
**Buhler Versatile Row Crop R2 Series
250, 280, and 305 (Including UltraSteer)
and 260, 290, and 310 Series
SmarTrax™ Installation Manual**

P/N 016-5031-002 Rev. C

05/15

E25178

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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.

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: Buhler Versatile

**MODEL: Row Crop R2 Series 250, 280 and 305 (Including UltraSteer)
Row Crop R2 Series 260, 290, and 310**

FIGURE 1. Versatile 280



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.

Chapter 2

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 in the recommended location. Refer to the following table for the machine-specific antenna mounting location.

| Machine Preset | Antenna X Position (left to right) | Antenna Y Position (fore/aft offset) | Antenna Z Position (ground to bottom of antenna) |
|------------------------|---------------------------------------|---|--|
| Versatile 260-310 2013 | Centered | 5 ft./1.524 m | 11 ft. 2 in./3.399 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

- Buhler Versatile Row Crop R2 Series 250-310 SmarTrax™ Installation Manual*
- P/N 016-5031-002 Rev. C*
- 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 (P/N 117-5031-002)

| Picture | Item Description | Part Number | Qty. |
|---|--|--------------|------|
| Not Pictured | Manual - Buhler Versatile Row Crop R2 Series 250-305 SmarTrax Installation | 016-5031-002 | 1 |
|  | Valve - SmarTrax Hydraulic | 334-0003-088 | 1 |
|  | Bracket - WAS Rod Mounting | 107-0172-030 | 1 |
|  | Bracket - WAS Axle Mounting | 107-0172-150 | 1 |
|  | Sensor - 250 mm Non-Contact Linear Wheel Angle | 063-0181-017 | 1 |
|  | Cable - Tee Safety Harness | 115-4001-209 | 1 |
|  | Cable - Finger Toggle Enable Adapter | 115-4001-215 | 1 |
|  | Cable - SmarTrax Valve Harness | 115-4001-143 | 1 |
|  | Mount - M10 Ball Linear Sensor | 103-0001-029 | 1 |

TABLE 1. SmarTrax Installation Kit (P/N 117-5031-002)

| Picture | Item Description | Part Number | Qty. |
|---|--|--------------|------|
|  | Mount - M10 Stud Linear Sensor | 103-0001-030 | 1 |
|  | Switch - Master | 063-0173-545 | |
|  | Transducer - 0-3000 PSI Pressure | 422-0000-086 | 1 |
|  | Clamp - 1-7/8" Muffler | 435-3003-055 | 1 |
|  | Spacer - 0.406" ID x 0.75" OD x 0.75" Long | 107-0172-037 | 1 |
|  | Spacer - 0.406" ID x 0.375" OD x 0.375" Long | 107-0172-103 | 3 |
|  | Bolt - 5/16"-18 UNC x 7/8" Hex | 311-0052-104 | 4 |
|  | Bolt - 3/8"-16 UNC x 2" Hex | 311-0054-202 | 3 |
|  | Bolt - M8 x 20 mm Metric Hex | 311-0070-002 | 3 |
|  | Bolt - M10 x 1.5 60 mm Metric Hex | 311-0070-025 | 1 |
|  | Nut - 3/8"-16 UNC Zinc Plated Hex | 312-1001-037 | 3 |

TABLE 1. SmarTrax Installation Kit (P/N 117-5031-002)

| Picture | Item Description | Part Number | Qty. |
|---|-----------------------------------|--------------|------|
|  | Nut - M10 x 1.5 x 5 mm Jam | 312-1002-035 | 2 |
|  | Nut - 5/16"-18 Nylon Insert Lock | 312-4000-059 | 2 |
|  | Nut - M10 x 1.5 Nylon Insert Lock | 312-4000-208 | 2 |
|  | Nut - 3/8"-16 Nylon Insert Lock | 312-4001-109 | 3 |
|  | Washer - 5/16" Lock | 313-1000-019 | 4 |
|  | Washer - 5/8" Lock | 313-1000-045 | 1 |
|  | Washer - 5/16" Flat | 313-2300-012 | 4 |
|  | Washer - 3/8" Flat | 313-2300-043 | 3 |
|  | Washer - 8 mm Steel Flat | 313-2300-121 | 4 |

TABLE 2. Hydraulic Installation Kit (P/N 117-0199-087)

| Picture | Item Description | Part Number | Qty. |
|---|--|--------------|------|
|  | Fitting - -8 ORFS M/M/F Swivel Run Tee Adapter | 333-0012-028 | 4 |
|  | Fitting - -6 ORFS (M) to -6 SAE O-Ring (M) Straight Adapter | 333-0012-084 | 2 |
|  | Fitting - -6 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter | 333-0012-199 | 2 |
|  | Fitting - -6 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter | 333-0012-233 | 2 |
|  | Hydraulic Hose - -6 ORFS (F) to -6 ORFS 90° - 76" | 214-1000-628 | 1 |
|  | Hydraulic Hose - -6 ORFS (F) to -6 ORFS 90° - 84" | 214-1000-629 | 1 |
|  | Hydraulic Hose - -8 ORFS (F) to -6 ORFS 90° - 90" | 214-1000-631 | 2 |
|  | Hydraulic Hose - -8 ORFS (F) to -6 ORFS 90° - 84" | 214-1000-903 | 2 |

TABLE 3. Node Installation Kit (P/N 117-5030-005)

| Picture | Item Description | Part Number | Qty. |
|---|--|--------------|------|
| Not Pictured | Manual - SmarTrax and SmartSteer Calibration & Operation | 016-0171-277 | 1 |
|  | Node - SmarTrax CAN Control | 063-0173-228 | 1 |

TABLE 3. Node Installation Kit (P/N 117-5030-005)

| Picture | Item Description | Part Number | Qty. |
|---|--|--------------|------|
|  | Assembly - SmarTrax Enable Foot Switch | 063-0172-470 | 1 |
|  | Cable - SmarTrax Node Harness | 115-4001-109 | 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 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> | |

Install Fittings in the SmarTrax Valve

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

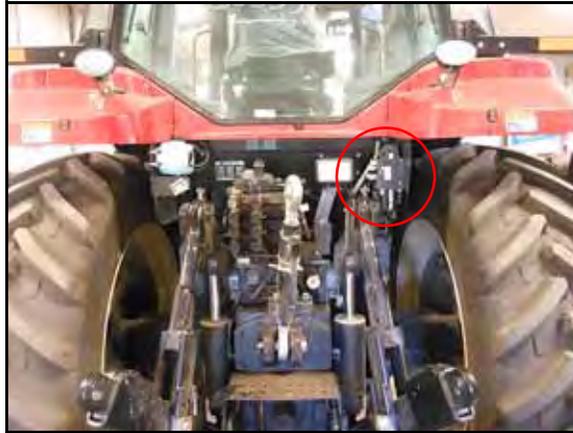
FIGURE 1. Fittings Installed in the SmarTrax Valve



| Fitting | Part Number | Port |
|---|--------------|-------------------|
| Fitting - 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 |

Mount the SmarTrax Valve

FIGURE 2. SmarTrax Valve Mounting Location



1. Identify the SmarTrax valve (P/N 334-0003-088) mounting location inside the machine's right fender.
2. Using the holes in the bottom of the valve as a guide, drill at least three holes into the right fender.

Note: To prevent the valve from being damaged, mount it away from the bottom edge of the fender and ensure there is clearance between the three point hitch and the valve.

FIGURE 3. SmarTrax Valve Installed



3. Mount the valve to the machine using 5/16"-18 UNC x 7/8" hex bolts (P/N 311-0052-104), 5/16" flat washers (P/N 313-2300-012), and 5/16" lock washers (P/N 313-1000-019).

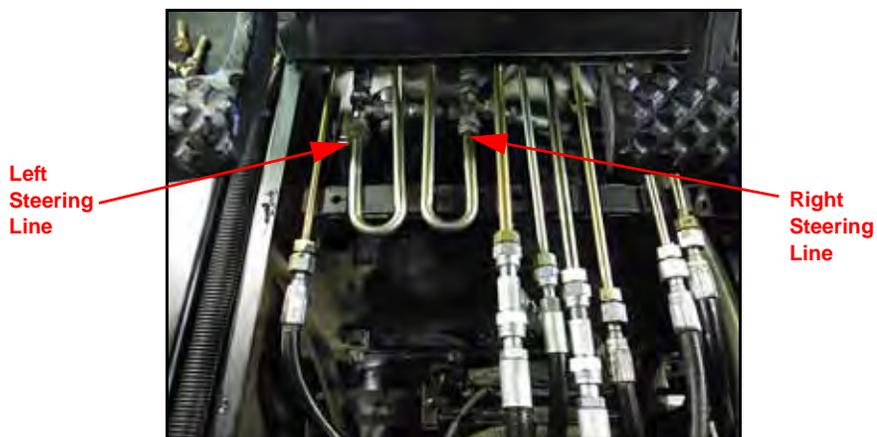
Install the Left and Right Steering Hoses

FIGURE 4. Machine's Floor Mat and Cover Plate Removed



1. Remove the floor mat and cover plate to access the steering lines.

FIGURE 5. Steering Lines



2. Identify the machine's left and right steering lines.
3. Disconnect the left steering hose from the steel line.

FIGURE 6. Left and Right Steering Hoses Installed

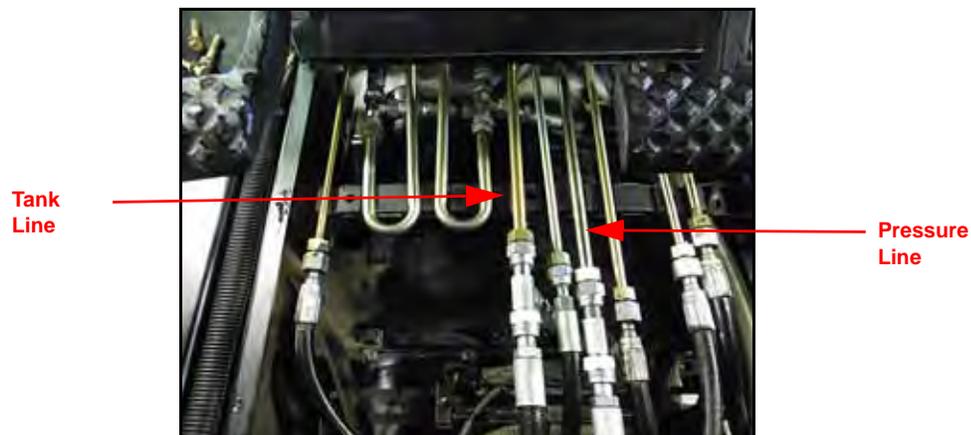


4. Install a -8 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-028) on the end of the left steering line.
5. Connect the machine's left steering hose to the opposite end of the installed tee fitting.
6. Install the straight end of the supplied hydraulic hose (P/N 214-1000-631) on the 90° end of the installed tee fitting.
7. Connect the 90° end of the installed hydraulic hose to the fitting installed in Port A of the SmarTrax valve.
8. Disconnect the machine's right steering hose from the steel line.
9. Install a -8 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-028) on the end of the right steering line.
10. Connect the machine's right steering hose to the opposite end of the installed tee fitting.
11. Install the straight end of the supplied hydraulic hose (P/N 214-1000-631) on the 90° end of the installed tee fitting.
12. Connect the 90° end of the installed hydraulic hose to the fitting installed in Port B of the SmarTrax valve.



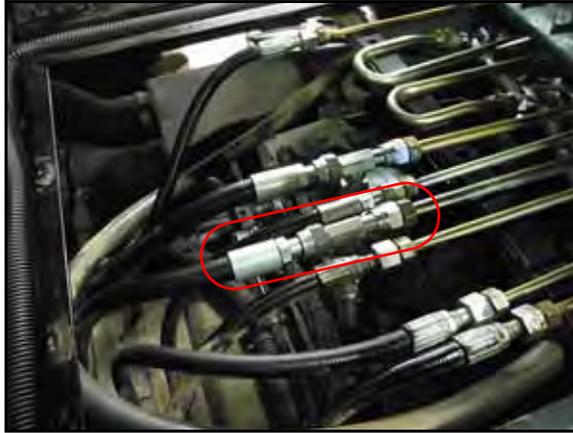
Install the Pressure and Tank Hoses

FIGURE 7. Pressure and Tank Lines



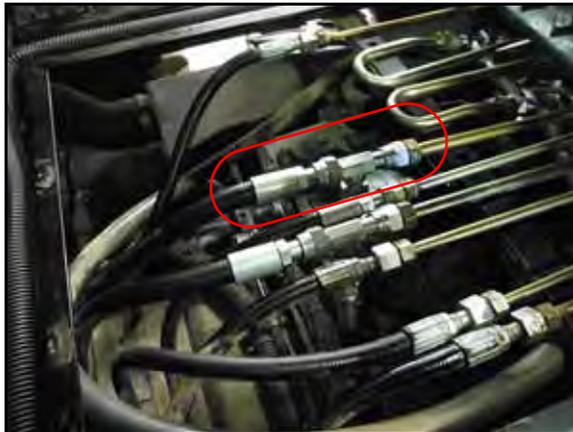
1. Identify the machine's pressure and tank lines.
2. Disconnect the machine's pressure hose from the steel line.

FIGURE 8. Machine's Pressure Hose Installed



3. Install a -8 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-028) on the end of the steering line.
4. Connect the machine's pressure hose to the opposite end of the installed tee fitting.
5. Install the straight end of the supplied hydraulic hose (P/N 214-1000-903) on the 90° end of the installed tee fitting.
6. Connect the 90° end of the installed hydraulic hose to the fitting installed in Port P of the SmarTrax valve.
7. Disconnect the machine's tank hose from the steel line.

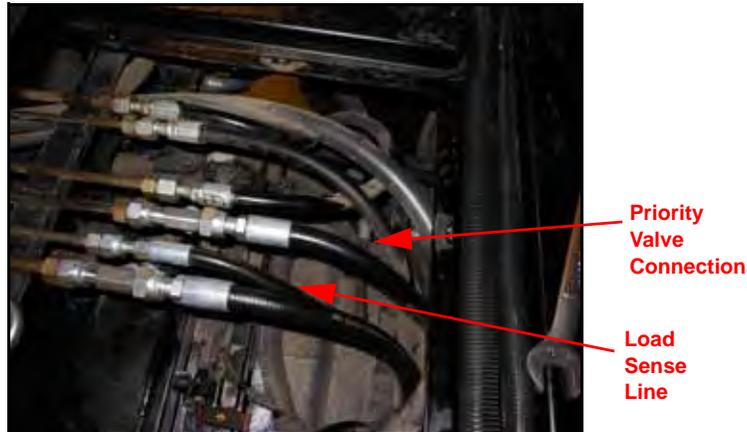
FIGURE 9. Machine's Tank Hose Installed



8. Install a -8 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-028) on the end of the tank line.
9. Connect the machine's tank hose to the opposite end of the installed tee fitting.
10. Install the straight end of the supplied hydraulic hose (P/N 214-1000-903) on the 90° end of the installed tee fitting.
11. Connect the 90° end of the installed hydraulic hose to the fitting installed in Port T of the SmarTrax valve.

Install the Load Sense Hoses

FIGURE 10. Machine's Load Sense Line

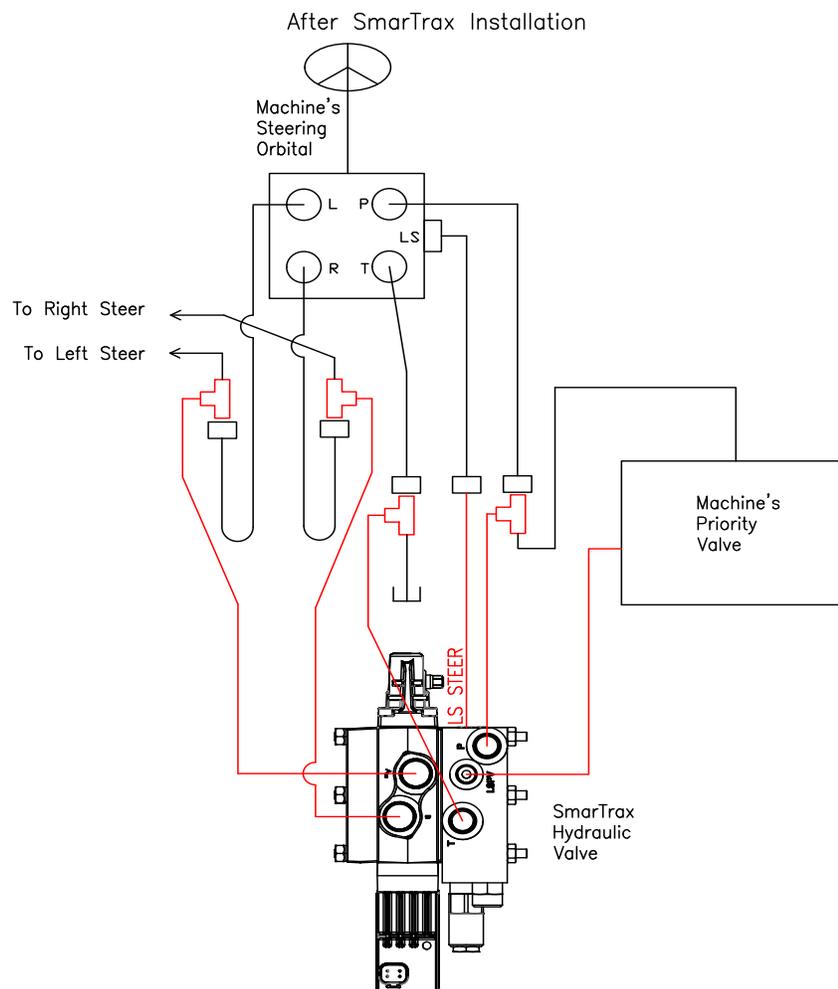
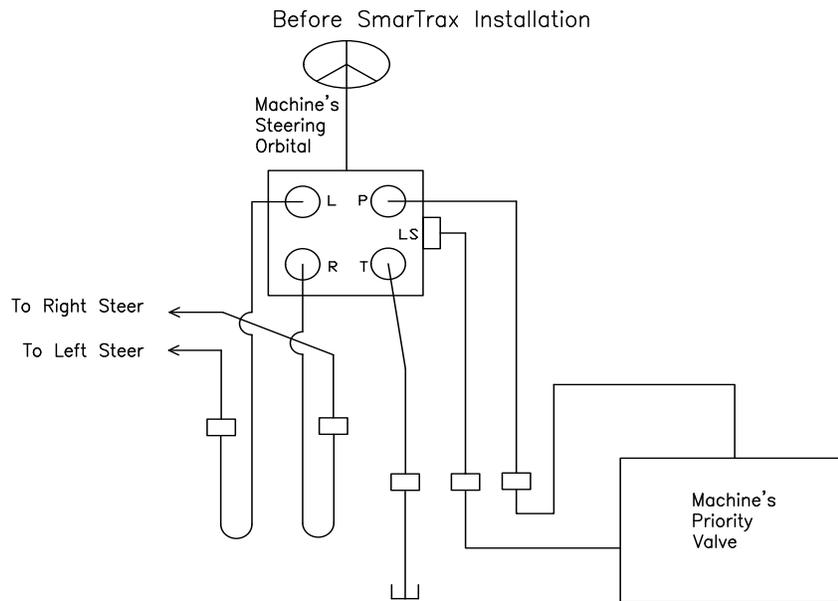


1. Disconnect the machine's load sense hose from the steel line and the machine's priority valve.

Note: *Keep the hose for future use. It will be needed in the future if SmarTrax is ever removed from the machine.*

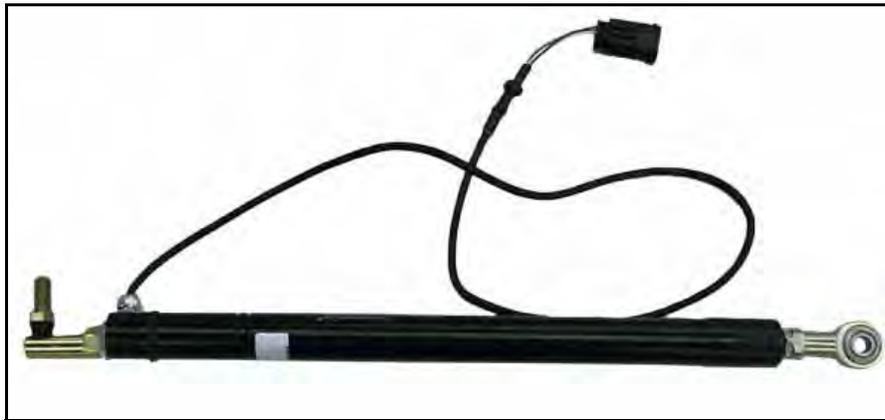
2. Install the straight end of the supplied hydraulic hose (P/N 214-1000-629) on the steel load sense line.
3. Connect the 90° end of the installed hydraulic hose to the fitting installed in Port LS STEER of the SmarTrax valve.
4. Install the straight end of the supplied hydraulic hose (P/N 214-1000-628) on the open load sense port of the machine's priority valve.
5. Connect the 90° end of the installed hydraulic hose to the fitting installed in Port LSPV of the SmarTrax valve.

Hydraulic Diagram



Assemble the Wheel Angle Sensor (WAS)

FIGURE 1. WAS Assembly



1. Install the M10 stud linear sensor mount (P/N 103-0001-030) and M10 jam nut (P/N 312-1001-035) on the base-end (where the cable is connected) of the 250 mm non-contact linear wheel angle sensor (P/N 063-0181-017).

Note: Orient the stud to point the same direction as the cable exiting the WAS before tightening the nut.

2. Install the M10 ball linear sensor mount (P/N 103-0001-029) on the rod-end of the WAS using the remaining jam nut.

Mount the WAS

Models 250, 280, and 305

FIGURE 2. WAS Axle Mounting Bracket Installed



1. Install an axle mounting bracket (P/N 107-0172-150) on the installed stud mount using a M10 x 1.5 nylon insert lock nut (P/N 312-4000-208).

FIGURE 3. Axle Differential Housing Bolt



2. Remove the top center bolt on the front axle differential housing.
3. Insert the machine's bolt into the hole in the axle mounting bracket.
4. Install a 5/8" lock washer (P/N 313-1000-045) on the end of the machine's bolt.

Note: The lock washer will space the mounting bracket away from the differential housing.

FIGURE 4. Axle Mounting Bracket Installed



5. Install the axle mounting bracket on the front axle differential housing by reinstalling the machine's axle bolt.

FIGURE 5. M10 Bolt Inserted into Rod Mounting Bracket



6. Insert the M10 x 1.5 x 60 mm metric hex bolt (P/N 311-0070-025) into the rod mounting bracket (P/N 107-0172-030).

FIGURE 6. Muffler Clamp Installed



7. Remove the nuts and clamp from the 1-7/8" muffler clamp (P/N 435-3003-055) and install the U-bolt around the right tie rod with the U-bolt pointing in.
8. Install the clamp as shown in Figure 6 above using the 5/16" nuts that came with the clamp.

FIGURE 7. Rod Mounting Bracket Installed



9. Install the rod mounting bracket and M10 bolt on the muffler clamp using two 5/16"-18 nylon insert lock nuts (P/N 312-4000-059).

Note: *The M10 bolt should be pointing in.*

FIGURE 8. Rod-End of Sensor Installed on Machine



10. Install the 0.406" ID x 0.75" OD x 0.75" long steel spacer (P/N 107-0172-037) on the end of the M10 bolt.
11. Install the rod-end of the WAS on the end of the installed M10 bolt using a M10 nylon insert lock nut (P/N 312-4000-208).

Important: *Verify that the WAS cannot be overextended or compressed when the wheels are turned to their extremes. Also verify that the sensor moves freely and is not being damaged within its range of motion. The muffler clamp nuts may have to be loosened and the clamp's position on the tie rod adjusted.*

FIGURE 9. Cable Secured



Secured with
Cable Ties on
Sensor Body

12. Route the WAS cable along the body of the sensor (toward the rod-end) and to the radiator and secure it with plastic cable ties.

Important: Allow enough slack in the cable to allow the front axle to move laterally. Secure the cable away from moving parts and heat sources using plastic cable ties.

Models 260, 290, and 310

FIGURE 10. Bolt to be Removed



1. Remove the top bolt on the left side of the front axle differential housing.

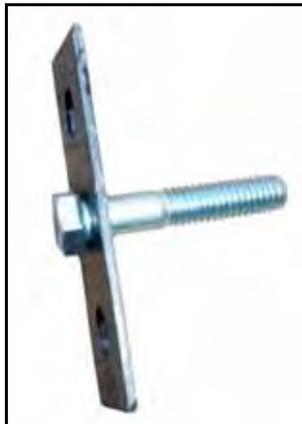
FIGURE 11. Axle Mounting Bracket Installed



2. Insert the machine's axle housing bolt into the hole in the tapered end of the axle mounting bracket (P/N 107-0172-150).
3. Install a 5/8" split lock washer (P/N 313-1000-045) on the end of the axle housing bolt.
4. Install the axle mounting bracket and axle housing bolt in the hole of the front axle differential housing.

Note: *The lock washer will space the axle mounting bracket away from the axle differential housing.*

FIGURE 12. M10 Bolt Inserted into Rod Mounting Bracket



5. Insert the M10 x 1.5 x 60 mm metric hex bolt (P/N 311-0070-025) into the rod mounting bracket (P/N 107-0172-030).

FIGURE 13. Rod Mounting Bracket Installed



6. Remove the nuts and clamp from the 1-7/8" muffler clamp (P/N 435-3003-055) and install the U-bolt around the right side of the tie rod with the U-bolt pointing toward the hydraulic cylinder.
7. Install the clamp as shown in Figure 6 above using the 5/16" nuts that came with the clamp.
8. Install the rod mounting bracket and M10 bolt on the muffler clamp using two 5/16"-18 nylon insert lock nuts (P/N 312-4000-059).

Note: The M10 bolt should be pointing toward the hydraulic cylinder.

FIGURE 14. Rod-End of Sensor Installed on Machine



9. Install the rod-end of the WAS on the end of the installed M10 bolt.
10. Install the 0.406" ID x 0.75" OD x 0.75" long steel spacer (P/N 107-0172-037) on the end of the M10 bolt.
11. Install a M10 nylon insert lock nut (P/N 312-4000-208) on the end of the bolt.

FIGURE 15. WAS Installed on Axle Mounting Bracket



12. Insert the installed stud mount through the hole in the installed axle mounting bracket.
13. Secure the WAS to the axle mounting bracket using a M10 x 1.5 nylon insert lock nut (P/N 312-4000-208).

FIGURE 16. WAS Installed



Secured with
Cable Ties on
Sensor Body

14. Route the WAS cable along the hydraulic hoses leading to the steering cylinders and secure it with plastic cable ties.

Important: Allow enough slack in the cable to allow the front axle to move laterally. Secure the cable away from moving parts and heat sources using plastic cable ties.

Important: Verify that the WAS cannot be overextended or compressed when the wheels are turned to their extremes. Also verify that the sensor moves freely and is not being damaged within its range of motion. The muffler clamp nuts may have to be loosened and the clamp's position on the tie rod adjusted.

Install the SmarTrax Node

Prepare the Cab for Installation - Models 250, 280, and 305

FIGURE 1. Node Mounting Location



1. Identify the SmarTrax node (P/N 063-0173-228) mounting location behind the seat.
2. Place the node on the floor mat.
3. Using the holes in the node as a guide, drill three holes through the floor mat.

Important: *Drill through until the bit touches the steel plate. DO NOT drill through the steel plate when drilling, as critical electrical components located under the steel plate may be damaged.*

4. Remove the steel plate from the floor of the cab.
5. Drill 3/8" holes in the location where the bit touched the plate.

FIGURE 2. Node Installed on Steel Plate



6. Place 3/8" flat washers (P/N 313-2300-043) over the three 3/8" UNC x 2" hex bolts (P/N 311-0054-202) and insert the bolts through the bottom of the steel plate.
7. Install the three 0.406" ID x 0.375" OD, x 0.375" long spacers (P/N 107-0172-103) on the bolts.
8. Install 3/8"-16 zinc hex nuts (P/N 311-0054-202) on top of the spacers.
9. Place the node on the installed bolts and tighten the nuts to ensure the bolts are properly aligned with the holes in the node.

Note: Once the bolts are properly aligned, remove the node.

10. Enlarge the holes previously drilled in the floor mat using at least a 3/4"-sized drill bit.

FIGURE 3. SmarTrax Node Installed



11. Reinstall the plate in the floor of the cab.
12. Replace the floor mat by aligning it with bolts installed in the mounting plate assembly.
13. Install the two large, rectangular connectors of the node harness (P/N 115-4001-109) into the correct ports of the node.
14. Tighten the bolts on the harness connectors to secure the connections.
15. Install the node on the bolts protruding through the floor mat and secure it with three 3/8"-16 nylon insert lock nuts (P/N 312-4001-109).

Prepare the Cab for Installation - Models 260, 290, and 310

FIGURE 4. Node Mounting Location



1. Identify the SmarTrax node (P/N 063-0173-228) mounting location on the wall to the right of the operator's seat.
2. Install the two large, rectangular connectors of the node harness (P/N 115-4001-109) into the correct ports of the node.
3. Tighten the bolts on the harness connector to secure the connections.

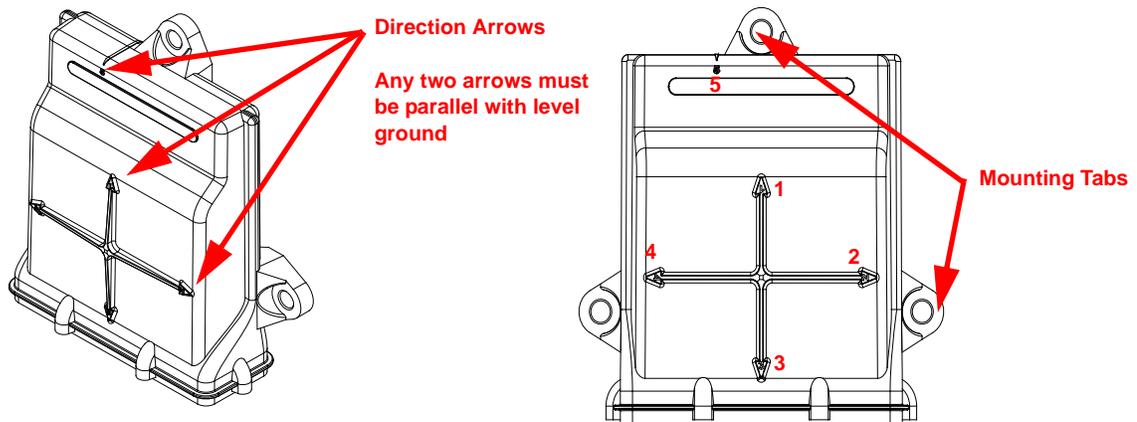
FIGURE 5. Node Installed



4. Route the remainder of the node harness through the back of the console cover and toward the rear of the cab.
5. Position the node so that directional arrow #1 is pointing toward the front of the machine.
6. Align the holes in the node with the holes in the wall and secure it using two M8 x 20 mm hex bolts (P/N 311-0070-002) and two 8 mm flat washers (P/N 313-2300-121).

Node Mounting Locations

FIGURE 6. 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 (If Applicable)

FIGURE 7. 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.

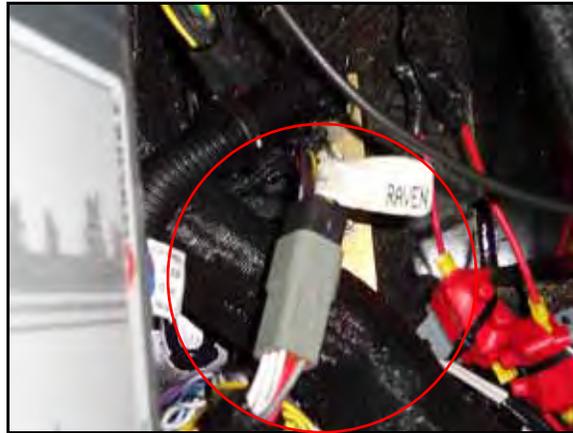
Connect the Factory-Installed Enable Switch (If Applicable)

FIGURE 8. Factory-Installed Enable Switch



1. Locate the TO ENABLE connector on the node harness (P/N 115-4001-109) and connect it to the 4-pin connector on the finger toggle enable adapter cable (P/N 115-4001-215).

FIGURE 9. 6-pin Connector Connected to Factory-Installed Cable



2. Connect the TO FACTORY CONNECTOR "RAVEN" connector on the finger toggle enable adapter cable to the 6-pin RAVEN connector on the factory-installed cable connector.

Install the Master Switch

FIGURE 10. Master Switch Installation Location



1. Locate an unused port of the armrest console and remove the plug.

FIGURE 11. Master Switch Installed



2. Route the 4-pin connector of the SmarTrax tee safety harness (P/N 115-4001-209) through the bottom of the armrest console and into the open port.
3. Connect the 4-pin connector to the connector on the master switch (P/N 063-0173-545).
4. Thread the harness and master switch wires into the armrest console.
5. Press on the master switch casing to ensure the switch is securely installed.

Install the Valve Harness

FIGURE 12. 12-Pin Node Harness Connector



1. Connect the female 12-pin connector of the tee safety harness (P/N 115-4001-209) into the mating 12-pin connector of the node harness (P/N 115-4001-109).
2. Connect the male 12-pin connector of the tee safety harness to the CHASSIS connector of the valve harness (P/N 115-4001-143).

FIGURE 13. Valve Harness Routed Out of Cab



3. Route the valve harness through the access plate in the back of the cab and toward the SmarTrax valve (P/N 334-0003-088).

Note: *It may be necessary to create a notch in the access plate to accommodate the valve harness and power cable.*

FIGURE 14. Valve Harness Connected to SmarTrax Valve



4. Connect the VALVE connector to the open 4-pin port of the SmarTrax valve.
5. Connect the TRANSDUCER connector to the pressure transducer (P/N 422-0000-086) installed in Port PS of the SmarTrax valve.

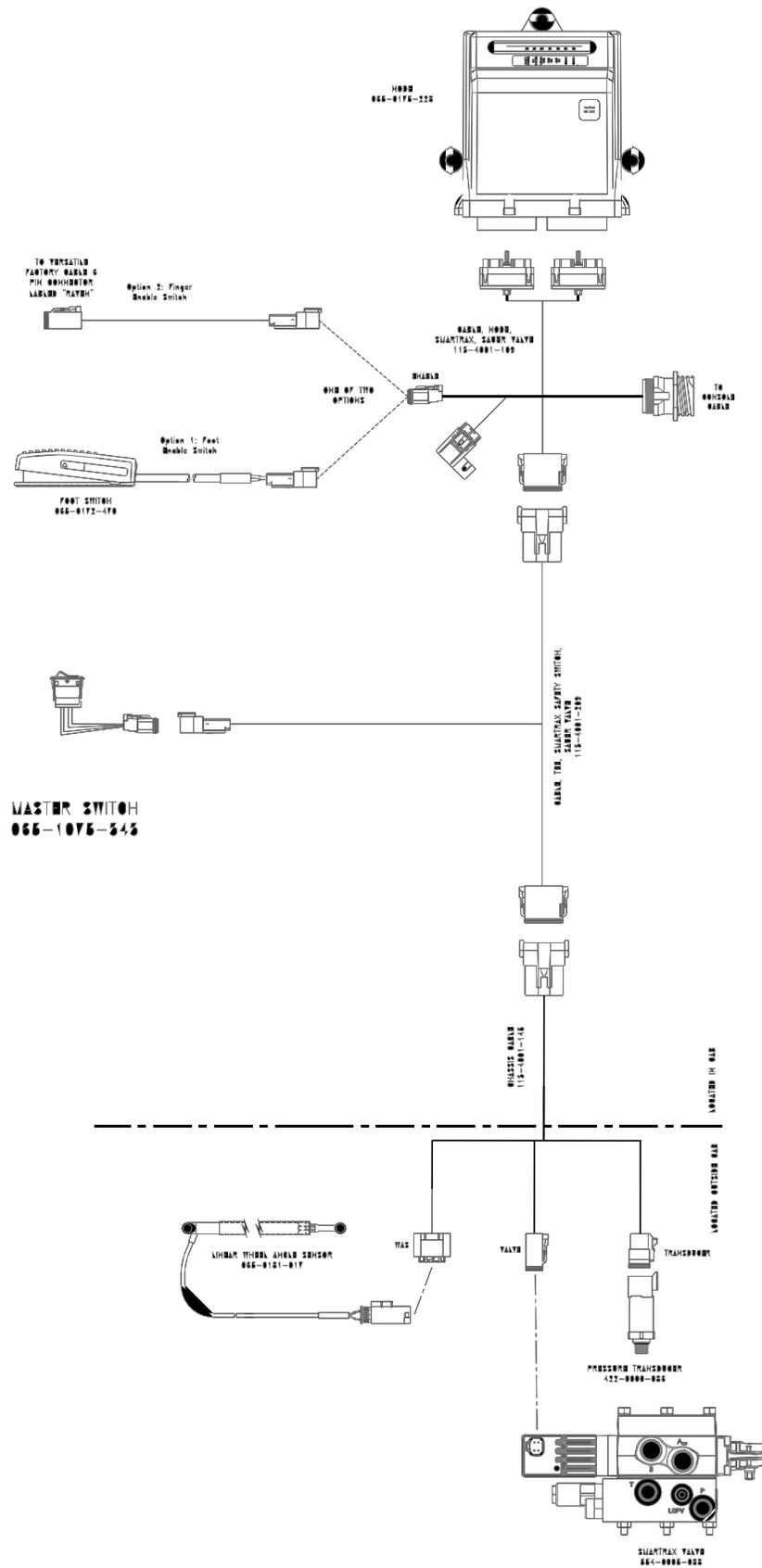
FIGURE 15. WAS Connection



6. Route the WAS connection along the frame and connect it to the cable of the installed WAS (P/N 063-0181-017).

Note: Secure excess cable with 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 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 round 16-pin connector on the node harness.
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)

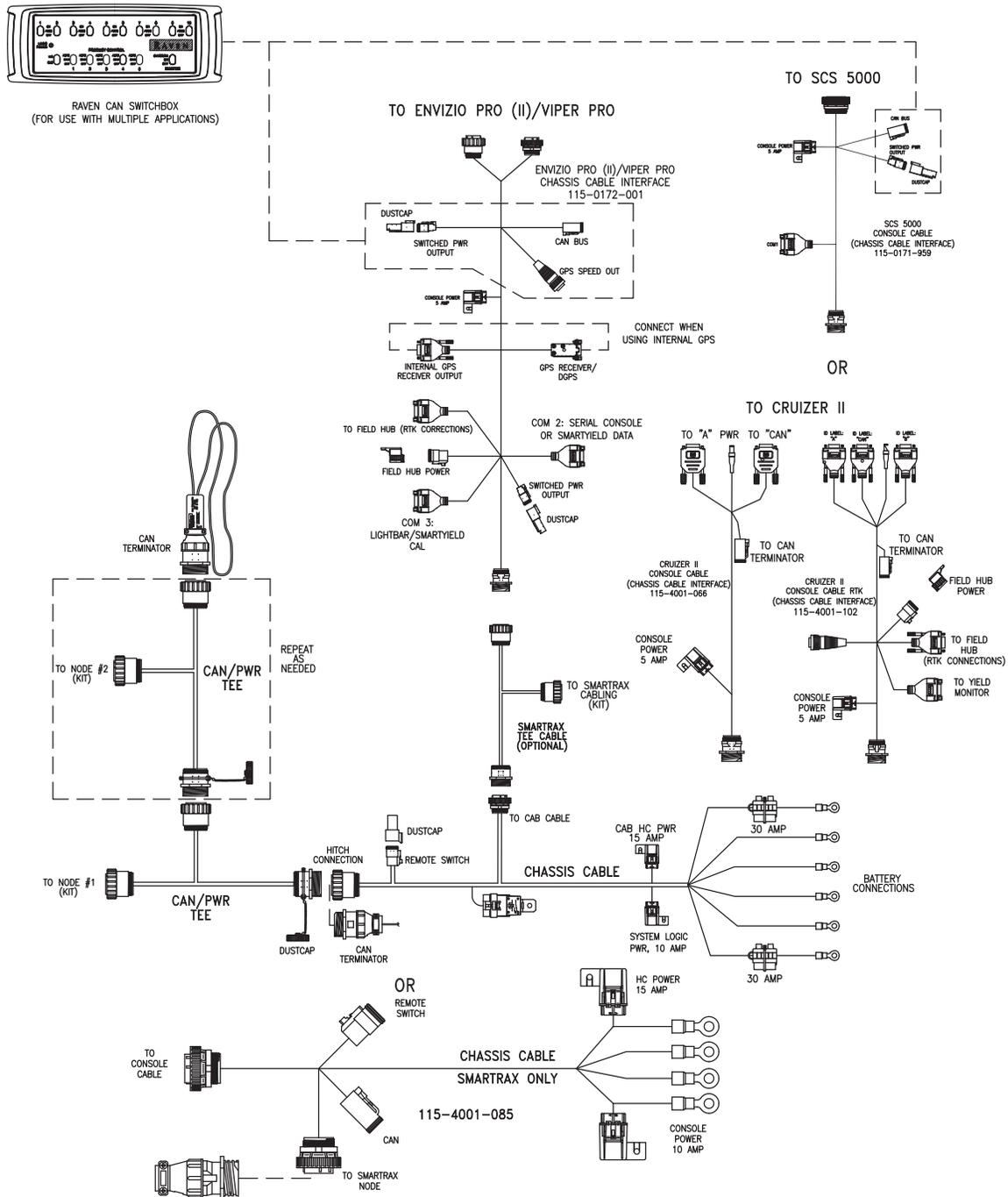
Note: *The SmarTrax interface tee is sold separately. Contact your local Raven dealer for ordering information.*

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





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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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.



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.