
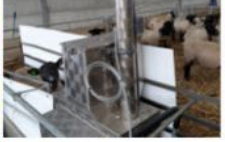
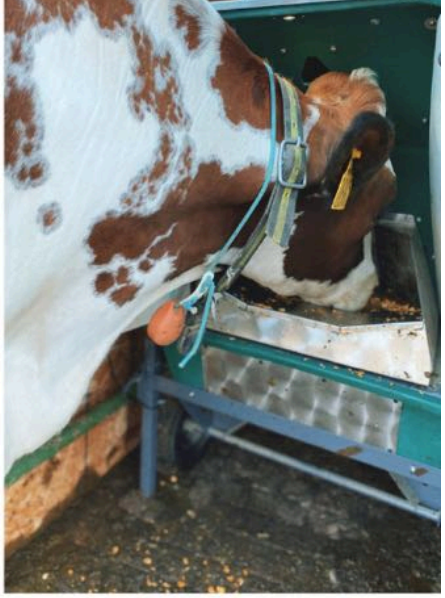


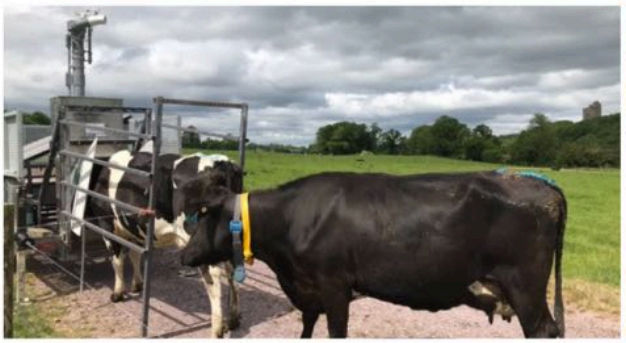

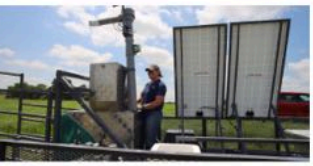

GreenFeed Instruction Manual

C-LOCK INC.

Measure and Control
Feed Intake and Emissions

Join the *Global Standard*

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1. Introduction

1.1. Science and Mathematics of GreenFeed

GreenFeed (TM, Patent Pending) is a system to monitor the metabolic gas composition of animals in a cost-effective, non-intrusive way. Its design and measurement capabilities have been initially tailored to the measurement of metabolic gases emitted from ruminants. The system is optimized to quantitatively capture the breath of cattle and to analyze the emitted gases for trace constituents, including methane (CH_4), carbon dioxide (CO_2), and water-vapor.

GreenFeed is an important tool for research scientists as well as for those responsible for the husbandry of animals, especially ruminants, because it provides new data that allows scientists and producers to monitor trace gas emissions with a high time-resolution in near-real time, remotely from a large number of individual animals in a cost-effective and non-intrusive way. The trace gas composition and flux rates are important because they can reflect changes in the animal's physical and biological condition. This can lead to improved animal health, higher feed efficiency, lower greenhouse gas (GHG) emissions, increased production and lower costs to operators and to society.

The purpose is to attract animals to a specific location periodically throughout the day for at least five minutes so that emitted gases can be measured at the location without interfering with an animal's normal routine. For this purpose, an automated feeder has been developed which will attract the animals. While the animals are at the station, air is drawn past the animal's nose and into a collection pipe. The concentrations are analyzed in the pipe second-by-second using a non-dispersive infrared analyzer. A flow meter is also used to measure the pipe flow. In addition, a number of strategies have been implemented to ensure that a uniform flow measurement and mixed sampling measurement are obtained. Once the methane concentrations and air flow rates are known, it is possible to calculate a mass emissions rate from the animal while it is visiting the feeder.

The mass flux of CH_4 and CO_2 is calculated by multiplying the measured increase in concentrations from ambient levels related to the animal, by the measured airflow rate, and then applying the ideal gas laws. Also, a "capture" rate adjustment factor, as discussed below, is applied. The correct dimensional conversion factors are also used.

$$CH_{4volume} = F_c * C_R * \sum_{tp} \left[\Delta_t * (CH_{4avg} - CH_{4bkgrnd}) * Q_{air} \right]$$

Where:

- C_R = Capture rate of emissions into collection pipe, determined using the tracer (%)
- Δt = Time period over which emissions are measured (1 second)
- CH_{4avg} = Average concentrations during the measurement period (%)
- $CH_{4bkgrnd}$ = Background concentrations of CH_4 (%)
- Q_{air} = Airflow rate during the measurement period (flow per unit time)
- F_c = Dimensional factor

Once the volume of CH_4 is calculated, the number of CH_4 molecules per unit time can be calculated using the ideal gas law. Then, the mass of CH_4 emitted per unit time can be calculated by multiplying by the molecular weight of CH_4.

With ever-changing wind currents and movement of the animal's head, it is important to collect additional data to characterize the "catch" rate of the animal's breath that is pulled into the feeder. To do this, multiple techniques have been implemented to help understand the catch rates and mixing conditions inside the feeder, these techniques include:

- Incorporating a "head" position sensor inside the unit.
- Monitoring the wind speed and direction to ensure 100% capture of emissions
- Including wind-shielding "wings" on the GreenFeed that block wind currents

The aerodynamics of the feeder have also been designed to capture as much of the emitted gas from the animal as possible under a wide range of environmental conditions. C-Lock has found that even in 55 km/hour head-on winds, it is possible to capture approximately 70% of the animal's breath into the sample pipe.

Figure 1 includes a typical 20-minute snap shot of "Head/Nose Position", "CH_4", and "CO_2" concentrations from a GreenFeed stand-alone feeder. This data represents a series of different animals. In the data, it is possible to see each eructation event (typically every 30-45 seconds), the metabolic CO_2 rates, and CO_2 spike that is emitted with each associated eructation.

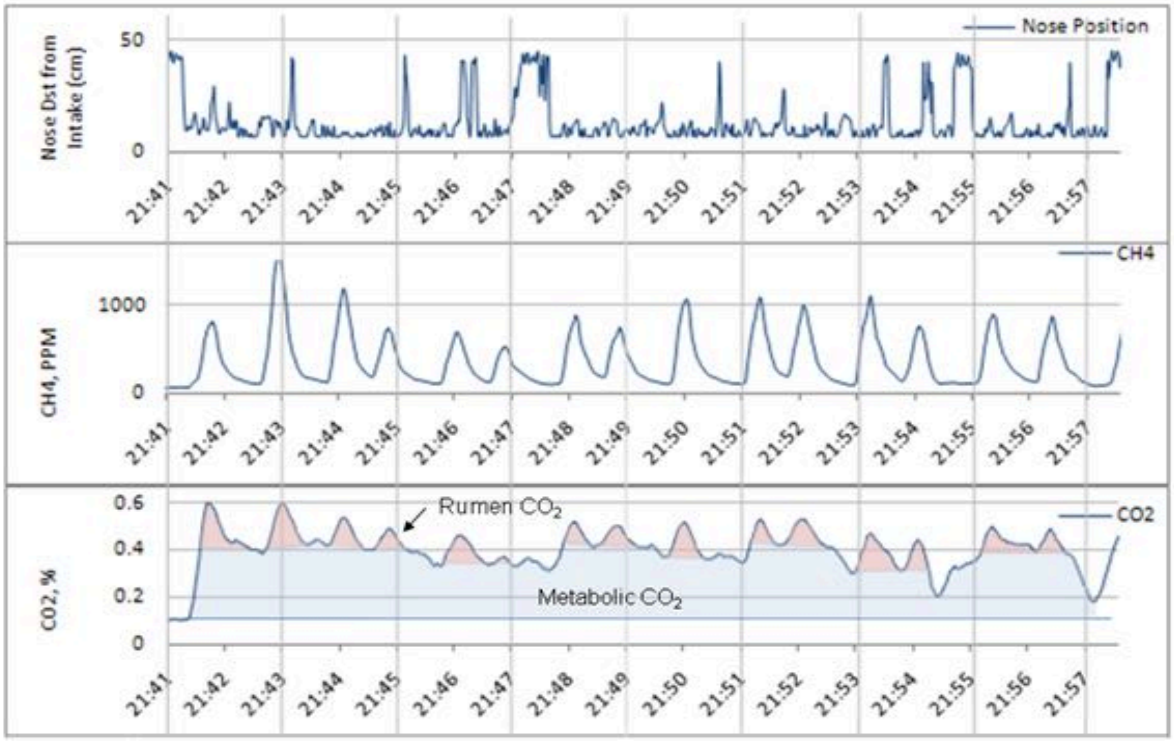


Figure 1) Typical CH_4 and CO_2 Data Obtained from the GreenFeed System

As GreenFeed is used in the field, and data is collected, new potential uses of the data are even still being discovered. For example, as highlighted in **Figure 2**, an animal enters the feeder and does not immediately eructate. However, the concentration of methane increases a small amount before an eructation occurs. We believe that this increase is associated with methane expelled through the lungs, which is a normal part of the physiological process in the animal. It therefore should be possible to estimate the ratio of lung methane compared to eructated methane.

Once GreenFeed collects the data, the data is automatically processed and the results are calculated for each animal. A daily report for the herd average and animal specific emissions is emailed to the user. The user can access the controls for the feeder through a user-friendly, secure, web-based interface.

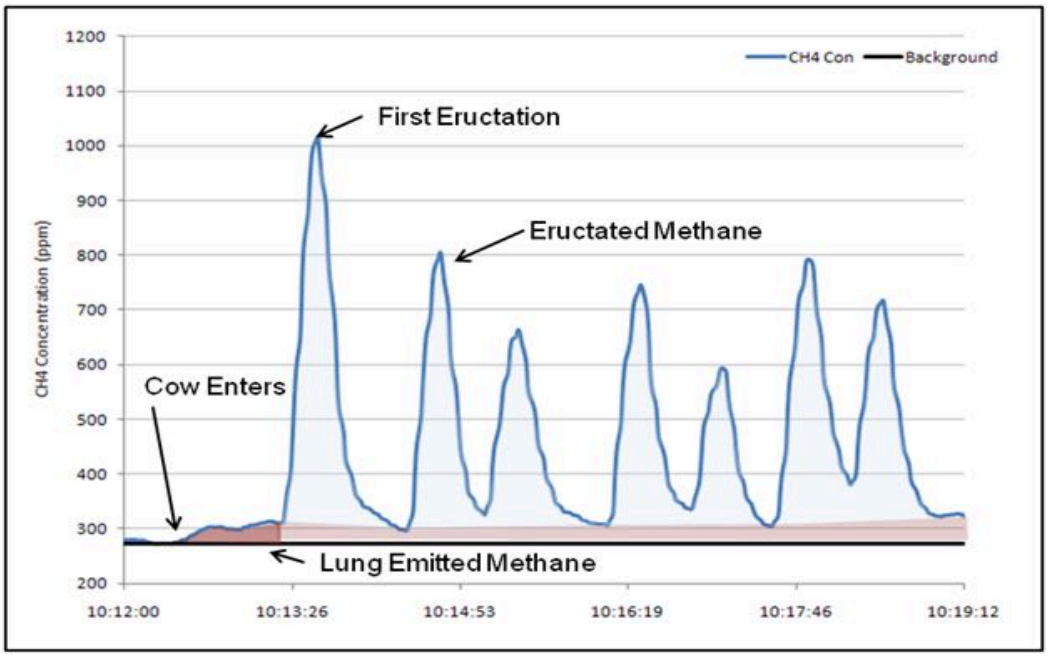


Figure 2) Example Data from GreenFeed System, Methane Production, by Source

The GreenFeed system has also been designed so that each animal can be fed a specific amount of food supplement in a specific time period. In addition, with multiple feeders, specific animals could be allowed to eat at one feeder and others at a different feeder with different feed types. Therefore, the animals can be treated differently, and the system is very flexible for adapting to a specific research program.

1.2. GreenFeed Component Layout

Figure 3 shows the layout of GreenFeed, including the essential components. Note the path of the animal's emissions:

1) From the animal muzzle, the air is collected through the feeding dish up through the primary air filter - where debris and large particles are removed
2) Next it is directed through the pipe past the air flow meter - this sensor is used to measure the air velocity, represented as Q_{air} in the equation from section 1.1
3) The air continues flowing upward through the fan, which introduces more eddy currents to ensure a homogenous mixture of the gas.
4) The fan exhausts the air out the outlet, but before exiting, a subsample of the gas is collected just before the air flow outlet.
5) The subsample is pumped from the fan exhaust down to the bottom of the system, passing through a secondary filter to remove finer debris, then into the electronics box, where the sample is processed for gas concentrations.

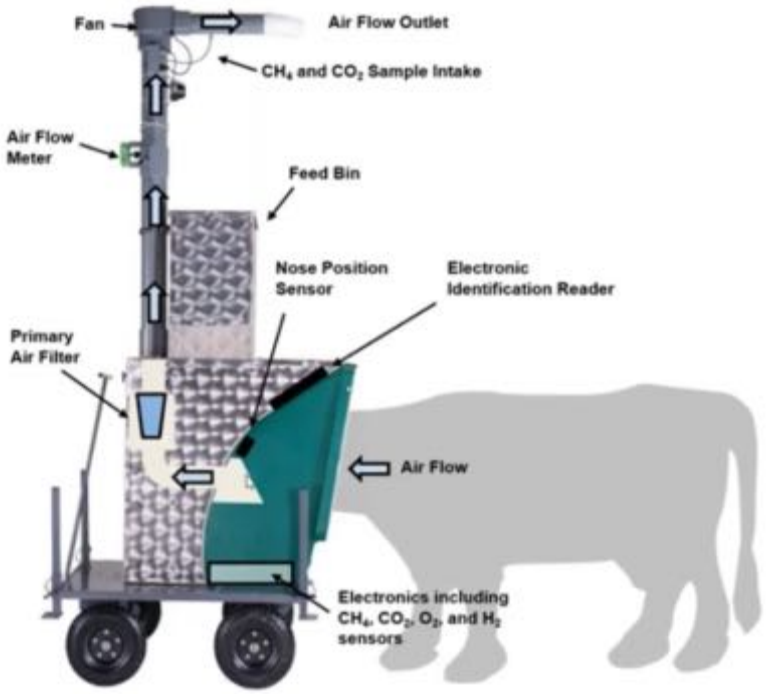


Figure 3) Sensors and Layout of Included Components in the Stand-Alone GreenFeed

1.3. Assembling GreenFeed

If you opted for a remote-assisted self-installation, then instructions for assembling GreenFeed vary depending on the particular system type. For walk-through instructions for your GreenFeed, please visit our playlists at https://videos.c-lockinc.com. There you will find video playlists for assembling:

- GreenFeed Pasture Trailer Setup
- GreenFeed Freestall Setup

These videos will walk you through assembling your system from first unpacking it, all the way to initial power-on. For answers to specific questions, please contact support@c-lockinc.com.

2. Setting Up GreenFeed

2.1. Selecting a Location for GreenFeed

Picking the location and layout for GreenFeed is crucial to collecting valid measurements. Some considerations include:

1) Ensuring enough airflow in the environment to prevent background gas concentrations from building up. A closed barn is not an ideal location without ventilation.
2) Preventing animals from gathering around the system, which will also increase the background concentrations.
3) Allowing only one animal to visit GreenFeed at a time. This requires the use of alleyways to prevent multiple animals from fitting into the feed area at once.
4) Protecting the back of GreenFeed, as there is important calibration and electrical equipment that must *not* be accessible by the animals.
5) Allowing enough space in front of GreenFeed to ensure that a ~2 meter alleyway fits comfortably in front, allowing a passageway for the animals to approach GreenFeed.
6) Ensuring there is enough space behind GreenFeed for a person to comfortably fit. Much of the maintenance that must be done on a regular basis requires being behind GreenFeed.
7) Using sturdy structures to anchor GreenFeed in place.
8) Freestall and Tie-stall GreenFeed setups require a standard grounded AC power outlet (110V or 220V). Please ensure you have a means of safely running power to the system. Ensure an electrician has verified the outlet is properly grounded and safe.

In a common freestall scenario, dedicating one of the stalls would be adequate, as long as there is ample space to put a 2 meter alleyway in the front.

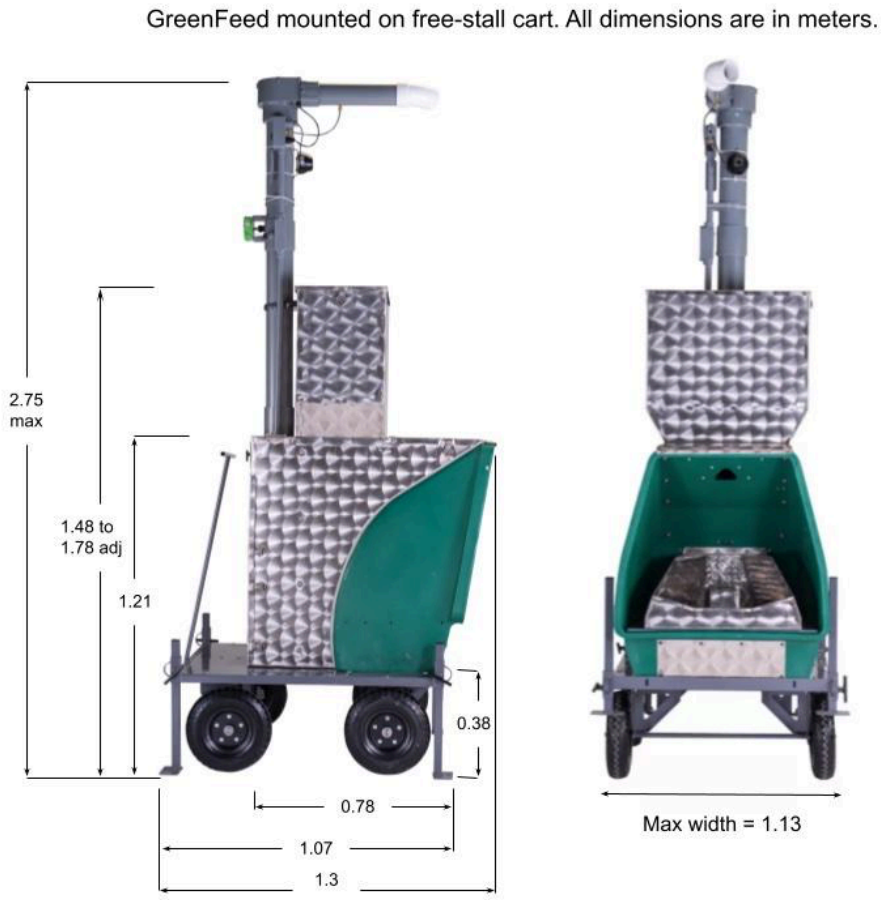


Figure 4) Dimensions of GreenFeed

2.2. Anchoring GreenFeed

Once a location is selected, GreenFeed must be anchored into place. Some common techniques include:

1) Using rebar or lead-anchors to secure it firmly to the ground.
2) Using alleyways, fencing, or walls in conjunction with chains or cables to secure the system.

In a Pasture Trailer, the weight of the trailer will be enough to secure GreenFeed.

If your system included a freestall cart, each of the 4 feet include a hole drilled into them. In addition, each corner has a metal loop. These are meant as a way to fasten the cart to the ground with anchors, rebar, and/or chains. See **Figure 5**.

Figure 5) Freestall Cart Holes for Securing GreenFeed

2.3. Setting Up Alleyways

Alleyways are crucial for GreenFeed to ensure that only one animal can access the system at a time. If multiple animals are present, the system cannot separate the emissions and attribute them to each animal.

In addition to alleyways, a solid wall must be used to ensure other animals cannot breathe into the system during a visit. Some examples of alleyway setups are shown below in **Figures 6 and 7**.

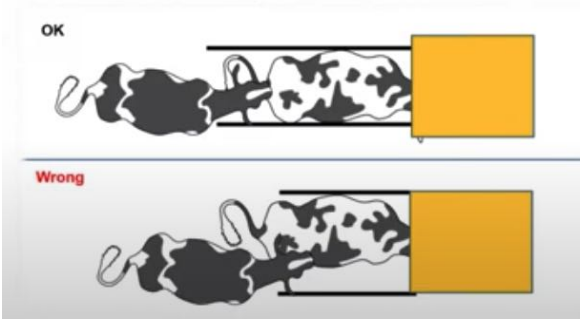


Figure 6) Alleyway Setups to Allow Only One Animal in GreenFeed at a Time

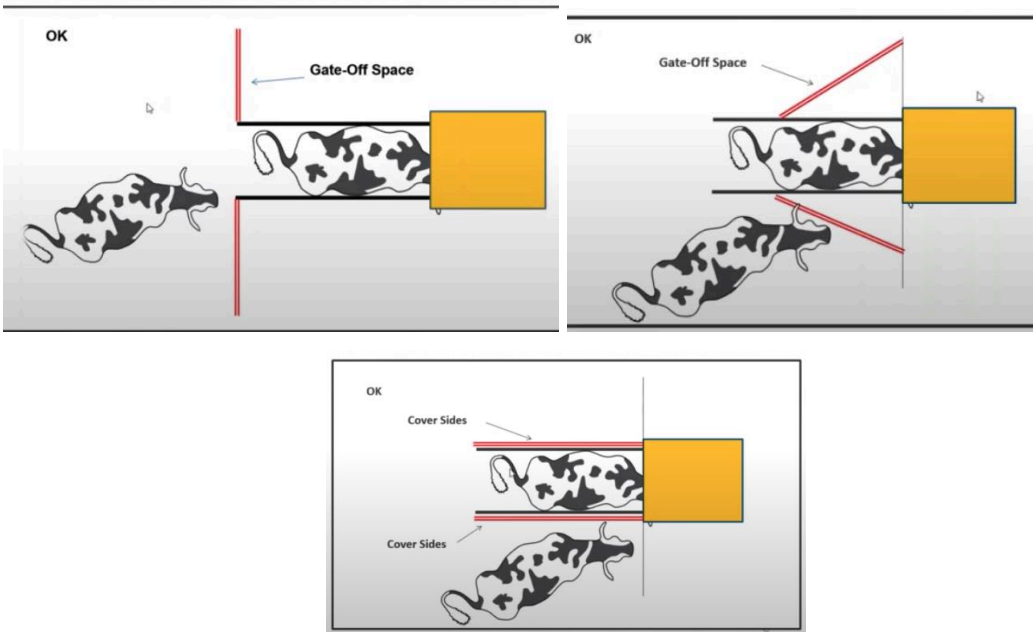


Figure 7) Alleyway setups to block other animals' breath (red lines represent a solid barrier)

2.4. Protecting GreenFeed

Although GreenFeed is built to withstand animal use, this only applies to the front of the system. Animal access to the back of the system must be prevented. In most freestall scenarios, this requires a sturdy barrier around the back of the system, preventing the animals from reaching and accessing the equipment (including cables and tubing). When designing the back barrier, please remember that a person must access the back for maintenance and cleaning.

2.5. Powering On GreenFeed

Once the system is in place and secure, powering on the system is simple.

- For freestall and tie-stall systems, simply plug in the power cord to a standard grounded AC outlet (110V ~ 220V, 50 ~ 60Hz). Ensure that the outlet as well as any extension cables used are properly grounded, and ensure your power cables are routed in a way that prevents animals from accessing them.
- For pasture trailer systems, the power switch is located in the battery box. See the GreenFeed Pasture Trailer Setup playlist - Trailer Walk Around video for instructions (https://videos.c-lockinc.com)

Once the system is powered on, please allow at least 30 minutes for the concentrations to "warm up" and equilibrate. **Calibrations, CO_2 Recoveries, and animal measurements done before the 30 minute warm-up time may not be valid.**

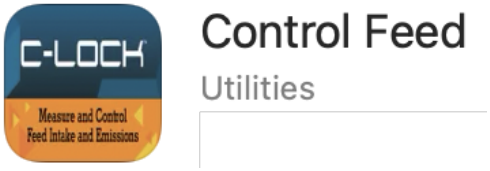
2.6. Powering Off GreenFeed

To power off the system, It is recommended to first put the system into sleep mode. This will allow it to save the logged data, and attempt to upload it. Once in sleep mode, continue turning off the system. To perform these steps, please follow the steps in **Section 3.2 -** part **6a** and **6b** ("place system into sleep mode" and "turn the system off").
Once the system is commanded to shut off, please wait 30 seconds before unplugging the power. This will allow enough time for GreenFeed to save its data and full power down.

3. Control Feed Mobile App

Although GreenFeed is an online measurement system, most common tasks can be performed from the feeder itself using the Control Feed mobile app.

Control Feed can be downloaded from the Google Play Store or Apple App Store. To install, search for Control Feed in your respective app store, or scan the QR code below.



Apple App Store

Google Play Store

https://apps.apple.com/us/app/control-feed/id1524038899

https://play.google.com/store/apps/details?id=com.controlfeed

Please note, the Control Feed app will only work within 20 meters of a GreenFeed system. It is not guaranteed that feeders farther than 20 meters will respond correctly.

3.1. Scanning for Systems

1. Begin by pressing “Start Scanning for Systems”.
2. A list of nearby devices will appear on the screen. See **Figure 8**.
3. Press the system you wish to control.
4. A side-box will appear while it attempts to connect to the system.

Figure 8) Scanning and Connecting to a System using Control Feed

3.2. Controlling GreenFeed

Once connected to a GreenFeed system, you will be able to perform the following tasks:

1) View real-time sensor values of the machine
2) Turn on and off the fan and sample pump
3) Dispense feed from the hopper
4) Trigger an auto-calibration
5) View the status of a in-progress CO_2 Recovery
6) Perform other actions such as:
    a) Put the system to sleep/Wake it back up
    b) Power off the system
    c) Turn on and off the dome light
    d) Sound the chime
7) Plot real-time sensor values

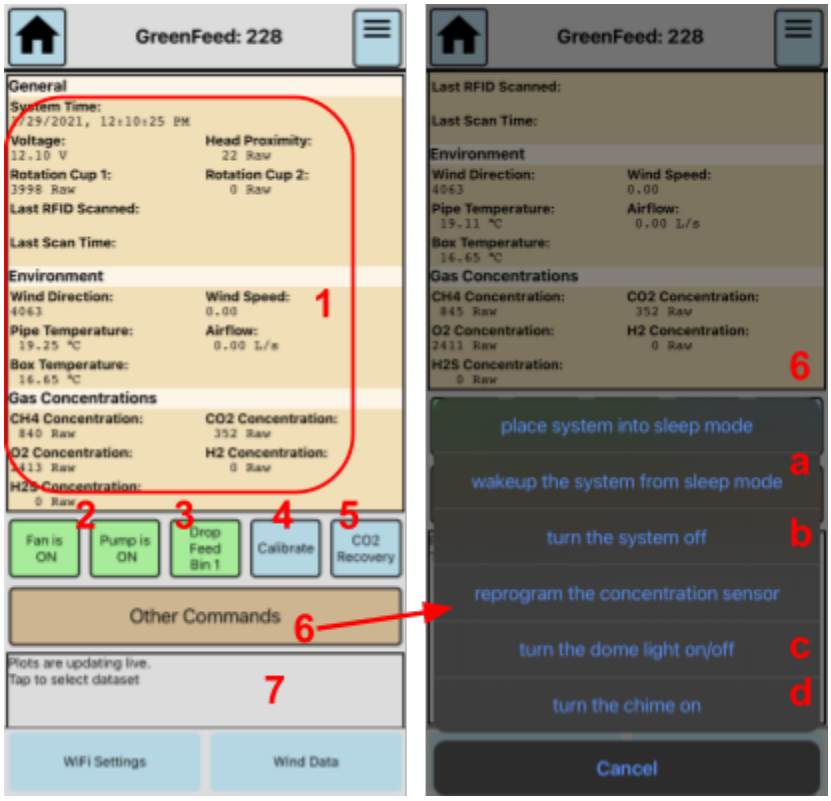


Figure 9) Viewing and Controlling a GreenFeed System from Control Feed

3.3. Connecting GreenFeed to a Different WiFi Network

To change the WiFi network that GreenFeed connects to:

1. Tap “WiFi Settings”
2. Tap the button with the WiFi network you wish GreenFeed to use
3. In the box that appears, select WPA2
    - If the network is an open network (no password), select None
4. Enter the password for the network under “Password” (if applicable).
5. Tap Add. The system will immediately reboot and connect to the new network.
    - When the reboot occurs, Control Feed may state that it has unexpectedly disconnected. If this happens, wait ~2 minutes and reconnect.

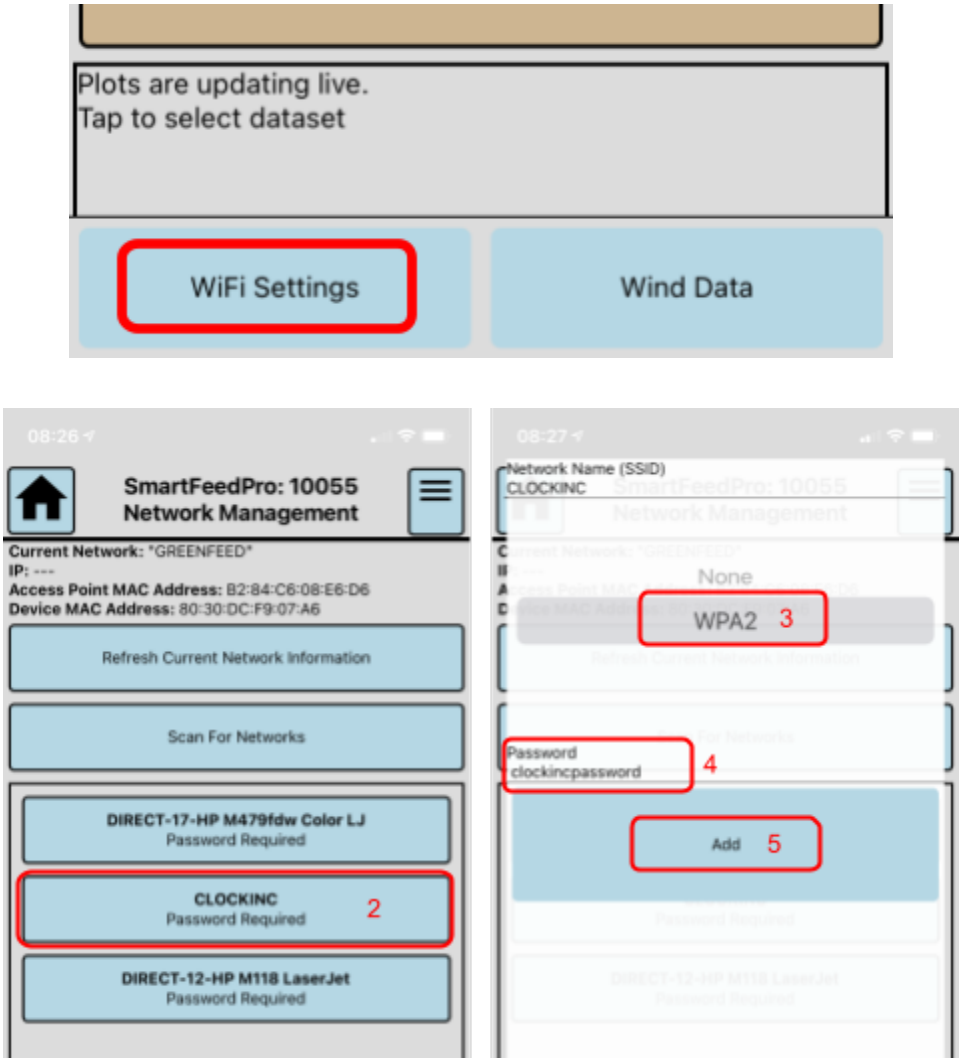


Figure 10) Control Feed WiFi Configuration

4. Calibrating GreenFeed

4.1. Standard Calibrations

Standard calibrations are used to ensure that the reported concentration of GreenFeed gas sensors are correct. This is done by running two separate and distinct known gas concentrations into the system one at a time. The first gas run is usually referred to as the "Zero" gas. This gas will typically consist of the following constituent concentrations:

1) Oxygen (O_2): ~20% (200,000ppm)
2) Nitrogen (N_2) Balanced - which means the rest of the gas consists of nitrogen

The second gas is commonly referred to as the "Span" gas. This gas must consist of a known concentration of all gases intended to measure with GreenFeed. This will typically consist of the following constituent concentrations:

1) Oxygen (O_2): ~20.5% (205,000ppm) - Note that this **must** be a different concentration from the zero gas
2) Methane (CH_4): ~500ppm (0.05%)
3) Carbon Dioxide (CO_2): ~5000ppm (0.5%)
4) Hydrogen (H_2): ~10ppm
5) Nitrogen (N_2) Balanced

It is important to note that the gas concentrations are not required to be exactly these values, but if ordering your own gases, these concentrations are ideal.

Standard Calibrations are done automatically by GreenFeed, but ensuring the gas tanks are installed correctly without leaks is crucial to performing a valid standard calibration. For assistance with ensuring your gas tanks are properly installed without leaks, please contact support@c-lockinc.com.

Figure 11 shows a typical gas response from a Standard Calibration. The zero gas is first run for 60 seconds, then the span gas is run for 60 seconds. When run regularly, these responses are enough to calibrate and ensure precision of the gas concentration sensors.

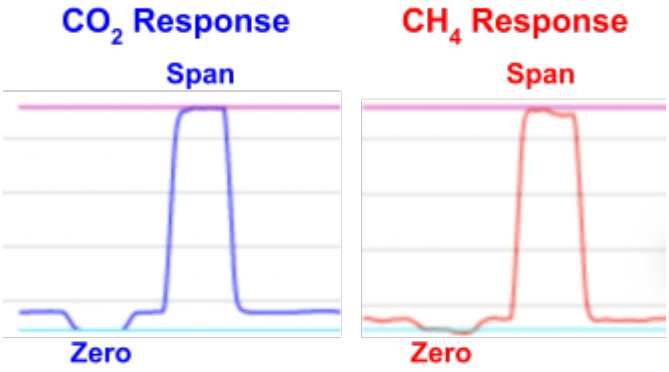


Figure 11) CO_2 and CH_4 Response to a Standard Calibration

4.2. CO_2 Recovery

CO_2 Recoveries are used to verify that the whole system is working properly. It also serves as a calibration of the air flow meter.

The process involves releasing a measured amount of CO_2 into the system, then comparing that known amount to GreenFeed's calculated value.

For an in-depth demonstration of performing a CO_2 recovery, please refer to our Maintenance playlist - Performing a CO_2 Recovery video (https://videos.c-lockinc.com)

Written instructions can be downloaded from: https://docs.c-lockinc.com.

5. Maintenance

5.1. Cleaning the Head Position Sensor

The head position sensor is located directly above the edge of the feed dish. From time to time, this sensor will become dirty due to animals and debris. It is important to keep the lenses clean on this sensor. Use a dry cotton swab to remove any debris from the two lenses. If a dry cotton swab cannot remove all the debris, use a lightly wetted cotton swab. It is recommended to clean this sensor once per week.

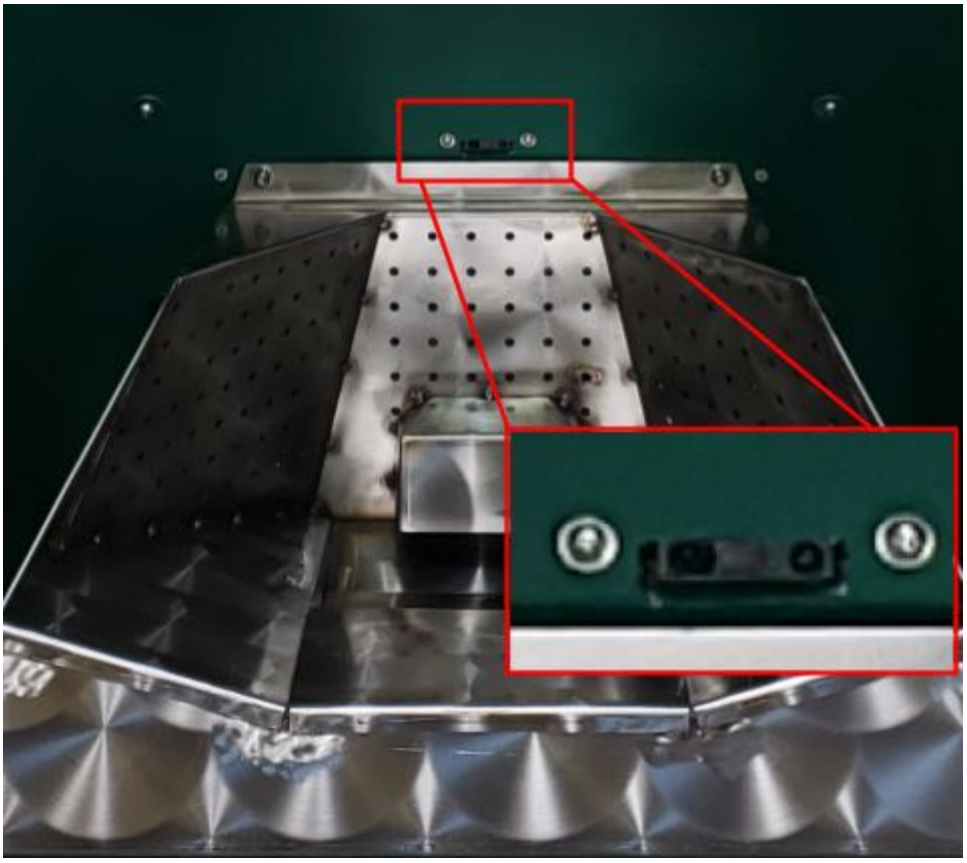


Figure 12) Location of the Head Proximity Sensor

5.2. Replacing and Cleaning the Air Filter

The primary air filter is crucial to keep debris and particulate matter from getting into the system. This filter should be regularly swapped with a clean air filter. For a typical GreenFeed setup, the filter should be swapped once per week. But several factors can contribute to the duration between changing air filters. Every GreenFeed comes with two (2) air filters. So one can be in use while the other one is being cleaned and dried.

Note: Using an air filter that has not been approved by C-Lock Inc., or failure to use an air filter in GreenFeed will **VOID YOUR WARRANTY.**

When the time comes to swap the air filter, please perform the following steps:

1) Turn the fan off. You can do this by either putting the GreenFeed to sleep, or by issuing the "Fan Off" command (Section 3.2). Wait for the fan to fully stop.
2) Undo the top two latches on both sides of the back of GreenFeed. These latches hold the back top cover in place.
3) Once both top latches are loose, lift up the door to expose the air filter box.
4) Unlatch the air filter door and open it.
5) Unlatch the clamp on the old air filter and remove it from the filter box.
6) Remove the clamp from the old air filter and place it on the new air filter.
7) Put the new air filter over the pipe in the same manner the old air filter was placed.
8) Tighten the clamp to secure the air filter in place.
9) Close the door and latch it shut.
10) Shut the top door to cover the air filter box and tighten the top two latches to hold it in place.
11) Turn the fan back on. See Section 3.2 for instructions.

Dirty air filters can be cleaned using one of the following methods:

1) Running hot water into the inside of the air filter, then letting it drain out. Do this several times, and ensure water is thoroughly rinsing all areas inside the air filter. When finished rinsing, set in a dry location overnight to allow for drying.
2) Pressurized air (~50psi or 3500 mbar) can be used to clean out dirty filters.

Video instructions for replacing and cleaning dirty air filters can be found in the Maintenance playlist found here: https://videos.c-lockinc.com

Over time, the reusable filters will require cleaning much more often. This usually occurs after 1 year of full use. It is recommended to dispose of the air filters at this time and purchase replacements. Contact sales@c-lockinc.com for replacement air filters.

5.3. Filling the Hopper Bin

To fill the feed bin, remove the two latches on either side of the bin, then remove the lid.

Once the bin is filled, replace the lid and tighten the latches. **Do not leave the lid off during normal operation, as food can become wet and clog inside the feed hopper.**

Figure 13) Removing the Feed Bin Lid

The hopper is designed to handle 7mm or smaller pelletized feed. Feed types larger than 7mm will likely not dispense properly. **Powdered/Dusty feed, large pellets, and straw type feed should not be used in GreenFeed**. Using "dusty" feed will result in more frequent air filter changes. If you are unsure if your feed will work in GreenFeed, please contact support@c-lockinc.com.

5.4. Storing GreenFeed

When GreenFeed is to be stored for an extended duration, maintenance operations must be performed to ensure it will be ready for the next use:

1) Remove the feed dish and plug the feed spout and the air intake spout with a temporary rodent barrier. Steel wool or copper mesh are recommended options.

Figure 14) Protecting Feed Chute From Animals

2) Securely install a cover on the fan exhaust. Use a plastic cover or strong adhesive tape. This will prevent birds from landing in the fan exhaust and building a nest.

Figure 15) Protecting Fan Outlet From Animals

3) Fully close your calibration gas tank.
4) Use a vacuum cleaner to remove all feed out of the hopper.
5) Clean the feed dish, removing any debris from the intake manifold holes.
6) Vacuum all feed out of the back of the GreenFeed, underneath the air filter box.

Pasture Trailer Only:

7) Turn off both a) the red battery switch and b) the main power switch.
8) Connect a trickle charger once per month to keep the batteries in good condition.

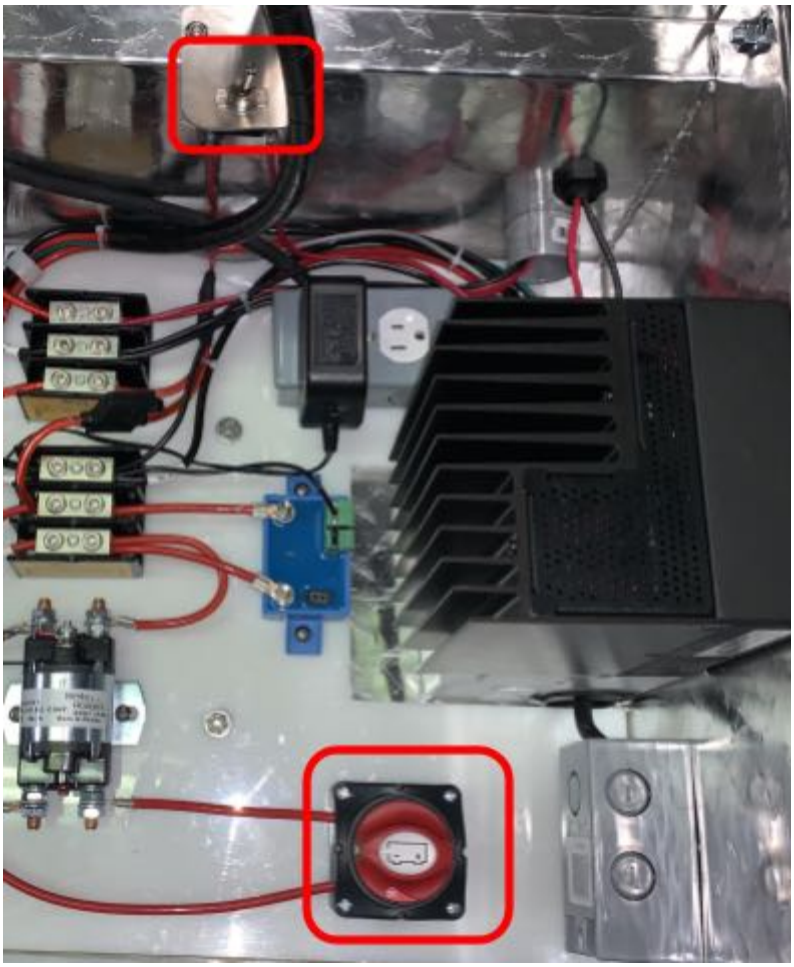


Figure 16) Disconnecting The Battery While Storing GreenFeed

5.5. Transporting GreenFeed

When transporting GreenFeed, steps must be taken to ensure the safety of both people and the equipment. See the GreenFeed Pasture Trailer Travel Preparation document for instructions: https://docs.c-lockinc.com/?s=GreenFeed+travel

5.6. Secondary Sample Filter

The secondary sample filter is the last point that protects the electronic components from debris and particulate matter. Over time, as the filter is used, there will be a noticeable delay between animals visiting the system, and the gas response from the animals. If the filter goes for too long without being changed, this can damage the system.

Replacing the secondary sample filter every year of full operation is required. To purchase a replacement sample filter, please contact sales@c-lockinc.com.

Instructions for replacing the sample filter can be found on the Maintenance playlist - Replacing GreenFeed Inline Sample Filter video at https://videos.c-lockinc.com.

Note: Using a sample filter that has not been approved by C-Lock Inc., or failure to use a sample filter in GreenFeed will **VOID YOUR WARRANTY.**

6. Controlling GreenFeed

Power Up GreenFeed

Every time the feeder is powered-up from a cold boot, it will require about 30 minutes to warm-up the concentration sensors before they are usable. Because of the required warm-up period, it is recommended that the system is left powered-up or in sleep mode if it will be used on a daily basis. There is no need to power-down the unit on a nightly basis.

“Sleep mode” can be used to allow the user to reduce the power consumption of the feeder if it will not be used for a short period of time (overnight or for a weekend, for example). This mode will allow the user to immediately power-up the system if it will be used in the near future. Once sleep mode is activated, the GreenFeed unit will do the following:

1) Stop collecting data and upload any unsaved data to the central C-Lock server, which may take up to two minutes, depending on connection speed and amount of data to upload
2) Turn off the fan and sample pump, disable the feeder, and turn off the RFID reader

Powering Down GreenFeed

Moving GreenFeed long distances while the system is running can cause damage to the sensors. Please power down the system if it will be moved across rough terrain.

In order to power off the system, GreenFeed must be properly shut down to do this:

1. Put GreenFeed to sleep (See Section 3.2)
2. Once the system is in sleep mode, select “Turn Off The System”
3. Wait 30 seconds, then unplug the power.

4. If GreenFeed is powered by a solar trailer, turn the power switch to OFF in the main electrical box. If GreenFeed is powered by the provided AC power supply, unplug the power from the AC side of the power supply.

7. Data Flow

The data flow for GreenFeed is shown below:

1) A computer located inside GreenFeed stores the real-time data then uploads it to the C-Lock server once per hour (this time can be changed).
2) Once the data is entirely uploaded on the central C-Lock server, the data is archived in the onboard computer (where it is removed after 4 months).
3) Once per day, the raw data on the server is processed, to determine animal-specific fluxes and herd daily averaged fluxes. The user has the ability to control and download real-time data directly from GreenFeed, or can download historical raw data from the C-Lock server using the online graphical user interface (GUI).

GreenFeed requires a few network connections to ensure the system is able to upload data, synchronize feeding schedules, and communicate with the C-Lock server. This requires certain firewall exceptions be enabled. These exceptions (network "ports") are listed below:

- 22 TCP Outgoing (SSH connection) to greenfeed.c-lockinc.com
- 80 TCP Outgoing (HTTP connection) to greenfeed.c-lockinc.com
- 1883 TCP Outgoing (MQTT connection) to mqtt.c-lockinc.com
- 123 UDP Incoming/Outgoing (NTP connection) with ntp.c-lockinc.com

If you plan to connect GreenFeed to your own WiFi network, please contact your network administrator to ensure these port permissions are set correctly.

8. GreenFeed GUI Control Interface™

The GreenFeed unit is configured through the Internet. To access, view, and configure your GreenFeed unit(s), go to https://greenfeed.c-lockinc.com and log in using your assigned username and password.

By default, your password is “greenfeed”. It is very important that you change your password immediately after logging in for the first time.

9. Instrument Specifications

Power Requirements
Power Input: 100 ~ 240VAC / 2.8A 10.5 ~ 15VDC / 10A
Maximum Power Rating: 300 W

Operating Temperature
-20 to 50 ℃ (-4 to 120 ℉) (Heated Dish required for below freezing temperatures)

Flow Meter (Velocity)
Accuracy at 20°C, 45%RH, 1013 hPa: 0.2 m/s + 3% of m.v.
Range: 0.2-10 m/s

CO_2 Concentration Measurement
Linearity error: < +/- 1% FS
Accuracy: 0.5% FS
Range: 0-1%
Warm-up Period: 30 minutes

CH_4 Concentration Measurement
Linearity error: < +/- 1% FS
Accuracy: 0.5% FS
Range: 0-1%
Warm-up Period: 5 minutes

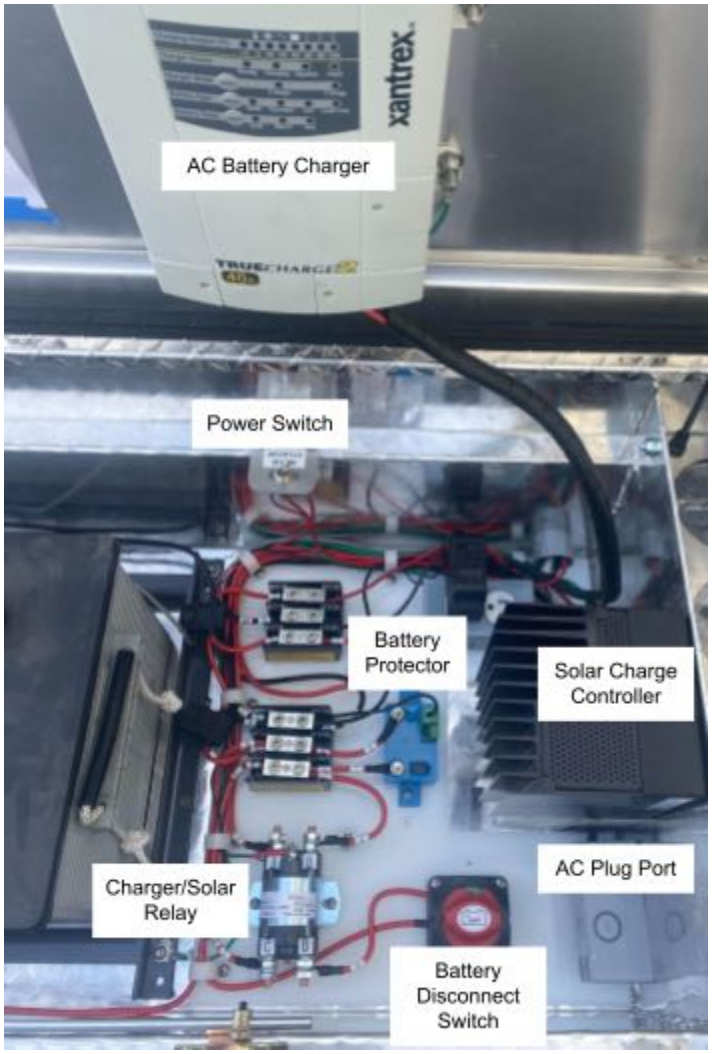
RFID (EID) Reader
ISO 11784/5 134KHz

Temperature Measurement
Accuracy: +/- 0.75°C
Range: -30°C to +50°C

Appendix A - Solar Charging System

If your GreenFeed unit is ordered with a pasture trailer, it will include solar charging capability to assure it can run autonomously for long periods of time without a need for replacing batteries or running extension cords. Please read these instructions to learn how to properly use the solar charging system.

Components Inside The Battery Box



To turn your unit on or off, simply toggle the unit power switch to ON or OFF:

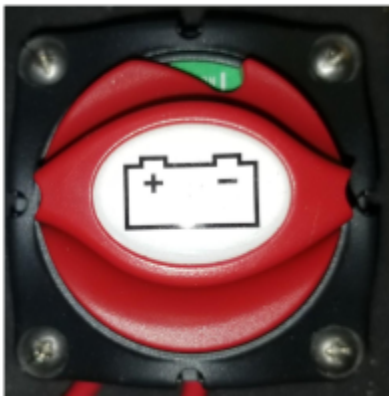
OFF

ON

To turn the charge controller on and off, rotate the battery charge switch to ON or OFF:

OFF

ON

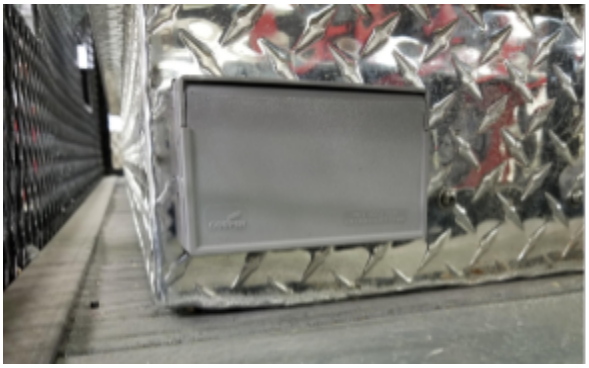


When to turn your unit or battery charge switch on and off:

CAUTION: Failure to follow these instructions will result in degraded battery performance and decreased battery life which will void the warranty of the unit and batteries

If your unit will be stored for a long duration, it is recommended that you turn the unit power switch OFF. If you plan to store the system for more than three days without a power source (solar or AC power), the battery charge switch should also be turned OFF. This will prevent the charge controller from draining the batteries.

You may also plug in the unit to an AC power source while it is being stored. If this is done, the battery charge switch may be left ON.



When GreenFeed is in use, the battery charge switch should always be ON.

The table below shows the different switch positions depending on how the system is stored

Condition	Power Switch	Battery Charge Switch
In good sunlight and system is being used	ON	ON
Without sunlight, but with AC power source and system is being used	ON	ON
In good sunlight and system is not being used	OFF	ON
Without sunlight, and without AC power source	OFF	OFF