

SideKick Pro™ ICD 1-40
oz./min. and 5-200 oz./
min. Installation &
Operation Manual

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SAFETY

NOTICE

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

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

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

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

WARNING

AGRICULTURAL CHEMICAL SAFETY

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

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

HYDRAULIC SAFETY

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

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

 **CAUTION**

ELECTRICAL SAFETY

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

RECOMMENDATIONS AND BEST PRACTICES

HOSE ROUTING

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

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

WIRE ROUTING

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

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

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

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

SYSTEM OVERVIEW

The Raven Sidekick Pro™ ICD (ISO Client Device) 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.

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.

TABLE 1. Injection Modules

Description	Module
1-40 Oz./min. 24 Gallon Injection Module	063-0173-771
5-200 Oz./min. 24 Gallon Injection Module	063-0173-772

By connecting the module to an ISOBUS Universal Terminal and compatible rate controller, including Raven ISO Product Controller II or Raven RCM (Rate Control Module), multiple injection pumps can be controlled through a single UT working set.

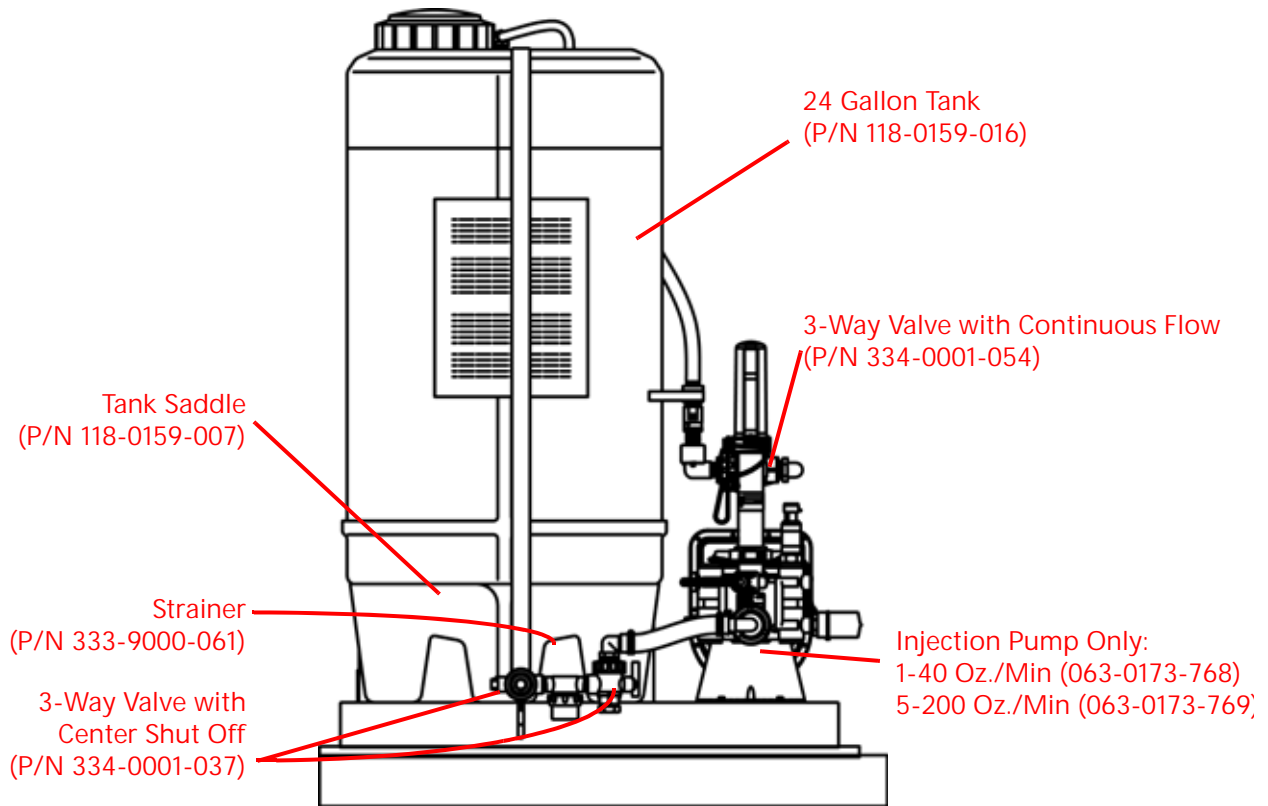
NOTE: Priming, calibration, rinsing, and diagnostics options are available from the individual ICD working set. Refer to the rate controller operation manual for capabilities and user settings.

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 application rate regardless of vehicle speed or active boom section width.

Performance of the Sidekick Pro™ 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 injection system.

INJECTION SYSTEM COMPONENTS

FIGURE 1. Injection Module Components



The Sidekick Pro injection system consists of:

- ISOBUS based universal terminal (UT) and appropriate cabling
- Sidekick Pro™ ICD injection pump
- In-line mixer
- Check valves
- Cabling required to connect injection system components and existing ISOBUS

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

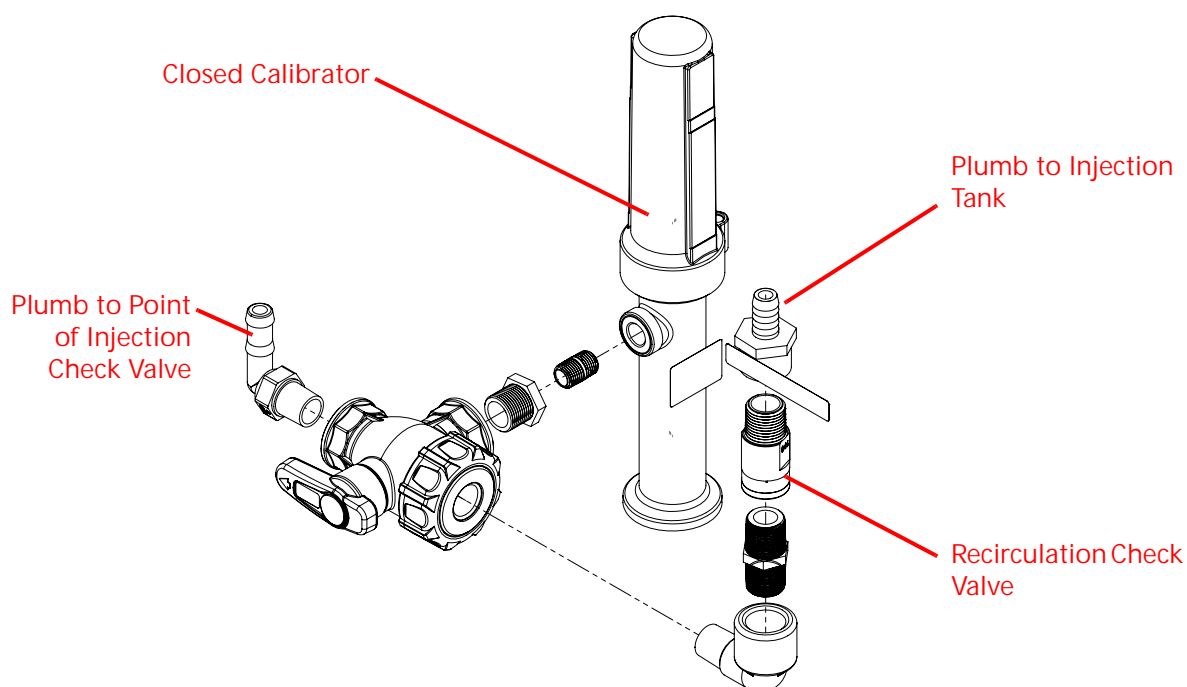
- Viper 4
- CR7 or CR12
- ISOBUS compatible UT

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.

FIGURE 2. Pump Calibrator Kit (P/N 063-0173-260)



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 kit (P/N 063-0173-260) provides a quick tool to check pump efficiency and verify that the pump is ready for operation.

RINSE ASSIST

The Sidekick Pro™ Rinse Assist provides a quick method to rinse the injection pump with clean water which helps to ensure problem-free operation of the Sidekick Pro injection system. The Rinse Assist system utilizes an automated 3-way rinse valve to switch the inlet source to a rinse tank without leaving the cab. When the rinse process is complete, the 3-way valve returns to the chemical supply tank inlet setting and is ready for the next application.

FIGURE 3. Rinse Assist System



FAST RATE RESPONSE

High precision sensing allows the Sidekick Pro™ ICD direct injection system to dynamically lock onto the target rate while the application equipment works the field. This ensures that the injection pump is providing the proper chemical concentration throughout the field regardless of vehicle speed or boom section status changes.

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.

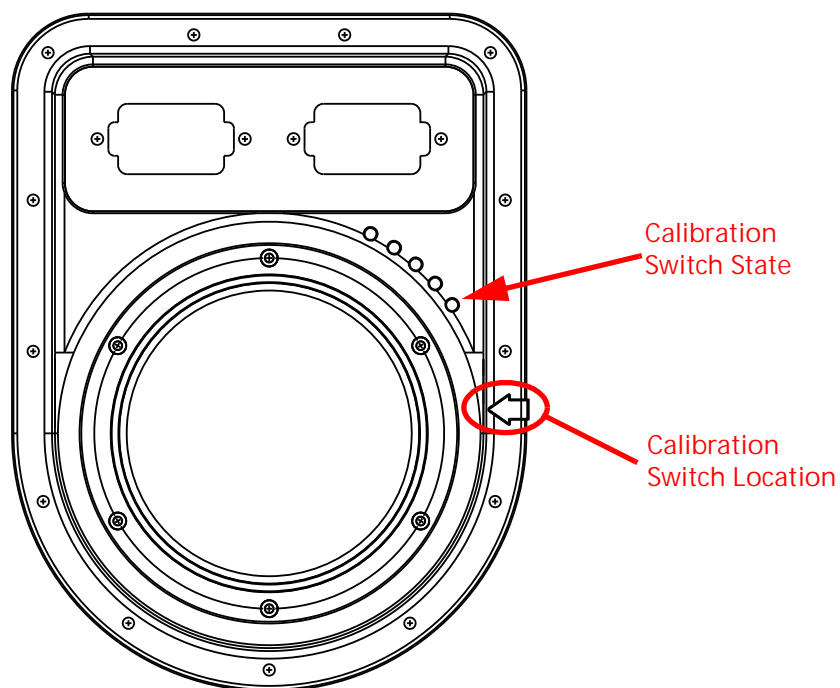
INTEGRATED CALIBRATION SWITCH (FOR USE WITH PUMP CALIBRATOR ASSEMBLY ONLY)

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 also must be initiated from the universal terminal (UT) in the vehicle cab. See the *Pump Calibration with Pump Calibrator* section on page 40 for a detailed calibration procedure.

The Calibration 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 4. Motor Control ECU Calibration Sensor



The integrated calibration switch may also be used to:

- Prime the pump
- Calibrate the pump
- Perform a catch test
- Rinse the pump

SYSTEM DIAGNOSTICS

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

FLOW MONITORING

The 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, or issues with the injection pump valves.

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 5 on page 13)
	Injection Module: <ul style="list-style-type: none"> • 24 Gallon - See Figure 6 on page 21 • 50 Gallon - See Figure 7 on page 22
Piston	1 (Dual Acting) at 0.750 in. Dia. [1.910 cm]
Maximum Stroke Length	0.390 in. [0.99 cm]
Flow Output Range	5-200 oz./min. [1.5-59 dL/min.] 1-40 oz./min. [0.3-11.8 dL/min.] (P/N 063-0173-769) (P/N 063-0173-768)
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 5. Sidekick Pro ICD Injection Pump Dimensions

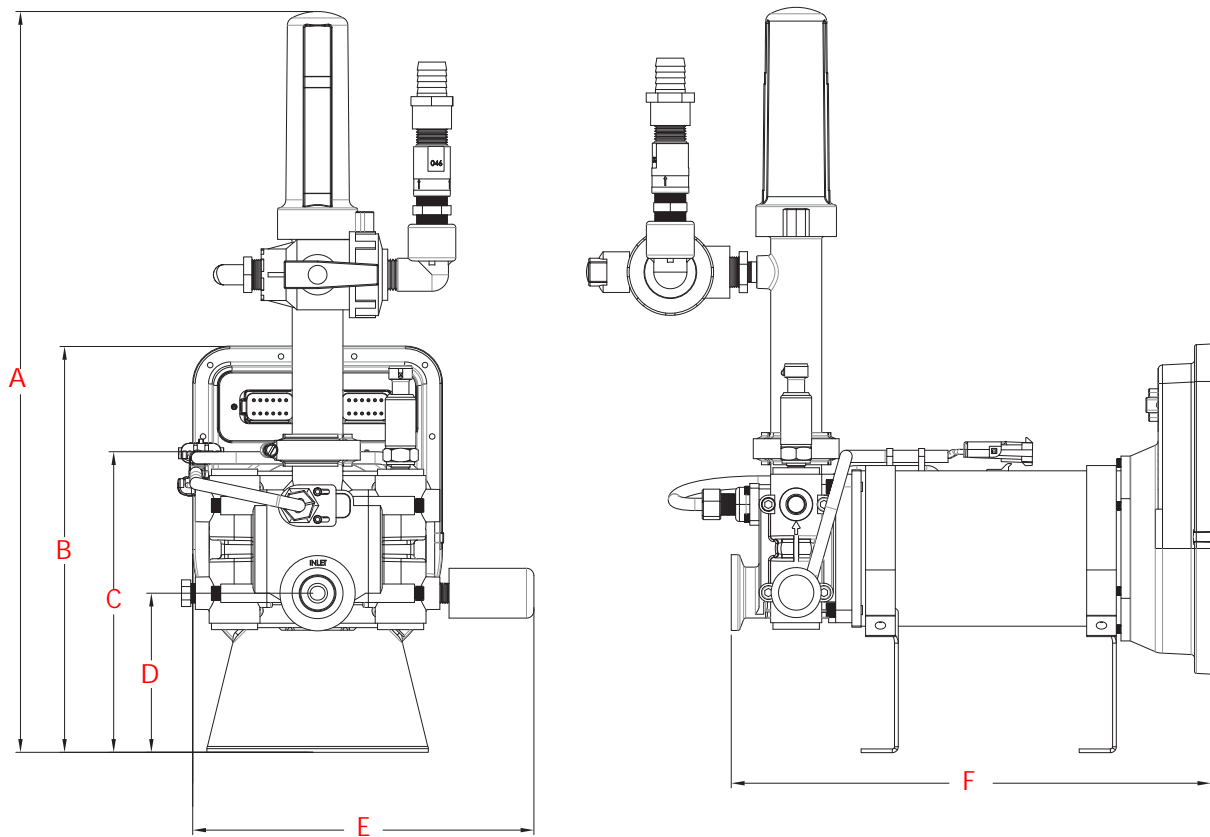


TABLE 2. Sidekick Pro™ ICD Injection Pump Dimensions

Dimension	English (in.)	Metric (cm)
A	20.1	51
B	9.6	24.4
C	8.2	20.8
D	4.3	10.9
E	9.25	23.5
F	16.5	41.91
G	12.96	32.92

NOTE: 1-40 oz./min. pump shown. Overall length of the 5-200 oz./min. pump is 16.19 inches [41.12 cm]. Other basic dimensions are the same for 5-200 oz./min. pump.

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 1-40 oz./min. and 5-200 oz./min. Installation & Operation Manual
- 016-0171-605 Rev. E
- Any comments or feedback (include chapter or page numbers if applicable).
- Let us know how long have you been using this or other Raven products.

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

Thank you for your time.

CHAPTER 3 INSTALLATION

3

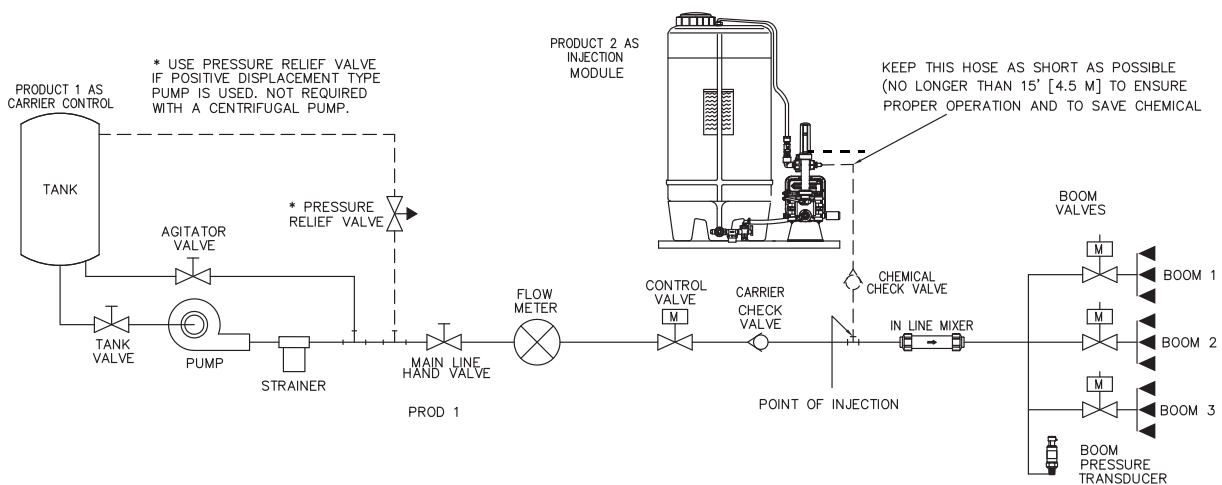
OVERVIEW

The following steps must be completed to install the Raven Sidekick Pro™ ICD injection system:

1. Select and plumb the point of injection.
 - a. Install carrier and chemical injection check valves.
 - b. Install in-line mixer.See the *Initial Plumbing and Point of Injection* section on page 16.
2. Mount the Sidekick Pro™ ICD injection module or tank.
See the *Mount the Injection Module* section on page 21 or the *Mount the Chemical Tank* section on page 23.
3. Mount the Sidekick Pro™ ICD injection pump.
See the *Mount the Sidekick Pro™ ICD Pump and Chemical Tank* section on page 21.
4. Plumb the Sidekick Pro™ ICD pump and injection lines into the main carrier line at point of injection.
See the *Sidekick Pro™ ICD Injection System Plumbing* section on page 25.
5. Install the closed calibration system (if equipped).
See the *Plumb the Sidekick Pro™ ICD Closed Calibration System* section on page 26.
6. Plumb the rinse system.
See the *Plumb the Rinse Assist System* section on page 27.
7. Connect the Sidekick Pro™ ICD injection pump to the ISOBUS and a source of electrical power.
See the *ISOBUS and Power Connections* section on page 29

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

FIGURE 1. Example Sidekick Pro™ ICD Injection System



TANK AGITATOR INSTALLATION

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

The following agitators are available for use with the Sidekick Pro™ ICD system. Refer to the installation guide shipped with the agitator for installation instructions.

TABLE 1. Available Tank Agitators

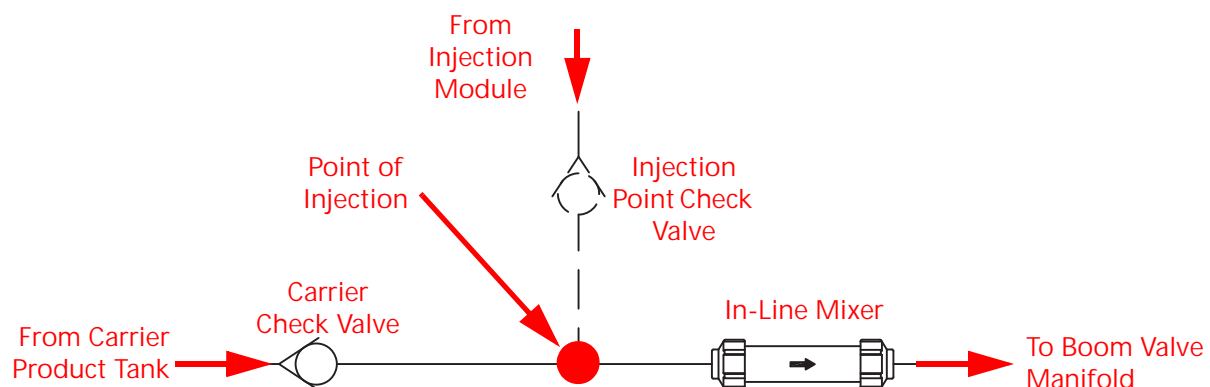
Agitator Type	Blade Size	Tank	Part Number
Mix-All	3"	Non-Raven Tanks	910-0000-331
Mix-All	4"	Non-Raven Tanks	910-0000-341
Raven	3"	Raven 24 Gallon Tanks	117-0159-544
Raven	3"	Raven 50 Gallon Tanks	117-0171-655

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 with which the injection system will normally be used, 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 and components by minimizing 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.
 - A mixer assembly with a carrier check valve included is recommended.
 - Additional tee fittings may be required for each injected chemical.
 - A separate injection check valve is required for each injected chemical.

FIGURE 2. Point of Injection Detail

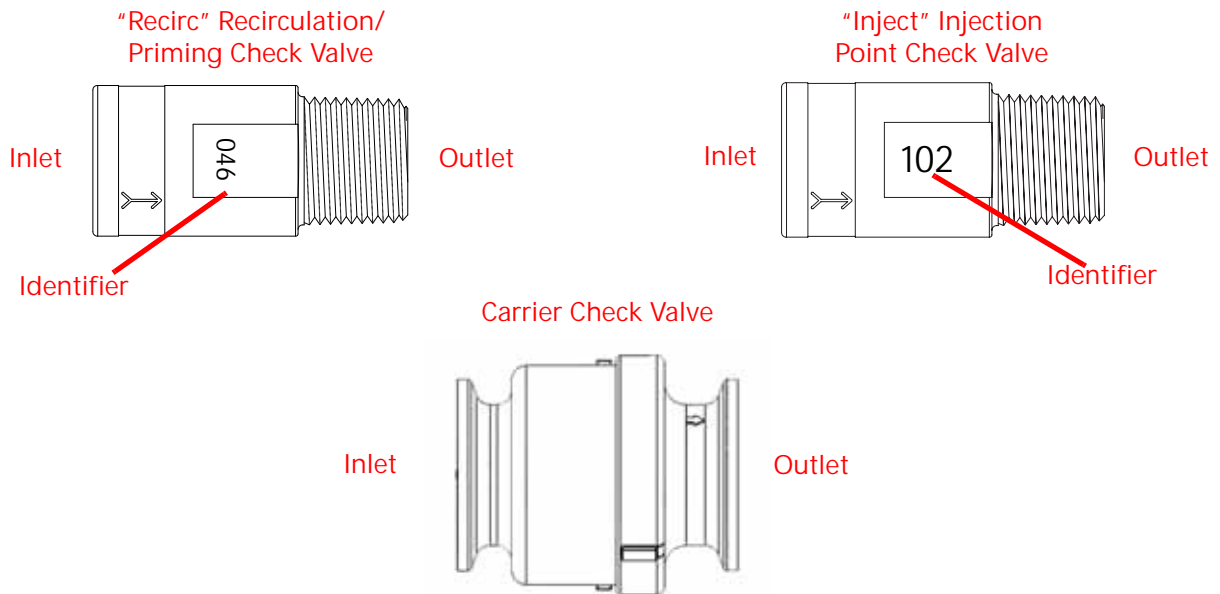


To set up the point of injection:

1. Select the location for 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 on page 18 for assistance with proper sizing of the carrier check valve or see Figure 4 on page 19 for details on available mixer assemblies.
3. Install an in-line mixer to the through port of the tee fitting and connect to the existing carrier product line or boom valve manifold.
Refer to Figure 4 on page 19 for assistance with 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.
Refer to Table 2 on page 18 for assistance with proper sizing of the carrier check valve.
5. Install a 12 PSI chemical injection check valve (P/N 333-0011-102) into the injection line in front of the point of injection to prevent back flow to the chemical reservoir.
Refer to Table 2 on page 18 to for assistance with proper sizing of the injection check valve.

NOTE: It is important to flush the injection point check valve periodically and when changing chemicals to preserve proper operation.

FIGURE 3. Available Check Valve Options



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



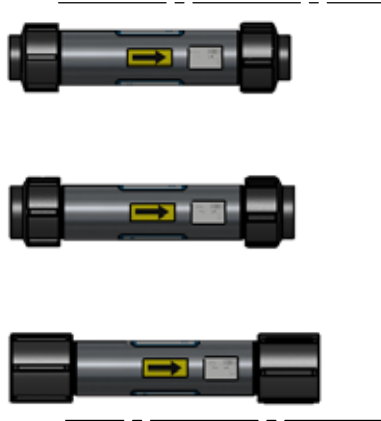
TABLE 2. Check Valve Selection Chart

	Part No.	Identifier	Inlet	Outlet	Flow Coefficient ^a
Recirculation and Priming Check Valve ^b	333-0011-100	046	1/2" (F) NPT	1/2" (M) NPT	N/A
Injection Point Check Valve ^c	333-0011-102	102	1/2" (F) NPT	1/2" (M) NPT	N/A
Carrier Check Valve	333-0011-090	N/A	1"	1"	14 GPM [53 L/m]
	333-0011-091	N/A	1-1/4"	1-1/4"	22 GPM [83.28 L/m]
	333-0011-104	N/A	M220 Banjo Flange	M220 Banjo Flange	70 GPM [264.98 L/M]
	333-0011-105	N/A	M300 Banjo Flange	M300 Banjo Flange	100 GPM [378.54 L/m]

- The flow coefficient (C_v) is the volume per minute (water) at which the pressure drop equals 1 PSI [6.9 kPa].
- "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.
- "102" Identifier. Rated for 12 PSI [82.7 kPa] (cracking pressure). Stainless steel for NH₃ applications. Verify the check valve is installed with the flow arrow pointing in the direction of flow through the valve.

FIGURE 4. In-Line Mixer Selection Chart

(P/N 063-0171-303)



(P/N 063-0159-632)

(P/N 063-0171-300)

(P/N 333-9000-010)



(P/N 063-0173-770)



(P/N 063-0173-737)



(P/N 063-0173-698)



(P/N 063-0173-699)

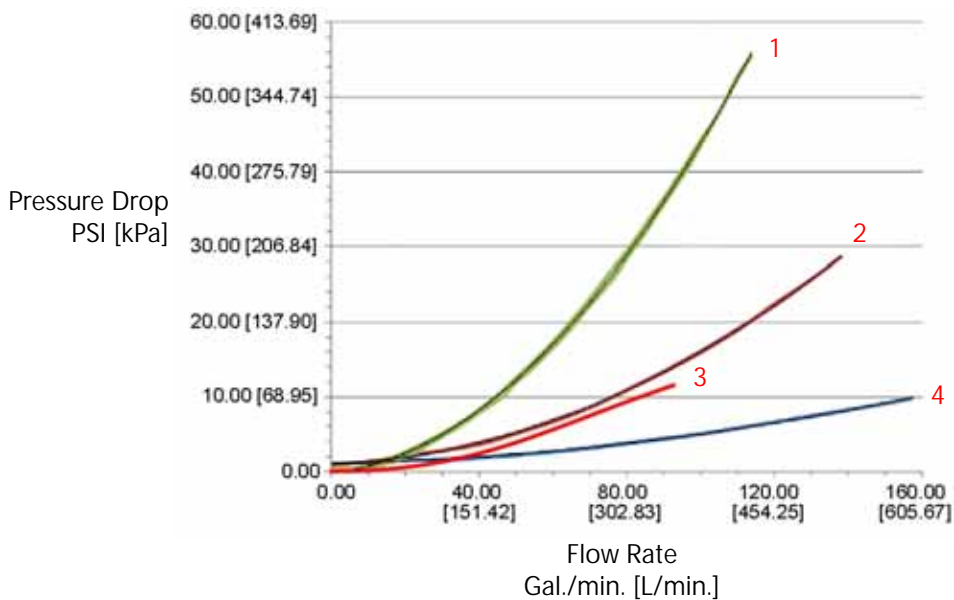


TABLE 3. In-Line Mixer Selection Chart

Part No.	Material	Carrier Check Valve Included?	Size	Fitting	Length (Approx.)	Flow Coefficient ^a
063-0171-303	Stainless Steel Pipe/Polypropylene Fittings	No	1"	NPT	12.5" [31.75 cm]	25 GPM [94.64 L/m]
063-0159-632			1-1/4"	NPT	12.6" [32.0 cm]	
063-0171-300			2"	NPT	13.7" [34.78 cm]	
333-9000-010	Stainless Steel	No	3"	NPT	18" [45.72 cm]	60 GPM [227.13 L/m]
063-0173-770	Stainless Steel	No	1-1/4"	NPT	14.6" [37.08 cm]	Refer to Figure 5 on page 20.
063-0173-737	Stainless Steel Pipe/Polypropylene Fittings	Yes	2"	M220 Banjo Flange	19.7" [50.04 cm]	
063-0173-698	Stainless Steel	Yes	3"	M300 Banjo Flange	32.9" [83.57 cm]	
063-0173-699	Stainless Steel	Yes	4"	M300 Banjo Flange	36.9" [93.73 cm]	

a. The flow coefficient (C_v) is the volume per minute (water) at which the pressure drop equals 1 PSI [6.9 kPa].

FIGURE 5. Pressure Drop vs. Flow Rate



1. 2" Check Valve and 2" Poly Mixer
2. 3" Check Valve and 3" Mixer

3. 1.5" NPT NH₃ Mixer (Without Check Valve)
4. 4" Check Valve and 4" Mixer

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 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.

NOTE: The Sidekick Pro ICD injection module may be ordered with a 24 gallon [90.85 L] chemical supply tank, a 50 gallon [189.27 L] chemical supply tank, or without a chemical tank to connect the injection system with an existing tank on the vehicle or purchased separately.

- 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 6. 24 Gallon [90.85 L] Injection Module Platform Dimensions

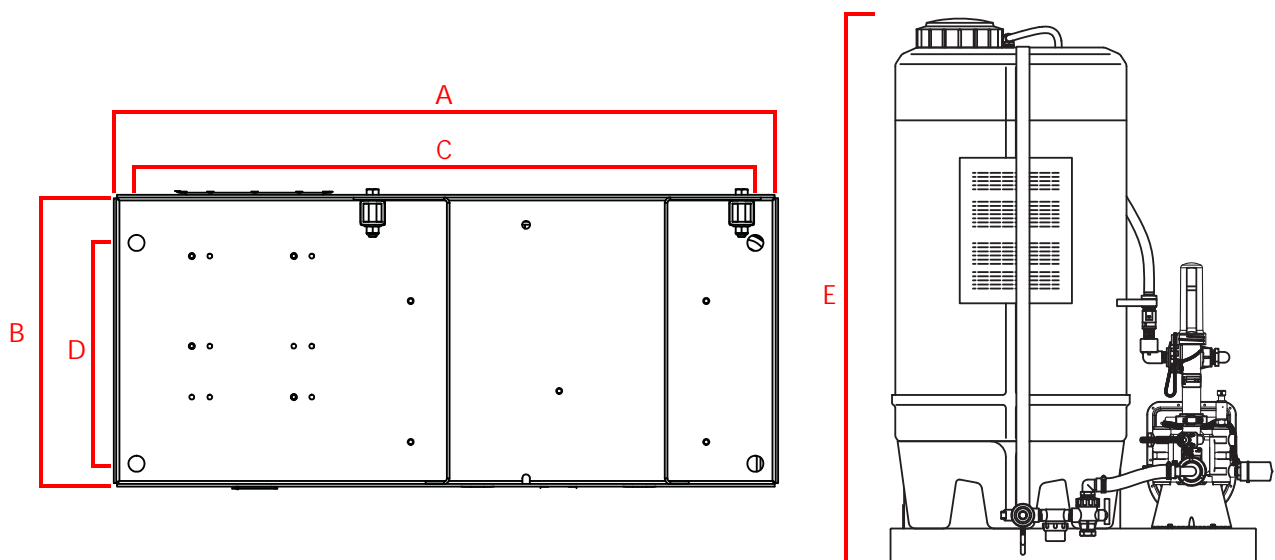


TABLE 4. 24 Gallon [90.85 L] Injection Module and Platform Dimensions

Module Dimensions			Mounting Port Dimensions	
Width (A)	Depth (B)	Height (E)	Width (C)	Depth (D)
27.7" [70.36 cm]	17" [43.2 cm]	42" [106.75 cm]	17" [43.2 cm]	9.2" [23.27 cm]

FIGURE 7. 50 gallon [189.27 L] Injection Module Platform and Tank Dimensions (P/N 117-0175-035)

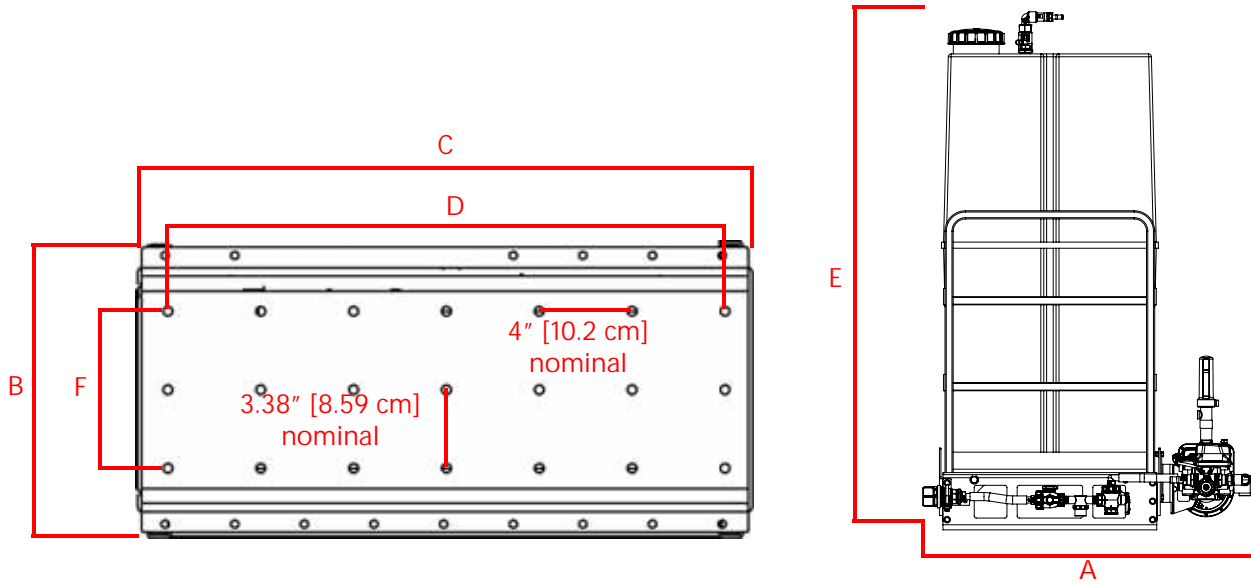


TABLE 5. 50 gallon [189.27 L] Injection Module and Platform Dimensions

Module Dimensions			Platform Dimensions		Mounting Port Dimensions	
Width (A)	Depth	Height (E)	Width (C)	Depth (B)	Width (D)	Depth (F)
37" [94 cm]	16.92" [42.98 cm]	62" [157.5 cm]	26.25" [66.68 cm]	12.25" [31.12 cm]	24" [61 cm]	6.75" [17.15 cm]

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 as close as possible to the injection pump. Minimize the length of the hose 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.

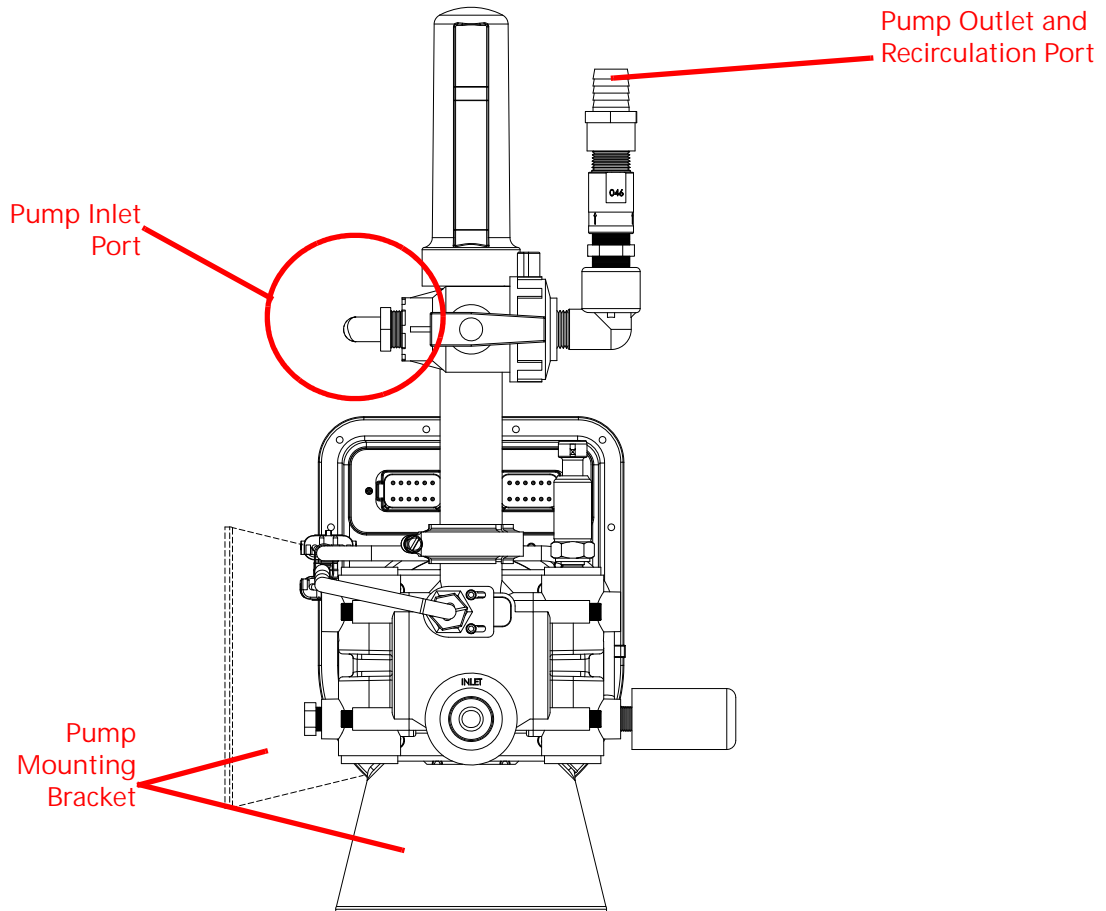
If vacuum errors are encountered during pump operation, perform one or both of the following corrective measures to reduce inlet pressure:

- Reduce the inlet plumbing length
 - Increase the tubing diameter
- 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 more than 2 ft. [0.6 m] from the chemical supply tank outlet.

MOUNT THE SIDEKICK PRO™ ICD PUMP

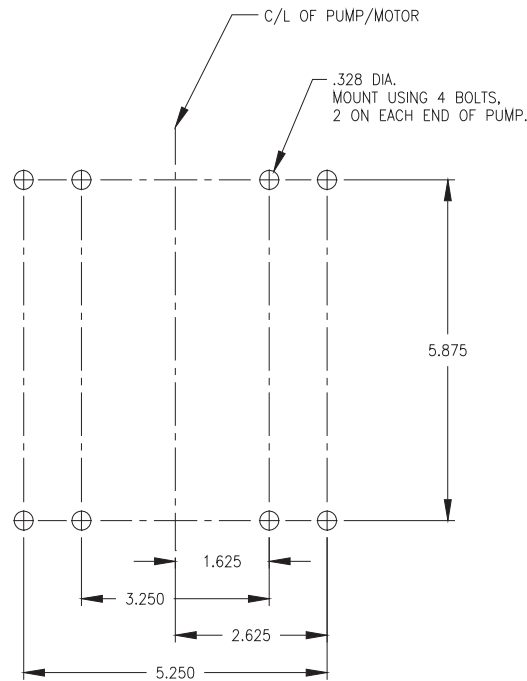
- Mount the Sidekick Pro™ ICD pump as close as possible to the selected point of injection.
- Mount the Sidekick Pro™ ICD pump so that the outlet port is pointing up. The pump will not meter product application correctly if the pump is mounted in any other orientation.
- Mount the Sidekick Pro™ ICD in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

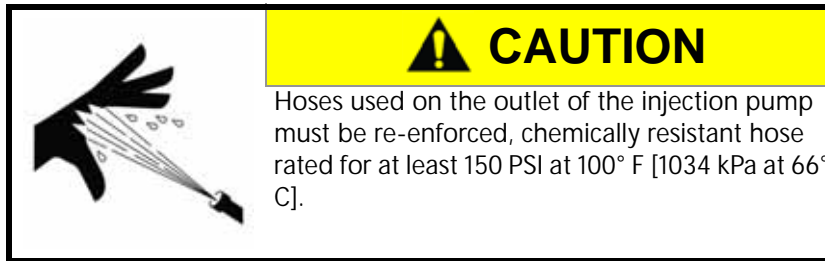
STRAINER

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	Hose Size
1-40 oz./min.	3/8"
5-200 oz./min.	1/2"



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 *Setting Application Mode and Injection Diagnostics* section on page 47 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.

NOTE: Trapped air will cause the plunger to feel “spongy” when pressed and will cause the pump calibrator to work improperly.

The Sidekick Pro injection system includes the pump calibrator, a 3-way ball valve, and vented check valve which allows the system to detect whether the pump is primed and also allows for recirculation of chemical back to the chemical supply tank.

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 25 with the closed calibration system.

RECIRCULATION CHECK VALVE

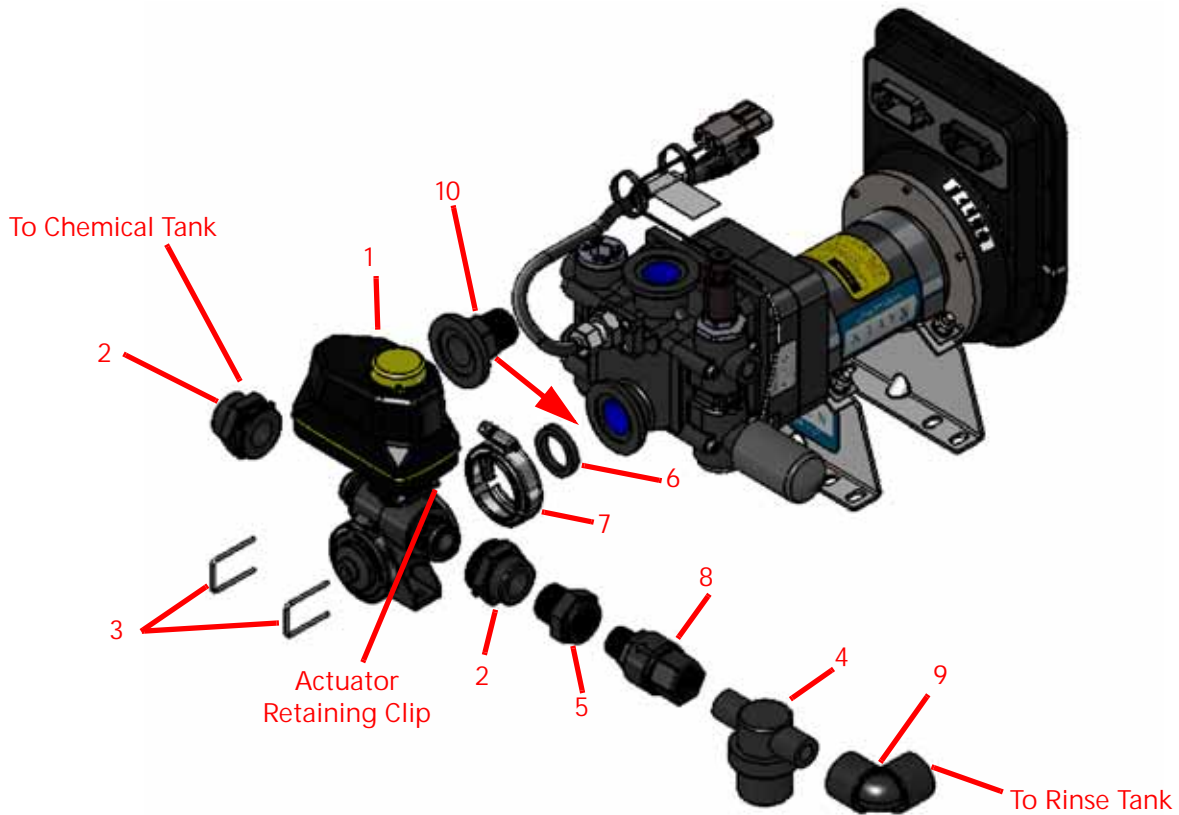
A recirculation and priming check valve (P/N 333-0011-100) must be plumbed into the recirculation line either at the outlet port of the pump or at the inlet of the chemical tank. This check valve is required to allow air to bleed off during priming of the injection pump and to allow the system to detect whether the pump priming is complete or not. A removable coupler is recommended at the chemical supply tank so a catch test may be performed if desired.

PLUMB THE RINSE ASSIST SYSTEM

KIT CONTENTS

Before installing the Rinse Assist system, review the following components provided with the Rinse Assist kit. Contact a local Raven dealer for questions or additional assistance with these components:

FIGURE 10. Low Profile Sidekick Pro Rinse Assist Kit (P/N 117-0171-733 Rev. B)



NOTE: Install Item 10 Between the Pump and M100 Flange Gasket (Item 6) When Clearance for Flow Monitor Sensor is Needed.

TABLE 6. Rinse Assist Kit (P/N 117-0171-733)

Item	Quantity	Description
1	1	Valve, 1/2" BL MNFD L-Port 180° KZ Actuated EH7
2	2	Fitting, 3/4" FNPT Adapter Valve
3	2	Fitting, KZ Valve Retainer Hairpin
4	1	Fitting, 1/2" NPT Low Profile Strainer
5	1	Fitting, Polypropylene 3/4" x 1/2" Pipe Bushing
6	1	Gasket, M-100 Viton Flange
7	1	Clamp, F-100 V-Band
8	1	Check Valve, Polypropylene 1/2" NPT 0.3 PSI
9	1	Fitting, Polypropylene 90° Pipe Elbow
10	1	Fitting, M100 to 3/4" MNPT Flanged



PLUMBING THE RINSE ASSIST 3-WAY VALVE TO THE INJECTION PUMP

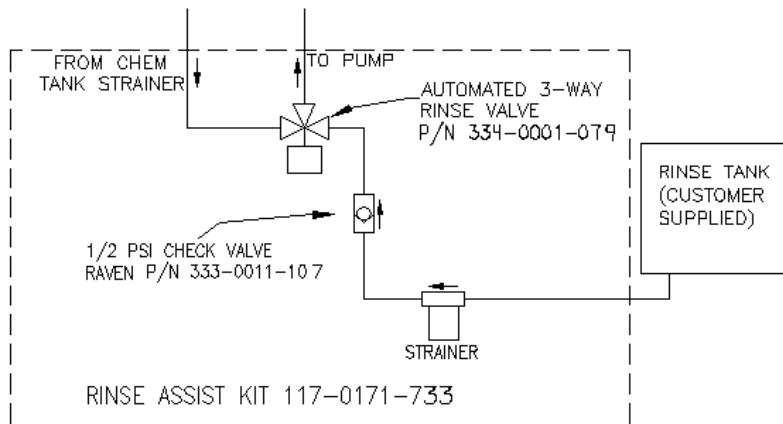
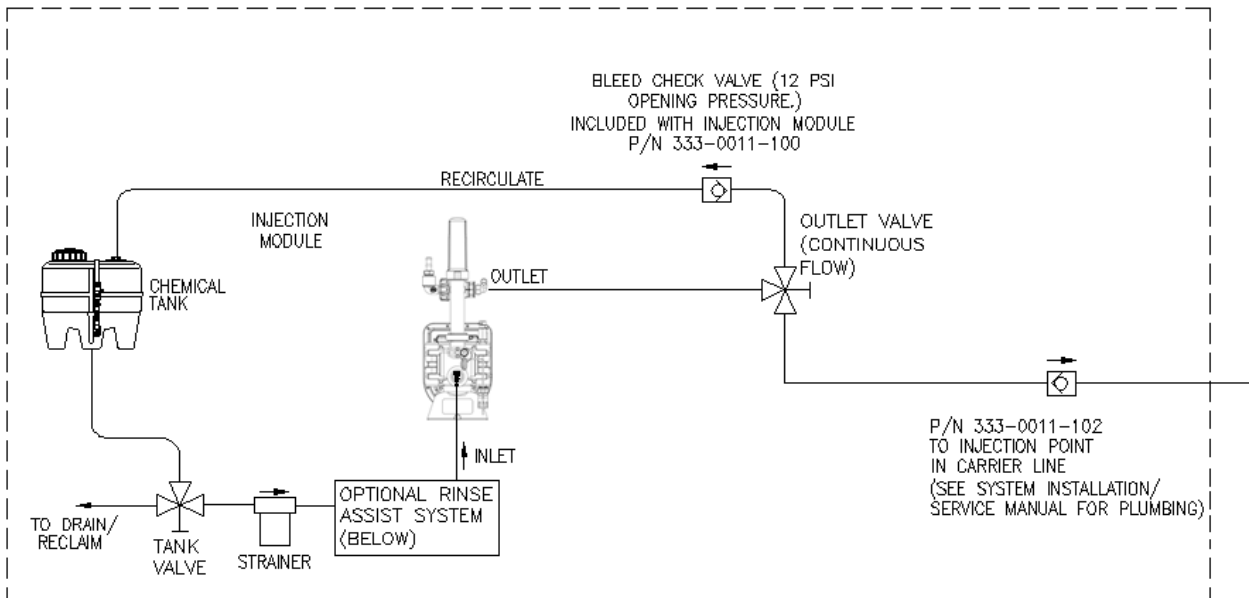
The illustration below is a basic illustration of how to plumb the rinse assist valve to the pump. If needed, additional plumbing can be added to allow for a better fit.

IMPORTANT: The chemical tank must always be plumbed to the normally open port of the rinse valve. The rinse valve comes set up with the ports as shown.

With power removed from the valve, the normally open port can be determined by looking into the left or right portion of the valve. The side of the valve that shows the open side of the ball is considered the normally open port.

IMPORTANT: The check valve and the strainer must connect to the clean water rinse tank. The arrow on the check valve must point towards the rinse valve.

FIGURE 11. Rinse Assist 3-Way Valve Plumbing



NOTE: Install the 100 flanged fitting (item 10) between the pump and M100 flange gasket (item 6) when clearance is needed for the flow monitor sensor.

REVERSING THE NORMALLY OPEN AND NORMALLY CLOSED PORTS

It may be desirable to reverse the port arrangement to accommodate plumbing depending on the chemical tank location. To reverse the ports:

1. Disconnect power to the valve.
2. Remove the electric actuator by pulling the actuator retaining clip.
3. Use a flat screwdriver to rotate the ball valve 180 degrees.
4. Re-assemble the electric actuator to the valve.
5. Re-install the actuator retaining clip. The normally open port should now be on the opposite side of the valve.

REMOTE MOUNTING OF THE 3-WAY RINSE ASSIST VALVE

If the pump inlet port does not allow for convenient mounting or installation of the rinse assist valve, the valve may also be mounted remotely. If mounting the rinse assist valve remotely:

- Refer to the best practices section and keep all plumbing runs as short as possible to avoid chemical waste during application and rinse valve operation.
- Check valve and strainers must be installed to prevent cross contamination of rinse fluid and to protect critical system components.
- Hoses must be chemical resistant and compatible with the injected chemical.
- Hoses to chemical tank must be sized properly.
 - Minimum size required for high volume pump on the chemical side is 3/4".
 - Minimum size required for low volume pump of the chemical side is 1/2".
- Refer to the *Plumbing the Rinse Assist System* section on page 29 for assistance with completing the plumbing connections for the rinse assist valve.

PLUMBING THE RINSE ASSIST SYSTEM

Refer to Figure 11 on page 28 while performing the following steps.

NOTE: Check valves and strainers are recommended to prevent contamination of chemical rinse fluid. Use of 1/2" or larger chemical resistant hose is recommended for all plumbing between reservoirs and the inlet port on the Sidekick Pro™ injection pump. Verify chemical compatibility. Contact a local Raven dealer for additional assistance with reservoirs, check valves, or strainers recommended for the Rinse Assist system.

1. Route plumbing from the chemical reservoir to an in-line strainer, check valve, and then to the normally open port on the Rinse Assist valve.
2. Route the plumbing from the rinse fluid reservoir to an in-line strainer, check valve, and then to the Aux port.
3. Verify that all check valves and strainers are installed.

ISOBUS AND POWER CONNECTIONS

The Sidekick Pro™ ICD connects to an ISOBUS system via an integrated motor control ECU. The injection pump requires a connection to both clean logic power and high current power either at the battery or a power bus bar.

Depending upon the specific machine and system, the Sidekick Pro may connect to existing machine cabling or via cable harnesses supplied by Raven. Contact a local Raven dealer for additional assistance with cabling and components needed for your specific application.

BEST PRACTICES

The main points of CAN installation are summarized below:

NOTE: Following these recommendations will result in the most robust system possible while greatly reducing CAN communication problems.

1. Always use sealed connectors with dielectric grease. Avoid unsealed, crimped connections (i.e. butt connectors).

In addition to using dielectric grease, mount all CAN terminators with the connector pointing down to avoid collecting water and/or chemical. Liquids collecting within the terminator can corrode pins and may cause CAN communication issues.

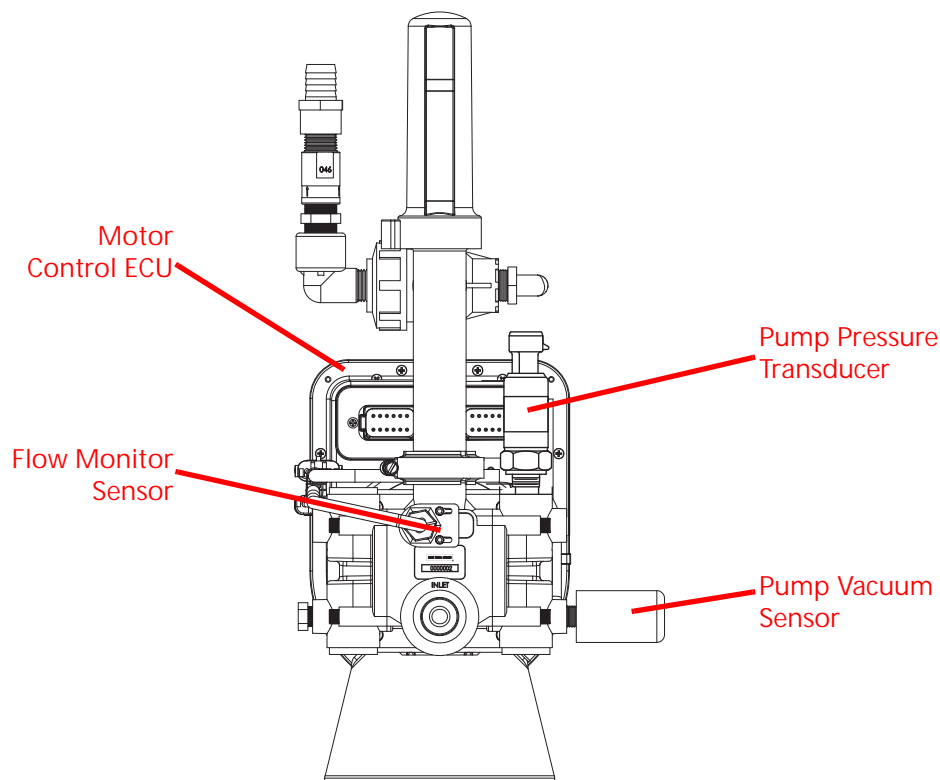
2. Connect the power directly to a controlled clean power source.
3. Connect the ground directly to the vehicle battery.
4. Node logic power should be connected to a clean power bus relay.

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


5. Use dedicated bus bars to connect the console and all nodes to the same source for both power and ground.
6. Provide relays to switch power on and off to avoid draining the battery. Raven recommends connecting the console to a clean power source (at relay) and using the console 'orange' wire to activate the relay. This makes the console the master power switch and allows engine shutdown without turning off the console.

SIDEKICK PRO™ ICD ISOBUS CONNECTION

FIGURE 12. Integrated Motor Control ECU and Pump Connection



VERIFYING INSTALLATION OF THE SIDEKICK PRO™ ICD

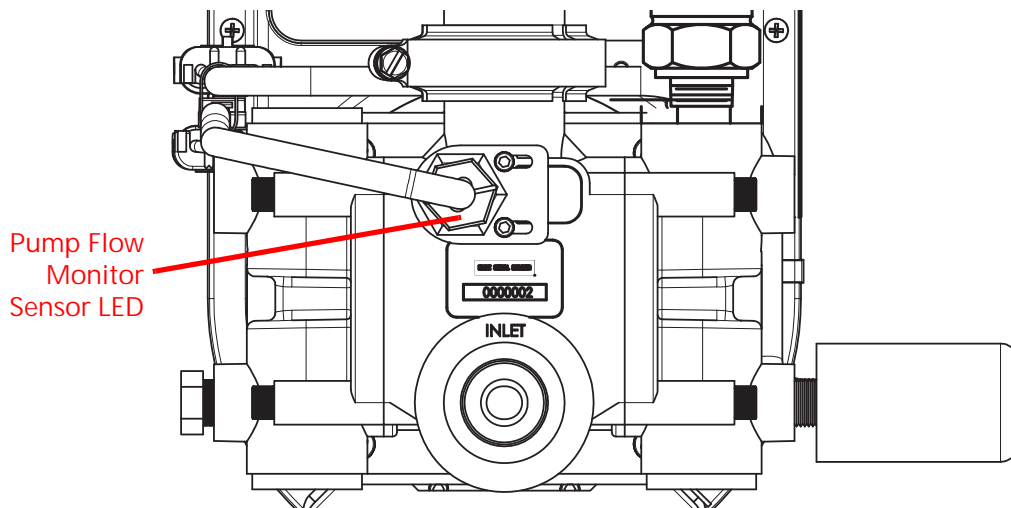
	<p data-bbox="873 258 1060 300">NOTICE</p> <p data-bbox="683 317 1243 478">Plastic or metal particles may be left in the tank from the manufacturing or installation process. These particles may cause a significant reduction in pump performance if they get stuck within the injection pump.</p> <p data-bbox="683 510 1243 695">Prior to filling the chemical tank or testing the injection system, thoroughly vacuum the chemical supply tank. Turn the hand valve(s) to allow the tank to drain without running through the pump or injection plumbing and thoroughly rinse tank.</p>
---	---

Perform the following procedure to verify that the system is installed properly:

1. Fill the chemical supply tank with clean water.
2. Verify all calibration settings are set for each injection node on the system. Refer to Chapter 4, *Calibration and Operation*.
3. Prime and calibrate the pump. Refer to Chapter 4, *Calibration and Operation*.
4. Set a target rate for the chemical injection and run the pump in Auto application mode.
5. Check for any leaks at each plumbing connection before applying chemicals with the injection system. It is also recommended to check the system periodically and replace worn or damaged connections, valves, or hoses.

FLOW MONITOR SENSOR

FIGURE 1. Pump Head and Flow Monitor Sensor

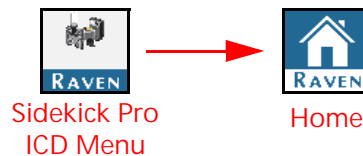


The flow monitor sensor has a dual color LED. Power is present when the LED is illuminated. The LED will flash between green and amber when the flow monitor is sensing the flow monitor magnet shuttle assembly.

The flow monitor sensor registers the magnet shuttle assembly passing the sensor to provide an output signal.











SIDEKICK PRO™ ICD MENU

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

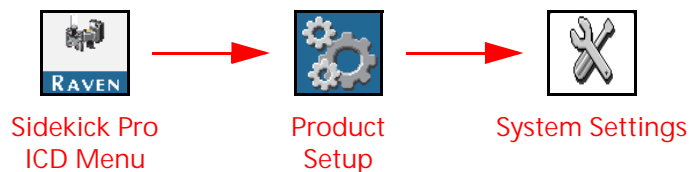


1. Open the UT Menu and select the desired Sidekick Pro™ ICD Menu button.
2. Press the Home icon. The following information will display:

TABLE 1. Sidekick Pro™ ICD Main Screen Information

Display	Icon	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.
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 an agitator is equipped.

SYSTEM SETTINGS

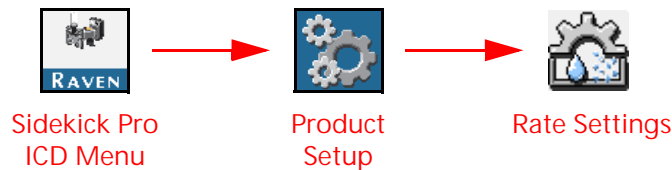


1. Open the UT Menu and select the desired Sidekick Pro™ ICD Menu button.
2. Press the Product Setup button.
3. Select Settings. The following information will display:

TABLE 2. 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 $\pm 3\%$.
Function Instance Number	Each Sidekick Pro injection pump connected to an ISOBUS system will have a unique number from 1 to 8 assigned.
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.

RATE SETTINGS



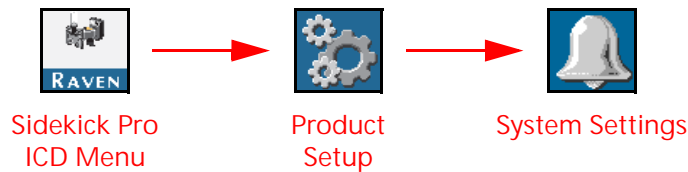
1. Open the UT Menu and select the desired Sidekick Pro™ ICD Menu button.
2. Press the Product Setup button.
3. Select the Rate Settings tab. The following information will display:

NOTE: The following Rate Settings options will only be displayed when connected to a rate per area device.

TABLE 3. System Settings Page Information

Display	Additional Setting Information
Preset Rate Values	Use the rate presets to set three target rate settings. With preset rate values set, the operator may to quickly select a different target rate by selecting the rate preset buttons on the run screen while operating in the field.
Rate Bump	Sets the increment by which either the target rate will increase or decrease when using the bump during an active application.
Rate Selection	Use the drop-down list to select the method for changing the injected product target rate on the run screen and home pages.
Display Smoothing	Enable this option to allow the system to smooth fluctuations in the application rate displayed. If the actual monitored rate is within 10% of the target rate, the target rate will be displayed as the actual rate.

ALARMS SETTINGS

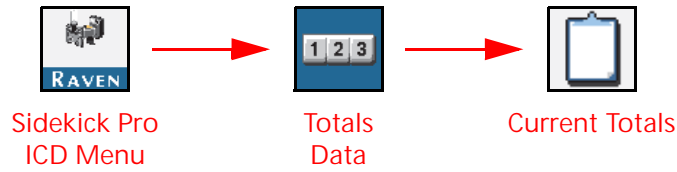


1. Open the UT Menu and select the desired Sidekick Pro™ ICD Menu icon.
2. Select Alarms Settings. The following information will display:












TABLE 4. 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 efficeincy 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 actaul 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 enablee to disable the low tank alarm.
Pop Up Alarms	Pop Up Alarms are used to notify the user of system erros 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 direct injection chemical supply tank.

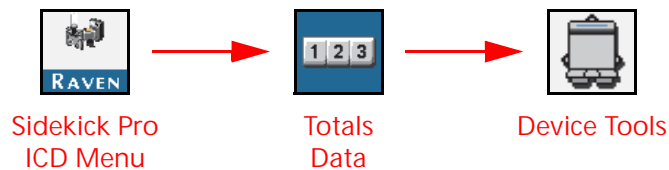
CURRENT TOTALS DATA



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:
TABLE 5. Current Totals

Display	Icon	Description
Actual Flow		Displays the actual flow rate of the pump during operation.
Target Flow		Use this field to enter the target 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 or product dispensed during a field operation and is resettable by the user.
Actual Rate		Displays the actual rate of injection during operation.
Target Rate		Use this field to enter the target rate of injection for field operation.
Area per Hour		Displays the current rate at which area is covered.
Area Remaining		Displays the calculated area that can be covered with the volume of product remaining in the tank.
Speed		The speed of the machine reported via the ISOBUS system.
Area		The total area covered since the last time the tally was reset.





DEVICE TOTALS



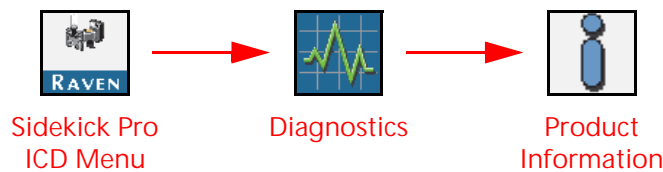
1. Open the UT Menu and select the desired Sidekick Pro™ ICD menu icon.
2. Select the Totals Data icon then Device Totals. The following information will display:



TABLE 6. 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.
Area		The total area covered by the system.

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.

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

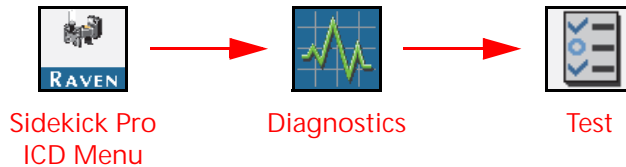
PUMP PRIME

Prime the injection pump before operation to ensure the system is full of fluid and air is removed from the injection 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.

- Ensure the plumbing is properly installed from the chemical tank to the injection pump and from the injection pump to the point of injection.
- Ensure the chemical tanks for the pump(s) have liquid in them for priming functions.

NOTE: 3 - 5 gallons [11 - 19 liters] of liquid may be required 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



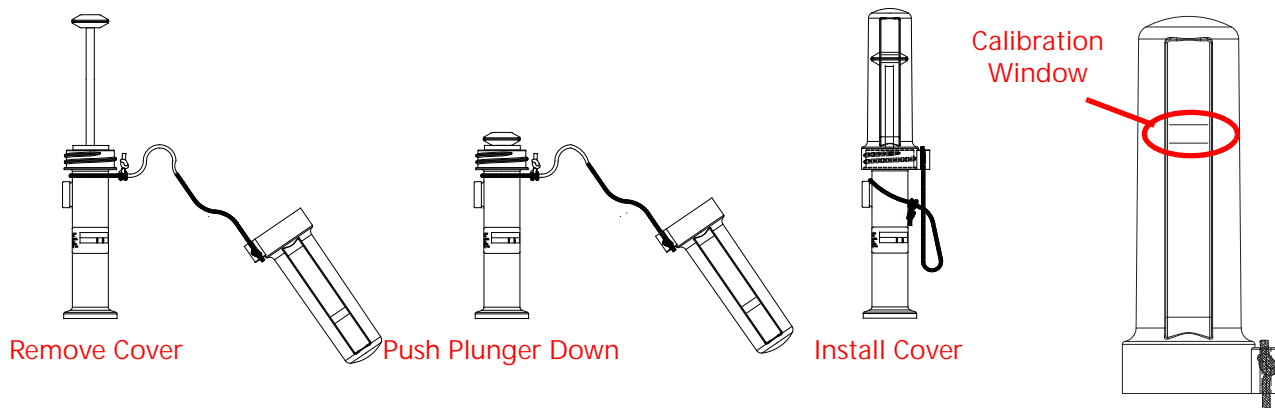
the system for leaks, verify the valves are turned on, and verify the hoses are filled with product. It may not be necessary to recalibrate the pressure transducer.

PUMP CALIBRATION WITH PUMP CALIBRATOR

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 2. Calibration Process

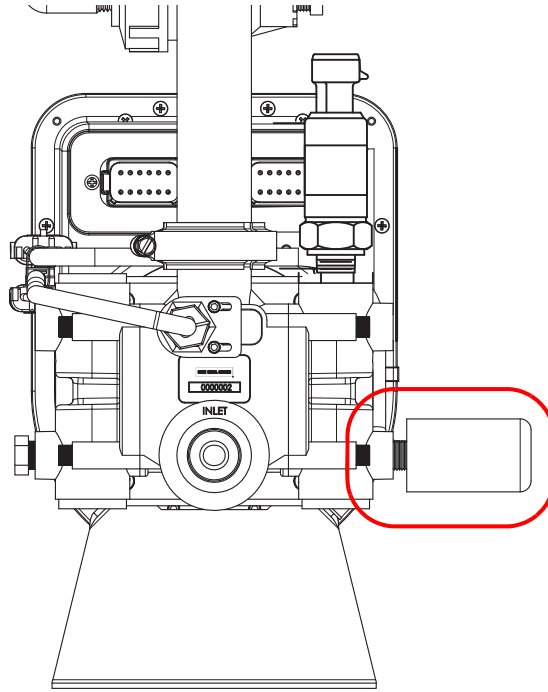


NOTE: Do not over-tighten the calibrator cover.

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.

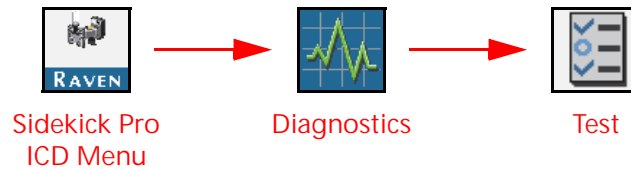
NOTE: The vacuum switch on the pump will engage and a flow alarm will display if the product cannot be drawn into the pump (e.g. vacuum pressure at, or above, 11.5" of mercury [29 cm of mercury]). Check screens, hoses diameter, and hand valves between the chemical tank and pump inlet. Also, verify that 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 3. Vacuum Switch



6. Touch the Sidekick Pro ICD Menu button.

FIGURE 4. Sidekick Pro ICD Menu Button



7. Select the Diagnostics tab.
8. Select Test.
9. Use the drop down Select the Pump Calibration Test.
10. 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 Chapter 6, *Troubleshooting*, for troubleshooting steps.

11. 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 Chapter 4, *Calibration and Operation*, 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.

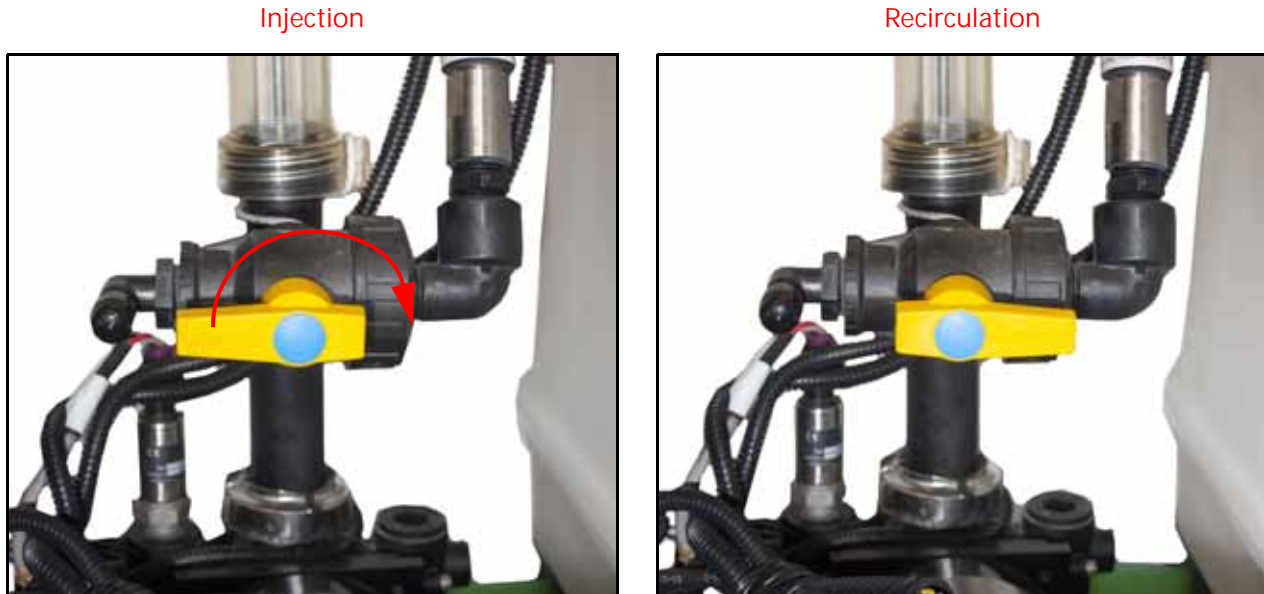
Before starting:

1. Ensure pump and injection plumbing are primed. Refer to the *Prime the Injection Pump* section on page 39.
2. Verify the catch test vessel is large enough to catch the desired volume.
3. 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.

To perform a catch test:

1. Set the hand valve on the injection pump outlet port to pump the fluid to the catch vessel through the recirculation line.

FIGURE 5. Hand Valve Position for Recirculation

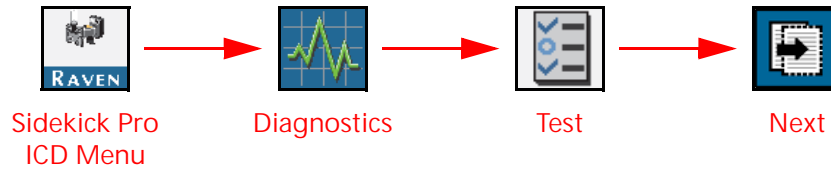


2. Verify the following conditions exist:
 - a. Injection pressure is less than 12 PSI [82.7 kPa].
 - b. Pump is off.
 - c. Vacuum pressure is less than 11.5" [29 cm] of mercury.

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.

3. Disconnect the coupler from the top of the chemical tank and place the recirculation hose in the catch test vessel.

- Return to the control console and select the injection product to calibrate.



- Select Diagnostics.
- Select Test.
- Select Catch Test from the drop-down.
- Enter the volume of injected chemical to use for the catch test.
- Select the Next button on the screen. The injection pump will run until the entered catch test volume has been dispensed.

NOTE: Select the Red X to stop the catch test at any time.

- Check the amount caught in the catch vessel after the catch test is complete. The caught volume should be within $\pm 3\%$ of the desired amount. If the caught volume is off by more than $\pm 3\%$, adjust the Flow Correction percentage value. Increase the Flow Correction% by the approximate error percentage to pump more fluid. Decrease the Flow Correction% to pump less fluid.

NOTE: If the console displays an error message during the catch test, verify the conditions listed in step 2 exist. 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:

- Select the Diagnostics icon.
- Select Test.
- 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 DTCs 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 DTCS

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

VIEW INACTIVE DTCS

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


	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.
---	--

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

Depending upon the type of chemicals used with the Raven injection system, periodic maintenance may be required to ensure proper operation of the injection pump.

NOTE: Some chemicals may require daily maintenance of the injection pump. Review best practices with a chemical supplier to ensure the proper frequency of pump maintenance.

MAINTENANCE AND STORAGE


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

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 service 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.

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


	<p style="text-align: center;">⚠ CAUTION</p> <p>Chemical residue or build up may be present on internal pump components. Wear gloves when servicing internal pump assemblies.</p>
---	--

4. Remove the pressure transducer and clean the cavity and transducer body of excess build up.
5. Clean and inspect each assembly as instructed in the *Check Valve Maintenance* section on page 46.

NOTE: Be sure to reinstall the intake and discharge valves into the correct ports on the injection pump. Refer to the *Check Valve Maintenance* section on page 46 for additional for valve information.

6. Perform the procedure described in the *Pump Cam and Bearing* section on page 49 to service the cam and bearing.
7. 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 MAINTENANCE

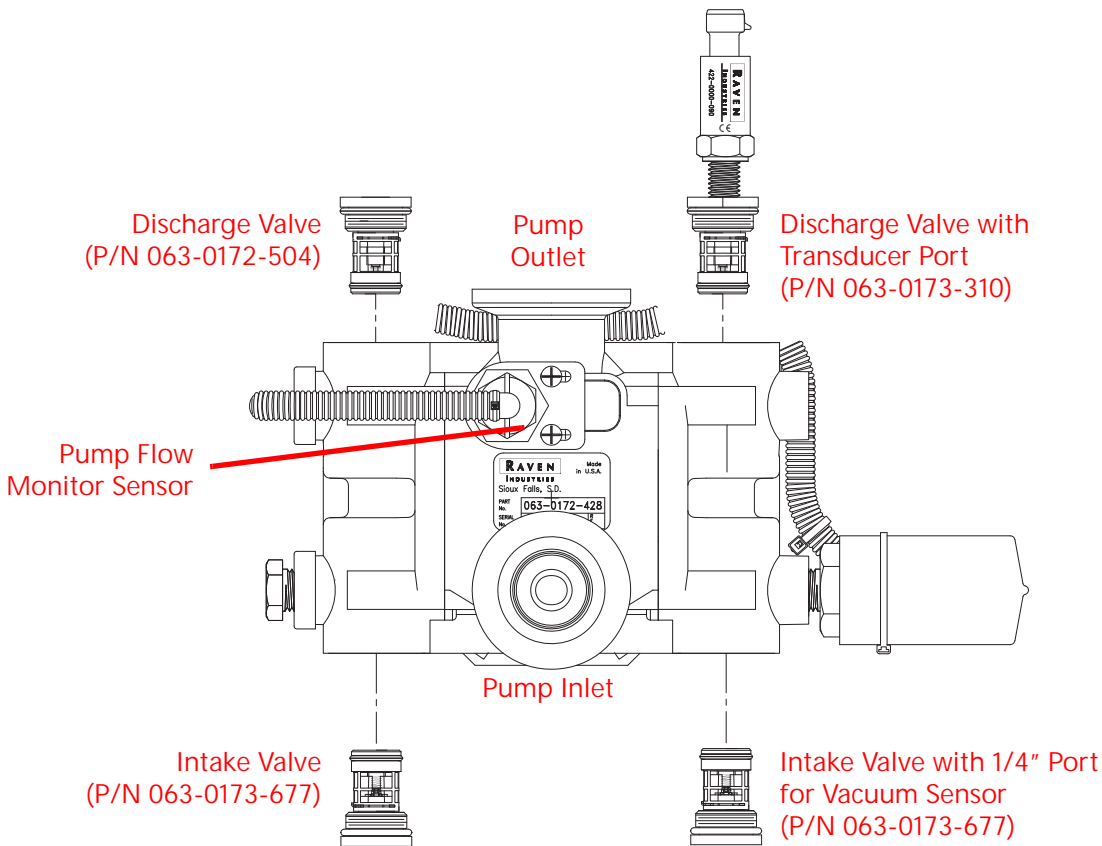
	<p style="text-align: center;">⚠ CAUTION</p> <p>Valve assembly contains small parts and springs under compression. Wear safety glasses when maintaining or cleaning valve assemblies.</p> <p>Chemical residue and build up may be present on internal pump components. Wear gloves when servicing internal pump assemblies.</p>
--	--

Small particles hard or dried crystallized chemical, 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.

To disassemble and maintain the check valve assemblies:

1. Empty and rinse product from the chemical supply tank and flush the injection pump with water.
2. Carefully remove the intake and discharge valve cartridges from the injection pump using a 9/16" Allen wrench or a 1-1/4" box end wrench for valves equipped with sensors.

FIGURE 1. Intake and Discharge Valve Cartridges



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.

3. 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.
4. Disassemble the check valve assemblies as shown in Figure 2 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.

5. 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.
6. Reassemble the intake and discharge plugs as shown in Figure 2 on page 48.
7. Apply petroleum jelly to valve body O-rings and replace valve assemblies into the pump head and tighten valve plug.

FIGURE 2. Check Valve Assemblies

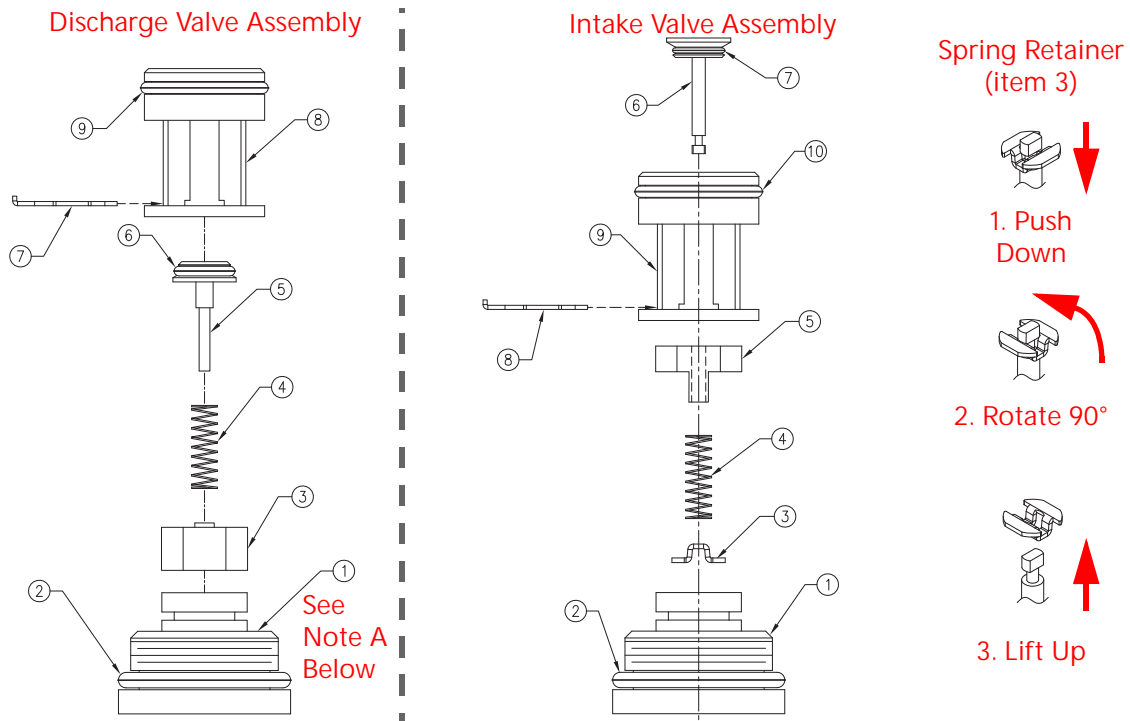


TABLE 1. Check Valve Assembly Replacement Parts

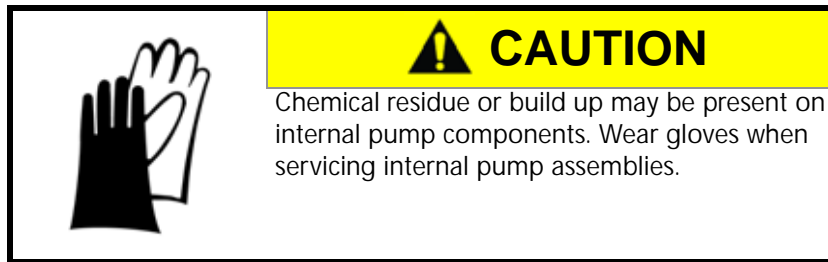
Discharge Valve Assemblies (White) (P/N 063-0172-504) (P/N 063-0173-310)		Intake Valve Assemblies (Blue) (P/N 063-0173-677)	
Item	Description	Item	Description
1	^a Fitting, 9/16" Internal Hex Plug or Fitting, 1.25" External Hex Plug with 1/4" NPT Port	1	Fitting, 9/16" Internal Hex Plug
2	O-ring, 0.680" ID x 0.924" OD Viton	2	O-ring, 0.680" ID x 0.924" OD Viton-912
3	Guide, Discharge Poppet	3	Retainer, Intake
4	^b Spring, Discharge	4	^b Spring, Intake
5	Poppet, Discharge	5	Guide, Intake Poppet
6	^c O-ring, 5/16" ID x 7/16" OD Extreme Viton -011	6	Stem, Intake Poppet
7	Clip, Retainer	7	^c O-ring, 5/16" ID x 7/16" OD Extreme Viton -011
8	Valve Body (White), Discharge	8	Clip, Retainer
9	^c O-ring, 3/4" ID x 7/8" OD Viton	9	Valve Body (Blue), Intake
		10	^c O-ring, 3/4" ID x 7/16" OD Viton

a. Check valve assemblies (P/N 063-0173-310) require plug fitting with external 1.25" hex.

b. Discharge is a heavier spring than the intake.

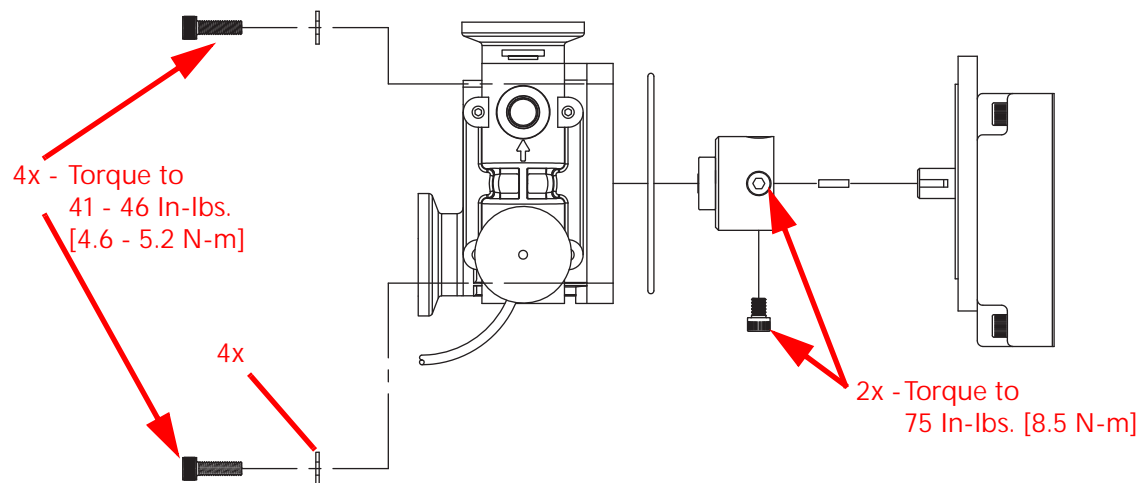
c. O-rings included in Pump Seal Kit (P/N 117-0171-657).

PUMP CAM AND BEARING



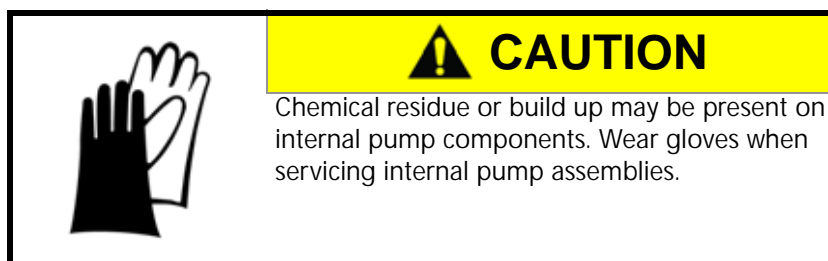
Chemicals may seep into the bearing cavity and from the underside of the pump housing. The pump cam and bearing housing should be cleaned and inspected periodically to prevent maintenance issues. Replace the seals and piston after approximately 400 hours of pump operation.

FIGURE 3. Pump Head and Motor Separation



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



NOTE: New piston seals are supplied in the Pump Seal Kit (P/N 117-0171-657, see Table 2 on page 51) available through a local Raven dealer. Complete replacement kits (P/N 063-0172-924) for both 1-40 Oz./min. and 5-200 Oz./min. pumps are available through a local Raven dealer.

FIGURE 4. Drive Bearing Assembly to Motor Spacing

26.289 mm \pm 0.127mm
[1.035" \pm 0.005"]

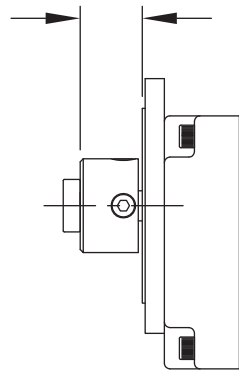


FIGURE 5. Pump Head Parts and Seal Installation

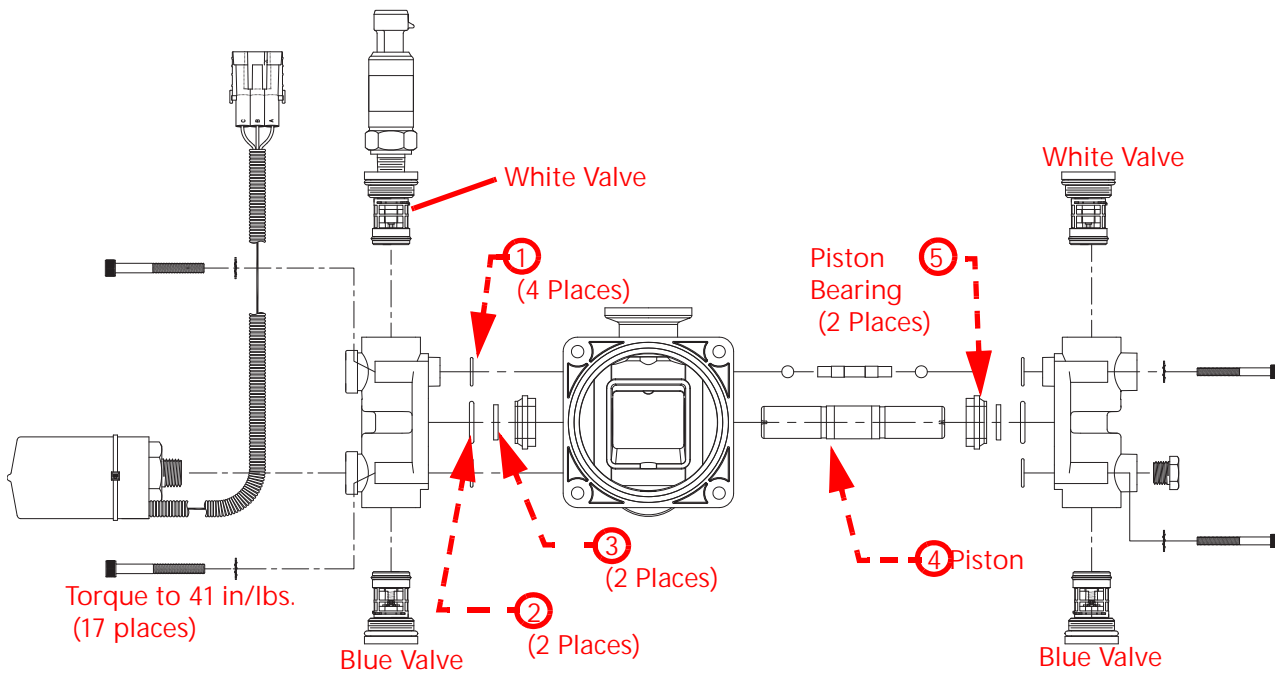


TABLE 2. Pump Seal Kit (P/N 117-0171-657) Replacement Parts

Item	Description	Qty.
1	Assembly, Bearing Drive	1
2	Piston, Injection Pump, 3/4"	1
3	Seal, Slipper 3/4"	2
4	O-ring, Buna-N, Black, 3-1/2" ID, 3-11/16" OD	1
5	O-ring, Metric, Viton, Brown, 2.00 mm CS x 13.5 ID	4
6	O-ring, Viton, Brown Color, 3/4" ID, 7/8" OD	4
7	O-ring, Viton, Brown Color, .924" ID, 3/4" OD	4
8	O-ring, Viton, 5/16" ID, 7/16" OD	4
9	O-ring, Viton, 13/16" ID, 1" OD	2
10	Bearing, Piston, 3/4"	2

NOTE: Refer to the *Check Valve Maintenance* section on page 46 for discharge and intake valve disassembly and maintenance procedures.

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 the slipper seal and 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. Remove the piston from the pump.
8. Replace the piston and the piston bearings.
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 slipper seal onto the piston.
 - b. Using general purpose grease, lubricate the O-ring (item 9) and seat over the slipper seal.
 - c. Replace pump head O-rings into the 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 17-24 inch pounds [1.9 - 2.7 Nm].

INJECTION PUMP PRESSURE TRANSDUCER

	<p>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 (P/N 422-0000-090):


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>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. Over tightening 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.

	<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>
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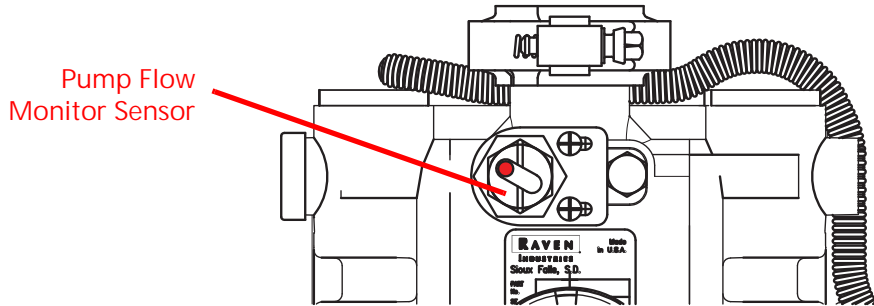
2. Disconnect the vacuum switch connector from the motor control cabling. Be careful to keep dust, debris, or liquid chemicals which may seep from the injection pump head from contaminating the cable connections.
3. Loosen the vacuum switch while securing the connected fitting to prevent damage to the pump head.
4. Apply RectorSeal[®] or equivalent thread sealant to the new vacuum switch and thread into the pump head.
5. Tighten the vacuum switch body to secure the vacuum switch.

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

FLOW MONITOR SENSOR

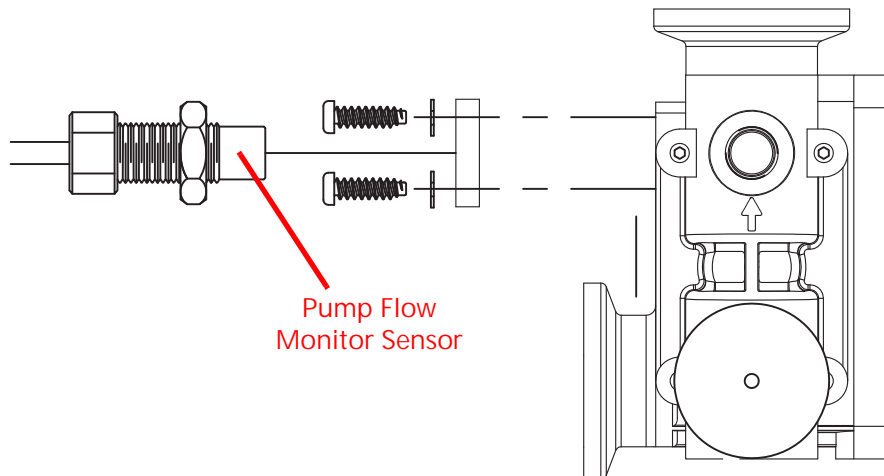
Perform the following procedure to replace the flow monitor sensor (P/N 063-0173-492).

FIGURE 6. Pump Head and Flow Monitor Sensor

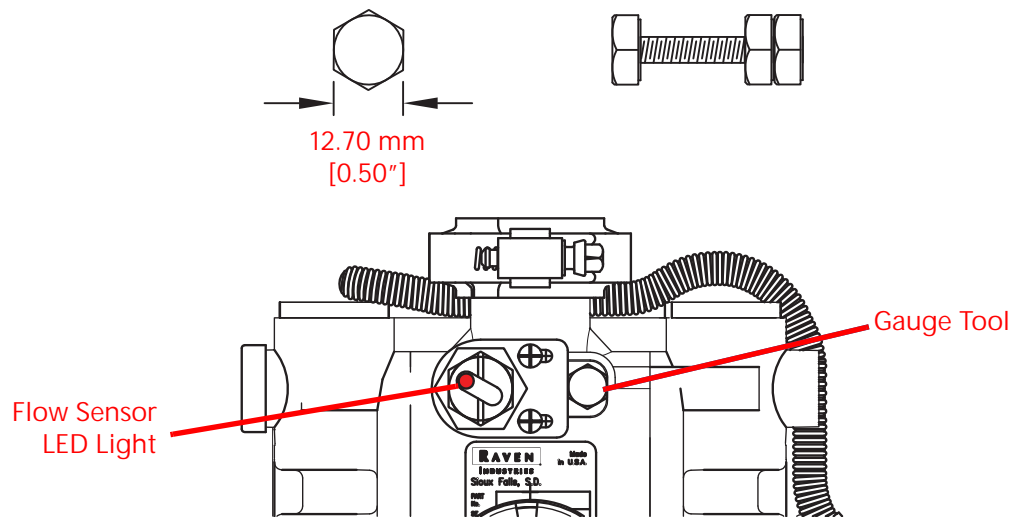


1. Disconnect the sensor cable from the motor control cabling.
2. Loosen the locking nut on the switch assembly and remove the old sensor assembly from the pump head.
3. Loosen the sensor bracket mounting screws enough to allow the bracket to slide freely on the pump head.

ADJUSTING THE STANDARD FLOW MONITOR SENSOR AND BRACKET



RETURNING THE PUMP FOR SERVICE OR REPAIR



	<p style="text-align: center;">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 style="text-align: center;">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 55 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

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

FIGURE 1. LED Status Indicators

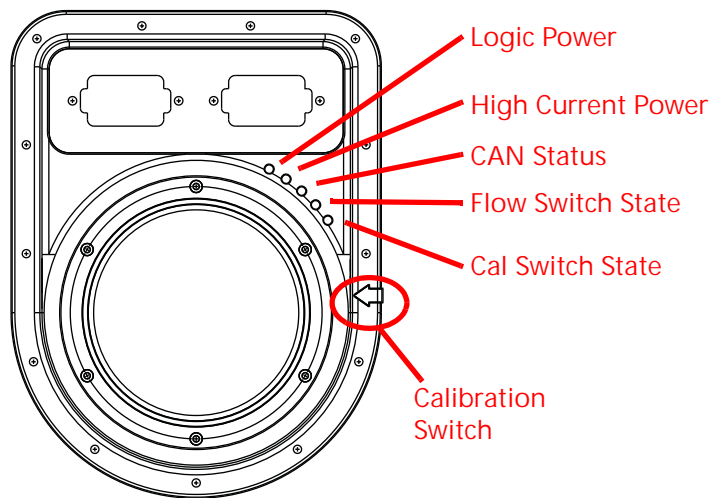


TABLE 1. LED Status Indicators

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 ISOBUS. If the motor control ECU cannot communicate via the ISOBUS, 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 (DTCS)

TABLE 2. Diagnostic Trouble Codes

Code ID		Description	Recommended Actions
523154	31	Lost communication	Verify the communication setup/shutdown alarm.
	16	Target flow too high	<ol style="list-style-type: none"> 1. Reduce the equipment speed. 2. Reduce the target application rate.
	18	Target flow too low	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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.
520194	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.

Code ID		Description	Recommended Actions
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. 8. Follow the "Injection Pump Troubleshooting Steps (If Pump Does Not Calibrate)" on page 60 to troubleshoot the pump.
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.
523189	7	Injection pump fault	Return pump to a local Raven dealer for service.
	13	Invalid pump calibration	Adjust the flow correction offset.

Code ID		Description	Recommended Actions
520192	3	ECU Voltage High	1. Verify battery connections. 2. Inspect cable for defects.
	4	ECU Voltage Low	1. Verify high current breaker is not tripped. 2. Verify battery connections. 3. Inspect cable for defects.
520194	3	High Motor Voltage	1. Verify battery connections. 2. Inspect cable for defects.
524082	31	Display is not online	1. Inspect cabling for defects. 2. Check CAN termination.

INJECTION PUMP TROUBLESHOOTING STEPS (IF PUMP DOES NOT CALIBRATE)

REQUIRED TOOLS

- Vacuum gauge with 1/4" NPT male port and a range of 0-30 in. Hg [0-762 mm Hg].
- Calibrated container that reads in fluid ounces/ml. and holds at least 32oz. [1000 mL]
- Pump manual to show assembly and component locations.

IMPORTANT: For testing purposes it is best to use water for pumping. Make sure pump has been flushed of chemical properly before beginning the following procedure and wear proper protective equipment. See product label of chemicals used.

TROUBLESHOOTING PROCEDURE

1. Set the hand valves in position so water recirculates back to the chemical tank.
2. Run the pump in recirculate at a medium rate for 5 minutes to verify there is water being pumped back to the tank. If water is being recirculated, skip to the next step. If water is not being recirculated, inspect and clean the pump check valves before performing the next step.
3. If the LED on the flow monitor sensor is not blinking, but the pump is running, verify the pump is installed correctly and all parts are present. If/when the red light on the flow monitor is blinking, perform the next step.
4. Verify the FER (on the Diagnostics Page) or pump efficiency (on Home Page) read above 95%.
5. Perform a catch test. If the pump did not calibrate correctly, inspect and clean the check valves. Verify the pump check valves are assembled correctly, verify the intake valve spring is the lighter spring, and verify the discharge valve spring is the heavier spring.
6. If performing the above steps does not fix the issue, there may be a vacuum leak on the intake pump. Use the vacuum gauge and perform the following steps.
7. Install the vacuum gauge in place of the vacuum sensor.
8. Run the pump at a high RPM.
9. Verify the pump is pumping water back to the tank.
10. Close the valve at the bottom of the supply tank.
11. Turn the pump off.
12. Verify the reading on the vacuum gauge reads and maintains at least 20 in. Hg [508 mm Hg]. If the vacuum gauge does not hold the required minimum pressure, perform the following steps to identify the leak location.
 - a. Verify all O-rings are present.

- b. Check for loose clamps.
 - c. Inspect for damaged hose barbs or loose fittings.
 - d. Verify pipe sealant has been used on all fittings.
 - e. Check for cracked pump heads and fittings.
 - f. If using quick disconnect couplings, verify those couplings are not leaking.
13. Open the supply valve at the bottom of the supply tank (valve closed in step 10).
14. Operate the pump in the recirculate mode and verify the vacuum gauge reads less than 12 in. Hg [304.8 mm Hg]. If the gauge displays a reading higher than the maximum value, verify the strainer screen is at least 20 mesh, the strainer is clean, and that the inlet plumbing size is correct.

NOTE: The inlet plumbing size on the 1 - 40 oz./min pump should be 1/2" ID minimum. Inlet for the 5 -200 oz./min pump should be 3/4" ID minimum.

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LIMITED WARRANTY

WHAT DOES THIS WARRANTY COVER?

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

HOW LONG IS THE COVERAGE PERIOD?

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

HOW CAN I GET SERVICE?

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

WHAT WILL RAVEN INDUSTRIES DO?

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

WHAT IS NOT COVERED BY THIS WARRANTY?

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

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

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.