

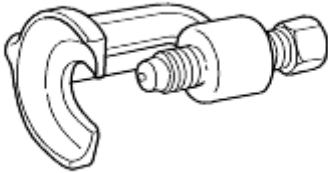
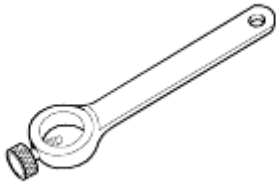
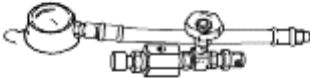



Steering System

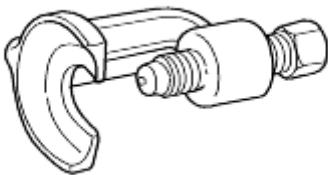
General Information

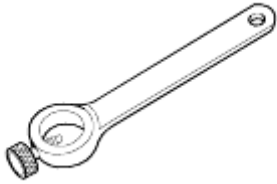
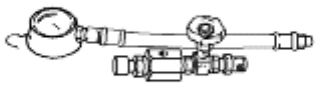



SPECIAL SERVICE TOOLS

Tool (Number and Name)	Illustration	Use
OK130 283 021 Puller, ball joint		Used for removing tie rod end.
OK130 322 020 Attachment, steering worm bearing preload measuring		Used for measuring pinion pre-load.
OK210 323 AA0 Gauge set, power steering		Used for measuring fluid pressure.
OK552 104 001 Pan belt tension lench		Used to remove drive belt tension.

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<p>OK552 104 001 Pan belt tension lench</p>		<p>Used to remove drive belt tension.</p>



Symptom-related diagnostic procedure

Power steering

Problem	Possible cause	Action
Movements of steering feels heavy	Looseness or damage of power steering belt	Adjust or replace power steering belt
	Insufficient power steering fluid or air insertion	Fluid fill up or air bleeding
	Crushed or twisted hoses	Replace hoses
	Pipe damage	Replace pipes
	Leakage of power steering fluid	Repair or replace leaking parts
	Low fluid pressure	Repair or replace power steering pump or gear
	Insufficient air pressure in tire	Adjust tire air pressure
	Incorrect wheel alignment adjustment	Adjust wheel alignment
	Steering gear linkage binding	Replace or repair steering gear linkage
	Interference between steering column and parts	Repair or replace steering column
	Steering column intermediate shaft coupling does not operate	Perform the turning effort
Poor returning of steering wheel	Insufficient air pressure in tire	Adjust tire air pressure
	Incorrect wheel alignment adjustment	Adjust wheel alignment
	Steering gear linkage binding	Repair or replace steering gear linkage
	Malfunction of steering gear	Replace steering gear
	Steering column intermediate shaft coupling does not operate	Perform the turning effort
	Steering column is overweight, restricted or bent	Inspect steering column or replace
Irregular steering power	Looseness of power steering belt	Adjust power steering belt
	Malfunction of steering column or looseness of mounting bolt	Repair or tightening of steering column
	Steering gear linkage binding	Repair or replace steering linkage
	Malfunction of steering gear	Replace steering gear
Steering wheel pulls to one side	Insufficient air pressure in tire	Adjust tire air pressure
	Improper preload adjustment or worn of wheel bearing	Adjust or replace wheel bearing
	Incorrect wheel alignment	Adjust wheel alignment
	Malfunction of steering gear	Replace steering gear
	Uneven tire wear	Replace tire or align

	Fatigued front coil spring	Replace coil spring
	Dragging brake(s)	Adjust brake(s)
	Damaged front wheel tie rod(s)	Replace front wheel tie rod
	Damaged front wheel knuckle	Inspect knuckle or replace
	Front suspension lower arm or stabilizer bar bushing worn or damaged	Repair or replace
	Front suspension lower arm bent or loose	Replace or tighten
Leakage of power steering fluid	Problem with hose coupling	Repair or replace hose coupling
	Clogged or damaged hoses	Replace hoses
	Damage of power steering fluid reservoir	Replace reservoir
	Over flow	Air bleeding or adjust fluid level
	Malfunction of power steering pump	Replace power steering pump
	Malfunction of steering gear	Replace steering gear
Abnormal noise	Looseness of power steering pump	Tightening of power steering pump
	Looseness of steering gear	Tightening of steering gear
	Looseness of power steering pump bracket	Tightening of power steering pump bracket
	Looseness of power steering pump pulley nut	Tightening of power steering pump pulley nut
	Excessive tightness or looseness of belt	Adjust power steering pump belt
	Air insertion	Air bleeding
	Malfunction of steering gear	Replace steering gear
	Malfunction of power steering pump	Replace power steering pump
	Interference on steering column or pressure hose	Remove interference on steering column or repair/replace hoses
	Looseness or excessive tightness of steering linkage	Adjust tightness of steering linkage or replace steering linkage



SPECIFICATIONS

Item		Type	P/S
Steering wheel	Outer diameter	in (mm)	14.96 (380)
	Lock - to - lock turns		3.56
Steering column	Type		Collapsible
	Joint type		Universal joint
	Tilt stroke	(degree)	±7°
Steering rack	Type		Rack and pinion
	Gear ratio		20.09 : 1
	Rack travel	in (mm)	5.51 (140)
P/S fluid	Capacity	US qt (liter)	1.05 (1.0)
	Type		PSF-III



Steering System

Hydraulic Power Steering System



DESCRIPTION AND OPERATION

POWER STEERING COMPONENTS

The power steering system consists of the following components:

- Steering column
- Steering gear & Linkage
- Tie rods & tie rod ends
- Power steering pump
- Power steering pump reservoir
- Interconnecting hydraulic tubes and hoses

POWER STEERING PUMP

The fluid is pressurized by the rotation of the rotor and vanes, then sent to the steering gear.

POWER STEERING GEAR

It is the only valve assembly serviced within the steering gear housing.

A flexible retainer encircles the steering gear pinion shaft bushing. This wire can be removed and installed through a slot in the steering gear housing.

Lockpins secure the front wheel tie rods to the steering gear sector shaft and replace the tab washers on many of steering.

HOSES, PRESSURE AND RETURN

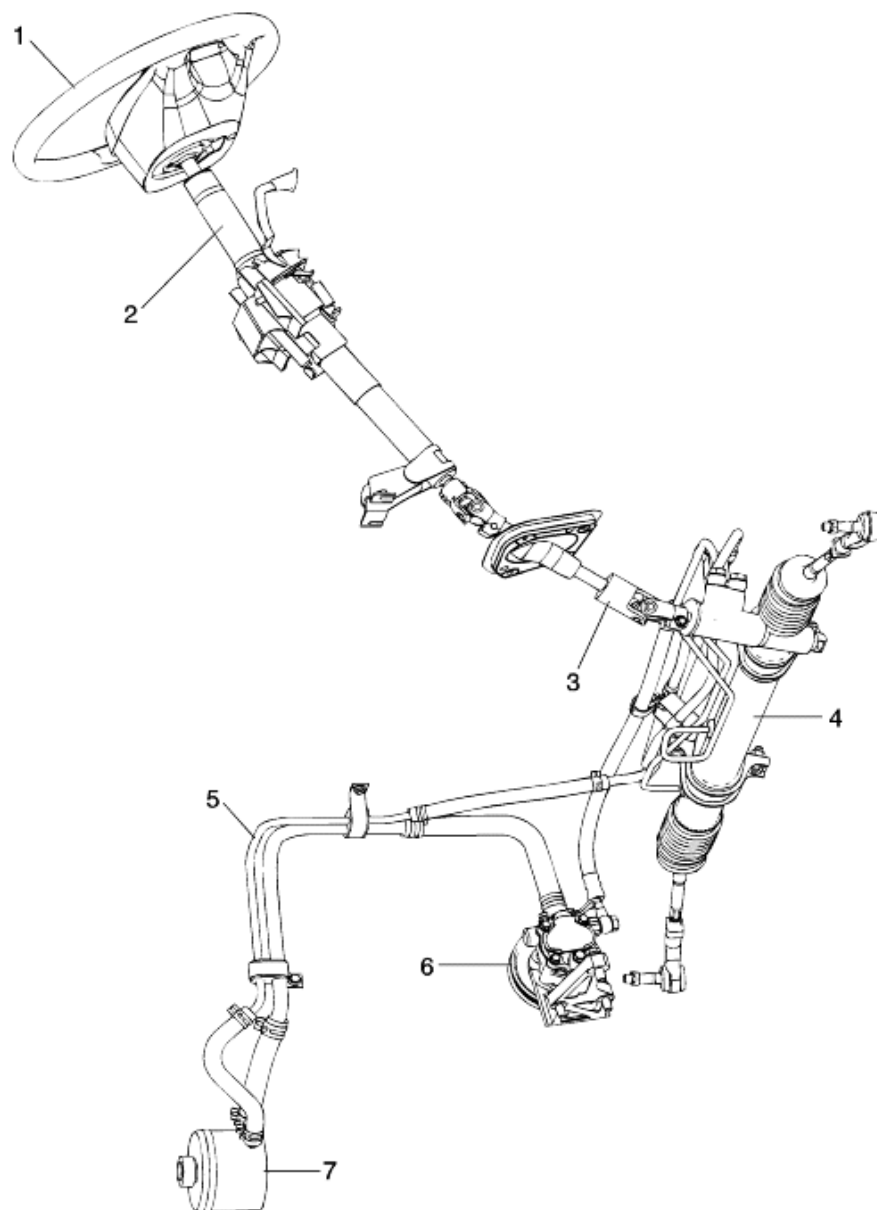
HYDRAULIC OPERATION

When the steering wheel is turned, the steering gear converts this hydraulic pressure and flow into mechanical motion that will move the front wheels in the direction of the turn.

Fluid is drawn into the vane type power steering pump from the power steering pump reservoir when the engine is running.



COMPONENT



1. Steering wheel
2. Steering shaft
3. Intermediate shaft
4. Steering gear & Linkage

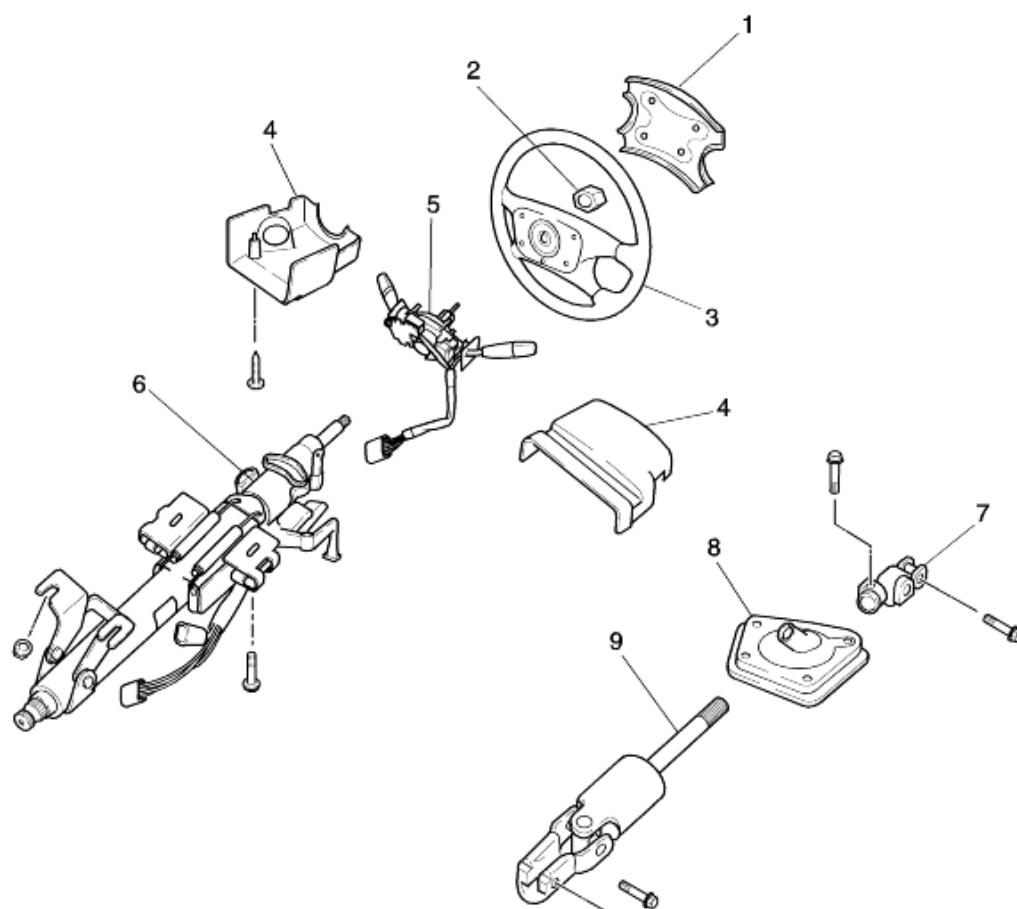
5. Oil pipe & Hose
6. Oil pump
7. Oil reserve tank

Steering System

Hydraulic Power Steering System - Power
Steering Gear Box



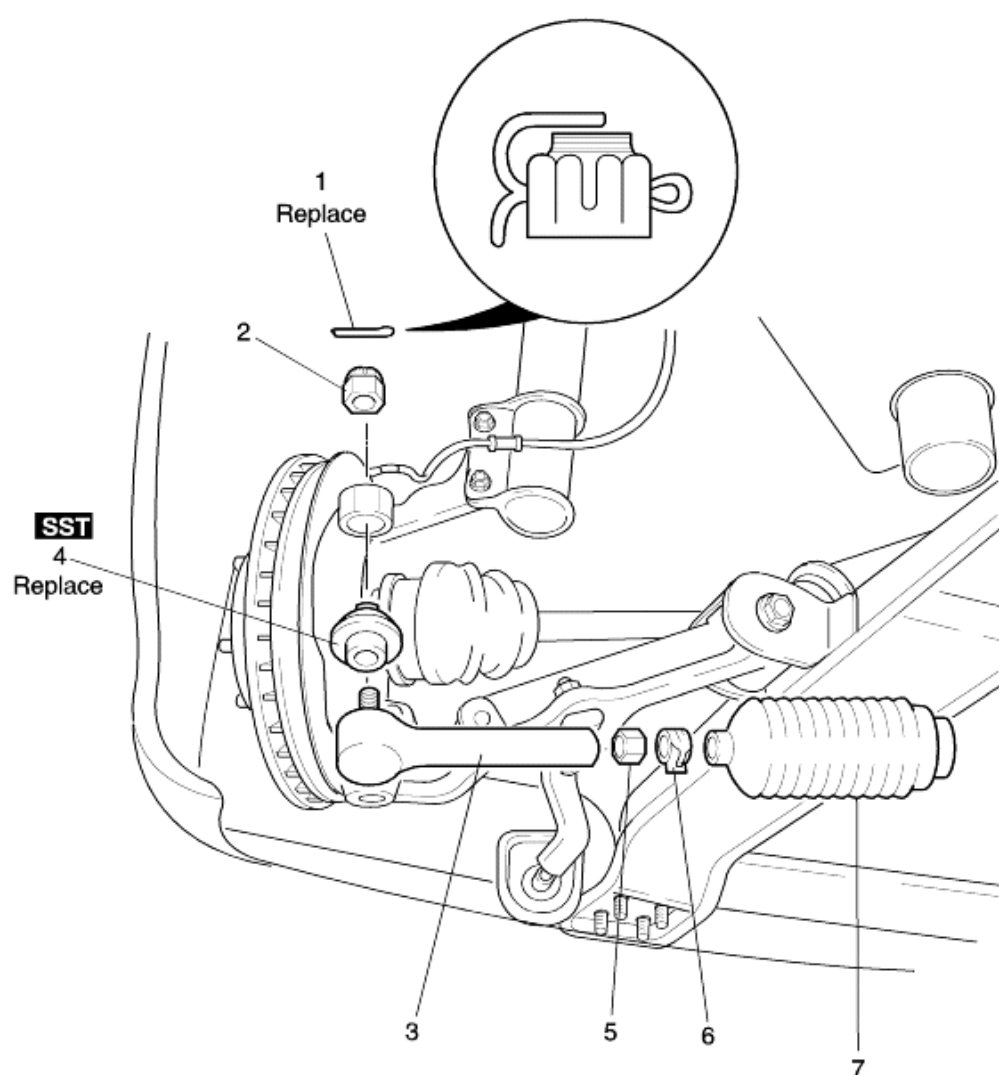
COMPONENT



1. Steering wheel cover
2. Steering wheel nut
3. Steering wheel
4. Steering column cover
5. Combination switch

6. Steering column
7. Universal joint
8. Dust cover
9. Intermediate shaft

COMPONENT (STEERING RACK BOOT)



1. Cotter pin

2. Nut

3. Tie rod end

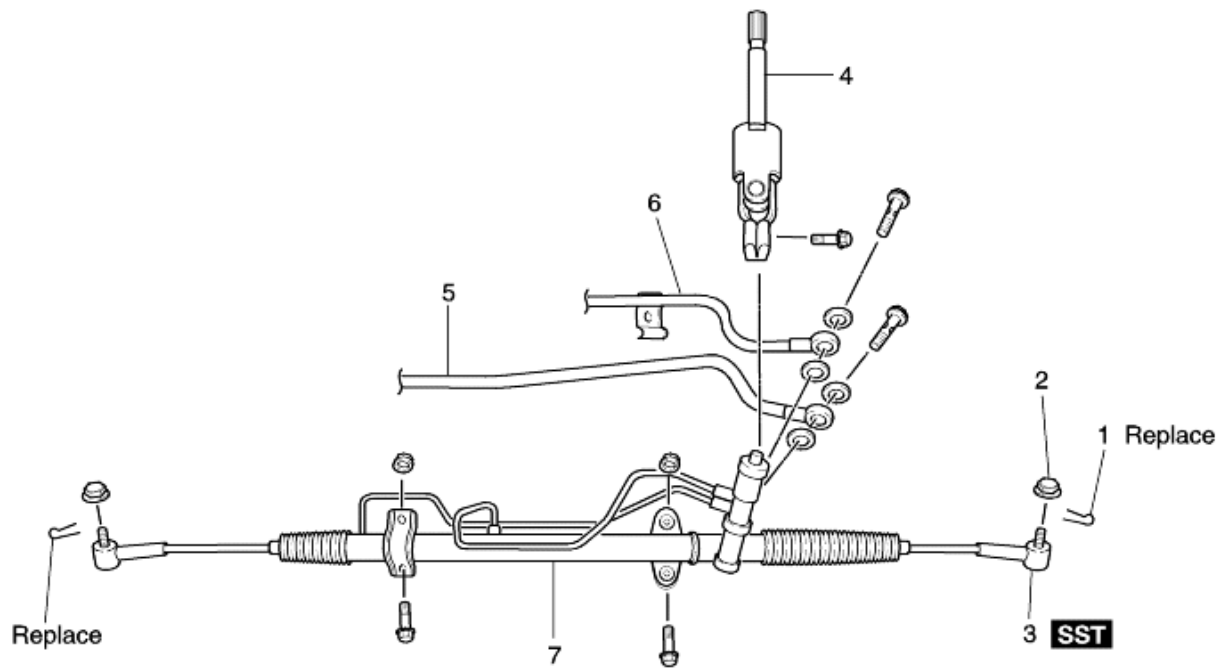
4. Ball joint boot

5. Jam nut

6. Boot band

7. Steering boot

COMPONENT



1. Cotter pin
2. Nut
3. Tie rod & ball joint
4. Intermediate shaft

5. Oil pipe (return)
5. Oil pipe (repressure)
7. Steering rack and linkage

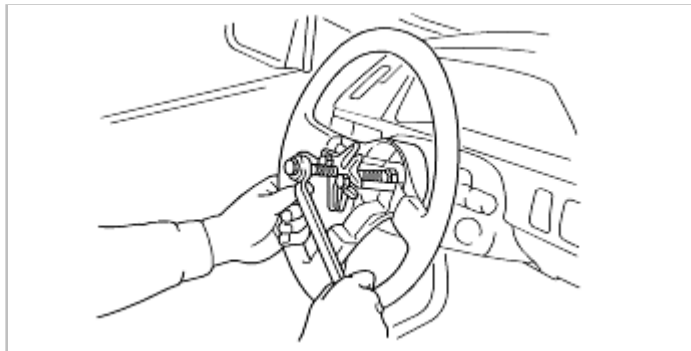


REMOVAL

1. Disconnect (-) terminal of battery.
2. Place vehicle in a straight forward position.
3. Loosen four bolts from steering wheel and remove steering wheel cover.
4. Disconnect horn switch electrical connector.
5. Make an alignment mark on steering wheel and steering shaft for proper installation.
6. Remove steering wheel nut from a end of steering shaft.
7. Remove steering wheel with a suitable puller.

NOTICE

Do not remove steering wheel by hitting end of shaft with a hammer. Damage to shaft threads and shaft support bearings could occur.



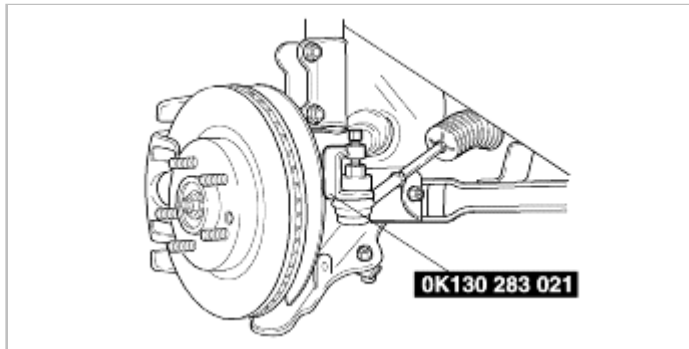
8. Loosen three lower steering column panel screws and separate upper and lower steering column panels.
9. Loosen three combination switch screws.
10. Disconnect combination switch electrical connectors.
11. Slide combination switch off steering column shaft.
12. Disconnect ignition switch electrical connector.
13. Loosen ignition switch screw.
14. Remove ignition switch.
15. Loosen one universal joint pinch bolts.
16. Remove dust cover in the engine room.
17. Remove intermediate shaft.
18. Loosen two column bracket nuts.
19. Remove steering column after removing under cover.

REMOVAL (STEERING RACK BOOT)

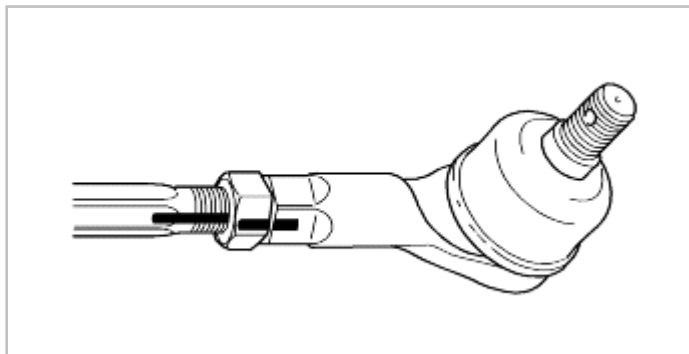
1. Lift front of vehicle and support it with safety stands.
2. Remove wheel and tire.
3. Turn wheels fully to left.
4. Pull out cotter pin and remove nut.
5. Remove tie rod from knuckle arm with SST(0K130 283 021).

NOTICE

Replace nut temporarily so screw thread does not become damaged.



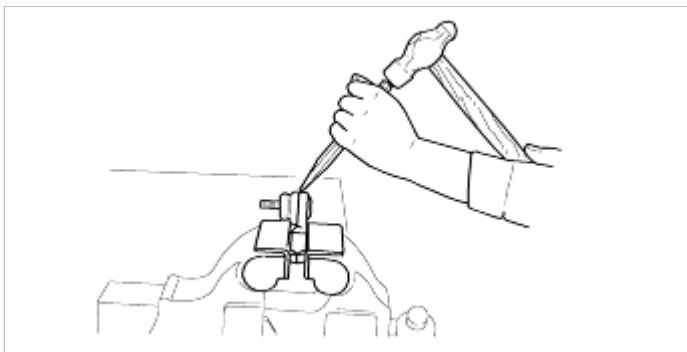
6. Mark alignment of tie rod, jam nut, and tie rod end as shown.



7. Loosen tie rod jam nut, and then remove tie rod.
8. Secure tie-rod end in a vise.
9. Place a chisel against dust boot, holding it at angle shown.
10. Carefully remove tie rod boot, working around boot.

NOTICE

Do not scar area where the tie rod seals to the dust boot.



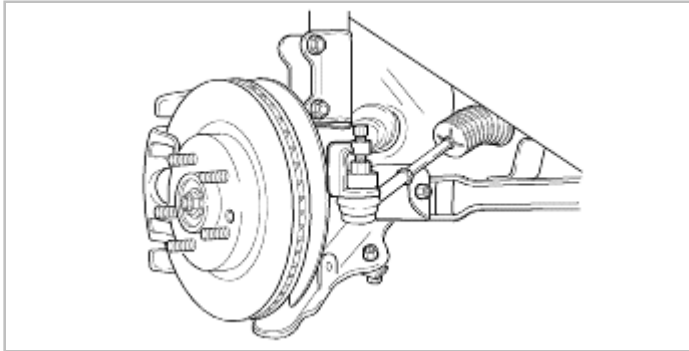
11. Loosen steering boot band.
12. Remove tie rod jam nut.
13. Remove steering boot.
14. Remove boot band.

REMOVAL

1. Raise front of vehicle and support with it safety stand.
2. Remove wheel and tire.
3. Pull out cotter pin and remove nut.
4. Seperate tie rod from knuckle arm with SST(0K130 283 021).

NOTICE

Replace nut temporarily so that screw threads do not become damaged.

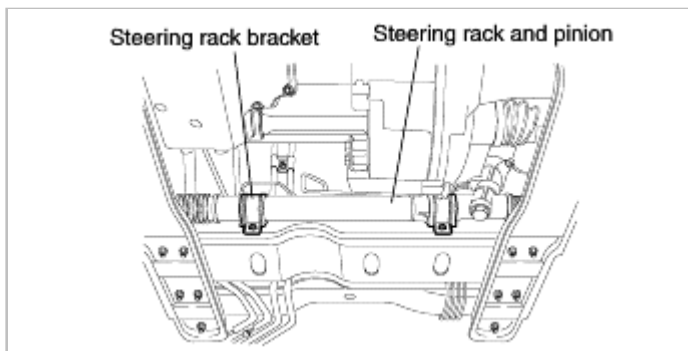


5. Loosen the bolts from the return oil pipe and pressure oil pipe and disconnect return oil pipe and pressure oil pipe.

NOTICE

Use a container or rags to catch power steering fluid when disconnecting return oil pipe and/or pressure oil pipe.

6. Remove intermediate shaft from the steering rack and linkage.
7. Loosen the bolts and nuts from the steering rack brackets.



8. Remove slowly steering rack from right side of vehicle if necessary, replace rack and linkage entirely. Do not disassemble.

REPLACEMENT

1. Install steering column and tighten column bracket nuts in vehicle.
2. Tighten under cover screws.

Tightening torque :Screw : 12-17 lb·ft (16-23 N·m, 1.6-2.3 kg·m)

3. Install intermediate shaft and dust cover.
 4. Install the steering column and the intermediate shaft to the universal joint and tighten the two universal joint bolts.
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Tightening torque :16-20 lb·ft (21-26 N·m, 2.2-2.7 kg·m)

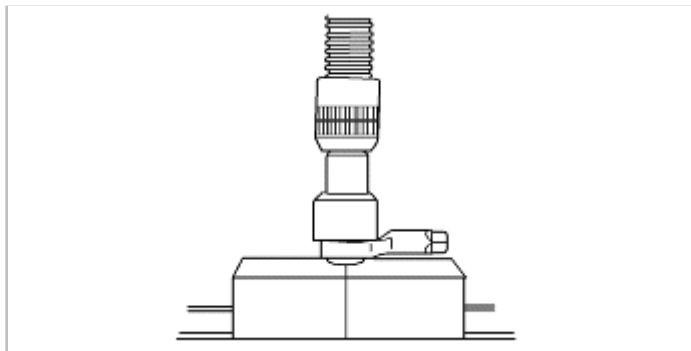
5. Install ignition switch.
6. Connect ignition switch electrical connector.
7. Connect combination switch electrical connectors.
8. Install combination switch to steering column shaft.
9. Install upper and lower steering column panels
10. Tighten three lower steering column panel screws.
11. Install properly steering wheel to steering shaft.
12. Install steering wheel nut and tighten it.

Tightening torque :29-36 lb·ft (39-49 N·m, 4-5 kg·m)

13. Connect horn switch electrical connector.
14. Install steering wheel cover and tighten four bolts.
15. Connect (-) terminal of battery.

REPLACEMENT (STEERING RACK BOOT)

1. Put a small amount of grease into new tie rod dust boot.
2. Install dust boot onto tie rod end with suitable tool and a press.

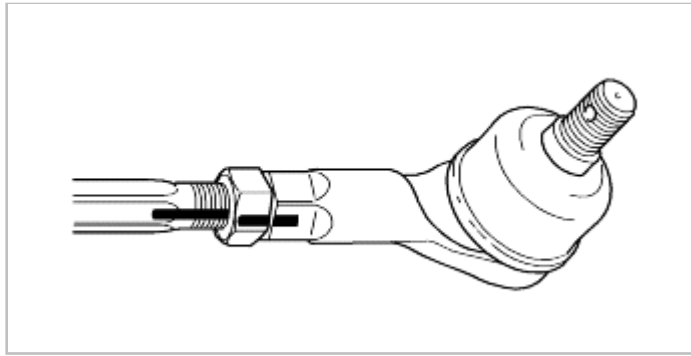


3. Fill the new steering boot with specified grease.

Specified grease : Approx. 1.05 oz (30g)

4. Apply a coat of sealant to inside of boot to rack housing contact area.
5. Install steering boot.
6. Install tie rod jam nut and align with mark made before removal.
7. Install tie rod end and rotate to align with mark made before removal.
8. Tighten tie rod jam nut.

Tightening torque :25-37 lb·ft (34-50 N·m, 7.0-8.0 kg·m)



9. Install tie rod to knuckle arm.
10. Install tie rod nut and tighten to specified torque. If necessary, tighten nut farther to install cotter pin.

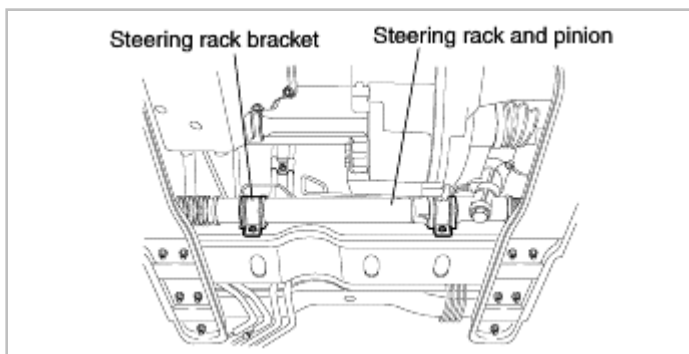
Tightening torque :22-33 lb·ft (29-44 N·m, 7.0-8.0 kg·m)

11. Install cotter pin.
12. Install wheel and tire.
13. Lower vehicle.

REPLACEMENT

1. Install steering rack into right side of vehicle.
2. Tighten bolts and nuts to steering rack brackets.

Tightening torque :55~69 lb·ft (74~93 N·m, 7.5~9.5 kg·m)



3. Tightening intermediate shaft bolt.

Tightening torque :16~20 lb·ft (21~26 N·m, 2.2~2.7 kg·m)

4. Connect return oil pipe and pressure oil pipe and tighten bolts from the return oil pipe and pressure oil pipe.

Tightening torque :17~26 lb·ft (24~35 N·m, 2.4~3.6 kg·m)

5. Install tie-rod into steering knuckle arm.
6. Tighten nut and install NEW cotter pin.

Tightening torque :43~58 lb·ft (59~78 N·m, 6.0~8.0 kg·m)

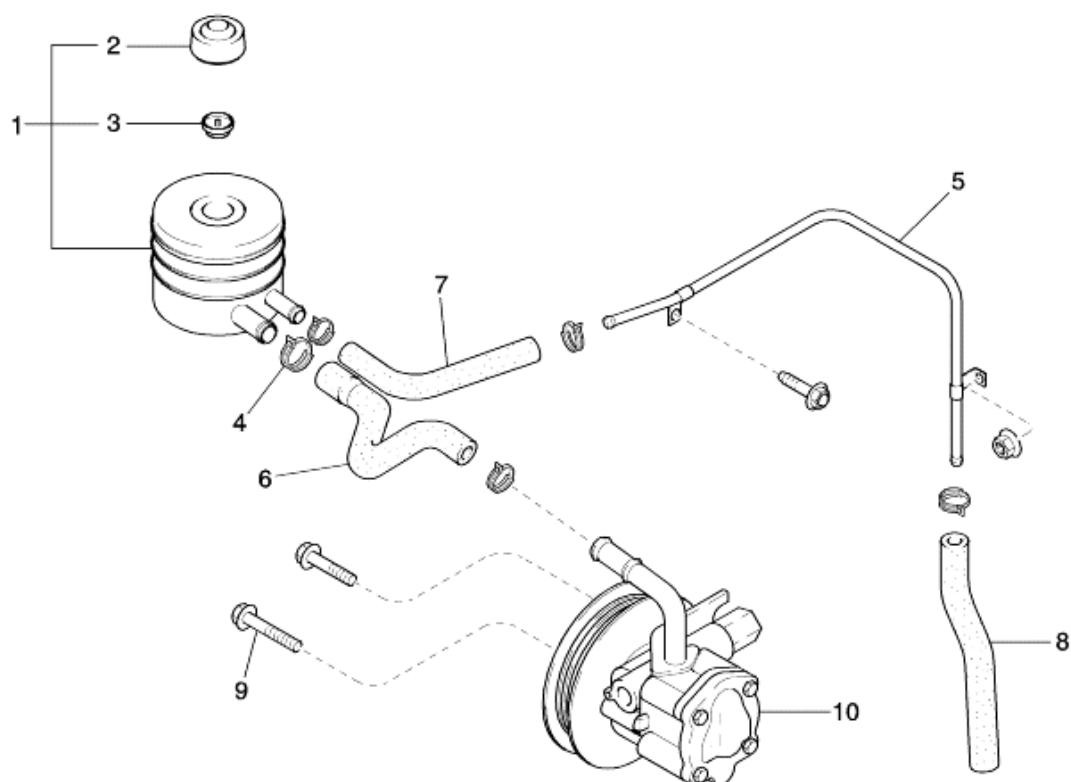
7. Install wheels and tires.
8. Lower vehicle.

Steering System

Hydraulic Power Steering System - Power
Steering Oil Pump



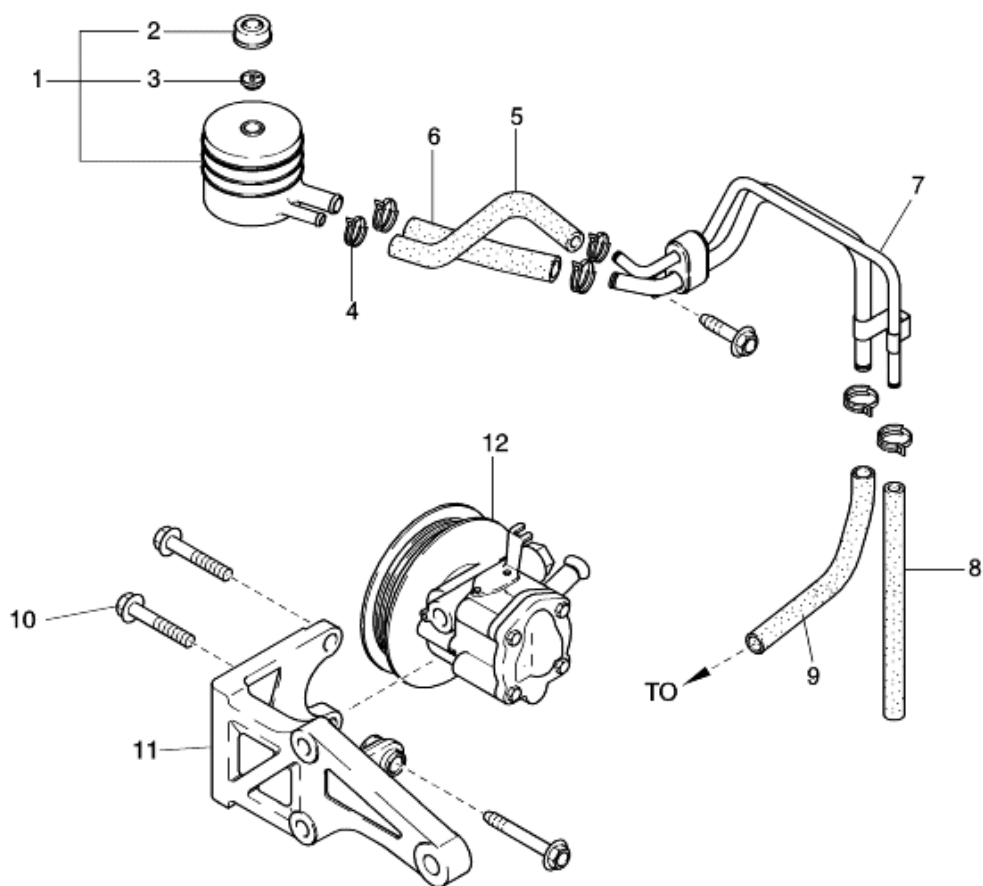
COMPONENT (GV6 GASOLINE)



- 1. Reserve tank
- 2. Reserve cap
- 3. Reserve baffle
- 4. Clamp
- 5. Return pipe

- 6. Suction hose
- 7. Return hose-1
- 8. Return hose-2
- 9. Bolt
- 10. Oil pump assembly

COMPONENT (J3 TCI DIESEL)



1. Reserve tank
2. Reserve cap
3. Reserve baffle
4. Clamp
5. Return hose-1
6. Suction hose-1

7. Pipe assembly
8. Return hose-2
9. Suction hose-2
10. Bolt
11. Power steering oil pump bracket
12. Power steering oil pump

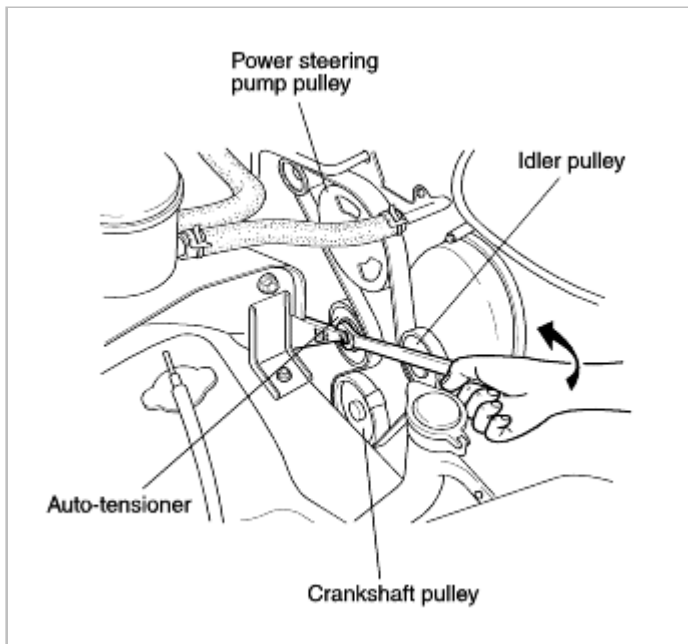


REMOVAL (GV6 GASOLINE)

WARNING

Power steering oil, engine compartments and the exhaust system may be extremely hot if engine has been running. Do not start engine with any loose or disconnected hoses. Do not allow hoses to touch hot exhaust manifold or catalyst.

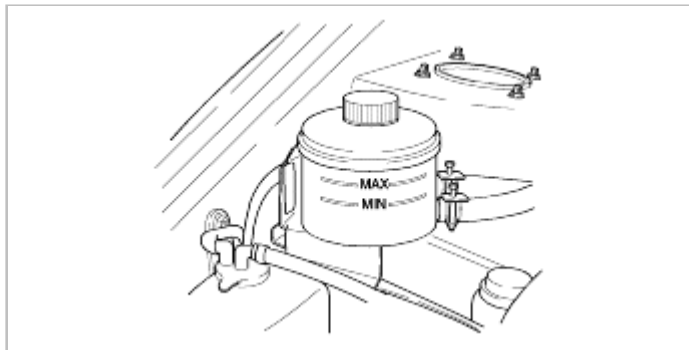
1. Raise an auto tensioner with spanner and then remove the timing belt.



2. Remove cap from power steering fluid reserve tank.
3. Using a siphon pump or suitable tool, reserve as much power steering fluid as possible from the reverse tank.
4. Disconnect the suction hose and return hose-1 after removing clamps from reserve tank.

NOTICE

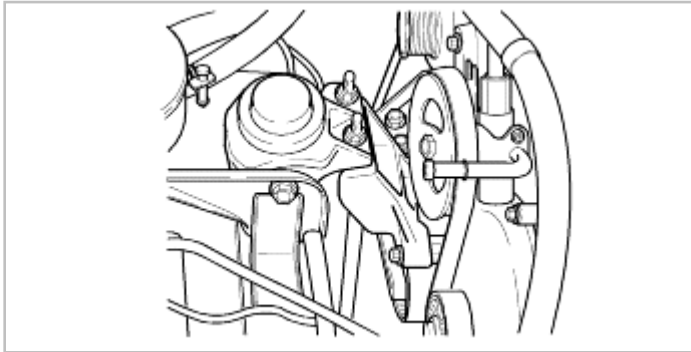
Using container or rags to catch power steering fluid when disconnecting the suction hose and return hose-1.



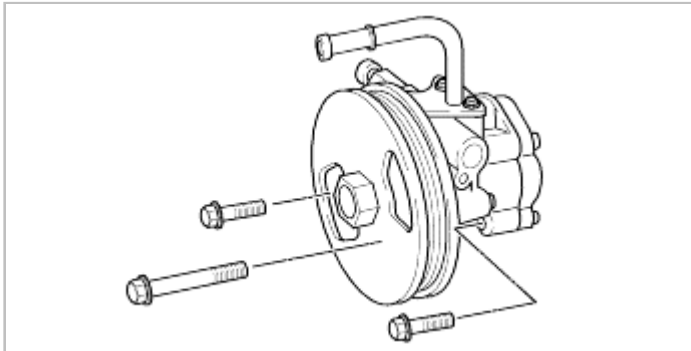
5. Disconnect the suction hose and return hose-2 from power steering pump after removing clamps.

NOTICE

Using container or rags to catch power steering fluid when disconnecting the suction hose and return hose-2.



6. Remove the power steering pump installed to the engine after loosening three bolts.

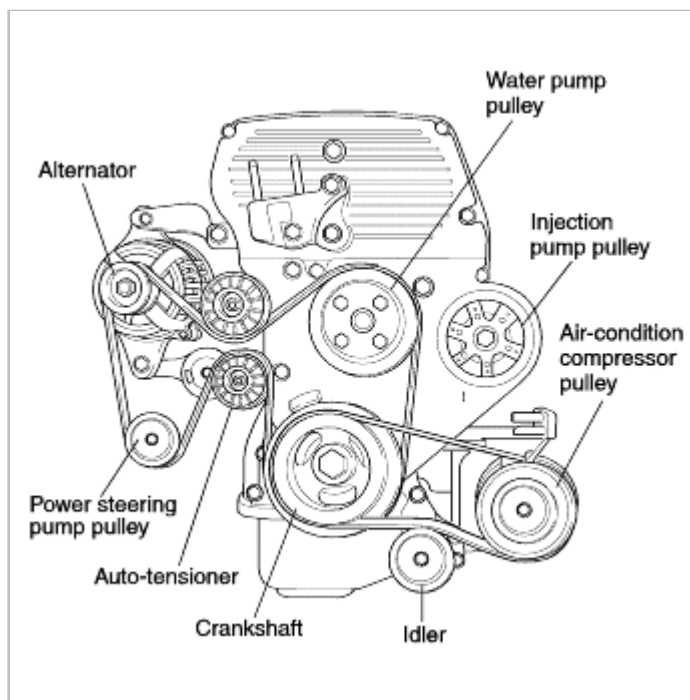


REMOVAL (J3 TCI DIESEL)

WARNING

Power steering oil, engine components and the exhaust system may be extremely hot if engine has been running. Do not start engine with any loose or disconnected hoses. Do not allow hoses to touch hot exhaust manifold or catalyst.

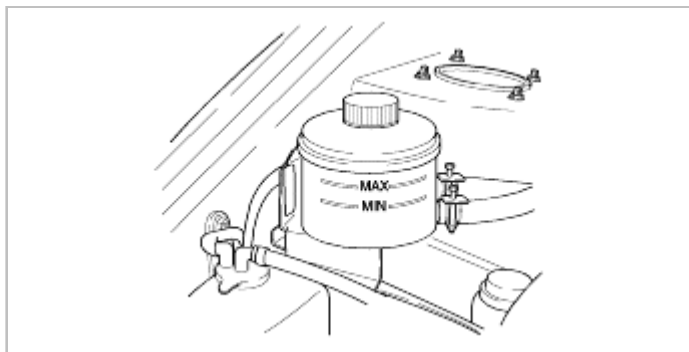
1. Pull out an auto tensioner with suitable tool and then remove the timing belt.



2. Remove cap from power steering fluid reserve tank.
3. Using a siphon pump or suitable tool, reserve as much power steering fluid as possible from the reserve tank.
4. Disconnect the suction hose-1 and return hose-1 after removing clamps from reserve tank.

NOTICE

Using container or rags to catch power steering fluid when disconnecting the suction hose-1 and return hose-1.

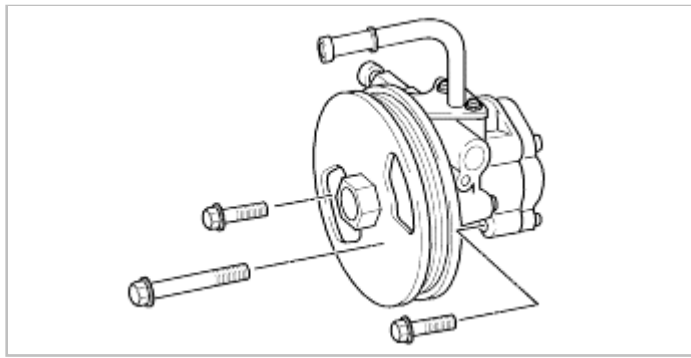


5. Disconnect the suction hose-2 and return hose-2 from power steering pump after removing clamp.

NOTICE

Using container or rags to catch power steering fluid when disconnecting suction hose-2 and return hose-2.

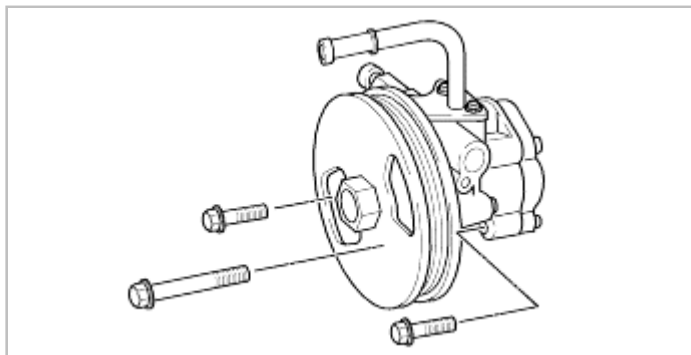
6. Loosen the oil pump bolts from the oil pump bracket in which the power steering oil pump is installed and then remove the power steering oil pump.



REPLACEMENT (GV6 GASOLINE)

1. Install the power steering pump to the right side of the engine and tighten the three bolts to the power steering pump.

Tightening torque :21.7-28.9 lb·ft (29.4-39.2 N·m, 3.0-4.0 kg·m)



NOTICE

Before connecting the power steering hoses to the power steering pump, inspect the O-ring on the steering hoses for damage and replace if damaged.

2. Install the suction hose and return hose-2 on the power steering pump and install two hose clamps.

NOTICE

Be sure hose clamps are properly reinstalled and suction hose and return hose-2 are clear of all accessory drive belt.

3. Connect the suction hose and return hose-1 to the reserve tank and install two hose clamps.

NOTICE

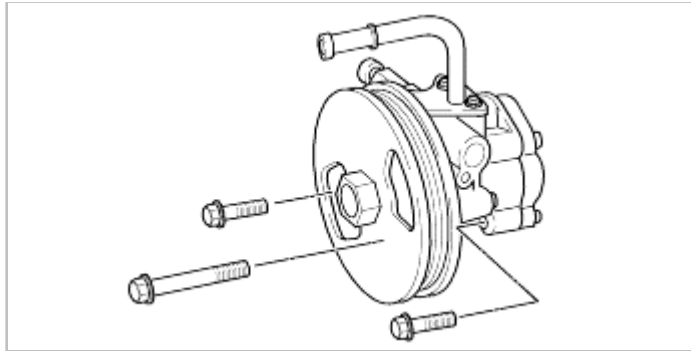
Be sure two hose clamps are properly reinstalled.

4. Install the drive belt to the power steering pump.
5. Fill the steering pump reserve tank to correct fluid level.
6. Install cap on the power steering pump reserve tank.
7. Start engine and turn steering wheel several times from stop to stop to bleed air from fluid in system. Stop engine, check fluid level, and inspect system for leaks.

REPLACEMENT (J3 TCI DIESEL)

1. Install the power steering pump bracket to the right side of engine and install the power steering pump into the bracket.

Tightening torque :21.7-28.9 lb·ft (29.4-39.2 N·m, 3.0-4.0 kg·m)



NOTICE

Before connecting the power steering hoses to the power steering pump, inspect the O-ring on the steering hoses for damage and replace if damaged.

2. Install the suction hose-2 and return hose-2 on the power steering pump and install two hose clamps.

NOTICE

Be sure hose clamps are properly reinstalled and suction hose-2 and return hose-2 are clear of all accessory drive belt.

3. Connect the suction hose-1 and return hose-1 to the reserve tank and install two hose clamps.

NOTICE

Be sure two hose clamps are properly reinstalled.

4. Install the drive belt to the power steering pump.
5. Fill the steering pump reserve tank to correct fluid level.
6. Install cap on the power steering pump reserve tank.
7. Start engine and turn steering wheel several times from stop to stop to bleed air from fluid in system. Stop engine, check fluid level and inspect system for leaks.

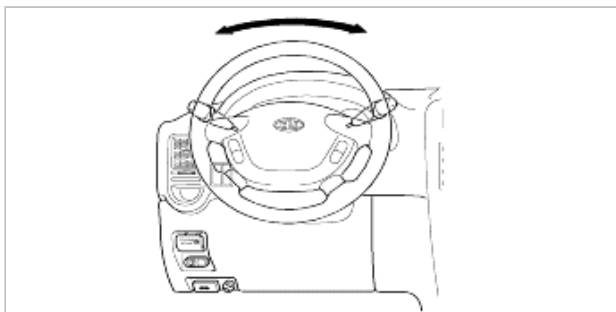


On-Vehicle service

Steering wheel play

NOTICE

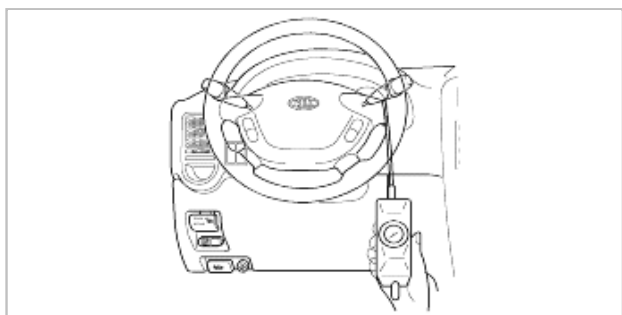
If play exceeds specification, either steering joints are worn or backlash in steering rack is excessive.



Steering wheel effort

1. With vehicle on a hard level surface, point wheels in straight-ahead position.
2. Start engine and warm power steering fluid to 122~140°F (50~60°C). Turn steering wheel fully left and right several times to warm fluid.
3. With engine running at idle speed, attach a pull scale to outermost point of a steering wheel spoke. Then, beginning with wheels in straight-ahead position, check steering effort required to turn steering wheel to left and to right.
4. If measured effort exceeds specification, check the following: fluid level, air in system, fluid leakage at hose or its connections, function of P/S oil pump and steering gear, and tire pressures.

Steering wheel effort : 6.6 lb (29 N, 3.0 kg) Max.

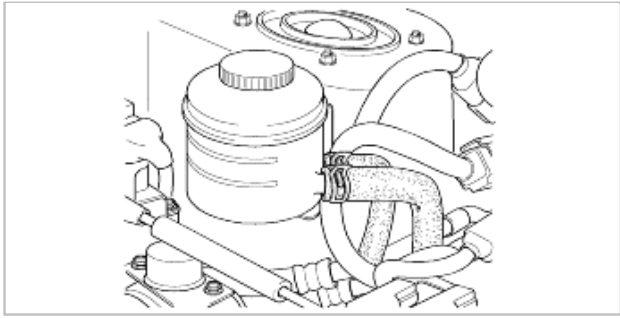


Power steering fluid level

NOTICE

Add only specified power steering fluid.

1. Verify that the fluid level is between MAX and MIN marks.
2. Add or remove fluid if not within specification.

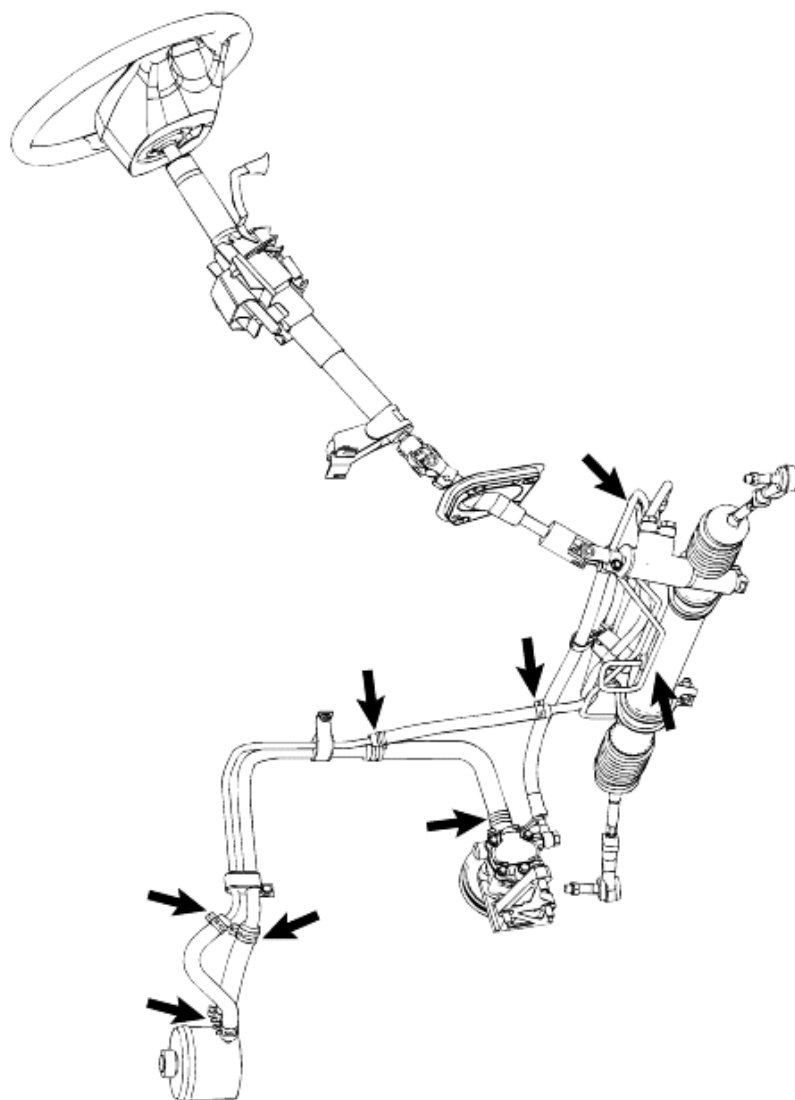


POWER STEERING FLUID LEAKAGE

1. Clean the outside of the steering gear, the bottom surfaces of the power steering pump, and all lines and fittings. Be sure all dirt, oil, and grease is removed from areas where leaks may exist.
2. Start engine.
3. Remember to turn steering wheel fully left and right to build fluid pressure.
4. Check for fluid leakage.

NOTICE

1. To prevent damage, do not keep steering wheel fully turned for more than 15 seconds.
2. Points where fluid leakage might occur are indicated by arrows in figure.

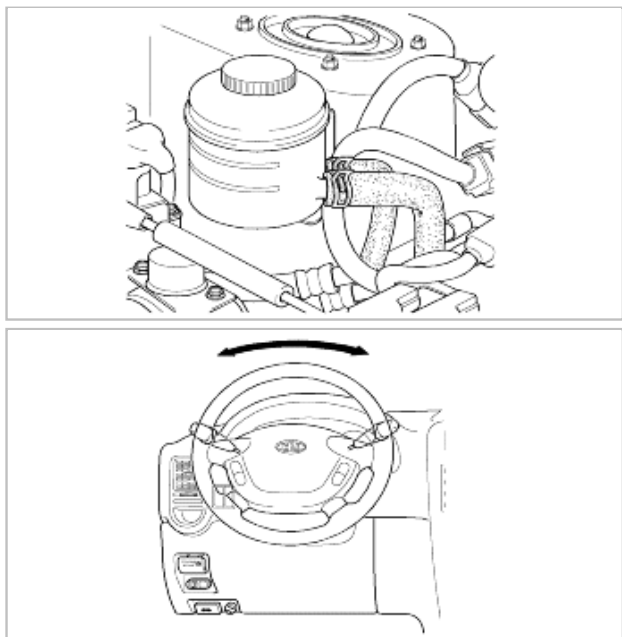


POWER STEERING AIR BLEEDING

CAUTION

- Do not start engine.
- Lift front of vehicle, and support with safety stands.

1. Check fluid level.
2. Turn steering wheel fully to left and right several times with engine not running.
3. Recheck fluid level. If level has lowered, add fluid.
4. Repeat steps 2 and 3 until fluid level stabilizes.
5. Start engine and let it idle.
6. Turn steering wheel fully to left and right several times.
7. Check that fluid has not foamed, and that fluid level has not dropped.
8. If necessary, add fluid and repeat steps 6 and 7.

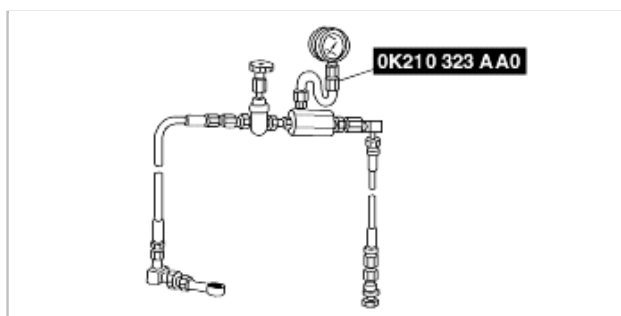


POWER STEERING FLUID PRESSURE CHECK

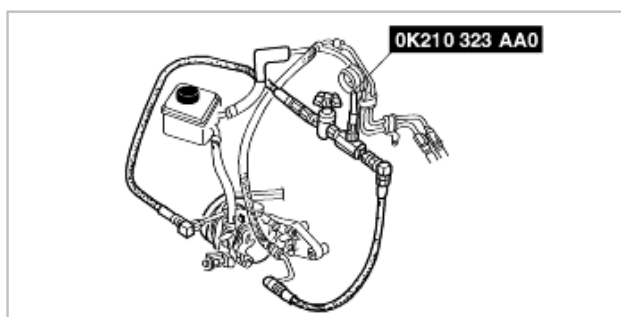
INSPECTION OF FLUID PRESSURE

1. Assemble SST(0K210 323 AA0) as shown in figure, and tighten its fittings.

Tightening torque :29-36 lb·ft (39-49 N·m, 4-5 kg·m)



2. Disconnect high-pressure hose from pump, and connect SST(0K210 323 AA0) between hose and pump.



NOTICE

Before disconnecting hose, place marks at connections for proper reinstallation.

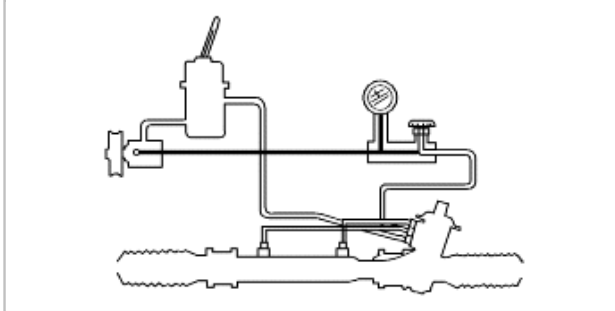
3. Bleed air from system.
4. Open gauge valve fully. Start engine and turn steering wheel fully left and right to raise fluid temperature to 122-140°F (50-60°C).

NOTICE

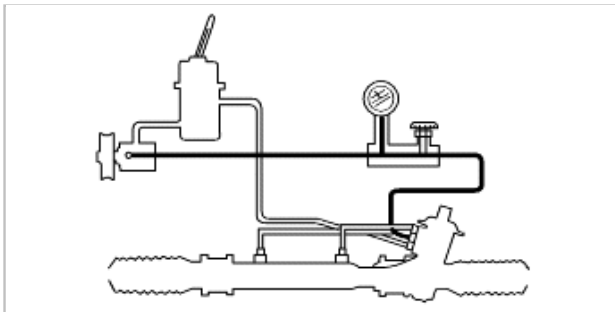
If valve is left closed for more than 15 seconds, fluid temperature will increase excessively and damage oil pump.

5. Close gauge valve completely. Increase engine speed to 1,000-1,500 rpm and measure fluid pressure generated by power steering pump. If pressure is below specification, replace power steering pump assembly.

Power steering pump fluid pressure :1265-1351 psi (8730-9319 kPa, 89-95 kg/cm²)



6. Open gauge valve fully and again increase engine speed to 1,000-1,500 rpm.



7. Turn steering wheel fully to left and right and measure fluid pressure generated by gear housing. If pressure is below specifications, replace gear housing assembly.

Gear housing fluid pressure :1265-1351 psi (8730-9319 kPa, 89-95 kg/cm²)

NOTICE

If steering wheel is kept in fully turned position for more than 15 seconds, fluid temperature will rise excessively and damage oil pump.

8. Remove SST (0K210 323 AA0). Replace and tighten high-pressure hose. Tighten to specified torque.

Tightening torque :29-36 lb·ft (39-49 N·m, 4-5 kg·m)

9. Bleed air from system.

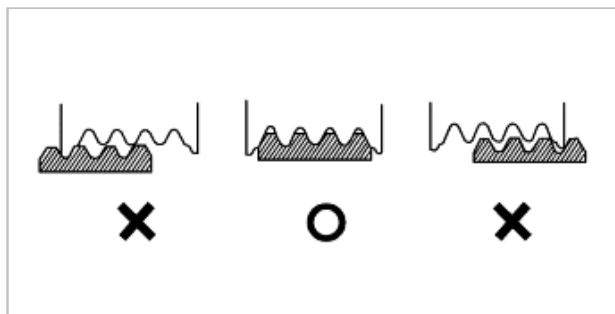
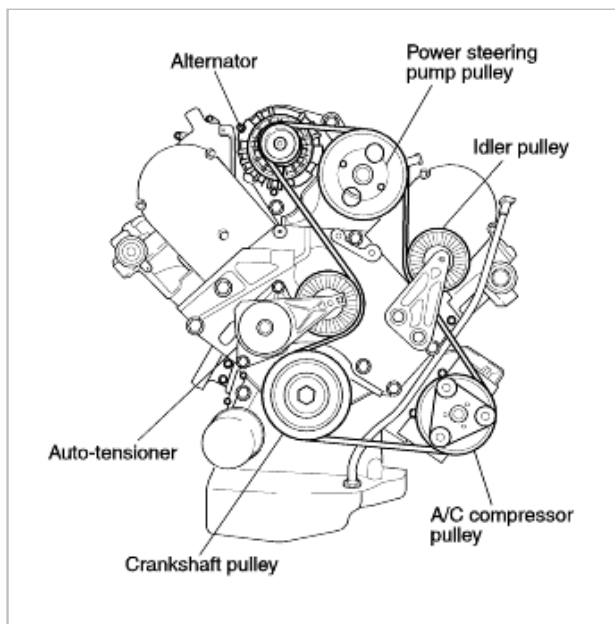
DRIVE BELT (GV6 GASOLINE)

Inspection

1. Check the drive belts for wear, cracks, and fraying.
Replace if necessary.
2. Verify that the drive belts are correctly mounted on the pulleys.

NOTICE

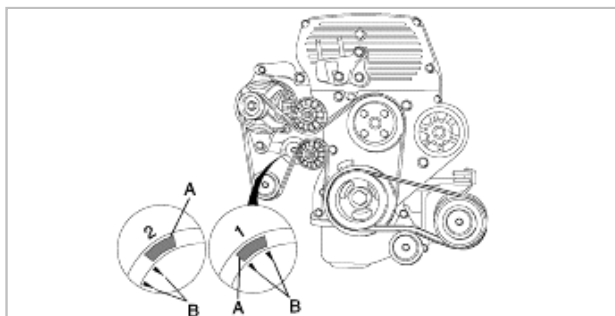
Measurement of drive belt tension is not necessary because of auto-tensioner is case of GV-6 engine.



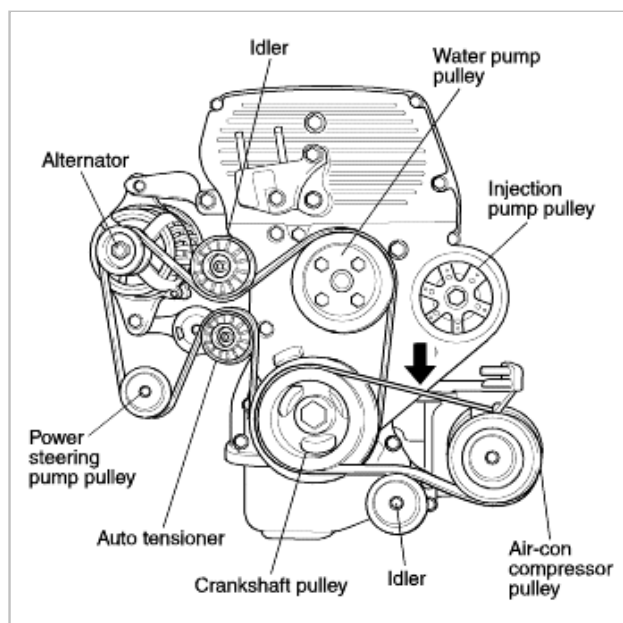
DRIVE BELT (J3 TCI DIESEL)

Inspection

1. Check the drive belts for wear, cracks, and fraying.
Replace if necessary.
2. Verify that the drive belts are correctly mounted on the pulleys.
3. Verify that "A" mark of auto-tensioner aligns "B" mark. If two marks align as shown 1, the tension of auto-tensioner is good. If not align as shown 2, reinstall the auto-tensioner or replace the drive belt or auto-tensioner.



4. Check the A/C drive belt deflection by applying moderate pressure (22 lb, 98 N, 10 kg) midway between the pulleys.



CAUTION

- Measure the belt deflection between the pulleys.
- Consider the belt as a new one if it has been used on a running engine for less than five minutes.
- Check the belt deflection when the engine is cold or at least 30 minutes after the engine is stopped.

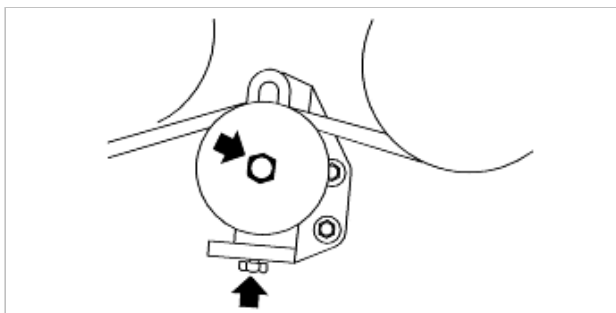
A/C belt deflection

New one : 0.28-0.35 in (7-9 mm)

Used one : 0.35-0.43 in (9-11 mm)

DRIVE BELT (J3 TCI DIESEL)

Adjustment



1. Loosen the idler pulley mounting bolt.
2. Adjust the belt deflection by turning the adjusting bolt.

Deflection (when applying 22 lb, 98 N, 10kg)

New one : 0.28-0.35 in (7-9 mm)

Used one : 0.35-0.43 in (9-11 mm)

3. After making the adjustment, tighten the idler pulley mounting bolt.

Tightening torque :28-38 lb·ft (37-52 N·m, 3.8-5.3 kg·m)