

Battery Basics

Introduction

This document will cover battery information, power management features, and how to troubleshoot power on and battery issues.

Battery Basics

The **EnSURE Touch™** battery is a Lithium Polymer cells with PCM Protection module, communication interface for fuel gauge, and external plastic case.

3.7V 2900



Temperature - Ambient

- Charge 0 deg C to 45 deg C
- Discharge -20 deg C to 60 deg C
- Storage -5 deg C to 35 deg C

Charge Cycles

800-1000 cycles @80% (still researching and testing)

This means you can charge the instrument each night for 800 nights before

seeing degradation.

Usage

- Always power the instrument off before removing the battery.
- Give the instrument 30 seconds to completely power down before removing the battery.
- If the instrument is not plugged into power, removing the battery removes power, and the instrument will shutoff abnormally.
- Abnormal power off is not desired and could lead to power on issues.
- Do not remove the battery when plugged into USB power.
- Do not expose the battery to extreme temperatures.
- Do not over tighten the battery. The screw should be tightened lightly until it is secure, and the battery does not move.

Power On/Off Basics

The power button has some basic behavior:

Current Instrument State	Power Button	Behavior
Powered Off	Press and Release	Power the instrument on
Powered Off	Press and hold for 12 seconds	Reset and power on the instrument
Display On	Press and Release	Turn off the display and invoke sleep
Sleep mode	Press and Release	Wake instrument up in 1 to 3 seconds depending on sleep state.
Display On	Press and hold for 12 seconds	Force power off (not desirable)
Sleep mode	Press and hold for 12 seconds	Force power off (not desirable)

Power Management Basics




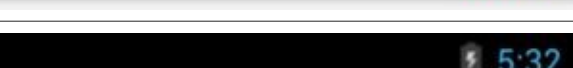

The **EnSURE Touch™** is designed to run off the USB power or the battery if properly charged. You can run the instrument without the battery and just use the USB adapter and USB cable. There is no need to charge the battery to address power on issues. All operations that consume power should work including display, WiFi, USB communication, light detection, EnSURE Touch Setup and install, Sync, etc. using the USB cable and the power adapter. In fact, we test the EnSURE Touch many times without the battery and just using the USB power.

The EnSURE Touch battery is a lithium ION battery. Lithium ION batteries has a

limited number of charge and discharge cycles, that define the battery life. Lithium ION batterie's ability to hold a full change degrades over time until the battery can only hold 10% or less of its original capacity.

Android Battery Information

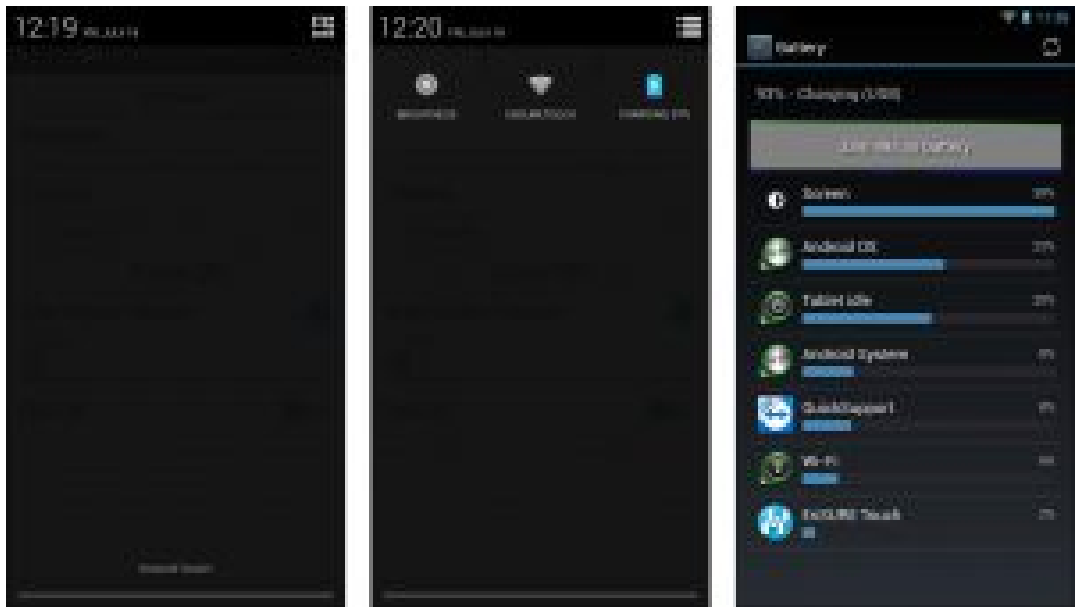
The battery status is visible in the notification area in the upper right corner of the screen as a battery icon. The following are the different battery icon states.

Battery is low Battery is not charging	
Battery has power Battery is not charging	
Battery has power Battery is charging	
Battery is empty Battery is charging	
Battery is critically low < 4% Battery is missing Battery is not charging	

You can access the Battery information from the notification area by swiping down from the top of the screen, selecting the Quick user option in the right corner of the notification area, and then pressing the charge icon. Or from the settings menu under Settings/General/Battery Status.

The Battery activity will show the amount of time the instrument has been on battery and the usage of the battery by area/application. The amount of time the instrument is on battery is critical to the accuracy of the numbers. The numbers will be different based on usage, but typically the Screen is the largest consumer of power. Also, you may see other activities based on usage, but the list below are the most common components.

When Charging the battery, usage statics are not accurate, but once on battery they will start to reflect usage.



Category	Description
Screen	Power used by the display. The brighter the screen the more battery is used. This is typically the largest consumer of power.
Android OS	Android features and functions. This includes all the Android features used by the EnSURE Touch and other applications, and the power used by the EnSURE Touch sensors. Such as light detection, lid, device detection, temperature sensor, accelerometer, etc.
Tablet idle	The power used the by the instrument when the display is off, and the instrument is power conservation mode (sleeping). This is typically a small percentage, however, if left in the sleep state for an extend period it can be much larger. Use the Power Off setting to power down the instrument if not used for an extended period.
Android System	Android kernel functions. This is typically a small percentage.
Wi-Fi	Wi-Fi is the amount of power used by Wi-Fi. If you perform a lot of manual sync operations, or your Wi-Fi signal is weak the power usage can increase, but in general the power usage is low.
EnSURE Touch	The EnSURE Touch application itself does not use a lot of power. Some activities like Results & Reports and Sync can used more power, but in general the EnSURE Touch application power usage will be low. Since the EnSURE Touch application is interactive it is assumed the display is active, so the display power usage will go up.
QuickSupport	QuickSupport is the TeamViewer application. It will only use power when it is running and being used. It can consume larger amounts of power because it is using the display, EnSURE Touch application, and Wi-Fi. The Wi-Fi will be sending screen and touch information to the remote computer. If you do not use the Support option the QuickSupport will not be running.

EnSURE Touch™ Power Management Options

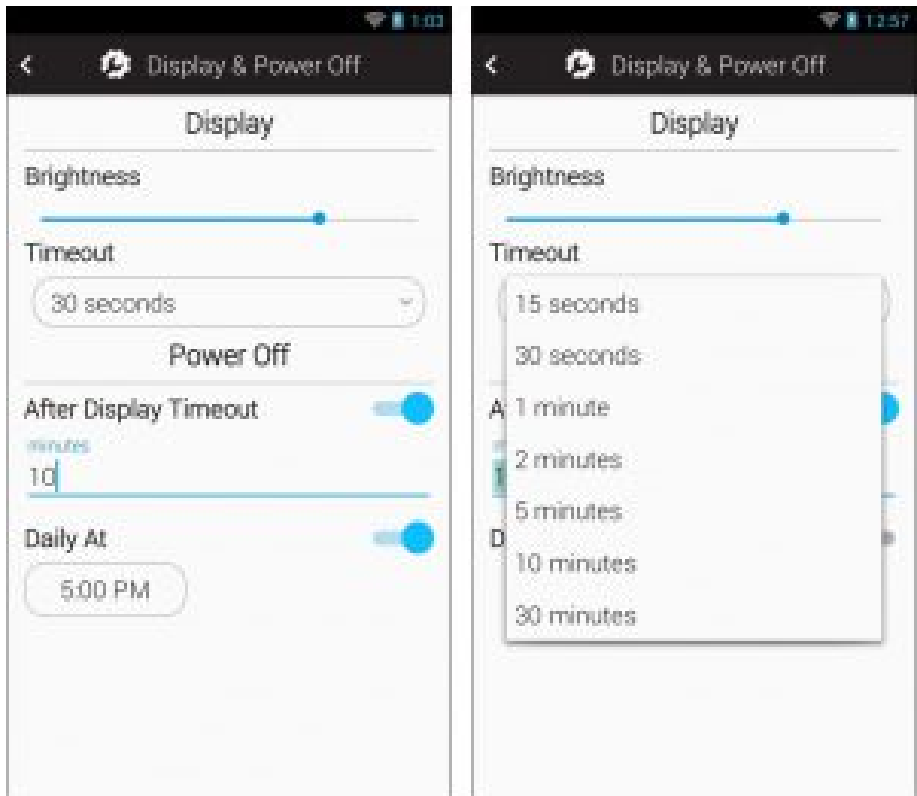
The **EnSURE Touch™** has some useful power management options. They can be used to conserve battery power and match your usage of the instrument.

In general, most users will want to turn the display to maximum brightness, keep the display on for long periods, and never power the instrument off. When performing a few tests per day this will likely work. However, using the Display & Power Off options below you could conserve the battery power and reduce charge cycles, extending the life of the battery.

The display will dim after 5 seconds of inactive use to conserve power regardless of the settings.

Power management features are designed to work when running on battery. Some features are ignored when the instrument is plugged into power. The screen will not turn off when connected to power, unless instructed to do so by pressing the power button.

Option	Behavior
Brightness	Controls the screen brightness. The brighter the more power used.
Timeout	The of time the display will stay on if not touched. One touch is all it takes to reset the timer. You can choose from a list of preset timeouts. Once the screen is turned off the power to internal sensors will be turned off and the processor will go into power conservation mode. If the instrument is plugged into power, it will not turn the display off.
Power Off	Power off has 2 options that can be enabled. After Display Time Out, and Daily At a specific time.
After Display Timeout	After the display is turned off this will define the time before the instrument will power off. You can enter between 1 and 60 minutes. The instrument much be in sleep mode for this to work. If connected to USB power the display will not turn off and the instrument will not automatically go into sleep mode. You will have to put the instrument to sleep by pressing the power button.
Daily At	When this time is reached the instrument will power down. The instrument must be in sleep mode. This is an alarm event so if the instrument is not ready to power down it will be ignored. You will have to put the instrument to sleep by pressing the power button.




Power on Troubleshooting

The **EnSURE Touch™** does not have a separate changing indicator. The only way to know the instrument is changing is to power it on. In the notification are is the charge indicator.

If the instrument does not power on there are a few things to do to troubleshoot the problem

Step	Results
Press and hold the power button for 12 seconds. Make sure it is a full 12 seconds.	This will cause a Power on reset operation and will recover from a failed shutdown. You should see the screen slightly light up when the power is activated. If this does not work the battery may be insufficient charge.
Connect the instrument to power. Use the supplied power adapter and cable. Press and hold the power button for 12 seconds.	The instrument is designed to power on an operate using the USB power. You do not need to change the instrument. If this does not work and of the following issues could be true. <ol style="list-style-type: none"> 1. Wall power is off 2. Power adapter is not working 3. Cable is not working 4. Cable fit in not working 5. Instrument is not working The following steps will try to identify the problem above and should be performed in the order most likely for your condition. Use the same 12 second power on operation to validate the remaining tests.
Connect a device you know it working to the wall power.	In most cases the wall power is working, but it possible the circuit is off or surge protector if used it not working.

Use an alternative power adapter.	The power adapter shipped with the EnSURE Touch share the same specification with phone, table, and most USB device chargers. We have used iPhone, Samsung, and many 3 rd no-name brand adapters, and they all work. Some adapters do not supply enough power to perform the most power intensive operation, so the instrument may turn off. Using a second USB adapter supplied by Hygiena is preferred.
Change the USB-C cable orientation.	The USB-C cable can be inserted in 2 different orientations. This is to make the insertion easy. However, connectors on both sides in the system and on the cable must be working. It is possible on side is failing.
Use and alternative USB-A to USB-C cable	This is a common cable used by many popular phones and tablets. It is possible the cable is damaged. Using a second USB cable supplied by Hygiena is preferred.
Remove the battery from the instrument, press down on the four connection pins located on the back of the instrument (These should be spring like), re-insert battery and power on.	<p>In some cases the battery may not be seated correctly on the unit. If this is the case removing the battery, and pressing down on the connection pins will resolve this issue.</p> 

If none of the above steps solve the problem the EnSURE Touch instrument is not working.

Super Capacitor

The EnSURE Touch has an internal super capacitor that is used to maintain the real-time clock (RTC) for an up to 2 hours with no power, including no battery. This is designed to help retain the time when changing the battery. The super capacitor recharges automatically. The EnSURE Touch could be below 3% battery and not have enough power to boot the instrument, but can still maintain the RTC for months.

Battery Power Levels

As the battery level depletes the instrument will respond accordingly. The goal is to make sure the instrument has enough power to warn the user of the battery status, perform functions correctly, power down the instrument to protect the OS form shutdown failure, and power the real time clock for an extended period.

Below are the battery level ranges and what the user should expect.

Battery Level	Behavior	Notes
15% to 3%	Low battery warnings	You can dismiss these and continue to use the instrument.
5% to 3%	Lower battery message when running a test or performing Sync advising that the power is low, and the instrument could power off during the function.	You can dismiss and proceed, but the test or sync may fail.
3% to 2%	Lower battery power down message. Instrument will power down.	This can happen at any time and will stop running tests or sync process.
2% to 0.5%	Will likely see the boot animation, but the instrument will power off.	Once the instrument has booted enough to check the battery it must shutdown immediately. This is when the boot cycle can become corrupted and require a 20 second power button hold to power on.
0.5% and 0%	Will likely see the screen illuminate but will not see the boot animation. Instrument will power off.	If you plug the instrument into power, it should boot.

Power Down Details

The instrument will power down at 2% or less. This is for multiple reasons.

1. There is not enough battery to run tests, sync or perform other functions. This protects the OS and the application behavior.
2. The Real Time Clock (RTC) has a super capacitor to keep the RTC alive at 0% battery, but if the battery is at 1-2% it can maintain the RTC for months. See Super Capacitor.

If you still need help [click here to submit a ticket for technical support.](#)