# Case IH MX/Magnum and New Holland T80x0 Series SmarTrax™ Installation Manual

*P/N 016-5032-003 Rev. D* *08/15* *E26072*

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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.

**⚠ CAUTION**

## Hydraulic Safety

- 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 valve.

## Electrical Safety

- Always verify that the power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the equipment.
- Ensure that the power cable is the last cable to be connected.

CHAPTER 2

# Introduction

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: Case IH**
**MODELS: MX - 215, 230, 255, and 285**
**Magnum - 215, 245, 275, 305, and 335**

**MAKE: New Holland**
**MODEL: T80X0 - 8010, 8020, 8030, 8040, and 8050**

**FIGURE 1. Case IH**

# 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:

- Install the GPS antenna on the front center of the machine's cab.

| Machine Preset | Antenna X Position (left to right) | Antenna Y Position (from the rear wheel axle to the antenna position on the cab) | Antenna Z Position (ground to top of antenna) |
|---|---|---|---|
| CNH MX/Magnum/TG/T80X0 | Centered | 4 ft. 6 in./1.37 m | 10 ft. 9 in./3.28 m |

- 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 system 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.

# 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 MX/Magnum and New Holland T80x0 Series SmarTrax™ Installation Manual*
*-P/N 016-5032-003 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.*



# 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.

**TABLE 1. SmarTrax Installation Kit - Class IV Axle (P/N 117-5032-003)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| Not Pictured | Manual - Case IH MX/Magnum and New Holland T80X0 Series SmarTrax Installation | 016-5032-003 | 1 |
| | Valve - SmarTrax Hydraulic | 334-0003-088 | 1 |
| | Bracket - Universal Hydraulic Mounting | 107-0171-907 | 1 |
| | Bracket - Node Mounting | 107-0172-097 | 1 |

**TABLE 1. SmarTrax Installation Kit - Class IV Axle (P/N 117-5032-003)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| | Cable - Case IH Magnum Valve | 115-4001-096 | 1 |
| | Transducer - 0-3000 PSI Pressure | 422-0000-086 | 1 |
| | Screw - #8 x 3/4” Long Self Tapping | 310-1002-070 | 2 |
| | Bolt - 5/16”-18 x 7/8” Hex Head | 311-0052-104 | 4 |
| | Bolt - 1/2”-13 x 2” Hex Head | 311-0058-168 | 2 |
| | Nut - 3/8”-16 Nylon Insert Lock | 312-4000-061 | 3 |
| | Nut - 1/2”-13 Nylon Insert Lock | 312-4000-065 | 2 |
| | Washer - 5/16” Lock | 313-1000-019 | 4 |
| | Washer - 1/2” Flat | 313-2300-017 | 2 |

**TABLE 2. SmarTrax Installation Kit - Class V Axle (P/N 117-5032-010)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| Not Pictured | Manual - Case IH MX/Magnum and New Holland T80X0 Series SmarTrax Installation | 016-5032-003 | 1 |
| | Valve - SmarTrax Hydraulic | 334-0003-088 | 1 |
| | Bracket - Universal Hydraulic Mounting | 107-0171-907 | 1 |
| | Bracket - Node Mounting | 107-0172-097 | 1 |
| | Cable - Case IH Magnum Valve | 115-4001-096 | 1 |
| | Cable - Magnum Class V Axle WAS Adapter | 115-4001-133 | 1 |
| | Transducer - 0-3000 PSI Pressure | 422-0000-086 | 1 |
| | Screw - #8 x 3/4” Long Self Tapping | 310-1002-070 | 2 |
| | Bolt - 5/16”-18 x 7/8” Hex Head | 311-0052-104 | 4 |
| | Bolt - 1/2”-13 x 2” Hex Head | 311-0058-168 | 2 |
| | Nut - 3/8”-16 Nylon Insert Lock | 312-4000-061 | 3 |

**TABLE 2. SmarTrax Installation Kit - Class V Axle (P/N 117-5032-010)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| | Nut - 1/2”-13 Nylon Insert Lock | 312-4000-065 | 2 |
| | Washer - 5/16” Lock | 313-1000-019 | 4 |
| | Washer - 1/2” Flat | 313-2300-017 | 2 |

**TABLE 3. Hydraulic Kit (P/N 117-0199-060)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| | Fitting - -6 ORFS M/F 90° Swivel Elbow | 333-0012-065 | 1 |
| | Fitting - -6 ORFS (M) to -6 SAE O-Ring (M) Straight Adapter | 333-0012-084 | 2 |
| | Fitting - -8 STC F/F/F Tee Adapter | 333-0012-150 | 4 |
| | Fitting - -6 STC (F) to -6 ORFS (F) 45° Elbow Adapter | 333-0012-151 | 1 |
| | Tool - -6 STC Fitting Release | 333-0012-152 | 1 |
| | Tool - -8 STC Fitting Release | 333-0012-153 | 1 |
| | Fitting - -6 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter | 333-0012-199 | 2 |

**TABLE 3. Hydraulic Kit (P/N 117-0199-060)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| | Fitting - -6 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter | 333-0012-233 | 2 |
| | Hydraulic Hose - -8 STC (M) to -8 STC (M) - 6-1/2” | 214-1000-282 | 4 |
| | Hydraulic Hose - -6 STC (M) to -6 ORFS 90° (F) - 42” | 214-1000-782 | 1 |
| | Hydraulic Hose - -6 ORFS (M) to -6 ORFS (F) - 15” | 214-1000-783 | 1 |
| | Hydraulic Hose - -8 STC90° (M) to -6 ORFS 90° (F) - 44” | 214-1000-954 | 4 |

**TABLE 4. W.A.S. Kit - Class IV Axle (P/N 117-0192-035)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| | Adapter - Case IH Magnum Machined Sensor | 107-0171-865 | 1 |
|  | Shaft - Case IH Magnum 10 Bolt Hub Wheel Angle Sensor | 107-0171-996 | 1 |
|  | Shaft - Case IH Magnum 12 Bolt Hub Wheel Angle Sensor | 107-0172-064 | 1 |
| | Bracket - Case IH Magnum Retaining | 107-0171-999 | 1 |
| | Bracket - Case IH Magnum Sensor Cover | 107-0172-002 | 1 |

**TABLE 4. W.A.S. Kit - Class IV Axle (P/N 117-0192-035)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| | Sensor - 120° Rotary Hall Effect | 416-0001-050 | 1 |
| | Coupler - WAS | 307-0159-419 | 1 |
| | Fitting - 1/8” NPT 45° Grease Zerk | 333-0001-026 | 1 |
| | O-Ring - 3/16” ID Buna-n 70 Duro | 219-0001-334 | 1 |
| | Spacer - #8 ID x 3/8” OD x 1” Long Plastic | 107-0172-031 | 2 |
| | Spacer - #8 ID x 3/8” OD x 3/4” Long | 107-0172-166 | 2 |
| | Screw - #8-32 UNC x 2-1/4” Long | 311-0001-032 | 2 |
| | Screw - #8-32 UNC x 2-1/2” SLTD | 311-0001-034 | 2 |
| | Bolt - M14 x 45 M x 2 MM Pitch Allen | 311-0007-052 | 1 |
| | Bolt - M16 x 2 x 25 MM | 311-0070-009 | 4 |

**TABLE 4. W.A.S. Kit - Class IV Axle (P/N 117-0192-035)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| | Nut - M6 x 1.0 Nylon Insert Lock | 312-4000-207 | 1 |
| | Washer - 0.812” ID x 1.469” OD x 0.134” Thick Flat | 313-2300-023 | 12 |

**TABLE 5. W.A.S. Kit - SuperSteer (P/N 117-0192-046)**

| Picture | Item Description | Part Number | Qty. |
|---|---|---|---|
| | Sensor - 250 mm Non-Contact Linear Wheel Angle | 063-0181-017 | 1 |
| | Bracket - WAS Shaft Collar | 107-0172-402 | 1 |
| | Mount - M10 Ball Universal | 103-0001-029 | 2 |
| | Spacer - 0.406” ID x 0.750” OD x 0.75” Long Steel | 107-0172-037 | 4 |
| | Bolt - M10 x 1.5 x 60 mm Hex | 311-0070-025 | 1 |
| | Bolt - M10 x 1.5 x 40 mm Hex | 311-0070-028 | 1 |
| | Nut - M10 x 1.5 x 5 mm Thick Jam | 312-1002-035 | 2 |
| | Nut - M10 x 1.5 Nylon Insert Lock | 312-4000-208 | 2 |

**TABLE 6. Node Kit (P/N 117-5030-005)**

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

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 reduce performance and possibly damage the SmarTrax hydraulic valve.

**NOTICE**

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.

# Install Fittings in the SmarTrax Valve

Before mounting the SmarTrax 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 SmarTrax valve.

| Fitting | Part Number | Port |
|---|---|---|
| Fitting - -6 ORFS (M) to -6 SAE O-Ring (M) Straight Adapter | 333-0012-084 | LSPV, LS STEER |
| Fitting - -6 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter | 333-0012-199 | P, T |
| Fitting - -6 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter | 333-0012-233 | A, B |
| Transducer - 0-3000 PSI Pressure | 422-0000-086 | PS |

# Mounting the SmarTrax Valve

## Machines with a Front Step

**FIGURE 1. Valve Mounting Location**

1. Identify the SmarTrax valve (P/N 334-0003-088) mounting location under the step of the machine.

**FIGURE 2. Step**

2. Remove the step by removing the two bolts on each side.

**FIGURE 3. Mounting Holes**

3. Measure 6 ½” to 7” from the bracket to edge of valve bracket as shown in Figure 3 below.

**FIGURE 4. Mounting Holes**

4. Using the hydraulic valve bracket (P/N 107-0171-907) as a template, drill two 1/2” holes into the step bracket at the measured point.

FIGURE 5. **Valve Mounted to Bracket**

***Note:*** *The mounting bracket has various hole patterns. Use a 4-hole pattern to mount in orientation shown.*

5. Mount the SmarTrax valve to the mounting bracket using four 5/16” bolts (P/N 311-0052-104) and four 5/16” lock washers (P/N 313-1000-019).

FIGURE 6. **Valve Mounted to the Machine**

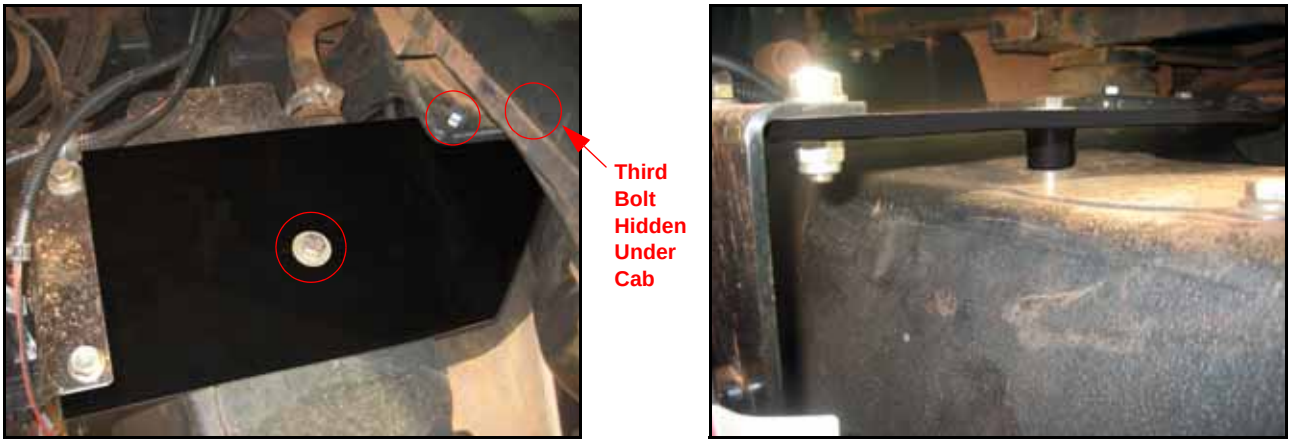
6. Mount valve and mounting bracket to mounting plate on machine using two 1/2”-13 x 2” hex head bolts (P/N 311-0058-168), two 1/2” washers (P/N 313-2300-017), and two 1/2”-13 nylon insert lock nuts (P/N 312-4000-065).

## Machines without a Front Step

***Note:*** *The cab mount valve bracket (P/N 116-0159-725) for machines without a front step is sold separately. Contact your local Raven dealer for ordering information.*

1. Identify the SmarTrax valve (P/N 334-0003-088) mounting location on top of the fuel tank.
2. Remove the two cab bolts and the bolt from the top of the fuel tank.
3. Align the cab mount valve bracket on the fuel tank so that the welded boss points down and the mounting holes line up with the empty bolt holes.

FIGURE 7. **Cab Mount Valve Bracket Installed**




4. Secure the cab mount valve bracket to the machine using the two cab bolts and one M10 x 50 mm bolt (not supplied).

FIGURE 8. **Valve Mounted to Bracket**

5. Mount the SmarTrax valve to the mounting bracket 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).

***Note:*** *The mounting bracket has various hole patterns. Use a 4-hole pattern to mount in orientation shown.*

FIGURE 9. **Valve Mounted to the Machine**

6. Mount valve and mounting bracket to mounting plate on machine using 1/2”-13 x 2” hex head bolts (P/N 311-0058-168), two 1/2” washers (P/N 313-2300-017), and two 1/2”-13 nylon insert lock nuts (P/N 312-4000-065).

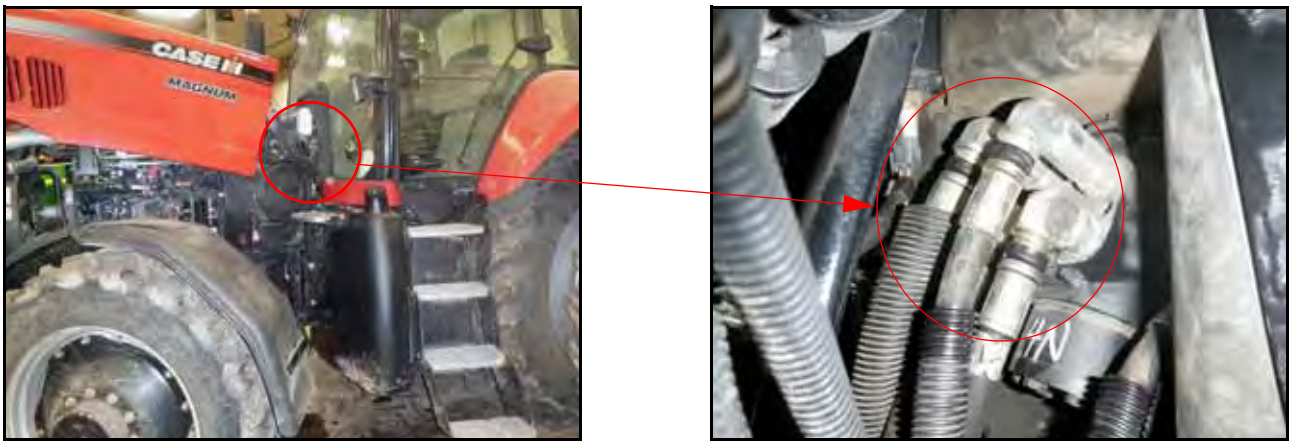
## Build Hose Assemblies

FIGURE 10. **Hose Assemblies**

1. Build four hose assemblies with supplied hoses and fittings as shown in Figure 10 above.
2. Ensure hydraulic connections are secure.

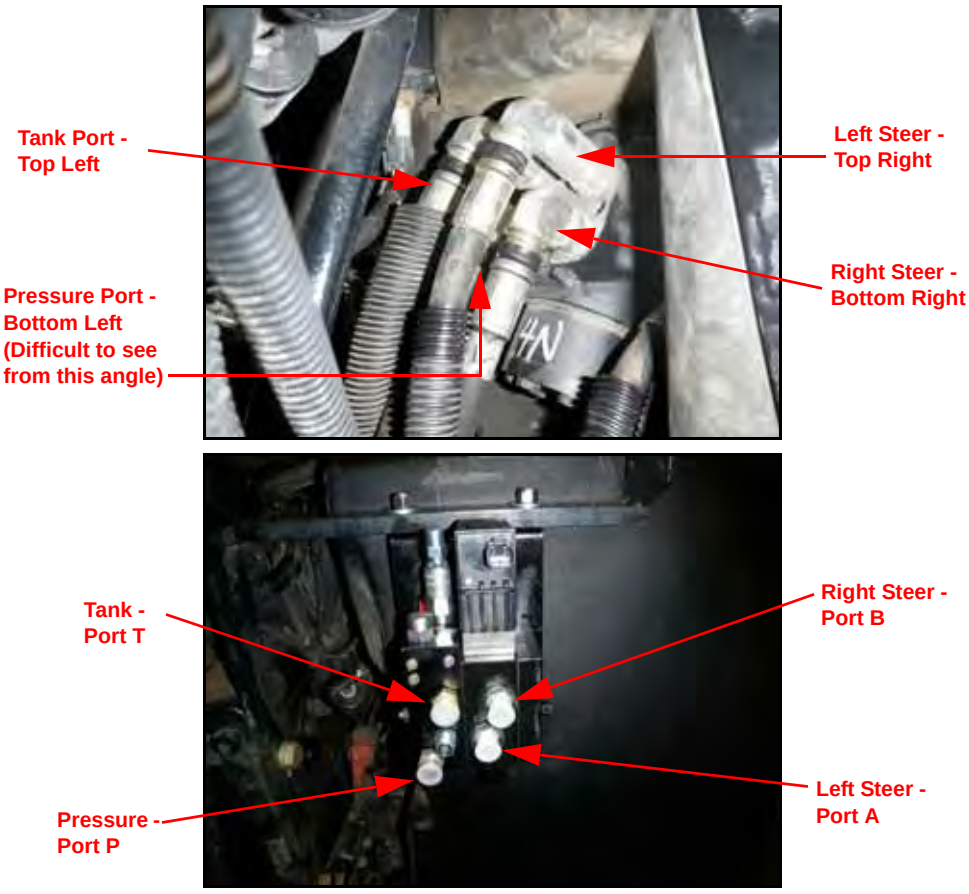
# Install the Tank, Pressure, and Left/Right Steering Hoses

**FIGURE 11. Hose Connections**




1. Locate steering orbital hose connections under hood.

**FIGURE 12. Ports of Steering Orbital and Steering Valve**




2. Refer to the pictures in Figure 12 to identify the ports on the machine's steering orbital and the SmarTrax valve (P/N 334-0003-088).

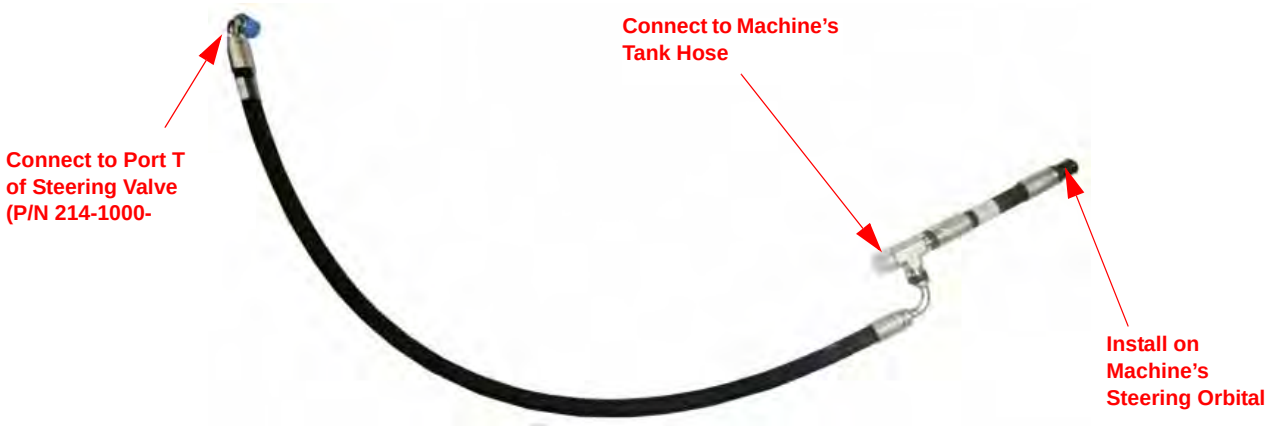
FIGURE 13. **08 STC Tool Inserted into Machine's Tank Hose**

3. Insert the 08 STC tool (P/N 333-0012-153) straight into the groove in the machine's existing tank hose.

FIGURE 14. **Machine's Tank Hose Disconnected from Steering Orbital**

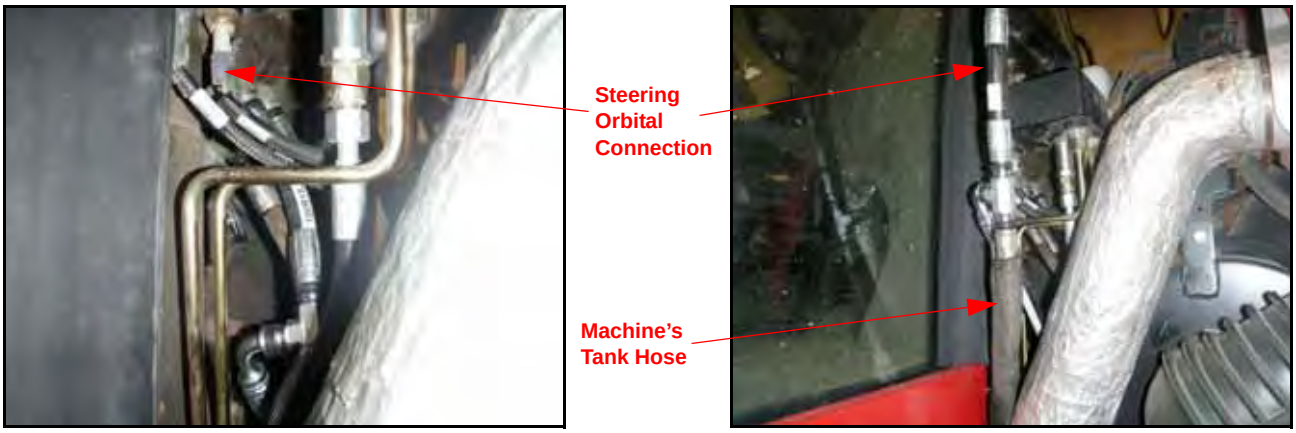
4. Disconnect the machine's tank hose from the steering orbital by pulling on the hose. DO NOT PRY.
5. Install the open end of the short hose (P/N 214-1000-282) of one hose assembly on the open tank port of the machine's steering orbital.

FIGURE 15. **Tank Hose Assembly**




6. Connect the machine's existing tank hose to the open end of the tee fitting on the hose assembly.

FIGURE 16. **Tank Hose Assembly Installed**



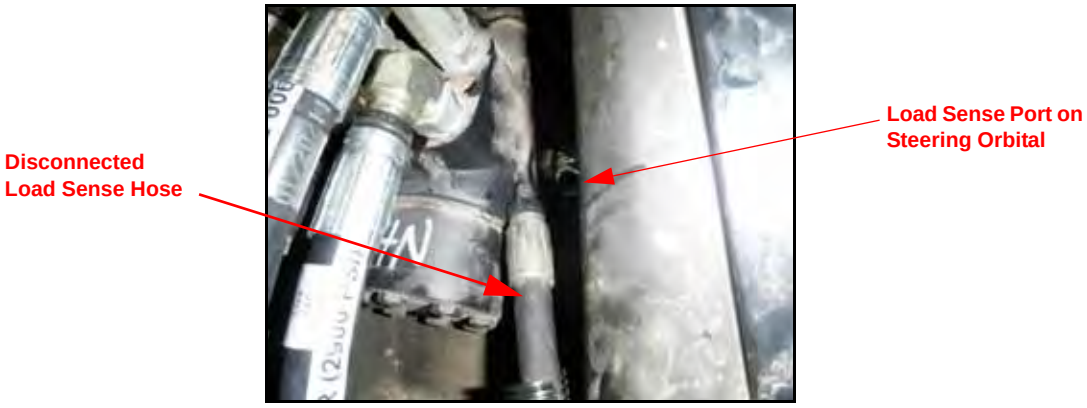

7. Connect the remaining end of the hose assembly to Port T of the SmarTrax valve.

FIGURE 17. **Tank Hose Assembly Connected to SmarTrax Valve**

8. Repeat the steps above to connect the pressure and left/right steering hose assemblies to their respective ports as illustrated in Figure 12.

# Install the Load Sense Hoses

**FIGURE 18. Machine's Load Sense Hose Disconnected**




1. Disconnect existing load sense hose from left side of steering orbital using supplied 06 STC tool (P/N 333-0012-152).

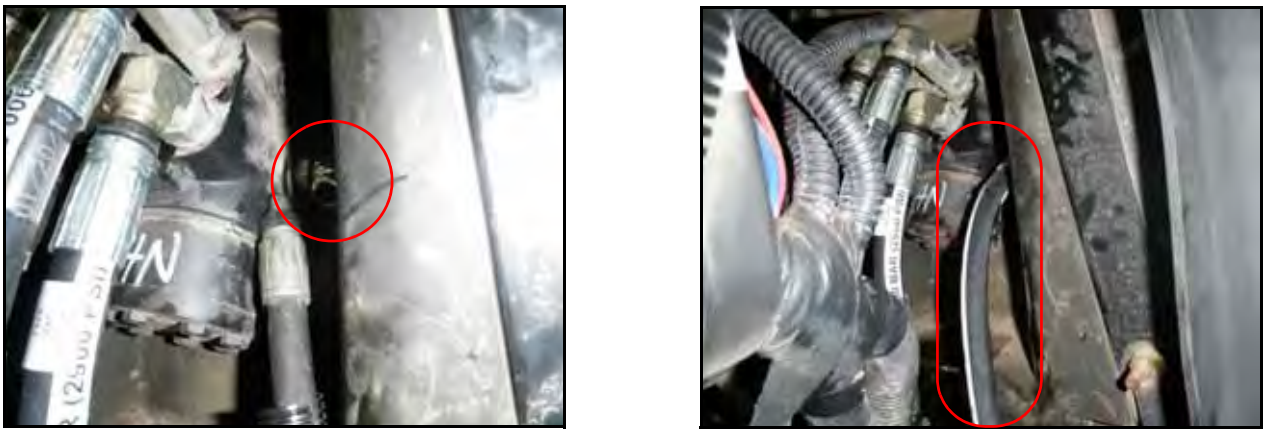
**FIGURE 19. Load Sense Line**

2. Install the -6 STC (F) to -6 ORFS (F) 45° elbow fitting (P/N 333-0012-151) on the end of the machine's load sense hose.
3. Install the supplied hydraulic hose (P/N 214-1000-783) on the installed 45° fitting.

**FIGURE 20. LSPV Port of SmarTrax Valve**

4. Connect the other end of the installed hydraulic hose to Port LSPV of the SmarTrax valve.

**FIGURE 21. Load Sense Hose Installed**



5. Install the supplied hydraulic hose (P/N 214-1000-782) on the open load sense port on the steering orbital.

**FIGURE 22. Hose Connected to Steering Valve**

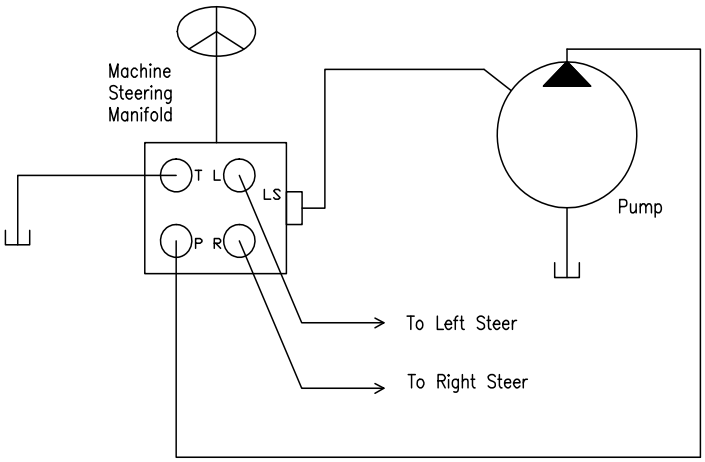
6. Route and connect the other end of the installed hydraulic hose to Port LS STEER of the SmarTrax valve.

**FIGURE 23. Mounted Steering Valve Under Front Step**

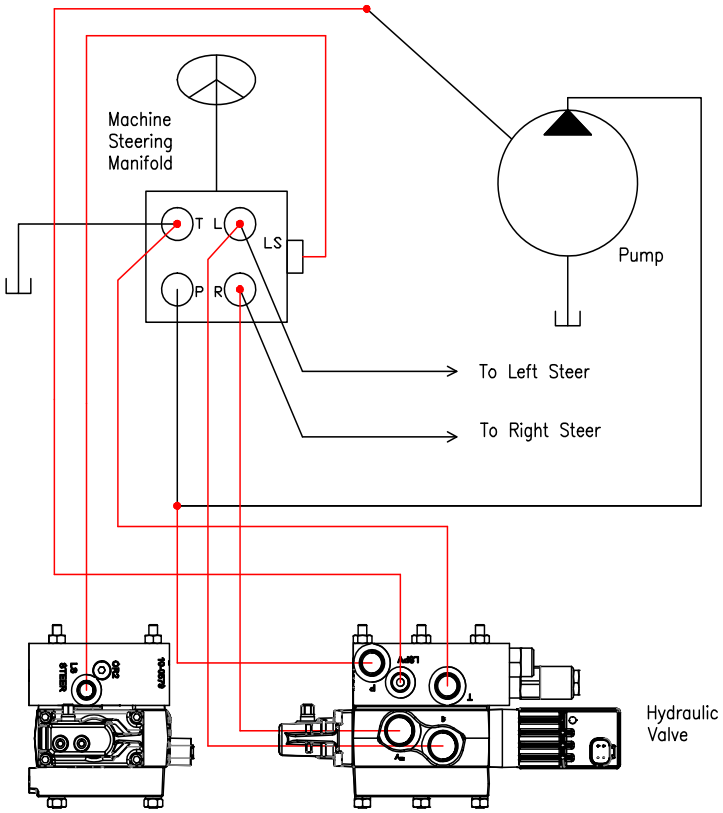
7. Reassemble the machine's front step (if applicable).

# Hydraulic System Diagram

Before




After



CHAPTER 4

# Wheel Angle Sensor Installation

## Install the Wheel Angle Sensor (WAS) - Class IV Axles Only

**FIGURE 1. Grease Retainer Plate**

Non-Threaded

Threaded

***Note:*** *The wheel angle sensor (WAS) cannot be installed unless the grease retainer plate located at the machine's front left kingpin is threaded as shown in Figure 1 above. If the plate is not threaded, contact your local Case IH or New Holland dealer to obtain a threaded grease retainer plate.*

1. Turn machine's front wheels fully to the left to access the wheel angle sensor (WAS) mounting location.
2. Remove the grease zerk fitting from the top of the left front kingpin.

FIGURE 2. **M14 Mounting Bolt Removed**

3. Remove the M14 mounting bolt that is closest to the rim.

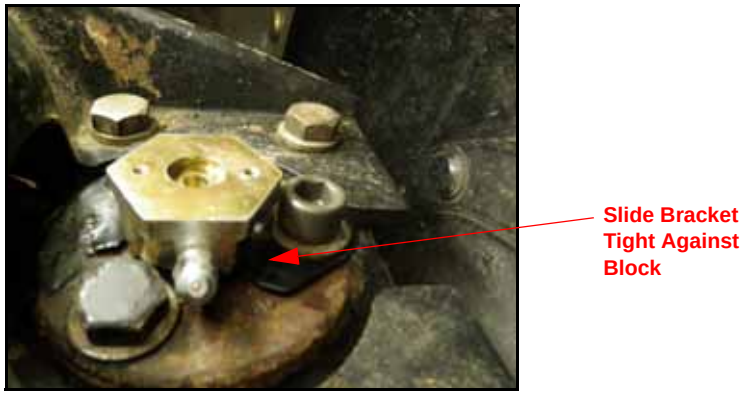
FIGURE 3. **Zerk Adapter Block Final Orientation**

4. Hand-tighten the zerk adapter block (P/N 107-0171-865) into the grease port until the open port in the zerk adapter block is 1/4 to 3/4 of a turn from the front kingpin mounting bolt.
5. Install the 45° grease zerk (P/N 333-0001-026) into the port in the adapter block so that the zerk points up.
6. Tighten the zerk adapter block until the holes on the top of the block are aligned with the exposed M14 bolt hole and the 45° zerk faces forward.

FIGURE 4. **Machine's Original Zerk Installed**

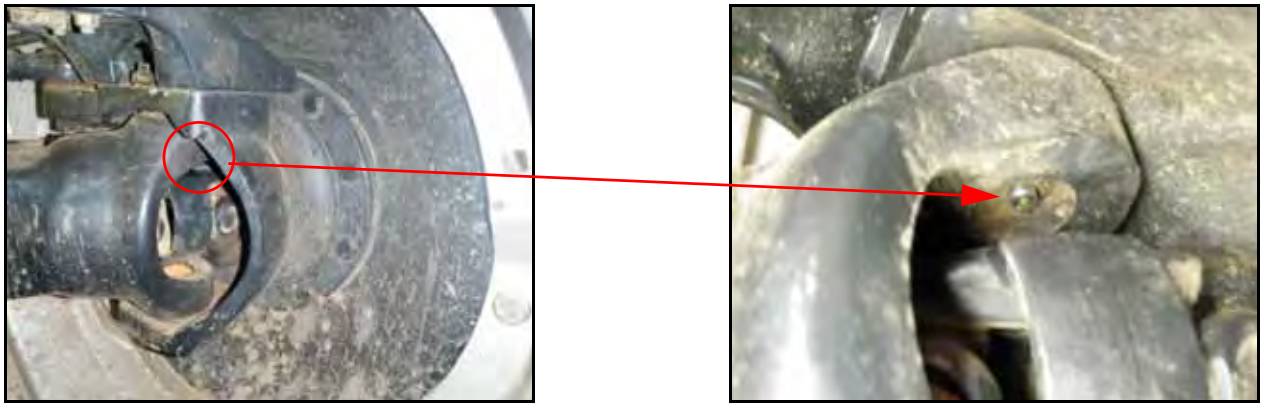
7. Install the machine's original grease zerk into the back port of the zerk adapter block.

FIGURE 5. **Retaining Bracket Installed**




8. Align retaining bracket (P/N 107-0171-999) with the exposed M14 bolt hole.
9. Insert the previously removed M14 bolt into the hole. If the hex head interferes with any components, use the supplied M14 Allen head bolt (P/N 311-0007-052) instead.
10. Slide the retaining bracket against the zerk adapter block.
11. Tighten the M14 bolt.

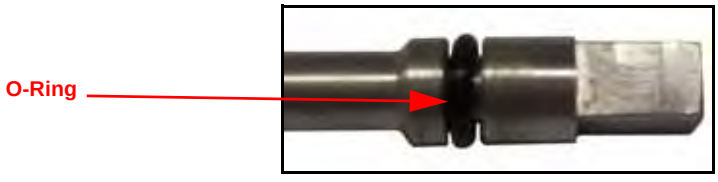
FIGURE 6. **Remove M6 Bolt**



12. Remove M6 bolt from the grease retainer plate under the upper kingpin.
13. Locate the sensor shafts in the installation kit.

***Note:*** *If the front hub has 10 bolts, use the shorter shaft (P/N 107-0171-996). If the front hub has 12 bolts, use the longer shaft (P/N 107-0172-064). Only one shaft will be used.*

FIGURE 7. **O-Ring on Sensor Shaft**




14. Slide the O-ring (P/N 219-4000-334) into the groove on the sensor shaft.

FIGURE 8. **Sensor Shaft Installed**

15. Insert the sensor shaft through center of zerk adapter block and screw into axle until the threads bottom out.

FIGURE 9. **Rotate Sensor Shaft**

16. Rotate the sensor shaft (maximum 1/4 turn counterclockwise) until the square face is parallel to the axle.

FIGURE 10. **M6 Lock Nut Installed**

17. Tighten the M6 lock nut (P/N 312-4000-207) onto bottom of sensor shaft, ensuring the sensor shaft does not turn.

**FIGURE 11. Sensor Adapter Installed**

**18.** Press plastic sensor adapter (P/N 307-0159-419) onto top of sensor shaft so the flat face of 'D' profile is closest to rear of the machine.

**FIGURE 12. Wheel Angle Sensor Installed**

**19.** Install the WAS (P/N 416-0001-050) on the plastic sensor adapter so that the sensor's connector points to the rear of the machine.

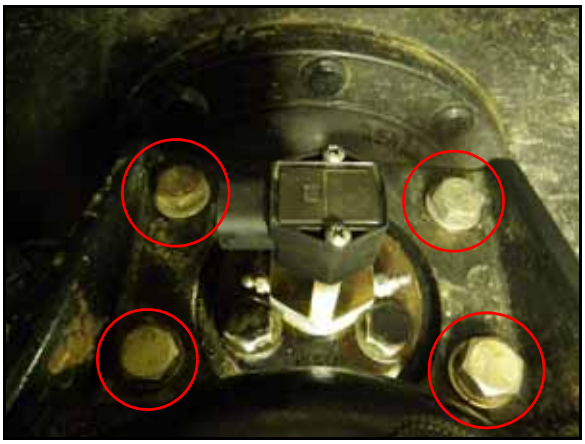
**FIGURE 13. Spacers Installed**

**20.** Install two spacers (P/N 107-0172-031 or 107-0172-166) between the sensor and zerk adapter block, aligning the holes with holes on the mounting holes on sensor and block.

***Note:*** *Use the spacers that allow for the most contact between the sensor, the zerk adapter block, and the shaft.*

**21.** Insert two #8-32 screws (P/N 311-0001-034 or 311-0001-032) and tighten.

**FIGURE 14. Fender Mounting Bolts**



**22.** Remove the machine's fender mounting bolts (if present).

**FIGURE 15. Sensor Cover Installed**

**23.** Align 0.812" ID x 1.469" OD x 0.134" thick flat washers (P/N 313-2300-023) over each of the fender mounting holes.

***Note:*** *The washers will elevate the cover bracket, providing clearance between the bracket and the sensor.*

**24.** Align the holes in the sensor cover bracket (P/N 107-0172-002) with the exposed fender mounting holes so that the larger cutout is toward back.

**25.** Install the fender mounting bolts to secure the bracket.

***Note:*** *If fenders are not being used and there are no bolts present, use the four supplied M16 x 2 x 25mm bolts (P/N 311-0070-009).*

# Install the Wheel Angle Sensor (WAS) - SuperSteer Only

## Assemble the WAS

**FIGURE 16. WAS Assembly**

1. Install the M10 universal ball mounts (P/N 103-0001-029) and M10 jam nuts (P/N 312-4000-208) on the ends of the 250 mm non-contact linear wheel angle sensor (P/N 063-0181-017).
2. Tighten the nuts to ensure the ball mounts are installed securely.

## Install the WAS

1. Turn the machine's front wheels fully to the right to access the WAS mounting location.

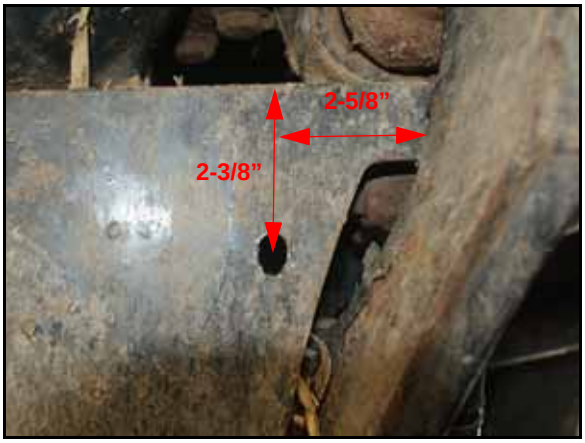
**FIGURE 17. Shaft Collar Bracket Installed**

2. Install the shaft collar bracket (P/N 107-0172-402) on the rod at the far end of the left steering cylinder, orienting so that the bracket points to the tire at the rear of the machine.
3. Tighten the collar bolts so that the clamp does not move.

FIGURE 18. **Rod-End of WAS Installed**

4. Insert an M10 x 1.5 x 60 metric hex bolt (P/N 311-0070-025) through the M10 ball mount installed on the rod-end of the WAS.
5. Install two 0.406” ID x 0.750” OD x 0.75” long spacers (P/N 107-0172-037) on the end of the installed hex bolt.
6. Install the rod-end of the WAS on the shaft collar mounting bracket using one M10 x 1.5 x 5 mm jam nut (P/N 312-1002-035).

FIGURE 19. **Machine’s Center Axle Plate**




7. Locate the plate in the center of the machine’s axle.
8. Identify the WAS’s base-end mounting location as shown in Figure 19 above and drill a 7/16” hole in that location.

FIGURE 20. **Base-End of WAS Installed**

9. Extend the WAS until the base-end is positioned over the hole.
10. Insert an M10 x 1.5 x 40 mm hex bolt (P/N 311-0070-028) through the hole in the ball mount installed on the base-end of the WAS.
11. Install a 0.406” ID x 0.750” OD x 0.75” long steel spacer (P/N 107-0172-037) on the end of the installed hex bolt.
12. Secure the base-end of the WAS to the machine’s plate using an M10 x 1.5 nylon insert lock nut (P/N 312-4000-208).
13. Verify that the WAS cannot be overextended or compressed when the wheels are turned to their extremes and that the sensor moves freely and is not being damaged within its range of motion.

***Note:*** *It may be necessary to adjust the wheel stops to prevent the sensor from being damaged.*

CHAPTER 5

# Cab Component Installation

## Install the SmarTrax Node

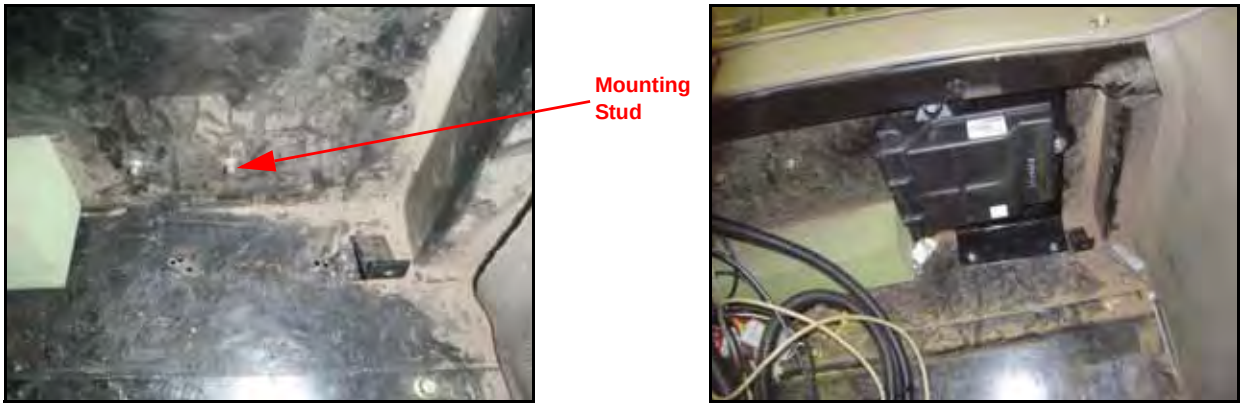
### Mount the SmarTrax Node

**FIGURE 1. SmarTrax Node Mounting**

1. Mount the SmarTrax node (P/N 063-0173-228) to the node mounting bracket (P/N 107-0172-097) using three 3/8”-16 nylon insert lock nuts (P/N 312-4000-061).
2. Remove the back wall access panel below the rear window (inside the cab).

***Note:*** *Do not reinstall the access panel until the wiring installation is complete.*

FIGURE 2. **Node Installed**



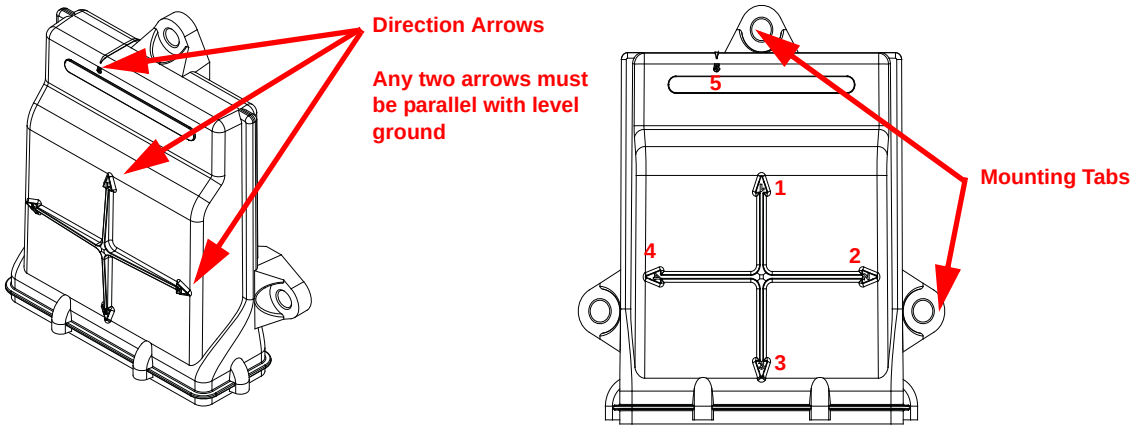

3. Use a 3/32” drill bit and the mounting bracket as a template to create pilot holes in the floor of the cab for self-tapping screws.
4. Position the node mounting bracket over the mounting stud on the back wall behind and to the left of the driver’s seat.
5. Secure the node mounting bracket to the floor of the cab using the supplied self-tapping screws (P/N 310-1002-070).

FIGURE 3. **Node Harness Installed on Node**

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

## 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 115-4001-109) and connect it to the foot switch cable connector.

## Install the Valve Harness

**FIGURE 6. Valve Harness Routing Location**

1. Carefully remove the exterior panel just below the rear window.

**FIGURE 7. Hole in Cab Floor**

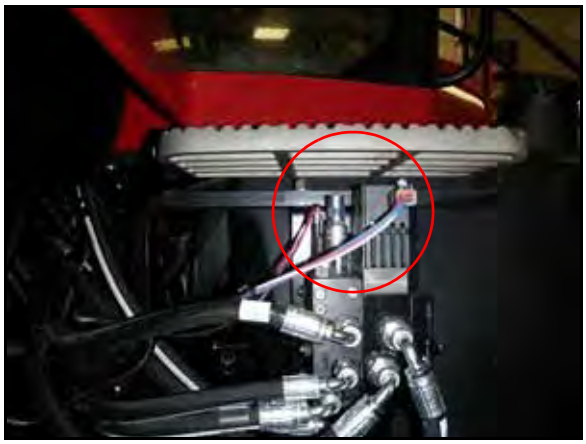
2. From outside the cab, route the 12-pin connector of the valve harness (P/N 115-4001-096) into the cab through the cutout in the floor of the cab.
3. Connect the 12-pin connector to the green mating connector on the node harness (P/N 115-4001-109).

FIGURE 8. **Valve Harness Routing**

4. Replace the exterior back panel of the machine.
5. Route the valve harness under the cab and toward the left axle and fuel tank.

***Note:*** *The harness should emerge between the front step and air cleaner. Ensure the cable is secured away from moving parts and heat sources.*

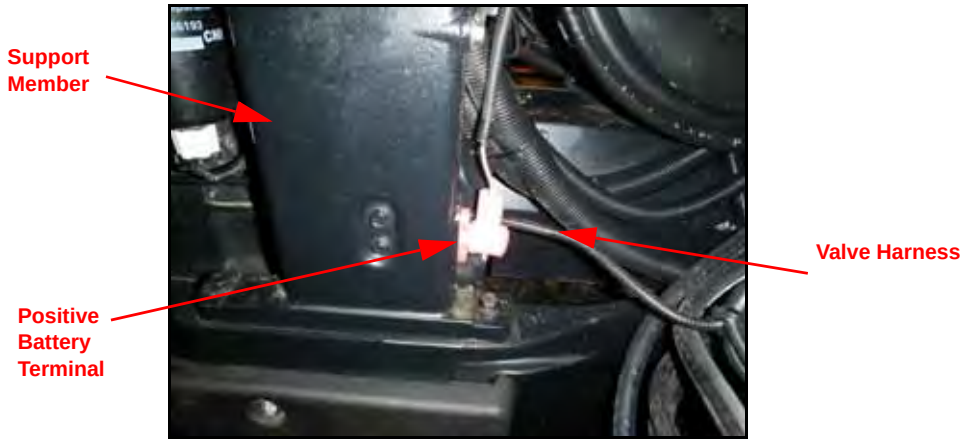
FIGURE 9. **Valve Harness Connections**



6. Connect the TRANSDUCER connector to the pressure transducer (P/N 422-0000-086) installed in Port PS of the SmarTrax valve.
7. Connect the VALVE connector to the open PVE port of the SmarTrax valve.

# Connect the Valve Harness to the WAS - Class IV Axles Only

**FIGURE 10. Valve Harness Routing**




1. Route the valve harness (P/N 115-4001-096) behind the support member along the machine's frame and between the engine block and positive battery terminal.

**FIGURE 11. Valve Harness Routed Through Frame Opening**

2. Route the valve harness straight down from the fuel filters and through the opening in the bottom of the frame.

FIGURE 12. **Valve Harness Routed Along Steering Hose and Tie Rod**

3. Route the valve harness along the steering cylinder hose and tie rod, toward the front tire.

FIGURE 13. **WAS Connection**

4. Secure the valve harness to the cylinder hose and tie rod using plastic cable ties.
5. Plug the WAS connector into the WAS installed on the front left kingpin.

# Connect the Valve Harness to the WAS - Class V Axles Only

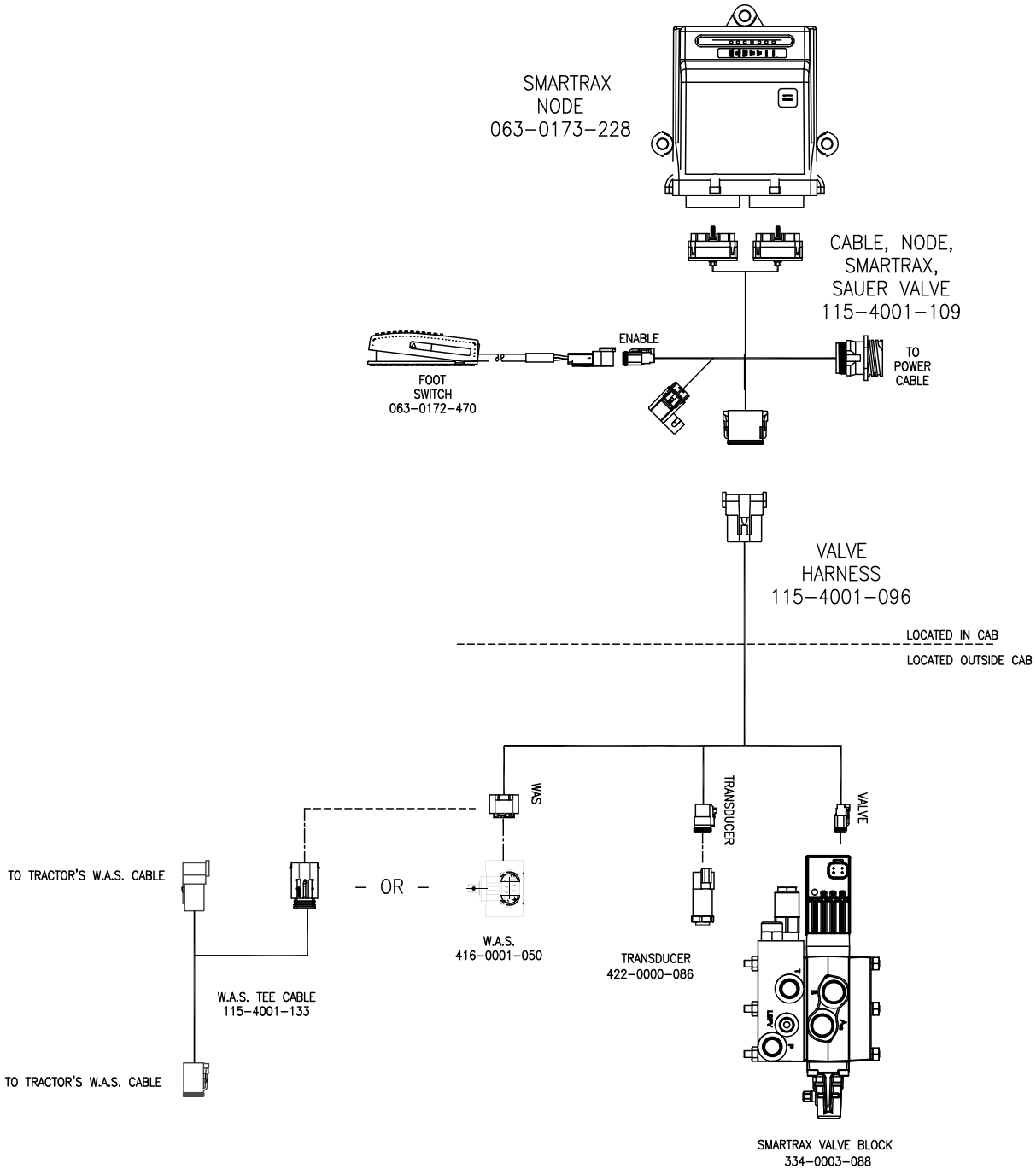
**FIGURE 14. Machine's WAS Cable**

1. Locate the existing WAS cable emerging from the left wheel axle.

**FIGURE 15. Machine's WAS Connection**

2. Trace the machine's WAS cable along the main frame to the 6-pin connector.
3. Disconnect the machine's WAS cable and install the WAS tee adapter cable (P/N 115-4001-133) between the machine's connectors.
4. Plug the remaining connector into WAS connector of the valve harness (P/N 115-4001-096).
5. Secure the valve harness to the machine using plastic cable ties.

**FIGURE 16. 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 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 17. Existing Chassis System Wiring Diagram**

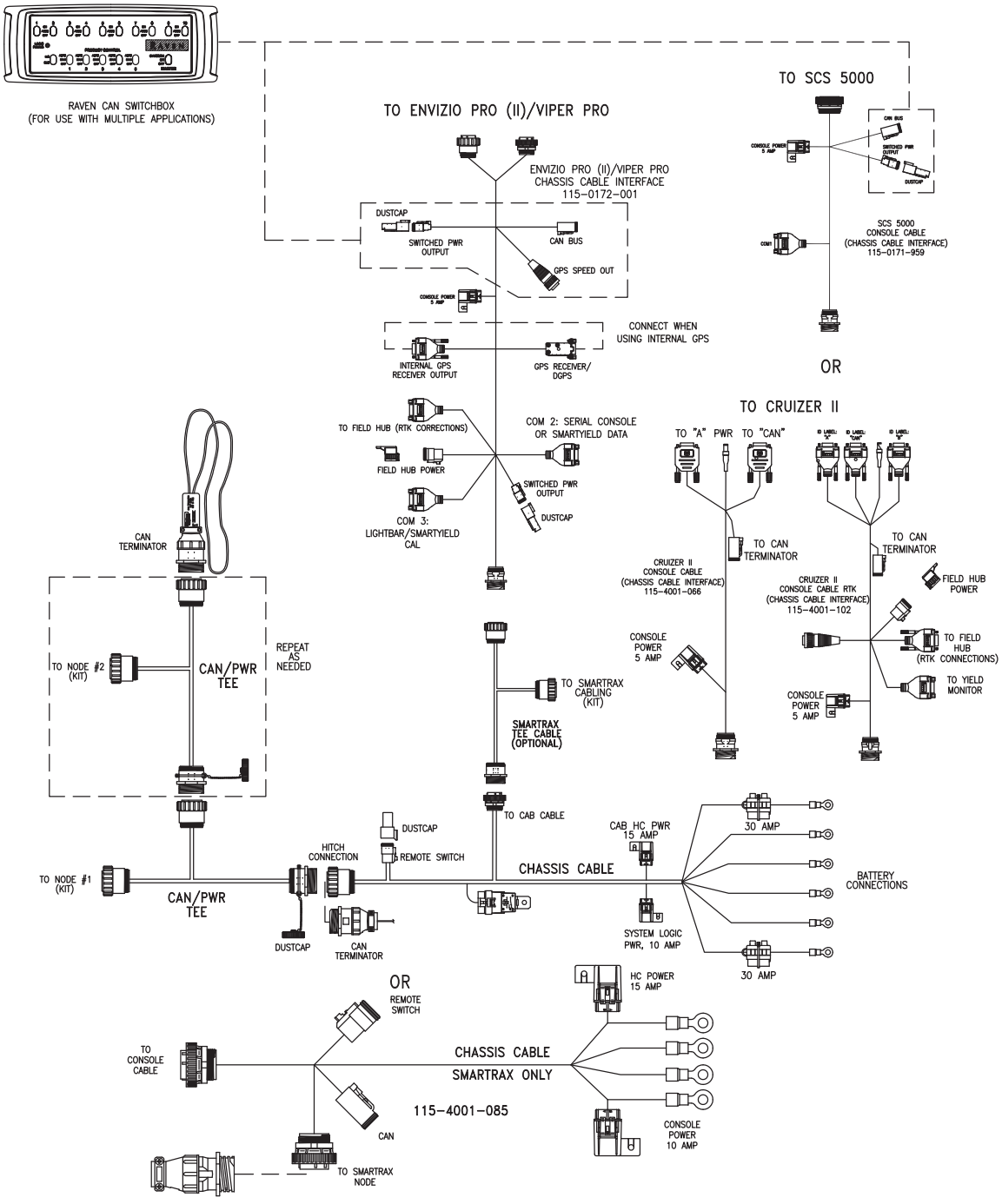


**FIGURE 18. Envizio Pro II with Slingshot**

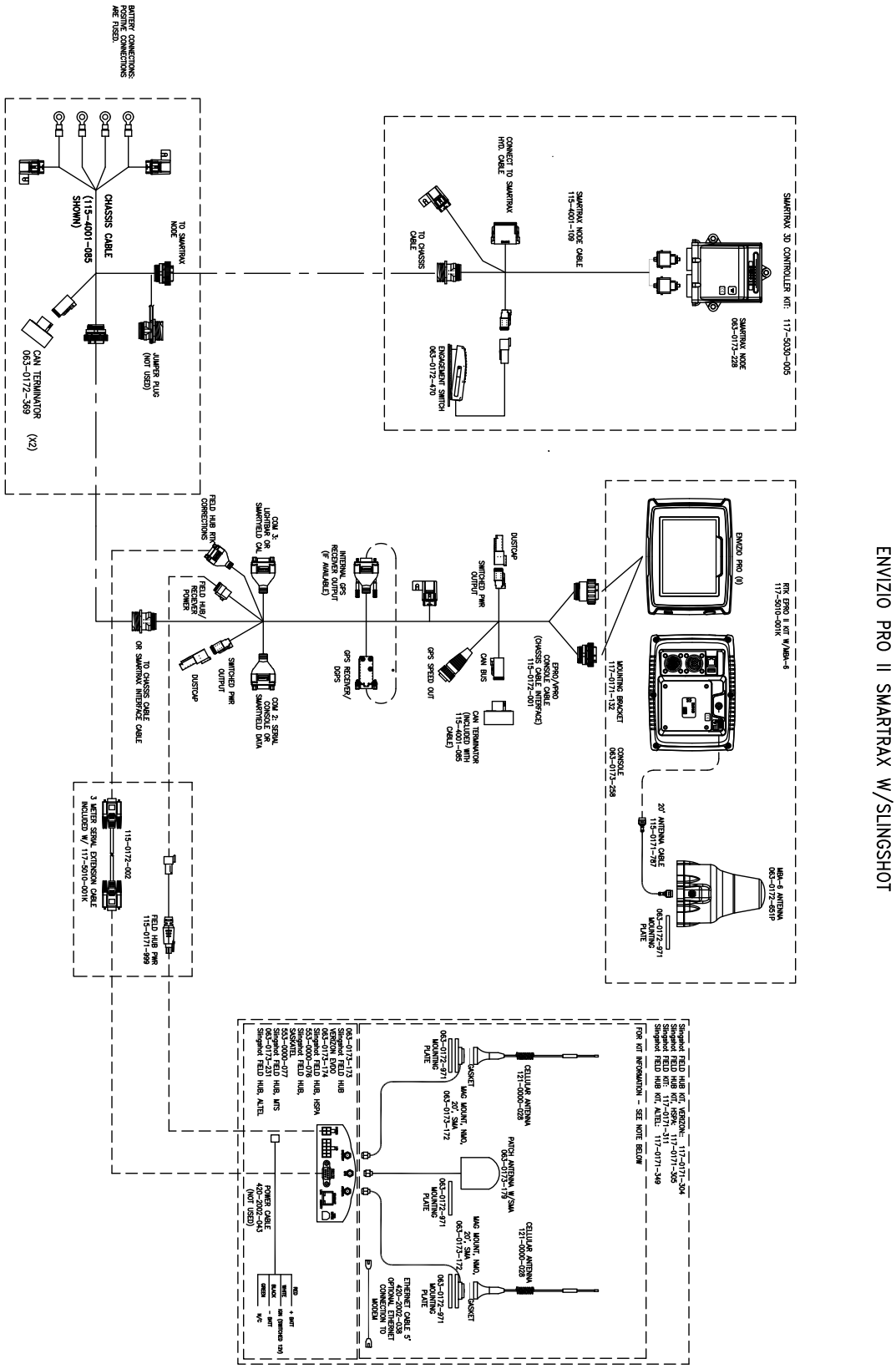


**FIGURE 19. Viper Pro/Envizio Pro with Slingshot**

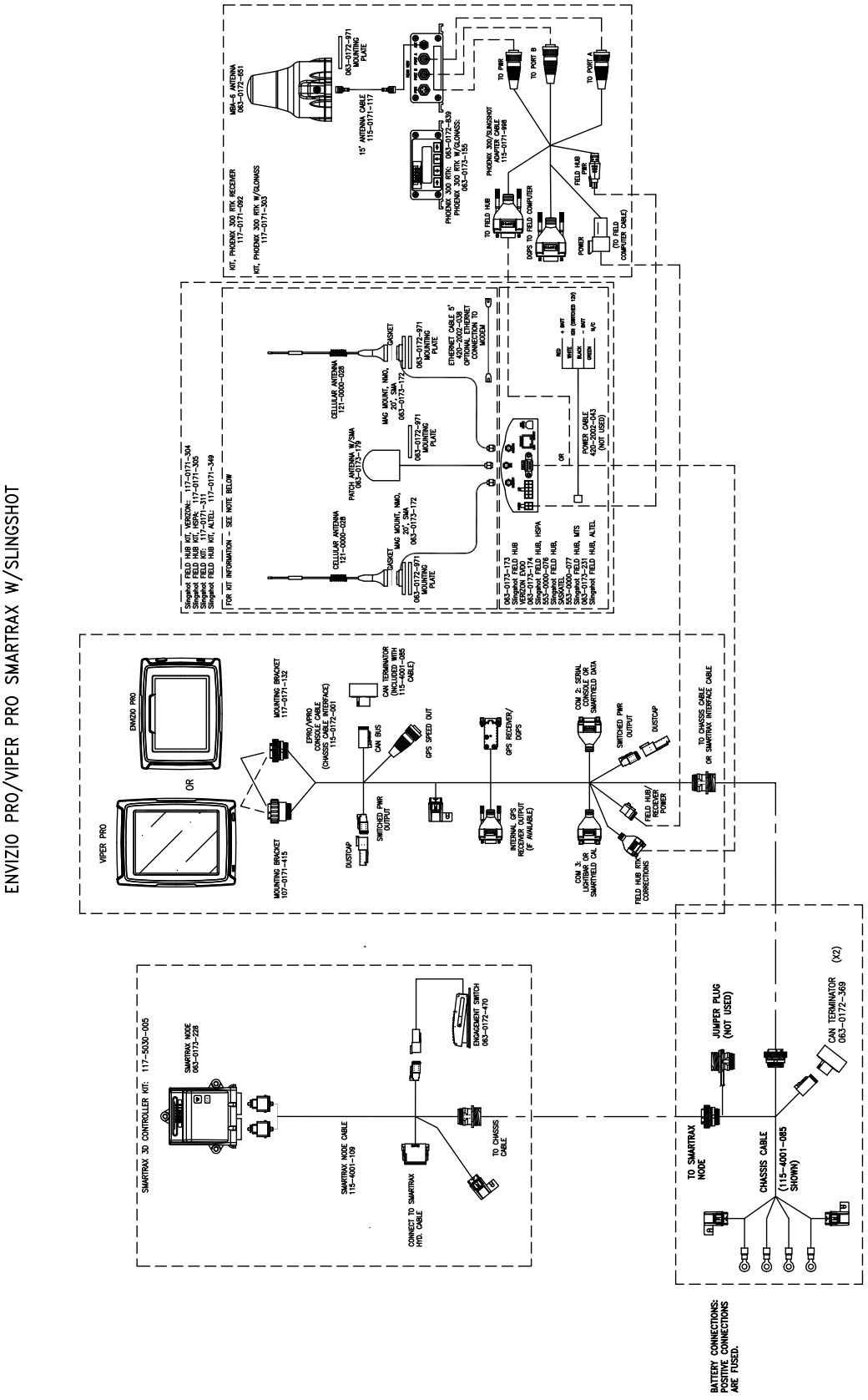
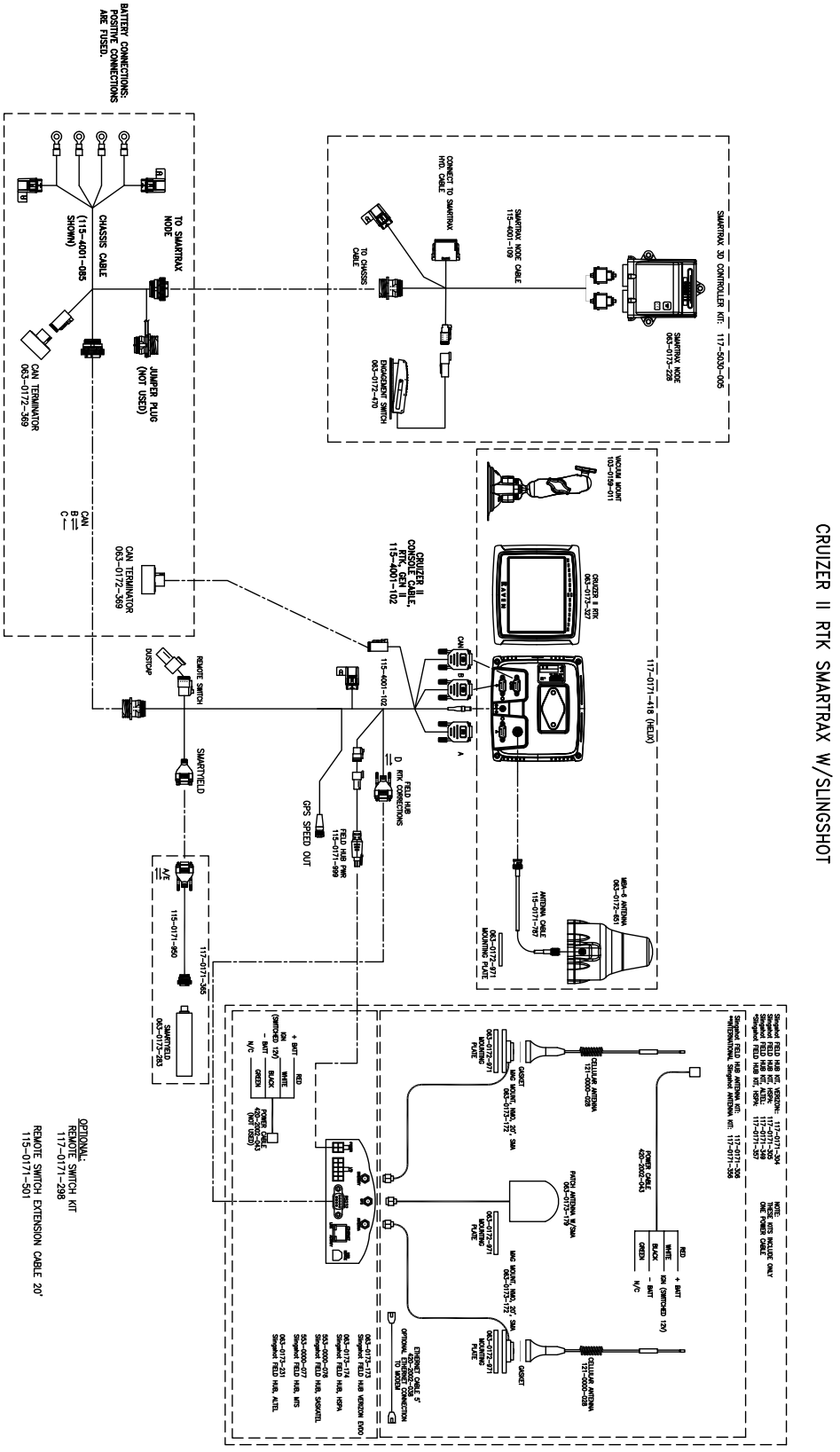


**FIGURE 20. Cruizer II with Slingshot**



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

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