoid rain	

4.2 Audio

	EMT 1	EMT 2	EMT 2 Pro
Recording Format:	12-bit WAV	16-bit WAV	16-bit WAV
Gain:	Fixed	Fixed	3 settings
Sample Rate:	256kHz	256kHz	256kHz/384kHz
Directionality:	Omnidirectional	Slightly Directional	Slightly Directional

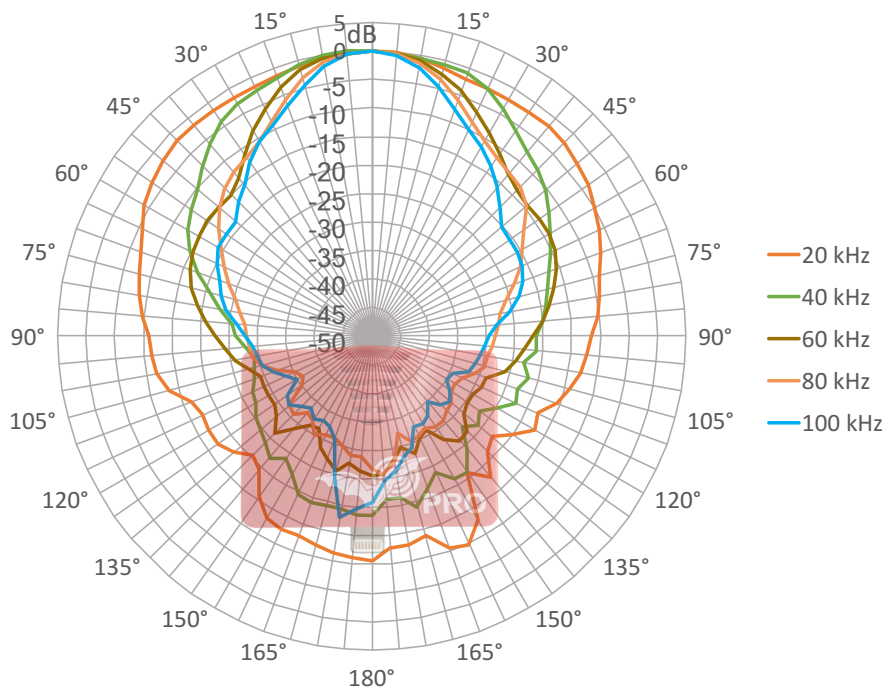
Maximum Recording Frequency: Half of the sample rate (up to 128 kHz for 256 kHz sample rate and up to 192 kHz for 384 kHz sample rate)

Signal to Noise Ratio (chart below): This is a measure of quality within the recording bandwidth. A higher value is better.

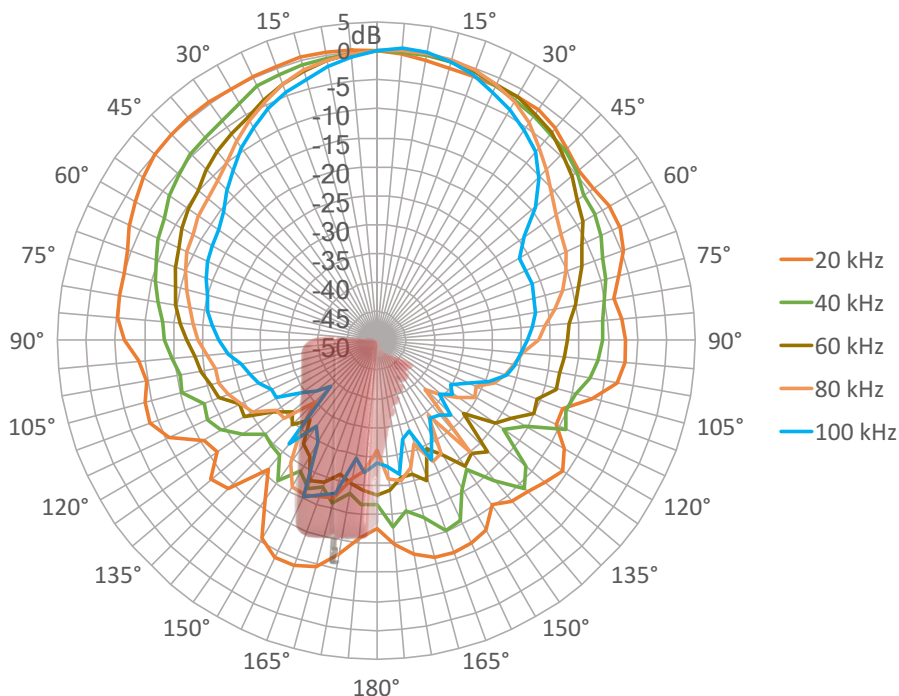


Directionality (charts below): The waveguide on the EMT 2 provides some directionality to reduce extraneous noise and echoes. See the chart below.

Echo Meter Touch 2 and Pro Directionality (Horizontal)



Echo Meter Touch 2 and Pro Directionality (Vertical)



4.3 Storage Requirements

How many recordings you can store on your iOS device depends on the capacity of your iPad or iPhone and how much memory is available. A 5.0-second recording uses 2.5 MB of storage. A 32 GB iPad with 28 GB of storage available, for example, would be able to save over 10,000 recordings.

The app also needs at least 600mb of storage for sufficient buffering of Live Mode. The app will warn you if you have insufficient storage.

4.4 Battery Life

iPad: Up to 9 hours

iPad mini: Up to 7 hours

iPhone: Up to 3.5 hours

NOTE: The above run times are with the following realistic settings: screen brightness minimized, audio at maximum, recording and Auto-ID on, and GPS off. Turning GPS on will significantly reduce battery life.

4.5 iOS Hardware Compatibility

The devices listed below are compatible with Echo Meter Touch 2 and Echo Meter Touch 2 Pro with iOS versions up to 11. There is no guarantee that future iOS versions (released each year in the fall) will work on older devices on this list. With each new iOS version, more processing is required to run the increasingly advanced features. For this reason, it will be necessary for us to remove older devices from this list annually.

- iPad Pro 9.7" and iPad Pro 12.9"
- iPad (released March 2017)
- iPad Air 2
- iPad mini 4
- iPhone SE, 6, 6 Plus, 6s, 6s Plus, 7, 7 Plus, 8 and 8 Plus
- iPod Touch (6th generation)

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U.S. Pat. No. 8,599,647

U.K. Pat. No. GB 2480358

European Pat. No. 2877820

Additional U.S. and international patents and trademarks are pending.