

# Ceres<sup>®</sup> Gateway3



**TENETICS, LLC**

Advanced Wireless Agriculture

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# Getting Started

Congratulations on selecting Ceres® for your precision agriculture. This manual will help you get your wireless Gateway installed and running in less than 5 minutes.

## Package Contents

Your Gateway package contains:

- Ceres® Gateway3
- Mounting Brackets
- Solar Panel with integral mount
- Available options include:
  - external power supply and cable
  - external antenna and cable
  - pole mount U-bolts

## Overview



The wireless Gateway is a part of the Ceres® farm management system (FMS). If you haven't already done so, you should start by registering and setting up your farm here:

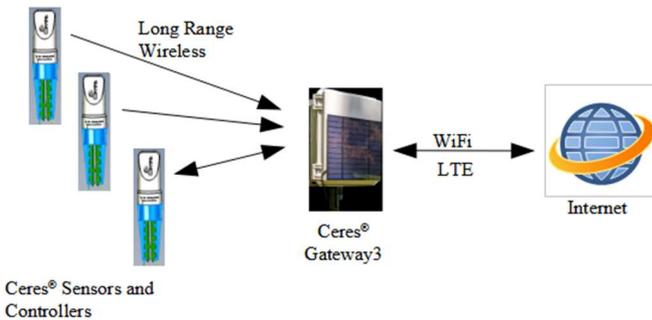
<https://ceresweb.tenetics.com>

The Gateway3 is an integral part of the FMS, connecting your long-range wireless sensors and controls with Ceres servers. Each Gateway3 supports up to 100 remote sensors and controllers.

**Ceres® is a registered trademark of Tenetics, LLC**

The Gateway3 contains several radio transceivers:

- An LTE cellular transceiver connects to the internet
- A short-range 2.4GHz 802.11 (Wi-Fi) and Bluetooth transceiver connects to the internet or your phone.
- A long-range sub-GHz transceiver that communicates with your remote Ceres sensors and controllers.



The gateway global LTE transceiver and eSIM card provide internet access wherever cellular service is available.

The long-range wireless reach varies with terrain and intervening obstacles, however 1-2 miles (2-3km) is typical for flat un-obstructed farms (depends on height and antenna).

Transmissions from remote wireless sensors and controllers are received by the gateway and stored in internal memory. The gateway can store more than 10000 readings allowing use in areas with limited or intermittent internet access.

The gateway periodically uses LTE or Wi-Fi to connect to the internet and forward received data to a secure database at a Tenetics data center. The database is automatically maintained and backed up so your data remains secure. The database makes your data available any time via smart-phone or computer.

## Mounting

The Gateway3 is fully self-contained, weatherproof, and solar powered so it can be deployed anywhere LTE cellular or WiFi networking are available. No more running wires through your fields.

**Pro Tips:** Mount your gateway:

- Securely, upright, and level
- Near your fields with a line-of-sight to the sensors
- As high as possible (**minimum: 2m**, preferred: 3-10m)
- Where the solar panel receives full sun.
- Not against or near large metal objects

The included stainless-steel mounting brackets support mounting to a pole or a structure (e.g. a barn or storage structure) using the 4 outer slots or to wooden, steel, PVC, or aluminum poles using U-bolts.

Use the included screws to mount the brackets to the back of the enclosure as shown below. **DO NOT OVERTIGHTEN SCREWS.**



Figure 1 - Mounting Brackets

For pole mounting, the inner holes of the brackets support standard 2" stainless steel antenna U-bolt mounts (option)



Figure 2 - U-bolt (option)

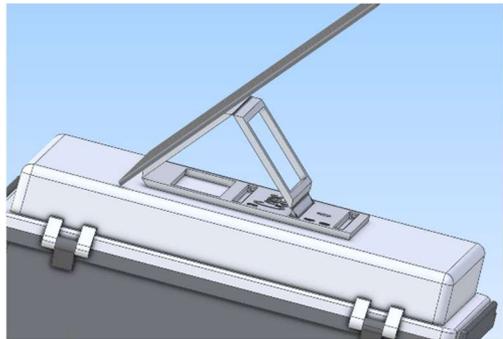
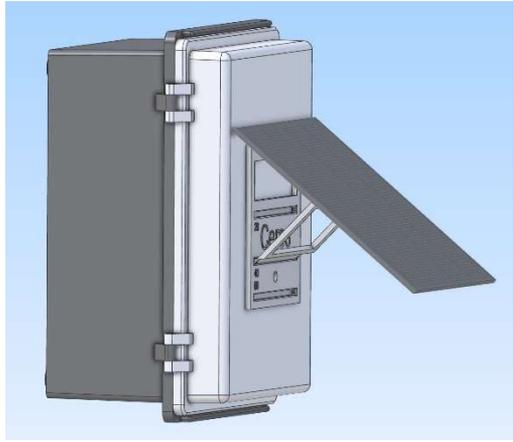
## Solar Power

The Gateway3 is powered by an internal sealed lead-acid (SLA) battery that is charged by a solar panel mounted to the front cover.

The solar panel should be exposed to full sun and face south. The panel should be angled toward the sun using the supplied angling adapter. The optimal angle depends on your latitude and the season.

For the Northern hemisphere, including the continental US, the optimal year-round angle is roughly the same as your latitude.

Unfold the solar panel mount carefully to avoid damaging the 3 hinges. Insert the smallest hinged section into one of the three slots until it snaps in place.



The folding hinged mount is convenient for storage and shipping and is rugged enough for most applications. However, if the mount is not appropriate for your location, you can also order a single-piece rugged mount from your Ceres supplier in a variety of solar angles.

For most US locations, the center slot of the 3-position adapter achieves good performance. Improved performance during the summer can be achieved using the top slot for a flatter angle to capture the higher sun. The most challenging season for solar power is winter when days are shorter and the sun sits lower in the sky. Move your angle adapter carefully to the lower slot for optimal winter performance. For many locations in South Asia, the 20-degree slot generally provides the best performance.

For example, in Tulsa, OK USA (latitude 35 degrees), during the summer, the optimal angle is roughly latitude-15degrees so use the top slot to angle the panel at 20 degrees. During the Spring and Fall, use the center slot for 40 degrees. During the Winter, the optimal angle is  $(\text{latitude} \times 0.9) + 29 = 59.6$  degrees so use the bottom slot for a 60 degree angle.

For more information about the optimal solar angle, including how to get better results in winter see <https://www.solarpaneltilt.com/>.

Once the panel is unfolded, connect the 2-pin waterproof circular connector to the socket on the bottom of the gateway.

To remove the old solar panel from the variable angle adapter, either remove the entire adapter from the front of the enclosure or tear the panel away from the upper hinge, leaving the rest of the angle adapter attached to the gateway front cover. The new angle adapter can be installed directly on top of the old adapter.

To attach the replacement panel and angle adapter, clean the surface that it will mount to, peel off the red film on the adhesive strips on the back of the adapter, and press the adhesive firmly against the surface it is being mounted to. Hold it firmly in place for at least 30 seconds.

## External Power

For most locations, if placed where it will receive full sun exposure, the supplied solar panel is sufficient to keep the battery fully charged. The gateway 3 will run for up to a week without significant solar charging.

If the supplied solar panel does not provide enough power in your location, a larger panel may be used. The panel should nominally nominal 12vdc. The maximum open-circuit panel voltage (Voc) **must** not exceed 24 volts or the Gateway3 may be damaged.

Contact Tenetics or your Ceres<sup>®</sup> reseller for larger solar panel and mounting options or for a cable-gland retrofit kit to allow use of your own solar panel and mounting hardware.

Where solar power is not available, the Gateway3 can be powered by a 12VDC power supply capable of providing at least 1A. Contact Tenetics or your Ceres<sup>®</sup> reseller for a suitable external DC power supply and/or DC power supply cable.

## Service and Maintenance

The supplied solar panel has a typical service life of 2-4 years (about the same as the life of the SLA battery). The precise service life of the battery and panel are affected by many factors including temperature and sun exposure. Both components are considered replaceable/consumables. When the panel and battery no longer power your Gateway3 reliably, they should be replaced. Low cost replacement panels and batteries are available from Tenetics or your Ceres<sup>®</sup> reseller.

To remove the solar panel, first unscrew the circular connector at the bottom of the gateway and pull it straight down to disconnect the panel.

## Battery Replacement/Disposal

All sealed lead-acid (SLA) batteries have limited service life, typically 2-4 years. When your battery no longer keeps your Gateway3 operating reliably, it should be replaced.

To remove the battery, unplug the yellow connector from the Gateway3 main board, then push the battery retaining clip gently to the right and slide the battery out of the gateway. Remove the cable from the battery and save it for use with the new battery. When removing the cable from the battery, grasp the connectors and wiggle them off the battery rather than pulling on the wires.

The recommended replacement battery is a [Powersonic PS-640 F1](#).

**IMPORTANT:** SLA batteries contain lead which is a toxic and material that must be recycled by law.

Do NOT dispose of SLA batteries in residential waste. Used batteries should be taken to a recycling center or household hazardous waste center. Lead-acid batteries are the most recycled

consumer product and most recycling facilities accept and recycle them. Please dispose of used SLA batteries responsibly.



**NOTE:** when replacing the SLA battery in your Gateway3, remove the battery cable from the battery and save it for use with your new battery. If you accidentally dispose of or damage your battery cable, contact Tenetics or your Ceres reseller for a replacement cable.

**Pro Tip:** cover one of the terminals of a used battery with a piece of electrical tape to prevent accidental short circuits.

## Storage and Shipping

If will not be using your Gateway3 for an extended period or if you are shipping the Gateway3, unplug the SLA battery. Note that SLA batteries should be charged at least every 6 months while in storage.

## External Antenna (option)

For most farms, the internal Gateway3 antenna provides excellent field coverage if mounted at least 2m (preferably 3-10m) high. For additional range, the Gateway3 is available with two external antenna options:

- A 3dBi external antenna that can be mounted directly to the RP-SMA connector on the top left of the Gateway3. The antenna should be screwed on securely but DO NOT OVERTIGHTEN.
- A 5dBi external antenna that provides maximum range and should be professionally mounted to a pole or structure and connected to the Gateway3 using low-loss N-to-RP-SMA coaxial cable such as [Times Microwave LMR-400](#). Be sure to use outdoor-rated cable/connectors and a lightning arrestor.

NOTE: use ONLY external antennas supplied by Tenetics; others may void your warranty and violate government regulations.

If using the external antenna option, the antenna should be mounted away from a metal pole (e.g. extending above the top of a metal pole) and must be deployed with an appropriate lightning arrestor.

The gateway or antenna should be mounted at least 2m above the ground, preferably 3-10m. Antenna height has a large impact on wireless range.

## LTE Cellular Connectivity

The gateway contains a global LTE cellular modem and includes a global eSIM. The gateway automatically connects to your local cellular provider (e.g. Verizon, T-Mobile, AT&T, etc.).

Note: Gateways can be ordered with a nano-SIM socket as a factory option for use with your SIM and cellular provider.

## Connecting to a WiFi Network

If WiFi networking is available at your gateway's location, using it can save cost. Refer to the Gateway 3 Advanced Setup manual for details on connecting and disconnecting to your WiFi network.

Note: the gateway should be within 100-300m of your Access Point.

Note: if a WiFi network is configured, the Gateway3 will automatically use it instead of LTE cellular for internet access.

## Restoring Factory Defaults

To restore a gateway to its factory default settings:

1. Disconnect the battery (turn the gateway off)
2. Press and hold the SETUP button
3. Connect the battery (turns the gateway on)
4. Continue holding the SETUP button for 10 seconds
5. Release the SETUP button

**NOTE:** all configuration and settings will be erased including stored configuration and readings; the password will revert to the original factory password.

# Specifications

## Power

- Typical power consumption less than 1/10 Watt
- Internal: 6V 4.5Ah AGM sealed lead-acid battery
- External: solar panel or 12VDC power supply

## Physical

- 9"x 7"x 4.41"
- -40 to +85C operating temperature range
- IP65 Waterproof
- Mounting: pole or structure
- 12V Solar Panel: 145mm x 145mm

## Wireless

- LTE Global Cellular
- Wi-Fi: 802.11 b/g/n compliant
- Bluetooth and BLE
- GPS Receiver
- FCC certified Ceres Long-Range Wireless:
  - Long range sub-GHz frequency band
  - Secure frequency hopping spread spectrum (FHSS)
  - Internal antenna OR
  - Optional external RP-SMA antenna

## FCC Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter. Changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The distance between user and products should be no less than 20cm.

FCC ID: 2AA6Q-GW3

Contains FCC ID: 2AC7Z-ESPWROOM32E

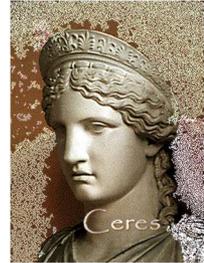
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## Who we are

Tenetics is committed to bringing technology for precision agriculture to small and medium-sized farms. Our Ceres wireless products help you monitor and manage your farm from your computer or smart-phone.

Ceres is designed for agriculture:

- Easy installation
- Solar power
- Long wireless range
- Wide operating temperature
- Rugged outdoor reliability



Ceres (Demeter) was the Greek and Roman goddess of agriculture. “Cereal” comes from her name.

## Contact Us

Tenetics is located in suburban Maryland. For more information about Ceres products, please contact us or visit our website.

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