

**Sidekick Pro™ ICD 1 to 40 oz./
min and 5 to 200 oz/min
Installation and Operation
Manual**

P/N 016-0171-605 Rev. D 03/18

E31129

Disclaimer

While every effort has been made to ensure the accuracy of this document, Raven Industries assumes no responsibility for omissions and errors. Nor is any liability assumed for damages resulting from the use of information contained herein.

Raven Industries shall not be responsible or liable for incidental or consequential damages or a loss of anticipated benefits or profits, work stoppage or loss, or impairment of data arising out of the use, or inability to use, this system or any of its components. Raven Industries shall not be held responsible for any modifications or repairs made outside our facilities, nor damages resulting from inadequate maintenance of this system.

As with all wireless and satellite signals, several factors may affect the availability and accuracy of wireless and satellite navigation and correction services (e.g. GPS, GNSS, SBAS, etc.). Therefore, Raven Industries cannot guarantee the accuracy, integrity, continuity, or availability of these services and cannot guarantee the ability to use Raven systems, or products used as components of systems, which rely upon the reception of these signals or availability of these services. Raven Industries accepts no responsibility for the use of any of these signals or services for other than the stated purpose.

Chapter 1	<i>Important Safety Information</i>	1
	Chemical Handling and Safety	1
	Electrical Safety	2
	Instructions for Wire Routing	2
	Instructions for Hose Routing	4
Chapter 2	<i>Introduction</i>	7
	System Overview	7
	Injection System Components	7
	Sidekick Pro ICD Features	8
	Closed Calibration System	8
	Integrated Motor Control ECU	9
	Fast Rate Response	9
	System Diagnostics	10
	Sidekick Pro ICD Pump Specifications	10
	Updates	13
Chapter 3	<i>Installation</i>	15
	Overview	15
	Agitator Installation	16
	Initial Plumbing and Point of Injection	16
	Best Practices	16
	Mount the Sidekick Pro ICD Pump and Chemical Tank	19
	Mount the Injection Module	19
	Mount the Chemical Tank	21
	Mount the Sidekick Pro ICD Pump	21
	Sidekick Pro™ ICD Injection System Plumbing	23
	Plumb the Sidekick Pro™ ICD Pump	23
	Plumb the Sidekick Pro ICD Closed Calibration System	24
	Plumb the Optional Rinse Assist System	24
	CANbus and Power Connections	26
	Sidekick Pro™ ICD CANbus Connection	33
	Verifying Installation of the Sidekick Pro™ ICD	34
Chapter 4	<i>Calibration and Operation</i>	35
	Sidekick Pro™ Tab Information	35
	Sidekick Pro™ ICD Menu	35
	Sidekick Pro™ ICD System Settings	36
	Sidekick Pro ICD Alarms Settings	37
	Current Totals Data	38
	Device Totals	39
	System information	39

Table of Contents

Tests	40
Pump Prime	40
Prime the Injection Pump	40
Pump Calibration	41
Catch Test	42
Demonstration Mode	43
Diagnostic Trouble Codes	43
Chapter 5 System Maintenance	45
Maintenance and Storage	45
Check Valve O-Rings	46
Pump Cam and Bearing	48
Piston Seal Replacement	48
Returning the Pump for Service or Repair	50
Chapter 6 Troubleshooting	53
Motor Control ECU LED Status Indicators	53
Motor Control ECU LED Status Indicators	53
Chapter 7 Replacement Parts	57
Sidekick Pro ICD Injection Module Parts	57
Injection Pump Flow Monitor Sensor	64
Appendix A Flowchart.....	65
Calibration Flowchart	65

CHAPTER

1

IMPORTANT SAFETY INFORMATION

NOTICE

Read this manual carefully before installing the Raven Sidekick Pro™ ICD, injection module or any other system components.

- Follow all safety information presented within this manual.
- Keep safety labels in good condition. Replace missing or damaged safety labels as necessary and verify labels are included on replacement parts or new equipment components. Replacement safety labels are available from any local Raven dealer.
- If you require assistance with any portion of the installation or service of Raven equipment, contact a local Raven dealer for support.

When operating the machine after installing the Raven Sidekick Pro™ ICD, observe the following safety measures:

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

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

Do not reverse power leads. Doing so could cause severe damage to the equipment. Always make sure that the power leads are connected to the correct polarity as marked. Ensure that the power cables are the last cables to be connected.

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

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

SYSTEM OVERVIEW

The Raven Sidekick Pro™ ICD Direct Injection system is designed to provide efficient and accurate application of liquid chemicals from an injection module. By using a separate injection module, the system eliminates mixing chemicals in the tank, reduces chemical waste, and simplifies equipment care and maintenance. By connecting the module to an ISOBUS Universal Terminal and compatible rate controller, including Raven ISO Product Controller II or Raven Rate Control Module (RCM), multiple injection pumps can be controlled through a single UT working set.

Refer to the rate controller operation manual for capabilities and user settings.

Priming, calibration, rinsing, and diagnostics options are available from the individual ICD working set.

Select a high flow injection system to control a wide range of chemical flow rates from 5 - 200 oz/min. Select low flow injection system to provide chemical flow rates from 1 - 40 oz/min.

After proper installation and calibration of the injection system and ISOBUS controller, including a set target rate for the carrier and injected chemicals, the operator enables the product control system and the control console will automatically maintain the flow regardless of vehicle speed or active boom sections.

Performance of the ISOBUS injection system relies upon proper installation and maintenance of the complete sprayer system. Please review this manual before installing or operating this system to help ensure proper setup and follow instructions provided for proper care and maintenance of the Raven injection system.

INJECTION SYSTEM COMPONENTS

The Raven injection system consists of:

- ISOBUS based control console and appropriate cabling
- Sidekick Pro™ ICD injection pump
- In-line mixer
- Cabling required to connect injection system components and existing CANbus
- Check valves

The following ISOBUS control consoles may be used with the injection system:

- Viper 4
- Approved ISOBUS control consoles

SIDEKICK PRO ICD FEATURES

CLOSED CALIBRATION SYSTEM

Calibrating chemical injection pumps is necessary for accurate chemical injection applications. The Sidekick Pro™ ICD closed calibration system allows the operator to perform calibration or system tests without catching or handling dangerous chemicals.

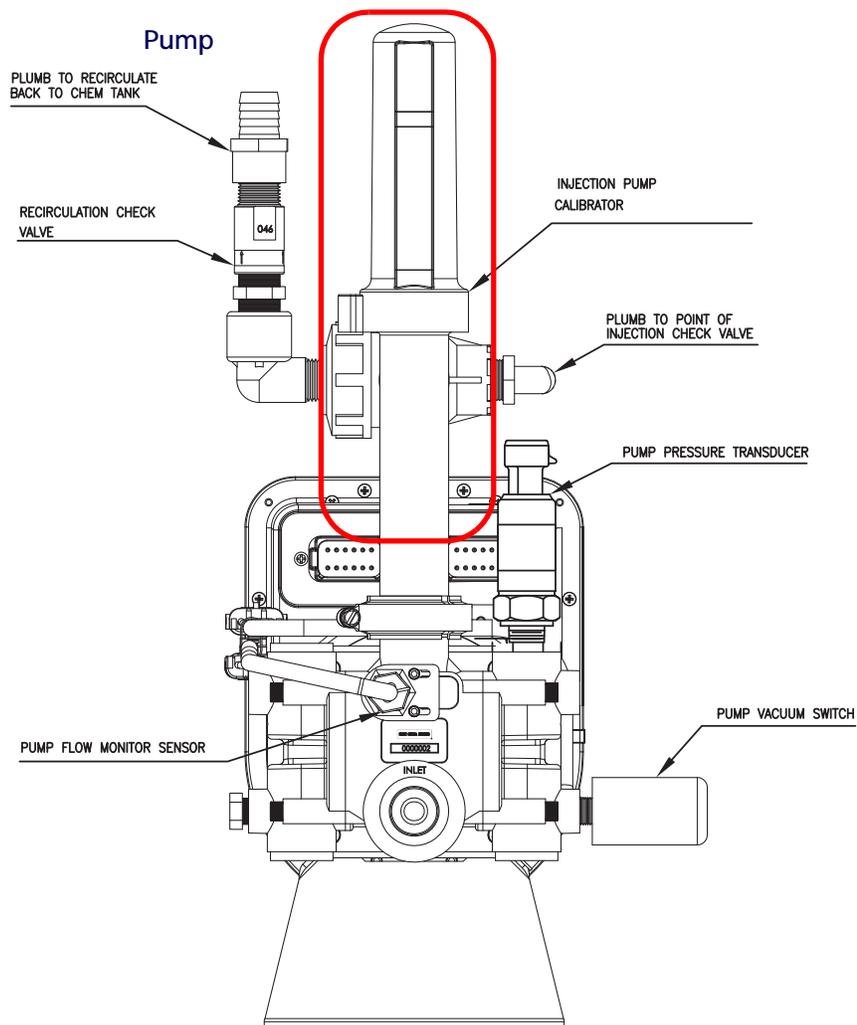
PRIMING

An automatic priming feature ensures the pump is correctly primed and ready for operation when the operator is ready to apply product.

PUMP CALIBRATOR

The pump calibrator provides a quick tool to check pump efficiency and verify that the pump is ready for operation.

FIGURE 1. Pump Calibrator



INTEGRATED MOTOR CONTROL ECU

Sidekick Pro™ ICD features an integrated motor control ECU mounted directly on the pump housing for simplified installation and enhanced performance. The control ECU features status LEDs for calibrating or system troubleshooting.

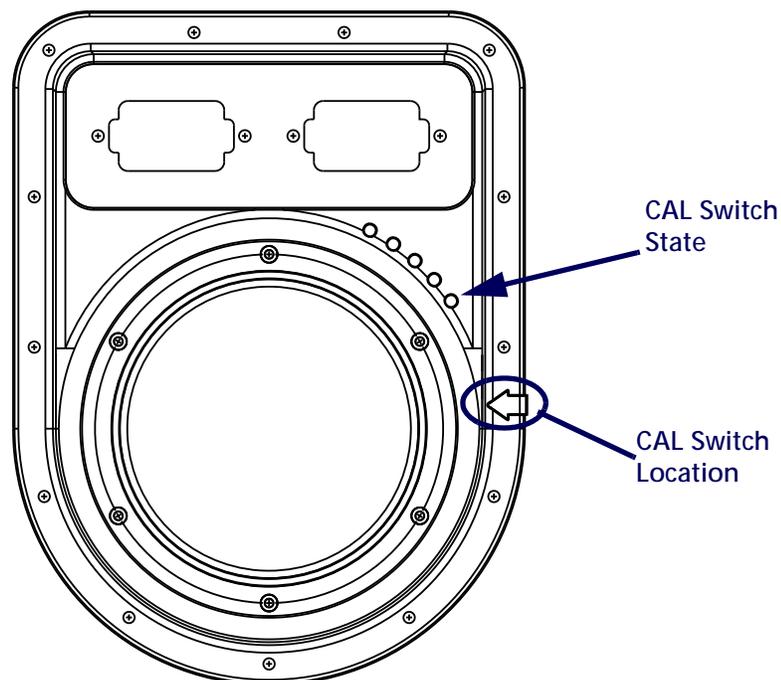
INTEGRATED CALIBRATION SWITCH

The integrated motor control ECU also features a sealed calibration switch. The sealed calibration switch allows the operator to begin the pump calibration process by passing a magnetic metallic object, such as a screwdriver, across the switch sensor on the Sidekick Pro™ ICD injection pump. This feature allows the operator to run multiple calibration tests quickly and easily and ensure the system is ready for operation.

NOTE: Calibration may also be initiated from the control console in the vehicle cab.

The CAL switch state LED light will flash when the calibration sensor registers a metallic object by the switch. Pass the metal object past the sensor twice to initiate a pump calibration.

FIGURE 2. Motor Control ECU Calibration Sensor



The integrated calibration switch can also:

- Prime the pump
- Calibrate the pump
- Catch test
- Rinse the pump

FAST RATE RESPONSE

The Sidekick Pro™ ICD direct injection system is capable of making accurate adjustments to chemical injection rates to help ensure accurate and proper chemical applications in the field.

SYSTEM DIAGNOSTICS

Enhanced diagnostic features are monitored by the control console during operation of the Sidekick Pro™ ICD injection system to help identify potential issues and minimize equipment down time.

FLOW MONITORING

The CAN integrated Sidekick Pro™ ICD offers enhanced monitoring of pump operation during chemical injection applications to alert the operator to conditions such as an empty chemical supply tank, low injection pressure, incorrect calibration, or issues with the injection pump valves.

RINSE ASSIST

Rinse assist is optional and required Kit P/N 117-0171-733.

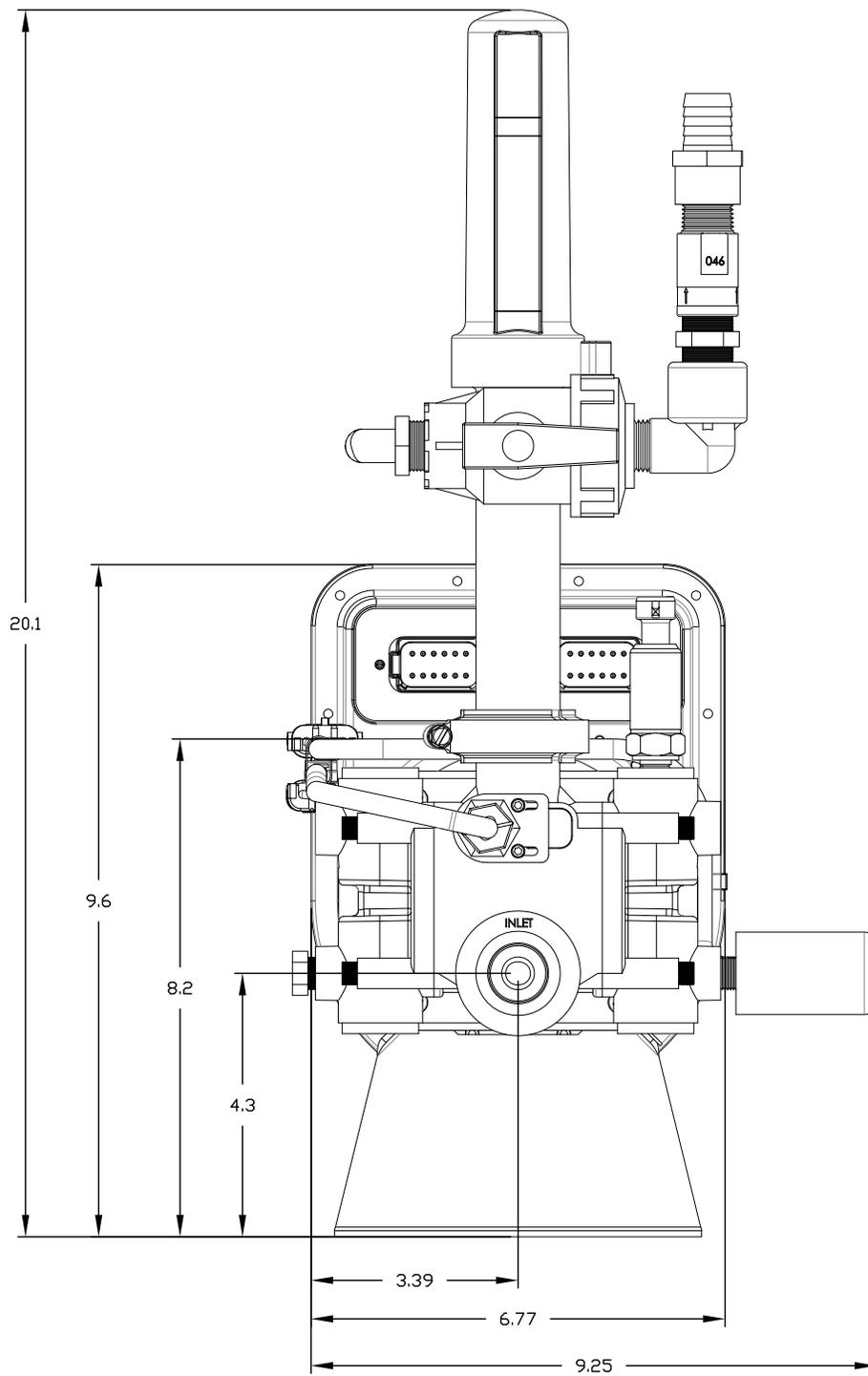
The Sidekick Pro™ Rinse Assist system allows an operator to quickly rinse the Sidekick Pro™ direction injection pump without leaving the machine cabin. The Rinse Assist system utilizes an automated 3-way rinse valve to switch the Inlet source to a rinse tank valve components which many help ensure problem free operation of the Sidekick Pro™ injection system when the rinse process if complete, the automated 3-way valve returns to the chemical supply tank inlet setting and is ready for the next application.

SIDEKICK PRO ICD PUMP SPECIFICATIONS

The Raven Sidekick Pro™ ICD injection pump is a positive displacement, variable speed piston pump used for direct chemical injection applications.

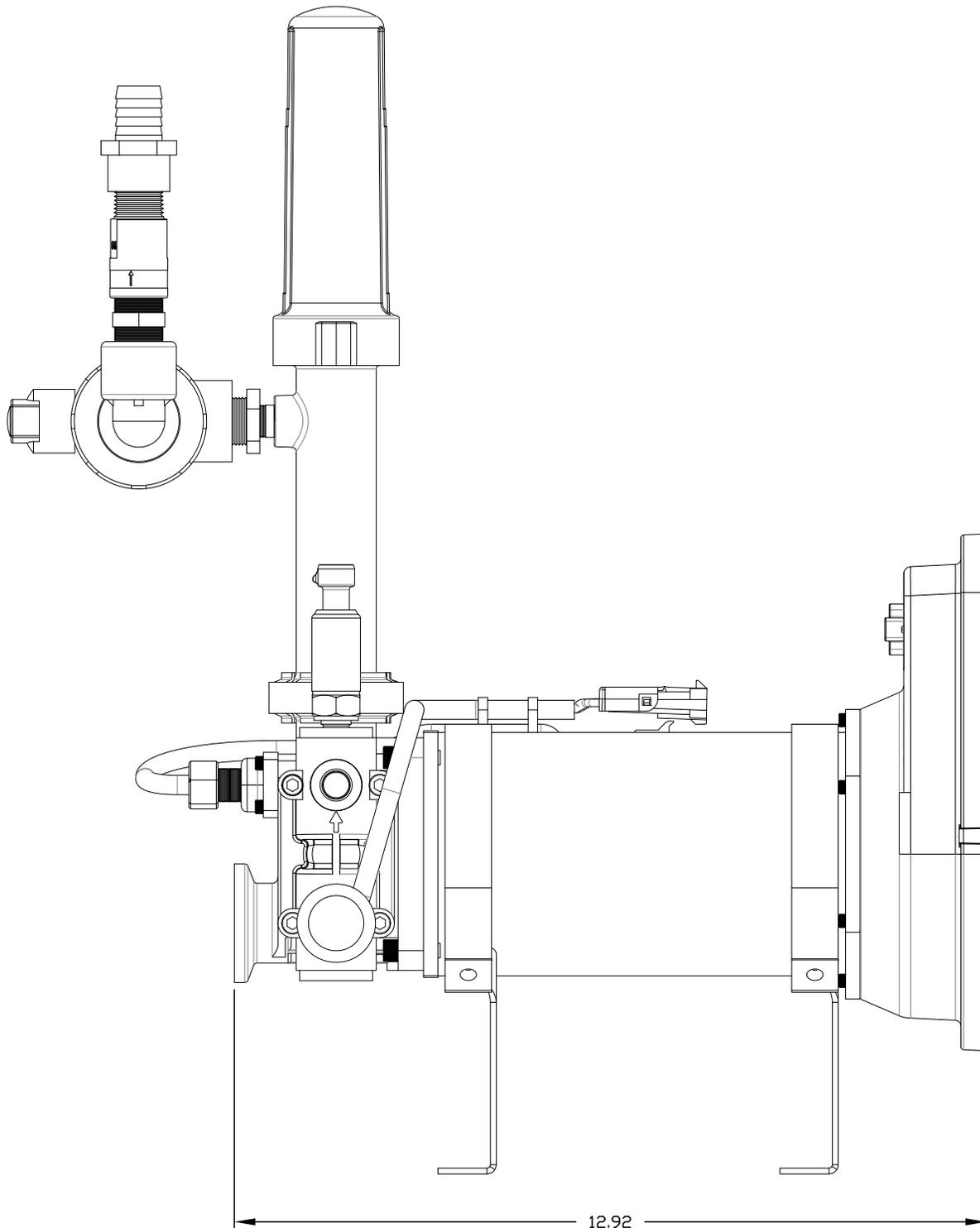
Dimensions	Pump (See Figure 3 on page 11 or Figure 4 on page 12)	
	Injection Module Width - 28.5" [71.12 cm] Depth - 12" [30 cm] (17" [43 cm] with plumbing) Height - 42" [106.75 cm]	
Pistons	1 (Dual Acting) at 0.750 in Dia. [1.910 cm]	
Maximum Stroke Length	0.390 in [0.99 cm]	
Flow Output Range	P/N 063-0173-769 5-200 oz./min. [1.5-59 dL/min.]	P/N 063-0173-768 1-40 oz./min. [0.3-11.8 dL/min.]
Maximum Operating Pressure	150 psi [1034 kPa]	
Maximum Power Required	1/4 HP [186.4 W]	
Maximum Recommended Suction Lift	2 ft. [0.6 m]	
Inlet and Outlet Plumbing	Mates with Banjo M100 Flange and 3/4" Female NPT	
Wetted Parts	Polypropylene Stainless Steel	
Body Material	Polypropylene	
Wetted Seals/O-Rings	Type GF Viton and Graphite Filled Teflon	

FIGURE 3. Sidekick Pro ICD Injection Pump Dimensions (in inches)



NOTE: 5-200 oz./min. pump shown. Basic dimensions are the same for 1-40 oz./min. pump.

FIGURE 4. Sidekick Pro ICD Injection Pump Dimensions (Cont.)



NOTE: 5-200 oz./min. pump shown. Overall length of 1-40 oz./min. pump is 13.25 inches [33.66 cm].

UPDATES

Updates for Raven manuals as well as several system components are available at:

portal.ravenprecision.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

- Sidekick Pro™ ICD 1 to 40 oz./min and 5 to 200 oz/min Installation and Operation Manual
- P/N 016-0171-605 Rev. D
- 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.



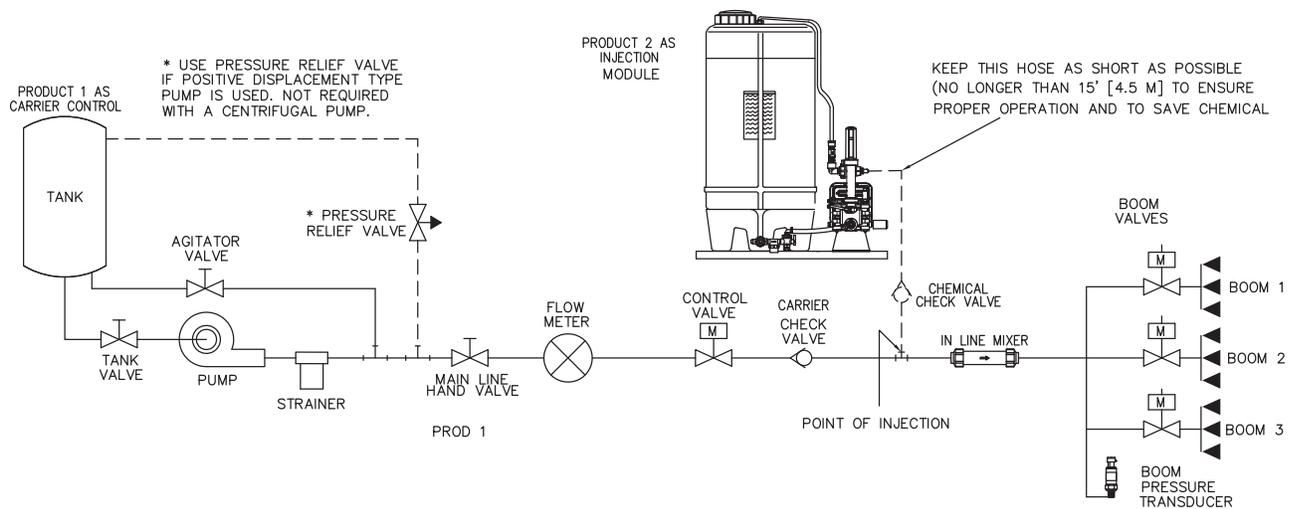
OVERVIEW

The following steps are an overview of Raven Sidekick Pro™ ICD injection system installation:

1. Select and plumb the point of injection.
 - a. Install chemical injection check valves in the mixer.
 - b. Install in-line mixer.
2. Mount the Sidekick Pro™ ICD injection module or tank.
3. Mount the Sidekick Pro™ ICD injection pump.
4. Plumb the Sidekick Pro™ ICD pump and injection lines into the main carrier line at point of injection.
5. Install the closed calibration system.
6. Plumb the rinse system.
7. Connect the Sidekick Pro™ ICD injection pump to CANbus.
8. Connect the Sidekick Pro™ ICD pump to source of electrical power.

The following sections provide detailed information and procedure to assist with completing the above steps. Contact a local Raven dealer for assistance or questions during the installation procedure.

FIGURE 1. Example Sidekick Pro ICD Injection System



AGITATOR INSTALLATION

The following agitators are available for use with the Sidekick Pro™ ICD system.

NOTE: Over agitation may add air to the tank or cause the chemical to break down and cause inaccurate application.

TABLE 1. Available Agitators

Agitator Type	Blade Size	Tank	Part Number
Mix-All	3"	Non-Raven Tanks	910-0000-331
Mix-All	4"	Non-Raven Tanks	910-0000-341
Raven	NA	Raven 24 Gallon Modules	117-0159-544

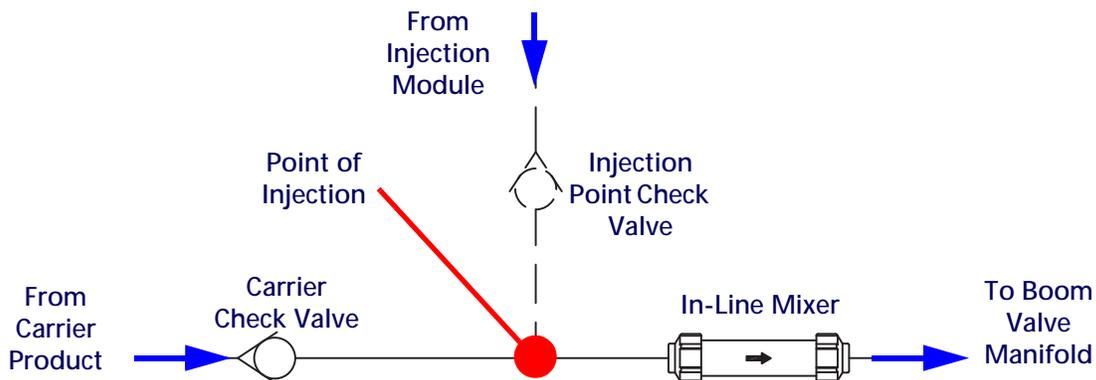
Refer to the installation quick guide shipped with the agitator for installation instructions.

INITIAL PLUMBING AND POINT OF INJECTION

BEST PRACTICES

- The Raven Sidekick Pro™ ICD injection system pumps chemical into the main carrier line at the point of injection. This point must be on the pressure side of the carrier product pump and should be as close to the boom section valves as possible.
- It is not necessary for injected products or chemicals to be measured by the flow meter. Depending upon the type of applications or chemical mixtures the injection system will normally be used with, it may be more desirable to place the injection point after the flow meter. This configuration may help to extend the service life of the flow meter by minimizing flow meter components exposure to corrosive chemicals.
- Use check valves in both the carrier and injection lines to prevent back flow and contamination of carrier and chemical reservoirs.
- Install an in-line mixer after the point of injection to ensure even mixing of the injected product.
- An in-line mixer assembly with a carrier check valve included. This option requires use of a separate injection check valve for each injected chemical.

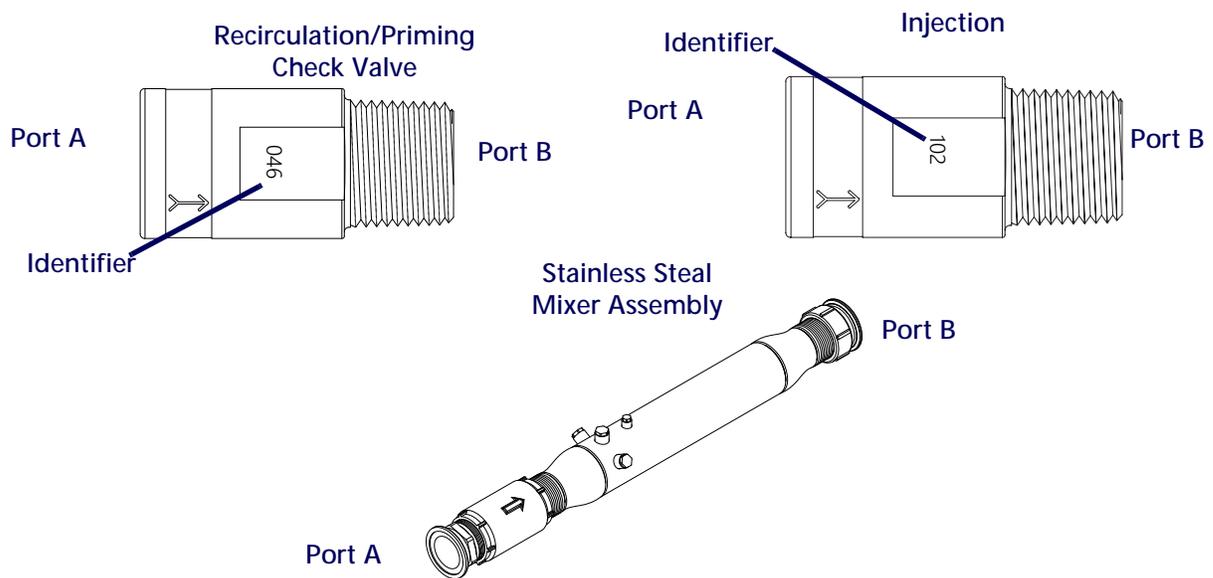
FIGURE 2. Point of Injection Detail



To set up the point of injection:

1. Select the point of injection.
2. Install a carrier check valve or a mixer assembly in the main product line to prevent back flow to the carrier reservoir. Refer to Table 2, "Check Valve Selection Chart," on page 17 for assistance with proper sizing of the carrier check valve or see Figure 4 on page 18 for details on available mixer assemblies.
3. Install an in-line mixer, tee fitting and connect to the existing carrier product line or boom valve manifold. Use Figure 4 on page 18 to determine proper sizing of the in-line mixer.
4. Install a chemical injection check valve to the injection line in front of the point of injection to prevent back flow to the chemical reservoir. Use Table 2, "Check Valve Selection Chart," on page 17.

FIGURE 3. Check Valve Thread



NOTE: Be sure to install the check valves with the flow direction indicator pointing in the direction of chemical flow.

TABLE 2. Check Valve Selection Chart

	Raven Part No.	"A" NPT	"B" NPT	Flow Coefficient ^a
Recirculation and Priming Check Valve ^a	333-0011-100	1/2" (F)	1/2" (M)	N/A
Injection Point Check Valve ^b	333-0011-102	1/2" (F)	1/2" (M)	N/A

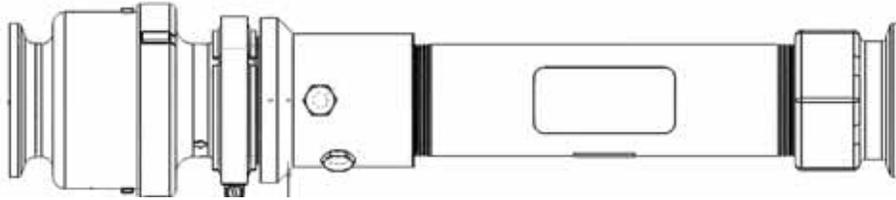
a. "046" Identifier. Rated for 12 PSI [82.7 kPa] (cracking pressure) and has 0.046" bleed hole. Verify the check valve is installed with the flow arrow pointing in the direction of flow through the valve.

b. "102" Identifier. Rated for 12 PSI [82.7 kPa] (cracking pressure) Verify the check valve is installed with the flow arrow pointing in the direction of flow through the valve.

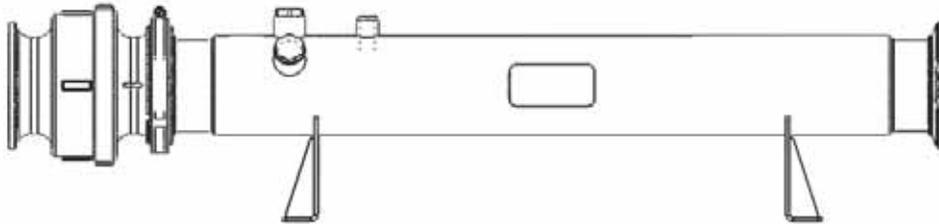


FIGURE 4. In-Line Mixer and Mixer Assembly Options

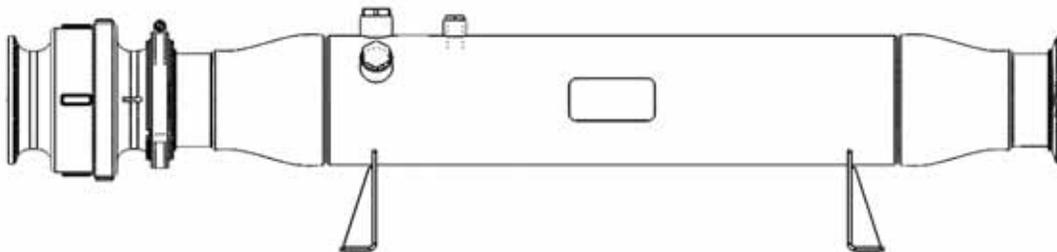
2 In. Polypropylene Check Valve Included M 220 Banjo Flange Fittings Approximately 19.5" Long



3 In. Stainless Steel Check Valve Included M300 Banjo Flange Fittings Approximately 33" Long



4 In. Stainless Steel Check Valve Included M300 Banjo Flange Fitting Approximately 36.9" Long



1.5" NH₃ Mixer Approximately 14.6" Long

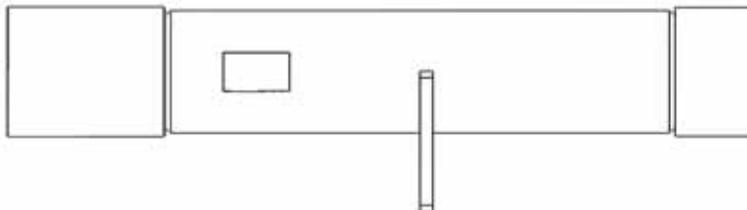
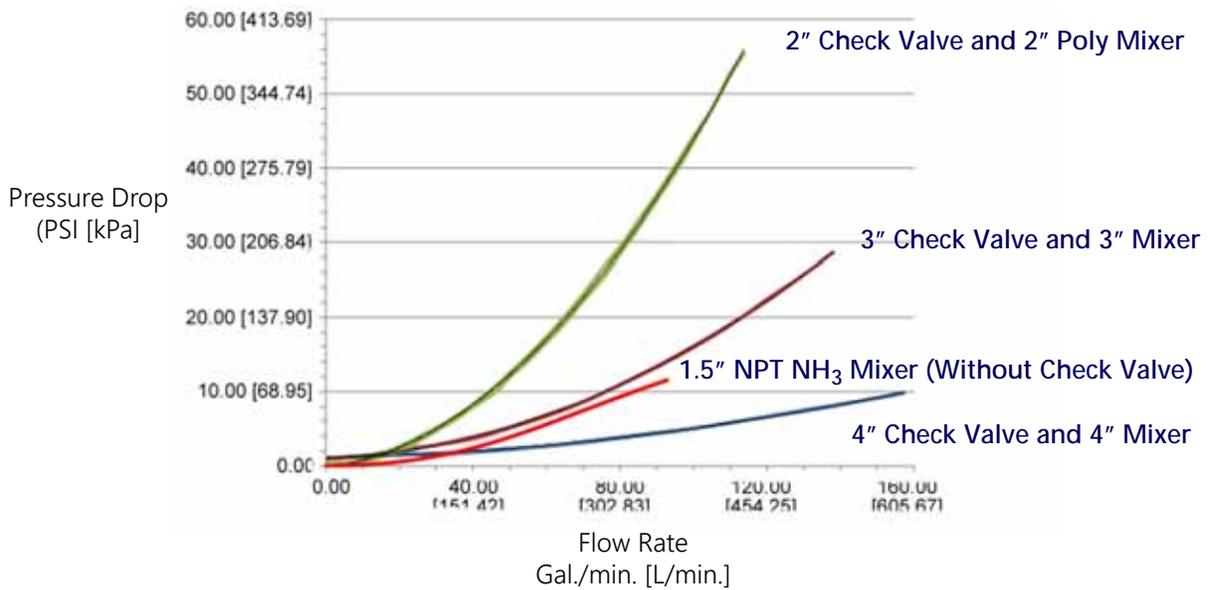


FIGURE 5. Pressure Drop vs. Flow Rate



MOUNT THE SIDEKICK PRO ICD PUMP AND CHEMICAL TANK

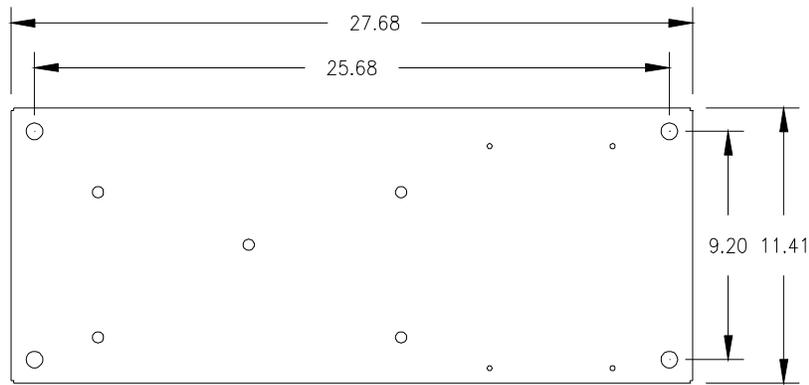
Installation and mounting of the Sidekick Pro™ ICD injection pump and injection module, or chemical tank, will vary between implements. Use the following sections to help select an appropriate mounting location on the implement.

MOUNT THE INJECTION MODULE

The Raven Sidekick Pro™ ICD injection module provides a platform for mounting the chemical supply tank and Sidekick Pro™ ICD injection pump in the optimal configuration for pump operation.



FIGURE 6. Injection Module Platform Dimensions

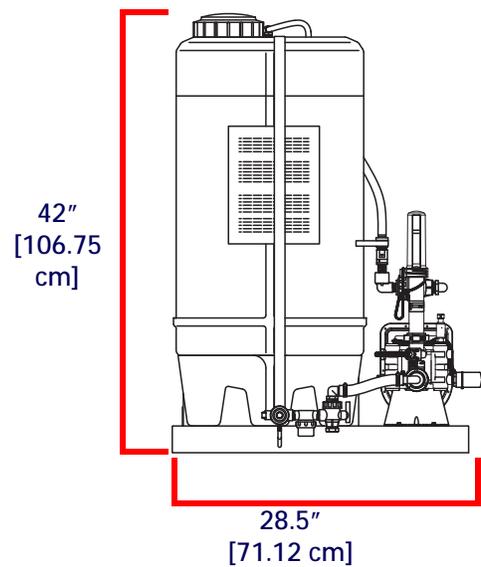


NOTE: The Raven Sidekick Pro™ ICD injection module may be ordered with a 24 gallon chemical supply tank, a 50 gallon chemical supply tank, or without a chemical tank to connect the injection system with an existing tank on the vehicle or purchased separately.

The assembled injection module will measure approximately:

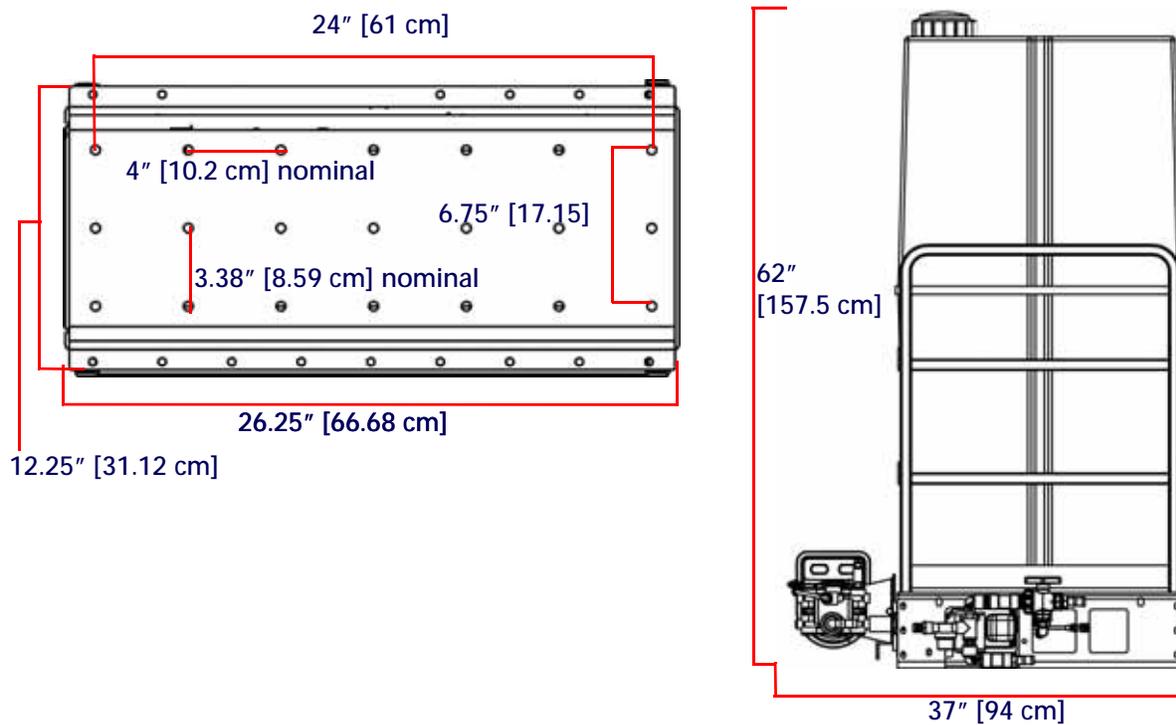
TABLE 3.

Gallon	Width	Depth	Height
24	28.5" 71.12 cm	12" 30 cm	42" 106.75 cm
50	37 94 cm	12.25 31.12 cm	62 157.5



- Mount the injection module platform in an area close to the boom valve manifold. This minimizes the volume of chemical in the injection line between the pump and point of injection and allows for more accurate control of the injected chemical.
- Verify that the hand valves and drain are accessible in the selected mounting location.
- Verify that the injection pump is accessible to perform periodic maintenance.

FIGURE 7. 50 Gallon Injection Module Platform and Tank Dimensions (P/N 117-0175-035)



MOUNT THE CHEMICAL TANK

NOTE: If a Raven injection module is used, the supplied platform provides an ideal mounting configuration for the Sidekick Pro™ ICD injection pump and chemical tank.

- Mount the chemical tank or injection module as close as possible to the injection pump. Minimize the length of the product line between the chemical tank and injection pump. Avoid any product lines longer than 5 ft. [1.5 m] between the chemical tank and injection pump inlet port.

NOTE: Long product lines between the chemical tank and injection pump may cause high vacuum pressures on the pump inlet, long pump priming times, difficulty priming the pump, and larger amounts of chemical waste during rinsing.

If vacuum errors are encountered during pump operation, perform one or both of the following corrective measures to reduce inlet pressure:

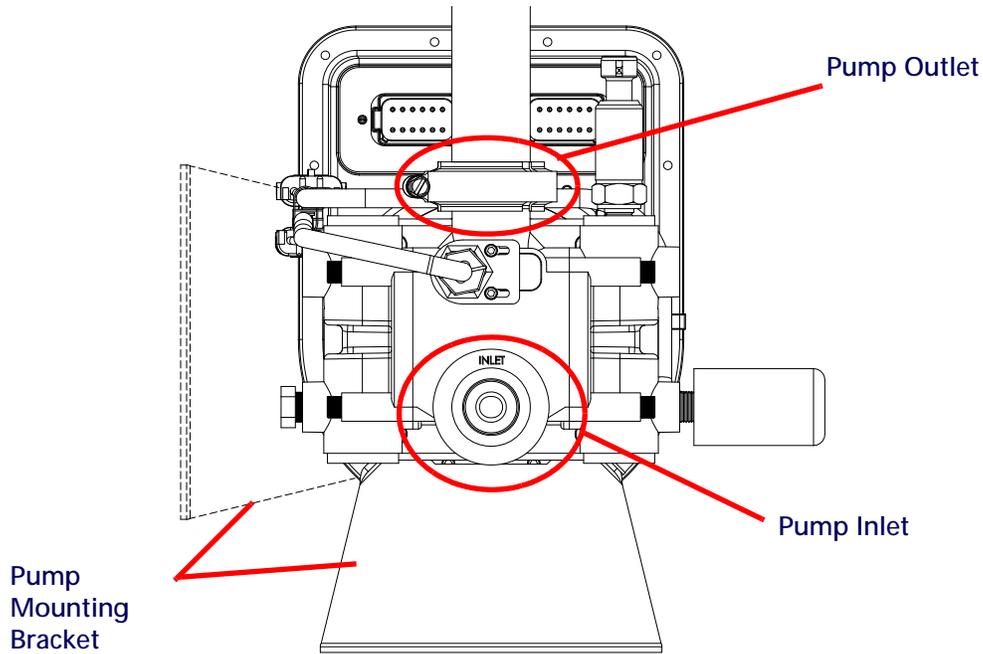
- Reduce the inlet plumbing length
- Increase the tubing size
- Mount the Sidekick Pro™ ICD pump so that the line between the injection pump and chemical supply tank is near level with a slight incline to help relieve air bubbles. The line connected to the pump inlet must not raise chemical above 2 ft. [0.6 m] from the chemical supply tank outlet. See Figure 10 on page 25.

MOUNT THE SIDEKICK PRO ICD PUMP

- Mount the Sidekick Pro™ ICD pump as close as possible to the selected point of injection.
- Mount the Sidekick Pro™ ICD pump so that the outlet port is pointing up. The pump will not meter product application correctly if the pump is mounted in any other orientation.

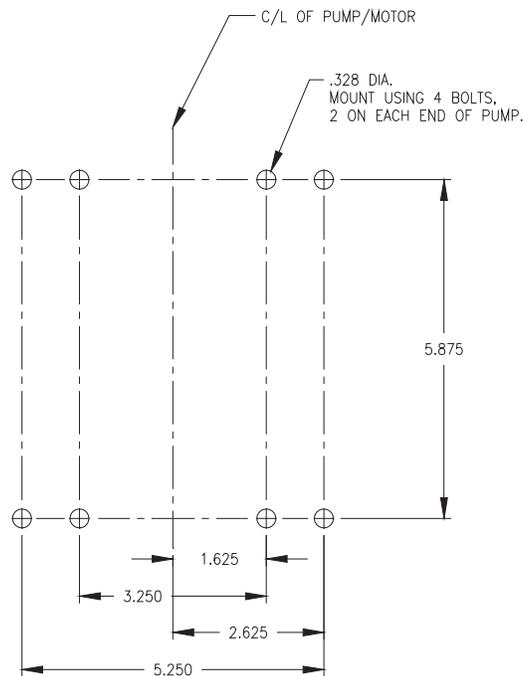
- Mount the Sidekick Pro™ ICD in a location which provides access to the pump and control ECU to simplify calibration and troubleshooting.

FIGURE 8. Sidekick Pro ICD Pump Mounting and Bracket Orientation



NOTE: The pump mounting bracket may be rotated to accommodate mounting to a vertical surface, however, the injection pump must be mounted level with the outlet port perpendicular to the ground.

FIGURE 9. Sidekick Pro ICD Pump Mounting Bracket Bolt Pattern



SIDEKICK PRO™ ICD INJECTION SYSTEM PLUMBING

PLUMB THE SIDEKICK PRO™ ICD PUMP

PUMP INLET

Use 3/4" chemically resistant hose between the chemical tank and injection pump inlet. Do not use hose or tubing that may collapse when a vacuum is applied during pump operation.

The product line should be as straight as possible. Avoid low spots in plumbing to ease pump priming and avoid chemical waste.

STRAINER

A strainer with a #20 mesh screen must be installed on the inlet side of the injection pump.

PUMP OUTLET

Connect the pump outlet to the injection check valve at the point of injection. Use the following hose sizes depending upon the capacity of the injection pump used with the system.

Pump Capacity	Tubing Size
1-40 oz./min.	3/8"
5-200 oz./min.	1/2"




CAUTION

Hoses used on the outlet of the injection pump must be re-enforced, chemically resistant hose rated for at least 150 PSI at 100° F [1034 kPa at 66° C].

Avoid product lines longer than 15 ft. [4.5 m] between the pump outlet and the point of injection. Long runs can cause increased pressure in the pump heads which cause the pump to pull more electrical current and may raise the temperature of the injection pump motor and integrated motor control ECU. See the Initial Setup and Calibration section on page 49 for details on injection system diagnostics and to monitor pump pressure and ECU temperature.

PLUMB THE SIDEKICK PRO ICD CLOSED CALIBRATION SYSTEM

The Sidekick Pro™ ICD closed calibration system provides an effective method of calibrating the injection pump without exposing the operator to dangerous or hazardous chemicals.

PUMP CALIBRATOR

To provide accurate calibration of the injection pump, install the pump calibrator directly onto the outlet of the pump. This configuration prevents air from getting trapped between the injection pump and the calibration plunger. Trapped air will cause the plunger to feel "spongy" when pressed and will cause the pump calibrator to work improperly.

3-WAY VALVE

A 3-way valve must be plumbed after the closed calibration system to allow chemical to be directed either back to the chemical tank or to the point of injection.

HOSES

Use chemically resistant hose compatible with the chemicals which will be used with the injection system. Follow the same hose specifications as described in the Pump Outlet section on page 23 with the closed calibration system.

RECIRCULATION CHECK VALVE

A recirculation and priming check valve must be plumbed into the recirculation line between the 3-way valve on the outlet side of the injection pump and the chemical tank. This check valve is required to allow air to bleed off during priming of the injection pump. The recirculation and priming check valve is also necessary to allow the system to detect if the pump is primed. See Figure 1 on page 15.

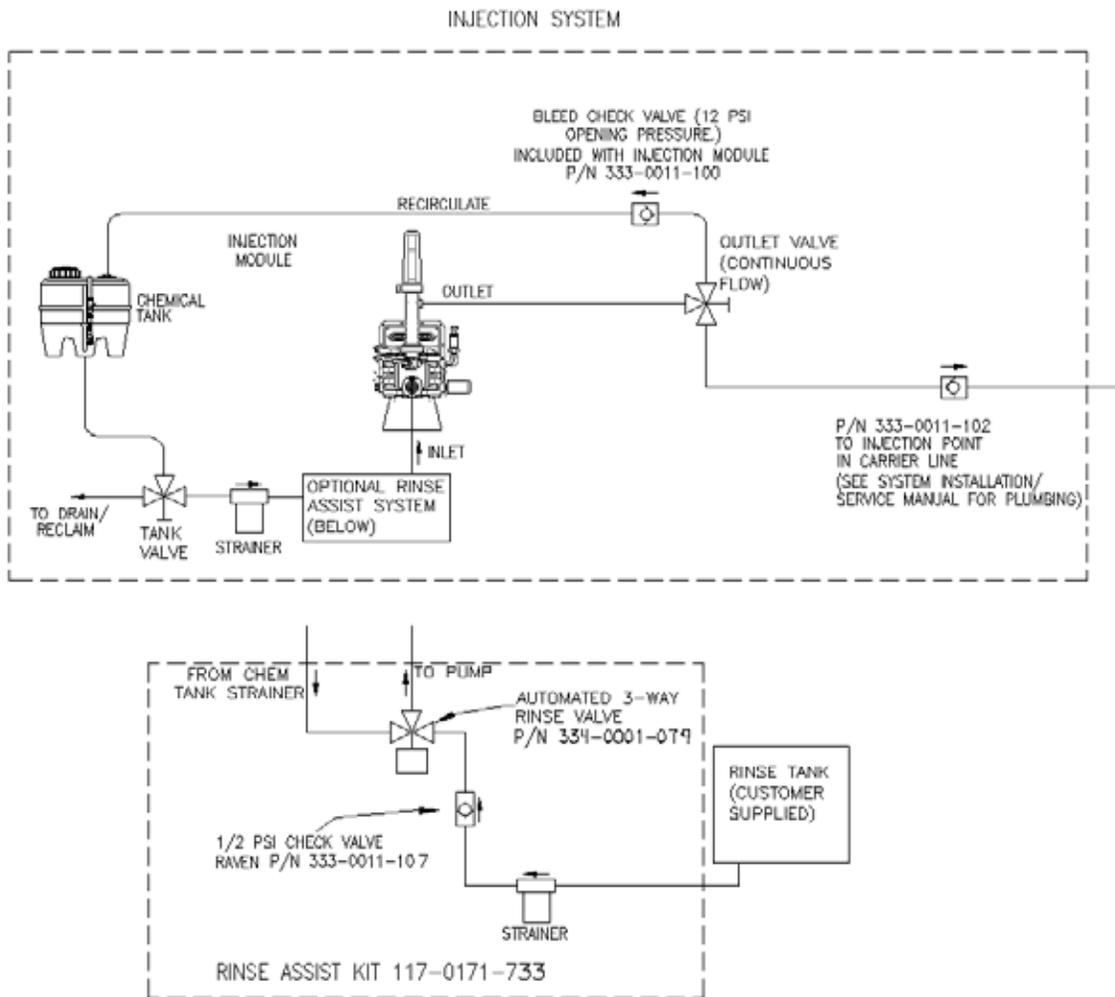
PLUMB THE OPTIONAL RINSE ASSIST SYSTEM

The optional Rinse Assist system is recommended to enhance the performance of the Rinse Assist Ready Sidekick Pro™ ICD injection pump. Rinse Assist provides an automated rinse function to flush chemical build up or residue which may collect in the injection pump from the vehicle cabin and allows the operator to rinse the injection pump between chemical applications without directly handling hazardous chemicals.

NOTE: The following components are not included with the Rinse Assist Kit (P/N 117-0171-733) but will be required to complete the system installation:

- Rinse fluid supply tank
- Optional chemical reclaim or catch tank
- Rinse fluid supply plumbing
- Rinse fluid
- Miscellaneous fittings

FIGURE 10. Recommended Injection System Plumbing with Optional Rinse Assist Kit

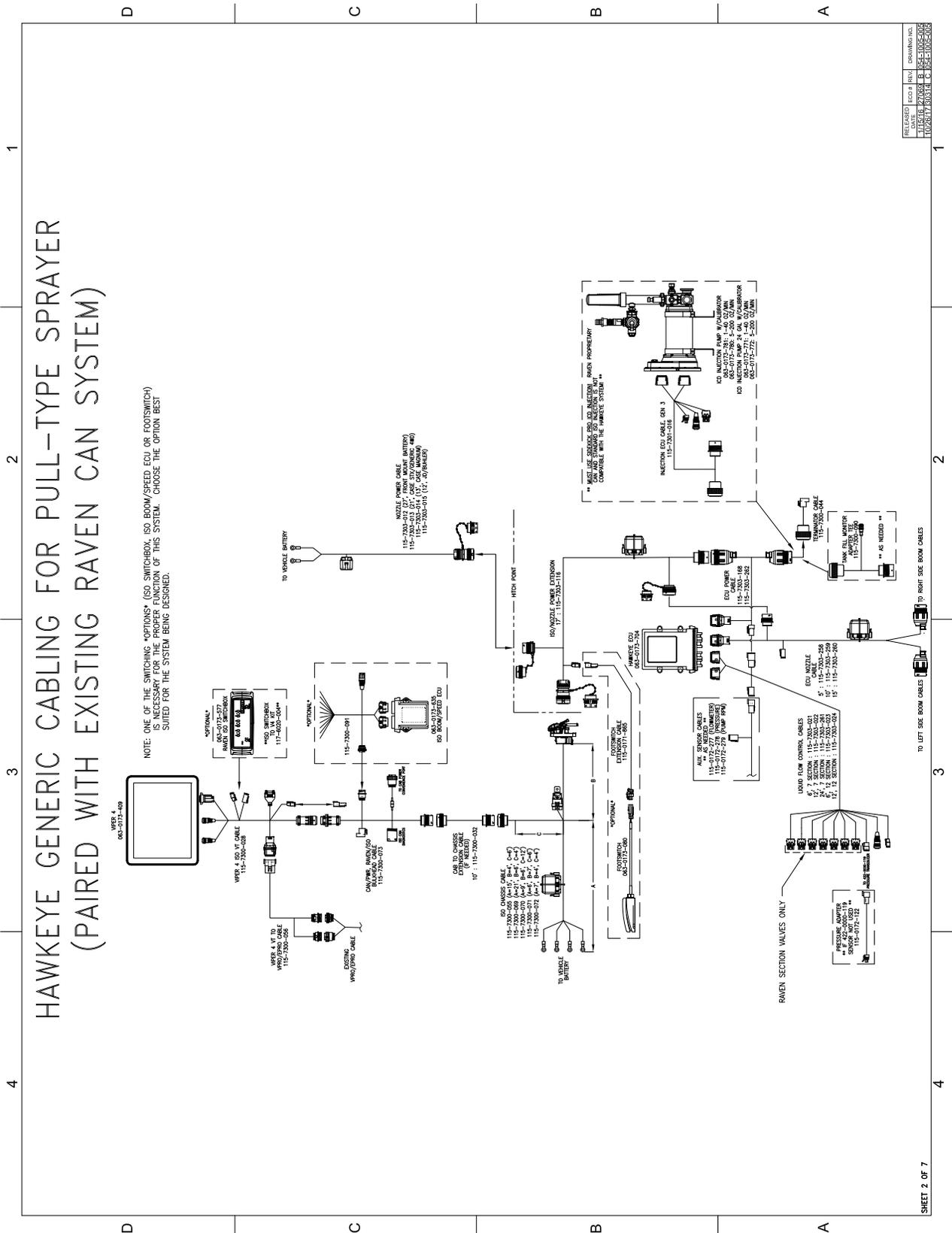


CANBUS AND POWER CONNECTIONS

The Raven Sidekick Pro™ ICD connects to a Raven CANbus system via a CAN motor control cable and requires both a clean logic power and a high current power connection.

NOTE: Refer to the installation manual for the specific CAN control console for detailed information about installing and powering a CAN system.

FIGURE 12. Generic Pull Type Sprayer Cabling Option 2

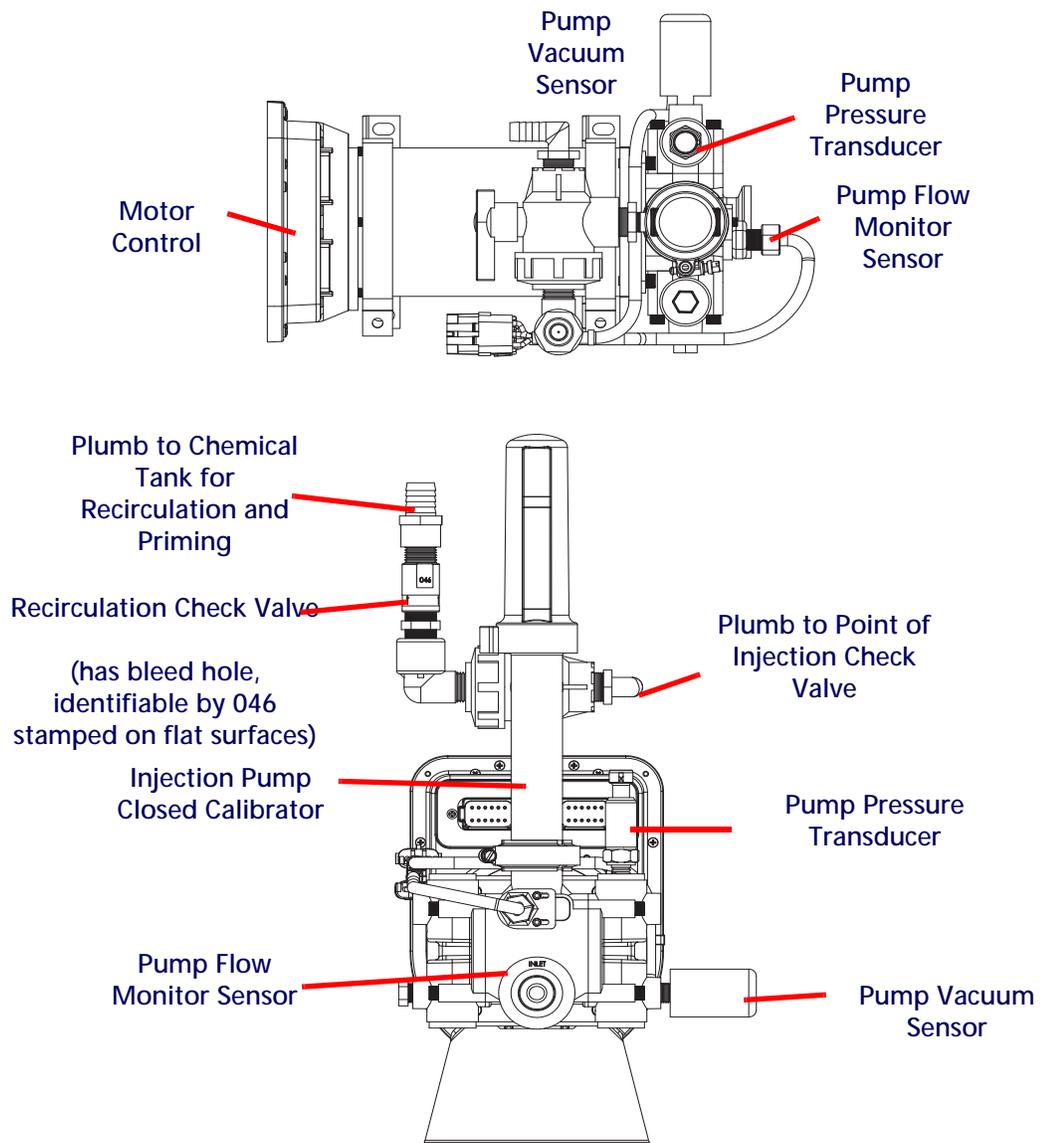


SIDEKICK PRO™ ICD CANBUS CONNECTION

Review the following diagrams for assistance with installation and connection of the injection pump to the CANbus system.

NOTE: The high current power and ground lead wires are larger gauge wire than the logic power and ground leads.

FIGURE 18. CAN Motor Control and Pump Connection (D/N 054-6400-006)



VERIFYING INSTALLATION OF THE SIDEKICK PRO™ ICD

NOTE: Before filling the tank with chemical for the first time, thoroughly vacuum the chemical supply tank and clean any plastic or metal particles that may be left from the manufacturing or installation process. If these particles get stuck within the injection pump, they may cause a significant reduction in pump accuracy. Turn the hand valve(s) to allow the tank to drain without running through the pump or injection plumbing and thoroughly rinse tank prior to testing or running the injection system for the first time.

Verify that the system is installed properly.

Fill the chemical supply tank with clean water when checking the installation. Check for any leaks on all plumbing connections before applying chemicals with the injection system. It is recommended to check the system periodically and replace worn or damaged connections, valves, or hoses.

SIDEKICK PRO™ TAB INFORMATION

Refer to Appendix A, Flowchart, to view an example of how the screens flow.

SIDEKICK PRO™ ICD MENU

To access the calibration and diagnostics for a specific injection product:



1. Open the UT Menu and select the desired Sidekick Pro™ ICD Menu button.
2. Press the Home icon. The following information will display:

FIGURE 1. Sidekick Pro™ ICD Main Screen

Display		Description
Actual Flow		Displays the actual flow rate of the pump during operation.
Target Flow		Displays the target flow rate of the pump.
Actual Pump State		Shows if the actual state of the pump is ON or OFF.
Pressure		Displays the pressure at the injection pump pressure transducer.
DI Efficiency		Displays the efficiency value of the pump during operation. Typical values range from 60-100% and will vary depending on ambient temperature, product viscosity, system plumbing, and system pressure.

Display		Description
Current Volume		Displays the volume of product dispensed during field operation and is resettable by the user.
Motor PWM		Displays the motor Duty Cycle (between 0 to 100%) value during operation.
Motor Voltage		The voltage for the high current bus circuit. High current power is provided to system components such as the motor.
Motor RPM		Displays the Motor RPM of the injection pump during operation.
Rinse Assist	N/A	Allows the user to toggle the state of the Rinse Assist feature if equipped. If ON, the pump will ignore target rate messages and will allow the user to perform rinse cycles. If OFF, the pump returns to normal operation.
Agitation		Allows the user to toggle the state of the agitator to ON or OFF if the agitator is equipped.

SIDEKICK PRO™ ICD SYSTEM SETTINGS



1. Open the UT Menu and select the desired Sidekick Pro™ ICD Menu button.
2. Press the Product Setup button.
3. Select Settings. The following information will display:

TABLE 1. System Settings Page Information

Display	Additional Setting Information
Tank Capacity	Displays the capacity of the direct injection chemical supply tank in gallons (US) or liters (SI).
Tank Level	Displays the volume of product currently in the injection chemical supply tank. This volume is used to calculate the volume remaining in the tank and for the low tank alarm if enabled.
Flow Correction	Used to adjust the actual amount pumped by the injection pump for a given target amount. A positive value will increase the amount pumped. A negative value will decrease the amount pumped. If the volume caught during a catch test or pumped during normal operation is less than the desired volume pumped, increase the Flow Correction% by the% difference. If the volume caught is greater than the desired volume pumped, decrease the Flow Correction% by the% difference. Typical error should be no more than +/-3%.
Agitator Duty Cycle	This displays the amount of time during a ten minute cycle the agitator is on. For example, a 20% duty cycle would turn on the agitator for two minutes and off for eight minutes.
Agitator Equipped	Enables the agitator feature. Check the box to enable the feature if agitation is required and the system is equipped with the direct injection chemical supply tank agitation system.
Rinse Assist Equip	Enables the rinse assist feature. Check the box to enable the feature if the injection system is equipped with the direct injection automated rinse system.

SIDEKICK PRO ICD ALARMS SETTINGS



1. Open the UT Menu and select the desired Sidekick Pro™ ICD Menu icon.
2. Select Alarms Settings. The following information will display:



TABLE 2. Alarms Information

Alarms	Description
DI Efficiency Limit	The minimum allowable efficiency for the DI pump. Typical values range from 60 - 99%. Alarm will trigger if actual efficiency is below the limit for 10 seconds. Higher efficiency values may cause alarms to trigger more often, lower efficiency values may not trigger the alarm.
Off Rate Limit	The allowable difference between the target and actual product application rates. If the difference between the actual and target rate exceeds the set percentage for more than five seconds, the system will display an off rate alarm.
Low Tank Limit	The volume at which the low injection chemical supply tank alarm will activate. Enter a value of zero or deselect enable to disable the low tank alarm.
Pop Up Alarms	Pop Up Alarms are used to notify the user of system errors by displaying an alarm on the home screen.
High Inlet Vacuum	Notifies the user that the maximum pump inlet vacuum has been exceeded. There may be a restriction in the plumbing between the injection pump inlet and the injection chemical supply tank.

CURRENT TOTALS DATA



1. Open the UT Menu and select the desired Sidekick Pro™ ICD menu icon.
2. Select the Totals Data icon then Current Totals. The following information will display:

FIGURE 2. Current Totals

Display	Icon	Description
Actual Flow		Displays the actual flow rate of the pump during operation.
Target Flow		Displays the current flow rate of the pump set from the controlling ECU.
Tank Percentage		Displays the current percentage of the tank volume to the tank capacity.
Pressure		Displays the pressure at the injection pump pressure transducer.
Current Volume		Displays the volume of product dispensed during a field operation and is resettable by the user.

DEVICE TOTALS

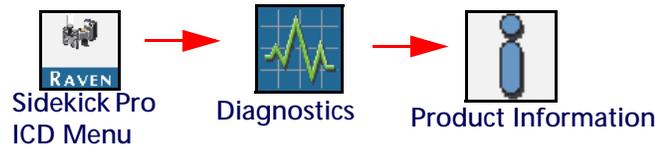


1. Open the UT Menu and select the desired Sidekick Pro™ ICD menu icon.
2. Select the Totals Data icon then Device Totals. The following information will display:

TABLE 3. Device Totals

Display	Icon	Description
Device Volume		This register keeps a running tally of the operating life of the system cannot be reset by the machine operator.
Engaged Hours		Displays the amount of time the pump has actively pumping product.
Software Hours		Displays the amount of time the software has been on the injection pump.

SYSTEM INFORMATION



1. Open the UT Menu and select the desired Sidekick Pro™ ICD Menu icon.
2. Select the Diagnostics icon.
3. Select Product Information.
4. Select the desired information from the drop-down. The options are:
 - Hardware/Software
 - System Readings
 - System Hours
 - CAN Bus Information
 - Reset Defaults

HARDWARE/SOFTWARE

This screen includes the Hardware Part Number, Hardware Serial Number, Hardware Revision, Software Part Number, Bootloader Version Number, and Software Version Number.

SYSTEM READINGS

This screen displays the ECU Power, Motor Power, and ECU Temperature.

SYSTEM HOURS

This screen shows the Software Hours and Engaged Hours.



CAN BUS INFORMATION

The CAN Bus Information screen shows CAN Address, Instance Number, and Extended Identify Number.

RESET DEFAULTS

Select the Reset Defaults icon to restore the default system settings.

TESTS

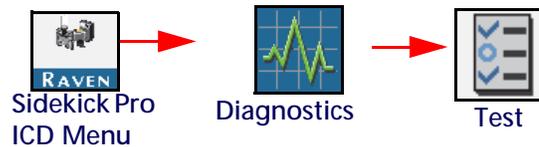
PUMP PRIME

Prime the injection pump before regular season operation to ensure the system is full of fluid and air is removed from the injection point system plumbing. 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. Ensure the plumbing is properly installed to and from the injection pump.
2. Ensure the chemical tanks for the pump(s) have liquid in them for priming functions.

NOTE: It may required 3 - 5 gallons (11 - 19 liters) of liquid in the chemical tank to ensure the system is primed properly.

PRIME THE INJECTION PUMP



1. Open the hand valve(s) between the supply tank and injection pump so that the valves direct flow from the tank towards the pump. Ensure any tank valves, fill station valves, rinse valves, and drain valves are in the correct position.
2. Lift the plunger handle on the pump calibrator (if equipped) to the top of the calibration cylinder.
3. Verify the following conditions exist:
 - a. Injection pressure is less than 12 PSI [82.7 kPa].
 - b. Pump is off.
 - c. Vacuum pressure is less than 11.5" [29 cm] of mercury.

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

4. Select the Sidekick Pro™ ICD Menu icon.
5. Select Diagnostics.
6. Select Test.
7. Select Prime Pump from the drop-down list.

8. Follow the on-screen prompts to complete pump priming. Allow the pump to prime. The priming procedure will run until the controller detects the pump is primed. If the pump is unable to prime, the console will end the priming procedure after two minutes and display an error.

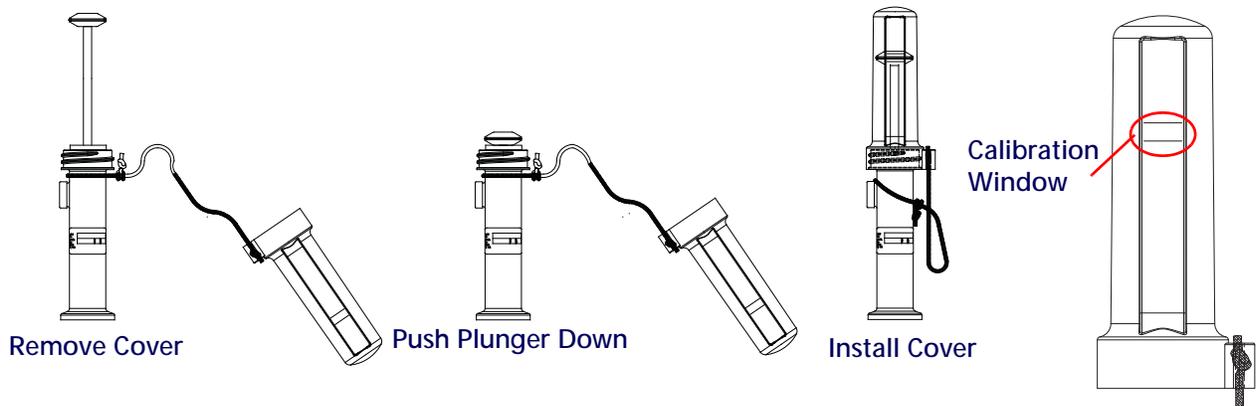
NOTE: If the console displays an error message during the priming process, verify that the conditions listed in step 3 exist. Press Stop at any time to stop the priming procedure. If the pump fails to prime after the first attempt, restart the priming procedure. If the pump is still unable to prime successfully, check the system for leaks, verify the valves are turned on, and verify the hoses are filled with product. It may not be necessary to recalibrate the pressure transducer.

PUMP CALIBRATION

Prior to starting a chemical injection application, verify the pump is calibrated and operational.

1. Prime the pump.
2. Set the hand valve on the injection pump outlet to recirculate the product back to the supply tank.
3. Remove the cover from the injection pump calibrator.
4. Press the calibrator all the way down and gently replace the calibrator cover.

FIGURE 3. Calibration Process

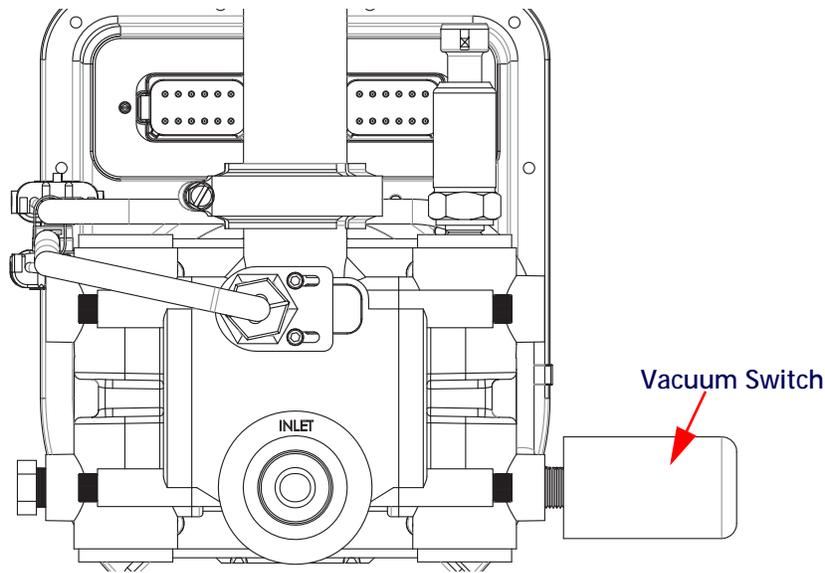


NOTE: Do not over-tighten the calibrator cover.

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

NOTE: The vacuum switch on the pump will engage and a flow alarm will display if the product cannot be drawn into the pump (e.g. vacuum pressure at, or above, 11.5" of mercury [29 cm of mercury]). Check screens, hoses diameter, and 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.

FIGURE 4. Vacuum Switch



6. Touch the Sidekick Pro ICD Menu button.

FIGURE 5. Sidekick Pro ICD Menu Button



7. Select the Diagnostics tab.
8. Select the Cal Pump.
9. Follow the on-screen prompts to complete pump calibration. The pump will run until the ECU detects 1 oz. [0.3 dL] of chemical has been passed through the pump and the "Calibration Complete" message displays.

NOTE: If the console displays an error message during the calibration process, verify that the conditions from step 5 exist. If the problem continues, refer to Troubleshooting section on page 51 for troubleshooting steps.

10. Verify the calibrator plunger on the injection pump. The black ring should stop within the "window" markings on the calibrator cover if calibration was successful. If the black ring stops outside of the calibration window, the Flow Correction% value may be adjusted to compensate.

NOTE: If the console displays an error message during the catch test, verify that the conditions listed in step 5 exist. If the problem persists, refer to "Troubleshooting" section on page 51 for troubleshooting information.

CATCH TEST

Prior to starting a chemical injection application, perform a catch test (if desired) to manually verify the pump output before operation. This test ensures the desired catch volume, volume caught, and flow correction are correct. To perform a catch test:

1. Verify the catch test vessel is large enough to catch the desired volume.

2. Ensure the end of the hose going from the pump to the catch vessel has a check valve to prevent excess fluid from exhausting when the pump has stopped pumping.
3. Set the hand valve on the injection pump outlet to pump the fluid to the catch vessel.
4. Ensure the pump and hoses are primed.
5. Verify the following conditions exist:
 - a. Injection pressure is less than 12 PSI [82.7 kPa].
 - b. Pump is off.
 - c. Vacuum pressure is less than 11.5" [29 cm] of mercury.

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

6. Press the Sidekick Pro™ ICD icon for the desired pump product number.
7. Select Diagnostics.
8. Select Test.
9. Select Catch Test from the drop-down.
10. Check the amount caught in the catch vessel after the catch test is complete. The caught volume should be within +/- 3% of the desired amount. If the caught volume is off by more than +/- 3%, adjust the Flow Correction percentage value. Increase the Flow Correction% by approximate error percentage to pump more fluid if needed. Decrease the Flow Correction% to pump less fluid if needed.

NOTE: If the console displays an error message during the catch test, verify the conditions listed in step 5 exit, If the problem persists, refer to the Chapter 6, Troubleshooting for assistance.

DEMONSTRATION MODE

Use Demonstration Mode to simulate pressure with a specified value and to stimulate flow. To operate the Sidekick Pro™ ICD in demonstration mode:

1. Select the Diagnostics icon.
2. Select Test.
3. Select Demonstration Mode.

DIAGNOSTIC TROUBLE CODES

The Diagnostic Trouble Code (DTC) list provides a list of recent errors for the equipment operator. access the DTC list to review the previous error conditions, the tally for each condition, during operation. Refer to DTC section in Chapter 6, Troubleshooting for additional information on Diagnostic Trouble Codes.

CLEAR DIAGNOSTIC TROUBLE CODES

Press the Clear DTC's icon to clear the diagnostic trouble codes.

VIEW DTC INFO

Press View DTC Info to view the alarm mask associated with the highlighted active DTC.

View Active DTC's

Shows the SPN and FMI for all the active DTC's along with a short description and the number of times this error occurred.

VIEW INACTIVE DTC'S

Shows the SPN and FMI for all of the inactive DTC's along with a short description and the number of times the error occurred.

Proper injection pump maintenance is critical to maintain system performance and extend the lifetime of the injection pump. Perform these maintenance procedures periodically over a season and be sure to store the pump properly when not being used.

**WARNING**


Always use caution when performing maintenance or servicing an injection pump or system which has been previously pressurized. Wear appropriate protective equipment to prevent contact with hazardous chemicals and rinse the chemical system as instructed by the chemical manufacturer prior to performing maintenance.

MAINTENANCE AND STORAGE

**WARNING**


Always use caution when performing maintenance or servicing an injection pump or system which has been previously pressurized. Wear appropriate protective equipment to prevent contact with hazardous chemicals and rinse the chemical system as instructed by the chemical manufacturer prior to performing maintenance.

Perform the following procedure before storing the injection pump for long periods:

NOTE: Failure to perform seasonal maintenance may result in damage to injection system or reduce the working life of the injection pump.

1. Empty product from the chemical supply tank and flush the injection pump with water.
2. Remove hardened chemical residues or build up by flushing the injection system with:
 - a. kerosene or fuel oil if the last product through the pump was petroleum based.
 - b. soap and water if the last product through the pump was water based.

- Remove the intake and discharge valve assemblies from the pump.

	 CAUTION
	<p>Chemical residue or build up may be present on internal pump components. Wear gloves when servicing internal pump assemblies.</p>

- Remove the pressure transducer and clean the cavity and transducer body of excess build up.
- Clean and inspect each assembly as instructed in the Check Valve O-Rings section on page 46.

NOTE: Be sure to reinstall the intake and discharge valves into the correct ports on the injection pump. Refer to "Check Valve Assemblies" on page 61 for additional for valve information.

- Perform the procedure described in the Pump Cam and Bearing section on page 48 to service the cam and bearing.
- Recirculate a 50% water and automotive antifreeze or 100% RV antifreeze mixture through the injection pump to check pump operation after reassembly as well as prevent freezing of pump components.

CHECK VALVE O-RINGS

	 CAUTION
	<p>Valve assembly contains small parts and springs under compression. Wear safety glasses when maintaining or cleaning valve assemblies.</p> <p>Chemical residue and build up may be present on internal pump components. Wear gloves when servicing internal pump assemblies.</p>

Small particles of rust, sand, or grit may build up around the check valve seals. Over time, this may cause a noticeable decrease in the accuracy of injected product application rates. Clean or replace the o-ring seals periodically to ensure accuracy of the injection system.

- Empty and rinse product from the chemical supply tank and flush the injection pump with water.
- Carefully remove the intake and discharge valve cartridges from the injection pump using a 9/16" allen wrench.

NOTE: The intake and discharge valve assemblies contain parts which are not interchangeable. To ensure proper re-assembly, clean and inspect the intake and discharge valve assemblies separately.

- Examine the valve assembly o-ring and replace if cut or nicked. These o-rings are made of a chemical resistant compound and should only be replaced with o-rings supplied by a local Raven dealer.
- Disassemble the check valve assemblies as shown in Figure 1 below.

NOTE: Valve assembly contains tension springs and small parts. To prevent the loss of parts, place the valve assembly inside a clear plastic bag while disassembling.

- Examine the guide, spring, poppet and poppet o-ring for wear, pitting, swelling or foreign matter. Clean or replace if necessary. O-rings inside valve assembly are made of a chemical resistant compound and should only be replaced with o-rings supplied by a local Raven dealer.
- Reassemble the intake and discharge plugs as shown in Figure 1 on page 47.
- Apply petroleum jelly to valve body o-rings and replace valve assemblies into the pump head and tighten valve plug.

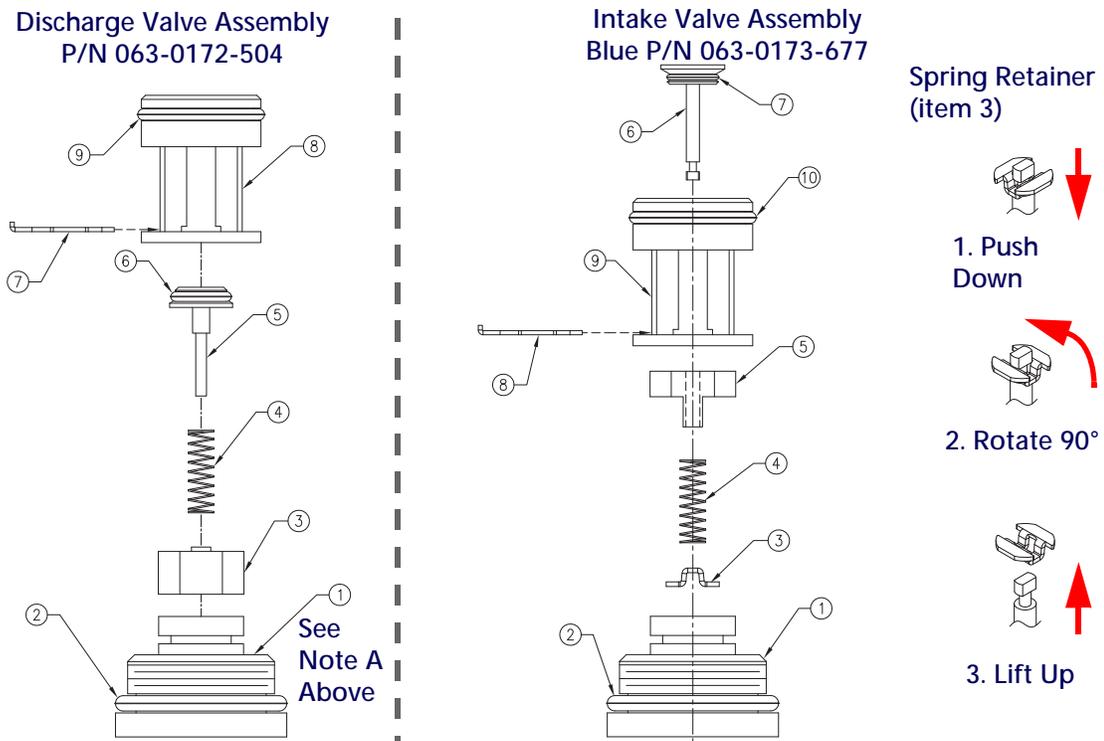
TABLE 1. Check Valve Assembly Replacement Parts

Discharge Valve Assemblies			Intake Valve Assemblies		
Item	Description	Raven P/N	Item	Description	Raven P/N
1	Fitting, Plug	107-0171-519 or 107-0171-955 ^a	1	Fitting, Plug	107-0171-519
2	O-Ring	219-0002-912	2	O-Ring	219-0002-912
3	Guide, Poppet	107-0159-934	3	Retainer, Intake	107-0171-459
4	Spring	314-0000-006	4	Spring	314-0000-005
5	Poppet	107-0159-935	5	Guide, Poppet	107-0171-092
6	O-Ring (Viton)	219-0007-011 ^b	6	Stem, Poppet	107-0171-447
7	Clip, Retainer	107-0171-576	7	O-Ring (Viton)	219-0007-011 ^b
8	Valve Body, Discharge	106-0159-621	8	Clip, Retainer	107-0171-576
9	O-Ring (Viton)	219-0002-018 ^b	9	Valve, Body Intake	106-0159-622
			10	O-Ring (Viton)	219-0002-018 ^b

a. Plug fitting (P/N 107-0171-955) is used with check valve assemblies (P/N 063-0173-310).

b. O-Rings included in Pump Seal Kit (P/N 117-0171-657).

FIGURE 1. Check Valve Assemblies



PUMP CAM AND BEARING




CAUTION

Chemical residue or build up may be present on internal pump components. Wear gloves when servicing internal pump assemblies.

Chemicals may seep into the bearing cavity. The pump cam and bearing housing should be cleaned and inspected periodically to prevent maintenance issues.

1. Loosen the four socket head screws holding the pump head to the motor assembly.
2. Remove pump from motor and clean surfaces of cam and bearing.
3. Examine the sealed bearing. If the bearing does not turn freely or smoothly, replace the bearing.
4. Apply a heavy coating of automotive grease to the area where the piston engages the cam bearing and reassemble pump to motor.

PISTON SEAL REPLACEMENT




CAUTION

Chemical residue or build up may be present on internal pump components. Wear gloves when servicing internal pump assemblies.

It is normal to have seepage from the weep hole on the pump housing. The piston seals within the injection pump housing should be replaced periodically. Replace the seals and piston after approximately 400 pump hours.

NOTE: New piston seals are supplied in the Pump Seal Kit (P/N 117-0171-657) available through a local Raven dealer.

FIGURE 2. Pump Head and Motor Separation

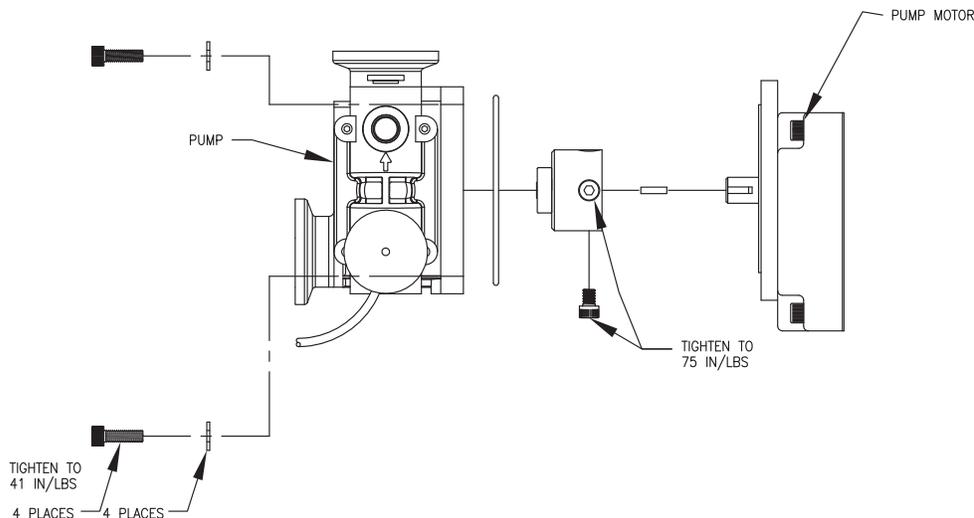


FIGURE 3. Bearing Assembly to Motor Spacing

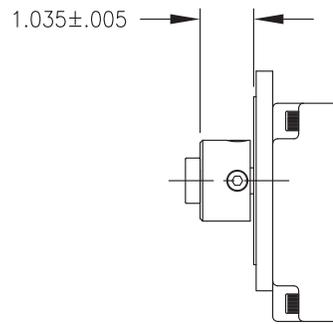
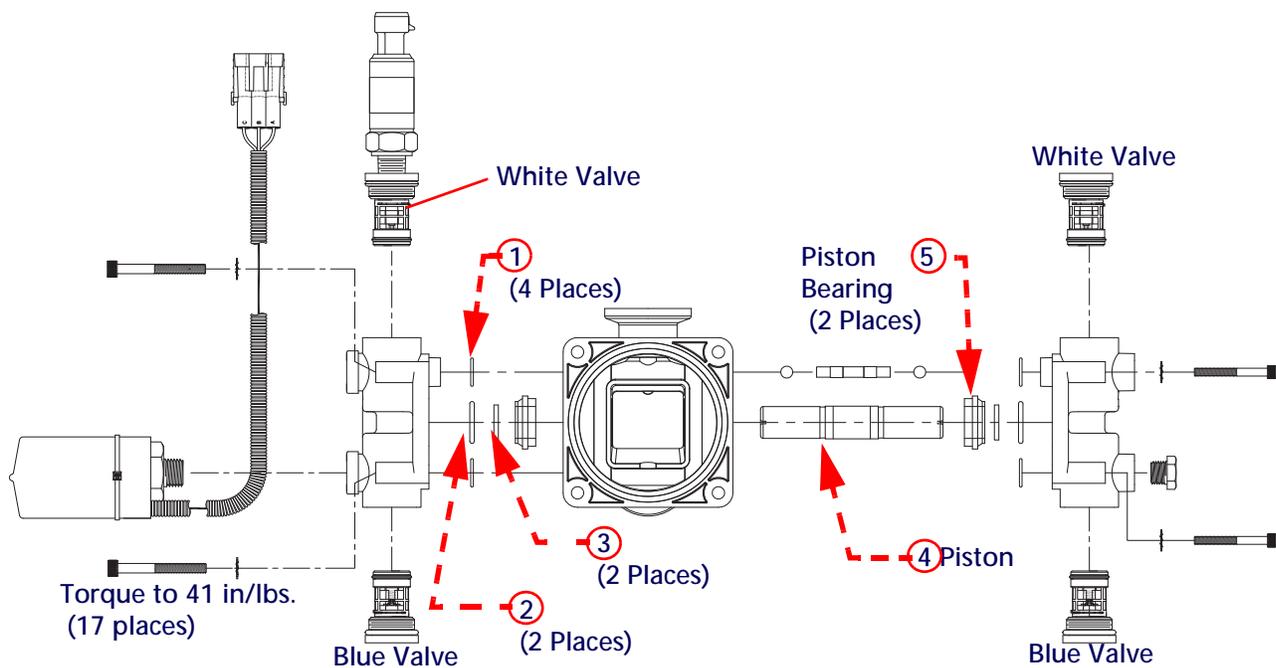


FIGURE 4. Pump Head Parts and Seal Installation



Item	Description	Raven P/N	Qt.
1	O-Ring, Viton	219-0002-015	4
2	O-Ring, GF Viton 117965-80	219-0007-117	2
3	Seal, 3/4" Slipper	219-0000-125	2
4	Piston	107-0172-467	1
5	Bearing, Piston	325-0000-018	2

1. Empty product from the chemical supply tank and flush the injection pump with water.
2. Disconnect the injection pump plumbing and cabling. Remove the injection pump from the implement and take to a suitable work area to perform maintenance.
3. Separate the pump from the motor by removing the four socket head screws.
4. Loosen the four socket head screws securing each pump head to the crank case.
5. Carefully remove the pump heads. While removing the pump heads, take care not to damage the exposed finish on the piston during disassembly.



6. Remove the slipper seals and o-rings from the pump.

NOTE: During removal of the piston, the slipper seal and o-rings may stick within the pump housing. Be sure to remove and inspect both of the two slipper seals and two o-rings used with the piston.

The seals and o-rings are made of a chemical resistant compound and should only be replaced with o-rings supplied by a local Raven dealer.

7. Inspect the piston for scratches. If the finish is scratched or damaged, replace the piston.

8. Inspect the piston bearing for wear and replace if necessary.

9. Replace the seals and o-rings into the pump housing:

NOTE: Complete one side of the piston and head assembly before starting on the other side.

- a. Install the slipper seal onto the piston.
- b. Using general purpose grease, lubricate the o-ring and seat over the slipper seal.
- c. Replace pump head o-rings into pump heads. If the o-rings tend to slip before the head is installed, use a small amount of additional grease on the o-ring to help hold it in place.
- d. Install the pump head to the pump assembly.
- e. Repeat the above steps to install the remaining pump head.

10. Tighten socket head screws to the torque specified in Figure 4 on page 49.

RETURNING THE PUMP FOR SERVICE OR REPAIR

	<p>WARNING</p> <p>Always follow safety labels and instructions provided by the chemical manufacturer or supplier. Always wear proper personal protective equipment when handling or disposing chemicals.</p>
	<p>CAUTION</p> <p>Injection pumps must be cleaned prior to shipping for service or repair. Pumps returned with chemical residue or contamination will not be accepted or subject to service fees.</p>

Refer to the following procedure should it be necessary to return the Sidekick Pro ICD injection pump for service or repairs:

1. Prior to disconnecting the injection pump, drain the chemical tank and rinse with clean water.
2. If pump is operating, refer to the Returning the Pump for Service or Repair section on page 50 and run clean water through the injection pump. If pump is not operational, proceed with the following steps.
3. Remove the inlet and outlet cartridge valves and rinse with clean water.
4. Place cartridges in a plastic envelope for shipping.
5. Run clean water through both the inlet and outlet port on the pump head.
6. Run clean water through the both cartridge ports.

MOTOR CONTROL ECU LED STATUS INDICATORS

MOTOR CONTROL ECU LED STATUS INDICATORS

The Sidekick Pro integrated motor control ECU displays the status of the injection pump with the following ECU status indicators.

FIGURE 1. LED Status Indicators

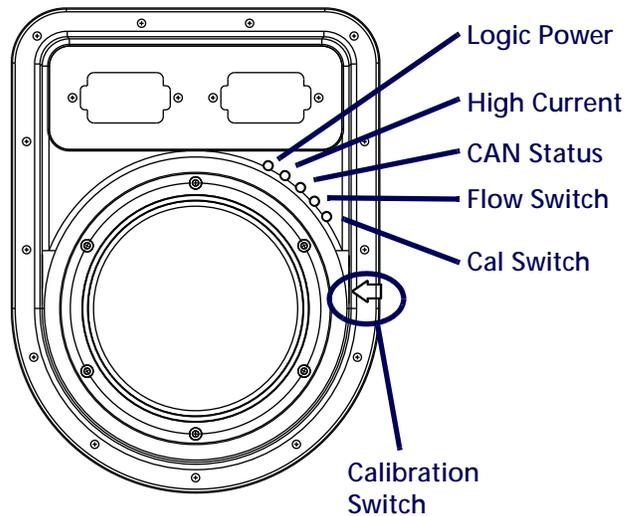


TABLE 1. LED Status Indicators

LED	Status Display
Logic Power	If logic power is present at the motor control ECU, the logic power indicator will be on.
High Current Power	If high current power is present at the motor control ECU, the high current power indicator will be on.
CAN Status	The CAN status indicator will flash once per second if the motor control ECU is communicating on the CANbus. If the motor control ECU cannot communicate via the CANbus, the CAN status indicator will flash four times per second.
Flow Switch State	The flow switch indicator will flash when flow is detected from both sides of the pump.
Calibration Switch State	The calibration switch indicator will flash when a metal object is passed by the calibration switch sensor.

DIAGNOSTIC TROUBLE CODES

TABLE 2. Diagnostic Trouble Codes

Code ID		Description	Recommended Actions
523152	31	Invalid pump state	Verify the communication setup/shutdown alarm.
523154	9	Lost communication	Verify the communication setup/shutdown alarm.
	16	Target flow too high	1. Reduce the equipment speed. 2. Reduce the target application rate.
	18	Target flow too low	1. Increase the equipment speed. 2. Increase the target application rate.
523160	1	Chemical tank is empty	Refill the product to continue field applications.
	17	Low tank volume remaining	Refill the product to continue field applications.
523167	2	Injection pressure sensor disconnected	1. Verify good connection to the pressure sensor on the pump. 2. Verify the sensor is getting supply voltage. 3. Verify the signal voltage is getting back to the pump ECU.
	16	High injection pressure	1. Verify the communication setup/shutdown alarm. 2. Check for an obstruction in the injection system discharge hose. 3. Verify the carrier pressure is not exceeding 150 PSI.

Code ID		Description	Recommended Actions
523169	4	Low motor voltage	<ol style="list-style-type: none"> 1. Verify high current breaker is not tripped. 2. Verify battery connections. 3. 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.
523175	18	Low pump efficiency	<p>Check for:</p> <ol style="list-style-type: none"> 1. Fouled pump check valves. 2. Air leaks on the injection pump inlet plumbing. 3. Air in the chemical. 4. Plugged inlet strainer. 5. Chemical too thick to flow through the pump. 6. Calculate the volume per minute for the application and verify the rate is within the range of the injection pump. 7. Check the flow monitor sensor.
523176	16	Off rate high	<ol style="list-style-type: none"> 1. Check calibration for the correct data entry. 2. Calculate the volume per minute for the application and verify the rate is within the range of the injection pump.
	18	Off rate low	<p>Check for:</p> <ul style="list-style-type: none"> • Fouled pump check valves • Air leaks on the injection pump inlet. • Air in the chemical. • Plugged inlet strainer. • Chemical too thick to flow through the pump. • Calculate the volume per minute for the application and verify the rate is within the range of the injection pump.
523188	16	DI high vacuum error	<ol style="list-style-type: none"> 1. Disconnect the vacuum switch from the product cable. Test for continuity between pins A and C. If the OHM meter reads a short, the switch is good. If it reads open, the vacuum switch is bad. 2. Check for obstructions from the inlet of the tank. There may be debris in the inlet, a plugged filter/strainer, hand valve turned the wrong directions or obstruction in the outlet of the chemical tank.

Code ID		Description	Recommended Actions
523189	7	Injection pump fault	Return pump to a local Raven dealer for service.
	16	Invalid pump calibration	Adjust the flow correction offset.
524025	31	Security failure	Cycle the device power.

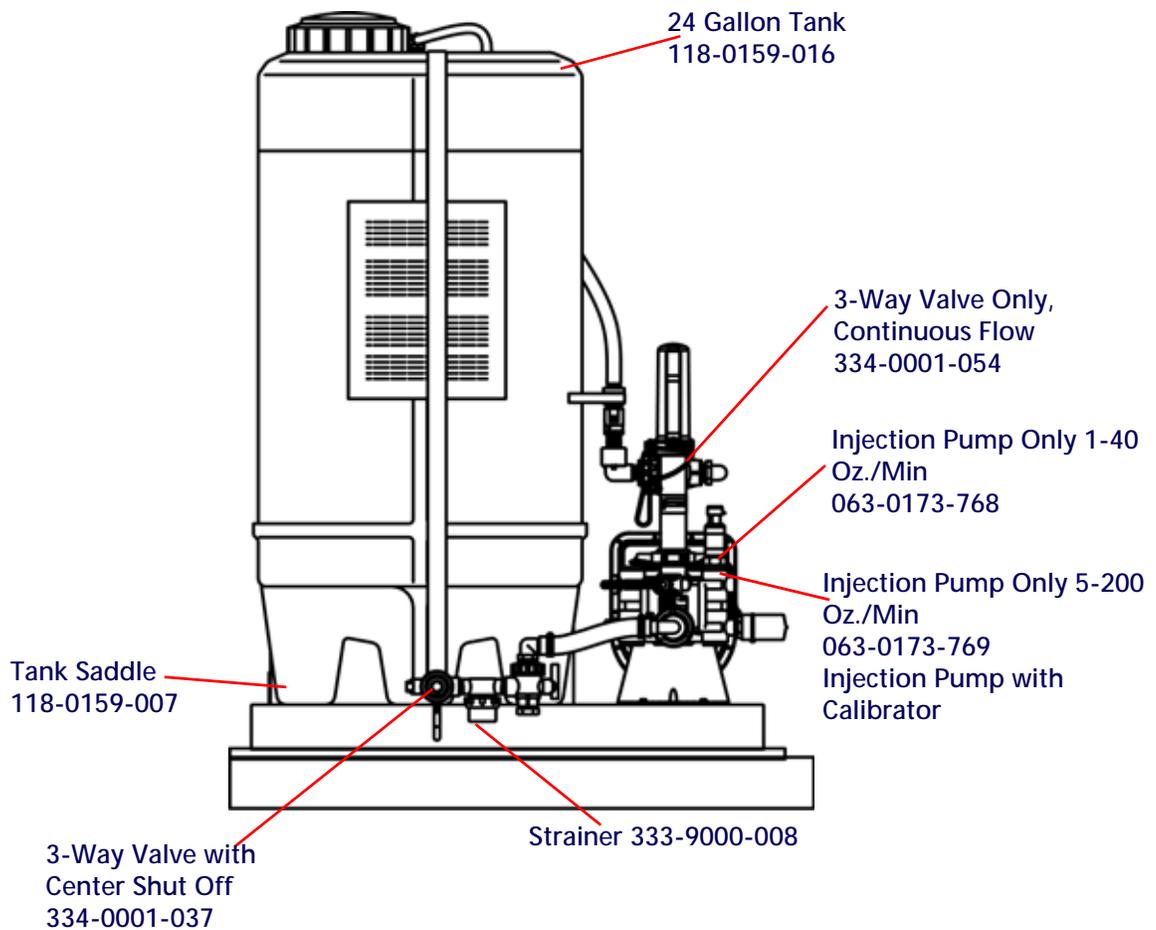
SIDEKICK PRO ICD INJECTION MODULE PARTS

FIGURE 1. Injection Module Components

Replacement Parts

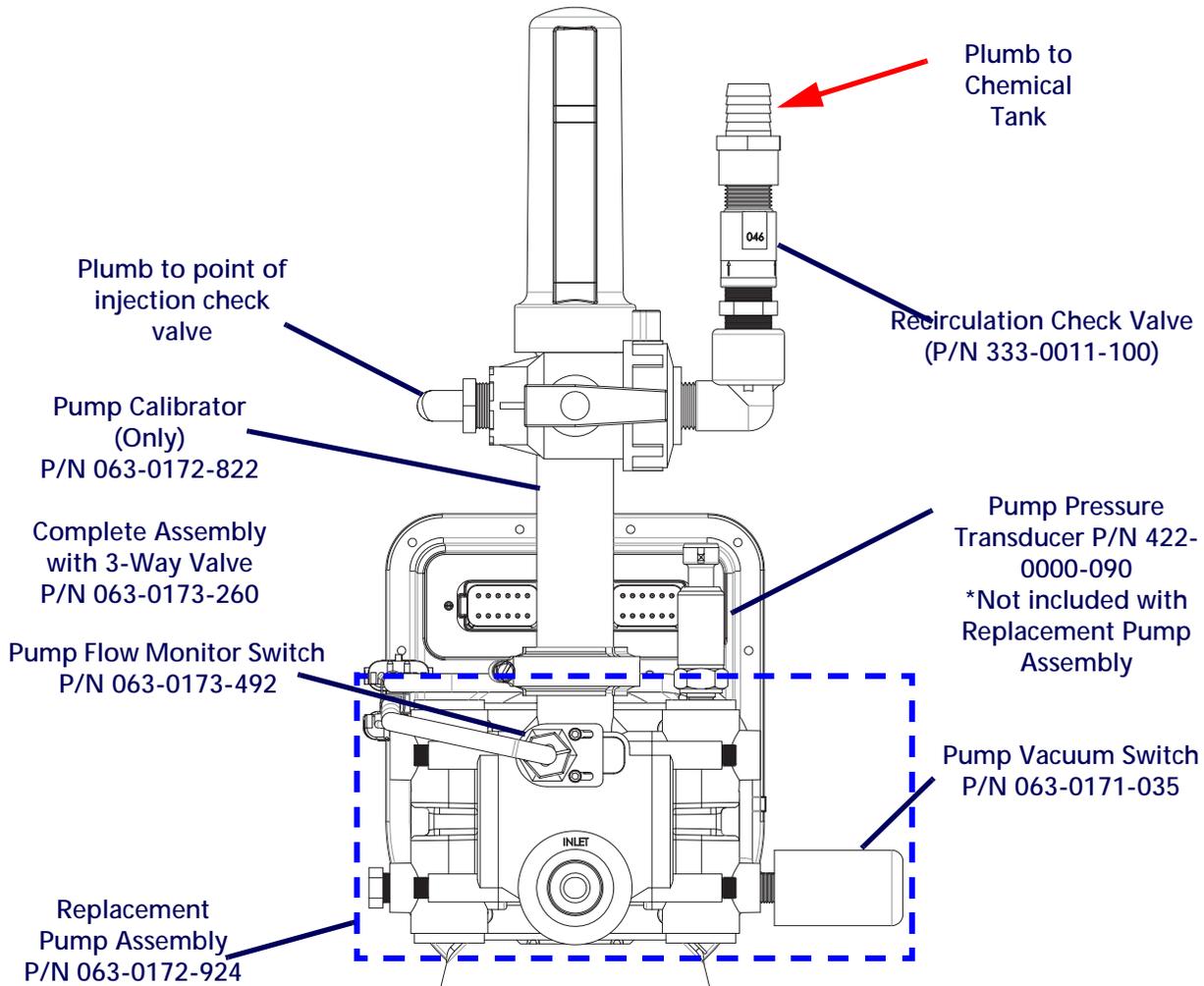
Injection Module 24 Gallon, 1-40Oz./Min 063-0173-771

Injection Module 24 Gallon 5-200 Oz./Min 063-0171-772



SIDEKICK PRO PUMP REPLACEMENT PARTS

FIGURE 2. Injection Pump Components



INJECTION PUMP PRESSURE TRANSDUCER

	<p style="text-align: center;">⚠ WARNING</p> <p>Always use caution when performing maintenance or servicing an injection pump or system which has been previously pressurized. Wear appropriate protective equipment to prevent contact with hazardous chemicals and rinse the chemical system as instructed by the chemical manufacturer prior to performing maintenance.</p>
---	---

To replace the pressure transducer:

1. Disable and shutdown any automatic product control features of the Sidekick Pro injection system and turn off the vehicle when replacing the pressure transducer assembly.

	<p style="text-align: center;">⚠ WARNING</p> <p>Hazardous chemicals may be under pressure even if the pump has not been in service recently. Before replacing any components on the injection pump, thoroughly rinse the injection pump with clean water to remove excess chemical residue.</p>
---	--

2. Disconnect the pressure transducer connector on the top of the pressure transducer body. Be careful to keep dust, debris, or liquid chemicals which may seep from the injection pump head from contaminating the cable connection.
3. Loosen the pressure transducer while securing the connected fitting to prevent damage to the pump head.
4. Apply RectorSeal[®] or equivalent thread sealant to the new pressure transducer and thread into the pump head.
5. Tighten the pressure transducer body to secure the pressure transducer.

NOTE: Do not over tighten the pressure transducer. Overtightening the pressure transducer may damage the pump head.

INJECTION PUMP VACUUM SWITCH

	<p style="text-align: center;">⚠ WARNING</p> <p>Always use caution when performing maintenance or servicing an injection pump or system which has been previously pressurized. Wear appropriate protective equipment to prevent contact with hazardous chemicals and rinse the chemical system as instructed by the chemical manufacturer prior to performing maintenance.</p>
---	---

To replace the vacuum switch (P/N 063-0171-035):

1. Disable and shutdown any automatic product control features of the Sidekick Pro injection system and turn off the vehicle when replacing the vacuum switch assembly.



⚠ WARNING

Hazardous chemicals may be under pressure even if the pump has not been in service recently. Before replacing any components on the injection pump, thoroughly rinse the injection pump with clean water to remove excess chemical residue.

2. Disconnect the vacuum switch connector from the motor control cabling. Be careful to keep dust, debris, or liquid chemicals which may seep from the injection pump head from contaminating the cable connections.
3. Loosen the vacuum switch while securing the connected fitting to prevent damage to the pump head.
4. Apply RectorSeal[®] or equivalent thread sealant to the new vacuum switch and thread into the pump head.
5. If necessary, slide the protective covering on the vacuum switch back slightly to expose the hex surface for tightening the vacuum switch body.
6. Tighten the vacuum switch body to secure the vacuum switch.

NOTE: Do not over tighten the vacuum switch. Overtightening the vacuum switch may damage the pump head.

7. Be sure to replace the protective cover over the vacuum switch before operating the pump.

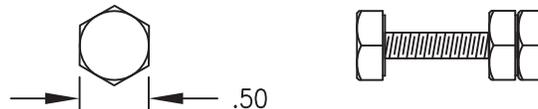
FLOW MONITOR SENSOR ADJUSTMENT PROCEDURE

1. Set the hand valves for the system to recirculate product to the chemical tank and prime and calibrate the pump.
2. Run the injection pump at the lowest injection rate within tolerance for the pump (i.e. 1 oz./min. for 1-40 oz./min. pumps or 5 oz. for 5-200 oz./min. pumps).

The LED indicator should be flashing while the pump is running. If the indicator light is not flashing, turn the sensor body a few degrees until the LED flashes.

NOTE: The line on the sensor body should not be more than 45° off of vertical to ensure maximum sensitivity.

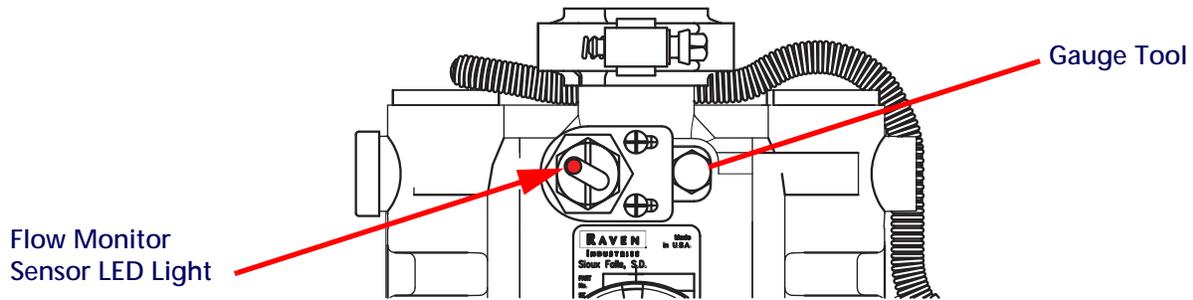
3. Once the sensor assembly is properly set and the LED indicator is flashing, tighten the sensor lock nut to secure the sensor body to the bracket.
4. Thread two 5/16" nuts (not supplied) onto a 5/16" bolt (not supplied) to make a gauge tool.



The gauge tool will be used to help align the sensor bracket and ensure the sensor body is mounted properly on the pump head.

5. Insert the gauge tool into the recess in the pump head to the right side of the sensor bracket as shown in Figure 3 below.

FIGURE 3. Gauge Tool and Flow Monitor Sensor Bracket Alignment



6. Tighten the two allen head screws to secure the sensor bracket.

NOTE: Leave the gauge tool in place to ensure that the sensor bracket stays properly aligned during the rest of the process. The gauge tool may be removed once the sensor lock nut is tightened.

7. Thread the new flow monitor sensor into the pump head until the sensor body contacts the pump head.

8. Tighten the sensor assembly a partial turn until the line on the flow monitor sensor is near vertical and the LED is on the left side of the line. Do not over tighten.

CHECK VALVE ASSEMBLIES

FIGURE 4. Injection Pump Valve Cartridge Replacement Parts

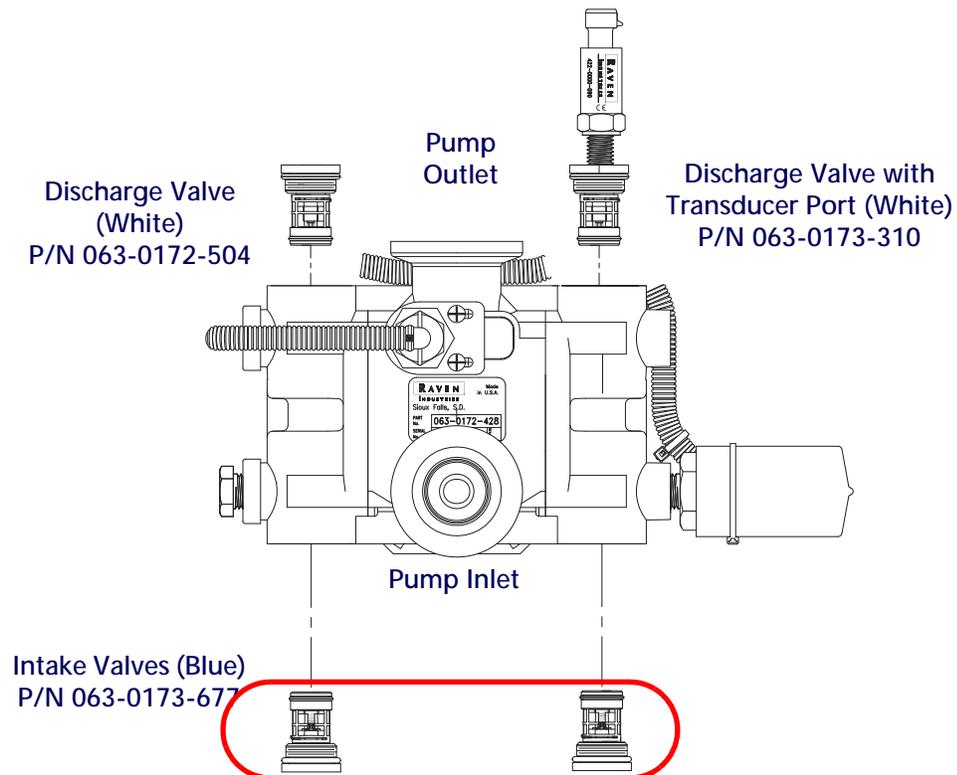
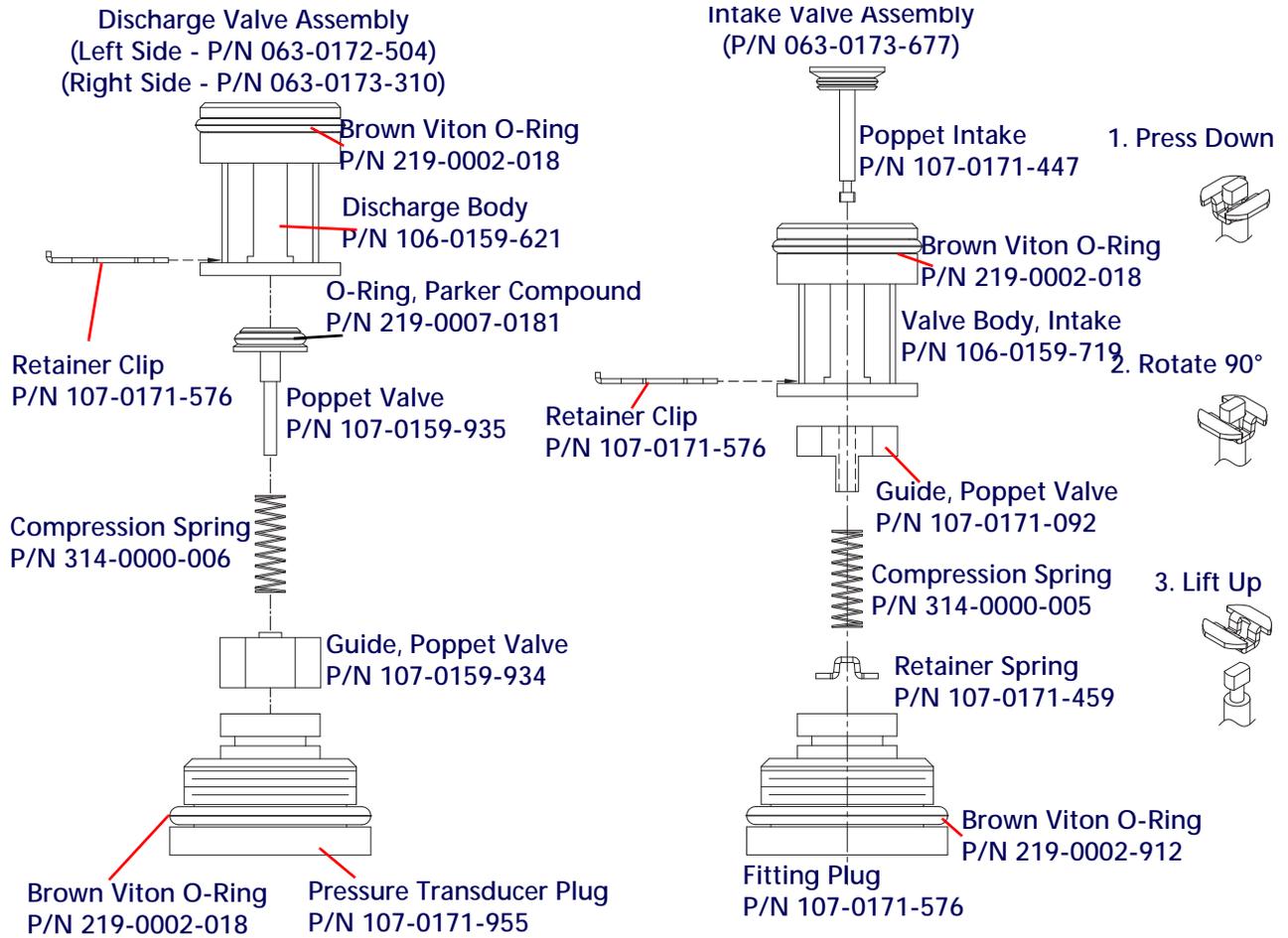


TABLE 1. Pump Seal Kit (P/N 117-0171-657) Replacement Parts

Description	Raven P/N	Qty.
Assembly, Bearing Drive	063-0172-501	1
Piston, Injection Pump, 3/4"	107-0172-467	1
Seal, Slipper 3/4"	219-0000-125	2
O-Ring, Buna-N, Black, 3-1/2" ID, 3-11/16" OD	219-0001-153	1
O-Ring, Viton, Brown Color, 9/16" ID, 11/16" OD	219-0002-015	4
O-Ring, Viton, Brown Color, 3/4" ID, 7/8" OD	219-0002-018	4
O-Ring, Viton, Brown, .924" ID, 3/4" OD	219-0002-912	4
O-Ring, Viton Parker Compound V1274-75, 5/16" ID, 7/16" OD	219-0007-011	4
O-Ring, Viton Parker Compound V1274-75, 13/16" ID, 1" OD	219-0007-117	2
Bearing, Piston, 3/4"	325-0000-018	2

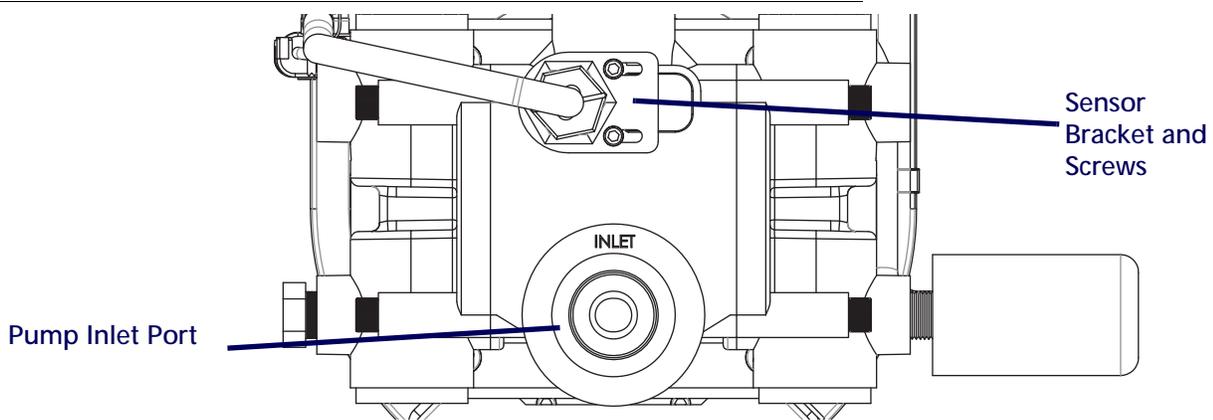
FIGURE 5. Check Valve Spring Retainer Assemblies



INJECTION PUMP FLOW MONITOR SENSOR

Perform the following procedure to replace the flow monitor sensor (P/N 063-0173-492).

FIGURE 6. Pump Head and Flow Monitor Sensor



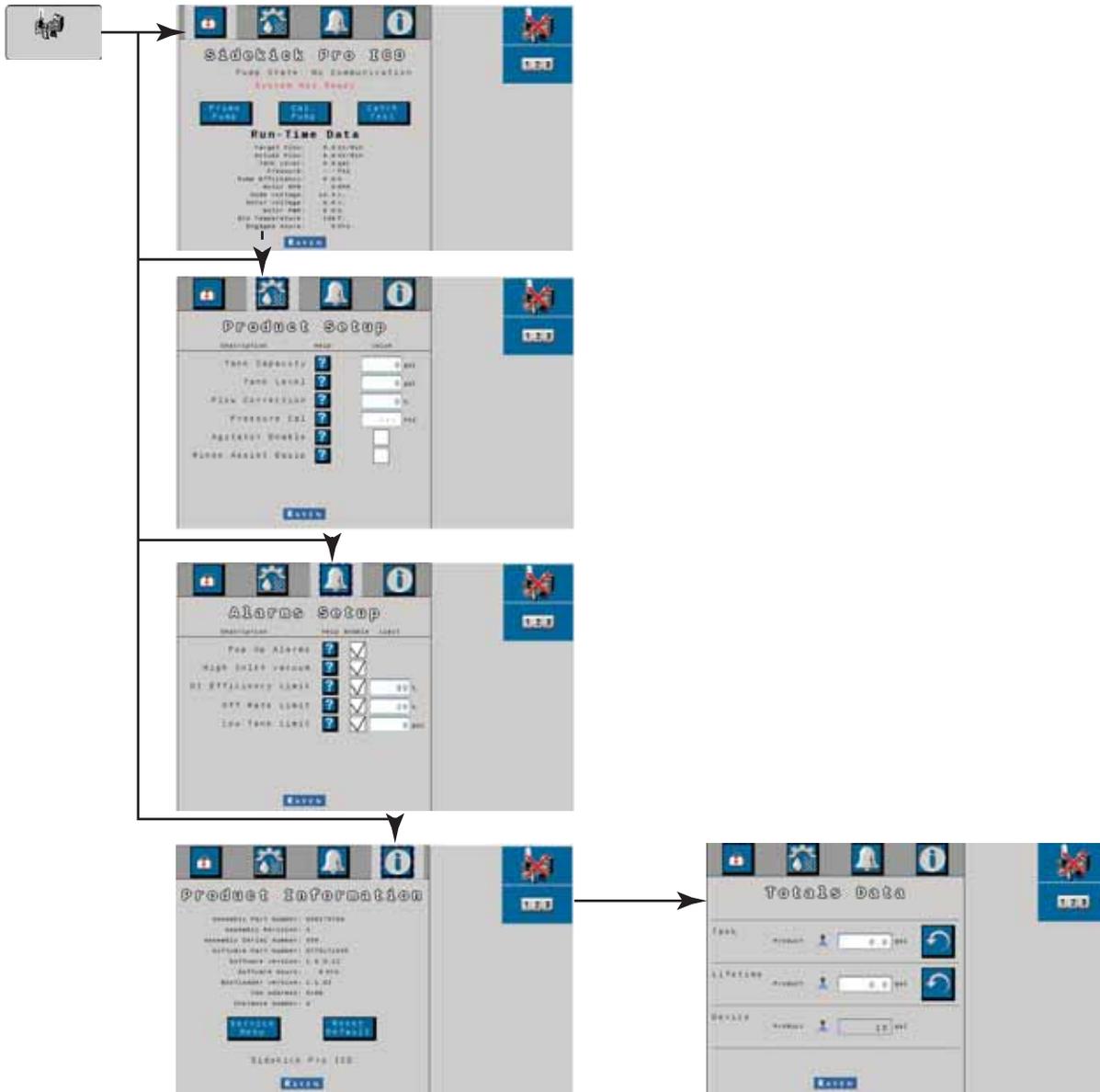
1. Disconnect the sensor cable from the motor control cabling.
2. Loosen the locking nut on the switch assembly and remove the old sensor assembly from the pump head.
3. Loosen the sensor bracket mounting screws enough to allow the bracket to slide freely on the pump head.
4. Adjust the flowmeter as needed using the "Flow Monitor Sensor Adjustment Procedure" on page 60.

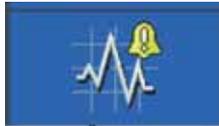
A

CALIBRATION FLOWCHART

This section provides a flowchart of the calibration screens and may be useful for calibration. The flowchart starts on the next page.

FIGURE 1. Calibration Screen Flow





System Information

Hardware/Software

Hardware Part Number	0630173769
Hardware Serial Number	891
Hardware Revision	A
Software Part Number	0770171445
Software Version Number	1.1.0.20
Bootloader Version Number	1.1.02

System Information

System Readings

ECU Power (Vrms)	13.1
Motor Power (Vrms)	0.0
ECU Temperature (°F)	113

Tests

Diagnostic Test

Please select a Diagnostic Test from the list above to continue.

System Information

CAN Bus Information

CAN Address	0x88
Instance Number	0
Extended Identity Number	0

Diagnostic Trouble Codes

Active	ID #	Count
	023107.02	0

Pressure Sensor Disconnected

Inactive	ID #	Count
----------	------	-------

System Information

System Hours

Software Hours (hours)	939
Engaged Hours (hours)	0

System Information

Reset Defaults

Reset Defaults

C**Calibration and Operation** 35**Calibration Values**

Section Widths 65

CAN (Controller Area Network)

CANbus and Power Connections 26

Sidekick Pro Pump 33

Catch Test 42**Current Totals Data** 38**D****Demonstration Mode** 43**Device Totals** 39**Diagnostic Trouble Codes** 43**F****Features** 8

Closed Calibration System 8

Integrated Motor Control Node 9

System Diagnostics 10

I**Important Safety Information** 1

Chemical Handling and Safety 1

Electrical Safety 2

Installation

Chemical Tank 21

Initial Plumbing and Point of Injection 16

Injection Module 19

Overview 15

Sidekick Pro Pump 21

Verifying Sidekick Pro 34

M**Maintenance** 45

Seasonal Maintenance and Storage 50

O**Overview** 7

Injection System Components 7

P**Plumbing** 23

Closed Calibration System 24

Optional Rinse Assist System 24

Sidekick Pro Pump 23

Power Connections 26**Pump Prime Test** 40**R****Replacement Parts** 57

Check Valve Assemblies 61

Injection Pump Flow Switch 57, 64

Injection Pump Pressure Transducer 57, 59

Sidekick Pro Pump 58

S**Sidekick Pro ICD Menu** 35**Specifications** 10**System Information** 39**T****Tests** 40**Troubleshooting**

Alarms 54

Motor Control Node LED Status Indicators 53

V**Verifying Installation of the Sidekick Pro** 34

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.