

# John Deere CCS Air Drill Installation Manual

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# CHAPTER

# 1

# IMPORTANT SAFETY INFORMATION

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## NOTICE

Read this manual and the operation and safety instructions included with your implement and/or controller carefully before installing the CCS Air Drill™ system.

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

When operating the machine after installing CCS Air Drill, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate CCS Air Drill or any 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 CCS Air Drill is engaged.
- Disable CCS Air Drill when exiting from the operator's seat and machine.
- Do not drive the machine with CCS Air Drill enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling CCS Air Drill when the safe working distance has diminished.
- Ensure CCS Air Drill is disabled prior to starting any maintenance work on CCS Air Drill or the machine.

## WARNING

- When starting the machine for the first time after installing CCS Air Drill, be sure that all persons stand clear, in case a hose has not been properly tightened.
- Install the enclosed warning labels in a highly-visible area of the air drill's tool bar.

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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.

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## INSTRUCTIONS FOR HOSE ROUTING

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

Hoses should not contact or be attached to:

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

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

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

Routing should not allow hoses to:

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

Hoses should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

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

For hose sections that move during machine operation:

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

Protect hoses from:

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



This system is designed to allow you to manage variable rate applications, automatic on/off section control, and monitor real time scale inputs.

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### PREPARING FOR INSTALLATION

Before installing Raven components on the CCS Air Drill, park the machine on a level, clean, and dry surface. Leave the machine turned off for the duration of the installation process.

During the installation process, follow good safety practices. Be sure to carefully read the instructions in this manual as you complete the installation process.

### RECOMMENDATIONS

Raven Industries recommends the following best practices before installing or operating the CCS Air Drill system for the first time, at the start of the season, or when moving the CCS Air Drill system to another machine:

- Ensure the machine's hydraulic filters have been recently changed and there are no issues with the machine's hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).
- Cycle the air drill's folding operations to ensure that hoses are not rubbing on or interfering with moving parts and hydraulic fluid is not leaking from the system.

Raven Industries recommends the following best practices when installing the CCS Air Drill system.

- Use part numbers to identify the parts.
- Do not remove the plastic wrap from a part until it is necessary for installation.
- Do not remove plastic caps from a part until it is necessary for installation.

### TOOLS NEEDED

The following tools are recommended for installation of the CCS Air Drill system:

- SAE standard-sized wrenches/sockets
- Metric wrenches/sockets
- Hammer
- Allen wrenches
- Set of short wrenches
- Set of tools
- Cut off tools (angle grinder with cutoff discs, cutoff wheel, reciprocating saw)
- Ratchet straps
- Penetrating fluid

POINT OF REFERENCE

The instructions in this manual assume that you are standing behind the air drill, looking toward the air drill’s hitch or tractor.

HYDRAULIC FITTINGS

This manual may reference the following types of hydraulic fittings:

- SAE O-Ring fittings
- ORFS (O-Ring Face Seal) fittings
- JIC fittings

SAE O-ring fitting



ORFS fitting



JIC fitting (M)



Dash Size	JIC and UNO	SAE	ORFS	NPT	BSP
04			9/16"	1/4"	1/4"
06	3/8"	3/8"	11/16"	3/8"	3/8"
08	1/2"	1/2"	13/16"	1/2"	1/2"
10		5/8"	1"		5/8"
12	3/4"	3/4"	1-3/16"	3/4"	3/4"
16			1-7/16"	1"	1"

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# CHAPTER

# INSTALLATION

## 3

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### PREPARING FOR INSTALLATION

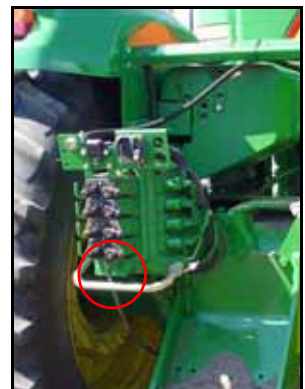
**IMPORTANT:** Refer to the implement's operation manual before changing the connection or configuration of any of the existing hydraulic hoses.

For the CCS Air Drill system to function properly, its hydraulic tank line must connect to a low pressure return connection on the tractor that prohibits the tank pressure from exceeding 200 psi. A motor return connection is the ideal connection for the CCS Air Drill system because it prevents the pressure from being reversed to the system. The vacuum fan motor on the air drill is often installed on this connection. If this is the case, it is likely that the fan return line can be connected to the SCV return port next to the fan pressure line. If there is no available return connection, one will have to be added to the tractor. Contact your local tractor service provider for more information.

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### LOW PRESSURE MOTOR RETURN

FIGURE 1. Low Pressure Motor Returns



## EXISTING ASSEMBLY

FIGURE 2. Machine's Existing Hex Shaft

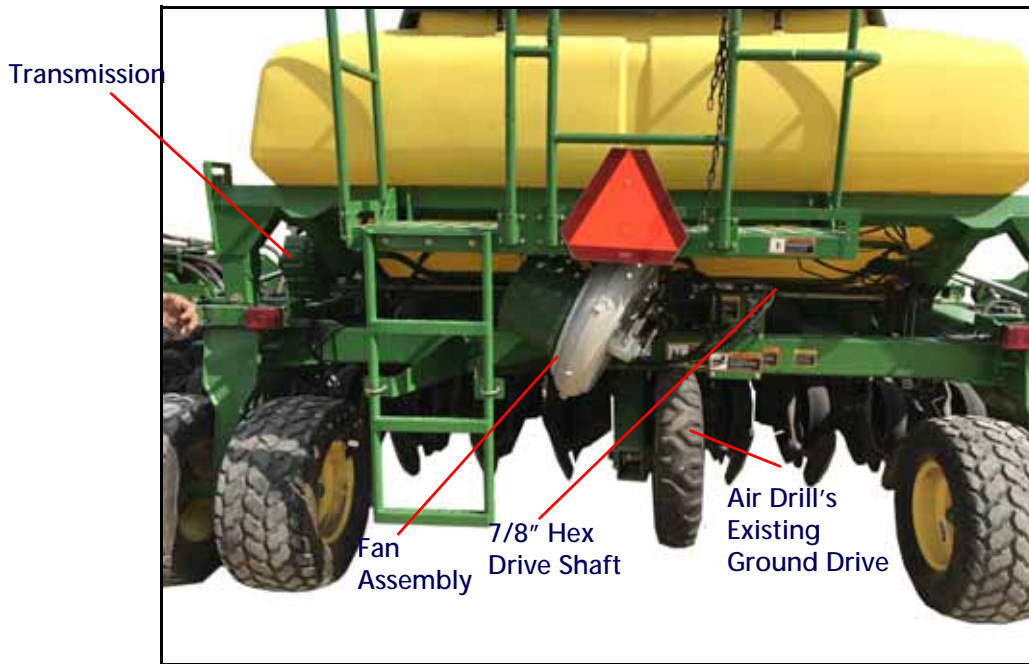
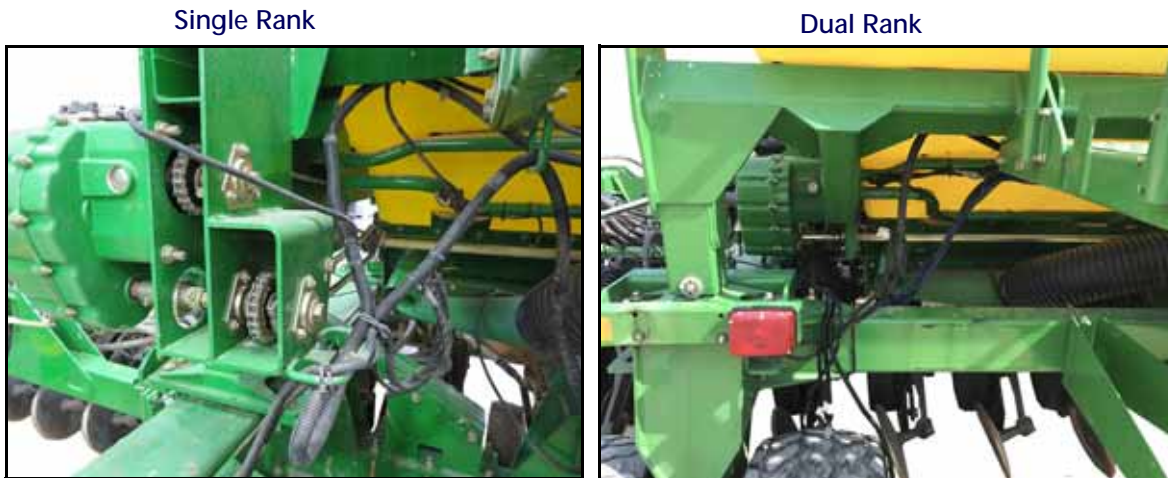
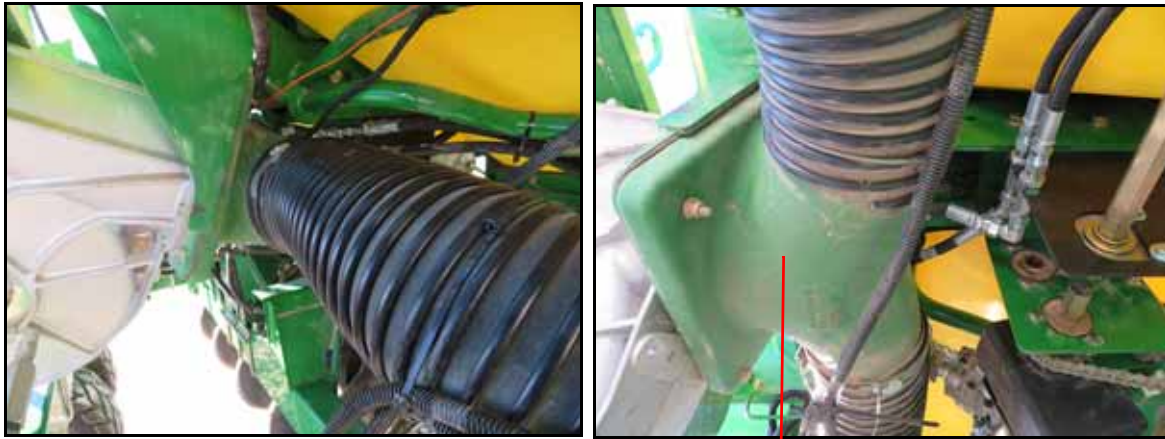


FIGURE 3. Existing Single Rank and Dual Rank Assembly



## REMOVE FAN DISTRIBUTION MANIFOLD

FIGURE 4. Fan Distribution Manifold



Fan Distribution Manifold

**NOTE:** Due to the confined work environment it is necessary to remove the fan distribution manifold and plumbing. Ensure the motors will not interfere with the fan distribution manifold and plumbing after they are installed. Adjust the motors to avoid interference.

## DISASSEMBLE THE AIR DRILL'S DRIVE SYSTEM

**NOTE:** The CCS Air Drill system requires the use of the machine's main hex drive shaft. Modifications to the shafts must be made to divide the air drill into two sections. Refer to the air drill-specific guide included with the CCS Air Drill installation kit to identify the air drill sections.

Excluding the hex shafts, the air drill's existing ground drive system is not required for operation once the CCS Air Drill system is installed. Single rank machines will require the removal of the ground drive system for clearance purposes. For dual rank machines, the removal of the ground drive system is optional.

Use extreme caution when removing the ground drive wheel frame assembly from the drill tank frame. The assembly is very heavy and can be awkward to handle. Try to secure and support the wheel drive assembly when removing the hardware and find a way to slowly lower it to the ground.

1. Secure the ground wheel assembly.

## REMOVE DRIVE WHEEL ASSEMBLY (SINGLE RANK MACHINES)

1. Remove any chains and sprockets interfering with the removal of the ground drive wheel assembly.
2. Remove the six bolts holding the ground drive wheel assembly to the drill frame.

**NOTE:** Use extreme caution removing bolts supporting the ground drive wheel assembly. The ground drive wheel assembly is very heavy and awkward to handle. Use ratchet straps or other means to support the weight of the assembly and to be able to gradually lower to the ground.



FIGURE 5. Ground Drive Wheel Assembly

Ground Drive  
Assembly  
Mounting Bolts



FIGURE 6. Ground Drive Wheel Assembly



Ground Drive Wheel Assembly



Remove

3. Carefully lower and remove the ground drive assembly from the air drill frame.

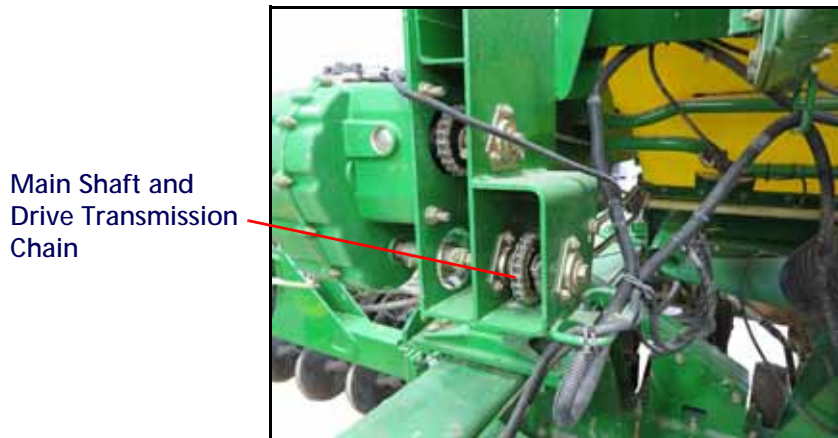
## SEEDER DRIVE SYSTEM DISASSEMBLY

### SHAFT REMOVAL

#### SINGLE RANK MACHINES

1. Remove the chain connecting the main shaft and drive to the transmission.

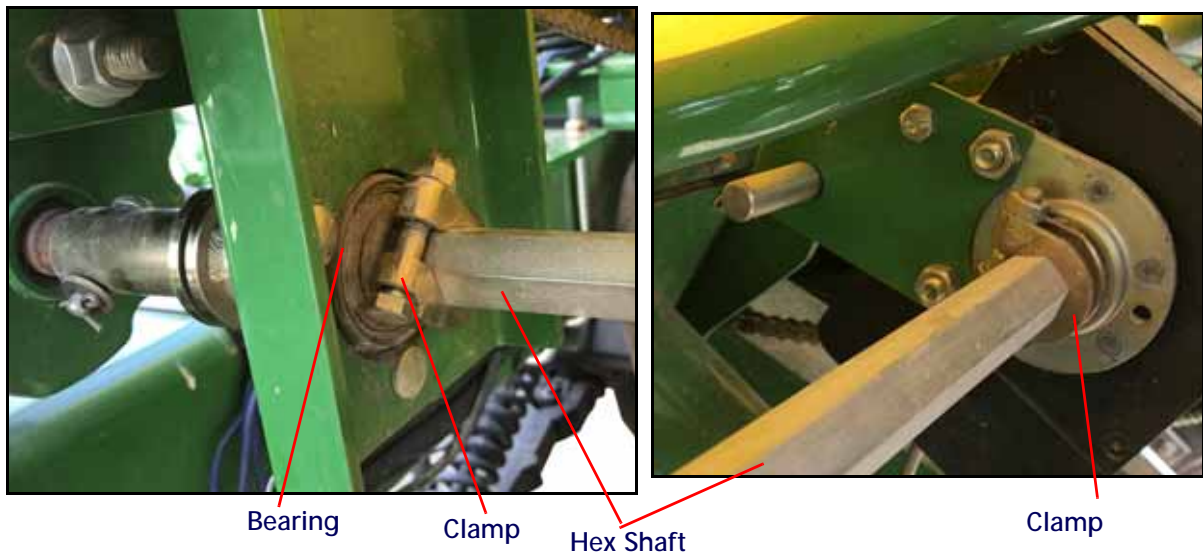
FIGURE 7. Single Rank Machine Chain



2. Loosen the clamps and bearings securing the main shaft.

**NOTE:** The shaft may be difficult to remove due to misalignment and surface rust. Use lubrication around bearings and clutches to break the shaft free. Use a soft blow hammer or a piece of wood to prevent shaft distortion.

FIGURE 8. Clamp and Bearing Removal



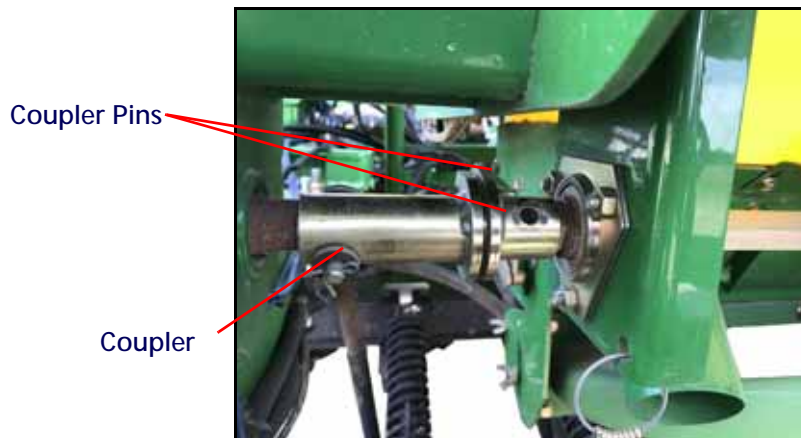
3. Slide the hex shaft out the right side of the machine.

**NOTE:** Note the clutch orientation before fully removing the shaft as the clutches will fall out when removing the shaft.

DUAL RANK MACHINES

1. Remove the coupler pins connecting the transmission to the shaft.

FIGURE 9. Transmission Coupler



- Loosen the clamps and bearings securing the main shaft. Refer to Figure 8 on page 11.

**NOTE:** The shaft may be difficult to remove due to misalignment and surface rust. Use lubrication around bearings and clutches to break the shaft free. Use a soft blow hammer or a piece of wood to prevent shaft distortion.

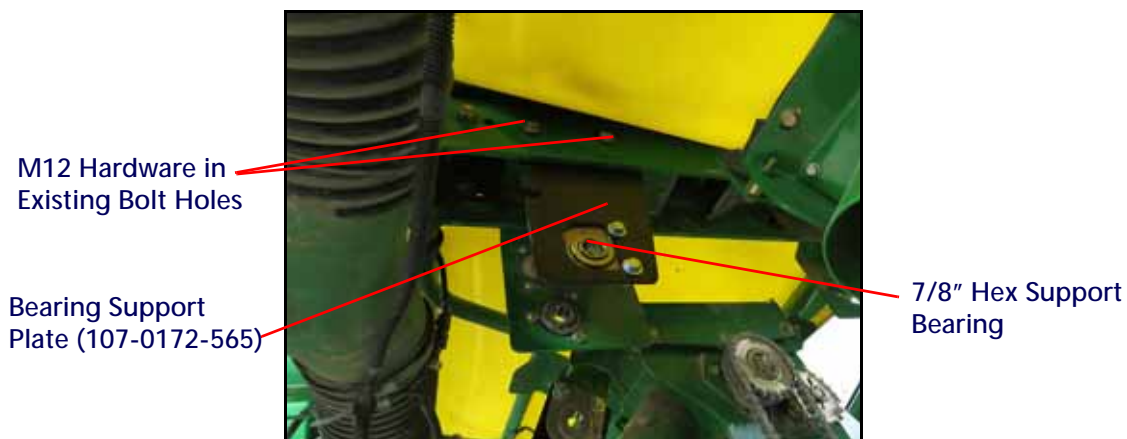
- Slide the hex shaft out the right side of the machine.

**NOTE:** Note the clutch orientation before fully removing the shaft as the clutches will fall out when removing the shaft.

## INSTALLING THE BEARING SUPPORT PLATE

- Locate the holes in the frame where the ground drive system would mount.
- Use the provided M12 hardware to mount the bearing support bracket (P/N 107-0172-565) to the frame.

FIGURE 10. Installed Bearing Support Plate



- Attach the 7/8" hex bearing to the bearing support bracket using the provided 3/8" - 16 x 1" bolts, 3/8" washer, and flanged lock nuts.



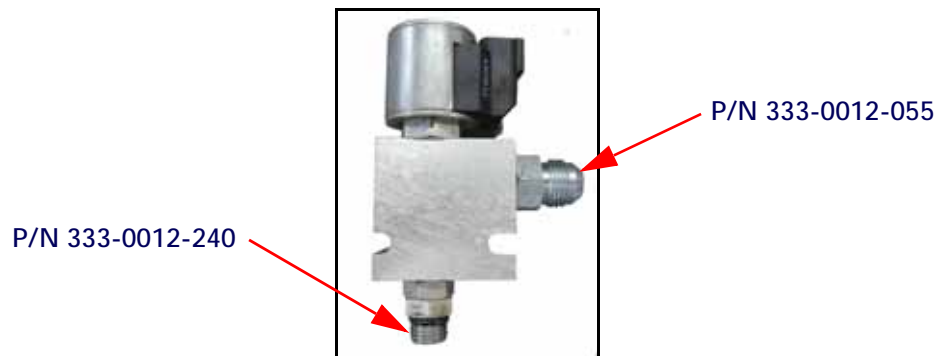
## INSTALLING HYDRAULIC MOTORS

### INSTALL THE FITTINGS ON THE CCS AIR DRILL HYDRAULIC MOTORS

Before mounting the CCS Air Drill hydraulic motors on the machine, install the proper fittings in the motors. This prepares the motors for installation and simplifies the hose connection process later in the procedure. Refer to the following table to install the fittings in the appropriate ports of the CCS Air Drill hydraulic motors.

## INSTALLING THE FITTINGS ON THE PWM VALVE

FIGURE 11. Fittings and PWM Valves Installed

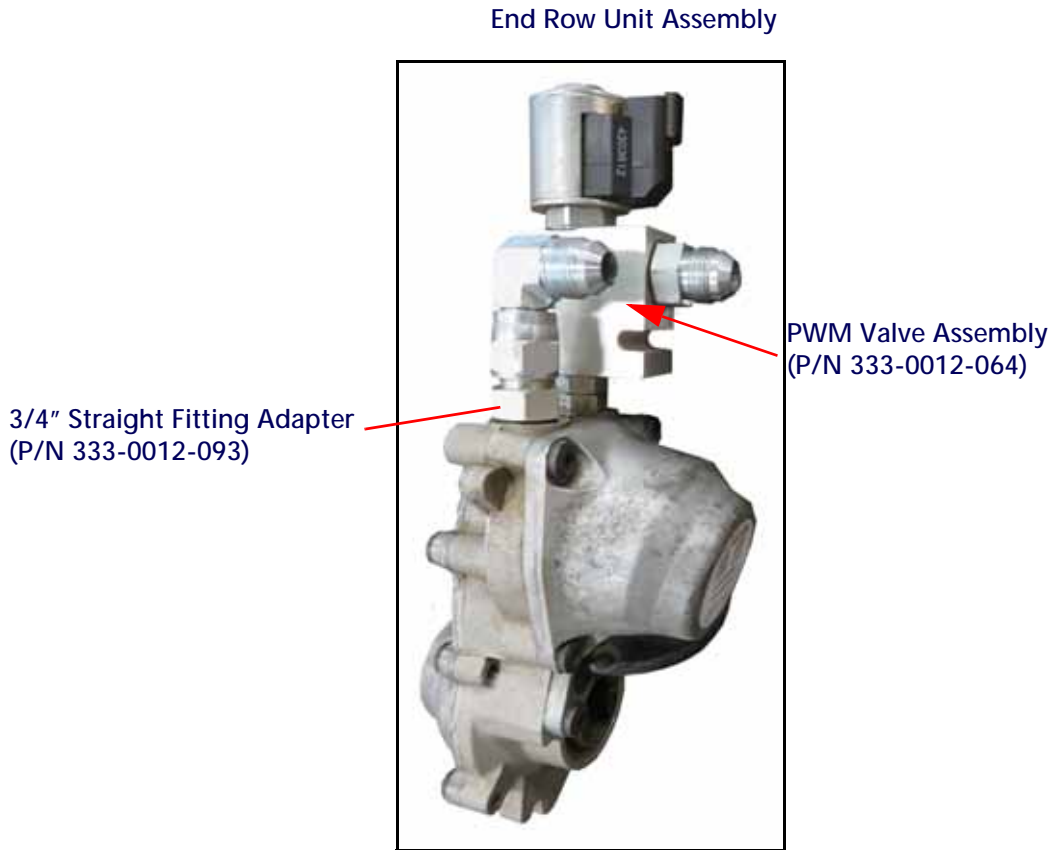


Fitting	Part Number	Port
Fitting - 9/16" SAE O-Ring (M) to 9/16" SAE O-Ring (M) Straight Adapter	333-0012-240	1
Fitting - 3/4" JIC (M) to 9/16" SAE O-Ring (M)	333-0012-055	2

1. Refer to the figure and table above to install the fittings in the appropriate ports of the PWM valve (P/N 063-0131-140) for the end row units.
2. Tighten the fittings to ensure they are securely installed.

## INSTALL THE PWM VALVE AND FITTINGS ON THE CCS AIR DRILL HYDRAULIC MOTOR

FIGURE 12. PWM Valve and Fittings Installed

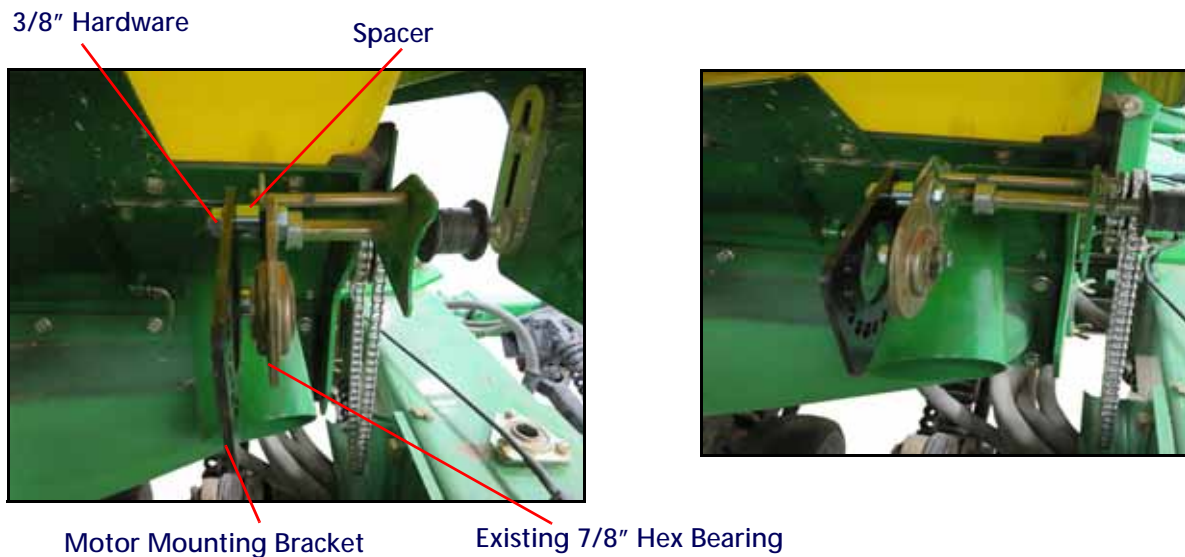


1. Install the PWM valve assembly in the pressure port of the CCS Air Drill hydraulic motor (P/N 416-8000-002).
2. Install a 3/4" SAE O-ring (M) to 3/4" JIC (M) straight adapter fitting (P/N 333-0012-093) in the tank port of the CCS Air Drill hydraulic motor.
3. Install the 3/4" Elbow (P/N 333-0012-064) onto the installed adapter fitting.

## INSTALL THE CCS AIR DRILL HYDRAULIC MOTORS

1. Replace the current hardware securing the hex shaft bearing with 3/8" - 16 x 1 1/2" bolts.
2. Install spacers.

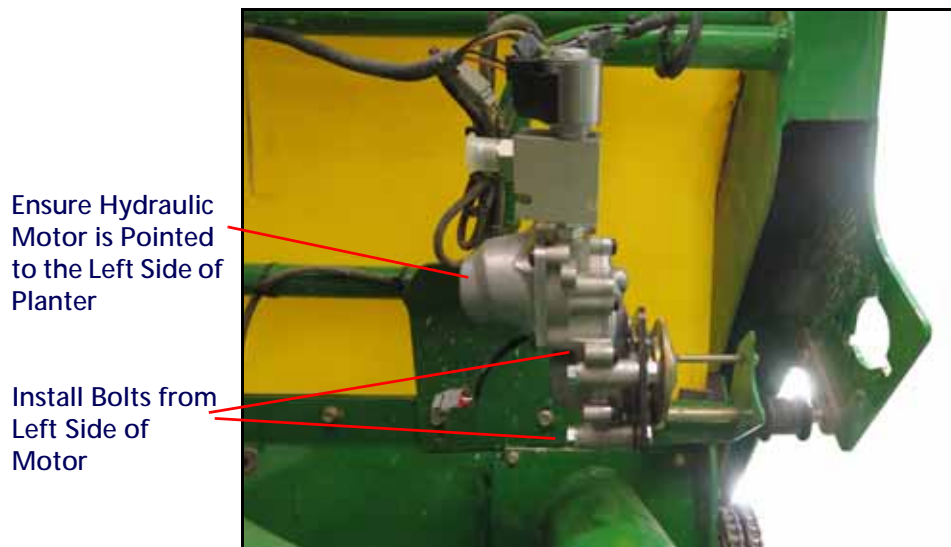
FIGURE 13. Spacer Installation



3. Loosely mount the motor mounting bracket to the existing bracket. Secure using the provided flanged lock nuts.
4. Loosely mount the hydraulic motors to the motor mounting plates with the hydraulic motor pointing to the left side of the planter drill using 3/8" - 16 x 2 1/2" bolts, washers, and flange lock nuts. Install the bolts and washers from the left side of the motor and secure with flanged lock nuts.

**NOTE:** Ensure the motors have plenty of clearance with the surrounding area. If the manifold was removed, ensure the motors will clear all manifold duct work when the manifold is reinstalled. Several adjustments may need to take place throughout the installation.

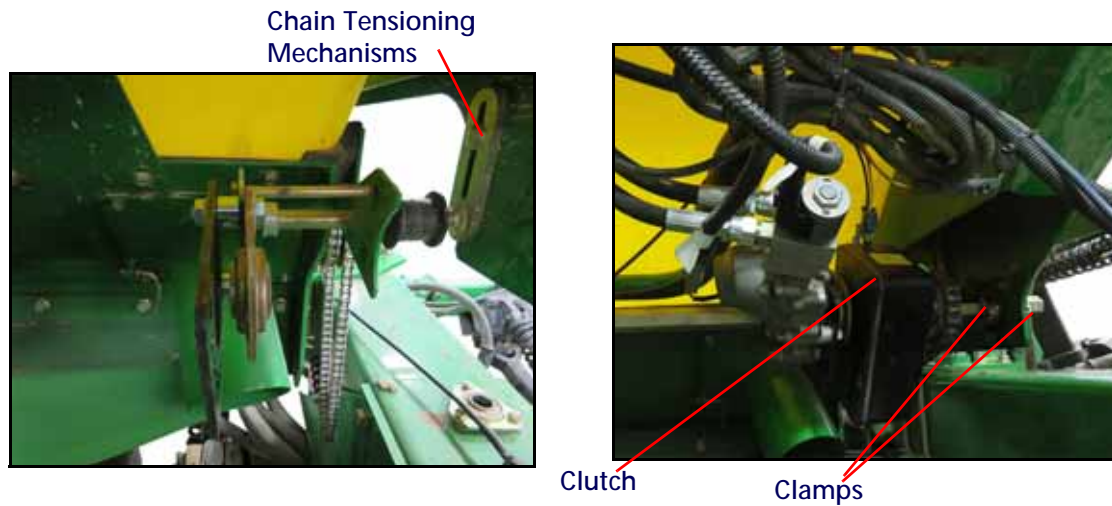
FIGURE 14. Installed Hydraulic Motors



## SHAFT INSTALLATION

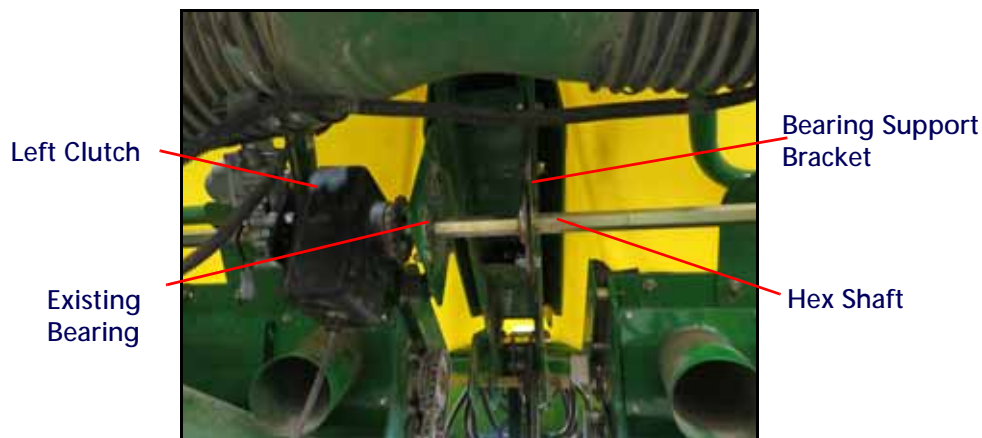
1. Starting on the right side of the machine, install the hex shaft in the existing machine support bearing.
2. Reinstall the existing shaft collars on both sides of the existing support bearing. These prevent the shaft from moving side to side.
3. With the meter drive chain on the clutch sprocket and meter sprocket and with the chain tension adjusted out, slide the hex shaft through the clutch.

FIGURE 15. Right Clutch Assembly



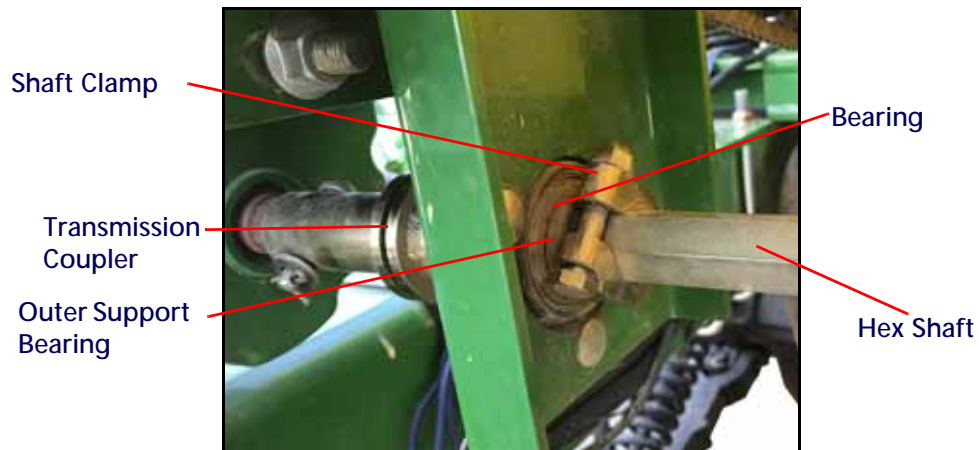
4. Route the shaft through the hydraulic motor, existing 7/8" hex bearing, and to the previously installed 7/8" bearing and support bracket located at the center of the machine.
5. Route the installed hex shaft through the bearing and bracket.

FIGURE 16. Right Hex Shaft in Bearing and Bracket



6. Repeat step 3 through step 5 for the left clutch.
7. Install the shaft clamp then install it into the existing outer support bearing.
8. Secure the outer edge of the shaft with a shaft clamp for single rank machines or the transmission coupler on dual rank machines.

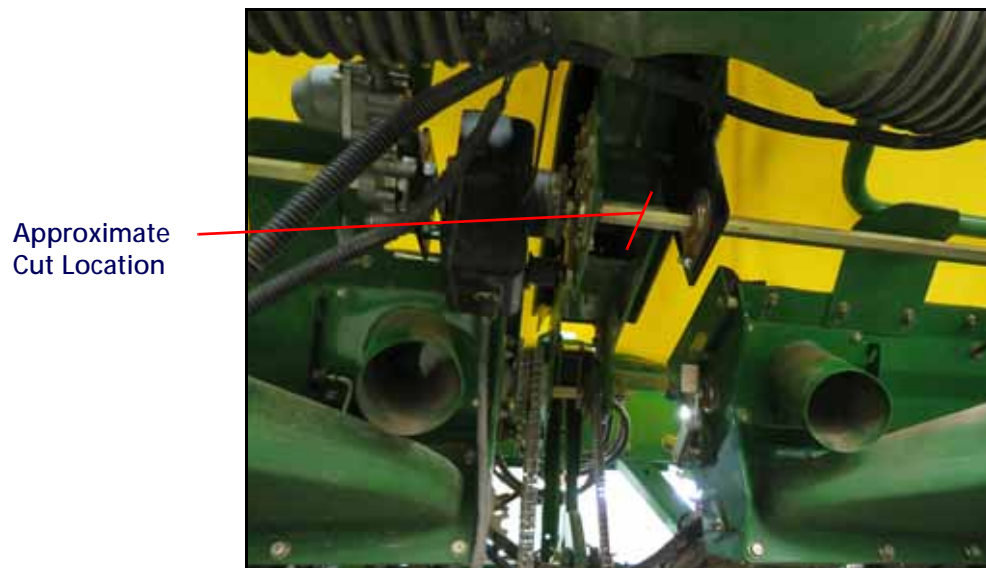
FIGURE 17. Left Hex Shaft in Bearing and Bracket



## CUT THE HEX SHAFT

1. Ensure the shaft is properly centered in the seeder frame.
2. Locate the center of the shaft between the existing brackets and new bearing support bracket.

FIGURE 18. Installed Hex Shaft



3. Cut the hex shaft in a location that allows enough room to slide the shafts towards the outside of the machine about 1/2" to avoid the interface between the two shafts.

## INSTALLING THE PRESSURE REDUCING HYDRAULIC MANIFOLD

**NOTE:** Refer to the machine-specific installation guide to determine the appropriate mounting location for the pressure reducing hydraulic manifold. Additional hardware and mounting plate modification may be required.

### INSTALL THE FITTINGS ON THE VALVE

Before mounting the pressure reducing valve on the machine, install the proper fittings in the valve. This prepares the valve for installation and simplifies the hose connection process later in the procedure. Refer to the following table to install the fittings in the appropriate ports of the pressure reducing valve.

#### LOW FLOW VALVE (P/N 063-0131-141)

**FIGURE 19. Fittings Installed on the Valve**

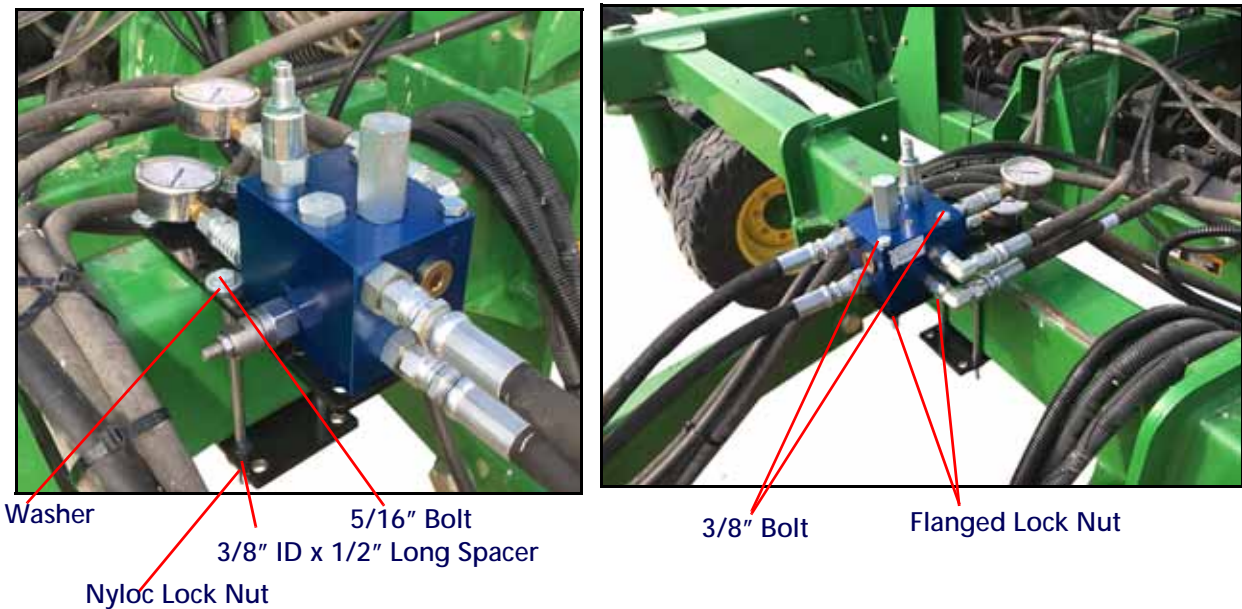


Fitting	Part Number	Port
Fitting - 3/4" JIC (M) to 7/8" SAE O-Ring (M) Straight Adapter	333-0012-056	P, T
Fitting - 7/16" SAE O-Ring (M) to Male Diagnostic Nipple Hydraulic	333-0012-308	G1, G2
Fitting - 3/4" JIC (M) to 3/4" SAE O-Ring (M)	333-0012-093	CF, T1
Fitting - 3/4" SAE O-Ring (M) Plug	333-0012-211	T2
Fitting - 1/4" NPT Breather	333-0012-189	RV

1. Use the supplied 5/16" x 8 bolts to secure the pressure reducing manifold mounting plates to the front cross tube on the implement. The longer bracket (P/N 107-0171-956) will be mounted to the top and the shorter bracket (P/N 107-0171-979) will be mounted on the bottom. The brackets should be secured as shown in the following image.



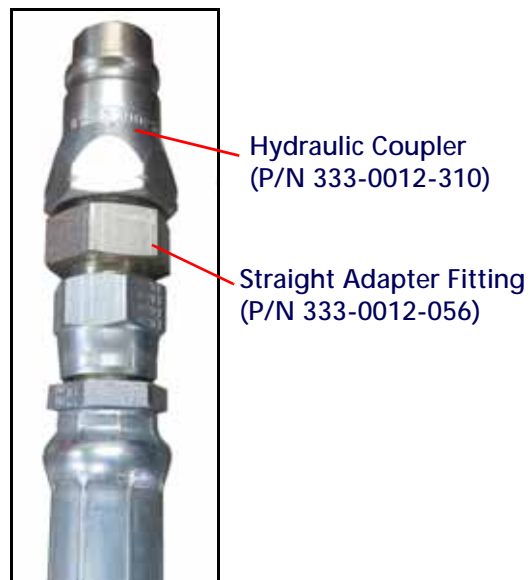
FIGURE 20. Pressure Reducing Manifold on Bar



## HOSE ROUTING

While completing this section refer to the installation diagram for hose layout.

FIGURE 21. Pioneer Coupler Installation



1. Install the pioneer couplers and adapter fittings to the ends of the pressure and tank hoses going to the tractor.
2. On the pressure reducing manifold, install hose with the "T" on the end to the tank ports.

**NOTE:** The pressure gauge is shipped in the Pressure Testing Kit (P/N 117-3001-018).

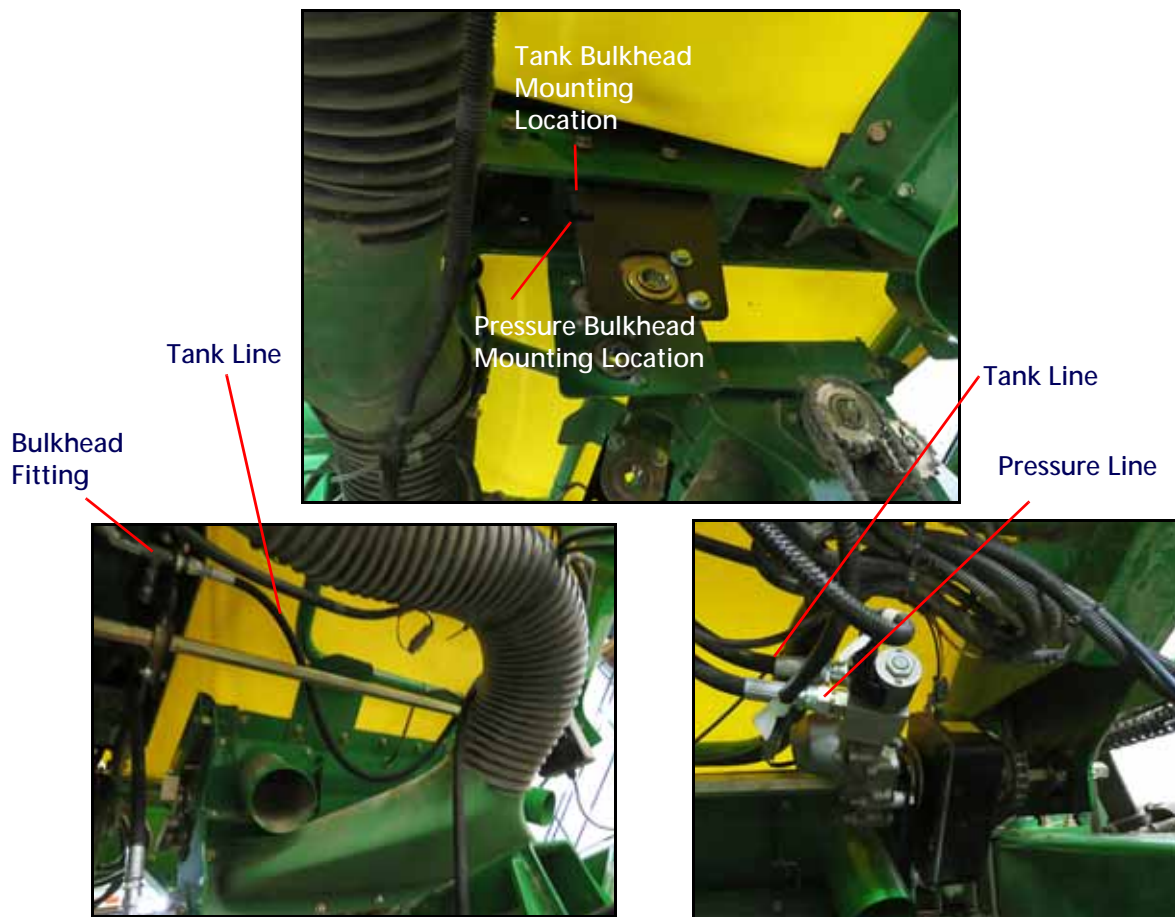
FIGURE 22. Hoses Connected on Manifold



3. On the pressure reducing manifold, install the hose with the P on the end to the P port.
4. On the control side of the pressure manifold, connect the hose with the T1 on the end to the tank port.
5. On the control side of the pressure manifold, connect the hose with the P on the end to the CF port.
6. Route the hydraulic hoses to the rear of the machine between the CCS tanks.
7. Install and hand tighten a bulkhead tee fitting to the tank hose. Tighten the jam nut to secure the bulkhead fitting into the top mounting slot on the bearing retaining bracket.
8. Tighten the hose to the bulkhead fitting.
9. Install the hoses from the tank bulk head tee to connect the motor tank fittings.
10. Tighten the hoses to the tank bulkhead fitting and tank fittings.



FIGURE 23. Hose Secured to Bulkhead Fitting



11. Install and hand tighten a bulkhead tee fitting to the pressure hose. Tighten the fitting jam nut to secure the bulkhead fitting into the bottom mounting slot on the bearing retaining bracket.
12. Tighten the pressure hose to the bulkhead fitting.
13. Install the hoses from the install pressure bulkhead tee to connect the PWM valves.
14. Tighten the hoses to pressure bulkhead fitting and PWM valve fittings.

## FINALIZING THE MOTOR AND SHAFT INSTALLATION

1. Adjust the proper tension on the clutch to meter chains and tighten the adjuster.

FIGURE 24. Meter Chain Installed

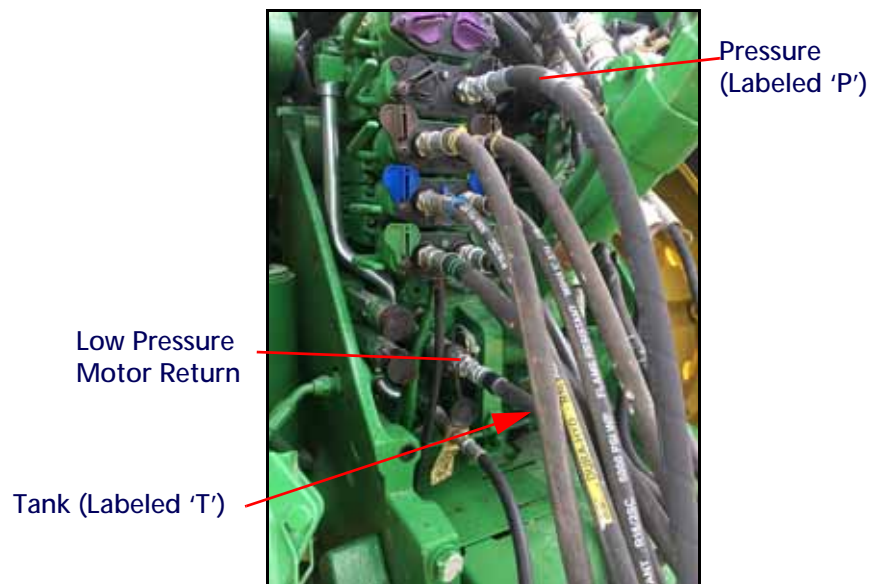


1. Position the hydraulic hoses so they will not interfere with surrounding components.
2. Tighten all the hardware securing the motors, brackets, and bearings.
3. Install the fan and duct components if removed earlier. Verify it does not come in contact with the motors or PWM valve.

## CONNECT THE HYDRAULIC HOSES TO THE TRACTOR

### CLOSED CENTER HYDRAULIC SYSTEM

FIGURE 25. Hydraulic Hoses Connected to the Tractor



1. Connect the pressure hose (labeled 'P') to the pressure side of the tractor's SCV.
2. Connect the tank hose (labeled 'T') to the low pressure motor return on the tractor.

## INSTALL THE OPENER PRESSURE TRANSDUCER

1. Install the open pressure transducer.

FIGURE 26. Open Pressure Transducer



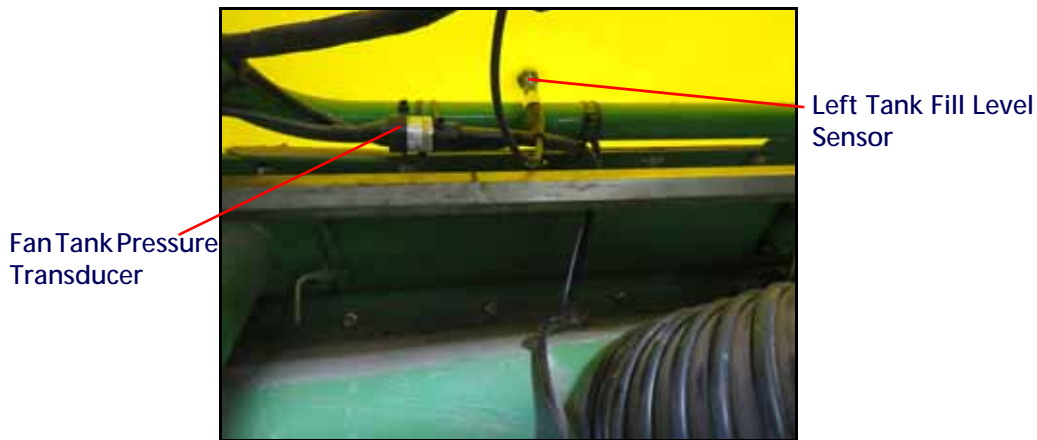
TABLE 1. Pressure Transducer Assembly

	Description	Part Number
A	Pressure Transducer	422-0000-093
B	Adapter -4 SAE O-ring (F) to 1/4" MNPT	333-0012-163
C, D	Adapter -6 JIC (F) to 1/4" FNPT	333-0012-311
E	-6 JIC Run Tee	333-0012-043
F	Adapter -8 SAE O-Ring (M) to -6 JIC (M)	333-0012-046

## TANK PRESSURE TRANSDUCER INSTALLATION

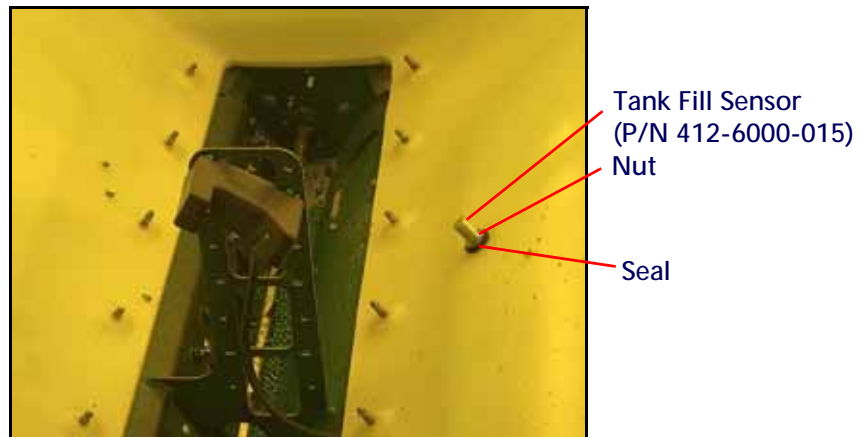
1. Refer to the instructions shipped with the transducer kit (P/N 422-0000-125) for installation instructions.

FIGURE 27. Fan Transducer and Left Tank Fill Sensor



2. Using 1/2" drill bit, drill a hole on each side of the tank approximately 6" above the bottom of the tank.
3. Install the left and right fill level sensors so they are located approximately 6" above the bottom of the tank.

FIGURE 28. Installed Tank Fill Sensor

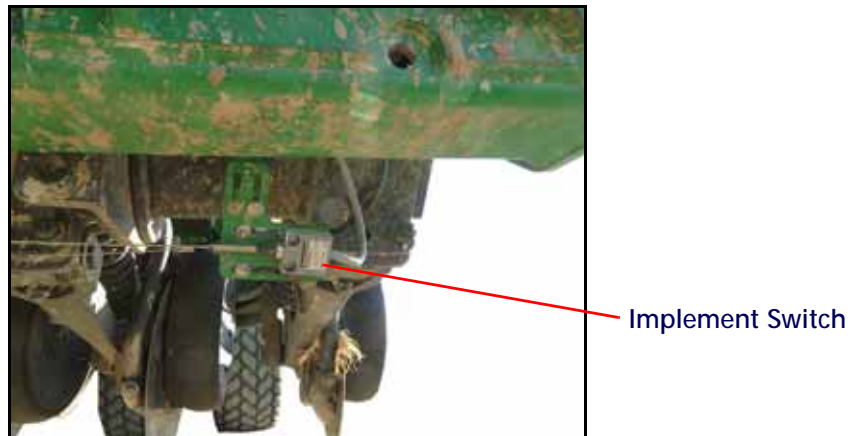


4. Secure the tank fill sensors in the tank so they stick approximately 3/4" of an inch inside the tank.
5. Install the seal and the nut to secure the tank fill sensor in place.

## INSTALLING THE IMPLEMENT SWITCH

1. Locate the existing machine implement switch (usually behind the front left set of tires).
2. Use the supplied hardware to mount the implement whisker switch to the existing brackets.

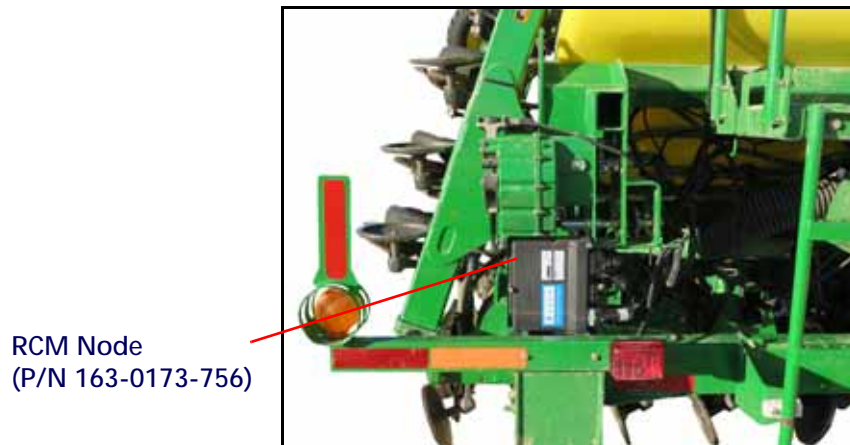
FIGURE 29. Installed Implement Switch



## RCM NODE INSTALLATION

1. Using a mag mount or bracket (P/N 107-0172-484), install the node in a suitable location on the left rear of the machine.

FIGURE 30. RCM Node

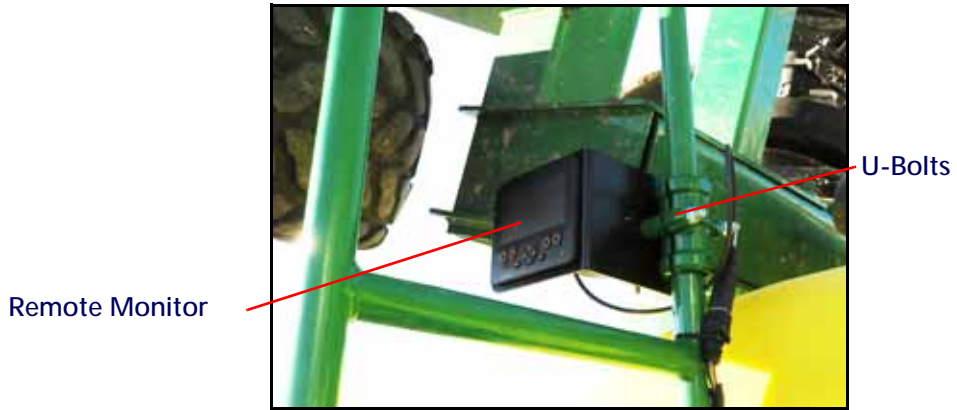


## OPTIONAL REMOTE MONITOR INSTALLATION

1. Use the supplied U-bolts to mount the optional remote monitor to the bracket and monitor.

FIGURE 31. Remote Monitor Installation

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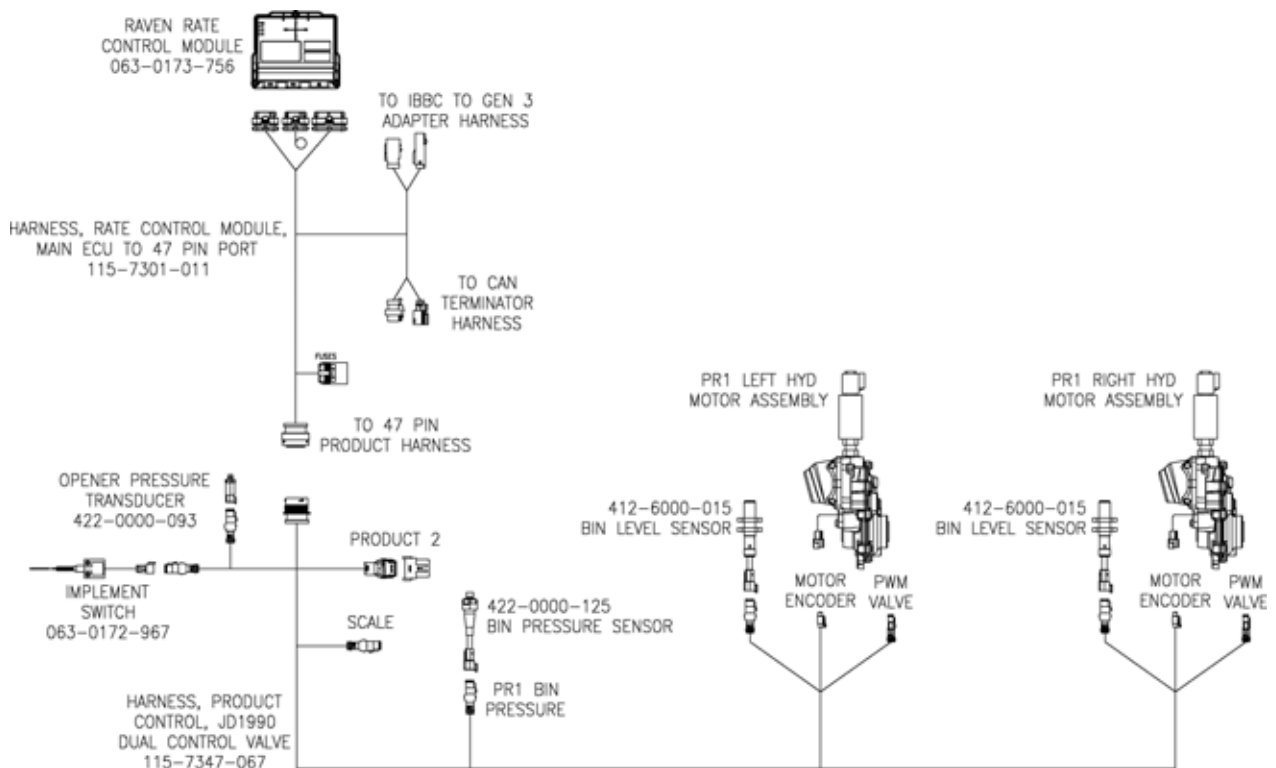
# CHAPTER

# WIRING INSTALLATION

## 4

### WIRING DIAGRAM

FIGURE 1. Air Drill Wiring Diagram




### SYSTEM INSTALLATION VERIFICATION

**NOTE:** If there are issues with the CCS Air Drill system, turn off the machine and correct them immediately. For additional assistance, contact your local Raven dealer.

### SYSTEM COMPONENT MOUNTING AND ROUTINGS

1. Cycle the air drill's folding operation to ensure:
  - hoses and cabling are not rubbing on or interfering with moving parts.
  - mounted components are secure and not interfering with moving parts.

## HYDRAULIC SYSTEM PURGE AND INITIAL OPERATION

	<p><b>WARNING</b></p> <p>Hydraulics are under pressure. Care should always be taken with a system that has been pressurized. When disconnecting or purging hydraulic hoses, be aware that the hydraulic fluid within the machine's system may be extremely hot and under high pressure.</p>
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1. Assemble the hydraulic pressure gauge using the components found in kit P/N 117-3001-018.

FIGURE 2. Hydraulic Pressure Gauge

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2. Attach the hydraulic pressure gauge to the pressure reducing manifold.

**NOTE:** G1 measures the pressure side of the system and G2 measures the return side of the system.



FIGURE 3. Installed Hydraulic Pressure Gauge



3. On the field computer, locate the product control settings and adjust the PWM valve frequency to 200 Hz.

**NOTE:** If needed, refer to the field computer specific manual for assistance.

4. Start a job or a test job to get signal to activate the PWM valves.
5. Cycle the hydraulics to purge the system of air.
6. If necessary, use the PR1 cartridge to adjust the pressure reducing manifold. Manifolds are factory set to reduce the pressure to 600 PSI. The pressure many need to be adjusted slightly but should not exceed 1500 PSI.

**NOTE:** The return pressure on G2 should not exceed 200 PSI. If it exceeds 200 PSI the relief valve will trip and allow fluid out of the brass fitting.



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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.**