Raven Rate Control Module (RCM) Operation Manual for Dry Manure/ Litter Applications

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DISCLAIMER

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CHAPTER 1 IMPORTANT INFORMATION

SAFETY

NOTICE

Follow the operation and safety instructions included with the implement and/or controller and read this manual carefully before installing or operating this Raven system.

- Follow all safety information presented within this manual. Review implement operation with your local dealer.
- Contact a local Raven dealer for assistance with any portion of the installation, service, or operation of Raven equipment.
- Follow all safety labels affixed to system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. Contact a local Raven dealer to obtain replacements for safety labels.

Observe the following safety measures when operating the implement after installing this Raven system:

- Do not operate this Raven system or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Be alert and aware of surroundings and remain in the operator seat at all times when operating this Raven system.
    - Do not operate the implement on any public road with this Raven system enabled.
    - Disable this Raven system before exiting the operator seat.
    - Determine and remain a safe working distance from obstacles and bystanders. The operator is responsible for disabling the system when a safe working distance has diminished.
    - Disable this Raven system prior to starting any maintenance work on the implement or components of this Raven system.
- Do not attempt to modify or lengthen any of the system control cables. Extension cables are available from a local Raven dealer.

⚠ WARNING

AGRICULTURAL CHEMICAL SAFETY

Follow all federal, state, and local regulations regarding the handling, use, and disposal of agricultural chemicals, products, and containers. Triple-rinse and puncture or crush empty containers before properly disposing of them. Contact a local environmental agency or recycling center for additional information.

- Always follow safety labels and instructions provided by the chemical manufacturer or supplier.
- Always wear appropriate personal protective equipment as recommended by the chemical and/or equipment manufacturer.
- When storing unused agricultural chemicals:
    - Store agricultural chemicals in the original container and do not transfer chemicals to unmarked containers or containers used for food or drink.
    - Store chemicals in a secure, locked area away from human and livestock food.
    - Keep children away from chemical storage areas.
- Fill, flush, calibrate, and decontaminate chemical application systems in an area where runoff will not reach ponds, lakes, streams, livestock areas, gardens, or populated areas.
- Follow all label instructions for chemical mixing, handling, and disposal.
- Avoid direct contact with agricultural chemicals or inhaling chemical dust or spray particulate. Seek immediate medical attention if symptoms of illness occur during, or soon after, use of agricultural chemicals or products.
- After handling or applying agricultural chemicals:
    - Thoroughly wash hands and face after using agricultural chemicals and before eating, drinking, or using the restroom.
    - Thoroughly flush or rinse equipment used to mix, transfer, or apply chemicals with water after use or before servicing any component of the application system.

HYDRAULIC SAFETY

When installing or servicing a hydraulic system or hydraulic components, be aware that hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.

- Always wear appropriate personal protective equipment when installing or servicing hydraulic systems.
- Never attempt to open or work on a hydraulic system with the implement running.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- Care should always be taken when servicing or opening a system that has been pressurized.
- The implement or machine must remain stationary and switched off with booms or implement sections unfolded and supported during installation or maintenance.
- Take precautions to prevent foreign material or contaminants from being introduced into the implement hydraulic system. Contaminants that are able to bypass the hydraulic filtration system will reduce performance and may damage hydraulic components.
- Stand clear of the implement when starting the system for the first time after installing or servicing hydraulic components in case a hose has not been properly connected or tightened.

⚠ CAUTION

ELECTRICAL SAFETY

- Always verify that power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the Raven system or other components.
- To prevent personal injury or fire, replace defective or blown fuses with only fuses of the same type and amperage.
- Do not connect the power leads to the battery until all system components are mounted and all electrical connections are completed.
- Always start the machine before initializing this Raven system to prevent power surges or peak voltage.
- To avoid tripping and entanglement hazards, route cables and harnesses away from walkways, steps, grab bars, and other areas used by the operator or service personnel when operating or servicing the equipment.

RECOMMENDATIONS AND BEST PRACTICES

HOSE ROUTING

The word “hose” is used to describe any flexible, fluid carrying components. Use the following guidelines and recommendations when connecting and routing hoses while installing or maintaining this Raven system:

- Leave protective caps/covers over hose ends until connecting the end into the hydraulic system to help prevent contaminants from entering the system.
- Follow existing hose runs already routed on the implement as much as possible. Proper hose routing should:
    - Secure hoses and prevent hoses from hanging below the implement.
    - Provide sufficient clearance from moving components and operational zones around shafts; universal joints and suspension components; pulleys, gears, belts, and chains; moving linkages, cylinders, articulation joints, etc.
    - Protect hoses from field debris and surrounding hazards (e.g. tree limbs, fence posts, crop stubble, dirt clumps or rocks that may fall or be thrown by the implement).
    - Protect hoses from sharp bends, twisting, or flexing over short distances and normal implement operation.
    - Ensure sufficient length for free movement of the implement during normal operation and prevent pulling, pinching, catching, or rubbing, especially in articulation and pivot points. Clamp hoses securely to force controlled movement of the hose.
    - Avoid abrasive surfaces and sharp edges such as sheared or flame cut corners, fastener threads or cap screw heads, hose clamp ends, etc.
    - Avoid areas where the operator or service personnel might step or use as a grab bar.
- Do not connect, affix, or allow hoses to come into contact with components with high vibration forces, hot surfaces, or components carrying hot fluids beyond the temperature rating of hose components.
    - Hoses should be protected or shielded if routing requires the hose to be exposed to conditions beyond hose component specifications.
- Avoid routing hoses in areas where damage may occur due to build up of material (e.g. dirt, mud, snow, ice, etc.).

HARNESS ROUTING

The word “harness” is used to describe any electrical cables and leads, both bundled and unbundled. Use the following guidelines and recommendations when connecting and routing harnesses while installing or maintaining this Raven system:

- Leave protective caps/covers over harness connectors until needed to avoid dirt and moisture from contaminating electrical circuits.
- Secure the harness to the frame or solid structural members at least every 12 in [30 cm].
- Follow existing harness runs already routed on the implement as much as possible. Proper harness routing should:
    - Secure harnessing and prevent the harness from hanging below the implement.
    - Provide sufficient clearance from moving components and operational zones around shafts; universal joints and suspension components; pulleys, gears, belts, and chains; moving linkages, cylinders, articulation joints, etc.
    - Protect harnessing from field debris and surrounding hazards (e.g. tree limbs, fence posts, crop stubble, dirt clumps or rocks that may fall or be thrown by the implement).
    - Protect harnessing from sharp bends, twisting, or flexing over short distances and normal implement operation.
    - Connectors and splices should not be located at bending points or in harness sections that move.
    - Ensure sufficient length for free movement of the implement during normal operation and prevent pulling, pinching, catching, or rubbing, especially in articulation and pivot points. Clamp harnessing securely to force controlled movement of the harness.
    - Avoid abrasive surfaces and sharp edges such as sheared or flame cut corners, fastener threads or cap screw heads, hose clamp ends, etc.
- Do not connect, affix, or allow harnessing to come into contact with components with high vibration forces, hot surfaces, or components carrying hot fluids beyond the temperature rating of harness components.
    - Harnessing should be protected or shielded if routing requires the hose to be exposed to conditions beyond harnessing component specifications.
- Avoid routing harnesses in areas where damage may occur due to build up of material (e.g. dirt, mud, snow, ice, etc.).
- Avoid routing harnesses in areas where the operator or service personnel might step or use as a grab bar.

IMPORTANT: Avoid applying direct spray or pressure washing of electrical components and connections. High pressure streams and sprays can penetrate seals, cause corrosion, or otherwise damage electrical components. When performing maintenance:

- Inspect electrical components and connectors for corrosion, damaged pins or housings, etc. Repair or replace components or harnessing as necessary.
- Ensure connectors are kept clean and dry. Apply dielectric grease to the sealing surfaces of all connections exposed to moisture, dirt, debris, and other contaminates. Repair or replace harnessing as necessary.
- Clean electrical components with pressurized air, aerosol electrical cleaning agent, or low pressure rinse.
- Remove visible surface water from electrical components and connections using pressurized air or an aerosol cleaning agent. Allow components to dry thoroughly before reconnecting cables.

CHAPTER 2 INTRODUCTION

RCM OVERVIEW

Thank you for choosing Raven Applied Technologies. The Raven Rate Control Module (RCM) is a multi-product application control system built on an ISOBUS platform. The RCM offers a machine operator with the ability to simultaneously monitor and control dry manure or litter application via ISOBUS Universal Terminal (UT) and task control for as-applied documentation, prescription rate, and section control.

LITTER AND DRY MANURE CONTROLLER FEATURES

DYNAMIC CALIBRATION

The dynamic calibration automatically adjusts the “density factor” to compensate for varying product density, even when the product is highly variable. Refer to the *Dynamic Calibration* section on page 21 for additional assistance with the dynamic calibration feature.

CLEANOUT MODE

The clean out mode is used to compensate for the end of a load when the beaters or spinners are no longer full. The apron chain will continue to speed up until it is at full speed. The controller will resume normal operation when the spreader has been refilled to a level above the trigger weight. Review the *Cleanout Setup* section on page 23 for additional assistance with setting up the cleanout mode.

GATE HEIGHT MONITORING

Gate height monitoring is used to actively monitor the real time position of the physical gate height on the machine. This always allows the system to know the precise height of the gate and adjust the spreader constant accordingly to maintain a reliable and consistent application rate. Refer to the *Gate Height Sensor Calibration* section on page 24 for additional assistance.

MULTIPLE UTS

When an RCM is used in a system with more than one UT (universal terminal), the RCM can be assigned a primary UT.

FIGURE 1. Set Primary UT Menu

RCM DRY MANURE AND LITTER CONTROLLER OPTIONS

This guide is intended to assist with the setup and configuration of the Raven Rate Control Module (RCM) on pull-type or self-propelled dry manure and litter applicators.

- Initial Setup and Navigation
- Calibration

NOTE: Prior to using the Raven Rate Control Module control features with any UT display, the Raven Rate Control Module electronic control unit (ECU) must be calibrated for the control system. Refer to Chapter 3, *Calibration*, for assistance with completing the calibration wizard.

This manual assumes that the required control hardware is already installed on supported equipment and is properly connected. Contact a local Raven dealer for additional information on supported equipment configurations.

MACHINE TYPES

The information provided in this manual is intended for the following machine types:

NOTE: See Chapter 3 for Setup, Calibration, and Operation Instructions. Settings depicted are generic values. Reference Chapter 6, *Machine Settings*, for machine specific settings.

TABLE 1. RCM Machine Types

Machine Type	Feature Unlock Level	Application Type	Application Mode Uses
Scale Only	0	N/A	General purpose scale without product control.
Pull-Behind Spreader	3	Dry Manure/ Litter	Granular full width control using litter or manure application control features.
Self-propelled Spreader	3	Dry Manure/ Litter	Granular full width control using litter or manure application control features.

RCM LVL 0 – SCALE ONLY

NOTE: RCM Level 0 does not offer dynamic calibration, cleanout mode, or gate height monitoring features.

RCM LVL 0 (Scale Only) does not provide product or task control features with base functionality. These features may be unlocked to achieve dry manure and litter application control features if desired.

TABLE 2. Applicable Part Numbers for Scale Only Applications

Part Number	Description
063-0173-940	Raven Rate Control Module - Level 0
117-7100-004	Kit - RCM LVL 0 Gen 1 ISOBUS ECU Harness
117-7100-001	Kit - RCM LVL 0 Gen 3 ECU Harness

RCM LVL 3 – DRY MANURE/LITTER APPLICATION CONTROL

RCM Level 3 is required for dynamic calibration, cleanout mode, and gate height monitoring features and is only available for granular spreaders operating in the dry manure/litter application mode and equipped with a product scale.

When paired with a scale system, the Raven Rate Control Module (RCM) is capable of compensating for varying product density within a spreader load. This capability offers optimal consistency of application even when the product composition is highly variable.

TABLE 3. Applicable Part Numbers for Dry Manure/Litter Applications

Part Number	Description
063-0173-953	Raven Rate Control Module - Level 3
117-7100-007	Kit - RCM LVL 3 Gen 1 ISOBUS ECU Harness
117-7100-008	Kit - RCM LVL 3 Gen 3 ECU Harness

FEATURE UNLOCKS

Many control features require specific unlock levels. If control features are not available with the RCM installed on your machine, contact your local Raven dealer or visit the Raven Precision portal at the link below to unlock additional control features if needed.

https://portal.ravenprecision.com

TABLE 4. Feature Unlock

Part Number	Description	Reason
077-0180-198	Auth Code, Raven Control Module - Lvl 0 to Lvl 1	
077-0180-200	Auth Code, Raven Control Module - Lvl 1 to Lvl 2	
077-0180-241	Auth Code, Raven Control Module - Lvl 2 to Lvl 3	Required for dynamic calibration, cleanout mode, and gate height monitoring features.

UPDATES

Updates for Raven manuals as well as software updates for Raven consoles and product controllers are available at the Applied Technology Division web site:

https://portal.ravenprecision.com

The Raven Service Tool and a laptop PC are required to perform software updates of the Raven Rate Control Module. Refer to the Raven Service Tool Operation manual for additional assistance with updating the Raven Rate Control Module.

Sign up for e-mail alerts to receive notifications when updates for your Raven products are available on the Raven web site.

At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual.

Your feedback will help shape the future of our product documentation and the overall service we provide. We appreciate the opportunity to see ourselves as our customers see us and are eager to gather ideas on how we have been helping or how we can do better.

To serve you best, please send an email with the following information to

techwriting@ravenind.com

-RCM Dry Manure/Litter Setup Guide
-016-0171-694 Rev. B
-Any comments or feedback (include chapter or page numbers if applicable).
-Let us know how long have you been using this or other Raven products.

We will not share your email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

Thank you for your time.

CHAPTER 3 CALIBRATION

CALIBRATION WIZARD

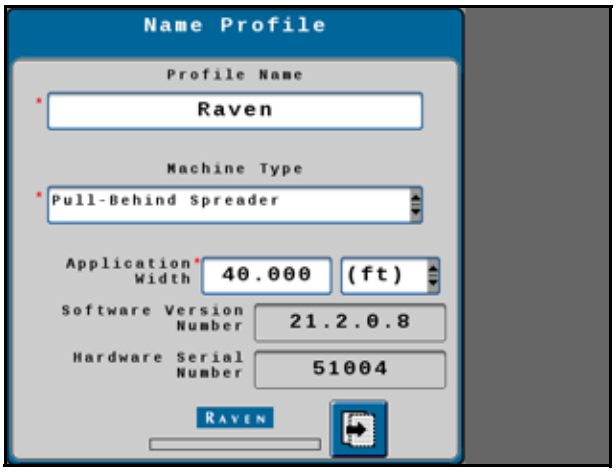
NOTE: Complete the following calibration steps to setup an RCM Level 3 with dry manure or litter spreading features.

1. Enter the profile name for the implement.
2. Select Pull-Behind Spreader from the drop down menu.

NOTE: If the spreader box is installed on a truck chassis, select the “Self-Propelled Spreader” option for the machine type.

3. Enter the application width of the spreader.
4. Select the Next button in the lower, right corner of the page to proceed.

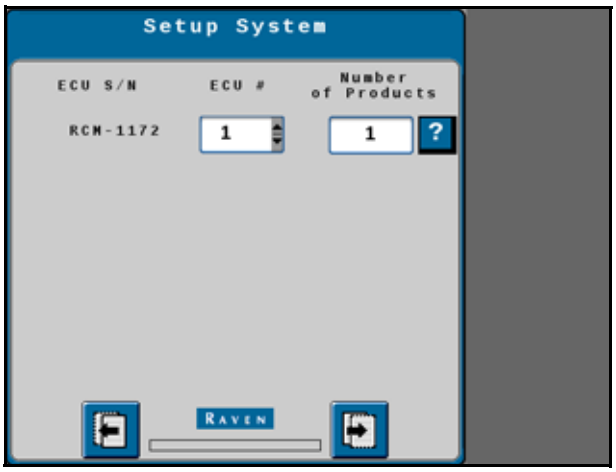
FIGURE 1. Name Profile Page



5. The ECU number will remain at 1.
6. The Number of Products will also be set to 1.
7. Select the Next button in the lower, right of the page to proceed.

NOTE: Select the Back button in the lower, left corner of the page to return to the previous page if needed.

FIGURE 2. Setup System



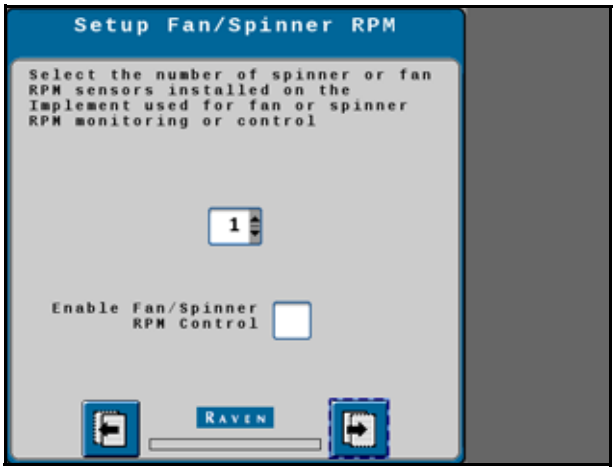
8. Set the number of spinner or fan RPM sensors installed on the implement to 1 if one is installed.

IMPORTANT: Do not check the box to enable Fan/Spinner RPM Control for Pull-Behind applications.

NOTE: Enable Fan/Spinner Control may be used on pull-type or truck mounted boxes which are configured with hydraulically driven spreaders or beaters.

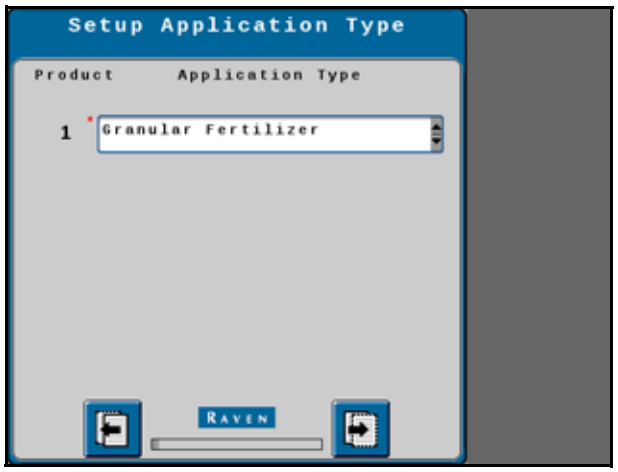
9. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 3. Setup Fan/Spinner RPM



10. Use the drop down list to select the Granular Fertilizer option.
11. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 4. Setup Application Type

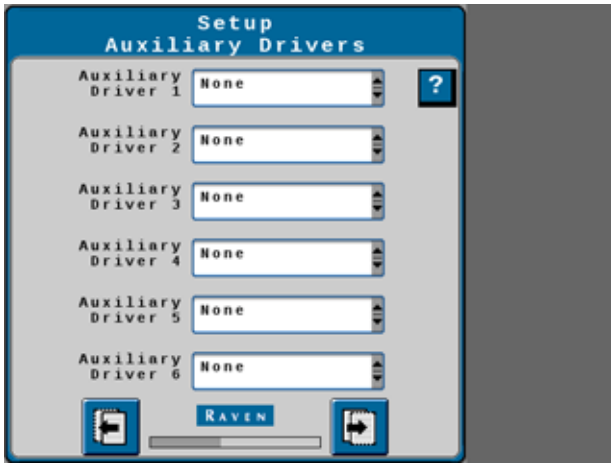


12. Use the drop down list to select Dry Manure/Litter option.
13. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 5. Setup Application Type - Product 1

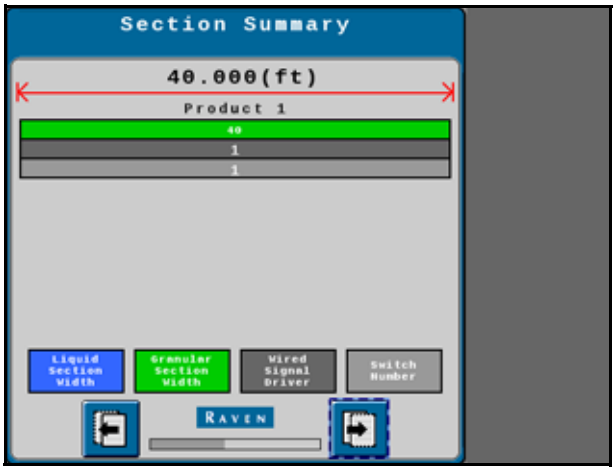
14. No Auxiliary Drivers are currently used on the Dry Manure/Litter configurations.
15. Ensure all Drivers (Auxiliary Driver 1 - 6) are set to “None”.
16. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 6. Setup Auxiliary Drivers



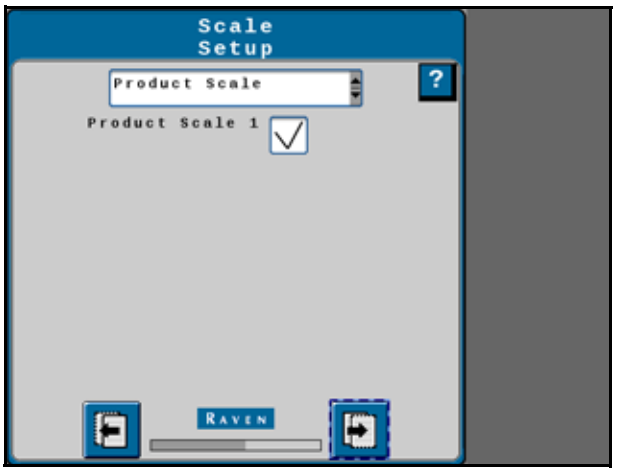
17. Review the Section Summary. No changes will be made on this page.
18. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 7. Section Summary



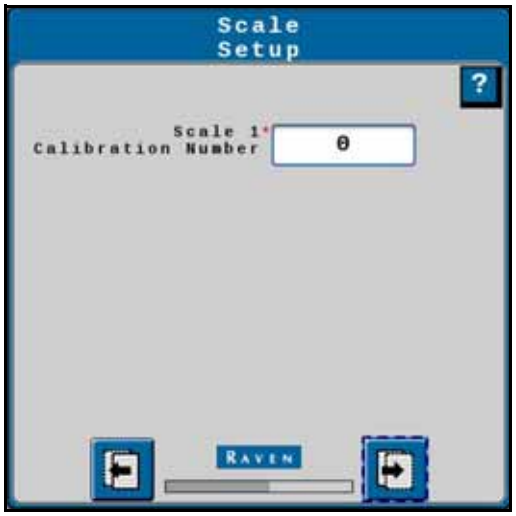
19. Use the drop down list to select Product Scale.
20. Assign the “Product Scale 1” to Product 1 by placing a check mark in the box next to Product Scale 1.
21. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 8. Scale Setup



22. Enter the calibration number for the scale. Refer to Chapter 6, *Machine Settings*, for manufacturer scale calibration numbers.

FIGURE 9. Scale Setup



NOTE: The manufacturer scale calibration numbers are an initial starting point for the scale calibration. It is highly recommended to verify the scale calibration with a known weight of at least 25% of the total scale capacity, after initial scale calibration, to ensure scale accuracy.

23. Enter the number of pickups which the sensor reads per revolution of the shaft as the RPM 1 Calibration Number.

NOTE: If the number of pickups is changed, this value must be changed accordingly.

24. Enter an initial value for RPM 1 Low Limit.

NOTE: Refer to Chapter 6, *Machine Settings*, for assistance with setting an initial RPM 1 Low Limit value.

25. Enter an initial value for RPM 1 High Limit.

NOTE: The Low and High Limit values may be adjusted as needed for the per each machine configuration as desired by the operator. Refer to Reference Chapter 6, *Machine Settings*, for assistance with setting an initial RPM 1 High Limit value.

NOTE: Optionally, enable the Alarm check boxes for the Low or High Limit values to sound an audible alarm if the PTO shaft speed nears the limit value.

26. Select the Next button in the lower, right corner of the page to proceed.

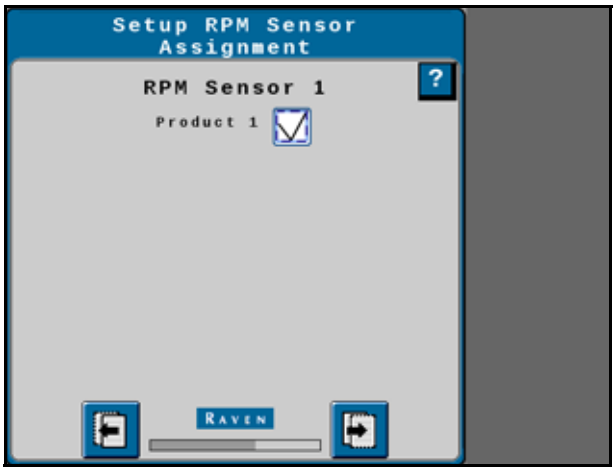
FIGURE 10. Setup Fan/Spinner RPM Calibration

27. Place a check mark in the box next to Product 1.

NOTE: This will assign the RPM sensor to Product 1 and disable product application unless the RPM sensor detects PTO shaft rotation. This is a safety catch to prevent belt movement without the beaters running.

28. Select the Next button in the lower, right corner of the page to proceed.

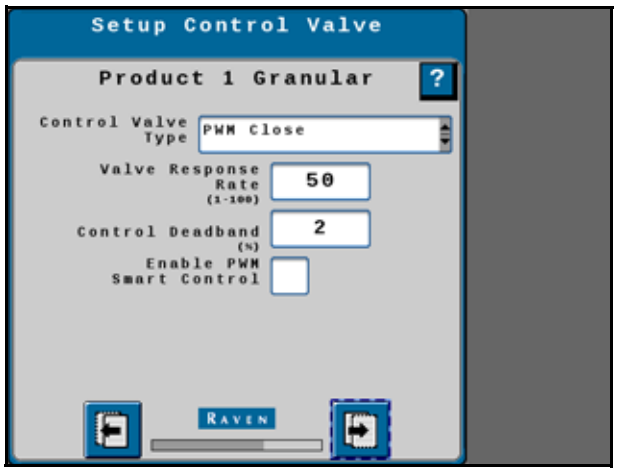
FIGURE 11. Setup RPM Sensor Assignment



29. Use the Control Valve Type drop down list to select the PWM Close valve.

30. Valve Response Rate will be set to 50.
31. Control Deadband will be set to 2.
32. Enable PWM Smart Control box will remain unchecked.
33. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 12. Setup Control Valve

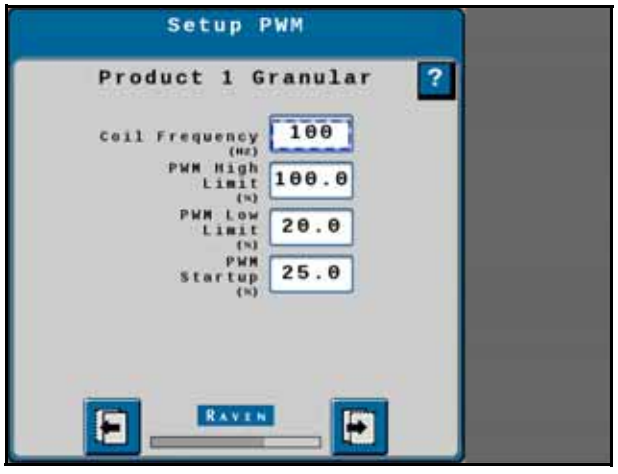


34. The Coil Frequency defaults to 60 Hz. Refer to Chapter 6, *Machine Settings*, for machine specific settings.
35. PWM High Limit is set to “100”.
36. PWM Low Limit is set to “20”.
37. PWM Startup is set to “25”.

NOTE: The High, Low, and Startup PWM values can be adjusted per each machine configuration as desired by the operator.

38. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 13. Setup PWM



RATE SENSOR WITHOUT GATE HEIGHT SENSOR ENABLED

NOTE: Complete the following steps to calibrate a granular product without a gate height sensor enabled.

a. Enter a Density Factor value of “60”.

NOTE: If the density value of the product is known, it is recommended to enter the known value as the Density Factor to provide a closer starting calibration from which the dynamic calibration will begin adjusting during operation.

b. Based upon the equipment make and model being calibrated, enter:

- Spreader Constant value.
- Pulses/Revolution value.
- Gate Height value.

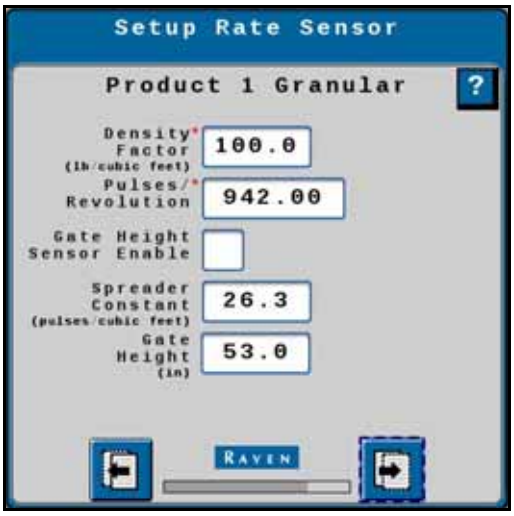
NOTE: Refer to Reference Chapter 6, *Machine Settings*, for assistance with initial and default values on specific make and model equipment.

During initial setup, it is recommended to enter the maximum gate height value. Spreader constant values shown in Chapter 6, *Machine Settings*, are based upon max gate height opening.

During normal operation of the system, manually adjust the gate height value to the physical gate height measurement. The system will automatically adjust the Spreader Constant based upon the Gate Height entered.

c. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 14. Setup Rate Sensor



RATE SENSOR WITH GATE HEIGHT SENSOR ENABLED

NOTE: Complete the following steps to calibrate a granular product with a gate height sensor enabled.

a. Enter a Density Factor value of “60”.

NOTE: If the density value of the product is known, it is recommended to enter the known value as the Density Factor to provide a closer starting calibration from which the dynamic calibration will begin adjusting during operation.

b. Based upon the equipment make and model being calibrated, enter:
   - Spreader Constant value based on the model that is being setup.
   - Pulses/Revolution value.
   - Gate Height value.

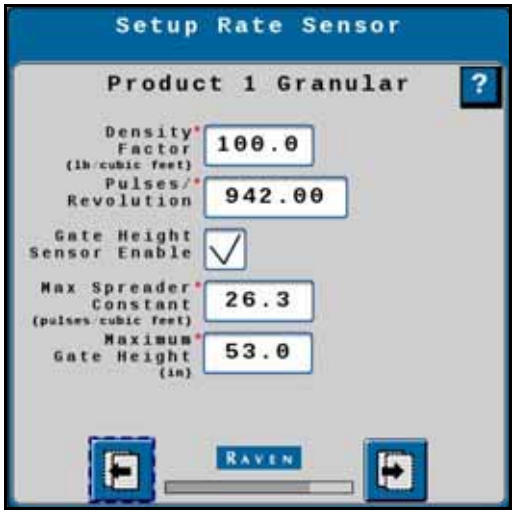
NOTE: Refer to Reference Chapter 6, *Machine Settings*, for assistance with initial and default values on specific make and model equipment.

During initial setup, it is recommended to enter the maximum gate height value. Spreader constant values shown in Reference Chapter 6, *Machine Settings*, are based upon max gate height opening.

During normal operation of the system, the system will monitor the gate height and automatically adjust the spreader constant.

c. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 15. Setup Rate Sensor

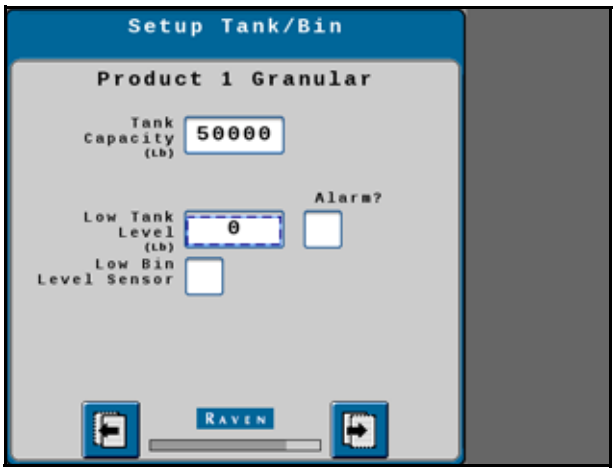


39. Enter the total tank capacity of the spreader.
40. Enter a Low Tank level amount as desired.
41. Enable the Low Tank Level Alarm as desired.

NOTE: It may be beneficial to the end user to set the Low Tank Alarm to alarm when the spreader enters Cleanout Mode.

42. Leave the Low Bin Level Sensor box unchecked.
43. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 16. Setup Tank/Bin



44. Enter desired application rates into the Preset Rate Value boxes.

NOTE: It is only required to enter one present rate value to complete profile setup.

45. Enter a Rate Bump value if desired.

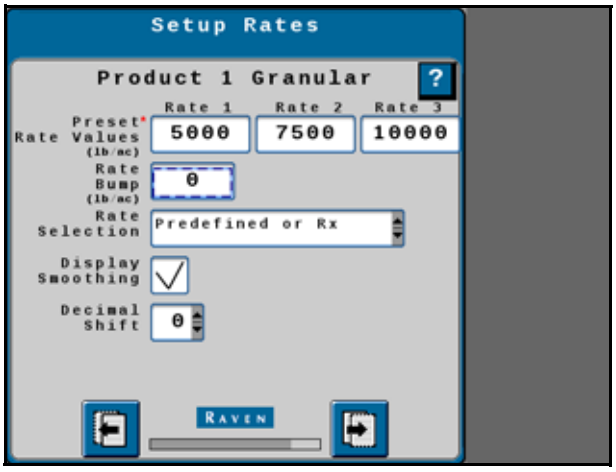
NOTE: If the Rate bump Value is to be used, change the Rate Selection drop down menu from “Predefined or RX” to “Rate Bump or RX”.

46. Select the desired Rate Selection.

NOTE: For predefined rate entries, use “Predefined or RX” selection. For rate bump abilities, use “Rate Bump or RX” selection.

47. Ensure the Display Smoothing box is checked.
48. Decimal Shift should remain at “0”.
49. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 17. Setup Rates



50. Off Rate Alarm should be set to “20”.
51. Ensure the alarm box is checked.
52. Ensure the Shaft Sensor Alarm box is unchecked.

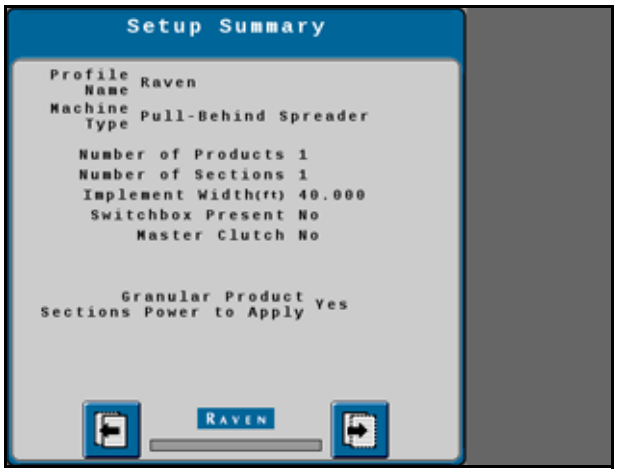
53. Select the Next button in the lower, right corner of the page to proceed.

FIGURE 18. Setup Alarms

54. Review the Setup Summary.
55. Select the Next button in the lower, right corner of the page to complete the profile setup.

NOTE: Select the Back button in the lower, left corner of the page to return to the previous page if needed.

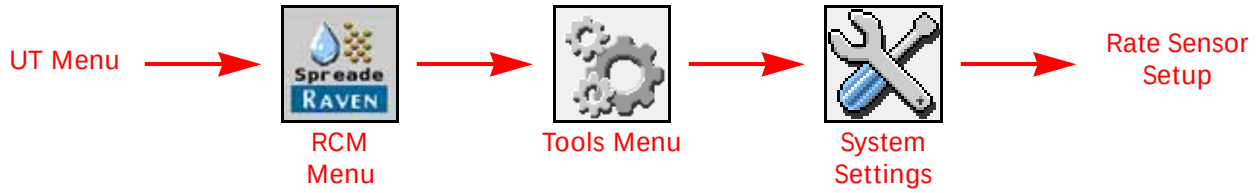
FIGURE 19. Setup Summary



CHAPTER 4 SPREADER OPERATION

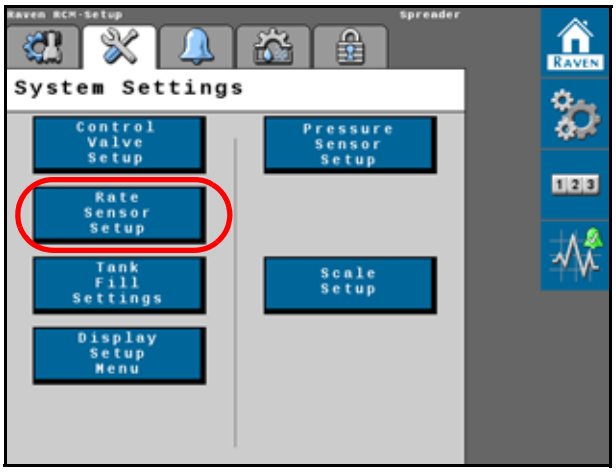
DYNAMIC CALIBRATION

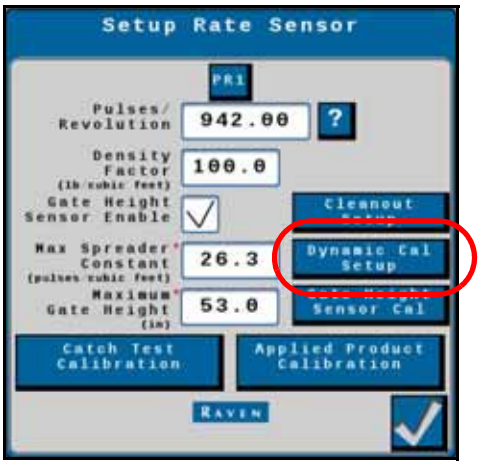
To access settings for Dynamic Calibration, navigate to the Rate Sensor Setup Page:



1. From the RCM home page, select the “Tools” button along the right side of the page.
2. Select the “System Settings” tab and then the “Rate Sensor Setup” button.

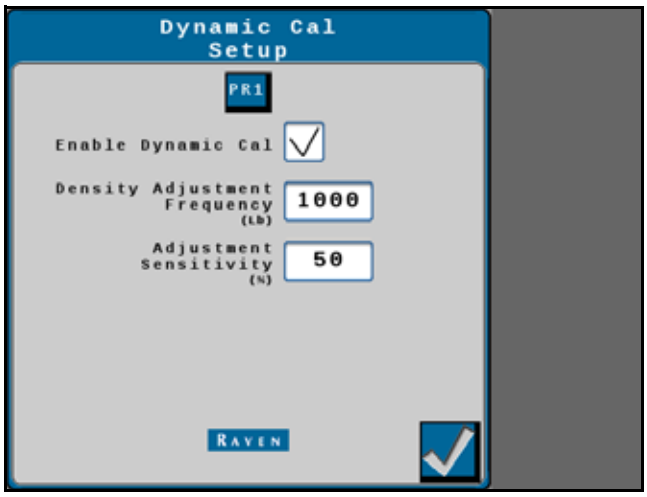
FIGURE 1. Setup Rate Sensor Page





3. Select the “Dynamic Cal Setup” button.

FIGURE 2. Dynamic Cal Setup



DENSITY ADJUSTMENT FREQUENCY

The Adjustment Frequency value is used to determine how often the controller recalculates the Density Factor. Enter the weight in pounds [kilograms] dispensed before the controller makes an adjustment. The recommended starting point is 1/20th of the total load weight. This will result in 20 density adjustments per load. On very uneven loads, the Adjustment Frequency weight value can be decreased, however, rate fluctuation may be observed. If excessive rate fluctuation is occurring, increase the value.

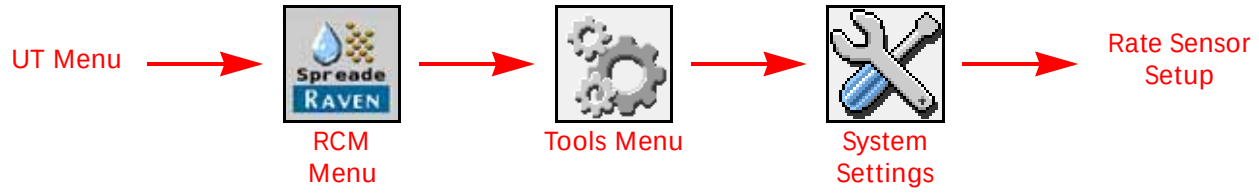
ADJUSTMENT SENSITIVITY

The Adjustment Sensitivity percentage is used to set how aggressively the controller will adjust the Density Factor. It is recommended to leave this setting at the default setting of 50% unless otherwise instructed.

If the total applied weight displayed on the controller is not matching the actual scale weight applied, the Sensitivity percentage may be increased (not to exceed 75%). If erratic rates are observed, reduce this value (not to be set below 25%) but may lead to some variation between controller totals and scale totals.

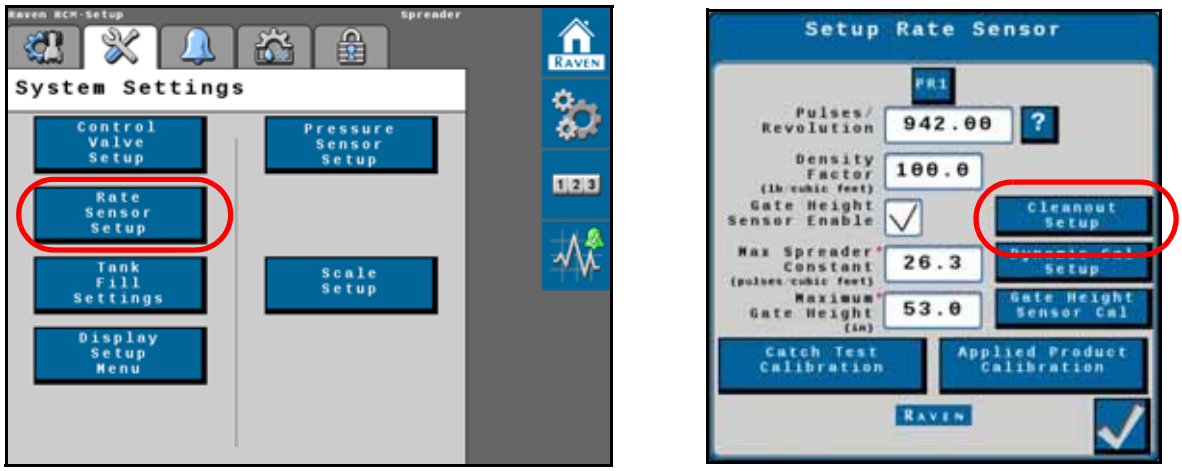
CLEANOUT SETUP

The Cleanout Mode is used to compensate for the end of a load when the beaters or spinners are no longer full. The apron chain will continue to speed up until it is at full speed. The controller will resume normal operation when the spreader has been refilled to above the trigger weight. Configuration of the cleanout mode consists of two settings - Trigger Weight and Cleanout Duration. To enable the cleanout mode:



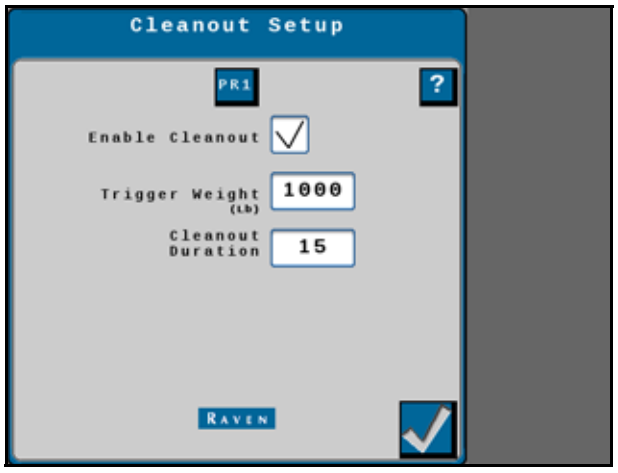
1. From the RCM home page, select the “Tools” button along the right side of the page.
2. Select the “System Settings” tab and then the “Rate Sensor Setup” button.
3. On the Setup Rate Sensor page, press the “Cleanout Setup” button to access the Cleanout settings.

FIGURE 3. Setup Rate Sensor Page



ENABLE CLEANOUT MODE

FIGURE 4. Clean Out Setup



TRIGGER WEIGHT

When the scale reaches the weight set in the Trigger Weight field, clean out mode will begin. Set the Trigger Weight to the scale reading when the opening to the beaters or spinners is no longer completely covered.

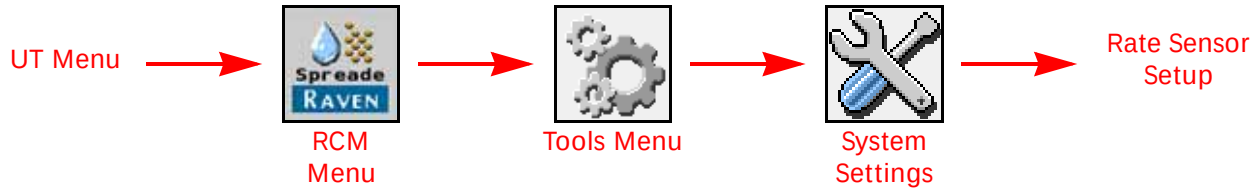
CLEANOUT DURATION

This value is used to control how aggressively the apron will speed up once the trigger weight is achieved.

The steeper the angle of the material left in the spreader when the trigger weight is reached, a lower duration value should be used. If the angle of the material left in the spreader is more gradual, a higher duration value should be used. The default value is 15 and may be adjusted by the operator based upon the behavior of the material being applied.

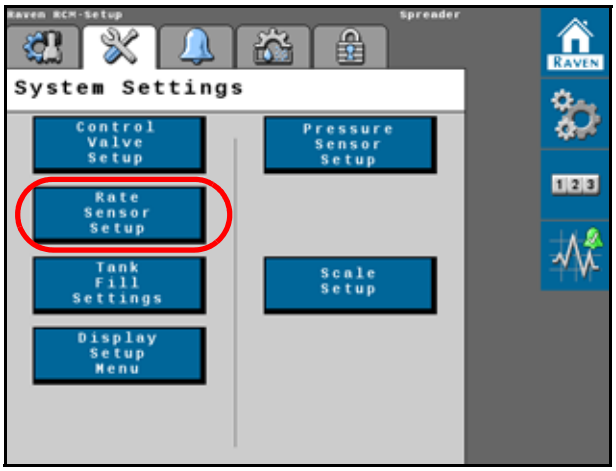
GATE HEIGHT SENSOR CALIBRATION

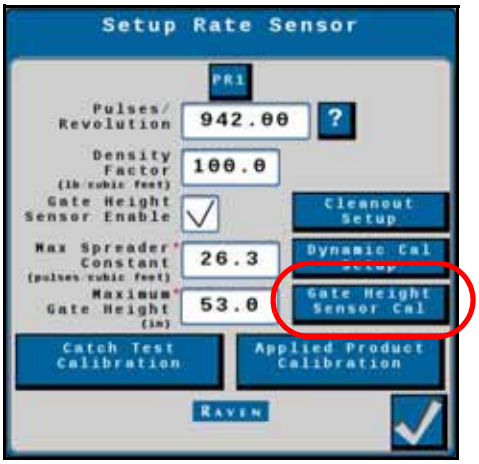
To access settings for Gate Height Calibration, navigate to the Rate Sensor Setup Page:



1. From the RCM home page, select the “Tools” button along the right side of the page.
2. Select the “System Settings” tab and then the “Rate Sensor Setup” button.

FIGURE 5. Setup Rate Sensor Page





3. Select the "Gate Height Sensor Cal" button.
4. Select "Custom" from the drop down list.

FIGURE 6. Manual Gate Height Calibration

- If the specific "mV Per Length" value is known (mV/in), refer to the *Manual Calibration* section on page 25.
- If the specific "mV Per Length" value is not known, refer to the *Procedural Calibration* section on page 26.

MANUAL CALIBRATION

If the specific "mV Per Length" value is known (mV/in), select the “Manual Calibration” button and enter the known value into the field under the Manual Calibration tab to calibrate the gate height sensor.

FIGURE 7. Manual Gate Height Calibration

PROCEDURAL CALIBRATION

If the specific "mV Per Length" value is not known, select the “Procedural Calibration” button and complete the following steps:

FIGURE 8. Procedural Gate Height Calibration

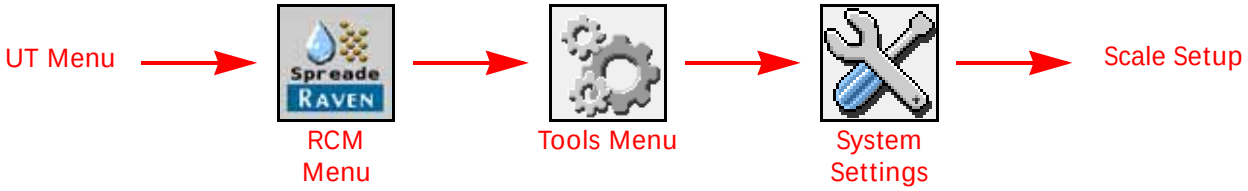
1. Enter the max gate height opening. Refer to Chapter 6, *Machine Settings*, for machine specific gate height values.
2. Lower the gate to the full closed position.
3. Select the "Zero" button.
4. Raise the gate to the maximum height.
5. Select the "Set Max" button.
6. Select the check mark in the lower, right corner of the page to complete the procedural calibration.

ADJUST THE MANUFACTURER SCALE CALIBRATION VALUE

The manufacturer scale calibration number is a good starting point to achieve a basic scale calibration. However, it is recommended to verify the scale calibration with a known weight for optimal performance.

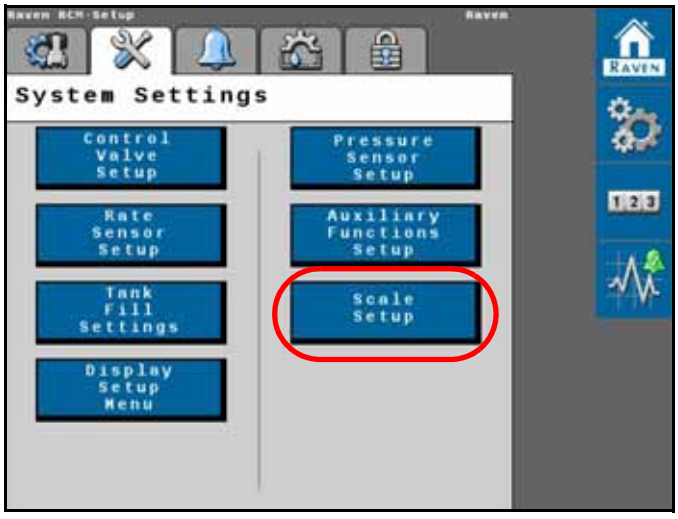
NOTE: Refer to Table 2, “Scale Settings,” on page 43 for manufacturer scale calibration information.

Complete the following steps to adjust scale calibration:



1. From the RCM home page, select the “Tools” button along the right side of the page.
2. Select the “System Settings” tab and then the “Scale Setup” button.

FIGURE 9. System Settings Menu



3. Select the Scale Calibration button at the bottom of the page.

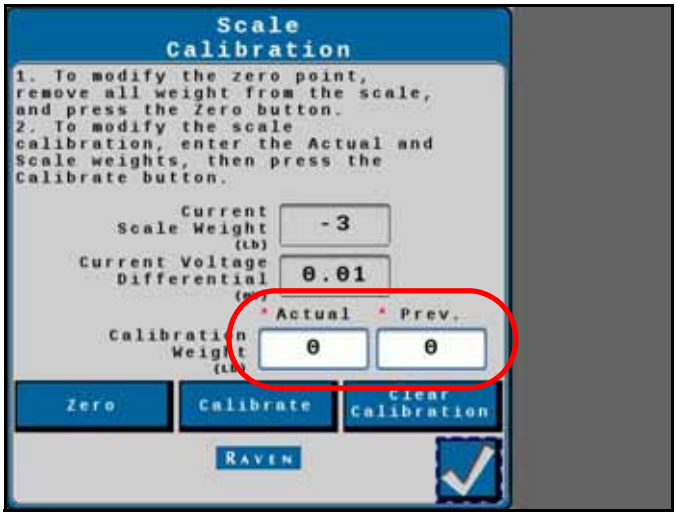
FIGURE 10. Scale Setup Page

4. Load a known weight of product into the implement tank or bin.

NOTE: It is recommended to use a known weight of at least 25% of the total scale capacity to obtain a more precise scale calibration slope.

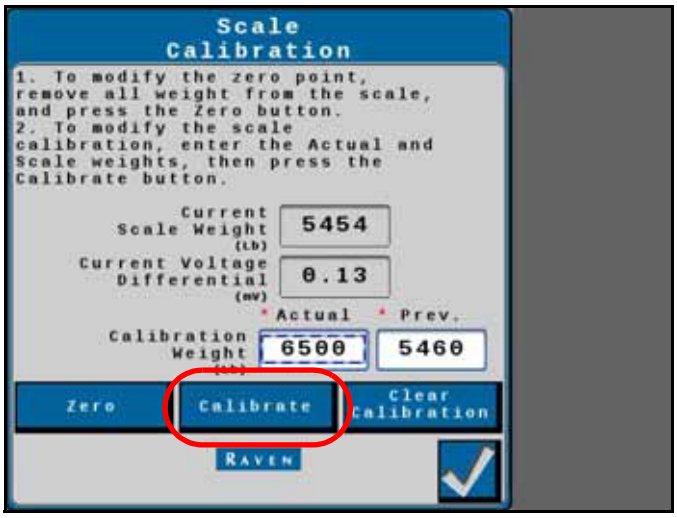
5. Enter the current scale weight reading into the Previous (Prev.) field on the Scale Calibration page.

FIGURE 11. Scale Weight Entry on the Scale Calibration Page



6. Enter the known weight of the product in the tank or bin into the Actual field on the Scale Calibration page.
7. Select the Calibrate button.

FIGURE 12. Scale Weight Entry on the Scale Calibration Page



8. Review the confirmation prompt and select the Accept button in the lower, right corner of the page. The scale calibration has been adjusted for the known weight of product in the tank or bin.

LITTER/MANURE OPERATION TIPS

For greatest accuracy and optimal performance:

TANK/BIN CHARGE

- The tank or bin charge feature can be used to “prime” the spreader. It will allow the apron chain to move and push product to the beaters to take up the dead space between the gate and the beaters. The apron will run as long as the operator presses the tank or bin charge button. The tank or bin charge feature does not add to applied product tallies.
- With the beaters running, toggle the master switch on and press and hold the bin charge button to prime the machine.

QUICK START:

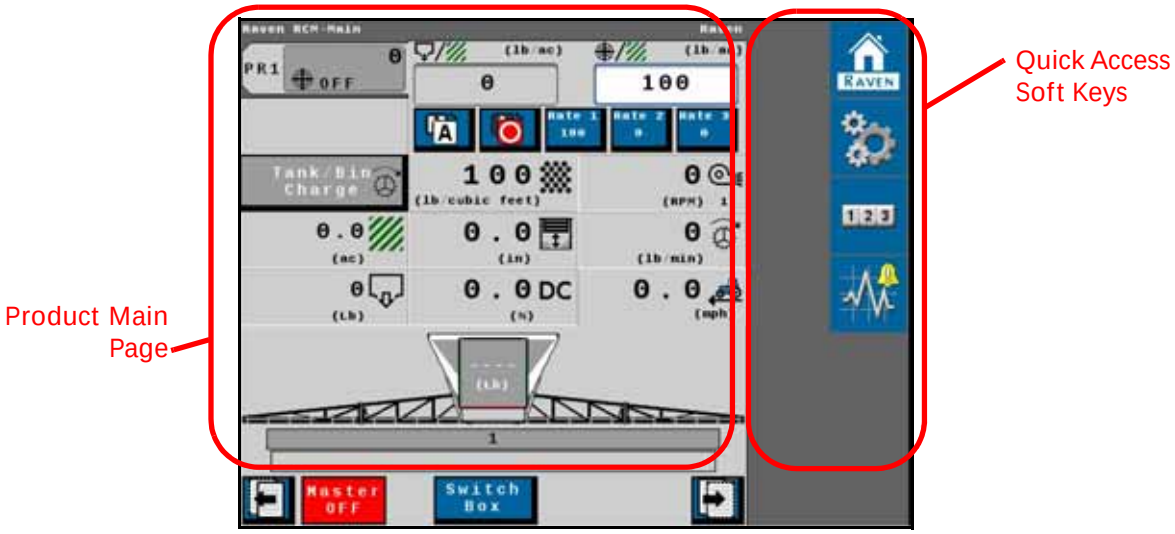
- Similar to the Tank/Bin Charge feature, Quick Start may also be used to prime the spreader. However, Quick Start runs for a set duration of 15 seconds and can be canceled by toggling the master switch off. Using Quick Start will allow the system to add to applied product tallies.
- With the beater running, toggle the master switch ON and press the Quick Start button in the lower, right corner of the RCM run page. The Quick Start feature will start the apron to run for up to 15 seconds while the equipment remains stopped. Toggle the master switch OFF to stop if necessary. Allow the apron to run until material starts to come out. Completing the Quick Start process will fill up the dead area between the gate and the beaters and help ensure that material is applied when the system is enabled for in-field application.

FIGURE 13. Tank/Bin Charge and Quick Start Features

SPREADER MAIN PAGE OVERVIEW

The current product main page displays information for the selected product. Each product run page may vary based on product configuration.

FIGURE 14. Spreader Run Page



QUICK ACCESS SOFTKEYS

The softkeys displayed along the right side of the RCM working set allow quick access to commonly used features, calibration settings, and options. Review the following sections for additional information about the RCM softkeys:

HOME

Touch the Home softkey to quickly return to the Home page and access the primary RCM operation information. Use these pages to monitor the system during field operations.

Home

TOOLS

Select the Tools Menu softkey to access the calibration prompts. See Chapter 4, *System Setup*, for additional assistance with system calibration, features, and settings.

Tools Menu

TOTALS

Select Totals softkey to view the distance, volume, and area tallies calculated by the RCM ECU.

The totals button provides options to access a Current Totals, Device totals, and Distance totals tabs.

Totals

DIAGNOSTICS


Diagnostics

Select Diagnostics to access system information, tests, and diagnostic trouble codes (DTCs).

The DTC Status indicator is displayed on the Diagnostics softkey and provides a visual indicator of the system status during field applications. The status indicator provides the following display states:

	OK. The system status is normal and no alarm conditions are currently present.
	Caution. A minor alarm condition has been detected. The control system is operating normally, however, the system has detected that a condition exists which could impact the current application.
	Critical. A critical system condition has been encountered. The control system is not responding as expected and the operator should cease application and troubleshoot the issue before resuming operations. The system will not apply in this state

MAIN PAGE OVERVIEW

FIGURE 15. Main Spreader Page

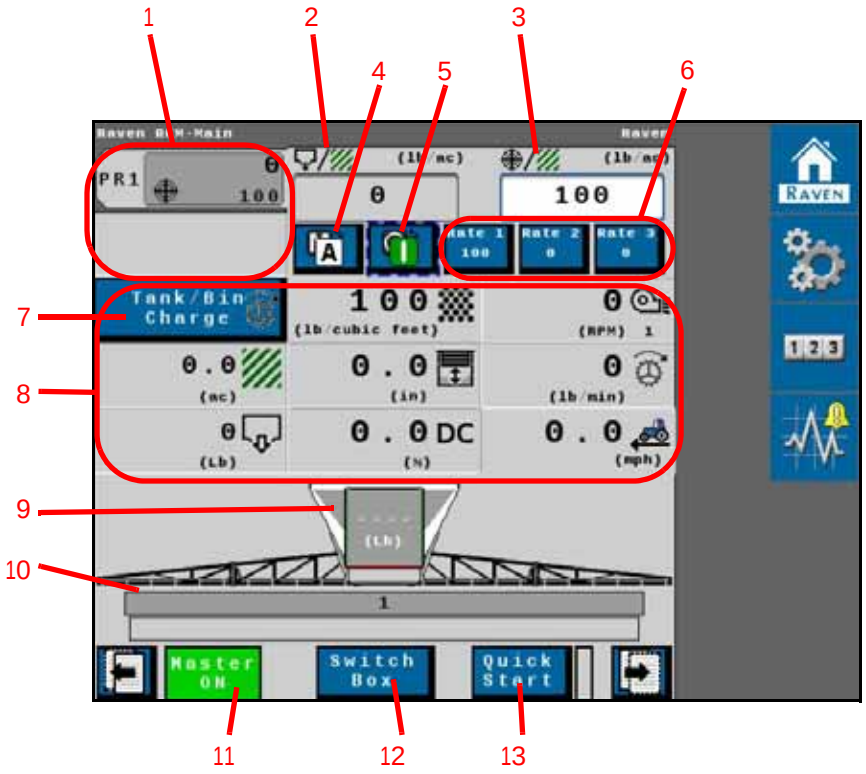


TABLE 1. Raven RCM Spreader Home Page Overview

	Button	Description	Function/Operation
	1.	Product Tabs	Select a product tab to display the main page for a desired product. The readout area of the main page for each product may be customized to the operators preferences
	2.	Actual Rate	Actual application rate.
	3.	Target Rate	Target application rate.
	4.	Manual/Automatic Mode	Toggle manual or automatic rate control modes.
	5.	Product On/Off Switch	Toggle a product on or off.
	6.	Preset Rate Buttons	Provides the user with preset rates to quickly change the application rate during field applications.
	7.	Tank/Bin Charge	Touch and hold button to fill the space between the gate and beaters to “prime” the spreader.

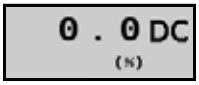
TABLE 1. Raven RCM Spreader Home Page Overview

	Button	Description	Function/Operation
--	8.	Readout Area	Refer to *Readout Descriptions* section on page 33.
	9.	Tank/Bin Level Indicator and Fill Button	Displays the level or volume of product remaining in the tank or bin.
	10.	Implement Sections	Displays active and inactive sections.
	11.	Master Switch Indicator	The Master Switch Indicator shows the status of the master switch. • Green - On • Red - Off • Orange - Cycle the master switch
	12.	Section Switchbox Button	Select this button to view the on-screen switch box. •

READOUT DESCRIPTIONS

When the RCM is configured for dry manure or litter application, the following readouts are displayed on the main page by default.

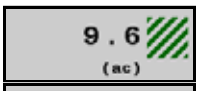
NOTE: The operator may customize readouts shown on the Main page if desired. Refer to the Raven Rate Control (RCM) Operation Manual (P/N 016-0171-637) for additional assistance with customizing readouts on the Main page.



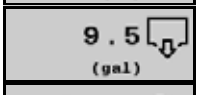
PWM Readout. The control duty cycle of the PWM control valve which controls the product pump.

Speed Readout. The current speed over ground of the machine.

NOTE: Press and hold the speed display to enter a self-test speed. Refer to the Raven Rate Control Module Operation Manual (P/N 016-0171-637) for additional assistance with the self-test speed feature.

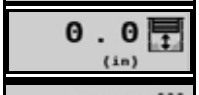


Applied Area. The field area covered during the current field application.



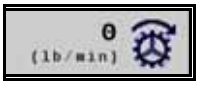
Total Volume Applied. The total product volume applied for the specific product displayed.

RPM 1. The RPM of the PTO shaft.



Gate Height. The current gate height setting.

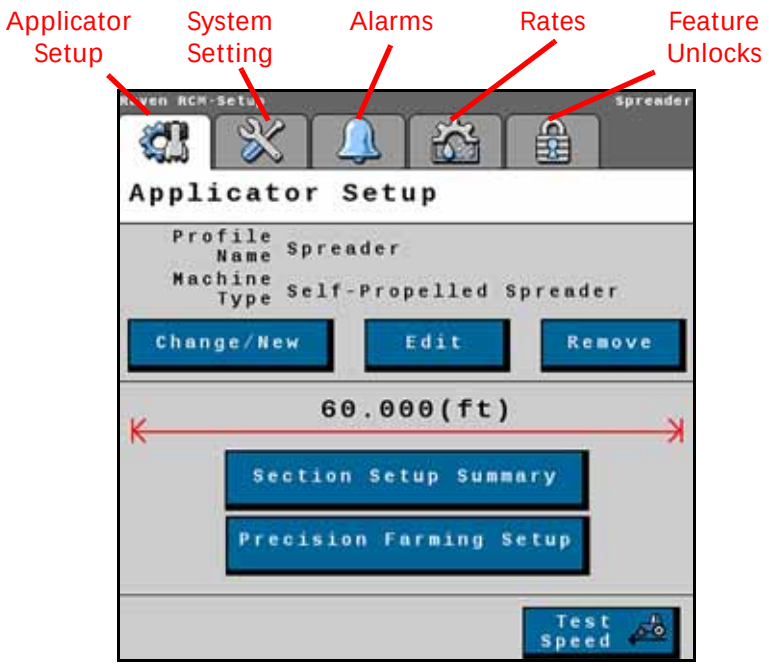
Product Density. The current density factor of the product.



Dry Rate. Current application rate in pounds [kilograms] per minute as read by an encoder.

TOOLS

FIGURE 16. Setup Tabs



APPLICATOR SETUP TAB

The Applicator Setup Tab provides options to create a new, edit, or remove an applicator. This tab also provides a summary to the section configuration. For more information on the Precision Farming Setup button, refer to the Raven Rate Control Module Operation Manual (P/N 016-0171-637).

SYSTEM SETTINGS

The system settings provides access to settings and options which allow the operator to adjust the system configuration values as needed, to maintain proper control of the system. The table below describes each button in detail.

TABLE 2. System Settings

Button	Description
Control Valve Setup	The Control Valve button allows the user to adjust the following settings for each product: • Valve Response Rate • Control Dead Band • Valve Delay • Enable PWM Smart Control
Rate Sensor Setup	Allows the operator to modify/edit the calibration value for the encoder used on the control channel.
Tank Fill Settings	This button allows the user to enter the Tank Capacity, Current Tank Level, and Low Tank Level.
Display Setup Menu	The Display Setup Menu allows the user to configure the main run page.
Pressure Sensor Setup	This button allows the user to modify the alarm Min and Max for any products that have pressure alarms selected.
Auxiliary Functions	The Auxiliary Functions button allows the user to create new or modify existing auxiliary functions such as RPM sensors.
Scale Setup	Scale Setup allows the user to configure scale options.

ALARM SETTINGS

Press the Alarm Settings tab to modify or update alarm settings such as Off Rate Alarm and the Minimum Flow Rate. There is also an option to update the Pressure Alarm.

RATES SETUP

The Rates Setup tab allows the user to adjust the Preset Rate Values, Rate Bump, Rate Selection, and other values that were entered during the original configuration.

FEATURE UNLOCKS

To activate additional features available for the RCM, enter the Activation Key to access these features.

NOTE: Contact a local Raven dealer for additional information regarding available features for your specific application and for assistance with purchasing activation keys.

TOTALS

The totals button provides options to access a Current Totals, Device totals, and Distance totals tabs.

DIAGNOSTICS

Selecting the Diagnostics button open a window with tabs for the items listed below.

SYSTEM INFORMATION

Displays information about the RCM including the Hardware Serial Number, Hardware Revision, and Software Version Number.

TESTS

The Tests tab allows the user to select various tests from a drop down list. These list of tests will vary by product configuration.

DIAGNOSTIC TROUBLE CODES

This tab lists Active and Inactive diagnostic trouble codes as well as the ability to Clear the active codes.

SYSTEM SUMMARY

Displays information configured during the setup process but does not provide the option to modify the configuration.

PRODUCT SUMMARY

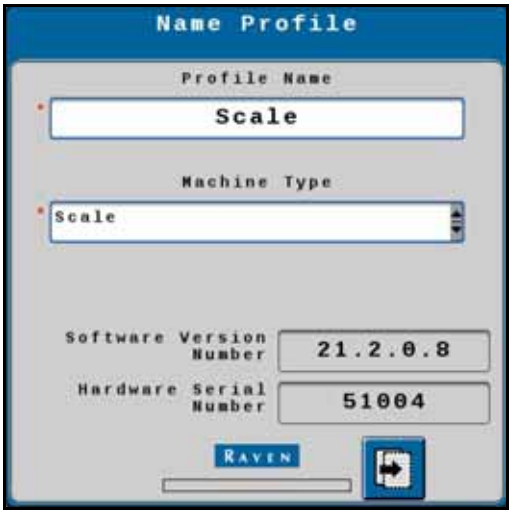
The Product Summary provides a brief summary for all of the products such as Application Type, Control Valve type, Target Rate, and other settings. This tab does not allow the user to modify the configurations.

CHAPTER 5 STAND-ALONE SCALE OPERATION

STAND-ALONE SCALE INITIAL CALIBRATION

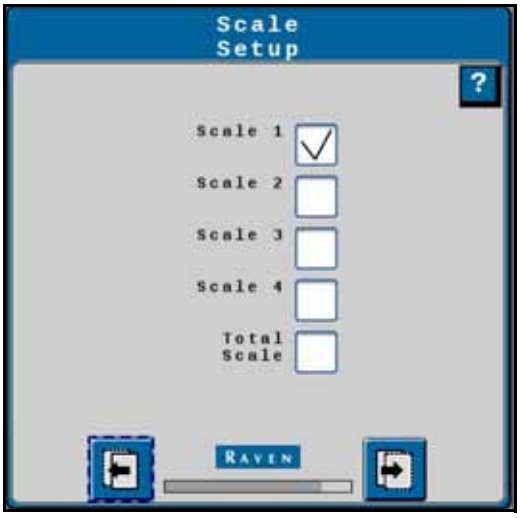
1. Select Scale as the Machine Type.

FIGURE 1. Name Profile



2. Enter a Profile Name.
3. Press Next.
4. Select the check box(es) next to the desired Scale(s) you want to monitor.

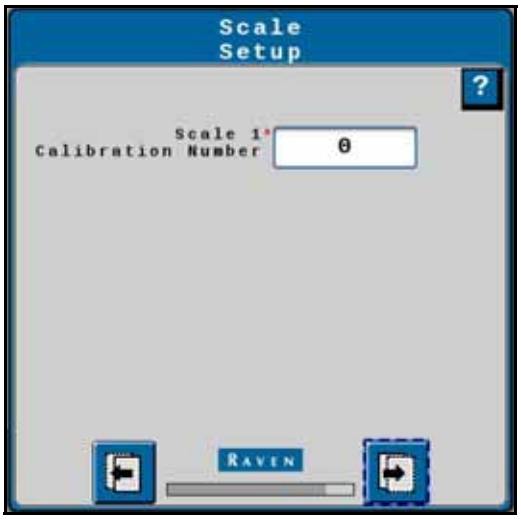
FIGURE 2. Scale Setup



NOTE: If more than one scale is selected, the Total Scale option may be used to monitor the combined weight of all the selected scales.

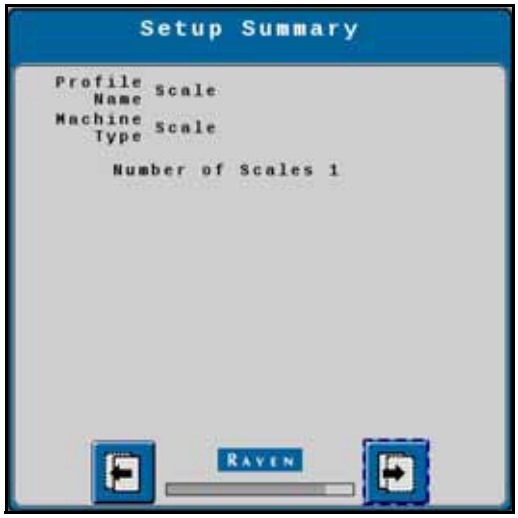
5. Press Next.
6. Enter the Scale Total Calibration Number. Refer to Chapter 6, *Machine Settings*, for machine specific scale information.

FIGURE 3. Scale Setup



7. Press Next.
8. Review the scale configuration on the Setup Summary page.

FIGURE 4. Setup Summary

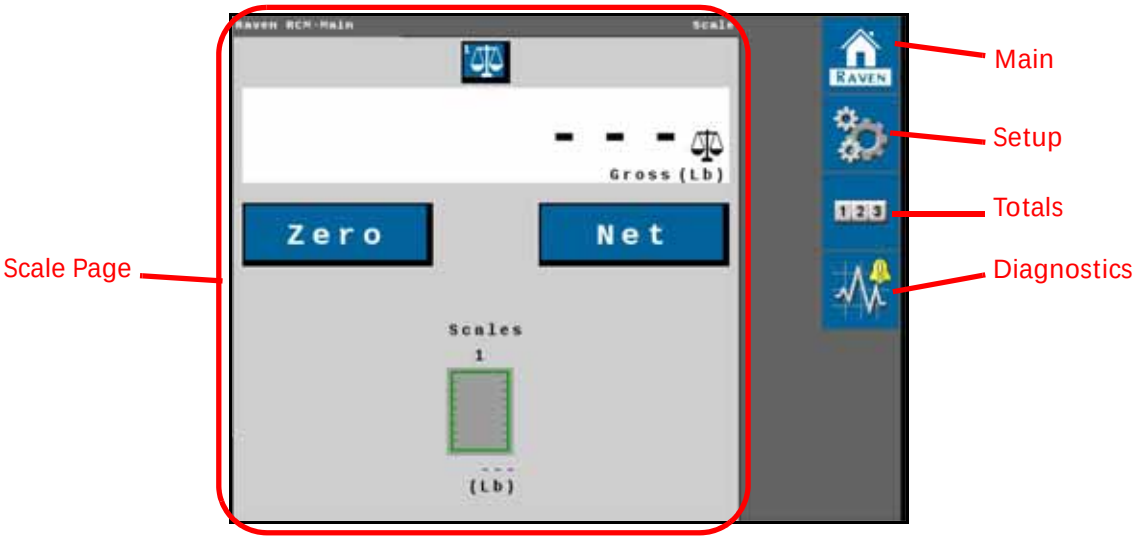


9. If any of the information is incorrect, press the back button to adjust the configuration. If the configuration is correct, press Next.

SCALE RUN PAGE OVERVIEW

The image below is an example of a typical run page.

FIGURE 5. RCM Main Page



SCALE PAGE

The scale page displays graphic and numeric representations of the scales as well as options to zero a scale or view the current gross scale weight.

CURRENT PRODUCT RUN PAGE

The current product run page displays information for the selected product. Each product run page will vary based on product configuration.

Data Fields display selected settings and can be changed to the operator's preferences.

FIGURE 6. Main Scale Page

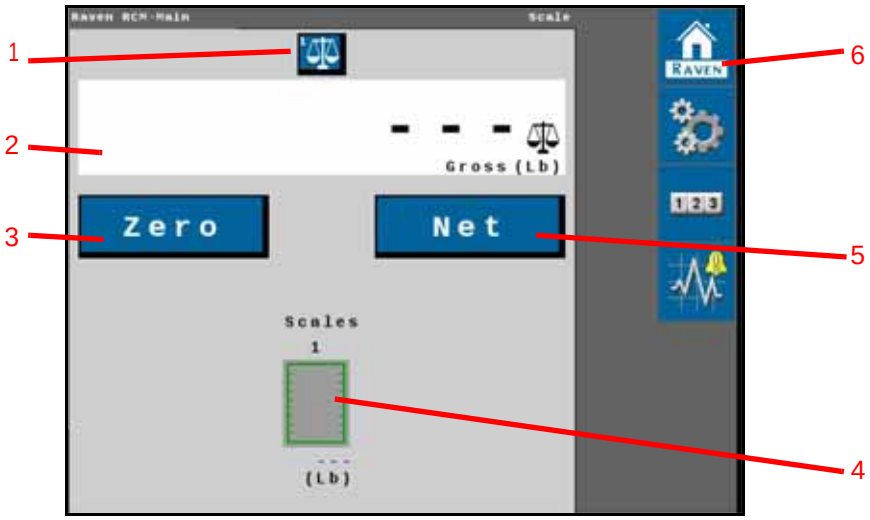
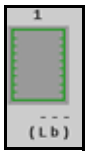


TABLE 1. Scale Run Page Information

	Button	Description	Function/Operation
	1	Scale Selection	If multiple scales are detected, select the scale information to display on the main page.
	2	Weight	Displays the current weight on the selected scale.
	3	Tare	Select the Tare button to zero out the selected scale. If the combined weight scale is selected this will display as Zero.
	4	Scale Graphics	Show a graphical representation of the weight on each scale.
	5	Gross	Displays the weight on the scale. If the combined weight scale is selected this will display as Net.
	6	Combined Weight	Displays the combined weight of all the scales.

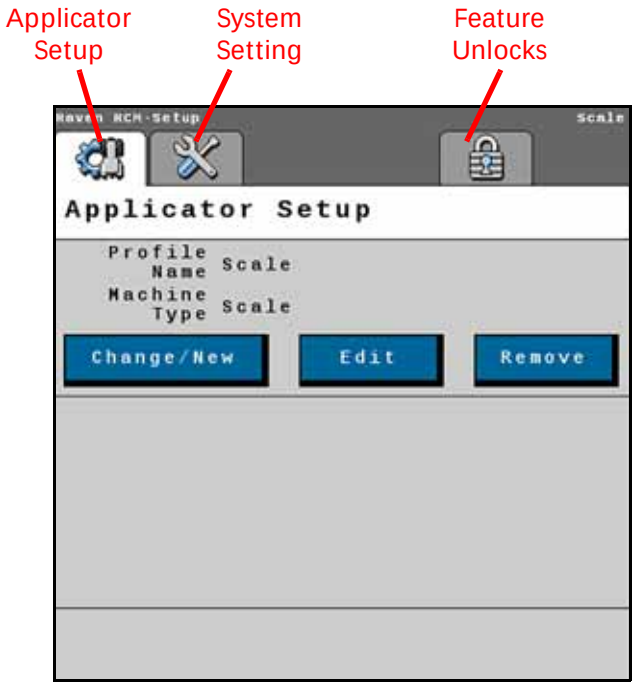
MAIN

Press main at any time to return to the current product run page.

SETUP

Pressing setup opens a page with many tabs.

FIGURE 7. Setup Tabs



APPLICATOR SETUP TAB

The Applicator Setup Tab provides options to create a new, edit, or remove an applicator. This tab also provides a summary to the section configuration.

SYSTEM SETTINGS

The Systems Settings Tab allows the user to modify the current scale calibration.

FEATURE UNLOCKS

To activate additional features available for the RCM, enter the Activation Key to access these features.

NOTE: Contact a local Raven dealer for additional information regarding available features for your specific application and for assistance with purchasing activation keys.

TOTALS

The totals button provides options to access a Current Totals, Device totals, and Distance totals tabs.

DIAGNOSTICS

Selecting the Diagnostics button open a window with tabs for the items listed below.

SYSTEM INFORMATION

Displays information about the RCM including the Hardware Serial Number, Hardware Revision, and Software Version Number.

TESTS

The Tests tab allows the user to select various tests from a drop down list. These list of tests will vary by product configuration.

DIAGNOSTIC TROUBLE CODES

This tab lists Active and Inactive diagnostic trouble codes as well as the ability to Clear the active codes.

SYSTEM SUMMARY

Displays information configured during the setup process but does not provide the option to modify the configuration.

PRODUCT SUMMARY

The Product Summary provides a brief summary for all of the products such as Application Type, Control Valve type, Target Rate, and other settings. This tab does not allow the user to modify the configurations.

CHAPTER 6 MACHINE SETTINGS

The following offers recommended initial settings for OEM manufacturer.

NOTE: These settings are only intended to assist with initial set up of the machine and test weight calibrations should be performed to validate and tune these settings.]

TABLE 1. OEM Machine Settings

	Artex				Arts Way		Kuhn
	SB	SBX	CB	Truck Mounted	X700	X900	PXL1100
Fan/Spinner RPM	1				1		1
RPM 1 Cal	1				1		1
RPM Low Limit	400				800		800
RPM High Limit	2000				1200		1500
Coil Frequency (Hz)	100				100		100
PWM High Limit (%)	100				100		100
PWM Low Limit (%)	20				20		20
PWM Start Up %	25				25		25
Pulses/Revolution	200				942		2180
Spreader Constant	6	5.1	4.4	Box Dependent	29.6	26.3	34.8
Gate Height (Max.)	48 in. [121.9 cm]				51 in. [129.5 cm]	53 in. [134.6 cm]	70 in. [177.8 cm]

TABLE 2. Scale Settings

	Artex				Arts Way	Kuhn
	4 Pt	5 Pt	6 Pt	8 Pt	5 Pt	-
Cal Value	36904	46130	55356	73808	80000	Contact Dealer

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LIMITED WARRANTY

WHAT DOES THIS WARRANTY COVER?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

HOW LONG IS THE COVERAGE PERIOD?

Raven Applied Technology products are covered by this warranty for 12 months from the date of retail sale. In no case will the Limited Warranty period exceed 24 months from the date the product was issued by Raven Industries Applied Technology Division. This warranty coverage applies only to the original owner and is non-transferable.

HOW CAN I GET SERVICE?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries.

WHAT WILL RAVEN INDUSTRIES DO?

Upon confirmation of the warranty claim, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

WHAT IS NOT COVERED BY THIS WARRANTY?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.

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EXTENDED WARRANTY

WHAT DOES THIS WARRANTY COVER?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

DO I NEED TO REGISTER MY PRODUCT TO QUALIFY FOR THE EXTENDED WARRANTY?

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

WHERE CAN I REGISTER MY PRODUCT FOR THE EXTENDED WARRANTY?

To register, go online to www.ravenhelp.com and select Product Registration.

HOW LONG IS THE EXTENDED WARRANTY COVERAGE PERIOD?

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

HOW CAN I GET SERVICE?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

WHAT WILL RAVEN INDUSTRIES DO?

Upon confirmation of the product's registration for the Extended Warranty and the claim itself, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

WHAT IS NOT COVERED BY THE EXTENDED WARRANTY?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.

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