

**Raven Operating System (ROS)
for Case IH Flex-Air Calibration
& Operation Manual**

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CALIBRATION REFERENCE SHEET

Record the settings and calibration values used when programming the ROS device and keep this sheet for future reference or when contacting a service technician. Circle the setting selected on the ROS device for the following options:

Units	US ^a		Metric ^b		Turf ^c
Speed Sensor	Wheel Speed (SP1)	Radar (SP2)	GPS	Speed Cal	

- Settings displayed in inches (in), gallons (gal), acres (ac), miles per hour (mph).
- Settings displayed in centimeters (cm), liters (L), hectares (ha), kilometers per hour (km/h).
- Settings displayed in inches (in), gallons per 1000 square feet (gal/1000 ft²), miles per hour (mph)

Write down the selected settings for each configured control channel in the spaces provided:

	Control Channel 1	Control Channel 2	Control Channel 3	Control Channel 4	Control Channel 5
Control Type					
Valve Type					
Meter Cal					
Valve Cal					
Rate Cal					
Tank Capacity					
Spreader Constant					

	Control Channel 6	Control Channel 7	Control Channel 8	Control Channel 9	Control Channel 10
Control Type					
Valve Type					
Meter Cal					
Valve Cal					

Rate Cal	
Tank Capacity	

Write down the calculated calibration values in the spaces provided:

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

UNIT DEFINITIONS AND CONVERSIONS

UNIT OF MEASURE DEFINITIONS

Abbreviation	Definition	Abbreviation	Definition
GPM	Gallons per Minute	PPK	Pounds per 1,000 square feet
L/min	Liters per Minute	mm	Millimeters
dL/min	Deciliters per Minute	cm	Centimeters
PSI	Pounds per Square Inch	dm	Decimeters
kPa	Kilopascal	m	Meter
GPA	Gallons per Acre	MPH	Miles per Hour
L/ha	Liters per Hectare	km	Kilometers
mL/ha	Milliliters per Hectare	km/h	Kilometers per Hour
GPK	Gallons per 1,000 Square Feet		
lbs./min.	Pounds per Minute		
kg/min	Kilograms per Minute		
lbs./acre	Pounds per Acre	[]	Metric Conversions
kg/ha	Kilograms per Hectare	{ }	Turf Unit Conversions

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
<u>Original METER CAL Number</u> 128	<u>Original METER CAL Number</u> 3.785	<u>Original METER CAL Number</u> Weight of One Gallon of Product

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)

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

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

Volume

Liquid

- 1 inch = 25.4 mm or 2.54 cm
- 1 mile = 1.609 km

Area

- 1 kilogram = 2.2 pounds
- 1 pound = 0.455 kilograms

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 ROS device.

- Follow all safety information in this manual.
- Contact a local Raven dealer for additional assistance or support with any portion of the installation or service of Raven equipment.
- Follow all safety labels affixed to the system components. Keep safety labels in good condition and replace any missing or damaged labels. Contact a local Raven dealer to obtain replacements for missing or damaged safety labels.

When operating the machine after installing the ROS device, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate the device while under the influence of alcohol or illegal substances.
- Remain in the operator's position at all times when the ROS device is engaged or operating product control or any additional automated features. Disable control functions or features when exiting the operator's position.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling the ROS device or any optional features when the safe working distance has been diminished.
- Ensure the device is disabled prior to starting any maintenance work on the machine.
- Follow all label instructions for proper chemical mixing, handling, and container disposal methods.
- Review procedures for safe handling and use of agricultural chemicals and products with a chemical supplier. Contact a local chemical supplier, or the appropriate agricultural department, for information on obtaining the necessary training.
- Do not attempt to modify or lengthen any of the system cables. Contact a local Raven dealer for available extension cables.

WARNING

AGRICULTURAL CHEMICALS

- 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 storage 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.

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

This document provides information regarding configuration of a Raven CANbus control system using a compatible ROS device:

- Application Types
- Product Control System Configuration and Tuning
- Product Configurations
- Product System Alarms

ROS PRODUCT CONTROL FEATURES

The following descriptions offer a brief introduction to the capabilities of a Raven CANbus product control system used with a ROS device and some of the optional features available for use with each of these systems.

NOTE: This document provides a discussion and illustration of product control settings, prompts, and features for use with a Raven CANbus control system. Settings and features available on an ISOBUS control system will vary depending upon the ECU and VT capabilities available on the ISOBUS.

SPEED COMPENSATED PRODUCT CONTROL

ROS capable devices may be capable of providing multiple channel product control via a CANbus system or network. When connected with the appropriate control hardware via the network, the device will automatically adjust the rate of application for each control channel according to the vehicle speed, active sections, and the monitored flow of product.

The flexibility of CANbus systems and the ROS platform allow the ROS device to be integrated into many existing control systems. Depending upon the device capabilities, the ROS may be used to monitor or control the various optional control systems such as:

- Liquid product application
- Raven Sidekick Pro™ injection
- Raven AccuFlow™ series anhydrous ammonia (NH₃)
- Granular application
- Spinner control

Contact a local Case IH dealer for details on compatibility with the specific ROS device.

VARIABLE RATE APPLICATIONS

With the optional variable rate application (VRA) feature, a ROS device may also be capable of automatic rate control based upon a prescription map stored on the ROS device.

NOTE: Single or a multiproduct VRA authorization may be required to unlock variable rate control features for product control channels. A single product VRA must be entered to successfully authorize the device for multiproduct VRA.

MAPPING AND DATALOGGING

During a field operation, or job, ROS will display a real-time, as-applied or coverage map on-screen while application information is logged and saved by the device. This job information may be transferred to a home or office PC via a Slingshot® Field Hub or a USB flash drive and used to create printed reports and coverage maps.

UPDATES

Software and manual updates are available on the Raven Applied Technology website:

<https://portal.ravenprecision.com/>

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 Operating System (ROS) for Case IH Flex-Air Calibration & Operation Manual
- Manual No. 016-0171-557 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.

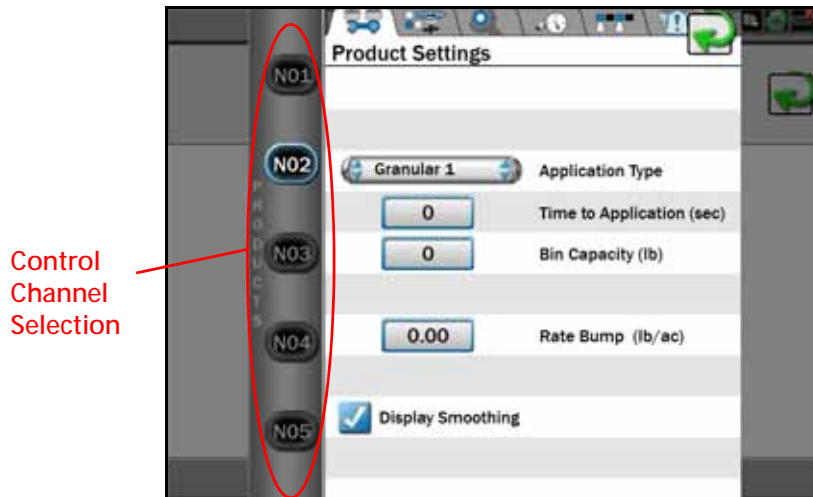
CHAPTER

3

PRODUCT CONTROL CONFIGURATION

OVERVIEW

Product control settings for various Raven CANbus control systems may be found within the machine panel. The Product Control module tabs and prompts allow an operator or system administrator to configure available product control channels on the Raven CANbus network to control application of various products on a product control system.



The product control settings prompt provides access to all control channels currently available or configured for the selected machine profile. Review the following sections for assistance with setting up control channels using the ROS device.

NOTE: Refer to the Case IH 810 Flex-Air Operation Manual for additional information.

BASIC PRODUCT CONTROL SETTINGS

The following sections are intended to assist with the settings required for basic product control operation via the ROS device. Complete the procedures described in the following sections for assistance with the initial product control system setup and calibration.

NOTE: Refer to Product Control Setting Definitions section on page 10 as instructed in the following procedures for information on additional product control settings and features.

If necessary, see Appendix A, Calculating the Calibration Values, or contact a local Case IH dealer for further assistance with system tuning or adjustments for field operations.

SET THE APPLICATION TYPE



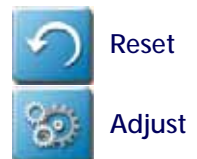
1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Product Settings tab.
4. Select the desired product control channel along the left side of the prompt to view settings for the appropriate control channel.
5. Touch the Application Type drop-down field and select the desired application type for the control channel. Refer to the Application Type section on page 11 for additional information on the available application type settings.
6. Touch the tank or bin capacity field and enter the maximum product level for the selected control channel. This value should represent the volume or weight of product used to fill the bin, not the total capacity of the tank or bin.
7. Touch the rate bump field and enter the desired increments by which the target rate will increase or decrease when using the rate bump widget on the guidance screen. Each product node or control channel must be programmed with the desired rate bump value. If no value, or a value of zero, is entered the rate bump buttons will have no affect on the selected product application rate from the guidance screen.

SET THE VALVE TYPE



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Valve Control tab.
4. Select the desired product control channel along the left side of the prompt to view settings for the appropriate control channel.
5. Touch the Valve Type drop-down field and select the type of control valve used on the selected control channel.
The recommended valve cal value will automatically be populated in the valve cal field.
6. If a known valve cal adjustment is necessary, touch the valve cal value and enter the adjusted valve cal value.

NOTE: Touch the reset button to reset the valve cal value to the recommended setting or the valve cal adjustment button to fine tune the valve response. Refer to Valve Calibration section on page 46 for additional assistance with adjusting the valve response.



SET THE METER CAL OR PRODUCT DENSITY

NOTE: The meter cal value will be available for channels configured for controlling liquid application systems or controlling a spinner or fan speed. Refer to the Appendix A, Calculating the Calibration Values, for assistance with tuning or adjusting the meter cal value for various application types.



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Product Calibration tab.
4. Select the desired product control channel along the left side of the prompt to view settings for the appropriate control channel.
5. Touch the meter cal field to access the Meter Cal Assistant prompt.
6. Touch the meter cal unit drop-down field and select the desired units for the flow meter calibration.
7. Touch the desired value field and use the displayed keypad to enter the adjusted meter cal value.

The meter cal can be found on the tag attached to the flow meter used to meter product application via the selected control channel. Refer to the Meter Calibration section on page 43 for additional assistance with adjusting and tuning the meter cal.

8. Touch the Done icon to return to the Product Calibration prompt.

SET THE SPREADER CONSTANT AND PRODUCT DENSITY

NOTE: The spreader constant and product density values will be available for channels configured for controlling granular or dry application systems. Refer to “Calculating the Calibration Values” on page 43 for assistance with changing the application type for various equipment or operation types.



1. Select the Edit icon in the machine panel.
2. Select the Product Control button to access the control settings.
3. Select the Product Calibration tab.
4. Select the desired product control channel along the left side of the prompt to view settings for the appropriate control channel.

PRODUCT DENSITY

1. Note the units displayed to the right of the product density field.
2. Touch the product density value and use the on-screen keyboard enter the density of the product to be applied with the selected control channel.

SPREADER CONSTANT

1. Select the spreader constant field to access the Spreader Constant Assist prompt.
2. Select the spreader constant unit drop-down field and select the desired units for the spreader calibration.
3. Select the desired value field and used the displayed keypad to enter the adjusted spreader constant value.

4. Select Done to return to the Product Calibration prompt.

SECTION ASSIGNMENT SETTINGS

The section assignments settings allow the operator or system administrator to configure the ROS device for the physical configuration of the application equipment or control systems. Use these settings to customize the sections from which products controlled by each channel will be applied.



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Section Settings tab.
4. Select the desired product control channel along the left side of the prompt to view settings for the appropriate control channel.
5. Verify that the correct number of sections are available on the display.

NOTE: If the appropriate number of sections are not displayed, refer to the ROS Basic Operation Manual for assistance with selecting a different machine configuration or setting up a new section configuration.

6. Select the sections of the boom or implement which will be associated with the selected control channel. This setting will configure the ROS device to map coverage for selected product when the assigned section or sections are toggled on during field operations.



NOTE: Touch the select all icon to select all available sections or the select none to clear all selections for the selected control channel.

PRODUCT CONTROL SETTING DEFINITIONS

The following sections provide detailed information about the settings and options accessible via the Product Control module within the Machine panel.

NOTE: Refer to the Display Settings chart found in the Case IH 810 Flex-Air Operation Manual for suggested metering system settings.

PRODUCT SETTINGS TAB



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Product Settings tab. The following features and options may be available for configuring or calibrating the product control system.

APPLICATION TYPE

The application type setting configures how the ROS device will interpret information from the CANbus control system and must be set correctly to ensure that the device interfaces with the control hardware correctly. Select one of the following application types for the displayed control channel.

NOTE: Some application types may require a specific node firmware version, optional CANbus control hardware, or an optional activation key. If an application type selection is not available, contact a local Raven dealer for assistance.

Liquid. Application of a liquid product.

NOTE: Sidekick Pro injection systems will display application type options for a high volume or low volume pump when the integrated motor control node is detected on the CANbus for the selected control channel. Sidekick motor control nodes for legacy injection systems will be controlled using either the Liquid or Granular application type.

Granular 1. Dry or granular product application using a single encoder to meter application equipment with a single bed.

Granular 2. Dry or granular product application using a single encoder to meter application from equipment with a dual bed.

Granular 3. Dry or granular product application using a dual encoder configuration to meter application from equipment with a dual bed.

Liquid Injection. Select this option for Pump RPM control of an injection pump during field operations.

3-Way Valve. Select this option for automated control of a liquid system with a 3-way by-pass or return valve used with the rate control system.

TIME TO APPLICATION
The time to application value is used along with the product chaining feature to advance to the next channel in the chain. Enter the time, in seconds, required for the product to travel from the bin to the point of application. The ROS device will use this value for each control channel to ensure smooth, continuous flow of product when automatically switching between control channels.

TANK OR BIN CAPACITY

The capacity value should be entered as the volume of product normally used to fill a tank or bin, not necessarily the capacity of the tank or bin. This value is also used to calculate the volume of product remaining in the tank during bin applications.

RATE BUMP

The rate bump value sets the increment by which the target rate will increase or decrease when using the rate bump features of various rate control widgets during an active application. Each control channel must be programmed with the desired rate bump value. If a value of zero is entered, the rate bump feature will have no affect on the target application rate for the selected product.

DISPLAY SMOOTHING

Enable the display smoothing feature to allow the ROS device to smooth any rate information displayed to the machine operator. With this feature enabled, the device will display the target application rate as long as the actual rate is within 10% of the target during applications.

The actual rate will be displayed if the actual rate does not reach the target rate dead band ($\pm 10\%$) within 10 seconds.

MANUAL PUMP CONTROL

To manually activate and control a pump outside of a job operation:



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Product Settings tab.
4. Touch the Manual Pump Control button in the lower, right corner of the prompt to access the Manual Pump Control prompt.
5. Use the up or down buttons to increase or decrease the pump pressure or PWM cycle.

NOTE: The pump will shut off when the manual pump control prompt is closed.

VALVE CONTROL TAB



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Valve Control tab. The following features and options may be available for configuring or calibrating the product control system.

VALVE TYPE

Select the type of control valve used to control the selected product during a job.

VALVE CAL

The valve cal value helps the ROS device adjust the valve control response for slight differences between control valves and is required for product control. Raven Industries recommends the following calibration values for initial system setup

These values are good starting points and will generally yield adequate results, however, the valve cal should be refined for the individual control valves installed on the specific machine. See Valve Calibration section on page 46 for additional assistance with tuning the valve cal value.

VALVE CAL 2

This value may be used to fine tune control valve response and helps to control application rate oscillations when the ROS device is programmed in PWM mode. When a fast close valve is selected, the valve cal 2 value is utilized to enable a high resolution rate control for lower application rates. Enter a non-zero value for the time, in milliseconds, which the valve will be fully opened before switching into high resolution control.

FOR EXAMPLE:

A value of 200 will give the valve a 200 millisecond “burst” at a full 12 V to open the fast valve from the closed position before resuming product rate control. A zero value will disable this feature.

VALVE DELAY

Use the valve delay option to include a delay in seconds between turning on the control valve (turning on sections) and when the product control nodes begin to control the flow rate.

NOTE: A value of zero must be entered when using a close-type valve, such as a Fast Close or PWM Close valve. A zero value must also be entered when programming a standard valve with an injection system.

PWM SETTINGS

The PWM settings features will be available if the selected control channel is configured with either a PWM or PWM Close type control valve. Refer to Valve Calibration section on page 46 for assistance with tuning PWM type control valves.

PRODUCT CALIBRATION TAB



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.

Select the Product Settings tab. The following features and options may be available for configuring or calibrating the product control system. [METER CAL](#)

Meter Cal for Liquid Applications. The flow meter calibration number may be found on the tag attached to each flow meter. Copy the information from the tag for future reference as the tags may fade or be lost during equipment operation.

Meter Cal for Spinner Applications. For spinner control applications, the meter cal value is calculated by multiplying the number of pulses per revolution of the spinner by 10.

PRODUCT DENSITY

Touch the product density and enter the measured density of the product assigned to the control channel for weight and rate calculations during the field operation.

The product density may be located on the product label, using a density scale, or may be obtained from the chemical supplier.

FAN CAL

The fan cal is used to calibrate the ROS device to the specific fan on the machine. Enter the number of pulses detected per revolution of the fan. The fan cal is for monitoring purposes only. The ROS device will not control based upon these calibration values of the monitored fan speed.

FAN RPM

The fan RPM is a display only. This read out displays the fan RPM if a fan sensor is equipped to monitor fan speed in a granular application system.

SPREADER CONSTANT

The spreader constant value is used by the ROS device to calibrate the control system for the machine gate height or belt travel measurements. This value is required to accurately monitor and control granular or dry product applications.

To maintain accuracy of the control system, the spreader constant value must be calibrated every time the machine gate opening dimensions are changed. [PUMP CAL](#)

The pump cal is used to calibrate the ROS device to the specific pump on the machine. Enter the number of pulses detected per revolution of the pump. Pump cal is for monitoring purposes only. The ROS device will not control based upon these calibration values or the monitored pump speed.

PUMP RPM

The Pump RPM is a display only. The read out displays the pump RPM if a pump sensor is equipped to monitor the pump speed in a liquid application system.

TIER DISABLE PERCENT

3. The disable percent settings is used to determine the percentage of the maximum tier rate at which tiers are disabled as the required flow rate decreases. Entering a tier disable percent allows the system to adjust the control valves more quickly as the required rate decreases.

PRESSURE SETTINGS TAB



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Pressure Settings tab. The following features and options may be available for configuring or calibrating the product control system.

PRESSURE 1 AND 2 CAL

The ROS device may be configured to monitor and display up to two system pressures per control channel. Select the Pressure 1 or Pressure 2 fields and use the on-screen keypad to enter the pressure cal for each pressure transducer.

Pressure Transducer Calibration. With no pressure in the machine product lines, enter a pressure cal of '0' to calibrate the pressure display.

BIN PRESSURE THRESHOLD PERCENT

If a pressure transducer is used to monitor bin pressure, enter the minimum pressure allowable during field operations before the ROS device will display an alert.

SECTION SETTINGS TAB



The section settings tab allows the machine operator or system administrator to configure the section associations for each control channel on the implement.

The section associations must be configured properly to accurately map field coverage for each control channel as well as to ensure the ROS device calculates the appropriate volume of product for active implement sections during field operations. Select sections for each control channel as necessary to accurately represent the product control system plumbing, clutches, or other control hardware to correctly configure the implement sections to corresponding product application.

ALARM SETTINGS TAB



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Alarm Settings tab. The following features and options may be available for configuring or calibrating the product control system.

LOW TANK VOLUME

Touch the low volume value and use the on-screen keypad to enter the minimum volume at which to alert the operator to a low tank or bin during field applications. This feature requires the operator to enter an initial volume when filling tanks or bins to allow the ROS device to calculate the tank or bin level during the operation.

LOW FLOW LIMIT

The low flow limit value sets the minimum volume per minute acceptable during application of a product. If the monitored flow rate drops below the low limit, the ROS device will adjust the control valve to maintain the set limit and display a flow alarm to alert the operator.

The ROS device will automatically adjust the low flow limit value for active sections.

FOR EXAMPLE:

If a low flow limit of 4 is entered, but only half of the total implement width is currently applying product, the ROS device will only display a flow alarm if the volume per minute drops below 2.

OFF RATE PERCENT

The off rate percent sets the allowable difference between the target and actual product application rates. If a non-zero value is entered for this setting and the difference between target and actual rate exceeds the set value for longer than five seconds, the ROS device will display an off rate alarm.

DUAL FLOW PERCENT

For dual bed systems controlled with Granular 3 application mode, the dual flow percent sets the tolerance between the belt encoder readings on each belt before the dual flow alarm is activated. This alarm may be used to indicate that the belts are moving at different rates or that one belt is not moving. Enter a value of 100 to disable the dual flow percent alarm or 0 to display an error any time the belt encoders do not match. The dual flow alarm activates when out of tolerance conditions have been met for at least five seconds.

BIN ALARM ENABLE

Enable the bin alarm feature in an optional bin level sensor is installed in the product bin. With this feature enabled, the ROS device will display an alert when the sensor detects that the product level in the bin falls below the sensor level.

NOTE: Contact a local Case IH dealer for additional information on bin level sensors available for use with the ROS device.

SHAFT ALARM ENABLE

Enable the shaft alarm to display an alert if the ROS device does not detect a signal from the shaft encoder. This alarm may be used to help troubleshoot flow errors with a CAN motor control node or belt encoder.

NOTE: This feature is not currently not used with Raven Sidekick Pro injection.

ZERO SPEED SHUTOFF FEATURE

Enable the zero speed shutoff feature to allow the ROS device to automatically shut off product application if the vehicle speed is slower than 0.7 mph [1.1 km/h]. If the zero speed shutoff feature is engaged during a job, the device will also display a zero speed alert to the operator.

NOTE: The zero speed shutoff feature only affects products set to automatic control. Products controlled manually will continue to be applied even if the zero speed shutoff feature is engaged.

To restart product application after the zero speed shutoff feature has been engaged, cycle the master switch 'Off' and then back 'On.' The zero speed shutoff feature will reactivate if the vehicle does not achieve a speed greater than 0.7 MPH [1.1 km/h] and maintain that speed for more than 10 seconds.

NOTE: If an optional AccuBoom system is detected, the AccuBoom override may be enabled to begin product application from a complete stop. Refer to the ROS AccuBoom Manual for additional assistance with the AccuBoom feature.

FLOW ALARM ENABLE

Enable the flow alarm to display an alert if the ROS device does not receive a signal from the pump flow switch. This alarm may be used to help troubleshoot flow errors with a CAN motor control node.

NOTE: This feature is currently not used with the Raven Sidekick Pro injection system.

SHAFT ALARM ENABLE

Enable the shaft alarm to display an alert if the ROS device does not detect a signal from the shaft encoder. This alarm may be used to help troubleshoot flow errors with a CAN motor control node or belt encoder.

NOTE: This feature is currently not used with the Raven Sidekick Pro injection system.

BIN ALARM ENABLE

Enable the bin alarm feature if an optional bin level sensor is installed in the product bin. With this feature enabled, the ROS device will display an alert when the sensor detects the product level if the bin falls below the sensor level.

NOTE: Contact a local Raven dealer for additional information on bin level sensors available for use with the ROS device.

VACUUM ALARM ENABLE

Enable the vacuum alarm feature if an injection pump is controlled via a CAN product control or motor control node. When enabled, the vacuum alarm will be displayed if the injection pump cannot draw product from the supply tank.

NOTE: Contact a local Raven dealer for additional information on injection systems compatible with the ROS device.

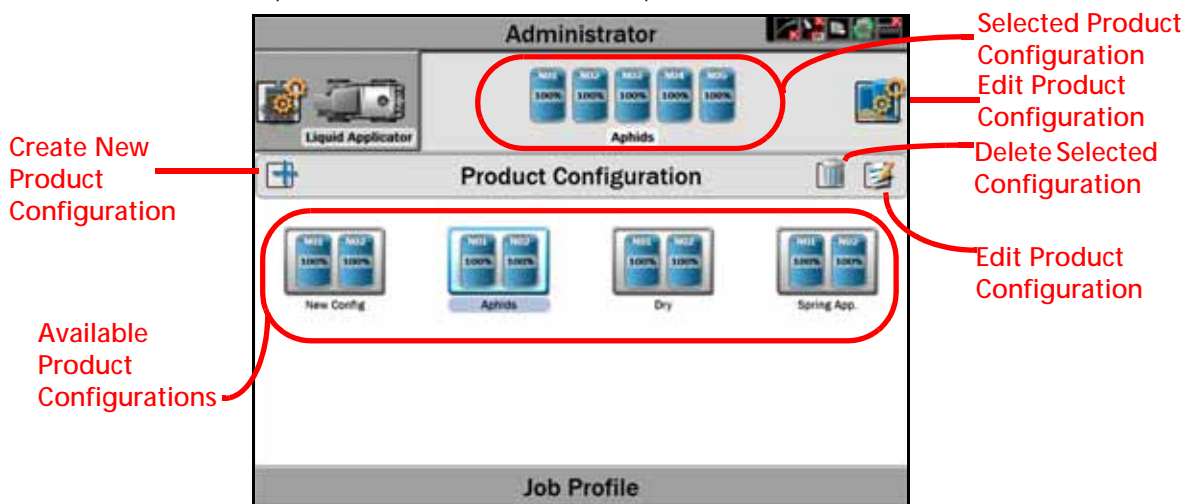
CHAPTER

4

PRODUCT PANEL AND CONFIGURATIONS

OVERVIEW

The Product Panel provides access to previously configured control channel assignments or allows an operator or system administrator to enter product information for a field operation.



Product configurations may be set up for various common or recurring field operations. Once saved, the product configuration allows the operator to select the saved product configuration and quickly set up the ROS device for various field operations.

Saved product configurations will be displayed based upon the selected machine configuration to allow the operator to quickly select the appropriate product application and begin the field application.

ROS has the AgX database loaded to allow easy access to many agricultural products currently on the market. If a product is not available in the database, configure the product. All product quantities are based on the Unit of Measure (UOM) they are sold in (gal, oz, lbs).

PRODUCT CONFIGURATIONS

Product configurations save information on products assigned to each control channel and may be used to quickly set up the ROS for common or reoccurring field operations. The information entered in the product configuration may be used to enhance job reporting information and allows improved product information to be saved, changed, and used quickly.

CREATE A NEW PRODUCT CONFIGURATION



1. Touch the Product Panel to display available product configurations.
2. Touch the Add button along the left side of the display to create a new product configuration.
3. Use the on-screen keyboard to enter the desired name or description for the product configuration and touch the Done button. The product setup prompt will be displayed.
4. Refer to the Mix and Control Channel Profiles section on page 20 to configure the product or mix information for each control channel available in the product configuration.

EDIT AN EXISTING PRODUCT CONFIGURATION



1. Touch the Product Panel to display the available product configurations.
2. If necessary, select the existing product configuration to be modified.
3. Touch the Edit button along the right side of the display to edit the selected product configuration. The product setup prompt will be displayed.
4. Edit the existing information for each control channel as necessary to modify or adjust the configuration for the field operation needs. Refer to Mix and Control Channel Profiles section on page 20 for additional information on entering product information for each control channel available in the product configuration.

DELETE AN EXISTING PRODUCT CONFIGURATION



NOTE: Deleting a product configuration does not delete product information assigned to the configuration.

1. Touch the Product Panel to display the available product configurations.
2. Touch the product configuration to be removed.
3. Touch the Delete button toward the right side of the display.
4. Touch the "Yes" button on the displayed prompt to permanently delete the product configuration.

MIX AND CONTROL CHANNEL PROFILES

The following sections are intended to assist with entering mix information for each control channel in the current product configuration. The control channel information will be available for job reporting features and provides

detailed input or as-applied information for reference after the operation is completed or for archival record keeping.

MIX PROFILES



Edit Product Configuration

1. Touch the Edit Product button to access the product configuration prompt for the selected product configuration.

NOTE: Refer to the Create a New Product Configuration section on page 20 or the Edit an Existing Product Configuration section on page 20 for additional assistance with creating or editing a product configuration.

2. Select a channel indicator along the left side of the prompt to select the control channel on which to edit product information.
3. Touch the Mix Name drop down to select an existing mix or blend for the control channel or touch within the mix name field to create a new mix or blend.

NOTE: Selecting an existing mix or blend will automatically enter any information entered previously for the remaining fields. Verify the mix or blend information before proceeding to the next control channel.

Editing existing mix or blend information will replace the existing mix or blend. A new mix or blend will not be created when editing the existing mix or blend information or ingredients.

4. If desired, touch the Display As field and edit the label (up to 4 characters) to be displayed during field operations on user selected widgets.
5. Touch the Current Volume or Current Weight field and set the current tank volume or bin weight available for the mix or blend. This value is the total amount of product (carrier and all ingredients) in the tank or bin.

NOTE: To refill a tank or bin to the full capacity of the product tank or bin, touch the Refill button. To refill all tanks or bins to full capacity, touch the Refill All button at the top of the prompt.



Refill

Refill All

MIX RATIOS AND INGREDIENTS



Edit Product Configuration

1. Touch the Edit Product button to access the product configuration prompt for the selected product configuration.

NOTE: Refer to the Create a New Product Configuration section on page 20 or the Edit an Existing Product Configuration section on page 20 for additional assistance with creating or editing a product configuration.

ADD INGREDIENTS

The lower portion of the Product Configuration prompt allows mix or blend ingredients to be added to the Product Configuration. This information is used to calculate the ratios of product applied during field operations with the mix or blend assigned to the control channel.



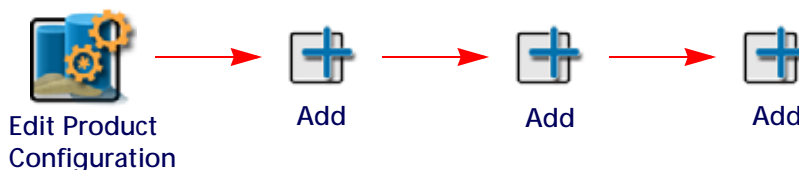
1. Touch the Edit button to access the product configuration prompt for the selected product configuration.

NOTE: Refer to the Create a New Product Configuration section on page 20 or the Edit an Existing Product Configuration section on page 20 for additional assistance with creating or editing a product configuration.

2. Touch the Add button at the bottom of the prompt to add a product to the ingredient list. The Favorite Products list will be displayed.
The Favorite Products prompt displays products that have been used for previous product configurations.
3. Select the desired product from the recently used list if available and touch the Done button to add the product to the ingredients list.
4. To add an ingredient from the product database, touch the Add button at the bottom of the Favorite Products prompt. The Reference Products prompt will be displayed.
The Reference Products database contains thousands of pre-configured agricultural products and information which may be added to the ingredient list.
5. Use the filter options at the top of the Reference Products prompt to help locate and select the desired product for the ingredients list and touch the Done button to add the selected product to the ingredients list.

NOTE: The selected product will also be added to the Favorite Products list. Refer to the Create a New Ingredient section on page 22 for additional assistance with creating a new product for a mix or blend configuration.

CREATE A NEW INGREDIENT



1. Touch the Edit button to access the product configuration prompt for the selected product configuration.

NOTE: Refer to the Create a New Product Configuration section on page 20 or the Edit an Existing Product Configuration section on page 20 for additional assistance with creating or editing a product configuration.

2. Select the Add button at the bottom of the Product Configuration prompt to display the Favorite Products list.
3. Touch the Add button again to view the Reference Products database.
4. Touch the Add button once more to access the Product Details prompt.
5. Select the Type drop down list and select the type of product to be added.

NOTE: Use the Type filter option available to the right of the Type drop down to filter the product database information. This feature may be useful when adding a new product based off of a previous product line already in the database.

6. Touch the Manufacturer field or select the drop down option to enter or select a chemical manufacturer.

NOTE: Use the Manufacturer filter option to the right of the Manufacturer drop down list to filter the product database information. This feature may be useful when adding a new product from a manufacturer already in the database.

7. Touch the Name field or select the drop down option to enter or select a product name or description already in the product database.

NOTE: Use the product Name filter option to the right of the Name drop down list to filter the product database information. This feature may be useful when adding a new product based upon a product or product line already in the database.

8. Touch the Liquid/Dry drop down and select the application type to be configured.

9. Touch the Units drop down and select the preferred application rate units.

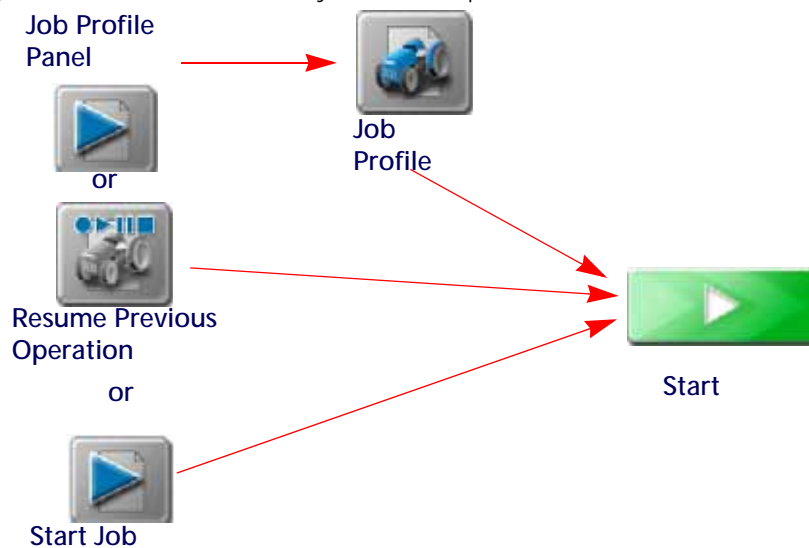
10. Touch the Registration field and enter any registration information as available or necessary for reporting to governmental or environmental agencies.

11. Enter any additional product notes in the Notes area.

JOB PROFILE AND RATE MODE SETUP

The following sections are intended to describe the rate control mode setup during the job start and validation process. Use the following sections to assist with setting up control channels for liquid, HN_3 , or granular rate control systems.

To begin configuring control channels for a new job or field operation:



1. Review the ROS Basic Operation Manual for assistance with setting or selecting job profile, guidance options or features, or scouting information.
2. Touch the Job Profile panel and select a job profile or a previous operation to resume.
3. In the tank assignment area, verify that the product loaded information is displayed correctly for the products to be applied during the field application.
4. Touch the Rate Mode field for the first control channel and select the appropriate rate control option. The following options will be displayed in this area:

NOTE: Toggle the product and node views at the bottom of the job start prompt to toggle the displayed information



Fixed Rate. Select the fixed rate mode to apply product at a fixed or straight rate during application. ROS will automatically adjust the control system to maintain the target rate based upon vehicle speed and active section width.

NOTE: Fixed rate mode does not automatically adjust the target rate for prescription information or other field conditions. Rate changes may be made by manually changing the target rate or using the rate bump feature during operations.



Prescription (Rx) Rate. Select the prescription (Rx) rate mode to apply product according to a prescription map stored on the ROS device and loaded into the job profile or active job operation. This mode allows ROS to automatically adjust the target rate for field areas as designated by the prescription map.

NOTE: Review the ROS Basic Operation Manual for assistance with using the file maintenance features to copy prescription maps to the ROS device or setting up a job profile or field operation. Refer to the Prescription Rate Mode Setup section on page 26 for assistance with loading a prescription map into a job for use during a field operation.



GreenSeeker® Rate. Select the GreenSeeker rate mode to allow ROS to automatically adjust the target rate based upon GreenSeeker rate information. Review the documentation provided with the GreenSeeker system for additional assistance with system setup and calibration prior to using this feature during field applications. A GreenSeeker unlock and a single VRA unlock are required for GreenSeeker interface to function on ROS.

NOTE: The GreenSeeker system interface only allows one rate control channel to be adjusted automatically.

5. If all other settings display properly, touch the Start button in the lower, right corner of the job to begin the field operation.

NOTE: Refer to Chapter 6, Product Chaining and Linking, for additional assistance with chaining and linking features.

FIXED RATE MODE SETUP

To configure control channels to use the prescription rate mode:



**Fixed Rate
Mode**

NOTE: The default selection for control channels in new job profiles is the fixed rate mode.

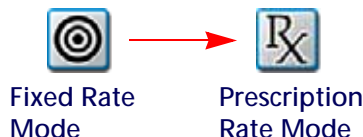
If an injection system is installed with the ROS device, refer to the ROS Injection Control Calibration and Operation manual for additional assistance with setting up and using the ratio rate mode during field applications.

1. Determine which control channels are to be controlled at a fixed target rate during field application.
2. Touch the fixed rate mode icon for the desired channel.
3. Enter the desired fixed target rate in the rate input prompt. Fixed rates are generally set in units of gallons per acre [liters per hectare].

IMPORTANT: For systems with injection modules, verify that the ratio rate feature is disabled to set fixed rates for injection control channels. Refer to the Prescription (Rx) Rate section on page 26 or the ROS Injection Control Calibration and Operation manual for additional information and further assistance with the ratio rate feature or operating the injection system during field applications.

PRESCRIPTION RATE MODE SETUP

To configure control channels to use the prescription rate mode:



1. Determine which control channel to change the rate mode to use a prescription rate.
2. Touch the fixed rate mode icon for the desired channel.
3. Touch the rate input drop down field and select the prescription rate option. The prescription rate input prompt will be displayed.
4. Touch the Prescription (Rx) Map Name drop down field and select the name of the prescription map for the field application.
5. With the prescription (Rx) map selected, touch the rate column drop down field and select the column title or heading containing the rate information for the application.
6. A conversion factor may be set to adjust the prescription rate map as necessary. Touch the Conversion Factor button to access a list of automated conversion factors for use with the prescription map feature.
7. If desired, set a default rate for any areas outside of the prescription map area. Set this value to zero if application is not desired outside of the defined prescription map zones.



Conversion Factors

NOTE: Zones assigned to zero rate will not be affected by the default rate setting.

A fast close or PWM close type control valve is required to automatically shut off product application in a zero rate zone. Automatic section controls will only shut off individual sections if all active products assigned to the section are inside a zero rate zone. Liquid products must have zero rate shut-off enabled.

8. Select the desired Rate Reference Point:

Boom Center. Select the center option to set the prescription target rate based upon the center of the implement location. This is the default option for most field applications.

Boom Minimum. Select the minimum option to set the prescription rate to the lowest non-zero prescription rate for the current implement position. Select this option if the implement is offset from the vehicle or if prescription rate zones are unavailable at the center of the implement. This can also be used when driving the tractor on the road (which is a no spray zone) but still want the booms on.

GREENSEEKER® RATE MODE SETUP

To configure fixed rate mode control channels:



1. Determine which control channel to change the rate mode to use the GreenSeeker rate.
2. Touch the fixed rate mode icon for the desired channel.
3. Touch the rate input drop down field and select the GreenSeeker rate option. The GreenSeeker rate input prompt will be displayed.
4. Check and verify the current units displayed at the bottom of the GreenSeeker rate input prompt.
5. A conversion factor may be set to adjust the GreenSeeker rate inputs if necessary. Touch the Conversion Factor button to access a list of automated conversion factors for use with the GreenSeeker system.



Conversion Factors

CHAPTER

6

PRODUCT CHAINING AND LINKING

OVERVIEW

ROS product chaining and linking features allow the operator to associate product control channels together during an application. These associations allow the operator to utilize the capacities of multiple tanks or bins for single product applications and reduce the number of trips required to refill products.

While applying products assigned to a chain, ROS may be configured to automatically advance to the next control channel when the current tank or bin runs out of product. This feature reduces the number of trips required to refill products and ensures that the equipment continues to meet the application rate desired when switching between control channels.

NOTE: Prior to starting a job using the product chaining feature, verify that the control channels to be chained are set correctly for the application. It may be necessary to adjust settings for a specific channel to ensure that products are applied at the correct rate for the chained products.

Multi-product links allow the operator to apply two or more control channels as a proportion of one product rate. This feature allows multiple control channels to be run simultaneously to utilize available tank or bin capacities on the machine or potentially allow the operator to supplement one control channel with another to apply at a higher rate than a single control channel may be able to achieve independently.

NOTE: Multi-product links may be restricted by the control system configuration. Contact a local equipment manufacturer for additional assistance.

BIN CHAINING

The Bin Chain widget provides options to reset the chain to the first link, cleanout, or open the settings page.

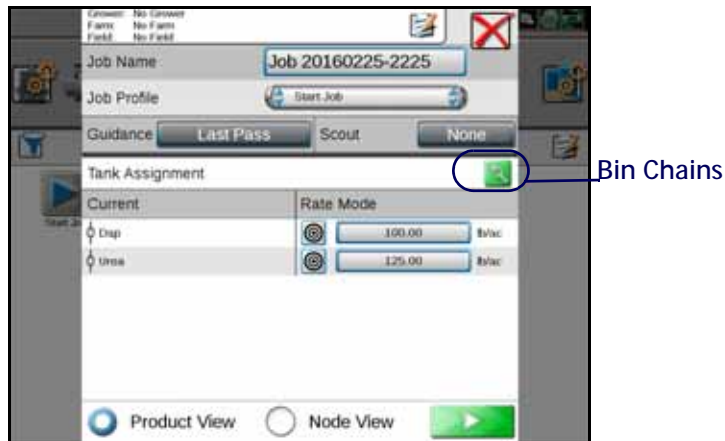


MANUAL CHAIN SETUP

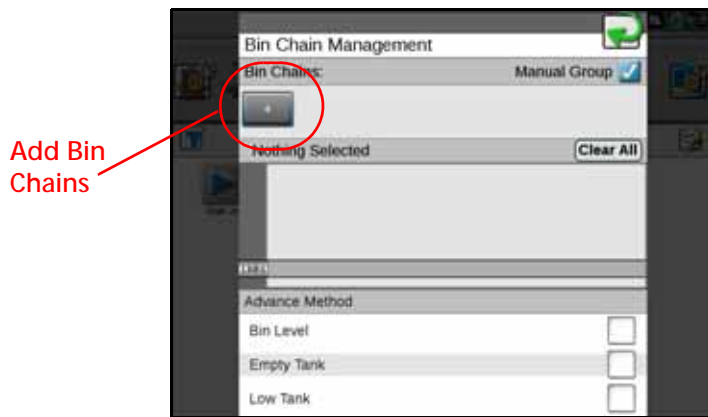
To manually configure Bin Chaining:

1. Press the Bin Chain icon. The Bin Chain Management window will display.

NOTE: If the chain is green, ROS has automatically chained the products with the same Product Mix name. If the icon is gray, there are no chained products or a manual chain is configured.



2. Check the Manual Group box.
3. Press and hold Add Bin Chains to add nodes. The primary product window will open.



4. Configure the Primary Product, Bin Chain Name, and Rate Information.

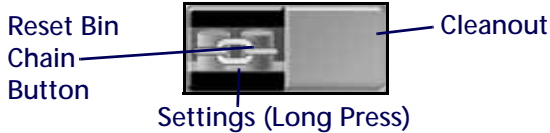


5. Press the Add Node in the selected chain field to add other bins to the product.



- 6. Select the advanced method for bin switching. This can either be done when the Bin Level sensor alarm is triggered, when there is an empty tank, or a low tank alarm is triggered.
- 7. Repeat step 3 through step 6 for each empty chain. A minimum of four products/nodes is required to have multiple chains.
- 8. After completing a bin chain it is possible to reverse the bin chain order by pressing Reverse. This changes the order of the links (instead of 1 - 3 the order would become 3 -1).

BIN CHAIN JOB WIDGETS



To reset the chain to the first link, press the left half of the Bin Chain button.

To activate or deactivate cleanout, press the right half of the Bin Chain button. Cleanout is only available after the chain has completed with the advance method detected for all links in the chain.

To open the Settings page, long press the bin chain button. There are two tabs. The first tab (Bin Chain Settings) allows the user to adjust the settings as desired. The second tab (Bin Link Order) allows the user to rearrange bin chain order.



To adjust settings on the Bin Chain Settings Page:

Select Bin Chain. - Change the product.

Active Link. - Select the desired node.

Advance Method. Select Auto Advance and refine the settings based on preferences.

- Bin Level Sensor - Advances to next node in the chain when the bin level sensor low level triggers.
- Tank Empty - Advances to the next node in the chain when the tank is empty.
- Low Tank - Advance to the next node in the chain when the low tank sensor triggers.

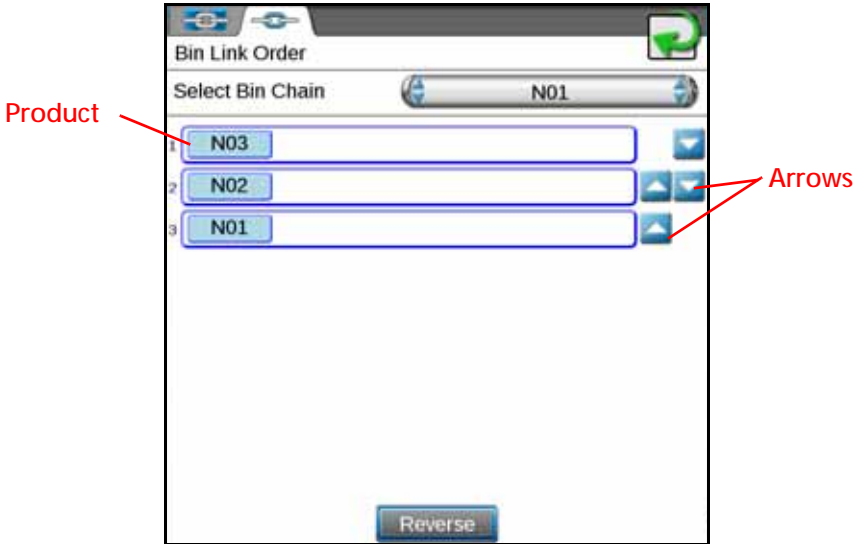
Activation Upon Completion.

- Shutdown Chain - Will turn all nodes in the chain off when the last bin is complete. The chain will go into cleanout ready mode.
- Start Cleanout - Will turn all of the nodes to auto with each having a fraction of the target rate for each bin. For example, a two bin chain will apply 50% out of each bin.
- Delayed Chain Shutdown - Will leave the last node running for the set time (in seconds) and then turn all nodes off or advance to the next link.

NOTE: If the machine was reloaded after chain configuration is complete, reset the chain to the first bin in the chain.

To reorder products on the Bin Link Order tab:

1. Press the up or down arrow next to the desired link.

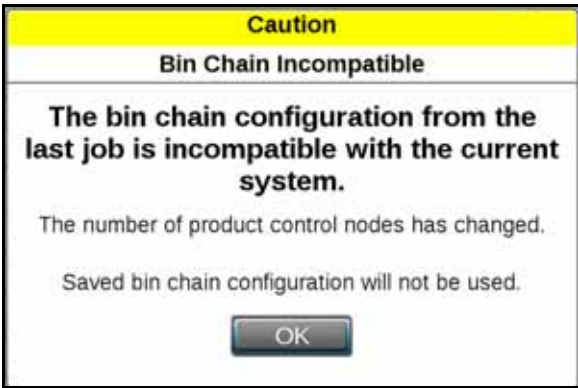


2. Once complete, press the back arrow to save the settings. If desired, press Reverse to reset the order to the previously ran job.

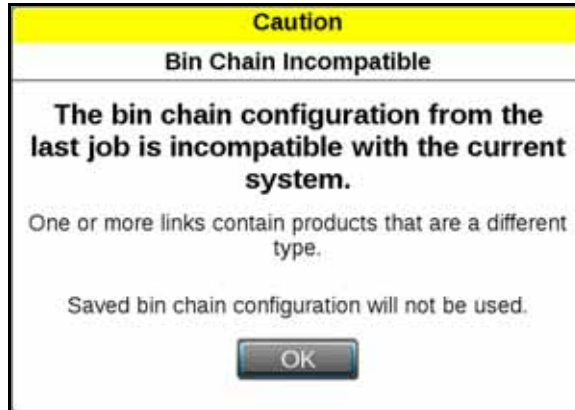
BIN CHAIN ERRORS

There are a few possible errors that only occur when using bin chain recall:

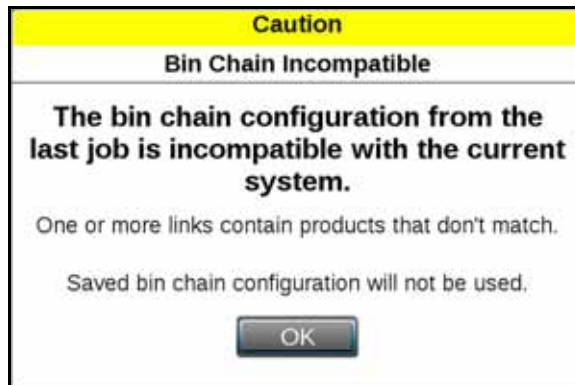
The Number of Product Nodes has Changed. This error condition will appear if one of the previously used nodes on the selected chain was disconnected or removed. To correct this issue either ensure all the correct nodes are connected or configure a new chain without the missing node.



One or More Links Contain Products that are a Different Type. This error occurs when different products types (liquid and granular) are contained in the same chain. To correct this issue either remove the different product type or create a new chain without the different product.



One or More Links Contain Products that Don't Match. This error condition occurs if there is a product configuration and the nodes within the chain have different product assignments.



CHAPTER

7

PRODUCT CONTROL OPERATION

OVERVIEW

ROS features user selectable widgets which allows the ROS operation screens to be configured to display the information necessary for various field operations or customized for operator preferences. Some widgets may be required to perform specific tasks with ROS while others may be used for status or information display if desired. Several widgets will require installation of additional hardware or components to enable use of the widget during a field operation. The following sections are intended to assist with selecting and using various ROS widgets available for use with standard system installations. Please refer to the ROS documentation for each optional system or feature for additional information on using widgets with these systems.

NOTE: ROS 2.7 introduced an optional widget layout called "Case IH Flex-Air." The Case IH Flex-Air layout includes many of the widgets described below.

WIDGET CATALOG DEFINITIONS

FLEX-AIR SYSTEM WIDGETS

PRODUCT SWITCHES

Flex-Air (Node Control) - Long press the node control widget allows the four Flex-Air nodes to be enabled and disabled.



PRESSURE MONITOR

Flex-Air (Pressure Readings) - Long press to display the boom and sparge pressure readings.



FAN AND AUGER CONTROL

Flex-Air (Auger and Fan Control) - Long press to display the Flex-Air Settings screen. This screen allows the augers and fan to be enabled, the fan to be adjusted, and the boom and sparge PSI settings to be changed.

RATE CONTROL WIDGETS



INDIVIDUAL PRODUCT CONTROL

Displays the target and actual application rate for the selected product.


- When multiple individual product control widgets are being used, one short press of the icon toggles the map settings to display the application data for that product.
- One long press of the icon allows the product type to be selected for that widget. This menu also allows the target rate, application mode, and rate to be adjusted.
- Press the arrows on the ends of the widget to increase or decrease the application rate by the value entered into the Rate Bump field in the Product Settings tab during setup.
- Pressing the rate area then the blue arrow displays the meter, valve, and pressure cal settings and the application data values per product.



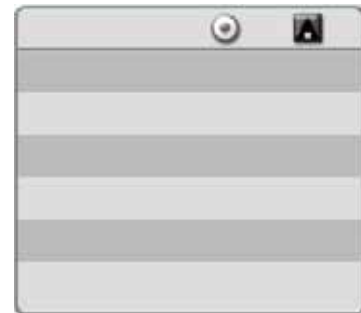
NOTE: During application with an ISOBUS application system, the application mode may only be toggled between on and off states.

- The product name displayed in white indicates that particular widget is selected and the application data is displayed on the map.

MULTIPLE PRODUCT CONTROL

Multiple Product Control - Displays the target and actual application rates for multiple products. The  icon next to the product indicates that product is selected and the application data is displayed on the map.

- Toggle between the products with one short press on the product name.
- One long press of the icon allows the product type to be selected for that widget. This menu also allows the target rate, application mode, and rate to be adjusted.
- Pressing the blue arrow displays the meter, valve, and pressure cal settings and the application data values per product.



TALLY REGISTERS WIDGETS

TALLY REGISTERS

One long press of the icon displays the application data values per product. These values may be reset either by product or by data type, or all data values may be reset by pressing the double arrow in the upper-left corner of the table. The distance values may be reset by pressing the single arrow in the lower-right corner of the screen.



FIELD AREA

Displays number of acres [hectares] applied for the selected product type. One long press of the icon displays a drop-down box that allows you to choose between the product shown on the map or another product type listed in the menu.



PRODUCT LEVEL

Product Level - The product level icon displays the amount of product remaining in the tank based on the amount of product that has been applied according to the flow meter.



- One short press of the icon allows you to select a specific product and change the bin level/capacity. Pressing the fill or empty icons to the right of the capacity value allows the operator to manually indicate that the bin has been filled or emptied.
- One long press of the icon allows the operator to manually adjust the tank level to full.

NOTE: When operating with an ISOBUS product control system, the product level widget provides a display of the level configured via the VT working set. Review the operation guide for the VT feature for additional assistance with configuring tank capacity or product levels during field operations.

PRESSURE MONITORING WIDGETS

SYSTEM PRESSURE

Displays the pressure level of the selected pressure transducer. One long press of the icon will display up to two pressure transducers for each product. The drop-down box lists the available products.



PUMP MONITORING AND CONTROL WIDGETS

LIQUID PUMP RPM

Displays the pump RPM for the selected pump. One long press of the icon displays the pump RPMs. The drop-down box lists the available products.



PUMP SWITCH

The pump switch turns the pump on and off for the product selected.

- One long press of the icon displays a drop-down box that allows you to choose between the products.



Once the product has been selected, one short press of the icon toggles the pump for that product on and off.

FAN SPEED RPM

- Displays the fan RPM.

BIN CHAIN WIDGET

BIN CHAIN STATUS

Displays the current group associated with the widget and the status. The status will either be active, cleanout ready, and cleanout active.



PRESCRIPTION WIDGETS

PRESCRIPTION (RX) MAP SETTINGS

One long press displays the Rx map settings menu. The left side of the screen displays the products to choose from, while the right side of the screen displays the settings that can be adjusted for the selected product.



OVERVIEW

The boom capacity features of the ROS provides flow capacity of the application system and allows the operator to monitor the current capacity used to ensure the system is meeting the application expectations during field operations. As the system approaches the maximum capacity, the ROS device will provide an alert to the operator to allow the operator to made adjustments to the equipment or application to maintain coverage and rate requirements.

BOOM CAPACITY CONFIGURATION

To configure the boom capacity feature for the application equipment:

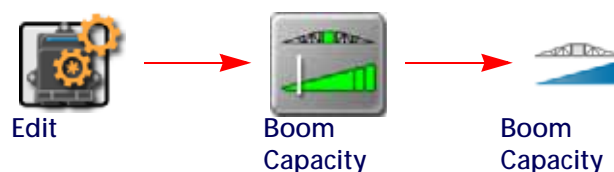


1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Boom Capacity module. The Boom Capacity tab will be displayed.
3. Select the boom section group of which to configure the capacity.

NOTE: Capacity may be configured for each boom section group to provide customized information during field operations.

4. Select the Enable option to enable the capacity features for the selected boom section group.
5. Select the desired capacity setting for the application equipment. Contact a local equipment dealer or the manufacturer for additional assistance with the maximum capacity of the application system.

BOOM CAPACITY SETTINGS DEFINITIONS



1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Boom Capacity module. The Boom Capacity tab will be displayed.
3. Select the boom section group of which to configure the capacity.

Select Boom. Select the section group on which the capacity feature settings will be applied. This selection allows the operator to enable or disable the capacity settings for each configured section group individually.

Capacity Enable. Enable the capacity monitoring feature for the selected section group. Capacity monitoring may be enabled or disabled for each group individually.

Override. The user definable override value is intended to allow the operator to adjust the capacity of the boom configuration for temporary changes, such as product density for a single application, etc. Select and adjust this value for temporary or conditional application requirements.

Custom Default. The custom default value is intended to provide the system administrator or machine operator with a definable value for normal operations. This value is intended to allow the capacity feature to be adjusted for non-standard section configurations or customized booms without modifying the factory recommended capacity value.

Factory Default. The factory default value is the recommended capacity setting from the factory. This value is not user definable and may be selected for standard configurations or to reset the capacity features to the recommended user settings.

WIDGET CATALOG DEFINITIONS

BOOM CAPACITY WIDGETS

CAPACITY WIDGET

Use the boom capacity widget during field operations to monitor the capacity of a selected section group. When the application capacity reaches 90% of the entered capacity, the system will provide an operator alert.



Touch and hold the capacity widget to view the section group selection and enable the capacity monitoring feature during the field operation.

NOTE: The capacity values cannot be changed during a field operation. To adjust the capacity, close the job and review to the Boom Capacity Configuration section on page 41 for additional assistance with configuring the boom capacity feature.

BOOM AND SECTION CALIBRATION

Refer to the following sections for assistance with calculating the section widths for various implement types. Use the following formulas to help calculate the boom or implement section widths for either broadcast or band applications.


METER CALIBRATION

The flow meter calibration number may be found on the tag attached to each flow meter. Copy the information from the tag for future reference as the tags may fade or be lost during equipment operation.

NOTE: Refer to the Verifying Flow Rate Limits section on page 50 to verify that the desired flow rate is within the range specified for the installed flow meter.

FLOW METER SERVICE AND MAINTENANCE

Periodic maintenance of the flow meter may help to extend the effective service life of the flow meter or internal components. If the flow meter does not register the applied product volume properly, the following steps will be necessary to service the flow meter:

	<p>⚠ WARNING</p> <p>Exposure to agricultural chemicals may be harmful or fatal. Thoroughly bleed and flush the application system lines prior to disassembling fittings, hoses and the flow meter.</p> <p>If the flow meter is used for applying anhydrous ammonia (NH₃), bleed the nurse tank hose and flush the system with water before maintaining the flow meter.</p>
---	--

The following procedure should be performed more frequently if the flow meter is used with harsh chemicals or with anhydrous ammonia (NH₃).

1. Remove the flow meter from the application system and flush with clean water.
2. If necessary, dismantle the flow meter housing.
3. Remove the turbine hub and turbine from the flow meter.
4. Clean the turbine hub and turbine and remove any metal filings or other foreign materials such as wettable powders.

5. Check the turbine blades for wear or damage. Refer to the flow meter replacement parts sheet provided with the flow meter and replace the turbine as necessary.
6. While holding the turbine hub, spin the turbine. The turbine should spin freely with very little drag within the turbine hub. Refer to the flow meter replacement parts sheet provided with the flow meter and replace the turbine hub/turbine assembly as necessary.
7. Reassemble the flow meter.
8. Using a low pressure jet of air (approximately 5 PSI [34 kPa]), verify that the turbine still spins freely after reassembly. If the turbine drags or does not move, loosen the hex stud on the bottom of the turbine hub 1/16 turn until the turbine spins freely.
9. If the flow meter continues to provide inaccurate product volumes, refer to the Flow Meter/Encoder Extension Cable section on page 54.

FLOW METER RECALIBRATION

The calibration value for the specific flow meter is printed on the tag attached to the flow meter and will typically provide accurate metering of product application. The following procedure may be used to check the meter calibration or recalibrate the flow meter.

NOTE: Performing routine maintenance is recommended to help extend the service life and accuracy of the flow meter. Review the Flow Meter Service and Maintenance section on page 43 to service the flow meter as necessary.

BEFORE CALIBRATING THE FLOW METER

- Perform flow meter calibration with clean water only. Clean out the supply tank and flush the product lines with clean water. Refill the tank with clean water.
- Close or end any active jobs on the ROS device.
- Toggle all boom section switches and the master section switch to the off position.
- Disconnect one of the section product lines near the spray tips.
- Set a calibrated catch container (i.e. 5 gallon [19 L] bucket) and place the disconnected end of the product line in the container.

TO RECALIBRATE THE FLOW METER



1. Touch the Edit icon in the Machine Panel.
2. Touch the Product Control button to access the control settings.
3. Select the Product Calibration tab.
4. Select the desired product control channel along the left side of the prompt to view settings for the appropriate control channel.
5. Select the Meter Cal value and use the on-screen keypad to enter a value of 10 [38].
6. Begin a job and access the tally registers information.
7. Enter a value of 0 for the total volume.
8. While monitoring the Total Volume on the screen and the container, toggle the master switch and the appropriate section switch to the on position.
9. Dispense exactly 10 gallons [38 L] through the flow meter as measured by the calibrated catch container.

IMPORTANT: Do not rely on graduation markings/numbers molded into the applicator tank.

10. Toggle the section or master switch off.
11. Read the value displayed on the ROS device tally registers display. This value should be within $\pm 3\%$ of the meter cal value printed on the flow meter tag.
12. To confirm accuracy, reset the total volume to 0 and repeat the above process several times. Always 'zero out' the total volume display before toggling the section switch on.

NOTE: The above process is usually sufficient to check the flow meter calibration. For best results, set the meter cal value to 100 [378] and repeat the above procedure to dispense exactly 100 gallons [378 L] through the flow meter.

TO VERIFY THE FLOW METER CALIBRATION

1. Fill the applicator tank with a predetermined volume of liquid (i.e. 250 gallons [946 L]).

IMPORTANT: Do not rely on graduation markings/numbers molded into the applicator tank.

2. Begin a job and access the tally registers information.
3. Empty the applicator tank under normal operating conditions.
4. Return to the tally registers information displayed on the ROS device and read the new value. The total volume value should match the known volume ($\pm 3\%$) used to fill the applicator tank.
5. If the total volume value displayed differs from the known volume by greater than 3%, use the following formula

$$\frac{OMC \times V_m}{V_k} = CMC$$

Where OMC = the Original Meter Cal value used during the test, V_m = the Volume measured by the ROS device, V_k = the known Volume in the applicator tank and CMC = the Corrected Meter Cal.

FOR EXAMPLE:

A set meter cal of 720 [190] is used to dispense 250 gallons [946 L] through the flow meter. At the end of the test, the ROS device displays a measured volume of 260 gallons [984 L]:

English	Metric
$\frac{720 \times 260}{250} = 749$	$\frac{[190] \times [984]}{[946]} = [198]$

Therefore, the corrected meter cal is 749 [198].

6. Enter the corrected meter cal value before resuming application.

SPREADER CONSTANT CALIBRATION

There are two main methods for calculating the spreader constant using the calibration wizard. The option you choose will depend on the available equipment.

WEIGH THE MACHINE WITH AND WITHOUT PRODUCT

This is the most common, especially when a truck scale is available. Follow the prompts in the Viper 4 calibration wizard to complete this process.

WEIGH THE CONTAINER BEFORE AND AFTER PRODUCT IS DUMPED INTO IT

The container can be anything (cart, skid-loader with bucket, etc.) as long as it is weighed when empty and then weighed when full. An ideal container should be able to hold at least 500 lbs [227 kg], but 1000 lbs [454 kg] or more is preferred.

The calibration wizard will calculate the spreader constant regardless of which option you choose. When dumping product, it is recommended to measure at least 500 lbs [227 kg]. Measuring 1000 lbs [454 kg] or more will yield more accurate results.

To perform a Spreader Constant Calibration:

1. Press Edit, Product Control, Product Control Tab, and Calibration Wizard on the Viper 4.
2. Select the Next arrow.
3. Weigh the machine or container and enter that weight into the Start Weight.
4. Select Dump Product.
5. Turn the Master Switch on. The screen should start displaying the volume dumped. Use the up and down arrows to adjust the valve output to increase/decrease the application rate.
6. Dump approximately 500 lbs [227 kg.]. Turn off the master switch when finished.
7. Select End Calibration.
8. Weigh the machine or container and enter the weight into the End Weight field.
9. Select Calculate.
10. Review the information on the screen then select Apply. The new spreader constant will be applied.
11. Repeat this process for each additional product channel/bin being controlled.

VALVE CALIBRATION

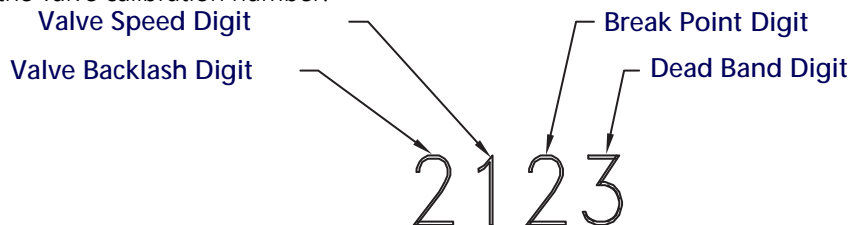
NOTE: If the dual loop control feature is enabled, the valve cal value will be replaced by the flow cal value.

To ensure that the proper amount of product is being applied, the valve cal must be programmed for the type of control valve(s) connected to the control system. The field computer uses the calibration number to adjust the response time of the control valve motor to changes in the vehicle speed.

The following control valve calibration numbers are recommended for the valves listed:

Control Valve Type	Valve Cal
Standard (C-SD)	2123
Fast (C-F) or Fast Close (C-FC)	743
PWM (C-P) or PWM Close (C-PC)	43

Each digit in the calibration number corresponds to a specific function of the valve. The following functions apply to the digits in the valve calibration number:



VALVE BACKLASH DIGIT

This value controls the time of the first correction pulse after detecting a change in correction direction. The values range from 1 to 9, where 1 is for a short pulse and 9 is for a long pulse.

NOTE: The backlash digit is not used with a fast, fast close, PWM, PWM close or standard motor control valve.

VALVE SPEED DIGIT

This value controls the response time of the control valve motor. If the valve speed setting is too fast, the valve will over correct and the system can start to oscillate. The following valves have specific values:

- Standard Control Valve: This valve has a range of values from 1 to 9, with 1 being slow and 9 being fast.
- Fast and Fast Close Control Valve: These valves have a range of values from 0 to 9, with 0 for fast and 9 for slow.

NOTE: The speed digit is not used with a PWM or PWM close valve.

BRAKE POINT DIGIT

The brake point digit sets the percent away from the target rate at which the control valve starts to turn at a slower rate so that it does not overshoot the target rate. The values range from 0 to 9, where 0 is a 5% rate, 1 is a 10% rate and 90 is a 90% rate.

DEAD BAND DIGIT

The dead band digit is the allowable difference between the target rate and the actual application rate. The values range from 1 to 9, where 1 equals 1% difference and 9 equals 9% of the difference.

PWM CONTROL VALVE CALIBRATION SETTINGS

PWM and PWM Close valves allow the option to modify the PWM settings.

MANUAL CALIBRATION MODE

Allows the operator to manually enter the PWM minimum, maximum, and preset known values.

NOTE: The PWM valve cannot be operated in the Manual Calibration mode. Verify that the changes to the settings have the desired effect before controlling product application.

CALIBRATION ASSISTANT

Allows the operator to increase or decrease the PWM output using on-screen controls and set the PWM minimum, maximum, frequency, and preset values based on observed operation. To use Calibration Assistant mode, toggle the vehicle's master switch and on least on section switch on ON. To stop PWM output at any time during the calibration process, toggle the vehicle master switch OFF.

VALVE CAL 2

NOTE: If the dual loop control feature is enabled, the valve cal 2 value will be replaced by the Sgain (pressure system gain) value.

When a fast close valve is selected, the valve cal 2 value is utilized to enable a high resolution rate control for lower application rates.

Enter a non-zero value for the time, in milliseconds, which the valve will be fully opened before switching into high resolution control. For example, a value of 200 will give the valve a 200 millisecond “burst” at a full 12V to open the fast valve from the closed position before resuming product rate control. A zero value will disable this feature.

PWM CONTROL VALVE CALIBRATION SETTINGS

PWM and PWM close valves allow the option to modify the PWM settings.

MANUAL CALIBRATION MODE

Allows the operator to manually enter the PWM minimum, maximum, and preset valves to known values.

NOTE: The PWM valve cannot be operated in Manual Calibration mode. Verify that the changes to the settings have the desired effect before controlling product application.

CALIBRATION ASSISTANT

Allows the operator to increase or decrease the PWM output using on-screen controls and set the PWM minimum, maximum, frequency, and preset values based on observed operation. To use the Calibration Assistant mode, toggle the vehicle’s master switch and at least one section switch on. To stop the PWM output at any time during the calibration process, toggle the vehicle master switch off.

AUTOMATIC CALIBRATION

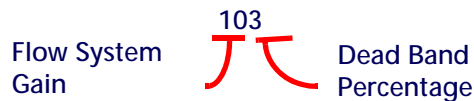
Allows the ROS device to automatically adjust the PWM output and determine the minimum, maximum, and preset values. To use the Automatic Calibration mode, toggle the vehicle’s master switch and at least one section switch on. To stop PWM output at any time during the calibration process, press “Cancel.”

NOTE: The Automatic Calibration process may take up to two minutes to complete. Maintain sufficient engine RPM and set the remote hydraulic flow for at least 1 GOM [3.8 L/m] flow for each motor on the control system. The field computer will display a prompt when the calibration process is complete. If the system fails to calibrate properly, press “Re-Calibrate” to restart the calibration process.

DUAL LOOP CONTROL MODE CALIBRATION SETTINGS

FLOW CAL

The flow cal value has two components which may be used to adjust the response of the application system.



NOTE: It is recommended to set the pressure s-gain value prior to making any adjustments to the flow cal value.

Flow System Gain. The first digit(s) of the flow cal correspond to a flow system gain between 1 and 99. The higher the flow system gain, the more aggressive the system will respond to changes in flow rate.

NOTE: When entering a flow gain value from 1 to 9, it is not necessary to enter a zero in front of the value.

If the system adjusts to rate control changes too slowly, increase the flow gain digit(s) to increase the system response rate. If the system overshoots or oscillates around the desired flow rate, decrease the flow gain digit(s) to help stabilize the system.

Dead Band Digit. The last, or right most, digit in the flow cal value is the dead band digit. The dead band digit is the allowable difference between the target rate and the actual application rate. The values range from 1 to 9, where 1 equals 1% difference and 9 equals 9% of the difference.

PRESSURE S-GAIN (PRESSURE SYSTEM GAIN)

The default setting for the pressure s-gain value is 100. To adjust the system aggressiveness, enter a value between 1 and 999 as necessary.

NOTE: It is recommended to increase or decrease the current value in increments of 10 or less when making adjustments to the pressure s-gain setting. If the new value does not produce significant or notable changes in the system response, increments of 20 may be used.

Increase the pressure s-gain value if the observed product pressure increases too slowly or if the system takes a long time to reach a set standby pressure or rate input change. If the system is consistently over shooting a set standby pressure or oscillating around a target rate, decrease the pressure s-gain value until the system stabilizes.

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:

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

where NVPM = Nozzle Volume per Minute (Gallons/Acre or [lit/ha]), Rate = Target Application Rate and 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 tip that is capable of these application specifications. Contact a local sprayer supply dealer for available nozzles or spray tips.

VERIFYING FLOW RATE LIMITS

The target rate for a field application also must be within the specified range of the flow meter measuring flow rate for the control channel.

Flow Meter Model	Flow Range
RFM 5	0.1 - 5 GPM [0.2 - 18.9 L/min]
RFM 15	0.3 - 15 GPM [1.1 - 56.8 L/min]
RFM 60P	1 - 60 GPM [3.8 - 210 L/min]
RFM 100	5 - 100 GPM [11.4 - 380 L/min]
RFM 200/ 200 Poly	15 - 200 GPM [56.8 - 760 L/min]
RFM 400	25 - 400 GPM [94.6 - 1515 L/min]

GRANULAR APPLICATIONS

The target application rate must be entered in lbs/acre [kg/ha] as the rate value. Consult the equipment manual to ensure that the selected gate opening is capable of applying at this application rate.

NOTE: The spreader constant must be recalculated anytime the gate opening is changed.

SPREADER CONSTANT

NOTE: The spreader constant should be verified by performing the Spreader Constant Calibration section on page 45.
For Gran 2 or Gran 3 applications, gate width is the total of both openings.

For Rates displays in 1 pound [1 kg] increments, the formula to calculate the spreader constant is:

$SC = 311,040 / (L \times GH \times GW)$	$SC = 18,000,000 / (L \times GH \times GW)$
--	---

Where SC = Spreader Constant, L = Length of belt travel in inches [centimeters] per revolution of the encoder, GH = Gate height in inches [centimeters], GW = Gate Width in inches [centimeters].

FOR EXAMPLE:

Given a Length of belt travel of 13" [33cm], a Gate Height of 7" [18 cm], and a Gate Width of 15" [38 cm]:

$311,040 / (13 \times 7 \times 15) = SC \text{ of } 228$	$18,000,000 / (33 \times 18 \times 338) = SC \text{ of } 797$
--	---

Enter 228 [797] as the Spreader Constant

ENCODER CALIBRATION

Determine the number of pulses emitted by the encoder per one revolution of the sensor.

1. Enter a meter cal value of 10.

2. Set the total volume value to 0.
3. Turn the sensor exactly one revolution. The value in tally registers total volume field is the number of encoder pulses per sensor revolution.

CATCH TEST VERIFICATION

To verify and refine the spreader constant:

1. Weigh the loaded truck and record the initial weight.
2. Enter the product density in lbs/cu. ft. [grams/liter] under the Density button in the Calibration Settings screen.
3. Set the total volume to zero for the product node being tested.
4. With the product mode in Manual mode, unload a portion of the load by toggling the boom switch ON.
5. Weigh the truck again to determine the actual unloaded weight.
6. Compare this weight to the total volume displayed on the field computer display. If desired, perform the following calculation to refine the spreader constant:

$$(OSC \times TC) / AW = CSC$$

Where OSC = the Old Spreader Constant, TV = the Total Volume and AW = the Actual Weight unloaded and CSC = the Corrected Spreader Constant.

FOR EXAMPLE:

Using on Old Spreader Constant = 228 [797], Total Volume = 200 lbs [4400 kg] and an Actual Weight Unloaded = 1950 [4290]:

English	Metric
$(228 \times 2000) / 1950 = 234$	$(797 \times 4400) / 4290 = 817$

The new Spreader Constant is 234 [817]. Repeat this procedure until the weight of the metered materials equals the total volume.

ADDITIONAL CALIBRATION DATA

Although not required operation, the following values may be programmed to enhance feedback for the operator during field application.

ENTERING TANK VOLUME OR BIN LEVEL

The tank volume or bin level displayed on the field computer is the calculated estimate of the amount of product remaining in the tank or bin (not the capacity of the tank or bin). The volume or level must be reset when refilling product to allow the field computer to calculate the remaining volume during product application. To reset the tank volume or bin level:

1. Touch the Tank Volume or Bin Level button to display the tank or bin configuration prompt.
2. Touch the Tank or Bin Size button to access the Total Tank Size prompt.
3. Use the on-screen keypad to enter the volume or level of product normally used to fill the tank or bin.
4. Touch the Accept icon to save the entered volume. The entered value will be displayed in the Reset Tank or Reset Bin button.

5. When refilling the tank or bin, touch the reset button to reset the tank or bin level quickly.

LOW TANK ALARM

The field computer may be set to display or sound or an alarm when the calculated volume of product remaining in the in the tank falls to a user defined level. To setup the Low Tank Alarm, refer to the Alarm Settings Tab section on page 15.

RESET VOLUME/AREA DISPLAY INFORMATION

The current total area, total volume, field area, and field volume information is displayed as applied information that can be reset at any time. Refer to the Tally Registers Widgets section on page 38 to reset these display values.

RESET DISPLAY DISTANCE

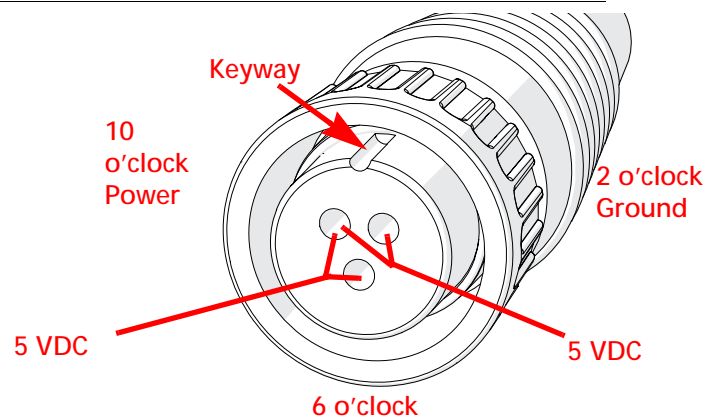
The current display distance, or odometer, registered by the field computer may be reset at any time. Refer to the Tally Registers Widgets section on page 38 for more information.

B

SPEED SENSOR EXTENSION CABLE

Disconnect the extension cable from the speed sensor assembly cable. Hold the extension cable connector so that the keyway is pointing in the 12 o'clock position as shown below.

FIGURE 1. Speed Sensor Extension Cable Pin Diagram



NOTE: If a radar type speed sensor is used, the voltage between the 10 o'clock and 2 o'clock positions may read 12V DC.

If a 5V DC voltage reading is not present, disconnect the flow meter cable and re-test the speed sensor cable. If the voltage reads 5V DC when the flow meter cable is disconnected, test the flow meter cable per Testing the Flow Meter/Encoder Cable section on page 54.

TESTING THE SPEED SENSOR EXTENSION CABLE

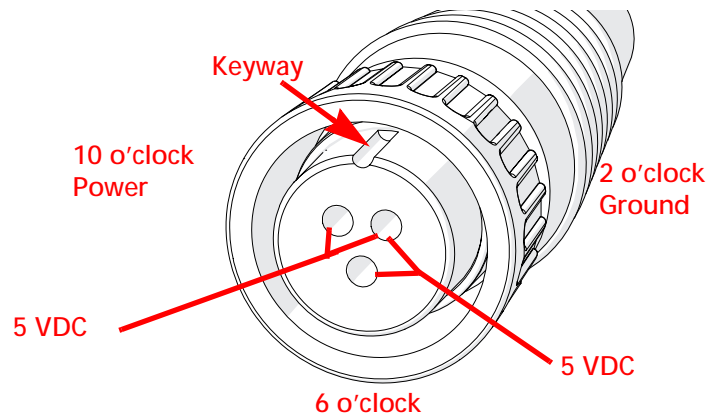
1. Enter a speed cal of 9999.
2. Zero the ROS device odometer.
3. With a small jumper wire (or paper clip), short between the 10 o'clock and 6 o'clock sockets with a 'short-no-short' motion. Each time contact is made, the distance total should increase by increments of 1 or more.
4. If the distance total does not increase, remove the section of cable and repeat the test at the connector that is the next closest to the node. If the distance total now increases with the short-no-short test, replace the defective cable as required.
5. If no pulses are registered, perform the above voltage checks.
6. If all of the cables test 'good,' replace the speed sensor.

NOTE: After testing is complete, re-enter the correct speed cal before starting an application.

FLOW METER/ENCODER EXTENSION CABLE

Before starting this test, disconnect the flow meter cable from the flow meter. Hold the flow meter cable so that the keyway is pointing in the 12 o'clock position as shown below.

FIGURE 2. Flow Meter Extension Cable Pin Diagram



TESTING THE FLOW METER/ENCODER CABLE

1. Enter a meter cal of 1 in liquid or direct injection modes, or density of 1 and spreader constant of 0 in granular mode.
2. Note the total volume for each product node connected to the CANbus.
3. Turn the boom and master switch On.
4. With a small jumper wire (or paper clip), short between the 2 o'clock and 6 o'clock sockets with a 'short-no-short' motion. Each time contact is made, the total volume number should increase by increments of 1 or more.
5. If the total volume value does not increase, remove the section of cable and repeat the test at the connector that is the next closest to the node. Replace the defective cable as required.
6. Verify the pin connection and voltage from the previous chart.
7. If all of the cables test 'good,' replace the rate sensor.

NOTE: After testing is complete, re-enter the correct cal values before starting an application.

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.

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.