Steering System

GENERAL

SPECIFICATIONS ED1E6761

Item			Specifications
Column and shaft	Shaft and joint type		Collapsible, crossjoint with tilt column
	Steering gear type		Rack and pinion
	Rack stroke mm		150
	Tilt stroke	Non electrical	7°
Oil pump	Type		Vane type
	Displacement		10.5 cc/rev
	Relief pressure		90 +3/-2 kg/㎠
Steering angle	Inner		39.17°±2°
	Outer		31.56°
	TIE ROD END BALL JOINT STARTING TORQUE		30kg·cm or less

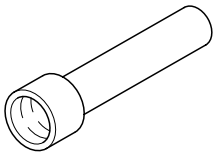
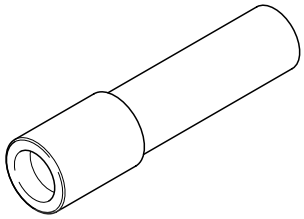
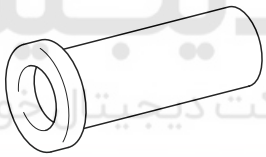
TIGHTENING TORQUE E3D74B0C

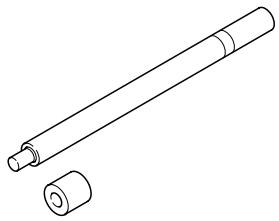
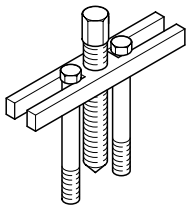
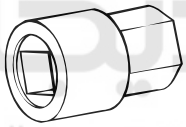
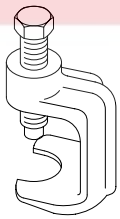
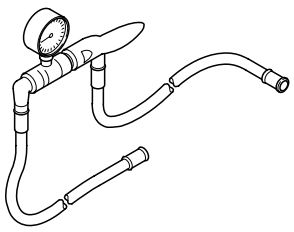
Items		Nm	kgf·m	lbf·ft
Steering column and shaft	Steering column to column member mounting (upper)	13 ~ 18	1.3 ~ 1.8	9.4 ~ 13
	Steering column memb to	4 ~ 6	0.4 ~ 0.6	2.8 ~ 4.3
	Steering column to column member mounting (lower)	13 ~ 18	1.3 ~ 1.8	9.4 ~ 13
	Steering wheel lock nut	40 ~ 50	4 ~ 5	28.9 ~ 36.1
	Joint assembly	18 ~ 25	1.8 ~ 2.5	13 ~ 18
Steering gear box	Pressure hose to gear box	12 ~ 18	1.2 ~ 1.8	8.6 ~ 13
	Return tube to gear box	12 ~ 18	1.2 ~ 1.8	8.6 ~ 13
	Tie rod end lock nut	50 ~ 55	5 ~ 5.5	36.1 ~ 39.7
	Pinion and valve assembly to self locking nut	20 ~ 30	2 ~ 3	14.4 ~ 21.6
	End plug	50 ~ 70	5 ~ 7	36.1 ~ 50.6
	lock nut	50 ~ 70	5 ~ 7	36.1 ~ 50.6
	Tie rod end self locking nut	24 ~ 34	2.4 ~ 3.4	17.3 ~ 24.5
	Mounting bracket to crossmember	60 ~ 80	6 ~ 8	43.3 ~ 57.8
Oil pump	Pressure hose to oil pump	55 ~ 65	5.5 ~ 6.5	39.7 ~ 47
	Oil pump mounting bolt(2.4)	17 ~ 26	1.7 ~ 2.6	12.2 ~ 18.8
	Oil pump mounting bolt(3.3)	35 ~ 50	3.5 ~ 5	25.3 ~ 36.1
	Pump cover to pump body	18 ~ 22	1.8 ~ 2.2	13 ~ 15.9
	Suction connector to oil pump body	6 ~ 10	0.6 ~ 1	4.3 ~ 7.2
	Flow control valve connector to pump body	65 ~ 75	6.5 ~ 7.5	47 ~ 54.2
Steering hoses and oil reservoir	Oil reservoir bracket mounting bolt	4 ~ 6	0.4 ~ 0.6	2.8 ~ 4.3
	Cooler tube clamp mounting bolt	4 ~ 6	0.4 ~ 0.6	2.8 ~ 4.3
	Tube clip and tube bracket	4 ~ 6	0.4 ~ 0.6	2.8 ~ 4.3
	Pressure hose bracket mounting bolt	4 ~ 6	0.4 ~ 0.6	2.8 ~ 4.3
	Hose clamp	4 ~ 6	0.4 ~ 0.6	2.8 ~ 4.3

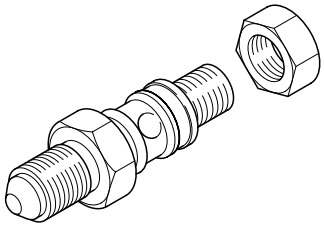
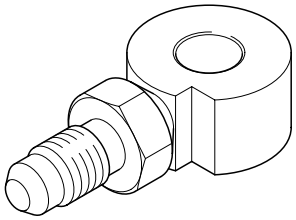
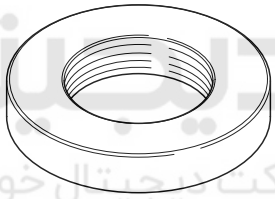
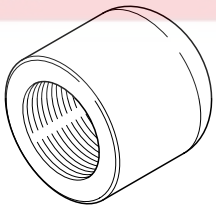
LUBRICANTS

Items	Specified lubircant	Quantity
Steering column bearing	Multipurpose grease SAE J310a, NLGI No.2	As required
Steering gear box rack, pinion gear part	Multipurpose grease SAE J310a, NLGI No.2	As required
Bellows	Silicone grease	As required
Oil pump	Power steering fluid (PSF-3)	As required
Power steering fluid	Power steering fluid (PSF-3)	1.0 lit (0.88 qts.)

SPECIAL TOOLS ECFFCCE1

Tool (Number and Name)	Illustration	Use
09222-21100 Valve stem oil seal installer	 EPRF001A	Installation of the pinion gear bearing
09222-32100 Valve stem oil seal installer	 EPRF001B	Installation of the oil pump oil seal
09432-21601 Bearing installer	 EPRF001C	Installation of the pinion gear bearing
09431-11000 Front oil seal installer	 KPRE103D	Installation of the pinion gear oil seal
09517-21400 Drift	 KPRE103E	1. Removal of pinion gear bearing 2. Removal of pinion bearing outer race

Tool (Number and Name)	Illustration	Use
09555-21000 Bar	 EPRF001D	Removal and installation of the oil seal (Use with 09573-33100, 09573-33000,09573-21000)
09561-11001 Steering wheel puller	 EPRF001E	Removal of steering wheel
09565-31300 Yoke plug torque wrench socket	 KPRE103H	Removal, installation and adjustment of steering gear yoke plug
09568-4A000 Tie rod end puller	 KPRE103I	Separation of the tie rod end bail joint
09572-21000 Oil pressure gauge	 EPRF001F	Measurement of the oil pressure (Use with 09572-22100, 09572-21200)

Tool (Number and Name)	Illustration	Use
09572-21200 Oil pressure gauge adapter	 EPRF001G	Measurement of the oil pressure (Use with 09572-21000, 09572-22100)
09572-22100 Oil pressure gauge adapter	 EPRF001H	Measurement of the oil pressure (Use with 09572-21000, 09572-21200)
09573-33000 Oil seal installer	 EPRF001I	Installation of the back up washer and oil seal (Use with 09753-21000,09573-33100, 09555-21000)
09573-33100 Oil seal guide	 EPRF001K	Removal and installation of the oil seal (Use with 09573-21000, 09573-33000,09555-21000)

TROUBLESHOOTING E6CF1134

Symptom	Probable cause	Remedy
Excessive play in steering	Loose yoke plug	Retighten
	Loose steering gear mounting bolts	Retighten
	Loose or worn tie rod end	Retighten or replace as necessary
Steering wheel operation is not smooth (Insufficient power assist)	V-belt slippage	Readjust
	Damaged V-belt	Replace
	Low fluid level	Replenish
	Air in the fluid	Bleed air
	Twisted or damaged hoses	Correct the routing or replace
	Insufficient oil pump pressure	Repair or replace the oil pump
	Sticky flow control valve	Replace
	Excessive internal oil pump leakage	Replace the damaged parts
	Excessive oil leaks from rack and pinion in gear box	Replace the damaged parts
	Distorted or damaged gear box or valve body seals	Replace
Steering wheel does not return properly	Excessive turning resistance of tierod end	Replace
	Yoke plug excessively tight	Adjust
	Tie rod and/or ball joint cannot turn smoothly	Replace
	Loose mounting of gear box mounting bracket Worn steering shaft joint and/or	Retighten
	body grommet	Correct or replace
	Distorted rack	Replace
	Damaged pinion bearing	Replace
	Twisted or damaged hoses	Reposition or replace
	Damaged oil pressure control valve	Replace
	Damaged oil pump input shaft bearing	Replace
Noise	Hissing Noise in Steering Gear There is some noise with all power steering systems. Oe of the most common isa hissing sound when the steering wheel is turned and the car is not moving.This noise will be most evident when turning the wheel while the brakes are beingapplied. There is no relationship between this noise and steering performance.Do not replace the valve unless the "hissing" noise becomes extreme. A replacedvalve will also make a slight noise, andis not always a solution for the condition	

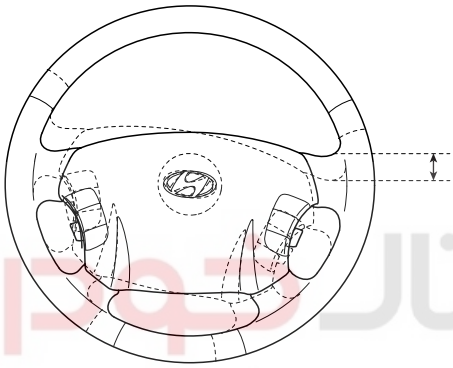
Symptom	Probable cause	Remedy
Rattling or chucking noise in the rack and pinion	Interference with hoses from vehicle body	Reposition
	Loose gear box bracket	Retighten
	Loose tie rod end and/or ball joint	Retighten
	Worn tie rod and/or ball joint	Replace
Noise in the oil pump	Low fluid leve	Replenish
	Air in the fluid	Bleed air
	Loose pump mounting bolts	Retighten

SERVICE ADJUSTMENT PROCEDURE E26071B8

CHECKING STEERING WHEEL FREE PLAY

1. Start the engine and with the steering wheel in the straight ahead position.
2. Measure the play while turning the steering wheel to the left and right.

Standard value :
Steering wheel free play : 30 mm (1.1 in)



KPRE105A

3. If the play exceeds the standard value, inspect the connection between the steering shaft and tie rod ends.

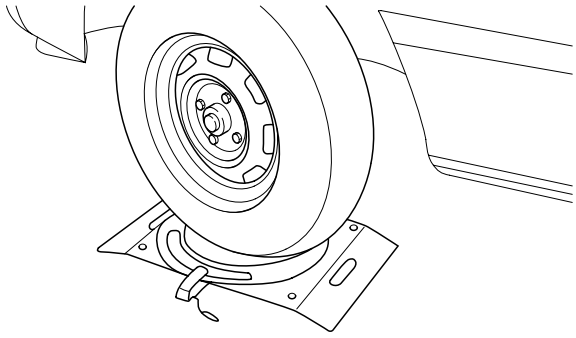
CHECKING STEERING ANGLE

1. Place the front wheel on a turning radius gauge and measure the steering angle.

Standard value :

Wheel angle	
Inside wheel	39.17°±2°
Outside wheel	31.56°

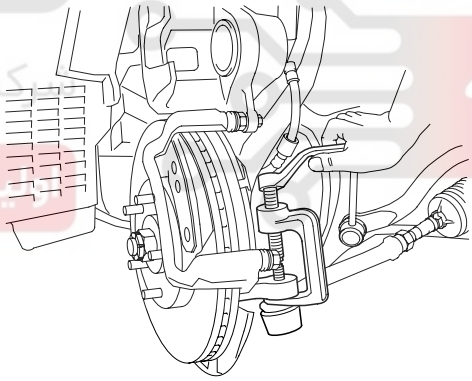
2. If the measured value is not within the standard value, adjust the toe and inspect again.



EPRF010A

CHECKING THE TIE ROD END BALL JOINT STARTING TORQUE

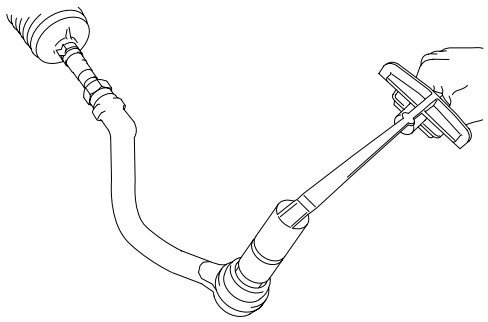
1. Disconnect tie rod and knuckle with the special tool (09568-4A000).



KPRE105B

2. Shake the ball joint stud several times to check for looseness.

Tie rod end ball joint starting torque :
30 kg·cm or less



KPRE105C

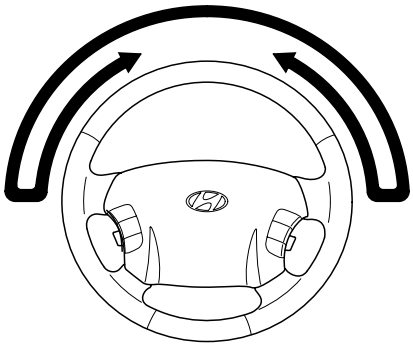
3. If the starting torque exceeds the upper limit of the standard value, replace the tie rod end.
4. Even if the starting torque is below the lower limit of the standard value, check the play of the ball joint and replace if necessary.

CHECKING STEERING WHEEL RETURN

1. The force required to turn the steering wheel and the wheel return should be the same for both moderate and sharp turns.
2. When the steering wheel is turned 90 and held for a couple of seconds while the vehicle is being driven at 20-30 kph (12-19 mph), the steering wheel should return at least 20 from its central position when it is released.

NOTE

If the steering wheel is turned very quickly, steering may be momentarily difficult. This is not a malfunction because the oil pump output will be somewhat decreased.



KPRE105D

CHECKING POWER STEERING BELT TENSION

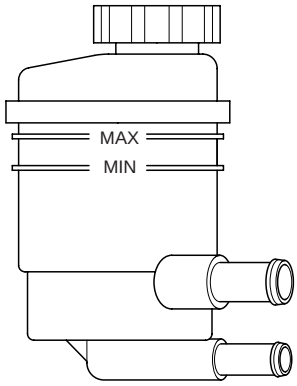
Refer to EM group(Timing system).

CHECKING POWER STEERING FLUID LEVEL

1. Position the vehicle on a level surface.
2. Start the engine. With the vehicle kept stationary, turn the steering wheel several times continuously to raise the fluid temperature to 50-60 C (122-140 F).
3. With the engine at idle, turn the steering wheel fully clockwise and counter-clockwise several times.
4. Make sure that there is no foaming or cloudiness in the reservoir fluid.
5. Stop the engine and check for any difference in fluid level between a stationary and a running engine.

NOTE

1. *If the fluid level varies 5 mm (0.2 in) or more, bleed the system again.*
2. *If the fluid level suddenly rises after stopping the engine, further bleeding is required.*
3. *Incomplete bleeding will produce a chattering sound in the pump and noise in the flow control valve, and lead to decreased durability of the pump.*



EPRF010B

REPLACING POWER STEERING FLUID

1. Jack up the front wheels and support them with jack-stands.
2. Disconnect the return hose from the oil reservoir and plug the oil reservoir.
3. Connect a vinyl hose to the disconnected return hose, and drain the oil into a container.
4. Disconnect the high-tension cable at the ignition coil side. While operating the starter motor intermittently, turn the steering wheel all the way to the left and then to the right several times to drain the fluid.
5. Connect the return hoses, then fill the oil reservoir with the specified fluid.
6. Start the engine. Check for oil leakage.
7. Stop the engine.
8. Bleed the system.

Power steering fluid type : PSF-3
Total quantity : Approx 1.0 liter

AIR BLEEDING

1. Disconnect the high tension cable, and while operating the starting motor intermittently (for 15-20 seconds), turn the steering wheel all the way to the left and then to the right five or six times.

NOTE

1. During air bleeding, replenish the fluid supply so that the level never falls below the lower position of the filter.
2. If air bleeding is done while the vehicle is idling, the air will be broken up and absorbed into the fluid. Be sure to do the bleeding only while cranking.

2. Connect the high tension cable, and start the engine(idling).
3. Turn the steering wheel to the left and the right until there are no air bubbles in the oil reservoir.

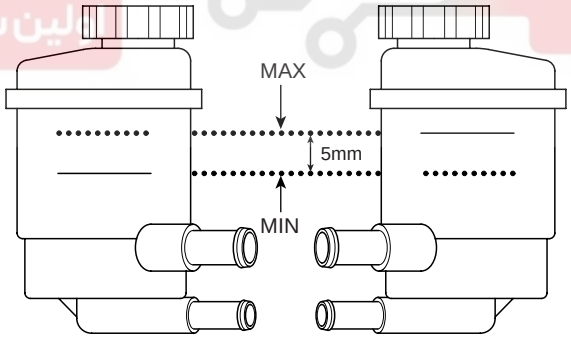
CAUTION

Do not hold the steering wheel turned all the way to either side for more than ten seconds.

4. Confirm that the fluid is not milky, and that the level is up to the position specified on the level gauge.
5. Confirm that there is little change in the surface o the fluid when the steering wheel is turned left and right.

CAUTION

1. If the surface of the fluid changes considerably, air bleeding should be done again.
2. If the fluid level rises suddenly when the engine is stopped, it indicates that there is still air in the system.
3. If there is air in the system, a jingling noise may be heard from the pump and the control valve may also produce unusual noises. Air in the system will shorten the life of the pump and other parts.



EPRF010C

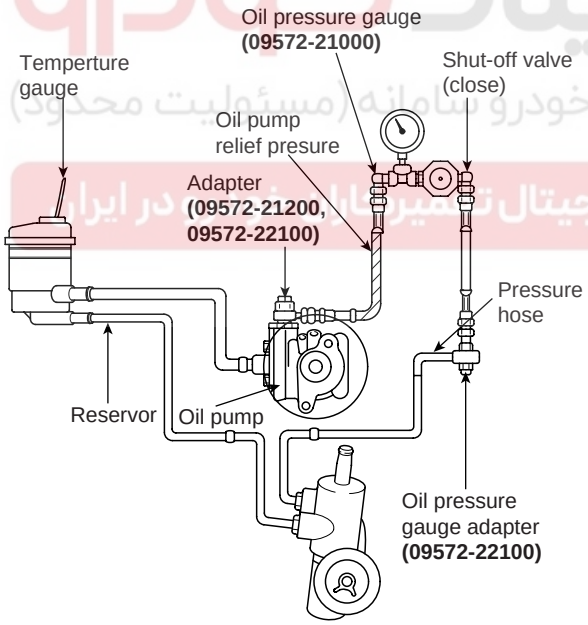
OIL PUMP PRESSURE TEST (OIL PUMP RELIEF PRESSURE)

1. Disconnect the pressure hose from the oil pump. Connect the special tool between the oil pump and pressure hose as illustrated.
2. Bleed the air, and then start the engine and turn the steering wheel several times so that the fluid temperature rises to approximately 50 C (122 F).
3. Set the engine speed to 1,000 rpm.
4. Colse the shut-off valve of the special tool and measure the fluid pressure to confirm the it is within the standard vaule range.

Relief pressure: 90 +3/-2 kg/㎠

CAUTION

Don' t keep the shut-off valve on the pressure gauge closed for longer than seconds.



EPRF010D

5. Remove the special tools, and tighten the pressure hose to the specified torque.

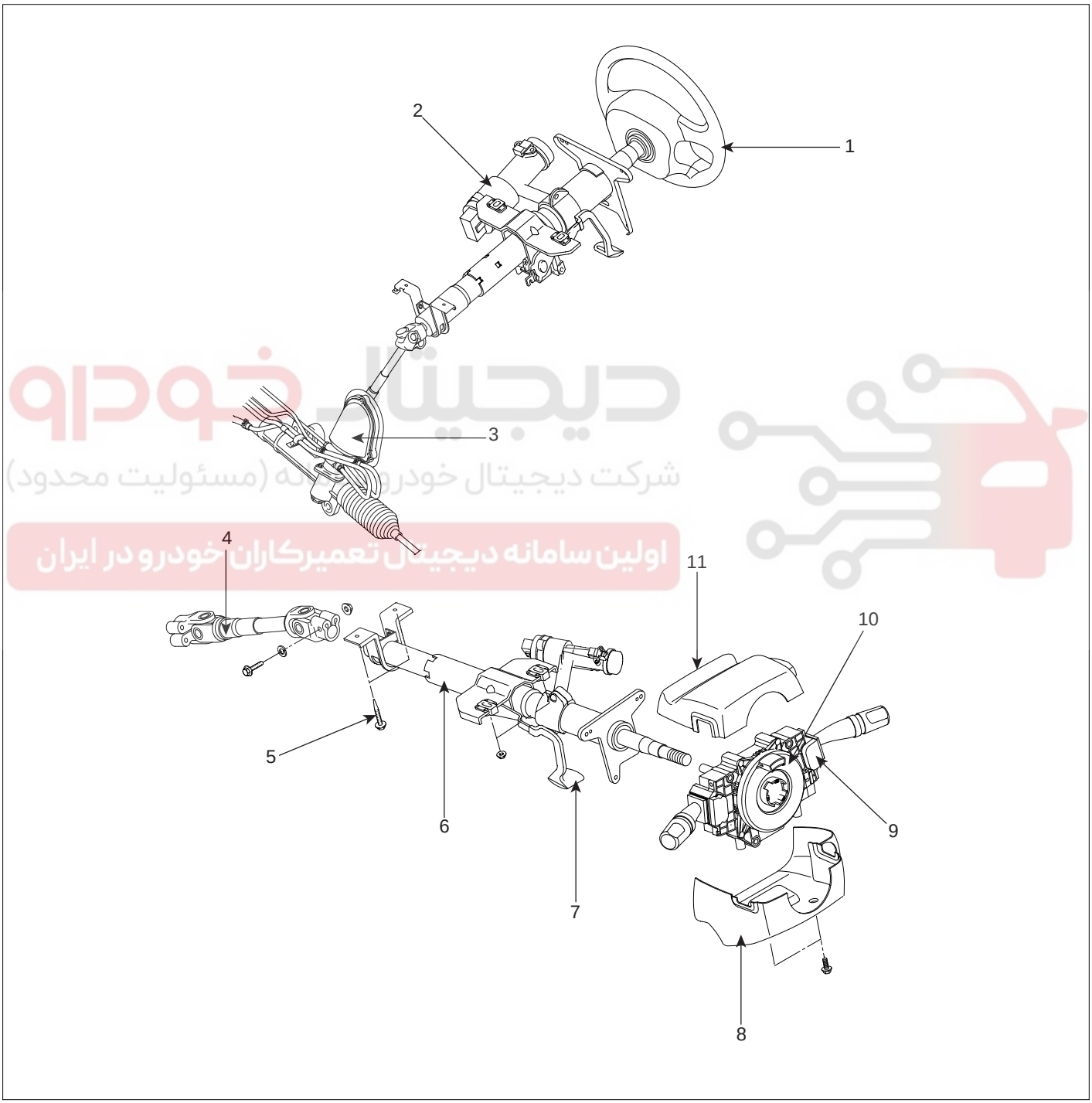
Tightening torque : 55-65 Nm (5.5-6.5 kgf·m)

6. Bleed the system.

STEERING COLUMN & SHAFT

STEERING COLUMN／SHAFT

COMPONENTS EC2D024C

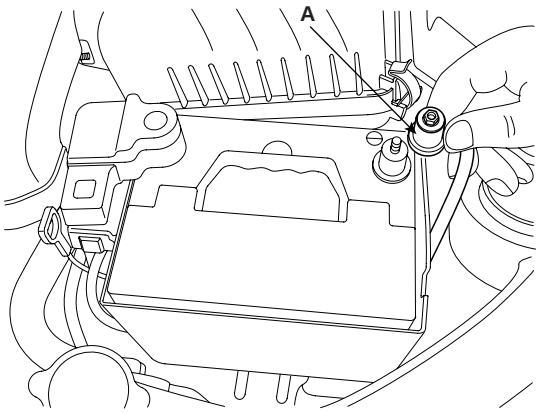


1. Steering wheel
2. Key lock assembly
3. Dust cover assembly
4. Universal joint assembly
5. Steering column shaft mounting bolt
6. Steering colum shaft assembly
7. Tilt lever
8. Steering column lower shroud
9. Multifunction switch
10. Clock spring
11. Steering column upper shroud

EPRF100A

REMOVAL E0B7A093

1. Disconnect the negative (-) terminal(A) from the battery.



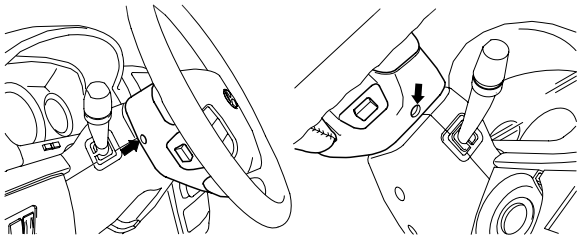
APIE102B

2. Loosen the tapping screws and lift up the horn pad and remove it.

3. Remove the lock nut and the washer.

CAUTION

Before doing these procedures, see the SRS section (RT Group. Olny for vehicle equipped with SRS).



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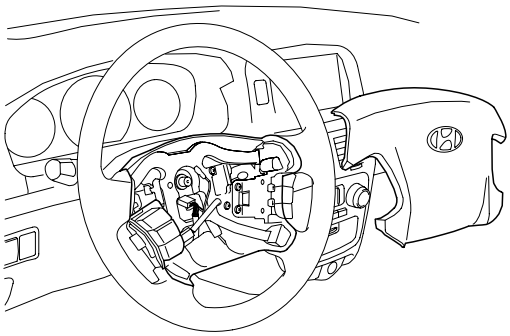
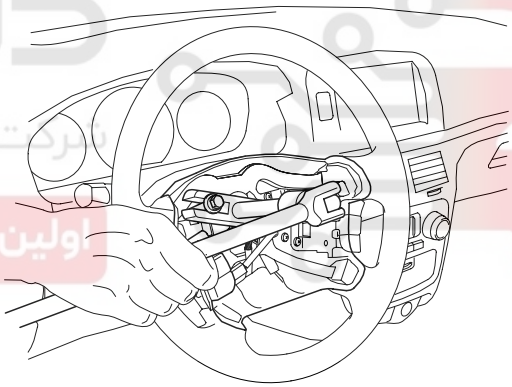


KPRE201C

4. Remove the steering wheel with (09561-11001).

CAUTION

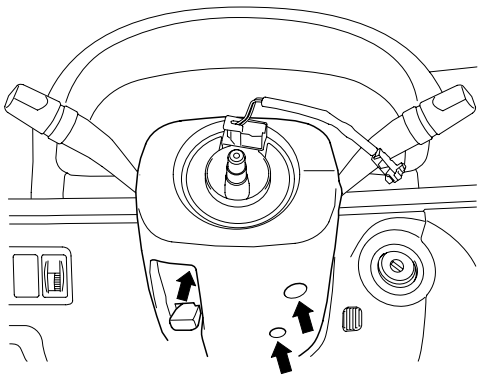
Do not hammer on the steering wheel to remove it doing somay damage the collapsible mechanism.



KPRE201D

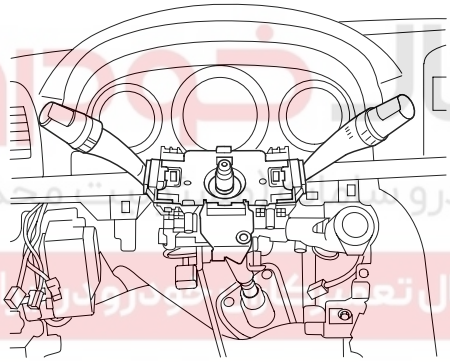
5. Remove the steering column lower and upper shrouds.

6. Remove the lower cover.



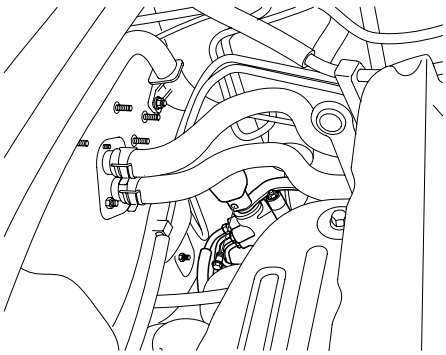
KPRE201E

7. Disconnect the connectors and remove the multifunction switch.



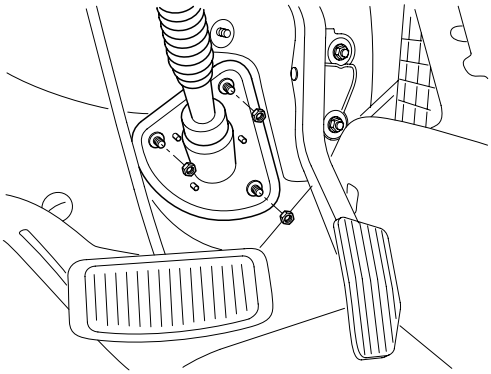
KPRE201F

8. Remove the bolts securing the coupling and universal joint. Pull out the universal joint from the gear box.



KPRE201G

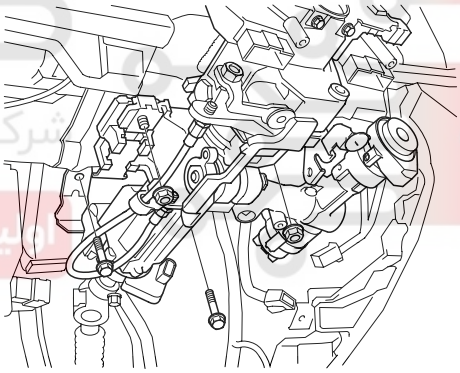
9. Remove the dust cover mounting bolts.



KPRE201H

10. Remove the steering column mounting bolts (4bolts).

11. Remove the steering column and shaft with the universal joint and cover.



KPRE201I

INSPECTION EE1596B3

1. Check the steering shaft for damage, play and round movement.
2. Check the upper and lower bearing for wear or damage.
3. Check the joints for excessive play, damage or rough movement
4. Check the tilt bracket for cracks or damage.
5. Check the cover or boot for damage.
6. Check that the steering lock mechanism operates properly. If necessary, replace.

REASSEMBLY EF83DAAF

1. Reassembly is reverse of the removal.
2. Make parallel the steering shaft’ s groove to the hook of the steering lock, when installing the steering lock assembly.

INSTALLATION ECAB94A5

1. Before installation, apply multipurpose grease to the groove inside the bearing and contracting surfaces of the boot and cover assembly.
2. Connect the steering lower shaft and joint assembly.

NOTE

When installing, mount the U-joint to the gear box first, then to the steering column shaft.

3. Install the dust cover to the column shaft assembly.
4. Install the steering column assembly to the column member assembly.
5. Install the multifunction switch and connect the connectors.
6. Install the lower cover and steering column upper and lower shroud.
7. Install the steering wheel.

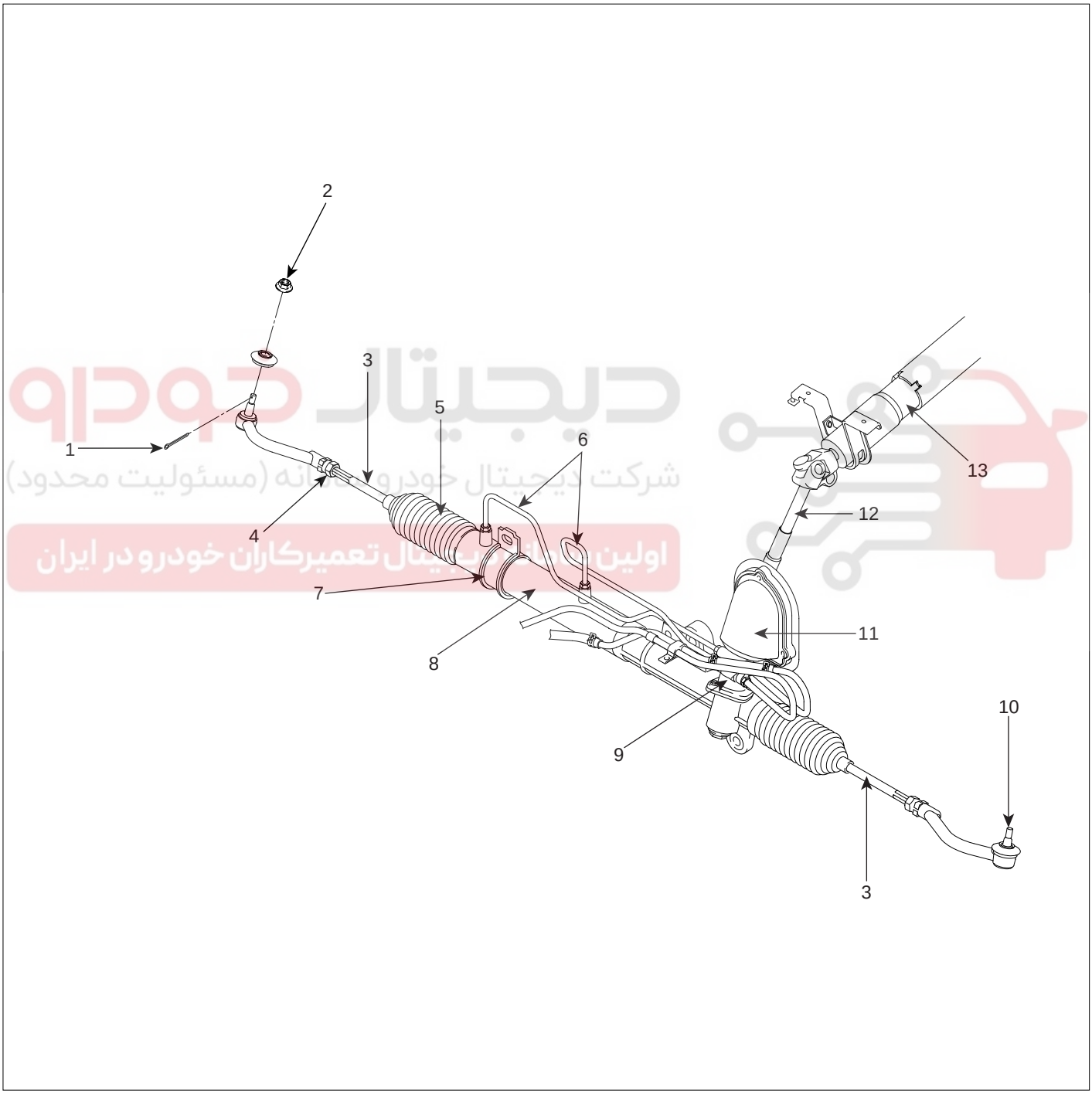
NOTE

When installing, do not use a hammer because the collapsible column shaft could be damaged.

MECHANICAL POWER STEERING SYSTEM

POWER STEERING GEAR BOX

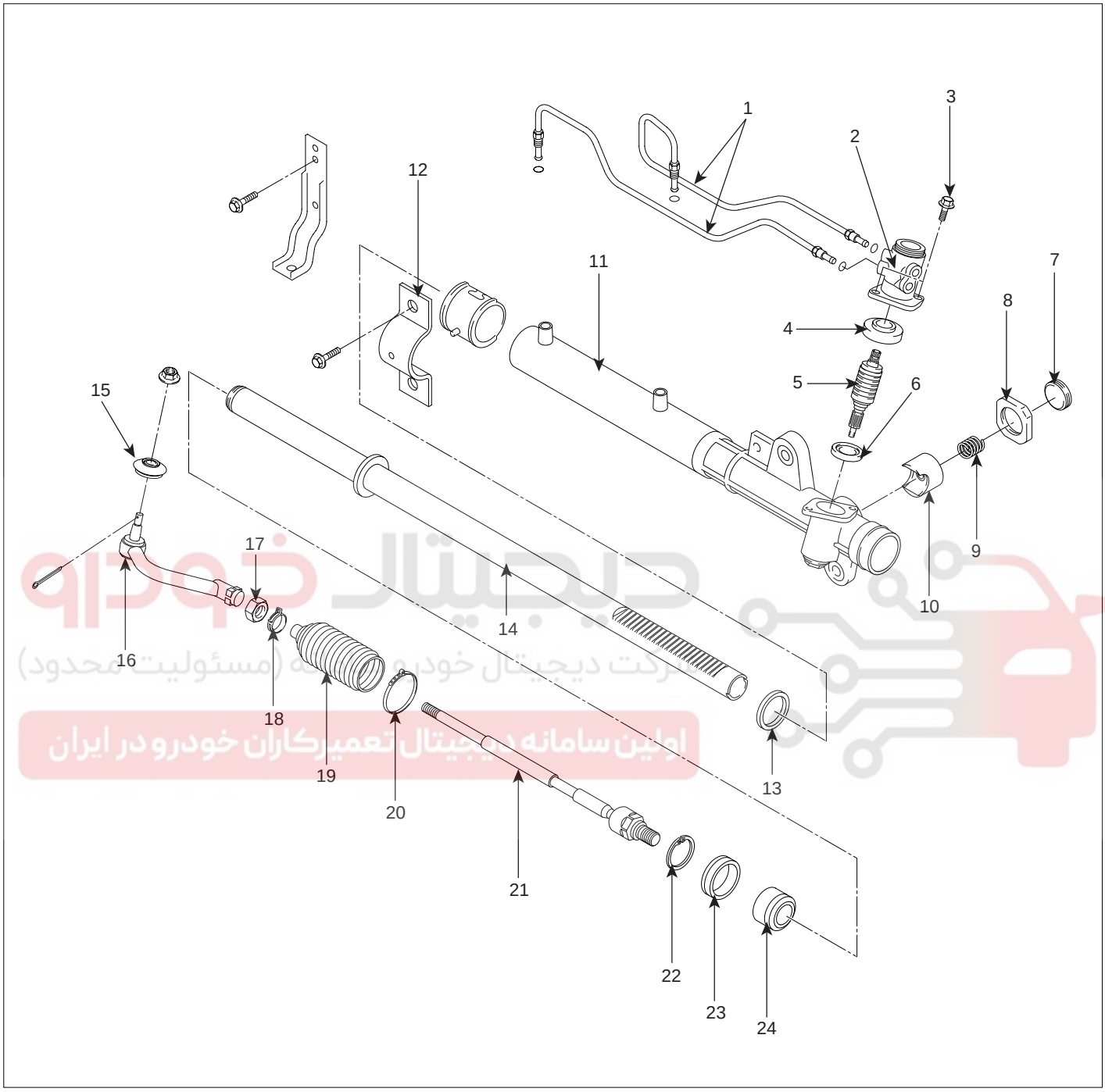
COMPONENTS EAAA82EE



1. Split pin
2. Slotted nut
3. Tie rod assembly
4. Lock nut
5. Bellows
6. Feed tube
7. Power steering gear box mounting clamp
8. Rack housing
9. Valve body assembly
10. Tie rod end assembly
11. Dust cover
12. Joint assembly
13. Steering column assembly

EPRF200A

DISSASSEMBLY AND ASSEMBLY

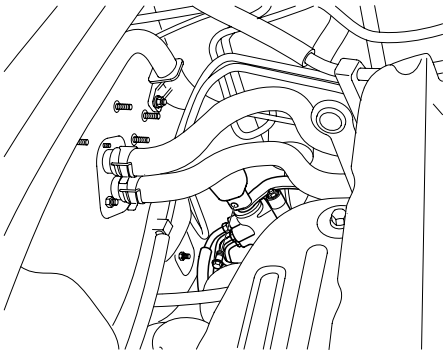


1. Feed tube
2. Valve body housing
3. Bolt
4. Oil seal
5. Pinion valve assembly
6. Oil seal
7. Yoke plug
8. Lock nut
9. Rack support spring
10. Rack support yoke
11. Rack housing
12. Power steering gear box mounting clamp
13. Oil seal
14. Rack
15. Dust cover
16. Tie rod end
17. Lock nut
18. Bellows clip
19. Bellows
20. Bellows band
21. Tie rod
22. Circlip
23. Oil seal
24. Rack stopper

EPRF200B

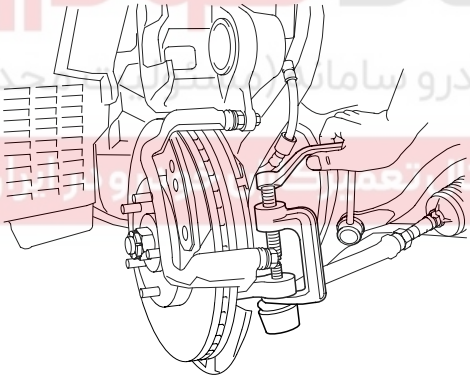
REMOVAL EF9CB4AE

1. Drain the power steering fluid.
2. Remove the joint assembly connecting bolt.



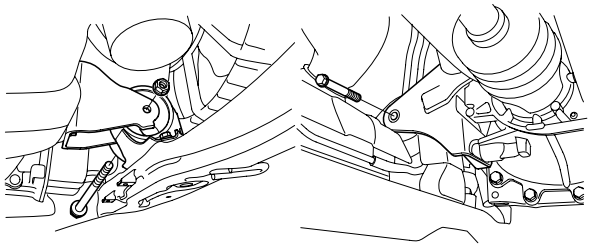
KPRE201G

3. Using the special tool (09568-4A000), disconnect the tie rod end from the knuckle arm.



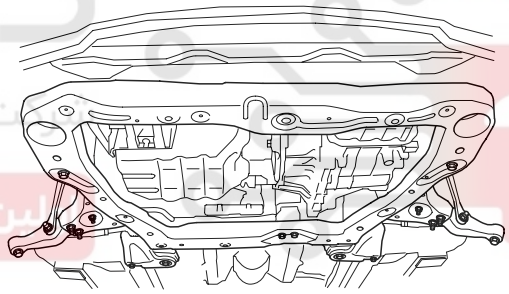
KPRE105B

4. Remove the front fork and the knuckle ball joint from the front lower arm.
5. Remove the connecting bolts of front and rear roll stopper.



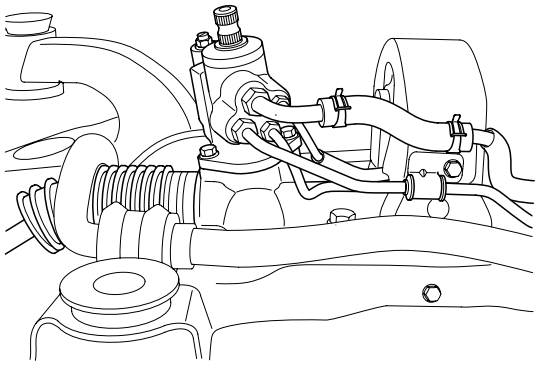
KPRE301A

6. Remove the mounting bolts(10EA) of cross member complete assembly.



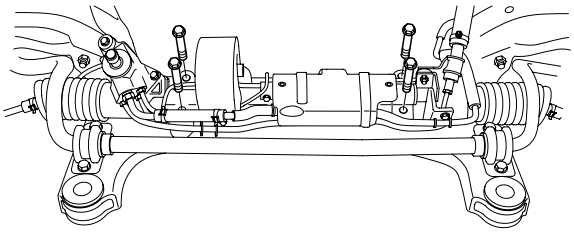
KPRE301C

7. Disconnect the pressure hose and the retrun tube.



KPRE301D

8. Remove the steering gear box mounting bolts and remove the steering gear box assembly and the mounting rubber.

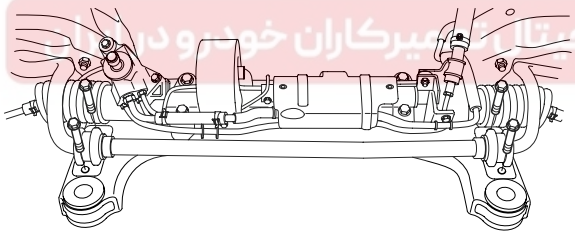


KPRE301E

CAUTION

When removing the gear box, pull it out carefully and slowly to avoid damaging the boots.

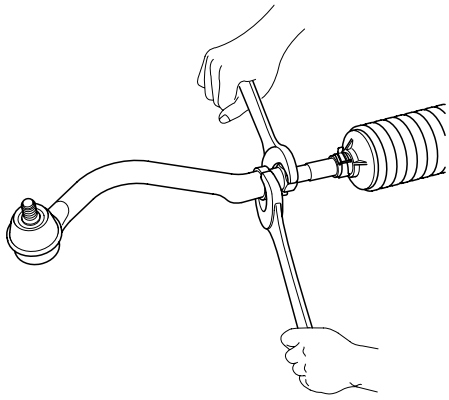
9. Remove the stabilizer bar.



KPRE301F

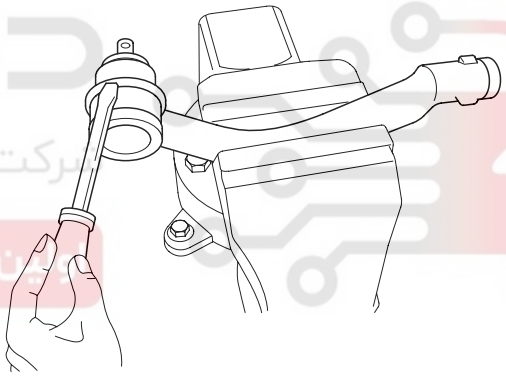
DISASSEMBLY E3E8ACC6

1. Remove the tie rod end from the tie rod.



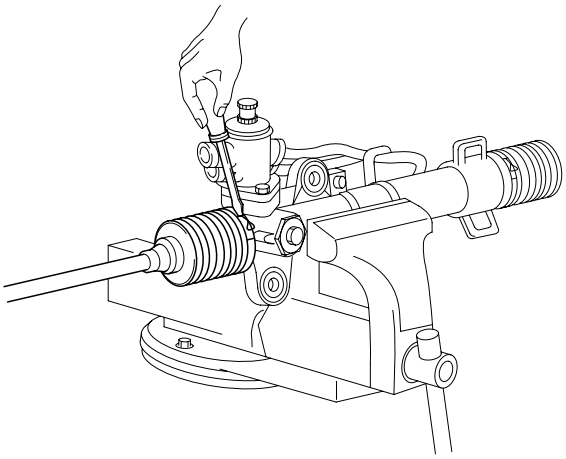
KPRE302A

2. Remove the dust cover from the ball joint.



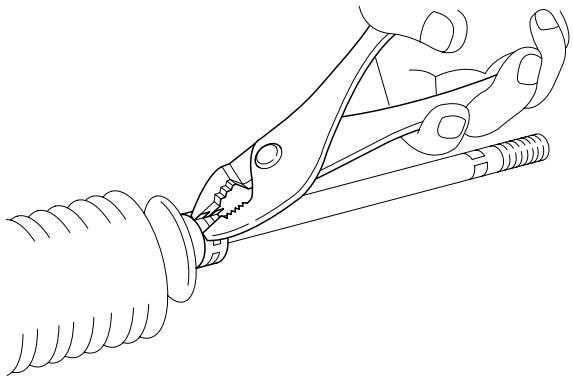
KPRE302B

3. Remove the bellows band.



EPOF001Y

4. Remove the bellows clip.



EPOF001Z

5. Pull the bellows out toward the tie rod.

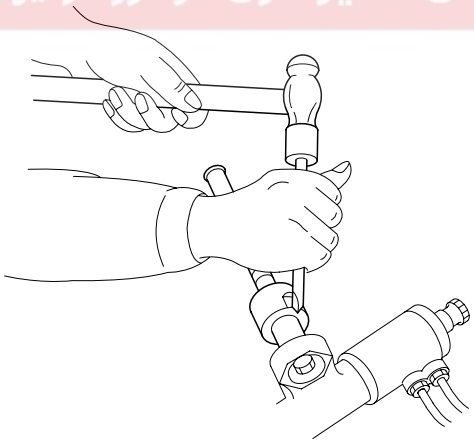
NOTE

Check for rust on the rack when the bellows are replaced.

6. Remove the feed tube from the gear housing.

7. While moving the rack slowly, drain the fluid from the gear housing.

8. Unstake the tab washer which fixes the tie rod and rack with a chisel.

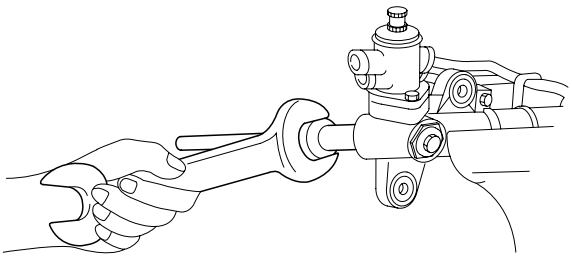


EPOF002A

9. Remove the tie rod from the rack.

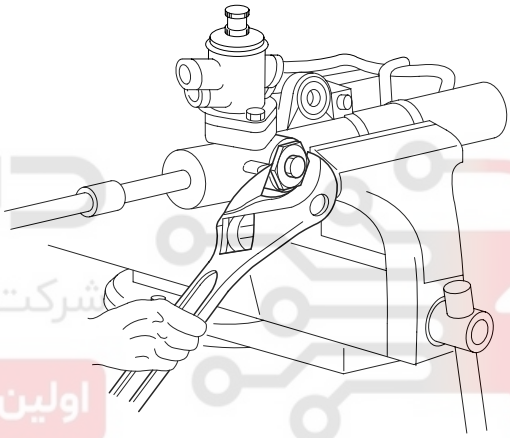
CAUTION

Remove the tie rod from the rack, taking care not to twist the rack.



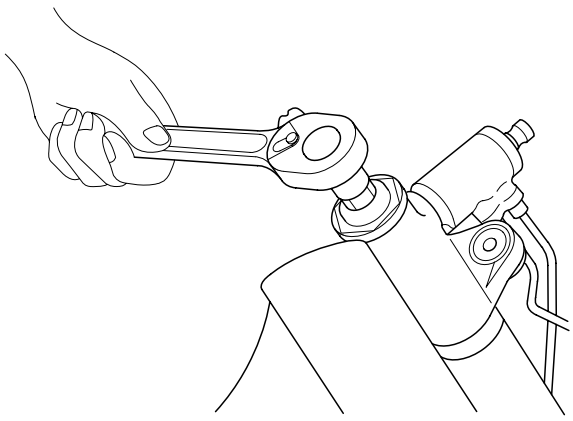
EPOF002B

10. Remove the yoke plug lock nut.



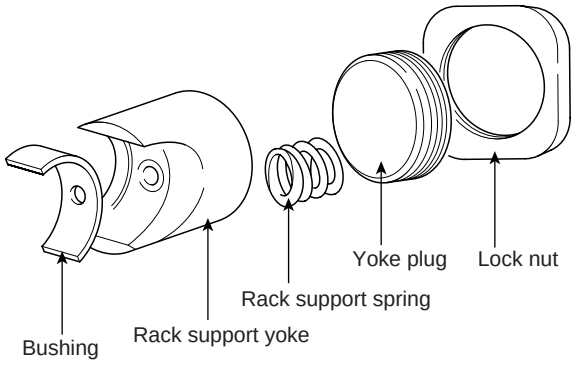
EPOF002C

11. Using the special tool (09565-31300), remove the yoke plug.



EPOF002D

12. Remove the rack support spring, yoke support and bushing from the gear box.

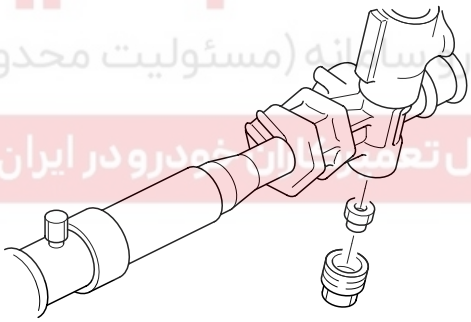


EPOF002E

13. Remove the end plug self-locking nut.

14. Detach the dust seal.

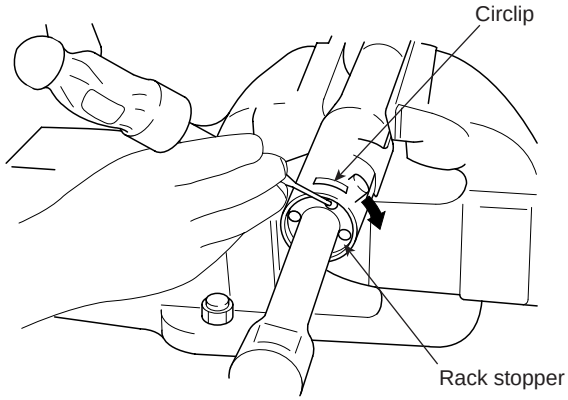
15. Remove the snap ring with snap ring pliers.



EPRF201A

16. Remove the pinion and valve assembly and the oil seal (upper) using a soft hammer.

17. Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the gear housing.

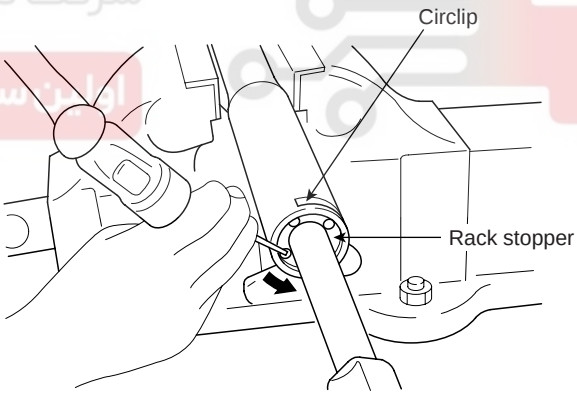


EPOF002G

18. When the end of the circlip comes out from the notched hole of the housing rack cylinder, turn the rack stopper counter clockwise and remove the circlip.

CAUTION

Do not damage the rack when disassemble.

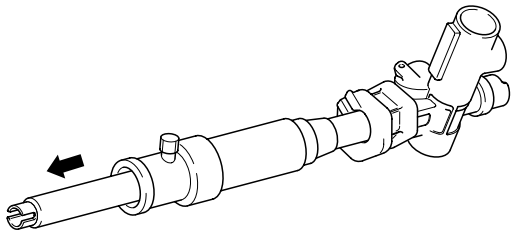


EPOF002H

19. Remove the rack stopper, rack bushing and rack from the gear housing by moving them toward the piston side.

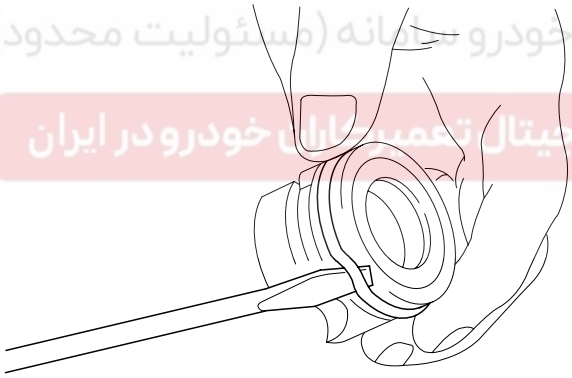
CAUTION

When the rack has been removed, be sure to replace the housing side oil seal with a new one.



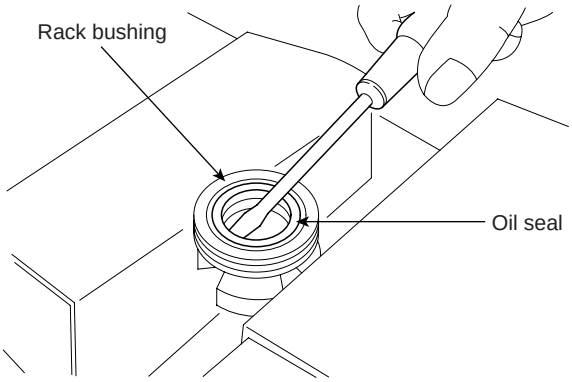
EPRF201B

20. Remove the O-ring from the rack bushing.



EPOF002I

21. Remove the oil seal from the rack bushing.

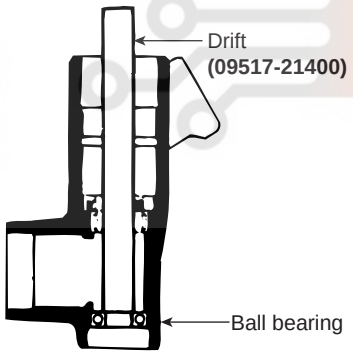


EPOF002J

22. Remove out the ball bearing from the gear hausing using special tool(09517-21400)and hammer.

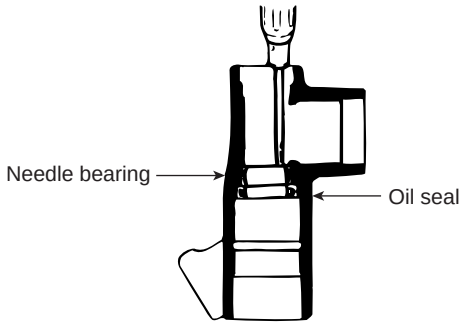
CAUTION

Do not damage the pinion valve cylinder inside of the gear housing.



EPRF201C

23. Remove out the needle bearing and oil seal.



EPRF201D

24. Use the special tools(09555-21000, 09573–33100)to remove the back washer and oil seal from the gear housing.

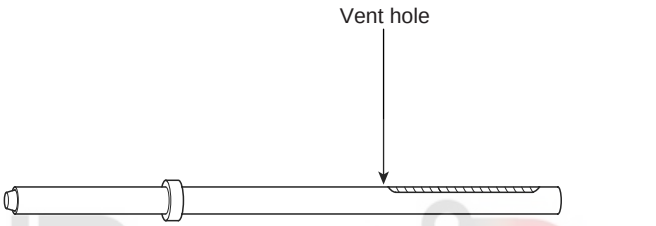
CAUTION

Do not damage the rack cylinder inside of the gear housing.

EPRF201R

INSPECTION E5DA43DC

1. Rack
   1) Check for rack tooth face damage or wear.
   2) Check for oil seal contact surface damage or wear.
   3) Check for bending or twisting of rack.
   4) Check for oil seal ring damage or wear.
   5) Check for oil seal damage or wear.



EPOF002M

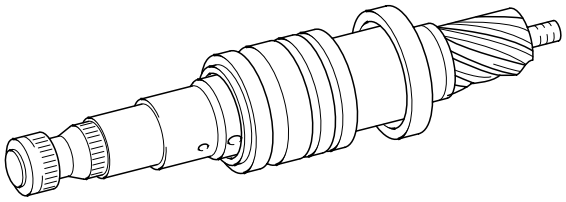
2. Pinion valve

   1) Check for pinion gear tooth face damage or wear.

   2) Check for oil seal contact surface damage.

   3) Check for seal ring damage or wear.

   4) Check for oil seal damage or wear.



EPOF002P

3. Bearing

   1) Check for seizure or abnormal noise during bearing rotation.

   2) Check for excessive play.

   3) Check for missing needle bearing rollers.

4. Others

   1) Check for damage of the gear housing cylinder bore.

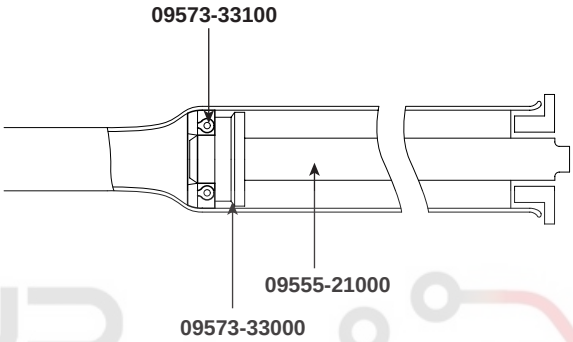
   2) Check for boot damage, cracking or ageing.

REASSEMBLY EBF064BE

1. Apply the specified fluid to the entire surface of the oil seal and gear housing.

Recommended fluid :
Power steering fluid (PSF-3)

2. Using the special tools (09555-21000, 09573-33000, 09573-33100), install the backup washer and oil seal to the specified position in the gear housing.

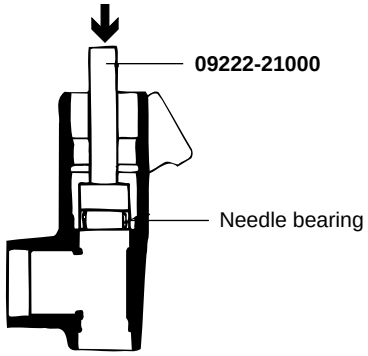


EPRF201O

3. Apply the specified grease to the entire surface of the needle bearing.

Recommended grease :
Multipurpose grease SAE J310a, NLGI No.2

4. Install the needle bearing in the gear housing using the special tool(09222-21100).

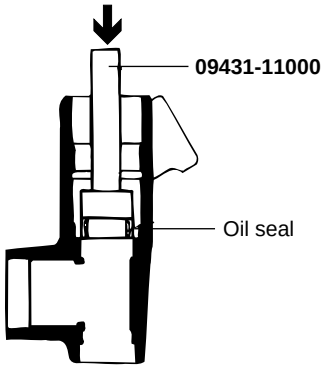


EPRF201G

5. Set the scribed side of the oil seal (inner) in the special tool(09431-11000)and install in the gear housing.

CAUTION

1. Note the direction of the oil seal.
2. Use a new oil seal.

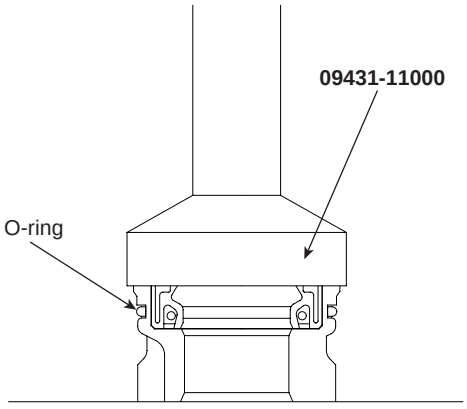


EPRF201H

6. Apply the specified fluid to the entire surface of the rack bushing oil seal.

Recommended fluid :
Power steering fluid (PSF-3)

7. Install the oil seal on the rack bushing.
8. Apply the specified fluid to the entire surface of the O-ring and install to the rack bushing using the special tool (09431-11000).



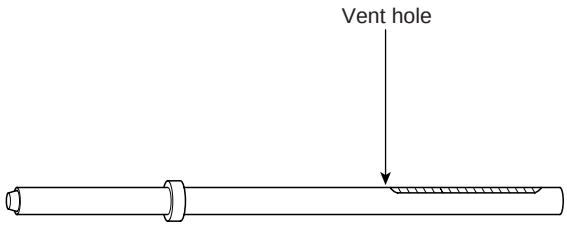
EPRF201P

9. Apply the specified grease to the rack teeth.

Recommended grease :
Multipurpose grease SAE J310a, NLGI grade #2 EP

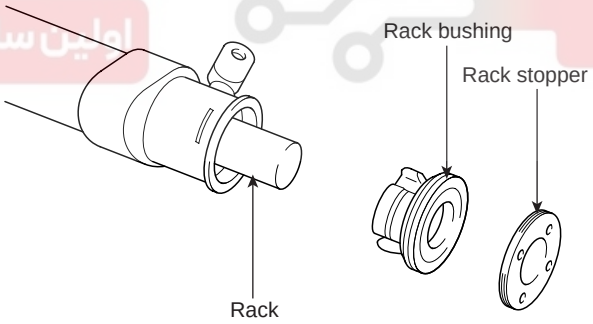
CAUTION

Do not plug the vent hole in the rack with grease.



EPOF002M

10. Insert the rack into the gear housing. Install the rack bushing and rack stopper.

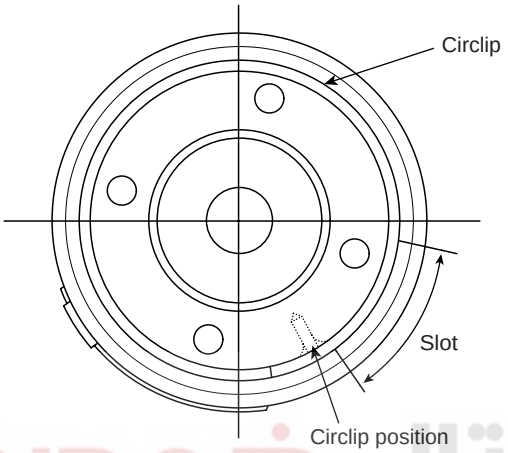


EPOF002Q

11. Push in the rack stopper until the circlip groove of the rack stopper is aligned with the notched hole of the rack housing and then install the circlip while turning the rack stopper.

CAUTION

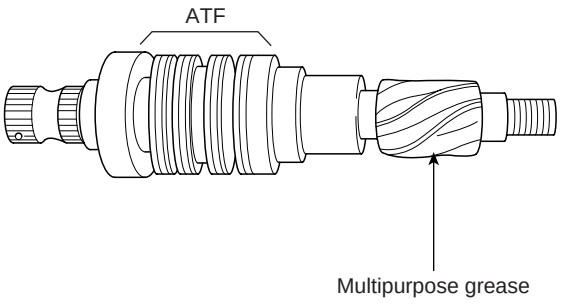
The circlip end should not be visible through the notched hole of the rack housing.



EPOF002R

12. Apply the specified fluid and grease to the pinion valve assembly and install to the gear housing assembly.

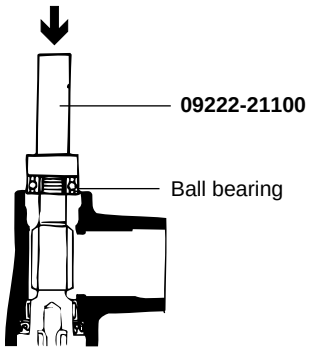
Recommended fluid :
Power steering fluid (PSF-3)
Recommended grease :
Multipurpose grease SAE J310a, NLGI #2 EP



EPRF201J

13. Install the ball bearing using the special tool (09222-21100).

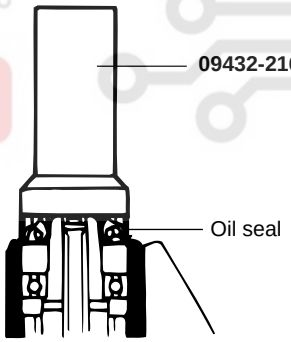
14. Install the pinion and valve assembly to the valve housing.



EPRF201K

15. Install the oil seal using the special tool (09432-21601).

16. Install the snap ring with snap ring pliers.

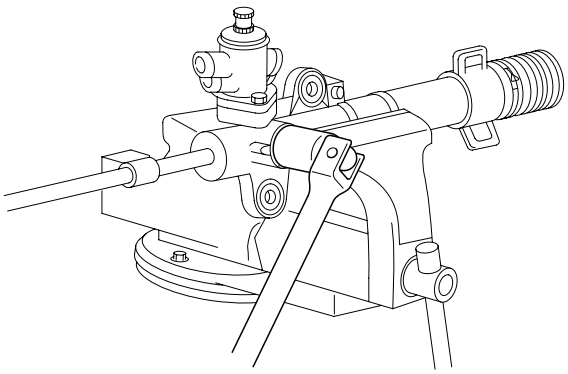


EPRF201L

17. With the pinion turned all the way clockwise, tighten the self-locking nut.

CAUTION

Always replace the self-locking nut with a new one.



EPOF012U

18. Apply semi-drying sealant to the threaded section of the end plug and tighten to the specified torque.

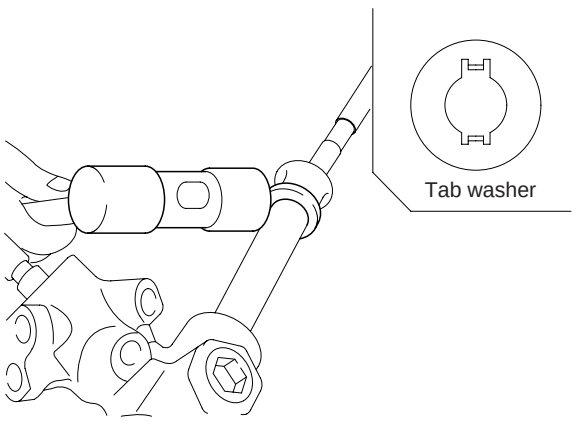
Tightening torque :
50 ~ 70 Nm (5 ~ 7 kgf·m, 36 ~ 51 lbf·ft)

19. Stake the end plug at two points on its circumference with a punch.

20. Install the tab washer and then the tie rod and hammer the tab washer end at two points to the tie rod.

CAUTION

1. ***Align the tab washer pawls with the rack grooves.***
2. ***Use a new tab washer.***

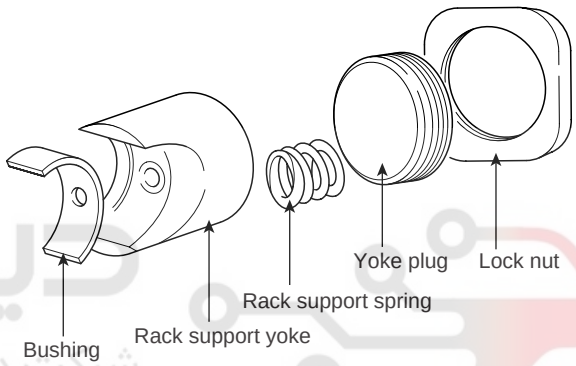


EPOF002V

21. Install the bushing, rack support, yoke support spring and rack pluge in the order shown. Apply semi-drying sealant to the threaded section of the yoke pluge support cover before installation.

22. With the rack placed at the center position, attach the yoke plug to the gear housing. Tighten the yoke plug within the range of 20-25 Nm(200-250 kg.cm, 14.5-18 lb.ft), using the special tool. Loosen the yoke plug for approximately 20 and tighten the locking nut to the standard value.

Lock nut :
50 ~ 70 Nm (5 ~ 7 kgf·m, 63.1 ~ 50.6 lbf·ft)



EPOF002E

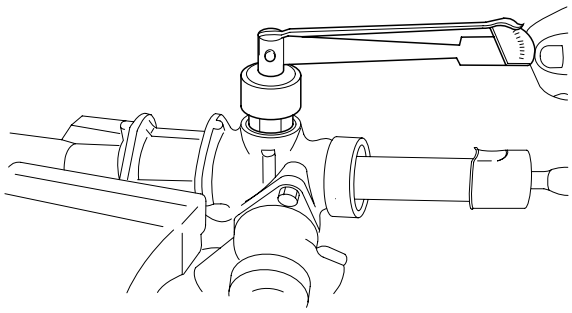
Stadard value :
Total pinion torque :
0.6-1.3Nm(6-13kgf·cm, 0.4-0.9 lbf·ft)

23. After adjusting, install the yoke plug with lock nut.

NOTE

When it cannot be adjusted within the specified return angle, check rack support plug components or replace.

24. Tighten the feed tube to the specified torque and install the mounting rubber with adhesive.



EPRF201M

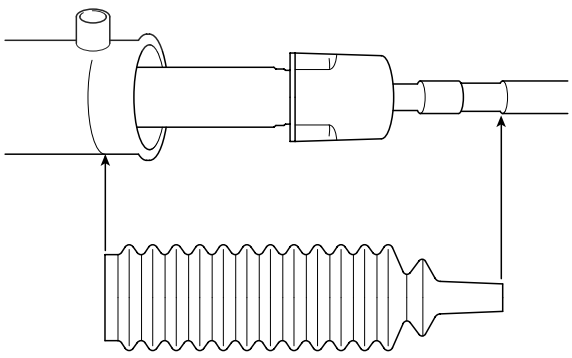
25. Apply the specified grease to the bellows mounting-position (fitting groove) of the tie rod.

Recommended grease :
Multipurpose grease SAE J310a, NLGI #2 EP

26. Install the new attaching band to the bellows.

CAUTION

Whenever the bellows are installed, a new band must be used.

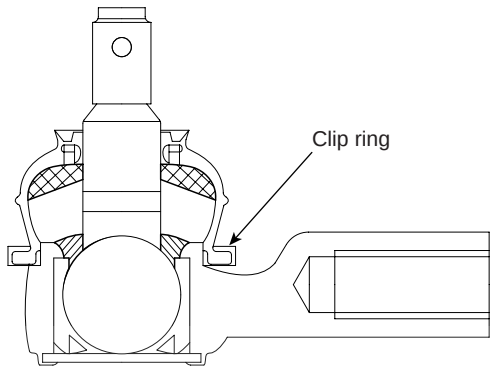


EPRF201Q

27. Install the bellows in, taking care not to twist it.

28. Fill the dust cover inner side and lip with the specified multipurpose grease, and place the dust cover in position with the clip ring attached in the groove of the tie rod end.

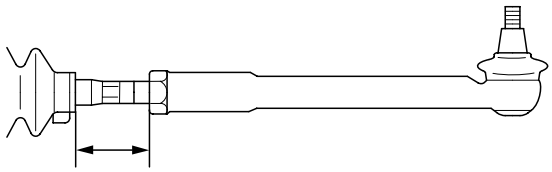
Recommended grease :
Multipurpose grease SAE J310a, NLGI #2 EP



EPRF201N

29. Install the tie rods so that the length of the left and right tie rods equals the standard value.

Tie rod free length : 45.2±1mm

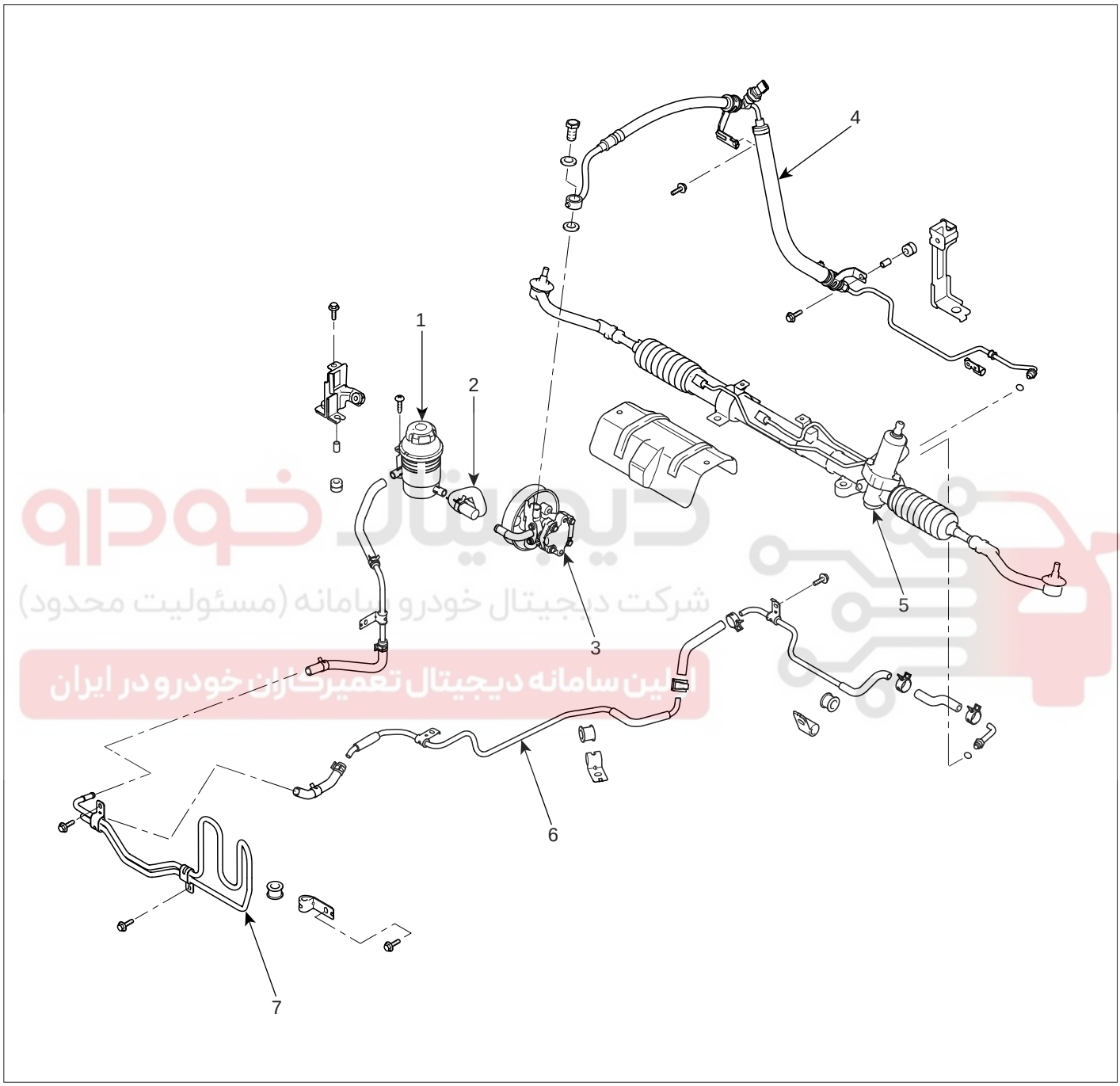


KPRE304A

30. Install the rack, pinion and the tie rod as an assembly.

POWER STEERING HOSES

COMPONENTS E7523D5D

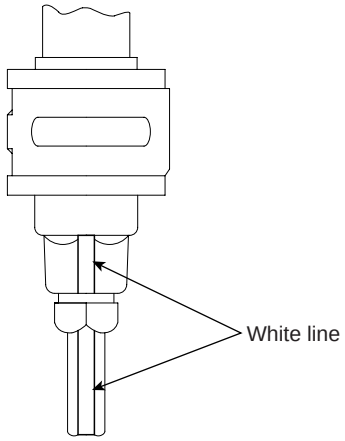


1. Power steering oil reservoir
2. Suction hose
3. Oil pump
4. Pressure hose
5. Power steering gear box
6. Return tube
7. Cooler tube

EPRF300A

REMOVAL EEC7CF85

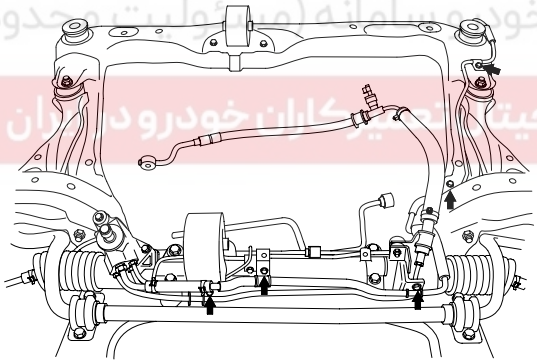
While installing the tube and hose assembly, be sure to align white marks(A) on each fitting.



EPOF003O

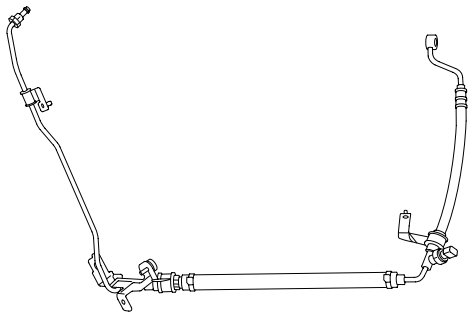
PRESSURE HOSE, TUBE AND RETURN TUBE, HOSE

1. Remove the mounting clamps from the pressure tube and the return tube.



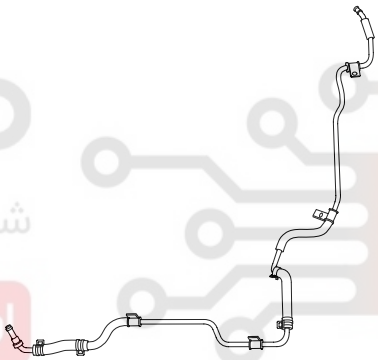
KPRE401A

2. Remove the pitting of both the pressure tube and the return tube from the gear box.
3. Remove the pressure hose and tube.



KPRE401B

4. Remove the return tube and hose.



KPRE401C

INSTALLATION E5D03860

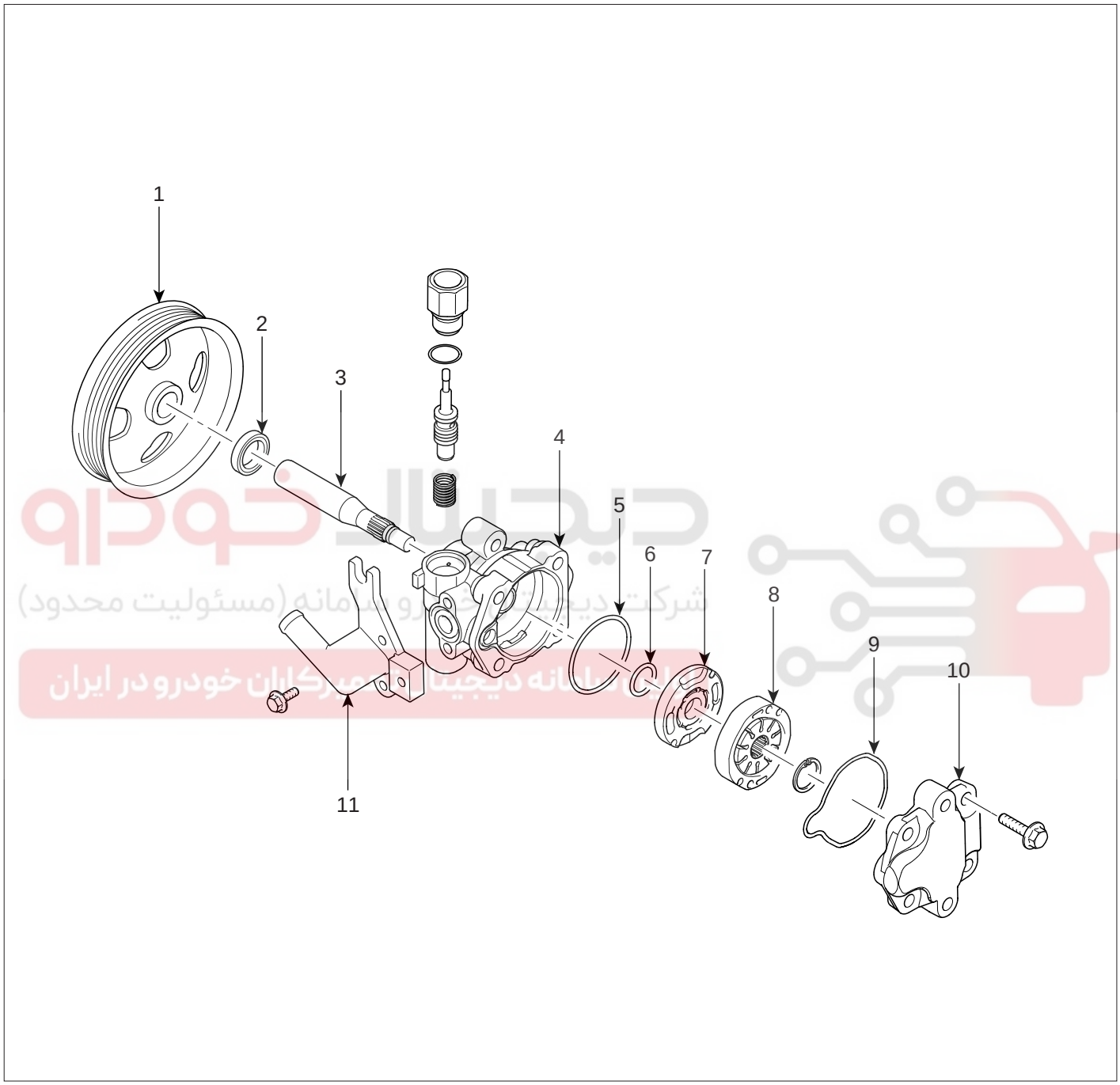
Installation is the reverse of removal.

NOTE

- *Install the return tube and hoses so that they are not twisted and it does not come in contact with any other parts.*
- *After installation, air bleed the system.*

POWER STEERING OIL PUMP

COMPONENTS EA9BF3AF

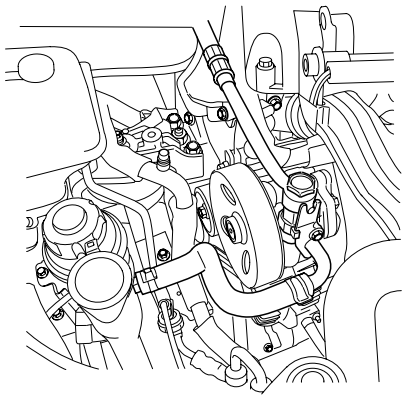


1. Pulley
2. Dust spacer
3. Pulley shaft
4. Front housing
5. O-ring (Outer)
6. O-ring (Inner)
7. Front side plate
8. Cam ring
9. Gasket
10. Oil pump cover assembly
11. Suction pipe

EPRF400A

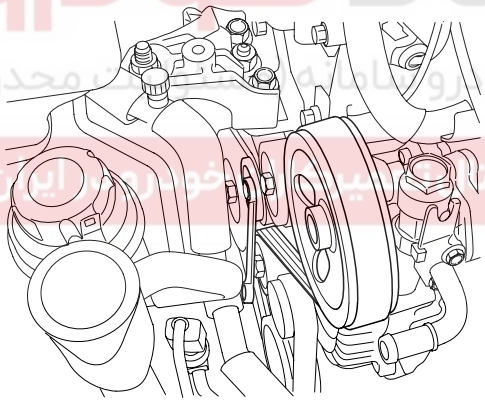
REMOVAL E75D45F4

1. Remove the pressure hose from the oil pump and the suction hose from the suction pipe, then drain the powersteering oil.



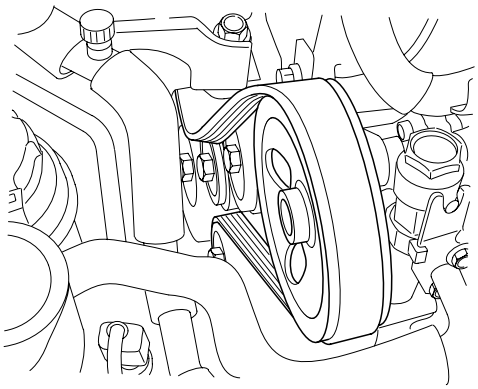
KPRE501A

2. Release the tension of the powersteering V-type belt by lifting the auto-tensioner pulley.



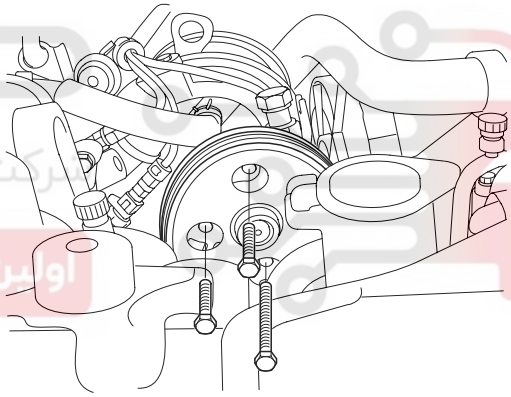
KPRE501B

3. Remove the V-type belt from the pulley of the power-steering oil pump.



KPRE501C

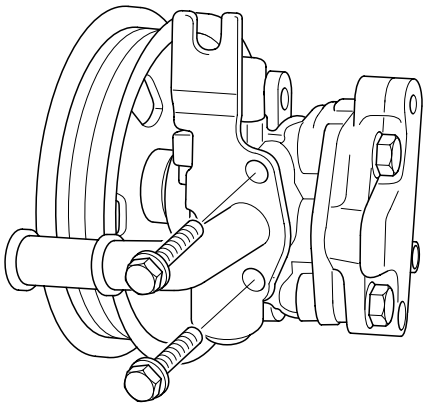
4. Remove the powersteering oil pump assembly by removing the three bolts as shown below.



EPRF501D

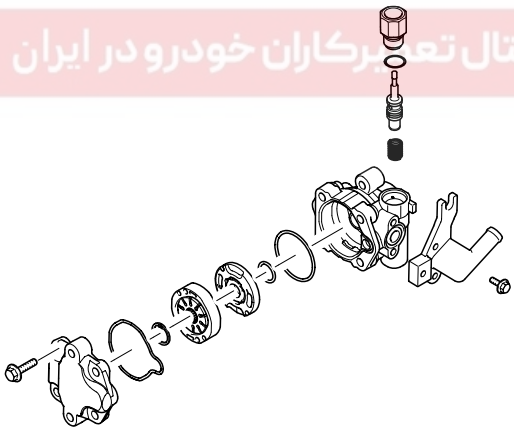
DISASSEMBLY EF6E7D18

1. Remove the bolts from the oil pump body, and then remove the suction pipe and O-ring.



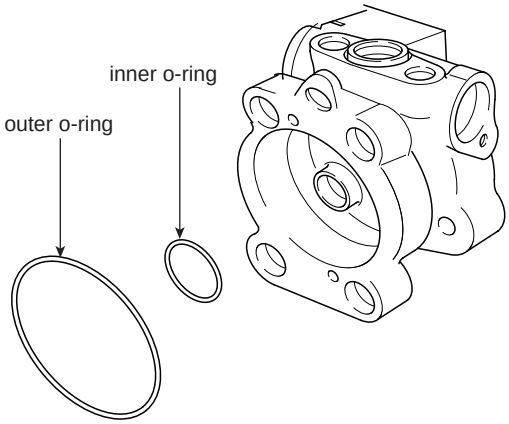
KPRE502A

2. Loosen the four bolts and remove the oil pump cover assembly.
3. Remove the cam ring.
4. Remove the rotor and vanes.
5. Remove the oil pump side plate.



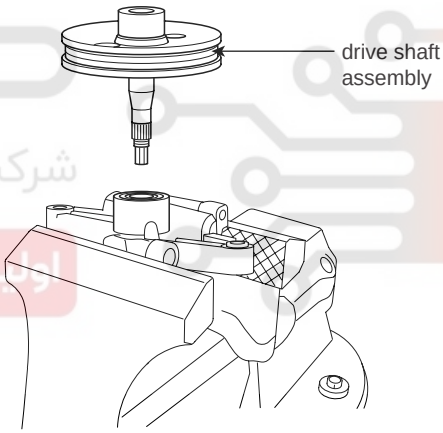
EPRF401A

6. Remove the inner and outer O-ring.
7. Remove the inner O-ring and outer O-ring.



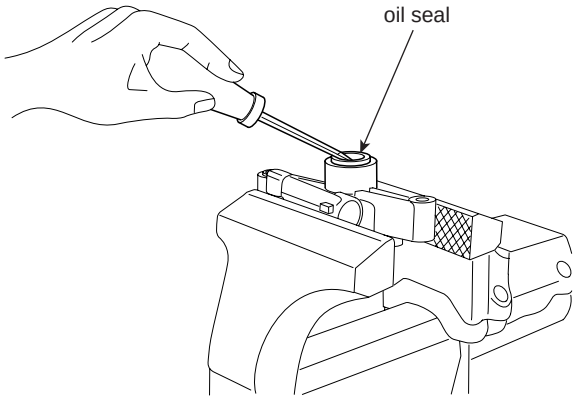
EPRF401B

8. Remove the snap ring and take out the pulley and the drive shaft assembly.



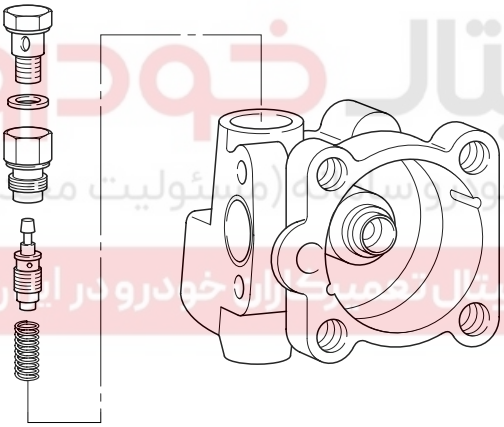
EPRF401F

9. Remove the oil seal from the oil pump body.



EPRF401G

10. Remove the connector from the oil pump body, and take out the flow control valve and the flow control spring.

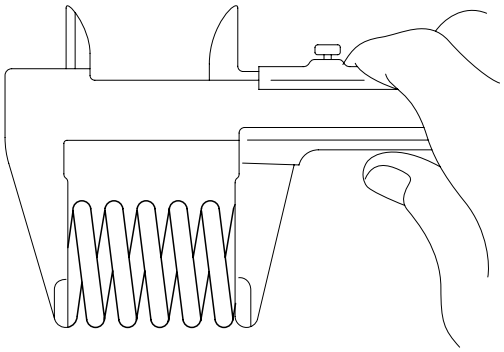


EPOF003X

INSPECTION E0E9C6B5

1. Check the free length of the flow control spring.

Free length of the flow control spring : 36.5mm

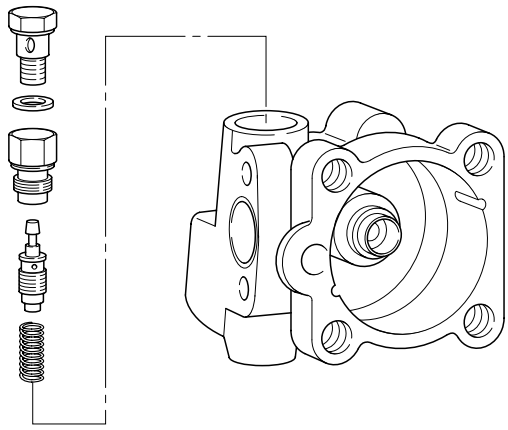


EPOF003R

2. Check that the flow control valve is not bent.
3. Check the shaft for wear and damage.
4. Check the V-belt for wear and deterioration.
5. Check the grooves of the rotor and vanes for stratified abrasion.
6. Check the contact surface of the cam ring and vanes for stratified abrasion.
7. Check vanes for damage.
8. Check that there is no striped wear in the side plate or contacting part between the shaft and the pump cover surface.

REASSEMBLY E61B2193

1. Install the flow control spring, the flow control valve and the connector in to the pump body.

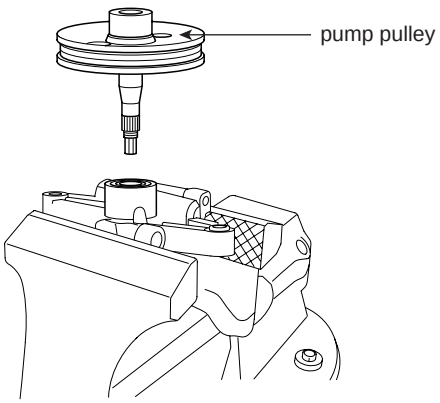


EPOF003X

2. Install the oil seal in the pump body by using the special tool(09222-32100).

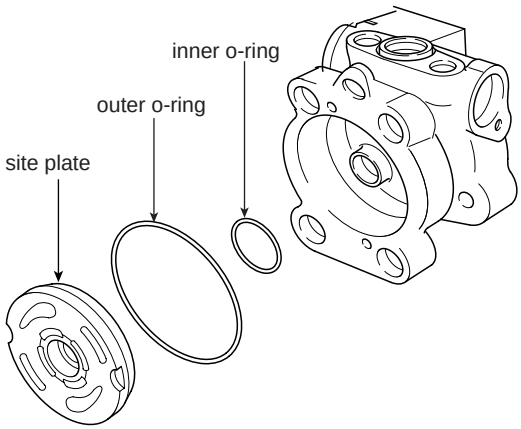
EPRF401E

3. Install the pump pulley.



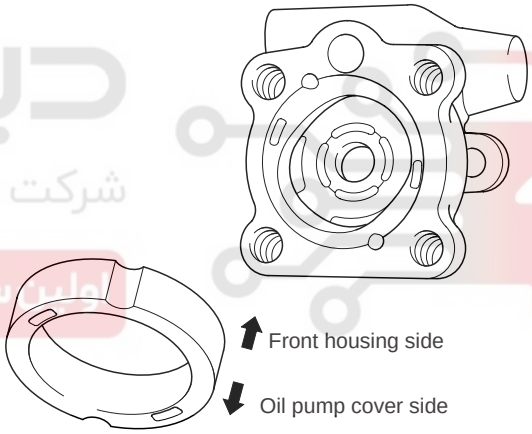
EPRF401H

4. Assengle the inner O-ring and the outer O-ring and install the site plate.



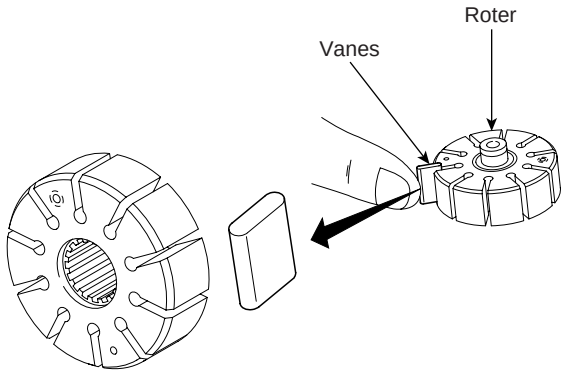
EPRF401I

5. After inserting the lock pin into the groove of the front housing, install the camring attending to the direction.



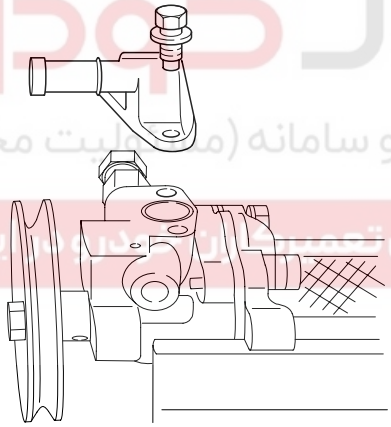
EPRF401C

6. Install the rotor.
7. Install the vanes.



EPRF401D

8. Install the gasket and oil pump cover assembly.
9. Install the suction pipe and O-ring.

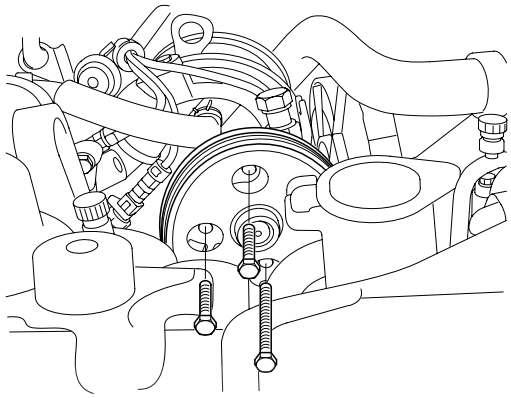


EPOF004D

INSTALLATION E817E983

1. After installing the oil pump to the oil pump bracket, install "V" velt and tighten the bolt adjusting tension to the specified torque.

Oil pump adjusting bolt : 3.5 ~ 5.0



EPRF501D

2. Install the suction hose.

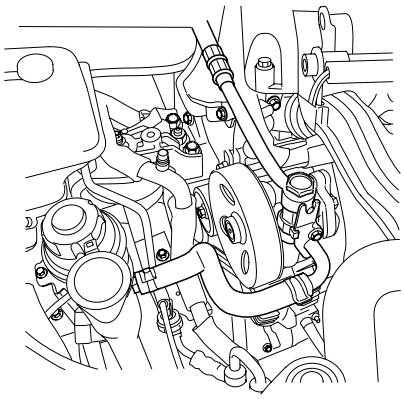
CAUTION

Install the pressure hose to the oil pump.

3. Install the pressure hose to the oil pump.

NOTE

Install the pressure hose being careful so that it does not twist and come in contact with other components.



KPRE501A

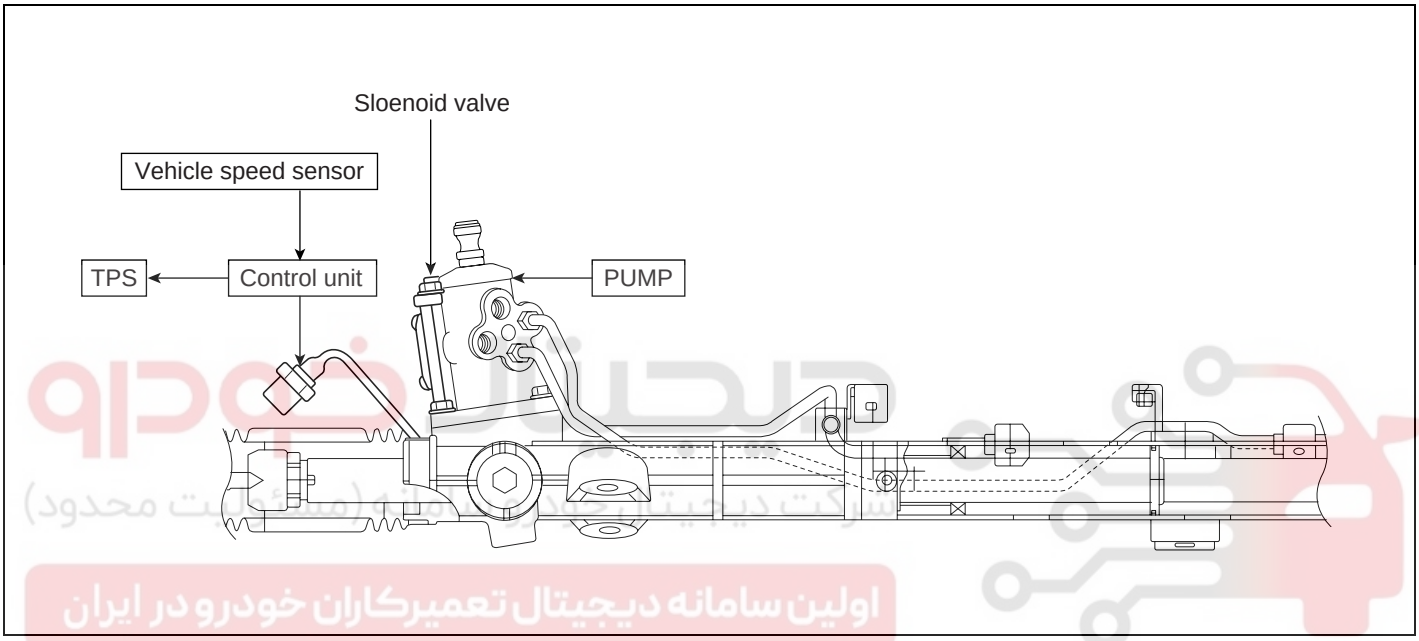
4. Add power steering fluid (PSF-3).
5. Air bleed the system.
6. Check the oil pump pressure.

EPS (ELECTRONIC POWER STEERING) SYSTEM

ELECTRONIC POWER STEERING SYSTEM

GENERAL E7A2FF5F

The electronic power steering (EPS) system includes the same components of conventional power steering system.

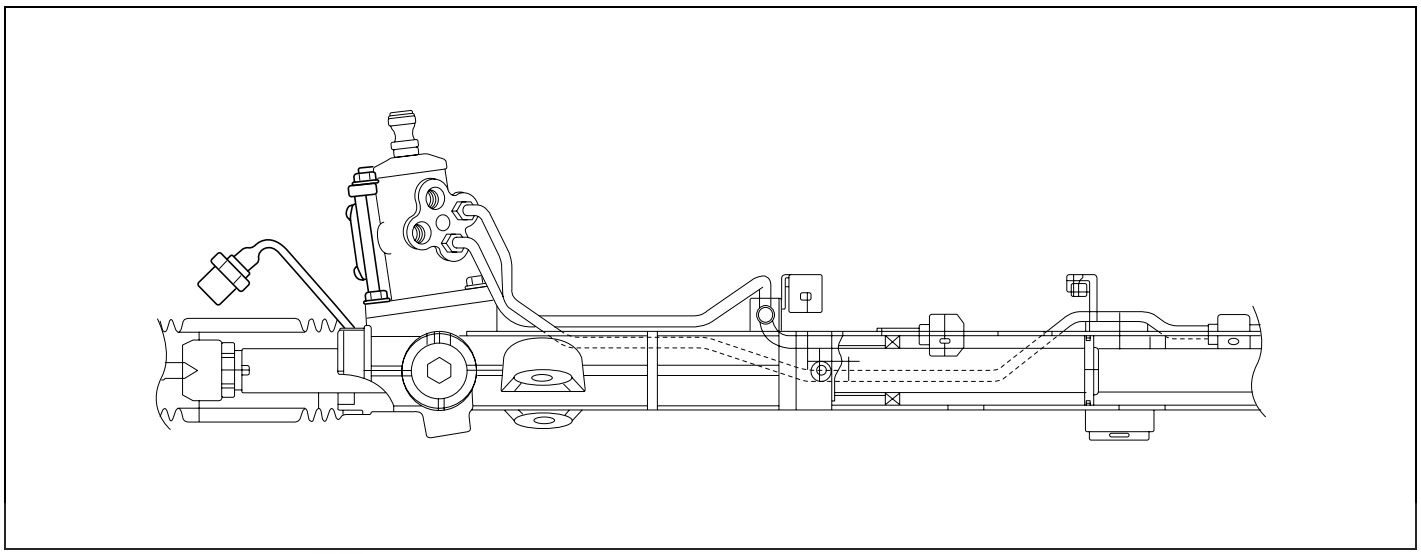


EPRF503A

EPS performs the conventional power steering function in case a failure has occurred in the system. EPS electronically controls the current to the solenoid of by-pass valve by inputting sensor's signals to control the hydraulic amount in cylinder chamber and thereby varying the steering effort versus the hydraulic pressure according to vehicle speed. In addition, it has a solenoid valve on power steering gear box, and a control unit underneath the audio of the center facia. To control the oil flow of steering gear box, a solenoid is provided and it functions by the current from control module which receives signals from VSS (Vehicle Speed Sensor) and TPS.

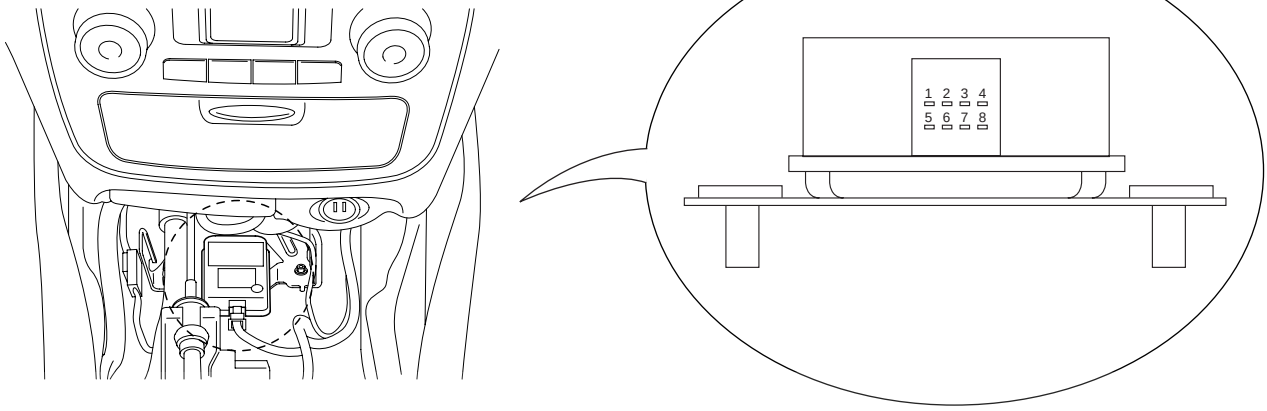
REMOVAL AND INSTALLATION EED98798

The removal and installation procedure is the same as that of conventional power steering system except for the solenoid valve components and EPS control module. Refer to the following figures.



KPRE603A

ELECTRONIC POWER STEERING CONTROL MODULE E8F19C24

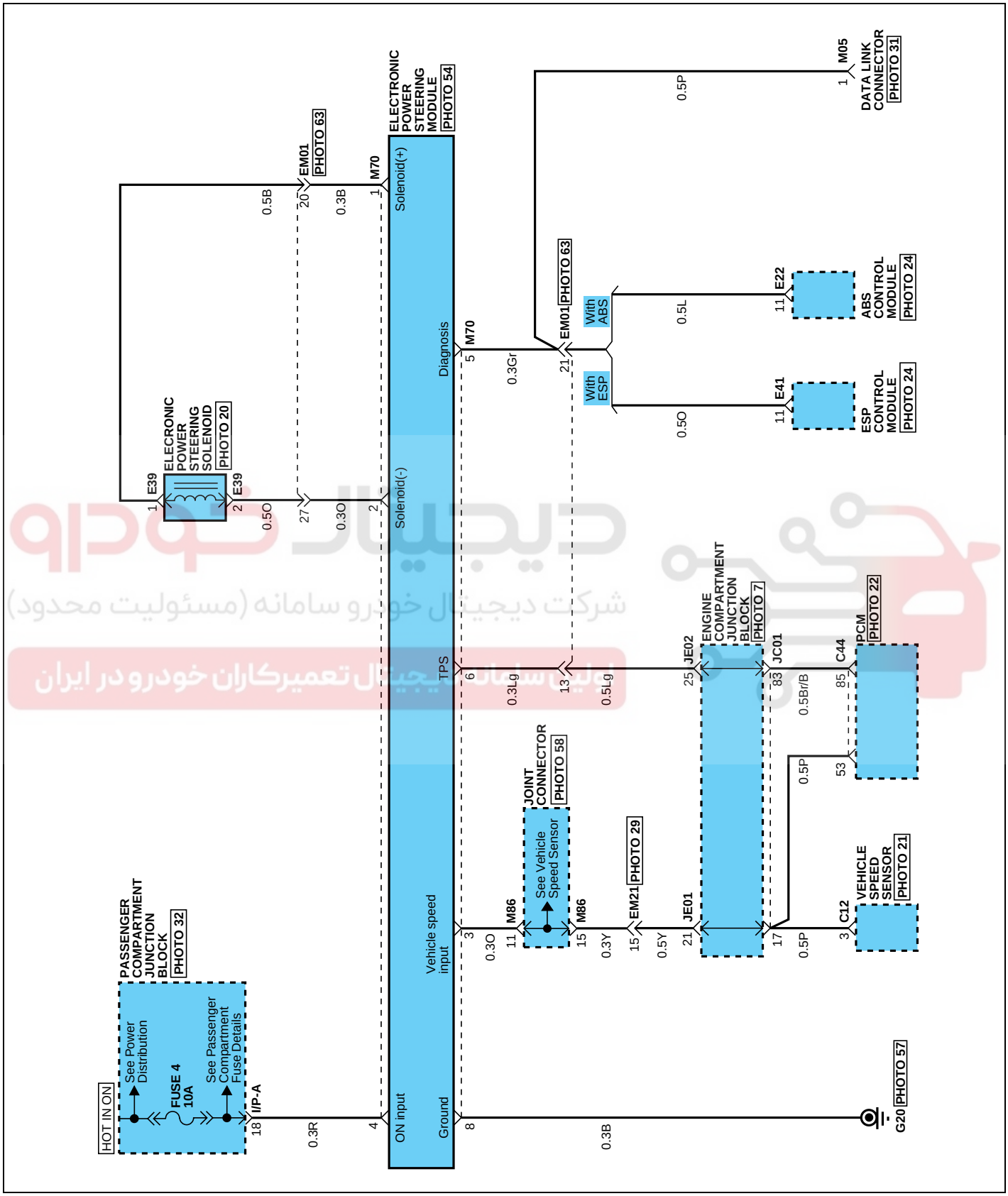


PIN LAYOUT

PIN NO.	DESCRIPTION
1	Solenoid
2	Solenoid
3	Sensor signal from vehicle speed sensor
4	IG2
5	Data link connector
6	Sensor signal from TPS
7	-
8	Ground

EPRF501A

CIRCUIT SIAGRAM EAABCA6A



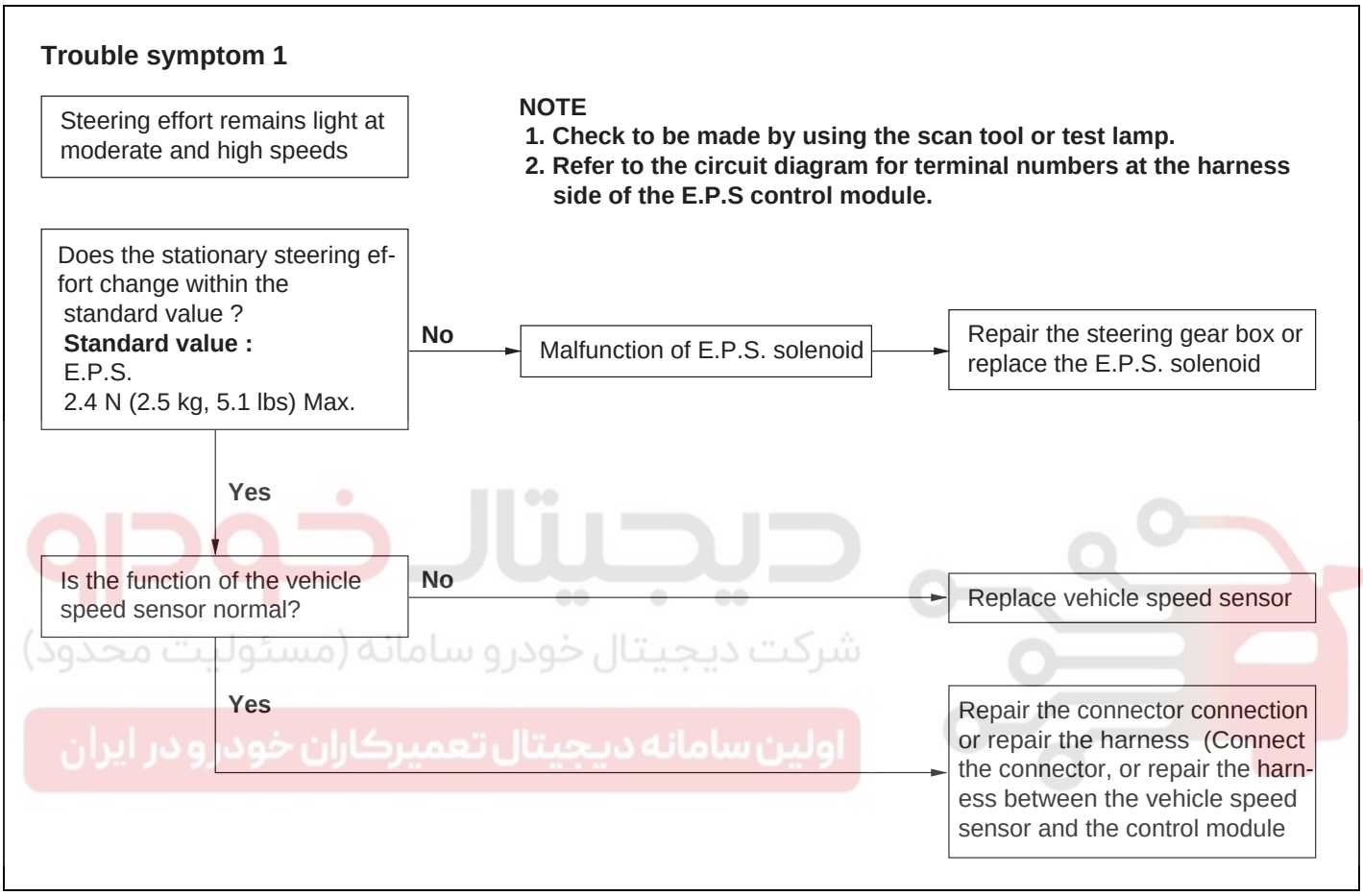
E2RF057A

TROUBLESHOOTING E7A90FA2

NOTE

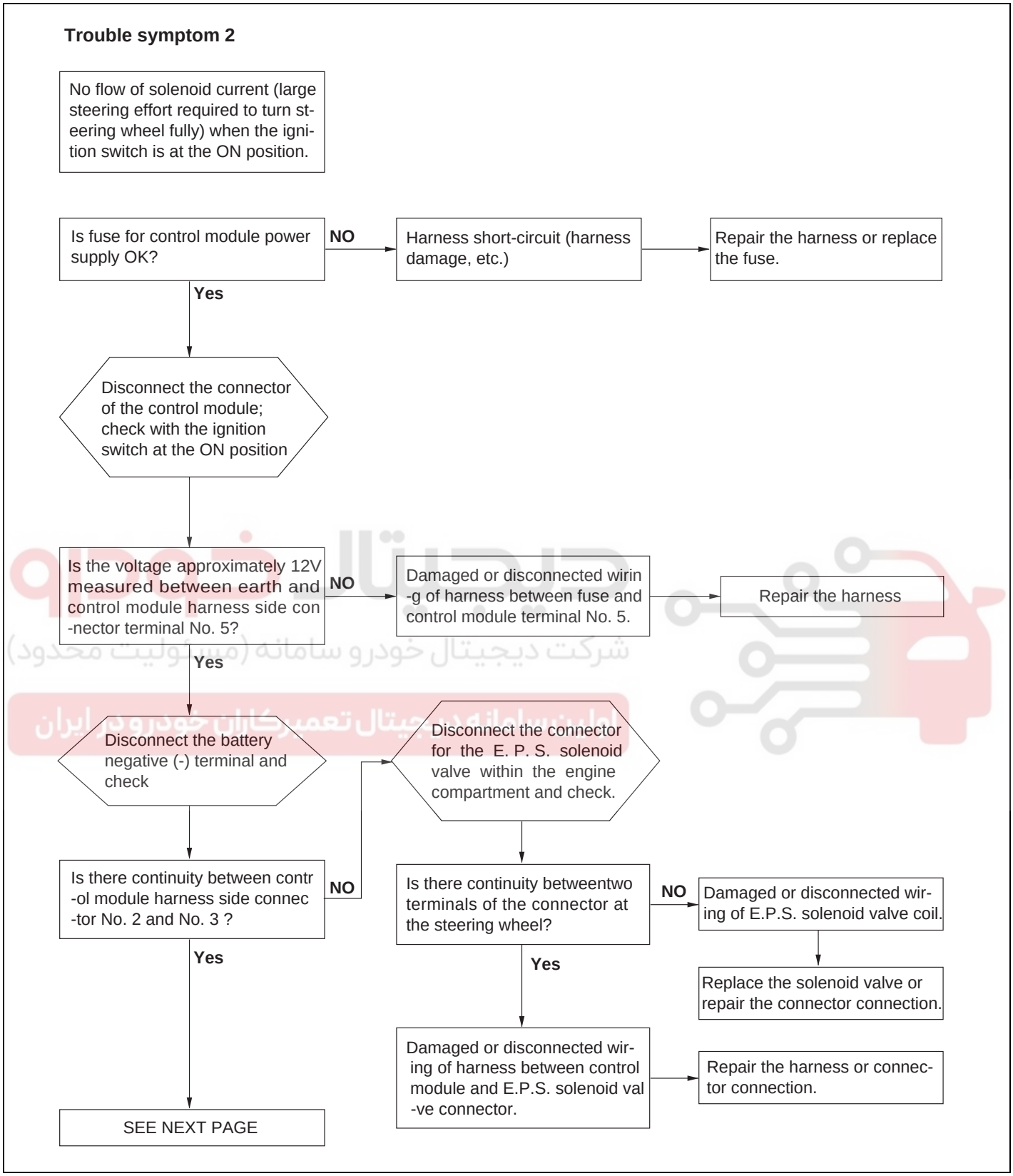
For checking procedures for each problem, refer to the flow-chart type of troubleshooting guide on the following page.

Trouble symptom 1

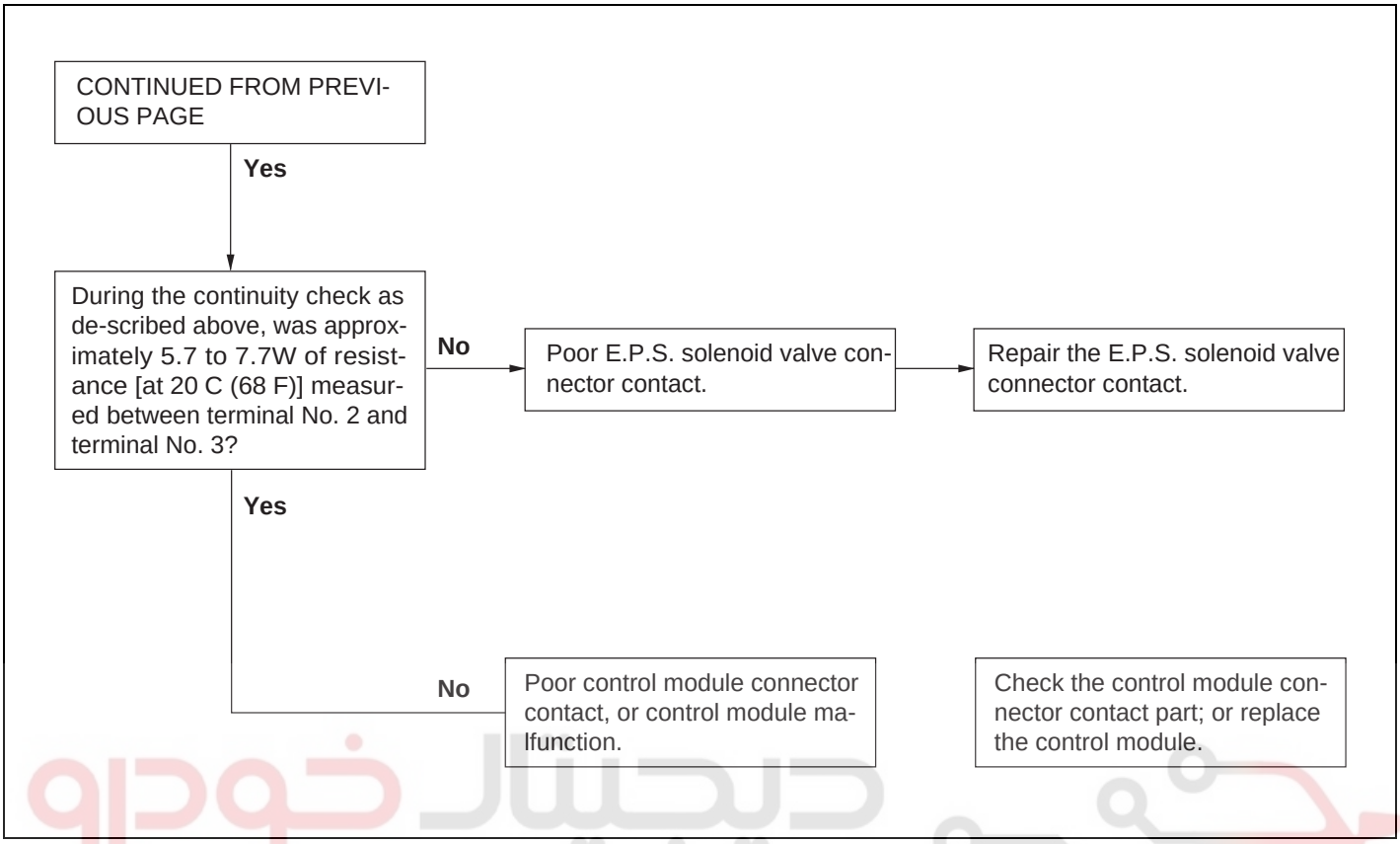


EPRF502A

Trouble symptom 2



EPRF502B

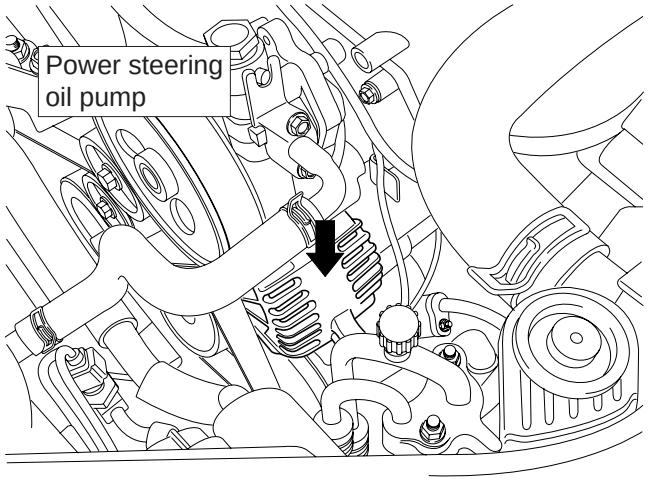


EPRF502C

DTC	Trouble	Condition	Measure time	Disposal	
C1101	Voltage over	IG[V] > 17V	1sec	Solenoid control stop	10V < IG[V] < 16V
C1102	Voltage under	IG[V] > 8V	1sec	Solenoid control stop	10V < IG[V] < 16V
C1212	Vehicle speed sensor	TPS > 30% over and vehiclespeed 0km/h	60sec	Vehicle speed : 80km/h	Vehicle speed > 5km/h
C1604	ECU error	EEPROM Read/Write fail andPWM management error	1sec	Solenoid control stop	IGN ON/OFF
C2230	Solenoid current error	Measure voltage > 1.28A	1sec	Solenoid control stop	Power ON reset
		Solenoid disconnection	1sec		
		Target voltage-Measuervoltage > 0.2A and IG[V] > 13V	2sec		

DTC C1101 BATTERY VOLTAGE HIGH

COMPONENT LOCATION E97277B3



EPRF602A

GENERAL DESCRIPTION EBF87DB7

EPS CM precisely controls the EPS solenoid's current, according to the vehicle speed. The value of the controlled current, according to voltage changes, are minute, and power is provided by IG2. EPS CM does monitor IG2 voltage to monitor excessive rises and drops in voltage. Current control is limited which prevents, damage to the EPS CM due to over-voltage, and operation of the EPS CM at low voltage.

DTC DESCRIPTION EA850CB5

Trouble code occurs when high voltage is caused by a fault in the charging system or IG2 power circuit. EPS CM prohibits solenoid current control by monitoring IG2 battery voltage of EPS CM.

DTC DETECTING CONDITION EEEE98F3

Item	Detecting Condition	Possible cause
DTC strategy	Voltage monitoring	- Open in ground circuit - Contact resistance in connections. - Faulty battery voltage
Enable conditions	IG key "ON"	
Threshold value	IG2 > 17V	
Diagnosis time	1 sec	
Fail safe	Prohibit solenoid 's current control (0 A) Restoration condition : 10V < IG2(V) < 16V ⇒ When the voltage is restored to normal from over voltage, restart solenoid's current control.	

MONITOR SCANTOOL DATA E16E12F3

1. Connect scantool to Data Link Connector(DLC).
2. Start engine and turn the headight and the heatwire on.
3. Monitor the "BATTERY VOLTAGE" parameter on the scantool.
4. Maintaining ENG. RPM at 2,500RPM(idle) over 2 minutes.

■ Specification

	IG Key ON	ENG. ON
Bat. Voltage	Approx. 11.8V~12.5V	Approx. 12.5V~14.5V

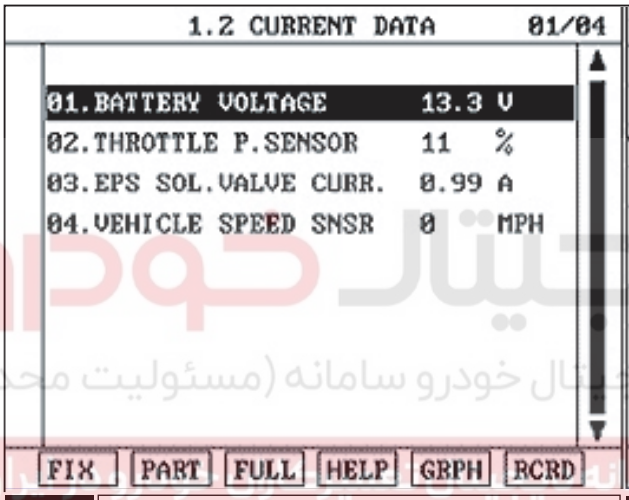


Fig1 Battery voltage current data (normal)

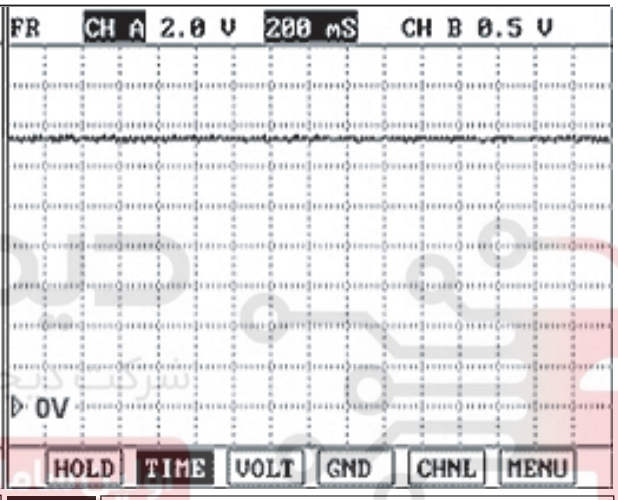


Fig2 Battery voltage signal waveform (normal)

BPCE601B

5. Is parameter within specifications?

YES

⇒ Fault is intermittent and caused either by poor contact in connectors or wiring harness, or it has been repaired and EPS CM memory is not cleared yet. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

⇒ Go to "W/Harness Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION EDCEDFBB

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

⇒ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

⇒ Go to ""Charging System Inspection"" procedure.

CHARGING SYSTEM INSPECTION EA9BFA1A

1. Engine "ON", headight and heatwire "ON".
2. Measure voltage between terminal (+) and (-) of battery maintaining ENG. RPM at 2,500RPM(idle) over 2 minutes.

■ Specification

	IG Key ON	ENG. ON
Bat. Voltage	Approx. 11.8V~12.5V	Approx. 12.5V~14.5V

3. Is the measured voltage within specifications?

YES

⇒ Go to "Power Circuit Inspection" procedure.

NO

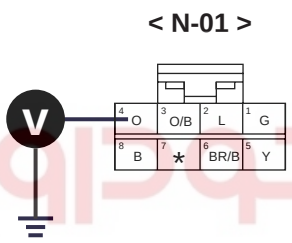
⇒ Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage from battery to alternator and fault in charging system.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

POWER CIRCUIT INSPECTION EBCF3E95

1. Ignition "OFF".
2. Disconnect EPS CM connector.
3. Engine "ON", headight and heatwire "ON".
4. Measure voltage between terminal "4" of EPS CM harness connector and chassis ground maintaining ENG. RPM at 2,500RPM(idle) over 2 minutes.

■ Specification

	IG Key ON	ENG. ON
Bat. Voltage	Approx. 11.8V~12.5V	Approx. 12.5V~14.5V



1. EPS solenoid "+"
2. EPS solenoid "-"
3. Vehicle speed
4. **IG 2**
5. OBD
6. TPS PWM
8. Ground

BPCE601C

5. Is the measured voltage within specifications?

YES

⇒ Go to "Ground Circuit Inspection" procedure.

NO

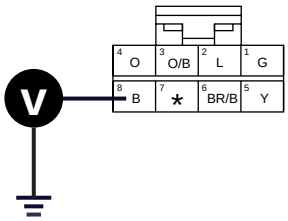
⇒Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION E3BAD232

1. Ignition "OFF".
2. Disconnect EPS CM connector.
3. Measure resistance between terminal "8" of EPS CM harness connector and chassis ground.

   ■ Specification : Approx. 0 Ω

< N-01 >



1. EPS solenoid "+"
2. EPS solenoid "-"
3. Vehicle speed
4. IG 2
5. OBD
6. TPS PWM
8. Ground

BPCE601D

4. Is the measured resistance within specifications?

YES

⇒ Substitute with a known-good EPS CM and check for proper operation.
If the problem is corrected,replace EPS CM and then go to "Verification of Vehicle Repair" procedure.

NO

⇒ Check for open or contact resistance in ground harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR ED1D3D48

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

⇒ Go to the applicable troubleshooting procedure.

NO

⇒ System performing to specification at this time.

DTC C1102 BATTERY VOLTAGE LOW

COMPONENT LOCATION EFA63D86

Refer to DTC C1101

GENERAL DESCRIPTION EE97FC3D

Refer to DTC C1101

DTC DESCRIPTION E02BBE82

Refer to DTC C1101

DTC DETECTING CONDITION ECF85A0B

Item	Detecting Condition	Possible cause
DTC strategy	Voltage check	- Open/short in power. - Contact resistance in connections. - Poor contact of fail-safe relay. - Faulty charging system. - Low idle rpm. - Loose alternator belt tension.
Enable conditions	IG key "ON"	
Threshold value	IG2 < 8V	
Diagnosis time	1 sec	
Fail safe	Prohibit current control of EPS solenoid (0 A) Restoration condition : 10V < IG2(V) < 16V ⇒ When the voltage is restored to normal from low voltage, restart solenoid's current control "	

MONITOR SCANTOOL DATA E17D2FAC

Refer to DTC C1101

TERMINAL AND CONNECTOR INSPECTION EA41C87A

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.

3. Has a problem been found?

   YES

   ⇒ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

   NO

   ⇒ Go to "Charging System Inspection" procedure.

CHARGING SYSTEM INSPECTION EA3B2FDC

1. Engine "ON", headight and heatwire "ON".
2. Measure voltage between terminal (+) and (-) of battery maintaining ENG. RPM at 2,500RPM(idle) over 2 minutes.

■ Specification

	IG Key ON	ENG. ON
Bat. Voltage	Approx. 11.8V~12.5V	Approx. 12.5V~14.5V

3. Is the measured voltage within specifications?

YES

⇒ Go to "Power Circuit Inspection" procedure.

NO

⇒ Check for fault in charging system and check for tension of alternator drive belt, ENG.idle rpm or open/short in harness from battery to alternator.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

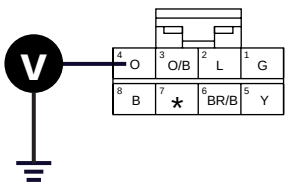
POWER CIRCUIT INSPECTION EEAA20E1

1. Ignition "OFF".
2. Disconnect EPS CM connector.
3. Engine "ON", headight and heatwire "ON".
4. Measure voltage between terminal "4" of EPS CM harness connector and chassis ground maintaining ENG. RPM at 2,500RPM(idle) over 2 minutes.

■ Specification

	IG Key ON	ENG. ON
Bat. Voltage	Approx. 11.8V~12.5V	Approx. 12.5V~14.5V

< N-01 >



1. EPS solenoid "+"
2. EPS solenoid "-"
3. Vehicle speed
4. **IG 2**
5. OBD
6. TPS PWM
8. Ground

BPCE601C

5. Is the measured voltage within specifications?

YES

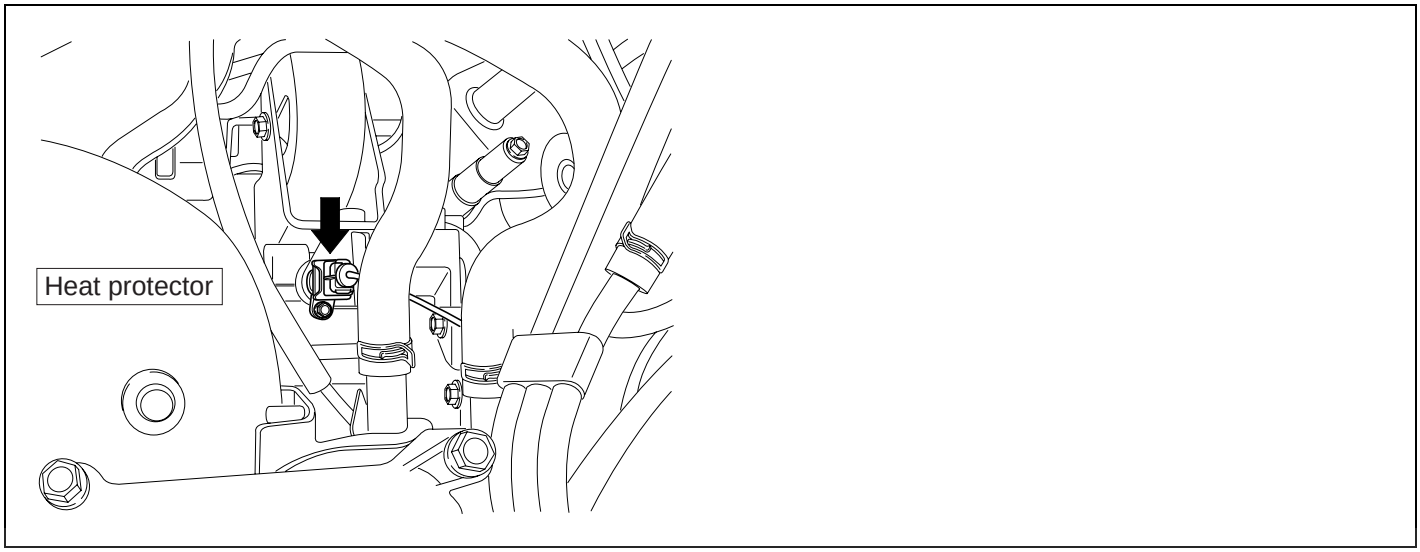
⇒ Substitute with a known-good EPS CM and check for proper operation.
If the problem is corrected, replace EPS CM and then go to "Verification of Vehicle Repair" procedure.

NO

⇒ Check for open/short to ground in power harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

DTC C1212 VEHICLE SPEED SENSOR

COMPONENT LOCATION E2E0C30B



EPRF602E

GENERAL DESCRIPTION ED23CCD1

Speed sensor is a sensor which applies a principal of Hall-effect and is located at speedmeter driven gear of transaxle. If output shaft of transaxle rotates, the rotation of Rotor which has 4 teeth inside the sensor generate a hall effect and outputs the digital pulse. EPS CM detects vehicle speed based on digital pulse signal and controls amount of current t of solenoid valve which controls driving force of steering wheel.

DTC DESCRIPTION EA61B55B

Trouble code occurs when a faulty circuit related to the sensor is detected or when an open/short is detected in the speed sensor circuit. EPS CM detect trouble code and sets solenoid current values according to corresponding 80kph(48mph) values, to reserve driving stability.

DTC DETECTING CONDITION E6F1FDC2

Item	Detecting Condition	Possible cause
DTC strategy	Signal check	- Open/short in power circuit - Open/short in signal circuit - Open in ground circuit - Contact resistance in connections. - Faulty circuit to use VSS - Faulty sensor
Enable conditions	IG key "ON"	
Threshold value	TPS PWM > 30% vehicle speed < 0 kph(0mph)	
Diagnosis time	60 sec	
Fail safe	Fixing solenoid current value corresponding to 80kph(48mph) Restoration : Normal vehicle speed 5kph(0.8mph) of input for 1sec	

SIGNAL WAVEFORM E08D60EC

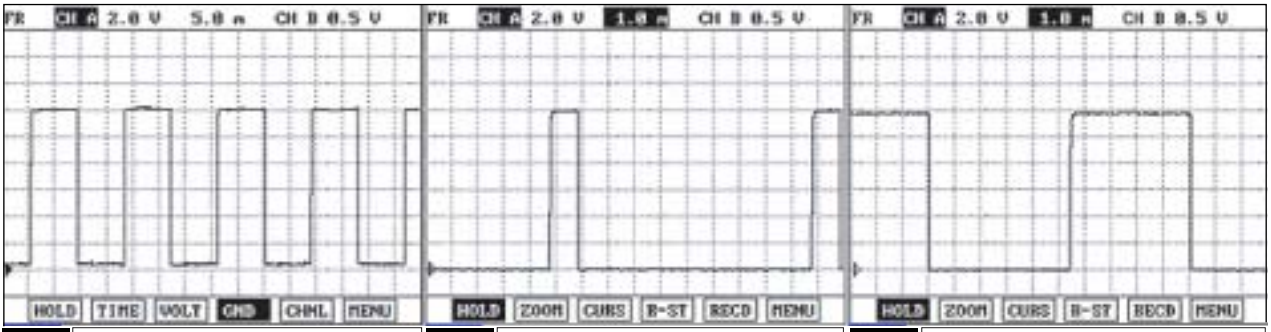


Fig1 Driving (Vehicle speed sensor output) | Fig2 TPS PWM (idle) | Fig3 TPS PWM (acceleration)

Fig1) Driving : Vehicle speed sensor output 8.0~12.5V(HIGH SIGNAL) or 0.2~0.5V(LOW SIGNAL), as the vehicle moves, the 50% of digital duty wave is ouput. (As vehicle speed increase, Hz increase)
Fig2) Engine RPM signal at idle (TPS PWM duty 10%)
Fig3) Engine RPM signal at acceleration (TPS PWM duty 45%)

BPCE603B

MONITOR SCANTOOL DATA E62D0229

1. Connect scantool to Data Link Connector(DLC).
2. Start engine and monitor the "VEHICLE SPEED SENSOR" parameter on the scantool.
3. Drive the vehicle approx.80kph(48mph) watching the speedometer on the instrument panel.

■ Specification : [Current data value - speedometer value] ≤ [± 10 %]

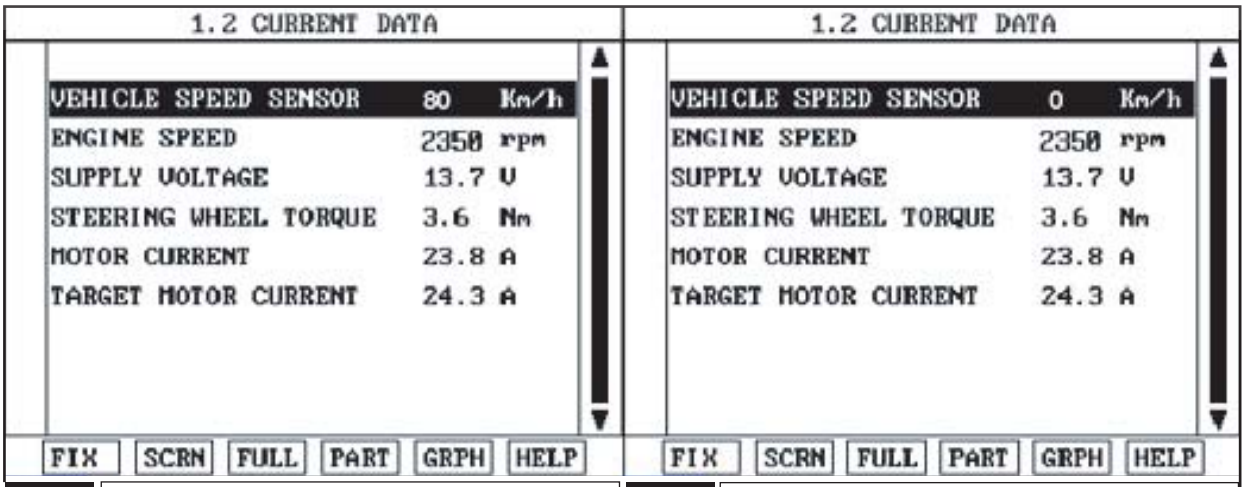


Fig1 Sensor current data (normal) | Fig2 Sensor current data (abnormal)

BPCE603C

4. Is parameter within specifications?

YES

⇒ Fault is intermittent and caused either by poor contact in connectors or wiring harness, or it has been repaired and EPS CM memory is not cleared yet. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

⇒ Go to "W/Harness Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION EAAC1E11

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
3. Has a problem been found?

YES

⇒ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

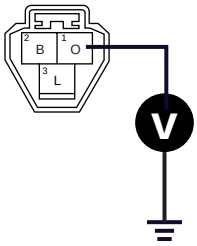
⇒ Check DTC on engine, A/T and other systems which use VSS.
▶ If DTC is detected DTC only in EPS, go to "Signal Circuit Inspection" procedure.
▶ If DTC is detected DTC in other systems also, remove speedometer driven gear and check damage of gear.
→ If Speedometer driven gear is damaged, change it and then go to "Verification of Vehicle Repair" procedure.
→ If Speedometer driven gear is normal, go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION EC9977DA

1. Ignition "OFF".
2. Disconnect vehicle speed sensor connector.
3. Engine "ON".
4. Measure voltage between terminal "1" of vehicle speed sensor harness connector and chassis ground.

■ Specification : Approx. B+

< N-03 >



1. Power supply
2. Sensor Ground
3. Sensor signal

BPCE603D

5. Is the measured voltage within specifications?

YES

⇒ Go to "Ground Circuit Inspection" procedure.

NO

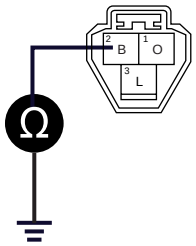
⇒ Check for open/short to ground in power harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION EE715553

1. Ignition "OFF".
2. Disconnect vehicle speed sensor connector.
3. Measure resistance between terminal "2" of Vehicle speed sensor harness connector and chassis ground.

■ Specification : Approx. 0 Ω

< N-03 >



1. Power supply
2. Sensor Ground
3. Sensor signal

EPRF603E

4. Is the measured resistance within specifications?

YES

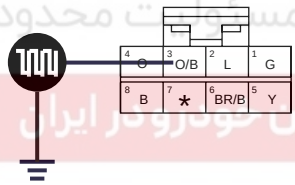
⇒ Go to "Signal Circuit Inspection" procedure.

NO

⇒ Check for open/short to power in ground harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION EBDBEE5D

1. Ignition "OFF".
2. Connect Scantool to Data Link Connector(DLC).
3. Start engine and select "SCOPEMETER FUNCTION" on scantool.
4. Drive the vehicle and measure output signal between terminal "3" of EPS CM harness connector and chassis ground.
   ■ Specification : Refer to 'Signal Waveform'



1.EPS solenoid (+)
2.EPS solenoid (-)
3.Vehicle speed
4.IG 2
5.OBD
6.TPS PWM
7.Space
8.Ground

BPCE603F

5. Is vehicle speed sensor output signal within specifications?

YES

⇒ Substitute with a known-good EPS CM and check for proper operation.
If the problem is corrected, replace EPS CM and then go to "Verification of Vehicle Repair" procedure.

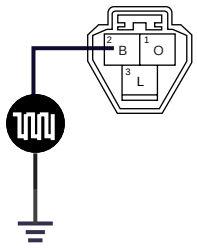
NO

⇒ Check for open/short to ground in signal circuit and other systems which use VSS.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.
If a problem hasn't found, go to "Component Inspection" procedure.

COMPONENT INSPECTION EFEA3BCD

1. Ignition "OFF".
2. Connect Scantool to Data Link Connector(DLC).
3. Start engine and select "SCOPEMETER FUNCTION" on scantool.
4. Drive the vehicle and measure output signal between terminal "3" of Vehicle speed sensor harness connector and chasiss ground.

< N-03 >



1. Power supply
2. Sensor Ground
3. Sensor signal

BPCE603G

■ Specification : Refer to 'Signal Waveform'

5. Is vehicle speed sensor output signal within specifications?

YES

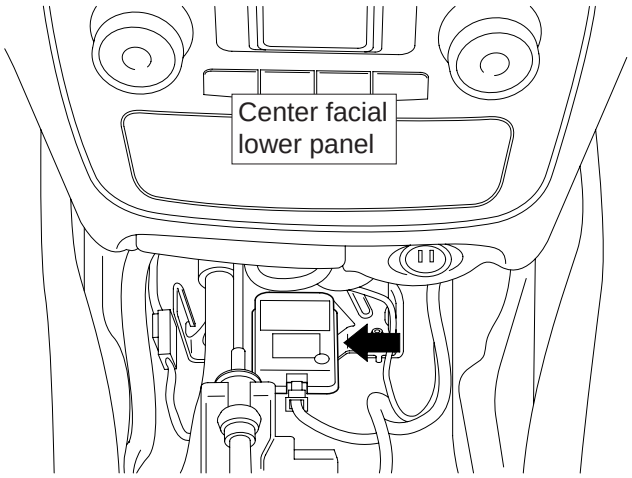
⇒Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

⇒ Check vehicle speed sensor for contamination, deterioration, or damage.
Substitute with a known-good vehicle speed sensor and check for proper operation.
If the problem is corrected, replace vehicle speed sensor and then go to "Verification of Vehicle Repair" procedure.

DTC C1604 ECU HARDWARE ERROR

COMPONENT LOCATION EADC45EC



EPRF602M

GENERAL DESCRIPTION E1F86DC4

EPS has a solenoid valve on power steering gear box, and a EPS CM underneath the audio center facia. EPS CM which receives signals from VSS (Vehicle Speed Sensor) and TPS controls the oil flow of steering gear box.
EPS CM performs the conventional power steering function in case a failure has occurred in the system.
EPS CM electronically controls the current to the solenoid of by-pass valve by inputting sensor's signals to control the hydraulic amount in cylinder chamber and thereby varying the steering effort versus the hydraulic pressure according to vehicle speed.

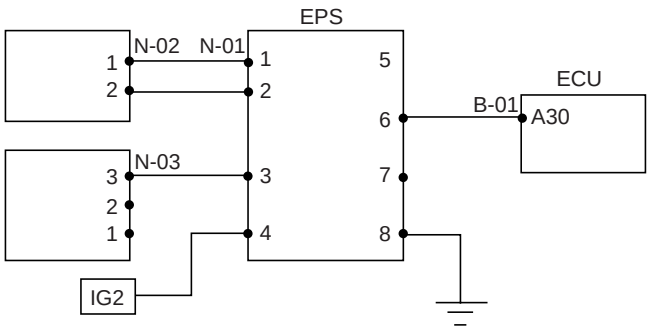
DTC DESCRIPTION E1A7C0D3

This DTC is about general error of inside EPS CM. If this DTC is set, check unstable power or excessive surge influx by faulty power supply and chassis ground.

DTC DETECTING CONDITION EAC60287

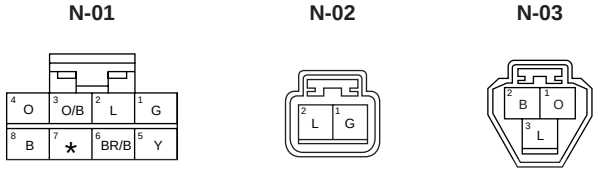
Item	Detecting Condition	Possible cause
DTC strategy	Voltage monitoring	- Contact resistance in ground circuit. - Surge in power circuit. - Faulty EPS CM
Enable conditions	IG key "ON"	
Threshold value	EEPROM read/write failPWM managerment error	
Diagnosis time	1 sec	
Fail safe	Prohibit solenoid current control (0 A) IG2 ON/OFF	

SCHEMATIC DIAGRAM E8DCCF83



[CONNECTION INFORMATION]

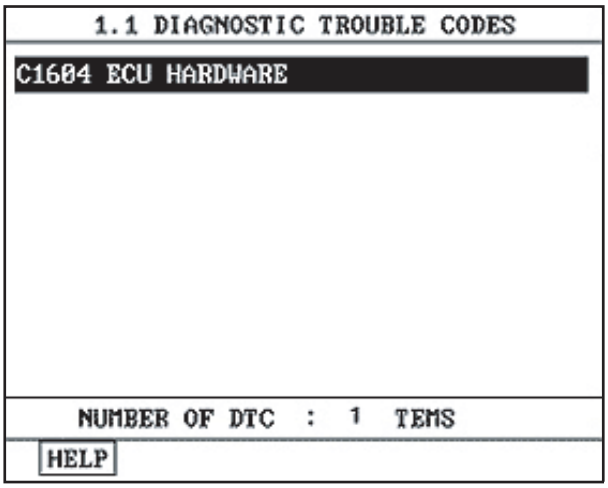
M70	Connected to	Fuction
1	N-01 terminal 1	Solenoid(+)
2	N-02 terminal 2	Solenoid(-)
3	N-03 terminal 3	Vehicle speed
4	IG SWITCH	Power(IG2)
5	-	DTC
6	B-01 terminal A30	TPS
8	-	Ground



BPCE604B

MONITOR SCANTOOL DATA E5C9C4C4

1. Ignition "OFF" and connect scantool to Data Link Connector(DLC).
2. Ignition "ON" Engine "OFF".
3. Select "DIAGNOSTIC TROUBLE CODES" mode and monitor "Diagnostic Trouble Code".
4. Clear DTC and drive the vehicle within DTC Enable conditions in General Information.



BPCE604C

5. Is "C1604" present ?

YES

⇒ Fault is intermittent and caused either by poor contact in connectors or wiring harness, or it has been repaired and EPS CM memory is not cleared yet. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

⇒ Go to "W/Harness Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION E4AFFCBF

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
3. Has a problem been found?

YES

⇒ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

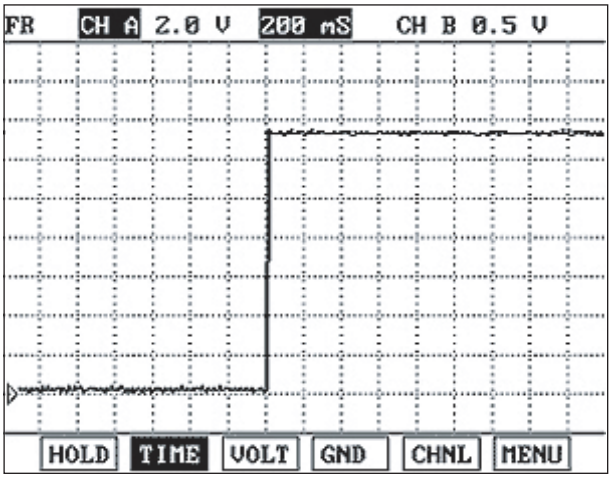
NO

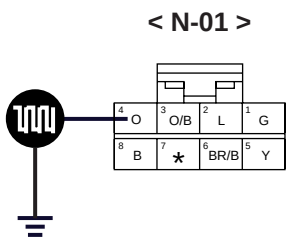
⇒ Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION EFB0DC3F

1. Ignition "OFF".
2. Connect Scantool to Data Link Connector(DLC) and start engine.
3. Select "SCOPEMETER FUNCTION" on scantool and accelerate engine.
4. Measure output signal between terminal "4"of EPS CM harness connector and chassis ground with switching (A/C,headlight etc.).

■ Specification : Surge always must not happen when turn IG key ON, OFF with turn the electricity device ON, OFF.





1. EPS solenoid "+"
2. EPS solenoid "-"
3. Vehicle speed
4. IG 2
5. OBD
6. TPS PWM
8. Ground

BPCE604E

5. Is the resistance measured within specifications?

YES

⇒Go to "Ground in power harness" procedure.

NO

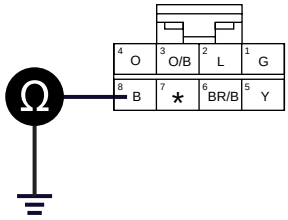
⇒ Check for contact resistance in connections or open in power harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION E165624A

1.CHECK FOR OPEN IN GROUND HARNESS

1. Ignition "OFF".
2. Disconnect EPS CM connector.
3. Measure resistance between terminal "8" of EPS CM harness connector and chassis ground.

■ Specification : Approx. 0 Ω



1. EPS solenoid "+"
2. EPS solenoid "-"
3. Vehicle speed
4. IG 2
5. OBD
6. TPS PWM
8. Ground

BPCE604F

4. Is the resistance measured within specifications?

YES

⇒ Go to "Check for earthing in ground harness" as below.

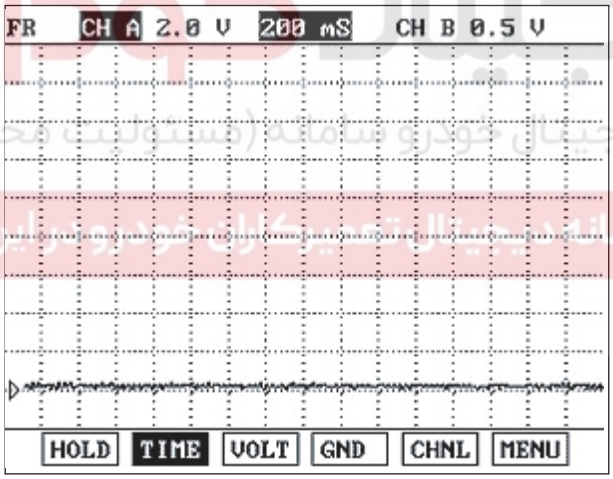
NO

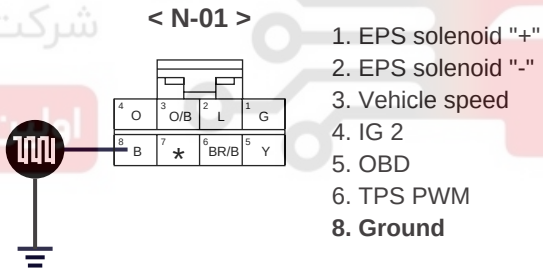
⇒ Check for open or contact resistance in ground harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2.CHECK FOR EARTHING IN GROUND HARNESS

1. Ignition "OFF".
2. Connect Scantool to Data Link Connector(DLC) and start engine.
3. Select "SCOPEMETER FUNCTION" on scantool and accelerate engine.
4. Measure output signal between terminal "8" of EPS CM harness connector and chassis ground with switching (A/C,headlight etc.).

■ Specification : Surge always must not happen when turn IG key ON, OFF with turn the electricity device ON, OFF.





BPCE604H

5. Is the output signal within specifications?

YES

⇒ Go to "Component Inspection " procedure.

NO

⇒ Check for open or poor earthing in ground harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION EAF9F5FA

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear DTC.
3. Drive the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

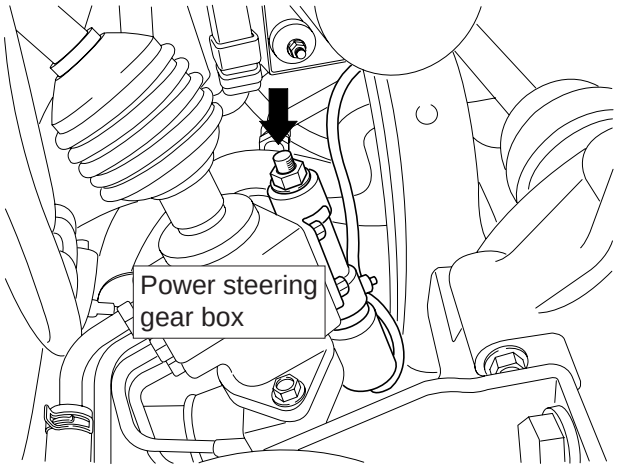
⇒ Check EPS CM for damage or sticking by the naked eye. Substitute with a known-good EPS CM and check for proper operation.
If the problem is corrected, replace EPS CM and then go to "Verification of vehicle Repair" procedure.

NO

⇒ Substitute with a known-good EPS CM and check for proper operation.
If the problem is corrected, replace EPS CM and then go to "Verification of Vehicle Repair" procedure.

DTC C2230 SOLENID

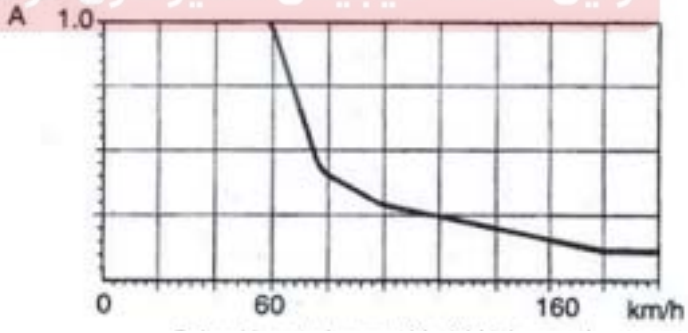
COMPONENT LOCATION E5DDAE5D



EPRF602S

GENERAL DESCRIPTION E8C48A9C

EPS CM controls current amounts to the solenoid valve which adjust driving force of steering wheel, based on vehicle speed information recieved from the vehicle speed sensor. The EPS solenoid maintains proper steering force by adjusting fluid amounts into the EPS valvebody according to current values.



Current value HIGH : Handle light

Currentvalue LOW : Handle heavy

Solenoid control current Vs Vehicle speed
(Vehicle speed increase, solenoid current value is decreased)

BPCE605B

DTC DESCRIPTION EC1B81DD

If an open/short is detected in the solenoid circuit. or current value is under/over, while EPS CM is monitoring solenoid's current, EPS CM sets this trouble and the current value will be controlled "0".

DTC DETECTING CONDITION EE4A56AC

Item	Detecting Condition		Possible Cause
DTC Strategy	Current check		- Open/short in power circuit and control circuit - Contact resistance in connections. - Faulty solenoid
Enable Conditions	IG key "ON"		
Threshold Value		Diagnostic Time	
Measuer current ＞ 1.28A		1 sec	
Solenoid open		1 sec	
[target current-measure current] ＞ 0.2A and IG(V) ＞13V		2 sec	
Fail Safe	Prohibit solenoid 's current control (0 A) Restoration condition : Power ON reset		

SPECIFICATION EBAC1F6B

Solenoid resistance	Frequency	Duty
5.7~7.7Ω [at 20℃(68°F)]	125/333 Hz	5~95%

SIGNAL WAVEFORM ED9EF678

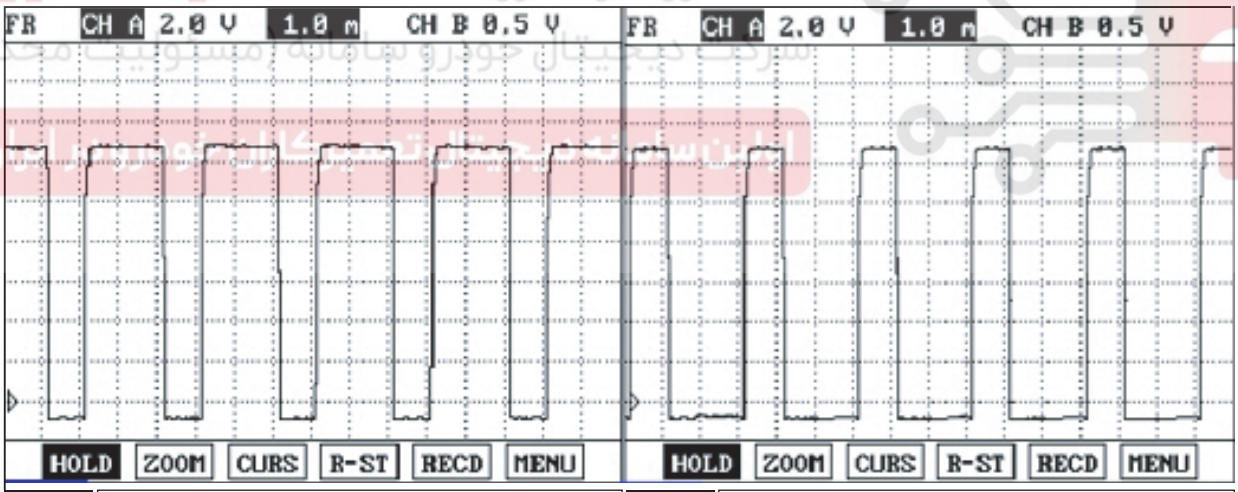


Fig1	Idle	Fig2	Vehicle speed increase

Fig 1) Normal signal waveform which is the current control at idle (1A).
Fig 2) Signal waveform which is the current decrease by vehicle speed increase.

BPCE605C

MONITOR SCANTOOL DATA EF5A65FC

1. Ignition "OFF" and connect scantool to Data Link Connector(DLC).
2. Ignition "ON" Engine "OFF".
3. Select "DIAGNOSTIC TROUBLE CODES" mode and monitor "Diagnostic Trouble Codes(DTCs)".

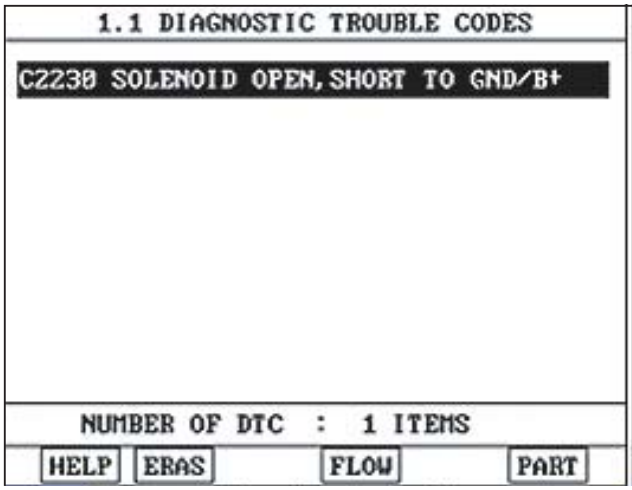


Fig1 Diagnostic Trouble Code (abnormal)

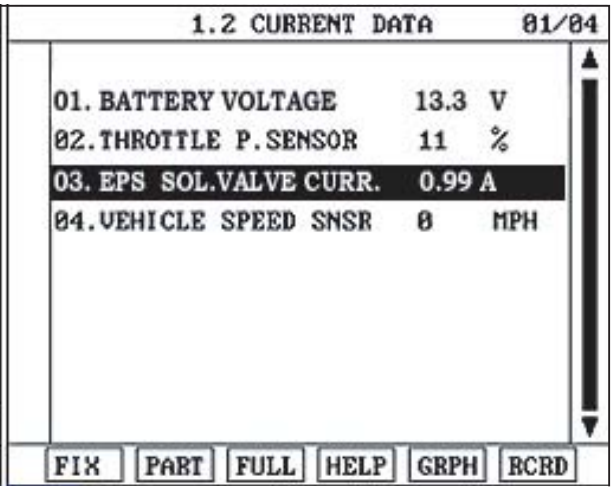


Fig2 Sensor current data (abnormal)

BPCE605D

4. Is parameter within specifications?

YES

⇒ Fault is intermittent and caused either by poor contact in connectors or wiring harness, or it has been repaired and EPS CM memory is not cleared yet. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

⇒ Go to "W/Harness Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION EB026EB9

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.

3. Has a problem been found?

YES

⇒ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

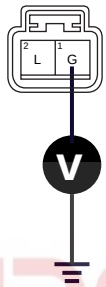
⇒ Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION E2A9DBA7

1. Ignition "OFF".
2. Disconnect solenoid connector.
3. Engine "ON".
4. Measure voltage between terminal "1" of solenoid harness connector and chassis ground.

   ■ Specification : Approx. B+

< N-02 >



1.Solenoid (+)
2.Solenoid (-)

BPCE605E

5. Is the voltage measured within specifications?

YES

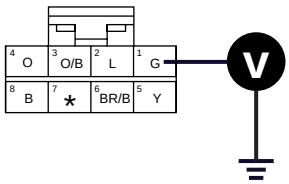
⇒ Go to "Control Circuit Inspection" procedure.

NO

⇒ Measure voltage between terminal "1" of EPS CM harness connector and chassis ground in above condition.

■ Specification : Approx. B+

< N-01 >



1. EPS solenoid "+"
2. EPS solenoid "-"
3. Vehicle speed
4. IG 2
5. OBD
6. TPS PWM
8. Ground

BPCE605F

▶ If it is normal, Check for open/short to ground or control harness in power harness. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

▶ If it is abnormal, substitute with a known-good EPS CM and check for proper operation. If the problem is corrected, replace EPS CM and then go to "Verification of Vehicle Repair" procedure.

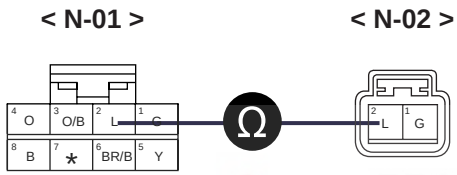
CONTROL CIRCUIT INSPECTION EC16C8C9

1. Ignition "OFF".

2. Disconnect solenoid connector and EPS CM connector.

3. Measure resistance between terminal "2"of solenoid harness connector and terminal "2" of EPS CM harness connector.

   ■ Specification : Approx. 0 Ω



1.EPS solenoid (+)	5.OBD	1.Solenoid (+)
2.EPS solenoid (-)	6.TPS PWM	**2.Solenoid (-)**
3.Vehicle speed	7.Space	
4.IG 2	8.Ground	

BPCE605G

4. Is the measured resistance within specifications?

YES

⇒ Check for short to ground in control harness.
▶ If it is normal, go to "Component Inspection" procedure.
▶ If it is abnormal, repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

⇒ Check for open/short to ground in control harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION E5D9BAB3

CHECK EPS SOLENOID

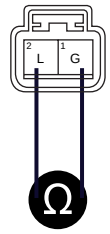
1. Ignition "OFF".

2. Disconnect EPS solenoid connector.

3. Measure resistance between terminal "2" and terminal "1" of solenoid harness connector(To sensor side).

   ■ Specification : 5.7~7.7Ω [at 20℃(68°F)]

< N-02 >



1.Solenoid (+)
2.Solenoid (-)

BPCE605H

4. Is the measured resistance within specifications?

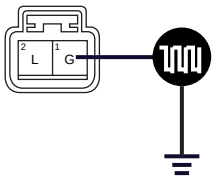
YES

1) Ignition "OFF".
2) Connect Scantool to Data Link Connector(DLC) and then Engine "ON ".
3) Select "SCOPEMETER FUNCTION" on scantool.
4) Measure output signal between terminal "1" of EPS solenoid harness connector and chassis ground.

■ Specification : Refer to 'Signal Waveform'

⇒ If it is normal, substitute with a known-good EPS CM and check for proper operation.
If the problem is corrected, replace EPS CM and then go to ""Verification of Vehicle Repair"" procedure.
⇒ If it is abnormal, check EPS solenoid for contamination, deterioration, or damage.
Substitute with a known-good EPS solenoid and check for proper operation.
If the problem is corrected, replace EPS solenoid and then go to "Verification of Vehicle Repair" procedure.

< N-02 >



1.Solenoid (+)
2.Solenoid (-)

BPCE605I

NO

⇒ Check EPS solenoid for contamination, deterioration, or damage.
Substitute with a known-good EPS solenoid and check for proper operation.
If the problem is corrected, replace EPS solenoid and then go to "Verification of Vehicle Repair" procedure.