

## SECTION : 211-02 Power Steering

**VEHICLE APPLICATION :** 2008.0 Falcon

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## SPECIFICATIONS

### General Specifications

Description	Specification
<b>Lubrication</b>	
Power Steering Hydraulic System	ESN M2C 134 D (Mobil 424 or equivalent) Ford R1-424 0.95 litres approximately (total system)
Power Steering Rack and Pinion (Shell Alvania L PRO)	ES M1 C 75B 50 grams
Pump Capacity	0.6 litres
Multi-Purpose Grease DOAZ-19584-AA	ESB-M1C93-B and ESR-M1C159-A
MERCON® Multi-Purpose ATF XT-2-QDX	MERCON®
<b>Power Steering Gear</b>	
Steering Gear Variable Ratio	54.5mm/rev to 66mm/rev
Steering Ratio (on centre)	18.9:1
Turns of Steering Wheel (Stop to Stop)	3.09
Preload: Maximum allowable over full travel of rack	5 Nm

Description	Nm
Pressure Hose Tube Nut	30
Return Hose Clamp Screw	30
Discharge Fitting to Pump	5
Fitting	65
Connector to Discharge	30
Power Steering Pump (V8) Lower Bolt	20 - 30
Power Steering Pump (V8) Upper Bolts	20 - 30

### Torque Specifications

Description	Nm
Rack Pad Locknut	75
Tube Nuts (Feed Pipes)	20
Tube Nuts (Pressure and Return)	35
Tie Rod Ball Housing	85
Pressure Switch (V8)	14
Pressure Transducer (I6)	14
Steering Gear to Sub-frame	80
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DESCRIPTION AND OPERATION

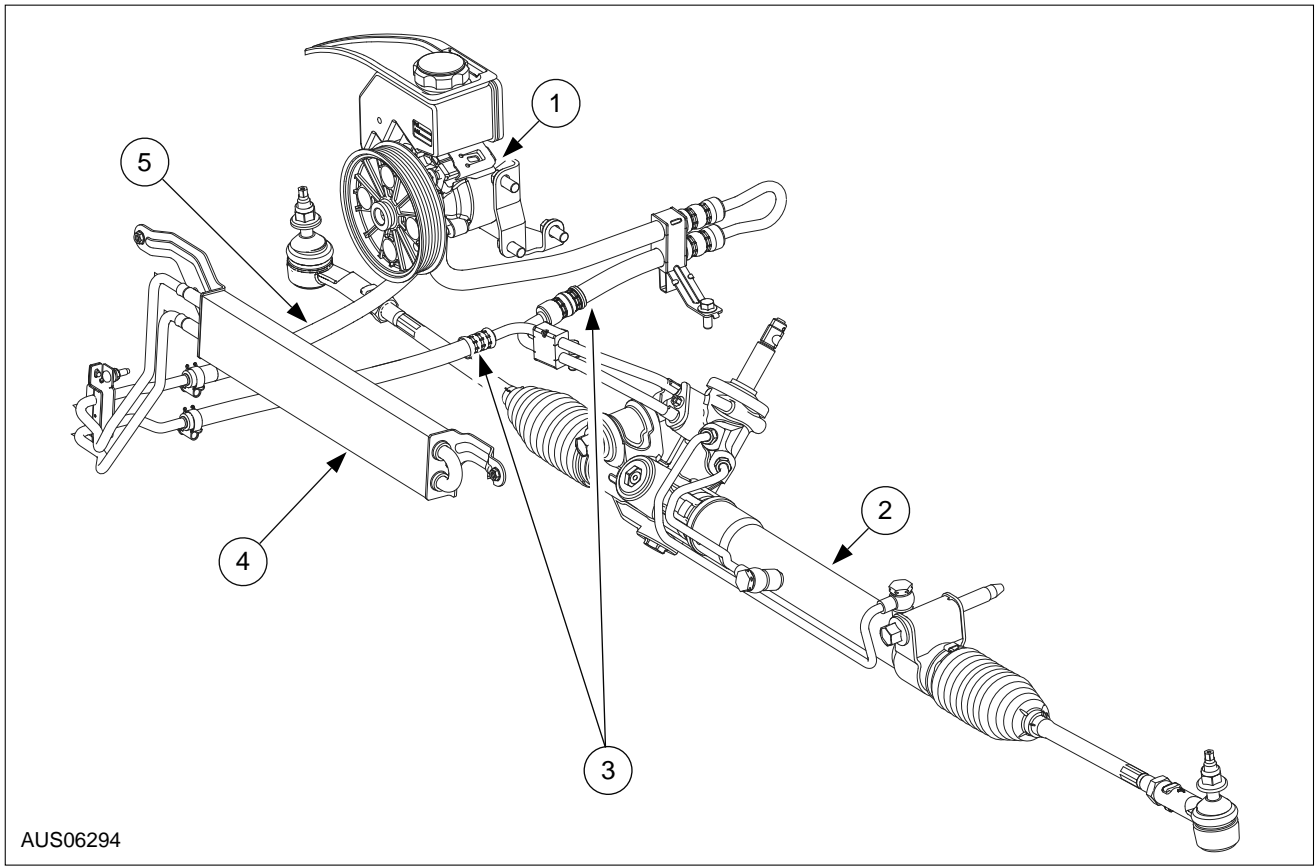
Power Steering Pump - I6

The power steering pump is a constant displacement vane type providing hydraulic pressure for the steering system. The housing and internal parts of the pump are inside the reservoir so the pump parts operate submerged in oil. The reservoir is sealed against the pump housing, leaving the housing face and the shaft hub exposed.

The drive shaft is fitted with a pulley and is belt driven from the crankshaft. The rotor is loosely splined to the drive shaft and secured with a retaining ring. Ten vanes are mounted in radial slots in the rotor.

An identification label showing the pump model number is located on the outboard side of the pump reservoir.

System View - I6



Item	Description
1	Power Steering Pump
2	Steering Gear
3	Press & Return Hose Assy
4	Power Steering Fluid Cooler
5	Power Steering Return Hose



## DESCRIPTION AND OPERATION

### Power Steering Pump - V8

**NOTE:** On early build 5.4L engines there are four bolts mounting the power steering pump to the engine block. The fourth bolt on earlier builds may be discarded upon the replacement of the power steering pump.

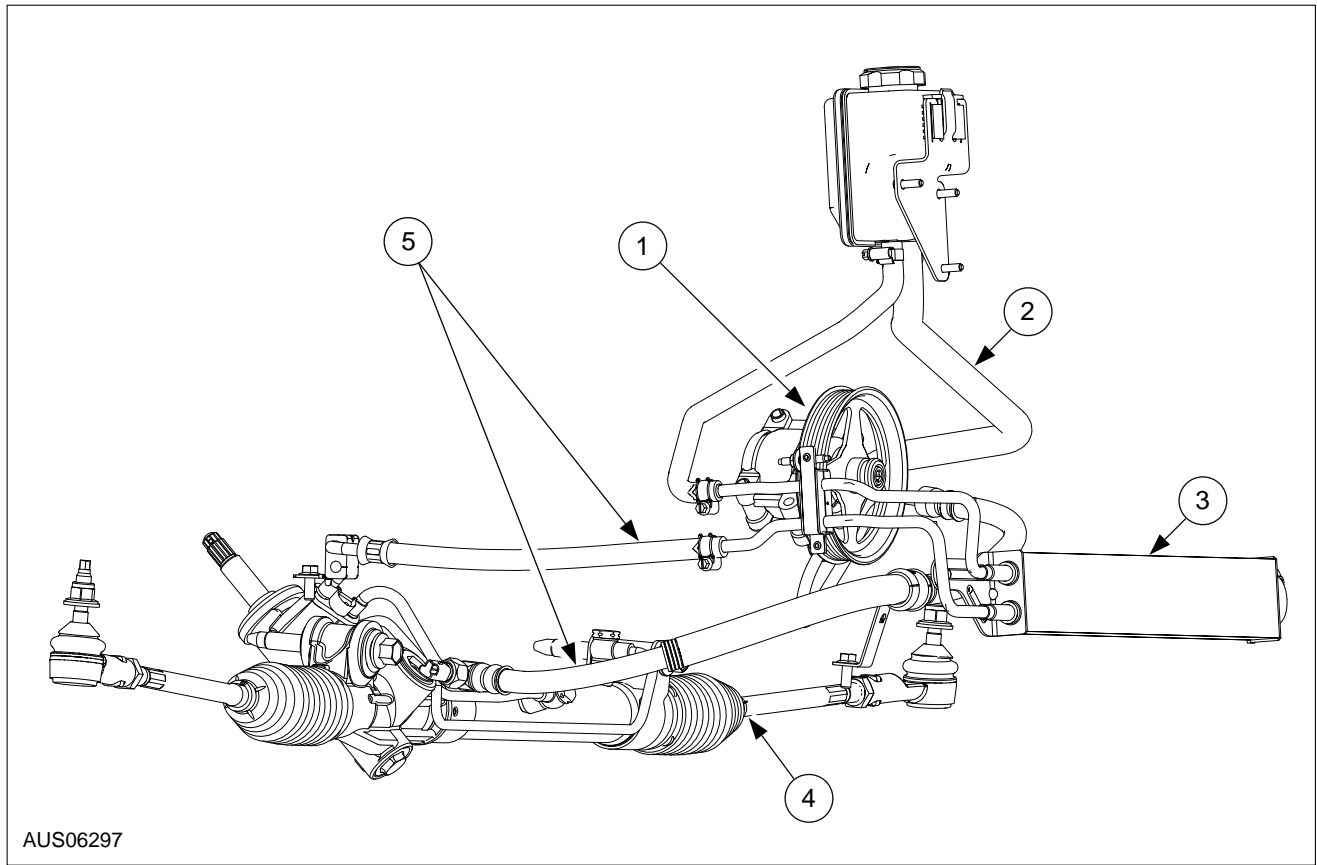
The CIII power steering pump has the following features:

- It is a belt driven, vane type, power steering pump.
- It is mounted directly to the engine block by three bolts.
- The power steering pump is replaced as an assembly.
- An identification tag attached to the power steering pump indicates the model number and bar code. Refer to the identification tag when pump replacement is required.
- The power steering pump uses a quick connect fitting for the power steering pressure hoses.
- The power steering fluid reservoir is mounted to the front of the engine bay on top of the shroud.



DESCRIPTION AND OPERATION (Continued)

System View - V8



Item	Description
1	Power Steering Pump
2	Power Steering Return Hose
3	Power Steering Fluid Cooler
4	Steering Gear
5	Press & Return Hose Assy

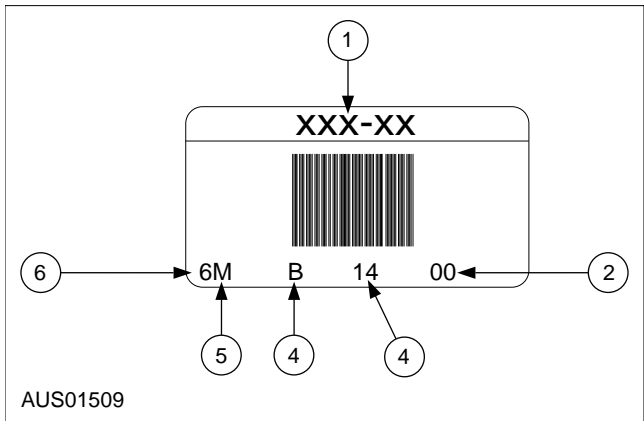


DESCRIPTION AND OPERATION (Continued)

Pump Identification

**CAUTION:** ⚠ Always use the ID code when ordering service parts.

An identification tag is attached to the valve housing.



Item	Description
1	Model code
2	For manufacturing purposes only
3	Day
4	Shift
5	Year
6	Month



## DIAGNOSIS AND TESTING

### Symptom Chart

**WARNING:** ⚠ Whenever a repair to the power steering system is carried out, which may permit air to enter the fluid lines or the pump, the system must be purged of air on completion of the repair.

**CAUTION:** ⚠ Do not hold the steering gear against the lock stops for more than 5 seconds.

Several of these symptoms are also common to suspension, frame, wheel and tyre troubles. For this reason, be sure that the cause of the trouble is in the power steering pump before adjusting, repairing or replacing any part of the pump parts.

### General Diagnosis

Condition	Source	Action
• Chirp noise in steering pump	• Loose belt	• Remove/Repair as required
• Belt squeal (particularly noticeable at full wheel travel and standstill parking)	• Loose belt	• Remove/Repair as required
• Growl noise in steering pump	• Excessive back-pressure in hoses or steering gear caused by restriction	• Remove/Repair as required
• Growl noise in steering pump (particularly noticeable at full wheel travel and standstill parking)	• Scored pressure plate, thrust plate or rotor. • Extreme wear of pump ring and vanes.	• Remove/Repair as required
• Groan noise in steering pump	• Low oil level • Air in the oil. Poor pressure hose connection	• Remove/Repair as required
• Rattle noise in steering pump	• Vanes not installed properly	• Remove/Repair as required
• Momentary increase in effort when turning wheel fast to right or left	• Low oil level in pump • Pump belt slipping • High internal leakage. Valve or gear cylinder	• Remove/Repair as required
• Steering wheel surges or jerks when turning with engine running, especially during parking	• Low oil level • Loose pump belt • Insufficient pump pressure • Sticky flow control valve	• Remove/Repair as required
• Hard steering or lack of assist, especially in parking	• Loose pump belt • Low oil level in reservoir • Steering gear to column misalignment • Tyres not properly inflated <b>NOTE:</b> If check 1 through 4 do not reveal the cause of hard steering, follow the Power Steering Test Procedure. • <b>Further possible causes could be:</b> <ul style="list-style-type: none"> <li>• Sticky flow control valve</li> <li>• Insufficient pump pressure output</li> <li>• Excessive internal pump leakage</li> <li>• Excessive internal system leakage</li> </ul>	• Remove/Repair as required



**DIAGNOSIS AND TESTING (Continued)**

Condition	Source	Action
<ul style="list-style-type: none"> <li>Foaming milky power steering fluid, low fluid level and possible low pressure</li> </ul>	<ul style="list-style-type: none"> <li>Air in the fluid, and loss of fluid due to internal pump leakage causing overflow</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Low pressure from steering pump</li> </ul>	<ul style="list-style-type: none"> <li>Flow-control valve stuck or inoperative</li> <li>Pressure plate not flat against pump ring</li> <li>Extreme wear of pump ring and vanes</li> <li>Scored pressure plate, thrust plate or rotor</li> <li>Vanes not installed properly</li> <li>Vanes sticking in rotor slots</li> <li>Cracked or broken thrust or pressure plate</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>

**Power Steering Symptom Chart**

Condition	Source	Action
<ul style="list-style-type: none"> <li>Jerky steering</li> </ul>	<ul style="list-style-type: none"> <li>Power steering fluid level low leak</li> <li>Glazed, loose or broken power steering pump belt</li> <li>Air in power steering system</li> <li>Binding front suspension ball joints or steering linkage</li> <li>Loose, worn, or damaged steering linkage or connections</li> <li>Loose steering gear mountings</li> <li>Incorrect steering gear adjustment</li> <li>Incorrect brake adjustment</li> <li>Incorrect front wheel bearing adjustment</li> <li>Wheel out of balance</li> <li>Obstruction within steering gear</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Loose steering</li> </ul>	<ul style="list-style-type: none"> <li>Loose, worn, or damaged steering linkage or connections</li> <li>Loose steering gear mountings</li> <li>Incorrect steering gear adjustment</li> <li>Incorrect front wheel bearing adjustment</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>





**DIAGNOSIS AND TESTING (Continued)**

Condition	Source	Action
<ul style="list-style-type: none"> <li>• Hard steering and/or loss of power assist</li> </ul>	<ul style="list-style-type: none"> <li>• Incorrect tyre pressures</li> <li>• Tyre sizes not uniform</li> <li>• Power steering fluid level low leak</li> <li>• Glazed, loose, or broken power steering pump belt.</li> <li>• Lack of lubrication</li> <li>• Air in power steering system</li> <li>• Obstruction in power steering lines</li> <li>• Binding front suspension ball joints or steering linkage</li> <li>• Insufficient steering pump pressure</li> <li>• Incorrect steering gear adjustment</li> <li>• Incorrect front wheel alignment</li> <li>• Excessive wear of steering pump internal parts</li> <li>• Steering gear valve sleeve or seals worn</li> <li>• Obstruction within steering gear</li> </ul>	<ul style="list-style-type: none"> <li>• Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>• Hard turning when stationary</li> </ul>	<ul style="list-style-type: none"> <li>• Incorrect tyre pressures</li> <li>• Tyre sizes not uniform</li> <li>• Power steering fluid level low leak</li> <li>• Glazed, loose, or broken power steering pump belt.</li> <li>• Lack of lubrication</li> <li>• Obstruction in power steering lines</li> <li>• Binding front suspension ball joints or steering linkage</li> <li>• Insufficient steering pump pressure</li> <li>• Incorrect steering gear adjustment</li> <li>• Steering gear valve sleeve or seals worn</li> <li>• Obstruction within steering gear</li> </ul>	<ul style="list-style-type: none"> <li>• Remove/Repair as required</li> </ul>



**DIAGNOSIS AND TESTING (Continued)**

Condition	Source	Action
<ul style="list-style-type: none"> <li>Steering and suspension noises</li> </ul>	<ul style="list-style-type: none"> <li>Power steering fluid level low leak</li> <li>Sagging or broken spring</li> <li>Glazed, loose or broken power steering pump belt.</li> <li>Lack of lubrication</li> <li>Air in power steering system</li> <li>Obstruction in power steering lines</li> <li>Loose or weak shock absorber</li> <li>Loose or worn suspension arm bushings</li> <li>Binding front suspension ball joints or steering linkage</li> <li>Loose, worn, or damaged steering linkage or connections</li> <li>Loose steering gear mountings</li> <li>Incorrect steering gear adjustment</li> <li>Incorrect brake adjustment</li> <li>Incorrect front wheel bearing adjustment</li> <li>Incorrect front wheel alignment</li> <li>Bent rear axle housing</li> <li>Excessive wear of steering pump internal parts</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Shimmy or wheel tramp</li> </ul>	<ul style="list-style-type: none"> <li>Incorrect tyre pressure</li> <li>Air in power steering system</li> <li>Loose or weak shock absorber</li> <li>Loose or worn suspension arm bushings</li> <li>Loose, worn, or damaged steering linkage or connections</li> <li>Loose steering gear mountings</li> <li>Incorrect steering gear adjustment</li> <li>Incorrect front wheel bearing adjustment</li> <li>Wheel out of balance</li> <li>Incorrect front wheel alignment</li> <li>Out-of-round wheel</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Pull to one side</li> </ul>	<ul style="list-style-type: none"> <li>Incorrect tyre pressure</li> <li>Tyre sizes not uniform</li> <li>Overloaded or unevenly loaded vehicle</li> <li>Sagging or broken spring</li> <li>Bent spindle arm</li> <li>Bent spindle</li> <li>Loose or worn suspension arm bushings</li> <li>Incorrect brake adjustment</li> <li>Incorrect front wheel bearing adjustment</li> <li>Incorrect front wheel alignment</li> <li>Frame or underbody out of alignment</li> <li>Bent rear axle housing</li> <li>Steering gear valve sleeve or seals worn</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>



**DIAGNOSIS AND TESTING (Continued)**

Condition	Source	Action
<ul style="list-style-type: none"> <li>Side - to - side wander</li> </ul>	<ul style="list-style-type: none"> <li>Incorrect tyre pressure</li> <li>Tyre sizes not uniform</li> <li>Overloaded or unevenly loaded vehicle</li> <li>Sagging or broken spring</li> <li>Bent spindle arm</li> <li>Bent spindle</li> <li>Loose or weak shock absorber</li> <li>Loose or worn suspension arm bushings</li> <li>Loose, worn, or damaged steering linkage or connections</li> <li>Loose steering gear mountings</li> <li>Incorrect steering gear adjustment</li> <li>Incorrect front wheel bearing adjustment</li> <li>Incorrect front wheel alignment</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Body sway or roll</li> </ul>	<ul style="list-style-type: none"> <li>Incorrect tyre pressure</li> <li>Sagging or broken spring</li> <li>Loose or weak shock absorber</li> <li>Incorrect front wheel alignment</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Tyre squeal on turns</li> </ul>	<ul style="list-style-type: none"> <li>Incorrect tyre pressure</li> <li>Tyre sizes not uniform</li> <li>Bent spindle arm</li> <li>Bent spindle</li> <li>Loose, worn, or damaged steering linkage or connections</li> <li>Incorrect front wheel alignment</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Binding or poor recovery</li> </ul>	<ul style="list-style-type: none"> <li>Incorrect tyre pressure</li> <li>Lack of lubrication</li> <li>Binding front suspension ball joints or steering linkages</li> <li>Insufficient steering pump pressure</li> <li>Incorrect steering gear adjustment</li> <li>Incorrect brake adjustment</li> <li>Incorrect front wheel alignment</li> <li>Steering gear valve sleeve or seals worn</li> <li>Obstruction within steering gear</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>



**DIAGNOSIS AND TESTING (Continued)**

Condition	Source	Action
<ul style="list-style-type: none"> <li>Abnormal or irregular tyre wear</li> </ul>	<ul style="list-style-type: none"> <li>Incorrect tyre pressure</li> <li>Tyre sizes not uniform</li> <li>Overloaded or unevenly loaded vehicle</li> <li>Sagging or broken spring</li> <li>Bent spindle arm</li> <li>Bent spindle</li> <li>Loose or weak shock absorber</li> <li>Loose or worn suspension arm bushings</li> <li>Loose, worn, or damaged steering linkage or connections</li> <li>Incorrect steering gear adjustment</li> <li>Incorrect brake adjustment</li> <li>Incorrect front wheel alignment</li> <li>Wheel out of balance</li> <li>Incorrect front wheel alignment</li> <li>Out-of-round wheel</li> <li>Frame or underbody out of alignment</li> <li>Bent rear axle housing</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Sag to one wheel</li> </ul>	<ul style="list-style-type: none"> <li>Incorrect tyre pressure</li> <li>Tyre sizes not uniform</li> <li>Overloaded or unevenly loaded vehicle</li> <li>Sagging or broken spring</li> <li>Loose or worn suspension arm bushings</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Hard or rough ride</li> </ul>	<ul style="list-style-type: none"> <li>Incorrect tyre pressure</li> <li>Overloaded or unevenly loaded vehicle</li> <li>Sagging or broken spring</li> <li>Lack of lubrication</li> <li>Loose or weak shock absorber</li> <li>Loose or worn suspension arm bushings</li> <li>Binding front suspension ball joints or steering linkage</li> <li>Wheel out of balance</li> <li>Out-of-round wheel</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>
<ul style="list-style-type: none"> <li>Rear suspension misalignment (Dog-Tracking)</li> </ul>	<ul style="list-style-type: none"> <li>Loose or worn suspension arm bushings</li> <li>Frame or underbody out of alignment</li> <li>Bent rear axle housing</li> </ul>	<ul style="list-style-type: none"> <li>Remove/Repair as required</li> </ul>



## GENERAL PROCEDURES

### Start of procedure

#### After power steering pump of gear overhaul

After engine start up, follow these steps to eliminate excessive steering system noise due to air trapped in the system during service:

1. Disconnect the starter solenoid activation wire.
2. Connect the remote starter switch wiring the starter solenoid and the battery positive terminal.
3. Ensure the power steering pump reservoir is full.
4. Crank the engine, using the remote starter switch, and add fluid until the level remains constant.
5. While cranking the engine, rotate the steering wheel from lock-to-lock.

**NOTE:** Front wheels must either be off the floor or on free running turntables during lock-to-lock rotation of the steering wheel.

6. Check the fluid level and add fluid if necessary.
7. Disconnect the remote starter, reconnect the starter solenoid activation wire and start the engine, allow it to run for several minutes.
8. Rotate the steering wheel from lock-to-lock.
9. Switch the engine off and check the fluid level. Add fluid if required.
10. If air is still present in the steering system, purge the system as described in the Purging Power Steering System of Air procedure below.

### Remedying Pump Noise

The most common noise complaint is a moan or whine noise (refer to symptom chart) which in most cases is caused by air trapped in the system.

The system must be purged of air promptly to prevent permanent damage to the power steering pump.

If the air purging operation only temporarily overcomes the noise, check for faults that could cause entry of air into the system.

### Purging Power Steering System of Air

Air trapped in the power steering system, which causes a whine or moan type noise, can be removed by using a power steering pump air evacuator assembly (devac tool).

**CAUTION:**  Under no circumstances should engine vacuum be utilised.

1. Check and fill the pump reservoir with power steering fluid mobil 424 (or equivalent that meets specification ESN-M2C-134D) to the FULL mark on pump dipstick.
2. Raise the vehicle front wheels from the floor.

3. Install an auxiliary starter switch in the starting circuit.
4. With the ignition switch in the OFF position, use the auxiliary starter switch to crank the engine.
5. Fill the pump reservoir to FULL mark on the dipstick. Using the auxiliary starter switch, crank the engine while cycling the steering wheel from lock-to-lock. Constantly monitor the fluid level.
6. Tightly insert the rubber stopper of the air evacuator assembly into the pump reservoir fill neck.
7. Apply 51 kPa (15 in-Hg) vacuum on the pump reservoir for a minimum of three minutes with the engine idling. As air purges from the system, the vacuum will fall off. Maintain adequate vacuum with vacuum source.
8. Release vacuum and remove the vacuum source. Fill the reservoir to the FULL mark.
9. With the engine idling, apply 51 kPa (15 in-Hg) vacuum to the pump reservoir. Slowly cycle the steering from lock-to-lock every 30 seconds for approximately 5 minutes. Do not hold steering wheel on the stops while cycling. Maintain adequate vacuum with the vacuum source as the air purges.
10. Release the vacuum and remove the vacuum equipment. Add additional fluid if necessary. Install the dipstick.
11. Start engine and cycle steering wheel. Check for oil leaks at all connections. In severe cases of aeration, it may be necessary to repeat steps 5 through 9.

### Flushing Power Steering Pump

If dirt is found in the power steering gear, flush the pump as follows:

1. Making sure all hoses are connected, disconnect the pressure hose at the steering gear.
2. Place end of the hose in a container.
3. Fill reservoir with power steering fluid Mobil 424 or equivalent that meets the specification ESN-M2C-134D.
4. Disconnect the starter solenoid activation wire.
5. Connect a remote starter switch to the starter solenoid.
6. While adding approximately 2 litres of fluid, crank the engine using the remote starter switch. When all fluid has been added cease cranking the engine.
7. Re-attach the pressure hose to the steering gear.
8. Check the fluid level, add as required.



## GENERAL PROCEDURES

9. Remove the remote starter switch and reconnect the starter solenoid wire.

### Flushing Power Steering Gear

**NOTE:** Always flush the power steering gear when replacing the pump due to fluid contamination.

1. Disconnect the fluid return hose at the power steering pump and place the end in a container. Plug the return hose nipple on the reservoir.
2. Fill the reservoir with power steering fluid Mobil 424 or equivalent that meets the specification ESN-M2C-134D.
3. Disconnect the starter solenoid activation wire.
4. Connect a remote starter switch to the starter solenoid.
5. Raise the vehicle front wheels off the floor.
6. While adding approximately 2 litres of fluid, crank the engine using the remote starter switch, whilst turning the steering wheel from lock-to-lock. When all fluid has been added cease cranking the engine.
7. Lower the vehicle.
8. Remove the remote starter switch and reconnect the starter solenoid wire.
9. Remove the plug from the reservoir return hose nipple. Attach the return hose the nipple.
10. Check the fluid level. Add fluid if necessary. Do not overfill the reservoir.
11. Start the engine and turn the steering wheel slowly from lock-to-lock several times. Check the fluid level and adjust as required.
12. Check for air in the system. If so, purge the system as explained in this section.

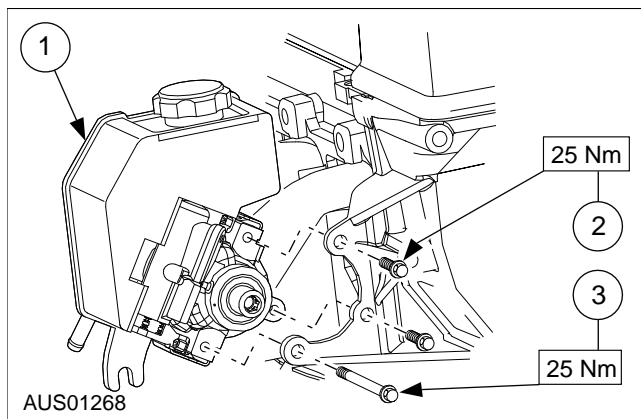


## REMOVAL AND INSTALLATION

### Power Steering Pump - I6

#### Removal

1. Remove the drive belt. For additional information, refer to Section 303-05.
2. Remove the pump and pulley as a whole unit by accessing pump attaching hardware through holes in pulley.



3. Remove the power steering fluid from the power steering pump reservoir using a syringe or syphon hose.
4. Loosen the pump pressure line connector and detach the pressure line. Detach the return line.

**CAUTION:** ⚠ Take care to prevent power steering pump fluid loss by plugging the connections.

5. Remove the power steering pump retaining hardware and withdraw the power steering pump from the mount.

#### Installation

1. To install, reverse the removal procedure.


**NOTE:** Ensure all bolts and hose clamps are tightened to specification.

**NOTE:** Ensure the drive belt is correctly engaged on the pulley ribs.

2. Fill the power steering pump reservoir with Mobil 424 or equivalent that meets the specification ESN-M2C-134D.
3. Attach a remote starter switch and carry out start up procedure.

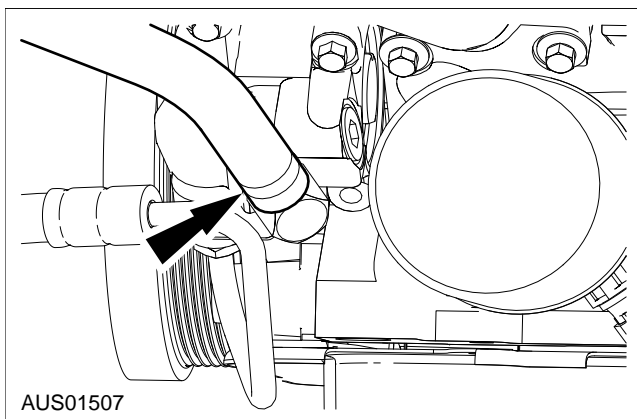
### Power Steering Pump - V8

#### Special Tools

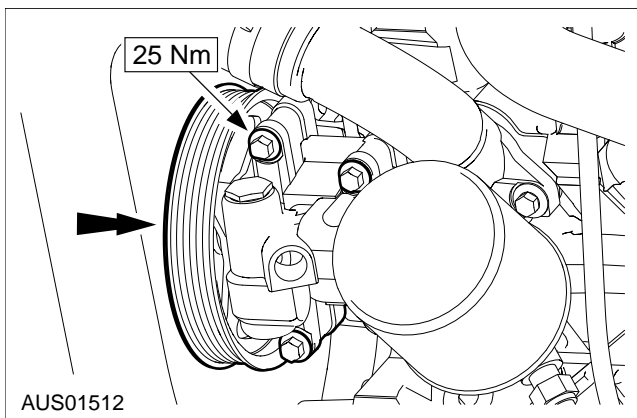
	<p>Teflon® Seal Replacement Set</p> <p>211-D027 or equivalent</p> <p>AU / BA / BF / FG</p>
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#### Removal

1. Remove the power steering pulley. For additional information, refer to Power Steering Pump Pulley - V8 procedure in this section.
2. Raise the vehicle. For additional information, refer to Section 100-02.
3. Disconnect the power steering pump reservoir hose and pressure line from the power steering pump.
4. Drain the power steering oil reservoir.



5. Remove the three bolts power steering pump retaining bolts and remove the power steering pump.



## REMOVAL AND INSTALLATION (Continued)



### Installation

1. To install, reverse the removal procedure.

**NOTE:** Install a new power steering seal on the power steering pressure fitting by stretching the seal over the seal replacer until it is large enough to slip over the threads of the fitting.

2. Fill, purge and leak check the system as outlined in this section.

### Power Steering Pump Pulley - V8

Special Tools	
	Remover, Power Steering Pump Pulley
	A7185 BA / BF / FG
	Installer, Power Steering Pump Pulley
	A7005 BA / BF / FG

### Removal

1. Remove the drive belt. For additional information, refer to Section 303-05.
2. Using the special tool A7185, remove the power steering pump pulley.

### Installation

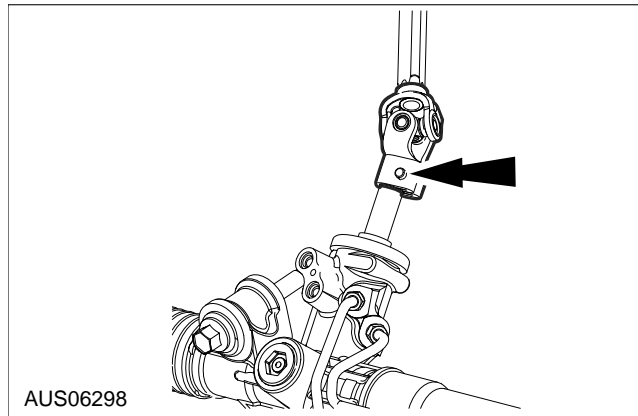
1. Using the special tool A7005, install the power steering pump pulley.
2. Install the drive belt. For additional information, refer to Section 303-05.

## Steering Gear

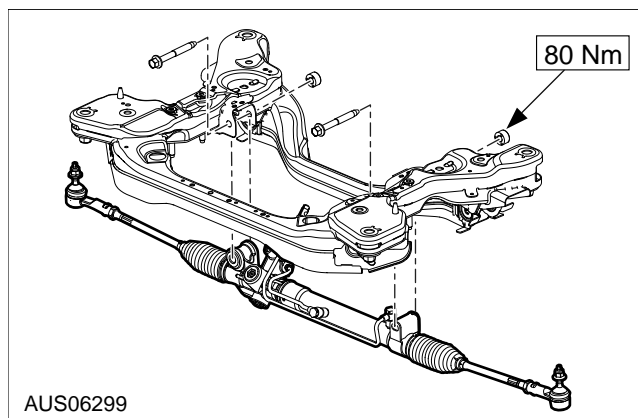
### Removal

1. Remove the front wheels. For additional information, refer to Section 204-04.
2. Raise the hood and raise the vehicle. For additional information, refer to Section 100-02.
3. Place a drain pan under the steering gear.
4. Disconnect the power steering pump to steering gear hydraulic lines at the steering gear using a six point tube nut wrench.

5. Remove the bolt from the clamp at the lower end of the intermediate shaft. Slide the intermediate shaft upwards until it is clear of the steering gear valve splines.



6. Loosen the tie rod end stud nuts and free the tie rod end stud tapers in the wheel spindles.
7. Remove the tie rod end nuts and detach the tie rod ends from the spindles.
8. Remove the two nut and bolts securing the steering gear to the subframe and remove the steering gear from the vehicle.

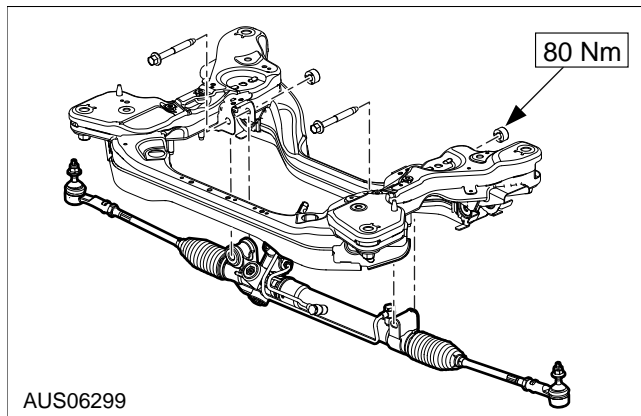




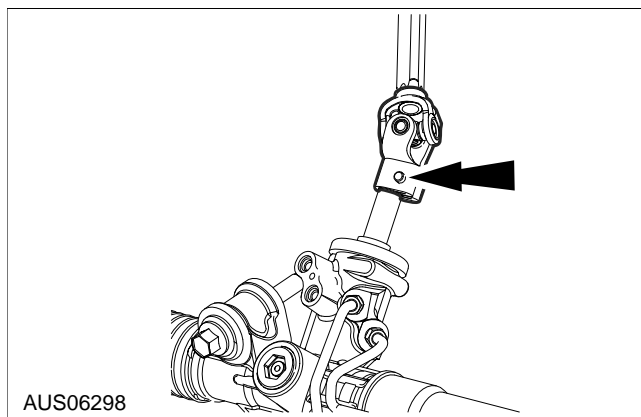
## REMOVAL AND INSTALLATION (Continued)

### Installation

1. Position the steering gear assembly to the subframe. Install and tighten to specification the securing nuts and bolts.



2. Connect the tie rod ends to the wheel spindles, install and tighten the nuts to specification.
3. Centralise the steering gear and align the intermediate shaft with the steering gear valve and slide the shaft yoke onto the valve. Install and tighten the lower clamp bolt to specification.

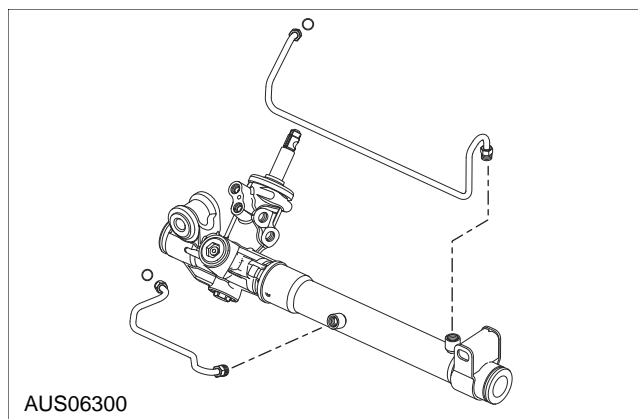


4. Connect the hydraulic lines to the steering gear and tighten the unions with a six point tube nut wrench to specification.
5. Remove the drain pan and lower the vehicle.
6. Top up the power steering pump reservoir with Mobil 424 or equivalent that meets the specification ESN-M2C-134D.
7. Bleed the system as the procedure states in this section.

### Steering Gear Cylinder Pipe and O-Ring Seals

#### Removal

1. Remove the steering gear from the vehicle. For additional information, refer to the Steering Gear procedure in this Section.
2. Loosen both cylinder line fittings on the cylinder end of the steering gear assembly.
3. Loosen both cylinder line assemblies on the valve end of the steering gear.
4. Remove both the cylinder line assemblies from the rack and pinion gear assembly.
5. Remove the O-ring seals from the valve end of the cylinder line.



6. Discard the O-ring seals.

#### Installation

1. Inspect the cylinder lines for the following items:
  - Cracks
  - Dents
  - Damage to the threads
2. Replace parts as needed.
3. Install the new O-ring seals to the valve end of the cylinder lines.
4. Install the cylinder line assemblies to the steering gear assembly.

**NOTE:** Tighten the valve end fittings to 16.9 Nm and tighten the cylinder end fittings to 27 Nm.

5. Install the steering gear to the vehicle. For additional information, refer to the Steering Gear procedure in this section.

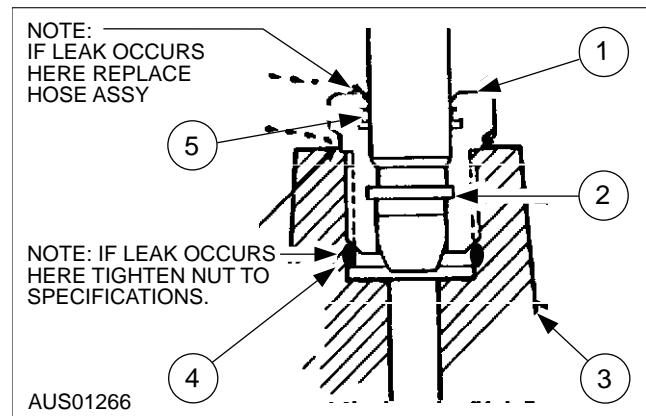


## REMOVAL AND INSTALLATION (Continued)

### Quick Connect Power Steering Fitting (Pre September)

#### Seal Replacement

If a leak occurs between the tubing and the tube nut, replace the hose assembly. If a leak occurs between the tube nut and the pump outlet, replace the teflon seal.



If the fitting disengages, replace the hose assembly. The fitting is fully engaged only when the hose will not pull out. To test for positive engagement, the system should be properly filled, the engine started, and the steering wheel cycled from lock-to-lock. When replacing pressure hose assemblies the following parts will be required.

Pressure hose assembly - Qty 1.

Quick Connect Fitting - Qty 1.

Item	Description
1	Tube nut
2	Snap ring
3	Pump outlet
4	Rubber O-ring
5	Rubber O-ring

1. Check the fitting to determine whether the leak is between the tube and tube nut or between the tube nut and the pump outlet.
2. If a leak is between the tube nut and pump outlet, check to ensure the nut is tightened to 30 Nm.

**CAUTION:** **DO NOT over tighten.**

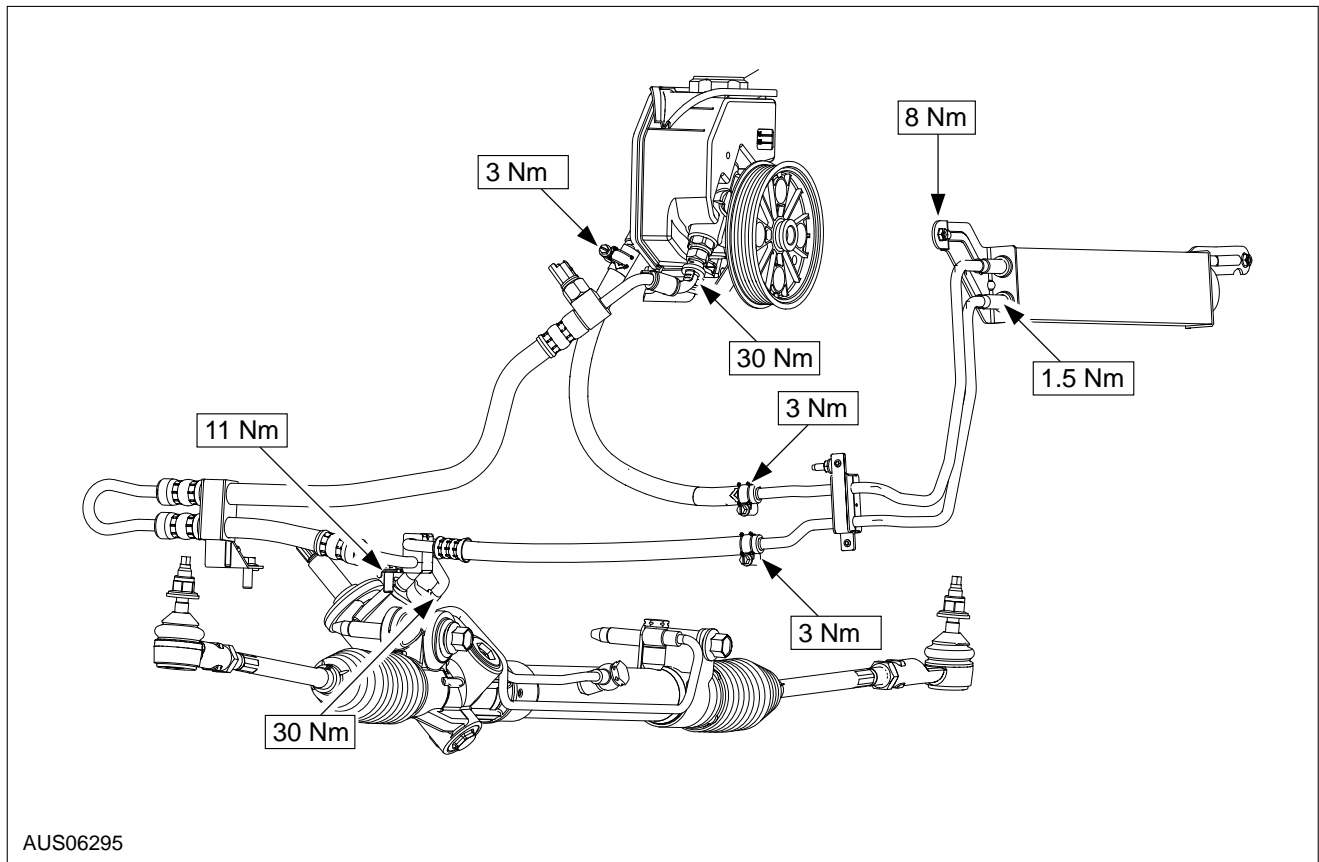
3. If a leak continues or if leak is between the tube and connector, remove the line.
4. Unscrew the connector and inspect and replace the rubber O-ring seal.
5. The rubber O-ring inside the connector (quick connect fitting) cannot be serviced with this design. If leak is due to the O-ring, replace the hose assembly.
6. Connect the quick connector and tighten to 30 Nm.

**NOTE:** The quick connect fitting may disengage if not fully assembled, if the snap ring is missing, or if the tube nut or the hose end is not machined properly.



## REMOVAL AND INSTALLATION (Continued)

### Power Steering Lines - I6



#### Removal

1. Disconnect the pressure and return lines from the steering gear and drain the fluid into a suitable container.
2. Remove the bolt from the securing clamp on the RH side of the subframe.
3. Remove the bolt from the cooler line securing clamp of the RH side of the subframe.
4. Remove the air deflector. For additional information, refer to Section 501-02.
5. Disconnect the pressure line from the power steering pump.
6. Loosen both clamps on the return hoses at the cooler ends and disconnect the hoses.
7. Loosen the clamp on the return hose at the reservoir and remove the hose.
8. Remove the nuts securing the cooler to the subframe cooler brackets.
9. Remove the pressure and return line assembly and the cooler assembly from the vehicle.
2. Secure the cooler to the cooler mounting brackets on the subframe.
3. Check that the clearances from the cooler and side chassis rails are adequate and tighten the nuts to specification.
4. Secure the bolt from the cooler line securing clamp to the RH side of the subframe.
5. Secure the bolt from the pressure and return line assembly clamp to the RH side of the subframe.
6. Connect the pressure and return lines to the steering gear end.
7. Connect both return hoses to the cooler ends and secure both clamps to specification.
8. Connect the return hose to reservoir inlet and secure clamp to specification.
9. Refit a new quick connector fitting to the power steering pump and connect the pressure line.
10. Install the air deflector. For additional information, refer to Section 501-02.
11. Fill with specified Mobil 424 or equivalent and conduct specified bleed procedure.

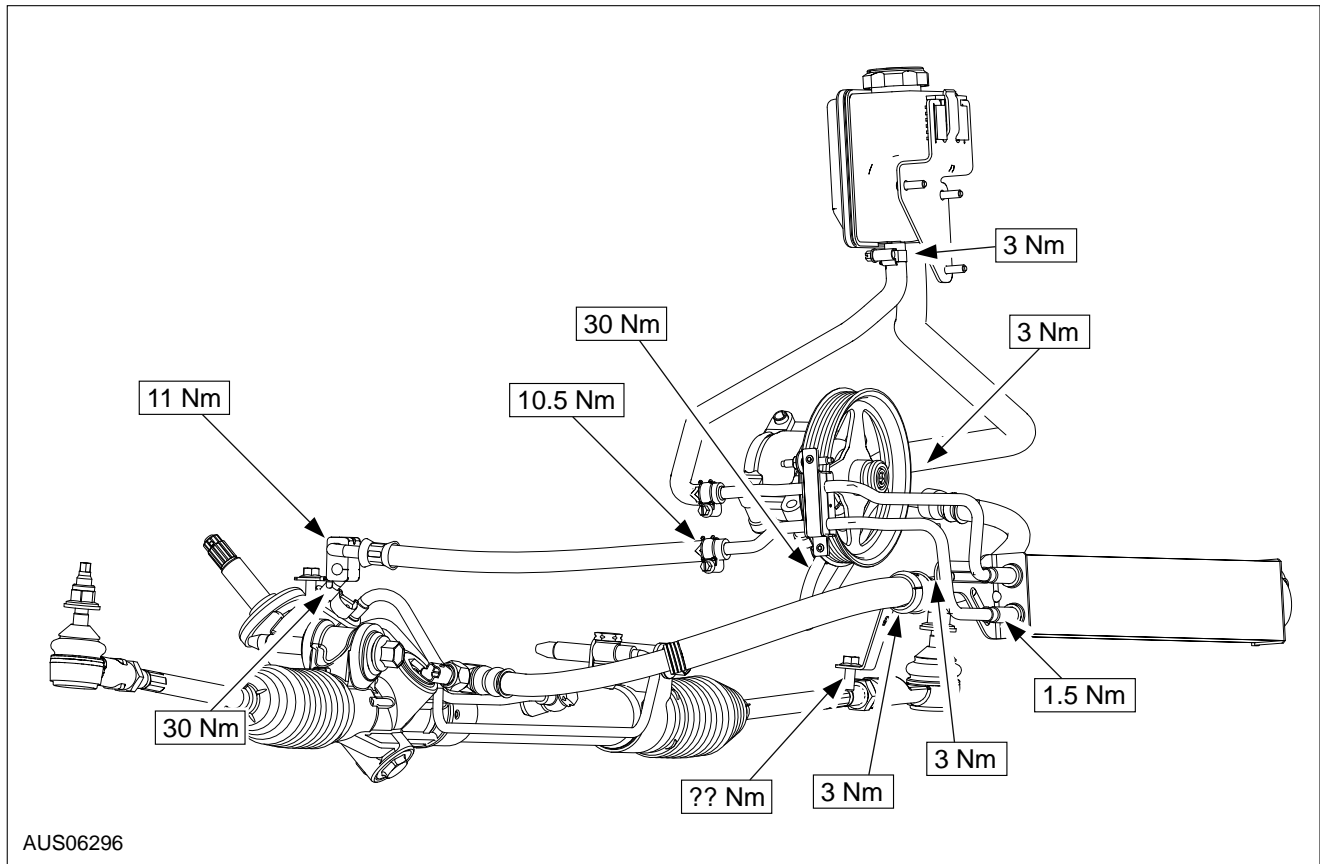
#### Installation

1. Refit the pressure and return line assembly and cooler assembly to the vehicle.
12. Start the vehicle, check for leaks, rectify if necessary.



## REMOVAL AND INSTALLATION (Continued)

### Power Steering Lines - V8



#### Removal

1. Disconnect the pressure and return lines from the steering gear and drain the fluid into a suitable container.
2. Remove the bolt from the securing clamp on the RH side of the subframe.
3. Remove the bolt from the cooler line securing clamp of the RH and LH side of the subframe.
4. Remove the air deflector. For additional information, refer to Section 501-02.
5. Disconnect the pressure line from the power steering pump.
6. Loosen both clamps on the return hoses at the pump and disconnect the hoses.
7. Loosen the clamp on the return hose at the cooler ends and disconnect the hoses.
8. Loosen both clamps on the return hoses at the reservoir and remove the hoses.
9. Remove the nuts securing the cooler to the subframe cooler brackets.
10. Remove the pressure and return line assembly and the cooler assembly from the vehicle.

#### Installation

**NOTE:** When connecting a fitting with a seal ring, the ring must be replaced, using a the seal replacer special tool.

1. Refit the pressure and return line assembly and cooler assembly to the vehicle.
2. Secure the cooler to the cooler mounting brackets on the subframe.
3. Check that the clearances from the cooler and side chassis rails are adequate and tighten the nuts to specification.
4. Secure the bolt from the cooler line securing clamp to the RH and LH side of the subframe.
5. Secure the bolt from the pressure and return line assembly clamp to the RH side of the subframe.
6. Connect the pressure and return lines to the steering gear end.
7. Connect the return hose to pump and secure clamp to specification.
8. Connect both return hoses to the cooler ends and secure both clamps to specification.
9. Connect the return hose to reservoir inlet and secure clamp to specification.



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**REMOVAL AND INSTALLATION (Continued)**

10. Refit a new quick connector fitting to the power steering pump and connect the pressure line.
11. Install the air deflector. For additional information, refer to Section 501-02.
12. Fill with specified Mobil 424 or equivalent and conduct specified bleed procedure.
13. Start the vehicle, check for leaks, rectify if necessary.



## DISASSEMBLY AND ASSEMBLY

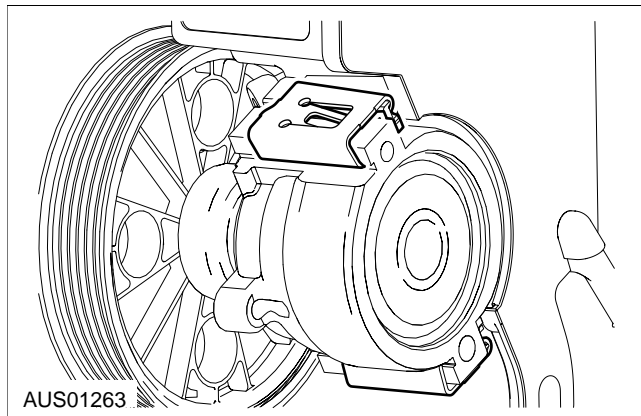
### Reservior Assembly - I6

**NOTE:** Take the following precautions when servicing the power steering pump reservior.

- Using a clean work bench and tools.
- Plug the inlet and outlet openings of the pump with plugs or masking tape.
- Thoroughly clean the exterior of the pump with solvent.

#### Disassembly

1. Remove the pump assembly from the vehicle. For additional information, refer to the Power Steering Pump - I6 procedure in this section.
2. Disconnect the retaining clips from the reservior assembly and housing.



3. Remove the power steering reservior from the housing.
4. Remove the O-ring seal from the reservior.

#### Assembly

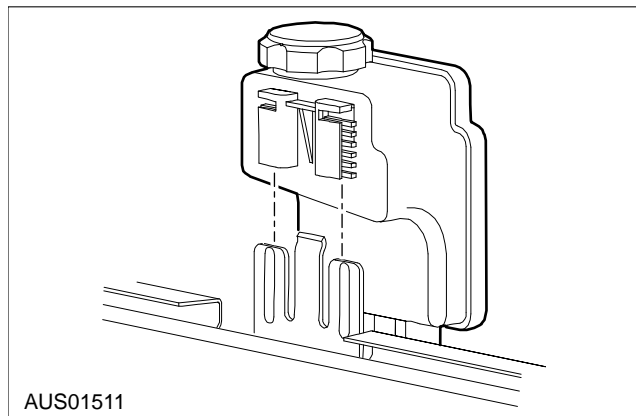
1. Lubricate the new O-ring with power steering steering fluid and install the O-ring to the reservior.
2. Connect the power steering reservior to housing.
3. Install the retaining clips to reservior and housing.
4. Install the power steering pump to the vehicle. For additional information, refer to the Power Steering Pump - I6 procedure in this section.

### Reservior Assembly - V8

#### Disassembly

1. Drain the power steering fluid reservior.
2. Disconnect the power steering warm drive hoses.
  - Loosen and move the power steering hose clamps.
  - Disconnect the power steering return hose and the power steering reservior pump hose.

3. Remove the power steering fluid reservior from the support bracket.

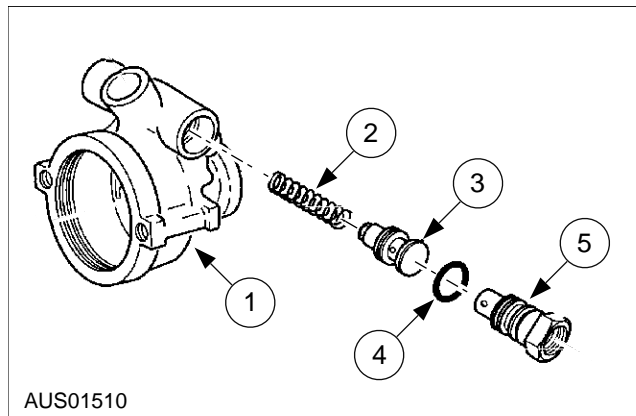


#### Assembly

1. To install, reverse the removal procedure.
2. Fill and leak check the system.

### Control Valve Assembly - I6

#### Disassembly



Item	Description
1	Housing assembly, Hydraulic pump
2	Spring, Flow control
3	Valve assembly, control
4	Seal, O-ring
5	Fitting, O-ring union

1. Remove the power steering pump assembly from the vehicle, if necessary for access. For additional information, refer to the Power Steering Pump - I6 procedure in this section.
2. Remove the O-ring union fitting and O-ring.
3. Remove the control valve assembly.
4. Remove the flow control spring.

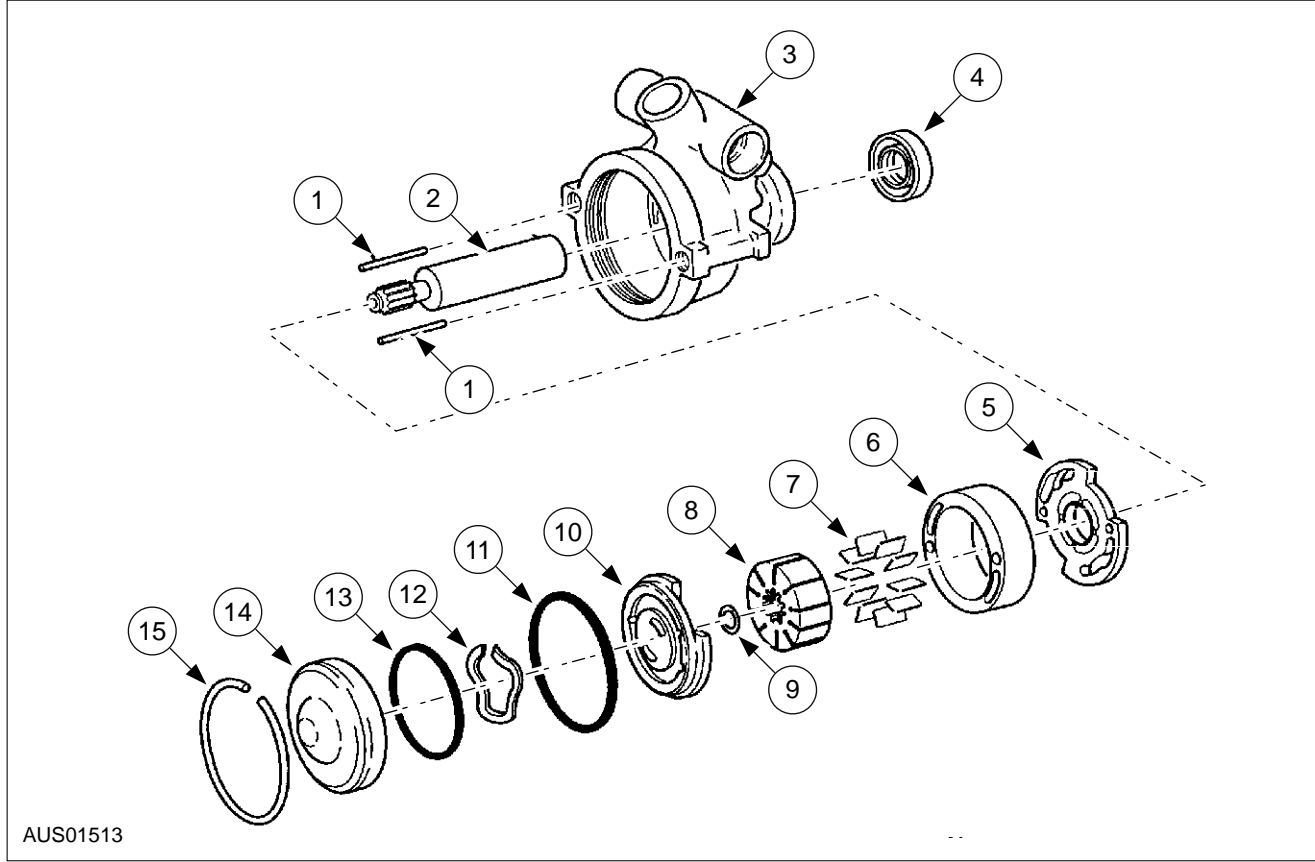


DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

- 1. Install the flow control spring.
- 2. Install the control valve assembly.
- 3. Install the O-ring fitting and a new O-ring.
- 4. Install the fitting into the hydraulic pump housing assembly and tighten to 75 Nm.
- 5. Install the power steering pump to the vehicle if required. For additional information, refer to the Power Steering Pump - I6 procedure in this section.

Drive Shaft Seal - I6






Item	Description
1	Pump ring dowel pin
2	Drive shaft
3	Hydraulic pump housing assembly
4	Drive shaft seal
5	Thrust plate
6	Pump ring
7	Vane
8	Pump rotor
9	Shaft retaining ring

Item	Description
10	Pressure plate
11	O-ring seal
12	Pressure plate spring
13	O-ring seal
14	End cover
15	Retaining ring

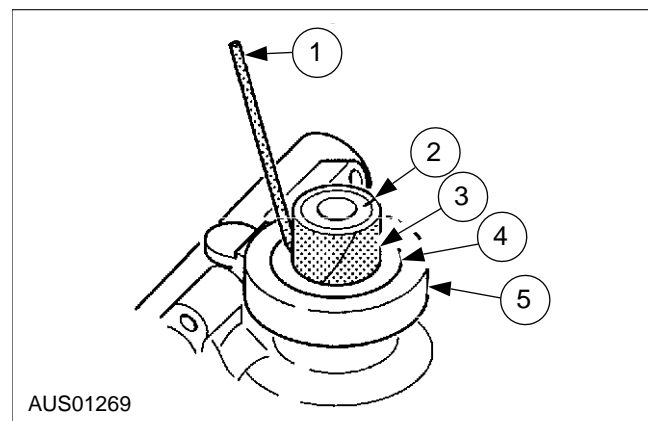


## DISASSEMBLY AND ASSEMBLY (Continued)

Special Tools	
 SST000-J7728	Shaft Oil Seal Installer  J 7728 BA / BF / FG
 SST983-000	Remover, Power Steering Pump Pulley  A7185 BA / BF / FG
 SST115-D001	Installer, Power Steering Pump Pulley  A7005 BA / BF / FG

### Disassembly

1. Remove the drive belt. For additional information, refer to Section 303-05.
2. Remove the power steering pump pulley using special tool A7185.
3. Remove the power steering pump assembly from the vehicle, if necessary for access. For additional information, refer to the Power Steering Pump - I6 procedure in this section.
4. Protect the drive shaft with the shim stock.

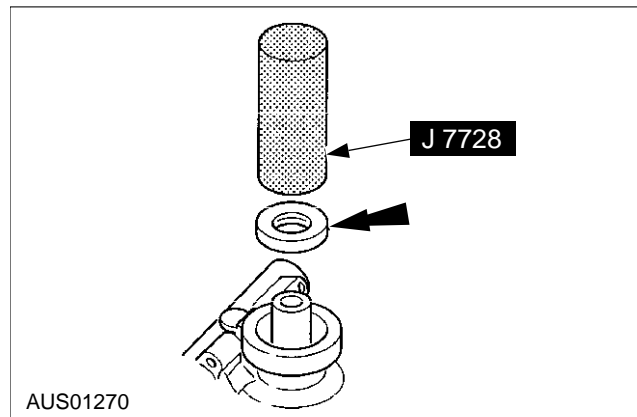


Item	Description
1	Chisel
2	Drive shaft
3	Shim stock
4	Hydraulic pump housing assembly
5	Drive shaft seal

5. Remove the seal and discard (Use small chisel to cut the drive shaft seal).

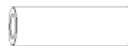
### Assembly

1. Lubricate the new drive shaft seal with power steering fluid and install the new drive shaft seal using special tool J 7728.



2. Install the power steering pump assembly to the vehicle if removed. For additional information, refer to the Power Steering Pump - I6 procedure in this section.
3. Install the power steering pulley to the vehicle using special tool A7005.
4. Install the drive belt. For additional information, refer to Section 303-05.

### Hydraulic Pump

Special Tools	
 SST000-J7728	Shaft Oil Seal Installer  J 7728 BA / BF / FG

**NOTE:** The following precautions must be observed when servicing the power steering pump:

- Use a clean work bench and tools.
- Thoroughly clean the exterior of the unit with solvent. Drain as much fluid from the pump as possible.
- If only the reservoir is to be removed, clean as outlined.
- Do not use cleaning solvents on the seal.

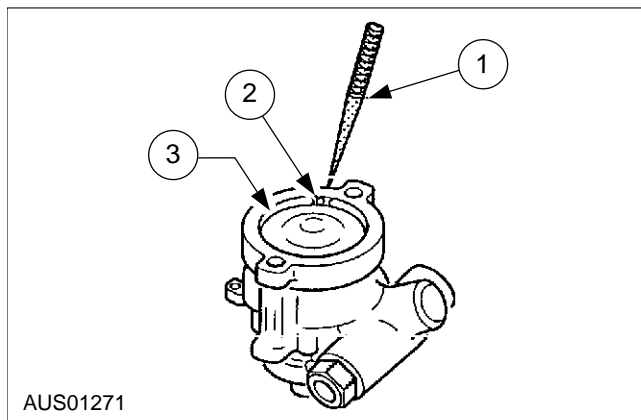




## DISASSEMBLY AND ASSEMBLY (Continued)

### Disassembly

1. Disassemble the retaining ring using a punch in the access hole.



Item	Description
1	Punch
2	Access hole
3	Retaining ring

2. Disassemble the internal components of the pump from the pump housing by gently pushing on the drive shaft. Components should include pressure plate subassembly consisting of:
  - End cover
  - O-ring seal
  - Pressure plate spring
  - Pressure plate
  - Drive shaft subassembly consisting of:
    - Pump rotor
    - Thrust plate
    - Drive shaft
    - Shaft retaining ring, pump ring and vanes
3. Remove the O-ring from the pump housing.
4. Remove the dowel pins.
5. Remove the drive shaft seal.
6. Remove the end cover (pressure plate spring) and O-ring from the pressure plate.
7. Remove the pump ring (and vanes) from the drive shaft subassembly.
8. Remove the shaft retaining ring (from the drive shaft).
9. Remove the pump rotor (and thrust plate) from the drive shaft.

### Assembly

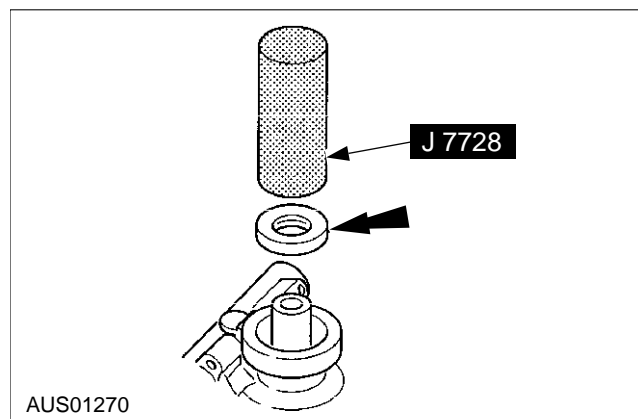
**NOTE:** Clean all parts in power steering fluid, then dry parts.

Inspect the following parts

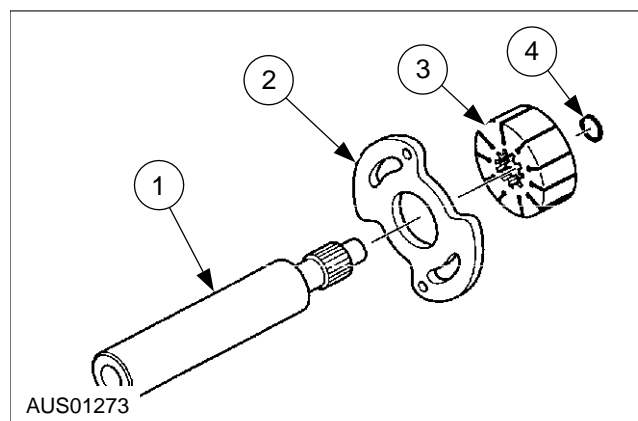
- Pressure plate
- Pump ring
- Vanes
- Thrust plate
- Drive shaft

For scoring, pitting or chatter marks. If noted replace the appropriate parts.

1. Lubricate the new drive shaft seal with power steering fluid and install the drive shaft seal into the power steering pump housing with special tool J 7728.



2. Install pump ring dowel pins into pump housing.
3. Install thrust plate and pump rotor to drive shaft.

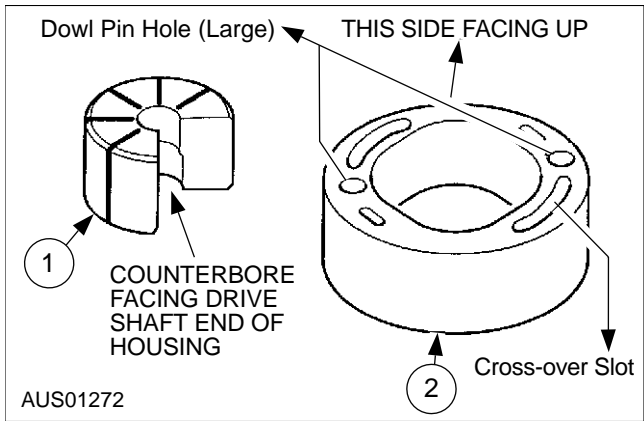


Item	Description
1	Drive shaft
2	Thrust plate
3	Pump rotor
4	Shaft retaining ring



DISASSEMBLY AND ASSEMBLY (Continued)

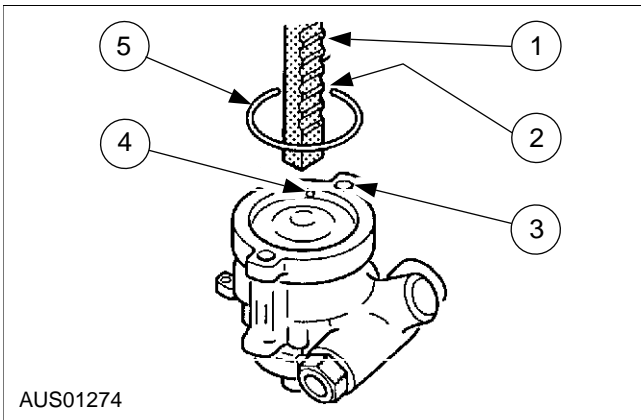
- 4. Install a new shaft retaining clip onto the drive shaft.
- 5. Install drive shaft subassembly into the pump housing.
- 6. Install vanes into pump rotor.
- 7. Install pump ring (with holes positioned correctly onto dowel pins in pump housing).



Item	Description
1	Pump rotor
2	Pump ring

- 8. Lubricate new O-ring with power steering fluid. Install the O-ring into the groove in the pump housing.
- 9. Assemble the pressure plate.
- 10. Assemble pressure plate spring.
- 11. Lubricate new O-ring (with power steering fluid). Assemble the O-ring into the end cover.
- 12. Lubricate the outer edge of the end cover with power steering fluid.
- 13. Press end cover into the pump housing.

- 14. Assemble the retaining ring into groove in the pump housing (with ring opening near the access hole in the pump housing).



Item	Description
1	Press
2	Retaining clip opening
3	Bolt hole
4	Access hole
5	Ring retaining

