# Acclima

# SDI-12 Sensor Reader



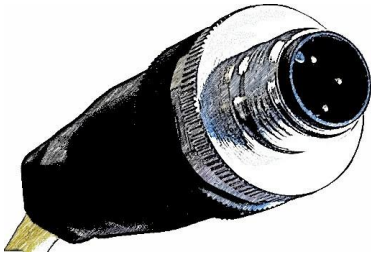# User Guide

Introducing Waveform Capture

# Contents

Temp-BEC

Waveform captureE
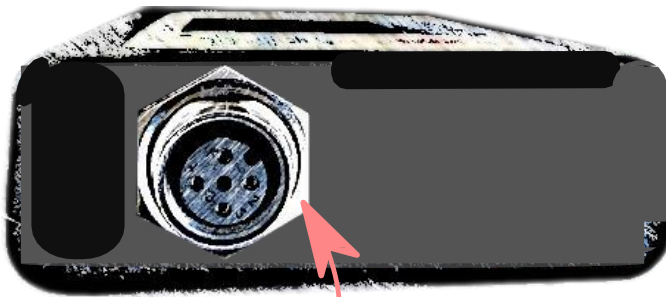
Model # AC

**Note: Only Acclima sensors with WAVEFORM CAPTURE labeling will be able to provide waveform data.**

**1. Connecting a Sensor**
Plug the the keyed male M-12 connector on the end of the sensor cable into the M-12 port on the Acclima Sensor Reader. Tighten the lock nut by turning it clockwise until it is finger-tight.

**Male M-12 Connector On Cable**
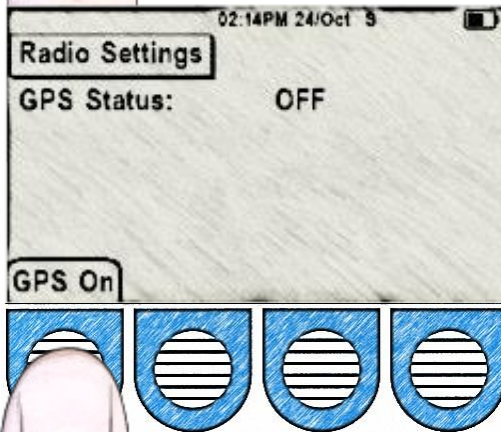
**Female M-12 Connection**

## 2. Powering the Reader On or Off

You can turn the Reader on or off at any time by pressing the red power button. Note that whenever you press any button, do so firmly, then release.
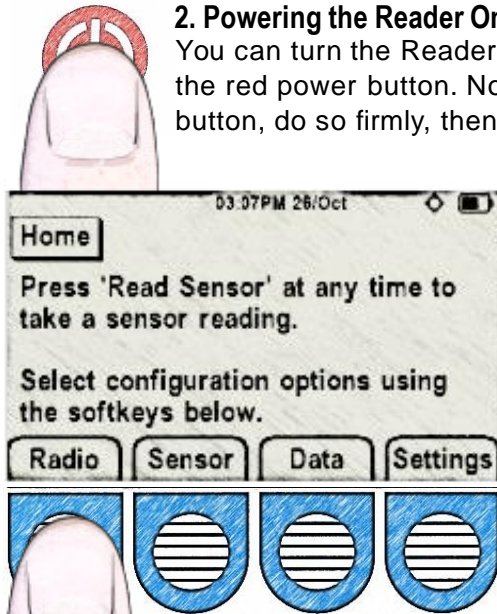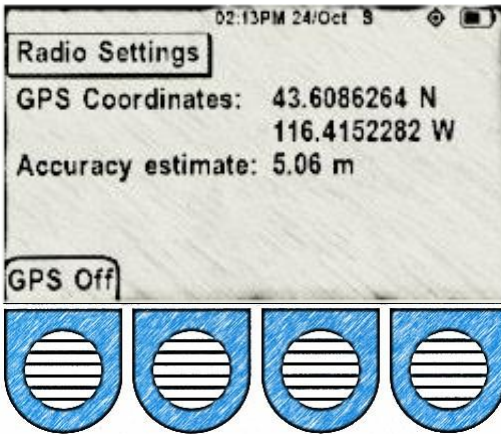
## 3. GPS and Time Settings

To turn on the GPS radio, if you are on the 'Home' screen you will see a menu of selections above the blue and white-striped membrane buttons. Press (and release) the soft button under 'Radio'. Another screen will appear with one menu option 'GPS On'. Press the same button to turn the GPS Radio on. Subsequently, you will see a stop-watch counter run as the Reader synchronizes with GPS satellites overhead. (The time on your reader will be updated by the satellites, but you may need go to the 'Home' screen, choose 'Settings', then choose 'Set time' to change your time zone). It usually takes 10 - 15 seconds to sync-up and and acquire the signal. This may vary depending on your geographic location and other factors such as dense cloud cover and/or tall obstructions such as buildings and trees with dense foliage. Try to have a direct line-of-sight to the sky from horizon to horizon when turning on the GPS Radio. If a clear line-of-sight from horizon to horizon isn't available try to find an area with a lot of viewable sky.

03.07PM 26/Oct

**Home**

Press 'Read Sensor' at any time to take a sensor reading.

Select configuration options using the softkeys below.

| Radio | Sensor | Data | Settings |

02:14PM 24/Oct 5

**Radio Settings**

GPS Status:      OFF

GPS On

**Radio Settings**

02:13PM 24/Oct 3

GPS Coordinates: 43.6086264 N
116.4152282 W
Accuracy estimate: 5.06 m

**GPS Off**

Once the Reader has synced up with the GPS satellite system, you will see the GPS coordinates and an estimated accuracy (given in meters). It's also here on this screen that you are able to turn off the GPS Radio by pressing the menu button under 'GPS Off'. When the GPS contacts the satellite system the time on the Reader will also sync.

**Home**

03:07PM 26/Oct

Press 'Read Sensor' at any time to take a sensor reading.

Select configuration options using the softkeys below.

| Radio | Sensor | Data | Settings |
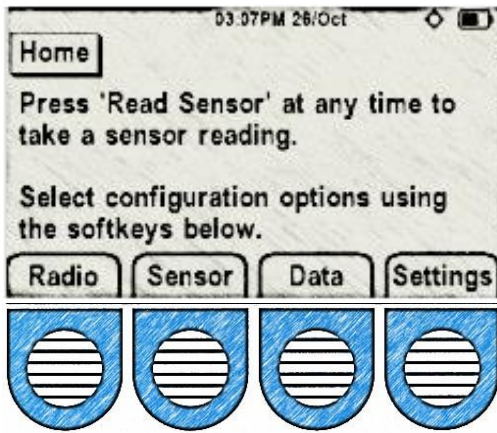
To return to the 'Home' screen at anytime you simply need to press the blue 'Home' button as shown below and the screen on the left will appear .
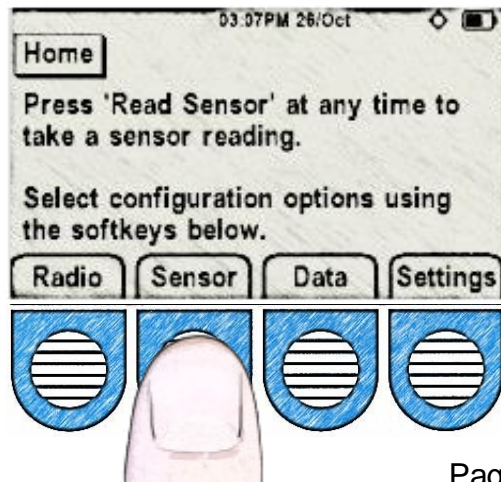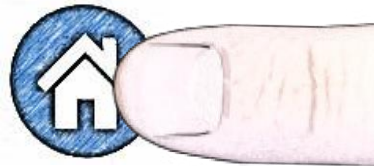
**4. General Setup**
To ensure that your sensor is properly connected to the Reader, press the 'Sensor' button on the 'Home' screen and then the 'Detect' button on the subsequent 'Sensor Setup' screen. An address, model, and serial number should be detected and show on the screen.

**Home**

03:07PM 26/Oct

Press 'Read Sensor' at any time to take a sensor reading.

Select configuration options using the softkeys below.

| Radio | Sensor | Data | Settings |
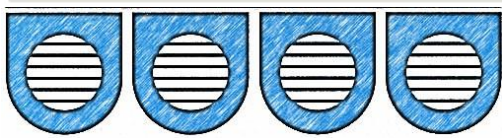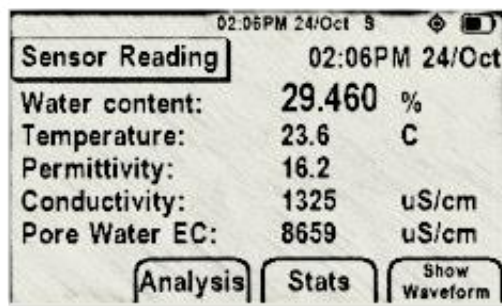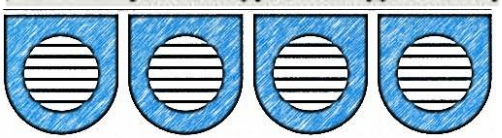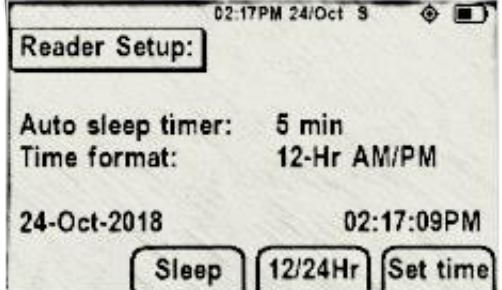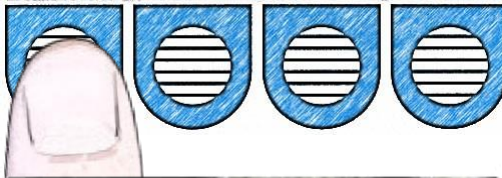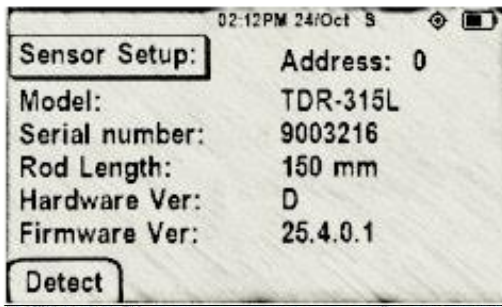
The length of the sensor wave-guide rods, the hardware and firmware versions will also be displayed.

**Sensor Setup:**

Address: 0
Model: TDR-315L
Serial number: 9003216
Rod Length: 150 mm
Hardware Ver: D
Firmware Ver: 25.4.0.1

Detect

When you press the 'Settings' button on the 'Home' screen, the screen to the left will appear. You can configure the sleep or power down time settings by toggling the 'Sleep' button through eight different options. One of the options is to disable sleep mode. Toggle the '12/24 Hr' button for one of those two prefer-ences. For setting the time refer back to page 2.

**Reader Setup:**

Auto sleep timer: 5 min
Time format: 12-Hr AM/PM

24-Oct-2018          02:17:09PM

Sleep | 12/24Hr | Set time

**5. Reading the sensor**
Any time you want to take a sensor reading, press the green 'Read Sensor' button and the screen on the left will appear.

**Sensor Reading**          02:06PM 24/Oct

Water content: 29.460 %
Temperature: 23.6 C
Permittivity: 16.2
Conductivity: 1325 uS/cm
Pore Water EC: 8659 uS/cm

Analysis | Stats | Show Waveform

Read Se

**Screen 1 (Sensor Reading):**

| Sensor Reading | | 02:06PM 24/Oct |
|---|---|---|
| Water content: | 29.460 | % |
| Temperature: | 23.6 | C |
| Permittivity: | 16.2 | |
| Conductivity: | 1325 | uS/cm |
| Pore Water EC: | 8659 | uS/cm |

[Analysis] [Stats] [Show Waveform]

**Screen 2 (Waveform):** 09:17AM 15/Nov

5ns 10ns 15ns

[Analysis] [Stats] [Show Reading]

**Screen 3 (Reading Statistics):** 02:11PM 24/Oct

| Reading Statistics: | | | 10 Readings |
|---|---|---|---|
| | Last | Avg | Max | Min |
| VWC | 29.460 | 25.734 | 29.580 | 10.510 |
| Temp | 23.6 | 23.6 | 24.0 | 23.5 |
| Perm | 16.2 | 14.2 | 16.3 | 6.1 |
| BEC | 1325 | 1063 | 1370 | 58 |

[Clear] [Analysis] [Show Reading] [Show Waveform]

When you are on the 'Sensor Reading' screen, you can generate a waveform of the latest reading by pressing the button on the right, 'Show Waveform'. A wavefo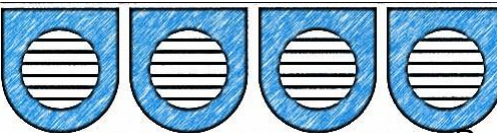rm will be presented within about five seconds. (See waveform graph: center-left.) To return to the 'Reading' view, just press the 'Show Reading' button.

To look at the statistics, press the 'Stats' button.

To show the last reading, press 'Show Reading' from the menu.

If you select the 'Stats' button notice that it will display the number of readings from which the averages, maximums and minimums are taken.

To disregard previous readings and begin a new set you will need to press the 'Clear' button.

**Note: If you are on any four of the 'Sensor Reading', 'Waveform', 'Reading Statistics', or 'Reading Analysis' screens, pressing the 'Read Sensor' button will refresh that particular screen with the newest data taken into account.**

## Sensor Reading

| | | |
|---|---|---|
| 02:06PM 24/Oct S ◈ ▭ | | |

**Sensor Reading**     02:06PM 24/Oct

| | | |
|---|---|---|
| Water content: | 29.460 | % |
| Temperature: | 23.6 | C |
| Permittivity: | 16.2 | |
| Conductivity: | 1325 | uS/cm |
| Pore Water EC: | 8659 | uS/cm |

| Analysis | Stats | Show Waveform |
|---|---|---|

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02:06PM 24/Oct S ◈ ▭

**Reading Analysis:**

| | | |
|---|---|---|
| Water content: | 29.460 | % |
| Water fill level: | 20% | full |
| Water needed to refill: | 1.4 | cm |
| Refill depth/Rod Length: | 15.0 | cm |

Thresholds must be set per soil type!

| Thresholds | Show Reading | Stats | Show Waveform |
|---|---|---|---|

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02:06PM 24/Oct S ◈ ▭

**Set Sensor Thresholds:**

| | | |
|---|---|---|
| Soil Type [ST]: | custom | |
| Field Capacity [FC]: | | 39.0 |
| Allowed depletion [MAD]: | | 27.0 |
| Managed Water [FC-MAD]: | | 12.0 |

| Change ST | Change FC | Change MAD | Done |
|---|---|---|---|

## 6. Water Thresholds

The 'Sensor Reading' screen presents the volumetric water content as a percentage, soil temperature in Celsius (will only be accurate if sensor is in subsurface soil for several hours or longer), permittivity, and bulk electrical conductivity in µS per centimeter.

If you press the 'Analysis' button you will be presented with the 'Reading Analysis' screen which can be useful for indicating the fill level of the soil's field capacity (FC). To be accurate you must push the 'Thresholds' button and select the proper settings for the soil you are reading. This includes selecting the closest soil type which will automatically set an approximate field capacity, managed allowable depletion (MAD), and the range between the MAD and FC.

All of these settings can be manually overridden and edited by pressing each respective 'Change' button. For instance, to change the default field capacity, press the 'Change FC' button for a screen and controls that allow you to adjust it up or down at your discretion.
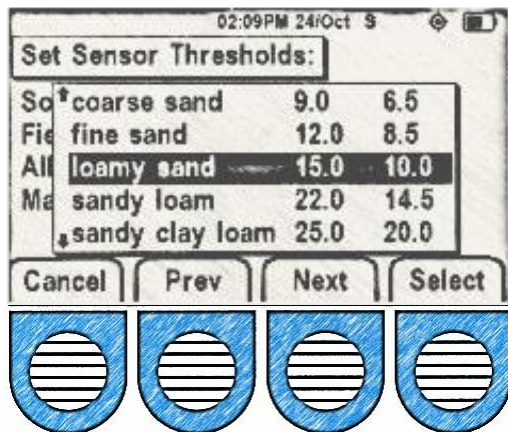
Note that if you select 'loamy sand' as depicted on the left, your default field capacity is set to 15 % VWC which can be edited and overridden by selecting 'Change FC' as shown in the preceding menu control illustration.
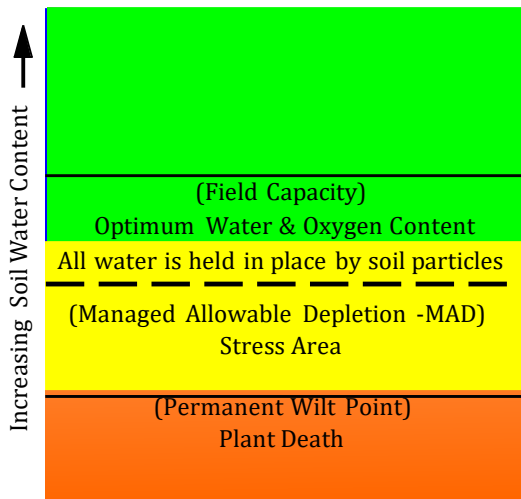


This wetness scale gives a depiction of the important stages of soil water content starting with saturation at the top where soil water content exceeds the surface tension of the soil particles driving the water down into the subsoil washing away critical nutrients with it and potentially rotting the roots. Field capacity is the ideal soil water content that allows moisture, nutrients, and oxygen to stay around the roots. The Managed Allowable Depletion level is the lowest that soil moistue can go without permanently harming or killing the plant.
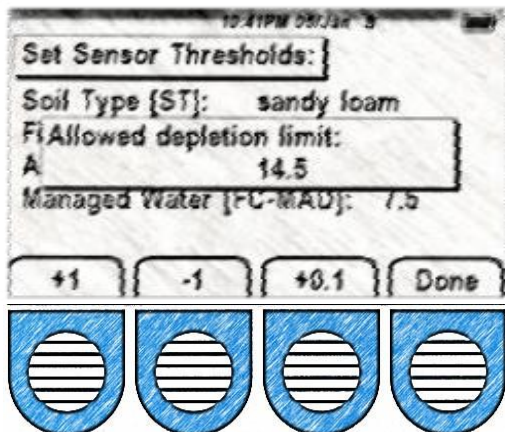


The customized 'Allowed depletion limit' can be set to a chosen value using the keys to the left if desired.
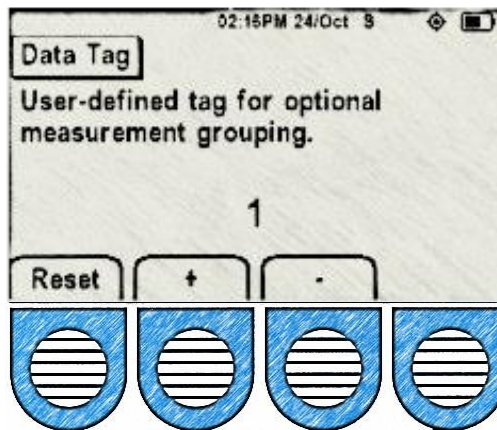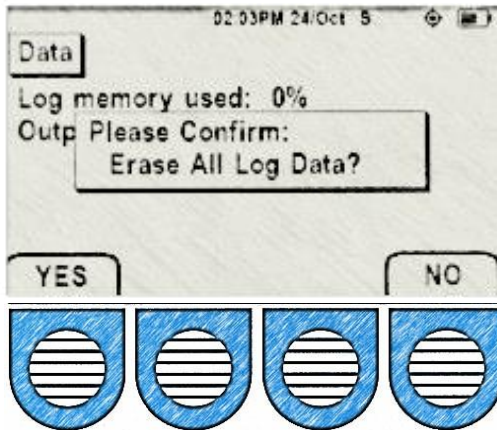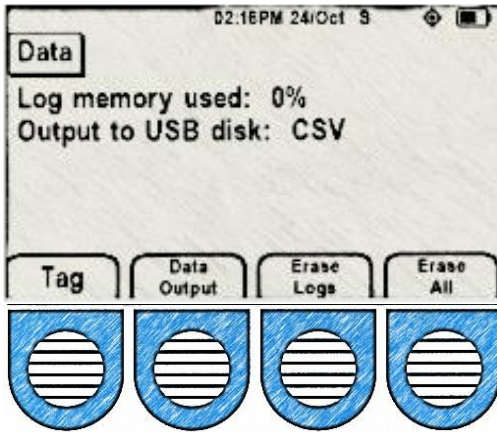
## 7. Data Options

The screen on the left is accessed by pressing the 'Data' button on the 'Home Screen'. It provides you with the memory usage information (must be at least 1% to show up). You can select your preferred 'Data Output' by pressing that button and toggling through 'CSV''only, 'CSV and binary', or just 'binary'. This data will then be able to be transferred to your micro-USB drive in the preferred format when it is plugged into the Reader.

The 'Erase Logs' button allows you to erase all log data, but requires you to confirm by pressing a 'YES' or 'NO' button. Similarly, the 'Erase All' enables you to erase all log and configuration data, also with a confirmation of 'YES' or 'NO'.

On the 'Data' screen (top-left) you can access the 'Data Tag' screen to by pressing 'Tag'. The 'Data Tag' screen gives you control to group your readings with a specified identification number. Once a number has been selected all subsequent readings will be associated with that number which will show up in your exported data.

**Micro USB Connector**
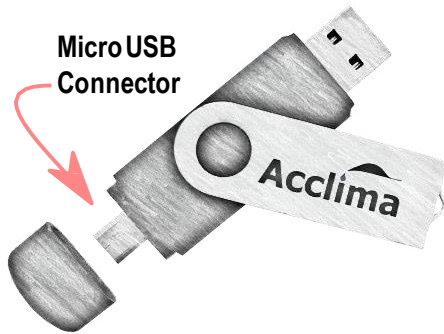
### 8. Retrieving your data

To retrieve your data for viewing on a computer, insert the micro-USB connector on the 32 gigabyte Acclima thumb drive into the micro-USB port on the side of the Sensor Reader. All of the Reader's records will be transferred to the Thumb drive, which can then be connected to your computer's USB port for downloading to the PC and viewing in CSV format. Important--Please allow the Reader time to synchronize. Do not disconnect the thumb drive until the Reader indicates the synchronization is complete. It will only take a moment to synchronize.

Please note that data can only be transferred using a thumb drive. A direct connection between the PC and the Reader will only charge the Reader's battery, not transfer data.
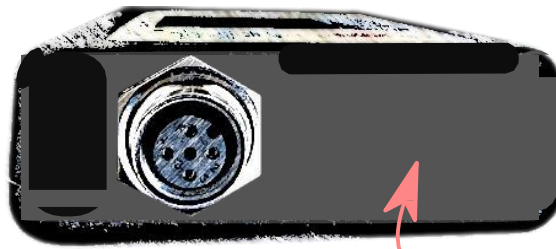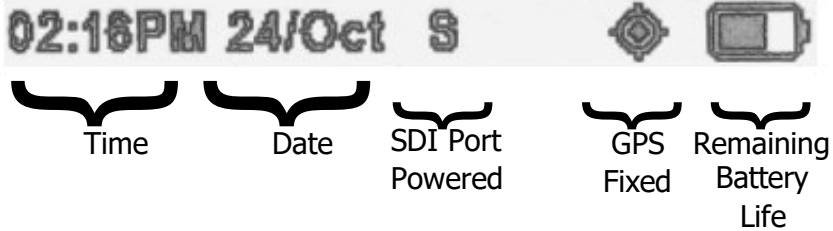
**Micro USB Port**

### 9. Upgrading the Reader's Firmware

If you desire to apply a new firmware update that becomes available for the Sensor Reader on the Acclima.com website, you should download it into the Acclima\RD1200\Updates folder on the thumb drive. Then when you plug the thumb drive into the micro-USB port on the Sensor Reader (while powered on), it will automatically update. Caution: Let this process complete uninterrupted by waiting until you see the message 'Synchronization Complete' before removing the thumb drive. The Reader will only automatically update if there is a newer firmware file version than it currently has.

**10. Icon Tray Legend**

`02:16PM 24/Oct  S          ◈  ▭`

Time    Date    SDI Port    GPS    Remaining
                Powered    Fixed    Battery
                                    Life

**11. Charging the Reader Battery**

Use the USB cable and proper international power adapter for your area (included) to charge the internal 18650 lithium ion battery by connecting the micro-USB end of the cable into the Reader's micro-USB port and plugging the other end of the cable into the USB port on the power adapter. The battery will be fully charged when the small lightning bolt no longer appears in the battery icon.

Acclima