

ConnectedCrops

User Manual

Kernel6

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ConnectedCrops™

1 OVERVIEW

1.1 Summary

The ConnectedCrops system is a powerful agriculture tool, providing critical field data right on a user's mobile phone. This real-time data, in addition to email and text message alerts, allows agricultural professionals to make key decisions for irrigation, frost protection, spraying and other field activities without having to be in the field, or even in the country. The historical data allows agricultural professionals to look at monthly and seasonal trends or compare year-to-year field conditions, allowing for a more in-depth analysis of how field conditions impact crop yields and quality. Users can receive monthly reports or download data in Excel format to perform their own data analysis or upload data to other farm management platforms.

This manual describes the procedures for assembling, registering, and preparing the ConnectedCrops Kernel6 Agriculture Station ("Kernel6") prior to installation, the considerations for choosing an installation site, and the steps to install the Kernel6.

NOTE: This manual contains detailed instructions for installing and registering the ConnectedCrops Kernel6 agriculture station, but it does not describe all the features and functionality available through the CCMobile App. For more detailed instruction on using the ConnectedCrops CCMobile App on your phone, please refer to the CCMobile App User Manual found at https://www.connectedcrops.ca/manual

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1.2 Contents of the Box

Kernel6 Box
1 x **Kernel6 station**
1 x SIM card (already installed)
1 x Battery Disconnect Tool
1 x QuickStart Guide





Figure 1

Sensors
The Kernel6 agriculture station supports a variety of sensors designed to help farmers gather essential data. This document does not provide installation instructions for these sensors. For installation and configuration details, please refer to the QuickStart Guides provided with each sensor and/or the individual manuals specific to each sensor type.

This manual does provide considerations and guidance for choosing the optimal installation location for the Kernel6 station, based on the type of sensor(s) the user intends to deploy.

Please refer to the specifications section for more details on sensor specifications.

1.3 How It Works

The ConnectedCrops solution is the integration of three components:

1. **Kernel6 station:**
   The Kernel6 station is the core of the system, with:

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- Built-in cellular connectivity and internal antenna, making it smaller, portable and easier to keep out-of-the-path of farm equipment operating in the field
- a battery designed to operate throughout an entire growing season before requiring a recharge. The battery can be recharged in the field using a phone battery pack, or brought indoors after the growing season to be recharged using the included wall charger
- Models compatible with a growing list of supported sensors
- a focus on durability, featuring a waterproof enclosure and no external components that could be easily damaged in the field

2. Sensors:
   Research-grade sensors deliver critical data of your field and crop conditions. Growers can select a Kernel6 model based on the specific types of data they need to collect. The sensors connect to one of the two available sensor ports on the side of the station and are configured via the mobile app.

3. ConnectedCrops Mobile Application (CCMobile App)
   CCMobile App is the mobile application you can download to your Android or iOS smartphone. This application is the interface to your Kernel6 station, allowing you to register and configure the station, check current sensors readings, change sensor thresholds for alerts via email, SMS text messaging or phone calls, view historical sensor data, and download your sensor data for use in other farm management tools.

Each Kernel6 station collects data from connected sensors at a configurable interval and transmits it over a cellular network to the cloud-based ConnectedCrops servers. The data is then updated in the CCMobile App on your phone within seconds, providing you with real-time visibility of your field conditions.

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Figure 2

ConnectedCrops was designed and engineered to eliminate many of the challenges with traditional weather stations. Each Kernel6 station works independently; you don't have to rely on setting up base stations, towers, gateways or connecting to WIFI's. With a rechargeable battery that powers the Kernel6 for an entire growing season on a single charge, there is no need to run electrical cables, replace batteries during the season, or worry about successive cloudy days resulting in interruptions. It truly is the easiest system to deploy and operate.

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2 DEPLOYING ConnectedCrops

2.1: What You Will Need

To mount the Kernel6:

1. a wooden, plastic, or metal post
2. 2 screws when mounting to a wooden post OR,
   metal strapping, a 4-inch hose clamp (worm gear clamp) when mounting to a plastic or metal post
3. drill/impact driver or screwdrivers, depending on your mounting method
4. cable ties and wire cutters

To install sensors in the ground:

1. auger, post-hole digger, or shovel
2. protective conduit (1.5″ diameter, between 18 and 30 inches in length). Avoid using metal pipes as it can affect the soil sensor readings.
3. measuring tape
4. cable ties and wire cutters
5. electrical tape

To install sensors above the ground:
Depending on where the sensor(s) will be mounted, you may need:

1. cable ties and wire cutters
2. a ladder

Regardless of which sensors you are using, avoid tools or mounting methods that could damage the sensors or their cables. Be sure to plan ahead if you intend on moving the Kernel6 station and sensors periodically.

To install the CCMobile App:
You will need an Android or iPhone smartphone. The minimum requirements are:

- For Android: running 16.0 operating system or higher
- For iPhone: running iOS 15.5 or higher

The CCMobile App is designed to be used on smartphones only. Running it on tablets and iPads may affect its behaviour and graphics.

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2.2 Deployment Process



2.2.1 Assembling the Kernel6

To start using the Kernel6, you need to:

1. Connect the Sensors: The sensors come with a waterproof, universal M12-style connector. If only deploying a single sensor, it can be connected into either Port 1 or Port 2. Make sure the sensor(s) are fully screwed in to ensure accurate readings and to prevent water contamination.

   Be sure to correctly configure the sensor port(s) in the CCMobile App while activating your station, as described in the **Sensor Setup** section 2.2.4 Step 4: Activate a Station. If you need to change this initial configuration later, you can do this easily from the **Sensors Setup** option under **Station Configuration** in the CCMobile App.

2. DO NOT remove the **Battery Disconnect Tool** at this time.



Figure 3

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2.2.2 Downloading and installing the ConnectedCrops Mobile App

On your phone, navigate to the App Store for iPhones OR the Google Play Store for Android phones.





Once in the store:

1. search for **connectedcrops** (one word), **ccmobile** or **Esprida**
2. click on the application icon with the description **ConnectedCrops - CCMobile**
3. click on the Install button
4. Once installed, click on the Open button to launch the CCMobile App

2.2.3 Signing Up or Signing In

To activate the Kernel6 station, you need to set up your account in the CCMobile App. If you've already activated a station previously, or know you already have an account, click the



button and log in with your user credentials.

If you know the email address used for your account but forget your password, click on the Forgot your password? link to trigger a password reset.

For a first-time user, a ConnectedCrops account must be created:

1. launch the CCMobile Application
2. click on Sign Up Now
3. fill in your farm name and the remaining fields. Note: *All fields are mandatory*
4. view the Licence Agreement
5. click on the



button

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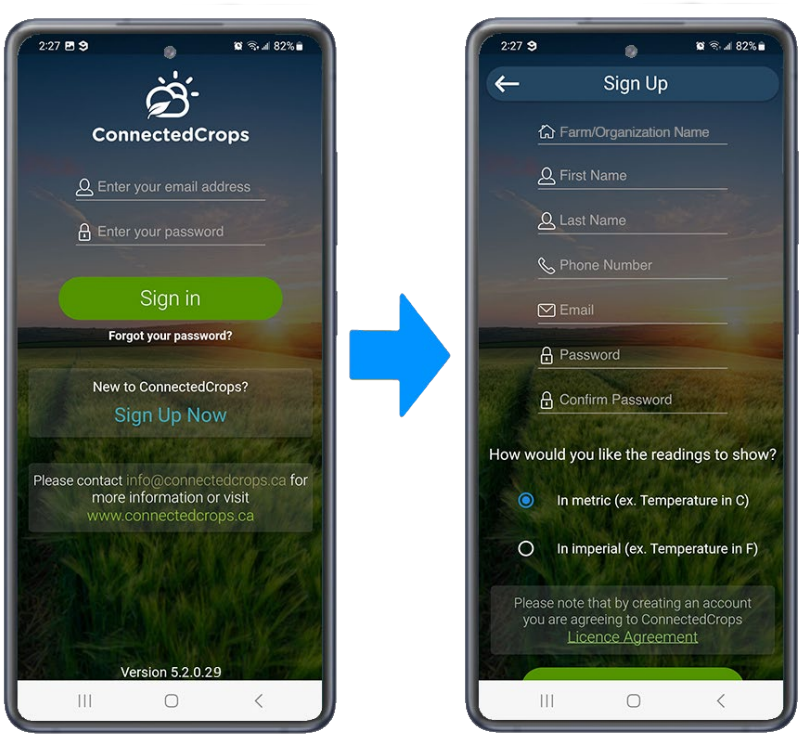


Figure 4

6. Once pressed, you will see an ALERT confirmation message on your screen and an email will be sent to the email address you entered with the confirmation/activation link
7. Click on the OK button in the ALERT screen

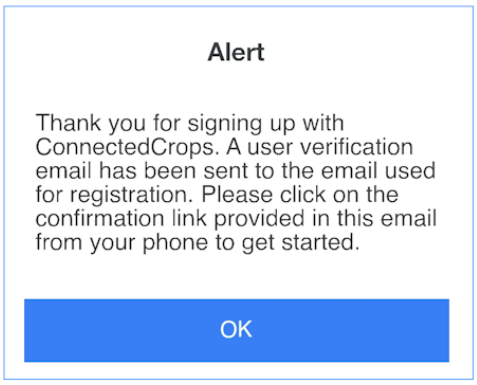


Figure 5

NOTE: CCMobile App passwords must conform to the following specifications:

- a minimum length of 8 characters
- must contain at least one (1) number
- must contain at least one (1) lower case letter
- must contain at least one (1) upper case letter
- must contain at least one (1) special character from the list of
- @, $, !, %, *, ?, and &

8. You will be directed back to the Sign in screen (Figure 4)
9. On the same phone, open the email you received from ConnectedCrops and click on the link to verify your account

NOTE: if you don't see the email, please check your Spam or Junk folder.

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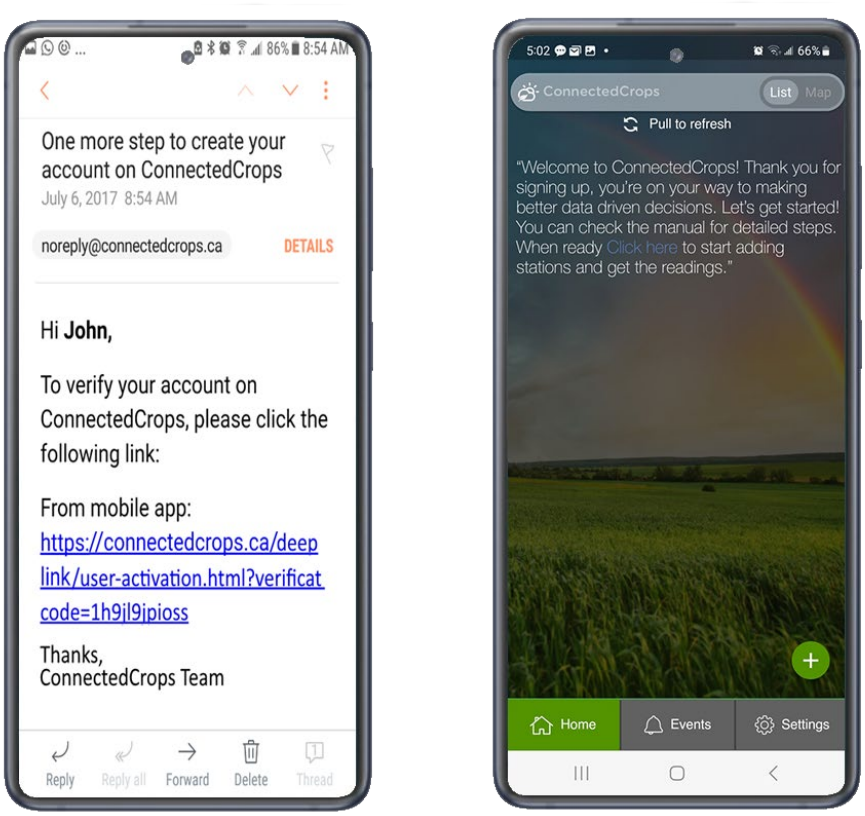


Figure 6

10. clicking on the link in the email will re-launch the CCMobile App and log you in if you are using the same phone on which you signed up. If not using the same phone, enter the email address and password credentials you just created and click on the Sign in button
11. the first time you log in, the CCMobile App will provide some help pages to give you a quick overview of its features. We recommend reading them
12. if you encounter an alert message indicating the account is not active, email support@connnectedcrops.ca and provide the email address you are trying to setup, and our support team will manually activate your account

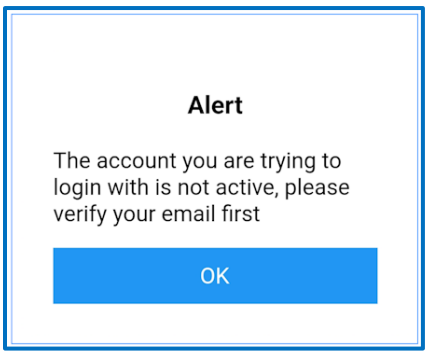


Figure 7

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2.2.4 Activating the Kernel6

This step involves working with the **CCMobile App** and the **Kernel6** station together.

The QR Code label on the side of the Kernel6 station provides the following information:

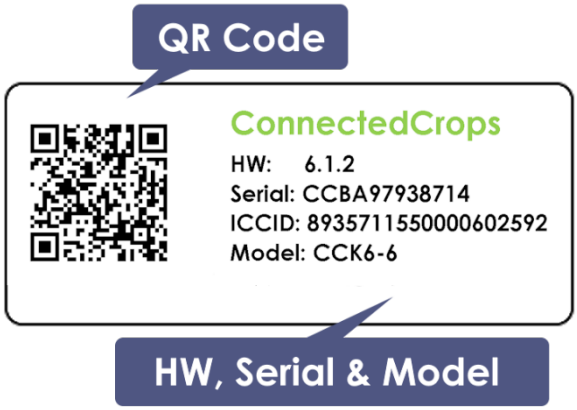


Figure 8

- **HW**: Hardware version
- **Serial**: Serial number
- **ICCID**: SIM Card Identification number with the mobile operator
- **Model**: The Kernel6 model number

To activate a Kernel6 station for the first time, open the **CCMobile App** on your smartphone:

1. click on the Click here link in the message shown on the home screen (as shown in the screenshot in Figure 6), OR
2. click on the + button in the bottom right corner of the screen, OR
3. click on Settings the button and then select Add New Station

At any time, if you want to add a new station, click + on the button or Settings click on the button at the bottom of the screen.

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A wizard in the CCMobile App will walk you through the four steps for activating a station:

- **Registration:** Registering the station to ConnectedCrops Cloud
- **Sensor Setup**: Setting up the sensors; defining their types, names, and the ports to which they're physically connected
- **Activation**: Powering up the Kernel6 station, resetting it, and checking if CCMobile App is receiving sensor readings from the station
- **Configuration**: Setting up the alerts, station's properties, and operation mode

Registration:

The following steps register the Kernel6 station to ConnectedCrops Cloud using a station name of your choice and its unique serial number.

Using the QR Code

1. in the **Station Name** field, enter a name that reflects the station's location. This will make it easier to manage if you're using multiple stations. (e.g., "East Field")
2. press the **Scan QR Code** button to scan the QR code on the back of the station. You may be presented with a pop-up alert asking you to allow the CCMobile to access your camera app. Please allow this to proceed
3. if allowed, the phone's camera will be automatically launched
4. scanning the QR code label will automatically populate all the registration fields
5. Click the **Register** button to complete the Kernel6 registration process

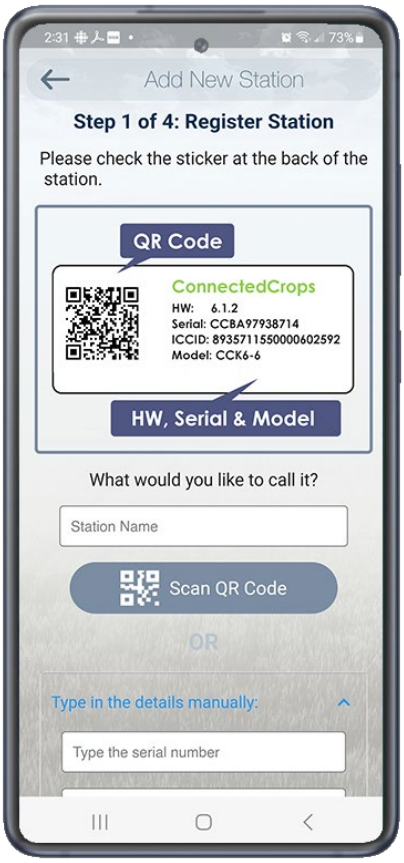


Figure 9

NOTE: If you DENY access to the camera, you must manually enter the registration information from the QR code label on the side of the station using the phone's onscreen keyboard

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Manual Entry

1. if you do not use the QR code or have issues with your camera, you may enter the details of the station manually. To do this, click on the down arrow next to Type in the details manually
2. this will present the user with two fields: the **Serial number** and the **HW version**. Fill in these two fields using the information on the QR code label
3. the moment the **HW version** field is entered, additional fields for entering the **ICCID** and the **Model #** will appear. (Note: all Kernel6 models have a HW version starting with "6."). Populate these fields using the information on the QR code label
4. click the Register button at the bottom of the screen
5. if the registration process is successful, the CCMobile App will display the message **Station was registered successfully to the system. Let's get the readings!** Press the OK button and proceed to the next step of the registration process
6. if you receive the message **Station was already registered**, it means the ConnectedCrops Cloud believes this Kernel6 station is already connected. If this occurs, email support@connnectedcrops.ca with your contact information and the **Kernel6** serial number and we will assist in identifying the issue

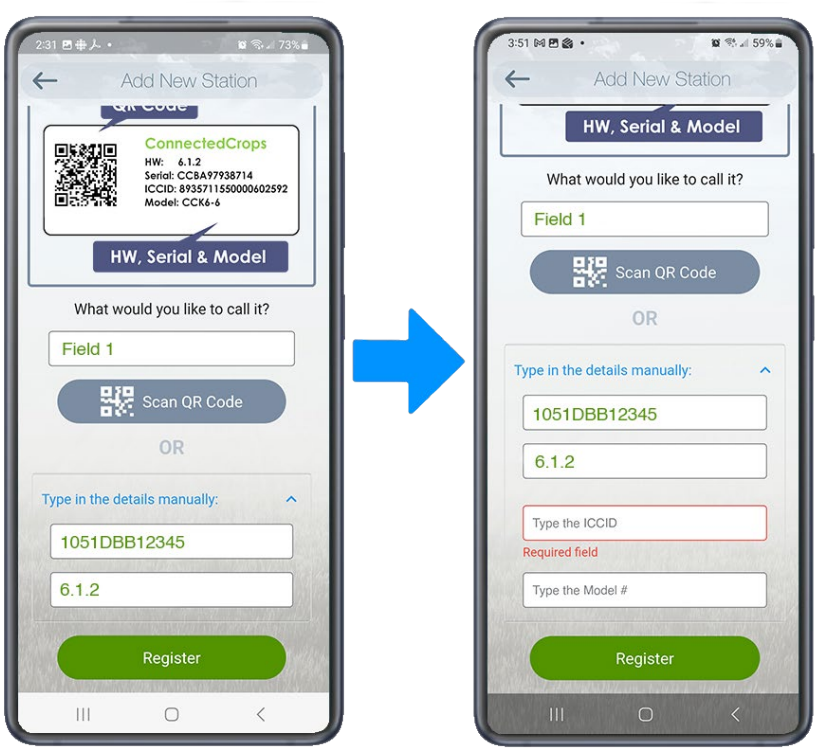


Figure 10

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Sensor Setup:

This step of the registration process will define what types of sensors are connected to the station and to which ports. When presented with this screen:

1. the Port 1 radio button will be selected by default, and None will be the selected by default for the type of sensor connected to port 1
2. if a sensor will be connected to port 1, select the radio button beside the sensor in the section **What type of sensor is connected to Port 1?** . If not, skip to step 4
3. provide a descriptive name for this sensor in the section **What would you like to name it?** For example; (1) Soil Sensor at 30cm or (2) Temperature at 3 metres
4. click the Save changes to Port 1 button to save and move to the second port
5. you will receive the popup message **Sensor in Port 1 is configured!** Press the OK button on the popup
6. repeat these steps to set up a sensor in Port 2 if you are deploying 2 sensors

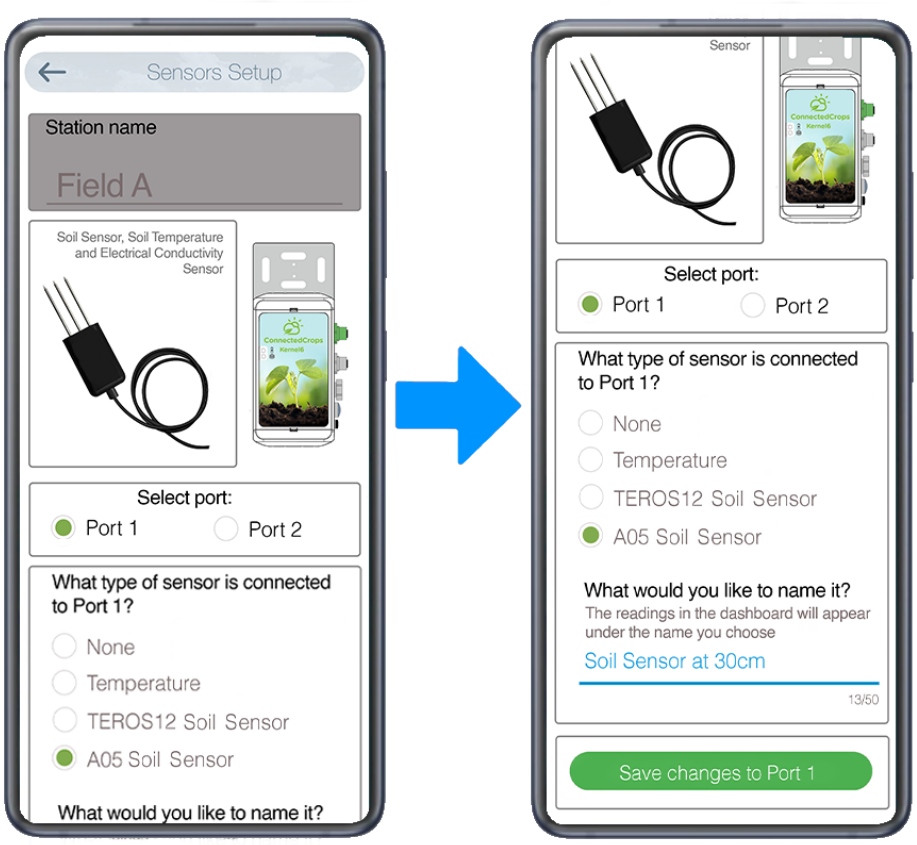


Figure 11

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Activation:

The following steps of the registration process will activate the station to start the data collection process.

1. make sure that you are in an area that has good mobile coverage
2. connect the sensor(s) to the station
3. Remove the Battery Disconnect Tool from the station mounting bracket using a screwdriver and wrench. This will enable power to the station
4. press the Next button in the CCMobile App
5. a countdown timer will be displayed as the Kernel6 starts up. If the communication link between your station and the ConnectedCrops Cloud is established, sensor readings from the station will be sent to the cloud and the CCMobile app will retrieve this information from the cloud

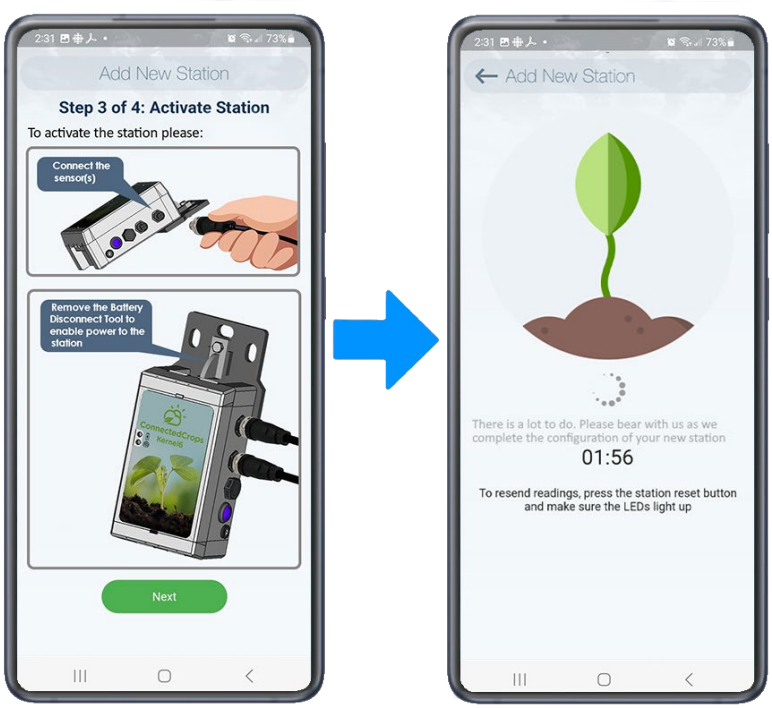


Figure 12

You can monitor the lights on the Kernel6 during the registration process:

- the battery light should illuminate blue during the registration process indicating there is enough battery charge to transmit the data required for the process
- the communication light will transition from flashing on/off blue (establishing a connection to a cellular network) to a continuous blue illumination (transmitting data) during the registration process

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1. once the Congratulations! screen is displayed, the Kernel6 station is now active and successfully communicating sensor data. Click the Next button to proceed to the next step

2. if you receive an error message:
   - check the listed steps in the CCMobile App (Figure 13) to guide you through solving the issue,
   - using your finger, pull the screen down to refresh the screen, OR press back arrow button on the bottom of the screen and then click the Next button again to proceed to the next step

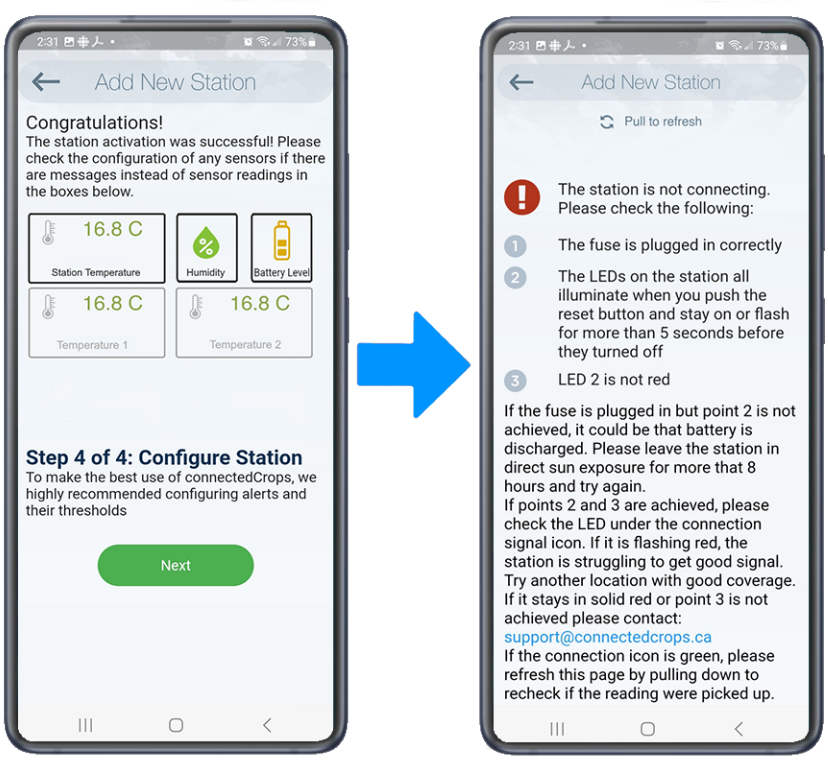


Figure 13

Please check the troubleshooting section if you are facing issues while activating your station.

NOTE: The ConnectedCrops team recommends you test the sensors before installing them in the field. For example, a temperature sensor in air should provide a value close to the ambient temperature of your surroundings. Sticking the prongs of a soil sensor in the ground or a pot of soil should provide a soil moisture value between 5% - 60% and roughly correlate to what you might expect when touching the soil.

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2.2.5 Configuring the Kernel6

To take advantage of all that ConnectedCrops platform has to offer, the Kernel6 should be configured according to your unique needs. The following configuration options are available to customize your ConnectedCrops experience. These steps can be completed immediately after the Kernel6 has been activated or later using the Settings tab on the CCMobile App menu.

Rename Station

- Pressing on Rename Station will allow a user to change the name of this station. This may not be necessary when setting up the station for the first time, but if the station is moved to a different location later, this may be helpful

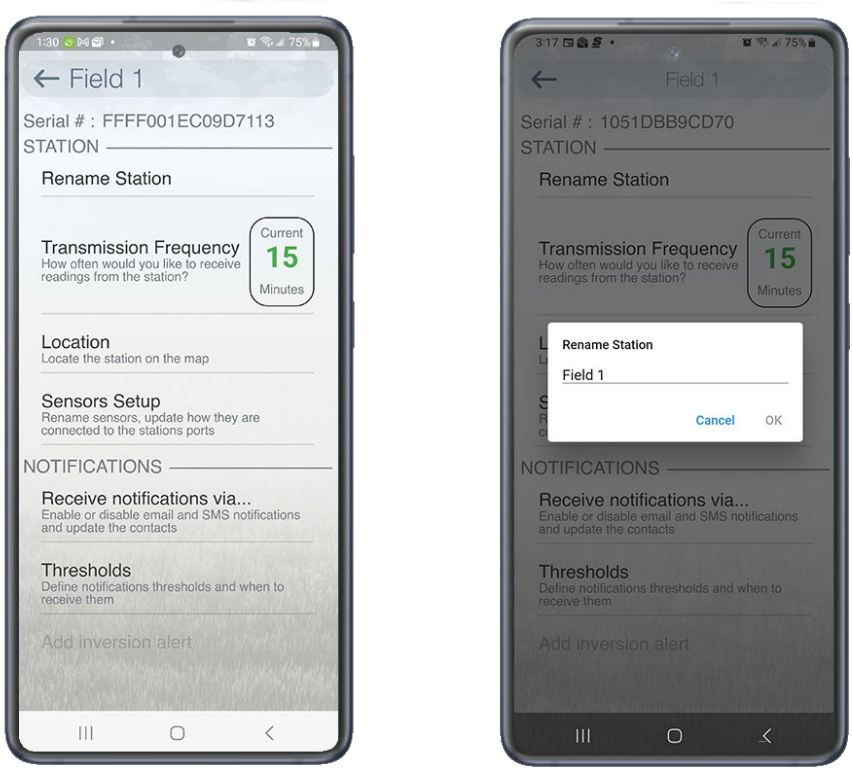


Figure 14

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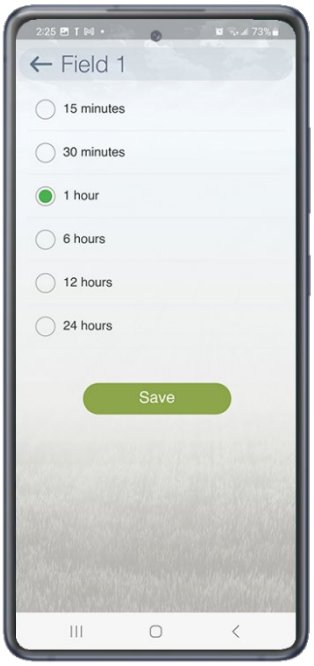


Figure 15

Transmission Frequency

The Kernel6 has a default transmission frequency that can be adjusted to specific intervals. Click on Transmission Frequency or the current interval number to display the list of frequencies available. Once selected, select the Save button. When the next communication cycle occurs, the new Transmission Frequency will be downloaded and used in all future communication cycles.

The user should consider the following factors when selecting the transmission frequency:

- how quickly the environmental conditions being monitored can change. Temperatures can change quickly while soil conditions change much slower. Adjust the transmission frequency according to the sensors on the station
- when using the Kernel6 for frost detection, a more frequent temperature update is necessary, however, temperature changes in the summer month are less critical to farm operation decisions, so a less frequent update can be set during the growing season

NOTE: The more frequent the data transmission, the more load on the Kernel6's battery

Location

- pressing on Location will display a popup requesting to use your phone's GPS location services if this is the first time this feature has been used. Select While using the app when presented with the popup
- pressing on Location after the first use will display the map directly
- when the map is displayed, a pin will be placed at the precise latitude and longitude coordinates as detected by your phone. When standing beside your Kernel6 station in the field where it is installed, this pin will then also represent the location of your Kernel6 station
- with the pin displaying the location of the station, click on the Save button

NOTE: This step should be performed while standing beside the station AFTER the station has been installed in the field. You can come back to this Configuration step later.

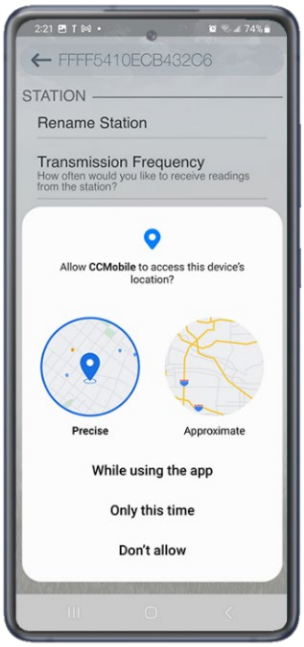


Figure 16

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Sensors Setup

The Sensors Setup feature allows a user to modify the sensor connected to a specific port. Specifically, a user can:

- define if a port has a sensor connected to it
- change the name of the sensor in the port

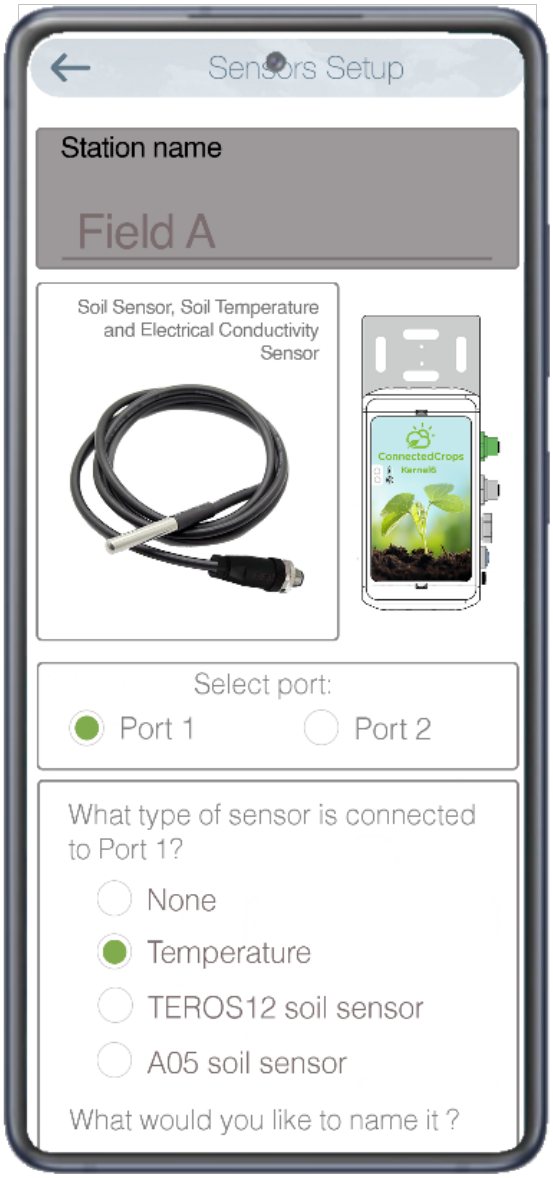


Figure 17

Receive notifications via…

- pressing on Receive notifications via … allows a user to specify how and when to receive sensor alerts and monthly sensor reports
- use the slider to enable **Blackout Periods** during which time users will not receive email, SMS text, or phone call alerts (but will continue to receive silent push notifications)
- use the slider to enable Email alerts. The email address used during registration will automatically be prepopulated in the email address field. You can add additional email addresses by clicking on the + Add More button. The email address format is example@email.com. Each field holds one email address only

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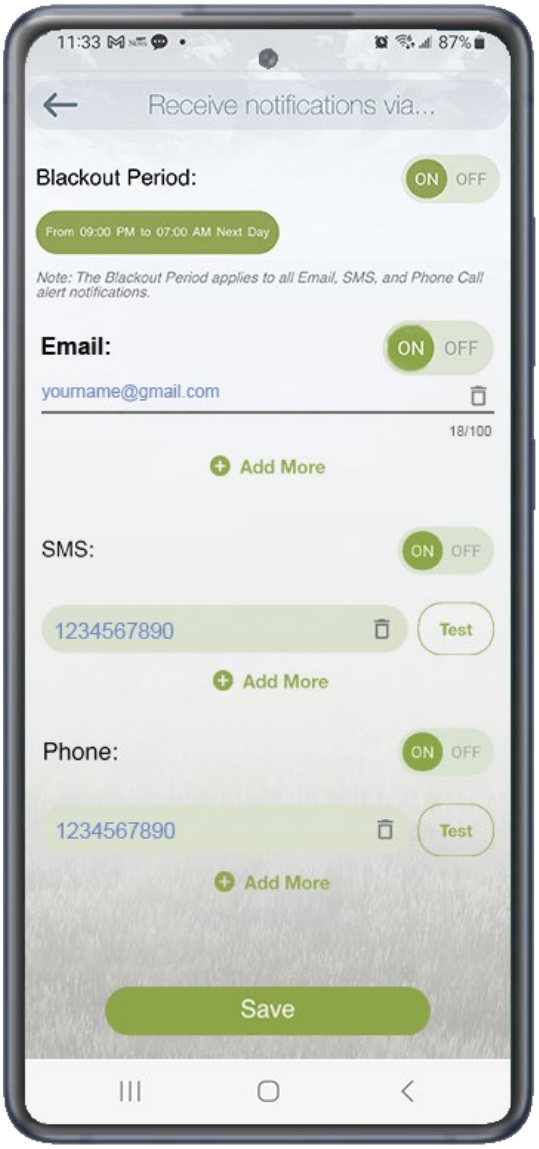


Figure 18

Email Alerts

Moving the **Email:** slider to the ON position (Figure 18) allows a user to enter one or more email addresses where alerts notifications will be sent when a sensor exceeds a defined threshold or when other important station events occur.

- Moving the **Email:** slider to the ON position will display a field to enter an email address
- Enter an email address ensuring the spelling is correct. The email address format is example@email.com. Each field holds one email address only
- You can add additional email addresses by clicking on the + Add More button and remove email addresses by clicking the Garbage Can (🗑) button beside the address
- To disable all Email alerts, move the **Email:** slider to the OFF position

SMS Alerts

Moving the **SMS:** (Text Message) slider to the ON position (Figure 18) allows a user to enter one or more phone numbers to which SMS messages will be sent when a sensor exceeds a defined threshold or when other important station events occur.

- Moving the **SMS:** slider to the ON position will display a popup field to enter a phone number (Figure 19)
- Touching in the Enter phone no field will display the on-screen keyboard for entering the phone number
- Enter a mobile phone number in the popup. The phone number format must be all numbers, no spaces or characters, and only a "+" sign is allowed at the beginning. (e.g., +14161234567, 14161234567 or 4161234567). Each field holds one phone number only
- Click the Next button on the popup

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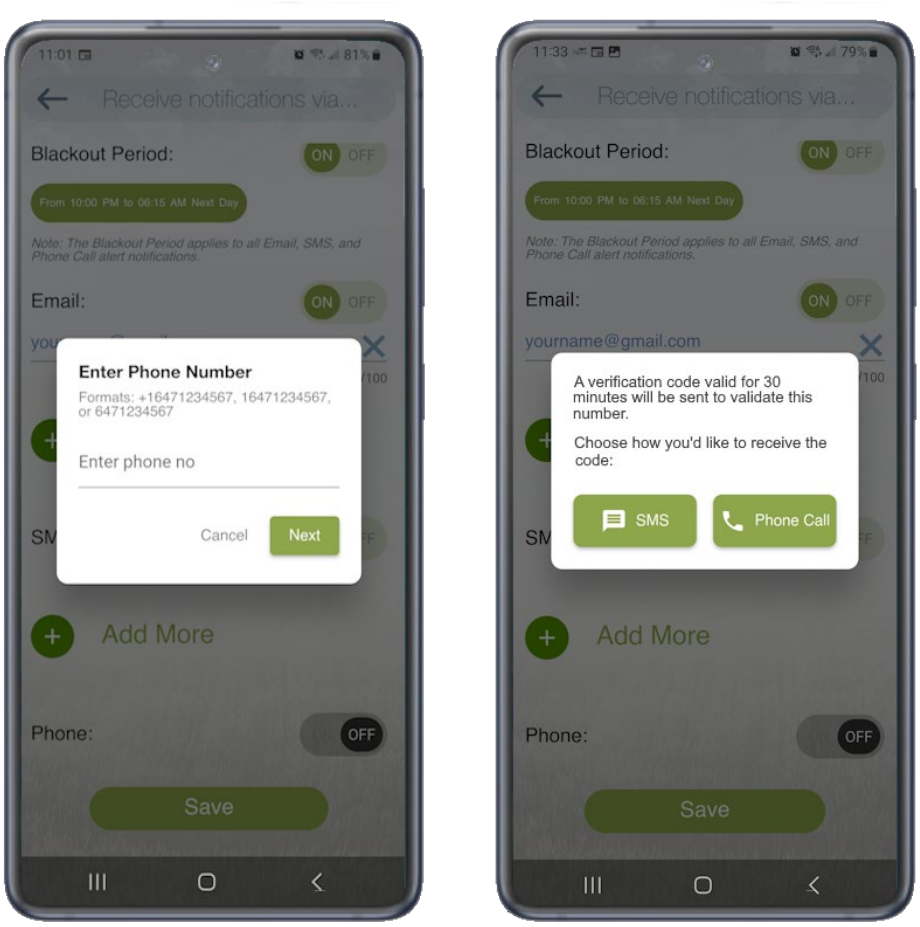


Figure 19

- A popup will be displayed (Figure 19) to validate the phone number being entered. Clicking on the SMS button will send a verification code via SMS to this number. Clicking on the Phone Call button will result in a call to the number with the verification code

> NOTE: If the **Phone call** option is chosen, it may take several seconds after answering the call before the voice message begins and the verification code is provided. Please be patient.

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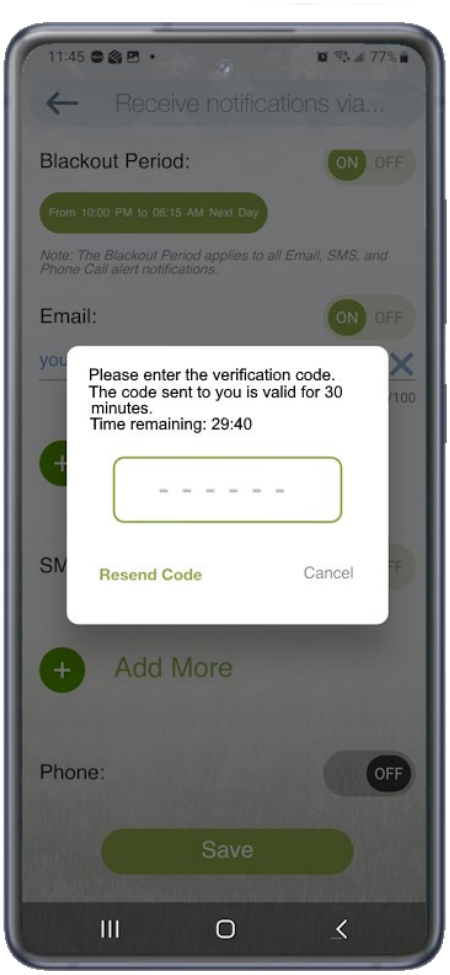


Figure 20

- After clicking on the SMS button or Phone Call button, a new popup will be displayed (Figure 20)
- Touching in the code box field will display the on-screen keyboard for entering the validation code provided. When the 6th digit of the validation code is entered, the screen will automatically return to the **Receive notifications via …** screen (Figure 18)
- The validation Code is valid for 30 minutes
- Click on the Save button at the bottom of the screen
- You can add additional mobile phone numbers by clicking on the + Add More button
- You can remove a phone number by clicking the Garbage Can (🗑) button beside the number
- You can test that an SMS will be delivered to this phone number by clicking on the Test button beside the number

Phone Call Alerts

Moving the **Phone:** slider to the ON position (Figure 18) allows a user to enter one or more phone numbers to which a Phone call will be placed when a sensor exceeds a defined threshold or when other important station events occur.

- Moving the **Phone:** slider to the ON position will display a popup field to enter a phone number (Figure 19)
- Touching in the Enter phone no field will display the on-screen keyboard for entering the phone number
- Enter a mobile phone number in the popup. The phone number format must be all numbers, no spaces or characters, and only a “+” sign is allowed at the beginning. (e.g., +14161234567, 14161234567 or 4161234567). Each field holds one phone number only
- Click the Next button on the popup

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- A popup will be displayed (Figure 19) to validate the phone number being entered. Clicking on the SMS button will send a verification code via SMS to this number. Clicking on the Phone Call button will result in a call to the number with the verification code
- After clicking on the SMS button or Phone Call button, a new popup will be displayed (Figure 20)
- Touching in the code box field will display the on-screen keyboard for entering the validation code provided. When the 6th digit of the validation code is entered, the screen will automatically return to the Receive notifications via … screen (Figure 20)
- The validation Code is valid for 30 minutes
- Click on the Save button at the bottom of the screen
- You can add additional mobile phone numbers by clicking on the + Add More button
- You can remove a phone number by clicking the Garbage Can ( ) button beside the number
- You can test that an SMS message will be delivered to this phone number by clicking on the Test button beside the number

Monthly Reports

On the Receive notifications via… page, a user can also define the months that they would like to receive a monthly sensor report for this station. The monthly report provides a chart showing the sensor readings for the past month in PDF format. It also includes the raw sensor data in Excel® format so users familiar with Excel can perform their own spreadsheet data analysis.

To enable receiving monthly reports (Figure 24):

- move the Monthly Report: slider to the ON position
- select the checkboxes beside the months you would like to receive a report
- Click on the Save button at the bottom of the screen
- To disable a Monthly Reports, move the Monthly Report: slider to the OFF position

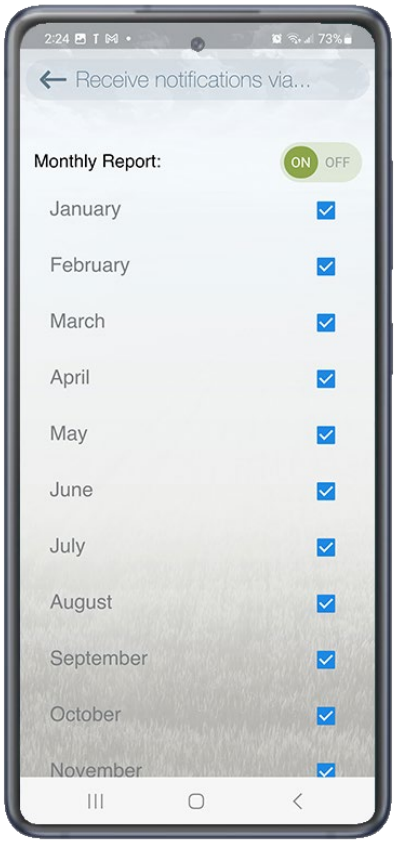


Figure 21

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NOTE: For all changes made on the Receive notifications via… page, ensure you press the Save button at the bottom of the Receive notifications via… page before returning to the previous page.

NOTE: Monthly Reports will only be sent to email addresses listed under Emails:. If no email addresses have been provided, the Monthly Report will not be sent even if the feature is enabled

Thresholds

Sensor thresholds are target values for an individual sensor that, when reached or exceeded, will trigger an email and/or SMS text message notification. These alerts will only be sent to the listed email addresses and phone numbers IF they have been enabled in the Receive notifications via … screen.

Pressing on Thresholds takes the user to a screen that identifies all the sensors on the selected Kernel6 station. From this screen, the user can select the specific sensor on which they wish to define or modify the thresholds.

There are 2 different possible views a user will see when presented with this selection screen:

- The left screen (Figure 20) shows a sensor (e.g. Sensor at 6") that provides multiple readings. In this example, the



Figure 22

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sensor can provide (a) Bulk EC, (b) Soil Moisture and (c) Soil Temperature from a single sensor

- The right screen (Figure 20) shows a sensor (e.g., Temperature a 1m) that only provides a single reading. In this example it is temperature.

No matter what type of sensors are connected to the Kernel6 station, the user will always see a Station Temperature sensor. This is a temperature sensor embedded in the Kernel6 station. Because the Kernel6 is an ultra-low power system that generates minimal heat, the temperature reading from the built-in Station Temperature sensor will closely match the readings provided by any external temperature sensor connected to the station. This effectively serves as a third sensor, which can be especially useful if the sensors connected to the two external ports do not measure outside air temperature.

Regardless of which view is displayed to the user, custom threshold values can be set for each sensor. To do this:

- select the radio button beside the sensor you wish to configure
- To modify a temperature sensor's threshold value:
  - Use the + or – buttons to adjust the **Temperature is above** and **Temperature is below** threshold values
  - Email and/or SMS alert notifications will be sent out when the temperature is above the **Temperature is above** value or below the **Temperature is below** value
  - click on the Save button

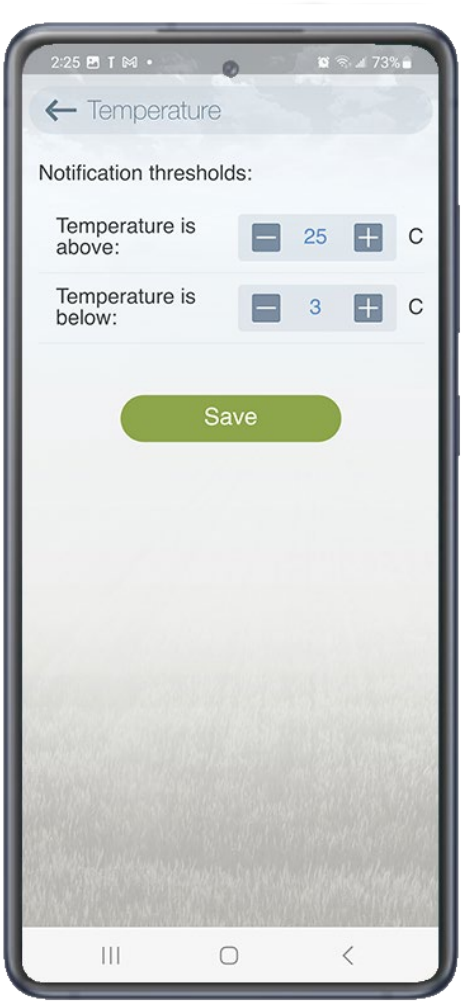


Figure 23

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- To modify a soil moisture sensor's threshold value:
  - select the soil type from the drop-down list. This will populate default VWC% threshold values for **Wilting point**, **Field capacity**, **VWC% is above** and **VWC% is below**
  - Use the + or – buttons to adjust the four (4) thresholds to the desired values
  - Email and/or SMS alert notifications will be sent out when the VWC% value is:
    - below the **Wilting point** threshold
    - below the **VWC% is below** warning threshold
    - above the **VWC% is above** warning threshold
    - above the **Field capacity** threshold
  - click on the **Save** button

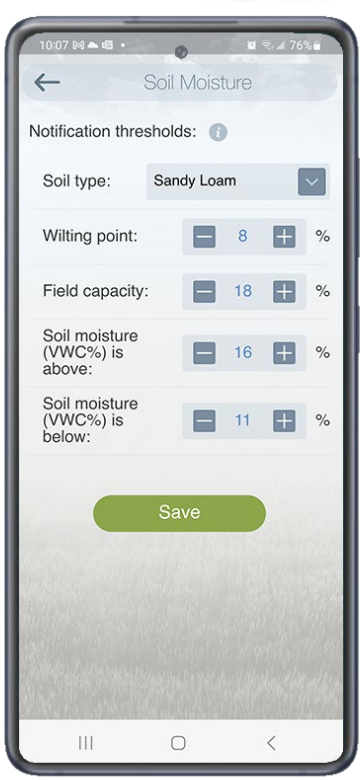


Figure 24

- To modify an Electrical Conductivity (EC) sensor's threshold value:
  - Use the + or – buttons to adjust the four (4) thresholds to the desired values
  - Email and/or SMS alert notifications will be sent out when the deciSiemens per meter (dS/m) value is:
    - below the **Critical Low EC** threshold
    - below the **EC is below** warning threshold
    - above the **EC is above** warning threshold
    - above the **Critical High EC** threshold
  - click on the **Save** button

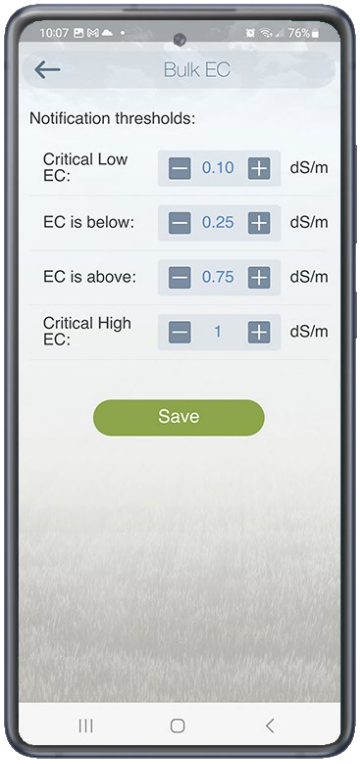


Figure 25

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Add inversion alert

NOTE: This option is only available if the Kernel6 has been configured with two (2) temperature sensors connected.

Pressing on Add inversion alert will display the page for settings temperature thresholds for sending alert notifications if a temperature inversion is occurring.

To configure the thresholds:

- Click on the **Choose sensor …** field under the heading Sensor at the top and select the name of the sensor that is highest above the ground
- Click on the **Choose sensor …** field under the heading Sensor at the bottom and select the other sensor
- Use the + or – buttons to adjust difference between the two sensor readings which will trigger a temperature inversion alert notification to be sent

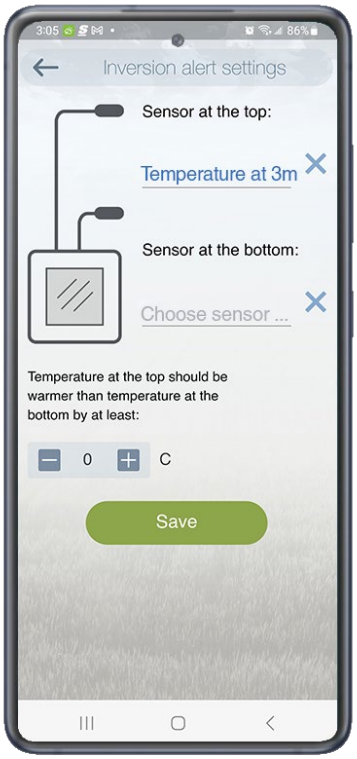


Figure 26

2.2.6 Choosing a location

With the Kernel6 now activated, it is ready to be installed in the field. Choosing the correct location in a field is critical to getting the most accurate and reliable information for basing your decisions. Consider the following when choosing a location to install the Kernel6:

For all sensor types

- make sure that the location has a strong **cellular/mobile internet connection**. Use the signal strength bars on your phone to determine if the cellular service is strong enough in the location. Attempt a call to ensure you have a strong, clear signal;
- install the Kernel6 **away from heavy machinery routes** (e.g., harvesting machines, sprayers, etc.). If the Kernel6 cannot be moved away from these routes, unmount the Kernel6 prior to equipment movement to avoid damaging the Kernel6 and sensor cables;
- make sure to use the **location mapping** feature in the CCMobile App to record the precise installation location. Once the crop is in full foliage or if crop covers are installed, it can be hard to find the Kernel6;

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- NEVER leave the Kernel6 on the ground. While the Kernel6 enclosure provides strong ingress protection from water, a Kernel6 lying in water for a prolonged period can result in damage to the internal electronics;
- Make sure the Kernel6 is sending data from this location, and the data is being transmitted to the CCMobile App before mounting the Kernel6.

For all temperature sensor models

- select a spot that is not protected by trees, hedges or buildings. These can skew the temperature readings when winds are coming from specific directions. If possible, the Kernel6 should be located away from any wind obstructions;
- do not allow the temperature probe end to remain in contact with metal object (like metal poles/stakes). These can result in skewed temperature readings. Use tie wraps or cable ties to keep the probe ends away from these objects.

For all soil sensor models

- Identify the soil type in the field, as soil moisture retention varies significantly depending on it. An incorrect soil type setting can result in inaccurate readings for soil moisture, electrical conductivity (EC), unreliable alerts, and poor irrigation decisions;
- If the field contains a transition between two distinct soil types, consider installing a second station to ensure accurate data collection across both soil conditions;
- Choose a location that accurately represents the majority of the field. Avoid placing the Kernel6 in the following areas:
  - High spots: soil moisture and EC values may be lower than other parts of the field
  - Low spots: soil moisture and EC readings may be unusually high
  - Sloped areas: runoff can prevent water from soaking into the soil

For the most accurate readings, install the device on flat, level ground.

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2.2.7 Installing the Kernel6 in the field

Mounting to a Wood Post

If mounting to a wood post, you will need 2 x #10 1¼ or longer wood screws (not supplied) and a drill or screwdriver. Insert the 2 wood screws through the two (2) vertical holes in the centre of the Kernel6 Mounting Bracket.



Figure 27

Mounting to a Plastic Pole/Conduit

If mounting to a plastic pole or conduit, you will need a 4 ½ inch hose clamp or a plastic cable tie. Insert the hose clamp or cable tie through the two (2) elliptical holes on either side of Kernel6 Mounting Bracket and tighten.

If necessary, to prevent the Kernel6 from sliding down the pole, you can drill a small screw into the back of the plastic post below the hose clamp or cable tie.



Figure 28

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2.2.8 Installing temperature sensors

Temperature Sensors



Figure 29

Temperature sensors can be installed in air, water, or soil as follows:

To measure air temperature:

- choose where to install the high-accuracy temperature sensor(s) based on the conditions you want to measure. For example, grape growers may want to place temperature sensors at the top of the canopy and at the fruiting zone to understand what temperature the grapes are experiencing, accounting for shade and wind effects. A grower could also mount one high on a pole and another in the fruiting zone to monitor for temperature inversion. Berry growers may want to mount temperature sensors inside and outside of the protective cover so they can understand the efficiency of the protective cover and its effect on the yield. In cold climates, root vegetable growers have placed temperature sensors in the ground to monitor when mitigation actions should be used to their growing cycle.
- make sure the sensor is not close to any metal objects and take notice if the location is in shade or direct sunlight which can impact the temperature reading. Ensure that sensors and the station are not installed in areas where heavy machinery operates, to prevent accidental damage to sensor cables. Use cable ties or electric tape or similar products to fasten the sensor probe in the location of your choice. You can gently wrap the probe around the wire or the post to which you're mounting. If you're planning to move the Kernel6, make sure the fasteners can be removed without damaging the sensors.

To measure water temperature:

- the temperature sensor is a probe with a metal tip. Dip the metal tip in the water making sure the Kernel6 stays dry and away from the water. The Kernel6 is designed to be weatherproof but not for working while submerged.
- fasten the probe gently using cable ties or electric tape making sure it is not pulled too hard from the station which may harm the cable or the connector, which may prevent the Kernel6 from getting readings.

To measure soil temperature:

- follow the installation steps for installing a soil sensor.

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2.2.9 Installing soil sensors

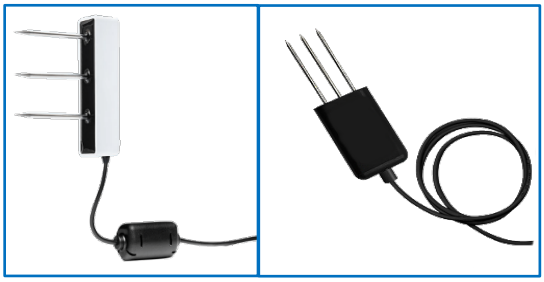


Figure 30

Protecting sensor cables – Protective Pipe

Soil sensor cables are particularly vulnerable to damage, as they are often buried underground or exposed to potential contact with farm machinery.

To help protect sensors cables as they extend from the ground to the Kernel6, the portion of sensor cable extending above ground should be protected with a section of 1 ¼ inch diameter ABS or PVC piping, partially buried in the ground. Where possible, the pipe should extend from the bottom of the installed Kernel6 to a minimum of 6 inches below ground.

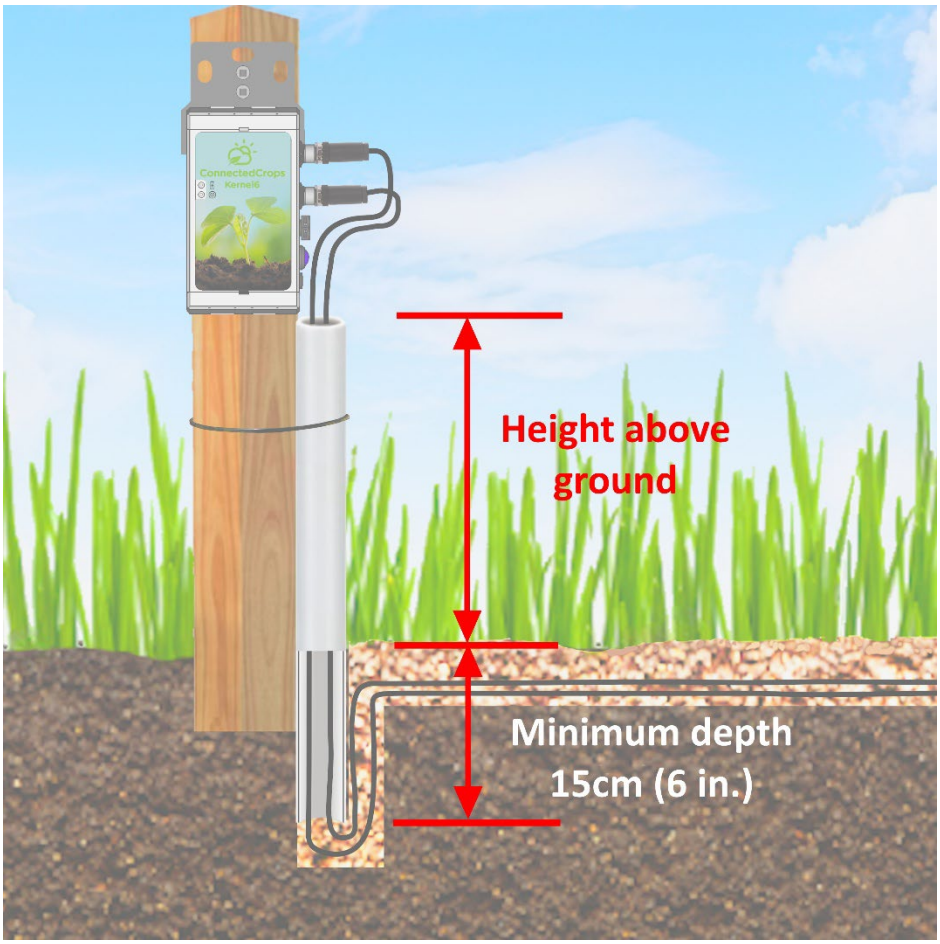


Figure 31

If installing 2 soil sensors, both cables can be enclosed in the same pipe.

To determine the length of pipe you need, the following formula can be used:

Minimum length of ABS Pipe required =
Height above ground
\+ **15 cm** (6 Inches)

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Protecting sensor cables – Buried cable indicators

Do not install a soil sensor directly at the base of the pole or post the Kernel6 is mounted to. The presence of the pole or post so close to the sensor can impact the water flow and lead to inaccurate soil moisture and soil EC readings. The soil sensor should be installed at least 1 metre (3 ft) from any post or pole that could affect the water flow.

It is NOT recommended leaving the 1 metre length of cable from the sensor to the Kernel6 station lying exposed on the ground. It should be buried in a trench to protect it from passing farm equipment.

This buried cable is still prone to damage by shovels from farm workers who may be unaware of the cable's existence. It is recommended placing markers along the path where the cable is buried. Coloured flag markers can be purchased online and provide a simple indicator to workers to be careful while digging in this area.

Installing soil sensors

When installing a soil sensor, it is important the sensor's prongs are inserted into densely compacted soil to ensure maximise contact between the sensor and the soil. If the soil sensor is placed in loosely compacted soil, air pockets around the sensor's prongs will accumulate water and result in inaccurate reading of the Volumetric Water Content percentage (VWC%), soil temperature and soil Electrical Conductivity values.

If installing two soil sensors on a Kernel6, each at different depths, wrap coloured tape around one of the cables: one piece close to the sensor and another close to the connector to help distinguish between the 2 sensors.

1. Dig a hole at the base of the post 2-3 inches deeper than the depth the ABS or PVC protective pipe will be buried,
2. Feed the connector end of one soil sensor through the ABS or PVC protective pipe and connect it to the assigned port on the Kernel6,
3. If installing a second soil sensor, feed the connector end of the second soil sensor through the ABS or PVC protective pipe and connect it to the other port on the Kernel6,
4. Attach the ABS or PVC protective pipe to the post using one or more zip ties, or pipe clamps so it's buried end is at the correct depth (Figure 27),
5. for the soil sensor, dig a hole to the desired depth using an auger, shovel or post hole digger. The hole should be at least 1 metre (3 feet) from the mounting post to ensure the post does not interfere with the waterflow near the soil sensor (Figure 28). Ensure at least one side of the hole has a clean, vertical cut to ensure the soil profile is not altered,

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6. Insert the soil sensor in the sidewall of the hole:
    a. For the TEROS 12 soil sensor,
        i. push the sensor prongs into undisturbed soil in the sidewall of the hole at the desired depth for this sensor. The white sensor housing and prongs should be oriented vertically and the cable from the housing should be oriented toward the surface
        ii. make sure the prongs are pushed in until the white sensor housing is flat against the hole sidewall
        iii. the sensor may be difficult to insert into extremely compact or dry soil. If you have difficulty inserting the sensor, try wetting the soil. NEVER pound the sensor into the soil
        iv. ensure the prongs do not come into contact with a rock or any other debris. If necessary, move the sensor to the left or right to insert into clean soil



Figure 32

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b. For the A05 soil sensor,
   i. push the sensor prongs into undisturbed soil in the sidewall of the hole at the desired depth for this sensor. The prongs should be oriented vertically and the cable from the housing should be oriented toward the opposite sidewall of the hole
   ii. make sure that the prongs are pushed in until the molded-plastic body is flat against the hole sidewall
   iii. the sensor may be difficult to insert into extremely compact or dry soil. If you have difficulty inserting the sensor, try wetting the soil. NEVER pound the sensor into the soil
   iv. ensure the prongs do not come into contact with rocks or any other debris. If necessary, adjust the sensor position to insert into clean soil

> NOTE: Orienting the prongs vertical (i.e., perpendicular to the surface of the soil) minimizes the impact on normal downward water movement and the potential for water pooling on the sensor prongs

7. if possible, develop a pattern of orienting the direction of the prongs so that if you needed to dig up the sensor in the future, you could take it out safely and easily (e.g., always orienting the prongs directly away from the post or always orienting the prongs facing North)
8. If installing a second soil sensor, repeat step 6 for the second soil sensor making sure to locate it at the desired depth
9. Dig a trough roughly 10 cm (3 - 4 inches) deep between the post hole and the soil sensor hole and place the sensor cables in the trough
10. Backfill the hole containing the soil sensors. Carefully pack down the soil using your hand or a trowel as you backfill the hole to match the bulk density of the surround soil to ensure the waterflow is consistent with the surrounding soil. Be careful not to disturb the soil sensor or its cable while backfilling
11. Backfill the hole with the ABS or PVC protective pipe and compact the soil to ensure the soil is roughly the same bulk density of the surrounding soil
12. gather any loose length of exposed sensor cable near the Kernel6 and feed it down the top of the ABS or PVC protective pipe. Having as little cable as possible exposed outside the pipe will minimize the chance of damage from farm equipment or from wildlife
13. fill the ABS or PVC protective pipe with soil too to prevent it from accumulating water or filling with other debris. Alternatively, cover the opening of the ABS or PVC protective pipe with electrical tape

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14. backfill the cable trough with soil and compact the soil to ensure the soil is roughly the same bulk density of the surrounding soil
15. if possible, use markers to indicate where the soil sensors are located and where the soil sensors are running to alert farm workers to be careful when digging in these areas.

Removing soil sensors

Dig carefully around the sensor(s) to make sure you don't break it. If Step 7 of the sensor installation process was followed correctly, the orientation of the prongs should already be known, making it easier to determine the appropriate location for digging. When removing the sensor from the soil, do not pull it out by the cable! Doing so may break internal connections and make the sensor unusable.

2.2.10 Confirming the Installation



Figure 33

With the deployment process completed, field conditions can be monitored through the CCMobile App. To check this:

- Open the CCMobile App on your phone
- Press and hold the **Reset** button on the side of the Kernel6
- Wait for approximately 3 minutes for the Kernel6 station to collect the sensor data and transmit it to the ConnectedCrops server
- Place your finger on Pull to refresh at the top of the screen and pull your finger down the screen to force the CCMobile App to download the latest data from the ConnectedCrops server

Once the screen has refreshed:

- The Last Communication value should indicate 0 minutes ago
- Some of the sensors may have been updated with different values

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ConnectedCrops™

Congratulations

You've successfully registered and deployed the Kernel6 station

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3 POWER AND RECHARGING

3.1 Kernel6 Transmission Frequency

The Kernel6 was designed using ultra-low power consumption components, allowing it to operate for a complete growing season on a single charge. It uses a single, rechargeable lithium-polymer battery.

The largest factors affecting power consumption are:

- The sensor(s): the time and energy required to power up the sensor, request and receive data, and power off the sensor
- The modem: the time to power up the modem, transmit the data to the ConnectedCrops server and put the modem to sleep mode

The power used by the station is directly related to how often data is being transmitted (the Transmission Frequency). On the Kernel6, a default transmission frequency has been set. Users can adjust the transmission from this default value but should follow the recommendations in section 2.2.5.

To determine the transmission frequency for your Kernel6 model:

- click on the Settings button on the bottom menu
- select Configure Station
- select your station from the list of your available kernel6 stations

The transmission frequency will be displayed on this screen.

3.2 Data transmission and battery level

The Kernel6 functionality depends on the current battery level:

- If the battery level is above 15%, the Kernel6 will operate normally and transmit data at the defined frequency
- if the battery falls below 15% of full charge:
    - the Battery LED light will be solid Red during the data transmission cycle
    - the Kernel6 will only send the most recent sensor readings. If some older data has been placed in the queue, this data will not be sent to preserve the battery power. The queued data will be sent when the battery level returns above 15%

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- if the battery falls to between 3% and 7% of full charge:
    - the Battery LED light will flash Red during the data transmission cycle
    - the Kernel6 will not transmit any data to the ConnectedCrops Cloud but will continue to gather data from the sensor(s) and hold the data in the queue
    - on the CCMobile App, the user will see that the Last Communication Time value will be a date in the past
- if the battery falls below 3%:
    - the Kernel6 will go into a deep sleep mode. The Kernel6 will show no activity if the Reset button is pressed and no data will be gathered from the sensor(s)

3.2 Battery Recharging

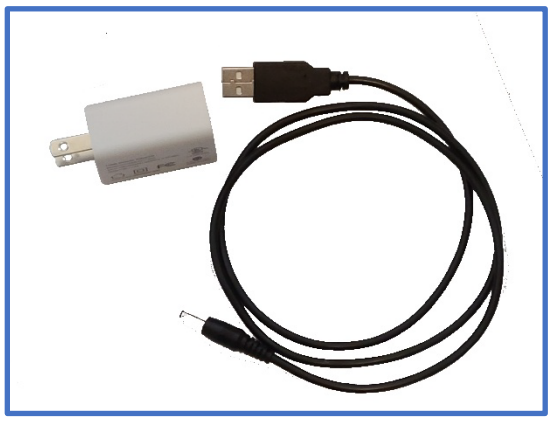


Figure 34

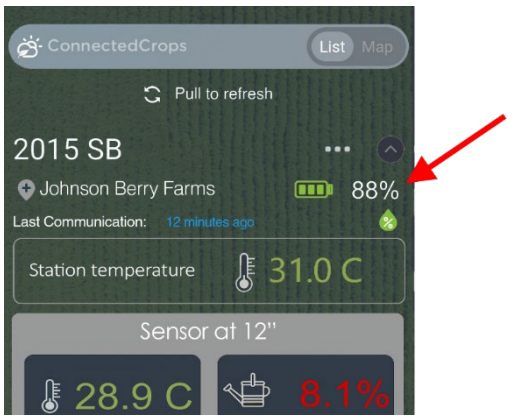


Figure 35

Included with your Kernel6 is a power adapter and USB-A cable with a 3.5*1.35mm plug.

To charge your Kernel6 station:

- Ensure the **Battery Disconnect Tool** is **NOT** attached to the Kernel6 mounting plate
- Attach the 3.5*1.35mm adapter to the end of the charging cable (if required)
- Plug the 3.5*1.35mm adapter into the power port on the side of the Kernel6
- Plug the adaptor into any 110V wall socket
- Monitor the battery percentage for the Kernel6 in the CCMobile App on your phone to determine when the battery is fully charged

> **DO NOT** use a different power adapter from the one supplied with your Kernel6 station. Doing so could damage the Kernel6 station.

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4: TROUBLESHOOTING

The Kernel6 has 2 bi-colour LED lights on the front panel for status indication and troubleshooting. They will be either red, blue, or not illuminated.

While the Station is in its 'Wake' state, the LED lights will illuminate solid or flash red or blue to indicate the status of their respective features. While the Station is in its 'Sleep' state the lights are not illuminated to conserve battery power.

4.1 Status Lights

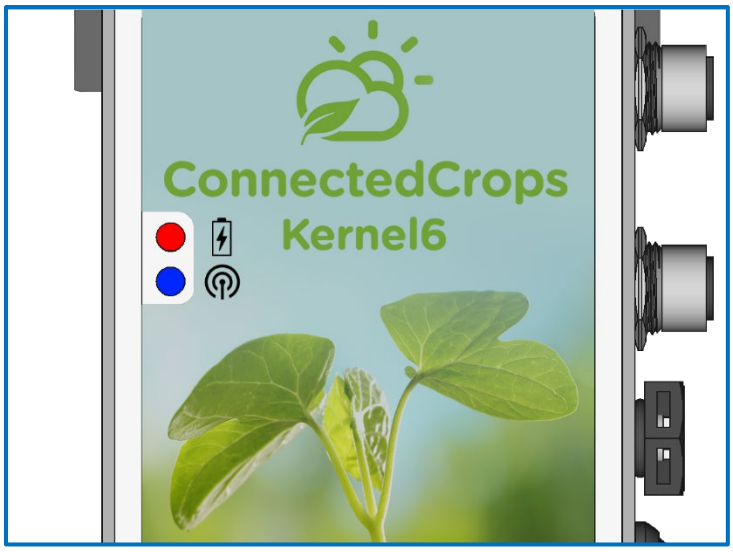


Figure 36

The Kernel6 station has 2 states:

- **Wake**: when the Station is communicating sensor data, and
- **Sleep**: when the station is performing no activities and operating with the lowest battery consumption possible.

While the Station is in its **Wake** state, these LED lights will illuminate and flash to indicate the status of their respective features. While the Station is in its **Sleep** state these lights are extinguished to conserve the battery.

	The Battery status indicator
	The Communication (connection) status indicator

On Kernel6 startup:

a. when the Battery Disconnect Tool is removed from the Kernel6 mounting plate
b. when the Reset button is pressed and released on the back of the enclosure
c. when the Kernel6 enters its Wake state for a data transmission cycle

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The lights will flash or illuminate steady to indicate the Kernel6's battery and commutation status. The tables below show the meaning of the solid or flashing light sequences for each light.

4.1.1 Battery LED

Battery Level Normal - Illuminates if the battery level is greater than 15% and is not charging	Solid Blue					
Battery Charging - Illuminates if the battery is charging	Blue	Off	Blue	Off	Blue	Off
Low Battery - Illuminates if the battery level is between 8% and 15% and not charging	Solid Red					
Very Low battery - Illuminates if the battery level is less than 8% and not charging	Red	Off	Red	Off	Red	Off
Battery being charged – will extinguish when a communication cycle is in progress. Extinguished when the battery is fully charged	Solid Green					

4.1.2 Communication LED

Transmitting - Actively transmitting data	Solid Blue					
Connecting – 1st Attempt - Attempting to connect to the cellular network - 1st attempt	Blue	Off	Blue	Off	Blue	Off
Connecting – 2nd and 3rd Attempts - Attempting to connect to the cellular network - 2nd and 3rd attempt	Red	Off	Red	Off	Red	Off
Cannot Connect - Illuminate if unable to connect to the ConnectedCrops server	Solid Red					

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4.2 Troubleshooting Scenarios

4.2.1: Kernel6 registration issues

(1) Signed up but never got a confirmation email

If you are signing up in the CCMobile App for the first time and you did not receive a confirmation email:

- check your email spam folder
- it is possible you mistyped your email address when registering the first time. Try going through the Sign Up process again

If you still don't receive a confirmation email or you get an error message on CCMobile App indicating that the email address used during your subsequent attempt to signup is already used, please contact support@connectedcrops.ca and supply the email addressed used to register for the ConnectedCrops account.

(2) Station registration error: Station already exists

If you receive a message during the registration process that the Kernel6 is already registered, perform the following steps to see if you can identify this Kernel6 station. In the CCMobile App:

- open the CCMobile App on your phone
- click on the Settings button on the bottom menu
- select Configure Station
    - select the first ConnectedCrops station from the list of stations registered to your farm operation
    - look at the Serial # listed at the top of the screen
    - compare this to serial number indicated on the QR Code on the side of the Kernel6
    - repeat these steps for each ConnectedCrops station registered to your farm operation

If any of your stations has a matching serial number, the Kernel6 is already registered and cannot be registered again.

If you can't identify the station, please contact support@connectedcrops.ca and supply the Serial Number that is printed on the QR Code on the side of the Kernel6.

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4.2.2: Kernel6 communication issues

The Kernel6 uses a cellular modem to connect to one of the cellular networks available in your area. It is not tied to any one specific cellular network. The Kernel6's modem will automatically establish the strongest network signal in the area and communicate on this service provider.

(1) Kernel6 has not communicated according to its schedule

The Kernel6 station lights are illuminating, and the station appears to be functioning, but you don't see any updated data in the CCMobile App:

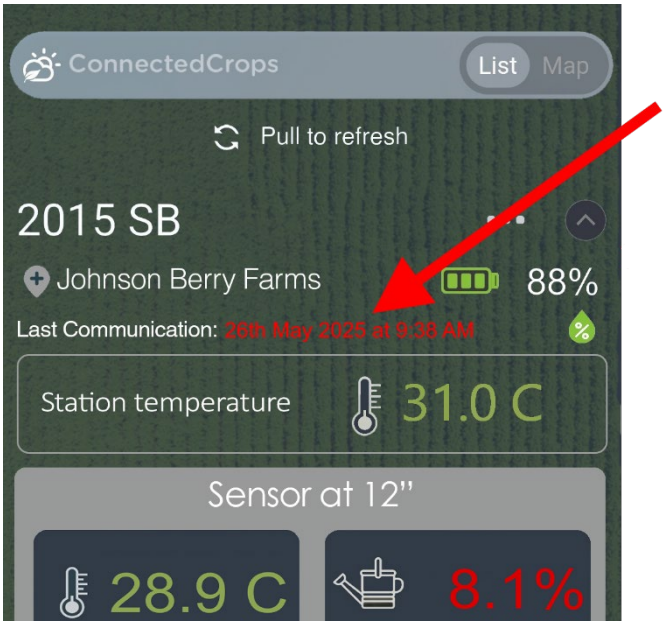


Figure 37

- try to reset the station by pushing the reset button. This will restart the station and attempt to send new sensor readings

Battery LED	Comm. LED	What is happening	What to try
Flashing Red		The battery is too low. To conserve battery power, the Kernel6 station will not send data if the battery is below 8%. The sensor data is collected but stored in the station's queue until the battery is above 15%	Charge the station's battery fully and then check if data is received on the completion of the next communications cycle

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Battery LED	Comm. LED	What is happening	What to try
Solid Blue	Flashing Blue then flashing Red	The Kernel6 cannot connect to the cellular network	See the section below with detailed instructions on what steps to take
Solid Blue	Flashing Blue then solid Red	The Kernel6 is connected to the cellular network but cannot connect to the ConnectedCrops Server, or the Kernel6 has received an error from the ConnectedCrops server	Contact the ConnectedCrops support team at support@connectedcrops.ca, explaining the issue and provide your contact information including a phone number. A support team member will perform an initial investigation and contact you.

The Kernel6 cannot connect to the cellular network

If the station is struggling to connect, it could be an indication:

- the cellular signal strength is poor where the station is located
  - Check the cellular signal strength using your mobile phone while near the station and attempt to connect to the internet
  - Try another location
    - Move the Kernel6 station to another location where you know the cellular signal strength is strong
    - press the Reset button on the side of the kernel6
    - wait for a few minutes for data to be transmitted to ConnectedCrops server and downloaded to the CCMobile App on your phone
    - check the station in the CCMobile App to see if new data was received
- the cellular network could be having temporary issues. Check the station again in a few hours to see if the issue resolves itself. If you have another ConnectedCrops Station, see if it is also experiencing issues

if none of these activities result in the station re-establishing communication, please contact support at support@connectedcrops.ca and explain the issue you are experiencing.

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(2) Kernel6 lights are not illuminating

- is the Battery Disconnect Tool removed from the mounting plate on the Kernel6? If it is still attached to the mounting plate, the Kernel6 will not receive power
- is there another powerful magnet near the Kernel6 station? The Battery Disconnect Tool uses a magnet to disable power to the Kernel6 station. The presence of another powerful magnet near the Kernel6 could cause the switch inside the station to disable the power
- do the station lights illuminate, even briefly, when the Reset button is pressed on the side of the Kernel6? If they do illuminate briefly but then extinguish, the battery could be very low. Recharge the battery until it is at 20% capacity or more on the CCMobile App, then press the Reset button on the side and see if the Kernel6's LED illuminate
- inspect for physical damage to the Kernel6's enclosure. If water has penetrated the enclosure, it could damage internal electronics and prevent the station from operating
- power cycle the Kernel6 station. To do this:
    - get the Battery Disconnect Tool that was attached to the mounting plate on the Kernel6 prior to registration
    - place the Battery Disconnect Tool on the mounting plate in the location as shown in Figure 34
    - wait for 5 seconds
    - remove the Battery Disconnect Tool from the mounting plate and place it back in the original packaging or in a safe place

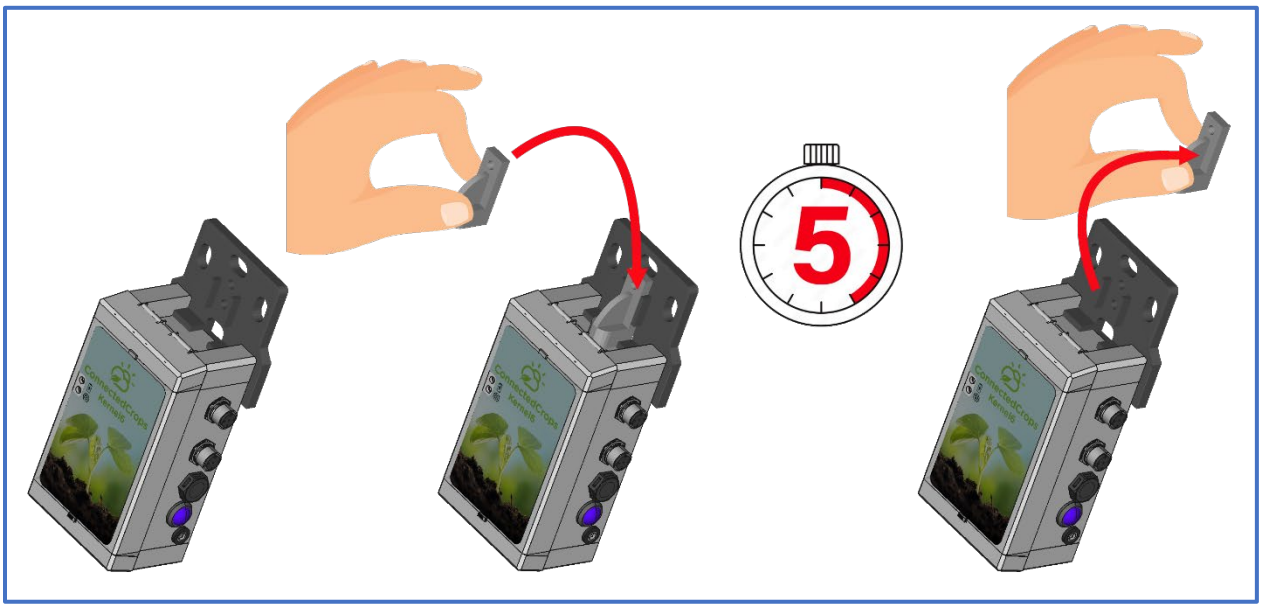


Figure 38

If none of these solutions corrects your problem, please contact support@connectedcrops.ca.

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4.2.3: Sensor issues

(1) Sensors are connected but show “Sensor not connected”

If you encounter the message “Please connect the sensor” in the CCMobile App for one (or more) of your sensors, this indicates the Kernel6 is not able to receive data from the indicated sensor. In the CCMobile App:

- Check if the port is configured for a sensor and if the sensor is connected to that port. If you are only connecting one sensor to the Kernel6, you may have connected the sensor to the wrong port. In the CCMobile App:
    - click on the Settings button on the bottom menu
    - select Configure Station
    - select the Kernel6 from the list
    - select Sensors Setup
    - Confirm which port the sensor is configured to be in
- is the connector screwed all the way in? Disconnect and re-connect the sensor, making sure you align the pins correctly, and then turn the metal ring on the connector clockwise until you feel resistance. DO NOT use tools to tighten the connector. The connector should be finger tight. If you feel it offers too much resistance:
    - remove the connector and make sure the pins are straight
    - make sure the key guide on the sensor connector (male) is properly aligned with the key slot on the station connector (female) when inserting the connector. It helps to rotate the sensor connector around with a light amount of force applied until you feel the slot and key align and the sensor connector inserts up to the threads
    - make sure the threads are properly aligned before connecting the sensor fully. Never apply excessive torque when connecting the sensors as this could mean the threads are not aligned. It helps to rotate the sensor connector counterclockwise initially until you feel the threads align

  Once the sensor cable has been reconnected:

    - press the Reset button on the side of the Kernel6 station
    - wait for the communication cycle to finish (2 LED lights are extinguished)
    - press the Reset button on the side of the Kernel6 station
    - wait for the communication cycle to finish

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    - in the CCMobile App, swipe down from the top of the screen to refresh the page and see if there is a sensor reading in place of the “Please connect the sensor” message
- confirm that when you disconnected and reconnected the sensor connector, there was no water leaking from the sensor connector or indication of water penetration
- make sure that the sensor itself does not have any physical damage or breaks in the cable that might affect the signal
- if you also have Model5 ConnectedCrops stations, make sure you have the correct type of sensor for a Kernel6 station. Sensors for Model5 stations are not compatible with Kernel6 stations

If none of these solutions corrects your problem, please contact support@connectedcrops.ca.

(2) Soil Sensor “Please install sensor in soil” reading

If you are seeing the message “Please install sensor in soil” in the CCMobile App for a Teros-12 or CC-A05 sensor, it means the readings received from the soil sensor are consistent with the sensor not being in soil.

- if the sensor is in the air (i.e., not installed in the ground) this is expected. Installing the sensor in the ground will rectify the situation
- if the sensor is buried in the ground, there could be an air gap around the sensor. This could occur if:
    - the sensor was initially installed in loosely packed soil and the air between the prongs is preventing an electrical conductivity reading from occurring
    - if the sensor has been installed for a while but environmental conditions, water pockets, or machinery operating close by have resulted in an air pocket forming around the sensor prongs

      In either case, dig around the sensor carefully and re-install it into the sidewall of tightly packed soil properly.

If none of these solutions corrects your problem, please contact support@connectedcrops.ca.

(3) Sensor “Error” reading

If you receive the message “Error” for a sensor in the CCMobile App, it means the value being returned by the sensor is outside of its normal operating range:

- check the sensor and its cable for physical damage or cuts

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- if possible, move the sensor to another location to see if the readings appear in the CCMobile App
- disconnect and reconnect the connector to the station
- press the Reset button on the side of the station

If none of these solutions corrects your problem, please contact support@connectedcrops.ca.

4.2.4: Power issues

(1) Kernel6 station doesn't seem to be charging

The Kernel6 station battery must be charged using the adapter/cable provided with the station. If you have multiple Kernel6 stations, or a combination of Kernel6 and Model5 stations, the battery chargers are interchangeable and can be used on any of your stations.

To confirm if the battery is charging:

1. Make sure the charging cable is fully inserted into the side power port of the Kernel6, and the adapter is plugged into a wall socket
2. Remove the Battery Disconnect Tool from the mounting bracket to supply power to the station
3. The Battery LED will turn green while the battery is charging
4. The Battery LED will turn green while the battery is charging. It will change to Blue or Red while a communication cycle is in progress and will return to green when the communication cycle is completed
5. Check and record the battery % level for this station in the CCMobile App
6. Allow the battery to charge for an hour and then check the battery % level for this station in the CCMobile App. If the battery % level has increased, then the battery is charging.
7. The battery light will extinguish when the battery is fully charged, or the adapter/cable is unplugged

If the battery % level does not increase while the Kernel6 is plugged into a wall outlet via the charging cable:

1. There could be a problem with the charging cable - If you have another Kernel6 station, get the charging cable from that station and try the charging steps above again
2. There could be a problem with the battery - Please contact support at support@connectedcrops.ca

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4.2.5: Notification issues

(1) Not Receiving email, SMS text messages, or phone calls when sensor thresholds are exceeded

If you completed all the steps during the deployment process, you should be receiving notifications (email, SMS text messages and/or Phone calls) if any of your sensor values exceed their defined thresholds. If you're not receiving any notifications, or you want to adjust the thresholds, the following steps can be performed.

Confirm Alerts are configured

- Navigate to Settings > Configure Station
- select the station from the list
- Select Receive notifications via…

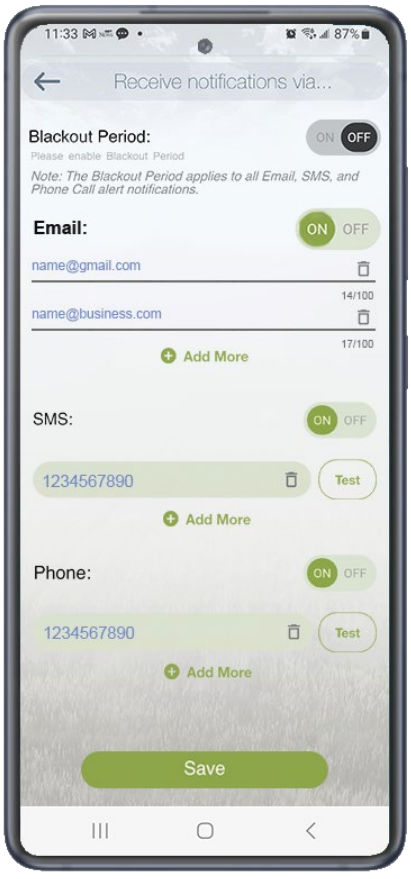


Figure 39

On this page:

- confirm the slider for **Email**, **SMS** and/or **Phone** alerts is enabled
- ensure the email addresses, SMS numbers or phone call numbers are correct
- use the Add More button to add missing emails addresses or phone numbers
- use the garbage can icon to removed unwanted email addresses, SMS numbers or phone call numbers

Remember: Email addresses, SMS numbers and Phone Call numbers are configured for an individual Kernel6 station. If you have multiple Kernel6 stations, you need to add these addresses and phone numbers to each individual station.

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Check the status of the Blackout Period

A daily **Blackout Period** can be defined for a Kernel6 station during which emails or SMS messages will not be sent. A Blackout period can be created if, for example, you do not want to be disturbed at night by your phone's sounds as these alerts are received.

If you think you are not receiving all email or SMS messages:

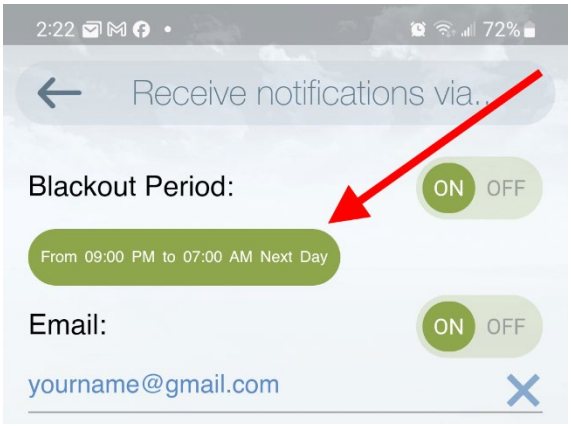


Figure 40

- Navigate to Settings > Configure Station
- Select the station from the list
- Select Receive notifications via...

If a Blackout Period has been defined, this page will display the hours of the blackout period.

- ➢ The Blackout Period can be enabled or disabled using the use the slider
- ➢ The Blackout Period can be edited by clicking on the current Blackout Period hours
- ➢ Only one blackout period can be defined per Kernel6 station

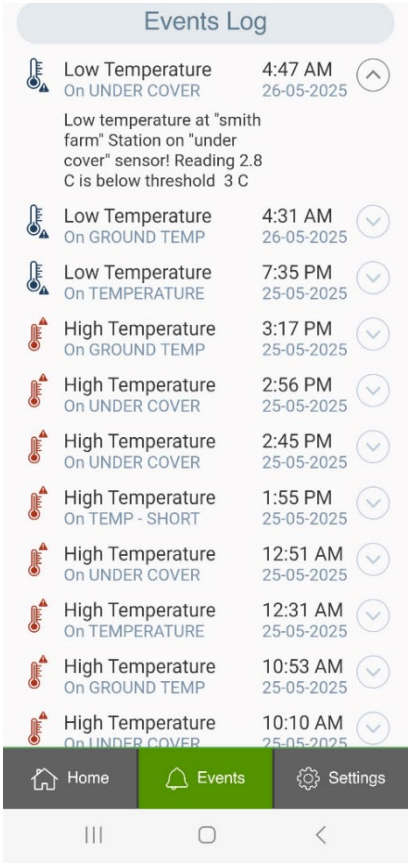


Figure 41

To see messages not sent because of the blackout period, check the message history on the Events page:

- click on the back arrow in the upper left corner of the CCMobile App page until the main dashboard page is displayed
- select Events on the menu at the bottom of the dashboard page
- on the **Events Log** page, look for events that occurred during the Blackout Period. Since the **Events Log** page displays events for all your ConnectedCrops stations, you may need to click on the down arrow beside an event to see which station and which sensor generated the event.

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4.2.6 CCMobile App issues

(1) Can't log in to the CCMobile App

If you experience trouble logging into the CCMobile App:

- check that you have a strong cellular or Wi-Fi signal and can connect to the internet. If your signal is weak, try moving to an area with better coverage or switch between Wi-Fi and cellular and try to login again
- if you've forgotten your password, please click on the Forgot your password? link on the Sign In page in CCMobile App
- if you can't remember your username, please contact support@connectedcrops.ca and supply your name and the name of your farm operation. The ConnectedCrops support team will use the mobile phone number we have associated to your account to validate your identity and help reestablish your credentials.

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5: SPECIFICATIONS

5.1 Kernel6 Specifications

The Temperature range the station is expected to operate under is: -20°C to 50°C / -4°F to 122°F

Enclosure:

- Polycarbonate UL 94 V-0 enclosure, flame resistant, self-extinguishing, suitable for outdoor use
- Designed to meet IP 66/ IP 68 & NEMA 4, 4X, 12 & 13 ratings.
- UV stabilized for outdoor use
- Dimensions: 151mm x 80mm x 80mm (5.94” x 3.15” x 3.15”)

Battery:

- Rechargeable Lithium-polymer battery with protective circuit
- Voltage: 3.7V
- Capacity: 10,000 mAh

Modem:

- Type: Simcom SIM7080G Multi-Band using LTE Cat M1
- Frequency: 850 MHz to 1.9 GHz
- Operating temperatures: -40 °C to +85 °C
- Certifications:
    - FCC (US), ISED (Canada), PTCRB, GCF
    - Carrier: Rogers, Telus, Bell, AT&T, T-Mobile, Sprint, and Verizon

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5.2 Sensors Specifications

Temperature Sensor:

- Cable Length: 1m (3.3') or 3m (9.9')
- Temperature Range: -55°C to +125°C (-67°F to +257°F)
- Temperature Accuracy: ±0.5°C Accuracy

⚠ NOTE: Please note that the CCMobile App provides readings between -55°C and 70°C only and considers values out of this range as "Error" values.

Teros 12 Soil Sensor:

Volumetric Water Content (VWC)	
Mineral Soil Calibration - Range	0.0 - 0.70 m^3/m^3
Soilless media Calibration - Range	0.0 - 1.0 m^3/m^3
Apparent Dielectric permittivity (ε_a)	1 (air) to 80 (water)
Resolution	0.001 m^3/m^3
Accuracy	± 0.03 m^3/m^3
Temperature	
Range	-40 to +60 °C
Resolution	0.1 °C
Accuracy	± 1.0 °C from -40 to 0 °C ± 0.5 °C from 0 to +60 °C
Bulk Electrical Conductivity (EC_b)	
Range	0 – 20,000 µS/cm
Resolution	1 µS/cm
Accuracy	± (5% +10 µS/cm) from 0-10,000 µS/cm ± 8% from 10,000-20,000 µS/cm
Other	
Cable Length	5 metres
Supply Voltage	6 V

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CC-A05 Soil Sensor:

Volumetric Water Content (VWC)	
Mineral Soil Calibration - Range	0.0 - 0.70 m^3/m^3
Soilless media Calibration - Range	0.0 - 1.0 m^3/m^3
Apparent Dielectric permittivity (ε_a)	1 (air) to 80 (water)
Resolution	0.001 m^3/m^3
Accuracy	15%
Temperature	
Range	-40 to +80 °C
Resolution	0.1 °C
Accuracy	± 0.5 °C
Bulk Electrical Conductivity (EC_b)	
Range	0 – 20 dS/m
Resolution	0.01 dS/m
Accuracy	± 5% from 0-7 dS/cm
Other	
Cable Length	5 metres
Supply Voltage	6 V

6: CONTACT US

Sales Support: info@connectedcrops.ca
(905) 629-6654

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