



BatteryXPRT *for Android*

BatteryXPRT for Android

2014

User manual

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Introduction

The purpose of the BatteryXPRT for Android benchmark is to reliably evaluate the battery life of Android devices. The benchmark provides an intuitive user interface and easy-to-understand results.

About the benchmark

The BatteryXPRT for Android workload is based on the tests included in MobileXPRT 2013. In addition, the workload also contains activities which are not part of MobileXPRT, and some of the tests have been altered to make them better suited to a battery-life test.

BatteryXPRT for Android can run in one of three modes. It can represent a device in airplane mode, a device connected to the internet via Wi-Fi, or a device connected to the internet through a cellular data connection. The Wi-Fi and Cellular modes are represented together on the benchmark's home page by the Wi-Fi/Cellular button. If a user wishes to estimate battery life while connected to the internet, they simply need to select the Wi-Fi/Cellular button, and BatteryXPRT will use Wi-Fi or Cellular mode based on the current device settings. There is not an option to change the device connection settings from within the BatteryXPRT UI.

Note: For readability, we will refer to the mode where you select Wi-Fi/Cellular mode using a Wi-Fi connection as “Wi-Fi,” and using a cellular connection as “Cellular.”

- **Airplane mode.** Airplane mode requires the user to turn on airplane mode in the device settings menu. During the web browsing and video playback portions of the benchmark, the benchmark accesses locally stored content included during the initial installation.
- **Wi-Fi mode.** Wi-Fi mode requires the device to be connected to the internet via a Wi-Fi connection. In Wi-Fi mode, the benchmark accesses an externally-hosted web site to obtain content for the web browsing and video playback tests. In addition, continuous background activity during the run simulates the power draw required by common data sync tasks for email clients and resident applications.
- **Cellular mode.** Cellular mode requires the device to be connected to the internet via a cellular data connection. In Cellular mode, the benchmark accesses an externally-hosted web site to obtain content for the web browsing and video playback tests. In addition, continuous background activity during the run simulates the power draw required by common data sync tasks for email clients and resident applications.

In all three modes, the benchmark will, by default, run a 45-minute workload 60 times, or until the battery is exhausted, and estimate the battery life. BatteryXPRT also allows the user to decrease the number of times it runs the workload, but the benchmark will flag the results with a qualifier that recommends performing a full rundown.

The detailed results information for the run includes elapsed time so that testers can compare the estimated battery life to the actual elapsed time if they desire.

Figure 1 compares workloads across the two modes. For readability, Figure 1 does not show simulated sync activity.

	Wi-Fi/Cellular mode sub-test	Airplane mode sub-test
List Scroll	Scroll a list for 1 minute.	
Video Playback	Stream a 2-minute 720p H.264 video clip from the internet.	Play a 2-minute 1,080p H.264 video clip from local storage.
Stand by	Device goes to standby for 1 minute.	
Zoom and Pinch	Zoom and pinch an image for 40 seconds.	
Apply Photo Effects	Apply four different photo effects to twenty 8MP photos and save them to JPEG/WebP format.	
Stand by	Device goes to standby for 1 minute.	
Gallery Scroll	Swipe through a photo gallery for 90 seconds.	
Stand by	Device goes to standby for 1 minute.	
Detect Faces	Organize a photo album based on whether it has faces or not.	
Audio	Play an audio clip for 3 minutes.	
Browser Scroll	Browse web pages from a remote location for 2 minutes.	Browse local (cached) web pages for 2 minutes.
Video Playback	Stream a 2-minute 720p H.264 video clip from the Internet.	Play a 2-minute 1,080p H.264 video clip from local storage.
Create Photo Collages	Create five photo collages from twenty 8MP photos.	
Stand by	Device goes to standby for 1 minute.	
Encrypt Personal Content	Encrypt and decrypt photos, video, and an audio clip, which takes 2 to 3 minutes.	
Audio	Play an audio clip for 3 minutes.	
Create Slideshow	Create a video slideshow (720p; H.264; 20 seconds) using 20 images with different transitions and effects.	

Stand by	Device goes to standby for 1 minute.
Grid Scroll	Scroll the list of apps on the device for 90 seconds.
Stand by	Device goes to standby for the rest of the 45-minute cycle.

Figure 1: Comparison of the Wi-Fi/Cellular modes and Airplane mode.

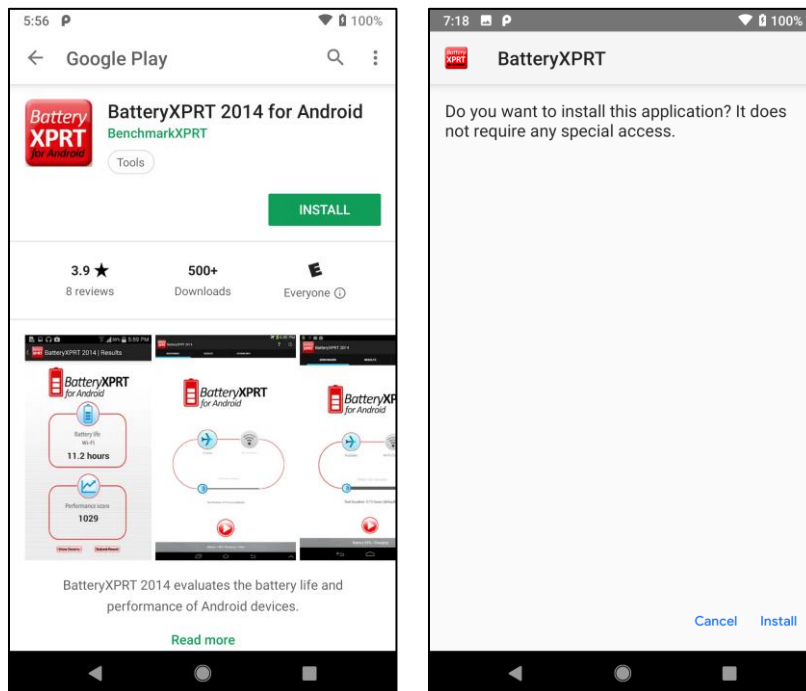
After completing a test run, the benchmark displays a results page. The results details include estimated battery life with a 95 percent confidence interval and the performance score. For details about how the results are calculated, see the [BatteryXPRT for Android design document](#).

Installing the benchmark

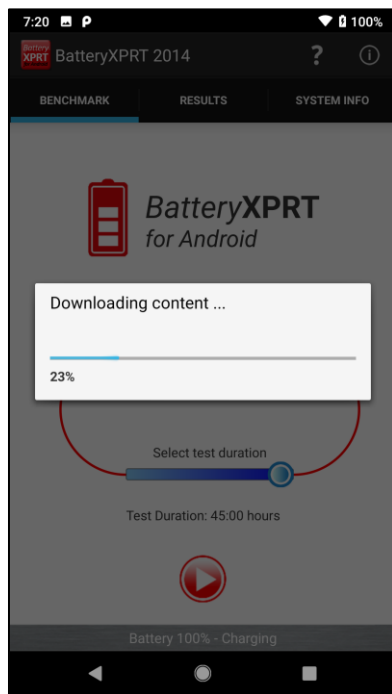
There are three ways to install the benchmark. BatteryXPRT can be installed from the Google Play Store or sideloaded by using a combined installer package or the individual APKs at [BatteryXPRT.com](#). The installer from BatteryXPRT.com bundles the required content inside the installer. Below are steps for each method of installation.

Installing the benchmark from the Google Play Store

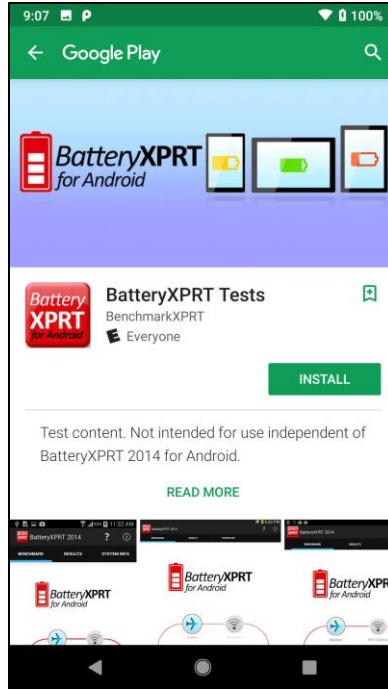
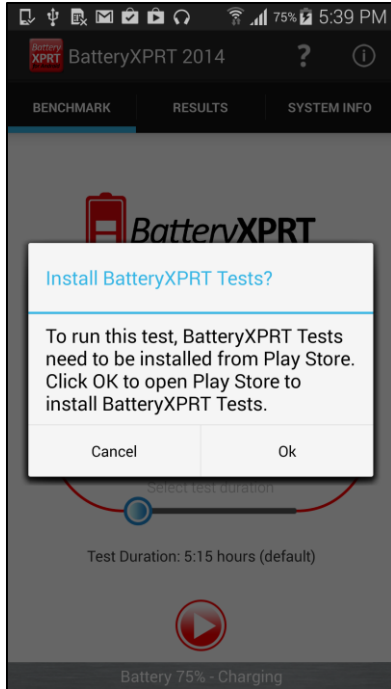
1. Search for BatteryXPRT on the Google Play Store. You will see results for “BatteryXPRT 2014 for Android” and “BatteryXPRT Tests.” Select BatteryXPRT 2014 for Android.
2. Once you have located the app listing, tap the install button.



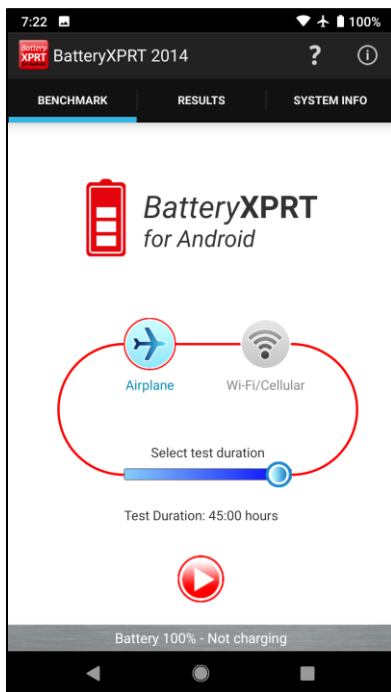
3. When asked if you want to install this application, select Install.
4. Once the “App installed” screen appears, select Open.
5. On the “BatteryXPRT needs permission” screen, select OK to grant BatteryXPRT permission to adjust the Screen Timeout setting.
6. On the “Modify system settings” screen, tap the toggle switch to allow BatteryXPRT to modify system settings. Tap the back button to return to the BatteryXPRT installation process. Depending on the device, you may need to close the windows and navigate to the device home screen to find the BatteryXPRT app icon. If so, tap the icon to restart the installation process. At the app access screen, tap Allow.
7. BatteryXPRT will initiate a content download. The download process may take a few minutes.



8. Once the content is downloaded, BatteryXPRT will prompt the user to install “BatteryXPRT Tests” from the Play Store. Select OK, and the BatteryXPRT Tests app page will open in the Google Play Store.
9. Tap Install to install BatteryXPRT Tests. At the app access screen, tap accept.
10. Once the BatteryXPRT Tests app is installed, close the Google Play Store app.

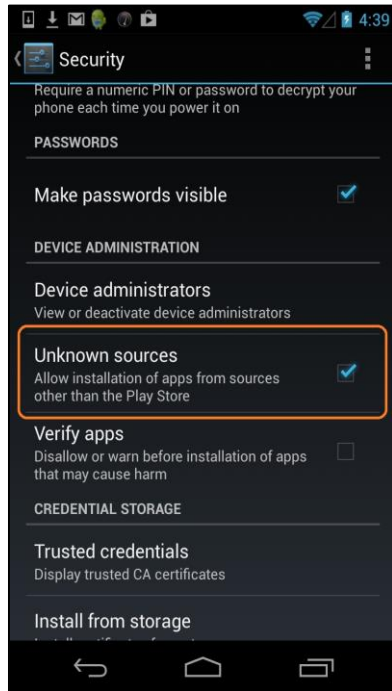


11. Once the content download finishes, BatteryXPRT 2014 for Android installation is complete.



Installing the benchmark from the BatteryXPRT.com installer

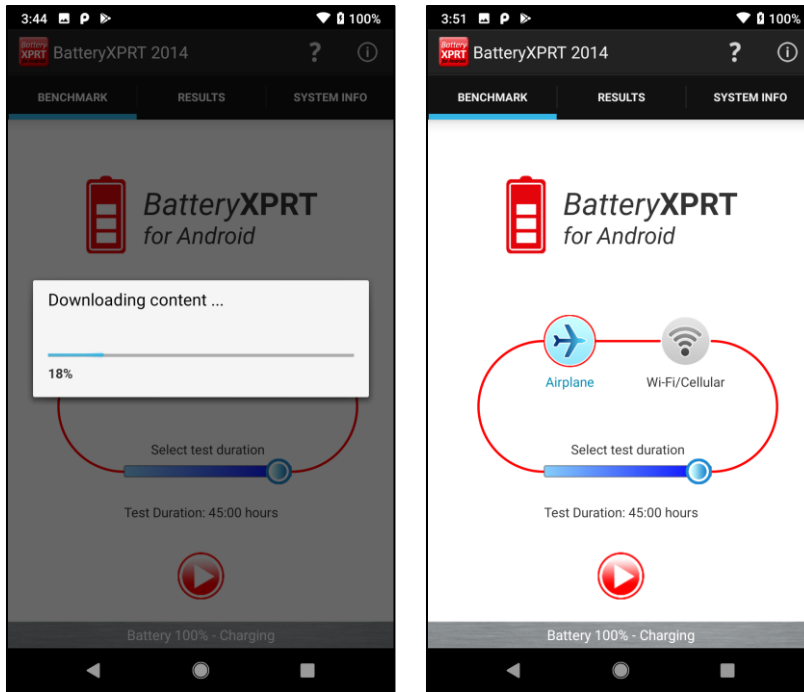
1. Configure the test device to allow installation of apps from local storage. For devices running Android 7.0 Nougat and older, this setting is found in Settings | Security. For devices running Android 8.0 Oreo and newer, this setting is found in Apps & notifications | Special app access | Install unknown apps.



2. Download the full BatteryXPRT installer from the “Or download it here” link on BatteryXPRT.com.
3. Copy the installer APK file to Android/data on the Android device.
4. On the Android device, tap the APK file to launch the installer. Note: If the test device does not have a default file explorer, you may need to install a file explorer application.
5. A screen will ask if you want to install the application. Select Install to start installing the BatteryXPRT Installer.
6. After the installation completes, click Open to start the installation of required components.
7. A screen will say that BatteryXPRT needs permission to change the Screen Timeout system settings. Select OK.
8. On the “Modify system settings” screen, tap the toggle switch to allow BatteryXPRT to modify system settings. Tap the back button to return to the BatteryXPRT installation

process. Depending on the device, you may need to navigate to the device home screen to find the BatteryXPRT icon. If so, tap the icon to restart the installation process.

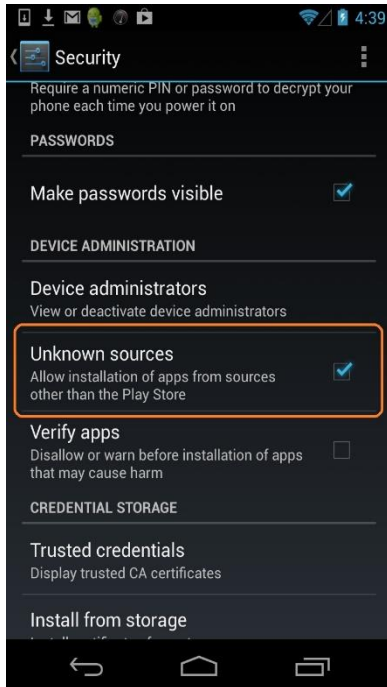
9. Select Allow to allow BatteryXPRT to access media storage on your device.
10. The screen will show a “Downloading content...” notice during the installation. The download process may take a few minutes.



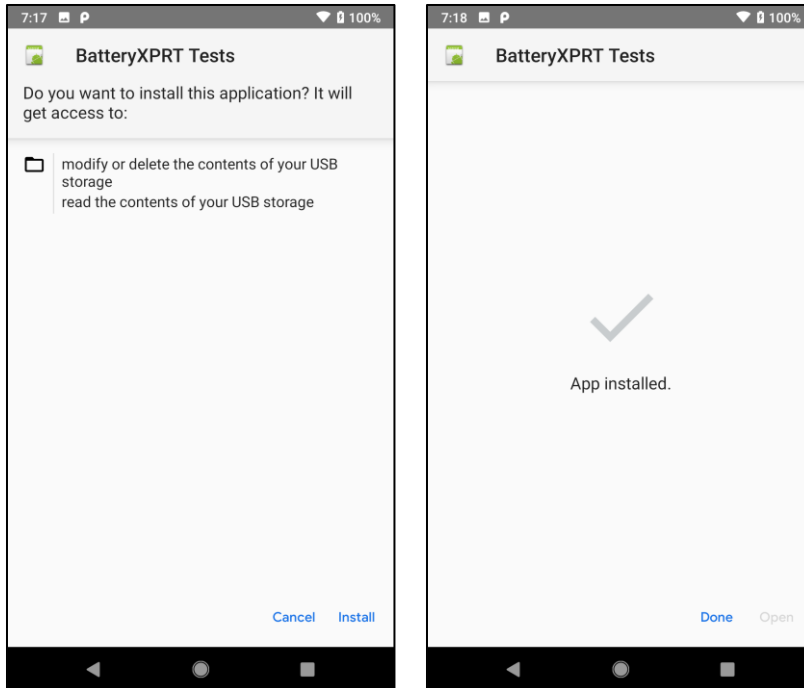
11. Once the download process is complete, the installation process has finished.

Installing the benchmark from APKs published at BatteryXPRT.com

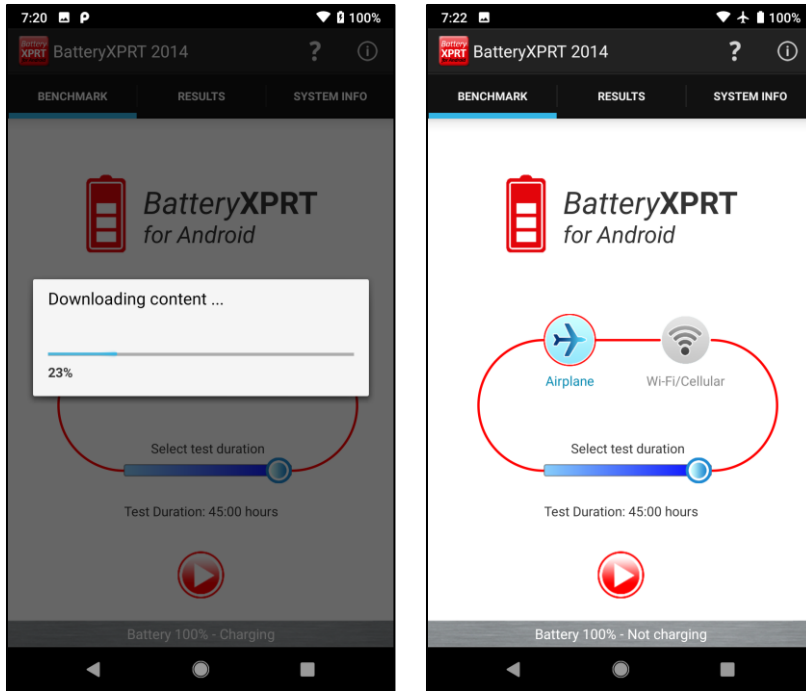
1. Before installation, you may need to configure the test device to allow installation of apps from local storage. For devices running Android 7.0 Nougat and older, this setting is found in Settings | Security. For devices running Android 8.0 Oreo and newer, this setting is found in Apps & notifications | Special app access | Install unknown apps.



2. Download the BatteryXPRT and BatteryXPRTTests APKs from BatteryXPRT.com. The download links are directly below the Google Play Store icon in the middle of the page.
3. Copy both APK files to Android/data on your device. Note: If the test device does not have a default file explorer, you may need to install a file explorer application.
4. Click on the BatteryXPRTTests.APK file to launch the installer. Note: It's important to install the BatteryXPRTTests APK before the BatteryXPRT APK. This prevents the benchmark from attempting to download the BatteryXPRTTests APK online.
5. When asked if you want to install this application, select Install.
6. Once the "App installed" screen appears, select Done.



7. Click on the BatteryXPRT.APK file to launch the installer.
8. When asked if you want to install this application, select Install.
9. Once the “App installed” screen appears, select Open.
10. On the “BatteryXPRT needs permission” screen, select OK to grant BatteryXPRT permission to adjust the Screen Timeout setting.
11. On the “Modify system settings” screen, tap the toggle switch to allow BatteryXPRT to modify system settings. Tap the back button to return to the BatteryXPRT installation process. Depending on the device, you may need to close the windows and navigate to the device home screen to find the BatteryXPRT app icon. If so, tap the icon to restart the installation process.
12. At the app access screen, tap Allow.
13. BatteryXPRT will initiate a content download. The download process may take a few minutes.



14. Once the content download finishes, BatteryXPRT 2014 for Android installation is complete.

Configuring the test device

The following test device configuration steps are recommended for reliable results using BatteryXPRT:

- Set the display brightness to 200 nits.
- Connect a set of ear-fitting headphones (with sensitivity of ~100 dB/1mW) to the audio port and set the noise level to 75 dB.
- Charge the battery of the device to 100 percent.
- Go to Settings | Display | Daydream, and turn Daydream OFF (Android 4.4 KITKAT only).
- Make sure any system or app update messages are addressed or dismissed completely (update notices may interrupt the benchmark run).
- Turn off any “Always on” display features.
- Make sure to close all running apps. To do this, click on the recent apps menu item and remove all apps from the list.
- Disconnect the device power adapter.
- Set the proper connectivity configuration:
 - Wi-Fi/Cellular mode
 - Turn on Wi-Fi or Cellular connection.

- If using Wi-Fi:
 - Connect to a wireless access point.
 - Make sure the Wi-Fi signal strength is around -45 dBm.
 - Make sure the device is a minimum of 5 ft. from the router.
- Disable Bluetooth and NFC connectivity.
- Test the connection by connecting to a known Web site using an Internet browser.
- Airplane mode
 - Turn on Airplane mode.
 - Disable Bluetooth, Wi-Fi, and NFC.

If testing a Lenovo K900 with an Atom Z2580 processor

On this device, BatteryXPRT does not exit standby mode, and test runs will not complete successfully. To fix this issue, adjust the following settings to allow the device to exit standby when necessary:

1. Go to Settings | Feature Settings.
2. Select the System wake-up control option.
3. Choose the BatteryXPRT and BatteryXPRT Tests apps.

Testing instructions

Before starting the test, please make sure the device is prepared according to the steps listed in the Test Device Configuration section. These steps are necessary to produce reliable numbers comparable to results from other devices.

After launching the BatteryXPRT app, perform the following steps:

1. Select Airplane mode or Wi-Fi/Cellular mode, according to the test you wish to run.
2. Disconnect the device from its power adapter.
3. Verify that the current battery capacity is at least 95 percent.
4. Click the red Start button to begin the test. After a successful run, the test displays a results screen.

Running with fewer than 45 iterations

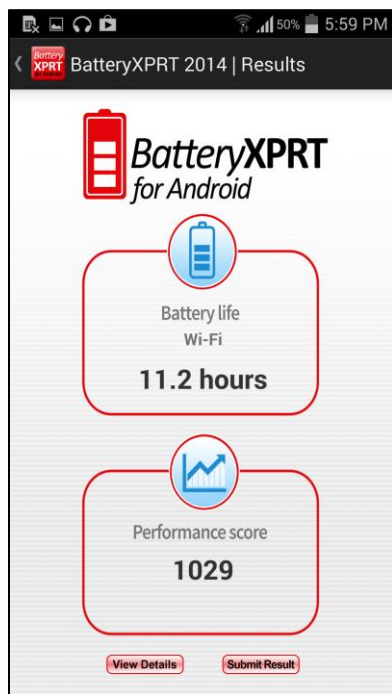
BatteryXPRT for Android provides the ability to run the test for less than the default 45 iterations. Using this approach, a user can choose to set the test duration to a time less than the expected battery life for the device.

To run the test longer than the default 45 iterations, use the slide bar to set the intended duration of the run. When set to a less-than-default duration, the benchmark will run the test until the desired duration.

Based on our testing, we consider full rundown tests to be the most accurate. For shorter tests, BatteryXPRT will flag the results with a qualifier that recommends performing a full rundown.

Results

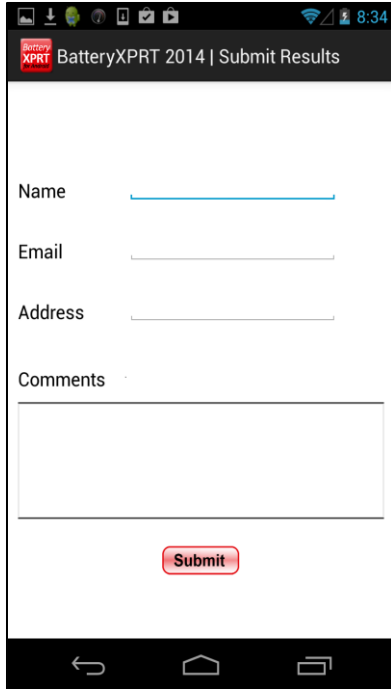
At the end of a successful test, results are automatically displayed. The results show the performance-qualified battery life.



Results for all successful previous tests are archived on the test device, and can be accessed by clicking the Results tab on the main screen.

Submitting results

BatteryXPRT 2014 for Android allows you to submit results to Principled Technologies. Simply click the Submit Result button on the result screen. Fill in a contact name and e-mail address. The address and comment fields are optional. Then, all you have to do is click submit.



Important note: Never compare results from one mode to results from a different mode. Your device will use different amounts of power depending on whether it is accessing the Internet, and whether the Wi-Fi is enabled.

Uninstall

BatteryXPRT can be uninstalled from the device app drawer or Application Manager, depending on the version of Android on the device. The BatteryXPRT Tests component must be uninstalled separately from the BatteryXPRT app.

OS versions

BatteryXPRT is designed to run on devices with Android 4.2 and above.