Automated Steering Kit Installation Guide

Kit: EDX-AP20AS, P/N 911-2037-000

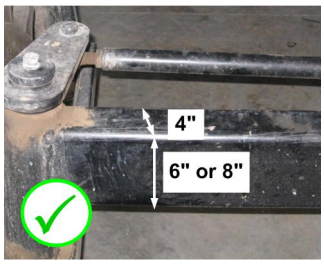
Fits Apache Sprayer Models:

AS720
AS1020
AS1220

(See **Notes** below about front axle types and the hydraulics on 2012 models)

NOTE: *This installation kit is applicable to Apache sprayer models that have a light (4 x 6) or a heavy (4 x 8) fixed front axle (see picture at right). The kit is not applicable to models with an adjustable front axle. If you are unsure about your machine compatibility, contact your local dealer before continuing this installation.*

The pressure and tank ports in the hydraulic junction block are located differently on 2012 (and later) models so hose connection at these ports is slightly different. The steps make it clear which instructions you should follow for the later machines.



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 on the next page. 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 kits 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.

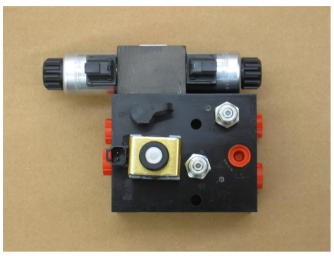
Before attempting to install any of the components, park the machine on a clean level floor with adequate clearance to work all around.

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 spray cleaner such as 'Brake Clean' 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 solvent cleaners such as 'Brake Clean'. If a fitting is to be cleaned internally, the o-ring should first be removed and cleaned 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	760-0020-000	1	Assembly, hyd valve block - 15L\proportional (Hydraulic steering block)	
Bag H1 contains HB and HC				
HB	760-2060-000	4	Adapter, hyd - #6maleJIC x #8maleORB (A, B, P and T ports on hydraulic steering block)	
HC	760-2045-000	1	Adapter, hyd - #6maleORB plug (LS port on hydraulic steering block)	

Kit Contents - Steering Hydraulics *(continued)*

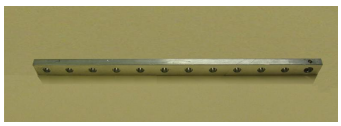
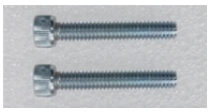
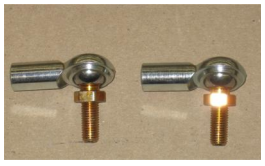
REF	PART NUMBER	QTY	DESCRIPTION	PHOTOGRAPH
HD	640-0092-000	1	Hydraulic steering block mounting bracket (Mount HA on machine)	
Bag H2 contains HE				
HE	675-2006-000 678-1054-000 676-1035-000	2 2 2	Bolt - 3/8NC x 3-3/4" Gr5, ZP Washer, flat - 3/8 ZP Nut, nylock - 3/8NC ZP (Mount HA on HD)	
Bag H4 contains HI, HJ, HK and HL				
HI	760-2054	2	Adapter, hyd run-tee - #6JIC (Steering lines)	
HJ	760-2016	1	Adapter, hyd run-tee - #12JIC (Pressure line, pre-2012 models)	
HK	760-2077	1	Adapter, hyd run-tee - #8JIC (Tank line, pre-2012 models)	
HL	760-2012	1	Adapter, hyd - #12femJIC x #8maleJIC (Pressure line, pre-2012 models)	
Bag H5 contains HM and HN				
HM	760-2110-000	1	Adapter, hyd - #10maleORB x #8maleJIC (Pressure line, 2012 and later models)	
HN	760-2002-000	1	Adapter, hyd - #10femJIC x #8maleJIC (Tank line, 2012 and later models)	

Kit Contents - Steering Hydraulics *(continued)*

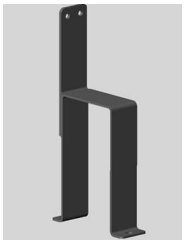
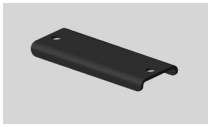
REF	PART NUMBER	QTY	DESCRIPTION	PHOTOGRAPH
HO	760-1115	2	Hose, hyd - 3/8" x 57", #6femJIC swivel x #8femJIC 90 swivel (P and T hoses)	
HP	760-1171	2	Hose, hyd - 1/4" x 91", #6femJIC swivel x #6femJIC 90 swivel (Steering hoses)	
HQ	677-2001	20	Tie strap, 11" heavy duty	

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.

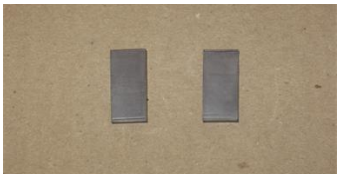
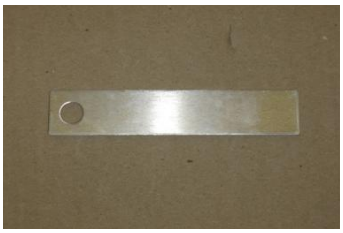
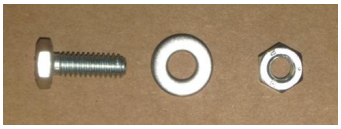
REF	PART NUMBER	QTY	DESCRIPTION	PHOTOGRAPH
Bag 710-0099-000 contains WA to WJ				
WA	720-0045-000#	1	WAS assembly	
WB	750-5002-000	1	Sensor, dual output, BEI	
WC	602-1087-000	1	Connector arm, steering	
WD	675-1191-000	2	Screw, mach, 8-32 x 3", PPH ZP	
WE	676-1054-000	4	Nut, nylock 8-32NC, ZP	
WF	675-1150-000	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	
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	
			(Attach WAS assembly to WK)	
WK	640-0108-000	1	WAS assembly upper mounting bracket	
			(Use with WL and WM)	
WL	640-0109-000	1	WAS assembly lower mounting bracket	
			(Use with WK and WM)	
Bag W3 contains WM				
WM	675-2047	2	Bolt - 3/8NC x 1-1/2" Gr5 ZP	
	675-2030	2	Bolt - 3/8NC x 3-1/2" Gr5 ZP	
	678-1054	2	Washer, flat - 3/8" ZP	
	676-1035	2	Nut, nylock - 3/8NC ZP	
			(Attach WK to WL - light or heavy fixed axle)	
WN	640-0110	1	WAS rod link bracket	

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"T, plain 1 (Only one required for this installation)	
SB	675-0077	1	Epoxy, Hardman 04001 - single double bub	
SC	602-1062	1	Steering wheel switch mounting bracket	
SD	726-1054 or 051-0443-10	1	Assembly, steering wheel switch/cable	
SE	677-2002	4	Tie strap, 7" releasable	
Bag S1 contains SF				
SF	675-2049-000 678-1073-000 676-1040-000	1 1 1	Bolt - 1/4"-20 x 1" Gr5, ZP Washer, flat, 1/4"ID, 5/8"OD, 1/16"thk Nut, 1/4NC Gr5 ZP (Mount steering switch mounting bracket)	

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.*

Remove the plastic plugs from hydraulic steering block **HA** and install adapter fittings as follows (Figure 1):

- **HB** in the **P**, **T, A** and **B** ports
- **HC** in the LS port

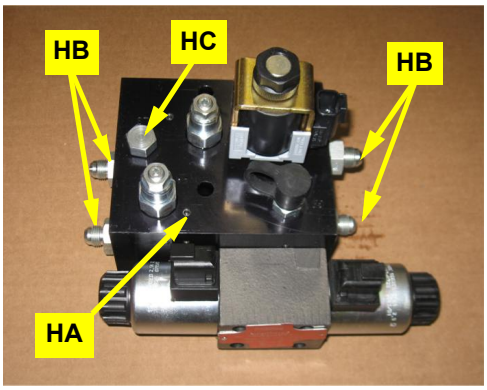


Figure 1: Prepared hydraulic block

2. Install the steering block mounting bracket.

Locate the four frame bolts on the left side and remove the top right bolt (nearest the starter motor - (Figure 2). Install steering block mounting bracket **HD** on the bolt. Mount the bracket with its two pairs of mounting holes to the rear and slid fully forward (Figure 2 inset).

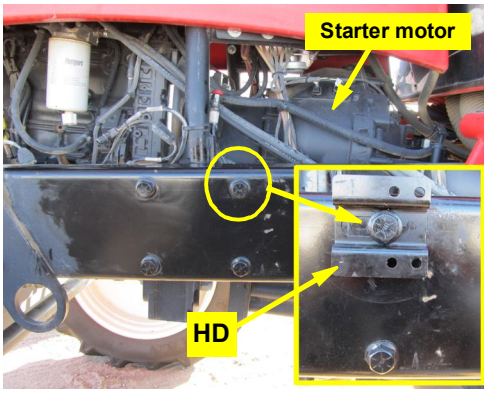


Figure 2 with inset: Installed steering block mounting bracket - fully forward on the slot

3. Install the hydraulic steering block and steering controller mounting bracket.

Using hardware **HE**, attach hydraulic steering block **HA** to bracket **HD**. Mount **HA** with its solenoids downward (so P and T ports to the rear - Figure 3).

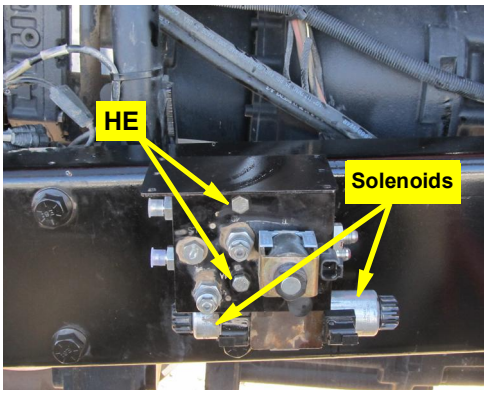


Figure 3: Installed steering block

NOTE: *The next step is in two parts, 4-1 and 4-2. Step 4-1 applies to pre-2012 models, step 4-2 applies to 2012 models and later. Follow the appropriate instructions.*

NOTE: *When installing hydraulic fittings and hoses, plastic caps placed on the open ends of the fittings will prevent excessive leakage prior to hose installation.*

4-1. Install the pressure and tank fittings, connect the pressure and tank hoses - pre-2012 models.

a. Under the machine, locate the pressure and tank hoses at the hydraulic junction block (Figure 4-1a with inset).

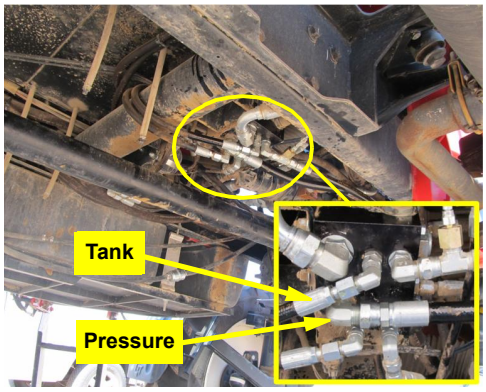


Figure 4-1a with inset: Pressure and tank lines at hydraulic junction block

b. ***Pressure line:*** Disconnect the machine's pressure hose and install the run-tee **HJ** (the larger, #12) onto the pressure port fitting. Reconnect the machines's pressure hose to the open 'T' end of **HJ** (Figure 4-1b).

Connect reducer fitting **HL** to the open stem of run-tee **HJ** and connect pressure hose **HO** to **HL** (Figure 4-1b inset).

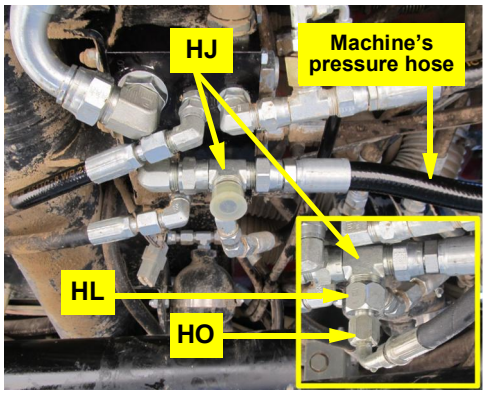


Figure 4-1b with inset: Pressure line fittings installed, hoses reconnected/connected

c. ***Tank line:*** Disconnect the machine's tank hose and install the run-tee **HK** (the #8) onto the tank port fitting. Reconnect the machines's tank hose to the open 'T' end of **HK** (Figure 4-1c).

Connect tank hose **HO** to the open stem of run-tee **HK** (Figure 4-1c inset).

NOTE: *Leave run-tees loose to allow for alignment when attaching hoses.*

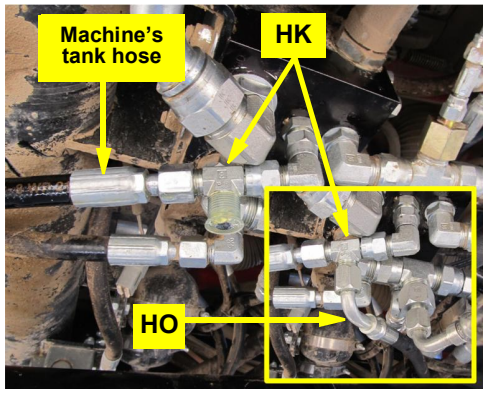


Figure 4-1c with inset: Pressure line fittings installed, hoses reconnected/connected

4-2. Install the pressure and tank fittings, connect the pressure and tank hoses - 2012 models.

a. ***Pressure line:*** Locate the pressure port (marked **AUX P1**) in the underside (as mounted) of the hydraulic junction block under the machine. Remove the plug and install adapter **HM**. Connect pressure hose **HO** to **HM** (Figure 4-2a with insets).

NOTE: *Figure 4-2a's right inset shows a straight hose end onto an elbow fitting on HM. Your hose has an elbow end so will fit directly onto HM.*

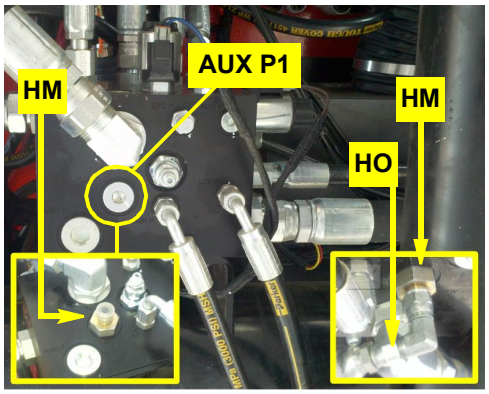


Figure 4-2a with insets: Pressure hose connected at pressure port in hydraulic junction block

4-2. Install the pressure and tank fittings, connect the pressure and tank hoses - 2012 models *(continued).*

b. ***Tank line:*** Locate the tank port (marked **STA T**) in the forward face (as mounted) of the hydraulic junction block under the machine. Remove the cap and install adapter **HN**. Connect tank hose **HO** to **HN** (Figure 4-2b with insets).

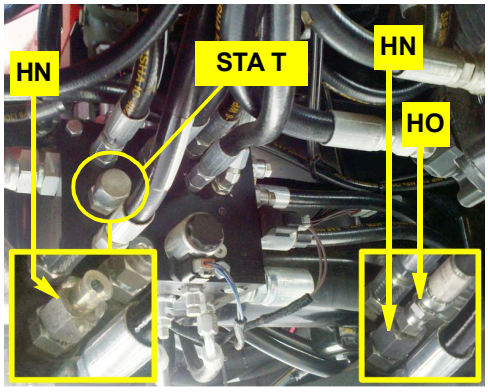


Figure 4-2b with insets: Tank hose connected at tank port in hydraulic junction block

5. Connect the pressure and tank hoses at the hydraulic steering block (all models).

Route pressure and tank hoses **HO** from the hydraulic junction block along to the hydraulic steering block installed at step 3. Route the hoses inside the machine's frame along with other plumbing and clear of moving parts.

Routing the hoses to the outside of the frame, connect the pressure and tank hoses **HO** to adapter fittings **HB** in the **P** and **T** ports on the hydraulic steering block (Figure 5).

NOTE: *Secure routed hoses in place with the provided heavy tie straps **HQ**. Securely tighten all hose fittings and connections.*

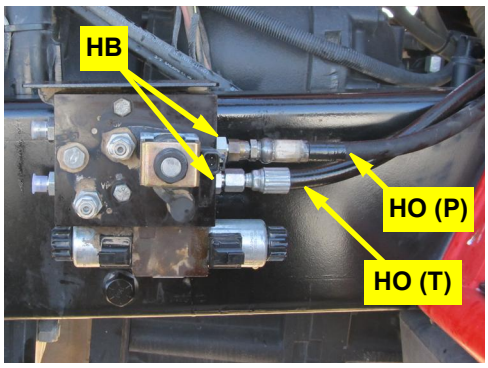
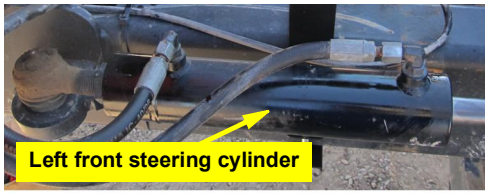


Figure 5: Tank and pressure hoses connected at hydraulic steering block

6. Install the steering output fittings.

NOTE: *Plastic caps placed on the open ends of the fittings will prevent excessive leakage prior to hose installation.*

Locate the two steering hoses on the left front steering cylinder (Figure 6, top image). Disconnect the steering hoses, install run-tees **HI** and reconnect the machine's steering hoses to the open 'T' ends of the run-tees (Figure 6, bottom image).



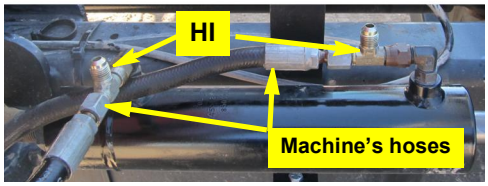


Figure 6: Steering run-tees installed, machine's steering hoses reconnected

7. Install the steering output hoses.

a. Connect steering hoses **HP** to the open stems of the run-tees **HI** (Figure 7a, top image). Route the hoses inside the axle channel to the center of the machine then rearward toward the hydraulic steering block (Figure 7a, bottom image).

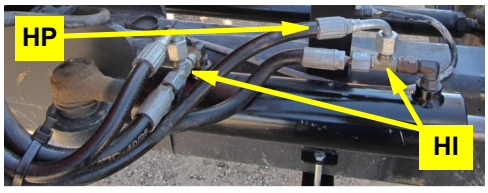


Figure 7a: Steering lines connected to run-tees, steering hoses reconnected, hoses routed towards the steering block

7. Install the steering output hoses *(continued)*.

b. Connect steering hoses **HP** to adapter fittings **HB** in the **A** and **B** ports on the hydraulic steering block (Figure 7b).

NOTE: *To ensure problem-free operation, secure routed hoses in place with the provided heavy tie straps HQ. Securely tighten all hose fittings and connections.*

8. Verify operation.

⚠WARNING: *During tests of the hydraulic system, the machine may move unexpectedly. Be prepared for machine movement to avoid injury.*

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. Start the machine and check hydraulic connections for any leaks.

c. Rotate the steering wheel from one extreme to the other and back.

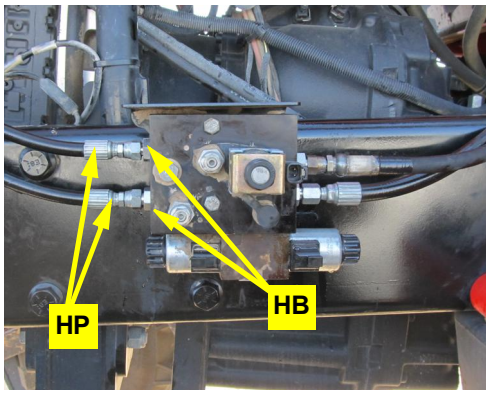


Figure 7b: Steering hoses connected at hydraulic steering block

Installation - Wheel Angle Sensor (WAS)

⚠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 the provided hardware **WE** (nuts) and **WD** (bolts - not visible), attach the WAS wire connector **WB** to the WAS housing **WA**. Install the bolts up through the bottom of the housing. The WAS wire connector **WB** can be mounted 90° to any of the WAS housing **WA** sides (Figure 1a).

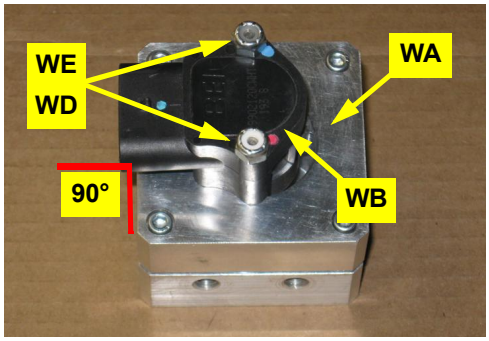


Figure 1a: Prepared WAS housing\connector

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

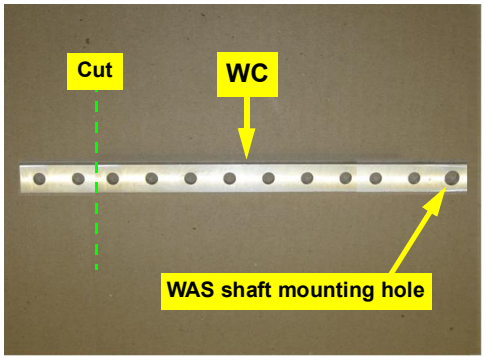


Figure 1b: WAS arm preparation

c. Using hardware **WF** (screw) and **WE** (nut), attach the WAS arm **WC** to the WAS assembly. Mount the arm in the opposite direction to the WAS wire connector **WB** (Figure 1c with inset).

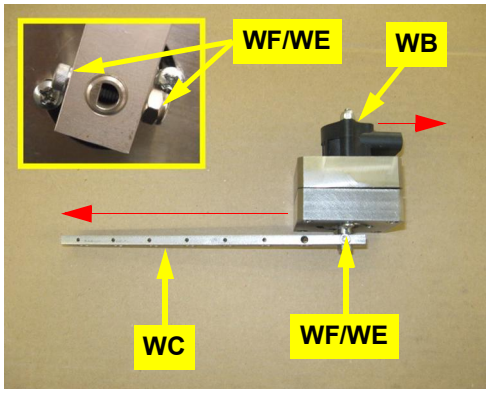


Figure 1c with inset: WAS arm installed

d. Screw two of hardware **WH** and rod swivels **WI** onto the threaded rod to achieve a center-to-center stud measurement of 13¼" (Figure 1d). Leave **WH** loose until you complete linkage adjustment at step 2e.

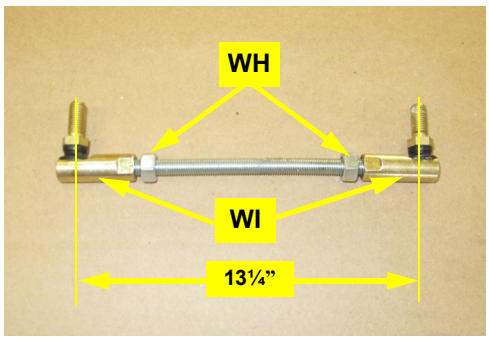


Figure 1d: Assembled threaded rod

2. Mount the wheel angle sensor.

NOTE: *The figures in this section show prototype brackets and fittings. Install your fittings and brackets as described.*

a. Using hardware **WM** (long or short bolts) attach brackets **WK** and **WL** to the left side of the front axle as follows (Figure 2a with inset - heavy [4 x 8] axle installation shown):

- Set **WK** on top of the axle with its vertical extension at the front.
- Set the centerline of the bracket assembly 12½" from the center of the steering king pin.

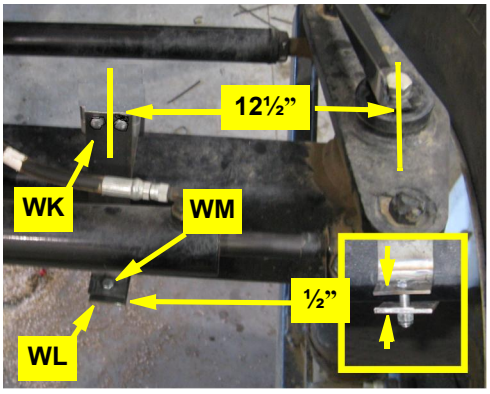


Figure 2a with inset: WAS assembly mounting bracket location and (inset) brackets gap

b. Using hardware **WJ** (not visible), attach the prepared WAS assembly to the rear face of bracket **WK**. Mount the assembly with WAS arm **WC** uppermost and facing inward and the wire connector of **WB** facing outward (Figure 2b).

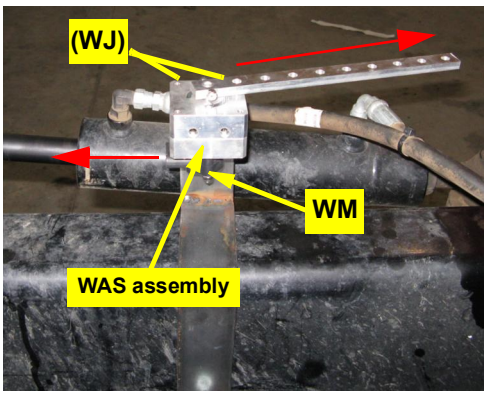


Figure 2b: Installed WAS assembly

c. Remove the left side king pin bolt and use it to install rod link bracket **WN** (Figure 2c with inset).

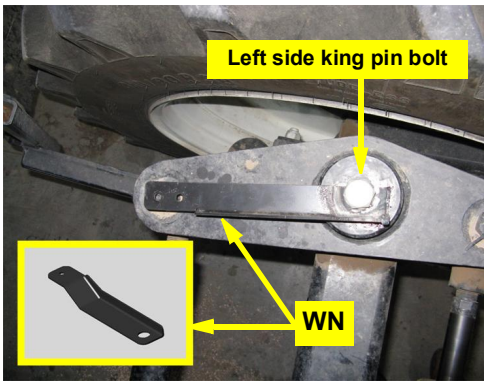


Figure 2c with inset: WAS rod link bracket installed

d. Using hardware **WH** install the assembled WAS link rod from step 1 between the last hole in WAS arm **WC** and bracket **WN**. Set the swivel studs downward at both ends (Figure 2d). Leave swivel nuts **WH** loose.

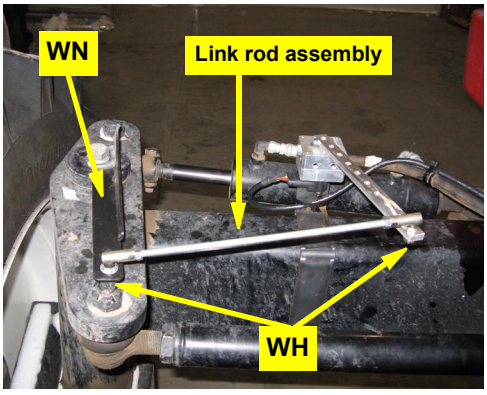


Figure 2d: Installed WAS link rod bracket. (You will connect the WAS cable at step 2d in the ECU installation section.)

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

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

Figure 2e-i: Full left lock

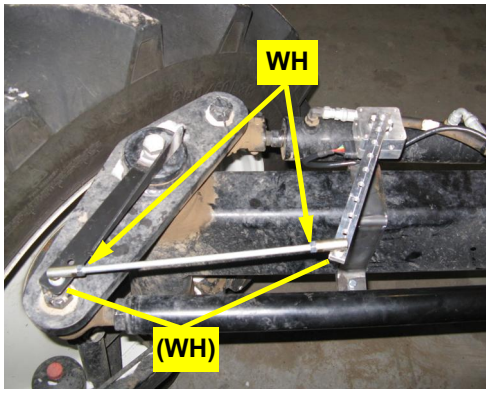
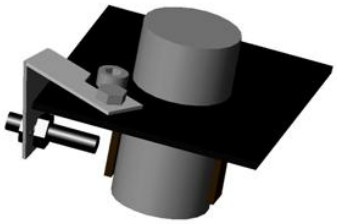


Figure 2e-ii: Full right lock

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

Installation - Steering Wheel Switch (SWS)

NOTE: *The AP20AS models provide only limited access to the steering shaft without major dismantling of the steering column enclosure. You can, however, access the steering shaft through the opening behind the climate control knobs. Inside the enclosure, you can manipulate the magnets and the switch sensor into position on and near the shaft respectively (see picture at right) without a clear view of the shaft and the items you are placing. This is the procedure described below but you may prefer to undertake more dismantling to facilitate the installation.*



1. Access the installation area.

Locate the climate control knobs on the left side of the steering column, remove the three retaining screws and move the control panel aside (Figure 1 with inset).

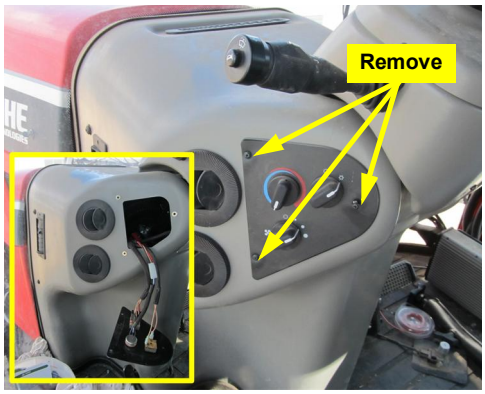


Figure 1 with inset: Access to the installation area - climate controls panel removed

2. Prepare the steering wheel switch bracket.

Prepare the steering wheel switch bracket **SC** as follows:

- Drill a 5/16" hole in the end opposite the pre-drilled hole
- Cut a notch from the top side (as viewed in Figure 2) to clear the front left bolt steering column bolt (see Figure 3, top right inset). Check that the notch is big enough to clear the bolt when the bracket is installed (Figure 3, top right inset).
- At 45° put a 90° downward bend in the bracket to create a 2" and a 2¼" side.
- Twist the pre-drilled end clockwise (viewed from pre-drilled end, cut notch on the left) to align the pre-drilled hole with the steering shaft when the bracket is installed.

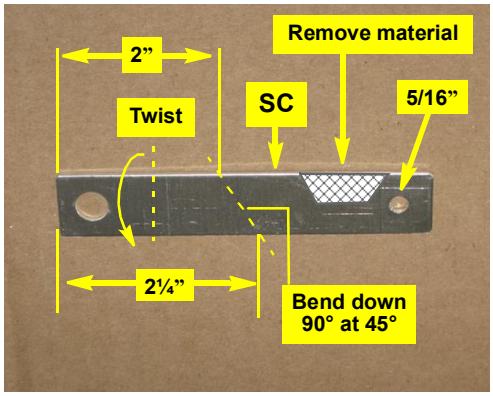


Figure 2: Prepared switch bracket (not to scale)

3. Install the magnets and the switch.

a. Using the bolt from hardware **SF**, temporarily install prepared bracket **SC** on the hole beside the left front column bolt (Figure 3 with insets).

b. Using **SC** as a template, use the two-part epoxy **SB** to attach magnets **SA** vertically to the shaft 180° apart. Align the center of each magnet with the center of the sensor hole in bracket **SC**.

c. Remove **SC** and mount switch/sensor **SD** in it. Temporarily locating the **SC/SD** assembly in position, adjust the bend and twist of the bracket to align the sensor with the center of the magnets, and adjust the sensor length to set its tip 1/8" to 1/4" from the magnets (see picture beside the **NOTE** at the top of this page).

d. Finally, using hardware **SF**, install the **SC/SD** assembly permanently (Figure 3, top right inset).

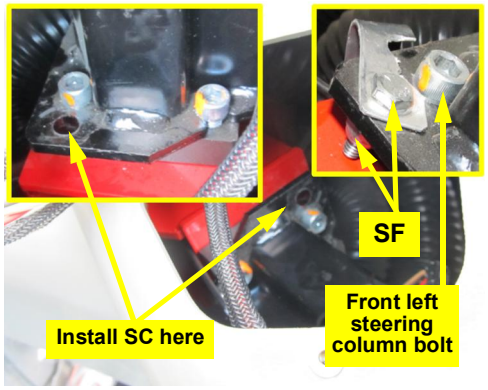


Figure 3 with insets: Switch/sensor bracket installation location

Appendix B - Hydraulic Circuits