

Automated Steering Kit Installation Guide


Kit: EDX-V280, P/N 911-2045-000

**Fits Buhler Versatile MFWD Tractor
Models:**

250 280 305



Read and Follow Safety Messages

- In these instructions, you will see the heading **WARNING** and the safety alert symbol . They indicate a hazardous situation that, if not avoided, could result in death or serious injury. The safety messages provide information to identify a hazard associated with potential injury.
- Before installing, operating, or performing maintenance or service on any part of the system:
 - Read and understand this installation guide and all of the safety information.
 - Read and understand the Automated Steering System User Guide.
- Do not allow anyone to operate without instruction.
- Keep these instructions and all related safety information with the manual for your machine and other implements.

If you have any questions or need assistance, contact your local dealer or distributor.

Overview

A series of equipment specific kits has been developed to work in conjunction with your automated steering system. For the machine models listed above, these kits contain the components for:

- the steering hydraulics
- the wheel angle sensor (WAS)
- the steering wheel switch (SWS - for steering override)

The items in each kit are detailed in the tables that follow the safety warnings starting below. After the kit tables, there are four step-by-step installation sections, one for each of the kits.

Please read this manual thoroughly before beginning the installation.

WARNING:

To avoid serious injury or death during machine operation, install the appropriate kit for your machine make and model.

Machine Preparation

⚠ WARNING:

Inspect the machine and perform any needed maintenance (for example, contaminated hydraulic fluid) before installing the automated steering kit. This kit cannot perform as intended on a machine that is not maintained properly. Errors in performance increase the risk of operator and bystander injury or death.

Failure to maintain clean hydraulic fluid and operational hydraulic components can cause loss of directional control resulting in serious injury or death.

To avoid serious injury, wear hand and eye protection and use wood or cardboard when checking for leaks.

Turn off the machine and power off the automated steering controller when installing or performing maintenance.

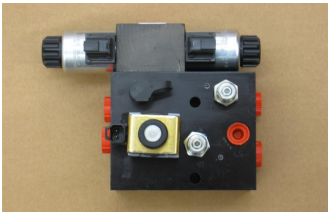


Before attempting to install any of the components, park the machine on a clean level floor with adequate clearance to work all around.

Before you perform any drilling, cutting or fastening, ensure that no other machine components, such as hydraulic hoses or electrical wiring, will be damaged. Failure to follow this warning may cause physical injury and/or damage to the machine.







To prevent hydraulic system contamination, it is essential to thoroughly clean hydraulic system fittings and hose connections prior to disconnecting or removing. Use a degreasing solvent spray cleaner such as a brake cleaner to prevent hydraulic system contamination. Note that o-rings used on ORB and ORFF type fittings, referred to in the Kit Contents section, may be damaged by degreasing solvent cleaners. If a fitting is to be cleaned internally, you should first remove and clean the o-ring with a fiberless cloth.

Kit Contents - Steering Hydraulics





Unpack the hydraulics installation kit and identify the required parts as shown. Kit items are A, B, C etc. with an H (Hydraulic) prefix.

REF	PART NUMBER	QTY	DESCRIPTION	PHOTOGRAPH
HA	760-0021-000	1	Assembly, hyd valve block - 35L\proportional (Hydraulic steering block)	
Bag H1 contains HB and HC				
HB	760-2061-000	4	Adapter, hyd 90 elbow - #6maleJIC x #8maleORB (P [pressure], T [tank] and A and B [steering] ports in HA)	
HC	760-2058-000	1	Adapter, hyd 90 elbow - #6maleJIC x #6maleORB (LS port in HA)	

Kit Contents - Steering Hydraulics *(continued)*






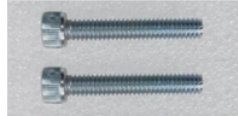



REF	PART NUMBER	QTY	DESCRIPTION	PHOTOGRAPH
Bag H2 contains HD				
HD	675-2006	2	Bolt, 3/8NC x 3-3/4" Gr5, ZP	
	678-1054	2	Washer, narrow flat, 3/4"OD x 13/32"ID x 1/16" thk, ZP	
	676-1035	2	Nut, nylock - 3/8NC, ZP	
(Mount HA and HE on machine)				
Bag H4 contains HH				
HH	760-2069	4	Adapter, hyd run-tee - #8ORFF	
			(Pressure, tank and steering lines)	
Bag H5 contains HI, HJ, HK and HL				
HI	760-0002	1	Assembly, hydraulic load sense shuttle valve - #6femORB	
HJ	760-2040	1	Adapter, hyd 90 elbow - #6maleORB x #6femORFF swivel	
			(Function port of HI, connects to machine's steel LS line)	
HK	760-2048	1	Adapter, hyd - #6maleORFF x #6maleORB	
			(Source port of HI, connects to machine's rubber LS hose)	
HL	760-2058	1	Adapter, hyd 90 elbow - #6maleJIC x #6maleORB	
			(LS port of HI, connects to HO)	

Kit Contents - Steering Hydraulics (continued)






REF	PART NUMBER	QTY	DESCRIPTION	PHOTOGRAPH
HM	760-1338-000	2	Hose, hyd - 3/8" x 90", #6femJIC swivel x #8femORFF 90 swivel (Steering hoses)	
HN	760-1337-000	2	Hose, hyd - 3/8" x 74", #6femJIC swivel x #8femORFF 90 swivel (Pressure and tank hoses)	
HO	760-1028	1	Hose, hyd - 1/4" x 78", #6femJIC swivel both ends (Load sense hose)	
HP	677-2001	20	Tie strap, 11" heavy duty	

Kit Contents - Wheel Angle Sensor

Unpack the wheel angle sensor kit and identify the required parts as shown. Kit items are A, B, C etc. with a W (Wheel) prefix.

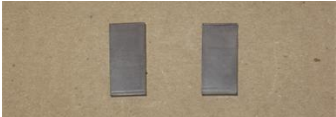





REF	PART NUMBER	QTY	DESCRIPTION	PHOTOGRAPH
Bag 710-0099-000 contains WA to WJ				
WA	720-0045-000#	1	WAS assembly	
WB	750-5002-000	1	Sensor, dual output, BEI (‘wire connector’)	
WC	602-1087-000	1	Connector arm, steering	
WD	675-1191-000	2	Screw, mach, 8-32 x 3", PPH, ZP	
WE	676-1054-000	4	Nut, nylock 8-32NC, ZP	
WF	675-1150-000	2	Screw, 8-32 x 1", Allen socket cap, ZP	
WG	675-2031-000	1	Threaded rod, 5/16-24 x 12"	
WH	676-1053-000	4	Nut, 5/16-24 standard, ZP (Use with WG and WI)	
WI	760-0018-000	2	Rod end swivel with stud, 5/16-24	

Kit Contents - Wheel Angle Sensor *(continued)*

REF	PART NUMBER	QTY	DESCRIPTION	PHOTOGRAPH
WJ	675-2010-000	2	Bolt, 5/16NC x 3/4" Gr5, ZP	
	678-1077-000	2	Washer, lock 5/16, ZP (Attaches WAS assembly to WL)	
WK	640-0126-000	1	WAS assembly mounting bracket (Extend using WL)	
WL	640-0160-000	1	WAS assembly mounting bracket extension (Extend WK)	
Bag W3 contains WM, WN, WO and WP				
WM	675-2010-000	2	Bolt, 5/16NC x 3/4" Gr5, ZP	
	676-1083-000	2	Nut, nylock 5/16", SS (Join WK and WL)	
WN	675-2050-000	2	Bolt M16-2.0 x 25mm, Gr 8.8, ZP	
	678-1056-000	2	Washer, narrow flat - 5/8" (Bolt WK to axle if no fender bracket bolts to use)	
WO	675-0132-000	1	Clamp bracket, 1.62" - 1.87" TBOLT, SS (For link rod assembly - or use WP, depending on tie rod diameter)	
WP	675-0167-000	1	Clamp bracket, 1.75" - 2.0" TBOLT, SS (For link rod assembly - or use WO, depending on tie rod diameter)	

Kit Contents - Steering Wheel Switch

Unpack the steering wheel switch kit and identify the required parts as shown. Kit items are A, B, C etc. with an S (Switch) prefix.

REF	PART NUMBER	QTY	DESCRIPTION	PHOTOGRAPH
SA	478-0008	2	Magnet, flex - 1/2" W x 1" L x 1/8"thk, plain 1	
SB	675-0077	1	Epoxy, Hardman 04001 - single double bub	
SC	602-1062	1	Bracket, steering wheel switch mounting	
SD	726-1054 or 051-0443-10	1	Assembly, steering wheel switch	
SE	677-2002	4	Tie strap, 7" releasable	
Bag S1 of 1 contains SF				
SF	675-2010	1	Bolt - 5/16NC x 3/4" Gr5, ZP	
	676-1036	1	Nut, lock - 5/16NC, ZP	

Installation - Automated Hydraulic Steering Kit

⚠ WARNING:

Before installing, disconnecting or repairing the hydraulic hoses and components, turn off the machine and relieve all pressure from the hydraulic system by turning the steering wheel left and right. Failure to remove the pressure can result in serious injury or death from unexpected machine movement.

To avoid burn injury when installing, disconnecting or repairing the hydraulic hoses and components, turn off the machine and allow the system to cool down prior to touching the parts of the machine that are heated.

See Appendix B for a schematic of the hydraulic circuits.

1. Prepare the hydraulic steering block.

NOTE:

Make sure the hydraulic steering block **HA** is clean and dust free. If required, loosen the solenoid end nuts to improve access to the connector sockets. Hand tighten the end nuts only.

Remove the plastic plugs from hydraulic steering block **HA** and install adapter fittings **HB** in the **P**, **T**, **A** and **B** ports and adapter fitting **HC** in the **LS** port (Figure 1).

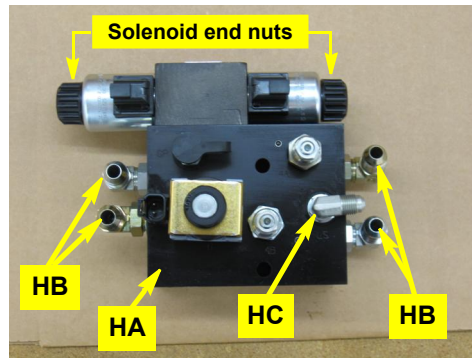


Figure 1: Prepared steering block

2. Install the hydraulic steering block

You will mount the hydraulic steering block **HA** with its solenoids upward on the inside face of the right rear fender plate (Figure 2a).

- Drill a $\frac{3}{8}$ " hole $5\text{-}\frac{1}{4}$ " down from the bottom edge of the fender arch and 3 " in from the rear edge of the fender plate (measured at the bottom of the vertical edge of the plate - Figure 2a). Use this hole for **HA**'s top mounting bolt (hardware **HD**).
- Using **HA** as template, mark the second hole vertically downward. Drill a second $\frac{3}{8}$ " hole. (Or drill the second hole $8\text{-}\frac{1}{8}$ " from the bottom edge of the fender vertically down from the first hole. The holes will be $2\text{-}\frac{7}{8}$ " apart - Figure 2a).
- Using hardware **HD**, mount **HA** on the fender plate as follows (Figure 2b):
 - Mount **HA** with its solenoids upward (so with the **A** and **B** ports rearward).

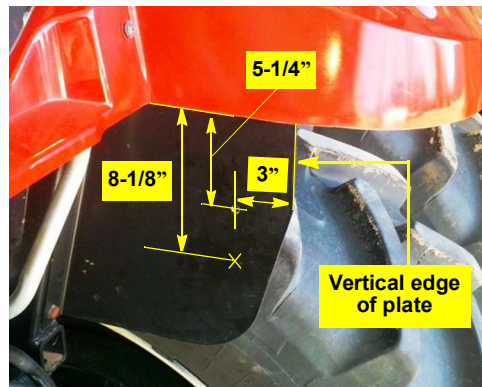


Figure 2a: Steering block mounting location

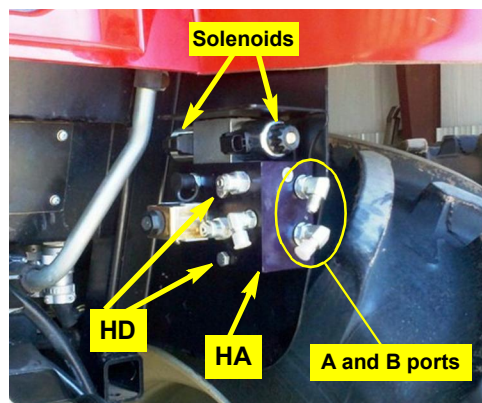


Figure 2b: Steering block installed

3. Install the steering fittings and hoses.

NOTE:

Leave run-tees loose to allow for alignment when attaching hoses. Plastic caps placed on the open ends of the fittings will prevent excessive leakage prior to hose installation and absorbent material placed under pipe disconnections will catch any leakage.

- a. Remove the rubber floor mat and cab floor plate (Figure 3a) to expose the hydraulic connections (rubber hose/steel line junctions - Figure 3a inset).

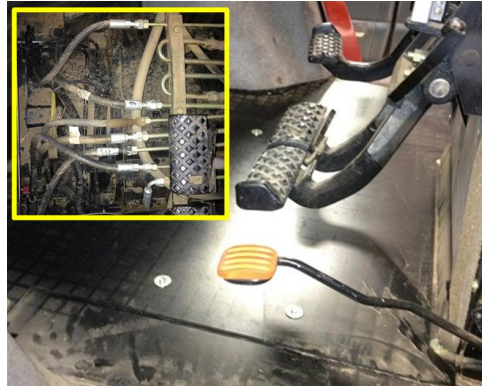


Figure 3a with inset: Floor plate and rubber hose/steel line junctions

- b. Locate the 'U-bend' steering lines (Figure 3b, bottom), disconnect each steering hose from its steering line and connect it to the male 'T' end of a run-tee HH (Figure 3b, top left and right). Connect the female 'T' end of each run-tee to its respective steel line (Figure 3b, bottom).

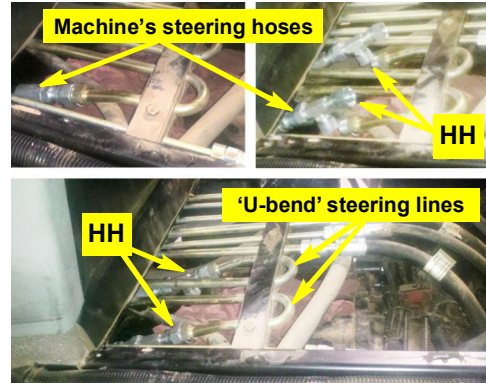


Figure 3b: Steering run-tees installed

- c. Routing them over the rear axle and transmission and under the cab, install steering hoses HM between the stems of run-tees HH (Figure 3c, left) and fittings HB in the A and B ports of the hydraulic steering block (figure 3c, right). Use ties HP (not shown) as required, securing the hoses to other machine plumbing and clear of moving parts.

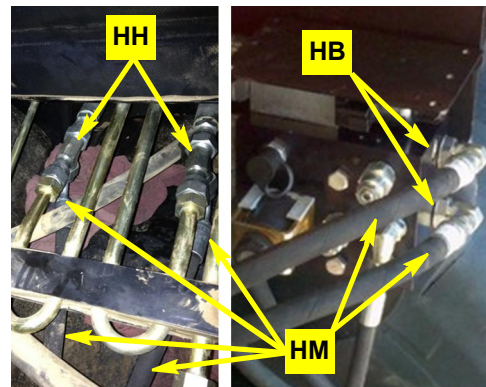


Figure 3c: Steering hoses at run-tees (left) and steering block (right)

4. Prepare the load sense valve.

Prepare load sense valve HI as follows (Figure 4):

- Install adapter HJ in valve's function port
- Install adapter HK in the valve's source port
- Install adapter HL in the valve's load sense port (to hydraulic steering block)

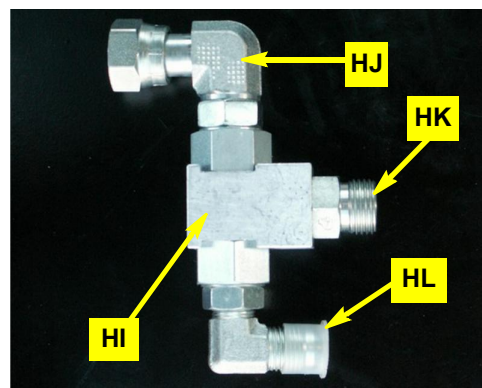


Figure 4: Prepared load sense valve

5. **Install the load sense valve.**

Disconnect the machine's rubber load sense hose from its steel load sense line (it's the second line from the left after the inner 'U-bend' steering line - Figure 5, top left inset). Connect **HI**'s fitting **HJ** to the machine's steel load sense line (Figure 5) and the machine's load sense hose to **HI**'s fitting **HK** (Figure 5, bottom right inset).

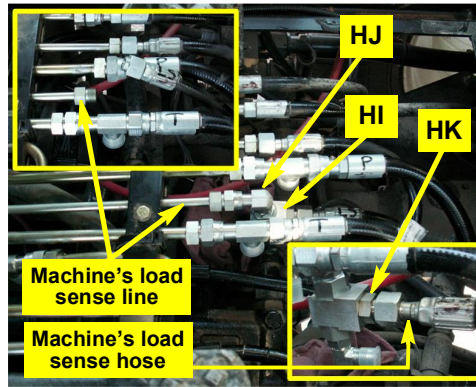


Figure 5 with insets: Load sense valve installation

6. **Install the tank and pressure fittings.**

Disconnect the machine's rubber tank and pressure hoses from their steel lines (they are either side of the load sense line with the tank line next to the inner 'U-bend' steering line). Install run-tees **HH** on the steel lines and reconnect the machine's tank and pressure hoses to the open 'T' ends of the run-tees (Figure 6).

NOTE: *In the following hose installation steps, route hoses with other machine plumbing and clear of moving parts. Secure hoses with heavy duty tie straps **HP**. Tighten all hoses, run-tees and steering block fittings when installation is complete.*

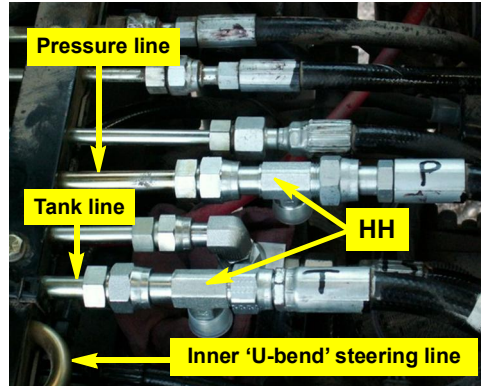


Figure 6: Pressure and tank run-tees installed

7. **Install the load sense, tank and pressure hoses.**

Install the load sense hose **HO** and tank and pressure hoses **HN** between load sense fitting **HL** (Figure 7-i inset) and run-tees **HH** (Figure 7-i) respectively, and fittings **HC** (LS) and **HB** (T and P) at the hydraulic steering block (Figure 7-ii).

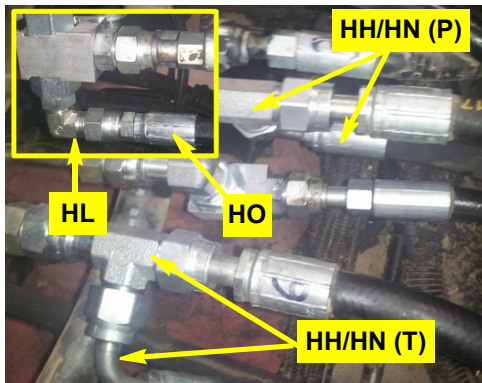


Figure 7-i with inset: Pressure, tank and load sense hoses at load sense valve and run-tees

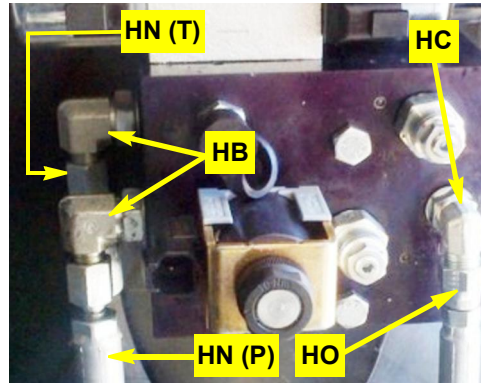


Figure 7-ii: Pressure, tank and load sense hoses at steering block

8. Verify operation.

- ⚠ WARNING:**
- 1. Lay the floor plate in place before testing the system to avoid any hydraulic oil leakage into the cab.*
 - 2. During tests of the hydraulic system, the machine may move unexpectedly. Be prepared for machine movement to avoid injury.*
 - 3. Keep others away and stay clear of mechanical steering linkages to prevent serious injury or death from pinch point hazards while manually operating the hydraulic steering circuit.*
- a. Tighten all connections and clean up the installation area around the machine and make certain that it is safe to operate.
 - b. Rotate the steering wheel from one extreme to the other and back.
 - c. Start the machine and check hydraulic connections for any leaks.
 - d. Secure the floor plate and refit the mat when verification is complete.

Installation - Wheel Angle Sensor

⚠ WARNING:

Switch off the machine's engine while installing or adjusting the WAS. Keep others away and stay clear of mechanical steering linkages to prevent serious injury or death from pinch point hazards while manually operating the hydraulic steering circuit.

1. Prepare the wheel angle sensor.

- a. Using hardware **WD** (screws) and **WE** (nuts), attach the WAS wire connector (sensor) **WB** to the WAS housing **WA**. Install the bolts up through the bottom of the housing. Mount **WB** at 45° to any of **WA**'s sides (Figure 1a).

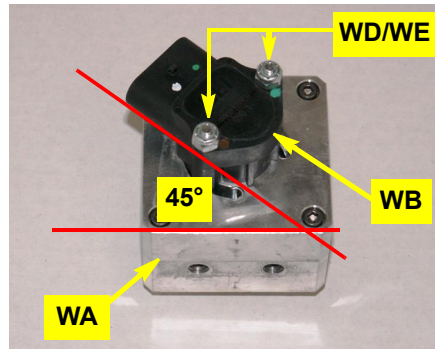


Figure 1a: WAS wire connector mounted

- b. Cut six holes off WAS arm **WC** at the opposite end from the WAS shaft mounting hole (Figure 1b).

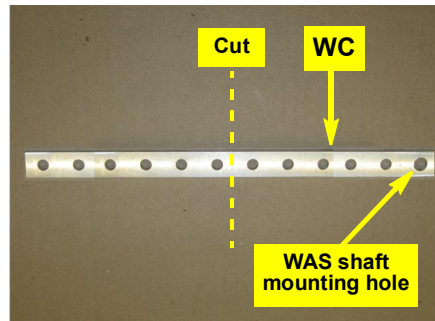


Figure 1b: WAS arm prepared

- c. Attach WAS arm **WC** to the WAS assembly using hardware **WE** (nut) and **WF** (screw). Mount **WC** in the same direction as **WB**'s wire connector (Figure 1c).

NOTE: Before you cut the rod at step 1d, screw the provided nuts **WH** onto the threaded rod **WG** so that they are inside the cut you will make. After you have cut the rod, the nuts can help clean the threads.

- d. Cut the provided threaded rod **WG** 8½" long (Figure 1d-i) then screw the lock nuts **WH** and swivel rod ends **WI** onto the cut threaded rod to achieve a center-to-center stud measurement of 9¾" (Figure 1d-ii). Leave **WH** loose until you complete linkage adjustment at step 2e, page 14.

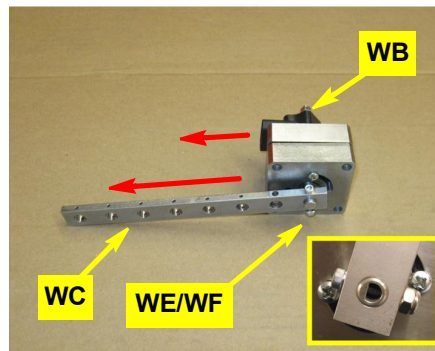


Figure 1c: WAS arm attached

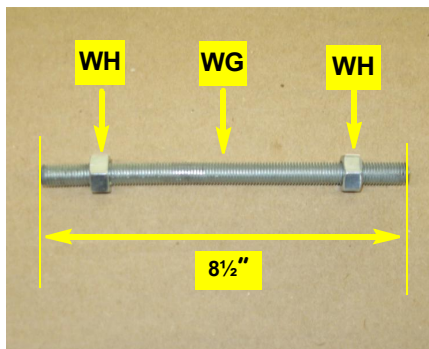


Figure 1d-i: Threaded rod cut

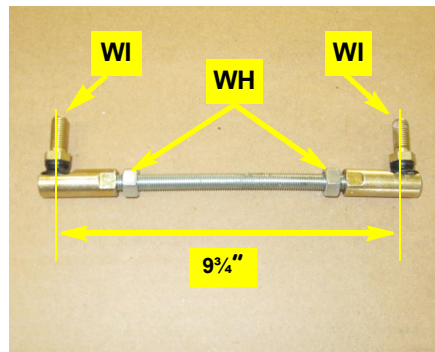


Figure 1d-ii: Threaded rod assembled

2. Mount the wheel angle sensor.

NOTE:

1. Mount the WAS assembly bracket **WK** on the front of the steering axle on the right side. Use the bolt holes for the front fender bracket (which your machine may or may not have). If your machine does have front fenders, use the existing fender bracket bolts; otherwise, use hardware **WN**.

2. The figures in this section show prototype brackets.

- a. Using hardware **WM**, join brackets **WK** and **WL** (Figure 2a inset).

Using the machine's existing fender bracket bolts, (or hardware **WN**), install **WK/WL** against the fender bracket (or directly against the axle). Slide the bracket combination in from the right (as viewed) so that the offset in the bracket is upward and forward (Figure 2a and inset).

- b. Using hardware **WJ** install the WAS assembly prepared in step 1 on **WL** (Figure 2b and inset). Mount the assembly:

- On the back face of **WL**
- With connector arm **WC** at the top
- With wire connector **WB** facing the right rear

- c. Install link rod clamp bracket **WO** (or **WP**) on the right tie rod—flanges uppermost and horizontal—with the clamp's outer edge against the track adjustment locknut (Figure 2c).

- d. Using the remaining hardware **WH** (not visible) install the assembled WAS linkage from step 1 between the forward flange of clamp **WO** (or **WP**) and the last hole in connector arm **WC**. Install the linkage with the swivel studs downward at both ends (Figure 2d). Leave the swivel nuts **WH** loose.

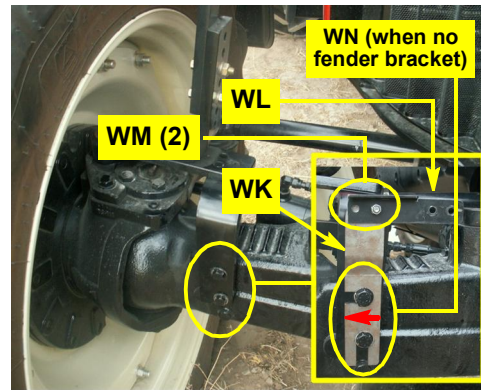


Figure 2a with inset: WAS mounting bracket(s) location and, inset, joined and installed

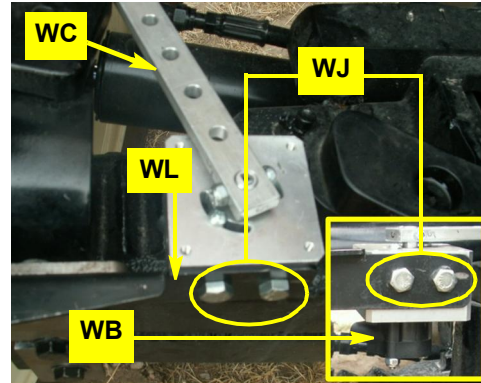


Figure 2b with inset: WAS assembly installed

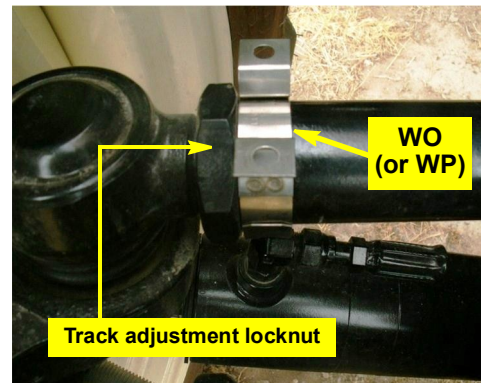


Figure 2c: Link rod clamp bracket installed

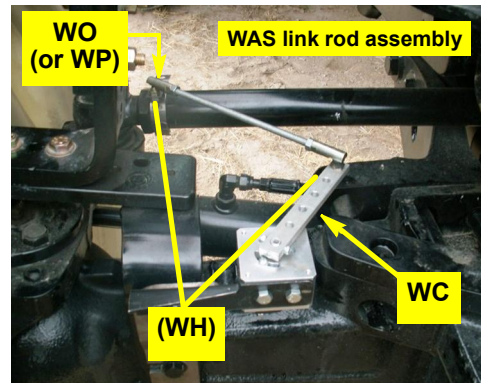


Figure 2d: Link rod assembly installed

2. **Mount the wheel angle sensor (continued).**

- e. With all hardware **WH** loose, slowly turn the wheels full left lock (Figure 2e-i) then full right lock (Figure 2e-ii). Check that the linkage moves freely without binding and adjust the linkage if necessary.

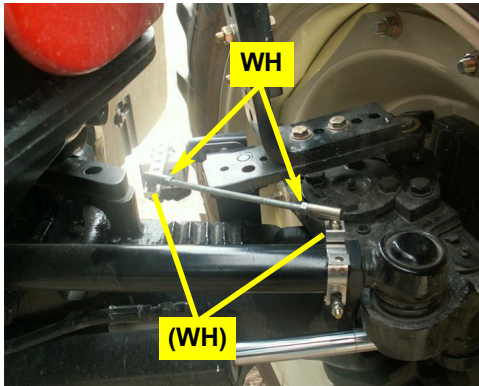


Figure 2e-i: Full left lock



Figure 2e-ii: Full right lock

- f. When the linkage moves freely and without binding, tighten hardware **WH** on the rod and the swivels (Figure 2e-i).

Installation - Steering Wheel Switch (SWS)

1. Install the steering wheel switch.

- a. Access the steering shaft by removing the lower right panel of the steering console (Figure 1a).

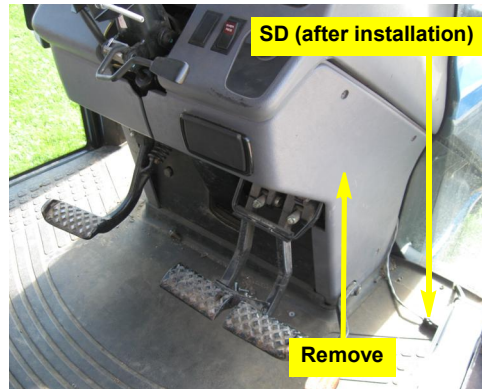


Figure 1a: The lower right steering console

- b. Drill a 5/16" hole in the sensor bracket **SC** at the opposite end from the pre-drilled sensor hole (Figure 1b).

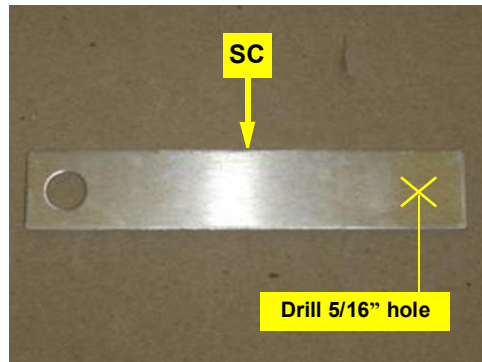


Figure 1b: Drilling the sensor bracket

- c. Drill a 5/16" hole in the steel steering column 2 3/4" from the top and 1" from the edge (Figure 1c with inset).

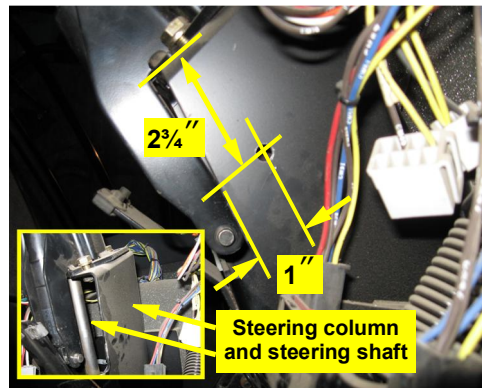


Figure 1c: Location of drilled hole in steering column (see inset for steering shaft location)

- d. Using the two-part epoxy **SB**, attach magnets **SA** to the steering shaft at 180° apart. Align the center of each magnet with the center of the drilled hole (Figure 1d).

- e. Mount **SD** in the pre-drilled hole of **SC** then, using hardware **SF** through the new hole in **SC**, attach the sensor and sensor bracket assembly (**SC/SD**) to the steering column. Bending **SC** as required, align the sensor with the magnets and adjust the sensor tip to 1/8" to 1/4" from the magnets (Figure 1d). Secure **SD**'s cable with ties **SE**.

- f. Refit the lower right steering console keeping **SD**'s connector outside (Figure 1a).

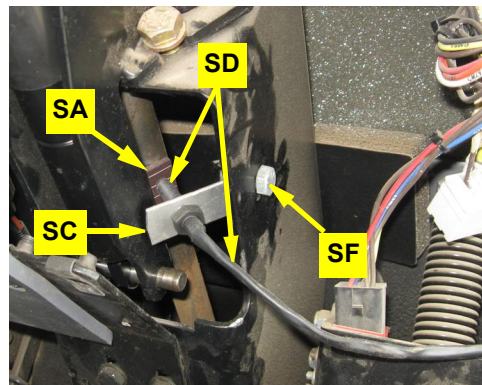


Figure 1d: Installed magnets, sensor bracket and sensor

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Appendix A - Hydraulic Circuits

