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EADO Workshop Manual

Suspension system- General Information

EADORM2D/3/1

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2.1 Suspension system

2012 EADO

2. 1. 1Suspension system- General Information

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Specifications

General Specifications

Name		Specifications
Front wheels alignment parameter	Front wheel toe-in	$0.1^{\circ} \pm 0.1^{\circ}$
	Front wheel camber angle	$-0.45^{\circ} \pm 0.5^{\circ}$
	Caster angle	$13.18^{\circ} \pm 0.5^{\circ}$
	Kingpin inclination angle	$4.19^{\circ} \pm 0.5^{\circ}$
Rear wheels alignment parameter	Rear wheel toe-in	$0.2^{\circ} \pm 0.1^{\circ}$
	Rear wheel camber angle	$-1.5^{\circ} \pm 0.5^{\circ}$

 **CAUTION:** For EADO, only the front wheel toe-in can be adjusted. If other alignment data is out of the range, the suspension system shall be adjusted or replaced.

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Description and Operation

System Overview

The primary aim of the vehicle engineering is to ensure the safety and reliability of the steering and suspension system. Every component shall be of enough strength to bear and absorb extreme shock. The steering system and the front & rear suspension system must keep certain geometrical relationship with the vehicle body.

The steering and the suspension system require the front wheel to return automatically and minimize the front wheel rolling resistance and the road friction force. It helps users control the vehicle directions easily and comfortably.

Comprehensive wheel alignment inspection includes front toe-in angle and camber angle measurement. 4-wheel alignment can make sure all 4 wheels can turn to the same directions accurately. After geometrical alignment, vehicle can get best fuel economics and tire service life and optimize the steering performance.

1. Caster angle

Caster angle refers to the pitch or tip back capacity from the highest point of the steering axial line deviating the vertical surface, observed from the lateral of vehicle. Tip back is positive and pitch is negative. Caster angle influences the direction control in steering but has no impact on the tire wear. Too soft spring or overload will influence the caster angle. When the caster angle of the vehicle is positive, pull the vehicle to its center. The minimal positive caster angle will lead the side-way and rolling of the vehicle. The measure unit of caster angle is degree and can not be adjusted.

2. Camber angle

Camber angle is the angle of tire top deviating vertical surface, observed from the front of vehicle. The camber angle is positive when tire toes out. When tire toes in, camber angle is negative. Camber angle is the angle deviating vertical surface. Camber angle will influence direction control and tire wear. If vehicle positive camber angle is too large, it will lead tire outer shoulder wear. If vehicle negative camber angle is too large, it will lead tire inner shoulder wear. Camber angle can not be adjusted.

3. Toe-in description

Toe-in is the tire inner drifts from geometric center line or thrust line and negative toe-in is the tire outer drifts from geometric center line or thrust line. Toe-in is used to ensure the smooth rolling of tire. Toe-in can counteract the slight deviation of the wheel supporting system in wheel rolling forward. The specified toe-in angle is the setting value of toe-in reaching 0° when vehicle drives forward.

Incorrect toe-in or negative toe-in will lead tire wear and reduce fuel economics. Because every steering and suspension system component wear will become serious with the increasing driving mileage, the toe-in should be increased to compensate the wear of these components. It is necessary to calibrate toe-in angle finally.

4. Steering axis inclination

Steering axis inclination (SAI) means the slope capacity of steering knuckle top deviating vertical surface. Observing from vehicle head, steering axis inclination is the angle of vertical surface and the line of crossing column center and lower ball joint. Steering axle inclination is helpful to keep vehicle driving straightly and assist the wheel to return to right ahead. Steering axis inclination of the front wheel driving vehicle is negative.

5. Wrap angle

Observing from the vehicle head, the wrap angle is the angle between the camber angle and the straight line crossing the traveller center and the lower ball joint. Wrap angle is accounted according to the angle. A lot of alignment table can not measure the wrap angle directly. When determining the wrap angle, subtract the negative camber angle or add the positive camber angle from the steering axis inclination.

6. Buffering tire radius

Buffering tire radius is the distance from the vertical surface to the line crossing the column center and the lower ball joint. Buffering tire radius is the design feature of the vehicle. Buffering tire can not be adjusted.

7. Rear dislocation

Rear dislocation is the distance of a front hub and the bearing assembly falling behind the other front hub and bearing assembly. Rear dislocation is caused by the road obstruction and crash.

8. Steering angle

Steering angle is the angle of every front wheel related to the vertical direction when steering.

 **WARNING: Make sure the right tire pressure before and after the inspection.**

Excessive tire wear, depression or imbalance will result in the vehicle vibration, shaking or smooth drive.

The pavement surface unevenness or undulation will also result in situations above. If situation above happens on the road, please drive on different pavements for confirmation.

When looking for the vehicle vibration reason, the tire is not the first to considered, followings can also result in the vibration:

1. Loosen or wear front wheel bearing.
2. Loosen or wear suspension or steering components.
3. Excessive front brake disc runout.
4. Loosen engine or transaxle support.
5. Engine accessories.

This chapter includes the suspension and tire related vibration.

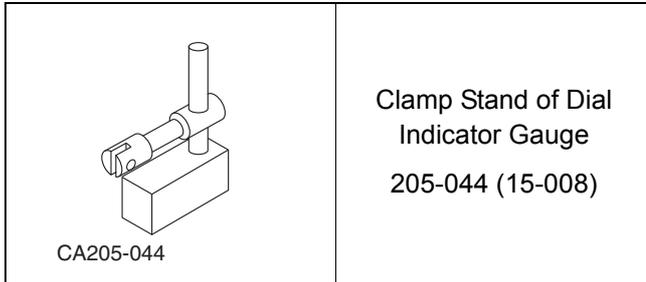
Usually, excessive noise is the friction result of the wear tire position with the road. The the tire whine sound is different from the transaxle sound, which depends on the load or speed. While the tire noise keeps the same in a certain range.

To confirm the tire noise is unrelated with the vehicle vibration, you can inspect the noise by excessive inflation. The vehicle vibration level and noise depend on the tire pressure.

General Procedures

Wheel Bearing Inspection

Special Tool



General Tool

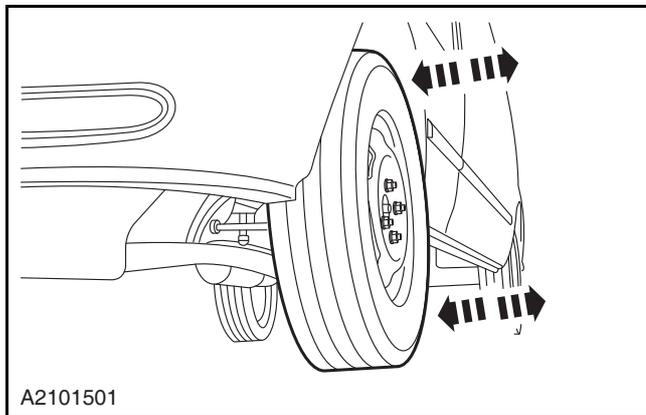


⚠ CAUTION: Do not mix up the front swinging arm ball joint loosen and the bearing loosen.

1. Lift the front vehicle.

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

2. Swag wheel. Inspect whether the front wheel bearing is loose.

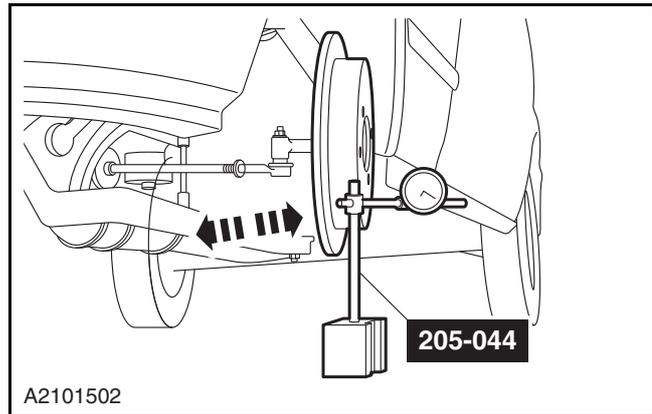


3. Rotate the wheel rapidly to make sure that wheel rotates smoothly and peacefully.
4. Remove the front brake caliper and the brake disc plate.

Refer to: Brake Caliper (2.3.3 Front Disc Brake, Removal and Installation).

5. Install a suitable dial indicator gauge retainer or similar equipment, then push and pull wheel hub. Measure the axial clearance between the hub and the front wheel bearing

assembly. There shall be no axial clearance. Replace the front wheel bearing if necessary.



6. Remove the front brake caliper and the plate.

Tie Rod Ball Joint Inspection

⚠ CAUTION: Inspect the worn of tie rod ball joint first before front suspension inspection or alignment.

1. Inspect the air pressure of 4 tires.
2. Lift the vehicle.

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

Inspect whether the front suspension ball joint and the support is loosened, worn or damaged. Relative information please refer to the front control arm ball joint chapter. Tighten all loosen nuts according to the torque specification. Replace the part if necessary.

Refer to: Front Wheel Steering Knuckle (2.1.2 Front Suspension, Removal and Installation), Tie Rod Ball Joint (2.4.3 Steering Gear, Removal and Installation).

3. Inspect whether the steering gear and the tie rod connection are loose. Tighten according to the torque specification. Replace the worn or damaged tie rod ball joint.

Refer to: Tie Rod Ball Joint (2.4.3 Steering Gear, Removal and Installation).

4. Remove the front wheel, inspect the tire runout and monolateral worn and carry out the tire dynamic poise.

5. Inspect the working situation of the suspension device and the attachment. Refer to the suspension assembly inspection for relative information. The locked suspension assembly can not reach the normal position and will influence the front wheel alignment.

Front Control Arm Ball Joint Inspection

1. Lift the vehicle.

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

2. Hold the outer end of the front control arm and try to move up and down and observe whether it moves. Free movement will bring with click sound and cause damage.
3. If there is free movement, replace the ball joint.

Refer to: Front Control Arm (2.1.2 Front Suspension, Removal and Installation).

4. Carry out the front wheel alignment after replacing the ball joint. Refer to the general flow for relative information.

Suspension Device Inspection

 **CAUTION: All vehicles are equipped with the low pressure gas-fluid suspension device. This device can not be adjusted or refilled.**

1. Oil leaks. It is allowed to deposit a layer of oil film (exudation) on the front and rear shock absorber, it is normal. Oil leakage means a layer of thick oil accumulating at the outside of the shock absorber shell. It is normally noticed due to a collection of dust on it. The oil leakage in shock absorption is the normal function and no necessary to replace shock absorber. The leakage means when the shock absorber device suspension is covered by leaking oil and the oil will drop on ground.

If this situation happens:

- Make sure the observing oil film is from the shock absorption device only.
- Replace the worn or damaged shock absorber.

2. The vehicle body subsidises. Generally, the problem is solved by replacing the front and rear shock absorbers. Because the shock absorber we designed is a hydraulic pressure device, which is unlike the suspension spring and can not be used to bear the load. So the suspension device replacement can not solve the problem.

 **CAUTION: When a suspension device is damaged, it is unnecessary to replace them in pairs. In the past, we suggest to replace the shock absorber in pairs if one is damaged. At present, since the new technology and strengthening management in manufacturing, air sealing technology is greatly improved to increase the reliability of the shock absorber.**

Vehicle Inspection

1. Inspect the air pressure of all tires.
2. Inspect the tire to make sure the alignment of tie rod ball joint and tire balance for cracks and abnormal tubers.
3. Inspect the optional suspension equipment, such as the suspension for heavy trailer traction. The suspension is firmer than standard suspension in driving.
4. Inspect the vehicle for overload. Inspect whether there are heavy things in trunk.
5. After finishing above steps, carry out the road test to verify the symptoms that are brought forward by customer.

Lift the Vehicle for Inspection

1. Noise:

The loose of suspension and its attachment may make noise. Inspect and tighten suspension assembly and its attachment. Replace lower bracket bushing if it is damaged. Inspect whether there is outer damage on front and rear suspension assembly.

2. Bottom / Rebound:

Inspect the travel of the rubber shock absorption bushing. Install a new shock absorption bushing if it is damaged or lost. Inspect whether the shock absorption bushing is overloaded. Replace it if such problem appears.

3. Replace the damaged shock absorber if is worn.

Workbench Test

The interior shock absorber is full of compressed air and shall be completely extended when it is not limited. No extension means that the shock absorber is damaged. Install a new shock absorber. Inspect the length of the shock absorber. If it dose not satisfy the requirement, it means that certain parts fail to meet the requirement and the shock absorption device shall be replaced. When the suspension device is in the vertical position, compress it and spread it for 3 times in order to clean the air entering the pressing cabin in processing.

⚠ WARNING: When removing the dust boot or the limited block, avoid too much shock absorber push rod pushing down, preventing damage to the inner components.

The shock absorber shall be installed on the vise upright. Compress the shock absorber in a long travel as quick as possible. Every compressing action must be stable and consistent. It is normal for the spread resistance larger than the compressing resistance.

Following situations are abnormal:

- In the process of installing and returning after installation, the shock absorber lags and jumps.
- Blocked.
- Noise, light whoose, for example, the click sound in rapid returning.
- Leakage.
- The shock absorber pull rod is completely extended and its piston swags compared with the shock absorber casing.

If the shock absorber is still unstable after air cleaning, please install a new shock absorber.

[Refer to: Front Strut and Spring Assembly \(2.1.2 Front Suspension, Disassembly and Assembly\), Rear Shock Absorber Assembly \(2.1.3 Rear Suspension, Removal and Installation\).](#)

Rear Shock Absorber Inspection

Inspect the shock abosrber regularly as following:

1. Inspect whether there is oil leakage in rear shock absorber. (A layer oil firm is allowed and make sure the leakage is not from other locations).
2. Inspect the working state of the rear shock absorber.
3. Inspect the working state of the upper and lower bushings.

Road Test

The tire vibration diagnosis is started with the road test. Communicate with the customer for more information about the vibration source. Road test shall be carried out on the flat ground. Pay attention to and record following items if vibration happens:

1. The vehicle speed when vibration happens.
2. The vibration types in all speed range.
3. Mechanical or audible virbation.
4. Following conditions will influence the vibration:
 - Engine torque.
 - Vehicle speed.
 - Engine speed.
 - Vibration type - sensitive: sensitive torque, vehicle speed or engine speed.

Following explanations are helpful to identify the vibration sources.

1. Sensitive torque

It means the situations will become better or worse due to acceleration, deceleration, coasting, constant speed and engine torque.

2. Sensitive vehicle speed

It means the vibration always appears at the same vehicle speed and will not be influenced by the engine torque, engine speed or the choice of driving axle shaft.

3. Sensitive engine speed

It means the vibration appear at the speed in different gears. Sometimes it can be tested when the engine speed is increased or decreased under the neutral gear or under the stall test of transmission. In case it is related to the engine speed, it might be irrelevant with the tires.

If the tire makes sob sound in road test but no vibration and shake, the noise may be caused by the contact between tire and road surface.

Large noise indicates a flat tire or something soft contacting the road surface. The sob sound of tire will be seemed as the beam axle noise by mistake. The tire sob will be heard continuously at a certain vehicle speed.

Front Wheel Toe-in Inspection and Adjustment Procedures

General Tool

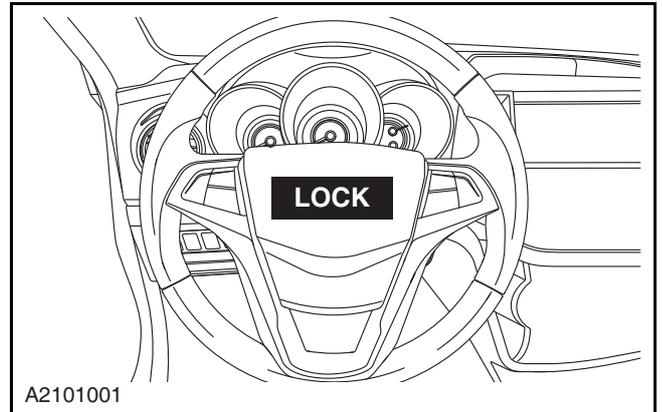
Wheel alignment gauge

Inspection

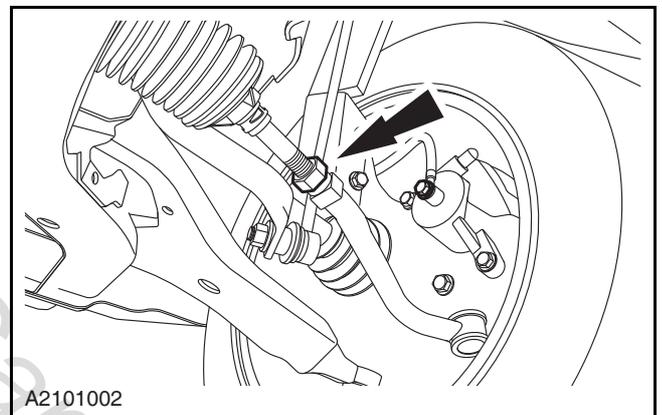
- Adjust the toe-in on the flat ground according to instruction with the wheel alignment gauge.
 - Inspect the suspension and the steering components for wear.
 - Inspect and adjust the tire air pressure if necessary.
 - Make sure the vehicle is of gross weight. Spare tire, jack and onboard tool are equipped. Take out other tools or goods.
 - Press the vehicle up and down to set the suspension system in the normal position.

Adjustment

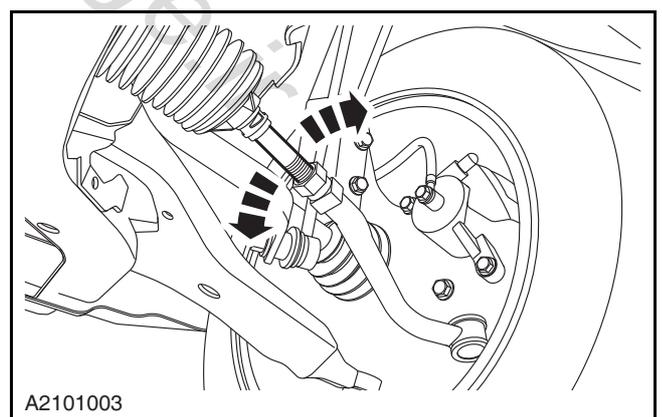
- Turn the steering wheel to the center and lock it.



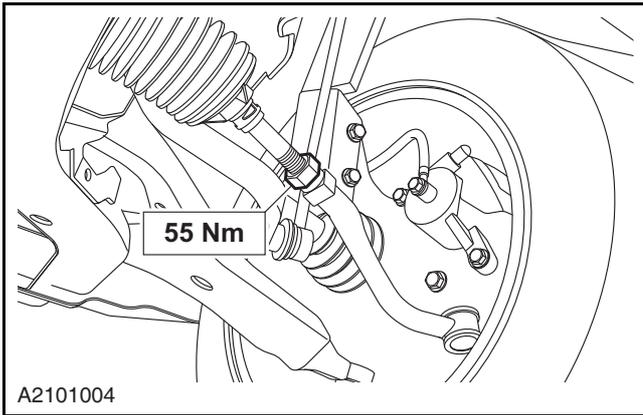
- Release the tie rod ball joint retaining nut.



- Turn the tie rod clockwise or counterclockwise to adjust the toe-in.



4. Lock the tie rod ball joint adjusting nut.



5. Inspect the toe-in

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Symptom Diagnosis and Testing

Inspection and Verification

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

Visual Inspection Chart

Mechanical
<ul style="list-style-type: none">•Tire pressure•Wheels and tires•Front wheel steering knuckle•Tie rod ball joint•Front control arm and ball joint pin•Front suspension lower control arm bushing•Front strut and spring•Front strut stabilizer rod and connection rod•Rear spring•Rear shock absorber•Rear shaft and rear shaft bushing

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) 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) stored in control module and can not confirm the causes through the General Procedures, it is necessary to diagnose and fix the problem in the sequence as shown in the following chart.

Symptom	Possible Sources	Action
Vehicle Drift	<ul style="list-style-type: none"> •Wheels and tires •Wheel alignment •Rear dislocation •Driving height •Wheel bearing •Ball joint •Brake drag •Steering pull rod •Rear suspension 	<p>Refer to: Vehicle Drift Diagnostic Procedures (2.1.1 Suspension System-General Information, Symptom Diagnosis and Testing).</p>
Abnormal driving track (vehicle can not keep driving straight)	<ul style="list-style-type: none"> •Wheels and tires •Wheel alignment •Wheel bearing •Ball joint •Control arm bushing •Steering pull rod clearance •Steering gear clearance •Rear suspension 	<p>Refer to: Abnormal Driving Track (Vehicle can not run straight) Diagnosis Procedures (2.1.1 Suspension System-General Information, Symptom Diagnosis and Testing).</p>
Vehicle swing	<ul style="list-style-type: none"> •Tire out of balance and over-worn •Front wheel half shaft worn •Wheel bearing wearing •Steering system worn •Suspension device assembly loose and worn. •Front control arm ball joint worn •Front control arm bushing of the front suspension worn and loose •Stabilizer bar bushing worn •Rear suspension and bushing is worn and loose. •Incorrect wheel alignment 	<p>Refer to: Vehicle Swing Diagnostic Procedures (2.1.1 Suspension System-General Information, Symptom Diagnosis and Testing).</p>

Symptom	Possible Sources	Action
Vehicle vibrates in driving	•Tire out of balance and over-worn	<ul style="list-style-type: none"> •Inspect the tire <p>Refer to: Tire Wear Inspection (2.1.4 Wheels and Tires,General Inspection).</p>
	•Front wheel half shaft worn	<ul style="list-style-type: none"> •Inspect the front wheel half shaft <p>Refer to: Halfshaft Inspection (2.2.1 Drive System-General Information, General Inspection).</p>
	•Wheel bearing worn.	<ul style="list-style-type: none"> •Replace the wheel bearing <p>Refer to: Front Wheel Bearing Removal and Installation (2.1.2 Front Suspension, Removal and Installation), Rear Wheel Bearing Removal and Installation (2.1.3 Rear Suspension, Removal and Installation).</p>
	•Steering system worn	<ul style="list-style-type: none"> •Replace the worn steering system parts
	•Suspension device assembly loose or worn	<ul style="list-style-type: none"> •Inspect suspension device assembly <p>Refer to: Torque Specifications (2.1.2 Front Suspension, Specifications), Torque Specifications (2.1.3 Rear Suspension, Specifications).</p>
	•Suspension device assembly support loose and worn	<ul style="list-style-type: none"> •Tighten it according to the torque requirement <p>Refer to: Torque Specifications (2.1.2 Front Suspension, Specifications), Torque Specifications (2.1.3 Rear Suspension, Specifications).</p>
	•Front control arm ball joint worn	<ul style="list-style-type: none"> •Replace the front control arm ball joint <p>Refer to: Front Control Arm and Control Arm Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).</p>
	•Front control arm bushing of the front suspension worn and loose	<ul style="list-style-type: none"> •Replace the bushing of the front suspension front control arm <p>Refer to: Front Control Arm and Control Arm Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).</p>

Symptom	Possible Sources	Action
Vehicle vibrates in driving	<ul style="list-style-type: none"> • Incorrect wheel alignment 	<ul style="list-style-type: none"> • Align the wheels <p>Refer to: Wheel Alignment (2.1.1 Suspension System-General Information, General Inspection).</p>
	<ul style="list-style-type: none"> • Stabilizer bar bushing worn 	<ul style="list-style-type: none"> • Replace the stabilizer bar bushing or link. <p>Refer to: Front Stabilizer Bar (2.1.2 Front Suspension, Removal and Installation).</p>
	<ul style="list-style-type: none"> • Rear suspension and shaft bushing worn or loosen 	<ul style="list-style-type: none"> • Replace the rear suspension and shaft bushing, if necessary <p>Refer to: Rear Axle (2.1.3 Rear Suspension, Removal and Installation), Rear Axle Bushing (2.1.3 Rear Suspension, Removal and Installation).</p>
Steering wheel off center diagnosis	<ul style="list-style-type: none"> • Wheel alignment • Steering system components 	Refer to: Steering Wheel Off Center Diagnosis Procedures
Excessive noise	<ul style="list-style-type: none"> • Suspension assembly support loose or worn • Wheel bearing worn • Front control arm bushing • Damping spring • Tire • Front control arm ball joint 	Refer to: Excessive Noise Diagnostic Procedures (2.1.1 Suspension System - General Information, Symptom Diagnosis and Testing).
Abnormal wear of wheel	<ul style="list-style-type: none"> • Tire conversion • Tire pressure • Wheel distortion • Tire imbalance • Wheel alignment • Suspension part • High speed running • Rear dislocation • Overload • Poor operation habits 	Refer to: Abnormal Tire Wear Diagnosis Procedures (2.1.1 Suspension System General Information, Symptom Diagnosis and Testing).

Symptom	Possible Sources	Action
Heavy steering	<ul style="list-style-type: none"> • Too large positive camber angle 	<ul style="list-style-type: none"> • Align the wheels <p>Refer to: Front Wheel Toe-in Adjusting Procedure (2.1.1 Suspension System-General Information, General Inspection).</p>
	<ul style="list-style-type: none"> • Incorrect vehicle driving height (front or rear, up or down) 	<ul style="list-style-type: none"> • The load meets the standard and replace standard spring components
	<ul style="list-style-type: none"> • Steering gear or tie rod wearing 	<ul style="list-style-type: none"> • Replace the worn steering system parts
	<ul style="list-style-type: none"> • Front suspension front control arm ball joint worn 	<ul style="list-style-type: none"> • Replace the control arm ball joint of the front shaft <p>Refer to: Front Control Arm and Control Arm Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).</p>
	<ul style="list-style-type: none"> • Tire wearing or loosing balance 	<ul style="list-style-type: none"> • Inspect the tire <p>Refer to: Tire Wear Inspection (2.1.4 Wheels and Tires, General Inspection).</p>
	<ul style="list-style-type: none"> • Insufficient power steering 	<ul style="list-style-type: none"> • Inspect the oil pressure and supplement of power steering system. Inspect the power steering system and replace worn components.

Symptom	Possible Sources	Action
Unstable direction	•Tire out of balance, damaged or with too large runout	•Inspect the tire Refer to: Tire Wear Inspection (2.1.4 Wheels and Tires, General Inspection).
	•Toe-in value exceeding the specification	•Align the wheels Refer to: Front Wheel Toe-in Adjusting Procedure (2.1.1 Suspension System - General Information, General Inspection).
	•Steering system worn	•Replace the worn steering system parts
	•Front suspension front control arm ball joint worn	•Replace the front control arm ball joint Refer to: Front Control Arm and Control Arm Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).
	•Front or rear damping springs become soft	•Inspect the damping spring and replace it if necessary Refer to: Front Strut Assembly Disassembly and Assembly (2.1.2 Front Suspension, Removal and Installation), Rear Shock Absorber Assembly/Rear Coil Spring/ Upper and Lower Rear Coil Spring Stand (2.1.3 Rear Suspension, Removal and Installation).
	•Front or rear suspensions assembly worn	•Replace the worn components of the suspension assembly
	•Rear suspension, shaft bushing or bolt loose or worn	•Replace the worn components of the rear suspension.
	•Stabilizer bar bushing or link worn	•Replace the stabilizer bar bushing or linkage Refer to: Front Stabilizer Bar (2.1.2 Front Suspension, Removal and Installation).

Symptom	Possible Sources	Action
Steering wheel can not return normally	<ul style="list-style-type: none"> •Abnormal wheel alignment 	<ul style="list-style-type: none"> •Align the wheels <p>Refer to: Front Wheel Toe-in Adjusting Procedure (2.1.1 Suspension System - General Information, General Inspection).</p>
	<ul style="list-style-type: none"> •Steering system worn 	<ul style="list-style-type: none"> •Inspect the steering system <p>Refer to: (2.4.1 Steering System, General Inspection).</p>
	<ul style="list-style-type: none"> •Front suspension front control arm ball joint worn 	<ul style="list-style-type: none"> •Replace the front control arm bushing of the front suspension <p>Refer to: Front Control Arm and Control Arm Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).</p>
The vehicle body swing	<ul style="list-style-type: none"> •Front stabilizer bar linkage or the bearing worn (if applicable) 	<ul style="list-style-type: none"> •Replace the stabilizer bar linkage or the shaft bushing <p>Refer to: Front Stabilizer Bar (2.1.2 Front Suspension, Removal and Installation).</p>
	<ul style="list-style-type: none"> •Front suspension front control arm shaft bushing loose or worn 	<ul style="list-style-type: none"> •Repair or replace the front control arm shaft bushing <p>Refer to: Front Control Arm and Control Arm Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).</p>
	<ul style="list-style-type: none"> •Suspension assembly loose or worn 	<ul style="list-style-type: none"> •Inspect the suspension assembly and replace the worn parts
Vehicle body slants	<ul style="list-style-type: none"> •Front or rear damping spring becomes soft or damaged 	<ul style="list-style-type: none"> •Inspect damping spring and replace it if necessary <p>Refer to: Front Strut Assembly Disassembly and Assembly (2.1.2 Front Suspension, Removal and Installation), Rear Shock Absorber Assembly/Rear Coil Spring/ Upper and Lower Rear Coil Spring Stand (2.1.3 Rear Suspension, Removal and Installation).</p>
	<ul style="list-style-type: none"> •Tire pressure is improper 	<ul style="list-style-type: none"> •Adjust the tire pressure

Symptom	Possible Sources	Action
Poor driving comfort	<ul style="list-style-type: none"> •Front or rear damping springs become soft 	<ul style="list-style-type: none"> •Inspect damping spring and replace it if necessary <p>Refer to: Front Strut Assembly Disassembly and Assembly (2.1.2 Front Suspension, Removal and Installation), Rear Shock Absorber Assembly/Rear Coil Spring/ Upper and Lower Rear Coil Spring Stand (2.1.3 Rear Suspension, Removal and Installation).</p>
	<ul style="list-style-type: none"> •Front or rear suspensions assembly worn 	<ul style="list-style-type: none"> •Replace the worn components of the suspension assembly
Vibration in driving	<ul style="list-style-type: none"> •Tire •Front wheel bearing •Rear wheel bearing •Front wheel hub •Rear wheel hub 	<p>Refer to: Vibration Drive Diagnostic Procedures (2.1.1 Suspension System-General Information, Symptom Diagnosis and Testing).</p>

Vehicle Drift Diagnosis Procedures

Test Conditions	Details/Results/Actions
1. Inspect the left and right drift	
 WARNING: In order to avoid personal injury caused by out of control operation, the road test should be conducted by two persons jointly to keep safe driving. Control the steering wheel suitably. Failure to follow this instruction may result in personal injury.	
	A. Drive the vehicle on the flat road at the speed of 88 km/h. B. Make sure there is no crosswind and strong wind in driving. C. Drive back and forth at least for 2 times. D. If the vehicle deviating value is 12ft within 7 seconds, it indicates the vehicle drifts. Does vehicle drift? Y Go to step 2. N Adjust the steering wheel to the proper position.
2. Inspect the tire	
	A. Inspect whether all wheels and tires type are the same. B. Inspect whether all tire worn levels are similar. C. Inspect the tire for bulge or cracks. D. Inspect the tire air pressure. Inspect whether the wheel is normal? Y Go to step 3. N Adjust or replace tire.
3. Inspect the influence of tire to fault	
	A. Exchange the right and left tires of front suspension. B. Install 4 tires in good state if necessary. Does the vehicle drift? Y Go to step 4. N Replace the tire.

Test Conditions	Details/Results/Actions
4. Inspect the left and right wheel track	<p>A. Inspect left and right wheel track.</p> <p>Are the left and the right wheel track the same?</p> <p>Y</p> <p>Go to step 5.</p> <p>N</p> <p>Calibrate the left and the right wheel track.</p>
5. Inspect steering connection rod	<p>A. Lift the vehicle.</p> <p>Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B. Inspect the steering connection rod for excessive wear.</p> <p>Is steering connection rod excessive wear?</p> <p>Y</p> <p>Replace or repair the damaged parts.</p> <p>N</p> <p>Go to step 6.</p>
6. Inspect the driving height.	<p>A. Inspect the driving height.</p> <p>Is the driving height normal?</p> <p>Y</p> <p>Go to step 7.</p> <p>N</p> <p>Repair the fault due to inconsistent driving height.</p>
7. Inspect the wheel alignment	<p>A. Inspect the wheel alignment.</p> <p>Is the steering wheel in central position or the wheel alignment data in the specification?</p> <p>Y</p> <p>Go to step 8.</p> <p>N</p> <p>If necessary, carry out the wheel alignment.</p>

Test Conditions	Details/Results/Actions
8. Inspect the brake lag	<p>A.Lift the vehicle.</p> <p style="color: blue;">Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B.Inspect the wheel for brake lag.</p> <p>Does the wheel brake lag?</p> <p>Y</p> <p>Repair the brake lag fault.</p> <p style="color: blue;">Refer to: Brake Drag (2.3.1 Brake System-General Information, Symptom Diagnosis and Testing).</p> <p>N</p> <p>Go to step 9.</p>
9. Inspect the rear suspension	<p>A.Inspect the rear suspension alignment parameter.</p> <p>Is the rear suspension normal?</p> <p>Y</p> <p>Inspect the suspension parts for wear. Replace or repair damaged components if necessary.</p> <p style="color: blue;">Refer to: Front Strut Assembly Disassembly and Assembly (2.1.2 Front Suspension, Removal and Installation), Rear Shock Absorber Assembly\Rear Coil Spring\Lower and Upper Rear Coil Spring Stand (2.1.3 Rear Suspension, Removal and Installation).</p> <p>N</p> <p>Adjust or repair the abnormal rear suspension alignment.</p>

Abnormal Driving Track (Vehicle Can Not Run Straight) Diagnosis Procedures

Test Conditions	Details/Results/Actions
<p> WARNING: In order to avoid personal injury caused by out of control operation, the road test should be conducted by two persons jointly to keep safe driving. Control the steering wheel suitably. Failure to follow this instruction may result in personal injury.</p>	
1. Inspect the tire	
	<p>A. Inspect whether all wheels and tires type are the same.</p> <p>B. Inspect whether all tire worn levels are similar.</p> <p>C. Inspect the tire for bulge or cracks.</p> <p>D. Inspect the tire air pressure.</p> <p>Inspect whether the wheel is normal?</p> <p>Y</p> <p>Go to step 2.</p> <p>N</p> <p>Adjust or replace tire.</p>
2. Inspect the influence of tire to fault	
	<p>A. Exchange the right and left tires of front suspension.</p> <p>B. Install 4 tires in good state if necessary.</p> <p>Is the vehicle drive normal?</p> <p>Y</p> <p>Go to step 3.</p> <p>N</p> <p>Replace the tire.</p>
3. Inspect the front control arm bushing	
	<p>A. Inspect whether front swinging arm bushing cracks, looses or moves.</p> <p>Is the front swinging arm normal?</p> <p>Y</p> <p>Go to step 4.</p> <p>N</p> <p>Replace the front swinging arm bushing.</p> <p>Refer to: Front Control Arm and Arm Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).</p>

Test Conditions	Details/Results/Actions
4. Inspect steering connection rod	<p>A. Lift the vehicle.</p> <p style="color: blue;">Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B. Inspect the steering connection rod for excessive wear.</p> <p>Is steering connection rod excessive wear?</p> <p>Y</p> <p>Replace or repair the damaged parts.</p> <p>N</p> <p>Go to step 5.</p>
5. Inspect the wheel alignment	<p>A. Inspect the wheel alignment.</p> <p>Whether the steering wheel is in central position or wheel alignment data is in the specification?</p> <p>Y</p> <p>Go to step 6.</p> <p>N</p> <p>Align the wheels.</p>
6. Inspect the steering gear clearance	<p>A. Lift the vehicle.</p> <p style="color: blue;">Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B. Inspect the steering gear clearance.</p> <p style="color: blue;">Refer to: Steering Linkage Device Inspection (2.4.1 Steering System-General Information, General Inspection).</p> <p>Whether the steering gear clearance is normal?</p> <p>Y</p> <p>Go to step 7.</p> <p>N</p> <p>Repair or replace the failed component.</p>

Test Conditions	Details/Results/Actions
7. Inspect the rear suspension	<p>A. Inspect the rear suspension alignment parameter.</p> <p>Is the rear suspension normal?</p> <p>Y</p> <p>Inspect the suspension parts for wear. Replace or repair damaged components if necessary</p> <p>Refer to: Front Strut Assembly Disassembly and Assembly (2.1.2 Front Suspension, Removal and Installation), Rear Shock Absorber Assembly\ Rear Coil Spring\ Lower and Upper Rear Coil Spring Stand (2.1.3 Rear Suspension, Removal and Installation).</p> <p>N</p> <p>Adjust or repair the abnormal rear suspension incorrect alignment.</p>

Vehicle Swing Diagnosis Procedures

Test Conditions	Details/Results/Actions
<p> WARNING: In order to avoid personal injury caused by out of control operation, the road test should be conducted by two persons jointly to keep safe driving. Control the steering wheel suitably. Failure to follow this instruction may result in personal injury.</p>	
1. Inspect the tire	<p>A. Inspect whether all wheels and tires type are the same.</p> <p>B. Inspect whether all tire worn levels are similar.</p> <p>C. Inspect the tire for bulge or cracks.</p> <p>D. Inspect the tire air pressure.</p> <p>Is the wheel normal?</p> <p>Y</p> <p>Go to step 2.</p> <p>N</p> <p>Adjust or replace the tire.</p>

Test Conditions	Details/Results/Actions
2. Inspect the influence of tire to fault	
	<p>A.Exchange the right and left tires of the front suspension.</p> <p>B.Install 4 tires in good state if necessary.</p> <p>Is the vehicle drive normal?</p> <p>Y</p> <p>Go to step 3.</p> <p>N</p> <p>Replace the tire.</p>
3.Inspect the front control arm bushing	
	<p>A.Inspect whether front swinging arm bushing cracks, looses or moves.</p> <p>Is the front swinging arm normal?</p> <p>Y</p> <p>Go to step 4.</p> <p>N</p> <p>Replace the front control arm bushing.</p> <p>Refer to: Front Control Arm and Arm Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).</p>
4.Inspect the wheel bearing	
	<p>A.Lift the vehicle.</p> <p>Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B.Inspect the wheel bearing.</p> <p>Refer to: Wheel Bearing Inspection (2.1.1 Suspension System-General Information, General Inspection).</p> <p>Y</p> <p>Go to step 5.</p> <p>N</p> <p>Replace the wheel bearing.</p>

Test Conditions	Details/Results/Actions
5. Inspect the stabilizer bar	
	<p>A. Inspect the stabilizer rod bushing for any crack, loose and missing.</p> <p>B. Inspect the stabilizer rod for damage. Is the stabilizer rod inspection normal?</p> <p>Y</p> <p>Go to step 6.</p> <p>N</p> <p>Repair or replace the stabilizer rod and the bushing.</p>
6. Inspect the wheel alignment	
	<p>A. Inspect the wheel alignment.</p> <p>Is the steering wheel in central position or the wheel alignment data in the specification?</p> <p>Y</p> <p>Go to step 7.</p> <p>N</p> <p>If necessary, carry out the wheel alignment.</p>
7. Inspect the steering gear clearance	
	<p>A. Lift the vehicle.</p> <p>Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B. Inspect the steering gear clearance.</p> <p>Refer to: Steering Linkage Device Inspection (2.4.1 Steering System-General Information, General Inspection).</p> <p>Is the steering gear clearance normal?</p> <p>Y</p> <p>Go to step 8.</p> <p>N</p> <p>Repair or replace the failed component.</p>

Test Conditions	Details/Results/Actions
8. Inspect the rear suspension	
	<p>A. Inspect the rear suspension alignment parameter.</p> <p>Is the rear suspension normal?</p> <p>Y</p> <p>Inspect the suspension parts for wear. Replace or repair damaged components if necessary</p> <p>Refer to: Front Strut Assembly Disassembly and Assembly (2.1.2 Front Suspension, Removal and Installation), Rear Shock Absorber Assembly\ Rear Coil Spring\ Lower and Upper Rear Coil Spring Stand (2.1.3 Rear Suspension, Removal and Installation).</p> <p>N</p> <p>Adjust or repair the abnormal rear suspension alignment.</p>

Steering Wheel Off Center Diagnosis Procedures

Test Conditions	Details/Results/Actions
1. Inspect the steering components	
	<p>A. Lift the vehicle.</p> <p>Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B. Inspect the steering components for excessively worn.</p> <p>Are the steering components excessively worn?</p> <p>Y</p> <p>Replace or repair wear parts</p> <p>N</p> <p>Go to step 2.</p>

Test Conditions	Details/Results/Actions
2. Inspect the wheel alignment	
	<p>A. Inspect the wheel alignment parameter.</p> <p>Is the steering wheel in central position or the wheel alignment data in the specification?</p> <p>Y</p> <p>Refer to: Abnormal Driving Track Diagnostic Procedures (2.1.1 Suspension System-General Information, Symptom Diagnosis and Testing).</p> <p>N</p> <p>Align the wheels.</p>

Abnormal Driving Track Diagnostic Procedures

Test Conditions	Details/Results/Actions
1. Inspect the front wheel caster angle	
	<p>A. Inspect front wheel caster angle.</p> <p>Is the front caster angle within the specified range?</p> <p>Y</p> <p>Go to step 2.</p> <p>N</p> <p>Inspect the suspension parts for worn. Replace or repair wear parts if necessary.</p>
2. Inspect the rear suspension	
	<p>A. Measure the left and right wheel track of vehicle.</p> <p>B. Compare the measuring values.</p> <p>Is the data same?</p> <p>Y</p> <p>Align 4 wheels.</p> <p>N</p> <p>Inspect the rear suspension parts for worn. Replace or repair wear parts if necessary.</p> <p>Refer to: (2.1.3 Rear suspension, Removal and Installation).</p>

Excessive Noise Diagnosis Procedures

Test Conditions	Details/Results/Actions
1. Inspect the suspension	<p>A. Lift the vehicle.</p> <p style="color: blue;">Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B. Inspect the mounting bolts of suspension parts</p> <p style="padding-left: 20px;">Dose the bolt looses or crack?</p> <p style="padding-left: 20px;">Y</p> <p style="padding-left: 20px;">Tighten them or install new one.</p> <p style="padding-left: 20px;">N</p> <p style="padding-left: 20px;">Go to step 2.</p>
2. Inspect the damping spring	<p>A. Inspect the damping spring for damage.</p> <p style="padding-left: 20px;">Is the damping spring damaged?</p> <p style="padding-left: 20px;">Y</p> <p style="padding-left: 20px;">Replace the damping spring.</p> <p style="padding-left: 20px;">N</p> <p style="padding-left: 20px;">Go to step 3.</p>
3. Inspect the front swinging arm of front suspension	<p>A. Inspect the front swinging arm bushing of front suspension for excessive wear or damage.</p> <p style="padding-left: 20px;">Is the front swinging arm bushing of front suspension worn?</p> <p style="padding-left: 20px;">Y</p> <p style="padding-left: 20px;">Replace the front swinging arm bushing of the front suspension.</p> <p style="color: blue;">Refer to: Front Control Arm and Control Arm Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).</p> <p style="padding-left: 20px;">N</p> <p style="padding-left: 20px;">Go to step 4.</p>

Test Conditions	Details/Results/Actions
4. Inspect the ball joint	<p>A. Lift the vehicle.</p> <p>Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B. Hold the outer end of front control arm and try to move up and down and observe whether it moves. No free movement is allowed.</p> <p>Whether there is free movement?</p> <p>Y</p> <p>Replace the front control arm and the control arm ball joint pin.</p> <p>Refer to: Control Arm Ball Joint and Ball Joint Pin (2.1.2 Front Suspension, Removal and Installation).</p> <p>N</p> <p>Go to step 5.</p>
5. Inspect the tire	<p>A. Inspect the tire uneven wear.</p> <p>Is the tire wear uneven?</p> <p>Y</p> <p>Replace the tire. Align the wheels.</p> <p>N</p> <p>Go to step 6.</p>
6. Inspect the front wheel bearing	<p>A. Inspect the front wheel bearing.</p> <p>B. Hold the bottom and top of the wheel and shake forcefully. Inspect the bearing for excessive loose.</p> <p>C. Turn the front wheel and inspect the working condition.</p> <p>Is the bearing loose or making noise?</p> <p>Y</p> <p>Replace the front wheel bearing if necessary.</p> <p>N</p> <p>Verify the customer concerns.</p>

Vibration Driving Diagnosis Procedures

Test Conditions	Details/Results/Actions
1. Inspect the tire	<p>A.Lift the vehicle.</p> <p>Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B.Inspect the tire for damage or excessively worn.</p> <p>Is the tire damaged or worn?</p> <p>Y</p> <p>Replace the tire.</p> <p>N</p> <p>Go to step 2.</p>
2. Inspect the front wheel bearing	<p>A.Inspect the front wheel bearing.</p> <p>B.Hold the bottom and top of the wheel and shake it forcefully. Inspect the bearing for excessive loose.</p> <p>C.Turn the front wheel. Inspect the working condition of the front wheel.</p> <p>Is the bearing loose or making noise?</p> <p>Y</p> <p>Go to step 3.</p> <p>N</p> <p>Go to step 4.</p>
3.Measure the front wheel bearing axial clearance	<p>A.Remove the wheel, the brake caliper and the brake disc.</p> <p>B.Install the dial indicator gauge with the support and the position shall be close to the front hub.</p> <p>C.Push and pull the hub in the axial direction to inspect the axial clearance of the hub and the front wheel bearing.</p> <p>Whether the front wheel bearing axial clearance is in the specification?</p> <p>Y</p> <p>Inspect the ball joint. Go to step 4.</p> <p>N</p> <p>Replace the hub and the bearing assembly.</p>

Test Conditions	Details/Results/Actions
4. Inspect the rear wheel bearing	<p>A. Remove the rear wheel bearing.</p> <p>B. Hold the bottom and top of the wheel and shake it forcefully. Inspect the bearing for excessive loose.</p> <p>C. Turn the rear wheel. Inspect the working condition of the rear wheel.</p> <p>Is the bearing loose or making noise?</p> <p>Y</p> <p>Go to step 5.</p> <p>N</p> <p>Go to step 6.</p>
5. Measure the rear wheel bearing axial clearance	<p>A. Remove the rear wheel.</p> <p>B. Install the dial indicator gauge with the support and the position shall be close to the rear brake drum.</p> <p>C. Push and pull the hub in the axial direction to inspect the axial clearance of the rear wheel bearing.</p> <p>Whether the rear wheel bearing axial clearance is in the specification?</p> <p>Y</p> <p>Go to step 6.</p> <p>N</p> <p>Replace the rear wheel bearing if necessary.</p> <p>Refer to: Rear Wheel Bearing(2.1.3 Rear Suspension, Removal and Installation).</p>
6. Inspect the wheel/tire runout value	<p>A. Measure the wheel and the tire with the radial runout gauge. The radial and crosswise runout of wheels and tires shall be less than 1.14 mm.</p> <p>Whether the measuring value is in the specification?</p> <p>Y</p> <p>Go to step 12.</p> <p>N</p> <p>Go to step 7.</p>

Test Conditions	Details/Results/Actions
7.Measuring wheel/tire runout value	<p>A.Measure the wheel with over 1.14 mm radial and crosswise runout. Mark the positions of tire bolts and relative bolt holes before removing wheel for wheel installation. Remove wheel and install it on tire balance machine to measure runout value. The radial and crosswise runout of wheels and tires must be less than 1.14 mm.</p> <p>Is the measuring value in the specification?</p> <p>Y</p> <p>Go to step 10.</p> <p>N</p> <p>Go to step 8.</p>
8.Match installtion position	<p>A.Mark the highest runout position of tire and wheel. Exhaust the air in tire and rotate for 180°. Charge the tire and measure its runout value.</p> <p>Whether the runout positon of tire and wheel is coincident?</p> <p>Y</p> <p>Carry out the tire dynamic balance.</p> <p>N</p> <p>If the two runout top value is out of 101.6 mm, replace the tire. If the value is in 101.6 mm, go to step 9.</p>
9.Measure the wheel runout	<p>A.Remove wheel tire cover and install it on the tire balance machine. Measure the runout of the wheel inner and outer edge. The runout of crosswise and radial shall be less than 1.14 mm.</p> <p>Is the runout normal?</p> <p>Y</p> <p>Go to step 10.</p> <p>N</p> <p>Replace the wheel. Inspect the runout of new wheel. If the runout of new wheel is in the specification. Mark the lowest point of runout. Install the tire and make the highest runout point and lowest runout point match for balance.</p>

Test Conditions	Details/Results/Actions
10.Radial runout of the rear hub and the tire bolt	<p>A.Measure the hub flange runout (beyond 0.254 mm), and the wheel bolt circle runout (beyond 0.08 mm).</p> <p>Is the measuring value in the specification?</p> <p>Y</p> <p>Go to step 11.</p> <p>N</p> <p>Replace the rear wheel hub.</p> <p>Refer to: Rear Wheel Bearing (2.1.3 Rear Suspension, Removal and Installation).</p>
11.Circle runout of the front hub and the tire bolt	<p>A.Remove the front wheel.</p> <p>B.Remove the brake disc.</p> <p>C. Measure the radial runout of the tire bolt circle (beyond 0.06 mm). Whether the measuring value is in the specification?</p> <p>Y</p> <p>Inspect the brake disc runout.</p> <p>Refer to: Brake Disc Runout Inspection (2.3.1 Brake System-General Information, General Inspection).</p> <p>N</p> <p>Replace the wheel hub.</p> <p>Refer to: Front Wheel Hub (2.1.2 Front Suspension, Removal and Installation).</p>
12.Wheel balance	<p>A.Carry out the wheel balance. Carry out the road test.</p> <p>Does vehicle vibrate?</p> <p>Y</p> <p>Carry out the repair.</p> <p>Refer to: (1.1.5 Noise, Vibration and Harshness).</p> <p>N</p> <p>Make sure the maintenance has been finished.</p>

Abnormal Tire Wear Diagnosis Procedures

Test Conditions	Details/Results/Actions
1. Inspect the tire wear	<p>A.Lift the vehicle.</p> <p style="color: blue;">Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B.Inspect the tire wear.</p> <p>Are the two front wheels excessively worn?</p> <p>Y</p> <p>Exchange the tires and replace the wheel if necessary.</p> <p>N</p> <p>Go to step 2.</p>
2. Inspect the tire	<p>A.Inspect the tire pressure and model.</p> <p>Is the tire pressure normal and the same model?</p> <p>Y</p> <p>Go to step 3.</p> <p>N</p> <p>Replace the tire with different model and adjust the tire pressure.</p> <p style="color: blue;">Refer to: General Specifications (2.1.4 Wheel and Tire, Specifications)</p>
3. Inspect the wheel	<p>A.Inspect the wheel for distortion and deformation.</p> <p>B.Inspect the wheel runout.</p> <p style="color: blue;">Refer to: Wheel Runout Inspection (2.1.4 Wheels and Tires, General Inspection).</p> <p>Is the wheel normal?</p> <p>Y</p> <p>Go to step 4.</p> <p>N</p> <p>Adjust or replace the wheel.</p>

Test Conditions	Details/Results/Actions
4. Inspect the tire balance	<p>A.Lift the vehicle.</p> <p>Refer to: Lifting (1.1.3 Traction and Lifting, Description and Operation).</p> <p>B.Remove the tire.</p> <p>C.Balance the tires on the balancer.</p> <p>Inspect whether the tire balance is normal?</p> <p>Y</p> <p>Go to step 5.</p> <p>N</p> <p>Balance the tires and replace the them if necessary.</p>
5. Inspect the wheel alignment	<p>A.Inspect the wheel alignment parameter.</p> <p>Does the wheel alignment parameters meet the specified requirement?</p> <p>Y</p> <p>Go to step 6.</p> <p>N</p> <p>Adjust the wheel alignment parameter.</p>
6.Inspect the front and rear suspension component	<p>A.Inspect whether the retaining bolts of front suspension parts are tightened firmly.</p> <p>B.Inspect the front control arm bushing and the direction stablizer bar bushing for any crack, loose and missing.</p> <p>C.Inspect the ball joint of the front suspension for loose.</p> <p>D.Inspect whether the retaining bolts of front suspension parts are tightened firmly.</p> <p>E.Inspect the rear control arm bushing for any crack, loose and missing.</p> <p>Are the front and rear suspension parts normal?</p> <p>Y</p> <p>Go to step 7.</p> <p>N</p> <p>Repair the front and rear suspension.</p>

Test Conditions	Details/Results/Actions
7. Inspect the rear axial track	
	<p>A. Inspect the vehicle left and right tire track.</p> <p>Are the left and the right wheel track the same?</p> <p>Y</p> <p>Inquire about the vehicle load and the driver's habit. Correct the over-load, over-speed and any incorrect driving habit.</p> <p>N</p> <p>Calibrate the left and the right wheel track.</p>

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