长安汽车
CHANGAN

EADO Workshop Manual

Steering System - General Information

EADORM2E/3/1

2.4 Steering System

2012 EADO

2.4.1Steering System - General Information

Specifications

General Specifications

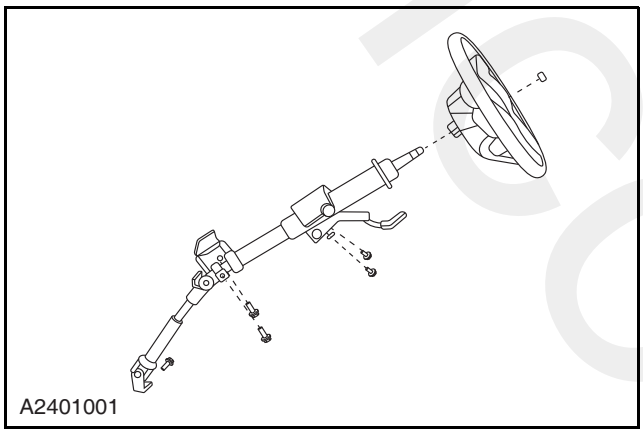
Item		Specifications
Steering wheel assembly	Diameter	369 mm
	Maximum total turns	About 2.89 turns
Steering strut assembly	Angle adjustment range (degree)	-2~+1.5
Steering gear assembly	Rack travel	140 mm
Power Steering Fluid	Model	Great Wall ATF- III
	Capacity	About 950 ml
Minimum turning diameter	-	About 10.5 m

Description and Operation

System Overview

The rotation of steering wheel is transferred to steering gear by steering column. Steering gear changes the rotation to straight movement by all inner gear and rack. This straight movement is transferred to wheel steering knuckle by tie rod and tie rod external connection.

Steering oil pressure is applied on steering gear by powe steering pump. When turning steering wheel, based on the turning direction, power steering fluid will open the valve at one end of bidirection phase piston. Oil pressure drives piston to move and provide the assisted power in steering.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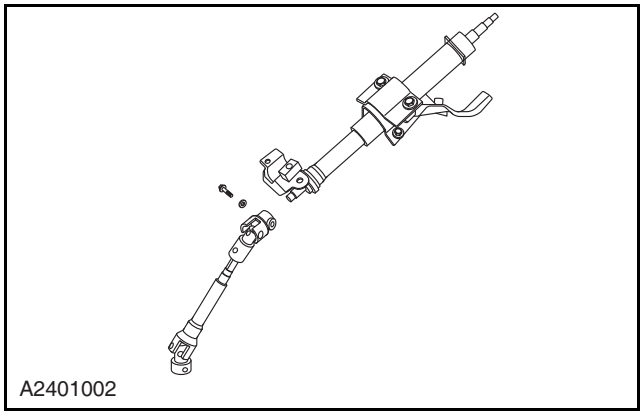
Component Description

Steering Column

Steering wheel is equipped with multi-direction steering wheel lock (or anti-theft lock) approved by strict tests. The steering wheel is equipped with a safety lock cylinder. Steering column and its top is fixed on the periphery of instrument panel.

Steering wheel is fixed on steering column assembly by retaining nut. Steering small gear is connected to steering column with flexiable universal joint. Universal joint is fixed on the small gear with retaining bolt and fixed on steering column with retainer and axle alignment assembly retaining bolt.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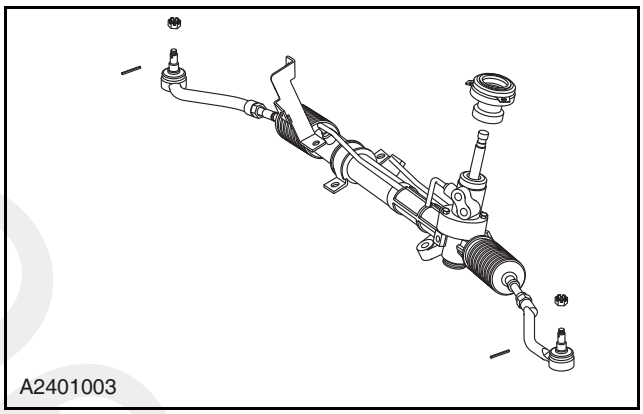
Steering Gear

Steering gear is of the rack and gear design. Power steering gear is equipped with distribution control valve.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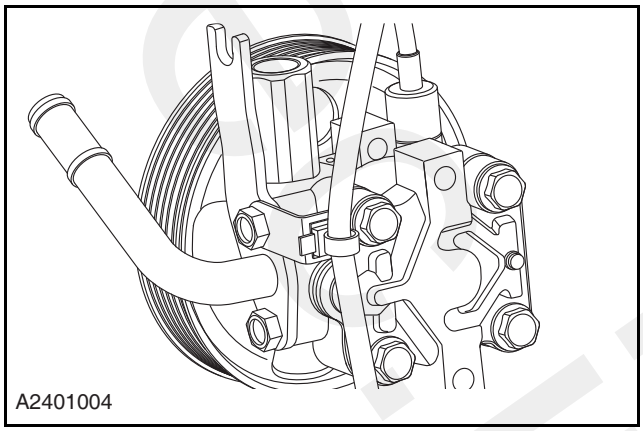
Power Steering Pump

The fluid in steering fluid reservior provides steering gear with fluid pressure by hydraulic pressure pump. Steering oil reservior is fixed on the right side of engine compartment.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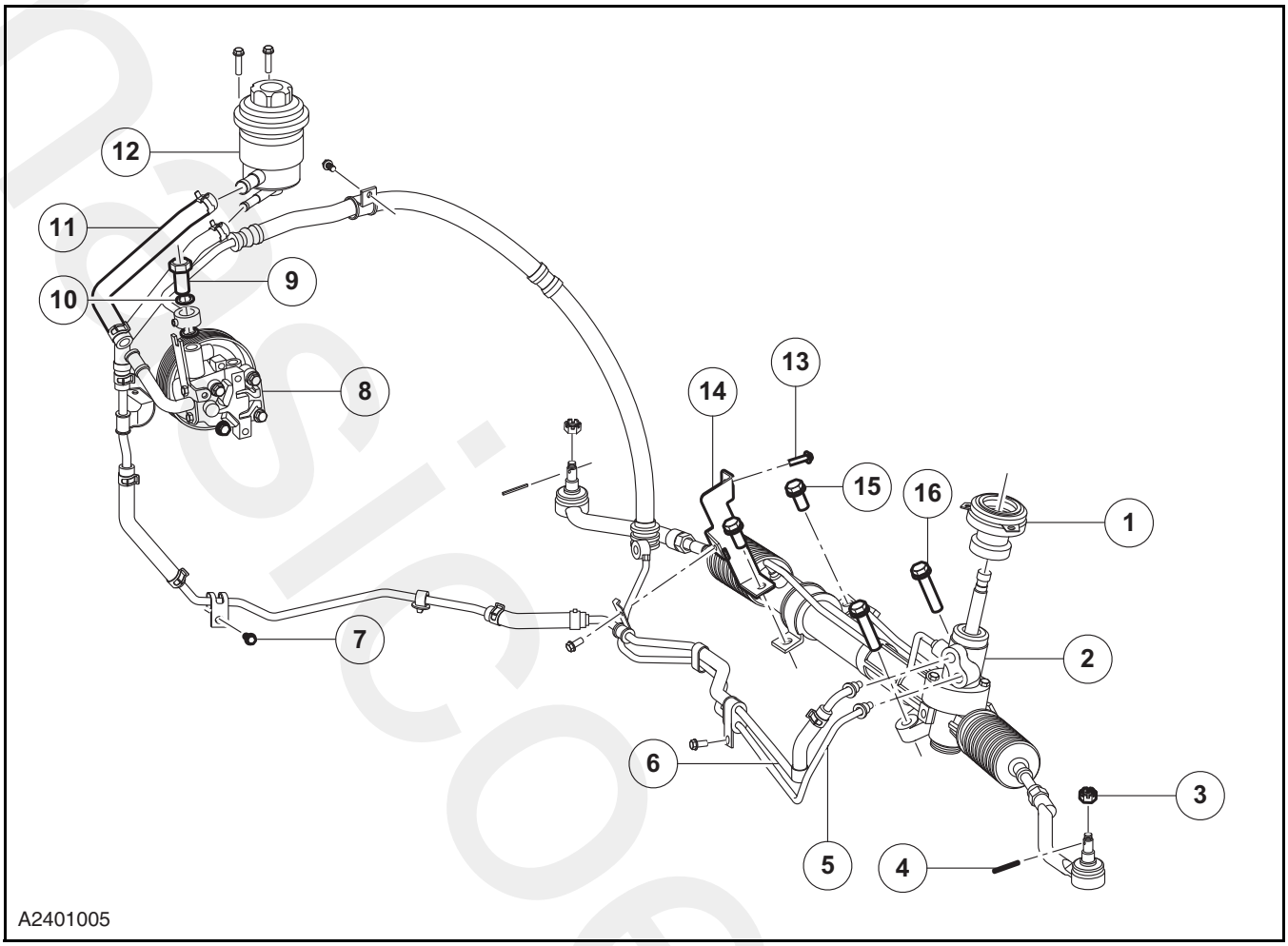
Exploded View



Item	Description	Qty	No.	Description	Qty
1	Steering shaft dust boot	1	9	Steering pump pressure oil pipe bolt	1
2	Power steering gear assembly	1	10	Steering pump pressure oil pipe washer	2
3	Hex slotted locking nut	1	11	Fuel extraction pipe assembly	1
4	Cotter pin	1	12	Steering reservoir	1
5	Pressure oil pipe assembly	1	13	Combined hex bolt, spring washer and flat washer	3
6	Fuel return pipe assembly	1	14	Power steering fuel pipe support	1
7	Combined hex bolt and spring washer	4	15	Combined hex bolt and spring washer	2
8	Steering oil pump assembly	1	16	Combined hex bolt and spring washer	2

General Procedures

Steering Linkage Inspection

Inspect whether the steering linkage dust boot is damaged, eroded or twisted. Make sure that dust boot is safe and reliable. Replace dust boot and clamp if necessary.

1. Park the vehicle on the dry and flat ground and pull parking brake. Turn the steering wheel to central position.
2. Shut down the engine and hold the steering wheel. Rock the steering wheel to four directions powerfully (do not turn the steering wheel), inspect the wear of steering column bearing and the loose of steering coupling, steering wheel and steering column. If any, inspect the retaining bolt torque of steering column, coupling and steering wheel. Steering column can not be repaired, replace the steering column if necessary.

   Refer to: Steering Column (2.4.4 Steering Column, Removal and Installation).

3. Replace the steering coupling if it is damaged.

   Refer to: Steering Column (2.4.4 Steering Column, Removal and Installation).

   Steering column can not be repaired and replace it if necessary.

   Refer to: Steering Column (2.4.4 Steering Column, Removal and Installation).

   Steering linkage clearance can not be adjusted and replace it if necessary.

Power Steering Fluid Filling

Filling Method

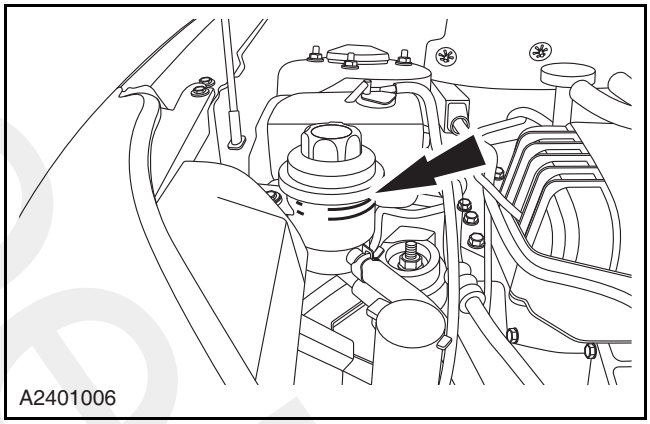
1. Fill the steering fluid to the max scale of reservior (the top marked line).
2. Raise the front wheel, do not start the engine. Start the motor to rotate the pulley only. Rotate the steering wheel to left or right limited position for 15 to 20 seconds and repeat it for 5 to 6 times.
3. Start the engine and rotate the steering wheel to bleed the air in reservior.
4. If the fluid will not turn white and the fluid level reaches the max scale, fluid filling is finished.

CAUTION: If the fluid level dose not reach the max scale or the fluid overflows when rotate the steering wheel. It means the air still exists, so it may make noise and damage the power steering pump.

Filling

1. Fill to MAX mark of the fluid reservior.

CAUTION: When filling the fluid in the reservior, make sure the power steering fluid is clean and not shaked before filling. Slowly fill the fluid into the reservior to reduce the possibility to cause bubble. Fluid level should be kept in the required position.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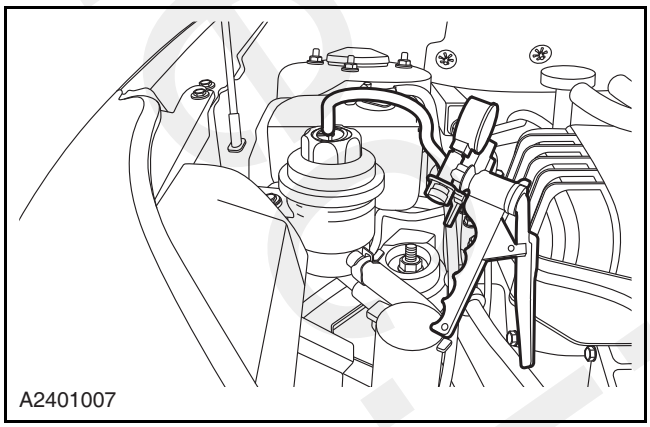
2. Keep vacuum pressure for 30 seconds with special connectors and vacuum pressure pump. Pressure range: 84 to 101 kPa.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3. Observe the reading of vacuum meter.

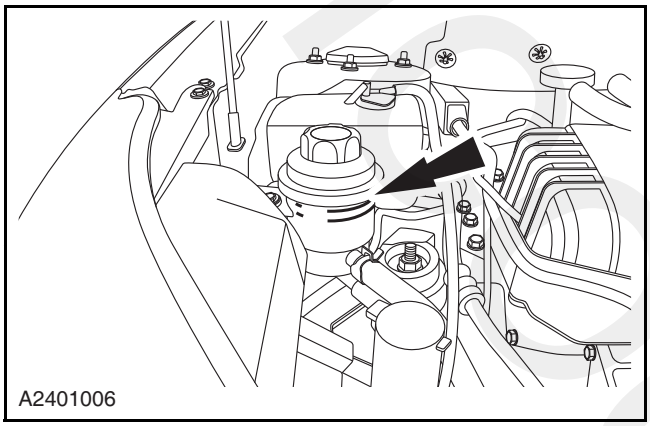
If vacuum pressure decrease by 7 kpa or more within 5 minutes, inspect the system leakage.

4. Remove the vacuum pressure pump and plug cover and fill the fluid to MAX mark of reservior.

Steering System Bleeding

1. Fill to MAX mark of fluid reservior.

CAUTION: When filling the fluid, make sure the power steering fluid is clean and not shaked before filling. Slowly fill the fluid into fluid reservior to reduce the possibility to cause bubble. Fluid level should be kept in the required position.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2. Start the engine and run it at idle speed. Rotate the steering wheel from one limited position to another (do not stay at limited position for over 10 seconds).

CAUTION: Do not decrease the fluid level to below MIN mark because air may enter into the system.

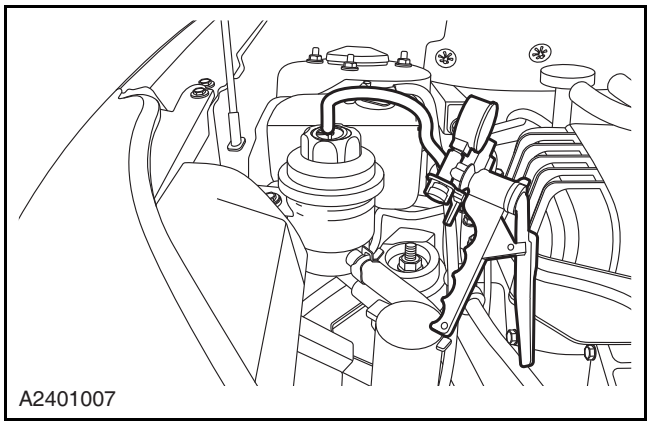
3. Turn off the engine ignition switch and inspect the leakages in steering fluid hose circuit, steering linkage dust boot, valve body and pump.

4. Inspect the fluid level and fill it if necessary.

5. Bleed the system with special tools.

CAUTION: When the vacuum pressure is reduced, keep the vacuum pressure at 51 kPa in the pump. If the vacuum pressure is reduced by 7 kpa or more within 5 minutes, inspect the system leakage.

- Start the engine and run it at idle speed. Rotate the steering wheel from one limited position to another (do not stay at limited position for over 10 seconds). Make sure the power steering fluid is totally discharged from the power system.
- Turn off the engine ignition switch and keep the vacuum pressure at 51 kPa until the air is exhausted (5 minutes at least).
- Release the vacuum with manual pressure pump.
- Repeat the bleeding process and rotate the steering wheel to left and stop.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6. Remove the manual vacuum pressure pump and cover and fill steering fluid if necessary.

7. Start the engine and run at idle speed. Rotate the steering wheel from one limited position to another. If there is obvious abnormal sound, repeat bleeding process.

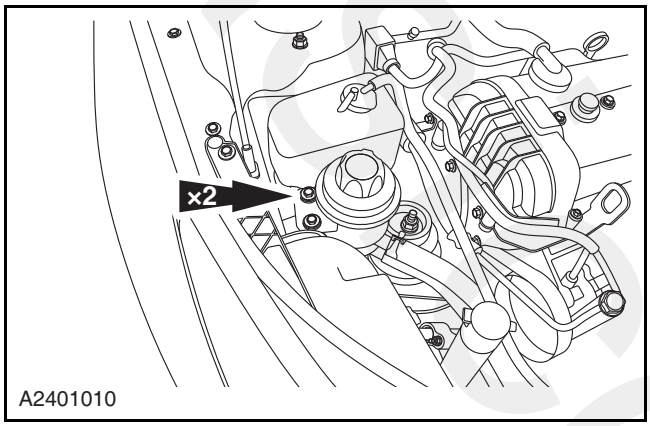
8. If there is serious obvious abnormal sound, repeat the bleeding process after 24 hours.

Steering Hose Cleaning

1. Lift the vehicle.

   Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).

2. Lower the vehicle near ground and rotate the steering wheel freely from one limited positon to another.
3. Remove the steering fluid reservior retaining bolt and detach it from bracket.



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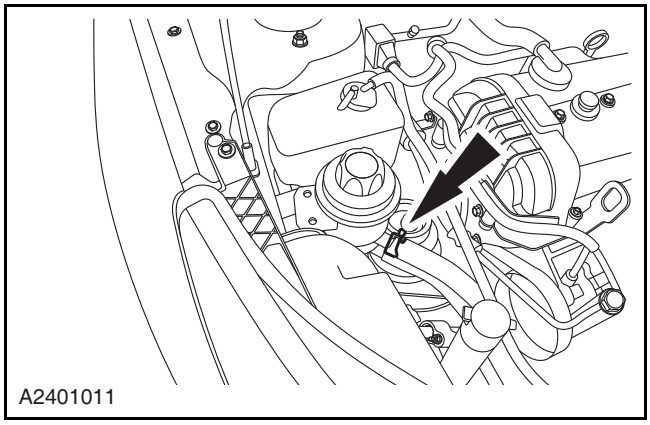
4. Detach the cooling return hose and let the steering fluid flow into a suitable container.

CAUTION: Use a suitable cap to cover fluid reservior.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5. Put the end of cooling return hose into steering fluid reclaimed container.
6. Slowly fill the fluid to reduce the possibility of causing bubble. Fluid level should be kept in the required positon.

   Fill the steering fluid to the MAX mark of fluid reservior.

CAUTION: When filling the fluid, make sure the power steering fluid is clean and not shaked before filling. Slowly fill the fluid into fluid reservior to reduce the possibility to cause bubble. Fluid level should be kept in the required position.

7. Start the motor for less than 30 s. Rotate the steering wheel from one limited position to another.

WARNING: Do not start the engine continously for over 30 s, because it will damage the start motor.

CAUTION: Make sure the fluid level in fluid reservior is higher than the MIN mark in the process of cleaning the system.

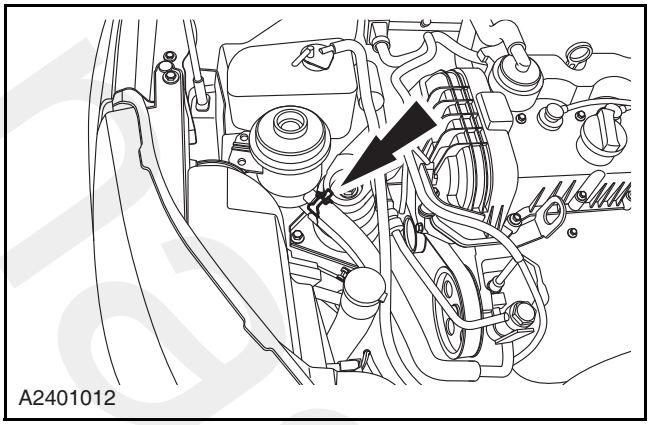
- Fill 1L pure power steering fluid into the fluid reservior with the help of one technician.

8. Wait for 60 s and cool the start motor.
9. Start the motor for less than 30 s and rotate the steering wheel from one limited position to another.
   - Fill 1L pure power steering fluid into fluid reservior again with the help of one technician.

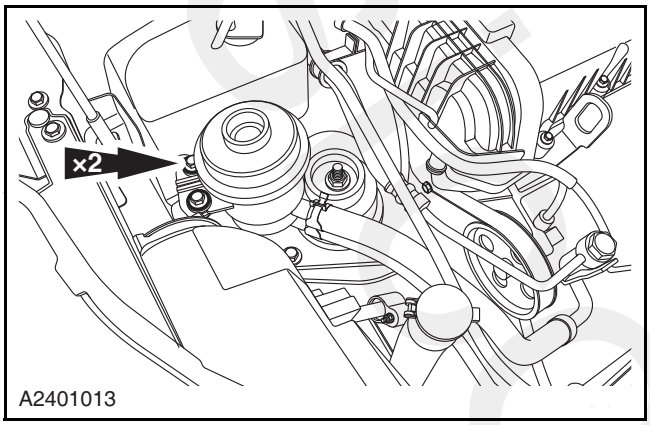
WARNING: Do not start the motor continously for over 30 s, because it will damage the start motor.

CAUTION: Make sure the fluid level in fluid reservior is higher than the MIN mark in the process of cleaning the system.

10. When fluid filling is finished, rotate the ignition switch to “LOCK” position.
11. Remove the reservior cap and install the cooling return hose.



12. Install the fluid reservior on the bracket.



13. Lower the vehicle.

14. Refill steering fluid into the fluid reservior and bleed the air.

Refer to: Steering System Bleeding (2.4.1 Steering System - General Information, General Procedures).

Symptom Diagnosis and Testing

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
•Tire pressure •Accessory driving belt •Tie rod end •Tie rod •Front strut and spring assembly •Front suspension control arm ball joint •Front suspension front control arm bushing •Retaining bolts on steering column shaft flexible joint •Wheels and tires • Power steering fluid hose leakage •Steering gear sleeve	•Power steering pressure switch

3. If an obvious cause for an observed or reported concern is found, correct the cause before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

If there is symptom but no diagnosis trouble code (DTC) is stored in control module and can not confirm symptom reasons in regular inspect, it is necessary to fix the fault in the order in the following chart.

Symptom	Possible Sources	Action
Steering column lean function fails and can not work	•Adjusting device	•Repair or replace the adjusting device **Refer to: Steering Column (2.4.4 Steering Column, Removal and Installation).**
	•Steering column is twisted	•Replace the steering column **Refer to: Steering Column (2.4.4 Steering Column, Removal and Installation).**
	•Component interference	•Eliminate the component interference
Noise from steering column	•Steering interference	•Adjust or replace steering column if necessary **Refer to: Steering Column (2.4.4 Steering Column, Removal and Installation).**
	•Steering gear	•Replace the steering gear **Refer to: Power Steering Gear (2.4.2 Power Steering, Removal and Installation).**
	•Steering linkage is loosed	•Fasten
Steering wheel trembe in brake	•Brake disc •Tire •Wheel alignment •Tie rod ball •Front swinging arm ball •Steering gear	**Refer to: Steering Wheel Tremble in Brake Diagnosis (2.4.1 Steering System - General Information, Symptom Diagnosis and Testing).**
Steering wheel off center	•Wheel alignment •Steering system components	**Refer to: Steering Wheel Off Center Diagnosis (2.1.1 Suspension - General Information, Symptom Diagnosis and Testing).**

Symptom	Possible Sources	Action
Abnormal steering return function	•Too large inner friction of tie rod ball joint	•Replace the tie rod ball **Refer to: Tie Rod Ball (2.4.3 Steering Linkage, Removal and Installation).**
	•Plug is too tight	•Pre-tighten it again
	•Steering tie rod and ball joint defect	•Replace the tie rod ball **Refer to: Power Steering Gear (2.4.2 Power Steering, Removal and Installation).**
	•The fixation between steering gear and frame is loose	•Retighten
	•Steering shaft and valve body aging	•Replace the steering gear **Refer to: Power Steering Gear (2.4.2 Power Steering, Removal and Installation).**
	•Rack bends	•Replace the steering gear **Refer to: Power Steering Gear (2.4.2 Power Steering, Removal and Installation).**
	•Gear bearing is damaged	•Replace the steering gear **Refer to: Power Steering Gear (2.4.2 Power Steering, Removal and Installation).**
	•Hose is twisted or damaged	•Redispose or replace the hose
	•Fluid pump pressure control valve is damaged	•Replace the power steering pump **Refer to: Power Steering Gear (2.4.2 Power Steering, Removal and Installation).**
	•Tire pressure is too low	•Inflate the wheel

Symptom	Possible Sources	Action
Abnormal steering return function	•Incorrect wheel alignement	•Adjust the wheel alignment parameter to specified value **Refer to: Front Wheel Toe-in Adjusting Procedure (2.1.1 Suspension system - General Information, General Procedures).**
Steering power fails	•Accessory drive belt is loose or worn •Leakage • Air in fluid hose •Steering power pump is damaged • Steering gear is damaged •Steering fluid is polluted •Hose blocked •Steering column is damaged •Suspension ball is seized	**Refer to: Steering Power Failure Diagnosis (2.4.1 Steering System - General Information, Symptom Diagnosis and Testing).**
Too large steering clearance between steering wheel	•Plug is loose	•Retighten
	•The bolts on steering gear is loose	•Retighten
	•The ball bolts on steering tie rod assembly are worn or loose	•Retighten or replace it if necessary **Refer to: Tie Rod Ball (2.4.3 Steering Linkage, Removal and Installation).**
Squeak between rack and gear	•Hose and chassis interference	•Redispose hose
	•Steering gear mounting bolts are loose	•Retighten
	•Tie rod ball is loose	•Retighten
	•Tie rod ball worn and aging	•Replace the tie rod ball **Refer to: Tie Rod Ball (2.4.3 Steering Linkage, Removal and Installation).**

Symptom	Possible Sources	Action
Abnormal noise in fluid pump	•Insufficient steering fluid	•Fill fluid **Refer to: Power Steering Fluid Filling (2.4.1 Steering System - General Information, General Procedures).**
	•Bubble in fluid	•Bleeding **Refer to: Steering Sytem Bleeding (2.4.1 Steering System - General Information, General Procedures).**
	•Bolts on fluid pump are loosed	•Retighten

Steering Wheel Tremble in Brake Diagnosis

Test Conditions	Details/Results/Actions
1.Inspect tires and wheels	
	A.Inspect whether the tire type, air pressure and tire surface wear are close to each other and the tire uneven wear. B.Inspect the wheel for twist, distortion and damage. Are the tires and wheels normal? **Y** Go to step 2. **N** Adjust or replace the wheels and tires.
2.Inspect the brake disc and the brake pad	
	A.Inspect the brake disc **Refer to: Inspect Brake Disc Runout (2.3.1 Brake Sysem - General Information, General Procedures).** B.Inspect the brake pad. **Refer to: Brake Disc (2.3.3 Front Disc Brake, Removal and Installation).** Whether the brake disc and the brake pad are normal? **Y** Go to step 3. **N** Adjust or replace the brake disc and the brake pad.

Test Conditions	Details/Results/Actions
3. Inspect the wheel alignment	
	A.Inspect the wheel alignment. **Refer to: Front Wheel Toe-in Adjusting Procedure (2.1.1 Suspension System - General Information, General Procedures).** Whether the wheel alignment parameter is normal? **Y** Go to step 4. **N** Adjsut the wheel alignment parameter. **Refer to: Front Wheel Toe-in Adjustment (2.1.1 Suspension System - General Information, General Procedures).**
4.Inspect the tie rod ball and the front control arm ball	
	A.Lift the vehicle. **Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).** B.Inspect the tie rod ball and the front control arm ball. Whether the ball is normal? **Y** Replace the steering gear. **Refer to: Power Steering Gear (2.1.2 Power Steering, Removal and Installation).** **N** Replace the tie rod ball. **Refer to: Tie Rod Ball (2.4.3 Steering Linkage, Removal and Installation).** Replace the front control arm ball. **Refer to: Front Control Arm (2.1.2 Front Suspension, Removal and Installation).**

Steering Power Failure Diagnosis

Test Conditions	Details/Results/Actions
1.Inspect the power steering fluid	
	A.Inspect whether the power steering fluid color is lighted or darken with abnormal smell and poor liquidity. Whether the power steering fluid is normal? **Y** Go to step 2. **N** Replace the power steering fluid.
2.Inspect the steering power pump drive belt	
	A.Turn the ignition switch to “LOCK” position. B.Inspect whether the steering power pump drive belt is cracked and shortage in tensioning force or slided. Whether the steering power pump drive belt is normal? **Y** Go to step 3. **N** Adjust or replace the steering power pump drive belt.
3. Inspect the leakage	
	A.Inspect the fluid leakage of power steering system. Whether the fluid is leaked? **Y** Repair the fluid leakgae. **N** Go to step 4.
4.Inspect the power steering hose	
	A.Turn the ignition switch to “LOCK” position. B.Inspect whether the power steering hose is folded, twisted, damaged or blocked. Whether the power steering hose is normal? **Y** Go to step 5. **N** Replace the power steering hose.

Test Conditions	Details/Results/Actions
5.Inspect the air in hose	
	A.Carry out the bleeding procedure of steering system. **Refer to: Steering System Bleeding (2.4.1 Steering system - General Information, General Procedures).** Whether the system works normally? **Y** Verify the maintenance is finished. **N** Go to step 6.
6.Inspect the power steering pump	
	A.Remove the power steering pump. **Refer to: Power Steering Pump (2.4.2 Power Steering, Removal and Installation).** B.Install the power steering pump in good state. Whether the system works normally? **Y** Replace the power steering pump. **N** Go to step 7.
7.Inspect the steering gear	
	A.Remove the steering gear. **Refer to: Power Steering Gear (2.4.2 Power Steering, Removal and Installation).** B.Install the steering gear in good state. Whether the system works normally? **Y** Replace the power steering gear. **N** Go to step 8.

Test Conditions	Details/Results/Actions
8.Inspecet the steering column	
	A.Turn the steering wheel and inspect the turning interference and twisted situation of the steering column. Whether the steering column is normal? **Y** Adjust or replace the steering tie rod. **N** Adjust or replace the steering column.