Document Title:	Function Group:	Information Type:	Date:
Steering, description	**600**	**Service Information**	**2015/9/30**
Profile: **GRD, G946 [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.

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Construction Equipment

Service Information

Document Title: **Steering system, function check**	Function Group: **600**	Information Type: **Service Information**	Date: **2015/9/30**
Profile: **GRD, G946 [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.

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Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Steering axle, description and operation	**620**	**Service Information**	**2015/9/30**
Profile: **GRD, G946 [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.

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Document Title:	Function Group:	Information Type:	Date:
Steering axle, components	**620**	**Service Information**	**2015/9/30**
Profile: **GRD, G946 [GB]**			

Steering axle, components

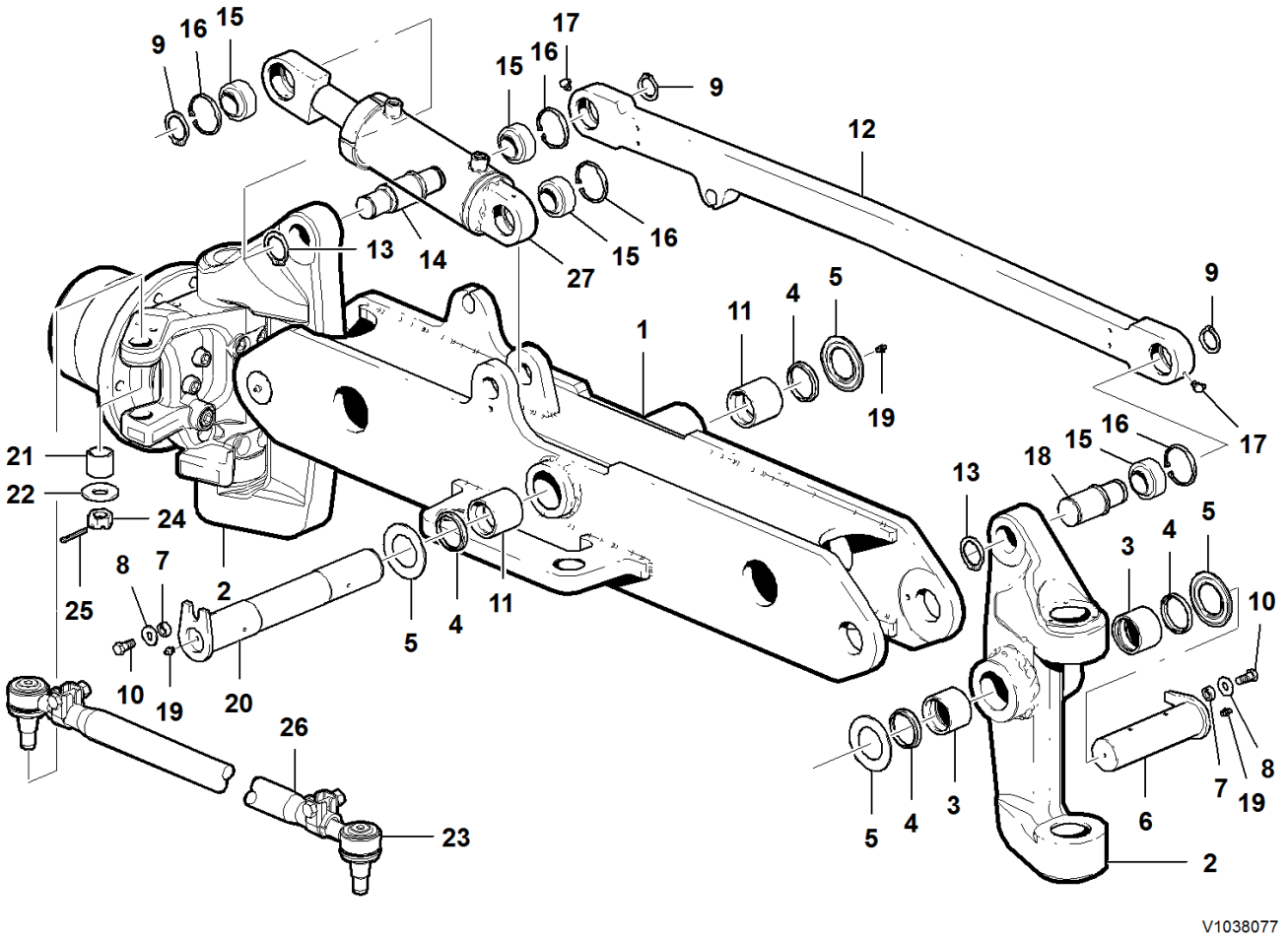

Figure 1
Front axle assembly — G930, G940 and G960

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

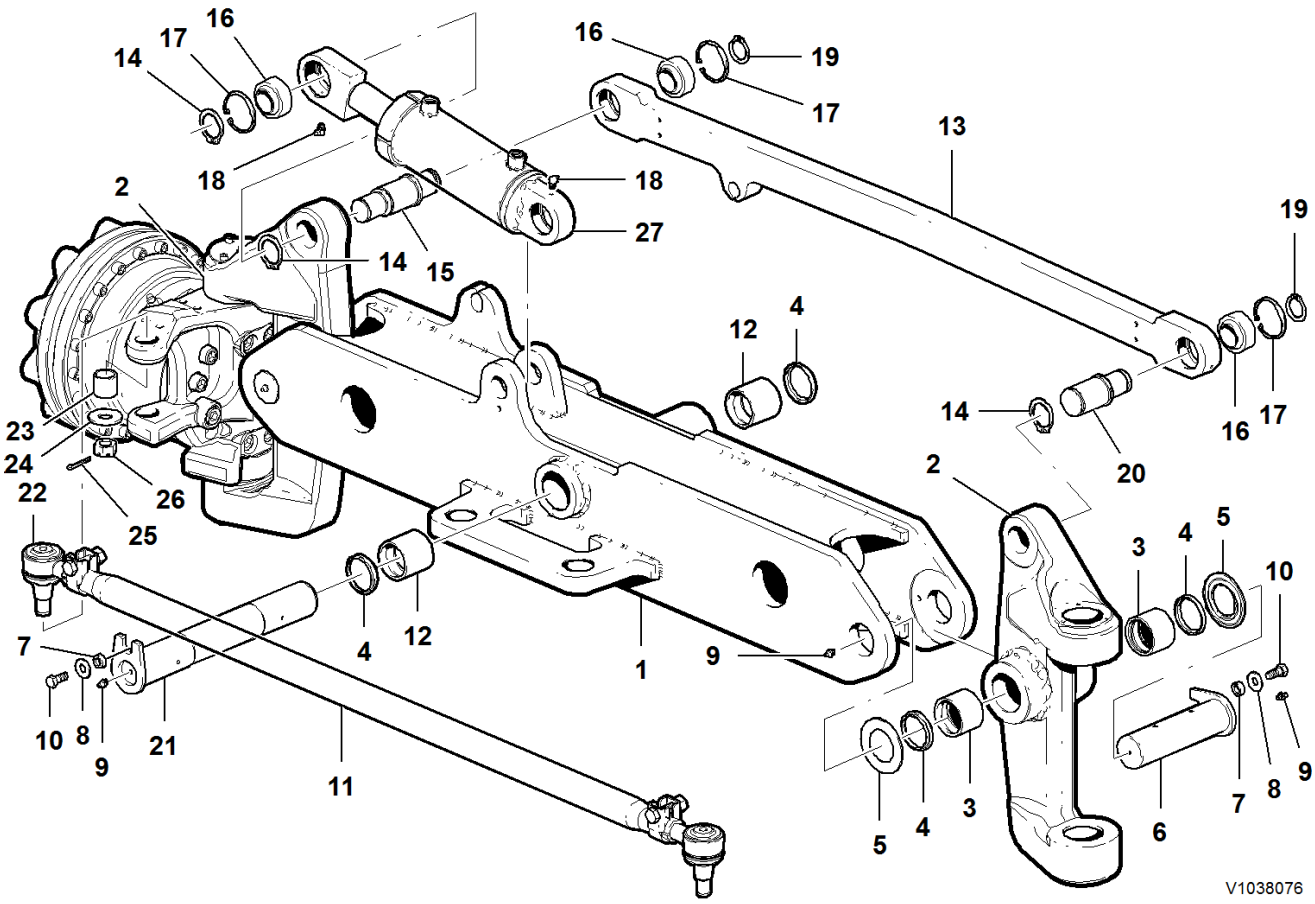

Figure 2
AWD (All Wheel Drive) front axle assembly — G946 and G976

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:	Function Group:	Information Type:	Date:
Front axle frame, removing	**622**	**Service Information**	**2015/9/30**
Profile: **GRD, G946 [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.


V1040290

Figure 1
Lifting stands placed underneath the axle frame

4. Place the machine in the 191 Service position.

5. Remove the front tyres.

WARNING
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.

V1040395

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.

V1040396

Figure 3
Removing the retaining bolt from the center pin

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

Document Title:	Function Group:	Information Type:	Date:
Toe - in, adjustment	**622**	**Service Information**	**2015/9/30**
Profile: **GRD, G946 [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.

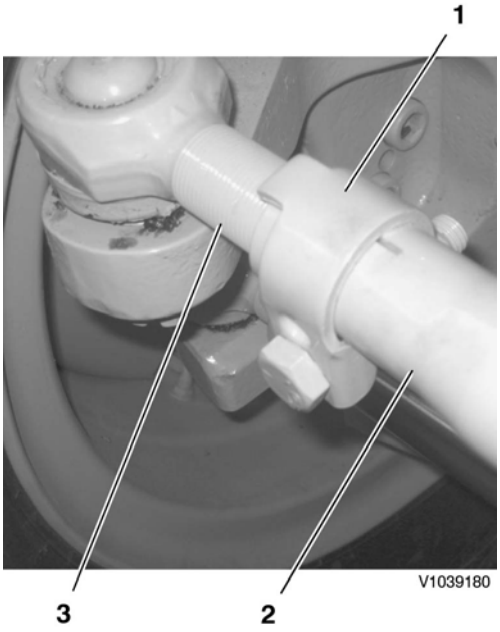

Figure 1

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:	Function Group:	Information Type:	Date:
Front axle frame, installing	**622**	**Service Information**	**2015/9/30**
Profile: **GRD, G946 [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.

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.

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Document Title: **Drag link, removing**	Function Group: **622**	Information Type: **Service Information**	Date: **2015/9/30**
Profile: **GRD, G946 [GB]**			

Drag link, removing

Op nbr 622-054

Lifting strap

WARNING

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.

   WARNING

   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.

Document Title:	Function Group:	Information Type:	Date:
Front axle, overhaul	**622**	**Service Information**	**2015/9/30**
Profile: **GRD, G946 [GB]**			

Front axle, overhaul

Op nbr 622-081

Lifting strap, 1 m

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. Place the machine in the 191 Service position.

3. Loosen the front left and right wheel rim bolts.

4. **WARNING**
   Never work under/on machines without using recommended support equipment.

   Using the blade lift cylinders, raise the axle until there is no weight placed on the front wheels. Place suitable lifting stands underneath the front of the machine for support.

5. Remove the front wheels from the machine.

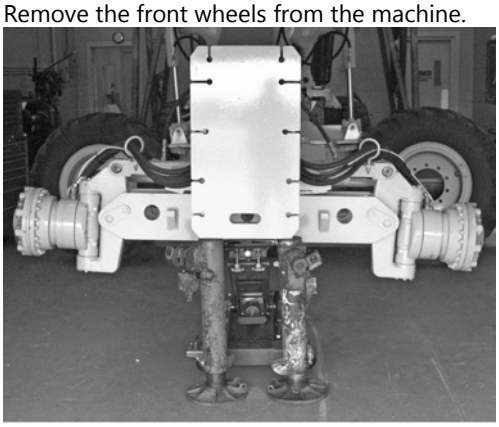
V1047383

Figure 1
Lifting stands underneath the nose plate and wheels removed

6. **CAUTION**
   Maintain greatest possible cleanliness during all work on the hydraulic system.

   Disconnect and cap the wheel lean cylinder hydraulic hoses. Disconnect and cap (at the steering cylinder connection) the hydraulic hoses leading from the bulkhead to the steering cylinders. Mark the proper orientation of the hydraulic hoses to prevent confusion during reassembly.

7. Remove and discard the cotter pins securing the nuts on the ball joints. Remove the castellated nuts to disconnect the steering cylinder and drag link from the right side spindle. Position the drag link and steering cylinder away from the spindle. Repeat the procedure on the left side.
   NOTE!
   As a service tip, use a hydraulic jack to put pressure on the tapered portion of the ball joint. Using a large hammer,

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