# Veracity® Series (Flow Sensor and PLC)

# CADARO BASE Software

# TECHNICAL OPERATIONS MANUAL

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“Patent”:  www.cadaro.com


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# CONTENTS

# PRODUCT DESCRIPTION

## HOW THE VERACITY FLOW SENSOR WORKS

The patented Veracity flow sensor from CADARO is designed to measure the real-time flowrate, batch weight, and total accumulated weight of dry flowable materials. Utilizing advanced load cell signal processing technology, the flow sensor is often installed in-line within an existing vertical pipe/chute where the material flows. As the product passes through the sensor, it generates an electrical signal that is transmitted to the CADARO PLC control box. The control box employs proprietary software to convert the signal into easily readable data. The Veracity brand is synonymous and replaces the previous FM product series.

For seamless integration, the flow sensor can be connected to an existing automation system using the CADARO Modbus TCP communications. This is a CADARO CONNECT Enterprise Plan feature. (Contact CADARO for more information at info@cadaro.com.)

## BEST SUITED APPLICATIONS

The Veracity Flow Sensor is particularly well-suited for the following applications:

- Dry flowable materials characterized by low moisture content and relatively clean composition.
- Processes involving the gravity-fed flow of material in a vertical direction (90-degree angle from horizontal) with a consistent flow rate.
- Facilities equipped to perform material calibration tests during initial setup and as required.

## LIMITATIONS

While the Veracity Flow Sensor offers exceptional performance in numerous scenarios, it may not be suitable for the following applications:

- Situations involving non-uniform material flow or materials with a long drop, leading to excessive material velocity.
- Environments experiencing abrupt changes in temperature or material moisture, which can affect the accuracy of measurements.
- Installation sites subject to excessive motion, vibration, or exposure to electronic and mechanical shocks.
- Outdoor installations or locations with ambient temperatures below 20°F (-6.7°C) or above 120°F (49°C).
- Applications requiring NTEP certification for legal trade purposes.
- Installation sites located within 5 feet of strong RF or electromagnetic interference sources.

To ensure optimal performance and accurate measurements, please note these limitations when selecting the installation location and relying on the Veracity Flow Sensor.

## ENVIRONMENTAL RATINGS (CONTROL BOX, JUNCTION BOX, AND LOADCELL)

The control box enclosure and the loadcell junction box will be treated separately. Both meet Class 2 Div 1 hazardous location ratings. The CADARO equipment is not intended to be used in a Class 1 environment.

The control box contains the PLC, HMI, and other related equipment. *(Confirm with CADARO when below ratings required for site equipment.)*

- Control box NEMA Rating: 6P
- Control box IP Rating: IP67

The junction box contains an electrical union of the loadcell cable to the sensor cable. It is located near or on the sensor box.

- Junction box NEMA Rating: 6P
- Junction box IP Rating: IP67

The Transducer Techniques loadcell for Veracity series is not officially rated. The manufacturer lists the electrode coating as moisture proof.

Temperature Range: -14°F – 140°F

# VERACITY SERIES FLOW SENSOR ASSEMBLY AND INSTALLATION

## BEFORE INSTALLATION

1. Determine the inlet pipe diameter by direct measurement if possible or measure the pipe circumference and divide by 3.14 to calculate the diameter. For other diameters other than the primary sizes, an adapter will be required.
2. Determine if the correct length of vertical spouting can be removed for the Veracity flow sensor installation. If the sensor length exceeds the amount of vertical spouting available, then either the pipe configuration, type of sensor, or space itself may need to be changed.
3. Determine if the flow rate of the material is within the rated capacity of the Veracity flow sensor. Calculate the flow rate by timing a known weight of material (either pre-weighed or post-weighed) and converting the numbers to pounds per minute (or the flow rate specified for your application). Refer to the chart below to determine the appropriate Veracity flow sensor.

***Figure 1: Veracity Sub-Models Specifications***

| MODEL | Low Operating Range (lbs/min)* | High Operating Range (lbs/min)* | Inlet/Outlet Pipe Size (diameter round/square)* | Configuration | Flow Sensor Dimensions (L x W) | Flow Sensor Weight (lbs)* |
|---|---|---|---|---|---|---|
| VERACITY VR/600 | 200 | 600 | 4" & 6" ID | Round | 18 ½" x 11" (4")<br>22" x 11" (6") | 25 (4")<br>28 (6") |
| VERACITY VR/2K | 800 | 2,000 | 6" ID | Round | 22 ¼" x 15" | 50 |
| VERACITY VR/4K | 1,600 | 4,000 | 8" & 10" ID | Round | 23" x 17" (8")<br>26" x 17" (10") | 60 (8")<br>65 (10") |
| VERACITY VR/5K | 2,000 | 5,000 | 10" ID | Round | 26" x 21" | 75 |

**Operating range can be calibrated to measure lower flow rates but overall range and accuracy requirements need to be considered.*

## ADDITIONAL INSTALLATION SITE CONSIDERATIONS

- Vertical Orientation: Ensure that the Veracity flow sensor is installed in a vertical position to ensure proper functionality and accurate measurements.
- Handle with Care: The load cells in the Veracity flow sensor are sensitive to mechanical shock, vibration, and drops. Avoid dropping the sensor or subjecting it to excessive vibration or mechanical shock. Additionally, do not perform any welding activities on or near the sensor. If welding is necessary nearby, it is recommended to remove the Veracity flow sensor until the welding process is completed to protect the load cells from potential damage.
- Uninterrupted Material Flow: The material being measured must flow freely through the Veracity flow sensor. To ensure smooth flow, prevent material backup from occurring either from above or below the sensor. If necessary, consider installing a flow regulator or surge bin above the Veracity flow sensor to maintain proper material flow.
- Steady Material Flow: For optimal performance, the Veracity flow sensor operates best with a steady material flow. Avoid surging or fluctuating flows as they may affect the accuracy of the measurements.

## ASSEMBLY OF VERACITY FLOW SENSOR

Before starting the assembly, carefully unpack all the components and compare them to the delivery notice to ensure that all necessary parts are available.

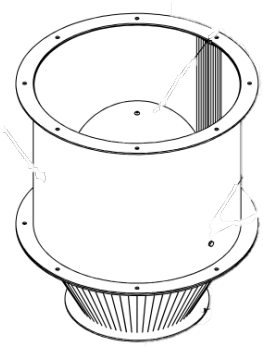
Materials Required for Assembly:

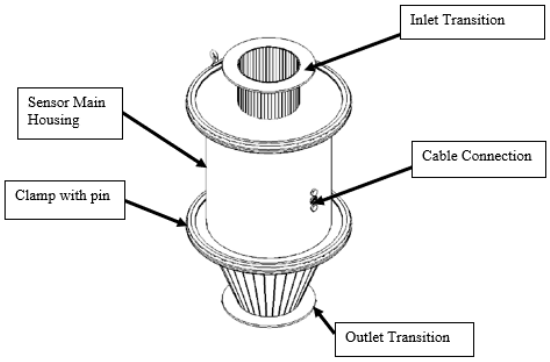
Veracity VR/600-VR/4K
- Wrench set (SAE) for flange clamp bolts
- Phillips screwdriver
- Blue Locktite (Anti-seize compound)

Veracity VR/5K
- Size 13 socket wrench or ½" socket wrench
- Wrench
- Phillips screwdriver
- Blue Locktite (Anti-seize compound)

**Note:** Always prioritize safety while handling, assembling, and installing the Veracity flow sensor.

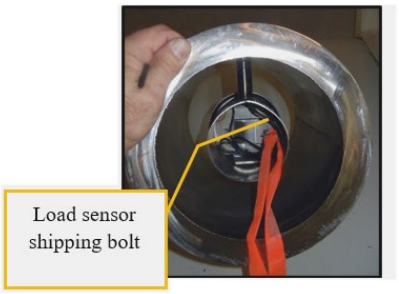
1. Organizing Components:
   Arrange the components required for the Veracity flow sensor assembly, including:






2. Attaching the Flow Sensor Dome:
   Position the dome above the dome base plate to align the screw with the connector on the base plate. Before tightening, apply a small amount of Loctite to the screw. Use a Phillips screwdriver to secure the dome with the bolt. While securing the bolt, hold onto the dome with one hand. Please hand-tighten the bolt and avoid using power tools to prevent damage to the load cell. Be cautious not to apply excessive downward pressure on the cap screw, as it may damage the load cell.

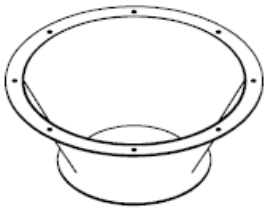
   Important: Whether it is a new installation or cap replacement, always insert the load sensor shipping bolt prior to performing the task.



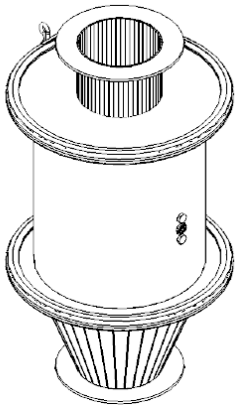
3. Removing the Load Sensor Shipping Bolt:
   Rotate the sensor main housing to gain access to the load sensor shipping bolt. Once located, carefully remove the shipping bolt. After removing the shipping bolt, return the housing to the upright position.

   **Important Note:** The shipping bolt is intended to provide support during shipping and cap installation. Take extra care when handling the Veracity flow sensor after removing the shipping bolt.

4. Placing the Outlet Transition:
   Position the outlet transition on a stable work platform or surface.



5. Attaching the Main Housing:
   Place the Veracity flow sensor main housing on top of the outlet transition. Ensure stability of the components while attaching the flange clamp. Before attaching the lower flange clamp, ensure that it securely encloses the entire transition and housing rings. Close the latch mechanism to secure the retaining clamp, then insert the securing pin as indicated in the provided photo.



6. Placing the Inlet Transition:
   Position the inlet transition on top of the main flow sensor housing. Ensure stability of the components while attaching the flange clamp.

   Final Installation:
   Complete the installation in a vertical application, attaching the Veracity flow sensor to the site piping using appropriately sized flanges and flange clamps determined during the pre-site assessment.

   Once the assembly and installation are complete, you can proceed to attach the control box cable to the flow sensor and PLC control box, followed by the calibration process.

**Once the shipping spacer is removed and the shipping bolts are lowered, place the system on a level/horizontal surface and connect the PLC control box to the sensor using the provided cable.**

1. Connect the male end of the load cell cable to the Veracity flow sensor junction box and the female end to the to the PLC control box.
2. If the loadcell is reading correctly, there will not be an alarm described as 'Signal Fault' or 'Signal Max'. Apply slight pressure to the interior sensor box and watch for weight to begin accumulating, indicating successful communication with the load cells.
3. If the weight factor is zero or if the load cell weight is signal fault or signal max, then refer to section 5.3 Alarm

System Confirmation with Weight

1. Place a small weight, such as a standard 500 or 1,000 gram weight, onto the sensing plate. If a standard weight is not available, an unopened bottle of water can be used as a substitute.
2. Once placed inside the sensing box, the gross weight should increase steadily, and the net weight should be greater than zero. If this does not occur, please contact CADARO as it is possible that your sensor has been damaged during shipment.

Note: Resecure the sensing box using the shipping bolts and shipping spacers to protect your system during installation. Ideally, the removal of the shipping spacer and lowering of the shipping bolts within the sensor should be done after installation. However, if it is difficult to access all areas post-installation, these steps can be performed before installation; however, the unsecured unit must be handled with care.

## INSTALLATION

Best Practices/Guidelines

- A manual gate or choke immediately upstream or downstream of automatic gate will ensure consistent and repeatable flow.
- Certain system configurations may require the inclusion of gate/choke immediately upstream of the flow sensor.
- For installations without a gate or choke, avoid placement of the sensor near inflection points that change either the direction or speed of material flow.

The Veracity flow sensor is installed by removing a section of vertical spouting and replacing it with the Veracity flow sensor, as specified in the table below. Metal angle flanges will be used on the existing metal piping to match the flanges on the Veracity flow sensor, facilitating the installation process.

Note: Stainless steel bolts are commonly used to secure the V-band flanges to both the Veracity flow sensor and the existing piping. Regular steel bolts and nuts can also be used. If stainless steel bolts and nuts are utilized, it is recommended to apply an anti-seize compound to prevent cold fusion or galling of the bolts.

Important: Avoid operating welding equipment in the vicinity of the Veracity flow sensor when it is installed. Prior to any welding activities near or on the equipment where the Veracity flow sensor is installed, remove the Veracity flow sensor. Any damage caused to the Veracity flow sensor by welding equipment will not be covered under the warranty. Refer to Section 10 for further details.

## POST-INSTALLATION

After a 30-minute waiting period, enter your customer-specific license provided by CADARO.

# PLC CONTROL BOX INSTALLATION

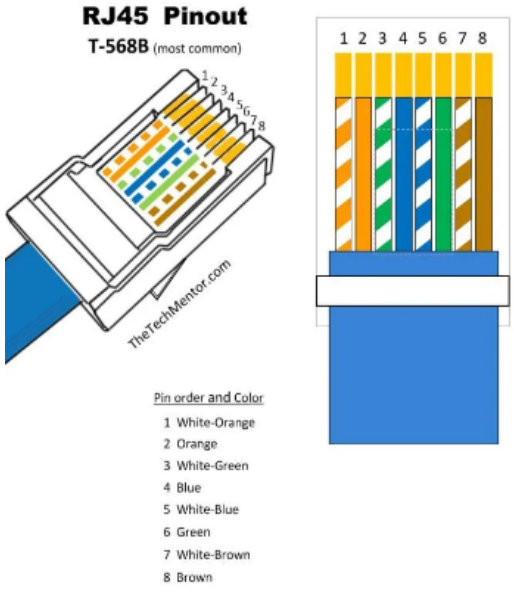
## BOX LOCATION

Choose a safe, dry, and convenient location to mount the PLC control box.

We recommend the total cable length between the control box and sensor box be no more than 300 feet. Connect the RJ45 end at the Veracity flow sensor box to the RJ45 end at the PLC control box.

Depending on the customer, a prefabricated signal cable or a bulk cable without ends may be included. In either case, this cable may be altered to the customer's liking. Qualified personnel should follow the pinout diagram below to ensure the wiring is done correctly. Necessary tools are required.

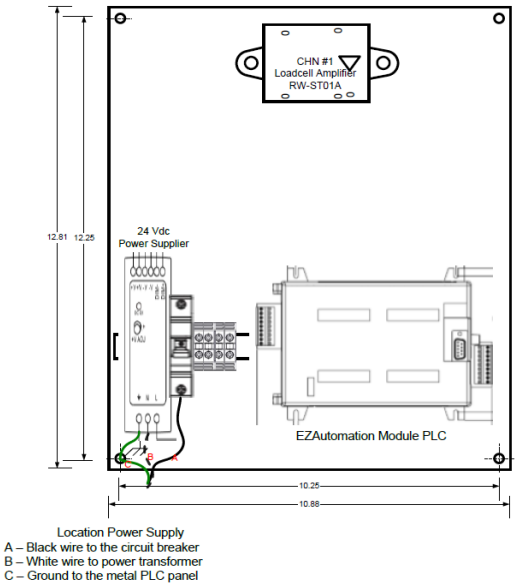
***Figure 2: RJ45 Pinout Diagram***




**Important:** Avoid placing the PLC control box in direct sunlight. Treat the PLC control box with the same care as a computer and avoid placing it where it will be exposed to less-than-ideal conditions. CADARO recommends placing the control box inside a building or, if that is not possible, in its own enclosure to provide shelter and protection from external conditions.

## PLC CONTROL BOX POWER REQUIREMENTS

***Figure 3: PLC Power Wiring Diagram***




The PLC control box is designed to be plugged into a standard 120V AC outlet. (Reference Section 9.6)

## PLC MODBUS TCP DESCRIPTION

For installations with an existing automation system, the Veracity flow sensor signal can be managed and delivered via Modbus TCP to an existing automation platform. Our PLC acts as the slave device storing data inputs and outputs to registers accordingly.

More about the Modbus is found in the Initialization section below. This is a CADARO CONNECT Enterprise Plan feature. See "CADARO ENTERPRISE Software Technical Operations Manual" for further instruction.

## PLC MODBUS TCP PIN ASSIGNMENT

The connector used is a standard RJ45 Ethernet connector. The connector pinout is the same as described above in *Figure 2*.

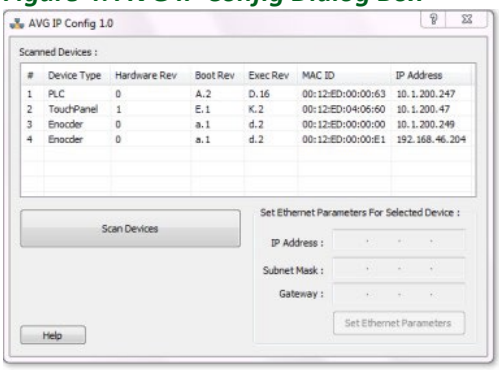
## PLC IP ADDRESS

1. Record the settings you currently have on the Main Menu > Calibration > Load Cal Factors.
2. Download the IP configuration program (AVG IPConfig 1.0.2 for Windows) onto your PC.
3. Connect one ethernet cable from your PLC control box RJ45 Port to your PC.
4. Open the PLC control box and confirm that there is an ethernet cable connection between the PLC component, and the RJ45 plug on the bottom side of the PLC control box.
5. If there is no ethernet cable between the RJ45 and the PLC component, plug directly into the ethernet jack on the PLC component.
6. Make sure all devices are powered on.
7. Install and open the 'AVG IPCofig' program on your PC and click on "Scan Devices."

## SIGNAL AMPLIFIER

The amplifier communicates with the PLC via Modbus. It is required that there be an additional Modbus network IP address assigned to the amplifier. The configuration for this amplifier is done during manufacturing.

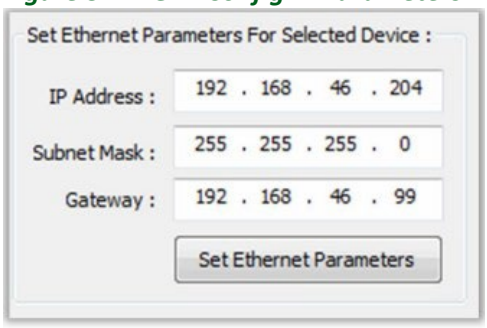
*Figure 4: AVG IP Config Dialog Box*




- If you only have a connection between the PLC control box and PC, it should detect only one device.
- If you have multiple networks, choose the device you want to edit from the list.
- If necessary, change the IP address, Subnet mask, and gateway to your choice. Press "Set Ethernet Parameters" and wait for the system to update.

Power cycle (restart) the control system and "Scan Devices" to ensure the IP settings are as desired. It is necessary to restart the PLC control box to engage the new IP Address. Restart PLC by turning off the power breaker for 30 seconds and turning it back on.

*Figure 5: AVG IP Config IP Parameters*




The following table is an example of typical private network ethernet parameters. Consult IT or CADARO for further support if needed.

Table 1: Typical IP Parameters

| | | | | |
|---|---|---|---|---|
| IP Address | 192 | 168 | 1 | X |
| Subnet Mask | 255 | 255 | 255 | 0 |
| Gateway | Empty | | | |

It is recommended to store the IP address within the PLC control box for future reference either on a flash drive that is kept **INSIDE** the PLC control box (but not plugged into anything) or written down on a piece of paper or notepad and stored **INSIDE** the PLC control box for easy reference.

# START-UP INSTRUCTIONS

## START-UP

**Pre-Licensed Screen**

*Figure 6: Unlicensed Loadout/Startup Screen*


**Licensed Screen**

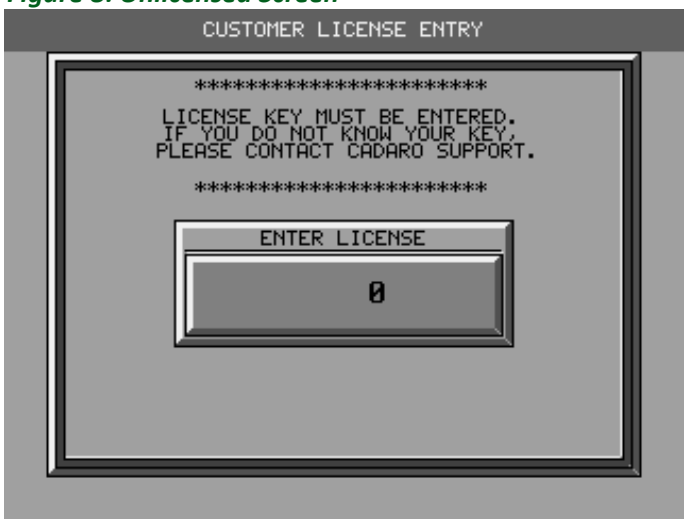
*Figure 7: Licensed Loadout/Startup Screen*


'Loadout Summary' screen can be treated as a lock screen. To leave the 'Loadout Summary' screen requires a password that can be held confidential, from Truckers for example.
This screen can be later accessed from the 'Flow Sensor Menu' screen.

## LICENSING

Pre-Licensed Screen

*Figure 8: Unlicensed Screen*




If the license has not been configured, the above screen will appear.

*Figure 9: License Accepted Screen*


Enter the prescribed license. If correct, the software will allow for advancement to the below screen.

Post-Licensed Startup Screen

*Figure 10: Licensed Bootup or Post-License Entry Screen*


From bootup, if license has been previously accepted, the above screen will appear. This screen will also appear after the correct license has been entered.

## INITIALIZATION

Pre-Initialized

*Figure 11: Before Any Initialization*

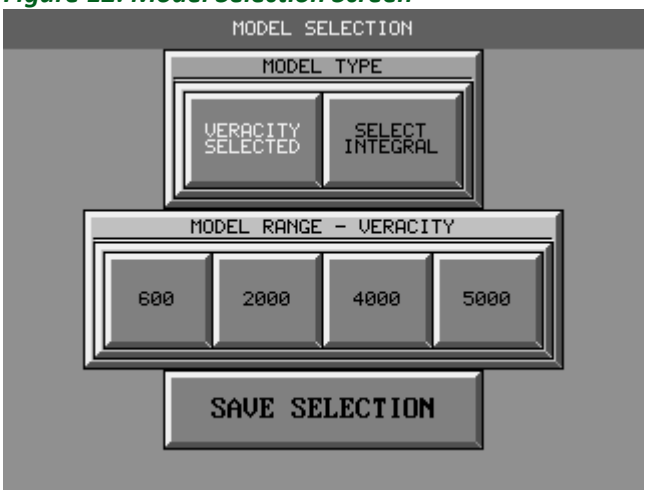

As seen before anything has been initialized to a specific customer or flow sensor box. Please verify the 'Software Version' matches what CADARO has prescribed. If not, contact CADARO.

If operator prefers metric units, now is the time to toggle the 'Select Units' button to 'Metric Selected'.

'Setup Comms/IO' is only accessible by having a CADARO CONNECT Pro or Enterprise Plan. The functionalities within this option are described in further detail below.

Model Selection

*Figure 12: Model Selection Screen*




Take care when selecting the model type and range. The model selection step can only be performed once. Thereafter, the license will need to be reinitialized.

Time

*Figure 13: System Time Setup Screen*


The system time is important for datalogging time stamps.
To manually update time, gently press and hold the top left 'HOLD' button for over 6 seconds.

Setup Communications and IO

***Figure 14: Comms, Modbus, and IO Setup Screen***


'Setup HMI Comms' and 'Modbus Enable' require a CADARO CONNECT Enterprise Plan. HMI Comms will allow for remote access to the HMI screen and/or the stored data from a desktop.

Modbus turns on the data within the software to allow for remote monitoring and/or control.

If Enterprise Plan subscriber: See "CADARO ENTERPRISE Software Technical Operations Manual" for further instruction.

- "HMI Comms Technical Data Sheet"
- "Modbus Technical Data Sheet"

'Initialize IO' is only accessible for CADARO Pro Plan subscribers. See "PRO Software Technical Operations Manual".

***Figure 15: Analog IO Setup Screen***

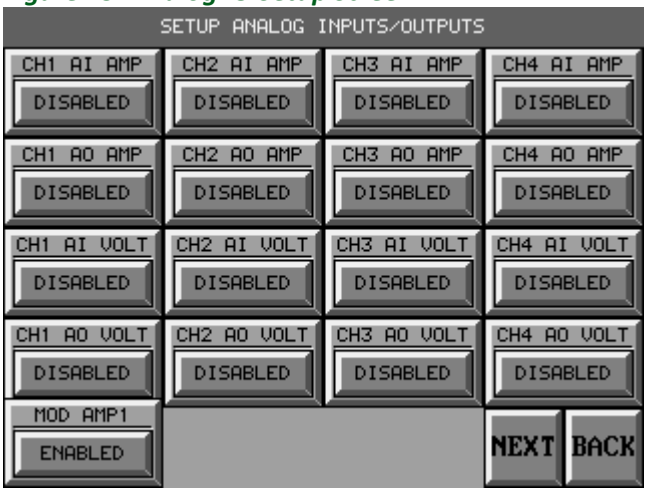


*Figure 16: Discrete IO Setup Screen*


Tune Amplifier/Tare Sensor

*Figure 15: Amplifier, Tare, and Wt-Factor Screen*


The 'tune amplifier/tare sensor' screen is used to visualize the reading from the amplifier for tuning purposes and tare the net reading if needed. Tuning is typically only needed once by CADARO. If CADARO support prescribes tuning, the instructions will be delivered at that time.

Taring is meant to be an automatic functionality. If you find the tare does not match the raw (amplifier reading), a manual tare shall be done.

The 'WT-Factor' value should be reflected in this table.

Table 2: WT Factor Table

| Model | Weight Factor |
|---|---|
| VR600 | 0.1 |
| VR 2K | 1.0 |
| VR 4K | 1.0 |
| VR 5K | 1.0 |

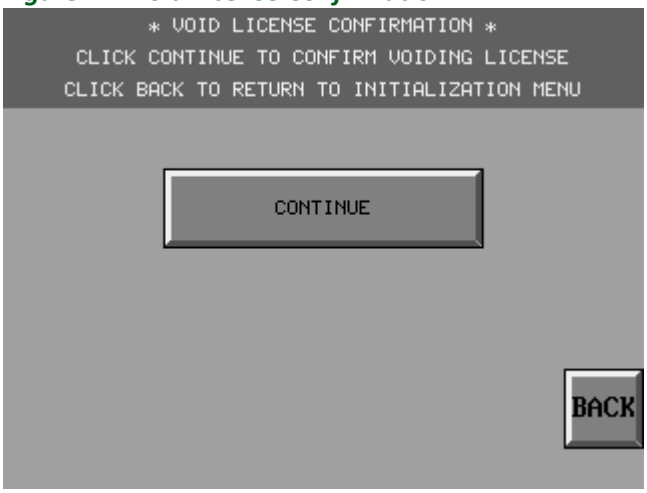
If the Weight Factor does not match this table, as per the selected model, contact CADARO.

Post-Initialization

*Figure 16: After All Initialization Is Complete*


If for any reason the 'Model Selection' needs to be redone, the confirmation screen below will appear.

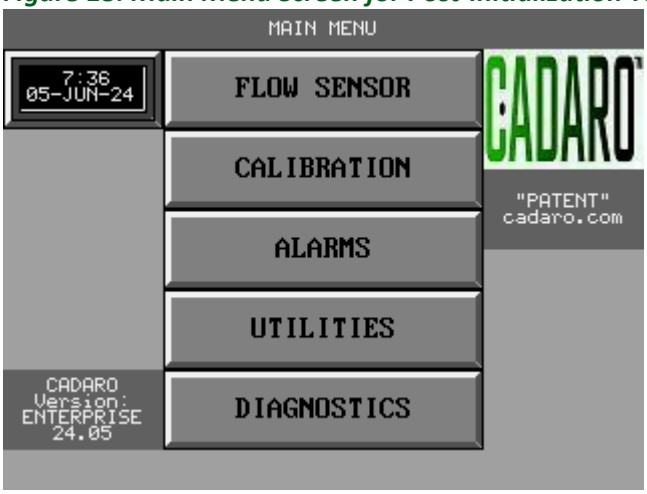
*Figure 17: Void License Confirmation*




If 'Continue' is clicked, the license will void and a new license will be required to proceed.

# MAIN MENU

*Figure 18: Main Menu Screen for Post-Initialization Tasks*




## FLOW SENSOR

*Figure 19: Flow Sensor Menu Screen*

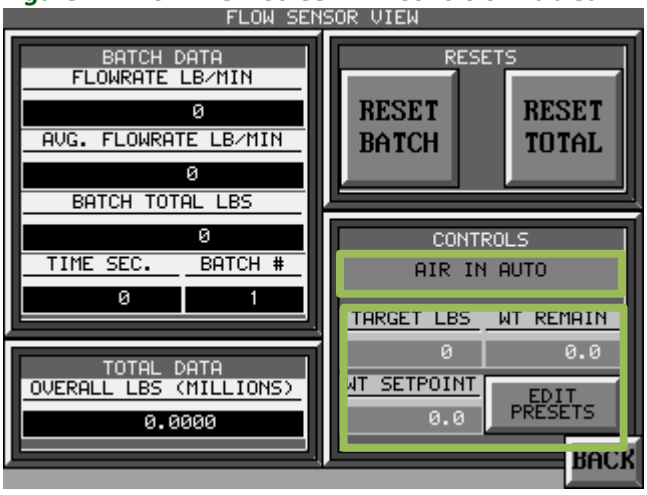

Double-check the 'Active Model Type' and 'Active Model Range' match the installed sensor box characteristics.

'Loadout Summary' screen can be treated as a lock screen. To leave the 'Loadout Summary' screen requires a password that can be held confidential, from Truckers for example.

Flow View

*Figure 20: Flow View Screen. No Controls Enabled*


*Figure 21: Flow View Screen. All Controls Enabled*



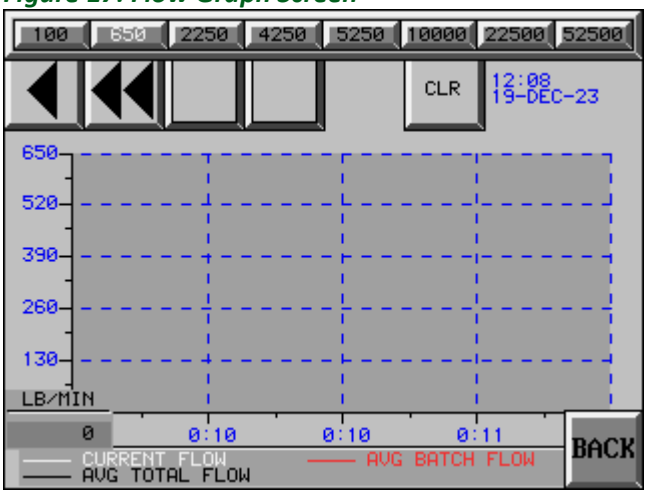

The Flow Sensor View screen is intended to be the default screen for operator use once device has been fully initialized and calibrated. Feel free to reach out to CADARO if there are any requests for alterations to this screen.

The target weight capability requires CADARO CONNECT Pro Plan. See "CADARO PRO Software Technical Operations Manual". More information on 'Target Presets' is below.

The air blower capability requires CADARO CONNECT Pro Plan. More information on 'Air Control' is below.

Flow Graph

*Figure 17: Flow Graph Screen*




The Flow Graph screen allows for a trendline and historical visual representation of the 'Current Flow', 'Average Batch Flow', and 'Average Total Flow'. If you need to request a different value to be trended, contact CADARO.

The y-axis (lbs.) is preset adjustable on the top option bar.

Flow Settings

*Figure 23: Flow Settings Screen*


'Target Presets' and 'Air Control' are covered in further detail below.

The 'Tare Tuning' section of this screen allows for gross to tare check and manual tare if needed. This performs the same function as the 'Initialization' screen 'Tune Amplifier/Tare Sensor'.

The 'Enter Scale Info: For Record' section allows for manual entry of the scale weight and respective batch for the scale weight. This data saves to the microSD card upon clicking 'Save Scale'. This data can later be used as reference.

Flow Settings: Target Presets

*Figure 24: Target Presets (Percent Setpoint) Screen*


*Figure 25: Target Presets (Weight Setpoint) Screen*


The target preset functionality is intended to be used as a controllable output of the PLC when the target is met.

Example: If the target is 80,000 lbs., PLC will shut slide gate at 79,000 lbs. to meet the target. This is tunable.

The target weight capability requires a CADARO CONNECT Pro Plan. If a Pro Plan subscriber: See "CADARO PRO Software Technical Operations Manual", "Target Preset Tech Technical Data Sheet" for further instruction.

Flow Settings: Air Control

*Figure 26: Air Control Screen (Applicable for Veracity Flow Sensors only)*


The auto/manual air blower control is intended to clean the flow sensor after each batch or other criteria.

Example: Heavy buildup of dust or residue from material may cause inaccurate readings.

The air blower capability requires CADARO CONNECT Pro Plan. If Pro Plan subscriber, see "CADARO PRO Software Technical Operations Manual", "Air Control Technical Data Sheet" for further instruction.

## CALIBRATION

Calibration Menu

*Figure 18: Calibration Menu Screen*


All calibration functions derive from this 'Calibration Menu'.

Perform Calibration Menu

*Figure 28: Perform Calibration Menu Screen*


Note: 'Perform Cal 2' option only appears after Cal 1 has been performed.

'Stop Batch' is used only for calibration scenarios when the process of material is not capable of smooth/quick starts and stops. It can also be used for scenarios when the flow rate of a process takes time to build up to or slowdown from. Pressing 'Stop Batch' will force the software to stop calculating flow, even if material is still flowing.

The physical batch of material used to calibrate a run will need to closely match the calculated batch. Meaning, a manual bypass gate or needs to be swung at the same time 'Stop Batch' is pressed.

Perform Cal 1

*Figure 29: Perform Calibration 1 Screen*


Calibration screen for Cal 1 depicts three rows of information:

- Row 1 at the top are all pre-calibration values. These values are used as a baseline to calculate 'real' values in row 3.
- Row 2 is for operator control/input.
    1. Ensure the batch has been reset before running a calibration batch.
    2. Input scale weight after material has stopped flowing. This scale weight shall be for the

respective calibration batch run.

3. Press 'Perform Cal 1' after scale weight has been submitted.

- **Row 3** is real values calculated from pre-calibration and scale weight values.

Perform Cal 2

***Figure 30: Perform Calibration 2 Screen***


When a second calibration point is performed and calculated by the software, it is called 'Two-Point Cal'.

Calibration 2 screen is similar to Calibration 1 screen.

- 'Two-Point Cal' uses Cal 1 factors and Cal 2 factors to create a linear slope of calibration information.
- This calibration information is used to apply the appropriate Cal factor to the respective real flowrate along the slope of calibration.

Note: The difference in flowrate between Cal 1 and Cal 2 shall be greater than the 'Cal % Difference' setting. This setting is addressed below in the 'Cal Settings' section.

Manual Cal Factors

***Figure 31: Manual Cal Factor Control Screen***


From this screen, calibration values can either be forced or pushed. This screen also acts as a helpful calibration summary screen.

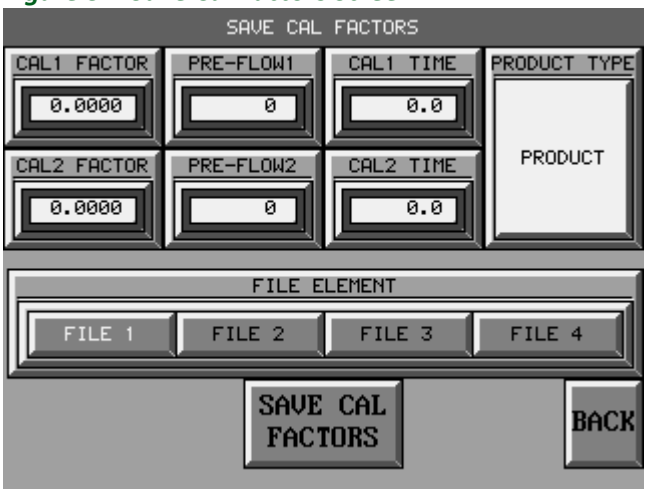
- Forcing will overwrite all predetermined Cal values. This applies to two-point Cal as well.

- Forcing Cal values for C1 or C2 is done by pressing 'Force Cal 1' or 'Force Cal 2'.
- Only a single force can be active at any given time.
- The C values can be manually changed by clicking C1 or C2 and editing the value.
- Pushing Cal reverse calculates the calibration information from the real value state to the pre-calibration state.
- Pushing cal values for C1 or C2 is done by pressing 'Push Cal 1' or 'Push Cal 2'.
- 'Push Cal 2' will appear after Cal 1 has either been completed normally or pushed.

Note: This should only be used if the values entered are accurate to a previous "normal" calibration run.

Save Cal Factors

*Figure 32: Save Cal Factors Screen*




After a calibration has been performed, the active calibration values will be auto populated onto the 'Save Cal Factors' screen.

- This is where a product or flowrate profile can be saved to the software. Select a 'File Element' to save to before clicking 'Save Cal Factors'. If saving to a previously occupied 'File Element' all previously saved information in that particular 'File Element' will be overwritten.
- The 'Product Type' section allows for shorthand notes about the profile. Limited to 10 characters. Examples may include 'Soybean', 'CornFlow2k', 'Milo2Point', '9Aug2023', etc.
- The software will store up to four profiles for future loading to the active calibration when needed. The active profile is always the one loaded into the values on this screen.

For manual saving of calibration information, refer to the below table for guidance.

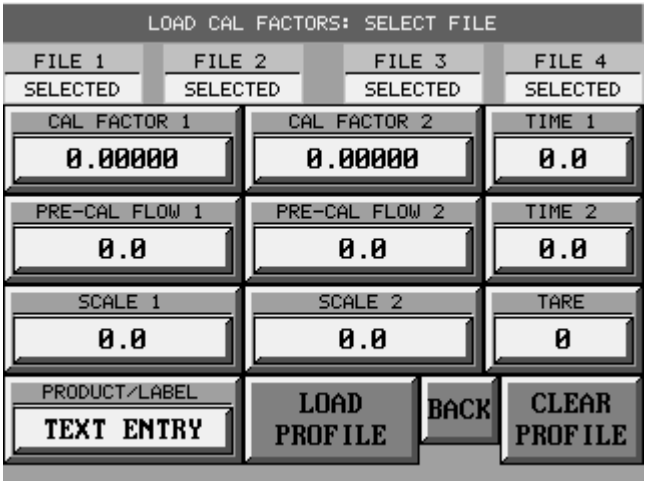
Table 3: Calibration Profile Saving Example

| | File 1 | File 2 | File 3 | File 4 |
|---|---|---|---|---|
| CAL1 | | | | |
| CAL2 | | | | |
| Pre-Cal Flow1 | | | | |
| Pre-Cal Flow2 | | | | |
| Time1 | | | | |
| Time2 | | | | |
| Scale1 | | | | |
| Scale2 | | | | |
| Tare | | | | |
| Product | | | | |

You may also email the calibration information to CADARO directly at info@cadaro.com.

Load Cal Factors

***Figure 33: Load Cal Factors Screen***




This is the repository of the saved calibration profiles. Four files are depicted with 'File 1' being selected in this picture.

- Select any of the four files by clicking anywhere on the respective column. If selected, the white color will appear behind the data.
- Select 'Load Profile' when ready. On the 'Save Cal Factors' screen, the loaded profile is now the active profile.
- 'Clear Profile' will delete the selected profile.

Cal Settings: Password protected for supervisor-level access

***Figure 34: Calibration Settings Screen***


The *Cal % Difference* is an allowable range between Flowrates for Cal 1 and Cal 2.

- For instance, Cal 1 Flowrate of 100 and Cal 2 Flowrate of 89 is acceptable. The % difference is 11%.
- This setting is meant to inform the user of calibration flowrate values being too close, which can cause two-point calibration calculation problems.
- If this condition is violated, it will produce an alarm and nothing more. Specifically, it will continue the calibration calculations as normal, even if they are malfunctioning.

## ALARMS

There are seven alarms pre-programmed into the software:

Table 4: Alarm List

| Alarm Name | Severity | Solution – Contact CADARO If Needed |
|---|---|---|
| Panel/HMI Battery Low | Low | Follow procedure to replace battery with exact match battery |
| PLC Battery Low | Low | Follow procedure to replace battery with exact match battery |
| Signal Fault | High | Signal reading 0. Bad loadcell or faulty wiring. |
| Signal Max Reading | Medium | Signal reading max. Bad loadcell or too much flow. |
| Auto-Tare Fault | Medium | Tare value not updating. Signal issue or not in auto. |
| Cal Flowrates Too Close | Low | Cal settings need adjustment. Cal 2 flowrate needs to change. |
| Uncomputable Cal Factor | High | Cal settings and/or results are not satisfactory for computation. |

### Alarm List

*Figure 35: Alarm Summary Screen*


All active alarms will be shown here. Refer to the alarm list above for more information.

### Alarm History

*Figure 36: Alarm History Screen*


All alarms, whether active or not, will show here. The alarms can be cleared if necessary, by clicking 'Clear All'.

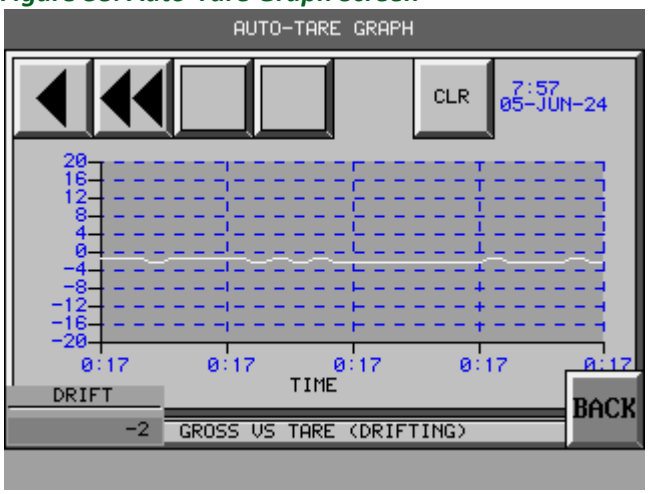
## UTILITIES: PASSWORD PROTECTED FOR SUPERVISOR LEVEL ACCESS

***Figure 37: Utilities Menu Screen***


- *Re-Initialize* will navigate the user to the 'Initialization' screen.

Auto-Tare Graph

***Figure 38: Auto-Tare Graph Screen***

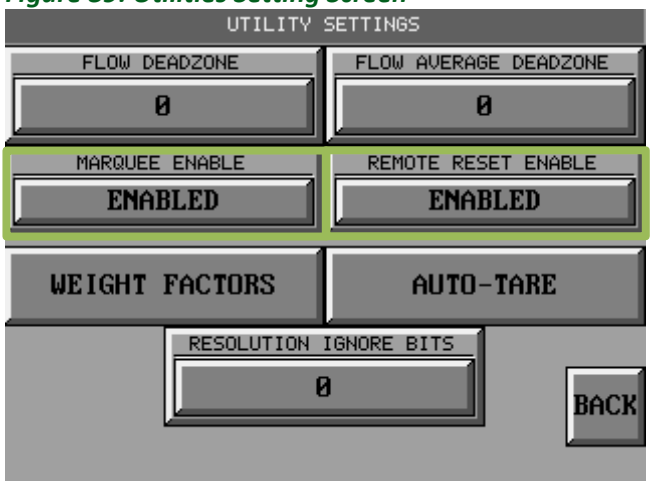



The 'Auto-Tare Graph' screen is used to visualize the 'noise' of the signal.

- This is a direct comparison of the gross (raw) value from the sensor to the tare (zero) value of the software.
- The 'noise' could be from a handful of interactions to the PLC or Loadcell. For example: radio interference, vibration, temperature, etc.
- If auto-tare is enabled, the drift will re-tare when the drift is beyond the tare dead zone for more than one second.

Utility Settings

***Figure 39: Utilities Setting Screen***




*Flow Deadzone* and *Flow Average Deadzone:* The values used to determine active flow. For example: If the tare is 100 and flow dead zone is 20, then gross will need to be greater than 120 for flow to be considered active.

Possible reasons to change *Flow Deadzone*:

- Considerable noise causing the signal to bounce above the dead zone without actual flow of material. This problem should be fixed in a different way for a long-term solution.
- Material is light weight or slow flow where the signal is not moving enough to be considered active.

*Marquee Enable:* An optional installation of a remote LED data display device, or Marquee, can be activated. The *Marquee* capability requires a CADARO CONNECT Enterprise Plan.

- If Enterprise Plan subscriber: See document named "CADARO Marquee Tech Sheet".

*Remote Reset Enable:* A hardwired push button can be installed to allow for remote resetting of the batch. If other criteria are requested for use by a hardwired push button, please reach out to CADARO Support. The *Remote Reset Enable* capability requires CADARO CONNECT Pro Plan.

- If Pro Plan subscriber: See document named "CADARO Remote Reset (Hardwired) Tech Sheet".

*Weight Factors:* Separate screen with multiple options described below.

*Auto Tare:* Separate screen with multiple options described below.

*Resolution Ignore Bits:* A setting determined during calibration. After calibration, it should be left as is.

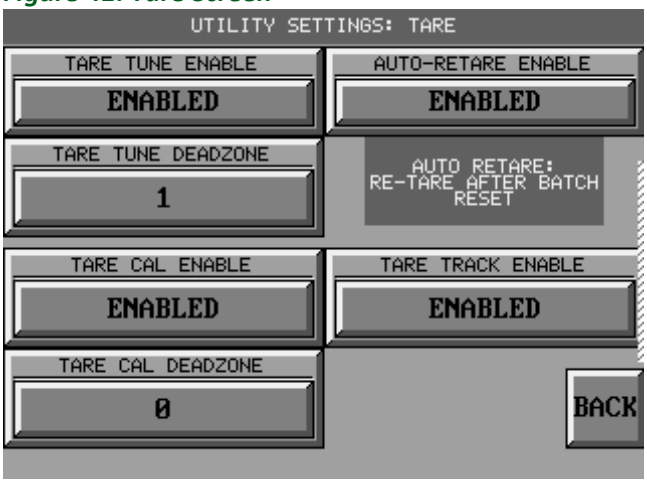
Utility Settings: Weight Factors

***Figure 40: Weight Factors Screen***


Each sensor box has an assigned flow rate capacity as well as a weight factor. This weight factor is what the software uses to calculate the pre-calibration values. These factors should only be adjusted after discussion with CADARO Support. Displayed values in the above figure may not reflect actual.

Utility Settings: Auto Tare

***Figure 41: Tare Screen***




This is 'Auto-Tare' functionality, and it is default enabled. When enabled, the tare will adjust itself to follow any deviations in gross (raw) over time.

The *Tare Deadzone* is the value used to determine if gross has drifted too far from tare, i.e. if gross-minus-tare is greater than 'Tare Deadzone' for greater than five seconds, the tare will 'Auto-Tare'.

The 'Auto-Retare' functionality is default enabled. When enabled, the software will perform a tare each time the batch is reset. This is regardless of drift status.

*Tare Cal Enable:* May or may not be used during initial setup. It should be left as is. Same with Tare Cal Deadzone.

*Tare Track Enable:* May or may not be used during initial setup. It should be left as is.

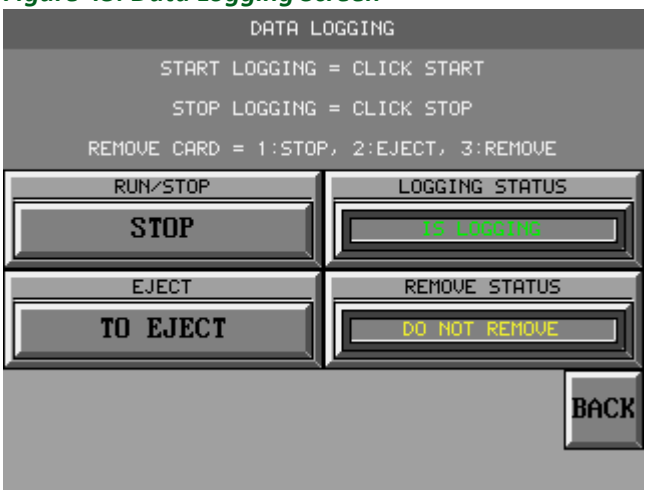
Passwords

*Figure 42: Passwords Screen*


The 'Supervisor' password is adjustable by the supervisor only. The default is password '3456'. If changed, do not forget it. This is the only password customers can use to access certain areas of the product functionality.

Data Logging

*Figure 43: Data Logging Screen*




There are a handful of pre-programmed scenarios in which data is logged to the on-board microSD card. The PLC manufacturer suggests a 4 GB microSD card, but it has been successful with up to a 32 GB. The card shall be formatted to 'FAT32' with default allocation size.

This functionality is enabled and running by default.

- If ever there is a blinking notification on the top-left of any screen saying, 'Data Not Logging', please contact CADARO.
- To remove the microSD card or start/stop data logging, follow the on-screen instructions.

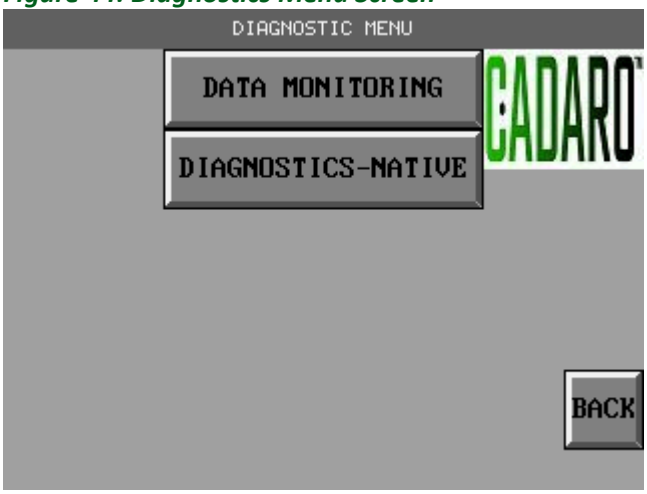
The data logging scenarios and data logged is as follows:

Table 5: Data Logging Criteria

| Log Trigger | Data Logged |
|---|---|
| Batch Reset | Batch Total<br>Batch Number<br>Batch Time<br>Batch Average Flowrate/Min<br>Tare<br>Cal 1 Batch Time<br>Cal 1 Batch Weight<br>Cal 1 Factor<br>Cal 1 Scale Weight<br>Cal 1 Flowrate/Min<br>Cal 1 Pre-Calibration Flowrate/min<br>Cal 2 Batch Time<br>Cal 2 Batch Weight<br>Cal 2 Factor<br>Cal 2 Scale Weight<br>Cal 2 Flowrate/Min<br>Cal 2 Pre-Calibration Flowrate/min |
| Active Batch | Batch Number<br>Gross<br>Tare<br>Batch Mini-Number<br>Tare Calibration Status<br>Tare Calibration |
| Scale Save | Scale Weight<br>Scale Batch |

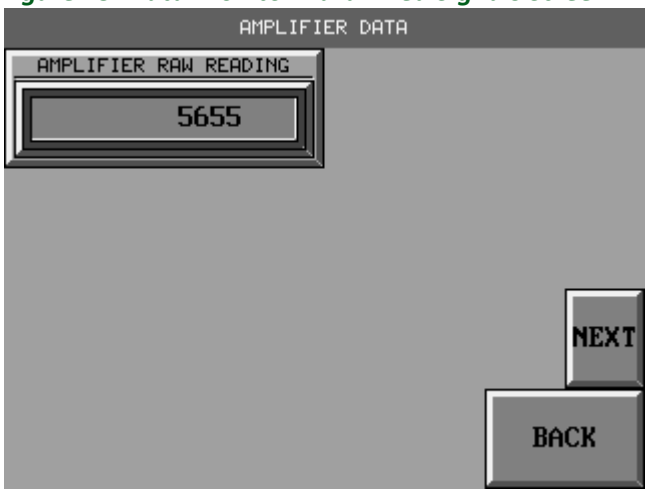
## DIAGNOSTICS: PASSWORD PROTECTED FOR SUPERVISOR LEVEL ACCESS

***Figure 44: Diagnostics Menu Screen***

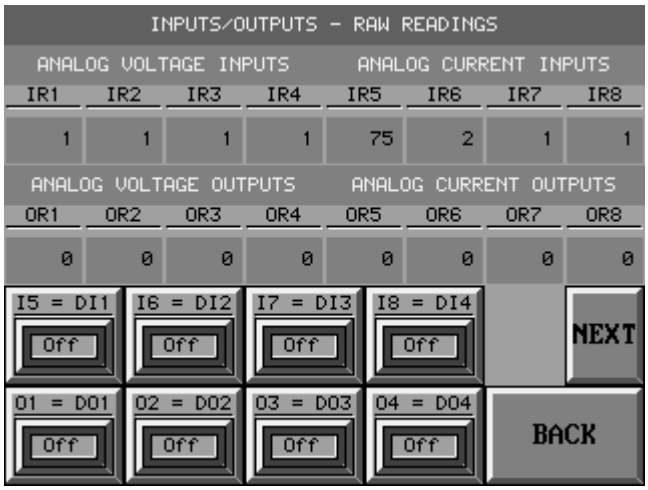


Data Monitoring

***Figure 45: Data Monitor Hardwired Signals Screen***

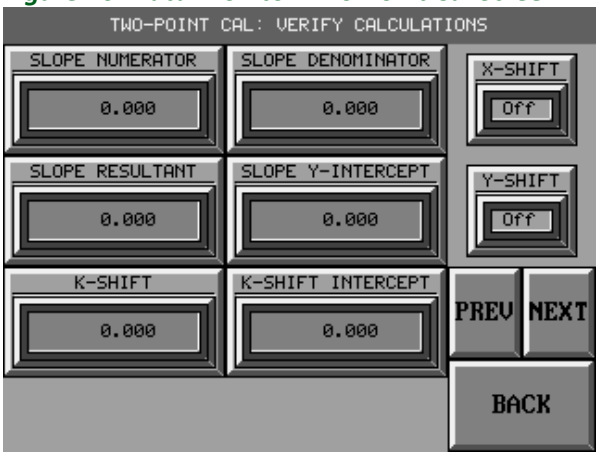



*Amplifier Raw Reading* is the value from the amplifier.




*Raw Readings* is the active status of all analog inputs and outputs and all digital inputs and outputs.

***Figure 46: Data Monitor Two-Point Cal Screen***




*Two-Point Cal* is used by CADARO to help troubleshoot any issues with 2-point Cal calculations.

*Figure 47: Data Monitor Modbus Reads 1 Screen*

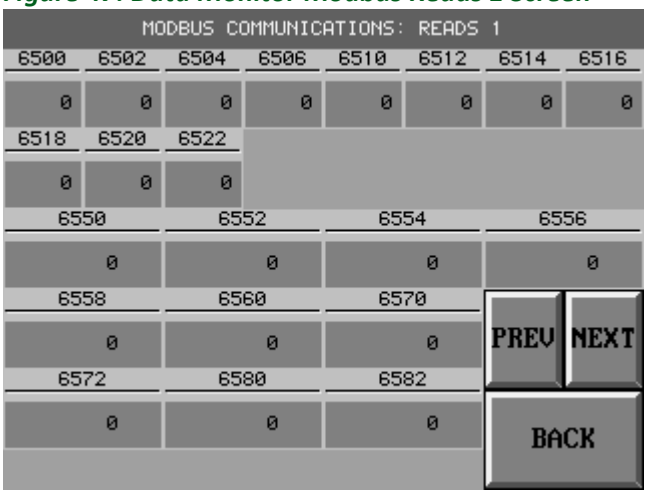



*Figure 48: Data Monitor Modbus Reads 2 Screen*

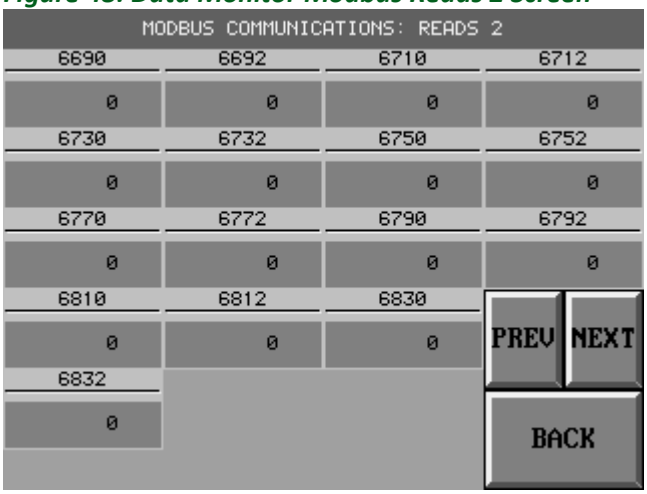



*Figure 49: Data Monitor Modbus Reads 3 Screen*

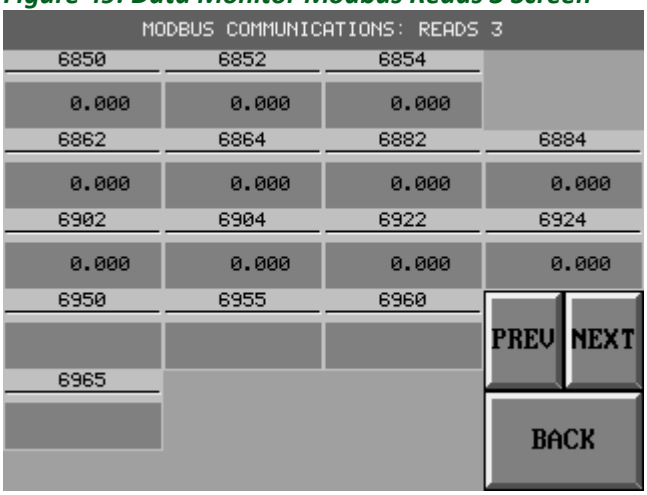


*Figure 50 Data Monitor Modbus Writes 1 Screen*

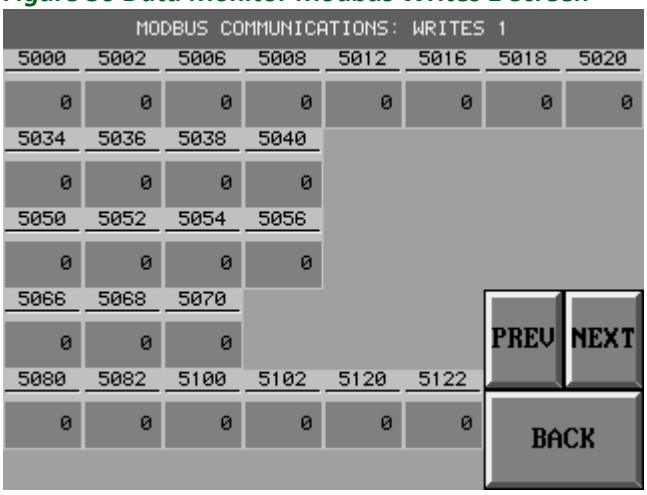
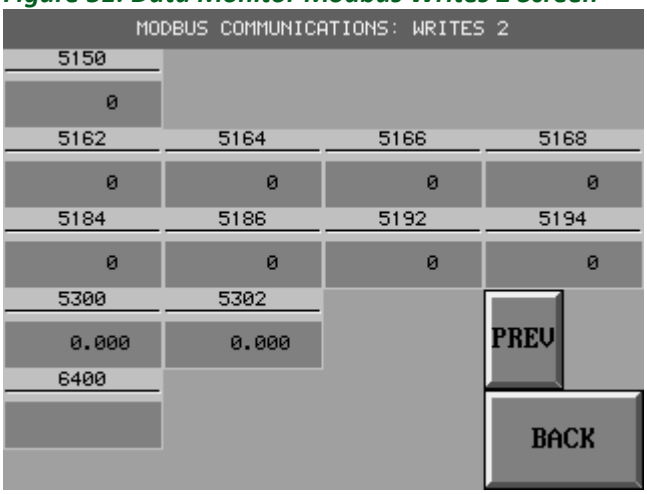



*Figure 51: Data Monitor Modbus Writes 2 Screen*




Diagnostics-Native: Password protected for Master level Access

# LOADING SOFTWARE FROM USB FILE

In special circumstances, CADARO may provide the customer with a USB drive. This drive will be preloaded with a file ready for download to the HMI.

Place the USB file into the 'Host' port on the HMI.

***Figure 52: USB Port on HMI***


- The HMI screen will automatically load a screen displaying all recognizable files.
- Ideally there will only be one file. Select 'Accept' for it to be downloaded.
- Once the software update is completed, the system will automatically restart. If the system does not automatically restart, then power cycle the PLC control box.

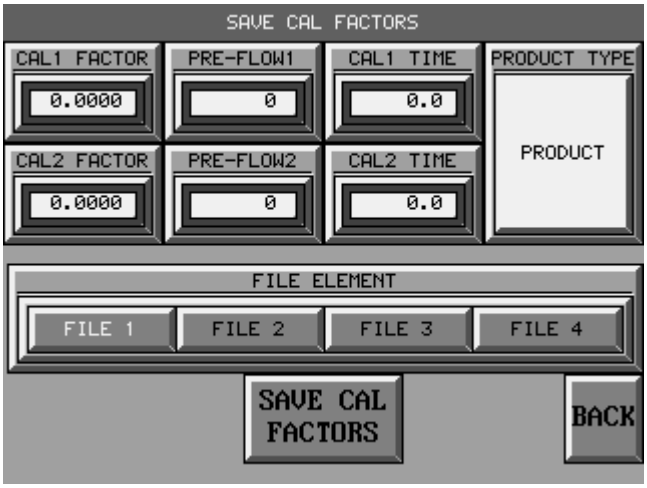
## TARE AND WEIGHT FACTOR

Navigate to 'Tune Amplifier/Tare Sensor' screen within the 'Initialization' screen.


Locate the 'Tare' and 'WT-Factor' values.
Record: TARE: _____ WT_FACTOR: _____ Date: _____

## CALIBRATION VALUES

Navigate to 'Save Cal Factors' screen within the 'Calibration Menu' screen.




Navigate to the Field Calibration screen and select "CAL Master".

Cal C1: _____ @ Pre-flow 1 _____ lbs./min @ Time 1 _____ seconds
Cal C2: _____ @ Pre-flow 2 _____ lbs./min @ Time 2 _____ seconds

# TROUBLE-SHOOTING TIPS

## SLOW OPERATION OR DELAYED SCREEN TRANSITIONS

If the operator notices that the system is experiencing a delay when changing between screens or operating slower than normal, consider power cycling the system:

- Unplug the unit from the 110 volt AC power supply (AVOID opening the enclosure).
- Wait 30 seconds.
- Plug the power cord back into the 110 volt AC power supply and observe if performance improves.

## INCORRECT GROSS READING

If the tare reading does not reflect the expected reading, consider checking the connections between the PLC control box and the flow sensor(s):

- If the gross reading shows zero "0" with a standard weight (or full bottle of water), check the connection between the PLC control box and the flow sensor(s).
- If the gross reading does not change when a standard weight is placed on the sensor box/plate, and it has been verified that all shipping bolts (one top bolt and 2 bottom bolts) are removed, it is possible that a load cell is not functioning correctly. Contact your CADARO representative for further assistance.

## UNRECOGNIZED FLOW RATE BY THE PLC

If the PLC is not recognizing the flow rate, consider the following:

- Ensure that the Veracity flow sensor is properly connected.
- Check for any system restrictions that may be affecting the flow rate.
- If the issue persists, it could indicate a damaged load cell. Contact your CADARO representative for further assistance.

## DATA SHARING ISSUES BETWEEN PLC AND SITE AUTOMATION SYSTEM VIA ETHERNET

To resolve issues related to data sharing between the PLC and a site automation system via Ethernet, follow these steps:

- Verify that the Ethernet connection is secure and properly connected.
- Check if the IP parameters at the location have changed and no longer match the CADARO PLC. You can use the IP configuration program from CADARO to investigate and adjust the settings accordingly. Although a newer version of the AVG IPConfig tool may exist, we recommended that ONLY version 1.0.2 (AVG IPConfig 1.0.2.exe) is installed/utilized to view and set IP addresses for external communication.

## OPERATOR SCREEN ISSUES

If the screen on the PLC control box is not turning on, consider performing the following checks to ensure power is being provided to the unit:

- Verify that the unit is properly plugged into a 110 volt AC power source.
- If applicable, ensure the interruptible power supply has a visible green light (APC UPS units illustrate a green light under normal conditions). If the power supply is off despite proper connections, it may be faulty.
- If 110 volt AC power is being provided to the PLC control box, and the screen does not power up or respond to touch, there could be an issue with an internal component. Contact your CADARO representative for further assistance.

### LOSS OF FACTORY SETTINGS DUE TO POWER LOSS

Values should remain as long as the PLC and HMI backup batteries are in working order. If a power loss has resulted in the loss of factory settings:

- Replace both HMI and PLC batteries.
- Inspect the PLC door to locate the original factory settings. If unavailable, a new initialization and calibration needs to be completed.
- Manually input factory settings into the 'Manual Cal Factors' screen.

### NO SIGNAL FROM FLOW SENSOR(S)

If there is no signal from the flow sensor(s), perform the following checks:

- Verify that the cable and connections are in good condition and securely connected on each end of the sensor cable.
- Contact your CADARO representative for further assistance.

### NAN (NOT A NUMBER) VALUE

If you encounter a NAN value, which is seen when the code has been lost because of a power disruption (often associated with lightning strikes), please take the following steps:

- Record the C1 and C2 values along with their respective pre-cal flow rates.
- Power cycle the PLC by switching the breaker off for 30 seconds, then back on. Allow for bootup.
- Navigate to 'Save Cal Factors' screen within the 'Calibration Menu' screen.
- Check if the recorded values match the on-screen values.
  - If 'yes', the problem should be resolved.
  - If 'no', a manual 'Push Cal Factors' will need to be performed using the recorded values.
- Instructions for this can be found in 'Calibration Menu' section.

### SIGNAL AMPLIFIER

If the signal from amplifier is not changing:

- Ensure the power cables and network cable are plugged in on both ends.
- Power cycle the control box by unplugging the AC wall plug for > 10 seconds.
- Check supplied power by removing the smaller cover plate.
  - LED readout should show ~24 Volts.
  - Press small black pushbutton on lower right, this toggle to the output voltage.
  - LED readout should show 7.0 Volts.
- If no resolution is found, contact CADARO Support.

# SERVICE AND REPAIR

## CONTACT PHONE NUMBER AND EMAIL ADDRESS

For service or any questions regarding the product, please contact CADARO using the following details:

- Email: service@CADARO.com
- Phone: 806-338-7478

## WARRANTY

**Warranty Voidance Notice:** Please note that any alterations, repairs, or disassembly performed by unauthorized individuals or persons not authorized by CADARO are strictly prohibited and will result in the voidance of the warranty.

# SPECIFICATIONS

## PRODUCT WEIGHTS

Figure ***53***: Product Weights

| MODEL | Low Operating Range (lbs/min)* | High Operating Range (lbs/min)* | Inlet/Outlet Pipe Size | Configuration | Flow Sensor Dimensions (L x W) | Flow Sensor Weight (lbs) |
|---|---|---|---|---|---|---|
| VERACITY VR/600 | 200 | 600 | 4" ID | Round | 18 ½" x 11" | 25 |
| | | | 6" ID | Round | 22" x 11" | 28 |
| VERACITY VR/2K | 800 | 2,000 | 6" ID | Round | 22 ¼" x 15" | 50 |
| VERACITY VR/4K | 1,600 | 4,000 | 8" ID | Round | 23" x 17" | 60 |
| | | | 10" ID | Round | 26" x 17" | 65 |
| VERACITY VR/5K | 2,000 | 5,000 | 10" ID | Round | 26" x 21" | 75 |

## SIGNAL OUTPUT VOLTAGE

Ethernet (standard) with Modbus option, and/or 4 channel analog outputs with 0-5 VDC, 0-10 VDC (optional)

## PLC CONTROL BOX

12.8 lbs. for single channel

## POWER RATING

1.3 amps at 110VAC

## RATED CAPACITY

The table below lists the acceptable flowrates (lbs./min) for 4 common models.

Table 6: Flow Sensor Specifications

| Model | Measurement Range Lbs./Min | Measurement Range Kg/Minute (1) |
|---|---|---|
| Veracity NR/2K | 800-2,000 | 400-1,000 |
| Veracity NS/5K | 1,750-5,000 | 800-2500 |
| Veracity NS/20K | 5,000-20,000 | 2,300-9,100 |
| Veracity NS/50K | 17,500-50,000 | 8,000-22,700 |

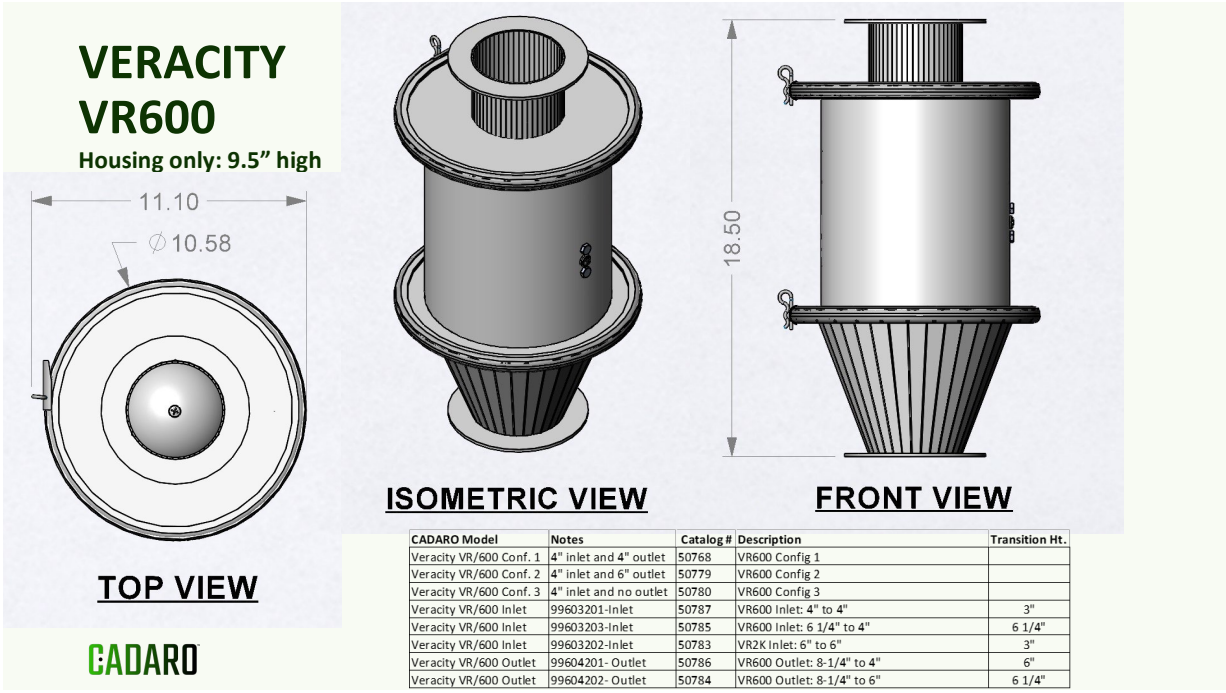
## REQUIRED POWER AND SUGGESTED UPS

The PLC Control box requires a 110VAC and Un-interruptible Power Supply (UPS) [recommended] along with spike free, steady voltage. Electrical components may not be covered under OEM warrantee if a quality UPS is not used to power the system. It is further recommended that a professional licensed electrician (or other experienced/qualified individual) evaluate the quality of the original power supply to ensure that spike-free, steady is being supplied to the UPS and to the PLC Control box.

## FLOW SENSOR DIMENSIONS

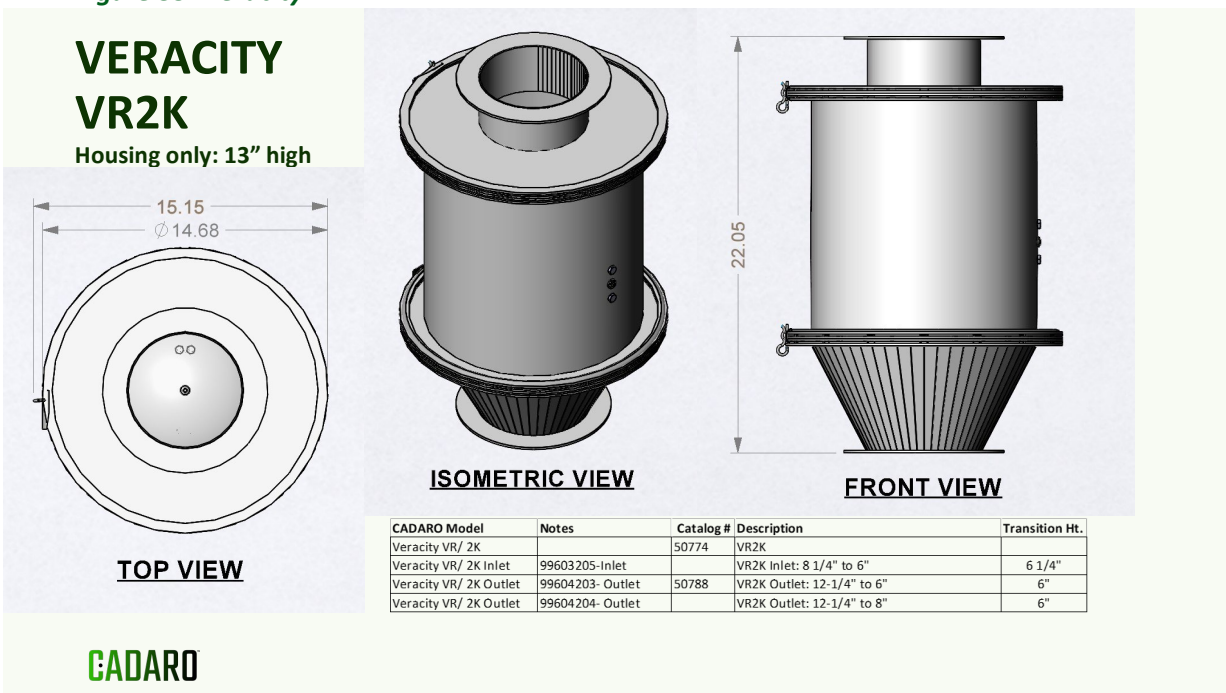
Veracity Models

*Figure 54: Veracity VR600*



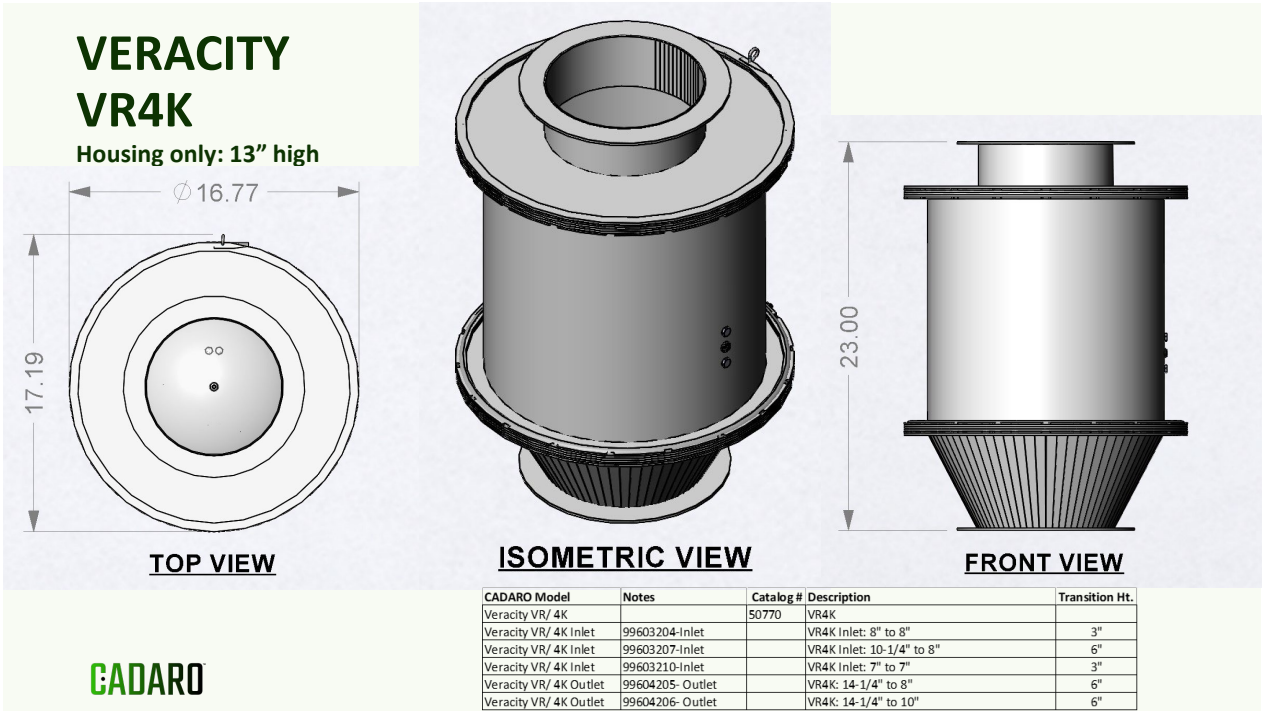

| CADARO Model | Notes | Catalog # | Description | Transition Ht. |
|---|---|---|---|---|
| Veracity VR/600 Conf. 1 | 4" inlet and 4" outlet | 50768 | VR600 Config 1 | |
| Veracity VR/600 Conf. 2 | 4" inlet and 6" outlet | 50779 | VR600 Config 2 | |
| Veracity VR/600 Conf. 3 | 4" inlet and no outlet | 50780 | VR600 Config 3 | |
| Veracity VR/600 Inlet | 99603201-Inlet | 50787 | VR600 Inlet: 4" to 4" | 3" |
| Veracity VR/600 Inlet | 99603203-Inlet | 50785 | VR600 Inlet: 6 1/4" to 4" | 6 1/4" |
| Veracity VR/600 Inlet | 99603202-Inlet | 50783 | VR2K Inlet: 6" to 6" | 3" |
| Veracity VR/600 Outlet | 99604201- Outlet | 50786 | VR600 Outlet: 8-1/4" to 4" | 6" |
| Veracity VR/600 Outlet | 99604202- Outlet | 50784 | VR600 Outlet: 8-1/4" to 6" | 6 1/4" |

*Figure 55: Veracity VR2K*



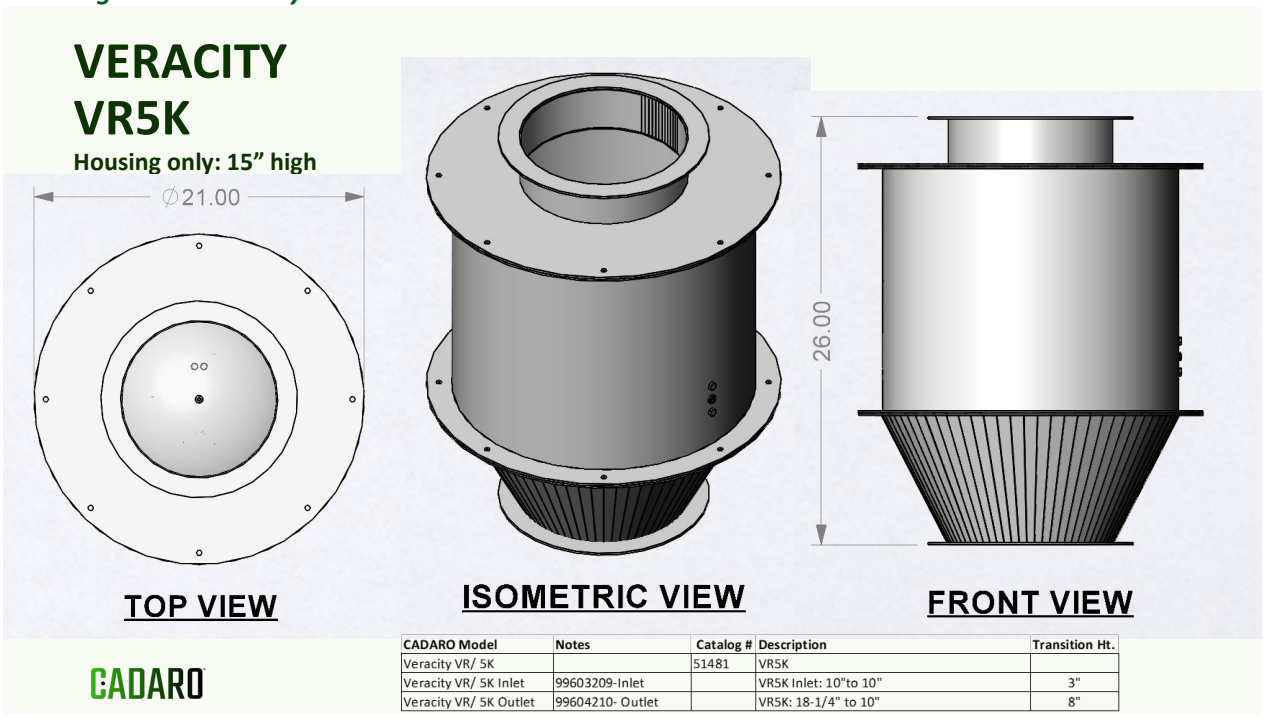

| CADARO Model | Notes | Catalog # | Description | Transition Ht. |
|---|---|---|---|---|
| Veracity VR/ 2K | | 50774 | VR2K | |
| Veracity VR/ 2K Inlet | 99603205-Inlet | | VR2K Inlet: 8 1/4" to 6" | 6 1/4" |
| Veracity VR/ 2K Outlet | 99604203- Outlet | 50788 | VR2K Outlet: 12-1/4" to 6" | 6" |
| Veracity VR/ 2K Outlet | 99604204- Outlet | | VR2K Outlet: 12-1/4" to 8" | 6" |

*Figure 56: Veracity VR4K*




| CADARO Model | Notes | Catalog # | Description | Transition Ht. |
|---|---|---|---|---|
| Veracity VR/ 4K | | 50770 | VR4K | |
| Veracity VR/ 4K Inlet | 99603204-Inlet | | VR4K Inlet: 8" to 8" | 3" |
| Veracity VR/ 4K Inlet | 99603207-Inlet | | VR4K Inlet: 10-1/4" to 8" | 6" |
| Veracity VR/ 4K Inlet | 99603210-Inlet | | VR4K Inlet: 7" to 7" | 3" |
| Veracity VR/ 4K Outlet | 99604205- Outlet | | VR4K: 14-1/4" to 8" | 6" |
| Veracity VR/ 4K Outlet | 99604206- Outlet | | VR4K: 14-1/4" to 10" | 6" |

*Figure 57: Veracity VR5K*

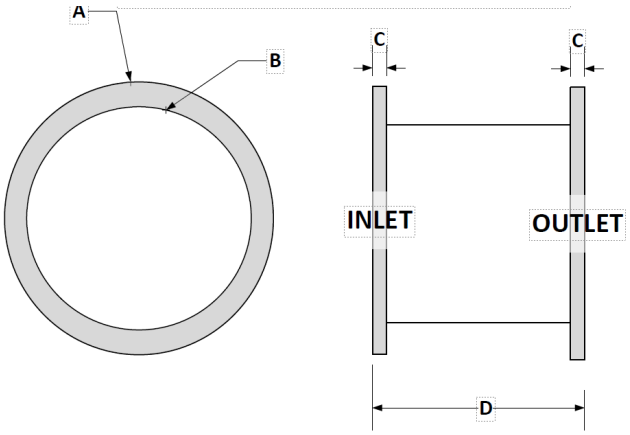



| CADARO Model | Notes | Catalog # | Description | Transition Ht. |
|---|---|---|---|---|
| Veracity VR/ 5K | | 51481 | VR5K | |
| Veracity VR/ 5K Inlet | 99603209-Inlet | | VR5K Inlet: 10"to 10" | 3" |
| Veracity VR/ 5K Outlet | 99604210- Outlet | | VR5K: 18-1/4" to 10" | 8" |

## VERACITY FLANGES

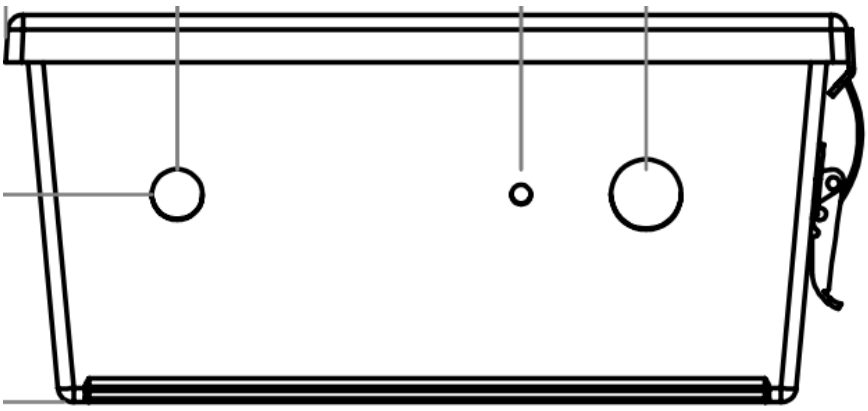
### *Figure 58: Veracity Flange Detail*

| Model | Catalog # | Stock # | Size | Adapter Description | Standard round angle flange size | Nordfab clamp size | A | B | C | D | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VR600- Inlet | 50787 | 99603201 | 4" to 4" | WELDMENT,TRANS,INLET,4"TO4" | 4" | 6" | 6.00 | 4.00 | 0.135 | 3.00 | **A= O.D.** |
| VR600- Inlet | 50785 | 99603203 | 6-1/4" to 4" | WELDMENT,TRANS,INLET,6-1/4"TO4" | 6" | 8" | 8.50 | 6.25 | 0.135 | 6.29 | **B= I.D.** |
| VR600- Outlet | 50786 | 99604201 | 8-1/4" to 4" | WELDMENT,TRANS,OUTLET,8-1/4"TO4" | 4" | 6" | 6.00 | 4.00 | 0.135 | 6.00 | **C= Thick** |
| VR600- Outlet | 50784 | 99604202 | 8-1/4" to 6" | WELDMENT,TRANS,OUTLET,8-1/4"TO6" | 6" | 8" | 8.50 | 6.00 | 0.135 | 6.27 | **D= Depth** |
| VR2K- Inlet | 50783 | 99603202 | 6" to 6" | WELDMENT,TRANS,INLET,6"TO6" | 6" | 8" | 8.50 | 6.00 | 0.135 | 3.00 | **All Inches** |
| VR2K- Inlet | | 99603205 | 8-1/4" to 6" | WELDMENT,TRANS,8-1/4"TO6" | 8" | 10" | 10.50 | 8.25 | 0.135 | 6.27 | |
| VR2K- Outlet | 50788 | 99604203 | 12-1/4" to 6" | WELDMENT,TRANS,OUTLET,12-1/4"TO6" | 6" | 8" | 8.50 | 6.00 | 0.135 | 6.00 | |
| VR2K- Outlet | | 99604204 | 12-1/4" to 8" | WELDMENT,TRANS,OUTLET,12-1/4"TO8" | 8" | 10" | 10.50 | 8.00 | 0.135 | 6.00 | |
| VR4K- Inlet | | 99603207 | 10-1/4" to 8" | WELDMENT,TRANS,INLET,10"TO8" | 10" | 12" | 12.50 | 10.25 | 0.135 | 6.00 | |
| VR4K- Inlet | | 99603204 | 8" to 8" | WELDMENT,TRANS,INLET,8"TO8" | 8" | 10" | 10.50 | 8.00 | 0.135 | 3.00 | |
| VR4K- Inlet | | 99603210 | 7" to 7" | WELDMENT,TRANS,INLET,7"TO7" | 7" | 9" | 9.50 | 7.00 | 0.135 | 3.00 | |
| VR4K- Outlet | | 99604205 | 14-1/4" to 8" | WELDMENT,TRANS,OUTLET,14-1/4"TO8" | 8" | 10" | 10.50 | 8.00 | 0.135 | 6.00 | |
| VR4K- Outlet | | 99604206 | 14-1/4" to 10" | WELDMENT,TRANS,OUTLET,14-1/4"TO10" | 10" | 12" | 12.50 | 10.00 | 0.135 | 6.00 | |
| VR5K- Inlet | | 99603209 | 10" to 10" | WELDMENT,TRANS,INLET,FM5000 | 10" | 12" | 12.50 | 10.00 | 0.135 | 3.00 | |
| VR5K- Outlet | | 99604210 | 18-1/4" to 10" | WELDMENT,TRANS,OUTLET,18-1/4"TP10" | 10" | 12" | 12.50 | 10.00 | 0.135 | 8.00 | |



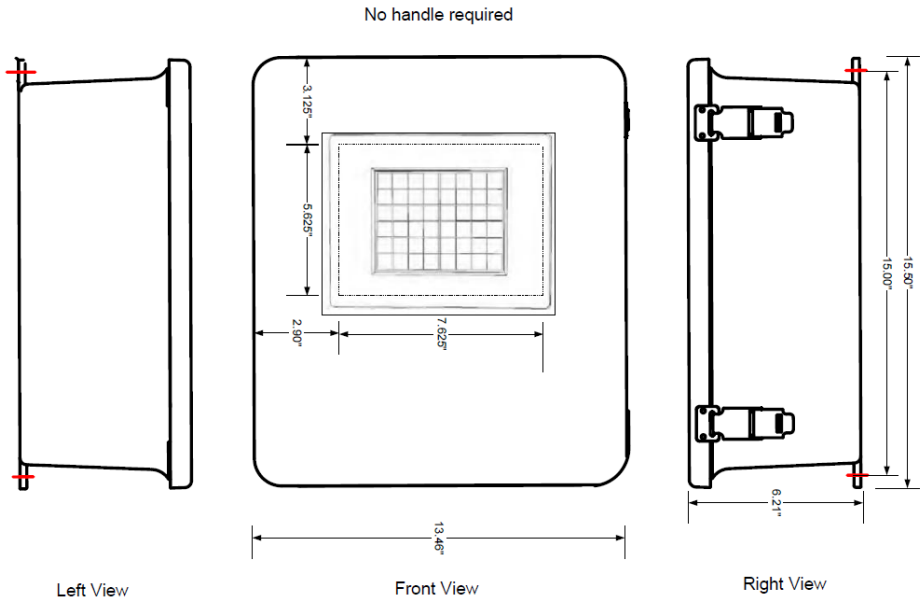
## PLC CONTROL BOX DIMENSIONS

*Figure 59. PLC Control Box Enclosure with 6-inch HMI*



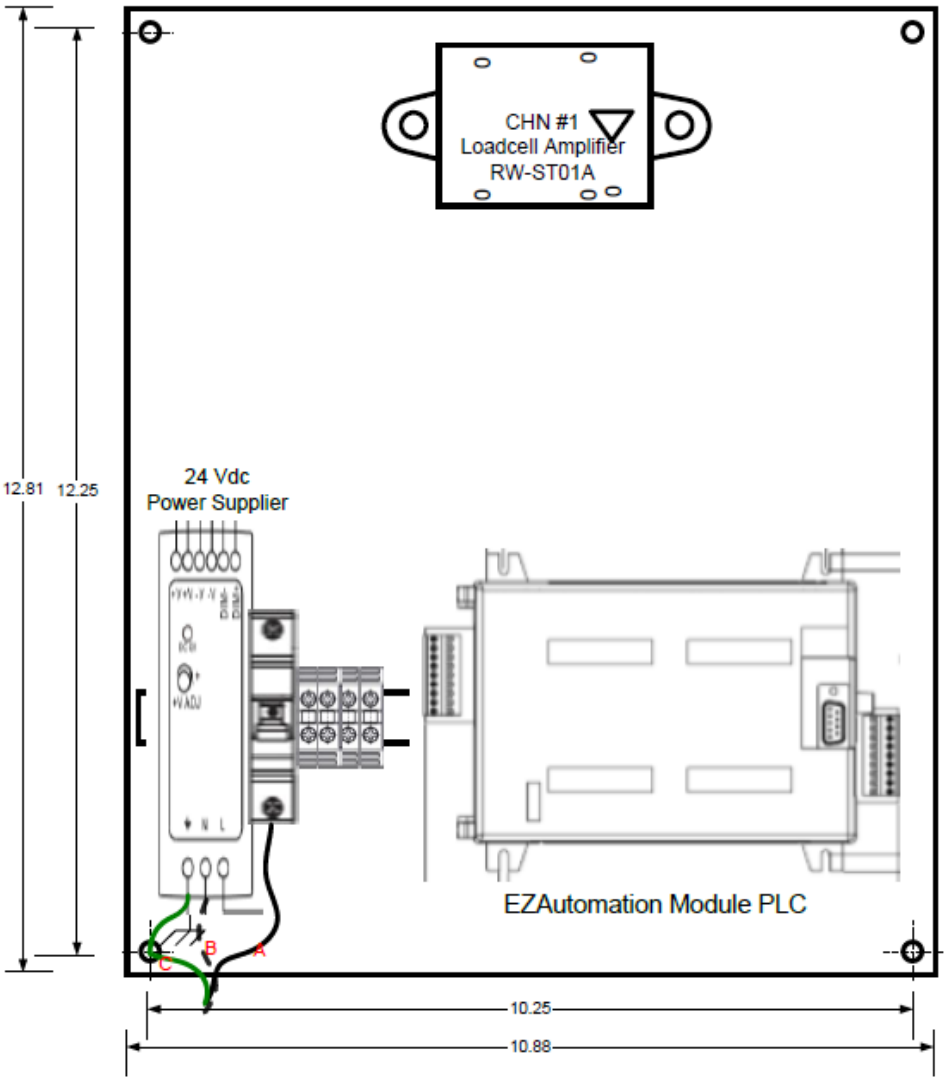
**Note:** Pre-site assessment will determine the recommended sensor.

The power supply hole is in place for site installation to hard wire the PLC control box to the electrical supply. The site will need to drill the exact hole size to meet their conduit or other installation requirements.



## PLC WIRING DIAGRAM

*Figure 60. PLC Wiring Diagram*




Location Power Supply
A – Black wire to the circuit breaker
B – White wire to power transformer
C – Ground to the metal PLC panel

## BATTERY REPLACEMENT GUIDE: HMI AND PLC BATTERIES

It is recommended that both batteries are replaced every 3 to 5 years, or when a battery alarm appears.

Reloading calibration profile after battery replacement:

- A partial RAM memory will be wiped when a battery replacement is performed on the HMI.
- *All RAM memory will be wiped* when a battery replacement is performed on the PLC.
- If either battery is replaced, or both, there needs to be some preparation beforehand to ensure smooth recovery to full function.

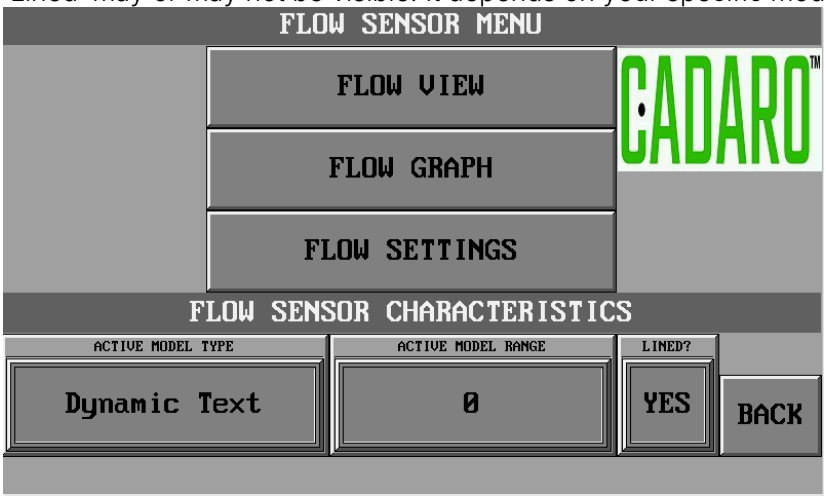
### HMI Battery Pre-Replacement Preparation

1. On the HMI, navigate to 'Flow Sensor Menu'.

   Take a picture or write down the 'Flow Sensor Characteristics' values of 'Active Model Type', 'Active Model Range', and 'Lined?'.

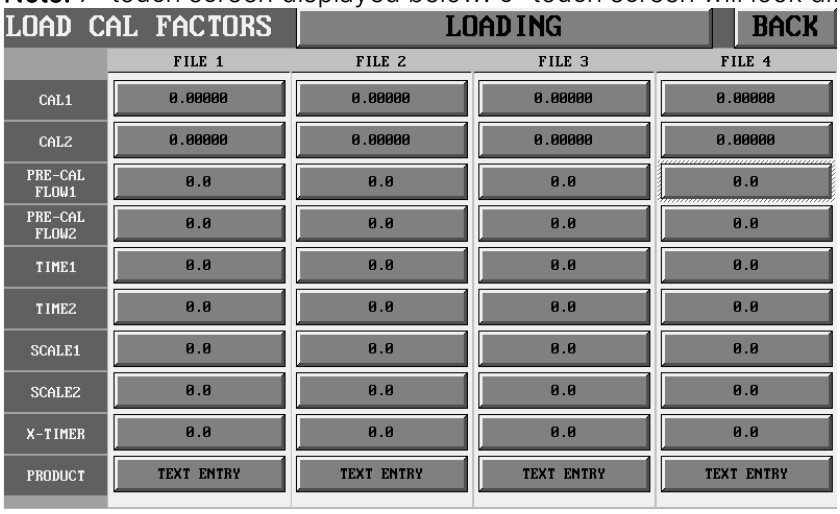
   **Note:** 7" touch screen displayed below. 6" touch screen will look different but function the same.

   'Lined' may or may not be visible. It depends on your specific model installed.




   Navigate to the 'Load Cal Factors' screen. Take a picture or note down the values populated in each File.

   **Note:** 7" touch screen displayed below. 6" touch screen will look different but function the same.



2. After the battery/s have been replaced and the system reinitialized, input the saved calibration profile values to the respective calibration file.
3. To load the profile, select the file at the top of the column. The selected file will be white, while the others are gray.
4. Press 'Load Cal Factors' button at the top.
5. The unit will be back to functioning as before. If not, contact Cadaro Support.

## HMI Battery Replacement Procedure

1. Power down the unit by turning the breaker off.
2. Access HMI battery by opening the cover. There is a press-to-open latch opposite the pivot hinge.
3. The battery is near the pivot hinge.


4. Remove the battery and replace it with a new battery. Be sure to follow positive (+) and negative (-) installation instructions on or near where the battery is installed.

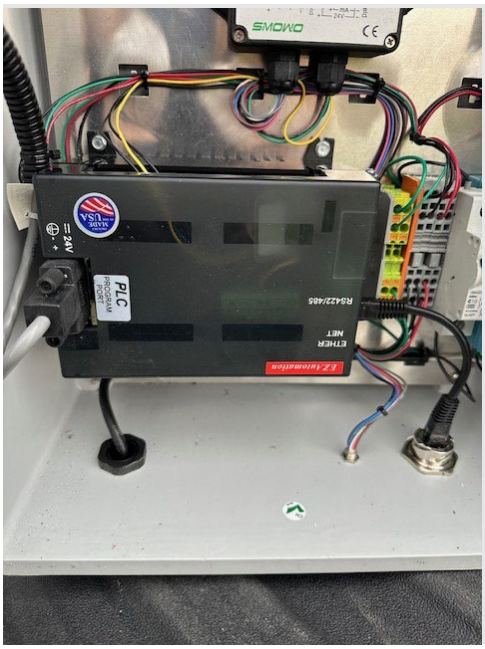

5. Power on the unit by turning the breaker on.
6. **Caution:** Do not touch any equipment or wires while power is applied.
7. Wait a maximum of 30 seconds for HMI panel to power up. If HMI does not power up, power down the system again by turning the breaker off. Wait 30 seconds. Power up the unit again by turning the breaker on.

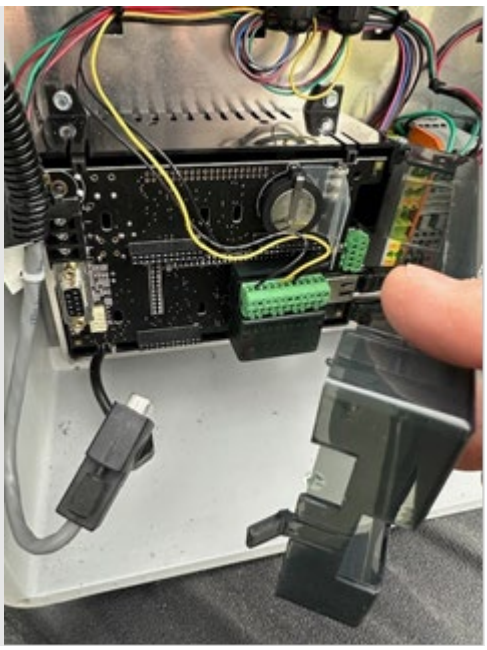
8. If still no bootup from the HMI, try 6.a -6.c again.
9. If still no bootup, double check the battery installation is correct.
10. If still no bootup, contact Cadaro Support.

HMI Battery Specifications: LS14250 3.6 Volt 1200 mAh PLC Lithium 1/2AA Battery


PLC Battery Replacement Procedure

1. Power down the unit by turning the breaker off.
2. Access PLC battery by opening the cover. There is a press-to-open latch opposite the pivot hinge.
3. The battery is near the pivot hinge.



4. Remove the battery and replace it with a new battery. Be sure to follow positive (+) and negative (-) installation instructions on or near where the battery is installed.
   *The PLC battery can be difficult to remove. It is suggested to use a small flathead screwdriver to pry up the pressure clip while using a second small flathead screwdriver to push the battery out.
5. Power on the unit by turning the breaker on.
6. Caution: Do not touch any equipment or wires while power is applied.
7. If the screen does not power up, refer to point 6 in the HMI battery replacement section.

PLC Battery Specifications: CR2032 3-Volt Battery

# CADARO LIMITED WARRANTY

M&S Flowmatics Incorporated, doing business as CADARO, ("CADARO") warrants that all CADARO equipment properly installed by CADARO, or its Distributor or Original Equipment Manufacturer (OEM) will operate according to the written product specifications. CADARO, its Distributor or OEM, at CADARO sole option may determine whether the product fails to meet its specification. Should a Distributor or OEM determine the product fails to meet its specification, it shall submit the claim to CADARO. CADARO must review the determination and accept the claim. All systems and components are warranted against defects in electronic equipment and defects in material/assembly for one (1) year beginning with the delivery date.

CADARO warrants the equipment against faulty workmanship and defective materials. If any equipment fails to conform to these warranties during the warranty period set forth above, CADARO will, at its option, repair or replace the non-conforming portion of the product returned within the warranty period subject to the following conditions:

- Upon discovery by Buyer of a nonconformity and provided such discovery is within the warranty period, Buyer will provide CADARO with prompt written notice within 30 days and provide a detailed explanation of the alleged deficiencies.
- Upon examination of the equipment CADARO will determine whether the equipment fails to meet its specifications consistent with the Operations Manual and such failure was not the result of accident, abuse, welding, misuse, neglect, alteration, improper installation, or improper testing by Buyer or any third party authorized by Buyer. Such determination of any alleged non-conformity shall be made in good faith; however, such determination shall be CADARO' sole and exclusive determination.
- Only CADARO or a party authorized in writing is authorized to make any repairs. The equipment may not have been modified, altered, or changed by any person other than CADARO or a party CADARO authorizes to make the repair, or the warranty shall be void.
- CADARO will have a reasonable time to repair or replace defective equipment. The buyer is responsible for shipping charges to and from CADARO's designated location.

THESE WARRANTIES EXCLUDE ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NEITHER CADARO NOR DISTRIBUTOR WILL, IN ANY EVENT, BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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# RECOMMENDED INFORMATION TO BE STORED IN PLC CONTROL BOX

Information

| | |
|---|---|
| Date | |
| Serial Number Flow Sensor | |
| Serial Number PLC Control Box | |
| Load Cell Tare | |
| Wt. Factor | |
| Lined or Unlined Sensing Plate | |
| Auto Retare | |
| Dead zone | |
| Software Version | |
| IP Address | |
| Subnet | |
| Gateway | |
| HMI IP Address | |
| Amplifier IP Address | |

Calibration

| | File 1 | File 2 | File 3 | File 4 |
|---|---|---|---|---|
| CAL1 | | | | |
| CAL2 | | | | |
| Pre-Cal Flow1 | | | | |
| Pre-Cal Flow2 | | | | |
| Time1 | | | | |
| Time2 | | | | |
| Scale1 | | | | |
| Scale2 | | | | |
| Product | | | | |

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