

Case IH Patriot 4440  
Model Year 2017-2018  
Raven RS1™ HDU  
Guidance and Steering  
Installation Manual

*016-5032-109 Rev. D*

*4/2020*

*E35334*



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## Table of Contents

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|  |  |           |
|--|--|-----------|
| <b>Chapter 1</b>   | <b>Important Information.....</b>            | <b>1</b>  |
| Safety .....   |  | 1         |
| Displays and Control Consoles .....                              |  | 1         |
| Hydraulic Safety .....   |  | 2         |
| Electrical safety .....  |  | 2         |
| Touch Screen .....   |  | 2         |
| Recommendations and Best Practices .....                         |  | 3         |
| Hose Routing .....   |  | 3         |
| Harness Routing .....  |  | 3         |
| <br>   |  |           |
| <b>Chapter 2</b>   | <b>Introduction.....</b>                     | <b>5</b>  |
| Preparing for Installation .....                                 |  | 5         |
| Recommendations .....  |  | 5         |
| Point of Reference .....   |  | 5         |
| Updates .....  |  | 5         |
| Kit Contents .....   |  | 7         |
| <br>   |  |           |
| <b>Chapter 3</b>   | <b>Hydraulic System Installation.....</b>    | <b>9</b>  |
| Install Fittings on the Steering Valve .....                     |  | 10        |
| Install Fittings on the Dual Transducer Hydraulic Manifold ..... |  | 11        |
| Mount the Steering Valve .....                                   |  | 11        |
| Install the Steering Valve Mounting Bracket .....                |  | 11        |
| Mount the Steering Valve .....                                   |  | 12        |
| Install the Pressure Hose .....                                  |  | 12        |
| Install the Tank Hose .....                                      |  | 13        |
| Install the Left and Right Steering Hoses .....                  |  | 14        |
| Hydraulic System Diagram .....                                   |  | 15        |
| <br>   |  |           |
| <b>Chapter 4</b>   | <b>Wheel Angle Sensor Installation .....</b> | <b>17</b> |
| Assemble the Wheel Angle Sensor (WAS) .....                      |  | 17        |
| Install the WAS .....  |  | 17        |
| <br>   |  |           |
| <b>Chapter 5</b>   | <b>Cab Component Installation.....</b>       | <b>23</b> |
| Install the RS1 Unit .....                                       |  | 23        |
| Install the Hydraulic Drive Unit (HDU) .....                     |  | 24        |
| Install the RS1 Cables .....                                     |  | 25        |
| Install the RS1 HDU Harness Cable .....                          |  | 25        |
| Install the RS1 Tee Cable .....                                  |  | 27        |
| Install the HDU Switch Harness Cable .....                       |  | 28        |
| Install the RS1 to Bulkhead Harness Cable .....                  |  | 30        |
| Install the Valve Harness Cable .....                            |  | 31        |
| Routine Operation .....  |  | 33        |
| System Diagram .....   |  | 34        |



## SAFETY

### **NOTICE**

Follow the operation and safety instructions included with the implement and/or controller and read this manual carefully before installing or operating this Raven system.

- Follow all safety information presented within this manual. Review implement operation with your local dealer.
- Contact a local Raven dealer for assistance with any portion of the installation, service, or operation of Raven equipment.
- Follow all safety labels affixed to system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. Contact a local Raven dealer to obtain replacements for safety labels.

Observe the following safety measures when operating the implement after installing this Raven system:

- Do not operate this Raven system or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Be alert and aware of surroundings and remain in the operator seat at all times when operating this Raven system.
  - Do not operate the implement on any public road with this Raven system enabled.
  - Disable this Raven system before exiting the operator seat.
  - Determine and remain a safe working distance from obstacles and bystanders. The operator is responsible for disabling the system when a safe working distance has diminished.
  - Disable this Raven system prior to starting any maintenance work on the implement or components of this Raven system.
- Do not attempt to modify or lengthen any of the system control cables. Extension cables are available from a local Raven dealer.

## DISPLAYS AND CONTROL CONSOLES

- If the display will not be used for an extended period, it is best to remove the display from the machine and store it in a climate controlled environment. This may help to extend the service life of electronic components.
- To prevent theft, secure the display and GPS antenna when leaving the machine unattended.

## **WARNING**

### HYDRAULIC SAFETY

When installing or servicing a hydraulic system or hydraulic components, be aware that hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.

- Always wear appropriate personal protective equipment when installing or servicing hydraulic systems.
- Never attempt to open or work on a hydraulic system with the implement running.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- Care should always be taken when servicing or opening a system that has been pressurized.
- The implement or machine must remain stationary and switched off with booms or implement sections unfolded and supported during installation or maintenance.
- Take precautions to prevent foreign material or contaminants from being introduced into the implement hydraulic system. Contaminants that are able to bypass the hydraulic filtration system will reduce performance and may damage hydraulic components.
- Stand clear of the implement when starting the system for the first time after installing or servicing hydraulic components in case a hose has not been properly connected or tightened.

## **CAUTION**

### ELECTRICAL SAFETY

- Always verify that power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the Raven system or other components.
- To prevent personal injury or fire, replace defective or blown fuses with only fuses of the same type and amperage.
- Do not connect the power leads to the battery until all system components are mounted and all electrical connections are completed.
- Always start the machine before initializing this Raven system to prevent power surges or peak voltage.
- To avoid tripping and entanglement hazards, route cables and harnesses away from walkways, steps, grab bars, and other areas used by the operator or service personnel when operating or servicing the equipment.

### TOUCH SCREEN

- Only touch the touch-screen with your finger or by using a special touch-screen stylus/pen. Operating the touch-screen with sharp objects may cause permanent damage to the screen.
- Only clean the screen using a damp cloth. Never use caustic or other aggressive substances.

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## RECOMMENDATIONS AND BEST PRACTICES

### HOSE ROUTING

The word “hose” is used to describe any flexible, fluid carrying components. Use the following guidelines and recommendations when connecting and routing hoses while installing or maintaining this Raven system:

- Leave protective caps/covers over hose ends until connecting the end into the hydraulic system to help prevent contaminants from entering the system.
- Follow existing hose runs already routed on the implement as much as possible. Proper hose routing should:
  - Secure hoses and prevent hoses from hanging below the implement.
  - Provide sufficient clearance from moving components and operational zones around shafts; universal joints and suspension components; pulleys, gears, belts, and chains; moving linkages, cylinders, articulation joints, etc.
  - Protect hoses from field debris and surrounding hazards (e.g. tree limbs, fence posts, crop stubble, dirt clumps or rocks that may fall or be thrown by the implement).
  - Protect hoses from sharp bends, twisting, or flexing over short distances and normal implement operation.
  - Ensure sufficient length for free movement of the implement during normal operation and prevent pulling, pinching, catching, or rubbing, especially in articulation and pivot points. Clamp hoses securely to force controlled movement of the hose.
  - Avoid abrasive surfaces and sharp edges such as sheared or flame cut corners, fastener threads or cap screw heads, hose clamp ends, etc.
  - Avoid areas where the operator or service personnel might step or use as a grab bar.
- Do not connect, affix, or allow hoses to come into contact with components with high vibration forces, hot surfaces, or components carrying hot fluids beyond the temperature rating of hose components.
  - Hoses should be protected or shielded if routing requires the hose to be exposed to conditions beyond hose component specifications.
- Avoid routing hoses in areas where damage may occur due to build up of material (e.g. dirt, mud, snow, ice, etc.).

### HARNESS ROUTING

The word “harness” is used to describe any electrical cables and leads, both bundled and unbundled. Use the following guidelines and recommendations when connecting and routing harnesses while installing or maintaining this Raven system:

- Leave protective caps/covers over harness connectors until needed to avoid dirt and moisture from contaminating electrical circuits.
- Secure the harness to the frame or solid structural members at least every 12 in [30 cm].
- Follow existing harness runs already routed on the implement as much as possible. Proper harness routing should:
  - Secure harnessing and prevent the harness from hanging below the implement.
  - Provide sufficient clearance from moving components and operational zones around shafts; universal joints and suspension components; pulleys, gears, belts, and chains; moving linkages, cylinders, articulation joints, etc.
  - Protect harnessing from field debris and surrounding hazards (e.g. tree limbs, fence posts, crop stubble, dirt clumps or rocks that may fall or be thrown by the implement).

- Protect harnessing from sharp bends, twisting, or flexing over short distances and normal implement operation.
- Connectors and splices should not be located at bending points or in harness sections that move.
- Ensure sufficient length for free movement of the implement during normal operation and prevent pulling, pinching, catching, or rubbing, especially in articulation and pivot points. Clamp harnessing securely to force controlled movement of the harness.
- Avoid abrasive surfaces and sharp edges such as sheared or flame cut corners, fastener threads or cap screw heads, hose clamp ends, etc.
- Do not connect, affix, or allow harnessing to come into contact with components with high vibration forces, hot surfaces, or components carrying hot fluids beyond the temperature rating of harness components.
  - Harnessing should be protected or shielded if routing requires the hose to be exposed to conditions beyond harnessing component specifications.
- Avoid routing harnesses in areas where damage may occur due to build up of material (e.g. dirt, mud, snow, ice, etc.).
- Avoid routing harnesses in areas where the operator or service personnel might step or use as a grab bar.

**IMPORTANT:** Avoid applying direct spray or pressure washing of electrical components and connections. High pressure streams and sprays can penetrate seals, cause corrosion, or otherwise damage electrical components.  
When performing maintenance:

- Inspect electrical components and connectors for corrosion, damaged pins or housings, etc. Repair or replace components or harnessing as necessary.
- Ensure connectors are kept clean and dry. Apply dielectric grease to the sealing surfaces of all connections exposed to moisture, dirt, debris, and other contaminants. Repair or replace harnessing as necessary.
- Clean electrical components with pressurized air, aerosol electrical cleaning agent, or low pressure rinse.
- Remove visible surface water from electrical components and connections using pressurized air or an aerosol cleaning agent. Allow components to dry thoroughly before reconnecting cables.
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# CHAPTER

# INTRODUCTION

## 2

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Congratulations on your purchase of the RS1 HDU system!

The following instructions are designed to assist with the proper installation of the RS1 HDU system. Refer to the RS1 Calibration & Operation Manual (P/N 016-4010-001) for assistance with calibrating the software and using the RS1 HDU system.

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### PREPARING FOR INSTALLATION

Before installing the RS1 HDU 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.

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 RS1 HDU system for the first time, at the start of the season, or when moving the RS1 HDU system to another machine:

- Install the RS1 unit in the recommended location.
- 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

Updates for Raven manuals as well as software updates for Raven consoles, and product controllers are available at the Applied Technology Division web site:

<https://portal.ravenprecision.com>

Sign up for e-mail alerts to receive notifications when updates for your Raven products are available on the Raven web site.

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](mailto:techwriting@ravenind.com)

- Case IH Patriot 4440 Model Year 2017-2018 Raven RS1™ HDU Guidance and Steering Installation Manual
- 016-5032-109 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 RS1 HDU kit. Before beginning the system installation, compare the items in the kit with the components on this list. If you have questions about the kit, contact your Raven dealer.

FIGURE 1. RS1 HDU Installation Kit (P/N 117-5032-109 Rev. C)

| <b>QTY</b> | <b>PART #</b> | <b>DESCRIPTION</b>                        |
|------------|---------------|---|
| 1          | 053-0159-193  | BOX, SHIPPING (LABELED 1 OF 2)            |
| 1          | 016-0171-649  | SHEET, WARRANTY/HELP (016-5032-109)       |
| 1          | 063-0173-887  | ECU, HYDRAULIC DRIVE UNIT (HDU)           |
| 1          | 063-0173-961  | MASTER SWITCH                             |
| 1          | 107-0171-705  | BRACKET, VALVE MOUNT, PATRIOT             |
| 1          | 107-0172-498  | BRACKET, MOUNTING, RS1 CNH                |
| 1          | 115-4010-036  | CABLE, RS1, MY17 PATRIOT                  |
| 1          | 115-4010-056  | CABLE, HDU CIH PATRIOT MY17 NSR           |
| 1          | 115-4010-057  | CABLE, HDU B TO BULKHEAD                  |
| 1          | 115-4010-058  | CABLE, SAUER VALVE TO BULKHEAD            |
| 1          | 115-4010-059  | CABLE, HDU CAB SWITCHES MY2017 PATRIOT    |
| 1          | 116-0159-803  | BRACKET, RS1 LATCH, CIH                   |
| 1          | 117-0199-017  | KIT, HYDRAULIC STEERING, PATRIOT          |
| 1          | 334-0003-085  | MANIFOLD, HYDRAULIC OVERRIDE              |
| 1          | 334-0003-088  | VALVE, HYDRAULIC PVG, STEERING            |
| 1          | 053-0159-074  | ENVELOPE, PLASTIC                         |
| 4          | 311-0003-041  | SCREW, MACHINE, 1/4"-20 X 1/2" FLAT HEAD  |
| 2          | 311-0052-109  | BOLT, 5/16"-18 X 2", HEX HEAD             |
| 4          | 311-0052-104  | BOLT, 5/16"-18 X 7/8", HEX HEAD           |
| 2          | 311-4055-137K | BOLT, M6 X 25 X 1.0, HEX HEAD             |
| 2          | 312-1001-169  | NUT, FLANGED LOCK, 5/16"-18               |
| 4          | 313-1000-019  | WASHER, LOCK, 5/16"                       |
| 5          | 435-3001-049  | CLAMP, CABLE, 0.625" INSULATED            |
| 1          | 117-0192-049  | (LABELED 2 OF 2)<br>KIT, WAS, CIH PATRIOT |

FIGURE 2. Hydraulic Installation Kit (P/N 117-0199-081 Rev. D)

| PART #       | QTY | DESCRIPTION  |              |                            |       |
|--------------|-----|--|--------------|----------------------------|-------|
| 333-0012-028 | 1   | FTG., ADAPTER, SWIVEL RUN TEE, -8 ORFS M/M/F               |              |                            |       |
| 333-0012-051 | 1   | FTG., PLUG, -4 O-RING, INTERNAL HEX                        |              |                            |       |
| 333-0012-069 | 3   | FTG., ADAPTER, SWIVEL RUN TEE, -6 ORFS M/M/F               |              |                            |       |
| 333-0012-084 | 6   | FTG., ADAPTER, -6 ORFS (M) TO -6 SAE O-RING (M)            |              |                            |       |
| 333-0012-104 | 2   | FTG., PLUG, -6 SAE O-RING, INTERNAL HEX                    |              |                            |       |
| 333-0012-199 | 2   | FTG., ADAPTER, STRAIGHT, -6 ORFS (M) TO -8 SAE O-RING (M)  |              |                            |       |
| 333-0012-233 | 2   | FTG., ADAPTER, STRAIGHT, -6 ORFS (M) TO -10 SAE O-RING (M) |              |                            |       |
|              |     | END 1  | HOSE<br>SIZE | OVERALL LENGTH<br>(INCHES) | END 2 |
| 214-1000-318 | 1   | 6FF90S   | 6            | 84                         | 6FF   |
| 214-1000-630 | 1   | 8FF  | 6            | 84                         | 6FF   |
| 214-1000-671 | 2   | 6FF90S   | 6            | 128                        | 6FF   |
| 214-1000-672 | 1   | 6FF  | 6            | 128                        | 6FF   |

FIGURE 3. Wheel Angle Sensor Kit (P/N 117-0192-049 Rev. E)

| QTY | PART #        | DESCRIPTION  |
|-----|---------------|--|
| 1   | 053-0159-118  | BOX, SHIPPING  |
| 1   | 107-0172-649  | BRACKET, WAS, CIH PATRIOT, BASE END, STRAIGHT        |
| 1   | 416-0001-052  | SENSOR, LINEAR NON-CONTACT, 300MM                    |
| 1   | 116-0159-840  | WELDMENT, WAS, CIH PATRIOT, BASE END, L SHAPE        |
| 1   | 053-0159-074  | ENVELOPE, PLASTIC                                    |
| 2   | 103-0001-029  | MOUNT, UNIVERSAL, M10 BALL                           |
| 1   | 107-0172-030  | BRACKET, WAS ROD MOUNTING                            |
| 2   | 107-0172-037  | SPACER, STEEL .406" ID X .750" OD X .75" LONG        |
| 2   | 312-1002-035  | NUT, JAM, M10 X 1.5 PITCH X 5MM THICK                |
| 2   | 312-4000-059  | NUT, 5/16"-18, LOCK NYLON INSERT                     |
| 1   | 311-4050-226K | BOLT, HEX, METRIC, M10-1.5 X 40mm, CLASS 8.8         |
| 2   | 312-6001-042K | NUT, M10 X 1.5 LOCK NYL INSERT                       |
| 1   | 311-0070-060  | BOLT, FLANGED HEX, METRIC, M10-1.5 X 35mm, CLASS 8.8 |
| 4   | 313-2301-005  | WASHER, FLAT, 5/16" SS                               |
| 1   | 435-3003-056  | CLAMP, U-BOLT, 1.25" X 5/16"-18                      |
| 2   | 311-4070-140L | SCREW, SHCS, M6-1x40, 8.8, CLASS III                 |
| 2   | 312-6000-017L | HEX NUT, M6-1, CLASS 8 STEEL, CLASS III COATING      |
| 2   | 313-1000-046  | WASHER, HELICAL LOCK, 6MM                            |
| 2   | 313-2300-129  | WASHER, FLAT, 6MM, STEEL                             |
| 2   | 107-0172-103  | SPACER, STEEL .406" ID X .750" OD X .375" LONG       |

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# CHAPTER

# 3

# HYDRAULIC SYSTEM INSTALLATION

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## **WARNING**

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

Before beginning the RS1 hydraulic installation, turn off the machine and relieve pressure by turning the steering wheel left and right.

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 RS1 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 RS1 hydraulic valve.



## **NOTICE**

The appearance of the steering valve may vary slightly from the images contained in this manual. However, the fittings, hose connections, and cable connections remain the same.

## INSTALL FITTINGS ON THE STEERING VALVE

Before mounting the steering valve (P/N 334-0003-088) on the machine, install the proper fittings in the valve. This prepares the valve for installation and simplifies the hose connection process later in the procedure.

FIGURE 1. Fittings Installed on the Steering Valve



| Fitting  | Part Number  | Port              |
|--|--------------|-------------------|
| Fitting - -6 SAE O-Ring Plug                                 | 333-0012-104 | LSPV,<br>LS STEER |
| Fitting - -4 SAE O-Ring Plug                                 | 333-0012-051 | PS                |
| 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              |

## INSTALL FITTINGS ON THE DUAL TRANSDUCER HYDRAULIC MANIFOLD

FIGURE 2. Fittings Installed on the Flow Switch



1. Install a -6 ORFS (M) to -6 SAE O-ring (M) straight adapter fitting (P/N 333-0012-084) in Ports A2 and B3 of the dual transducer hydraulic manifold (P/N 334-003-085).
2. Install the pressure transducers in Ports A1 and B1 of the dual transducer hydraulic manifold.

## MOUNT THE STEERING VALVE

### INSTALL THE STEERING VALVE MOUNTING BRACKET

FIGURE 3. Valve Mounting Location



1. Remove the bolts used to secure the machine's radar bracket (beneath the cab).

FIGURE 4. Mounting Bracket Installed

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2. Mount the hydraulic valve mounting bracket (P/N 107-0171-705) to the machine's radar bracket using the bolts removed in step 1.

## MOUNT THE STEERING VALVE

FIGURE 5. Steering Valve Installed on Mounting Bracket

---



1. Mount the steering valve (P/N 334-0003-088) to the valve mounting bracket (P/N 107-0171-705) using four 5/16" hex bolts (P/N 311-0052-104) and four 5/16" lock washers (P/N 313-1000-019).
2. Mount the flow switch (P/N 334-0003-085) to the valve mounting bracket using two 1/4"-20 x 2" screws (P/N 311-0050-109), two 1/4" flat washers (P/N 313-2300-009), two 1/4" split lock washers (P/N 313-1000-016) and two 1/4"-20 hex nuts (P/N 312-1001-074).

---

## INSTALL THE PRESSURE HOSE

1. Locate the machine's steel pressure line.

**NOTE:** The pressure line runs on the inside of the frame from the rear of the machine. The line bends 45° just before the hydraulic hose connection. Trace it to the P port on the steering orbital if necessary.

2. Disconnect the machine's pressure hose from the steel pressure line.



FIGURE 6. Pressure Hose Installed



3. Install a -6 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-069) on the steel pressure line.
4. Connect the machine's pressure hose to the opposite end of the installed tee fitting.
5. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-657) on the 90° end of the installed tee fitting.
6. Connect the straight end of the installed hydraulic hose to Port P of the steering valve.

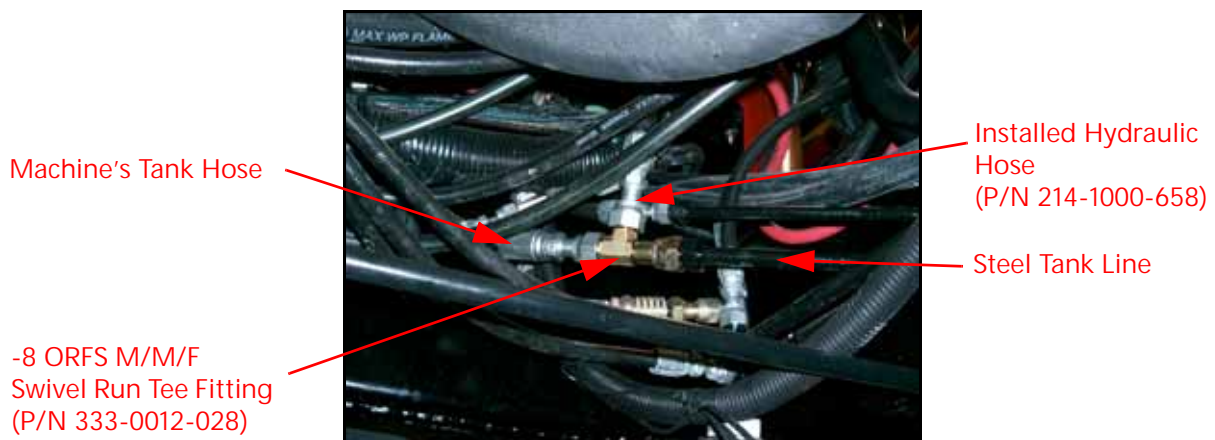
## INSTALL THE TANK HOSE

1. Locate the machine's steel tank line.

**NOTE:** The pressure line runs on the inside of the frame from the rear of the machine. Trace it to the T port on the steering orbital if necessary.

2. Disconnect the machine's tank hose from the steel tank line.

FIGURE 7. Tank Hose Installed



3. Install a -8 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-028) on the machine's steel tank line.
4. Connect the machine's tank hose to the opposite end of the installed tee fitting.
5. Install the -8 end of the supplied hydraulic hose (P/N 214-1000-658) on the 90° end of the installed tee fitting.
6. Connect the other end of the installed hydraulic hose to Port T of the steering valve.

## INSTALL THE LEFT AND RIGHT STEERING HOSES

1. Locate and disconnect the machine's left steering hose from the right steering cylinder.

**NOTE:** The left steering hose is connected to the fitting located closest to the center of the machine.

2. Route and connect the left steering hose to the Port A2 of the installed flow switch (P/N 334-0003-085).

FIGURE 8. Installed Left Steering Hose on Right Steering Cylinder

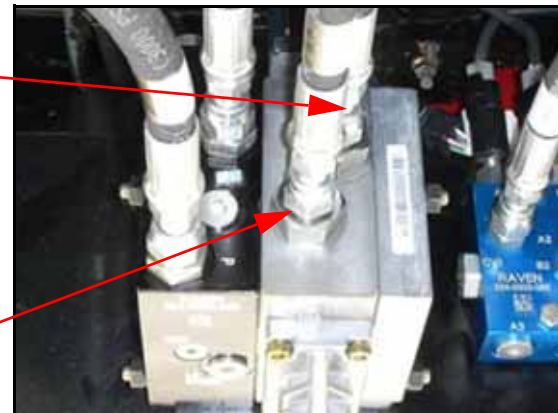


3. Install a -6 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-069) on the open steering cylinder port.
4. Install the straight end of the supplied hydraulic hose (P/N 214-1000-318) on the opposite end of the installed tee fitting.
5. Connect the 90° end of the installed hydraulic hose to the fitting installed in Port B3 of the installed flow switch.
6. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-318) on the 90° end of the installed tee fitting.
7. Connect the straight end of the installed hydraulic hose to Port A of the steering valve.

FIGURE 9. Installed Right Steering Hose on Left Steering Cylinder



Right  
Steering  
Hose

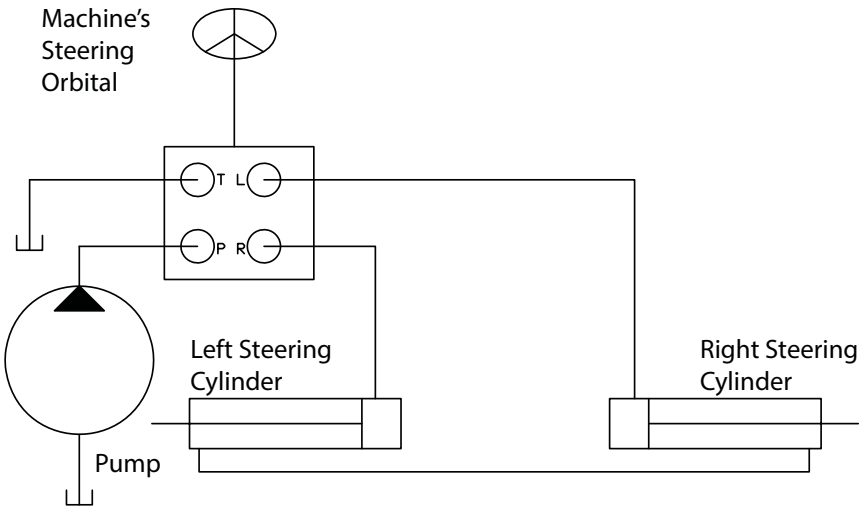


Left  
Steering  
Hose

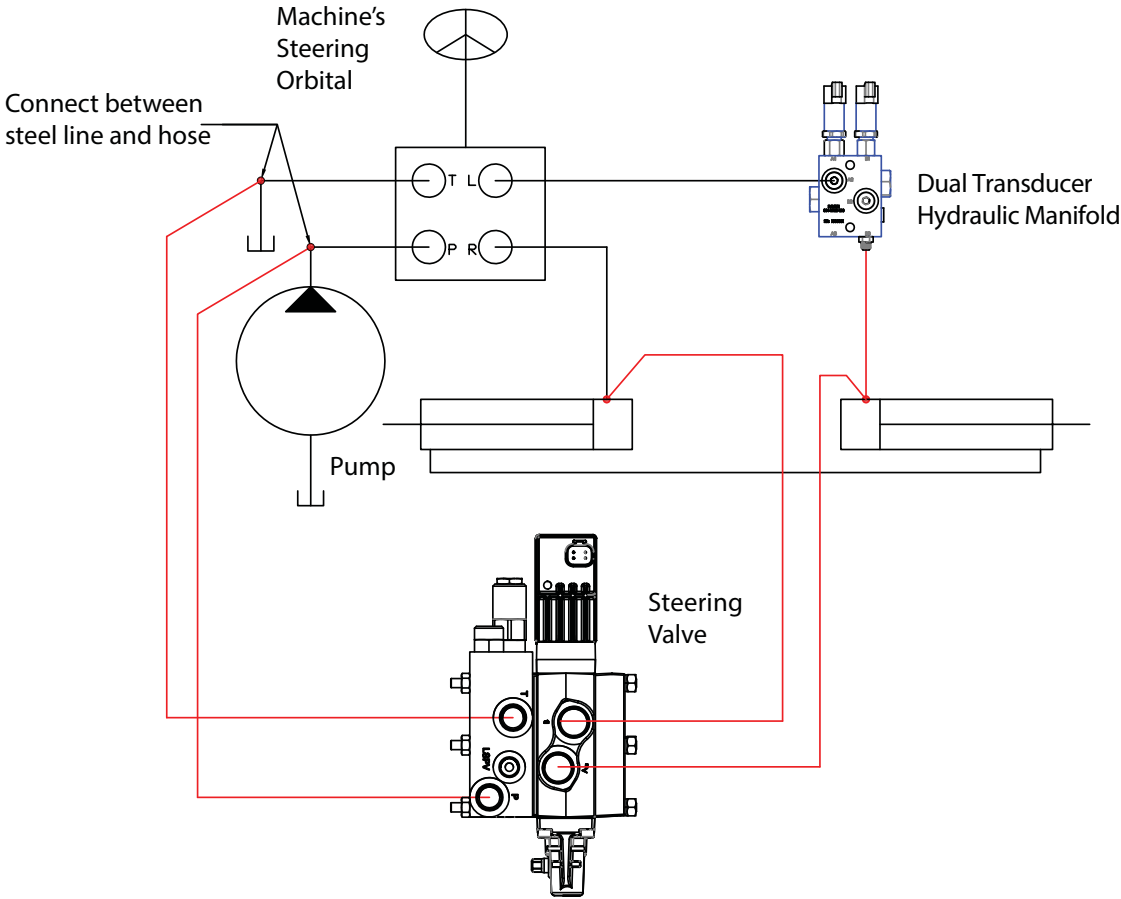
8. Locate and disconnect the machine's right steering hose from the left steering cylinder.
9. Install a -6 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-069) in the open steering cylinder port.
10. Connect the machine's right steering hose to the opposite end of the installed tee fitting.
11. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-659) on the 90° end of the installed tee fitting.
12. Connect the straight end of the installed hydraulic hose to Port B of the steering valve (P/N 334-0003-088).

HYDRAULIC SYSTEM DIAGRAM

Before RS1 Installation



After RS1 Installation





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# CHAPTER

# 4

# WHEEL ANGLE SENSOR INSTALLATION

---

## ASSEMBLE THE WHEEL ANGLE SENSOR (WAS)

FIGURE 1. WAS

Base-End  
of Sensor



Rod-End of  
Sensor

1. Install the M10 universal ball mounts (P/N 103-0001-029) and M10 jam nuts on both ends of the linear WAS (P/N 416-0001-052).
2. Leave the nuts and ball mounts loose until the sensor is installed later in the procedure.

## INSTALL THE WAS

1. Park the machine on a level surface with the wheels pointing to the left.
2. Install the WAS base end mounting brackets on the right steering cylinder clevis using the provided M8 flat-head machine screws, flat washers, lock washers, and nuts.

FIGURE 2. WAS Base End Mounting Brackets Installed

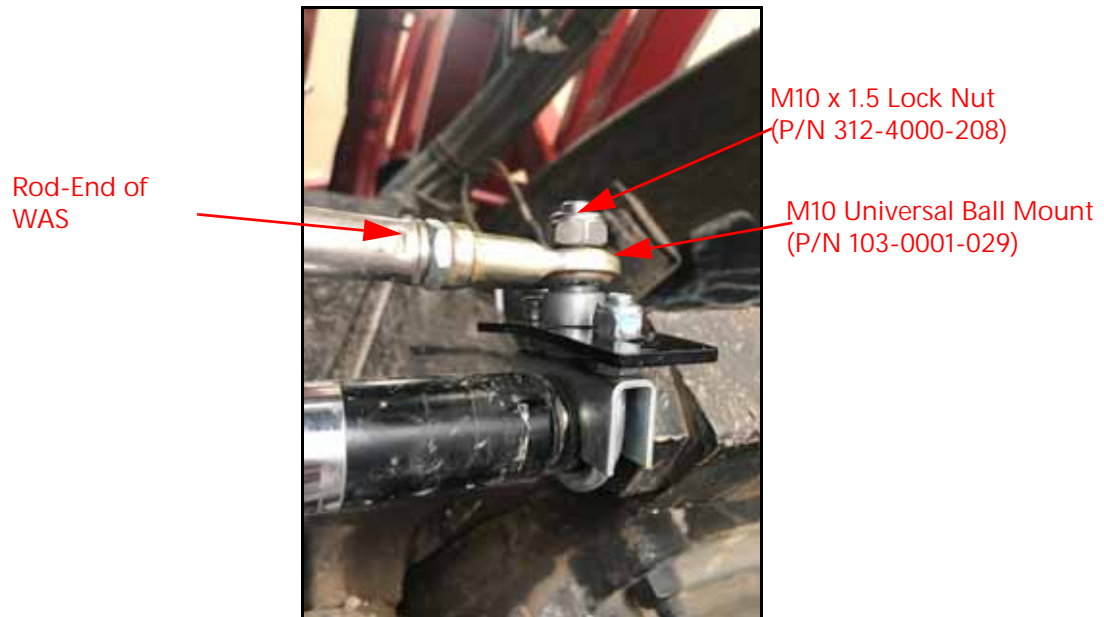


FIGURE 3. Small WAS Mounting Bracket Installed on Rod-End of Steering Cylinder



3. Remove the nuts and clamp from the 1-1/4" U-bolt clamp (P/N 435-3003-056).
4. Install the U-bolt clamp on the threaded rod-end of the right steering cylinder adjacent to the existing jam nut, positioning the U-bolt so that the threaded ends point upward.
5. Tighten the nuts to secure the U-bolt clamp in place.
6. Install 5/16" washers on the ends of the U-bolt clamp.
7. Insert one of the M10 x 1.5 x 40 metric hex bolts through the center hole of the small WAS mounting bracket (P/N 107-0172-030).
8. Install the small WAS mounting bracket on the ends of the U-bolt clamp so that the installed hex bolt points upward.
9. Install one 5/16" flat washer and one 5/16"-18 nylon insert lock nut on the each end of the U-bolt clamp to secure the small WAS mounting bracket.
10. Tighten the nuts to ensure the small WAS mounting bracket is installed securely.
11. Install a 0.406" ID x 0.750" OD x 0.375" long spacer (P/N 107-0172-037) on the end of the protruding hex bolt.

FIGURE 4. Rod-End of WAS Installed on Rod-End of Steering Cylinder



12. Install the ball mount on the rod-end of the WAS assembly on the installed hex bolt and secure it using an M10 x 1.5 lock nut.

FIGURE 5. Base-End of WAS Installed on Base-End of Steering Cylinder



13. Insert an M10 x 1.5 x 35 hex bolt (P/N 311-0070-025) through the back of the WAS base end mounting bracket.
14. Install the base-end of the WAS assembly on the hex bolt and secure it using an M10 x 1.5 nylon insert lock nut.
15. Orient the WAS so the cable plug is oriented as shown in Figure 5 on page 19.

FIGURE 6. WAS Installed

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16. Tighten the M10 universal ball mounts and M10 jam nuts to each other on the WAS assembly to ensure they are installed securely.
17. Connect to the connector labeled WAS on the 115-4010-058 cable.



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# CHAPTER

# 5

# CAB COMPONENT INSTALLATION

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## INSTALL THE RS1 UNIT

FIGURE 1. Mounting Bracket Installed



1. Install the RS1 mounting bracket (P/N 107-0172-498) on the bottom of the RS1 unit using four 1/4"-20 x 1/2" flat head machine screws (P/N 311-0003-041).

FIGURE 2. Machine's Existing Receiver Mounting Bracket



2. Install the RS1 mounting bracket (P/N 116-0159-803) on the front of the cab roof using the machine's existing hardware.

NOTE: The RS1 mounting bracket should be installed so that the latch is on the left side.

FIGURE 3. RS1 Unit Installed on Cab Roof

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3. Insert the tab of the RS1 latch mounting bracket into the slotted tab of the receiver mounting bracket to interlock the brackets.
4. Secure the RS1 mounting bracket to the latch mounting bracket by securing the latch.

NOTE: It may be necessary to adjust the latch in order to secure the RS1 unit.

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## INSTALL THE HYDRAULIC DRIVE UNIT (HDU)

1. Lift the instructional seat cushion.

FIGURE 4. HDU Installed

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2. Align the holes of the HDU with the holes in the instructional seat compartment wall closest to the operator's seat.
3. Secure the HDU to the instructional seat compartment wall using two M6 x 25 mm x 1.0 pitch hex bolts (P/N 311-0070-059).

---

## INSTALL THE RS1 CABLES

### INSTALL THE RS1 HDU HARNESS CABLE

FIGURE 5. Vent Cover to be Removed

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1. Remove the vent cover on the back wall of the cab, behind the operator's seat.

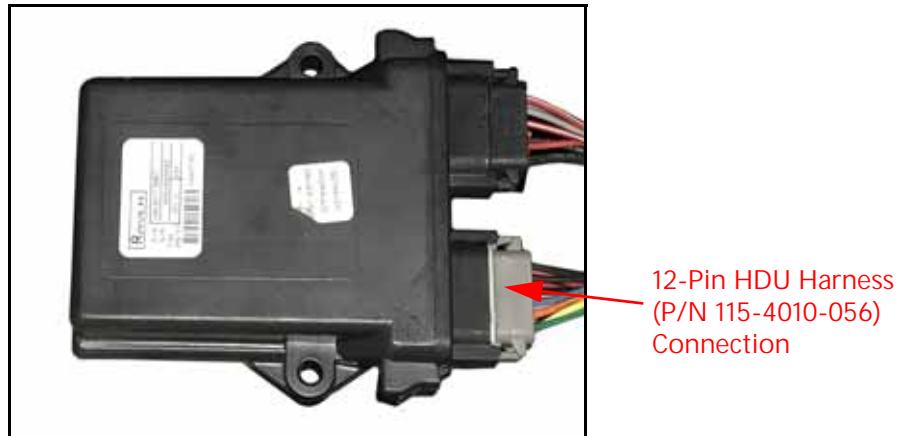
FIGURE 6. RS1 HDU Harness in Instructional Seat Compartment

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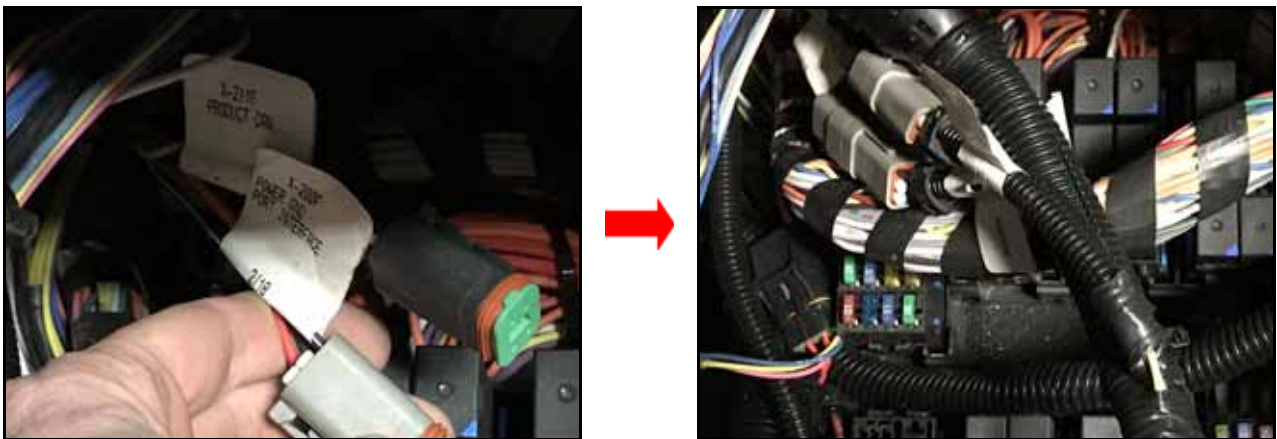
2. Place the RS1 HDU harness cable into the instructional seat.

FIGURE 7. RS1 HDU Harness Cable Installed on HDU



3. Connect the gray 12-pin connector of the RS1 HDU harness cable (P/N 115-4010-056) to the mating port of the installed HDU (P/N 063-0173-887).

FIGURE 8. POWER and CAN Cable Connections



4. Locate the machine's X-211 PRODUCT CAN and X-200 POWER GND PORT INTERFACE connections on the machine's harness, stored in the vent compartment.
5. Connect the CAN connector of the RS1 harness cable (P/N 115-4010-031) to the machine's X-211 PRODUCT CAN connector.
6. Connect the POWER connector of the RS1 harness cable to the machine's X-200 POWER GND PORT INTERFACE.

## INSTALL THE RS1 TEE CABLE

FIGURE 9. RS1 Tee Cable Connection



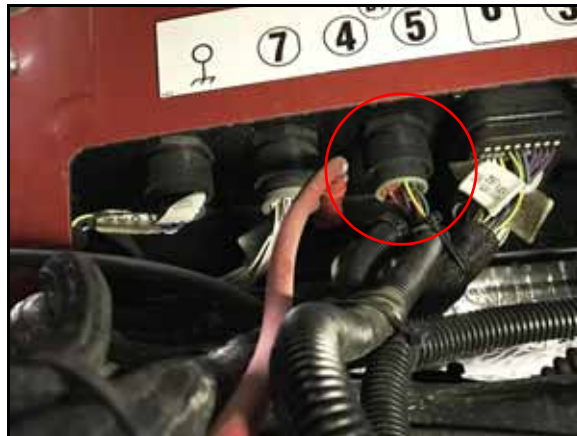
1. Connect the black 12-pin connector of the RS1 tee cable (P/N 115-4010-036) to the back of the RS1 unit.

FIGURE 10. RS1 Tee Cable Routing



2. Route the RS1 tee cable along the roof and down the back-right corner of the cab.
3. Locate the machine's 35-pin XB-5 BULKHEAD PRODUCT CAB connector beneath the cab, near the back-left corner.
4. Disconnect the machine's XB-5 connector from the bulkhead.
5. Connect the machine's harness connector to the mating 35-pin connector on the RS1 tee cable.

FIGURE 11. RS1 Tee Cable Connected to Machine's Bulkhead



6. Connect the remaining 35-pin connector of the RS1 tee cable to the open port of the machine's bulkhead.

### INSTALL THE HDU SWITCH HARNESS CABLE

FIGURE 12. HDU Harness Cable Connection



1. Connect the 8-pin CAB SWITCHES connector of the HDU harness cable (P/N 115-4010-056) to the mating female 8-pin connector of the HDU switch harness cable (P/N 115-4010-059).

FIGURE 13. Seat Switch Harness Connections



2. Locate and disconnect the machine's seat switch harness connections.
3. Connect the SEAT SWITCH harness connections of the HDU switch harness cable between the machine's seat switch connections.
4. Connect the ENGAGE connector of the HDU switch harness cable to the machine's mating X-708 REMOTE ENGAGE SWITCH connector, located behind the vent access cover.

FIGURE 14. Master Switch Installation Location



5. Locate an unused switch port of the machine's control console.
6. Use a flat-head screwdriver to gently remove the cover of the unused switch port.
7. Route the MASTER connector on the HDU switch harness cable up the right corner post of the cab and into the control console casing.
8. Pull the MASTER connector through the switch port opening.

FIGURE 15. Master Switch Installed



9. Install the master switch (P/N 063-0173-961) on the MASTER connector of the HDU switch harness cable (P/N 115-4010-028).
10. Feed the harness and switch wires back into the console casing.
11. Press on the switch casing to ensure the switch is securely installed.

### INSTALL THE RS1 TO BULKHEAD HARNESS CABLE

FIGURE 16. RS1 to Bulkhead Cable Installed on HDU



12-Pin Bulkhead  
Harness Cable  
(P/N 115-4010-057)  
Connection

1. Connect the black, rectangular 12-pin connector of the RS1 to bulkhead harness cable (P/N 115-4010-057) to the mating port of the installed HDU.
2. Connect the 2-pin connector of the RS1 to bulkhead harness to the mating 2-pin connector of the RS1 HDU harness cable (P/N 115-4010-056).



FIGURE 17. Bulkhead Connection



3. Locate the unused bulkhead opening in the right-rear corner, underneath the cab.
4. Remove the adhesive film from the bulkhead opening.
5. Install the 31-pin connector of the RS1 to bulkhead harness in the bulkhead opening, securing it with the supplied nut.

### INSTALL THE VALVE HARNESS CABLE

1. From beneath the cab, connect the round, 31-pin connector of the valve harness (P/N 115-4010-058) to the mating 31-pin connector of the bulkhead harness cable (P/N 115-4010-057).

FIGURE 18. VALVE Harness Cable Installation Location



2. Connect the 4-pin VALVE connector to the open port of the RS1 hydraulic valve (P/N 334-0003-088).

FIGURE 19. PS1 and PS2 Connections



3. Install the PSI 1 and PSI 2 connectors on the pressure transducers installed in Ports A1 and B1 of the flow switch (P/N 334-0003-085).

NOTE: The connectors can be installed in either port of the flow switch.

FIGURE 20. WAS Connection



4. Connect the WAS connector to the base-end of the installed WAS (P/N 416-0001-052).

## ROUTINE OPERATION

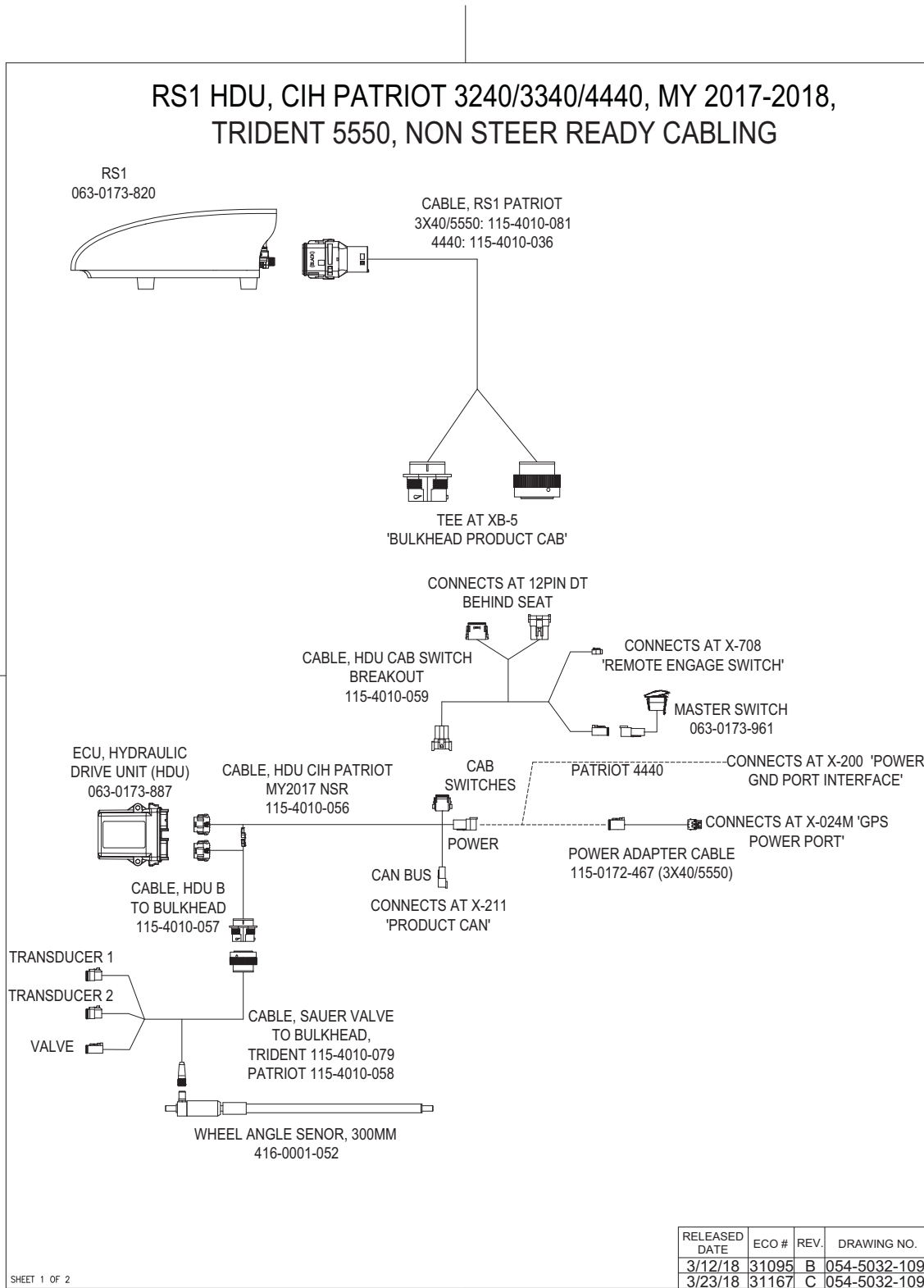
FIGURE 21. Resume Switch Location



Locate and identify the machine's resume switch on the joystick as it is required for RS1 system operation.

Refer to the Raven RS1 Guidance and Steering Calibration & Operation Manual (P/N 016-4010-001) for instructions on Calibrating the RS1 system, adjusting system settings, and system operation.

SYSTEM DIAGRAM



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## C

- Cab Component Installation 23
  - Installing the Hydraulic Drive Unit (HDU) 24
  - Installing the Master Switch 33
  - Installing the RS1 Cables 25
    - Installing the HDU Switch Harness Cable 28
    - Installing the RS1 HDU Harness Cable 25
    - Installing the RS1 Tee Cable 27
    - Installing the RS1 to Bulkhead Harness Cable 30
    - Installing the Valve Harness Cable 31
  - Installing the RS1 Unit 23

## H

- Hydraulic System Installation 9
  - Hydraulic System Diagram 15
  - Installing Fittings on the Dual Transducer Hydraulic Manifold 11
  - Installing Fittings on the Steering Valve 10
  - Installing the Left and Right Steering Hoses 14
  - Installing the Pressure Hose 12
  - Installing the Tank Hose 13
  - Mounting the Steering Valve
    - Installing the Steering Valve Mounting Bracket 11
    - Mounting the Steering Valve 12

## I

- Introduction 5
  - Kit Contents 7
  - Preparing for Installation 5
    - Point of Reference 5
    - Recommendations 5
  - Updates 5

## K

- Kit Contents 7

## R

- Routine Operation 33

## S

- System Diagram 34

## U

- Updates 5

## W

- Wheel Angle Sensor Installation 17
  - Assembling the Wheel Angle Sensor (WAS) 17
  - Installing the WAS 17



# LIMITED WARRANTY

## WHAT DOES THIS WARRANTY COVER?

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

## HOW LONG IS THE COVERAGE PERIOD?

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

## HOW CAN I GET SERVICE?

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

## WHAT WILL RAVEN INDUSTRIES DO?

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

## WHAT IS NOT COVERED BY THIS WARRANTY?

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

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

# EXTENDED WARRANTY

## WHAT DOES THIS WARRANTY COVER?

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

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

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

## WHERE CAN I REGISTER MY PRODUCT FOR THE EXTENDED WARRANTY?

To register, go online to [www.ravenhelp.com](http://www.ravenhelp.com) and select Product Registration.

## HOW LONG IS THE EXTENDED WARRANTY COVERAGE PERIOD?

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

## HOW CAN I GET SERVICE?

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

## WHAT WILL RAVEN INDUSTRIES DO?

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

## WHAT IS NOT COVERED BY THE EXTENDED WARRANTY?

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

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