Injection for Equipment Technologies Apache 20 and 30 Series Spayers Installation Manual

P/N 016-0171-672 Rev. A 03/18 E30665

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CHAPTER 1 IMPORTANT SAFETY INFORMATION

NOTICE

Read this manual and all operation and safety instructions included with the implement and/or controller carefully before installing the system.

- Follow all safety information presented within this manual.
- If you require assistance with any portion of the installation or service of Raven equipment, contact a local Raven dealer for support.
- Follow all safety labels affixed to system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. To obtain replacements for missing or damaged safety labels, contact a local Raven dealer.

When operating the machine, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate agricultural equipment while under the influence of alcohol or an illegal substance.
- Remain in the operator's position in the machine at all times when equipment is engaged. Disable system functions or features when exiting from the operator's seat and machine.
- Do not drive the machine with equipment enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling the system when the safe working distance has been diminished.
- Ensure the system is disabled prior to starting any maintenance work on the system or the implement.

⚠ DANGER

AGRICULTURAL CHEMICAL SAFETY

- Thoroughly bleed pressure from chemical lines and rinse the system with clean water prior to installing or servicing fittings, hoses, valves, or nozzles in the application system.
- Always follow safety labels and instructions provided by the chemical manufacturer or supplier.
- Always wear appropriate personal protective equipment as recommended by the chemical and/or equipment manufacturer.
- Fill, flush, calibrate, and decontaminate chemical application systems in an area where runoff will not reach ponds, lakes, streams, livestock areas, gardens, or populated areas.
- Avoid inhaling chemical dust or spray particulate and avoid direct contact with any agricultural chemicals. Seek immediate medical attention if symptoms of illness occur during, or soon after, use of agricultural chemicals, products, or equipment.
- After handling or applying agricultural chemicals:

  - Thoroughly wash hands and face after using agricultural chemicals and before eating, drinking, or using the rest room.
  - Thoroughly flush or rinse equipment used to mix, transfer, or apply chemicals with water after use or before servicing any component of the application system.
- Follow all federal, state, and local regulations regarding the handling, use, and disposal of agricultural chemicals, products, and containers. Triple-rinse and puncture or crush empty containers before disposing of them properly. Contact a local environmental agency or recycling center for additional information.

⚠ CAUTION

ELECTRICAL SAFETY

- Always verify that the power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the equipment.
- Disconnect the system ECUs and control console before jump starting the vehicle or welding on any part of the implement or machine.

INSTRUCTIONS FOR WIRE ROUTING

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

Harness should not contact or be attached to:

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

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

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

Routing should not allow harnesses to:

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

Harnessing should not have sharp bends.

Allow sufficient clearance from machine component operational zones such as:

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

For harness sections that move during machine operation:

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

Protect harnesses from:

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

INSTRUCTIONS FOR HOSE ROUTING

The word hoses is used to mean all flexible fluid carrying components. Follow existing hoses as much as possible and use these guidelines:

Hoses should not contact or be attached to:

- Components with high vibration forces
- Components carrying hot fluids beyond hoses component specifications

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

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads
- Ends of adjustable hose clamps

Routing should not allow hoses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of hose components

- Hoses should be protected or shielded if it needs to route near hot temperatures beyond hose component specifications

Hoses should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

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

For hose sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp hoses securely to force controlled movement to occur in the desired hose section
- Avoid sharp twisting or flexing of hoses in short distances

Protect hoses from:

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

CHAPTER 2 INTRODUCTION

SYSTEM OVERVIEW

The Raven Sidekick Pro™ ICD 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, reduces chemical waste, and simplifies equipment care and maintenance.

Sidekick Pro™ ICD provides connectivity to a Raven ISOBUS system to allow an existing Raven ISO UT/TC control console to control the rate of the chemical injection system.

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

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

INJECTION SYSTEM COMPONENTS

The Raven injection system consists of:

- Raven Viper® 4 or CR7™
- Sidekick Pro™ ICD pump(s)
- In-line mixer
- Chemical tanks
- Check valves
- Plumbing components including hoses, fittings, and valves
- Brackets and hardware to fasten components to the machine

TABLE 1. Equipment Technologies Make and Model Information,

Make	Model
Apache	720/1020/1220
Apache	730/1030/1230

REQUIRED COMPONENTS

The following components must be installed with the Sidekick Pro ICD:

- Raven OS Version 2.1.5.32 for the Viper® 4 Console.
- Hawkeye™ or RCM.

TOOLS AND MATERIALS NEEDED

The following tools are recommended for completing the installation:

- SAE wrenches and tools
- Drill bit set and drill
- Dielectric grease (supplied)
- Cable ties (supplied)
- Tape measure
- Center punch
- 9/16" drill bit
- Torque wrench
- Thread sealant tape

POINT OF REFERENCE

The instructions provided in this manual assume the installer is standing behind the machine, looking toward the machine cabin.

UPDATES

Raven software and documentation updates may be made available periodically on the Raven Applied Technology web site:

www.ravenprecision.com

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

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

techwriting@ravenind.com

-Injection for Equipment Technologies Apache 20 and 30 Series Spayers Installation Manual
-P/N 016-0171-672 Rev. A
-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

INSTALLATION PREPARATION

Verify Software version 2.1.5.32 or higher is present on the Raven Viper® 4.

SYSTEM CLEANOUT

Remove all pressure from plumbing components. Drain out the main carrier tank, rinse tank, and boom plumbing.

THREAD SEALANT

Apply thread sealant tape to all threaded plumbing connections before assembly.

INSTALLATION INSTRUCTIONS

REROUTE HYDRAULIC HOSES

1. Remove the filler panel between the rear taillights.
2. Identify the hoses routed over the round structural cross member. Reroute hoses so they go beneath the round structural cross member.

NOTE: The hoses will be pressurized. Crack the fitting loose and allow the pressure to bleed slowly. The sprayer suspension will lower as oil pressure is released.

FIGURE 1. Hoses Routes Beneath the Structural Cross Member

3. Route the hoses so they look similar to the Figure 2 on page 8.

FIGURE 2. Updated Hose Routing

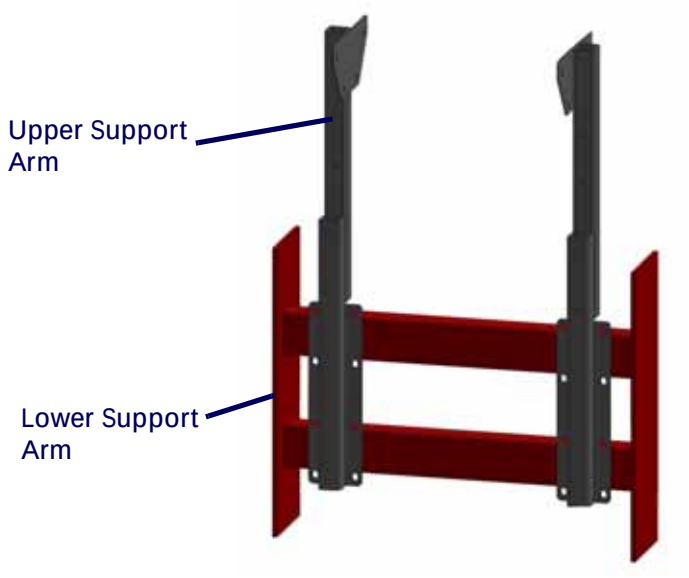
INSTALL TANK BRACKETS

1. Locate the 5″ wide U-bolts and install four of them around the box tubes near the right side of the sprayer frame.

FIGURE 3. U-Tubes Installed Around Sprayer Frame

2. Slide the lower support arm weldment over the U-bolts and secure with the provided flange nuts. Do not tighten the hardware at this time.
3. Attach the upper support arm weldment to the lower support arm using the provided 7/8″ bolts and flange nuts. Do not tighten at this time.

FIGURE 4. Upper Support Arm Attached to Lower Support Arm

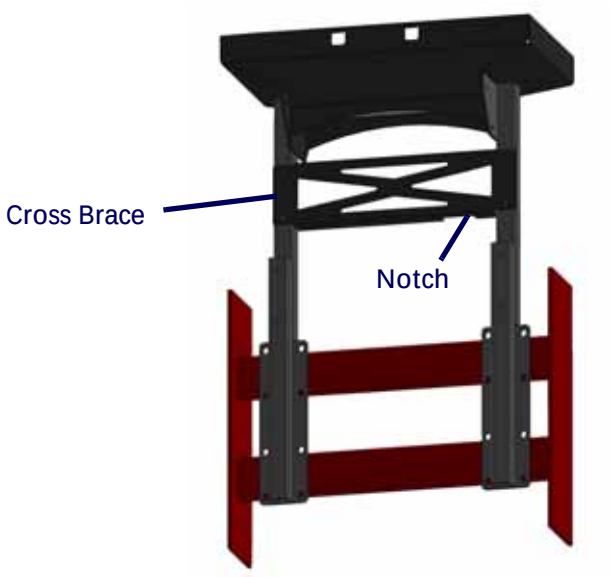


4. Repeat step 1 through step 3 on the left side of the machine.
5. With the help of an assistant, lift the tank cradle into place between the upper support arms and secure with the provided 5/8" x 1.5" bolts and flange nuts. Do not tighten at this time.

FIGURE 5. Tank Cradle to Upper Support Arms

6. Using the 5/8" x 1.5" bolts and flange nuts, install and secure the cross brace between the two upper support arms. Verify that the notch is aligned with the rinse tank sight gauge. Do not tighten the hardware at this time.

FIGURE 6. Installed Cross Brace

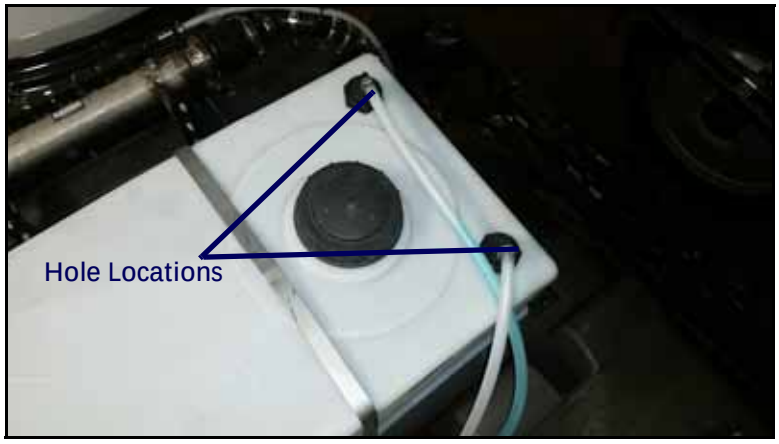


7. Starting at the top of the assembly, tighten all of the hardware installed during this process. Align and square components as needed.

TANK INSTALLATION

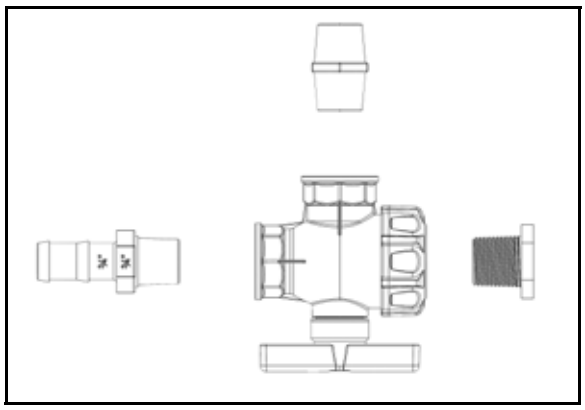
1. Using a 1.625" hole saw, cut two holes in the top of the 56 gallon tank at the locations shown below.

FIGURE 7. Holes on 56 Gallon Tank



2. Install the two provided bulkhead fittings.
3. Install a 1/2" NPT x 1/2" hose barb 90° elbow into both bulkhead fittings. The hose barbs should face towards the front of the machine.
4. In the bulkhead fitting in the bottom of the tank, install a 3/4" NPT pipe nipple, 3/4" hand valve, 3/4" plug, and 3/4" NPT x 3/4" hose barb fitting. The ports on the valve should align with the long side of the tank when tightened.

FIGURE 8. Bottom Bulkhead Fitting Assembly



5. Set the tank in the tank cradle.
6. Place the stainless steel strap over the tank and secure with the provided 5/16" hardware.
7. Connect a 1/2" hose to one of the hose barb elbows installed previously. Route the hose down between the rinse and main carrier tanks. Cut the hose so the end is flush with the bottom of the chassis. This serves as the vent line.

NOTE: The other hose barb fitting will be used later.

MIXER INSTALLATION

1. Remove the electronics cover on the top of the center rack.
2. Loosen the nuts on the U-bolts securing the electronics mounting plate to the center rack.
3. Install two 4" U-bolts (provided) between the back side of the mounting plate and the 4" box tube. The legs of the U-bolt should be pointing towards the cab. Space the U-bolts approximately 18" apart.
4. Slide a mixer mount bracket onto each U-bolt and secure with the 3/8" flange nuts. Do not tighten at this time.
5. Attach the mixer (P/N 063-0173-698) to the mounting bracket using the 3/8" bolts and flanged lock nuts.

NOTE: The mixer needs to be installed so that the check valve is on the left side of the center rack.

FIGURE 9. Installed Mixer

6. Align the brackets and tighten all the mounting hardware.
7. Tighten the nuts securing the electronics mounting plate and reinstall the electronic cover.

8. Install and tighten the M300 to M220 reducing couplings on both ends of the mixer.
9. Install two M220 45° elbows onto the end of the reducing coupling. Do not tighten the hardware at this time.
10. Disconnect the primary carrier hose from the flowmeter near the valve manifold.
11. Reroute the carrier hose to elbows installed in step 9. It may be necessary to reorient the hose routing guide attached lower on the center rack.

FIGURE 10. Carrier Hose to Elbow Installation

12. Install a 1/2" NPT street elbow into one of the available ports on the mixer.
13. Install the 12 psi stainless steel check valve into the street elbow. Verify that the arrow on the check valve is pointed towards the mixer.
14. Install a 1/2" NPT to 1/2" hose barb adapter into the other end of the check valve. A hose will be connected to this port later.
15. Remove the flowmeter from the left side of the valve manifold.
16. Remove the cap and transducer from the right side of the valve manifold.
17. Reinstall the cap and transducer on the left side where the flowmeter was previously installed.
18. Install a M220 flanged elbow onto the right side of the manifold with the elbow pointing straight back.
19. Reinstall the flowmeter to the elbow on the valve manifold.

NOTE: Verify the direction arrow on the flowmeter points towards the valve manifold.

FIGURE 11. Flowmeter Connected to Elbow

20. Connect the outlet of the mixer to the flowmeter inlet. Use a M222 x 1.5" hose barb 90° elbow on the mixer end and a straight M220 x 1.5" hose barb on the flowmeter.

NOTE: The fittings, gaskets, and clamps are provided. Hoses are not provided.

FIGURE 12. Mixer Outlet to Flowmeter Inlet Assembly

RINSE WATER CONNECTION

To complete the rinse water connection, a tee is required under the water/rinse portion of the tank. To install the tee:

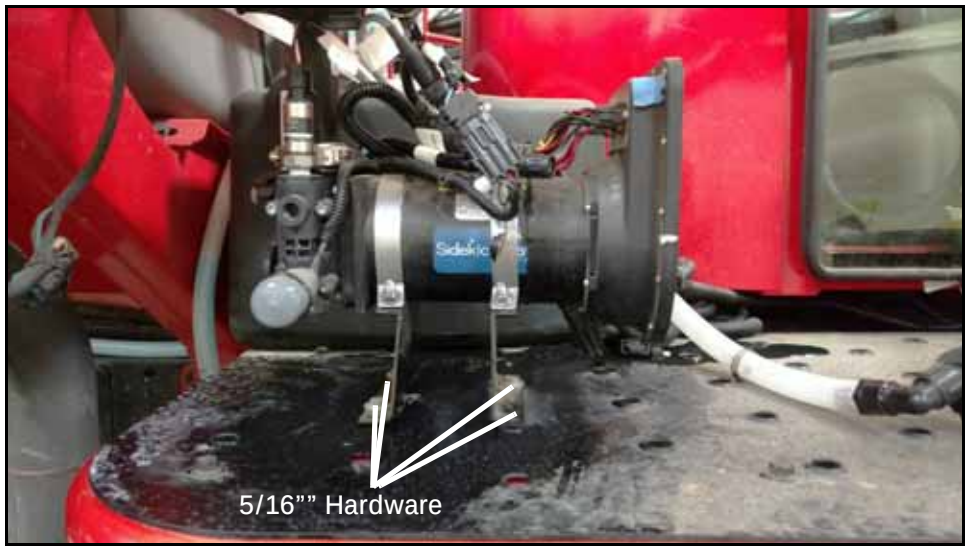
1. Locate the M200 port on the bottom of the machine's rinse tank.
2. Remove the 90° flanged elbow from the M200 port.
3. Install a M200 flanged tee, connecting the center port of the tee to the rinse tank port.
4. Reconnect the elbow removed in step 2 to one of the open ports of the tee.
5. On the remaining port on the Tee, install a M200 to 3/4" NPT adapter.
6. Install a 3/4" NPT x 3/4" hose barb 90° fitting into the adapter, pointed towards the front of the machine.

FIGURE 13. Completed Tank Tee Installation

PUMP AND RINSE VALVE INSTALLATION

1. Mount the pump to the platform on the right side of the cab. The pump should be close to the rear of the platform and clear of the boom.
2. Use the provided 5/16" hardware and existing holes in the platform to mount the pump. If necessary, slide the legs together to align with the existing holes in the platform.
3. Secure the pump to the platform using the provided 5/16" bolts, washers, and nuts.

FIGURE 14. Installed Rinse Valve

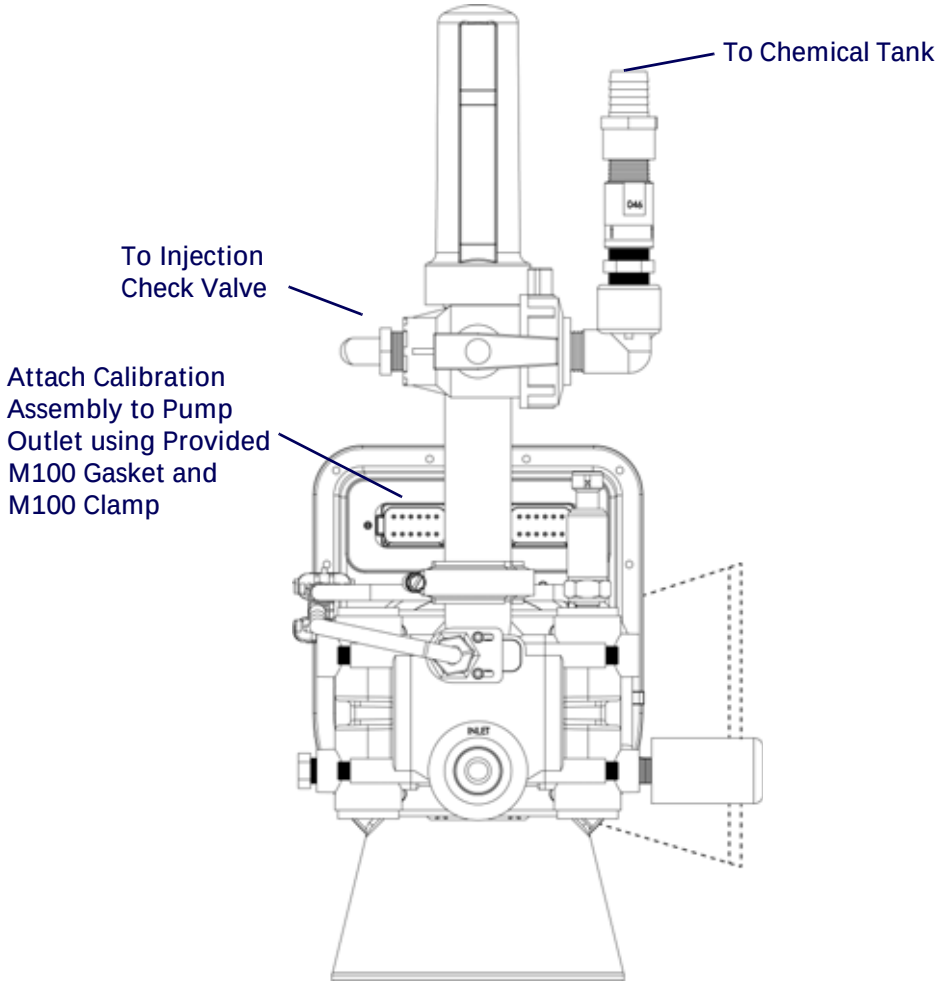


4. Using a M100 gasket and flange clamp, secure the rinse valve to the pump.

FIGURE 15. Installed Rinse Valve

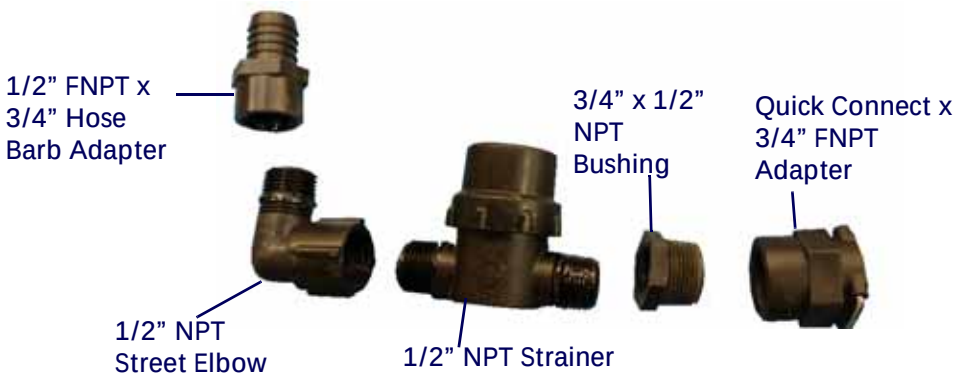
5. Use the provided gasket and clamp to attach the provided calibrator and recirculation valve assembly to the pump outlet as shown.

FIGURE 16. Installed Calibrator and Recirculation Valve Assembly



6. Run a 1/2" hose from the check valve on the calibrator to the open port on the top of the 56 gallon tank.
7. Run a 1/2" hose from the open port on the calibrator to the injection point on the mixer.
8. Assemble the chemical inlet components as shown below.

FIGURE 17. Chemical Inlet Assembly



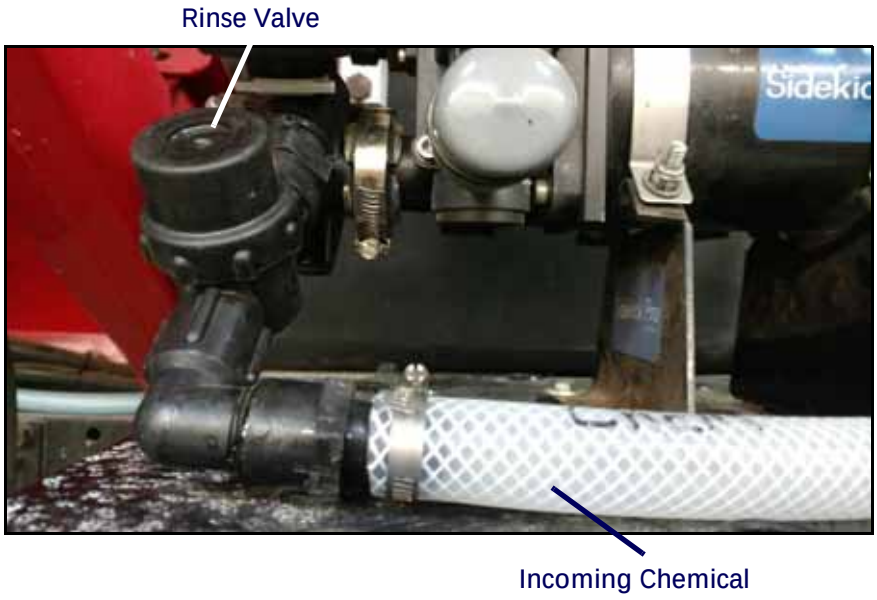
NOTE: Before applying thread sealant to the chemical inlet assembly perform a dry fit on the rinse valve to verify clearance.

9. After performing a dry fit and reassembling the chemical inlet assembly with thread sealant, attach the assembly to the chemical inlet port of the rinse valve.

NOTE: The rinse valve is pre-assembled with the rinse port cap. Connect the chemical inlet assembly to the quick connect port that is not capped.

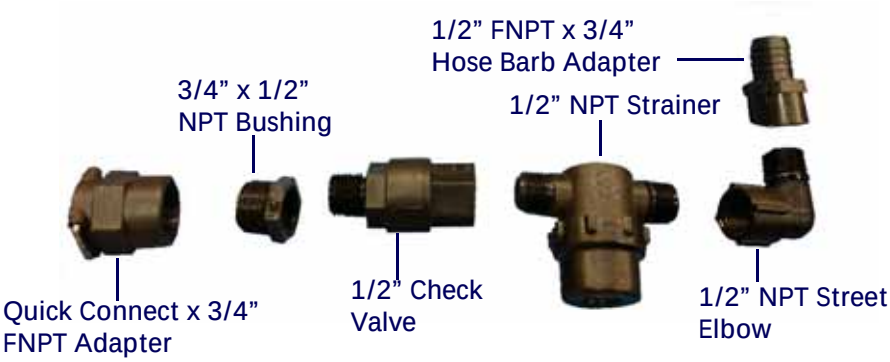
10. Attach the chemical hose to the 3/4" pipe nipple and secure with a hose clamp.
11. Attach the other end of the chemical hose to the hose barb installed in the valve on the bottom of the 56 gallon chemical tank.

FIGURE 18. Assembled Chemical Inlet on Rinse Valve



12. Assemble the rinse inlet plumbing as shown below.

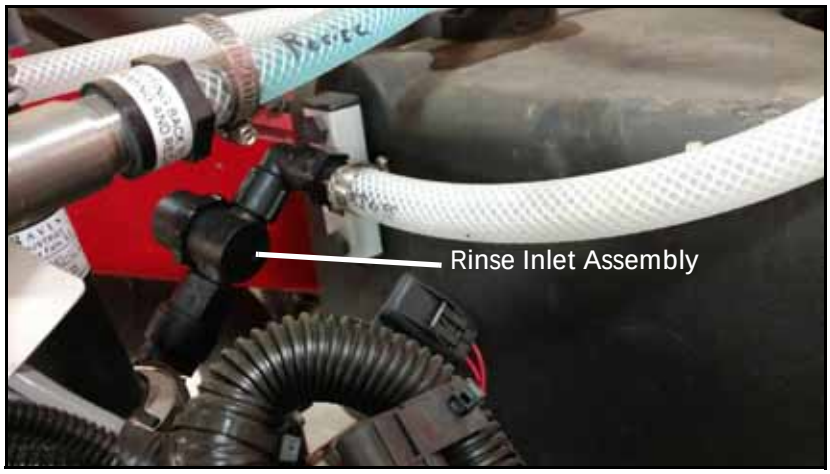
FIGURE 19. Rinse Inlet Assembly



NOTE: Before applying thread sealant to the rinse inlet assembly perform a dry fit on the rinse valve to verify clearance.

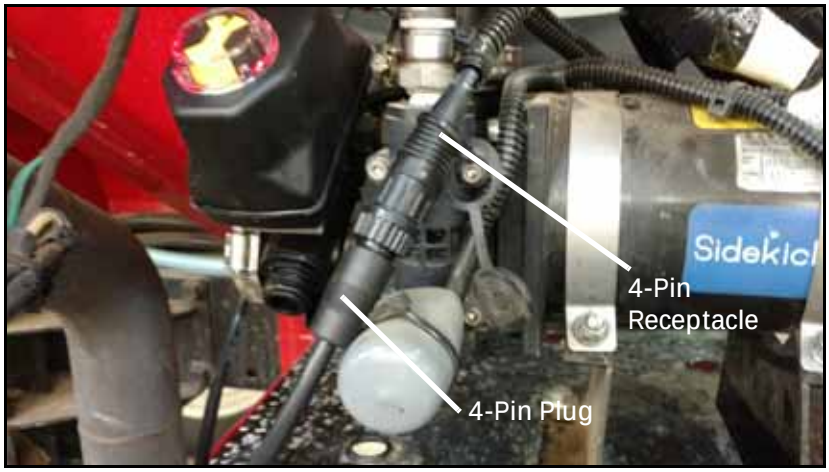
13. After performing a dry fit and reassembling the rinse inlet assembly with thread sealant, remove the cap from the remaining quick connect port of the valve. Attach the assembly to this inlet port.
14. Attach the rinse hose to the 3/4” pipe nipple.
15. Route the other end of the hose to the hose barb fitting installed on the bottom of the machines rinse tank.

FIGURE 20. Rinse Inlet Assembly Attached to the Rinse Valve



16. Connect the 4-Pin plug to on the rinse valve to the 4-Pin receptacle on the pump.

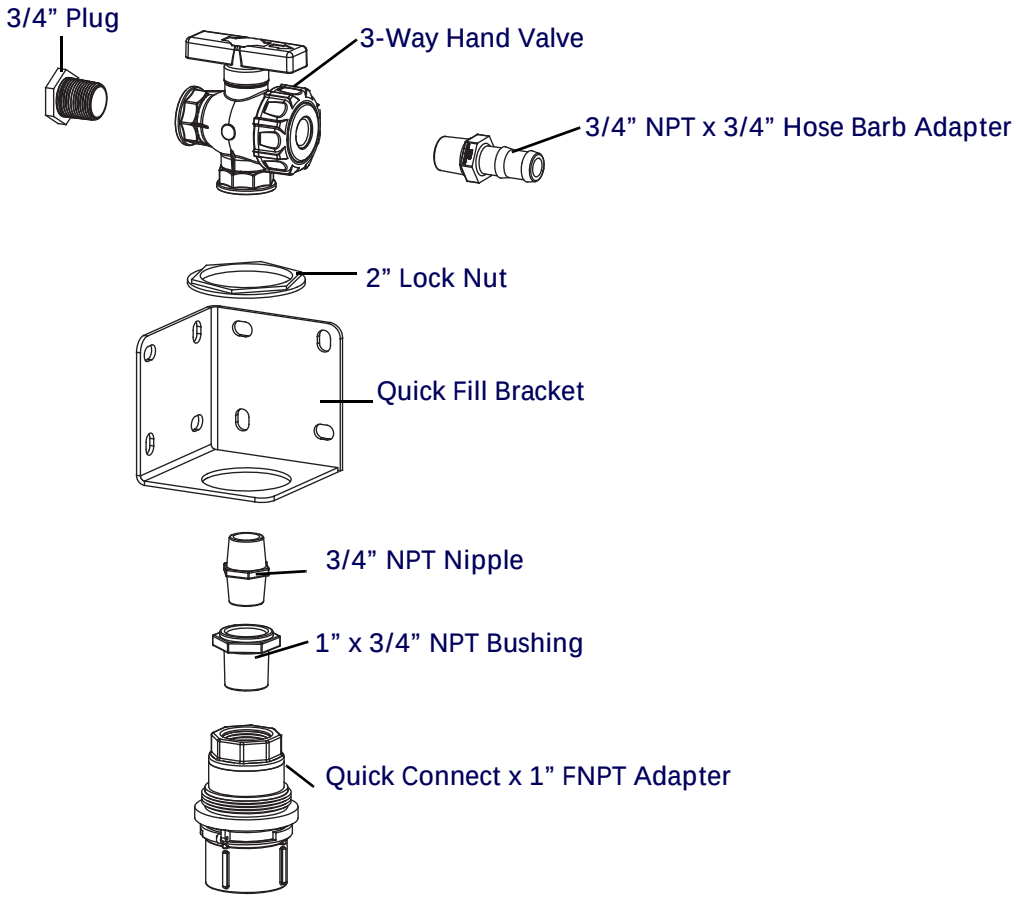
FIGURE 21. Rinse Valve to Pump Connection



QUICK FILL INSTALLATION

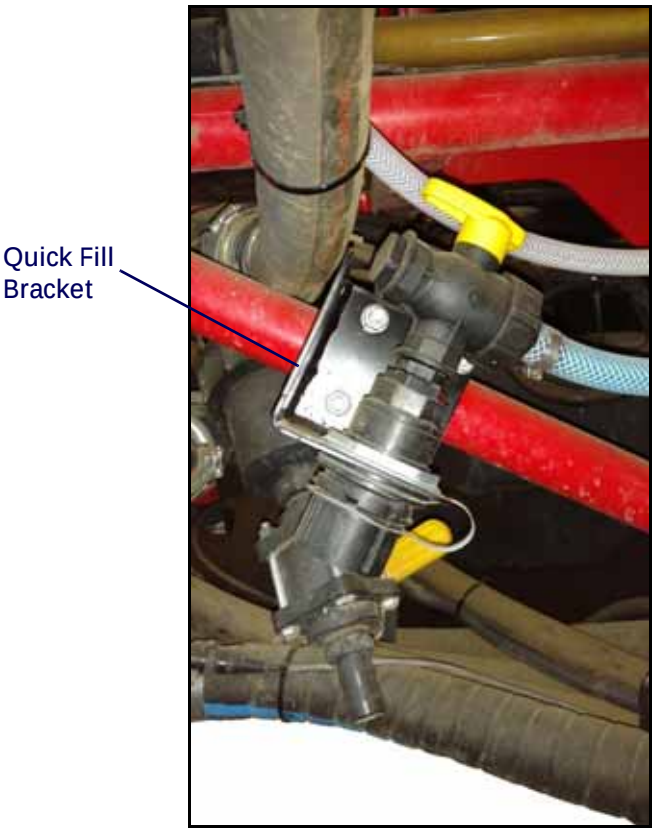
1. Assemble the quick fill fittings with the quick fill bracket. Tighten all the fittings before tightening the 2" lock nut.

FIGURE 22. Quick Fill Assembly



2. Mount the quick fill bracket on the frame tubing near the fill station using the provided U-bolts.

FIGURE 23. Installed Quick Fill

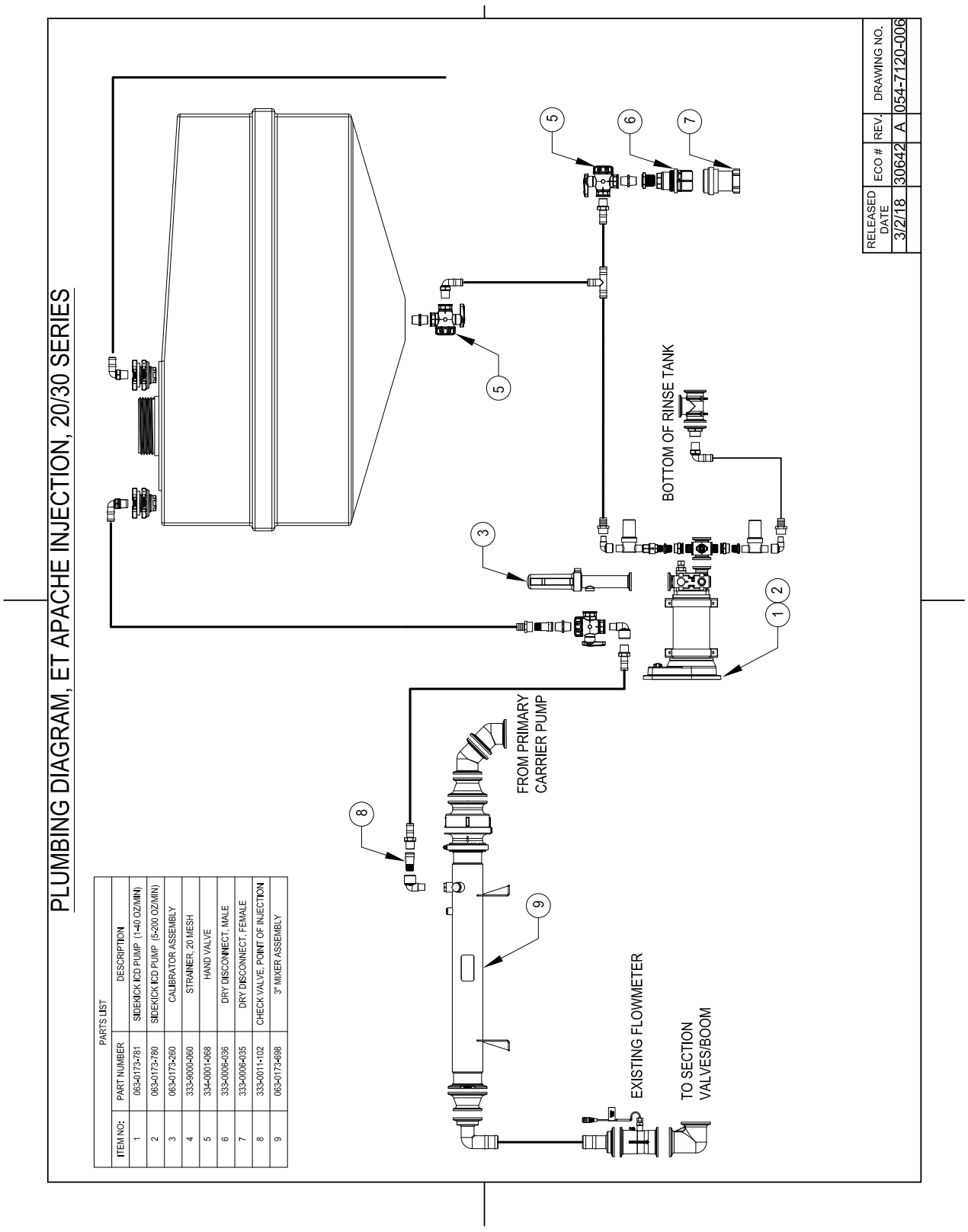


3. Run a 3/4" hose from the hose barb on the quick fill assembly to a convenient location on the hose that provides chemical to the pump.
4. Cut the chemical hose and install a 3/4" hose barb tee.
5. Connect the quick fill hose to the remaining port of the tee.

NOTE: The hand valve on the quick fill assembly should be closed for normal field operations. Only open when the quick fill port is in use.

PLUMBING

FIGURE 24. Plumbing Diagram (P/N 054-7120-006)



CHAPTER 4 TROUBLESHOOTING

MOTOR CONTROL NODE LED STATUS INDICATORS

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

FIGURE 1. LED Status Indicators

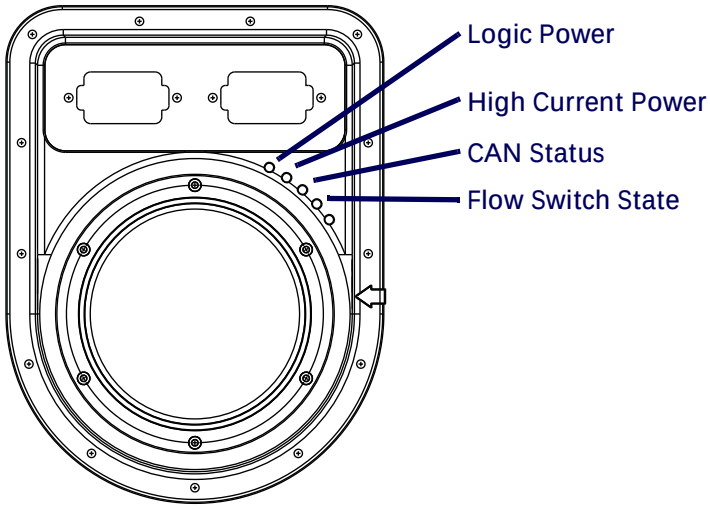


TABLE 1. LED Status Indicators

LED	Status Display
Logic Power	If logic power is present at the motor control 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.

ALARMS

TABLE 2. Sidekick Pro ICD Error Codes

Error Description	Possible Cause	Solution
Off Rate Alarm	• Difference between actual and target application rates has been greater than the entered value for the "Off Rate Percent" for more than 5 seconds	• Required flow rate is out of range for the injection pump. Calculate the volume per minute required for the application and verify rate is within range of the injection pump.
Low Tank Alarm	• Chemical supply tank is below the refill threshold level	• Refill injection chemical supply tank and reset tank level in UT display.
Flow Error Alarm	• Flow obstruction in inlet cartridges • Chemical supply tank is out of chemical	• Perform a pump calibration test. If the pump does not calibrate properly, remove the intake cartridges and perform pump maintenance to clear obstructions. • Refill chemical supply tank and perform the pump priming procedure.
Flow Error Alarm	• Flow obstruction in discharge cartridges	• Perform a pump calibration test. If the pump does not calibrate properly, remove the discharge cartridges and perform pump maintenance to clear obstructions.
Low Pressure Alarm	• Injection pressure is lower than carrier pressure	• Perform a pump calibration test. If the pump does not calibrate properly, clean the injection pump inlet and discharge valves. • Calibrate the pump transducer. • Check lines between injection pump and in-line mixer. • Verify all hand valves are in the correct position. • Replace the pump transducer.
Maximum Vacuum Alarm	• Clogged pump strainer • Tubing or plumbing size restriction • Hand Valve Closed • Chemical too thick	• Clean pump strainer and check for obstructions in injection line between the pump inlet and chemical supply tank. • Verify the proper size of injection supply tubing is used between the chemical supply tank and pump inlet. • Check that hand valves are open and allow flow from the tank to the injection pump inlet. • Dilute product in chemical supply tank. Some chemicals may not be applied using a direct injection system.

Error Description	Possible Cause	Solution
Maximum Pressure Alarm	• Clogged or restricted pump outlet supply lines • Tubing or plumbing size restriction • Faulty PSI transducer • Hand valve closed • Low injection pressure	• Check for restrictions or blockages in outlet supply lines. Flush the injection system to clear clogs and residue buildup. • Verify the proper size of injection outlet tubing is used between the point of injection and pump outlet. • Check hand valves are open and allow flow from the injection pump outlet port.
Pressure Sensor Alarm	• Boom pressure transducer not connected • Faulty boom pressure transducer	• If installed, check that the boom pressure transducer is installed and properly connected. • Replace boom pressure transducer.
Motor/Encoder Alarm	• No power to pump motor • Pump motor or encoder issue	• Verify that the high current LED on the injection pump node is lit. • Check motor connections. If these connections appear secure, 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	• Increase vehicle speed. • The pump will maintain the programmed low limit rate. If this rate is the desired lowest injection rate, no action is required. If the current field operation requires a lower rate of injection, reduce the programmed low limit setting to allow the pump to reduce the rate of injection. Refer to the console or field computer operation manual for additional information on the low limit feature.

CHAPTER 5 REPLACEMENT PARTS

REPLACEMENT PARTS

TABLE 1. Pumps and Cabling

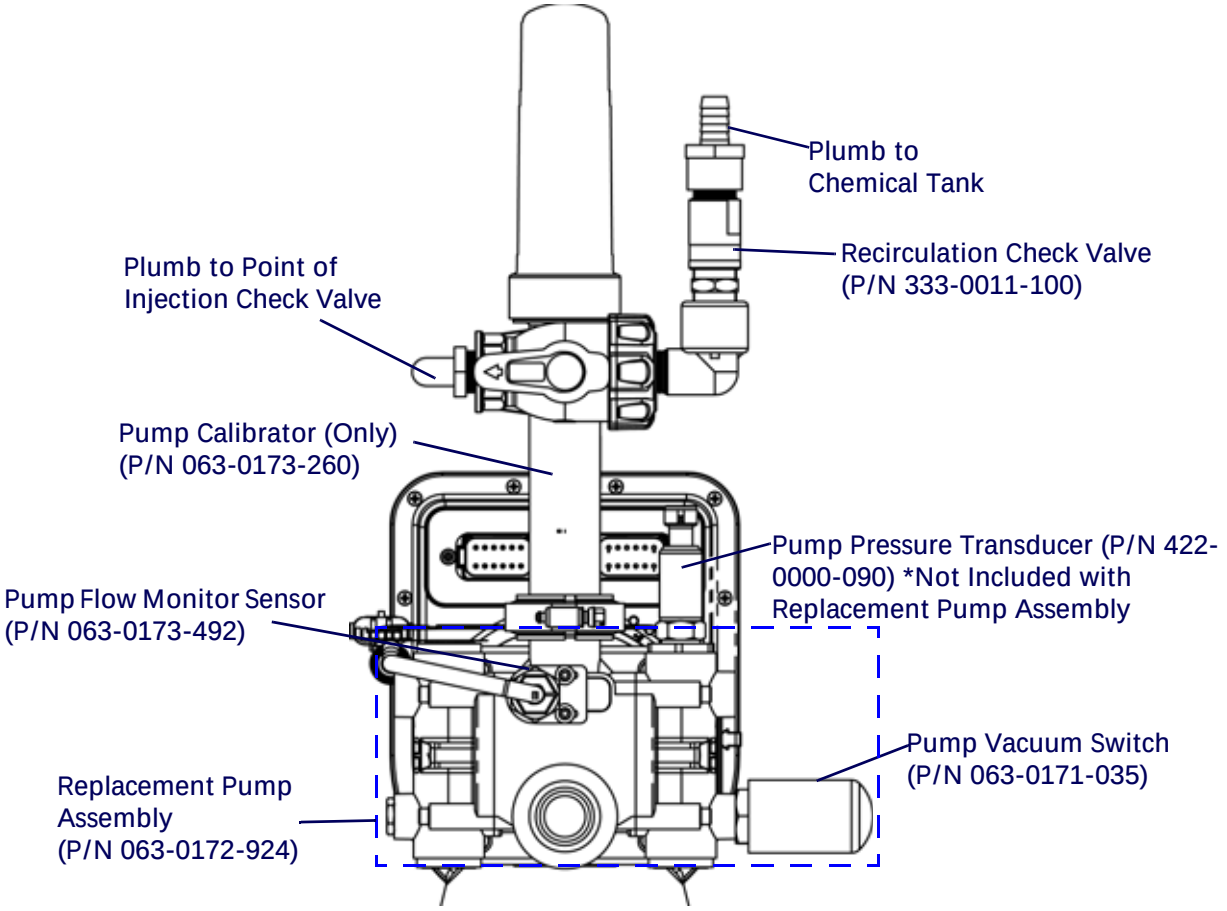
Item Description	Raven Part Number
Vacuum Switch	063-0171-035
Exhaust Check (No Transducer)	063-0172-504
Calibrator, Pump	063-0172-822
Pump Assembly (no Motor or Node)	063-0172-924
Calibration Assembly	063-0173-260
Exhaust Check (Transducer)	063-0173-310
Flow Sensor	063-0173-492
Intake Check Valve	063-0172-677
Calibrator Cover	106-0159-637
Pump Seal Kit	117-0159-987
Valve, Check, 1/2" with Bleed Hole	333-0011-100
Pressure Transducer	422-0000-090
Pump, Sidekick Pro™ ICD, 5 to 200 oz/min	063-0173-769
Pump, Sidekick Pro™ ICD, 1 - 40 OZ	063-0173-768

TABLE 2. Plumbing

Item Description	Raven Part Number
Mixer, 3" with 3" Check Valve, Flanged	063-0173-698
Cover, Tank, Vented Female Threaded ARAG	118-0159-043
Tank, 50 Gallon	118-0159-059
Coupler, Dry Disconnect, 1", Banjo, Female	333-0006-035
Coupler, Dry Disconnect, 1", Banjo, Male	333-0006-036
Valve, Check, 3/4" Delrin,.5 PSI	333-0011-087
Valve, Check, EXTR 1/2" Point of Injection, 12 PSI	333-0011-102
3" Full Port Manifold Check Valve	333-0011-105
Strainer, 1/2" MNPT, Polypropylene, 20 Mesh	333-9000-060
Valve, 3 Way, Poly 1/2" NPT	334-0001-037

Item Description	Raven Part Number
Fitting, 3 Way Ball Valve, 3/4" NPT	334-0001-068
Valve, 3 Way, Poly 1/2" NPT Continuous Flow	334-0001-054

FIGURE 1. Injection Pump Components



NOTE: Refer to the flow monitor specific documentation for additional adjustment information.

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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.

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EXTENDED WARRANTY

WHAT DOES THIS WARRANTY COVER?

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

DO I NEED TO REGISTER MY PRODUCT TO QUALIFY FOR THE EXTENDED WARRANTY?

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

WHERE CAN I REGISTER MY PRODUCT FOR THE EXTENDED WARRANTY?

To register, go online to www.ravenhelp.com and select Product Registration.

HOW LONG IS THE EXTENDED WARRANTY COVERAGE PERIOD?

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

HOW CAN I GET SERVICE?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

WHAT WILL RAVEN INDUSTRIES DO?

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

WHAT IS NOT COVERED BY THE EXTENDED WARRANTY?

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

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

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