Qualcomm Technologies, Inc.

Qualcomm Aware™ Positioning Services SkyLogger XYZ

User Guide

80-42222-1 Rev. AC

August 14, 2024

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Revision history

Revision	Date	Description
AC	August 2024	Updated the product name from Qualcomm Terrestrial Positioning Service (TPS) to Qualcomm Aware Positioning Service in the entire document.
AB	October 2023	Updated the document to conform to current documentation standards. No technical content was changed in this revision.
AA	June 2022	Initial release

Contents

1 SkyLogger application overview

The Qualcomm Aware™ positioning service SkyLogger application is designed to allow users to map an indoor location and help to improve the quality and accuracy of location returned by the Qualcomm Aware positioning service API.

The SkyLogger application collects and logs the field test data to replay and analyze the performance and accuracy of the Qualcomm hybrid positioning system. To achieve this, the application leverages the Qualcomm Aware precision location SDK for Android.

Scope

This document is intended for users to submit ground-truth locations with accurate Wi-Fi, cell data, and Bluetooth data to Qualcomm Aware positioning servers.

Technical assistance

For assistance or clarification on information in this document, write to support.tps@qti.qualcomm.com.

2 Installation of SkyLogger application

The SkyLogger application is installed through push-to-device method with the ADB command or the APK file that is downloaded in the device.

NOTE To get access to the APK file, contact Qualcomm Technologies, Inc. (QTI) point of contact.

2.1 Supported Android versions

The SkyLogger application runs on devices with Android versions 8 and later.

- Android version 10 and later: If the user is testing with Android 10 and later versions, do the following settings in the device:
  a. In **Settings**, select **About device** > **Version** > **Build number**.
  b. To enable **Developer** options, tap **Build number** option seven times until `You are now a developer!` message appears.
  c. In **Developer options**, disable **Wi-Fi scan throttling**.
  d. In **Settings**, select **Location** > **Location Services**, and select **Enable Wi-Fi scanning**.

  For more information on configuring developer options in an Android device, go to https://developer.android.com/studio/debug/dev-options
- Android version 9 and later: SkyLogger application runs on Android 9 and later versions but at a lower scan rate due to the operating system throttle for on-demand Wi-Fi scanning functionality.

  If the throttle for on-demand Wi-Fi scanning is not disabled, Qualcomm recommends NOT to run the SkyLogger application.
- Android version 8 and later: SkyLogger application is tested in Android 8.1 and later versions.

2.2 Configure the test device

The SkyLogger application collects the ground-truth locations with accurate Wi-Fi, cellular data, and Bluetooth data and uploads to positioning servers.

Before installing the SkyLogger application, the test device must be configured.

2.2.1 Device requirements

The SkyLogger application works on any device with Android version 8 and later. However, QTI recommends using the application in Android versions 10 and later.

2.2.2 Device configuration

The test device must be configured before installing the SkyLogger application.

To configure the test device, do the following settings in the device:

1. (Mandatory) In **Settings**, do the following settings:
   a. Disable **Wi-Fi** to enable maximize the number of the Wi-Fi scans that the SkyLogger application collects without throttled by the device.

      For devices with Android version 10 and later, disable **Wi-Fi scan throttling**. See Supported Android versions for more information.

   b. Enable **Location**

   c. Turn off **Power Optimization**, **Applications** > **Application management** > **Battery usage** > **SkyLogger** > **Don't optimize**
2. (Optional) Increase screen timeout, in **Settings** > **Display** > **Screen timeout** > **30 minutes**
3. (Optional) Disable **OEM-specific power-saving functionality**.

2.2.3 Activation code

QTI provides an activation code to enable the SkyLogger application in the test device.

To get activation code, contact the Qualcomm Aware positioning service support team at support.tps@qti.Qualcomm.com.

2.3 Install SkyLogger application

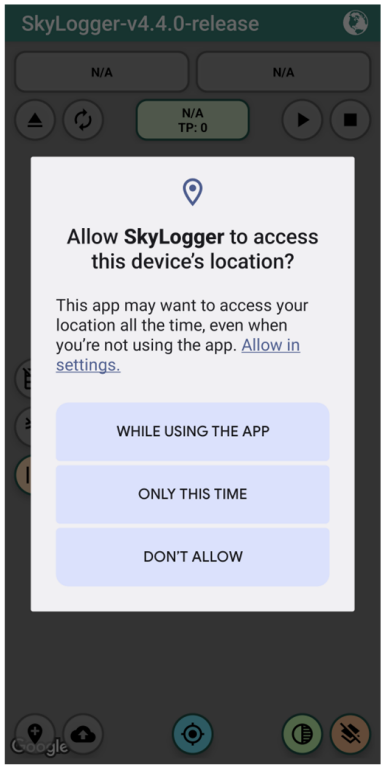
Prerequisites:

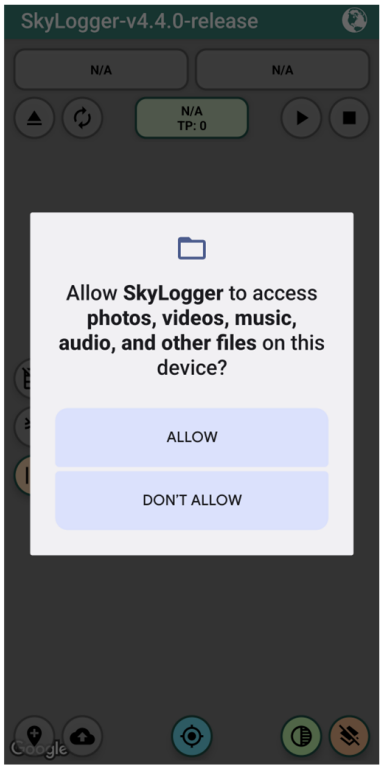
Connect the device to the Internet to verify the activation code.

To install the SkyLogger application, do the following:

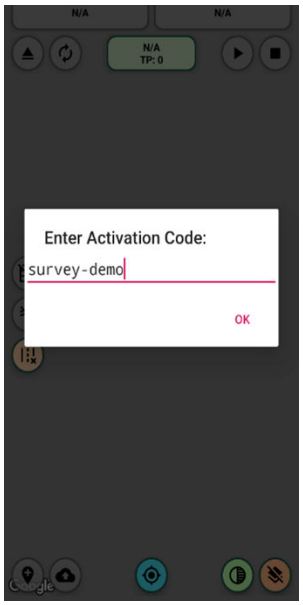
1. Using the ADB command or the APK file, install the SkyLogger application in the device.
2. Allow the following permissions on the device:
   a. To allow device to access location, tap **Location** > **Allow in settings** > **Allow all the time**.

   b. To store and access device storage, tap **Photos, media, and files** > **Allow**.





3. Enter `Activation code` to verify the test device.



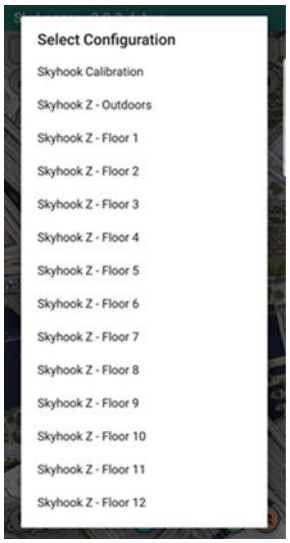
NOTE To get an activation code, share venue address and floor plan (if available) with QTI point of contact.

After successful verification of the activation code, the device is ready to perform the field tests.

2.3.1 Select configuration

To configure the SkyLogger application, do the following:

1. On the top-right corner of the application, tap **Select Configuration**
2. Choose the appropriate floor from the drop-down menu.



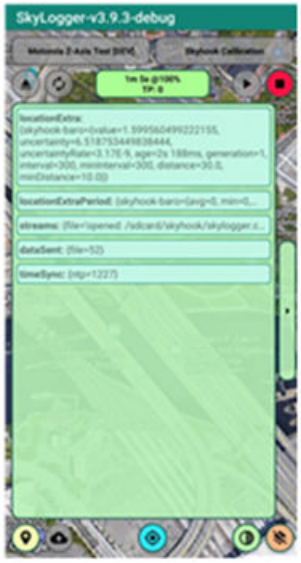
3. To change a floor after a test session, tap **Select Configuration** and choose the appropriate floor.

2.3.2 Debug window

Before field testing, the test device barometric sensor has to be calibrated to provide accurate Z location estimation. The calibration occurs in the background actively by collecting GNSS and pressure data. Depending on GNSS availability, quality, and device mobility, the calibration may take between two hours to a few days.

Qualcomm Aware positioning service support team coordinates the threshold value for bias uncertainty that must be observed before field test depending on the test scenario. The calibration

uncertainty value can be observed in the debug window during a calibration session in the `locationExtra` field.



NOTE For accurate test results, the uncertainty value must be in between 0.001 to 0.01.

3 SkyLogger application field test

The SkyLogger application must have access to device location and storage permissions.

Before performing the field test, configure the device and verify the activation code.

3.1 Best practices

Consider the following key points to have efficient and accurate test results while recording the sessions:

- Walk in straight-line segments at a slow and steady pace for walking surveys.
- The user must record the survey with the device in hand and line of sight (LoS) to the beacon.
- Do not survey with the device in backpack, pocket, and so on.
- If possible, survey each line segment from both directions.
- Survey the perimeter of all rooms and the middle of large open areas.
- If surveying an environment with many outside ambient beacon signals within the venue, it is recommended to use beacon whitelist/blacklist features.
- If whitelist/blacklist features are not used in the survey, a negative survey is valuable outside the perimeter of the venue.

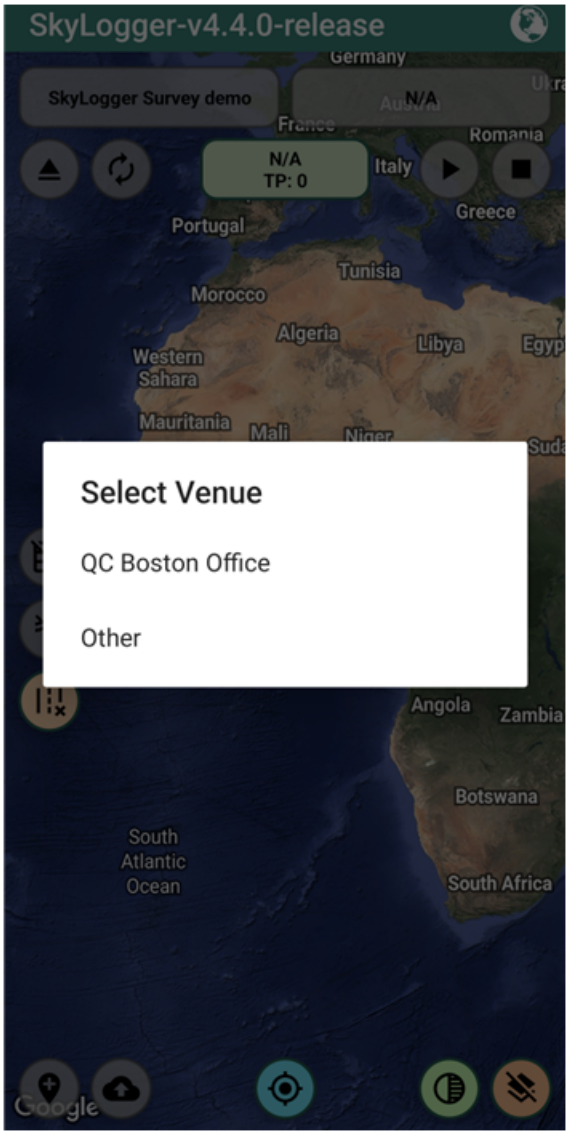
3.2 Record a session

The SkyLogger application allows the user to map the location and record the logs.

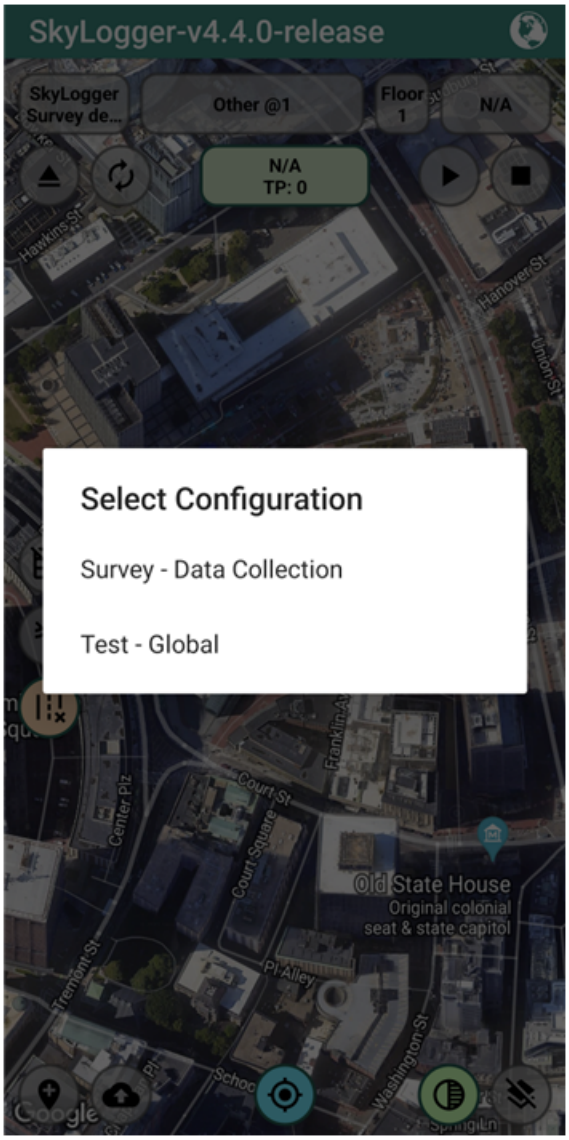
3.2.1 Configure the SkyLogger application

To configure the Skylogger application to collect logs, do the following:

1. In the test device, open **SkyLogger** application.
2. In **Select Venue**, select the venue from the drop-down.



3. In **Select Configuration**, select **Survey - Data Collection** or **Test - Global** (as applicable).



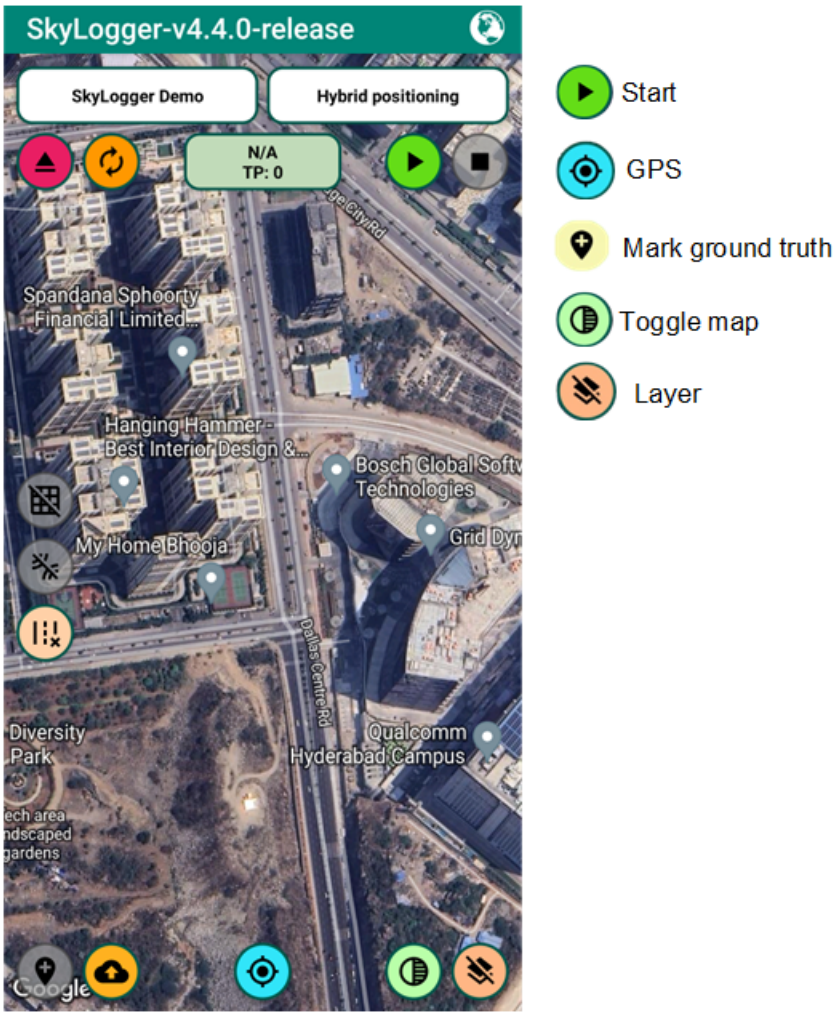
The device is now configured to perform the field tests.

3.3 Mark ground truth

Marking ground truth sets the current location to record the session.

To mark the ground truth, do the following:

1. In the test device, open **SkyLogger** application.
2. At the top-left corner of the screen, tap **Start**.



3. At bottom of the screen, tap **GPS** to center the map to current location.
4. (Optional) Tap **Toggle map** to switch between roadmap view and satellite view.
5. (Optional) Tap **Layer** to toggle indoor map.
6. Tap **Mark ground truth** to set the location.
7. Adjust **Yellow cross hair** to mark ground truth for precise location.

8. Tap **Thumb up** to confirm the position.

After marking the ground truth to the intended location, the `ready to start record` message appears at the bottom of the application to record stationary survey or walking survey.

3.4 Perform stationary survey

A stationary survey collects the location details of a fixed indoor location.

Prerequisites:

Before starting a stationary survey, mark the ground truth and confirm the location.

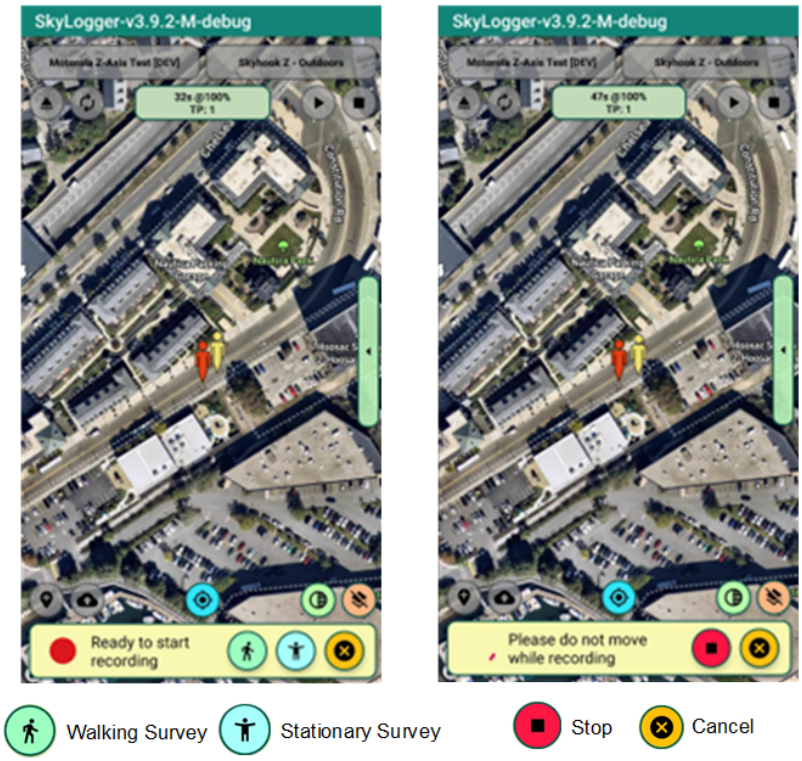
To start a stationary survey, do the following:

NOTE Do not move the device while performing the stationary survey.

1. At the bottom of the screen, tap **Stationary survey** to start recording the stationary test.
2. After 60 seconds, tap **Stop** at the top-right corner of the screen to stop the session.
3. Move the device to a different location.

4. Repeat the steps from Mark ground truth to record a session.

NOTE While performing the stationary survey test, do not move the device.



After recoding the session, the `Process results?` message appears at the bottom of the screen to upload, archive, or delete the recorded logs.

3.5 Perform walking survey

Walking survey collects the location details of the different locations while walking steadily in a straight path.

Prerequisites:

Before starting a walking survey, mark the ground truth and confirm the location.

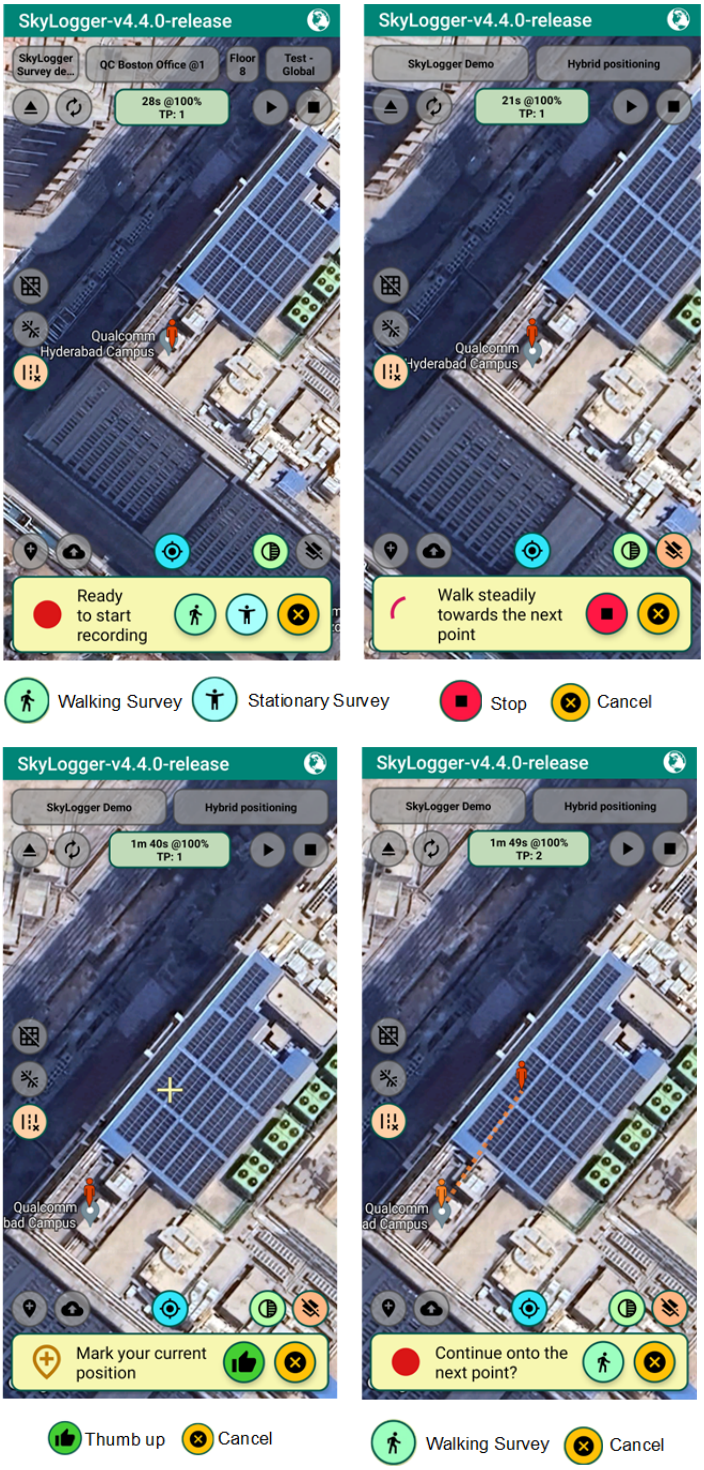
To start a walking survey, do the following:

1. At the bottom of the screen, tap **Walking survey** to start recording the session.
2. Walk steadily towards the next point in a straight path.
3. Tap **Mark ground truth** to mark the point.

   The `Continue onto the next point?` message appears at the bottom of the application.
4. Tap **Walking survey** to continue onto the next point.

   The `Walk steadily towards the next point` message appears at the bottom of the application.
5. Repeat the steps from Mark ground truth to record session for different locations.

6. At the top-right corner of the screen, tap **Stop** to stop the recoding the session.



After recoding the session, the `Process results?` message appears at the bottom of the screen to upload, archive, or delete the recorded logs.

3.6 Process results

In the **Process Results** tab, session logs can be uploaded, archived, or deleted.

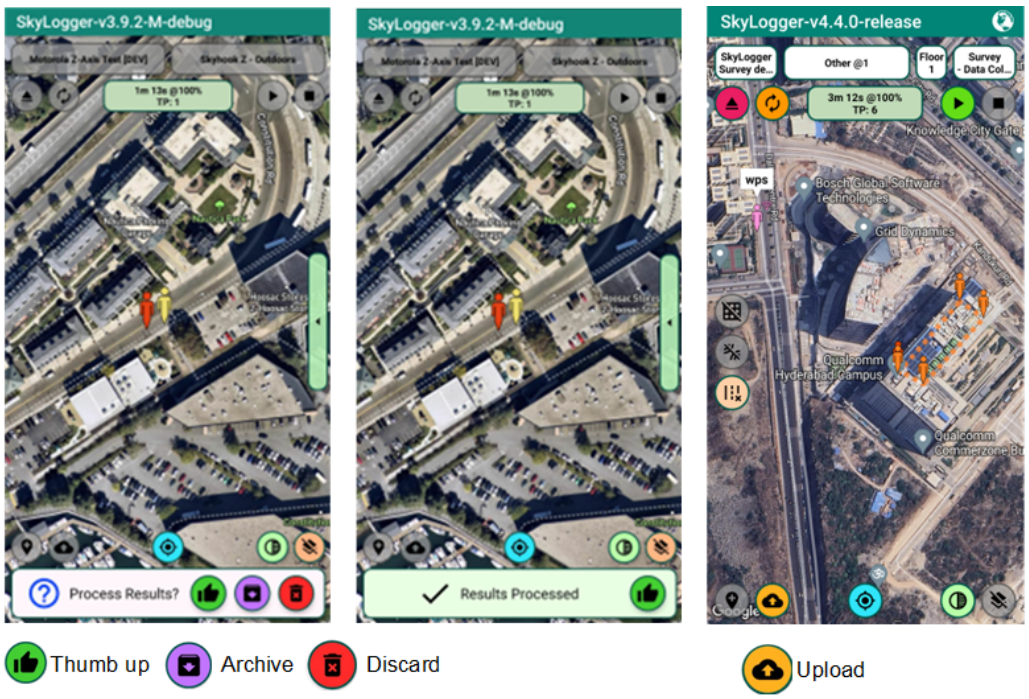
Prerequisites:

Record a session before processing results.

To process the results, do the following:

- To upload logs to the server, tap **Thumb up**.

- If the device is not connect to the Internet while processing the logs, archive the logs in the device:
  a. Tap **Archive** to save the log file on the device.
  b. Tap **Upload** to upload log file to the server when the device is connected to the Internet.

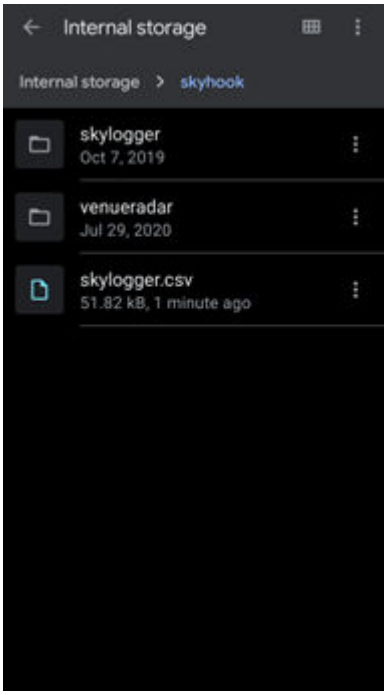


- Tap **Discard** to delete the session.

3.7 Access log file

The SkyLogger application sends the log file automatically to Skyhook for automated accuracy analysis for each test session. The visualization and CDF analysis for the test sessions are provided on request.

The logs are available locally in the device SD card (`/sdcard/skyhook/skylogger.csv`) as .csv file for local analysis or extraction.



The scan creates a csv file named in the following format:

`Timestamp | config | Source | Latitude | Longitude | HPE | altitude | vpe | agl | agle`

The log files in the device are accessed by using the file manager application or adb command:

```
adb pull /sdcard/skylogger/skylogger_output.csv
```

Example log

```
1619469025620,outdoor,skyhook-baro_start,,,,,,,
1619469035192,outdoor,skyhook-
baro,42.3196860,-71.0511790,7,-12.3,36.1,14.5,36.1
1619469043201,outdoor,skyhook-
baro,42.3197200,-71.0512540,5,-12.1,36.1,14.6,36.1
1619469055110,outdoor,skyhook-
baro,42.3197230,-71.0512540,4,-12.3,36.1,14.4,36.1
1619469068230,outdoor,skyhook-baro_stop,,,,,,,
1619469070317,floor1,skyhook-baro_start,,,,,,,
1619469080508,floor1,skyhook-
baro,42.3197210,-71.0512550,4,-12.7,36.1,14.0,36.1
```

```
1619469088280,floor1,skyhook-
baro,42.3197210,-71.0512560,4,-12.8,36.1,13.9,36.1
1619469100667,floor1,skyhook-
baro,42.3197210,-71.0512560,4,-12.7,36.1,13.9,36.1
1619469112673,floor1,skyhook-
baro,42.3197200,-71.0512560,4,-13.1,36.1,13.5,36.1
1619469120588,floor1,skyhook-
baro,42.3197200,-71.0512570,4,-13.2,36.1,13.4,36.1
1619469132551,floor1,skyhook-
baro,42.3197200,-71.0512580,4,-12.2,36.1,14.5,36.1
1619469279420,floor1,skyhook-baro_stop,,,,,,,
1619469286870,floor5,skyhook-baro_start,,,,,,,
1619469297019,floor5,skyhook-
baro,42.3197260,-71.0512650,4,-13.8,36.1,12.9,36.1
1619469304592,floor5,skyhook-baro_stop,,,,,,,
1619469307501,floor10,skyhook-baro_start,,,,,,,
1619469317423,floor10,skyhook-
baro,42.3197250,-71.0512670,4,-14.0,36.1,12.8,36.1
1619469328545,floor10,skyhook-baro_stop,,,,,,,
```

Command	Description
`skyhook-baro`	Enables Qualcomm Aware positioning service with polaris pressure-based Z provider
`skyhook-baro_start`	Location provider (Skyhook XPS + Z) starts tracking location
`skyhook-baro_stop`	Location provider (Skyhook XPS + Z) stops tracking location
`user_start`	Marks the initial location (when the user starts a stationary recording or walking test)
`user_stop`	Stops recording the session

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