

SECTION 14: STEERING

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1. STEERING SYSTEM

1.1 Description

the steering system consists of the steering wheel and column assembly, a vane-type hydraulic pump, reservoir, filter, interconnecting system lines and hoses, integral power steering gear, linkage and steering damper (Figs. 1 & 2). The steering linkage includes the pitman arm, drag link, steering arm, tie rod arms and tie rod. Hydraulic components are added to transmit, increase and regulate steering control forces.

These elements are:

1. Hydraulic cylinder ;
2. Steering stabilizer (damper);

3. A vane type hydraulic pump; and
4. Hydraulic reservoir and hoses.

The steering stabilizer reduces road shocks and vibrations in the system. The steering gearbox is self powered and provides movement with power assistance mainly to the left wheel. The hydraulic cylinder provides an added source of assistance and, being connected to the right wheel, makes it such that the total steering forces are produced with minimal stress on mechanical linkages.

Steering stability and tire wear are influenced by wheels, hubs, tires, air suspension, brakes, front suspension and front end alignment which are all covered in their respective sections in this manual.

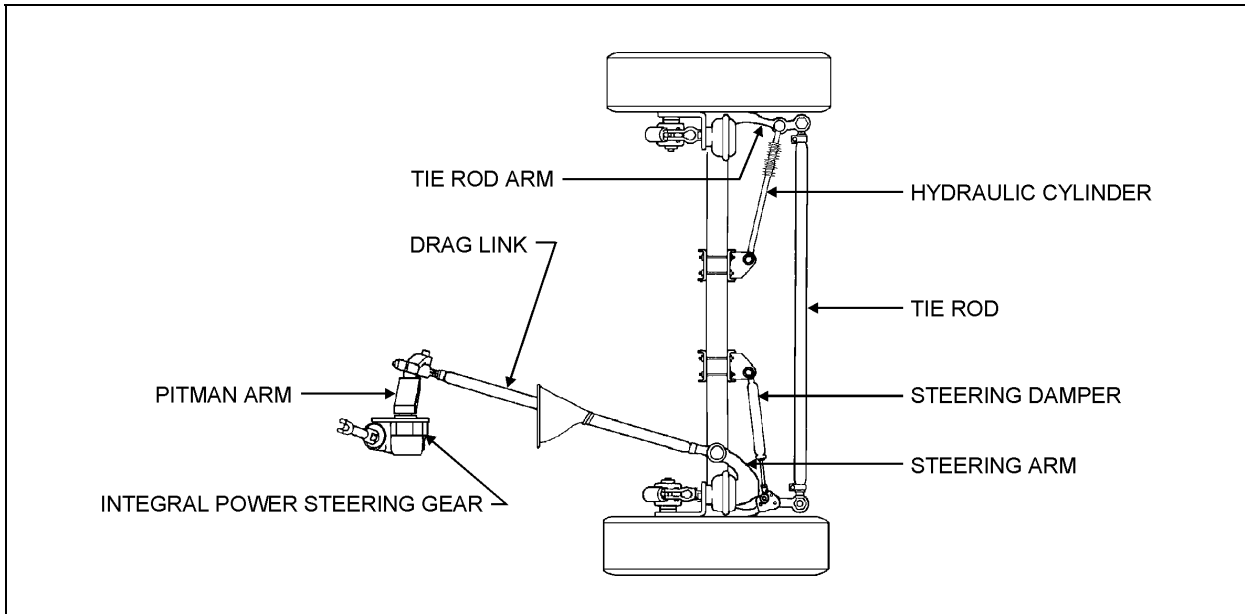


FIGURE 1: STEERING SYSTEM AXLE SETUP

14011

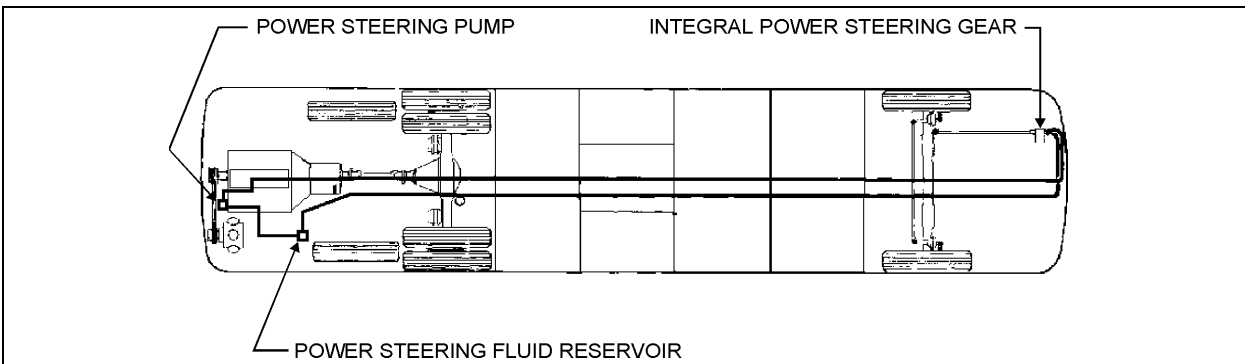


FIGURE 2: POWER STEERING SYSTEM

14012

2. INTEGRAL POWER STEERING GEAR

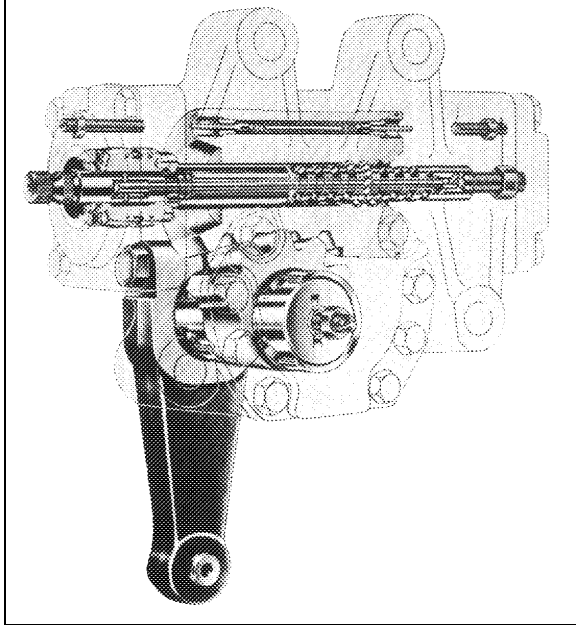


FIGURE 3: INTEGRAL POWER STEERING GEAR 14013

2.1 Description

The power steering gear is located in the steering compartment (Fig. 4). The integral power steering gear (TAS 85) incorporates a manual steering mechanism, a hydraulic control valve and a hydraulic power cylinder.



FIGURE 4: STEERING COMPARTMENT 14014

Force on the steering wheel is transmitted to the steering gear input shaft. The input shaft is connected to the worm shaft by means of a torsion bar. The torsion bar turns with the input

shaft, exerting a rotational force on the worm shaft. The worm shaft in turn transmits the force through a ball nut mechanism to axial force on the rack piston. The rack piston resists this force due to its engagement to the sector shaft. With this resistance, the torsion bar is twisted by the input shaft. Pressurized fluid moves the rack piston axially through the cylinder bore, and the rack piston then turns the sector shaft and steers the vehicle.

If the steered wheels receive a shock load, the shock force is transmitted through the sector shaft to the rack piston and on the worm shaft. This force causes the control valve to send high pressure fluid to the proper cavity to resist the shock force. By hydraulically absorbing the shock, the steering gear prevents kickback at the steering wheel.

The steering gear is equipped with two unloading valves (poppets) at either end of the housing. As the steered wheels approach the axle stop, the corresponding poppet is opened. This reduces heat generated by the pump. The tripped poppet also reduces the load force on the steering linkage. These poppets may be adjusted by the adjusting screw located at bottom of steering gear.

Refer to the "TAS STEERING GEAR SERVICE MANUAL" annexed to this section for the functional aspects and maintenance procedure of the power steering gear.

Caution: Before attempting to adjust the poppet valves of the power steering gear, properly set the steering stop screws as outlined in section 10 "FRONT AXLE", under heading "7.5 Steering Geometry (Turning Angle Adjustment)".

2.2 Power Steering Gear Removal

Warning: The steering gear weighs approximately 112 lbs (51 kg) dry. Exercise caution when maneuvering.

1. Put a container into place, then disconnect both the inlet and outlet hoses from the power steering gear. Cover fittings to prevent fluid contamination.

2. Mark both the pitman arm and sector shaft in line, then remove pitman arm. Refer to "11.1 Pitman Arm Removal" procedure.
3. Mark both the steering shaft universal joint yoke and steering gear input shaft in line, then disconnect universal joint.
4. Unscrew and remove the power steering gear.

2.3 Power Steering Gear Installation

Reverse "Power Steering Gear Removal" procedure paying particular attention to the following:

1. Tighten fasteners as recommended under "14. TORQUE SPECIFICATIONS".
2. Bleed air from the system as per step 3, next.

3. BLEEDING POWER STEERING HYDRAULIC SYSTEM

To bleed the power steering hydraulic system, refer to the "TAS STEERING GEAR SERVICE MANUAL" annexed to this section, under heading "FILLING AND AIR BLEEDING THE SYSTEM".

4. HYDRAULIC PRESSURE TEST

Perform a pressure test as outlined in the "TAS STEERING GEAR SERVICE MANUAL" annexed to this section.

5. TROUBLESHOOTING

Perform troubleshooting of the steering gear as outlined in the "TAS STEERING GEAR SERVICE MANUAL" and the "VICKERS - VANE PUMP OVERHAUL MANUAL" annexed to this section.

6. POWER STEERING HYDRAULIC PUMP

6.1 Description

The power steering pump is a vane type, gear driven, hydraulic unit which supplies hydraulic pressure for the operation of the steering gear. The pump is mounted on the engine, to crankshaft pulleys R.H. side.

6.2 Removal and Installation

The pump is accessible through the engine compartment rear door.

To remove the pump, proceed as follows:

1. Put an empty container directly below pump, then disconnect both the inlet and outlet hoses from the pump. Block fitting cavities to prevent fluid contamination.
2. Remove the two (2) mounting screws, then slowly pry out the pump.
3. Remove and discard gasket.

Caution: *Inspect the drive coupling thoroughly, and replace if necessary (the drive coupling is a fiber component located between the engine and the pump).*

For pump installation, reverse the removal procedure paying particular attention to the following:

Caution: *Insure that drive coupling is correctly positioned before reinstalling the pump.*

1. Install a new gasket (Prévost P/N 510488).
2. Bleed air from the system as per step 3, "Bleeding Power Steering Hydraulic System", on this page.

6.3 Maintenance

Refer to the "TAS STEERING GEAR SERVICE MANUAL" annexed to this section.

7. STEERING WHEEL

7.1 Removal

1. Set the battery main disconnect switches (XL-40) or the battery master switch (XL-45) to the "OFF" position.
2. Using a tool, such as a small flat head screwdriver, pry off the electric horn cap.
3. Loosen the small screw in center of cap and the other retaining the black wire, then disconnect the white terminal. Remove horn cap.
4. Loosen and remove the steering wheel nut.
5. Using a suitable puller, remove the steering wheel.

7.2 Installation

To install, reverse the removal procedure. Torque steering wheel nut to 35-45 lbf•ft (47-60 N•m).

8. STEERING COLUMN

8.1 Removal and Lubrication

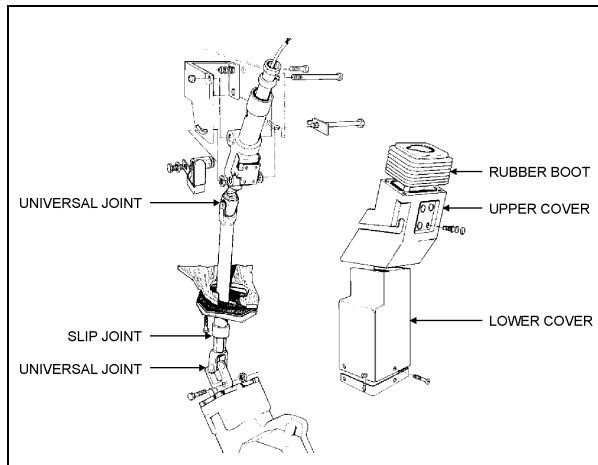


FIGURE 5: STEERING COLUMN

14015

To disassemble the steering column from system, refer to Figure 6. The steering column has three lubrication points which must be serviced only

when needed, using a good quality lithium-base grease NLGI No. 1 and 2. The lower steering column U-joint and slip joint grease fittings are easily accessible through the steering compartment. The upper steering column U-joint grease fitting is accessible from the front driver's area as follows:

1. From the front driver's area, unfasten and lift the steering column boot, then remove the four snap caps on front of upper steering column cover (Fig. 5).
2. Unscrew the four retaining screws on upper steering column cover. Remove the upper cover.
3. Unscrew the three retaining screws on lower steering column cover. Remove the lower cover.
4. Position the steering wheel in order to gain access to the grease fittings.

9. TURNING ANGLE ADJUSTMENT

The maximum turning angle is set through the two (2) steering stop screws installed on the axle center. Steering stop screws are factory adjusted to accommodate the chassis design, and therefore, do not require adjustment on new vehicles. However, these should be checked and adjusted if necessary, any time a steering system component is repaired, disassembled or adjusted. Refer to section 10 "FRONT AXLE" under heading "7. FRONT END ALIGNMENT".

Caution: To prevent the steering damper from interfering with the adjustment of turning angles, make sure its fixing bracket is at correct location on the axle center (refer to "12.2 Steering Stabilizer Cylinder (Damper)").

Hydraulic Stop

Caution reduce or shut off the power steering hydraulic pressure before the boss on the axle center touches the stop screw. If not, the components of the front axle will be damaged (refer to "TAS STEERING GEAR SERVICE MANUAL" annexed to this section, under heading "POPPET RESETTING").

Caution: Never maintain the relief pressure for more than 5 seconds, since damage to the power steering pump may occur.

10. STEERING LINKAGE ADJUSTMENT

The steering linkage includes the pitman arm, drag link, steering arm, tie rod arms and tie rod.

Perform lubrication according to "ROCKWELL MAINTENANCE MANUAL NO. 2 - FRONT NON-DRIVE STEERING AXLES" annexed to section 10 "FRONT AXLE".

Drag link ends are provided with grease fittings. Under normal conditions, these should be serviced every 6,250 miles (10 000 km). Refer to section 24 "LUBRICATION".

Steering linkage pivot points should be checked each time they are lubricated. Looseness can be visually detected while rotating the steering wheel in both directions. Replace defective parts.

Caution: Front end alignment should be checked and adjusted if necessary, any time a component of the steering system is repaired, disassembled or adjusted. Refer to section 10 "FRONT AXLE" under heading "7. FRONT END ALIGNMENT".

11. PITMAN ARM

11.1 Removal

1. Remove cotter pin, nut and washers from drag link ball stud at pitman arm.

2. Disconnect drag link from pitman arm, using jaw style pullers (pressure screw type).

Warning: Always wear approved eye protection when operating pullers.

Caution: Do not drive (hammer in) pitman arm on or off pitman shaft as this can damage the steering gear.

Caution: Heating of components to aid in disassembly is not allowed because it has a detrimental effect on axle components and steering linkages.

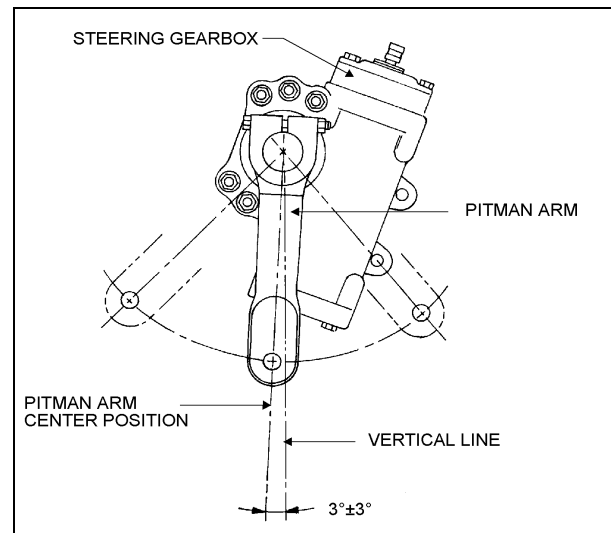


FIGURE 6: PITMAN ARM ADJUSTMENT

14007

3. Remove pitman arm clamp bolt nut, washer and bolt.
4. Check the radial position of the pitman arm in relation to the sector shaft prior to removal of pitman arm.
5. Add reference marks to the arm and shaft if necessary to ensure correct alignment at reassembly.
6. Remove pitman arm. A chisel will help you loosen the pitman arm. Use a puller if you cannot remove the pitman arm manually.

11.2 Installation

1. Position pitman arm on sector gear shaft with reference marks aligned. Ensure that the clamp bolt groove matches.
2. Install bolt, washer and nut. Tighten nut to 280-300 lbf•ft (380-408 N•m).
3. Connect drag link to pitman arm while ensuring that rubber stabilizer is in place on the rod end. Install washers. Tighten nut to 200-220 lbf•ft (272-300 N•m). Afterwards, install a new cotter pin.

11.3 Adjustment

1. Disconnect the drag link from pitman arm. Center steering wheel by dividing the total number of steering wheel turns in two. Scribe a reference mark on steering gearbox at the center previously determined.
2. Using a protractor, check the angle of the pitman arm (refer to Fig. 6 for details).
3. The pitman arm should be adjusted to an angle of $3^{\circ} \pm 3^{\circ}$ in relation with the vertical axis (towards rear of vehicle). If not, unscrew and remove bolt, nut and washer. Remove the pitman arm according to the procedure outlined under previous heading "*Pitman arm removal*". Adjust to the proper angle.
4. When adjustment is achieved, replace bolt, nut and washer, and torque to 280-300 lbf•ft (380-408 N•m).

12. MAINTENANCE

The power steering system requires little maintenance. However, the system should be kept clean to ensure maximum operating performance and troublefree service. Periodic

inspections should also be made to check for leakage and all parts for damage or distortion. Insure all fasteners are tight (see "*14. SPECIFICATIONS*" for recommended tightening torques.

When the slightest evidence of dirt, sludge or water is discovered in the system, disconnect fluid lines at the power steering gear to drain the system. Drain and refill the system with "*Dexron-II* or *Dexron-III*" automatic transmission oil.

Air in the hydraulic system will cause spongy action and noisy operation. When a hose has been disconnected or when fluid has been lost for any reason, the system must be bled. Bleed system as outlined under heading "*3. Bleeding Power Steering Hydraulic System*".

Warning: **Do not operate the pump without fluid in the power steering fluid reservoir.**

If the steering linkage between the steering gear and the two front wheels is not properly adjusted, bent, twisted or worn, the steering of the vehicle will be seriously impaired. Whenever a steering linkage part is repaired, replaced or adjusted, steering geometry and front wheel alignment must be checked and necessary corrections made. Refer to "*7. FRONT END ALIGNMENT*" in section 10 "*FRONT AXLE*".

At regular lubrication intervals, the steering linkage should be thoroughly inspected for worn or loose components.

After the vehicle has been operated continually and high mileage figures have been reached, overhaul of the various steering units will be required. General overhaul procedure normally requires removal of the entire assembly, cleaning and inspection of all parts and final assembly. Careful inspection of all parts during overhaul is very important and must not be neglected.

Lubrication fittings must all be cleaned before applying lubricant. Moreover, always be sure the equipment used in applying lubricant is clean.

Every precaution should be taken to prevent entry of dirt, grit, lint or other foreign matter into lubricant containers. Replace fittings that have become broken or damaged. Lubrication intervals, as well as the recommended lubricants for the steering components, are given in the "LUBRICATION AND SERVICING SCHEDULE" in Section 24 of this manual. The intervals given in the schedule are recommended for normal service. More frequent intervals may be required under severe operating conditions.

12.1 Power Steering Reservoir and Filter

The power steering reservoir is located on R.H. side of engine compartment, on front wall and accessible through either the compartment rear doors or the L.H. side door, depending on vehicle (Figs. 7 & 8).

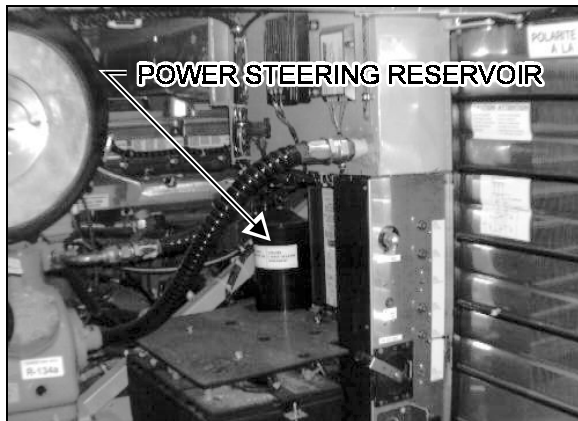


FIGURE 7: ENGINE COMP'T - R.H. SIDE DOOR 14016

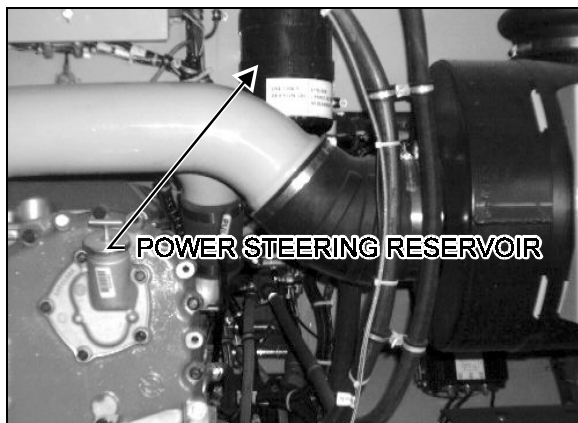


FIGURE 8: ENGINE COMP'T - REAR DOORS 14017

At regular intervals, fluid level should be checked in the reservoir and filter assembly. Furthermore, the oil filter cartridge element in the power steering reservoir should be replaced every 50,000 miles (80 000 km) or once a year, whichever comes first.

12.1.1 Oil Level Check Procedure

1. Stop engine. Open engine compartment door(s) (Figs. 7 & 8).
2. Unscrew and remove the dipstick located on top of reservoir and wipe with a clean rag.
3. Replace dipstick in reservoir. Remove it again to check fluid level.
4. Adjust level to "FULL" mark, using "Dexron-II E or Dexron-III" automatic transmission oil.
5. Replace and tighten the dipstick.

12.1.2 Filter Replacement

1. Unscrew and remove the cover screw located on top of the power steering reservoir.
2. Remove the reservoir cover and gasket.
3. Remove the retaining spring and finally the filter cartridge element.

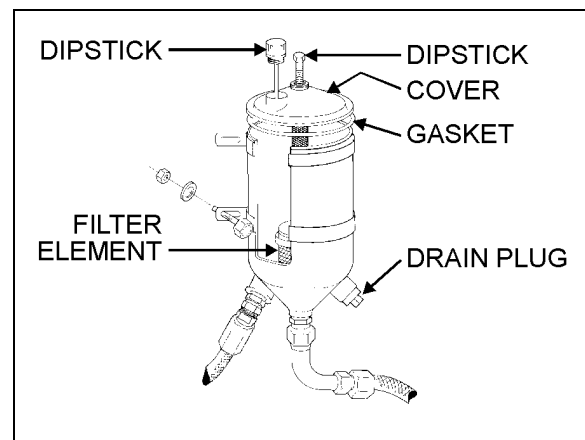


FIGURE 9: POWER STEERING FLUID RESERVOIR 14018

12.2 Steering Stabilizer Cylinder (Damper)

The steering damper is located on L.H. side, at back of front axle center.

The cylinder is nonadjustable and nonrepairable. Check for oil leaks or lack of resistance. Disconnect the cylinder from axle center, then carefully attempt to extend and collapse it manually.

The rod end (ball joint) is provided with a grease fitting. Under normal conditions, it should be serviced every 6,250 miles (10 000 km) or twice a year, whichever comes first. Good quality lithium-base grease NLGI No. 1 and 2 are recommended (refer to section 24 "LUBRICATION"). Check the ball joint for wear, and replace if necessary.

Caution: To prevent the steering damper from interfering with the turning angle adjustment of front wheels, make sure its fitting bracket is at the correct location on the axle center. With front wheels in the straight ahead position, the bracket must be positioned in order to obtain a distance of 26"-26 1/4" (660 - 665 mm) between the center of both steering damper fixing points (Fig. 10).

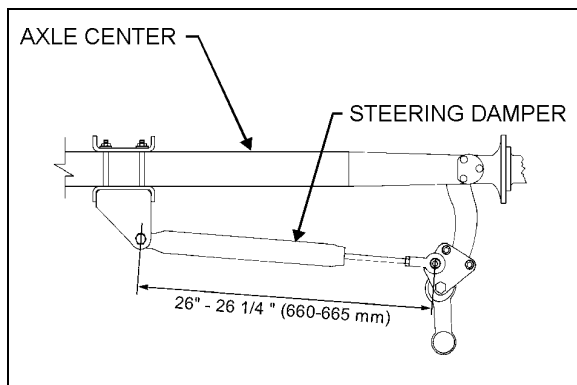


FIGURE 10: DAMPER BRACKET ADJUSTMENT 14019

12.3 Hydraulic Cylinder Assembly

The hydraulic cylinder is located on R.H. side, at back of front axle center. For seal replacement,

use repair kit number 66-0902 (prior V.I.N. 2P9M33490S1001519) or kit number 661003 (from V.I.N. 2P9M33490S1001519). Lubricate the fittings at each cylinder end of the power steering cylinder every 6,250 miles (10 000 km) or twice a year, whichever comes first. Good quality lithium-base grease NLGI No. 1 and 2 are recommended.

12.4 Drag Link

Lubricate the fittings every 6,250 miles (10 000 km) or twice a year, whichever comes first. Good quality lithium-base grease NLGI No. 1 and 2 are recommended (refer to section 24 "LUBRICATION").

12.5 Power Steering Hydraulic Pump

For maintenance of power steering hydraulic pump, refer to the "VICKERS - VANE PUMP OVERHAUL MANUAL" annexed to this section.

13. DRIVING TIP

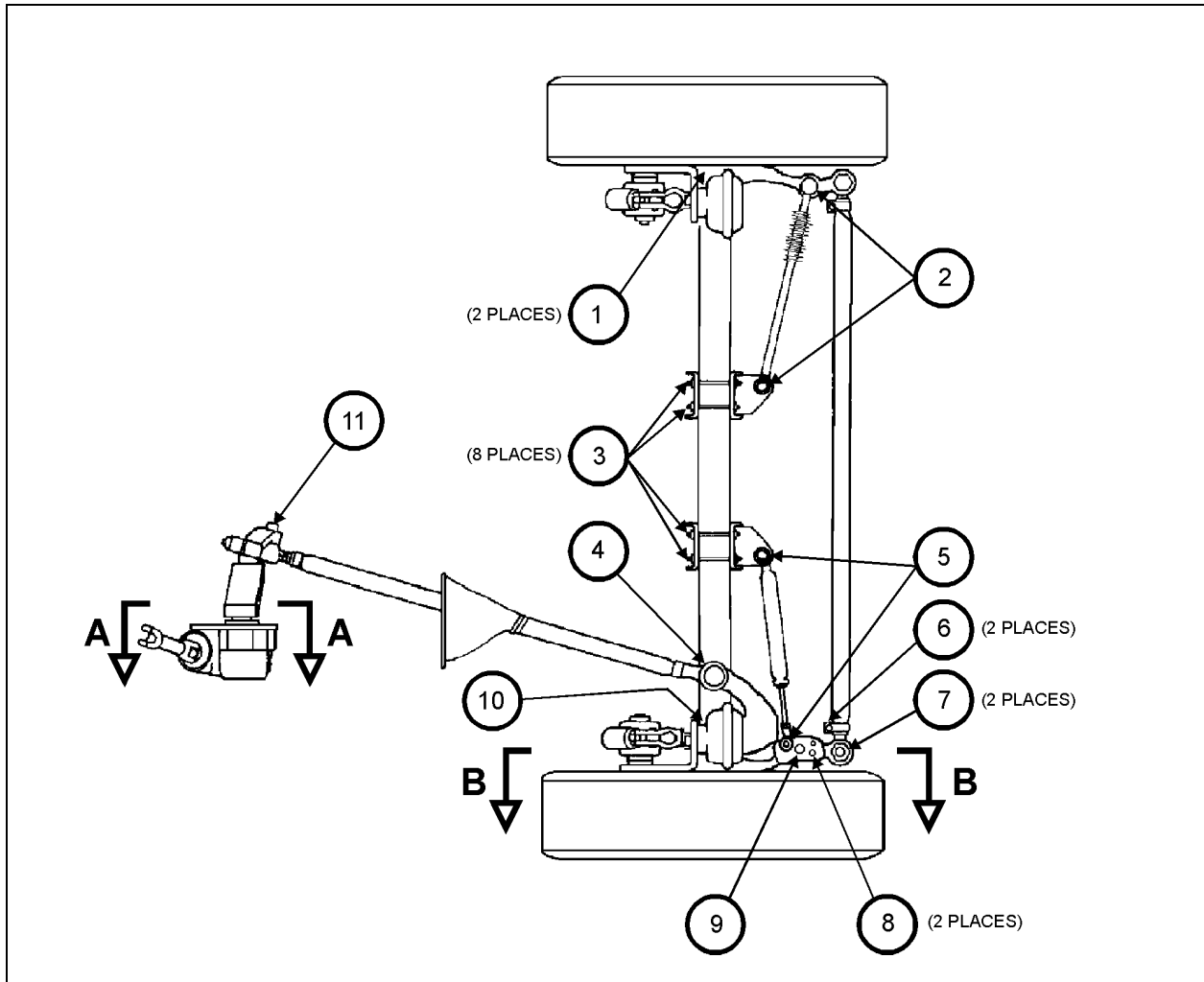
In order to maximize power steering pump service life, do not attempt to turn the steering wheel when the vehicle is stationary, and especially when service brakes are applied (wheel locking will oppose the effect of steering geometry which tends to make the front wheels rotate in opposite directions).

Persisting in turning, or maintaining the steering wheel with an extra effort, could make the hydraulic system work at the relief pressure, and consequently, cause the hydraulic fluid to become overheated.

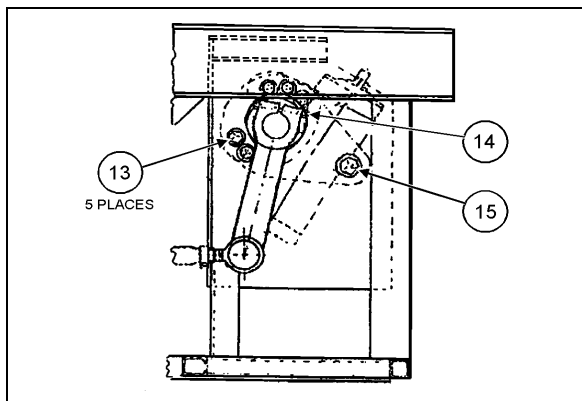
Caution: Never maintain the hydraulic system at the relief pressure for longer than 5/10 seconds to avoid damaging the power steering pump.

Note: Unequal or low tire pressure, oversize tires, and vehicle overloading are some of the causes that may increase steering effort.

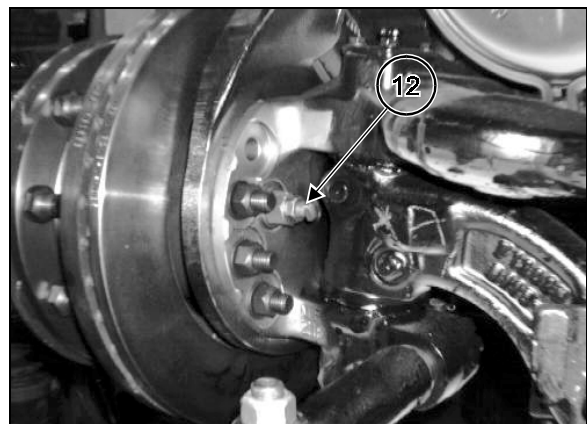
14. TORQUE SPECIFICATIONS



14020A



VIEW A-A 14020B



VIEW B-B 14020C

FIGURE 11: TORQUE REFERENCE NUMBERS

Section 14: STEERING

DRY TORQUES			
Description	Reference	lbf•ft	N•m
Tie Rod Arm Nut	1	550/1025	750/1390
Hydraulic Cylinder Arm Nuts	2	160/300	220/405
Hydraulic Cylinder & Steering Damper Bracket Nuts	3	30/40	41/54
Drag Link End Nut	4	160/300	220/405
Steering Damper	5	100/120	136/163
Tie Rod Clamp Nut	6	40/60	55/80
Tie Rod End Nut	7	160/300	220/405
Stabilizer Support Nuts	8	24/30	33/41
Stabilizer/axle Nut	9	54/60	73/82
Steering Arm Nut	10	775/1450	1050/1965
Pitman Arm Nut	11	300/320	410/435
Stop Screw Jam Nut	12	50/65	70/85
Steering Gear Retaining Bolts	13	250/270	340/367
Steering Gear Retaining Bolt	14	365/385	496/524
Pitman Arm Mounting Bolt	15	250/270	340/367
Fluid Reservoir Cover Screw	-	12	16
Steering Wheel Central Nut	-	35/45	50/60

15. SPECIFICATIONS

Power Steering Gear

Make..... TWR
 Model..... TAS 85
 Supplier number..... TAS85040
 Prevost number..... 660927
 F.E.W. 18,000 lbs (8 200 kg)
 Pressure rating.....2,175 psi (150 Bar)
 Gear ratio23.3:1
 Minimum pump flow for 1.5 hwt/sec3.5 gpm (13.2 lpm)

Power Steering Pump

Make.....Vickers
 Type V20
 Relief valve setting.....2,000 psi (13 790 kPa)
 Capacity 11 GPM/1200 RPM
 Controlled flow rate 6 gpm (23 lpm)
 Inlet port 1 1/4 NPT
 Outlet port..... 3/4-16 straight thread SAE o-ring boss conn.
 Supplier number.....V20NF-1P11T-38C6H22LH
 Prevost number..... 660933
 Gasket - Supplier number..... 23516100
 Gasket - Prevost number..... 510488

Power Steering Reservoir

Make..... Nelson Muffler
 Oil capacity 4 US qts (3.7 liters)
 Supplier number..... 91410A
 Prevost number..... 66-0982
 Make..... Nelson Muffler
 Element filter - Supplier number 83804 E
 Element filter - Prevost number 660987

Steering Stabilizer Cylinder (Damper)

Make..... Gabriel
 Extended length 32.73±0.12"
 Collapsed length 20.26±0.12"
 Stroke 12.47±0.12"
 Supplier number..... 651535
 Prevost number..... 660979
 Dust cap - Prevost number 660980

Hydraulic Cylinder Assembly (Prior 2P9M33490S1001519)

Make..... Hayes-Dana
 Bore..... 1 1/2"
 Stroke 17"
 Required fluid flow for 1.5 hwt/sec.....2.1 gpm (8 lpm)
 Rod diameter..... 0.875"
 Supplier number..... 006-9231-0
 Prevost number..... 160886
 Repair kit - Supplier number 306-7200-00
 Repair kit - Prevost number 660902

Hydraulic Cylinder Assembly (From 2P9M33490S1001519)

Make..... Hayes-Dana
 Bore..... 1 1/2"
 Stroke 17"
 Rod diameter..... 0.875"
 Supplier number..... 006-9231-5
 Prevost number..... 661001
 Repair kit - Supplier number 106-4016-6
 Repair kit - Prevost number 661003

FOR CONVERTED COACH SHELL

REFER TO

SUPPLEMENT INFORMATION ON
INDEPENDENT FRONT SUSPENSION
(IFS)
ANNEXED AT THE END OF SECTION 16