

# Sidekick Pro™ ISO Installation & Operation Manual

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# CHAPTER

# 1

# IMPORTANT SAFETY INFORMATION

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## NOTICE

Read this manual carefully before installing the Sidekick Pro™ ISO direct injection module or any other system components.

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

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

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

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

## WARNING

### CHEMICAL HANDLING AND SAFETY

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

- Always follow safety labels and instructions provided by the chemical manufacturer or supplier.
- Store agricultural chemicals in original containers and do not transfer to unmarked containers or containers used for food or drink. Store chemicals in a secure, locked area away from human or livestock food and keep children away from storage areas.
- Avoid inhaling chemical dust or spray particulate and avoid direct contact with agricultural chemicals. Always wear appropriate personal protective equipment as recommended by the chemical and/or equipment manufacturer. Wash hands and face after using agricultural chemicals and before eating, drinking, or using the rest room.

- Seek medical attention immediately if illness occurs during or shortly after the use of chemicals.
- Fill, flush, calibrate, and decontaminate sprayer systems in an area where runoff will not reach ponds, lakes, streams, livestock areas, gardens, or populated areas. Thoroughly flush or rinse equipment used to mix, transfer, and apply chemicals after use.
- Before servicing any component of the system, thoroughly flush or rinse components with water.
- Improper disposal of waste may threaten the environment and ecology. Dispose of empty containers properly. Triple-rinse empty containers and puncture or crush when disposing. Contact a local environmental or recycling center for additional information.

### **CAUTION**

If the system malfunctions or becomes clogged, stop the engine or pump and relieve pressure from the spraying system before servicing.

Do not operate machinery without instruction and keep equipment in proper working condition. Unauthorized modification to equipment may impair machine function and/or safety and may shorten the working life of equipment.

Wear clothing appropriate for the job being performed and avoid loose fitting clothing while working on or near moving components. Keep long hair away from moving components.

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## INSTRUCTIONS FOR WIRE ROUTING

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

Harness should not contact or be attached to:

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

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

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

Routing should not allow harnesses to:

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

Harnessing should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

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

For harness sections that move during machine operation:

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

Protect harnesses from:

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

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

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





### SYSTEM OVERVIEW

The Raven Sidekick Pro™ ISO injection system is designed to provide efficient and accurate application of liquid chemicals applied from an injection module. Using a separate injection module, or tank, eliminates mixing chemicals and reduces chemical waste, and simplifies equipment care and maintenance.

Sidekick Pro ISO provides connectivity to a ISOBUS system to allow an existing ISO Universal Terminal (UT) display (such as a Viper 4) to control the rate of the chemical injection system.

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

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

**NOTE:** The Raven Sidekick Pro™ ISO injection systems are not compatible with John Deere Spray Ready application equipment.

### INJECTION SYSTEM COMPONENTS

The direct injection system consists of:

- ISOBUS based virtual terminal (UT) display (not provided)
- Appropriate cabling and plumbing
- Sidekick Pro ISO injection pump
- In-line mixer
- Cabling required to connect the injection system components and existing ISOBUS
- Check valves
- Raven ISOBUS product control ECU for carrier rate control and to relay section status to the Sidekick Pro ISO ECU.

## SIDEKICK PRO™ ISO FEATURES

### CLOSED CALIBRATION SYSTEM

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

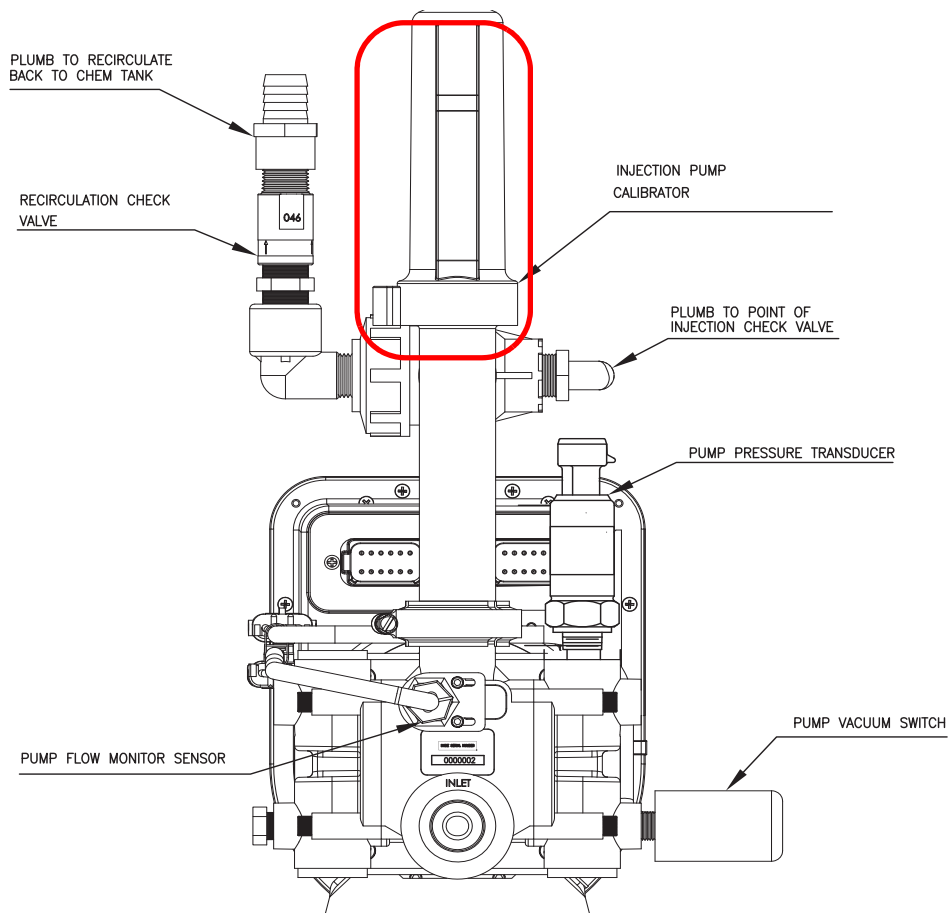
### PRIMING

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

### PUMP CALIBRATOR

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

FIGURE 1. Pump Calibrator



### FAST RATE RESPONSE

High precision sensing allows the Sidekick Pro™ ISO direct injection pump 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 NODE

Sidekick Pro™ ISO features an integrated motor control node mounted directly on the pump housing for simplified installation and enhanced performance. The control node features status LEDs which provide status and CAN communication information which the operator may be able to use during calibration or system troubleshooting.

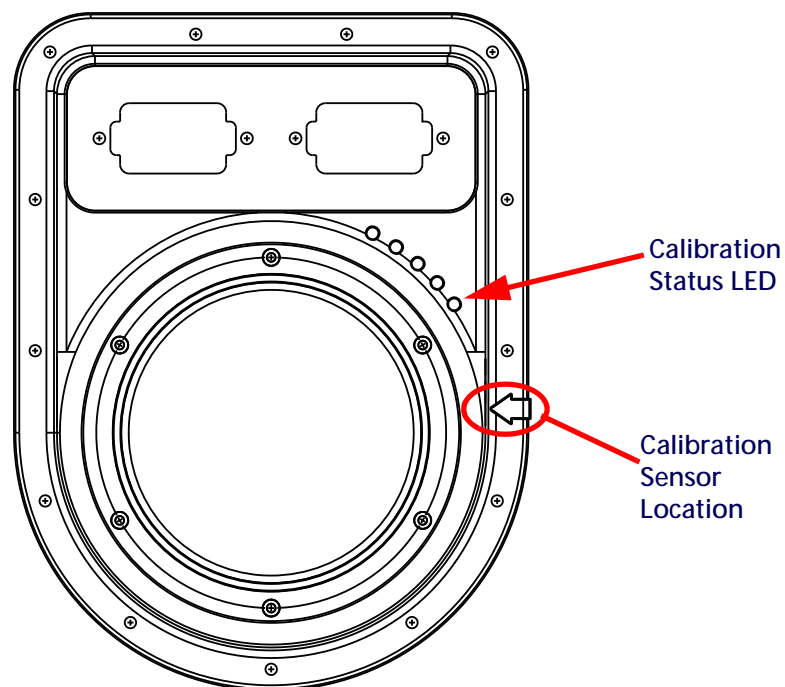
## INTEGRATED CALIBRATION SWITCH

The integrated motor control node also features a sealed calibration switch. The sealed calibration switch allows the operator to begin the pump calibration process by passing a metallic object, such as a screwdriver, across the switch sensor on the Sidekick Pro™ ISO 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 must be initiated from the control console in the vehicle cab. See the Calibrate the Injection Pump section on page 44 for a detailed calibration procedure.

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

**FIGURE 2. Motor Control Node Calibration Sensor**



## SYSTEM DIAGNOSTICS

Enhanced diagnostic features are monitored by the control console during operation of the Sidekick Pro™ ISO injection system to help identify potential issues and minimize equipment down time. Refer to Chapter 6, Injection Diagnostics and Troubleshooting for more information on using diagnostics features on a specific console.

## FLOW MONITORING

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

## RINSE ASSIST (OPTIONAL)

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

### RINSE ASSIST REQUIREMENTS

The following is required to utilize Raven Rinse Assist.

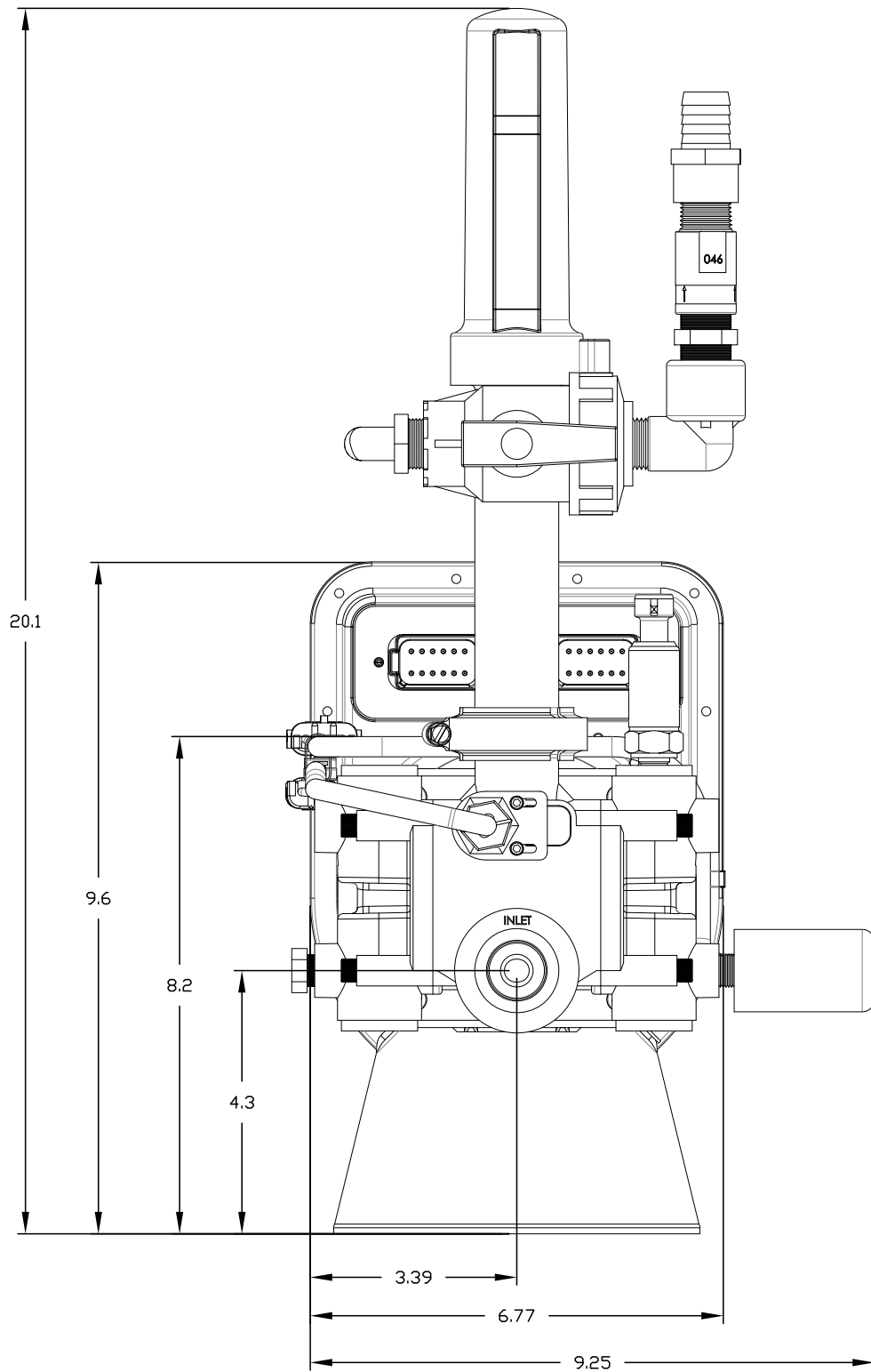
- Rinse Assist Ready Sidekick injection pump.
- Sidekick Pro™ ISO integrated motor control firmware 1.04.01 or newer.
- Generation 1 cable (P/N 115-0172-192)
- Generation 2 cable (P/N 115-0172-191)

## SIDEKICK PRO™ ISO PUMP SPECIFICATIONS

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

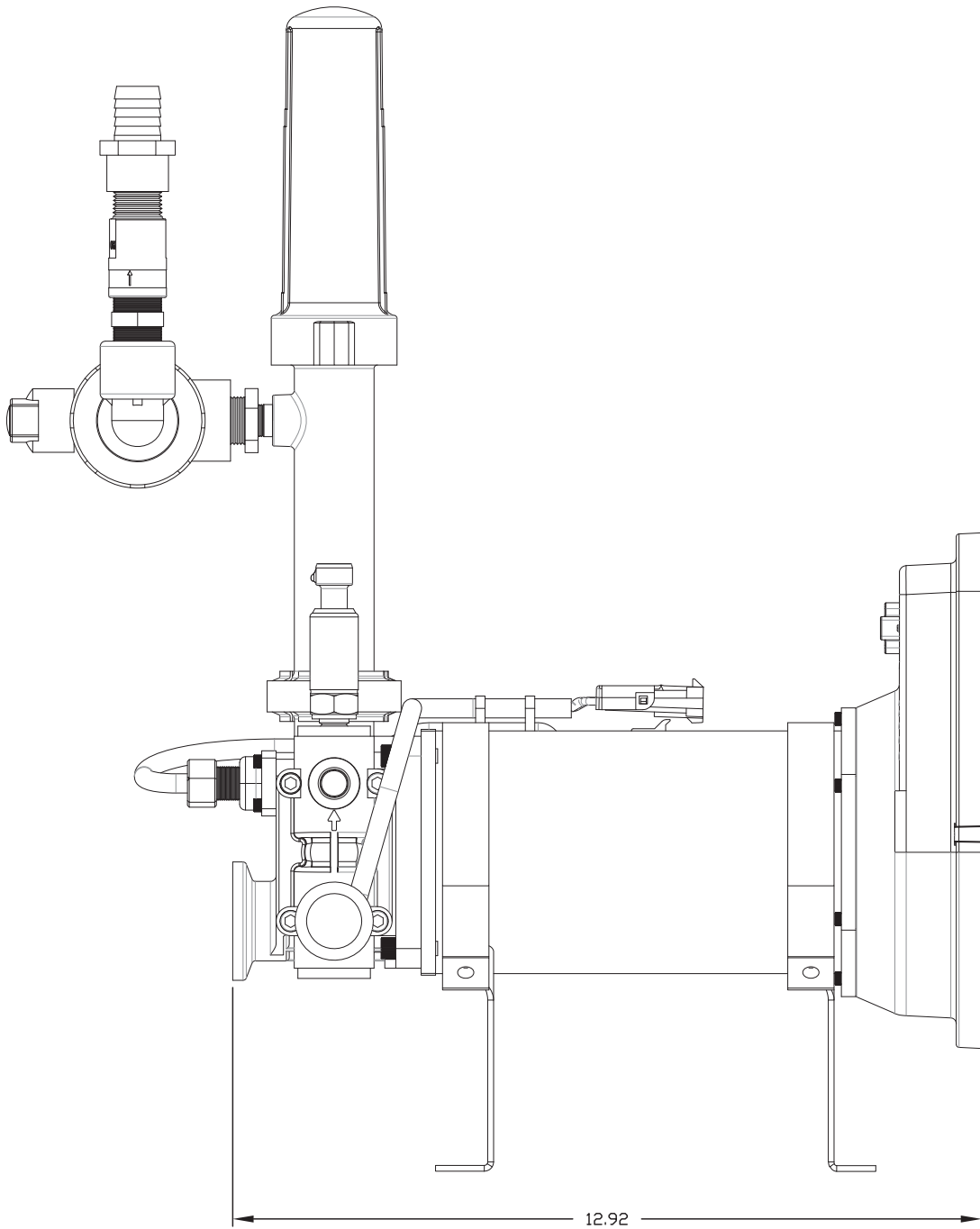
<b>Dimensions</b>	(See Figure 3 on page 9 or Figure 4 on page 10)	
<b>Pistons</b>	1 (Dual Acting) at 0.750 in Dia. [1.910 cm]	
<b>Maximum Stroke Length</b>	0.390 in [0.99 cm]	
<b>Flow Output Range</b>	P/N 063-0173-402 5-200 oz./min. [1.5-59 dl/min.]	P/N 063-0173-403 1-40 oz./min. [0.3-11.8 dl/min.]
<b>Maximum Operating Pressure</b>	150 PSI [1034 kPa]	
<b>Maximum Power Required</b>	1/4 HP	
<b>Maximum Recommended Suction Lift</b>	2 ft. [0.6 m]	
<b>Inlet and Outlet Plumbing</b>	Mates with Banjo M100 Flange and 3/4" Female NPT	
<b>Wetted Parts</b>	Polypropylene Stainless Steel	
<b>Body Material</b>	Polypropylene	
<b>Wetted Seals/O-rings</b>	V965-80 Viton and Graphite Filled Teflon	

FIGURE 3. Sidekick Pro™ ISO Injection Pump Dimensions



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

FIGURE 4. Sidekick Pro™ ISO Injection Pump Dimensions (Cont.)



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

## UPDATES

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

[portal.ravenprecision.com](http://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.

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

[techwriting@ravenind.com](mailto:techwriting@ravenind.com)

- Sidekick Pro™ ISO Installation & Operation Manual
- P/N 016-0171-509 Rev. F
- 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

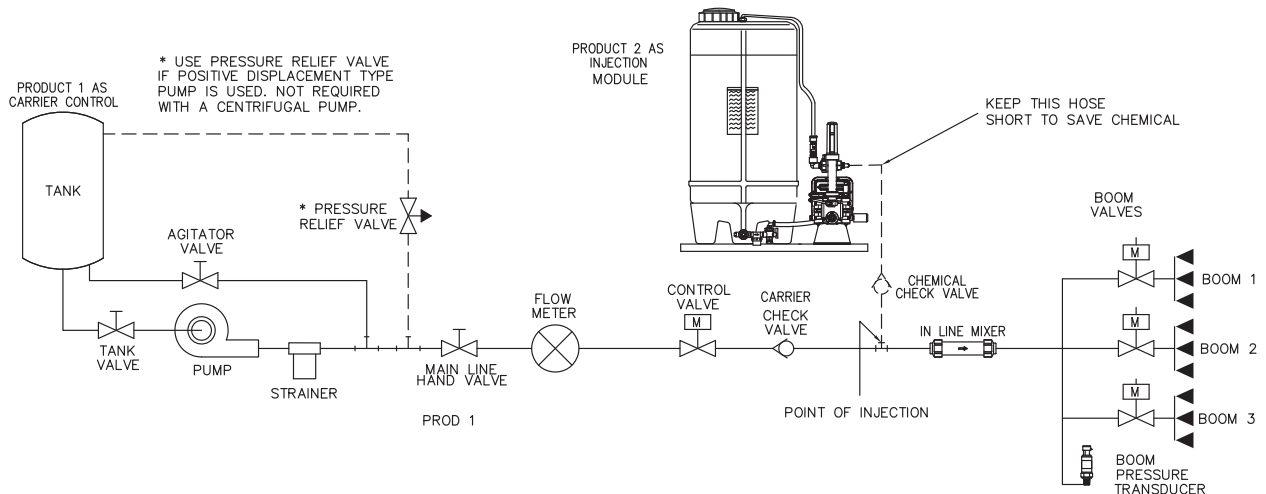
### OVERVIEW

The following steps must be completed to install a Sidekick Pro™ ISO injection system:

1. Select and plumb the point of injection. See page 14.
  - a. Install carrier and chemical injection check valves.
  - b. Install in-line mixer.
2. Mount the Sidekick Pro™ ISO injection module or tank. See page 20.
3. Mount the Sidekick Pro™ ISO injection pump. See page 20.
4. Plumb the Sidekick Pro™ ISO pump and injection lines into the main carrier line at point of injection. See page 22.
5. Install the closed calibration system. See page 23.
6. Plumb the recommended rinse system. See page 24.
7. Connect the Sidekick Pro™ ISO injection pump to CANbus. See page 25.
8. Connect the Sidekick Pro™ ISO pump to source of electrical power. See page 25.

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

**FIGURE 1. Example Sidekick Pro™ ISO Injection System**



## INITIAL PLUMBING AND POINT OF INJECTION

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

FIGURE 2. Basic Sprayer Plumbing Diagram with Added Injection System

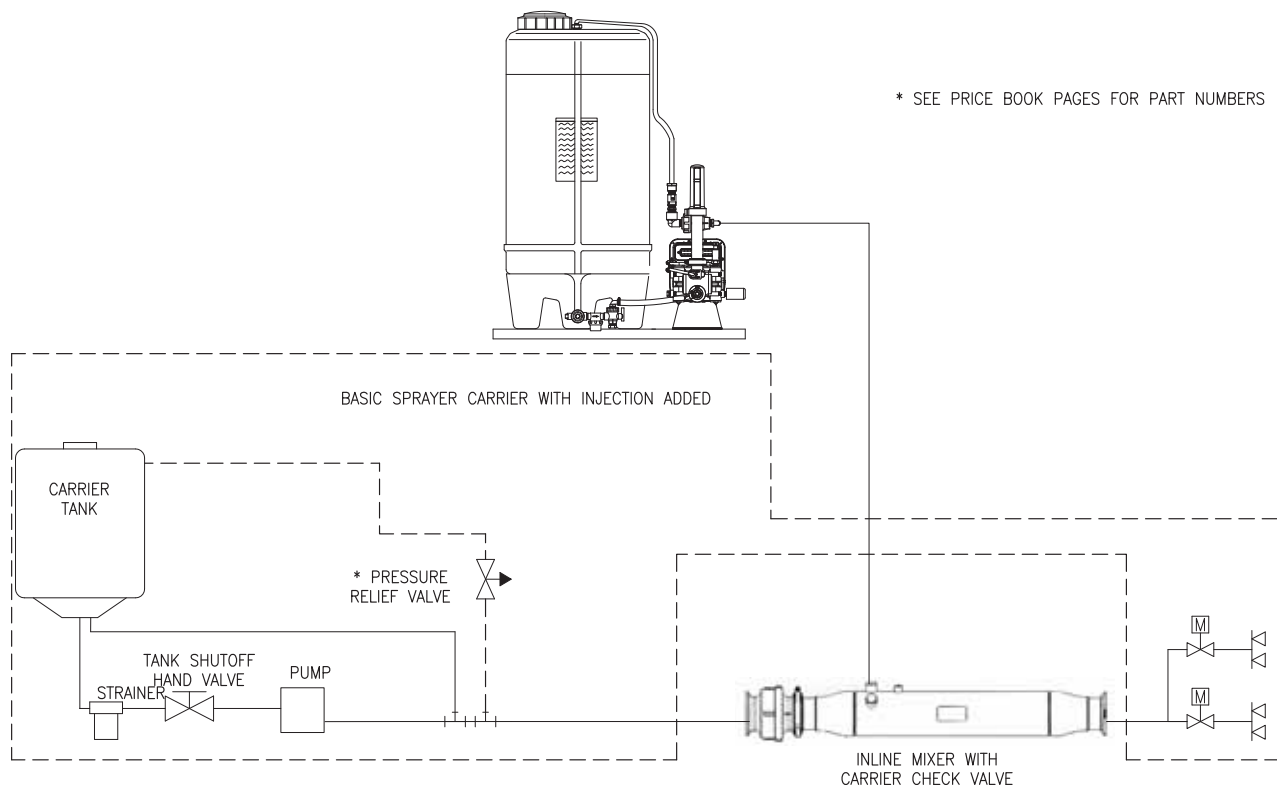
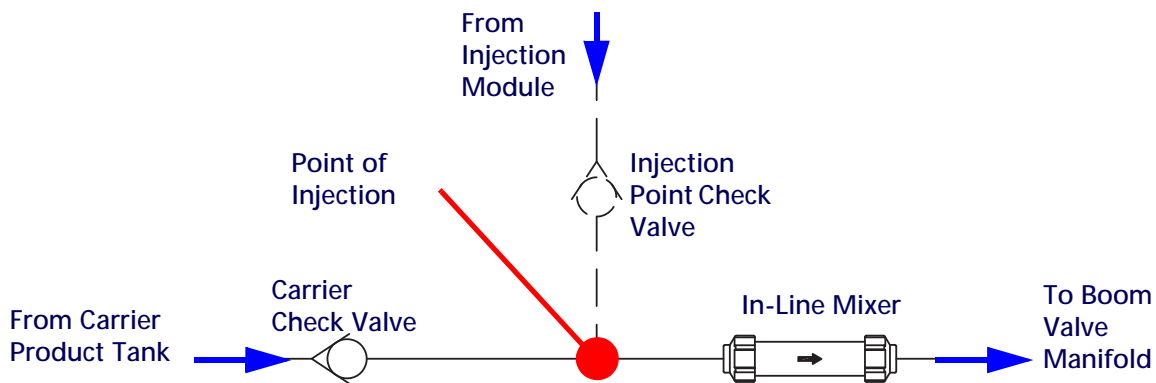


FIGURE 3. Point of Injection Detail

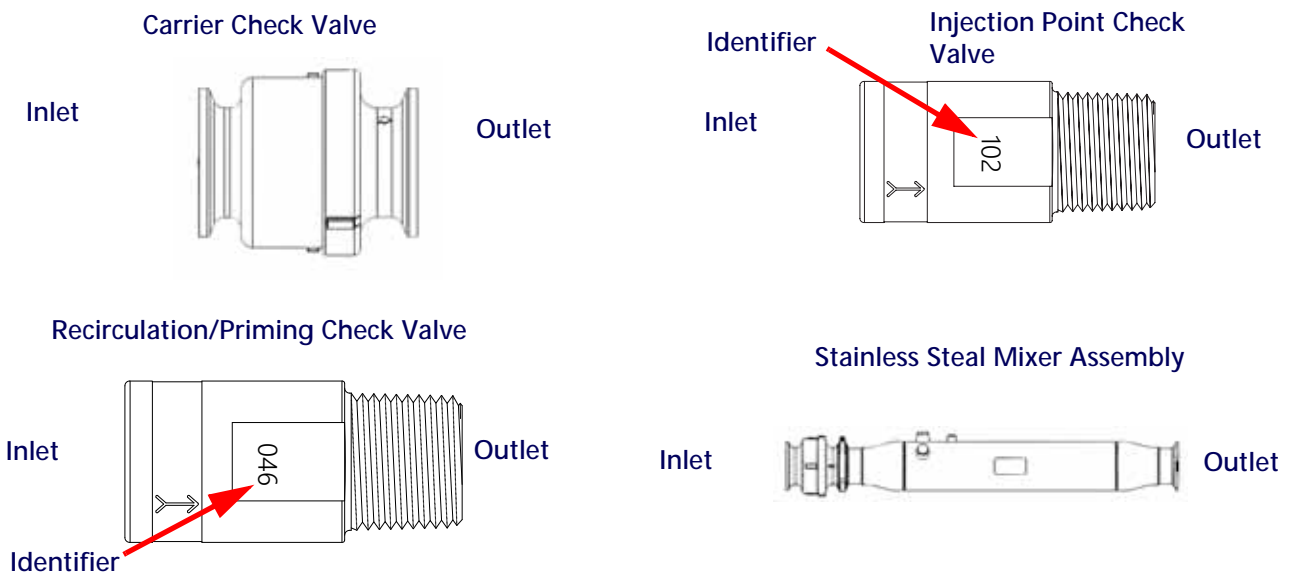


To set up the point of injection:

1. Select the point of injection.
2. Install a carrier check valve or a mixer assembly in the main product line to prevent back flow to the carrier reservoir. Refer to Table 1, "Check Valve Sizing and Selection Chart," on page 16 proper sizing of the carrier check valve or see Figure 4 on page 15 for details on available mixer assemblies.
3. Install tee type fitting, or fittings, suitable for chemical applications after the carrier check valve as needed. Tee fittings may be installed in mixer assemblies to provide inlets for additional injection systems.
4. 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. Use Figure 5 on page 17 to determine proper sizing of the in-line mixer. Use Table 1, "Check Valve Sizing and Selection Chart," on page 16 to determine proper sizing of the carrier check valve.
5. Install a Raven 12 PSI chemical injection check valve (P/N 333-0011-102) to the injection line in front of the point of injection to prevent back flow to the chemical reservoir.

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

FIGURE 4. Check Valves and In-Line Mixer



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



TABLE 1. Check Valve Sizing and Selection Chart

	Raven Part No.	Inlet	Outlet	Flow Coefficient <sup>a</sup>
Recirculation and Priming Check Valve <sup>b</sup>	333-0011-100	1/2" (F)	1/2" (M)	N/A
Injection Point Check Valve <sup>c</sup>	333-0011-102	1/2" (F)	1/2" (M)	N/A
Carrier Check Valve	333-0011-090	1"	1"	14
	333-0011-091	1-1/4"	1-1/4"	22
	333-0011-104	m220 Banjo Flange	m220 Banjo Flange	70
	333-0011-105	m330 Banjo Flange	m300 Banjo Flange	110

- a. The flow coefficient ( $C_v$ ) is the volume per minute (water) at which the pressure drop equals 1 PSI [6.9 kPa].
- b. "046" Identifier. Rated for 12 PSI [82.7 kPa] 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.
- c. "102" Identifier. Rated for 12 PSI [82.7 kPa] Verify the check valve is installed with the flow arrow pointing in the direction of flow through the valve.

FIGURE 5. In-Line Mixer and Mixer Assembly Options (D/N 016-0171-579)

INLINE MIXER SELECTION CHART



063-0171-303  
1 IN. POLYPROPYLENE FITTINGS  
WITH STAINLESS STEEL PIPE  
NO CHECK VALVE INCLUDED



063-0159-632  
1-1/4 IN. POLYPROPYLENE FITTINGS  
WITH STAINLESS STEEL PIPE  
NO CHECK VALVE INCLUDED



063-0171-300  
2 IN. POLYPROPYLENE FITTINGS  
WITH STAINLESS STEEL PIPE  
NO CHECK VALVE INCLUDED

THIS GROUP OF MIXERS HAVE A  
PRESSURE DROP OF 1 PSI @ 25  
GPM WATER



333-9000-010  
3 IN. STAINLESS STEEL  
NO CHECK VALVE INCLUDED

HIS MIXER HAS A PRESSURE  
DROP OF 1 PSI @ 60 GPM  
WATER



063-0173-770  
1-1/2 IN. STAINLESS STEEL (FOR NH3)  
NO CHECK VALVE INCLUDED

REFER TO PRESSURE DROP  
VS. FLOW RATE CHART



063-0173-737  
2 IN. POLYPROPYLENE  
CHECK VALVE INCLUDED  
M 220 BANJO FLANGE FITTINGS



063-0173-698  
3 IN. STAINLESS STEEL  
CHECK VALVE INCLUDED  
M 300 BANJO FLANGE FITTINGS

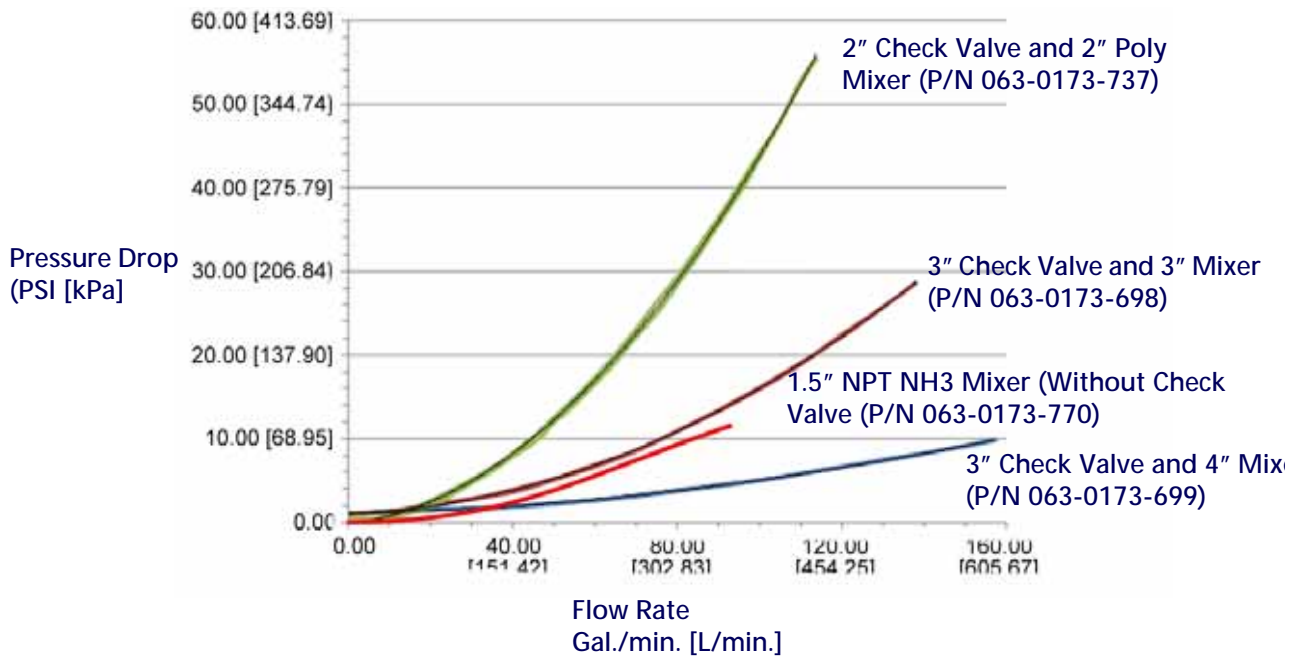


063-0173-699  
4 IN. STAINLESS STEEL  
CHECK VALVE INCLUDED  
M 300 BANJO FLANGE FITTINGS

016-0171-579  
07/17 REV. B  
SHEET 1 OF 1  
E29857



FIGURE 6. Pressure Drop vs. Flow Rate



## MOUNT THE SIDEKICK PRO™ ISO PUMP AND CHEMICAL TANK

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

### MOUNT THE INJECTION MODULE

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

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

- 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.

The assembled injection module will measure approximately as follows:

Tank Capacity	Width	Depth	Height
24 Gallon	28.5" [71.12 cm]	12" [30 cm] (17" [43 cm] with plumbing)	42" [106.75 cm]
50 Gallon	37" [94 cm]	18" [45.72 cm]	62" [157.5 cm]

FIGURE 7. 24 Gallon Injection Module Platform and Tank Dimensions

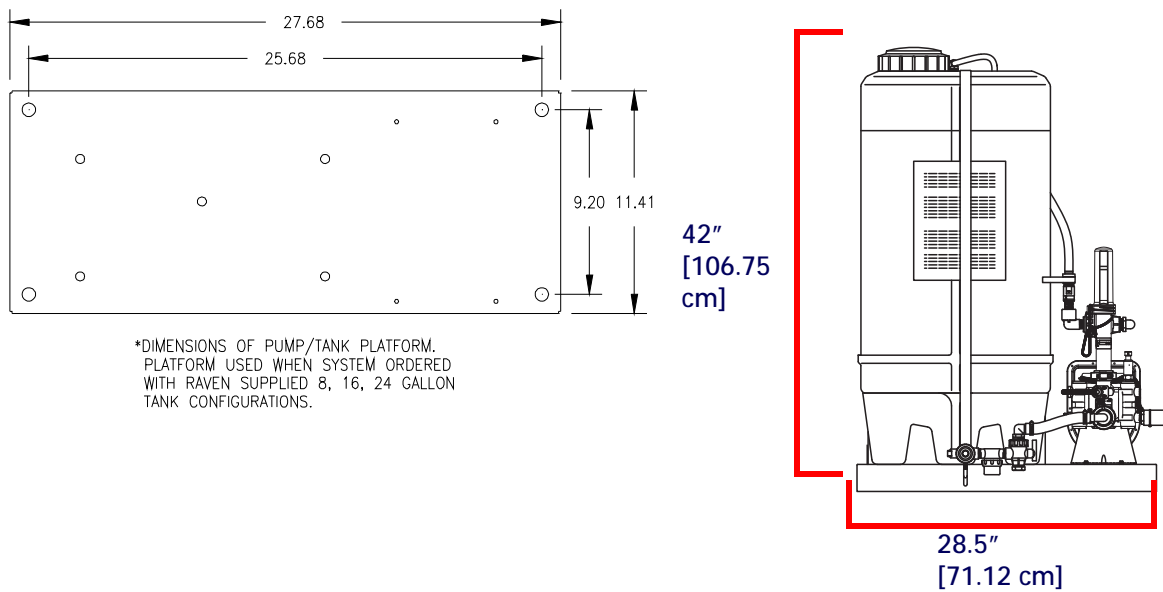
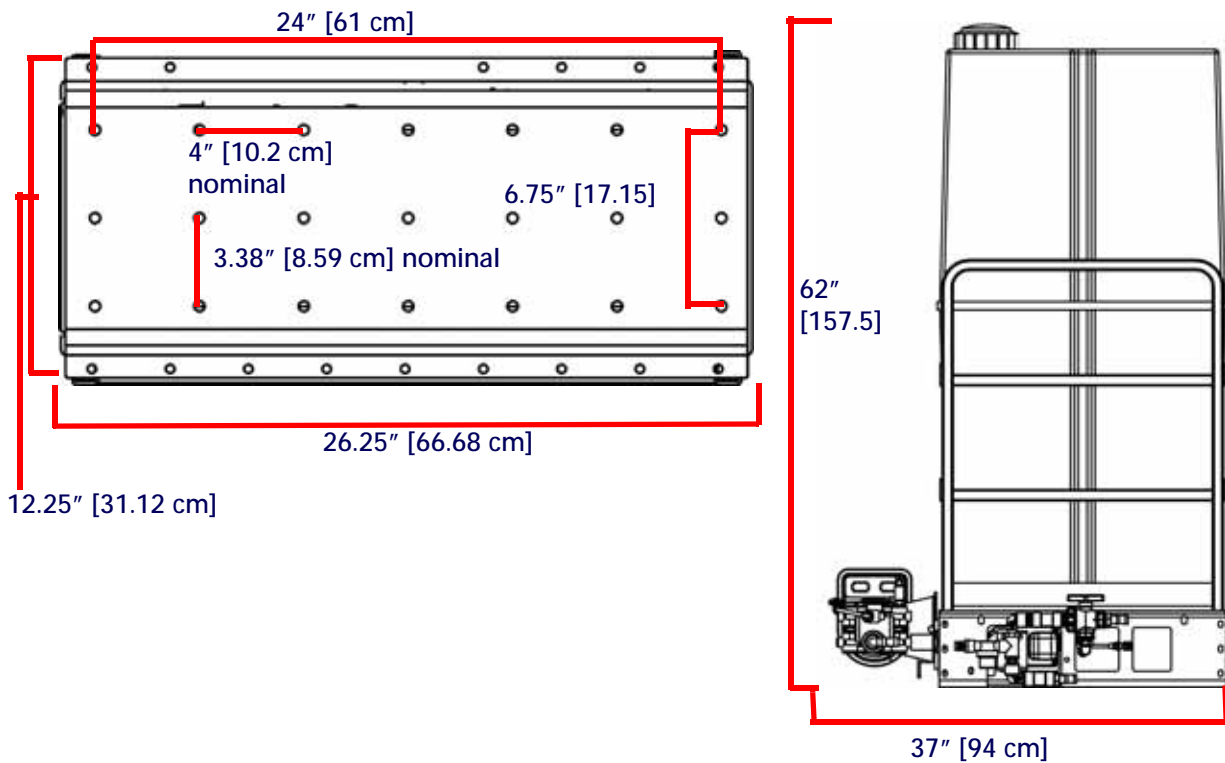


FIGURE 8. 50 Gallon Injection Module Platform and Tank Dimensions (P/N 117-0175-035)



## MOUNT THE CHEMICAL TANK

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

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

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

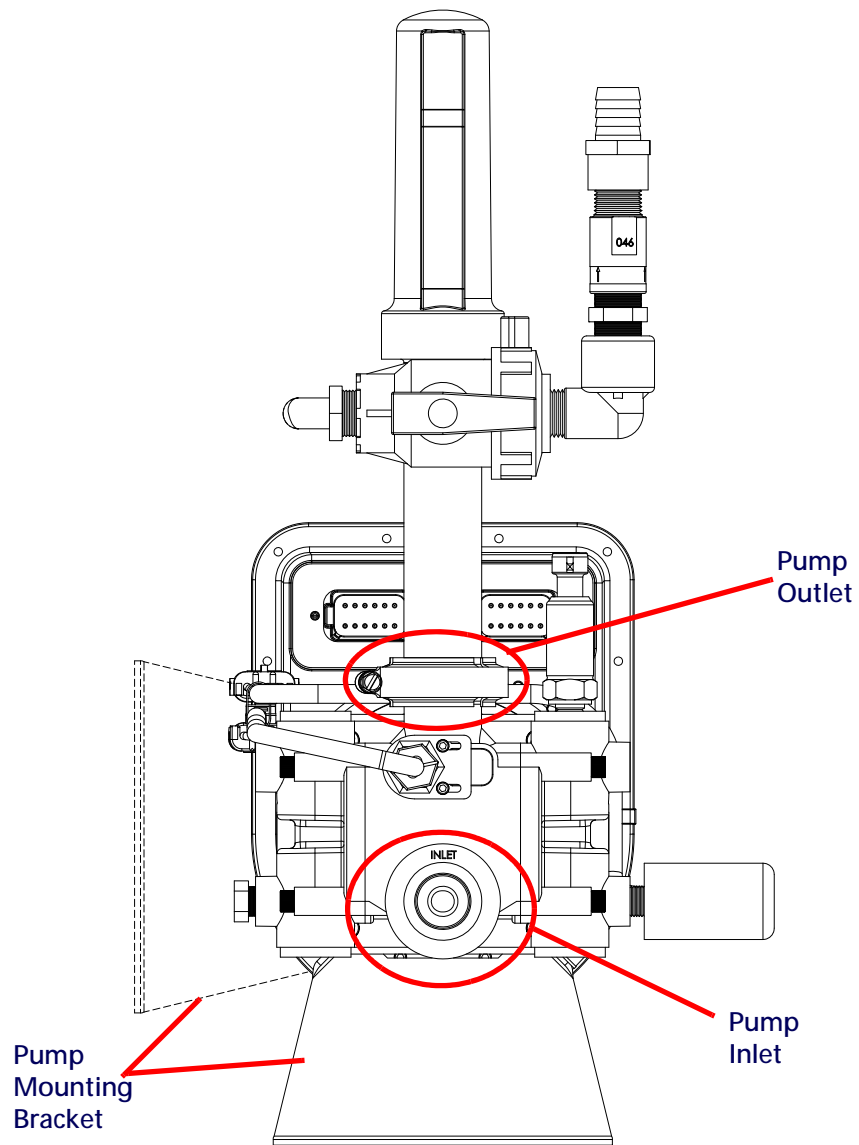
- Reduce the inlet plumbing length
  - Increase the tubing size
- Mount the Sidekick Pro™ ISO pump so that the line between the injection pump and chemical supply tank is near level with a slight incline to help relieve air bubbles. The line connected to the pump inlet must not raise chemical above 2 ft. [0.6 m] from the chemical supply tank outlet. See Figure 11 on page 24.

## MOUNT THE SIDEKICK PRO™ ISO PUMP

- Mount the Sidekick Pro™ ISO pump as close as possible to the selected point of injection.
- Mount the Sidekick Pro™ ISO 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.
- The Sidekick Pro™ ISO should be mounted in a location which provides access to the pump and control node to simplify calibration and troubleshooting.

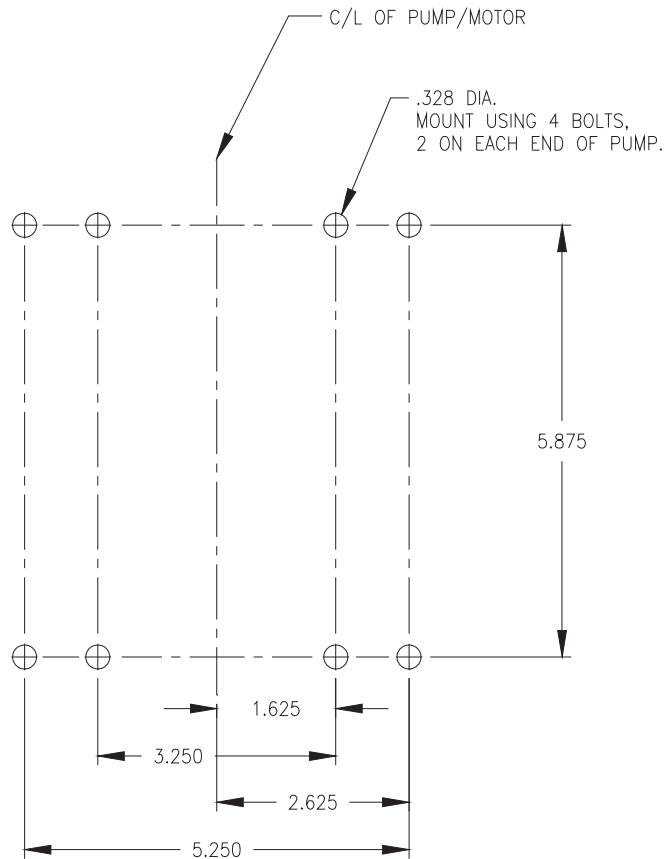


FIGURE 9. Sidekick Pro™ ISO Pump Mounting and Bracket Orientation



**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 10. Sidekick Pro™ ISO Pump Mounting Bracket Bolt Pattern



## SIDEKICK PRO™ ISO INJECTION SYSTEM PLUMBING

### PLUMB THE SIDEKICK PRO™ ISO 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 waist.


#### 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"




**CAUTION**

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

Avoid product lines longer than 15 ft. [4.5 m] between the pump outlet and the point of injection. Long runs can cause increased pressure in the pump heads which cause the pump to pull more electrical current and may raise the temperature of the injection pump motor and integrated motor control node. See Chapter 6, Injection Diagnostics and Troubleshooting, for details on injection system diagnostics and to monitor pump pressure and node temperature.

## PLUMB THE SIDEKICK PRO™ ISO CLOSED CALIBRATION SYSTEM

The Sidekick Pro™ ISO closed calibration system provides an environmentally 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, the pump calibrator (P/N 063-0172-822) must be installed directly onto the outlet of the pump. This configuration prevents air from getting trapped between the injection pump and the calibration plunger. Trapped air will cause the plunger to feel "spongy" when pressed and will cause the pump calibrator to work improperly.

### 3-WAY VALVE

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

### HOSES

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

### RECIRCULATION CHECK VALVE

A recirculation and priming check valve (P/N 333-0011-100) must be plumbed into the recirculation line between the 3-way valve on the outlet side of the injection pump and the chemical tank. This check valve is required to

allow air to bleed off during priming of the injection pump. The recirculation and priming check valve is also necessary to allow the system to detect if the pump is primed. See Figure 1 on page 13.

**NOTE:** The recirculation check valve has a 0.046" dia. hole in the poppet to allow air to pass. This check valve applies 12 PSI [83.74 kPa] to the pump during priming.

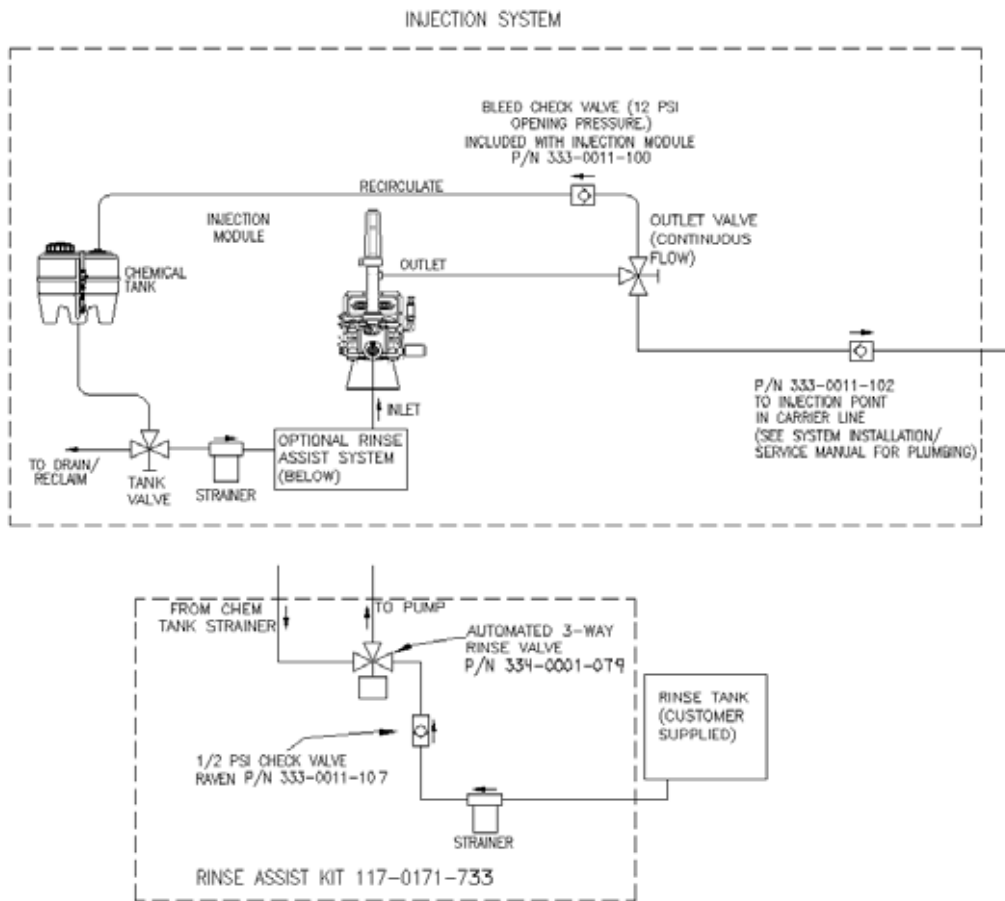
### PLUMB THE OPTIONAL RINSE ASSIST SYSTEM

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

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

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

**FIGURE 11. Recommended Injection System Plumbing with Optional Pump Rinse Tank**



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## ISOBUS AND POWER CONNECTIONS

The Sidekick Pro™ ISO connects to an ISOBUS system via a CAN motor control cable and requires both a clean logic power and a high current power connection.

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

### BEST INSTALLATION PRACTICES

The information below illustrates proper methods for wiring an ISOBUS system. The main points of ISOBUS system 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 (P/N 063-0172-964) 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's battery.
4. Node logic power should be connected to a clean power bus relay.
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 vehicle ignition switch to switch the relay.

### CAN TERMINATORS

A CAN terminator (P/N 063-0172-964) is required to provide optimal signal integrity through the CANbus. This terminator should be installed as shown in Figure 12 on page 26.

FIGURE 12. Sidekick Pro™ ISO Injection Pump Cabling with Raven ISO Product Control

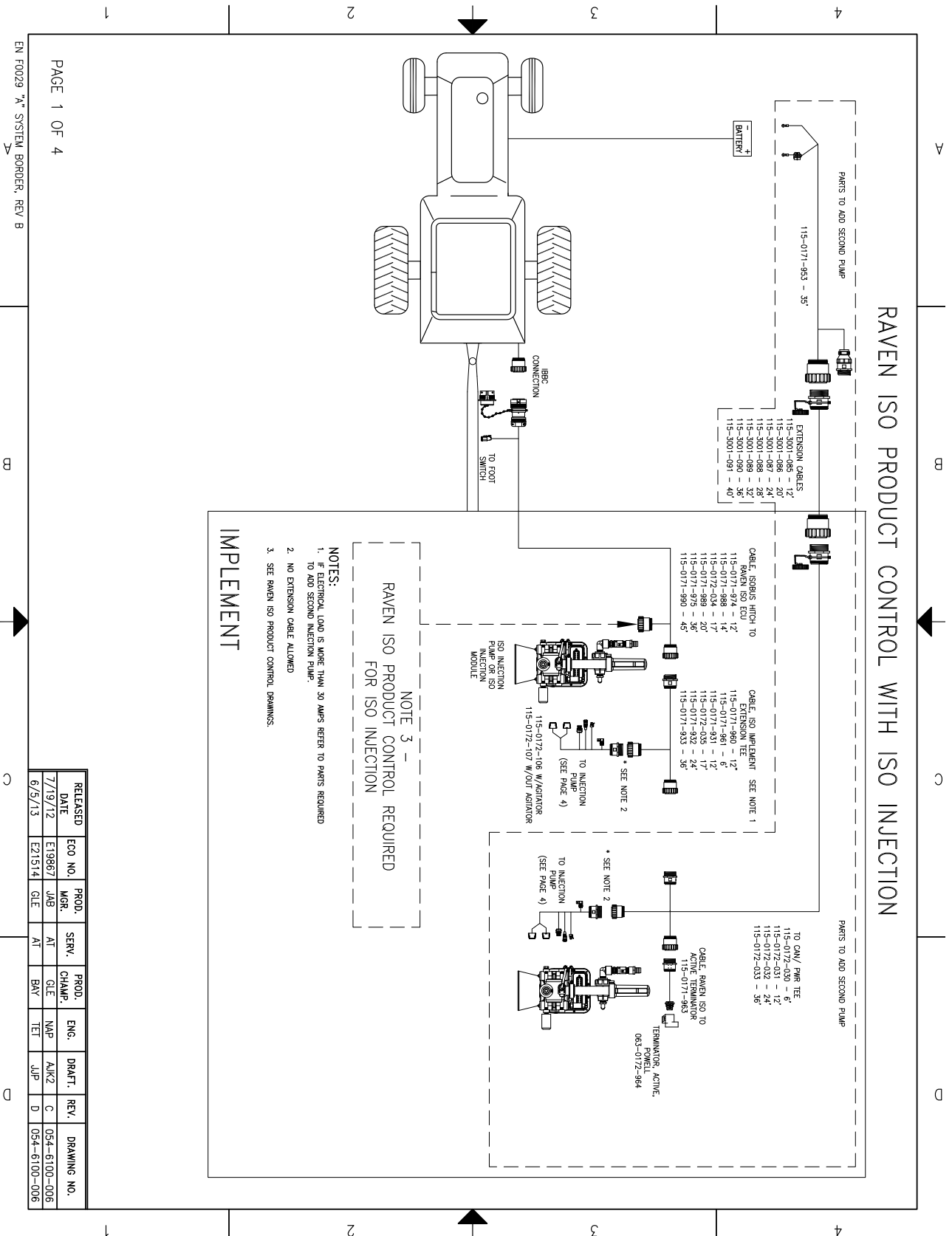
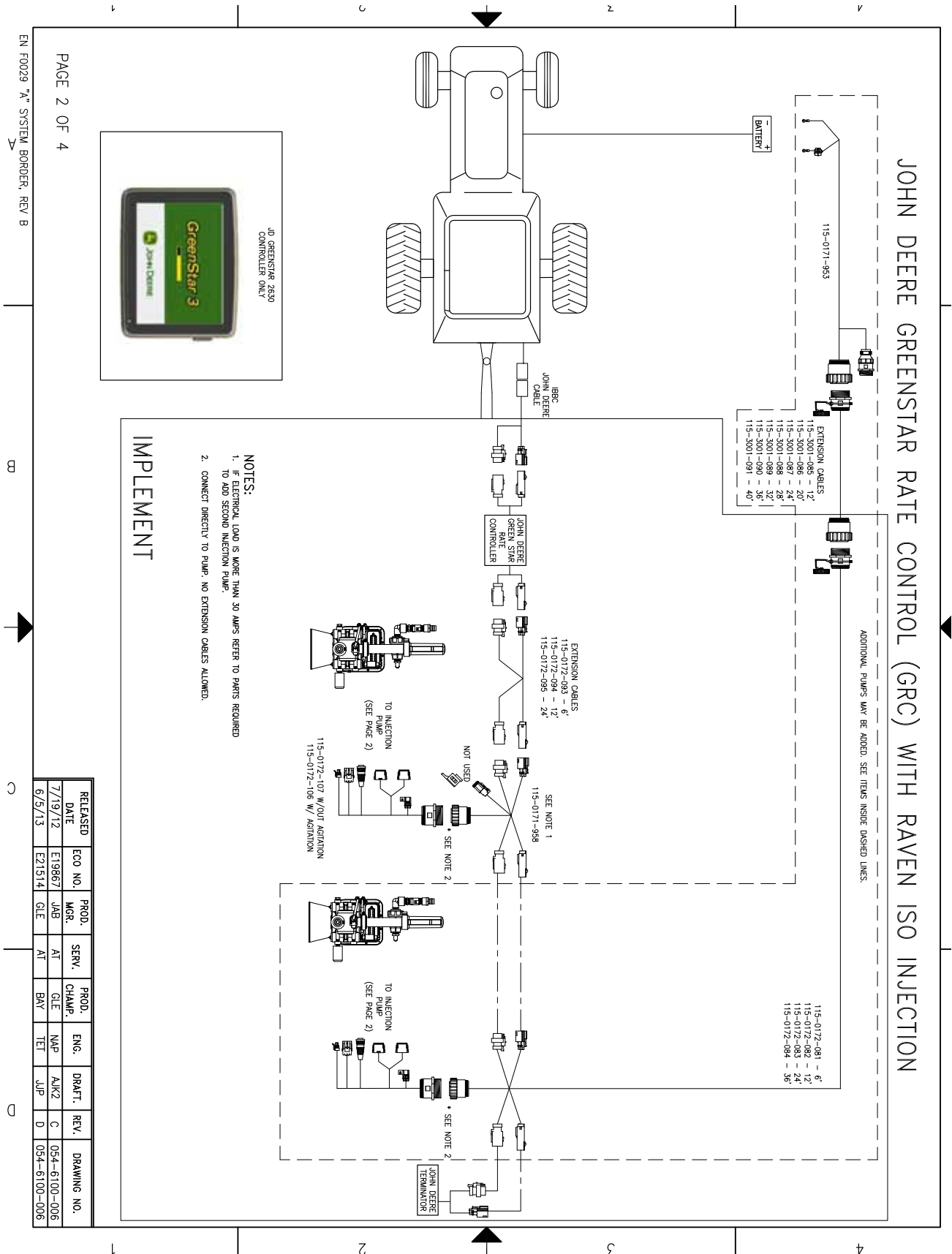


FIGURE 13. Sidekick Pro™ ISO Injection Pump Cabling with John Deere GreenStar Rate Control



PAGE 2 OF 4

EN F0029 "A" SYSTEM BORDER, REV B

RELEASED DATE	EGO NO.	PROD. MGR.	SERV. CHAMP.	PROD. CHAMP.	ENG. VAP	DRAFT. A/K2	REV. C	DRAWING NO.
7/19/12	E19867	JAB	AT	GLE	BAV	TET	JUP	D
6/5/13	E21514	GLE	AT	BAV	TET	JUP	D	054-6100-006

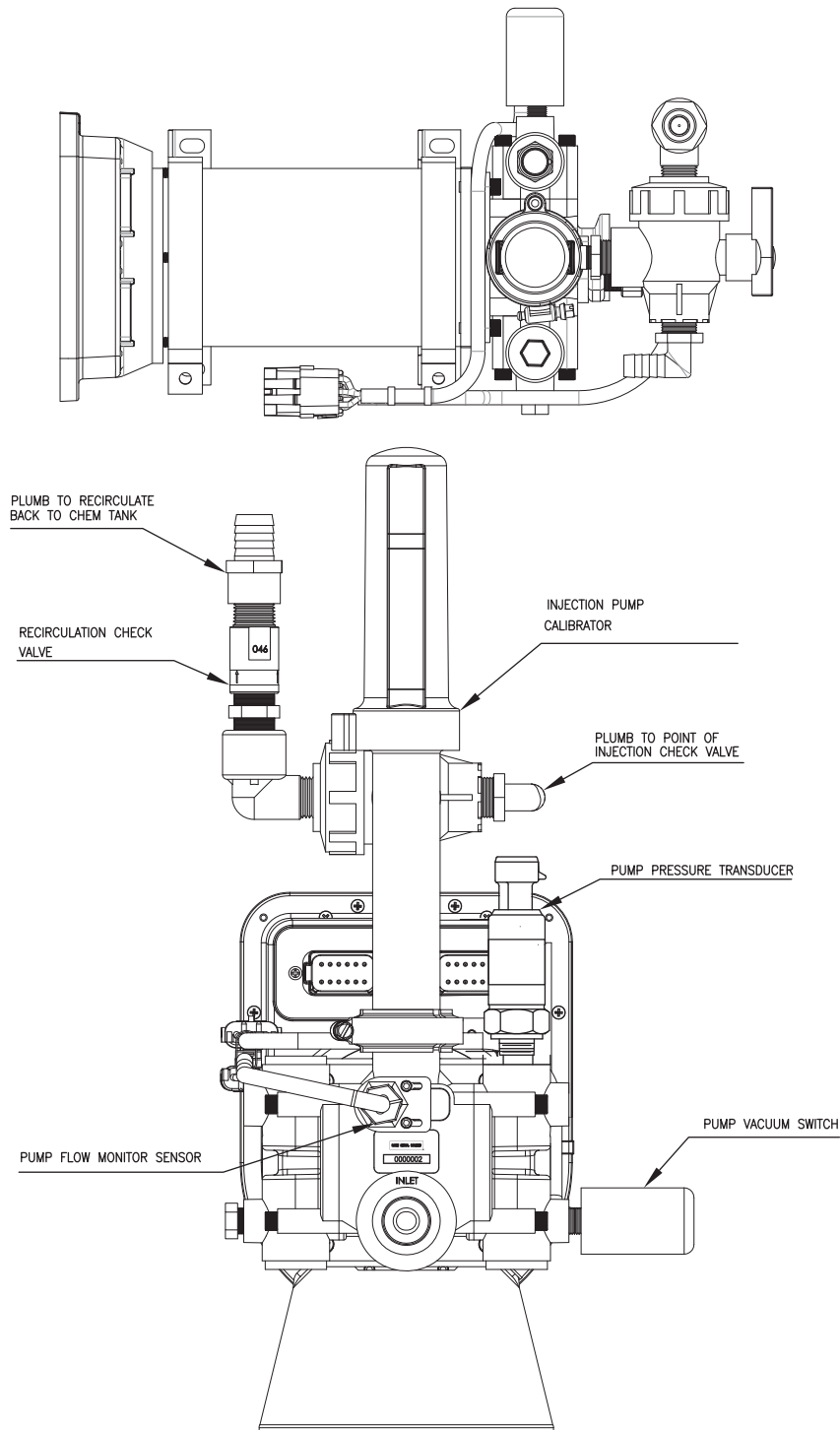


## SIDEKICK PRO™ ISO CANBUS CONNECTION

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

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

FIGURE 14. CAN Motor Control and Pump Connection





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## VERIFY INSTALLATION OF THE SIDEKICK PRO™ ISO

**NOTE:** If more than one injection pump is installed on an ISOBUS system, it may be necessary to readdress the motor control nodes on each pump. Refer to Detecting and Addressing the Motor Control Node section on page 31 for assistance with readdressing the ISOBUS motor control nodes.

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

1. Fill the chemical supply tank with clean water.

**NOTE:** Before filling the tank with chemical for the first time, thoroughly vacuum the chemical supply tank and clean any plastic or metal particles that may be left from the manufacturing or installation process. If these particles get stuck within the injection pump, they may cause a significant reduction in pump accuracy.

Turn the hand valve(s) to allow the tank to drain without running through the pump or injection plumbing and thoroughly rinse tank prior to testing or running the injection system for the first time.

2. Verify all calibration settings for each injection node on the ISOBUS system are set. Refer to Chapter 4, Calibration.
3. Prime and calibrate the pump as described in Prime the Injection Pump section on page 43.
4. Set a target rate for the chemical injection and run the pump in Auto application mode as described in Product Home Screen Calibration Settings section on page 34.
5. Check for any leaks on all plumbing connections 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.



# CHAPTER

# CALIBRATION

## 4

### DETECTING AND ADDRESSING THE MOTOR CONTROL NODE

When the system is first powered on after installing a Sidekick Pro™ ISO injection pump, the pump control node will initially be assigned an address of "0" on the ISOBUS. To readdress the Sidekick Pro ISO control node:

**NOTE:** If the node is not detected on the ISOBUS, see Chapter 6, Injection Diagnostics and Troubleshooting, to troubleshoot the control node and ISOBUS system.

1. Select the UT display menu.

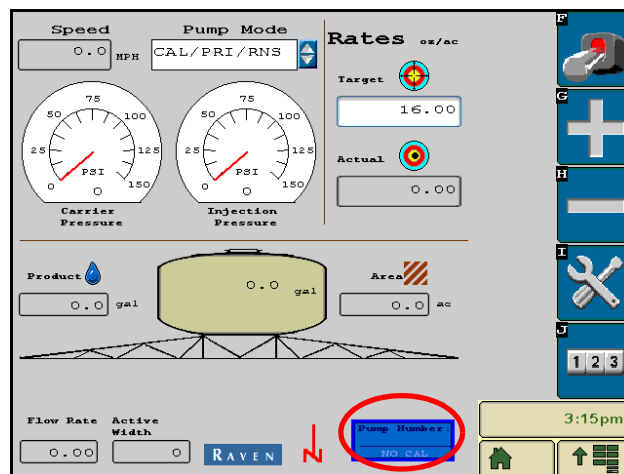


2. Locate the ISO injection pump icon in the UT menu similar to the following.



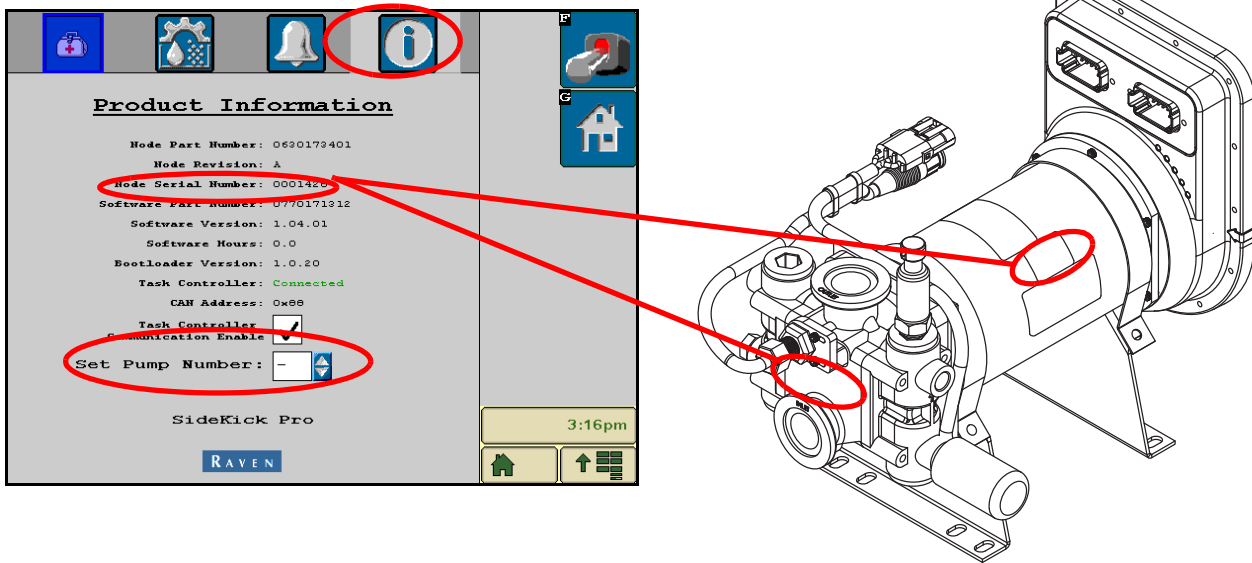
The UT menu will display a pump icon for each pump detected on the ISOBUS system.

3. Select the injection pump icon to display the main product control screen for the selected injection pump.



**NOTE:** If more than one injection pump is detected on the ISOBUS system, each pump will have a separate product control screen for calibrating or operating each pump. Be sure to access each control screen to calibrate or operate the appropriate pump(s).

4. Select the button in the lower, right corner of the product control screen labeled 'Pump Number: No Cal' and select the information icon along the top of the display to access the Product Information screen.



5. Locate the "Node Serial Number" on the Product Information screen and then locate the pump on the vehicle or implement with the same number on the pump head or side of the injection pump motor.
6. Select the "Set Pump Number" field on the Product Information screen and select the control channel number to which the pump and chemical tank are assigned. The Product Information screen will display the assigned value and the UT menu icon will display the assigned pump number in the menu.
7. Repeat this process for each Sidekick Pro ISO Injection Pump connected to the system.

## UNIVERSAL TERMINAL CALIBRATION

Once installation of the injection system has been verified, and the motor control node is recognized by the ISOBUS UT control console, the Sidekick Pro™ ISO and UT display must be calibrated to provide accurate control of the injected product.

The following settings must be calibrated or programmed to ensure proper control and operation of each injection pump:

Raven ISOBUS Interface Screen	Required Settings
Product Information	Pump Number (see the Detecting and Addressing the Motor Control Node section on page 31)
Product Home Screen	Pump Mode section on page 34
	Target Rate section on page 34
	Tank Volume section on page 35
Product Setup Screen	Pump Size section on page 36
	Meter Cal section on page 36
	Valve Cal section on page 36
	Valve Cal 2 section on page 37
	Direct Injection (DI) Tank Capacity section on page 37
	Pressure Cal section on page 37
	Rate Bump (±) section on page 38
	Display Smoothing section on page 39
	Zero Speed Shutoff section on page 39
	Agitator Enable section on page 39
Ratio Rate Enable section on page 39	
Alarm Setup Screen	Low Tank section on page 40
	Off Rate section on page 40
	FER Cal section on page 40
	Low Limit section on page 41

**NOTE:** These settings must be programmed for each injection product or pump which will be used to control product during an application. Refer to the specific control console manual for instructions on programming these settings or other calibration information on the console.

To access the Raven Product Control screen and begin calibrating the Sidekick Pro™ ISO injection pump:

1. Select the UT display menu.



2. Locate the ISO injection pump icon in the UT menu similar to the following.



**NOTE:** The UT menu will display a pump icon for each pump detected on the ISOBUS system.

3. Select the desired pump number to calibrate and proceed to the following sections to set up the Sidekick Pro™ ISO direct injection pump for the first time:

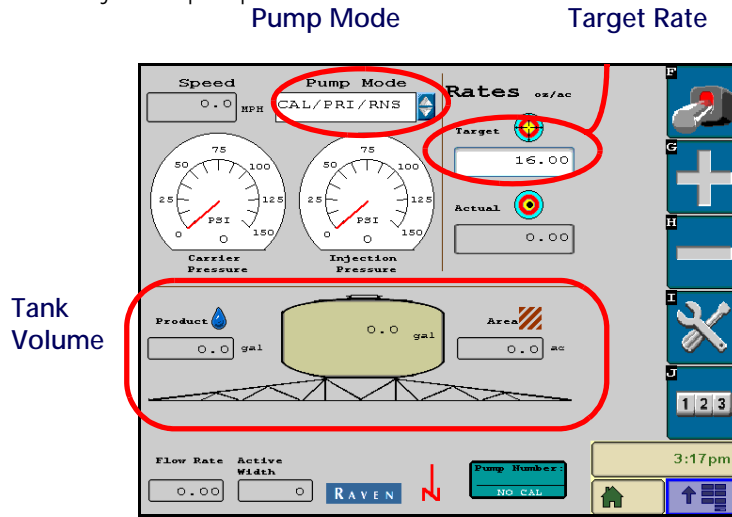


- Product Home Screen Calibration Settings section on page 34.
- Product Setup Screen Calibration Settings section on page 35.
- Alarms Setup Screen Calibration Settings section on page 39.

Once the calibration settings or values on these screens are configured or set, the Sidekick Pro™ ISO pump may be controlled with the UT display.

## PRODUCT HOME SCREEN CALIBRATION SETTINGS

The Product Control Home screen display provides access to the following calibration settings for the Raven Sidekick Pro™ ISO direct injection pump:



### PUMP MODE

The current pump mode is displayed at the top of the Product Control Home screen. Select the pump mode to change the operation mode of the injection pump between CAL/PRI/RNS, Manual, Auto and Rx.

**NOTE:** The CAL/PRI/RNS mode will be used during the pump calibration, prime, or rinse process. Refer to Chapter 5, Operation, for information on the manual, automatic and Rx pump modes.

### TARGET RATE

The programmed target rate for operations is displayed in the Rates area to the right side of the Product Control home screen. Enter the desired rate of injected chemical in ounces per acre [deciliters/hectare].

**Verifying Flow Rate Limits.** Before starting actual field operations, use the following formula to verify that Sidekick Pro™ ISO is capable of applying at the target application rate and speeds:

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

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

Flow Output Range	P/N 063-0173-402 5-200 oz./min. [1.5-59 dl/min.]	P/N 063-0173-403 1-40 oz./min. [0.3-11.8 dl/min.]
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**FOR EXAMPLE:**

When using U.S. units, given a target rate of 75 oz./acre, a target application speed of 11.0 MPH, and a boom width of 85 ft. (1020 in.):

$$\text{Volume/Minute} = \frac{75 \times 11.0 \times 1020}{5940} = 141.67 \text{oz/min}$$

Thus, the desired rate of 75 oz./acre is within the capacity of the 5 - 200 oz./min. pump, but will not be acceptable for the 1 - 40 oz./min. pump.

When using Metric units, given a target rate of 50 dl/ha, a target application speed of 17.0 km/h, and a boom width of 25 m (2500 cm):

$$\text{Volume/Minute} = \frac{50 \times 17.0 \times 2500}{60000} = 35.42 \text{dl/min}$$

Thus, the desired rate of 50 dl/ha is within the capacity of the 1.5 - 59 dl/min. pump, but will not be acceptable for the 0.3 - 11.8 dl/min. pump.

### TANK VOLUME

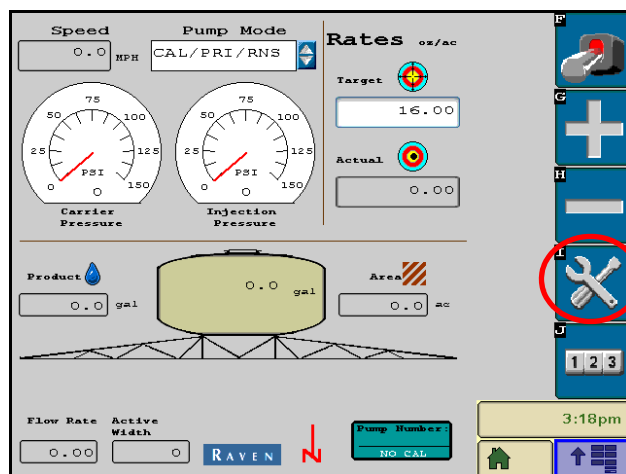
Select the tank volume indicator during field operations to enter the volume of product used to fill the tank. This volume is used to calculate the volume remaining in the tank and for the low tank alarm if enabled.

It is only necessary to enter a non-zero value during the initial pump calibration and while verifying the pump installation. Review the Verify Installation of the Sidekick Pro™ ISO section on page 29 for the proper procedure for checking the pump installation.

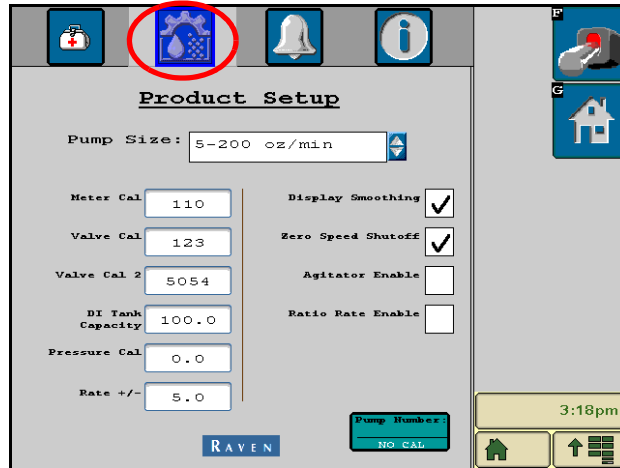
**NOTE:** Refer to Chapter 5, Operation, for more information entering tank product volumes and operating the Sidekick Pro™ ISO during field operations.

### PRODUCT SETUP SCREEN CALIBRATION SETTINGS

1. Select the Tools icon from the soft keys area on the right side of the Product Control Home screen.



2. Touch the Product Setup icon along the top of the UT display.



3. Refer to the following sections for information on the displayed settings and options. Once all settings have been programmed for the selected pump, proceed to the Sidekick Pro™ ISO Priming and Calibration section on page 43 to test operation of the pump.

### PUMP SIZE

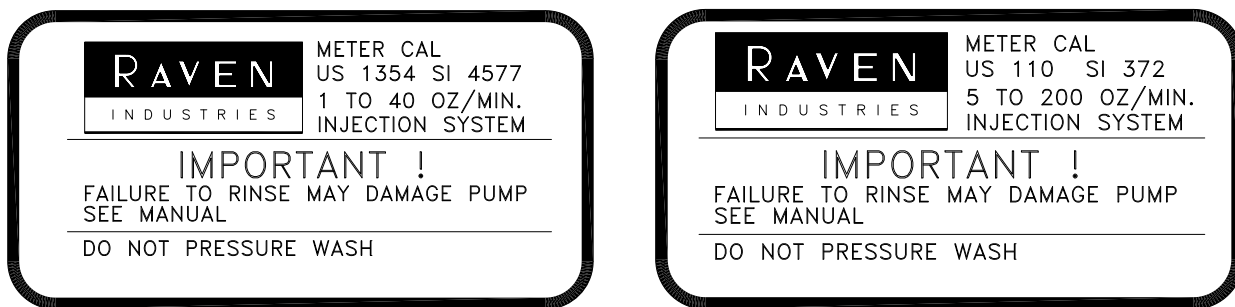
Select the size of the injection pump at the selected address. Select the 5-200 oz./min. [1.5-59 dl/min.] for the high volume pump or 1-40 oz./min. [0.3-11.8 dl/min.] for the low volume pump.

### METER CAL

The meter cal value for the Sidekick Pro™ ISO injection pump may be found on the label located on the pump motor. Enter this value as the initial meter cal in the control console.

**NOTE:** The meter cal may be adjusted to refine calibration of the chemical injection pump. Refer to the Calibrate the Injection Pump section on page 44 to check or refine the meter cal.

FIGURE 1. Sidekick Pro™ ISO Pump Motor Label with Meter Cal

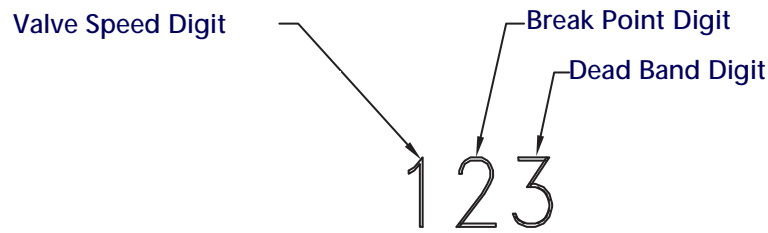


### VALVE CAL

The valve cal is used to modify the control response of the injection pump and adjust how the pump controls the injected product. The default valve cal value for any injection pump is 123.



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



**NOTE:** The initial valve cal may be adjusted to refine Sidekick Pro ISO system response for various application needs.

**Valve Speed Digit.** This value controls the response time of the control valve motor. If the valve speed setting is too fast, the valve will over correct and the system may start to oscillate. When operating a Sidekick Pro ISO injection pump, this value has a range from 0 to 9, with 0 being slow and 9 being fast.

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

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

## VALVE CAL 2

The valve cal 2 value is not editable by the vehicle operator. A customer service key is required to modify this value. The default value for a high volume pump is '5054' and for a low volume pump is '5055.'

## DIRECT INJECTION (DI) TANK CAPACITY

Enter the capacity of the direct injection chemical supply tank in gallons.

## PRESSURE CAL

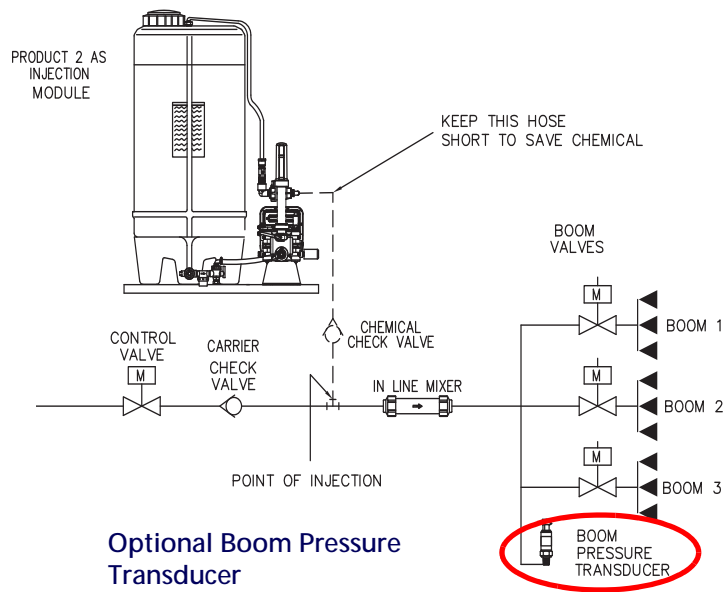
**NOTE:** Injection pump software version 1.0.6.3 and later. The transducer is pre-calibrated.

Before operating the Sidekick Pro ISO system, calibrate the pressure transducers which monitor both the injected chemical and carrier product pressures.

Pressure of the injected product is monitored by a pressure transducer connected to the Sidekick Pro ISO pump. Pressure of the carrier product is monitored by an optional boom or carrier product line pressure transducer.



FIGURE 2. Boom Pressure Transducer Location



**NOTE:** Sidekick Pro™ ISO uses these pressure transducers to verify injection status and for error detection.

To calibrate the pump transducer:

**NOTE:** Injection pump software version 1.0.6.3 and later. The transducer is pre-calibrated.

**NOTE:** The following process offers a general overview of calibrating or resetting the Sidekick Pro ISO pump pressure transducer. Refer to the operation manual for the specific control console for detailed navigation and calibration of the pressure transducer or pressure display.

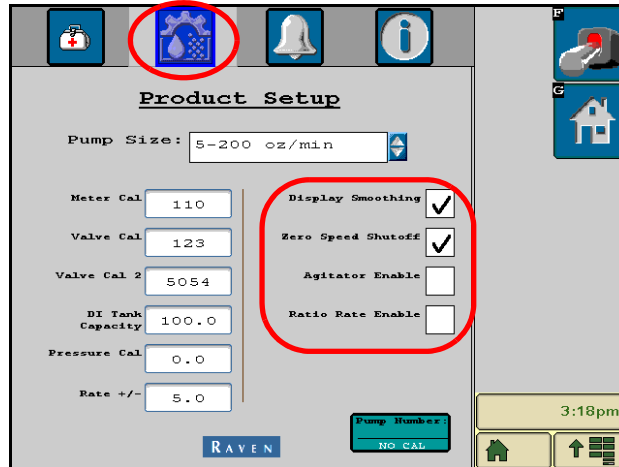
1. Turn off the injection pump and product control system and ensure there is no pressure at the pump outlet port.
2. Select or display the set up screens for the correct product.
3. Verify no product pressure is in the injection lines.
4. Enter a value of zero for the pressure calibration value.

**RATE BUMP (±)**

Enter the desired rate change when using the rate increase (+) or decrease (-) soft keys on the product control home screen.

**NOTE:** The rate increase and decrease feature is only functional when the injection product is set to either automatic or Rx mode.

DISPLAY SMOOTHING



Toggle the display smoothing feature to smooth the rate displayed on the product control home screen. With the feature enabled, as long as the actual rate is within 10% of the actual application rate, the target rate will display as the actual rate on the display. The actual rate will be displayed if the actual rate does not reach the target rate dead band (+/-3%) within 10 seconds.

ZERO SPEED SHUTOFF

The zero speed feature will automatically turn off product application if the vehicle speed drops below 0.7 mph [1.1 km/h] while in automatic mode. To restart the system, cycle the master switch 'Off' then back 'On.' A speed of 0.7 mph [1.1 km/h] must be maintained for more than 10 seconds or the zero speed feature will reactivate.

AGITATOR ENABLE

If equipped with an injection system featuring an agitator enabled output, this option enables or disables a chemical agitator.

RATIO RATE ENABLE

The ratio rate feature configures the selected control channel to apply an injected chemical at a rate proportional to the carrier product flow rate. The ratio rate application mode must be enabled via the control console and a ratio rate cal value must be entered for each product controlled in ratio to the carrier.

**NOTE:** If the off rate alarm is triggered frequently during injection applications in ratio rate mode, access the volume per minute display on the control console and verify that the target flow rate is within the application range for the pump.

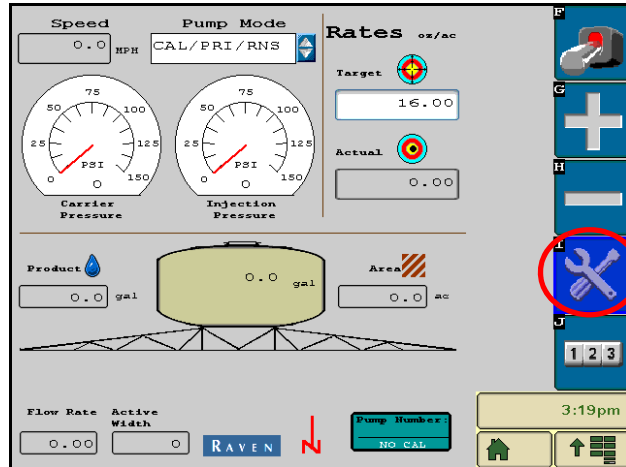
The ratio rate calibration value is entered as the ratio of injected chemical to carrier in ounces per gallon [deciliters per liter].

ALARMS SETUP SCREEN CALIBRATION SETTINGS

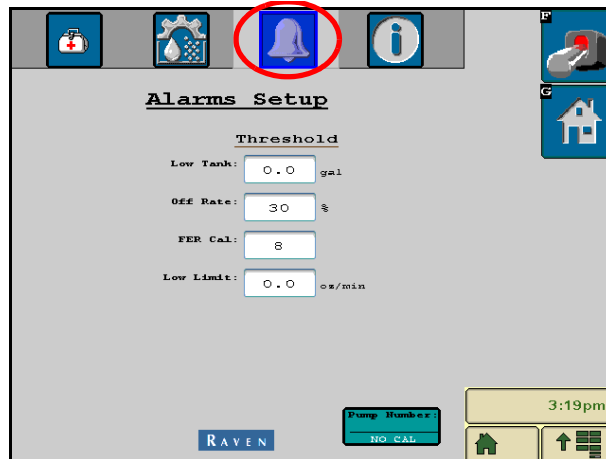
In addition to the product control capabilities of the Raven ISOBUS product control system, the ISOBUS communication protocol offers excellent error detection capabilities, making it very suitable and reliable for agricultural applications. To access the Alarm Setup screen:



1. Select the Tools icon from the soft keys area on the right side of the Product Control Home screen.



2. Touch the Alarms icon along the top of the display to access the Alarms Setup screen.



Refer to the following sections for details on the alarm settings available on the Alarms Setup screen.

### LOW TANK

Enter the volume at which the system will display an alert when the calculated volume of product remaining in the tank drops below the desired value. Enter a value of zero to disable the low tank alarm.

### OFF RATE

Enter the percent at which the off rate alarm will activate. The off rate alarm activates when the actual rate differs from the target rate by the programmed value for longer than five seconds.

### FER CAL

The FER (Flow Encoder Ratio) cal value is used to set the flow error tolerance of chemical injection applications. Increase the FER error cal value to set a tighter tolerance. Set the FER error cal to zero to turn off all flow monitor alarms for the injected chemical. The default value is 8.

## LOW LIMIT

The low limit value sets the minimum volume per minute which a product will be applied. If the flow meter drops below this setting, an alert will be displayed on the UT control console.

**NOTE:** The injection pump will maintain the current rate when the Low Limit setting is reached.



## SIDEKICK PRO™ ISO PRIMING AND CALIBRATION

Before starting application of injected products, perform the following procedures to ensure the system is properly calibrated and ready for chemical application:

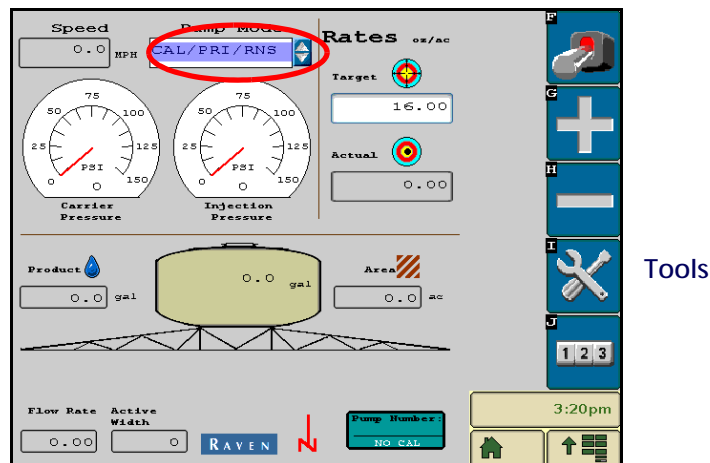
1. Verify control console setup
2. Prime the injection pump
3. Calibrate the injection pump

### VERIFY CONTROL CONSOLE SETTINGS

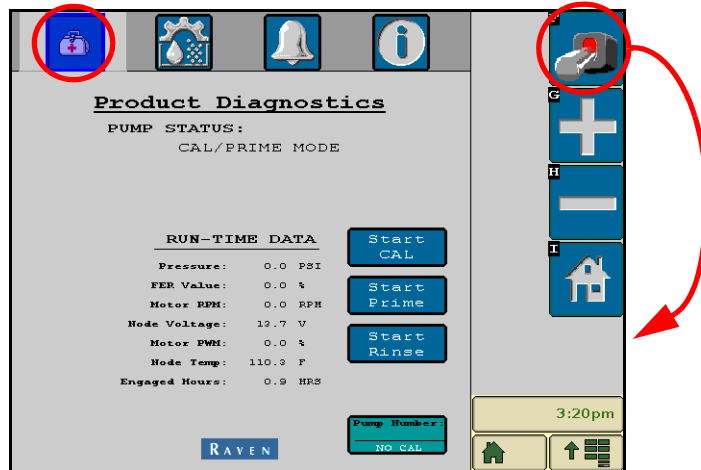
Review the Universal Terminal Calibration section on page 32 and verify that the correct settings for the chemical injection product are programmed for the correct product node or product number.

### PRIME THE INJECTION PUMP

1. Open the hand valve(s) between the supply tank and injection pump.
2. Set the hand valve on the injection pump outlet to recirculate product back to the supply tank.
3. Lift the plunger handle on the pump calibrator to the top of the calibration cylinder.
4. Verify the following conditions are present:
  - a. Vacuum pressure for the injected product must be less than 5.5 PSI [37.92 kPa]
  - b. Injection pump discharge pressure must be less than 12 PSI [82.7 kPa]
  - c. Injection product pump mode must be set to "CAL/PRM" (Calibration/Prime)
  - d. Injection pump product master switch must be set to on
5. On the UT display, set the pump mode on the main product control screen to "CAL/PRI/RNS."



6. Select the Tools icon and select the diagnostics icon to access the Product Diagnostics screen.



7. Select the Master Switch icon to toggle the master switch to the On position and select the 'Start Prime' button from the soft keys area.
8. Verify that the hand valve is set to the recirculation mode and select the 'OK' button.
9. The priming procedure will run until the controller detects the pump has primed. If the pump is unable to prime, the console will end the priming procedure after two minutes and display a "prime time-out" message.

**NOTE:** If the console displays an error message during the priming process, verify that the conditions listed in step 4 are present. If the problem continues, see Chapter 6, Injection Diagnostics and Troubleshooting, to resolve issues during the pump priming process.

Press the "Stop Prime" button to stop the priming procedure at any time. If the pump fails to prime successfully after the first attempt, restart the priming procedure. If the pump is still unable to prime successfully, refer to Chapter 6, Injection Diagnostics and Troubleshooting, for assistance diagnosing issues with the injection system.

10. When the display shows the prime complete message, touch the 'Stop Prime' button to stop the priming process.

**NOTE:** Before beginning an application, verify that the hand valve is set to the injection position and select the OK button on the UT display to proceed. If the hand valve is not set properly, the pump will not inject chemical into the main product line during an application.

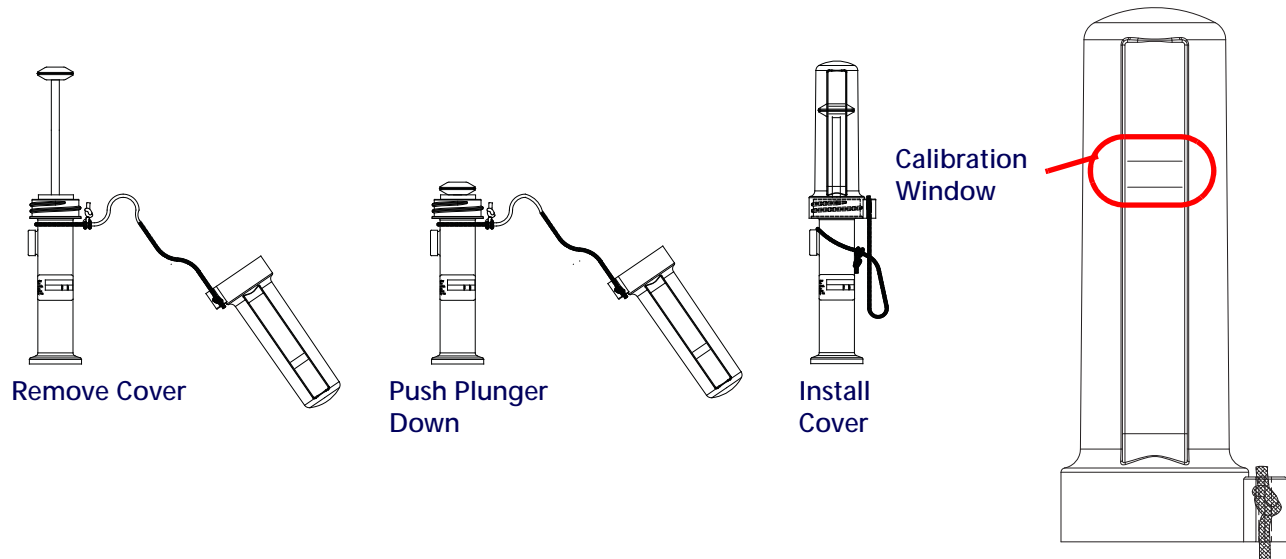
## CALIBRATE THE INJECTION PUMP

Prior to starting a field operation with an injected chemical, verify that the pump is properly calibrated and operational by performing a pump calibration.

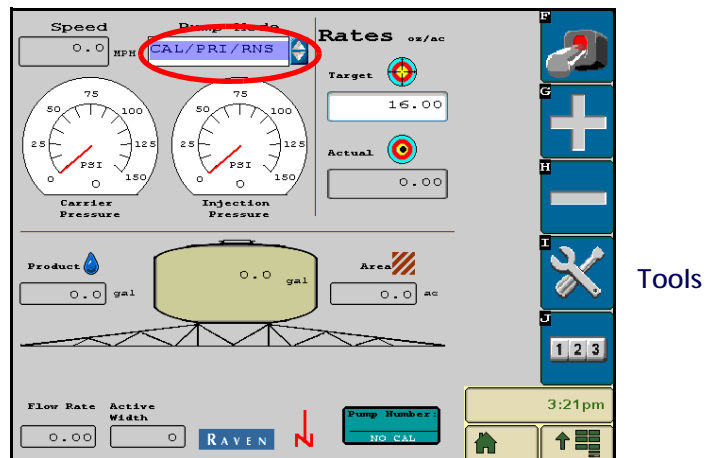
1. Ensure the pump is primed as described in the Prime the Injection Pump section on page 43 before proceeding with the calibration process.
2. Remove the cover from the injection pump calibrator.
3. Press the calibrator all the way down and replace the calibrator cover.



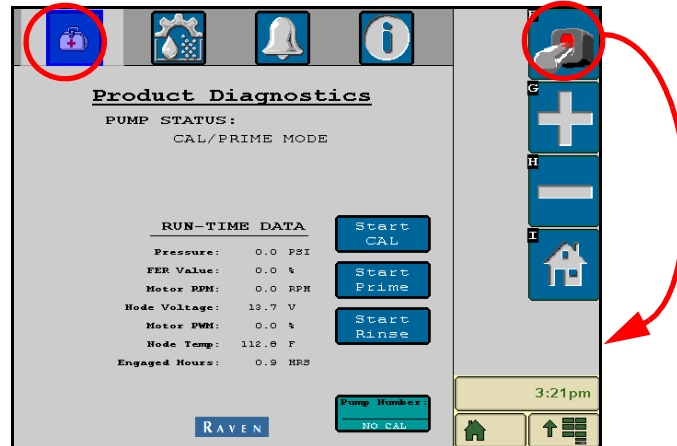
FIGURE 1. Sidekick Pro™ ISO Pump Calibrator



4. Verify the following conditions are present:
  - a. Pump pressure less than 12 PSI [82.7 kPa]
  - b. Vacuum pressure for the injected product must be less than 5.5 PSI [37.92 kPa]
  - c. Injection product pump mode must be set to "CAL/PRI/RNS" (Calibrate/Prime/Rinse)
  - d. Injection pump product master switch must be set to on
5. On the UT display, set the pump mode on the main screen to "CAL/PRI/RNS."



6. Select the Tools icon and select the diagnostics icon to access the Product Diagnostics screen.



7. Select the Master Switch icon to toggle the master switch to the On position and select the 'Start CAL' button from the soft keys area.
8. Verify that the hand valve is set to the recirculation mode and ensure that the closed calibration plunger is pushed all the way down on the pump and select the 'OK' button.
9. The pump will proceed to run until the console detects that 1 oz. [0.3 dL] of chemical has been passed through the pump. The console will display a "CAL complete" message.

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

If the console displays an error message during the calibration process, verify that the conditions listed in step 4 are present. If the problem continues, see Chapter 6, Injection Diagnostics and Troubleshooting, to resolve issues during the pump calibration process.

After the initial calibration has been completed, the injection pump calibration process may be re-initiated by passing a metal object past the integrated calibration sensor twice. Use an object such as a screw driver or spare bolt.

10. When the display shows the calibration complete message, touch the 'Stop CAL' button to stop the calibration process.
11. Check the calibrator plunger on the injection pump. The black ring on the plunger should stop within the "window" markings on the calibrator cover if the pump calibration is successful. If the black ring stops slightly outside of the calibration window, the meter cal value may be adjusted to compensate:
- If the plunger stops below the calibration window, increase the meter cal.
  - If the plunger stops above the calibration window, decrease the meter cal.

The initial meter cal should be adjusted in increments of 1% from the default meter cal. If the meter cal must be increased or decreased by more than 5% from the value printed on the pump housing, perform pump maintenance procedures outlined in Chapter 7, System Maintenance. If the problem persists, see Chapter 6, Injection Diagnostics and Troubleshooting, for possible solutions to issues with the injection pump.

**NOTE:** Before beginning an application, verify that the hand valve is set to the injection position and select the OK button on the UT display to proceed. If the hand valve is not set properly, the pump will not inject chemical into the main product line during an application.

---

## APPLICATION MODES AND PUMP OPERATION

The following sections outline control features and application modes which may be used with an injection system.

### APPLICATION MODES

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

**CAL/PRI/RNS.** This mode allows for chemical to be primed to the outlet of the pump and to validate pump performance through a 1 oz. calibration test. Refer to the Prime the Injection Pump section on page 43 or the Calibrate the Injection Pump section on page 44 for details on the CAL/PRI/RNS mode.

**Automatic.** This mode allows for the injection pump to run at a target application rate (oz./ac or L/ha) by compensating for changes in section width and speed.

**Manual.** This mode allows for the injection pump to be run at a fixed flow rate (oz./min. or L/min.). The application rate (oz./ac. or L/ha) does not compensate for section width and speed changes. This mode is typically used for testing purposes.

**Rx.** This mode allows the system to automatically change the rate of injected chemical based upon a prescription map loaded on the UT display.

The following procedure outlines the general operation of Sidekick Pro ISO and controlling an injected chemical in the manual, automatic and Rx modes.

**NOTE:** Perform pump priming and calibration checks before beginning to apply an injected chemical. Be sure to verify console calibration settings for each injection pump before operating the Sidekick Pro ISO pump(s).

### SETTING THE PUMP FOR FIELD OPERATION

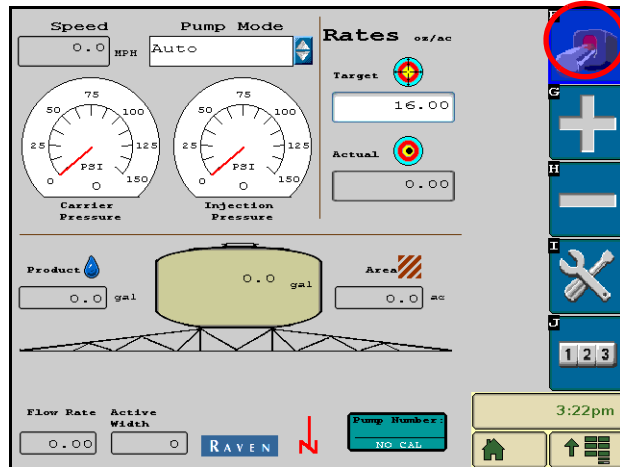
1. Check injection system hand valves and ensure that product will be routed to the point of injection and boom valves.
2. Toggle the master boom switch to the off position.
3. Turn product control on for each of the injected chemical(s) on the control console.
4. Select manual or automatic or Rx pump mode for each Sidekick Pro ISO pump. Refer to the Application Modes section on page 47 for details on each pump mode.
5. Increase vehicle speed and toggle the master boom switch to the on position. The Sidekick Pro ISO injection pump will begin injecting product into the main product line at the injection point.

**NOTE:** If the pump does not turn on or an error is displayed, verify calibration values in the control console, make sure the system has a rate cal, speed, and an active boom section, and verify that the pump is primed. See Chapter 6, Injection Diagnostics and Troubleshooting, if the pump still does not respond.

6. To shut the injection pump off:
  - a. Toggle the master boom switch to the off position.



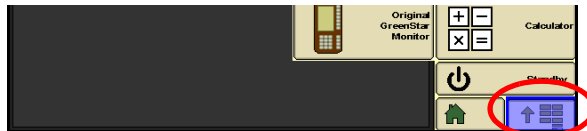
- b. Toggle the selected injection pump master switch to off.



### SIDEKICK PRO™ ISO OPERATION

Each Sidekick Pro™ ISO injection pump may be monitored during field operations via the UT display using the respective Product Control Home screen.

1. Select the UT display menu.

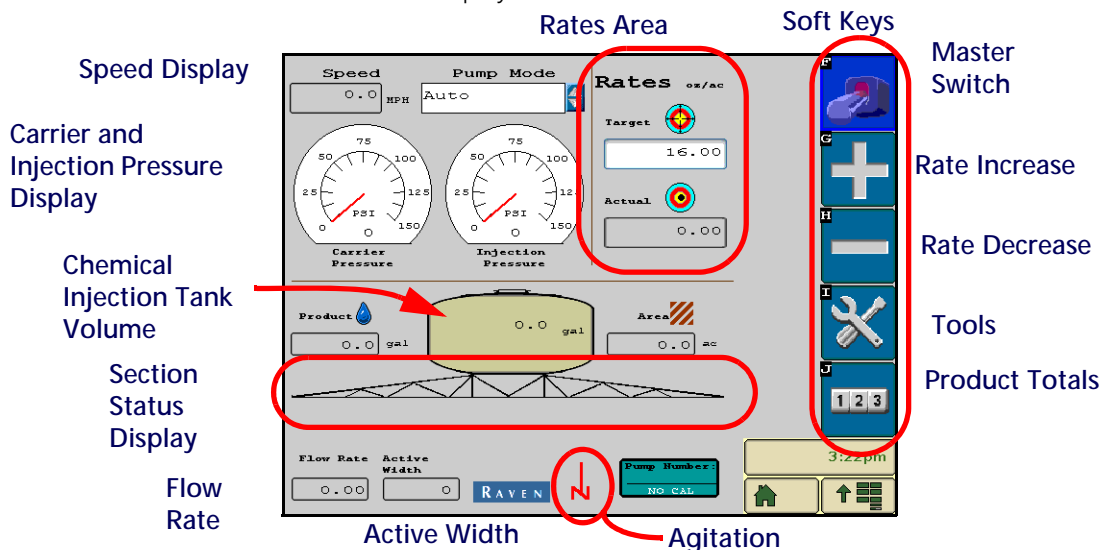


2. Locate the ISO injection pump icon in the UT menu similar to the following.



**NOTE:** The UT menu will display a pump icon for each pump detected on the ISOBUS system.

3. The Product Control Home screen will be displayed.



The Product Control Home screen may be used to monitor operation of each Sidekick Pro ISO direct injection pump connected to the ISOBUS system. The following sections offer a brief description of the information displayed on the Product Control Home screen during field operations.

### SPEED DISPLAY

The speed reported over the ISOBUS is displayed on the Product Control Home screen for reference. If the pump mode is set to automatic during field operations, the Sidekick Pro ISO will automatically adjust the chemical injection rate for changes in vehicle speed.

**NOTE:** The Product Control Home screen displays the current flow rate for the selected pump in the lower, left corner of the UT display for reference during field operations.

If the speed display is not registering actual vehicle speed properly, the product control and injection system may not be applying the correct amount of product during field operations. Troubleshoot the speed sensor as necessary.

### CARRIER AND INJECTION PRESSURE DISPLAYS

The Product Control Home screen displays the carrier and injected chemical pressure for the selected injection pump for reference during field operations. The injection pressure is monitored at the pump outlet port.

### SECTION STATUS DISPLAY

The status of sections configured with the ISO product control system is displayed on the injection Product Control Home screen for reference. If the pump mode is set to automatic during field operations, the Sidekick Pro ISO will automatically adjust the chemical injection rate for active sections.

**NOTE:** The Product Control Home screen displays the calculated width of active sections in the lower, left corner of the UT display for reference during field operations.



### SOFT KEYS

**Master Switch.** Select this icon to toggle the injection pump on or off.



**Rate ± (Increase/Decrease).** Use the rate increase and decrease buttons to adjust the target application rate in automatic control mode. When selected in manual mode, the rate increase or decrease buttons adjust the actual rate of injection.

Refer to the Target Rate section on page 34 to set the rate bump value.

**Tools.** Select the Tools icon to access the Calibration screens. Refer to the following sections for more information on the calibration screens:

Calibration Screen Tab	Section
	Product Diagnostics Screen section on page 53
	Product Setup Screen Calibration Settings section on page 35



Calibration Screen Tab	Section
	Alarms Setup Screen Calibration Settings section on page 39
	Product Information Screen section on page 55

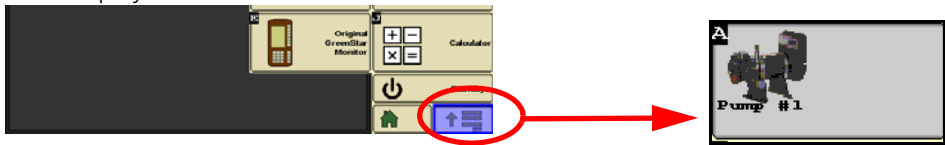
**Product Totals.** Select the Product Totals icon to view the volume and area registers for the field or cumulative since the last time the totals were reset. Refer to the Product Totals Screen section on page 50 for more information on the Product Totals screen and information displays.

## PRODUCT TOTALS SCREEN

The Product Totals screen displays the field and total area covered and product volume applied. The field volume and area tallies are intended to track the operation in a single field or over the course of the days operations while the total volume and area tally may be used over a full application season.

To access the Product Totals screen on the UT display:

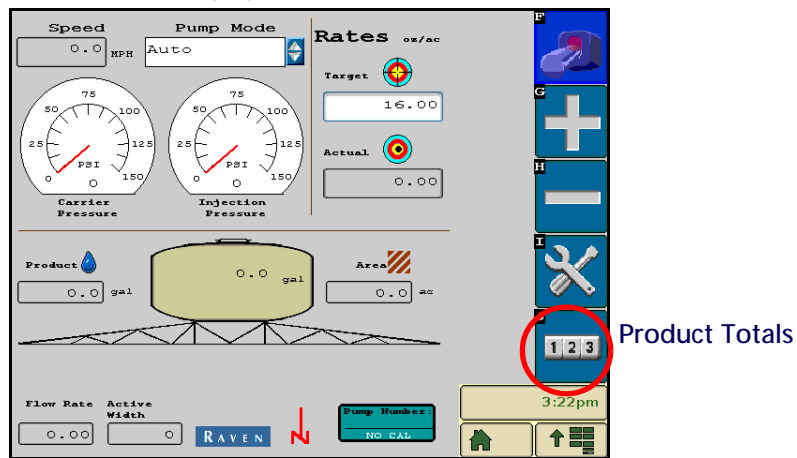
1. Select the UT display menu.



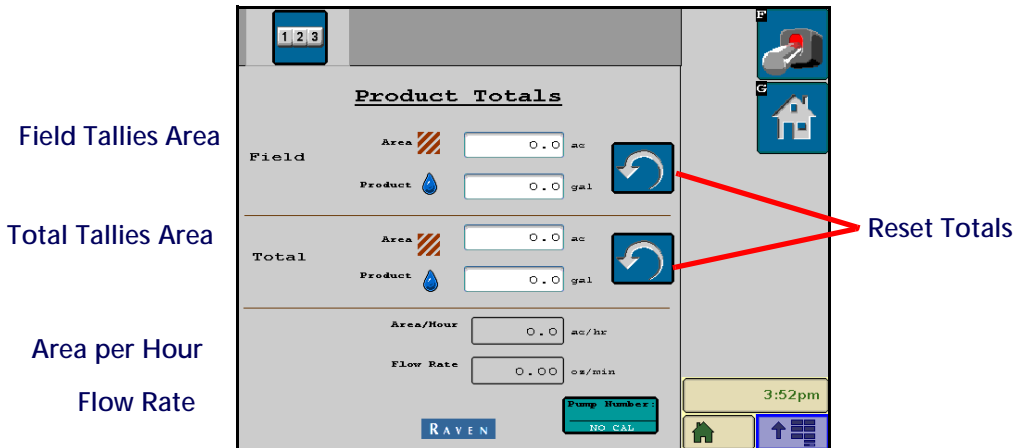
2. Locate the ISO injection pump icon in the UT menu similar to the following.

**NOTE:** The UT menu will display a pump icon for each pump detected on the ISOBUS system.

3. The Product Control Home screen will be displayed.



4. Select the Product Totals icon from the soft keys area to access the Product Totals screen.



**NOTE:** The Total area and product volume tally are displayed on the Product Control Home screen for reference during field operations.

The Product Totals screen displays the following information for the selected pump control channel:

### FIELD TALLIES AREA

#### FIELD AREA

The area total in the field tallies area displays the field area covered since the field totals were last reset.

#### FIELD PRODUCT VOLUME

The product total in the field tallies area displays the volume of product applied since the field totals were last reset.

#### RESET FIELD TALLIES

Touch the reset button in the field tallies area to reset the field totals for the next field or job area.

### TOTAL TALLIES AREA

#### TOTAL AREA

The area total in the total tallies area displays the total field area covered since the totals were last reset.

#### TOTAL PRODUCT VOLUME

The product total in the field tallies area displays the volume of product applied since the field totals were last reset.

#### RESET TOTAL TALLIES

Touch the ">0" button in the field tallies area to reset the field totals for the next field or job area.



## AREA PER HOUR AND FLOW RATE DISPLAY

The current rate of area covered per hour and the current flow rate for the selected pump control channel is also displayed on the Product Totals screen for reference during field operations. These instantaneous readings may be helpful to troubleshoot or diagnose any issues with the injection or product control system or to quickly verify pump operation during active jobs.



# CHAPTER

# 6

# INJECTION DIAGNOSTICS AND TROUBLESHOOTING

## PRODUCT DIAGNOSTICS SCREEN

The Sidekick Pro™ ISO direct injection system provides a diagnostics screen which provides data for the equipment operator or a service technician to help diagnose issues encountered with the injection system. To access the pump diagnostics on the UT display:

1. Select the UT display menu.

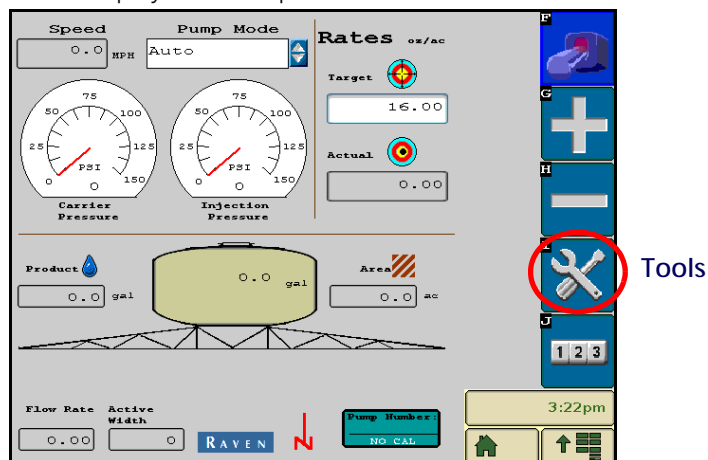


2. Locate the ISO injection pump icon in the UT menu similar to the following.

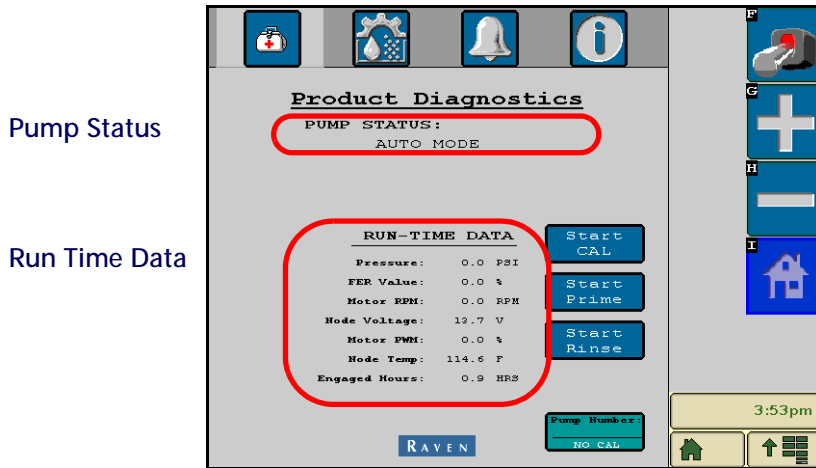


**NOTE:** The UT menu will display a pump icon for each pump detected on the ISOBUS system.

3. Select the injection pump icon to display the main product control screen for the selected injection pump.



- Select the Tools icon from the soft keys area and select the diagnostics icon at the top of the display to access the Product Diagnostics screen for the selected product pump.



Pump Status

Run Time Data

## PUMP STATUS

The current pump mode is displayed for reference during diagnostic tests. When priming or calibrating the injection pump, verify that this status display reads “Cal/Prime” before priming or calibrating the injection pump.

The following status modes may be displayed on the Product Diagnostics screen:

Modes	Description
Auto (Automatic)	This mode allows for the injection pump to run at a target application rate (oz./ac or L/ha) by compensating for changes in section width and speed.
Manual	This mode allows for the injection pump to be run at a fixed flow rate (oz./min. or L/min.). The application rate (oz./ac. or L/ha) does not compensate for section width and speed changes. This mode is typically used for testing purposes.
Rx	This mode allows the system to automatically change the rate of injected chemical based upon a prescription map loaded on the UT display.
CAL/PRM Calibrate/Prime)	This mode allows for chemical to be primed to the outlet of the pump and to validate pump performance through a 1 oz. [29.6 mL] calibration test.

## RUN TIME DATA

The following information is available for the selected pump control channel.

**NOTE:** The following usage statistics are the last available values recorded during pump operation.

**Pressure.** The pressure of the injection product monitored at pump outlet port.

**FER Value.** The FER (flow to encoder ratio) value is a tool used in conjunction with the FER Error Cal to identify the relative efficiency of the pump. This area displays a value between 0 and 100.

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

**Node Voltage.** The high current voltage detected by the Sidekick Pro ISO node is displayed in this area.

**Motor PWM.** The percent PWM value may be used to determine how hard the pump is being driven. A value of 100 indicates the pump is being driven at maximum.

**Node Temp.** The temperature of the Sidekick Pro ISO node is displayed in this area. This value, in conjunction with the motor RPM, may be useful to help determine how hard the pump is being driven.

**Engaged Hours.** This value represents the number of hours which the injection node has been engaged for operation.

START CAL, START PRIME, AND START RINSE SOFT KEYS

The Start Cal, Start Prime, and Start Rinse buttons are used during the pump priming, calibration, and rinsing processes. Refer to the Prime the Injection Pump section on page 43 or the Calibrate the Injection Pump section on page 44 for details on performing these processes.

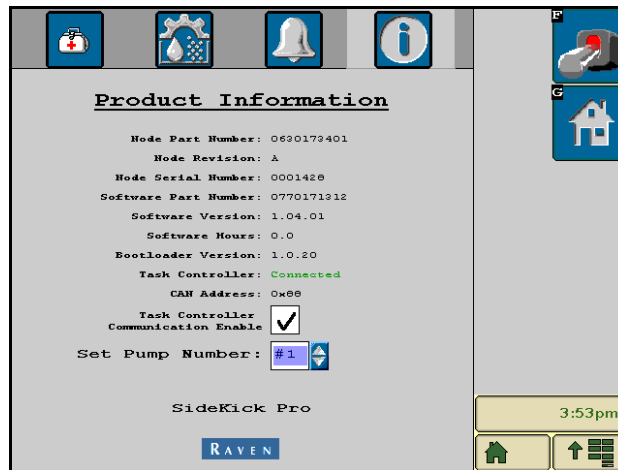
**NOTE:** The injection pump should be primed before starting a pump calibration.

ERROR STATUS AND SOLUTION

If any error conditions are encountered during an injected chemical application, the error type will be displayed on the Injection Settings screen. Refer to Chapter 6, Injection Diagnostics and Troubleshooting, for detailed troubleshooting information and solutions.

PRODUCT INFORMATION SCREEN

Select the information icon along the top of the setup display to access Product Information screen. This screen displays hardware and software version information for the selected Sidekick Pro ISO.



**Node Part Number.** The Raven part number of the Sidekick Pro ISO node.

**Node Revision.** Hardware revision level of the Sidekick Pro ISO node.

**Node Serial Number.** Serial number of the Sidekick Pro ISO node.

**Software Part Number.** The Raven part number of the software installed on the Sidekick Pro ISO system.

**Software Hours.** Software revision level of the Sidekick Pro ISO node.



**Boot Loader Version.** Revision level of the software boot loader on the Sidekick Pro ISO system.

**Task Controller Status.** Indicates whether the Sidekick Pro ISO node is communicating with the ISOBUS task controller.

**Set Pump Number.** Selected address for the Sidekick Pro ISO pump.

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## MOTOR CONTROL NODE LED STATUS INDICATORS

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

FIGURE 1. LED Status Indicators

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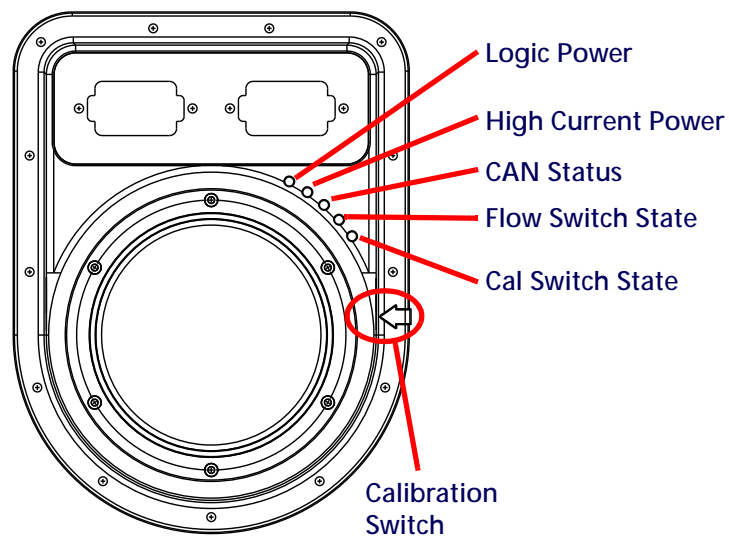


TABLE 1. LED Status Indicators

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

ALARMS


TABLE 2. Sidekick Pro™ ISO Error Codes

Error Description	Possible Cause	Solution
Off Rate Alarm	<ul style="list-style-type: none"> <li>Difference between actual and target application rates has been greater than 28% for more than 5 seconds</li> </ul>	<ul style="list-style-type: none"> <li>Required flow rate is out of range for the injection pump. Calculate the volume per minute required for the application and verify rate is within range of the injection pump.</li> </ul>
Low Tank Alarm	<ul style="list-style-type: none"> <li>Chemical supply tank is below the refill threshold level</li> </ul>	<ul style="list-style-type: none"> <li>Refill injection chemical supply tank and reset tank level in UT display.</li> </ul>
Flow Error Alarm	<ul style="list-style-type: none"> <li>Flow obstruction in inlet cartridges</li> </ul>	<ul style="list-style-type: none"> <li>Perform a pump calibration test. If the pump does not calibrate properly, remove the intake cartridges and perform pump maintenance to clear obstructions.</li> </ul>
	<ul style="list-style-type: none"> <li>Chemical supply tank is out of chemical</li> </ul>	<ul style="list-style-type: none"> <li>Refill chemical supply tank and perform the pump priming procedure.</li> </ul>
Flow Error Alarm	<ul style="list-style-type: none"> <li>Flow obstruction in discharge cartridges</li> </ul>	<ul style="list-style-type: none"> <li>Perform a pump calibration test. If the pump does not calibrate properly, remove the discharge cartridges and perform pump maintenance to clear obstructions.</li> </ul>
Low Pressure Alarm	<ul style="list-style-type: none"> <li>Injection pressure is lower than carrier pressure</li> </ul>	<ul style="list-style-type: none"> <li>Perform a pump calibration test. If the pump does not calibrate properly, clean the injection pump inlet and discharge valves.</li> <li>Calibrate the pump transducer.</li> <li>Check lines between injection pump and in-line mixer.</li> <li>Verify all hand valves are in the correct position.</li> <li>Replace the pump transducer.</li> </ul>




Error Description	Possible Cause	Solution
Maximum Vacuum Alarm	• Clogged pump strainer	• Clean pump strainer and check for obstructions in injection line between the pump inlet and chemical supply tank.
	• Tubing or plumbing size restriction	• Verify the proper size of injection supply tubing is used between the chemical supply tank and pump inlet.
	• Chemical too thick	• Dilute product in chemical supply tank. Some chemicals may not be applied using a direct injection system.
Maximum Pressure Alarm	• Clogged or restricted pump outlet supply lines	• Check for restrictions or blockages in outlet supply lines. Flush the injection system to clear clogs and residue buildup.
	• Tubing or plumbing size restriction	• Verify the proper size of injection outlet tubing is used between the point of injection and pump outlet.
	• Faulty PSI transducer	
	• Hand valve closed	• Check hand valves are open and allow flow from the injection pump outlet port.
	• Low injection pressure	
Pressure Sensor Alarm	• Boom pressure transducer not connected	• If installed, check that the boom pressure transducer is installed and properly connected.
	• Faulty boom pressure transducer	• Replace boom pressure transducer.
Motor/Encoder Alarm	• No power to pump motor	• Verify that the high current LED on the injection pump node is lit.
	• Pump motor or encoder issue	• Check motor and encoder connections. Disconnect the injection pump node from the pump motor and check that the motor and encoder connections are seated properly. If these connections appear solid, return pump to a local Raven dealer for service.
HC Power Alarm	• Injection node not connected to high current power	• Verify high current breaker is not tripped. • Verify battery connections.
Zero Speed Alarm	• Faulty cabling, connection or speed sensor	• Verify speed sensor and signal. Refer to the field computer operation manual for information on testing speed and flow cabling and troubleshooting the speed sensor.
Low Limit Alarm	• Implement speed or width is insufficient to maintain pump rate and the pump "low limit" rate has become active	• The pump will maintain the programmed low limit rate. If this rate is the desired lowest injection rate, no action is required. If the current field operation requires a lower rate of injection, reduce the programmed low limit setting to allow the pump to reduce the rate of injection. Refer to the Low Limit section on page 41.

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

	<p><b>WARNING</b></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>
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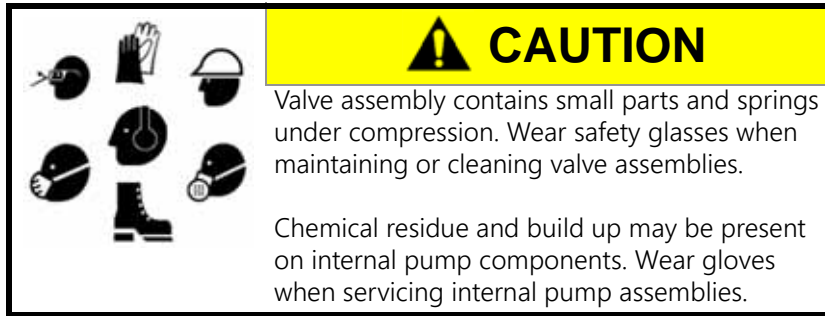
## MAINTENANCE AND CLEANING

	<p><b>WARNING</b></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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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.

## CHECK VALVE O-RINGS



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

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.

**NOTE:** The intake and discharge valve assemblies contain parts which are not interchangeable. To ensure proper re-assembly, it is recommended that the intake and discharge valve assemblies are cleaned and inspected separately.

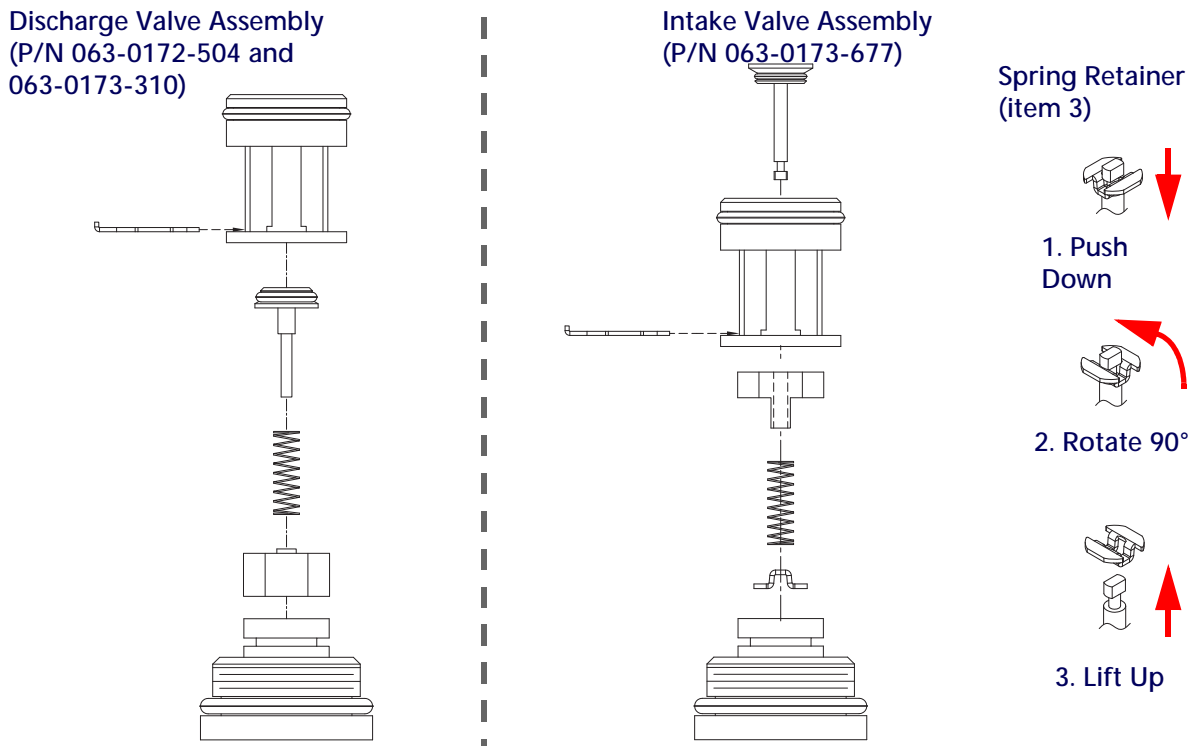
3. Examine the valve assembly O-ring and replace if cut or nicked. These O-rings are made of a chemical resistant compound and should only be replaced with O-rings supplied by a local Raven dealer.
4. Disassemble the check valve assemblies as shown in Figure 1 below.

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

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 1 on page 61.
7. Apply petroleum jelly to valve body O-rings and replace valve assemblies into the pump head and tighten valve plug.



FIGURE 1. Check Valve Assemblies





Item	Description	Raven P/N	Item	Description	Raven P/N
1	Fitting, Plug	107-0171-519 or 107-0171-955 <sup>a</sup>	1	Fitting, Plug	107-0171-519
2	O-ring	219-0002-912	2	O-ring	219-0002-912
3	Guide, Poppet	107-0159-934	3	Retainer, Intake	107-0171-459
4	Spring	314-0000-006	4	Spring	314-0000-005
5	Poppet	107-0159-935	5	Guide, Poppet	107-0171-092
6	O-ring (Viton)	219-0007-011 <sup>b</sup>	6	Stem, Poppet	107-0171-447
7	Clip, Retainer	107-0171-576	7	O-ring (Viton)	219-0007-011 <sup>b</sup>
8	Valve Body, Discharge	106-0159-621	8	Clip, Retainer	107-0171-576
9	O-ring (White)	219-0002-018 <sup>b</sup>	9	Valve, Body Intake	106-0159-719
			10	O-ring (Blue)	219-0002-018 <sup>b</sup>

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

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

PUMP CAM AND BEARING





**CAUTION**


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

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

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

PISTON SEAL REPLACEMENT




**CAUTION**

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

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

**NOTE:** New piston seals are supplied in the Pump Seal Kit (P/N 117-0171-657) available through a local Raven dealer. A complete replacement pump kit (063-0172-924) is available through a local raven dealer.

FIGURE 2. Pump Head and Motor Separation (D/N 016-0171-134)

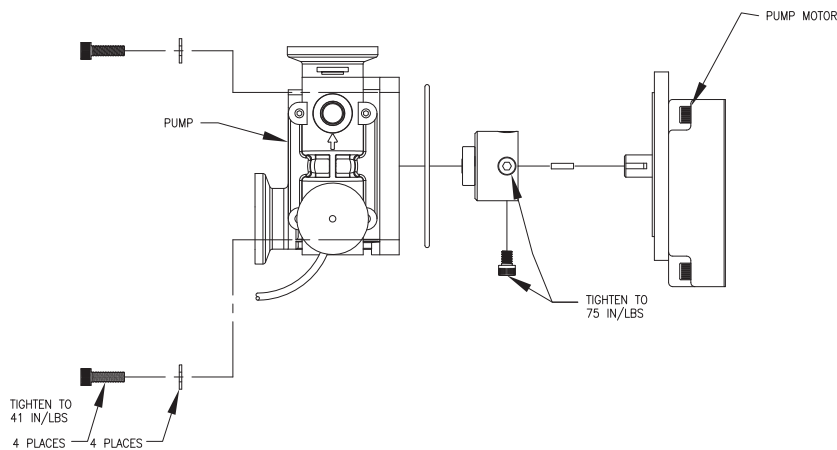


FIGURE 3. Bearing Assembly to Motor Spacing (D/N 016-0171-134)

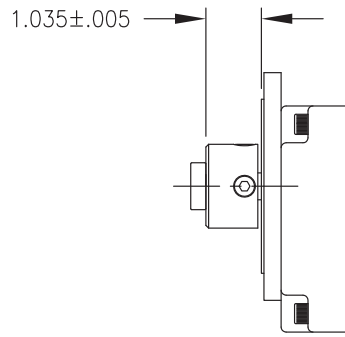
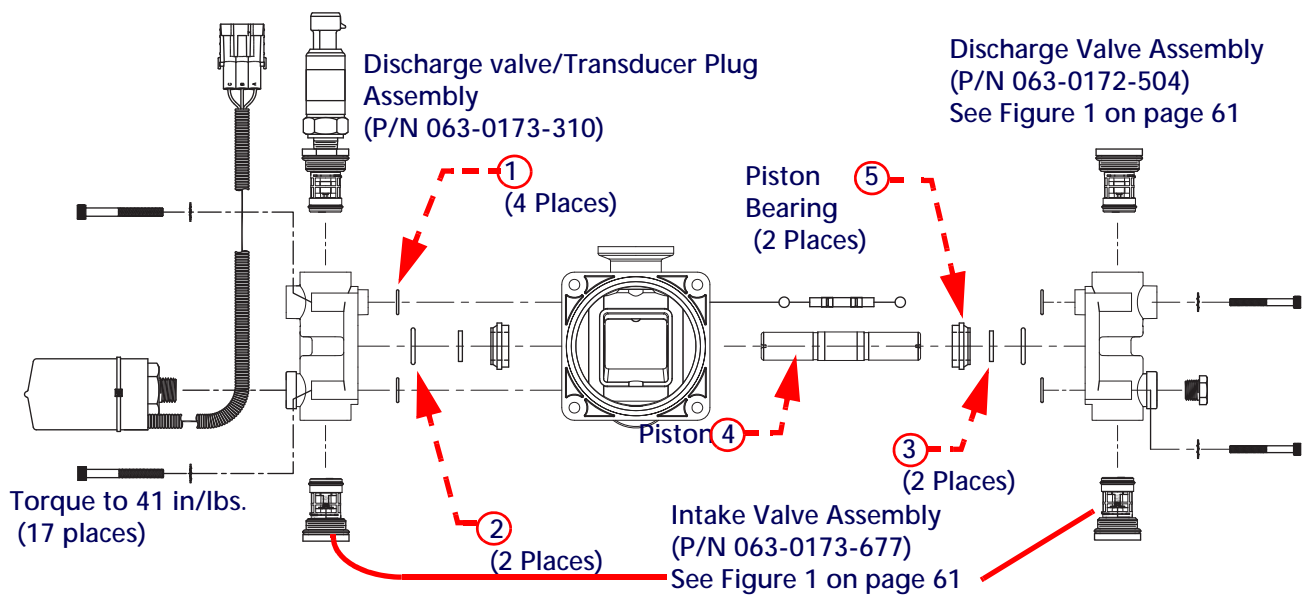


FIGURE 4. Pump Head Parts and Seal Installation (P/N 016-0171-612)



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

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



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

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

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

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

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

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


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

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

10. Tighten socket head screws to the torque specified in Figure 4 on page 63.

---

## SEASONAL MAINTENANCE AND STORAGE


	<p><b>WARNING</b></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>
---	---

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

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

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

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

	<p><b>⚠ CAUTION</b></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 O-rings section on page 60.

**NOTE:** Be sure to reinstall the intake and discharge valves into the correct ports on the injection pump.

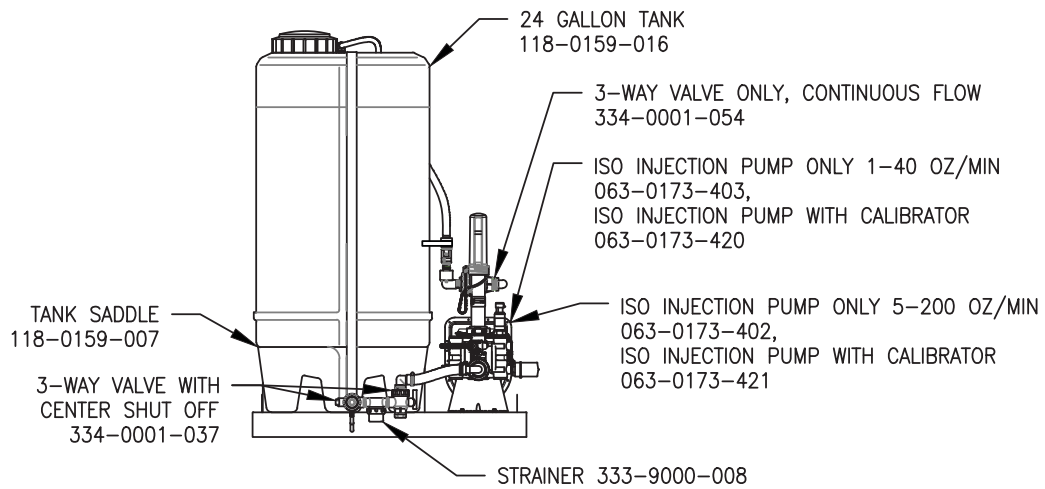
6. Perform the procedure described in the Pump Cam and Bearing section on page 62 to service the cam and bearing.
7. Recirculate a 50% water and automotive antifreeze mixture through the injection pump to check pump operation after reassembly as well as prevent freezing of pump components.



SIDEKICK PRO™ INJECTION MODULE PARTS

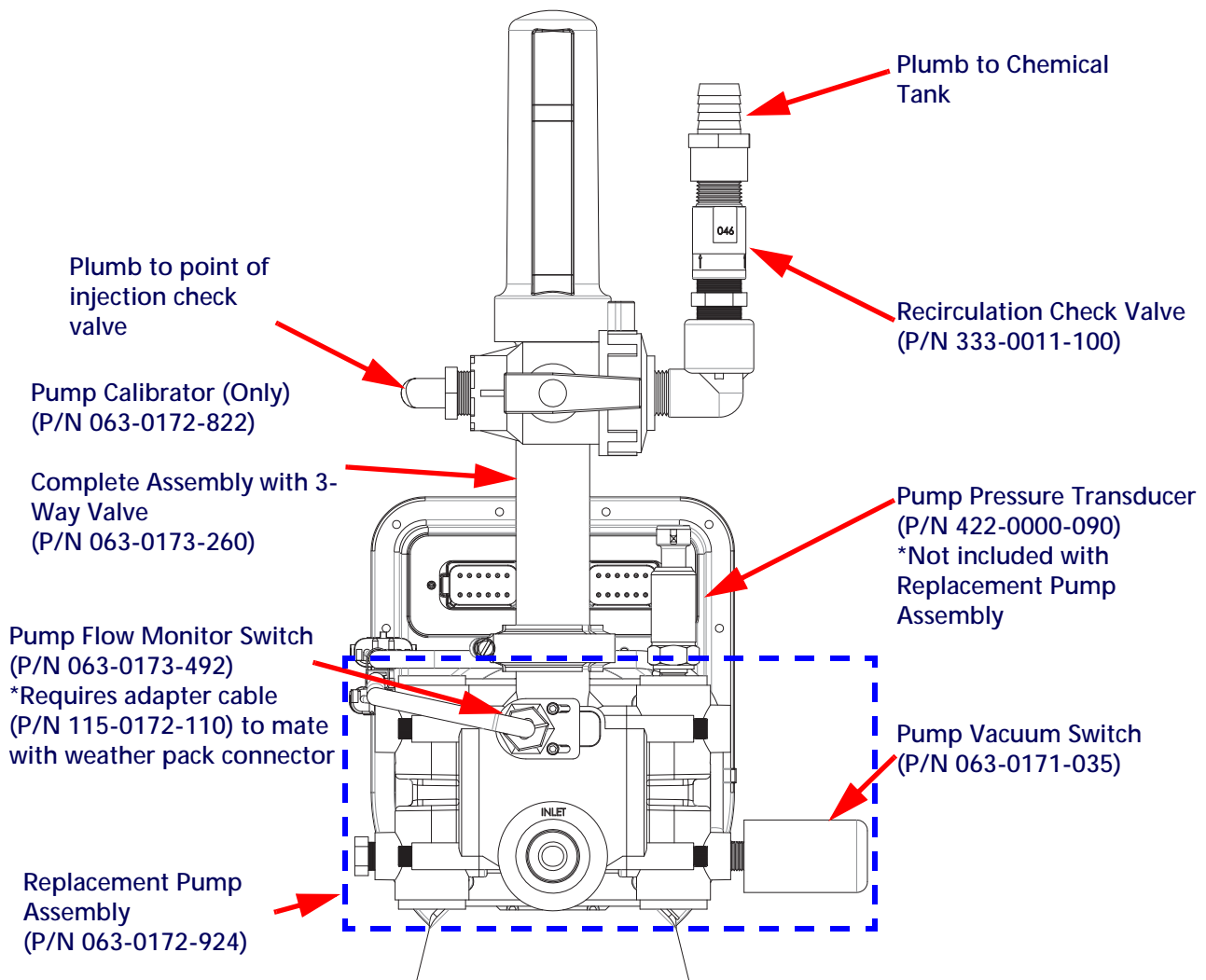
FIGURE 1. Injection Module Components

REPLACEMENT PARTS, PART NUMBER 063-0173-422  
 INJECTION MODULE 24 GALLON, 1-40 OZ/MIN, AND  
 PART NUMBER 063-0173-423  
 INJECTION MODULE 24 GALLON 5-200 OZ/MIN



## SIDEKICK PRO™ ISO PUMP REPLACEMENT PARTS

FIGURE 2. Injection Pump Components




### INJECTION PUMP PRESSURE TRANSDUCER

	<p style="text-align: center;"><b>WARNING</b></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 ISO injection system and turn off the vehicle when replacing the pressure transducer assembly.

	<p style="text-align: center;"><b>⚠ WARNING</b></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 two or three quarter turns to secure the pressure transducer.


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

#### CALIBRATING THE PUMP PRESSURE TRANSDUCER

**NOTE:** The following process offers a general overview of calibrating or resetting the Sidekick Pro™ ISO pump pressure transducer. Refer to the operation manual for the specific control console for detailed navigation and calibration of the pressure transducer or pressure display.

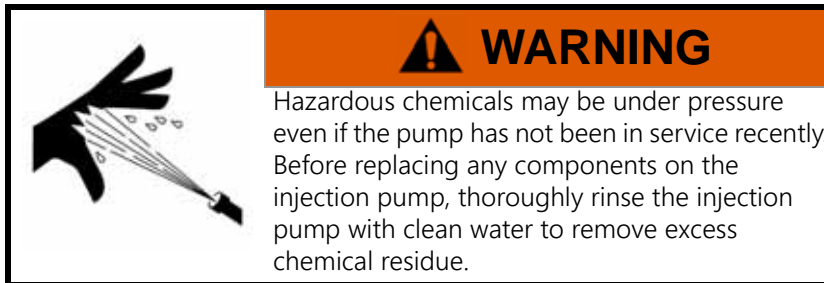
1. Select or display the set up screens for the correct product.
2. Turn off the injection pump and product control system and ensure no product pressure in the injection lines.
3. Enter a value of zero for the pressure calibration value.

#### INJECTION PUMP VACUUM SWITCH

	<p style="text-align: center;"><b>⚠ WARNING</b></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™ ISO injection system and turn off the vehicle when replacing the vacuum switch assembly.



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

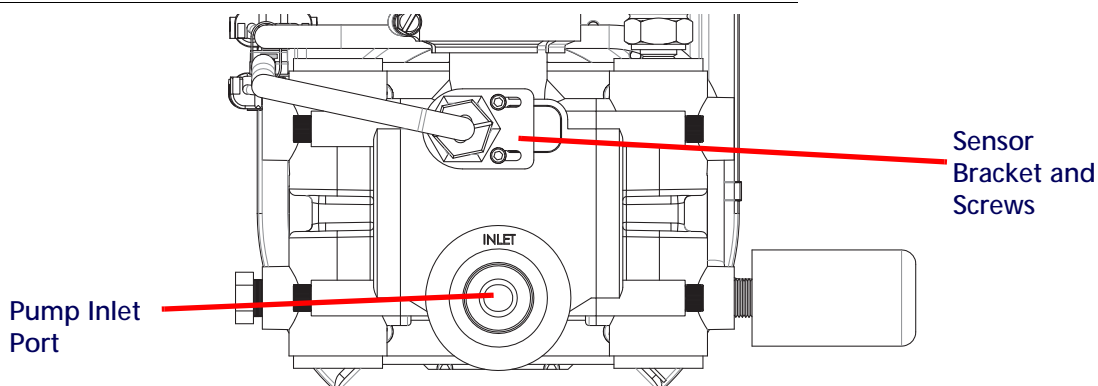
**NOTE:** Do not over tighten the pressure transducer. Overtightening the pressure transducer may damage the pump head.

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

## INJECTION PUMP FLOW MONITOR SENSOR

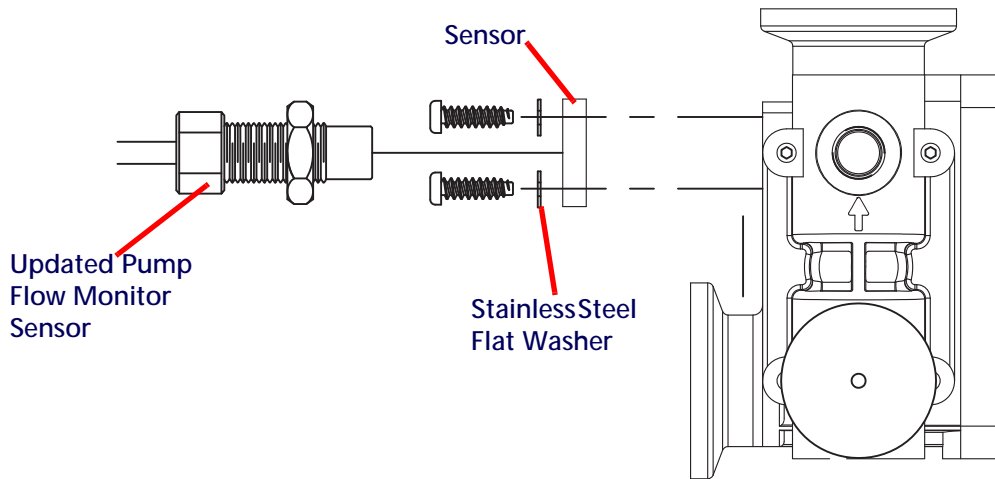
Perform the following procedure to replace the flow monitor sensor (P/N 063-0173-492).

FIGURE 3. Pump Head and Flow Monitor Sensor

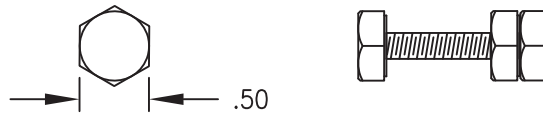


1. Disconnect the sensor cable from the motor control cabling.
2. Loosen the locking nut on the sensor assembly and remove the old sensor assembly from the pump head.
3. Loosen the sensor bracket mounting screws enough to allow the bracket to slide freely on the pump head.

FIGURE 4. Flow Sensor Replacement (P/N 063-0173-492) with Bracket and Hardware



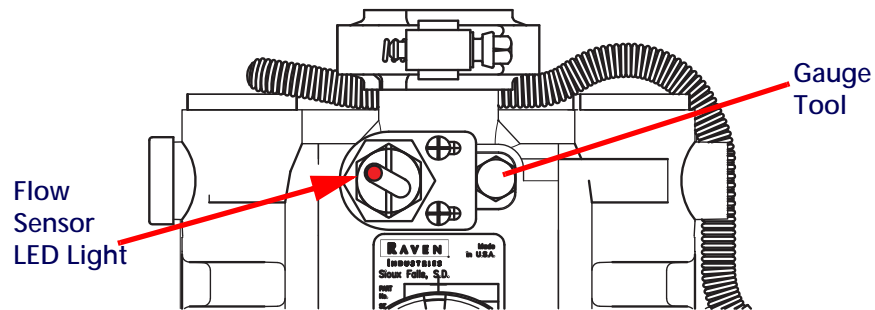
4. Thread two 5/16" nuts (not supplied) onto a 5/16" bolt (not supplied) to make a gauge tool.



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

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

FIGURE 5. Gauge Tool and Flow Sensor Bracket Alignment



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

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

7. Thread the new flow monitor sensor into the pump head until the sensor body contacts the pump head.
8. Tighten the sensor assembly a partial turn until the line on the flow monitor sensor is near vertical and the LED is on the left side of the line. Do not overtighten.

#### FLOW MONITOR SWITCH ADJUSTMENT PROCEDURE

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

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

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

Once the sensor assembly is properly set and the LED indicator is flashing, tighten the sensor lock nut to secure the sensor body to the bracket.

### CHECK VALVE ASSEMBLIES

FIGURE 6. Injection Pump Valve Cartridge Replacement Parts

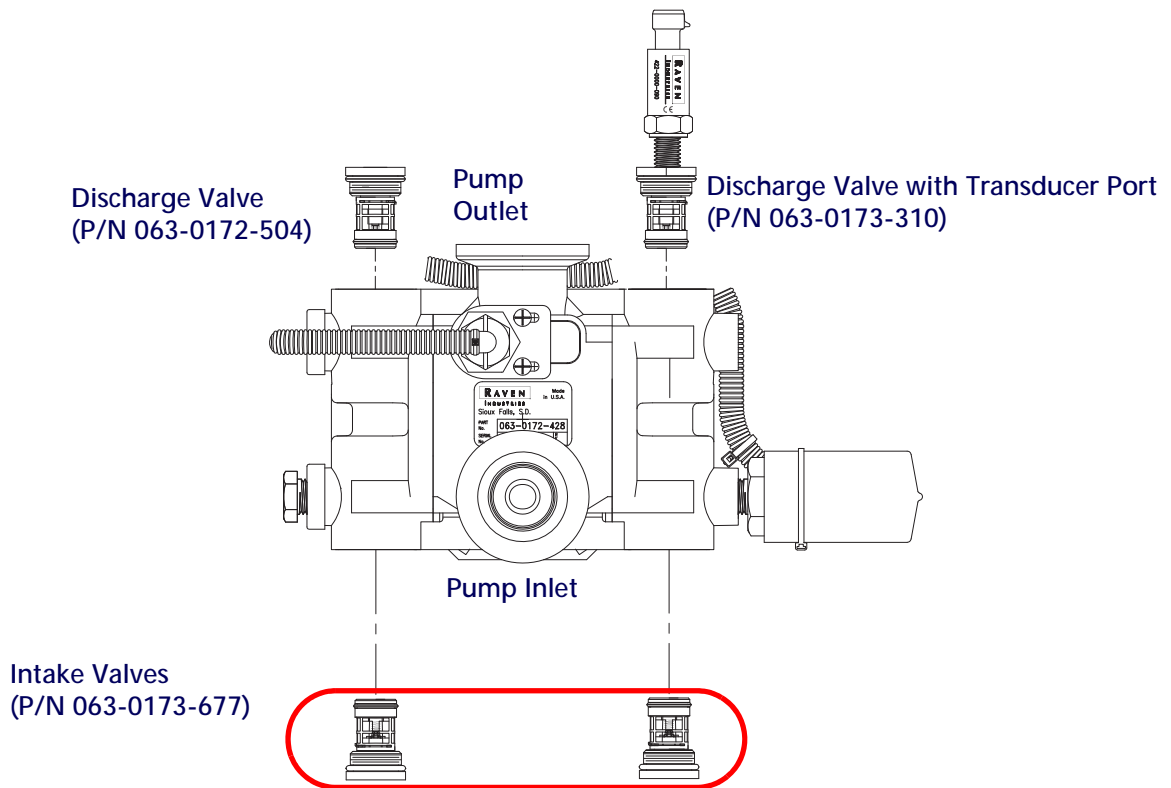


TABLE 1. Pump Seal Kit (P/N 117-0171-657) Replacement Parts

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

TABLE 2. Check Valve Assembly Replacement Parts

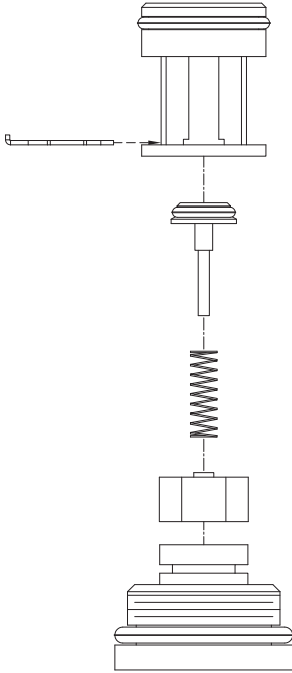
Discharge Valve Assemblies			Intake Valve Assemblies		
Item	Description	Raven P/N	Item	Description	Raven P/N
1	Fitting, Plug	107-0171-519 or 107-0171-955 <sup>a</sup>	1	Fitting, Plug	107-0171-519
2	O-ring	219-0002-912	2	O-ring	219-0002-912
3	Guide, Poppet	107-0159-934	3	Retainer, Intake	107-0171-459
4	Spring	314-0000-006	4	Spring	314-0000-005
5	Poppet	107-0159-935	5	Guide, Poppet	107-0171-092
6	O-ring (Viton)	219-0007-011 <sup>b</sup>	6	Stem, Poppet	107-0171-447
7	Clip, Retainer	107-0171-576	7	O-ring (Viton)	219-0007-011 <sup>b</sup>
8	Valve Body, Discharge	106-0159-621	8	Clip, Retainer	107-0171-576
9	O-ring (White)	219-0002-018 <sup>b</sup>	9	Valve, Body Intake	106-0159-719
			10	O-ring (Blue)	219-0002-018 <sup>b</sup>

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

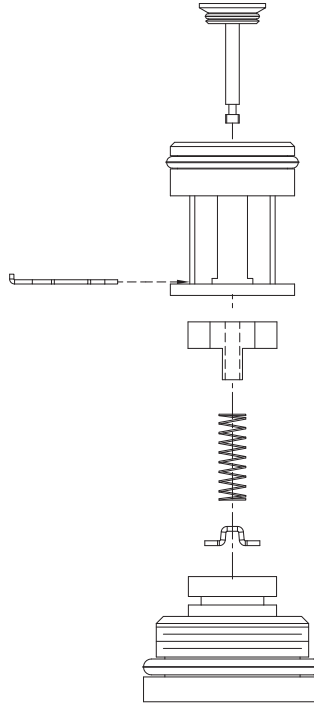
b. O-rings included in Pump Seal Kit (P/N 117-0171-657)

FIGURE 7. Check Valve Spring Retainer Assemblies

Discharge Valve Assembly  
(P/N 063-0172-504 and  
063-0173-310)



Intake Valve Assembly  
(P/N 063-0173-677)



- 
1. Press Down  
2. Rotate 90°  
3. Lift Up
- The diagram illustrates the three-step process for installing the spring retainer. Step 1 shows a red arrow pointing down to a spring retainer being pressed onto the shaft. Step 2 shows a red arrow pointing to the right, indicating a 90-degree rotation of the spring retainer. Step 3 shows a red arrow pointing up, indicating the spring retainer being lifted into its final position.

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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](http://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.**