HDU/TC1 Installation Manual for Kubota M7 Series (Non-Steer Ready)

016-5035-006 Rev. A *9/2019* *E33386*

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RAVEN

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 TC1 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 TC1 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 TC1, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate TC1 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 TC1 is engaged.
- Disable TC1 when exiting from the operator's seat and machine.
- Do not drive the machine with TC1 enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling TC1 when the safe working distance has diminished.
- Ensure TC1 is disabled prior to starting any maintenance work on TC1 or the machine.

⚠ WARNING

- When starting the machine for the first time after installing TC1, be sure that all persons stand clear in case a hose has not been properly tightened.
- The machine must remain stationary and switched off, with the booms unfolded and supported, during installation or maintenance.

⚠ CAUTION

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 TC1 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 TC1 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

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.

CHAPTER 2 INTRODUCTION

INTRODUCTION

Thank you for selecting the Raven TC1/HDU steering system. The TC1 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: M7-131, M7-151, and M7-171
YEAR: 2015 & Newer

PREPARING FOR INSTALLATION

Before installing TC1, 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 TC1 system for the first time, at the start of the season, or when moving the TC1 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 TC1 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 TC1 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.

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

-HDU/TC1 Installation Manual for Kubota M7 Series (Non-Steer Ready)
-016-5035-006 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.

KIT CONTENTS

This section contains a list of the components that are included in the TC1 kit. Before beginning the TC1 installation, compare the items in the TC1 kit with the components on this list. If you have questions about the kit, contact your local Raven dealer.

FIGURE 1. TC1/HDU Installation Kit for Kubota M7 (Non-Steer Ready) (P/N 117-5035-006 Rev. A)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION
1	1	053-0159-193	BOX, SHIPPING
2	1	063-0173-961	ASSEMBLY, SWITCH, MASTER RS1
3	1	063-0173-887	NODE, HDU
4	1	063-0174-070	ECU, ISO, TC1, LOW SPEED STEERING
5	1	107-0172-635	BRACKET, SC1/HDU, KUBOTA TRACTORS
6	1	117-0199-153	KIT., HYD., STEERING, KUBOTA M7.XXX SERIES
7	1	107-0172-514	BRACKET, VALVE, KUBOTA M7
8	1	115-4010-134	CABLE, HDU/SC1, KUBOTA M7 TRACTOR
9	1	115-4010-133	CABLE, VALVE, KUBOTA M7 TRACTORS
10	1	334-0003-099	VALVE HYD DUAL POCI
11	1	334-0003-088	VALVE, HYDRAULICS, SMARTRAX, DLS, PVG 32, W/ PVES
12	1	422-0000-086	TRANSDUCER, PRESSURE, 0-3000 PSI
13	1	115-4010-028	CABLE, CAB SWITCH
14	1	063-0172-470	ENGAGE FOOT SWITCH
15	1	107-0172-637	BRACKET, MOUNT, STEERING VALVE, KUBOTA M7
16	1	107-0172-636	BRACKET, MOUNT, CONSOLE, KUBOTA M7
17	1	053-0159-074	ENVELOPE, PLASTIC
18	2	305-1000-013	STANDOFF, 1/4"-20 X 1.5" F/F
19	2	311-0050-105	BOLT, HEX HEAD, 1/4"-20 UNC, 1" LG, ZINC PLATED
20	3	312-6001-042K	NUT, NYLOCK, DIN 985, M10-1.5
21	3	311-4050-137K	HEX BOLT, DIN 931, M6-1 x 25MM
22	4	311-0052-104	BOLT, 5/16"-18 x 7/8" HEX HEAD
23	2	311-0054-086	BOLT, 5/16-18 x 2.50" HEX HEAD
24	3	311-4050-225K	HEX BOLT, DIN 931, M10-1.5 x 35MM
25	2	312-4000-057	NUT, NYLOCK, 1/4-20
26	2	312-4000-059	NUT, NYLOC, 5/16"-18
27	10	313-6000-013	WASHER, M8
28	2	311-4050-182K	HEX BOLT, DIN 931, M8-1.25 x 35MM
29	4	312-6001-027K	NUT, NYLOCK, DIN 985, M8-1.25
30	6	311-4050-180K	HEX BOLT, DIN 931, M8-1.25 x 25MM
31	1	053-0159-015	ENVELOPE, PLASTIC
32	1	016-0171-649	SHEET, WARRANTY/HELP (016-5035-006)

FIGURE 2. Hydraulic Steering Kit for Kubota M7 Series (P/N 117-0199-153 Rev. B)

THIS KIT TO CONTAIN THE FOLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION
1	1	333-0012-023	FITTING, ELBOW, 90° SWIVEL, -4 ORFS M/F
2	2	333-0012-051	FITTING, PLUG, -4 SAE O-RING
3	4	333-0012-067	FITTING, ELBOW, 90° SWIVEL, -8 ORFS M/F
4	2	333-0012-102	FITTING, ELBOW, 45° SWIVEL, -8 ORFS M/F
5	1	333-0012-104	FITTING, PLUG, -6 SAE O-RING
6	4	333-0012-168	FITTING, ADAPTER, STRAIGHT, -8 ORFS (M) TO -8 SAE O-RING (M
7	3	333-0012-195	FITTING, ADAPTER, STRAIGHT, -6 SAE O-RING (M) to -4 ORFS (M
8	2	333-0012-199	FITTING, ADAPTER, STRAIGHT, -6 ORFS (M) TO -8 SAE O-RING (M
9	2	333-0012-229	FITTING, ADAPTER, 90° ELBOW, -8 ORFS (M) TO -8 SAE O-RING
10	2	333-0012-233	FITTING, ADAPTER, STRAIGHT, -10 SAE O-RING (M) to -6 ORFS (
11	2	333-0012-361	FITTING, ADAPT, SWIVEL RUN TEE, 15L M/M/F
12	1	333-0012-367	FITTING, ELBOW, 90° SWIVEL, 8L M/F
13	2	333-0012-065	FITTING, ELBOW, 90° SWIVEL, 11/16" ORFS M/F
14	1	333-0012-028	FITTING, ADAPTER, SWIVEL RUN TEE, 13/16" ORFS M/M/F
15	1	333-0012-359	FITTING, ELBOW, 45° 9/16" ORFS (M) TO 9/16" ORFS (F) SWIVEL
16	1	333-0012-114	FITTING, ADAPTER, STRAIGHT, 11/16" ORFS (M) TO 7/16" SAE O

HYDRAULIC HOSES

		PART # / LABEL	END 1	SIZE	END2	LENGTH
17	2	214-1001-161	15L 45° (F)	8	8FF	102"
18	2	214-1001-162	6FF	6	6FF 90S	18"
19	2	214-1001-199	15L (M)	8	8FF 45S	120"
20	1	214-1001-200	8L (F)	4	4FF 45S	62"
21	1	214-1001-201	8L (M)	4	4FF	68"
22	2	214-1001-202	15L 90° (F)	8	8FF	68"
23	1	214-1001-203	8FF	6	6FF 90S	30"

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 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.

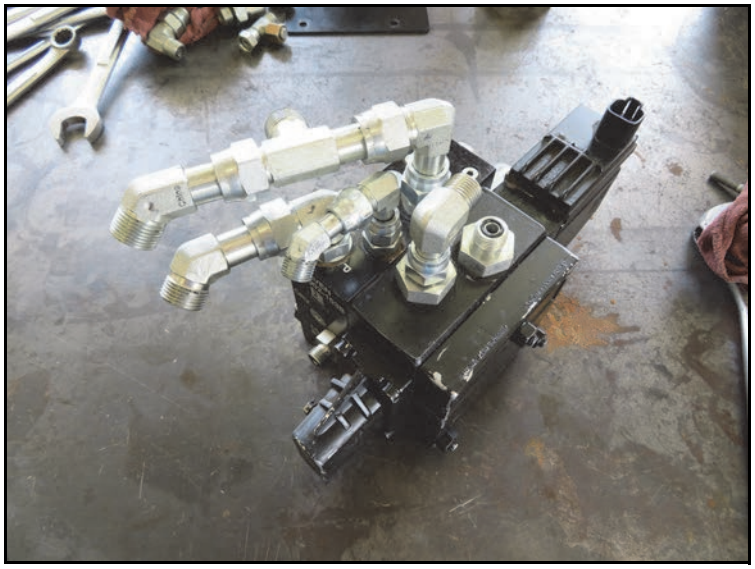
NOTICE

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.

INSTALL FITTINGS IN THE HYDRAULIC STEERING VALVE

Before mounting the hydraulic 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. 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



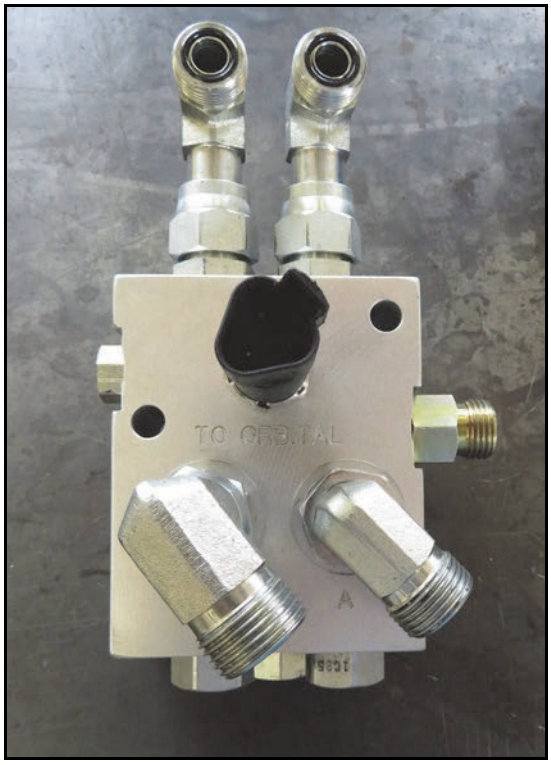
Fitting	Part Number	Port
Fitting - -4 ORFS M/F 45° Swivel Elbow	333-0012-359	LSPV
Fitting - -4 ORFS (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-195	LSPV, LS STEER
Fitting - -4 ORFS M/F 90° Swivel Elbow	333-0012-023	LSPV
Fitting - -6 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-233	A, B
Fitting - -8 ORFS (M) to -8 SAE O-Ring (M) 90° Elbow	333-0012-229	P

Fitting	Part Number	Port
Fitting - -8 ORFS M/F 45° Swivel Elbow	333-0012-102	P, T
Fitting - -8 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-168	T
Fitting - -8 ORFS Run Tee	333-0012-028	T
Fitting - -8 ORFS M/F 90° Swivel Elbow	333-0012-067	T
Fitting - -6 SAE O-Ring Plug	333-0012-104	PS
Fitting - -6 ORFS M/F 90° Swivel Elbow	333-0012-065	A

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



Fitting	Part Number	Port
Fitting - -8 SAE O-Ring (M) to -6 ORFS (M) Straight Adapter	333-0012-199	A1, B1
Fitting - -8 SAE O-Ring (M) to -8 ORFS (M) Straight Adapter	333-0012-168	A2, B, B2
Fitting - -8 ORFS M/F 90° Elbow	333-0012-067	A2, B, B2
Fitting - -4 SAE O-Ring Plug	333-0012-051	P1, T1
Fitting - -4 SAE O-Ring to -6 ORFS (M)	333-0012-114	T2
Fitting - -8 ORFS (M) to -8 SAE O-Ring (M) 90° Elbow	333-0012-229	A
Transducer - 0-3000 PSI Pressure	422-0000-086	PS

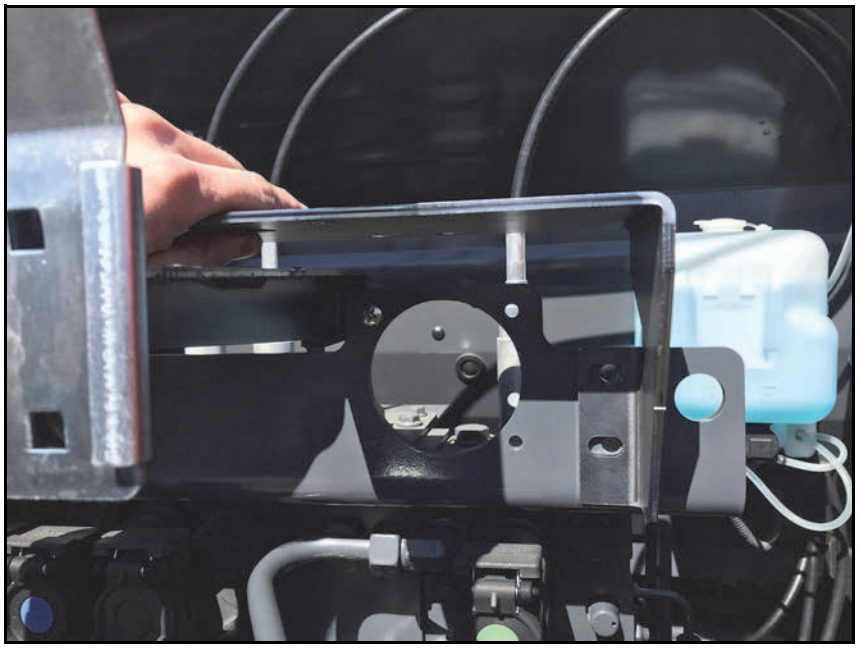
MOUNT THE HYDRAULIC STEERING AND DUAL POCI VALVES

1. Locate the steering valve mounting location at the rear of the machine.

FIGURE 3. Steering Valve Assembly Mounting Location

2. Mount the valve assembly base bracket (P/N 107-0172-637) to the machine using the supplied M8-1.25 x 25mm bolts (P/N 311-4050-180), M8 washers (P/N 313-6000-013) and M8-1.25 locknuts (P/N 312-6001-027).

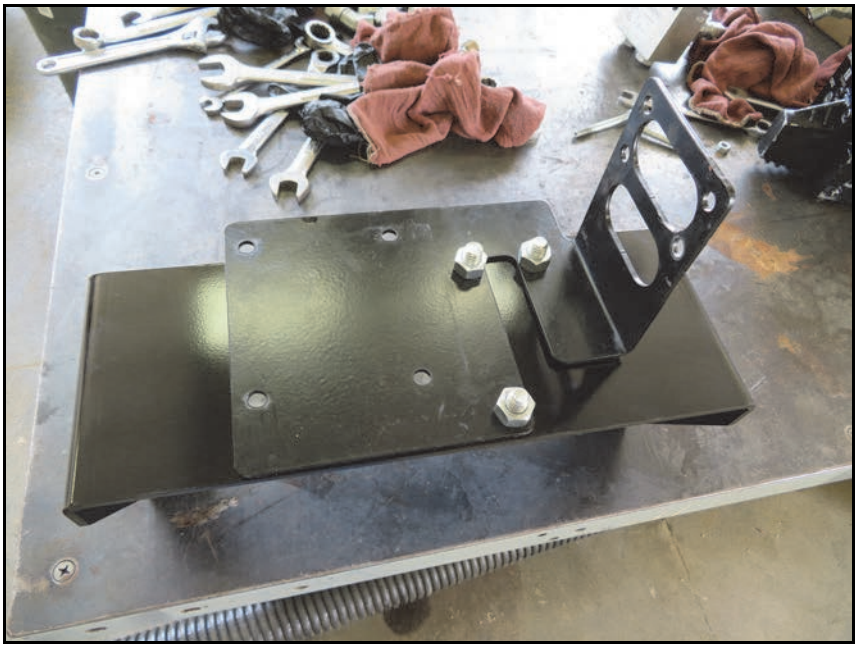
FIGURE 4. Valve Mounting Base Bracket Installed



3. Secure the valve bracket (P/N 107-0172-514) onto bracket (P/N 107-0172-637) with the supplied M10-1.5 x 35mm flanged head bolts (PN 311-4050-225K) and M10-1.5 locknuts (P/N 312-6001-042K).

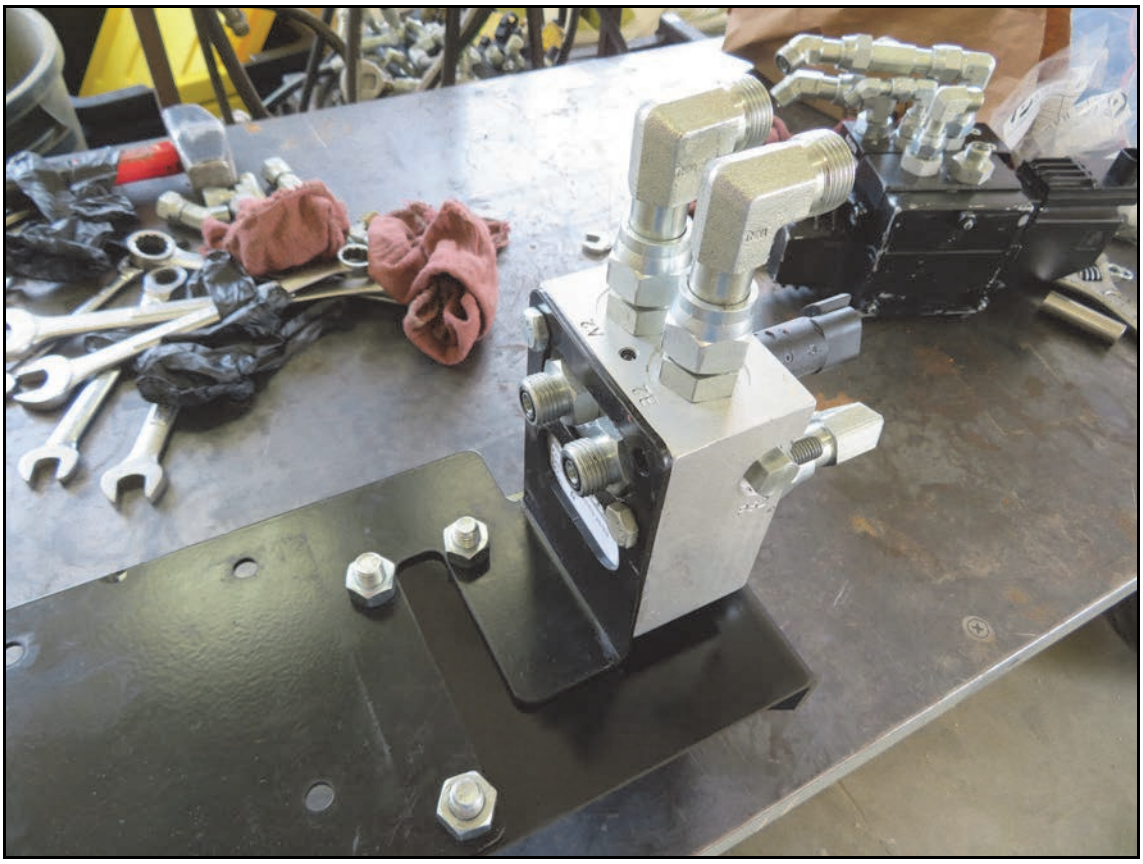
NOTE: Install the M10 bolts from the bottom side to allow clearance below the base bracket.

FIGURE 5. Valve Bracket Installed on Base Bracket



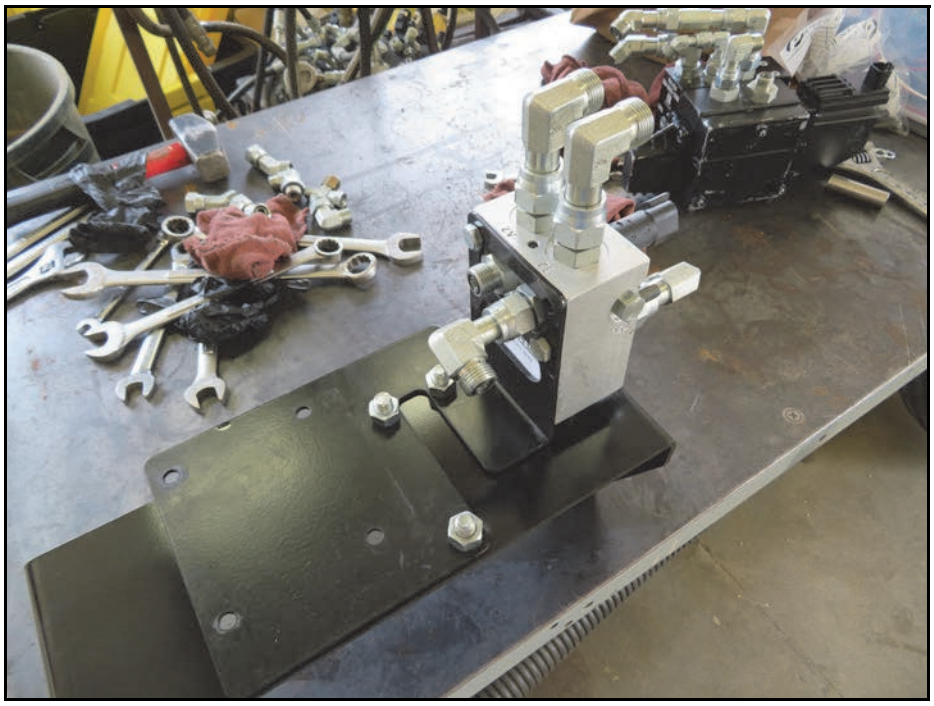
4. Install the dual POCI valve (P/N 334-0003-099) on the valve mounting bracket using two 5/16"-18 x 2-1/2" hex bolts (P/N 311-0054-086) and two 5/16"-18 nylon insert lock nuts (P/N 312-4000-059).

FIGURE 6. POCI Valve Mounted on Bracket



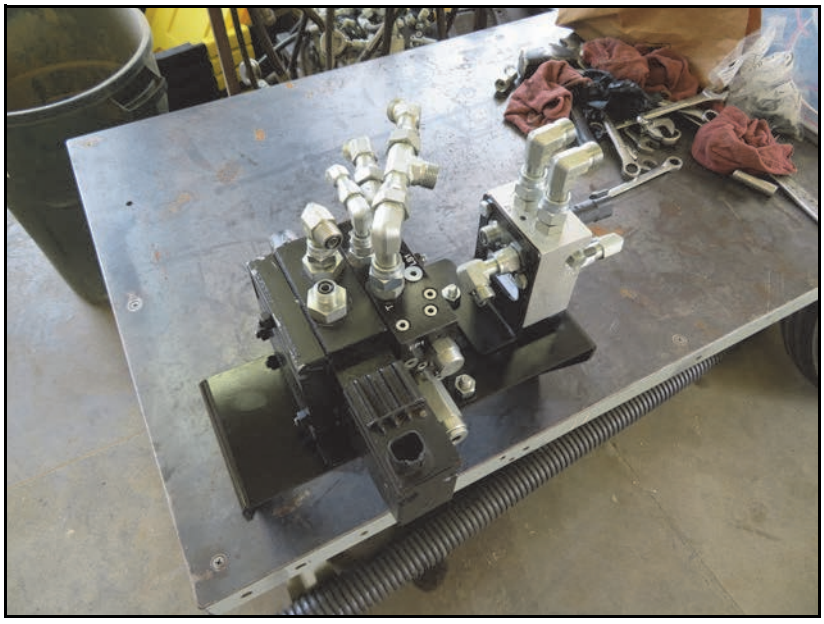
5. Install -6 ORFS swivel elbow (P/N 333-0012-065) onto port B1 of the dual POCI valve.

FIGURE 7. Elbow Fitting Installed in POCI Valve



6. Install and secure steering valve (P/N 334-0003-088) on the valve mounting bracket (P/N 107-0172-514) using four 5/16"-18 x 7/8" hex bolts (P/N 311-0052-104),

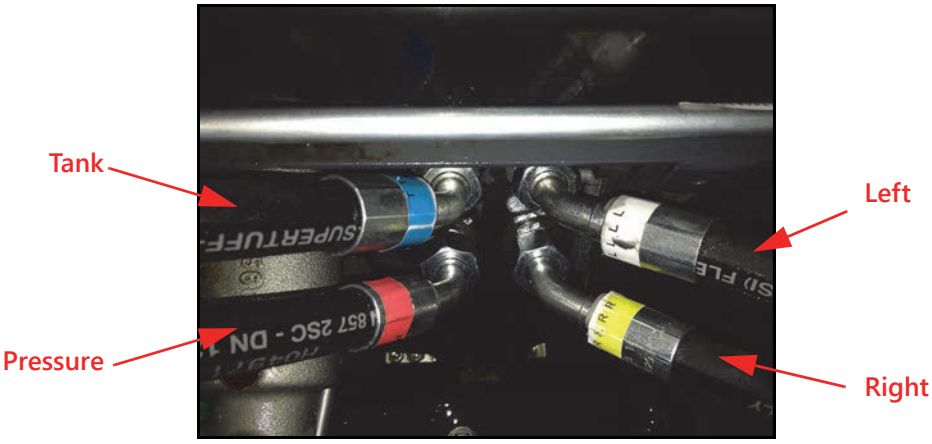
FIGURE 8. Steering Valve Mounted to Valve Mounting Bracket



INSTALL THE LEFT AND RIGHT STEERING HOSES

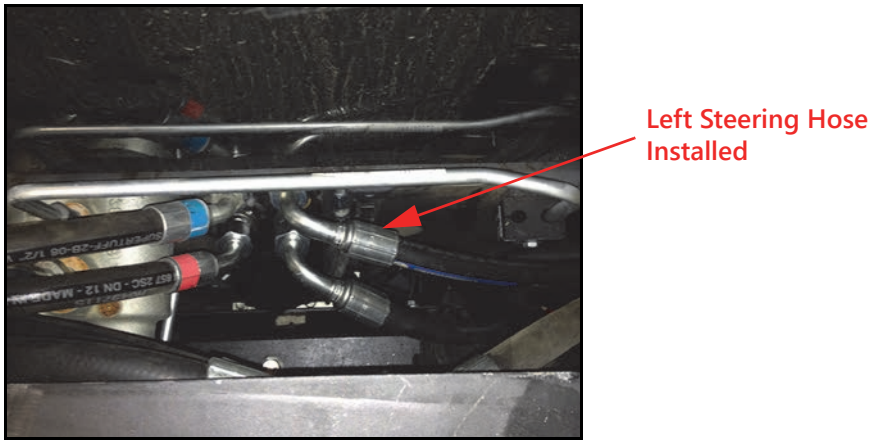
1. Locate the machine steering orbital under the hood.
2. Ensure that the labels on the hydraulic hoses are legible. Relabel the hoses if necessary.

FIGURE 9. Machine Hoses



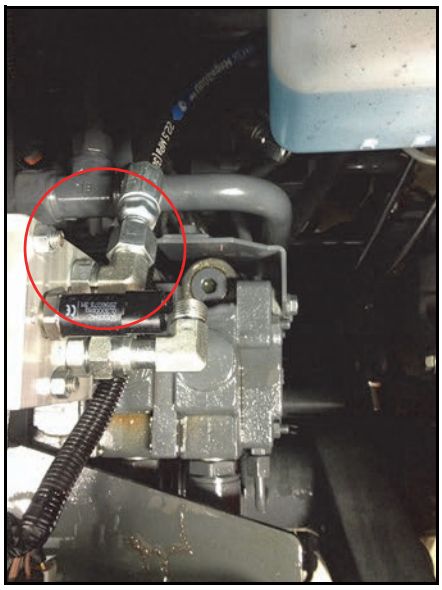
3. Disconnect the left and right steering hoses from the steering orbital.

FIGURE 10. Left Hose Installed on Steering Orbital



4. Install the 45° end of the supplied hydraulic hose (P/N 214-1001-161) on the open left steering port of the steering orbital.

FIGURE 11. Hydraulic Hose Installed on Port A of the Dual POCI Valve



5. Connect the straight end of the installed hydraulic hose to the fitting installed in Port A of the dual POCI valve (P/N 334-0003-099).

FIGURE 12. Hydraulic Hose Installed on Left Steering Hose

6. Install the -15L male end of the supplied hydraulic hose (P/N 214-1001-199) on the left steering hose that was disconnected from the steering orbital.
7. Connect the 45° end of the installed hydraulic hose to the fitting installed in Port A2 of the dual POCI valve.

FIGURE 13. Dual POCI Valve Port A2 Connection

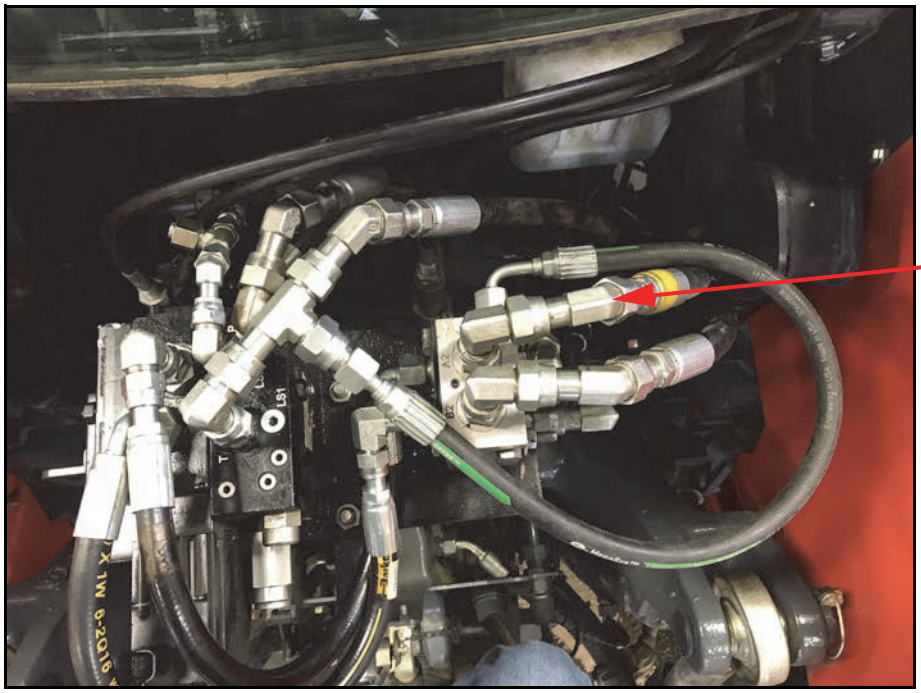
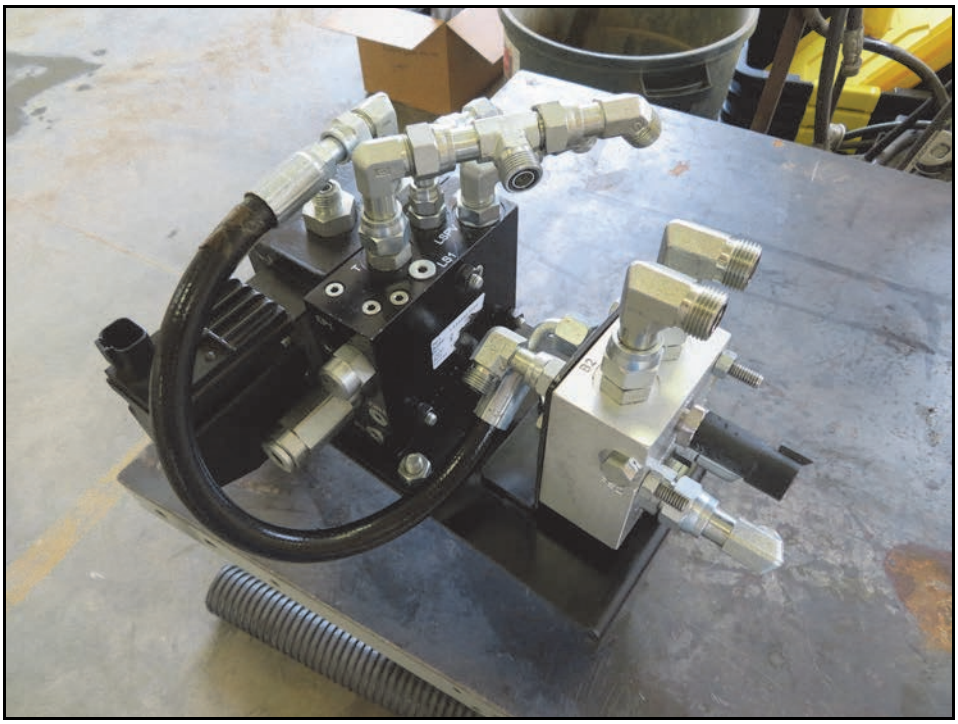
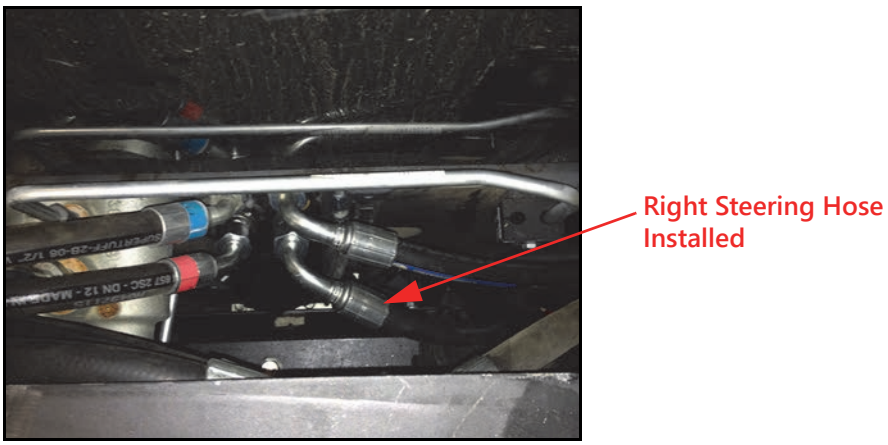


FIGURE 14. Left Steering Hose Installed on Hydraulic Steering and Dual POCI Valve



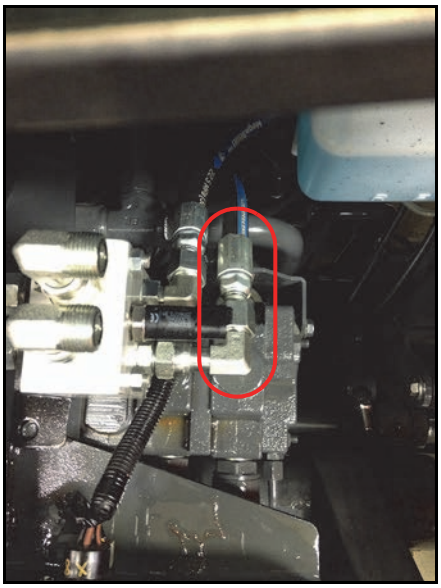
8. Install the 90° end of the supplied hydraulic hose (P/N 214-1001-162) on the fitting installed in Port A1 of the dual POCI valve.
9. Connect the straight end of the installed hydraulic hose to the fitting installed in Port A of the hydraulic steering valve (P/N 334-0003-088).

FIGURE 15. Right Steering Hoses Installed on Steering Orbital



10. Install the 45° end of the supplied hydraulic hose {P/N 214-1001-161) on the open right steering port of the steering orbital.

FIGURE 16. Hydraulic Hose Installed on Dual POCI Valve Port B



11. Connect the straight end of the installed hydraulic hose to the fitting installed in Port B of the dual POCI valve.

FIGURE 17. Hydraulic Hose Installed on Right Steering Hose

12. Install the -15L male end of the supplied hydraulic hose (P/N 214-1001-199) on the right steering hose that was disconnected from the steering orbital.
13. Connect the 45° end of the installed hydraulic hose to the fitting installed in Port B2 of the dual POCI valve.

FIGURE 18. Dual POCI Valve Port B2 Connection

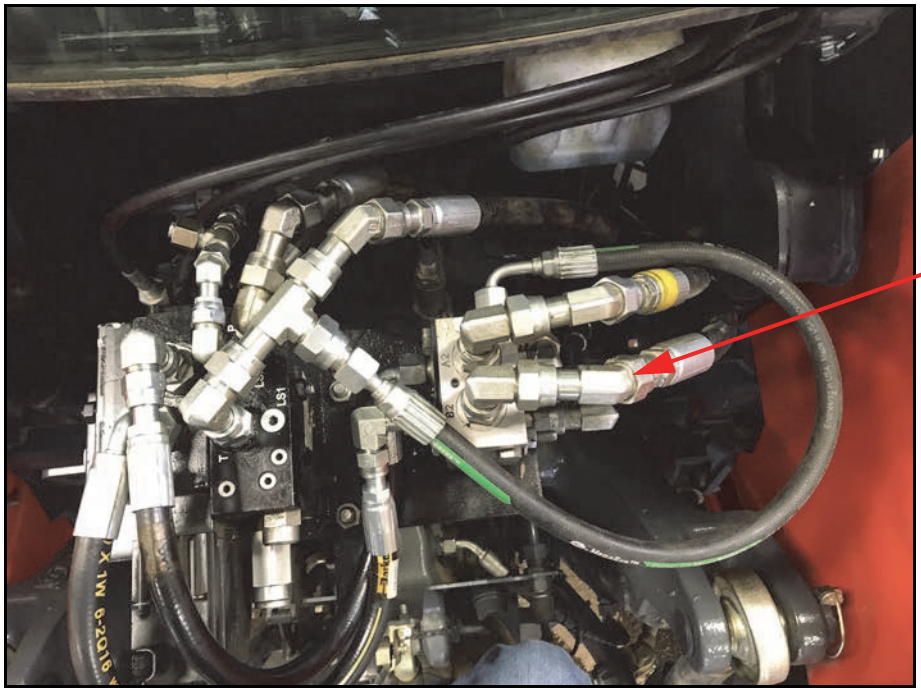
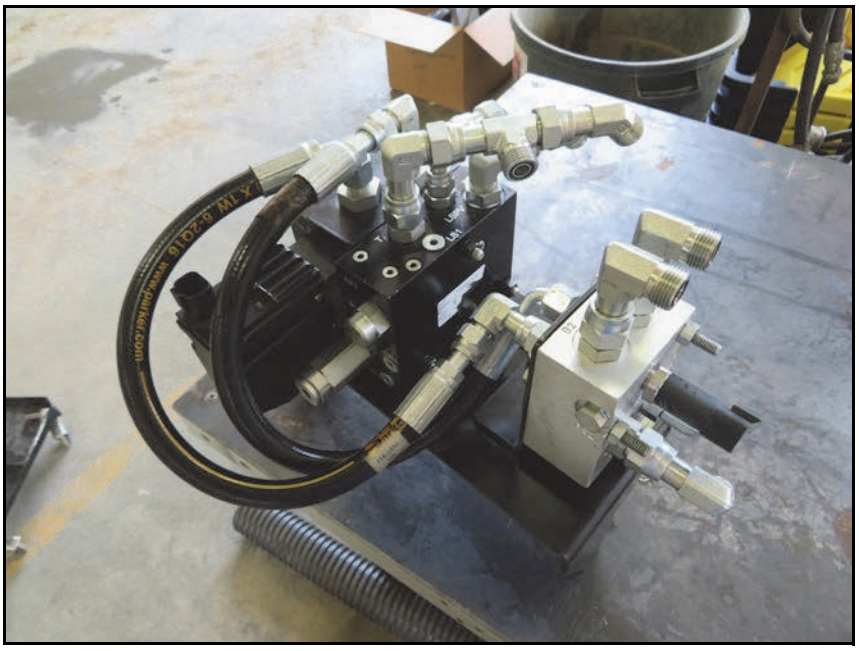


FIGURE 19. Right Steering Hose Installed on the Hydraulic Steering and Dual POCI Valve



14. Install the 90° end of the supplied hydraulic hose (P/N 214-1001-162) on Port B of the hydraulic steering valve.
15. Connect the straight end of the installed hydraulic hose to the fitting installed in Port B1 of the dual POCI valve.
16. Secure the left and right steering hoses away from sharp edges, pinch points, and heat sources.

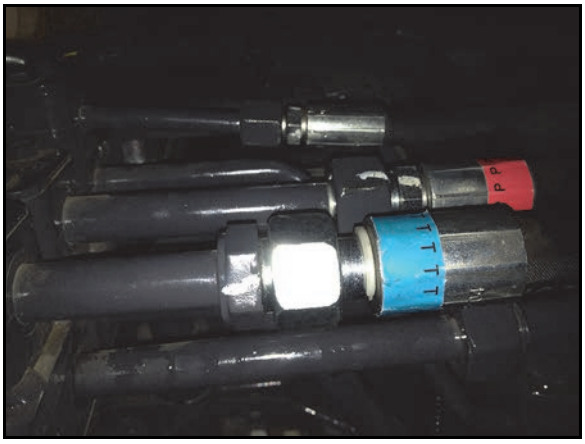
INSTALL THE LOAD SENSE HOSES

NOTE: The pressure and tank hoses disconnected in this section will be connected later in the installation procedure.

FIGURE 20. Pressure and Tank Hose Location

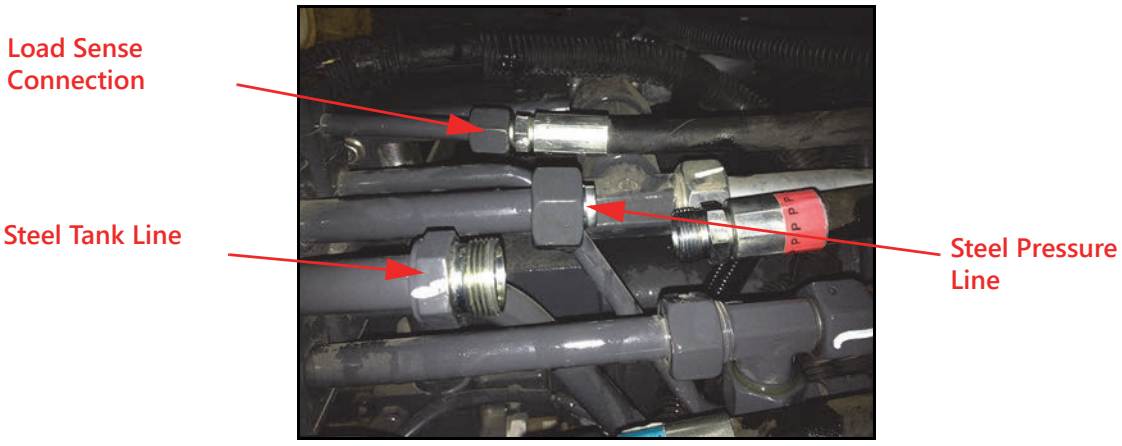
1. Locate the pressure and tank hoses below the right side of the cab.

FIGURE 21. Pressure and Tank Hoses



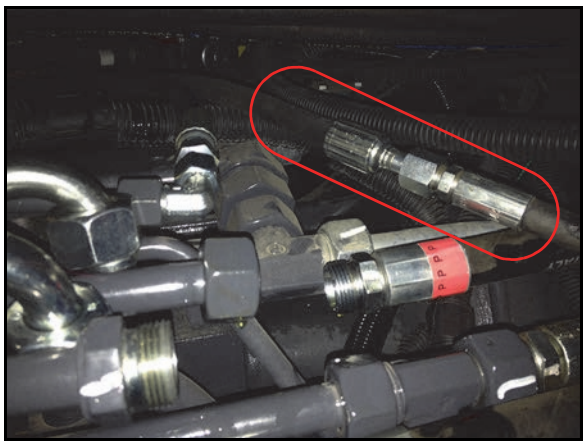
2. Label and disconnect the pressure and tank hoses from their steel lines.

FIGURE 22. Load Sense Connection on Hydraulic Valve



3. Locate the load sense connection behind the steel pressure and tank lines.
4. Disconnect the load sense hose from the steel load sense line.

FIGURE 23. Hydraulic Hose Installed on Load Sense Hose



5. Install the straight end of the supplied hydraulic hose (P/N 214-1001-200) on the load sense hose.

FIGURE 24. LS STEER Hose Installed on the Hydraulic Steering Valve

6. Connect the 45° end of the installed hydraulic hose to the fitting installed in Port LS STEER of the hydraulic steering valve (P/N 334-0003-088).

FIGURE 25. Hydraulic Hose Installed on Steel Load Sense Line

7. Install a 8L M/F 90° elbow fitting (P/N 333-0012-367) on the steel load sense line.
8. Install the male end of the supplied hydraulic hose (P/N 214-1001-201) on the installed elbow fitting.

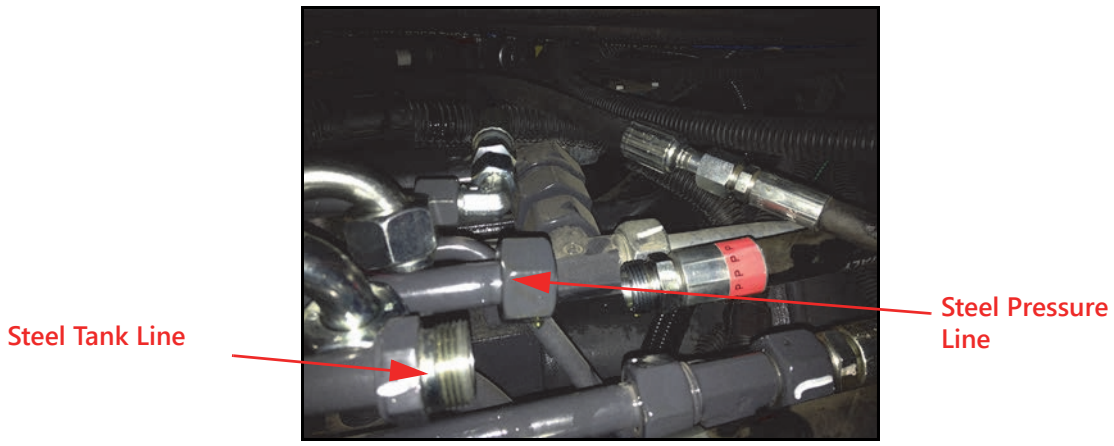
NOTE: It may be necessary to install additional 8L M/F 90° elbow fittings to achieve the connection.

FIGURE 26. LSPV Hose Installed on Hydraulic Steering Valve

9. Connect the other end of the installed hydraulic hose to the fitting installed in Port LSPV of the hydraulic steering valve.
10. Secure the load sense hoses away from sharp edges, pinch points, and heat sources.

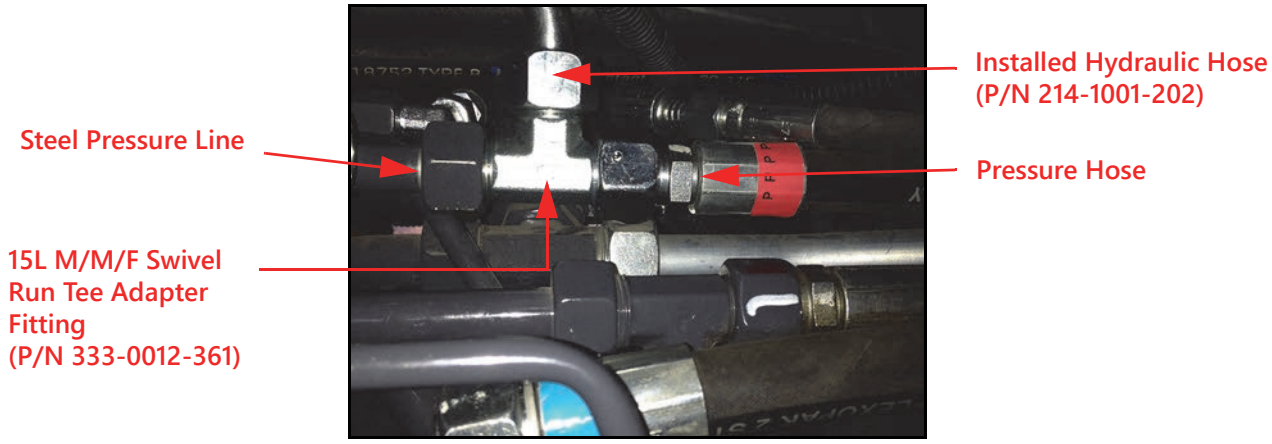
INSTALL THE PRESSURE AND TANK HOSE

FIGURE 27. Pressure Connection on Hydraulic Valve



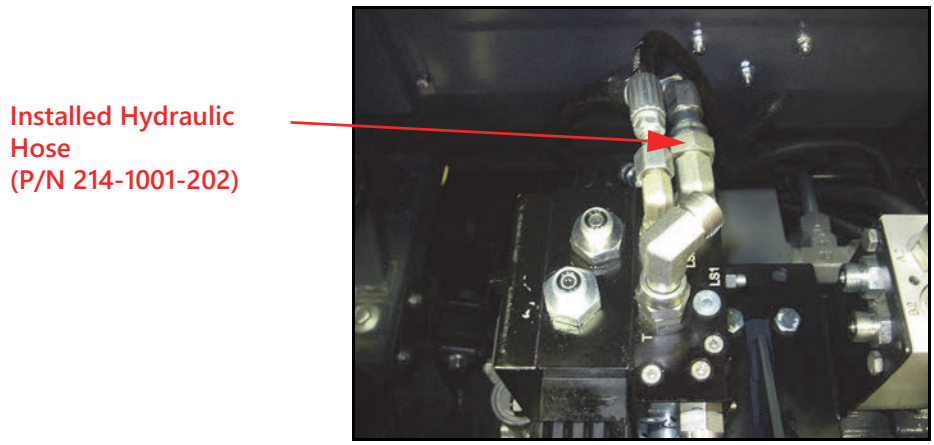
1. Locate the steel pressure line below the right side of the cab.

FIGURE 28. Pressure Hoses Installed on Steel Pressure Line



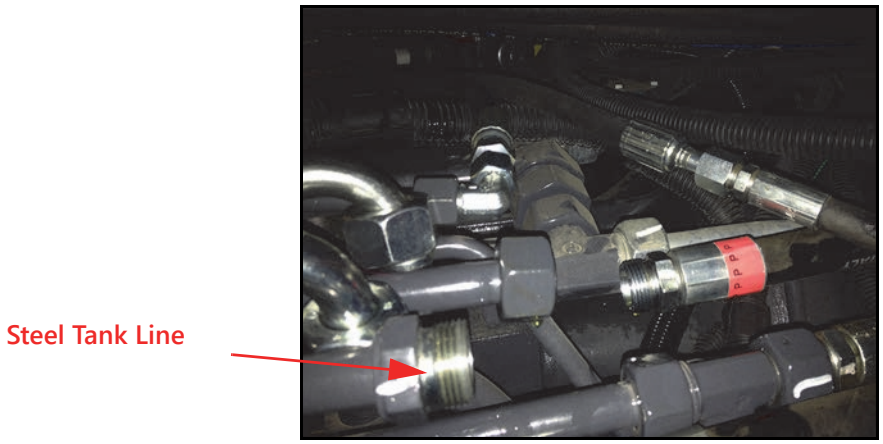
2. Install a 15L M/M/F swivel run tee adapter fitting (P/N 333-0012-361) on the steel pressure line.
3. Connect the pressure hose to the opposite end of the installed tee fitting.
4. Install the 90° end of the supplied hydraulic hose (P/N 214-1001-202) on the 90° end of the installed tee fitting.

FIGURE 29. Pressure Hose Installed on the Hydraulic Steering Valve



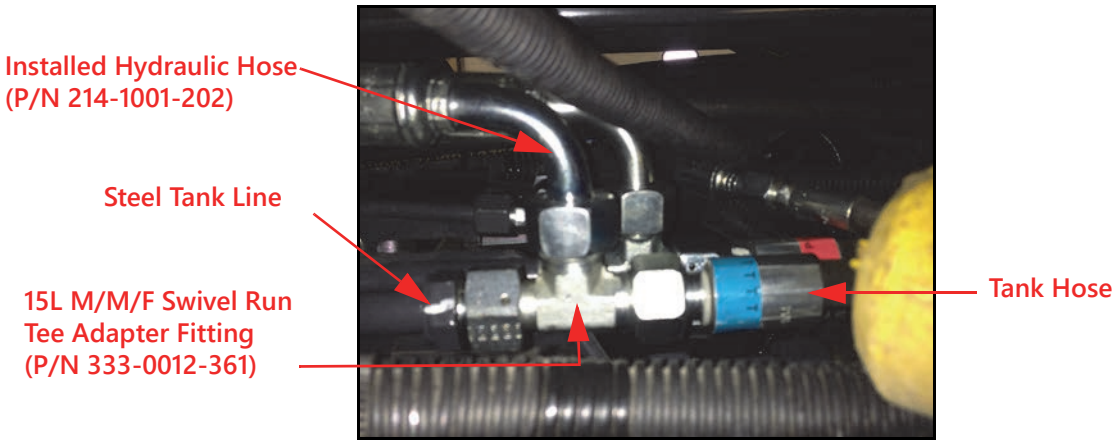
5. Connect the straight end of the installed hydraulic hose to the fitting installed in Port P of the hydraulic steering valve.
6. Secure the installed pressure hoses away from sharp edges, pinch points, moving parts, and heat sources.

FIGURE 30. Pressure Connection on Hydraulic Valve



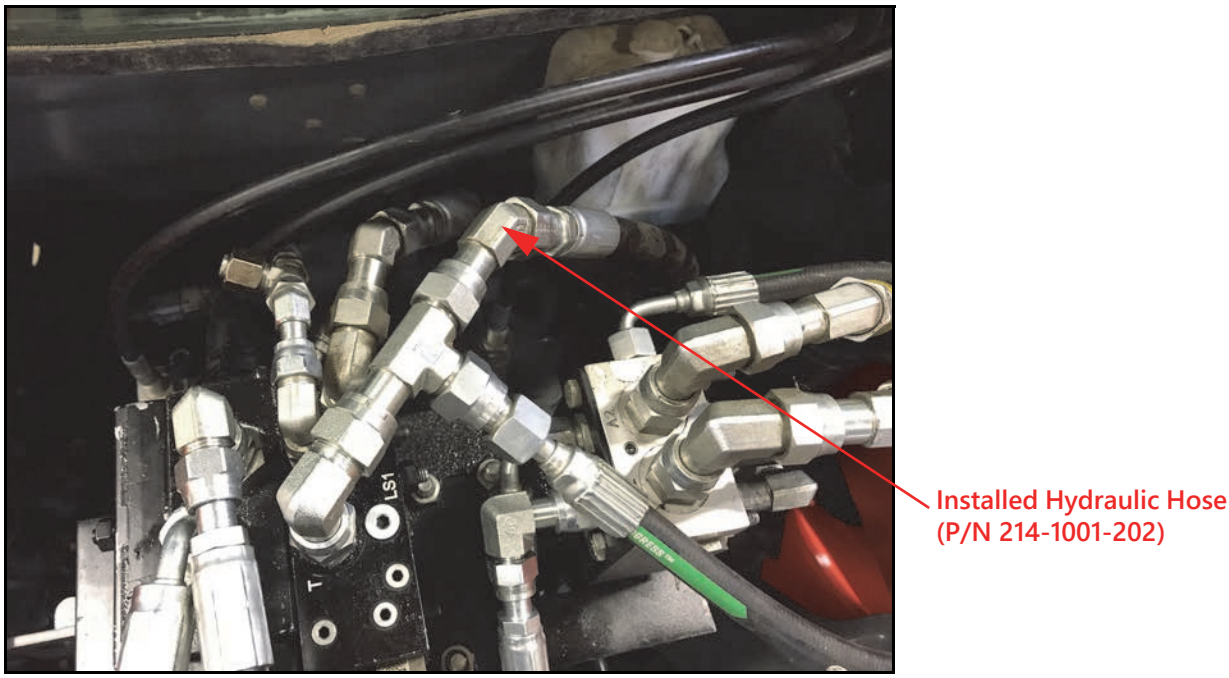
7. Locate the steel tank line below the right side of the cab.

FIGURE 31. Tank Hoses Installed on Steel Tank Line



8. Install a 15L M/M/F swivel run tee adapter fitting (P/N 333-0012-361) on the steel tank line.
9. Connect the tank hose to the opposite end of the installed tee fitting.
10. Install the 90° end of the supplied hydraulic hose (P/N 214-1001-202) on the 90° end of the installed tee fitting.

FIGURE 32. Tank Hose Installed on the Hydraulic Steering Valve

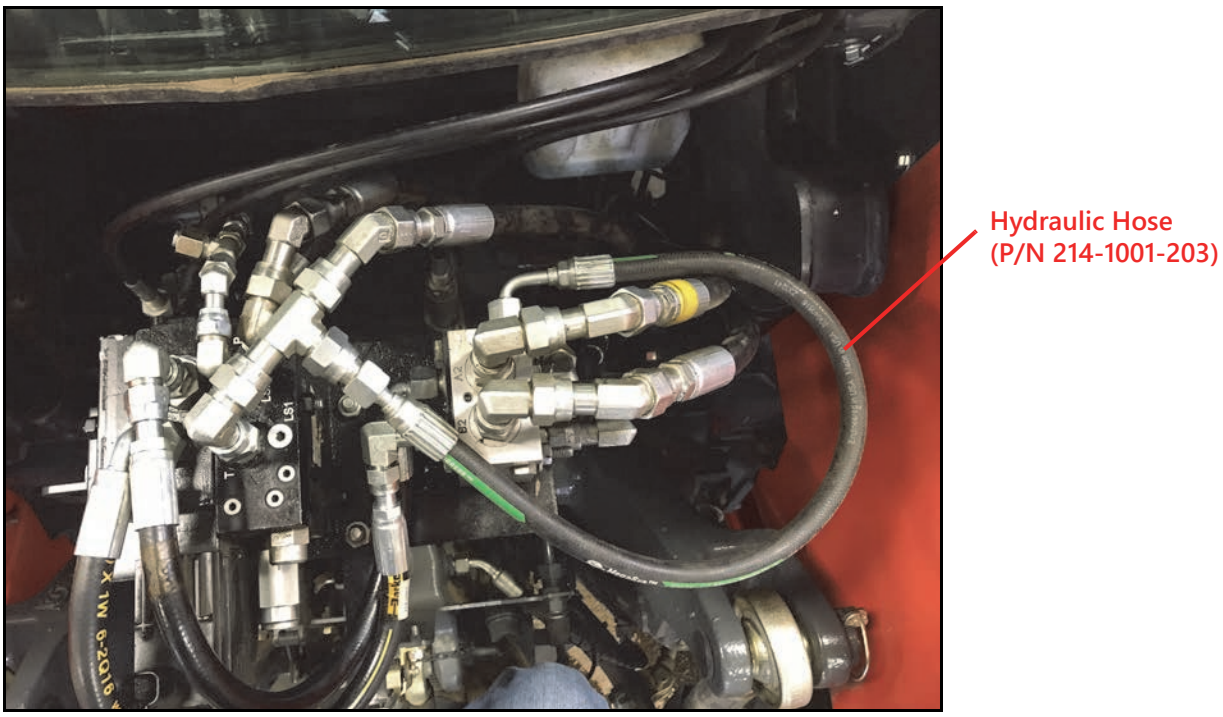


11. Connect the straight end of the installed hydraulic hose to the fitting installed in Port T of the hydraulic steering valve (P/N 334-0003-088).
12. Route the installed tank hoses away from sharp edges, pinch points, moving parts, and heat sources.

INSTALL TANK RELIEF HOSE

1. Install the -8 ORFS (F) end of hose (P/N 214-0001-203) to the open port of the tank tee fitting.

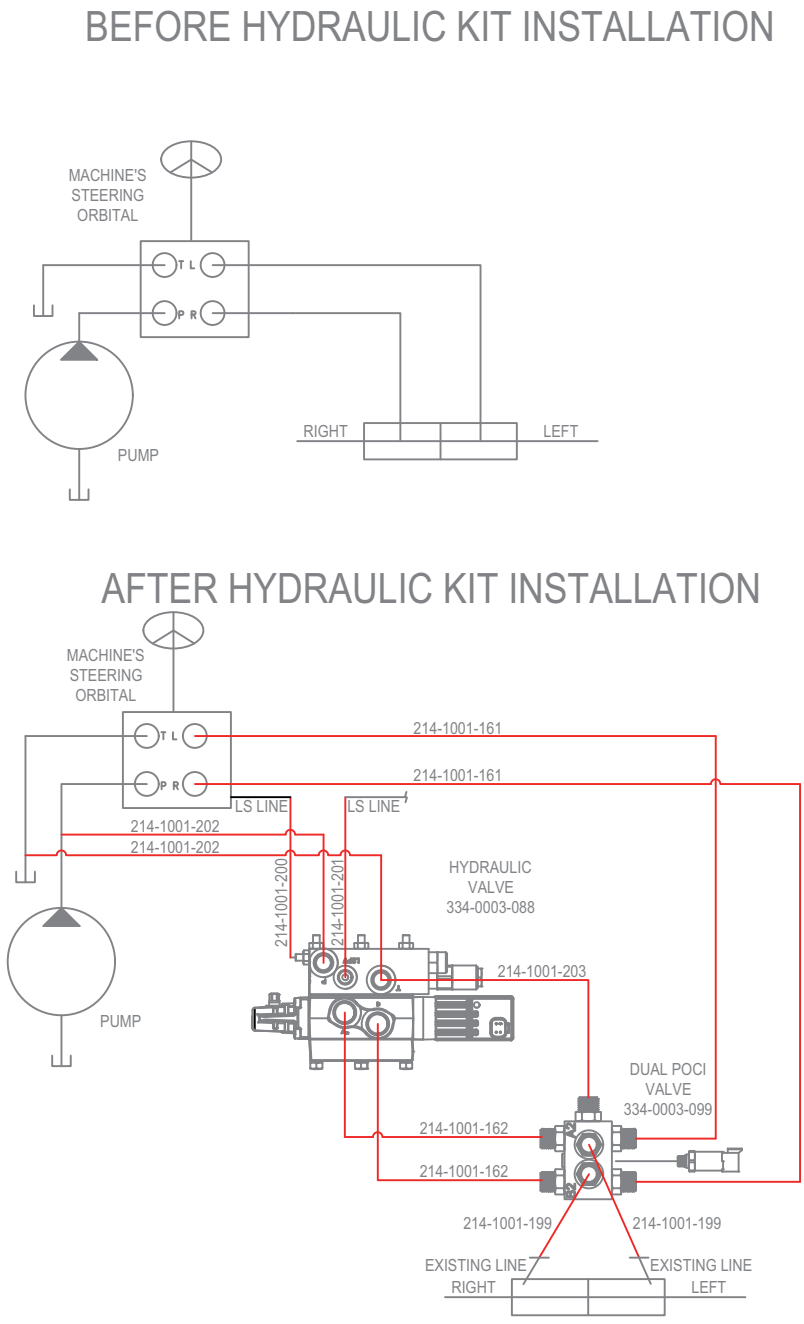
FIGURE 33. Tank Relief Hose Installed



2. Install the -6 ORFS (F) end of hose to the T2 port of the dual POCI valve.

HYDRAULIC DIAGRAM

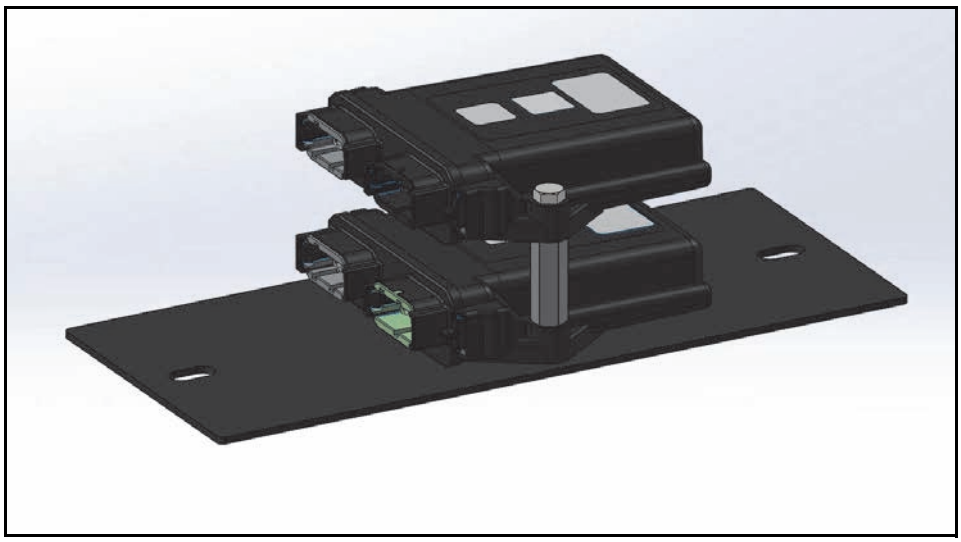
FIGURE 34. Hydraulic Steering Installation Diagram



CHAPTER 4 CAB COMPONENT INSTALLATION

HDU AND TC1 NODE MOUNTING

FIGURE 1. TC1/HDU Nodes Installed



1. Mount the TC1 node (P/N 063-0174-070) to the node mounting plate (P/N 107-0172-635) and secure with the hex standoffs (P/N 305-1000-013).
2. Mount the HDU node (P/N 063-0173-887) the installed standoffs and secure with 1/4"-20 x 1" bolts (P/N 311-0050-105).
3. Locate the predrilled holes behind the operator seat to which the HDU and TC1 nodes will be mounted.

FIGURE 2. Node Mounting Points

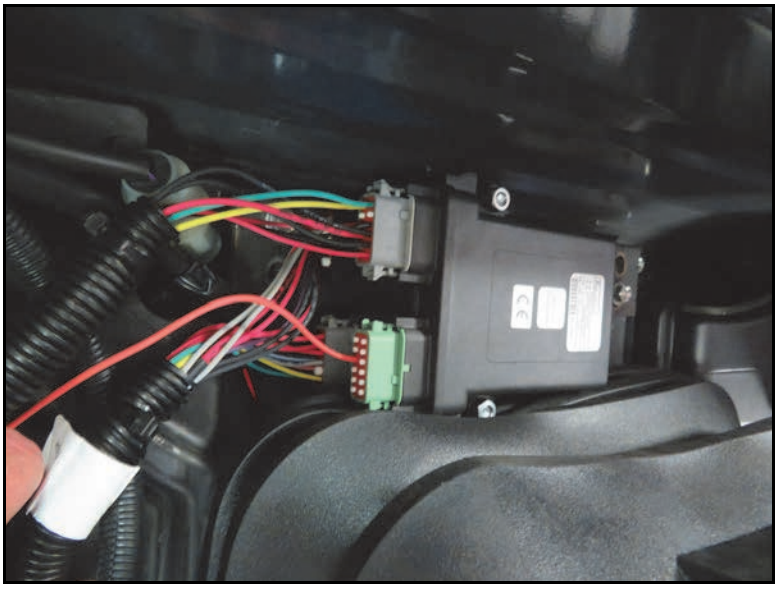
4. Secure the node and plate assembly to the floor with the provided M8-1.25 x 25mm bolts (P/N 311-4050-180K) and M8 washers (P/N 313-6000-013).

CABLE INSTALLATION

IN CAB

1. Connect the two 12-pin connectors labeled "SC1" on the HDU/SC1 cable (P/N 115-4010-134) into the TC1 node.
2. Connect the two 12-pin connectors labeled "HDU" on the HDU/SC1 cable (P/N 115-4010-134) into the HDU node.

FIGURE 3. TC1/HDU Cable Connection



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

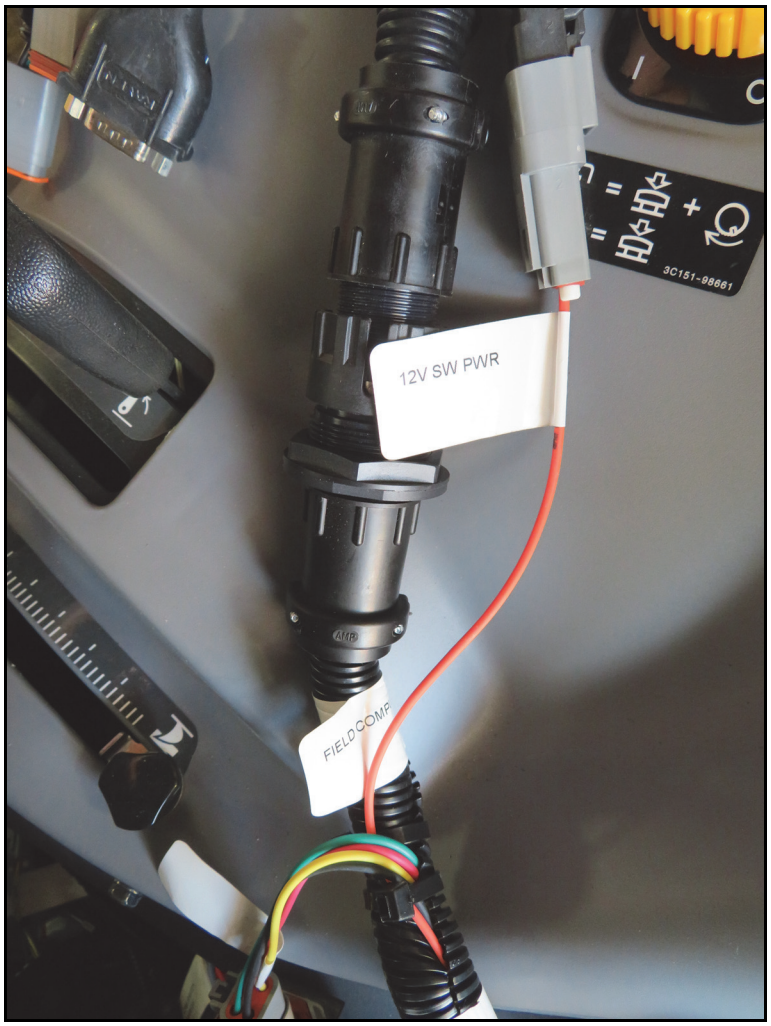
FIGURE 4. Power Terminal Location

4. Use the supplied GPS PWR and SERIAL GPS OUT connectors to connect to your specific GPS system. Contact your local dealer for assistance with integrating the TC1/HDU system with your specific GPS receiver.

FIGURE 5. GPS Connections

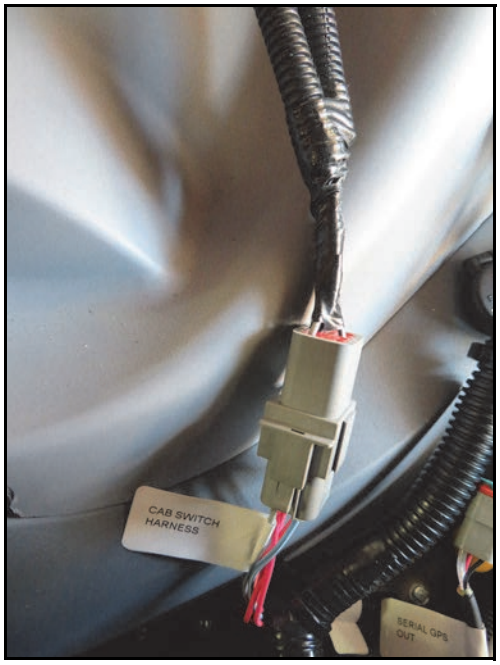
5. Locate the round connector labeled Field Computer and the 2-pin connector labeled 12V SW PWR. Connect to appropriate field computer harness.

FIGURE 6. Switched Power and Field Computer Connections



6. Locate the 8-pin connector labeled CAB SWITCH HARNESS on the Tractor Harness cable (P/N 115-4010-134) previously installed.

FIGURE 7. Cab Switch Harness Connection



7. Connect mating connector on HDU Cab Switch Breakout Cable (P/N 115-4010-028) to the CAB SWITCH HARNESS connection.
8. Route the Engage Foot Switch (P/N 063-0173-470) to the mating connector on the Breakout Cable (P/N 115-4010-028).

FIGURE 8. Resume Foot Switch Connection

9. 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.

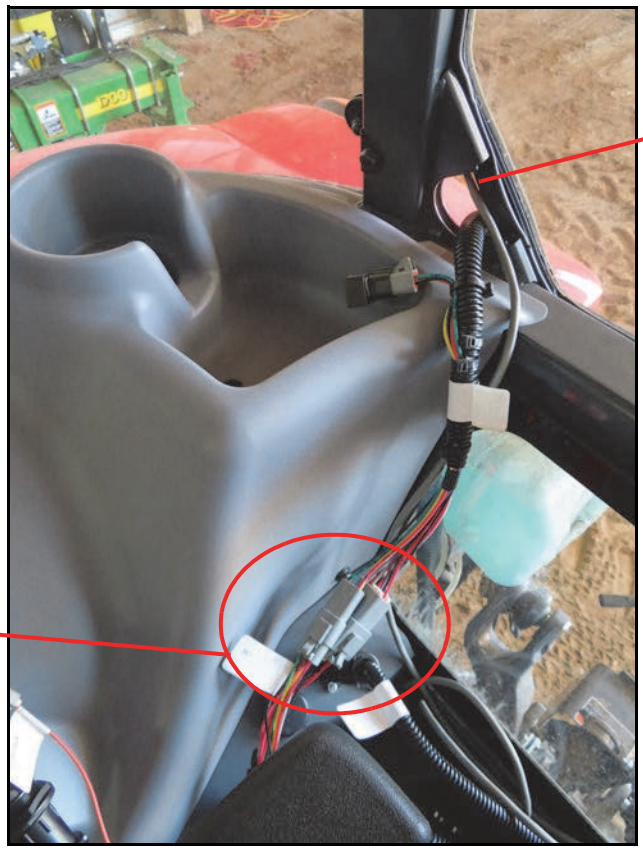
10. Using the holes in the foot switch as a template, drill holes in the floor of the cab.
11. Secure the foot switch to the floor by installing the supplied screws in each of the mounting holes.
12. Secure the Master Switch (P/N 063-0173-961) between the two switch enclosure halves (P/N 118-0159-056 and 118-0159-057) and locate an appropriate location to mount the master switch assembly.
13. Connect the supplied master switch (P/N 063-0173-961) to the mating connector on the Breakout Cable (P/N 115-4010-028).

FIGURE 9. Master Switch Connection

OUTSIDE OF CAB

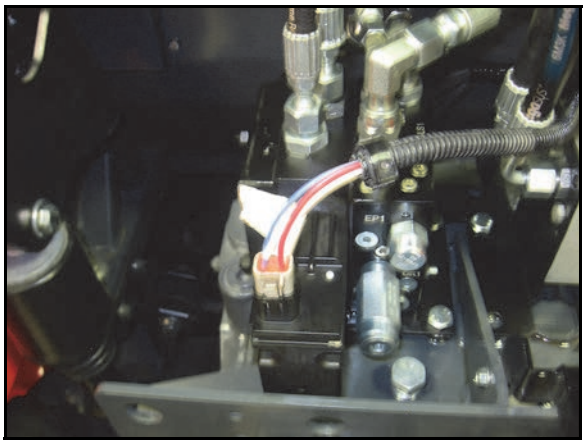
1. Locate the 12-pin and 4-pin connectors near the CAN terminator on the Valve Harness Cable (P/N 115-4010-133) and route them into the cab through the cab access port at the bottom, right corner of the rear window.
2. Connect the Valve Harness Cable (P/N 115-4010-133) to the mating connectors on the HDU/SC1 Cable (P/N 115-4010-134) inside the machine cab.

FIGURE 10. Cab Access Point



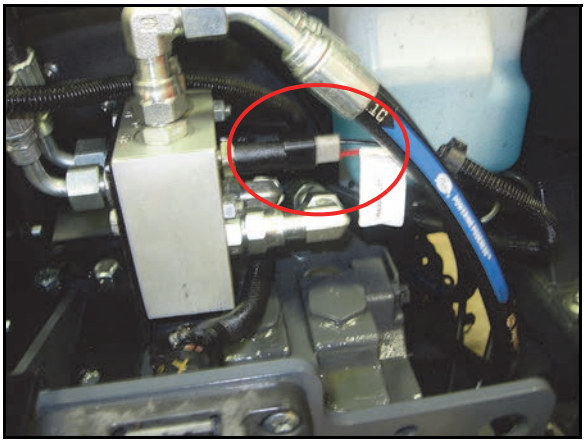
3. Route the 4-pin connector labeled VALVE to the steering valve at the rear of the machine.
4. Connect the VALVE connector to the mating port on the steering valve.

FIGURE 11. Valve Harness Connected to the Hydraulic Steering Valve



5. Connect the 3-pin connector labeled PSI to the pressure transducer on the dual POCI valve.

FIGURE 12. Pressure Transducer Connection



6. Route the remaining branch of the cable to the front, left wheel.
7. Locate the wheel angle sensor electrical connector.

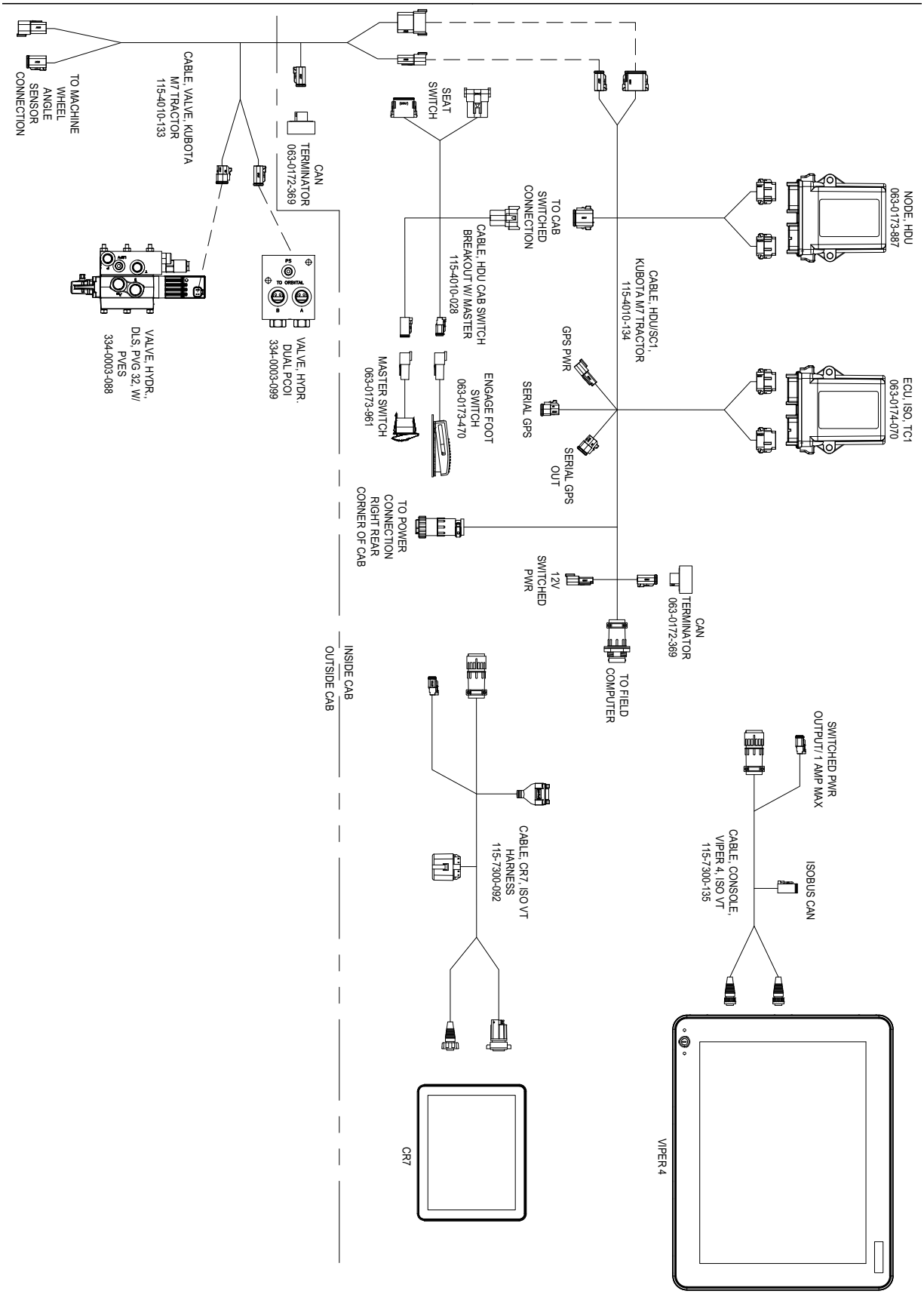
FIGURE 13. Wheel Angle Sensor Connection

8. Disconnect the 6-pin WAS connection on the left side of the machine, behind the front axle and tee in the connection labeled WAS on the valve cable harness (P/N 115-4010-133).

FIGURE 14. WAS Tee to Valve Harness Connection

9. Route the WAS cables away from moving parts and heat sources, securing them with plastic cable ties as necessary.

FIGURE 15. Valve Harness Wiring Diagram (P/N 054-5035-006 Rev. A)



CHAPTER 5 STARTUP PROCEDURES

WARNING

When starting the machine for the first time after installing TC1, 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 SC1/TC1 Calibration and Operation Manual (P/N 016-4010-005) or contact your local Raven dealer.

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We Solve Great Challenges.

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.

RAVEN

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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.