

ROS Sidekick™ Series Calibration and Operation Manual

016-0171-564 Rev. C

04/16

E27293



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CHAPTER

1

Important Safety Information

NOTICE

When operating the machine, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate any agricultural equipment while under the influence of alcohol or an illegal substance.
- Determine and maintain a safe working distance from obstacles or other individuals. The equipment operator is responsible for disabling the system if the safe working distance has diminished.

Review the operation and safety instructions included with the implement and/or controller.

WARNING

Chemical Handling and Safety

Chemicals used in agricultural applications may be harmful to your health or the environment if not used responsibly. Review the safe, effective, and legal use and disposal of agricultural chemicals with a chemical supplier.

- Always follow safety labels and instructions provided by the chemical manufacturer or supplier.
- Store agricultural chemicals in original containers and do not transfer to unmarked containers or containers used for food or drink. Store chemicals in a secure, locked area away from human or livestock food and keep children away from storage areas.
- Avoid inhaling chemical dust or spray particulate and avoid direct contact with agricultural chemicals. Always wear appropriate personal protective equipment as recommended by the chemical and/or equipment manufacturer. Wash hands and face after using agricultural chemicals and before eating, drinking, or using the rest room.
- Seek medical attention immediately if illness occurs during, or shortly after, the use of chemicals.
- Fill, flush, calibrate, and decontaminate sprayer systems in an area where runoff will not reach ponds, lakes/streams, livestock areas, gardens, or populated areas. Thoroughly flush or rinse equipment used to mix, transfer, and apply chemicals after use.
- Before servicing any component of the system, thoroughly flush or rinse components with water.

- Improper disposal of waste may threaten the environment and ecology. Dispose of empty containers properly. Triple-rinse empty containers and puncture or crush when disposing. Contact a local environmental or recycling center for additional information.

CAUTION

- Never attempt to open or work on an injection system with the equipment running. Always use caution when opening an previously pressurized injection system.
- Liquids in the injection system may be under pressure. Use caution, even if the system has not been in use recently. Refer to the *Sidekick Pro Installation and Operation Manual* for assistance with flushing or performing maintenance on the injection system.
- If the system malfunctions or becomes clogged, stop the engine or pump and relieve pressure from the spraying system before servicing.
- Do not operate machinery without instruction and keep equipment in proper working condition. Unauthorized modification to equipment may impair machine function and/or safety and may shorten the working life of equipment.
- Wear clothing appropriate for the job being performed and avoid loose fitting clothing while working on or near moving components. Keep long hair away from moving components.

Electrical Safety

- Disconnect the ROS device and all electrical components of the Raven system before jump-starting the vehicle or welding on any component of the equipment.
- Remove rings and other jewelry to prevent electrical shorts or entanglement in moving parts.

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
- High pressure wash

Instructions for Hose Routing

The word hoses 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 hoses 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

CHAPTER

2

Introduction

Overview

This manual is intended to offer assistance with the operation of a Sidekick™ series direct injection system using a ROS capable device.

Raven Sidekick series direct injection systems are designed to provide efficient and accurate application of liquid chemicals from an injection module. By using separate chemical tanks, the Raven injection systems eliminate the need to mix chemicals in the applicator tank, which may help to reduce chemical waste, improve the service life of application equipment, and simplify standard maintenance procedures.

Sidekick™ Direct Injection Systems

The CAN based Raven Sidekick injection system consists of a CAN motor control node and Sidekick injection pump to control the rate of injected chemical. Once the system is properly primed and calibrated, the injection pump may be used to automatically adjust the rate of injected chemical based upon the carrier chemical, vehicle speed, and active boom sections. The operator may also adjust the injection system during field operations via the ROS device and Raven CANbus to adjust rate or monitor system operation.

Note: *Performance of the direct injection system relies upon proper installation and maintenance of the complete application system. Please review this manual before operating this system and follow instructions provided for proper care and maintenance of the direct injection system.*

Refer to the Sidekick Installation manual for additional assistance or information on the CAN based Sidekick injection system.

Sidekick Pro™ Systems

The Sidekick Pro direct injection system consists of an integrated pump and control node and features a remote, closed calibration system. Sidekick Pro also provides advanced pump monitoring and diagnostics, which may be used to enhance data and improve operation of the direct injection system during field operations. The Sidekick Pro injection system also provides a closed calibration feature to minimize chemical waste and exposure to harsh agricultural chemicals during the calibration process.

Note: *Refer to the Sidekick Pro Installation manual for additional assistance with installing the Sidekick Pro™ injection system.*

Updates

Updates for Raven manuals as well as several system components are available at the Applied Technology Division web site:

www.ravenhelp.com

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

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

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

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

techwriting@ravenind.com

-ROS Sidekick™ Series Calibration and Operation Manual

-Manual No. 016-0171-564 Rev. C

-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

ROS Calibration

ROS Calibration

After installation of the injection system has been verified, and the motor control node is recognized by the ROS device, calibrate the Sidekick injection system to provide accurate control of the injected product.

Note: *Firmware version 1.20 or higher is recommended for the Sidekick Pro node. Refer to the ROS Basic Operation Manual for assistance with checking or updating node firmware versions over the Raven CANbus.*

The following settings must be calibrated or programmed to ensure proper control and operation of the Sidekick injection system:

<ul style="list-style-type: none">• Pump Type (Sidekick Pro only)	<ul style="list-style-type: none">• Flow Error Cal (Sidekick) or FER Cal (Sidekick Pro)
<ul style="list-style-type: none">• Meter Cal	<ul style="list-style-type: none">• Motor Cal
<ul style="list-style-type: none">• Pressure Transducer Cal (Sidekick Pro only)	

Note: *Program the settings for each control channel or pump which will be used to control product during field operations.*

Before attempting to configure the injection pump, verify that the ROS device has detected the injection control node. Refer to the ROS Basic Operation Manual for additional assistance with detecting and troubleshooting the CANbus system.

Application and Pump Type

To configure the application type and pump type for a Sidekick injection system:



1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Product Control button. The Product Settings tab will display.
3. Touch the product indicators along the left of the prompt to select the control channel assigned to the pump.
4. Verify that the application type is set to liquid injection.

Note: Contact a local Raven dealer if the liquid injection option is not available for the control channel application type.

5. Touch the Injection tab.

Note: The pump type setting will not be available when controlling a Sidekick injection system.

6. Select either the “Low Volume” or “High Volume” option to configure the system for the following Sidekick Pro injection pumps:
 - Low Volume 1-40 oz./min. [0.3-11.8 dL/min.] pump
 - High Volume 5-200 oz./min. [1.5-59 dL/min.] pump

Pressure Transducer Calibration



! WARNING

Always wear protective equipment and use caution when opening a system that has been previously pressurized. Fluid in the injection pump may be under pressure, even if the system has not been in use recently.

Refer to the *Sidekick Pro Installation and Operation Manual* for assistance with the injection system flushing or maintenance procedures.

Note: Pressure monitoring features are not available when interfacing with a Sidekick injection system. The pressure transducer on the Sidekick Pro injection pump monitors pressure at the outlet port of the pump. Calibrate the pressure transducer at an ambient pressure level prior to priming or calibrating the injection pump.

To calibrate the pump pressure transducer:



1. Turn off the injection pump and product control system.

2. Locate the injection pump and pressure transducer.
3. Using a 9/16" allen wrench, or a 9/16" bolt head, loosen the outlet valve cartridge on the opposite side the pump head from the transducer to release pressure at the injection pump outlet port.

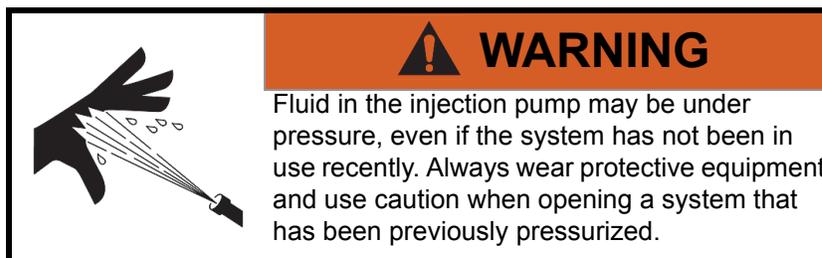
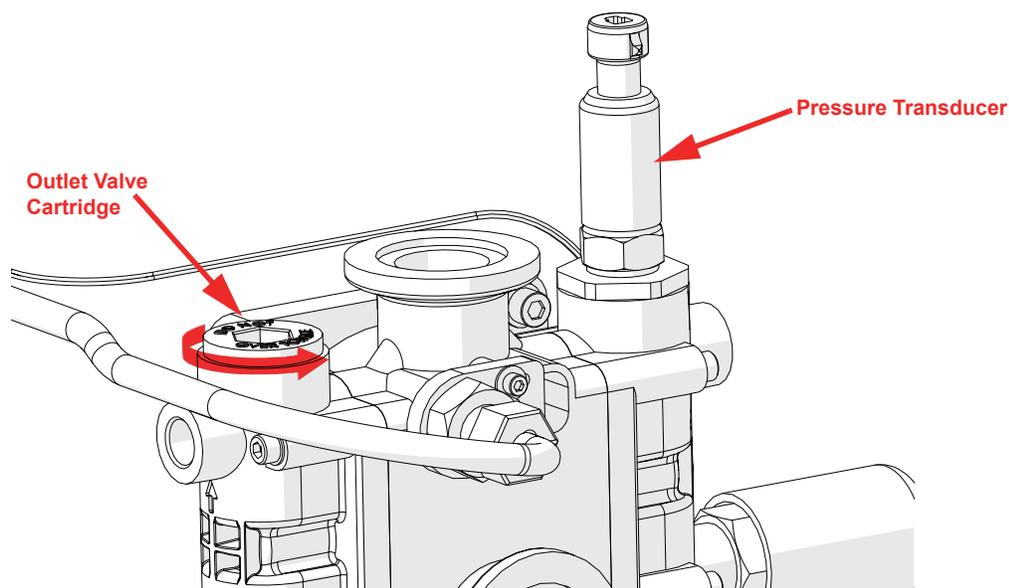


FIGURE 1. Outlet Valve Removal for Pressure Release



Note: It is not necessary to completely remove the valve cartridge from the pump head. Loosen the cartridge to relieve pressure from the pump.

4. On the ROS device, touch the Edit icon in the Machine Panel to view the Machine Devices.
5. Locate and select the Product Control button. The Product Settings tab will display.
6. Press the product indicators along the left of the prompt to select the control channel to which the pump is assigned.
7. Touch the Pressure Settings tab.
8. Select the Pressure 1 Cal value and enter a value of zero to calibrate for ambient conditions.
9. Retighten the outlet valve cartridge before resuming normal operations.

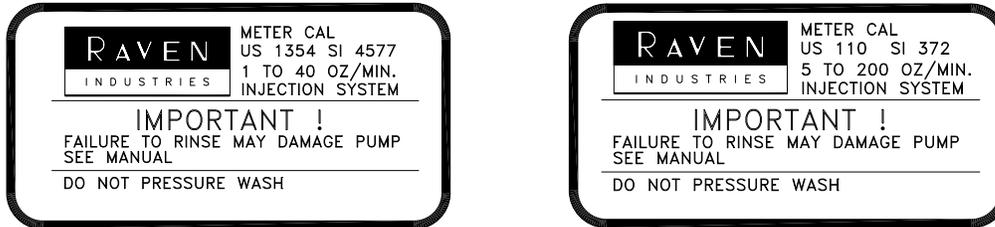
Meter and Motor Cal

To configure the meter cal and motor cal values for a Sidekick injection system:



1. Locate the injection pump.
2. Find the meter cal tag attached to the flow monitor lead or cable or label affixed to the pump motor and note the meter cal value.

FIGURE 2. Example Sidekick Pro Motor Label with Meter Cal



3. On the ROS device, touch the Edit icon in the Machine Panel to view the Machine Devices.
4. Locate and select the Product Control button. The Product Settings tab will display.
5. Touch the product indicators along the left of the prompt to select the control channel to which the pump is assigned.
6. Touch the Injection tab.
7. Enter the meter cal value from the pump tag.

Note: The meter cal may be tuned to refine calibration of the chemical injection pump. Refer to the *Calibrate the Injection Pump* section on page 39 to check or refine the meter cal.

8. Verify that the motor cal value is set to 123.
9. For Sidekick injection systems, the motor cal 2 value should be set to zero. When interfacing with a Sidekick Pro injection system, the motor cal 2 value is locked to either 5054 (high volume pumps) or 5055 (low volume pumps).

Flow Error Cal

Note: The off rate percentage will only display when interfacing with Sidekick injection systems.

The default flow error cal value for the motor control node is 25. The flow error cal may be set between 0 and 100 depending upon the type of error detection needed during field operations.

To adjust the flow error cal value:



1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Product Control button. The Product Settings tab will be displayed.
3. Touch the product indicators along the left of the prompt to select the control channel to which the pump is assigned.
4. Touch the Alarm Settings tab.
5. Touch the off rate percentage field and adjust the error tolerance value as necessary. Refer to *Alarm Settings Tab* section on page 13 for additional assistance with adjusting the flow error cal value.

Flow to Encoder Ratio (FER) Cal

Note: The FER Cal value will be displayed only with Sidekick Pro injection systems.

The default FER cal value for any Sidekick Pro injection pump is 6. The FER value may be set between 0 and 9 depending upon the type of error detection needed during field operations.

To adjust the FER value:



1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Product Control button. The Product Settings tab will display.
3. Touch the product indicators along the left of the prompt to select the control channel to which the pump is assigned.
4. Touch the Alarm Settings tab.
5. Touch the FER Cal field and adjust the error tolerance value as necessary. The default value is six. Refer to *Alarm Settings Tab* section on page 13 for additional assistance with adjusting the FER Cal value.

Injection Settings Definitions

The following sections are intended to provide detailed descriptions of settings, features, and options available for operation of Sidekick or Sidekick Pro injection systems.

Product Settings Tab

To access the Product Settings tab:



1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Product Control button.
3. Touch the Product Settings tab.
4. Select a product indicator along the left of the prompt to select the control channel to which the pump is assigned. Depending upon the injection system connected, the following settings may be available:

Application Type. The application type should automatically be set to liquid injection when ROS detects a Sidekick or Sidekick Pro injection system. Refer to the injection system troubleshooting information or contact a local Raven dealer for additional assistance if the liquid injection option is not available for the application type.

Tank Capacity. Enter the volume of chemical normally used to fill the chemical supply tank or enter the current tank volume. This value will be used during field operation to calculate when the tank is low or empty. This value must be reset when refilling the product.

Refer to the *Alarm Settings Tab* section on page 13 for additional assistance with the low tank alarm feature for use during operation.

Tank Level. The tank level indicator shows the current level of the chemical in the tank.

Rate Bump. Enter the desired increments by which the target rate will increase or decrease when using the rate bump widget on the guidance screen. Each 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 effect on the selected product application rate on the guidance screen.

Agitator. An optional tank agitator may be used to continually mix chemical suspensions which can help to ensure uniform application. If an agitator is installed with the injection system, enable the agitator feature to power the agitator motor.

Note: *Disable this option if the injection pump is not used or if the chemical supply tank is empty.*

Rinse System. Select the Rinse System check box to start a system rinse.

Display Smoothing. Enable the smoothing feature to allow ROS to smooth the actual rate display during field operations. With this feature enabled, ROS will display the target application rate as the actual rate as long as the actual rate is within 10% of the target rate.

If the actual rate is outside of the target rate dead band ($\pm 10\%$) for 10 seconds, ROS will display the actual application rate.

Ratio Rate. The ratio rate application mode allows the operator to configure application of an injected chemical at a rate proportional to the carrier product flow rate. The ratio rate mode must be enabled and a rate cal value must be entered in a ratio (oz./gal or dL/L) for each product controlled in ratio to the carrier.

Note: *Refer to the Ratio Rate Application Mode section on page 25 for additional assistance with setting up the Ratio Rate mode.*

Injection Tab

To access the Injection tab:

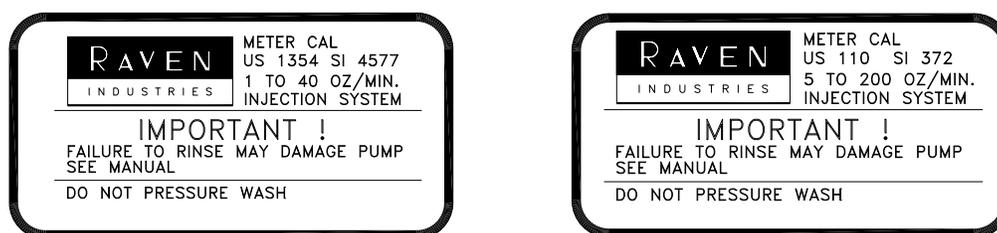


1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Product Control button.
3. Touch the Injection Settings tab.
4. Touch the product indicators along the left of the prompt to select the control channel to which the pump is assigned. Available options depend upon the injection system connected:

Pump Type (Sidekick Pro only). The type of pump used for chemical injection must be selected during the initial product calibration for each injection pump connected to the control system. Select either the "High Volume" (5-200 oz./min. [1.5-59 dL/min.]) or "Low Volume" (1-40 oz./min. [0.3-11.8 dL/min.]) for each product control channel connected to a Sidekick Pro injection system.

Meter Cal. The meter cal value for the Sidekick injection pump may be found on the label affixed to the pump motor or the flow sensor connector. Enter this value as the initial meter cal.

FIGURE 3. Sidekick Pro Pump Motor Label with Meter Cal



Note: The meter cal may be adjusted to refine calibration of the chemical injection pump. Refer to the injection system for assistance with checking or refining the meter cal.

Motor Cal. The initial motor cal value for any injection pump is 123.

Note: The initial motor cal may be adjusted to refine Sidekick Pro system response for various application needs. Refer to the ROS Product Control Calibration and Operation Manual for additional assistance with adjusting the valve cal values.

Motor Cal 2. When interfacing with Sidekick injection systems, set the motor cal 2 value to zero. For Sidekick Pro systems, the motor cal 2 value is 5054 for high volume pumps or 5055 for low volume pumps and should not be adjusted.

Injection Calibration Tab

Note: The Injection Calibration tab will be available only when interfacing with a Sidekick Pro injection system.

To access the Injection Calibration tab:



1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Product Control button.
3. Touch the Injection Calibration tab.
4. Select a product indicator along the left of the prompt to select the control channel to which the pump is assigned. The following Sidekick Pro injection pump settings will be available:

Calibrate Pump

Touch the Calibrate button to begin the pump calibration process. Refer to the *Calibrate the Injection Pump* section on page 16 for details on calibrating the Sidekick Pro injection pump.

Prime Pump

Touch the Prime button to begin priming the Sidekick Pro injection pump. Refer to *Prime the Injection Pump* section on page 15 for assistance with priming the Sidekick Pro injection pump.

Pump Rinse

If your Sidekick node supports pump rinse, press the pump rinse button so begin the pump rinse. Refer to “Rinse Assist” on page 17 for additional information.

Diagnostics

The bottom of the Injection Calibration tab displays advanced diagnostics information for the Sidekick Pro injection system.

Error Status and Solution. If any pump error conditions are encountered while applying injected products, the error type will be displayed on the Injection Calibration tab. A brief description of the error code and potential solution is displayed in the solution area. The injection node is capable of detecting the following flow error conditions:

- Maximum vacuum (plugged strainer, chemical too thick)
- Plugged pump valve or injection line
- Empty tank
- Severe leak on the inlet or outlet hose
- Hand valves in the wrong position

Each of these flow errors are isolated to provide minimal troubleshooting and to reduce machine down time. For additional assistance with troubleshooting the injection system, refer to the *Sidekick Pro Calibration and Operation Manual*. Refer to the *ROS Basic Operation Manual* for information on enabling or disabling audible alarms for the above error conditions.

Injection Pressure. The pressure monitored at the pump outlet.

Flow/Encoder Ratio. The Flow to Encoder Ratio is used with the FER Cal to identify the relative efficiency of the pump. This area displays a value between 0 and 100.

Note: *This number is an indicator of pump health and cannot be used to measure flow from the pump.*

Motor RPM. The current RPM of the injection pump motor is displayed in this field.

Voltage. The high current voltage detected by the CAN motor control node is displayed in this area.

PWM Percent. This value represents the current pump capacity being used, or how hard the pump is being driven. A value of 100 indicates the pump is being driven at maximum capacity.

Node Temperature. The temperature of the motor control node is displayed in this area. This value may be used with the motor RPM value to help determine how hard the pump is being driven.

Application Run Time. The total run time of the selected injection pump is displayed in this area.

Pressure Settings Tab

Note: *The Pressure Settings tab features are only available when interfacing with a Sidekick Pro injection system.*

To access the Section Settings tab:



1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Product Control button.
3. Touch the Pressure Settings tab.
4. Touch the product indicators along the left of the prompt to select the control channel to which the pump is assigned. The following Sidekick Pro injection pump settings will be available:

Pressure Cal 1. When connected to a Sidekick Pro motor control node, the pressure cal 1 value will display the pressure at the outlet port of the injection pump.

Pressure Cal 2. The pressure cal 2 value on the Sidekick Pro control channel will not be used.

Note: To monitor carrier or boom pressure, a pressure transducer may be installed and connected to the carrier product control channel and will have to be calibrated with the product node for the carrier.

Section Settings Tab

To access the Section Settings tab:



1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Product Control button.
3. Press the Section Settings tab.
4. Touch the product indicators along the left of the prompt to select the control channel to which the pump is assigned.
5. The section assignments for the injection system should be matched to the carrier product assignments to accurately map and control rate of the injected products. Refer to the *ROS Product Control Calibration and Operation Manual* for additional assistance with section assignments settings.

Alarm Settings Tab

To access the Alarm Settings tab:



1. Touch the Edit icon in the Machine Panel to view the Machine Devices.
2. Locate and select the Product Control button.
3. Touch the Alarm Settings tab.
4. Touch the product indicators along the left of the prompt to select the control channel to which the pump is assigned. Depending upon the injection system connected, the following settings may be available:

Low Tank Volume. Enter the volume at which to alert the operator to a low tank condition during field operations. This feature requires the operator to enter an initial volume when refilling tanks to allow ROS to calculate the tank 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, ROS will override the injection pump to maintain the entered low limit and display a flow alarm to alert the operator.

Note: ROS will automatically adjust the low flow limit value for active sections.

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, ROS will display an off rate alarm for the operator.

Flow Error Cal (Sidekick). Enter the allowable tolerance for rate error during injection applications. Increase the flow error cal value to set a tighter tolerance. Set the flow error cal to zero to turn off all flow monitor alarms for the injected chemical.

Note: *The range for the flow error cal is 0 through 100. The default value for a Sidekick injection pump is 25.*

FER Cal (Sidekick Pro). The Flow to Encoder Ratio (FER) error cal value is used to set the flow error tolerance of chemical injection applications. Increase the FER error cal value to set a tighter tolerance. Set the FER error cal to zero to turn off all flow monitor alarms for the injected chemical.

Note: *The range for the FER error cal is 0 through 9. The default value for a Sidekick Pro injection pump is 6.*

Maximum Vacuum Error. Enable the vacuum error to provide an alert to the operator if the injection pump cannot draw product from the chemical supply tank. Review the pump troubleshooting information, or contact a local Raven dealer for additional assistance with vacuum alarm conditions.

Flow Alarm Enable (Sidekick). Enable the flow alarm to display an alert if ROS 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.

Zero Speed Shutoff. Enable the zero speed shutoff feature to allow ROS 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.

Maximum Pressure Error (Sidekick Pro only). Enable the maximum pressure error feature to enable operator alarms for the Sidekick Pro injection pump. The maximum pressure alarm will be displayed if the pump outlet pressure reaches 150 PSI [1034 kPa].

Low Pressure Error (Sidekick Pro only). Enable the low pressure error feature to enable operator alarms for the Sidekick Pro injection pump. The minimum pressure alarm will be displayed if the pump outlet pressure falls below the monitored boom pressure for longer than five seconds.

Note: *A pressure transducer must be installed and connected to the carrier product control channel to monitor the boom pressure.*

CHAPTER

4

Sidekick™ Injection Pump Priming, Rinsing, and Calibration

Pump Priming, Rinsing, and Calibration Procedures

Before starting an application using the injection system, perform the following procedures to ensure the system is properly calibrated and ready for chemical application:

1. Review Chapter 3, *ROS Calibration*, and verify the ROS setup for any injection control channels are configured properly.
2. Perform the procedure outlined in the *Prime the Injection Pump* section on page 15 or *Prime the Injection Pump* section on page 15.
3. Perform the procedure outlined in the *Calibrate the Injection Pump* section on page 16 or *Calibrate the Injection Pump* section on page 20.
4. If equipped with the optional rise feature, perform the “Rinse Assist” on page 17.

Sidekick Pro™ Priming, Rinsing, and Calibration

Prime the Injection Pump

1. Open the hand valve(s) between the supply tank and injection pump.
2. If installed, set the hand valve on the injection pump outlet to recirculate product back to the supply tank.
3. Lift the plunger handle on the pump calibrator to the top of the calibration cylinder.
4. Verify the following conditions are present:
 - a. Injection pressure is less than 12 PSI [82.7 kPa].
 - b. Pump is in the off condition.
 - c. Vacuum pressure less than 11.5 inches of mercury [29 cm of mercury].

Note: *The vacuum switch on the pump will engage and a flow alarm will be displayed if product cannot be drawn into the pump (e.g. vacuum pressure at or above 11.5 inches of mercury [29 cm of mercury]). Check screens, hose diameter and any hand valves between the chemical tank and pump inlet. Also, verify that the product is flowing freely. Cold temperatures and low viscosity products may cause high vacuum pressures and cause the pump not to operate properly.*

5. Refer to the *Injection Calibration Tab* section on page 11 to access the Injection Calibration tab.
6. Touch the Prime Pump button to initiate pump priming.
7. Allow the pump to prime. The priming procedure will run until the controller detects the pump has primed. If the pump is unable to prime, the console will end the priming procedure after two minutes and display a “prime time-out” message.

Note: *If the console displays an error message during the priming process, verify that the conditions listed in step 4 are present. If the problem continues, refer to the Sidekick Pro Calibration and Operation Manual for assistance with addressing issues during the pump priming process.*

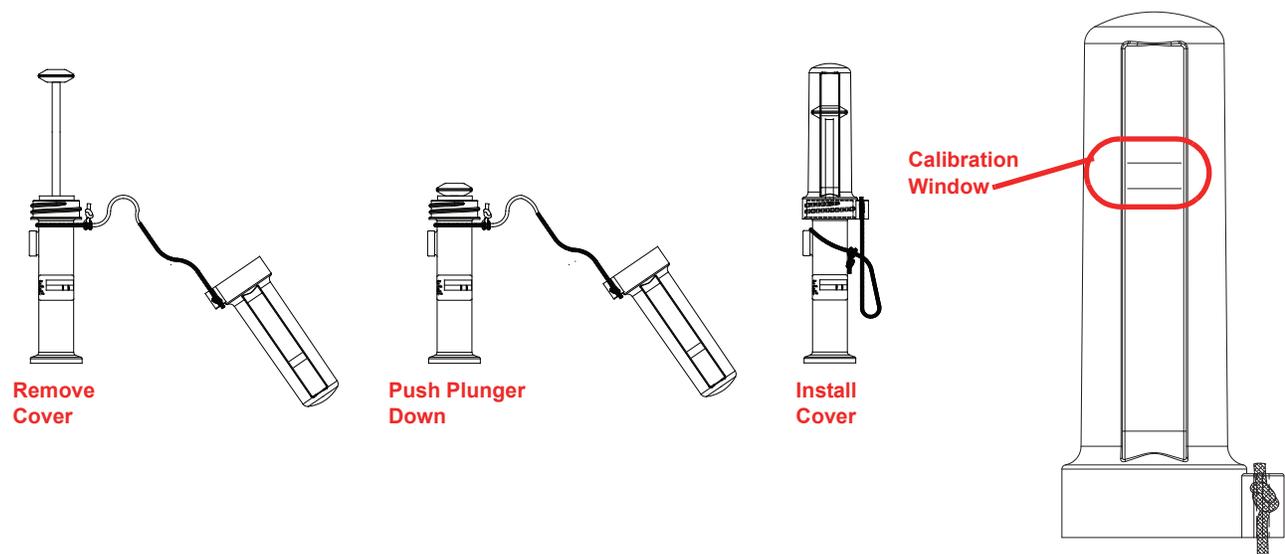
Press the “OK” button to stop the priming procedure at any time. If the pump fails to prime successfully after the first attempt, restart the priming procedure. If the pump is still unable to prime successfully, refer to the Sidekick Pro Calibration and Operation Manual for assistance with diagnosing issues with the injection system.

Calibrate the Injection Pump

Prior to starting a chemical injection application, verify that the pump is properly calibrated and operational by performing a pump calibration.

1. Ensure the pump is primed as described in the *Prime the Injection Pump* section on page 15 before proceeding with the calibration process.
2. If installed, set the hand valve on the injection pump outlet to recirculate product back to the supply tank.
3. Remove the cover from the injection pump calibrator.
4. Press the calibrator all the way down and replace the calibrator cover.

FIGURE 3. Sidekick Pro Pump Calibrator



5. Verify the following conditions are present:
 - a. Injection pressure is less than 12 PSI [82.7 kPa].
 - b. Pump is in the off condition.
 - c. Vacuum pressure less than 11.5 inches of mercury [29 cm of mercury].

Note: *The vacuum switch on the pump will engage and a flow alarm will be displayed if product cannot be drawn into the pump (e.g. vacuum pressure at or above 11.5 inches of mercury [29 cm of mercury]). Check screens, hose diameter and any hand valves between the chemical tank and*

pump inlet. Also, verify that the product is flowing freely. Cold temperatures and low viscosity products may cause high vacuum pressures and cause the pump not to operate properly.

6. Refer to the *Injection Calibration Tab* section on page 11 to access the Injection Calibration tab.
7. Touch the Calibrate Pump button to initiate pump calibration. The pump will proceed to run until the console detects 1 oz. [0.3 dL] of chemical has been passed through the pump and the console displays a “CAL complete” message.

Note: *To stop calibration while in progress, at any time pass the metal object past the calibration sensor.*

If the console displays an error message during the priming process, verify that the conditions listed in step 4 are present. If the problem continues, see Chapter 7, Troubleshooting, to resolve issues during the pump calibration process.

After the initial calibration has been completed, the injection pump calibration process may be re-initiated by passing a metal object (e.g. screw driver or spare bolt) past the integrated calibration sensor twice.

8. Check the calibrator plunger on the injection pump. The black ring on the plunger should stop within the “window” markings on the calibrator cover if the pump calibration is successful. If the black ring stops slightly outside of the calibration window, the meter cal value may be adjusted to compensate:
 - If the plunger stops below the calibration window, increase the meter cal.
 - If the plunger stops above the calibration window, decrease the meter cal.

Note: *The initial meter cal should be adjusted in increments of 1% from the default meter cal. If the meter cal must be increased or decreased by more than 5% from the value printed on the pump housing, perform pump maintenance procedures outlined in the Sidekick Pro Calibration and Operation Manual. If the problem persists, troubleshoot the injection system, for possible solutions to issues with the injection pump.*

Rinse Assist

The Sidekick Pro Rinse Assist system allows an operator to quickly rinse the Sidekick Pro direct injection pump without leaving the machine cabin. The Rinse Assist system utilizes an automated 3-way rinse valve to switch the inlet source to a rinse tank and the injection pump will draw rinse fluid through the pump.

Priming the Rinse Circuit

1. Prime the rinse fluid supply lines then the chemical supply plumbing until they are to the automated 3-way Rinse Assist valve.
2. To prime the rinse fluid supply lines, perform the procedure to rinse the pump as described below. Stop the pump once the rinse fluid reached the Rinse Assist valve.
3. Refer to the procedure in the Sidekick Pro Operation manual to prime the chemical supply lines as normal.

Rinse the Sidekick Pro Pump

1. Enable the Rinse Assist feature on a compatible Raven field computer of console.
2. Ensure the rinse supply tank contains at least one gallon [3.8 L] of rinse fluid.
3. The Rinse Assist system will operate with the master and section switches set in the off positions. However, the pump pressure switch will stop the pump if the pressure reaches approximately 100 PSO [689 kPa]. To flush additional portions of the injection system, or the main carrier line, toggle the master switch and at

least one boom section is on. Alternatively, a manual 3-way valve may be installed between the injection pump outlet port and the point of injection which may allow chemical to be reclaimed.

Note: *Reclaimed chemical may be contaminated or mixed with the rinse fluid or agent used in the Rinse Assist system. Contact the chemical supplier for additional assistance with handling, disposing, or before reusing reclaimed chemical.*

4. To begin the Rinse Assist operation, touch the “Rinse Pump” button. The valve will switch to the rinse fluid supply position and the pump will begin the rinse cycle.
5. Allow the rinse cycle to complete.
6. To stop the rinse cycle during operation, press the “Rinse Pump” button again. The pump will stop and the valve will return to the chemical supply position for the next field operation.
7. The rinse cycle may be run multiple times to run more rinse fluid through the pump or to rinse the other components of the injection or product system as desired.

Sidekick™ Priming and Calibration

Prime the Injection Pump

1. Open the hand valve(s) between the supply tank and injection pump.
2. If installed, set the hand valve on the injection pump outlet to recirculate product back to the supply tank.
3. Toggle the Sidekick pump to manual control mode.
4. Toggle at least one section switch to the on position.
5. Toggle the master switch to the on position and use the INC/DEC or \pm switch to operate the pump at maximum RPM until air is removed from the injection lines.

Calibrate the Injection Pump

Prior to starting a chemical injection application, verify that the pump is properly calibrated and operational by performing a pump calibration.

	<p>WARNING</p> <p>Review chemical handling and safety information prior to performing the calibration process. Use clean water to perform the calibration process if the chemical data sheet restricts handling or open containers of the chemicals to be applied.</p>
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1. Ensure the pump is primed as described in the *Prime the Injection Pump* section on page 15 before proceeding with the calibration process.
2. If installed, set the hand valve on the injection pump outlet to recirculate product back to the supply tank.
3. Toggle the section and master switches to the on position.
4. Operate the injection pump until liquid is flowing through the tank return hose.
5. Toggle the master switch off.

6. Reset the total volume tally for the injection pump control channel to zero.

Note: Refer to the ROS Product Control Calibration and Operation manual for assistance with using and resetting the tally registers if necessary.

7. Disconnect the tank return hose and place into a calibrated measuring container. For more accurate calibration results, install a check valve at the hose end to provide back pressure on the injection pump.
8. Toggle the master switch to the on position and operate the injection pump until 50 ounces [1.48 L] is dispensed into the calibrated container.
9. Check the total volume tally register for the injection control channel. The tally register should display a value between 49 and 51 ounces [1.45 and 1.51 L] if the injection pump is properly calibrated.

If the total volume value displayed differs from the known volume by greater than 3%, use the following formula to calculate the new meter cal value:

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

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 dispensed and CMC = the Corrected Meter Cal.

For Example:

A set meter cal of 110 [372] is used to dispense 50 ounces [1.48 L] through the injection pump. At the end of the test, the ROS device displays a total volume tally of 46 ounces [1.36 L]:

English	Metric
$\frac{110 \times 46}{50} = 101.2$	$\frac{[372] \times [1.36]}{[1.48]} = [341.8]$

Therefore, the corrected meter cal is 101.2 [341.8].

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

Note: Pour any product caught during the calibration process back into the chemical supply tank on the injection module.

Repeat the above procedure to verify the new meter cal value.

CHAPTER

5

Operation

Rate Cal and Verifying Rate Limits

When setting up a job using a job profile, enter the desired rate of injected chemical in ounces per acre [deciliters/hectare] for each Sidekick injection system used during the field operation.

Before beginning to apply product, use the following formula to verify that the Sidekick injection pump is capable of applying at the target application rate and speeds:

$$Volume/Minute = \frac{Rate \times Speed \times Width}{5940[60,000]}$$

Verify that the calculated volume per minute is within operating tolerance of the injection pump installed on the implement.

Flow Output Range	High Volume Pump		Low Volume Pump	
	English	Metric	English	Metric
	5-200 oz./min.	[1.5-59 dL/min.]	1-40 oz./min.	[0.3-11.8 dL/min.]

For Example. Given a target rate of 75 oz./acre [50 dL/ha], a target application speed of 11.0 MPH [17 km/h], and a boom width of 85 ft. (1020 in.) [25 m (2500 cm)]:

English	Metric
$Volume/Minute = \frac{75 \times 11 \times 1020}{5940} = 141.67$	$Volume/Minute = \frac{50 \times 17 \times 2500}{60,000} = 35.42$

Thus, the desired rate of 75 oz./acre [50 dL/ha] is within the capacity of the high volume pump, but will not be acceptable for the low volume pump.

Operation Modes

The following modes are available for rate control of injected chemicals:

- Normal Application Mode
- Ratio Rate Mode

Normal Application Mode

The normal mode for applying injected chemicals allows the operator to perform the same operation inputs as controlling the carrier product. Review the *ROS Product Control Calibration and Operation Manual* for specific operation instructions.

Note: *The ratio rate feature must be disabled to control injected chemical application in normal mode. The default setting for the ratio rate feature is disabled.*

The following procedure outlines the general operation of chemical injection systems:

Note: *Perform pump priming and calibration checks and verify ROS settings for each injection pump before operating the injection system for field applications.*

1. Check injection system hand valves and ensure that product will be routed to the point of injection and section valves.
2. Toggle the master boom switch to the off position.
3. Turn product control on for each of the injected chemical(s) on the control console.
4. Select manual or automatic mode of product control for each injection pump. In automatic control mode, the injection node will automatically adjust rate control based on speed and active sections. In manual mode, the machine operator must manually adjust the rate of chemical injection.
5. Accelerate to at least 0.7 MPH [1.1 km/h] and toggle the master switch to the on position. The injection pump will begin injecting product into the main product line at the injection point.

Note: *A self test speed may also be entered in ROS to simulate a vehicle speed for testing purposes.*

If the pump does not turn on or an error is displayed:

- verify calibration values in the ROS device
- verify the pump is primed
- make sure the system has a rate cal, speed, and at least one active section.

Refer to the *injection system documentation* for additional troubleshooting assistance if the pump still does not respond.

6. To shut the injection pump off:
 - a. Toggle the master switch to the off position.
 - b. Toggle the selected injection product(s) off.
 - c. Slow the vehicle speed to below 0.7 mph [1.1 km/h].

Ratio Rate Application Mode

The ratio rate application mode allows the operator to apply an injected chemical at a rate proportional to the carrier product flow rate. The ratio rate application mode must be enabled via ROS and a ratio rate cal value must be entered for each product controlled in ratio to the carrier.

Note: *The carrier product must be programmed on control channel 1 and the ratio rate application mode must be enabled. If a carrier product is not set as “product 1,” the low pressure alarm will not function, even if the alarm is enabled in the alarm settings.*

If the off rate alarm is triggered frequently during injection applications in ratio rate mode, access the volume per minute display in the ROS settings and verify that the target flow rate is within the application range for the pump.

The ratio rate calibration value is entered as the ratio of injected chemical to carrier in ounces per gallon [deciliters per liter].

For Example. If the desired ratio of injected chemical concentration is two ounces per gallon [0.59 deciliters per liter], enter a value of two [0.59] for the ratio rate cal value. Once the operation conditions for the carrier are set as described in the *Normal Application Mode* section on page 24, the system will automatically adjust the rate of injected product in proportion with the carrier product flow rate.

Widget Catalog Definitions

Note: *Review the ROS Product Control Calibration and Operation Manual for assistance with widgets for use during product application. The following widgets may be helpful during field operations with a Sidekick injection system:*

Sidekick Injection Widgets

Pressure

Displays the system pressure at the monitored transducer location.



Touch and hold the widget to select the desired control channel for the on-screen display during field operations.

Pump Switch

The pump switch allows the operator to view the status of pump operation during field operations. Tap the pump switch widget to toggle the selected pump on or off during operation.



Touch and hold the widget to select the control channel assigned to the injection pump to be controlled.

Note: *Pump status will be overridden by a CAN Switch Box or Switch Pro on the CANbus system.*

CHAPTER

Troubleshooting

6

Alarms

TABLE 1. Sidekick Pro Error Codes

Error Description	Possible Cause	Solution
Off Rate Alarm	<ul style="list-style-type: none"> • Difference between actual and target application rates has been greater than 28% for more than five seconds 	<ul style="list-style-type: none"> • Required flow rate is out of range for the injection pump. Calculate the volume per minute required for the application and verify rate is within range of the injection pump.
Low Tank Alarm	<ul style="list-style-type: none"> • Chemical supply tank is below the refill threshold level 	<ul style="list-style-type: none"> • Refill injection chemical supply tank and reset tank level in ROS.
Flow Error Alarm	<ul style="list-style-type: none"> • Flow obstruction in inlet cartridges 	<ul style="list-style-type: none"> • Perform a pump calibration test. If the pump does not calibrate properly, remove the intake cartridges and perform pump maintenance to clear obstructions.
	<ul style="list-style-type: none"> • Chemical supply tank is out of chemical 	<ul style="list-style-type: none"> • Refill chemical supply tank and perform the pump priming procedure.
Flow Error Alarm	<ul style="list-style-type: none"> • Flow obstruction in discharge cartridges 	<ul style="list-style-type: none"> • Perform a pump calibration test. If the pump does not calibrate properly, remove the discharge cartridges and perform pump maintenance to clear obstructions.
Low Pressure Alarm	<ul style="list-style-type: none"> • Injection pressure is lower than carrier pressure 	<ul style="list-style-type: none"> • Perform a pump calibration test. If the pump does not calibrate properly, clean the injection pump inlet and discharge valves. • Calibrate the pump transducer. • Check lines between injection pump and in-line mixer. • Verify all hand valves are in the correct position. • Replace the pump transducer.
Maximum Vacuum Alarm	<ul style="list-style-type: none"> • Clogged pump strainer 	<ul style="list-style-type: none"> • Clean pump strainer and check for obstructions in injection line between the pump inlet and chemical supply tank.
	<ul style="list-style-type: none"> • Tubing or plumbing size restriction 	<ul style="list-style-type: none"> • Verify the proper size of injection supply tubing is used between the chemical supply tank and pump inlet.
	<ul style="list-style-type: none"> • Chemical too thick 	<ul style="list-style-type: none"> • Dilute product in chemical supply tank. Some chemicals may not be applied using a direct injection system.

Error Description	Possible Cause	Solution
Maximum Pressure Alarm	<ul style="list-style-type: none"> • Clogged or restricted pump outlet supply lines 	<ul style="list-style-type: none"> • Check for restrictions or blockages in outlet supply lines. Flush the injection system to clear clogs and residue buildup.
	<ul style="list-style-type: none"> • Tubing or plumbing size restriction 	<ul style="list-style-type: none"> • Verify the proper size of injection outlet tubing is used between the point of injection and pump outlet.
	<ul style="list-style-type: none"> • Faulty PSI transducer 	
	<ul style="list-style-type: none"> • Hand valve closed • Low injection pressure 	<ul style="list-style-type: none"> • Check hand valves are open and allow flow from the injection pump outlet port.
Pressure Sensor Alarm	<ul style="list-style-type: none"> • Boom pressure transducer not connected 	<ul style="list-style-type: none"> • If installed, check that the boom pressure transducer is installed and properly connected.
	<ul style="list-style-type: none"> • Faulty boom pressure transducer 	<ul style="list-style-type: none"> • Replace boom pressure transducer.
Motor/Encoder Alarm	<ul style="list-style-type: none"> • No power to pump motor 	<ul style="list-style-type: none"> • Verify that the high current LED on the injection pump node is lit.
	<ul style="list-style-type: none"> • Pump motor or encoder issue 	<ul style="list-style-type: none"> • Check motor and encoder connections. Disconnect the injection pump node from the pump motor and check that the motor and encoder connections are seated properly. If these connections appear solid, return pump to a local Raven dealer for service.
HC Power Alarm	<ul style="list-style-type: none"> • Injection node not connected to high current power 	<ul style="list-style-type: none"> • Verify high current breaker is not tripped. • Verify battery connections.
Zero Speed Alarm	<ul style="list-style-type: none"> • Faulty cabling, connection or speed sensor. 	<ul style="list-style-type: none"> • Verify speed sensor and signal. Refer to the field computer operation manual for information on testing speed and flow cabling and troubleshooting the speed sensor.
Low Limit Alarm	<ul style="list-style-type: none"> • Implement speed or width is insufficient to maintain pump rate and the pump “low limit” rate has become active 	<ul style="list-style-type: none"> • Increase vehicle speed. • The pump will maintain the programmed low limit rate. If this rate is the desired lowest injection rate, no action is required. If the current field operation requires a lower rate of injection, reduce the programmed low limit setting to allow the pump to reduce the rate of injection. Refer to the console or field computer operation manual for additional information on the low limit feature.

RAVEN

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.