

05V-178



VEHICLE RECALL

SC298

(Not applicable to Mack Trucks Australia)

Date: 05/09/05

To: All MACK Dealers

Subject: Steering Gear Replacement — CXN Models Equipped with Sheppard M100 Steering Gear

Information:

On certain CXN model chassis equipped with Sheppard M100 steering gears, the potential exists for the front and rear steering gear mounting bosses to crack, resulting in a possible failure of the housing. Should this occur, a sudden loss of steering could result.

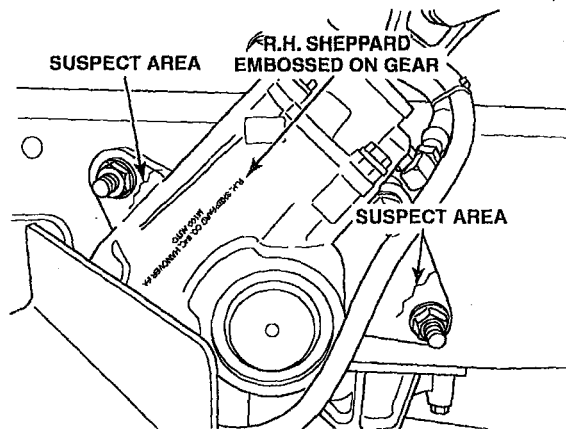


Figure 1 — Areas of Steering Gear Mounting Bosses Where Cracks May Occur

Approximately 2,793 CXN model chassis manufactured between May 26, 2004 and April 6, 2005 are involved in this campaign. A list of affected chassis has been sent to all applicable dealers.

NOTE

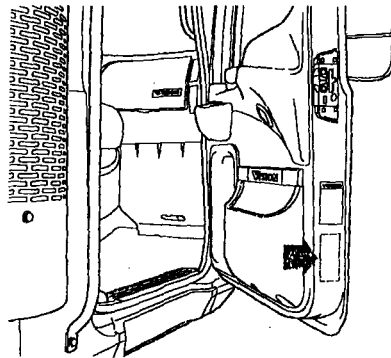
On chassis where both mounting bosses on the steering gear have broken, damage to the frame rail in the area of the center mounting hole may have occurred. In these cases, frame web flatness must be inspected by a qualified frame repair shop and repaired as required. Failure to repair a damaged frame will result in damage to the replacement gear. Contact Mack Trucks, Inc. Reliability Engineering at 610-709-2653 for additional information.

Procedures:

The steering gears on all affected chassis must be replaced.

NOTE

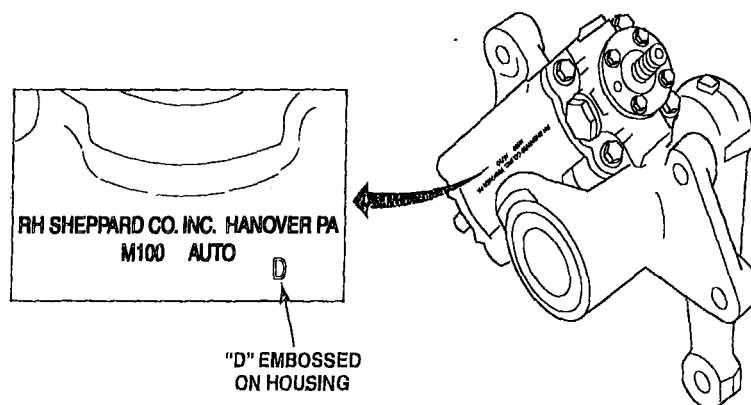
Before proceeding, check campaign status in the MACKnet system to see if the campaign has already been completed. Campaign status can also be checked by looking at the Campaign Completion Label located on the lower edge of the passenger-side door. If the campaign has been completed, the campaign number (SC298) and the completion date should be written on the label.



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Figure 2 — Campaign Label Location

Before replacing a steering gear, check the housing. The replacement steering gears are identified with a "D" embossed on the housing below the manufacturer's name as shown in the illustration below.



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Figure 3 — Steering Gear Identification

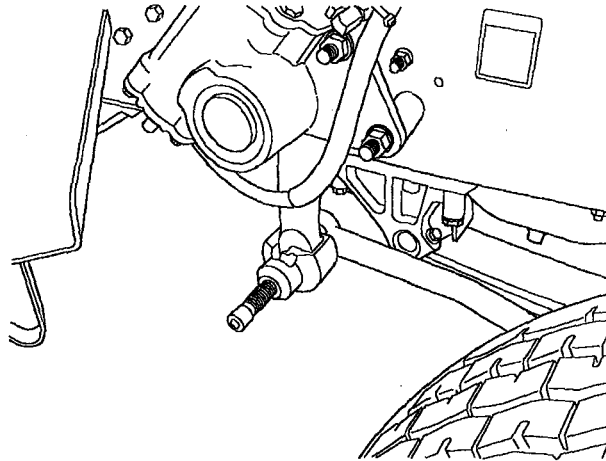
Do not replace any steering gears having a "D" embossed on the housing.

Steering gear replacement procedures are as follows:

1. Secure the vehicle for service, and drive the vehicle straight into the service bay with the front wheels facing straight ahead. Apply the parking brakes and block the wheels to prevent the vehicle from moving.
2. After making sure that the front wheels are facing straight ahead, place a piece of tape at the 12 o'clock position on the steering wheel. This will aid in making sure the steering wheel is properly centered when the steering shaft is reinstalled on the steering gear.
3. Place a suitable drain pan under the steering gear to catch any oil that will drain from the gear and hoses.
4. Disconnect the low and high pressure power steering hoses from the steering gear.
5. Remove the two fittings from the gear and save for reuse.
6. Remove the cotter pin from the drag link stud at the pitman arm, and then remove the castle nut.
7. Using a suitable ball socket removal tool, disconnect the drag link from the pitman arm.

NOTE

Do not remove the pitman arm from the steering gear. The replacement gear is supplied with a pitman arm.



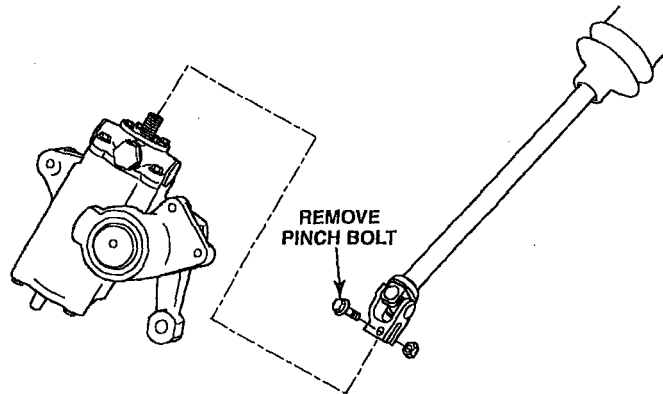
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Figure 4 — Disconnecting Drag Link from Pitman Arm

NOTE

With the steering gear mounted on the frame rail, the drag link stud will not completely clear the pitman arm. Use the ball socket removal tool to loosen the drag link. The drag link will clear the pitman arm when the steering gear mounting bolts are loosened.

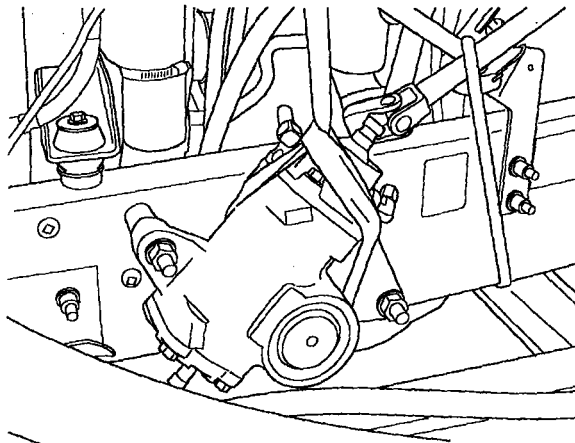
8. Remove the pinch bolt from the steering shaft lower U-joint, and then remove the shaft from the steering gear input shaft.



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Figure 5 — Disconnect Steering Shaft from Steering Gear

9. Using a nylon strap wrapped around the gear between the pitman arm and housing, use a hoist or other suitable lifting device to support the steering gear, and then remove the three mounting bolts that secure the gear to the frame rail.



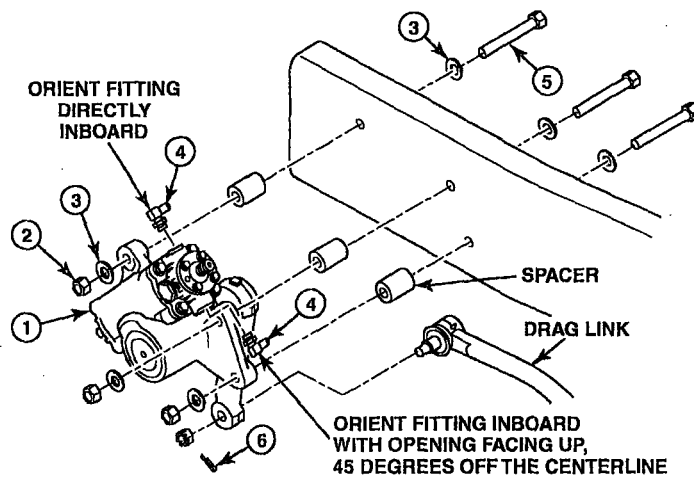
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Figure 6 — Removing Steering Gear

10. Using new O-rings (part No. 56AX379), replace the O-rings on the two 90-degree elbow fittings. These O-rings are included in mounting hardware kit (part No. 204SX418). Install the fittings into the ports on the new steering gear (part No. 20QC388), and orient the fittings as shown in figure 7. Lock in place with the jam nuts.
11. Wrap a nylon strap around the replacement gear (between the pitman arm and housing), and then use a hoist or similar suitable lifting device to position the steering gear on the frame rail. Loosely install the three bolts (part No. 2AM83), six washers (part No. 271AM18) and three nuts (part No. 157AM13). The fasteners are included in hardware kit (part No. 204SX418). Install the bolts from the inside of the frame, and place a flat washer under each bolt head and under each nut. Do not tighten the bolts at this time, as the steering gear must be loose so that the drag link can be installed.

NOTE

DO NOT lubricate the threads of the fasteners.



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Figure 7 — Steering Gear Installation

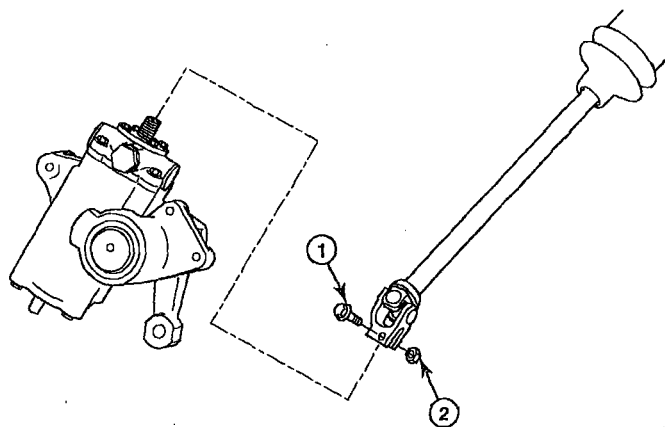
Key	Qty.	Part No.	Description
1	1	20QC388	Steering gear, M100, with pitman arm
2*	3	157AM13	Nuts, steering gear mounting
3*	6	271AM18	Washers, steering gear mounting
4*	2	56AX379	O-rings
5*	3	2AM83	Bolts, steering gear mounting
6*	1	29AX5	Cotter pin, 1/8" x 1-1/2"

* Items 2 through 6 above are included in the hardware kit (part No. 204SX418).

⚠ CAUTION

The steering gear mounting fasteners are one-time use only. DO NOT reuse the existing mounting hardware.

12. Connect the drag link to the pitman arm, and then loosely install the castle nut.
13. Tighten the steering gear mounting bolts to 400 lb-ft (542 N•m).
14. Tighten the drag link castle nut to 150 lb-ft (203 N•m). Install a new cotter pin (part No. 29AX5). If the hole in the stud does not align with the slots in the castle nut, tighten the nut further until alignment is attained. Do not loosen the castle nut in order to align the slots with the hole.
15. Connect the low and high pressure power steering hoses to the fittings on the steering gear. Tighten the hose clamp on the low pressure line to 25–30 lb-in (2.8–3.4 N•m).
16. After making sure that the piece of tape installed on the steering wheel is at the 12 o'clock position and the front wheels are facing straight ahead, install the steering shaft to the input shaft of the steering gear. Use a new pinch bolt (part No. 3AX1876) and nut (part No. 21AX789). Tighten the pinch bolt to 70 lb-ft (95 N•m). The pinch bolt and nut are included in the mounting hardware kit (part No. 204SX418).



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Figure 8 — Installing Steering Shaft Pinch Bolt

Key	Qty.	Part No.	Description
1	1	3AX1876	Bolt, 7/16-20 UNF x 2" long, SAE grade 8
2	1	21AX789	Lock nut, 7/16-20 UNF

17. Replenish the power steering reservoir with Bulldog® EO-N Premium Plus engine oil, the same viscosity as used in the engine.

18. Adjust the auto poppet valve as follows:

- a. Raise the front of the vehicle so that the front tires are off the ground and support the chassis on jackstands of sufficient capacity to support the weight of the vehicle.

 DANGER

DO NOT work on or around a vehicle supported on a hydraulic jack, as the jack can fail suddenly and unexpectedly, resulting in severe injury or death. Jackstands of adequate capacity to support the weight of the vehicle must be used.

 CAUTION

DO NOT attempt to adjust the automatic poppet valves with a screwdriver.

- b. Start the engine and allow it to run at an idle.
- c. Turn the steering wheel to a full left-hand turn until the axle stop bolt contacts the axle.
- d. Turn the steering wheel to a full right-hand turn until the axle stop bolt contacts the axle.

NOTE

Do not turn the steering wheel past the point of initial contact of the axle stop bolt to the axle, or the poppets will be improperly set.

- e. The poppet valves are now properly set and no further adjustments are required.
19. Bleed the steering gear as follows:

NOTE

DO NOT allow the reservoir to run dry during the bleeding procedure. Should the reservoir run dry, more air will be drawn into the system.

- a. Check the fluid level in the power steering reservoir and replenish with the proper engine oil as required.

- b. With the engine running at an idle, turn the steering wheel from a full left-hand turn to a full right-hand turn.

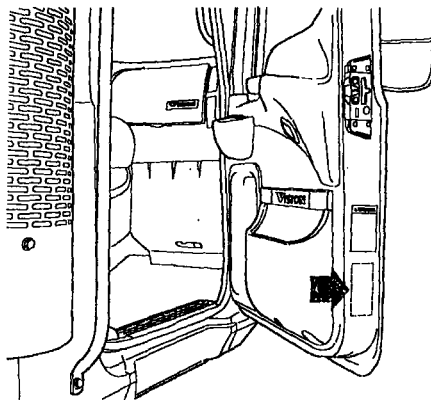
NOTE

Do not force the steering wheel when turning the wheel to a full turn.

- c. Repeat turning the steering wheel from a full left- to a full right-hand turn three to four times. The steering gear auto bleed feature will remove any residual air from the steering system as the steering wheel is turned.
20. After bleeding the steering system, shut the engine off and lower the vehicle to the ground. Check the fluid level in the power steering reservoir and replenish as necessary. Check the steering system for oil leaks.
 21. Perform a short road test.

NOTE

To signify that the campaign has been completed, use a permanent-type marker (such as a Sharpie®) to write the campaign number (SC298) and completion date in the spaces provided on the Campaign Completion label located on the lower edge (below the door latch) of the passenger-side door. If a label is not already affixed to the door, apply a label (part No. TS897) and supply the information as required. Campaign Completion labels are available in packs of 50 and can be ordered by faxing a completed BR313 to Pacesetters Business Services at 610-264-9465.



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Figure 9 — Campaign Label Location

Parts Required:

Order vehicle recall parts on a separate stock order and process through the parts distribution center normally serving your area. Do not include parts on this requisition that are not required for this recall campaign.

International orders are to be prefixed — V.O.R.

Qty	Part No.	Description
1	20QC388	Steering gear, Sheppard model M100
1	204SX418	Hardware mounting kit, includes: 2 56AX379 O-rings, oil port 90-degree fittings 3 2AM83 Bolts, steering gear mounting 3 157AM13 Nuts, steering gear mounting 6 271AM18 Flat washers 1 29AX5 Cotter pin, drag link 1 3AX1876 Bolt, steering shaft U-joint 1 21AX789 Nut, steering shaft U-joint

Removed Parts:

In the U.S., steering gears must be returned to R.H. Sheppard at the following address:

R.H. Sheppard Company
Attn: Warranty Department
447 East Middle Street
Hanover, PA 17331

In Canada, steering gears must be returned to:

Technical Material Analysis Center via Morrice Transportation
3049 Devon Drive
Windsor, Ontario
N8X 4L3

NOTE

When preparing the steering gear for shipment, purge as much oil as possible from the gear by rotating the input shaft the number of turns it takes for the gear to move through a complete range of travel. Be sure to install the plastic plugs taken from the oil ports of the replacement gear into the ports of the removed gear.

Reimbursement:

Campaign expenses are to be recovered through normal warranty claim procedures. Enter the following information on the warranty claim:

UNDER**ENTER**

Failed Part No.....

SC0298

Labor Code/Allowance

411 2C TK 95 — 0.2 hr.

Time allowed to take charge of vehicle and determine campaign status by checking the MACKnet system and the campaign completion label.

411 2D TK 95 — 1.8 hr.

Time allowed to remove and replace Sheppard M100 steering gear on CXN model chassis. Includes time to adjust auto poppets, bleed system and perform short road test. Does not include "take-charge" time.

NOTE

As required by Federal Motor Vehicle Safety Standards 49 CFR 573.11, no vehicle subject to an open safety campaign shall be delivered to the customer until such time as the defect or noncompliance is remedied.



VEHICLE RECALL

SC298

(Not applicable to Mack Trucks Australia)

Date: 05/25/05 (Supersedes SC298 dated 05/09/05)

To: All MACK Dealers

Subject: Steering Gear Replacement — CXN Models Equipped with Sheppard M100 Steering Gear

Information:

On certain CXN model chassis equipped with Sheppard M100 steering gears, the potential exists for the front and rear steering gear mounting bosses to crack, resulting in a possible failure of the housing. Should this occur, a sudden loss of steering could result.

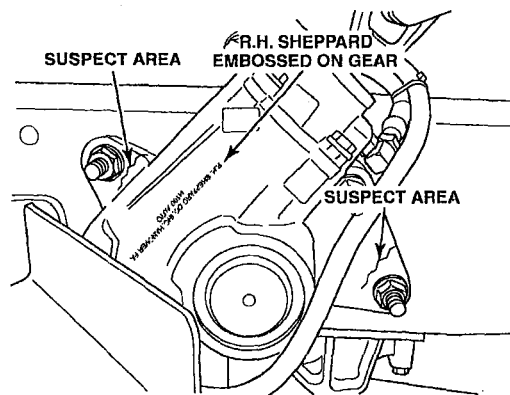


Figure 1 — Areas of Steering Gear Mounting Bosses Where Cracks May Occur

Approximately 2,793 CXN model chassis manufactured between May 26, 2004 and April 6, 2005 are involved in this campaign. A list of affected chassis has been sent to all applicable dealers.

NOTE

On chassis where both mounting bosses on the steering gear have broken, damage to the frame rail in the area of the center mounting hole may have occurred. In these cases, frame web flatness must be inspected by a qualified frame repair shop and repaired as required. Failure to repair a damaged frame will result in damage to the replacement gear. Contact Mack Trucks, Inc. Reliability Engineering at 610-709-2653 for additional information.

REV

Procedures:

THERE IS NO INSPECTION CRITERIA. DEFECTIVE STEERING GEARS (AS IDENTIFIED BY THE PART NUMBER STAMPED ON THE STEERING GEAR AND DEFINED BY THE CHART ON PAGE 3) ON ALL AFFECTED CHASSIS MUST BE REPLACED.

NOTE

Before proceeding:

1. Check campaign status in the MACKnet system.
2. Check the door campaign label to see if the campaign has been completed (SC298 and the completion date should be written on the label).
3. Check the Sheppard part number stamped on the steering gear.

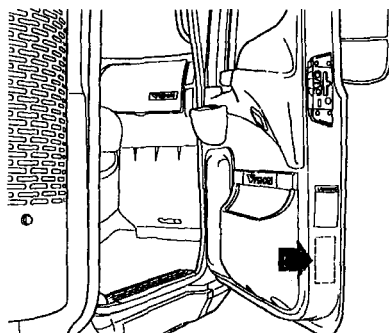
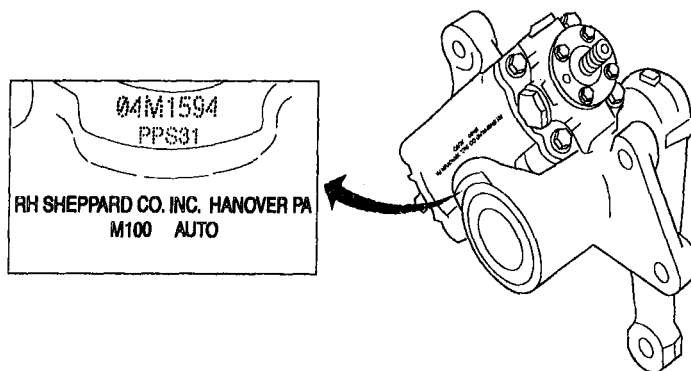


Figure 2 — Campaign Label Location

REV

Before replacing a steering gear, check the part number which is pin-stamped on the machined surface of the housing (at the sector shaft bore, opposite the pitman arm mounting side) as shown in the following illustration. Defective housings will have the part number PPS31 stamped at this location.



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Figure 3 — Steering Gear Identification

REV

Defective Steering Gear Part No.		Description	Replacement Steering Gear Part No.	
Sheppard Part No.	MACK Part No.		Sheppard Part No.	MACK Part No.
PPS31	20QC387	M100 steering gear	PQT31	20QC388

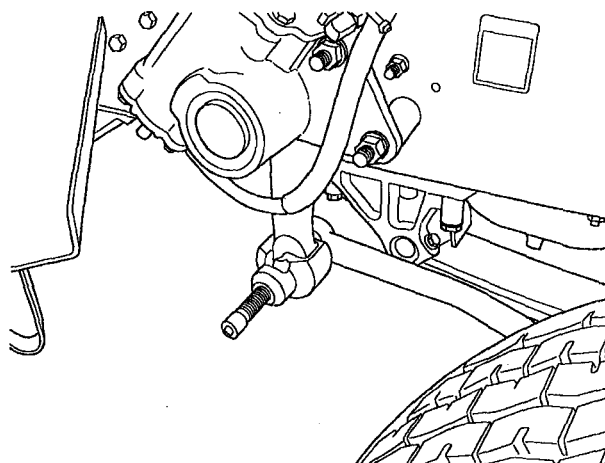
The replacement steering gears are Sheppard part No. PQT31. Do not replace any steering gears having PQT31 stamped on the housing.

Steering gear replacement procedures are as follows:

1. Secure the vehicle for service, and drive the vehicle straight into the service bay with the front wheels facing straight ahead. Apply the parking brakes and block the wheels to prevent the vehicle from moving.
2. After making sure that the front wheels are facing straight ahead, place a piece of tape at the 12 o'clock position on the steering wheel. This will aid in making sure the steering wheel is properly centered when the steering shaft is reinstalled on the steering gear.
3. Place a suitable drain pan under the steering gear to catch any oil that will drain from the gear and hoses.
4. Disconnect the low and high pressure power steering hoses from the steering gear.
5. Remove the two fittings from the gear and save for reuse.
6. Remove the cotter pin from the drag link stud at the pitman arm, and then remove the castle nut.
7. Using a suitable ball socket removal tool, disconnect the drag link from the pitman arm.

NOTE

Do not remove the pitman arm from the steering gear. The replacement gear is supplied with a pitman arm.



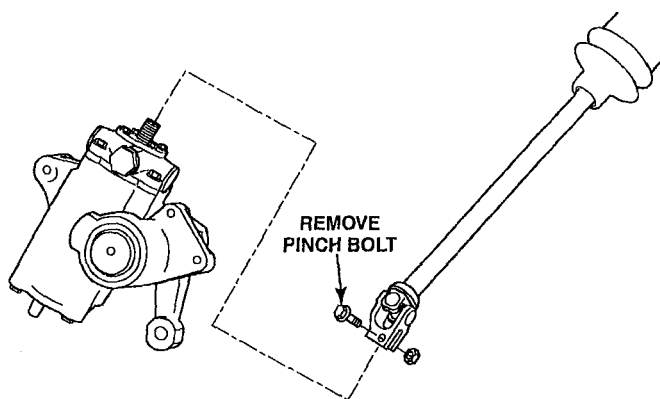
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Figure 4 — Disconnecting Drag Link from Pitman Arm

NOTE

With the steering gear mounted on the frame rail, the drag link stud will not completely clear the pitman arm. Use the ball socket removal tool to loosen the drag link. The drag link will clear the pitman arm when the steering gear mounting bolts are loosened.

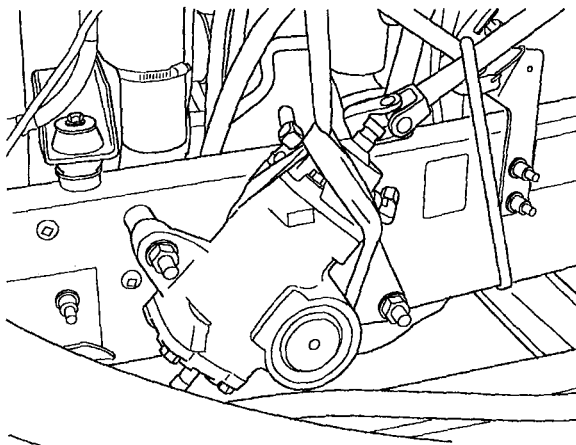
8. Remove the pinch bolt from the steering shaft lower U-joint, and then remove the shaft from the steering gear input shaft.



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Figure 5 — Disconnect Steering Shaft from Steering Gear

9. Using a nylon strap wrapped around the gear between the pitman arm and housing, use a hoist or other suitable lifting device to support the steering gear, and then remove the three mounting bolts that secure the gear to the frame rail.



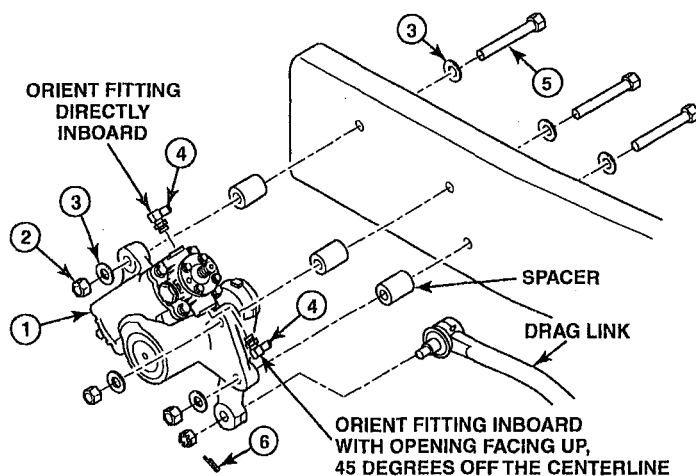
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Figure 6 — Removing Steering Gear

10. Using new O-rings (part No. 56AX379), replace the O-rings on the two 90-degree elbow fittings. These O-rings are included in mounting hardware kit (part No. 204SX418). Install the fittings into the ports on the new steering gear (part No. 20QC388), and orient the fittings as shown in figure 7. Lock in place with the jam nuts.
11. Wrap a nylon strap around the replacement gear (between the pitman arm and housing), and then use a hoist or similar suitable lifting device to position the steering gear on the frame rail. Loosely install the three bolts (part No. 2AM83), six washers (part No. 271AM18) and three nuts (part No. 157AM13). The fasteners are included in hardware kit (part No. 204SX418). Install the bolts from the inside of the frame, and place a flat washer under each bolt head and under each nut. Do not tighten the bolts at this time, as the steering gear must be loose so that the drag link can be installed.

NOTE

DO NOT lubricate the threads of the fasteners.



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Figure 7 — Steering Gear Installation

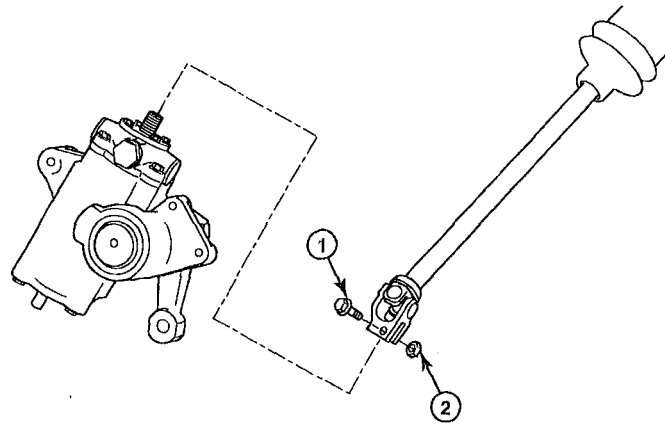
Key	Qty.	Part No.	Description
1	1	20QC388	Steering gear, M100, with pitman arm
2*	3	157AM13	Nuts, steering gear mounting
3*	6	271AM18	Washers, steering gear mounting
4*	2	56AX379	O-rings
5*	3	2AM83	Bolts, steering gear mounting
6*	1	29AX5	Cotter pin, 1/8" x 1-1/2"

* Items 2 through 6 above are included in the hardware kit (part No. 204SX418).

CAUTION

The steering gear mounting fasteners are one-time use only. DO NOT reuse the existing mounting hardware.

12. Connect the drag link to the pitman arm, and then loosely install the castle nut.
13. Tighten the steering gear mounting bolts to 400 lb-ft (542 N•m).
14. Tighten the drag link castle nut to 150 lb-ft (203 N•m). Install a new cotter pin (part No. 29AX5). If the hole in the stud does not align with the slots in the castle nut, tighten the nut further until alignment is attained. Do not loosen the castle nut in order to align the slots with the hole.
15. Connect the low and high pressure power steering hoses to the fittings on the steering gear. Tighten the hose clamp on the low pressure line to 25–30 lb-in (2.8–3.4 N•m).
16. After making sure that the piece of tape installed on the steering wheel is at the 12 o'clock position and the front wheels are facing straight ahead, install the steering shaft to the input shaft of the steering gear. Use a new pinch bolt (part No. 3AX1876) and nut (part No. 21AX789). Tighten the pinch bolt to 70 lb-ft (95 N•m). The pinch bolt and nut are included in the mounting hardware kit (part No. 204SX418).



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Figure 8 — Installing Steering Shaft Pinch Bolt

Key	Qty.	Part No.	Description
1	1	3AX1876	Bolt, 7/16-20 UNF x 2" long, SAE grade 8
2	1	21AX789	Lock nut, 7/16-20 UNF

17. Replenish the power steering reservoir with Bulldog® EO-N Premium Plus engine oil, the same viscosity as used in the engine.

18. Adjust the auto poppet valve as follows:

- a. Raise the front of the vehicle so that the front tires are off the ground and support the chassis on jackstands of sufficient capacity to support the weight of the vehicle.

 DANGER

DO NOT work on or around a vehicle supported on a hydraulic jack, as the jack can fail suddenly and unexpectedly, resulting in severe injury or death. Jackstands of adequate capacity to support the weight of the vehicle must be used.

 CAUTION

DO NOT attempt to adjust the automatic poppet valves with a screwdriver.

- b. Start the engine and allow it to run at an idle.
- c. Turn the steering wheel to a full left-hand turn until the axle stop bolt contacts the axle.
- d. Turn the steering wheel to a full right-hand turn until the axle stop bolt contacts the axle.

NOTE

Do not turn the steering wheel past the point of initial contact of the axle stop bolt to the axle, or the poppets will be improperly set.

- e. The poppet valves are now properly set and no further adjustments are required.
19. Bleed the steering gear as follows:

NOTE

DO NOT allow the reservoir to run dry during the bleeding procedure. Should the reservoir run dry, more air will be drawn into the system.

- a. Check the fluid level in the power steering reservoir and replenish with the proper engine oil as required.

- b. With the engine running at an idle, turn the steering wheel from a full left-hand turn to a full right-hand turn.

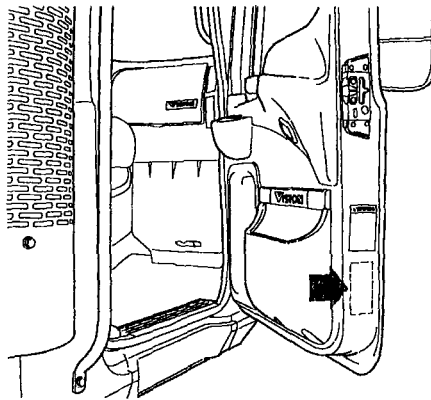
NOTE

Do not force the steering wheel when turning the wheel to a full turn.

- c. Repeat turning the steering wheel from a full left- to a full right-hand turn three to four times. The steering gear auto bleed feature will remove any residual air from the steering system as the steering wheel is turned.
20. After bleeding the steering system, shut the engine off and lower the vehicle to the ground. Check the fluid level in the power steering reservoir and replenish as necessary. Check the steering system for oil leaks.
21. Perform a short road test.

NOTE

To signify that the campaign has been completed, use a permanent-type marker (such as a Sharpie®) to write the campaign number (SC298) and completion date in the spaces provided on the Campaign Completion label located on the lower edge (below the door latch) of the passenger-side door. If a label is not already affixed to the door, apply a label (part No. TS897) and supply the information as required. Campaign Completion labels are available in packs of 50 and can be ordered by faxing a completed BR313 to Pacesetters Business Services at 610-264-9465.



703153a

Figure 9 — Campaign Label Location

Parts Required:

Order vehicle recall parts on a separate stock order and process through the parts distribution center normally serving your area. Do not include parts on this requisition that are not required for this recall campaign.

International orders are to be prefixed — V.O.R.

Qty.	Part No.	Description
1	20QC388	Steering gear, Sheppard model M100
1	204SX418	Hardware mounting kit, includes: 2 56AX379 O-rings, oil port 90-degree fittings 3 2AM83 Bolts, steering gear mounting 3 157AM13 Nuts, steering gear mounting 6 271AM18 Flat washers 1 29AX5 Cotter pin, drag link 1 3AX1876 Bolt, steering shaft U-joint 1 21AX789 Nut, steering shaft U-joint

Removed Parts:

In the U.S., steering gears must be returned to R.H. Sheppard at the following address:

R.H. Sheppard Company
Attn: Warranty Department
447 East Middle Street
Hanover, PA 17331

In Canada, steering gears must be returned to:

Technical Material Analysis Center via Morrice Transportation
3049 Devon Drive
Windsor, Ontario
N8X 4L3

NOTE

 When preparing the steering gear for shipment, purge as much oil as possible from the gear by rotating the input shaft the number of turns it takes for the gear to move through a complete range of travel. Be sure to install the plastic plugs taken from the oil ports of the replacement gear into the ports of the removed gear.

Mark a large "X" on the steering gear with red paint.

The steering gear **MUST** be returned with the pitman arm included. **DO NOT** remove the pitman arm from the steering gear.

A copy of the MACK warranty claim must be returned along with the steering gear.

Reimbursement:

Campaign expenses are to be recovered through normal warranty claim procedures..Enter the following information on the warranty claim:

UNDER	ENTER	
Failed Part No.....	SC0298	
Labor Code/Allowance	411 2C TK 95 — 0.2 hr.	Time allowed to take charge of vehicle and determine campaign status by checking the MACKnet system and the campaign completion label.
	411 2D TK 95 — 1.8 hr.	Time allowed to remove and replace Sheppard M100 steering gear on CXN model chassis. Includes time to adjust auto poppets, bleed system and perform short road test. Does not include "take-charge" time.

NOTE

As required by Federal Motor Vehicle Safety Standards 49 CFR 573.11, no vehicle subject to an open safety campaign shall be delivered to the customer until such time as the defect or noncompliance is remedied.