Chapter Ⅵ Steering system

Section Ⅰ General

The automobile steering system refers to a special mechanism to change or keep the driving direction of a vehicle. It serves to change the driving direction at proper time during traveling of the vehicle as required by the driver and work with the traveling system to keep the vehicle running stably when it deviates from the correct traveling direction due to occasional impact from the road. The steering system is an important system for safe driving. Therefore, checking and maintaining the steering system properly is an effective measure to keep safe driving and reduce traffic accidents.

Lifan car uses variable hydraulic power steering system. As for position control of the steering wheel, it is consisted of control of height and angle for the best convenience of operation by the driver. The steering shaft is capable of energy absorption for collision safety and the steering wheel is mounted with air bag.

I. Composition and layout of power steering system

The layout of power steering system in Lifan car is shown in Figure 6-1. The system consists of steering wheel, steering column, power steering pump, fluid reservoir, power hydraulic cylinder, steering control valve and steering pinion mechanism.

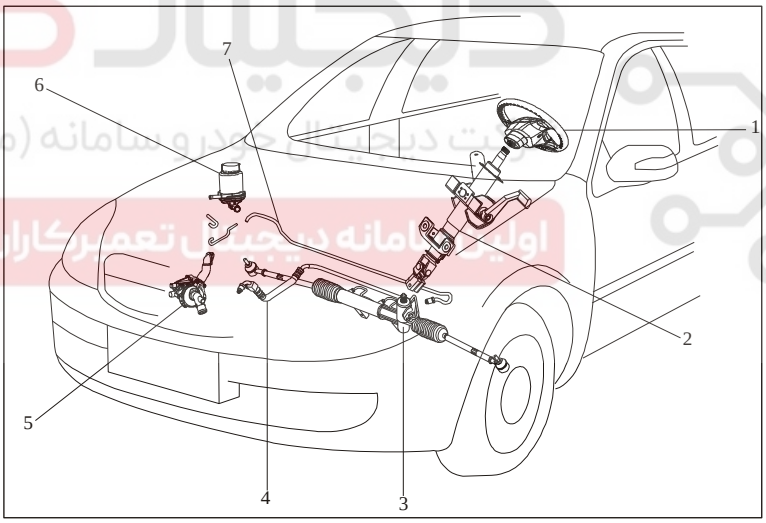


Figure 6-1 Layout of power steering system

1-steering wheel 2-steering column 3-power steering gear assembly 4-fuel pipe for steering gear 5-steering pump 6-oil tank 7-fuel return for steering gear

The power steering system is equipped in Lifan car compact with rotary steering control valve as the control device, vane power steering pump as the power source and piston control lever and gear rack of power hydraulic cylinder as the power transfer mechanism. When steering, the engine will drive the power steering pump to produce hydraulic pressure. The flow and pressure of steering liquid will be controlled by the pressure controller in the pump. Then the hydraulic pressure is transferred by the steering pump to the rotary steering control valve for steering pinion mechanism, which will control hydraulic pressure in compliance with the rotation of steering wheel and change the flow direction of steering liquid to direct the pressure fluid into

the power hydraulic cylinder to prompt piston control lever and gear rack to act in rectilinear motion for steering of the steering wheel and power steering, by the time, the steering fluid returned from the power cylinder on the lower pressure side flows into fluid reservoir and is filtered before being re-transferred into the steering pump for circulating operation.

1. Power steering pump

The power steering pump is a vane pump and driven by the engine providing hydraulic pressure for the system. The steering pump absorbs oil from the power steering fluid reservoir connected to the power steering. The relief valve in flow control valve is used to control the pump pressure. There's a rotary control valve for power steering gear rack and pinion which directs introduces the hydraulic oil from the steering pump into one side or the other side of gear rack piston. The integral gear rack piston is connected with the gear rack. The gear rack piston will convert the hydraulic pressure into a linear force to move the gear rack right and left, which is transferred to the steering knuckle via the steering tie rod and changes the traveling direction of wheel consequently.

The power steering pump of Lifan 520 is shown in Figure 6-2 & 6-3:

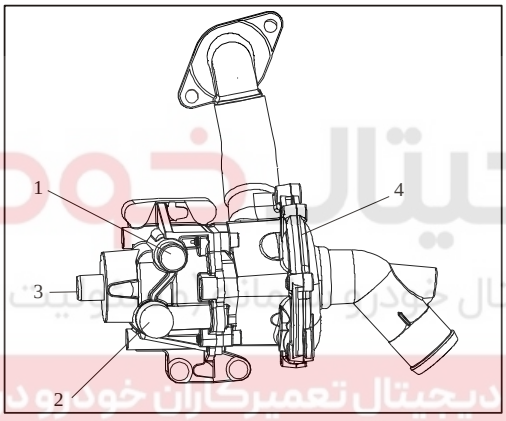


Figure 6-2 Power steering pump (Tritec 1.6)

1-fuel inlet 2-fuel outlet 3-drive shaft 4-water pump

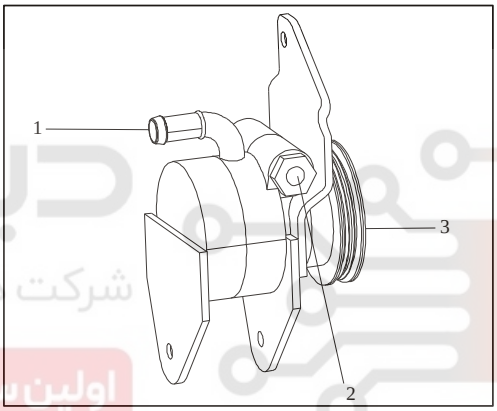


Figure 6-3 Power steering pump (LF481Q3)

1-fuel inlet 2-fuel outlet 3- belt pulley

2. Power steering gear

The power rack and pinion steering gear is equipped with a rotary control valve directing the hydraulic oil from the hydraulic pump into one side or the other side of the gear rack piston. The integral gear rack piston is connected with gear rack while the gear rack piston transfers hydraulic pressure into the linear force to move the gear rack right or left, which is transferred to the steering knuckle via the steering tie rod and changes the traveling direction of wheel consequently. The power steering gear assembly is shown in Figure 6-4.

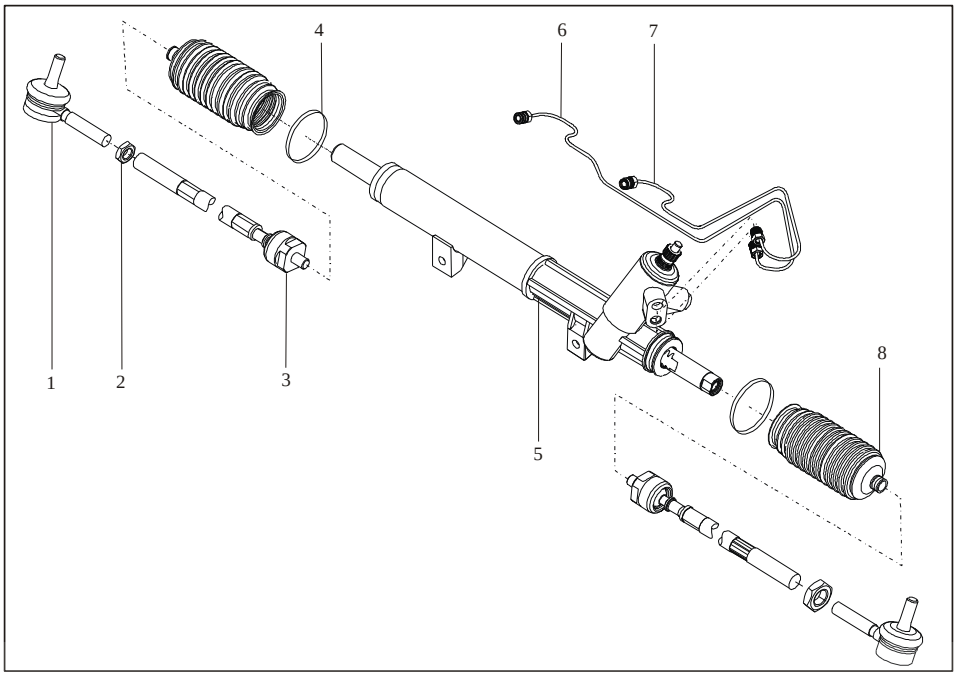


Figure 6-4 Power steering gear

1- steering ball stud 2-regulating nut 3- steering linkage subassembly 4-strap 5-steering gear 6-right pipe 7- left pipe 8- gear rack shield

3. Steering column

The steering column is made up of the upper steering shaft assembly and lower steering shaft assembly, as shown in Figure 6-5. The upper steering shaft assembly is connected to steering wheel with the spline and to the lower steering shaft assembly through the universal joint, equipped with steering wheel height regulating device.

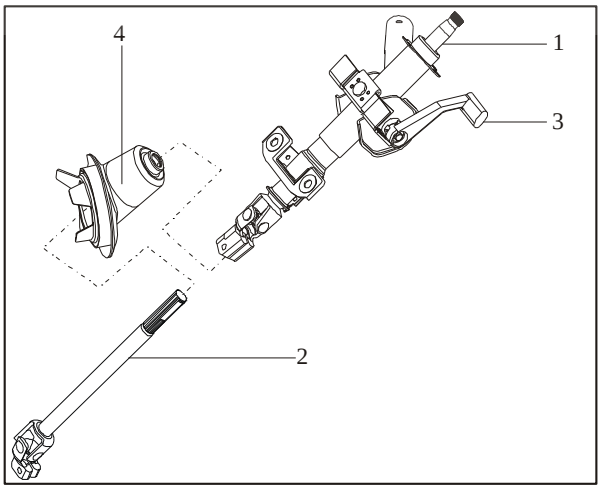


Figure 6-5 steering column

1-upper steering shaft assembly 2- lower steering shaft assembly

3-steering wheel height regulating mechanism 4- dust shield

4. Steering wheel

The steering wheel of Lifan 520 is shown in Figure 6-6. The steering wheel is mounted with SRS air bag and horn switch.

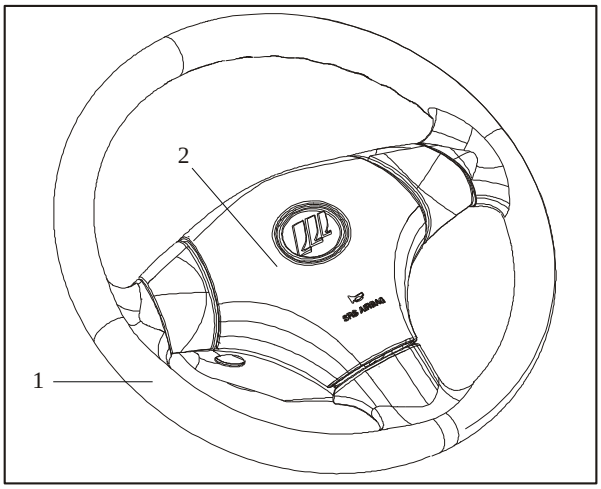


Figure 6-6 steering wheel assembly

1-steering wheel 2-SRSair bag

5. Oil tank

The oil tank is mounted on the front bulkhead on the right of engine cabin, with upper and lower limit scale, as shown in Figure 6-7.

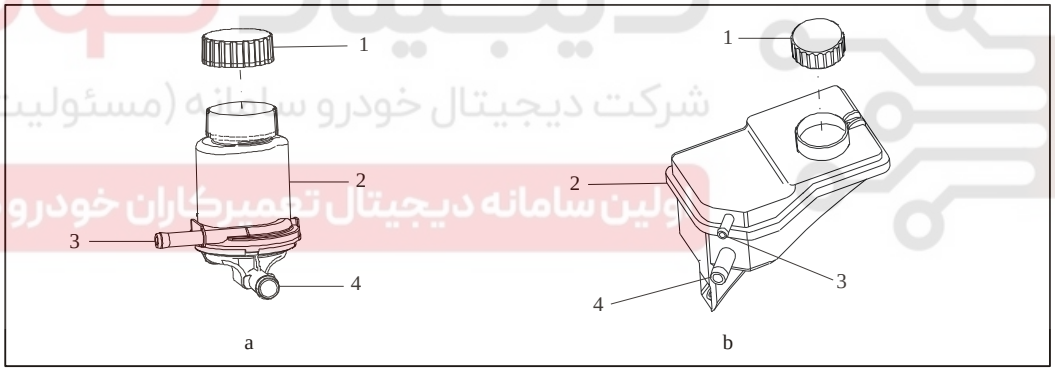


Figure 6-7 Oil tank

a-LF481Q3 range b-TRITEC1.6L range

1-oil tank 2-oil tank cover 3- steering gear nozzle 4- fuel inlet of steering pump

II. Technical parameters

Table 6-1 Technical parameters of steering system

Model of steering pump	Accessory supply for engine
Action pressure of relief valve（MPa）	8
Speed range（r/min）	500～8000
Output flow（L/min）	5
Pattern of steering gear	Integral rack and pinion steering gear
Model	LF7160-3411000A1
Applicable front axle load (N)	7900

Output load (N)	5700
Maximum operating pressure (MPa)	7.9
Recommended flow of oil pump (L/min)	5
Linear angle ratio (mm/r)	42.83
Application temperature range (℃)	-40～+120
Travel range of gear rack (mm)	143±1
Total number of input shaft turns (turn)	3.34±0.1
Minimum turning radius(m)	5.5
Angle ratio	19.39
Number of turns of steering wheel	3.41
Pivot steering resisting moment (Nm)	323221
Action force of steering resistance on steering wheel (N)	118.5
Steering force from power steering gear (N)	5719
Maximum moment on wheel from steering gear (Nm)	755118
Diameter of steering wheel（mm）	375

Section Ⅱ Troubleshooting

Drive the car and figure out the problem for customer. Check the car if there's any obvious mechanical or electrical damage with naked eyes. In case causes for observed or presented failure have been figured out, they shall be corrected before next step being taken (if possible).

Table 6-2 Visual check list

Mechanical part	The tire pressure doesn't fit and wheels are loose.
	Ends of tie rod and inner ball joint are loose.
	Strut and spring assembly or ball joints are loose.
	Shaft universal joint of steering column is loose.
	Bolts for shaft universal joint of steering column are loose.
	The steering gear assembly is loose.
	Accessory driving belt suffers incorrect tension.
	The steering column, pump and steering gear are restrained or deviated.
	Improper power steering pump is equipped.
	The fluid level is not correct.
	Hose leak or line jam occurs.
Electrical part	Power steering pressure (PSP) switch
	Wiring
	Loop

In case the problem can not be figured out through visual check, refer to the Vehicle Failure List and identify the failure.

Table 6-3 Vehicle Failure List

State	Possible cause	Troubleshooting
When the car moves straight forward as the steering wheel is fixed, it swings between both sides.	The tire size or pressure doesn't fit well.	Check the size of tire and adjust the tire pressure.
	The vehicle is overloaded or loaded unevenly.	Adjust the load.
	The tie rod or its ends are loose or worn.	Replace steering gear or ends of tie rod as needed.
	Bolts for the steering gear are loose or damaged.	Fasten or replace the bolts.
	The suspension ball joint is loose or worn.	Replace suspension ball joint assembly.
	Bolts from universal joint for steering column to pinion shaft are loose.	Fasten bolts for the pinion shaft.
		Fasten axle universal joints for steering column.
	Axle universal joint for steering column is loose or worn.	Replace the axle universal joint for steering column.
	The beam angle is not adjusted properly.	Make adjustment as required.
	The rear suspension is loose or worn.	Fasten or replace components of the rear suspension.
When running on the flat road, the car declines to one side.	The tire pressure doesn't fit..	Adjust tire pressure.
	The tire size or different tires/tread type is not proper.	Replace the tire with a new one as required.
	The vehicle is overloaded or loaded unevenly.	Adjust load.
	The beam angle is not adjusted properly.	Make adjustment as required.
	Components of front suspension are broken.	Install new components for front suspension as required.
	Components of rear suspension are broken.	Install new components for rear suspension as required.
	The steering gear valve acts in unbalanced manners.	When driving below 50 km/h, shift the transmission to neutral position and turn the ignition switch to position I. In the event that the car isn't declined to one side being hated, replace the steering gear. In case the car is not wandering before the engine is stopped, exchange the front assembly.
		When the car isn't driven to one side, exchange the front and rear wheel on the same side. When the car is always driven to the same direction, then check the components of front suspension and beam angle and make proper adjustment.
	Check if the front / rear braking operation is proper.	Make adjustment as required.
	Check if any components or bolts of rear suspension are loose or worn.	Replace components of rear suspension as required.
		Fasten all bolts.

State	Possible cause	Troubleshooting
Feedback (noise or knock of steering gear) – when the vehicle is running on coarse road, the driver feels coarse about the steering wheel.	Because of the steering gear input shaft connection.	Replace the steering shaft as required.
	The tie rod is loose / worn.	Replace the steering gear as required.
	The steering gear bolts are loose or broken.	Fasten or replace fixing bolts as required.
	Bolts from the shaft of steering column to universal joint are loose.	Fasten bolts.
	Bushings, bolts, or ball joints of suspension are loose.	Fasten or replace bolts or ball joints as required.
	Shaft of steering column is in bad state.	Replace steering column as required. Refer to
The steering wheel will not return to the central position unless with help of the driver. Additionally, when the driver turns the steering wheel back to the central position, it feels like there's blockage or hindering.	The tire pressure doesn't fit.	Adjust tire pressure.
	The size or type of tire doesn't fit.	Replace tires as required.
	The steering column is in bad position or protective cover rubs against the steering wheel.	Align the steering column.
	The universal joint for steering column is blocked.	Replace universal joint.
	Gasket for the axle bottom plate of steering column may be torn out.	Replace the floor gasket as required.
	The tie rod is blocked or damaged.	Replace the steering gear as required.
	Components of front suspension are damaged or worn out. .	Replace components of front suspension as required.
	The beam angle is not adjusted properly.	Make adjustment as required.
	Column bearing is blocked.	Replace the steering column.
	The steering oil is contaminated.	Flush the power steering system.
When steering and parking by the road, it feels heavy steering.	No sufficient oil in power steering pump.	Add and check the system for any leakage as required.
	The accessory drive belt is of improper tension.	Check the tension of accessory drive belt.
	Hose or cooler leakage outside.	Repair or replace hose or cooler as required.
	The engine is at incorrect idle speed.	Refer to Diagnostic (PC/ED) Manual for Deflation Control of Power System.
	Belt pulley of power steering pump is loosened or deformed.	Replace the belt pulley of power steering pump.
	The power steering pump isn't compliant with specifications in flow or pressure.	Check the flow and pressure of pump. Refer to pump flow and pressure test in this chapter.
	Hose or cooler pipe are blocked.	Clean or replace hose or cooler as required.
	The steering oil is contaminated.	Check the system for any foreign objects and pollution. Flush the power steering system.
	There's air in steering oil	Perform system deflation.
	PSP switch is in open loop.	Test or replace PSP switch as required.
Oil leakage	Overfilling of system	Correct the liquid level as required.
	Leakage of components.	Find out the potential defect components and repair them as required.

State	Possible cause	Troubleshooting
The accessory drive belt squeals (particularly when the steering wheel turns to meet ends or during pivot parking)	Check the accessory drive belt to see if the tension is correct or if it slips.	Replace accessory drive belt as required.
Chirps from steering pump	Drive belts are loose or worn.	Replace drive belts.
Noise from power steering pump	Inadequate oil or probably leakage.	Refuel to the specified level and discharge air in the system.
	Power steering pump.	Check if there's any leakage. Repair as required.
		Replace power steering pump as required.
Swishing noise	Oil below 54°C (130°F) flows into they bypass valve in the pump valve casing.	Normal noise.
Moan noise	There's air in the oil and air leakage in the system.	Purify the air inside the system.
	Cover of single check valve & O-ring oil seal.	Replace power steering pump as required.
Leak of power steering pump or reservoir	Overfilling of oil.	Correct the liquid level as required.
	The oil cover is lost, loosened and damaged or O-ring is missing.	Replace the oil cover or O-ring as required.
	Hose connector is loose or broken.	Replace hose connector as required.
	Leakage from shaft seal:	Replace power steering pump.
	Oil seal is damaged.	
	The rotor shaft is damaged, e.g. groove or scratch.	
	Bushing or collar of shaft are worn.	
	Inlet pipe.	Replace power steering pump.
	The enclosure is punctured.	Replace power steering pump.
	Joints, nuts or plug valves of outlet pipe are loosened.	Fasten them as required.
	Joints, nuts or plugs of outlet pipe are broken.	Replace power steering pump.

Section Ⅲ Maintenance operation

The power steering system is a complex delicate hydraulic system and it requires regular inspection and adjustment, which is an important factor to ensure safe and stable operation and powerful guarantee for service life of power steering mechanism. As it is proved, the power steering system fails mostly because of no timely inspection and maintenance. In this case, in order to reduce failures, the power steering system shall be checked and provided with necessary maintenance and adjustment periodically.

1. Check the fluid in fluid reservoir

（1）Park the car on the flat and plain ground.

（2）When the engine is at idle state, move the steering wheel for several turns to enable to liquid temperature to reach 80℃or so.

（3）Check if there's foam formed in the steering fluid or it is emulsified; if the steering fluid is presented with foam or emulsification, there's air in the steering fluid and air discharge shall be performed.

（4）Check the quality of steering fluid, if the steering fluid deteriorates or expires, then replace the fluid.

（5）Check the oil level in oil tank to ensure it is between the upper and lower limit for the oil tank. When the fluid doesn't go bad and no air penetrates in the fluid but only the air level is below the lower limit, then probably leakage happens and check and repair the leaking part before refilling recommended fluid to maintain the oil level around the upper limit. For this steering system, ESSO ATF.D fluid is sued.

2. Discharge air in the power steering hydraulic system

When the steering hydraulic system of vehicle is filled with air, it will causes unstable steering operation and imbalance of vehicle and influences the steering safety due to the compressibility of air.

The reason for air penetration into the hydraulic system is that the fuel pipe joint is unfastened or damaged, fuel pipe is broken or the air is not discharged or not cleared after re-connection of fuel pipe, air is not discharged completely during replacement of steering fluid, the oil level in fluid reservoir is too low, etc. In order to ensure easy steering, stable and safe operation, air in the steering hydraulic system should be discharged in time. Before air discharge for power steering system, the oil tank shall be checked for oil level and hydraulic oil shall be refilled as required. When it requires proper fluid level, air suction can be performed in following steps:

（1）Jack up the vehicle with a jack or lifter in the front part and fix it firmly with supports.

（2）Turn the steering wheel from the left to the right extreme position for 3~5 times.

（3）Start the engine making it run at idle speed and repeat turning the steering wheel for 3~5 times as said above.

（4）Lower the vehicle and turn the steering wheel back and fro for 5~8 times to make raise the oil temperature when the engine runs at idle speed, then put the steering wheel in the middle position and check and record the oil level in oil tank.

（5）Turn off the ignition switch to stop the engine and check the oil level in oil tank in 3~5 min and compare it with the oil level in（4）; in case of no difference or difference within 5.0 mm

and no bubble or emulsification in fluid, then air has been exhausted in the system; otherwise, repeat step（4）and (5）till the air is exhausted.

（6）Check the oil level and refuel the fluid reservoir to the specified oil level as required.

3. Replace power steering fluid

Once the power steering system in Lifan 520 fails and it requires overhauling, the power steering fluid should be replaced; in case the fluid is discovered to be deteriorated, it should be replaced timely too. Follow steps stated below for replacement:

（1）Jack up the vehicle with a jack or lifter in the front part and fix and support it firmly.

（2）Remove the return hose of oil tank and discharge the used oil in the oil tank and return hose into proper container. Take care not to splash used oil on the body or parts and components in case of damage to paint; in the event of any splash, wipe it clean immediately.

（3）Run the engine at idle speed and discharge the oil as turning the steering wheel left and right to the extreme position constantly until the fluid is drained out completely before turning off the engine.

（4）Re-mount the return hose on the fluid reservoir.

（5）Refill specified hydraulic fluid in the fluid reservoir to the upper limit of oil level: capacity of system 1.1L; capacity of fluid reservoir 0.3L.

（6）Start and run the engine at idle speed, then turn the steering wheel from the left to the right extreme position for several times so as to exhaust air in the steering hydraulic system.

（7）Check the oil level again, refill specified hydraulic fluid to the upper limit of oil level for oil tank when necessary.

4. Check and adjust the deflection of transmission belt for power steering pump

The working power of power steering pump in Lifan 520 comes from the engine transmitted from the transmission belt. When the transmission belt is too loose and apt to slip, it will causes lower fuel delivery in the oil pump and lower oil pressure in the steering system resulting in heavy steering; when the transmission belt is too tight, it will leads to increase of stress on the pump shaft and bearing so that parts and components will be worn out soon and the service life of units and transmission belt will be shortened; at the mean time, the power consumption of engine will be increased. Therefore, the transmission belt of power steering pump shall be adjusted at proper tension. However, difference shall be made between new and used transmission belt. When using a new transmission belt, check it against the standard deflection of new belt, run the engine for 5 minutes and then adjust the deflection to the standard value for transmission belt.

（1）Check

1）Inspection process of static deflection for transmission belt:

Apply 100N force in the middle of transmission belt for power steering pump and measure its static deflection which shall be compliant with the standard, otherwise, adjustment shall be conducted.

The standard static deflection for used transmission belt is 13～14 mm.

The standard static deflection for new transmission belt is 9～10 mm.

2）Running inspection process for transmission belt:

When the vehicle is parked on a dry road, run the engine to increase the fluid temperature to normal level and turn the steering wheel right and left; when the steering wheel is turned to the extreme position, the power steering pump outputs maximum oil pressure, when the transmission belt bears maximum load. In the event the transmission belt slips, it proves the transmission belt is

of inadequate tension or there's mechanical damage in the oil pump.

（2）Adjustment

1）Unscrew the regulating bolt and fixing bolt of power steering pump（LF481/479 engine）as shown in Figure 6-8.

2）Hold the power steering pump tight to tighten the transmission belt and screw down the regulating bolt and fixing bolt.

3）Start the engine and turn steering wheel between the left and right extreme position continuously for several times, then turn off the engine.

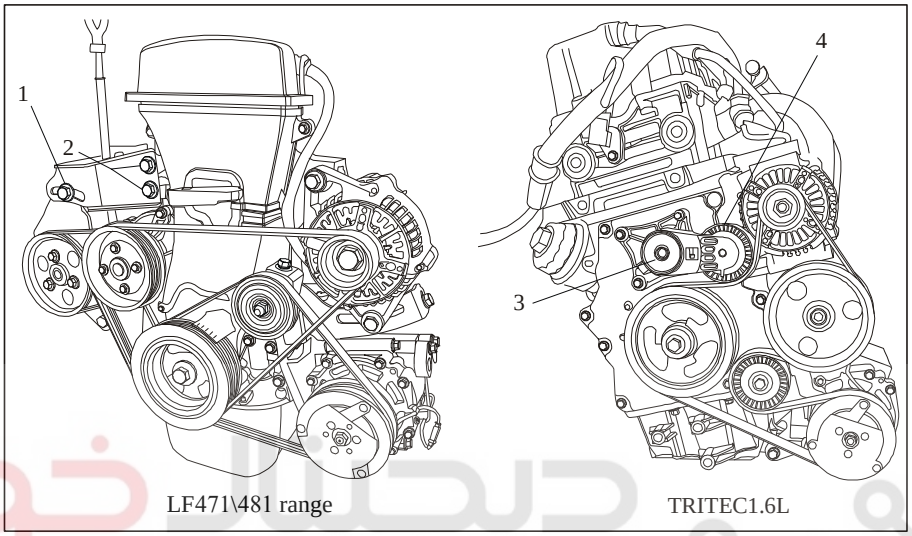


Figure 6-8 Deflection adjustment of transmission belt

1-regulating bolt 2-fixing bolt 3-tensioning device 4-tension gear

4）Check the deflection of transmission belt again. In the event that the transmission belt doesn't conform to the standard in tension, re-adjust it till compliance with the standard.

5）The transmission belt for TRITEC1.6L engine is tightened by means of tension gear and tensioning device as shown in Figure 6-8. After the tensioning device being replaced, in case the transmission belt still doesn't conform to the standard in deflection, then replace the transmission belt.

5. Check output pressure in power steering pump

To check the output pressure of power steering pump is mainly for confirming if there's any fault in power steering pump or steering pinion mechanism. In order to measure the output pressure of power steering pump accurately, the oil tank shall be made at normal oil level and the transmission belt for power steering pump shall be compliant with standard in tension before the inspection.

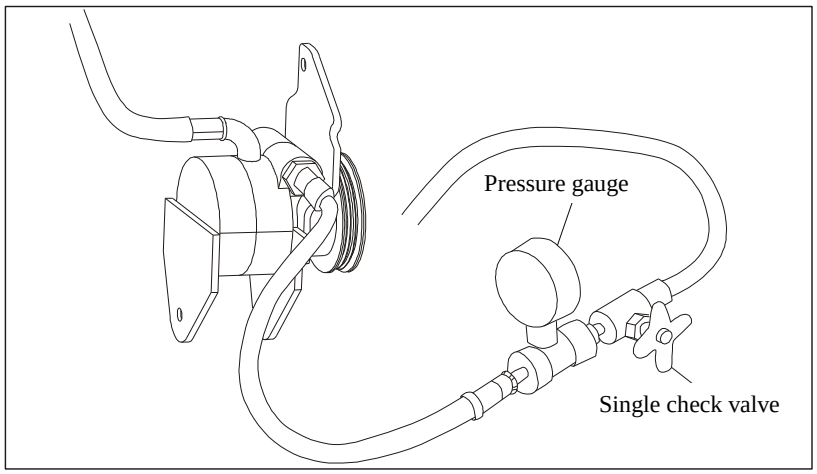


Figure 6-9 Inspecting output pressure with pressure gauge

Check the output pressure of power steering pump with pressure gauge. The connection of pressure gauge and manual valve is shown in Figure 6-9. Under idle state of engine, remove the pressure pipeline form power steering pump and connect the end measured with pressure gauge to the joint of liquid outlet on the pump and the other end of the manual valve to the inlet of steering control valve so that the pressure gauge and manual valve are connected in series in the pressure conduit of power steering pump and steering control valve.

Process of output pressure measurement for power steering pump is shown below:

（1）Full open the manual valve.

（2）Start and run the engine idle.

（3）Move steering wheel between the right and left extreme position for many turns to increase the axial fluid temperature to 80℃and make sure the fluid level is proper.

（4）Measure static oil pressure when the engine runs at 800r/min, if the power steering pump functions well, then the reading of pressure gauge shall be at least 300 kPa（minimum pressure when not steering）.

（5）Close the manual valve gradually till the pointer of pressure gauge stays stable, then read the pressure value when the output standard pressure of power steering pump shall be at least 6.2~6.9 MPa(maximum pressure under resistance against wheel steering).

（6）Full open the manual valve rapidly, take care the turn-off time of manual valve shall be kept within 5s every time, or the steering pump will be overheated and damaged consequently.

The oil pressure of manual valve upon full off can indicate the working state of power steering pump. If the power steering pump works well, the reading of pressure gauge shall be at least 6.2~6.9 MPa; in the event of lower reading of pressure gauge, it means that the steering pump produces too low output pressure and fails to boost steering effectively; in this case, there's something wrong with the power steering pump and the power steering pump shall be repaired or replaced.

6. Check steering force

Check the operating force upon turning of the wheel, park the car on level, dry and clean road, charge the tire to normal pressure and enable oil tank to reach normal oil level and tighten transmission belt of the steering pump to standard value as well. The check process is shown as follows:

（1）Start and run the engine idle, at the same time, move the steering wheel continuously to the extreme positions for many turns to increase the temperature of steering fluid.

（2）Set the front wheels at forward position.

（3）Connect the spring dynamometer to the flange of steering wheel as shown in Figure 6-10.

（4）Start and run the engine idle, then pull the spring dynamometer; once the steering tire starts moving, write down the reading of spring dynamometer.

（5）The reading of spring dynamometer shall be less than 40N; in the case of over-large reading, it indicates over-large operating force required by steering wheel upon rotation and abnormal function of power steering, then the power steering pump and steering gear shall be checked; in the case of normal pressure in power steering pump but over-large steering force, the steering control valve, power hydraulic cylinder and steering gear shall be checked.

7. Check fluid leakage outside the power steering hydraulic system

Leakage outside the hydraulic power steering system are mainly resulted from damage or aging of oil seal and gasket, cracking of housing and metal members, leaking of fuel pipe and detachment of fuel pipe joints. Potential leaking parts include fuel pipe, power steering pump, steering control valve, power hydraulic cylinder and oil tank, etc. and repair can be performed by replacing the oil seal, damaged components or fastening joist.

Common leakage in the hydraulic power steering system are shown at pump oil seal, the side of pump case and lid, oil seal on top of case of steering control valve, power hydraulic cylinder, fuel pipe joints for power steering pump and steering control valve as well as power hydraulic cylinder. In this way, for leaking failure, emphasis shall be laid on the foresaid parts.

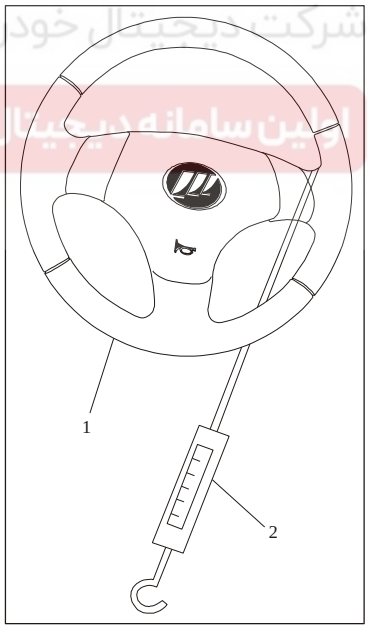


Figure 6-10 Check of operating force of steering wheel

1-steering wheel 2-dynamometer

To check the leakage, start the engine first, then turn the steering wheel left and right for many times to the extreme position (take care, no more than 5s on the extreme position) to enable the steering pump to output maximum pressure so that the overall power hydraulic pipeline system will generates maximum pressure. At this moment, check the leakage on the pipe joints of steering

pump and common leaking points on power steering pump, steering control valve and power hydraulic cylinder.

Specifically, check shall be made in following process:

（1）Jack up the car, add safety supporting, then dry the leaking point.

（2）Check if the fluid reservoir is overfilled, if yes, discharge the surplus fluid.

（3） Check and screw down the steering pump, steering control valve and on fuel pipe joint on the power hydraulic cylinder.

（4）Start the engine, turn the steering wheel right and left in repetition to figure out the leaking part. When the source of leakage is detected, stop the engine for overhauling and troubleshooting.

8. Check and adjustment after reassembly and repair of power steering gear assembly

Check shall be made after the repair and reassembly of power steering gear assembly and adjustment shall be made when necessary to ensure normal steering performance.

（1）As for leak check, it shall be done during heat run after the power steering gear assembly is on board. Therefore, start and run the engine at idle speed, move the steering wheel to between right and left extreme position for sever turns to increase the temperature of power steering fluid, then turn the steering wheel to stay at the right and left extreme position for a moment (within 5s) to rise the pressure pipeline in maximum pressure and check the leak performance of following parts:

Power pipeline in power steering system and fuel pipe joints, valve devices and power hydraulic cylinder pushrod.

In case of leakage at any point, causes must be found out for troubleshooting till the leakage is eliminated.

（2）Check of steering performance: start and run the engine at idle speed, turn the steering wheel right and left when the power steering gear assembly should functions normally within the full operating range and is easy to operate, steering wheel should steer and return smoothly with little noise and no vibration. Certainly, it is required that the power steering pump works correctly.

（3）Check and adjust the front beam of front wheels to turn them into normal condition.

（4）Check if the steering wheel is centered when the steering wheel is in forward position, if necessary, turn left and right tie rod to the same extent for adjustment.

Section Ⅳ Assembly and disassembly of steering system

I. Disassembly of steering wheel

1. Cut off the negative cable joint of battery.

2. Screw off the two erection bolts for air bag and take out the air bag for driver as shown in Figure 6-11.

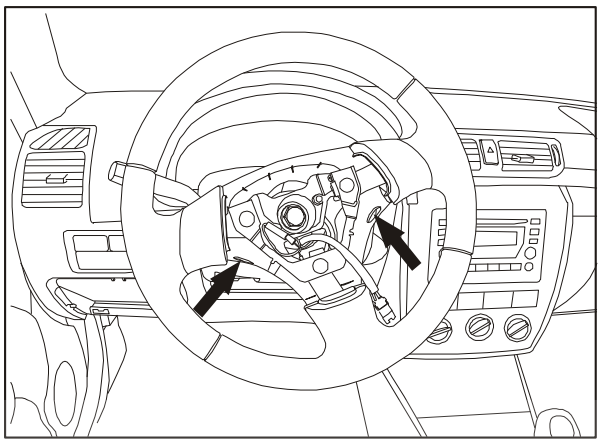


Figure 6-11 Disassembly of air bag

3. Cut off the cable joint of horn switch, screw off the fastening bolt of steering wheel and remove the steering wheel from steering column as shown in Figure 6-12.

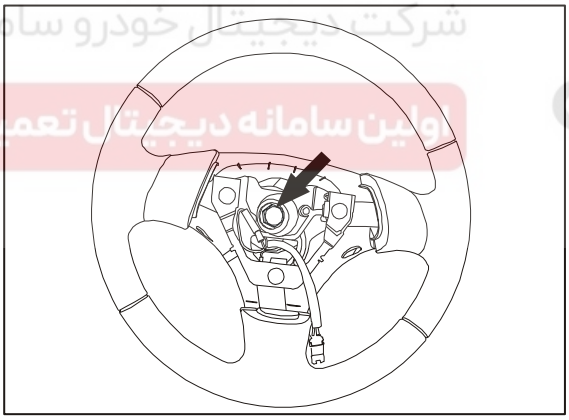


Figure 6-12 Disassembly of steering wheel

II. Disassembly of steering column

1. Remove the upper and lower cover board of steering column as shown in Figure 6-13.

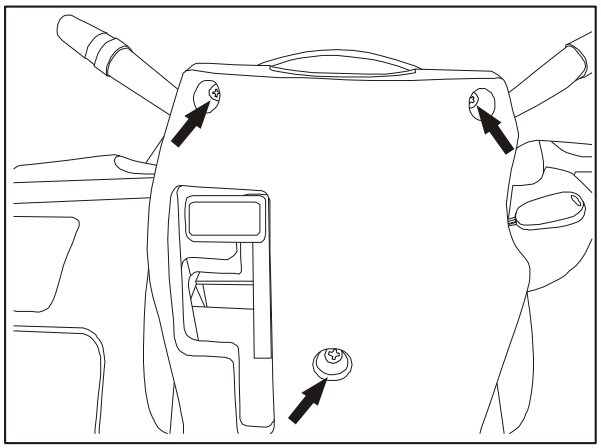


Figure 6-13 Disassembly of upper and lower cover plate for steering column

2. Cut off the cable joint of timer spring, screw off the three fastening bolts and remove the timer spring as shown in Figure 6-14.

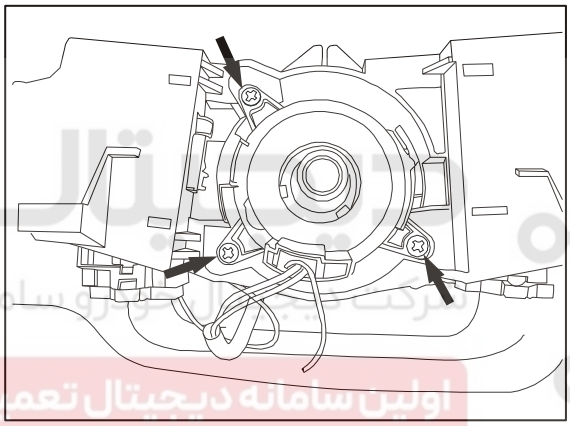


Figure 6-14 Disassembly of timer spring

3. Cut off cable joints of the left and right multi-function switch, screw off the three fastening bolts and remove the multi-function switch as shown in Figure 6-15.

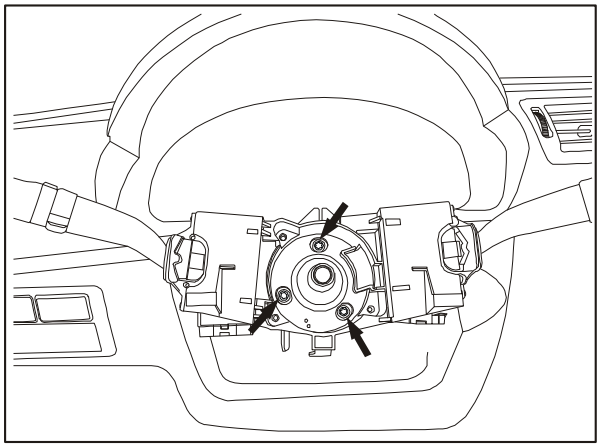


Figure 6-15 Disassembly of multi-function switch

4. Cut off the cable joint of the ignition switch, screw off the two stop screws and take down ignition switch assembly as shown in Figure 6-16.

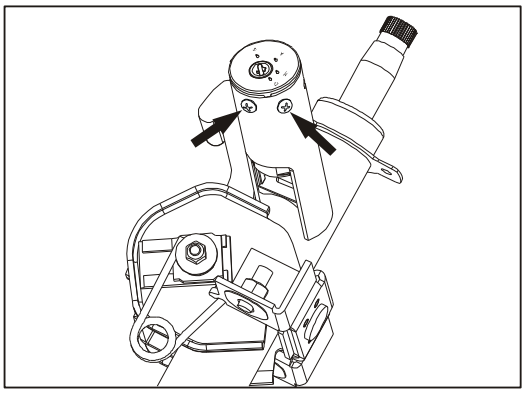


Figure 6-16 Disassembly of ignition switch

5. Screw off check nuts for both upper and lower steering shaft and plug out connecting bolts as shown in Figure 6-17.

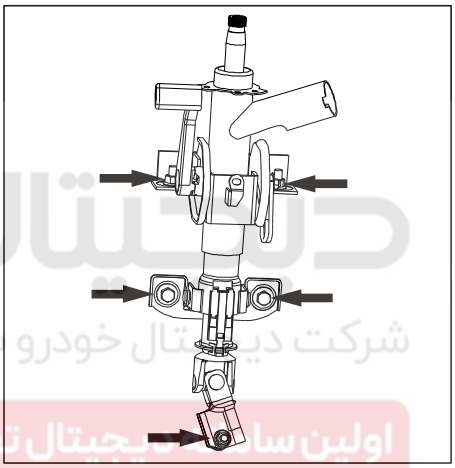


Figure 6-17 Disassembly of upper steering shaft

6. Screw off the two check nuts and fastening bolts separately, take down the steering shaft from the steering bracket as shown in Figure 6-17.

7. Screw off check nuts between the lower steering shaft and steering gear and pull out the connecting bolts, the remove the lower steering shaft as shown in Figure 6-18.

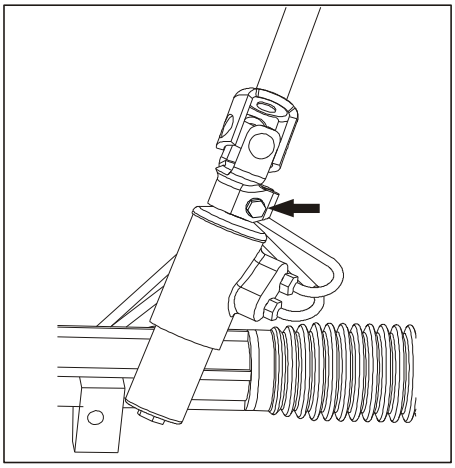


Figure 6-18 Disassembly of lower steering shaft

III. Disassembly of steering gear

1. Cut off the connection between inlet and outlet pipes for steering gear as shown in Figure 6-19.

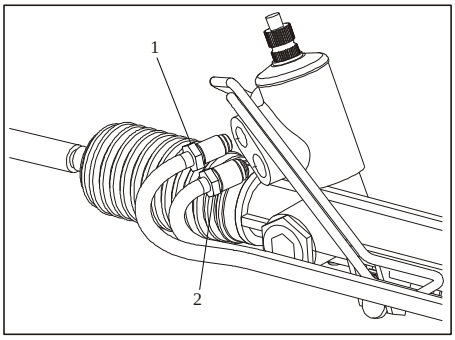


Figure 6-19 Disassembly of inlet and outlet pipe for steering gear

1-outlet pipe 2-inlet pipe

2. Remove the steering ball from steering knuckle as shown in Figure 6-20.

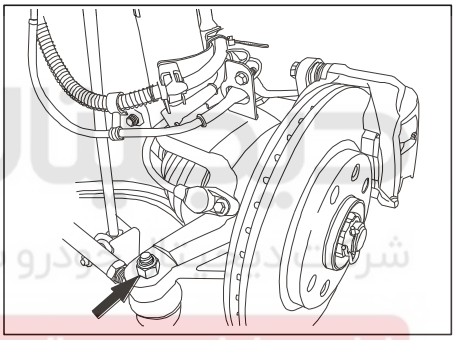


Figure 6-20 Disassembly of steering ball

3. Screw off the two erection bolts for steering gear and pick up the steering gear assembly as shown in Figure 6-21.

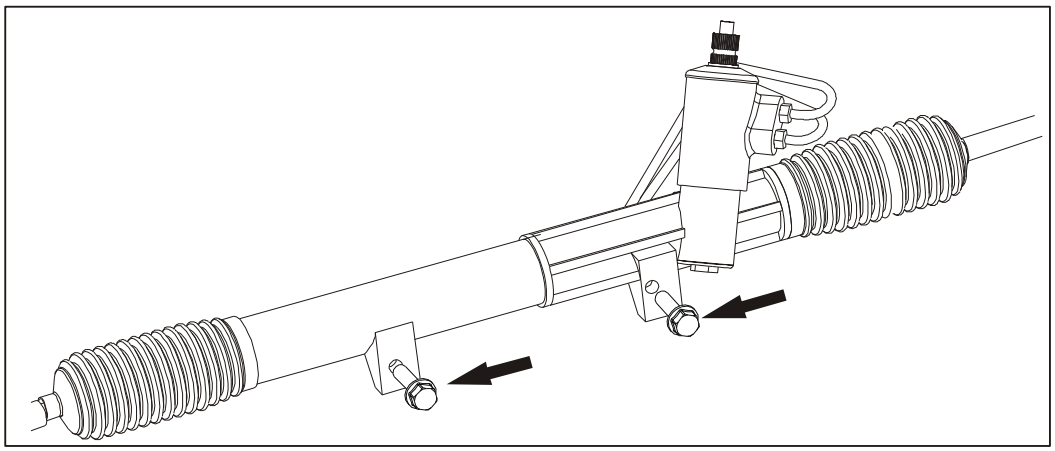


Figure 6-21 Disassembly of steering gear

Chapter IV Suspension System

Section Ⅰ General

Ⅰ Front Axle and Front Suspension

1. Basic structure of front axle

Lifan Car adopts breakaway steering drive axle. This axle uses McPherson independent suspension. The structure of front axle is as shown in Figure 4-1, which is mainly composed of steering knuckle 5, drive shaft 8, subframe 1, rocker arm 3 and its suspension.

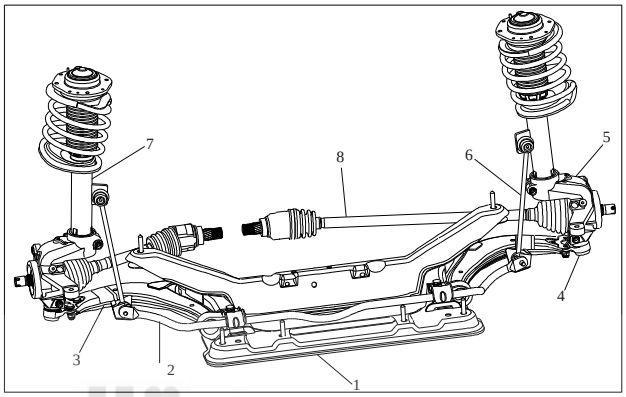


Figure 4-1 Front Axle and Suspension

1- Subframe 2- Stabilizer bar 3- Shift arm 4- Ball pin 5- Steering knuckle 6- Longitudinal tie 7- Front damper 8- Drive shaft

2. Structural features of front suspension

The front suspension is McPherson independent suspension, and is composed of coil spring, integral asymmetrical double acting telescopic hydraulic shock absorber, stabilizer bar and lower rocker arm. The axial line of kingpin pin is not aligned with the central line of damper piston rod, and the inclination angle of kingpin is larger than the inclination angle of damper piston rod. The features of front suspension are as follows:

(1) Avoid the lateral movement of steering wheel in the course of deformation process of strut independent suspension, and reduce the wear of steering wheel.

(2) During elastic deformation of suspension, although location parameter of wheel kingpin changes, respective location parameter of steering wheel can compensate for each other, therefore the driving stability is improved.

(3) The damper, spring and vertical pin are integrated and occupy small space, and this compact structure is useful for allocation of front engine driving vehicle.

(4) Due to little change of front wheel alignment during use, it is unnecessary to adjust the inclination angle and the caster angle of kingpin.

(5) The low unsprung load mass is good for reducing impact load on suspension and improving driving smoothness of the vehicle.

Ⅱ Rear Axle and Rear Suspension

1. Structural features of rear axle and rear suspension

The rear axle of Lifan car is longitudinal rocker arm independent suspension, as shown in Figure 4-2, consisting of rear axle 1, rear rocker arm 5 and its suspension. The entire rear axle is connected to body by rear axle bracket via spring cushion. Its rear suspension bracket is single longitudinal rocker arm independent suspension, consisting of two cross torsion bar springs 3 and two double acting telescopic shock absorber 4 and stabilizer bar 2.

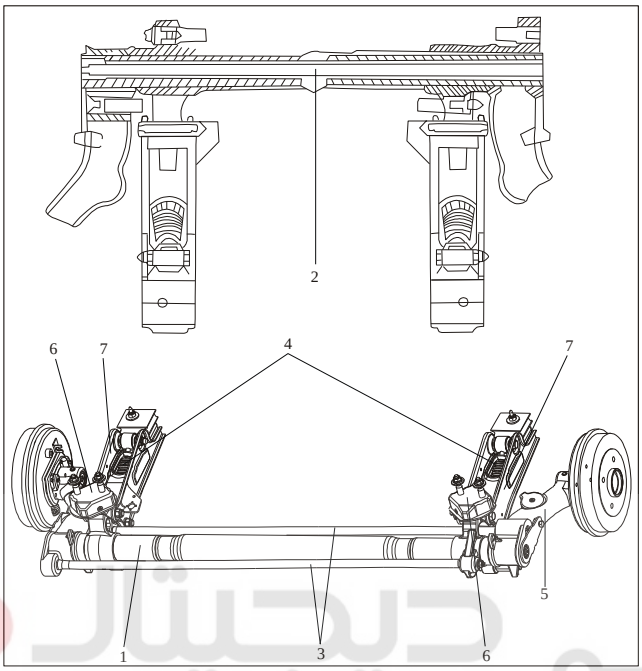


Figure 4-2 Rear Axle and its Rear Suspension

1- Rear axle 2- Stabilizer bar 3- Torsion bar spring 4- Rear damper 5- Rear rocker arm 6- Spring buffer 7- Damper bracket

The rear axle and its suspension of Lifan car are of distinctive characteristics, as follows:

(1) That all parts of suspension and rear axle are fixed on one bracket, providing compact structure and convenient maintenance.

(2) Rear suspension uses torsion bar spring as its elastic element, connecting body and wheels elastically. Since the stored energy per unit of torsion bar spring is much more than that of coil spring as well as leaf spring, this light-weight torsion bar spring can improve vehicle driving smoothness.

(3) The torsion rigidity of rear suspension torsion bar spring is a constant, but the rigidity of rear suspension adopting torsion bar spring is alterable, and this is useful to improve driving smoothness of the vehicle when load changes. Besides, it's easy to realize adjustment of body height by adopting torsion bar spring.

(4) The joint between rear axle assembly and body adopts specially-designed self-deflection spring cushion, therefore rear axle possesses follow-up steering function. When the vehicle turns, the lateral force arising from the centrifugal force will deform the spring cushion, and then the rear axle assembly will deflects itself in the turning direction of front wheel by certain degree in the horizontal plane, so that the understeer of the vehicle will be increased. Adopting rear axle with follow-up steering function helps to increase handling and stability of the vehicle when running at high-speed (making a turn and running is straight).

Ⅲ Wheel Assembly

A wheel is composed of rim and tire, and the tire is fitted around the rim. The wheel assembly of Lifan cars is shown as in Figure 4-3, whose structural features includes:

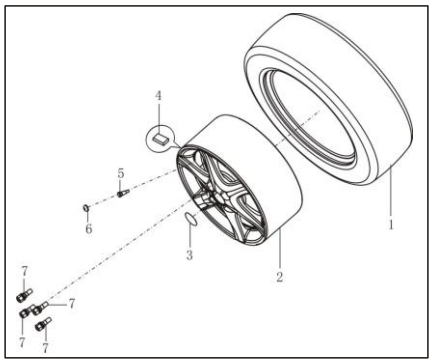


Figure 4-3 Aluminum Wheel Hub Wheel Assembly

1- Tire 2- Aluminum wheel hub 3- Aluminum wheel hub cover board 4- Adhesive balance weight 5- Tire valve 6- Tire valve protection cap 7- Bolt

1. The wheel rim is steel or aluminum drop center rim (as shown in Figure 4-4), with simple structure, light mass and great stiffness.

Figure 4-4 Steel Wheel Hub Wheel Assembly

1- Tire 2- Steel wheel hub 3- Wheel decorative cover 4- Clip-on balance weight 5- Tire valve assembly 6- Tire valve protective cap 7- Wheel fastening bolt

2. Tubeless pneumatic tire is adopted for the wheel (as is shown in Figure 4-5). There is an air barrier made of specially formulated thick rubber on the inner wall of the tubeless tire, providing a good driving safety with tubeless tire. When the tire is punctured by some sharp body, the air barrier will wrap tightly around the sharp body to prevent leakage for a long time. Even when the sharp body is pulled out, owing to the action of air barrier, the air pressure will be maintained temporarily, so that normal driving will not get affected. Due to puncture resistant, the repair rate of this tire is quite low. For wheel with an inner tube, due to friction and slippage between inner tube and tire, leakage of inner tube occurs immediately after puncture, as a result, the vehicle can not move normally.

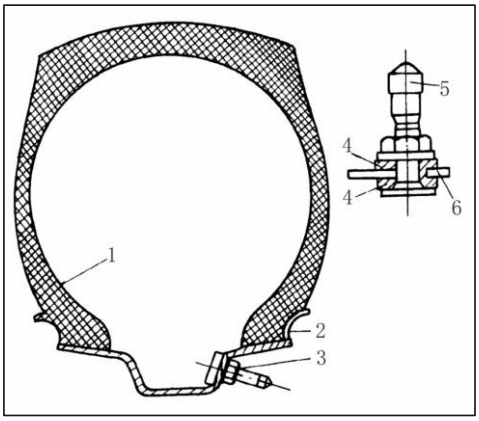


Figure 4-5 Tubeless tire

1- Tightness 2- Bead inner liner 3- Tire valve 4- Rubber seal cushion 5- Tire valve cap 6- Wheel rim

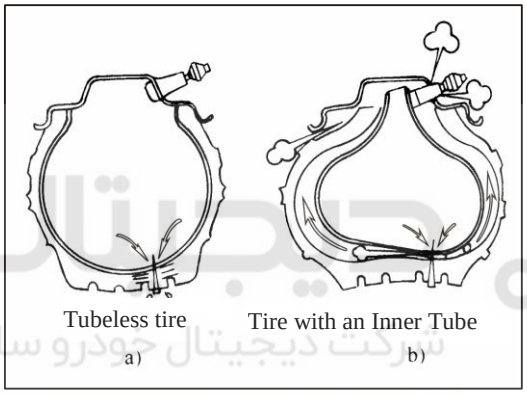


Figure 4-6 Leak Situation after Tire Puncture

3. Since the tubeless tire is used for wheel, the tire heat generated in the course of driving will be emitted out from the rim directly. In addition, since no heat is produced from friction between inner tube and tire, the temperature of tire in the course of driving is low (20%~25% lower than tire with inner tube). As a result, the tubeless tire is good for high-speed driving, and has long wear-resistance life.

4. Due to adopting low pressure series radial tubeless tires, Lifan car has the advantages including little rolling resistance, good fuel economy, good shock-absorbing capacity, comfort riding, good adherence, good cling capacity, safe driving, little circumferential deformation of tread of tire, high running speed and so on.

Ⅴ Technical Specification of Suspension System

1. The impact on tire performance from load, tire pressure, speed and temperature

Load ---- If the load is over 20%, the service life of tire will be reduced by 30% in average.

Tire pressure ---- If tire pressure is lower than 20% of the specified pressure, the service life of tire will be reduced by 20% in average.

Speed ---- Supposing that the tire life is 100% at 65km/h, the service life of tire will be reduced by 54% at 100km/h.

Temperature ---- Supposing that the tire life is 150% at 4℃ at 80km/h, the serviceable life of tire will be reduced by 2/3 at 30℃.

2. The major technical parameters of front axle and front suspension are as shown in Figure 4-1.

Figure 4-1 Major Parameters of Front Axle and Suspension

Item	Unload	Full Load
Front Wheel Camber	0°30′±30′	0°30′±31′
Front Wheel Toe-in	−2~0	−3~0
Kingpin Inclination Angle	10°45′±30′	10°30′±30′
Kingpin Caster Angle	2°55′±30′	2°30′±30′
Rear Wheel Camber Angle	1°±30′	1°±31′
Rear Wheel Toe-in	−2~2	2.5~6

3. Dimensions and specifications of tire are as shown in Figure 4-2.

Figure 4-2 Dimensions and Specifications of Tire

Name of Item	Technical Parameter
Type of Tire	Radial Tire
Specification of Rim	Steel Rim 5.5J
Specification of Tire	185 / 60 R14
Air Pressure of Front Wheel	240kPa
Air Pressure of Rear Wheel	240kPa
Air Pressure of Spare Tire	

4. Speed calibration of tire is as shown in Figure 4-3.

Figure 4-3 Speed Calibration of Tire

Speed Symbol	Allowed Maximum Speed (km/h)
T	190
H	210

Section Ⅱ Fault Diagnosis

When the vehicle is running, the suspension & axle system works under serve conditions. It will not only transmit driving force, braking force and its moment, but also bear the load of vehicle and the impact from road surface. Therefore, after long-time driving, some linkages in the suspension & axle system will get worn, deformed, cracked or damaged certain extent, so that fault may occur and then the riding comfort and control stability of the vehicle will get affected. In order to solve these problems, fault diagnosis shall be made accurately.

The fault of suspension & axle system is relatively complex. Most faults are accompanied by abnormal sound, noise, vibration, and sometimes these problems are not only caused by suspension system itself, but also related to tire and steering, braking, driving system and muffler. Therefore, when diagnosing a fault such as abnormal sound or vibration, be sure to accurately determine the driving condition under which such fault occurs. In addition, before making fault diagnosis, be sure to carry out the basic inspection on the parts from which the abnormal sound or vibration arises, so as to determine the scope of fault.

Ⅰ Inspection and Confirmation

1. Confirm the problems with customer.
2. Inspect existence of any evidence of mechanical failure visually.

(1) tire pressure, (2) wheel and tire, (3) steering knuckle, (4) tie rod end, (5) front suspension lower arm ball joint, (6) front suspension lower arm bushing, (7) front damper and spring assembly, (8) front/rear balancing rod and connecting rod, (9) rear spring, (10) rear damper, (11) rear suspension lower arm.

3. If any obvious cause for the observed problem or complaint is found, be sure to eliminate this cause before going to the next step.
4. If the cause for fault can not be found by visual inspection, confirm the failure symptom and refer to the Failure Symptom Diagram.

Ⅱ Failure Symptom Diagram

Figure 4-4 Failure Symptom Diagram

Symptom	Possible Cause	Action
Vibration	Front damper and spring assembly	Inspect front damper and spring assembly.
	Damage of front suspension lower arm	Inspect front suspension lower arm.
	Wheel and tire swing	Inspect wheel and tire and balance wheel.
Deviation	Incorrect height of the vehicle (The front of the rear part of the vehicle is too high or too low).	Inspect whether load is abnormal, the circle spring is sagging, or the spring is not standard spring.
	Wear or damage of redirector or connecting rod.	Inspect steering system.
	Brake system.	Inspect brake.
	Incorrect wheel alignment.	Adjust wheel alignment.
	Front wheel bearing wear	Inspect front wheel bearing. Refer to this Chapter.
	Wheel and tire.	Change wheel or replace tire.
Steering spinner is not centered correctly	Incorrect height of the vehicle (The front of the rear part of the vehicle is too high or too low).	Inspect whether load is abnormal, the circle spring is sagging, or spring is not standard spring.
	Redirector and connecting rod.	Inspect steering system.
	Suspension lower arm ball joint.	Test ball joints in this Chapter.
	Incorrect wheel alignment.	Adjust wheel alignment.
Incorrect track	Incorrect caster angle.	Inspect caster angle.
	Rear suspension damage	Inspect rear suspension.
Uncomfortable riding	Front or rear balanced connecting rod, joint or bushing.	Inspect or install new suspension parts as needed.
	Front suspension lower arm bushing.	Inspect or install new suspension parts as needed.
	Rear suspension arm bushing.	Inspect or install new suspension parts as needed.
	Front damper and spring assembly.	Inspect front damper and spring assembly.
	Rear damper.	Inspect rear damper
Loud noise	Front wheel bearing damage	Inspect wheel bearing.
	Suspension lower arm ball joint.	Test ball joints in this Chapter.
	Suspension damage.	Inspect suspension.

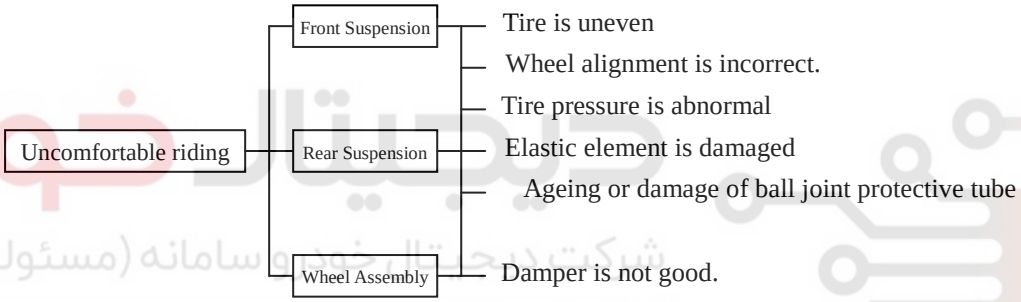
Situation	Possible Cause	Action
Improper tire wear	Incorrect tire pressure.	Adjust tire pressure.
	Incorrect wheel alignment	Adjust wheel alignment.
Vibration	Damage or wear of front wheel bearing.	Inspect front wheel bearing.
	Wheel and tire.	Inspect tire. Balance tire or replace tires as needed.
	Incorrect wheel alignment.	Adjust wheel alignment.
	Abnormal operation of steering system	Inspect steering system.

III Diagnosis Procedures

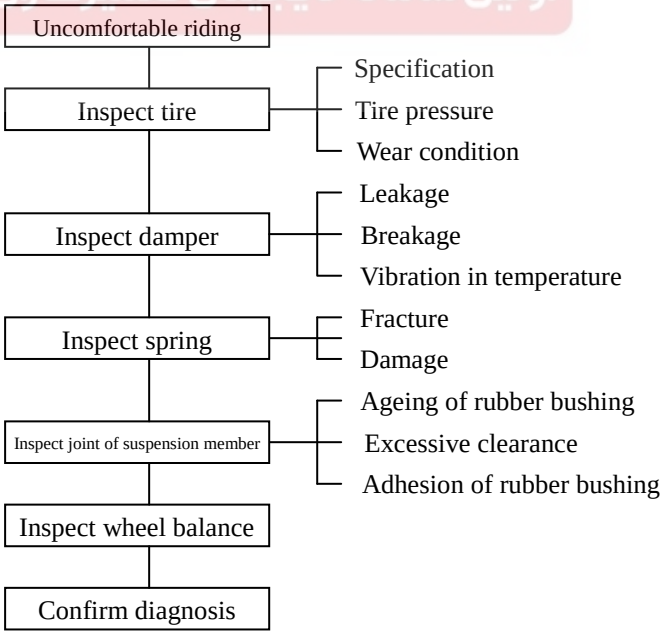
1. Uncomfortable riding

Uncomfortable riding refers to the phenomenon that, when the vehicle is running on a rough road, the body vibration can not be reduced rapidly, and thus the riding performance is poor.

(1) Failure Cause



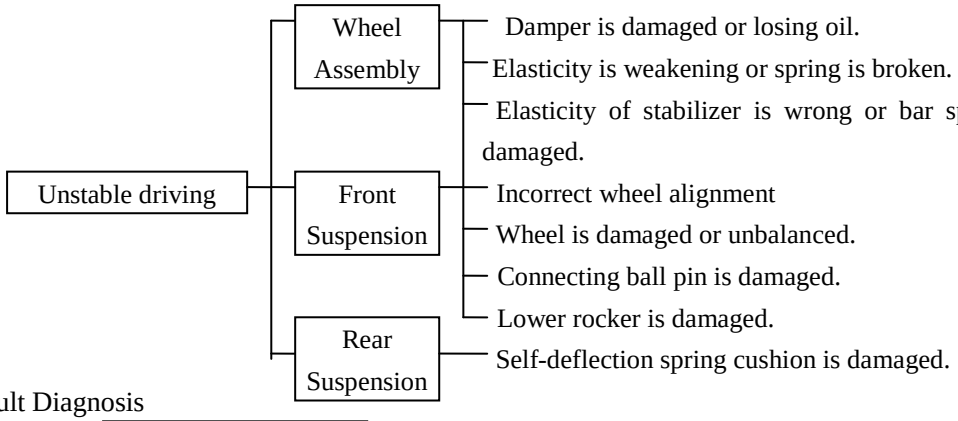
(2) Fault Diagnosis



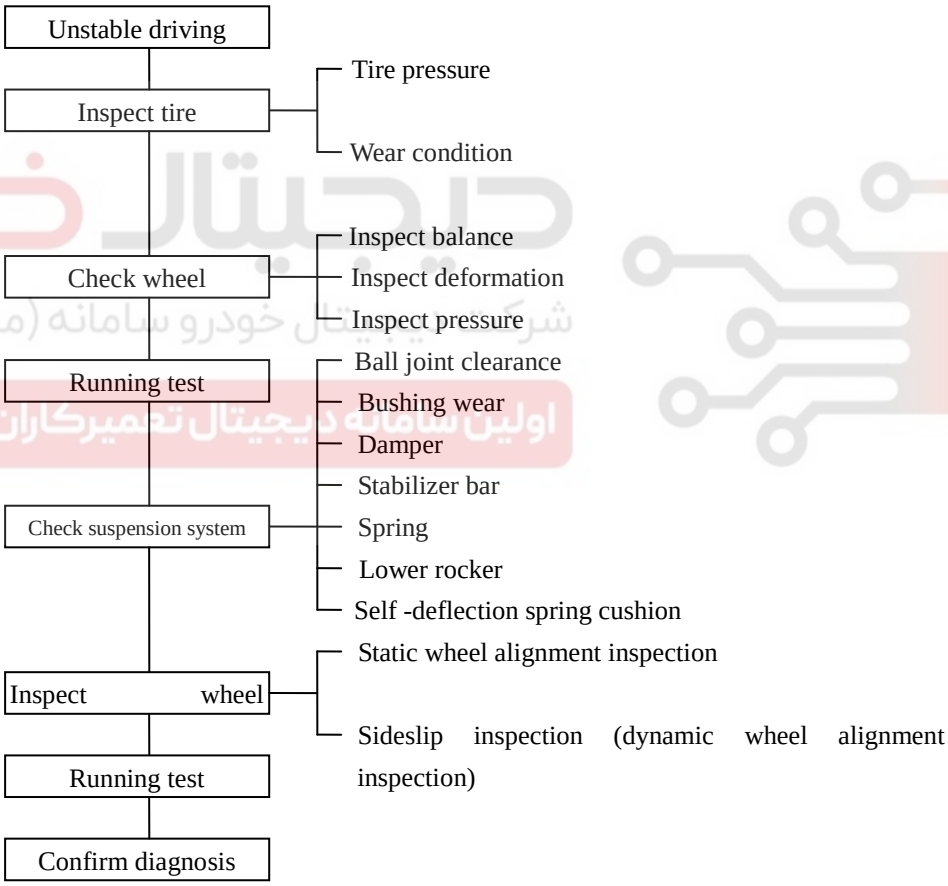
2. Unstable running

Unstable driving refers to the phenomenon that, in the course of running, the vehicle pulls to one side or incurs serious vibration, and thus the steering wheel continually shakes.

(1) Failure Cause



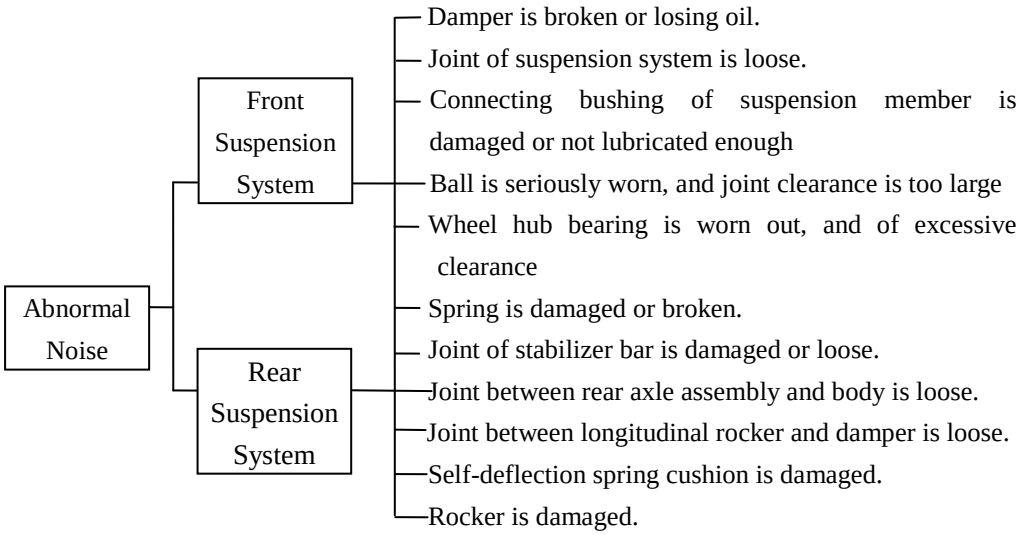
(2)Fault Diagnosis



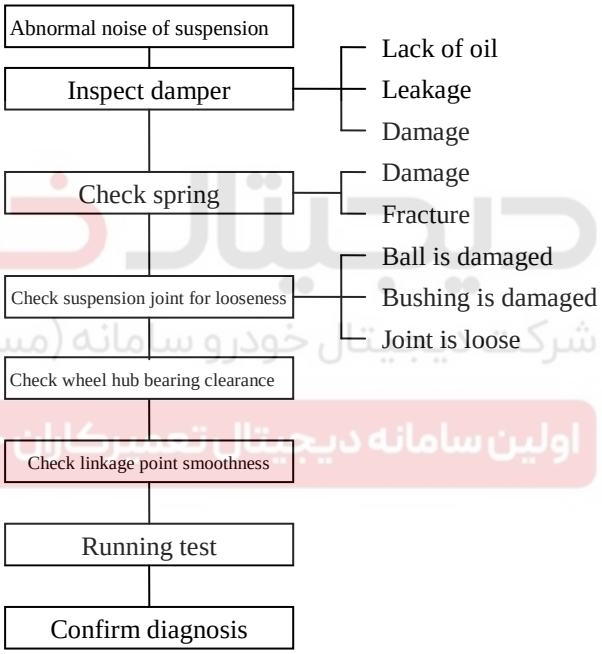
3. Abnormal noise of suspension system

Abnormal noise of suspension system refers to the abnormal noise which arises from front and rear suspensions when the vehicle is running.

(1) Failure Cause



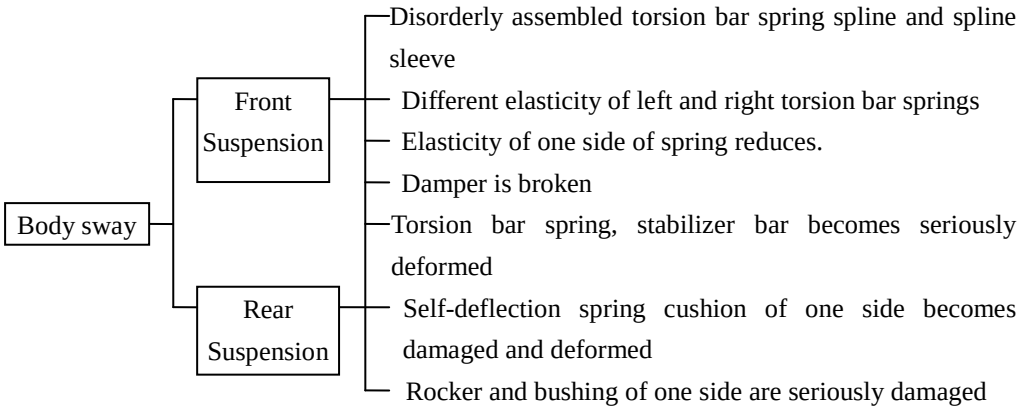
(2) Fault Diagnosis



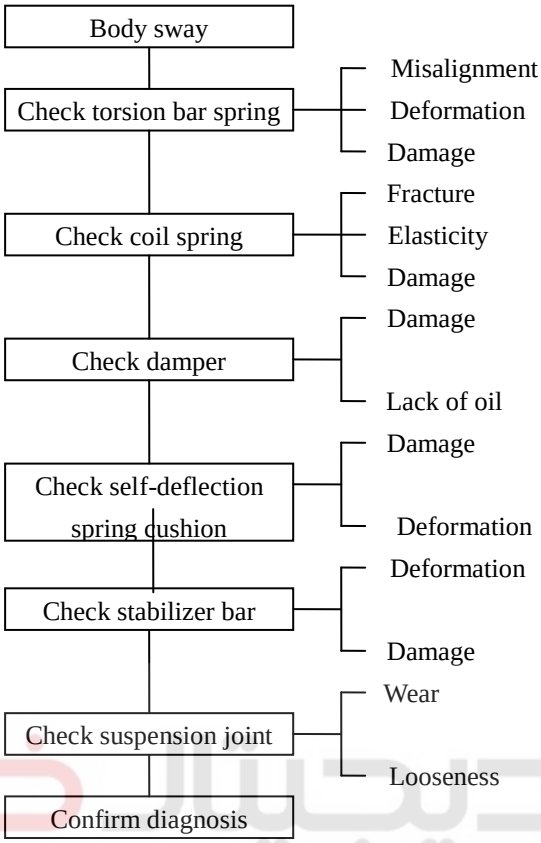
4. Body sway

Body sway refers to the phenomenon that, when being parked on a level ground, the vehicle sways because the height of left body is different from the height of right body.

(1) Fault cause



(2) Fault Diagnosis



Section Ⅲ Maintenance

Ⅰ Maintenance of Front Axle and Front Suspension

（Ⅰ）Disassembly, Assembly and Maintenance of rocker arm

1. Disassembly of rocker arm

(1) Loosen the front wheel bolt.

(2) Lift up and block up the front of the vehicle.

(3) Remove the wheel.

(4) As indicated in Figure 4-7, remove the drive shaft end fixing nut.

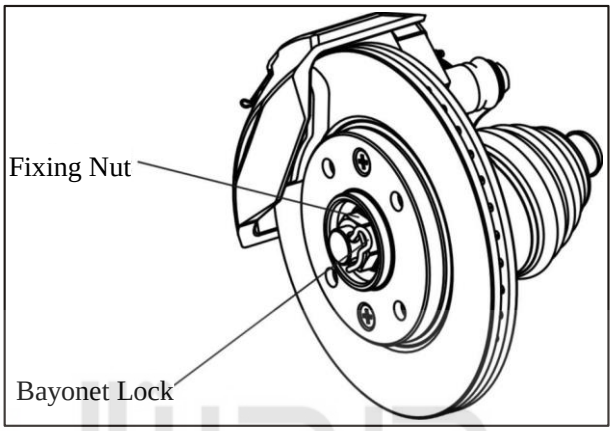


Figure 4-7 Fix Wheel Hub and Dismantle End Nut

(5) Screw off three bolt 1 as shown in Figure 4-8, remove the ball joint of rocker arm assembly, and separate the rocker arm from the steering knuckle.

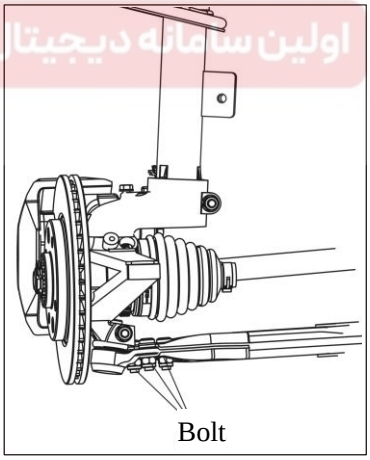


Figure 4-8 Dismantle Rocker Arm Ball Joint

(7) As indicated in Figure 4-9, screw off the elastic hinge fixing bolt 14 and 23 on rocker arm and subframe, remove the bolt 16, and then remove the rocker arm.

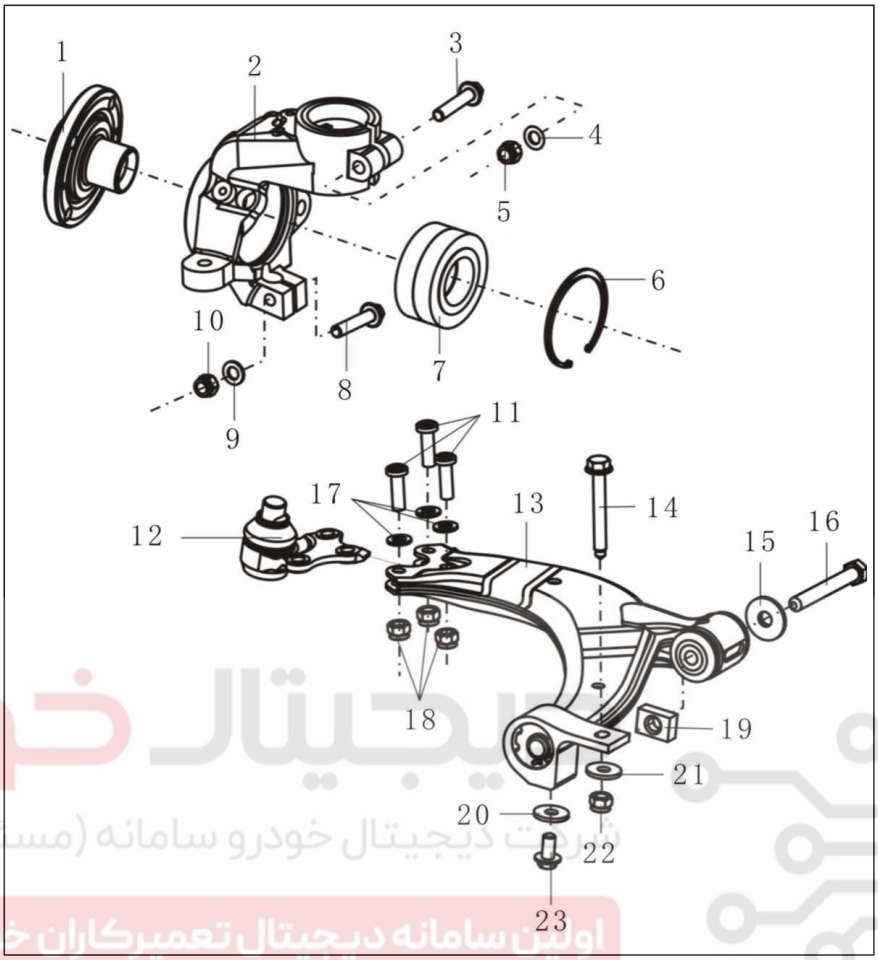


Figure 4-9 Exploded View of Relation Between Rocker and Steering Knuckle

1- Wheel hub 2- Steering knuckle 3- Bolt 4,9- Plain washer 5- Nut 6- Retainer ring 7- Wheel hub bearing 8- Bolt 10- Nut 11- Bolt 12- Ball joint 13- Rocker 14- Bolt 15- Plain washer 16- Bolt 17- Washer 18- Nut 19- Square nut 20- Plain washer 21- Plain washer 22- Nut 23- Bolt

(8) Dismantle the joint bushing and ball hinges.

2. Maintenance of rocker arm and ball pin

Since rocker arm is not only an important component for front wheel alignment and stress, but also a guiding part of front suspension, therefore, it shall be inspected carefully. When rocker arm has any sign of crack, deformation or damage, it shall be replaced. If new part is unavailable, just reshape and weld up the rocker arm, so as to recover the original dimension and shape. Derust the repaired rocker arm and coat it with anti-rust paint.

Inspect whether the ball pin could rotate freely, inspect whether the kingpin stud is damaged, and if necessary, replace it. When replacing the rocker arm assembly or rocker arm ball joint, the new ball joint shall be used to inspect aperture of steering knuckle ball joint hole. Once the aperture becomes large, out-of-round or loose, the steering knuckle shall be replaced. The ball joint not only absorbs vertical and lateral load, but also plays a role of fulcrum to turn wheels when the vehicle making a turn. Therefore, the ball joint will be worn after a certain time of use.

When the ball pin is damaged badly, the clearance will get large, which will result in front wheel misalignment, hard steering, unstable direction and abnormal wear of tire. Therefore, be sure to inspect the wear of ball pin strictly. Inspect surface wear and adaption of the removed ball pin; As for the ball pin in use, the inspection method is as follows: Lift the vehicle off the ground using a jack, make the ball joint stay in unloading position, and move wheels up and down. If the clearance is larger than the specified value, but the wheel hub bearing clearance is still proper, the ball pin should be replaced.

Inspect the rocker arm elastic hinge and lifting eye hinges and sleeve (See Figure 4-9). If the aperture becomes large or is deformed obviously, it is necessary to replace it with a new one.

3. Assembly of rocker arm

The assembly shall follow opposite steps of disassembly. Attention shall be paid as follows:

(1) Clean up all parts.

(2) Replace the fixing bolts removed.

(3) Replace all damaged parts.

(4) Tighten up the fixing bolts to the torque as specified in Figure 4-5, and coat the bolts with looseness-proof adhesive.

Figure 4-5 Tightening Torque Diagram of Suspension Fastener

No.	Name	Tightening Torque/N·m
1	Front Elastic Hinge Fastening Bolt	60
2	Rear Elastic Hinge Fastening Bolt	55
3	Small Rear Elastic Hinge Fastening Bolt	27
4	Fastening Bolt for Connecting Rocker arm Ball Joint	45
5	Stabilizer Bar Bracket Fastening Bolt	20
6	Drive Shaft End Fixing Nut	240
7	Tire Nut	90
8	Steering Knuckle Ball Joint Fastening Bolt	40
9	Fastening Bolt Between Steering Knuckle and Lower End of Damper	55
10	Clamp Nut Between Front Damper Axle and Front Suspension bracket	45
11	Fastening Bolt Between Front Suspension Upper Bracket and Body	25
12	Clamp Nut Between Front Stabilizer Bar and Longitudinal tie	40
13	Clamp Nut Between Longitudinal Tie and Front Damper	40
14	Clamp Nut Between Subframe and Body	84
15	Tie Rod End nut	35

(Ⅱ) Assembly, Disassembly and Maintenance of Front Suspension Damper and Steering Knuckle

1. Disassembly of front suspension steering knuckle

(1) Loosen the tire bolt.

(2) Elevate and block up the vehicle, and remove the front wheel.

(3) Fix the wheel hub with the tool fixing bracket (as shown in Figure 4-7), and then screw off the drive shaft end fixing nut.

(4) Screw off the bolts used to fix the brake lining wearing signal lamp harness fixing bracket, and then remove the fixing bracket.

(5) As indicated in Figure 4-10, remove the tie rod end pin nut, and then remove the tie rod end ball connector with the special service tool (ball pin remover).

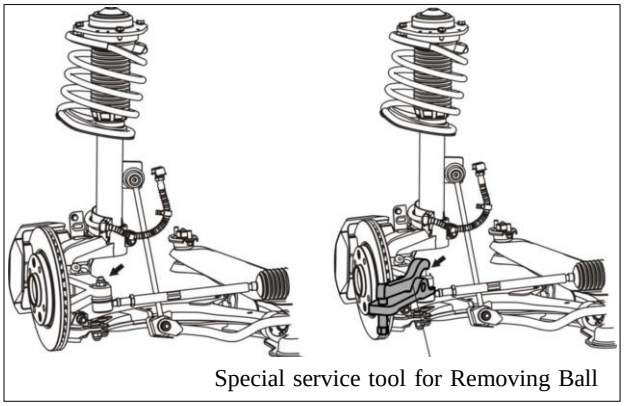


Figure 4-10 Remove tie rod end pin nut

Attention Points: Remove the ball joint only with the recommended tool. Otherwise, the ball joint and seal may get damaged.

(6) Remove the brake lining, screw off two fixing bolts from the brake caliper, and then remove the brake caliper.

(7) Remove the clamp nut 2 which is used to connect the longitudinal tie of stabilizer bar with the suspension damper from the center of suspension damper,.(as shown in Figure 4-11), and remove the stabilizer bar.

(8) Screw off the three clamp nuts from the ball joint of rocker arm, remove the ball joint, and separate the rocker arm from the steering knuckle.

(9) Remove the drive shaft from one side of the steering knuckle, and make sure that the medial drive shaft maintain is in the differential, so as to avoid the outflow of lubricant from differential.

(10) Screw off the fixing bolt 1 which is used to fix the end of suspension damper from the steering knuckle (as shown in Figure 4-11), insert the special service tool into the opening on steering knuckle seat ring (as shown in Figure 4-12), pull it to loosen the steering knuckle hole and damper cylinder, and then pull out the steering knuckle.

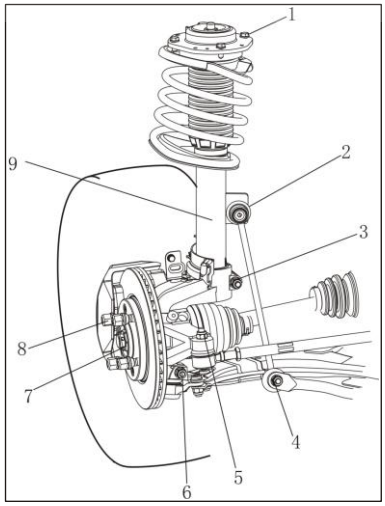


Figure 4-11 Front Suspension

1- Damper shaft clamp nut 2- Clamp nut 3- Fixing nut between steering knuckle and suspension damper end 4- Clamp nut 5- Steering knuckle ball joint fixing nut 6- Fixing nut 7-Drive shaft end nut 8- Ttire nut 9- Damper

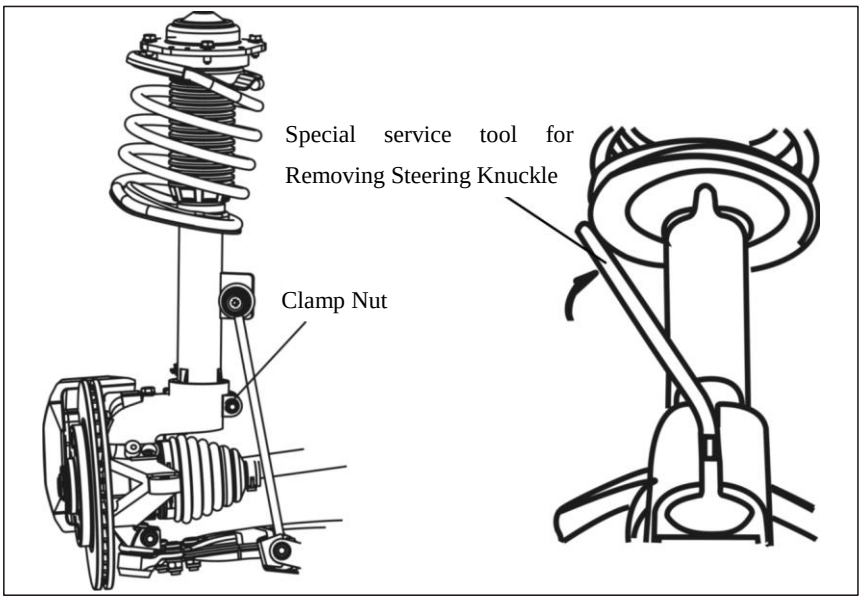


Figure 4-12 Remove Steering Knuckle

(11) As indicated in Figure 4-13, screw off the connecting nut 9 between front suspension damper and body, and then take out the front suspension damper assembly from bottom of the vehicle.

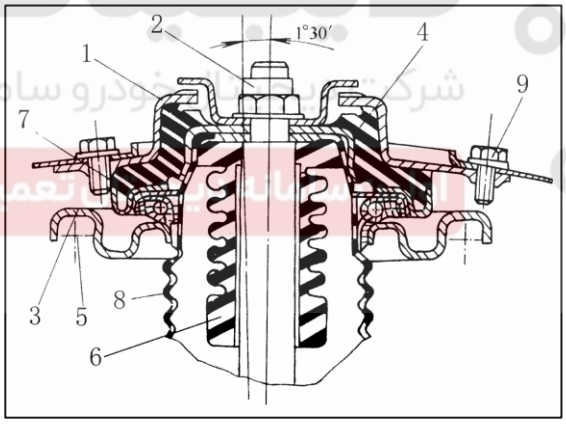


Figure 4-13 linkage Between Front Suspension and Body

1- Front suspension upper bracket 2- Damper end nut 3- Spring upper bracket 4- Block rubber
5- Spring 6-limit block 7- Thrust ball bearing 8- Dust cover 9- Bolt

2. Disassembly of front suspension damper

The disassembly of front suspension damper shall be carried out on tools like spring compressor. When disassembling it, just fix the special service tool on a bench clamp (as shown in Figure 4-14), insert the upper and lower compression forks into the upper and lower part of spring, pull the screw mandrel to tighten up the compression forks, compress the suspension spring with compressor until the end fixing nut can be removed, and then remove the end fixing nut with a wrench. Thereafter, slowly loosen the spring compressor, disassemble the front suspension damper, and take down the upper spring bracket, protective tube, thrust ball bearing, dust cover and other parts. Parts after disassembly are as shown in Figure 4-15.

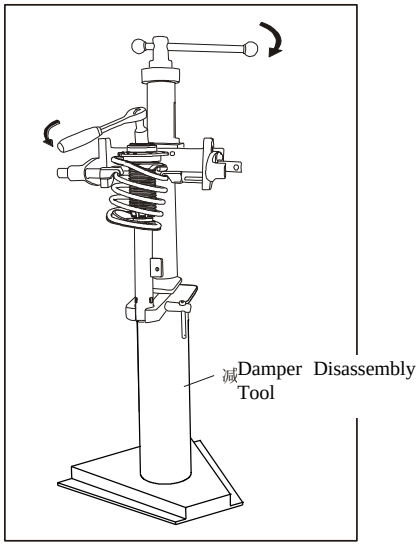


Figure 4-14 Disassembly and Assembly of Front Suspension Damper

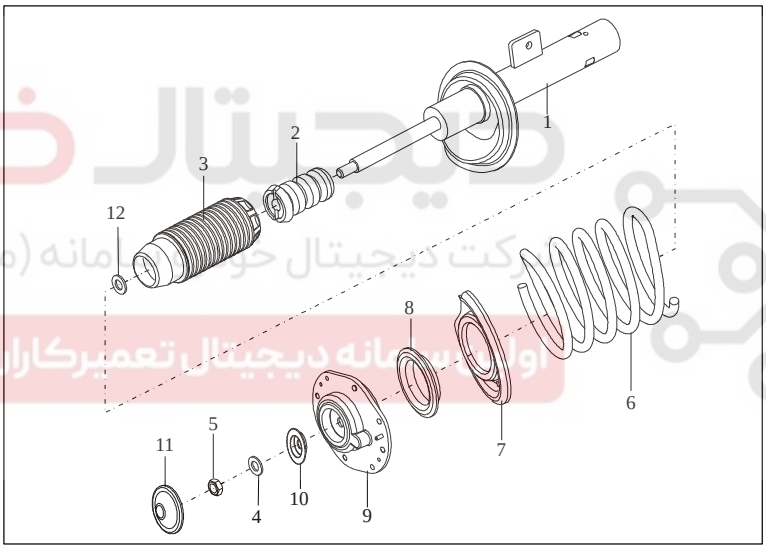


Figure 4-15 Front Suspension Damper Parts

1- Front damper 2- Front buffer block 3- Front damper protective tube 4- Decompression limit cushion 5- Metal flanged self-locking nut 6- Front suspension coil spring 7- Spring upper bracket 8- Thrust ball bearing 9- Front damper connecting plate 10- Upper mounting 11- Front damper water proof rubber cover 12- Plain washer

Warning: Since the spring possesses great tension; it's necessary to be very careful. Injury may occur if this instruction is not followed.

Compress the spring with the special service tool.

3. Inspection and maintenance of front suspension damper

(1) Inspection and maintenance of front damper: The suspension damper is non-detachable, that is, it’s a disposable component. If any bend or obvious depression or puncture exists on damper, the damper should be replaced.

Normally, only when excessive leak exists on the damper, oil droplets can be seen on the damper cover, and wheel produces excessive rebound due to shocks from the road, it is necessary to replace the damper.

Remove and inspect the damper as indicated in Figure 4-16a.

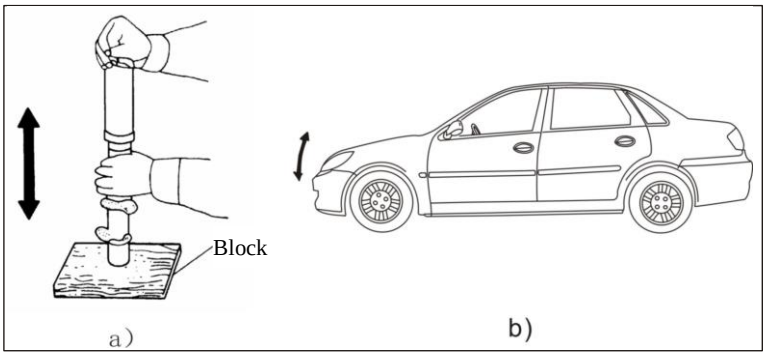


Figure 4-16 Inspect Damper

a) Remove and inspect b) On-board inspection

Follow the indicated method, push and pull the damper to and fro, and inspect the smoothness, compression and extension performance during the whole process. A satisfied damper should provide strong stable resistance during compression and extension (during compression and extension, the resistance may be different), and move freely without getting stuck. If stable resistance exists, the damper is in good condition; if compression or extension resistance does not exist, it indicates that the damper leaks oil or lacks oil, and should be replaced. In addition, the damper piston rod should be inspected for bend, obstructed movement, oil leakage and abnormal noise. If any of the above problems exists, replace the damper.

Inspect the performance of damper directly without removing the damper from the vehicle (as shown in Figure 4-16b). Inspection method: Make the damper working, press down the vehicle with hand, and release it rapidly. If the vehicle rebounds two more times, the performance of the damper is poor, and the damper should be replaced.

Inspect the damper for lack of oil without removing it from the vehicle. For visual inspection, see whether any sign of oil leakage exists. Secondly, touch-inspection after running: touch the damper cylinder rapidly after the vehicle stops running. If the cylinder is heated and hot, it means that the damper works normally and no lack of oil exists. If the cylinder is not heated or only tiny changes in temperature, it means that the damper lacks oil or runs out of oil and shall be replaced.

When lacking oil, the damper will make a noise, because the damper absorbs shock by using the drag arising from the recirculation of hydraulic oil (engine oil) in its cylinder. In case of lack of oil, the damping function will fail. When running on an uneven road, the vehicle will make click noise. Therefore, if abnormal noise arises from the damper, just replace the damper. If the new damper has been stored for a certain period, pull its piston rod to and fro before installation, so as to make it work normally.

(2) Inspection and maintenance of other components of front suspension damper: Firstly, visually inspect the front suspension spring. If any defects like obvious plastic deformation or crack exist on spring, just replace it. Then inspect the elasticity of spring. If the elasticity is weakening, this spring should be replaced. The inspection methods fall into on-board inspection and off-board inspection. For the purpose of carrying out on-board inspection, park the vehicle on flat ground,

inflate tires to the specified value, and measure the body height at the specified position. If the body height measured at either side or both sides is lower than the specified value, it means that the elasticity of one spring or of all springs is weakening, and the weakening spring(s) should be replaced. As for the spring removed from the vehicle, inspect its elasticity by using device or by means of free height.

Inspect the impact limit block, and if any sign of damage or elasticity weakening is found, replace it; inspect the working condition and running resistance of suspension thrust ball bearing, and if any damage to thrust ball bearing is found, replace it. Inspect the rest components for serious wear, damage or deformation, and if any above-mentioned problem exists, carry out replacement; also replace the dust cover and suspension seal components.

4. Assembly of front suspension damper

(1) Clean all components.

(2) Fix the lower bracket of spring onto the damper cylinder, as shown in Figure 4-17.

(3) Separately install protective tube 2, buffer block 3 and plain washer 4 on damper 1, as shown in Figure 4-17.

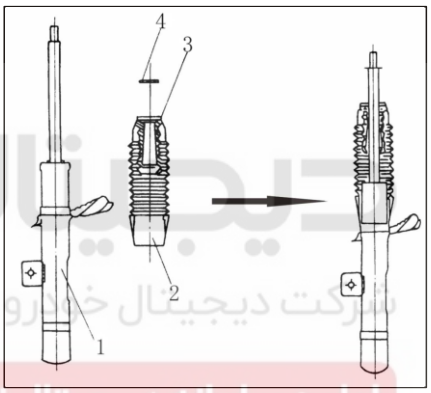


Figure 4-17 Install Parts of Protective Sleeve

1- Damper 2- Protective tube 3- Buffer block 4- Plain washer

(4) Use a bench clamp to fix the special service tool (spring compressor) (as shown in Figure 4-14), and then install the suspension spring and compress spring.

(5) Install the spring upper bracket 5, thrust ball bearing 6, upper bracket 7, upper mounting cover 8, washer 9 and lock nut 10 one by one (as shown in Figure 4-15), and then tighten up the fixing nuts with the torque of 45N·m.

(6) After assembly, slowly loosen the spring by loosening the spring compressor, and the spring should be maintained between the upper and lower brackets.

5. Inspection and maintenance of steering knuckle assembly

(1) Inspection and maintenance of steering knuckle and wheel hub: The steering knuckle is a part used for supporting the front wheel hub, and enabling the front wheel hub to make relative rotary motion around steering axis. When the vehicle is running on an uneven road, the steering knuckle will withstand variable impact load, and then it may get broken or deformed and the ball pin hole will get worn. Normally, the crack is tiny and invisible at the very beginning; if the steering knuckle is used continually and withstands relatively high impact load, it will get broken suddenly, and thus serious accident may occur. Therefore, a careful inspection is necessary, electromagnetic flaw detector or immersing in the oil and knocking method is usually used to find out crack.

Immersing in the oil and knocking method is a simple and effective method to detect concealed crack, when detecting, immerse steering knuckle in kerosene or diesel fuel for a few minutes, take it out and dry its surface, sprinkle a layer of whitewash, then knock at the non-working surface of steering knuckle lightly using a hammer, if crack exists, kerosene or diesel fuel immersed in the crack will spill, yellow stria will show on crack, then determine crack position according to the stria. Defects of steering knuckle occur, like crack, deformation, serious wear and scratch of bearing seat hole, out-of-circularity or damage of aperture of steering knuckle ball pin connecting hole, steering knuckle should be replaced.

Defects of wheel hub like crack, deformation, internal spline gear damage, fatigue spalling of spline gear face, corrosion pit, scratch and serious wear of axle journal for mounting wheel bearing, wheel hub should be replaced.

(2) Inspection and maintenance of wheel bearing: Once the wheel bearing is excessively worn, the radial clearance and axial clearance will become excessively large, and then the bearing should be replaced.

Lift and support the front of the vehicle, shake upper and lower of wheels, to inspect front wheel bearing for looseness. Note: Do not confuse looseness of lower supporting arm ball joint with bearing looseness. Turn wheels rapidly by hands, to confirm whether wheels turn smoothly and quietly on wheel bearing.

The standard value of axial clearance of wheel bearing for normal car is from 0 to 0.05mm. Inspect axial clearance of bearing before removing steering knuckle. Methods are as follows:

1) Elevate the vehicle off the ground, remove the wheels, and then re-install the wheel nuts.

2) As illustrated in Figure 4-18, install a suitable micrometer gauge retainer or similar device on wheel hub, then push and pull wheel hub. Measure end clearance between wheel hub and front wheel bearing assembly.

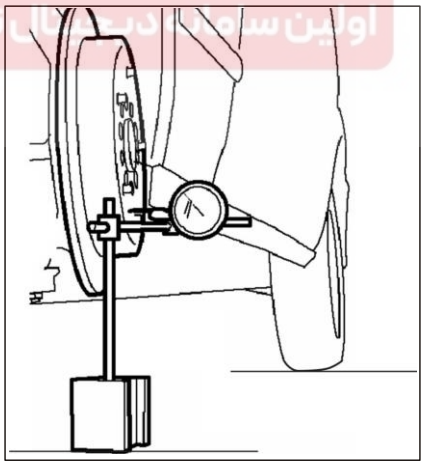


Figure 4-18 Measure Axial Clearance of Wheel Bearing

3) Measure the axial clearance of bearing by moving the brake disc inwards/outwards. After the inspection, if the measured value of axial clearance of bearing is higher than the standard value, the wheel bearing should be replaced.

Since the front wheel hub bearing of Lifan car is a maintenance-free self-lubricating bearing, customer need not increase grease. Instead, if increased, chemical changes among different greases of different compositions may cause lubrication failure, result in acceleration of bearing

wear. While bearing of excessive wear should be replaced rather than be installed. When changing wheel hub, special service tool and press machine should be used to remove wheel hub first, and force down or pull out bearing, then install new bearing and wheel hub.

6. Installation of front suspension damper and steering knuckle

The installation sequence of front suspension damper steering knuckle is the reverse sequence of disassembly. Points for attention during installation are as follows:

(1) Replace all lock nuts. All lock nuts are disposable. If no new nut is available on site and the original is intact, the original one can be used.

(2) When installing steering knuckle seat hole into suspension damper end, the joint of seat hole should match projecting mark on suspension damper end.

(3) Before tightening the fasteners, clear away all dirts, engine oil or grease on tread, and coat the bolts with looseness-proof adhesive.

(4) Tighten up all fixing nut to torque as specified in Table 7-1.

(5) After locking nut on drive shaft wheel hub end, force inward the flange of nut into the thrust groove on drive using locking punch (old type vehicle), so as to prevent looseness of nut.

(6) After installation of front suspension, front wheel alignment shall be inspected, if necessary, individual adjustment shall be made.

(Ⅲ) Inspection of Front Stabilizer Bar

The fitting & connecting relation between stabilizer bar and car is shown in Figure 4-19. The stabilizer bar 1 is mounted on elastic bracket 2, the elastic bracket 2 is installed on the susframe via the bracket cover board 3, and both ends of stabilizer bar are connected to the damper via the longitudinal tie 4. When installing stabilizer bar, the mark 2 on stabilizer bar shall fit with the mark 3 on elastic bracket (as shown in Figure 4-20), so as to ensure the proper location of stabilizer bar on the side and on level surface. Its mounting cover board will make the stabilizer bar pressed against the bracket.

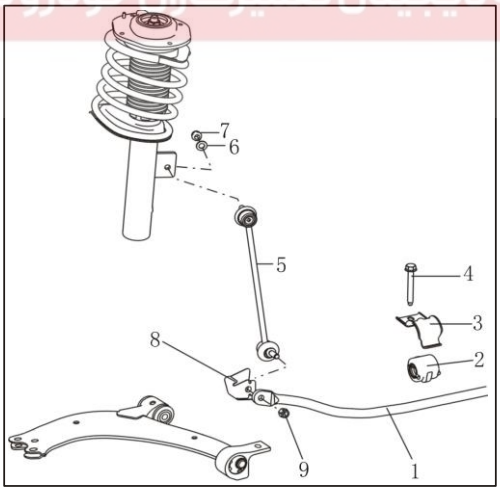


Figure 4-19 Fitting Relation of Front Stabilizer bar

1- Front stabilizer bar 2- Clock rubber 3- Fixing plate 4- fixing bolt 5- longitudinal tie 6- elastic washer 7- self-locking nut 8- dust boot 9- self-locking nut

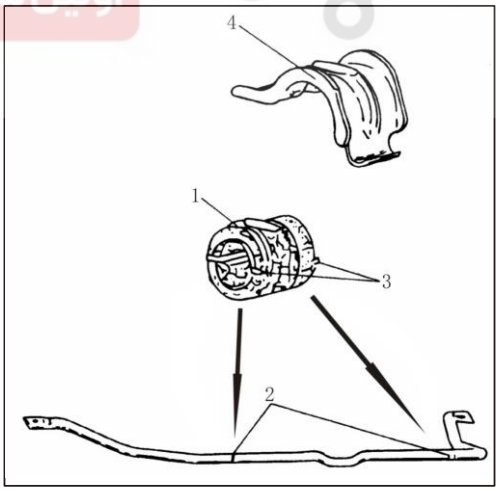


Figure 4-20 Fitting Mark on Front Stabilizer Bar

1- Elastic bracket 2- Fitting mark on front stabilizer bar 3- Fitting mark of elastic bracket 4- bracket cover board

The function of stabilizer bar: When the vehicle is making a turn, or when the vertical deformation of both sides of suspension is different, the stabilizer bar will reduce body sway and

swing by using counter torque, which could stop body sway, to assure driving safety. Any damage to stabilizer bar will affect driving stability. Therefore, the stabilizer bar and its longitudinal tie shall be inspected carefully. If the stabilizer bar is broken, bent or damaged, it shall be replaced; as for the stabilizer bar, on-board inspection can be carried out for any defect like movement and wear. If the joint of stabilizer bar is loose, it shall be fastened; if the elastic bracket of stabilizer bar is aged or worn seriously, loud noise will be produced when the vehicle is running at high speed, so that the elastic bracket shall be replaced.

(Ⅴ) Inspection and Maintenance of Front Body Height

The front body height of Lifan car refers to the height of front elastic hinge joint center line above the ground, when the vehicle parking on a level ground, as shown in Figure 4-21.

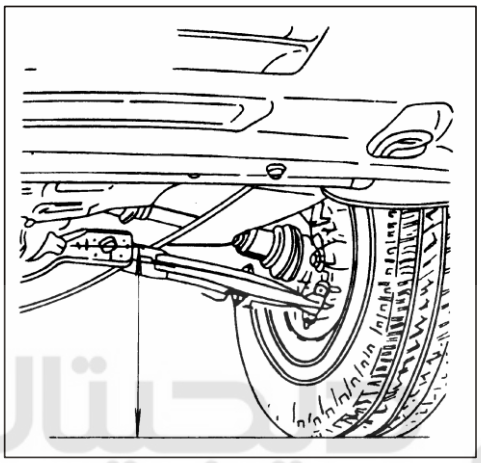


Figure 4-21 Test of Front Body Height

Test condition of front body height: Refill water, oil, fuel as required, and measure when the vehicle is vacant and unloading.

Under specified test condition, standard value of front body height is 193mm. This front body height is not adjustable.

Whether tested value of front body height is within the standard or not has great influence on front wheel alignment of the vehicle, tire wear, directional stability. When tested value of front body height is outside the standard, inspect whether rocker arm is bent or not, inspect whether elastic hinge joint tube or mounting bolt is worn, faults should be cleared in order to ensure front body height of the vehicle.

Ⅱ Maintenance of Rear Axle and Rear Suspension

The maintenance of rear axle and rear suspension emphasizes on inspection of installation condition and function after long use of all components, and the defects like looseness, big clearance, bend or deformation, elasticity weakening, excessive wear are not allowed. Especially, wear of rear rocker arm axle journal, wear or even looseness of needle bearing in rear axle tube and damage or elasticity weakening of torsion bar spring will lead to wheel misalignment of the vehicle, influence driving performance, and the vehicle goes wrong easily. The major maintenance of rear axle and rear suspension includes disassembly and assembly of rear axle and rear suspension, repair of rear rocker arm axle, replacement of rear axle needle bearing, replacement of torsion bar spring, inspection of damper etc.

(Ⅰ) Maintenance of Rear Rocker Arm Assembly

Due to adoption of longitudinal single arm stabilizer double torsion bar independent suspension on rear axle, when running, the center of rear rocker arm circling rear axle swing a little. After long use, long-term swinging motion of rear rocker arm may result in side-wearing of axle journal, wearing of needle bearing, worse still, it may even lead to looseness of rear rocker arm axle tube radial, cause rear wheel inclination, in order to clear this fault, longitudinal rocker arm axle tube should be replaced or axle tube journal should be repaired and needle bearing should be replaced. Besides, when damage occurs to axle of rear rocker assembly, rear rocker arm assembly should be repaired.

1. Disassembly of rear rocker arm assembly

(1) Lift the vehicle with a jack.

(2) Loosen the rear tire bolt, and then remove the wheels.

(3) Remove the brake drum.

(4) Screw off the stabilizer bar rocker arm fixing bolt 1, as shown in Figure 4-22.

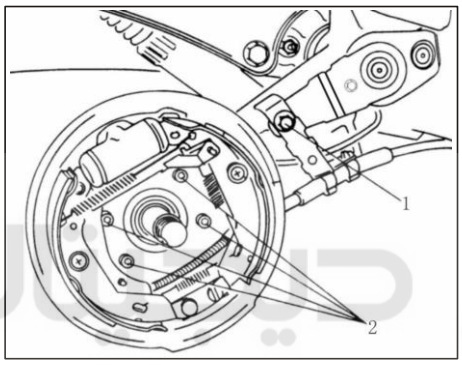


Figure 4-22 Remove Bolt

1- Rocker fastening bolt 2- Brake backing plate fastening bolt

(5) Screw off the brake backing plate bolt 2 (as shown in Figure 4-22), and then remove the brake backing plate.

(6) As indicated in Figure 4-23, remove the stabilizer bar rocker arm 1.

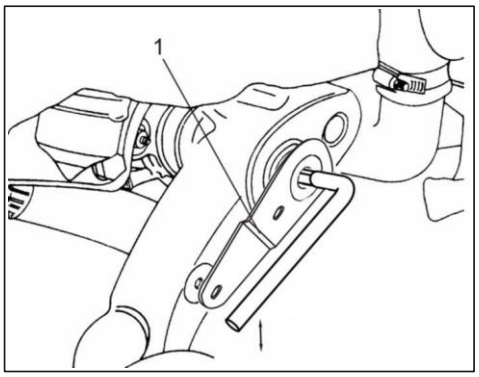


Figure 4-23 Remove Rocker arm

1- Stabilizer bar rocker arm

(7) As indicated in Figure 4-24, remove the fixing clip of handbrake brake cable, screw off the fixing bolts 15, 16 from the upper and lower part of damper, and then remove the damper 17.

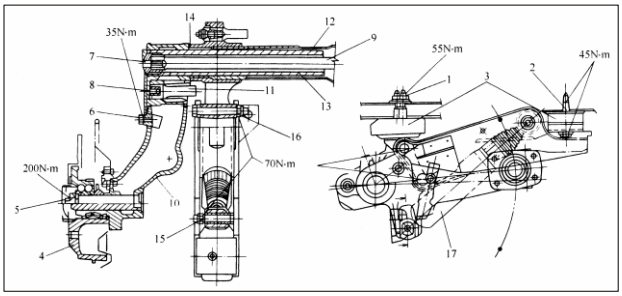


Figure 4-24 Rear Axle and Suspension

1- Front nut 2- Rear nut 3- Spring cushion 4- Brake drum 5- Drive shaft end nut 6- Fixing bolt 7- plug 8- Rocker 9- Stabilizer bar 10- Longitudinal rocker arm 11- Torsion bar spring 12- Needle bearing 13- Rear axle tube 14- Oil seal 15,16- Fixing bolt 17- Damper

(8) Adjust the locating tool, fix it as indicated in Figure 4-25, and then tighten up the looseness-proof nut on tool.

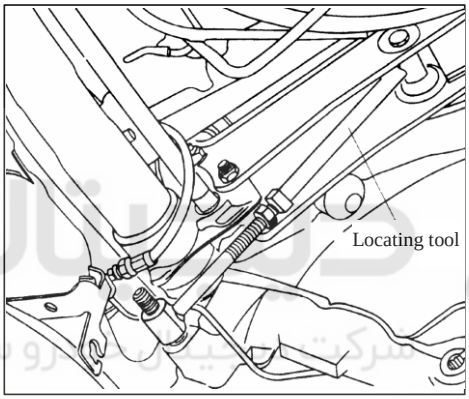


Figure 4-25 Install Setting Tool

(9) Remove the torsion bar spring: Remove the bolts and retaining ring from the left and right ends of torsion bar spring, mark on the relative position of torsion bar surface and rear rocker arm surface by drawing lines or printing points (as shown in Figure 4-53), and then pull out the torsion bar spring.

(10) Remove the locating tool.

(11) As indicated in Figure 4-26, remove the rear rocker arm assembly.

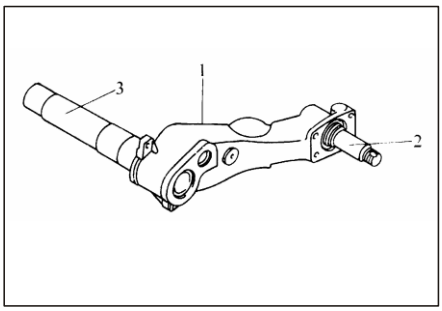


Figure 4-26 Rear Rocker arm Assembly

1- Rear rocker 2- Axle 3- Axle tube

(12) As indicated in Figure 4-27, remove the oil seal 1.

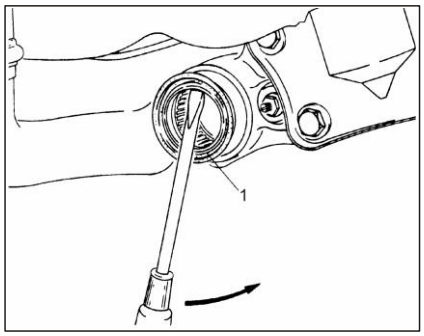


Figure 4-27 Remove Oil Seal

1- remove oil seal

(13) When misplacement or damage occurs to the retaining ring 1 (as shown in Figure 4-28), remove it.

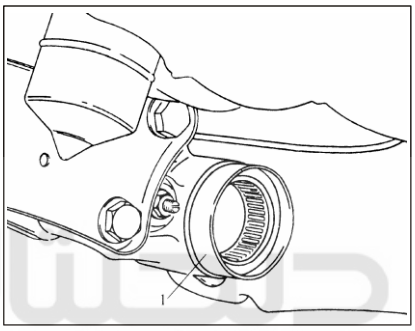


Figure 4-28 Remove Retaining Ring

1- Retaining ring

The rear rocker arm assembly as shown in Figure 4-26 is composed of rear rocker arm 1, axle 2 and axle tube 3. The rear rocker arm is a basic component, and its axle tube and axle are separately pressed into rocker arm holes.

Inspect the rear rocker arm 1 for crack or deformation, and if any problem exists, just replace the rear rocker arm; if the axle is damaged or deformed, just replace it with a new one rather than repair it by means of welding or flattening, and use the special service tool to press out the old axle and press in the new axle; inspect rocker arm axle journal for scratch or damage (as shown in Figure 4-29), if it's seriously damaged, workshop with good condition can take repair action to recover original dimension using brush plating, otherwise, use special service tool and press machine to replace a new rocker arm axle; inspect both sides of oil seal seat (as shown in Figure 4-29) for scratch or collision.

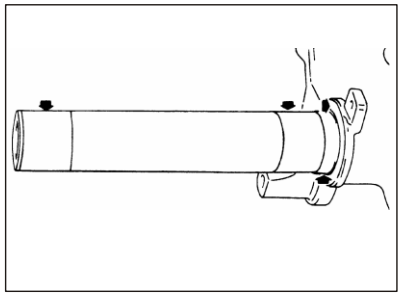


Figure 4-29 Inspect Rocker arm Axle Journal and Oil Seal Seat Surface

3. Installation of rear rocker arm assembly

(1) Clean both sides of oil seal seat, pour TOTAL MULTIS plate (special service tool) grease into the three edges of new oil seal, place the new oil seal on oil seal seat, ensure exterior edge a face one side of rocker arm, so that it can be integrated with oil seal seat, as shown in Figure 4-30.

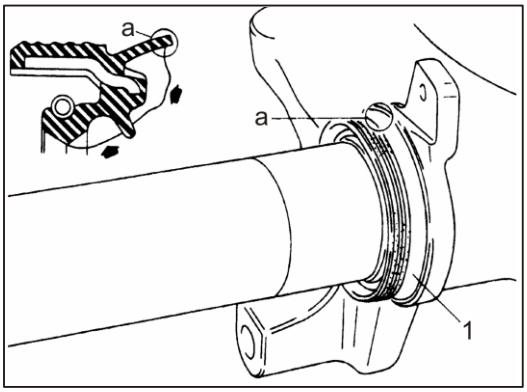


Figure 4-30 Install Oil Seal

1- Oil seal

(2) As indicated in Figure 4-31, use the special service tool to properly install the retaining ring 1 on the rear axle tube.

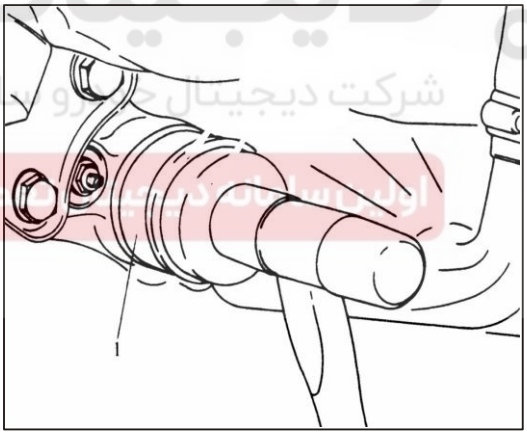


Figure 4-31 Install Retaining Ring

1- Retaining ring

(3) Lubricate the rocker arm axle journal and the needle bearing spacer ring with TOTAL MULTIS plate (special service tool) grease, put the rear rocker arm axle into the rear axle tube until the oil seal touches retaining ring, as shown in Figure 4-32.

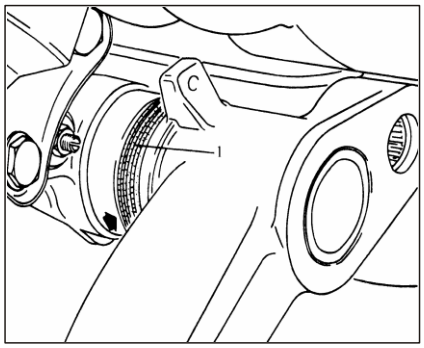


Figure 4-32 Install Rear Rocker arm Axle

1- Oil seal

(4) Install the special service tool damper locating block and adjusted setting tool (see Figure 4-33), push up damper locating block as much as possible to make it approach to retaining ring 1, and tighten up the nut 2.

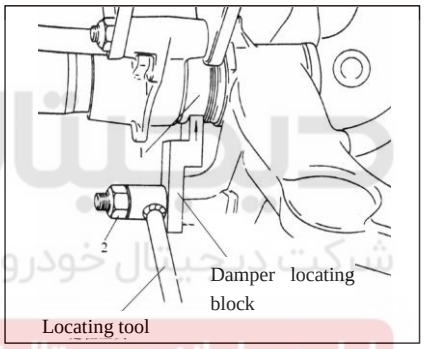


Figure 4-33 Install Setting Tool

1- Retaining ring 2- Nut

(5) As indicated in Figure 4-34, put 0.05mm gauge between rear axle damper and rear axle tube, knock rocker arm with a wooden mallet, to place rocker arm axle in position inside axle tube, when clearance of b point reaches 0.05mm, job is done.

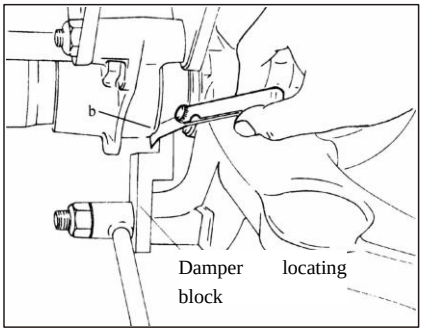


Figure 4-34 Install Rear Rocker in Position

(6) Install the torsion bar spring and the fixing bolt as per the fitting mark.

(7) Install the brake backing plate, tighten up the fixing bolt 2 with the torque of 37N·m (as indicated in Figure 4-22), and then install the brake drum.

(8) Remove the locating tools (locating block and localizer), install the damper, and loosely mount rather than tighten up the damper fixing bolt.

(9) As indicated in Figure 4-35, on the left side, install the bolt 1 (M8×1.25) onto the stabilizer bar, so as to fix the position of stabilizer bar and facilitate the installation of right rocker arm.

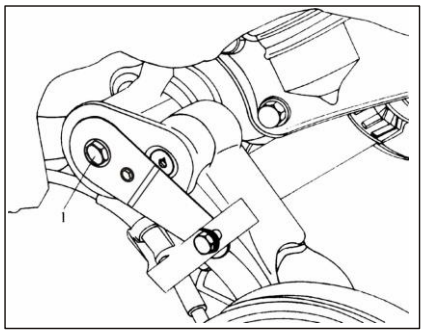


Figure 4-35 Install Bolt

1- Bolt

(10) On the right side of rocker arm: Carefully clean up the rocker arm and inside of oil seal, coat MOBIL TEMP G9 grease onto the outside surface of oil seal, install the new oil seals 1 and 2 as shown in Figure 4-36, and then properly install the rocker arm with the special service tool (as shown in Figure 4-37). Once the clearance between rocker arms reaches 1mm, the assembly is completed. Tighten up the bolt l.

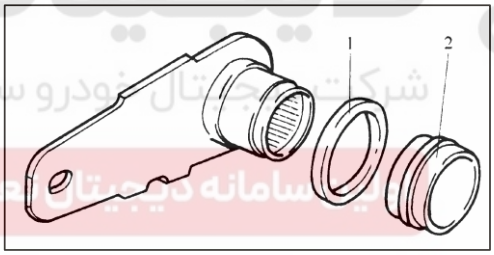


Figure 4-36 Install Oil Seal

1- Oil seal 2- Oil seal

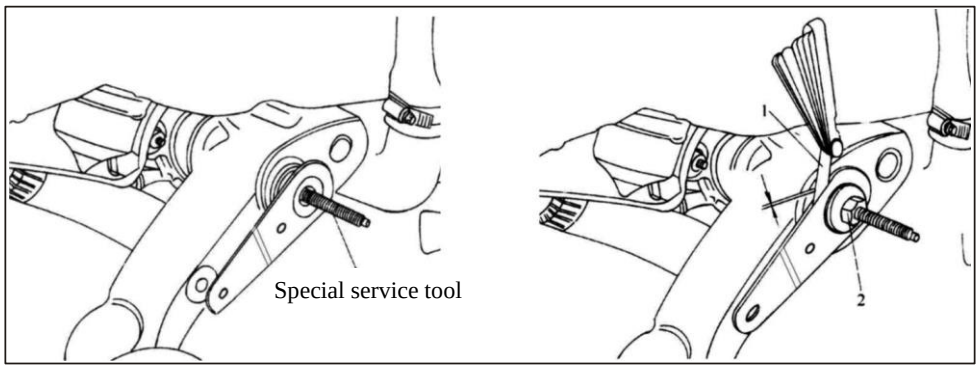


Figure 4-37 Install Rocker Arm

1- Gauge 2- Nut

(11) As indicated in Figure 4-38, coat both left and right blanking covers with sealant, install the plug 1 on both left and right sides of rocker arm,.

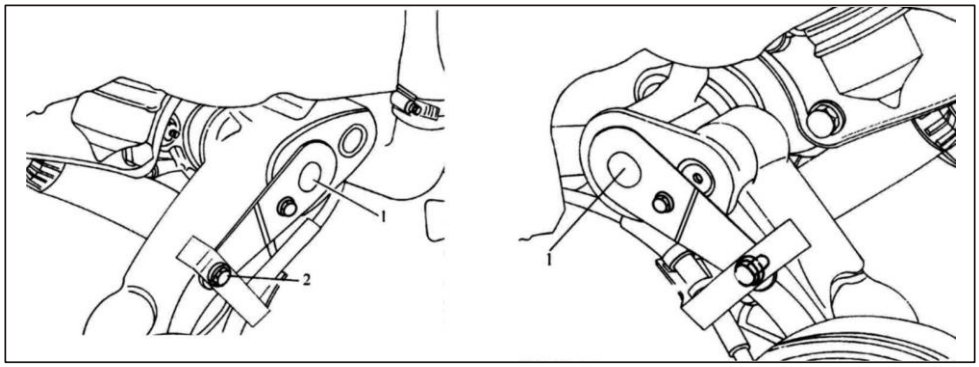


Figure 4-38 Tighten Rocker Arm Fixing Bolt

a) Left side view b) Right side view

1- Rear suspension stabilizer blanking cover 2- Rocker arm fixing bolt

(12) Install the wheel, and lower the vehicle onto the ground.

(13) Tighten up the tire bolts and damper fixing bolts.

(Ⅱ) Replacement of Rear Axle Tube Needle Bearing

When the needle bearing in rear axle tube is seriously worn, the radial of rear rocker arm assembly will be loose and the wheel will incline seriously, so that the needle bearing should be replaced; when the needle bearing is damaged, it should be replaced too. The replacement method is as follows:

1. Disassembly of needle bearing

Remove both left and right rear rocker arm assemblies and stabilizer bars, and the removal procedures are as same as the dismantlement procedure of rear rocker arm assembly. Continue according to following procedures.

(1) Remove the needle bearing outside the axle tube; using special service tool as shown in Figure 4-39a, insert head of inertia hammer into back of outside needle bearing 1, knock outwards with special service tool inertia hammer as shown in Figure 4-39b, to pull out needle bearing 1.

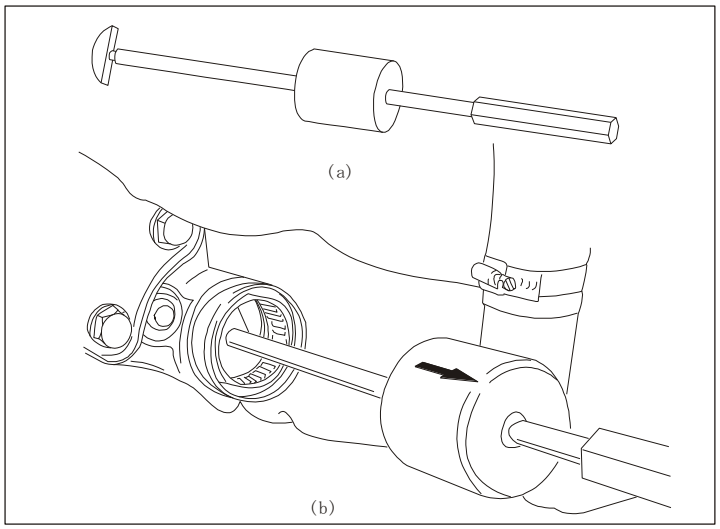


Figure 4-39 Remove Outer Needle Bearing

a) Special tool b) Pull out needle bearing 1- Needle bearing

(2) Remove the medial needle bearing:

1) Place plate (special service tool) on backside of medial bearing using special service tool as shown in Figure 4-40.

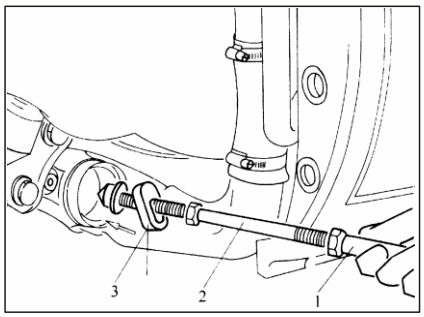


Figure 4-40 Install Special service tool

2) Fasten screw 2, remove solenoid 1 (see Figure 4-40), install special service tool mounting ring (special service tool), friction washer (special service tool), nut component (special service tool), as shown in Figure 4-41.

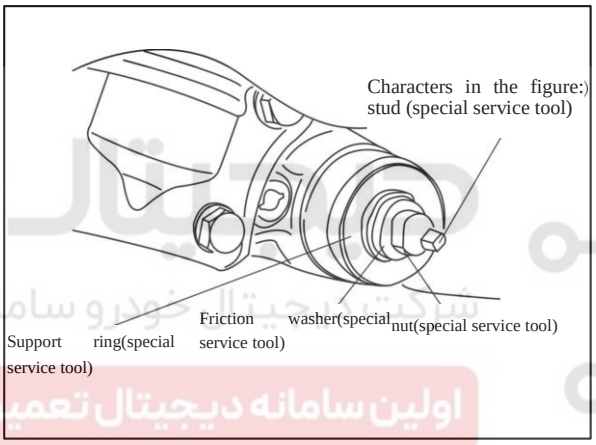


Figure 4-41 Remove Medial Needle Bearing

1- Solenoid 2- Stud (special service tool) (stud) 3- Pressure plate (special tool)

3) Rotate nut components (special service tool), remove medial needle bearing. In case it's difficult to remove the components, a tube with inner diameter of 21mm, length of 1m can be used to knock plate (special service tool), to remove bearing.(as shown in Figure 4-42).

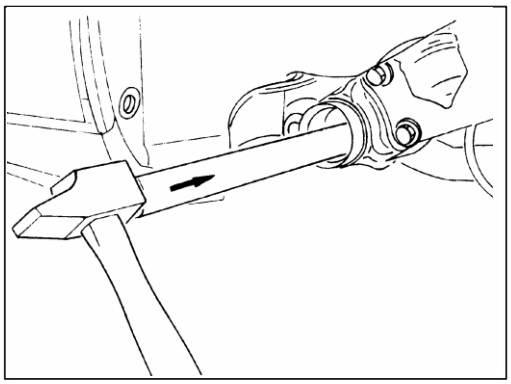


Figure 4-42 Remove Medial Needle Bearing

The disassembly method for both medial and outer needle bearing on the other side is same.

2. Installation of needle bearing

(1) Install the rear axle tube medial needle bearing, and the method is as follows:

1) Carefully clean the inner of rear axle tube.

2) As indicated in Figure 4-43, coat the new needle bearing with grease, and put on the regulated installation tool (joint).

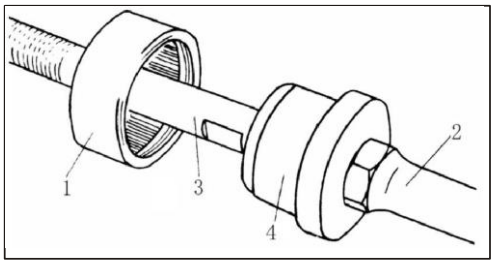


Figure 4-43 Fit Bearing on Joint (Special service tool)

1- Needle bearing 2- Solenoid (special service tool)

3- Stud (special service tool) 4- Joint (special service tool)

3) On the left, put needle bearing and installation tool into rear axle tube (as shown in Figure 4-44), lean special service tool thrust washer (special service tool) against axle tube bracket, with its regulated nut component (special service tool).

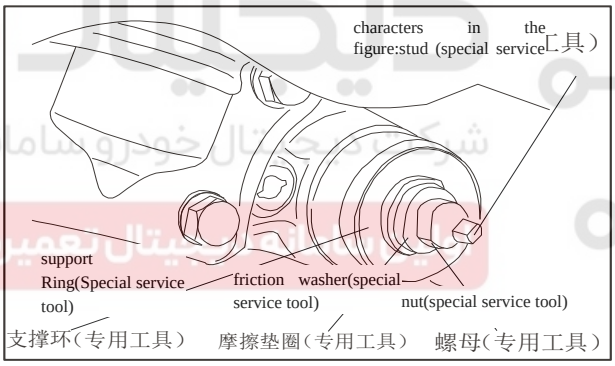


Figure 4-44 Install Bearing into Rear Axle Tube

4) On the right side, install special service tool support ring (special service tool), friction washer (special service tool), nut (special service tool) on stud shown in Figure 4-43, as shown in Figure 4-45.

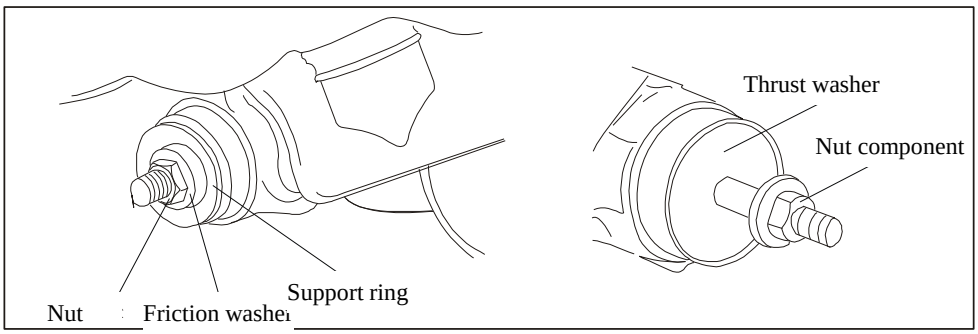


Figure 4-45 Install Medial Needle Bearing

The support ring, nut component, thrust washer, friction washer and nut shown in the

following Figure are special service tools.

5) Screw nut (special service tool) in the direction indicated in Figure 4-45, to force needle bearing in position slowly, when thrust washer (special service tool) press tightly with nut (special service tool), stop screwing nut (special service tool), the medial needle bearing has been installed.

6) Remove installation tool, install medial needle bearing on the other side using same method.

(2) Install rear axle tube outer needle bearing: refer to Figure 4-46, put new needle bearing on assembly special service tool limit block, then put bearing into rear axle tube, gently knock on assembly limit block with mallet (as shown in Figure 4-47), to help to install needle bearing in position, then remove limit block, and coat needle bearing with grease.

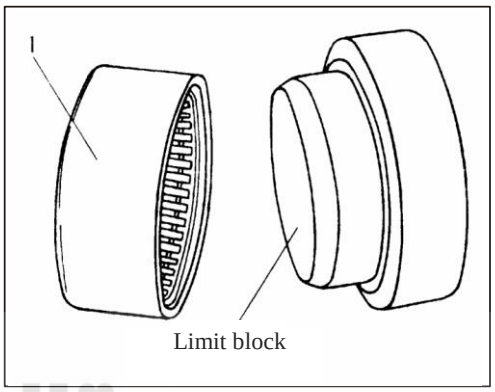


Figure 4-46 Install Bearing on limit block

1- Needle bearing

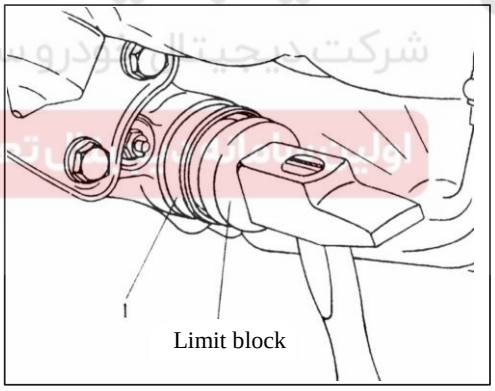


Figure 4-47 Install Bearing into Rear Axle Tube

1- Needle bearing

3. Install rear rocker arm assembly on both sides and other components, installation method is same with installation method of rear rocker arm assembly.

(Ⅲ) Inspection and Maintenance of Torsion Bar Spring

The torsion bar spring, with spline seriously worn, loose after assembly, will affect driving smoothness of the vehicle, when the vehicle is moving on an uneven road, suspension will produce abnormal noise; if torsion bar spring is losing tension or spring is deformed or fixed end is worn, rear body height will be reduced, and parameters of front wheel alignment will be replaced, result in affecting driving smoothness of the vehicle and excessive wear of tires, therefore, torsion bar spring shall be replaced when any fault occurs.

1. Assembly and disassembly points of torsion bar spring

Assembly and disassembly of torsion bar spring has been stated in rear rocker arm assembly

maintenance, we would like to emphasize assembly and disassembly points here.

(1) Before dismantling torsion bar spring, pay attention to relative position relation between torsion bar spring and damper, when dismantling, install setting tool on damper position, and make length adjustment.

(2) Before dismantling torsion bar spring, make assembly marks on torsion bar spring and rocker arm, to avoid changing the relative position between torsion bar spring spline and rocker arm hole spline, consequently influence terrain clearance of body.

(3) When re-installing, be sure not to install left and right torsion bar spring wrongly, they can not be exchanged. Since bearing force direction of left and right torsion bar spring is opposite, in order to maintain strength of fatigue, torsion bar spring treats pre-stressing in different direction during thermal treatment. If install wrongly, performance of torsion bar spring will be reduced and spring breaks easily. So when re-installing, marks on torsion bar spring shall be followed, there are two paint markings on left torsion bar spring, and one paint marking on right torsion bar spring, see Figure 4-48.

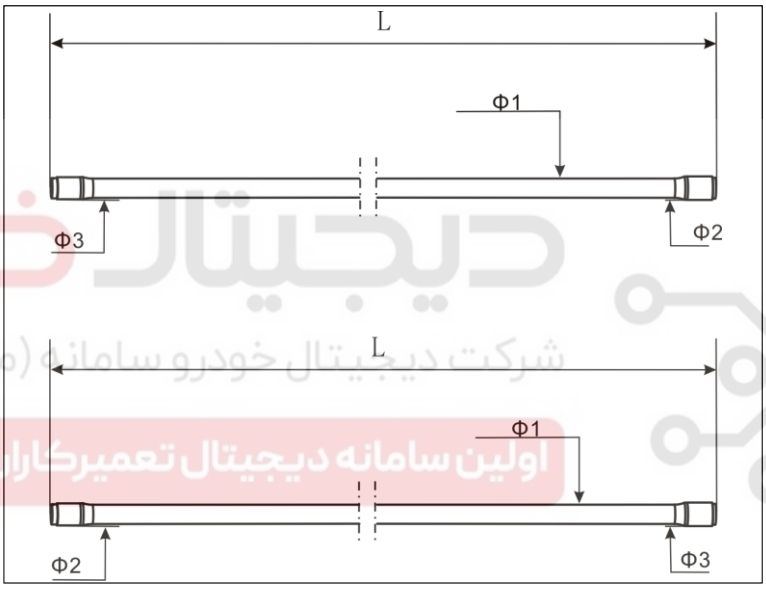


Figure 4-48 Left, Right Torsion Bar Spring Mark

(4) When installing torsion bar spring, coat torsion bar spline with grease, and install torsion bar, following assembly mark made during disassembly; for those bars without assembly marks, turn gradually, to find out a suitable place where torsion bar can be inserted into the hole for 8~10mm, special service tool shall be used to install torsion bar spring. Note: The number of spline gears for both torsion bar spring ends are 30 and 32, there are two relative positions in diametrical direction, where torsion bar can be inserted into the hole without changing under frame height.

(5) When torsion bar spring is seated, install retainer ring and fastening bolt as well as locknut.

2. Inspection and maintenance of torsion bar spring

Torsion bar spring shall not have obvious deformation or damage, otherwise, it shall be replaced; If there exist scratch, crack on surface of torsion bar spring, or its spline is seriously worn, loose after assembly as well as deformation after pressing and other defects, replacement is necessary; when elasticity of torsion spring is weakening, replacement is necessary, inspect torsion bar spring for weakening elasticity by detecting rear body height; when installation location of torsion bar spring is correct, while rear body height is lower than standard value, it indicates that elasticity is weakening.

(Ⅳ) Inspection and Maintenance of Other Components

1. Self-deflection spring cushion

Lifan car adopts patent product of Lifan company as its rear axle, it's a rear axle possesses a degree of steering effecting, which greatly improve driving stability of the vehicle. The axle steering function, tends to understeer of its rear axle, is mainly realized by front self-deflection spring cushion on rear axle. Therefore, soundness of front self-deflection spring cushion will greatly affect control stability of the vehicle. But front self-deflection spring cushion is a connecting member of body frame and rear axle, so it has to bear and transmit vertical and horizontal force and torque, especially when the vehicle moving on an uneven road, it also has to reduce vibration from vertical and horizontal direction, bear heavy dynamic load. Therefore, front self-deflection spring cushion, after long time use, will be damaged easily, result in poor performance, and shall be replaced.

The structure of front self-deflection spring cushion is as shown in Figure 4-49. Any form of deformation and damage occurs on spring cushion, replacement is necessary.

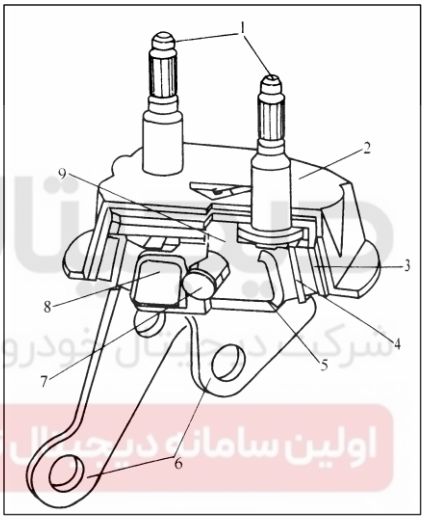


Figure 4-49 Front Self-deflection spring cushion

1-Bolt fixed with body 2- Steel outside case 3- Steel inside case 4- Interpolating adhesion rubber 5- Inner box 6- Steel rear axle mounting bracket 7- Locating pin 8- Limit block 9- Central rubber base

2. Damper

Refer to the inspection method for front damper. Inspect the damper for oil leakage, damage or failure, and if any problem is found, replace the damper. Inspect the installation position of damper for crack, damage or excessive clearance, and if any problem is found, replace or repair the relevant part.

3. Stabilizer bar

As shown in Figure 4-50, two ends of stabilizer bar is connected to the rocker arm through spline. When left rear wheel and right rear wheel run synchronously, the stabilizer bar does not work; when the relative swing of left rear wheel and right rear wheel is comparatively large (such as turn driving at high speed), the stabilizer bar is distorted, and its counter torque force both wheels tend to balance, so as to reduce the sideway and swing of body and assure the driving stability. Due to the different size, the left and right ends of stabilizer bar are not exchangeable.

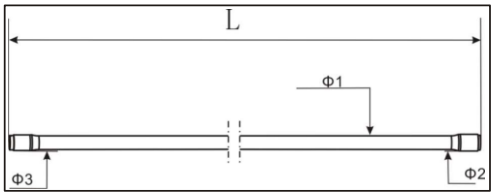


Figure 4-50 Rear Stabilizer Bar

If the splines of stabilizer bar are seriously worn or loosened after assembly, loud noise may arise from the vehicle when it is running on an uneven road. Therefore, the stabilizer bar with loose spline should be replaced; and the stabilizer bar with surface defects like crack, scratch should also be replaced.

(Ⅴ) Inspection and Adjustment of Rear Body Height

Rear body height is determined by condition of torsion bar spring, elasticity weakening of torsion bar spring will reduce height of empty vehicle. Since distance between rear limit block and cushion is shortened, the cushion bumps against limit block frequently, affect driving smoothness of the vehicle. Besides, when elasticity of both torsion bar spring weakens, kingpin camber angle of front wheel alignment is enlarged, affect steering. Therefore find out malposition of torsion bar spring as well as performance failure by inspecting rear body height periodically, assure driving safety and riding comfort, through proper adjustment and fault-clearing .

1. Inspection of rear body height

(1) Inspection conditions

1) Equipped car (no-load, filled with 5L fuel).

2) Standard pressure tire.

3) Park the vehicle on a flat road.

4) Before measuring, shake the vehicle to eliminate stress on suspension mechanism.

(2) Height inspection Rear body height of the vehicle refers to the distance from the ground to ϕ58mm tubular rear axle, as shown in Figure 4-51. Its standard value H=465mm, both heights of left and right sides shall be less than 10mm.

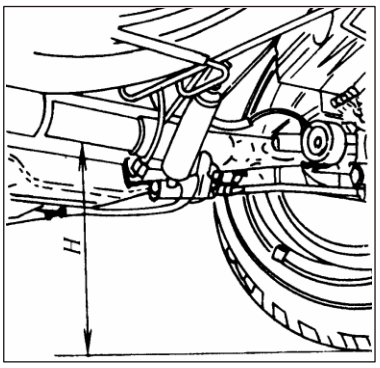


Figure 4-51 Inspect Rear Body Height

Inspection method, firstly, measure three values on the right side of body, compute its average; secondly, measure three values on the left side of body and compute its average. Finally, add up two averages and divide it by 2, the result is rear body height. When rear body height is not within specified value, adjustment should be made; when height difference between left and right rear body is bigger than 10mm, adjustment should be made.

2. Adjustment of rear body height

Since both rear suspension torsion bar spring ends are separately connected to rocker arm and rear axle tube bracket via spline, when spline mesh position of both torsion bar spring is changed, rear body height would also be replaced. This indicates that rear body height is determined by installation location of torsion bar spring, therefore, rear body height of Lifan car could be adjusted by changing installation location of torsion bar spring spline.

(1) Method of adjustment Adjust rear body height by turning torsion bar spring, change its location inside rear axle tube bracket spline hole (30 gears) and rocker arm spline hole (32 gears), turning one gear will change rear body height by 3mm.

Make adjustment using setting tool (as shown in Figure 4-52). Take length X as a starting point of adjustment, which is measured from installation location on both rear damper ends using setting tool before removing torsion bar spring, adjust the height by changing installation location of torsion bar determined by length X.

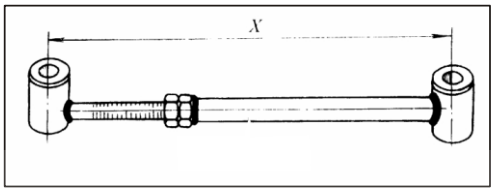


Figure 4-52 Special Setting Tool

For all Lifan 520 series vehicles, the preset length of special setting tool is 346mm, with a tool pitch of 1mm. Each time, change length X of tool for 2mm, the engagement position of torsion bar and rocker arm splines will be replaced for one gear, and body height will also change a corresponding 3mm.

(2) Adjustment

1) Inspect rear body height of the vehicle, determine required height and direction.

2) Before removing torsion bar spring, mark the position of torsion bar spring on rocker arm by drawing lines or print point a, b (See Figure 4-53).

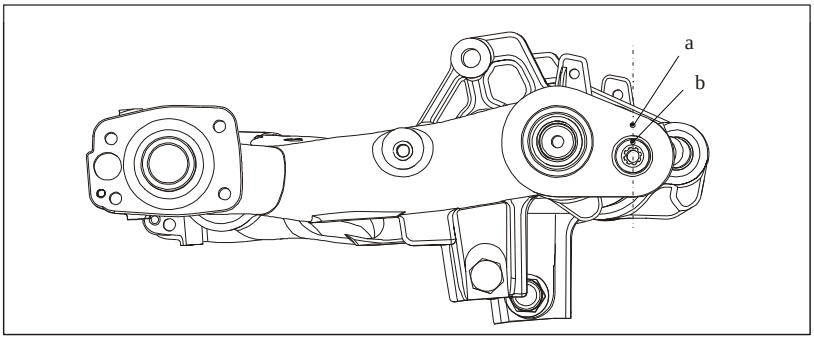


Figure 4-53 Mark on Torsion Bar Spring and Rocker arm

3) Measure X value, the starting point of adjustment for tool 9501-T.F1, remove torsion bar spring.

4) Adjustment of height: Lengthen (gain) or shorten (lose) a suitable value of X of setting tool, according to required value and direction, turn torsion bar spring as indicated in Table 7-2 gear by gear, to find a place where torsion bar can be inserted for 6~8mm into hole freely. Then install torsion bar spring. For example, if you want to increase rear body height by 6mm, increase length X of setting tool by 4mm, and turn torsion bar as indicated in Table 4-6 gradually, to find a place

where torsion bar can be inserted into the hole freely, this moment, in Figure 4-53, mark a moves 2 gears in relation to mark b.

5) When height torsion bar spring of one side is adjusted, height of the other side will be replaced, therefore, height of the other side shall be adjusted too.

6) After adjustment of rear body height, re-inspect rear body height, and make readjustment if necessary.

Table 4-6 Adjustment Method of Rear Body Height

Adjustment Direction	The rotation direction of torsion bar, facing adjusted torsion bar spring	
	Left Torsion Bar	Right Torsion Bar
Increase Height	Clock-wise	Anti Clock-wise
Decrease Height	Anti Clock-wise	Clock-wise

Ⅲ Inspection and Adjustment of Wheel Alignment

Wheel alignment involves wheel toe-in, wheel camber, kingpin caster and kingpin inclination, and is an important diagnosis parameter for the technical condition of axle,. Whether wheel alignment is correct or not will not only directly affect the straight motion stability, safety and fuel economy of vehicle, wear of tire and relevant parts and labor intensity of driver, but also acts as the comprehensive representation of the failure of some assemblies and systems (such as body deformation and suspension damages). Therefore, the inspection, adjustment and fault diagnosis of front wheel alignment are of great importance.

There are two detection methods for wheel alignment parameter: static detection method and dynamic detection method. Static detection method is used when the vehicle stay still, measure geometric parameter using measuring instrument on wheel alignment; dynamic detection method is used when the vehicle is moving at certain speed, detect lateral force produced by wheel alignment or side sliding arising therefrom, to reflect the wheel alignment condition.

(Ⅰ) Static Measurement and Adjustment of Wheel Alignment Parameter

In normal use, frequent inspection and adjustment of wheel alignment is not necessary. Inspect and adjust wheel alignment only when tire is seriously and unevenly worn, and wheels are unsteady, driving stability is bad or suspension axle, body system are repaired after an accident.

Before wheel alignment inspection, the following requirements shall be fulfilled: tire inflation pressure is within specified value, dimensions of tires are same; tires and wheels are steady; clearance of wheel bearing is normal; clearance of suspension system ball pin is not too big; the vehicle is load-free with full oil and vacant.

1. Inspection and adjustment of wheel toe-in

When installing wheel, for coaxial wheels (left one and right one), the front distance is less than the rear distance, this is called wheel toe-in (as shown in Figure 4-54), its difference value B-A is toe-in value, when B-A is a negative, it's called as toe-out.

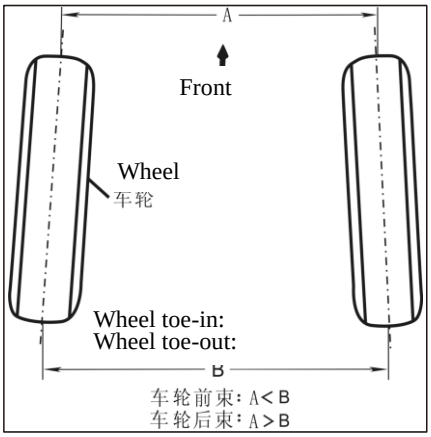


Figure 4-54 Front Wheel Toe-in

(1) Inspection of wheel toe-in

1) Park the vehicle on a level road, center steering-wheel arm, put steering wheel straight, release parking brake, push forward the vehicle 5m, to eliminate clearance of steering mechanism.

2) As indicated in Figure 4-55, on rear of each wheel, make a mark on tread center line (on wheel tread) in height of shaft center line.

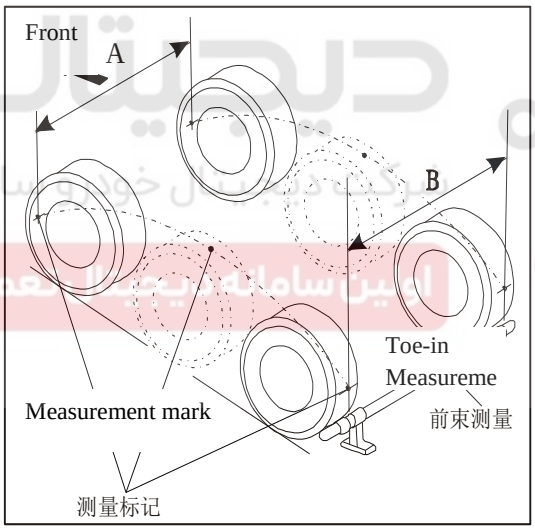


Figure 4-55 Wheel Toe-in Measurement

3) As indicated in Figure 4-55, measure the distance B between two marks.

4) Push forward the vehicle slowly until measuring marks are turned to the front, then measure the distance A between two marks.

Calculate toe-in value, that's B-A. Measure respectively front wheel toe-in value and rear wheel toe-in value.

Front wheel toe-in specified value is: power steering type 1~3mm; non-power steering type -1~-3mm.

Rear wheel toe-in specified value is:-2~2mm.

(2) Adjustment of wheel toe-in. Rear wheel toe-in of Lifan car is non-adjustable, while its front wheel toe-in is adjustable, when the tested toe-in value does not satisfy specified value, it should be adjusted to satisfy the requirement.

Make toe-in adjustment by adjusting the adjusting nut 2 on left and right stabilizer bars (as

shown in Figure 4-6), when adjusting, adjust left and right wheels symmetrically, independent adjustment of one side will make the vehicle pull to one side or interference between steering wheel and body, so it's not allowed.

After toe-in adjustment, when steering spinner is in straight position, inspect whether steering wheel is placed in the middle. If it isn't placed in the middle, toe-in shall be re-adjusted, to make sure that when steering spinner is placed in the middle, and steering wheel is straight position, toe-in value is up to standard.

2. Inspection of wheel camber angle

When installing wheels, wheels lean out slightly and form a wheel plane, wheel camber angle is the included angle between this wheel plain and longitudinal vertical plain. When wheel camber angle is a negative value, the wheels incline. The formation of wheel camber angle is determined by design of steering knuckle (or rear rocker assembly) and mounting position of suspension member bars, the front and rear wheel camber angles of Lifan car are not adjustable.

Inspection method of wheel camber angle:

(1) Install horizontal wheel alignment tester on wheel hub of tested wheel, as shown in Figure 4-56.

(2) Make wheels stay in straight line running position.

(3) Observe bubbles in the middle of tester, read wheel camber angle value, the front and rear wheel camber angle value shall be within specified range.

(4) When front wheel camber angle is more than 3°30', rear wheel camber angle is more than-1°±30′, relevant components of front suspension system and rear suspension system shall be inspected for deformation or damage, inspect bodywork for deformation, find out cause and clear fault, re-inspect front, rear wheel camber angle until they are normal.

3. Inspection of kingpin caster angle and kingpin inclination angle

Kingpin caster angle is that the upper end of steering axis leans rearwards, and forming an included angle with vertical line, in longitudinal plane of the vehicle, the purpose of kingpin caster is to assure the vehicle can move in straight line, however, excessive caster will cause hard steering, over returnability of wheel. Kingpin inclination angle is that the upper end of steering axis leans outwards, and forming an included angle with vertical line, in lateral plane of the vehicle, the purpose of kingpin inclination is to assure auto-returnability of steering wheel. Since Lifan car uses McPherson independent suspension, its kingpin is invisible, its kingpin inclination angle, kingpin caster angle are assured by corresponding dimensions of suspension mechanism member, steering knuckle, ball joint, whose angles are non-adjustable.

Inspect kingpin caster angle and kingpin inclination angle using horizontal wheel alignment tester, place front wheel on swivel angle tester, to align the point of intersection of center line of tire and centre line of central spindle with tester center (as shown in Figure 4-57). Put a bench equal to the height of tester under rear wheels (as shown in Figure 4-58), to make sure all wheels are in the same plane. Install horizontal wheel alignment tester, on wheel hub of front wheel (as shown in Figure 4-56), measure kingpin inclination angle and caster angle, deflect front wheel to left and right for a certain angle (usually 20o), the wheel angle of deflection is controlled by swivel angle tester. In order to avoid test result influences due to wheel rolling, press foot brake pedal using a brake pedal push rod (as shown in Figure 4-59), rather than by an operator in the vehicle.

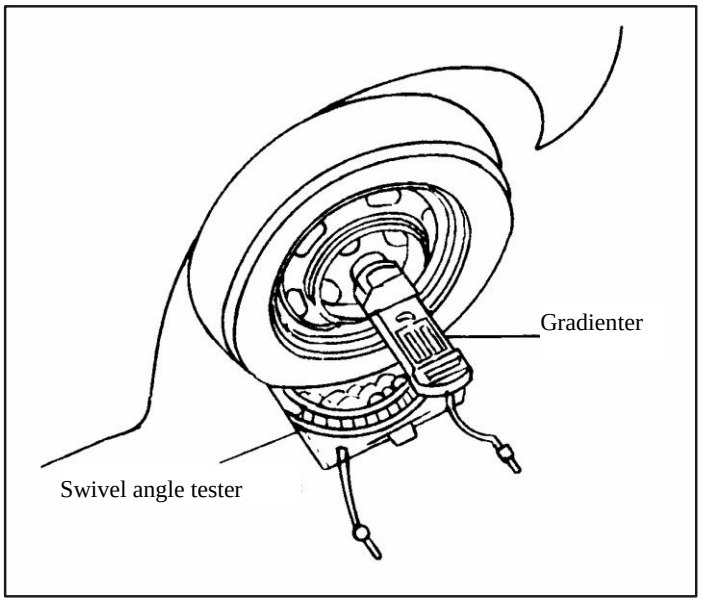


Figure 4-56 Horizontal Wheel Alignment Tester

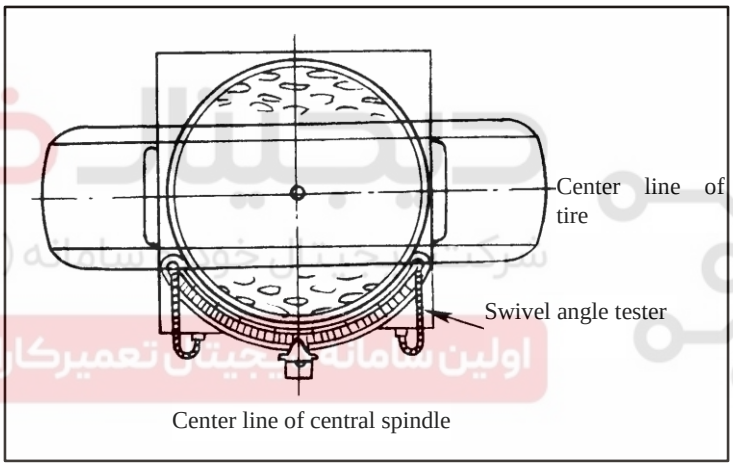


Figure 4-57 Install Swivel Angle Tester

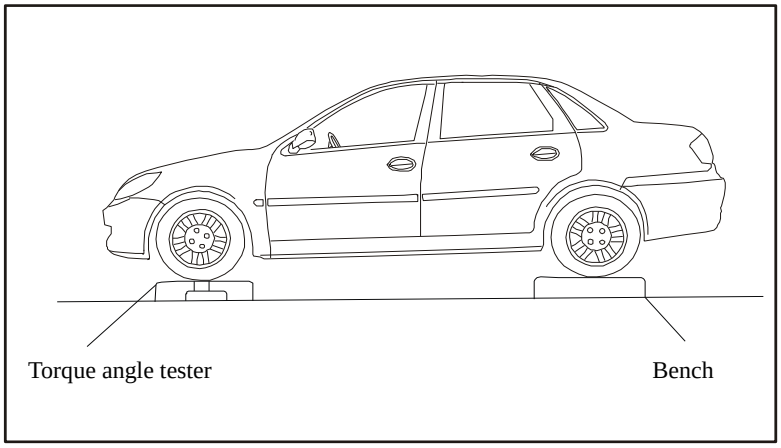


Figure 4-58 Put Bench Under Rear Wheel

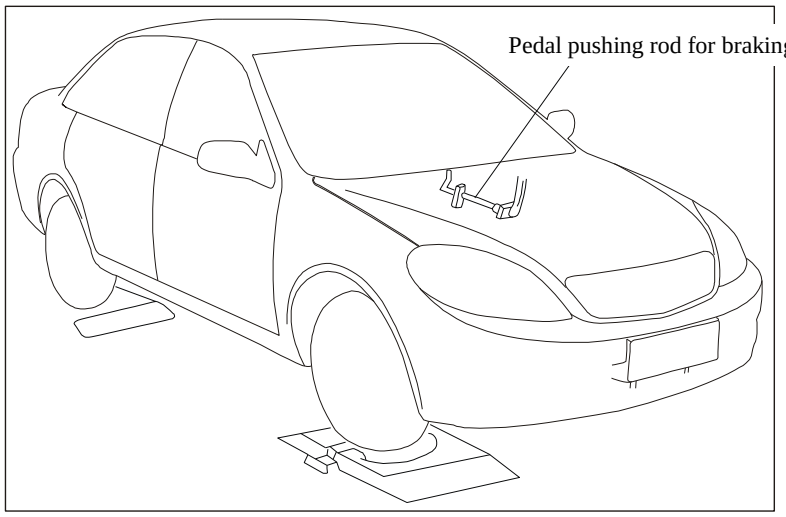


Figure 4-59 Press Brake Pedal with Pushrod

The tested kingpin caster angle shall be within range of 2.96°±30′, otherwise, relevant components of front and rear suspension shall be inspected for deformation or damage; the tested kingpin inclination angle shall be within range of 10.627°±30′, otherwise, relevant components of front suspension shall be inspected for deformation, damage or loose connection.

Since kingpin caster angle and inclination angle of Lifan car are not adjustable, if they fail the tests, find out cause, clear fault, re-inspect kingpin caster angle and kingpin inclination angle until they are normal again.

(Ⅱ) Dynamic Detection of Front Wheel Alignment

The parameter of dynamic detection of front wheel alignment is the side-slip amount of front wheel, and the purpose of dynamic detection is to judge whether the cooperation between front wheel toe-in and front wheel camber is proper.

1. Principle of front-wheel sideslip

If the alignment parameters of front wheel are incorrect, a lateral force will be applied onto the front wheel and thus sideslip of front wheel will occur. Among the alignment parameters, wheel camber and toe-in are of most important influence on sideslip of front wheel.

(1) Wheel camber cause sideslip: After camber of steering front wheel, when wheels are moving forward, they tend to roll away. Restricted by stiffness of front axle, front wheels can not roll away, but inward lateral force of two front wheels from front axle is actual, as well as sliding wear of tire on the road. Therefore, when vehicle running, the two steering wheels are moving forward and sideslipping inwardly simultaneously.

(2) Front wheel toe-in cause sideslip: After toe-in of front wheel, when wheels are moving forward, they tend to roll inward. Restricted by stiffness of front axle, front wheels can not roll inward, but outward lateral force of two front wheels from front axle is actual, as well as sliding wear of tire on the road. Therefore, when vehicle running, the two steering wheels are moving forward and sideslipping outwardly simultaneously.

(3) Combined function of camber and toe-in: In front wheel alignment, camber exists with toe-in, if camber co-operates well with toe-in, when front wheels are rolling forward, lateral force of equal and opposite in direction from wheel camber and toe-in counteract, wheels are moving forward straightly, no sideslip occurs. If camber does not co-operate well with toe-in, the wheels

will lose balance, and sideslip to direction of larger lateral force.

2. Detection of front wheel sideslip

The detection of front wheel sideslip may be carried on bilateral sideslip tester, structure of sideslip tester is as shown in Figure 4-60. When detecting, the vehicle is travelling at a speed below 4km/h on sliding plate 1, 15, since the sliding plate does not have any constraint laterally, lateral sideslip of wheel on sliding plate is detected by measuring indicating system.

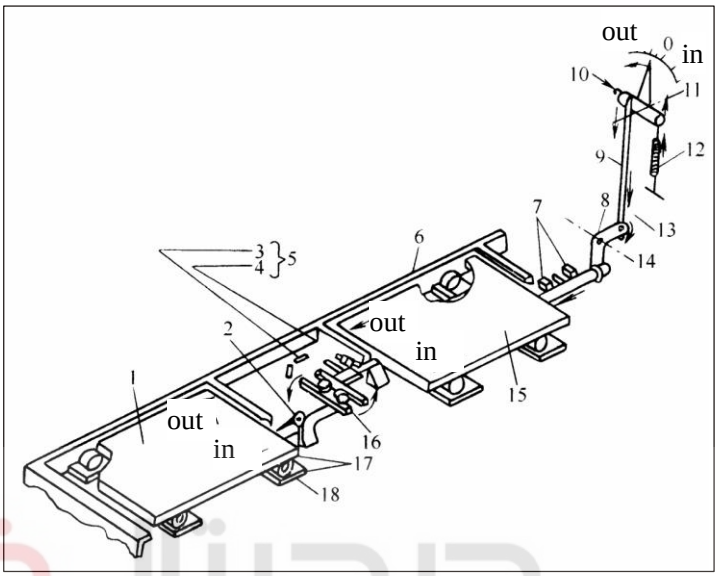


Figure 4-60 Bilateral Sideslip Tester

1-Left sliding plate 2- Guide roller 3- Return spring 4- Rocker 5- Return device 6- Frame 7- Limit switch 8-L- Type level 9- Connecting rod 10- Scale-magnification regulator 11- Index mechanism 12- Adjusting spring 13- Adjuster 14- Fulcrum 15- Right sliding plate 16- Double-pin crank 17- Track 18-Roller

3. Control standard and test result analysis of sideslip

The control standard of front wheel sideslip of Lifan car is less than or equal to 3m/km. If test result of sideslip is within this standard, then toe-in co-operates well with camber. If test result is more than 3m/km, then toe-in does not co-operate well with camber, and both shall be adjusted.

Since the camber angle of Lifan car can not be adjusted, only adjust the toe-in in the course of adjustment. If the vehicle still fails to satisfy sideslip requirement after the adjustment of toe-in, or if the adjustment amount of toe-in is too much, it can be judged that the change of camber angle is too much. In such case, it is necessary to inspect the alignment parameters with the wheel aligner, and find out and eliminate the cause of failure.

Ⅳ Inspection of Maximum Steering Angle of Front Wheel

The inspection on maximum steering angle of front wheel can be carried out by using instrumental method and measuring angle method

1. Inspection by using swivel angle tester

(1) Place tester under front wheel and cushion under rear wheel, to hold the vehicle in a horizontal status, as shown in Figure 4-57 and Figure 4-58.

(2) Push on brake pedal, turn steering wheel to the end from right to left and left to right, measure steering angle of both front wheel. The specified steering angle: inner wheel 38°50′, outer wheel 31°40′.

(3) If tested steering angle is not within specified value, components of front suspension system shall be inspected for bend or damage.

2. Inspection by using measuring angle method

(1) Lift the front wheels.

(2) Set front wheels in straight line position.

(3) Draw forwards a line, parallel to front wheel.

(4) Turn steering wheel to the end of one side, draw a line in the direction of wheel angle, the included angle of these two lines is the maximum steering angle. Measure maximum steering angle of both wheels as per same method.

Ⅴ Maintenance of Wheel and Tire

(Ⅰ) Inspection and Maintenance of Wheel

1. Inspection of radial/lateral swing of wheel

When the vehicle is running, the wheels are used to understand the weight of the vehicle, transmit various forces between vehicle and road, and support the impact load produced from uneven road. Therefore, most wheels are damaged due to distortion. For a wheel which is seriously deformed, its balance is broken, and severe vibration may occur when the wheel is rotating at high speed. As a result, the wheels shall be carefully inspected for deformation and swing.

In the course of maintenance and repair, control the distortion of wheels by inspecting the radial/lateral swing of wheel. The inspection methods for radial/lateral swing of wheel are as follows:

(1) Elevate the vehicle, and support it with safety stand.

(2) Inspect the wheels for obvious deformation.

(3) Install a dial gauge as indicated in Figure 4-61a, turn the wheel slowly, and measure the lateral swing of front and rear wheels. Usually, the standard lateral swing of front and rear wheels are 0~1.0mm for steel wheel, and for 0~0.7mm for aluminum wheel, and the repair limit is 2.0mm. .

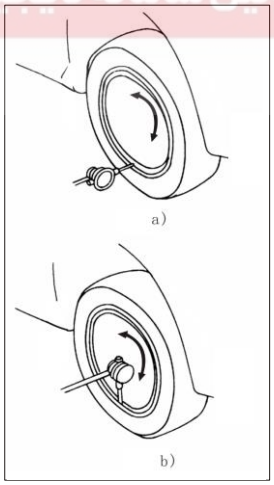


Figure 4-61 Measurement of Wheel swing

a) Measure lateral swing of tire b) Measure radial swing of tire

(4) Install a dial gauge as indicated in Figure 4-61b, turn wheels slowly, and measure the radial swing of front and rear wheels. Usually, the standard of radial swing of front and rear wheels is 0~1.0mm for steel wheel and 0~0.7mm for aluminum wheel, and the repair limit is 1.5mm.

(5) If the radial or lateral swing of wheel is more than the repair limit, the wheel rim shall be

replaced.

Uneven rigidity distribution of tire will also produce radial swing or lateral swing of wheel. Therefore, measure radial swing of tire using tire swing tester (as shown in Figure 4-62), when radial swing of tire is more than 1.55mm, it will cause vibration to the vehicle. Measure lateral swing of using tire swing tester on sidewall. Excessive lateral swing will cause shaking to rotating tire. If lateral swing of tire is more than 2.0 mm, it will cause vibration to the vehicle, when tire swing is more than specified value, tire should be removed from wheel.

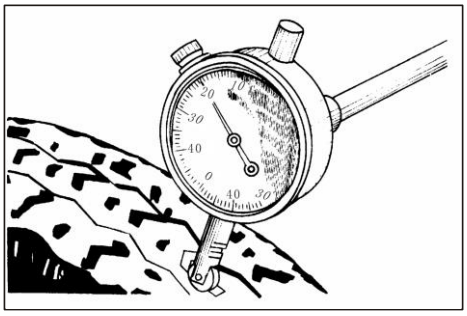


Figure 4-62 Measurement of Tire Radial swing

If radial or lateral swing of wheel rim or tire is more than the specified value, just replace them.

2. Detection of wheel dynamic balance

Wheel is a rapid rolling component. If its centroid does not coincide with its rolling center, static unbalance will occur (as shown in Figure 4-63a). Since wheel is wide, if mass distribution of wheel and wheel longitudinal center plane are asymmetrical, dynamic unbalance may occur, as shown in Figure 4-63b.

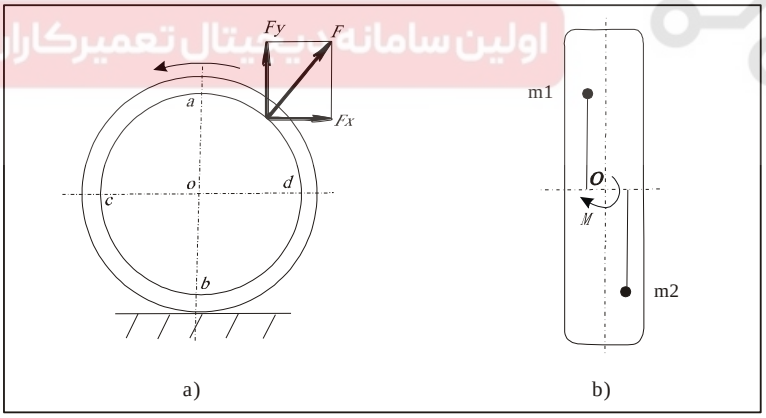


Figure 4-63 Wheel Unbalance

a) Static unbalance b) Dynamic unbalance

Wheel dynamic unbalance will cause wheel bounce and swing, shimmy of steering wheel, faster wear of tire, damage to relevant parts of the vehicle, and shorten serviceable life of the vehicle. Especially for vehicle moving at high speed, wheel dynamic unbalance will cause serious shaking of the vehicle, destroy control stability of the vehicle and result in unsafe driving. Therefore, detection of wheel dynamic unbalance and balancing is necessary. Since the wheels for dynamic balance detection must be in static balance state, if dynamic balance is detected, detection of static balance is not necessary.

(1) Pre-inspection of wheel dynamic balance Since tire and wheel assembly are rolling rapidly during dynamic balance operation, safety shall be specially emphasized, there are many factors affecting wheel balance, for rapid balance detection, the pre-inspection shall include:

1) Inspect tread for foreign body. If foreign body is not cleaned up, it will fly out of tire and result in personal injury under centrifugal.

2) Inspect inside tire for foreign body. Foreign body existing in the tire like rubber ball will cause tire unbalance. Before dynamic test, turn the tire slowly and listen to sound of foreign body carefully. If exists, get rid of it before dynamic test.

3) Inspect tread and sidewall for defect. These defects may affect wheel balance, for example, chuck of tread can not balance the wheels.

4) Inspect inflation pressure.

5) Measure wheel swing, to inspect wheel rim for deformation.

6) Inspect installation of wheel bearing, if wheel hub bearing clearance is not up to standard, it will affect personalized dynamic balance test and balancing.

7) Inspect wheel for mud, dust and grit shall be washed off before wheel dynamic balance test.

(2) Detection of wheel dynamic balance and balancing There are two method for detection of wheel dynamic balance and balancing: removal method and personalized method. For removal method, loosen the wheel, detect dynamic balance of the wheel and balancing, it has advantage of simple balancing; while for personalized method, do not loosen wheels and carry on dynamic balance directly on the vehicle, it has advantage of carrying on overall dynamic balance for all rolling components, including unbalance correction of brake drum or brake disc. Removal method and personalized method can complement each other mutually, to reach good balance condition of wheels. For example, after individual wheel balancing using removal method, the wheel is still unstable, detection of personalized wheel balance shall be used. Personalized wheel balance is widely used at present.

Figure 4-64 is structural diagram of personalized wheel balancer. The balancer mainly consists of drive unit, measuring unit, indicating unit and brake unit, and drive unit consists of engine and runner. When detecting driven wheel, attach runner to tread directly, engine drives wheel via runner, while detecting driving wheel, drive unit is useless, wheels are driven directly by engine and transmissions. The measuring unit consists of sensing head, adjustable bracket, base (with built-in sensor) etc. When detecting, attach sensing head to place where has strong vibration signal, transmit vibration signal to built-in sensor of base, transformed into electric signal and sent to indicating unit; indicating unit consists of flashing light and unbalance meter, senor send signal to indicating unit, drive flashing light to flash unbalance position, while unbalance meter indicates unbalance value; brake unit is friction brake, used to stop wheel turning, as so to carry on wheel balancing rapidly. The method of wheel dynamic balance and balancing are as follows:

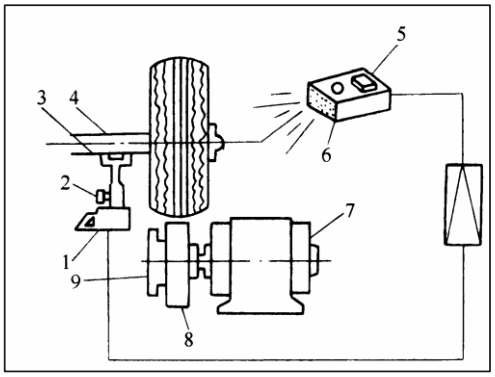


Figure 4-64 Personalized Wheel Balancer

1- Base 2- Adjustable bracket 3- Sensing head 4- Steering knuckle 5- Unbalance meter 6- Flashlight 7- Motor 8- Runner 9- Brake

1) As mentioned above, pre-inspect the wheels.

2) Remove the old balance weight.

3) Inflate the tire to the specified pressure.

4) Elevate the axle appropriately so that both wheels have the same ground clearance.

5) Turn the tires by hands, inspect the wheel hub bearing for looseness, and make adjustment or treatment properly if necessary.

6) Use chalk to make a reference mark on the sidewall of tire.

7) Attach the driver head to polished place of brake backing plate edge, keep the head stay in the same level with rolling center wheel as much as possible, as shown in Figure 4-65.

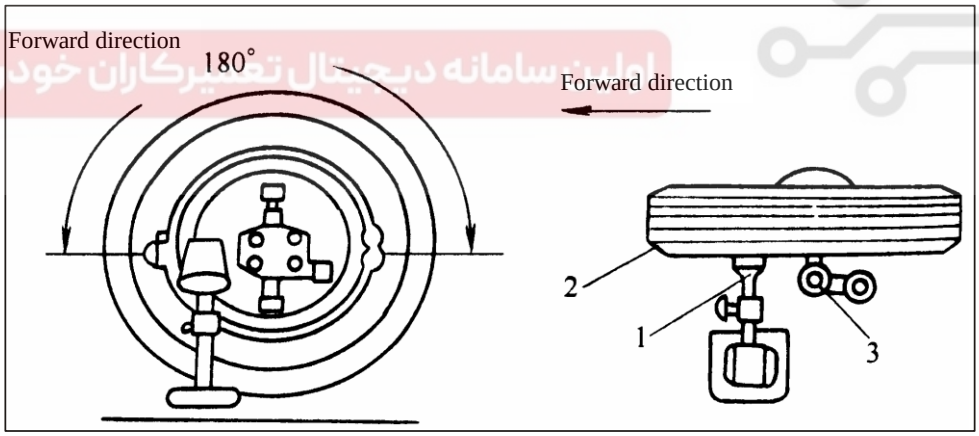


Figure 4-65 Installation Location of Sensing Head of Dynamic Balancer

1- Sensing head 2- Wheel 3- Steering knuckle

8) Turn wheels at the specified running speed: driving wheel can be driven by engine and transmissions; while driven wheel can be driven by drive unit of balancer. The running speed can be set at about 60km/h.

9) Observe mark position of tire using flashlight, read wheel unbalance value from meter.

10) Stop the wheel by braking.

11) Install the balance weight in proper position of wheel, and carry out re-inspection until qualified.

(3) Analysis of test result

In dynamic balance test, the relatively small dynamic unbalance value is normal, and it can be adjusted satisfactorily through balancing. However, if the dynamic unbalance value is relatively high, or it is difficult to satisfy the requirements through balancing operation, further inspection shall be carried out to find out the cause for fault. The main causes for dynamic unbalance of wheels are detailed as follows:

1) The wheel rim or brake drum is seriously deformed.

2) The wheel hub and wheel rim are of poor quality, such as center misalignment, unevenly distributed tire bolt holes, poor-quality bolts and so on.

3) The tire is abnormally worn, partly damaged or improperly repaired.

4) The tire is of poor-quality.

5) The installation location is incorrect, and the location of tube charging connector does not comply with the requirements

6) The balance weight has come off.

3. Inspection and maintenance of wheel rim

(1) Cleaning of wheel rim: Flush clean the steel wheel rim by using water pipe, and clean up the bead seat on the wheel rim by using wire brush or steel wool; as for aluminum alloy wheel rim, wash it with diluted soap lye or aqueous solution, and then rinse it with fresh water. The bead seat of wheel rim shall be washed thoroughly, so as not to affect the sealing performance. Be sure not to use base detergent or corrosive solvent to wash aluminum alloy wheel rim，otherwise the protective cover will get damaged.

(2) Inspection on wheel rim: Inspect the steel wheel rim for corrosion, inspect the steel/aluminum alloy wheel rim for crack, inspect the bead seat for bend or damage, and inspect all screws for rolling deformation. If any of the above-mentioned defects exists, be sure to replace the wheel rim rather than repair it by welding, heating or knocking, because the strength of wheel rim will be reduced after these operations.

(3) Repair for air leakage of wheel rim: For air leakage of wheel rim, the following repair procedures may be used:

1）Use 80# sandpaper to thoroughly clean up the surface around the air leakage area on wheel rim, and then use a rag to clear away those grains with a rag.

2) At room temperature, coat the air-leakage area with strong silica sealant.

3) Use a putty knife to evenly apply the sealant evenly onto the sandpaper-polished area.

4) Wait 6 hours until the sealant gets solidified, and then install the tire.

(Ⅱ) Failure Inspection for Tire

Inspect the tread for wear. This inspection may be carried out by using a depth gauge to measure the depth of tread void, or by observing the treadwear indicator. A tire which is worn excessively or has any of the following defects shall be replaced rather than repaired:

(1) The wear indicator can be seen.

(2) The cord or belt can be seen.

(3) The tire is partly bulged or serious bumped.

(4) The cord fabric is separated.

(5) The bead is ruptured or broken.

(6) There is serious opening or crack on tire.

Inspect the tread and tire shoulder for sharp body like nail or something else. Leakage caused by puncture on tire is the most common failure. This failure can be fixed satisfactorily. However, in case the puncture hole is too big, or the puncture is located on sidewall, the tire can not be repaired. Repairable area of punctured tire is as wide as belt, as shown in Figure 4-66.

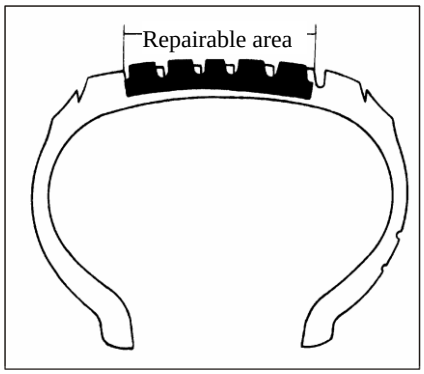


Figure 4-66 Repairable Area of Punctured Tire

Before repairing the leakage failure of tire, be sure to accurate indentify the leakage area. There are two methods to identify the leakage area: one method is to inflate the tire to 210kPa, immerse the tire and wheel in water, and then air bubble will come from the leakage area on wheel or tire; after identifying the leakage area, leave mark on it; the other method is to put some suds on inflated wheel and tire using sponge, area forming bubble is leak area.

1. Dismantlement of tire

Firstly, remove the wheel from the vehicle, and then put the wheel on the tire changer so as to remove the tire. It is prohibited to remove any tire with hand, otherwise the tire bead and wheel rim may get damaged; it is prohibited to knock or pry the wheel rim, otherwise the wheel rim will get deformed or the air tightness will get affected. As for a tire to be repaired, be sure to leave a mark on the position of tire valve before dismantlement, so as to ensure that when the tire is re-installed, it can be installed on the original position and thus the wheel balance can be realized. Procedure for dismantlement of tire is detailed as follows:

(1) Fully deflate the tire.

(2) Loosen the connection between tire and wheel rim on tire changer, rotate the wheel and press it repeatedly, and then turn the wheel over so as to loosen another side, as shown in Figure 4-67.

(3) Remove the balancing weight from the wheel rim.

(4) Place the wheel rim in the working disc 6 and make the convex of wheel rim face upwards (as shown in Figure 4-67), press it lightly so as to keep it flat, and then operate the pedal so as to get the rim clamped.

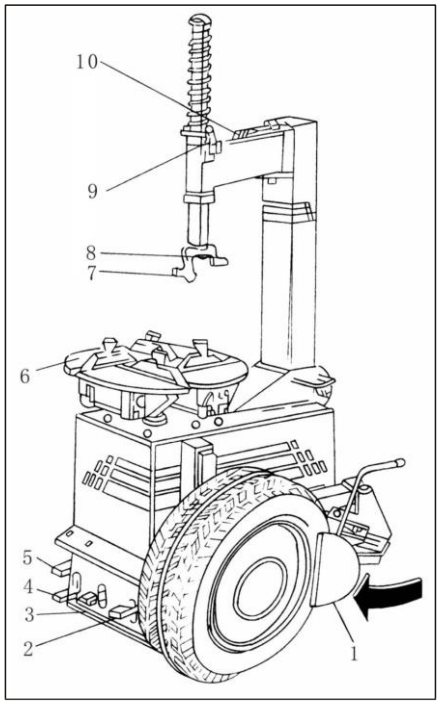


Figure 4-67 Remove Tire Using Tire Changer (Ⅰ)

1- Pressure plate 2, 3, 4, 5- Control pedal 6- Working disc
7, 8- Changer 9- Handle 10- Alignment pin

(5) Coat the wheel rim edge with a little lubricant. Press down and fix the lifting rod, and form a 3mm clearance between changer 7,8 and wheel rim edge.

(6) Take the end F of changer as a pivot, lift outside of tire using lever so as to place it on F end of changer, as shown in Figure 4-68.

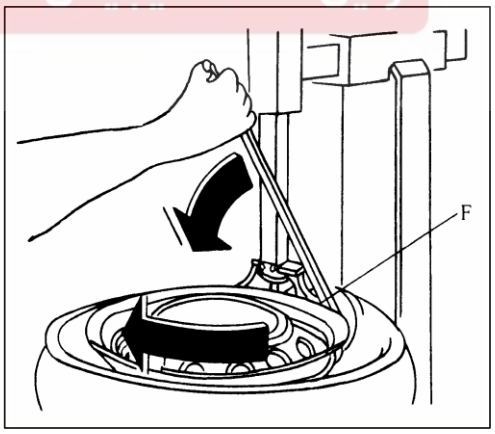


Figure 4-68 Remove Tire (Ⅱ)

(7) Operate the pedal so as to turn the working disc until the upper edge of tire is removed completely.

(8) Remove the other edge of tire by using the above-mentioned method.

2. Repair of tire

Most punctures in tires can be repaired by applying a maintenance plug or a vulcanization patch on the inside, and we will introduce you these two methods respectively:

(1) Mend a puncture using maintenance plug

1) File inner surface of tire around the puncture hole using tire patching file.

2) Choose a suitable plug which is slightly larger than puncture hole, and insert it into the hole of lead-in tool.

3) Lubricate the plug and lead-in tool with vulcanization liquid.

4) Insert the plug into the puncture hole from tire inside using lead-in tool (as shown in Figure 4-69), and press head of plug as tightly as possible so as to fix the head of plug to tire inside.

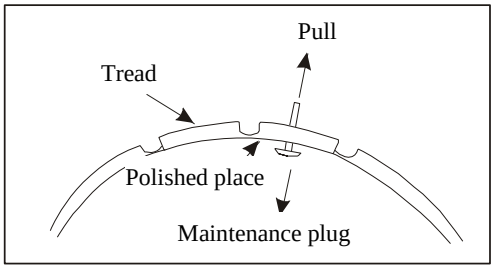


Figure 4-69 Installation of Maintenance Plug

5) Stay the plug outside tread surface for 0.8mm, cut off rest part.

(2) Mend a puncture using cold patch

1) File the inner surface of tire around the puncture hole by using a tire patching file.

2) Coat the filed surface with vulcanization liquid evenly, and dry them naturally until it become tacky.

3) Strip off the patch sheath, align center of patch with puncture hole, and attach the patch to the puncture.

4) Move the press-in tool on the patch from front to back, to tighter the patch with tire.

3. Installation of tire

The installation of tire shall be carried out by using a tire changer. When re-installing a tire, be sure to make the side of tire on which there is a red mark face outwards; as for a repaired tire, the mark left on the tire in the course of dismantlement shall be aligned. Procedure for installation of tire is detailed as follows:

(1) Wipe the bead seat on wheel rim.

(2) Fix the wheel rim on the working disc 6 (as shown in Figure 4-67), and then lubricate the outside surface of bead with grease.

(3) Install the tire on wheel rim, and make its left side slip into the drop center in the middle part of wheel rim.

(4) Adjust the changer 7, 8 to suitable location, lock the lifting rod, and ensure that the right-side tire edge which is outside the drop center of wheel rim is placed above the end G and below end F, as shown in Figure 4-70.

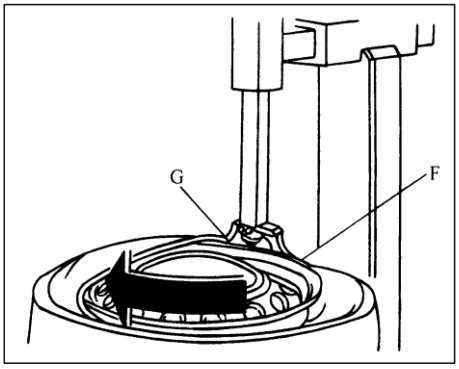


Figure 4-70 Fix Tires

(5) Press the tire with hand, start the workbench, and install the tire edge on one side.

(6) Install the tire edge on the other side by following the above-mentioned method, and fit the tire on wheel rim evenly; after the installation, inflate the tire and carry out dynamic balance test.

(Ⅲ) Proper Use and Maintenance of Tire

In order to ensure the optimal driving conditions and driving safety of vehicle, it is necessary to properly use and maintain the tires.

1. Maintain suitable tire pressure

As for Lifan car, the specified tire pressure is 220kPa for front tire and 210kPa for rear tire. The pressure of tire in service shall reach the specified value. Since the tire pressure standard is determined on the basis of the structure, material strength, actual load of tire as well as the requirements on control stability, riding performance, power and fuel economy of vehicle, either excessively high or excessively low tire pressure will negatively affect the performance of vehicle. Excessively low pressure will increase the rolling resistance of tire, weaken the power of vehicle, increase the fuel consumption and affect the steerability of the vehicle; if the tire pressure is excessively high, the ability of tire to adhere to ground will reduce, the braking distance of vehicle will increase, and sideslip may occur to vehicle. In addition, excessively high or excessively low pressure will accelerate the wear of tire, and shorten the service life of tire, as shown in Figure 4-71. When tire is of excessively low pressure, tire stiffness degrades, bend tire side easily when the vehicle moving, produce great stress on tire, result in damage to cord fabric, meanwhile, when deformation of tire side occurs, tire temperature increases, accelerate wear of tire shoulder (as shown in Figure 4-72); when tire is of high pressure, wear of middle of tread is accelerated due to excessive tire stress, worst of all, tire will burst. Therefore, regular inspection and adjustment of tire pressure is necessary to fulfill specified value.

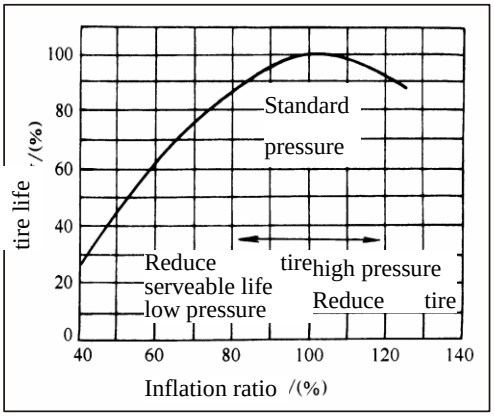


Figure 4-71 The Relation Between Tire Pressure and Service Life

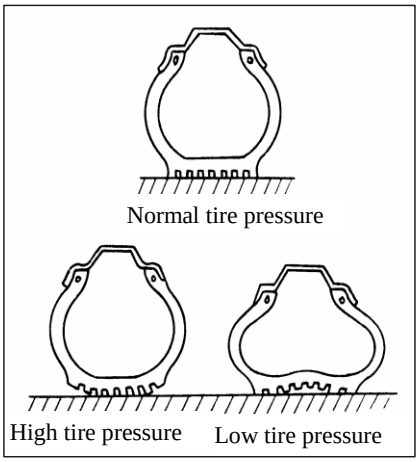


Figure 4-72 Tire Pressure Condition and Wear of Tire

The inspection on tire pressure shall be carried out when the tire is in cold state. Remove the cap from tire valve, and then inspect the tire pressure by using a pressure gauge. If the pressure is excessively high, discharge some air through valve core. If the pressure is excessively low, inflate the tire to specified pressure with compressed air. Inspect the valve for leakage by applying soap solution on the valve. If bubble appears, it means that the valve is leaking, and location of valve core shall be adjusted or the valve core shall be tightened up. If the leakage continues, replace the valve core. Finally, screw on valve cap, so as to prevent the valve core from getting blocked up by foreign materials.

2. Carry out tire rotation on a regular basis

During running, wear of tire is different due to different load, stress, function of front and rear tire, therefore, periodical rotation of tires shall be used to maintain even wear of tires, to extends serviceable life of all tires to same length, after 15000~20000km of haulage, tires of Lifan car shall be rotated, re-rotate the tires according to Table 1-6. Tire pressure shall be adjusted to specified value after rotation.

3. Points of use and maintenance of tire

(1) Tires used for the same car shall be of same brand and tread, tires of different specification can not be allowed. Otherwise, mixed tires will speed up wear of tire, increase fuel consumption, destroy control stability of the vehicle.

(2) If possible, change all tires when changing tire. If can not change all, at least change the two tires in the same axle simultaneously, rather than change only one tire, installing two tires of great different in the same axle is not allowed. Since Lifan car is front drive vehicle, whose front wheel is both driving wheel and steering wheel, and its axle load is heavier than that of rear wheel, result in rapid wear of front wheel tire. Therefore, tire with deepest tread or new tire shall be fitted on front wheel, to reduce sway and sideslip of front wheel, assure driving safety.

(3) Change tires using tire changer, manual replacement is not allowed, incorrect change of tire tends to deformation or damage to tire bead, affect tightness of tire or produce bump on sidewall, what's worse, may reject the tire due to broken tire cord.

(4) Dynamic balance shall be carried on repaired or replaced tires before installation, installing wheels without efficient balance will result in shiver and louder noise of running vehicle, besides

the produced irregular wear of tire will reduce serviceable life of tire

(5) Wheel alignment shall be inspected when irregular wear occurs due to side wear, change of front and rear wheel alignment affects not only control stability of vehicle, but also wear of tire.

(6) Inspect tire for damage frequently, get rid of foreign body brought into tire tread, to avoid shiver to the vehicle running at high speed.

(7) Sidewall of tubeless tire is relatively thin, and do not run into ditch or dike when parking.

(Ⅳ) Common Fault and Elimination of Tire

1. Rapid wear of tire shoulder

(1) Failure symptom: Rapid wear of shoulder of tread, as shown in Figure 4-73.

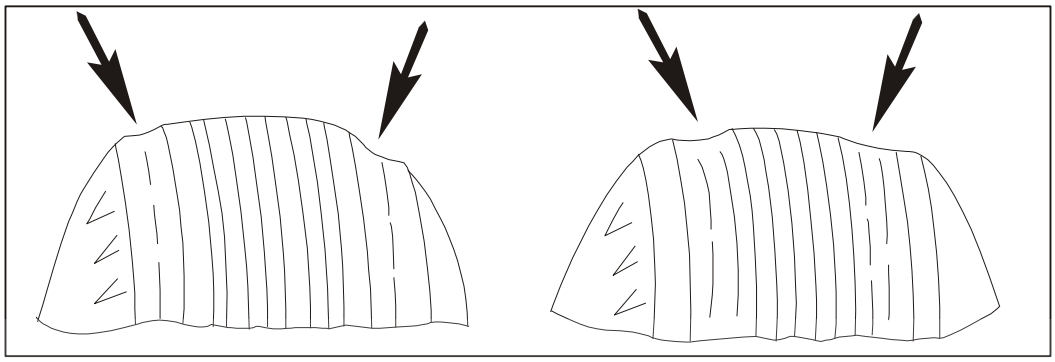


Figure 4-73 Abnormal Fault of Tire Pressure

(2) Fault diagnosis: Driving with low-pressure tire will broaden grounding area of tread, while the middle part of tire arch slightly, force tread shoulder touch the ground, which accelerating shoulder wear, what's more, it will split tread when the vehicle running at high speed.

(3) Fault cause and elimination method: when tire pressure is low, or drive for too long a time and lack of alternation, inflate tire， as shown in Figure 4-74

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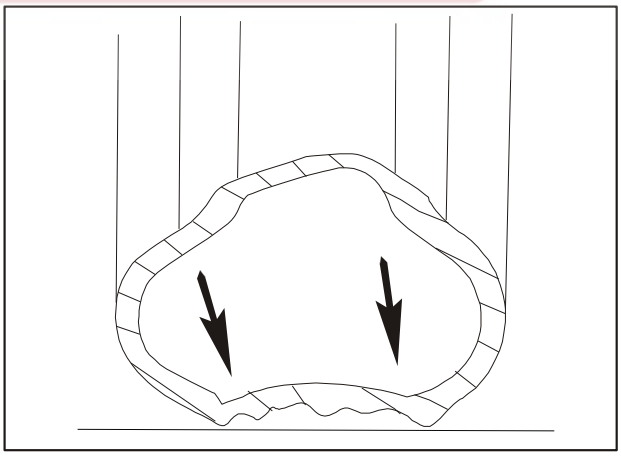

Figure 4-74 Tire Low Pressure

2. Rapid wear in the middle part of tread

(1) Failure symptom: Early wear in the middle of tread, as shown in Figure 4-75.

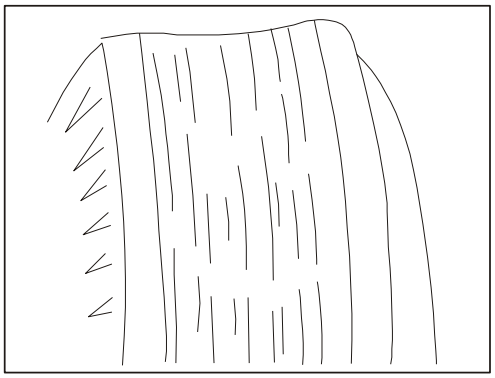

Figure 4-75 Early Wear in the Middle of Tread

(2) Fault diagnosis: High pressure increase load per unit grounding area, accelerate wear in middle of tread. Besides since cord in cord fabric withstands excessive stretching stress, cause early damage of tire.

(3) Fault cause and elimination method: Tire high pressure, or lack of alternation, tire pressure shall be adjusted to specified standard value. As shown in Figure 4-76.

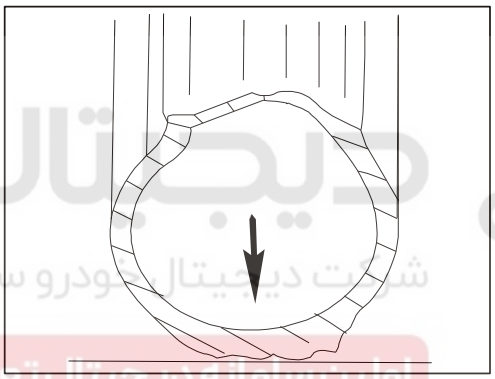

Figure 4-76 High Pressure Tire

3. Serious Wear of outside or inside of tire tread

(1) Failure symptom: Rapid wear of outside or inside of tire.

(2) Fault diagnosis: Rapid wear of outside or inside of tire relates to camber angle. If outside of tread is of eccentric wear, it means that the wheel camber angle is too large; if the inside of tread is of eccentric, it means that the wheel camber angle is too small.

(3) Fault cause and elimination method: Wheel camber angle is too large or too small. Find out the cause for abnormal wheel camber angle, and eliminate the fault to obtain normal camber angle.

4. Jagged wear occurs on tread

(1) Failure symptom: Jagged wear occurs on tread from inside to outside, or from outside to inside, as shown in Figure 4-77.

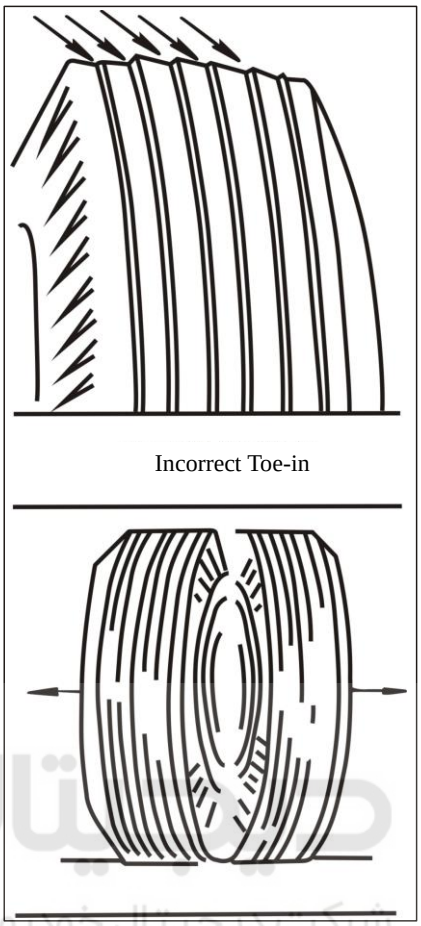

Figure 4-77 Jagged Wear of Tread

(2) Fault diagnosis: This wear is partly caused by improper toe-in adjustment, so this wear occurs on steering wheel. If the tread is jaggedly worn from outside to inside, it means that toe-in is too large; if the tread is jaggedly worn from inside to outside, it means that toe-in is too small.

(3) Fault cause and elimination method: Deformation of suspension bar system or looseness of connector will change toe-in. For toe-in, too large or too small, fault shall be cleared; toe-in shall be adjusted to meet the requirement.

5. Partly spotted wear of tire

(1) Failure symptom: The polished spot exists on part of tread is salient point (as shown in Figure 4-78).

(2) Fault diagnosis: This kind of wear is related to wheel dynamic unbalance. When the wheel is out of dynamic balance, the vibration of wheel will cause directional wear of tire, and then result in spotted wear.

(3) Fault cause and elimination method: Tire with spotted wear is out of dynamic balance, and dynamic balancing shall be carried out.

6. Fan-shaped wear of tire

(1) Failure symptom: Fan-shaped wear occurs on one side of tread, as shown in Figure 4-78.

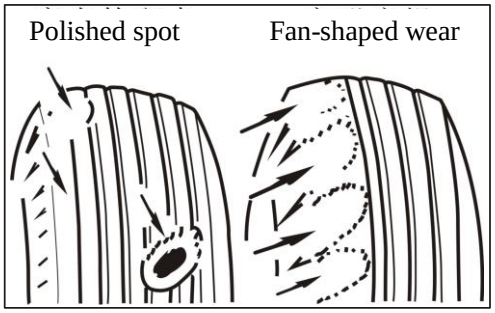

Figure 4-78 Spotted and Fan-shaped Wear on Tire

(2) Fault diagnosis: Tire installed in a certain position for long time without rotation, or improper position of suspension causes the fan-shaped wear on tire.

(3) Fault cause and elimination method: Tires shall be rotated periodically, inspect and eliminate suspension fault.

7. Excessive wear of individual tire

(1) Failure symptom: Individual tire is seriously worn, and the other tires of the same car are slightly worn.

(2) Fault diagnosis: Inspect the worn tire, its suspension, wheel alignment, wheel hub bearing clearance, balance of wheel and deformation of wheel rim, to find out cause for serious wear of individual wheel. If one side of a tire is excessively worn, wheel camber angle is not within standard. If wheel camber angle is too large, early wear of outside of tread; if wheel camber angle is too small, then inside of tread is worn excessively.

(3) Fault cause and elimination method:

1) The suspension system of the excessively worn wheel is abnormal, support member become deformed, cause a single wheel misalignment and excessive load of wheel, inspect independent suspension spring, damper and wheel alignment, find out fault and clear it.

2) Wheel hub bearing clearance of the wheel is excessive, adjust it or change wheel hub bearing.

3) The wheel is unbalanced, cause excessive dynamic load of one single tire and result in excessive wear, the wheel shall be dynamic balanced.

4) The wheel rim of wheel is deformed, and shall be replaced.

8. Tire bump

(1) Failure symptom: Tire is partly raised or bulged.

(2) Fault diagnosis: Excessive stress on tire, cord fabric is partly damaged and cause tire bump.

(3) Fault cause and elimination method: Tire bump, caused by excessive tire stress due to excessive tire pressure, or bead is broken when repair tire by hand or during disassembly and assembly of tire. Tire shall be replaced when there is serious tire bump. Besides, eliminate or reduce tire bump by inflating tire to specified pressure, and remove and install tire on tire changer.

Section Ⅳ Front Drive Axle Shaft

Ⅰ Summary

Lifan car adopts front wheel drive, and its drive shaft is the axle shaft connecting left and right turning/driving wheels in transmission differential. The inner ends of left/right drive shafts connect with the side gear via splines, and is fixed with clamps. The outer spline stretches into spline of wheel hub, and is locked with nuts. The assembly relation is as shown in Figure 4-79.

As for the exploded view of 520 home-made engine axle shaft, please see Figure 4-80.

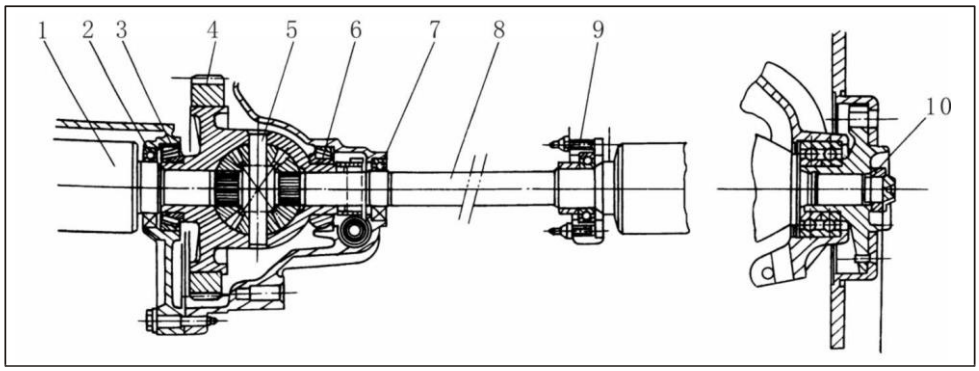

Figure 4-79 Assembly Relation of Drive Shaft on the vehicle

1- Left drive shaft 2- Left oil seal 3、6- Conical roller bearing 4- Final driving/driven gear 5- Differential 7- Right oil seal 8- Right drive shaft 9- Right drive shaft mounting bearing 10- Drive shaft end nut

As for the exploded view of 520 imported engine axle shaft, please see Figure 4-81.

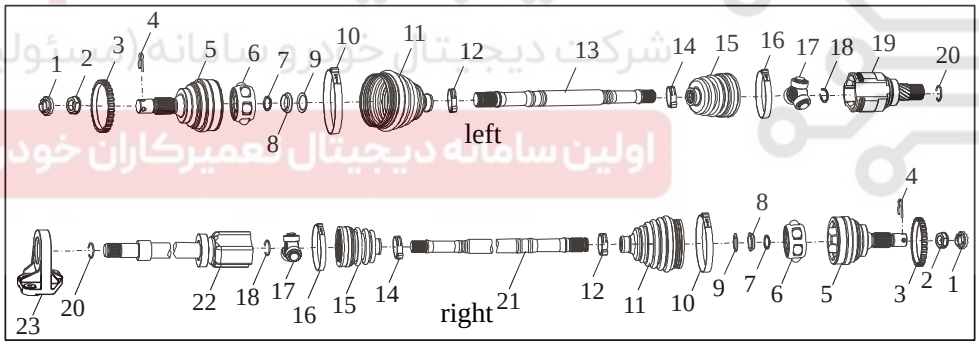

Figure 4-80 Exploded View of Home-made Engine Axle Shaft

1- Rut lock ring 2- Rut 3- ABS gear ring 4- Bayonet lock 5- Fixed end ball cage 6- Ball cage universal joint 7- Steel retaining ring of fixed end 8- Nylon locking collar 9- Dish-shaped washer 10- Big clip of fixed end 11- Fixed end protective tube 12- Small clip of fixed end 13- Intermediate shaft (short shaft) 14- Small clip of flexible end 15- Slippage end protective tube 16- Big clip of flexible end 17- Tri-pin universal joint 18- Elastic retainer ring 19- Ball cage on flexible end (left) 20- TJ differential elastic retaining ring 21- Intermediate shaft (long axle) 22- Ball cage on flexible end (right) 23- Intermediate support fixing bracket

Note: Drive shaft is a dynamic balance component which has passed strict dynamic balance test before leaving the factory. Unless necessary, it is prohibited to disassemble the drive shaft (especially the ball cage universal joint) in the course of use. If the drive shaft has any problem, we can only replace it.

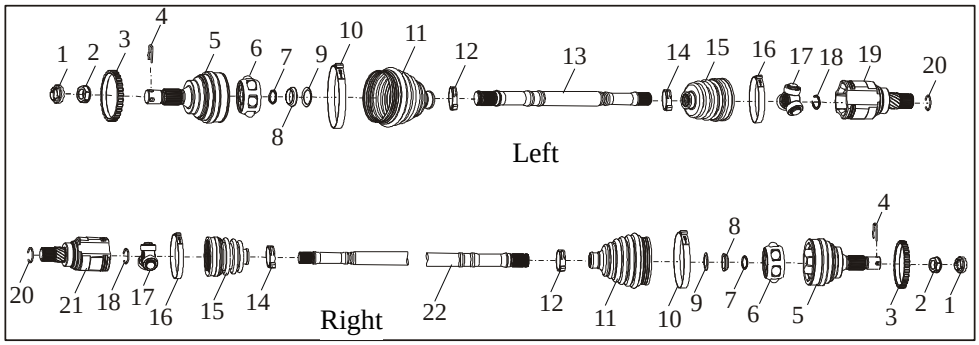

Figure 4-81 Exploded View of TRIEC1.6L Engine Axle Shaft

1- Nut lock ring 2- Nut 3- ABS gear ring 4- Bayonet lock 5- Fixed end ball cage 6- Ball cage universal joint 7- Steel retaining ring of fixed end 8- Nylon locking collar 9- Dish-shaped washer 10- Big clip of fixed end 11- Fixed end protective tube 12- Small clip of fixed end 13- Intermediate shaft (short shaft) 14- Small clip of flexible end 15- Slippage end protective tube 16- Big clip of flexible end 17- Tri-pin universal joint 18- Elastic retainer ring 19- Ball cage of flexible end (left) 20- TJ differential elastic retaining ring 21- Ball cage of flexible end (right) 22- Intermediate shaft (long axle)

Ⅱ Fault Diagnosis

(Ⅰ) Inspection and Confirmation

1. Confirm the customer's problem.
2. Visually inspect the obvious symptom of mechanical or electrical fault.
3. Once the obvious cause for problem is found, mend it before taking next action (if possible).

(Ⅱ) Fault Symptom Diagram

(III) Diagnosis Procedures

(1) Inspect the drive shaft for deformation: When the drive shaft is bent, clamp it on latch, and measure it at its middle portion with a micrometer gauge. If the run-out tolerance is more than 2mm, correct the drive shaft by means of cold press or just replace the drive shaft.

(2) Inspect the universal joint of drive shaft for wear: Universal joint with serious wear will affect the working condition of drive shaft, so inspect the wear of universal joint carefully. On-board inspection method and off-board inspection method can be adopted for inspection.

Table 4-7 Failure Symptom of Drive Shaft

Symptom	Possible Cause	Action
Clatter, vibration or friction when making a turn	Inside /outside front drive axle shaft Constant velocity (CV)universal join is not lubricated enough or polluted	Inspect, clean and lubricate as needed.
	Other components contact front drive axle shaft assembly wheel bearing, brake, suspension or steering component	Inspect and repair as needed. Inspect and repair as needed.
Vibration at high speed	Front wheel or tire is out of trim. Tire is out-of-round Constant velocity (CV) universal joint outside front wheel hub is dislocated.	Repair and replace as needed. Repair and replace as needed. Repair and replace as needed.
Shakes when accelerating	Operation angle of universal joint is too large due to improper ride height. Inside/outside front drive axle shaft (CV) universal joint is excessively worn or damaged.	Inspect ride height, inspect whether spring rate is correct or not, and inspect item of axle shaft joint draw-out. Repair or replace as needed. Inspect and replace as needed.
Axle shaft joint draw-out	Retaining ring of outside front drive axle shaft is lost or not retained on differential correctly. Engine/transmission assembly is disarranged. Structure or support tower transpose or is damaged. Front suspension component is worn or damaged.	Inspect, repair of replace as needed. Inspect engine fixing base for damage or wear. Repair or replace as needed. Inspect dimension under the vehicle. Inspect worn bushing or bent component (front stabilizer bar, front suspension lower arm). Repair or replace as needed.

On-board inspection method: Drive the vehicle slowly, and turn the steering wheel to the end. If clang occurs, it is likely that the universal joint outside the drive shaft gets loosened due to wear; if obvious vibration occurs when the vehicle is accelerating, it is likely that the universal joint inside the drive shaft gets loosened due to wear. Park and lift the vehicle, and push the drive shaft and turn wheel under the vehicle with hand. If looseness and clang occur, it means that the universal joint gets loosened due to wear.

Off-board inspection method: As shown in Figure 4-82, clamp the drive shaft on a bench clamp, and screw both ends of drive shaft in the direction as indicated by the arrow. If obvious clearance exists in radial direction of universal joint, it means that the universal joint is seriously worn. Universal joint with serious wear shall be replaced. The universal joint of differential shall slide freely in axial direction; otherwise, the drive shaft assembly shall be replaced.

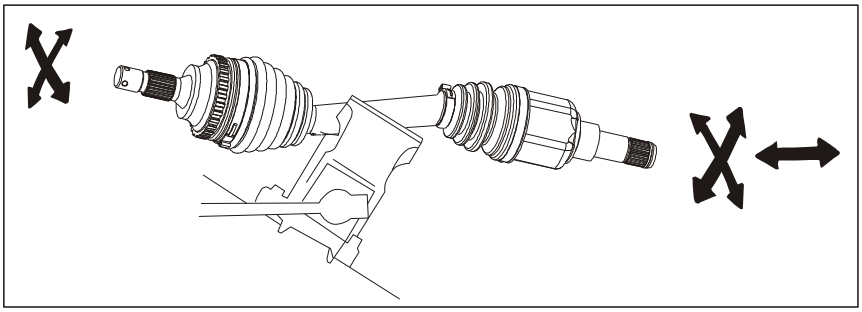

Figure 4-82 Inspect Drive Shaft Universal Joint

(3) If there is any crack, breakage or obvious deformation exists on drive shaft, the drive shaft shall be replaced immediately; if oil seal journal on drive shaft is excessively worn or has obvious groove, the drive shaft shall be replaced. If the drive shaft goes wrong or does not work normally, the drive shaft assembly shall be replaced.

(4) Drive shaft is a dynamic balance component which has passed strict dynamic balance test before leaving the factory. Unless needed, it is prohibited to disassemble the drive shaft. If it is necessary to disassemble the drive shaft, make mating mark on drive shaft with paint (as shown in Figure 4-83), and be sure not to leave mark by using punch.

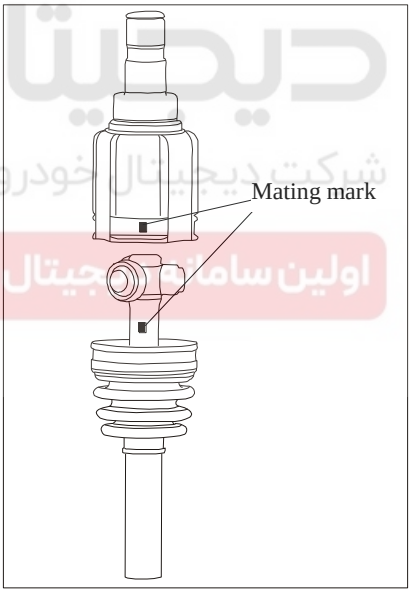

Figure 4-83 Matching Marks

(5) Inspect the intermediate mounting bearing

The intermediate mounting bearing shall be able to rotate smoothly without obvious clearance and abnormal noise; if the inner or outer ring of intermediate mounting bearing is damaged, the bearing is jammed, or the bearing clearance is to large, the bearing shall be replaced.

(6) Inspect the protective tube

In the course of routine maintenance, inspect the protective tube of drive shaft for breakage. If the protective tube is broken, just replace it; also inspect the protective tube clamp for fracture or deformation, and if any problem exists, just replace it. Otherwise, the lubricating grease will leak out, the universal joint will incur abnormal wear, and then the drive shaft will work

abnormally or even get fully damaged. The method to replace protective tube is detailed as follows (take the replacement of protective tube near transmission as an example):

1) Remove the protective tube by using spring clamp pliers and special service tool, as shown in Figure 4-84.

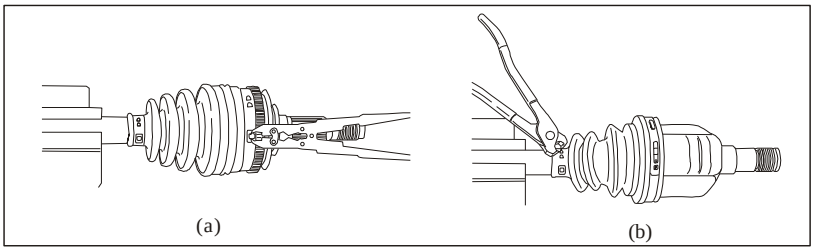

Figure 4-84 Remove Protective Tube

2) As shown in Figure 4-85, make fitting markings on the drive shaft and universal joint, and then pull out the drive shaft and tripod assembly from the universal joint tube,.

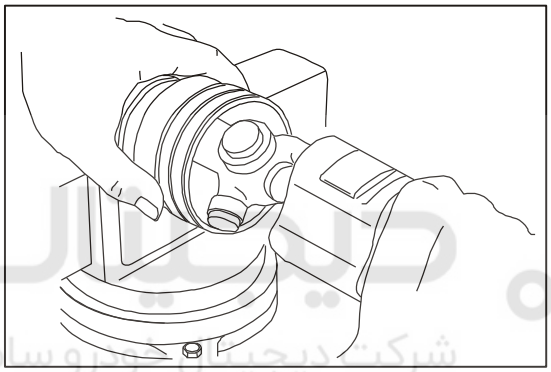

Figure 4-85 Pull out Drive Shaft and Tripod Assembly

3) As shown in Figure 4-86, make fitting markings on tripod assembly and drive shaft, place the drive shaft in proper position, remove drive shaft end spring clamp by using the special service tool (spring clamp pliers), and then pull out the drive shaft from the tripod assembly.

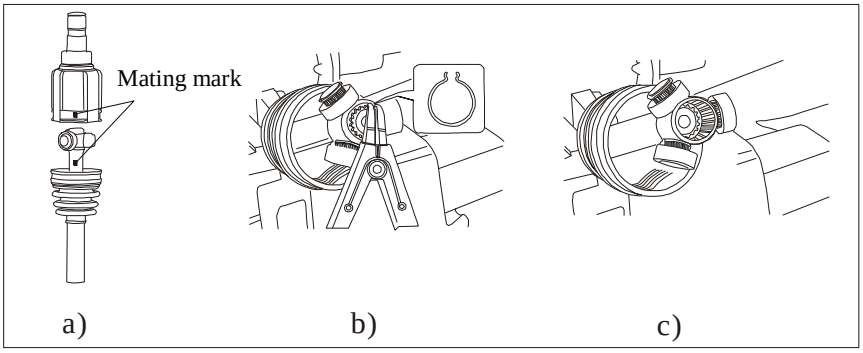

Figure 4-86 Pull out Drive Shaft

4) Change a new protective tube with grease.

5) Coat the operation surface of universal joint moving member with grease.

6) On the basis of the fitting marks, assemble the protective tube for drive shaft, universal joint and tripod assembly in the reverse order of disassembly of protective tube.

7) Put the protective tube clamp, so as to lock the protective tube firmly.

4. Installation of drive shaft

Install left and right drive shafts in the reverse order of dismantlement. In the course of installation, the instructions below shall be followed:

(1) Before the installation, inspect the oil seal on drive shaft for damage, and if any problem is found, just replace it with a new one.

(2) When installing new components like drive shaft, protective tube and universal joint, pay attention to commonality of parts according to vehicle model.

(3) Carry out each step carefully, and be sure not to damage the oil seal.

(4) Replace nut with lock banking stop, lock nut, bayonet lock on drive shaft wheel hub end.

(5) Tighten up each fixing nuts with the torque as specified in Table 4-8.

Table 4-8 Torque Table

No	Name	Tightening Torque/N·m
1	Tire Bolt	45
2	Drive Shaft End Nut	325
3	Drive Shaft Intermediate Mounting Fixing Nut	10
4	Steering Knuckle Arm Ball Joint Fixing Nut	45

Ⅲ Maintenance

Dismantlement

(1) Lift up the front portion of the vehicle so as to get two front wheels away from ground.

(2) Screw off the fixing bolts from both wheel tires, and then remove both front wheels.

(3) As shown in Figure 4-87, screw off the transmission oil drain plug, and then discharge all transmission oil.

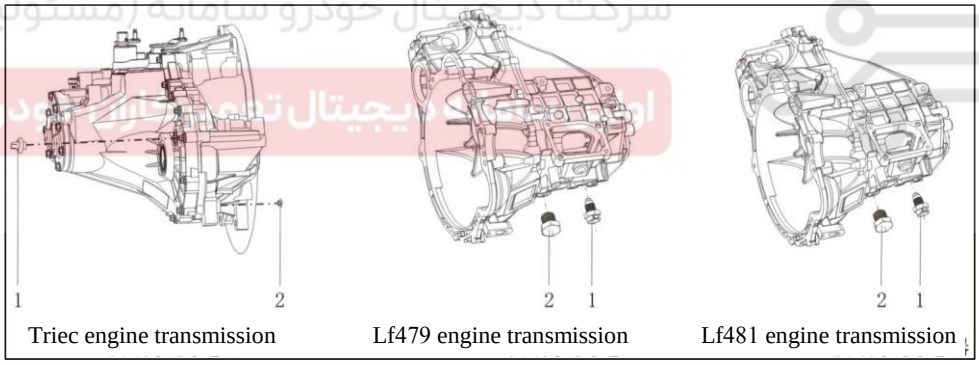

Figure 4-87 Drain Oil from Transmission

1- Oil filler bolt 2- Oil drain bolt

Note: Place oil-receiving trough under transmission drive axle to receive the oil discharged. After the drive shaft is dismantled, block up the drive shaft hole on transmission drive shaft, so as to avoid oil leakage and entrance of dirts.

(4) As shown in Figure 4-88, hold the wheel hub, remove the drive shaft end nut retainer bayonet lock, and then screw off the end nut.

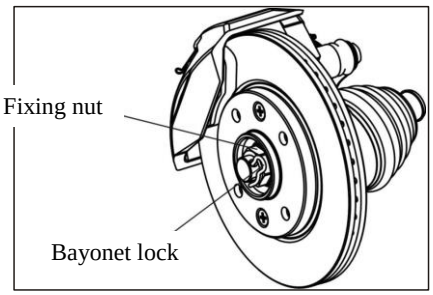

Figure 4-88 Fix Wheel Hub and Remove End Nut

(5) Remove the rocker ball joint fixing bolt (as shown in Figure 4-89), and then remove ball joint from the rocker.

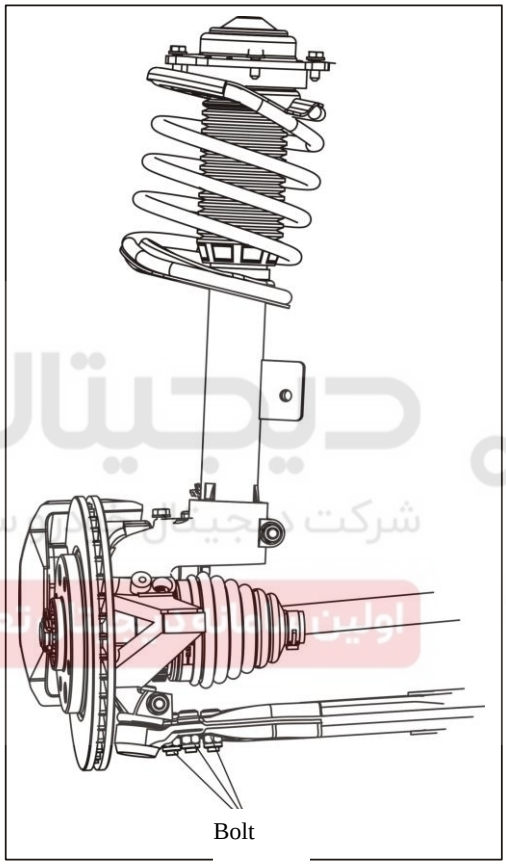

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Figure 4-89 Remove Rocker Arm Ball Joint

(6) Separate the wheel hub from left/right drive shafts, and if necessary, knock the drive shaft with small wooden hammer or rubber hammer so as facilitate the separation of wheel hub from drive shaf

(7) As shown in Figure 4-90, separate the left/right drive shaft from the differential by using the special service tool.

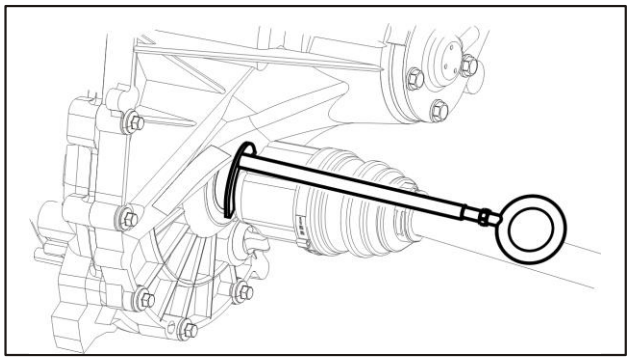


Figure 4-90 Separate Drive Shaft from Differentia

Caution: Be sure not to damage the axle shaft oil seal.

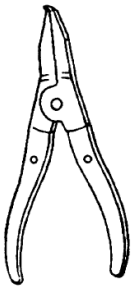
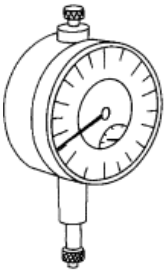
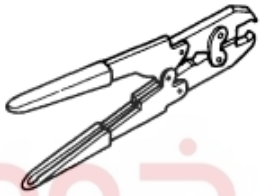
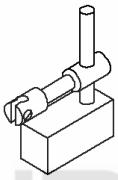
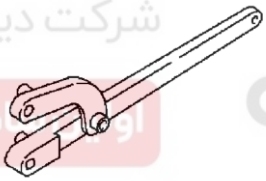
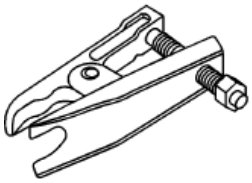
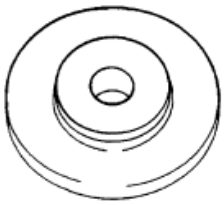
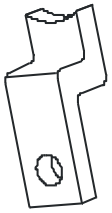
Note: Block up the transmission, so as to avoid oil leakage or entrance of dirt. Note: Replace the clamp with a new one.

(8) Remove the left drive shaft.

(9) Remove the right drive shaft.

Section Ⅴ List of Special Service Tools

Special service tools used for Lifan 520 suspension are as follows

Graphic Presentation	Description		Graphic Presentation	Description
	Spring Clamp Pliers			Micrometer Gauge
	Dust Cover Clamp Pliers			Micrometer Gauge Retainer
	Axle Shaft Remover			Wheel Disc Fixer
	Ball Joint Remover			Plug Gauge
	Bearing Limit Block			Damper Locating Block

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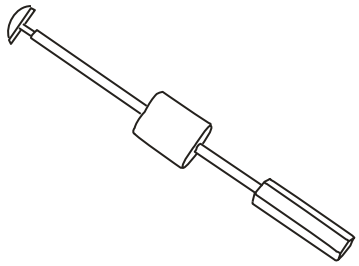
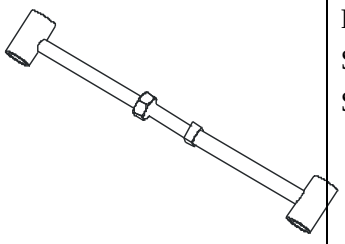
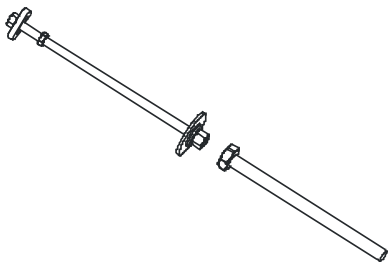
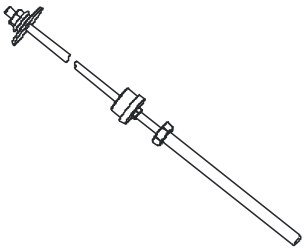
	Inertia Hammer			Rear Suspension Setting Tool
	Rear Axle Medial Bearing Remover			Rear Axle Medial Bearing Erection Tool

Chapter V Braking System

Section I General

The car braking system is a device used to force the car to decelerate and even stop, and make the car park or fix on the ramp or plain. In order to give full play to the technical performance of car, and ensure its safety driving at high speed, its braking system shall have a good braking performance, which is short in braking distance, stable in braking direction and little in tyre wear, etc.

The braking friction material must produce the noise and heat, resulting in eliminating the energy. Therefore, it's possible to produce long and sharp sound sometimes. This case may be multiplied due to the strict operating conditions, e.g. coldness, heat, rain, snow, salt and slurry. This braking system adopts front disc/rear drum brake; its diagonal is designed in dual circuit. Each pair of crossed wheels has a separate hydraulic system (left front, rear right and right front, left rear). Front brake caliper is designed in single sliding piston structure, in order to ensure that the equal force is applied to two brake blocks.

The control of parking brake is used to steer rear brake through a cable system. The parking brake cable adopts a ratchet pawl mechanism on the parking brake control assembly, and has self-control function.

I. Composition and operating principles of common braking system

(I)Composition of common braking system

Common braking system of Lifan car has two sets of braking systems including service brake and parking brake. It service braking system is a hydraulic braking system having engine vacuum booster, front and rear wheel dual pipes and designed in "X"-form layout, which is composed of two front wheel disc brakes, two rear wheel drum brakes, vacuum booster, hydraulic brake master cylinder and brake cylinder, and the layout of these parts is shown in Fig.5-1.

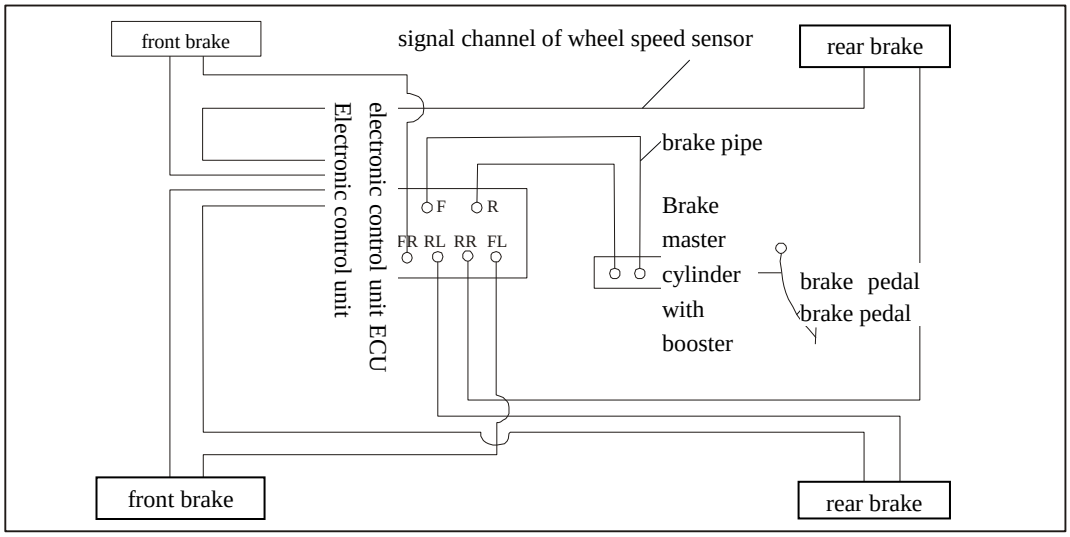


Fig.5-1 Braking System

1. Front brake

Front wheel of Lifan car adopts a floating caliper disc brake, as shown in Fig.5-2. It's mainly composed of brake disc 2, brake caliper 1, brake block 3 and brake cylinder component 8.

In case of braking, the braking fluid from brake master cylinder pushes the brake cylinder piston to move to right, and make brake block 9 pressing on brake disc 2. Since the floating caliper body 12 and brake cylinder are fixed together, and they can slide on floating caliper support 10 in axial direction towards the brake disc, so the hydraulic brake counter acting force of brake cylinder piston makes the brake cylinder and caliper body move together to left, and makes brake block 9 pressing on brake disc 3, thus, brake block 9 seizes the brake disc synchronously rotating with the wheel due to the action of brake cylinder hydraulic force, so as to realize its braking effect.

2. Rear brake

Rear wheel of Lifan car adopts a drum brake, whose composition is shown in Fig.5-3. Upper end of brake shoe is reclined on piston bearing seat of brake cylinder 20, lower ends of two brake shoes are supported on the bearing seat of brake bottom plate 23, and their both ends are pulled against clearance self-control lever 14 with brake shoe return spring 10 or 12. Both brake shoes are pressed against six fixing support points of brake bottom plate with a clamping pin and spring 16. In order to ensure good contact of brake shoe plate and brake drum, six fixing points of brake bottom plate must stay in the same plane.

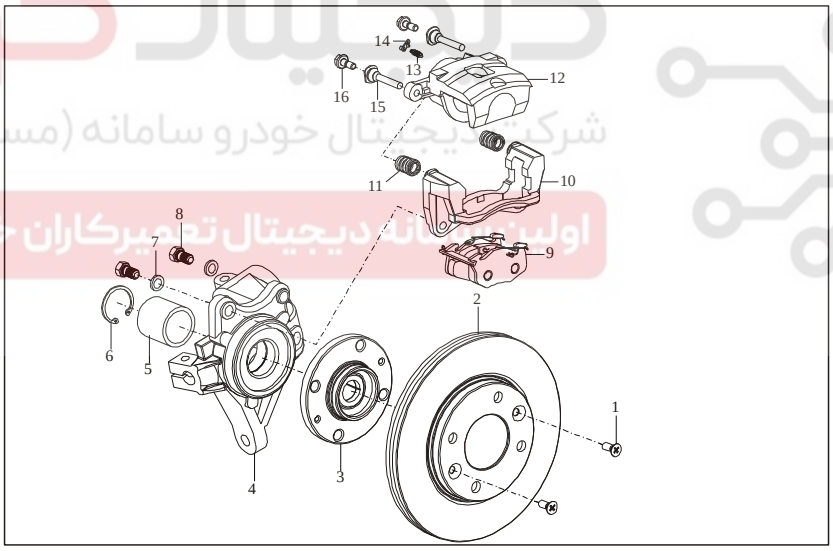


Fig.5-2 Exploded View of Front Brake

1-Sunk screw 2-Brake disc 3-Front wheel hub 4-Steering knuckle 5-Hub bearing 6-Circlip 7-Washer 8-Caliper fastening bolt 9-Brake plate 10-Caliper support 11-Shaft pin dust cover 12-Brake caliper component 13-Bleed screw 14- Bleed screw 15-Shaft pin 16-Shaft pin screw

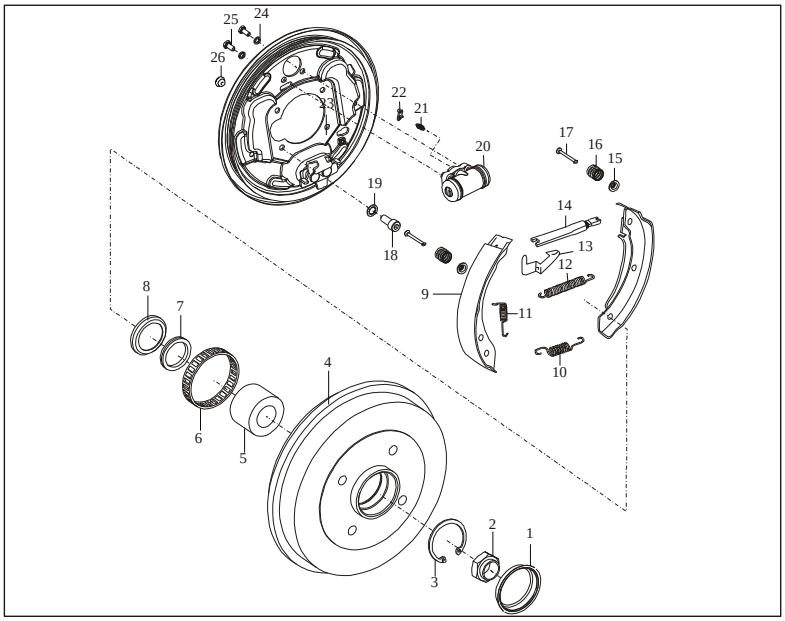


Fig.5-3 Exploded View of Rear Brake

1-Bowl-shape plug 2-Hex flange nut 3-Circlip 4-Rear brake drum 5-Rear hub bearing 6-Rear wheel ABS toothed ring 7-Spacer sleeve 8-Hub seal washer 9-Brake shoe 10-Lower pull spring 11-Left pull spring 12-Upper pull spring 13-Poking plate 14-Control screw rod 15-Pressure spring cap 16-Pressure spring 17-Clamping pin 18-Inner hexagon round head bolt 19-Spring washer 20-Rear brake cylinder 21-Bleed screw 22-Bleed screw cover 23-Brake bottom plate assembly 24-Elastic washer 25-Wheel cylinder fixing bolt 26-Sight hole

In case of braking, after the driver steps down the brake pedal, the braking fluid enters into rear brake cylinder. Due to the action of hydraulic force, the piston in brake cylinder moves outwards and gets over the acting force of brake shoe return spring to make the brake shoe expanded outwards, thus the shoe can be tightly pressed on inner friction surface of brake drum synchronously rotating with the wheel, and a braking torque opposite to the moving direction is produced to realize the braking effects.

The brake of rear wheel has a clearance self-control position, while this brake is also acted as a parking brake.

3. Brake master cylinder

Lifan car adopts a tandem master cylinder to realize the control of “X”-form dual braking pipeline. The structure of its brake master cylinder is shown in Fig.5-4. Its right side is connected to a push rod of vacuum booster, its upper part is connected to the fluid reservoir, and two holes in its side are respectively connected to two diagonal pipes. It divides the whole braking system into two separate systems, so as to avoid the failure of whole braking system when any fault occurs to part of braking pipeline or elements occasionally, thus the car has dual safety effects.

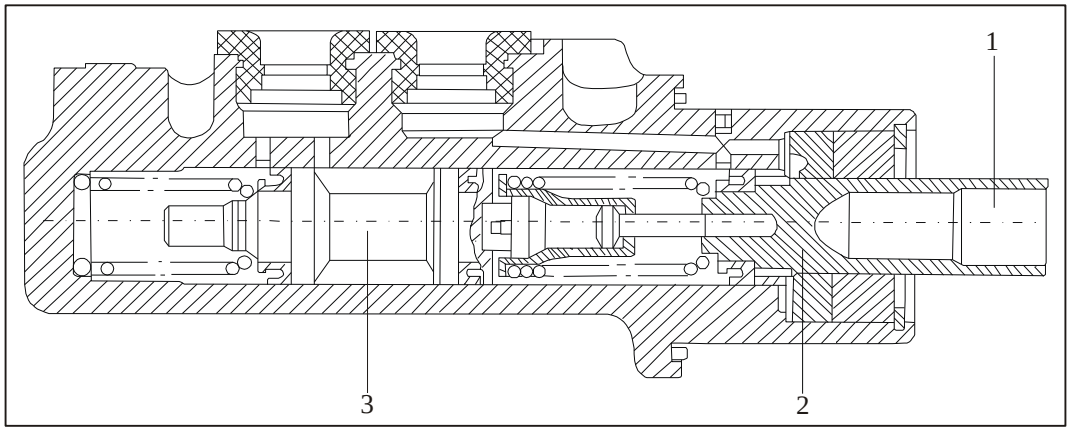


Fig.5-4 Structure of Brake Master Cylinder

1-Brake pushrod 2-Piston a 3-Piston b

4. Vacuum booster

The braking system of Lifan car adopts a vacuum booster, whose structure is shown in Fig.5-5, and it's a single-diaphragm vacuum suspension booster, which mainly consists of piston, diaphragm, return spring, pushrod and control lever, check valve, air valve and plunger vacuum valve, etc. The vacuum booster is installed between brake pedal control lever and brake master cylinder, which is used to provide an assisted power for braking the car. In case of not braking, the vacuum where the diaphragm of booster suspends is kept in balance depending on the vacuum of A or B chamber and return spring 3. When the driver steps on the brake pedal, the control lever of brake pedal pushes plunger 10 to move to left, and also pushes air valve 12 to move to left due to the pushing force of spring, thus A or B chamber channel of diaphragm is closed, and air valve 12 is opened. At this time, A chamber on left side of diaphragm is still vacuum, while B chamber on right side of diaphragm is open to atmosphere, thus the pressure difference is produced on both sides of diaphragm, forcing the diaphragm piston to move to left, and applying the increased force to piston of brake master cylinder through pushrod 4, which can provide an assisted force for driver. In case of maintaining its braking operation, step down the pedal to a certain position, it continues to move to left due to the increasing pressure difference between both sides of diaphragm first, but the valve spool stops moving to left at this time, and air/vacuum valve moves right due to the reaction of push disc 11, thus, the channel to atmosphere is closed, air/vacuum valve is kept in balance, so that the pressure difference between A and B chambers of diaphragm keeps constant, and this difference keeps in the balance with the established oil pressure of brake master cylinder, which can provide assisted braking effects. In case of releasing its braking operation, the pedal braking force disappears, the return spring presses the diaphragm back to its balance, and the control lever moves to right, thus the air valve is closed, the vacuum valve is opened to connect A and B chambers, and the same vacuum is again formed between both sides of diaphragm. If the vacuum booster fails, or the vacuum pipeline has no vacuum for braking, the brake pedal drives booster control lever 9 to directly push the diaphragm seat and push disc through the air valve seat, so that output pushrod 4 is directly pushed to make the brake master cylinder produce a braking pressure, which can't achieve any assisted force.

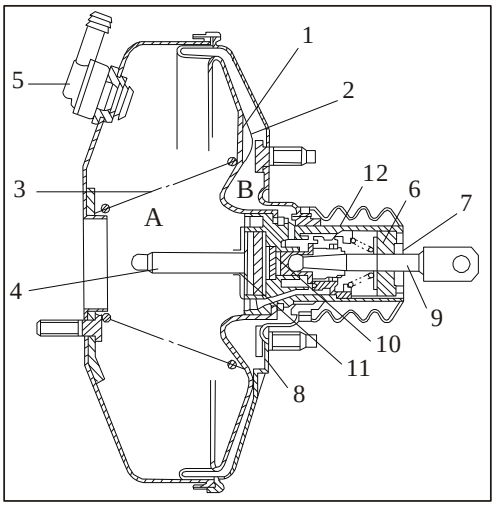


Fig.5-5 Structure of Vacuum Booster

1-Piston 2-Diaphragm 3-Return spring 4-Push rod 5-Check valve 6-Air filter 7-Vent hole 8-B chamber vacuum-pumping channel 9-Control lever 10-Plunger vacuum valve 11-Push disc 12-Air valve

5. Parking brake

The parking braking system of Lifan car is a mechanical one, which is used to control the steel wire cable with a hand brake pull rod, and activate it with a rear wheel drum brake, whose layout is shown in Fig.5-6.

(II)Operating principles of common braking system

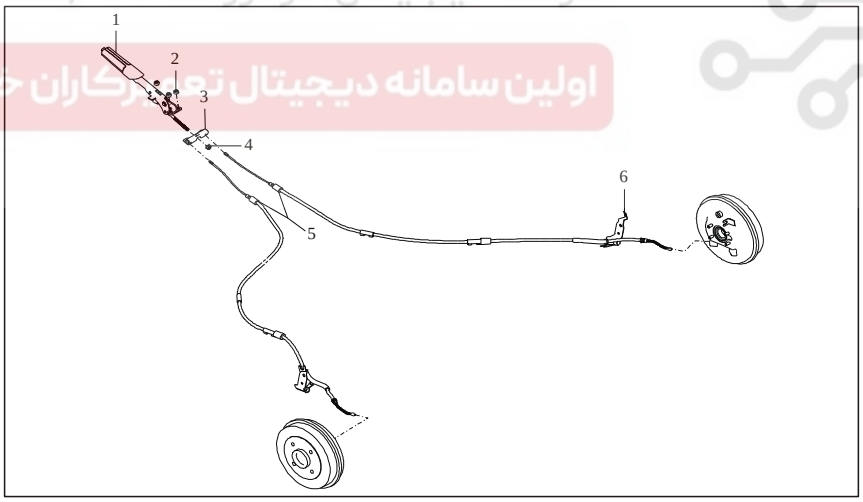


Fig.5-6 Layout of Parking Brake

1-Parking brake control lever 2-Locking nut 3-Balancing block 4-Regulating nut 5-Parking brake cable 6-Cable support

In case of braking, the driver steps down the brake pedal, and obtains an amplified oil pressure distributed to the brake cylinders of front and rear wheel brakes through a braking booster, hydraulic brake master cylinder and braking pressure regulator, and the brake makes a nonrotating brake friction plate of front brake caliper tightly pressed on rotating brake drum due to the action of brake cylinder's oil pressure, which can produce a friction torque respectively in the same

direction as that of wheel rotation. After this torque is applied to the wheel, the wheel gives a forward tangential force to road surface due to its adhesion with the road surface, and the road surface also gives an equal backward force to the wheel in the reverse direction, which is a braking force to stop the car from moving forward. This braking force is applied to the car body by the wheel via the suspension system, so as to force the car to slow down and even stop.

II. Composition and operating principles of antilock braking system

(I)Basic composition of antilock braking system

This system mainly consists of wheel speed sensor, HECU and fault indicator, etc (as shown in Fig.5-7).

1. Wheel speed sensor

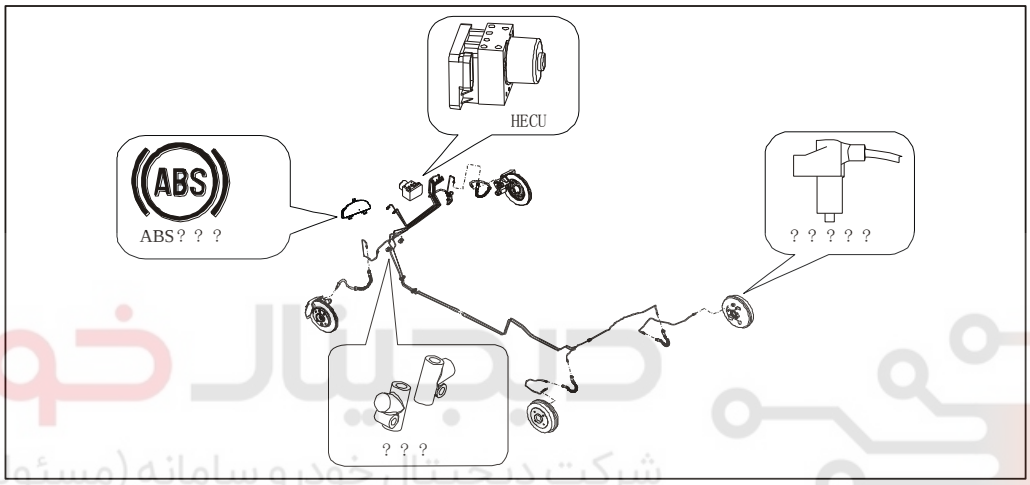


Fig.5-7 Schematic of Braking System Layout

Wheel speed sensor is used to check the wheel speed, whose layout on the car is 4-sensor layout, i.e. one sensor is respectively installed on front, rear, left or right wheel. The sensor is mainly composed of permanent magnet, magnetic pole with a probe and coil, as shown in Fig.5-8.

2. HCU(hydraulic control unit)

ABS actuator is a device used to control the pressure of braking system. It adjusts the oil pressure of each brake cylinder by increasing, reducing and maintaining the pressure to control the wheel speed according to the commands sent by ABS ECU.

ABS actuator mainly consists of solenoid valve, fluid reservoir, retarder, pump and motor, as shown in Fig.5-9.

3. ECU (electronic control unit)

ECU and HCU (hydraulic control unit) are combined into one body, whose construction is shown in Fig.5-10. In fact, the electronic control unit is a microprocessor. According to the signals of sensor, calculate the speeds, accelerations and decelerations, judge the sliding conditions of wheel, so as to activate the solenoid valve and motor to control the increase, reduction or maintaining of pressure, etc.

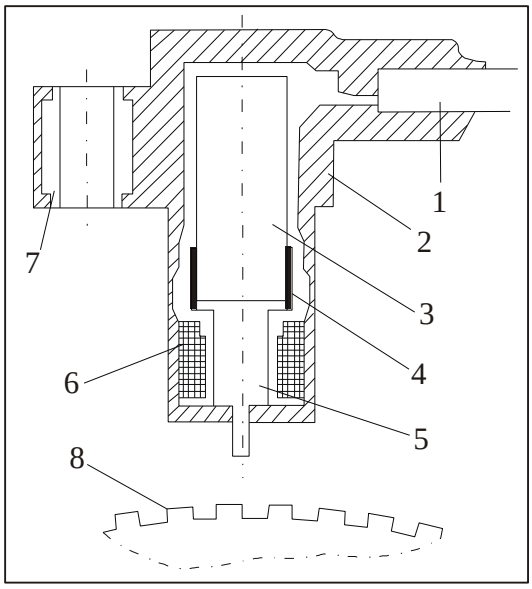


Fig.5-8 Structure of Wheel Speed Sensor

1-Cable 2-Shell 3-Permanent magnet 4-Bushing 5-Magnetic pole with a probe 6-Coil 7-Bushing 8-Inductive toothed ring

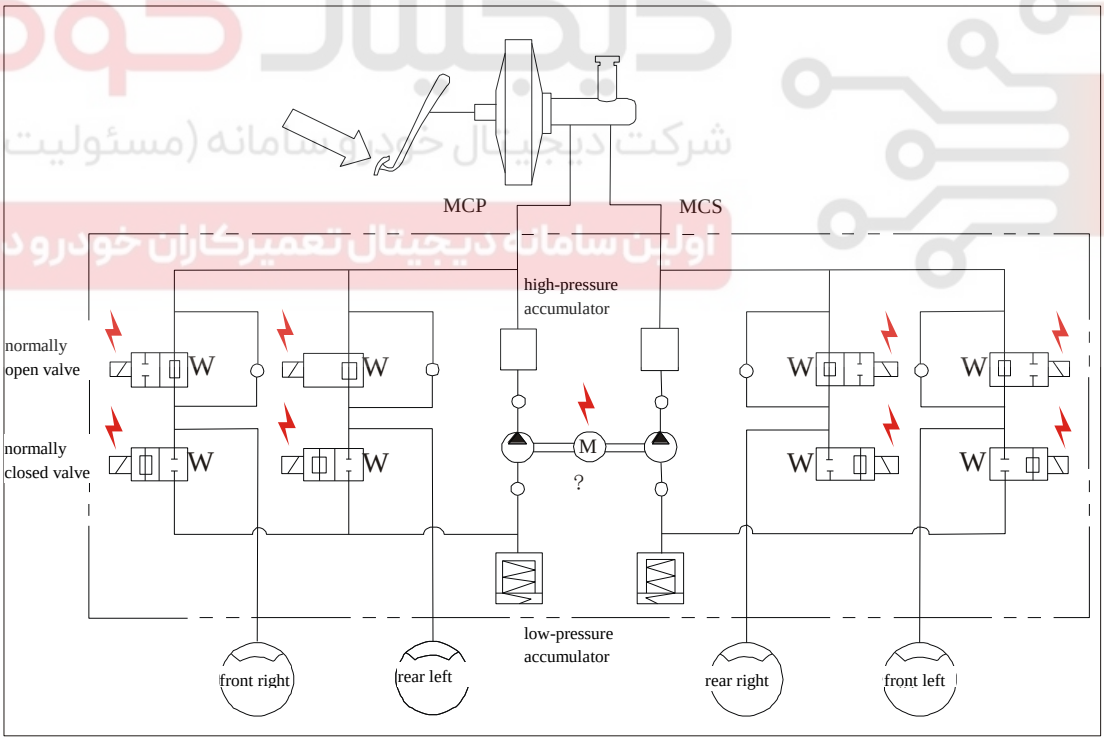


Fig.5-9 Principle of ABS Actuator

ECU has the following functions:

(1) Output of ECU identifying information.

(2) Output of stored faults.

(3) Control of ABS actuating elements.

(4) Output of dynamic parameters (e.g. wheel speed, voltage).

(5) Deletion of fault memory.

(6) Drain the hydraulic control unit as per the procedure.

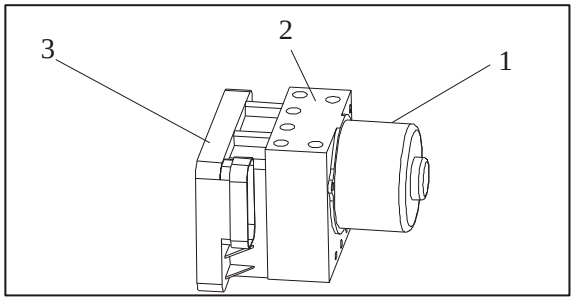


Fig.5-10 Structure of HECU

1-Motor 2-HCU 2-3-ECU

4. ABS fault indicator

ABS fault indicator is used to indicate whether the operation of system is normal. After turning on the ignition switch, ABS indicator goes on and checks the operation of system. If ABS is normal, the indicator shall go out after starting the engine; otherwise it indicates the faults of ABS.

(II)Operating principles of antilock braking system

In case of braking the car, each wheel speed sensor inputs each wheel speed signal into ECU, ECU monitors and judges the running conditions of each wheel according to the signals provided by each wheel speed sensor, forms the corresponding control commands to control ABS actuator, and the actuator controls the braking pressure of each brake cylinder according to the commands of ECU to each wheel. Separate control of two front wheels of Lifan car's ABS, i.e. ECU checks or determines the decelerations and sliding ratios of two front wheels and adjusts its braking pressure separately according to the actual conditions of each wheel, and the operations of both wheels are independent to each other. In case of two rear wheels, the adjustment of its ABS is carried out according to the slower wheel of rear wheels (i.e. the principle of selecting the slower one). ECU checks or determines the decelerations and sliding ratios of two rear wheels separately, but it determines the pressure control mode according to the deceleration and sliding ratio of the first wheel that may be locked of two rear wheels, and control the braking pressures of both rear wheels at the same time as per the same mode to ensure that the braking forces of both rear wheels are equal to each other, thus the sideslip or braking swerve of rear shaft can be avoided. Since the braking system adopts "X"-shape pipe layout, and two rear wheels don't belong to the same pipe, ABS actuator requires a pair of solenoid valves of each rear wheel to be adjusted and controlled by the same mode according to the principle of "Selecting the Slower Wheel". There are three modes of controlling its oil pressures, i.e. reduction, maintaining and increase of pressure.

IV. Technical parameters

Table 5-1 Technical Parameters of Braking System

Car type		520 3-compartment/2-compartment
Form of system structure		X-shape dual circuit of vacuum booster ABS hydraulic brake
Front wheel brake	Form	Disc brake
	Diameter of brake disc/mm	Φ247
	Thickness of brake disc/mm	20.4
	Min. allowable thickness of brake disc/mm	18.4
	Max. allowable deflection of brake disc/mm	0.2
	Max. allowable difference of brake disc/mm	0.02
	Thickness of new brake caliper friction plate/mm	12.5
	Min. allowable worn thickness of brake caliper friction plate /mm	2
	Diameter of front brake cylinder piston/mm	Φ48
Rear wheel brake		Drum brake
	Diameter of brake drum/mm	Φ203
	Max. allowable diameter of worn brake drum/mm	Φ204.5
	Diameter of rear brake cylinder/mm	Φ20.64
	Thickness of new brake shoe/mm	4.7/3.5(main/slave)
	Min. allowable worn thickness of brake shoe/mm	1
	Width of brake shoe/mm	36.5
	Diameter of brake master cylinder/mm	Φ22.22
	Diameter of vacuum booster cylinder/mm	228.6
	Max. stroke of brake pedal/mm	60
	Number of hand-brake operating gears	4-7

Section II Fault Diagnosis

The braking performance of car will directly influence the play of car's driving safety and dynamic performance, so the faults of braking system shall be diagnosed and remedied in time. These faults of braking system can be divided into common faults of braking system and ABS faults, which shall be respectively handled during the diagnosis.

Carry out the road tests, and compare with the braking performance and expected driving performance standards of actual car. Test the confidence level compared for driving and ability for detecting the performance difference, which is different according to the experiences. The driver shall have enough knowledge for the operation of braking system, carry out a correct comparison and detect the performances as per the common performance guides.

Before carrying out the road test, obtain a complete description of customers' problems or suspected conditions. According to the relevant description, technicians' experiences can make them combine the possible causes with the fault symptoms. Some parts can be regarded as the suspected sources, while the other parts can be excluded according to the symptoms. More importantly, the customers' descriptions can disclose the unsafe conditions checked or repaired before the road test. These descriptions are focused on special parts, car speeds or conditions to assist in determining the basic methods of road test.

The road test shall begin with the check of common braking performance. Remember the descriptions for above problems at any time, and test the braking operation by different pedal applying pressures at different speeds. In case of determining that the fault occurs to front or rear braking system, adopt the brake pedal, and then adopt the parking brake control device. If the problem (pull, vibration or isolation) only occurs during the use of parking brake, it indicates that the problem occurs to rear braking system.

Avoid the lock of brake and slipping of tyre. The lock of brake and slipping of tyre don't stand for the effective braking. Forced braking and wheel rotating can make the car stop within the shorter distance than that of locked brake.

If the problem is obvious in this test, determine whether it's consistent with the description before the road test. If the problem is not obvious, adopt the information obtained through the above description, and try to make the problem reappear.

If the problem exists, adopt a table for fault symptoms to isolate this problem into the special subsystem and description. By adopting this description, it's allowed to use a sheet of possible causes to limit the cause to a special part or symptom further.

I. Fault diagnosis of common braking system

Common braking system is the source of car's braking force and core of braking system, and its faults can lead to the failure of whole braking system, so the fault diagnosis and remedy of common braking system shall be taken into account. For the fault of common braking system, analyze and diagnose this fault according to the fault symptoms, and adopt an effective method to remedy them. The methods for fault diagnosis and remedy of common braking system are as follows:

1. Insufficient braking force, poor braking effects

Possible causes and remedy methods of this fault:

(1)If air exists in hydraulic system of braking system, remove the air in the hydraulic system.

(2)In case of loose oil pipe joint or oil leaks of oil pipe, tighten the pipe joint, check and repair the leaked parts, and replace the oil pipe.

(3)If the braking pipe is blocked, check and repair the brake pipe.

(4)If the brake master cylinder or brake cylinder piston rubber bowl is deformed, aged, damaged or expanded for seizure, replace the rubber bowl.

(5)If the friction plate is seriously worn, its surface is hardened or smudged by oil, replace the friction plate.

(6)If the stroke of brake pedal is too large, adjust the stroke of brake pedal, and make its value not more than 60mm.

(7)If the vacuum booster is damaged, replace the vacuum booster.

(8)If the amount of braking fluid is insufficient or the brake pipe is blocked, add in the braking fluid, check and repair the brake pipe.

(9)If the bore of brake master cylinder or brake cylinder is seriously worn, replace the cylinder assembly.

(10)If the piston of brake cylinder is locked and can't move, replace the brake cylinder piston or the whole cylinder.

(11)If the brake drum is out of circularity or seriously deformed, repair it by machining or replace the brake drum or brake disc.

(12)If the brake clearance self-control device fails, leading to the overlarge clearance between the shoe and brake, check and repair the clearance self-control device.

2. Retardation of brake

Possible causes and remedy methods of this fault:

(1)If the brake pedal has no free strokes, adjust the free stroke of brake pedal.

(2)If the parking brake is improperly adjusted and can't be completely disengaged, re-adjust it.

(3)If the brake pipe is blocked and oil return is not smooth, check and repair the brake pipe.

(4)If the piston of brake master cylinder or brake cylinder is seized and can't return, check and repair the brake master cylinder or brake cylinder.

(5)If the brake disc or brake drum is seriously warped or deformed, repair the brake disc or brake drum by machining or replace it.

(6)If the return spring of brake shoe is too soft, replace the return spring.

(7)If rear brake clearance self-control device fails, adjust or replace it.

(8)If the caliper is loosened or out of adjustment, check the fastening device of caliper.

(9)If the caliper moves slowly or is clipped, remove the brake caliper for cleaning, apply some braking fluid to the sliding pin, and pull the brake caliper, which shall slide freely.

(10)If the friction plate is cracked or deformed, replace the friction plate.

(11)If the dirt are affixed to the friction plate, remove the dirt.

(12)The air valve of vacuum booster can't be tightly sealed and may be leaked.

(13)In case of no clearance between vacuum booster pushrod and brake master cylinder, adjust the specified clearance.

3. Failure of braking

Possible causes and remedy methods of this fault:

(1)In case of too little braking fluid, check the braking system, find out the fault cause and remedy it, and then add in the braking fluid.

(2)If the brake pipe is damaged or loosened, replace the damaged pipe or tighten the loosened part.

(3)If the sealing elements of brake master cylinder or brake cylinder fail, replace these sealing elements.

(4)If oil dirt exist on the surface of braking friction plate, clean or replace the friction plate.

(5)If the mechanical connection part is detached, check the connection part.

4. Overlarge pedal braking force

Possible causes and remedy methods of this fault:

(1)If the vacuum brake booster fails, check its vacuum pipe for breakage and the pipe joint for loosening. After determining the failure of vacuum booster, renew it.

(2)If the vacuum pipe is damaged or loosened, replace or tighten it.

(3)If the piston of brake master cylinder or brake cylinder is clipped, repair or replace it.

5. Abnormal noise or vibration in case of braking

Possible causes and remedy methods of this fault:

(1)If the friction plate is worn, its surface deteriorates, is hardened or damaged, replace it.

(2)If the contact surface of brake disc or brake drum is damaged or has any foreign material on it, replace the brake disc or brake drum, or remove the foreign material.

(3)If the brake is locked, repair it according to the actual conditions.

(4)If the installation of brake caliper is loosened, tighten the mounting bolt.

(5)If any sliding part of brake is poorly lubricated, add in the lubricant.

(6)If the hub bearing is loose, or its clearance is too large, replace the hub bearing.

6. Runout of brake

Possible causes and remedy methods of this fault:

(1)If the clearance difference between left or right wheel brake shoe and brake drum is larger, adjust the clearance.

(2)If any fault or failure occurs to the clearance self-control device, repair or replace it.

(3)If any individual friction plate is seriously worn, hardened or poorly contacted, replace or adjust it.

(4)If any individual friction plate is affixed by oil or grease, replace it.

(5)If any individual brake is out of circularity, or any brake disc is seriously warped or deformed, replace it.

(6)If any fault occurs to clipping of brake cylinder, check and repair this brake cylinder.

(7)If the air pressure difference between left and right wheel tyres is larger, inflate the tyres up to the specified value.

(8)If the location of front wheel loses its accuracy, or the suspension guide mechanism is seriously deformed, re-check, adjust, repair or replace it.

II. Diagnosis of ABS faults

The antilock braking system is high in operational reliability, which has fewer faults and doesn’t require any special maintenance. Once any fault occurs to ABS, i.e. this fault is mostly caused by disengagement or poor contact of wire plug of system, open or short conductor, open or short coil of solenoid valve, open or short circuit of pump motor, open or short coil of wheel sensor, overlow voltage of battery, overlow level of fluid reservoir, overlarge clearance between wheel speed sensor and toothed ring or pollution of sludge, etc, therefore, it’s important to check

these parts.

ABS fault symptoms have great variety, the fault causes are complex, and it's more difficult to diagnose these faults than those of common braking system. Therefore, the diagnosis of ABS faults usually requires some integrated steps including analysis of ABS circuit diagram, self-diagnosis of ABS, diagnosis of ELIT instrument and man-made rapid diagnosis.

(I)Common steps for ABS fault diagnosis

When ABS fault indicator goes on constantly, it indicates that ABS has faults, so the faults of ABS system shall be diagnosed and remedied in time. During the diagnosis and remedy of faults, carry out some steps to achieve a good effect. Common steps for ABS fault diagnosis and remedy:

(1)Determine the conditions and symptoms of fault.

(2)Carry out an initial check to ABS system, including the following check items:

1) Check whether the parking brake is completely released.

2) Check whether the level of braking fluid is within the specified range.

3) Check whether the connection or contact of each conductor plug or socket of ABS system is good.

4) Check whether the conductor is damaged, or the fuse is melt.

5) Check whether the capacity and voltage of battery conform to the provisions, and check whether the connection of positive and negative conductors of battery is reliable.

6) Check the wheel sensor and its circuit. Verify the accuracy of air gap range and reliability of sensor connection, and check whether the toothed ring of sensor rotor is damaged and installation position of sensor is correct.

7) Check the braking elements on each wheel to ensure that the operation of brake is normal and the wheel is clear of obstruction.

In case of not determining the fault position by adopting the above method, diagnose it with a fault self-diagnosis method.

(3)Read the faults subject to ABS self-diagnosis with a fault detector to initially determine the faulted parts.

(4)According to the read faults, start a further rapid check to the faulted parts with any required tool, e.g. detection kit or multimeter, to determine the faulted parts and fault causes.

(5)Remedy the faults.

(6)After removing ABS faults, delete the fault information. Otherwise, ABS faults are removed, and the system becomes normal, but ABSECU memory still stores the original faults.

(7)Check whether ABS fault indicator goes on constantly. If the indicator still goes on, it indicates the faults still exist in the system, or the faults have been removed, but their information has not been deleted, so the faults shall be further removed or their information is re-deleted.

(8)When ABS fault indicator doesn't go on, carry out a road test to confirm that ABS system is normal.

During the road test, pay attention to the following items:

1)When ABS works, the motor runs, and the fluid in fluid reservoir is drawn to brake master cylinder to cause the rebounding of brake pedal, it indicates that the antilock braking system has been activated, which is normal.

2)After stepping down the brake pedal, ABS works, the brake cylinder of braking system starts the cycle of pressure reduction-pressure maintaining-pressure increase depending on the pressure of brake oil, and a slight vibration of brake pedal is felt, which is normal.

(II) Self-diagnosis of ABS faults

ABS system has a fault self-diagnosis function. After starting the ignition switch to make it in ignition position, ABS ECU will carry out a static test automatically to itself, wheel speed sensor, ABS actuator or relay, etc, thus ABS fault indicator goes on automatically, and its test time is ca.3s. During the test, if ABS ECU can't find out any fault of the system, ABS fault indicator will go out automatically after ending the test; if ECU finds out any fault of system, ECU will store and memorize the fault in the form of fault code, its ABS fault indicator will go on to make ABS deactivated.

During the work of ABS system, its ECU monitors the electric elements of system, and checks whether any fault occurs to the system. Once any fault occurs to the system, ECU will store and memorize the fault in the form of fault code, and make ABS system deactivated, ABS fault indicator will go on constantly. Note: before closing the ignition key, the fault detected by ECU indicates as a permanent fault. If the detected fault disappears, it will indicate as a temporary fault upon opening the ignition key next time.

In fact, the methods for ABS fault self-diagnosis shall be subject to the normal running state of ABS ECU, any abnormal running (i.e. said fault) is recorded by a certain symbol for user's reading of faulted part. After the self-diagnosis, ABS fault indicator will give an operation hint to indicate whether the operation of its ABS system is normal. After turning on the ignition switch, if ABS fault indicator goes on constantly, it indicates that the faults must exist in ABS system. At this time, read the information for ABS faults with a fault detector to determine the faulted parts.

Read the following fault information with a fault detector:

1. ABS pump motor
2. Safety relay
3. Left rear wheel speed sensor
4. Information for left rear wheel speed sensor
5. Right front wheel speed sensor
6. Information for right front wheel speed sensor
7. Right rear wheel speed sensor
8. Information for right front wheel speed sensor
9. Left front wheel speed sensor
10. Information for left front wheel speed sensor
11. Left rear wheel solenoid valve
12. Right front wheel solenoid valve
13. Right rear wheel solenoid valve
14. Left front wheel solenoid valve
15. Consistency of sensor rotor induction coil
16. Brake lamp switch
17. ECU
18. Battery voltage

(III)Fault codes and fault check

1. Checklist of faults with fault codes (Table 5-2)

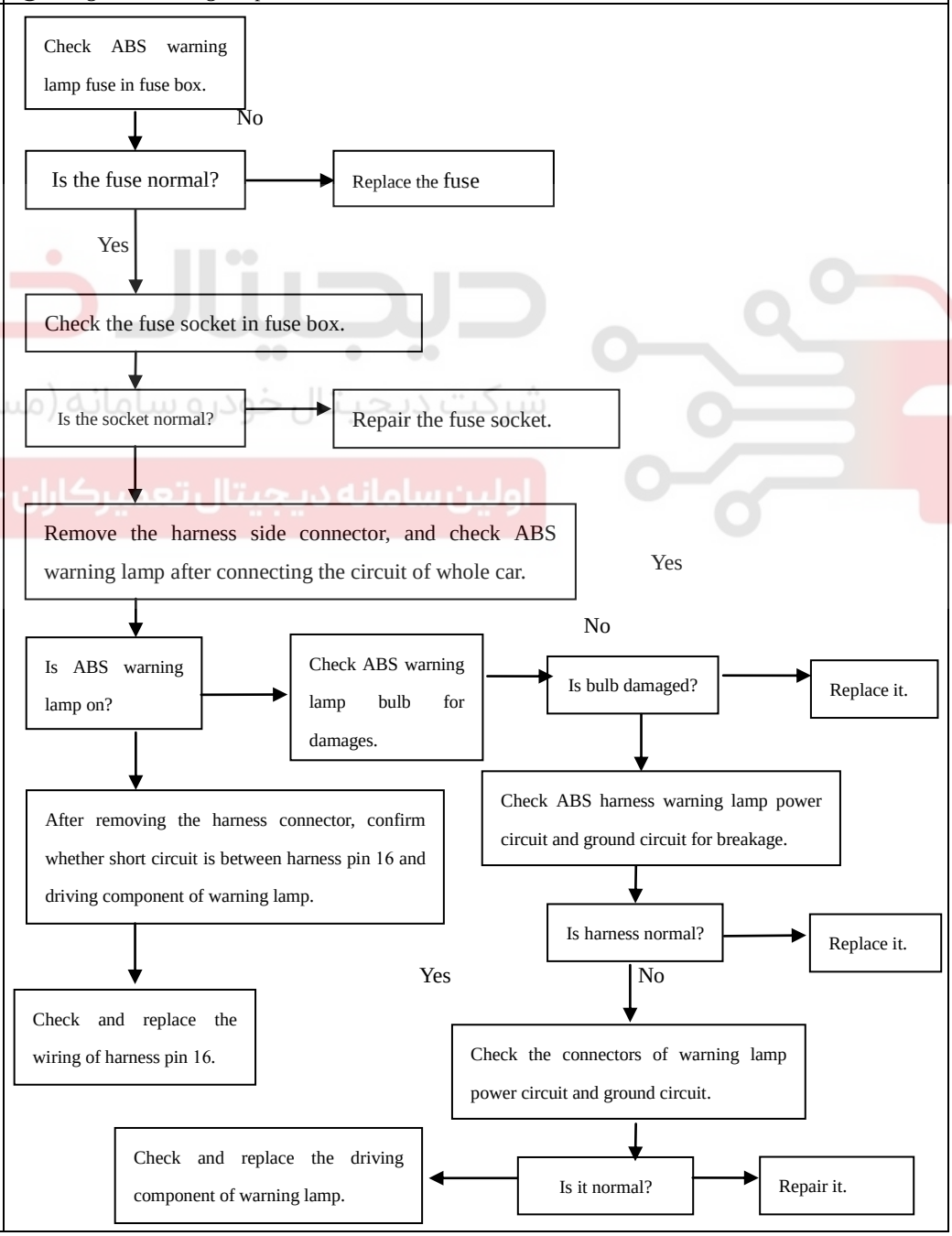
DTC Fault code (flashing code)	Fault indication	Faulted part	Methods of fault remedy
1-1	Fault-free (the system is normal)		
2-1	Power-off fault of left front wheel feeding solenoid valve	Pressure control valve of left front wheel	Check whether the solenoid valve wire and its wire joint are normal.
2-2	Power-up fault of left front wheel feeding solenoid valve		
2-3	Power-off fault of left front wheel draining solenoid valve		
2-4	Power-up fault of left front wheel draining solenoid valve		
2-5	Fault of left front wheel feeding solenoid valve		
2-7	Fault of left front wheel draining solenoid valve		

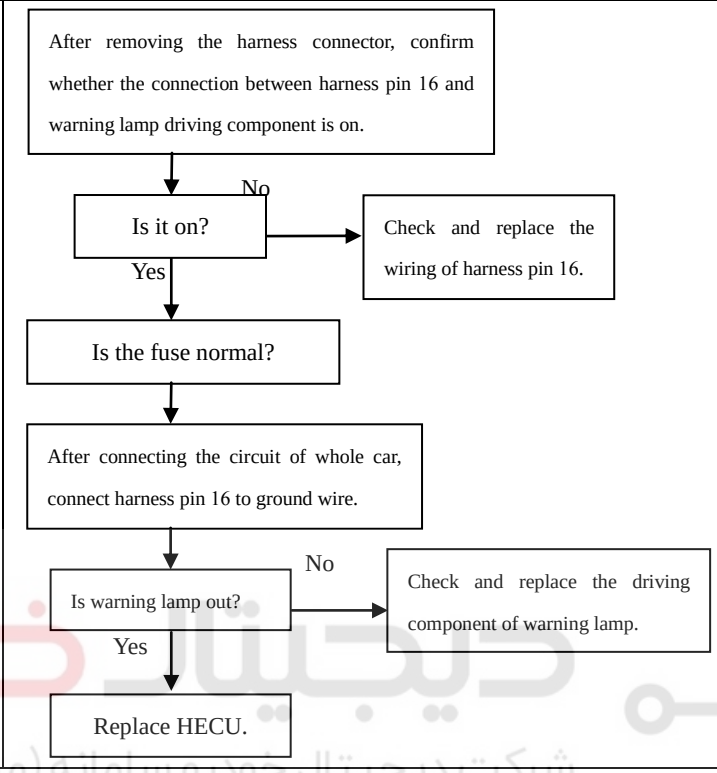
DTC Fault code (flashing code)	Fault indication	Faulted part	Methods of fault remedy
3-1	Power-off fault of right front wheel feeding solenoid valve	Pressure control valve of right front wheel	Check whether the solenoid valve wire and its wire joint are normal.
3-2	Power-up fault of right front wheel feeding solenoid valve		
3-3	Power-off fault of right front wheel draining solenoid valve		
3-4	Power-up fault of right front wheel draining solenoid valve		
3-5	Fault of right front wheel feeding solenoid valve		
3-7	Fault of right front wheel draining solenoid valve		
4-1	Power-off fault of left rear wheel feeding solenoid valve	Pressure control valve of left rear wheel	Check whether the solenoid valve wire and its wire joint are normal.
4-2	Power-up fault of left rear wheel feeding solenoid valve		
4-3	Power-off fault of left rear wheel draining solenoid valve		
4-4	Power-up fault of left rear wheel draining solenoid valve		
4-5	Fault of left rear wheel feeding solenoid valve		
4-7	Fault of left rear wheel draining solenoid valve		
5-1	Power-off fault of right rear wheel feeding solenoid valve	Pressure control valve of right rear wheel	Check whether the solenoid valve wire and its wire joint are normal.
5-2	Power-up fault of right rear wheel feeding solenoid valve		
5-3	Power-off fault of right rear wheel draining solenoid valve		
5-4	Power-up fault of right rear wheel draining solenoid valve		
5-5	Fault of right rear wheel feeding solenoid valve		
5-7	Fault of right rear wheel draining solenoid valve		
1-2	Wrong matching of system parameters	ECU	
1-3	EEPROM error, mismatching of code.	ECU	Replace ECU.
1-4	Error of ECU off-test	ECU	Check ECU again.
1-5	Overhigh voltage of power supply	Power supply of car battery	Measure whether the voltage of battery is normal.
1-6	Overlow voltage of power supply		
1-7	Overhigh voltage of ECU power supply	ECU power supply	Measure the voltage of ECU power supply as per the diagnostic procedure.
1-8	Overlow voltage of ECU power supply		
1-9	Fault of power supply	ECU power supply	
1-A	Fault of motor diagnosis The current in the motor too high or too low	ABS motor	Check the motor.

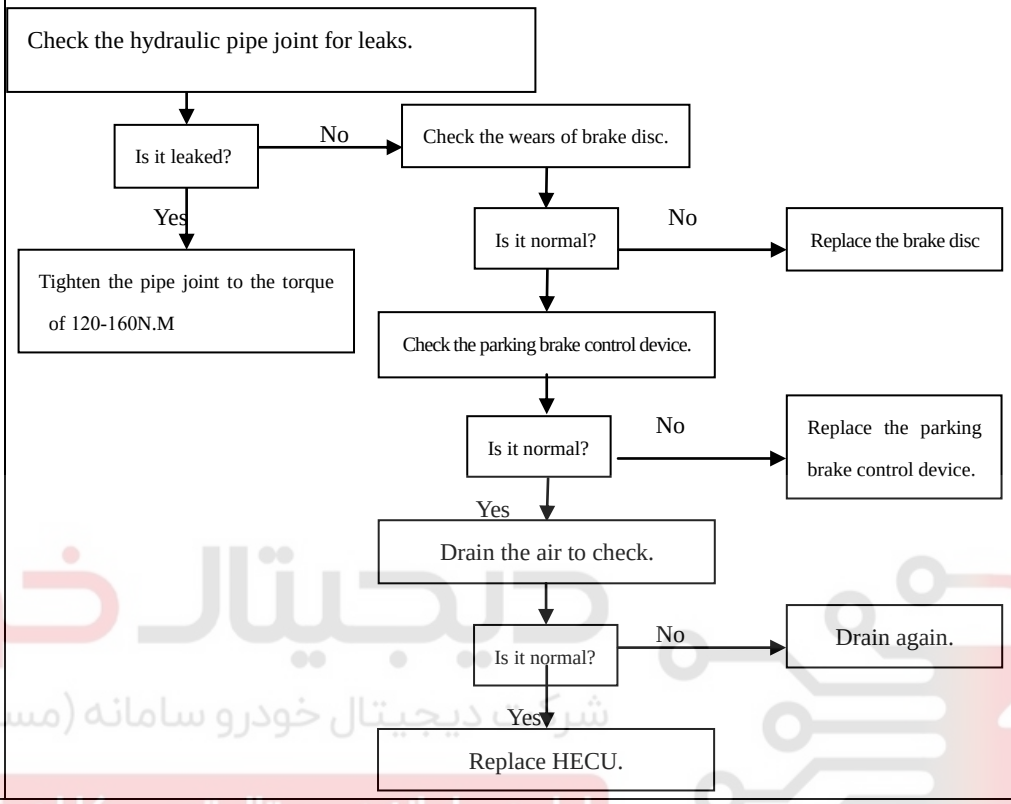
DTC Fault code (flashing code)	Fault indication	Faulted part	Methods of fault remedy
1-B	Fault of brake lamp switch		Check the brake lamp switch.
1-C	Fault of ABS warning lamp		Check ABS warning lamp.
1-D	Failure of ABS function	Error of system setting	Check with a diagnostic unit.
1-E	Overlow input voltage of ABS motor	ABS motor	Check the motor.
0D	Overhigh or overlow current of ABS valve	ABS solenoid valve	Check the coil of solenoid valve.
8-1	Short or open circuit of left front wheel speed sensor	Left front wheel speed sensor	Check whether the sensor wire and its wire joint are normal.
9-1	Short or open circuit of right front wheel speed sensor	Right front wheel speed sensor	Check whether the sensor wire and its wire joint are normal.
A-1	Short or open circuit of left rear wheel speed sensor	Left rear wheel speed sensor	Check whether the sensor wire and its wire joint are normal.
B-1	Short or open circuit of right rear wheel speed sensor	Right rear wheel speed sensor	Check whether the sensor wire and its wire joint are normal.
1-F	Inconsistency of speed signal	ECU parameter setting and toothed ring	
8-2	No sensor signal of left front wheel	Left front wheel speed sensor	Check whether the sensor wire and its wire joint are normal.
8-3	Unstable signal of left front wheel speed		
8-4	Unstable signal of left front wheel ABS speed		
8-5	Overhigh low speed of left front wheel	Left front wheel speed sensor	Check the sensor clearance.
8-6	Long locking time of left front wheel brake		Check whether the motor is normal.
9-2	No sensor signal of right front wheel	Right front wheel speed sensor	Check whether the sensor wire and its wire joint are normal.
9-3	Unstable signal of right front wheel speed		
9-4	Unstable signal of right front wheel ABS speed		
9-5	Overhigh low speed of right front wheel	Right front wheel speed sensor	Check the sensor clearance.
9-6	Long locking time of right front wheel brake		Check whether the motor is normal.
A-2	No sensor signal of left rear wheel	Left rear wheel speed sensor	Check whether the sensor wire and its wire joint are normal.
A-3	Unstable signal of left rear wheel speed		
A-4	Unstable signal of left rear wheel ABS speed		
A-5	Overhigh low speed of left rear wheel	Left rear wheel speed sensor	Check the sensor clearance.
A-6	Long locking time of left rear wheel brake		Check whether the motor is normal.
B-2	No sensor signal of right rear wheel	Right rear wheel speed sensor	Check whether the sensor wire and its wire joint are normal.

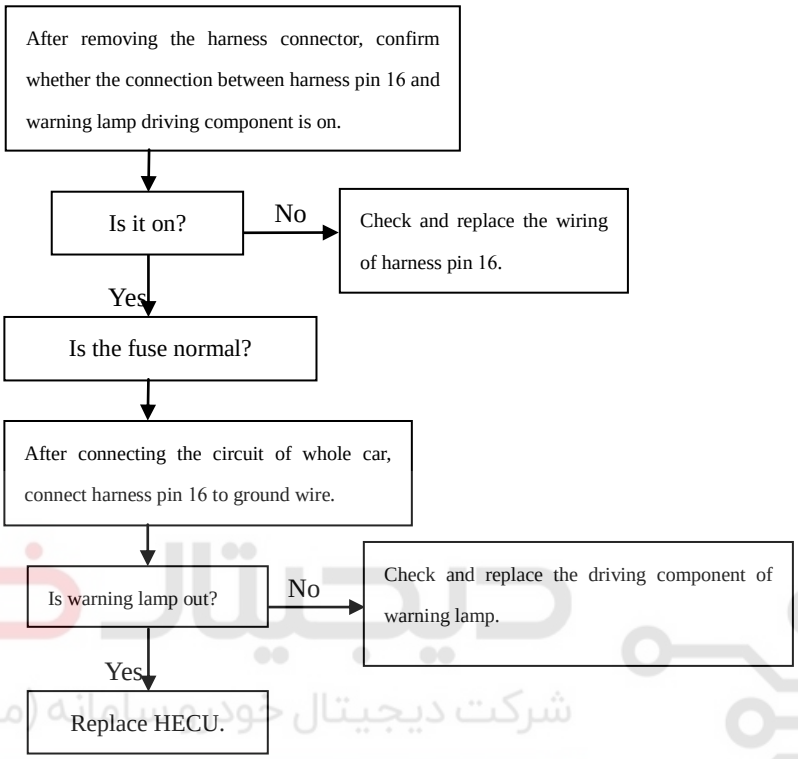
DTC Fault code (flashing code)	Fault indication	Faulted part	Methods of fault remedy
B-3	Unstable signal of right rear wheel speed	Right rear wheel speed sensor	Check whether the sensor wire and its wire joint are normal.
B-4	Unstable signal of right rear wheel ABS speed		
B-5	Overhigh low speed of right rear wheel	Right rear wheel speed sensor	Check the sensor clearance.
B-6	Long locking time of right rear wheel brake		Check whether the motor is normal.

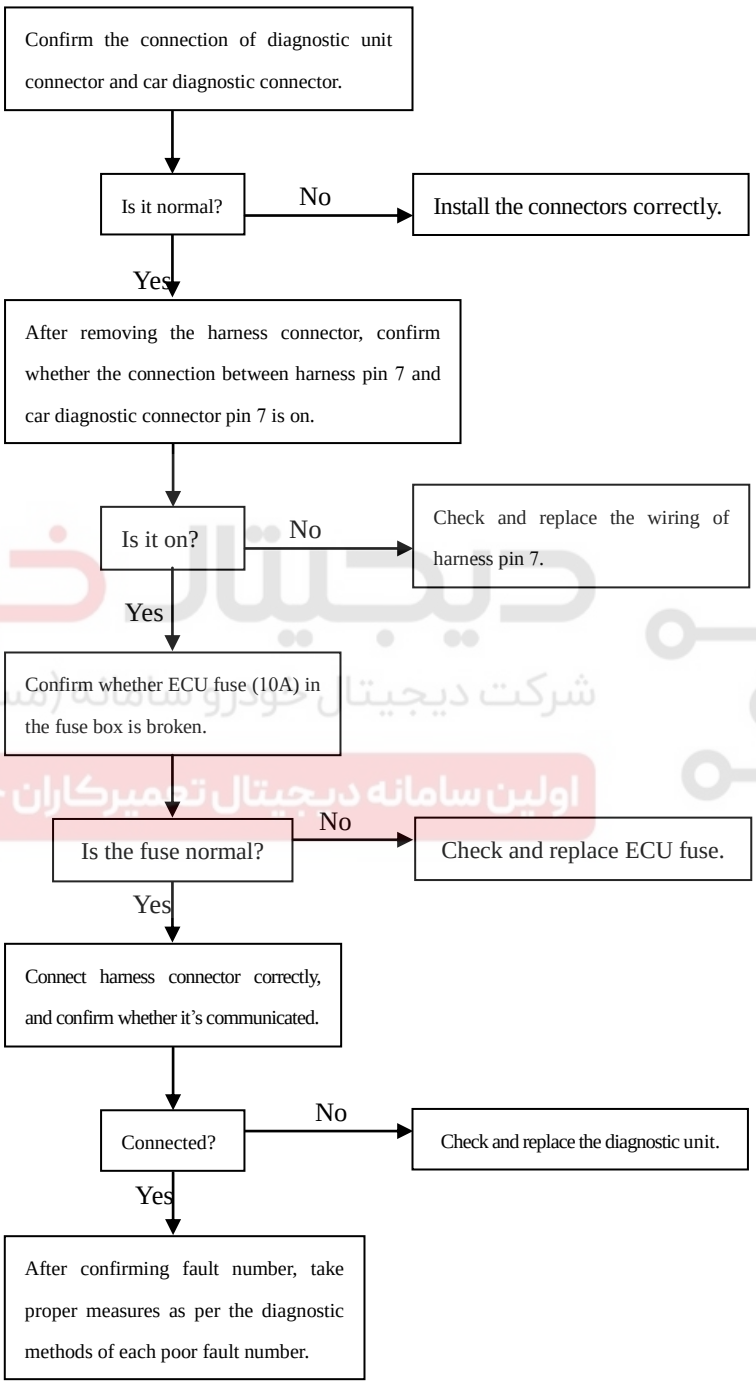
1. Checklist of Faults without Fault Codes (Table 5-3)

Fault symptom	After starting the engine, ABS warning lamp goes out.
Fault cause	①Burning of fuse ②Burning of ABS warning lamp bulb ③Open circuit of power supply ④Damages of warning lamp controller
Remedy procedure	

Fault symptom	After starting the engine, ABS warning lamp is constantly on.
Fault cause	①Damages of ABS warning lamp controller ②Open circuit of warning lamp controller ③Damages of ECU
Remedy procedure	

Fault symptom	Overlong stroke of brake pedal
Fault cause	①Improper adjustment of parking brake ②Leaks of braking fluid ③Serious wears of brake friction plate ④Untight closing of normally closed valve ⑤Air in the system
Remedy procedure	

Fault symptom	After starting the engine, ABS warning lamp is constantly on.
Fault cause	①Damages of ABS warning lamp controller ②Open circuit of warning lamp controller ③Damages of ECU
Remedy procedure	

Fault symptom	Output of no fault codes (failure to establish the communication with any fault diagnostic unit)
Fault cause	①Damages of fault diagnostic unit ②Burning of fuse ③Broken diagnostic line or loosened line joint ④Damages of ECU
Remedy procedure	

2. Schematic of ECU socket

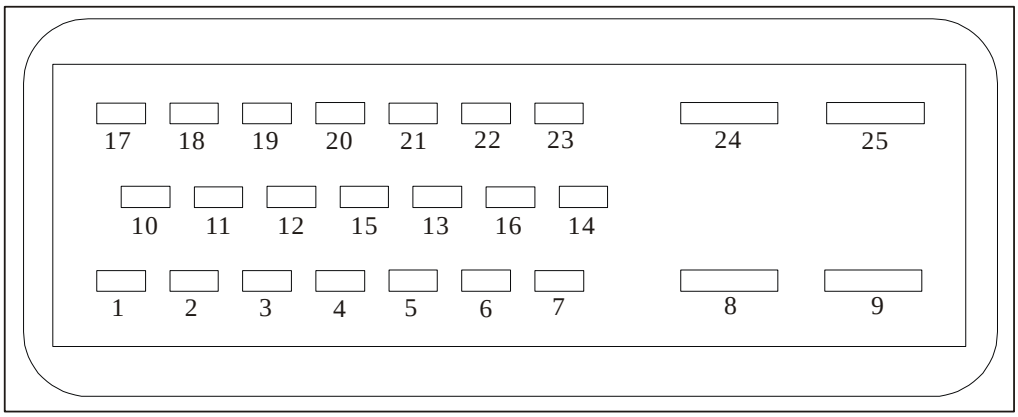


Fig.5-11 Schematic of ECU Socket

3. Definitions of ECU pins (Table 5-4)

Mark	Definition	Mark	Definition
1	Power supply of left front sensor	14	Blank
2	Left front sensor signal	15	Blank
3	Blank	16	Fault lamp
4	ECU power+	17	Blank
5	Power supply of left rear sensor	18	Input of brake lamp switch signal
6	Left rear sensor signal	19	Power supply of right front sensor
7	K line	20	Right front sensor signal
8	Ground wire	21	Blank
9	Power supply of solenoid valve	22	Power supply of right rear sensor
10	CANL	23	Right rear sensor signal
11	CANH	24	Ground wire
12	Blank	25	Power supply of motor
13	Blank		

Section III Repair Work

The completion of technical conditions of car's braking system is directly related to the driving safety and transport effects of car. Therefore, according to the technical conditions of braking system, analyze the faults in time, find out the fault causes, adopt effective measures to maintain, repair and adjust the braking system, so as to recover its good braking performance and ensure the safety of car.

I. Repair of front brake

1. Attentions for repair of front brake

(1)In case of removing the wheels, don't damage the brake disc, external pipe and bleed screw.

(2)Don't strew any braking fluid on the car, leading to the damages of car paint. If the braking fluid contacts with the car paint, wipe off the fluid immediately.

(3)During the removal and installation, be careful to avoid any damage to brake disc, scuffs or scratches to brake block.

(4)During the repair, grease, engine oil or braking fluid doesn't contact with the friction surface of brake block or brake disc, etc, so as to avoid the reduction of braking effects.

(5)Don't use gasoline or diesel to clean each part of brake and connecting pipe. It's best to apply the special cleaning agent, anhydrous alcohol or braking fluid to clean the part.

(6)Don't mix different brands of braking fluids, because they may be incompatible.

(7)During the installation, dusts or other dirt shall not exist on all the parts.

(8)After repairing the brake, carry out a road test.

2. Check and replacement of front brake block

After the car drives for a certain mileage, if front brake block is seriously worn, or the wear indication warner shows the limit wears of brake block, replace the brake block of front wheel brake.

(1)Removal of brake block

1) Remove the bolt of front wheel tyres, lift and support the front of car stably to make two wheels suspended, and remove front wheels.

2) Remove the shaft pin bolt in the front of caliper, and push the caliper backwards, as shown in Fig.5-12.

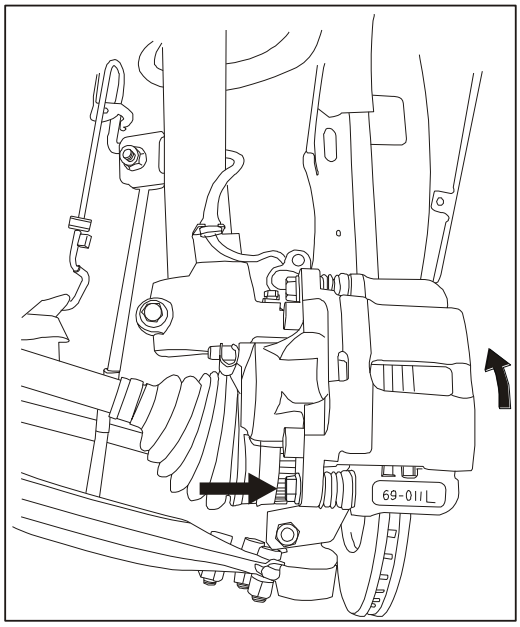


Fig. 5-12 Removal of brake caliper

3) In the direction shown in Fig.5-13, remove external and internal brake blocks respectively.

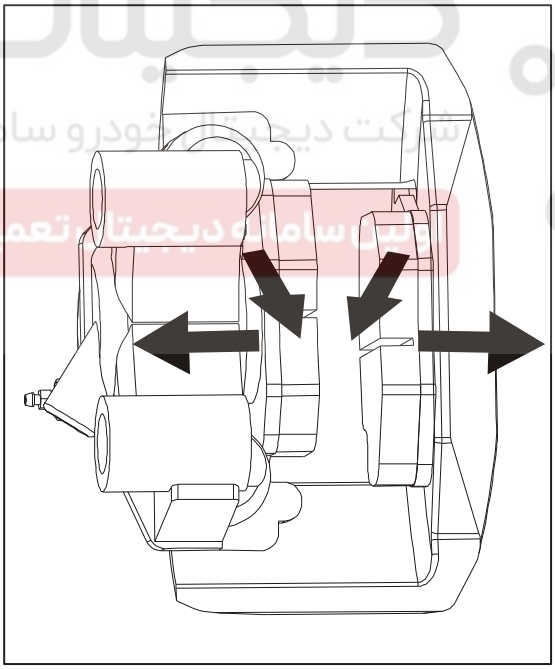


Fig.5-13 Removal of brake block

(2)Check

1) Check the brake block for wears: measure the thickness of each brake block with a vernier caliper. Standard thickness of brake block is 12.5mm, and its repair limit is 2mm. If the thickness of brake block is less than the repair limit, or it's not evenly worn, replace the complete set of brake block of front wheel brake to maintain good distribution of braking force.

2) The surface of brake block shall be clean, complete and crack-free. If the brake block is polluted by oil dirt, clean the brake block.

3) Check whether inner and outer brake blocks are evenly worn. If the worn size of inner brake block is more than that of outer brake block, check and repair the caliper. If the worn size of outer brake block is more than that of outer brake block, the sliding elements of assembly may be adhesive, bent or worse, lay stress on checking these parts. In any case, uneven wear of brake block is a signal required to repair the brake caliper or replace the brake block.

4) Check the brake disc for damages, cracks, wears and deformations.

5) Clean the caliper thoroughly, remove the rusts, and check it for grooves or cracks.

6) Check the seal ring and dust cover of piston. If they are aged or damaged, renew them; check the brake cylinder for oil leaks. If it's leaked, replace the bad seal ring.

(3)Installation of brake block

Before the installation, replace all the damaged parts. During the installation, ensure that each brake part is in correct position, and it shall be installed as per the following steps:

1) Push the piston back to bottom. Ensure that the piston or dust cover is not damaged.

3) Install the brake block as shown in Fig.5-14. If required, renew it.

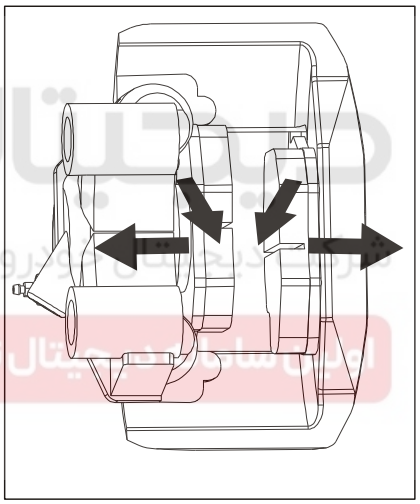


Fig.5-14 Installation of Brake Block

4) Connect the wear indication sensor harness of brake block (optional), as shown in Fig.5-15.

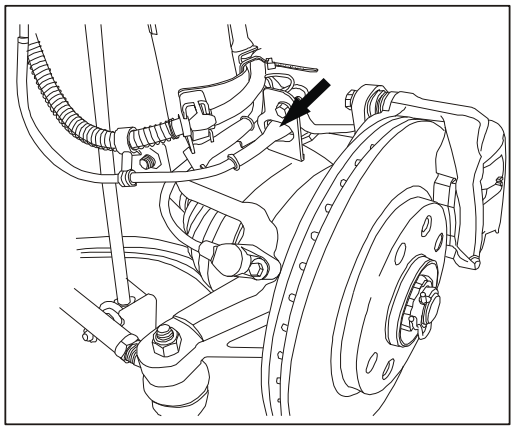


Fig.5-15 Connection of brake block wear indication sensor harness

5) Install the wheel.

After installing the brake block, step on the brake pedal again and again before starting the car, so as to make the brake cylinder full of braking fluid, while making the brake block in correct operating position, and ensuring the normal stroke of brake pedal.

3. Check and repair of brake disc

(1)Check and repair of brake disc During every replacement of brake block or repair of caliper, or removal of wheel for other repair work, always check the brake disc of disc brake. Because the surface conditions and rotation accuracy of brake disc have a great influence on the braking performance, the requirements for check and repair of brake disc are very strict. Usually, the following checks shall be applied to brake disc:

1) Check the surface of brake disc for damages and cracks. Clean the brake disc thoroughly, remove all the rusts, and check it. In case of finding out any crack, hard spot or deep scoring in the brake disc during the visual check, replace the brake disc. The thermal defects of brake disc is caused by the constant high temperature produced during the braking operation.

2) Check the surface of brake disc for wears. If any slight friction score and braking worn fragment in operating surface of brake disc is normal, strip them during the check and repair. When the friction scoring of brake disc is very deep, or the disc is seriously or unevenly worn, measure the thickness of disc with a micrometer. Select 8 measured points spaced 45mm from 10mm away from external edge of brake disc, as per the methods shown in Fig.3-16.

Standard thickness of brake disc: 20.4mm

Max. repair limit of brake disc:18.4mm

If the Min. measured value of brake disc thickness is below its Max. repair limit, replace the brake disc. In addition, control the change of brake disc thickness. If the change of brake disc thickness is overlarge, it will cause the pulsation, unstable braking of brake pedal and vibration of front shaft during the braking operation, therefore, when Max. difference between the measured thicknesses exceeds 0.02mm, and Min. thickness of brake disc is more than its Max. repair limit, machine and finish the brake disc on a special lathe, so as to make its thickness and thickness change finished within the specified range.

3) Check the brake disc for deformation. Max. warping and deformation of brake disc, i.e. overlarge lateral runout, which can make the brake disc swing to left or right during the rotation. This swing will impact the brake block, make the brake pedal pulsating or vibrating if serious, and make its braking effects worse.

The lateral runout of brake disc can be checked with a dial indicator. Before the check, fix the brake disc reliably to the hub with a wheel nut and its flat washer, then install the dial indicator, and measure the end pulsation 10mm away from external edge of brake disc. Adjust the dial indicator to zero, turn the brake disc by a complete cycle, and observe the scale shown in the indicator, and Max. runout of its pointer, i.e. end pulsation shall be within 0.2mm. When its end pulsation exceeds its repair limit, if the lateral runouts of hub and bearing assembly conform to the technical requirements, it indicates that there is a trouble in brake disc, therefore, the brake disc shall be repaired or renewed. Any repair with its deformation exceeding the repair limit can be performed on the lathe, but Max.repair limit of disc thickness shall be ensured. In case of renewing the brake disc, when its end pulsation is more than 0.2mm, it shall be also repaired.

(2)Removal of brake disc If it's required to repair or replace the brake disc or hub, remove the brake. Remove the brake disc as per the following steps:

1) As mentioned above, remove the brake block.

2) Remove two fastening bolts of brake disc, as shown in Fig.5-17.

3) Remove the brake disc. If the brake disc can't be pulled down by hands, make the rusts in matching surface of brake disc with the hub spalling, and hit the brake disc with a rubber or plastic hammer to remove it.

(3)Installation of brake disc. Install the brake disc according to the reverse sequence of brake removal. Pay attention to the following items during the installation:

1) Before the installation, remove the rusts and foreign materials from the matching surface of hub and brake disc.

2) In case of installing the original or re-finished brake disc, grind the surface of brake disc with a 120 grain-size sandpaper, so as to remove the dirts and dust for cleaning.

3) In case of installing any new brake disc, remove the protective oil layer from the surface of brake disc by applying the cleaning agent.

4) Ensure all the mounting surfaces are clean.

5) After installing the brake disc, install the brake block and wheels.

6) Step on the brake pedal repeatedly until the pressure of brake cylinder becomes normal.

4. Check and repair of brake caliper

(1) Removal of brake caliper

Activate the parking brake at first, support the front of car safely and effectively, remove the front wheels, remove the brake block and separate the brake hose from caliper, and then remove the mounting bolt of caliper to disassemble the caliper.

(2)Check and repair of brake caliper

1) Wipe each part carefully with clean hydraulic oil or anhydrous alcohol, and blow it dry with compressed air.

2) Check the piston surface for scratches and rusts, and check the piston for clipping.

3) Check the cylinder wall for wears, scratches or damages. If necessary, replace it.

4) Check the caliper body for cracks and damages.

5) Replace all the rubber seal rings or dust covers.

(3)Installation of brake caliper. Assemble the brake caliper assembly and install it on the car as per the reverse sequence of removal, but pay attention to the following items:

1) Before the assembling, apply the braking fluid to clean all the parts, which shall not be polluted by dust or other dirts.

2) During the assembling, replace all the unqualified parts.

3) During the assembling, apply the clean braking fluid to the piston seal ring and caliper cylinder wall, the model of its braking fluid shall be the one used by this car, and different brands of braking fluids can't be mixed.

4) During the assembling, ensure that each part is in correct position. After assembling the part, recover it to avoid the reduction of braking efficiency.

5) After installing the part, add in the braking fluid.

6) Exhaust the braking system, step on the brake pedal several times to make the brake cylinder full of braking fluid and braking parts in correct positions.

7) Check each brake pipe and its joint for leaks. If necessary, tighten the leaked joint.

II. Repair of rear brake

(I)Removal of rear brake

After the car drives for a certain mileage, if it's only required to check the conditions of brake pedal, remove the blank cover of brake (see Fig.5-18), check it through the sightglass, but it's not required to remove the brake. If any fault occurs to rear brake, or any brake shoe is required, remove the rear brake according to the following steps:

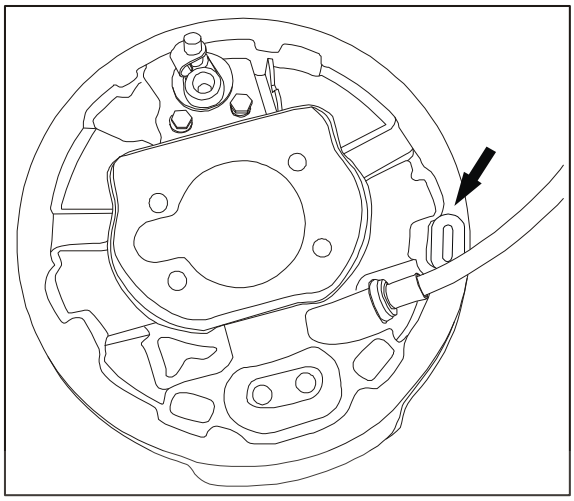


Fig.5-18 Blank Cover of Rear Brake

(1)Loosen the bolt of rear tyre.

(2)Lift and support the rear of car make the rear wheel suspended, and then remove the wheel.

(3)Loosen the parking brake cable.

(4)Remove the hub cover.

(5)Remove the hub fastening nut and its washer.

(6)Remove the brake drum. If it's difficult to remove the brake drum, move the brake clearance self-control device from the side with a punch through the tyre bolt hole (see Fig.5-19), so as to remove the brake drum.

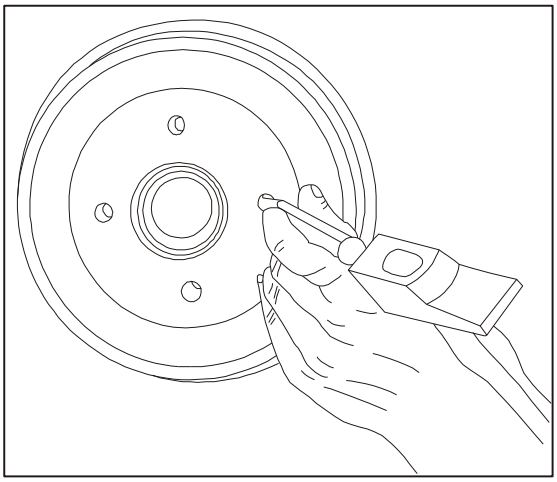


Fig. 5-19 Removal of Brake Drum

(7)Adopt a spring removing and installing caliper (see Fig.5-21b) to remove Springs 2 and 9 shown in Fig.5-20.

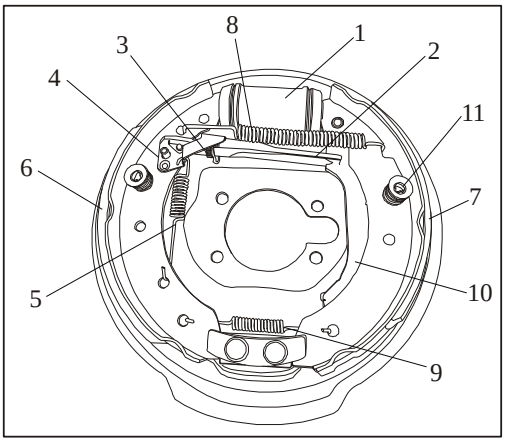


Fig.5-20 Construction of Rear Brake

1-Brake cylinder 2-Clearance self-control lever 3-control nut 4-Clearance toggling lever 5-Toggling lever spring 6-Front shoe 7-Rear shoe 8-Brake shoe return spring 9-Brake shoe holding spring 10-Parking brake lever 11-Holding dowel and spring locking plate

(8)Adopt a removing wrench (see Fig.5-21c) to remove limit dowel 11(see Fig.5-20).

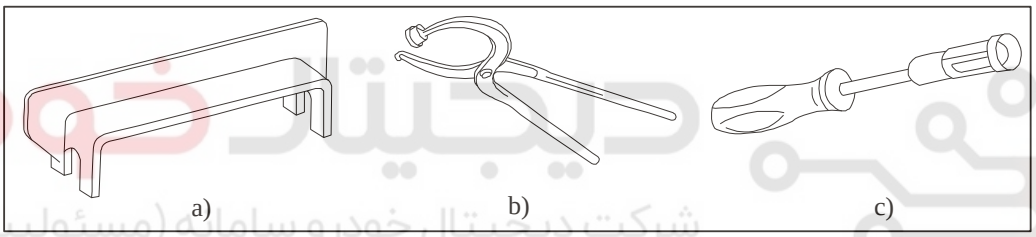


Fig.5-21 Special Tools

(9)Remove clearance self-control lever 2.

(10)Remove the parking brake cable.

(11)Remove the brake shoe.

(12)Attach a support to brake cylinder piston (see Fig.5-21a).

(II)Check of brake drum

1. Check of brake drum

Due to high operating temperature, high pressure and serious operating conditions, the brake drum is easy to be deformed, worn or cracked, etc. After removing the brake, check it strictly according to the following methods:

(1)Clean the braking fluid thoroughly, and remove the dust and dirt.

(2)Skid over the operating surface of brake drum with finger nails, check the braking surface of brake drum visually for scratches and cracks, any large and deep scratch means that the surface of brake drum must be repaired, and any crack means that the brake drum must be replaced. In addition, highly polished brake drum surface can cause the insufficiency of braking noise and braking force.

(3)Check the brake shoe for wears to judge and disclose the defects of brake drum. If one end of brake shoe is seriously worn, it indicates that the brake drum is deformed and out of circularity; if the brake shoe is unevenly worn, it may be caused by the pyramid formation of brake drum.

(4)Check the brake drum for wears and deformations by measuring the inner diameters of brake drum in several positions around the operating surface of brake drum with a vernier caliper, as shown in Fig.5-22. Max. allowable diameter of worn brake drum shall be ϕ205mm. When the measured diameter exceeds the maximum allowable value, replace the brake drum. When the brake drum is deformed to conicity or out of circularity but its allowance for machining is enough, machine and repair it.

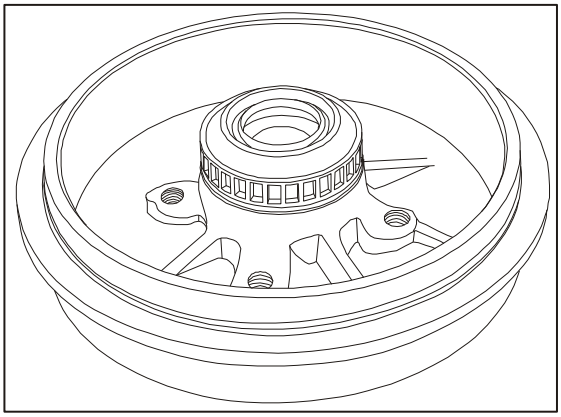


Fig.5-22 Rear Brake Drum

2. Common defects of brake drum and their repair

(1)Scratches of brake drum surface. Most of brake drum scratches are caused by the road sand grains or brake dusts seized between the brake shoe and brake drum, which are used as abrasive. Of course, the exposed rivet heads or hard poor friction plates can also make the surface of brake drum grooved.

For the slight surface scratches, just finish them with a crocus cloth. For the intermediately serious scratches, machine and finish them on a lathe or boring machine of brake drum. In case of machining them, ensure the sizes of brake drums on both sides of the same shaft are consistent with each other to make left and right wheels on the same shaft produce an equal braking force. Therefore, in case of cutting and machining the defective brake drum on one side, cut and machine the brake drum on other side of the same shaft to the same diameter by adopting the same method.

The cracks in brake drum are caused by the excessive stress. The cracks can appear in any position, but most of common cracks appear near to the bolt hole or flange edge. Small cracks are usually difficult to see or found out after machining and repairing them. Once any crack appears in the brake drum, replace it.

(2)The brake drum is out of circularity. The brake drum is out of circularity due to its high operating temperature and pressure during the braking operation. Usually, the brake drum is slightly out of circularity, and it looks good, but this brake drum can lead to pulling, seizure, vibration or pulsation of brake pedal due to its larger diameter change. Therefore, when the brake drum leads to the vibration of car or unstable braking operation because it’s out of circularity, repair and machine the defects of this brake drum on the lathe or boring machine of brake drum. If its machined diameter exceeds its maximum allowable diameter, replace the brake drum.

(III)Check and repair of brake shoe

1. Check of brake shoe

Check the thickness of brake shoe friction plate. The operating limit of friction plate thickness is 1mm, measure the thickness of each brake shoe friction plate by adopting multi-point

measuring method. When the worn size exceeds or is approximate to the operating limit, renew the friction plate.

Check the brake shoe and friction plate for deformations, cracks or loosening. In case of finding out any of these cases, replace the brake shoe assembly. Don't try repairing the damaged brake shoe and friction plate.

When the friction plate is smudged by the lubricant, lubricating oil or braking fluid, it's best to replace the friction plate of brake shoe, find out the cause, and remove it in time. Replace the brake shoe in pair from the shaft to keep its braking force balanced.

3. Check and repair of brake cylinder

Unless the drum-type brake cylinder is kept in leakage or leaked, it shall not be removed or installed. Check its leaks by pulling each cylinder dust cover apart. It's usually normal to see a little bit of braking fluid, because the braking fluid can be used to lubricate the piston. However, it's abnormal that a great amount of braking fluid exists behind the dust cover. It indicates that the braking fluid leaks out of the piston seal ring. As to the leaked brake cylinder, pay attention to its check, and repair or replace it to prevent the braking fluid from flowing out of the contacts in the surfaces of brake drum and brake shoe friction plate.

After the brake cylinder works for a time, the cylinder barrel and piston may be worn, and the seal ring may be aged, etc, resulting in deterioration of sealing performance or insufficiency of braking force, check and repair it in time.

The operating surfaces of brake cylinder and piston must be smooth, if any slight scratch or spot exists in the surface, polish it with a crocus cloth; in case of finding out any obvious scar, e.g. sgraffito or scratch, replace the brake cylinder and piston.

Check the cylinder barrel and piston for wears. If the worn size of cylinder barrel exceeds 0.1 mm, or the fit clearance between cylinder barrel and piston is overlarge, replace the cylinder assembly.

Any rubber sealing element can't be reused. During the check and repair of cylinder, renew it with the same model of new sealing element, no matter the piston seal ring is worn or damaged. The dust cover of brake cylinder shall be renewed.

For the oil cylinder or piston of brake cylinder, so long as one of these parts is damaged, it's required to replace it at the same time.

Before assembling the cylinder, each part shall be cleaned by applying the braking fluid other than gasoline or kerosene. After assembling the cylinder, the piston shall be freely pushed and not clipped in the cylinder.

(IV)Check and repair of other parts

1. Check of various springs

Check whether all the return springs and retainer springs have extending rings or shrink-rings, check them for torsions, bends and deformations, or check the shackle for damages; check the spring for discoloration, which is caused by the overheat of spring operation. The discolored spring will lose a part of its elastic force to lose its operating capability, which is a potential defect. If any of above cases occurs to the spring, replace it.

Check the elastic force of spring by adopting the spring drop method. This method is easy and convenient. During the check, drop the spring vertically to the clean cement ground. If the spring recoils and makes a firm sound, it is good; if the spring recoils with a weak sound, it shall be “fatigued”, and replace it. Certainly, it's the most accurate method to test the elastic force of

spring with a blenometer, and confirm whether the spring is replaced by comparing its results with the standard values.

2.Check of control nut assembly

Check the ratchet and pawl of braking clearance self-control nut for damages or passivation; check each thread form of control nut and screw rod for damages, ensure that the rotation of control nut is not blocked or seized. During every removal, clean and check the control nut assembly, and replace any damaged part. During the installation, lubricate the threads with wheel bearing lubricant or antisticking agent, and ensure that the operation of control nut assembly is normal.

3. Check of brake bottom plate

Check the brake bottom plate for rupture or bend. If any of above damages occurs, replace it. Check the convex plates raised above brake bottom plate, and these convex plates must be rust-free or have no other surface defects.

(VI)Installation of rear brake

Install rear brake in the reverse sequence of removal. During the installation, pay attention to the following items:

(1)Before the installation, wipe the operating surfaces of friction plate and brake drum with clean cotton yarns, on which any grease or grease stain shall not exist.

(2)Before installing the brake shoe, apply a little of lubricant to six supporting points of brake shoe.

(3)Before installing the clearance self-control lever, tighten the control nut to limit position c, as shown in Fig.5-23.

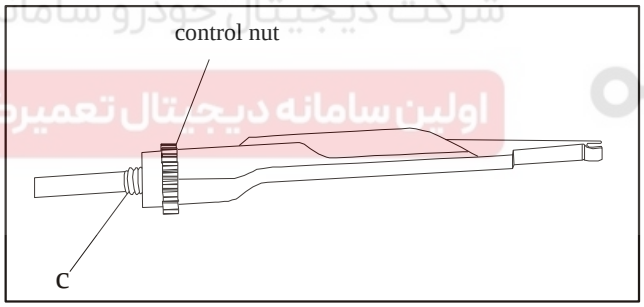


Fig.5-23 Clearance Self-control Lever

(4)Before installing the brake drum, turn the control nut as per the methods shown in Fig.5-24 to make the diameter R of brake shoe conform to the specified value: R=202.5 mm. For the repaired and machined brake drum with non-standard diameter, adjust its X value properly.

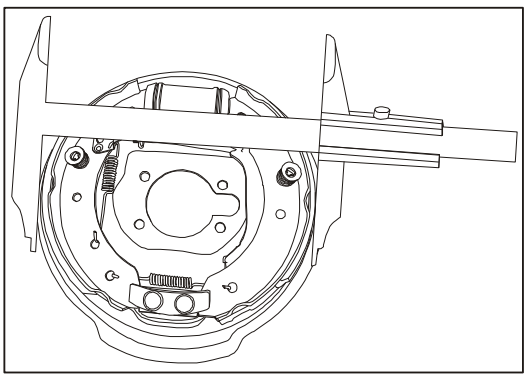


Fig.5-24 Measuring the Diameter of Brake Shoe

(5)Adopt a new hub nut, apply the lubricating oil to its surface and threads during the installation, and tighten the nut to the specified torque of 200N·m.

(6)After installing the brake and wheel, start the engine, and step on the brake pedal repeatedly. If necessary, exhaust the braking system.

(7)Adjust the parking brake.

(VII)Self-control of rear brake braking clearance

The braking clearance control device of rear brake (see Fig.5-20) consists of clearance toggle lever 4, clearance control nut 5, clearance toggle lever spring 6 and self-control lever 2.

The self-control of braking clearance is carried out in case of activating main brake when the parking brake is completely released. In case of braking, the brake shoe locks the brake drum, the clearance self-control device 2 clamped between both brake shoes by spring 7 is loosened, the pressure to end face of clearance control nut with its external circle with ratchets disappears, spring 6 can be pulled down due to its elastic force, while the clearance toggle lever strikes control nut 5 to rotate. Only if the compensated clearance exceeds T/Z (where: T is the pitch of screw rod, Z is the number of ratchets), a ratchet can be struck so as to make the length of self-control lever 2 increased, thus the self-control of clearance can be realized. The wear of automatic compensating friction plate ensures the appropriate clearance between the shoe and brake drum. When the clearance between brake drum and shoe reaches the specified value, the stroke of brake cylinder piston is very little, the down-movement of clearance toggle lever 4 is not enough to toggle any tooth of control nut external circle, the movement of lever is idle stroke, self-control lever can't extend, causing the deactivation of its control function, both shoes reset upon releasing main brake, self-control lever 2 is repressed, and its clearance toggle lever 4 is re-inserted into ratchet groove.

III. Repair of brake master cylinder

The brake master cylinder is a major component of hydraulic brake, whose technical conditions have direct influence on the braking efficiency of car. Therefore, carry out proper maintenance and check to brake master cylinder. Common faults of hydraulic brake master cylinder include wears or corrosion of cylinder barrel, ageing and failure of sealing element.

1. Removal of brake master cylinder

(1)Pull down the plug of master cylinder oil chamber, and suck the braking fluid out of this oil chamber with a siphon.

(2)Pull down the harness connector from the fluid reservoir.

(3)Remove the braking fluid pipe from the master cylinder, block the outlet of each connecting pipe and outlet of master cylinder with a plug or tape. During the removal, don't splash the braking fluid onto the car body.

(4)Screw off two mounting nuts of brake master cylinder, remove the brake master cylinder from the brake booster, and take it out.

2. Check and repair of brake master cylinder

(1)Clean the exterior of brake master cylinder.

(2)Disassemble the brake master cylinder, use the clean braking fluid to clean the oil cylinder and relevant parts, and blow them dry with compressed air for check.

(3)Check the hole of master cylinder for wears, place the piston into the master cylinder, and check the clearance between the piston and cylinder hole with a feeler gauge. If the clearance exceeds 0.15mm, replace the cylinder assembly.

(4)The surface of master cylinder hole must be smooth and rust-free. If slight scuffing or spots exist in its wall surface, polish the surface with a crocus cloth (metal oxide powder), don't grind it with a sand paper. In case of deep scores, replace the brake master cylinder.

(5)Check the fluid reservoir for damages, check the fluid reservoir for ageing or cracks, check the filter net for blockage, and remove the accumulated deposits.

(6)Replace all the rubber sealing elements.

(7)Replace all the damaged parts. For the hydraulic cylinder or piston, only if one of them is damaged, replace them at the same time.

(8)Clean all the parts in braking fluid, blow all the channels with compressed air, ensure that the parts have no dust or other foreign materials, and re-assemble the brake master cylinder.

3. Installation of brake master cylinder

Install the brake master cylinder on the car in the reverse sequence of removal. Pay attention to the following items during the installation:

(1)Be careful to avoid the bends or damages to braking hydraulic pipes during the installation.

(2)In case of installing the fastening bolt of brake master cylinder, tighten it to the torque of 10N·m.

(3)After installing the brake master cylinder, check the stroke of brake pedal, and adjust it according to the demands.

(4)Add in the braking fluid, and exhaust the system.

IV. Check and adjustment of braking system

(I)Check and adjustment of vacuum booster

The vacuum booster is a key part of braking system, whose performance has a direct influence on the driving safety of car. Therefore, check the performance and faults of vacuum booster in time, and adjust the repaired or replaced vacuum booster properly.

1. Check of vacuum booster

Insufficient vacuum of inlet manifold, leakage or damage of vacuum pipe and air leaks of diaphragm can lead to the poor operation of vacuum booster. But the brake pedal that's difficult to steer is usually a key signal for complete damage of vacuum booster. Check whether the operation of vacuum booster is normal by adopting the following method.

(1)Check of seal ability. Start the engine and run it for 1 to 2 min, and then stop the engine. Step down the brake pedal at the interval of at least 5s by common pedal braking force several times. If the height of its brake pedal is progressively increasing (as shown in Fig.8-54), it indicates that the sealing performance of vacuum booster is good, otherwise, the vacuum supply conditions of engine shall be checked. If the engine runs, the supplied vacuum is normal, it indicates that the tightness of vacuum booster is poor, and the vacuum booster shall be checked and repaired.

(2)Check of load seal ability. After starting the engine and making the engine idling for 1 to 2 min, step down the brake pedal several times, and stop the engine in the event that the pedal is in the lowest position and the pedal braking force keeps constant. If the vacuum provided by the engine is normal, and the height of pedal keeps constant within 30s, it indicates that the seal ability of vacuum booster is good. In case of feeling obvious rebounding of brake pedal, the vacuum booster may be leaked.

(3)Check of boost function. When the engine dies, step down the brake pedal several times by the same force braking force to remove all the residual vacuum of vacuum booster. Hold the pedal, and then start the engine after confirming no changes of pedal height. At this time, if the brake pedal slightly sinks, it indicates that the boost function of vacuum booster is normal. If the pedal is immobile, the booster can't activate its boost function. At this time, check whether the vacuum source has supplied a certain vacuum first, and then check the vacuum pipe, check valve and vacuum booster.

(4)Check of vacuum supply If the vacuum booster loses its boost function or its boost function is very weak in case of braking, pay important attention to the check of vacuum source and its vacuum pipes that supply the vacuum to the booster, in addition to the check of vacuum booster.

During the check, pull down the vacuum pipe joint from vacuum booster, start the engine to make it idling, and block the opening of vacuum pipe quickly with your thumb. At this time, if any strong suction is felt, it indicates that the vacuum provided by engine is enough and the vacuum pipe is normal. If no strong or none of suction is felt after the opening is blocked with a thumb, stop the engine, and check the vacuum pipe for damages, curls, loosening or blockage. If the vacuum pipe is damaged, replace it; if the vacuum pipe is normal, check the vacuum of inlet manifold when the engine is idling with a vacuum meter. If the engine is normal, the reading of its vacuum meter shall be within 40 to 67kPa. If the vacuum is too little, it indicates that the engine supplying the vacuum source is faulty. It is usually neglected that the vacuum provided by vacuum source is too little, which causes the wrong diagnosis of vacuum booster and even the replacement of vacuum booster, so it shall be attentive.

(5)Check of vacuum check valve. The vacuum check valve (see 5 in Fig.5-5) is located between the engine inlet manifold and vacuum booster. The vacuum of engine inlet manifold reaches the vacuum booster through a vacuum check valve, but the vacuum of vacuum booster can't return through this valve. Therefore, the vacuum check valve is used to ensure the vacuum in vacuum booster can keep for a certain time after stopping the engine.

During the check, make the engine idling first, then stop the engine and wait for 5 min, and step down the pedal to activate its braking function, which starts its boosting function at least in a stroke of pedal. If the first stepping on the pedal fails to activate its boosting function, the check valve must be leaked. During the further check, remove the check valve, blow one end of inlet manifold of check valve with your mouth, and none of air shall get through it. In case of reverse leakage of vacuum check valve, replace the valve. In addition, if the vacuum check valve is difficult to open/close or seized, replace it, too.

(6)Check of vacuum booster air valve. If air leakage occurs to the air valve of vacuum booster, a part of air enters into B chamber (see Fig.5-5) to produce a pressure difference between B and A chambers on both sides of diaphragm in case of no service braking functions, which leads to the automatic operation of booster and increases the retarding force of wheel running. The driver is usually difficult to detect such fault of car. Sometimes the retarding force of wheel running is too large and the brake drum is seriously heated, but the cause of this fault is usually regarded as improper adjustment of brake, while the fault of vacuum booster is rarely suspected. This fault is hidden and can lead to the serious reduction of car's power performance or economy. It can be checked with the following two methods.

1) Based on the towing test of brake, check the air valve of vacuum booster as per the following method:

①Lift the wheels away from the ground to make it suspended.

②Step down the brake pedal several times to remove the residual vacuum in vacuum booster.

③Loosen the brake pedal, turn the wheel by hands, and notice its resistance.

④Start the engine, make it idling for 1min, and then stop the engine.

⑤Turn the wheel again by hands. If its resistance is increased, it indicates that the air leakage occurs to the air valve of vacuum booster; its fault cause is that the air enters into B chamber of vacuum booster after releasing the brake of vacuum booster. At this time, replace the vacuum booster.

2)Check the seal ability of air valve directly by adopting the following method: in case of releasing the brake pedal, when the engine runs at idle speed, suspend a small bundle of cotton yarns or a paper in front of air valve inlet. If it's sucked, it indicates that the seal ability of air valve is poor and the valve may be leaked; if it's not sucked, but it's sucked upon stepping down the brake pedal, it indicates that the air valve is good and has no air-leakage faults.

2. Adjustment of vacuum booster

When the shell of vacuum booster is damaged or cracked, the pushrod is bent or damaged, the booster is leaked or loses its boost function, replace the vacuum booster. The vacuum booster of Lifan car may not be disassembled or repaired.

In case of replacing or commissioning the vacuum booster, check and adjust the distance from pushrod 4(see Fig.5-5) to the mounting face of brake master cylinder, which must be 22.3mm±0.1mm, to make the free clearance between vacuum booster pushrod(see Fig.5-25) and brake master cylinder piston 2 to 3mm. Only in this way the piston can completely return in case of releasing the brake, the expansion hole can be thoroughly opened, and the braking fluid can return to fluid reservoir to release the brake thoroughly.

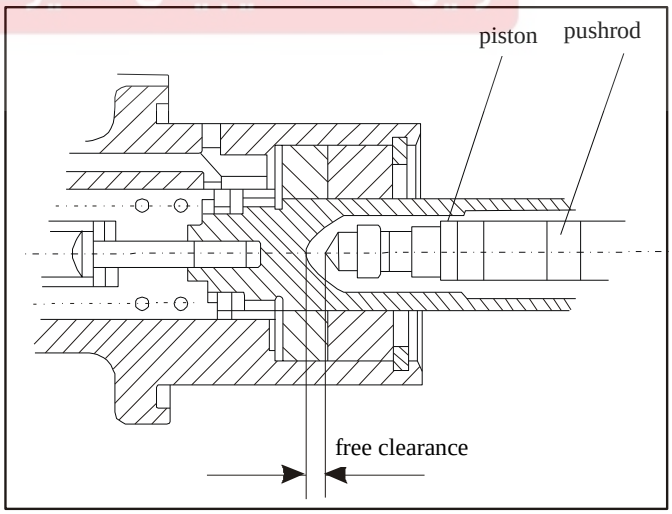


Fig.5-25 Free Clearance from Pushrod to Master Cylinder Piston

(II)Check and adjust the parking brake as per the following steps:

(1)Remove the parking brake cover.

(2)Lift the rear of car to make its rear wheels suspended.

(3)Check whether the parking brake cable runs well.

(4)Step down the brake pedal several times to achieve the correct clearance between brake shoe and drum.

(5)Tighten and loosen the handle of parking brake continually 4 times to confirm that the operation of mechanical clearance self-control device is normal.

(6)In case of releasing the handle of parking brake, turn the rear wheels, while adjusting the nut slowly (see Fig.5-26), until the wheels can't rotate freely due to an slight resistance.

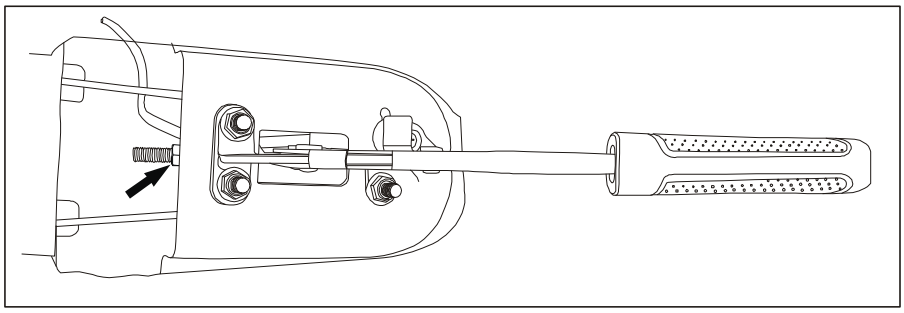


Fig.5-26 Parking Brake Control Nut

(7)Pull the handle of parking brake taut, check the positions of rear wheels and pawl in the gear sector. At this time, brake the rear wheels tightly, and hold the pawl between 9# tooth and 11# tooth of gear sector, otherwise restart the operation following Step (5).

(8)Loosen the handle of parking brake, check whether both rear wheels can rotate freely. The one capable of rotating freely is qualified, while the one having any feeling of collision or friction resistance must be readjusted.

(9)Install the cover of hand brake.

In case of replacing the parking brake cable, installing a new brake shoe or removing and repairing rear brake, adjust the parking brake.

(III)Check and adjustment of service braking system

1. Check and adjustment of brake pedal stroke

In the hydraulic braking system, the stroke of brake pedal and the height of brake pedal reflect the troubles of braking system to a certain extent. For instance, the possible causes for overlow height of brake pedal or overlong stroke of brake pedal: air existing in the hydraulic system, leakage of hydraulic system, incorrect adjustment of vacuum booster pushrod length, excessive wears of brake friction plate, overlarge clearance between brake shoe and brake drum, etc. If the brake pedal is too long, find out its cause, remove the fault, then check and adjust the stroke of pedal. For the overhauled braking system, check and adjust the stroke of its brake pedal, too.

Before checking the stroke of brake pedal, stop the engine, step down the brake pedal several times (at least 5 times) to make the vacuum of its vacuum booster zero, and then check the brake pedal. The maximum stroke of Lifan car's brake pedal is 60mm (as shown in Fig.5-27). If the stroke of brake pedal is too long, adjust its stroke. During the adjustment, ensure the clearance at the switch of brake lamp is 2 to 3mm, and confirm the brake lamp goes on after stepping down the brake pedal; the lamp goes out after loosening the brake pedal.

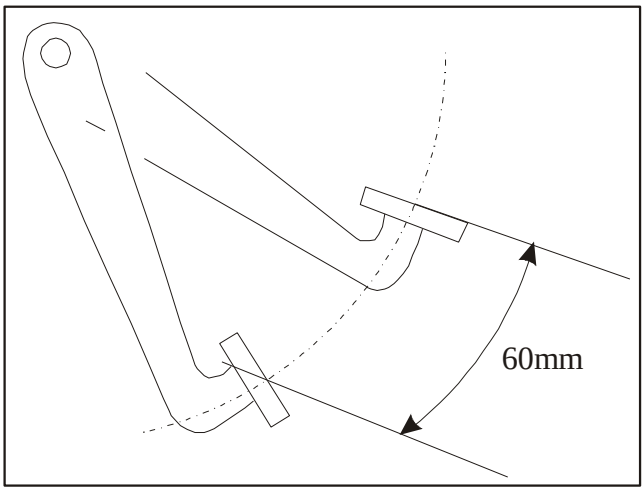


Fig.5-27 Stroke of Brake Pedal

2. On-board check of braking fluid leakage

The leakage of hydraulic braking system is divided into internal leakage and external leakage. Internal leakage occurs in the master cylinder, it can't lose any braking fluid, but it can lead to the failure of braking performance; external leakage occurs in any loosened connection of pressure channel of whole braking system, damaged position of sealing element or crack of pipe wall. It can not only lose the braking fluid but also lead to the failure of braking performance. Therefore, check the internal and external leakages of braking system, find out their causes and remove the faults to ensure the driving safety and reduction of braking fluid loss. The common check methods are as follows:

(1)On-board visual check. For the braking system having serious external leakage, check the braking fluid leakage of brake pipes on the car during the shutdown of car, so as to determine the leaked parts, but the internal leakage can't be checked.

(2)On-board check by pressing the pedal. Its check methods are as follows:

1) Put the gearbox in neutral gear.

2) Make the engine idling.

3) After stepping down the brake pedal, hold the pedal stably by a medium pedal braking force for ca.15s. If the pedal doesn't drop after applying the stable pedal pressure, it indicates that internal and external leakages don't occur to the braking system; if the pedal drops, it indicates that internal leakage may occur to the master cylinder or the leakage may occur to the braking pipe. At this time, carry out the next visual check.

4)When any leakage occurs to the braking system, lift the car with a lifter, visually check all the brake pipes, hoses and joints, rear brake bottom plates and front brake calipers for oil leaks, check the braking pipes for damages, cracks, joint loosening, etc, to determine the leaked parts of braking system. If no external leakage is found out after the check, it indicates that internal leakage occurs to the brake master cylinder, so the brake master cylinder shall be replaced or repaired.

3. Addition and replacement of braking fluid

The braking fluid reservoir is above the brake master cylinder. There are upper limit mark “MAX” and lower limit mark “MIN” lines of braking fluid level, as shown in Fig.5-28. During the braking operation, the height of fluid reservoir level will fluctuate up and down. In order to ensure

the safety and reliability of braking, pay attention to the height of fluid reservoir level. The correct height of braking fluid level shall be between upper limit and lower limit marks, and its level shall be closest to the maximum level.

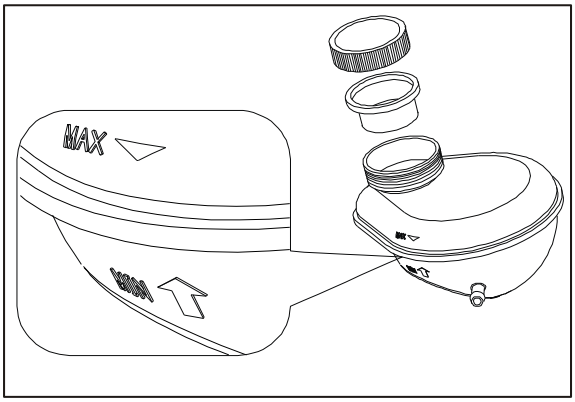


Fig.5-28 Braking Fluid Reservoir

If the level of braking fluid can't reach the specified level, add the braking fluid into the fluid reservoir to upper limit “MAX”. For the repaired car for delivery, the height of braking fluid in the fluid reservoir shall be at the upper limit mark.

In the event no leakage occurs to the hydraulic oil pipe system of service brake, the height of braking fluid in the fluid reservoir can reflect the wears of shoe. After the car has driven for a time, the wear of brake shoe is increased, and the level of braking fluid will be a little reduced. When the level of braking fluid is reduced below the dangerous lower limit mark, check the braking system for leakage or other faults, and add in the braking fluid after confirming no faults or removing the faults.

Lifan car needs to apply DOT4 braking fluid. Be careful to avoid mixing different models of braking fluids during the use, otherwise it will lead to the failure of braking fluid. Don't use the braking fluid that has absorbed the moisture or dirty braking fluid, otherwise it will cause the premature wears of brake master cylinder and brake cylinder or the reduction of their braking performance. Before replacing the braking fluid, drain all the braking fluid out of the brake pipe firstly by adopting the methods: connect one end of hose to the opened bleed screw plug and insert the other end of hose into a container first, step down the brake pedal to drain all the braking fluid out of each brake cylinder, clean the braking system with anhydrous alcohol, and then blow it dry with a pump. Refill the braking fluid, make the filled braking fluid to upper limit mark, and the demand of each car for braking fluid is 0.55L. In the whole filling process, always keep the braking fluid above the lower limit mark to prevent the air from entering the circuit. After adding in the fluid, exhaust the braking system.

(IV)Exhausting of braking system

If the air enters into the braking system, the brake pedal will be weak and can't brake, the stroke of pedal will be too long, the braking force will be insufficient, even the braking operation will fail, and the braking performance of car will get worse. Therefore, it's absolutely required to exhaust the braking system with air. Commonly, it's required to exhaust the braking system after repairing the braking system, cleaning the system or replacing its braking fluid or the air sinks into braking fluid. Before exhausting the braking system, remove the faults existing in the braking system, and check the pipes and their joints of braking hydraulic system. In case of finding out the

breakage of pipe or loosening of its joint, repair the pipe or its joint to prevent the air from entering into the braking system after exhausting the system.

Warning: avoid the contact of braking fluid with the eyes. Clean the hands thoroughly after handling the fluid. If the braking fluid contacts with the eyes, flush the eyes for 15min with cold water from the faucet. If the pain still exists, please go to the hospital. If swallowed, drink the water and vomit, and then go to the hospital at once. Please abide by these instructions; otherwise it may lead to the personal injury.

Caution: if the braking fluid is splashed on the paint surface, the influenced part must be immediately cleaned with clean water.

Note: ensure that the car parks on the flat ground.

Note: the system is formed by separate circuits, which are crosswise opposite to front/rear wheels. Each circuit can drain its air independently.

Caution: in case of draining the air of braking fluid reservoir, keep fresh or clean braking fluid.

Note: drain the air of braking system from the farthest deflating valve away from the brake master cylinder.

Caution: after draining the air of braking pipe, be sure to re-install the deflating valve cover to avoid the corrosion of deflating valve. Abide these instructions; otherwise it may lead to the blockage of deflating valve.

Caution: if the braking fluid is splashed on the paint surface, the influenced part must be immediately cleaned with clean water.

1. Exhausting common braking system

Exhausting common braking system means exhausting the pipe from brake master cylinder to brake cylinder. Its common exhausting method: by adopting the pressure of braking pipe provided by stepping down the brake pedal by feet, exhaust each brake cylinder one by one. In case of starting the exhausting operation, the face of brake master cylinder fluid reservoir must be at the highest level mark. During the exhausting operation, check the fluid level frequently, keep the fluid reservoir at least half full, so as to prevent the air re-entering into the braking system in case of overlow fluid level. After exhausting each cylinder, check the fluid level; fill enough braking fluid as per the demands. Its exhausting procedure is as follows:

(1)Stop the engine; check the height of fluid reservoir level. If the fluid level can't reach the specified value, add in the braking fluid.

(2)Connect one end of a transparent plastic hose to the bleed screw of right rear wheel brake cylinder, and insert its other end into the container containing the braking fluid.

(3)Step down the brake pedal several times, and then hold the pedal vigorously.

(4)Loosen the bleed screw of right rear wheel to drain the air from the system, and then tighten the bleed screw. Be sure to tighten the bleed screw before the oil pressure in the cylinder disappears.

(5)Loosen the brake pedal slowly and completely.

(6)Repeat Steps (3) to (5) several times, until air bubbles disappear in the braking fluid flowing out of the pipe.

(7)Exhaust other brake cylinders in the sequence of right rear wheel brake cylinder→left front wheel brake cylinder→left rear wheel brake cylinder→right front wheel brake cylinder.

(8)Add the braking fluid into the fluid reservoir up to the upper limit.

(9)Step down the brake pedal, check each part of brake pipe, and ensure that no fluids are leaked.

For all the Lifan cars without antilock braking systems, their braking systems can be exhausted as per the above method.

2. Exhausting the braking system with ABS

For the Lifan car with antilock braking system, its exhausting operation is different from that of common braking system, which can exhaust all the air sunk into the antilock braking system with a special instrument as per the special procedures. It can be divided into two-stage exhausts. Its first-stage pipe exhaust refers to the exhaust of pipe from brake master cylinder to brake cylinder, whose operating method is completely the same as that of any common braking system, but during the exhausting operation, the deactivation of ABS system shall be ensured; its second-stage pipe exhaust refers to the exhaust of ABS actuator (i.e. hydraulic control unit), which requires a special tool for exhausting.

V. Replacement of antilock brake system

(I)Replacement of wheel speed sensor

Standard resistance of wheel speed sensor coil is 1600Ω through 320Ω at 20℃, and 20MΩ more than insulation resistance of ground wire. If the measured value of wheel speed sensor doesn't conform to the above standard, replace the sensor. In fact, the replacement process of wheel speed sensor is the removal and installation process of this sensor.

1. Replacement of front wheel speed sensor

(1)Lift the car with a lifter.

(2)Remove front wheels.

(3)Disconnect the connector of wheel speed sensor.

(4)Screw off the mounting bolt of wheel speed sensor (see Fig.5-29), and pull out the speed sensor.

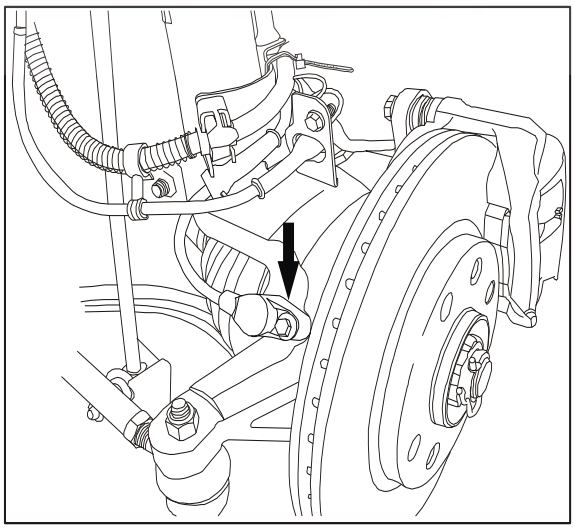


Fig.5-29 Removal of Front Wheel Speed Sensor

(5)Check the sensor rotor teeth for fractures or damages, and keep the tooth surface clean; check the clearance between sensor head and rotor tooth top, which is unadjustable, and whose standard value is 0.3 to 1.2 mm.

(6) Install the sensor in the reverse sequence of removal. Pay attention to the following items during the installation:

1) Keep the surface of sensor head (see Fig.5-30) clean.

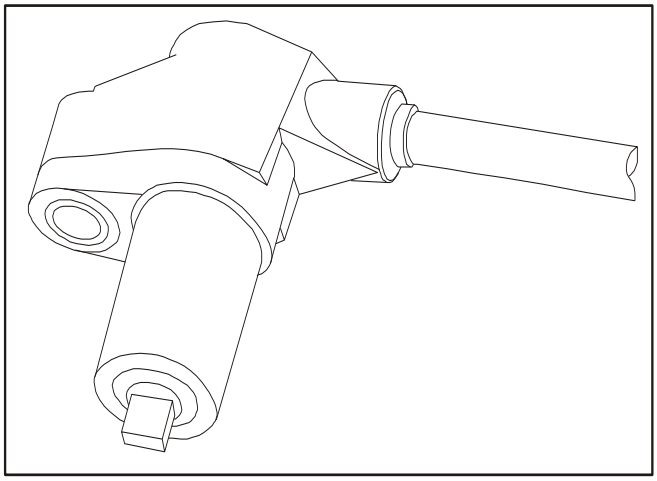


Fig.5-30 Head of Sensor

2) Don't knock at the head of sensor.

3) Tighten the mounting screw of sensor to the torque of 8N·m.

(7)Carry out the road test after replacing the sensor, and ensure that ABS is normal.

2. Replacement of rear wheel speed sensor

(1)Lift the car with a lifter.

(2)Untie the harness of sensor, and disconnect the connector of speed sensor.

(3)Screw off the mounting bolt of sensor, and remove the sensor, as shown in Fig.5-31.

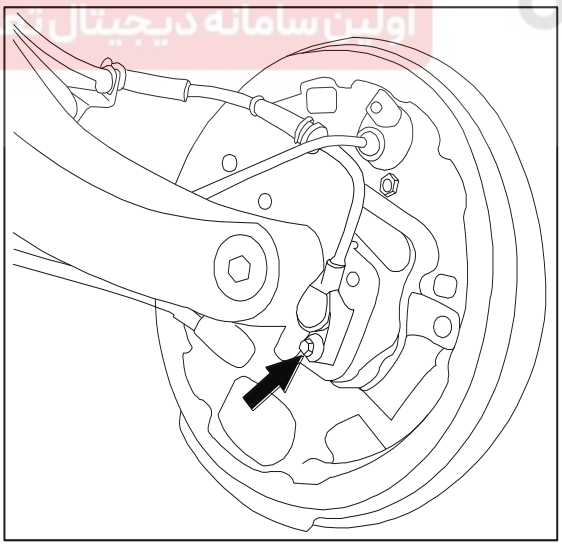


Figure 5-31 Rear wheel speed sensor

(4)Check the tooth surface of sensor rotor for scratches, deformations or fractures. Its tooth surface keep clean, the clearance between its tooth top and sensor head shall be a standard value, which is 0.3 to 1.2 mm.

(5)Install rear wheel speed sensor as per the reverse sequence of removal. During the

installation, keep the surface of sensor head clean, don't collide with or damage the head of speed sensor, be careful to avoid the torsion of harness, and tighten the mounting screw of sensor to the specified torque (8N·m).

(6)After replacing the sensor, carry out the road test to ensure that its operation is normal.

(II) Replacement of HECU

HECU is located in the engine compartment or behind right front headlamp, and fix it on the support with three anti-vibration cushion blocks. After HECU is damaged, replace it as per the following steps:

(1)Disconnect the negative pole of battery.

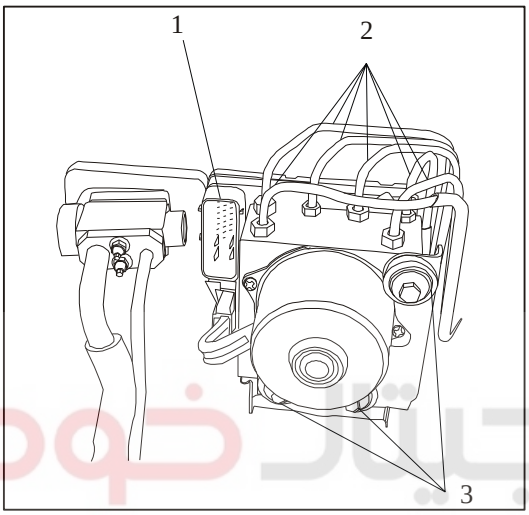


Fig.5-32 Replacement of HECU

1-Harness connector 2-Hose joint 3-Support bolt

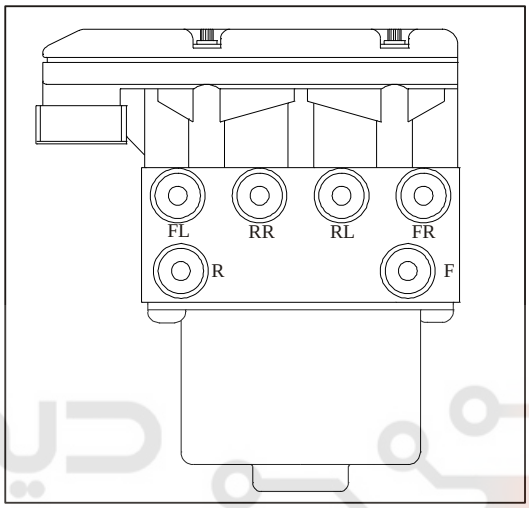


Fig.5-33 Mark of HECU Pipe