Chapter Ⅲ

Chassis System

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Section Ⅰ Brake System

Ⅰ Technical Parameters of Brake System

1. Front Brake

1) Specification

Application	Specification
Piston diameter of brake caliper	57mm
Brake disc diameter	265mm
Min. thickness of brake disc	23mm
Brake disc thickness (new)	25mm
Maximum jump	0.1mm
Thickness of front brake lining	17.8mm
Thickness of rear brake pad	14mm

2) Fastener Tightening Specification

Brake caliper guide bolt	31～38Nm
Brake caliper locating bolt	120～128Nm
Bleeding screw	9～11Nm
Dust board bolt	6.5～8.5Nm
Locating bolt (brake disc)	6～12Nm

2. Rear Brake

1) **Fastener Tightening Specification**

Locating stay bolt of brake caliper	60～66N.m
Locating stove bolt of brake caliper	60～66N.m
Brake caliper guide bolt	80～110N.m
Bleeding screw	9～11N.m
Retaining nut of bearing	73～83N.m
Fastening bolt of hand brake fasteners	6～12N.m

2) Specification

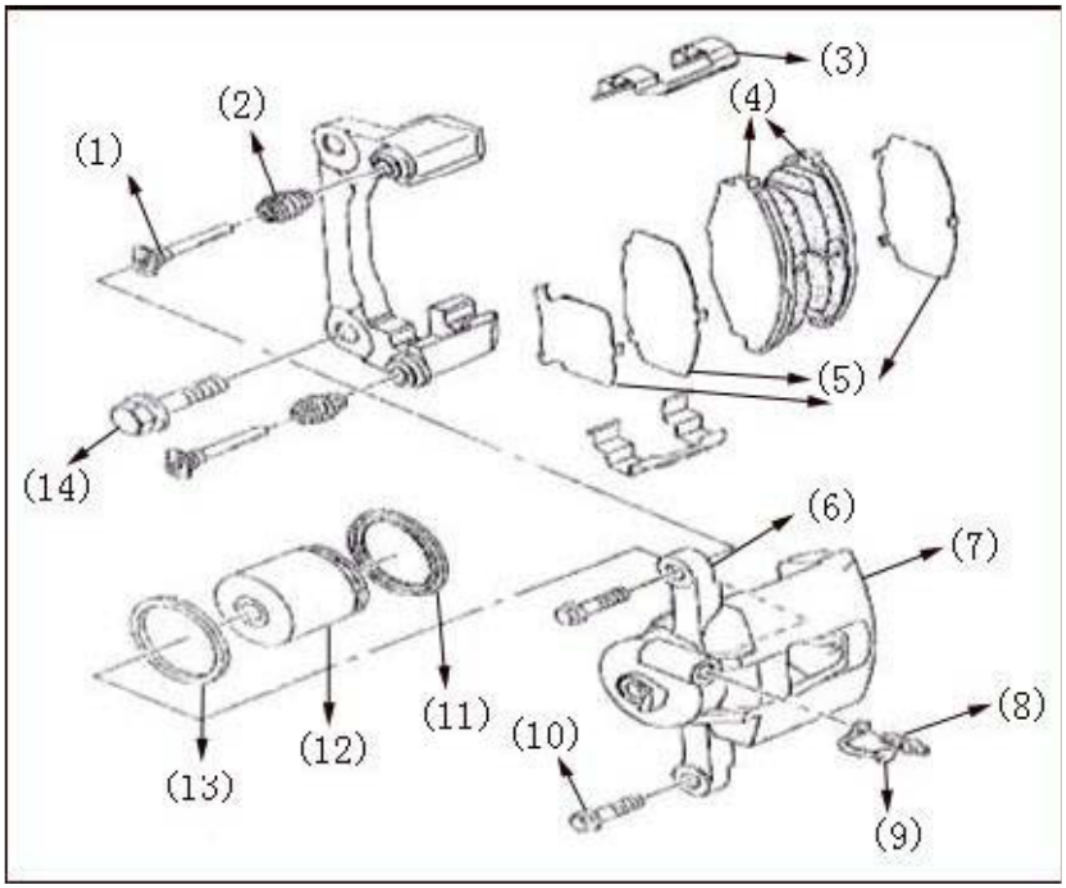
Nominal brake disc diameter	303mm
Brake disc thickness	9mm
Min. thickness of brake disc	7mm
Thickness of brake pad	15mm
Min. thickness of brake pad	7mm
Thickness of brake lining	2.5mm
Min. thickness of brake lining	1.5mm

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Ⅱ Front Brake

1. Structural Drawing of Adjusting Caliper

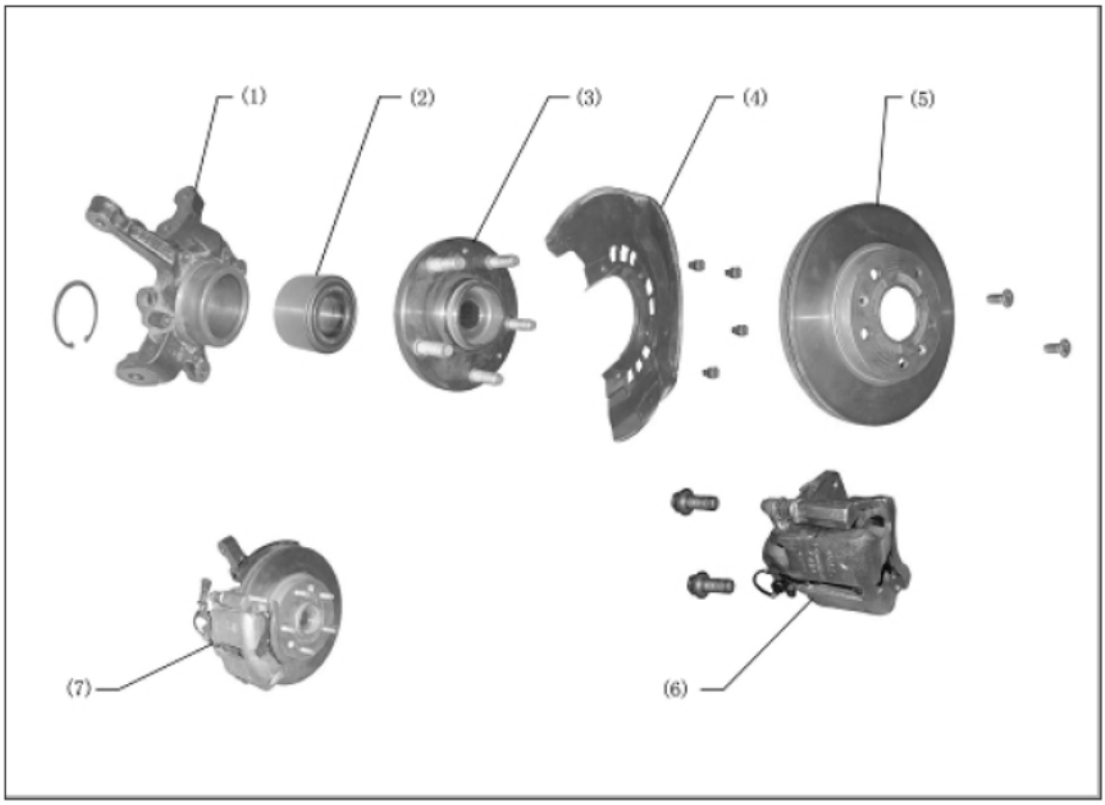
The brake caliper assembly consists of brake caliper body, brake caliper bracket, bleeding screw, dust cover, piston, piston dust cap, piston seal ring, rack shim, locating guide rod, brake lining assembly, lining damper, dust cap and bracket, etc.



(1) Locating guide rod
(2) Dust cap
(3) Rack gasket
(4) Brake lining assembly
(5) Lining damper
(6) Brake caliper bracket
(7) Brake caliper body
(8) Bleeding screw
(9) Dust cover
(10) Connecting bolt of brake caliper body
(11) Piston dust cap
(12) Piston
(13) Piston seal
(14) Fixing bolt of brake caliper bracket

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2. Assembly Drawing of Front Brake

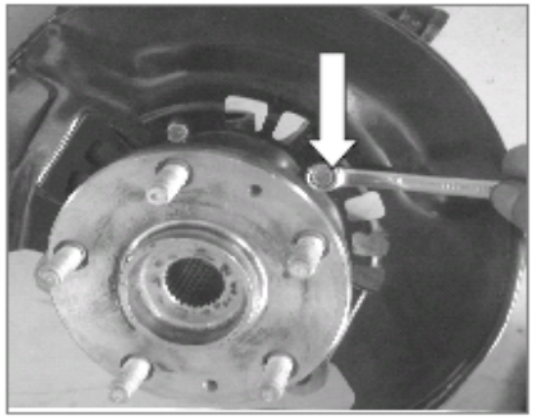


(1) Front wheel knuckle
(2) Knuckle hub Bearing
(3) Front wheel hub assembly
(4) Dust board
(5) Front brake disc
(6) Brake caliper assembly
(7) Disc brake assembly of front knuckle

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3. Installation of Disc Brake Assembly of Front Knuckle

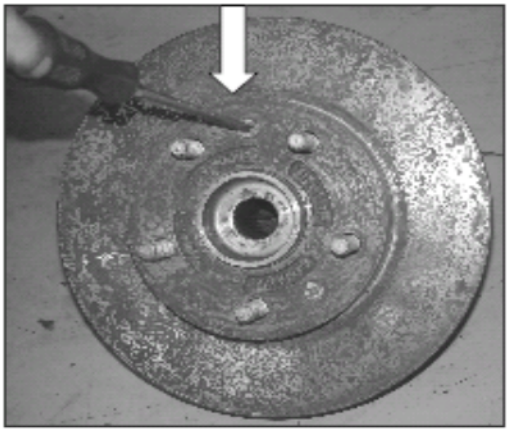
1) Put knuckle into clamp, and fix dust board onto knuckle, then use bolt to tighten it. The tightening torque shall be 9~11N.m.



2) Press the front wheel hub-bearing unit into the knuckle.

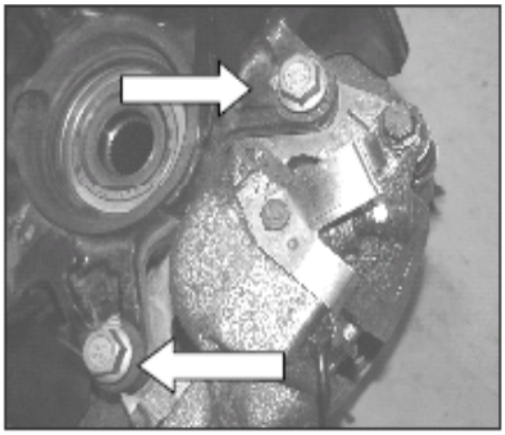


3) Bolt brake disc onto front wheel hub bearing unit. And the tightening torque shall be 7~9N.m.



4) Joint brake caliper assembly and knuckle via two bolts. The brake disc shall be located between brake linings. And the tightening torque shall be 85±5N.m.

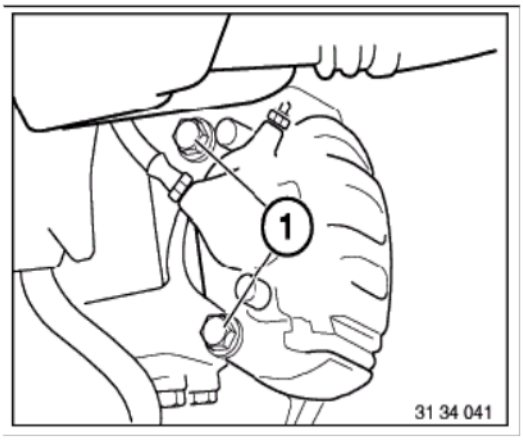
Note: grease shall not exist on the brake disc and brake lining.



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4. Installation or Replacement of Front Brake Discs

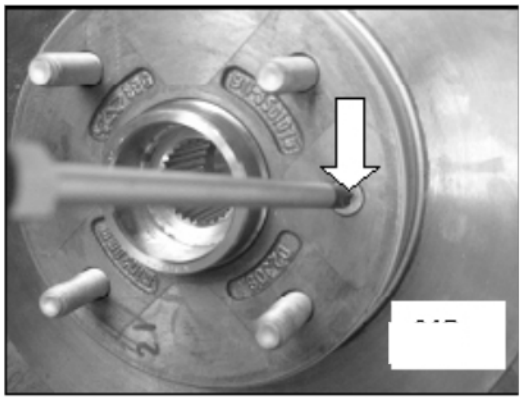
1) Remove wheels



Remove and clean the brake linings if necessary.

Note: if less than the minimum thickness of brake disc, it is necessary to replace the brake disc. Always replace the brake discs (of the same axle) in pairs! If brake disc is replaced, brake linings must be re-fixed as well.

2) Loosen the fixing bolt of brake caliper assembly, then remove the brake caliper and tie it on one side.



Hint: Keep connection between brake lines.

3) Loosen the locating screw and remove brake disc.

Caution: under no circumstances could it use hammer or equivalent to knock the worn ring to loosen the brake disc! Use rubber hammer to carefully knock the body of brake disc if necessary.

Installation instructions:

Replace the fixing bolt of brake disc, and thoroughly clean the contact surface of hub, then remove corrosions if necessary. Uneven contact surface may result in deformation of brake disc, and refer to specific technical data for tightening torque. Installation sequence is opposite to that of removal.

5. Diagnostic Information of Brake Discs

1) Inspection of brake disc thickness deviation

Use micrometer to measure the thickness of random four or more points on the brake disc. Measure all of the thickness at the points that have the same distance from brake disc edge. If the thickness deviation of brake disc exceeds 0.013 mm, when braking, it may result in brake pedal pulsation or front end vibration. Replace the brake disc that cannot meet the above requirements.

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2) Inspection of transverse jump of brake disc

Remark: Once disconnecting the brake disc from the flange of wheel bearing, rust or impurities on fitting surface between brake disc and flange must be cleaned, otherwise it may increase brake disc transverse jump or brake vibration. Keep the wheel on the vehicle, and inspect its transverse jump so as to obtain more accurate overall jump indications at actual braking conditions. If there is no certain device along with the vehicle to inspect the wheel, remove the wheel while keeping the position of caliper for the purpose of getting more accurate readings.

3) Removal procedures

a. Refer to the general information of vehicle elevating and lifting to properly lift and sustain the vehicle.
b. Mark relative positions of wheel and wheel hub.
c. Remove wheel and tire.
d. Clean the brake disc surface.
e. Re-screw wheel nuts to tighten brake disc.
f. Fix the micrometer assembly onto knuckle to ensure that the distance between exterior margin and the contact point of indication lamp button and brake disc surface is about 13 mm.
g. Adjust micrometer to zero.
h. Turn wheel for one circle and check the readings of micrometer, if the overall indication variation of TIR exceeds 0.080mm, then perform surface finishing or replace brake disc.

Under certain circumstances, excessive transverse jump of brake disc can be solved via calibrating the brake disc position of wheel hub by means of staggering one or two bolts distance. After calibrating the brake disc, if transverse jump still occurs, the wheel hub shall be inspected to confirm whether the transverse jump of the hub is excessive or over loose. If transverse jump of the hub exceeds 0.040mm, it must be replaced. If transverse jump meets the requirement, surface finishing or brake disc replacement can be performed if necessary.

4) Tolerance of brake disc.

Under the following circumstances, it shall strictly maintain the surface tolerance of brake during the process of brake disc manufacturing.

- ☐ Flatness
- ☐ Parallelism
- ☐ Transverse jump

Maintain the form tolerance of brake surface and thus prevent brake from abrasion or pulsation. Surface accuracy must be maintained below the specified 60° of radius roughness. New brake disc shall conform to above specifications. And the brake disc that is subject to proper surface finishing shall also conform to the above specifications. Refer to the specification of brake surface finishing to control its surface precision and thus to eliminate the following malfunctions.

- ☐ Pedal excessive rigidity
- ☐ Severe degeneration of braking performance

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- ☐ Deflection driving
- ☐ Abnormal performance

Maintain brake surface precision can prolong the service life of lining. Brake disc slight scratch whose depth is less than 1.5mm will not influence braking performance, as normal use can also result in slight scratch.

6. Replacement of Brake Caliper

1) Removal procedures

Caution: prior to achieving stable brake pedal stroke, never move the vehicle to prevent from personal injury!

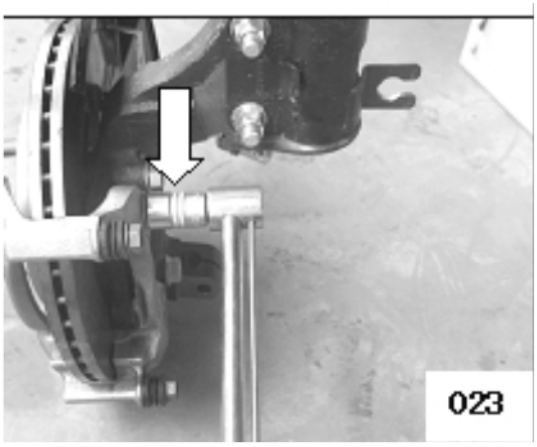
a. Discharge a small amount of brake fluid from master cylinder.

b. Lift and properly sustain the vehicle.

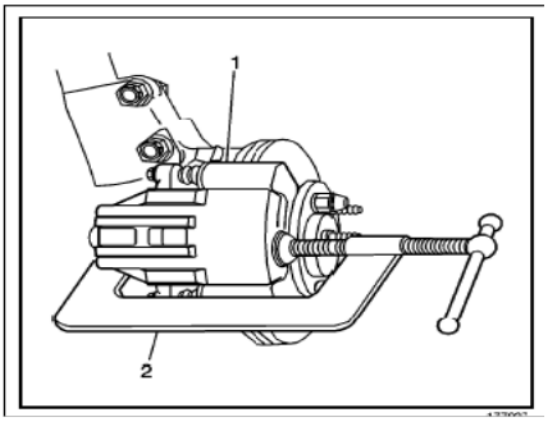
c. Mark the relative locations of wheel and hub.

d. Refer to tire and wheel removal and installation to remove the front tire and wheel assembly.

e. Unscrew the fixing bolt of brake caliper



f. Fix a large C-shape clamp 2 onto the top of brake caliper, and press it to the back of external brake lining.



g. Tighten the C-shape clamp till the caliper piston is pushed to an adequate depth in the caliper cylinder sleeve so as to make the brake caliper slide out of the brake disc.

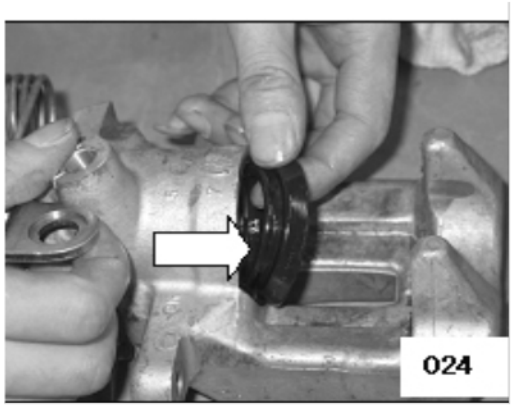
h. Remove the fixed bracket of the lining thickness sensor harness.

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i. Refer to the replacement of brake lining.

j. Remove the dust cover of oil cylinder.

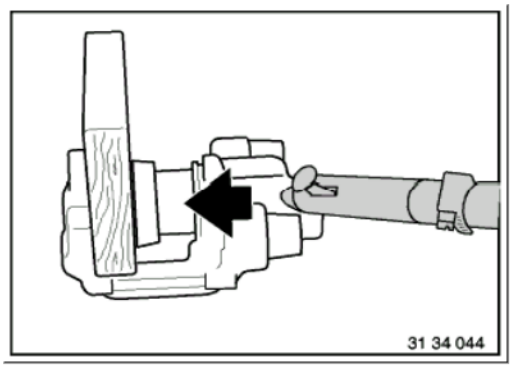
Remove dust cover from oil cylinder by screwdriver.



k. Remove the piston

(a) Use a piece of wood board to stop the piston, put the board between pistons, and then insert the lining from one side.

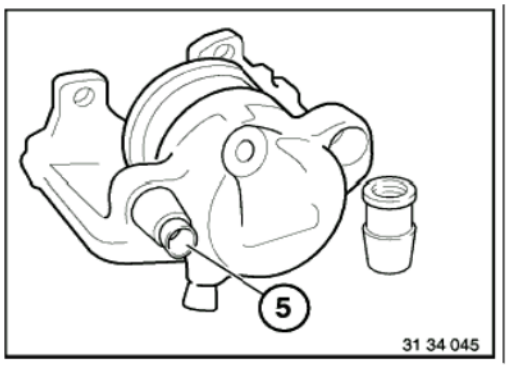
(b) Use compressed air to carefully squeeze out the piston through switch port. Put a shield (for example, hardwood) at the notch of brake caliper to protect the piston. Never hold the piston by finger, as it is too dangerous!



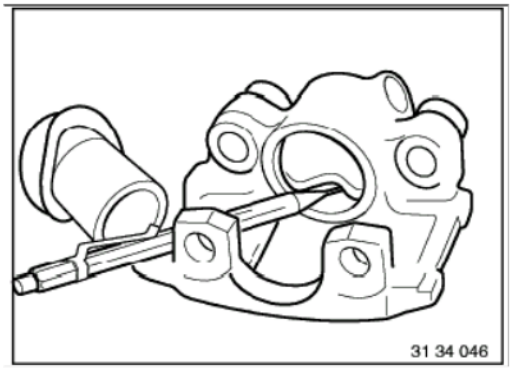
l. Inspect the guide sleeve (5)

When manually push the guide sleeve, it must be smooth. If stagnation or heaviness occurs, please replace the guide sleeve

Note: Grease shall be applied to the guide sleeve when assembling.



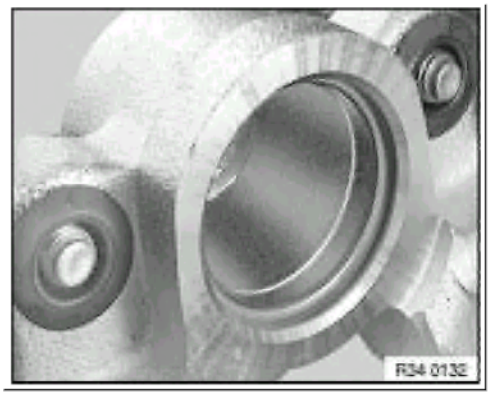
m. Remove the seal ring via plastic pin carefully. Use alcohol to clean the brake cylinder and parts, and apply compressed air to blow it dry. Check through the surface of brake cylinder, piston and flange. Never carry out mechanical machining to brake cylinder and piston.



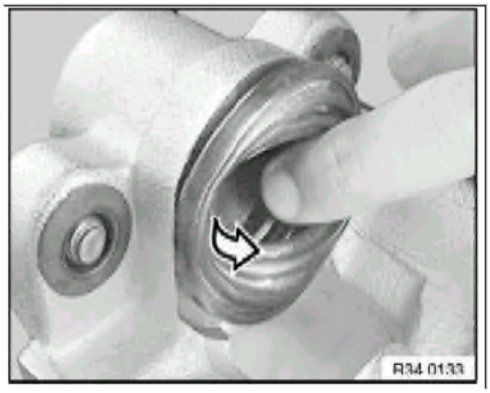
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2) Installation

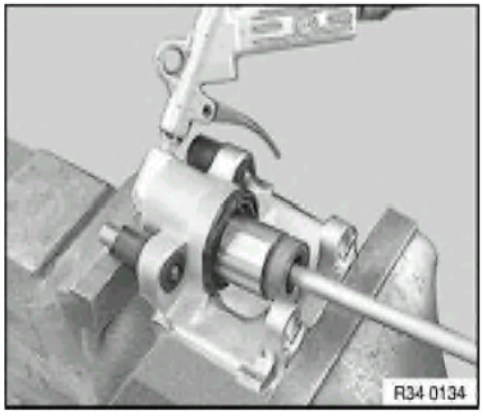
a. Bray brake cylinder grease on the cylinder, stud plug and seal sleeve, and then fix seal ring in the ring slot at the tail of brake cylinder. Finally fix the dust seal ring into the front ring slot and press the overall seal ring into the ring slot.



b. The area between dust seal ring and brake caliper house must be kept dry. Never contact brake cylinder grease or brake fluid to ensure the dust seal ring properly located.



c. Use extended piece sold in the market to fix the brake piston and gently press it onto dust seal ring, and then blow dust ring via compressed air (maximum 3bar). Finally fix the sealing ring over the brake piston.



d. Use brake fluid to soak the dust seal ring and brake piston to enable the seal ring to past through the piston easily.

7. Inspection and Replacement of Brake Lining

For all of the Chery vehicles, genuine brake linings shall be used for replacement to prevent from affecting braking performance.

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i **Removal**

1) Lift and properly sustain the vehicle to remove trim board.



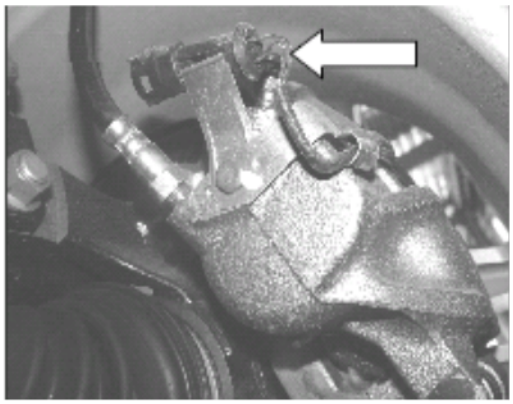
Note: prevent the front surface of the trim board from scraping ground after dismounting the trim board.

2) Unscrew the five fixing bolts of the wheel and then remove the wheel.



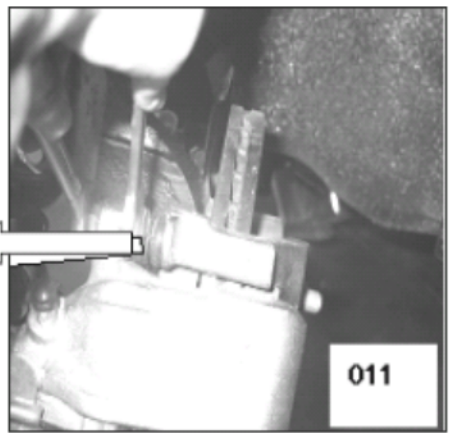
Torque: 120N.m
Note: The tightening torque of tire bolt shall be highlighted.

3) Unscrew the fixing bolt of the harness of the lining wearing indication lamp, and then pull out the plug of lining thickness warning lamp. (Remark: the plug of lining thickness warning lamp is a kind of preset one.)



4) Loosen the guide bolt above brake caliper (a), and then loosen the guide bolt below brake caliper. And finally take out the brake caliper. Never connect brake caliper with brake hose to prevent from brake hose damage.

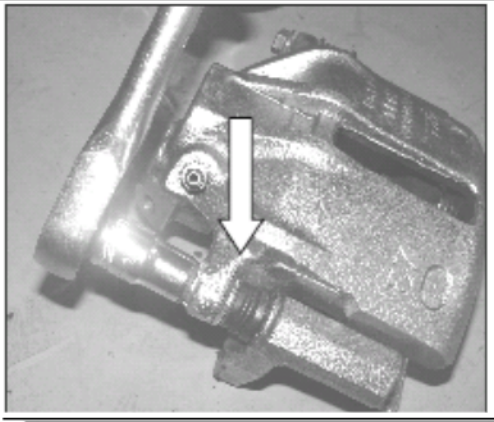
(a)



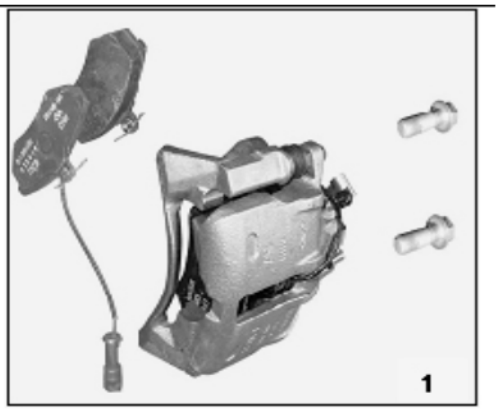
Installation instructions:
Only clean the guide bolt, but never apply grease to the guide bolt.

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Inspect screw thread to ensure there is no guide bolt damage. Waggle the brake caliper from below to the up to unscrew it. And then remove the brake lining thickness sensor harness bracket and brake caliper bracket.

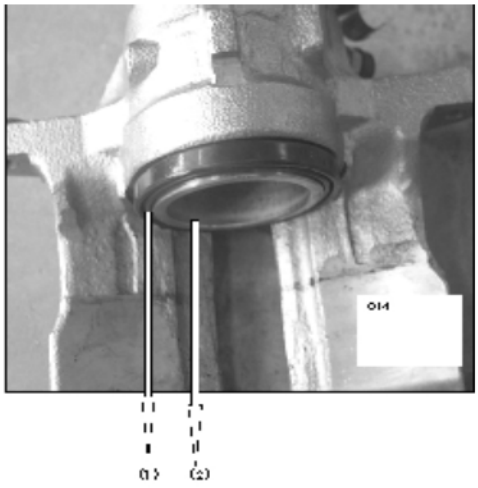


5) Remove the brake lining



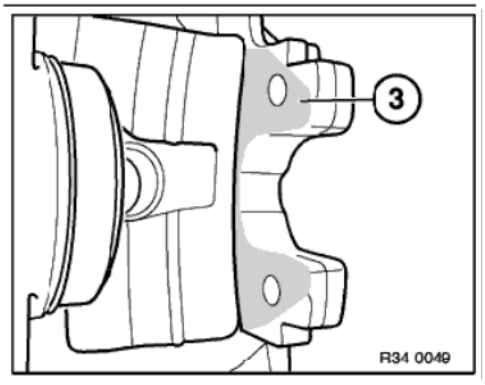
Note: mark the linings that have been subject to running in. Never replace brake disc if brake linings have side wear. Employ a new brake lining if the thickness of brake disc is equal or less than minimum thickness. Pay attention to the minimum thickness of brake lining, and then clean the brake lining. Never apply grease to the back plate of brake lining.

6) Check the damage status of dust seal ring (1) and replace if necessary. Clean the contact surface (2) of the piston, and apply muffle grease.



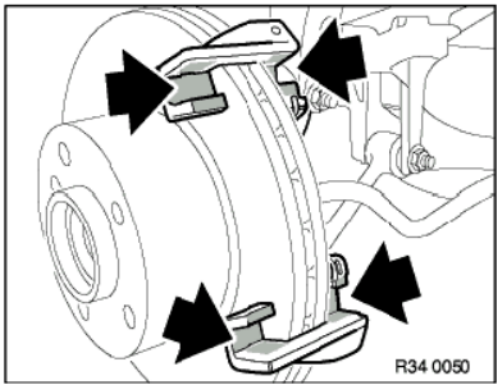
Note: dust seal ring shall not contact muffle grease to prevent from expansion.

7) Clean the contact surface (3) of brake caliper, and coat thin muffle grease on it.



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8) Clean the hammerhead-shaped guiding piece of brake caliper bracket, and coat thin grease on it.



ii Installation Procedures

Installation sequence is opposite to that of removal.

Note:

a. New brake surface needs running in after replacing the brake lining.
b. Run in the new brake surface after surface finishing or replacing the brake disc.
c. Apply the brake for 15 times at a speed of 40-60km/ h to run in the new brake lining.
d. Apply the brake pedal by intermediate or above force to prevent from brake overheating.

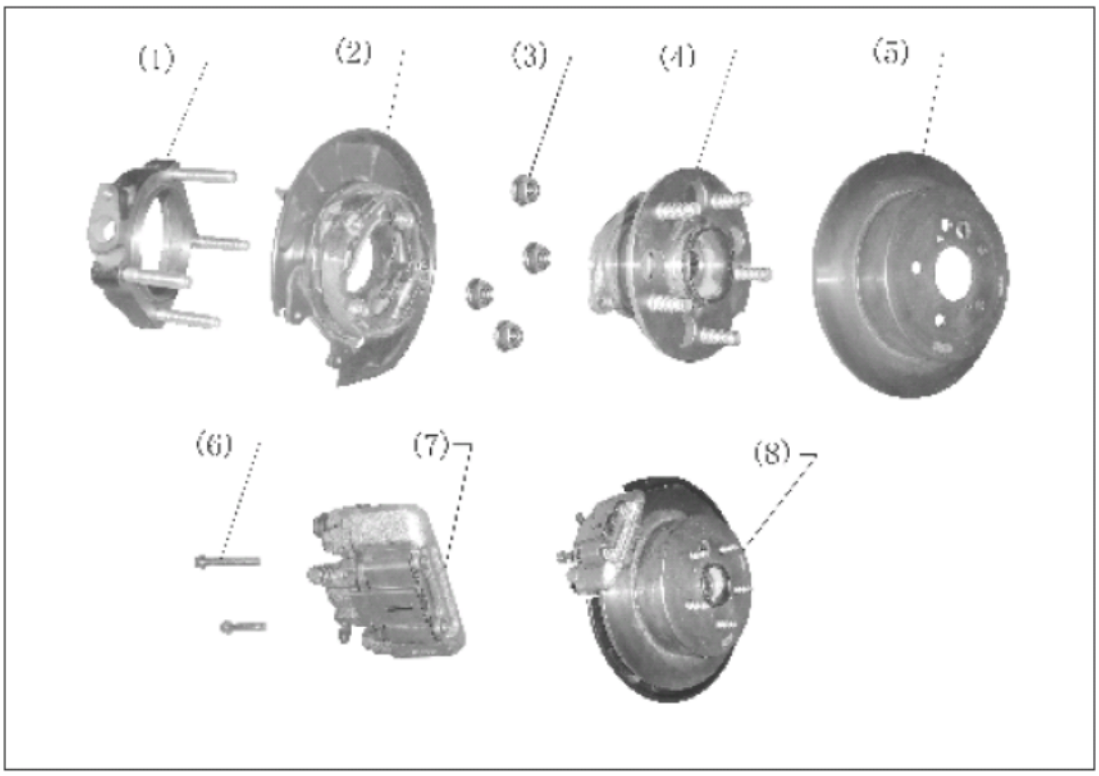
iii Diagnostic Information of Brake Lining

a. Check brake lining once per 10000 kilometers.
b. Check brake lining once as long as removing wheel or changing the tire.
c. Check the wearing condition of brake lining at both ends of caliper.
d. Inspect the thickness of internal brake lining to ensure no wear occurs to brake lining. And some brake linings have a thermal-protective coating, which is molded along with linings. Avoid wearing between the said thermal-protective coating and the uneven inside/outside linings, and inspect brake linings via caliper sight hole.
e. Brake lining shall be replaced if the thickness of worn brake lining is less than 7mm. And for brake lining that is riveted, it shall be replaced if the worn rivet head is less than 5mm.

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Ⅲ Rear Brakes

1. Assembly drawing of rear brakes



(1) Joint plate assembly
(2) Rear brake assembly
(3) Lock nut
(4) Rear wheel hub bearing unit
(5) Rear brake disc
(6) Fixing bolt
(7) Brake caliper assembly
(8) Disc brake with drum brake assembly

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2. Removal and Installation of Rear Brake Lining

Hint: after completing the operation, apply the brake for several times to run in brake lining and brake disc to ensure safety! After replacing the brake lining of rear axle, brake fluid level shall be inspected to ensure it is between MIN. and MAX.

1) Dismount trim board

Note: prevent the front surface of the vehicle from friction with ground after removing the trim board in case of scratching it.



2) Unscrew five fixing bolts of the wheel and remove the wheel.

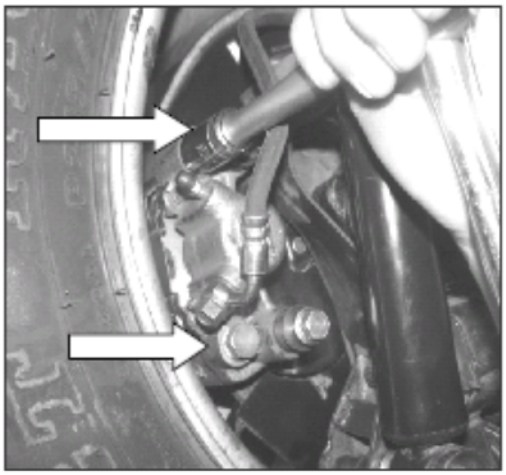
Torque: 120N.m

Note: The tightening torque of tire bolt shall be highlighted.



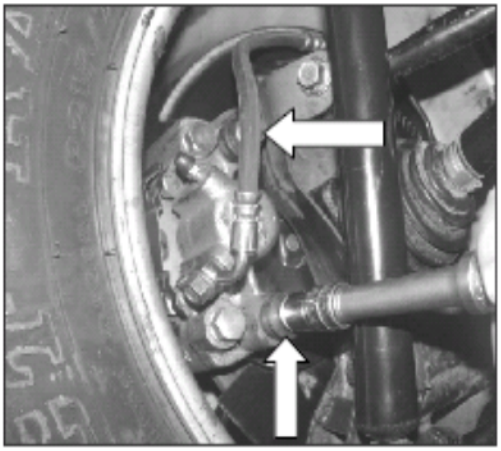
3) Loosen guide bolt and the fixing bolt of brake hose.

Inspect screw thread and replace defective guide bolt. Waggle brake caliper from below to the up and dismount it. And then hang the brake caliper by wire.



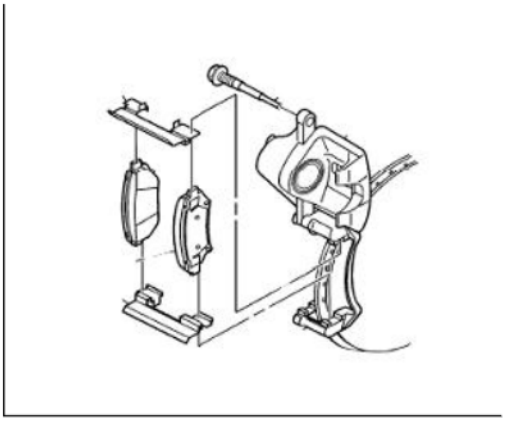
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4) Unscrew the fixing bolt of brake caliper and pull out brake caliper outward.



5) Remove the brake lining

Note: mark the linings that have been undergone running in. Never replace brake disc if brake linings have side wear. Never replace brake lining only if the thickness of brake disc is equal or less than minimum thickness. Pay attention to the minimum thickness of brake lining, and then clean the brake lining. Never apply grease to the back plate of brake lining.



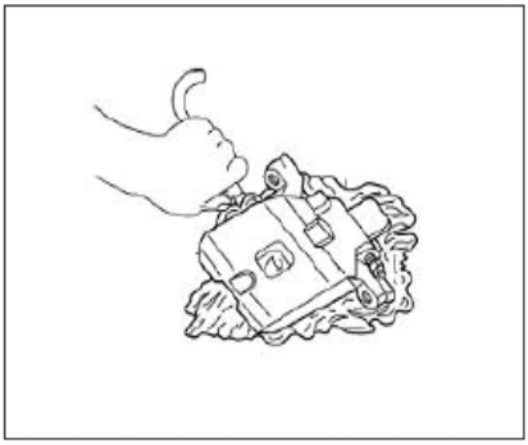
6) Check the damage status of dust seal ring and replace it if necessary. Clean the contact surface of the brake piston, and apply thin muffle grease on it.

Note: dust seal ring shall not contact muffle grease to prevent from expansion. To prevent from severe vehicle body damage due to piston flying off, never put finger before caliper piston to attempt to seize or protect it when using compressed air.



7) Remove piston

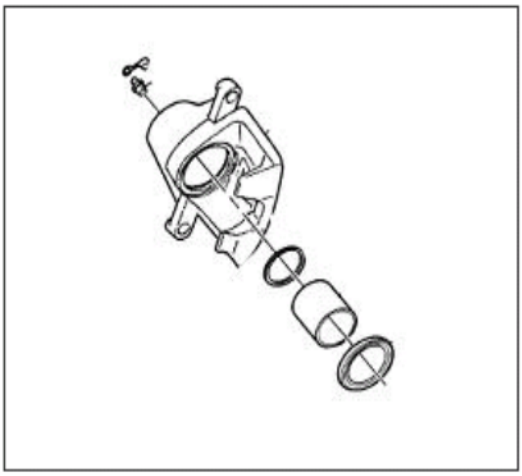
Blow compressed air into the caliper inlet, then the piston will be pulled out of piston shield.



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8) Inspect the piston to see whether there are scratch, crack, erosion, plating wear or damage, etc. And replace it if necessary.

Hint: The installation procedure of lining is opposite to that of removal!



3. Replacement of Rear Brake Disc

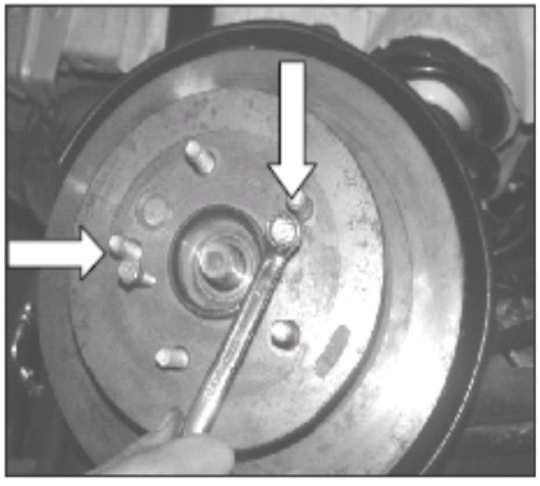
i Removal

1) Remove the tire.

2) Loosen the fixing bolt of brake caliper assembly, then remove the brake caliper and tie it to one side.

Hint: keep brake lines connectted.

3) Use two bolts to tighten it to the brake disc through two preset holes, and then remove the brake disc.



Caution: never knock the friction ring via a hammer or equivalences when removing the brake disc.

ii Installation

Replace the fixing bolts of brake disc. And thoroughly clean the contact surface of wheel hub, and then eliminate the erosions if necessary. Uneven contact surface will result in brake disc deformation!

Caution: Never perform surface finishing for brake disc for the purpose of solving the following troubles.

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- ☐ Brake noises, for example, roar or squeal
- ☐ Undue wear of brake lining
- ☐ Brake disc surface erosion
- ☐ Brake disc fading

Only under the circumstances of one or a combination of the following items can the brake disc is subject to surface finishing:

- ☐ Grave scratches on brake disc surface and the depth exceeding specification.
- ☐ Brake jump due to the following conditions:
  - Transverse jump exceeds limit.
  - The thickness deviation of brake disc exceeds specification.
  - Erosion or pitting penetration exceeds brake disc surface.

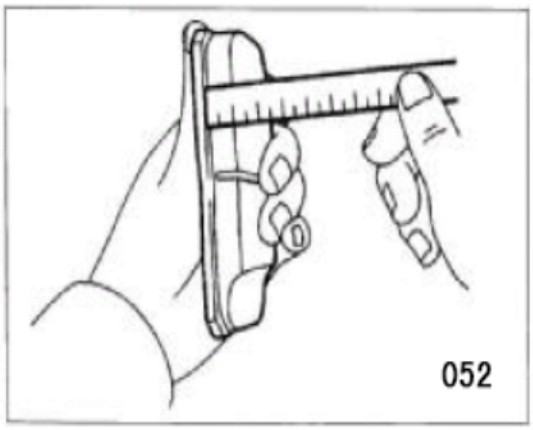
Remark: Please refer to the overhaul of front brake disc to inspect the brake disc.

4. Rear Brake Parts

1) Inspection and maintenance

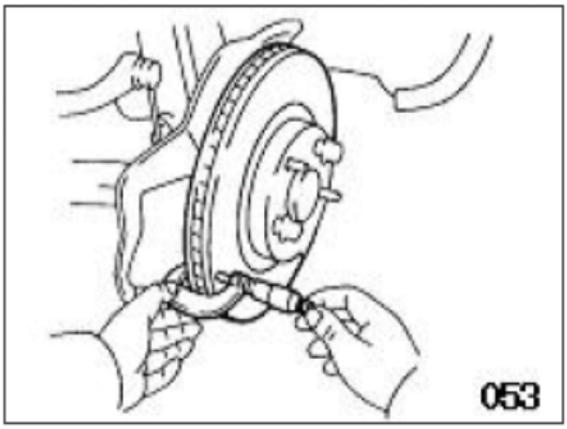
a. Measure the thickness of brake lining pad.

Measure the thickness of brake lining pad via ruler. If the thickness of lining pad is less than or equal to minimum value, or the wear is severely non-uniform, the lining pad shall be replaced.



b. Measure the thickness of brake disc.

If the brake disc thickness is equal or less than minimum thickness value, please replace the brake disc. If there is scratch or irregular wear on the brake disc, the brake disc shall be grinded and finished via machine tools or even replaced.

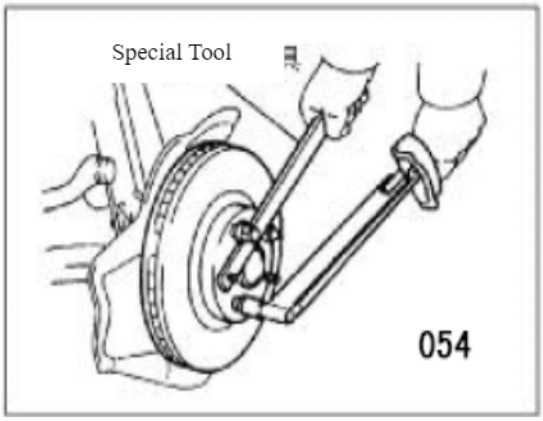


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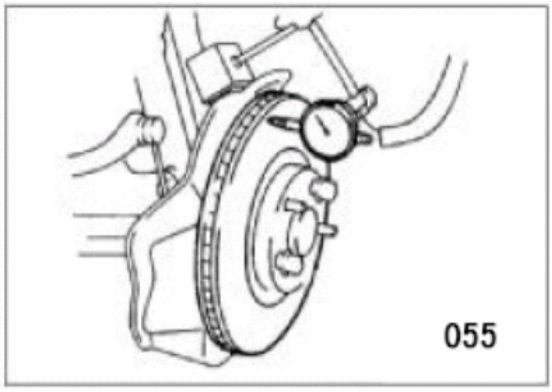
c. Measure the run-out of brake disc.

(a) Tighten the brake disc via two hub nuts.

Hint: special tools shall be used to clamp the brake disc when measuring the run-out value.
Torque: 120N.m



(b) Measure the run-out value of brake disc via micrometer at the location where is 10mm away from disc exterior margin. If the run-out value of brake disc is equal or more than the maximum value, inspect the axial clearance of bearing and the run-out of vehicle axle wheel hub. If bearing free play and the run-out of vehicle axle and hub are in good condition, adjust the run-out value of brake disc.



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Ⅳ Installation of Parking Brakes

1. Replacement of Parking Brake Shoes

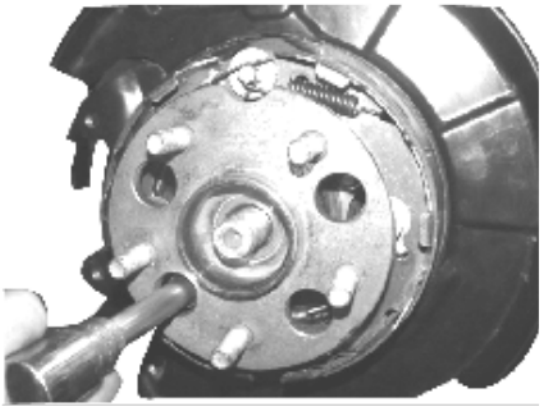
1) Removal

a. Remove the tire.

b. Remove brake caliper, and refer to the section of "Disc brake" to replace the bracket of brake caliper.

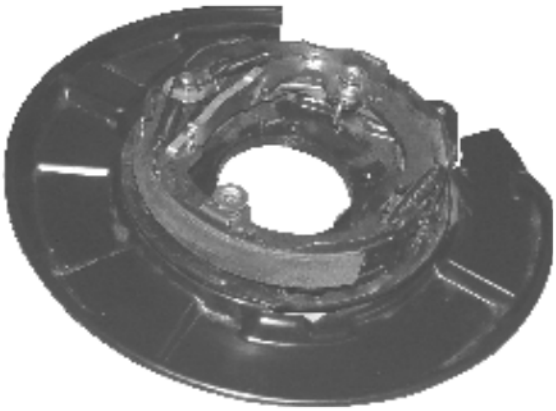
c. Refer to the replacement of brake disc to remove rear brake disc.

d. Remove the rear wheel hub units.

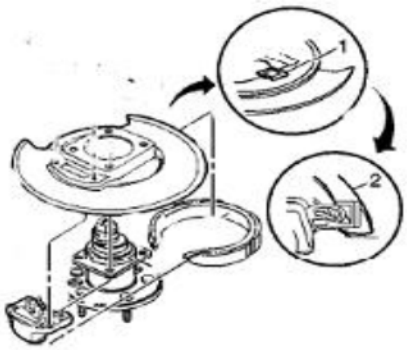


Remark: properly align the four holes in the brake hub units to the corresponding fixing bolts of brake elements.

e. Remove the actuator of parking brake.



f. Remove the brake shoes.



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2) Installation

a. Fix the brake shoes and linings.

Note: Ensure brake shoes and parking brake is well engaged.

b. Install the actuator of parking brake

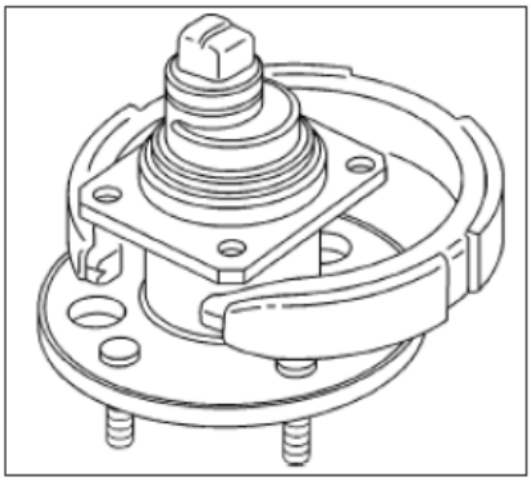
c. Refer to the replacement of wheel bearing/hub of rear suspension to install rear wheel hub.

d. Adjust the rear parking brake shoes.

e. Refer to the replacement of brake disc to install rear brake disc.

f. Refer to the replacement of brake caliper bracket in disc brake to install rear caliper bracket.

g. Adjust the parking brake.



2. Adjustment of Parking Brake Shoes

Necessary adjusting tools

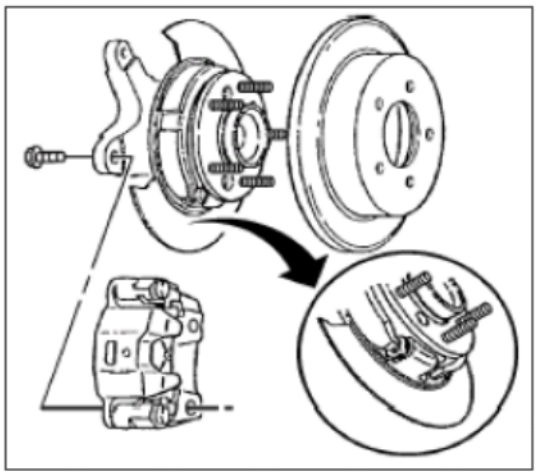
J21177-A gap gauge for brake drum and brake shoes

a. Refer to the replacement of brake caliper bracket in disc brake to remove caliper bracket.

b. Remove the brake disc.

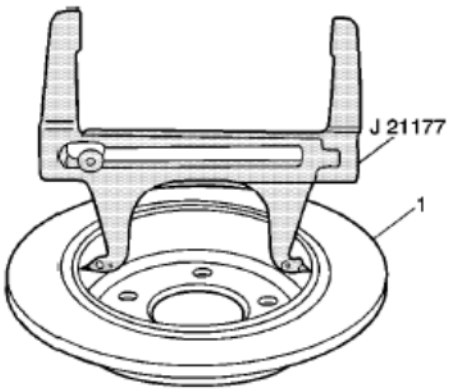
When pulling out the brake disc from wheel hub, please slowly turn the brake disc.

c. Loosen the adjusting nut on the cable of parking brake to keep the bar at a stop position.



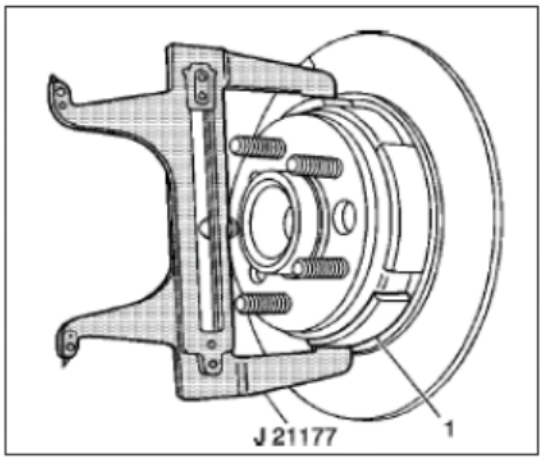
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d. Adjust J21177-A to contact the inside diameter of brake disc.



e. Put J21177-A at the widest area of the clearance between brake shoe and lining.

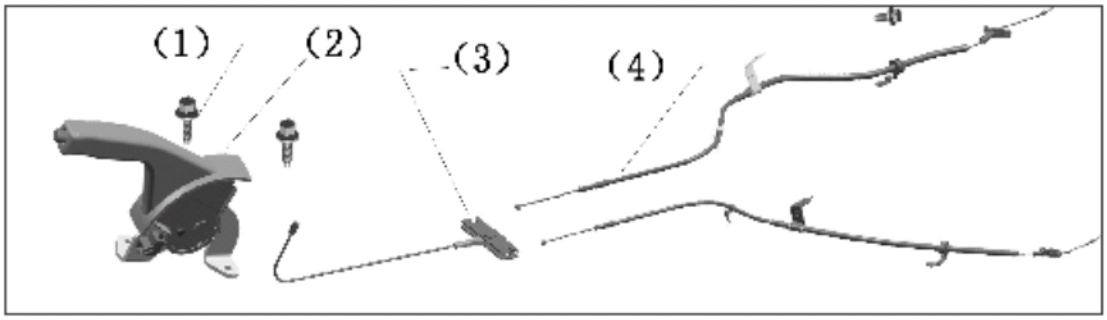
f. Turn the adjusting nut till the brake shoe and lining 1 barely contact J21177- A.



g. With respect to the brake disc of the opposite side, please repeat the above-mentioned procedure 2 to 5.

h. Adjust the adjusting nut on the cable of rear parking brake, and then install brake disc and brake caliper.

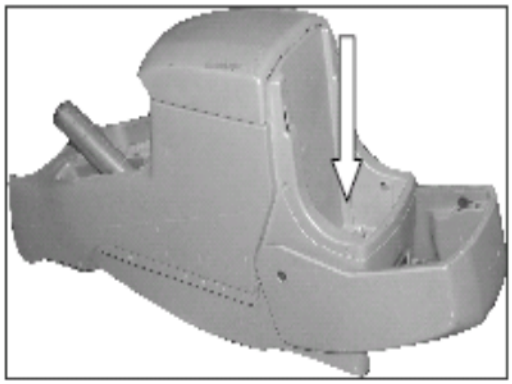
3. Replacement of Parking Brake Cable



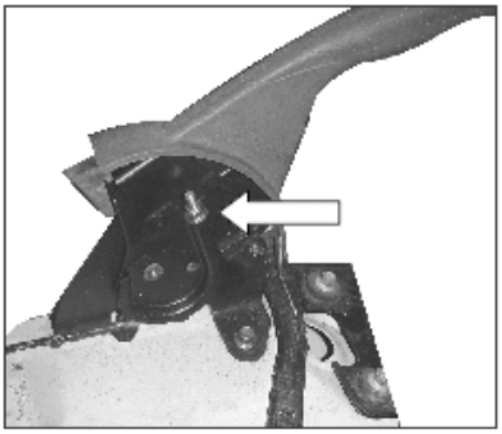
(1) Fixing bolt of hand brake maneuver mechanism
(2) Hand brake maneuver mechanism assembly
(3) Hand brake front cable assembly
(4) Hand brake cable assembly

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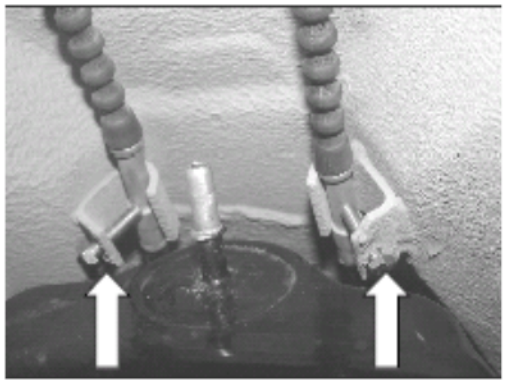
a. Remove the handrail case.



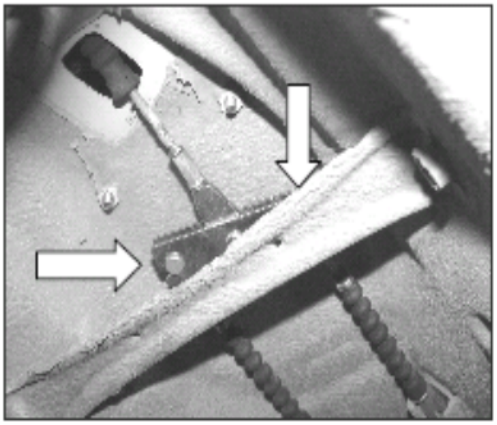
b. Loosen the adjusting bolt of hand brake.



c. Loosen the fixing bolts of right and left cable.

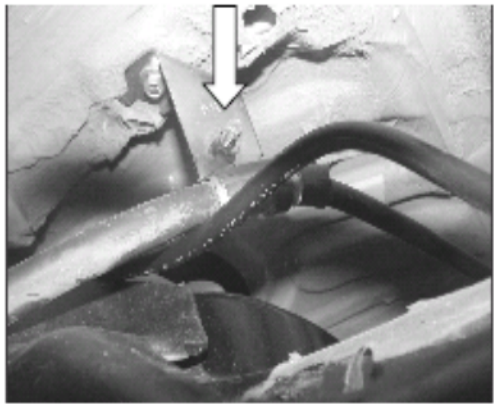


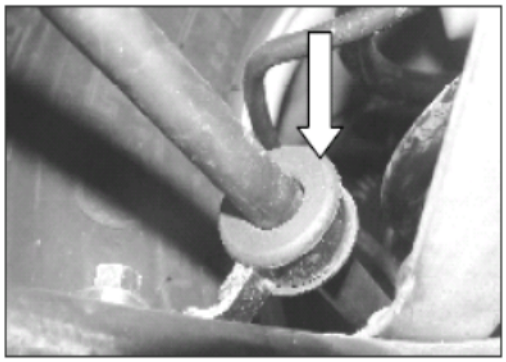
d. Loosen the hand brake cable.



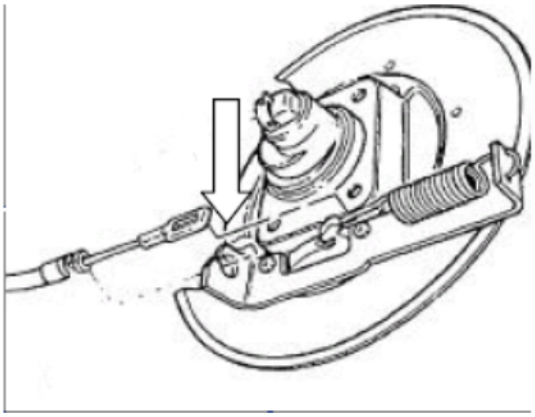
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e. Unscrew the fixing bolts of right and left hand brake cable.





f. Remove the hand cable from the actuator of brake.



Hint: the installation procedure is opposite to that of removal!

Remark: the parking brake shall be adjusted after replacing brake shoes or hand brake cable.

- ☐ Loosen the parking brake handle.
- ☐ Forcibly step on brake pedal once.
- ☐ Pull the parking brake handle up by four teeth.
- ☐ Tighten the adjusting nut till the two wheels cannot be turned by hand.
- ☐ After completing the above procedures, loosen the parking brake to inspect the two rear wheels to see whether they can be turned freely. Otherwise the above process of adjustment shall be repeated.

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Ⅴ Removal of Brake Master Cylinder

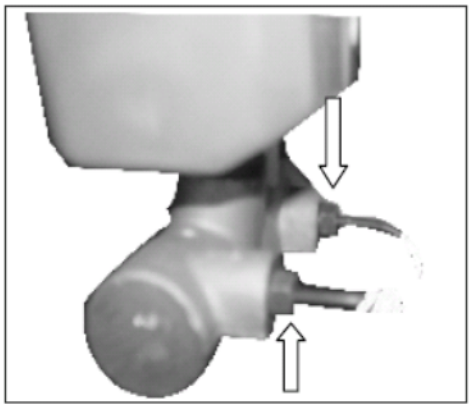
1. Removal of Brake Master Cylinder

a. Disconnect the electric joint of fuel level gauge.

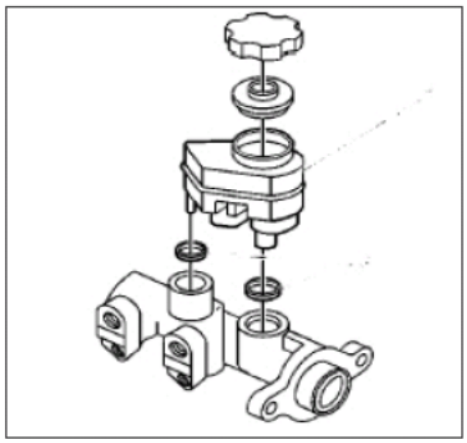
b. Drain the brake oil via suction hose.

Remark: avoid splashing brake oil onto skin or vehicle finish, as it has comparatively strong corrosiveness!

c. Loosen the brake lines of brake master cylinder.

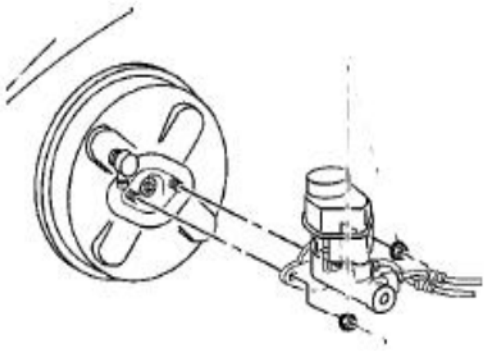


d. Remove the liquid reservoir.



Remark: straightly push the liquid reservoir body upwards so as to dismount is from the master cylinder body. And then remove O-ring from the reservoir flute. Inspect the liquid reservoir to avoid crack or deformation, and replace it if necessary. Then clean the reservoir via denatured alcohol. Finally dry the liquid reservoir by oil free compressed air.

e. Unscrew the retaining nut of brake master cylinder.



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2. Disassembly of Brake Master Cylinder

a. Refer to the removal instruction to remove the brake master cylinder.



b. Clean the liquid reservoir cover.

c. Remove the liquid reservoir cover and membrane element.





d. If there exist the following damages, please replace liquid reservoir cover and membrane element 3.
   - ☐ Kerfs
   - ☐ Rupture
   - ☐ Scratch
   - ☐ Deformation

e. Remove the liquid reservoir of master cylinder.

f. When removing the clamp holder, in the mean time, the primary piston shall be pressed downward. Be cautious to avoid damaging the following parts:
   - ☐ Piston
   - ☐ Cylinder sleeve
   - ☐ Groove of clamp holder

g. When other external tapping is jammed, please feed low-pressure and non-lubricated compressed air into the upper outlet of hole closed-end. When removing the following parts, the above described operation procedures must be performed.
   - ☐ Primary piston
   - ☐ Auxiliary piston
   - ☐ Spring
   - ☐ Spring retainer

h. Remove the seal and spring retainer from the secondary piston.

i. Inspect the master cylinder to avoid scratch or erosion, if damage occurs, please replace the master cylinder. And never employ abrasive in the holes.

j. Clean all of parts in uncontaminated denatured alcohol.

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k. Dry the parts by oil free compressed air.

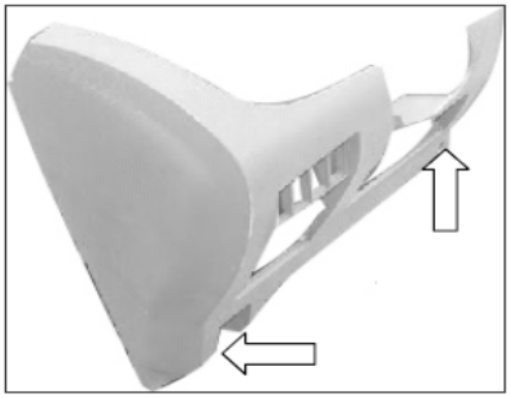
Remark: the installation procedure is opposite to that of removal!

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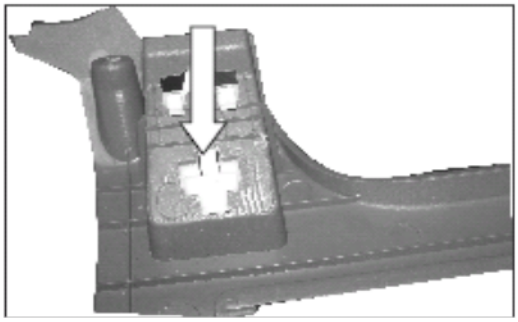
Ⅵ Brake Booster and Brake Pedal

1. Removal of Brake Pedal and Vacuum Booster.

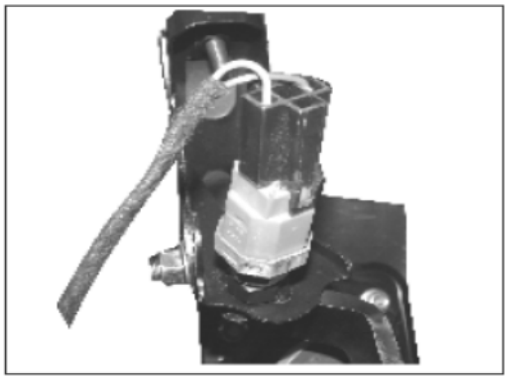
1) Unscrew the two fixing bolts of the plate that is left and downward to the instrument panel.



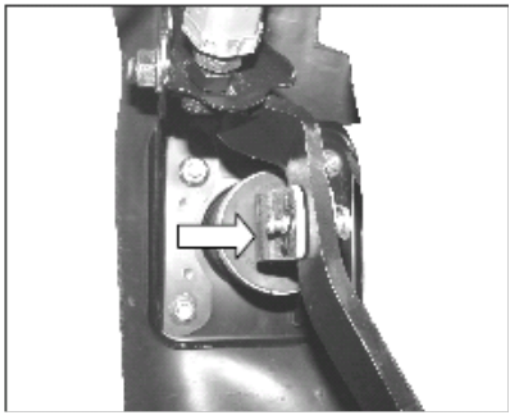
2) Forcibly press and remove the handle assembly of front engine cover then disconnect four switch plugs and finally remove the instrument shield.



3) Disconnect the plug of brake lamp switch and then remove it.

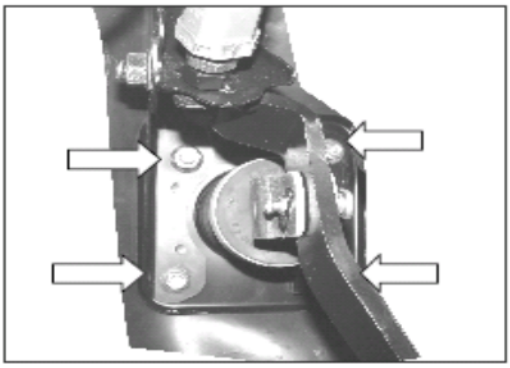


4) Loosen the connecting pin of vacuum booster pump and brake pedal and then remove the pin.

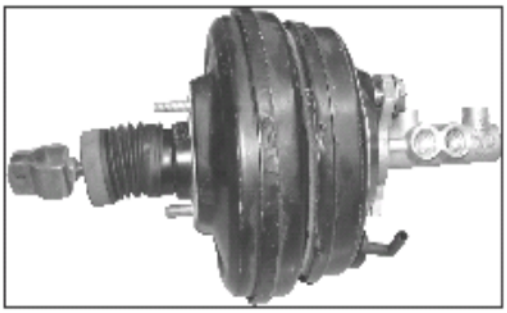


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5) Unscrew the four fixing bolts of brake pedal bracket.
6) Remove the bracket of brake pedal.



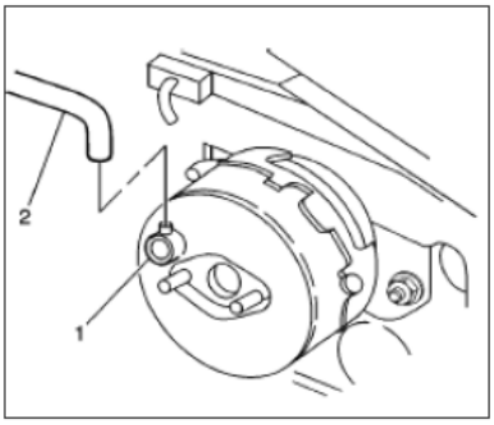
7) Remove the vacuum tube, and refer to the section of removal of booster master cylinder to remove the vacuum booster.



Remark: the interior parts of booster cannot be repaired and the housing shall not be split. Because splitting the housing may result in permanent deformation and improper boosting capacity.

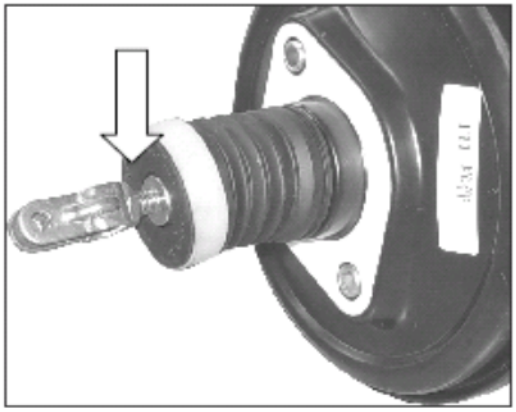
8) Replacement of cone-way valve of vacuum booster.

Note: the vacuum cone-way valve and seal ring can be inspected without demounting the booster from vehicle.



a. Disconnect the vacuum hose of brake booster via vacuum cone-way valve.
b. Disconnect the vacuum cone-way valve of brake booster from the booster.
c. Remove the vacuum cone-way valve seal ring from the brake booster.

9) Loosen the adjusting bolt and adjust the brake pedal to specified height.



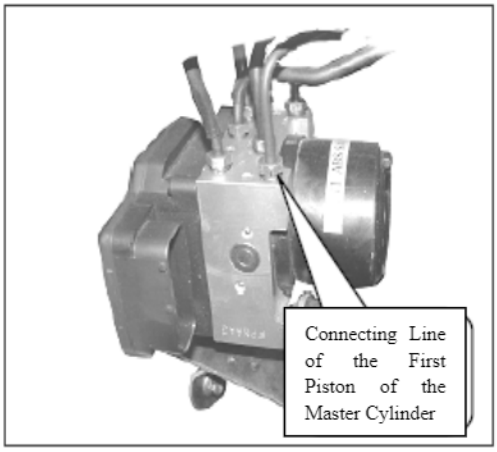
Remark: after finishing the above procedures, the installation procedure of vacuum booster and brake pedal is opposite to their removal and mounting procedures.

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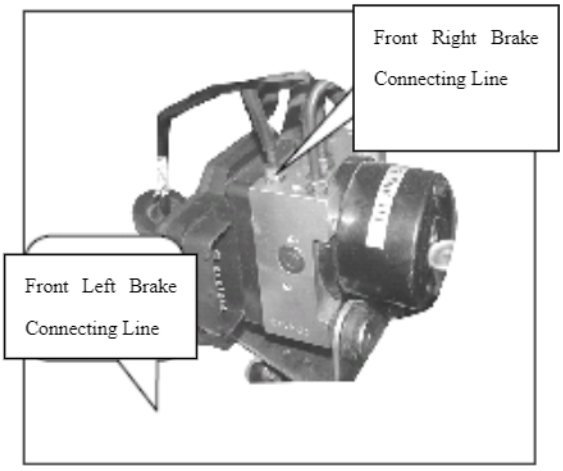
Ⅶ Installation and Removal of Brake Line

Note: double-wall steel brake line shall be employed when replacing the brake line to avoid brake system malfunction. Properly layout and replace the brake line, and then fix the new brake line to the original location. Inadequate layout or fixing may damage the brake line, and it may result in poor braking effect or malfunction.

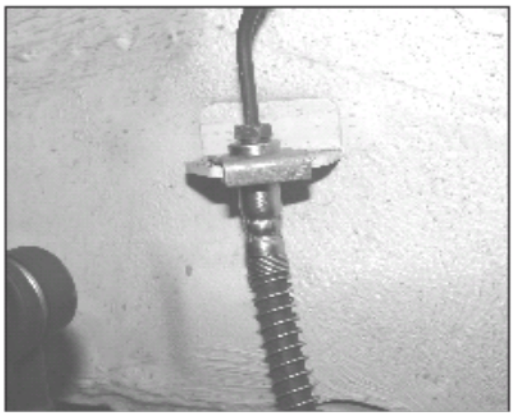
1) Removal of brake's master cylinder and ABS controller assembly lines.



2) Removal of brake line.
   a. Loosen the connecting bolt of ABS hydraulic unit.

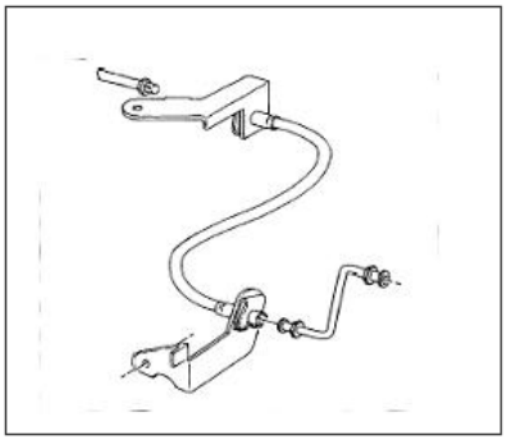


   b. Remove the fixing clip of vehicle body and the fixing bolts of brake line.

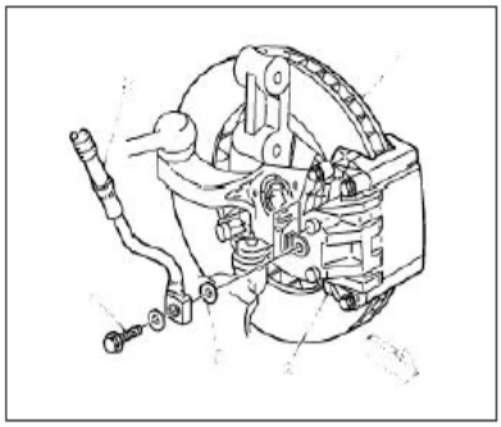


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3) Removal of brake hose
   a. Lift the vehicle to remove the tires.
   b. Employ sustaining spanner to clamp the hose coupling, and then remove the brake line from the brake hose bracket. Please never bend or break the brake pipeline or bracket.
   c. Remove the clip of clamp holder on the hose assembly bracket.
   d. Remove the hose from the bracket.



4) Remove the following parts from caliper: brake hose bolt, hose, and two washers (Remark: They shall be replaced when installing).



Caution: prior to achieving reliable brake pedal travel, never move the vehicle. And air in the brake line may result in poor braking effect or brake malfunction.

Remark: never suspends parts onto brake flexible hose, because this may damage the hose. Never bend or break any section of the brake hose to avoid brake fluid leakage from any parts.

Remark: brake lines shall not disturb vehicle body.

Tightening torque of brake joint bolts shall be as below:

M12×1: 16~20N.m

M11×1.5: 13~17N.m

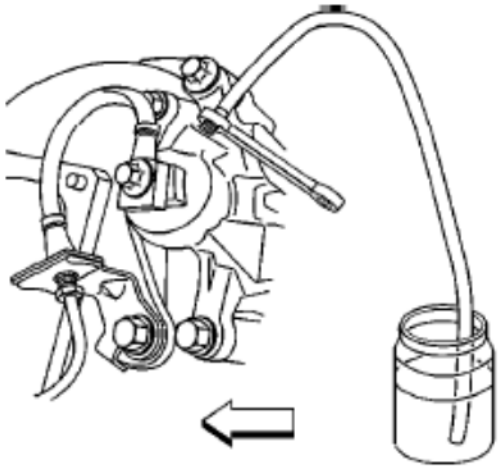
M10×1: 10~14N.m

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Ⅷ Filling and Bleeding of Brake Fluid

Hint: if air enters brake system when repairing or replacing brake parts, a complete exhaust procedure shall be performed. Prior to performing brake bleeding, front and rear exhaust cylinder pistons must return to the highest position; and the preferred method is to employ malfunction analyzer to perform the returning procedure. If the malfunction analyzer is not available, adopt the second procedure. However, it must be operated strictly in accordance with the above-described procedures. If air comes into the brake line due to the liquid level is too low, or the master cylinder brake lines are disconnected, all of the four braking hydraulic systems must be bled. If brake hose or brake is disconnected at some wheel, only bleeding the caliper of that wheel. If any joint of brake line or hose between master cylinder and brake is disconnected, only bleeding the disconnected line or the brake system that is related to the hose.

1) Bleeding of brake system
   a. Lift and properly sustain the vehicle.
   b. Fix the transparent plastic bleeding hose onto the bleeding valve of brake caliper.
   c. Immerge the other end of transparent plastic bleeding hose into a clean vessel containing part of clean brake.
   d. Slowly open the bleeding valve to allow the brake fluid flow.
   e. Shut off the bleeding valve when bubble does not appear in brake fluid any more.
   f. Remove the transparent plastic bleeding hose from bleeding valve.



Remark: the above procedures are applicable to the bleeding of brake line.

2. The bleeding sequence of brake system shall be: back, right, left, front, right back and left front. If ABS system is available, link the malfunction analyzer and start fluid filling and air bleeding procedure till completely bleeding the air in the ABS system.

3. Perform air bleeding to the brake loop.

Joint the bleeding hose that has vessels to the bleed and bleeding valve of rear-left brake caliper. Open the bleeding valve, then push the brake pedal to the bottom for quite a few times. The discharged brake fluid must be clean and free of bubbles. Then keep the brake pedal to the bottom and cut off the bleed and bleeding valve. Finally release the brake, and the similar operation can also be performed to the brakes of other wheels.

4. Brake fluid filling

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To ensure the reliability of brake during cruise, please do not forget to inspect the level of brake fluid at intervals or after bleeding the brake system. And refill brake fluid in time if necessary.

Note:

1) Brake fluid shall conform to the standard (only apply DOT4) stipulated by Ministry of Transportation (DOT) of PRC, in addition, brake fluid shall not be blended with other types of brake fluid for application.
2) Brake fluid has very strong hydroscopic property, so its recovery shall be operated inside an original packaging sealed container.
3) Brake fluid has comparatively strong corrosiveness, if it splashes onto skin, please use wet cloth to clean it immediately, and then use soap and water to thoroughly clean the skin. Brake fluid also has strong corrosion against vehicle body paint, therefore, never splash brake fluid onto vehicle finish. If it happens, flush it immediately.
4) Observe the brake fluid level inside the reservoir during the bleeding process, if it is very low, add brake fluid in time.
5) If manually bleeding the air, it shall be repeated for several times till all of the air inside the brake system has been bleed.
6) After completing the liquid filling and bleeding operation, inspect the brake system to avoid leakage. If leakage occurs, please handle it in time to ensure cruise safety.

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Section Ⅱ Anti-block Brake System

Ⅰ General Description

The ABS of T11 is supplied by Mando Auto Spare Parts Co., Ltd (South Korea). MGH-20 dry-type product employs four-channel control technology, and by means of collecting the wheel speed data, the ABS electronic control unit can perform independent control to each wheel brake pressure. When ABS warning lamp is on, malfunction diagnosis and maintenance can be done via diagnostic device.

Precautions of maintenance:

1) Prior to performing electric welding, disconnect the harness plug from electronic brake control modular.
2) The parts of antilock brake system are exceptionally sensitive to EMI, so please be cautious to all of the location, installation and positioning of the parts of ABS and pay close attention to wiring, joints, clips and brackets, etc.
3) Never employ quick charger to charge the battery that enables engine start-up, or still connects to the engine, to avoid battery malfunction or damage to the parts of ABS.
4) Shut off ignition switch to turn off the battery.
5) Cut off ignition, and then disconnect the harness plug from electronic brake control modular.
6) Never attempt to repair any parts of ABS, as all of the parts can only be replaced.
7) Never hang the suspension parts on the harness of wheel sped sensor to avoid harness damage.
8) Never put electronic brake control modular at a gear ring environment that is higher than 85°C (184 F).
9) Never use petroleum-based liquid in brake master cylinder, nor employ vessels that ever contain petroleum-based liquid. Because petroleum may make the rubber parts of brake fluid system swollen or deformation, bring water into the system, or lower the boiling point of liquid.

2.1 Precautions of Removal and Installation

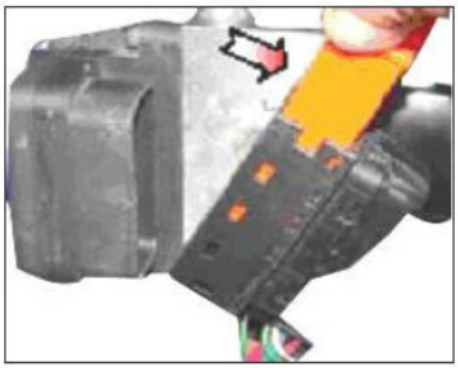
1) Find out the malfunction causes using analyzer and then repair it.
2) Only unpack the spare parts prior to installation.
3) Only use genuine parts supplied by the original manufacturer.
4) Be cautious to the cleanliness when performing maintenance, and always employ non-wool cloth to wipe it.
5) Prior to maintenance, employ mineral oil free cleaner to clean the surface.
6) Never employ compressed air or move the vehicle when the system is running.
7) Proper plugs shall be used to clog all of the hydraulic outlets after removing ABS assembly.
8) Remove other parts that may disturb its normal operation.
9) Please employ DOT 4 brake fluid but never use mineral oil.
10) Use brake fluid but not engine oil or brake oil/ grease to soak sealing elements and O-ring.
11) Inspect the conventional brake system and ABS function after finishing maintenance.
12) Inspect all of hydraulic pipe joints to avoid any leakage.

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2.2 Removal of MGH-20 Assembly

1) Shut off ignition switch and then disconnect the negative wire of battery.

2) Remove the harness plug from ABS control unit assembly.



3) Push down the pedal by more than 60mm and use pedal bracket to clamp it. In this way to shut the center valve of master cylinder and avoid brake fluid from flowing out of the outlet when starting the system.



4) Remove the brake hard tube on HCU firstly, then mark it and immediately block the outlet by plug.



5) Loosen the bracket bolt of ABS control unit.



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2.3 Installation of ABS Assembly

Caution: only when mounting brake hard tube can the hydraulic opening plug of ABS assembly is taken off so as to avoid impurities coming into the brake system.

1. Mount the ABS assembly onto the bracket, and the tightening torque shall be 16~24Nm;
2. Remove the plug in the hydraulic opening and mount the brake hard tube, and then confirm that the hard tube connection is correct.
3. Mount the brake hard tube that leads to master cylinder, and the tightening torque of brake hard tube shall be 8~16Nm and 12~18Nm respectively.
4. Fill new brake fluid into liquid reservoir till the level reaches MAX, and then bleeding in accordance with specified method.
5. When turning the ignition switch to ON, the ABS warning lamp will be on for 3.7 seconds as well, and then it will be off.

2.4 The Bleeding and Oil Filling after Replacing HECU

1. Employ HECU (wet type) that is used for after-sales service as substitution, and then turn the ignition switch to the position ON, finally use analyzer to check if malfunction code exists.
   - If there exist malfunction codes, firstly eliminate the malfunction code via analyzer.
   - If it fails to eliminate the malfunction code, refer to "Malfunction Maintenance" for inspection.
2. Step on the brake pedal, and unscrew the venting bolts of brake caliper or drum brake of all of the wheels for air bleeding.
   - The oil storage tank of master cylinder shall connect to a device, which can continuously supply brake fluid so as to ensure the oil storage tank is always full.
   - The operation shall not be stopped until there is no air in the brake fluid, which comes through the venting bolt. In addition, the brake pedal shall be adequately stiff (the same as the bleeding /oil filling operation of the brake system without ABS).
3. Measure the pedal stroke, if it does not conform to specification, repeat the operation as described in item (2).
   - Repeat the two operations above for over 10 times, if the brake pedal stroke does not conform to specification, rerun it after replacing and mount the HECU (wet type) that is used for after sales service.
   - If the brake pedal stroke conforms to the specification, terminate the bleeding / oil filling operation.
4. Precautions of bleeding / oil filling:

   Run the ABS and if found brake pedal soft, then use analyzer to perform bleeding mode operation. If there is no counterforce when applying the brake pedal, repeat the action of applying/releasing the pedal till terminate bleeding mode.
   - Bleeding mode: repeatedly start-up/stop the control unit of HECU with 2-second intervals, and close solenoid valve for 1 minute, then keep the drive motor running.
   - After the bleeding mode operation, the operation of item 2 and 3 must be performed.

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Ⅱ Diagnosis and Maintenance of ABS

2.1 Summary of Operating Principle of ABS

Wheel speed sensor collects the signals of wheel speed, and then transmits to the electronic control unit, which works out each wheel speed, and finally calculates vehicle deceleration as well as the slip rate of wheel. According to the calculated parameters, the ABS electronic control unit regulates the brake pressure in the braking process via hydraulic control unit so as to achieve wheel lockup. When ABS is out of service, electronic braking force distribution system still can regulate the braking force of rear wheel to guarantee that the rear wheel will not be locked before front wheel, thus to ensure wheel safety. Once the ignition switch is turned on, ABS will proceed self-checking. If malfunction occurs, electronic control unit will automatically deactivate ABS function and turn on ABS warning lamp. In this case, brake system will run as without ABS.

2.2 Regulating Process of ABS

The regulating process of wheel brake pressure is as below:

1) Pressurizing phase: when braking, the brake pressure will be generated via vacuum booster and master cylinder. In this case, the normally open valve opens, and the normally closed valve closes, then brake pressure gets into wheel brake, and the wheel speed is quickly reduced till the ABS electronic control unit identifies that wheel tends to lock up via speed sensor.
2) Pressure maintaining phase: when the ABS electronic control unit identifies that wheel tends to lock up via speed sensor signals, the control unit will close the normally open valve immediately. In the mean time, normally closed valve will be still closed.
3) Depressurizing phase: if wheel still tends to lock up at pressure maintaining phase, the ABS will start depressurizing phase. In this case, electronic control unit sends out command to open normally closed valve and close normally open valve. Then hydraulic pump goes into operation, and the brake fluid is returned from wheel cylinder to the brake master cylinder via low pressure accumulator, then the brake pedal shakes due to the reduction of brake pressure, and the wheel lockup level is reduced, finally the wheel speed begins to increases.
4) Boosting phase: in order to achieve optimum braking effect, when wheel speed reaches certain value, ABS electronic control unit again opens the normally open valve and close the normally closed valve. With the increase of brake pressure, the wheel again is subject to braking and deceleration. The pressure regulating frequency of ABS is 2 ~ 4 circles per second.

2.3 The Working Process of EBD

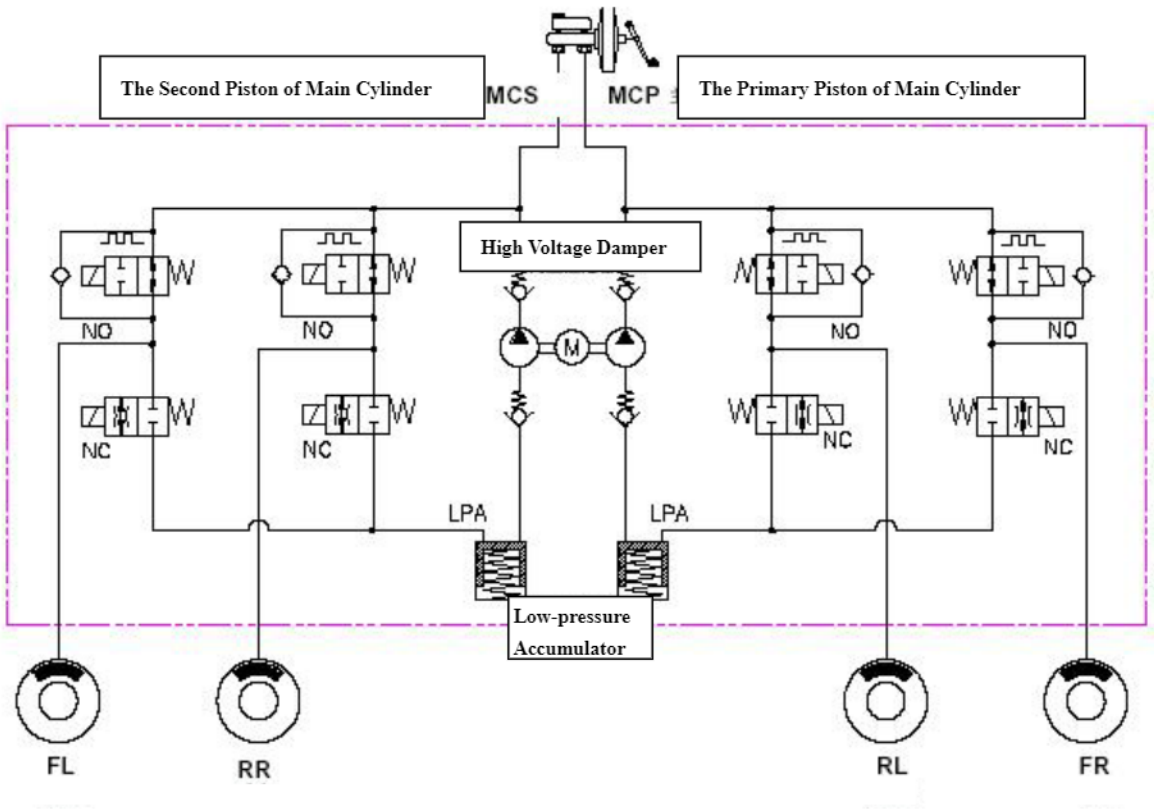
When braking only part of the wheel, especially when steering, the electronic brake-force distribution (EBD) function will be activated. Speed sensor will sent out speed signals of four wheels, and the electronic control unit will figure out wheel speed as well as slip rate according to these signals. If the slip rate of rear wheel exceeds some set value, the hydraulic control unit will adjust, control and reduce rear brake pressure to guarantee that rear wheel will not be locked before the front wheel. Compared to conventional braking force distribution of proportioning valve, electronic braking force distribution function guarantees higher adhesion of wheels as well

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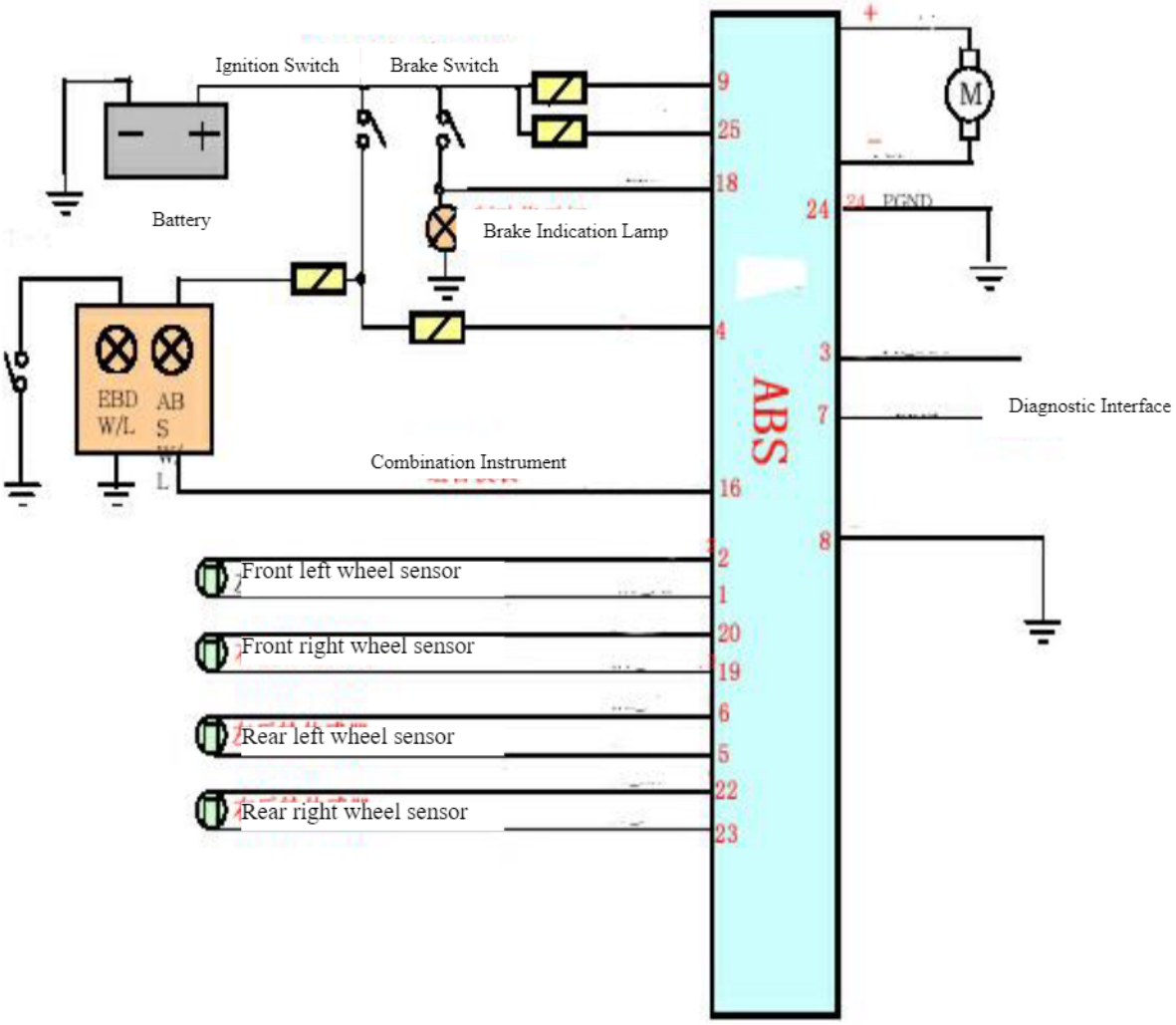
as rational braking force distribution. When ABS is working, electronic braking force distribution function will be deactivated. The boosting and pressure maintaining of EBD is just the same as the working process of ABS, however, their depressurizing controls are differed in some cases. When rear wheel tends to lock up, the normally open valve of rear wheel will be closed, normally closed valve will be opened, and the wheel brake pressure will be reduced. Unlike ABS, in this case, hydraulic pump does not work, and the brake fluid that is discharged in depressurizing process will be temporarily stored within low-pressure accumulator. After finishing the braking operation, release the brake pressure inside the brake pedal master cylinder. In the meantime, open the normally open valve and normally closed valve again, and the brake fluid inside the low pressure accumulator will be returned into master cylinder via normally open valve and normally closed valve. The low-pressure accumulator will be drained to stand by for the next ABS or EBD operation.

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2.4 ABS Brake Schematic Diagram



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2.5 Malfunction Code List

Malfunction code	Malfunction name	Malfunction code	Malfunction name
C1 200	Front-left sensor: open or short circuit over the ground	C1 101	Excessive low battery voltage (<9.4v)
C1 201	Front-left sensor or gear ring interference	C1 102	Excessive High battery voltage (＞16v)
C1 202	Air gap malfunction or incorrect gear ring	C1 604	HCU hardware malfunction
C1 203	Front right sensor: open circuit or short circuit over the ground	C2 112	Solenoid valve fuse and solenoid valve relay malfunction
C1 204	Front right sensor malfunction or gear ring interference	C2 402	Motor malfunction
C1 205	Air gap malfunction or incorrect gear ring	C1 274	Sensor short circuit over the ground or open circuit
C1 206	Rear-left sensor: Open circuit or short circuit over the ground	C1 275	Sensor signal malfunction
C1 207	Rear-left sensor malfunction or gear ring interference		
C1 208	Air gap malfunction or incorrect gear ring		
C1 209	Rear-right sensor: open circuit or short circuit over the ground		
C1 210	Rear-right sensor malfunction or gear ring interference		
C1 211	Air gap malfunction or incorrect gear ring		

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2.6 ABS Malfunction

Malfunction Location	Malfunction Type	Malfunction Symptom	Warning Lamp	
			ABS	EDS
Vehicle harness	Brake line mounting error	Wheel lockup malfunction or brake deflection	Lamp off	Lamp off
	Brake oil leakage	ABS and EBD start-up malfunction		
	Wire mounting error	Unable to brake		
	Bleeding malfunction	ABS performance degradation	Lamp off	Lamp off
Motor	Motor operational malfunction	ABS unable to start up	Lamp on	Lamp off
ECU	ECU power supply malfunction	ABS / EBD unable to start up	Lamp on	Lamp on
	Valve power line malfunction	ABS / EBD unable to start up	Lamp on	Lamp on
	Motor power line malfunction	ABS unable to start up	Lamp on	Lamp off
	ECU imperfect earth	ABS / EBD unable to start up	Lamp on	Lamp on
	ECU malfunction	ABS / EBD unable to start up	Lamp on	Lamp on
Wheel speed sensor	Sensor short circuit or broken circuit	1 malfunction occurs: ABS unable to start-up	Lamp on	Note)
	Gear ring malfunction Sensor interference Air gap malfunction	ABS wrong start up ABS / EBD unable to start up	Lamp on	Note)
G Sensor	Short circuit/broken circuit	ABS unable to start up	Lamp on	Lamp off

Note) when one sensor fails: EBD warning lamp is off (EBD starts up),
When two sensors fail: EBD warning lamp is on (EBD does not start up).

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2.7 Troubleshooting

Malfunction	Malfunction Type	Measures
C1 200 C1 203 C1 206 C1 209	Sensor short circuit / broken circuit The anode or cathode of sensor has short circuit/broken circuit over the ground	1. Measure the voltage between harness plug pin2, 5, 20, 22 and the ground (normal voltage scope: 2-4V). 2. Sensor voltage less than 2V indicates sensor broken circuit or ground wire short circuit or sensor connector plug disengagement. 3. Replace sensor if broken circuit occurs, however, for short circuit, only after confirming the short-circuit condition can it be decided whether replace the sensor or not.
C1 202 C1 205 C1 208 C1 211	Air gap malfunction Excessive air gap, or sensor short circuit (resistance is zero), or gear ring is not properly mounted.	1. Inspect the air gap to ensure it meets the specification. 2. Inspect the resistances of both sides of the sensor to ensure they meet the specification. 3. Employ analyzer to ensure the normal condition of the speed of four wheels (slowly increase to 60Km/h) 4. Inspect the gear ring to confirm whether it meets the specification or not
C1 201 C1 204 C1 207 C1 210	Gear ring and sensor interference Install a nonstandard gear ring	1. Inspect the air gap to ensure it conforms to standard. 2. Inspect the gear ring and gear wheel to ensure they conform to specification 3. Inspect the area in-between gear ring and sensor to see whether there exist impurities or not. 4. Inspect sensor resistance to see whether it is normal or not
C1 101 C1 102	Battery voltage malfunction Excessive high or low battery volt	1. Inspect the main ground wire to ensure the contact is in good condition (check the resistances between chassis ground wire and No. 8 / 25 of ABS to see whether they are less than 1 ohm). 2. Check the voltage of the No. 4 pin of the joint and the ground to see whether it is within normal voltage scope or not (normal voltage is 9.4~16V).
C1 402	Motor fuse or motor malfunction	1. Firstly confirm when the malfunction occurs, during parking or at a speed over 20Km / h. (If it is uncertain, after eliminating the malfunction then reconfirms it.) 2. Inspect the voltage between No. 25 pin of harness plug and ground. If voltage inspection confirms that harness and fuse are normal, it can be confirmed it belongs to motor malfunction.
C1 112	Valve fuse relay malfunction a) Main relay or fuse disconnection b) Main relay short circuit	1. If it belongs to a) condition, inspect the voltage between No. 9 pin of harness and ground wire. If there is no voltage, ensure the normal condition of fuse and harness. 2. If the above voltage is normal, then it can be confirmed that there exists malfunction inside the ABS control unit, so it shall be
C1 604	ECU internal circuit or valve coil malfunction	Replace

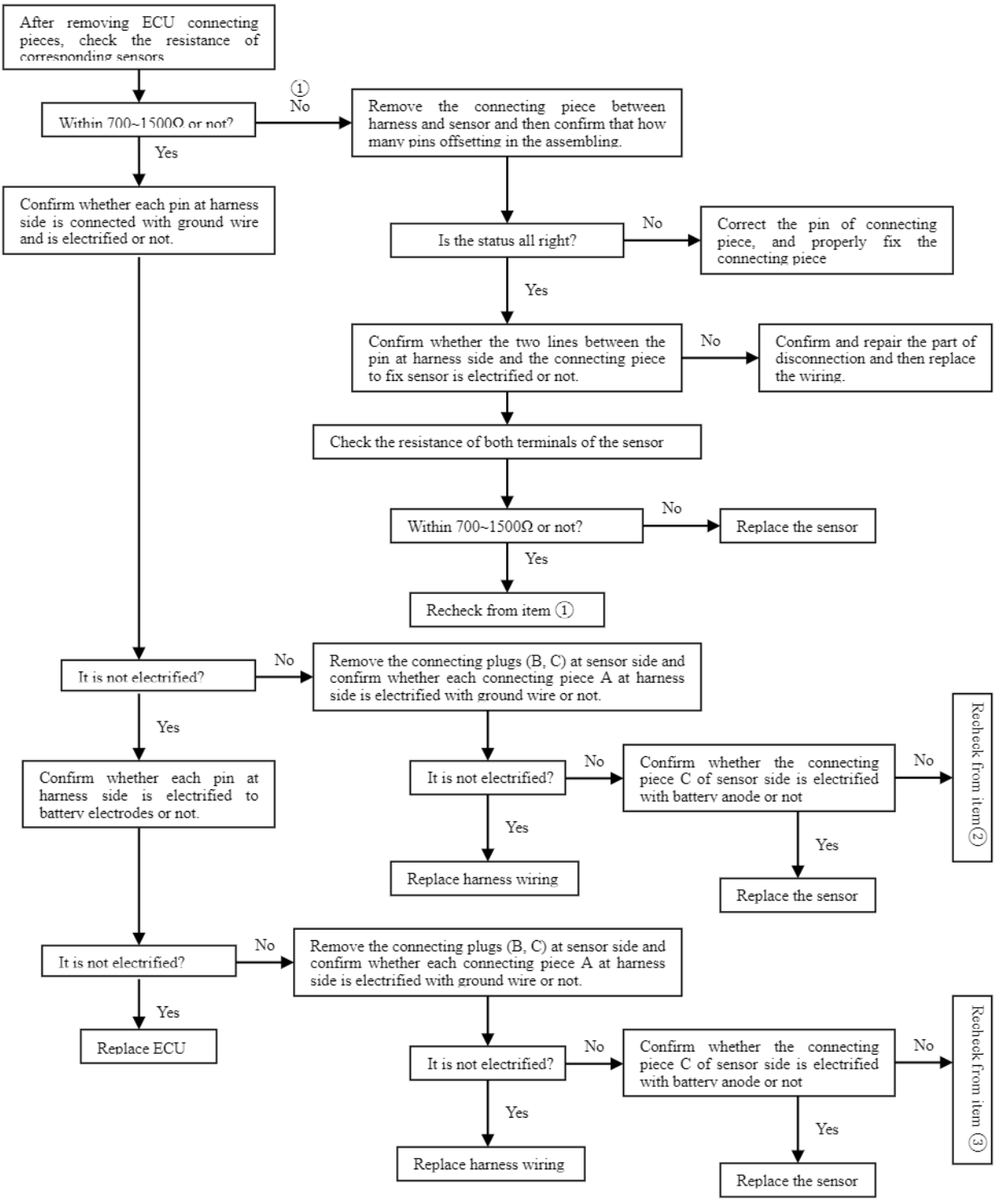
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C1 274	G sensor short circuit or broken circuit	1. Firstly disconnect the connector at harness side, and connect the harness sensor battery anode with the No. 15 pin of short cathode, and then perform ground connection. Finally measure the malfunction voltage of No. 13 pin short circuit or broken circuit as well as the voltage of No. 15 pin (normal voltage scope is between 0.6 ~ 4.5V). 2. Sensor voltage less than 2v indicates sensor broken circuit or ground wire short circuit or sensor connecting piece plug disengagement. 3. Confirm whether there is supply power (IGN1) for G sensor (normal voltage scope shall be between 10 - 16V). 4. If there is no problem occurs to item 1, 2 and 3, but there still exist errors, it can be confirmed as ECU internal circuit troubles.
	The anode or cathode of sensor has short circuit / broken circuit over the ground	

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2.8 Diagnosis Procedures

2.8.1 Sensor Short Circuit/ Open Circuit Malfunction C1 200, C1 203, C1 206, C1 209



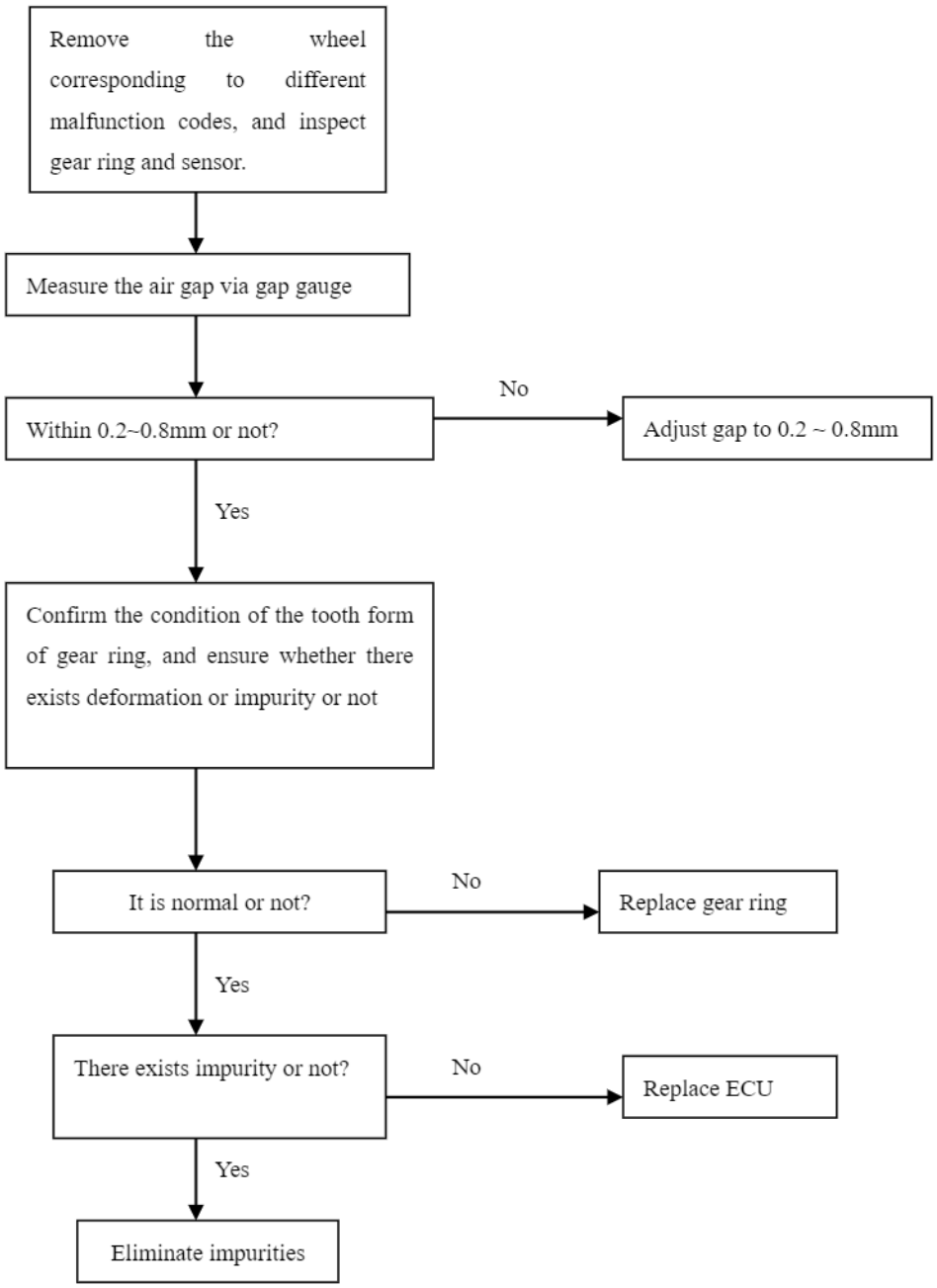
Remark: Reference of connecting piece classification



Harness sensor

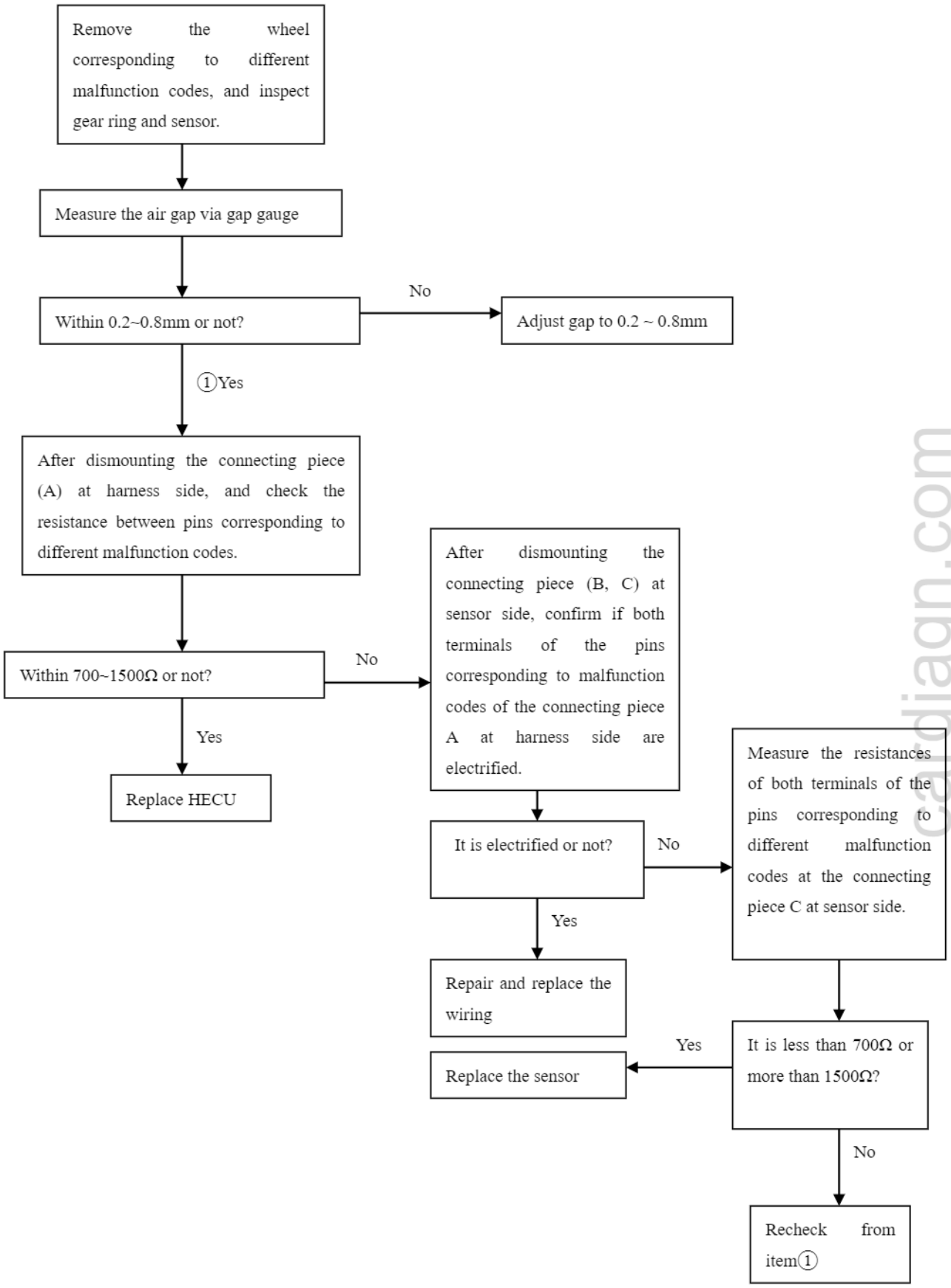
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2.8.2 Gear Ring and Sensor Interference C1 201, C1 204, C1 207, C1 210



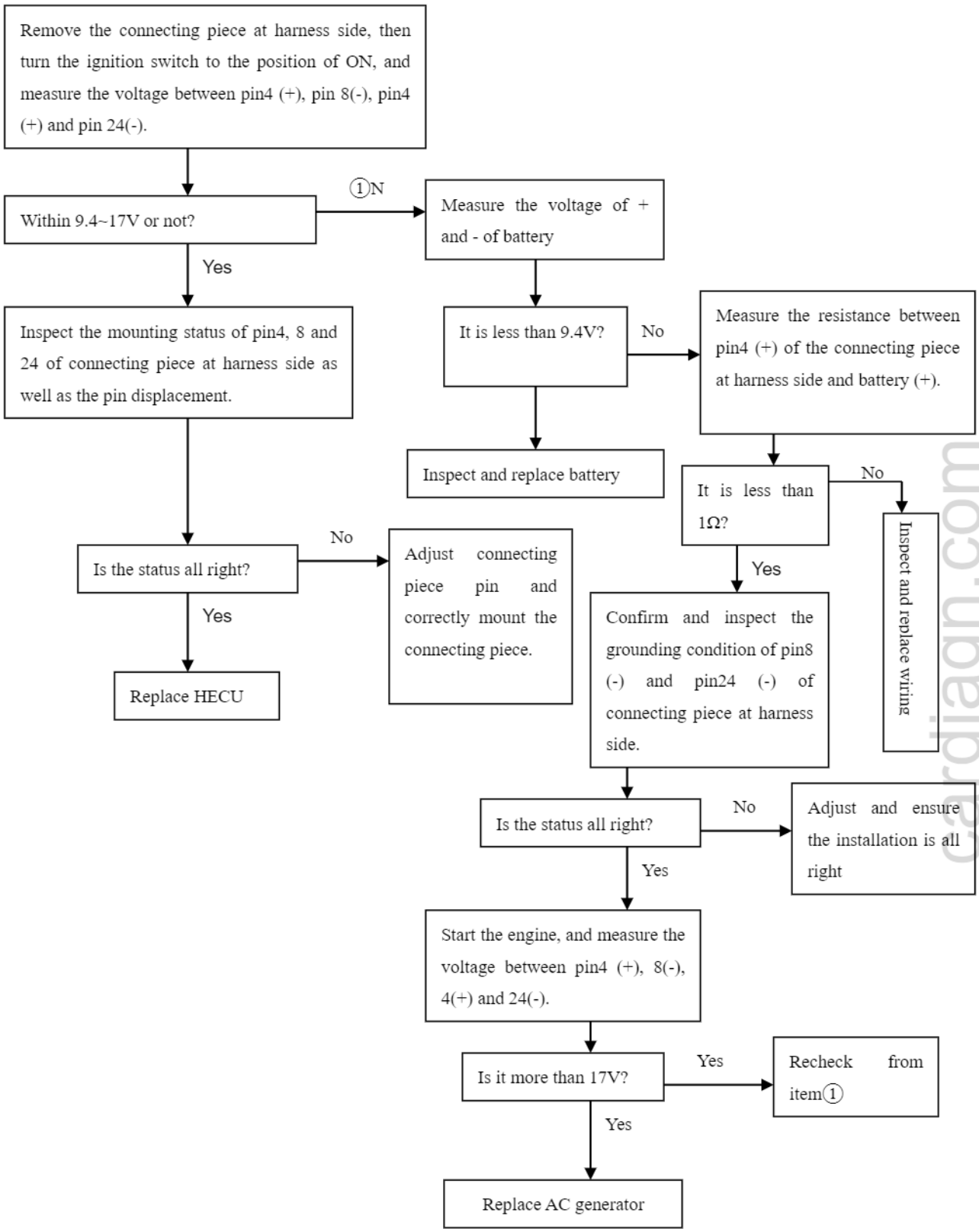
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2.8.3 Air Gap Malfunction C1 202, C1 205, C1 208 and C1 211.



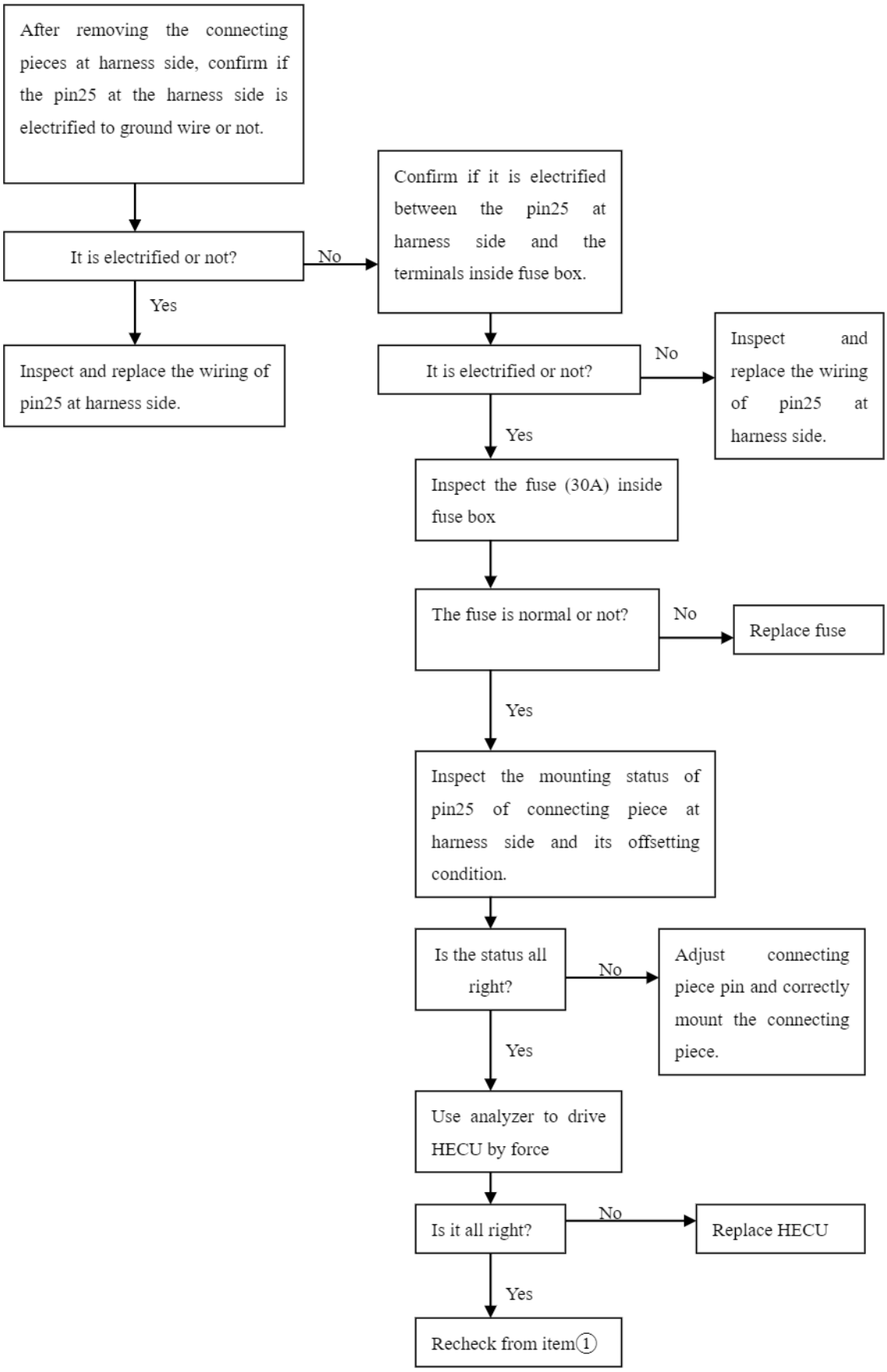
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2.8.4 Battery Malfunction C1 101 and C1 102.



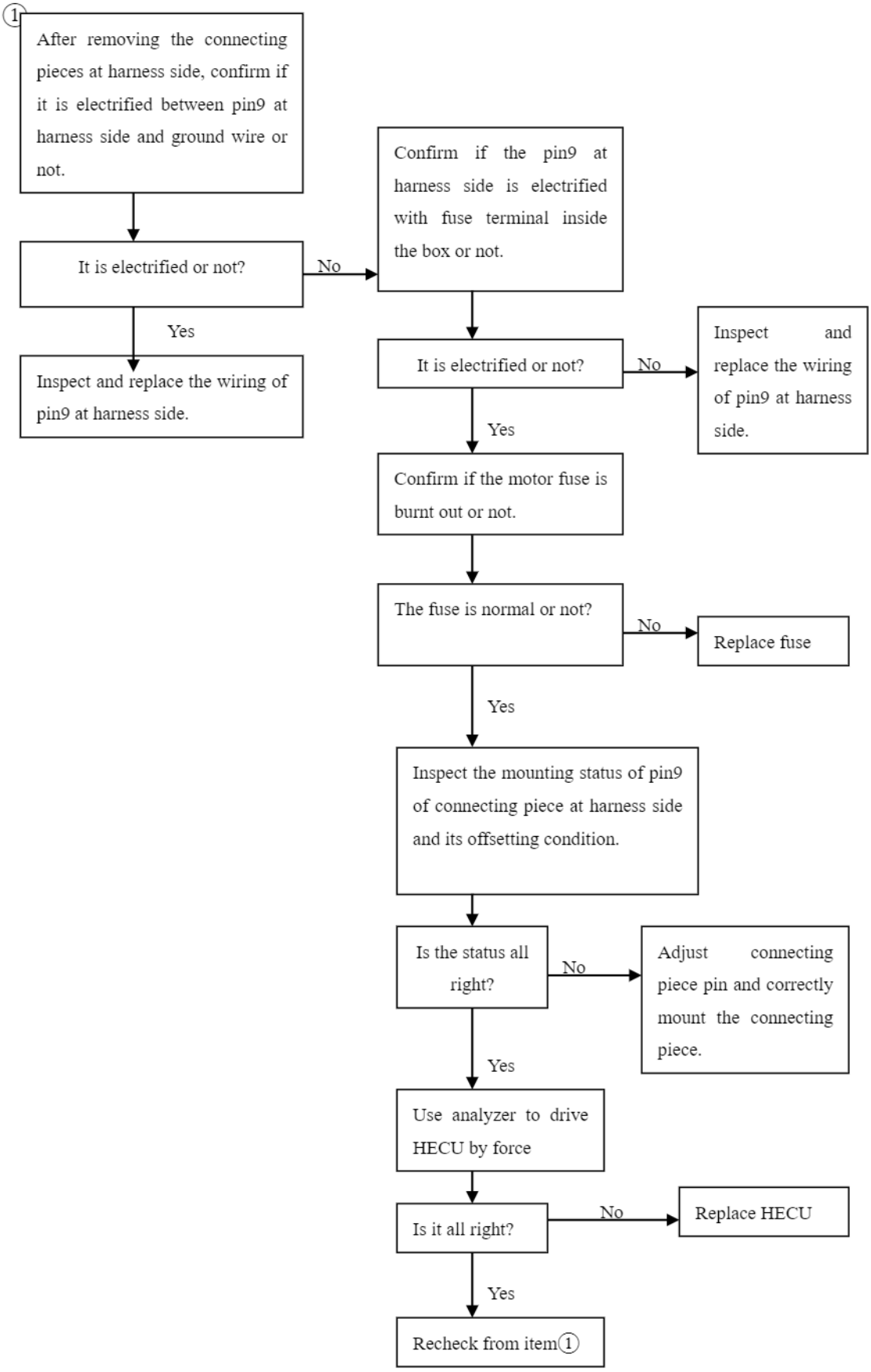
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2.8.5 Solenoid Valve Fuse or Solenoid Valve Relay Malfunction C2 112.



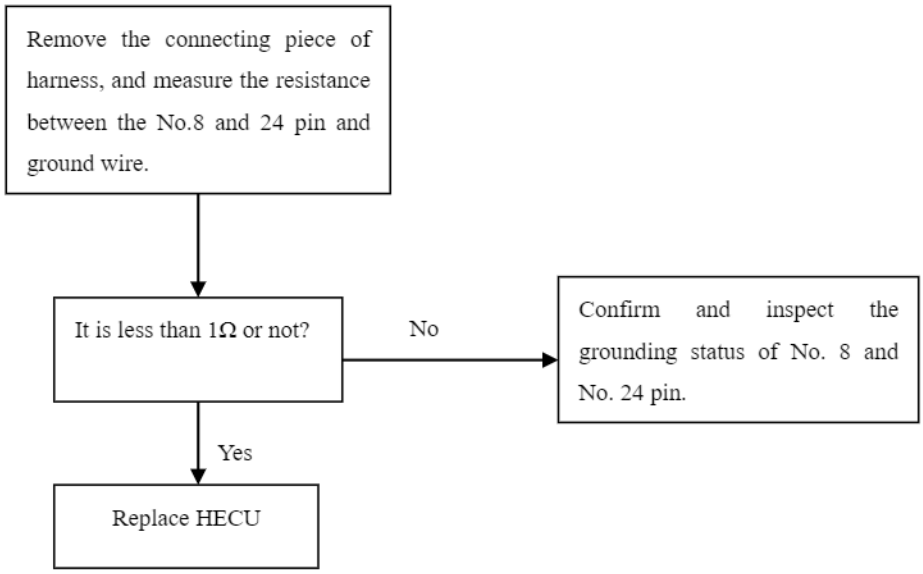
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2.8.6 Motor Fuse or Motor Malfunction C2 402.



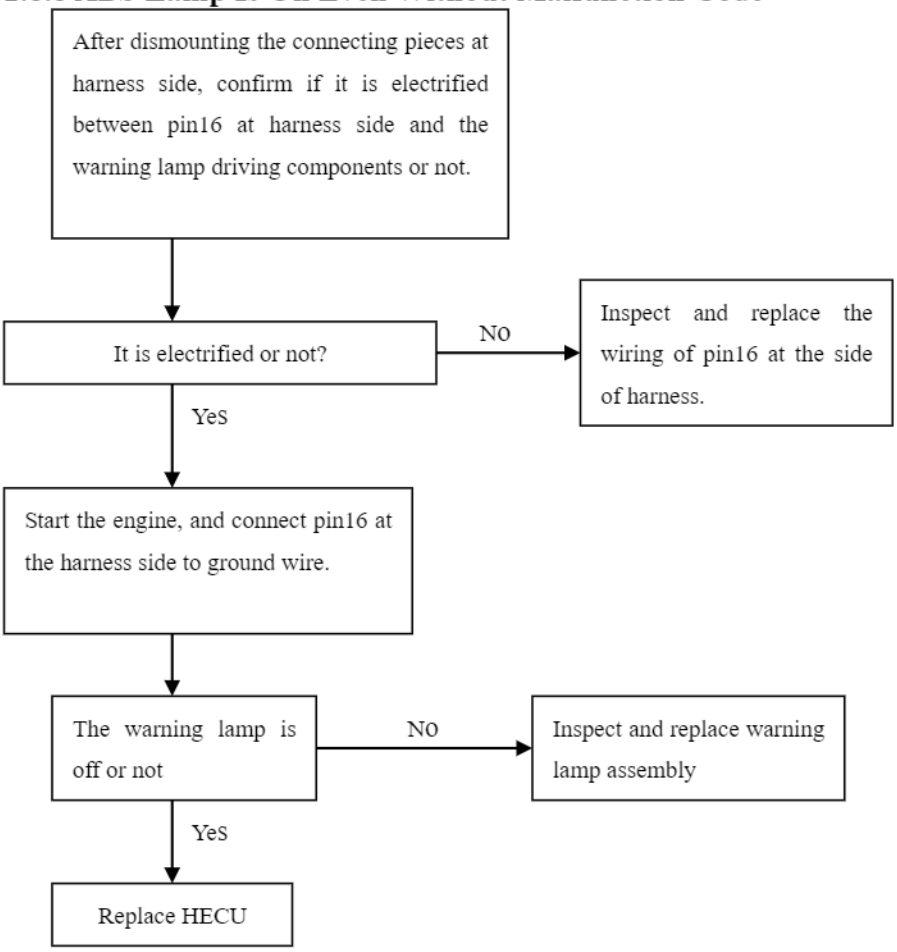
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2.8.7 ECU Internal Circuit or Valve Coil Malfunction C1 604



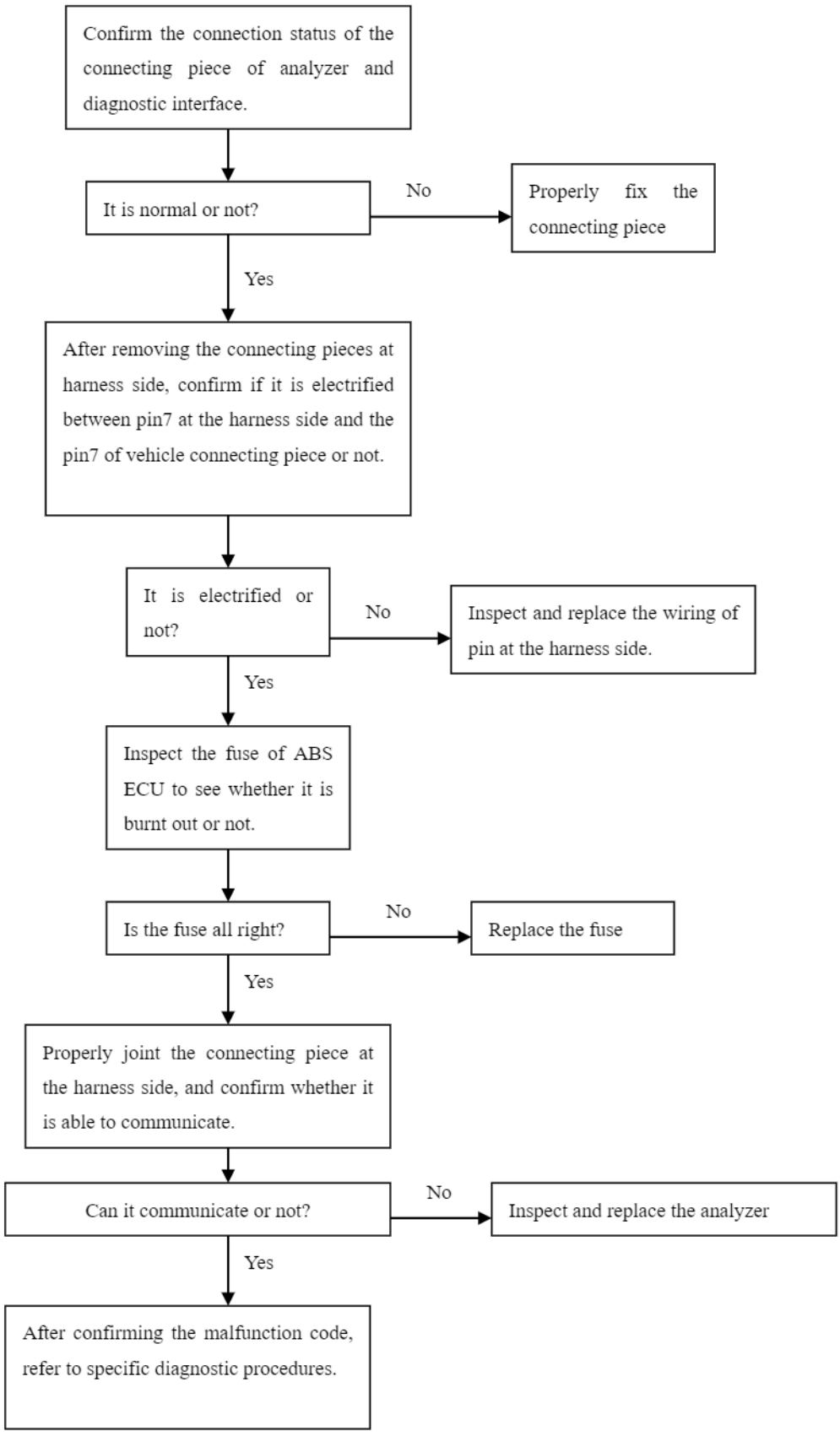
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2.8.8 ABS Lamp Is On Even Without Malfunction Code



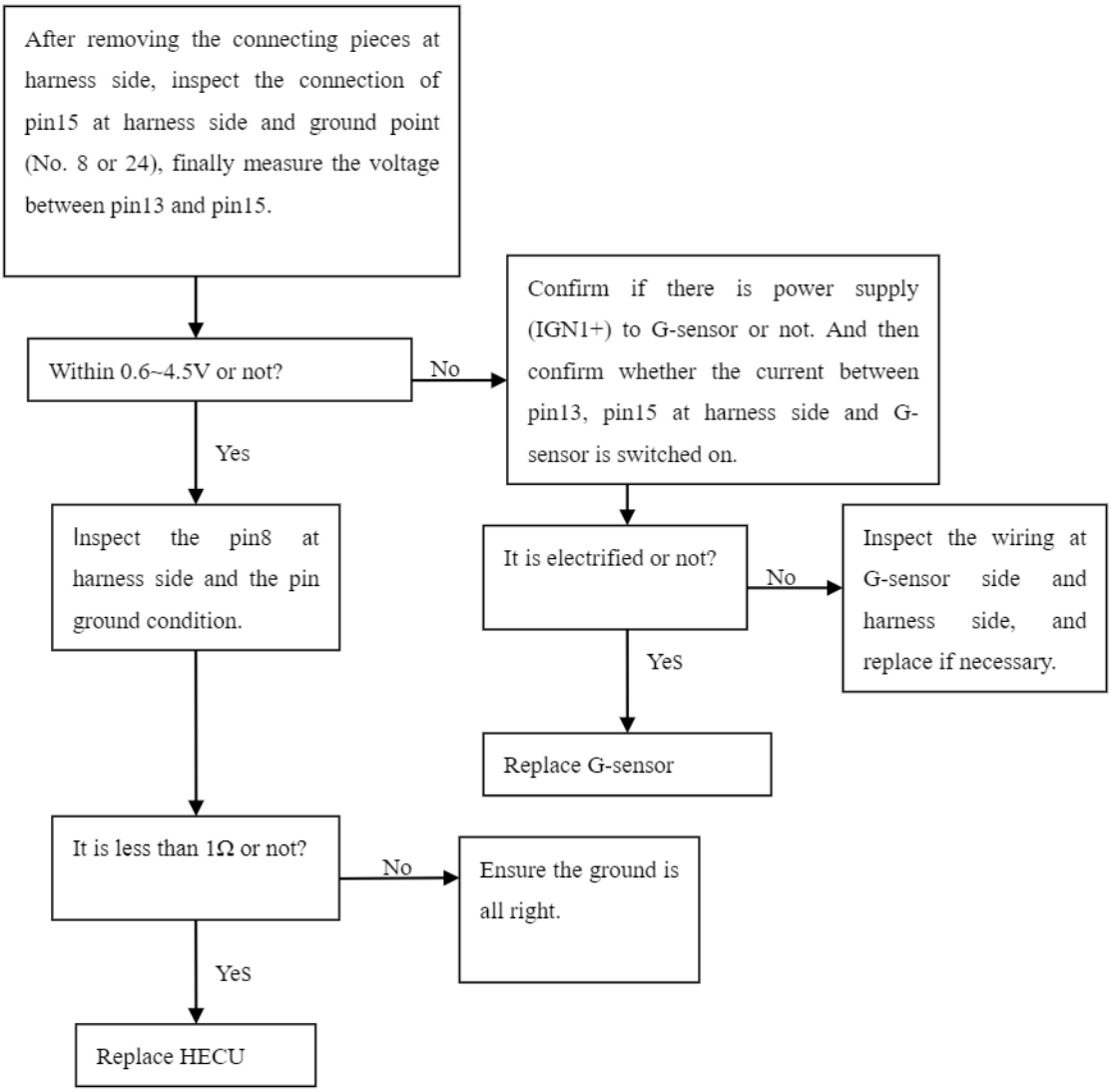
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2.8.9 Unable to Communicate (Analyzer Unable to Communicate with HECU)



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2.8.10 G-sensor Short Circuit/Broken Circuit, C1 274



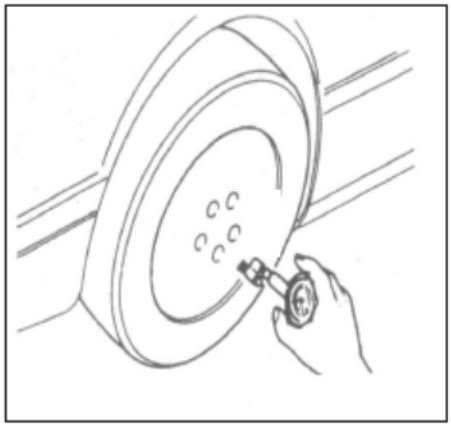
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Section Ⅲ Wheel Alignment Inspection and Adjustment

I Adjustment before Inspection

1. The Following Inspection Efforts Shall Be Performed Prior to Checking Wheel Alignment.

1）Check tire pressure and adjust to set value.



Standard inflation pressure of cold tire (kpa)

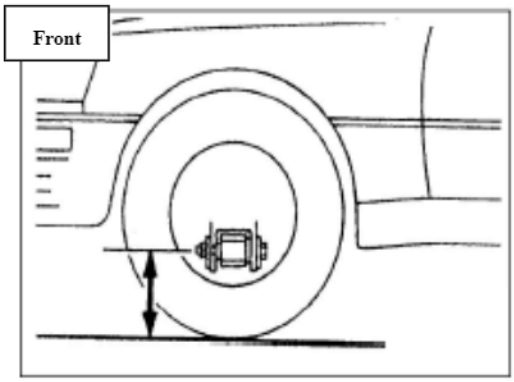
Item	215／70R16（99H）	235／60R16 （100H）	Spare tire
Front wheel	200	200	250
Rear wheel	200	200	

2) Inspect body height

Prior to measuring vehicle height, pressurize tire to specified value (note: the pressure value of right and left tires shall be identical).

a. Forehead measuring point

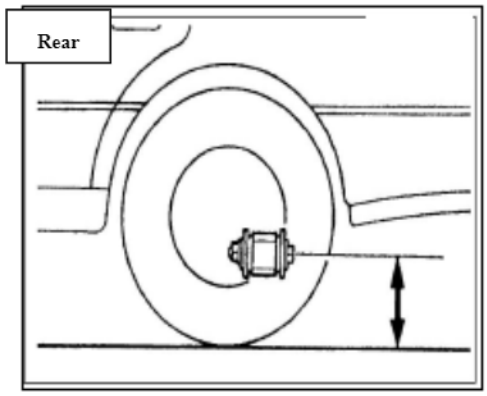
Measure the height between the ground and the center point of connecting bolt that joins the lower control arm assembly and the front knuckle. The body height of the left and right wheels shall be identical.



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b. Rear measuring point

Check the height between the ground and the connecting bolt that joins the rear axle to the shock absorber. The body height of the left and right wheels shall be identical.



Note: Prior to checking wheel alignment, firstly adjust the vehicle to specified height.

If vehicle height does not conform to standard, inspect the front and rear suspension of the vehicle to confirm whether there exists damage or deformation.

c. Inspect wheel bearing clearance, and replace front-wheel bearing if necessary.

d. Inspect the status of wheel rim and tire.

e. Inspect the loosening level of steering linkage and ball joint.

f. Park the vehicle (without luggage or passengers) on a level ground.

g. Shake the wheel and inspect the loosening status of front suspension.

h. Inspect shock absorber to ensure its normal operation.

a) Inspect and avoid oil leakage.

b) Inspect the mounting bushing to avoid wear.

c) Inspect the damping force of shock absorber, and replace if not conform to specification.

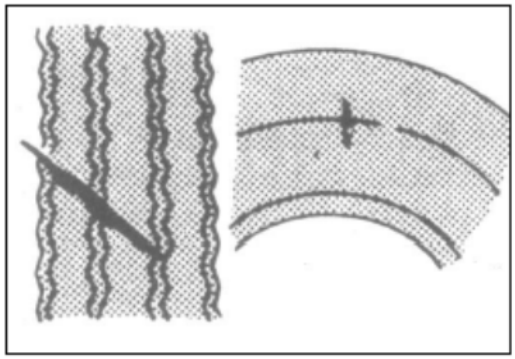
Note: fuel tank shall be half-full. Cooling water in radiator and the engine oil shall be at specified height. Tire jack and driver's tools shall be placed at designated location.

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2. Wheel Rim and Tire

1) Visual inspection

Inspect the tire and wheel rim, if there exists crack, damage, deformation or other defects, replace wheel or tire. As is shown in the right figure.



Tire Wear

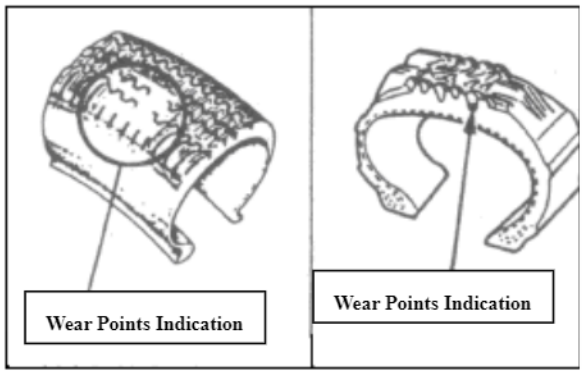
2) Tire wear

a. Refer to the standard tire figure to inspect the tire thread depth of other parts.

Minimum depth: 1.6mm

Tire for snow condition: 50% of the thread depth

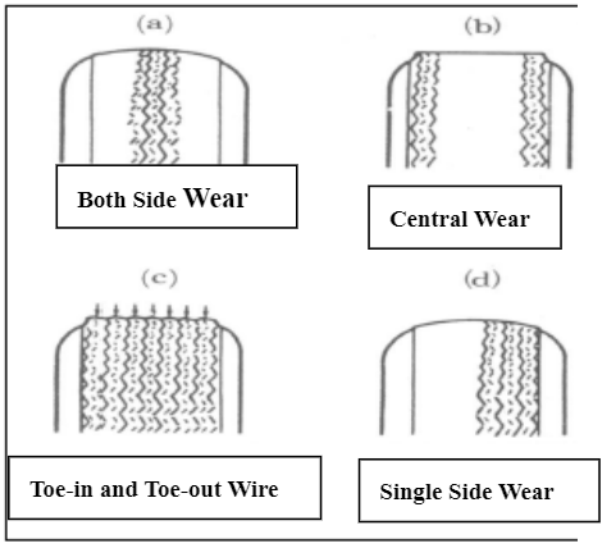
b. If wear indication strip appears, the tire must be replaced.



Tire Wear Point Indication

3) Tire abnormal wear

Tire abnormal wear is shown in right figure.



Tire Wear

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Refer to the table below for possible causes and remedies.

	Possible causes	Remedies
(a)	Inadequate tire pressure (both sides wear) High speed turning Tire swap is not performed	Measure and adjust tire pressure. Reduce vehicle speed. Perform tire swap
(b)	Excessive high pressure of tire (central wear) Tire swap is not performed	Measure and adjust tire pressure Perform tire swap
(c)	Incorrect toe-in	Adjust toe-in
(d)	Incorrect camber angle or caster angle Suspension system malfunction Tire unbalance Brake drum or disc out of round Other mechanical problems Tire swap is not performed	Adjust, repair or replace axle and parts of suspension system Repair or replace Perform tire dynamic balancing or replace the tire Calibrate or replace Correct or replace Perform tire swap

4) Precautions of wheel rim and tire

a. Never use defective wheel rim or tire.

b. Aluminum alloy rim is easily to be scratched, therefore, use soft cloth but never use steel brush when cleaning. And never contact the rim with boiling water when washing the vehicle by steam.

c. If abrasive compound (such as turbid water and ground mud) adheres to aluminum alloy rim, please rinse the rim with neutral detergent as soon as possible to avoid damage.

5) Tire replacement

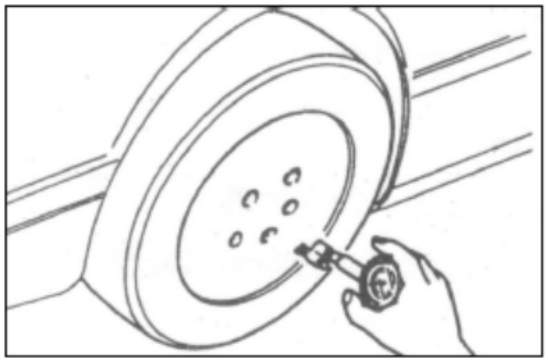
a. Prior to installing tire valve, firstly inspect the wheel to see whether the valve port of the wheel is smooth and burr-free. Then apply glycerol to the valve rubber surface or soak the valve into glycerol solution. Finally use special tools to apply a pressure of 200-400N to press the locating ring on the valve to pass through the wheel valve port, thus it shall be deemed as being installed to proper position (Soap water is allowed to substitute glycerol).

b. Prior to installing tire, apply glycerol or soap water at the periphery of tire bead. Meanwhile, if there is slight mark on the wheel rim, please align the tire uniformity testing mark to the rim slight mark. If there is no slight mark, align the tire dynamic balance testing mark to the position of wire valve. If there is no slight mark on the wheel rim, and the wire has static balancing test mark instead of a dynamic one, align the wheel valve to static balance testing mark.

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6) Tire pressure

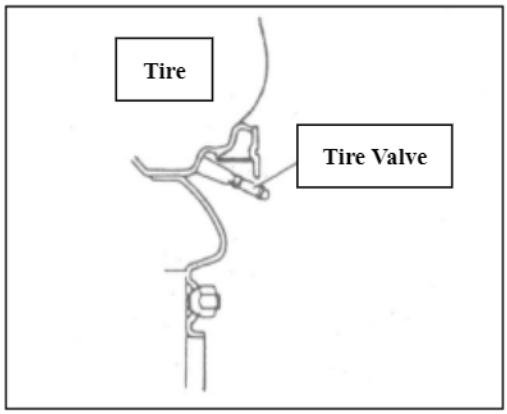
Inspect all of the tire pressures (including spare tire) via barometer, and adjust if necessary. Inflate the tire strictly in accordance with specified pressure value, and the tire pressure shall not exceed the rated pressure by 10% during inflating process. The rated inflation pressure of the spare tire shall be 2.5bar when the spare tire assembly is separately installed, and the spare tire shall be stored separately from the other 4 wheels. Prior to aligning the wheels, inspect and adjust the tire pressure: the front wheel pressure shall be 2.0bar; the rear wheel pressure shall be 2.0bar, as shown in the right figure.



Inspection of Tire Pressure

7) Air leakage

Confirm whether there exists tire valve leakage, as shown in the right figure.

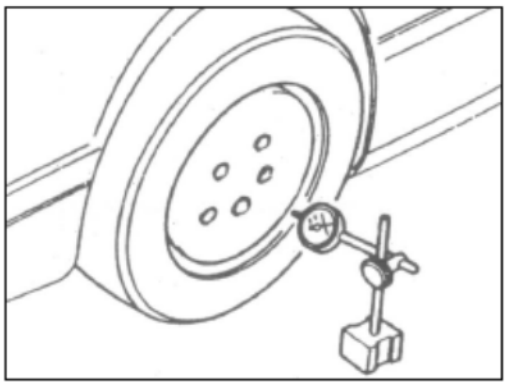


8) Tire unflatness inspection

a. Lift the vehicle, and cautiously support it.

b. Fix a micrometer (Φ10) with a cylindrical contact tip to the rim edge, then measure the unflatness depth, as shown in the figure.

c. Replace the wheel rim if necessary.



Inspection of Tire Unflatness

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Note the allowed deformation of wheel rim:

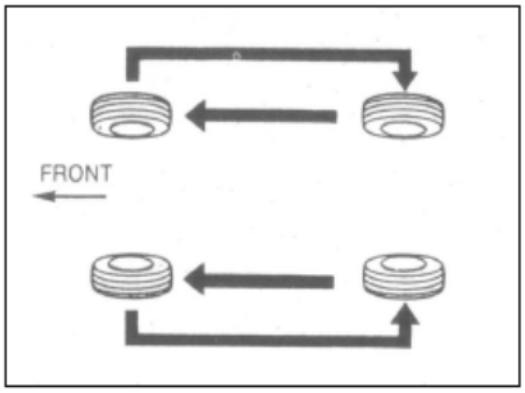
The average maximum allowable unflatness depth at the two edges of the wheel rim shall not exceed:

Steel wheel rim: 5mm

Aluminum alloy wheel rim: 3mm

9) **Tire swap**

In order to prolong the service life of tire and confirm its wear condition, tire swap shall be performed every 6000km (3750 miles), as shown in the figure.



Tire Swap

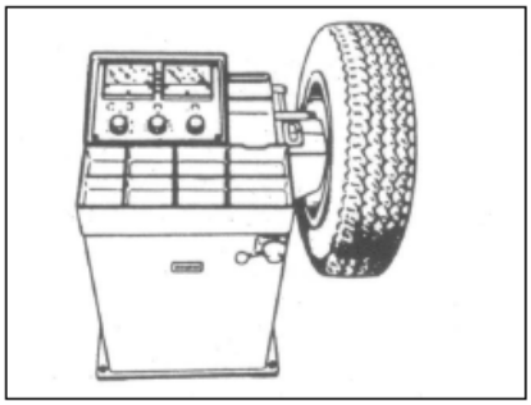
Note:

Front wheels shall use the best ones.

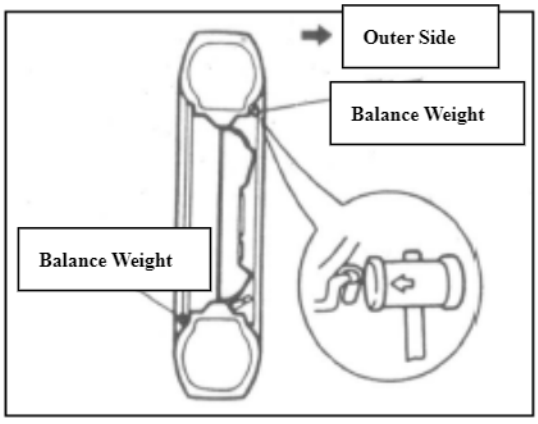
After tire swap, set its pressure to specified value.

10) Wheel balance adjustment

After inflating the tire, tighten the valve cap and perform dynamic balancing test, then fix a proper balance weight at the internal and external fringe of wheel rim. The ultimate unbalancedness of the assembly shall be less than 100g.cm, which is approximately equivalent to a 5g-balance weight located at the internal and external fringe of wheel rim.



Note: It is only allowed to employ one balance weight to each wheel at each side. Moreover, the maximum mass shall not exceed 70g. Avoid excessive knock to the balance weight during installation. If the operator feels the knock is excessive, then timely replace the balance weight. And the replaced balance weight is not reusable.



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11) Wheel Removal and Installation

Disassembly procedures:

a. Remove the trim cover of the wheel.



b. Unscrew the binding bolt of the wheel.

c. Remove the wheel.



Installation procedures:

1) When installing wheel and tire assembly, firstly, manually screw bolts to wheel hub for pretension, then use special tools to tighten them in accordance with diagonal method. The tightening torque shall be 100~120Nm. Never use impact wrench so as to avoid wheel damage or excessive loosening or tightening. And never apply grease to wheel bolts. (With respect to the newly mounted wheel and tire assembly, after the first 100km driving, wheel bolt shall be tightened once so as to ensure proper tightening torque. Inspection of wheel bolt tightening torque shall be one of the routine maintenance works).

2) Employ right-angled intersection method when tightening the fixing nut, the tightening status shall be similar, and the wheel shall be able to rotate freely. In addition, wheel shall be on the ground when performing final tightening.

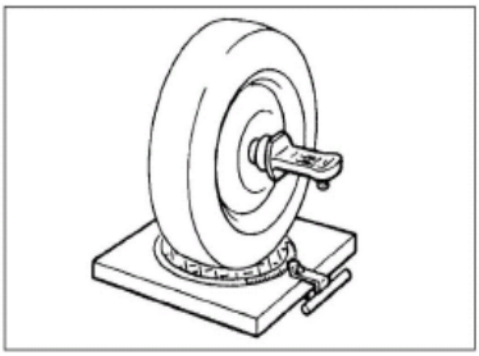
3) Mount trim cover or place it as required. Manually flap or employ rubber tools to knock it in when installing cassette-type trim cover.

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II Rear Wheel Alignment

1. Mount the Wheel Alignment Gauge or Wheel Alignment Tester onto the Wheel.

1) Mount according to manufacturer's specification.



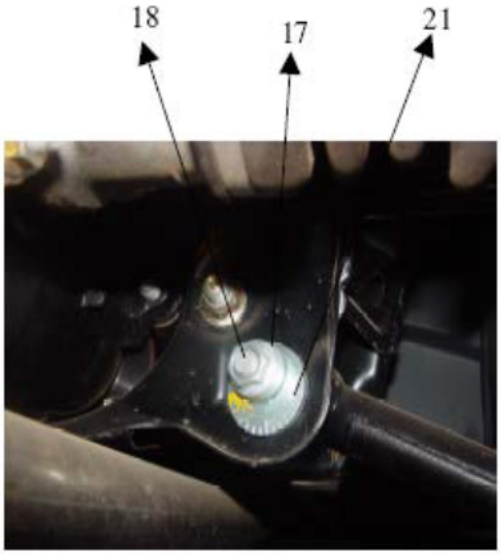
2) Perform detection and adjustment to the vehicle according to specification, and the vehicle alignment requirement is as follows:

General toe-in of rear wheel	18'±30'
Rear wheel camber angle	-54'±30'

2. Adjustment of Rear Wheel Toe-in

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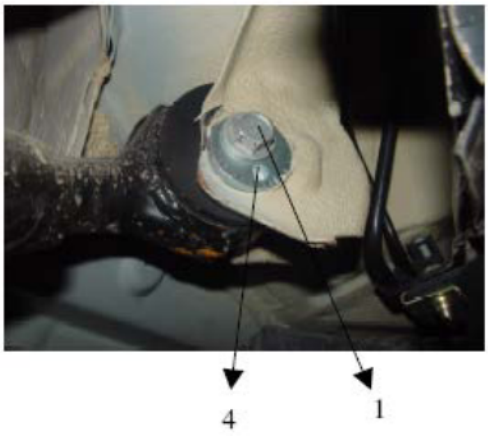
——If the rear wheel toe-in doesn't meet the requirements, use eccentric compensating pipe 18 or eccentric adjust nut 21 to perform adjustment. Loosen the bolt 17, and be cautious to prevent eccentric compensating pipe 18 and eccentric adjust nut 21 from loosening out of the groove, then turn eccentric compensating pipe 18 and eccentric adjust nut 21 till the toe-in value of rear wheel meets the requirement, finally torque the bolt 17 to specification. (The right and left side shall be identical)



3. Adjustment of Rear Wheel Camber Angle

—— If the rear wheel camber angle doesn't meet the requirements, use eccentric compensating pipe or eccentric adjust nut 4 to perform adjustment.

Loosen bolt 1, and be cautious to prevent the eccentric compensating pipe and eccentric adjust nut 4 from loosening out of the groove, then turn eccentric compensating pipe and eccentric adjust nut 4 till the chamber value of rear wheel meet the requirements, and finally torque bolt 1 to specification. (The left and right side shall be identical)

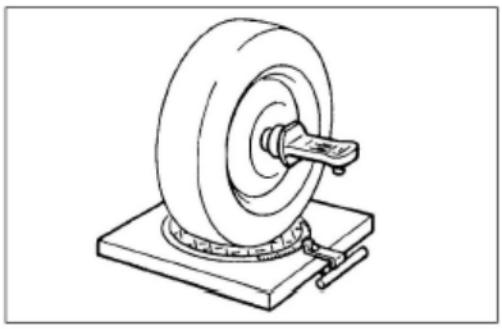


Ⅲ Front Wheel Alignment

1.Mount the Wheel Alignment Gauge or Wheel Alignment Tester onto the Wheel

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Mount according to manufacturer's specification.



2. Inspect and Adjust Caster Angle, Camber Angle, Front Wheel Toe-in Angle and Steering angle

The front wheel alignment specification is described as below:

King pin caster angle	$2^0 50' \pm 1^0$
Front wheel camber angle	$-0.85^0 \pm 1^0$
Front wheel toe-in (for single wheel)	±5'
King pin inclination angle	$11^0 30' \pm 1^0$
Max. steering angle of inner wheel	37^0
Max. steering angle of outer wheel	31.2^0

1) Caster angle

Caster angle is secured by structural design; therefore, it is unnecessary to be adjusted during operation.

The Effect of Caster Angle

The major function of caster angle is to keep the vehicle driving straight forward. If the caster angle is positive, when turning the front wheel, the vehicle inner side will descend downward and the chassis will consequently ascend. Therefore, the load will be increased and transferred onto steering knuckle. If the caster angle of the two wheels is identical, the vehicle will go back to the direction of straight forward after steering. Increasing positive caster angle will enhance the stability of steering wheel. However, the steering force will increase as well. Reducing positive caster angle will reduce the stability of steering wheel. However, the steering force will be reduced. The caster angle will not affect tire wear, and it is used to stabilize the driving direction and ensure automatic straight returning back to the center when steering. If the vehicle is equipped with a conventional mechanical steering system, the caster angle is usually very small, sometimes even tends to negative value, thus make steering easier. If the vehicle is equipped with power steering device, a larger positive angle is usually set to make the driver feel well when steering. Increasing positive caster angle will result in an increase of steering force as well as increase of vehicle stability when driving forward.

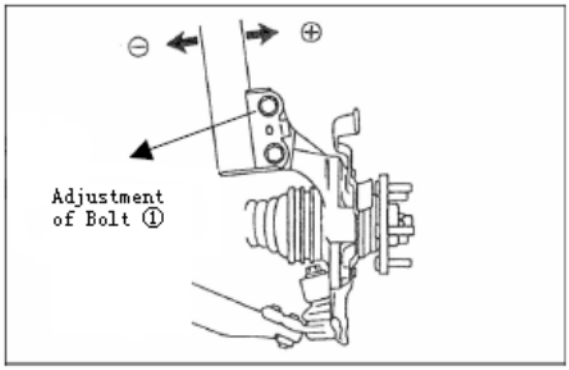
2) Camber angle

Under normal conditions, it is unnecessary to adjust camber angle after assembling independent suspension and wheel steering knuckle. If the wheel camber deviates from tolerance limit due to some other reasons, it shall be calibrated via connecting bolt that joins the independent suspension and the steering knuckle.

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a) Prior to calibrating, firstly inspect (visual inspection) whether there are damages to driving components, and then replace the defective ones.

b) If the front-wheel camber angle exceeds deviation limit, loosen the connecting bolt① that joins the front shock absorber and the steering knuckle; finally move the wheel to perform calibration.



3) Front wheel toe-in

Toe-in shall be inspected and adjusted via special wheel alignment detector.

a) Prepare for alignment and adjustment according to specific requirement of the detector, then fix steering wheel facing straight forward via commercially available steering wheel retainer (steering wheel must be located at central position with a deviation not exceeding ±5°). And the lower clamping flange bolt of steering shaft must be horizontal.

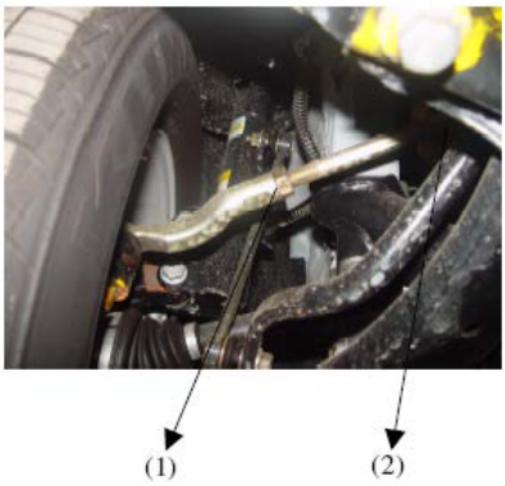
b) Unscrew the lock nut of steering tie rod.

c) Remove the flexible jacket snap ring (2) via pliers.

Note: replace the snap ring if its elasticity is insufficient.

d) Rotate the toe-in adjusting rod to adjust the length to specified value as required.

e) Tighten the lock nut (1), then remount jacket snap ring (2), and inspect the tightening condition of the lock nut and ensure the jacket is properly located.



f) After adjusting the front wheel toe-in, inspect whether steering wheel is horizontal. Otherwise loosen the steering wheel lock nut, and adjust steering wheel to horizontal position, finally torque the steering wheel lock nut to specification (27~33Nm).

4) Inspect front wheel steering angle

After replacing the steering knuckle tie rod joint or adjusting the toe-in, inspect the steering angle. If the front wheel steering angle doesn't conform to the specification, inspect and adjust the length of left and right steering knuckle tie rod.

Ⅳ Guideline of Troubleshooting

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Problems	Possible causes	Remedies
Tire undue wear	Incorrect tire pressure	Adjust
Tire noise	Incorrect tire pressure Tire wear	Adjust Inspect, adjust or replace
Road noise or vehicle body vibration	Insufficient tire pressure Tire unbalance	Adjust Adjust
Vertical vibration of steering wheel	Tire and wheel rim excessive deflection Wheel screw cap or axle stub loose Tire unbalance Engine suspension rubber crack or wear Gearbox bracket rubber crack or wear	Replace Lock Adjust Replace Replace
Circular vibration of steering wheel	Tire and wheel rim excessive deflection Wheel screw cap or axle head loose Tire unbalance Tire uneven wear Insufficient tire pressure	Replace Lock Adjust Inspect Adjust
Unilateral deflection of steering wheel	Incorrect tire pressure Wire excessive or uneven wear Steering system malfunction Brake system malfunction Suspension system malfunction	Adjust Inspect Inspect Inspect Inspect
Traveling instability	Right and left tire pressure non-uniform. Wheel rim or tire deformation Wheel screw cap loose Steering system malfunction Suspension system malfunction	Adjust Repair or replace Lock Inspect Inspect
Braking deflects to one side	Right and left tire pressure non-uniform Brake system malfunction	Adjust Inspect
Steering wheel is heavy	Insufficient tire pressure Steering system malfunction	Adjust Inspect
Poor straight returning of steering wheel	Insufficient tire pressure Steering system malfunction Suspension system malfunction Incorrect caster angle of front wheel	Adjust Inspect Inspect Adjust

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