

**AGCO DT-A Series, Massey Ferguson
84x0 Series, Challenger MT6x5B
Series SmarTrax Installation Manual**

P/N 016-5033-002 Rev. D

10/18

E31495

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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 in the machine at all times when SmarTrax is engaged.
- Disable SmarTrax when exiting 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 during SmarTrax installation or maintenance.

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.

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

CHAPTER

INTRODUCTION

2

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

This manual applies to the following machines:

MAKE: AGCO
MODEL: DT180A, DT200A, DT220A, DT240A

MAKE: Massey Ferguson
MODEL: 8450, 8460, 8470, 8480

MAKE: Challenger
MODEL: MT635B, MT645B, MT655B, MT665B

FIGURE 1. AGCO DT-A Series, Massey Ferguson 84x0 Series, Challenger MT6x5B Series



UPDATES

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

<https://ravenind.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

-AGCO DT-A Series, Massey Ferguson 84x0 Series, Challenger MT6x5B Series SmarTrax Installation Manual

-P/N 016-5033-002 Rev. D

-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.

PREPARING FOR INSTALLATION

Before installing the SmarTrax system, park the machine where the ground is level, clean, and dry. Turn off the machine and leave it turned off for the duration of the installation process. Bleed pressure from the hydraulic system by loosening the hydraulic fittings slowly, where applicable.

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 when 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.).
- 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.

POINT OF REFERENCE

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

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 kit with the components on this list. If you have questions about the kit, contact your Raven dealer.

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - AGCO DT Series, Massey Ferguson 84x0 Series, and Challenger MT6x5B Series SmarTrax Installation	016-5033-002	1
Not Pictured	Manual - SmarTrax and SmartSteer Calibration & Operation	016-0171-277	1
	Valve - Shuttle Hydraulic	334-0003-016	1
	Valve - SmarTrax Hydraulic	334-0003-088	1
	Valve - -6 JIC 5 PSI Check	334-0003-078	1
	Bracket - Rotary Wheel Angle Sensor Arm	116-0159-721	1
	Bracket - Node Mounting	107-0172-128	1
	Bracket - SmarTrax Valve Mounting	107-0172-104	1
	Bracket - Node Support	107-0172-105	1

Picture	Item Description	Part Number	Qty.
	Bracket - Rotary Wheel Angle Sensor	107-0172-106	1
	Cable - SmarTrax Node Harness	115-4001-126	1
	Cable - SmarTrax Valve Harness	115-4001-132	1
	Cable - WAS Adapter	115-4001-219	1
	Sensor - Rotary Wheel Angle	063-0181-024	1
	Assembly - SmarTrax Enable Foot Switch	063-0172-470	1
	Mount - M10 Ball Linear Sensor	103-0001-029	1
	Mount - M10 Stud Linear Sensor	103-0001-030	1
	Rod - M10 x 1.5 Threaded WAS Linkage	107-0172-125	1
	Transducer - 0-3000 PSI Pressure	422-0000-086	1
	Clamp - U-Bolt Muffler	435-3003-053	1

Picture	Item Description	Part Number	Qty.
	U-Bolt - 3/4" W x 1-1/4" L x 1/4"-20 UNC Thread	107-0172-102	2
	Bolt - 1/4"-20 UNC x 1" Hex	311-0050-105	1
	Bolt - 5/16"-18 UNC x 7/8" Hex	311-0052-104	4
	Bolt - M8 x 1.25 x 35mm Metric Hex	311-0070-020	2
	Screw - 1/2"-20 Knurled Cup Hex Socket Head Set	311-0015-729	2
	Nut - 1/4"-20 UNC Flanged Lock	312-1001-168	5
	Nut - M10 x 5mm x 1.5 Pitch Jam	312-1002-035	2
	Nut - 3/8"-16 Nylon Insert Lock	312-4000-061	2
	Nut - M10 x 1.5 Nylon Insert Lock	312-4000-208	1
	Nut - 3/8"-16 Nylon Insert Thin Lock	312-4001-109	3
	Washer - 5/16" Split Lock	313-1000-019	4

Picture	Item Description	Part Number	Qty.
	Washer - 5/8" Split Lock	313-1000-045	2
	Washer - 5/16" Flat Steel	313-2300-011	2
	Washer - 3/8" Flat Steel	313-2300-013	5

Picture	Item Description	Part Number	Qty.
	Fitting - -6 JIC M/F 90° Swivel Elbow	333-0012-042	1
	Fitting - -6 JIC (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-045	2
	Fitting - -4 SAE O-Ring (M) Plug	333-0012-051	1
	Fitting - -6 ORFS M/F 90° Swivel Elbow	333-0012-065	2
	Fitting - -6 JIC (F) to -6 SAE O-Ring (M) Straight Adapter	333-0012-086	1
	Fitting - -6 SAE O-Ring (M) Plug	333-0012-104	2
	Fitting - -8 SAE O-Ring (M) Plug	333-0012-211	1

Picture	Item Description	Part Number	Qty.
	Fitting - -6 ORFS (M) TO -10 SAE O-Ring (M) Straight Adapter	333-0012-233	2
	Fitting - -10 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-352	2
	Fitting - -4 JIC (M) X -4 NPT (F) X -4 JIC (M) Branch Tee Adapter	333-0012-353	1
	Fitting - -4 NPT (M) to -4 SAE O-Ring (F) Straight Adapter	333-0012-354	1
	Fitting - 12L, M18 x 1.5 Cap	333-0012-355	1
	Fitting - 12L, M18 x 1.5 M/M/F Swivel Run Tee Adapter	333-0012-356	2
	Fitting - 18L, M26 x 1.5 M/M/F Swivel Run Tee Adapter	333-0012-357	2
	Hydraulic Hose - -10 ORFS (F) 90° to 18L, M26 X 1.5 (F) - 36"	214-1000-860	2
	Hydraulic Hose - -6 ORFS (F) 45° to 12L, M18 X 1.5 (F) - 122"	214-1000-861	2
	Hydraulic Hose - -6 JIC (F) to 10L, M16 X 1.5 90° (F) - 36"	214-1000-862	1

Picture	Item Description	Part Number	Qty.
	Hydraulic Hose - -4 JIC (F) to 8L, M14 X 1.5 (M) - 6"	214-1000-863	1
	Hydraulic Hose - -4 JIC (F) to 8L, M14 X 1.5 (F) - 6"	214-1000-864	1

NODE

In addition to the kits listed above, it is necessary to order the following node from your supplier or from a Raven dealer:

Picture	Item Description	Part Number	Qty.
	Node - SmarTrax 3D Can Control	063-0173-228	1



⚠ 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 damage the SmarTrax hydraulic valve.

	NOTICE
	<p>The appearance of the SmarTrax hydraulic valve may vary slightly from the images contained in this manual. However, the fittings, hose connections, and cable connections remain the same.</p>

REMOVE THE CARTRIDGE FROM THE SMARTRAX VALVE

FIGURE 1. Fittings Installed in the SmarTrax Valve



Before installing the hydraulic fittings in the SmarTrax valve, remove the cartridge in Port EP1 from the valve.

NOTE: This cartridge is not used in the SmarTrax system for the machines listed in this manual. Keep the cartridge for future use in case the SmarTrax system is moved to another machine.

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 2. Fittings Installed in the SmarTrax Valve



Fitting	Part Number	Port
Fitting - -6 JIC (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-045	LSPV
Fitting - -4 SAE O-Ring (M) Plug	333-0012-051	PS
Fitting - -6 SAE O-Ring (M) Plug	333-0012-104	LS STEER
Fitting - -8 SAE O-Ring (M) Plug	333-0012-211	EP1
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
Fitting - -10 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-352	P, T

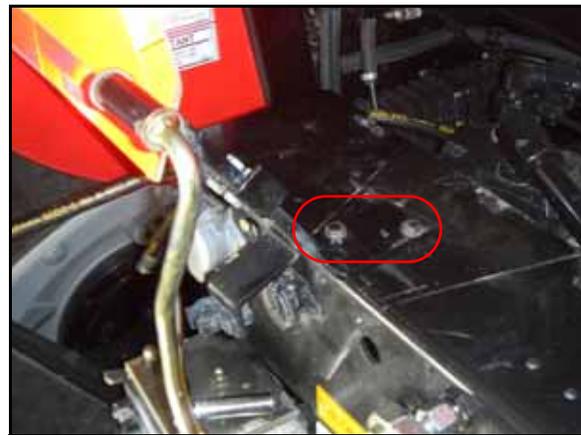
MOUNT THE SMARTRAX VALVE

FIGURE 3. Mounting Plate Installed



1. Install the SmarTrax valve (P/N 334-0003-088) on the mounting bracket (P/N 107-0172-104) using four 5/16"-18 x 7/8" hex bolts (P/N 311-0052-104) and four 5/16" lock washers (P/N 313-1000-019).

FIGURE 4. Machine's Top Link Cradle Bracket



2. Remove the two bolts used to fasten the top link cradle bracket to the machine.

FIGURE 5. SmarTrax Valve Installed



3. Position the valve mounting bracket over the holes.
4. Position the top link cradle bracket over the holes in the valve mounting bracket.
5. Secure valve mounting bracket and top link cradle bracket to the machine using two M8-1.25 x 35 mm metric hex bolts (P/N 311-0070-020) and two 5/16" flat washers (P/N 313-2300-011).

INSTALL THE PRESSURE TRANSDUCER

FIGURE 6. Pressure Transducer Hose Assembly



1. Install the -4 NPT (M) to SAE O-ring (F) straight adapter fitting (P/N 333-0012-354) in the female NPT branch of the -4 JIC (M) x -4 NPT (F) x -4 JIC (M) branch tee adapter fitting (P/N 333-0012-353).

NOTE: Use thread sealer on the connection to prevent leakage.

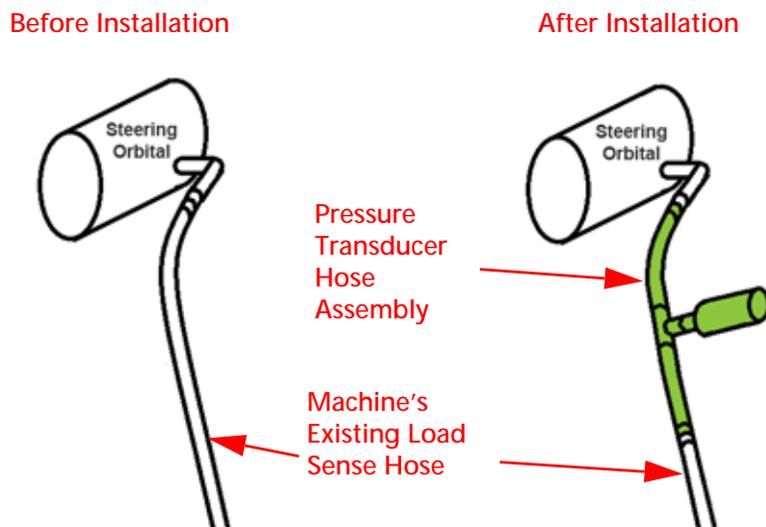
2. Install the 0-3000 PSI pressure transducer (P/N 422-0000-086) on the end of the installed adapter fitting.
3. Install the female JIC ends of the supplied hydraulic hoses (P/N 214-1000-863 and 214-1000-864) on the male ends of the branch tee fitting.

FIGURE 7. Steering Orbital Location



4. Raise the machine's hood and move the coolant overflow tank and mounting bracket to locate the steering orbital.

FIGURE 8. Machine's Load Sense Hose on the Steering Orbital



5. Disconnect the machine's load sense hose from the steering orbital.

6. Install the male end of the pressure transducer hose assembly on the machine's load sense hose.

NOTE: Install the pressure transducer hose assembly so that the transducer points outward, toward the left side of the machine.

7. Install the female end of the pressure transducer hose assembly on the steering orbital.

INSTALL THE LEFT AND RIGHT STEERING HOSES

1. Locate the left and right steering hoses connected to the steering orbital.

FIGURE 9. Steering Hoses Installed



2. Disconnect the machine's right steering hose from the steering orbital.
3. Install a 12L, M18 x 1.5 M/M/F swivel run tee adapter fitting (P/N 333-0012-356) in the open port of the steering orbital.
4. Connect the machine's right steering hose to the opposite end of the installed tee fitting.
5. Install the 12L end of the supplied hydraulic hose (P/N 214-1000-861) on the 90° end of the installed tee fitting.
6. Route and connect the other end of the installed hydraulic hose to the fittings installed in Port B of the SmarTrax valve (P/N 334-0003-088).

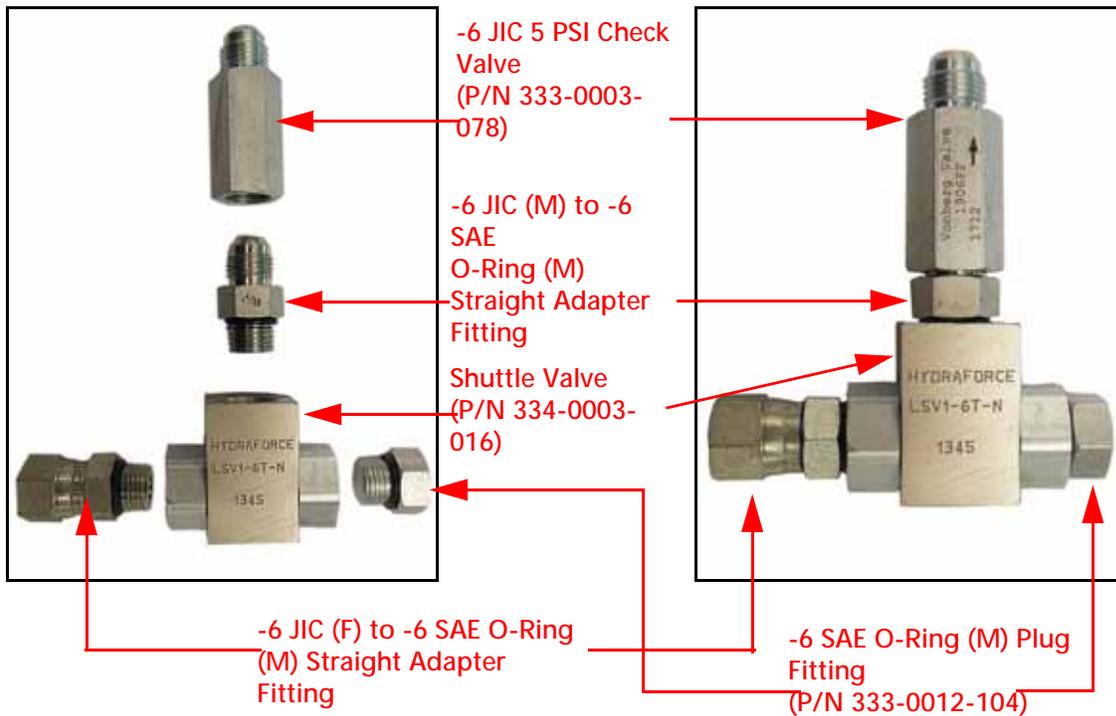
NOTE: Route the hose under the left side of the cab. Ensure the hose does not come into contact with the cab.

7. Disconnect the machine's left steering hose from the steering orbital.
8. Install a 12L, M18 x 1.5 M/M/F swivel run tee adapter fitting (P/N 333-0012-356) in the open port of the steering orbital.
9. Connect the machine's left steering hose to the opposite end of the installed tee fitting.
10. Install the 12L end of the supplied hydraulic hose (P/N 214-1000-861) on the 90° end of the installed tee fitting.
11. Route and connect the other end of the installed hydraulic hose to the fittings installed in Port A of the SmarTrax valve.

NOTE: Route the hose under the left side of the cab. Ensure the hose does not come into contact with the cab.

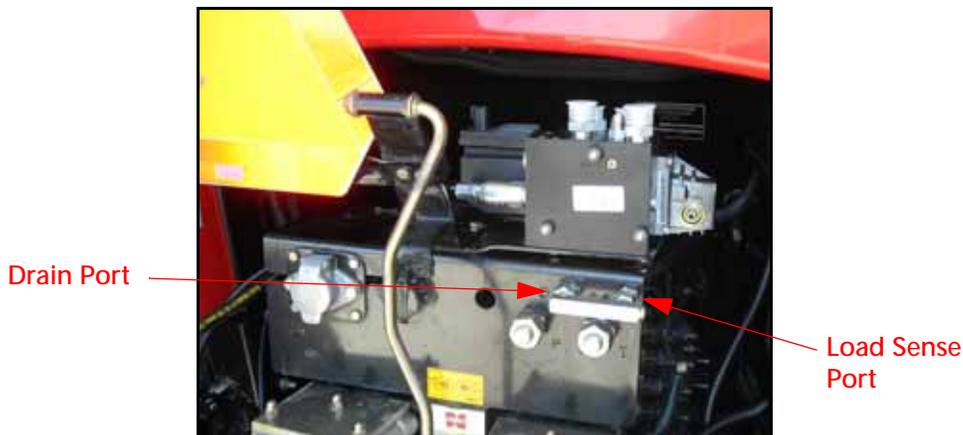
INSTALL THE LOAD SENSE HOSE

FIGURE 10. Shuttle Valve Assembly



1. Assemble the shuttle valve assembly as shown in Figure 10 above.
 - a. Install the -6 JIC (F) to 6- SAE O-ring (M) straight adapter fitting (P/N 333-0012-086) and -6 SAE O-ring (M) plug fitting (P/N 333-0012-104) into the end hex ports of the shuttle valve (P/N 334-0003-016).
 - b. Install a -6 JIC (M) to -6 SAE O-ring (M) straight adapter fitting (P/N 333-0012-045) on the remaining end of the shuttle valve.
 - c. Install the -6 JIC 5 PSI check valve (P/N 334-0003-078) on the end of the installed adapter fitting.
2. Install the shuttle valve assembly on the fitting installed in Port LSPV of the SmarTrax valve (P/N 34-0003-088).

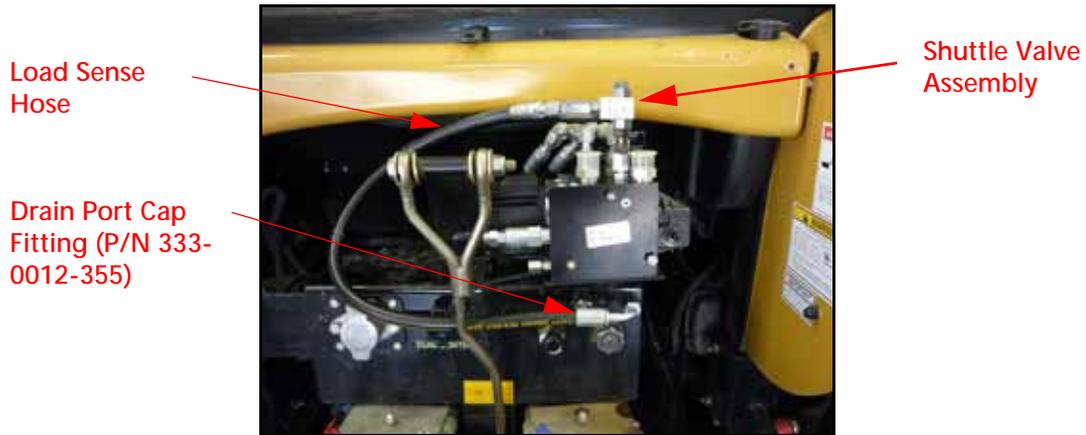
FIGURE 11. Load Sense and Drain Ports on the Hydraulic Valve



3. Locate the drain (D) and load sense (LS) ports on the machine's hydraulic valve.

4. Remove existing fittings from the ports.

FIGURE 12. Load Sense Hose Installed



5. Install the 12L, M18 x 1.5 cap fitting (P/N 333-0012-355) in the drain port.
6. Install the 10L 90° end of the supplied hydraulic hose (P/N 214-1000-862) in the machine's hydraulic valve load sense port.
7. Install the straight end of the installed hydraulic hose to the shuttle valve assembly installed in Port LSPV of the SmarTrax valve.

NOTE: If the machine is pulling an implement that utilizes load sense, the load sense hose from the implement must be connected the top port of the shuttle valve assembly in which the -6 SAE O-ring (M) plug is installed. The hydraulic fitting used to achieve this connection is not supplied in the SmarTrax installation kit.

INSTALL THE PRESSURE AND TANK HOSES

FIGURE 13. Machine's Pressure and Tank Ports



1. Locate the pressure (P) and tank (T) ports on the hydraulic valve at the rear of the machine.
2. Remove the existing cap on the pressure and tank ports.

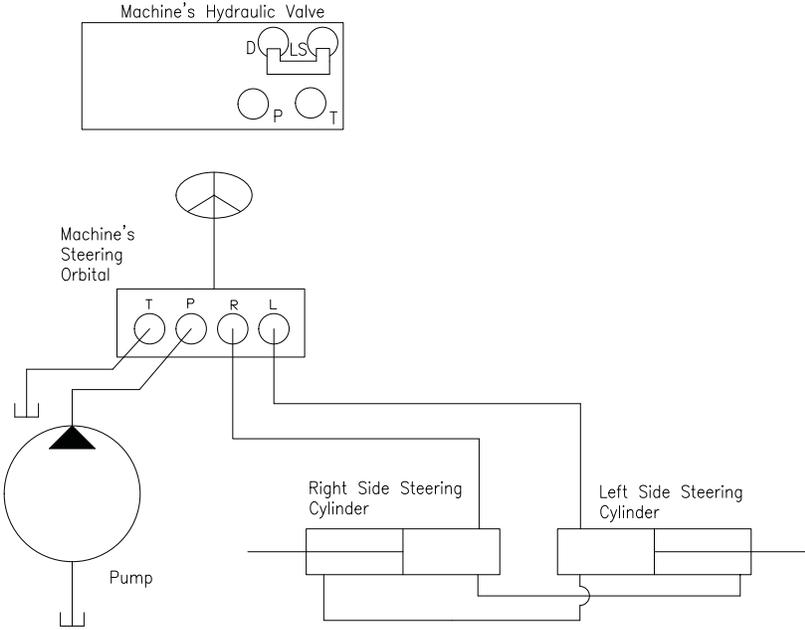
FIGURE 14. Tee Fittings Installed in Pressure and Tank Ports



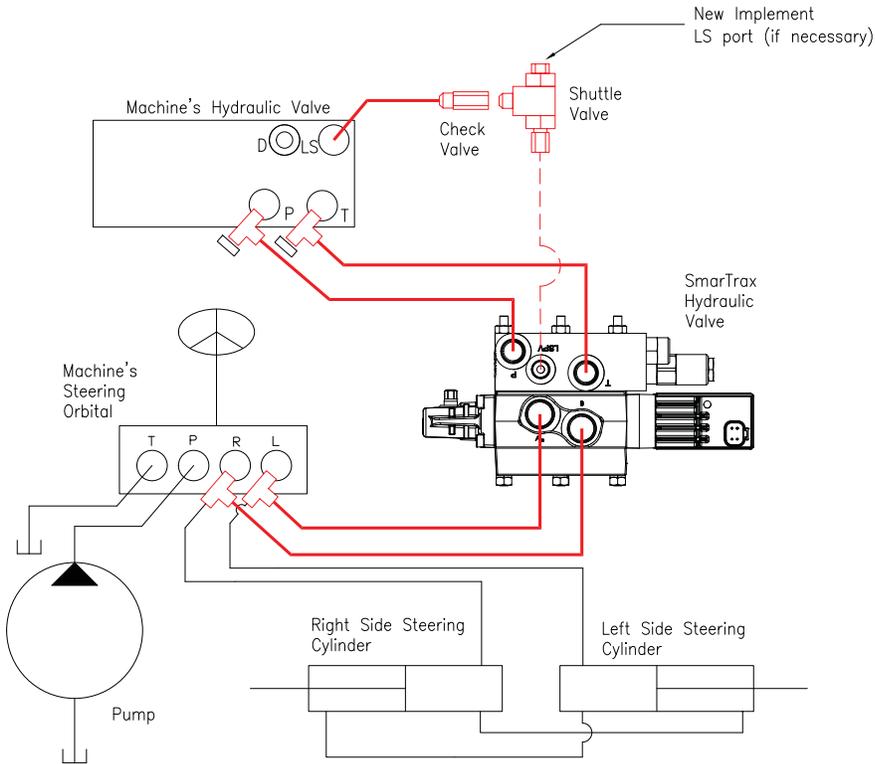
3. Install 18L, M26 x 1.5 swivel run tee adapter fittings (P/N 333-0012-357) in the open ports of the machine's hydraulic valve.
4. Install the machine's caps removed in step 2 on the opposite ends of the installed tee fittings.
5. Install the 18L end of the supplied hydraulic hose (P/N 214-1000-860) on the 90° end of the tee fitting installed in the machine's tank port.
6. Connect the other end of the installed hydraulic hose to the fitting installed in Port T of the SmarTrax valve (P/N 334-0003-088).
7. Install the 18L end of the supplied hydraulic hose (P/N 214-1000-860) on the 90° end of the tee fitting installed in the machine's pressure port.
8. Connect the other end of the installed hydraulic hose to the fitting installed in Port P of the SmarTrax valve.

HYDRAULIC DIAGRAM

Before SmarTrax Installation



After SmarTrax Installation



CHAPTER

4

WHEEL ANGLE SENSOR (WAS) INSTALLATION

ASSEMBLE THE WHEEL ANGLE SENSOR (WAS)

FIGURE 1. WAS Installed on Mounting Bracket



1. Mount the rotary WAS (P/N 063-0131-024) to the rotary WAS bracket (P/N 107-0172-106) using the hardware supplied in the WAS package.

FIGURE 2. Rotary Sensor Assembly Alignment



2. Align the flat side of the shaft with the cable exit point as shown in the figure above.

FIGURE 3. Arm Bracket Installed



3. Mount the arm bracket (P/N 116-0159-721) on the WAS shaft by installing the 1/4"-20 knurled cup hex socket head set screw (P/N 311-0015-729) through the hole in the arm bracket and tighten against the flat spot on the sensor shaft.

FIGURE 4. WAS Linkage Rod Assembly



4. Install the M10 jam nut (P/N 312-1001-035) and M10 stud linear sensor mount (P/N 103-0001-030) on one end of the WAS linkage rod (P/N 107-0172-125).

NOTE: Do not fully tighten the nut.

5. Install the other M10 jam nut and the M10 ball linear sensor mount (P/N 103-0001-029) on the other end of the WAS linkage rod.

NOTE: Do not fully tighten the nut.

INSTALL THE WAS

FIGURE 5. Machine's Axle Housing Bolts



1. Remove the machine's two axle housing bolts shown in the figure above.

FIGURE 6. Machine's Axle Housing Bolts Installed on WAS Bracket



2. Install the machine's axle housing bolts on the WAS bracket (P/N 107-0172-106).
3. Install two 5/8" split lock washers (P/N 313-1000-045) over the end of the installed axle housing bolts.

FIGURE 7. WAS Installed on Machine's Axle



4. Install the WAS assembly on the axle housing as shown in the figure above.

NOTE: Use thread locking compound on the bolts and adequately tighten.

5. Secure the WAS cable away from moving parts, using plastic cable ties as necessary.

FIGURE 8. Ball End of WAS Linkage Rod Installed



6. Remove the nuts and clamp from the U-bolt muffler clamp (P/N 435-3003-053) and install the U-bolt around the right tie rod.

NOTE: Discard the nuts from the muffler clamp. They are not used in the system installation.

7. Install the clamp on the ends of the U-bolt.
8. Install one 3/8"-16 nylon insert lock nut (P/N 312-4000-061) on the top leg of the U-bolt as shown in the figure above.

NOTE: Do not fully tighten the nut.

9. Install the ball end of the WAS linkage rod assembly on the bottom leg of the U-bolt.
10. Secure the WAS linkage rod assembly to the U-bolt using one 3/8"-16 nylon insert lock nut (P/N 312-4000-061) and 3/8" steel flat washers (P/N 313-2300-013) as needed.

NOTE: Do not fully tighten the nut.

FIGURE 9. Stud End of WAS Linkage Rod Installed



11. Insert the stud mount end of the WAS linkage rod assembly into the hole in the WAS rotary arm bracket (P/N 116-0159-721) and secure it with one M10 nyloc insert lock nut (P/N 312-4000-208).
12. Ensure the machine's wheels are pointing straight forward, then slide the installed muffler clamp along the tie rod until the WAS rotary arm bracket is pointing straight up and down as shown in the figure above.
13. Tighten the nuts on the muffler clamp evenly to secure the WAS linkage rod assembly in place.
14. Tighten the M10 jam nuts on the tie rod assembly so that each end can swivel an equal amount.

CHAPTER

5

CAB COMPONENT INSTALLATION

INSTALL THE SMARTRAX NODE

MOUNT THE SMARTRAX NODE

FIGURE 1. Node Mounting Plate and Support Bracket Installed



1. Mount the node mounting bracket (P/N 107-0172-128) on the bar running along the front of the cab using two 3/4" W x 1-1/4" L x 1/4"-20 thread U-bolts (P/N 107-0172-102) and four 1/4"-20 flanged lock nuts (P/N 312-1001-168).
2. Remove the existing screw to the right of the machine's dash.
3. Position the node support bracket (P/N 107-0172-105) over the hole and re-install the machine's screw.
4. Secure the other end of the node support bracket to the node mounting bracket using one 1/4"-20 UNC x 1" hex bolt (P/N 311-0050-105) and one 1/4"-20 UNC flanged lock nut (P/N 312-1001-168).

FIGURE 2. SmarTrax Node Installed



5. Install the two large, rectangular connectors of the node harness (P/N 115-4001-126) into the correct ports of the SmarTrax node (P/N 063-0173-228).
6. Tighten the bolts on the harness connectors to secure the connections.
7. Mount the node to the node mounting bracket using three 3/8"-16 nylon insert thin lock nuts (P/N 312-4001-109).

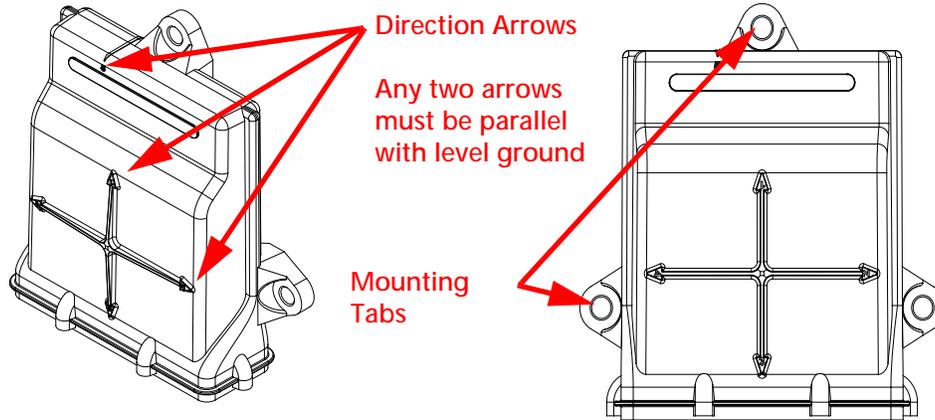
FIGURE 3. Access Panel Location



8. Route the node harness along the floor mat and under the access panel to the right of the operator's seat.

NODE MOUNTING LOCATIONS

FIGURE 4. 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 5. 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 on the node harness (P/N 115-4001-126) and connect it to the foot switch cable connector.

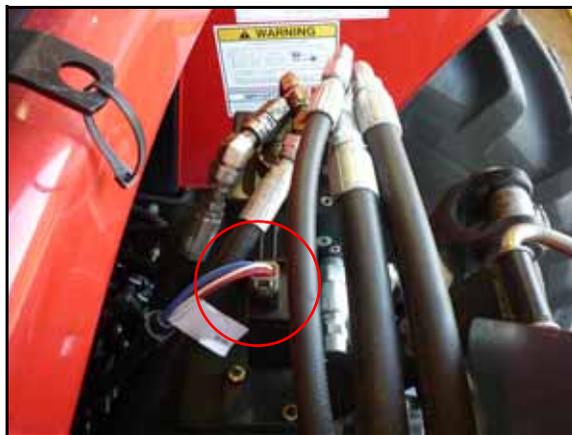
INSTALL THE VALVE HARNESS

FIGURE 6. Valve Harness Routed Through Back of the Cab



1. Route the 12-pin connector of the valve harness (P/N 115-4001-132) into the cab through the access hole in the back of the cab.
2. Connect the valve harness connector to the 12-pin connector of WAS adapter cable (P/N 115-4001-219).
3. Connect the 12-pin connector of the WAS adapter cable to the mating node harness (P/N 115-4001-126) connector.

FIGURE 7. VALVE Harness Connection



4. Connect the VALVE connector to the open 4-pin port of the SmarTrax valve (P/N 334-0003-088).

FIGURE 8. TRANSDUCER Valve Harness Connection

Load Sense
Hose
Assembly



5. Route the TRANSDUCER connector to the steering orbital and connect it to the pressure transducer (P/N 422-0000-086) installed in the load sense hose assembly as shown in the figure above.

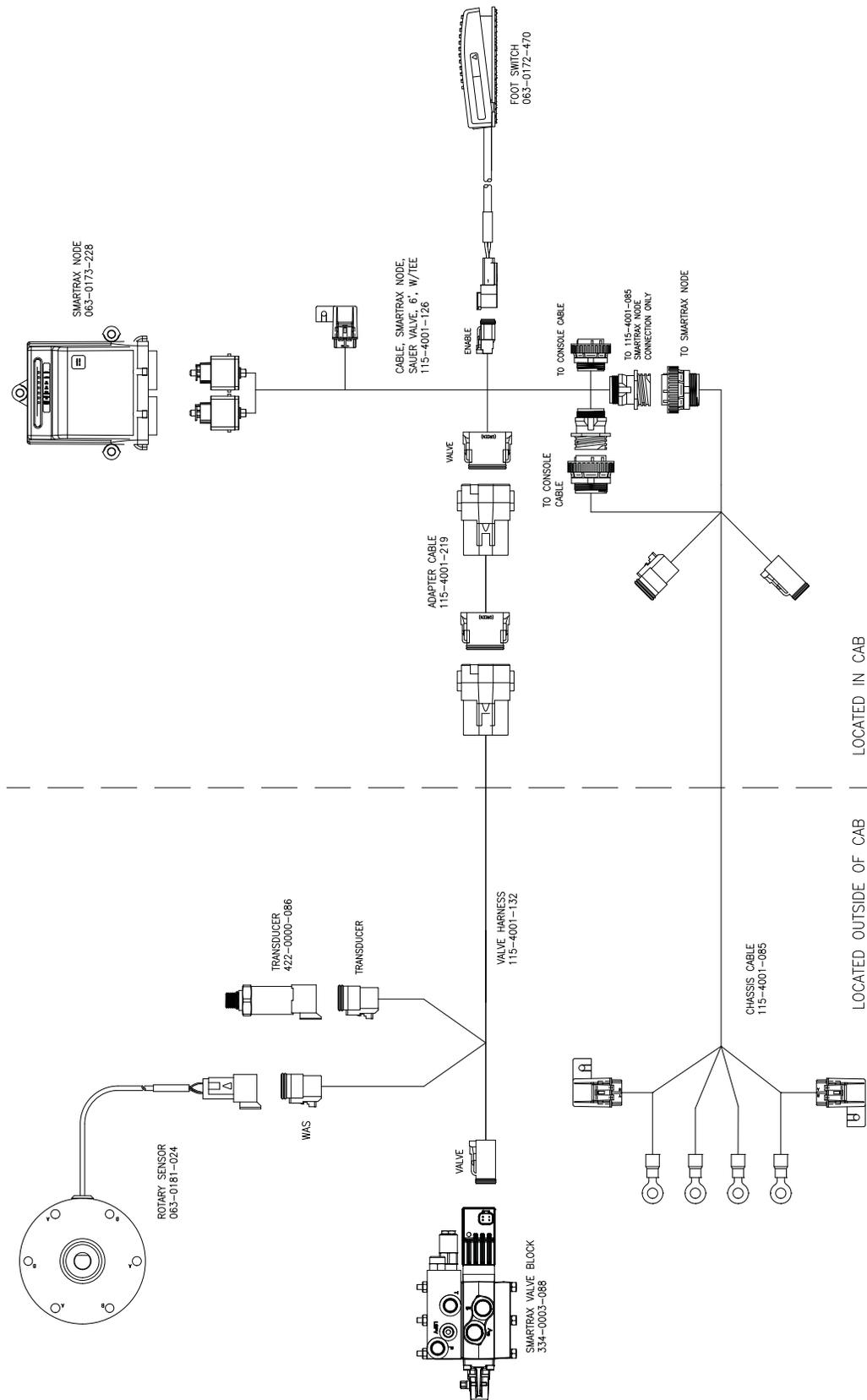
FIGURE 9. WAS Harness Connection



6. Route and connect the WAS connector to the cable of the installed WAS (P/N 063-0181-024).

NOTE: Secure cable with plastic cable ties.

FIGURE 10. Valve Harness Wiring Diagram



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 the 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 TO 115-4001-085 SMARTRAX NODE CONNECTION ONLY connector on the node harness (P/N 115-4001-126).
3. Connect the TO CONSOLE CABLE connector to the node harness.
4. Connect the remaining connector on the node harness to the Raven console cable.
5. Install a terminator (P/N 063-0172-369) on the CAN cable connector.
6. 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.

7. Connect the ring terminals to the battery.

NOTE: The positive connectors are fused.

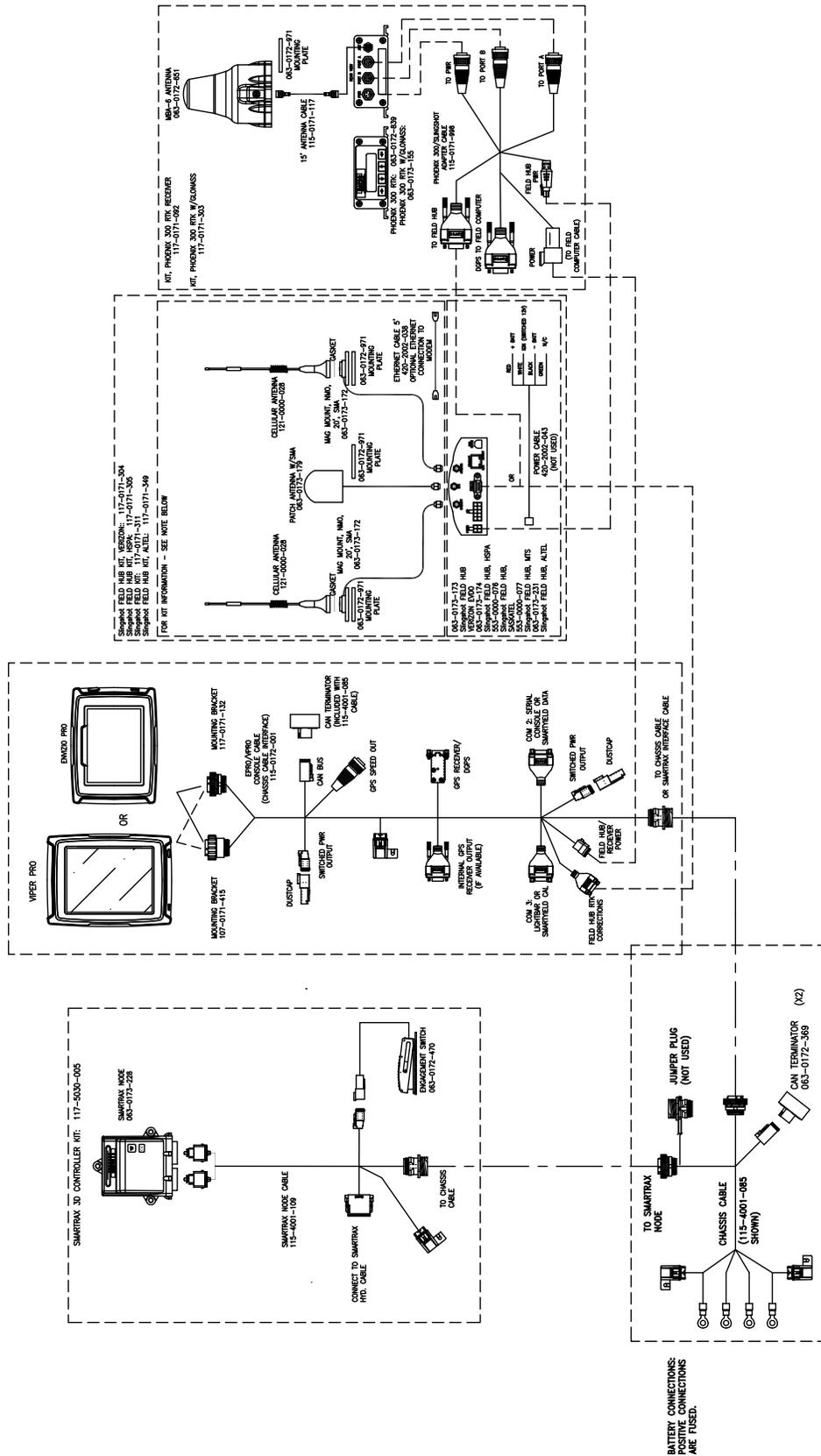
CONNECT SMARTRAX TO AN EXISTING CHASSIS CABLE (IF APPLICABLE)

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 node harness (P/N 115-4001-126) between the chassis and Raven console harness.
3. Loop and tie-off the TO 115-4001-085 SMARTRX NODE CONNECTION ONLY cable connection, securing it with plastic cable ties as necessary.

NOTE: The TO 115-4001-085 SMARTRAX NODE CONNECTION ONLY connector is not used in systems containing existing chassis cables.

FIGURE 13. Viper Pro/Envizio Pro with Slingshot

ENVIZIO PRO/VIPER PRO SMARTRAX W/SLINGSHOT





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 or 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

Refer to the SmarTrax & SmartSteer 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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LIMITED WARRANTY

WHAT DOES THIS WARRANTY COVER?

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

HOW LONG IS THE COVERAGE PERIOD?

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

HOW CAN I GET SERVICE?

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

WHAT WILL RAVEN INDUSTRIES DO?

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

WHAT IS NOT COVERED BY THIS WARRANTY?

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

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

EXTENDED WARRANTY

WHAT DOES THIS WARRANTY COVER?

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

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

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

WHERE CAN I REGISTER MY PRODUCT FOR THE EXTENDED WARRANTY?

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

HOW LONG IS THE EXTENDED WARRANTY COVERAGE PERIOD?

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

HOW CAN I GET SERVICE?

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

WHAT WILL RAVEN INDUSTRIES DO?

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

WHAT IS NOT COVERED BY THE EXTENDED WARRANTY?

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

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