

Volume

1



REDVOX INC.

iOS App Version 3.8.5

RedVox - iOS User Manual

REDVOX INC.

RedVox iOS User Manual

© RedVox Inc.
73-970 Makako Bay Drive • Room 116
Kailua-Kona, HI 96740

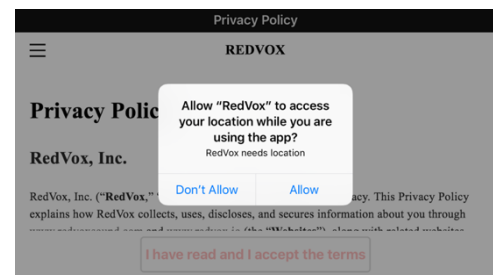
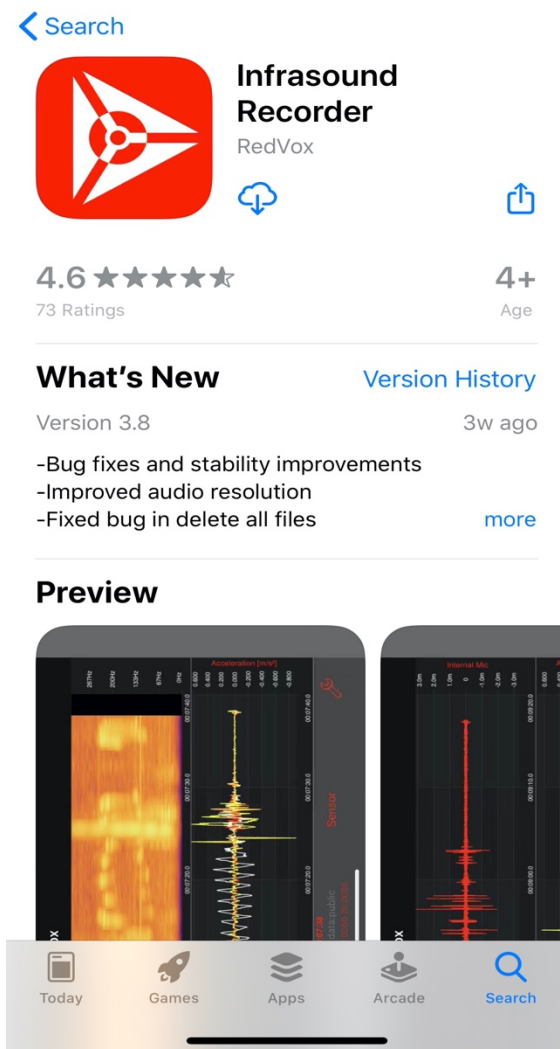
Table of Contents

Installing the RedVox App and First Use	1
RedVox App Settings	5
Optimizing a Device for Data Collection.....	9
Accessing Data	10
Active Devices.....	10
Data Explorer	11
Generate a RedVox Report	13
Installing Python	15
Installing Python on a Mac.....	16
Installing Python on Windows	17
Opening Jupyter Notebook and Reading RDVX Files	19

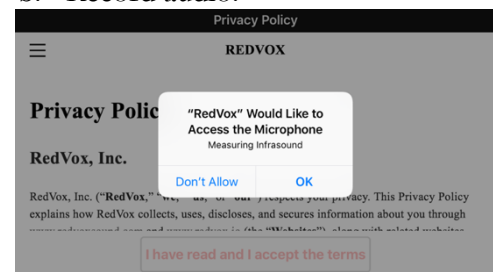
An iPhone X was used in this User Manual. For more information email
dev@redvoxsound.com

Installing the RedVox App and First Use

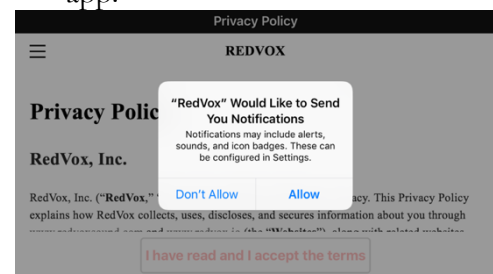
1. Download the app from the App Store.
2. Once it is installed, open the app.
3. A pop-up will ask for the following positions in order to collect data:
 - a. Access the device location. The location is used for geospatial analysis.



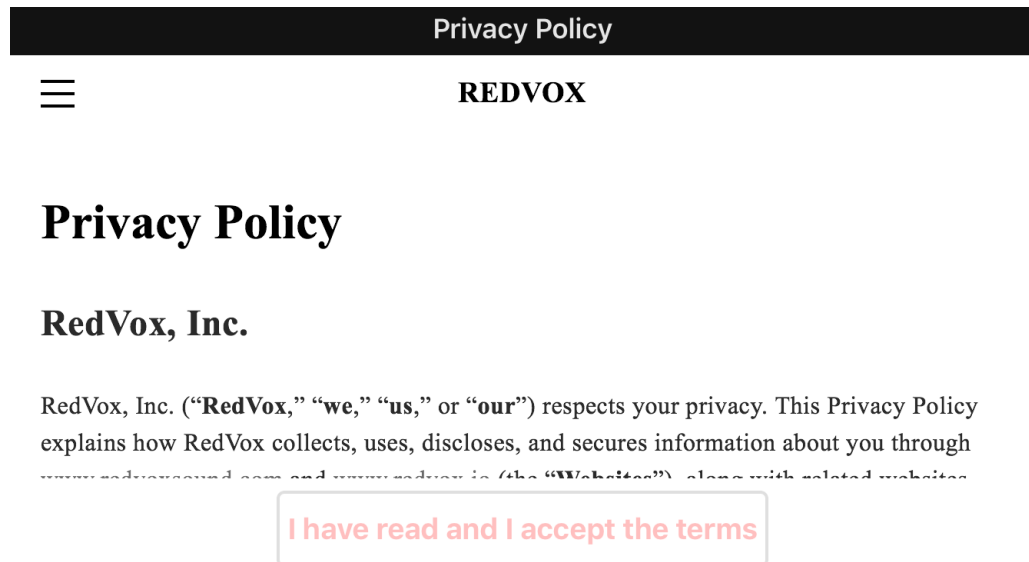
- b. Record audio.



- c. Allow notifications from the RedVox app.



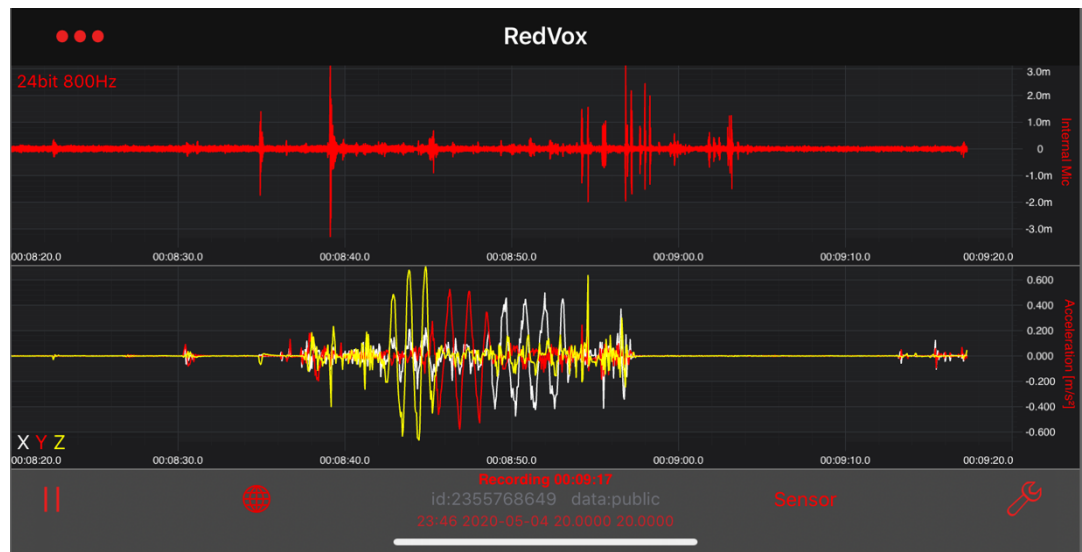
4. Read and accept the Privacy Policy (redvoxsound.com/policy).



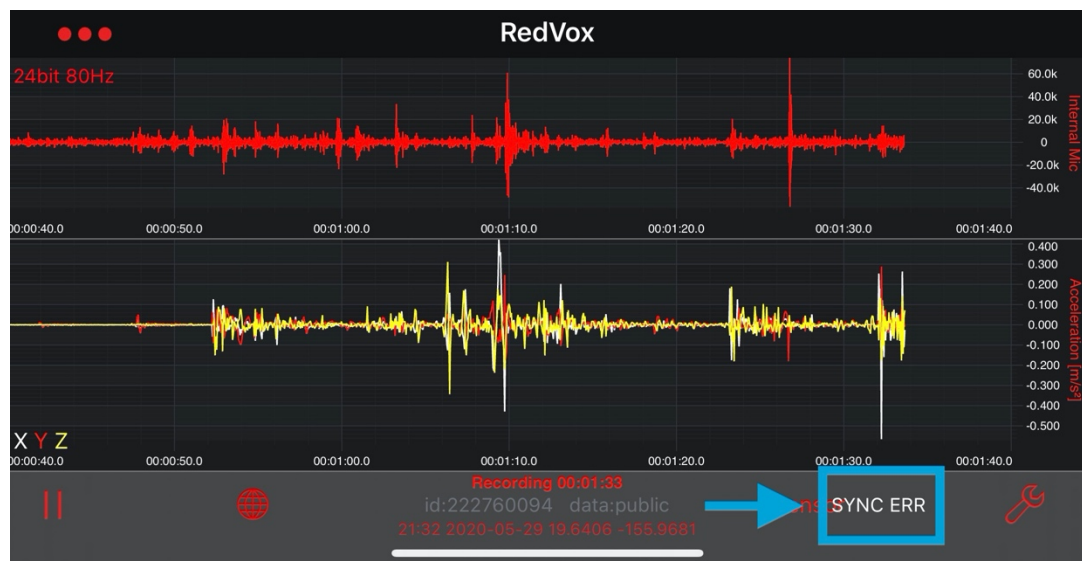
5. Tap Play to start recording (on the bottom left of screen). The screen should show a waveform and the timer in the top right should start. It will also indicate that it is recording at the bottom of the screen.



- a. The app will collect infrasound with a default sampling rate of 80Hz. The sampling rate can be seen in the top right-hand corner. The highest frequency the app can record at is 8 kHz, but there is no human voice in this frequency band. The Universal Time and device location can be seen in the bottom right corner of the screen.



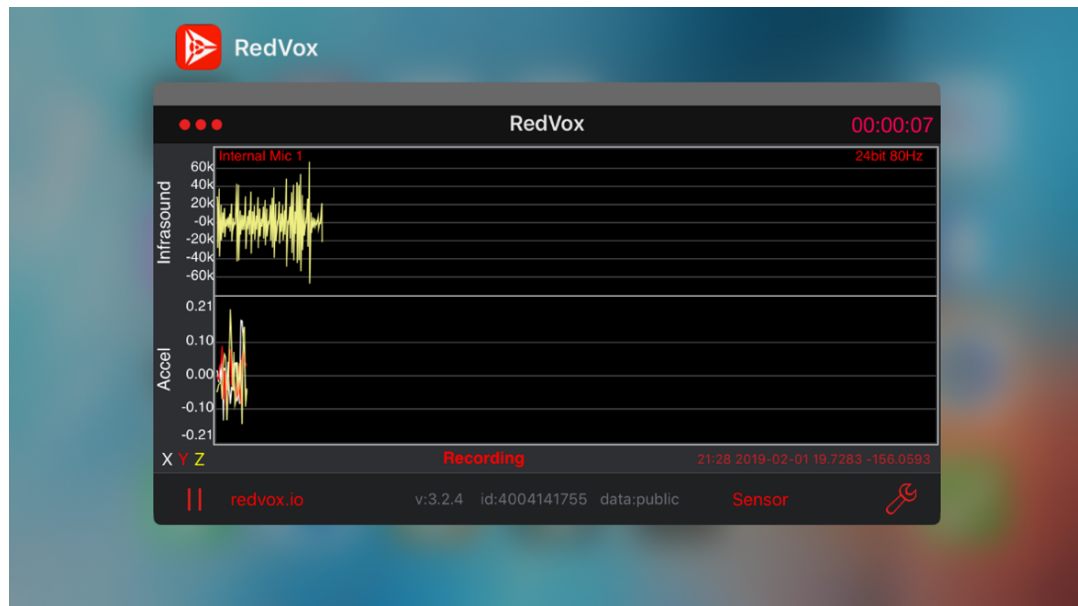
- b. If data is not saving to the Cloud storage, a number will appear at the top left of the screen and SYNC ERR will pop up on the bottom of the screen. The number indicates how many files are backed up on the device (not being saved to the Cloud storage). This error is either due to not having communication or a strong bandwidth.



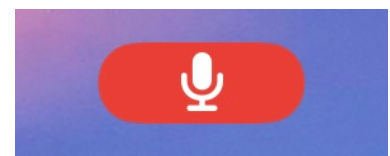
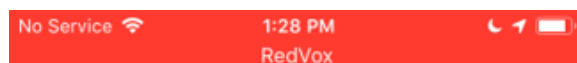
6. To stop collecting data, tap on the Pause button. A pop up will appear asking to "End recording infrasound?", tap STOP and data will stop being collected. The timer on the top right will stop as well.



7. To exit the app, go to the phone's task manager and swipe to close the app.

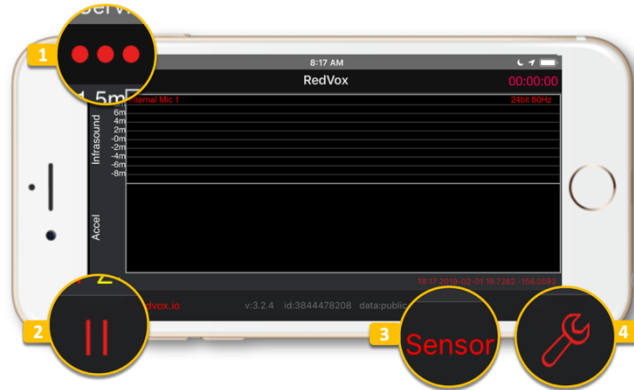


8. To ensure that the app has stopped running, check the status bar on the top of the screen. If it is red and flashing the word RedVox - the app is still recording, if the status bar is not red - the app is not recording.



RedVox App Settings

The figure below shows the setting in the RedVox app.



The main screen of the phone is shown in the figure to the left. There are three main menus on the main screen and one button for starting and stopping recordings in the phone. The menus are listed below:

1. Plot Type Menu
2. Pause/Start recording
3. Sensor Menu
4. App Settings

Done **InfraRecorder Setup** ⓘ

1 RedVox ID 2355768649

2 **Sensors**

Audio

8000 Hz 800 Hz 80 Hz

Barometer

Off On

Accelerometer

Off Normal High

Gyroscope

Off Normal High

Magnetometer

Off Normal High

Remove DC Sensor Offset

Raw Data Remove DC

Security Settings

3 enter email

enter password

Enter the email and password you used to register on Redvox.io

Authorize Register

4 Public Data Private Data

5 Data Files Settings

Allow Backfill ☒

Auto Delete Files ☒

4.00GB Max

Allocated Data File Space

All files transmitted to server, average 224.4kbps

Available Recording Time: 28 days, 22:26:40

[Total available 118.5GB]

Delete All Data Files

Custom Settings

20.00000 20.00000

Latitude Longitude

Enable Custom Location ☒

6 (null)

Enable Custom Sync Server ☐

Server IP Addr : Port

Enable Custom Packet Server ☐

Push Data to Server ☒

FFT Settings

Overlap

25% 50% 75%

Version 3.8.1

7 Clean and Restore

1. **Redox ID** – A RedVox ID is a unique 10-digit number for the device.

RedVox ID

2355768649

To create an ID for the device that is being used, click on the white text box and enter your desired ID.

****NOTE:** The RedVox ID can be up to 10 digits. If it is less than 10 digits, RedVox will fill the remaining spaces with zeros (ie. 15 will look like 0000000015). If there are more than 10 digits, it will not change the RedVox ID.

2. **Sensor Options** – Users may toggle the rates and levels of the sensors the RedVox app uses.

Sensors

Audio

8000 Hz800 Hz80 Hz

Barometer

OffOn

Accelerometer

OffNormalHigh

Gyroscope

OffNormalHigh

Magnetometer

OffNormalHigh

Remove DC Sensor Offset

Raw DataRemove DC

To enhance the quality of data, the sample rate should either be 800 Hz or 8kHz. Users can toggle between options to change sensor settings.

The default settings are 80 Hz, with all of the sensors on the phone/device enabled.

****NOTE:** In order to collect data with a sampling rate of 8000 Hz, an account needs to be logged into in the app


****NOTE:** The different sensors can be plotted on the main screen. To select a sensor to plot, go to the (3) Sensor Menu on the main screen.

3. **Log in/Create RedVox Account** – A RedVox account gives the user advanced settings for recording data.

1. If you do not have a RedVox account, tap on Register to create an account.
2. Fill out the areas and tap Signup to complete account registration
3. To log in, tap on Authorize after your account credentials are entered.

****NOTE:** A RedVox account is needed to access some features in app as well as analysis and device details on redvox.io. The areas ask for first/last name, organization affiliated with, e-mail address, and password for the account.

4. **Data Type** – The collected data can be published as private which only allows the account affiliated with the device(s) can see the data. If the device is left as a public device, anyone can see the data that was collected. If privacy is an issue, the recommended setting is private. Users can also toggle back and forth between these two settings, provided they have created a RedVox account.
5. **Allow Backfill** – This setting allows files to be sent to the packet server once communications have been restored.
Auto Delete Files – This setting is used to delete files after a certain amount of storage have been used for files.
Allocated Data File Space – This setting allows the user to dedicate an amount of space for the RedVox files.

The user can allot a certain amount of internal storage for the data files. Go to  > scroll down to Data Files Settings. Tap on the white box, as shown in the screenshot to the left, and input the desired amount of storage (in GB).

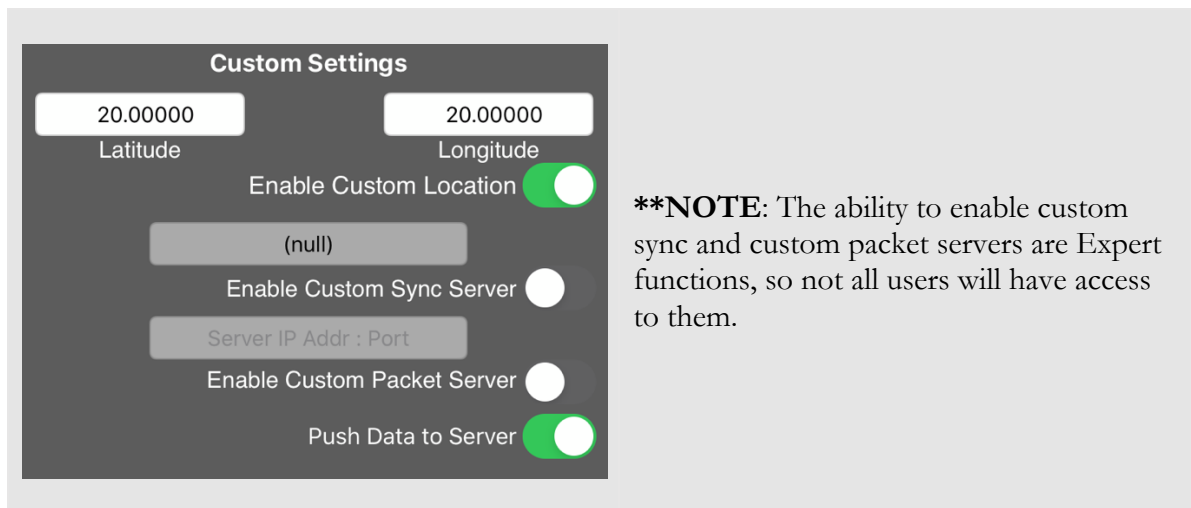
6. **Enable Custom Location** – The Custom Location allows custom input of latitude and longitude of a location. If the location permission is allowed, the app will use the coordinates of your location

using the GPS. If the location permission is denied, the app will use the fixed location: 0.0000, 0.0000.

Enable Custom Sync Server – When higher time accuracy is required, it is possible to direct the app to a RedVox Time Sync Server. Details to be described in a separate section.

Enable Custom Packet Server – Can enable data files be sent to a custom data server. Details to be described in a separate section.

Push Data to Server – This setting is used to make data packets go to the packet server and is suggested to be kept on.



7. **Clean and Restore** – Clean and restore deletes all the files on the device and resets all the RedVox settings but keeps the RedVox account logged in and the RedVox ID.

Optimizing a Device for Data Collection

If the device is going to be designated for data collection, these steps are recommended for optimizing the system. The goal is to conserve power and preserve a nearly-constant data transmission bandwidth.

1. Turn off all communications on the device except for cell data or Wi-Fi.
2. Standardize the home screen of the devices to make it easier to navigate through all the apps.
3. Turn off apps that are not needed for data collection and may consume power and bandwidth.
4. The recommended settings checklist for a sensor that may be changing locations and is using Wi-Fi communications is provided in the figure below.
5. If using Cell communications exclusively for data transfer, turn off Wi-Fi to save power. Will have to turn off Airplane Mode, and confirm Bluetooth is off.
6. If the device location is fixed and known, go to the RedVox App Settings, turn off Use Location Services, and input the latitude and longitude of the unit in decimal degrees. This will conserve power.
7. Turn off Amber Alerts and Emergency Alerts.
8. Turn off all notifications on all apps EXCEPT RedVox (NOTE: After any software Update some notifications turn back on so the notifications need to be turned back off if the phone is updated).

	Setting	ON	OFF
CONNECTIONS	Airplane Mode	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Wi-Fi	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Bluetooth	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Cellular	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Cellular Data Options > Roaming Off	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Wi-Fi Calling	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Calls on Other Devices	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Wi-Fi Assist	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	iCloud Drive	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Notifications > Show Previews	<input checked="" type="checkbox"/>	<input type="checkbox"/>
NOTIFICATIONS/ALERTS	Vibrate on Ring	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Vibrate on Silent	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Change with Buttons	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Keyboard Clicks	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Lock Sound	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Do Not Disturb	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Do Not Disturb > Scheduled	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Do Not Disturb > Silence > Always	<input type="checkbox"/>	<input type="checkbox"/>
	Do Not Disturb > Allow Calls From > No One	<input type="checkbox"/>	<input type="checkbox"/>
	Do Not Disturb > Repeated Calls	<input type="checkbox"/>	<input checked="" type="checkbox"/>
GENERAL	Do Not Disturb > Activate > Manually	<input type="checkbox"/>	<input type="checkbox"/>
	Software Update > Automatic Updates	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	AirDrop	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Handoff	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	CarPlay > USB Only	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Accessibility Settings	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Background App Refresh	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Date & Time > 24-Hour Time	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Date & Time > Set Automatically	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	VPN	<input type="checkbox"/>	<input checked="" type="checkbox"/>
OTHER GENERAL	Control Center > Access Within Apps	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Display > Night Shift	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Display > Auto-Lock > 5 minutes	<input type="checkbox"/>	<input type="checkbox"/>
	Display > Raise to Wake	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Display > Bold Text	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	View > Standard	<input type="checkbox"/>	<input type="checkbox"/>
	Siri Settings	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Emergency SOS > Auto Call	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Battery > Percentage	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Battery > Low Power Mode	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Privacy > Location	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Accessing Data

There are different ways to access collected data. This section will go over different ways to access the RedVox data files.



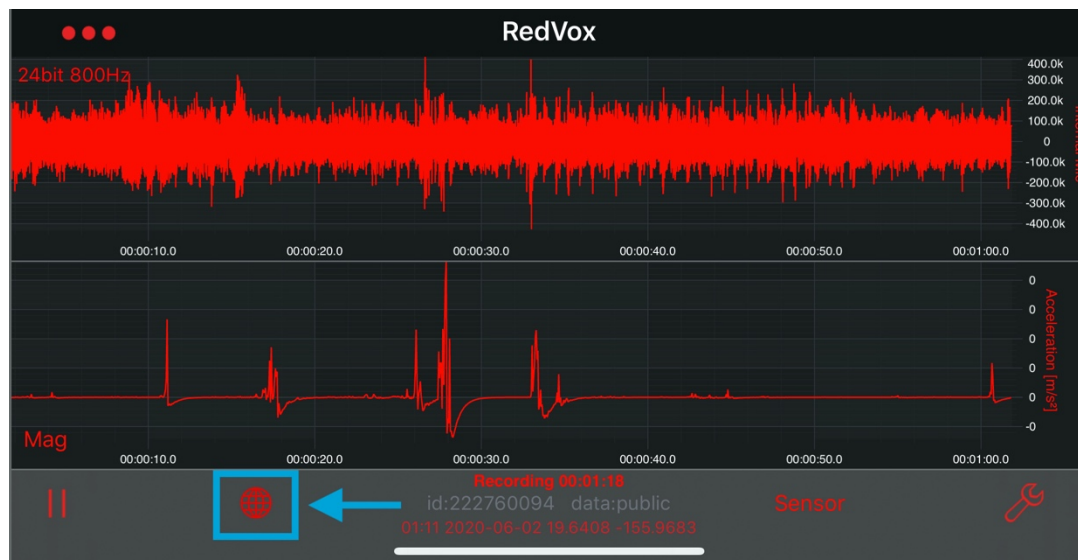
1. redvox.io > Network Status > Active Devices
2. redvox.io > Network Status > Data Explorer
3. redvox.io > Analysis > Generate a RedVox Report

As of the time being, a RedVox Reader SDK is available for Python and Java. The RedVox API 900 is described in detail in the SDK documentation. Please refer to <https://redvox.io/downloads>

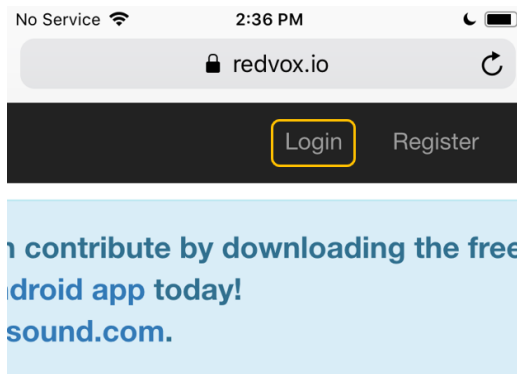
4. NEW FEATURE: In-App File Playback and Access

Active Devices

1. To access the collected data, go to: redvox.io or click the link in the app (boxed in blue below).



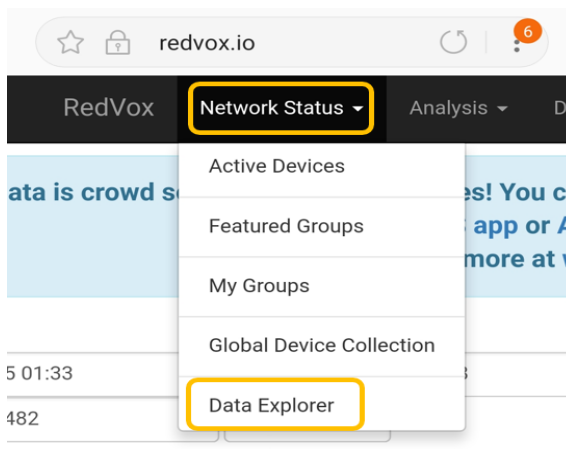
- a. A web browser will open. The blue marker above the phone shows which phone is in use. Phones with public data can be seen on the website's homepage to show the nearest phones.
 - b. Logging in can be done with the credentials created earlier (see *Create an Account* section).
2. Tap Login in the top right-hand corner of the Home Page.



3. Then go to Network Status > Active Devices. The Active Devices' page is useful for showing which devices are currently collecting data.

Data Explorer

1. Another way to access collected data is going to redvox.io > Network Status > Data Explorer. The Data Explorer is easier to view on a computer.



2. There are three different colors: red – private, owned devices; yellow – public, owned devices; white – public devices. The list of devices looks like the figure below.

Show / Hide Filters Update								
ID	Email	App Mach	Server Wall	Model	Backfilled?	Bat. %	#Ch	UUID
1221949338		2019/2/7 19:6.31.51	2019/1/15 20:51.0.525	FTU18A00	true	4	4	App Wall
1221949338		2019/2/7 19:6.23.462	2019/2/5 16:35.51.645	FTU18A00	true	28	4	Device Make
		2019/2/7 19:6.18.449	2019/2/7 19:6.57.669	iPhone8,1	false	100	7	Is Private?
3699695393		2019/2/7 19:6.13.590	2019/2/7 19:6.50.323	iPhone7,2	false	100	7	Is Scrambled?
		2019/2/7 19:6.13.75	2019/2/7 19:6.55.536	SM-G950U1	false	100	5	OS Version
		2019/2/7 19:6.10.749	2019/2/7 19:6.45.689	iPhone7,2	false	100	7	App Version
		2019/2/7 19:6.10.7	2019/2/7 19:6.58.683	iPhone7,2	false	100	7	Data Uri
								Synch Uri

Legend

Android iOS

Your private devices Your public devices Other public devices

- a. The list of devices has different columns. The columns are explained below. All timestamps are in microseconds referenced to 0 UTC of 1 January 1970 (Unix time, also referred to as Epoch in geophysics).

- **ID** – RedVox ID used for the device
- **Email** – Email used for RedVox account
- **App Mach** – The timestamp on the packet using the device’s machine time
- **Server Wall** – Wall time for the server
- **Model** – The model of the device (i.e. iPhone 6s)
- **Backfilled?** – Was the packet backfilled? (The packet was not sent once it was completed and it was sent at a later time)
- **Bat. %** – Charge of the battery, given in percentage of the device
- **#Ch** – Number of channels contained in the packet
- **UUID** – UUID of the device
- **App Wall** – Wall time for the app
- **Device Make** – The make/brand of the device
- **Is private?** – Is the data being published as private?
- **Is scrambled?** – Is the audio speech band scrambled?
- **OS Version** – Operating system version on the device
- **App Version** – Version of the app on the device
- **Data URL** – Data server URL
- **Synch URL** – Time synchronization server URL
- **Authentication URL** – The URL that was used to authenticate the device that this packet came from
- **Temperature °C** – Temperature of the device given in degrees Celsius
- **Authentication Token** – The json web token. Scrambled at the server.
- **API** – Application Programming Interface
- **Firebase Token** – Self-explanatory.
- **Metadata** – Extra information given in packet

3. Find the device and click it. A list of sensor channels will appear on the page.

- a. The information given for the sensor channel can be seen below:

- **Channel Type** – Type of channel for the row
- **Sensor Name** – Physical sensor inside of the device
- **Unit** – Units of the reported data for the channel type
- **Sample Rate Hz** – Sample rate (samples/second)
- **Timestamp 1st Sample** – Time of the first sample taken, given in Unix
- **Payload Type** – Type of payload/value of data
- **#Payload** – How many values of data was collected
- **#Timestamps** – Number of timestamps taken

- **Mean Payload** – Mean of the payload values
- **Std Payload** – Standard deviation of the payload values
- **Median Payload** – Median of the payload values
- **Mean Sample Rate** – Mean value of the uneven channels
- **Std Sample Rate** – Standard deviation of the uneven channels
- **Median Sample Rate** – Median value of the uneven channels

Generate a RedVox Report

1. Generating a RedVox report is recommended on a computer. Go to redvox.io > Analysis (drop down) > Generate RedVox Report.
2. It will redirect to the following page with instructions. Follow the instructions and fill out the areas.

Ad-Hoc Report Generation Instructions

1) Select an event origin time (UTC)
2) Select the relative number of minutes before the event origin time
3) Select the relative number of minutes after the event origin time
4) Select the event source origin using predefined values in the dropdown list, or select the location on the map, or enter the lat/ing manually
5) Select the height of the event source origin in meters
6) Click the "Update Stations" button to display stations available during the previously selected time range
7) Select product types that will be produced for this report
8) Select stations for which reports will be generated for (stations listed beside map)
9) Click "Create Report"

Steps 1-3) Event Origin Time (UTC)

10

0

2018-09-26 22:49:13

10

0

Steps 4-6) Event source. Either select from pre-populated list or enter event origin location manually

Select from pre-populated list of event origins

Choose Event Origin Location

or set event origin location manually

19.728373

-156.059216

0

Distance

Update Stations

Step 7) Available report product types

☒ Micropho FFT
☒ Microphone Multires
☒ Barometer Waveform
☒ Barometer Multires
☐ Latency
☒ Latitude Std
☐ Longitude Std
☐ Altitude Std
☐ Accuracy Std
☒ Magnetometer

Generate Report

Download Raw Data

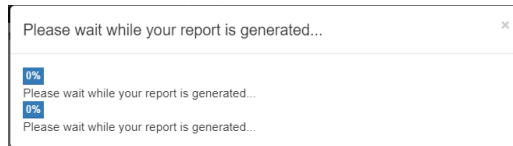
Group Visible Devices

3. After filling out the fields, click on Update Stations then select the device(s) the report would be for.

Step 8) Stations to include

<input type="checkbox"/> Device	Distance	Arrival	Azimuth
<input type="checkbox"/>	29 0km	+0s	187.6°
<input type="checkbox"/>	5 0km	+0s	175.0°
<input type="checkbox"/>	71 0km	+0s	1.7°
<input type="checkbox"/>	96 0km	+0s	17.8°
<input type="checkbox"/>	15 0km	+0s	181.8°
<input type="checkbox"/>	9 0km	+0s	173.5°
<input type="checkbox"/>	2 0km	+0s	342.3°
<input type="checkbox"/>	1 0km	+0s	355.7°
<input type="checkbox"/>	46 0km	+0s	186.9°
<input type="checkbox"/>	98 0km	+0s	173.3°

4. Once all the device(s) have been selected, click on Generate Report. A progress bar will show up on the top of the screen to tell the user how much the report was generated and show which part of the report is being generated. The figure below shows what the progress bar will look like.



5. The report that is generated will look like the one below.

RedVox Report	
Edit Report Metadata Rerun Report Sanitize Report Print View	
Report Id	6420e8cae762478f89cf05ee7942a23e
Created On	Wed Sep 26 23:59:07 UTC 2018
Event Origin Time UTC	2018-09-26T22:49:13Z Seconds from the Epoch UTC: 1538002153
Report Start UTC	2018-09-26T22:39:13Z Seconds from the Epoch UTC: 1538001553
Report End UTC	2018-09-26T22:59:13Z Seconds from the Epoch UTC: 1538002753
Event Origin Location	19.728373, -156.059216
Event Origin Height Meters	0.00 meters
Report Owner	redvox
Only Visible to Owner?	false
Report Publicly Listed?	false
Device	1637 093 Distance to Event Origin Kilometers: 0.02 Back Azimuth to Event Origin: 171.83°
Download Report Data	Download

- a. **Edit Report Metadata** allows the user to edit the metadata associated with the report. The report title, URLs, plot descriptions and titles can be edited with this feature.
- b. The report can be rerun with more devices or different sensor channels or at different times. Click on **Rerun Report**.
- c. **Sanitize Report** removes almost all sensitive information. It removes device IDs, locations, origin locations, and date/time information.
- d. **Print View** turns the page into a printable version without buttons, Redvox.io navigation bar, etc.
- e. **Download**. The user can download the raw data used for the report. Go to Download Report Data > click Download.
- f. To read the data, use the Python SDK or the API900 specifications.
- g. Scrolling down this page will show different plots for the sensor channels that were selected. Similar to the Device > Details, the plots can be saved to the computer or device viewing the page. Right click on the plot > Save image as.

Retrieving Files from Devices

The following sections describes how to access RedVox files from iOS devices.

NEW IN-APP FEATURE: The files in the device can be viewed by navigating to the Playback option in the RedVox app and selecting a file in the Files/RDVX directory. Android and iOS RDVX files can be sent to other users and can be loaded and displayed by other devices running the RedVox app. A fast and secure way to access the RDVX files is connecting the device to the computer and navigating to the Files directory.

NEW FILE DIRECTORY STRUCTURE: In preparation for API 1000 (API M) we use the native Files app available in iOS 11 for ease of access and file sharing. The iOS Files directory should be easy to access from the device as well as a computer.

Installing Python

If you are already using Python 3.6 or higher and a preferred IDE, you do not need this section. If you are new to Python and want to start fresh, we show how to install Anaconda, the required RedVox libraries and Python Software Developer Kit (SDK) for Application Programming Interface (API) 900. Please refer to:

<https://pypi.org/project/redvox/>

<https://redvox.io/downloads>

Installing Python on a Mac

1. Download and install the latest [Anaconda](#) base that matches the computer's operating system (Mac).



2. Open Terminal.
3. Find where Python and iPython is located in the computer's folders and what version of Python is downloaded on the computer. Enter the following commands in the Terminal.

```
which python
which ipython
python --version
```

4. Change the directory to anaconda3.

```
cd Location
ls
cd anaconda3/
ls
```

5. Once the directory is changed to anaconda3, install the following packages: lz4 and protobuf.

```
conda install lz4
conda install protobuf
```

6. Once both packages have been installed, install the RedVox reader.

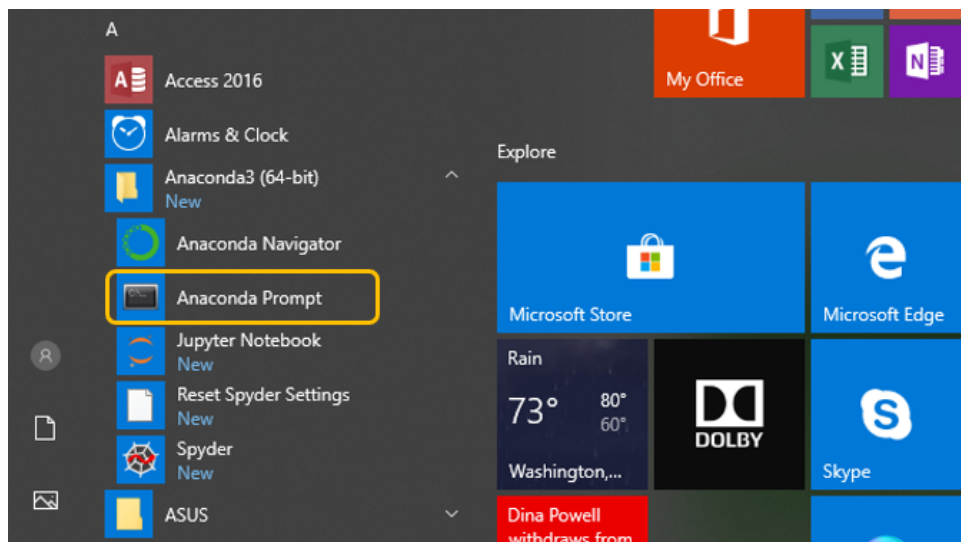
```
pip install redvox
```

Installing Python on Windows

1. Download and install the latest [Anaconda](#) base that matches the computer's operating system (Windows).



2. Open Anaconda Prompt. Go to Windows menu > Anaconda3 > Anaconda Prompt.



3. The “where” command will print the path of the following programs: python and conda. The “version” command will print which version python and conda currently are. This will also verify that these programs have been installed.

```
where python
where conda
python --version
conda -version
```

4. In the Anaconda Prompt, change the directory to the folder Anaconda3/. Command “dir” will list out the different directories, and “cd” will change directory.

```
cd Anaconda3/
```

4. Once the directory is changed to Anaconda3/, install the following packages: lz4 and protobuf.

```
conda install lz4  
conda install protobuf
```

5. Once the two packages have been installed, install the RedVox reader.

```
pip install redvox
```

- a. If necessary, update the reader with the following command:

```
python -m pip install --upgrade pip
```

Opening Jupyter Notebook and Reading RDVX Files

1. Jupyter Notebook is provided with the Anaconda download. Open the Jupyter Notebook by entering the following commands. This command will open the Jupyter Notebook in a web browser.

```
cd Documents/  
jupyter notebook
```

2. Once the Jupyter Notebook is open, use the following code or another code to load RedVox data into the notebook.

```
import os # operating system  
from redvox.api900 import reader # calling the reader from  
Redvox package  
  
path = '/Users/User/folder/api900/2018/10/01/' # location of the  
folder  
files = os.listdir(path) # list the files in the folder  
print(files) # print the list of files in the folder  
  
firstfile = files[0] # assign the first variable name, firstfile  
print(firstfile) # print the file name of the first file  
print(path + firstfile) # print the location of the .rdvx file  
  
readfile = reader.read_file(path + firstfile) # assign file path  
to readfile  
  
packet = reader.wrap(readfile) # filter the data in the .rdvx  
file  
print(packet) # print metadata
```