

# RS1 Installation Manual for Kubota M5 Series (Non-Steer Ready)

*016-5035-056 Rev. A*

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# CHAPTER

# 1

# IMPORTANT SAFETY INFORMATION

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## NOTICE

Read this manual and the operation and safety instructions included with your implement and/or controller carefully before installing the RS1 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 RS1 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 RS1, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate RS1 or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Remain in the operator's position or a safe working distance away from the booms at all times when RS1 is engaged.
- Disable RS1 when exiting from the operator's seat and machine.
- Do not drive the machine with RS1 enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling RS1 when the safe working distance has diminished.
- Ensure RS1 is disabled prior to starting any maintenance work on RS1 or the machine.

## WARNING

- When starting the machine for the first time after installing RS1, be sure that all persons stand clear in case a hose has not been properly tightened.

## CAUTION

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## HYDRAULIC

### GENERAL

- Raven Industries recommends that appropriate protective equipment be worn at all times when working on the hydraulic system.
- Never attempt to open or work on a hydraulic system with the equipment running. Care should always be taken when opening a system that has been previously pressurized.
- When disconnecting the hydraulic hoses or purging is required, be aware that the hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- When installing RS1 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 hydraulic system. Objects or materials that are able to bypass the hydraulic filtration system will reduce performance and possibly damage the RS1 hydraulic valve.

### INSTRUCTIONS FOR HOSE ROUTING

The word "hose" is used to mean all flexible fluid carrying components. Follow existing hoses as much as possible and use these guidelines:

Hoses should not contact or be attached to:

- Components with high vibration forces
- Components carrying hot fluids beyond component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads
- Ends of adjustable hose clamps

Routing should not allow hoses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of hose components
- Hoses should be protected or shielded if it needs to route near hot temperatures beyond hose component specifications

Hoses should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets
- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets
- Changes of position in steering and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For hose sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp hoses securely to force controlled movement to occur in the desired hose section
- Avoid sharp twisting or flexing of hoses in short distances

Protect hoses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures
- High pressure wash

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## ELECTRICAL

### GENERAL

- Always verify that the power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the equipment.
- Ensure that the power cable is the last cable to be connected.
- A minimum of 12 VDC is required for system operation with a maximum of 15 VDC.

### INSTRUCTIONS FOR WIRE ROUTING

The word "harness" is used to mean all electrical leads and cables, bundled and unbundled. When installing harness, secure it at least every 30 cm (12in) to the frame. Follow existing harness as much as possible and use these guidelines:

Harness should not contact or be attached to:

- Lines and hoses with high vibration forces or pressure spikes
- Lines and hoses carrying hot fluids beyond harness component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads

- Ends of adjustable hose clamps
- Wire exiting conduit without protection, either ends or side of conduit
- Hose and tube fittings

Routing should not allow harnesses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of harness components
- Wiring should be protected or shielded if it needs to route near hot temperatures beyond harness component specifications

Harnessing should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets
- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets
- Changes of position in steering and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For harness sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp harnesses securely to force controlled movement to occur in the desired harness section
- Avoid sharp twisting or flexing of harnesses in short distances
- Connectors and splices should not be located in harness sections that move

Protect harnesses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures

### IMPORTANT:

- Avoid directly spraying electrical components and connections with high pressure water. High pressure water sprays can penetrate seals and cause electrical components to corrode or otherwise become damaged. When performing maintenance:
  - Inspect all electrical components and connections for damage or corrosion. Repair or replace components, connections, or cable as necessary.
  - Ensure connections are clean, dry, and not damaged. Repair or replace components, connections, or cable as necessary.
  - Clean components or connections using low pressure water, pressurized air, or an aerosol electrical component cleaning agent.

- Remove visible surface water from components, connections, or seals using pressurized air or an aerosol electrical component cleaning agent. allow components to dry completely before reconnecting cables.



### INTRODUCTION

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Thank you for selecting the Raven RS1 steering system. The RS1 system is designed to provide hands free steering of agricultural equipment using Global Navigation Satellite System (GNSS) position data.

This manual applies to the following machines:

MAKE: Kubota  
MODEL: M5-091, M5-111  
YEAR: 2019 & Newer

### PREPARING FOR INSTALLATION

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Before installing RS1, park the machine where the ground is level, clean, and dry. Leave the machine turned off for the duration of the installation process.

During the installation process, follow good safety practices. Be sure to carefully read the instructions in this manual as you complete the installation process.

### RECOMMENDATIONS

Raven Industries recommends the following best practices before installing or operating the RS1 system for the first time, at the start of the season, or when moving the RS1 system to another machine:

- Ensure the hydraulic filters have been recently changed and there are no issues with the hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).
- Operate each of the hydraulic functions on the machine (i.e., tilt, fold, center rack, tongue extension, turning the steering wheel to the left and right steering locks, or other hydraulic valve functions) three times to ensure the hydraulic valve is using fresh oil and debris is flushed from the hydraulic hoses, valves, and filters.

Raven Industries recommends the following best practices when installing the RS1 system.

- Use part numbers to identify the parts.
- Do not remove the plastic wrap from a part until it is necessary for installation.
- Do not remove plastic caps from a part until it is necessary for installation.

### TOOLS NEEDED

The following tools are recommended for installation of the RS1 system:

- SAE and metric wrenches and sockets
- Cable ties
- Set of tools

### POINT OF REFERENCE

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

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### 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](mailto:techwriting@ravenind.com)

- RS1 Installation Manual for Kubota M5 Series (Non-Steer Ready)
- 016-5035-056 Rev. A
- Any comments or feedback (include chapter or page numbers if applicable).
- Let us know how long have you been using this or other Raven products.

We will not share your email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

Thank you for your time.

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### KIT CONTENTS

This section contains a list of the components that are included in the RS1 kit. Before beginning the RS1 installation, compare the items in the RS1 kit with the components on this list. If you have questions about the kit, contact your local Raven dealer.

FIGURE 1. RS1 Installation Kit for Kubota M5 (P/N 117-5035-056 Rev. B)

| <b>QTY</b> | <b>PART #</b> | <b>DESCRIPTION</b>                                |
|------------|---------------|---|
| 1          | 053-0159-197  | BOX, SHIPPING                                     |
| 1          | 116-0159-844  | WELDMENT, VALVE BRACKET, KUBOTA M5 MY19           |
| 1          | 107-0172-661  | BRACKET, VALVE SUPPORT, KUBOTA M5 MY19            |
| 1          | 107-0172-662  | BRACKET, TC1/HDU CAB MOUNT, KUBOTA M5 MY19        |
| 1          | 107-0172-663  | BRACKET, CYLINDER GUARD LEFT, KUBOTA M5 MY19      |
| 1          | 107-0172-664  | BRACKET, CYLINDER GUARD RIGHT, KUBOTA M5 MY19     |
| 1          | 107-0172-665  | BRACKET, CYLINDER GUARD CONNECTOR, KUBOTA M5 MY19 |
| 1          | 107-0172-666  | BRACKET, WAS CYLINDER MOUNT, KUBOTA M5 MY19       |
| 1          | 416-0001-054  | SENSOR, LINEAR, NON-CONTACT, 350MM                |
| 1          | 422-0000-086  | TRANSDUCER, PRESSURE, 0-3000 PSI                  |
| 1          | 115-4010-165  | CABLE, RS1, KUBOTA M5 TRACTOR                     |
| 1          | 115-4010-166  | CABLE, RS1, VALVE, KUBOTA M5 TRACTOR              |
| 1          | 115-4010-032  | CABLE, M12 WAS TO 4 PIN                           |
| 1          | 115-4010-028  | CABLE, CAB SWITCH                                 |
| 1          | 063-0173-961  | ASSEMBLY, SWITCH, MASTER RS1                      |
| 1          | 063-0173-887  | NODE, HDU   |
| 1          | 117-5001-051  | KIT, ROOF, RS1 GENERIC MAGNET                     |
| 1          | 334-0003-090  | VALVE, HYDRAULIC, SMARTRAX, OPEN CENTER           |
| 1          | 334-0003-099  | VALVE, HYD DUAL POCI                              |
| 1          | 063-0172-470  | ENGAGE FOOT SWITCH                                |
| 1          | 117-0199-009  | KIT, HYDRAULIC, STEERING, KUBOTA M5 MY19+         |
|            |               | CONT..  |

FIGURE 2. RS1 Installation Kit for Kubota M5 (P/N 117-5035-056 Rev. B)

| # | QTY | PART #        | DESCRIPTION  |
|---|-----|---------------|--|
|   |     |               | PREV..   |
|   | 1   | 053-0159-015  | ENVELOPE, PLASTIC  |
|   | 1   | 311-0070-010  | BOLT, HEX HEAD, M6 X 1.0 X 20 MM, ZINC PLATED, GRADE 8.8     |
|   | 6   | 311-0052-103  | BOLT, HEX HEAD, 5/16-18 UNC-2A X 3/4" LG                     |
|   | 2   | 311-0052-112  | BOLT, HEX HEAD, 5/16-18 UNC-2A X 2-3/4" LG                   |
|   | 2   | 311-4051-186K | HEX BOLT, DIN931, M8 X 55MM LG, 10.9 STEEL, CLASS II         |
|   | 2   | 311-0054-105  | BOLT, HEX HEAD, 3/8-16 UNC-2A X 1" LG                        |
|   | 2   | 311-4051-177K | HEX BOLT, DIN931, M8 X 16MM LG, 10.9 STEEL, CLASS II         |
|   | 2   | 311-4046-120K | HEX BOLT, DIN961, M12 X 1.25 X 35MM LG, 10.9 STEEL, CLASS II |
|   | 2   | 311-4051-229K | HEX BOLT, DIN931, M10 X 55MM LG, 10.9 STEEL, CLASS II        |
|   | 1   | 435-3003-059  | CLAMPING U-BOLT 2"   |
|   | 1   | 313-6000-010  | WASHER DIN125 - ZN - M6                                      |
|   | 4   | 313-2300-310  | 1/4 INCH WASHER  |
|   | 8   | 313-2300-012  | 5/16 WASHERS, 0.1IN THICK                                    |
|   | 2   | 313-6000-014  | M8 FENDER WASHER   |
|   | 2   | 313-2300-014  | 3/8 WASHER, STEEL, FLAT                                      |
|   | 2   | 313-6000-017  | M10 FLAT FENDER WASHER                                       |
|   | 2   | 312-4000-057  | 1/4-20 LOCK NUT  |
|   | 6   | 312-1001-034  | HEX NUT, 5/16-18, STEEL, ZINC PLATED                         |
|   | 2   | 312-4000-168  | LOCK NUT, HEX, 3/8"  |
|   | 2   | 312-6002-042K | HEX NUT, THIN, DIN439, M10, CLASS 8, CLASS II                |
|   | 2   | 312-1002-035  | NUT, JAM, M10X1.5MM PITCH                                    |
|   | 2   | 104-1000-276  | SPACER, 0.75 OD, M8 CLEAR HOLE, 1.63 LONG                    |
|   | 1   | 104-1000-277  | SPACER, 0.75 OD, M10 CLEAR HOLE, 0.75 LONG                   |
|   | 1   | 104-1000-278  | SPACER, 0.75 OD, M10 CLEAR HOLE, 15MM LONG                   |
|   | 2   | 103-0001-029  | MOUNT, SENSOR SWIVEL END (BALL)                              |
|   | 1   | 118-0159-056  | HOUSING, ROCKER SWITCH, BASE                                 |
|   | 1   | 118-0159-057  | HOUSING, ROCKER SWITCH, COVER                                |
|   | 4   | 311-0008-027  | SCREW 4-40 UNC X 1/2" PHILLIPS                               |

FIGURE 3. Hydraulic Steering Kit for Kubota M5 Series (P/N 117-0199-009 Rev. A)

| <b>QTY</b> | <b>PART #</b> | <b>DESCRIPTION</b>           |
|------------|---------------|------------------------------|
| 2          | 333-0012-233  | -10 ORING (M) TO -6 FF (M)   |
| 2          | 333-0012-304  | -10 ORING (M) TO -8FF(M)     |
| 1          | 333-0012-246  | -10 ORING (M) TO -10 JIC (M) |
| 1          | 333-0012-108  | -10 JIC 90 ELBOW (M TO F)    |
| 1          | 333-0012-113  | -10 JIC STREET TEE (M, M, F) |
| 6          | 333-0012-199  | -8 ORING (M) TO -6 FF(M)     |
| 2          | 333-0012-065  | -6 FF 90 ELBOW (M TO F)      |
| 4          | 333-0012-051  | -4 ORING PLUGS (M)           |

### HYDRAULIC HOSES

|   | <b>PART # / LABEL</b> | <b>END 1</b>   | <b>SIZE</b> | <b>END2</b>   | <b>LENGTH</b> |
|---|-----------------------|----------------|-------------|---------------|---------------|
| 1 | 214-1001-211          | -8 FF (F) 90   | -8          | -10 JIC (F)   | 24"           |
| 1 | 214-1001-212          | -10 JIC (F)    | -8          | -08 FF(F) 90  | 36"           |
| 2 | 214-1001-213          | -4 19 BSPP (F) | -4          | -6 FF (F) 45  | 48"           |
| 2 | 214-1001-214          | -4 19 BSPP (M) | -4          | -6 FF (F) 45  | 18"           |
| 2 | 214-1001-215          | -06 FF (F) 90  | -4          | -06 FF (F) 90 | 24"           |
| 1 | 214-1001-216          | -10 JIC (F) 90 | -8          | -08 JIC (F)   | 32"           |





**⚠ WARNING**

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

Before beginning the TC1 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 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 TC1 hydraulics or performing diagnostics, maintenance, or routine service, ensure precautions are taken to prevent any foreign material from being introduced into the hydraulic system.

Objects or materials that are able to bypass the hydraulic filtration system will reduce performance and possibly damage the TC1 hydraulic valve.

|  |               |
|--|---------------|
|   | <b>NOTICE</b> |
| <p>The appearance of the TC1 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 HYDRAULIC STEERING VALVE

Before mounting the hydraulic steering valve (P/N 334-0003-090) 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 hydraulic steering valve.

FIGURE 1. Fittings Installed in Hydraulic Steering Valve



TABLE 1. Steering Valve Fitting Installation

| Fitting                                     | Part Number  | Port |
|---|--------------|------|
| Fitting - -10 SAE O-Ring (M) to -6 ORFS (M) | 333-0012-233 | A, B |
| Fitting - -10 SAE O-Ring (M) to -8 ORFS (M) | 333-0012-304 | P, T |
| Fitting - -10 SAE O-Ring (M) to -10 JIC (M) | 333-0012-246 | EF   |

**INSTALL FITTINGS IN THE DUAL POCI VALVE**

Before mounting the dual POCI valve (P/N 334-0003-099) on the machine, install the proper fittings in the valve. This prepares the valve for installation and simplifies the hose connection process later in the procedure. Refer to Figure 2 and the table below to install fittings on the dual POCI valve.

FIGURE 2. Fittings Installed on Dual POCI Valve

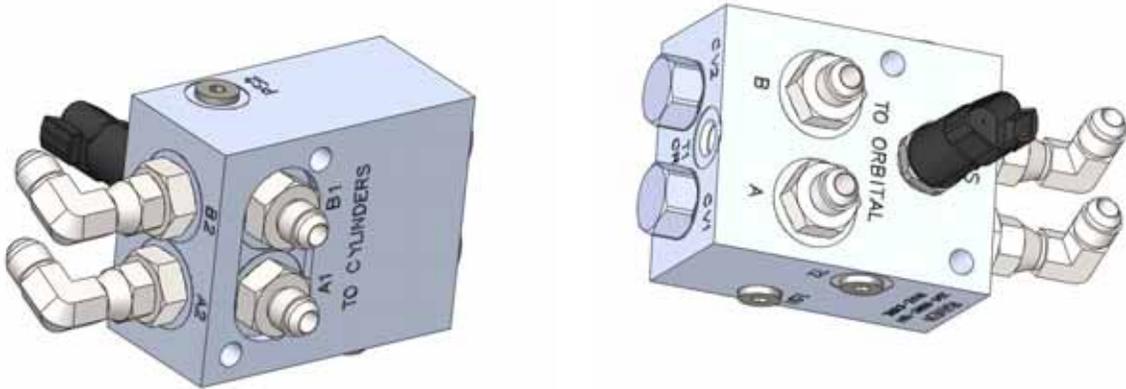


TABLE 2. Dual POCI Valve Fitting Installation

| Fitting   | Part Number  | Port                 |
|---|--------------|----------------------|
| Fitting - -8 SAE O-Ring (M) to -6 ORFS (M) Straight Adapter | 333-0012-199 | A, B, A1, B1, A2, B2 |
| Fitting - -6 ORFS 90° Swivel Elbow                          | 333-0012-065 | A2, B2               |
| Fitting - -4 SAE O-Ring Plug                                | 333-0012-051 | PS2, T2, LS1         |
| Fitting - -Pressure Transducer                              | 442-0000-086 | PS                   |

## MOUNT THE HYDRAULIC STEERING AND DUAL POCI VALVES

1. Remove the right side step for easier access to the hydraulic valve by removing the 4 bolts.

FIGURE 3. Remove Side Step

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2. If the tractor is equipped with a loader, remove the gray shield around the loader hydraulic valve.

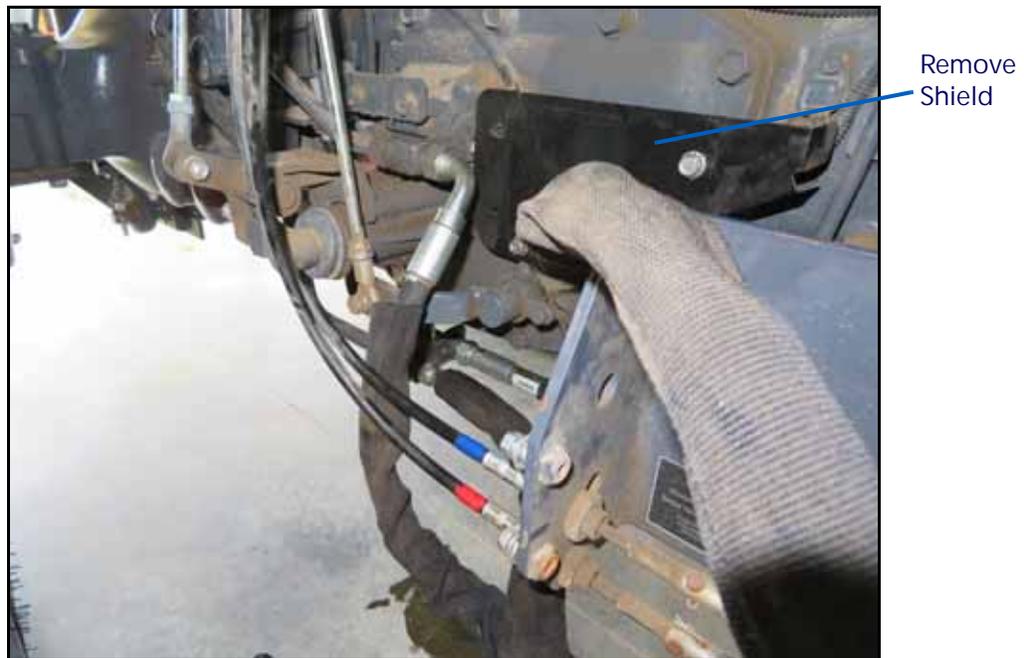
FIGURE 4. Remove Hydraulic Valve Shield

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3. Remove the black shield by removing two bolts shown in the figure.

FIGURE 5. Remove Shield



4. Mount the valve bracket (P/N 116-0159-844) using 2 included M8x16mm bolts in the threaded holes from the shield removed in step 3.

FIGURE 6. Steering Valve Bracket Mounted



5. Partially thread the four 5/16"x0.75" bolts and four 5/16" washers into the steering valve (P/N 334-0003-090).
6. Align the bolts with the notches, lower the valve to align the bolts in the bottom notches, and tighten the bolts to secure the steering valve to the valve bracket.

NOTE: Make sure the washers are between the bolt head and bracket, not between the bracket and valve.

FIGURE 7. Dual POCI Valve Bracket Mounted

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7. Remove the right side bolts from the cab mount bracket.
8. Install the valve support bracket (P/N 107-0172-661) to the cab support bracket using the supplied M12x35mm bolts.
9. Using the included 3/8"x1" bolts, washers, and nuts, secure the valve bracket to the valve support bracket.
10. Mount the DPOCI (P/N 334-0003-099) to the valve support bracket using the 5/16"x3" bolts and nuts.

FIGURE 8. Dual POCI and Steering Valves Mounted

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## DUAL POCI TO STEERING VALVE LINES

1. Using the supplied hoses (P/N 214-1001-215), connect port A on the steering valve to A1 on the dual POCI valve.
2. Connect port B on the steering valve to port B1 on the dual POCI valve.

FIGURE 9. Hoses Connected to the Dual POCI and Steering Valve

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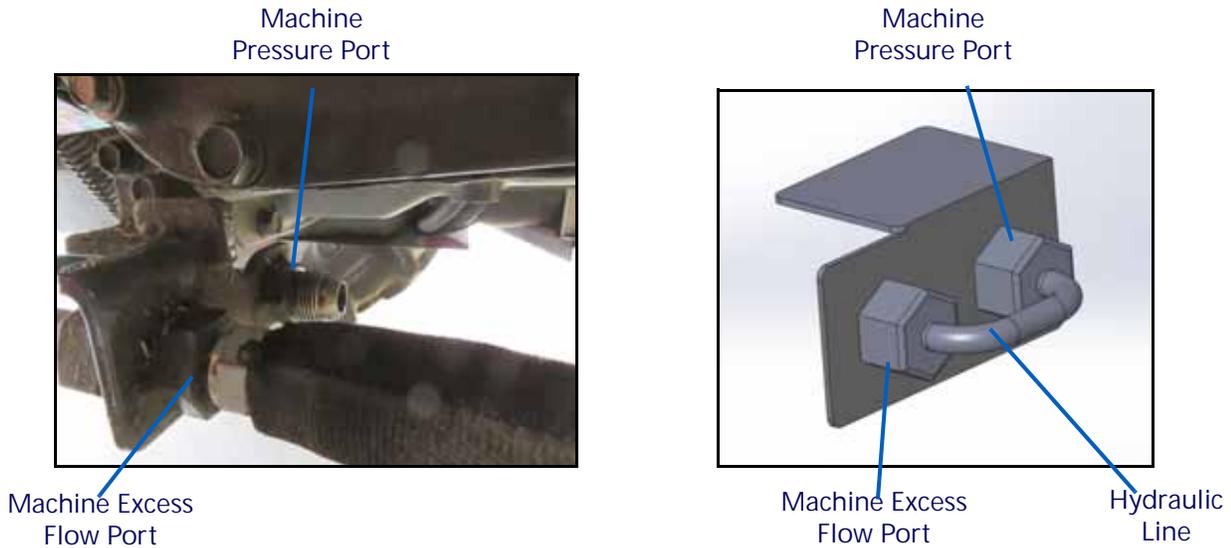
3. Tighten the hose connections.

## INSTALL THE PRESSURE, EXCESS FLOW, AND TANK LINES

### FOR TRACTOR WITHOUT LOADER

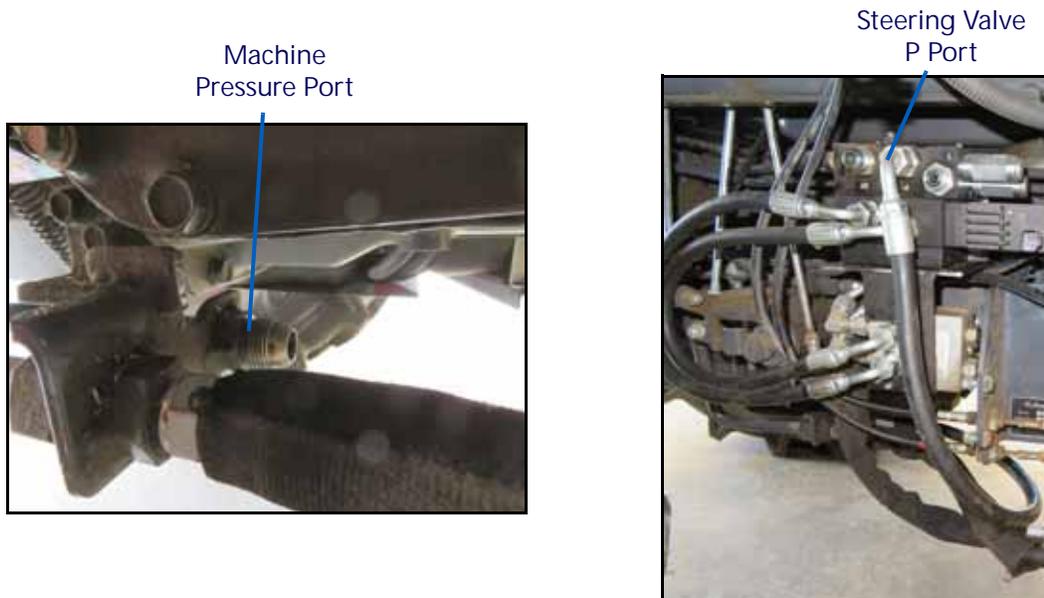
1. Remove the hydraulic line between the machine pressure port and the machine excess flow port.

FIGURE 10. Machine Pressure Port and Machine Excess Flow Port



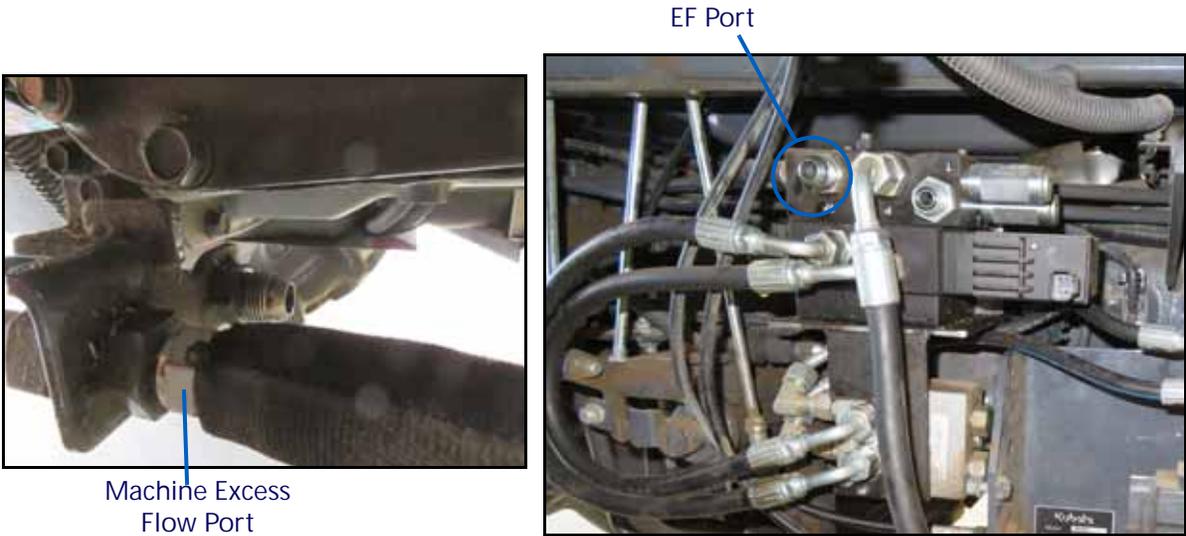
2. Connect the machine pressure port and the steering valve P port using the 214-1001-212 hose.

FIGURE 11. Machine Pressure Port and Steering Valve P Port



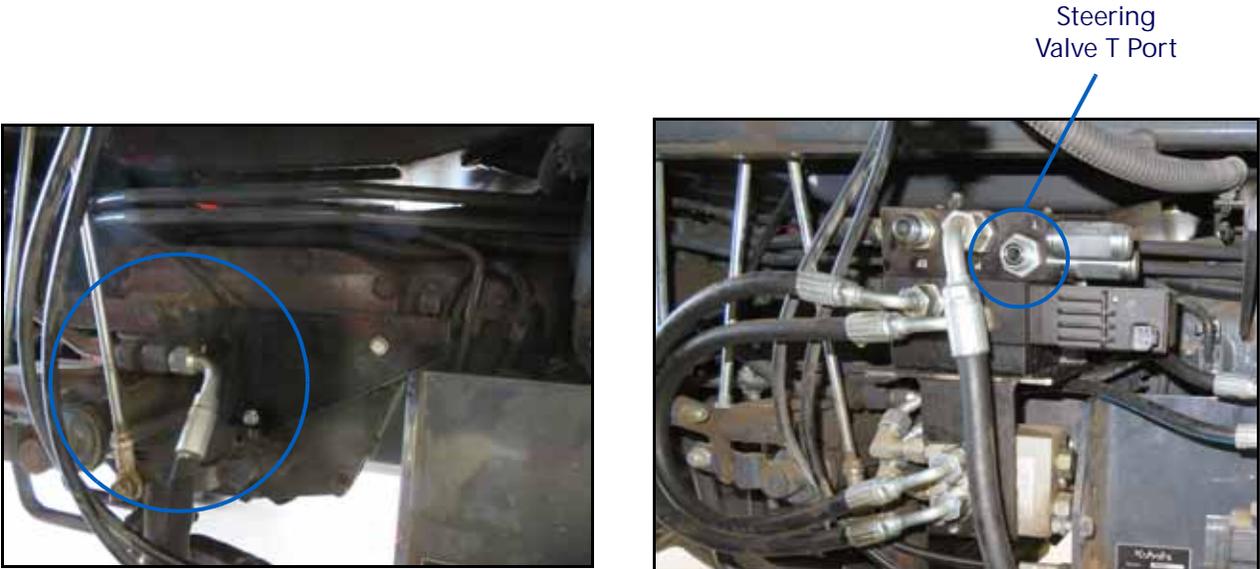
3. Connect the machine excess flow port and the steering valve EF port using the 214-1001-216 hose.

FIGURE 12. Machine Excess Flow Port and Steering Valve EF Port



- 4. Connect the machine tank port to the steering valve T port using the 214-1001-211 hose.

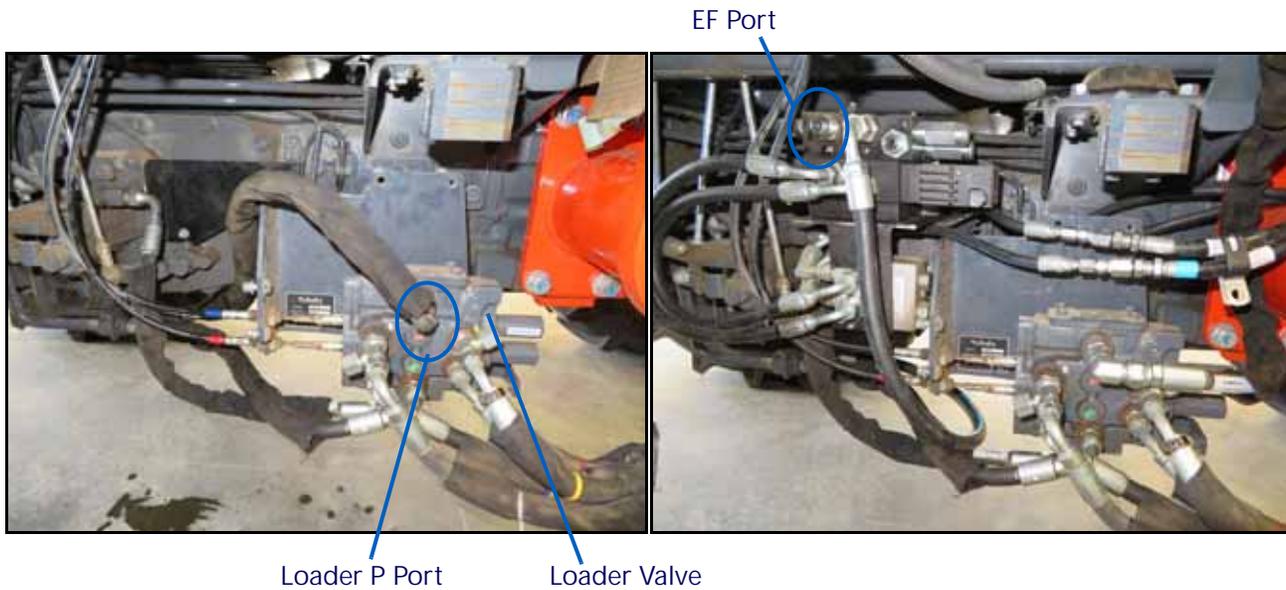
FIGURE 13. Machine Tank Port to the Steering Valve T Port



## EQUIPMENT WITH LOADER

1. Find the existing machine hose with a 90° end connected to the P port on the loader valve.

FIGURE 14. Reroute Existing Pressure Hose



2. Disconnect the hose from the loader valve and route to EF port on the steering valve.

**NOTE:** Do not tighten the EF port until the connections to the P and T ports are completed in the following steps.

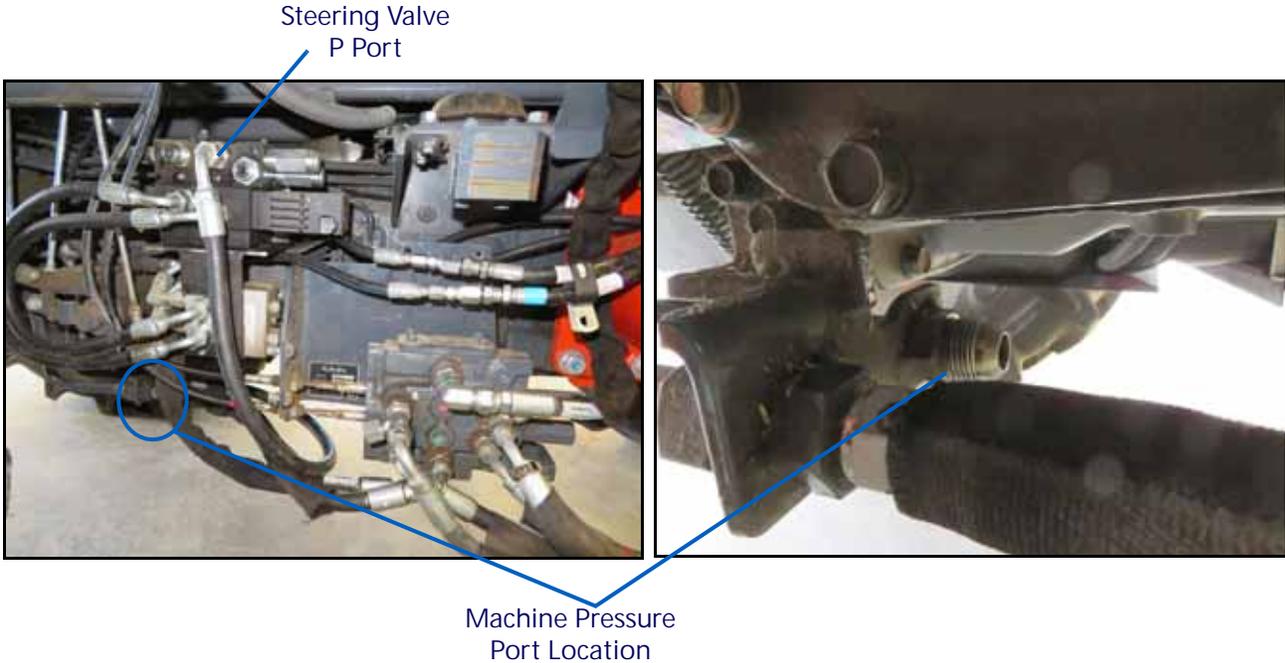
3. Trace this hose to the other end and disconnect from the machine P port.
4. Disconnect this end of the hose and reconnect to the loader valve where the other end was originally connected.

FIGURE 15. Existing Pressure Hose Connected to Steering Valve



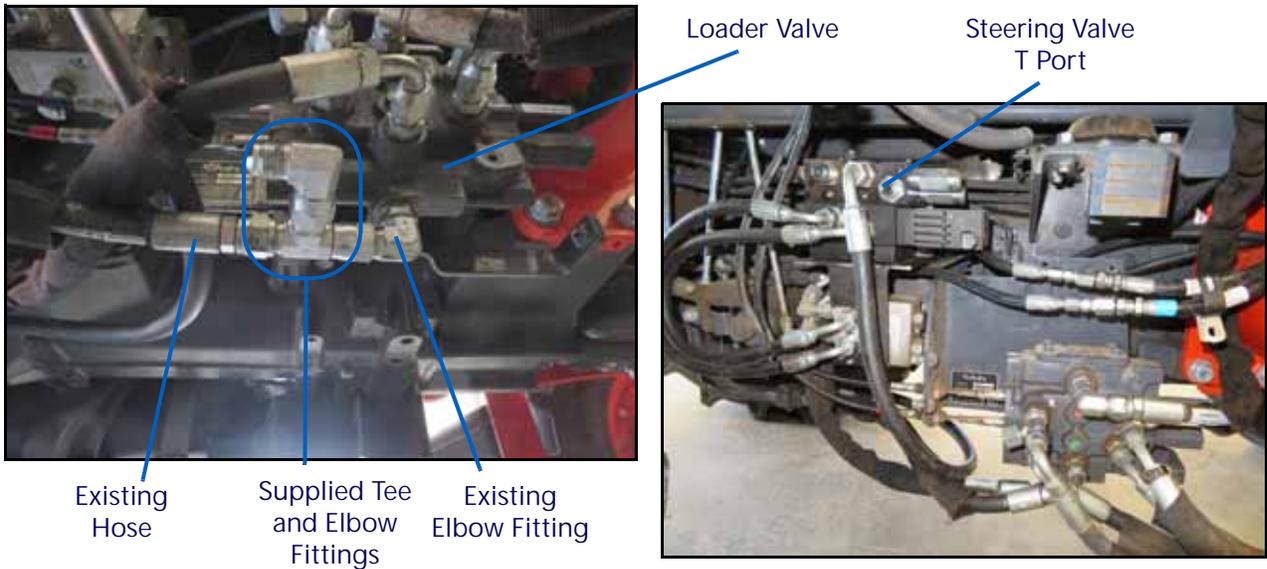
- 5. Connect the straight end of the hydraulic hose (P/N 214-1001-212) to the machine P port under the tractor where the hose was disconnected in step 3.
- 6. Route the 90° end to the P port on the steering block.

FIGURE 16. Excess Flow Rerouting



- 7. Disconnect the Tank hose on the bottom of the loader valve from the existing 90° swivel elbow.
- 8. Connect the run tee (P/N 333-0012-113) to the existing 90° swivel elbow and reconnect the existing hydraulic hose to the through port of the tee fitting.

FIGURE 17. Steering Valve Tank Port Connection



- 9. Connect the supplied 90° swivel elbow (P/N 333-0012-108) to the open branch of the tee fitting.

10. Attach the straight end of the supplied hose (P/N 214-1001-211) to the elbow fitting and route to the T port on the steering valve.
11. Tighten all hose connections on the steering valve and fittings and connections in the P, T, and EF lines.

## INSTALL THE LEFT AND RIGHT STEERING HOSES

1. Locate the left and right steering lines on the orbital under the hood. Both hoses have twisted protective plastic and the top hose (left) should have a blue marking.

FIGURE 18. Machine Orbital from Right Side of Machine



Disconnect Hoses  
from Machine  
Orbital

2. Remove the lines from the orbital using a crowfoot wrench and extensions.

|   |  |
|---|--|
|  | <p style="text-align: center;"><b>CAUTION</b></p> <p>Use care when removing hoses to avoid breaking the glass near the machine steering orbital.</p> |
|---|--|

3. Connect the Left and Right steering lines removed from the orbital to the supplied hoses (P/N 214-1001-214).
4. Route these hoses toward the dual POCI valve.

**NOTE:** Leave the dust caps on the opposite end of the supplied hoses until instructed to connect to the dual POCI valve to avoid dirt and debris from contaminating the hydraulic system.

5. Connect the straight end of the supplied hoses (P/N 214-1001-213) to both ports of the machine orbital.
6. Route the hose connected to the top port of the orbital to port A on the dual POCI valve. Route the hose connected to the bottom port of the orbital to port B on the dual POCI.

FIGURE 19. Ports A and B on the Dual POCI Valve



7. Route and connect the hydraulic line with the blue marking to port A2 on the dual POCI valve and the remaining line to port B2 on the dual POCI valve.

FIGURE 20. Existing Steering Cylinder Lines Connected to Supplied Hoses

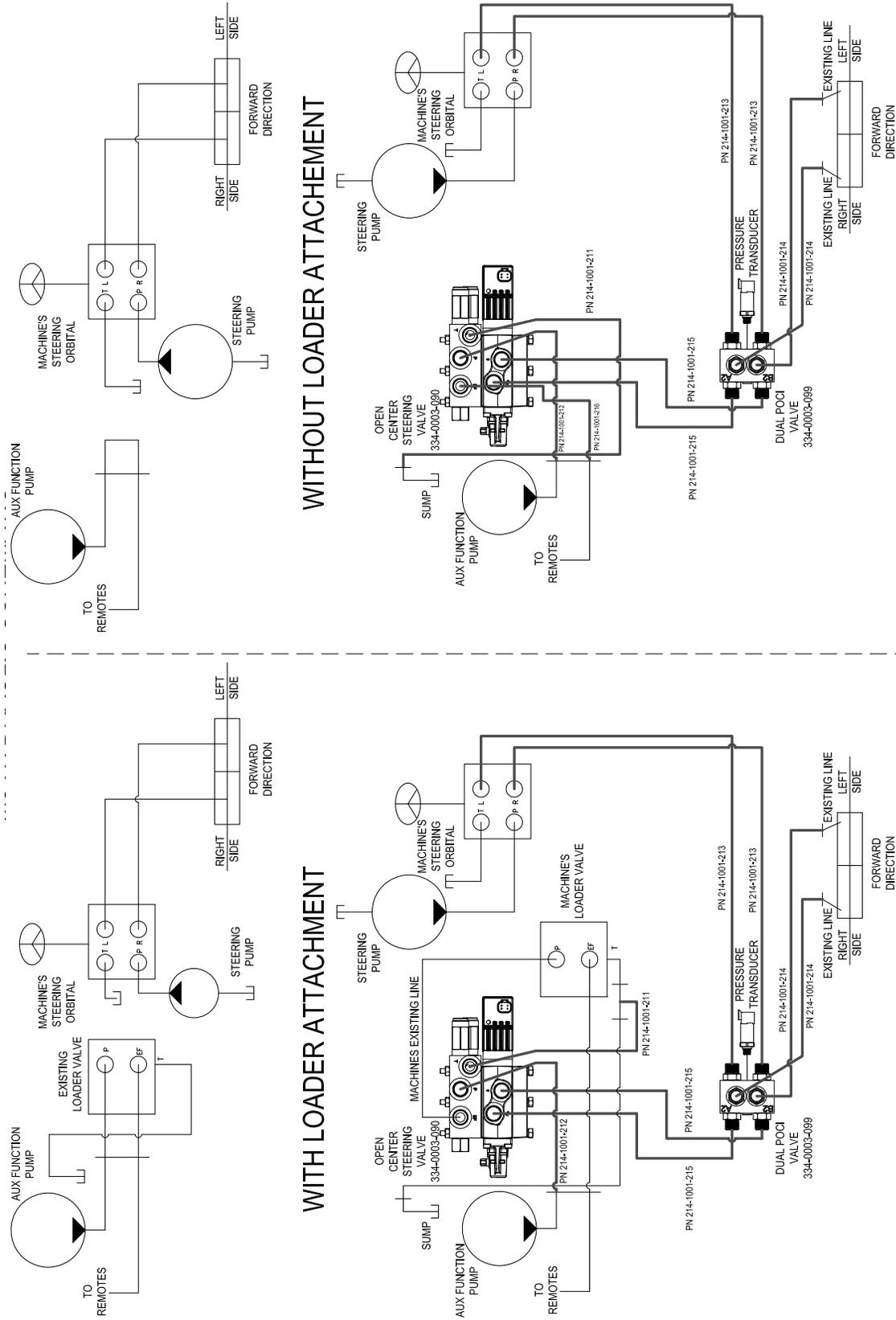


8. Reinstall the shield for the loader hydraulic valve and reinstall the right side step.
9. Tighten all hose connections on the orbital and fittings and connections in the left and right steering lines.

NOTE: Hose (P/N 214-1001-216) is included in the kit and is used only if the loader valve is removed or is not present.

HYDRAULIC DIAGRAM

FIGURE 21. Hydraulic Steering Installation Diagram



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## CHAPTER

## 4

## CAB COMPONENT AND SENSOR INSTALLATION

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### INSTALL WHEEL ANGLE SENSOR

#### WHEEL ANGLE SENSOR BRACKETS

1. Remove the existing hydraulic cylinder shields on the front of the tractor.

FIGURE 1. Remove Cylinder Shields on Front Axle

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2. Using bracket (P/N 107-0172-666), U-Bolt (P/N 435-3003-059), and two 5/16" nuts, install the cylinder bracket assembly on the cylinder rod end so the clamp sits in the groove on the gray rod end piece and face the bracket toward the front of the machine.

FIGURE 2. Angle Sensor Bracket



3. Install the new right cylinder guard (P/N 107-0172-664) using the existing bolts from the old shield on the outside holes and using one M8x55mm bolt and one (P/N 104-1000-276) spacer to hold the inside of the bracket.

FIGURE 3. New Cylinder Shield



4. Repeat step 3 to install the new left cylinder guard (P/N 107-0172-663).

## WHEEL ANGLE SENSOR

1. Install the linear wheel angle sensor (P/N 416-0001-054) Find the following components: (P/N 103-0001-029) tie rod ends, M10 jam nuts, M10 nuts, M10 washer, M10x55mm bolt, (P/N 104-1000-277) spacer, and (P/N 104-1000-278) spacer.

FIGURE 4. Angle Sensor Bracket



2. Thread the jam nut and the tie rod end (P/N 103-0001-029) to each end of the wheel angle sensor and tighten.
3. Insert the wheel angle sensor from the bottom of the bracket with the electrical connector at the left side of the machine.
4. On the cylinder end of the wheel angle sensor, secure the sensor using the included M10x55mm bolt, spacer (P/N 104-1000-277), and nut.

FIGURE 5. Cylinder End of the Wheel Angle Sensor Mounted

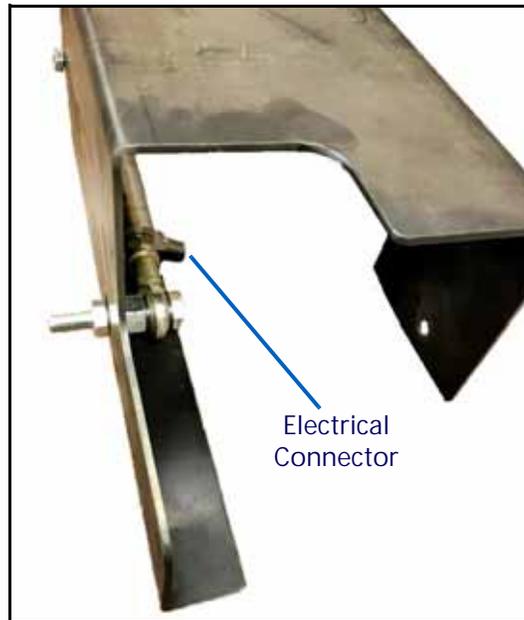


5. On the sensor end of the wheel angle sensor, place a washer on either side of the cylinder bracket with the nut on the front side of the sensor.
6. Secure using the included M10x55mm bolt, spacer (P/N 104-1000-278), and nut.

**NOTE:** Make sure the electrical connector does not contact the bracket, If the connector does contact the bracket, adjust the jam nut and swivel end on the base of the wheel angle sensor.

A washer is not necessary between the head of the bolt and the tie rod end on the wheel angle sensor.

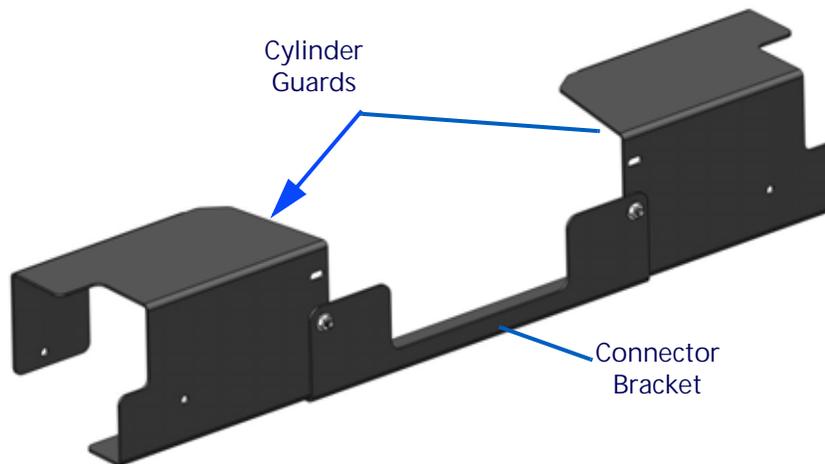
FIGURE 6. Cylinder End of the Wheel Angle Sensor Mounted



7. Install the connector bracket (P/N 107-0172-665) between the two cylinder guards using the included 5/16"x0.75" bolts, washers, and nuts.

NOTE: The nut will be mounted to the front of the machine.

FIGURE 7. Cylinder End of the Wheel Angle Sensor Mounted



---

## MOUNT HDU ECU

1. Locate and remove the 2 bolts in the floor pan behind the seat in the cab.

FIGURE 8. ECU Bracket Mounting Location



- 2. Secure the cab bracket (P/N 107-0172-662) to the floor using the existing bolts removed in the previous step and the included M6 bolt.
- 3. Secure the HDU (P/N 063-0173-887) ECU to the bracket with the studs and included washers and 1/4" nuts.

FIGURE 9. HDU ECU Installed

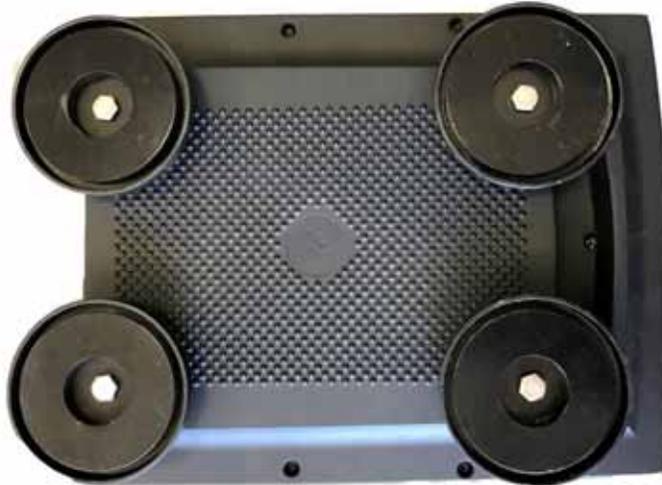


## MOUNT THE RS1

1. Using the 1/4-20 bolts included in the 117-5001-051 kit, connect the magnets to the RS1 as shown below.

FIGURE 10. Magnets Connected to RS1

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2. Using the 2-sided tape, connect the tape to the 107-4001-071 roof bracket.
3. Center the plate on the cab roof and apply the tape to secure the plate to the cab roof.

FIGURE 11. Roof Bracket Secured to Roof

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- Using the magnets to secure in place, mount the RS1 unit to the plate.

FIGURE 12. RS1 Mounted onto Plate



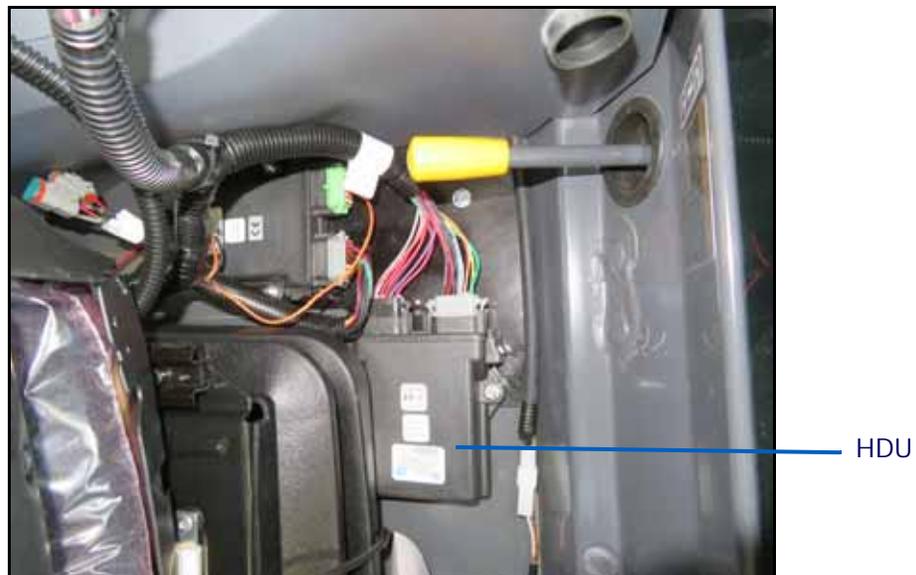
NOTE: Ensure the RS1 is centered on the plate and is facing the front of the cab.

## CONNECT THE RS1 AND HDU CABLE

### IN CAB

- Connect the two 12-pin connectors labeled "HDU" on the RS1 cable (P/N) 115-4010-165) into the HDU.

FIGURE 13. RS1 Cable Connection



- Locate the universal power connection in the right rear of the cab. Connect the mating connector labeled PWR.

FIGURE 14. Power Terminal Location



3. Locate the round connector labeled Field Computer. Connect to appropriate field computer harness.

FIGURE 15. Switched Power and Field Computer Connections



4. Locate the 8-pin connector labeled CAB SWITCH HARNESS on the Tractor Harness cable (P/N 115-4010-152) previously installed.

FIGURE 16. Cab Switch Harness Connection



5. Connect mating connector on HDU Cab Switch Breakout Cable (P/N 115-4010-028) to the CAB SWITCH HARNESS connection.

## MOUNT FOOT SWITCH

1. Route the Engage Foot Switch (P/N 063-0172-470) to the mating connector on the Breakout Cable (P/N 115-4010-028).

FIGURE 17. Resume Foot Switch Connection

---



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

**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.

3. Using the holes in the foot switch as a template, drill holes in the floor of the cab.
4. Secure the foot switch to the floor by installing the supplied screws in each of the mounting holes.

---

## ASSEMBLE AND MOUNT THE MASTER ENGAGE SWITCH

1. Secure the Master Switch (P/N 063-0173-961) between the two switch enclosure halves (P/N 118-0159-056 and 118-0159-057) and locate an appropriate location to mount the master switch assembly.
2. Connect the supplied master switch (P/N 063-0173-961) to the mating connector on the Breakout Cable (P/N 115-4010-028).

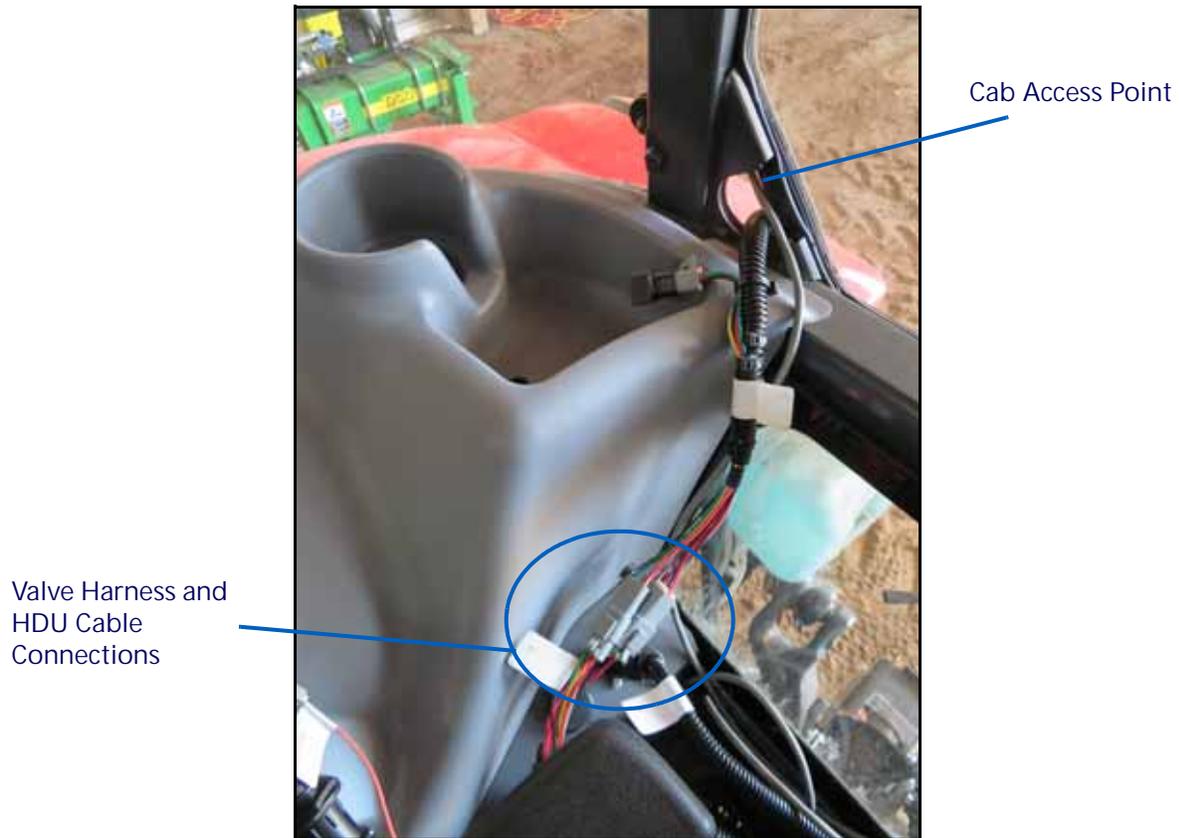
FIGURE 18. Master Switch Connection



### OUTSIDE OF CAB

1. Locate the 12-pin and 4-pin connectors on the Valve Harness Cable (P/N 115-4010-166) and route them into the cab through the cab access port at the bottom, right corner of the rear window.
2. Connect the Valve Harness Cable (P/N 115-4010-166) to the mating connectors on the HDU Cable (P/N 115-4010-165) inside the machine cab.

FIGURE 19. Cab Access Point



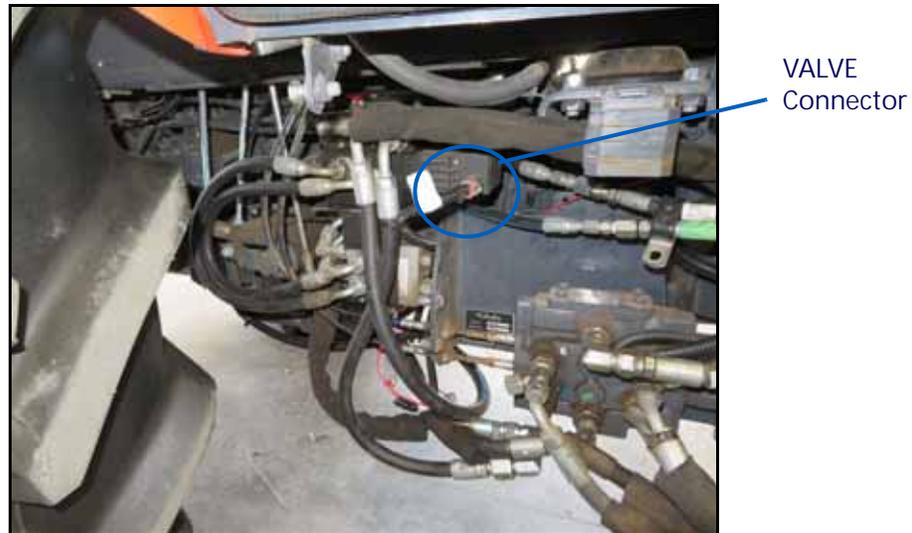
3. Route the two connectors labeled "RS1" up the corner pillar of the cab.
4. Connect the 12-pin connector to the RS1 unit on the roof.

FIGURE 20. Connected RS1



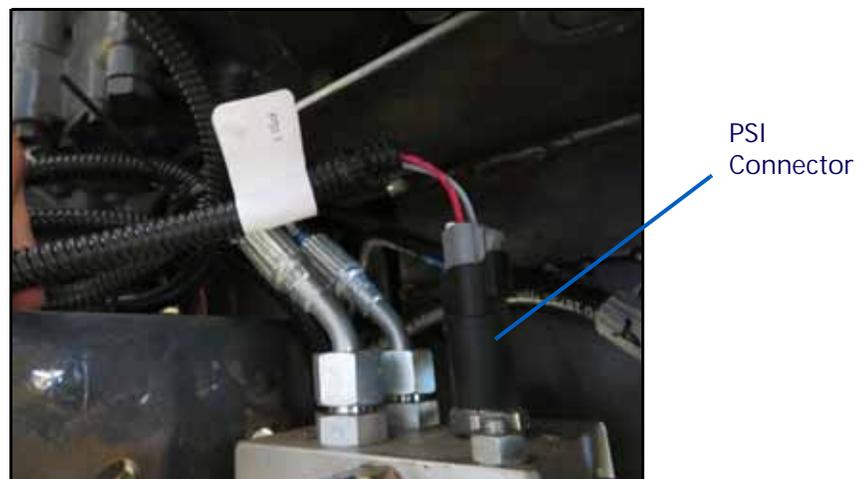
5. Route the 4-pin connector labeled VALVE to the steering valve mounted below the side step below the front, right corner of the cab.
6. Connect the VALVE connector to the mating port on the steering valve.

FIGURE 21. Valve Harness Connected to the Hydraulic Steering Valve



7. Connect the 3-pin connector labeled PSI to the pressure transducer on the dual POCl valve.

FIGURE 22. Pressure Transducer Connection



8. Route the remaining branch of the cable along the hydraulic hose lines near the orbital to the left side of the tractor.
9. Connect the wheel angle sensor cable (P/N 115-4010-032) to the wheel angle sensor and route along existing wiring on the left hand side of the hood toward the machine cab.

NOTE: Be sure to allow slack in the cable when tying the cable down for the front axle to articulate over terrain.

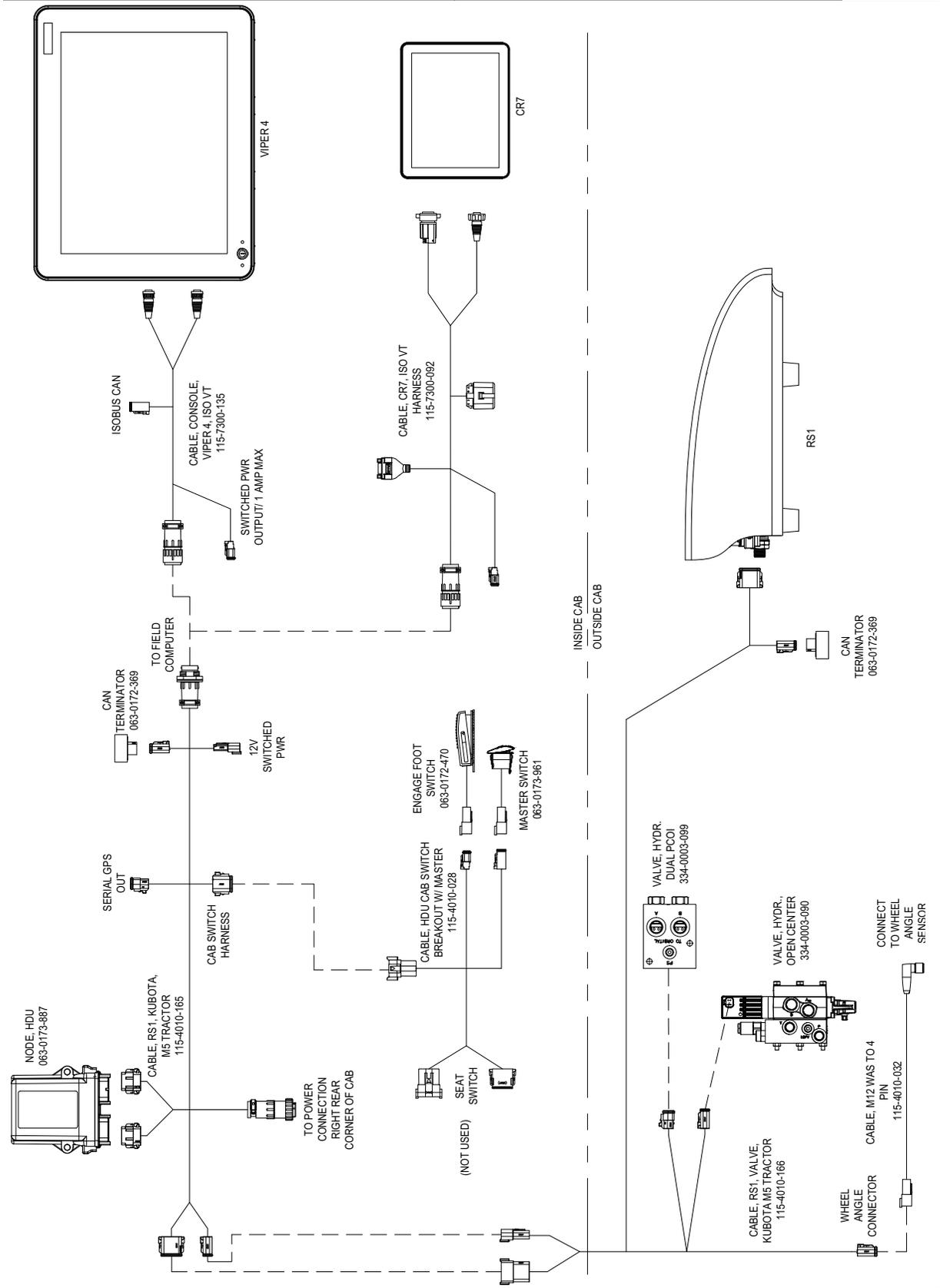
FIGURE 23. Wheel Angle Sensor Cable Routing

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10. Follow the cable harness to the front axle of the tractor on the left side like pictured and plug in the connector on the wheel angle sensor adapter cable.

FIGURE 24. Valve Harness Wiring Diagram (P/N 054-5035-056 Rev. A)







**WARNING**

When starting the machine for the first time after installing RS1, 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 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 wheels fully from side to side repeatedly to remove air from the hydraulic system.

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

4. Continue turning the wheels until they move steadily and smoothly when the steering wheel is turned.

**NOTE:** If there are issues with the system, turn off the machine and correct them immediately. For additional assistance, refer to the RS1 Calibration and Operation Manual (P/N 016-4010-005) or contact your local Raven dealer.



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# LIMITED WARRANTY

## WHAT DOES THIS WARRANTY COVER?

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

## HOW LONG IS THE COVERAGE PERIOD?

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

## HOW CAN I GET SERVICE?

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

## WHAT WILL RAVEN INDUSTRIES DO?

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

## WHAT IS NOT COVERED BY THIS WARRANTY?

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

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

# EXTENDED WARRANTY

## WHAT DOES THIS WARRANTY COVER?

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

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

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

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

To register, go online to [www.ravenhelp.com](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.**