

Document Title: Steering, description	Function Group: 600	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Steering, description

The G900 series machine is equipped with a load sense steering system. The steering system is powered by the main steering and implement pump. Priority is given to the steering hydraulic circuit by way of a priority flow valve. For a more comprehensive description of the priority flow valve, refer to [912 Priority flow valve - description and operation](#). A pressure relief valve within the steering priority flow valve, limits the maximum steering pressure to 10 MPa (103 bar, 1500 psi). Two steering cylinders are used on all G900 series machines.

Steering control unit

The steering control unit is mounted directly in front of the steering wheel and is activated by means of a driveshaft. The steering control unit is a non reaction type valve with a closed center. The steering control unit has a dynamic load sensing connection which drains to the hydraulic oil tank when the steering spool is in the neutral position. Whenever the spool is moved out of the neutral position, the load sense line is directed to the flow compensator of the main implement and steering pump.

Document Title: Steering system, function check	Function Group: 600	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Steering system, function check

Op nbr 600-001

[11666051 Pressure gauge](#)

1. After repair work has been completed in any steering system related hydraulic circuit, a steering system function check must be performed as described below:
 1. Install the pressure gauge at test ports P1 (main pressure) and P3 (steering pressure).
 2. Start the machine.
 3. Without any functions activated, check that the pressure at the test ports is correct:
P1: 2.4 MPa (24 bar, 350 psi) (stand-by pressure)
P3: 1.8 MPa (18 bar, 260 psi)
 4. Steer to the right. Check the response from the steering system. The function should be smooth all the way until the steering cylinders bottom out.
 5. When the cylinders bottom out read the pressure setting at test port P3. The pressure should be 11 MPa (110 bar, 1600 psi).
 6. Repeat steps 4 and 5 only steering to the left.
 7. Using the wheel lean function increase the main hydraulic pressure to the maximum and check that the reading at test port P1 is 22.4 MPa (224 bar, 3250 psi). Check the steering system pressure at test port P3 while having the main pressure up. Steering pressure should cut off at the correct level (11 MPa, 110 bar, 1600 psi) independent of the main system pressure.
 8. Remove the pressure gauge.

NOTE!

If the machine is equipped with a secondary steering system then test the system functionality as described in Secondary steering system, function check. Refer to [647 Secondary steering function, checking](#).

Document Title: Steering axle, description and operation	Function Group: 620	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Steering axle, description and operation

The front axle of the machine performs two primary functions. These functions are steering axle pivot and wheel lean. It must also be capable of carrying heavy front mounted attachments.

Tandem drive and AWD (All Wheel Drive) front axles share a group of common parts. What differentiates the two axles is the "wheel group" that attaches to the knuckle. A tandem drive machine uses a spindle to mount a wheel hub. An AWD machine uses a cradle to mount a hydraulic motor.

Steering

Two hydraulic cylinders pivot the spindles or cradles on king pins in the knuckle. Self lubricating bearings support the king pins in the knuckle frame. A seal is installed at the top and bottom of each bearing. Thrust loads are transferred between the knuckle and the spindle by a special thrust bearing. Each of the four king pins are retained in the spindle by hexagon screws. The drag link ensures that both sides turn simultaneously.

Pivoting axle

The pivot of the front axle allows the wheels to travel over uneven ground with minimal main frame movement. The axle frame mounts onto a pivot pin supported in the main frame with two self lubricating bearings. The pivot pin with retainer is secured to the axle frame by means of a spacer, washer and bolt. This locks the pivot pin to the axle frame. The pin pivots on the bearings installed in the main frame.

Thrust bearings are installed on the pivot pin between the axle frame and the main frame to transmit the thrust load. A seal is installed on the outside of the main frame pivot bearings. Pivot stops restrict axle oscillation to 16° on each side of the machine's center line.

Wheel lean

Leaning the wheels reduces the turning radius, braces against moldboard imposed side loads and gives better stability when grading on a slope. Bearings and seals are installed in the knuckle which supports the pivot pin. The pivot pin with retainer is secured to the axle frame by means of a spacer, washer and bolt. Thrust loads are transferred through thrust bearings mounted on the pivot pin between the knuckle and axle frame. Models G930 to G960 uses the standard duty axle and has one wheel lean cylinder. Models G970 to G990 uses the heavy duty axle and has two wheel lean cylinders. The crossbar keeps both wheels parallel so that they lean together.

Wheel hub - tandem drive wheel group

Two tapered roller bearings support the wheel hub. The spindle lock nut tightness determines preload. A sealing ring along with a lip seal prevents bearing cavity pressurization and dirt ingress.

Wheel - AWD (All Wheel Drive) group

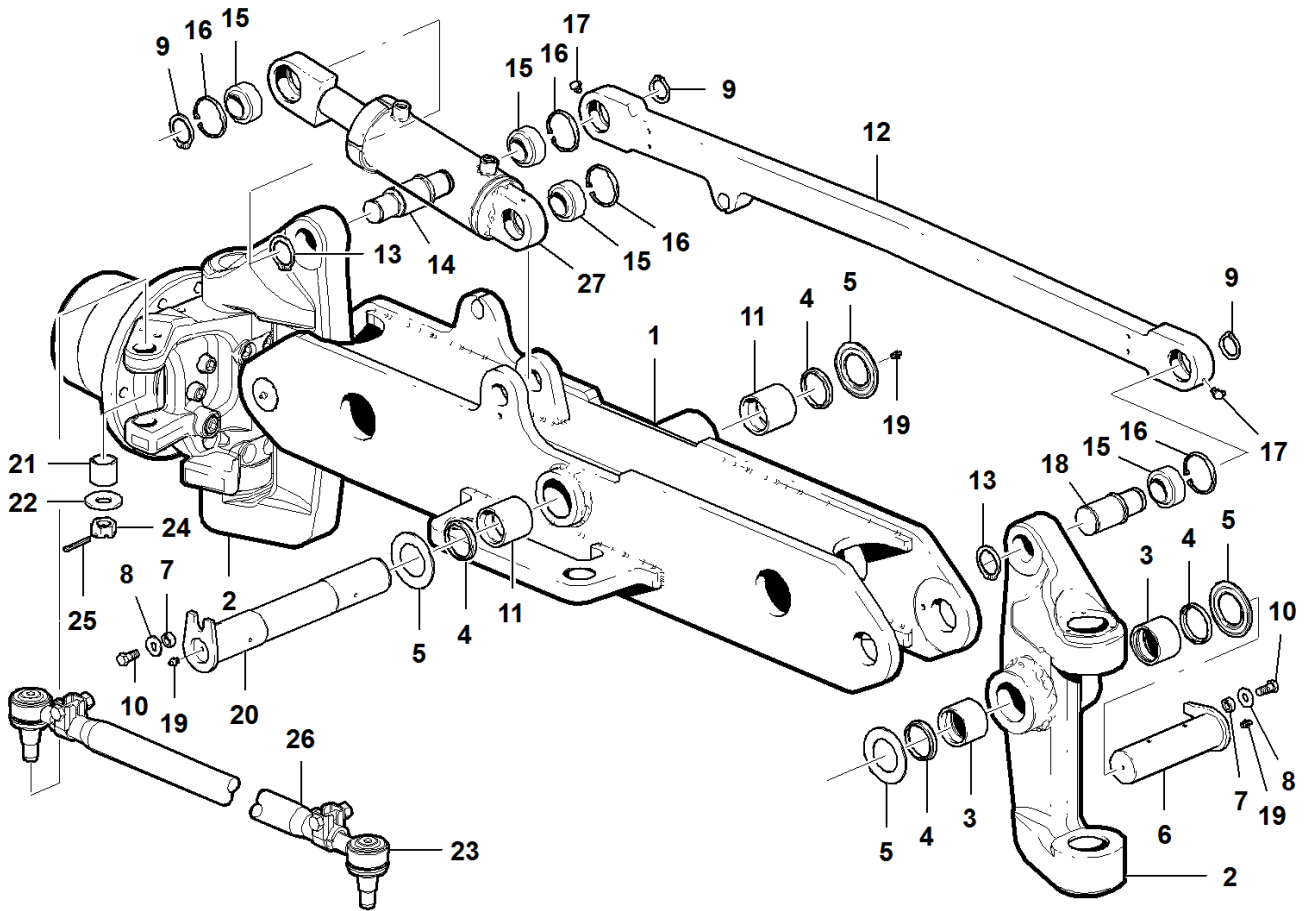
A hydraulic motor is mounted directly onto the AWD hub. The hub mounts into the knuckle the same way as the tandem driven machines. A hose guard on the hub protects the hydraulic hoses.

Toe-in

The term "toe-in" refers to the distance between the front toe of the tires is less than the distance between the rear of the tires. On tandem drive models, toe-in is 3 - 6.5 mm (1/8 - 1/4 in.). On AWD machines, there is no toe-in, as the front wheels are also driving wheels. Toe-in is altered by adjusting the drag link length.

Document Title: Steering axle, components	Function Group: 620	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Steering axle, components

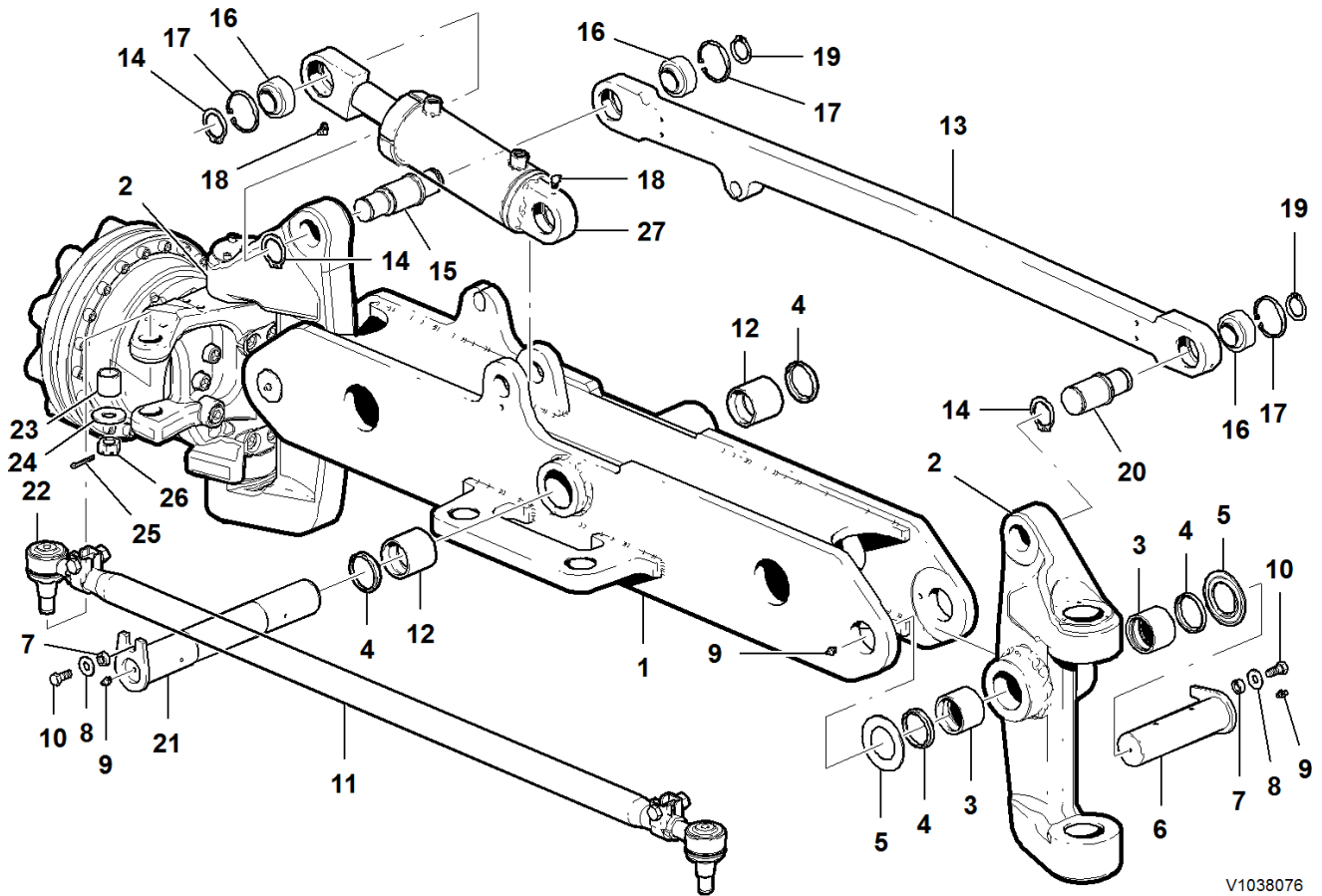


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Figure 1
Front axle assembly — G930, G940 and G960

- 1. Frame
- 2. Steering knuckle
- 3. Bearing
- 4. Seal
- 5. Thrust washer
- 6. Pivot pin
- 7. Spacer
- 8. Washer
- 9. Retaining ring
- 10. Hexagon screw
- 11. Bearing
- 12. Tie bar
- 13. Retaining ring
- 14. Pin
- 15. Spherical bearing

- 16. Retaining ring
- 17. Lubricating nipple
- 18. Pin
- 19. Lubricating nipple
- 20. Pivot pin
- 21. Bushing
- 22. Washer
- 23. Tie rod end
- 24. Castle nut
- 25. Cotter pin
- 26. Drag link
- 27. Wheel lean hydraulic cylinder



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Figure 2
AWD (All Wheel Drive) front axle assembly — G946 and G976

- 1. Frame
- 2. Steering knuckle
- 3. Bearing
- 4. Seal
- 5. Thrust washer
- 6. Pivot pin
- 7. Spacer
- 8. Washer
- 9. Lubricating nipple
- 10. Hexagon screw
- 11. Drag link
- 12. Bearing
- 13. Tie bar
- 14. Retaining ring
- 15. Pin

16. Spherical bearing
17. Retaining ring
18. Lubricating nipple
19. Retaining ring
20. Pin
21. Pivot pin
22. Tie rod end
23. Bushing
24. Washer
25. Cotter pin
26. Castle nut
27. Wheel lean hydraulic cylinder

Document Title: Wheel Hub - Removal	Function Group: 622	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Wheel Hub - Removal

Op nbr 622-052

1. Place the machine in the [191 Service position](#).



2. **Only use lifting devices with adequate capacity.**

Attach a safe lifting device to the wheel hub. Remove the hub cap and O-ring.

3. Bend back the tabs of the lock washer. Remove the outer lock nut, lock washer and inner lock nut. Remove the wheel bearing washer.
4. Pull the wheel hub out slightly on the spindle and remove the outer bearing cone. Remove the wheel hub from the spindle.
5. Remove the inner bearing cone. Remove and discard the seal.
6. Inspect the bearing cups for signs of damage or wear. If necessary, use a hammer and soft metal drift to remove them. If replacing the bearing cups, place them in a freezer to shrink them for easier installation.

Document Title: Wheel Hub - Installation	Function Group: 622	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Wheel Hub - Installation

Op nbr 622-069

1. Use a hammer and soft metal drift to install the inner and outer bearing cups into the wheel hub. Alternatively, place the cups into a freezer to shrink them for easier assembly.
2. Pack the inner bearing cone with grease. Mate the bearing cone with the cup and using a hammer and soft metal drift, install the seal into the wheel hub.
3. Install the seal ring onto the axle. Lubricate the seal on the wheel hub.
4. Attach a safe lifting device to the wheel hub. Slide the wheel hub onto the spindle.
5. Pack the outer bearing cone with grease and install it on the axle. Install the wheel bearing washer and the inner lock nut.

NOTE!

Always install the inner and outer lock nuts with the chamfer facing outwards from the wheel hub.

NOTE!

Do not over lubricate the wheel bearing cones. Excess grease can damage the hub cap O-ring.

6. Set the wheel bearing preload. Refer to [622 Front axle wheel bearing preload, checking and adjusting](#).
7. Place the machine back in service.

Document Title: Front wheel bearing, repacking	Function Group: 622	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Front wheel bearing, repacking

Op nbr 622-087

The front wheel bearings should be repacked with grease every 1500 hours.

Wheel bearing removal

1. Place the machine in the [191 Service position](#).
2. Remove the front wheel. Refer to [771 Wheel, removing and fitting one](#).
3. Remove the four socket head screws from the hub cap. Remove the hub cap from the hub assembly.
4. Clean out any excess grease and debris. Remove the outer lock nut.
5. Remove the tab washer.
6. Remove the inner lock nut, washer and outer wheel bearing.



7. **Only use lifting devices with adequate capacity.**

Attach a safe lifting device to the hub and gently remove the hub from the spindle.

NOTE!

The inner bearing and seal will stay with the hub.

8. Place the hub in position to allow the use of a punch to enter the cap side of the hub. Carefully drive out the inner seal and bearing together.
9. Thoroughly clean and inspect all components. Replace any damaged parts, if necessary.

Wheel bearing re-installing

10. Completely repack the wheel bearings with the recommended grease.
11. Re-install the inner bearing into the wheel hub. Apply grease into the hub cavity.
NOTE!
A total amount of 0.5 kg of grease should be used per wheel hub assembly. This includes applying grease to the wheel hub cap.
12. Install a new inner seal.
13. Install a new seal onto the spindle.
14. Attach a safe lifting device to the hub and position it back onto the spindle.
15. Slide the repacked outer bearing up the spindle and into position.

16. Re-install the bearing thrust washer and inner nut. Torque to specification. Refer to [173 Front axle wheel bearing preload, checking and adjusting](#).
17. Install a new tab washer and outer lock nut. Torque the outer lock nut to specification. Refer to [173 Front axle wheel bearing preload, checking and adjusting](#).
18. Lock down the tabs on the tab washer into the outer lock nut.
19. Apply grease to the wheel hub cap. Re-install the hub cap and tighten the four socket head screws to specification. Refer to [030 Front axle, specification](#).

NOTE!

A total amount of 0.5 kg of grease should be used per wheel hub assembly. This includes the previous step of applying grease to the wheel hub cavity.

NOTE!

Be sure that the O-ring stays in position.

20. Repeat the above steps for the other front wheel.
21. Place the machine back in service.

Document Title: Front axle frame, removing	Function Group: 622	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Front axle frame, removing

Op nbr 622-060

1. Rotate the circle until the moldboard is at 90° to the frame of the machine. Place two hardwood blocks underneath the moldboard approximately one foot from each end.
2. Loosen the wheel rim bolts.
3. Raise the machine with the blade lift cylinders until the tyres are off the floor. Place suitable lifting stands underneath the front of the machine for support.



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Figure 1
Lifting stands placed underneath the axle frame

4. Place the machine in the [191 Service position](#).
5. Remove the front tyres.



Only use lifting devices with adequate capacity.

6. Place a transmission jack underneath the center of the axle frame and support the weight. Chains from an overhead crane into the access holes on each side of the axle frame can also be used if no jack is available.



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Figure 2
Transmission jack underneath the front axle frame

7. Mark the locations of all hydraulic hoses. Remove them from the bulkhead fittings on the side of the frame. Cap and plug all hydraulic hoses and fittings to prevent contamination.
8. Remove the retaining rings from both ends of the tie bar and remove it from the axle frame.
9. From the rear of the axle, remove the hexagon screw from the center pivot pin. From the front of the axle, position a large bar through the lower cut out on the nose plate and on to the end of the center pivot pin. Make sure that the axle is supported and drive the center pivot pin out.



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Figure 3
Removing the retaining bolt from the center pin

10. Lower the axle frame out and away from the machine.

Document Title: Toe - in, adjustment	Function Group: 622	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Toe - in, adjustment

Op nbr 622-071

1. Check the toe-in adjustment of the front wheels by making a mark on the tires behind the front axle and level with the center line of the spindle. Measure the distance between the inside wall of the tires at these marks. Record this measurement.
2. Operate the blade lift cylinders and raise the front axle. Turn the wheels and position the marks on the center line of the spindles in front of the axle. Measure the distance between the inside walls of the tyres at these marks. Record this measurement.
For models G930, G940, G960, G970, and G990:
The front measurement should be 3 - 6,5 mm (1/8 - 1/4 in.) less than the measurement made behind the front axle.
For models G946 and G976:
The measurements should be equal, (0 toe in).
3. To adjust the toe-in, loosen the clamp at each end of the drag link.



Figure 1

1. Clamp
 2. Drag link
 3. Tie rod end
4. Turn the drag link **one full turn** to alter its length. When the toe-in adjustment is correct, tighten the clamps to secure the drag link.
NOTE!
Due to the drag link profile, it must be rotated in full turns only in order to keep the offset in the correct position.

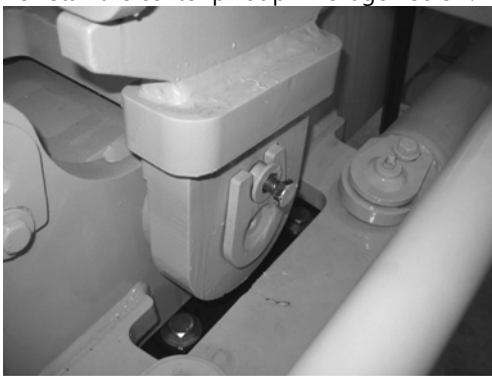
5. Lubricate all grease fittings. Road test the machine to ensure there are no problems with the mechanical function of the front axle, or hydraulic oil leaks.

Document Title: Front axle frame, installing	Function Group: 622	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Front axle frame, installing

Op nbr 622-061

1. Remove and replace the two seals and bushings from the axle.
2. Position the axle over the mounting lugs and install the center pivot pin and spacers.
3. Reinstall the center pivot pin hexagon screw.



V1040396

Figure 1
Reinstalling the center pivot pin hexagon screw

4. Reinstall the tie bar and retaining rings.
5. Reconnect all hydraulic hoses.
6. Raise the machine and remove the lifting stand from underneath the machine.
7. Reinstall the tyres, lower the front end to the floor and reinstall the wheel bolts. Torque to specification.
8. Place the machine back in service.

Document Title: Drag link, removing	Function Group: 622	Information Type: Service Information	Date: 2015/10/15
Profile: GRD, G940 [GB]			

Drag link, removing

Op nbr 622-054

Lifting strap



Only use lifting devices with adequate capacity.

1. Use a suitable lifting strap to support the drag link. Remove and discard the cotter pin securing the castle nut that retains the tie rod end. Remove the castle nut, washer and tie rod end. To aid in removal, it may be required to use a tuning fork and mallet to remove the tie rod end from the spindle.
2. Repeat the disassembly procedure for the other tie rod end. Remove the drag link from the front axle. **Weight 15.4 kg (34 lbs)**
3. Measure the distance between the centers of the tie rod end ball studs. Record the measurement.



Only use lifting devices with adequate capacity.

4. Secure the drag link, using an appropriate vise. Loosen the clamps at each end of the drag link and remove the tie rod ends.



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