

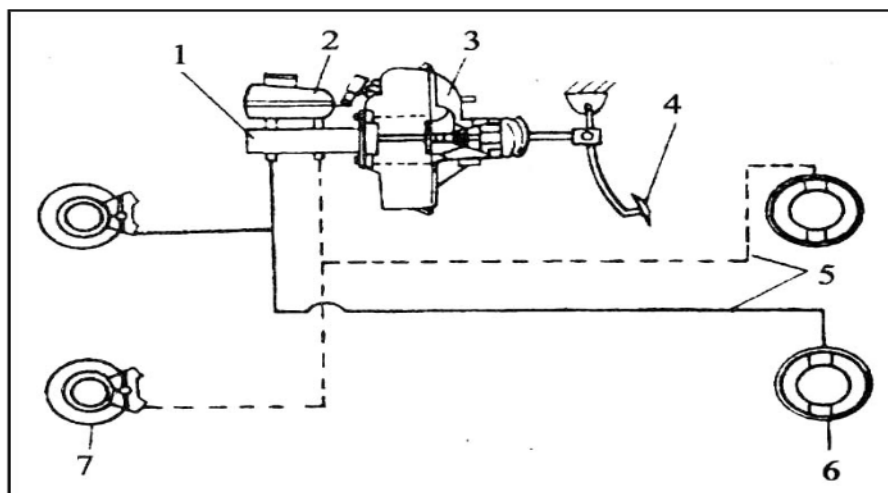
Chapter 1 Braking System

Section one: Hydraulic brake

I. Special features of brake system configuration

QQ model is equipped with diagonal-split dual-circuit vacuum boost hydraulic system. The braking system consists of two braking devices for driving and parking respectively. The front wheel adopts the disc brake while the rear wheel adopts the drum brake with automatic lash adjusting device. The whole system is equipped with the highly efficient vacuum booster and dual-circuit hydraulic master cylinder.

The QQ cars (for some models) are also equipped with the ABS system. By applying the ABS system, the control for steering in the process of braking as well as the efficiency for braking has been greatly improved. The adoption of the ABS system can avoid the abrupt braking of the wheels, and keep the tires always in the status of maximum vertical adhesion force, which ensures both the operability of the front wheels and the prevention of side slips of the rear wheels so as to ensure that the car brake can be made under the maximum road surface adhesion factors.

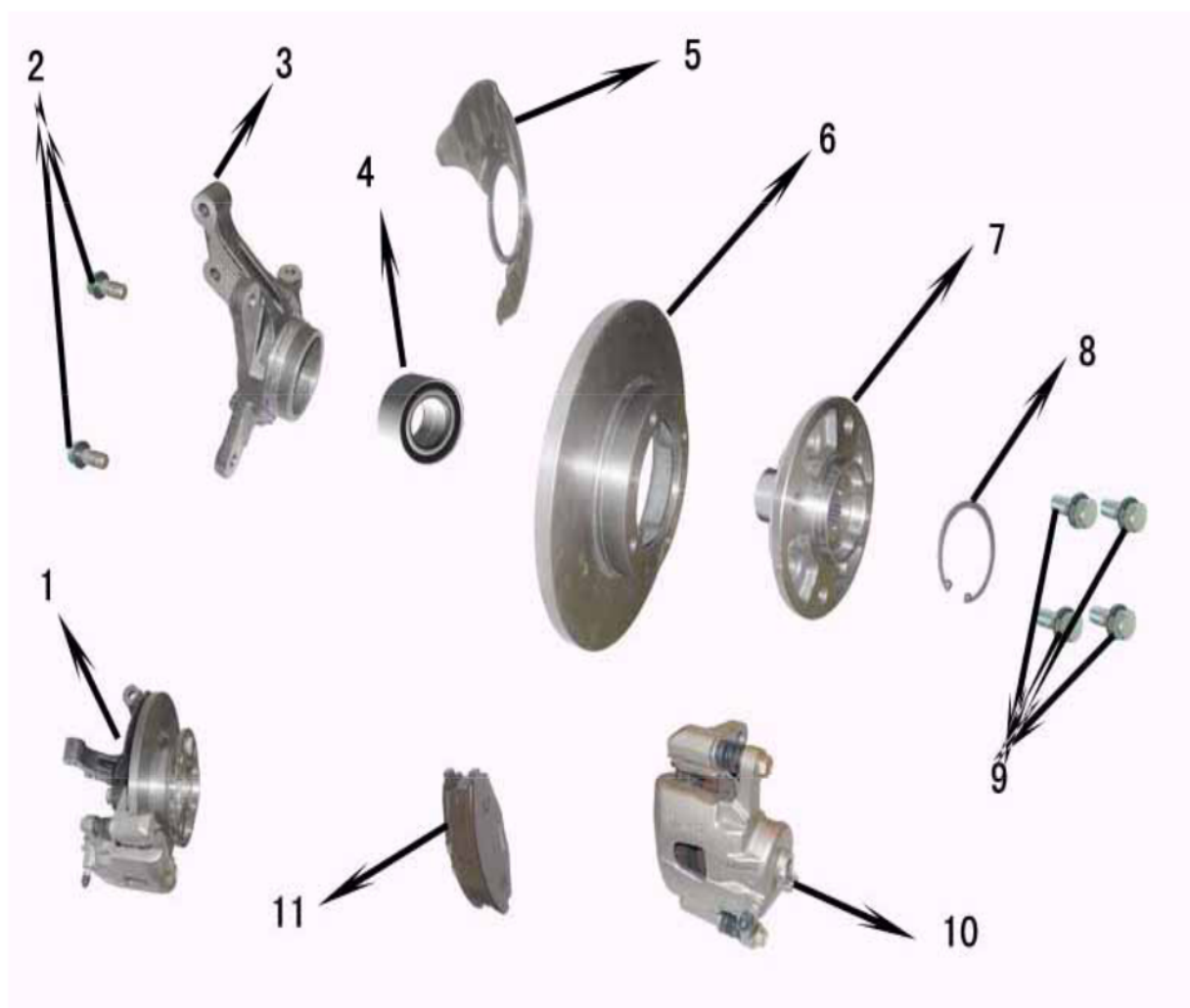


QQ Car Brake System

1-Brake mast cylinder; 2- Liquid storage tank;3 -Vacuum actuator; 4-Brake pedal;5-B raking line;6-Rear wheel drum type brake;7-Front wheel disc type brake;

The static status braking control mechanisms are arranged in between the front seats, which directly act on the brake arms of the two rear wheels by way of the sheathed wires with small friction resistance. The rear wheel brake also

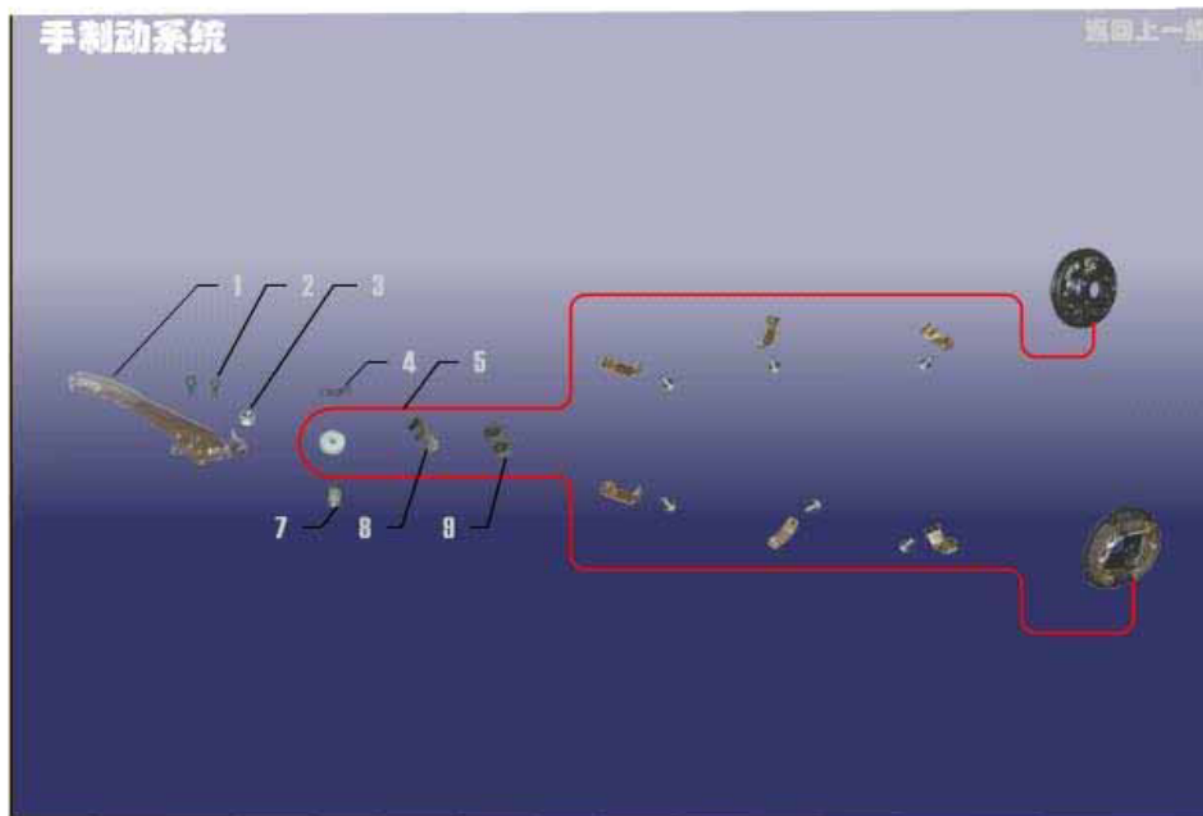
acts as the static status brake, featuring simple configuration and practicality as well as high efficiency in operations. The braking pipeline system of the QQ cars adopts the diagonally arrayed dual-loop braking system. The front chamber of the main cylinder is connected to the brake of the left front wheel and the brake on the right of the rear shaft. The rear chamber of the main cylinder is connected to the brakes of the right front wheel and the left rear wheel. Such arrangement is based on the idea of simple configuration. In the event that either loop fails to perform properly, the remaining braking force will keep up to 50 % of the normal value. That means no matter which loop fails to work, the basic requirements for braking can still be satisfied.



1、 Front steering knuckle and disk type brake assembly; 2、 Braking pawl fastening screw; 3、 Steering knuckle; 4、 Bearing; 5、 Dust shield; 6、 Brake disk; 7、 Front wheel hub; 8、 Jump ring; 9、 Fastening screw; 10、 Braking branch pump; 11、 Friction block;



1. Brake base plate; 2. Branch pump; 3. Brake shoe; 4. Upper reset spring of brake shoe; 5. Brake spacing self adjustment assembly; 6. Bolt; 7. Lower reset spring of brake shoe; 8. Spring; 9. Dust-proof cover; 10. Brake drum locking screw nut; 11. Jump ring; 12. Guard ring; 13. Bearing; 14. Brake drum; 15. Rear wheel brake assembly;



1. Parking brake system; 2. Bolt; 3. Nut; 4. Lock pin; 5. Parking brake cable;
7. Axis pin; 8. Ap ron; 9. Cable rubber sheath

1. Schematic diagram of brake alarming system

- 1). Refer to the “Schematic Diagram of Instruments” for the brake liquid sensor and static brake switch electric circuitry;
- 2) . Refer to the Schematic Diagram of Brake Lights for the electric circuitry of the brake switch.

2. Diagnostic information and procedures

- 1). Checklist for hydraulic brake diagnostic system



Step	Operation	Normal outcome	Abnormal outcome
1	Check the liquid level of the brake liquid inside the oil storage tank	At normal height	Too low
2	● Turn off the ignition switch ● Make sure the static brake is loose ● Activate the engine	● The alarming indicating light is on when the engine is activated. ● The light is on when the engine is activated, but it goes off after the engine is started.	● The light is not on when the engine is activated. ● The light is on after the engine is started.
3	Step the brake pedal to the extreme	● The pedal moves stably toward the floor. ● The pedal stops and resists the pressure.	● The pedal moves unsteadily; ● The pedal is too soft or too close to the floor.
4	Release the brake pedal	The pedal returns to its original position.	The pedal fails to return to the original position.
5	Test the hydraulic brake system	● The braking action is immediately operated when the pedal is stepped. ● The operation of the brake is smooth and normal without any blocks and vibration of the pedal. ● The steering wheel and the brake pedal do not vibrate when the pedal is stepped. ● The car stops without using too much force in stepping the pedal. ● The car moves steadily forward during braking operation. ● The front and rear brakes work simultaneously. ● The brake does not have much operational noise. ● The brake does not delay in reset after the pedal is released.	● The braking action delays after the pedal is stepped. ● The brake works roughly when the pedal is gently stepped. ● The steering wheel or the brake pedal vibrates when the pedal is stepped. ● It is hard to step the pedal and to stop the car movement. ● The car moves toward one side when the brake is applied. ● The front brake and the rear brake work unevenly. ● There is much operational noise of the brake. ● The brake delays to return to the original position, after the pedal is released.

To verify the outcome of the tests, make comparisons between the verified outcomes with those of the car/system of the same model in operation.

Refer to the related fault diagnosis table for the operational outcome.

2) External factors that have impacts upon the braking performances Tires

The differences of the contacts with the road surface as well as the differences in adhesion forces for various tires may lead to the differences in braking performances. Under the following circumstances, some unfavorable impacts might be caused to the braking performance.

- Difference in the sufficiency of air filling to the tires;
- Difference in tire sizes;
- Differences in tire surface patterns

Vehicle loads

Heavier duty vehicles need larger braking forces. For the vehicles with uneven loads, the wheel subject to the maximum loads needs larger braking force than the other wheels.

Wheel positioning

The tests for the braking system should be made on the road surface meeting the following conditions.

3) Tests for the braking system

The tests for the braking system should be made on the road surface meeting the following conditions.

- Dry
- Clean
- Properly leveled

➤ Horizontal

The tests are not to be made on the following road surfaces, because the tires will not evenly adhere to the ground surface.

- Wet
- Slippery
- Covered with soft and loose soil

If the road surface bulges, which makes the load weight lopsided toward the wheels on one side, unfavorable impacts will be caused to the tests. If the road surface is not leveled, which makes the wheel bounce and jump, unfavorable impacts will also be caused to the tests.

Under different car speeds, the tests on the braking system can be made by way of the brake pedal forces for the point braking and abrupt braking. It is advised not to apply the brake in a steady-firm way or to make the tires slip by towing. The braking distance for the wheel rotations in the action of abrupt braking will be shorter than the one for the dead movement of the wheels. Therefore, the deadly applied brake and the slipping tires cannot truly reflect the braking performances and efficiency.

Unless under extreme speed reduction, the brake system needs to be balanced so as to avoid the hard

feelings of the brake pedal when abrupt and dead braking action is applied.

4) Stroke of brake pedal

The excessively short stroke of the brake pedal is mostly caused by the action of the air inside the braking system. Discharge the air inside the system until all the air is discharged completely. Refer to the “Air Discharge for Hydraulic Systems” for more details. The reasons uncommonly seen to cause the excessively long stroke of the brake pedal are as follows:

- Excessive tears and wears of the friction lining
 - Leakage in the hydraulic system
- Make regular and periodic measurements of the brake pedal strokes, which refer to the distances for the pedal to move from a completely released position to the floor.

5). Braking liquid leakage

Leave the engine in idle running operation and leave the transmission shaft at the “idle gear” position. Step on the brake pedal and keep the stepping force unreplaced. If the pedal is lowered slowly under the unreplaced force, it means there might be leakage in the hydraulic system. Make the following visual checks to see if there is any leakage:

- Check the liquid level inside the main pump liquid storage tank of the braking system. Normal tears and wears of the friction lining

tank. If the liquid level is too low, it will cause the brake alarming indication light to be on, which means there might be internal or external leakage for the hydraulic system.

- Check to see if there is any leakage at the joints of the braking pipe and the braking tube. Check the torque of the fastening parts or replace the oil pipe and tube.
- Check to see if the components connecting the brake are damaged or not. Replace the components if needed.
- Check to see if there is any leakage at the protection cover of the clamp and wheel cylinder. If any, replace the parts as needed.

will lead to the slight lowering of the liquid level in the storage

II. Guide to the maintenance of hydraulic brake

1. The master pump of the braking system

1). Refilling of the liquid storage tank for the master braking pump

Warning: Do not fill in the liquid excessively, which may result in the overflow of the braking liquid to the engine or other parts of the front cabin during the operation of the braking system. The braking liquid is corrosive and combustible in nature, which may cause corruptions to the other parts and components. If it contacts with the air exhaustion system of the engine, it might lead to fire hazard or human injuries.

The liquid storage tank and the master pump are connected and sealed by way of sealing rubber sheath, fastened with screws. The liquid storage tank is located at the left side of the car and under the engine cabin cover. Sufficient level of braking liquid should be maintained in the tank of the master pump. Therefore, under normal conditions, the liquid storage tank does not need maintenance. When the braking liquid level inside the storage tank is excessively low, the liquid level sensor will make the timely alarming signal.



Refilling of braking liquid

Clean the outer surfaces before opening the cover of the liquid storage tank so as to prevent the dust from entering the tank.

- Open the screwed cover
- The refilled liquid should not exceed the maximum liquid level inside the tank
- Re-install the screwed cover

2) Replacement of the liquid storage tank of the master pump

1. Remove the wire plug of the liquid level sensor of the storage tank;





2. Take off the outer cover of the storage tank, draw the braking liquid inside the tank by way of a suction tube. The more thoroughly the discharge of the braking liquid, the better.

Points of attention:

Watch out the overflow of the braking liquid.

Do not allow the braking liquid to stain on the surface of the paint or of the other parts and components so as to avoid possible corrosion. If the braking liquid stains on the surface of the other parts and components, an immediate cleaning should be done to wipe them off.

3. Use a screwdriver to remove the fixing screw between the liquid storage tank and the master pump.

4. Separate the storage tank from the master pump.
5. Take out the sealing rubber sheath between the storage tank and the master pump.
6. Check to see if there are any cracks or deformations of the storage tank.
7. Check the cover of the liquid storage tank.

Make proper replacements if there are any damages as follows.

- Cut openings
- Breaks and cracks
- Scrapes
- Deformations

8. Clean the liquid storage tank with the compressed air not containing lubricating agents.

Steps of installation

1. Apply adhesive agent for braking master pumps (or clean braking liquid) onto the new sealing sheath, and install the rubber sheath into the master pump, and then install the liquid storage tank.



2. Fix the braking master pump and the storage tank with screws, and tighten the screw with a torque of 23-27N.m.
3. Connect the plug of the liquid level sensor of the storage tank.
4. Refill the braking liquid.
5. Discharge the air inside the braking system, and check to see if there is any leakage. Refer to the "Air Discharge of Braking System" for details.



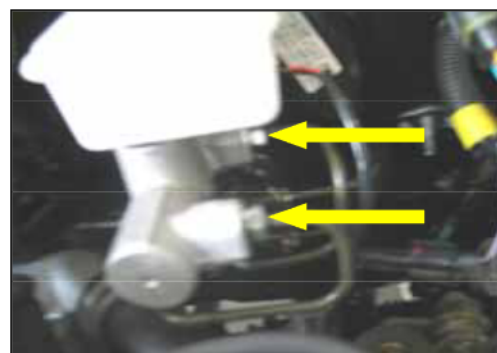
3) Dismounting and installation of the braking master pump

I. Dismounting of the master pump

1. Remove the wire plug of the liquid level sensor of the storage tank.
2. Take off the outer cover of the storage tank, and draw out the remaining braking liquid inside the tank with a suction tube.

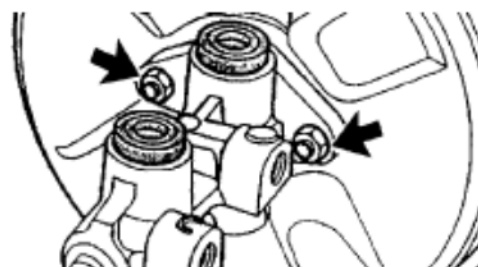


The more thoroughly the discharge of the braking liquid, the better.



Attention: Watch out for overflow of braking liquid.

3. Use the oil pipe wrench to loosen the two oil outlet pipes on the master pump.
4. Loosen the fastening screw nuts of the brake master pump and vacuum actuation pump.
5. Take off the master pump.



4) Installation of the braking master pump

1. Check to see if there are any damages on the sealing ring at the joining section of the master pump and the vacuum actuator pump. Make proper replacement if the ring is damaged.

2. Mount the master pump on the vacuum actuator. Install the proportion distribution valve stand, with two fastening screw nuts. Tighten with a torque of 23-27N.m.

3. Turn the two braking pipelines a few threads manually, then tighten the pipeline with a wrench with a torque of 14-18N.m.

Attention:

- The joints of the braking pipes must be clean;
- First turn the pipelines a few threads with hands when connecting the pipes so as to avoid any possible damage to the pipe joints.

4. Connect the plug of the liquid level sensor.

5. Refill the braking liquid.

Discharge the air of the braking system by referring to the "Air Discharge for Braking System".

Check to see if there is any leakage in the system.

Attention: It is not allowed to use absorber oil or any liquid containing mineral oils. It is not allowed to use the braking liquid contained in the vessels that once contained mineral

oils or that has been made wet by water, because the mineral oils might lead to the expansion or deformation of the rubber parts in the braking system, and water will dissolve the braking liquid, which will reduce the boiling point of the braking liquid. To prevent from contaminations, please screw the liquid storage tank cover tightly.

It is strictly forbidden to use mixed braking liquid. It is recommended to use the DOT-4 Shell-brand braking liquid.

2、Brake pedal replace

- 1、Removal stop lamp switch plug.
 - 2、Remove the split pin for the brake pedal and the vacuum actuation pump, then take of the pin bolt
 3. Loose brake pedal shaft lock nut, from right unsling pedal shaft
 4. Removal pedal and spring
- #### Steps of installation

1. Use special lubricant to lubricate pedal shaft.
2. Replacing assembly with brake bush when replacing brake pedal.
3. Install pedal and spring on installing position, and insert pedal shaft on support.
4. Note to install washers on two sides when installing pedal and spring.
5. Fix pedal shaft with nuts to the support. Screw torque is 30-40N.m.
6. Connect vacuum booster handspike to brake pedal. Insert the spring pins to handspike.



3、Proportioning valve replace

Disassembly procedure

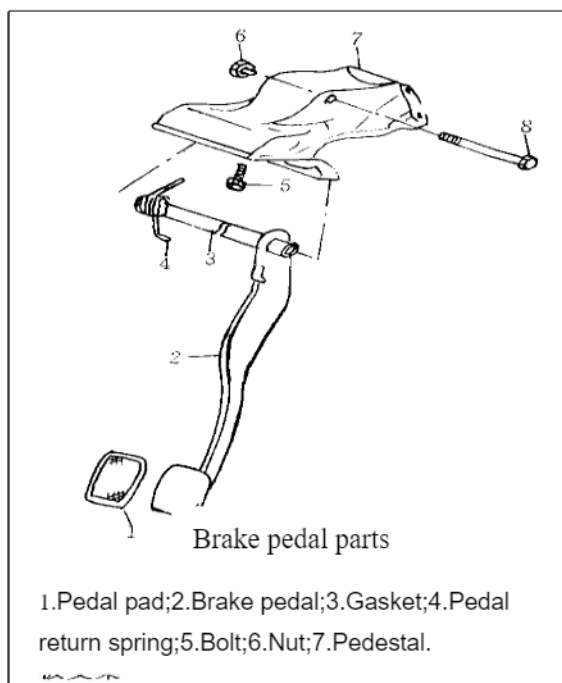
Points of attention:

Don't clean the valve in any cleaning liquid.

1. Remove the cover of reservoir. Pump out brake fluid in reservoir. The more the better.
2. Support vehicle.
3. Clean dusts on brake cylinder, pipe and the valve.
4. Use wrench to remove the connector between the valve and brake cylinder.
5. Remove the brake pipe between the valve to four wheel cylinders.
6. Remove nuts for valve, and remove the valve.

Steps of installation

1. Put valve bush on the nut of support with hand, but don't screw tightly.
2. Put four brake connectors on the valve with hand. Put pipe that connected with brake cylinder and the valve with hand.
3. Screw nuts of the valve with torque 10N.m.
4. Use wrench to fix the connector on brake cylinder and the valve with torque 23-27N.m.
5. Fill brake fluid. Refer "draining out hydraulic system" when draining out pressure.



4、Brake pipe replace

1)、Braking line check

Check if brake hose is cracked, damaged, leaked or projected. Check 2 times each year. Check if brake pipe is cracked, damaged, leaked or rusted.

2)、Brake pipe replace

Warning: Must use double wall steel pipe when replacing brake pipe. Don't use other type pipe, otherwise it will result malfunction for system. Using correct fixing parts during replacing. Lay the pipe on original position. Bad install pipe will cause interference to result malfunction for system.

Attention: Use pipe wrench. Don't use single blade tool.

1) Replace front brake hose

Disassembly procedure

Warning: Don't move vehicle before the brake pedal is stable. The air in the system will cause bad brake or personal injure.

Attention: Don't suspend parts on hose. It will damage the hose.

1. Loosen reservoir cover and fill fluid to maximum level. Cover the reservoir with other cover.
2. Support and lift vehicle.
3. Remove two front wheels. See "Remove and install wheels".
4. Clear dirt and dust on hose and connector.
5. Use wrench to remove brake pipe from hose.



6. Remove hose install bracket fixed card ,

Don't bend brake pipe or bracket

7. From bracket remove hose

8. From caliper 2 remove the below unit

➤ Brake hose screw 4

➤ Hose 5

➤ Two gaskets 3

Steps of installation

1. Install caliper 2

➤ Brake hose screw 4

➤ Hose 5

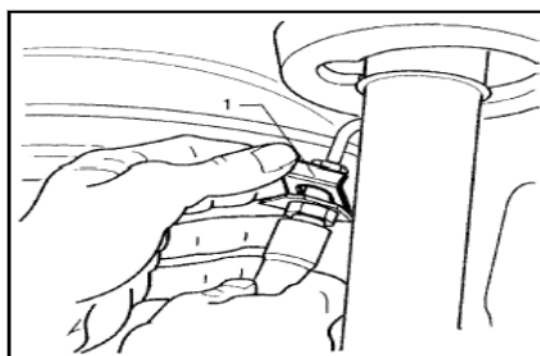
➤ Two new gaskets 3

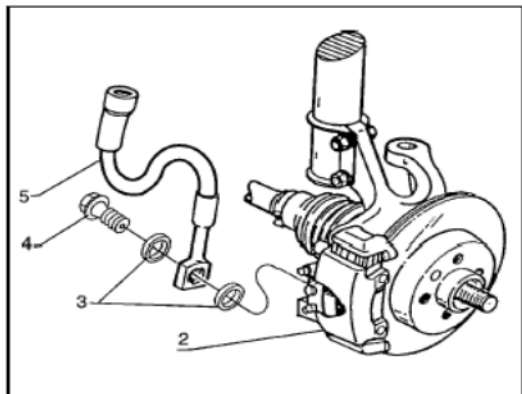
2. Use brake fluid to lubricate screw thread

Fixture

Fixture brake hose cram screw to 23-27N.m

3. Install brake hose on support without any wrest for hose.





4. Fix brake pipe onto brake hose with fingers.
 5. Install brake hose on support
 6.
 - Use wrench to open hose connector.
 - Don't bend support or pipe
- Fixture
- Fix brake pipe connector nuts to 16N.m.
7. Refer "Remove and install wheel" before installing wheel.
 8. Make sure no any touch for hose and suspension system. Check working condition on right and left hoses. If there is any touch for hose and suspension system, remove hose and correct it.

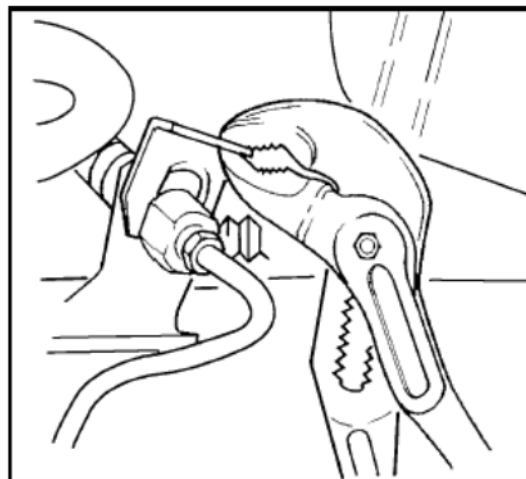
9. Lower vehicle.
10. Drain out air in brake system. Please refer to "Draining out air in hydraulic system".

2) Rear wheel brake replace Disassembly procedure

Warning: Don't move vehicle before the brake pedal stroke is stable. The air in brake system will result faulty for brake or hurt people.

Attention: Any brake hose cannot be bent to prevent no-braking.

1. Support vehicle and lift.
2. Clear the dusts on the hose and pipe connector.
3. Use wrench to remove brake pipe from hose. Don't bend pipe or support.
4. Remove clamp from brake hose.
5. Remove the hose from support.



Steps of installation

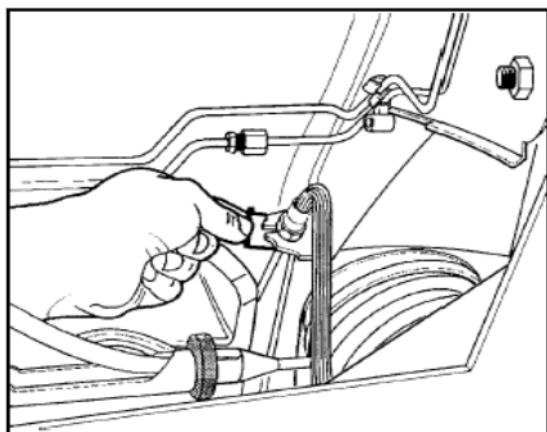
Fixture

1. Install brake hose on support with any wrest for hose.
2. Fix brake pipe onto brake hose .
3. Install fixed card onto the hose connector.
4.
 - Use wrench to open hose connector.
 - Don' t bend support or pipe.

Fixture

Fix brake pipe connector nuts to 16N.m.

5. Lower vehicle.
6. Drain out air in brake system. Please refer to “ Draining out air in hydraulic system” .



5、Hydraulic braking system

exhaust

Warning: Don' t move vehicle before the pedal is not stable. The air in the system will cause brake faulty or personal hurt.

Warning: Only use clean OPEL DOT 4

fluid in sealed container. Don' t use polluted fluid, otherwise it will cause damage to parts, bad brake or personal hurt.

Warning: Don' t fill fluid to much. It will flow out to engine exhaust parts to result fire.

HINT: If air enters into brake system during repairing, carry out complete draining out air process.

HINT: Avoid spraying the fluid on paint surface, wires and connectors. Rinse the parts if any fluid sprayed on vehicle.

HINT: Strictly observe the process of draining air. When air enters into hydraulic system, four hydraulic systems must be drained. If the hose or brake opens on one wheel, only drain out air for this wheel. If the hose opens in any connector between master cylinder and the brake, only drain out air related system.

1) Pressure exhaust

HINT: For vehicle with ABS, apply ABS automatic draining out air process. Check if ABS is normal before draining out.

1. Check the level of fluid and fill fluid to correct level if necessary.
2. Remove reservoir cover.
3. Use connector 1 to connect draining unit with the reservoir.
4. Apply pressure on system.
5. Wait for 5 minutes. Then check whole system to make sure no any leakage. If any leakage happens, service at once.

Attention: Clear the fluid flown out.

Fixture

6. Slowly open one of brake pipe

connector on ABS regulator to flow out the fluid.

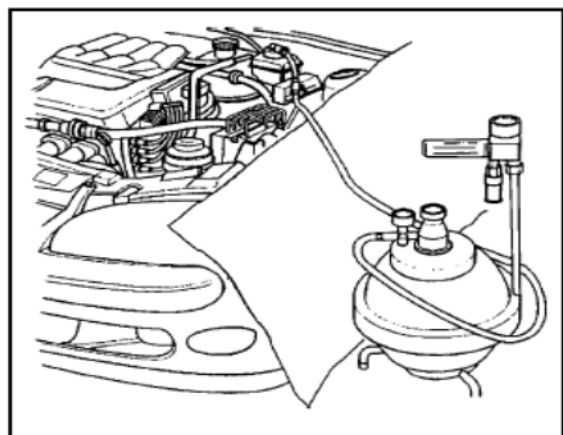
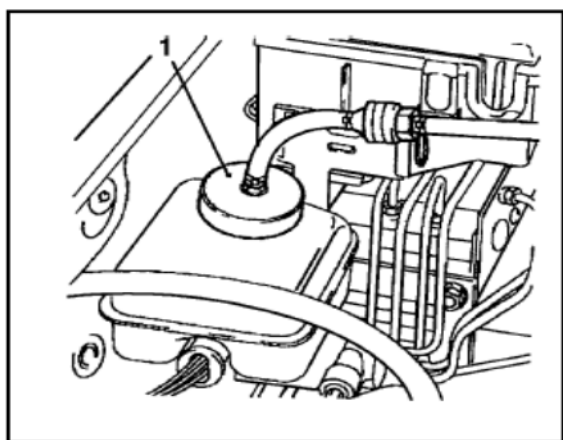
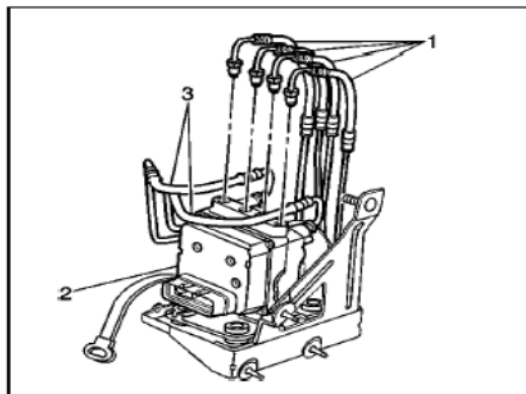
7. When no bubbles appear in the fluid, close brake pipe connector on ABS regulator.

Fixture

Screw brake pipe connector on ABS regulator to 8N.m.

8. For other connector, repeat step 6 and step 7.

9. Support and lift vehicle.



10. Remove right rear brake exhaust valve cover. Put transparent hose to the valve.

11. Put one end of hose into the container with clear brake fluid.

12. Slowly open the valve to flow out fluid.

13. Close the valve when no bubbles appear.

14. Fix the valve to 6 N.m.

15. Remove the transparent hose from the valve.

16. Repeat above steps for left rear brake, right front clamp and left front clamp until no any bubbles appear.

Points of attention:

Make sure no any leaks for the valve.

17. Remove the transparent plastic hose from valve.

18. Lower vehicle.

19. Note the pressure remaining in reservoir when remove exhaust units.

20. Check and fill fluid to suitable level in reservoir.

21. Install reservoir cover.

22. Start engine and run at least 10 s.

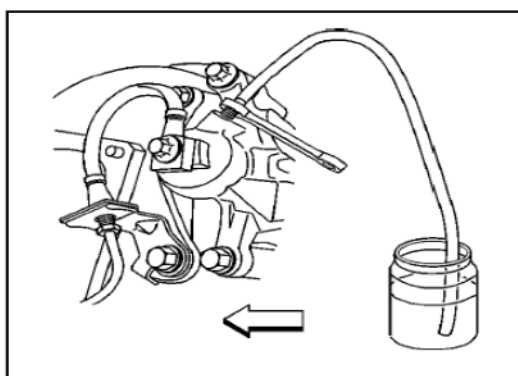
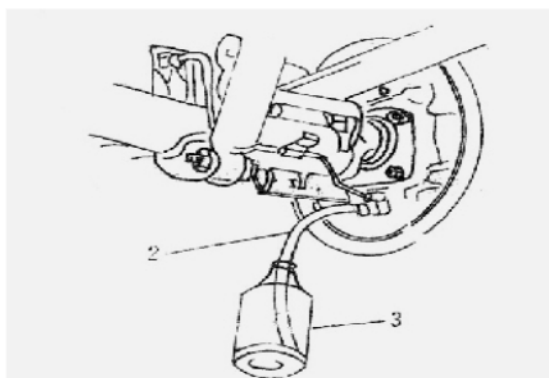
23. Turn off ignition switch.

24. Check brake pedal vibration and stroke.

- If brake pedal is felt stable and the stroke does not exceed specified value, go to step 25.
- If brake pedal is felt soft and the stroke exceeds specified value, don't drive vehicle and go to step 26.

25. Start engine and check the pedal.

- If the pedal is felt stable, go to step 27.
- If the pedal is felt soft, don't drive vehicle and got to step 26 again.



26. Make sure that the bad feeling of the pedal and the bad stroke are not caused by bad adjusting for friction line or other mechanical malfunction. Repeat draining out air process for brake system and go to step 1 again.
Warning: Don't move vehicle before the brake pedal is not stable. Otherwise it will cause accident or personal hurt.

27. Test vehicle on road at middle speed to brake vehicle (without ABS) in order to make sure that brake system is normal.

2)Braking system hand work exhaust procedure

Step down brake pedal when draining air for system.

Points of attention: Make sure that the bad feeling of the pedal and the bad stroke are not caused by bad adjusting for friction line or other mechanical malfunction. Repeat draining out air process for brake system and go to step 1 again.

1.Check the level of fluid and fill fluid to correct level if necessary.

2. Slowly open one of brake pipe connector on ABS regulator to pour into the fluid.

3. Step down the pedal to 75% of whole stroke and keep a period of time.

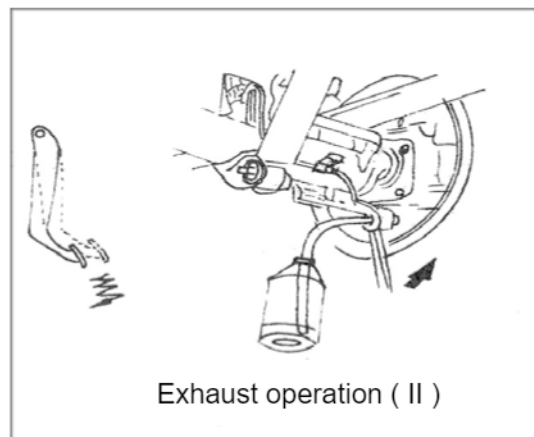
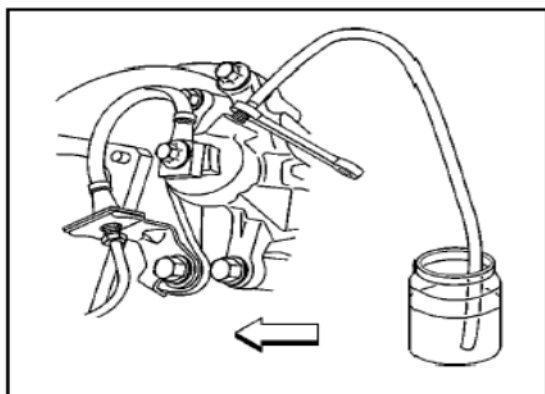
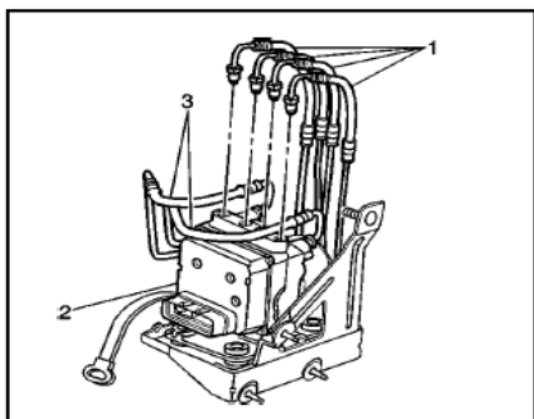
4. When no any bubbles in the fluid, close brake connector on ABS regulator

Fixture

N.m. Screw brake pipe connector on ABS regulator to 16N.m.

5. For other connector, repeat step 2 to step 4.

6. Check and fill fluid to suitable level.
7. Lift and support vehicle.
8. Install transparent plastic hose to right rear valve.
9. Put other end of hose into the container with clean fluid.
10. Step down the pedal for several times and keep step down. Loosen the valve.
11. When the valve does not drain out fluid, close the valve.
12. Repeat step 10 and step 11 until no any bubbles in brake pipe.
13. Step down the pedal and keep on to screw the valve.



6、Hydraulic braking system

rinse

1)Pressure rinse

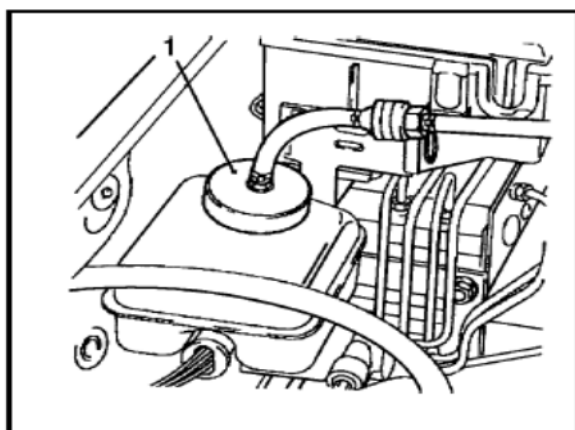
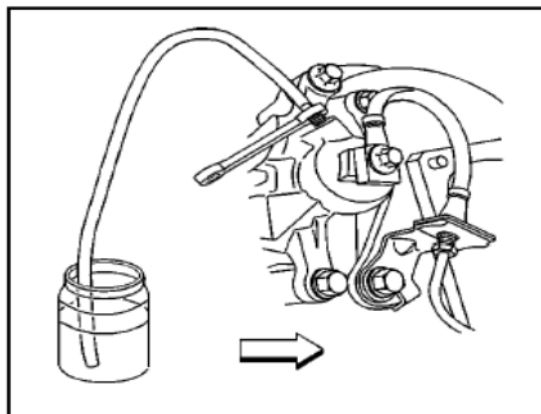
Warning: Only use clean OPEL DOT 4 fluid in sealed container. Don't use polluted fluid, otherwise it will cause damage to parts, bad brake or personal hurt.

Warning: Don't fill fluid too much. It will flow out to engine exhaust parts to result fire.

Attention: The compressed air draining unit can be used to resin system. The compressed air must be clean and dry. Prevent wet air or other dirt to pollute system.

1. Clear fluid reservoir cover and neighbor parts.
2. Remove the cover.
3. Drain out any fluid in the reservoir.
4. Use clean brake fluid to fill the reservoir to suitable level.
5. Use connector 1 to connect draining unit and reservoir Connection..
6. Apply pressure to system.
7. Support and lift vehicle.

8. Resin the brake according to following steps.
 - Right rear
 - Left rear
 - Right front
 - Left front
9. Install transparent plastic hose to right rear valve.
10. Put other end of hose into the container with clean fluid.
11. Slowly open the valve to flow out fluid.
12. Close the valve when no bubbles appear. fix the valve to 8 N.m.



Remove exhaust valve socket

14. If imperatively replace as follows all rubber parts.
 - Brake hose assembly.
 - Master brake cylinder rubber parts.
 - Brake pliers and brake drum seal.
15. Check the level of fluid and fill fluid to correct level if necessary.
16. Install reservoir cover.
17. Drain out air in brake system. Please refer to “Draining out air in hydraulic system”.
18. Lower vehicle

2)Hand work rinse

Points of attention: Use suitable container and cloth to absorber brake fluid and prevent the fluid to contact any paint surface.

1. Clear fluid reservoir cover and neighbor parts.
2. Remove the cover.
3. Drain out any fluid in the reservoir.
4. Use clean OPEL DOT 4 brake fluid to fill the reservoir to suitable level.
5. Install the cover.
6. Lift and support the vehicle.
7. Rinse the brake system according to following steps:
 - Right rear
 - Left rear
 - Right front
 - Left front
8. Install transparent plastic hose to right rear exhaust valve.
9. Put the other end of hose into container with clean fluid.
10. Slowly open the valve to flow out fluid.
11. When clean fluid begins to flow out, close the valve.

Fixture

Screw exhaust valve to 8N.m.

12. If imperatively replace as follows all rubber parts.

- Brake hose assembly.
- Master brake cylinder rubber parts.
- Brake pliers and brake drum seal.

13. Drain out air in the system. Please refer to “Drain out air in the system” .

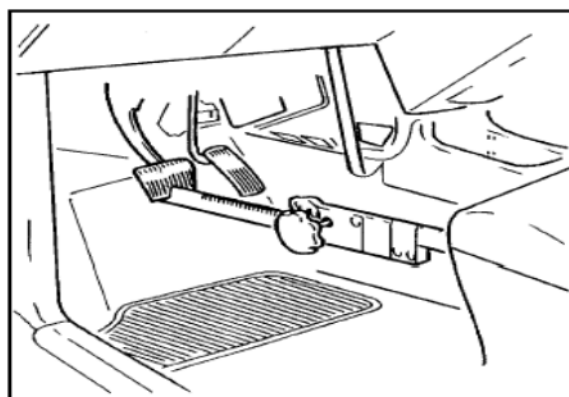
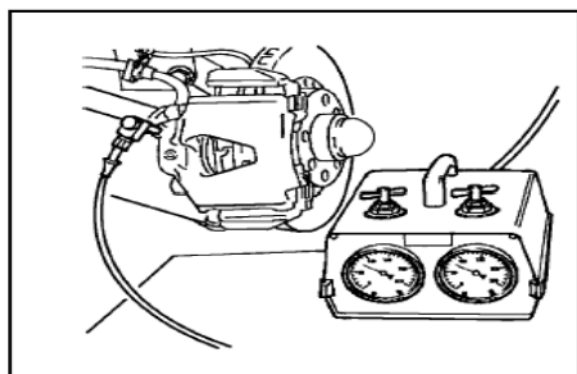
14. Check the fluid level in the reservoir. Fill the fluid to correct level if necessary.

15. Install reservoir cover.

16. Lower vehicle

Check whether leak

1. Connect test pipe with brake pliers and brake drum.
2. Install pressure gauge to display the pressure.
3. Repeat step down the pedal hard to set up 20 Pa pressure.
4. Install the pedal tensioner between driver seat and the pedal.
5. Test time is lasting about 5 minutes.
6. If no leak in the system, the pressure set up will keep constant.
7. If the pressure is dropping, check if any leak in the system. Drain out the air in the system.



7、Vacuum actuator replace

Disassembly procedure

- 1、Remove master cylinder and prorating valve from vacuum booster.

Points of Attention

Don' t remove brake pipe from master cylinder and prorating valve.

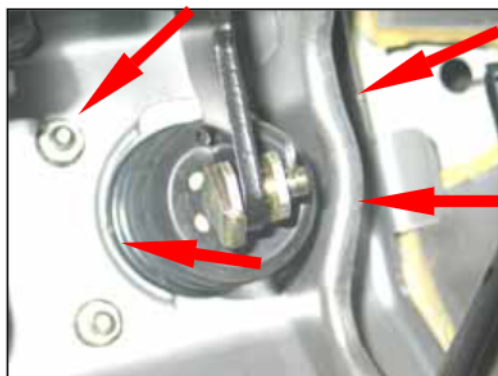
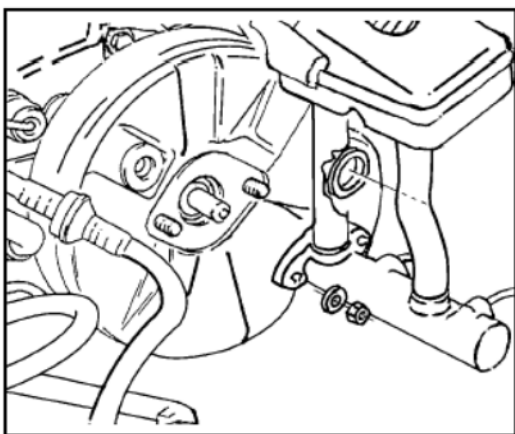
- 2、Remove vacuum hose from vacuum booster.
 - 3、Remove brake light switch connector. Turn light switch to pull out.
 - 4、Remove spring pins of brake pedal and vacuum booster lever and pull out pins.
- Attention: Remove vacuum booster only the lever and the pedal is disconnected.
- 5、Loosen 4 bolts on vacuum booster.
 - 6、Pull out vacuum booster from left of engine.

Vacuum actuator check

There are two methods for checking vacuum booster. One is to use tester. The other is confirming working condition without tester.

Attention:

Make sure no any air in system during checking.



Checking the air damping

- 1、Start the engine;
- 2、Run the engine for 1—2 minutes after the engine is started;
- 3、Step on the brake pedal repeatedly with equal force as usual, and observe the stroke of the pedal. If the stroke for the first stepping is large while the strokes for the

subsequent stepping are gradually reduced, it means the air damping has been established.

- 4、If the strokes for the pedal have no replaces at all, it means the air damping has not been established.

Attention:

If the checks fail, the inspections on the vacuum tube and sealing parts will be needed.

Make proper replacements of the defective parts. Repeat all the tests after replacing the parts.

Checking the operations

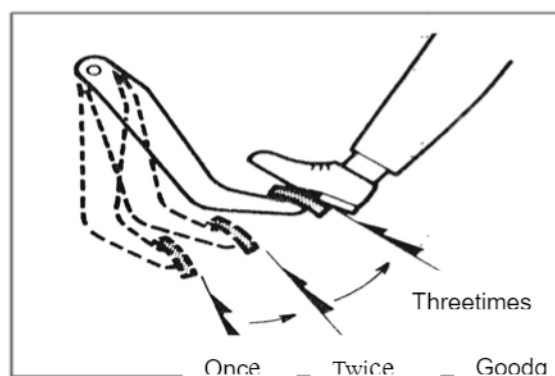
- 1、Let the engine in the stop mode. Step on the pedal repeatedly with equal force and make sure that there are no replaces in the pedal stroke.
- 2、After the engine is started, step the pedal once again. If the stroke is slightly increased, the operation will be safe; if there is no replace in the stroke, please contact the maintenance station or the manufacturer.

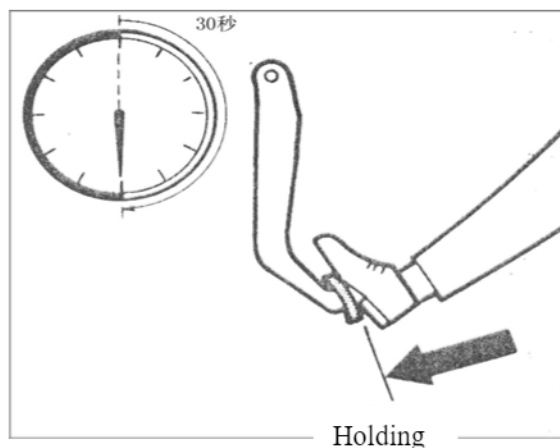
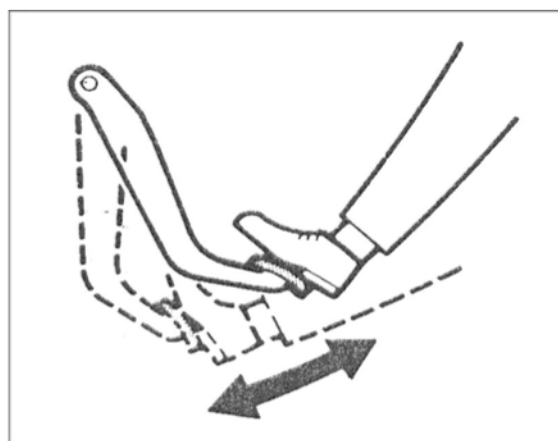
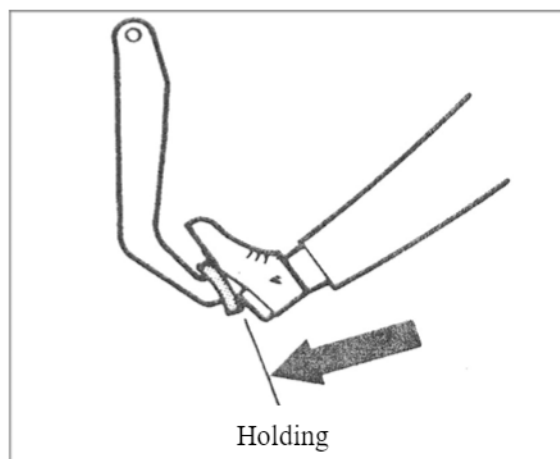
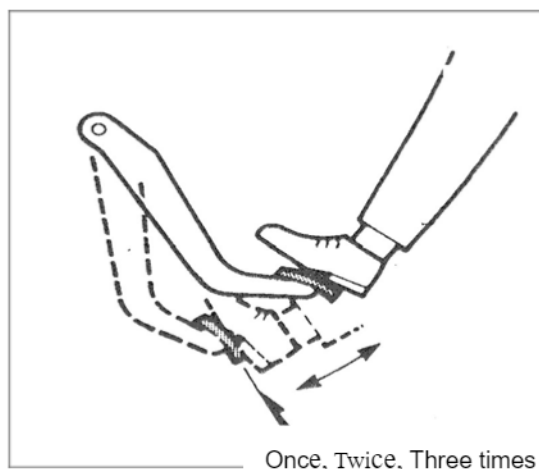
Attention:

If the checks fail, the inspections on the vacuum tube and sealing parts will be needed.

Make proper replacements of the defective parts.

Repeat all the tests after replacing the parts.





3、When the engine is running, step on the brake pedal, and stop the engine while stepping on the brake pedal.

4、Step on the pedal and keep for 30 seconds.

If there is no replace in the pedal height, it means the operation is normal. If the pedal rises, it means the operation is not normal.

Attention: If the checks fail, the inspections on the vacuum tube and sealing parts will be needed.

Make proper replacements of the defective parts. Repeat all the tests after replacing the parts.

Steps of installation

1. Align 4 bolts on vacuum booster in left engine compartment to 4 holes on front board.
2. Screw 4 bolts with torque 23-27N.m.
3. Use pins to connect the pedal and vacuum booster lever and install pins.
4. Install brake light switch. Adjust the position of light. Insert switch connector.
5. Install master cylinder and prorating valve to the booster. Screw 2 bolts with 16N.m.
7. Connect vacuum hose on the booster.



8、Description and operation

1) Brake gross pump

Points of attention

- Use clean fluid to lubricate rubber parts for easily mounting.
- Don' t use compressed air with lubricant on brake parts.
- Drain out air for whole or partial system after removing any hydraulic parts.
- The specified torque is used in dry fixture.
- Operate on the clean desk without mineral oil.

The master cylinder consists of plastic reservoir and aluminum shell. The primary piston is used for front brake and rear brake. Secondary piston is used other front brake and rear brake. Fluid level sensor in mounted on reservoir. Proportional valve is mounted below master cylinder. The valve is used to offer better balance for front/rear brake in heavy load.

Proportioning valve

Points of attention

Don' t clean the valve in any washing fluid. The valve is below master cylinder. Fluid will damage paint and electric element. Resin the parts if fluid sprayed on vehicle.

Level sensor

Level sensor in mounted in master cylinder. Sensor switch is in reservoir. If the level is too low, sensor will turn warning light on. When the level is correct, light is off. Please see “ Brake warning system” in “ Diagnosis for electric system” .



2) Vacuum actuator description

Points of attention

- Use clean fluid to lubricate rubber parts for easily mounting.
- Don't use compressed air with lubricant on brake parts.
- Drain out air for whole or partial system after removing any hydraulic parts.
- The specified torque is used in dry fixture.
- Operate on the clean desk without mineral oil.

- Brake fluid level is too low.
- ECU and instrument cluster ground.

3) Brake caution system description

The yellow ABS warning light is used in ABS system. The light is in instrument panel. The light will work under following process:

1. Turn on ignition switch and engine is not started, the light will be on.
2. Light will be on when engine starting.
3. Light will be off after engine starting.

The operation of light is one important part for diagnosis ABS system. If light is on during driving, it means system is fault. Please see "Diagnosis for ABS" in "ABS system".

5.1.6.4 Brake caution system circuit description

Circuit run

The warning light in instrument panel will be on under following conditions:

- Turn on ignition in starting position.
- Set park brake.

Section two Disc brake

1、Specifications

Unit Specifications

Application	Dimension Specifications
Caliper piston diameter	48mm
Brake disc diameter	236mm
Brake disc reject depth comment	16mm
Brake disc minimum depth	17mm
Brake disc process depth	18mm
Brake disc depth new	20mm
Depth deviation	0.01mm
Maximal transverse hop	0.03mm
Maximal transverse hop assembly	0.1mm
Maximal scratch	0.4mm

Application	Torque Specifications
Caliper bolt dowel pin	30N. m
Caliper bracket bolt	95N. m
Caliper linkage brake hosepipe	40N. m
Exhaust valve	8N. m
Front brake disc	6N. m
Cover plate	6N. m
Wheel bolt	110N. m
ABS front sensor bolt	10N. m
Brake gasket depth	16mm
Minimum Brake gasket depth	7mm

2. Diagnosis info and procedure

1) Brake disc depth deviation check
Measure brake disc depth in 4 points or more to check brake disc depth deviation. Use micrometer to measure all values on same distance from brake disc edge.

2) Brake disc transverse hop check
Attention: When removing the disc from wheel bearing flange, clear the rust or dirt on the interface of the disc. Leave wheel on the vehicle to check transverse hop in order to get more accurate hop in actual brake condition. If there are no any wheel check units on vehicle, remove wheel to check. Keep the position of caliper to insure exact readings.

Disassembly procedure

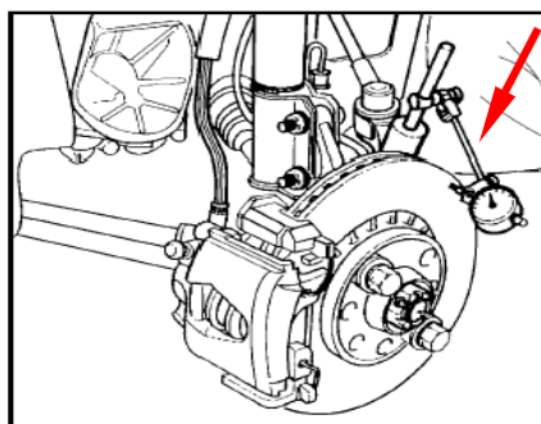
1. Support and lift vehicle.
2. Mark dots on wheel and wheel hub.
3. Remove wheel.
4. Clear surface of the disc.
5. Install and screw wheel nuts.
6. Fix micrometer to steering node. Must keep the contactor of micrometer contact with 10mm from edge of surface of the disc.
7. Set micrometer to zero.
8. Turn wheel a circle. Check the hop in micrometer. If the hop exceeds 0.1mm, repair or replace the disc. If total hop exceeds 0.1mm, adjust or replace the disc.

Under some conditions, the over Transverse hop can be improved by demarcate the position of the disc on wheel hub. If the hop cannot be improved in this way, check if the hop of wheel hub is too big or too loose. If the hop exceeds 0.05mm, wheel hub

must be replaced. If the hop is satisfied the request, the brake disc could be repaired or replaced.

Steps of installation

1. Remove wheel nuts fixing the disc on wheel hub.
2. Please refer “ Install and removing tire and wheel” when install tire and wheel. Align wheel and tire with original marks.
3. Lower vehicle



3. Service guide

1) Brake gasket check

- Check brake lining once driving every 10, 000—15, 000km.
- Check brake lining once replacing wheel or tire.
- Check two ends of caliper and two ends of out lining. Worst wear is usually in this position.
- Check the thickness of lining to insure the lining is not worn early. Some linings have a heat-insulating layer. Don't mistake the layer as lining. Inner lining can be checked through check hole on top of caliper.



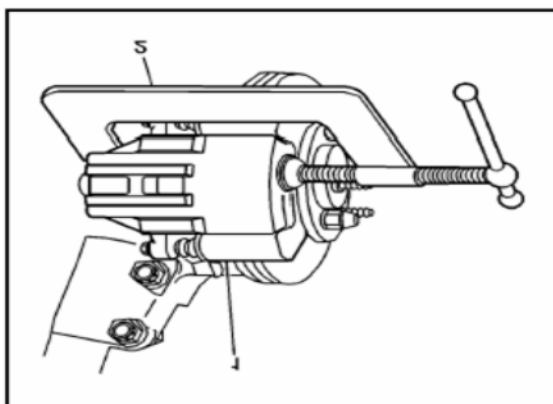
- Replace lining when its thickness is below 7mm. If the lining is fixed by rivet, when lining wear position is 0.5mm from rivet, replace lining and all linings in the disc.

2) Brake gasket replace

Disassembly procedure

For all vehicles produced by Chery Automobile Company, the brake fiction linings or other parts produced by Chery should be used to make sure the balance on front/rear brake. Otherwise the brake function will be changed.

1. Drain out 2/3 fluid from maser cylinder.
2. Support and lift vehicle.
3. Mark the position of wheel to the wheel hub.
4. Remove tire and wheel. See "Remove and install tire and wheel."
5. Put the piston into cylinder to separate lining and brake disc. Go to following steps:
 - Install a big C caliper on top of shell to peak rear of outside lining.
 - Slowly screw C caliper until the piston enters cylinder deep enough to pull out caliper from the disc.



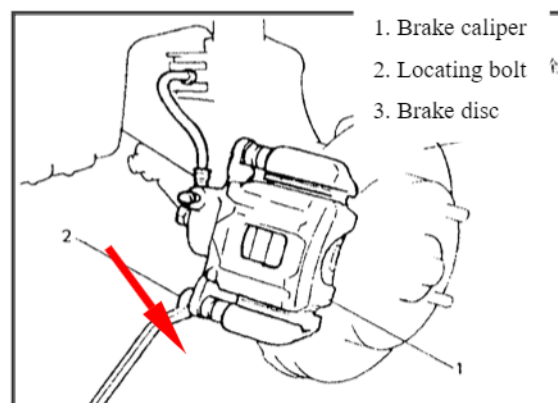
5. Remove bolts on lower end of caliper.

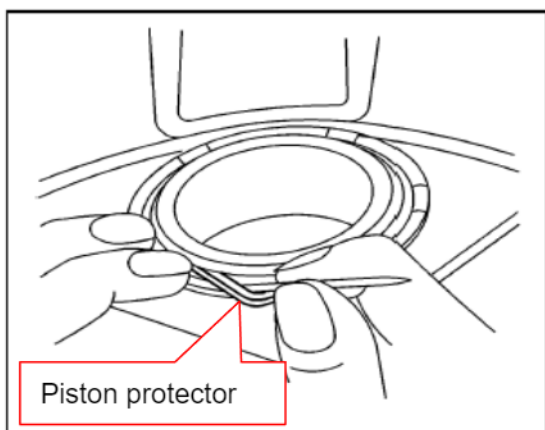
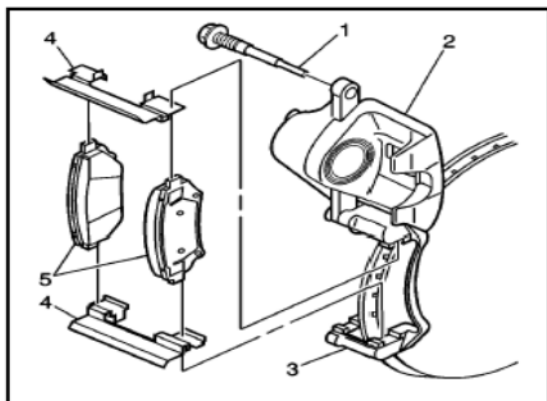
HINT: Turn caliper carefully to avoid damage bolt hood.

7. Turn caliper upwards to repair lining.
8. Remove lining from caliper support.
9. Remove two clamps from support.
10. Check if following parts is cut, crack or wear. Replace any damaged parts:
 - The support bolt hood.
 - Piston protector
11. Check if bolts are damaged. Replace new one if damaging.

3) Polish gasket and brake disc

- Polish the disc surface after replacing lining.
- Polish new disc surface after replacing disc.
- Polish new lining 2 times at 48km/h.
- Apply middle pressure on brake pedal.
- Keep enough cooling between two braking.





4) Brake caliper replace

Disassembly procedure

- 1、 Drain out 1/3 fluid in master cylinder.
 - 2、 Support and lift vehicle.
 - 3、 Mark the position of wheel to the wheel hub.
 - 4、 Remove front tire and wheel assembly. See "Remove and install tire and wheel".
 - 5、 Install a big C caliper on top of shell to peak rear of outside lining.
 - 6、 Slowly screw C caliper until the piston enters cylinder deep enough to pull out caliper from the disc.
- HINT: Don't use flexible hose to suspend caliper, otherwise it will

damage hose.

7. If remove caliper from vehicle to repair or replace, it will need to remove hose bolts and open hose. If only replacing brake lining, it needs not to open hose.

8. Block caliper shell and pipe outlet to prevent fluid to flow out.

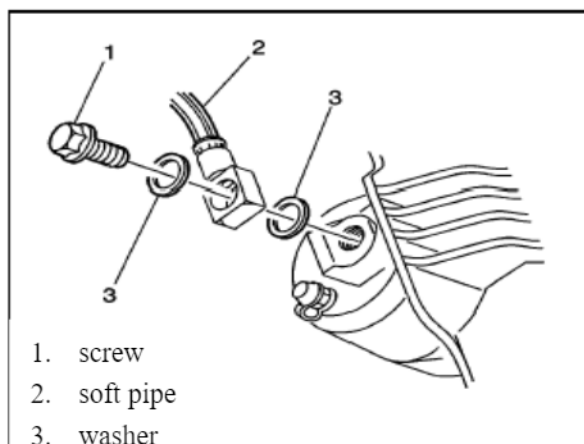
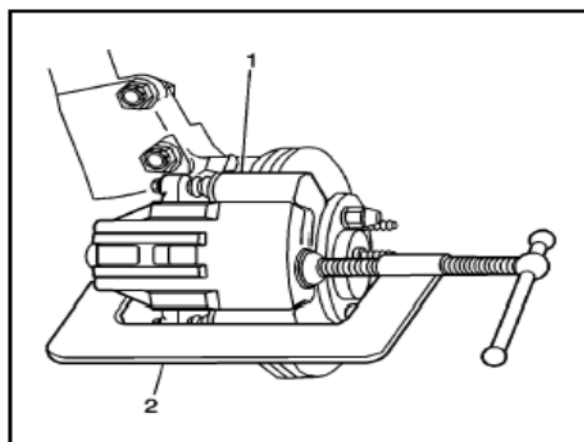
9. Removal caliper bolt

10. Remove caliper shell.

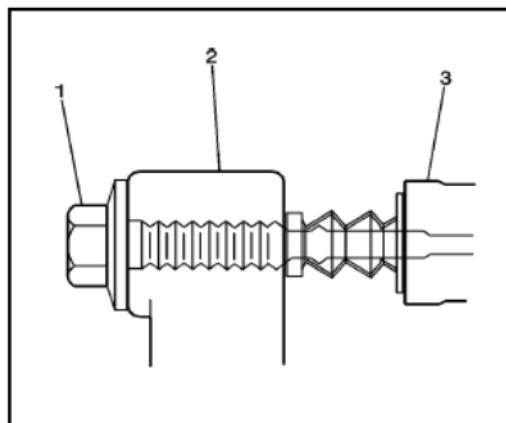
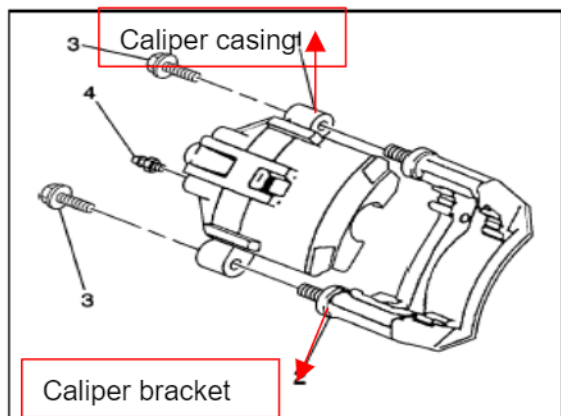
11. Check if bolt covers are cut, crack or wear. Replace any damaged cover.

12. Check if piston covers are cut, crack or wear. Replace any damaged cover.

13. Check if bolts are damaged. Replace new one if damaging.



1. screw
2. soft pipe
3. washer



Steps of installation

1. Install caliper shell on the disc and caliper support to make sure bush is in correct position.
2. Lubricate caliper bolt.
3. Lubricate two bolt hoods.
4. Install caliper bolt.

Fixture

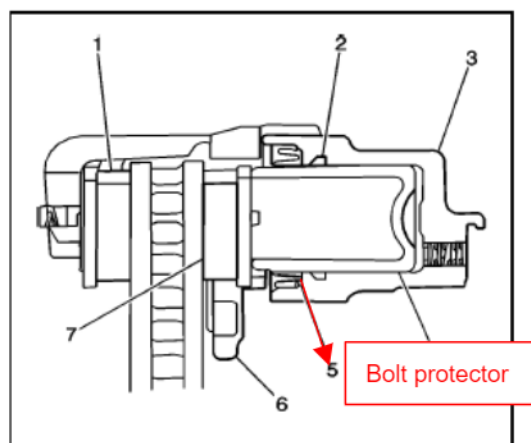
Screw torque is 85N.m.

5. Install hose bolts.

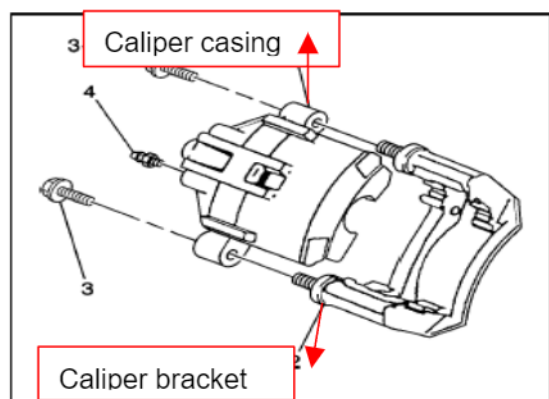
Fixture

The hose bolt screw torque is 85N.m.

6. Remove wheel bolts
7. Remove front tire and wheel assembly. See "Remove and install tire and wheel".
8. Lower vehicle
9. Fill brake fluid in master cylinder to correct level.



10. When removing hose bolts, it needs to drain out air in caliper.
11. Check if leaking fluid in hydraulic system. See "Check leaking fluid in hydraulic system".



5) Brake caliper overhaul

Disassembly procedure

Remove brake caliper. See "Remove brake caliper"

Warning: Don't use fingers to hold piston, it will cause serious personal hurt.

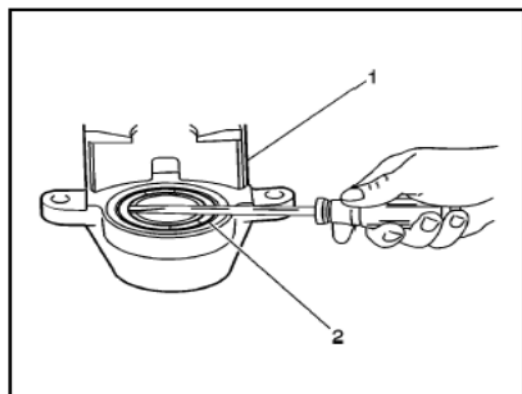
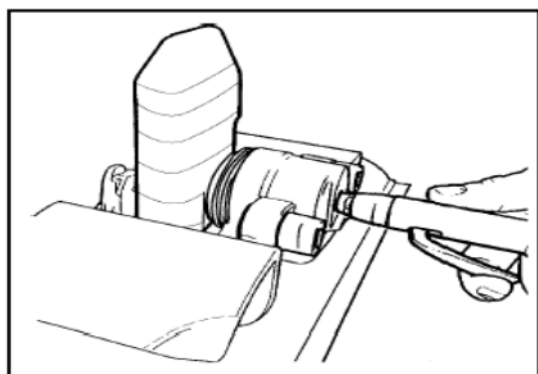
Attention: Take care to remove piston from cylinder.

1. Remove piston. Clamp caliper. Use compressed air to remove piston from

cylinder.

Attention: If piston is damaged, it must replace whole caliper.

Don't scratch cylinder during replacing.



3、Use small wooden tool or plastic tool to remove seal ring.

Attention: Don't use metal tool to remove. It will scratch cylinder or seal groove.

4、Check if piston is cut, crack or wear. Replace any damaged piston.

5、Check if cylinder or seal groove are cut, crack or wear.

6、Use fine sands paper to polish slight corrosion.

7、If the corrosion cannot be polished, replace caliper shell.

8、Check if pin hood is cut, crack or aging.

9、Replace old hood.

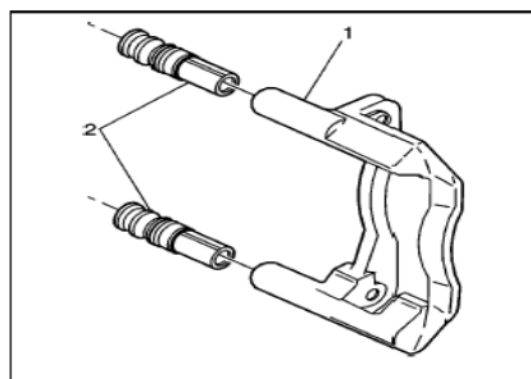
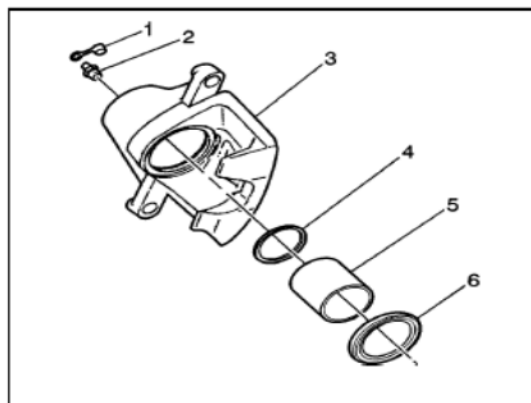
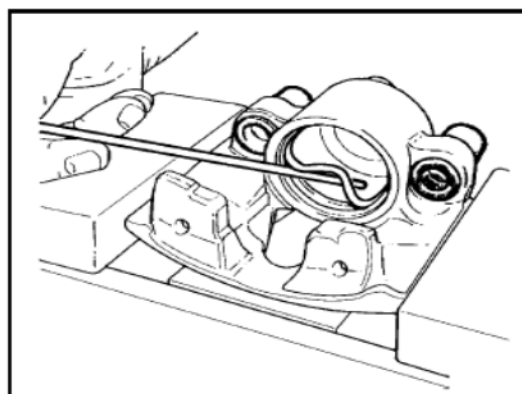
10、Check if caliper pins are corrosion or damaged. Replace corrupt pins.

11、Check if caliper seal groove is scratched. Replace new one.

12、Remove valve cover and valve.

13、Clean all parts with alcohol.

14、Dry all parts with clean compressed air.



6) Brake caliper bracket replace

Disassembly procedure

Points of attention: Don't disconnect hose from caliper. Don't suspend caliper on hose.

1、Remove caliper. See “ Remove caliper” .

Warning: Replace all fixture parts if they are loose or removed, otherwise it will cause personal hurt or vehicle damage.

Points of attention: New caliper bolts have been smeared bolt seal glue.

2、Remove caliper support bolts.

3、Remove caliper support bolts.

4、Remove hood bolts and bush from support.

5、Check if support is broken.

6、Replace new support if necessary.

Steps of installation

1、Use lubricant to lubricate parts.

2、Install following parts on support.

➤ Bolt protector

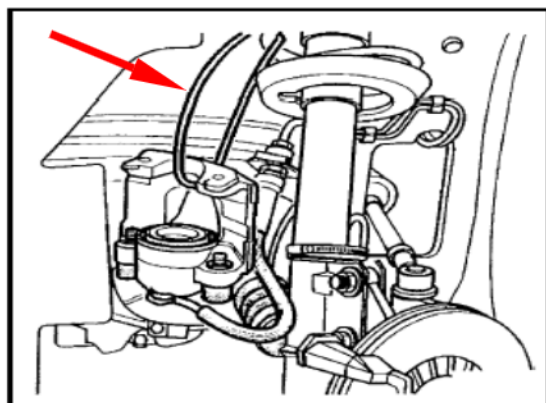
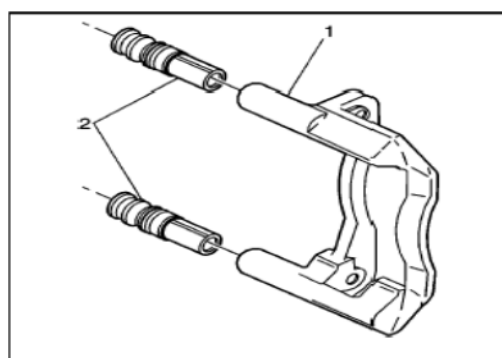
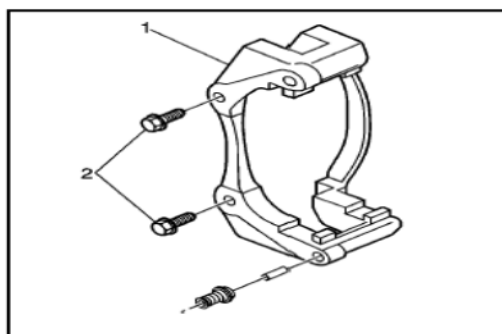
➤ Bush

3、Screw bolts to fix caliper support.

Fixture

Screw torque: 165N.m.

4、Install caliper. See “Replace brake caliper” .



7) Brake disc replace

Disassembly procedure

1. Support and lift vehicle.

2. Remove tire and wheel.

3. Check the thickness of brake disc.

4. Remove brake caliper.

5. Remove caliper support.

6. Remove brake disc bolts and brake disc.

7. Clear interface between the disc and the wheel hub flange.

Steps of installation

1. Install brake disc

2、Install the disc bolts.

Fixture

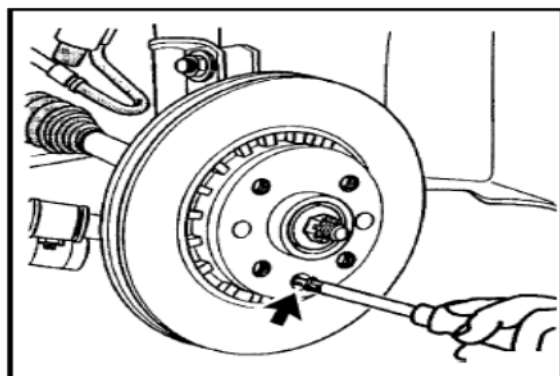
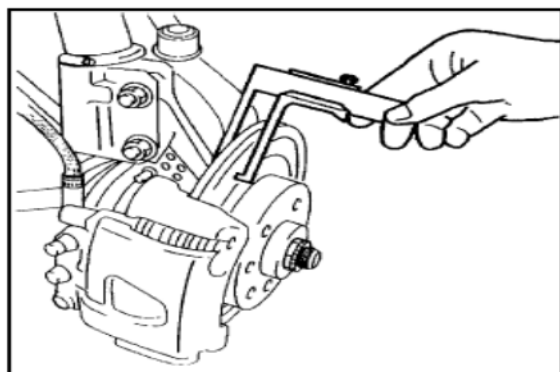
Screw bolts to 6 N.m.

3、Install caliper.

4、Install caliper support.

5、Install tire and wheel

6. Lower vehicle



8) Brake disc surface finishing

Points of attention: Don't finish disc to correct following process:

- Brake noise.
- Early wear of lining.
- Surface corrosion.
- Disc fade.

Only finish surface on one of following conditions:

- Serious scratch on surface of disc with depth of 0.4mm.
- The hop caused by following reasons:

——The deviation of disc depth exceeds 0.01mm.

——Corrosion or scratch depth exceeds the surface of disc.

Attention: Whenever to remove the disc from wheel flange, the corrosion or

dirt on disc or flange face must be cleaned, otherwise it will cause serious hop.

- 1、Clear the wheel bearing and hub.
- 2、Use micrometer to measure the thinnest point on disc. If the thickness of the point exceeds the minimum thickness of disc, don't finish surface of disc. Replace disc at once.

- 3、Clear completely the corrosion on flange.

- 4、Finish the disc.

Points of attention: If the best surface finishing could not be reached, it will cause bad brake ability.

- 5、After machining the disc, use alumna to get unidirectional surface.

- 6、Clean surface with suitable cleaning fluid

Attention: Loose wheel bolts will cause brake hop or damage. Screw wheel nuts to specified torque to avoid expensive service for brake system.

4. Description and operation

Disc braking system

Points of attention:

- Use clean fluid to lubricate all rubber parts for better installation.
- Don't use compressed air with lubricant.
- Whenever to remove hydraulic parts, drain out all air in system.
- Replace whole lining assembly.
- Fix dry parts in specified torque. Operate on clean working desk. The caliper has a single cylinder. The caliper is mounted on the

support with two bolts. When applying brake, the fluid pressure in rear caliper piston will increase. The pressure acts on the bottom of piston and cylinder and transfers to lining in order to push the surface of brake disc. Caliper will slide on mounting bolts to the center of vehicle. with setting up pipe pressure, the pressure on disc surface is higher

and higher to stop vehicle. When loosening brake pedal, pipe pressure will release. The piston will be back slightly. The movement of piston will compensate the wear of lining.

Section three Shoe brake

1. Specifications

Spare part

Application	Specifications
wheel cylinder piston diameter	19.05mm
Brake drum breadth	28mm
Brake drum diameter (new)	200mm
Finishing brake drum diameter	201mm
Maximum allow eccentricity	0.1mm
Brake lining diameter(rivet)	0.5mm

Tautness fasteners

Application	Number value
Rear brake bottom plate bolt	50Nm
Wheel cylinder bolt	10Nm
Wheel cylinder linkage	16Nm
Exhaust valve	8Nm
ABS left wheel sensor bolt	6Nm

2. Service guide

1) Brake scrape gasket check

- Check brake lining when driving every 1.5000km.
- Check lining when removing wheel and tire.

- Remove the rubber cock on check hole of lining.
- Check the thickness of lining.
- Whenever the wear of lining depth exceeds 2mm, replace new lining. If fixing lining with rivet, when wear exceeds 0.5mm, replace new lining.

2) Brake scrape gasket replace

Disassembly procedure

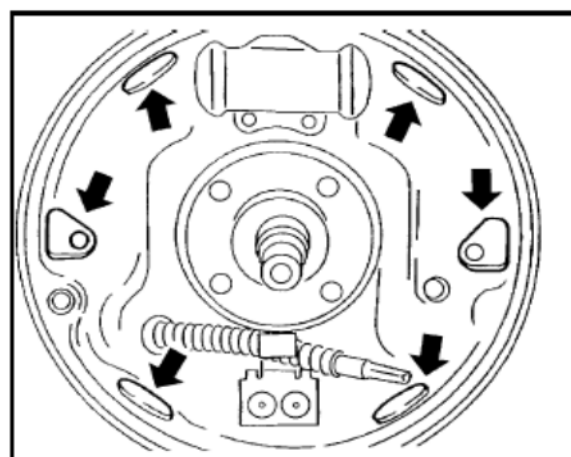
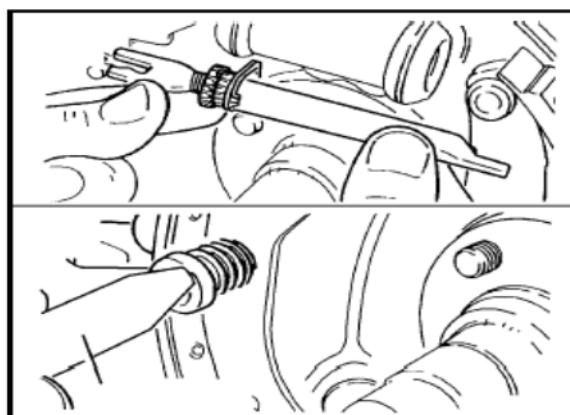
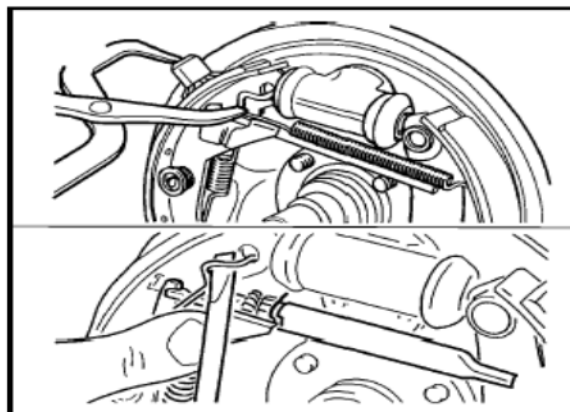
It recommends to use lining or other parts produced by Chery to keep front/rear brake function. The brake parts produced by Chery are selected carefully to offer best brake function.

1. Support and lift vehicle.
2. Mark the wheel position to the hub.
3. Remove tire and wheel.
4. Remove brake drum.
5. Remove park brake cable.
6. Remove return spring with spring caliper.
7. Remove spring and spring support with screwdriver.
8. Remove regulative lever.
9. Remove spring and pins.
10. Remove lining.
11. Must remember to remove all linings on same shaft.

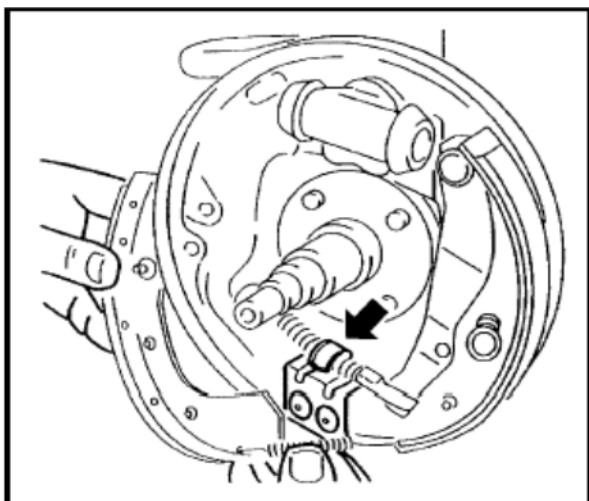
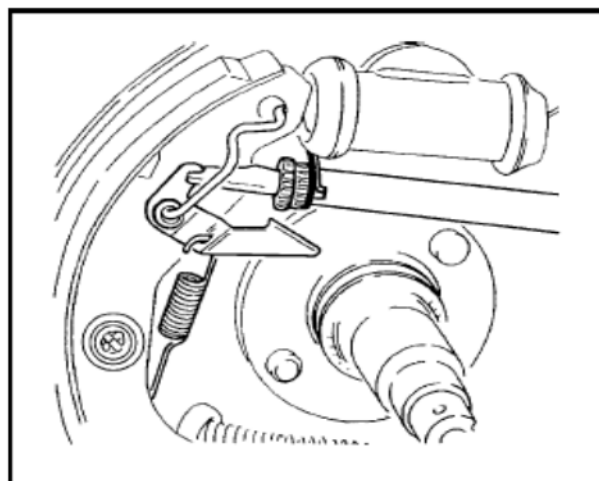
Steps of installation

1. Clear surface of brake plate.
2. Use soft cloth as shown in the figure.
3. Connect park brake cable and park brake lever.
4. Install lining, spring and spring reed.
5. Install the returning spring and brake hoof.
6. Make sure the correct position of the cable as shown in figure.
7. Install slide lever regulator between two linings.
8. Install small washer on new lining as shown in figure.

Points of attention: Make sure the small washer is mounted on lining, otherwise it will cause to damage brake or brake malfunction



9. Mount regulating support with spring to pins.
10. Install the support spring.
11. Install return spring with spring caliper.
12. Install brake drum.
13. Adjust clearance of drum bearing.
14. Adjust clearance of lining. Apply brake 10-15 times to make sure the clearances are correct.

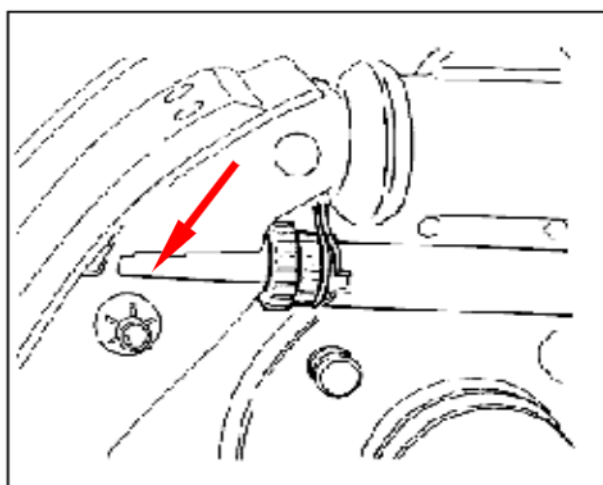


Attention: Stepping down brake pedal hard several times could adjust the clearance of lining automatically.

15. Install tire and wheel.
16. Mark the original labels on wheel and drum.
17. Drop vehicle.
18. Fill brake fluid to suitable level.
19. Grind lining and drum.

- 3) Gasket brake drum run in
 - Finish new surface of disc after replacing linings.
 - Run in the surface of new brake drum after finishing or replacing brake drum.
 - Brake 20 times at 48km/h to run in new braking surface.
 - Step down the pedal with the force gradually. Avoid over heat of brake.

Attention: Avoid sharp brake in driving 200km after replacing new lining.



4) Left brake replace

Disassembly procedure

1. Fill fluid to MAX level.
2. Lift and support vehicle.
3. Mark the position of wheel to the drum.
4. Remove tire and wheel.
5. Remove brake drum.
6. Remove park brake cable.
7. Remove brake cable
8. Remove brake pipe on rear shaft.
9. Remove sensor on rear ABS.
10. Remove 4 bolts on rear brake.
11. Remove rear brake.

Steps of installation

1. Clear and check wheel shaft surface.
2. Fix rear brake plate and rear brake with new bolts.

Screw bolts with torque 50N.m.

Caution: Don't use old bolts.

3. Install park brake cable
4. Mount brake pipe bolts on rear brake wheel cylinder

Fixture

Screw brake pipe bolts to 6 N.m.

5. Install rear vibration absorber bolts.

Fixture

Screw bolts to 65Nm.

6. Install brake drum.
7. Install rear sensor of ABS on rear brake.

Install and adjust sensor

Install sensor and screw bolts with hands.

Push the sensor until cannot move.

Screw bolts.

Turn clockwise 30 degree to adjust the lever.

Fixture

Screw bolts to 6Nm.

8. Fill clean fluid to suitable level

9. Drain out air in the brake if removing connector on inlet

10. Step down the pedal with 220N after draining out air if necessary.

11. Check if any leak of fluid in brake system.

12. Install tire and wheel.

13. Lower vehicle

5) Brake wheel cylinder overhaul

Disassembly procedure

1. Remove brake cylinder.
2. Remove cylinder hood.
3. Remove cylinder piston. Blow compressed air to inlet of cylinder, the piston will put out from hood.
4. Clear all parts with alcohol. Don't use other liquid.
5. Check if cylinder and piston is cut, scratch, corrosion or wear.
6. Replace cylinder shell or piston if any above condition appears.
7. Remove piston seal ring from cylinder groove.

Attention: Don't use metal tool to remove seal ring, otherwise it will damage cylinder or groove.

8. Check if scratch, nick, corrosion or wear appear on cylinder or groove.

9. Use a fine sand paper to remove slight corrosion.

10. If the corrosion cannot be removed, replace wheel cylinder.

11. Check if cut, scratch or aging appear on protection cover.

12. Replace damaged cover.

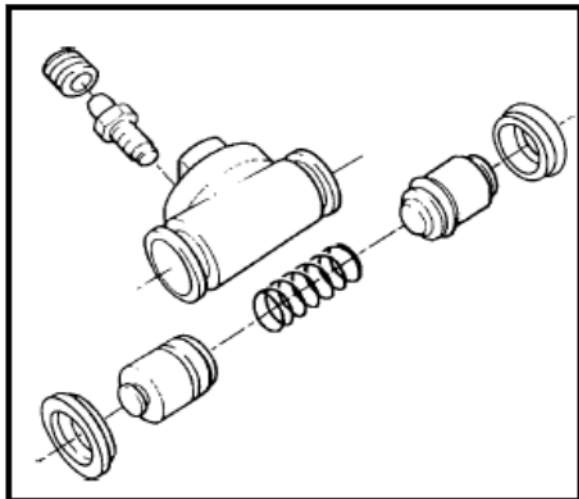
13. Check if cut and scratch appear on groove. If the groove is damaged, replace wheel cylinder.

14. Remove valve cover and valve from cylinder.

15. Clean all parts with alcohol.

16. Dry all parts with clean compressed

air.



Steps of installation

1. Install a new seal ring on groove and make sure there are no any bends on rings.
2. Put lubricated cover on piston.
3. Clean piston with fluid.
4. Install piston and cover in cylinder. Push the piston to the bottom of pump.
5. Install cover in the hole of cylinder.
6. Install valve and valve cover on cylinder.

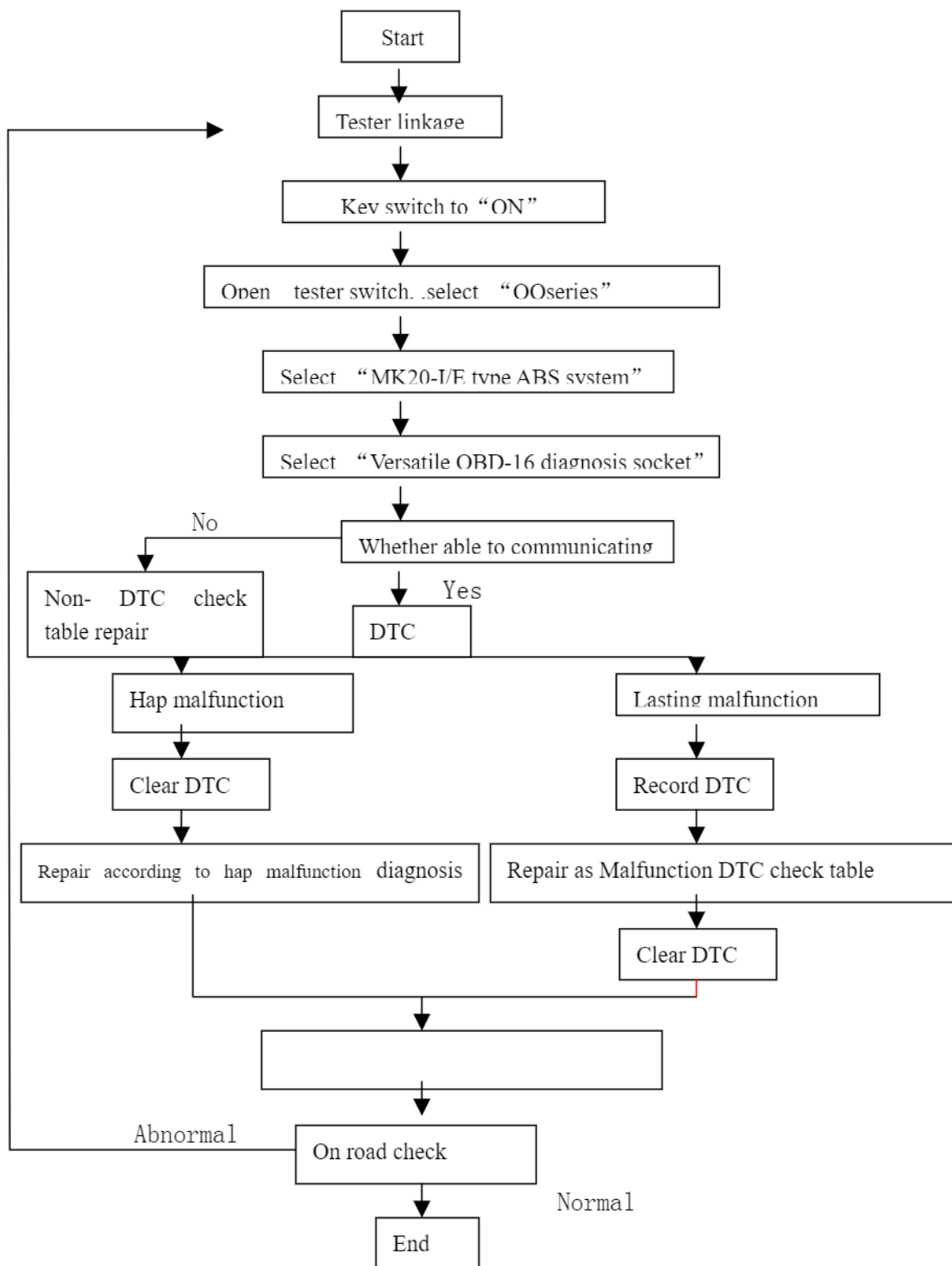
Fixture

Screw the valve to 8N.m.

7. Install cylinder.

Section four ABS controller

I、Fault diagnosis flow chart



II、Fault diagnosis Points of attention

ABS applies electronic hydraulic control system. The phenomenon in table below is not malfunction during system normal operation.

Symptom	Explain
System self diagnose sound	Knocking sound appears when engine starts. It' s normal for system self diagnose sound
ABS working sound	1. Sound in ABS HECU motor. 2. Pedal vibration sound 3. Sound from suspension knock or tire touch with ground Attention: When ABS works normally, tire still has sound.
Brake distance is long during ABS works	The braking distance of ABS vehicle is longer than NON-ABS vehicle on snow or sand road.

III、The operation and the function

- (1) Connect tester and diagnosis socket when power is off, turn on ignition switch
 - (2) Turn on tester power supply and select "Wind Cloud Series"
 - (3) Select "MK20-I/E type ABS system"
 - (4) Select correct diagnosis socket
 - (5) Select suitable function item
- (For ABS circuit control please refer S11 electronics service manual)

四、Service hints for intermittence malfunction

The intermittence malfunction appears because the bad contact in circuit and input/output signal points. Check the intermittence malfunction according to DTC table. Sometimes the intermittence malfunction will disappear automatically. So it' s not easy to find the problem.

Check the intermittence malfunction would appear again with following simulation.

1. If the vibration is main cause:
 - . Shake gently the connector left, right, up and down.
 - . Shake gently the harness left, right, up and down.
 - . Shake gently the sensor left, right, up and down.

. Shake gently other parts such as bearing left, right, up and down.

Attention: Replace new parts, especially the sensor, if harness is broken.

2. If over heat or over cold is main cause:

. Heat the parts with hair drier.

. Spray cold fog to check any cold weld.

3. If the contact resistance of source is too big:

. Turn on all appliance switches including headlamp and rear defogger switch.

Wait for another intermittence malfunction appears.

五、MK 20 ABS system

(1)、Check ABS warning light

Check if ABS light is on as follows:

1、Turn on ignition switch, the light will be on for 1.7s, then turn off.

2、It will be fault if not as above mentioned. Please check DTC.

3、If the light does not on at all, please refer non-DTC check table.

(2)、Read signal

Connect diagnosis instrument with the OBD-II connector near pedal. Turn on instrument and read signal from ABS ECU.

1、For example, the version and part number of ABS ECU.

S11-3550010

2、Coding (Coding) : 01901

(3)、Reading DTC

Enter “ABS for MK20-I/E”, select DTC and push CONFIRM key. DTC will be displayed on the screen.

(4)、Clear DTC

1) Push CLEAR after reading DTC.

2) The screen will display.

Want clear DTC ?

[Yes]: Delete (key on, engine off)

3) Push YES. If the trouble is cleared, DTC will be cleared completely.

(5) DTC display mode

System problem display code		The display code
Non-DTC	Never happened	Non-DTC
At present no problem	Happened before	Hap DTC
Problem still exists	Never happened	Non-hap DTC
	Happened before	Hap DTC and non-hap DTC

Troubleshooting table index

(1) Troubleshooting table index

DTC	Symptom	Diagnosis
65535	ECU	Damage
01276	ABS Hydraulic pump	Motor does not work
00283	Front left sensor	Electric or mechanic faults
00285	Front right sensor	
00290	Rear left sensor	
00287	Rear right sensor	
01044	ABS Code Fault	
00668	Source terminal 30	
01130	ABS abnormal	Bad signal

(2) Non-DTC malfunction table index

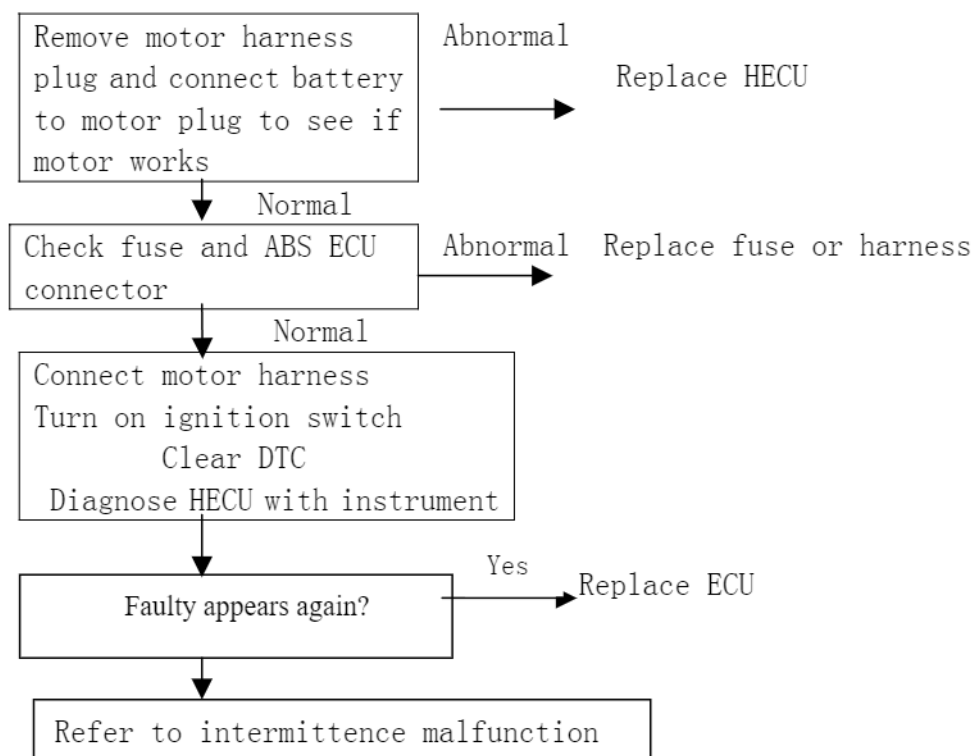
Symptom	
Turn on ignition switch, ABS light not up	
Start engine but warning light not turn off	
ABS abnormal	Uneven brake torque on both sides
	Brake torque not enough
	Step on pedal, ABS works (vehicle is stopping)
	Step on pedal, ABS works (vehicle is running)
	Pedal shocks badly when ABS works
Too long for brake travel	
Need too much force to step on pedal	
No DTC put out (cannot communicate with diagnosis instrument)	

七、Troubleshooting table

1、ABS Hydraulic pump

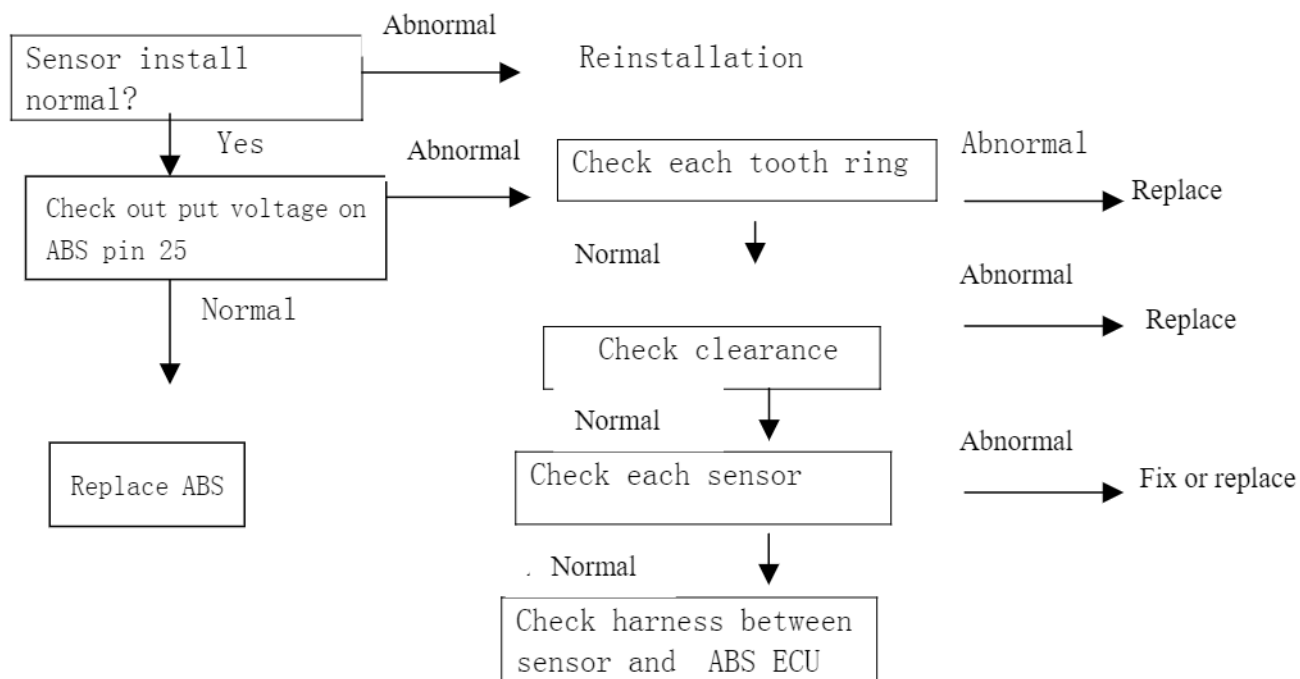
1、DTC 01276	Possible cause
It means ABS ECU find that motor cannot work normally at 20km/h	Source open or ground
Hint: Harness between motor and ECU is loose.	Motor harness loose
Test with diagnosis instrument.	Motor damage

Attention: Vehicle must be in idle state when proceeding electric motor drive test



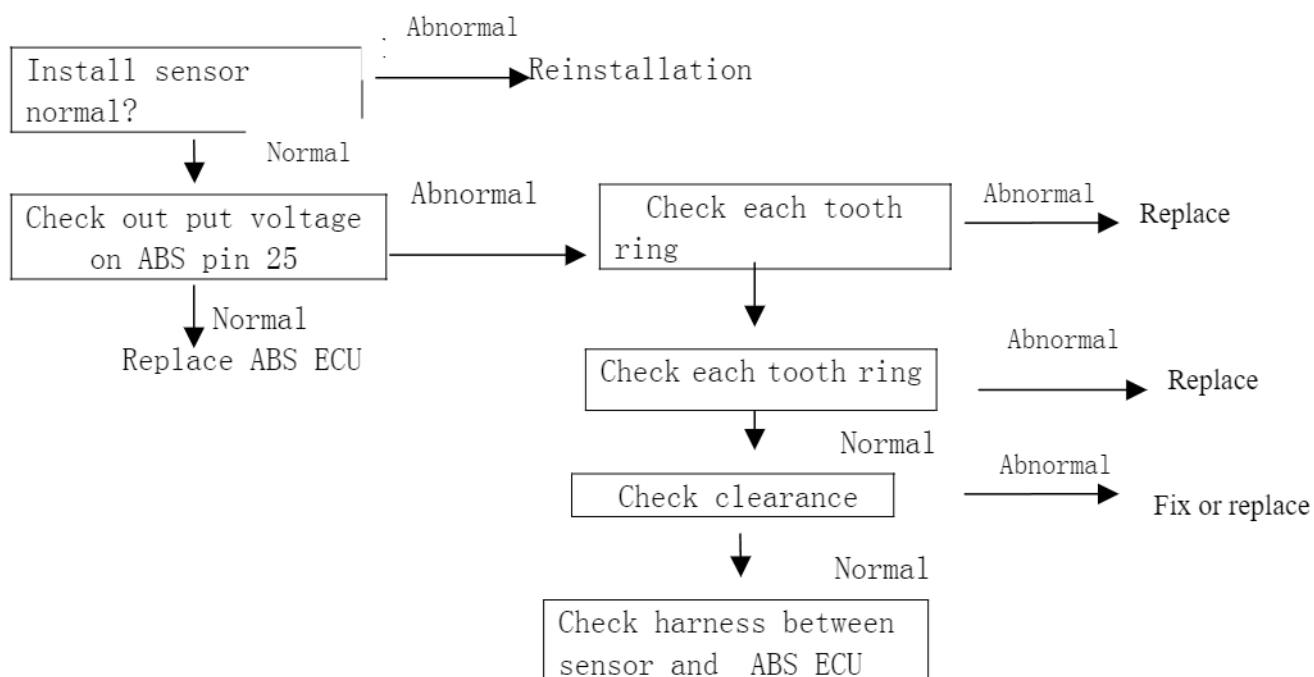
2、Wheel speed sensor: 00283, 00285, 00290, 00287

2、DTC 00283, 00285, 00290, 00287	Possible cause
Means no signal put out at 20km/h	No sensor
Hint: No sensor, sensor coil and harness short, too big or too small for clearance between sensor and tooth ring or bad tooth ring	Sensor coil and harness short
	Too big or too small for clearance between sensor and tooth ring
	Bad tooth ring
	ABS ECU fault



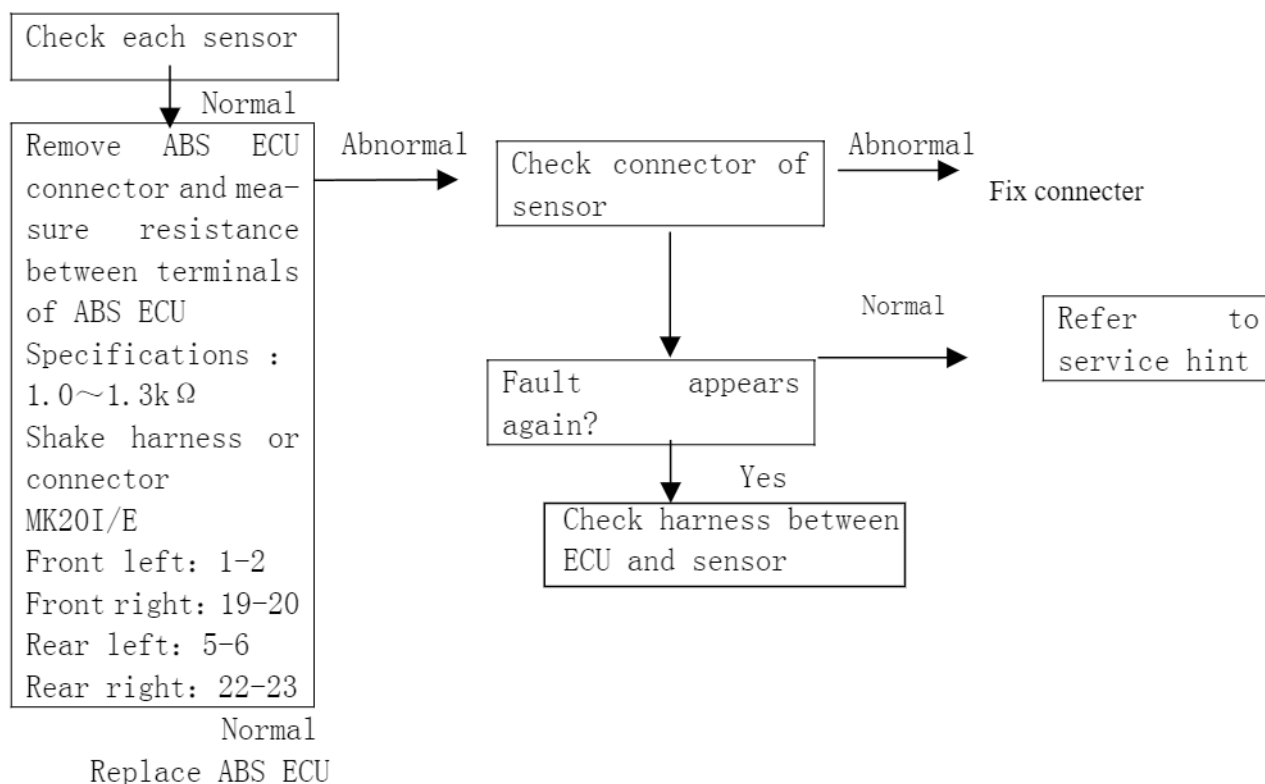
3、Wheel speed sensor

3、DTC 00283, 00285, 00290, 00287 Means signal is over specification at 20km/h Hint: Short sensor coil, tooth ring damage or too big clearance.	Possible cause Bad touch or short between coil and harness Too big or small for clearance between sensor and tooth ring Bad tooth ABS ECU fault
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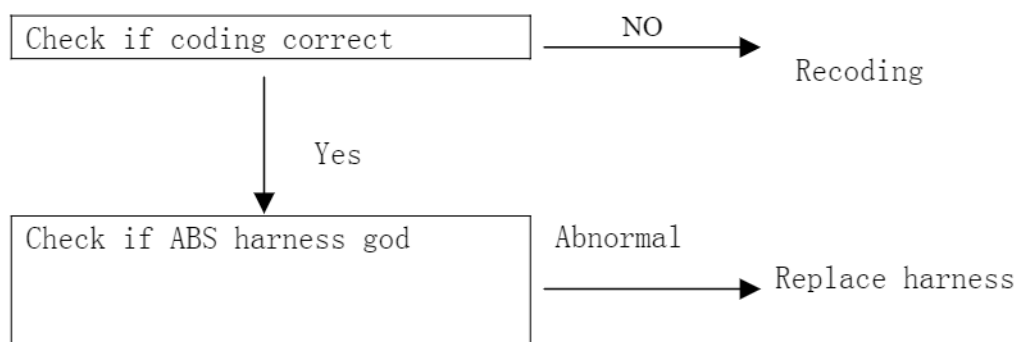
4、Wheel speed sensor

4、DTC 00283, 00285, 00290, 00287 Means open or short sensor Hint:Bad contact of sensor or short harness or circuit fault on ABS ECU	Possible fault Open sensor coil Short sensor coil Short between sensor and harness or source ABS ECU signal fault
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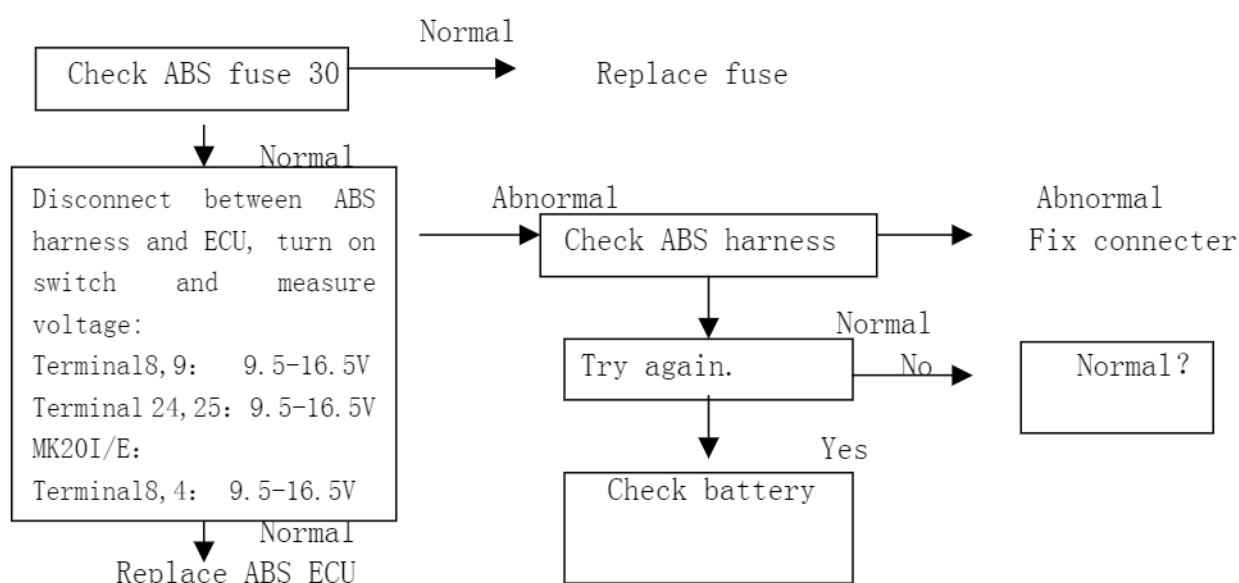
5、ABS coding err

5、DTC 01044 Means the software and hardware problem	Possible cause • Bad connect of ABS harness • ABS ECU coding fault
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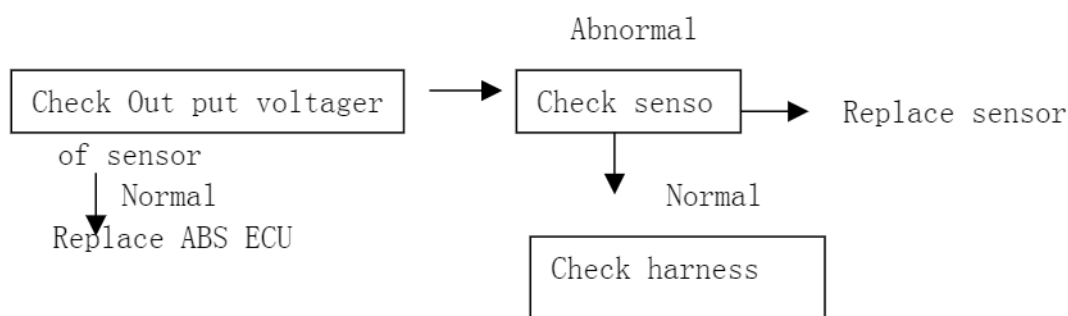
6、Supply terminal 30

6、DTC 00668 Means too high source voltage	Possible cause
	• ABS fuse burn out • Too low or too high battery voltage • ABS harness damage • ABS ECU damage



7、ABS service preternatural

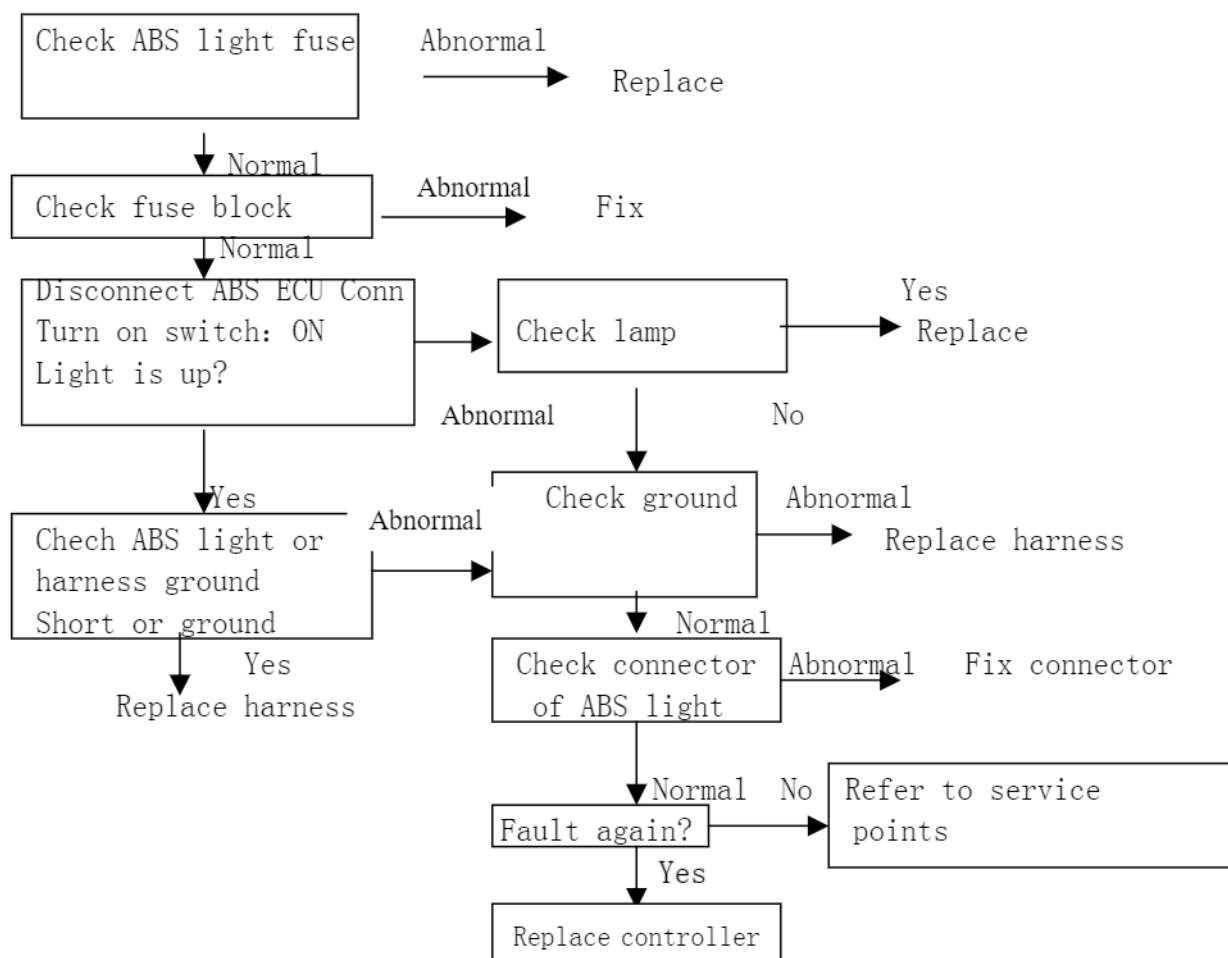
7、DTC 01130 Means interfere of high frequency or bad signal	Possible cause
	• Interfere of high frequency • Bad sensor or harness • ABS ECU damage



8、Non- DTC troubleshooting table

(1) Key on, engine of, ABS warning light off

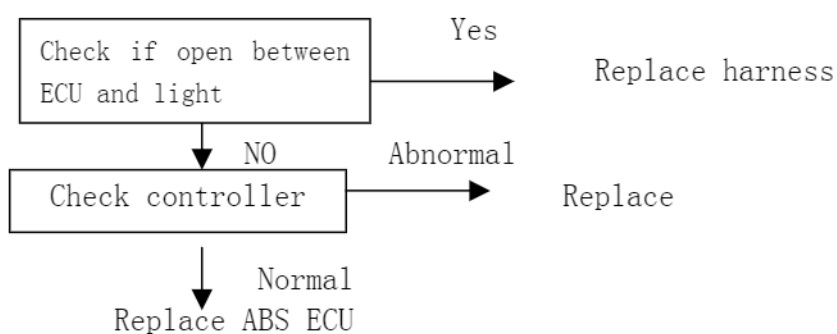
Means ABS light off, open light circuit, lamp burn out or light control unit damage	Possible cause • Fuse burn out • ABS lamp burn out • Open source circuit • ABS light control unit damage
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(2) Engine start, light is on

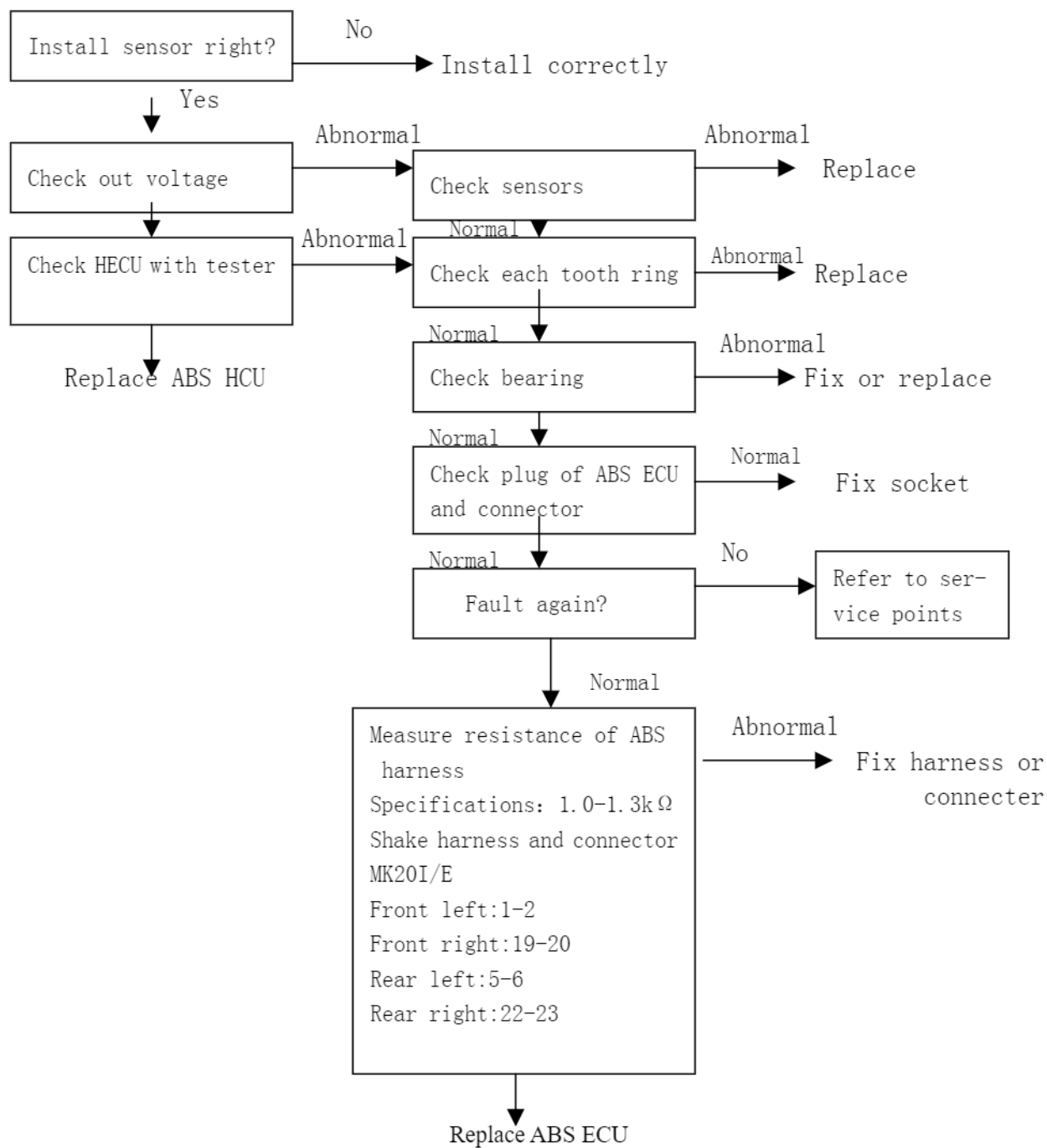
Means ABS light controller damage or open	Possible cause
	• Light controller damage • ABS light controller open • ABS ECU fault

Attention: This malfunction only appears on normal source voltage and without DTC.



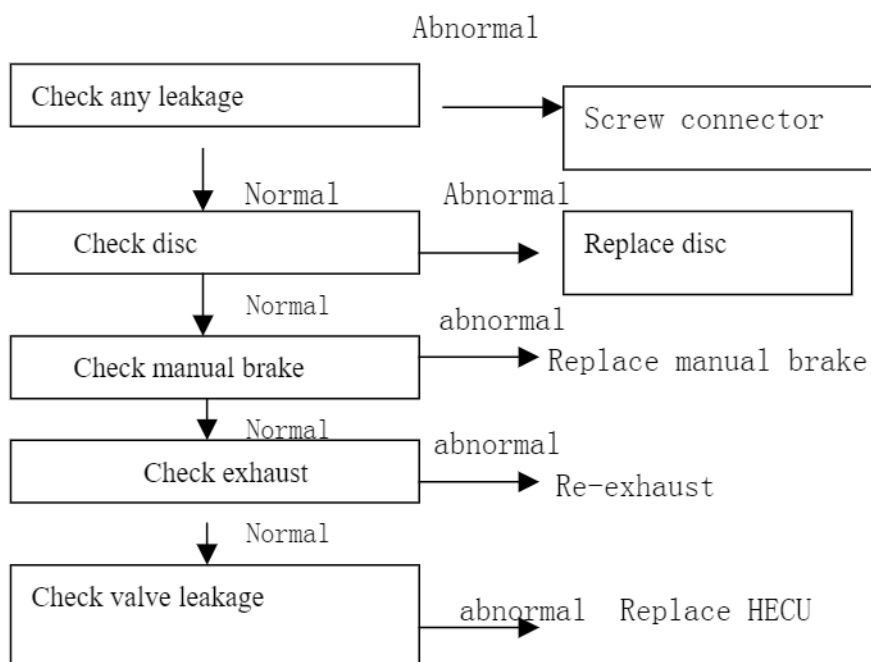
(3) ABS abnormal

Means the fault is connect with the driver or road	Possible cause
	• Sensor bad installation • Bad harness • Sensor damage • Tooth ring damage • Dirt on sensor • Bearing damage • ABS HCU damage • ABS ECU damage



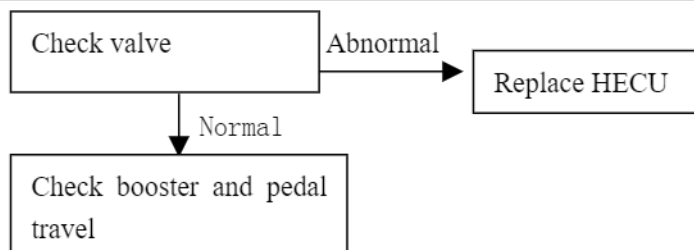
4、Too long for pedal travel

Check any leakage in system	Possible cause
	• Fluid leak • Valve leak • Air in system • Disc damage • Bad manual brake



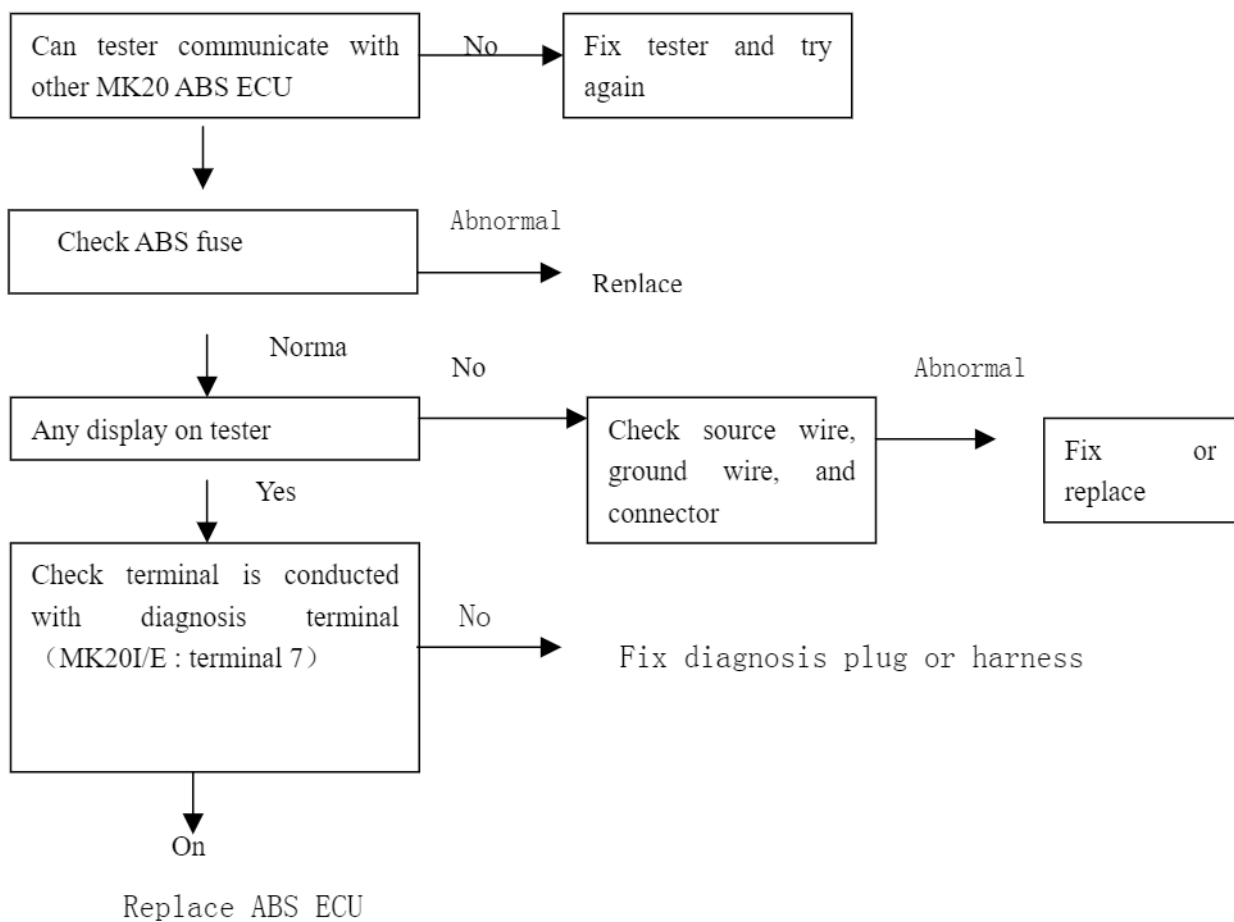
5、Must step on pedal hard

Check booster or pedal travel with conventional way	Possible cause
	• Bad booster • Bad valve



6、No DTC put out(cannot communicate with tester)

Open in ABS ECU source circuit or diagnosis circuit	Possible cause
	• Fuse burn out • Diagnosis wire loose or damage • ABS ECU damage • Tester problem





8、ABS inspection

Item	Key position	Terminal	Specifications	Unit
		MK20I/E		
Battery and motor voltage	OFF	25-8	10.1-14.5	V
Battery and solenoid voltage	↑	9-24	↑	V
Source isolation	↑	8-4	0.00-0.5	V
Ground isolation	↑	8-24	↑	V
Source	ON	8-4	10.0-14.5	V
ABS light	OFF	ECU not connected	Light off	
	ON		Light on	
	OFF	Connect ECU	Light off	
	ON		Light on for 1.7 sec and off	
Brake light pedal not push down	ON	8-18	0.0-0.5	V
Brake light pedal push down	ON	8-18	10.0-14.5	V
Front left sensor resistance	OFF	1-2	1.0-1.3	K Ω
Front right sensor resistance	OFF	19-20	1.0-1.3	K Ω
Rear left sensor resistance	OFF	5-6	1.0-1.3	K Ω
Rear right sensor resistance	OFF	22-23	1.0-1.3	K Ω
Front left sensor out put voltage	OFF	1-2	3.4-14.8	mV/HZ
Front right sensor resistance out put voltage	OFF	19-20	3.4-14.8	mV/HZ
Front left sensor out put voltage	OFF	5-6	>12.2	mV/HZ
Rear left sensor out put voltage	OFF	22-23	>12.2	mV/HZ
Sensor out put voltage ratio	$\frac{\text{Max peak voltage}}{\text{Min peak voltage}} \leq 2$			

9、Check ABS

(1) Check the out put voltage of speed sensor

1. Check if the clearance between speed sensor and teeth ring is satisfied with specification.
2. Lift the wheel and release manual brake.
3. Remove ABS harness and measure the points of connector.
4. Run the wheel at speed of 1/2 RPM and measure the out put voltage.

MK20 I

Front left wheel terminal 4 - 11
Front right wheel terminal 3 - 18
Rear left wheel terminal 2 - 10
Rear right wheel terminal 1 - 17

MK20 I/E

terminal 1 - 2
terminal 19 - 20
terminal 5 - 6
terminal 22 - 23

5. If the voltage is not with specification, the causes may be:

- The clearance between sensor and teeth ring is too big.
- Sensor malfunction.
- The resistance of sensor is 1.0—1.3 k.
- Distortion of teeth ring.

10、Removal and installation

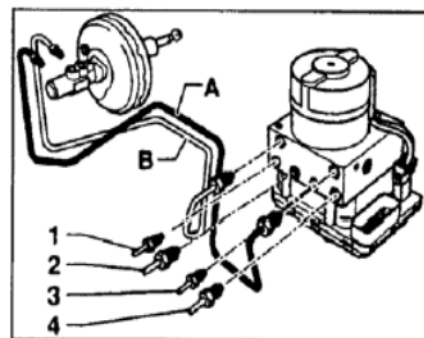
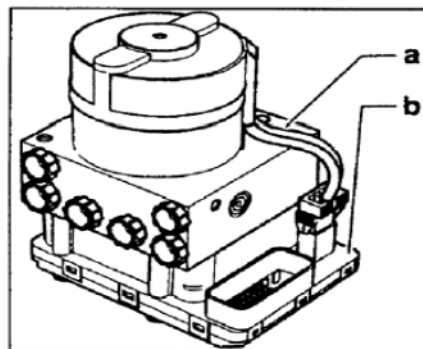
(1)、Spare parts offering

* HECU assembly dry type;

* HCU and ECU separate HCU wet type

(2)、Precaution on removing

- Repair the faults after find the cause for malfunction with test instrument
 - Only open the package before installation.
 - Only use original parts.
 - Only clean with soft cloth.
 - Don' t use compressed air or move the vehicle when ABS is working.
 - Block the outlet for each pipe after removing the parts.
 - Please use DOT 4 brake fluid.
 - Dip the seal and o-ring with brake liquid.
 - Check the function of ABS and conventional brake system is normal after repairing.
 - Check if any leakage on each connector.
- (3)、MK20-I HECU assembly Removal
- Turn off ignition switch and disconnect (-) wire on battery.
 - Remove the harness from ABS assembly.

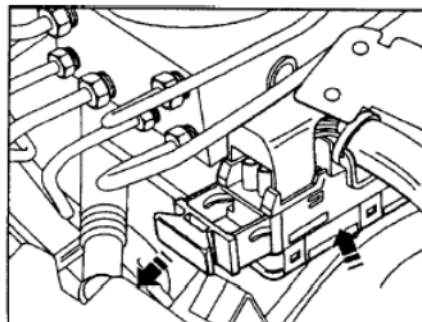


- Put down pedal >60mm and fix with bracket to prevent liquid flow out.
- Remove the brake pipe AB on master cylinder and marked with dot. Block the outlet with rubber cover.
- Remove brake liquid pipe 1—4 and marked with dot. Block the outlet with rubber cover.

- Loosen the bolts fixing HECU to support.
- Remove HECU from support.

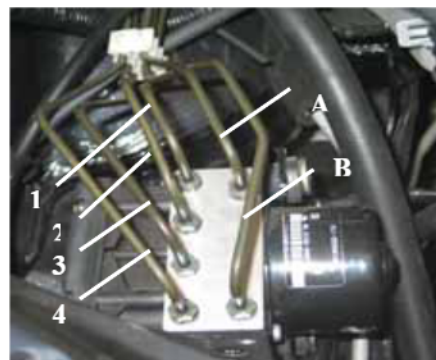
(4)、Replace HECU

- Remove the harness of pump motor.
- Remove 4 bolts and don't reuse.
- Separate HCU and ECU.
- Install new HCU on ECU.
- Screw the bolts fixed HCU on ECU with torque 2-4 Nm.
- Insert the harness of motor.



(5)、Replace ECU

- Remove the harness.
- Remove 4 bolts and don't reuse.
- Remove HCU from ECU.
- Install new HCU on ECU.
- Screw the bolts fixed HCU on ECU with torque 2-4 Nm.
- Insert the harness of motor.



(6)、Install ABS assembly again

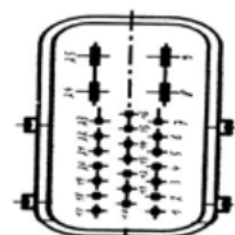
Attention: Only remove the cover on hydraulic outlet while install the brake pipe to prevent the matter dropping into system.

- Install ABS assembly on support with torque 16-24Nm.
- Remove the cover on hydraulic outlet and install brake pipe with torque 8-16Nm M10×1 and 12-18Nm M12×1.
- Make sure the pipe is installed correctly.
- Charge new brake fluid to MAX position and exhaust gas according to specification.
- Turn on ignition switch, ABS warning light will be up for 1.7 second and turn off.
- Clear DTC.
- Drive the vehicle to confirm the function of ABS and feel pedal is rebound.

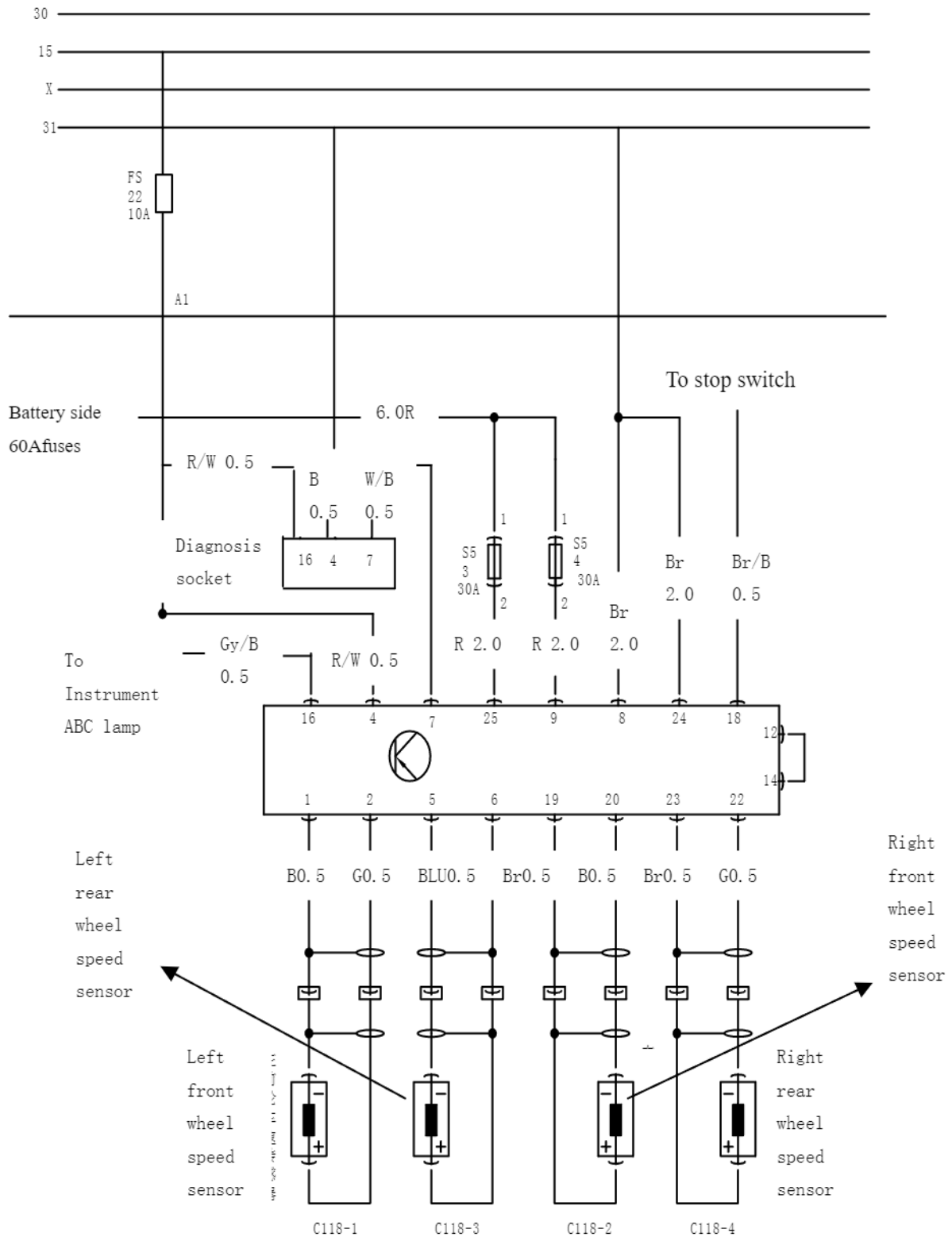
A.Front piston; B.Rear piston

1.Right front wheel;2.Left rear wheel
3.Right rear wheel;4.Left front wheel

11、ABS ECU Socket



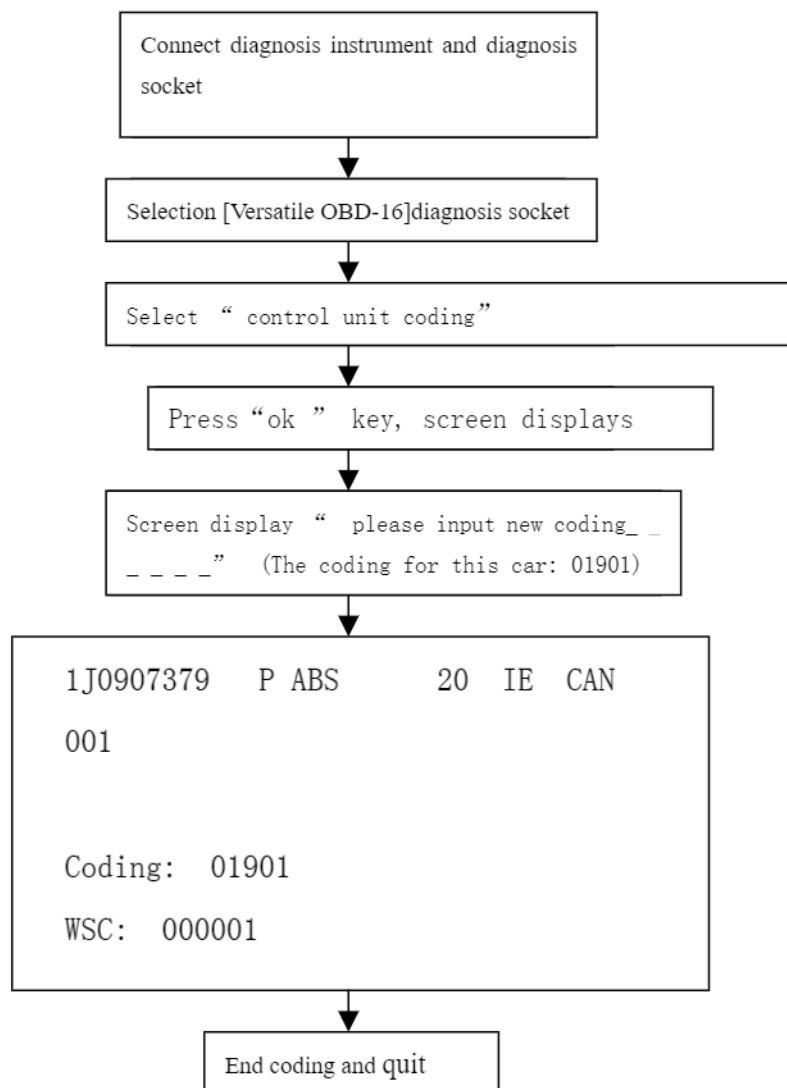
12、Electric circuit diagram MK20 I/E



13、ECU coding

Coding the new ECU after replacing/ repairing ECU or HECU. Otherwise ABS warning light cannot work normally.

Coding ECU with instrument, go to steps as follows:



14、Charging and evacuating

1. Wet HCU

If HCU is wet type, charge and evacuate according to conventional brake system after replacing HCU.

2. Dry HECU

If HCU is dry type, besides charging and evacuating according to conventional brake system after replacing HCU, it should be operated the second loop of HECU with instrument.

Appendix 1

Question and answer for ABS

1. What is ABS?
ABS is abbreviation for Anti-lock Brake System. ABS ensures good brake stability and steering on various roads to get best brake distance.
2. Why need ABS?
When braking, front wheel will lock up to lose steering ability; while rear wheel will lock up to run to a side or slide. ABS will help you to control vehicle and to steer clear of barrier during braking.
3. How to distinguish if your vehicle equipped with ABS?
Firstly, you could observe if the ABS warning light on instrument cluster or on switchboard is on in short period. Secondly, you may ask your dealer.
4. How does ABS work?
The ECU in ABS will adjust the pressure on each wheel brake through solenoid according to VSS signal. It just likes a good driver but with much faster reflection.
5. How to distinguish ABS is working?
When ABS is working, you will feel the vibration of brake pedal, and hear the noise of hydraulic controller is working. Keep step down on the pedal. At the most situations, the brake distance for vehicle with ABS is shorter than the vehicle without ABS, especially on icy road or wet road. Please remember to turn steering wheel to steer clear of barrier.
6. What should do if ABS is fault?
Once ABS is fault, ABS warning light will be on. ABS will not work, but the conventional brake system is working. So you could brake vehicle as usual way.
7. When will ABS light be on?
ABS light will be on for about 1.7s after engine starting, then turns off. Only ABS is fault, ABS light will be on again. So once ABS light is on, go to service station at once. Don' t try to repair ABS by yourself.

Appendix 2

How to use ABS?

- Always step down brake pedal to keep enough and lasting brake force for ABS.



- Keep enough brake distance. When driving on good road, keep at least 3 s of braking from front vehicle. When driving on bad road, keep more time for braking.
- Practice ABS braking before driving. Get ready for pedal' s vibration when ABS is working. Parking place and square are the best place for practicing.
- Read owner' s manual carefully to better understand each instruction offered by manufacture.
- Don' t drive vehicle with ABS at random. It' s dangerous to turn sharp or steer hard.
- Don' t step down brake pedal repeatedly. When driving vehicle with ABS, it will cause ABS on and off frequently, which will decrease the ability of braking and increase braking distance. In fact, ABS will control brake ability automatically.
- Don' t forget to turn steering wheel. ABS supply steering control ability for driver, but itself cannot steer automatically.
- Don' t be afraid of the noise of hydraulic system' s working and pedal vibration. The noise is normal and means ABS is working.