# Raven Rate Control Module (RCM) Operation Manual

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# CALIBRATION REFERENCE SHEET

Record settings and calibration values used when programming the system in the fields below and keep this sheet for future reference.

## GENERAL IMPLEMENT INFORMATION

| | | | | |
|---|---|---|---|---|
| UNITS | US (Acres) | SI (Hectares) | Nozzle Spacing | |
| Speed Cal | | | | |

| Section Widths (Boom Cal) | | | |
|---|---|---|---|
| 1. | 5. | 9. | 13. |
| 2. | 6. | 10. | 14. |
| 3. | 7. | 11. | 15. |
| 4. | 8. | 12. | 16. |

## TANK FILL SETTINGS

| | | | |
|---|---|---|---|
| Tank Capacity | | Low Tank Limit | |
| Fill Flow Meter Cal | | Units | |

## PRODUCT CONTROL SETTINGS

| | | | |
|---|---|---|---|
| Min. Pump PWM | | Max. Pump PWM | |
| Standby Pump PWM | | Pump PWM Frequency | |
| Minimum Nozzle PWM | | Meter Cal | |
| Units | | Response Rate | |
| Deadband | | | |

## PRESSURE SETTINGS

| | | | |
|---|---|---|---|
| Min. Pressure | | Max. Pressure | |

# UNIT DEFINITIONS AND CONVERSIONS

## UNIT OF MEASURE DEFINITIONS

| Abbreviation | Definition |
|---|---|
| GPM | Gallons per Minute |
| lit/min | Liters per Minute |
| dl/min | Deciliters per Minute |
| PSI | Pounds per Square Inch |
| kPa | Kilopascal |
| GPA | Gallons per Acre |
| lit/ha | Liters per Hectare |
| ml/ha | Milliliters per Hectare |
| GPK | Gallons per 1,000 Square Feet |
| mm | Millimeters |
| cm | Centimeters |

| Abbreviation | Definition |
|---|---|
| dm | Decimeters |
| m | Meter |
| MPH | Miles per Hour |
| km | Kilometers |
| km/h | Kilometers per Hour |
| US | Volume per Acre |
| SI | Volume per Hectare |
| TU | Volume per 1,000 Square Feet |
| [ ] | Metric Numbers |
| lb/acre | Pounds per Acre |
| kg/ha | Kilograms per Hectare |

## UNIT OF MEASURE CONVERSIONS

To convert the meter cal value into the selected unit of measure, divide the original number printed on the flow meter label by the desired conversion value.

| Fluid Ounces Conversion Formula | Liters Conversion Formula | Pounds Conversion Formula |
|---|---|---|
| $\frac{\text{Original Meter Cal}}{128}$ | $\frac{\text{Original Meter Cal}}{3.785}$ | $\frac{\text{Original Meter Cal}}{\text{Weight of One Gallon of}}$ |

### Liquid

- 1 U.S gallon = 128 fluid ounces
- 1 U.S. gallon = 3.785 liters
- 1 U.S. gallon = 0.83267 imperial gallons
- 1 U.S. gallon = 8.34 pounds (water)
- 1 U.S. gallon = 10.67 pounds (28% N)
- 1 U.S. gallon = 11.06 pounds (32% N)
- 1 U.S. gallon = 11.65 pounds (10-34-0)

### Length

- 1 millimeter (mm) = 0.039 inches
- 1 centimeter (cm) = 0.393 inches
- 1 meter (m) = 3.281 feet
- 1 kilometer (km) = 0.621 miles
- 1 inch = 25.4 mm or 2.54 cm
- 1 mile = 1.609 km

### Area

- 1 square meter = 10.764 square feet
- 1 hectare = 2.471 acres or 10,000 square meters
- 1 acre = 0.405 hectares or 43,560 square feet
- 1 square mile = 640 acres or 258.9 hectares

### Pressure

- 1 psi = 6.89 kPa
- 1 kPa = 0.145 psi

# CHAPTER 1 IMPORTANT SAFETY INFORMATION

## NOTICE

Read this manual and the operation and safety instructions included with the implement and/or controller carefully before installing the Raven Rate Control Module.

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

When operating the machine after installing the Raven Rate Control Module, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate any agricultural equipment while under the influence of alcohol or an illegal substance.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling product control when a safe working distance has diminished.
- Disable the system prior to starting any maintenance work on the machine or parts of the control system.

## ⚠ WARNING

### AGRICULTURAL CHEMICAL SAFETY

- 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.
- Avoid inhaling chemical dust or spray particulate and avoid direct contact with any agricultural chemicals. Seek immediate medical attention if symptoms of illness occur during, or soon after, use of agricultural chemicals, products, or equipment.
- After handling or applying agricultural chemicals:

- Thoroughly wash hands and face after using agricultural chemicals and before eating, drinking, or using the rest room.
- 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.

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 disposing of them properly. Contact a local environmental agency or recycling center for additional information

## *NOTICE*

- Read this manual carefully and the operation and safety instructions included with the implement and/or controller.
  - Follow safety information presented within this manual and review operation with your dealer.
  - Contact your dealer for additional assistance or support with any portion of the installation or service of Raven equipment or to obtain replacement parts, manuals, or labels.
- Follow all safety labels affixed to components. Be sure to keep safety labels in good condition and replace any missing or damaged labels.
- Review procedures for safe handling and use of anhydrous ammonia ($NH_3$) and properties of $NH_3$ with your $NH_3$ supplier. If you are not trained to handle, transfer, apply, transport, install, operate, or service $NH_3$ equipment, contact your dealer, $NH_3$ supplier, or the appropriate agricultural department for training information. Refresher training should be completed at least every three years.
- $NH_3$ can be harmful to the environment if not used properly. Follow all local, state, and federal regulations regarding proper handling of $NH_3$.
- Follow all label instructions for chemical mixing, handling, and disposal.
- When operating the machine:
  - Be alert and aware of surroundings.
  - Do not operate the device while under the influence of alcohol or illegal substances.
  - Ensure the device is disabled prior to starting maintenance work on the machine.
- Only $NH_3$ harness systems, control systems, and on/off valves approved by Raven Industries are recommended for use with this system. Raven shall not be liable for any damages and this warranty shall not cover defects from:
  - The use of a system with a harness not approved by Raven.
  - The use of a control system not approved by Raven.
  - The use of an on/off switch not approved by Raven.
  - The use of the system in a manner that is inconsistent with the instructions.
  - Unauthorized modification to the system or products used in the system.

## ⚠ DANGER

- Anhydrous Ammonia ($NH_3$) Under Pressure. $NH_3$ can cause severe burning, blindness, sickness, or death. Understand all safety instructions and warnings before operating or servicing equipment. Review safety requirements associated with $NH_3$ with your supplier.
- Seek immediate medical attention if symptoms of illness occur during, or shortly after, use of $NH_3$ products.
- In case of leak or accidental release of $NH_3$, immediately evacuate the area, contact your local fire department, and identify sources of clean water on the unit.

## ⚠ CAUTION

- Use caution when handling anhydrous ammonia ($NH_3$) products. Always wear personal protective equipment (PPE) when working with anhydrous ammonia. Appropriate PPE includes, but is not limited to:
    - Indirect vent chemical splash goggles or indirect vent chemical splash goggles with full face shield.
    - Liquid proof gauntlet-style gloves impervious to $NH_3$.
    - Long sleeved shirt and long pants or protective suit.
- Stand 'up wind' when working around $NH_3$ and related equipment. Never work on $NH_3$ equipment in confined spaces. Always keep $NH_3$ equipment away from buildings, livestock, and other people.
- Keep a full source of clean water (at least five gallons in addition to and separate from the water source on the nurse tank) readily available while working with $NH_3$. In case of exposure, flush exposed skin or eyes immediately with large quantities of water for at least 15 minutes and seek immediate medical attention.
- Never uncouple an $NH_3$ applicator or intermediate towing vehicle without appropriate parking stands, wheel chocks, or other braking systems if a nurse tank wagon is attached.
- Always remove the system from $NH_3$ service before performing maintenance.
    - Thoroughly bleed all system lines and disconnect nurse tank hose before beginning service or maintenance.
    - Remove all $NH_3$ from the system before disassembling or servicing.
- Use extreme caution when opening a previously pressurized system.
    - Pressure gauges can fail, become plugged, or display incorrect pressure. Every section where $NH_3$ can be trapped should be treated as if it were pressurized.
- Before performing service or maintenance on the system, read and follow the instructions provided with the equipment to properly discharge $NH_3$.

**⚠ CAUTION**

## INSTRUCTIONS FOR WIRE ROUTING

The word "harness" is used to mean all electrical leads and cables, bundled and unbundled. When installing harness, secure it at least every 30 cm (12in) to the frame. Follow existing harness as much as possible and use these guidelines:

Harness should not contact or be attached to:

- Lines and hoses with high vibration forces or pressure spikes
- Lines and hoses carrying hot fluids beyond harness component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads
- Ends of adjustable hose clamps
- Wire exiting conduit without protection, either ends or side of conduit
- Hose and tube fittings

Routing should not allow harnesses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of harness components
- Wiring should be protected or shielded if it needs to route near hot temperatures beyond harness component specifications

Harnessing should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets
- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets
- Changes of position in steering and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For harness sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp harnesses securely to force controlled movement to occur in the desired harness section
- Avoid sharp twisting or flexing of harnesses in short distances
- Connectors and splices should not be located in harness sections that move

Protect harnesses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures

IMPORTANT: Avoid directly spraying electrical components and connections with high pressure water. High pressure water sprays can penetrate seals and cause electrical components to corrode or otherwise become damaged. When performing maintenance:

- Inspect all electrical components and connections for damage or corrosion. Repair or replace components, connections, or cable as necessary.
- Ensure connections are clean, dry, and not damaged. Repair or replace components, connections, or cable as necessary.
- Clean components or connections using low pressure water, pressurized air, or an aerosol electrical component cleaning agent.
- Remove visible surface water from components, connections, or seals using pressurized air or an aerosol electrical component cleaning agent. allow components to dry completely before reconnecting cables.

## INSTRUCTIONS FOR HOSE ROUTING

The word “hose” is used to mean all flexible fluid carrying components. Follow existing hoses as much as possible and use these guidelines:

Hoses should not contact or be attached to:

- Components with high vibration forces
- Components carrying hot fluids beyond component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads
- Ends of adjustable hose clamps

Routing should not allow hoses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of hose components
- Hoses should be protected or shielded if it needs to route near hot temperatures beyond hose component specifications

Hoses should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets
- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets
- Changes of position in steering and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For hose sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp hoses securely to force controlled movement to occur in the desired hose section
- Avoid sharp twisting or flexing of hoses in short distances

Protect hoses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures

- High pressure wash

IMPORTANT: Avoid directly spraying electrical components and connections with high pressure water. High pressure water sprays can penetrate seals and cause electrical components to corrode or otherwise become damaged. When performing maintenance:

- Inspect all electrical components and connections for damage or corrosion. Repair or replace components, connections, or cable as necessary.
- Ensure connections are clean, dry, and not damaged. Repair or replace components, connections, or cable as necessary.
- Clean components or connections using low pressure water, pressurized air, or an aerosol electrical component cleaning agent.
- Remove visible surface water from components, connections, or seals using pressurized air or an aerosol electrical component cleaning agent. Allow components to dry completely before reconnecting cables.

# CHAPTER 2 INTRODUCTION

The Raven Rate Control Module (RCM) is a multi-product application control system built on an ISOBUS platform. The Raven Rate Controller Module is designed to provide a machine operator the ability to simultaneously monitor and control five product applications such as liquid, granular, NH3, and direct injection via ISOBUS Universal Terminal (UT) and task control for as-applied documentation, prescription rate, and section control.

This document is intended to provide information regarding the following aspects of the Raven Rate Control Module:

- Initial Setup and Navigation
- Calibration
- Raven Rate Control Module System Operation
- Raven Rate Control Module Alarms
- Updating Raven Rate Control Module Components

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, *ISOBUS System Calibration*, for assistance with completing the initial 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.

## RAVEN RATE CONTROL MODULE™ FEATURES

### DIRECT INJECTION

The Raven Sidekick™ Pro ICD provides for an optimal user experience by allowing control of direct injection through the Raven Rate Control Module interface. By using a separate injection module or tank, the system eliminates mixing chemicals in the tank, reduces chemical waste, and simplifies equipment care and maintenance. Connect up to four injection systems to the Viper 4 and ISOBUS to control the whole system through the Raven Rate Control Module user interface screens on the virtual terminal. Purchase a high flow injection system to control a wide range of chemical flow rates from 5 - 200 oz/min. Purchase a low flow injection system to provide chemical flow rates from 1 - 40 oz/min. Refer to the Sidekick™ ICD Manual for additional information on high and low flow injection systems.

Contact a local Raven dealer for additional details on direct injection using Sidekick Pro™ with Raven Rate Control.

## MULTIPLE UT SETTINGS

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


## MACHINE TYPES

The Raven Rate Control Module can be used with:

TABLE 1. RCM Machine List

| Machine Type | Application Mode | Application Type |
|---|---|---|
| Self-Propelled Sprayer<br>Pull-Behind Sprayer | Liquid<br>Liquid Tiered (Direct)<br>Liquid Tiered (External)<br>Liquid Constant Flow | Liquid |
| Liquid Fertilizer Tool | Liquid<br>Liquid Tiered (Direct)<br>Liquid Tiered (External)<br>Liquid Constant Flow<br>Liquid Slurry Dragline<br>Liquid Slurry | Liquid |
| NH3 Tool | NH3<br>NH3 HP+ | NH3 |
| Self-Propelled Spreader<br>Pull-Behind Spreader | Dry Manure/Litter<br>Granular Full Width<br>Granular RPM Compensated<br>Granular RPM Maintained<br>Granular Split Belt<br>Granular Dual Control Valve | Granular Fertilizer<br>Granular Seed |

TABLE 1. RCM Machine List

| Machine Type | Application Mode | Application Type |
|---|---|---|
| Air Cart<br>Generic | Liquid<br>Granular Full Width<br>Granular RPM Compensated<br>Granular RPM Maintained<br>Granular Split Belt<br>Granular Dual Control Valve<br>Granular Meter Per Section | Liquid<br>Granular |
| Planter | Planter Section Control<br>Seed Rate Control (/W Clutches)<br>See Rate Control (no Clutches) | NA |
| Scale | NA | NA |

## CARE AND USE

Always follow equipment manufacturer's recommended maintenance procedures for storing equipment. The following maintenance procedures are generally recommended for storing equipment with the Raven Rate Control Module:

1. Empty product from the chemical supply tank and flush the application system with water.
2. Remove hardened chemical residues or build up by flushing the system with:
   a. kerosene or fuel oil if the last product applied was petroleum based.
   b. soap and water if the last product applied was water based.
3. Prime the system plumbing with a 50% water and automotive antifreeze mixture to prevent freezing of components. Freezing will result in damage to the system and other plumbing components on the system.

## FEATURE UNLOCKS

Every RCM comes with different levels of unlocks. To purchase additional unlocks, navigate to portal.ravenprecision.com and purchase the desired unlocks. The table below lists unlock levels:

TABLE 2. RCM Unlocks

| Level | ECU P/N | Features |
|---|---|---|
| 0 | 063-0173-940 | • Ground drive/no control valve product monitoring/no task controller interface (section control, as applied documentation)<br>• Generic single channel scale/no application control |
| 1 | 063-0173-941 | • Single product control with section shut-off<br>• Liquid $NH_3$(HP+)/Granular<br>• Dual valve control (no support for multiple rate control sections)<br>• Spinner/fan control (two channel)<br>• No scale support (product or general purpose) with products enabled.<br>• Multiple Sidekick ICD control supported<br>• Task controller support for ground drive transmission (section control, as-applied documentation)<br>• Planter section control - up to 16 sections/clutches<br>• Generic four channel scale/no application control |
| 2 | 063-0173-756 | • Multi-product application control (up to five products)<br>• Scale support in conjunction with application control<br>• Tiered boom (two tiers)<br>• Multiple rate control sections (with or without VRA capability)<br>• Planter section control - up to 32 sections/clutches |
| 3 | 063-0173-953 | • Granular Meter per Section<br>• Planter Seed Rate Control (with clutches)<br>• Planter Seed Rate Control (without clutches)<br>• Manure/Litter spreader |

TABLE 2. RCM Unlocks

| Level | ECU P/N | Features |
|---|---|---|
| 3 Stack Tiered Boom | 077-0180-202 | • Enable for three stacks or tiers (A, B, and C or a combination thereof). |
| 3 Stack Blockage Monitoring | 077-0180-201 | • Enable interfacing to a third party blockage monitoring system to provide section awareness from RCM. |

## 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

-Raven Rate Control Module (RCM) Operation Manual
-016-0171-637 Rev. E
-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 LIQUID OPERATION

## LIQUID MACHINE LIST

TABLE 1. RCM Liquid Machine List

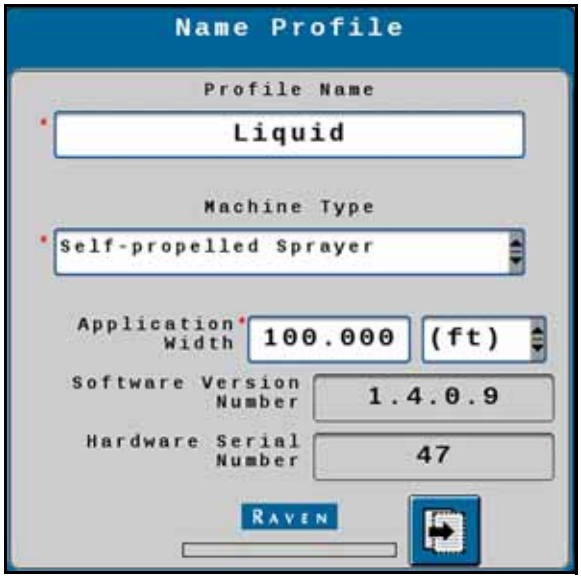
| Machine Type | Application Type | Application Mode | Application Mode Uses |
|---|---|---|---|
| • Self-Propelled Sprayer<br>• Pull-Behind Sprayer | • Liquid | Liquid | Conventional Liquid application. Application rate is entered and documented as gallons/acre (liters/hectare). |
| | | Liquid Tiered (Direct) | Tiered boom liquid application in which two-way boom valves are controlled directly by signals provided by the rate controller. |
| | | Liquid Tiered (External) | Tiered boom liquid application in which two-way boom valves are controlled by an external module using section and tier signals by the rate controller. |
| | | Liquid Constant Flow | Single boom liquid application using three-way boom valves that divert flow back to tank in the off position. |
| | | Tiered Boom - Low Side Drive | The controller will activate tiers by supplying a ground (earth) signal that can be connected to the return (low side) of the valve bank. The signal will float when the tier is off, causing the connected valve bank to turn off. |
| • Liquid Fertilizer Tool | • Liquid | Liquid Slurry Dragline | Liquid application for products that do not have a control valve and require a large application rate like liquid manure. |
| | | Liquid Slurry | Conventional liquid application for products that require a large application rate like liquid manure. |

## LIQUID FERTILIZER CONFIGURATION

This section provides a liquid fertilizer configuration example. Depending on machine configuration the following screens will vary.

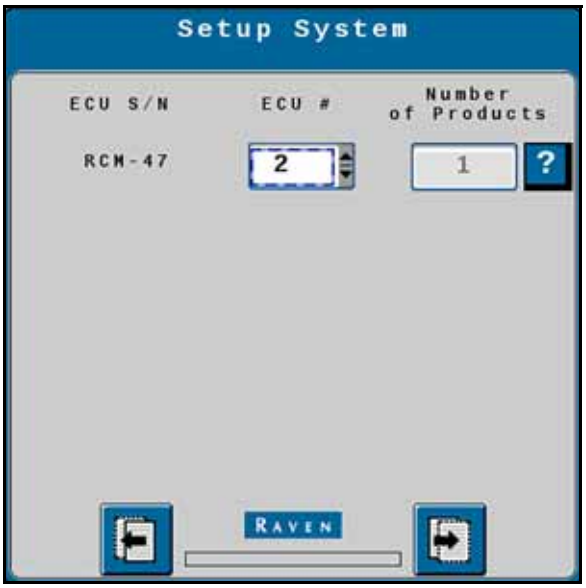
1. Select the desired sprayer type from the Machine Type drop down.

FIGURE 1. Name Profile




2. Enter a name for the profile in the Profile Name field.
3. Select the application width.
4. Press Next.
5. Select the appropriate ECU # from the drop down. The lower the ECU number, the higher priority the ECU will have when paired with an injection system.

FIGURE 2. Setup System

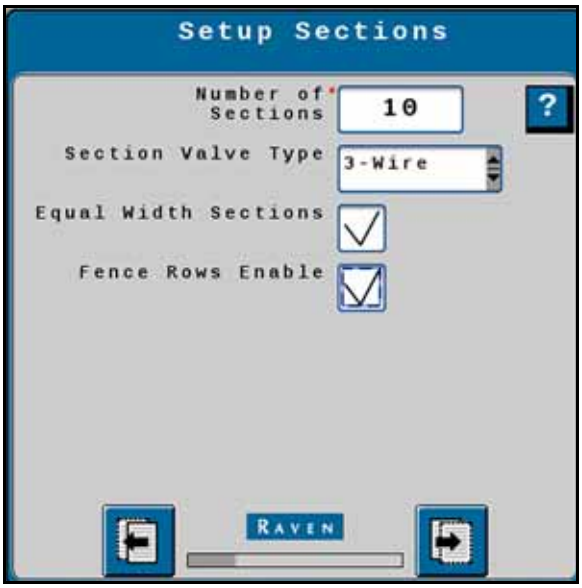



6. Press Next.
7. Select the Application Mode from the drop down.

FIGURE 3. Setup Application Type

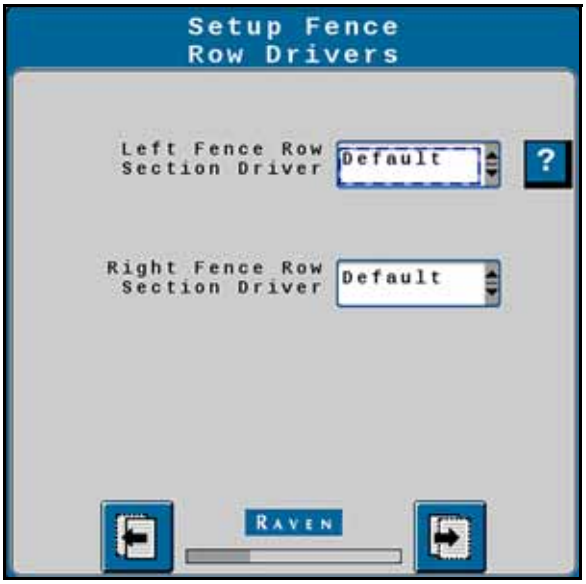

8. Press Next.
9. On the Setup Sections screen, enter the Number of Sections and select the Section Valve Type.

FIGURE 4. Setup Sections



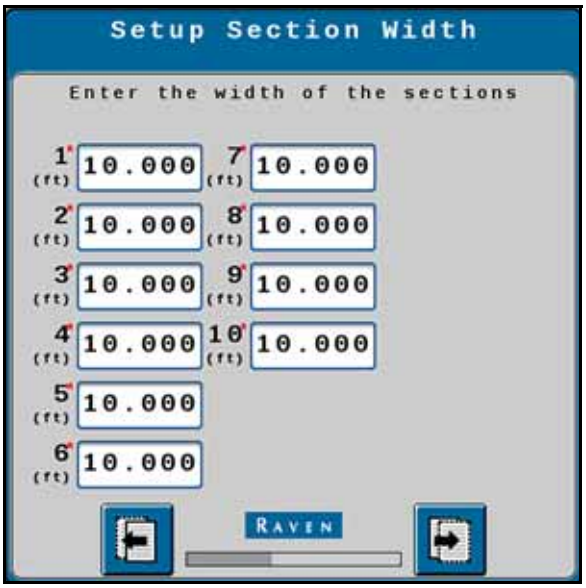

10. If desired, select the Equal Width Sections and Fence Rows Enable check boxes.
11. Press Next.
12. Select the fence row driver for each fence row (if selected earlier).

FIGURE 5. Setup Fence Row Drivers



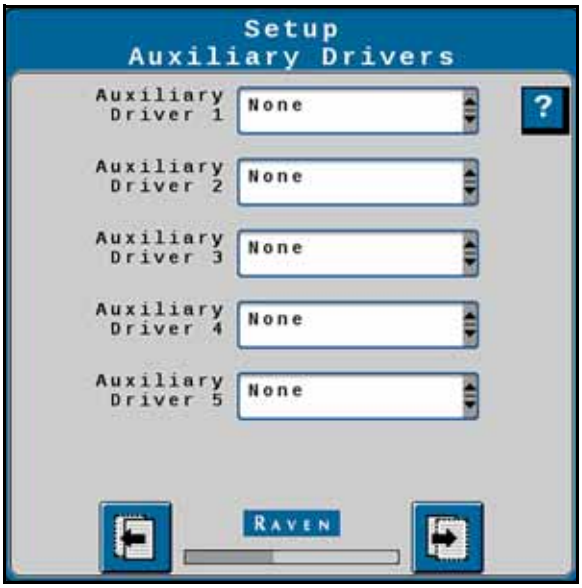

13. Press Next.
14. Review the section width information on the Setup Section Width screen.

FIGURE 6. Setup Section Width



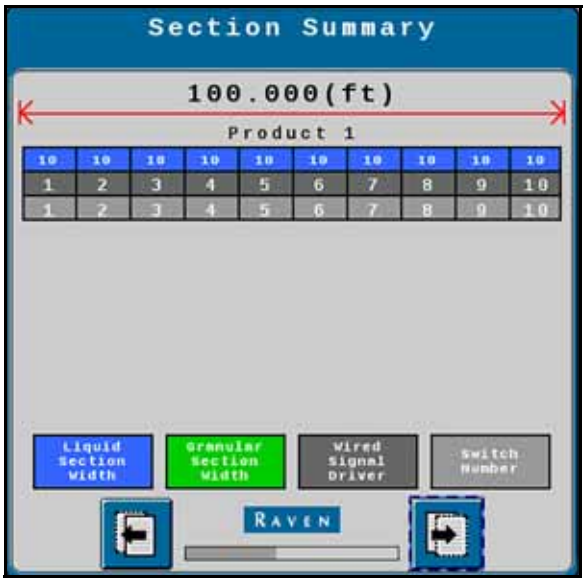

15. If needed, adjust the section widths.
16. Press Next.
17. If desired, configure auxiliary drivers on the Setup Auxiliary Drivers screen. Auxiliary drivers are additional switches that provide a 12V signal to a device.

FIGURE 7. Setup Auxiliary Drivers




18. Press Next.
19. Review the information on the Section Summary screen.

FIGURE 8. Section Summary

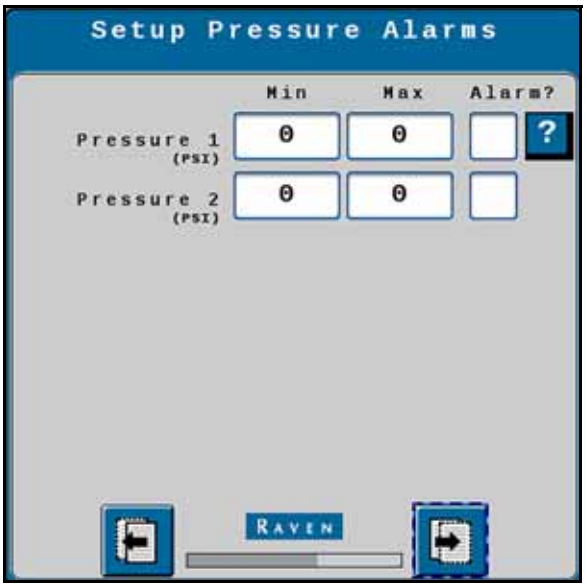



20. Press Next.
21. Select the appropriate pressure sensors configuration for each pressure sensor.

FIGURE 9. Setup Pressure Sensors

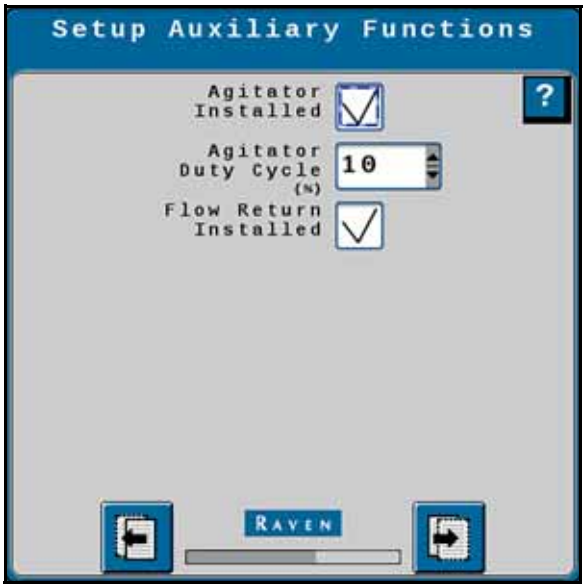

22. Press Next.
23. If desired, set the Min and Max pressures and select the Alarm? check box for each pressure sensor.

FIGURE 10. Setup Pressure Alarms



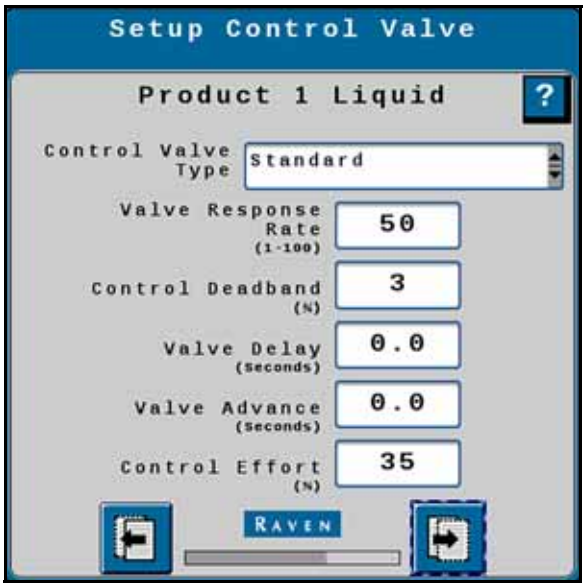

24. Press Next.
25. If an agitator is installed and will be used, select the Agitator Installed checkbox and configure the Agitator Duty Cycle. Also select the Flow Return Installed checkbox if desired.

FIGURE 11. Setup Auxiliary Functions



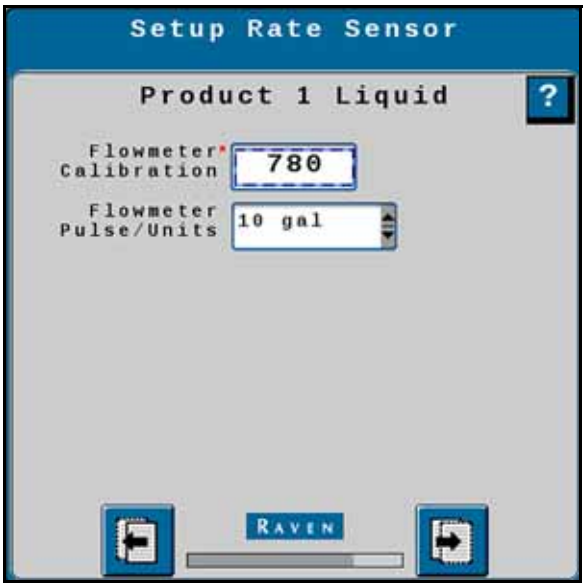

26. Press Next.
27. On the Setup Control Valve page, configure the information for the product. This includes selecting the Control Valve Type, Valve Response Rate, and Control Deadband.

FIGURE 12. Setup Control Valve



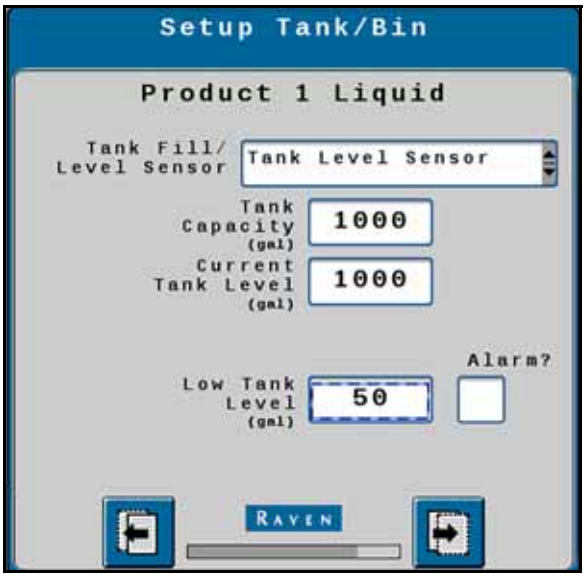

28. Press Next.
29. Configure the rate sensor for the product by entering the Flow Meter Calibration and selecting the Flow Meter Pulses/Units.

FIGURE 13. Setup Rate Sensors



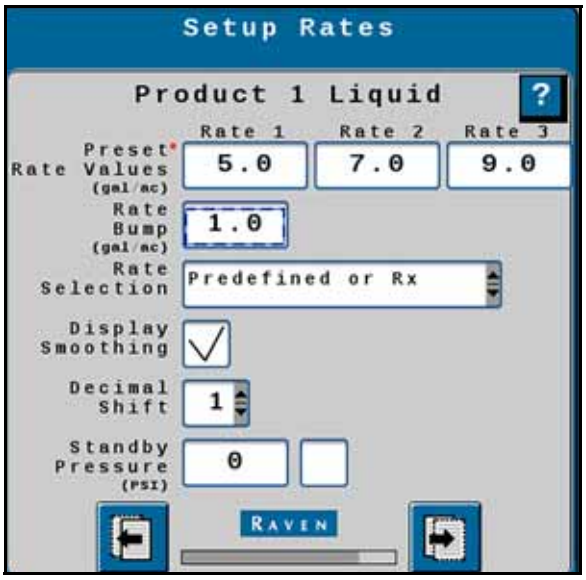

30. Press Next.
31. Select the Tank Fill/Level Sensor and enter the Tank Capacity, Current Tank Level, and Low Tank Level for the product.

FIGURE 14. Setup Tank/Bin




32. If desired, select the Alarm? checkbox for the Low Tank Level.
33. Press Next.
34. Enter the Preset Rate Values and Rate Bump values for the product.

FIGURE 15. Setup Rates




35. Select the desired Rate Selection from the drop down.
36. If desired, select the Display Smoothing check box and select the Decimal Shift number.
37. Enter a Standby Pressure.
38. Press Next.
39. If desired, enter a Off Rate Alarm percentage and select the Alarm? check box.

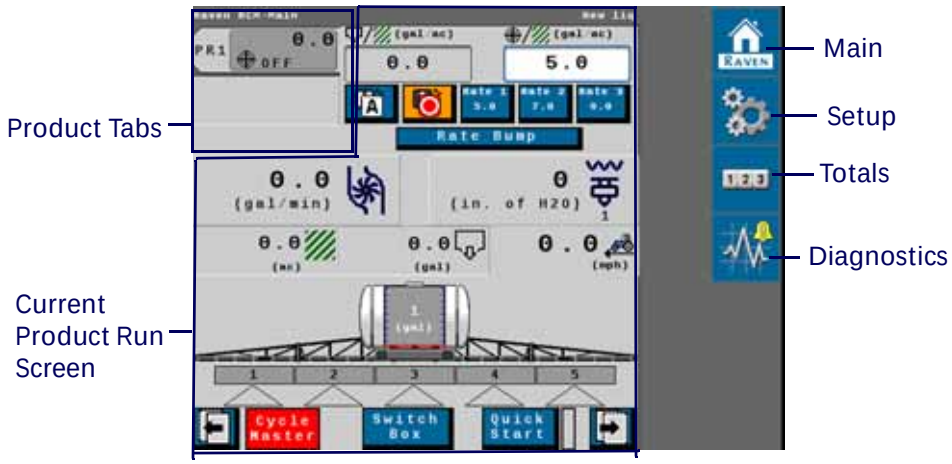
FIGURE 16. Setup Alarms


40. Review the information on the Setup Summary page. If the configuration is not correct, press back and make the necessary adjustments. If the configuration is correct, press Next.

# LIQUID RUN PAGE OVERVIEW

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

FIGURE 17. Liquid Run Screen




## PRODUCT TABS

Press on the product tab to select the desired product. This will open the product run screen for that product.

## CURRENT PRODUCT RUN SCREEN

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

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

FIGURE 18. Liquid Run Screen

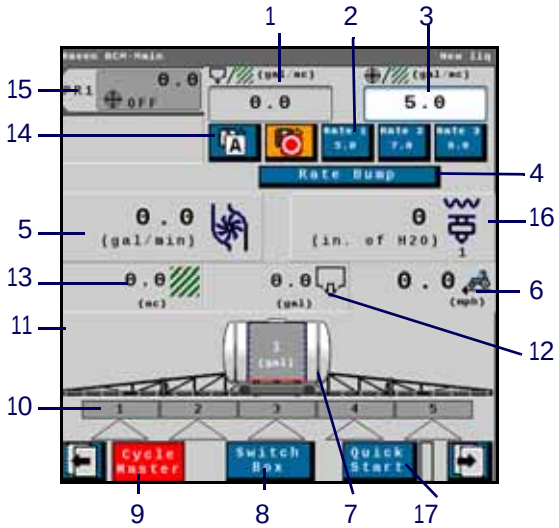


TABLE 2. Liquid Run Screen Information

| | Button | Description | Function/Operation |
|---|---|---|---|
|  | 1 | Actual Rate | Displays the actual application rate. |
|  | 2 | Preset Rate Bump | Provides the user the to increase the rate by the preconfigured rates defined during configuration. |
|  | 3 | Target Rate | Displays the current target rate. The target rate can be adjusted by pressing in the number cell and entering a new number. |
|  | 4 | Rate Bump/Presets | This will either display Rate Bump or Presents. This increases the rate by the rate bump value defined during configuration. |
|  | 5 | Flow Rate | Displays the gal/min going through the flow meter. |
|  | 6 | Traveling Speed | Shows the implement/ machine speed. May be pressed to enter the Self Test Speed Setup menu. |
|  | 7 | Tank Level | Displays the current tank level. |
|  | 8 | Section Switch Box Button | Indicates if the switch box is on or off:<br>• Green - On<br>• Red - Off<br>Press the switch box button to navigate to a screen that allows the user to turn off the switch boxes for individual sections. |
|  | 9 | Master Switch Indicator | The Master Switch Indicator shows the status of the master switch.<br>• Green - On<br>• Red - Off<br>• Orange - Cycle the master switch |
|  | 10 | Section Status | Displays the spray status of each section.<br>• Green - On<br>• Gray - Off |

| | Button | Description | Function/Operation |
|---|---|---|---|
|  | 11 | Fence Row | Provides the user the ability to turn the fence rows on or off. |
|  | 12 | Application Volume | Displays the tally register volume applied. |
|  | 13 | Applied Acres | Displays the number of acres applied. |
|  | 14 | Manual/Automatic Toggle | Press this to switch between manual and automatic operation. |
|  | 15 | Product Tab | Select a tab to view information for that product. |
|  | 16 | Low Pressure | Low pressure reading. |
|  | 17 | Quick Start | Select this to quickly configure/start a liquid application. |

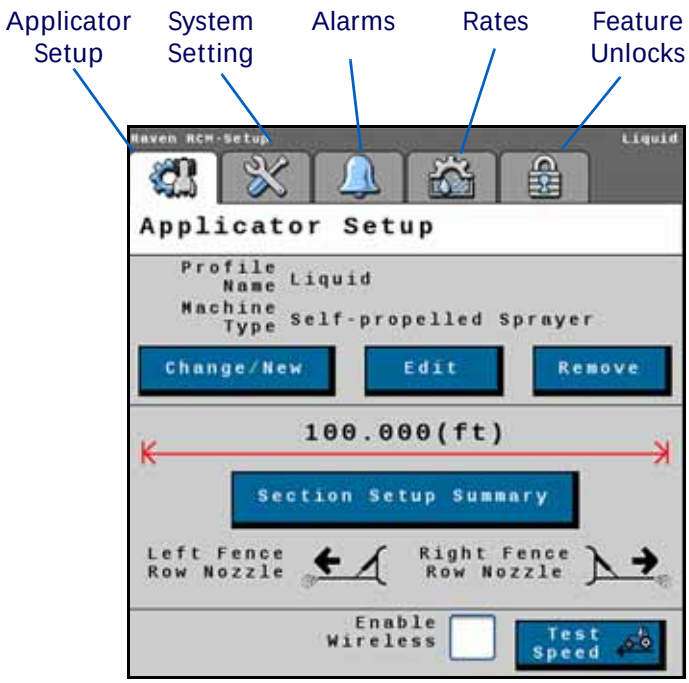
## MAIN

Press main at any time to return to the Current Product Run Screen.

## SETUP

Pressing setup opens a screen with many tabs.

FIGURE 19. 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 Chapter 9, *Precision Farming*.

## SYSTEM SETTINGS

The system settings provides many buttons that allow the user to modify the current configuration. The table below describes each button in detail.

TABLE 3. System Settings

| Button | Description |
|---|---|
| Control Valve Setup | The Control Valve button allows the user to adjust the following settings for each product:<br>• Valve Response Rate<br>• Control Deadband<br>• Valve Delay<br>• Valve Advance<br>• Control Effort |
| Rate Sensor Setup | The Rate Sensor Setup button provides the options to adjust the following settings:<br>• Flow Meter Calibration<br>• Flow Meter Pulse/Units<br>• Flow Meter Low Limit<br>• Tank Fill Flow Meter Calibration<br>• Tank Fill Flow Meter Pulse/Units<br>There is also the option to perform a catch test and applied product calibration. |
| 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 allow the user to configure the main run screen. |
| 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

If there are additional features available for the RCM, enter the provided Activation Key to access these features.

## 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 dropdown. 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.

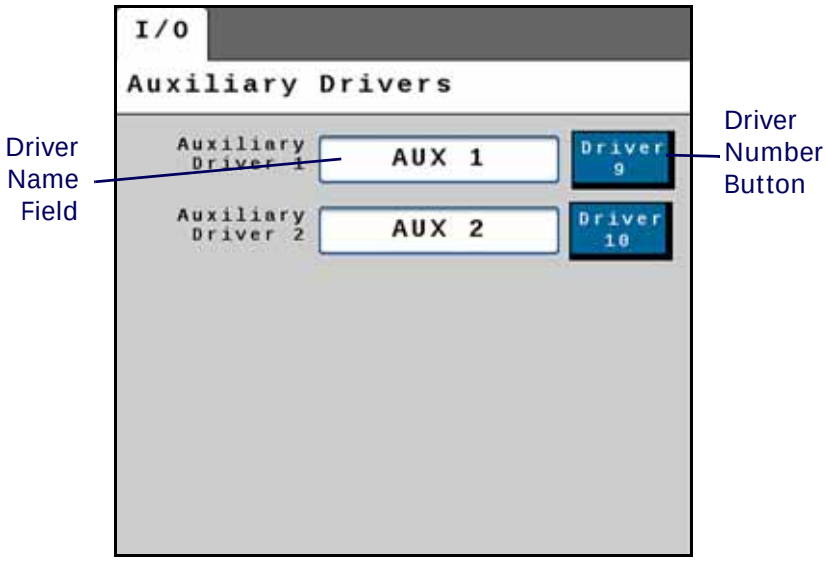
### PRODUCT SUMMARY

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.

## AUXILIARY DRIVERS

Auxiliary drivers that were created during configuration are listed in Auxiliary Drivers.

FIGURE 20. Auxiliary Drivers




To give the driver a custom name, press in the Driver Name field and, using the keypad, enter the desired name.

To activate the auxiliary driver, select the driver number button next to the desired driver.

# CHAPTER 4 ANHYDROUS AMMONIA (NH3) OPERATION

## NH3 MACHINE LIST

TABLE 1. RCM NH3 Machine List

| Machine Type | Application Type | Application Mode | Application Mode Uses |
|---|---|---|---|
| • NH3 Toolbar | • NA | NH3 | NH3 applicator or single valve configuration. |
| | | NH3 HP+ | NH3 applicator or single valve configuration. |

## RAVEN ACCUFLOW HP™ PLUS SYSTEMS

### OVERVIEW OF OPERATION

The HP+ System utilizes a PWM-controlled hydraulic valve and centrifugal pump to maintain a more consistent system pressure, improving control and increasing standard AccuFlow system capacity. The system is designed to only run the pump when it is needed to achieve target rate.

The pump will control to a target pressure calculated by the controller (RCM). The Standby Pressure is the starting point of the Target Pressure calculation. The Standby Pressure should be set to 5 PSI [35 KPA] above the static pressure of the system (Pressure 1 when no product is being applied and all tank valves are open).

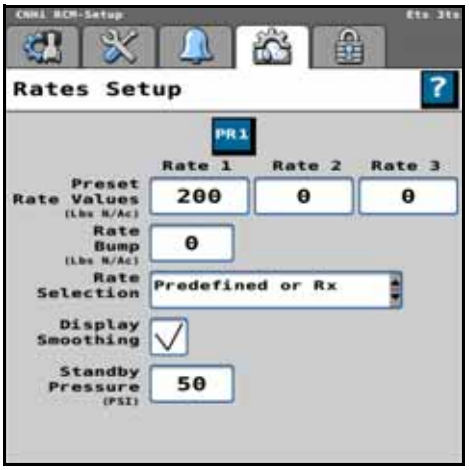
When applying, if the system is not reaching the desired rate, the RCM will increase the Target Pressure it is controlling. It will begin at the Standby Pressure and slowly increase until the rate can be achieved or the PWM has reached its maximum value.

When the machine is stopped the pump will shut off and the Target Pressure will reset to the Standby Pressure

Standby Pressure is entered at the bottom of the Rates Setup page.

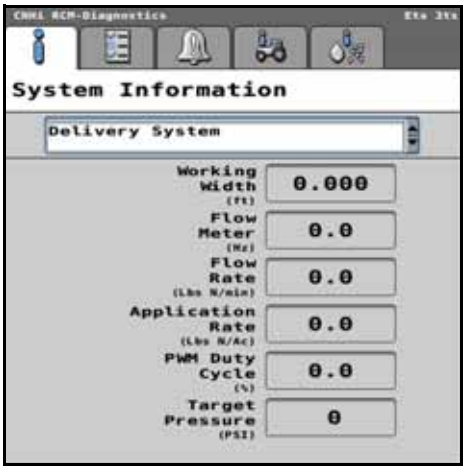
NOTE: To ensure proper performance throughout the season, Standby Pressure may need to be adjusted since the static pressure of the system can significantly change as external environmental temperatures increase or decrease.

FIGURE 1. Rates Setup Menu




The RCM Calculated Target Pressure can be viewed at the bottom of the Delivery System page. The Delivery System page can be selected in the System Information dropdown menu.

FIGURE 2. System Information Menu




## PUMP FAULT

The pump fault alarm is triggered when the pump PWM output from the RCM is running, and Pressure Sensor 1 (Gauge Tree) is lower or equal to Pressure Sensor 2 (Pump Inlet). Pressure Sensor 1 is on the output side of the pump and Pressure Sensor 2 is on the inlet to the pump so the difference between these 2 sensors is the pressure increase the pump is providing. This alarm is often caused by either a low or empty tank or a restriction on the inlet of the pump. May also be caused if there is not sufficient flow to the hydraulic valve caused by the tractor SCV is being operated backward or the hydraulic hoses have become disconnected, or the PWM valve not operating correctly.

## DELTA PRESSURE SENSOR / VAPOR MONITOR

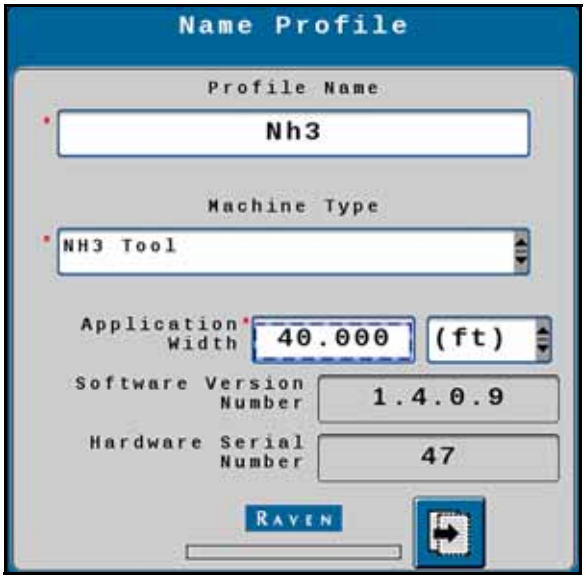
The Delta Pressure Sensor can be used as vapor monitor. Any AccuFlow™ Vortex cooler being controlled by an RCM can be equipped with this sensor. The Sensor can be connected to any unused pressure sensor connection and should be configured as Delta Pressure-NH3 Sensor type. The sensor is temperature transmitter. The RCM will calculate if the pressure and temperature of the NH3 is in the vapor zone or liquid zone of the NH3 pressure/ temperature curve. A negative delta pressure reading indicates that the NH3 is in the vapor zone and will not meter properly. Common causes for this are plugged strainers, plugged vapor lines, plugged vapor tube orifice or attempting to apply above the capability of the system.

FIGURE 3. Pressure Sensor Setup Menu


## NH3 CONFIGURATION

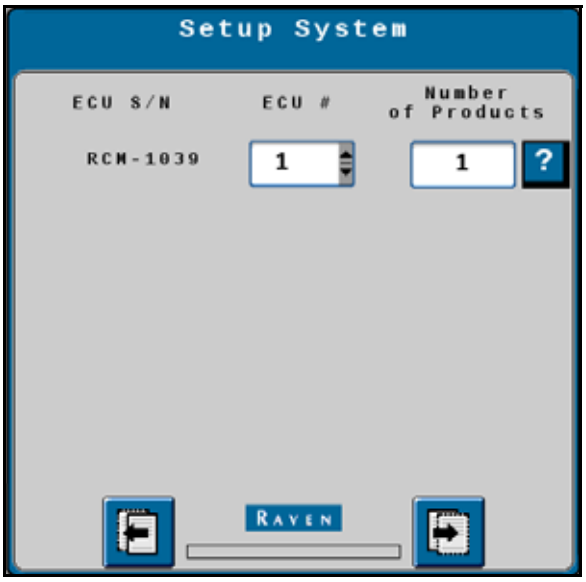
1. Select the desired Machine Type from the drop down.

FIGURE 4. Name Profile



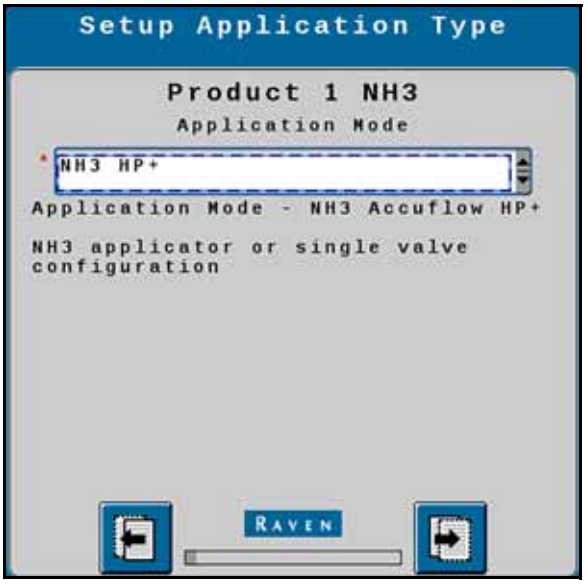
2. Enter the desired Profile Name.
3. Enter the Application Width.
4. Press Next.
5. Set the appropriate ECU # from the drop-down. This is used to identify, prioritize, and sort RCMs when multiple RCMs are on the same system. For systems with a single RCM, set this to "1".

FIGURE 5. Setup System




6. Enter the desired Number of Products.
7. Press Next.
8. Select the desired Application Mode for each product.

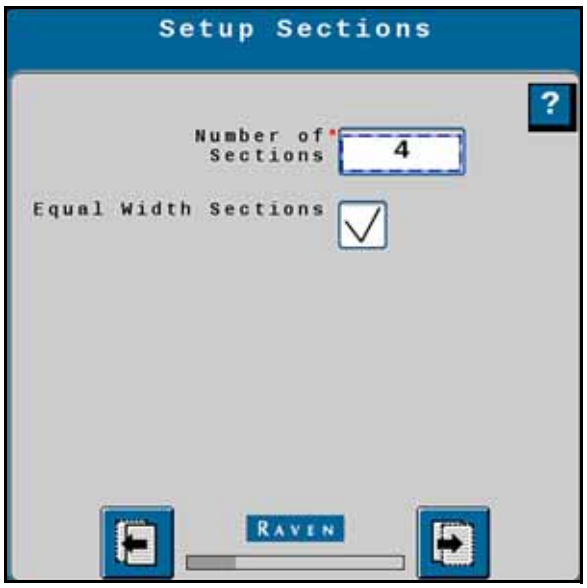
FIGURE 6. Setup Application Type




9. Press Next.

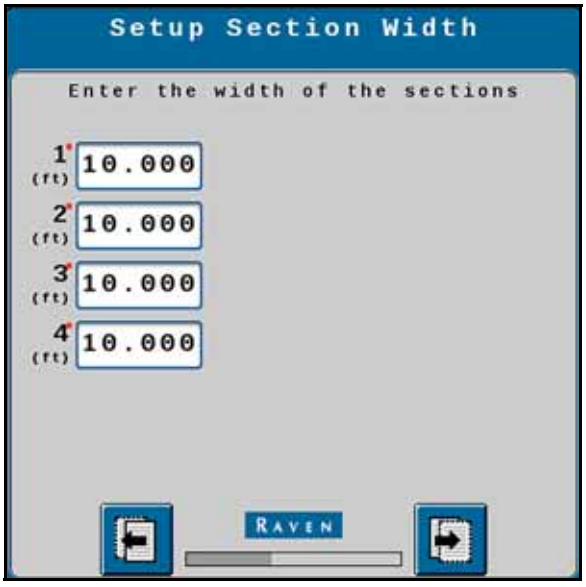
10. Enter the Number of Sections and, if desired, select the Equal Width Sections check box.

FIGURE 7. Setup Sections




11. Press Next.
12. Verify the section widths are correct.

FIGURE 8. Setup Section Width



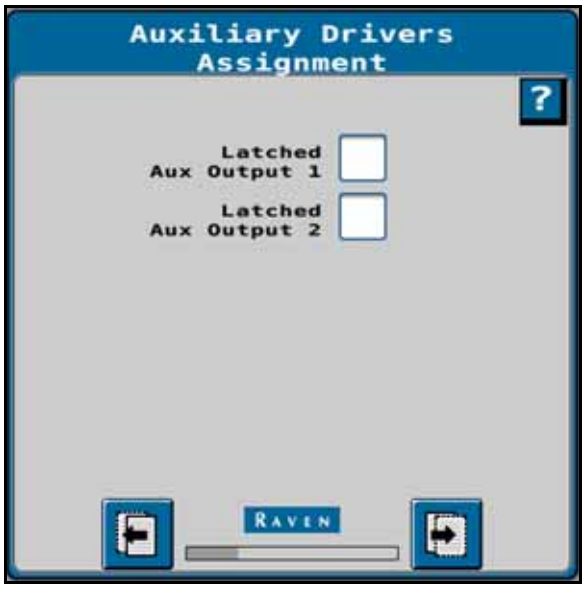

13. Press Next.
14. If desired, select an Auxiliary Driver. Auxiliary drivers are additional switches that provide a 12V signal to a device.

FIGURE 9. Setup Auxiliary Drivers


NOTE: Unused section drivers are necessary to set up auxiliary drivers and to run independently of any product control.

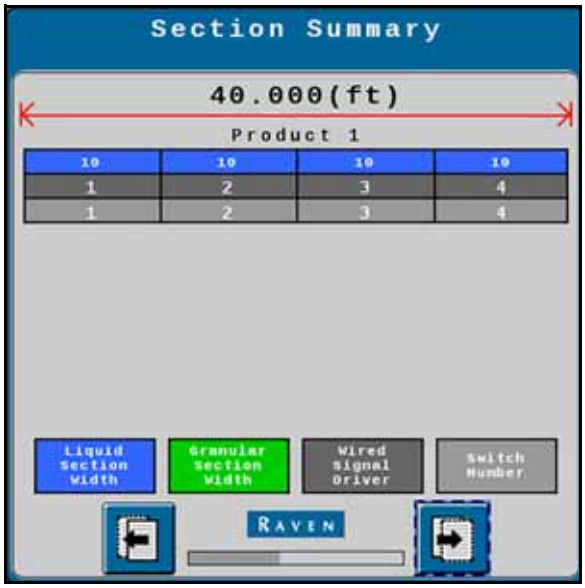
15. Press Next.
16. Select the Latched Output to allow the driver to stay on until a the driver button is pressed again.

FIGURE 10. Setup Auxiliary Drivers




17. Review the information on the Section Summary screen.

FIGURE 11. Section Summary

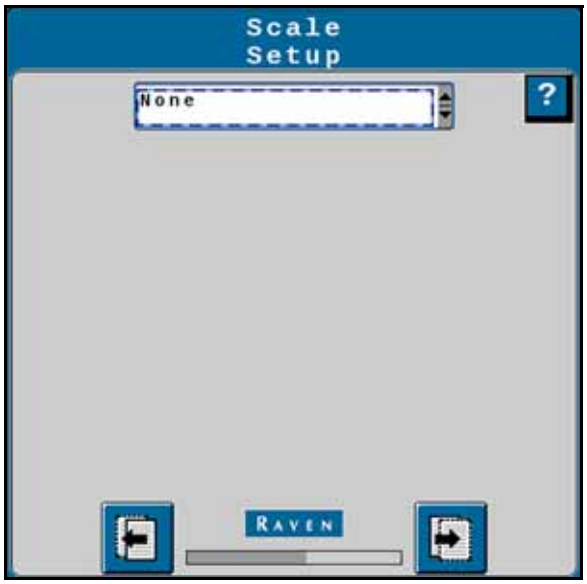


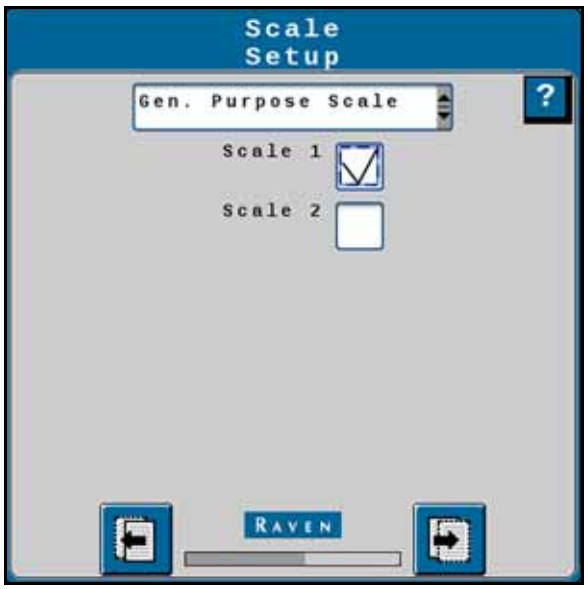

18. If the information is correct, press Next. To make adjustments to the configuration, press Back and adjust settings as needed.
19. Select the Product Scale type and the corresponding scale(s).

NOTE: General purpose scales are not associated with a product control channel.

20. Select the desired scale.

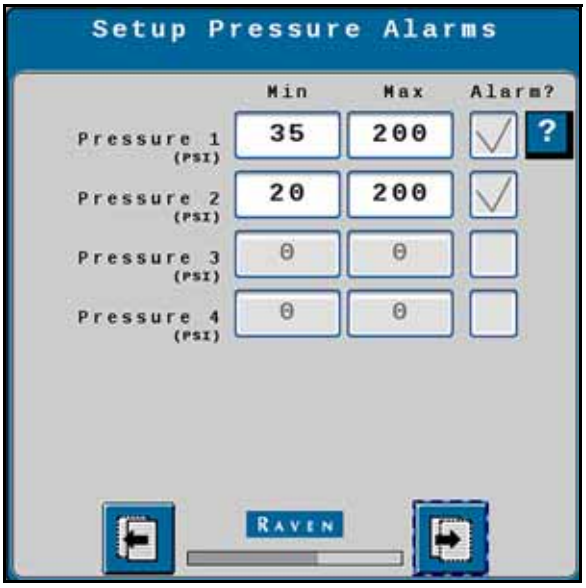
FIGURE 12. Scale Setup



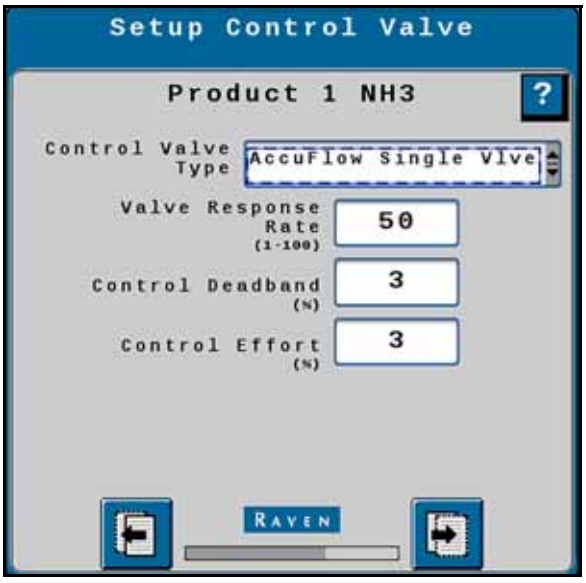

21. Press Next.
22. Enter the Min and Max value for the pressure alarms.

FIGURE 13. Setup Pressure Alarms



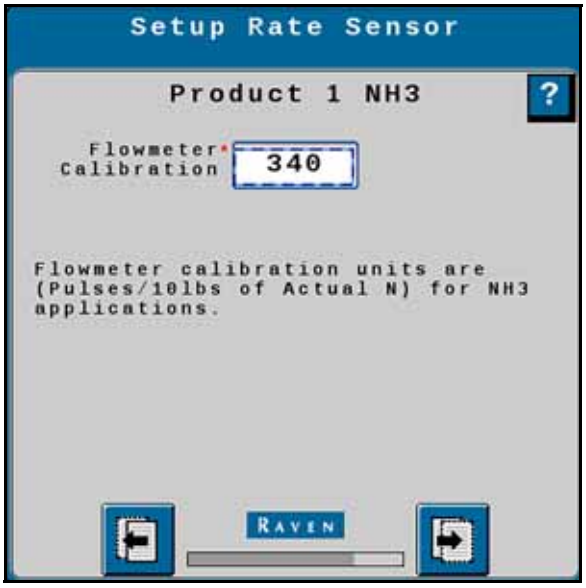

23. Press Next.
24. Press Next.
25. Enter the Min and Max values for the pressure alarms.
26. Select the Control Valve Type.

FIGURE 14. Setup Control Valve




27. Enter the desired Valve Response Rate, Control Deadband, and Control Effort.
28. Press Next.
29. Enter the Flow Meter Calibration.

FIGURE 15. Setup Rate Sensor

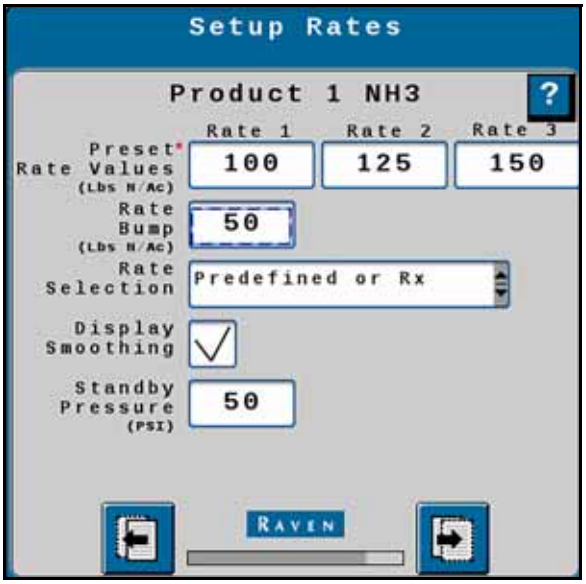



30. Press Next.
31. Enter the Tank Capacity, Current Tank Level, and Low Tank Level values.

FIGURE 16. Setup Tank/Bin

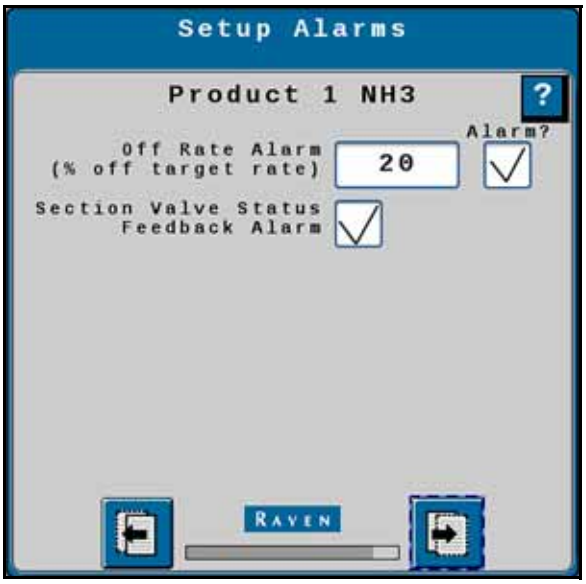

32. If desired, select the Alarm? checkbox for the Low Tank Level.
33. Press Next.
34. Enter the Preset Rate Values and the Rate Bump value.

FIGURE 17. Setup Rates




35. Select the Rate Selection and, if desired, select Display Smoothing.
36. Enter a Standby Pressure. This is the pressure the rate controller will attempt to maintain when all of the sections are off.
37. Press Next.
38. If desired, enter values for the Off Rate Alarm and select the Alarm? checkbox(es) for Off Rate Alarm and the Section Valve Status Feedback Alarm.

FIGURE 18. Setup Alarms




39. Press Next.
40. Review the information on the Setup Summary page.

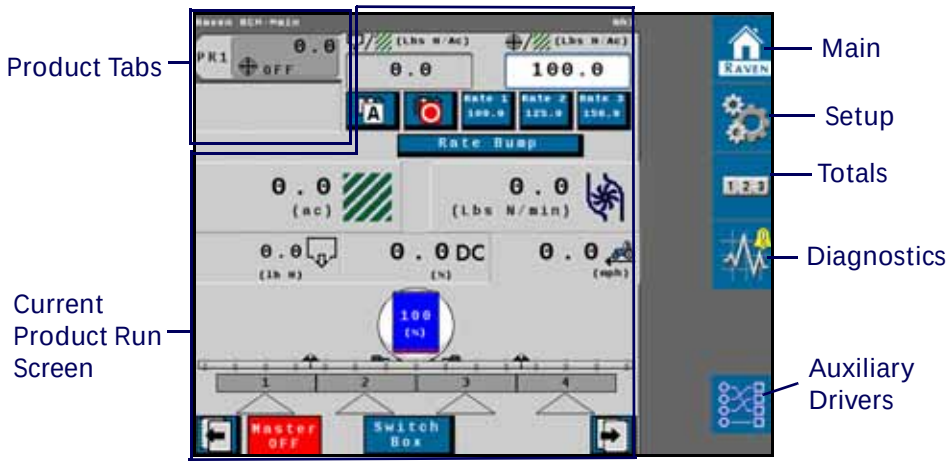
FIGURE 19. Setup Summary


41. If desired, press Back to adjust the configuration settings. If the configuration is correct, press Next.

# NH3 RUN PAGE OVERVIEW

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

FIGURE 20. NH3 Run Screen




## PRODUCT TABS

Press on the product tab to select the desired product. This will open the to product run screen for that product.

## CURRENT PRODUCT RUN SCREEN

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

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

## RUN PAGE OVERVIEW

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

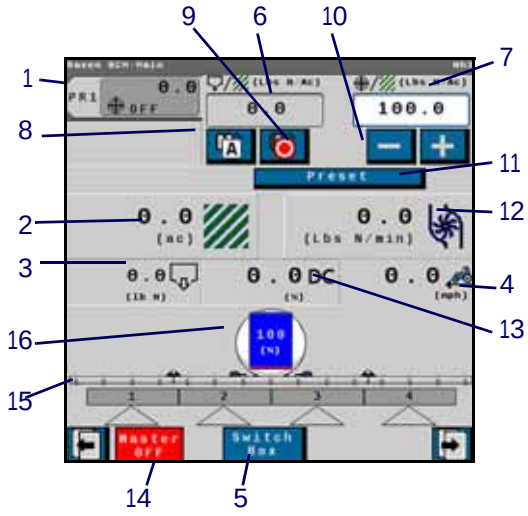


TABLE 2. Raven RCM Run Time Widgets

| | Button | Description | Function/Operation |
|---|---|---|---|
|  | 1 | Product Tabs | Select a tab to view information for that product. |
|  | 2 | Applied Area | Displays the number of acres applied. |
|  | 3 | Application Volume | Displays the tally register volume applied. |
|  | 4 | Traveling Speed | Displays the current machine traveling speed. |
|  | 5 | Section Switch Box button | Indicates if the switch box is on or off:<br>• Green - On<br>• Red - Off |
|  | 6 | Actual Rate | Displays the actual application rate. |
|  | 7 | Target Rate | Displays the target application rate. |
|  | 8 | Manual/Automatic Toggle | Press this to switch between manual and automatic operation. |
|  | 9 | Product On/Off Toggle | Press this to manually turn a product on or off. |
|  | 11 | Preset Rate Button | Provides the user the to increase the rate by the preconfigured rates defined during configuration. |
|  | 12 | Application Rate | Displays the current application rate in pounds per minute. |
|  | 13 | Duty Cycle | Displays the current duty cycle. |
|  | 14 | Master Switch Indicator | The Master Switch Indicator shows the status of the master switch.<br>• Green - On<br>• Red - Off<br>• Orange - Cycle the master switch |
|  | 15 | Implement Sections | Displays if the display section is on or off. |
|  | 16 | Tank Level Indicator and Fill Button | Displays the current tank fill level. |

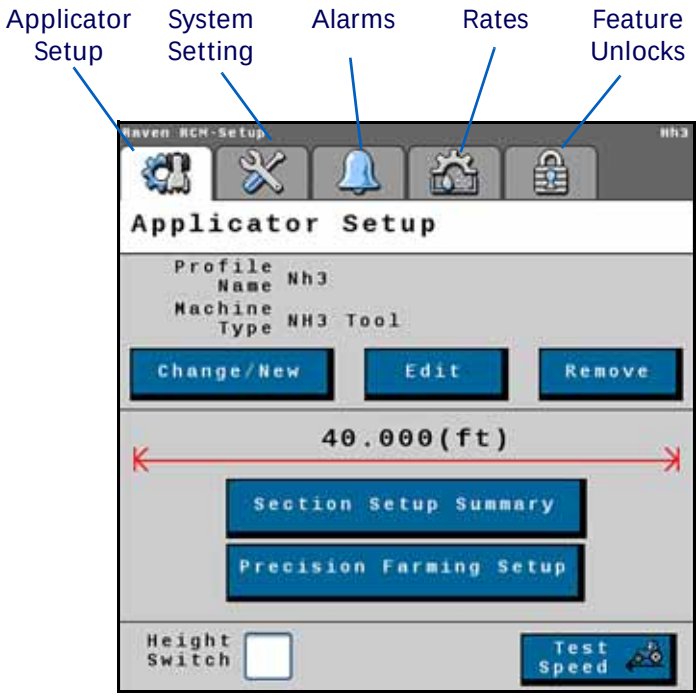
## MAIN

Press main at any time to return to the Current Product Run Screen.

## SETUP

Pressing setup opens a screen with many tabs.

FIGURE 21. 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 Chapter 9, *Precision Farming*.

### SYSTEM SETTINGS

The system settings provides many buttons that allow the user to modify the current configuration. The table below describes each button in detail.

TABLE 3. System Settings

| Button | Description |
|---|---|
| Control Valve Setup | The Control Valve button allows the user to adjust the following settings for each product:<br>• Valve Response Rate<br>• Control Deadband<br>• Valve Delay<br>• Valve Advance<br>• Control Effort |
| Rate Sensor Setup | The Rate Sensor Setup button provides the options to adjust the following settings:<br>• Flow Meter Calibration<br>• Flow Meter Pulse/Units<br>• Flow Meter Low Limit<br>• Tank Fill Flow Meter Calibration<br>• Tank Fill Flow Meter Pulse/Units<br>There is also the option to perform a catch test and applied product calibration. |
| 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 operator to configure the main run screen. |
| 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. |
| 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

If there a additional features available for the RCM, enter the provided Activation Key to access these features.

## 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 dropdown. 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.

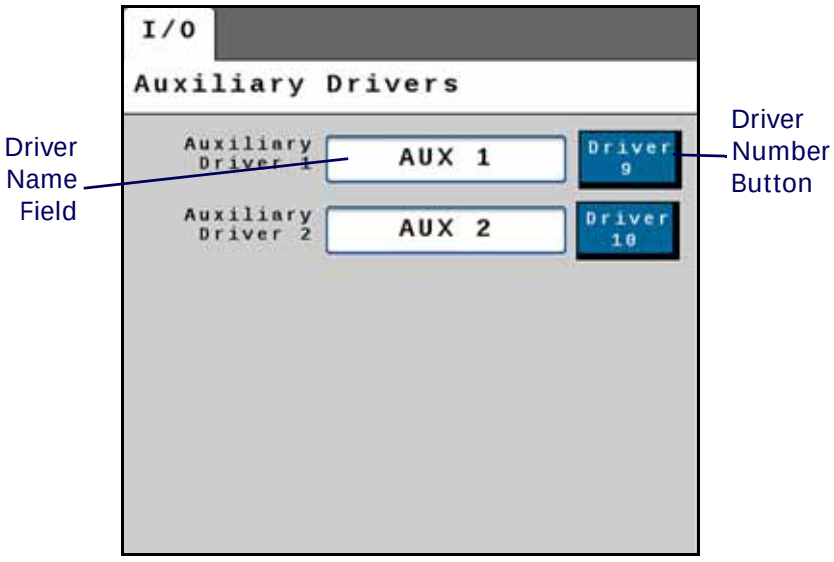
### PRODUCT SUMMARY

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.

## AUXILIARY DRIVERS

Auxiliary drivers that were created during configuration are listed in Auxiliary Drivers.

FIGURE 22. Auxiliary Drivers




To give the driver a custom name, press in the Driver Name field and, using the keypad, enter the desired name.

To activate the auxiliary driver, select the driver number button next to the desired driver.

# CHAPTER 5 SPREADER OPERATION

## SPREADER MACHINE LIST

TABLE 1. RCM Spreader Machine List

| Machine Type | Application Type | Application Mode | Application Mode Uses |
|---|---|---|---|
| • Self-Propelled Spreader<br>• Pull-Behind Spreader | • Granular Fertilizer<br>• Granular Seed | Dry Manure/Litter | Granular full width using product scales to adjust product density on the go during in-field operations. |
| | | Granular Full Width | Dry or seed application using a single shutoff section.<br>Application rate is entered and documented as lbs/acre [kg/ha]. |
| | | Granular RPM Compensated | Dry or seed application using multiple shutoff sections.<br>Meter/conveyor RPM is controlled/ compensated based upon machine speed and active width as sections turn on and off. Application rate is entered and documented as lbs/acre [kg/ha]. |
| | | Granular RPM Maintained | Granular multi-section RPM maintained dry or seed application using multiple shutoff sections.<br>Meter/conveyor RPM is controlled/ compensated based upon machine speed. Meter/conveyor RPM is not compensated for changes in active width as sections turn on and off. Meter/conveyor will be stopped when all sections are off. Application rate is entered and documented as lbs/acre [kg/ha]. |

TABLE 1. RCM Spreader Machine List

| Machine Type | Application Type | Application Mode | Application Mode Uses |
|---|---|---|---|
| (Cont.)<br>• Self-Propelled Spreader<br>• Pull-Behind Spreader | (Cont.)<br>• Granular Fertilizer<br>• Granular Seed | Granular Split Belt | Dry or seed application using one control valve of a split meter/conveyor RPM is available for each section.<br>Meter/Conveyor RPM is not compensated for changes in active width as left or right sections turn on and off. Meter/conveyor will be stopped when both sections are off. |
| | | Granular Dual Control Valve | Dual Control Valve Dry or seed application using dual PWM control valves to independently control a left and right meter/conveyor section.<br>Encoder feedback of meter or conveyor RPM is available for each section. Meter/conveyor RPM is independently controlled/compensated based on machine speed. Sections are turned off by closing the PWM control valve. |

Spreader configuration on the RCM can also support the following legacy applications:

TABLE 2. Legacy Granular Modes

| Legacy Granular Application Mode | New Application Mode | Mode Details |
|---|---|---|
| Gran 1 | Granular Full Width Selection | Dry or seed application using a single shutoff section.<br>Application rate is entered and documented as Pounds/Acre (Kilograms/Hectare). |
| Gran 2 | Granular Section Control RPM Maintained | Dry or seed application using multiple shutoff sections.<br>Meter/conveyor RPM is controlled/compensated based upon machine speed and active width as sections turn on and off. Application rate is entered and documented as lbs/acre [kg/ha]. |
| Gran 3 | Granular Split Tank/ Dual Encoder | Dry or seed application using one control valve for a split meter/conveyor with shutoff control of two independent sections.<br>Encoder feedback of meter or conveyor RPM is available for each section. Meter/conveyor RPM is controlled/compensated based upon the vehicle speed.<br>Meter/conveyor RPM is not compensated for changes in active section width as left or right sections turn on and off. Meter/conveyor will be stopped when both sections are off. |
| Gran 4 | Granular Section Control RPM Maintained | The Granular Section Control RPM Maintained is listed above for Gran 2. If this is the correct mode for the Legacy Gran 4, we should be able to copy the mode details from above. |

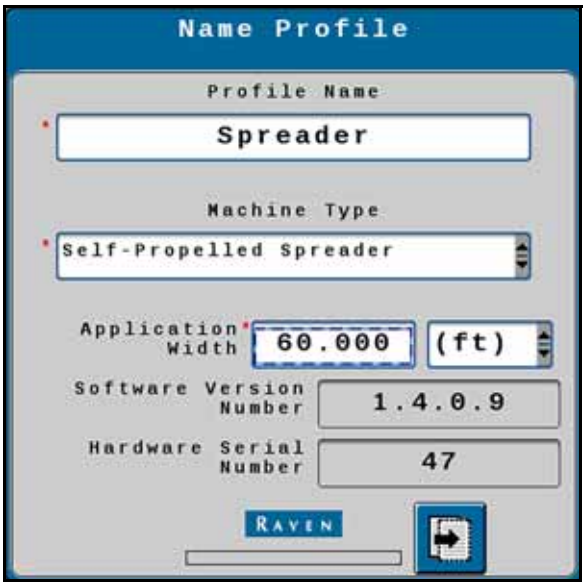
TABLE 2. Legacy Granular Modes

| Legacy Granular Application Mode | New Application Mode | Mode Details |
|---|---|---|
| Gran 5 | Granular Section Control RPM Compensated | Dry or seed application using multiple shutoff sections.<br>Meter/conveyor RPM is controlled/compensated based upon vehicle speed. Meter/conveyor RPM is not compensated for changes in active width as sections turn on and off. Meter/conveyor will be stopped when all sections are off. Application rate is entered and documented as lbs/acre [kg/ha]. |
| None | Dual Control Valve | Dry or seed application using dual PWM control valves to independently control a left and right meter/conveyor section.<br>Encoder feedback of meter or conveyor RPM is available for each section. Meter/conveyor RPM is independently controlled/compensated based upon vehicle speed. Sections are turned off by closing the PWM control valve. |
| None | Granular Meter Per Section | Dry or seed application using PWM control valves to independently control a meter/conveyor section.<br>Up to 16 individual control sections can be configured. Encoder feedback of meter or conveyor RPM is available for each section. Meter/conveyor RPM is independently controlled/compensated based upon vehicle speed. Sections are turned off by closing the PWM control valve.<br>NOTE: This mode is only available when the Generic machine type selected or in Air Cart mode. |

## SPREADER CONFIGURATION

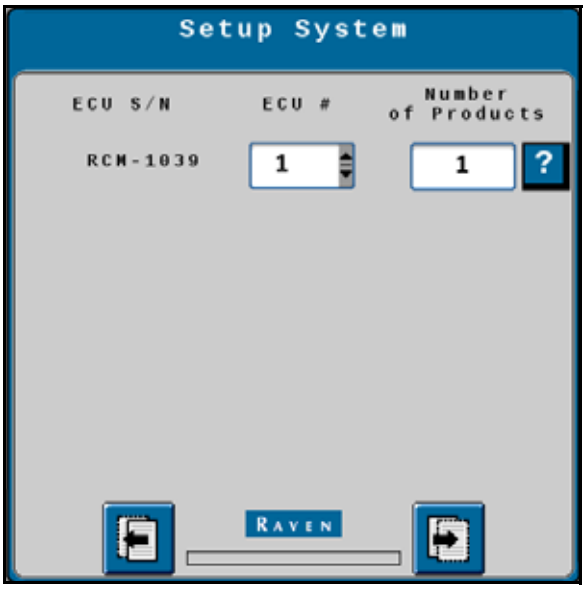
1. Select the desired Machine Type from the drop-down.

FIGURE 1. Name Profile




2. Enter the desired Profile Name.
3. Enter the Application Width.
4. Press Next.
5. Set the appropriate ECU # from the drop-down. This is used to identify, prioritize, and sort RCMs when multiple RCMs are on the same system. For systems with a single RCM, set this to “1”.

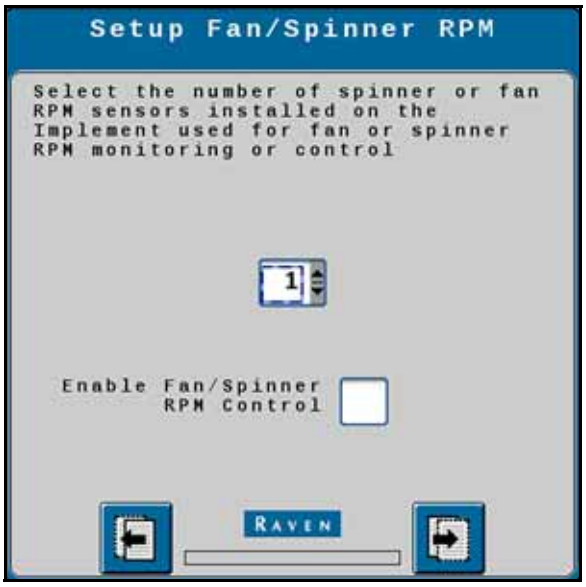
FIGURE 2. Setup System




6. Enter the desired Number of Products.

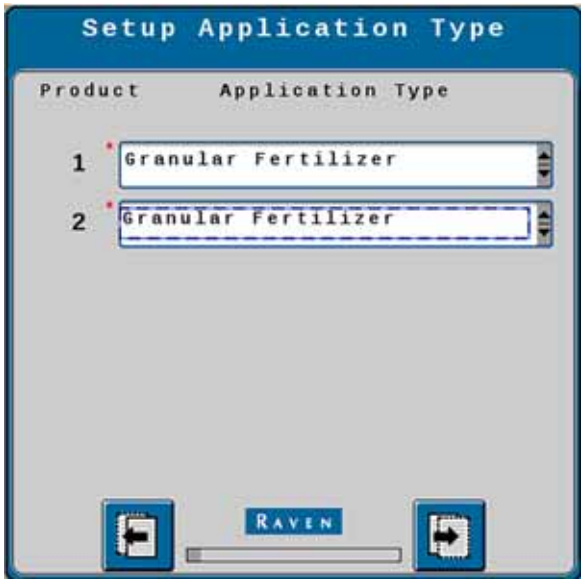
7. Press Next.
8. Select the desired number of spinner/fans.

FIGURE 3. Setup Fan/Spinner RPM




9. If desired, select the Enable Fan/Spinner RPM Control checkbox.
10. Press Next.
11. Select the Application Type for each Product.

FIGURE 4. Setup Application Type

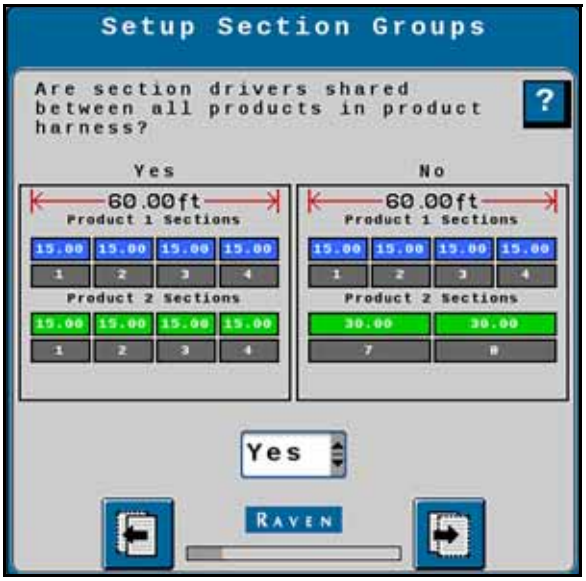



12. Press Next.
13. Select the Application Mode for each product.

FIGURE 5. Setup Application Type Screen Two

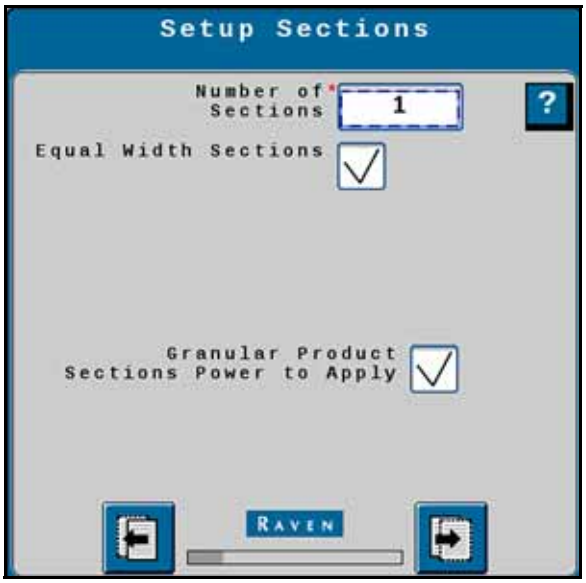

14. Press Next.
15. Review the information on the Setup Section Groups screen.

FIGURE 6. Setup Section Groups



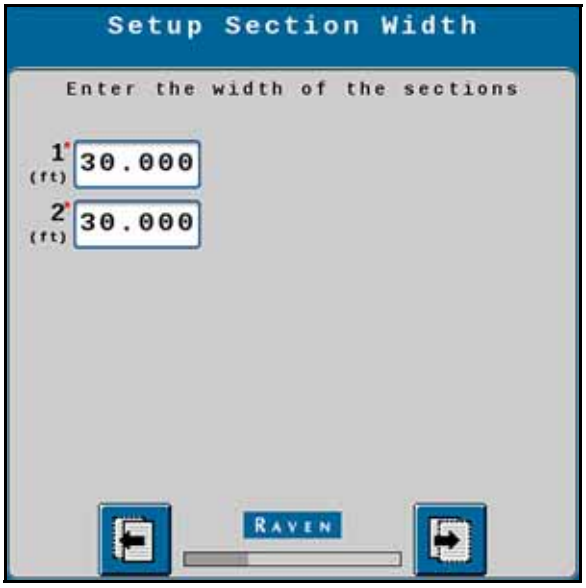

16. Press Next.
17. Enter the Number of Sections.

FIGURE 7. Setup Selections




18. If desired, select the Equal Width Sections and/or Granular Product Sections Power to Apply check boxes.
19. Press Next.
20. Verify the section widths are correct.

FIGURE 8. Setup Section Width



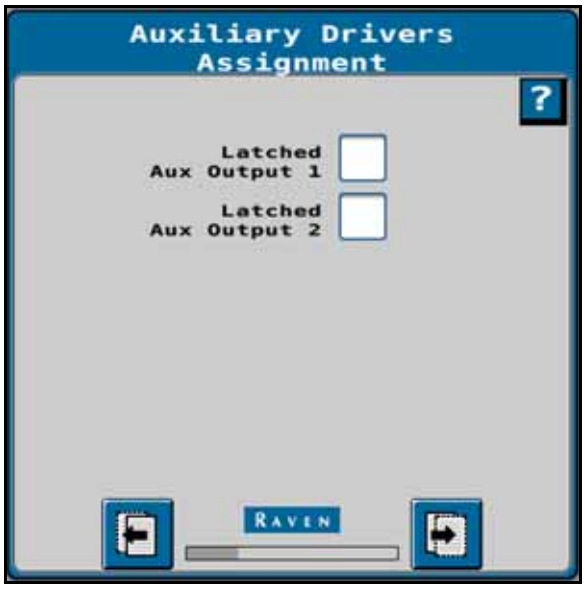

21. Press Next.
22. If desired, select an Auxiliary Driver. Auxiliary drivers are additional switches that provide a 12V signal to a device.

FIGURE 9. Setup Auxiliary Drivers


NOTE: Unused section drivers are necessary to set up auxiliary drivers and to run independently of any product control.

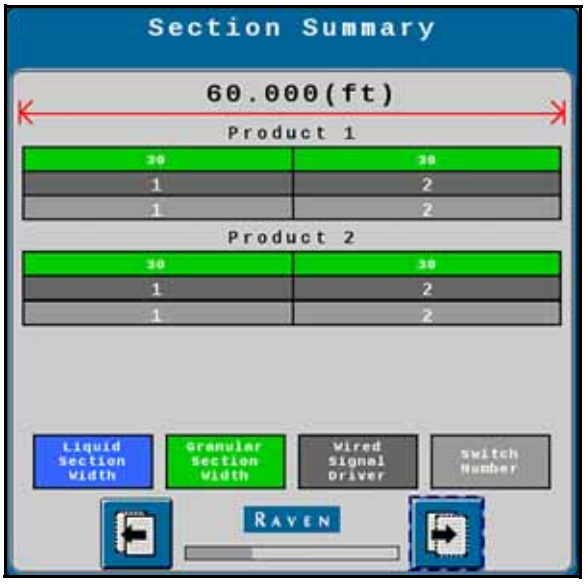
23. Press Next.
24. Select the Latched Output to allow the driver to stay on until a the driver button is pressed again.

FIGURE 10. Setup Auxiliary Drivers




25. Review the information on the Section Summary screen.

FIGURE 11. Section Summary

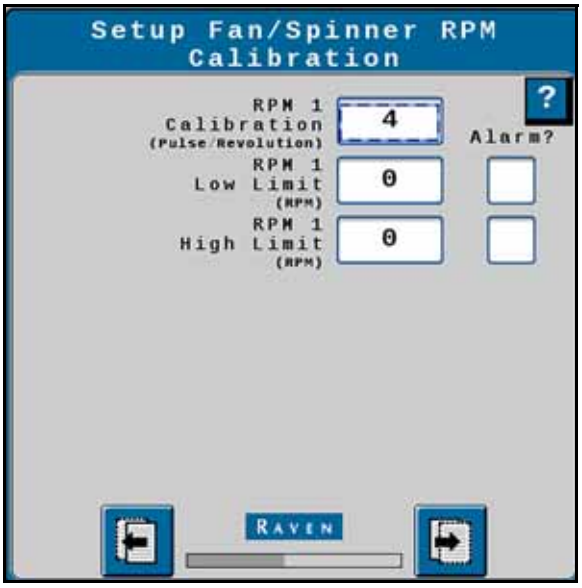



26. If the information is correct, press Next. To make adjustments to the configuration, press Back and adjust settings as needed.
27. Select the Product Scale type and the corresponding scale(s).

FIGURE 12. Scale Setup


28. Press Next.
29. Enter the RPM Calibration, RPM 1 Low Limit, and RPM 1 High Limit information. If desired, select the Alarm? checkbox(es).

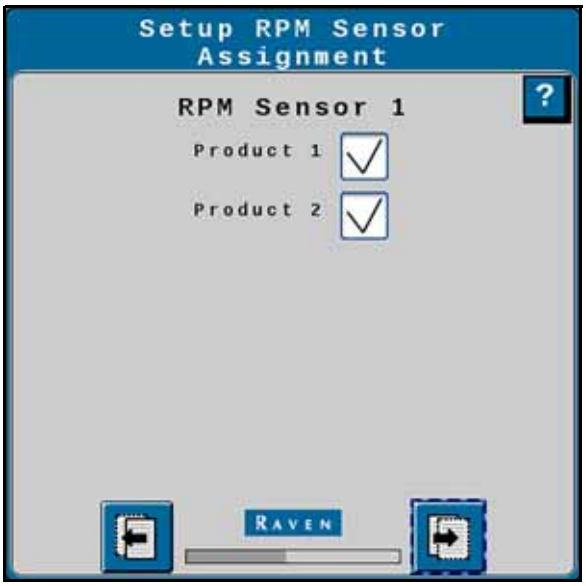
FIGURE 13. Setup Fan/Spinner RPM Calibration




30. Press Next.

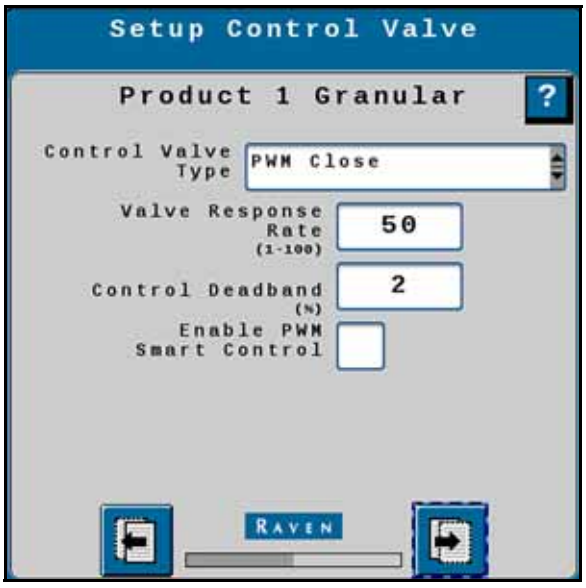
31. Select the checkbox(es) for the products that will be assigned to RPM Sensor 1.

FIGURE 14. Setup RPM Sensor Assignment



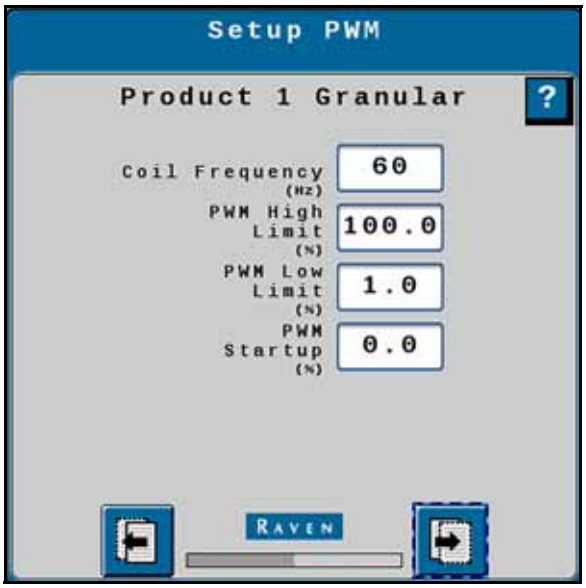

32. Select the Control Valve Type for the product.

FIGURE 15. Setup Control Valve



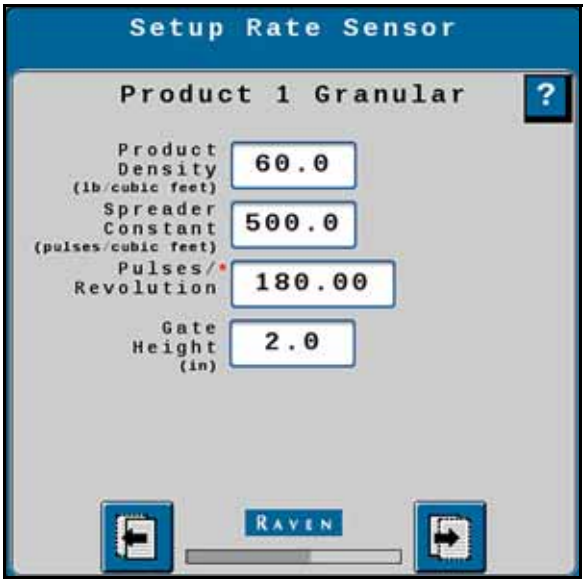

33. Enter the Valve Response Rate.
34. Enter the Control Deadband.
35. If desired, select Enable PWM Smart Control.
36. Press Next.
37. Enter the Coil Frequency, PWM High Limit, PWM Low Limit, and PWM Startup for the product.

FIGURE 16. Setup PWM



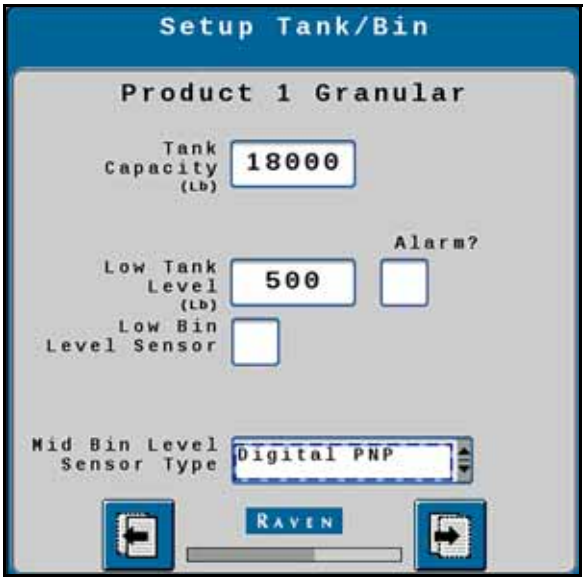

38. Press Next.
39. Enter the Product Density, Spreader Constant, Pulses/Revolution, and Gate Height. The Gate Height must be between one and three inches.

FIGURE 17. Setup Rate Sensor




40. Press Next.
41. Enter the Tank Capacity and Low Tank Level.

FIGURE 18. Setup Tank/Bin

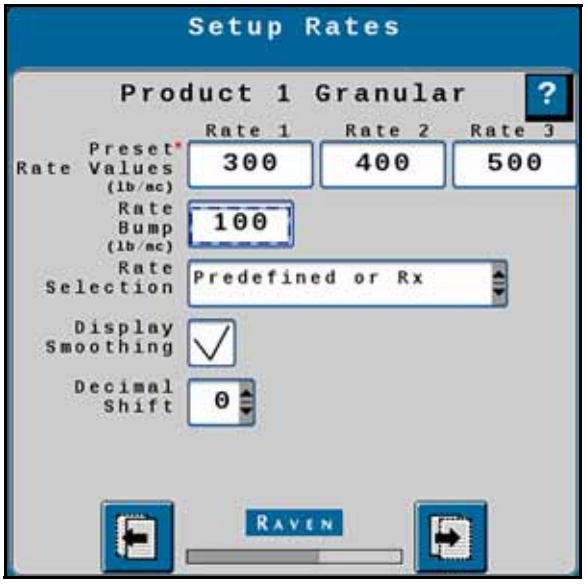



42. If desired, select the Alarm? and/or Low Bin Level Sensor checkbox(es).
43. Select the Mid Bin Level Sensor Type.

NOTE: To test the sensor type, place an object in front of the sensor. If the voltage reads 12v it is a PNP sensor. If it reads ground, it is a NPN sensor.

44. Press Next.
45. Enter the Preset Rate Values and the Rate Bump value.

FIGURE 19. Setup Rates




46. Select the Rate Selection and Decimal Shift values.
47. If desired, select Display Smoothing.
48. Press Next.
49. If desired, enter values for the Off Rate Alarm and Split Belt/Dual Encoder Alarm and select the Alarm? checkbox(es).

FIGURE 20. Setup Alarms


50. Press Next.
51. Repeat steps step 32 through step 49 for all products.
52. Press Next.
53. Review the information on the Setup Summary page.

FIGURE 21. Setup Summary


54. If desired, press Back to adjust the configuration settings. If the configuration is correct, press Next.

## MANURE/LITTER CONFIGURATION

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

The dynamic calibration feature continually adjusts the “Density Factory” based upon user-entered settings for:

- Adjustment Frequency - amount of product dispensed between adjustments
- Adjustment Sensitivity - percent of adjustment that should be made based upon the sample

In addition, the clean out feature dynamically adjusts the spreader constant for the final port of a load based upon a user-entered trigger weight. This feature increases the PWM duty cycle to a maximum over time to better maintain an even distribution pattern as the load trails off while maintaining the calibration settings for applying a normal load.

A Level 3 RCM is required for these features and is only available for the Litter/Manure application mode configured for a granular spreader equipped with a product scale. Applicable part numbers include:

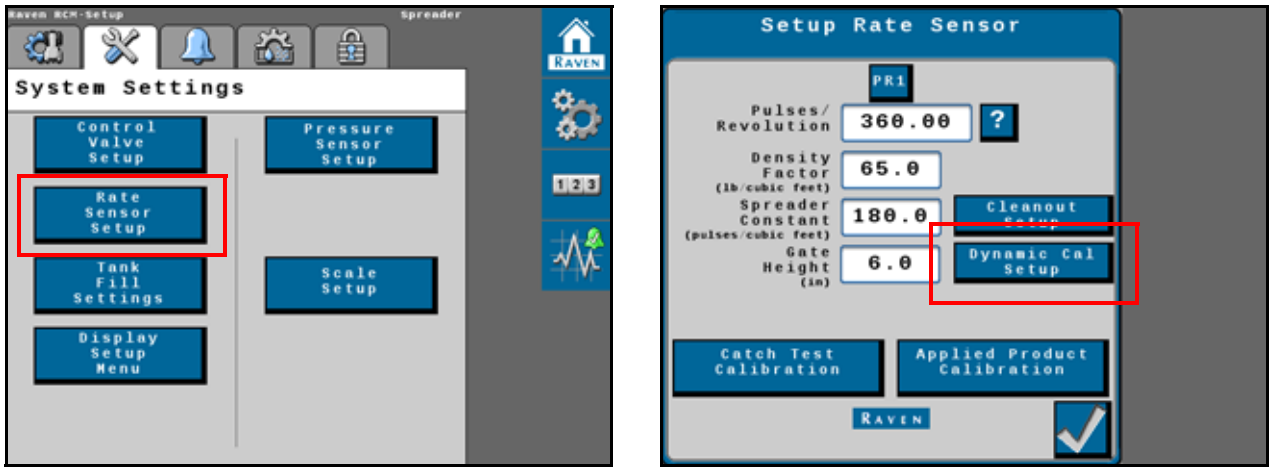
TABLE 3. Litter/Manure Part Numbers

| 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 |

## DYNAMIC CALIBRATION

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

FIGURE 22. Setup Rate Sensor

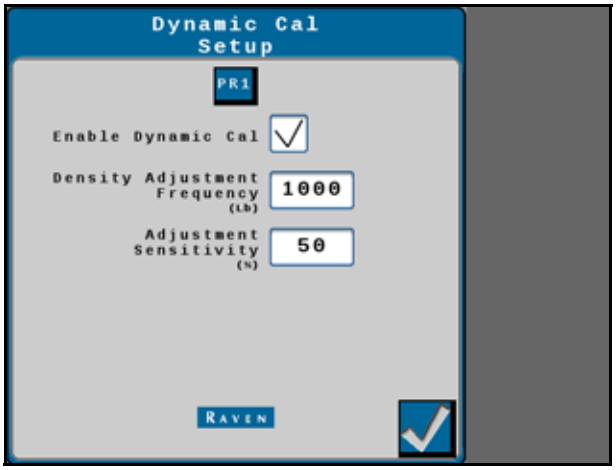



1. On the Setup Rate Sensor screen, set the Density Factor to 70 lb/ft³ [1,121 kg/m³] as a starting point.

NOTE: The other settings on the Setup Rate Sensor screen are specific to the spreader equipment.

2. Select the “Dynamic Cal Setup” button.
3. Set the Adjustment Frequency and Adjustment Sensitivity settings to adjust the Density Factor to the correct apron speed needed to apply at the desired rate.

FIGURE 23. 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

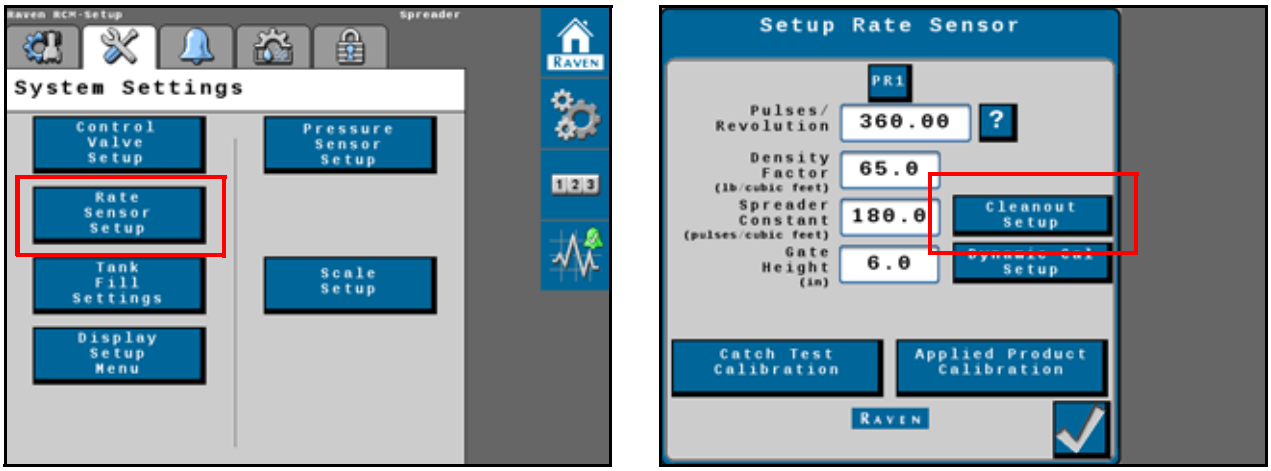
The Adjustment Sensitivity percentage is used to set how aggressively the controller will adjust the Density Factor. It is recommended to leave this setting at the default setting of 50% unless otherwise instructed.

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.

## CLEAN OUT SETUP

1. On the Setup Rate Sensor screen, press the “Clean Out Setup” button to access the Clean Out settings.

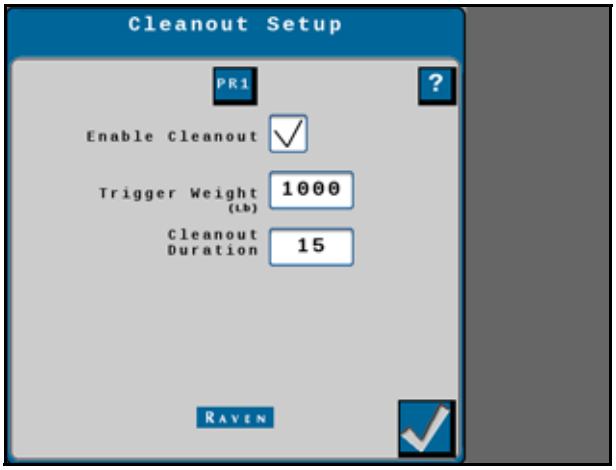
FIGURE 24. Setup Rate Sensor




## CLEAN OUT 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 above the trigger weight. Configuration of the clean out mode consists of two settings - Trigger Weight and Clean Out Duration.

FIGURE 25. Clean Out Setup



### TRIGGER WEIGHT

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

### CLEAN OUT DURATION

Enter the time in seconds during which the controller will gradually increase the apron chain speed. A value between 15 and 25 is a a recommended starting point for the Clean Out Duration setting.

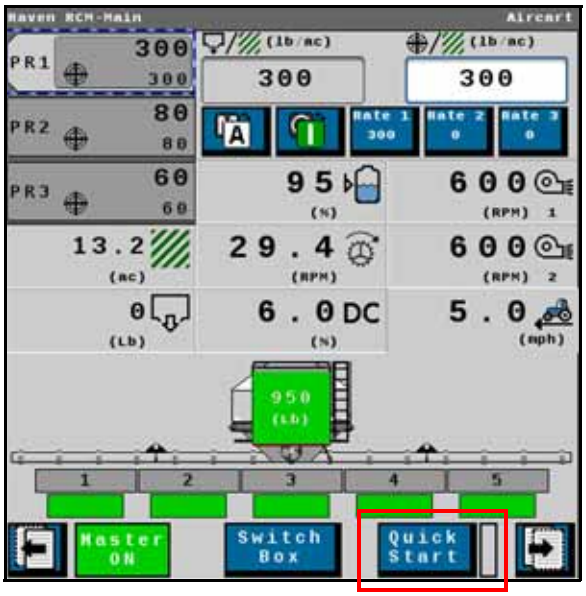
The steeper the angle of the material left in the spreader when the Trigger Weight is reached, the shorter the Duration value should be.

## LITTER/MANURE OPERATION TIPS

For greatest accuracy and optimal performance:

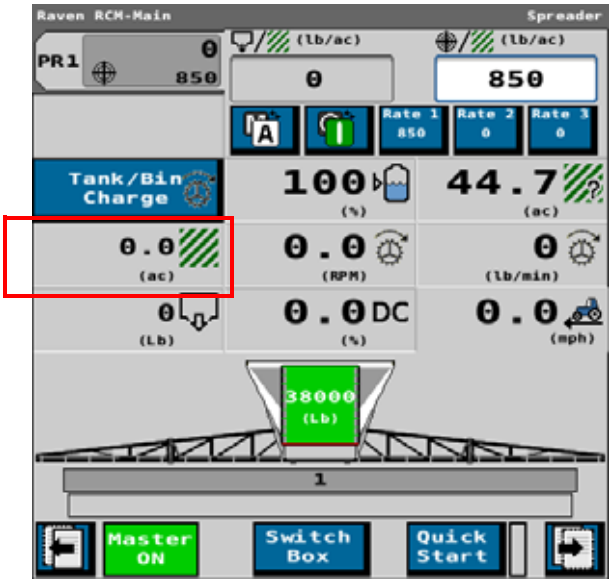
- Use Quick Start feature to prime the Spreader. Toggle the master switch ON and press the Quick Start button in the lower, right corner of the RCM run screen. The Quick Start feature will start the apron to run for up to 15 seconds while the equipment remains stopped. Toggle the master switch OFF to 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 26. Quick Start Feature




- Full loads will have better accuracy than partial loads. The controller will still adjust for a partial load, but the changes in Density factor will be much greater.
- The Density Factor may be monitored by adding a widget to the main run screen. While the widget is not required to operate, it is helpful for monitoring the system. The Density Factor will increase as the beaters are more full or the material is heavier.

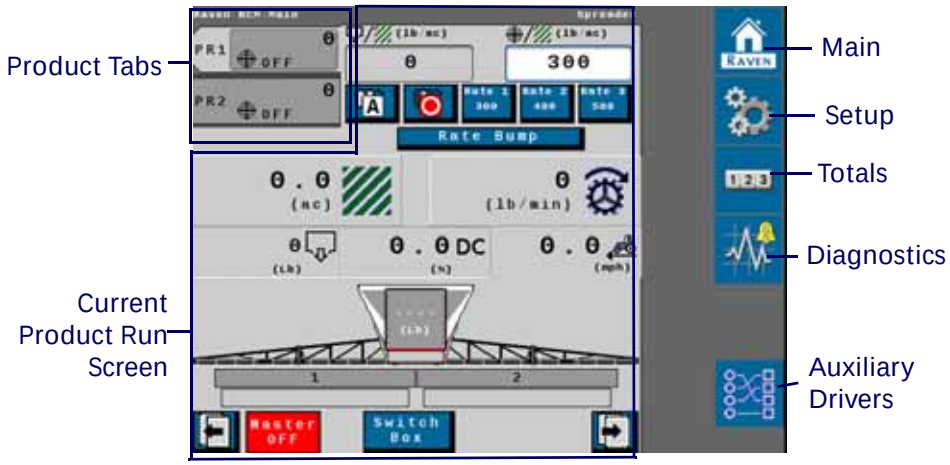
FIGURE 27. Product Density




## SPREADER RUN PAGE OVERVIEW

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

FIGURE 28. Spreader Run Screen




### PRODUCT TABS

Press on the product tab to select the desired product. This will open the to product run screen for that product.

### CURRENT PRODUCT RUN SCREEN

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

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

## RUN PAGE OVERVIEW

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

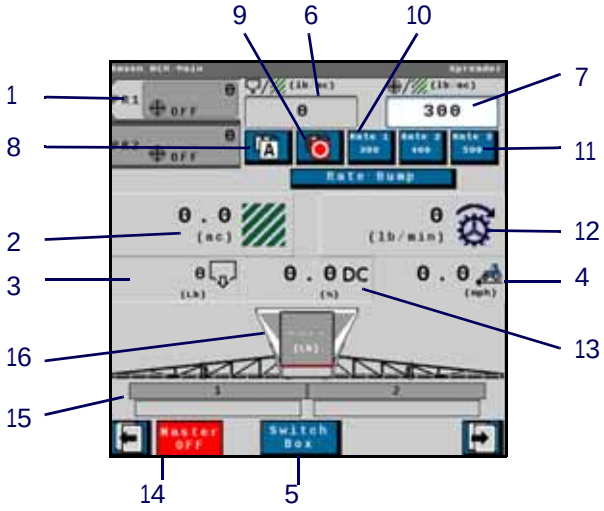
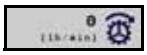


TABLE 4. Raven RCM Run Time Widgets

| | Button | Description | Function/Operation |
|---|---|---|---|
|  | 1 | Product Tabs | Select a tab to view information for that product. |
|  | 2 | Applied Area | Displays the number of acres applied. |
|  | 3 | Total Volume Applied | Displays the total volume of product applied since the last time the tally was reset. |
|  | 4 | Traveling Speed | Displays the current machine traveling speed. |
|  | 5 | Section Switchbox Button | Indicates if the switchbox is on or off:<br>• Green - On<br>• Red - Off |
|  | 6 | Actual Rate | Displays the actual application rate. |
|  | 7 | Target Rate | Displays the target application rate. |
|  | 8 | Manual/Automatic Toggle | Press this to switch between manual and automatic operation. |
|  | 9 | Product On/Off Toggle | Press this to manually turn a product on or off. |
|  | 11 | Preset Rate Button | Provides the user the to increase the rate by the preconfigured rates defined during configuration. |
|  | 12 | Application Rate | Displays the current application rate in pounds per minute. |
|  | 13 | Duty Cycle | Displays the current duty cycle. |
|  | 14 | Master Switch Indicator | The Master Switch Indicator shows the status of the master switch.<br>• Green - On<br>• Red - Off<br>• Orange - Cycle the master switch |
|  | 15 | Implement Sections | Displays if the display section is on or off. |
|  | 16 | Tank Level Indicator and Fill Button | Displays the current tank fill level. |

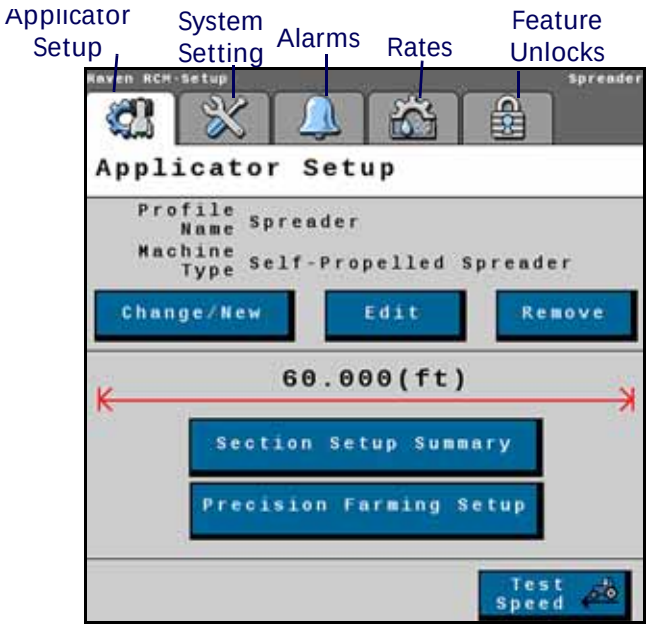
## MAIN

Press main at any time to return to the Current Product Run Screen.

## SETUP

Pressing setup opens a screen with many tabs.

FIGURE 29. 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 Chapter 9, *Precision Farming*.

### SYSTEM SETTINGS

The system settings provides many buttons that allow the user to modify the current configuration. The table below describes each button in detail.

TABLE 5. System Settings

| Button | Description |
|---|---|
| Control Valve Setup | The Control Valve button allows the user to adjust the following settings for each product:<br>• Valve Response Rate<br>• Control Deadband<br>• Valve Delay<br>• Valve Advance<br>• Control Effort |
| Rate Sensor Setup | Allows the operator to modify/edit the calibration value for the flow meter or 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 screen. |
| 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. |
| 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

If there a additional features available for the RCM, enter the provided Activation Key to access these features.

## TOTALS

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

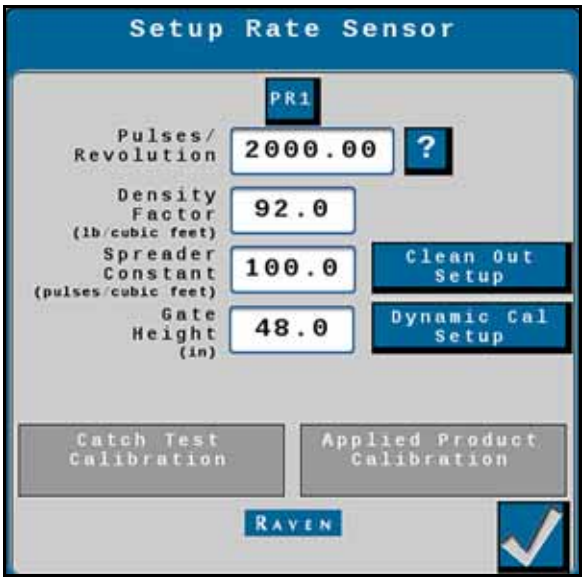
## DIAGNOSTICS

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

# MANURE/LITTER SPREADER CONFIGURATION AND SETTINGS

An RCM with level 3 unlocks can apply manure/litter. This is possible by adjusting the density factor in the Dynamic Cal Setup and Clean Out Setup settings during the initial implement configuration.

FIGURE 30. Manure/Litter Configuration




## CLEAN OUT SETUP

Clean out mode is used to compensate for the end of the of a load when the beaters/spinners are no longer full. The apron chain will continue to speed up until the chain is at full speed. After refilling above the trigger weight, the controller will resume normal operation.

FIGURE 31. Cleanout Setup


### TRIGGER WEIGHT

Cleanout mode will start when the Trigger Weight is met. Set this by watching the end of the load and monitoring the scale reading when the opening to the beaters/spinners are no longer completely covered.

### CLEANOUT DURATION

Cleanout duration sets the amount of time the controller uses to increase the apron chain speed. The steeper the angle of material left in the spreader when the trigger weight is hit, the smaller the duration. Generally a value of 15 to 25 is a good starting point.

## DYNAMIC CALIBRATION

Dynamic calibration adjusts the density factor used to determine the desired apron speed.

FIGURE 32. Dynamic Calibration


### ADJUSTMENT FREQUENCY

Adjustment Frequency determines how often the controller recalculates the density factor in lb [kg]. The recommended starting point is 1/20 of the total load weight. This will result is a 20 density adjustments per load. On uneven loads this number may fluctuate. If excessive fluctuation is observed, increase the adjustment frequency number.

### ADJUSTMENT SENSITIVITY

Adjust Sensitivity sets how aggressively the controller will change the density factor. A good starting point for this setting in 50% and, unless otherwise instructed, should remain at this number. Increase the sensitivity if the controllers total applied weight is not matching the applied scale weight but do not exceed 75%. Lower the number if erratic rates occur but not below 25%.

# CHAPTER 6 AIR CART OPERATION

## MACHINE TYPES

This section applies to air carts utilizing the following configuration:

TABLE 1. RCM Machine List

| Machine Type | Application Type | Application Mode | Application Mode Uses |
|---|---|---|---|
| • Air Cart<br>• Generic | • Liquid<br>• Granular | Liquid | Standard liquid system. |
| | | Granular Full Width | Dry or seed application using a single shutoff section.<br>Application rate is entered and documented as lbs/acre [kg/ha]. |
| | | Granular RPM Compensated | Dry or seed application using multiple shutoff sections.<br>Meter/conveyor RPM is controlled/ compensated based upon machine speed and active width as sections turn on and off. Application rate is entered and documented as lbs/acre [kg/ha]. |
| | | Granular RPM Maintained | Granular multi-section RPM maintained dry or seed application using multiple shutoff sections.<br>Meter/conveyor RPM is controlled/ compensated based upon machine speed. Meter/conveyor RPM is not compensated for changes in active width as sections turn on and off. Meter/conveyor will be stopped when all sections are off. Application rate is entered and documented as lbs/acre [kg/ha]. |
| | | Granular Split Belt | Dry or seed application using one control valve of a split meter/conveyor RPM is available for each section.<br>Meter/Conveyor RPM is not compensated for changes in active width as left or right sections turn on and off. Meter/conveyor will be stopped when both sections are off. |

TABLE 1. RCM Machine List

| Machine Type | Application Type | Application Mode | Application Mode Uses |
|---|---|---|---|
| (Cont.)<br>• Air Cart<br>• Generic | (Cont.)<br>• Liquid<br>• Granular | Granular Dual Control Valve | Dual Control Valve Dry or seed application using dual PWM control valves to independently control a left and right meter/conveyor section.<br>Encoder feedback of meter or conveyor RPM is available for each section. Meter/conveyor RPM is independently controlled/compensated based on machine speed. Sections are turned off by closing the PWM control valve. |
| | | Granular Meter Per Section | Dry or seed application using PWM control valves to independently control a meter/conveyor section.<br>Up to 16 individual control sections can be configured. Encoder feedback of meter or conveyor RPM is available for each section. Meter/conveyor RPM is independently controlled/compensated based on machine speed. Sections are turned off by closing the PWM control valve. |

Air cart configuration on the RCM can also support the following legacy applications:

TABLE 2. Legacy Granular Modes

| Legacy Granular Application Mode | New Application Mode | Mode Details |
|---|---|---|
| Gran 1 | Granular Full Width Selection | Dry or seed application using a single shutoff section. Application rate is entered and documented as Pounds/Acre (Kilograms/Hectare). |
| Gran 2 | Granular Section Control RPM Maintained | Application Mode - Granular Multi-Section RPM Maintained dry or seed application using multiple shutoff sections. Meter/conveyor RPM is controlled/compensated based on machine speed. Meter/conveyor RPM is not compensated for changes in active width as section turn on and off. Meter/conveyor will be stopped when all sections are off. Application rate is entered and documented as Pounds/Acre (Kilograms/Hectare). |
| Gran 3 | Granular Split Tank/ Dual Encoder | Dry or seed application using one control valve of a split meter/conveyor RPM is available for each section. Meter/Conveyor RPM is not compensated for changes in active width as left or right sections turn on and off. Meter/conveyor will be stopped when both sections are off. |

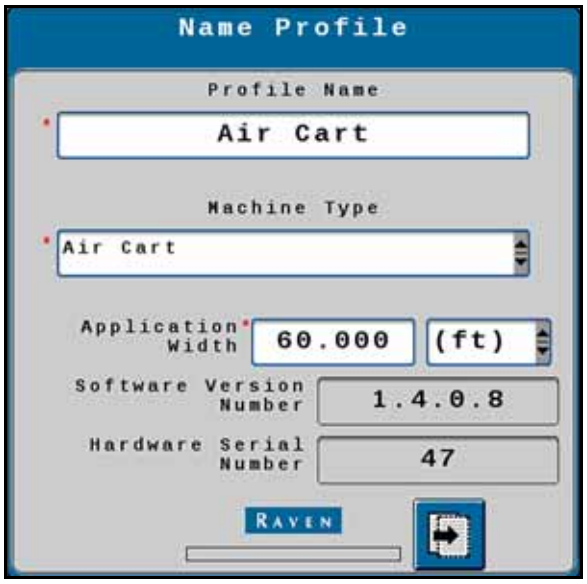
| Legacy Granular Application Mode | New Application Mode | Mode Details |
|---|---|---|
| Gran 4 | Granular Section Control RPM Maintained | Application Mode - Granular Multi-Section RPM Maintained dry or seed application using multiple shutoff sections. Meter/conveyor RPM is controlled/compensated based on machine speed. Meter/conveyor RPM is not compensated for changes in active width as section turn on and off. Meter/conveyor will be stopped when all sections are off. Application rate is entered and documented as Pounds/Acre (Kilograms/Hectare). |
| Gran 5 | Granular Section Control RPM Compensated | Dry or seed application using multiple shutoff sections. Meter/conveyor RPM is controlled/compensated based on machine speed and active width as sections turn on and off. Application rate is entered and documented as Pounds/Acre (Kilograms/Hectare). |
| None | Dual Control Valve | Dual Control Valve Dry or seed application using dual PWM control valves to independently control a left and right meter/conveyor section. Encoder feedback of meter or conveyor RPM is available for each section. Meter/conveyor ROM is independently controlled/compensated based on machine speed. Sections are turned off by closing the PWM control valve. |
| None | Granular Meter Per Section | Dry or seed application using PWM control valves to independently control a meter/conveyor section. Up to 16 individual control sections can be configured. Encoder feedback of meter or conveyor RPM is available for each section. Meter/conveyor RPM is independently controlled/compensated based on machine speed. Sections are turned off by closing the PWM control valve. |

# AIR CART CONFIGURATION

This configuration is an sample air cart configuration. Each configuration will vary so some of the steps shown below may not apply to your configuration or some steps may need to be repeated multiple times.

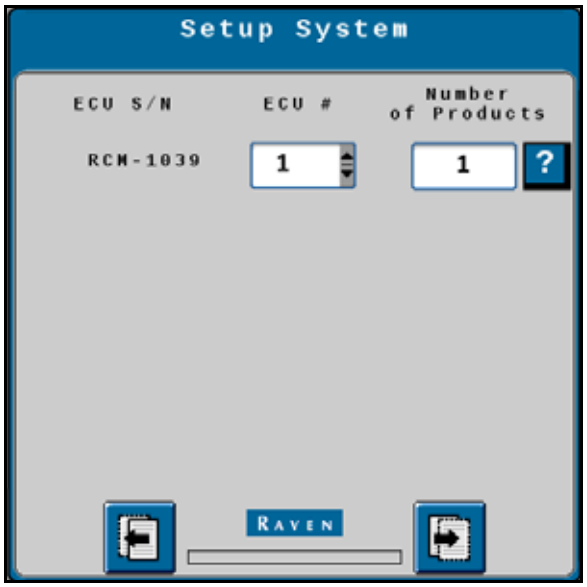
1. Enter a Profile Name.

FIGURE 1. Name Profile



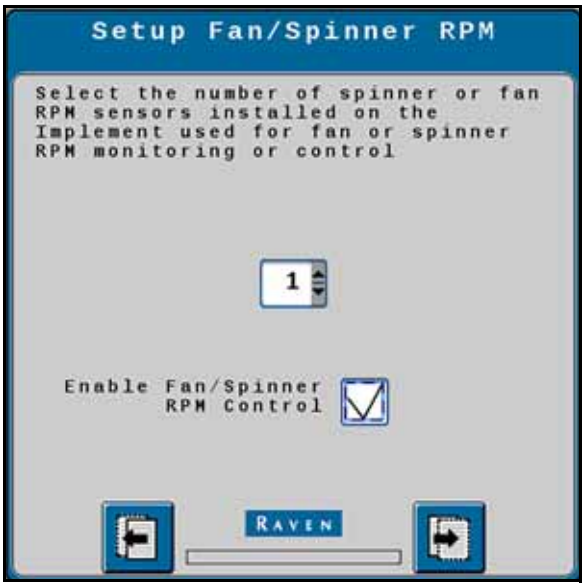

2. Select Air Cart as the Machine Type.
3. Enter the Application Width and select the desired unit of measure. The application width is typically the boom width.
4. Press Next.
5. Set the appropriate ECU # from the drop-down. This is used to identify, prioritize, and sort RCMs when multiple RCMs are on the same system. For systems with a single RCM, set this to “1”.

FIGURE 2. Setup System



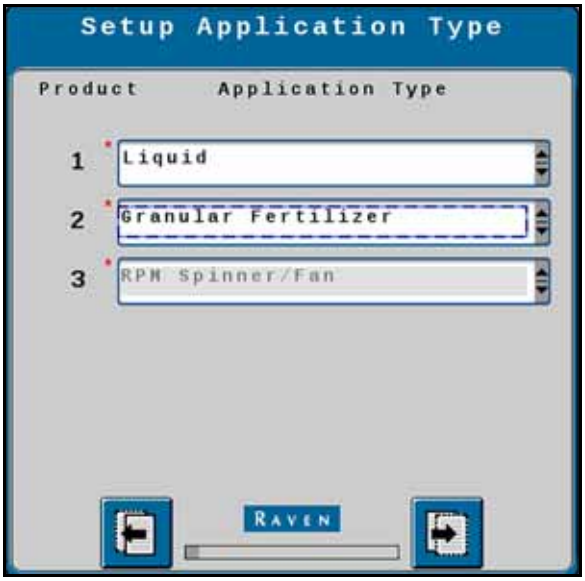
6. Enter the total desired Number of Products.
7. Press Next.
8. Use the Number of Products drop down to select the number of spinners or fans that are monitored or controlled by the ECU from the drop down.

FIGURE 3. Setup Fan/Spinner RPM




9. If desired, select the Enable Fan/Spinner RPM Control check box. This will allow the spinner/fan to be controlled from the main RCM run screen.
10. Press Next.
11. Select the desired application type for each product.

FIGURE 4. Setup Application Type



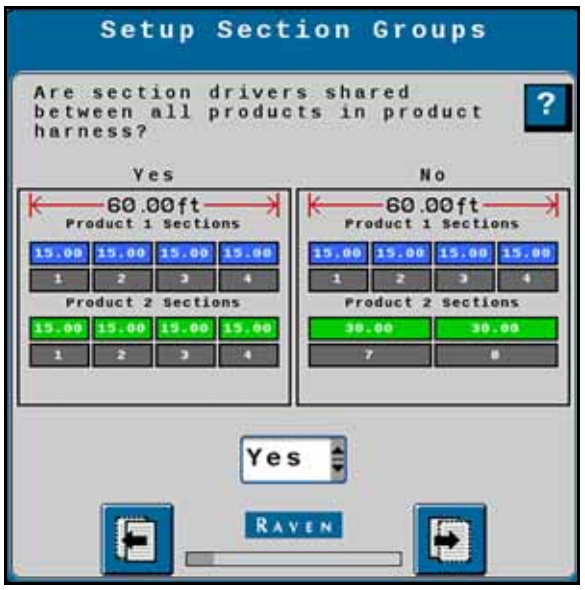

12. Press Next.

13. Use the Application Mode drop down to select the correct control type for the product. Review Table 1, “RCM Machine List,” on page 69 for details on available control types.

FIGURE 5. Setup Application Type

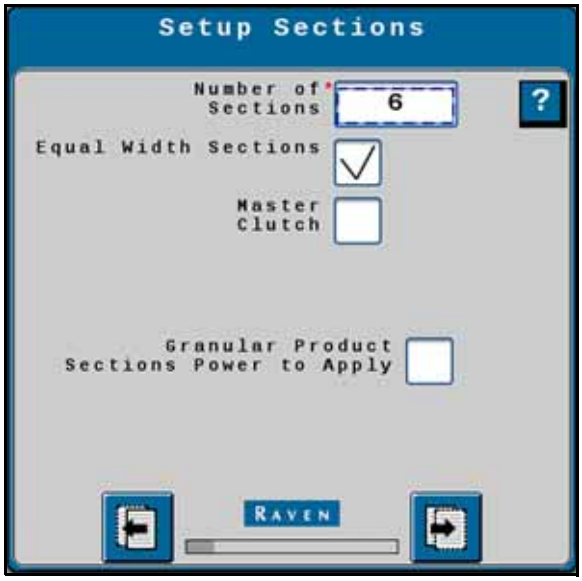

14. Press Next.
15. Select Yes or No from the Setup Section Groups screen. Setting up section groups shares the product drivers in the harness between all products.

FIGURE 6. Setup Section Groups



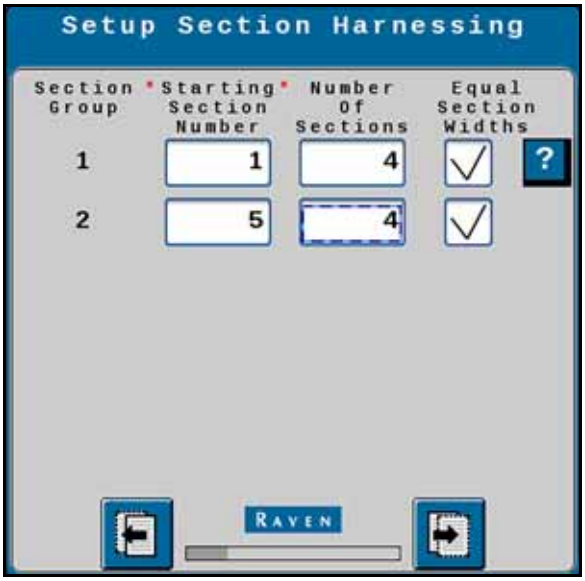

16. Press Next.
17. Enter the Number of Sections. This is the number of sections as defined by the harness configuration.

FIGURE 7. Setup Sections




18. If desired, select Equal Width Sections. This will evenly divide the machine width into equal sections.
19. If desired, select Master Clutch. This applies if there is a master clutch on the air cart that will control a magnetic clutch to engage or disengage the drive.
20. If applicable, select the Granular Product Sections Power to Apply checkbox. Select this if the controller will provide power on the section signal wire when the section is on. Leave unchecked if the controller will provide power to the section signal wire when the section is off.
21. Press Next.
22. Select the Starting Section Number for Section Group 1. A section group is a set of sections that will apply the same product at the same rate.

FIGURE 8. Setup Section Harnessing



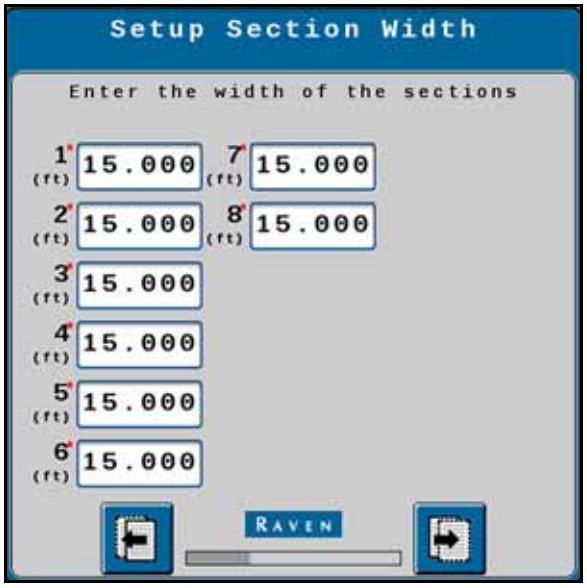

23. Enter the Number of Sections for the first section group.
24. If desired, select Equal Section Widths.

25. If applicable, enter the Starting Section Number for Section Group 2. In this case, it is five because it must be the first section not being used by the previous section group.
26. Press Next.
27. Select the Section Groups for each Product.

FIGURE 9. Setup Section Group Assignment

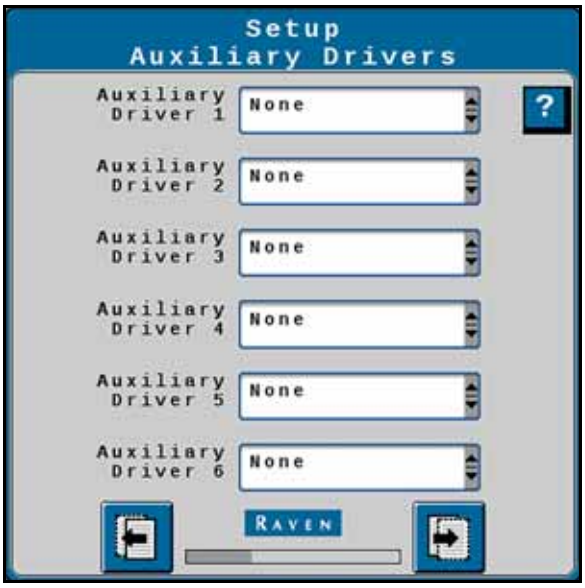

28. Select Next.
29. Review the widths for each section. If needed, select the measurement box next to section and enter a different width.

FIGURE 10. Setup Section Width



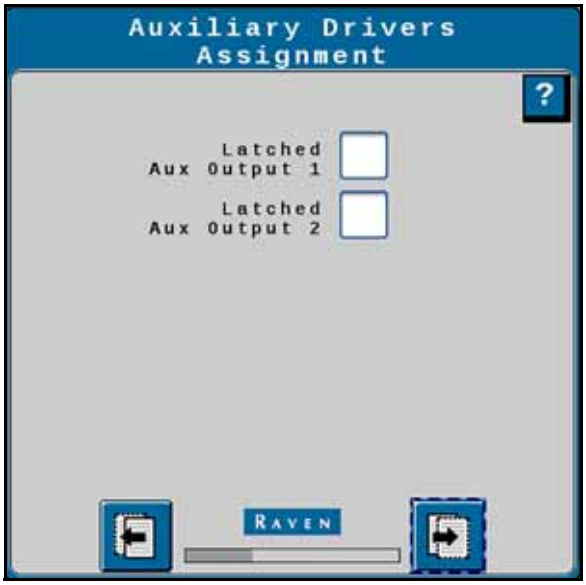

30. Press Next.
31. If desired, select a function for the Auxiliary Drivers. Auxiliary drivers are additional switches that provide a 12V signal to a device.

FIGURE 11. Setup Auxiliary Drivers



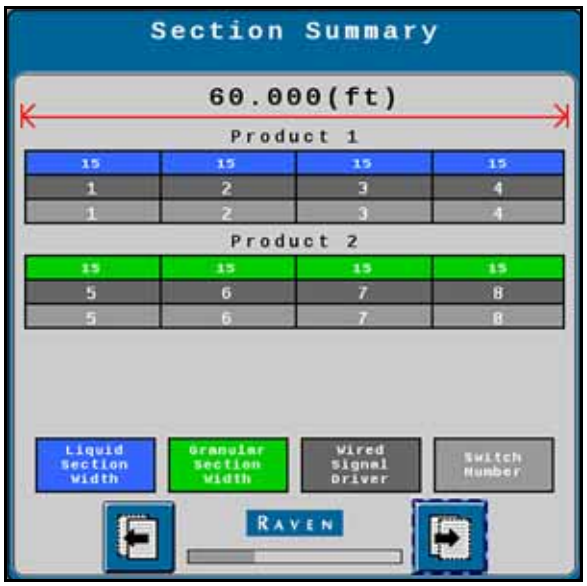

32. Press Next.
33. If desired, select latched for the auxiliary output. Latched means that, once selected, the signal remains constant until the button is pressed again. Leaving the check box unselected means that the signal is only active when the button is being pressed.

FIGURE 12. Auxiliary Drivers Assignments




34. Press Next.
35. Review the Section Summary.

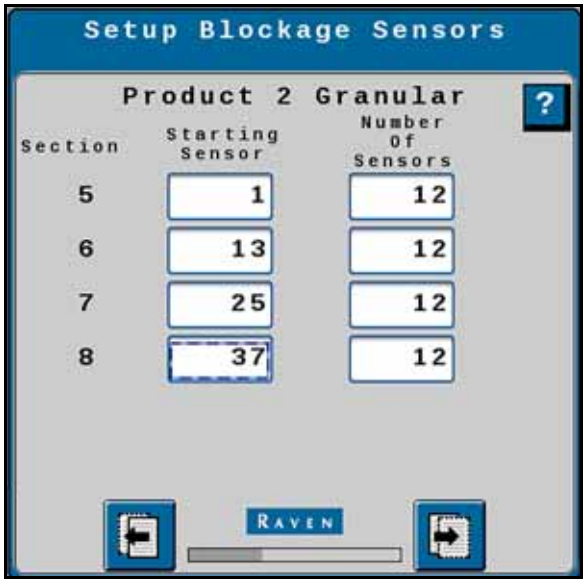
FIGURE 13. Section Summary




36. Press Next.
37. Enter the blockage sensor information for each section. The Starting Sensor number must be the next number after the previous section. In the case below, since section five has twelve sensors, the Starting Sensor number for Section 6 would be 13.

NOTE: Blockage sensor setup is only required when configuring an RBM system.

FIGURE 14. Setup Blockage Sensors




38. Press Next.
39. Select the desired scale type from the Scale Setup drop down.

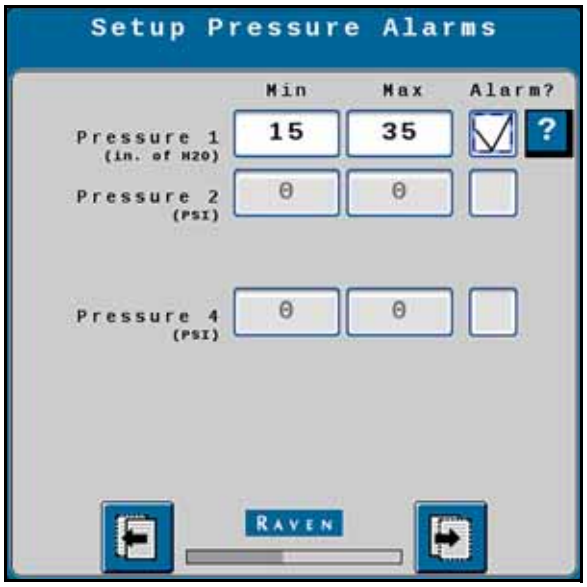
FIGURE 15. Scale Setup


40. If desired, select the Product Scale check box. This assigns the scale to a product.
41. Press Next.
42. Select the desired product(s) that will have a Pressure Sensor.

FIGURE 16. Setup Pressure Assignment

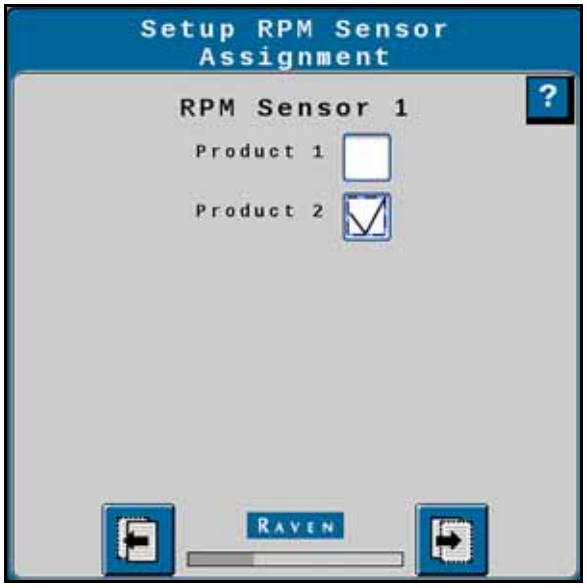

43. Press Next.
44. Enter the Min and Max pressures for each pressure setting.

FIGURE 17. Setup Pressure Alarms



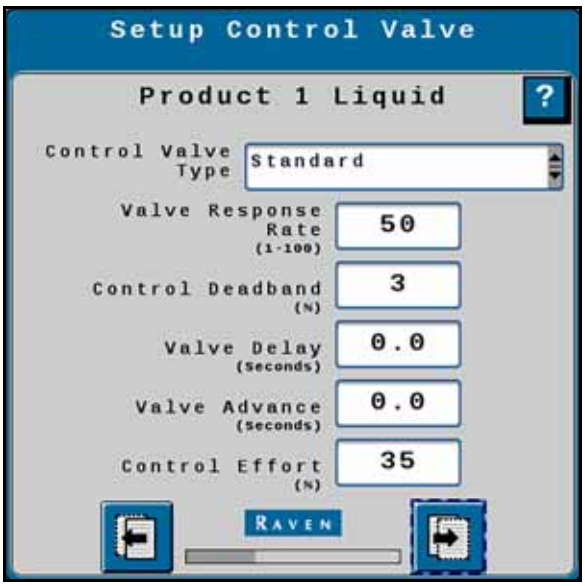

45. if desired, select the Alarm? check box to activate alarms.
46. Press Next.
47. Assign the RPM Sensor for each of the products.

FIGURE 18. Setup RPM Sensor Assignment



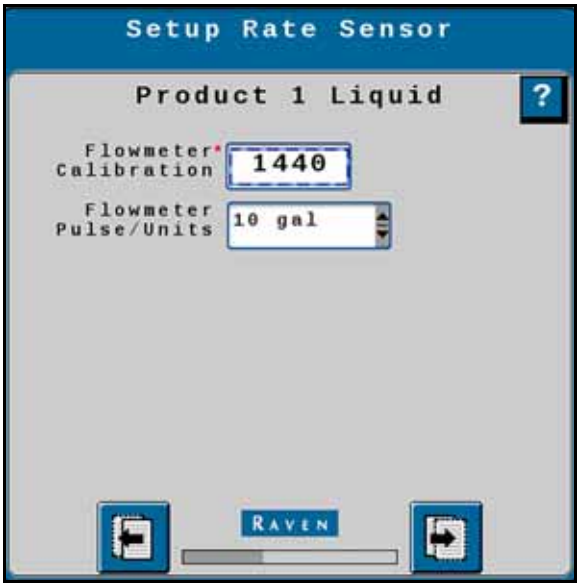

48. Press Next.
49. Select the Control Valve Type for the first product.

FIGURE 19. Setup Control Valve



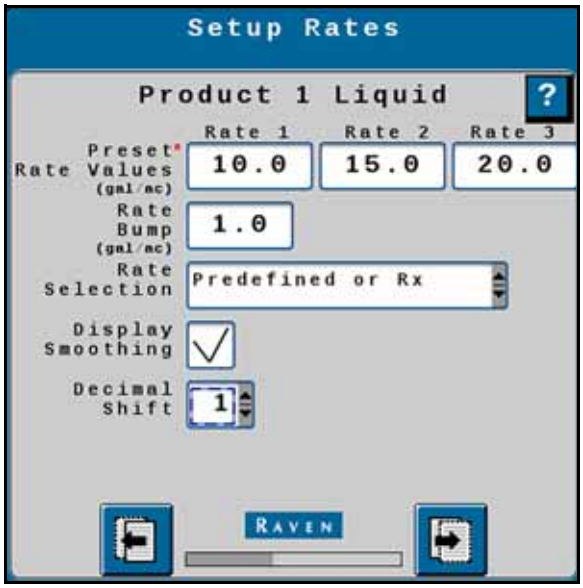

50. Enter the Valve Response Rate.
51. Enter the Control Deadband percentage.
52. Enter the Valve Delay value.
53. Enter the Valve Advance time.
54. Enter the Control Effort percentage.
55. Press Next.
56. Enter the Flow Meter Calibration number.

FIGURE 20. Setup Rate Sensor




57. Select the Flow Meter Pulse/Units.
58. Press Next.
59. Enter the Preset Rate Values for each rate.

FIGURE 21. Setup Rates




60. Enter the desired Rate Bump increment.
61. Select the Rate Selection.
62. Enable Display Smoothing if desired.
63. Select the Decimal Shift quantity.
64. Press Next.
65. Enter the desired Off Rate Alarm percentage.

FIGURE 22. Setup Alarms


66. Enter the Minimum Flow Rate.
67. Press Next.
68. Review the Setup Summary. If necessary, press Back to adjust the settings.

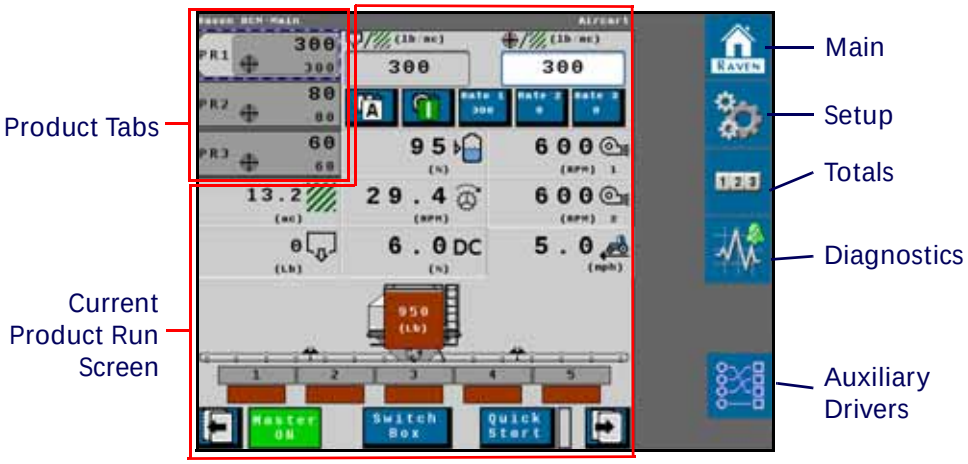
FIGURE 23. Setup Summary


69. Press Next.

## AIR CART RUN PAGE OVERVIEW

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

FIGURE 24. RCM Main Screen




### PRODUCT TABS

Press on the product tab to select the desired product. This will open the to product run screen for that product.

## CURRENT PRODUCT RUN SCREEN

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

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

FIGURE 25. Air Cart Run Screen

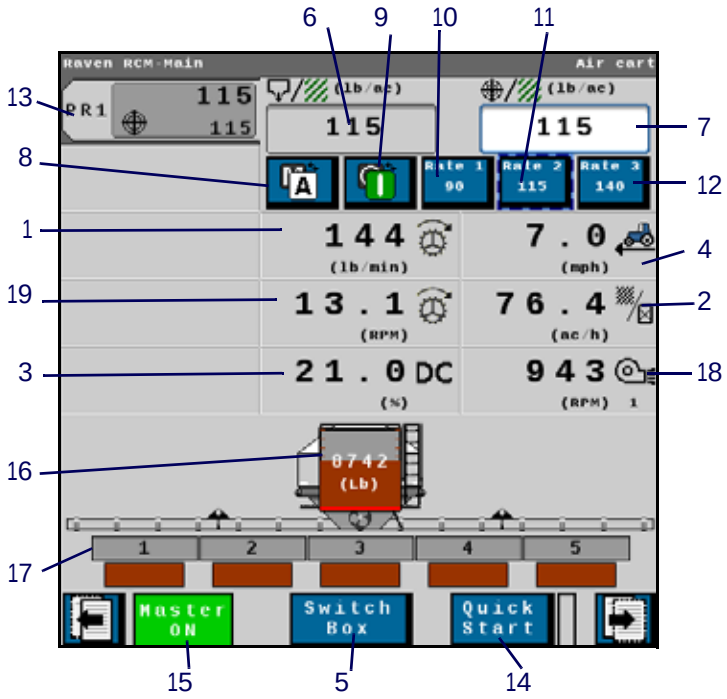
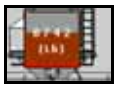
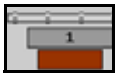



TABLE 3. Air Cart Run Screen Information

| | Button | Description | Function/Operation |
|---|---|---|---|
|  | 1 | Volume Per Minute | Indicates the application rate per minute. |
|  | 2 | Area Per Hour | Indicates the how many acres per hour are being applied. |
|  | 3 | PWM Readout | Shows the operating percentage of the PWM valve. |
|  | 4 | Traveling Speed | Shows the implement/machine speed. |
|  | 5 | Section Switch Box Button | Indicates if the switch box is on or off:<br>• Green - On<br>• Red - Off |
|  | 6 | Actual Rate | Displays the actual application rate. |

| | Button | Description | Function/Operation |
|---|---|---|---|
|  | 7 | Target Rate | Displays the current target rate. The target rate can be adjusted by pressing in the number cell and entering a new number. |
|  | 8 | Manual/Automatic Toggle | Press this to switch between manual and automatic operation. |
|  | 9 | Product On/Off Toggle | Press this to manually turn a product on or off. |
|  | 10 | Predefined Rate 1 Button | Select this button to start applying at the rate listed on the button. Refer to “Rates Setup” on page 87 for more information on adjusting rates. |
|  | 11 | Predefined Rate 2 Button | Select this button to start applying at the rate listed on the button. Refer to “Rates Setup” on page 87 for more information on adjusting rates. |
|  | 12 | Predefined Rate 3 Button | Select this button to start applying at the rate listed on the button. Refer to “Rates Setup” on page 87 for more information on adjusting rates. |
|  | 13 | Product Tab | Select a tab to view information for that product. |
|  | 14 | Quick Start Button | Press the quick start button to quickly configure a product. |
|  | 15 | Master Switch Indicator | The Master Switch Indicator shows the status of the master switch.<br>• Green - On<br>• Red - Off<br>• Orange - Cycle the master switch |
|  | 16 | Tank Level Indicator and Fill Button | Indicated the fill level of the tank. |
|  | 17 | Implement Sections | Displays the section number. The section status will display below the implement section.<br>• Red - Off<br>• Green - On<br>• Blue - Liquid |
|  | 18 | Fan Speed | Indicates the fan speed in RPM. |
|  | 19 | Meter/Shaft RPM | Indicates the shaft or meter RPM as read by an encoder. |

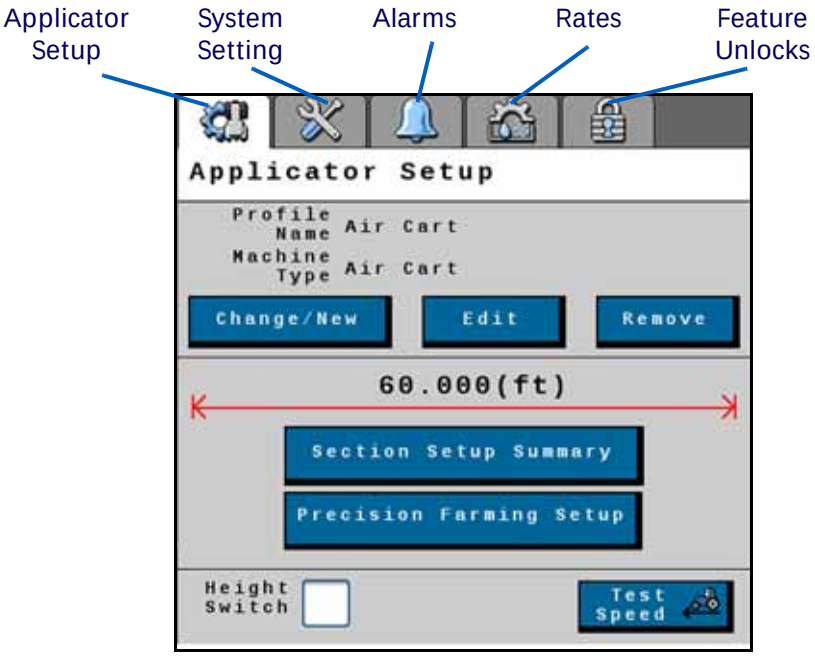
## MAIN

Press main at any time to return to the Current Product Run Screen.

## SETUP

Pressing setup opens a screen with many tabs.

FIGURE 26. 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 Chapter 9, *Precision Farming*.

### SYSTEM SETTINGS

The system settings provides many buttons that allow the user to modify the current configuration. The table below describes each button in detail.

TABLE 4. System Settings

| Button | Description |
|---|---|
| Control Valve Setup | The Control Valve button allows the user to adjust the following settings for each product:<br>• Valve Response Rate<br>• Control Deadband<br>• Valve Delay<br>• Valve Advance<br>• Control Effort |
| Rate Sensor Setup | The Rate Sensor Setup button provides the options to adjust the following settings:<br>• Flow Meter Calibration<br>• Flow Meter Pulse/Units<br>• Flow Meter Low Limit<br>• Tank Fill Flow Meter Calibration<br>• Tank Fill Flow Meter Pulse/Units<br>There is also the option to perform a catch test and applied product calibration. |
| 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 customize the main run screen object pool. |
| 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. |
| 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 entered during the original configuration.

### FEATURE UNLOCKS

If there a additional features available for the RCM, enter the provided Activation Key to access these features.

## 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 dropdown. 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.

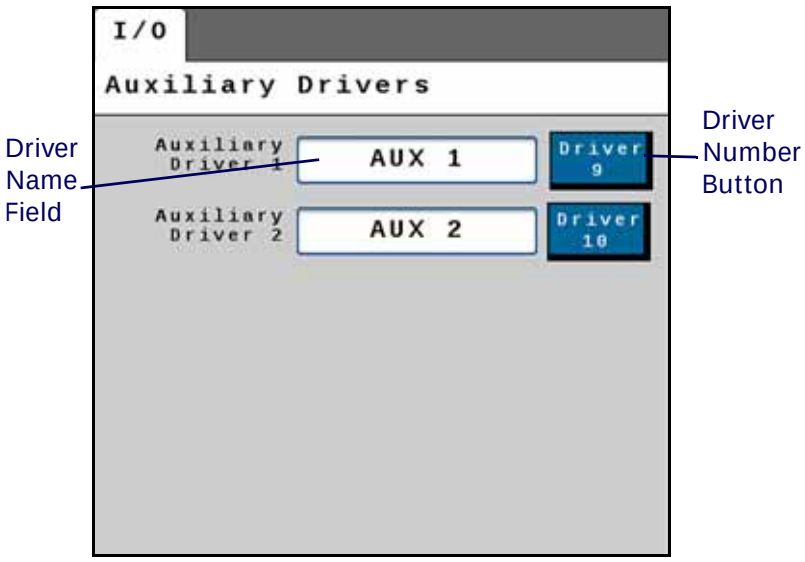
### PRODUCT SUMMARY

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.

## AUXILIARY DRIVERS

Auxiliary drivers that were created during configuration are listed in Auxiliary Drivers.

FIGURE 27. Auxiliary Drivers




To give the driver a custom name, press in the Driver Name field and, using the keypad, enter the desired name. To activate the auxiliary driver, select the driver number button next to the desired driver.

# CHAPTER 7 PLANTER OPERATION

## PLANTER MACHINE LIST

TABLE 1. RCM Machine List

| Machine Type | Application Type | Application Mode | Application Mode Uses |
|---|---|---|---|
| • Planter | • Granular Seed | Planter Section Control | Controller interfaces with up to 16 (Level 1) or 32 (Level 3) planter sections. Multiple row clutches ca be grouped for each section. Seed rate is manually controlled via ground drive transmission. |
| • Seeder | • Granular Seed | Seed Rate Control with Clutches | Controller interfaces with up to 4 hydraulic motor drives for seed rate control and up to 24 planter sections. Multiple row clutches can be grouped for each section. |
| | | Seed Rate Control without Clutches | Controller interfaces with up to 16 electric or hydraulic motor drives for seed rate and section control. Multiple rows can be grouped for each hydraulic motor drive. |

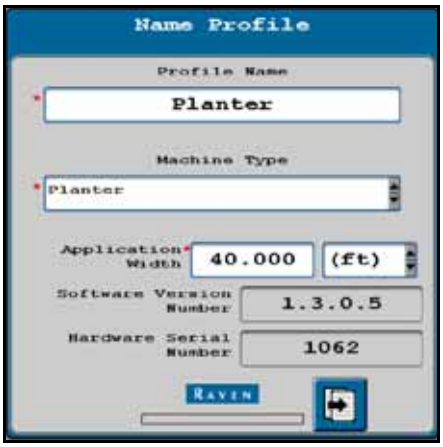
# PLANTER SETUP

There are three possible types on planter configurations. There is a wizard section listed below for each possible configuration.

## SECTION CONTROLLED PLANTER SETUP

1. Select Planter as the machine type.

FIGURE 1. Name Profile




2. Enter the Application Width.
3. Press Next.
4. Enter the Number of Sections, Row Spacing, and the Number of Rows. The Number of Rows x Row Spacing must equal the Application Width entered in step 2.

FIGURE 2. Setup Selections


NOTE: The number of total sections depends on task controller capability.

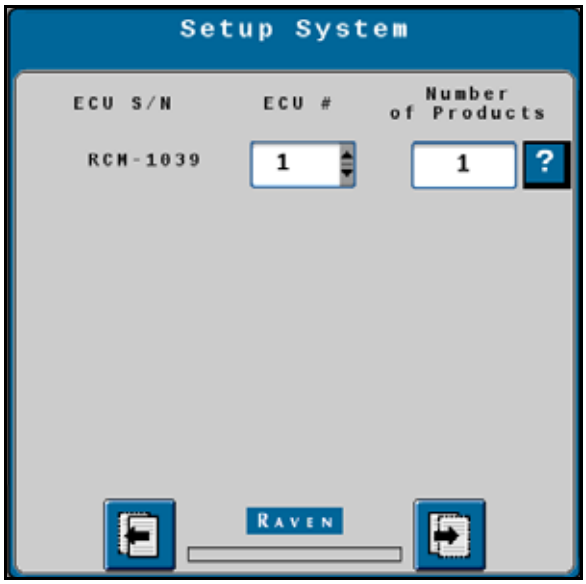
5. If you did not select Evenly Divide, enter the number of rows per section. The Planter run screen will open.

FIGURE 3. Setup Section Width


## SEED RATE CONTROL WITH CLUTCHES PLANTER SETUP

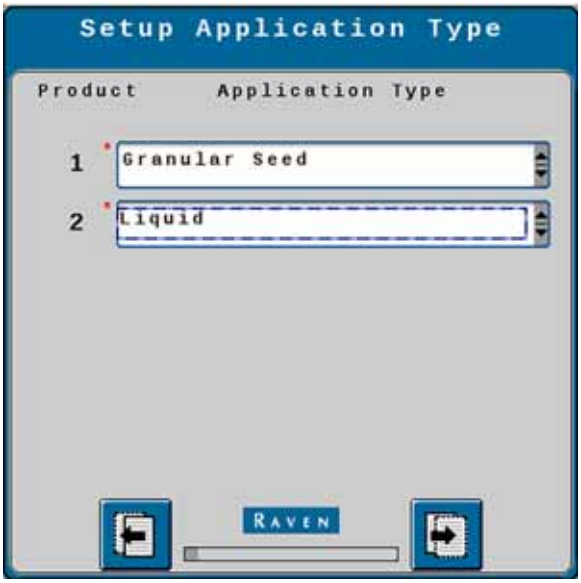
6. Set the appropriate ECU # from the drop-down. This is used to identify, prioritize, and sort RCMs when multiple RCMs are on the same system. For systems with a single RCM, set this to “1”.

FIGURE 4. Setup System




7. Enter the desired number in the Number or Products field.
8. Press Next.
9. Select the desired Application Type for the product.

FIGURE 5. Setup Application Type

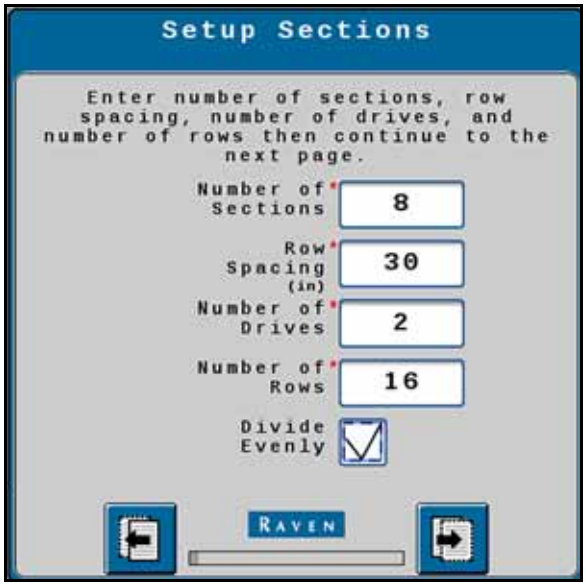



10. Press Next.
11. Select the Application Mode for Product 1.

FIGURE 6. Setup Application Type


12. Press Next.
13. Configure the Number of Sections, Row Spacing, Number of Drives, and Number of Rows. If desired, select the Divide Evenly checkbox to automatically divide the sections widths.

FIGURE 7. Setup Sections

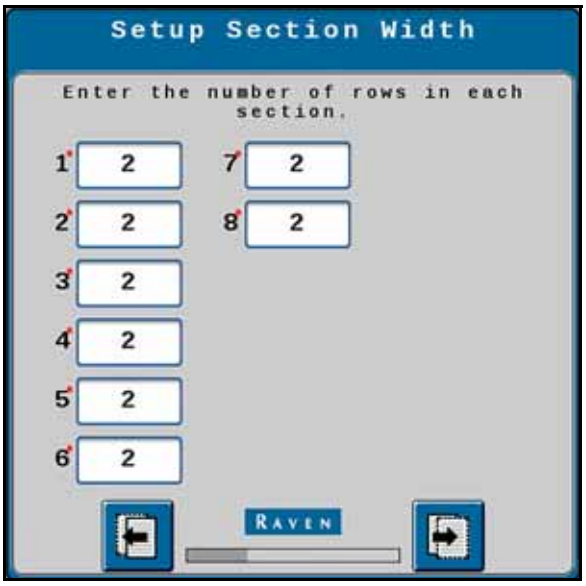


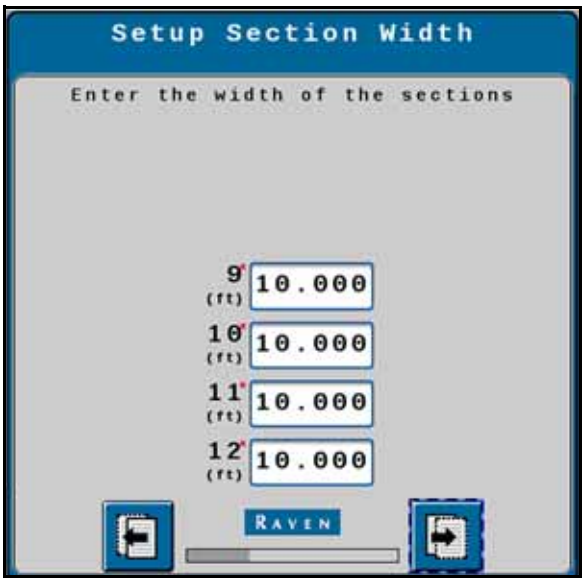

14. Press Next.
15. Repeat Figure 9 on page 91 through Figure 13 on page 92 for all products.

NOTE: On the Setup Sections Harnessing screen for additional products, enter the next lowest number not being used by the previous section group. For example, if the first product is using the first eight sections, start the second product on section 9.

16. After completing the product configurations, enter the information on the Setup Sections Width screens.

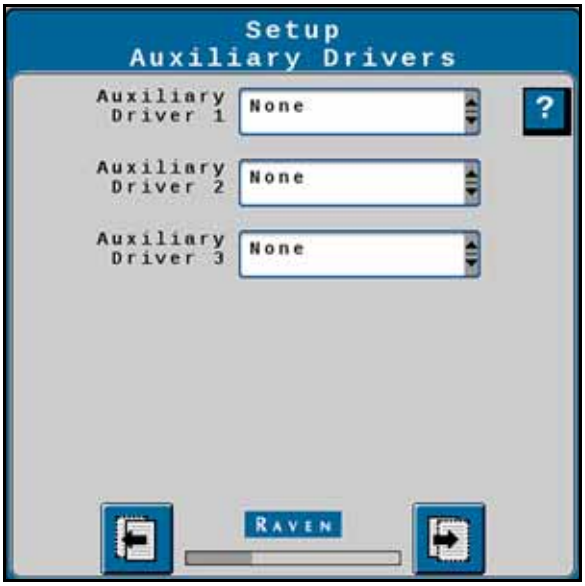
FIGURE 8. Setup Section Width Screens



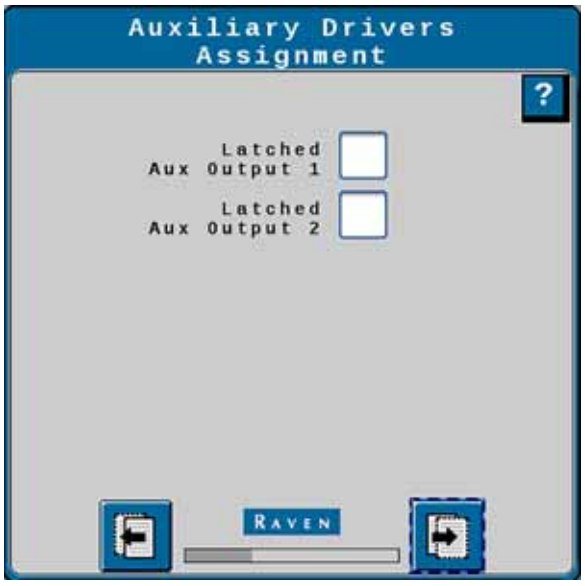

17. Press Next.
18. Select one of the Auxiliary Driver drop downs on the Setup Auxiliary Drivers page. Auxiliary drivers are additional switches that provide a 12V signal to a device.

FIGURE 9. Setup Auxiliary Drivers



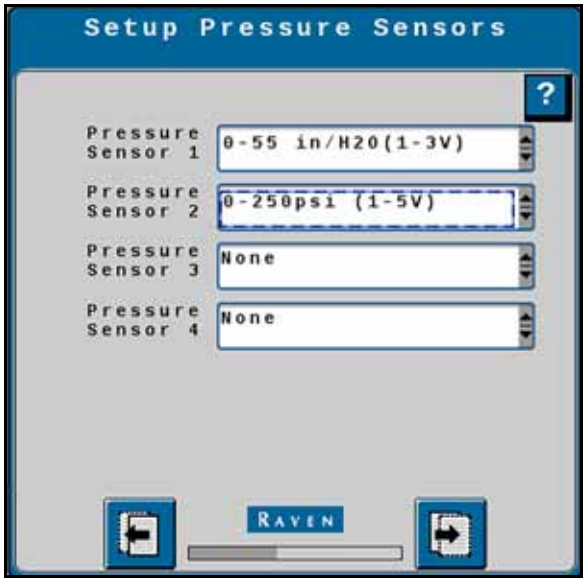

19. Press Next.
20. Select the checkbox next to the desired Latched Aux Output. Latched means that, once selected, the signal remains constant until the button is pressed again. Leaving the checkbox unselected means that the signal is only active when the button is held.

FIGURE 10. Auxiliary Driver Drivers




21. Press Next.
22. On the Setup Pressure Sensors page, select the appropriate Pressure Sensors for each product from the dropdown.

FIGURE 11. Setup Pressure Sensors

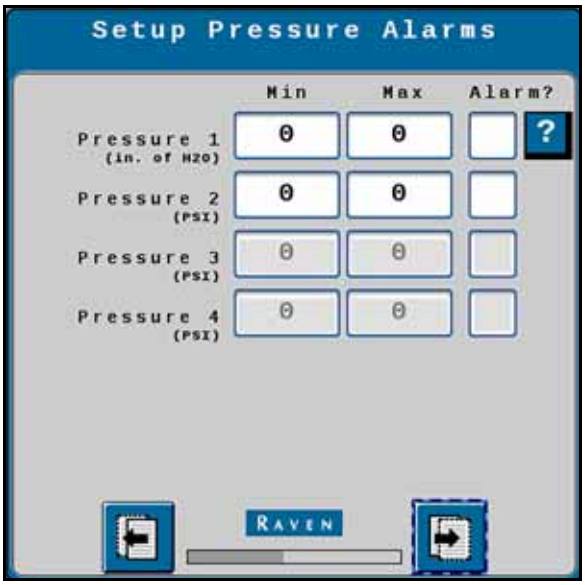



23. Press Next.
24. Use the check boxes on the Setup Pressure Driver screen to select a Product for the first pressure sensor.

FIGURE 12. Setup Pressure Drivers

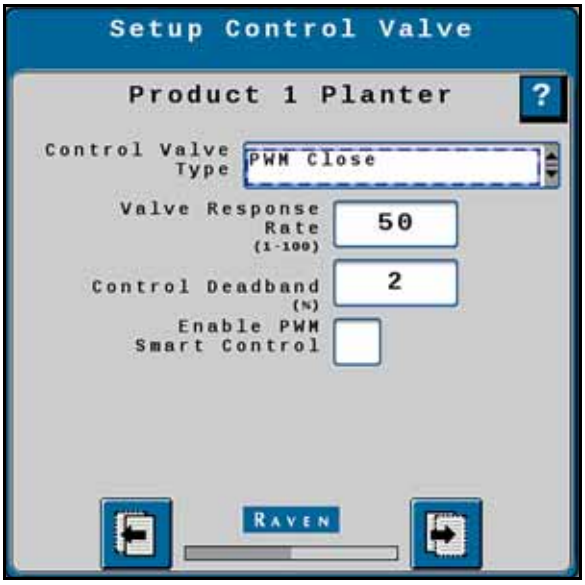

25. Press Next.
26. Repeat Figure 24 on page 95 and Figure 25 on page 95 for all pressure sensors.
27. If desired, configure the alarms for each pressure sensor on the Setup Pressure Alarms screen.

FIGURE 13. Setup Pressure Alarms



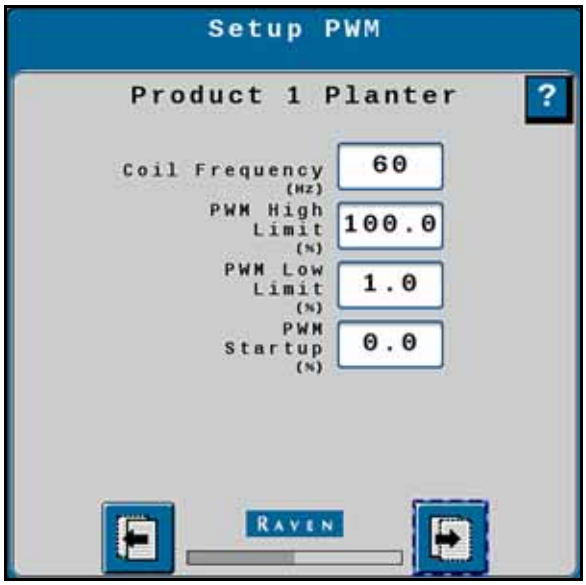

28. Press Next.
29. On the Setup Control Valve page configure the Control Valve Type, Valve Response Rate, and Control Deadband for the first product. If desired, select the Enable PWM Smart Control checkbox.

FIGURE 14. Setup Control Valve




30. Press Next.
31. On the Setup PWM page, configure the Coil Frequency, PWM High Limit, PWM Low Limit, and PWM Startup for the first product.

FIGURE 15. Setup PWM

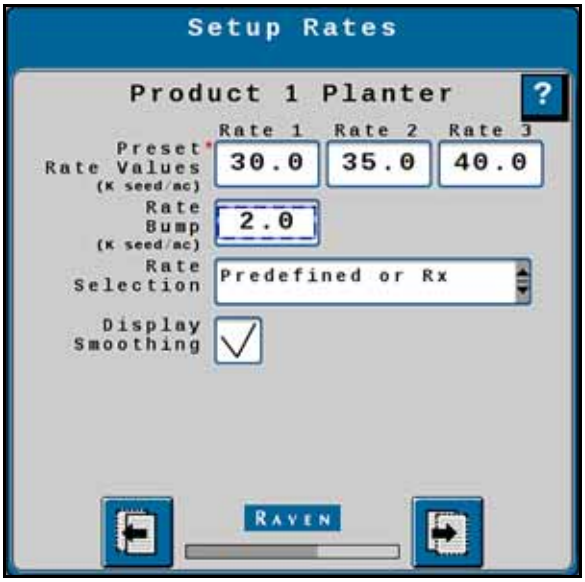



32. Press Next.
33. Configure the Seeds/Revolution, Motor/Meter Ratio, and Pulses/Revolution on the first Setup Rate Sensor Page.

FIGURE 16. Setup Rate Sensor


34. Press Next.
35. Enter the Preset Rate Values, Rate Bump, and Rate Selection on the Setup Rates page. If desired, select the Display Smoothing Checkbox.

FIGURE 17. Setup Rates




36. If desired, enter the Off Rate Alarm percentage and enable the Alarm checkbox.

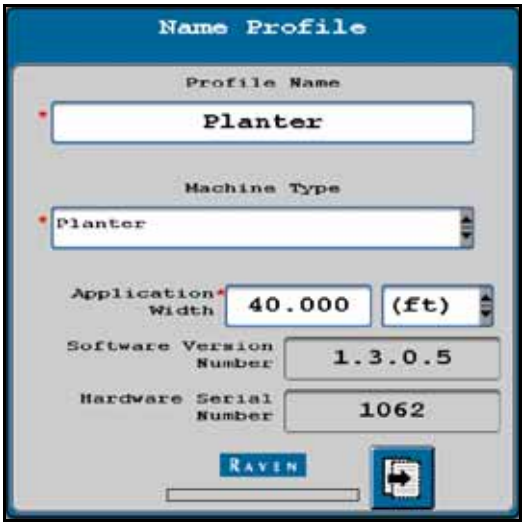
FIGURE 18. Setup Alarms


37. Press Next.
38. Repeat Figure 29 on page 96 through Figure 37 on page 98 for each product. Product configuration will vary depending on application type.
39. After all products are configures, a Setup Summary page will open displaying information about the configuration. If needed, press back to adjust the configurations. If the setup seems correct, press Next. The run page home screen will open. For additional formation on the run page, refer to “Planter Run Page Overview” on page 108.

## SEED RATE CONTROL WITHOUT CLUTCHES PLATER SETUP

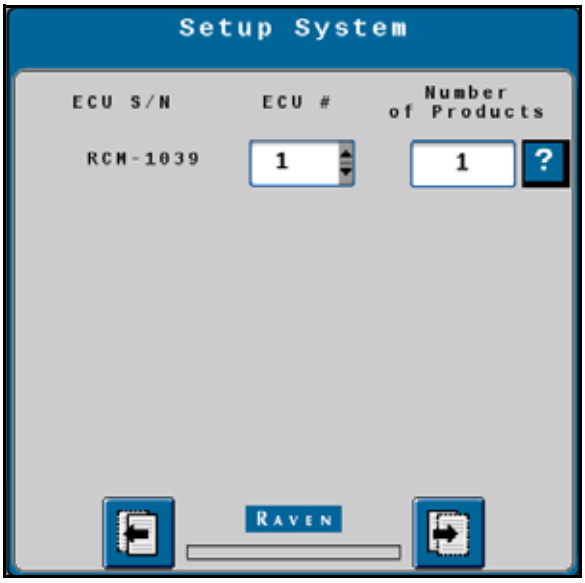
1. Select Planter from the dropdown on the Select Profile Page.

FIGURE 19. Name Profile



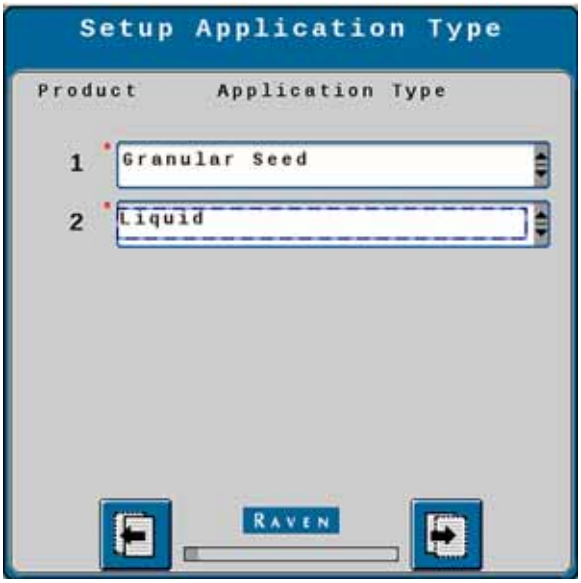

2. Press Next.
3. Set the appropriate ECU # from the drop-down. This is used to identify, prioritize, and sort RCMs when multiple RCMs are on the same system. For systems with a single RCM, set this to “1”.

FIGURE 20. Setup System




4. Enter the desired number in the Number or Products cell.
5. Press Next.
6. Select the desired Application Type for the product.

FIGURE 21. Setup Application Type

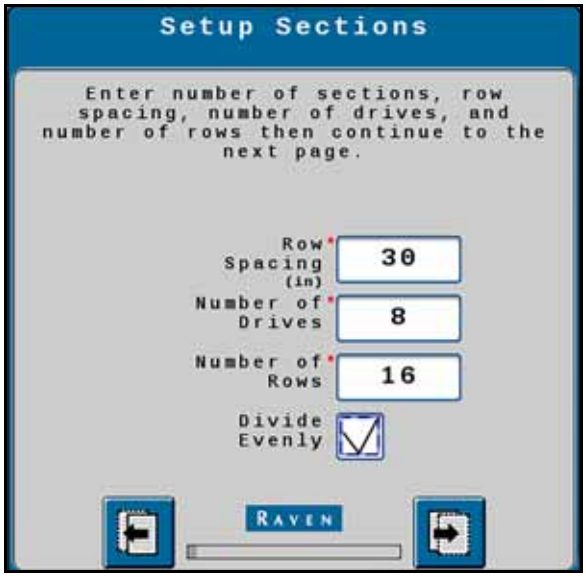



7. Press Next.
8. Select the Application Mode for Product 1.

FIGURE 22. Setup Application Type

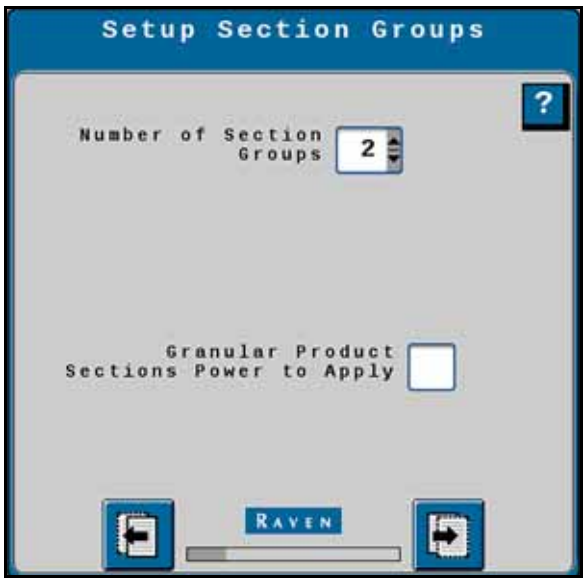

9. Press Next.
10. Configure the Number of Sections, Row Spacing, Number of Drives, and Number of Rows. If desired, select the Divide Evenly checkbox to automatically divide the sections widths.

FIGURE 23. Setup Sections



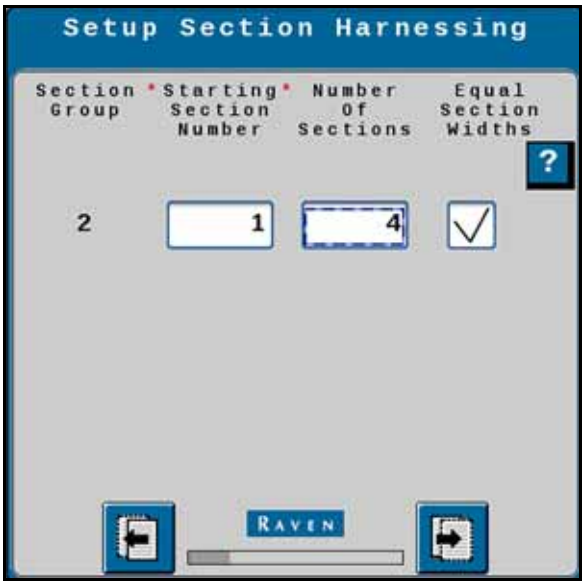

11. Press Next.
12. If necessary, select the Application Mode for additional products.
13. Press Next.
14. On the Setup Section Groups screen, select the Number of Section Groups from the dropdown.

FIGURE 24. Setup Section Groups




15. Press Next.
16. Review the information on the Setup Section Harnessing screen.
17. Press Next.
18. On the Setup Section Harnessing screen, enter the Starting Section Number, Number of Sections, and select Equal Section Widths (if desired).

FIGURE 25. Setup Section Harnessing

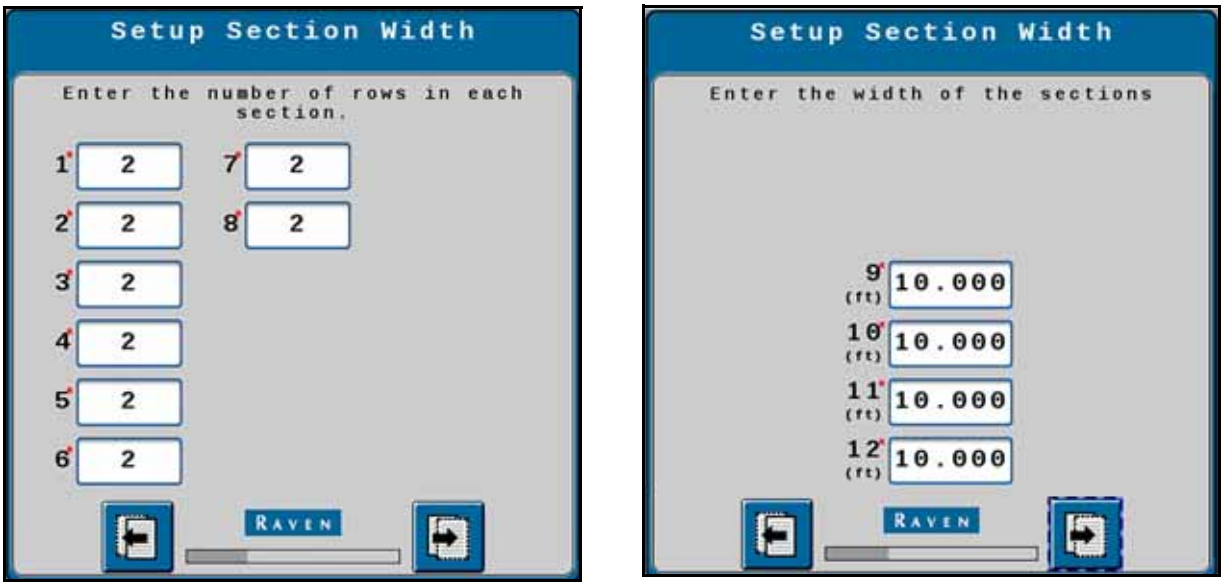



19. Press Next.
20. Select the Section Group assignment for each product from the dropdown on the Setup Section Group Assignment screen.

FIGURE 26. Setup Section Group Assignment

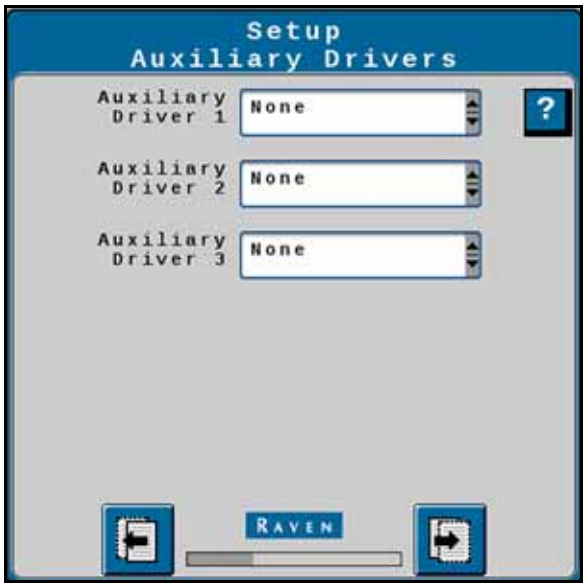

21. Press Next.
22. After completing the product configurations, enter the information on the Setup Sections Width screens.

FIGURE 27. Setup Section Width Screens



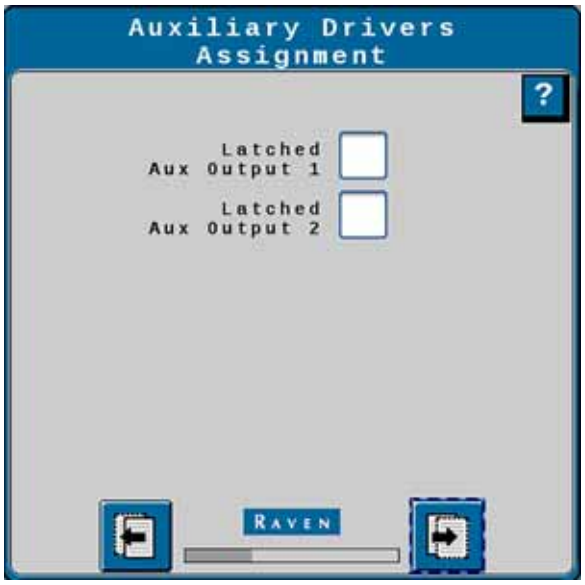

23. Press Next.
24. If desired, select Setup Auxiliary Drivers. Auxiliary drivers are additional switches that provide a 12V signal to a device.

FIGURE 28. Setup Auxiliary Drivers



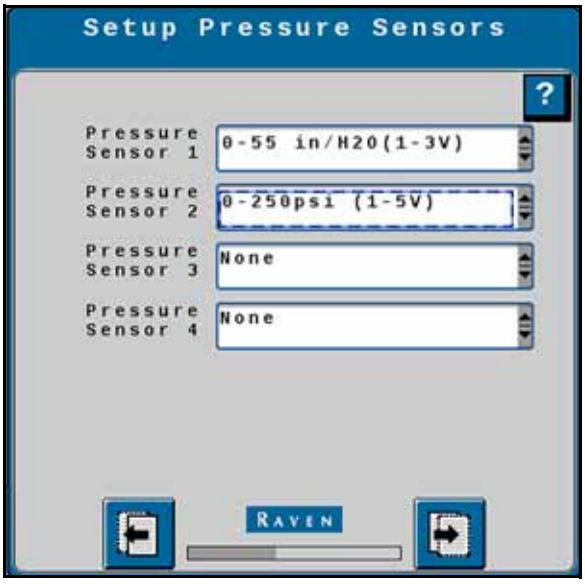

25. Press Next.
26. Select the checkbox next to the desired Latched Aux Output. Latched means that, once selected, the signal remains constant until the button is pressed again. Leaving the checkbox unselected means that the signal is only active when the button is held.

FIGURE 29. Auxiliary Driver Assignments



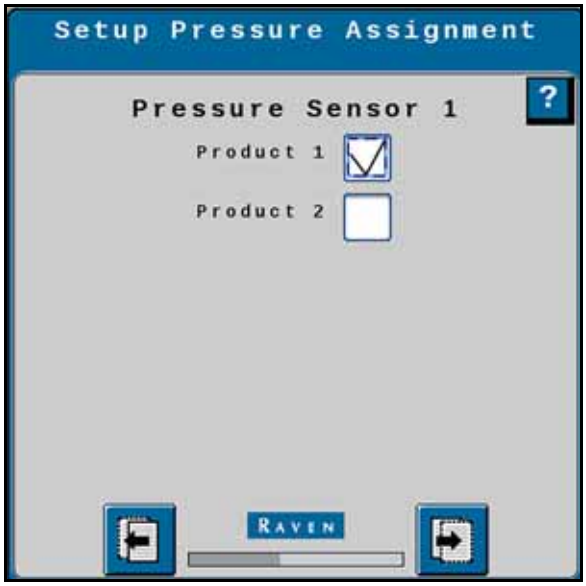

27. Press Next.
28. On the Setup Pressure Sensors page, select the appropriate Pressure Sensors for each product from the dropdown.

FIGURE 30. Setup Pressure Sensors



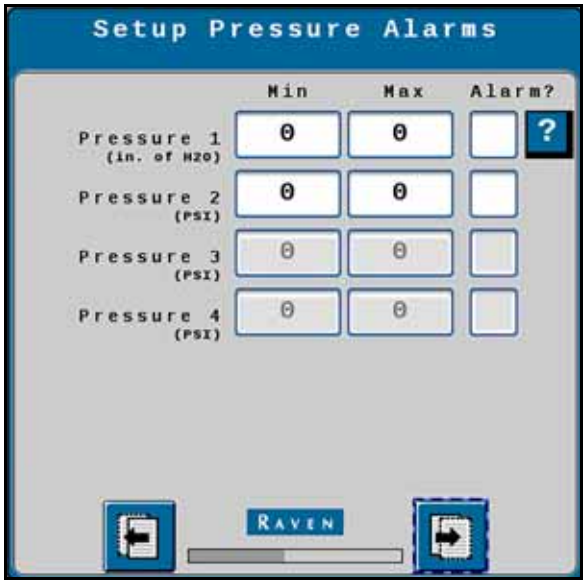

29. Press Next.
30. Use the check boxes on the Setup Pressure Assignment screen to select a Product for the first pressure Sensor.

FIGURE 31. Setup Pressure Assignments



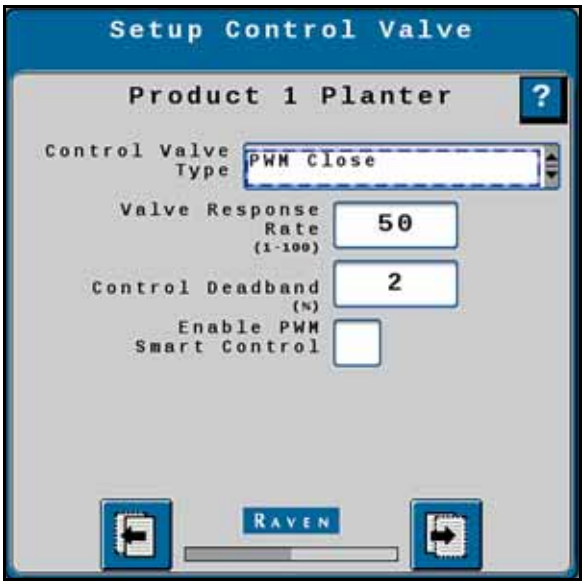

31. Press Next.
32. Repeat Figure 24 on page 95 and Figure 25 on page 95 for all pressure sensors.
33. If desired, configure the alarms for each pressure sensor on the Setup Pressure Alarms screen.

FIGURE 32. Setup Pressure Alarms



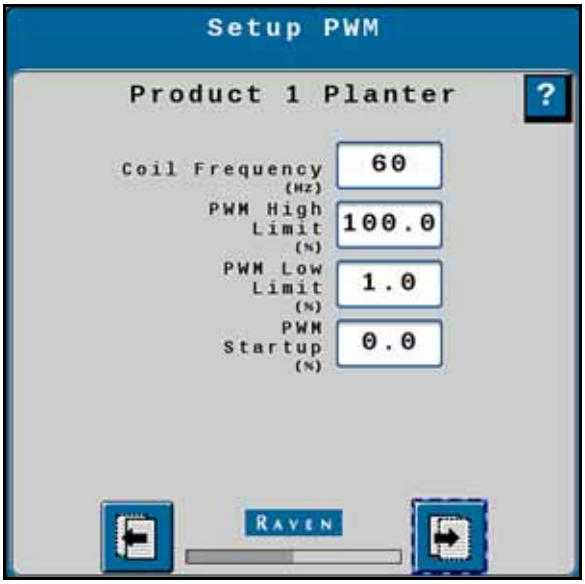

34. Press Next.
35. On the Setup Control Valve page configure the Control Valve Type, Valve Response Rate, and Control Deadband for the first product. If desired, select the Enable PWM Smart Control checkbox.

FIGURE 33. Setup Control Valve




36. Press Next.
37. On the Setup PWM page, configure the Coil Frequency, PWM High Limit, PWM Low Limit, and PWM Startup for the first product.

FIGURE 34. Setup PWM

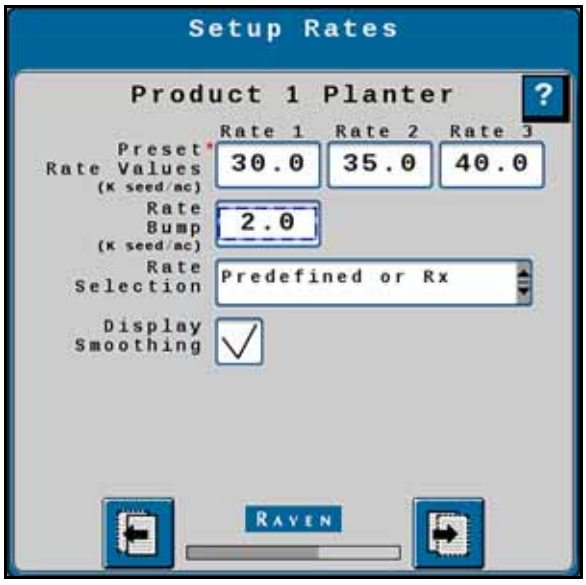



38. Press Next.
39. Configure the Seeds/Revolution, Motor/Meter Ratio, and Pulses/Revolution on the first Setup Rate Sensor Page.

FIGURE 35. Setup Rate Sensor


40. Press Next.
41. Enter the Preset Rate Values, Rate Bump, and Rate Selection on the Setup Rates page. If desired, select the Display Smoothing Checkbox.

FIGURE 36. Setup Rates




42. If desired, enter the Off Rate Alarm percentage and enable the Alarm checkbox.

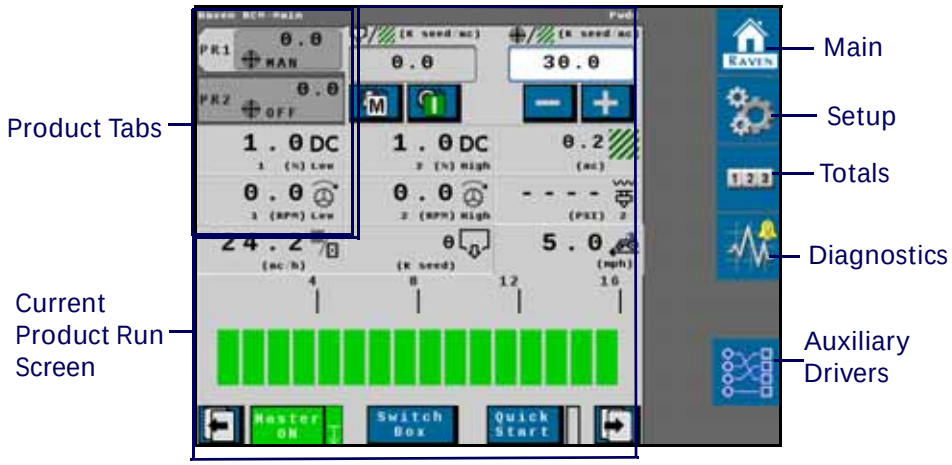
FIGURE 37. Setup Alarms


43. Press Next.
44. Repeat Figure 29 on page 96 through Figure 37 on page 98 for each product. Product configuration will vary depending on application type.
45. After all products are configured, a Setup Summary page will open displaying information about the configuration. If needed, press back to adjust the configuration. If the setup seems correct, press Next. The run page home screen will open. For additional information on the run page, refer to “Planter Run Page Overview” on page 108.

## PLANTER RUN PAGE OVERVIEW

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

FIGURE 38. Planter Run Screen



## PRODUCT TABS

Press on the product tab to select the desired product. This will open the to product run screen for that product.

## CURRENT PRODUCT RUN SCREEN

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

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

FIGURE 39. Planter Run Screen

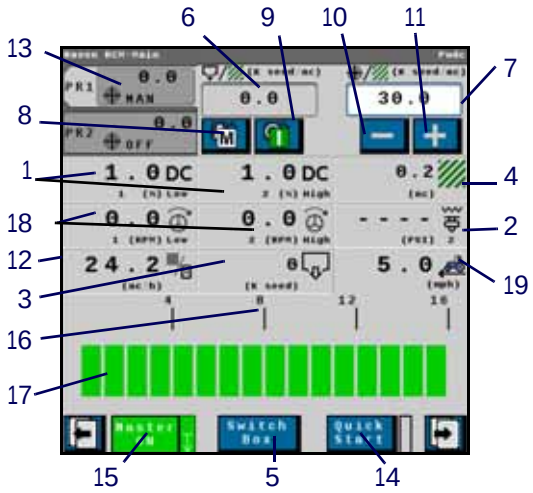


TABLE 2. Planter Run Screen Information

| | Button | Description | Function/Operation |
|---|---|---|---|
|  | 1 | Voltage | Indicates the current duty cycle. |
|  | 2 | Injection Pressure | Indicates the injection pressure. |
|  | 3 | Seed Level | Displays the current bin level. |
|  | 4 | Acres Applied | Displays the number of acres applied since starting the job. |
|  | 5 | Section Switchbox Button | Indicates if the switch box is on or off:<br>• Green - On<br>• Red - Off<br>Press the switch box button to navigate to a screen that allows the user to turn off the switch boxes for individual sections. |
|  | 6 | Actual Rate | Displays the actual application rate. |
|  | 7 | Target Rate | Displays the current target rate. The target rate can be adjusted by pressing in the number cell and entering a new number. |
|  | 8 | Manual/Automatic Toggle | Press this to switch between manual and automatic operation. |
|  | 9 | Product On/Off Toggle | Press this to manually turn a product on or off. |
|  | 10 | Rate Bump Down | Press this to decrease the application rate at the increment set during configuration. |
|  | 11 | Rate Bump Up | Press this to increase the application rate at the increment set during configuration. |
|  | 12 | Application Rate | Displays the current application speed in acres per hour. |
|  | 13 | Product Tab | Select a tab to view information for that product. |

| | Button | Description | Function/Operation |
|---|---|---|---|
|  | 14 | Quick Start Button | Press the quick start button to quickly configure a product. |
|  | 15 | Master Switch Indicator | The Master Switch Indicator shows the status of the master switch.<br>• Green - On<br>• Red - Off<br>• Orange - Cycle the master switch |
|  | 16 | Row Number | Displays the ending row number for the section. |
|  | 17 | Row Indicator | Displays the row status.<br>• Gray - Off<br>• Green - On |
|  | 18 | Meter Spread High and Low | Indicates the meter spread speed in RPM. |
|  | 19 | Traveling Speed | Shows the implement/ machine speed. |

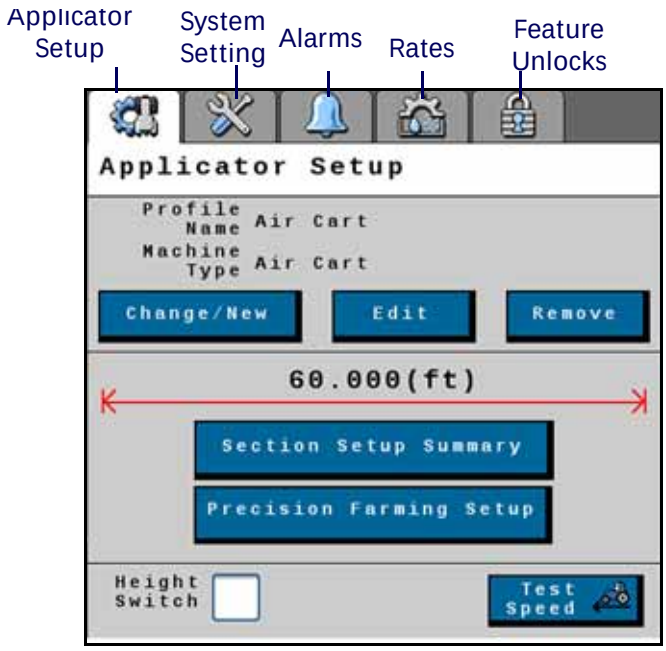
## MAIN

Press main at any time to return to the Current Product Run Screen.

## SETUP

Pressing setup opens a screen with many tabs.

FIGURE 40. 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 Chapter 9, *Precision Farming*.

## SYSTEM SETTINGS

The system settings provides many buttons that allow the user to modify the current configuration. The table below describes each button in detail.

TABLE 3. System Settings

| Button | Description |
|---|---|
| Control Valve Setup | The Control Valve button allows the user to adjust the following settings for each product:<br>• Valve Response Rate<br>• Control Deadband<br>• Valve Delay<br>• Valve Advance<br>• Control Effort |
| Rate Sensor Setup | The Rate Sensor Setup button provides the options to adjust the following settings:<br>• Flow meter Calibration<br>• Flow meter Pulse/Units<br>• Flow meter Low Limit<br>• Tank Fill Flow meter Calibration<br>• Tank Fill Flow meter Pulse/Units<br>There is also the option to perform a catch test and applied product calibration. |
| Tank Fill Settings | This button allows the user to enter the Tank Capacity, Current Tank Level, and Low Tank Level. |
| Display Setup Menu | Use the Display Setup Menu to add buttons, remove buttons, or reorganize the main run screen. |
| 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. |
| 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

If there a additional features available for the RCM, enter the provided Activation Key to access these features.

## 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 dropdown. 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.

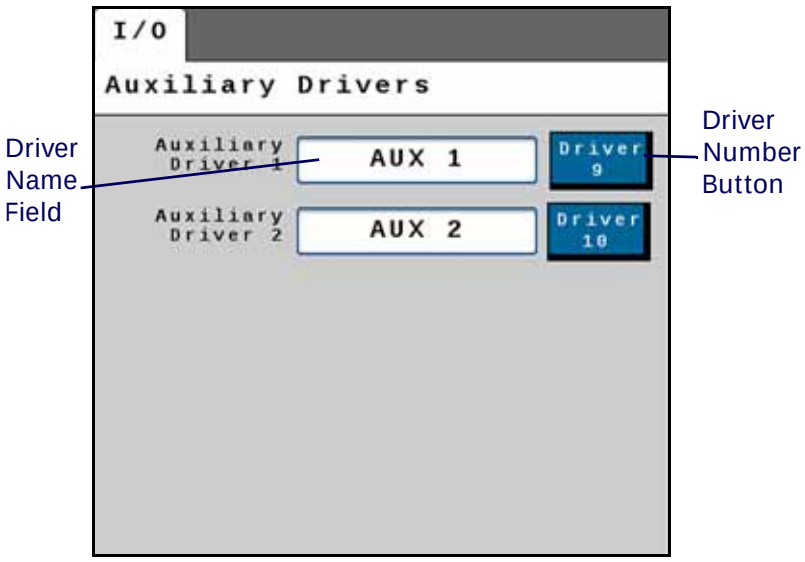
### PRODUCT SUMMARY

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.

## AUXILIARY DRIVERS

Auxiliary drivers that were created during configuration are listed in Auxiliary Drivers.

FIGURE 41. Auxiliary Drivers




To give the driver a custom name, press in the Driver Name field and, using the keypad, enter the desired name. To activate the auxiliary driver, select the driver number button next to the desired driver.

# CHAPTER 8 STAND ALONE SCALE OPERATION

## SCALE MACHINE LIST

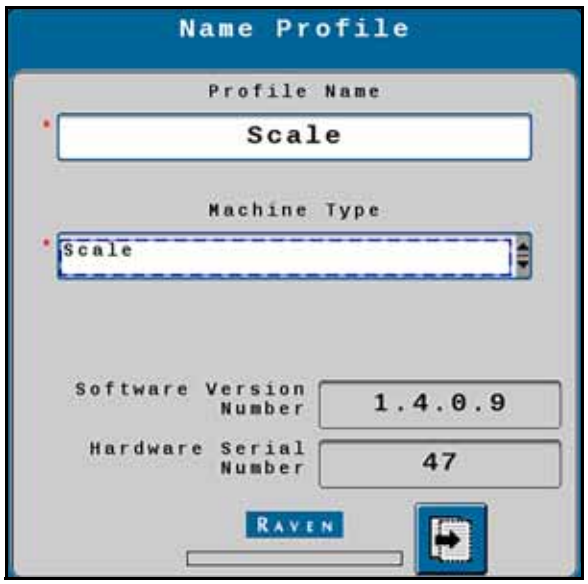
TABLE 1. RCM Machine List

| Machine Type | Application Type | Application Mode | Application Mode Uses |
|---|---|---|---|
| • Scale | • NA | NA | NA |

## STAND ALONE SCALE OPERATION

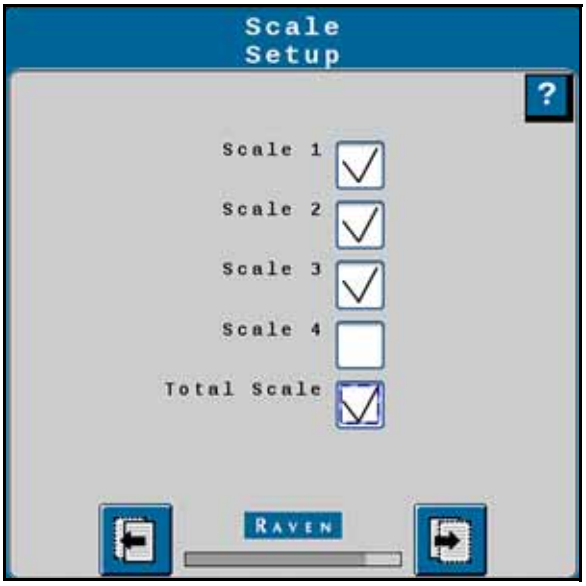
1. Select Scale as the Machine Type.

FIGURE 1. Name Profile



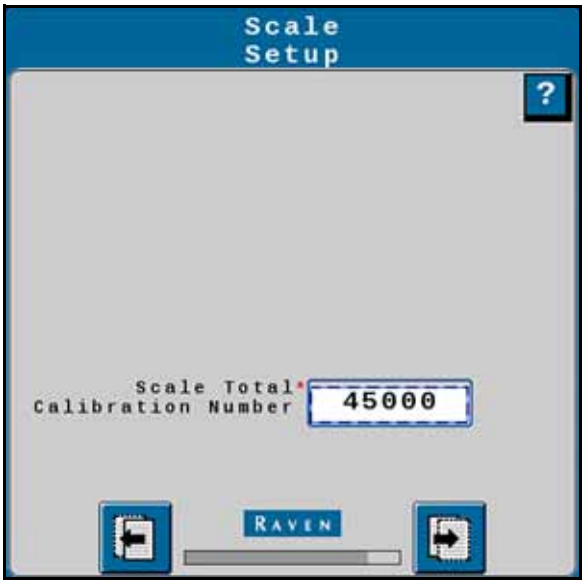

2. Enter a Profile Name.
3. Press Next.
4. Select the check box(es) next to the desired Scale(s) you want to monitor.

FIGURE 2. Scale Setup



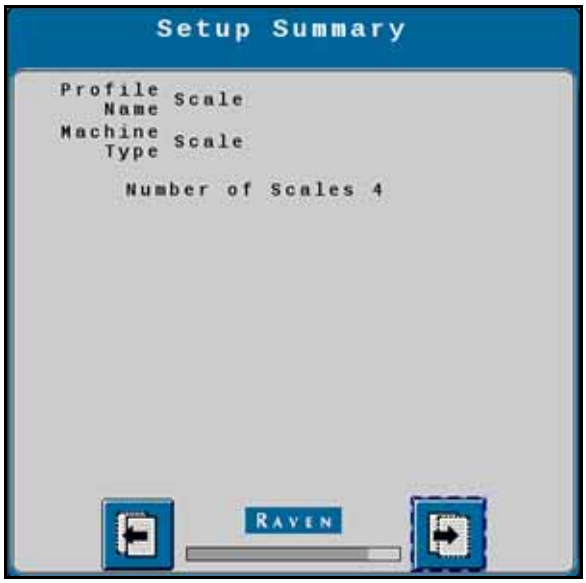

5. If desired, select the Total Scale checkbox to monitor the weight of all the selected scales combined.
6. Press Next.
7. Enter the Scale Total Calibration Number.

FIGURE 3. Scale Setup




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

FIGURE 4. Setup Summary

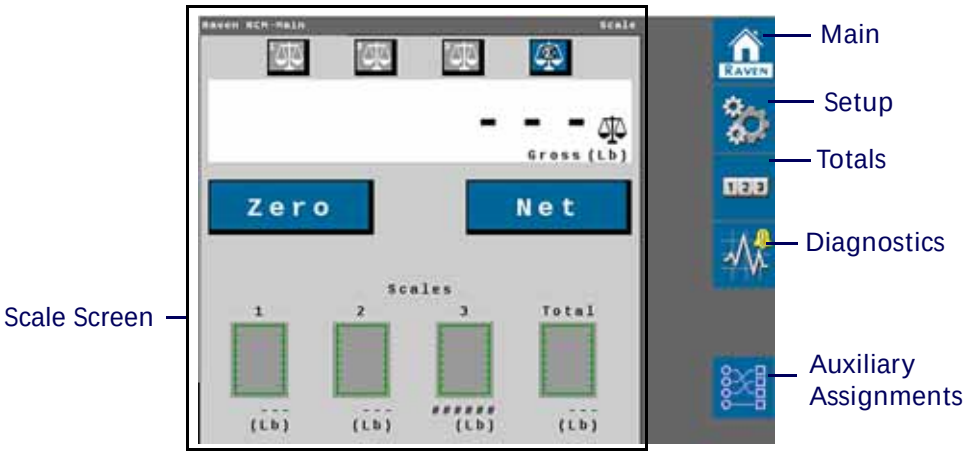



10. If any of the information is correct, press back to adjust the configuration. If the configuration is correct, press Next.

## SCALE RUN PAGE OVERVIEW

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

FIGURE 5. RCM Main Screen




### SCALE SCREEN

The scale screen 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 SCREEN

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

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

FIGURE 6. Air Cart Run Screen

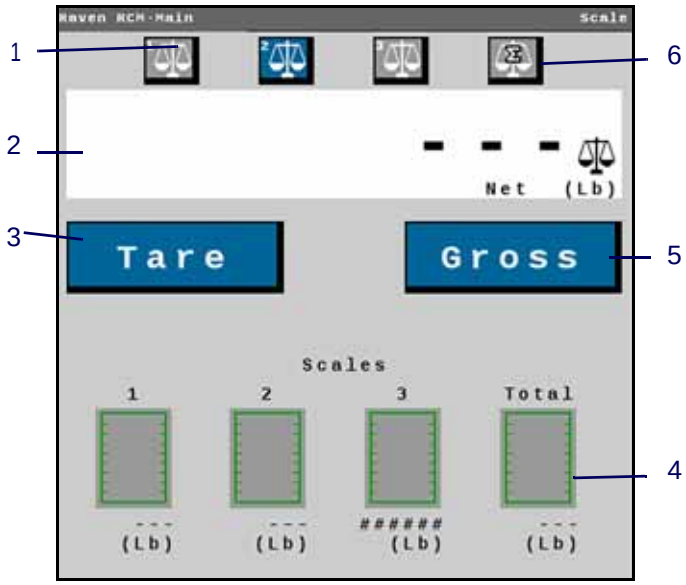
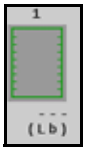


TABLE 2. Scale Run Screen Information

| | Button | Description | Function/Operation |
|---|---|---|---|
|  | 1 | Scale Selection | Press these buttons along to the to switch between the different scales. |
|  | 2 | Weight | Displays the current weight on the selected scale. |
|   | 3 | Tare | Press the Tare button to zero out the selected scale. If the combined weight scale is selected this will display as Zero. |
|   | 4 | Scale Graphics | Shows a graphical representation of the weight of teach 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. |

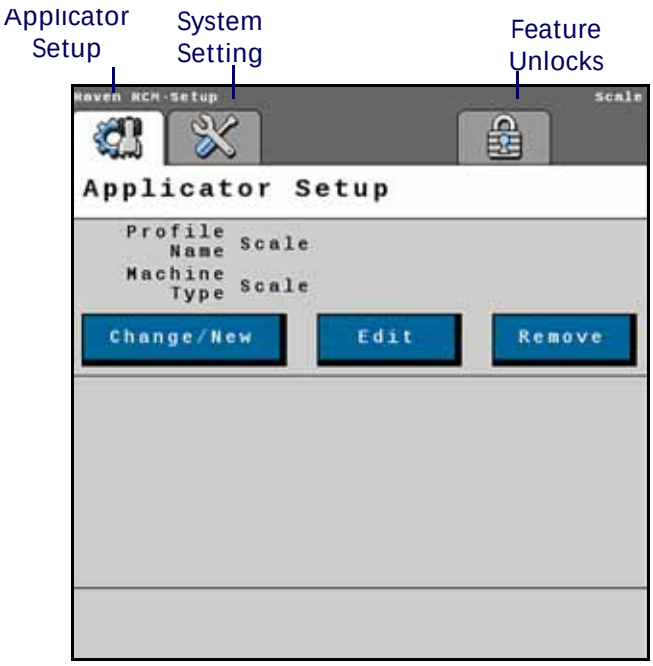
## MAIN

Press main at any time to return to the Current Product Run Screen.

## SETUP

Pressing setup opens a screen 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 system settings provides many buttons that allow the user to modify the current configuration. The table below describes each button in detail.

TABLE 3. System Settings

| Button | Description |
|---|---|
| Control Valve Setup | The Control Valve button allows the user to adjust the following settings for each product:<br>• Valve Response Rate<br>• Control Deadband<br>• Valve Delay<br>• Valve Advance<br>• Control Effort |
| Rate Sensor Setup | The Rate Sensor Setup button provides the options to adjust the following settings:<br>• Flow Meter Calibration<br>• Flow Meter Pulse/Units<br>• Flow Meter Low Limit<br>• Tank Fill Flow Meter Calibration<br>• Tank Fill Flow Meter Pulse/Units<br>There is also the option to perform a catch test and applied product calibration. |
| 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 operator to configure the main run screen. |
| 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. |
| Scale Setup | Scale Setup allows the user to configure scale options. |

### FEATURE UNLOCKS

If there a additional features available for the RCM, enter the provided Activation Key to access these features.

## 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 dropdown. 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.

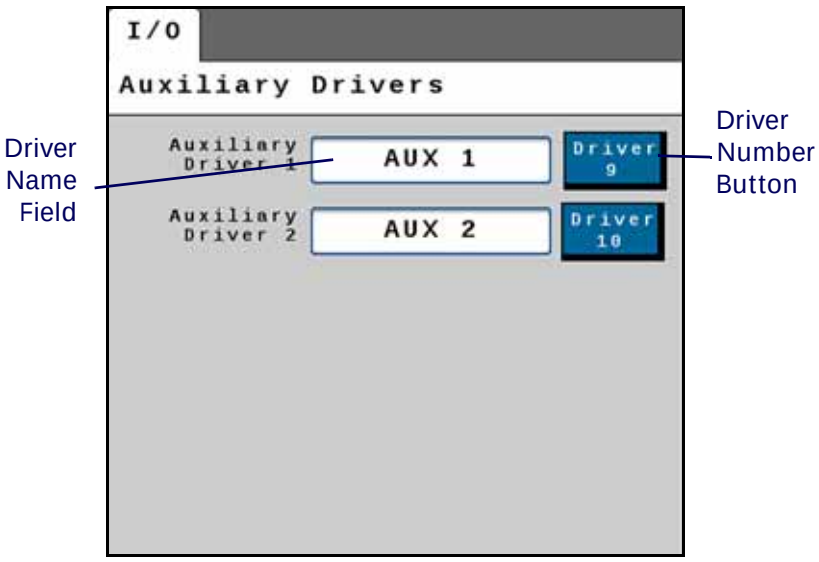
### PRODUCT SUMMARY

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.

## AUXILIARY ASSIGNMENTS

Auxiliary assignments that were created during configuration are listed in Auxiliary Assignments.

FIGURE 8. Auxiliary Assignments




To give the driver a custom name, press in the Driver Name field and, using the keypad, enter the desired name.

To activate the auxiliary driver, select the driver number button next to the desired driver.

# CHAPTER 9 PRECISION FARMING

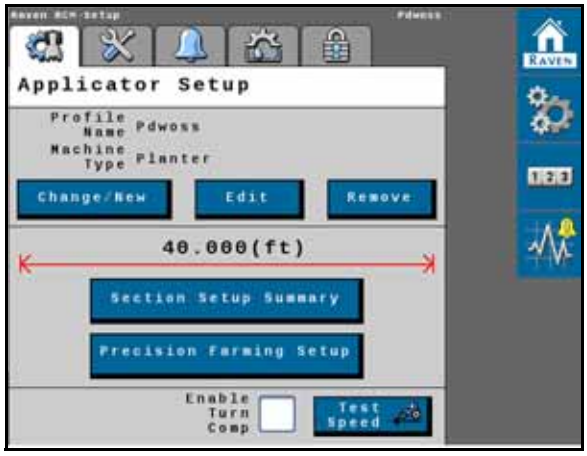
Precision farming allows the user to modify configurations that may not be available through the field computer.

IMPORTANT: Depending on the field computer, these settings may or may not be implemented.

To adjust precision farming settings after performing a machine configuration:

1. Press Setup.

FIGURE 1. RCM Settings

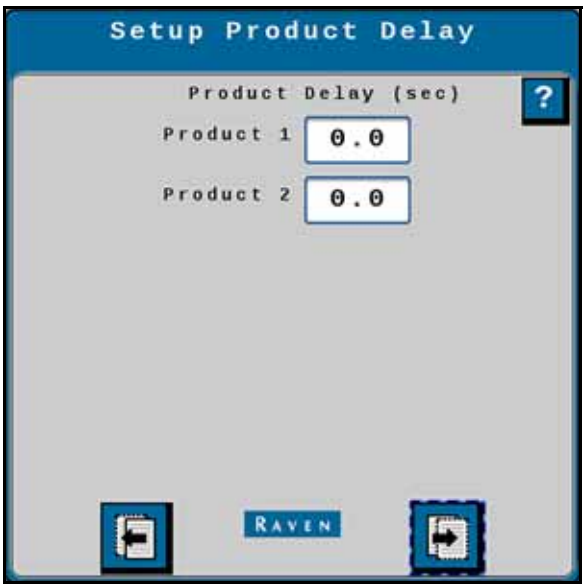



2. Select Precision Farming Setup.
3. Review the information on the Section Setup Wizard screen then press Next.

FIGURE 2. Section Setup Wizard

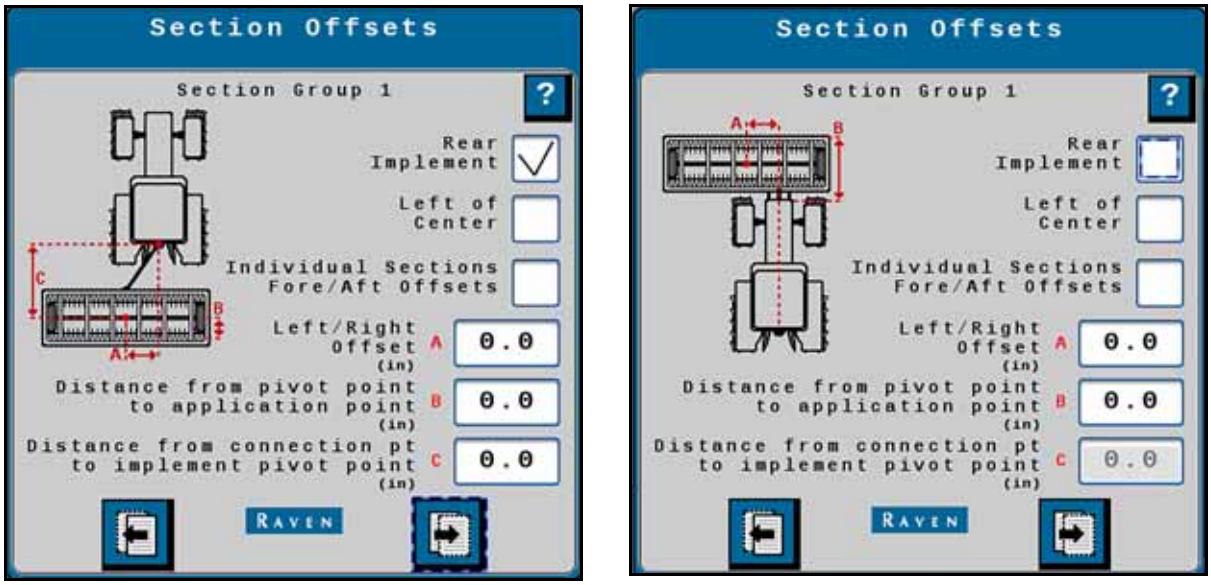

4. Enter a Product Delay value for every product. Product Delay is the amount of time the product needs to adjust when changing rate zones using a prescription map.

FIGURE 3. Setup Product Delay




5. Press Next.
6. Select Rear Implement if it is a rear mounted implement.

FIGURE 4. Section Offsets



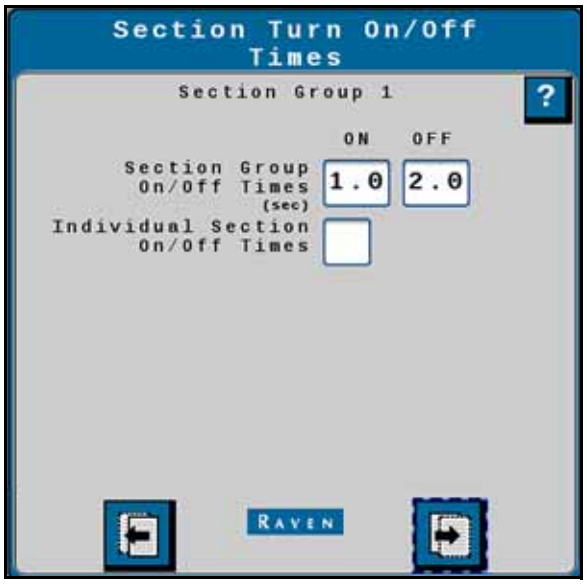

7. Select Left of Center of the implement is mounted left of center.
8. Select Individual Sections Fore/Aft Offsets if different sections for the same product have different fore and aft locations.
9. Enter the value for the Left/Right Offset.
10. Enter the Distance from Pivot Point to Application Point value.

NOTE: The pivot point is the point where the implement turns. Typically this is the wheels.

11. Ender the Distance from Connection point to Implement Pivot Point value.
12. Press Next.
13. If applicable, check Individual Section On/Off Times if different sections will need different look ahead times. For example, the center sections of an air cart will need shorter look ahead times than the outer sections.

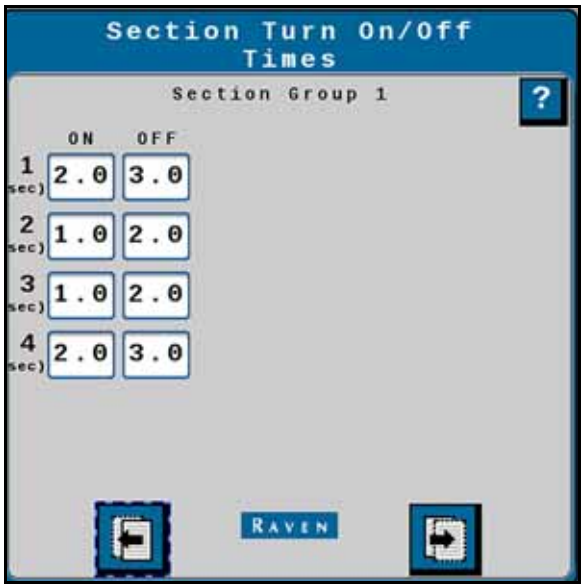
NOTE: Not all field computers support Individual Section On/Off Times.

FIGURE 5. Section Turn On/Off Times



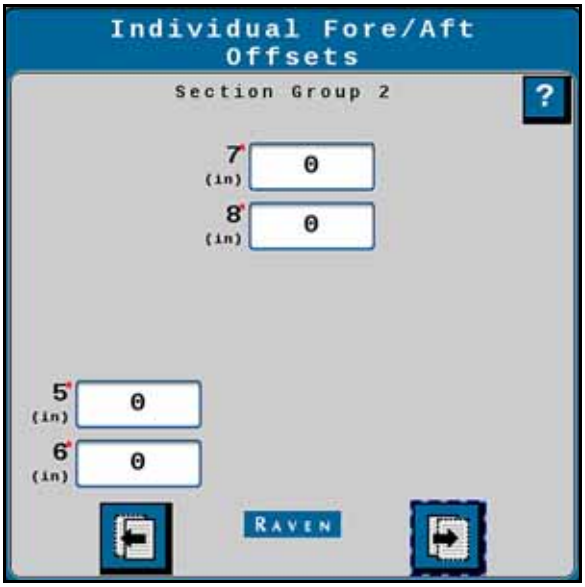

14. Press Next.
15. If Individual Section On/Off Times was selected, configure the Section Turn On/Off Times for the Section Group. If not, skip to step 16.

FIGURE 6. Section Turn On/Off Times




16. Press Next.
17. If applicable, enter the offset values for individual sections. If the section is located in front of the implement pivot point, enter it as a negative value.

FIGURE 7. Individual Fore/Aft Offsets




18. Press Next.
19. Repeat step 6 through step 18 for all section groups.
20. After configuration is complete, press Next and the Application Setup screen will display again.

# CHAPTER 10 TROUBLESHOOTING

## ACCESSING SYSTEM INFORMATION

1. Select the Diagnostics button.
2. Select the System Information tab.


3. Select the desired page from the drop-down.

| Option | Description |
|---|---|
| Hardware/Software | Displays the manufacturer's information for the Raven Rate Control Module hardware and software. |
| Switchbox | Displays if an external switchbox is present and the status of the switches. |
| Delivery System | Shows application information for the selected product. |
| Section Status | Shows if each section valve is currently open or closed. |
| System Voltages | Shows voltage and current information for the Raven Rate Control Module. |
| Working Parameters | Displays the implement width, current speed, and speed source. |
| Switches/Status | Displays the status of the Master switch. |
| Pressure Sensors | Displays voltage and pressure information for each pressure sensor. |
| Bin Level Sensors | Displays whether each bin level sensor is covered or uncovered. |
| RPM Sensors | Shows the signal detected by each RPM sensor. |
| Tank Fill Monitor | Displays the fill rate and volume detected by the tank fill monitor. |
| Task Totals | Shows the area covered and volume applied for the current task. |

## GENERAL TROUBLESHOOTING

| Symptom | Problem | Solution |
|---|---|---|
| Unexpected application rate. | Incorrect rate type selected (gal/min or gal/acre). | Select the correct rate type. |
| Product does not shut off. | Valve does not respond to commands. | Select the correct valve type. |
| 2-Wire valve selection is not available. | Dual boom is selected. | Disable dual boom. |
| | More than seven sections are selected. | Assign fewer than eight sections. |
| Implement section is not turning on or off. | Incorrect section valve type selected. | Select correct section valve type. |
| Application is erratic. | Calibration number is not set correctly. | Enter the correct calibration number. |
| Trouble code is displayed for high pressure. | System pressure is too high. | Select flow return in the system setup. |
| Trouble code is displayed for unexpected flow. | Constant flow is disabled when using a constant flow system with boom valve closed. | Select constant flow in system setup. |
| Flow is not applying at desired rate. | Incorrect application rate. | Ensure 10 gal/10L unit is used. |
| | Minimum Flow rate feature causes over-application in areas where machine speed is low enough to activate Minimum Flow Rate. | Set minimum flow rate to zero to disable feature. |
| System detects implement is down for an extensive period of time. | Height switch is disabled. | If height switch indicator does not match machine operation, service height switch. |
| Unexpected chemical flow detected. | Controller attempts to close section valves, but detects flow on a sprayer or liquid fertilizer system. | Shut off solution pump. |
| Unable to setup minimum and maximum alarms. | Minimum and maximum alarms are disabled. | Ensure pressure sensor is installed and configured. |
| Unable to set values. | System not allowing changes values or settings. | Ensure Master Switch is off. |
| Unexpected anhydrous ammonia flow detected. | Controller attempts to close On/Off valve, but still detects flow. | Select button to turn off control valve. |
| | Controller attempts to close all valves, but still detects flow. | Follow instructions on Warning page on display. |
| Pressure sensors are not configured. | Pressure sensor 2 is not an option. | Ensure both sensors are configured. |
| Not able to activate system. | Master Switch indicator is orange. | Cycle master switch. |
| Unwanted minimum flow rate activation. | Over application in low speed areas. | Set minimum flow rate to zero to disable function. |

## TESTS

1. Navigate to the Raven Rate Control Module.
2. Select Diagnostics button.
3. Select the Tests tab.


4. Select the test from the drop-down menu.
   a. Liquid Diagnostics Test Warning displays after selecting any of the following liquid application:
      - Nozzle Flow Check
      - Rinse Cycle
      - Control/Section Test
      - Control Valve Test
      - Calibrate PWM Limits


   b. $NH_3$ Diagnostics Test Warning displays after selecting any of the following for $NH_3$ applications:
      - Energize System

- Bleed System Test


NOTE: The bleed system test will not evacuate all of the $NH_3$ entirely. Perform the manual bleed procedure for the system to ensure $NH_3$ is completely evacuated.

c. Dry Diagnostic Test Warning displays after selecting any of the following for dry applications:
   - Granular Flow Check
   - Spreader/Air Cart Check
   - Control/Section Test
   - Calibrate PWM Limit
   - Bin/Tank Cleanout


5. Read the Discharge Warning and select Accept.

## NOZZLE FLOW CHECK

IMPORTANT: Always fill solution tank with clean water to perform nozzle flow check.

NOTE: Enter conditions that are comparable to normal operation. Larger dispensed volumes result in longer but more accurate calibration tests.

Perform Nozzle Flow Check to test an application rate at a desired speed without the machine moving. The following items can be determined:

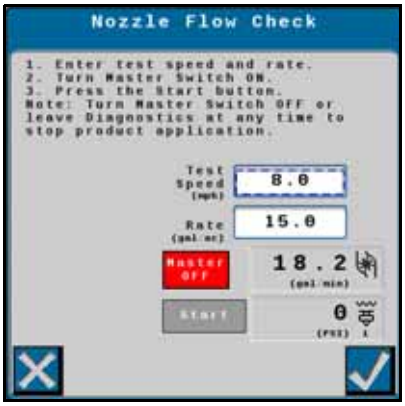
- If actual application rate meets the target application rate at a given speed.
- The actual flow rate of an implement section.

- Whether the nozzles are worn.
- Spray control valve pressure at a desired speed and application rate.

NOTE: Turn the master switch off or leave Diagnostics at any time to cancel the test.

Speed and rate can be changed while the test is running.

1. Enter a Test Speed and Rate.




2. Turn the master switch on.
3. Select Start.

If the volume is higher than expected and pressure is lower than expected, nozzle tips could be worn.

If pressure is higher than expected for the given output, nozzle tips could be partially plugged. Pressure drops can occur between section shutoff valves and nozzle tips. This is normally only associated with high flow rates.

## RINSE CYCLE

IMPORTANT: Always fill the solution tank with clean water to perform the rinse cycle.

Rinse Cycle test fully opens all sections, fence row valves, and flow control valve until the flow meter detects reduced flow.

NOTE: Turn the master switch off or leave Diagnostics at any time to cancel the test.


1. Turn the master switch on.

2. Select Start.

## CONTROL/SECTION TEST

Selected sections open while the test is in progress. Unselected sections remain closed.

NOTE: Turn the master switch off or leave Diagnostics at any time to cancel the test.

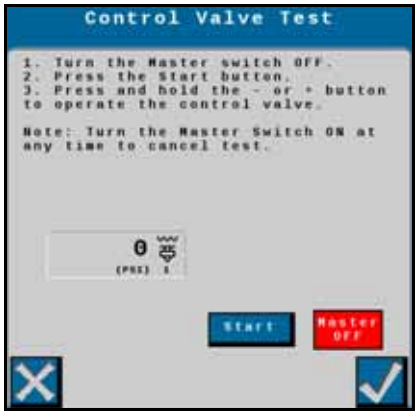
1. Enable the desired sections.
2. Turn the master switch on.


3. Select Start.
4. Toggle section on or off using the buttons.
5. Press and hold - or + to operate the control valve.

## CONTROL VALVE TEST

This test operates control valve without dispensing product.

NOTE: Turn the master switch on or leave the Diagnostics at any time to leave the test.




1. Select Start.
2. Press and hold - or + to operate the control valve.

## CALIBRATE PWM LIMITS

NOTE: Turn master switch off or leave Diagnostics at any time to cancel the test.

1. Turn the master switch on.


2. Press Start.
3. Press and hold - or + buttons until the minimum acceptable flow/pressure is achieved.
4. Select Set Low Limit.
5. Press and hold the - or + buttons until the maximum acceptable flow/pressure is achieved.
6. Select Set High Limit.

## ENERGIZE SYSTEM

NOTE: Turn the master switch off or leave diagnostics page to immediately force the valves to return to the closed position and stop flow.

Use the Energize System procedure to test for flow at openers, purge air and vapor from the $NH_3$ delivery system, and fill cooler and hoses with liquid anhydrous. Select Start to fully open the control valve and section valves for a few seconds and then automatically close the valves.

1. Ensure the area is clear of people, pets, and livestock.
2. Position the machine into the wind.
3. Turn the master switch on.


4. Select the Override Height Switch checkbox.
5. Select Start. The valves will stay open for a few seconds.

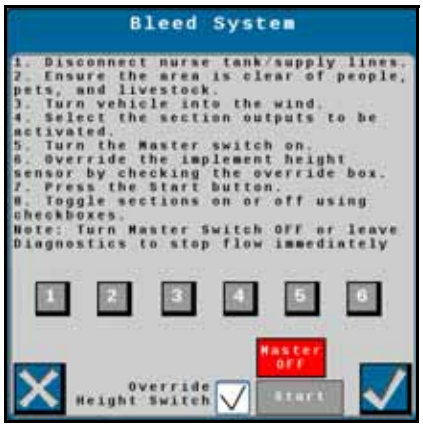
6. Repeat the procedure if needed.

## BLEED SYSTEM TEST

NOTE: Turn the master switch off or leave diagnostics page to immediately force the valves to return to the closed position and stop flow.

The Bleed System Test allows the operator to bleed trapped anhydrous ammonia from high-pressure lines between section valves and control valves while remaining seated in the cab.

1. Bleed and disconnect the nurse tank and supply lines.
2. Ensure that the area is clear of people, pets, and livestock.
3. Position the machine into the wind.
4. Enable the desired sections.




5. Select the Override Height Switch checkbox.
6. Select Start.
7. Toggle the sections as needed.

NOTE: Turn the master switch on or leave the Diagnostics at any time to leave the test.

## SPREADER/AIR CART CHECK

NOTE: Turn the master switch off or leave Diagnostics at any time to cancel test.

1. If the system is configured with an RPM assignment, the RPM assignment will be disabled for this test. If desired, select the Enable RPM Products check box.


2. Enter the Test Speed and Rate.


3. Turn the master switch on.
4. Select Start.

## BIN/TANK CLEANOUT

NOTE: Turn the master switch off or leave Diagnostics at any time to cancel the test.

1. Select Product bins or tanks to be cleaned out.


2. Turn the master switch on.

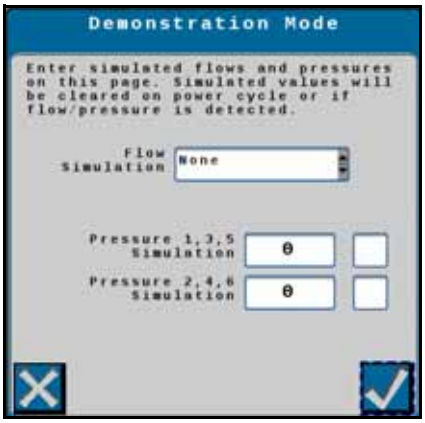
3. Select Start.

## DEMONSTRATION MODE

Demonstration Mode provides a bench top simulation only. It is not intended for use on actual equipment.

1. Select Demonstration Mode from the Tests tab. A warning prompt will appear.
2. Read the warning and either select Cancel or Accept.


3. After the Demonstration Mode screen opens, select the Flow Simulation type.
    - None: No flow will be simulated.
    - Fixed Freq: If Fixed Frequency is selected a Fixed Flow box will appear. Enter the desired flow value in the box.
    - Rate Tracking: The system will adjust flow so it matches the flow required to achieve the target application rate entered on the main screen.




4. Enter a simulated pressure value for pressure sensors 1, 3, and 5. Enable the checkbox.
5. Enter a simulated pressure value for pressure sensors 2, 4 and 6. Enable the checkbox.

## DIAGNOSTIC LOOP BACK TEST

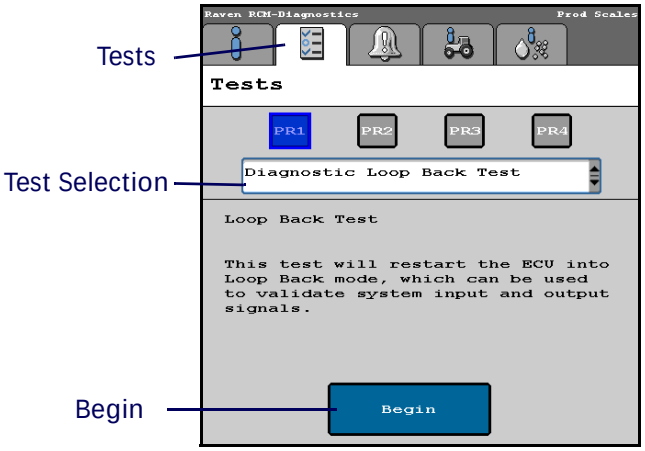
Loop back tests provide a way to self-test the Raven Rate Controller. There are two loop back tests available.

- ECU Test: The ECU Test performs a test of the Raven Rate Controller Module.

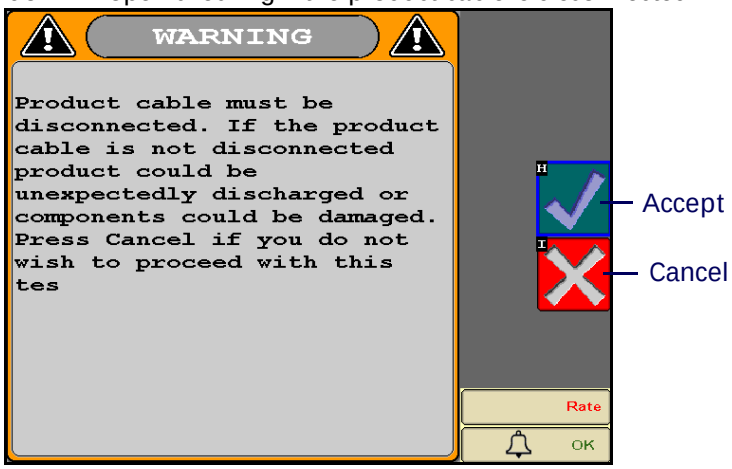
- 47 Pin: The 47 Pin test performs a test of the Raven Rate Controller Module and the cabling and pins of the product cable. This test requires a 47 pin loop back tester.

To perform a Diagnostic Loop back Test:

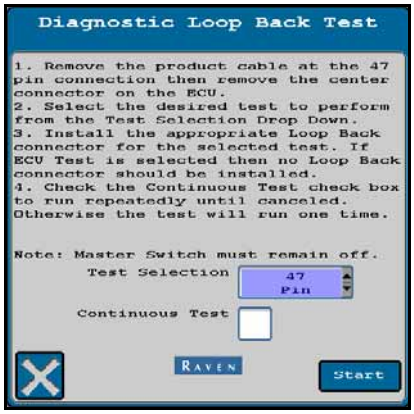
1. Ensure the Master Switch is off and the 47-pin plug of the product cable is disconnected.
2. Select the Tests tab.




3. Select Diagnostics Loop Back Test from the test selection drop down.
4. Press Begin. A Warning window will open checking if the product cable is disconnected.



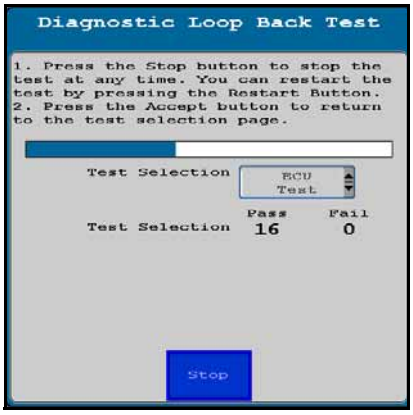

5. Press Accept to continue or Cancel to exit the test. After pressing Accept, the Diagnostic Loop Back Test window will open.



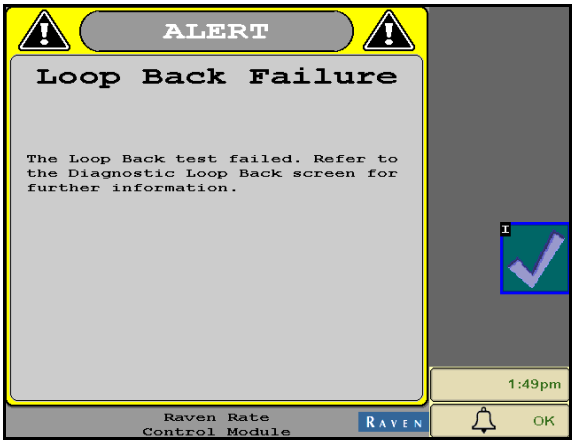

6. Review the information on the Diagnostic Loop Back Test.

7. Select the desired test (47 Pin or ECU Test) from the Test Selection drop down.
8. If desired, select the checkbox by Continuous Test. This checkbox will make the test run repeatedly until the Stop button is pressed.
9. After the desired test is selected, press Start. The Diagnostic Loop Back Test progress window will open. This window shows the test status and the number of tests that Pass or Fail. If the Continuous Test checkbox was not selected the test will run one time. If the Continuous Test checkbox was selected, the test will repeat until the Stop button is pressed.

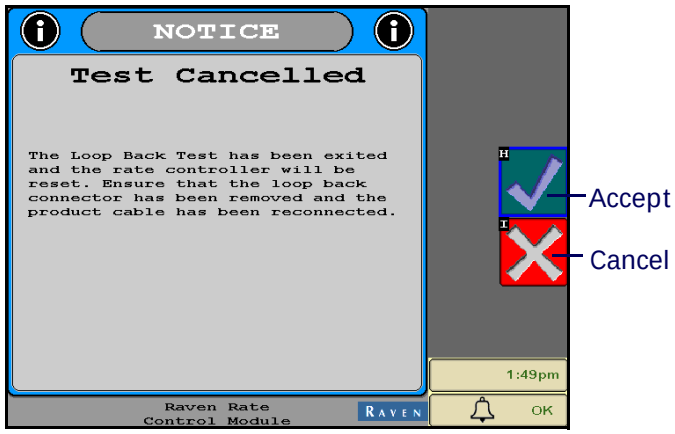
NOTE: The Start button will be grayed out if the product cable is connected or the master switch is on. Fix the issue to start the test.




10. If a failure is detected a Loop Back Failure Alert window will open. After reviewing the information of the Alert, select Accept.



11. After the loop back test is complete, press Accept to return to the test selection window. To exit the loop back test, select the cancel button.




12. Select the Accept button to exit the test or Cancel to return to the test.
13. Select the desired object pool.

## DIAGNOSTIC LEDS

There are four LEDs on the front of the ECU, labeled with the power symbol, A, B, and C. Each LED's color and blink rate indicates different information as detailed in the table below. If multiple states are true for a given LED the first active state listed in the table will be the state displayed. After addressing the displayed state (if needed), the next LED state will be indicated.

FIGURE 1. Raven Rate Controller LEDs


| LED | Main App Controlled | Color | Blinks Per Second | Status Name | Description |
|---|---|---|---|---|---|
| Power | No | GREEN | Solid | ECU powered | Active when ECU has power |
| A | No | OFF | Solid | Microprocessor Off | Active when the microprocessor is not powered |
| | No | ANY | Solid | System Fault | Active when the microprocessor has stopped functioning |
| | No | YELLOW | 1 | Boot Hold Mode | Active when the boot loader enters boot hold mode |
| | No | RED | 5 | Programming Microprocessor | Active when the microprocessor is being programmed |
| | Yes | RED | 1 | ISOBUS Offline | Active if the ISOBUS is offline |
| | Yes | WHITE | 1 | UT Offline | Active if the UT is offline |
| | Yes | PURPLE | 1 | Loop back Test Mode | Loop back test mode enabled |
| | Yes | GREEN | 1 | Systems Normal | Active when linked with UT and system is normal |

| LED | Main App Controlled | Color | Blinks Per Second | Status Name | Description |
|---|---|---|---|---|---|
| B | No | RED | Solid | FPGA not running | PCB subsystem not running (FPGA) |
| | Yes | RED | 1 | ECU Power Loss | System has lost ECU power |
| | Yes | BLUE | 1 | Rate Sensor Signal Present | Signal is present on 1 or more rate sensors |
| | Yes | YELLOW | 1 | DTC Active | One or more DTCs are active |
| | Yes | WHITE | 1 | System Under Voltage | System voltage is below 11.5 volts |
| | Yes | PURPLE | 1 | System Over Voltage | System voltage is above 16 volts |
| | Yes | BLUE | Solid | Product Enabled | One or more product switches have been set to On |
| | Yes | PURPLE | Solid | RPM Signal Present | Signal is present on one or more RPM sensors |
| | Yes | GREEN | Solid | All Products Disabled | All product switches have been set to Off |
| | Yes | RED | Solid | Current loopback test sequence failure | One or more loop back subtests failed in this current test sequence |
| | Yes | YELLOW | Solid | Previous loop back test sequence failure | One or more loop back subtests failed in the previous test sequence |
| | Yes | GREEN | Solid | No loop back subtests have failed | No loop back subtests have failed |
| C | No | RED | Solid | FPGA not running | PCB subsystem not running (FPGA) |
| | Yes | BLUE | 1 | Bluetooth Command | Bluetooth command has been received |
| | Yes | BLUE | Solid | Bluetooth Comm Active | Bluetooth communication is active |
| | Yes | GREEN | 1 | Aux CAN Active | The Auxiliary CAN channel is active |
| | Yes | RED | 1 | Aux CAN Comm Lost | Active if the Auxiliary CAN channel was active and is now offline |
| | Yes | GREEN | Solid | LED C Functional - No Error | LED C is functional and there are no other LED C states to report |
| | Yes | PURPLE | Solid | Loop back test in progress | A loop back test is in progress |
| | Yes | GREEN | Solid | Loop back test not in progress | A loop back test is not in progress |

# OUTPUTS TABLE - SINGLE PRODUCT

NOTE: Enabling optional features, such as fence row nozzles and agitators reduces the number of section controls.

| Output Number | 3-Wire Section Valves | 2-Wire Section Valves | $NH_3$ Tool | Tiered Boom Applications |
|---|---|---|---|---|
| 1 | Section 1 | Section 1 (+) | Section 1 | Section 1 |
| 2 | Section 2 | Section 1 (+) | Section 2 | Section 2 |
| 3 | Section 3 | Section 2(+) | Section 3 | Section 3 |
| 4 | Section 4 | Section 2 (-) | Section 4 | Section 4 |
| 5 | Section 5 | Section 3 (+) | Section 5 | Section 5 |
| 6 | Section 6 | Section 3 (-) | Section 6 | Section 6 |
| 7 | Section 7 | Section 4 (+) | Section 7 | Section 7 |
| 8 | Section 8 | Section 4 (-) | Section 8 | Section 8 |
| 9 | Section 9 | Section 5 (+) or agitator valve (+) | Boom pump (+) | Section 9 |
| 10 | Section 10 | Section 5 (-) or agitator valve (-) | Boost pump (-) | Section 10 |
| 11 | Section 15 or agitator value | Section 6 (+) or left fence row | | Section 15 or agitator valve |
| 12 | Section 16 or flow return (+) | Section 6 (-) or right fence row | | Section 16 or flow return (+) |
| 13 | Flow return (-) or left fence row | Section 7 (+) or flow return valve (-) | Master on-off valve | Section 17, tier 1 solenoid signal, flow return (-), or right fence row |
| 14 | Right fence row | Section 7 (-) or flow return valve (+) | | Section 18, tier 2 solenoid signal, or left fence row |
| 15 | Control valve (+) | Control valve (+) | Control valve (+) | Control valve (+) |
| 16 | Control valve (-) | Control valve (-) | Control valve (-) | Control valve (-) |
| 17 | Section 11 | | | Section 11 |
| 18 | Section 12 | | | Section 12 |
| 19 | Section 13 | | | Section 13 |
| 20 | Section 14 | | | Section 14 |
| 21 | | | | |
| 22 | | | | |
| 23 | | | | Section 19 |
| 24 | | | Fast control valve power | Section 20 |
| 25 | Flow return (+) | Section 8 (+) or agitator valve B (+) | | Flow return (+) |

| Output Number | 3-Wire Section Valves | 2-Wire Section Valves | $NH_3$ Tool | Tiered Boom Applications |
|---|---|---|---|---|
| 26 | Flow return (-) | Section 8 (-) or agitator valve b (-) | | Flow return (-) |
| 27 | | | Section 9 | |
| 28 | Agitator valve | | Section 10 | Agitator valve |
| 29 | Right fence row | Right fence row | | Right fence row |
| 30 | Left fence row | Left fence row | | Left fence row |
| 31 | | | | |
| 32 | | | | |

## OUTPUTS TABLE - MULTIPLE PRODUCTS

NOTE: Enabling optional features, such as fence row nozzles and agitators reduces the number of section controls.

| Output Number | $NH_3$ Tool | Spreader | Air Cart |
|---|---|---|---|
| 1 | Section 1 | Section 1 | Section 1 |
| 2 | Section 2 | Section 2 | Section 2 |
| 3 | Section 3 | Section 3 | Section 3 |
| 4 | Section 4 | Section 4 | Section 4 or input 22 |
| 5 | Section 5 | Product 5 control valve (+) or spinner PWM (+) | Product 5 control valve (+), section 5 (primary), or master clutch (secondary) |
| 6 | Section 6 | Product 5 control valve (-) or spinner PWM (-) | Product 5 control valve (-) or section 6 (primary) |
| 7 | Section 7 | | Input 21 or section 7 (primary) |
| 8 | Section 8 | | Master clutch (primary), section 8 (primary), or impute 10 |
| 9 | Boost pump (+) | Product 4 control valve (+) | Product 4 control valve (+) or section 9 (primary) |
| 10 | Boost pump (-) | Product 4 control valve (-) | Product 4 control valve (-) or section 10 (primary) |
| 11 | Product 2 control valve (+) | Product 3 control valve (+) | Product 3 control valve (+) or section 15 (primary) |
| 12 | Product 2 control valve (-) | Product 3 control valve (-) | Product 3 control valve (-) or section 16 (primary) |
| 13 | Master on-off valve | Product 2 control valve (+) | Product 2 control valve (+) |
| 14 | | Product 2 control valve (-) | Product 2 control valve (-) |
| 15 | NH3 control valve (+) | Product 1 control valve (+) | Product 1 control valve (+) |

| Output Number | $NH_3$ Tool | Spreader | Air Cart |
|---|---|---|---|
| 16 | NH3 control valve (-) | Product 1 control valve (-) | Product 1 control valve (-) |
| 17 | | | Section 11 |
| 18 | | | Section 12 |
| 19 | | | Section 13 |
| 20 | | | Section 14 |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | Fast control valve power | | |
| 25 | Product 3 control valve (+) | Section 11 | Next available section +6 |
| 26 | Product 3 control valve (-) | Section 12 | Next available section +7 |
| 27 | Section 9 | Section 5 | Next available section |
| 28 | Section 10 | Section 6 | Next available section +1 |
| 29 | Section 11 | Section 7 | Next available section +2 |
| 30 | Section 12 | Section 8 | Next available section +3 |
| 31 | Section 13 | Section 9 | Next available section +4 |
| 32 | Section 14 | Section 10 | Next available section +5 |

## INPUTS TABLE - SINGLE PRODUCT

NOTE: Enabling optional features, such as fence rows nozzles and agitators, reduces number of section controls.

| Input Number | Sprayer and Liquid Fertilizer Tool | $NH_3$ Tool |
|---|---|---|
| 1 | Flow meter signal | Flow meter signal |
| 2 | Fill flow meter signal | Master valve status |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | Valve status 4 |
| 7 | | Valve status 5 |
| 8 | | Valve status 3 |
| 9 | | Valve power 1 sense |
| 10 | | |
| 11 | | Valve power 2 sense |
| 12 | | |
| 13 | | Valve status 1 |
| 14 | Pressure signal 1 (boom pressure) | Pressure signal 1 (NH3 outlet) |

| Input Number | Sprayer and Liquid Fertilizer Tool | $NH_3$ Tool |
|---|---|---|
| 15 | | Valve status 2 |
| 16 | Pressure signal 2 (sparge pressure) | Pressure signal 2 (NH3 inlet) |
| 17 | | |
| 18 | | Pressure signal 3 |
| 19 | | Valve status 7 |
| 20 | | Valve status 8 |
| 21 | | |
| 22 | | |
| 23 | | Valve status 6 |
| 24 | Pump RPM signal | Pimp RPM signal |
| 25 | | |
| 26 | | |
| 27 | | |
| 28 | | Valve status 9 |
| 29 | | Valve status 10 |

## INPUTS TABLE - MULTIPLE PRODUCT

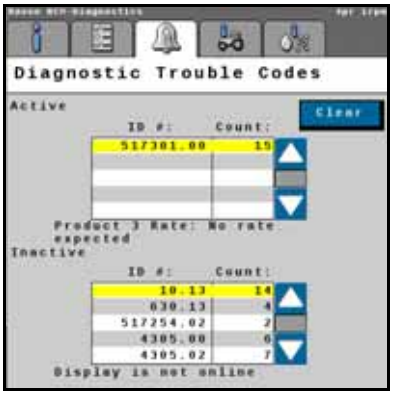
| Input Number | $NH_3$ | Spreader | Air Cart and Generic |
|---|---|---|---|
| 1 | Flow meter signal | Product 1 rate sensor signal | Product 1 rate sensor signal |
| 2 | Master valve status | Product 1 rate sensor signal (right-hand dual encoder) | Product 1 shaft sensor signal |
| 3 | | Product 2 rate sensor signal | Product 2 rate sensor signal |
| 4 | | Product 2 rate sensor signal (right-hand dual encoder) | Product 3 shaft sensor signal |
| 5 | Product 2 rate sensor signal | Product 3 rate sensor signal | Product 3 rate sensor signal |
| 6 | Valve status 4 | Product 3 rate sensor signal (right-hand dual encoder) | Product 3 shaft sensor signal |
| 7 | Valve status 5 | Product 4 rate sensor signal | Product 4 rate sensor signal |
| 8 | Valve status 3 | Product 4 rate sensor signal (right-hand dual encoder) | Product 4 shaft sensor signal |
| 9 | Valve power 1 sense | Product 5 rate sensor signal | Product 5 rate sensor signal |
| 10 | | Product 5 rate sensor signal (right-hand dual encoder) or pressure signal 5 | Product 5 shaft sensor signal or pressure signal 5 |
| 11 | Valve power 2 sense | | |
| 12 | Pressure signal 6 | Pressure signal 6 | Pressure signal 6 |
| 13 | Valve status 1 | Product 1 bin level signal | Product 1 bin level signal |

| Input Number | $NH_3$ | Spreader | Air Cart and Generic |
|---|---|---|---|
| 14 | Pressure signal 1 (NH3 outlet) | Pressure signal 1 (primary) | Pressure signal 1 (primary) |
| 15 | Valve status 2 | Product 2 bin level signal | Product 1 bin level signal |
| 16 | Pressure signal 2 (NH3 inlet) | Pressure signal 2 (primary) | Pressure signal 2 (primary) |
| 17 | Product 2 bin level signal | Product 3 bin level signal | Product 3 bin level signal |
| 18 | Pressure signal 3 | Pressure signal 3 (primary) | Pressure signal 3 (primary) |
| 19 | Valve status 7 | Product 2 bin level signal | Product 4 bin level signal |
| 20 | Valve status 8 | Pressure signal 4 (primary) | Pressure signal 4 (primary) |
| 21 | | Product 5 bin level signal | Product 5 bin level signal |
| 22 | | | |
| 23 | Valve status 6 | | Fan 2 PRM signal |
| 24 | Pump, fan, or spinner RPM signal | Fan or spinner RPM signal | Fan 1 RPM signal |
| 25 | Master switch | Master switch | Master switch |
| 26 | Implement height switch | Implement height | |
| 27 | Product 3 rate sensor signal | Pressure signal 4 (secondary) | Pressure signal 4 (secondary) |
| 28 | Valve status 9 | Pressure signal 3 (secondary) | Pressure signal 3 (secondary) |
| 29 | Product 3 bin level signal or valve status 10 | Pressure signal 2 (secondary) | Pressure signal 2 (secondary) |
| 30 | Pressure signal 4 | Pressure signal 1 (secondary) | Pressure signal 1 (secondary) |
| | | | |

# CHAPTER 11 DIAGNOSTICS TROUBLE CODES

## ACCESSING DIAGNOSTIC TROUBLE CODES

1. Select the Diagnostics button.
2. Select the Diagnostic Trouble Codes (DTC) tab.
    - Current trouble codes appear in the Active table. The DTC Identification number and occurrence count is listed.
    - Resolved trouble codes appear in the Inactive table. The DTC Identification number and occurrence count is listed.
3. Use the up and down arrows to scroll through the list of trouble codes. A description of the highlighted code is shown below each table.
4. If desired, press the Clear button to erase all the trouble codes listed in the Inactive table.




## DIAGNOSTIC TROUBLE CODES (DTC)

The table below provides the DTC number, a brief alarm description, and a possible solution.

| DTC | Alarm Description | Solution |
|---|---|---|
| 0.00 | Default no error state. | No Action Required |
| 158.03 | Switched Supply Voltage High. | Check the vehicle battery to ensure power harnessing is connected to a 12 VDC battery. |
| 158.04 | Switched Supply Voltage Low. | Check the vehicle battery to ensure power harnessing is connected to a 12 VDC battery. |
| 628.02 | NVM Warning | |
| 628.13 | NVM Invalid | |
| 628.13 | NVM Error | |

| DTC | Alarm Description | Solution |
|---|---|---|
| 630.13 | System configuration or calibration required. | Ensure all calibration parameters have valid data. |
| 4305.00 | Application speed exceeded. | Operate at lower application speeds. |
| 4305.02 | Speed is below operational speed | Operation at higher application speeds. |
| 520192.01 | Low Current Power Loss | |
| 520453.31 | FPGA has not loaded correctly | Contact your Raven dealer or a qualified service provider. |
| 522992.02 | Scale 1 - Load cell voltage invalid | Check load cell sensor connections and cabling. |
| 522993.02 | Scale 2 - Load cell voltage invalid | Check load cell sensor connections and cabling. |
| 522994.02 | Scale 3 - Load cell voltage invalid | Check load cell sensor connections and cabling. |
| 522995.02 | Scale 4 - Load cell voltage invalid | Check load cell sensor connections and cabling. |
| 523075.08 | Implement Height Switch Malfunction | Service the Implement Height Switch. |
| 523148.01 | Valve power sense circuit 1 error | Check fuses in IBIC harness. |
| 523149.01 | Valve power sense circuit 2 error | Check fuses in IBIC harness. |
| 523150.01 | Valve power harness error | Ensure that the product harness is connected and all fuses in IBIC harness are not blown. |
| 523160.17 | Product bin/tank 1 volume has fallen below the operator designated minimum level. | Refill the bin/tank. |
| 523196.00 | Section valve master open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523196.01 | Section valve master closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523200.00 | Section valve 1 open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523200.01 | Section valve 1 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523201.00 | Section valve 2 open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523201.01 | Section valve 2 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523202.00 | Section valve 3 open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523202.01 | Section valve 3 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523203.00 | Section valve 4 open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523203.01 | Section valve 4 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523204.00 | Section valve 5 open when it should be closed | Contact your Raven dealer or a qualified service provider. |

| DTC | Alarm Description | Solution |
|---|---|---|
| 523204.01 | Section valve 5 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523205.00 | Section valve 6 open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523205.01 | Section valve 6 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523206.00 | Section valve 7 open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523206.01 | Section valve 7 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523207.00 | Section valve 8 open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523207.01 | Section valve 8 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523208.00 | Section valve 9 open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523208.01 | Section valve 9 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523209.00 | Section valve 10 open when it should be closed | Contact your Raven dealer or a qualified service provider. |
| 523209.01 | Section valve 10 closed when it should be open | Contact your Raven dealer or a qualified service provider. |
| 523232.04 | Pressure 1 - Sensor not detected | Check the pressure transducer connection and cabling. |
| 523232.13 | Pressure 1 - Sensor not calibrated | Calibrate the pressure sensor. |
| 523232.16 | Pressure 1 - Pressure above maximum set point | Reduce the equipment speed or adjust the maximum pressure setting. |
| 523232.18 | Pressure 1 - Pressure below minimum set point | Increase the equipment speed or adjust the minimum pressure setting. |
| 523233.04 | Pressure 2 - Sensor not detected | Check the pressure transducer connection and cabling. |
| 523233.13 | Pressure 2 - Sensor not calibrated | Calibrate the pressure sensor. |
| 523233.16 | Pressure 2 - Pressure above maximum set point | Reduce the equipment speed or adjust the maximum pressure setting. |
| 523233.18 | Pressure 2 - Pressure below minimum set point | Increase the equipment speed or adjust the minimum pressure setting. |
| 523234.04 | Pressure 3 - Sensor not detected | Check the pressure transducer connection and cabling. |
| 523234.13 | Pressure 3 - Sensor not calibrated | Calibrate the pressure sensor. |
| 523234.16 | Pressure 3 - Pressure above maximum set point | Reduce the equipment speed or adjust the maximum pressure setting. |
| 523234.18 | Pressure 3 - Pressure below minimum set point | Increase the equipment speed or adjust the minimum pressure setting. |
| 523235.04 | Pressure 4 - Sensor not detected | Check the pressure transducer connection and cabling. |

| DTC | Alarm Description | Solution |
|---|---|---|
| 523235.13 | Pressure 4 - Sensor not calibrated | Calibrate the pressure sensor. |
| 523235.16 | Pressure 4 - Pressure above maximum set point | Reduce the equipment speed or adjust the maximum pressure setting. |
| 523235.18 | Pressure 4 - Pressure below minimum set point | Increase the equipment speed or adjust the minimum pressure setting. |
| 523236.04 | Pressure 5 - Sensor not detected | Check the pressure transducer connection and cabling. |
| 523236.13 | Pressure 5 - Sensor not calibrated | Calibrate the pressure sensor. |
| 523236.16 | Pressure 5 - Pressure above maximum set point | Reduce the equipment speed or adjust the maximum pressure setting. |
| 523236.18 | Pressure 5 - Pressure below minimum set point | Increase the equipment speed or adjust the minimum pressure setting. |
| 523237.04 | Pressure 6 - Sensor not detected | Check the pressure transducer connection and cabling. |
| 523237.13 | Pressure 6 - Sensor not calibrated | Calibrate the pressure sensor. |
| 523237.16 | Pressure 6 - Pressure above maximum set point | Reduce the equipment speed or adjust the maximum pressure setting. |
| 523237.18 | Pressure 6 - Pressure below minimum set point | Increase the equipment speed or adjust the minimum pressure setting. |
| 523242.01 | Product Pump 1 - PWM Pump dry | Verify there is product in the tank for the pump. |
| 523242.07 | Product Pump 1 - AccuFlow HP+ boost pump fault | Contact your Raven dealer or a qualified service provider. |
| 523242.18 | Product Pump 1 - Non-PWM Pump dry | Verify there is product in the tank/bin for the pump. |
| 523243.01 | Product Pump 2 - PWM Pump dry | Verify there is product in the tank for the pump. |
| 523243.18 | Product Pump 2 - Non-PWM Pump dry | Verify there is product in the tank for the pump. |
| 523244.01 | Product Pump 3 - PWM Pump dry | Verify there is product in the tank for the pump. |
| 523244.18 | Product Pump 3 - Non-PWM Pump dry | Verify there is product in the tank for the pump. |
| 523245.01 | Product Pump 4 - PWM Pump dry | Verify there is product in the tank for the pump. |
| 523245.18 | Product Pump 4 - Non-PWM Pump dry | Verify there is product in the tank for the pump. |
| 523246.01 | Product Pump 5 - PWM Pump dry | Verify there is product in the tank for the pump. |
| 523246.18 | Product Pump 5 - Non-PWM Pump dry | Verify there is product in the tank for the pump. |
| 523247.01 | Product Pump 6 - PWM Pump dry | Verify there is product in the tank for the pump. |
| 523247.18 | Product Pump 6 - Non-PWM Pump Dry | Verify there is product in the tank for the pump. |

| DTC | Alarm Description | Solution |
|---|---|---|
| 523253.17 | Product 2 Injection - Pump lost communication | Check power and ISOBUS connections to the injection pump. |
| 523254.17 | Product 3 Injection - Pump lost communication | Check power and ISOBUS connections to the injection pump. |
| 523255.17 | Product 4 Injection - Pump lost communication | Check power and ISOBUS connections to the injection pump. |
| 523256.17 | Product 5 Injection - Pump lost communication | Check power and ISOBUS connections to the injection pump. |
| 523257.17 | Product 6 Injection - Pump lost communication | Check power and ISOBUS connections to the injection pump. |
| 523262.15 | RPM 1 - Above maximum threshold | Contact your Raven dealer or a qualified service provider. |
| 523262.17 | RPM 1 - Below minimum threshold | Contact your Raven dealer or a qualified service provider. |
| 523263.15 | RPM 2 - Above maximum threshold | Contact your Raven dealer or a qualified service provider. |
| 523263.17 | RPM 2 - Below minimum threshold | Contact your Raven dealer or a qualified service provider. |
| 523285.01 | Product 1 Shaft Sensor - No rate detected. | Contact your Raven dealer or a qualified service provider. |
| 523286.01 | Product 2 Shaft Sensor - No rate detected. | Contact your Raven dealer or a qualified service provider. |
| 523287.01 | Product 3 Shaft Sensor - No rate detected. | Contact your Raven dealer or a qualified service provider. |
| 523288.01 | Product 4 Shaft Sensor - No rate detected. | Contact your Raven dealer or a qualified service provider. |
| 523289.01 | Product 5 Shaft Sensor - No rate detected. | Contact your Raven dealer or a qualified service provider. |
| 523290.01 | Product 6 Shaft Sensor - No rate detected. | Contact your Raven dealer or a qualified service provider. |
| 523295.01 | Product 1 Dual Encoder - Feedback out of tolerance. | Contact your Raven dealer or a qualified service provider. |
| 523296.01 | Product 2 Dual Encoder - Feedback out of tolerance. | Contact your Raven dealer or a qualified service provider. |
| 523297.01 | Product 3 Dual Encoder - Feedback out of tolerance. | Contact your Raven dealer or a qualified service provider. |
| 523298.01 | Product 4 Dual Encoder - Feedback out of tolerance. | Contact your Raven dealer or a qualified service provider. |
| 523299.01 | Product 5 Dual Encoder - Feedback out of tolerance. | Contact your Raven dealer or a qualified service provider. |
| 523300.01 | Product 6 Dual Encoder - Feedback out of tolerance. | Contact your Raven dealer or a qualified service provider. |
| 523305.00 | Product 1 Rate - No rate expected. | Check connection to the control valve. |
| 523305.01 | Product 1 Rate - No rate detected. | Check connections to the control valve and flow sensor. |
| 523306.00 | Product 2 Rate - No rate expected. | Check connection to the control valve. |

| DTC | Alarm Description | Solution |
|---|---|---|
| 523306.01 | Product 2 Rate - No rate detected. | Check connections to the control valve and flow sensor. |
| 523307.00 | Product 3 Rate - No rate expected. | Check the connection tot he control valve. |
| 523307.01 | Product 3 Rate - No rate detected. | Check connections to the control valve and flow sensor. |
| 523308.00 | Product 4 Rate - No rate expected. | Check the connection to the control valve. |
| 523308.01 | Product 4 Rate - No rate detected. | Check connections to the control valve and flow sensor. |
| 523309.00 | Product 5 Rate - No rate expected. | Check connections to the control valve. |
| 523309.01 | Product 5 Rate - No rate detected. | Check the connections to the control valve and flow sensor. |
| 523310.00 | Product 6 Rate - No rate expected | Check connections to the control valve. |
| 523310-01 | Product 6 Rate - No rate detected | Check the connections to the control valve and flow sensors. |
| 524082.13 | Display is not online | Check ISOBUS and power connections to the Raven Rate Control Module. |
| NA | Incompatible HW | |
| NA | Loopback test failed | |
| NA | Loopback test canceled | |
| NA | Loopback test warning | |
| NA | Manual bin chaining ready | |
| NA | Object pool will go offline | |
| NA | Test canceled | |
| NA | Product 2 Injection - Injection pressure below carrier pressure | |
| NA | Product 3 Injection - Injection pressure below carrier pressure | |
| NA | Product 4 Injection - Injection pressure below carrier pressure | |
| NA | Product 5 Injection - Injection pressure below carrier pressure | |
| NA | Product 6 Injection - Injection pressure below carrier pressure | |
| NA | Granular test warning | |
| NA | Liquid test warning | |
| NA | $NH_3$ test warning | |
| NA | New blockage system detected | |
| NA | Product 1 Rate - Calibration required | |
| NA | Product 2 Rate - Calibration required | |
| NA | Product 3 Rate - Calibration required | |
| NA | Product 4 Rate - Calibration required | |
| NA | Product 5 Rate - Calibration required | |
| NA | Product 6 Rate - Calibration required | |

| DTC | Alarm Description | Solution |
|---|---|---|
| NA | New switchbox detected | |
| NA | Product 1 Rate - Rate above target | |
| NA | Product 2 Rate - Rate above target | |
| NA | Product 3 Rate - Rate above target | |
| NA | Product 4 Rate - Rate above target | |
| NA | Product 5 Rate - Rate above target | |
| NA | Product 6 Rate - Rate above target | |
| NA | New direct injection pump detected | |
| NA | Product 1 - PWM duty maximum detected | |
| NA | Product 2 - PWM duty maximum detected | |
| NA | Product 3 - PWM duty maximum detected | |
| NA | Product 4 - PWM duty maximum detected | |
| NA | Product 5 - PWM duty maximum detected | |
| NA | Product 6 - PWM duty maximum detected | |
| NA | Product 1 Rate - Rate below target | |
| NA | Product 2 Rate - Rate below target | |
| NA | Product 3 Rate - Rate below target | |
| NA | Product 4 Rate - Rate below target | |
| NA | Product 5 Rate - Rate below target | |
| NA | Product 6 Rate - Rate below target | |
| NA | Product bin/tank 1 volume has fallen below the operator designated minimum level | |
| NA | Product bin/tank 2 volume has fallen below the operator designated minimum level | |
| NA | Product bin/tank 3 volume has fallen below the operator designated minimum level | |
| NA | Product bin/tank 4 volume has fallen below the operator designated minimum level | |
| NA | Product bin/tank 5 volume has fallen below the operator designated minimum level | |
| NA | Product bin/tank 6 volume has fallen below the operator designated minimum level | |
| NA | Product 1 Rate - Volume per minute below minimum | |
| NA | Product 1 - PWM duty cycle minimum reached. | |
| NA | Product 2 Rate - Volume per minute below minimum | |
| NA | Product 2 - PWM duty cycle minimum reached. | |
| NA | Product 3 Rate - Volume per minute below minimum | |

| DTC | Alarm Description | Solution |
|---|---|---|
| NA | Product 3 - PWM duty cycle minimum reached. | |
| NA | Product 4 Rate - Volume per minute below minimum | |
| NA | Product 4 - PWM duty cycle minimum reached. | |
| NA | Product 5 Rate - Volume per minute below minimum | |
| NA | Product 5 - PWM duty cycle minimum reached. | |
| NA | Product 6 Rate - Volume per minute below minimum | |
| NA | Product 6 - PWM duty cycle minimum reached. | |
| NA | Product bin/tank 1 level indicated empty bin/tank | |
| NA | Product bin/tank 2 level indicated empty bin/tank | |
| NA | Product bin/tank 3 level indicated empty bin/tank | |
| NA | Product bin/tank 4 level indicated empty bin/tank | |
| NA | Product bin/tank 5 level indicated empty bin/tank | |
| NA | Product bin/tank 6 level indicated empty bin/tank | |
| NA | Blockage system offline | |
| NA | Product 1 Rate - Application attempted with no controlled RPM speed. | |
| NA | Product 1 Rate - Application attempted with no monitored RPM speed. | |
| NA | Product 2 Rate - Application attempted with no controlled RPM speed. | |
| NA | Product 2 Rate - Application attempted with no monitored RPM speed. | |
| NA | Product 3 Rate - Application attempted with no controlled RPM speed. | |
| NA | Product 3 Rate - Application attempted with no monitored RPM speed. | |
| NA | Product 4 Rate - Application attempted with no controlled RPM speed. | |
| NA | Product 4 Rate - Application attempted with no monitored RPM speed. | |
| NA | Product 5 Rate - Application attempted with no controlled RPM speed. | |

| DTC | Alarm Description | Solution |
|---|---|---|
| NA | Product 5 Rate - Application attempted with no monitored RPM speed. | |
| NA | Product 6 Rate - Application attempted with no controlled RPM speed. | |
| NA | Product 6 Rate - Application attempted with no monitored RPM speed. | |
| NA | Communication lost with switchbox | |
| NA | Scale 1 - Unexpected weight increase | |
| NA | Scale 2 - Unexpected weight increase | |
| NA | Scale 3 - Unexpected weight increase | |
| NA | Scale 4 - Unexpected weight increase | |

# APPENDIX A CALIBRATION VALUES

## SECTION WIDTHS

Use the following formulas to help calculate the section widths.

Calculate the section width with the formula:

$$T \times S = SW$$

Where T = the number of Tips in each section, S = the Spacing between tips, and SW = the Section Width.

FOR EXAMPLE:

20 tips in a section with spacing of 40 inches [50.8 cm] would yield:

$$20 \times 40 = 800$$

or a Section Width of 800 inches [2032 cm] (approximately 67 feet [20 m]). Enter 800 [2032] as the width for this section.

## TARGET RATE CALIBRATION

The following information must be known in order to determine which spray nozzles to use with the sprayer:

- Nominal Application Pressure_____ PSI [kpa]
- Target Application Rate_____ GPA [lit/ha]
- Target Speed_____ MPH [km/h]
- Nozzle Spacing_____ inches [cm]

From this information, calculate the volume per minute per nozzle as follows:

$$NVPM = \frac{Rate \times Speed \times NS}{5,940 [60,000]}$$

NVPM = Nozzle Volume per Minute (gallons/acre [lit/ha]), Rate = target application Rate, Speed = target Speed of application, and NS = Nozzle Spacing

FOR EXAMPLE:

Application Pressure = 30 PSI, Target Application Rate = 20 GPA, Target Speed = 5.2 MPH, and Nozzle Spacing = 20 inches

$$NVPM = \frac{20 \times 5.2 \times 20}{5,940} = 0.35$$

Using the calculated nozzle volume per minute of 0.35 at an application pressure of 30, select a boom nozzle which comes closest to providing the desired output.

# APPENDIX B REMOTE CONTROL AND DIAGNOSTICS MOBILE APP

## SECTION CONTROL REMOTE 2.0 OPERATION

Refer to the Section Control Remote 2.0 Operation Guide (P/N 016-0171-685) for assistance with using the Section Control Remote 2.0 with the RCM or ..

## DIAGNOSTICS MOBILE APP OPERATION

The Raven Diagnostics mobile app allows the operator to control sections and perform diagnostics through a mobile device such as a smart phone or tablet.

NOTE: The Raven Diagnostics Application is available for download from the Google Play Store and Apple App Store. A Bluetooth low energy (BLE) compatible device is required to connect with the system.

FIGURE 1. Diagnostics Application Icon

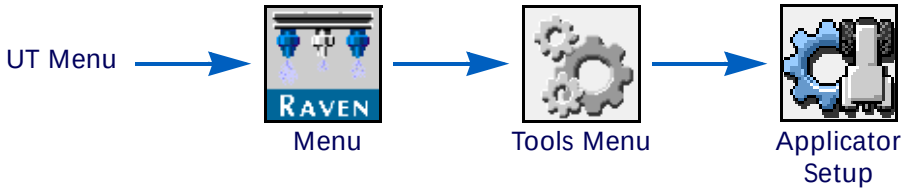

The mobile app allows the operator to turn on and turn off boom sections, the product pump, and view real-time system diagnostics without returning to the cab.

### CONNECT THE MOBILE APP

#### INSIDE THE MACHINE CAB

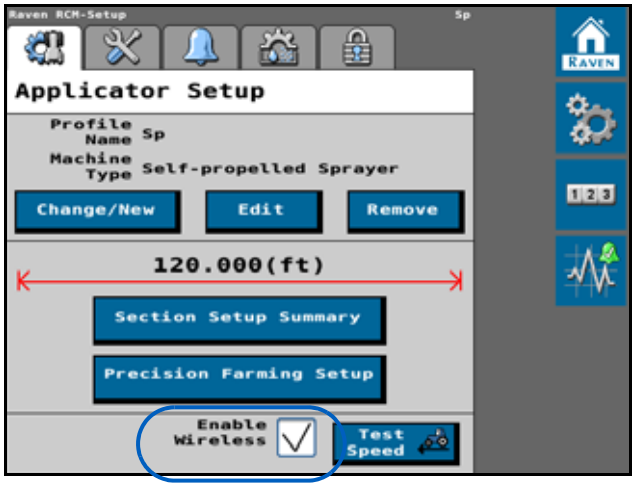
1. Verify that the system speed is zero by checking the speed display on the home screen.
2. Confirm that there are no active DTCs for the ECU or the NCV bus.
3. Verify that Bluetooth is enabled on the mobile device.
4. Turn on all boom section switches and the master switch.

5. Next, enable Bluetooth communication with the ECU. To enable Bluetooth via the UT:




a. Open the UT Menu and select the Menu button.
b. Select the Tools Menu softkey along the right side of the display.
c. Select the Applicator Setup tab along the top of the display.
d. Select the Enable Wireless option at the bottom of the page.
e. Select the Enable Wireless option.

FIGURE 2. Enable Wireless




NOTE: Take note of the Wireless ID and passcode on the prompt displayed on the UT. This information will be necessary to connect to the RCM ECU.

FIGURE 3. Wireless Connection Confirmation

IMPORTANT: Do not attempt to connect the Raven Diagnostics app and RCM devices yet.

### OUTSIDE OF THE MACHINE CAB

1. Exit the cab and go to the back of the machine until you have a clear view of the RCM ECU mounting location.

NOTE: The RCM may be mounted within an enclosure and not be directly visible on some OEM installations.

2. Open the Raven Diagnostics mobile app and wait for the app to finish scanning for devices.
3. When prompted, enter the Hardware Serial Number as the passcode. The passcode should only be required the first time that the mobile device is paired with the ECU.
4. Once the mobile app is connected to the RCM, the operator may:

- Toggle the product pump on and off using the pump icon in the mobile app.
- Toggle boom sections and NCVs on and off as needed using the ON and OFF buttons, Left/Right Indexing Arrows, or the sections displayed on the application.
    - Sections and NCVs will turn on as the boom is mapped for conventional or bypass section control.To take control of boom sections, use the off and on buttons.

## DISCONNECT THE MOBILE APP

1. Turn off sections and pump in the mobile app.
2. Turn off all boom section switches and the master switch.
3. Disconnect the mobile app or move the vehicle. This will disable the Enable Wireless Control option on the User Settings page.

NOTE: The mobile app will display Control Disabled if the Enable Wireless Control option is disabled on the User Settings page or if the boom and master switches are in the wrong position.

## MOBILE APP SCREENS

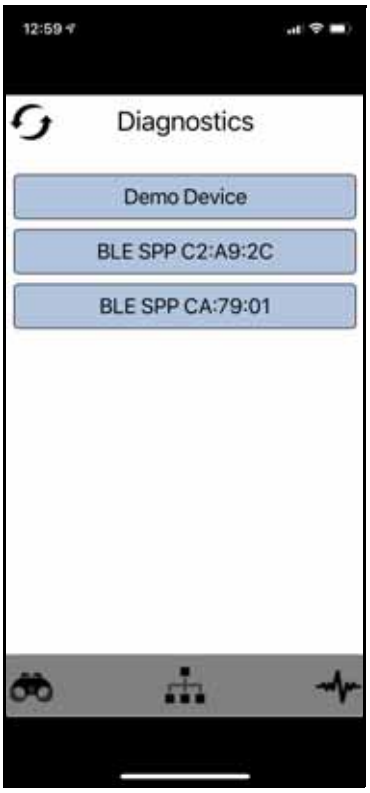
The following screens are available at the bottom of the Raven Diagnostics mobile app:

Device List | Wireless System Control | Diagnostics

### DEVICE LIST

The Device List screen will display each time that the app is opened and is used to select the desired device to connect with for wireless diagnostics.

FIGURE 4. Device List Screen




Select the desired ECU Wireless ID and enter the passcode.

NOTE: The wireless ID and passcode are displayed on the UT when the Enable Wireless Control option is selected. If the mobile device and ECU have been connected previously, the mobile app will automatically switch to the Wireless System Control screen.

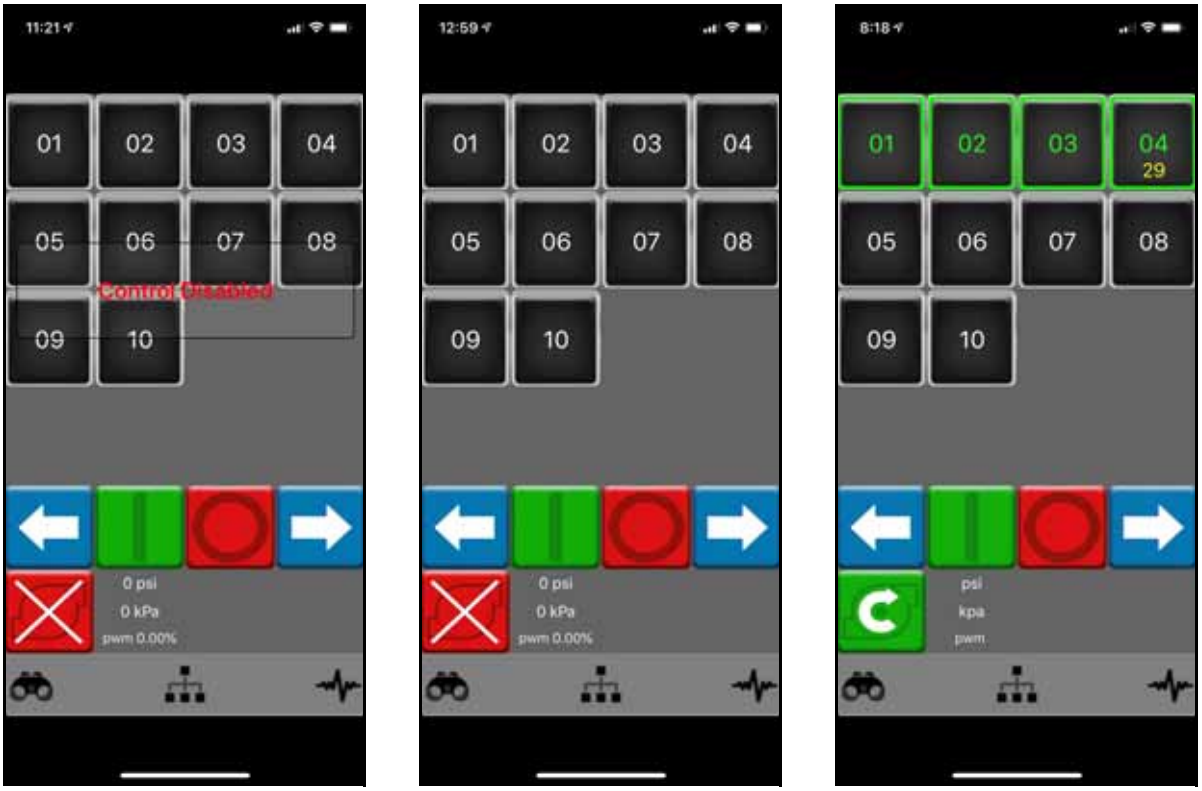
Touch the Refresh icon in the upper, left corner of the page to rescan for devices if necessary.

NOTE: Only one ECU can be connected at a time. The ECU wireless ID will not show up if it is connected to another mobile device.

NOTE: Select Demo Device to open the mobile app in demo mode. This mode may be used to explore the mobile app while not connected with a device.

## WIRELESS SYSTEM CONTROL SCREEN

FIGURE 5. Wireless System Control Screens



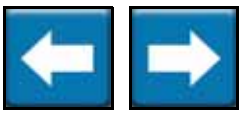

Control Disabled

Pump Off
All Sections Disabled

Pump On
Sections 1 through 4
Enabled

NOTE: Control Disabled indicates that the app is unable to control boom sections. Review the *Diagnostic Application Best PracticesConnect the Mobile App* section on page 116 and confirm that the required conditions are met.

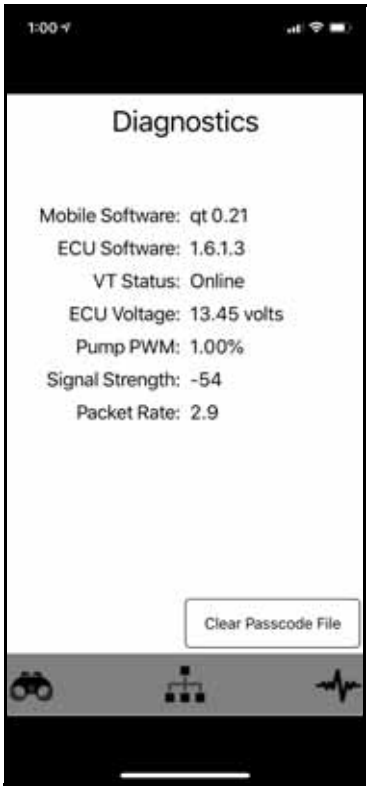
TABLE 1. Mobile App Icons

| Icon | Function |
|---|---|
|  <br>On Off | The status of each configured section is displayed in the upper portion of the Diagnostic app.<br><br>Sections with a gray boarder are disabled or off. When active, a section will display with a green boarder.<br><br>A timer is also displayed for active sections. When the timer expires, all active sections will be toggled off.<br><br>NOTE: Any section may be manually toggled off before the counter expires by touching the section or the All Sections Off icon described below. |
|  <br>Left Right | Use the left or right arrow keys to toggle the next section on the boom.<br><br>The arrow keys will automatically toggle the current section off and the adjacent left or right section on, depending upon which arrow key is used.<br><br>NOTE: If no sections are active, using the arrow keys will start from the furthest section on the boom (e.g. right section when using the left arrow key) and move to the next section based upon the direction arrow used. |
|  <br>On Off | Toggle all sections on or off. |
|  <br>On Off | The state of the pump is displayed in the lower, left corner of the screen. Tap the icon to toggle the product pump on or off. |

## DIAGNOSTICS

The Diagnostics screen information about the ECU and may be used to assist with system diagnostics.

FIGURE 6. Diagnostics Screen




Mobile Software. Version information for the mobile app currently installed on the mobile device.

ECU Software. Software version of the connected ECU.

UT Status. Displays the status of the ISOBUS connection with the UT display.

ECU Voltage. The voltage detected at the ECU.

Pump PWM. The monitored duty cycle of the product pump.

Signal Strength. Bluetooth signal strength at the time of connection.

Packet Rate. Speed of the Bluetooth data connection between the ECU and the connected mobile device.

Clear Passcode File Button. Touch this button to clear all passcodes entered into the mobile app. A passcode will be required the next time the mobile app is connected with the ECU.

# APPENDIX C SETTINGS AND HELP SCREEN TERMINOLOGY

TABLE 1. Setting and Help Screen Terminology

| Setting | Help Screen Terminology |
|---|---|
| Control Deadband | Allowable difference between the target and actual application rate. Rate correction is not performed as long as the application rate is within the allowable range. |
| Control Valve Type | Select the type of control valve used to control the product application. Valve types include: Standard, Fast, Fast Close, PWM, and PWM Close. |
| Display Smoothing | Enable the Display Smoothing feature to display target rate as actual rate when rate is within 10% of the target rate. Actual rate will be displayed if rate controller does not reach control deadband within ten seconds. |
| Enable Fence Rows | Enable Fence Rows if sprayer is equipped. On-screen soft switches or physical switches can be assigned to control fence row valves. Restart the setup wizard to modify this setting. |
| Fill Flow Meter Cal | The fill flow meter calibration value and units may be found on the tag attached to the flow meter installed in the tank fill system. Select the appropriate units for the flow meter calibration to ensure proper calibration of the tank fill system. |
| Flow Meter Cal | The flow meter calibration value and units may be found on the tag attached to the flow meter installed in the application system. Select the appropriate units for the flow meter calibration to ensure proper calibration of the application system. |
| Implement Switch | The implement switch senses the position of the toolbar and turns off application when raised and enables application when lowered. |
| Low Tank Limit | Enable the Low Tank feature and enter desired volume threshold at which an alert will be displayed for low tank condition. Tank volume must be either manually set upon refilling or tank fill flow meter utilized to automatically monitor tank level. |
| Max Pump PWM | Enter a maximum PWM duty cycle percent to set the maximum desired output for a pulse width modulated (PWM) hydraulic control valve. This setting limits how far the PWM valve will open. |
| Maximum Pressure | Enter the maximum desired pressure for the system. Upon exceeding maximum pressure, an alert will be displayed, flow control will be overridden and the rate controller will maintain maximum pressure. |
| Min Pump PWM | Enter a minimum PWM duty cycle percent to set the minimum desired output (zero point or shutoff point) for a pulse width modulated (PWM) hydraulic control valve). |
| Minimum Pressure | The minimum pressure feature will allow the operator to set the lowest tolerable pressure during field operations. If the application system reaches the minimum pressure, the UT will display an alert and application system will maintain the flow rate to keep the monitored pressure consistent and to maintain the spray pattern. |
| Number of Sections | The number of sections is the number of section valves installed on the machine. |

| Setting | Help Screen Terminology |
|---|---|
| Pressure Transducer Type | Select the pressure sensor range from the drop down Menu. Refer to OEM for transducer installed, or Raven part numbers. |
| Pressure Sensor Type | Select the pressure sensor drop down field and select the transducer to be calibrated for operation. |
| PWM Standby | Enter desired control valve PWM duty cycle percent when all sections are off. This is utilized when standby pressure control is not available (pressure sensor not available or direct injection is installed). |
| Rate Presets | Enter desired rate presets to allow the operator to quickly switch between target rates during field operation in the automatic rate control mode. |
| Response Rate | The response rate has a range of 1 to 100 and the setting determines how aggressively the target is controlled to. Increasing this value will cause the system to respond more quickly. Decreasing it will cause a slower response. If the system is slow to reach the target value consider increasing it. |
| Speed Cal | Enter the Speed Cal value of radar speed sensor (if equipped). Reference radar manufacturer's specification for recommended value and perform distance calibration to ensure accuracy. |
| Tank Capacity | Enter maximum capacity of the tank. |
| Tank Volume | Enter the current tank level. |

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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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