Case IH Maxxum 110-140, Case IH Puma 115-155, & New Holland T6 Series SmarTrax™ Installation Manual

P/N 016-5032-009 Rev. A 04/17 E28926

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CHAPTER 1 IMPORTANT SAFETY INFORMATION

NOTICE

Read this manual and the operation and safety instructions included with your implement and/or controller carefully before installing the SmarTrax™ 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 SmarTrax 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 your local Raven dealer.

When operating the machine after installing SmarTrax, observe the following safety measures:

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

⚠ WARNING

- When starting the machine for the first time after installing SmarTrax, be sure that all persons stand clear in case a hose has not been properly tightened.
- The machine must remain stationary and switched off, with the booms unfolded and supported, during installation or maintenance.

⚠ CAUTION

HYDRAULIC

GENERAL

- Raven Industries recommends that appropriate protective equipment be worn at all times when working on the hydraulic system.
- Never attempt to open or work on a hydraulic system with the equipment running. Care should always be taken when opening a system that has been previously pressurized.
- When disconnecting the hydraulic hoses or purging is required, be aware that the hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- When installing SmarTrax hydraulics or performing diagnostics, maintenance, or routine service, ensure that precautions are taken to prevent any foreign material or contaminants from being introduced into the machine's hydraulic system. Objects or materials that are able to bypass the machine's hydraulic filtration system will reduce performance and possibly damage the SmarTrax hydraulic valve.

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 SmarTrax 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

ELECTRICAL

GENERAL

- 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.
- Ensure that the power cable is the last cable to be connected.
- A minimum of 12 VDC is required for system operation with a maximum of 15 VDC.

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 SmarTrax 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.

CHAPTER 2 INTRODUCTION

INTRODUCTION

Congratulations on your purchase of the Raven SmarTrax system! This system is designed to provide cutting-edge, hands-free SmarTrax of the machine via Global Positioning System (GPS) coordinates.

This manual applies to the following machines:

MAKE: Case IH
MODEL: Maxxum 110, 115, 120, 125, 130, and 140
YEAR: 2007-2015

MAKE: Case IH
MODEL: Puma 115, 125, 140, and 155
YEAR: 2008-2010

MAKE: New Holland
MODEL: T6010, T6020, T6030, T6040, T6050, T6060, T6070, and T6080
YEAR: 2007-2011

MAKE: New Holland
MODEL: T6.140, T6.150, T6.155, T6.160, T6.165, and T6.175
YEAR: 2011-2015

PREPARING FOR INSTALLATION

Before installing SmarTrax, park the machine where the ground is level, clean, and dry. 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 SmarTrax system for the first time, at the start of the season, or when moving the SmarTrax 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.).
- Operate each of the machine's boom hydraulic functions (i.e., tilt, fold, center rack, tongue extension, or other hydraulic valve functions) three times to ensure the machine's hydraulic valve is using fresh oil and debris is flushed from the hydraulic hoses, valves, and filters.

Raven Industries recommends the following best practices when installing the SmarTrax 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 SmarTrax system:

- SAE standard-sized wrenches
- Cable ties
- Set of tools

POINT OF REFERENCE

The instructions in this manual assume that you are standing behind the machine, looking toward the cab.

UPDATES

Software and manual updates are available on the Raven Applied Technology website:

http://www.ravenhelp.com

At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual.

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

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

techwriting@ravenind.com

-Case IH Maxxum 110-140, Case IH Puma 115-155, & New Holland T6 Series SmarTrax™ Installation Manual
-P/N 016-5032-009 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.

KIT CONTENTS

This section contains a list of the components that are included in the SmarTrax kit. Before beginning the SmarTrax installation, compare the items in the SmarTrax kit with the components on this list. If you have questions about the kit, contact your local Raven dealer.

TABLE 1. SmarTrax Installation Kit MFWD (P/N 117-5032-009)

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - Case IH Puma/New Holland Non-Delta T60X0 Series SmarTrax Installation	016-5032-009	1
	Valve - SmarTrax Hydraulic	334-0003-088	1
	Valve - Dual Pilot Operated Check (POCI)	334-0003-099	1
	Bracket - SmarTrax Node Mounting	107-0172-137	1
	Bracket - Hydraulic Valve Mounting	107-0172-452	1
	Cable - Valve Harness	115-4001-136	1
	Transducer - 0-3000 PSI Pressure	422-0000-086	1
	Bolt - 1/4"-20 x 1.25" Hex	311-0050-106	4
	Bolt - 5/16"-18 x 7/8" Hex Head	311-0052-104	4

TABLE 1. SmarTrax Installation Kit MFWD (P/N 117-5032-009)

Picture	Item Description	Part Number	Qty.
	Bolt - 1/4"-20 x 2-1/2" Hex Head	311-0049-111	2
	Nut - 1/4"-20 Nylon Insert Lock	312-4000-057	4
	Nut - 5/16"-18 Nylon Insert Lock	312-4000-059	2
	Nut - 3/8"-16 Nylon Insert Lock	312-4000-061	3
	Washer - 5/16" Lock	313-1000-019	4
	Washer - 1/4" ID Flat	313-2300-009	8

TABLE 2. Hydraulic Kit (P/N JDP-FA10-692)

Picture	Item Description	Part Number	Qty.
	Fitting - -4 SAE O-Ring Plug	333-0012-051	4
	Fitting - -6 ORFS M/F 90° Elbow	333-0012-065	4
	Fitting - -6 ORFS M/F 45° Elbow	333-0012-090	4
	Fitting - -8 ORFS M/F 45° Elbow	333-0012-102	2

TABLE 2. Hydraulic Kit (P/N JDP-FA10-692)

Picture	Item Description	Part Number	Qty.
	Fitting - -6 SAE O-Ring Plug	333-0012-104	1
	Fitting - -6 ORFS M/F Straight Adapter	333-0012-167	4
	Fitting - -6 ORB (M) to -4 ORFS (M) Straight Adapter	333-0012-195	1
	Fitting - -6 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-199	8
	Fitting - -8 ORB (M) to -8 ORFS (M) Straight Adapter	333-0012-211	1
	Fitting - -10 ORB (M) to -6 ORFS (M) Straight Adapter	333-0012-233	2
	Fitting - M22 ORB (M) to -8 ORFS (M) Straight Adapter	333-0012-344	1
	Fitting - M22 ORV (M) to -8 ORFS (M) Straight Adapter	333-0012-344	1
	Fitting - M12 ORB (M) to -4 ORFS (M) Straight Adapter	333-0012-345	1
	Hydraulic Hose - -8 ORFS (F) 90° to -6 ORFS (F) - 108″	214-1001-085	2
	Hydraulic Hose - -4 ORFS (F) 90° to -4 ORFS (F) - 108″	214-1001-086	1

TABLE 2. Hydraulic Kit (P/N JDP-FA10-692)

Picture	Item Description	Part Number	Qty.
	Hydraulic Hose - -6 ORFS (F) 90° to -6 ORFS (F) - 18″	214-1001-088	1
	Hydraulic Hose - -6 ORFS (F) 90° to -6 ORFS (F) - 18″ LONG	214-1001-089	1
	Hydraulic Hose - -6 ORFS (F) 90° to -6 ORFS (F) - 30″	214-1001-090	1
	Hydraulic Hose - -6 ORFS (F) 90° to -6 ORFS (F) - 32″ LONG	214-1001-091	1

TABLE 3. **Wheel Angle Sensor Kit (P/N 117-0192-048)**

Picture	Item Description	Part Number	Qty.
	Sensor - 300 mm Linear Wheel Angle	416-0001-052	1
	Bracket - 1” WAS Shaft Collar	107-0172-400	1
	Bracket - WAS Fixed End	107-0172-453	1
	Cable - WAS Adapter	115-4001-266	1
	Mount - M10 Linear Sensor Stud	103-0001-030	2
	Nut - M10 x 1.5 Jam	312-1002-035	2

TABLE 3. **Wheel Angle Sensor Kit (P/N 117-0192-048)**

Picture	Item Description	Part Number	Qty.
	Nut - M10 x 1.5 Nylon Insert Lock	312-4000-208	2
	Washer - M12 Flat	313-2300-211	2
	Washer - M14 Flat	313-2300-212	2

TABLE 4. Node Installation Kit (P/N 117-5030-005)

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - SmarTrax Calibration & Operation	016-0171-277	1
	Node - SmarTrax 3D CAN Control	063-0173-228	1
	Cable - Node Harness	115-4001-109	1
	Assembly - SmarTrax Enable Foot Switch	063-0172-470	1

NOTE: The node installation kit is sold separately.

CHAPTER 3 HYDRAULIC SYSTEM INSTALLATION

⚠ WARNING

Hydraulics are under pressure. Care should always be taken with a system that has been pressurized.

Before beginning the SmarTrax hydraulic installation, turn off the machine and relieve pressure by turning the steering wheel left and right.

Never work on a hot machine. Always allow it to cool before performing diagnostics, maintenance, or routine service.

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.

Tampering with hydraulic valves may cause serious injury or death, and will void the warranty.

⚠ CAUTION

When installing SmarTrax hydraulics or performing diagnostics, maintenance, or routine service, ensure precautions are taken to prevent any foreign material from being introduced into the machine's hydraulic system.

Objects or materials that are able to bypass the machine's hydraulic filtration system will reduce performance and possibly cause damage to the SmarTrax hydraulic valve.

INSTALL FITTINGS IN THE SMARTRAX VALVE

Before mounting the SmarTrax valve (P/N 334-0003-088) 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.

FIGURE 1. Fittings Installed in the SmarTrax Valve

Fitting	Part Number	Port
Fitting - -4 ORFS (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-195	LSPV
Fitting - -4 SAE O-Ring Internal Hex Plug	333-0012-051	PS
Fitting - -6 SAE O-Ring Internal Hex Plug	333-0012-104	LS STEER
Fitting - -8 SAE O-Ring Internal Hex Plug	333-0012-211	EP1
Fitting - -6 ORFS (M) to -8 O-Ring (M) 90° Elbow	333-0012-165	P, T
Fitting - -6 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-233	A, B
Fitting - -6 ORFS M/F 90° Swivel Elbow	333-0012-065	A, B

INSTALL FITTINGS IN THE DUAL POCI VALVE

Before mounting the dual POCI valve (P/N 334-0003-099) 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 Figure 2 and the table below to install the fittings in the appropriate ports of the dual POCI valve.

FIGURE 2. Fittings Installed in Dual POCI Valve

Fitting	Port
Fitting - -8 SAE O-ring (M) to -6 ORFS (M) Straight Adapter	A, A1, A2 B, B1, B2
Fitting - -4 SAE O-Ring (M) Plug	PS2, T1, T2
Transducer - 0-3000 PSI Pressure	PS

INSTALL THE SMARTRAX AND DUAL POCI VALVE ON THE VALVE MOUNTING BRACKET

FIGURE 3. Valve Mounting Bracket Installed on SmarTrax Valve

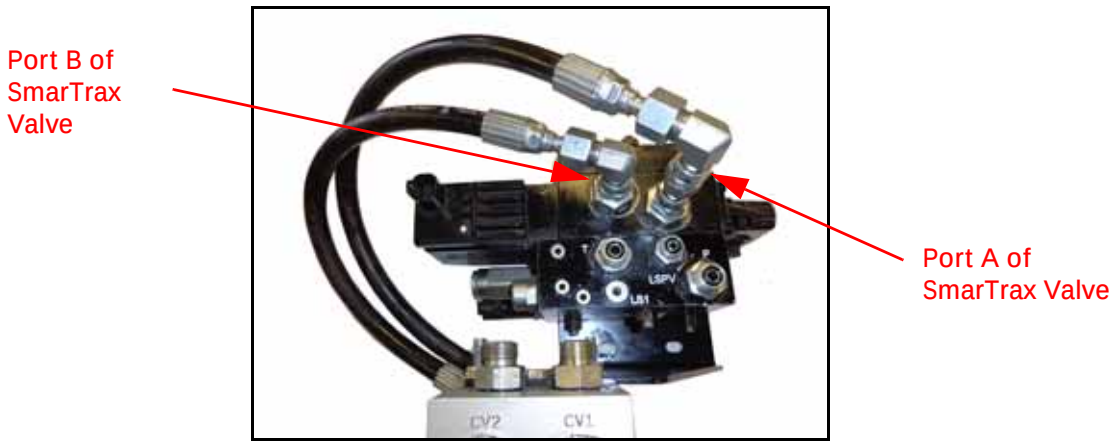
1. Secure the SmarTrax valve to the valve mounting bracket (P/N 107-0172-452) using four 5/16" x 7/8" bolts (P/N 311-0052-104) and four 5/16" split lock washers (P/N 313-1000-019).

FIGURE 4. Dual POCI Valve Installed on Valve Mounting Bracket

2. Install the dual POCI valve on the valve mounting bracket using the two 5/16" x 2.5" hex bolts (P/N 311-0052-111) and two 5/16"-18 nylon insert lock nuts (P/N 312-4000-059).

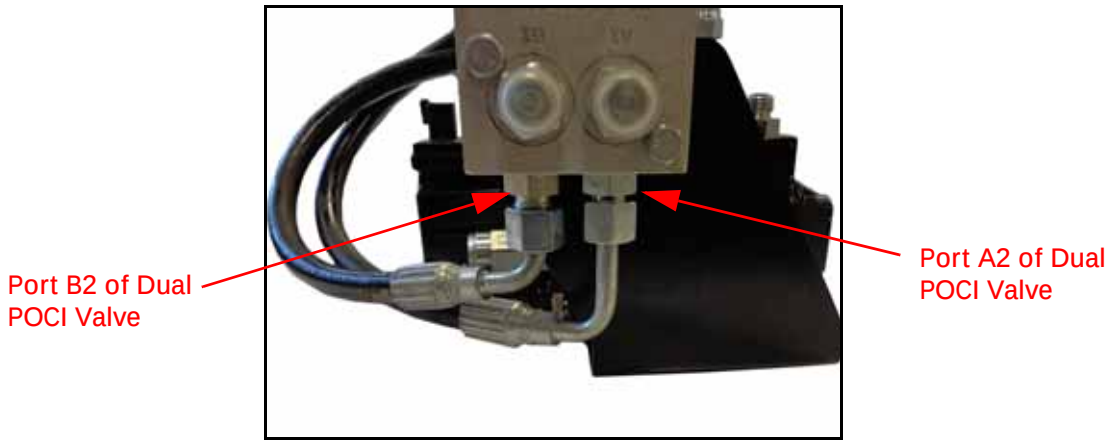
INSTALL THE HYDRAULIC HOSES ON THE VALVE

FIGURE 5. Hydraulic Hose Installed on Port A



1. Install the straight end of the supplied hydraulic hose (P/N 214-1001-089) on the elbow fitting installed in Port A of the SmarTrax valve.

FIGURE 6. Hydraulic Hose Installed on Dual POCI Valve



2. Install the 90° end of the installed hydraulic hose on the fitting installed in Port A2 of the dual POCI valve.
3. Install the straight end of the supplied hydraulic hose (P/N 214-1001-088) on the fitting installed in Port B of the SmarTrax valve.
4. Install the 90° end of the installed hydraulic hose on the fitting installed in Port B2 of the dual POCI valve.

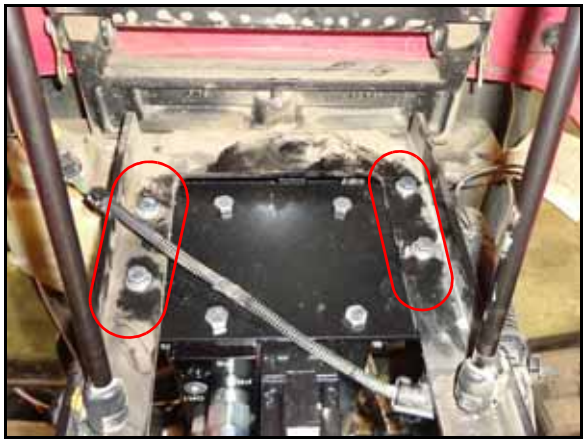
MOUNT THE SMARTRAX AND DUAL POCI VALVES ON THE MACHINE

FIGURE 7. Valve Mounting Location

1. Identify the valve mounting location on the machine's frame under the hood.

FIGURE 8. SmarTrax and Dual POCI Valves Installed

Top View



Right Side View

2. Position the valve mounting bracket over the existing holes in the machine's frame.

NOTE: If no existing holes exist, use the valve mounting bracket as a template to drill holes into the machine's frame.

3. Secure the valve mounting bracket to the machine's frame using the four 1/4"-20 x 1.25" hex bolts (P/N 311-0050-106), 1/4" flat washers (P/N 313-2300-009), and four 1/4"-20 nylon insert lock nuts (P/N 311-0050-106).

INSTALL THE LEFT AND RIGHT STEERING HOSES

NOTE: It may be necessary to install -6 ORFS 45° M/F elbow fittings (P/N 333-0012-090) -6 ORFS M/F 90° elbow fittings (P/N 333-0012-065) to achieve the left and right steering hose connections.

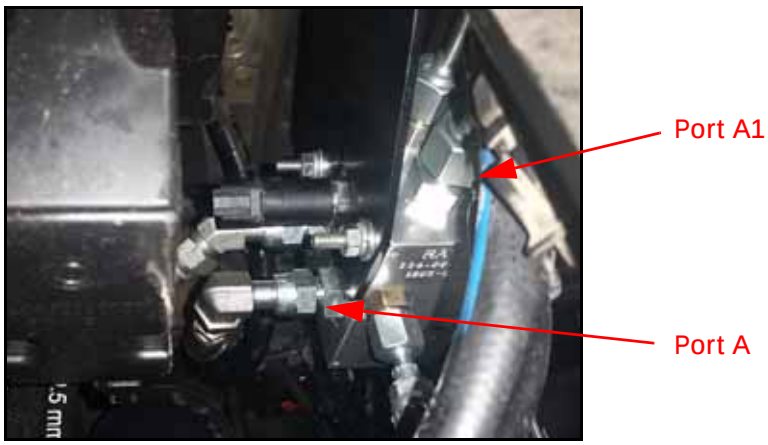
FIGURE 9. Machine's Left and Right Steering Hoses

1. Locate the left and right steering hoses on the steering orbital.

FIGURE 10. Left Steering Hose Removed

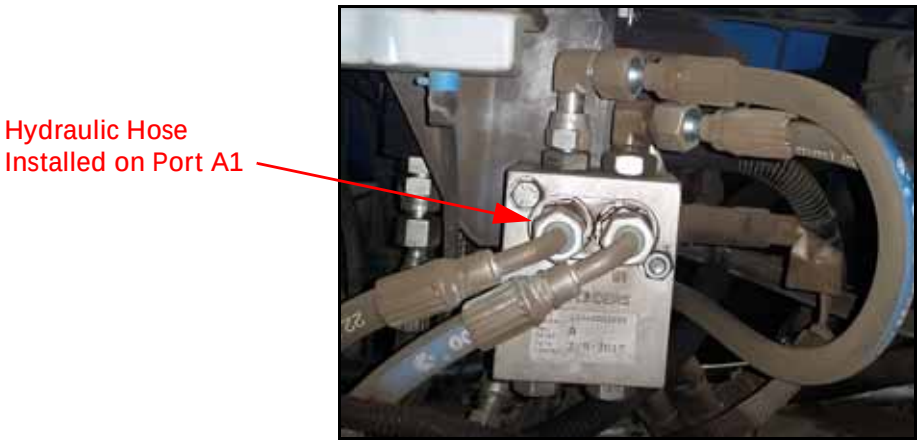
2. Remove the left steering hose from the steel line.

FIGURE 11. Left Steering Hose Installed on Dual POCI Valve



3. Install the left steering hose on the fitting installed in Port A of the dual POCI valve.

FIGURE 12. Hydraulic Hose Installed on Dual POCI Valve



4. Install the 90° end of the supplied hydraulic hose (P/N 214-1001-090) on the fitting installed in Port A1 of the dual POCI valve.

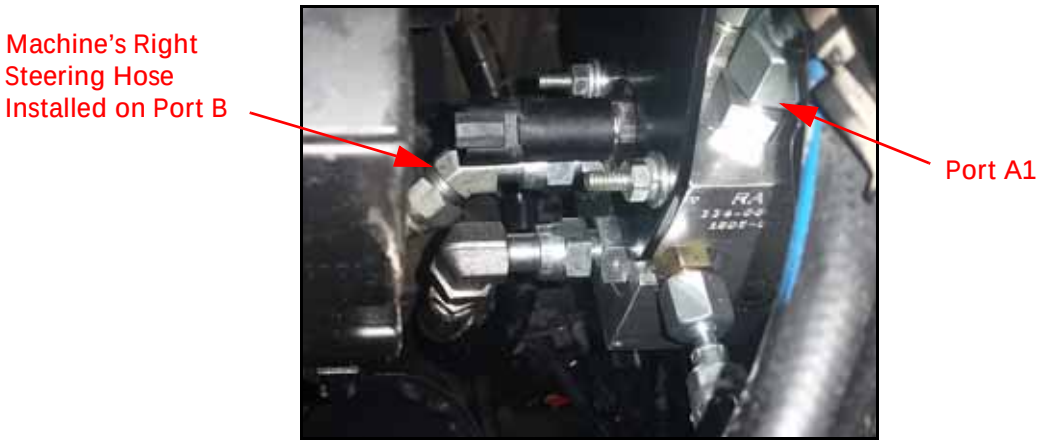
FIGURE 13. Hydraulic Hose Installed on Machine's Left Steering Line

5. Connect the other end of the installed hydraulic hose on the machine's left steel steering line.

FIGURE 14. Machine's Right Steering Hose

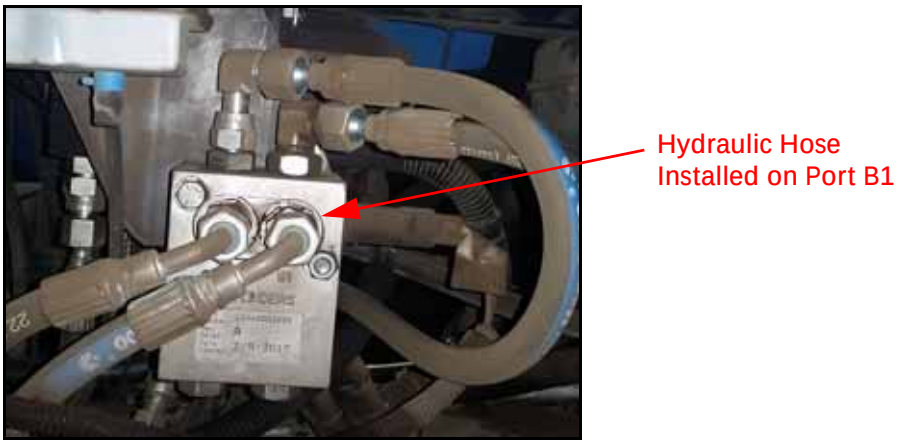
6. Remove the right steering hose from the steel line.

FIGURE 15. Machine's Right Steering Hose Installed on Dual POCI Valve



7. Install the right steering hose on the fitting installed in Port B of the dual POCI valve.

FIGURE 16. Hydraulic Hose Installed on Dual POCI Valve



8. Install the 90° end of the supplied hydraulic hose (P/N 214-1001-091) on the fitting installed in Port B1 of the dual POCI valve.

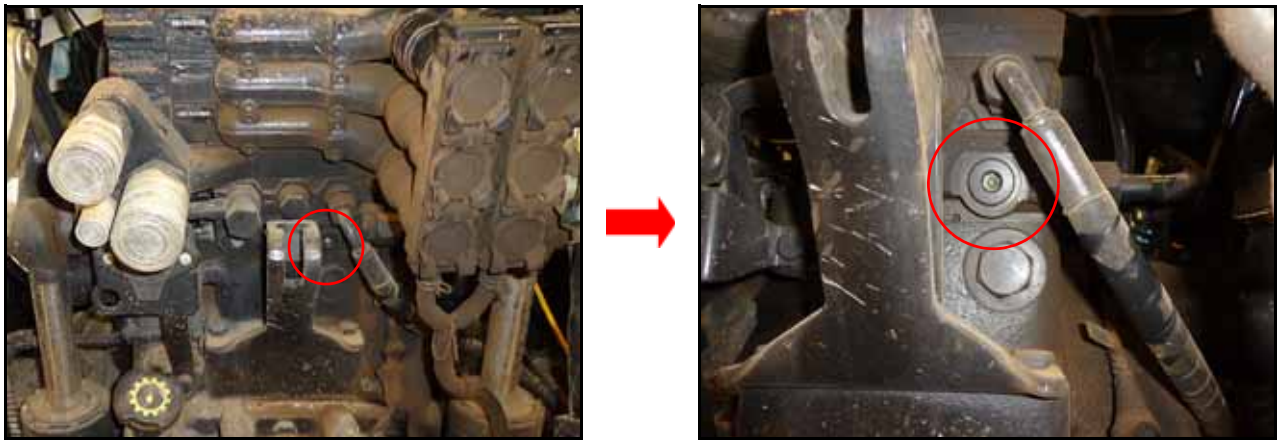
FIGURE 17. Hydraulic Hose Installed on Machine's Right Steering Line

9. Connect the other end of the installed hydraulic hose to the right steel steering line.

INSTALL THE PRESSURE, TANK, AND LOAD SENSE HOSES

IMPORTANT: Ensure that all hydraulic hoses are routed away from sharp edges, heat sources, and pinch points. Secure all hoses with plastic cable ties.

FIGURE 18. Machine's Pressure Port



1. Locate the machine's pressure port on the rear of the Power Beyond hydraulic valve.

FIGURE 19. Hydraulic Hose Installed on Pressure Port

2. Remove the pressure port plug and replace it with an M22 ORB (M) to -8 ORFS (M) straight adapter fitting (P/N 333-0012-344).

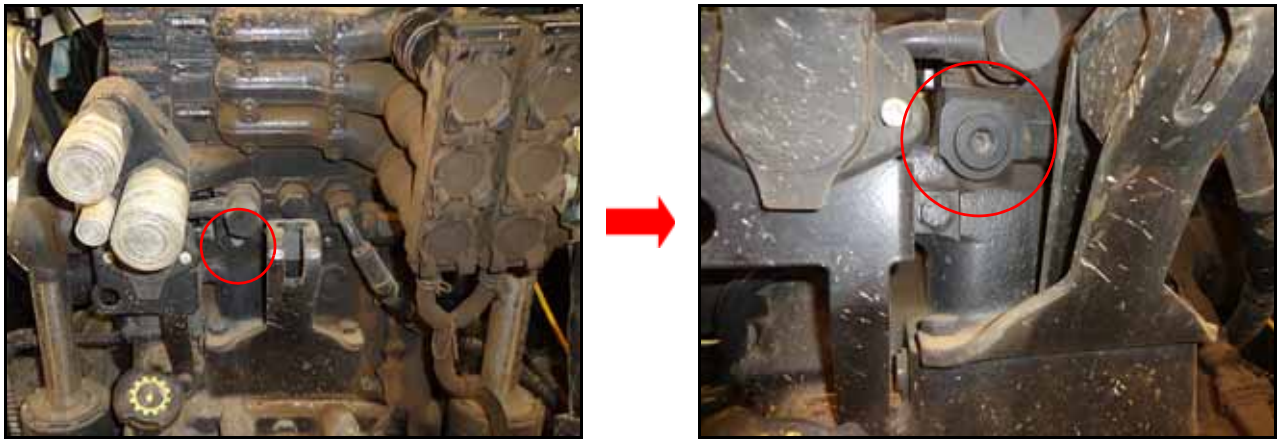
NOTE: Keep the pressure port plug for future use.

3. Install the -8 end of the supplied hydraulic hose (P/N 214-1001-085) on the machine's pressure port.
4. Route the other end of the installed hydraulic hose under the cab and to the SmarTrax valve.

FIGURE 20. Pressure Hose Installed on SmarTrax Valve

5. Connect the hydraulic hose to the fitting installed in Port P of the SmarTrax valve.

FIGURE 21. Machine's Tank Port



6. Locate the machine's tank port on the rear of the Power Beyond hydraulic valve.

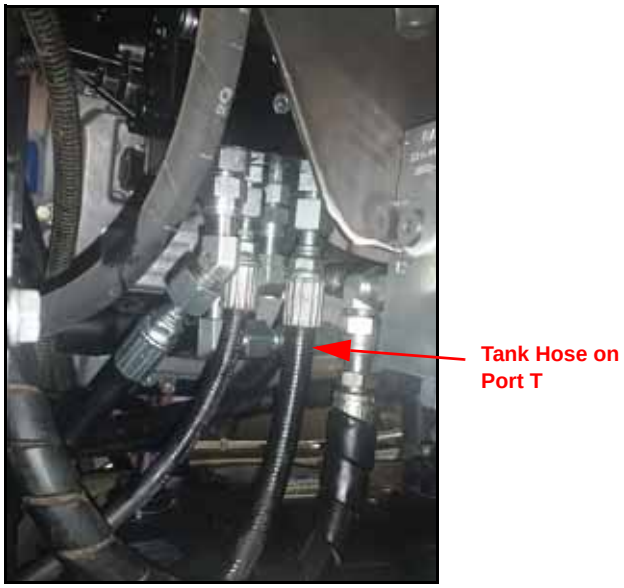
FIGURE 22. Hydraulic Hose Installed on Tank Port

7. Remove the tank port plug and replace it with an M27 ORB (M) to -8 ORFS (M) straight adapter fitting (P/N 333-0012-368).

NOTE: Keep the tank port plug for future use.

8. Install the 90° end of the supplied hydraulic hose (P/N 214-1001-085) on the installed plug fitting.
9. Route the other end of the installed hydraulic hose under the cab and to the SmarTrax valve.

FIGURE 23. Tank Hose Installed on SmarTrax Valve



10. Connect the hydraulic hose to the fitting installed in Port T of the SmarTrax valve.

FIGURE 24. Machine's Load Sense Port

11. Locate the machine's load sense port on the Power Beyond hydraulic valve.

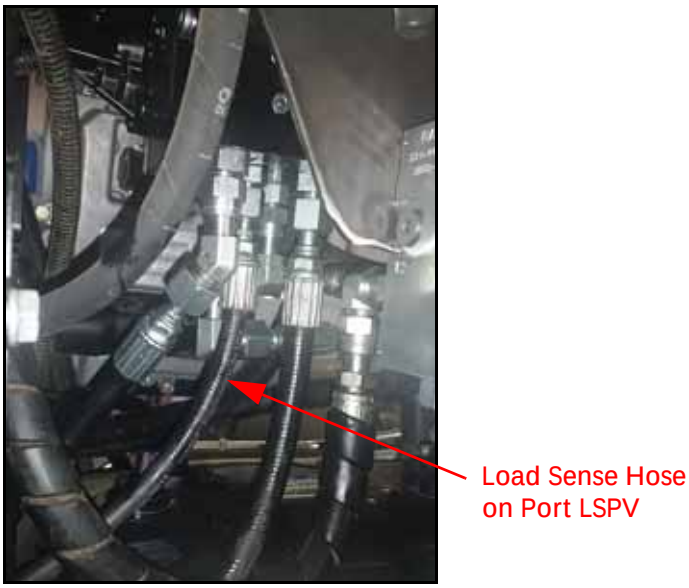
FIGURE 25. Hydraulic Hose Installed on Load Sense Port

12. Remove the load sense port plug and replace it with an M12 ORB to -4 ORFS (M) straight adapter fitting (P/N 333-0012-345).

NOTE: Keep the load sense port plug for future use.

13. Install the 90° end of the supplied hydraulic hose (P/N 214-1001-086) on the fitting installed in the load sense port.
14. Route the other end of the installed hydraulic hose under the cab and to the SmarTrax valve.

FIGURE 26. Load Sense Hose Installed on SmarTrax Valve

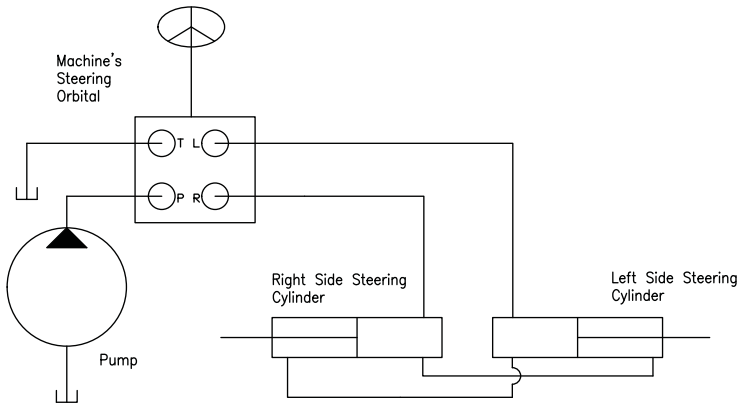


15. Connect the hydraulic hose to the fitting installed in Port LSPV of the SmarTrax valve.

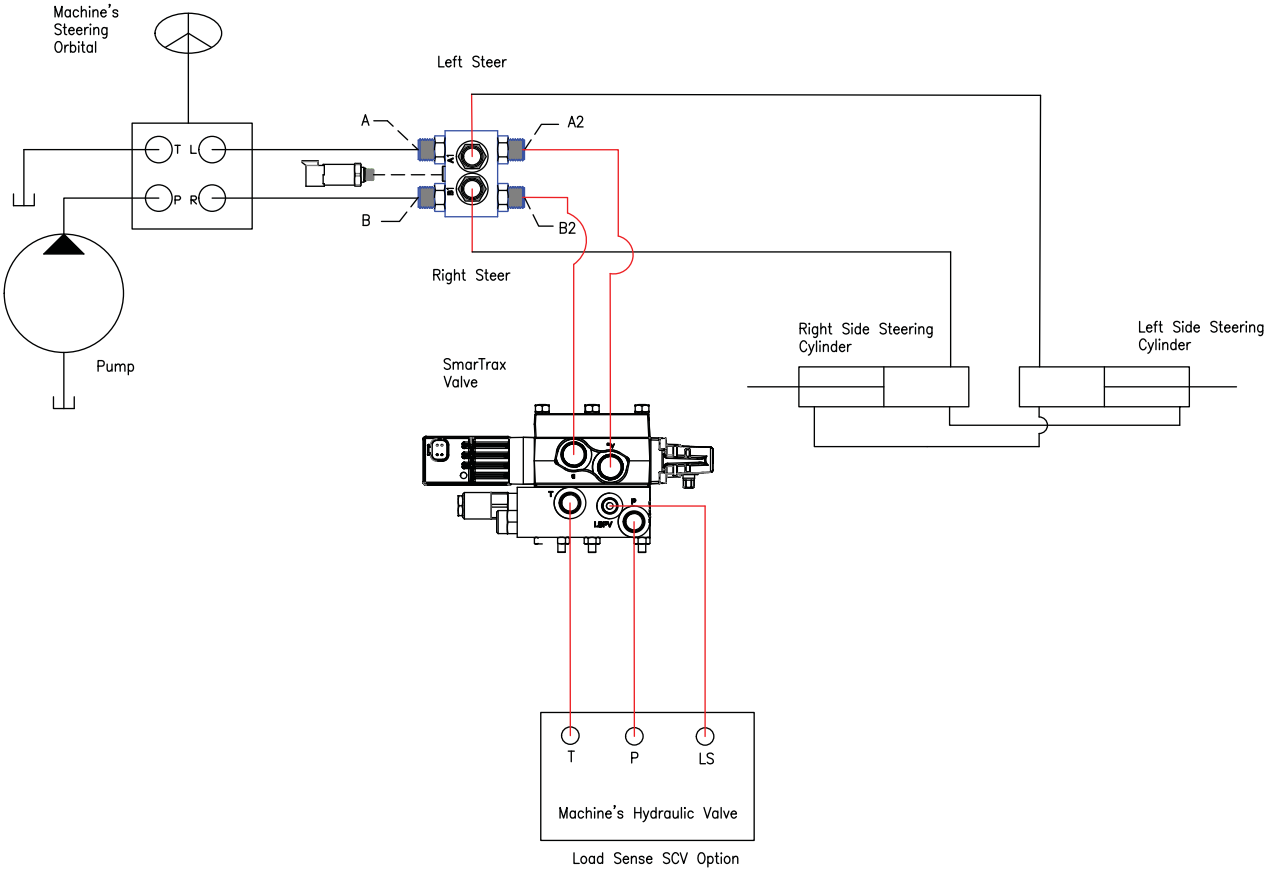
HYDRAULIC SYSTEM DIAGRAM

Open center orbital, closed center valve with blocker.

Before Installation



After Installation



CHAPTER 4 WHEEL ANGLE SENSOR INSTALLATION

NOTE: This section applies only to machines with MFWD axles that do not come equipped with the wheel angle sensor (WAS) installed. If the machine is factory-equipped with the WAS, skip this chapter and proceed to Chapter 5, Cab Component Installation.

ASSEMBLE THE WAS

FIGURE 1. WAS Assembly

1. Install the M10 stud sensor mount (P/N 103-0001-030) and M10 jam nut (P/N 312-1002-035) on each end of the wheel angle sensor (WAS) (P/N 416-0001-052).
2. Tighten the jam nuts to ensure the sensor mounts are installed securely.

INSTALL THE WAS

FIGURE 2. Bolts to be Removed

1. Turn the machine's front wheels fully to the right to access the WAS mounting location on the left side of the front axle housing differential.
2. Remove the two bolts shown in Figure 2 from the front housing differential.

FIGURE 3. WAS Fixed End Bracket Installed

3. Install the WAS fixed end bracket (P/N 107-0172-453) on the housing differential using the bolts that were previously removed and two M12 flat washers.

FIGURE 4. WAS Shaft Collar Bracket Installed

4. Install the WAS shaft collar bracket (P/N 107-0172-400) on the rod-end of the steering cylinder using the supplied hardware.

IMPORTANT: Ensure the WAS shaft collar bracket is installed on an unused portion of the cylinder stroke length. It may be necessary to adjust the wheel stops.

FIGURE 5. Base-End of WAS Installed

5. Install the base-end of the WAS on the fixed end mounting bracket using the supplied M10 nylon insert lock nut (P/N 312-4000-208).

FIGURE 6. Rod-End of WAS Installed

6. Install the rod-end of the WAS on the WAS shaft collar bracket using the supplied M10 nylon insert lock nut.

IMPORTANT: Verify that the WAS cannot be overextended or compressed when the wheels are turned to their extremes and adjust the wheel stops as necessary. Also verify that the sensor moves freely and is not being damaged within its range of motion. It may be necessary to adjust the wheel stops or select a different mounting hole in the WAS fixed end mounting bracket to ensure that the WAS is protected from damage during operation.

7. Tighten all WAS installation hardware.

FIGURE 7. WAS Installed

CHAPTER 5 CAB COMPONENT INSTALLATION

INSTALL THE SMARTRAX NODE

MOUNT THE SMARTRAX NODE

FIGURE 1. SmarTrax Node Installed on Bracket

1. Mount the node (P/N 063-0172-228) to the node mounting bracket (P/N 107-0172-137) using three supplied 3/8"-16 nylon insert lock nuts. (P/N 312-4001-061)

FIGURE 2. Bolts to be Removed

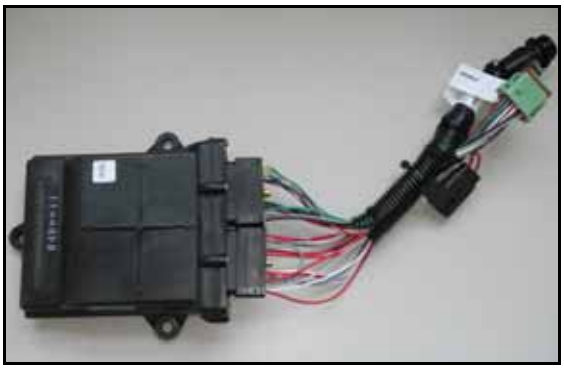
2. Remove the bolts and washers installed in the left-rear corner post.

NOTE: The washers are not used in the ECU installation. Keep them for future use.

FIGURE 3. ECU Mounting Bracket Installed

3. Mount the ECU mounting bracket to the left-rear corner post using the bolts that were previously removed.

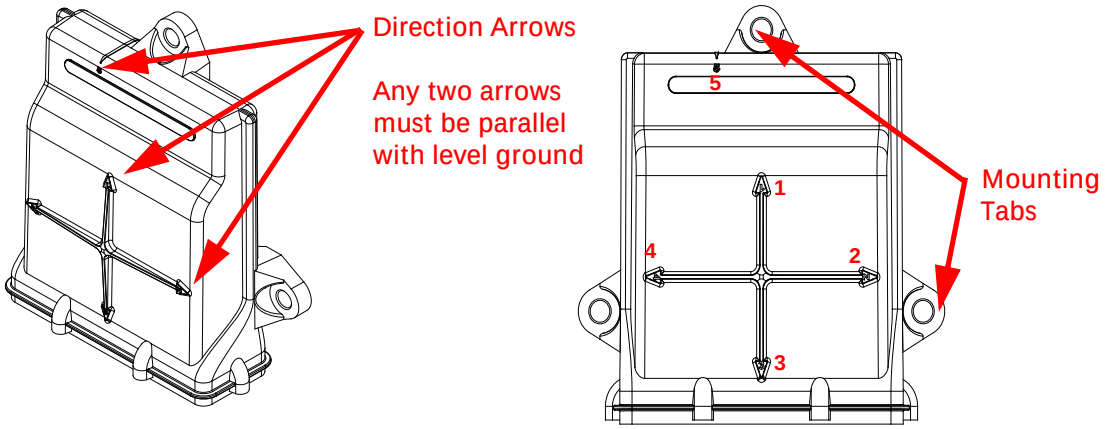
FIGURE 4. Node Harness Connected to the Node



4. Install the two large, rectangular connectors of the of the node harness (P/N 115-4001-109) into the correct ports of the SmarTrax node (P/N 063-0173-228), tightening the bolts on the harness connectors to secure the connections.

NODE MOUNTING LOCATIONS

FIGURE 5. **Node Mounting**



When choosing the location for the SmarTrax node, consider the following points:

- Mount the SmarTrax node inside the machine's cab on a flat, level surface for proper performance and cable connection.
- One of the six numbered direction arrows on the node must be oriented in the direction of forward vehicle travel, one arrow pointing straight up, and two of the arrows parallel to the ground.

NOTE: Make a note of the number of the arrow that is oriented in the direction of forward vehicle travel. This number will be needed during the SmarTrax calibration process.

- The node mounting location must not create tripping hazards.
- Mount the node in a location where it will not be kicked or jarred during normal equipment operation.
- The location must allow cable routing to avoid crimping or damaging the cables or the node connections.
- Securely fasten the node using bolts or screws through at least two of the three mounting holes. When mounted properly, the node should not become loose or rotate.

INSTALL THE FOOT SWITCH

FIGURE 6. Foot Switch Installed

1. Select a suitable location for the foot switch (P/N 063-0172-470) to be installed.

NOTE: The foot switch should be installed in a location where the operator has easy access to it and is able to fully press the pedal.

2. Using the holes in the foot switch as a template, drill holes in the floor of the cab.
3. Secure the foot switch to the floor by installing the supplied screws in each of the mounting holes.
4. Locate the ENABLE connector n the node harness (P/N 115-4001-109) and connect it to the foot switch cable connector.

INSTALL THE VALVE HARNESS

1. Connect the 12-pin connector of the valve harness (P/N 115-4001-115) into the mating connector of the node harness (P/N 115-4001-109). Route the remainder of the harness underneath the cab and toward the SmarTrax valve.

FIGURE 7. Pressure Transducer Connection

2. Connect the 3-pin Deutsch connector from the valve cable into the 0-3000 PSI pressure transducer (P/N 422-0000-086) installed in Port PS of the SmarTrax valve.

FIGURE 8. Valve Cable Connected to SmarTrax Valve

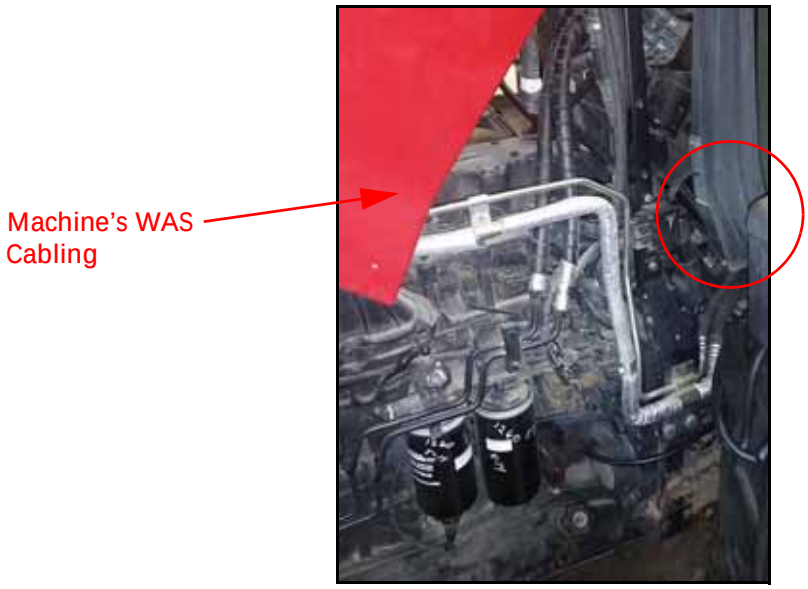
3. Connect the 4-pin Deutsch connector of the valve cable to the open cable port on the SmarTrax valve.

INSTALL THE WAS CONNECTION

FACTORY-INSTALLED WAS

1. Route the WAS connector toward the front-right of the machine.
2. Locate the machine's wheel angle sensor (WAS) in the steering knuckle on the right side of the front axle.

FIGURE 9. Machine's WAS



3. Trace the machine's WAS cabling along the right side panel of the tractor.
4. Disconnect the machine's WAS cable connection.

FIGURE 10. Machine's WAS Connection

5. Route and connect the WAS tee connection on the chassis harness to the machine's WAS.

MFWD AXLES NOT EQUIPPED WITH FACTORY-INSTALLED WAS

1. Route the WAS connector to the WAS that was installed on the left side of the front axle.

FIGURE 11. WAS Connection Installed

2. Connect the WAS converter cable (P/N 115-4001-266) to the mating WAS connector on the valve harness.
3. Install the M12 connector of the WAS converter cable on the installed WAS.

INSTALL THE CHASSIS CABLE - SMARTRAX-ONLY SYSTEMS (IF APPLICABLE)

If the machine does not contain an existing chassis power system (such as AutoBoom, product control, etc.), it is necessary to install the chassis power cable to operate the SmarTrax system. If a CAN system already exists on the machine, refer to Connect SmarTrax to an Existing Chassis Cable (If Applicable) below to connect power to the SmarTrax system.

NOTE: The chassis cable is sold separately. Contact your local Raven dealer for ordering information.

1. Locate the SmarTrax chassis cable (P/N 115-4001-085).
2. Connect the TO SMARTRAX NODE connector from the chassis cable to the round 16-pin connector on the node harness (P/N 115-4001-109).
3. Connect the TO CONSOLE CABLE connector to the Raven console cable.
4. Install a terminator (P/N 063-0172-369) on the CAN cable connector.
5. Loop and tie-off the REMOTE SWITCH cable connection, securing it with plastic cable ties as necessary.

NOTE: The REMOTE SWITCH connector is not used in the SmarTrax system. Ensure the cable is secured away from moving parts and heat sources.

6. Connect the ring terminals to the battery.

NOTE: The positive connectors are fused.

CONNECT SMARTRAX TO AN EXISTING CHASSIS CABLE (IF APPLICABLE)

NOTE: The SmarTrax interface tee is sold separately. Contact your local Raven dealer for ordering information.

1. Locate and disconnect the connection between the Raven console cable and chassis cable on the machine's existing CAN system.
2. Install the SmarTrax interface tee cable (P/N 115-4001-070 or 115-4001-071) between the chassis and Raven console harness.
3. Connect the SmarTrax node cable (P/N 115-4001-109) to the remaining SmarTrax interface tee.

SYSTEM DIAGRAMS

FIGURE 12. Envizio Pro II with Slingshot

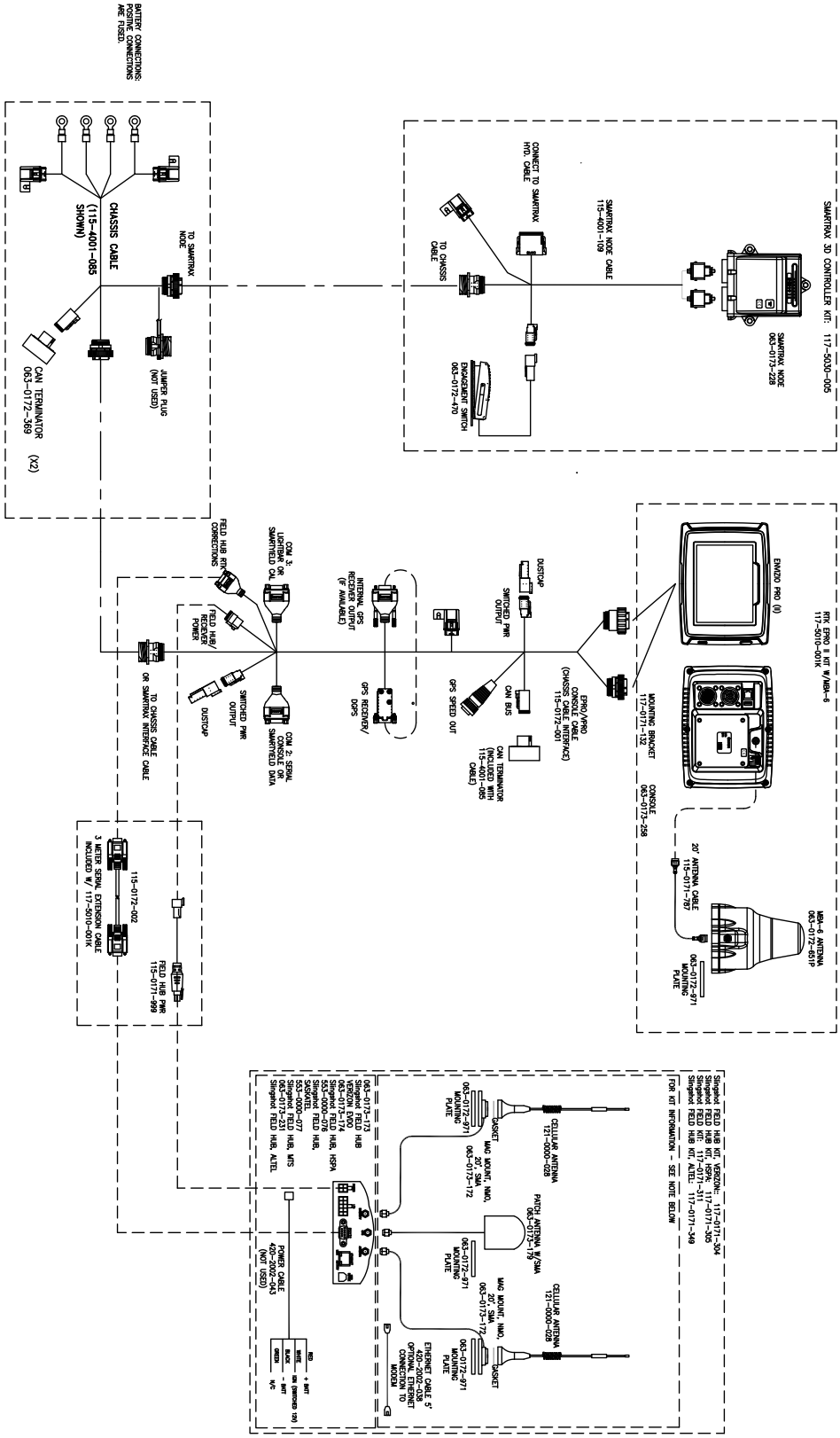


FIGURE 13. Viper Pro/Envizio Pro with Slingshot

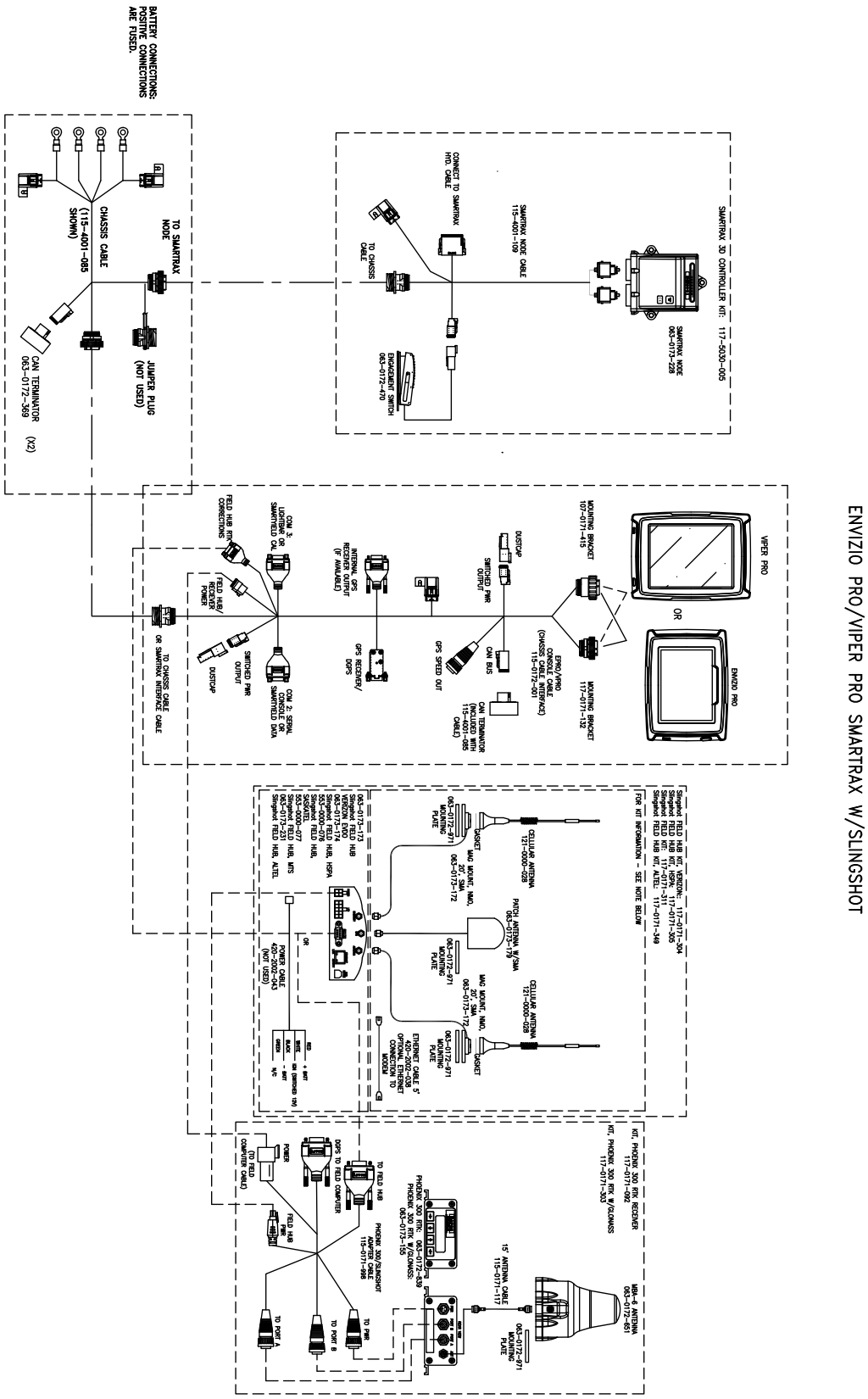
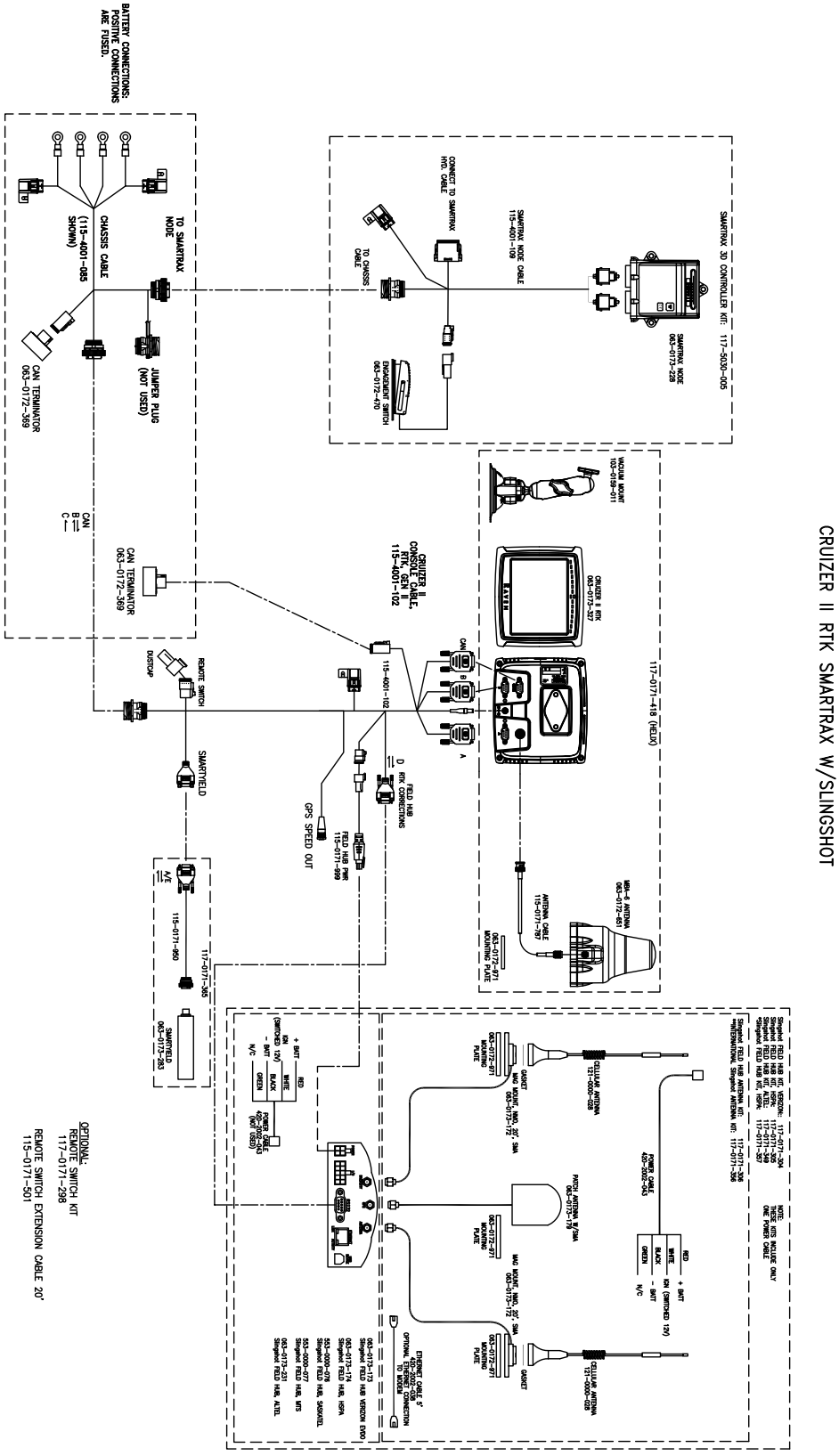


FIGURE 14. Cruizer II with Slingshot



CHAPTER 6 STARTUP PROCEDURES

⚠ WARNING

When starting the machine for the first time after installing SmarTrax, be sure that all persons stand clear in case a hose has not been properly tightened.

⚠ WARNING

Do not use hands to check for leaks. Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death.

VERIFY THE SMARTRAX SYSTEM INSTALLATION

1. Turn on the machine.
2. Double-check all fitting and hose connections to ensure that:
   - Hoses are not rubbing on or interfering with moving parts.
   - Hydraulic fluid is not leaking from the system.
3. Turn the machine's wheels fully from side to side repeatedly to remove air from the hydraulic system.

NOTE: During the SmarTrax system installation, whenever the hydraulic system is purged for maintenance, or when fittings are loosened to disconnected, air is introduced into the lines of the hydraulic system. If air pockets are present, the wheels may not move consistently when the steering wheel is turned.

4. Continue turning the wheels until they move steadily and smoothly when the steering wheel is turned.
5. Access the System Diagnostic screen by selecting the MACHINE TEST option on the Machine Type screen and turn the wheels using the Raven console.

NOTE: If there are issues with the SmarTrax system, turn off the machine and correct them immediately. For additional assistance, refer to the SmarTrax and SmartSteer Calibration & Operation Manual (P/N 016-0171-277) or contact your local Raven dealer.

CALIBRATE THE SMARTRAX SYSTEM

NOTE: Refer to the SmarTrax Calibration & Operation Manual (P/N 016-0171-277) for instructions on calibrating the SmarTrax system, adjusting system settings, and system operation.

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RAVEN

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.

016-0171-537 Rev. A, E19889

RAVEN

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.