SQR 472 Engine

（Service Manual for Mechanical Part）

After-sales Department of Chery Automobile Sales Co., Ltd.

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Chapter 1. Reading Instruction

1) Reading Method of Maintenance Instruction

1.1 Auxiliary Materials

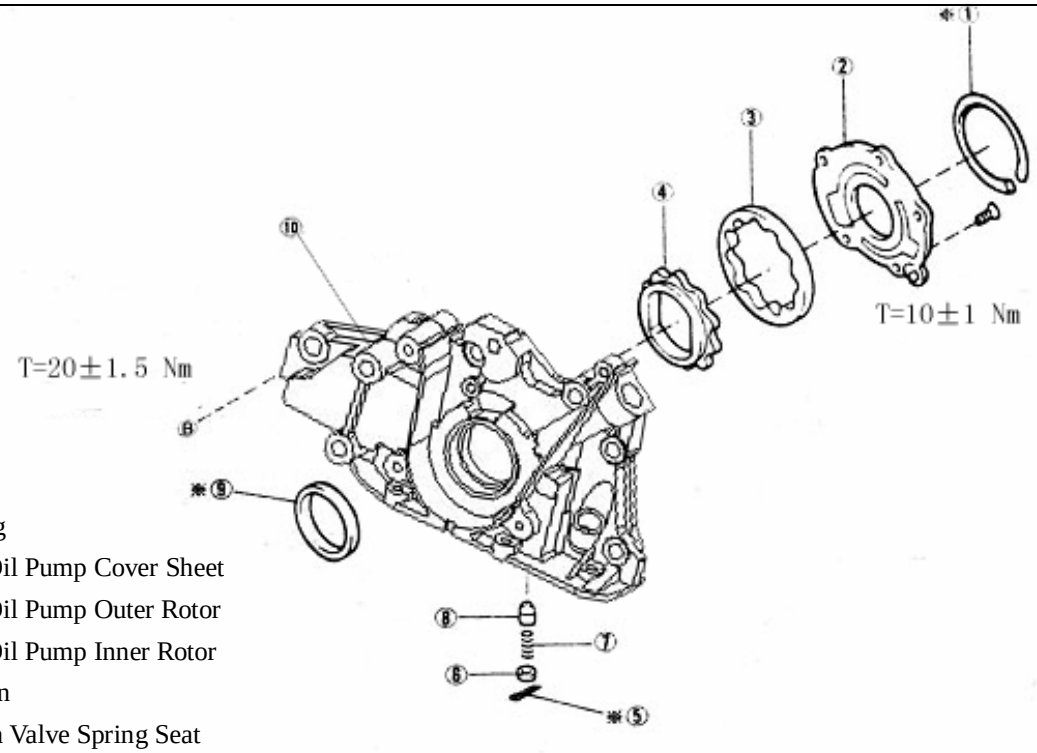
If it is required in the operation instruction to prepare the auxiliary materials such as special tools, tools, measuring instruments and grease in advance, you should list all auxiliary materials required in a table before carrying out each operation.

Since the ordinary tools, lifter and spare parts are conventional materials used in the maintenance, they are omitted here.

1.2 Operating Sequence and Structure Diagram

(1) The diagram of structure and components, name of components and installation status are set forth at the beginning of each chapter or section.

(2) The number in the figure refers to the disassembly sequence of each component. The components which may not be reused and the tightening torque are indicated in the figure.



① Seal Ring
② Engine Oil Pump Cover Sheet
③ Engine Oil Pump Outer Rotor
④ Engine Oil Pump Inner Rotor
⑤ Cotter Pin
⑥ Oil Drain Valve Spring Seat
⑦ Oil Drain Valve Spring
⑧ Slide Block
⑨ Crankshaft Front Oil Seal
⑩ Engine Oil Pump Housing

※: Components which may not be reused

Unit: N·m(kg·cm)

1.3 Content Omitted in this Manual

The following operating procedures have been omitted in this Manual, and they should be carried out in the actual operation:

(1) Operation relating to the lifter and the small-sized elevator;

(2) Cleaning and wipping of common components;

(3) Relevant visual inspection.

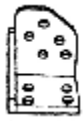
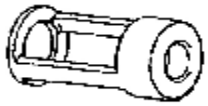
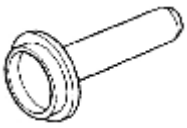
1 .4 Definitions

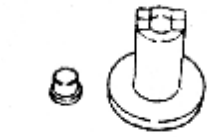
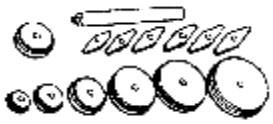
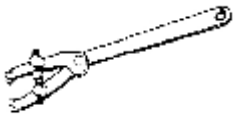
Standard value	Refers to allowed value during inspection, maintenance and adjustment.
Limit	Refers to the maximum or minimum value that should not be exceeded during inspection, maintenance and adjustment
Reference	Set the standard value for simple measurement to prevent from its measuring difficulty and inconsistency to facts.
Difference	Refers to the difference between maximum value and minimum value.
Notice	It carries the cases of damaging the vehicle and parts so you should pay attention to the operation description.
Warning	It records the operation descriptions of cases about person accident.

2) Meaning of Marks and Abbreviations

Mark	Original Words	Intepretation
RH	Right Hand	Right Hand
LH	Left Hand	Left Hand
FR	Front	Front
RR	Rear	Rear
IN	Intake	Intake
EX	Exhaust	Exhaust
SAE	Society of Automotive Engineers	Society of Automotive Engineers
API	American Petroleum Institute	American Petroleum Institute
SPECIAL TOOL	Special Tool	Special Tool
T	Torque	Torque
Ay	Assembly	Assembly
S/A	Sub Assembly	Sub Assembly
W/	With	With
M/T	Manual Transmission	Manual Transmission
A/T	Automatic Transmission	Automatic Transmission
T/C	Turbo Charger	Turbo Charger

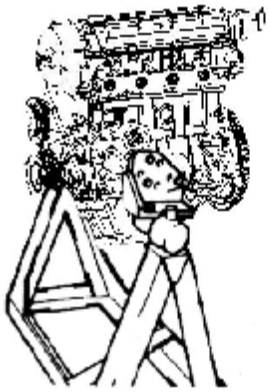
3) Special Maintenance Tools:

	Outside view	Name or symbol	Purpose
		Engine disassembly and inspection auxiliary device	Mount on the engine service stand
		Engine service stand	Disassembly and assembly of engine
		Clamp hole wrench for camshaft timing gears	Disassembly of camshaft timing gears
		Spring bushing puller	Assembly of camshaft Oil seal
		Valve keeper remove tool	Assembly and disassembly of valve spring retainer lock
		Auxiliary tools	
		Flywheel clamp	Assembly and disassembly of crankshaft gear
		Valve guide punch pin	Disassembly and assembly of Valve guide
		Axial Oil seal replacing device	
		Oil seal base drive	

	Outside view	Name or symbol	Purpose
		Piston pin puller	Disassembly and assembly of piston pin
		Embeded combination oil seal and helical gear puller	Installation of oil seal
		Crankshaft pulley holding tool	Disassembly and assembly of crankshaft pulley
		Wrench	Disassembly and assembly of crankshaft driven gear
			Replace valve clearance adjustment gasket
		Water pump pulley locking wrench	Assembly of coolant pump
Measuring tools	Feeler gauge. Micrometer caliper. Ruler. Dial gauge. Cylinder gauge. Caliber. Pressure gauge. Torque wrench torque wrench		
Tool	Piston ring extractor		
Oil	Engine Oil, adhesive		

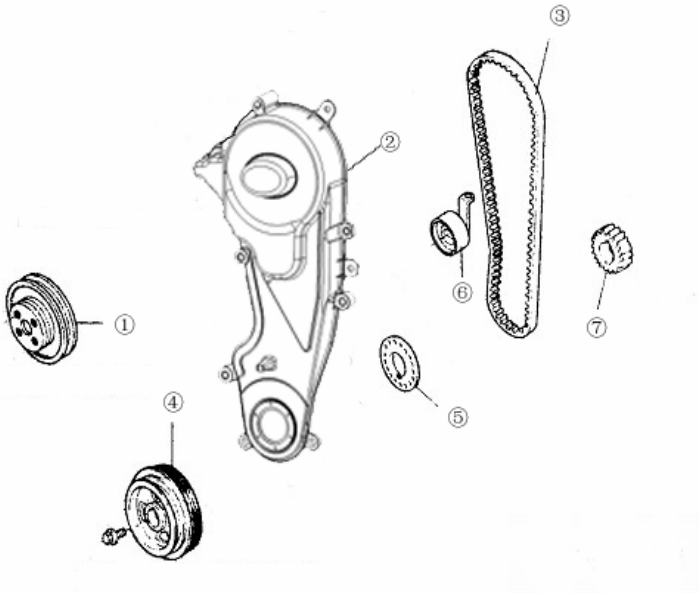
Chapter 2. Disassembly, Assembly and Maintenance

Disassemble or assemble the engine with roll over stand.
Disassemble or assemble the engine parts on the roll over stand.



1) Timing Belt

1. Structure Diagram

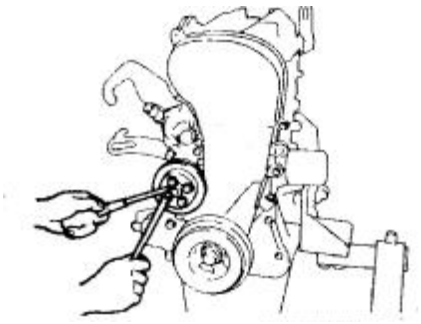


① Water pump pulley
② Timing shroud
③ Timing belt
④ Torsional damper
⑤ Timing belt back plate
⑥ Tension pulley
⑦ Camshaft timing pulley

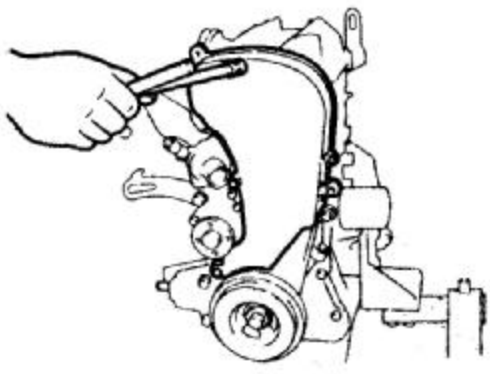
※: Components which may not be reused.
Unit: N·m(kg·cm)

2. Disassembly

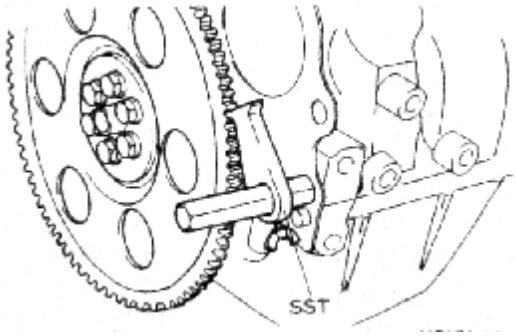
2.1 Remove the water pump pulley as the view showing.
It will be better of disassembling with special tool.
Torque: 25±1.5 N.m



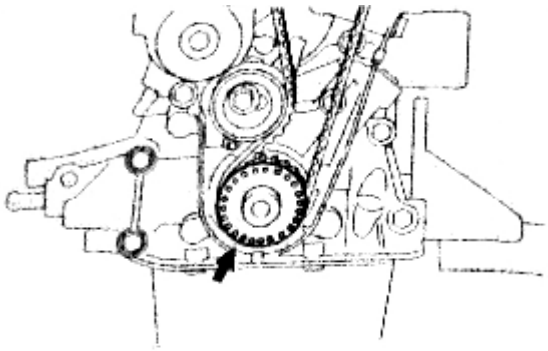
2.2 Disassembly of Timing Belt Cover
Torque: 6±1N.m



2.3 Disassembly of torsional damper
Use special tools to prevent the gear ring from rotating. When disassembling the fixing bolts of the torsional damper, make sure that the marks on the crankshaft timing pulley match with the timing marks on the engine oil pump.

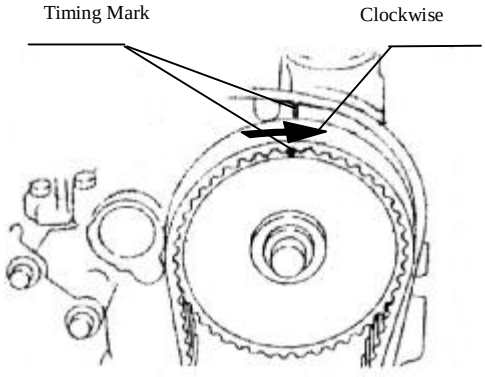


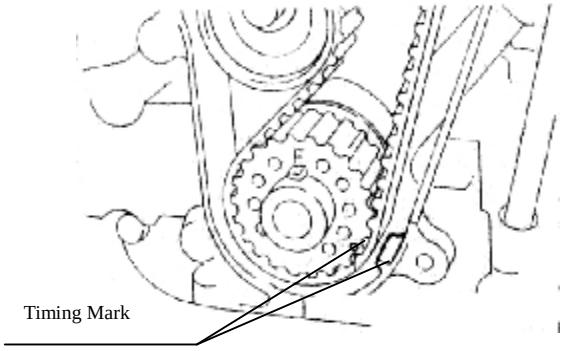
2.4 Remove the timing belt back plate.



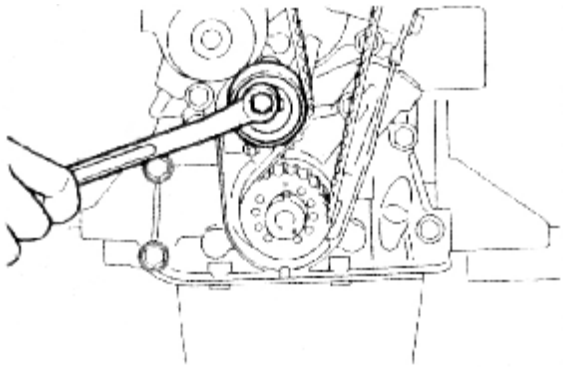
2.5 Disassembly of tension pulley

2.5.1 Compress the top dead center at the first cylinder piston. After disassembly of timing cover, pull the bolt and clockwise rotate the timing gear with wrench. And then align the timing mark of camshaft timing gear and the raised mark on camshaft cover;





2.5.2 Screw off the bolt of tension pulley and remove the tension pulley.

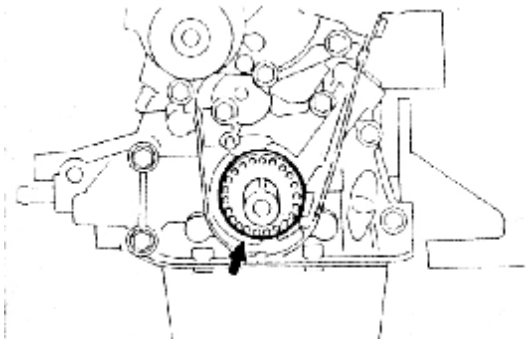


2.6 Disassembly of timing belt

Notice: Do not use sharp tools like screwdriver during disassembly of belt.

Notice: Pay attention to the following items during using the timing belt:

- Do not bend the belt with small angle, or the rigging in belt will break.
- Do not pollute grease and water because the using expectancy of belt is short.
- Only clockwise rotate the engine after mounting the belt.



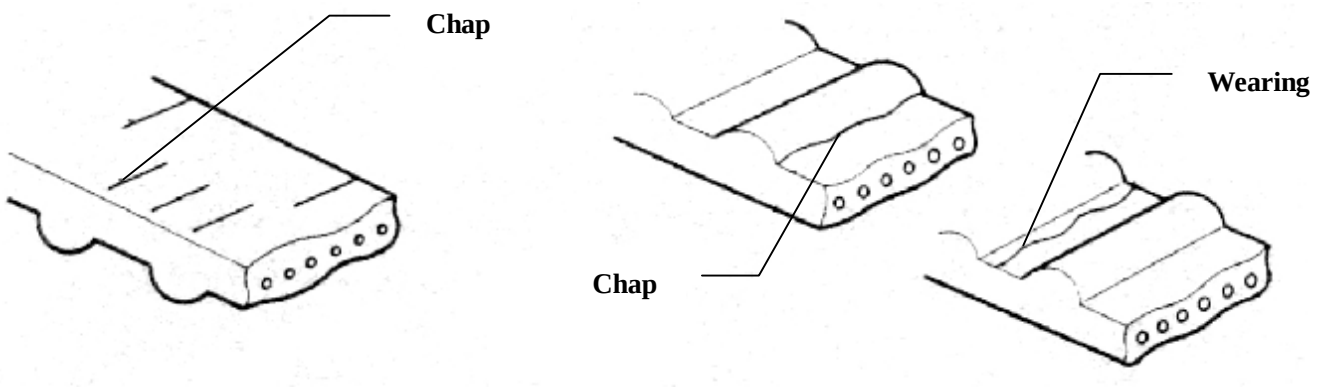
2.7 Disassembly of crankshaft timing gear

2.8 Inspect the timing belt carefully, and replace new components under any of the following circumstances or when the mileage is up to the conditions of replacement:

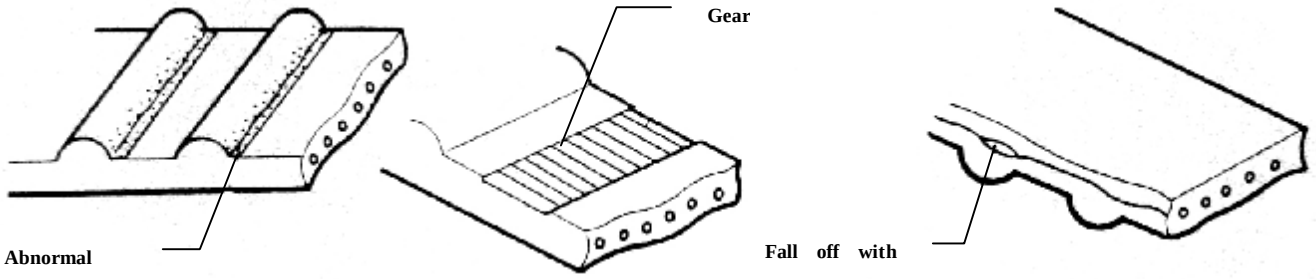
2.8.1 Chap of back-side rubber

2.8.2 Chap of dedendum, chap of separated cord fabric.

2.8.3 Wearing, gear missing and incomplete gear of cord fabric.



2.8.4 Abnormal wearing of belt flank.



2.8.5 Notice: Replace the belt as any following situation occurs, even though abrasion cannot be found directly:
The water pump leaks water out, and requires continuing infusion.If the belt is spotted with much oil stains, and the rubber may be damaged due to expansion, you should replace the belt.

Timing belt model and type

Part number	372-1007081
Width of belt	25.3mm

Tension Pulley of Timing BeltRotate the bolt of tension pulley bracket and hear if it is noisy; check the contacting surface and look if it is damaged.Model and type of tension pulley of timing belt

Part number	372-1007030
Width	27.0 mm
Outer diameter	φ50mm

Check if the out is damaged.Timing belt model and type

Type / Item	EF
	GL, ZL, GS, ZS
Camshaft timing pulley diameter(mm)	$\varphi 110.7^{+0.1}_{-0.2}$
Camshaft timing pulley diameter(mm)	$\varphi 54.65^{+0.7}_{-0.13}$

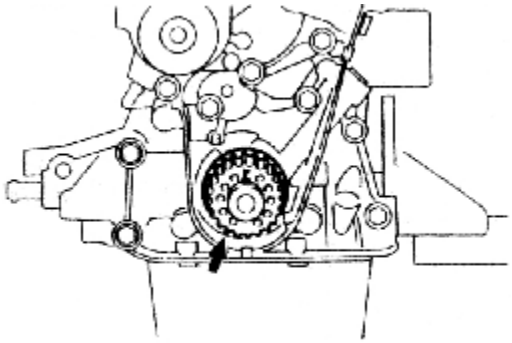
Check the timing belt back plate for any deformation.

Standard size of crankshaft timing gear

Width	28.6mm

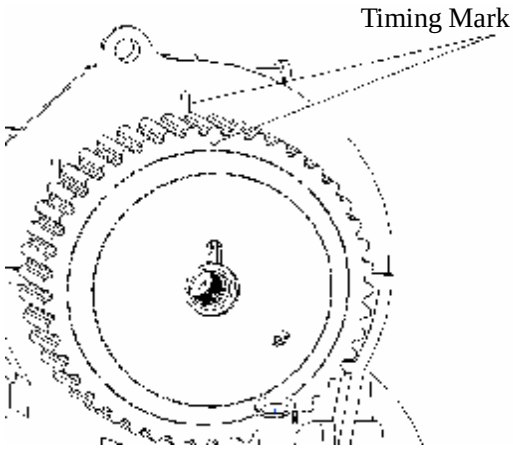
3. Installation

3.1 Assembly of crankshaft timing pulley.

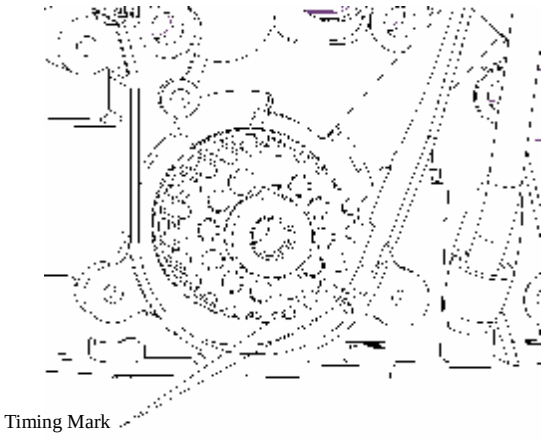


3.2 Installation of timing (at the top dead center of the first cylinder piston)

3.2.1 Put the camshaft timing gear on the front end of the exhaust camshaft, align the locating slot on the gear with the locating pin on the end of the camshaft, and then fix the timing gear with bolts. The tightening torque for the bolts is 100±5Nm.

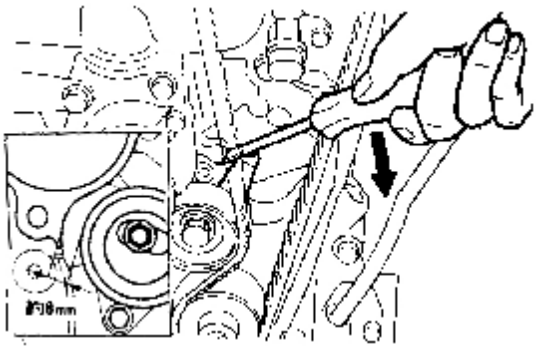


Make sure that the clashing mark of crankshaft timing pulley aligns with the mark of oil pump.



3.3 Install the tension pulley. After adjust the tension of timing belt, install the tension pulley bolt and tighten it with the torque specified. Adjust the tension of the timing belt acording to the following instruction, and install the tension pulley.

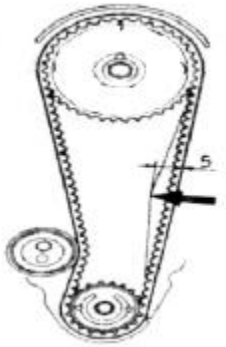
3.3.1 As indicated in the figure, make the tensioner swing to the right with a screwdriver so that the distance between the edge of the tension pulley and the circular arc of the water pump body is 8mm, and then tighten the tension pulley bolts with the torque of 25±3Nm.



3.3.2 Rotate the crankshaft along the rotating direction of the engine for 2 rounds so that the timing mark on the timing gear of camshaft and crankshaft is matched respectively, and then tighten the crankshaft belt pulley bolts.

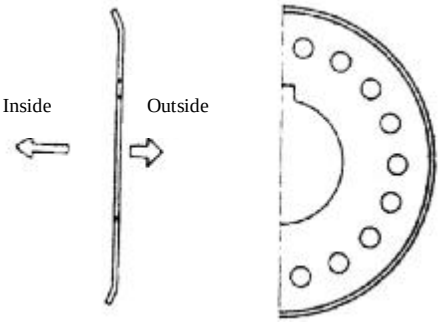
3.3.3 The force required to press down the central position between the 2 pulleys at the in-tension side of the timing belt for about 5mm is:

［Reference］ 19.6-29.4N(2.0-3.0kg)

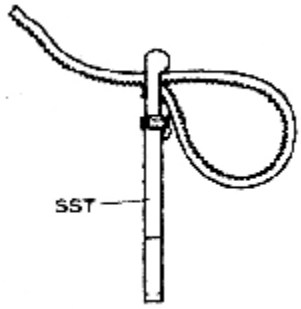


Notice: when the deflection can not reach the standard, it is necessary to adjust the fixing bolt of tension pulley mentioned above.
Tighten the fixing bolt of the tension pulley with the torque as specified. The tightening torque is 25±3N.m

3.4 Assembly of Timing Belt Back Plate.
Notice: Install the timing belt back plate in the direction as indicated in the right figure.

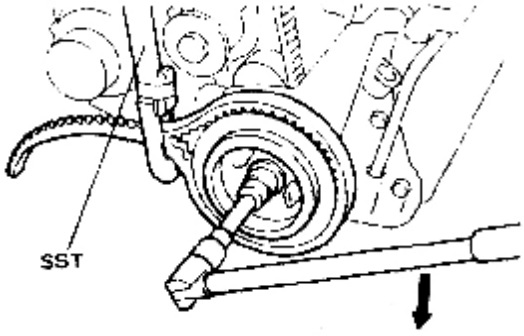


3.5 Install the torsional damper with special tools.
3.5.1 Without flywheel
3.5.1.1 Hitch the part of crankshaft pulley with the belt of special tool.



3.5.1.2 Hold on the handle of the special tool and prevent the toothed belt from rotating. Tighten the bolts with the specified torque.

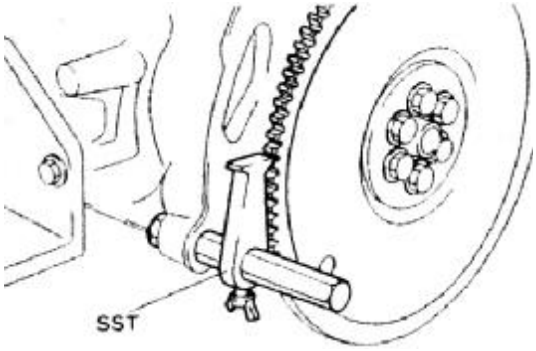
Torque: 98.0±10N.m{10±1kgm}



3.5.2 With flywheel

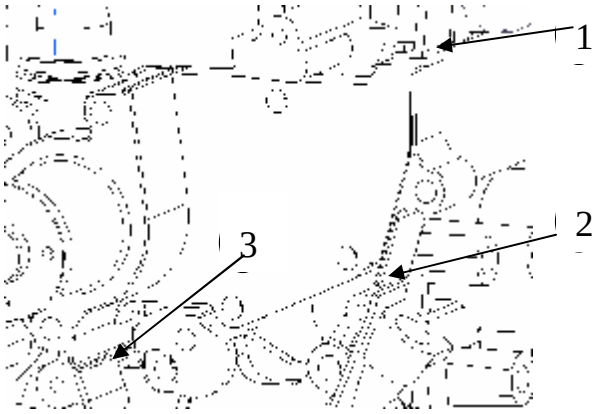
3.5.2.1 Prevent the gear from rotating with special tool.

3.5.2.2 Then screw down the bolt of torsional damper.



3.6 Assembly of timing cover.

Mount the sealing strips at the positions as indicated in the right figure. The sealing strips at the position 1 and 2 should be mounted before the assembly of the cylinder head assembly, and the sealing strip at the position 3 should be mounted before tightening the water pump.

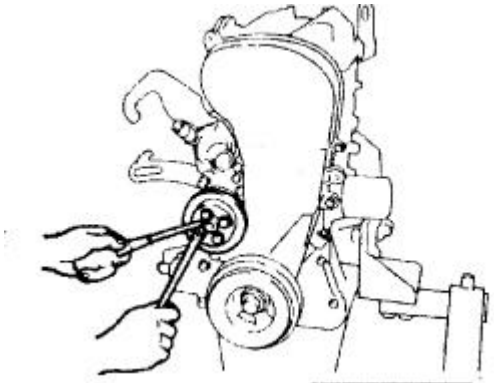


Install the timing cover, screw in the bolts with hand and then tighten them.

Torque: 6±1N.m

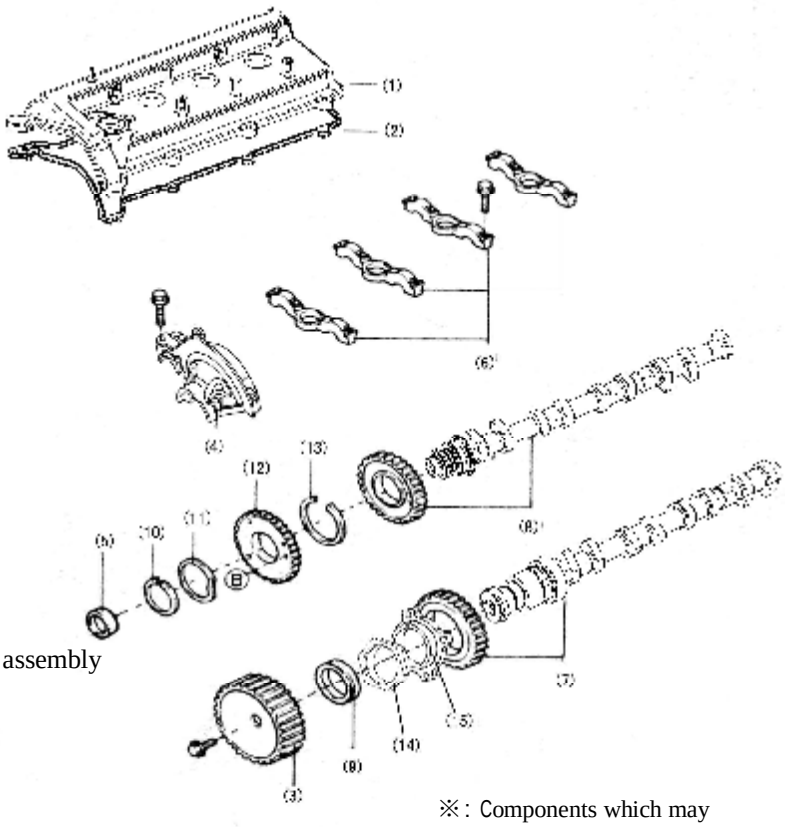
3.7 Installation of water pump pulley.

Torque: 6±1N.m



2) Camshaft

1. Structure Diagram



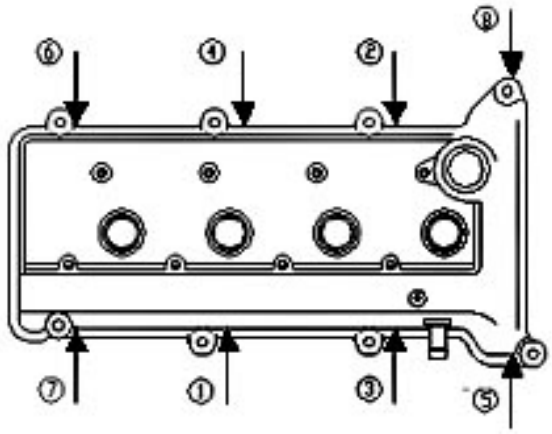
(1) Cylinder head chamber cover assembly
(2) Cylinder head cover gasket
(3) Camshaft timing belt
(4) Camshaft cover
(5) Blanking cover
(6) Camshaft bearing cap
(7) Exhaust camshaft assembly
(8) Intake camshaft assembly
(9) Camshaft oil seal
(10) Axial spring retainer ring
(11) Saddle washer
(12) Intake camshaft sub gear
(13) Transmission ring

※: Components which may not be reused

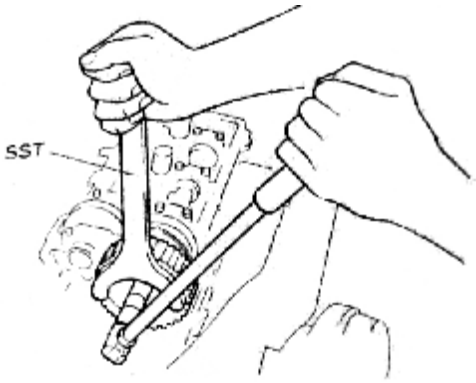
Unit: N·m(kg·cm)

2. Disassembly

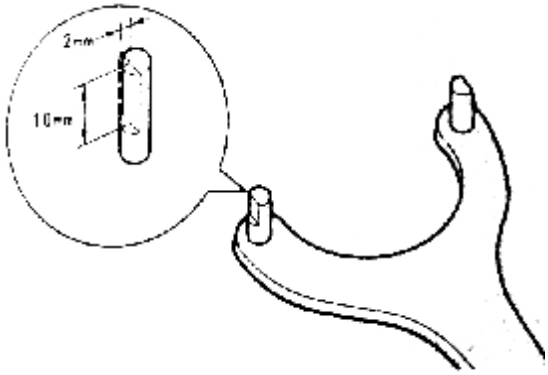
2.1 ① Cylinder head chamber cover assembly;
② Disassembly sequence of cylinder head chamber cover;



2.2 Remove the camshaft timing gear with special tool.

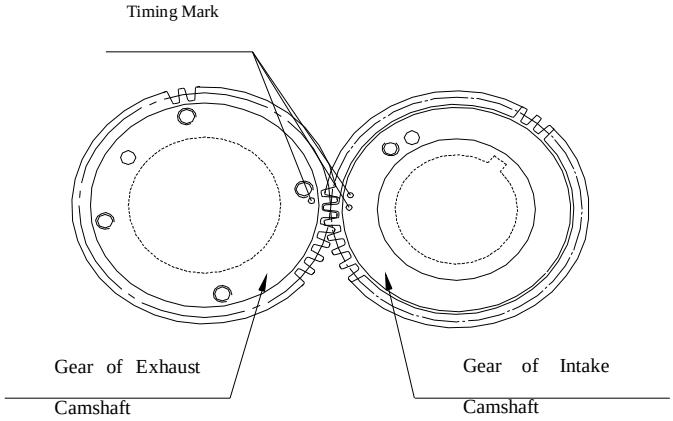


Notice: ·The special tool should be made as indicated in the right figure.
·Use the special tool to prevent the camshaft from rotating.



2.3 Remove the camshaft bearing cap

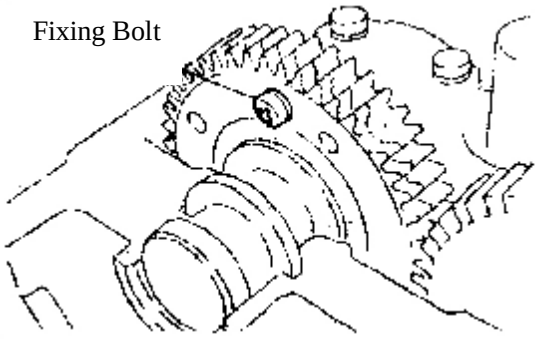
2.3.1 The marks on the camshaft gear should match with each other as indicated in the right figure.



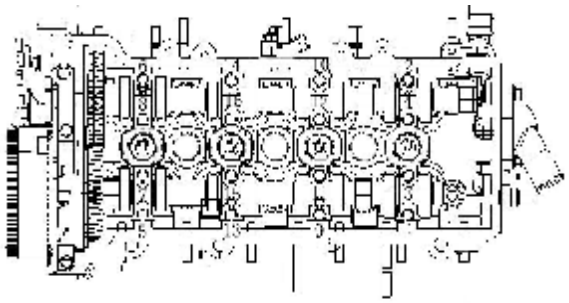
2.3.2 Position the main sub gear on intake camshaft with bolts, as can be seen from the right picture.

Notice: In order to eliminate the radial force of the camshaft, the camshaft should be kept at the horizontal position in the course of disassembly so as to prevent the damage caused by the excessively high radial force.

Fixing Bolt



2.4 Disassemble the bolts in the order as indicated in the right figure, and then disassembly the camshaft bearing cap.



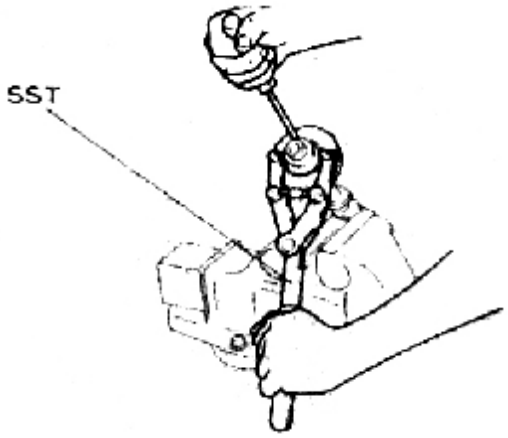
2.5 Remove the spark plug

2.6 Disassemble the sub gear of the camshaft.

2.6.1 If using the special tools, operate as indicated in the right figure.

Clamp the camshaft and plug the pins of special tool into the hole on gear; rotate the gear to keep the meshing of driven gear and driving gear, and then remove the fixing bolt of driven gear.

Notice: The surface of the camshaft may not be damaged.



2.6.2 If not using the special tools, operate as indicated in the right figure.

(1) Screw M6 bolts onto the sub gear of the intake camshaft at the position as indicated in the right figure.

(2) Use the screwdriver to turn the gear as indicated in the figure, and disassemble the fixing bolts of the sub gear.

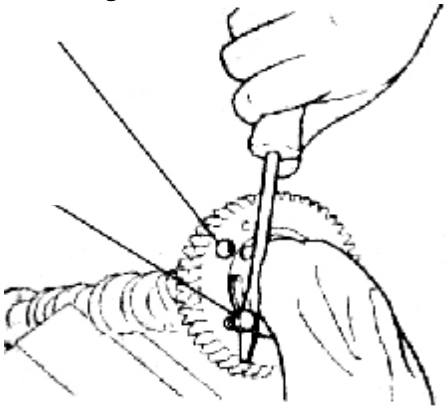
Notice: The surface of the camshaft may not be damaged.

(3) Disassemble the axial elastic retainer ring with tensioner and remove the saddle spring washer, transmission ring, and so on.

2.7 Camshaft

For Fixing

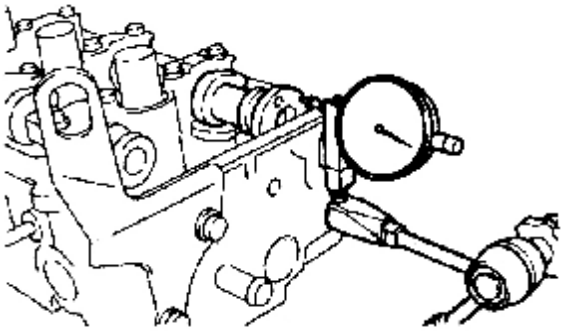
Bolt



2.7.1 Measure the camshaft with micrometer caliper. If it is below to the specified limit, replace with a new one.

Camshaft journal Unit: mm

Item \ Type		EF	
		ZL, RL	GL, GS, ZS
Standard value	IN	$\varphi 23.0^{-0.02}_{-0.033}$	
	EX	$\varphi 23.0^{-0.02}_{-0.033}$	
Limit: 0.10	IN	φ22.9	
	EX	φ22.9	



2.7.2 Inspection of camshaft axial clearance

(1) Replace the camshaft when the axial clearance value measured with dial gauge exceeds the standard value.The axial clearance of intake camshaft is 0.1~0.170mm.

The axial clearance of exhaust camshaft is 0.1~ 0.173mm.

Limit: 0.18mm.

2.7.3 Inspect the clearance of the engaging tooth of camshaft

(1) Install the camshaft into the cylinder head.

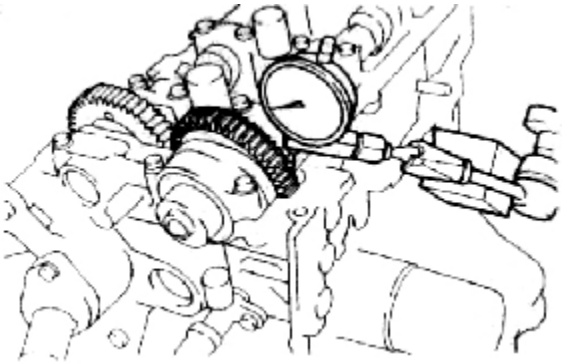
(2) Confirm the mark forwards on the bearing cap as well as the axle number, and then tighten the bolts.

(3) Measure the clearance of engaging tooth of the intake camshaft with dia indicator.

Notice: ·Measure at 4 points on the circle of the piston

·Turn the intake camshaft with special tools.

·Make sure that the marks on the driven gear and the driving gear of the camshaft match with each other.



Inspect the clearance of the engaging tooth of camshaft:

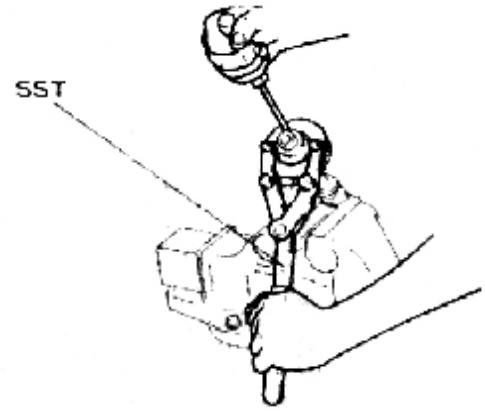
Item	Standard value	Limit
Single tootj	0.04-0.13	0.30

3. Installation

3.1 Under the circumstance that special tools are used:

3.1.1 Fix the 2 holes (φ6) of the camshaft gear assembly with special tool.

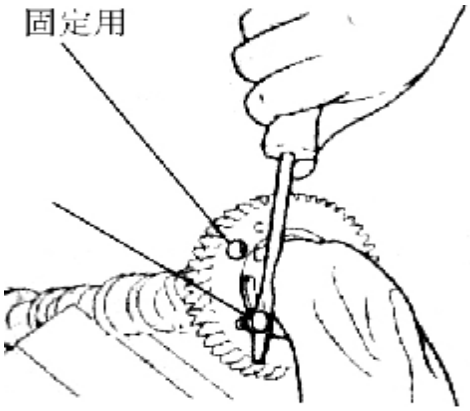
3.1.2 Rotate the driven gear to the right with special tool and tally the mark hole of driven gear with that of camshaft driving gear, or their marking way complies with each other, fix the driven gear with bolts.(Thread: M5; Thread pitch: 0.8)



For Fixing

3.2 Under the circumstance that special tools are not available:

3.2.1 Screw the M6 bolts into the camshaft driven gear at the position indicated in the right figure. Insert a screwdriver into the gap between the M6 bolt and the camshaft journal and trun the driven gear rightwards so that the fitting mark of the 2 gears match with each other or the tooth head of the 2 gears accord with each other, and then fix the driven gear with bolts (M5×0.8).



Notice: Don't damage the journal, adjust the operation.

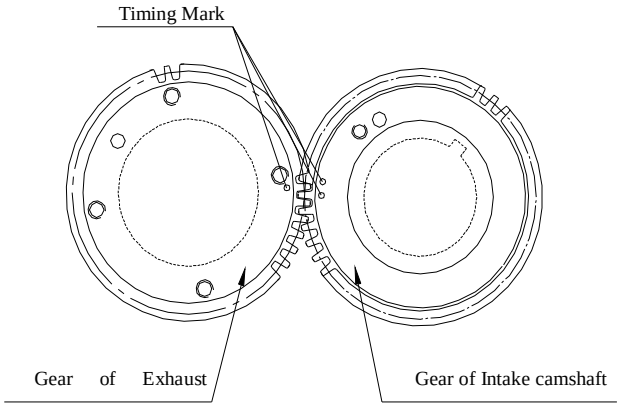
3.3 Assembly of camshaft

Notice: Pay attention to the axial clearance of the camshaft

3.3.1 Spread grease on the gear of camshaft and the axial of cylinder head.

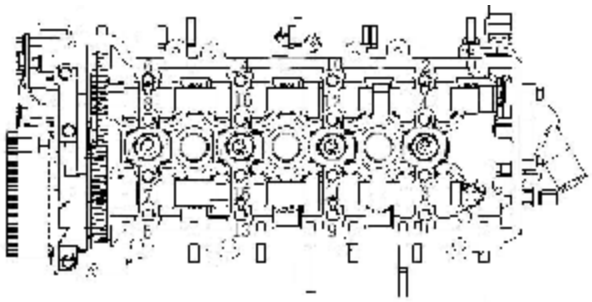
3.3.2 Remove the fixing bolts for camshaft driven gear after mounting the camshaft.

3.3.3 Mount the camshaft, align the timing mark as can be seen from the right picture

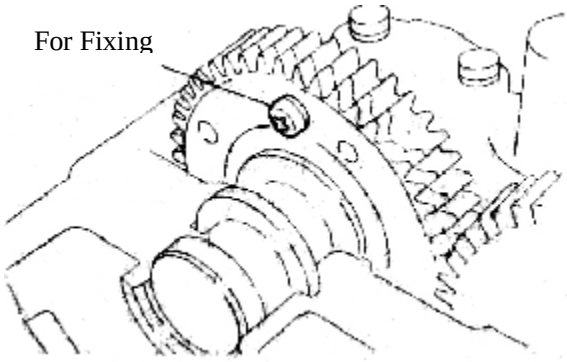


3.3.4 Spread oil fully on the cam of camshaft assembly, gears and axial of cylinder head.

3.4 Tighten the camshaft bearing cap by the order of right picture.

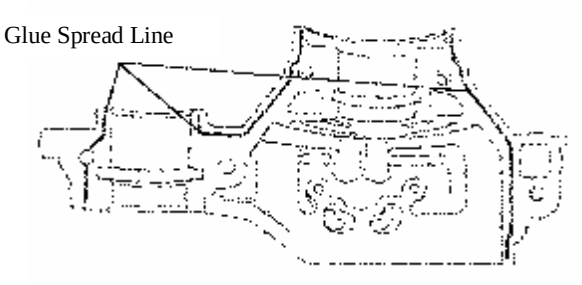


3.5 Screw off the fixing bolts for driven gear of intake camshaft assembly.



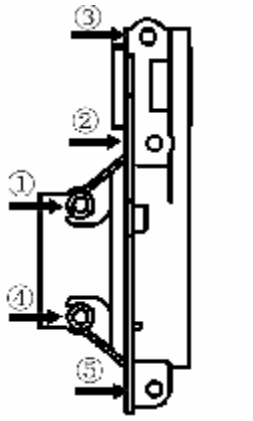
3.6 Assembly of camshaft cove

Spread sealant on the position (slot) of camshaft cover as can be seen from the right picture.



3.6.1 Assembly of Camshaft Cover

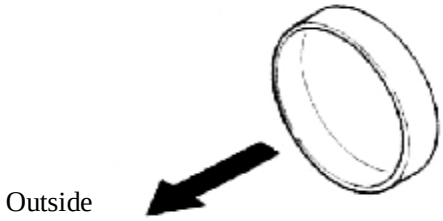
Tighten the bolts in the order as indicated in the right figure and with the specified torque.



3.6.2 After spreading oil on the blanking aperture of cylinder head and the mounting surface of blanking cover, press the blanking cover with special tool.

Notice:· The blanking cover should be installed in the direction as indicated in the right figure.

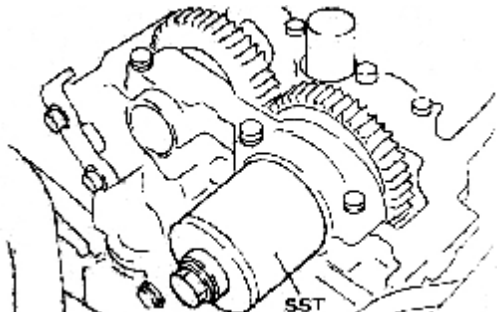
· After being pressed, the blanking cover should be 1±1mm higher than the surface of thecylinder head.



3.7 Spread the edge of the camshaft oil seal with oil, and press it into the cylinder head with M10 bolt (length: 50-60mm) and special tools.

Notice:· If the oil seal is reused, spread it with oil before pressing it into the cylinder head.

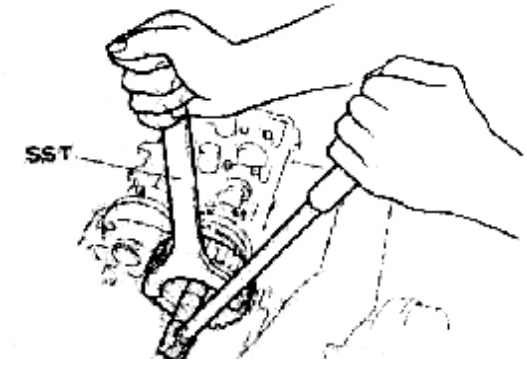
· After removing the bolt, knock it with hand so as to inspect and confirm it.



3.8 Assembly of camshaft timing gear

After spreading sealant on the bolt, prevent it from rotating with special tool and screw down the bolt of camshaft timing gear in specified torque.

Torque: 100±5N.m



Notice: Process the special tools as indicated in the right figure before using them.



3.9 Installation of cylinder head cover

3.9.1 The old cushion of the timing belt cover which contacts the cylinder head cover should be removed completely.

3.9.2 Put the new cushion into the gloove of the timing belt cover accurately.

3.9.3 Mount the cylinder head cover on the cylinder head, and tighten the 8 bolts in the order as indicated in the right figure and with the specified torque.

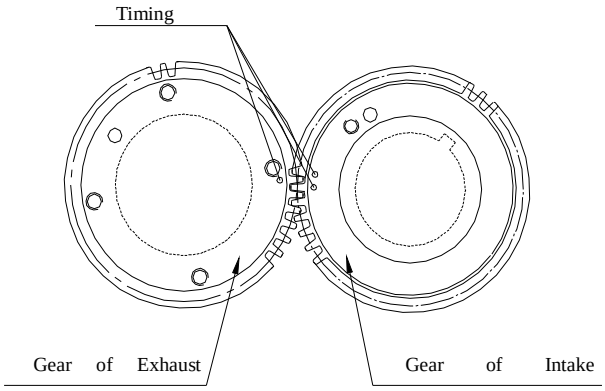
Torque: 6±1N.m

4 Inspection of valve

4.1 Standard valve clearance:

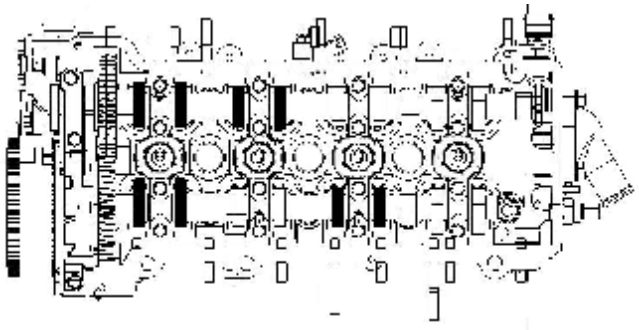
Valve clearance	IN	0.18±0.05
	EX	0.25±0.05

4.2 Make sure that the timing mark on the camshaft driving gear is aligned with that on the camshaft driven gear.

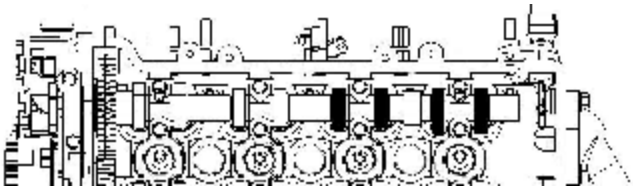


4.3 Inspect the valve clearance as specified in the figure below with the feeler gauge

Cylinder 1		Cylinder 2		Cylinder 3		Cylinder4	
IN	EX	IN	EX	IN	EX	IN	EX
O	O	O	—	—	O	—	—



4.4 Rotate the camshaft for a round to the position as indicated in the figure, and then measure the valve



clearance once again:

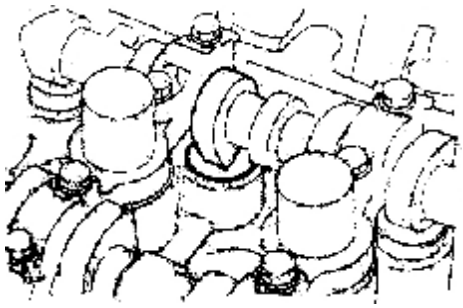
Cylinder 1		Cylinder 2		Cylinder 3		Cylinder 4	
IN	EX	IN	EX	IN	EX	IN	EX
—	—	—	O	O	—	O	O

If the clearance exceeds the standard value, adjust it by replacing the adjustment gasket.

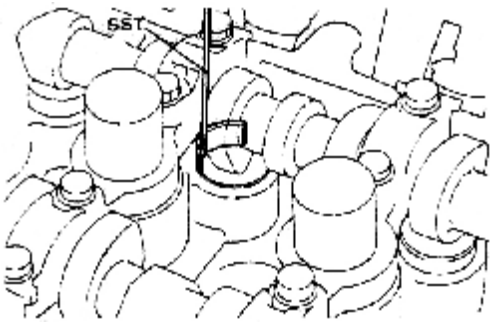
Notice: The position at which the measurement result exceeds the standard value as well as the measurement result should be recorded.

4.4.1 Rotate the camshaft and make the cam head of the cylinder which exceeds the standard value faces upwards and the opening of the valve tappet face inwards.

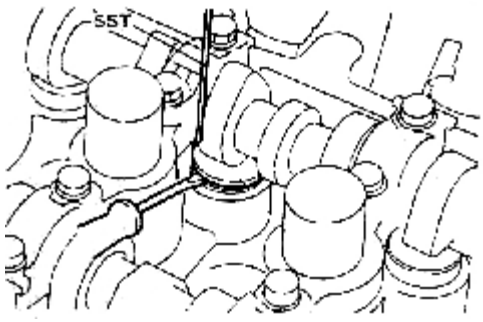
4.4.2 Rotate the crankshaft and press down the valve tappet with the crown head of the cylinder cam.



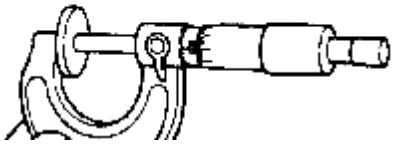
4.4.3 As indicated in the right figure, put special tools on and around the valve tappet from the inside of the cylinder head, and then rotate the crankshaft so that the crown head of the cam face upwards. Press the valve tappet with special tools and hold on.



4.4.3.1 Pry out the adjustment gasket with screw driver, remove the gasket inside with magnet.



4.4.3.2 Adjust the thickness of adjustment gasket with



micrometer caliper.

4.4.3.3 Select the gasket on the basis of the standard value of valve tappet

① Intake valve
Select gasket thickness = Unload thickness + (Measured valve clearance -0.25mm)

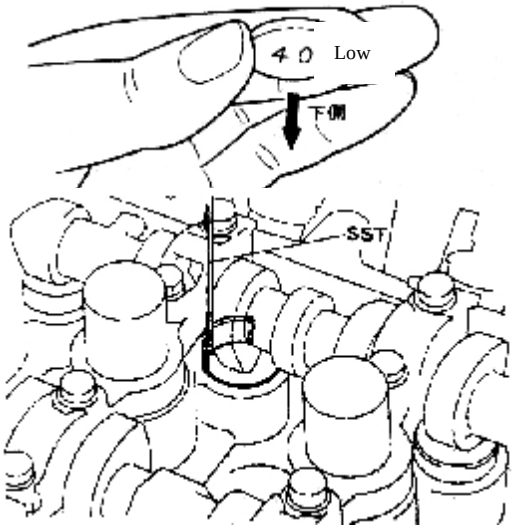
② Exhaust valve
Select gasket thickness = Unload thickness + (Measured valve clearance -0.25mm)

[Reference] The 32 kinds of gasket with different thickness are listed in the following table:

2.18	2.40	2.62
2.20	2.42	2.64
2.22	2.44	2.66
2.24	2.46	2.68
2.26	2.48	2.70
2.28	2.50	2.72
2.30	2.52	2.74
2.36	2.58	2.80
2.32	2.54	2.76
2.38	2.6	

4.4.3.4 Adjust the valve clearance with selected adjustment gasket.

Notice: Install the adjustment gasket with its identification mark facing downwards.

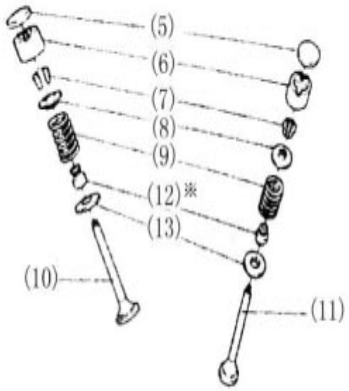


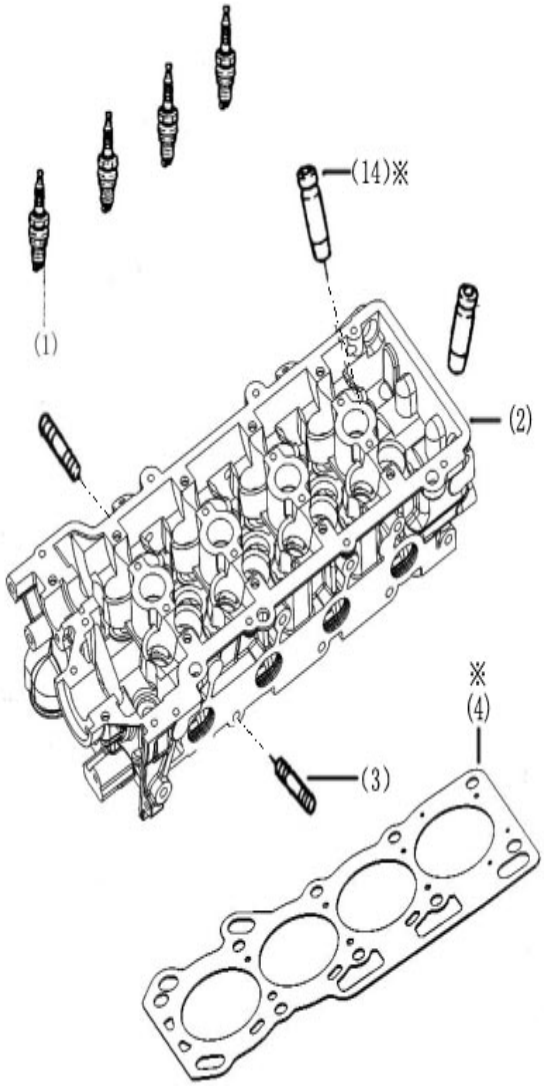
4.4.3.5 Rotate the crankshaft so that the crown head of the cam faces downwards and presses down the the valve. Pick up the special tool.

4.4.3.6 Rotate the crankshaft for 2-3 rounds and confirm once again the valve clearance. If it is still beyond the scope of standard value, adjust and inspect the valve clearance according to the operation specified in 4.1-4.4.

3) Cylinder Head

1. Structure Diagram





1 Spark plug 20±1Nm
2 Cylinder Head
3 Weather Strip I
4 Cylinder cushion
5 Adjustment gasket
6 Valve tappet
7 Valve spring retainer
8 Valve spring seat
9 Valve Spring
10 Intake valve
11 Exhaust valve
12 Valve oil seal
13 Valve seat
14 Valve guide

※: Components which may not be reused

2. Disassembly

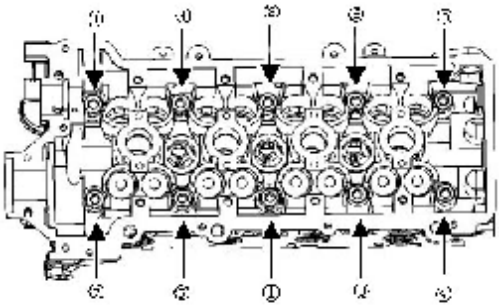
2.1 Disassembly of spark plug



2.2 There are 8 boltes on the cylinder head. In the course

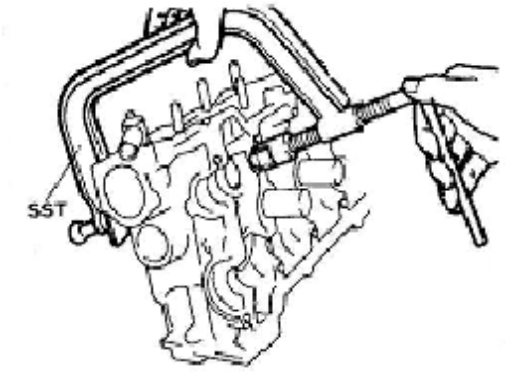
of the assembly of cylinder head, slowly tighten these bolts in the order as indicated in the right figure for several times untill ther are tightened properly.

Notice: Remove the cylinder head bolts with a torque socket wrench in the contrary order.



2.3 Disassembly of cylinder head and cylinder head gasket

Notice: The cylinder head gasket is nonreusable.



2.4 Disassembly of valve adjustment gasket and valve tappet

2.5 Disassemble the valve spring retainer lock, spring retainer, spring seat, valve spring, intake valve, and exhaust Valve etc with special tools.

2.6 Disassembly of valve oil seal and valve spring gasket

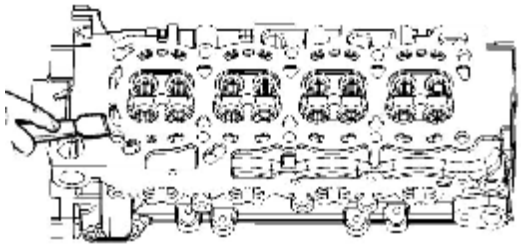
2.7 Cleanup

2.7.1 Clean the carbon dust on the valve.

2.7.2 Clean the bottom surface of cylinder head and the surface of intake and exhaust manifold with scraper knife.

Notice: The surface of the cylinder head may not be scratched in the course of cleanup.

Do not pollute the intake port and water passage.



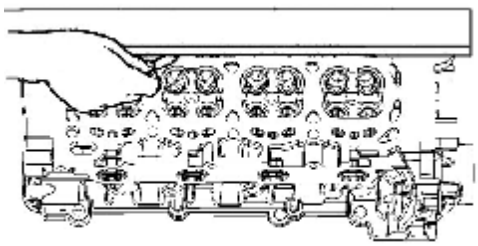
3. Routine Inspection

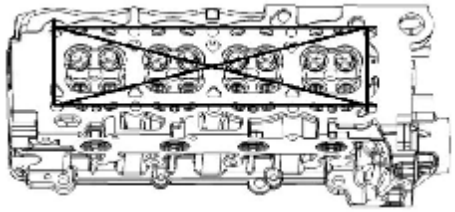
3.1 Cylinder Head

Measure the flatness at each point with ring gauge as indicated in the figure.

Cylinder head: 0.10mm

Surface of intake/exhaust manifold: 0.10 mm。

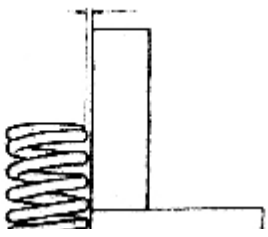




3.2 Valve Spring

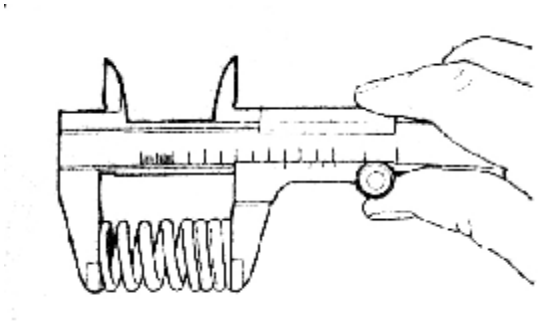
3.2.1 Measure the square degree of valve spring with square. Replace if it exceeds the specified value.

Limit: 1.2mm



3.2.2 Measure the free state of the spring.

Standard value: 37mm

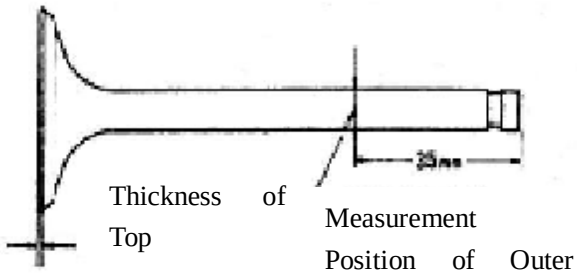


3.3 Inspection of valve

3.3.1 Check if it is deformed or abrades.

Inspection of valve Unit: mm

Item		Standard value	Limit: 0.10
Width of seal	IN	0.85～1.41	—
	EX	1.07～1.36	—
Thickness of top of valve	IN	1.0±0.2	0.75
	EX	1.0±0.2	0.75



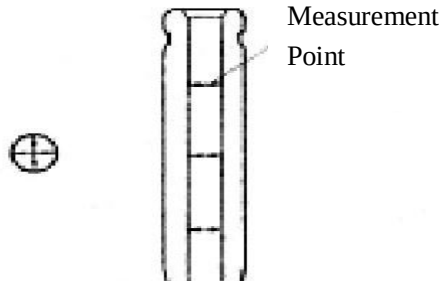
3.3.2 Check the clearance of valve guide and valve stem.

3.3.2.1 Measure the inside diameter of valve guide with dial gauge, the outer diameter of valve stem with micrometer caliper.

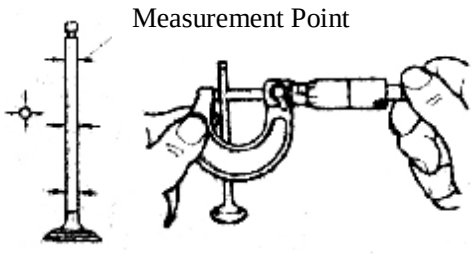
3.3.2.2 Figure out the difference of measured values and the clearance. If the clearance is beyond the specified value, replace valve or guide.

Notice: As can be seen from the right picture, at measuring point, work out the clearance of last abrasion part.

Item		Standard value	Limit: 0.10
Valve guide inside diameter(mm)		φ5.0	—
Valve guide outer diameter(mm)		φ5.0	—
Clearance	IN	0.056～0.020mm	0.07
	EX	0.066～0.030mm	0.08



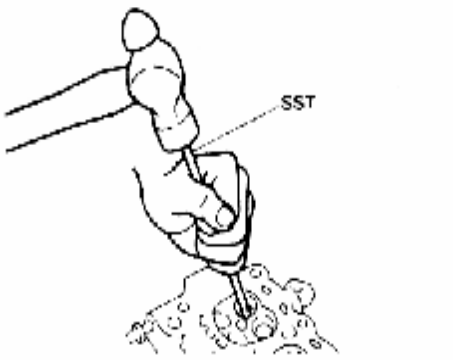
Measurement of Valve Guide Inside Diameter



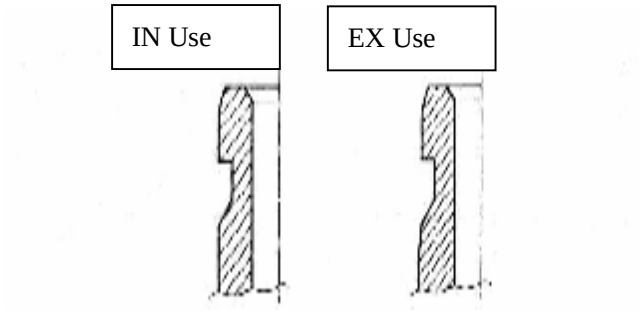
3.3.3 Replacement of valve guide.

3.3.3.1 Heat the cylinder head with hot water to 80-100 ℃.

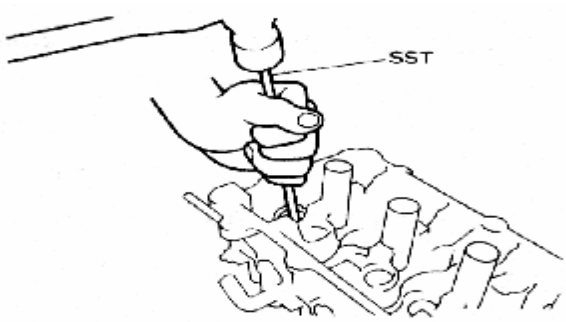
3.3.3.2 Take out the valve guide from one side of combustion chamber with special tool, as can be seen from the right picture.



Notice: The removed valve guide may not be reused. The intake valve guide and the exhaust valve guide may not be mis-installed.



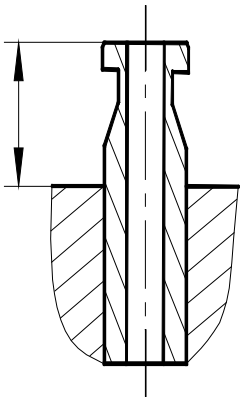
3.3.3.3 Mount the new valve guide with special tool at the place as can be seen from the right picture.



Notice: strike the conduit slowly to the position in the cylinder head; do not strike too far and be careful for size.

The height of the part of valve guide struck into the cylinder head:

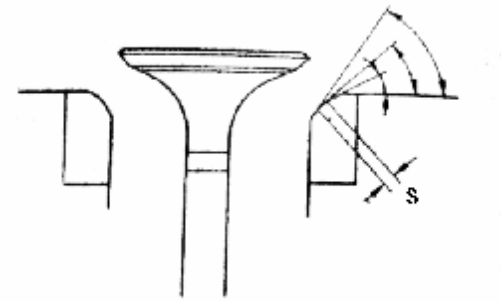
Item \ Type	EF	
	GL, ZL, RL, GS, ZS	
Height (mm）	IN	13.71±0.25
	EX	12.11±0.25



3.3.3.4 Rub the inside diameter with reamer to reach the standard clearance value.

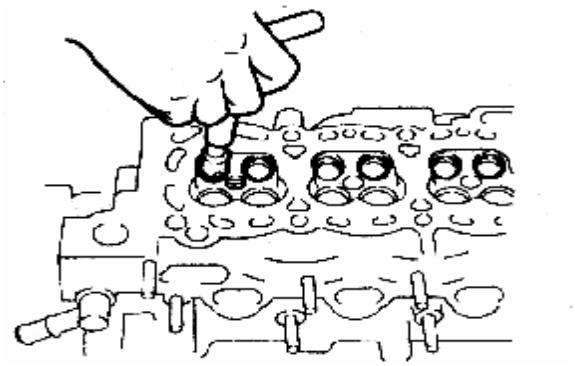
3.3.4 Assorted surface of valve

3.3.4.1 Spread with red lead on the assorted surface of valve. Do not rotate the valve but press lightly and check the assortment and width.



3.3.4.2 Repair of valve seat insert

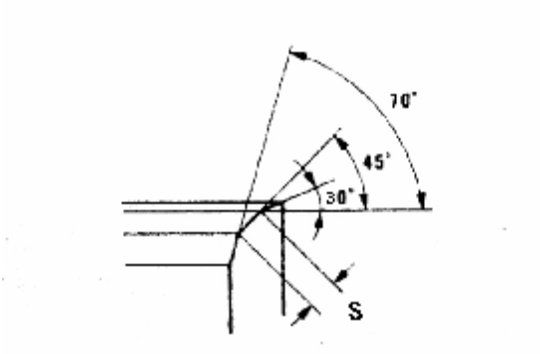
Notice: The repair of valve seat is always conducted in the course of the inspection of valve's fitting position. The surface repaired should be free from any breakage. Take it out slowly after the inspection.



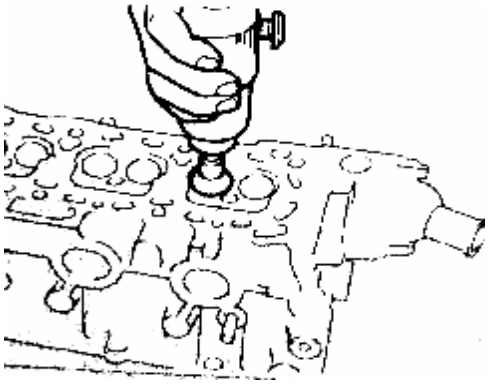
3.3.4.3 45wimble surface is assorted standard value.

3.3.4.4 Inspect the fitting position of the valve. The best position is the center of the valve. If no the valve should be adjusted.

3.3.4.5 Cut wimble surface at the center of assorted position with inner 70and outer 30



3.3.4.6 Prepare for polishing of valve seal.



3.4 Assembly of cylinder head

3.4.1 Cylinder head

Pay attention to the following for installing the other auxiliary part of cylinder head:

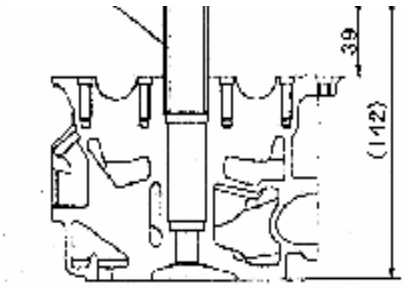
3.4.2 Protective tube of spark plug

1. Press the protective tube of spark plug into the protective tube hole on the cylinder head with the special auxiliary tool. Before pressing, spread the protective tube with sealant. The pressing depth is indicated in the right figure.

Notice: Pay attention to the pressing depth and the uprightness to top of cylinder head when pressing.

During pressing, the protective tube can not be deformed, or leaking will be occurred at the cylinder head cover.

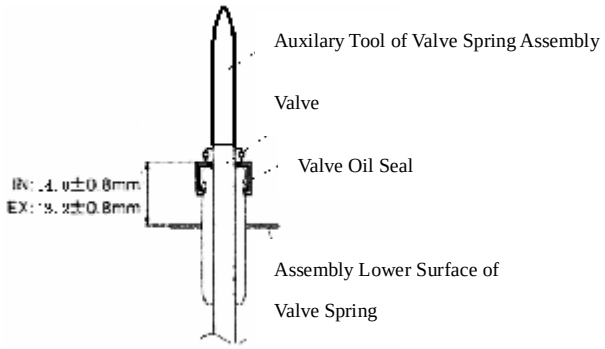
Protective Tube of Spark Plug



3.4.3 Installation

3.4.3.1 Assembly of valve spring washer and valve oil seal

3.4.3.1.1 Clamp the special auxiliary tool on the top of valve stem and spread oil around the auxiliary tool and the inner of new valve oil seal. Then mount it at the position as can be seen from the picture and pull out the mounting auxiliary tool of valve oil seal.

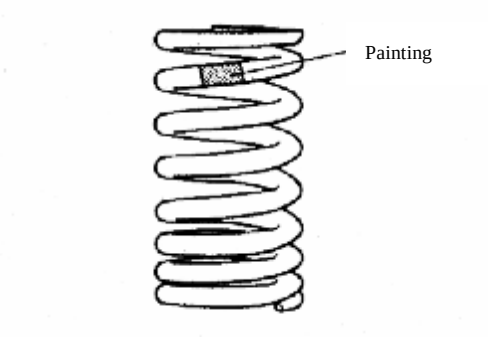


[Reference] After being pressed down, the size of the oil seal should comply with the value indicated in the right figure.

3.4.3.2 Assembly of intake valve and exhaust valve

3.4.3.2.1 Assembly of valve spring.

Notice: The painting is used for recognizing the different suppliers, so the same engine should use the valve spring with same painting.

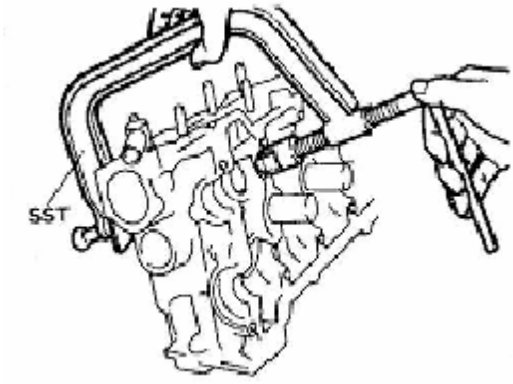


3.4.3.3 Assembly of valve keeper

Warning: Operate with goggle for protecting the eyes.

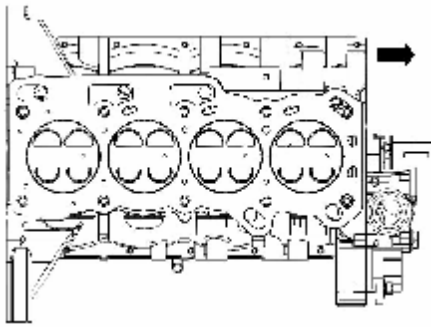
·Be care for spring jumping out.

After assembly of valve spring and its seat, press the valve spring with special tool and mount the valve keeper.



3.4.3.4 Assembly of valve tappet and valve clearance adjustment gasket

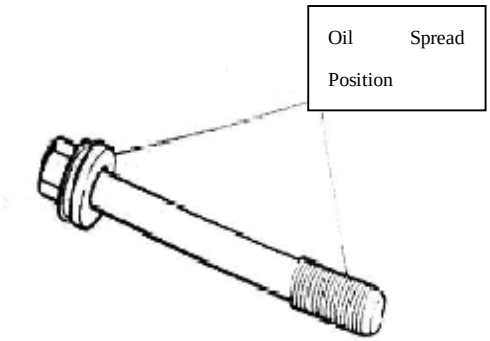
3.4.3.5 Mount the cylinder head gasket and recognize the direction of front and back.



3.4.4 Assembly of dust seal and cylinder head

assembly

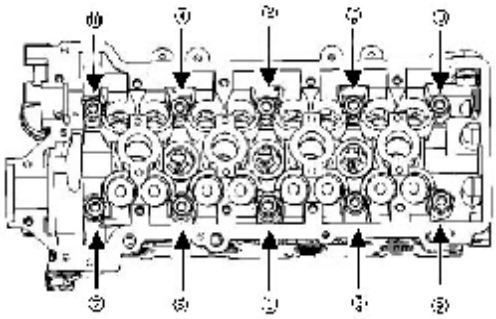
3.4.4.1 Spread a little oil on the flange side of bolt and threaded part



3.4.4.2 Tighten the cylinder bolts in the order indicated in the right figure for 3 times till the torque reaches the specified value. The tightening torque for each time is set forth as follows:

First time: 30±2Nm; second time: 50±3Nm; third time: 70±3.5Nm

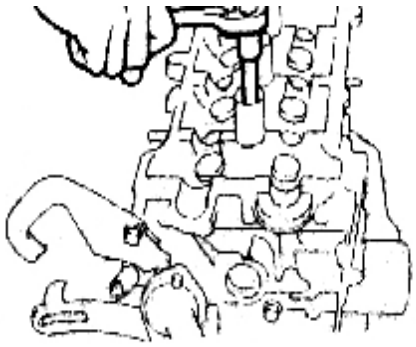
Torque: 70±3.5N.m



3.4.4.3 Mount spark plug

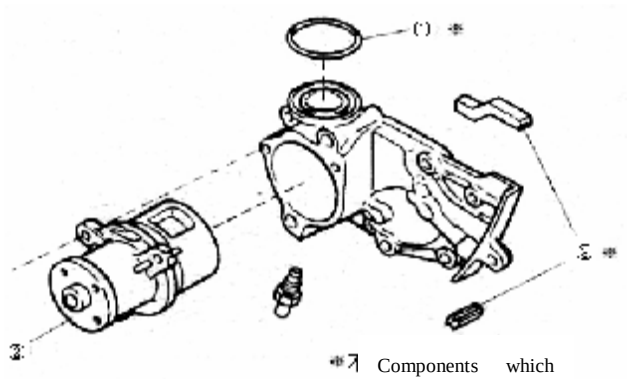
Torque: 20±1Nm

Notice: Tools should be vertical to prevent the protective tube of spark plug from distorting, or the oil will leak.



4) Water Pump

1. Structure Diagram



Components which may not be reused

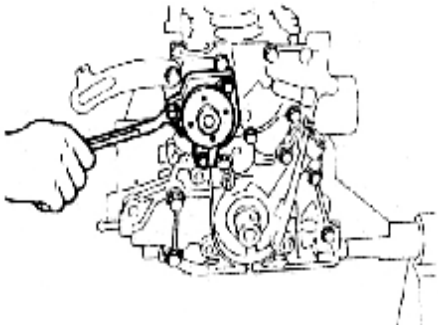
① O-ring (nonreusable)
② Water pump body
③ Dust seal

2. Disassembly

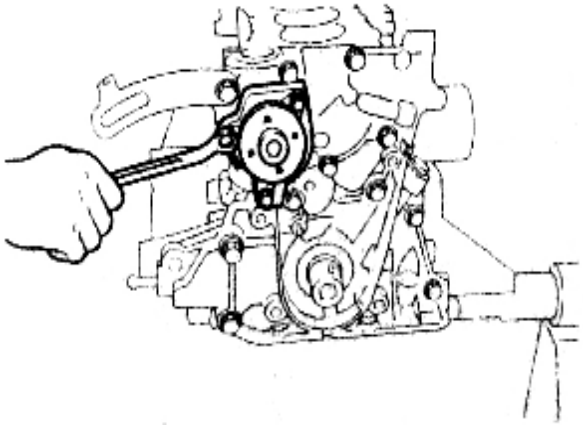
2.1.① Disassembly O-ring

Notice: The O-ring is nonreusable.

2.2 Screw off 3 bolts and disassemble water pump body.



2.3. Disassembly of dust seal



3. Cleanup

3.1 Clean water pump joint surface.

4. Routine Inspection

4.1 Check if it is deformed.

4.2 Rotate it with hand and inspect whether the rotor rotates and is lubricated well.

5 Assembly

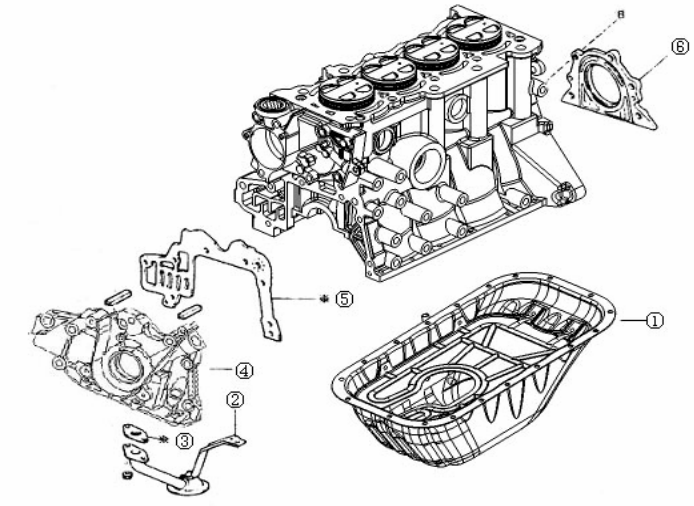
5.1 Mount Dust seal.

5.2 Mount Water Pump Body; torque: 25±1.5N.m.

5.3 Mount The New O-ring.

5) Oil Pump

1. Structure Diagram



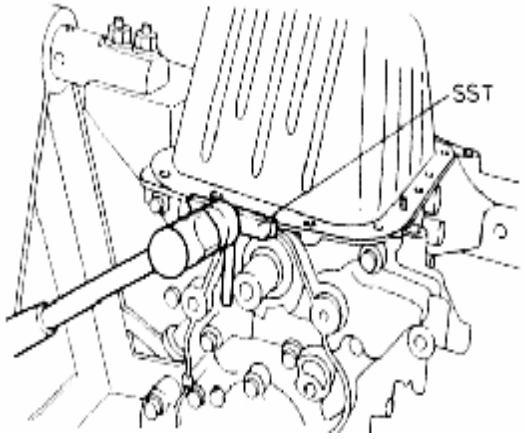
※: Components which may not be reused

① Torque for oil pan bolt: 8±2 N.m
② Oil collector
③ Oil collector spacer (nonreusable)
④ Oil pump
⑤ Oil pump spacer (nonreusable)
⑥ Rear oil seal bracket

2 Disassembly

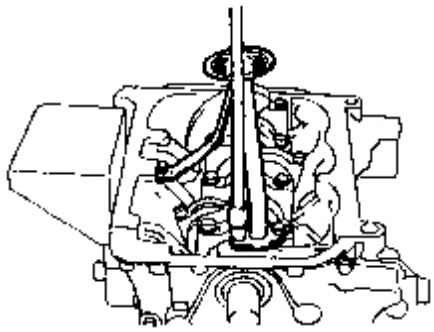
2.1 Screw off the bolts and nuts, and then remove the oil pan from the cylinder body with special tool (The engine is placed on the disassemble shelf upside down).

Notice: Don't make the oil pan flange deform.

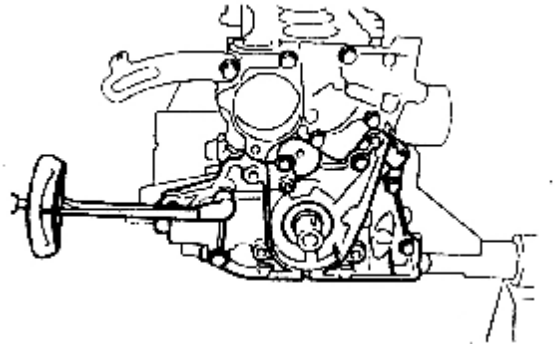


2.2 Remove the engine oil drainer, engine oil collector gasket

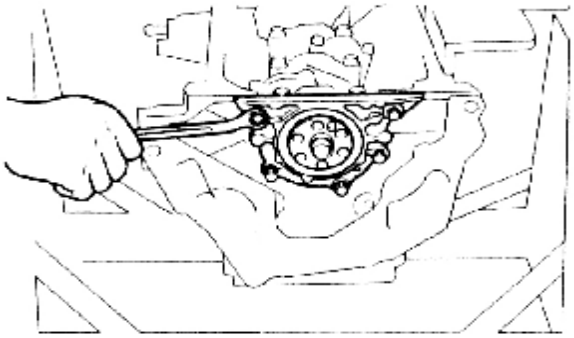
Notice: The oil collector gasket is nonreusable.



2.3 Remove the engine oil pump assembly and the engine oil pump gasket.



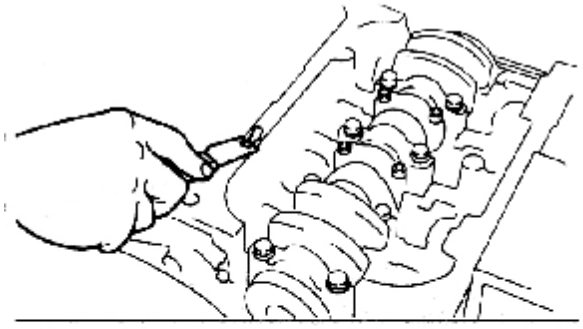
2.4 Remove the rear oil seal bracket.

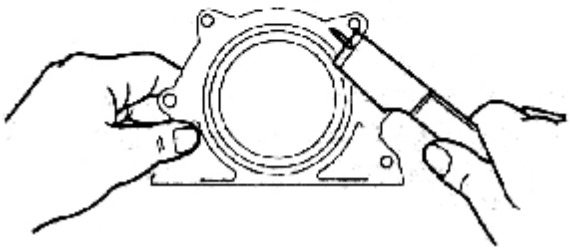


3. Cleanup

3.1 Remove the old cushion from the oil pan, oil pump and oil pan bracket with a scraper or shovel.

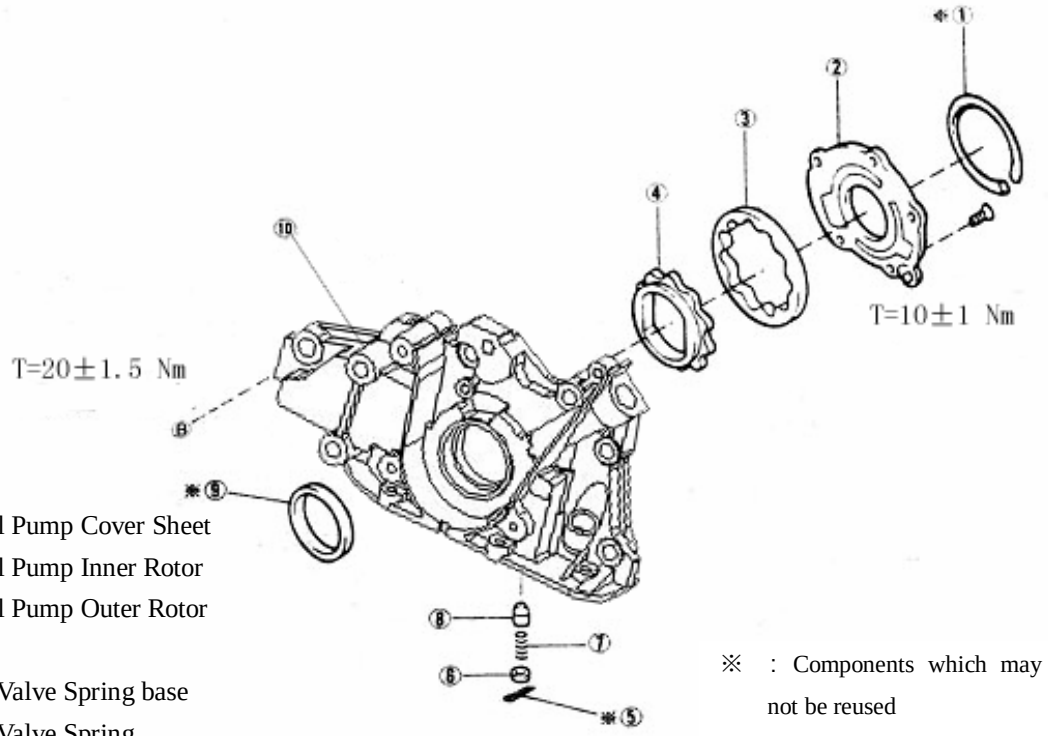
Notice: Don't let the fragment of the cushion fall into the cylinder.





4 Disassembly and Assembly of Engine Oil Pump

4.1 Structure Diagram



① Seal Ring
② Engine Oil Pump Cover Sheet
③ Engine Oil Pump Inner Rotor
④ Engine Oil Pump Outer Rotor
⑤ Cotter Pin
⑥ Oil Drain Valve Spring base
⑦ Oil Drain Valve Spring
⑧ Slide Block
⑨ Crankshaft Front Oil Seal
⑩ Engine Oil Pump Housing

※ : Components which may not be reused

Unit: N·m(kg·cm)

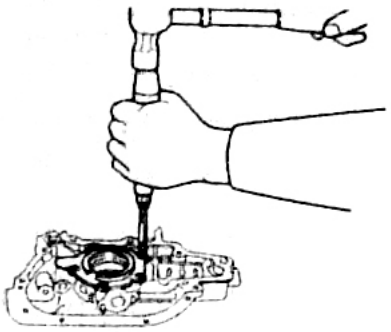
4.2 Disassembly

4.2.1 ① O-ring

Notice: The O-ring is nonreusable.

4.2.2 Remove the oil pump cover

Notice: If the screws are tightened, use a screw driver to remove them as indicated in the figure.

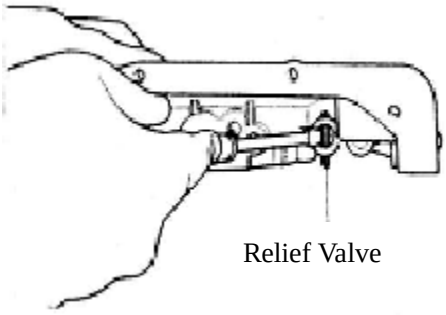


4.2.3 Remove the inner rotor, outer rotor of the engine oil pump.

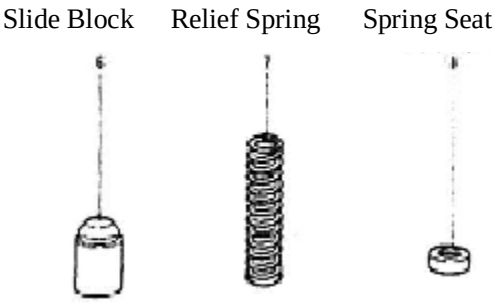
4.2.4 Remove the cotter pin

Notice: The cotter pin is nonreusable.

Notice: When removing the cotter pin, be careful not to let the spring or the spring seat spring out or fall off abruptly.

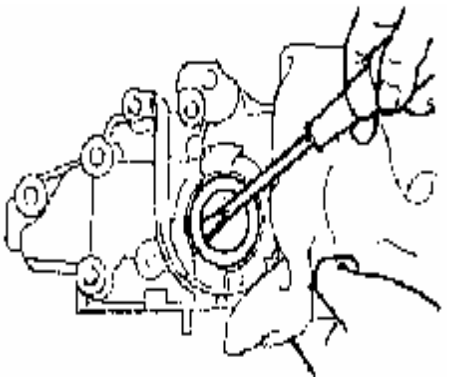


4.2.5 Remove the spring seat of the oil pressure relief valve for the engine oil pump, the coil spring, oil pump and oil pressure relief valve etc.



4.2.6 Remove the front crankshaft oil seal.

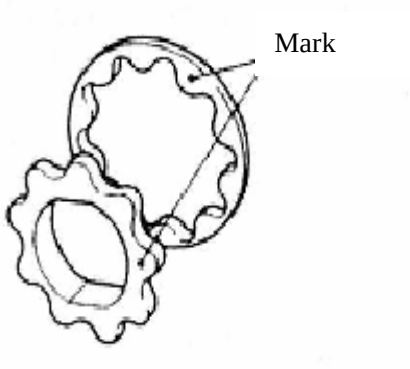
Notice: The oil seal removed may not be reused.



4.3 Routine Inspection

4.3.1 Inspect the engine oil pump for clearance.

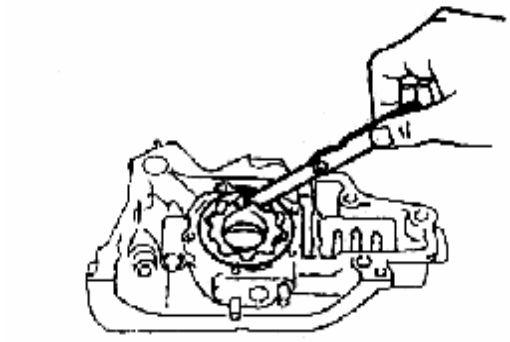
4.3.1.1 According to the marks for inner gear and outer gear in the engine oil pump, put the gears into the engine oil pump that is in the cylinder block.



4.3.1.2 Measure the clearance between the inner and outer gears with a feeler gauge

Standard value: 0.05-0.18mm (average value of 9 positions)

Limit: 0.35 mm



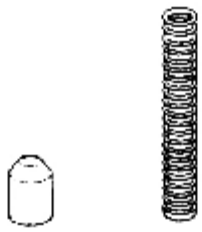
4.3.1.3 Measure the clearance between the rotor and pump body.

Standard value: 0.10-0.181mm

Limit: 0.25 mm

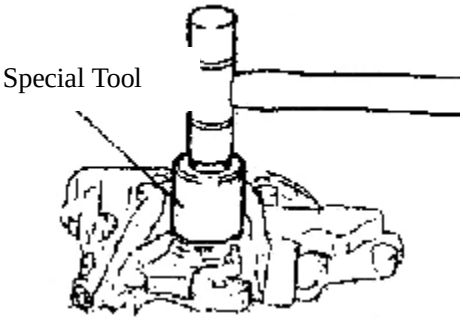
4.3.2 Inspect the oil pressure relief valve

4.3.2.1 No abrasion or scrape shall be found on the oil pressure relief valve.



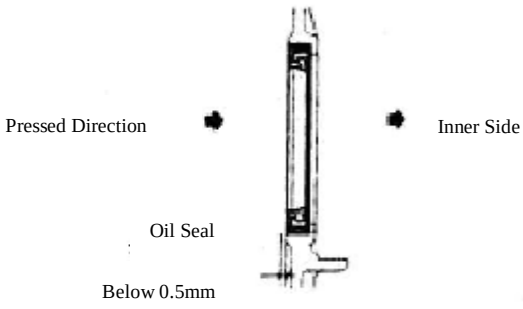
4.4 Installation

4.4.1 After the lip of the new oil seal for front crankshaft is spread with engine oil, fix it with a special tool.



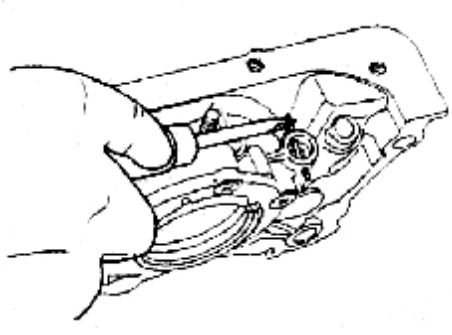
Notice: ·Use new oil seal

·The oil seal should be left less than 0.5 mm at its outer edge after it is pressed down.

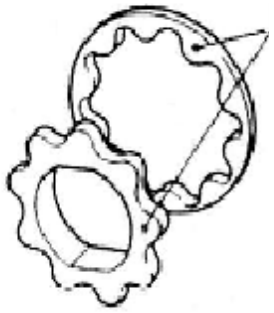


4.4.2 Assembly of the oil pressure relief valve for engine oil pump and the cotter pin.

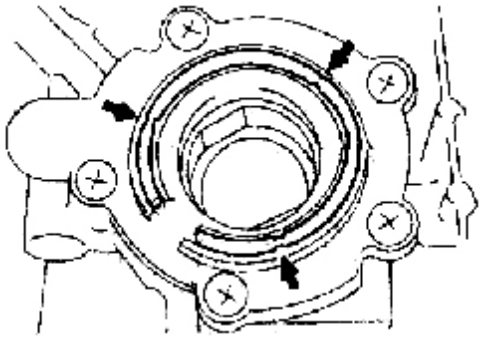
Notice: The cotter pin is nonreusable.



4.4.3 When the outer gear or inner gear is put into the engine oil pump, its mark should be seen.

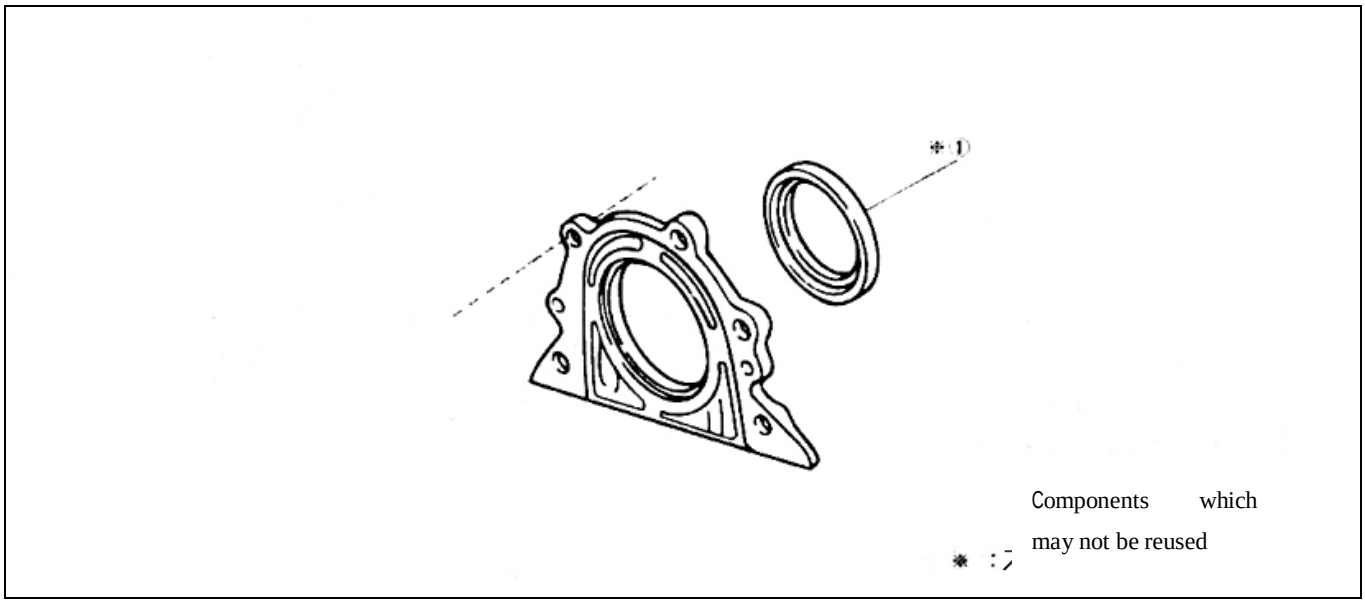


4.4.4 The new weather strip should be fixed in the groove of oil pump cover.



5. Disassembly of Oil Seal

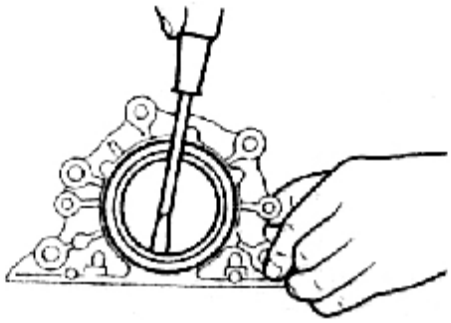
5.1 Structure Diagram



5.2 Disassembly

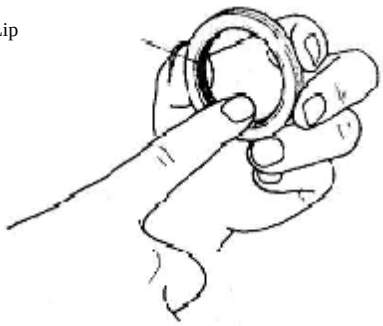
5.2.1 Remove the rear crankshaft oil seal with a screwdriver.

Notice: The rear oil seal of the crankshaft is nonreusable.



5.3 Inspection

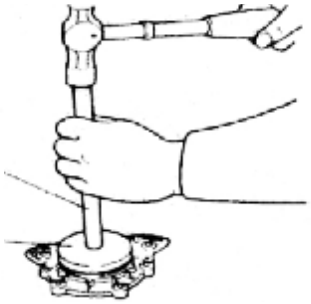
Inspect the oil seal for damage and the abrasion at its lip.



5.4 Assembly of oil seal

5.4.1 Spread engine oil over the lip of the new oil seal.

5.4.2 Mount the oil seal with special tool as indicated in the right figure

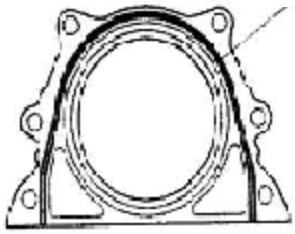


6. Assembly

6.1 Assembly of the oil seal seat

Spread sealant over the oil seal seat as shown in the right figure.

Grease: Loctite 5699

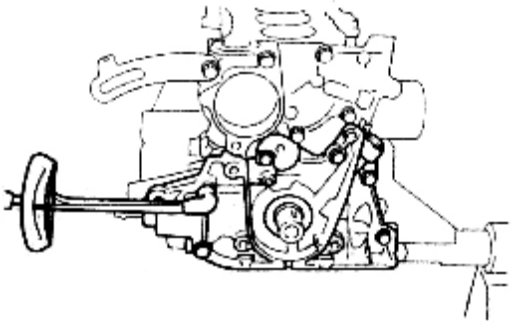


Notice: Spread the liquid sealant on the position of the oil seal base which is to contact with the cylinder body, and make sure the width of the sealant is 3-4mm.

Torque: 25±1.5N.m

6.2 Assembly of the new engine oil pump gasket and the engine oil pump assembly.

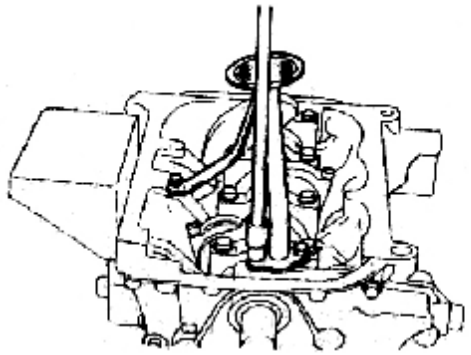
Torque: 20±1.5N.m



6.3 Assemble the new engine oil collector gasket and the

engine oil drainer

Torque: 6±1N.m



6.4 Assembly of the oil pan

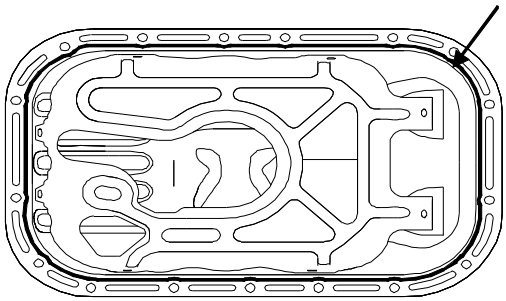
6.4.1 Clean up the joint surface between the oil pan with the cylinder.

6.4.2 Spread sealant, then assemble it.

Grease: Loctite 5699

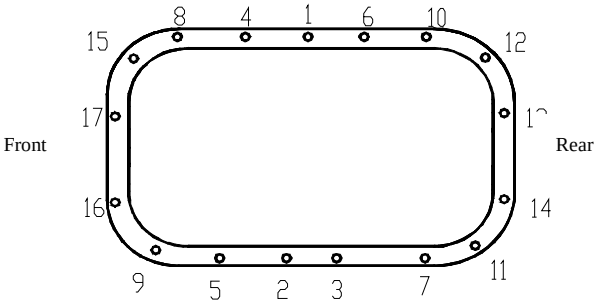
Notice: ·The sealing line should be unbroken with its diameter being ϕ3-4mm

·Assembly should take place fifteen minutes after glue-spreading.



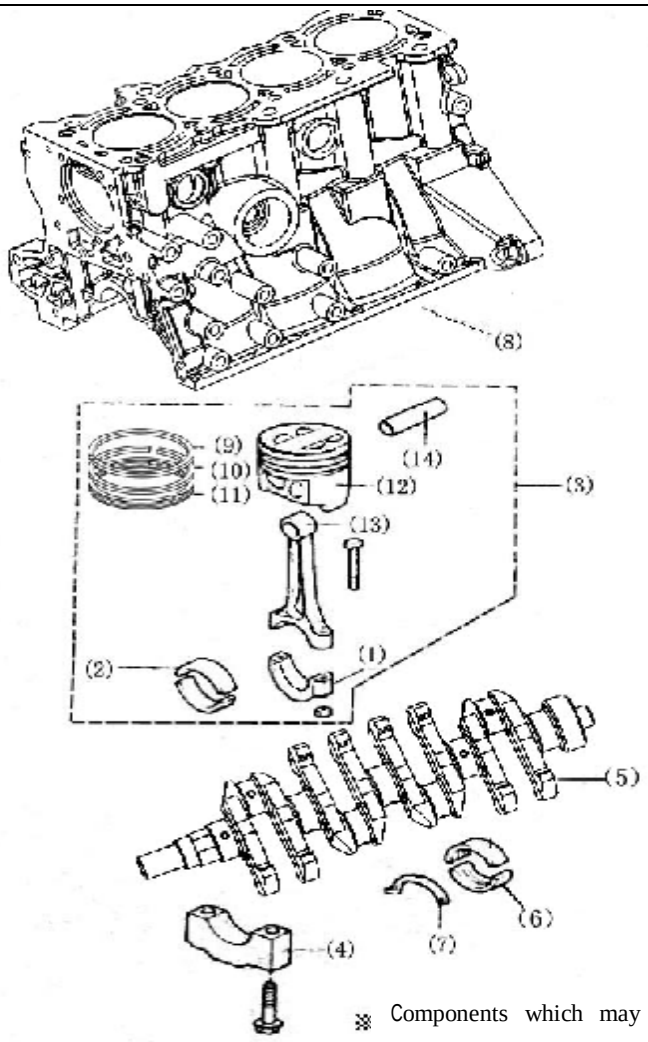
6.4.3 Tighten the bolts in the middle first up to the specified torque, then the bolts beside them as shown in the right figure.

Torque: 6±1N.m



6) Crank Connecting Rod Mechanism

1 Structure Diagram



※ Components which may not be reused

① Connecting rod cover
② Connecting rod bushing
③ Piston connecting rod assembly
④ Main bearing cap
⑤ Crankshaft
⑥ Crankshaft bearing bushing
⑦ Thrust plate
⑧ Cylinder body
⑨ First ring
⑩ Second ring
⑪ Steel tape combined oil ring
⑫ Piston
⑬ Connecting rod
⑭ Piston pin

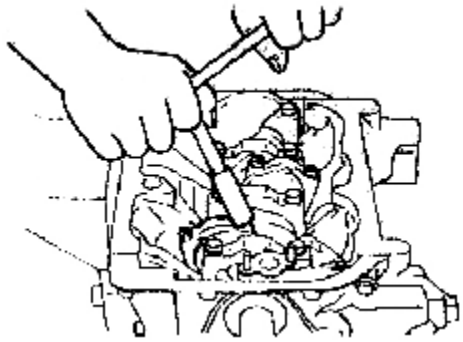
2 Disassemble of Crank Connecting Rod Mechanism

2.1 Inspect the axial momentum of the connecting rod

2.1.1 Measure the axial clearance with a dial gauge or feeler gauge.

Standard value: 0.15-0.25mm

Limit: 1.2mm

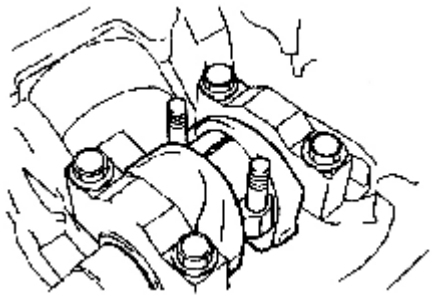


2.2 Inspect the connecting rod bushing for its radial clearance.

2.2.1 Remove the bushing cap.

Notice: The components of each cylinder shall be placed in order.

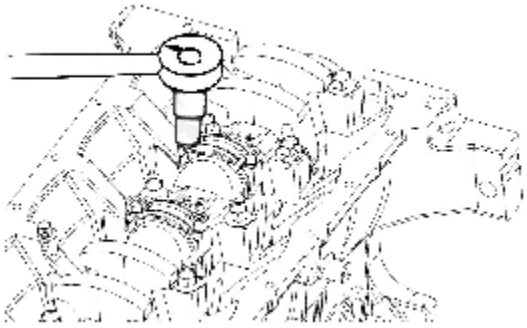
2.2.2 Clean the bearing bushing and the axle.



2.2.3 Conduct radial adjustment for the axial diameter of connecting rod with clearance gauge.

Tighten the bushing cap with specified torque.

Torque: 40±2N.m

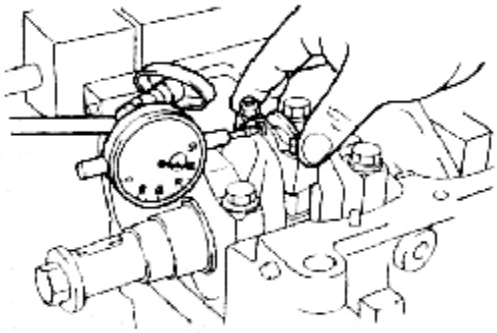


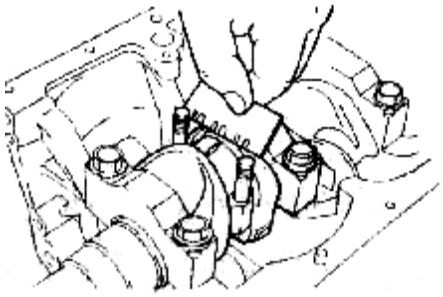
Notice: The crankshaft may not rotate.

2.2.4 Remove the bushing cap, measure the maximum thickness of the searcher.

Standard value: 0.020-0.044 mm

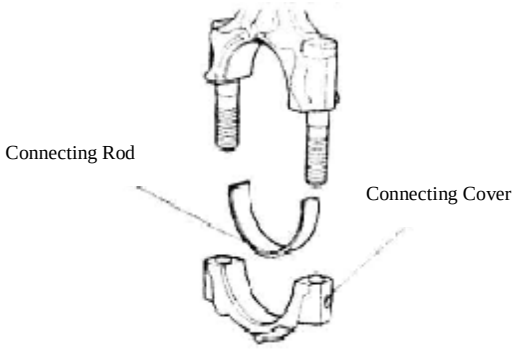
Limit: 0.07 mm



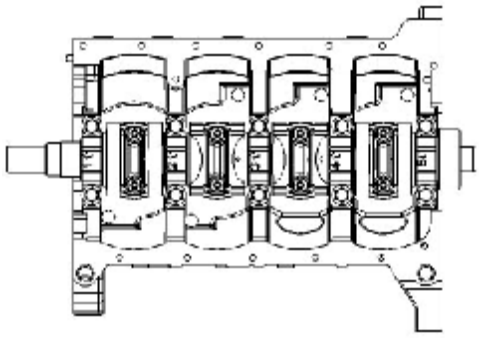


2.2.5 If it is beyond the limit, replace the bearing bushing.

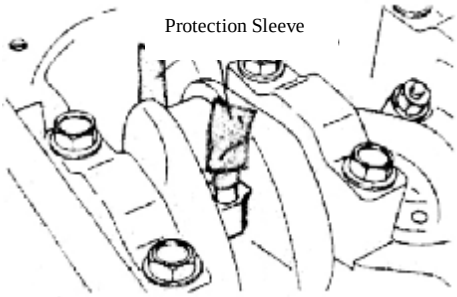
Notice: Replacing the bearing bushing with the product of the same manufacturer's brand. The thickness of the connecting rod bushing which meets the requirements of clearance = diameter of big end hold – axial diameter of connecting rod – standard value of bearing bushing clearance



2.2.6 Remove the connecting rod bearing cap and the connecting rod bearing bushing



2.2.7 Put vinyl-resin protecting jacket on the threaded part of the connecting rod bolt so as to prevent the bolts from scraping the cylinder hole and the crannkshaft connecting rod journal, and then disassemble the piston connecting rod by using the hammer handle striking it out.



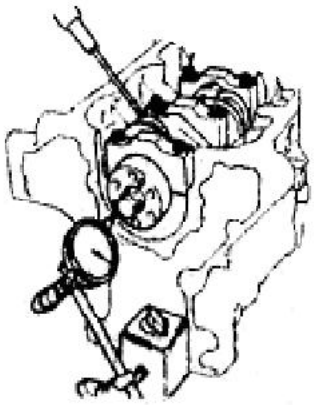
2.3 Inspect the axial clearance of crankshaft

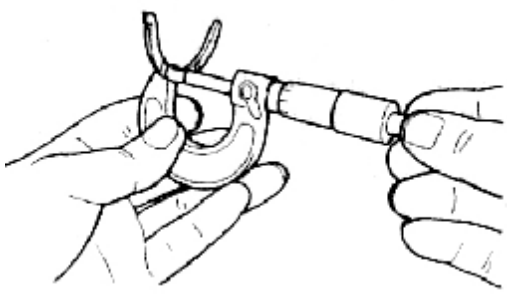
2.3.1 Measure the axial clearance of the crankshaft with a dial gauge, if it is beyond the limit, it is necessary to replace the axial thrust plate or the crankshaft.

Standard value: 0.089-0.211mm

Limit: 0.30mm

Item	Standard value
	$1.9^{-0.11}_{-0.03}$

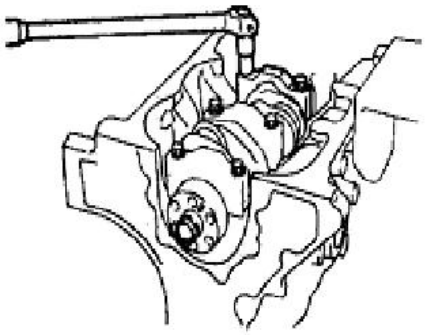


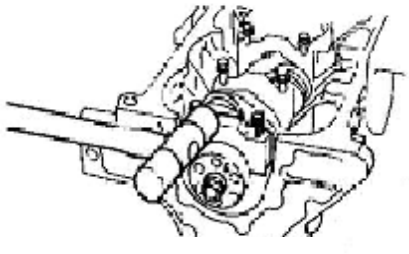


2.4 Inspect the crankshaft for its radial clearance.

2.4.1 Remove the crankshaft bearing cap by softly tapping with a resin hammer.

2.4.2 Clean the inside and surface of the bearing bushing, the inside and surface of the bearing cap, the cylinder wall and journal. Inspect them for abrasion and damage carefully.





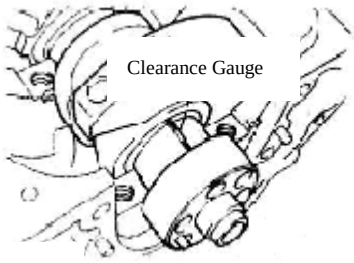
Protection Sleeve

2.4.3 Adjust the radial clearance of the crankshaft with a clearance gauge, and tighten the bearing bushing cover bolts with the specified torque.

Torque: 70±3.5N.m

Notice: After tightening the bolts, the rotating torque of the crankshaft should be less than 1Nm

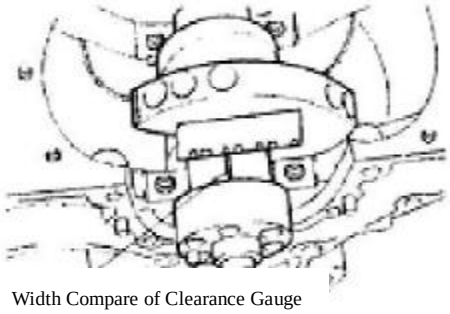
（The torque of crankshaft without piston connecting rod）



2.4.4 Remove the bearing cap and measure the maximum width with a clearance gauge. If the measurement result exceeds the limit, replace the bearing bushing.

Standard value: 0.025-0.069mm

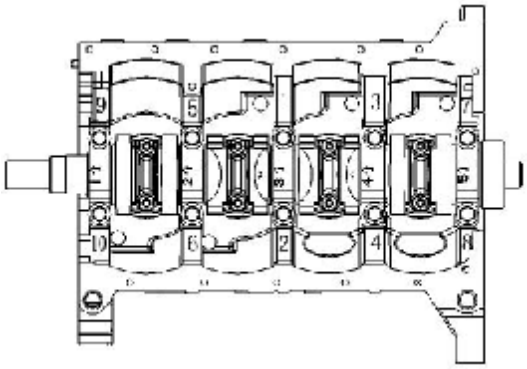
Limit: 0.10mm



Width Compare of Clearance Gauge

2.4.5 Remove the main bearing bushing cap of the crankshaft, crankshaft, crankshaft bearing bushing and crankshaft axial thrust plate

Notice: Tighten the bolts for the crankshaft bearing cap in the order shown in the right figure. Tighten the bolts for three times, then the torque must be up to the specified value.



2.5 Disassembly and assembly of the piston and connecting rod assembly

2.5.1 Remove the first ring, second ring and the oil ring with a pair of piston ring moving pliers.

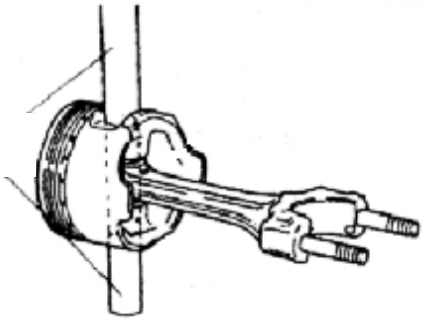
Notice: Don't get the piston and piston ring of each cylinder confused.



2.5.2 Remove the piston, connecting rod and the piston pin with special tool.

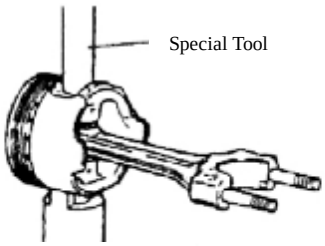
Disassemble the piston pin with special tool as indicated in the right figure.

Special Tool

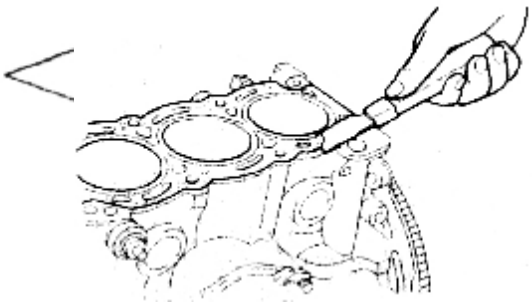


① As indicated in the right figure, disassemble the piston which is at the state mentioned above with special tools. Remove the piston pin with special tool, and then remove the piston and the connecting rod.

Special Tool



3 Cleanup



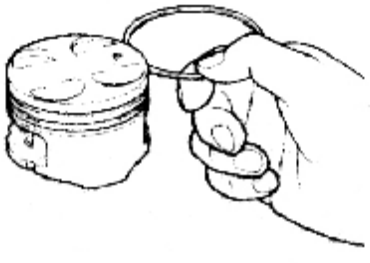
3.1 Cylinder Body

Warning: In the course of cleanup, protect your eyes with eyeglass.

3.1.1 Clean up the cylinder body, cylinder head, oil pan, oil pump and the oil seal with a flat blade.

3.2 Piston

Warning: In the course of cleanup, protect your eyes with eyeglass.



3.2.1 Use an old ring to remove the carbon in ring groove.

3.2.2 Remove the carbon of parts with scavenger.

Notice: Don't use hard articles such as metal brush.

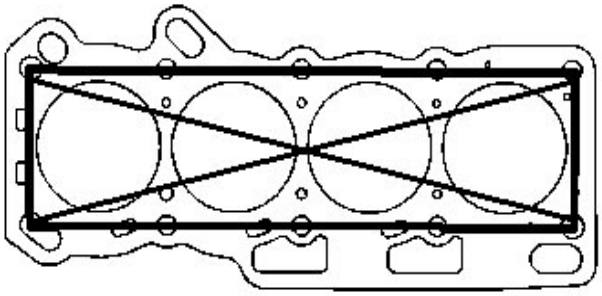
4 Routine Inspection

4.1 Cylinder Body

4.1.1 Inspect the top surface of cylinder body for its flatness

(1) Measure at the six points shown in the right figure with a ruler and a feeler gauge.

Limit: 0.08mm



4.1.2 Use of bore gauge

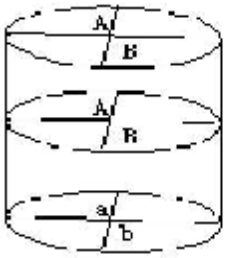
Measure the cylinder bore at the positions as indicated in the right figure with a bore gauge, and figure out the difference between the maximum value and the miximum value. If the difference exceeds the limit, repair or replace the cylinder.

Limit: 0.03mm

[Reference] Roundness: A-B or a-b

Cylindric degree: A-a or

[Reference] Standard diameter of cylinder: φ72.00-72.01mm



Upper Stopper Position of Piston

Lower Stopper Position of Piston

4.2 Piston

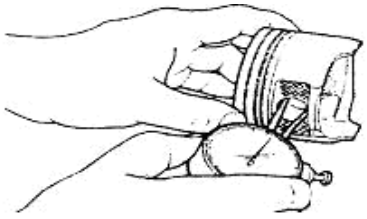
4.2.1 Inspect the piston pin hole for its clearance

Measure the piston pin at several positions with a micrometer caliper shown in the figure, make the maximum value as the diameter of pin.



Measurement Position of Piston Pin

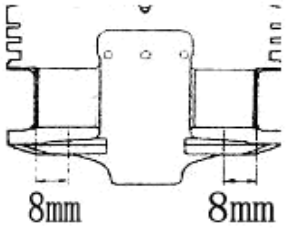
4.2.2 Measure the diameter of piston pin at several positions with an inner-diameter dial gauge as shown in the figure, make the minimum value as the diameter of the pin hole.



Work out the clearance with the difference between the pin diameter and pin hole diameter, if the difference is beyond the standard value, replace the piston pin or piston.

Standard value: 0.004-0.009mm

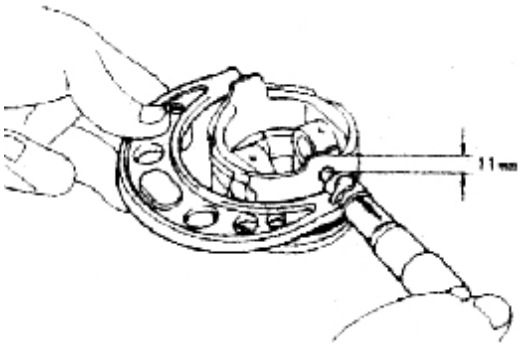
Limit: 0.015mm



4.2.4 Measure the diameter of the piston

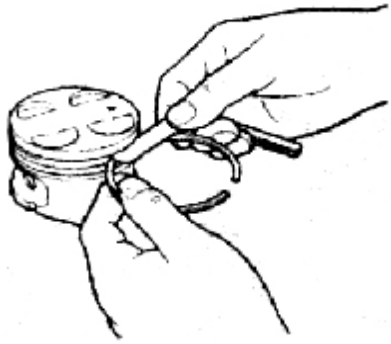
4.2.4.1 Measure at about 11 mm to the bottom of the piston, along the direction vertical to the piston pin.

Standard value: $f72^{-0.013}_{-0.025}$



4.2.5 Inspect the clearance between the piston ring and the ring gloove

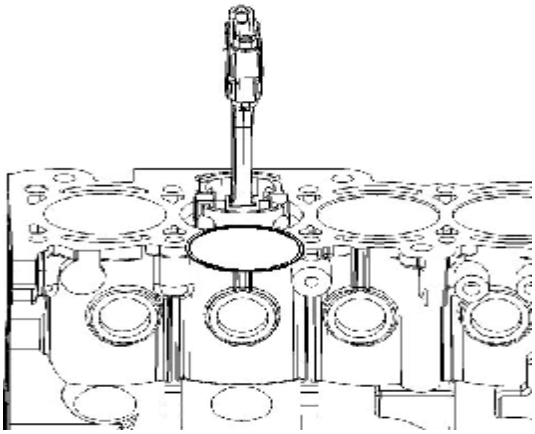
4.2.5.1 Measure around the ring gloove with a piston ring and a feeler gauge

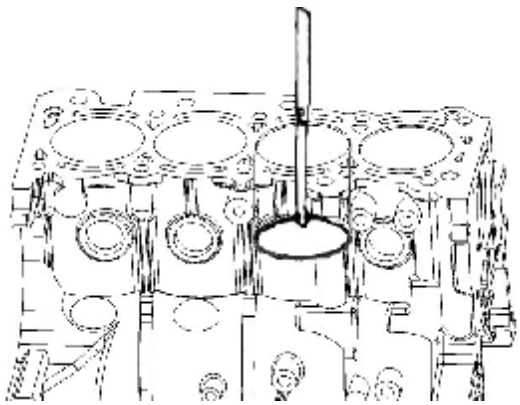


	Standard value (mm)	Limit (mm)
First ring	0.03~0.06	0.12
Second ring	0.03~0.06	0.11

4.2.6 Inspect the end clearance of piston ring

4.2.6.1 Put the piston ring 45mm below the top surface of the cylinder hole. Press down the piston ring with the piston head, and then measure the opening with a feeler gauge.





	Standard value (mm)	Limit (mm)
First ring	0.25-0.40	0.65
Second ring	0.35~0.50	0.65
Oil ring	0.20~0.70	1.00

4.2.7 Inspect the clearance between the piston and cylinder wall

4.2.7.1 Measure the inner diameter of the cylinder and the outer diameter of the piston at the positions as indicated in the right figure. If the measurement results exceed the limit, replace the piston or cylinder.

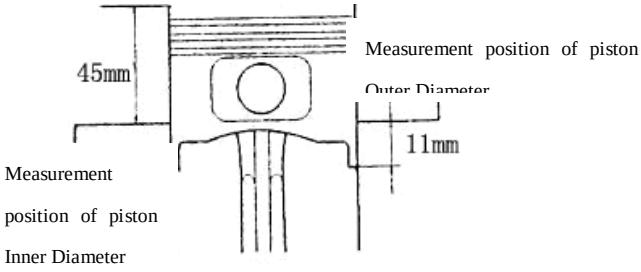
Standard value: 0.018～0.030

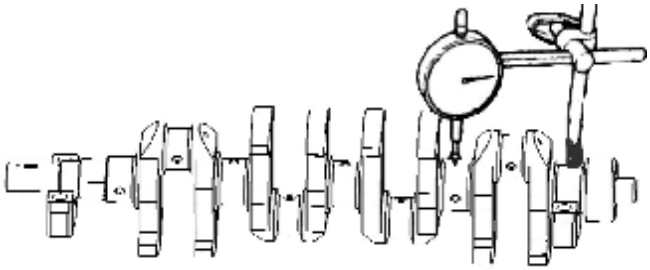
Limit: 0.10

[Reference] The clearance between the piston and cylinder bore is controlled by the difference between the minimum inside diameter of piston hole and the maximum outer diameter of piston.

4.2.7.2 After replacing the piston or the cylinder body, confirm the clearance again

Standard value: 0.018～0.030





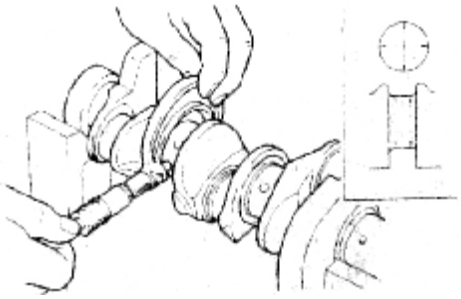
4.3 Crankshaft

4.3.1 Inspect the proper alignment of the main axle diameter.

4.3.1.1 Measure the proper alignment with a dial gauge, if the proper alignment is beyond the limit, replace the crankshaft.

Limit: 0.03mm

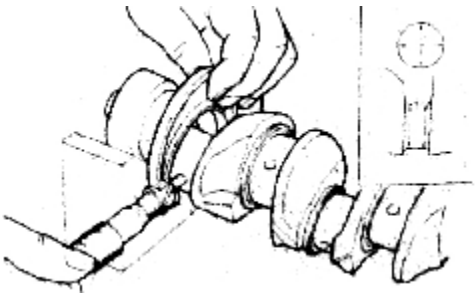
Notice: The bending value should be equal to one-second the run-out value of crankshaft rotating one circle.



4.3.2 Inspect the crankshaft for the abrasion.

4.3.2.1 Measure the connecting rod journal at the positions indicated in the left figure with a microcaliper, and figure out the roundness and cylindricity.

Limit: 0.005mm



4.3.2.2 Measure the connecting rod journal at the positions indicated in the right figure with a microcaliper, and figure out the roundness and cylindricity.

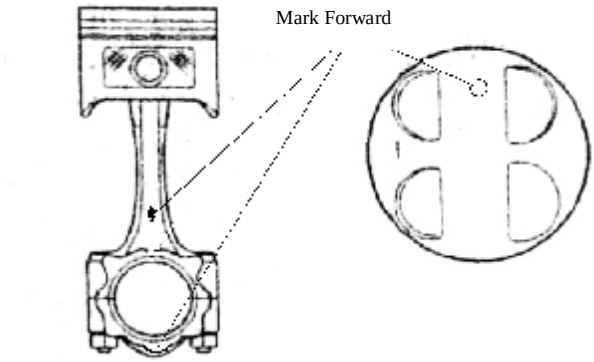
Limit: 0.004mm

5 Assembly of Crank Connecting Rod mechanism

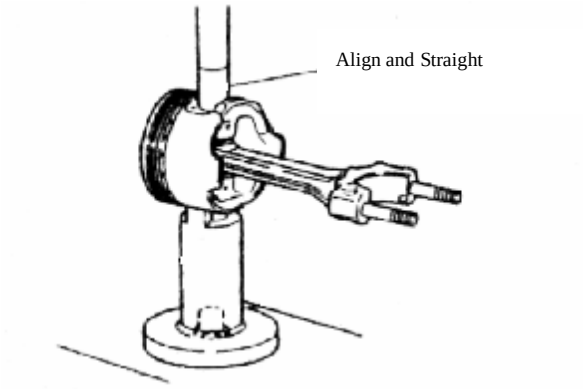
5.1 Assembly of the piston connecting rod

5.1.1 Assemble the piston, connecting rod and the piston pin with special tool following the instructions below:

5.1.1.1 Spread engine oil over the pin hole of the connecting rod, assemble according to the group mark and direction mark of piston and connecting rod.



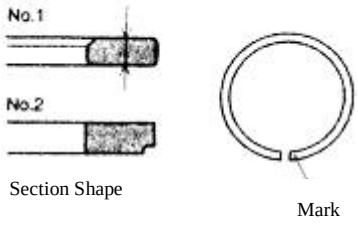
5.1.1.2 Assemble the piston and the connecting rod with special tools shown in the right figure.



5.1.1.3 Adjust and assemble the piston and connecting rod as indicated in the right figure. Spread the piston pin with oil and then assemble the piston and connecting rod with a oressing machine.

Notice: When pressing in the piston pin, make sure the fitting direction is correct.

·When the piston pin is pressed into the piston, the small end of the connecting rod should be heated to 300℃, and the pin should be aligned properly.

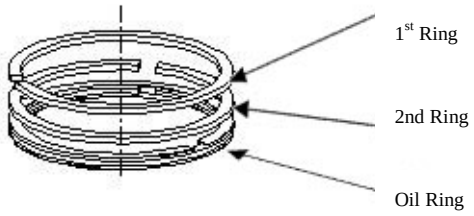


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5.2 Install the first and second pistion ring and the oil ring according to the following instruction:

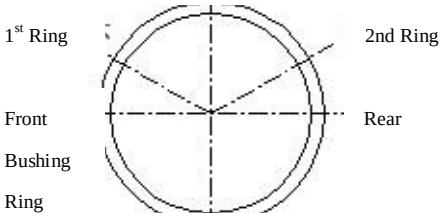
5.2.1 Installation of piston ring

Make the side with marks face upwards, and then fix it with piston pin tools.



Lower Blade

5.2.2 Mount the steel tape combined oil ring (bushing ring lower, lower blade, upper blade) firstly, and then mount the second gas ring, and finally mount the first gas ring. Opening angles of rings are shown in the figure:

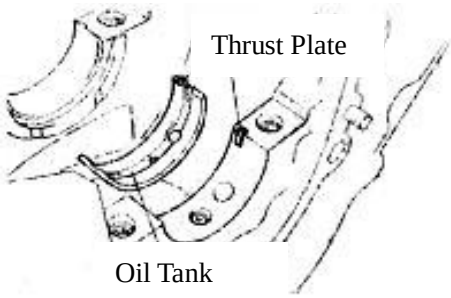


Upper Blade

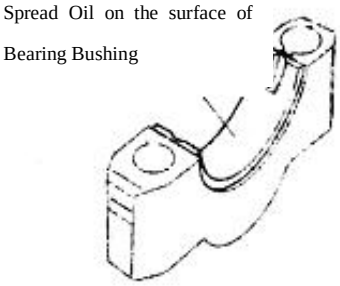
5.3 Resemble the crankshaft main bearing cap, crankshaft, crankshaft bearing bushing and the crankshaft axial thrust plate, pay attention to the following:

5.3.1 Assembling the bearing bushing, its raised thrust block should fit into the locating groove in the cylinder body.

Notice: The bearing bushing is from the same manufacturer.



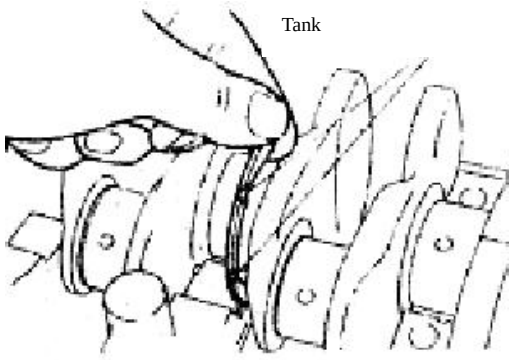
5.3.2 Spread the crankshaft bearing bushing (upper piece) with oil before assemble the crankshaft



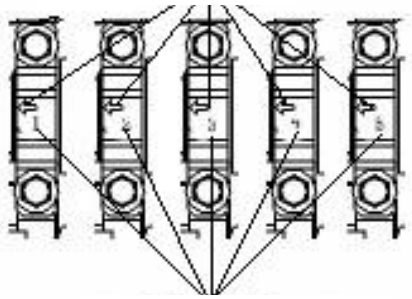
5.3.3 Mount the thrust plate on the cylinder body bearing base and make sure that the side with oil gloove (crankshaft shank) face outwards.

Notice: Spread the side of oil glove with oil

5.3.4 Fix the crankshaft bearing bushing (lower piece) in the bearing cap, the bearing bushing should fit into the thrust groove.

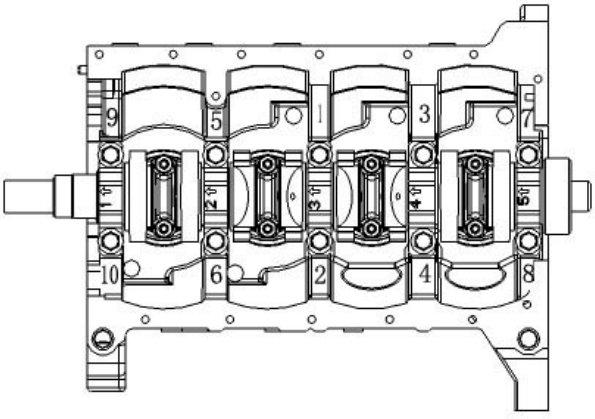


5.3.5 Spread engine oil over the friction surface of crankshaft bearing bushing (lower piece), assemble the bushing according to the mark forwards in the main bearing cap of the crankshaft.



5.3.6 Spread oil over the bolts, within three or two times, tighten them with specified torque.

Torque: 70±3.5N.m



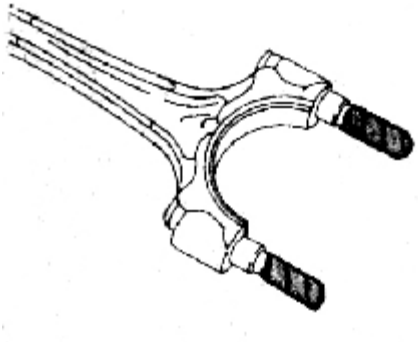
5.3.7 Rotate the crankshaft after assembly, it should rotates swiftly, the rotating torque should be less than 1Nm.

5.4 Assemble the piston and connecting rod assembly, connecting rod bearing bushing and the connecting rod bearing cap, pay attention to the following:

5.4.1 The opening of compression ring and the opening of oil ring should be in the specified direction.

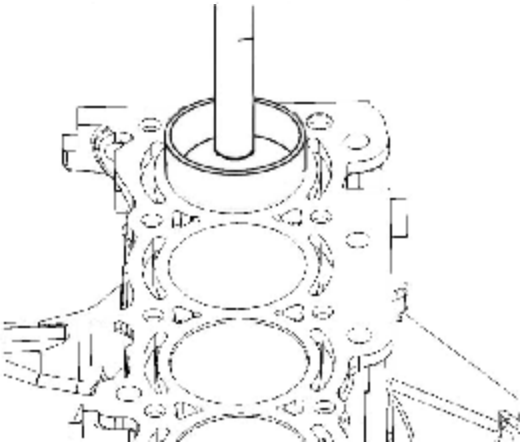
5.4.2 The bolts of the connecting rod should be covered with nylon sleeves for fear of scraping the cylinder body and the axle.

5.4.3 The surfaces of piston and connecting rod and other surfaces where relative motion exists should be spread with engine oil.



5.4.4 Confirm the mark forwards of the piston and strike it into the cylinder body with the piston ring striking tool.

Notice: The cylinder number of the piston and connecting rod assembly should be in accordance with the cylinder number.

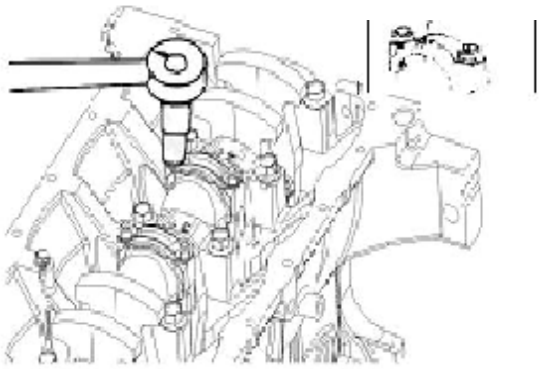


Forward Mark

5.4.5 Assemble the connecting rod bearing cap and the connecting rod bushing, pay attention to the following:

5.4.5.1 Put the cover on the bolt as per the mark forwards, spread a little engine oil over the joint surface between the nut and its seat.

5.4.5.2 Tighten the right nut and the left nut alternatively for several times with specified torque.



Torque: 40±2N.m

Notice: The connecting rod and the connecting rod bushing should be of the same subassembly:

.

Chapter 3. Table of Main Fit Clearance for SQR472 Engine SQR472

1 Clearance between Cylinder Hole and Piston Skirt (Piston to Cylinder Clearance)

	Name of Component	Size and Tolerance	Clearance or Value of Interferenc	Remark
	Cylinder hole	$\varphi 72^{+0.01}_{0}$	Divided into two groups: Clearance for group X: 0.019mm～0.03mm Clearance of group S: 0.018mm～0.029mm	Group X: $F72_{0}^{0.005}$ Group S: $F72_{0.005}^{0.01}$
	Piston skirt	$\varphi 72^{-0.015}_{-0.025}$		

2 Clearance of Crankshaft Main Bearing

	Name of Component	Size and Tolerance	Clearance or Value of Interferenc	Remark
	Crankshaft main journal	$\varphi 42h_{6-0.016}$	Clearance 0.025~0.069	
	Bearing bushing	$2^{0}_{-0.006}$		
	Bore of cylinder main bearing	$\varphi 46F_6{}^{+0.041}_{+0.025}$		

3 Clearance of Crankshaft Connecting Rod Bearing

	Name of Component	Size and Tolerance	Clearance or Value of Interferenc	Remark
	Crankshaft connecting rod journal	$\varphi 37h_6{}^{0}_{-0.016}$	Clearance 0.025~0.069	
	Bearing bushing	$1.5^{0}_{-0.006}$		
	Bore of connecting rodbig end bearing	$\varphi 40F_6{}^{+0.041}_{+0.025}$		

4 Clearance between Piston Pin and Piston Pin Hole

	Name of Component	Size and Tolerance	Clearance or Value of Interferenc	Remark
	Piston Pin Hole	$\varphi 18^{+0.007}_{+0.002}$	Divided into twogroups Clearance for group A: 0.004 mm～0.0085mm; Clearance for group B: 0.0045mm～0.009 mm	Notice: When installed with hand, the piston pin may pass through the piston pin hole smoothly without any obvious obstruction, otherwise the piston pin should be replaced.
	Piston pin	$\varphi 18^{-0.001}_{-0.004}$		

5 Inteference between Piston and Small End of Connecting Rod

	Name of Component	Size and Tolerance	Clearance or Value of Interferenc	Remark
	Connecting rod small end hole	$\varphi 18^{+0.026}_{+0.044}$	Value of Interferenc 0.021~0.043	

	Piston Pin	$\varphi 18\ ^{-0.001}_{-0.005}$		

6 Fit Clearance between Connecting Rod Body Hole and Bolt Bar

Name of Component		Size and Tolerance	Clearance or Value of Interferenc	Remark
	Connecting rod body hole	$\varphi 8.08\ H_7\ ^{+0.015}_{0}$	Value of Interferenc 0.008~0.032	The hole should be processed along with the connecting rod body.
	Bolt Bar	$\varphi 8.08\ S_6\ ^{+0.032}_{+0.023}$		

7 Fit Clearance between Connecting Rod Cover Hole and Bolt Bar

Name of Component		Size and Tolerance	Clearance or Value of Interferenc	Remark
	Connecting rod cover hole	$\varphi 8.08\ H_7\ ^{+0.015}_{0}$	Clearance 0.005~0.029	The hole should be processed along with the connecting rod body.
	Bolt bar	$\varphi 8.08\ f_6\ ^{-0.005}_{-0.014}$		

8 Radial Clearance of Camshaft Bearing

Name of Component		Size and Tolerance	Clearance or Value of Interferenc	Remark
Intake	Cylinder Head	$\varphi 26H_7\ ^{0.021}_{0}$	Clearance 0.020~0.054	1st bearing cap
	Camshaft	$\varphi 26f_6\ ^{-0.020}_{-0.033}$		1st bearing cap
	Cylinder Head	$\varphi 23H_7\ ^{0.021}_{0}$	Clearance 0.020~0.054	2nd, 3rd, 4th & 5th bearing caps
	Camshaft	$\varphi 23f_6\ ^{-0.020}_{-0.033}$		2nd, 3rd, 4th & 5th bearing caps
Exhaust	Cylinder Head	$\varphi 29H_7\ ^{0.021}_{0}$	Clearance 0.020~0.054	1st bearing cap
	Camshaft	$\varphi 29f_6\ ^{-0.020}_{-0.033}$		1st bearing cap
	Cylinder Head	$\varphi 23H_7\ ^{0.021}_{0}$	Clearance 0.020~0.054	2nd, 3rd, 4th & 5th bearing caps
	Camshaft	$\varphi 23f_6\ ^{-0.020}_{-0.033}$		2nd, 3rd, 4th & 5th bearing caps

9 Fit Clearance between Tappet Hole and Tappet

Name of Component		Size and Tolerance	Clearance or Value of Interferenc	Remark
	Cylinder Head Hole	$\varphi 28H_7\ ^{0.021}_{0}$	Clearance 0.020~0.054	
	Tappet	$\varphi 28f_6\ ^{-0.020}_{-0.033}$		

Remarks: In the above tables, the capital letter and suffix following the sizes (For example, H_7 of $\varphi 28H_7$) mean the process precision, which are unconcerned with the maintenance and may be ignored in the course of maintenance.

Chapter 4. Table of Measurement Parameters of SQR472 EngineSQR472

No.	Measuring Items		Acceptance value	Remark
1	Axial clearance of crankshaft		0.089-0.211mm	
2	Torque of crankshaft when rotating at uniform speed	Assemble the crankshaft and tighten the main bearing cap bolt	≤1 Nm	
		Mount the piston connecting rod assembly and tighten the connecting rod bolt	≤5.5Nm	
			≤6Nm	
		Installing timing belt and spark plug	≤26 Nm	
	Mount the valve, spring and camshaft (excluding timing belt and spark plug) on the cyllinder head, tighten the camshaft bolt, and then measure the torque of the camshaft rotating at uniform speed		≤32 Nm	
3	Distance between the outer edge of steel ball and the front end of camshaft		5.65±0.5mm	
4	Distance between the outer edge of steel ball and the rear end of camshaft		8.65±0.5mm	
5	Axial clearance of intake camshaft		0.10~0.179	
6	Axial clearance of exhaust camshaft		0.10~0.253	
7	Jumping amount of installation surface of flywheel wearing piece		0.10mmmax	
8	Protrusion height of crankshaft woodruff key		2～2.20mm	
9	Intake valve clearance		0.18±0.05mm	
10	Exhaust valve clearance		0.25±0.05mm	
11	Tension of timing belt (When the middle part of the rigth side is pressed down for 4-5mm）		200～280N.m	
12	Compression pressure of cylinder		10~14bar	
13	Tension of generator belt （When the part between the generator and water pump is pressed down for 4-5mm）		98N.m	
14	Refilling amount of engine oil (including filter)		3.5 Liter	

Chapter 5. Table of Main Fitting Torque for SQR472 EngineSQR472

No.	Name	Specification	Quantity	Fixing Torque (Nm)	Remark
1	Main bearing cap bolt	M10X1.25	10	70±3.5	
2	Connecting rod cover bolt	M8X1	8	40±2	
3	Oil pump bolt	M8X1	6	20±1.5	
4	Nut (oil collector – oil ppump)	M6	2	6±1	
5	Bolt (oil collector – cylinder body)	M6	1	6±1	
6	Water pump bolt	M8X1	6	25±1.5	
7	Rear oil seal bracket bolt	M8	5	25±1.5	
8	Drain plug	M12	1	45±3	
9	Oil pan bolt	M6	19	6±1	
10	Bolt connecting exhaust camshaft with flange (hexagonal)	M6	4	6±1	
11	Exhaust camshaft locking nut	M40X1.5(L)	1	100±5	
12	Cylinder head bolt	M10X1.25	10	70±3.5	
13	Camshaft bearing cap bolt	M6	19	9±1	
14	Cylinder head chamber cover bolt	M6	8	4.5±0.5	
15	Camshaft position sensor bolt	M8	1	10±1	
16	Bolt (knock sensor)	M8	1	20±1.5	
17	Camshaft timing gear bolt	M12X1.25	1	100±5	
18	Tension pulley bolt	M10	1	25±3	
19	Timing cover bolt	M6	7	6±1	
20	Engine oil gauge pipe bolt	M6		6±1	
21	Flywheel assembly bolt	M10X1.25	6	70±3.5	
22	Thermoregulator shell bolt	M8	2	10±1	
23	Oil filter conncetor	3/4"-16		40±2.5	
24	Oil filter	3/4"-16		20±1.5	

25	Intake/exhaust stud	M8	16	10±1	Spread glue
26	Intake pipe nut	M8	8	25±1.5	
27	Ignition coil bracket assembly bolt	M8	2	20±1.5	
28	Front lifting lug bolt	M8	2	20±1.5	
29	Exhaust pipe nut	M8	8	25±1.5	
30	Exhaust pipe thermal shroud bolt	M6	3	6±1	
31	Bolt on crankshaft pulley & torsional damper assembly	M12X1.25	1	100±5	
32	Water pump pulley bolt	M6	4	6±1	
33	Water temperature sensor	M12X1.5	1	15±1.5	
34	Oil pressure switch		1	30±2	
35	Spark plug	M14X1.25	4	20±1	
36	Fixing Bolt of spark plug cover board)	M6	8	2.5±0.5	
37	Bolt (intake pipe front bracket)	M8	1	20±1.5	
38	Bolt (intake pipe rear bracket)	M8	4	20±1.5	
39	Bolt (throttle cable)	M6	2	6±1	
40	Bolt (gas-oil spearator bracket)	M6	2	6±1	
41	Bolt (throttle valve casing)	M6	4	6±1	
42	Oxygen sensor	M18X1.5	1	40±2	
43	Bolt (intake temperature & pressure sensor)	M4	1	3±1	
44	Fixing bolt of fuel guide rail	M6	2	7±1	
45	Ignition coil bolt	M6	3	5±1	

Chapter 6. Positions on SQR472 Engine to be Lubricated

Type of lubricating oil: Engine lubricating oil

Designation of lubricating oil: SAE10W/30-50(SF Class)

No.	Position to be lubricated	Remark
1	Joint surface of connectong rod bolt head	
2	Screw of connecting rod bolt	
3	Exicrcle of piston pin	
4	Inner wall of piston pin hole	
5	Piston and piston ring	
6	Inner wall of cylinder hole	
7	Crankshaft main neck	
8	Connecting rod shaft neck	
9	Upper & lower main bearing bushing (inside)	
10	Upper & lower connecting rod bearing bushing (inside)	
11	Crankshaft thrust plate (the side of oil gloove)	
12	Front oil seal and crankshaft front oil seal journal	
13	Rear oil seal and crankshaft rear oil seal journal	
14	Valve seat hole	
15	Valve tappet and valve pipe hole	
16	Excircle and hole of valve tappet	
17	Camshaft journal and bearing base hole	
18	Camshaft driving gear	
19	Edge and excircle of oil seal	
20	Oil seal journal and oil seal base hole	
21	Surface oil filter sealing gasket	

Chapter 7. Positions on SQR472 Engine to be Spread with Sealant SQR472

No.	Position to be spread with sealant	Type of sealant	Form and amount of sealant (reference)	Remark
1	Joingt surface of oil pan	Loctite 5699	ϕ(3~4)mm	
2	Rear oil seal bracket	Loctite 5699	ϕ(3~4)mm	
3	Valve chamber cover	Loctite 5699	ϕ(3~4)mm	
4	Joint surface if timing gear chamber cover	Loctite 5699	ϕ(3~4)mm	
5	Joint surface of camshaft cover	Loctite 5699	ϕ(3~4)mm	
6	Sealing surface of the bowl shaped plug of cylinder head	Loctite 11747	Spread uniformly	
7	Flywheel bolt	Loctite 204	0.125(ml)×6	Pre-spread @3
8	Intake pipe stud	Loctite 262	0.125(ml)×7	The part screwed into the cylinder head
9	Exhaust pipe stud	Loctite 262	0.125(ml)×6	The part screwed into the cylinder head
10	Camshaft timing gear bolt	Loctite 243	0.2ml	
11	Oil collector stud	Loctite 243	0.08(ml)×2	The part screwed into the oil pump
12	Screw of thermoregulator shell fixing bolt	Loctite 243	0.08(ml)×2	The part screwed into the cylinder head

CHERY SQR7080R
SERVICE MANUAL

II

ENGINE-EFI

CHERY AUTOMOBILE CO., LTD

SERVICE CONTENT

MODEL：SQR7080R

SQR7080R ENGINE EFI DECEMBER 2005

Please write down the changes notice after each assembly numbers, the function is to remind the users there are changes and the technical department will inform the correlated department keep them in archives for checking.

ASSEMBLY	TECHNICAL CHANGES NOTICE				
1 Working Chamber Functional Diagram					
2 EFI Component					
3 EFI Fault					
4 Test Method Of System Component Circuit					
5 Diagnosing Procedure For Engine Symptom					
6 Diagnosing Method & Procedure For Typical Fault					
7 Precaution For EFI System Maintenance					
8 Finished Vehicle Circuit Diagram, System Functional Diagram					

The service man must master the technical improvement conditions of this car to provide better maintenance work.

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1. WORKING PRINCIPLE OF EFI CONTROL SYSTEM

1-1 BASIC PRINCIPLE OF EFI SYSTEM

Basic principle of EFI system is outlined in Diagram 1-1. We introduce Siemens SIMK31 electronic control multipoint gasoline injection system. With an ECU (Electronic Control Unit) as the control center, sensors installed on different parts of engine are used to measure operating parameters of engine. According to programs of computer, and by controlling fuel injectors, fuel injection capacity is precisely controlled. Thus in different operating modes, the engine can obtain mixed air with optimum density.

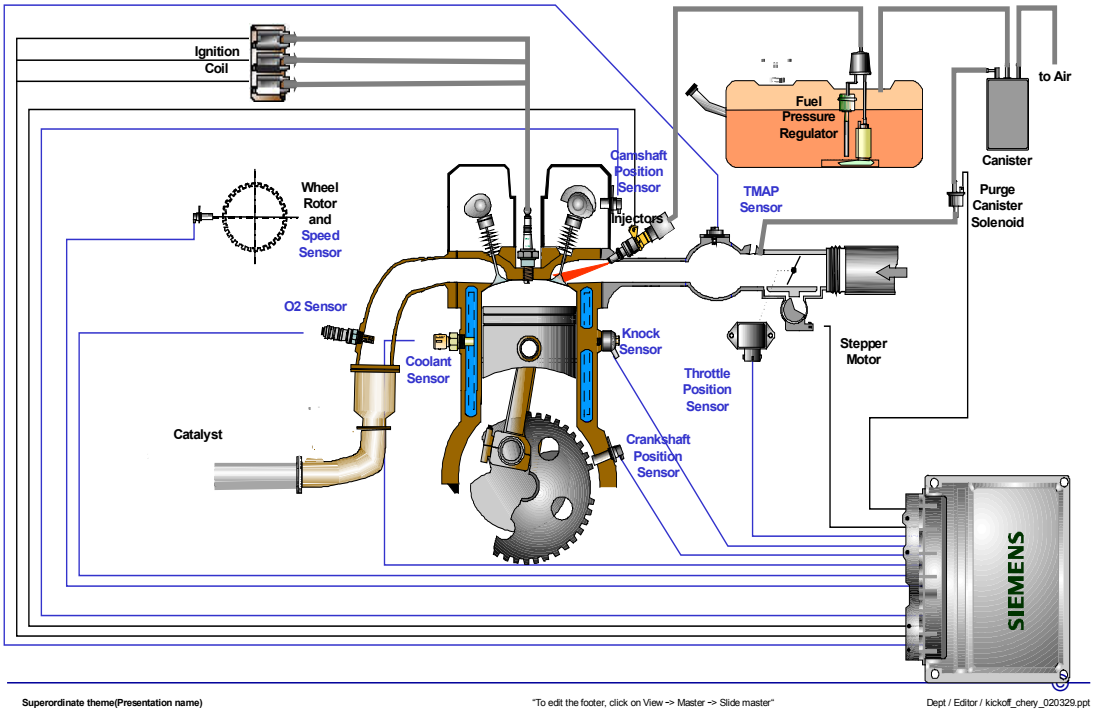


Figure 1-1 372 Basic Principle of Engine EFI System

In addition, the electronic- control(EC) gasoline injection system can achieve functions such as start-up enrichment, warm-up enrichment, accelerator enrichment, full-load enrichment, deceleration thinning, cutting off oil compulsively and automatic idle speed control to meet requirement concerning mixed air from engine in different operating modes. Thus 372 engine has favorable fuel economy and low exhaust emission; subsequently, performances of Chery QQ have been greatly improved.

Fuel injection pressure of electronic- control (EC) gasoline injection system is given by electric fuel pump that together with bracket is mounted inside fuel tank. When energized, the pump starts running. It sucks and pressurizes fuel from tank. The pressure is not allowed to exceed 3.8 bar, otherwise fuel-pressure adjuster will open valve to let the excess fuel back to tank. Hence, an electric fuel pump delivers fuel with constant pressure to the delivery pipe which communicates the three fuel injectors fixed on cylinder head. The fuel injector is a kind of solenoid valve, controlled by ECU. When energized, it will open and the pressurized fuel will spray into air intake channel inside cylinder head in atomization, to mix air and be sucked into cylinder during air intake stroke. Air intake consumption is controlled by throttle valve. Temperature and pressure of the air inside channel vary with the throttle opening. Air intake consumption is calculated by its relation with temperature and pressure. Then revolution speed of engine is calculated by means of sensor on crankshaft. According to air intake consumption and revolution speed, ECU calculates basic fuel injection capacities for cylinders respectively. This capacity is controlled by injection time; a longer time means a larger capacity.

1-2 COMPOSING OF FUEL INJECTION SYSTEM

As Diagram 1-2, Fuel injection system can be divided into three parts, namely sensor, ECU and actuator, and according to its functions it also can be divided into oil supply system, air intake system, ignition system and central controller.

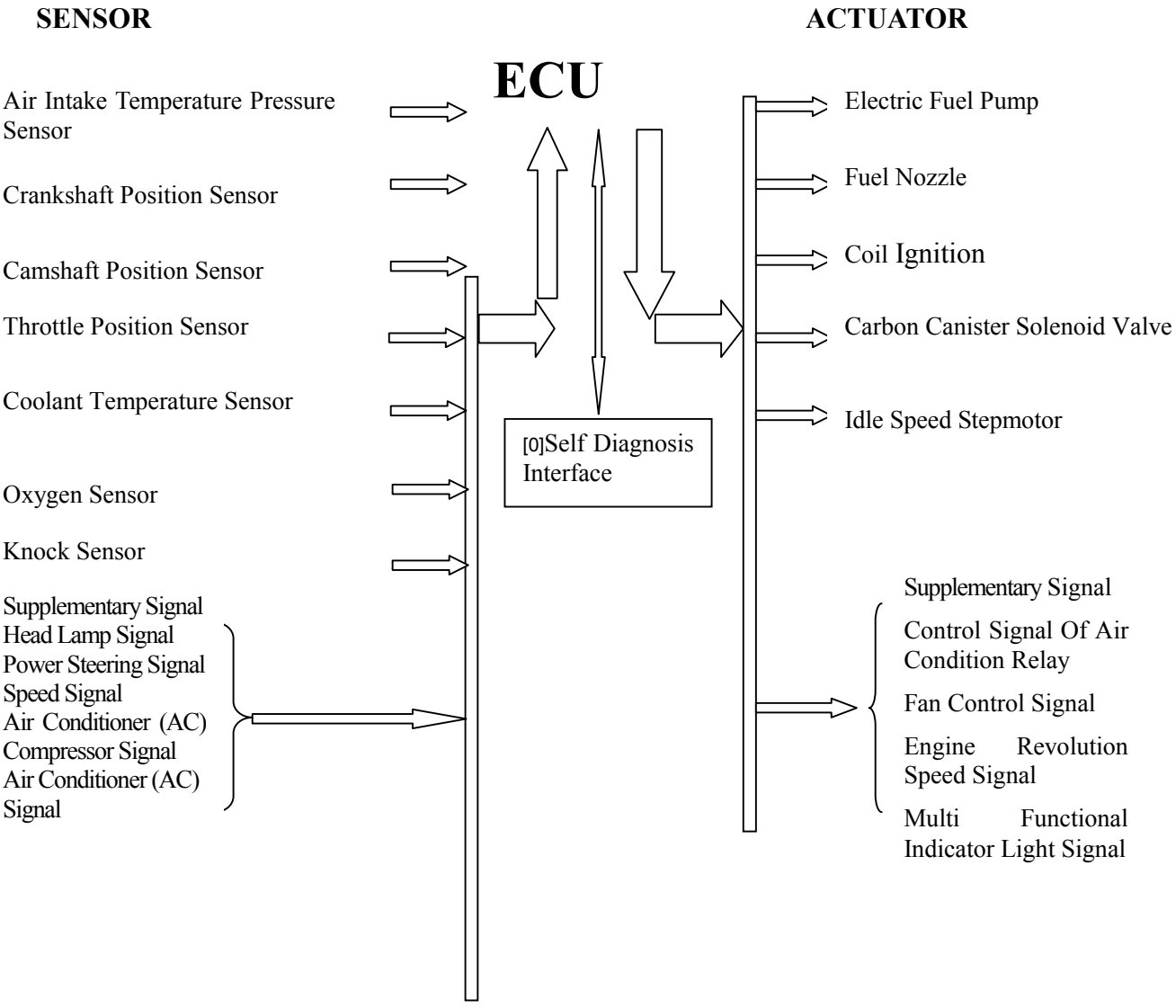
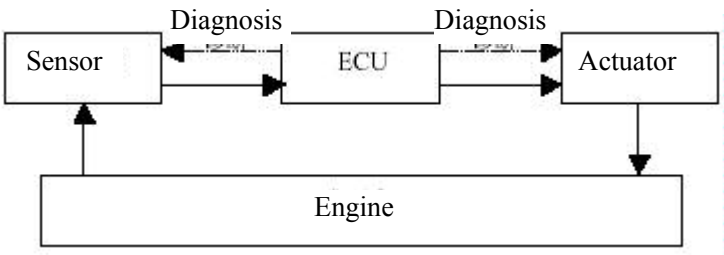


Diagram 1-2 Composing Of Fuel EFI System



EFI SYSTEM COMPOSING VIEW

2 SUMMARIZATION OF EFI COMPONENTS

2-1 AIR-INTAKE TEMPERATURE - PRESSURE SENSOR

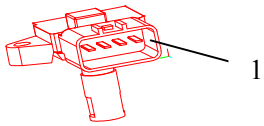
(part number: S11－1109411)

Purpose: It can sense 0.1-0.2bar absolute pressure in intake manifold and temperature of air intake. It provides ECU with air intake data under any load.

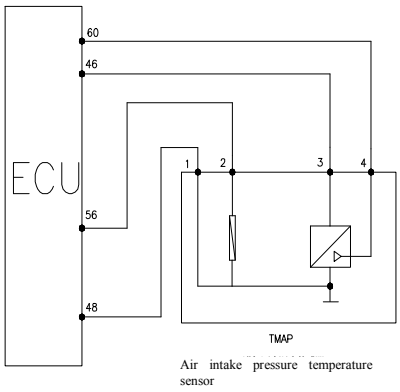
Composition and principle: This sensor is composed of by two sub-sensors, which are intake manifold absolute pressure sensor and air intake temperature sensor. It is installed on top of pressure control box. Air intake consumption is calculated by throttle opening (cross section area) and pressure difference, modification of air intake density is made according to air intake temperature.

Air intake pressure sensor: It is composed of by a silicon chip. A pressure diaphragm, where four piezoelectric resistors as strain elements form Wheatstone bridge, is etched in this chip. Besides the pressure diaphragm, the silicon chip also integrates circuit for signal processing. It forms a close reference with a metal housing where absolute pressure of air approximates zero. Hence a microelectronic mechanical system. The silicon chip is given a force near to zero on its active surface, whose back surface is under an absolute pressure yet to be measured of intake manifold introduced through a connecting pipe. The silicon chip is just several micrometers thick（μm）, so its mechanical deformation may be caused by a change of absolute pressure in intake manifold. Four piezoelectric resistors will also be deformed, and the resistance will be changed. After processed by the signal-processing circuit in silicon chip, voltage signal is linear to pressure.

Air intake temperature: A sensor element is a resistor with negative temperature coefficient (NTC), which is similar to water



Intake manifold absolute pressure/air intake temperature sensor



Circuit for sensor of air absolute pressure and temperature in intake manifold

Pins: No.1 grounds;

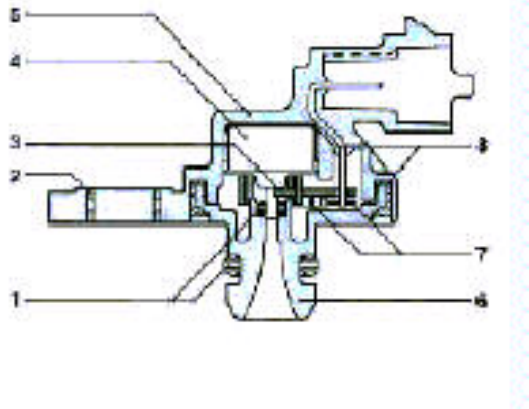
No.2 outputs temperature signal;

No.3 is applied 5V;

No.4 outputs pressure signal.

temperature sensor whose resistance decreases as air intake temperature increases. Engine ECU through its internal comparison circuit monitor the change of air intake temperature（equivalent to circuit in series）. Under normal temperature, the resistance of temperature sensor is 2KΩ.

Fault diagnosis: The subsequent electronic device of pressure sensor can detect faults such as open circuit, short circuit and damage to sensor, etc. When ECU detects output signal from the sensor falls beyond characteristic curves, it shall judge that something is wrong with the sensor. For example: when air intake pressure is higher than upper limit, or lower than lower limit，ECU will judge that there is a sensor fault（except in time of startup, air intake pressure is below than the lower limit, but ECU can judge the startup operating mode），simultaneously the indicator light for engine fault is on. The vehicle will run with the limp home function.（not all faults are indicted by light on）



Cross-Section View For Sensor Of Air Intake Pressure And Temperature

1 Gasket，2 Stainless Steel Sleeve，3 PCB Board，4 Sensing Element，5 Housing，6 Pressure Bracket，7 Soldering ，8 Bonded With Bonding Agent

2-2 THROTTLE POSITION SENSOR

(part number of throttle valve body:372-1107010)

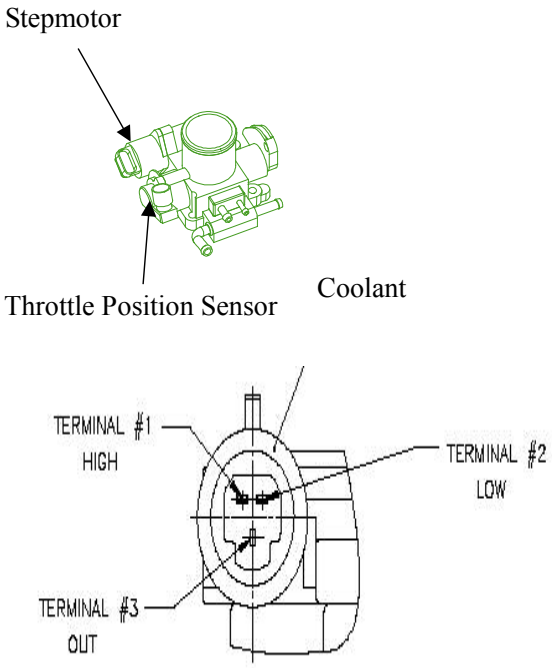
Purpose: This sensor provides information on throttle angle for ECU. According to this information, ECU can obtain information on engine load, operating modes (such as startup, idle speed, no full reduction, part load and full load), acceleration and reduction. This sensor is of 3-line model. ECU tests the opening and speed of throttle by monitoring the voltage change.

Composition and principle: This sensor is an angle sensor with linear output，composed of by two arc-shaped slide resistors and two slide arms. The axle of slide arm is connected to that of throttle, and they are in the same line. A 5v power supply, US, is applied between two ends of slide resistor. As throttle rotates, slide arm also rotates. Meanwhile, the arm slides along the resistor, taking potential at contact point, Up, as output voltage. Therefore the sensor is virtually an angle potential meter. The value employed by ECU is ratio of Up and Us, Up/Us, which can avoid value fluctuation of sensor resulting from that of engine voltage.

Fault diagnosis: ECU monitors whether throttle angle signal exceeds its upper limit or lower limit. When output signal exceeds the upper or lower limit, ECU will judge there is a fault with throttle sensor, and engine will operate in fault mode, its fault light on(The collision or inside dirt of sensor easily results in engine fault.

Rotate the throttle, measure the resistance change to judge whether there is fault with circuit.

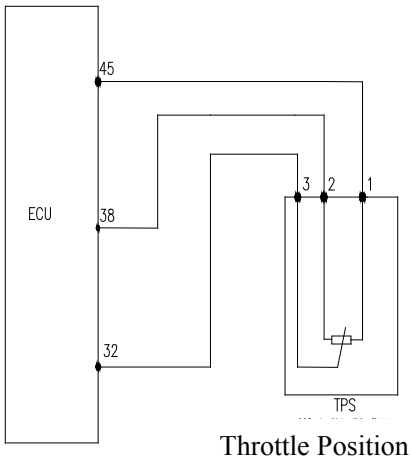
Assembly: The allowable tightening torque of the fastening screw is 1.5Nm-2.5Nm.



Appearance View For Throttle Position Sensor

Pins:

1. voltage input 2. signal ground 3. signal output



Throttle Position Sensor

Circuit For Throttle Position Sensor

2-3 COOLANT TEMPERATURE SENSOR TF-W

(Part Number:S11-3808013)

Purpose: The sensor provide the coolant temperature signal to ECU for ignition timing and controlling fuel injection of starting, idle speed and normal working.

Composition and principle: This sensor is a thermistor of negative temperature coefficient (NTC), and its value will decrease with the coolant temperature increasing but the changes are not linearity. Thermo-sensitive resistor with negative temperature coefficient is installed inside a copper heat conductive sleeve. ECU through a voltage division circuit converts change of thermo-sensitive resistance to that of voltage sent to ECU, thus monitoring change of water temperature（ECU inner structure）.

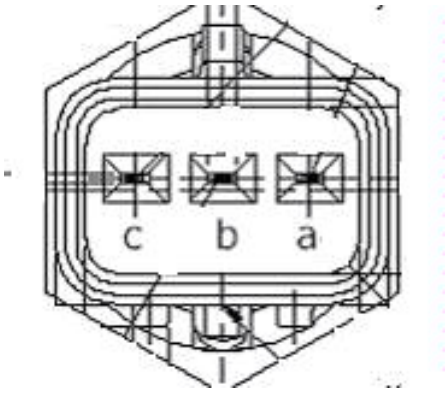
Fault diagnosis: When temperature of coolant is higher than its trusted upper limit, or water temperature is lower than its trusted lower limit, sign digit of fault will be set, fault indicator light for engine will be on, and engine operates in fault mode. ECU will control ignition and injection according to water temperature which is set according to engine operating mode in fault of water temperature, and at the meantime, fan will rotate at a high speed, engine performs its limp home function.

Water temperature signal is used to modify ignition advance angle, oil injection capacity, oil ventilation valve, etc. An interruption of water temperature signal will cause an increase of oil consumption, poor idle-speed self- adaptability and an increase of exhaust emission.

Limit data: 2.5±5%KΩ

Install notice: The tightening torque is15±2Nm

Notice: This vehicle is equipped with a water temperature sensor that has three wires, one of which is live wire, two of which are signal wires. One signal wire is linked to engine



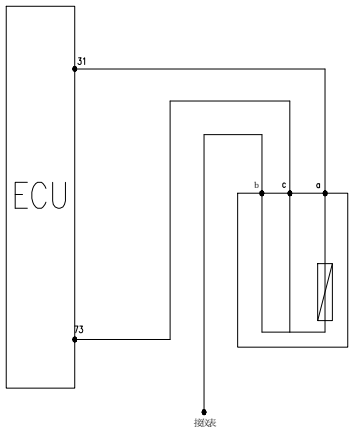
View For Coolant Temperature Sensor

Pins: This sensor has three pins, which can interchange for use.

a Pin for water temperature signal of EFI system, its resistance at 20°C is about 2.45KΩ

b Pin for water temperature of instrument, its resistance at80°C is about0.05KΩ

c Signal source



Circuit Diagram For Coolant Temperature Sensor

ECU; the other is linked to instruments.

2-4 KNOCK SENSOR KS

(Part Number:372-1002060)

Purpose: This sensor provides engine knock information to ECU, and carries out igniton advance angle control.

Composition and principle: Knock sensor is a kind of vibrating acceleration sensor and is assembled on cylinder block. The sense organ of the sensor is a piezoelectric element. The vibration of cylinder block is transferred to piezoelectric crystal by mass block inside of sensor. The piezoelectricity crystalloid gets pressure from mass block vibration, producing voltage on two polar and transferring vibration signals to voltage signal and output it. Because the frequency of knock vibration signal is much higher than the normal engine vibration signal, the ECU can separate the signal into knock signal and non knock signal. When load and revolution speed of engine, coolant temperature exceed their threshold values, while no record is for fault of knock sensor, signal from knock sensor will be used in knock closed loop control. When knock closed loop is activated, the signal from knock sensor is inputted to ECU, amplified, filtered and integrated. When the integral within a certain rotating angle of crankshaft exceeds its threshold value, ECU will think a fault occurs, then reduce the ignition advance angle at this moment. If there is another knock in next cycle, the ignition advance angle will be reduced again. If there is no knock in several cycles to follow, the ignition advance angle will be restored to its normal value.

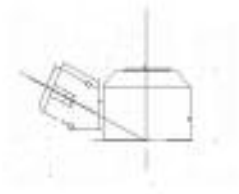
Fault diagnosis: ECU monitors sensors, actuators and power amplification circuit. Once one of the following is monitored, the sign digit of fault will be set:

Fault of knock sensor

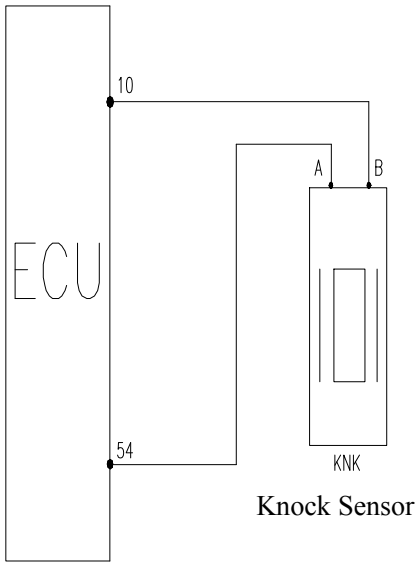
Fault of data processing circuit in knock sensor

Identification signal can not be used.

After the sign digit of fault is set at knock sensor, the knock closed loop control will be closed; the ignition advance angle saved in



Knock Sensor



Circuit Diagram For Knock Sensor

Pins: Pins A and B are not distinguished for connecting to ECU.

The shield wire package of sensor wraps around the signal wire.

ECU will be reduced by a safe angle. The sign digit of fault resets.

Assembly notice: The tightening torque is 20±5Nm.

Notice

It is installed on cylinder body at intake manifold side, bolt washer is not allowed for use. An error of tightening torque will cause inexact output signal

2-5 OXYGEN SENSOR(MODEL: 5WY2406A)

(Part Number: S11-1205110)

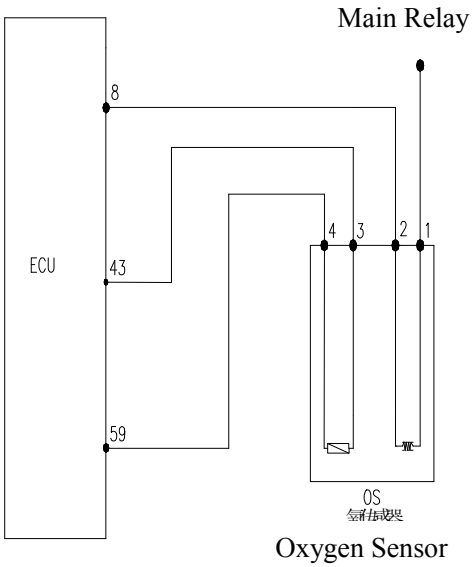
Purpose: This sensor provides information whether there is excess oxygen after the fuel taken into cylinder burns in the air taken in. ECU by virtue of the information performs the closed loop control of fuel quantity，to make three main harmful ingredients of engine emission, namely, transfer and purify CO, HC, NO_x compound in 3-way catalytic converter of the tail gas maximally.

Composition and principle: Sensing element of oxygen sensor is a kind of ceramic tube with holes, and outside of tube walls are surrounded by engine exhaust gas and inside is air. Ceramic sensor element is a kind of solid state electrolyte with electrical heating. When heated up to 300°C, the ceramic body begins to work, that is, it has properties of solid electrolyte. Thanks to the special material, oxygen ions can penetrate the ceramic pipe randomly. It is by making use of this property that the density difference is converted to potential difference and the voltage output signal is formed. Suppose the mixed air is a little denser, the oxygen density difference between inside and outside ceramic pipe will be a little higher, large quantity of oxygen ions will move from inside to outside，and the output voltage will be higher. Suppose mixed air is a little thin, oxygen density difference between inside and outside ceramic pipe will be smaller, only a little quantity of oxygen ions will move from inside to outside, and the output voltage will be smaller. On basis of this voltage signal, ECU makes closed loop control of oil injection capacity, to ensure the mixed air into cylinder comes close to theoretical air-fuel ratio; A/F=14·7/1

Operating voltage of the oxygen sensor fluctuates within 0.1-0.9V， 5-8 changes within 10 seconds. A frequency lower than this reveals sensor ageing and calls for a replacement. This sensor cannot be repaired. After ECU has been made to enter open loop control, it will operate in closed loop control



Oxygen Sensor



Oxygen Sensor

Circuit Diagram For Oxygen Sensor

An oxygen sensor is equipped with a cable. The other end of cable is the joint. The cable is wrapped with asbestus fireproof covering.

Every joint has four pins:

No.1 connects to the positive pole of heater power supply (white);

No.2 connects to the negative pole of heater power supply (white);

No.3 connects to signal negative pole (gray);

No.4 connects to signal positive (black).

that is set in advance.

Fault diagnosis: ECU monitors sensors, actuators, power amplification circuit and inspection circuit. Once one of the following is monitored, the sign digit of fault will be set:

Battery voltage can not be used.

Signal for absolute pressure in intake manifold can not be used.

Signal for coolant temperature in engine can not be used.

Fault with drive stage of injector

After the sign digit of fault is set in oxygen sensor, the closed loop control of fuel quantity will be invalidated. The fuel quantity will be controlled by the basic injection time stored in ECU.

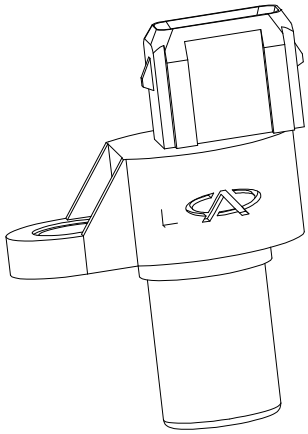
Assembly notice : The tightening torque of oxygen sensor is 50-60Nm.

When an oxygen sensor is replaced, it should be spread with a film of anticorrosive oil for fear that it can't be removed because of rust.

The heater coil of this oxygen sensor is controlled by computer. When oxygen sensor is heated up to a certain temperature, engine ECU will cut off the current to the heater coil, the heating will be stopped. (in case of a short circuit or open circuit of the heater coil, engine ECU can detect the fault, and turn on the fault indicator light. In some special operating modes, for example, startup, engine operates in mode of fault.

2-6 CRANKSHAFT POSITION SENSOR

Crankshaft position sensor is shown in the diagram. The crankshaft position sensor of 372 engine employs double Hall elements, so it is called as double Hall sensor. It can sense tiny change of magnetic force. This sensor is based on principle of Hall Effect. The so-called Hall Effect refers to: when a Hall semiconductor chip where a current flows is placed in a magnetic field whose direction is vertical to the current direction， a micro voltage will be generated at the transverse side vertical to the current direction of Hall semiconductor chip, which is called as Hall voltage. A change of magnetic field intensity will cause a change of voltage; Hall voltage is zero when the magnetic field disappears.



Sketch For Crankshaft Position Sensor

Crankshaft position sensor is fixed on the housing of the transmission, a clearance of 0.3-1.9 to the flywheel gear ring. A too large or too small clearance can cause a difficult startup or a startup failure.

The main purpose of this sensor is to detect the speed and angle position of engine and to sense the change of instantaneous speed of flywheel.

CAMSHAFT POSITION SENSOR

Camshaft position sensor is fixed on cylinder head, to sense the crescent gear at the back side of intake camshaft. The signal generated is sent to ECU to determine which cylinder of engine should oil spraying and ignition take place in.

2-6 ELECTRONIC CONTROL UNIT ECU（MODEL: 5WY5100A）

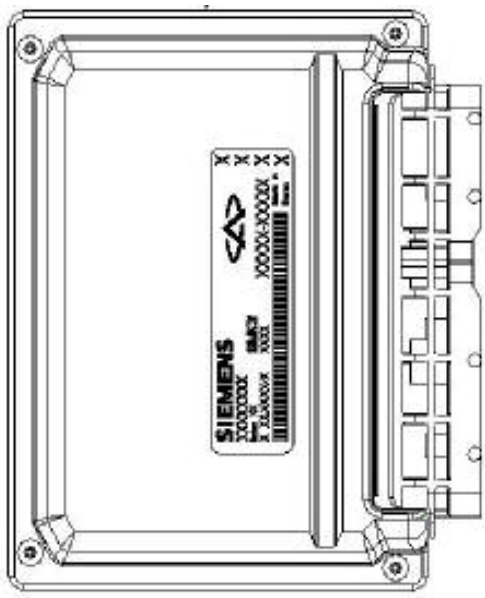
(Part Number:S11-3605010)

Purpose: ECU is the core of engine electronic control system. Sensors provide signals to ECUfor electronic control. After internal calculation, ECU will control a series of actuators, such as fuel injectors and ignition coil, to put the engine in normal condition.

ECU is ready to make and store records of system faults. The records in the form of code are stored in RAM; the codes will disappear when power is off. If the circuit from ECU to battery is open, or, the circuit from battery to vehicle is open, memory of fault will disappear. Therefore, before ECU is turned off, it is required to use X431 diagnostic tester in advance to detect fault. For ECU in vehicle, its operating voltage is 6-16V, its operating temperature is-40°C-70°C; its wire of power supply employs 2 A fuse connecting to relays.

Composition: A housing with shield , a printed circuit board on which many ECUare integrated for controlling EFI system.

Assembly: It is located inside the driver's compartment, above the pedal of clutch, fixed under the instrument panel. Engine ECU is a double-interface one, Series 372 employs an interface only, which is 81 PIN.

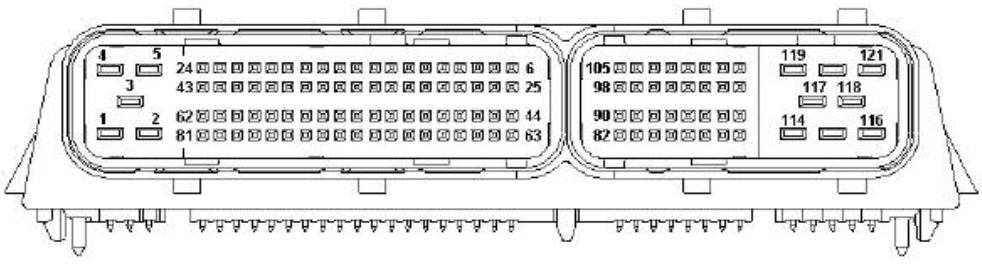


Outside View Of ECU

Definition of Engine Controller Pin:

1	Power Supply Earth	28	Unused	55	Ignition Coil Earth
2	Power Supply Earth	29	Crankshaft Position Sensor Input	56	Signal Of Air Intake Temperature Pressure Sensor
3	Ignition Coil 3	30	Camshaft Position Sensor Earth	57	Unused
4	Ignition Coil	31	Coolant Temperature Sensor Signal	58	Ac Application
5	Ignition Coil 2	32	Input Of Throttle Valve Position Sensor	59	Oxygen Sensor Earth
6	Can Wire Low	33	Unused	60	Pressure Sensor Earth Of Air Intake Temperature
7	Can Wire High	34	Unused	61	2 Cylinder Nozzle
8	Oxygen Sensor	35	Stepmotor B+	62	Unused
9	Unused	36	Stepmotor B -	63	ECU power Supply（+12v Bat）
10	Knock Signal	37	Unused	64	Control Output Of High-Speed Fan Relay
11	Unused	38	Throttle Valve Position Sensor	65	Control Output Of High-Speed Fan Relay
12	Evaporator	39	Speed Signal	66	Output Of Engine revolution speed Signal
13	Evaporator Temperature Sensor Earth	40	Unused	67	Main Relay Control Output
14	Unused	41	Unused	68	A/C Relay Control Output
15	Unused	42	Unused	69	Oil Pump Relay Output
16	Unused	43	Oxygen Sensor Signal	70	Failure Indicator Light
17	Unused	44	Vacancy	71	Unused
18	Unused	45	Power Supply Of Throttle Valve Position Sensor（+5v）	72	Crankshaft Position Sensor Output
19	Stepmotor A +	46	Power Supply Of Air Intake Temperature Pressure Sensor（+5v）	73	Coolant Temperature Sensor Earth
20	Stepmotor A -	47	Unused	74	Signal Of Power Steering Pressure Switch
21	Main Relay Power Supply	48	Air Intake Temperature Pressure Sensor Earth	75	
22	Power Supply Of Ignition Switch	49	Unused	76	Unused
23	3 Cylinder Nozzle	50	ECU Power Supply（+12v Bat）	77	Diagnosis（K Wire
24	1 Cylinder Nozzle	51	Unused	78	Unused
25	Unused	52	Unused	79	Unused
26	Carbon Canister Solenoid Valve	53	Unused	80	Unused
27	Crankshaft Position Sensor Earth	54	Knock Sensor Earth	81	Unused

Pin Definition And Joint Exterior



2-7 ELECTRIC FUEL PUMP

(Part Number:S11-1106610)

Purpose: It pumps fuel at a certain pressure and flow volume from oil tank to injector. It is greatly affected by temperature and voltage.

Composition and principle: The electric fuel pump is made up of DC electromotor, vane pump and end cover (it's an integration of check valve, relief valve and an anti electromagnetic interference element). Pump and electromotor are coaxial assembly and within the same casing. The pump and electromotor are full of gasoline for coolant and greasing inside of the casing. The accumulator provide power to electric fuel pump via the fuel pump relay controlled by ECU, and the relay switches on electric fuel pump only when engine starting and running at more than 30rpm. When the engine stops for some reason (n=) the pump will stop to run by itself. The maximum pressure at the outlet of electric pump is determined by relief valve. As 372 adopts non-oil-return system, a fuel pressure regulator is fixed on the pump assembly which will regulate oil pressure to 380kPa and stabilize it to suit the system requirement，for the exactness of fuel flow when a current with a certain pulse-width flows through.

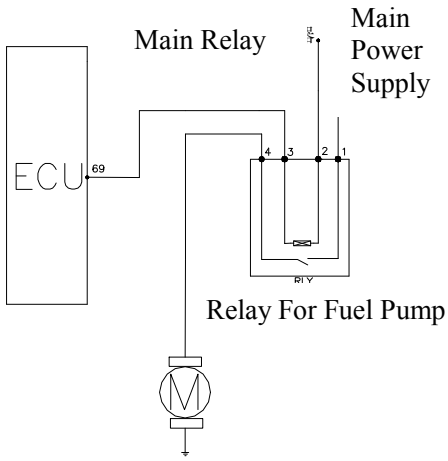
Notices: Fuel temperature has a lot influence on performance of oil pump. For long time operating at high temperature, when fuel temperature exceeds some value, pressure of oil pump sharply decreases. Therefore if engine can't start after a stop during operating, please inspect carefully for the poor performance at high temperature of oil pump.

Fuel pump is not allowed to operate without load if it is short of fuel. Otherwise loss of cooling may cause pump motor overheating, and the motor will be damaged quickly.

If ECU can not receive the signal for engine revolution speed, oil pump won't operate.



View Of Electric Oil Pump



Circuit Diagram For Electric Oil Pump

Pins: An electric fuel pump has two pins connected to pump relay. A "+" and"-" are carved beside the two pins on pump housing respectively, indicating positive pole and negative pole.

2-8 INJECTOR

(Part Number:S11-1112020)

Purpose : An injector according to instruction from ECU injects fuel within specified time. It provides fuel for engine and atomizes the fuel.

Composition and principle : An ECU transmits electric pulses to the electromagnetic coil of injector R=14.5，to generate magnetic force. When the magnetic force increases enough to overcome the resultant force of the return spring pressure, the gravity of needle valve and the frictional force, the needle valve begins to rise, and the fuel injecting begins. The maximum lift of needle valve isn't beyond 0.1mm. When pulses for fuel injecting are stopped, pressure from return spring closes the needle valve again.

Assembly notices : A certain injector has its own plug; plugs for different injectors can't interchange for use.

For ease installation, it is recommended that the surface of O-type ring connecting to fuel distribution pipe should be spread with non-silicon clean engine oil. Be careful not to pollute the inside of injector or injector nozzle with engine oil.

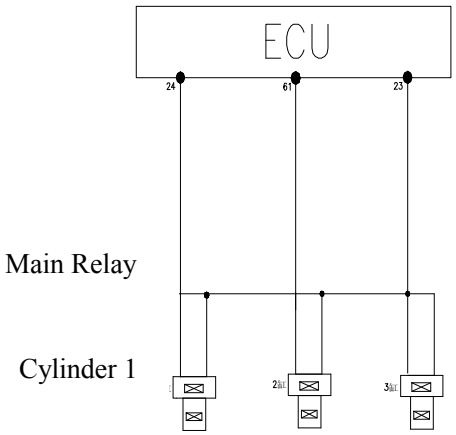
Place an injector in its base vertically. Then fix it to the base with retaining clips.

Notice: For vehicles not in use over a long time, as the wax in gasoline of injectors may deposit and become sticky, thus vehicles can't be started normally. Please inspect carefully for injector sticking.

Fault diagnosis: S11 diagnoses the driving solenoids of injectors instead of injector themselves. When the drive stage of injector is short circuit or overload to battery voltage, or short circuit to earth, or open circuit, the sign digit for fault will be set. In the meanwhile, the closed loop control of oxygen sensor and its self-tuning pre-control are invalidated，data of the last self-tuning is effective. After the fault is removed, sign digit for fault will be reset.



Electromagnetic Injector



Injector Group

Circuit Diagram For Electromagnetic Injector

Pins: Each injector has two pins, one is No.87 pin at housing side with positive sign connecting to the relay of fuel pump; the other is No.23, 24 or 61 pin connecting to ECU.

Notice: Don't mistake pin numbers, otherwise the order for fuel injecting is disturbed.

2-9 IDLE SPEED ACTUATOR–STEP MOTOR DLA

(Part Number Of Throttle Body:372-1107010)

Function: An idle speed actuator with step motor is located in throttle body and an air intake channel for bypassing is provided. When throttle is closed, air flows into engine through this bypassing channel. By virtue of a step motor, ECU can adjust the cross section area of this bypassing channel, consequently adjusting air intake to engine, and adjusting fuel injection by air intake. In engine idle speed actuator, ECU controls motor operating according to different operating modes of engine, .and then stabilizes the operating status of engine.

When because of low water temperature, or, driving other accessories (booster pump. Compressor), an engine need idle speed control, this will be done by a step motor.

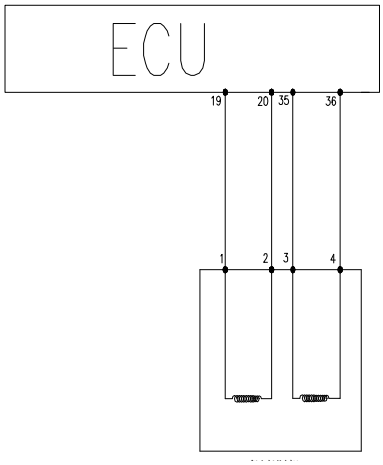
Composition and principle: A step motor is a mini-size one. It consists of several steel stators in a circle and a rotor. Every steel stator is winded with a winding ; the rotor is a permanent magnet, whose center is a nut. All stator windings are always energized. If direction of current in one of its windings is changed, the rotor will rotate by a certain angle, which is called as a step, the angle is generally 180°. When windings change current direction in an appropriate order, a rotating magnetic field is generated; this will rotate the rotor made of permanent magnet in a certain direction. Since a rotor is a nut whose pitch is 0.08 mm, each step means half pitch that is 0.04mm, and then the screw will move for 0.04 mm called as a step length. Steps of a step motor is generally around 200, so the whole open travel of idle- speed air valve driven by step motor is 0.04mm*200=8mm. Size of idle speed air channel is calculated by step number, for example, Step 38 means open,

0.04*38=1.52mm. The number of step for step motor start is indicated in the data flow from X431 diagnostic tester for reference.

Fault diagnosis: ECU can inspect two

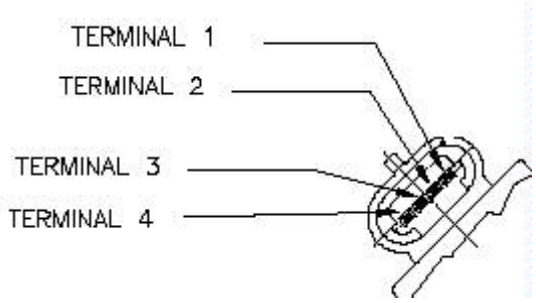


View For Step Motor Of Idle Speed Actuator



:Idle Speed Step Motor

Circuit Diagram For Step Motor Of Idle Speed Actuator



Pins:
Pin1 connects to Pin 19 of ECU
Pin2 connects to Pin 20 of ECU
Pin3 connects to Pin 35 of ECU
Pin4 connects to Pin 36 of ECU
Pins 1 and 2 are coils，Pins3 and 4 are coils. Resistance of the two coils shall be same. Therefore in inspection, please make sure resistance of coils fall within standard scope.

windings of idle speed step motor for short circuit or open circuit， and turn on the light for fault in such cases, engine will operate in fault mode. Sometimes diagnostic tester can detect changes of step number, but engine still can’t operate normally. Then inspect air intake pressure to judge whether the piston of step motor can move.

Notice: It is not allowed to remove step motor from throttle body, or to interchange with throttle body.

2-10 IGNITION COIL ZSK-ROV

(Part Number:S11-3705100)

Function: An ignition coil transforms low voltage of primary winding to high voltage of secondary winding. It sparks through spark plug charging， igniting the compressed appropriate mixed air inside cylinder.

Independent ignition: A vehicle has three such ignition coils, whose primary windings from grounding to power-off, secondary windings from inducing high voltage to igniting mixed air one cylinder after another for engine operating, are controlled by engine ECU according to signals from crankshaft position sensor and camshaft position sensor

Composition and principle: An ignition coil consists of a primary winding, a secondary winding, an iron core and housing. When voltage of battery is applied to primary winding, the primary winding is charged. Once ECU cuts off winding circuit loop, the charging will be interrupted, at the same time, a voltage will be induced at secondary winding which will be transmitted through ignition cable to spark plug and break down electrodes of spark plug, generating violent spark to ignite the compressed mixed air inside cylinder.

Fault diagnosis: ECU has no function of fault diagnosis to ignition coil，so there are no codes for fault in ECU if something is wrong with ignition coil. Only through examining primary and secondary windings or ignition coil, can the coil be determined whether it operates normally. In normal condition, an ignition coil emits heat fairly much when working. But an increase of resistance may arise from a too high temperature, subsequently, faults that engine do not work steadily or there is a self-extinguish in engine may occur.

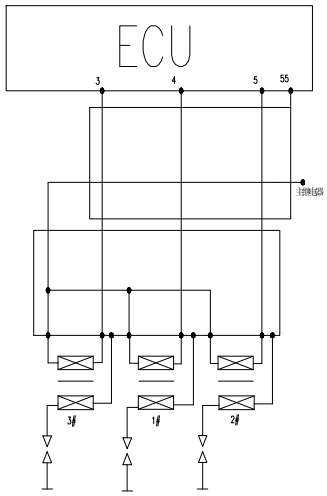
Primary winding: 0.47Ωm

Secondary winding: 8Ωm



Appearance Shape Of Ignition Coil

（372 Has 3 Such Ignition Coils In Total）

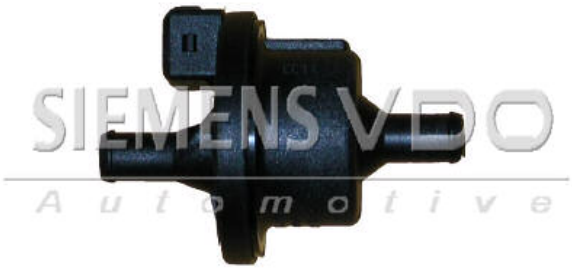


Circuit Diagram For Ignition Coil

Pins: There are two pins at lower-voltage side of ignition coil: the pin near which a “+” is marked on the housing connects to battery; the pin near which a “-” is marked on the housing connects to ECU,

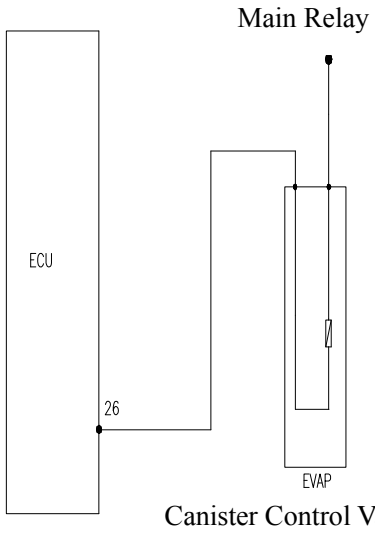
2-11 CANISTER PURGE VALVE

Purpose: It is used to control purging air flow for canister. Canister purge valve is controlled by ECU according to engine load, through the duration and frequency of electric pulse (i.e. duty cycle). Excessive accumulation of gasoline steam inside the active canister may cause gasoline overflow, resulting in environment pollution. Therefore, the purpose of canister purge valve is to open solenoid valve to let excessive gasoline into air intake pipe, participating in combustion.



Outside View Of Canister Control Valve

Composition and principle: Canister is made up of electromagnetic coil, armature and valve etc.. There is strainer on the intake. The flow quantity passes canister valve is correlate not only to electrical impulse duty ratio of canister control valve output by ECU, but also to the pressure difference between canister valve intake and outlet. When there is no electronic impulse, the canister control valve will shut down. According to signals from sensors, ECU controls energizing time of solenoid valve, to directly control the purging flow.



Circuit Diagram For Canister Control Valve TEV-2

Fault diagnosis: ECU has no diagnostic function with canister itself, but has diagnostic function with the drive stage of canister control valve. When drive stage of canister control valve is short circuit or overload to battery voltage, short circuit to earth or open circuit, the self-tuning for fuel closed loop control is invalidated, so is self-tuning for idle speed air needed. Data of self-tuning at that moment is still available. In case of canister fault, engine frequently operates in a manner of unsteady idle speed or too high an idle speed.

If a solenoid valve opens at time of engine idle speed, which equals to air leak out of the resonance cave of throttle, the idle speed will be directly affected. Therefore whenever vehicles are in maintenance, check that this valve is in normal condition, resistance between whose two pins is 26Ω (20°C).

Pins: A canister control valve has two pins connecting to Pin87 of the output port of the main relay and to Pin 26 of ECU.

2-12 STEEL FUEL DISTRIBUTION PIPE ASSEMBLY

Purpose: Its purpose is to store and distribute fuel and to let excessive fuel flow back to fuel tank. Injectors and fuel pressure regulators are installed on its top to make a relatively stable environment for fuel injection system, to achieve the balance of fuel-supplying, in pressure and capacity, in cylinders to drive engine operating steadily.

Composition: It consists of the 372 system fuel distribution main pipe and the fuel-supplying main pipe. Because the system employs no oil-return control, there is no fuel pressure adjuster for oil-supplying main pipe.



Fuel Distribution Pipe Assembly

Assembly requirement: Oil inlet pipe and oil outlet pipe connect to rubber hose, clip tightly with hoop. The type of hoop shall match the rubber hose to ensure the seal between oil pipes and rubber hose.

Fault diagnosis: In general, fault probability of fuel-supplying main pipe is fairly small. Most of faults result from improper installation that may result in fuel leak. Hence for installation do:

Notice: The used injection nozzles or O-type rings can't be used again.

3 SUMMARIZATION FOR FAULT OF EFI SYSTEM FAULT

（1）RECORDS OF FAULT

ECU continuously monitors sensors, actuators, related circuits, failure indicator lights and battery voltages etc, and even ECU themselves. ECU inspect signals from sensors, signals for actuator- driving and internal signals(such as oxygen closed loop control, knock control, idle speed speed-controlling and voltage-controlling of battery etc) for their reliabilities. Once a fault is detected in some aspect, or some signal can not be used, ECU will immediately put down records of fault in fault memory of RAM. Records of fault is stored in the form of codes, and displayed according to fault-occurring orders.

Faults can be divided into “stable faults” and “random faults” (for example, caused by transient open circuit of wires or poor contact of inserted parts) by fault frequency.

（2）FAULT STATE

If duration of a recognized fault exceeds the prescribed time for stabilization, ECU will consider it to be a steady fault, and store it as “steady-state fault”. If this fault disappears, it will be stored as “non-existed”. If this fault is again detected, it is still a “random fault”, but the early fault of “existed” doesn’t affect engine in normal use.

（3）TYPES OF FAULT

Short circuit to positive pole of power supply

Short circuit to earth

Open circuit（for the case where there are pull-up resistors or pull-down resistors during input stage, ECU will recognize fault of open circuit at input port as that of short circuit to positive pole of power supply or that of short circuit to earth） Signals can not be used.

（4）COMING BACK LAMELY

If durations of some important faults recognized exceed the prescribed time for stabilization, ECU will implement appropriate software strategy. For example, to invalidate some functions of control, and to set subsistent values for data are considered to be unusable. At this time, although engine is in poor operating mode, the vehicle can operate. The purpose of doing in this manner is to let vehicle try to go home reluctantly or run to repair station for repairing, saving the embarrassment of breakdown on expressway or in the field. Once it is recognized that the fault has gone, the normal data will be used again.

（6）FAULT ALARM

A fault indicator light is employed in 372 model that is equipped with MS2000. When faults occur at some important parts such as ECU, sensor of absolute pressure of intake manifold, throttle position sensor, coolant temperature sensor, knock sensor, oxygen sensor, phase sensor, injectors, two drive stages of step motor for idle speed actuator, canister control valve and fan relay, the corresponding digits for fault will be set, and ECU will alarm by means of fault indicator light until fault digits are reset.

（7）FAULT CALL

Records of fault can be called from ECU with Chery special diagnostic tester. If faults are related to the function of regulator for fuel-air mixing ratio, the records shan’t be called until engine operates for a while.

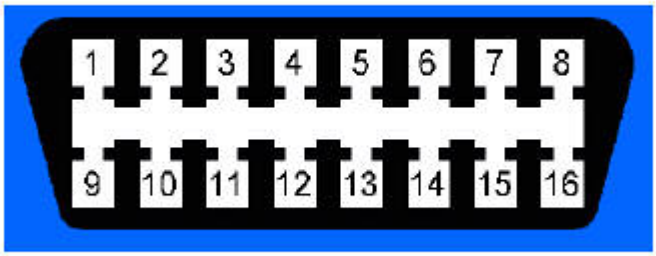


Diagram For ISO 9141-2 Standard Diagnostic Interface

This connector is fixed on co-driver side, under the glove box.

（8）CLEARING RECORDS OF FAULT

Faults removed, records of fault in memory shall be cleared in the following ways:

Employing fault diagnostic tester to clear records of fault with the instruction of “reset memory for records of fault”.

Pulling out connectors of ECU or disconnecting wires of battery to clear records of fault in external ram.

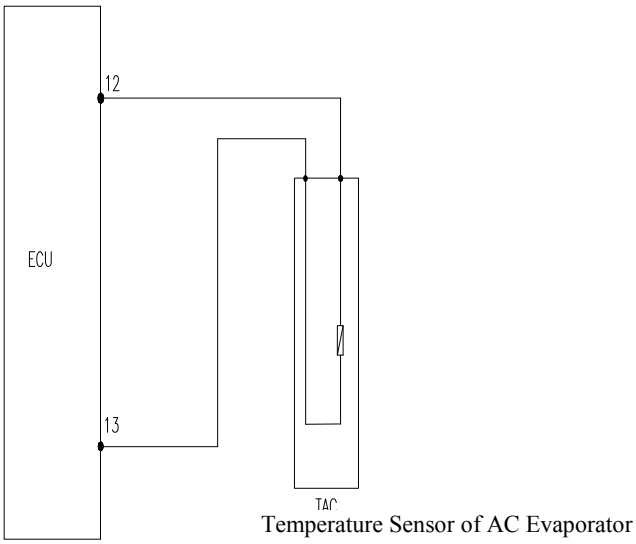
（9）FAULT-SEARCHING:

Records of fault are obtained by means above, only approximate locations of faults are known， which does not mean faults have already been detected. Because a fault may arise from damage of electric parts(for example, sensors, actuators or ECU, etc.), or may arise from open circuit, wires short circuit to earth or to battery positive pole, even from mechanical failure.

Faults take place internally, whose external representation are various symptoms. Once symptoms are found, employ a fault diagnostic tester or flashing codes to check that there are records of fault and to remove such faults according to these records. Then search for fault according to engine symptom.

4 INSPECTION METHOD OF EFI ELEMENT CIRCUIT

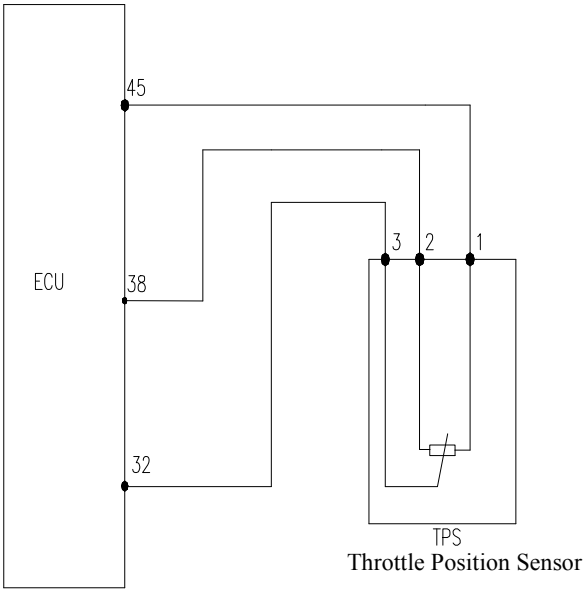
4-1 TEMPERATURE SENSOR OF AC EVAPORATOR EXIT



Temperature Sensor of AC Evaporator Circuit Diagram

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”.		Next step
2	Take off the connector of wires for AC evaporator output temperature sensor, check the voltage between two pins with multimeter and look if it is around 5V.	Yes	Next step
		No	4
3	Check if the sensor is short circuit or break circuit between two pins with multimeter.	Yes	Replace sensor
		No	Replace ECU
4	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No. 12 and No.13 and the sensor connector No. (1) and No. (2) respectively with multimeter.	Yes	Repair or replace wires
		No	Replace ECU

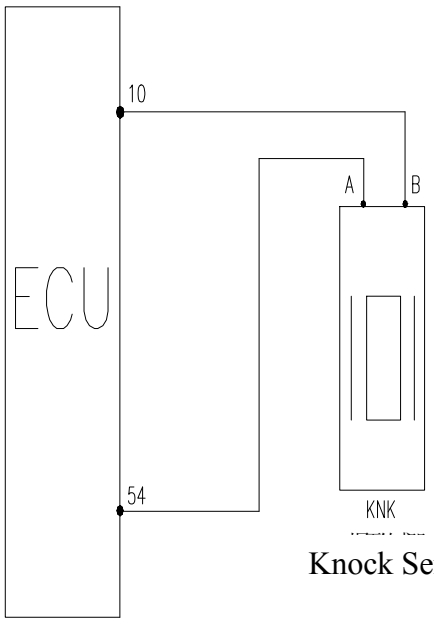
4-2 THROTTLE POSITION SENSOR



Circuit Diagram of Throttle Position Sensor

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”.		Next step
2	Take off the connector of wires for throttle position sensor, check the voltage between pin No. (1) and No. (2) with multimeter and look if it is around 5V.	Yes	Next step
		No	5
3	Check the resistance value between sensor pin No. (1) and No. (2) with multimeter, and observe if it is between 1.6 and 2.4kΩ.	yes	Next step
		No	Replace sensor
4	Rotate the throttle position sensor from one side to another side slowly. At the same time, check if it is short circuit or break circuit between the pin of throttle position sensor No. (1) (-) and No. (3) (+) with multimeter. Or check if the resistance value is leaping.	yes	Replace sensor
		No	Replace ECU
5	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No. 48, No. 38 and No. 32 and the sensor connector No. (1), No. (2) and No. (3) respectively with multimeter.	yes	Repair or replace wires
		No	Replace ECU

4-3 KNOCK SENSOR

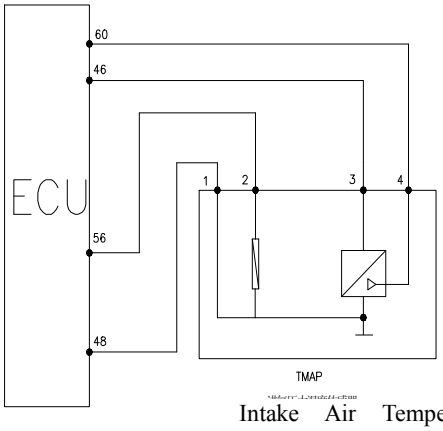


Knock Sensor

Circuit Diagram of Knock Sensor

No.	Operating steps	Result	Follow up steps
1	Close the ignition switch, and the engine stops.		Next step
2	Take off the connector of wires for knock sensor. Check the resistance value between knock sensor pin No. A and No. B with multimeter, and observe if it is above 1MΩ.	yes	Next step
		No	Replace with a new sensor
3	Knock on the edge of knock sensor with a small hammer and check with multimeter if there is communicating signal output between sensor pin No.A and No.B.	yes	Next step
		No	Replace sensor
4	Turn on the ignition switch but do not start the engine.		Next step
5	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No. 10 and No.54 and the sensor connector No. A and No. B respectively with multimeter.	yes	Repair or replace wires
		No	Replace ECU

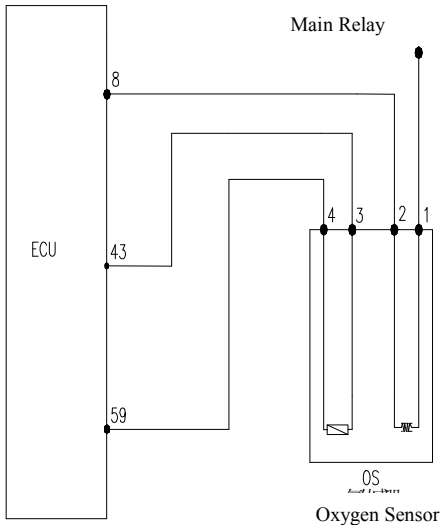
4-4 THE PRESSURE SENSOR OF AIR INTAKE PIPE ABSOLUTE PRESSURE AND INTAKE AIR TEMPERATURE SENSOR



Circuit Diagram of Air Intake Pipe Absolute Pressure and Intake Air Temperature Sensor

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”.		Next step
2	Take off the connector of wires for air intake pipe absolute pressure and intake air temperature sensor. Check the voltage between pin No. (1) and No. (3) with multimeter and look if it is around 5V.	yes	4
		No	Next step
3	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No. 48, No.46 and No. 60 and the sensor connector No. (1), No. (2) and No. (3) respectively with multimeter.	yes	Repair or replace wires
		No	Next step
4	Turn on the ignition switch but do not start the engine.		Next step
5	Use neutral and start engine at its idle running. Step on the accelerator slowly approach to open completely At the same time, check the voltage between pin No. (4) and No. (1) (between pin No. 60 and No. 48) with multimeter, by adaptor, and look if it is increased to about 4V.	yes	Replace ECU
		No	Replace ECU and sensor

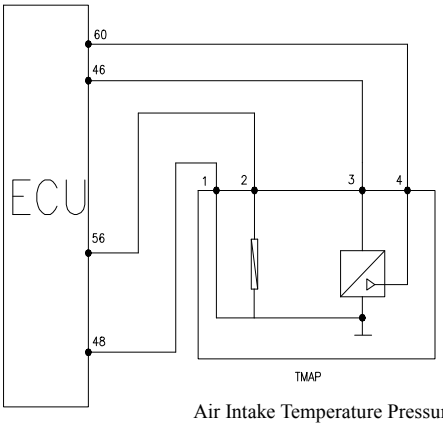
4-5 OXYGEN SENSOR



Circuit Diagram of Oxygen Sensor

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON".		Next step
2	Take off the connector of wires for oxygen sensor. Check the voltage between pin No. (1) (+) and No. (2) (-) with multimeter and look if it is around 12V.	yes	Next step
		No	4
3	Check the resistance value between oxygen sensor pin No. (1) and No. (2) with multimeter, and observe if it is between 6Ω and 25Ω.	yes	Replace ECU
		No	Next step Replace sensor
4	Check the fuse inside of oxygen sensor heating circuit and observe if it is blow.	yes	Replace fuse
		No	Next step
5	Check if it is short circuit or break circuit between the pin No. (1) and main relay No. (87) and between the sensor connector No. (2) and ECU No. (8) with multimeter.	yes	Repair or replace wires
		No	Next step
6	Connect the connector of wires for oxygen sensor and use neutral. Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value.		Next step
7	Take off the connector of wires for oxygen sensor. Check the battery output voltage between pin No. (4) (+) and No. (3) (-) with multimeter and look if it is from 0.1 to 0.9V.	yes	Next step
		yes	Replace sensor
8	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No. (43) and No. (59) of ECU and the sensor connector No. (3) and No. (4) respectively with multimeter.	yes	Repair or replace wires
		No	Replace ECU

4-6 THE INTAKE AIR TEMPERATURE PRESSURE SENSOR OF AIR INTAKE PIPE ABSOLUTE PRESSURE AND INTAKE AIR TEMPERATURE SENSOR

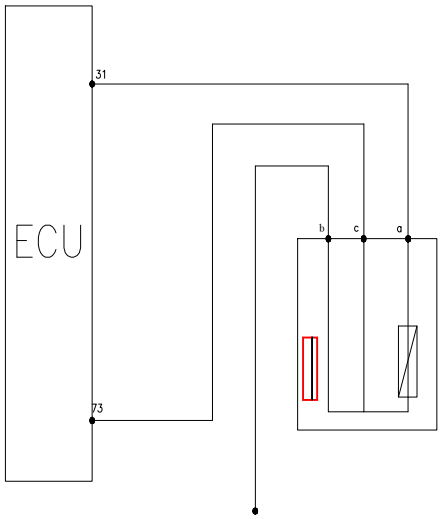


Air Intake Temperature Pressure Sensor

Circuit Diagram about Air Intake Temperature Part of Air Intake Temperature Pressure Sensor

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”.		Next step
2	Take off the connector of wires for air intake pipe absolute pressure and intake air temperature sensor. Check the voltage between pin No. (1) and No. (2) with multimeter and look if it is around 5V.	yes	Next step
		No	4
3	Check the resistance value between sensor pin No. (1) and No. (2) with multimeter, and observe if it is consistent with that temperature (refer to the relative part in this manual).	yes	Replace ECU
		No	Replace sensor
4	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No. 48, No.46 and No. 56 and the sensor connector No. (1), No. (3) and No. (2) respectively with multimeter.	yes	Repair or replace wires
		No	Replace ECU

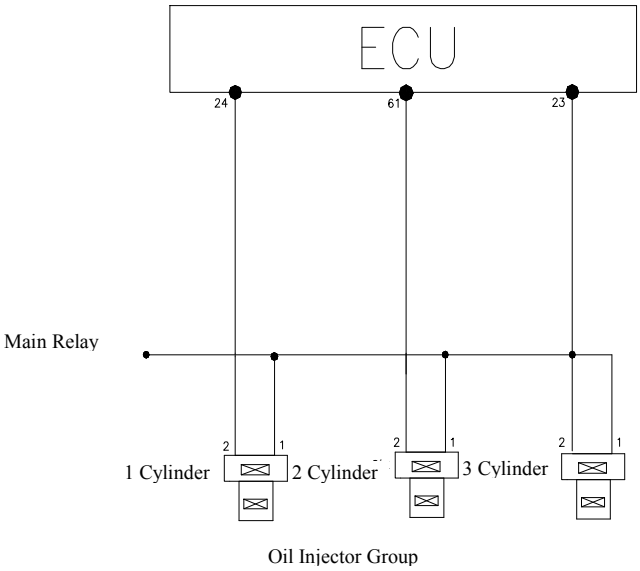
4-7 COOLANT TEMPERATURE SENSOR



Circuit Diagram of Coolant Temperature Sensor

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON".		Next step
2	Take off the connector of wires for coolant temperature sensor, check the voltage between pin No. (a) (+) and No. (c) (-) with multimeter and look if it is around 5V.	yes	Next step
		No	4
3	Check the resistance value between sensor pin No. (a) and No. (c) with multimeter, and observe if it is consistent with that temperature (refer to the relative part in this manual).	yes	Replace ECU
		No	Replace sensor
4	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No. 73 and No.31 and the sensor connector No. (a) and No. (c) respectively with multimeter.	yes	Repair or replace wires
		No	Replace ECU

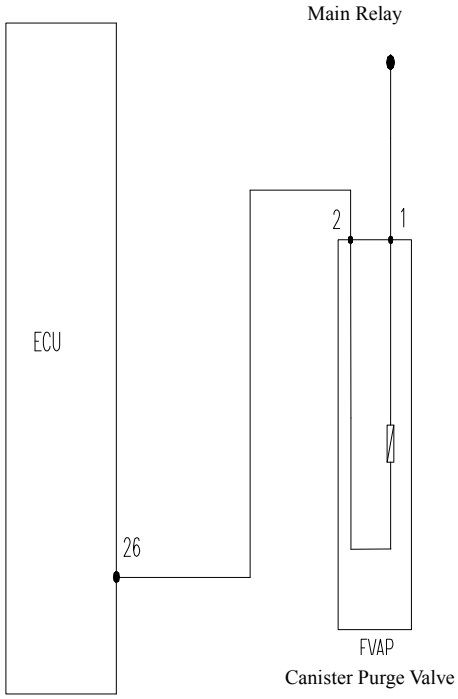
4-8 INJECTOR



Circuit Diagram of Electromagnetic Injector

No.	Operating steps	Result	Follow up steps
1	Close the ignition switch, and the engine stops.		Next step
2	Take off the connector of wires for electromagnetic injector. Connect the two pins of multimeter with the place between the pin No. (1) (+) and engine earth.		Next step
3	Put the ignition switch to “ON”. Observe the voltage as soon as putting on the ignition switch look if it is about 12 V and the battery reading is 1 second.	yes	Repeat the step No. 2
		Yes for all	6
		No	Next step
4	Take off all the joint of wires for electromagnetic injector in sequence. Connect the two pins of multimeter with the place between the pin No. (1) (+) and engine earth.	yes	Repair or replace wires
		No	Next step
5	Repair or replace the oil pump relay, the main relay and their circuits.	yes	Repair or replace wires
6	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No. 24, No.61 and No.23 of ECU and the pin No. (2) of electromagnetic injector joint respectively with multimeter.	No	Next step
7	Check the resistance value between the pin No. (1) and No. (2) of electromagnetic injector using multimeter, and observe if it is 12-16Ω when it is 20℃. The resistance value should be consistent with that of its injector （14、5Ω）.	yes	Repeat the step No. 7
		Yes for all	Next step
		No	Replace electromagnetic injector
8	Connect all the joints of electromagnetic injector again. And use neutral, start the engine and leave it running at idle speed. Take off the joints of wires for electromagnetic injector in sequence. And observe if the engine becomes more vibrant every time when a joint is taken off.	yes	Repeat the step No. 8
		No	Replace ECU

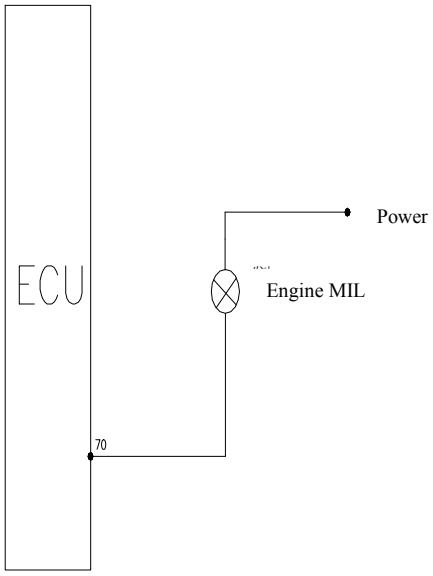
4-9 CANISTER PURGE VALVE DRIVES ELECTROMAGNETIC COIL



Circuit Diagram of Canister Purge Valve

No.	Operating steps	Result	Follow up steps
1	Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value.		Next step
2	Take off the joint of wires for canister purge valve. Check the battery voltage between the two pins of joint with multimeter and look if it is around 12V.	Yes	Next step
		No	5（Check the positive wire）
3	Connect the joint of wires for canister purge valve, make the engine revolution speed exceed 1500 rpm and touch the valve by hands in order to observe if the canister purge valve is lightly vibrant and impulsive at critical behaviors.	Yes	Next step
		No	7（Check ground）
4	Check the resistance value between the canister purge valve pins, No. (1) and No. (2), with multimeter, and observe if it is between 22 and 30Ω.	Yes	Replace ECU
		No	Replace canister purge valve
5	Check if it is short circuit or break circuit between the pin of main relay, No. 87, and the pin of canister purge valve, No. (1) with multimeter.	Yes	Repair or replace wires
		No	Next step
6	Repair or replace the main relay and the circuit.		
7	Stop the engine and connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin of ECU, No. 26 and the pin of canister purge valve, No. (2) with multimeter.	Yes	Repair or replace wires
		No	Replace ECU

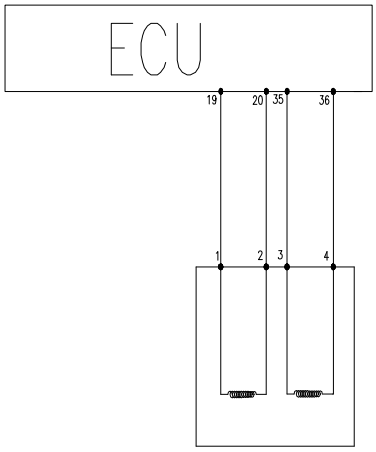
4-10 LIGHTING CIRCUIT OF MALFUNCTION INDICATOR LIGHT



Circuit Diagram of MIL

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”		Next step
2	Dissemble the instrument panel and take off the bulb of MIL. Check the battery voltage on the MIL socket with multimeter and look if it is around 12V.	Yes	Next step
		No	5 (Check the positive wire)
3	Check the bulb of instrument panel MIL with multimeter and look if it is whole.	Yes	Next step
		No	Replace bulb
4	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No. 70 of ECU and the input joint of MIL with multimeter.	Yes	Repair or replace wires
		No	Replace ECU
5	Check the fuse inside of oxygen sensor heating circuit and observe if it is blow.	Yes	Replace fuse
		No	Next step
6	Check if it is short circuit or break circuit between the pin of main relay, No. 87, and the pin of MIL socket, No. (1) with multimeter.	Yes	Repair or replace wires
		No	Next step
7	Repair or replace the main relay and the circuit.		

4-11 NO. 1 AND NO.2 COIL CIRCUIT OF STEPMOTOR



Idle Speed Actuator Stepmotor

Circuit Diagram of Idle Speed Actuator Stepmotor

No.	Operating steps	Result	Follow up steps
1	Turn on the ignition switch but do not start the engine.		Next step
2	Take off the joint of wires for idle speed actuator stepmotor. Check the resistance value between the pins of idle speed actuator stepmotor, between No.1 and No.2, and between No.3 and No.4. And then look if it is from 40 to 80.	Yes	Next step
		No	Replace idle actuator
3	Check the resistance value between the pins of idle speed actuator stepmotor with multimeter, between No.1 and No.2 and between No.3 and No. 4. And then look if it is infinite.	Yes	Next step
		No	Replace idle actuator
4	Check the battery voltage between the pins of idle speed actuator stepmotor with multimeter, between No.1 and No.2 and between No.3 and No.4, then look if it is about 12 V.	Yes	Replace idle speed actuator
		No	Next step
5	Connect the adaptor between ECU and wires. Check if it is short circuit or break circuit between the pin No.19, No.20, No.35 and No.36 and the joint of idle speed actuator stepmotor No. 1, No. 2, No. 3 and No.4 respectively with multimeter.	Yes	Repair or replace wires

5 FAULT-DIAGNOSING PROCEDURES BY ENGINE SYMPTOM

5-1 FUNDAMENTAL CHECKUPS OF ENGINE SHALL BE DONE BEFORE THE ENGINE FAULT-DIAGNOSING

(1) Inspect engine oil for volume and dirt.

(2) Inspect coolant for volume and dirt

(3) Inspect battery for volume of electrolyte and specific gravity.

(4) Inspect connecting post of battery and connection wire for connection state and corrosion state.

(5) Inspect multi-wedges belt and timing belt for deflection, abrasion and ageing states.

(6) Inspect spark plug for erosion, canister-depositing and electrode clearance.

(7) Inspect ignition timing.

(8) Inspect air-cooling-cleaning device for dirt.

(9) If necessary, inspect cylinder pressure, etc.

5-2 FUNDAMENTAL CHECKUPS SHALL BE IMPLEMENTED BEFORE FAULT-DIAGNOSING OF THE ENGINE IS DONE

(1) Make sure ECU and fault indicator lights (except for vehicles without faul t indicator lights) are in normal condition.

(2) Employ fault diagnostic tester or flashing light to check that there are no records of fault.

(3) Employ fault diagnostic tester to check that hot idle data from electronic control system fall within normal scope.

(4) Make sure the fault owner of vehicle complains about does exist and detect the exact location of symptom.

Then check the appearance:

- Check that grounding of wire harness is clean and firm.
- Check that vacuum is unbroken, twisted and in right connection.
- Check that there is no obstruction in pipe.
- Check that air intake pipe is not squashed or damaged.
- Check that the seal between throttle body and intake manifold is perfect.
- Check that ignition cable of ignition system is unbroken, no ageing and in right wiring.
- Check that wires are in right connection, no loosing or poor connection for connectors.

5-3 BASIC RULES FOR DIAGNOSIS OF ENGINE:

From simple to complicate, from outside to inside, from plain to profound, reason gradually, analyze carefully.

5-4 BASIC PRINCIPLES FOR DIAGNOSIS OF ENGINE:

According to three basic elements of engine:

1. Appropriate mixed air
2. Adequate compressing pressure
3. Violent electric spark

6 TYPICAL MOTHED AND PROCESS OF FAILURE DIAGNOSIS (ONLY FOR REFERENCE)

6-1 THE ENGINE DOES NOT ROTATE OR ROTATE SLOWLY WHEN IT IS STARTED

No.	Operating Steps	Result	Follow up steps
1	Check the voltage value between the two wiring terminals of battery by multimeter; check if it is around 8-12V.	Yes	Next step 2
		No	Repair or replace battery
2	Put the ignition switch to “ON”. Check the voltage value of anode wiring terminals of battery on the ignition switch by multimeter; check if it is around 10-12.5V.	Yes	Next step 3
		No	Repair wiring terminal or replace cable
3	Put the ignition switch at start position, checking the anode terminal of starting motor by multimeter and observe the voltage if it is above 8V.	Yes	Next step 4
		No	Repair or replace ignition switch
4	Put the ignition switch at start position, checking the anode terminal of starting motor by multimeter and observe the voltage if it is above 8V.	Yes	Next step 5
		No	Repair wiring terminal Or replace cable
5	Check if it is short circuit or break circuit in the starting motor.	Yes	Repair or replace starting motor
		No	Next step 6
6	Check if there is jammed by poor lubricating.	Yes	Troubleshooting
		No	Next step
7	If the failure is happened in winter time, check if it is because of the wrong engine lubricant and gearbox oil causes the big resistance of the starting motor.	Yes	Change to correct lubricant
		No	Repair or replace timing belt

6-2 THE ENGINE CAN DRAW ROTATING BUT CAN NOT START SUCCESSFULLY WHEN IT IS STARTED. (WITH DISTRIBUTOR)

No.	Operating Steps	Result	Follow up steps
1	Put the ignition switch to "ON". Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Pull off one of the cylinder separating line and connect spark plug to it; keep the spark electrode around 5-10 mm away from engine body; start the engine by starter and check if there is blue and white high pressure fire.	Yes	To step 8
		No	Next step
3	Check the resistance value of ignition cable and look if it is normal (it can not be too high, about 16 k/ m, or it means there are some problems on circuits.	Yes	Next step
		No	Repair or replace ignition cable
4	Check if the ignition coil broke or cracked.	Yes	Replace
		No	Next step
5	Check if the ignition coil is flexible or broke down.	Yes	Replace
		No	Next step
6	Check if the ignition coil is working correctly.	Yes	Next step
		No	Replace
7	Check if the ignition cable is connected correctly.	Yes	Next step
		No	Connect the connector
8	Put the ignition switch to "ON". Check if the fuel pump relay and fuel pump can work 3 minutes continuously.	Yes	Next step
		No	Check the circuit of fuel pump
9	Connect the valve of fuel pressure gauge. Connect the fuel pump relay pin No. 30 and No. 87 to run the fuel pump and check if the pressure value of fuel pump is around 380 kPa.	Yes	Next step
		No	To step 13
10	Pull off the fuel distributing pipe and the fuel injector; pull off the joints of fuel injector one by one. And supply the voltage of 12 V from battery to fuel injector directly and look if the fuel injector can inject normally.	Yes	To step 12
		No	Next step
11	Clean out the fuel injector and look if it can work correctly.	Yes	Next step
		No	Replace fuel injector
12	Check if fuel is bad or moisture.	Yes	Replace fuel
		No	To step 17
13	Check if the fuel pressure value is below 380kPa.	Yes	Next step
		No	To step 16
14	Close the valve of fuel gauge. Connect the ignition switch again to run the oil pump 3 minutes more and check if there is the oil pressure.	Yes	Next step
		No	15
15	Check if there is leaking or jam in oil intake pipe.	Yes	Repair or replace oil intake pipe

		No	Replace oil pump

16	Check if there is jam or bending of oil return pipe (this applies to that with oil return system).	Yes	Repair or replace oil return pipe
		No	Replace fuel Pressure regulator
17	Connect the adaptor between ECU and wires. Check if there is the voltage between the pins of ECU, No.1 and No.2, and then check if it is working correctly on the positive power cord connecting the ECU pins mentioned above and the ground wire connecting ECU pins, No.22, No.44 and No.63.	Yes	Next step
		No	Repair or replace wires
18	Check if the part of air intake system is leaking.	Yes	Repair
		No	Next step
19	Check the absolute pressure of air intake pipe and look if the temperature sensor is jammed.	Yes	Repair or replace
		No	Next step
20	Check if the coolant temperature sensor is working correctly.	Yes	Next step
		No	Repair or replace
21	Check if the reason for the failure on starting is about mechanism, such as much cylinder clearance, cylinder leaking, and so on.	Yes	Eliminate mechanical failure
		No	Replace ECU

6-3 IT IS HARD TO START THE HEATING CAR.

No.	Operating Steps	Result	Follow up steps
1	Put the ignition switch to "ON". Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Connect the valve of fuel pressure gauge. (connecting point is the oil intake pipe)Connect the fuel pump relay pin No. 30 and No. 87 to run the fuel pump and check if the pressure value of fuel pump is around 380 kPa.	Yes	Next step
		No	9
3	Disconnect the connecting oil pipe and turn off the ignition switch. Observe the voltage of fuel system and look if it is between 200 and 260 kPa after an hour.	Yes	Next step
		No	Repair the fuel system to stop leaking
4	Connect the connecting oil pipe, baffle the flow in oil return pipe with oil return baffle and close the valve of fuel pressure gauge at the same time. turn off the ignition switch. Observe the voltage of fuel system and look if it is around 380 kPa after an hour. (this applies to that with oil return system)	Yes	Replace fuel Pressure regulator (inside)
		No	Next step
5	Check if there is fuel leaking of fuel injector and oil pipe.	Yes	Replace fuel injector and oil pipe
		No	Next step
6	Take off the coolant temperature sensor joint and start the engine, observe if the engine can be started successfully.	Yes	Check coolant temperature sensor and wires
		No	Next step
7	Connect the adaptor between ECU and wires. Check if there is the voltage between the pins of ECU, No.1 and No.2, and then check if it is working correctly on the positive power cord connecting the ECU pins mentioned above and the ground wire connecting ECU pins, No.22, No.44 and No.63.	Yes	Next step
		No	Repair or replace wires
8	Replace fuel and warm up the engine; observe if the engine can be started successfully.	Yes	End
		No	Replace ECU
9	Check if there is jam or bending of fuel pipe and if the pressure regulator valve of oil pump is working correctly.	Yes	Next step
		No	Repair or replace
10	Check if there is battery voltage between the plugs of oil pump with multimeter.	Yes	Next step
		No	Repair or replace fuel pump relay and wires
11	Check if the fuel pump resistance value is correct.	Yes	Next step
		No	Replace fuel pump
12	Check if the fuel pump is stopped up.	Yes	Replace fuel pump
		No	Replace ECU

6-4 NORMAL ENGINE REVOLUTION SPEED BUT HARD TO START AT ANY TIME.

No.	Operating Steps	Result	Follow up steps
1	Put the ignition switch to “ON”. Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
3	After starting the engine, check the air intake pressure at idle speed and look if it is between 35 and 65 kpa.	Yes	Next step
		No	Eliminate the failure of air intake system leaking
4	Step on the throttle slightly and observe if it is easy to be started easily.	Yes	Replace and check throttle and idle speed air port
5	Connect the valve of fuel pressure gauge. Connect the fuel pump relay pin No. 30 and No. 87 to run the fuel pump and check if the pressure value of fuel pump is around 380 kPa.	Yes	Next step
		No	9
6	Supply with the voltage of 12 V from battery to fuel injector directly through the special joint and check if the fuel injector is working correctly.	Yes	8
		No	Next step
7	Clean out the fuel injector and look if it can work correctly.	Yes	Next step
		No	Replace fuel injector
8	Replace fuel, and check if the fuel is bad or moisture.	Yes	replace fuel
		No	14
9	Check if the fuel pressure value is below 380kPa.	Yes	Next step
		No	13
10	Close the valve of fuel gauge. Connect the ignition switch again to run the oil pump 3 minutes more and check if there is the oil pressure.	Yes	Next step
		No	12

11	Open the valve of fuel gauge and clamp the oil return pipe by oil return baffle so that the oil can not return. Check if the oil pressure occurs immediately (this item applies to that with oil return system).	Yes	Replace fuel pressure regulator
		No	Repair and replace fuel injector and oil pipe
12	Check if there is leaking or jam in oil intake pipe.	Yes	Repair or replace oil intake pipe
		No	Replace oil pump
13	Check if the pressure regulator is damaged or jammed.	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator
14	Pull off the joint of wires for idle speed actuator before the temperature of engine coolant becomes 35 °C; Observe if the engine revolution speed is decreased.	Yes	Next step
		No	Replace or repair idle speed actuator
15	Put the ignition switch to “ON”. Check if the voltages of following pins are normal: the battery voltage of pin No.27 is around 12V, and No.14 and No.19 are 0 V.	Yes	Next step
		No	Check wires and plugs
16	Run the engine at idle speed, short circuit the ECU pin No. 51 to ground after the temperature of coolant becomes normal, and check if the ignition advance angle is 6.75°of crankshaft angle.	Yes	Next step
		No	Adjust ignition advance angle
17	Check if the compression pressure of cylinder is normal.	Yes	Next step
		No	Troubleshooting
18	Check the absolute pressure of air intake pipe and look if the temperature sensor is jammed.	Yes	Repair or replace
		No	Next step
19	Check if the coolant temperature sensor is working correctly.	Yes	Replace ECU
		No	Repair or replace

6-5 IT IS HARD TO START THE COLD CAR.

No.	Operating Steps	Result	Follow up steps
1	Put the ignition switch to "ON". Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Check if the coolant temperature sensor is working correctly with multimeter. (Or serial connect a 1.5kΩ resistance between ECU pin No.45 and No.30 instead of the coolant temperature sensor to start the engine) If the engine can start, it means that the coolant temperature sensor is abnormal.	Yes	Next step
		No	Replace sensor
3	Connect the ignition switch and the adaptor between ECU and wires; Check if the voltages of following pins are normal: the battery voltage of pin No.27 is around 12V, and No.14 and No.19 are 0 V.	Yes	Next step
		No	Check wires and plugs
4	Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
5	After starting the engine, check the air intake pressure at idle speed and look if it is between -35 and -65 kpa.	Yes	Next step
		No	Eliminate the failure of air intake system leaking
6	Step on the throttle slightly and observe if it is easy to be started easily.	Yes	Check throttle and idle speed air port
		No	Next step
7	Pull off the joint of wires for idle speed actuator before the temperature of engine coolant becomes 35 °C; Observe if the engine revolution speed is decreased.	Yes	Next step
		No	Replace or repair idle speed actuator
8	Connect the valve of fuel pressure gauge. (connecting point is the oil intake pipe)Connect the pin No.86 of fuel pump relay to ground directly. Connect the ignition switch to run the fuel pump and its relay; check if the pressure value of fuel pump is around 380kPa.	Yes	Next step
		No	12
9	Supply with the voltage of 12 V from battery to fuel injector directly through the special joint and check if the fuel injector is working correctly.	Yes	11
		No	Next step
10	Clean out the fuel injector and look if it can work correctly.	Yes	Next step

	work correctly.	No	Replace fuel injector
11	Check if fuel is bad or moisture.	Yes	replace fuel
		No	17
12	Check if the fuel pressure value is below 380kPa.	Yes	Next step
		No	16
13	Close the valve of fuel gauge. Connect the ignition switch again to run the oil pump 3 minutes more and check if there is the oil pressure.	Yes	Next step
		No	15
14	Open the valve of fuel gauge and clamp the oil return pipe by oil return baffle so that the oil can not return. Check if the oil pressure occurs immediately.(this applies to that with oil return system)	Yes	Replace fuel pressure regulator
			Or fuel pump
		No	Repair and replace fuel injector and oil pipe
15	Check if the oil intake pipe is leaky or jammed.	Yes	Repair or replace oil intake pipe
		No	Replace oil pump
16	Check if there is jam or bending of oil return pipe (this applies to that with oil return system).	Yes	Repair or replace fuel pump
		No	Replace fuel pump Pressure regulator
17	Check if the pressure of cylinder is normal.	Yes	Next step
		No	Troubleshooting
18	Check if the engine air intake system is leaky.	Yes	Repair
		No	Next step
19	Check the absolute pressure of air intake pipe and look if the temperature sensor is jammed.	Yes	Repair or replace
		No	Replace ECU

6-6 THE IDLE SPEED IS NOT STEADY AT ANY TIME.

1	Put the ignition switch to "ON". Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Check if the idle speed actuator or that of stepmotor is jammed.	Yes	Replace or repair idle speed actuator
		No	Next step
3	Turn on the ignition switch and connect the adaptor between ECU and wires; Check the ECU pins, No.31 and No.56 (the output signal terminals of air intake temperature sensor and coolant temperature sensor), as well as No.19, No.20, No.35 and No.36 (the output signal terminals of stepmotor) and look if the voltage of pin No.19 and No.35 is normal.	Yes	Check wires and plugs
		No	Next step
4	Run the engine at idle speed and cut off oil of cylinder (cut off fire) and observe if the engine revolution speed is decreased and fluctuated.	Yes	8
		No	Next step
5	Check the fuel injectors of each cylinder and look if they are in right conditions.	Yes	Next step
		No	Check fuel injector and wires
6	Check if the resistance values of cylinders' ignition cable are normal.	Yes	Next step
		No	Replace
7	Check if the ignition coil is damaged or cracked.	Yes	Replace
		No	Next step
8	Check if the spark plug is in right conditions.	Yes	Next step
		No	Replace spark plug
9	Connect the valve of fuel pressure gauge. Connect the fuel pump relay pin No. 30 and No. 87 to run the fuel pump and check if the pressure value of fuel pump is around 380 kPa.	Yes	Next step
		No	13
10	Supply with the voltage of 12 V from battery to fuel injector directly through the special joint and check if the fuel injector is working correctly.	Yes	12
		No	Next step
11	Clean out the fuel injector and look if it can work correctly.	Yes	Next step

	work correctly.	No	Replace fuel injector
12	Check if fuel is bad or moisture.	Yes	replace fuel
		No	18
13	Check if the fuel pressure value is below 380kPa.	Yes	Next step
		No	17
14	Close the valve of fuel gauge. Connect the ignition switch again to run the oil pump 3 minutes more and check if there is the oil pressure.	Yes	Next step
		No	16
15	Open the valve of fuel gauge and clamp the oil return pipe by oil return baffle so that the oil can not return. Check if the oil pressure occurs immediately.(this applies to that with oil return system)	Yes	Replace fuel pressure regulator
		No	Repair and replace fuel injector and oil pipe
16	Check if there is leaking or jam in oil intake pipe.	Yes	Repair or replace oil return pipe
		No	Replace oil pump
17	Check if there is jam or bending of oil return pipe (this applies to that with oil return system).	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator
18	Check the pressure of air intake pipe and if the sense port of air intake temperature sensor is jammed.	Yes	Clean
		No	Next step
19	Run the engine at idle speed. After the coolant reaches the temperature of actuating closed loop control, you may observe if the oxygen sensor can work correctly.	Yes	Next step
		No	Check oxygen sensor and wires
20	Check if the engine air intake system is leaky.	Yes	Eliminate leaking
		No	Next step
21	Check if the pressure of cylinder is normal.	Yes	Next step
		No	Troubleshooting

6-7 THE IDLE SPEED IS NOT STEADY DURING ENGINE HEATING.

1	Put the ignition switch to “ON”. Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
3	Run the engine at idle speed and check if the air intake pressure during engine heating is between 35 and 65 kPa.	Yes	Next step
		No	Eliminate the failure of air intake system leaking
4	Turn off the engine and connect the ignition switch. Connect the adaptor between ECU and wires and check the ECU pins, No.31 and No.56 （the output signal terminals of air intake temperature sensor and coolant temperature sensor）.	Yes	Next step
		No	Check and repair
5	Pull off the joint of wires for idle speed actuator before finishing engine heating. Observe if the engine revolution speed is changing.	Yes	Next step
		No	Replace idle speed actuator
6	Check if the coolant temperature sensor is working correctly.	Yes	Next step
		No	Replace

6-8 IDLE SPEED IS NOT STEADY AFTER THE ENGINE HEATING.

1	Put the ignition switch to “ON”. Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Put the ignition switch to “ON”. Connect the adaptor between ECU and wires and check the ECU pins, No.60 (output of air intake absolute pressure sensor), No.56 (output of air intake temperature sensor), No.31 (output of coolant temperature sensor) and No.43 (output of oxygen sensor), as well as the voltages of ECU pins, No. 19, No.20, No.35 and No.36 (output to idle speed actuator).	Yes	Next step
		No	Repair or replace wires
3	Turn off the engine. Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
4	Check the air intake pressure at idle speed and look if it is between 35 and 65 kpa.	Yes	Next step
		No	Eliminate the failure of air intake system leaking
5	Connect the valve of fuel pressure gauge. Connect the fuel pump relay pin No. 30 and No. 87 to run the fuel pump and check if the pressure value of fuel pump is around 380 kPa.	Yes	Next step
		No	9
6	Supply with the voltage of 12 V from battery to fuel injector directly through the special joint and check if the fuel injector is working correctly.	Yes	8
		No	Next step
7	Clean out the fuel injector and look if it can work correctly.	Yes	Replace
		No	Replace fuel injector
8	Check if fuel is bad or moisture.	Yes	replace fuel
		No	14
9	Check if the fuel pressure value is below 380kPa.	Yes	Next step
		No	13
10	Close the valve of fuel gauge. Connect the ignition switch again to run the oil pump 3 minutes more and check if there is the oil pressure.	Yes	Next step
		No	12
11	Open the valve of fuel gauge and clamp the oil return pipe by oil return baffle so that the oil can not return. Check if the oil pressure occurs immediately.(this applies to that with oil	Yes	Replace fuel pressure regulator

	return system)	No	Repair and replace fuel injector and oil pipe
12	Check if there is leaking or jam in oil intake pipe.	Yes	Repair or replace oil intake pipe
		No	Replace oil pump
13	Check if the oil return pipe is bended or jammed. (this applies to that with oil return system)	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator
15	Pull off the coolant temperature sensor and observe if the engine is in right conditions.	Yes	Replace coolant temperature sensor
		No	Next step
16	Check if the compression pressure of cylinder is normal.	Yes	Next step
		No	Troubleshooting
17	Check if the resistance values of cylinders' ignition cable are normal.	Yes	Next step
		No	Replace
18	Check if the ignition coil is damaged or cracked.	Yes	Replace
		No	Next step
19	Check if the spark plug is in right conditions.	Yes	Replace ECU
		No	Replace spark plug

6-9 IDLE SPEED IS NOT STEADY OR DYING OUT WHEN THERE IS PARTIAL LOADING.

1	Put the ignition switch to “ON”. Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Connect the air condition switch and the adaptor between ECU and wires. Check if there are input signals on the ECU pins, No.50 and No.58 (Air Condition Switch).	Yes	Next step
		No	Check and repair air conditioning circuits
3	Check if the pressure of air conditioning system, the electromagnetic clutch of compressor and the air conditioning pump are in right conditions.	Yes	Next step
		No	Repair or replace
4	Put the ignition switch to “ON”. Check the voltages of ECU pins, No.19, No.20, No.35 and No.36 (output to the idle speed actuator), and look if they are normal.	Yes	Next step
		No	Check controlling circuit
5	Disassemble the stepmotor and check if the stepmotor is jammed or bad working.	Yes	Repair or replace stepmotor
		No	Next step
6	Start the engine and switch on the air condition. Check if the idle speed actuator is working correctly by the steps of stepmotor on failure diagnostic tester. （The normal amount of steps will be supplied later）	Yes	Replace ECU
		No	Replace idle speed actuator

6-10 IT IS PERIODICALLY UNSTEADY（NEED TO RESTUDY BY SELF AFTER ECU TURNING OFF）

1	Put the ignition switch to “ON”. Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
3	Run the engine at idle speed and check if the air intake pressure is from -35 to -65kPa.	Yes	Next step
		No	Check and repair air intake and leak
4	Run the engine at idle speed, make the cylinder cut off oil and observe if the engine revolution speed is decreased and fluctuated.	Yes	7
		No	Next step
5	Put the ignition switch to “ON”. Connect the adaptor between ECU and wires and check the ECU pins, No.48 (output of air intake absolute pressure sensor), No.60 (output of air intake temperature sensor), No.45 (output of coolant temperature sensor), No. 28 (output of oxygen sensor), No.1, No.2 (electron ground) and No.22 (ignition switch), as well as the voltages of ECU pins, No. 19, No.20, No.35 and No.36 (output to idle speed actuator).	Yes	Next step
		No	Repair or replace wires
6	Run the engine at idle speed and check if the ignition advance angle is normal after the coolant temperature reaches to the normal value.	Yes	Next step
		No	Adjust ignition advance angle
7	Check the pressure of air intake pipe and if the sense port of air intake temperature sensor is jammed.	Yes	Clean
		No	Next step
8	Check if fuel is bad or moisture.	Yes	replace fuel
		No	Next step
9	Supply with the voltage of 12 V from battery to fuel injector directly through the special joint and check if the fuel injector is working correctly.	Yes	Next step
		No	Check and repair oil injector and related wires
10	Check if the resistance values of cylinders’ ignition cable are normal.	Yes	Next step
		No	Replace
11	Check if the ignition coil is damaged or cracked	Yes	Replace

	cracked.	No	Next step
12	Check if the spark plug is in right conditions.	Yes	Replace ECU
		No	Replace spark plug

6-11 DLE SPEED IS TOO HIGH (NEED TO RESTUDY BY SELF AFTER ECU TURNING OFF).

1	Put the ignition switch to "ON". Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Check accelerator cable if it is blocked or over tightening	Yes	Adjust or repair
		No	Next step
3	Check if the canister purge valve, the fuel pressure regulator, the positive crankcase ventilation vacuum pipe and the vacuum pipe of brake system are mounted steadily or they are damaged.	Yes	Repair or replace
		No	Next step
4	Run the engine at idle speed and use neutral. Step on the accelerator and observe if the idle speed is too high.	Yes	Next step
		No	6
5	Clamp the vacuum pipe and observe if the idle speed becomes normal.	Yes	Repair or replace vacuum pipe
		No	Next step
6	Replace PVC valve and clamp the positive crankcase ventilation vacuum pipe. Observe if the idle speed becomes normal.	Yes	Replace PVC valve
		No	Next step
7	Clamp the canister purge valve pipe and observe if the idle speed becomes normal.	Yes	Replace canister purge valve
		No	Next step
8	Check if the idle speed actuator is jammed or on bad working.	Yes	Repair or replace
		No	Next step
9	Repair or replace, check if there is leaking at other place of air intake pipe.	Yes	Repair or replace
		No	Next step
10	Check if the gasket of fuel injector is in good condition.	Yes	Next step
		No	Replace gasket
11	Check the absolute pressure of air intake pipe and look if the air intake temperature sensor is in good condition.	Yes	Replace ECU
		No	Replace sensor

6-12 ENGINE REVOLUTION SPEED IS TOO LOW OR FLAMEOUT

1	Put the ignition switch to “ON”. Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
3	Run the engine at idle speed and check if the engine revolution speed is normal at idle speed.	Yes	Next step
		No	Next step refers to t check and repair of idle speed failure item
4	Run the engine at idle speed and check if the air intake pressure is from -35 to -65kPa.	Yes	Next step
		No	Check and repair
5	Run the engine at idle speed and check if the ignition advance angle is normal after the coolant temperature reaches to the normal value.	Yes	Next step
		No	Adjust ignition advance angle
6	Connect the valve of fuel pressure gauge. Connect the fuel pump relay pin No. 30 and No. 87 to run the fuel pump and check if the pressure value of fuel pump is around 380 kPa.	Yes	Next step
		No	10
7	Supply with the voltage of 12 V from battery to fuel injector directly through the special joint and check if the fuel injector is working correctly.	Yes	9
		No	Next step
8	Clean out the fuel injector and look if it can work correctly.	Yes	Next step
		No	Replace fuel injector
9	Check if fuel is bad or moisture.	Yes	Replace fuel
		No	15
10	Check if the fuel pressure value is below 250kPa.	Yes	Next step
		No	14
11	Close the valve of fuel gauge. Connect the ignition switch again to run the oil pump 3 minutes more and check if there is the oil pressure.	Yes	Next step
		No	13
12	Open the valve of fuel gauge and clamp the oil return pipe by oil return baffle so that the oil can not return. Check if the oil pressure occurs immediately.(this applies to that with oil return system)	Yes	Replace fuel pressure regulator
		No	Repair and replace fuel injector and oil pipe
13	Check if there is leaking or jam in oil intake pipe.	Yes	Repair or replace oil intake pipe
		No	Replace oil pump
14	Check if there is jam or bending of oil return pipe (this applies to that with oil return system).	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator
15	Put the ignition switch to “ON”. Connect the adaptor between ECU and wires. Check the voltages of ECU pins, No.32 (output signal terminal of throttle position sensor), No.38 (ground) and No.45 (power supply for 4.5 to 5V sensors), and look if they are normal.	Yes	Next step
		No	Repair or replace wires
16	Check if ignition coil, distributor, ignition cable and spark plug are in good condition.	Yes	Replace ECU
		No	Repair or replace the related parts

6-13 REACT SLOWLY WHEN IT IS ACCELERATED.

1	Put the ignition switch to "ON". Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
2	Turn off the engine. Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
3	Run the engine at idle speed and check if the engine revolution speed is normal at idle speed.	Yes	Next step
		No	Repair in accordance with idle speed failure item
4	Run the engine at idle speed and check if the air intake pressure is from 35 to 65 kPa.	Yes	Next step
		No	Check and repair
5	Switch on the ignition switch and connect the adaptor between ECU and wires. Check the voltages of ECU pins, No.32 (output signal terminal of throttle position sensor), No.38 (ground) and No.45 (power supply for 4.5 to 5V sensors), and look if they are normal.	Yes	Next step
		No	Repair or replace wires
6	Run the engine at idle speed and check if the ignition advance angle is normal after the coolant temperature reaches to the normal value.	Yes	Next step
		No	Adjust ignition advance angle
7	Connect the valve of fuel pressure gauge. Connect the fuel pump relay pin No. 30 and No. 87 to run the fuel pump and check if the pressure value of fuel pump is from 250 to 300kPa.	Yes	Next step
		No	11
8	Supply with the voltage of 12 V from battery to fuel injector directly through the special joint and check if the fuel injector is working correctly.	Yes	10
		No	Next step
9	Clean out the fuel injector and look if it can work correctly.	Yes	Next step
		No	Replace fuel injector
10	Check if fuel is bad or moisture.	Yes	replace fuel
		No	16
11	Check if the fuel pressure value is below 380kPa.	Yes	Next step
		No	15
12	Close the valve of fuel gauge. Connect the ignition switch again to run the oil pump 3 minutes more and check if there is the oil pressure.	Yes	Next step
		No	14
13	Open the valve of fuel gauge and clamp the oil return pipe by oil return baffle so that the oil can not return. Check if the oil pressure occurs immediately.(this applies to that with oil return system)	Yes	Replace fuel pressure regulator
		No	Repair and replace fuel injector and oil pipe
14	Check if there is leaking or jam in oil intake pipe.	Yes	Repair or replace oil intake pipe
		No	Replace oil pump
15	Check if the oil return pipe is bended or jammed. (this applies to that with oil return system)	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator
16	Check if the exhaust system and three-way catalytic converter are jammed.	Yes	Replace or clean
		No	Replace ECU

6-14 THE PERFORMANCE IS POOR WHEN IT IS ACCELERATED.

1	Check if failure occurs, such as clutch slipping, low tire pressure, brake delay, wrong tire size and incorrect four-wheel alignment.	Yes	Repair
		No	Next step
2	Check if the throttle can be open fully.	Yes	Next step
		No	Repair or replace throttle
3	Put the ignition switch to "ON". Check if there are some records about failures with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
4	Run the engine at idle speed and check if the ignition advance angle is normal after the coolant temperature reaches to the normal value.	Yes	Next step
		No	Adjust ignition advance angle
5	Put the ignition switch to "ON". Connect the adaptor between ECU and wires and check the ECU pins, No.48 (output of air intake absolute pressure sensor), No.60 (output of air intake temperature sensor), No.45 (output of coolant temperature sensor), No.28 (output of oxygen sensor), No.1, No.2 (electron ground) and No.22 (ignition switch), as well as the voltages of ECU pins, No. 19, No.20, No.35 and No.36 (output to idle speed actuator).	Yes	Next step
		No	Repair or replace wires
6	Run the engine at idle speed and check if the air intake pressure is from 35 to 65kPa.	Yes	Next step
		No	Check and repair
7	Connect the valve of fuel pressure gauge. Connect the fuel pump relay pin No. 30 and No. 87 to run the fuel pump and check if the pressure value of fuel pump is around 300 kPa.	Yes	Next step
		No	11
8	Supply with the voltage of 12 V from battery to fuel injector directly through the special joint and check if the fuel injector is working correctly.	Yes	10
		No	Next step
9	Clean out the fuel injector and look if it can work correctly.	Yes	Next step
		No	Replace fuel injector
10	Check if fuel is bad or moisture.	Yes	replace fuel
		No	16
11	Check if the fuel pressure value is below 380 kPa.	Yes	Next step
		No	15
12	Close the valve of fuel gauge. Connect the ignition switch again to run the oil pump 3 minutes more and check if	Yes	Next step

	again to run the oil pump 3 minutes more and check if there is the oil pressure.	No	14
13	Open the valve of fuel gauge and clamp the oil return pipe by oil return baffle so that the oil can not return. Check if the oil pressure occurs immediately.	Yes	Replace fuel pressure regulator
		No	Repair and replace fuel injector and oil pipe
14	Check if there is leaking or jam in oil intake pipe.	Yes	Repair or replace oil intake pipe
		No	Replace oil pump
15	Check if the oil return pipe is bended or jammed.	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator
16	Check the absolute pressure of air intake pipe and look if the date of air intake temperature sensor is normal.	Yes	Next step
		No	Replace sensor
17	Check if ignition coil, distributor, ignition cable and spark plug are in good condition.	Yes	Next step
		No	Adjust or repair
18	Check if it results from air conditioning system.	Yes	Check air conditioning system
		No	Replace ECU

6-15 AIR CONDITIONER SYSTEM FAILURE

1	Check if there is enough coolant, if the air condition belt, the air condition clutch and the pressure switch are in good condition.- {} -	Yes	Next step
		No	Troubleshooting
2	Run the engine at idle speed and connect the air condition switch. Check if there is the failure of air condition thermo-sensitive Resistance with failure diagnostic tester.	Yes	Eliminate display failure
		No	Next step
3	Connect the air condition switch and the adaptor between ECU and wires. Check if there are input signals on the ECU pins, No.50 and No.58 (Air Condition Switch).	Yes	Next step
		No	Check wires
4	If this vehicle adopts low level control, check if the air condition is working still even though it is turned off.	ÊÇ	Replace lamp or repair wires
		No	Next step
5	Check if there is low level output at ECU pin No.68 (connect to the ground of air condition drive coil).	Yes	Repair air condition relay and wires
		No	Replace ECU

7 PRECAUTIONS FOR EFI SYSTEM MAINTENANCE

7-1 PRECAUTIONS FOR EFI SYSTEM DIAGNOSIS AND MAINTENANCE

(1) Requirements for controller-removing

Controllers shall be removed before welding or paint-baking;

Set ignition switch to OFF when controller is being removed for fear of damage;

Power supply wires shall not be removed from battery when engine is in operation or electric system is in use;

It is not allowed to start engine in large current of battery charger;

Notice: Do not let the ambient temperature of controllers beyond 80 ℃.

(3) Requirements for cleanness : the following rules should be observed for any operation on oil-supply system and oil-injection system:

Parts removed shall be placed in clean place and well covered. It is not allowed to use cloth liable to fiber-dropping;

(2) All kinds of wiring harnesses and wire harness of fault diagnostic tester are not allowed to be plugged in or pulled out when ignition switch is ON;

When grounding measuring is done to electronic control system, make sure that wires are in right connection;

Disassembly of power-supply wires from battery or pulling out connectors of wires of controllers may cause loss of stored data of diagnosis and self-tuning.

(2) Precautions for maintenance of oil-supply system

Disassembly or installation of oil pump inside the tank full of oil or partly full of oil, notice:

Any device for hold leaking gasoline shall be installed near the opening of oil tank in advance;

Thoroughly clean the connecting part and area around it before loosing the connecting part;

Dishcloth shall be placed around the connecting part for fear of oil-spraying;

Removed parts which are not maintained immediately should be carefully covered or closed;

Fittings are not taken out from package until installation, it is not allowed to use fittings without package;

You should be careful not to damage the O-type ring when installing the injector. A small quantity of lubricant should be spread for easy installation;

After system is opened, try not to use compressed air or move vehicle.

7-2 SAFETY MEASUREMENT

For fear of any injury to personnel or damage to the fuel injection and ignition devices, note:

(1) Ignition wires are not allowed to be pulled out or contacted when engine is in normal operating or startup;

If engine doesn't start but is dragged by starter motor, for example when pressure of compression is inspected, its wire plug should be pulled out from Hall sensor (distributor).

8 CHECK OF SERVICE TOOLS

Tool name:

Ignition Timing Lamp

Function:

Inspect engine ignition timing etc.



Tool name:

Digital multimeter

Function:

Inspect the character parameter of voltage, current, resistance.



Tool name:

Fuel pressure gauge

Function:

Inspect the pressure in fuel system, judge the operating mode of fuel pump and fuel pressure regulator.





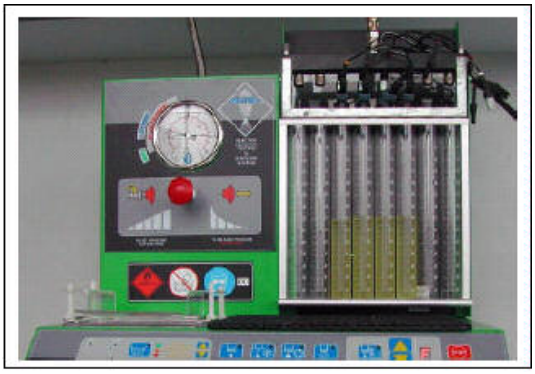
Tool name:

EFI diagnostic tester

Function:

Read/ clean EFI DTC

Observe date flow and test the part operation



Tool name:

Fuel injector cleaner and analyzer

Function:

Clean and analyze fuel injector.



Tool name:

Vacuum gauge

Function:

Check the pressure condition of air intake pipe



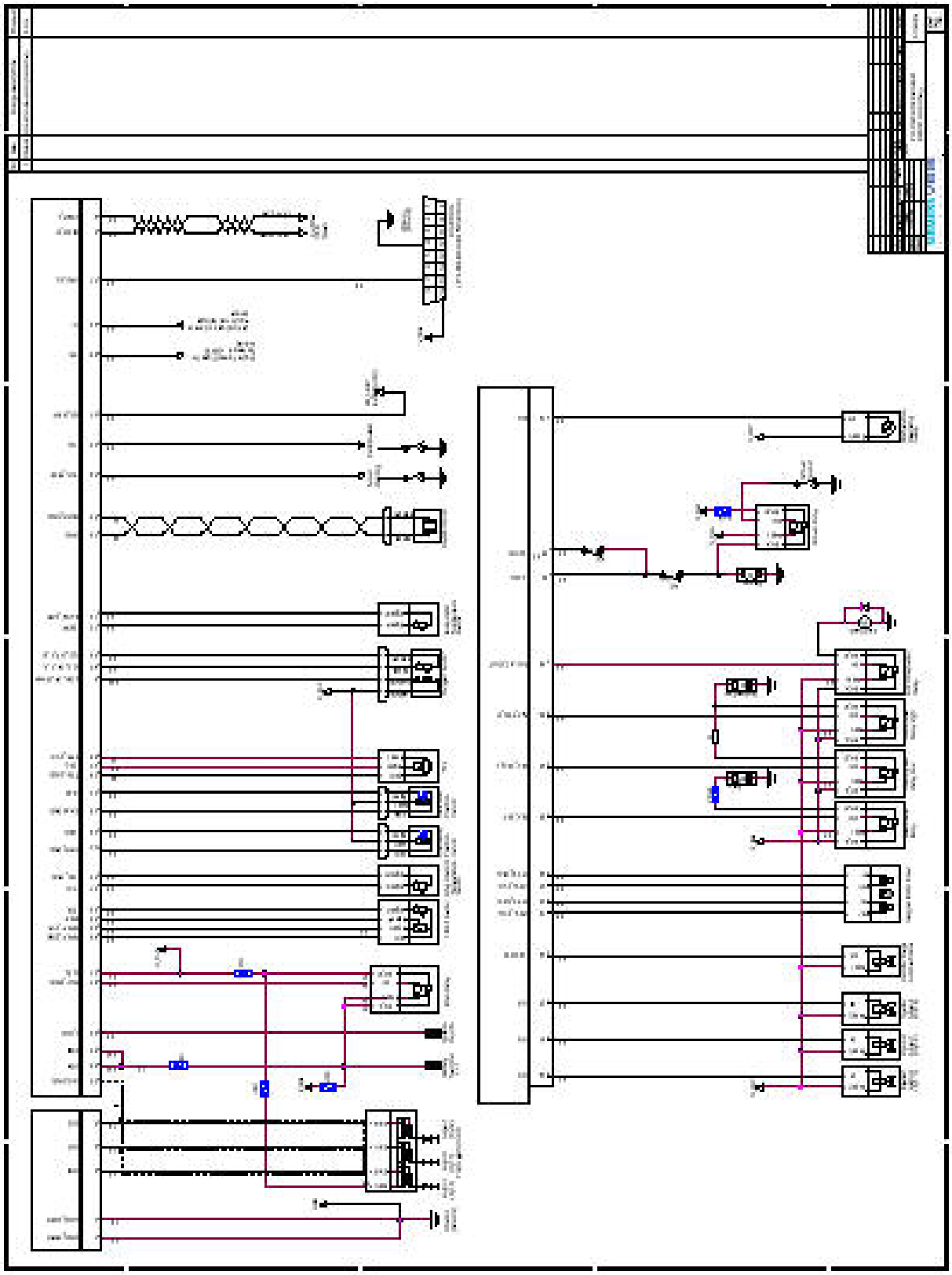
Tool name:

Pressure gauge for cylinder

Function:

Check the pressure condition of cylinders

SYSTEM FUNCTIONAL DIAGRAM



TECHNICAL BULLETIN

Vehicle Model:	***No:*** TB- A0037
Chery QQ 1.1L	***Date:*** July 26, 2006
	Section: ENGINE

Title:

QQ (1.1L) Ignition Timing Adjustment

Affected range:

Chery QQ 1.1L

Description:

According to investigation, we found that a great number of Chery Service Stations do not know how to adjust ignition advance angle of QQ (1.1L), and they have been adjusted the distributor and read the ignition advance angle by diagnose simultaneously, which is not a right way. The improper adjustment has caused some distributor to be changed falsely and vehicles' poor accelerating, air-conditioner incessant operation, high fuel-consumption and other troubles.

Please see attachment for QQ (1.1L) Ignition Timing Adjustment operational process.

Compiled by:	Checked by:	Approved by:
Tailai zhou	Tony Gu	Frank Ouyang

CHERY AUTOMOBILE

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Attachment

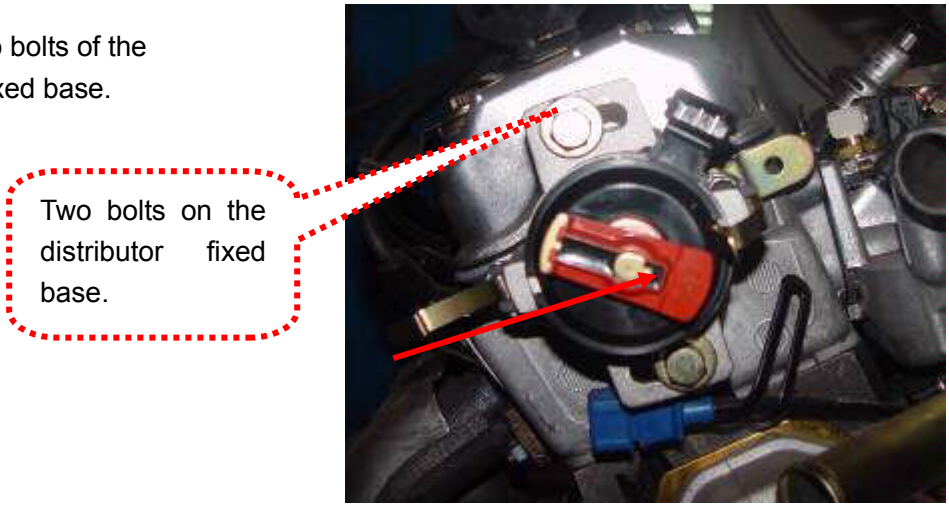
QQ (SQR7110) Ignition Timing Adjustment

1. Ground the red and green wire or purple wire of 3PIN connector that is under the battery.



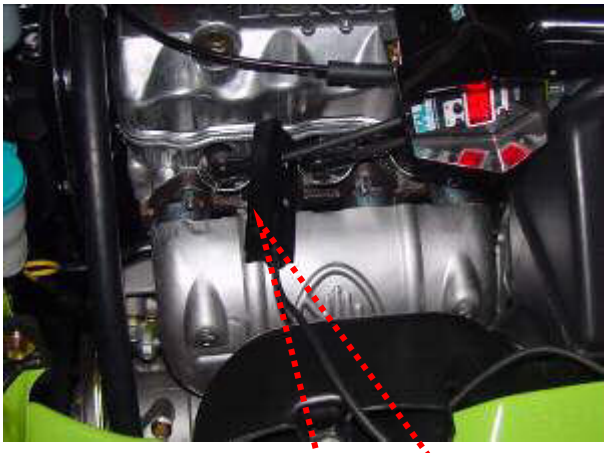
2. Use diagnostic equipment to check whether the ignition advance angle is 8 degree in the engine data flow. (If the first step succeeded, ignition advance angle should be locked at 8 degree)

3. Release two bolts of the distributor fixed base.



4. Install the distributor.

5. Connect the timing gun, then use high voltage clamp to clip the first cylinder high voltage wire.



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6.Starting the engine (wait water temperature going up to normal working level without turning on the air-conditioner) and turn the distributor fixed base at the same time check the ignition advance angle until adjusted to the standard value (6.75 degree).



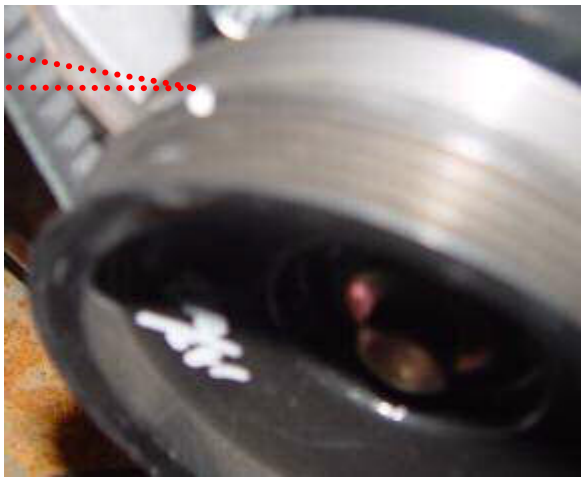
The dial on the cylinder block.

There are two kinds of ignition timing guns in market:

- One type of ignition timing gun can set the ignition advance angle. If making adjustment by it, please set the ignition advance angle to 6.75 degree, as the pulley scale mark aligns with the 0 degree of the cylinder block dial scale, the ignition advance angle is already set at 6.75 degree.
- Another type ignition timing gun can not set the ignition advance angle. If making adjustment by it, as the pulley scale mark aligns with the 6.75 degree of the cylinder block dial scale, the ignition advance angle is already set at 6.75 degree. (only 7 degree scale line on the cylinder block dial scale)

Please follow the process as per above after Service Stations change distributor or when vehicles have poor accelerating, air-conditioner incessant operation and other troubles.

Scale mark on the pulley



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Explanation

1,This manual book is applicable to the usage and maintenance of the gearboxes of model DABS10-4 and DABS10-8 manufactured by our factory.

2,The DABS10-4,DABS10-8 front-wheel-drive transaxles, with fine functions, advanced structures, made with high precise, compared with the current local products, it is in the leading position.

3,《DABS10-4 Gearbox Usage & Maintenance Manual Book 》 is edited at the request of our customers. It describes in details each parts of the gearbox and the relations between every part of the gearbox, according to this manual, customers and technicians dismantle the gearbox for maintenance and repair by themselves.

4,In process of maintain and use, please inform us of the existing problems of DABS10-4 gearbox and the existing problems in the manual book and forward your written improvement opinions to us at any time, we would like to express our sincere gratitude.

Chapter 1 The Clutch

Section 1 Summarization

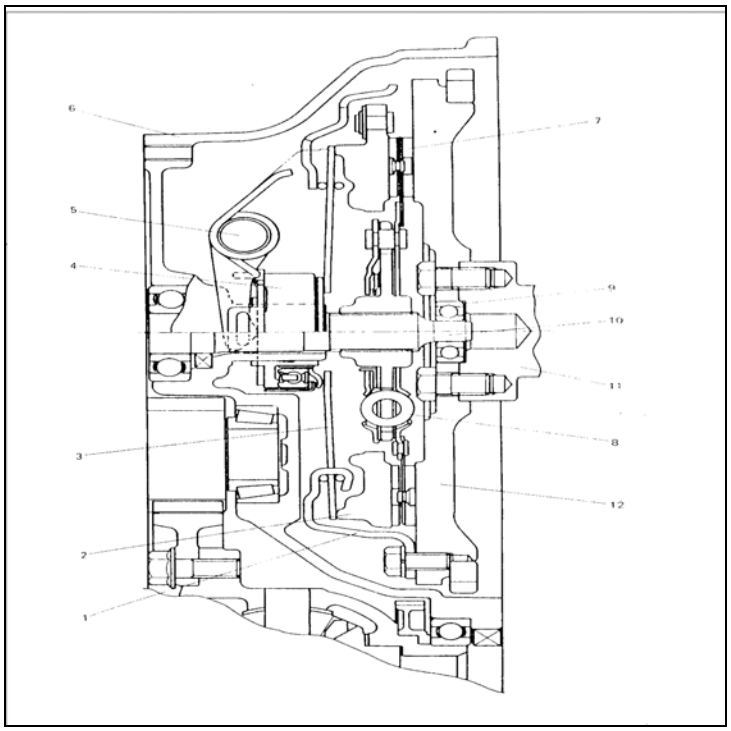
The clutch used in this car is dry type, a diaphragm spring disc spring, often press type clutch.

The clutch disc assembly is consist of six pieces of absorber springs, and is fixed on the input axle of the transmission through splined hub.

The clutch platen assembly is fixed on the flywheel, the fixing state of diaphragm spring is in this mode: when the Release bearing draws back, the edges of diaphragm spring is beginning to drive the platen against the flywheel。 This is the clutch jointing state.

Step on the clutch pedal to move release bearing forward, diaphragm spring. At this time, diaphragm spring pulls the platen and comes away from the flywheel, thereby disconnect driving from the flywheel via to input shaft.

For the vehicles with three-way catalyst, the clutch switch is located on the upper position of the clutch pedal.



1,Pressure plate assembly 2,Pressure plate 3,Diaphragm spring 4,Release bearing 5,Release fork 6,Clutch housing 7,Clutch disc 8,Cushion or damper spring 9, Input shaft 10.Input shaft 11.Crankshaft 12.Flywheel

Section 2 Fault Diagnosis

Fault Phenomenon	Reasons	Solution
The Clutch Skids	The free journey (free moving clearance) of the clutch pedal is unavailable. The clutch disc has been frayed or has greasy dirt. The surface of clutch disc pressure plate flywheel has been distorted. Diaphragm spring has become weaker. Clutch cable has rusted.	Adjust the pedal free play Replace the clutch disc, Pressure plate or flywheel. Replace the clutch cable.
The clutch does not come away completely.	The free journey (free moving clearance) of the clutch pedal is unavailable. Diaphragm spring has become weaker。 Input shaft splined hub has been frayed. The clutch disc swings excessively. The clutch disc has been damaged or has greasy dirt.	Adjust the free journey Replace the pressure plate assembly。 Lubricate Replace the input shaft Replace the clutch disc.
The clutch vibrate	The clutch disc has been frayed as clean as whistle. The clutch disc have greasy dirt 。 The Release bearing glides badly on the Spacer. The clutch disc shakes or the clutch disc contacts badly. The clutch disc Cushion or damper spring has become weaker. The clutch disc rivet has become loose. The Pressure plate was damaged or bolt has become loose.	Repair or replace the clutch disc Replace the clutch disc Lubricate. Replace the clutch disc Replace the clutch disc Replace pressure plate assembly or flywheel Tighten or replace gasket
The clutch contain noise	The release bearing has frayed or damaged. The input shaft front bearing was frayed. The clutch disc has unwonted noise. The clutch disc has cracks. The Pressure plate diaphragm spring have unwonted noise.	Replace the release bearing. Replace the input shaft bearing. Replace the clutch disc assembly. Replace the pressure plate assembly.
The clutch can't take off	The clutch disc was dipped by oil liquid. The clutch disc was frayed badly. The rivet comes out. The cushion or damper spring has become weaker.	Replace the clutch disc assembly

Section 3 Maintenance on car

Ⅰ.Maintenance

(1) The Clutch Pedal Height

According to the following regulations, use pedal bracket adjusting bolt to adjust the clutch pedal height. It is normal if the height of clutch pedal is higher 8mm(0.3in)than the height of brake pedal..

(2) The free play of the clutch pedal.

Step on the clutch pedal till you feel the resistance, stop stepping and mensurate the distance clutch pedal free play. The free play must be within the following stated ranges.

If the free play is wrong, please adjust the clutch cable free play according to the diagram below.

While checking clutch pedal free play, be sure to check if the working state of the clutch is normal under the circumstance that the engine is running.

(3) Clutch Switch

Attention:

This switch is applicable to the vehicles with catalyst.

Adjust:

1. Pull the parking brake handle, push the shift lever to the neutral positon.
2.Take apart the connect beside the pedal Bracket.
3.Loosen the lock nut.
4. Adjust the installation position of the gearing position of clutch pedal, the clearance between switch connect and clutch bracket is the size A, then tighten the lock nut.
5. Connect.

The clutch switch lock nut adjustment torque	N.m	Kg-m	1b-ft
	10-15	1.0-1.5	7.5-10.5

（4）Clutch Cable

Unload:

Dismantle the clutch cable connect nut , and move off connection lock on the inner cable.

Take apart two bolts from the front wainscot, cable top from the table, at last take out the cable.

Check:

Check the clutch cable, if appears one of the following status, replace the cable.

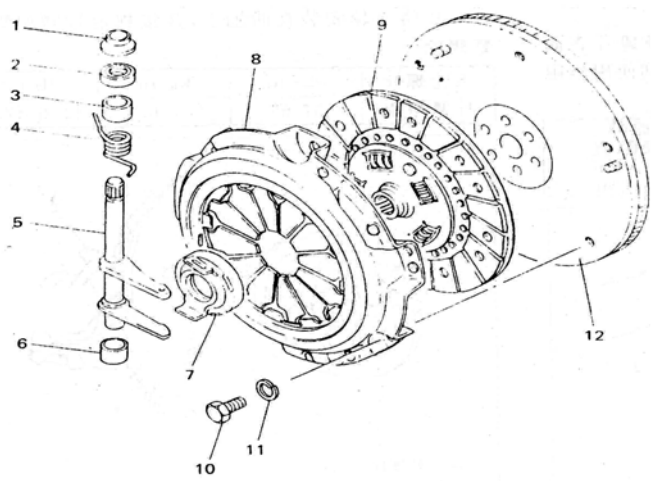
The cable is abraded badly.
The cable is abraded
The cable is bended or knotted.
The boot is broken.
The top is frayed.
Fixing the clutch cable.
Fixing:
Before fixing cable, lubricants must be laid on the cable top and the connector.
In the cab, use screwdriver or a pair of pliers to pull the cable and hang it on the pedal, then connection inner cable and release shaft..

Spray waterproof sealed adhesive on the fixing surface of cable and fix the cable on the front wainscot with two bolts. Switch lock nut Torque	N.m	Kg-m	1b-ft
	4-7	0.4-0.7	3.0-5.0

Tighten connect nut, turn the connect nut to adjust free play specification of the cable. Check if the working state of clutch is normal while the engine is running.

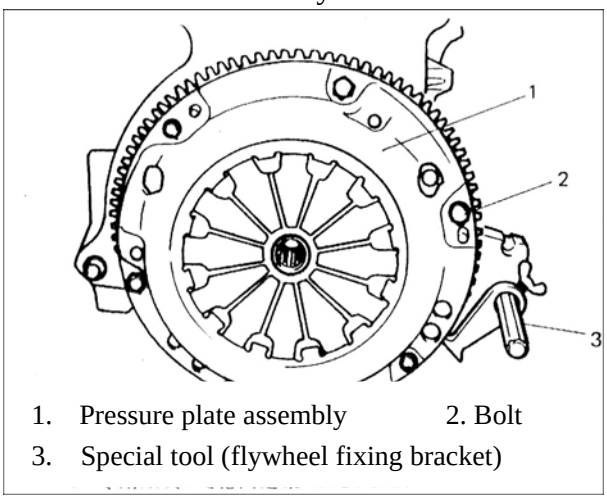
Section 4 Disassembling Repair

Disassembling the pressure plate assembly, clutch disc assembly and flywheel.



1,Release fork cover
2,Release fork seal
3,Spacer NO.2
4,Return spring
5,Release fork
6,Spacer NO.1
7,Release fork bearing
8,Pressure plate assembly
9,Clutch disc assembly
10,Pressure plate assembly bolt
11,Gasket spring
12,Flywheel

1.Fix the flywheel with special tool, take apart the bolt of the pressure plate assembly, Pressure plate assembly and clutch disc assembly.



1. Pressure plate assembly 2. Bolt
3. Special tool (flywheel fixing bracket)

Disassembling Pressure plate assembly.

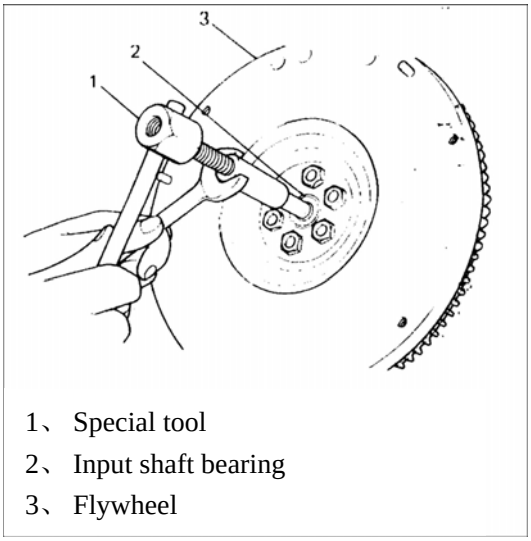
2.Pull up the input shaft input shaft bearing with special tools.

Check the input shaft bearing.

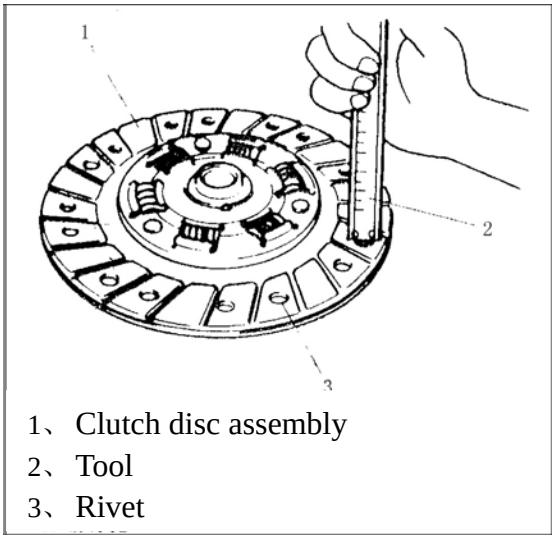
Check if the input shaft bearing runs smoothly. If appears abnormity, please replace the bearing.

Clutch disc assembly.

Measure the depressed depth (it is the distance between rivet and the surface of disc of rivet. In any hole, if the depth reaches the usage limit, please replace the clutch disc assembly.



1、 Special tool
2、 Input shaft bearing
3、 Flywheel



1、 Clutch disc assembly
2、 Tool
3、 Rivet

input shaft bearing Disassemble the input shaft	The Standard Value	Maintenance
Measure depressed depth of rivet	1. 5mm 0.06in	0.5mm 0.02in

Pressure plate assembly:

1.Check if the diaphragm spring has been frayed abnormally or damaged.

2.Check if the Pressure plate has been frayed or if there is overheat point on it.

3.If appears abnormal status, please replace the Pressure plate assembly.

The Pressure plate assembly is not allowed to be dissembled into diaphragm spring Pressure plate.

Flywheel:

Check if the flywheel surface has been frayed or if there is overheat point on it, if necessary please repair or replace.

Installation

Attention: Before assembling, check the flywheel surface and platens.

1. Whether surface is clean and dry

2.Install the flywheel on the crankshaft, fix the input shaft bearing on the flywheel.

Tighten the torque bolt Install the flywheel Flywheel bolt Tighten torque	N.m	Kg-m	1b-ft
	57-65	5.7-6.5	41.5-47.0

Install the input shaft bearing.

3.Aim the clutch disc assembly at the center of flywheel, fix the pressure plate assembly and bolt, tighten the bolt.

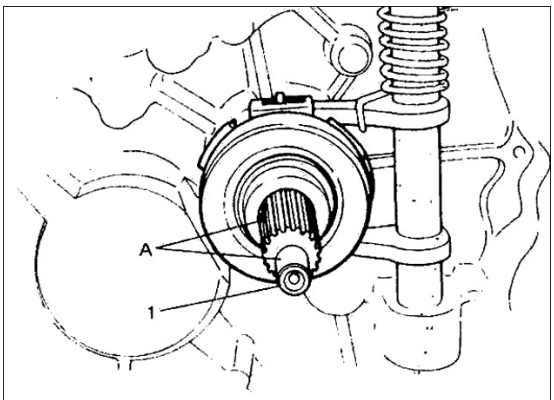
Attention:

Use hand and special tool to press the clutch disc assembly. Tighten the clutch pressure palte assembly bolt，according to diagonal ingravescence tighten clutch pressure plate assembly bolt。

Clutch pressure palte assembly bolt torque	N.m	Kg-m	1b-ft
	18-28	1.8-2.8	13.5-20.0

4.Apply a thin layer of lubricant on the input shaft , install the transaxle with engine.

Attention:



1. Input shaft
A: Baste

When installing the transmission input shaft in the clutch disc assembly, turn the crankshaft via flywheel till the Splined hub joggles.

Clutch Release shaft assembly

Disassembly:

Loosen the release shaft bolt, take apart the release shaft, turn the release fork，pull out release bearing, use pliers move of return spring，strike the spacer with professional tools，meanwhile push the release fork seal out.

1.Take apart the release fork spacer.

2.Take apart the release fork.

3.Screw M16 X tap into spacer NO.1 and leave the tap in spacer NO.1

4. Screw a connection hose with tap, and then connect the hose with the oil seal puller, strike the spacer NO.1.

Check:

1.Check if the clutch release bearing turns smoothly.

2.Check if the clutch release bearing is smooth. If necessary, please repair or replace the Clutch housing.

Attention: The release bearing cannot be cleaned , otherwise slide will be caused.

Installation:

1.Spread some grease on the inner sides of the new NO.1 Spacer.

After finishing installation of the return spring on the release fork, spread lubricant on the inner sides of the spacer NO.2, install the release fork.

2.Use the special tools to install the spacer NO.2.

3.Spread grease on the release fork seal, use special tools to install and keep the edges of the seal downwards.

4.Use rivet tool and Hammer, rivet the seal tightly on the position A.

5.Hang the return spring, spread lubricant on the side and the arm of the release fork, install the bearing. Spread lubricant on the splined hub, install the spacer NO.2 and seal .

Fix the release fork cover.

6. Fix the release shaft on the release fork, aim at the riveted mark and tighten the bolt .

7.Used 2 bolts fix up cable bracket, disassembly clutch cable bracket.

Pack the clutch separation arm

Lubricate the release fork assembly and the input shaft. Screw the torque tightly.	N.m	Kg-m	1b-ft
Release shaft bolt	10-16	10-1.6	7.5-11.5
Cable bracket bolt	18-28	1.8-2.8	13.5-20.0

Section 5 Recommended Torque.

Screw the torque tightly	N.m	Kg-m	1b-ft
1,Switch Lock nut	10-15	1.0-1.5	7.5-10.5
2,Clutch cable bolt	4-7	0.4-0.7	3.0-5.0
3,Flywheel bolt	57-65	5.7-6.5	41.5-47.0
4,The clutch cover stud bolt	18-28	1.8-2.8	13.5-20.0
5,Release shaft bolt	10-16	1.0-1.6	7.5-11.5
6,Cable bracket bolt	18-28	1.8-2.8	13.5-20.0

Section 6 Necessary Maintenance Materials

Material	**The SUZUKI product of the recommendation**	**Use the part**
The lithium lubricates the fat	The **SUZUKI** high class lubricates the fat A (99000-25010)	Pulling cable catch connecting pin. Release fork spacer and seal. Release bearing and release shaft.
	The **SUZUKI** high class lubricates the fat I (99000-25210)	Input shaft splined hub and forepart
Waterproof sealant	The **SUZUKI** seals completely the 366 Es (99000-31090)	Clutch cable and front clap board.

Chapter 2 Transaxle

Section 1 DABS10-4 Transaxle

I. A gearbox technique brief introduction of section 1

Main Functions And Technical Data	DABS10-4, DABS10-8 Transaxle	
A type	Machine gear type	
Gearshift	Compare speed	The gear number compare
1st	3.416	41/12
2nd	1.894	36/19
3rd	1.28	32/25
4th	0.914	32/35
5th	0.757	25/33
Reverse	3.818	42/35/11
The main ratio	4.389	79/18
Speedometer	0.944	17/18
Max input torque	72 N ·m	
Contour size	409×392×342.7（mm）	
Angle transaxle	5°	
Lubricant	18# hyperbolic gear oil（Q/SH006・1・27-89）	

II, Driven special

This transaxle, consist of three groups of synchronizer, input shaft and output shaft, is to realize the ahead shaft and reverse.

All the gear are gear, slip idler gear is for reverse.

The synchronizer is fixed on the output shaft, joggled with output shaft, the 1st gear and the 2nd gear; the synchronizer is fixed on the input shaft, joggled with the 3 rd, 4th gear.

The 5th synchronizer on the input shaft is joggled with the 5th gear fixed on the input shaft, thereby dive the transmission shaft and the wheels.

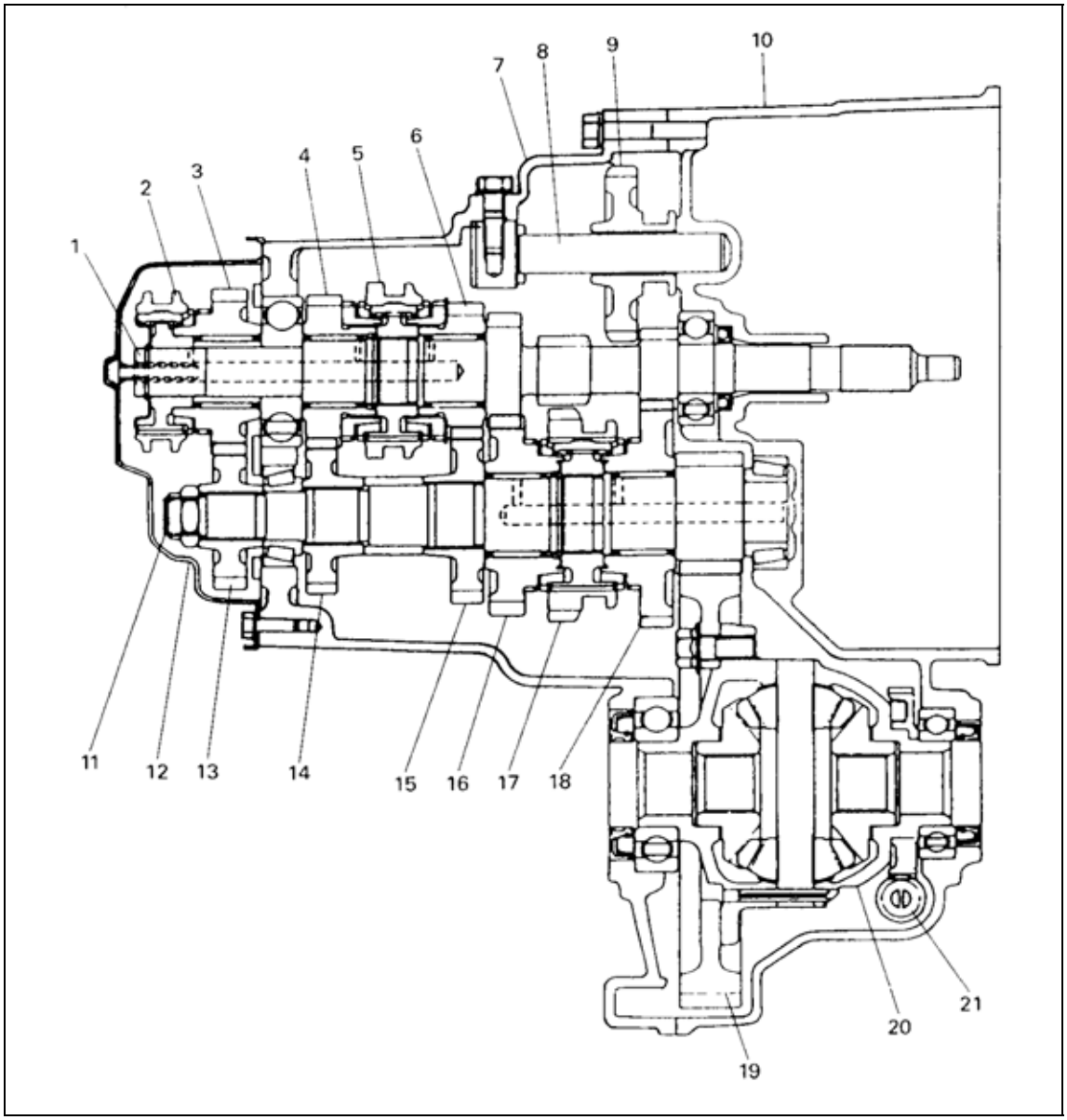


Fig.1-1 Transaxle

1- Input shaft 2- 5th Synchronizer assembly 3- 5th gear 4- 4th gear
5- Synchronizer assembly 6- 3rd gear 7- Transaxle case 8- Reverse gear shaft
9- Reverse gear 10-Clutch case 11- Output shaft 12-Transaxle behind case
13- 5th driven gear 14- 4th driven gear 15- 3rd driven gear 16- 2nd driven gear
17- Synchronizer assembly 18- 1st driven gear 19- Differential ring gear
20- Differential case 21- Speedometer driven gear

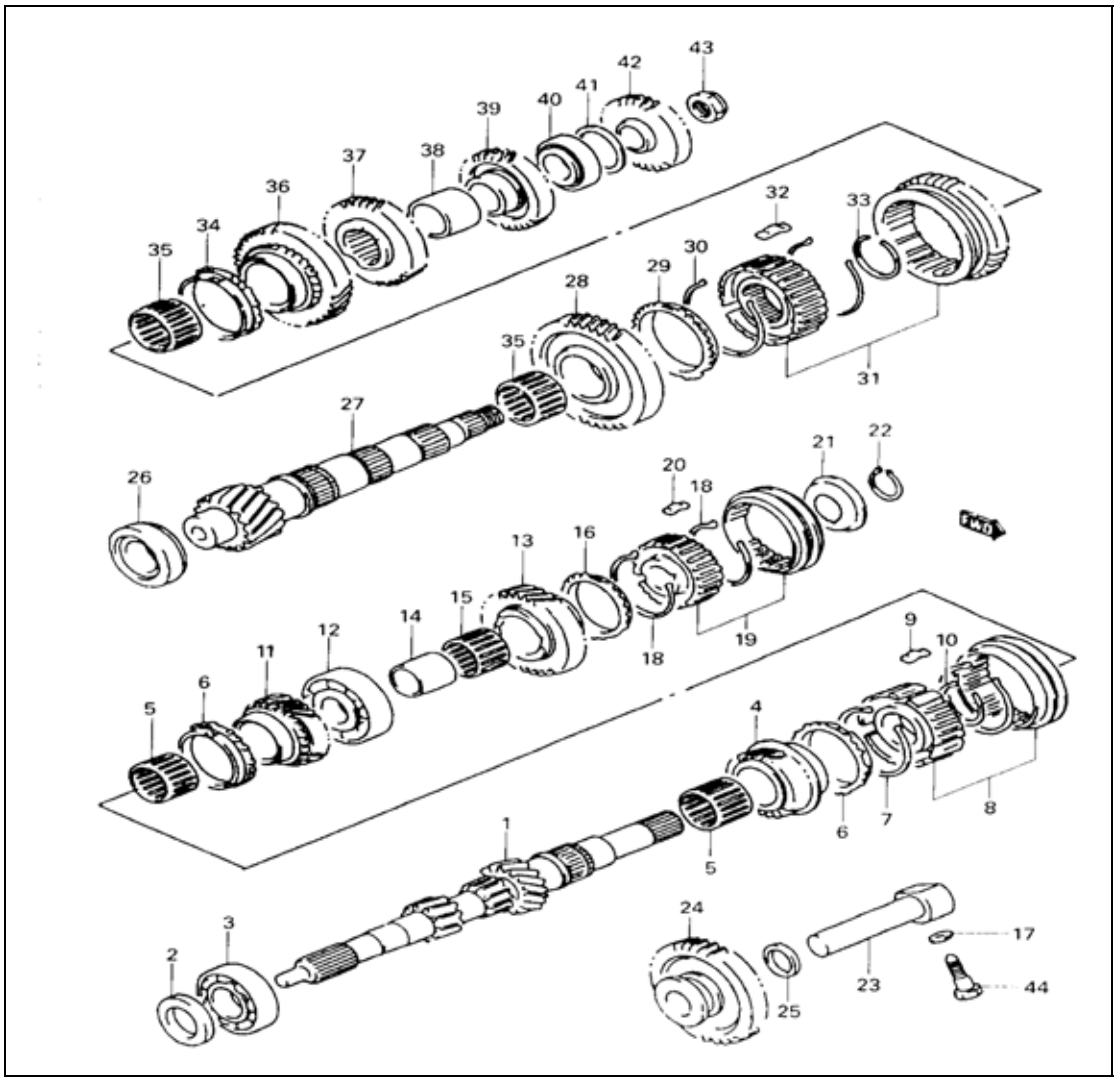


Fig.1-2 Transaxle drive system

1-Input shaft 2- Oil seal 3- Input shaft bearing 4- 3 rd gear 5-3rd, 4th needle roller bearing 6- Synchronizer ring 7- Snap ring 8- Synchronizer assembly 9- Synchronizer insert 10- Snap ring 11- 4th gear 12- Input shaft bearing 13- 5th gear 14- 5th Spacer 15- 5th needle roller bearing 16- 5th synchronizer ring 17-Gasket 18- 5th snap ring 19- 5th synchronizer assembly 20- 5th Synchronizer insert 21-Thrust washer 22-Snap ring 23- Reverse gear shaft 24- Reverse gear 25-gasket 26-Output shaft bearing 27- Output shaft 28- 1st driven gear 29- 1st synchronizer ring 30- Snap ring 31- Synchronizer assembly 32- Synchronizer insert 33- Snap ring 34- 2nd Synchronizer ring 35-1st, 2nd needle roller bearing 36- 2nd driven gear 37- 3 rd driven gear 38-3rd, 4th spacer 39- 4th driven gear 40-Output shaft bearing 41-Bearing adjust gasket 42- 5th driven gear 43- 5th gear Lock nut 44- Reverse output shaft bolt

III , Shift and select lever shaft control system

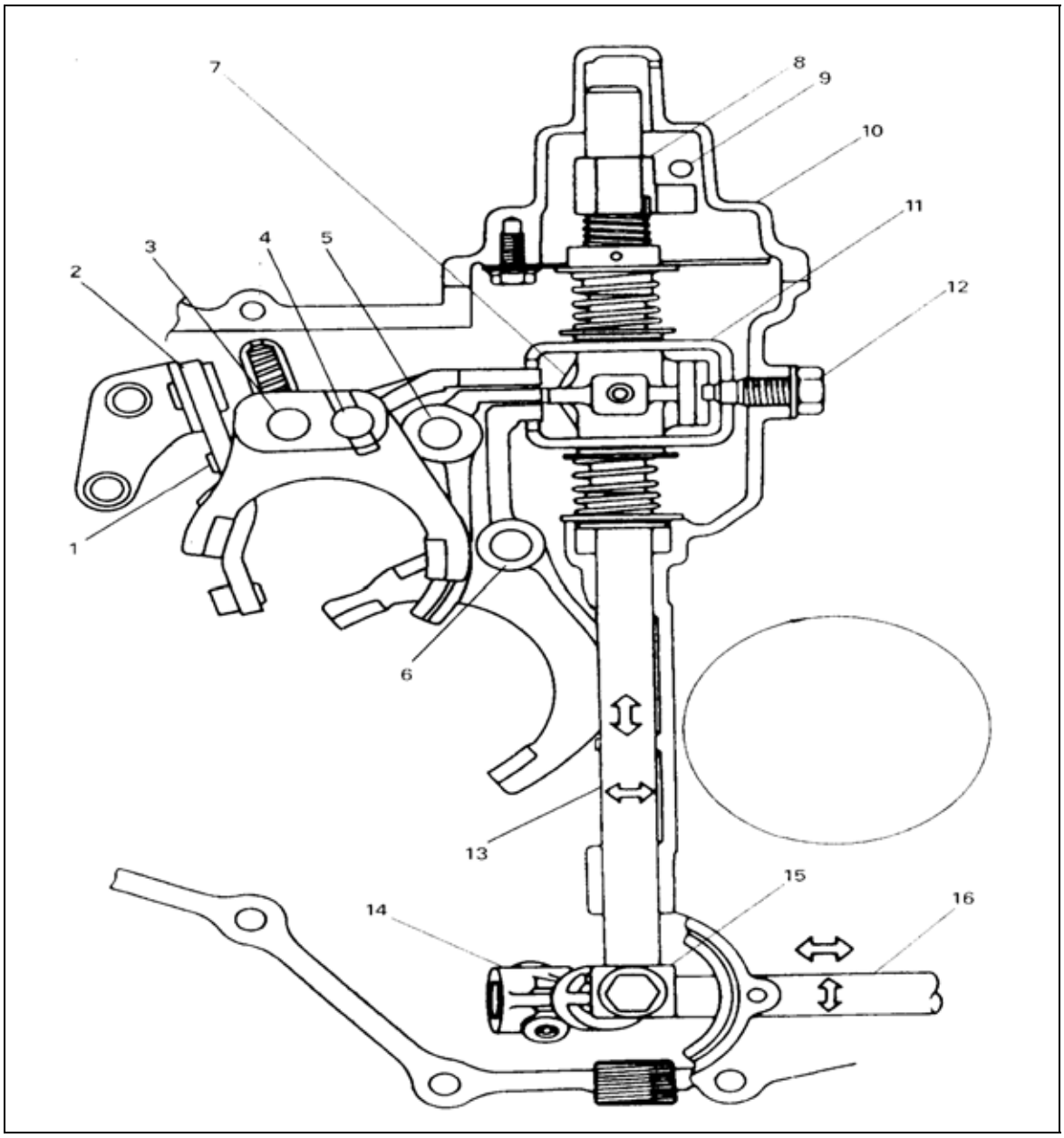


Fig.1-3

1- Reverse shift fork 2- Reverse shift fork assembly 3-Reverse, 5th shaft 4-Reverse, 5th shift fork shaft 5- 3rd, 4th shift fork shaft 6-1st, 2nd shift fork shaft 7- Select lever shaft 8-Reverse, 5th shift cam 9- Reverse, 5th Interlock roller 10-Case 11- Interlock bolt 12- Restrict bolt 13- Shift and select lever shaft 14- Shift lever 15- Shift head 16- Shift lever

The turning of the shift lever drives the shift and select lever shaft move up and down, and the select lever shaft also moves up and down, this is for select shaft. The forward and backward movement of shift lever drives the shift and select lever shaft turning, and with the movement, the select lever shaft also turns, the select lever shaft push on the shift and select lever shaft drives the shift head, thereby the shift fork drives synchronizer ring and reach the expected joggled state.

Under the circumstance of the neutral, spring on the shift and select lever shaft keep the shift and select lever shaft stay on the neutral. The interlock in the state of release state prevents from gear when shift.

VI. Reverse 5th Shift Cam

The reverse, 5th shift cam, 5th Interlock bolt and 5th return spring are used to prevent that shift lever shifts from 5th to reverse directly.

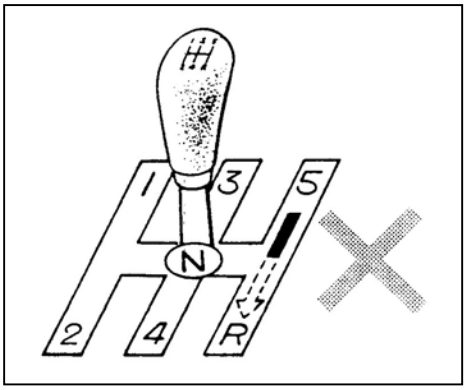


fig. 1-4 reverse,5th **shift cam**

Operation:

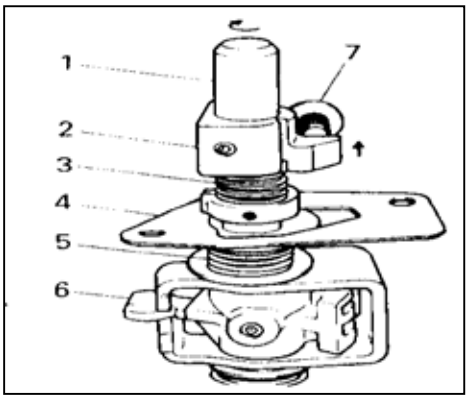


Fig.1-5

1,When gear shift 5th,the reverse, 5th shift cam turns clockwise with the shift and select lever shaft, under the effect of the shift cam return spring, the cam contacts reverse,5th Interlock bolt and

prevent reverse.

1- Shift and select lever shaft
2-Reverse,5th shift cam
3- Shift cam Return spring
4-Bracket
5-Reverse,5th Return spring
6-Select lever shaft (5th)
7-Reverse,5th restrict bolt

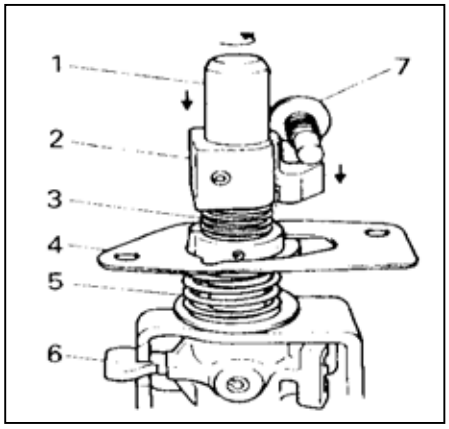


fig.1-6

2. It is allowed to shift from 5th to the middle position, but is not allowed to shift to reverse. However, when the shift and select lever shaft moves to neutral of 3rd, 4th, the shift restrict bolt cam cannot effect as the Figure 16.

3.shift select lever shaft to 5th or reverse， shift cam and bolt fixup.

1- Shift and select lever shaft
2-Reverse 5th shift cam
3- Shift cam Return spring
4-Reverse 5th return spring
5- Select lever shaft
6-Reverse 5th restrict bolt

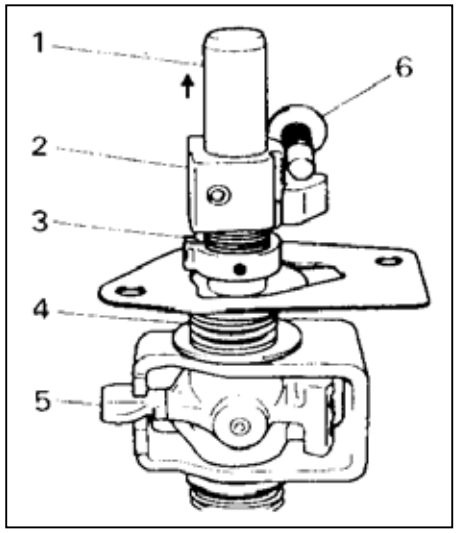


Fig.1-7

4.Shift to reverse do not connect shift cam.

1- Shift and select lever shaft
2-Reverse,5th shift cam
3-Shift cam Return spring
4-Reverse,5th Return spring
5- Select lever shaft
6-Reverse,5th restrict bolt

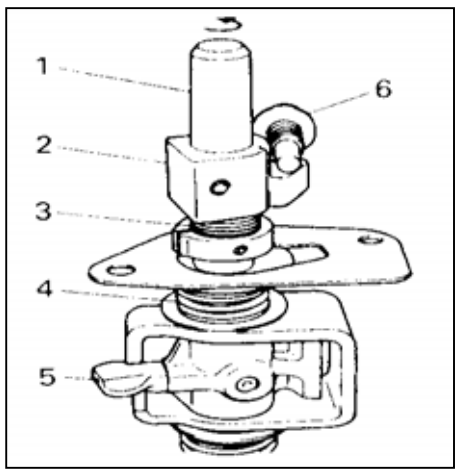


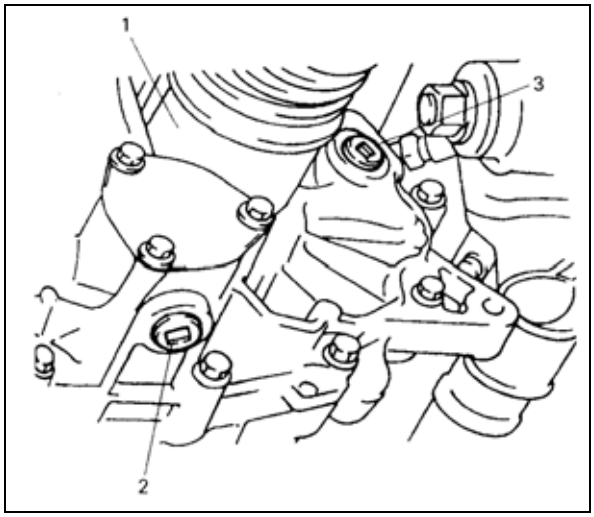
fig.1-8

5.Fault Diagnosis

Condition	Cause	Measure
Joggle is in version	● The shift fork shaft has been frayed. ● The shift fork and synchronizer ring have been frayed ● The spring has been destroyed. ● Input shaft/output shaft bearing have been frayed. ● The gear has been frayed.	Replace Replace Replace Replace the gear
Difficult to shift	● Lubricant is not enough. ● The clutch pedal free play is not correct ● The clutch disc has been broken ● The clutch pressure plate has been broken. ● The synchronizer has been frayed. ● The gear has been frayed. ● The gearshift lever has been frayed. ● The shift lever has bee broken.	Refill Adjust Replace Replace clutch cover assembly Replace the gear Replace Replace
Noise	● Lubricant is not enough ● The bearing has been frayed or broken. ● The gear has been frayed or broken ● The synchronizer has been frayed or broken.	Refill Replace Replace Replace

Section2 Transaxle Maintenance on Car

I. Exchange of Oil



1- Drive shaft
2- Drain plug
3- Filler plug

Fig.2-1

1.Before checking and changing the transaxle gear oil, be sure the engine has stopped and the vehicle stops on a plane surface.

2.Lift the vehicle, check the oil level and if there is any leakage.

3.Let out all the used transaxle oil, fill 2.1 L synthetic 18# gear oil (the oil level is equal with the foot of the filler plug).

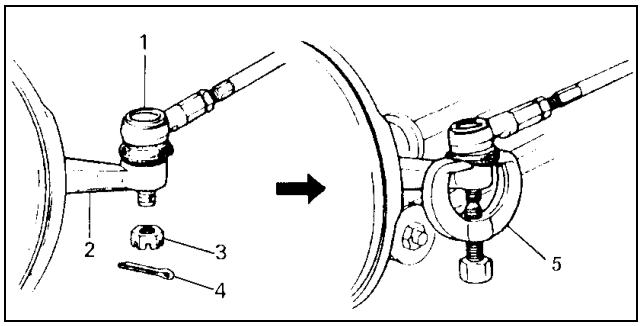
4.Before installation, spread oil on the whorl of the filler plug and drain plug.

Item	Torque
Filler plug	18~23N・m
Drain plug	18~23N・m

II. Differential oil seal

Replacement:

1. Lift the vehicle, let out all the used transaxle oil.
2. Remove the cotter pin and the lock cap at the end of tie rod.
3. Disjoin the steering and the end of tie rod.

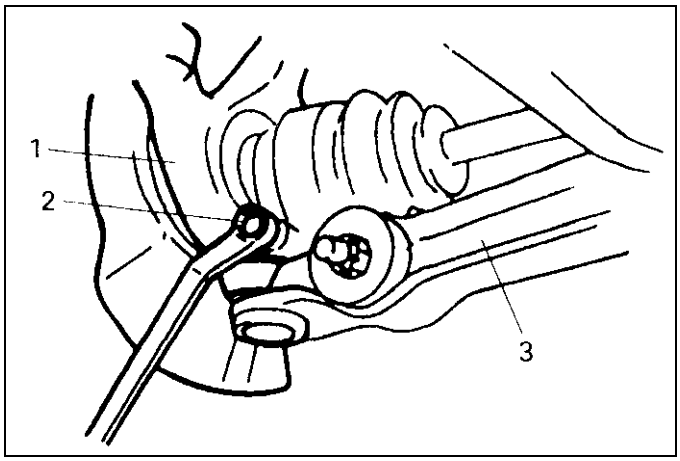


1-The end of Tie rod
2- Steering
3- Lock cap
4- Cotter pin
5-Special tool

Fig.2-2

4.Remove the two brackets.

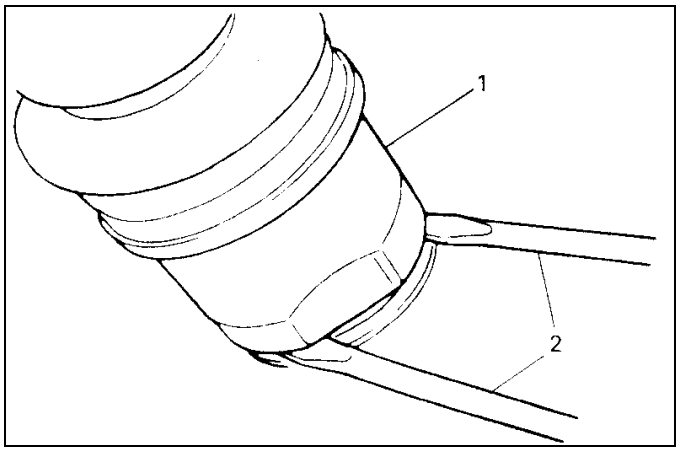
5.Remove Ball joint bolt and disjoin the Suspension arm from the steering.



1- Steering
2- Ball joint bolt
3- Suspension arm

Fig.2-3

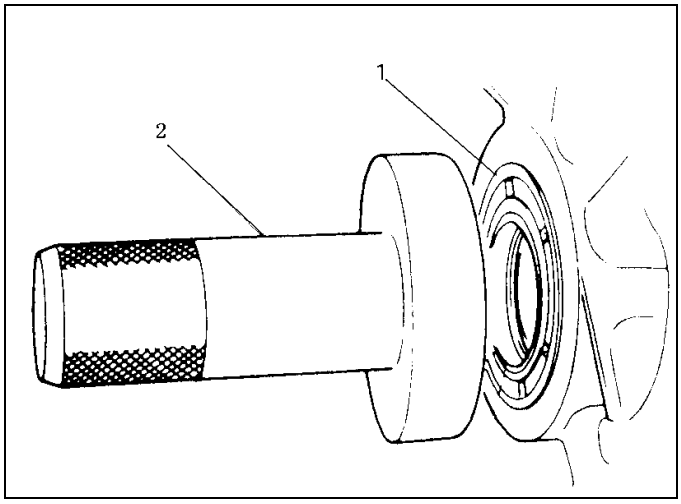
6. Insert a big screwdriver into the connection of the drive shaft to release the snap ring from the keyway of the differential.



1- Drive shaft
2-Screw driver

Fig.2-4

7. Remove the used differential oil seal , fix the new oil seal.



1- Differential oil seal

2- Special tool

Fig.2-5

8.Check if the surface of the oil seal is smooth and spread some lubricant on it.

9.Insert the drive shaft into the differential.

CAUTION

- Do not scratch the labium of the oil seal when installing the drive shaft.
- Be sure the drive shaft has reached the right position and the snap ring has been put into the snap ring slot.
- Do not hammer the boot of the drive shaft.

III. VEHICLE SPEED SENSOR

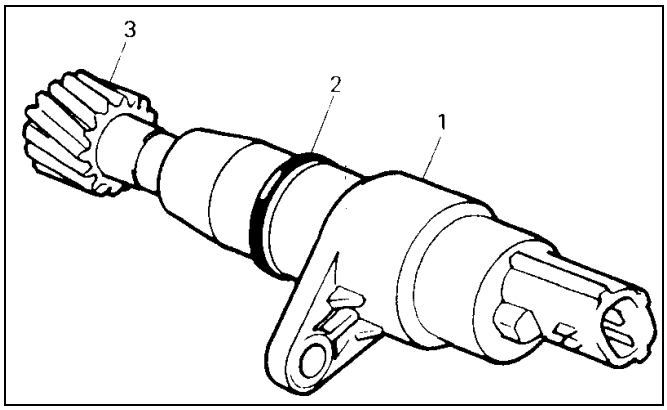
Dismantle:

1.Disconnect the cathode of the battery.

2.Draw back the speedometer cable Boot, pull out the Speedometer gear Snap ring, and then remove the speedometer cable from the gear, disconnect the sensor connector.

3. Remove the bolt, pull out the driven gear assembly with hands.

4.Use 2.8-3.0mm(0.11in) slotted spring pin disassembly tool to beat the slotted spring pin out, and then draw out the driven gear, remove the speed sensor.



1- Speedometer sensor

2- O-ring

3- Speed meter driven gear

Fig.2-7

5.Use the clamp to fix the plane part of the driven gear box, use professional tools bearing disassembly tool and puller slide hammer to remove the oil seal.

Installation:

1. Spread lubricant on the new oil seal, keep the spring downwards and put the oil seal into the box. Use valve guide bushing remover to install.

2. Check the driven gear has been abnormally frayed or distorted. After spreading lubricant on the driven gear put the fine driven gear into the driven gearbox.

3.Use wood to support driven gearbox, install the slotted spring pin, check if the gear turns smoothly.

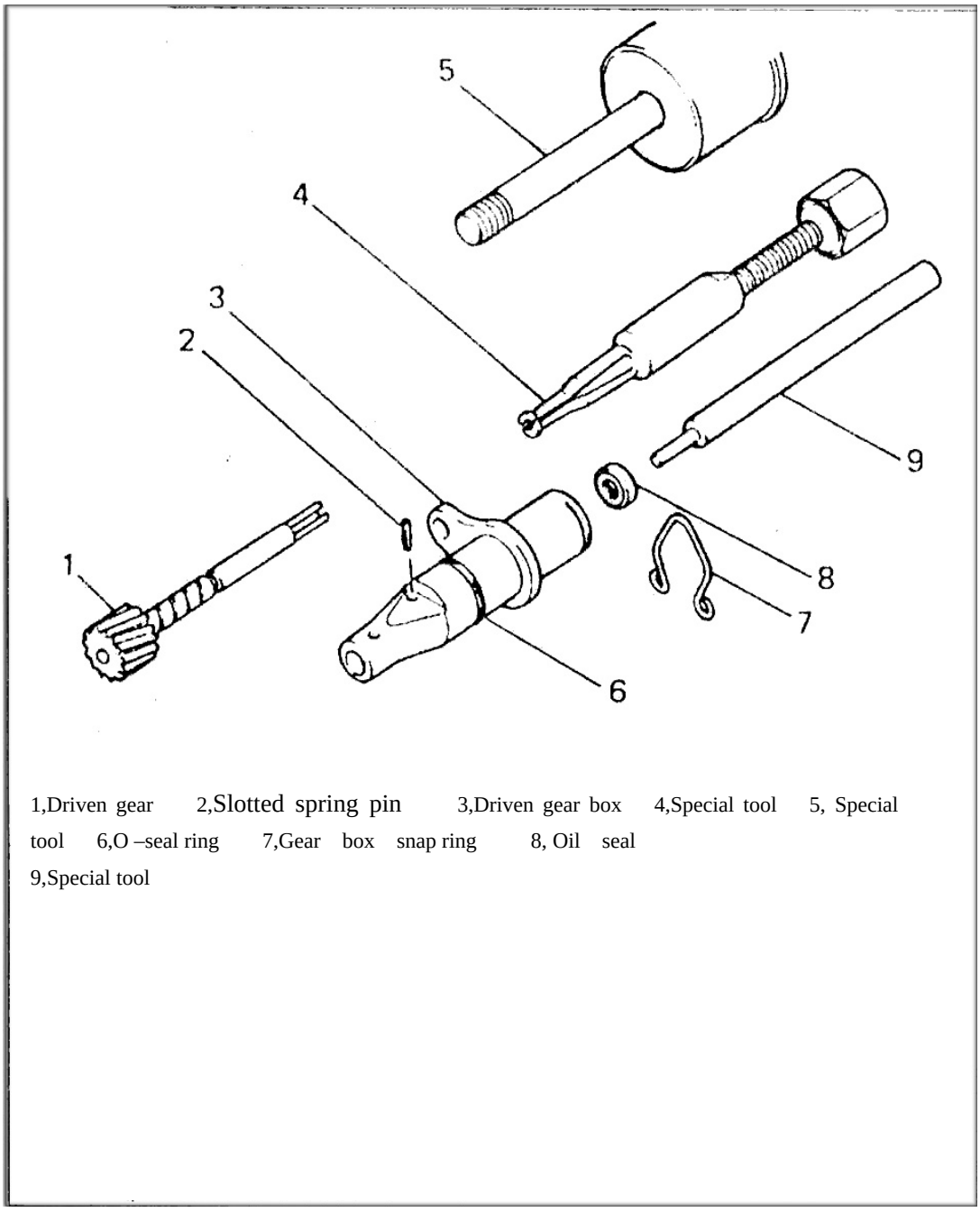
4. Check if there are some lacuna on the O-seal and gearbox. Spread some oil on the O-seal, and then install the driven gearbox assembly in the transaxle.

5. Connect the speedometer cable, put the gearbox Snap ring and boot on the original position.

CAUTION:

- Do not press the oil seal excessively, otherwise the oil seal will be distorted.
- Do not collide the driven gear and the driven gear box.
- When installing the driven gear box assembly into the Transaxle, use small screwdriver to turn the driven gear till the driven gear joggle.
- When installing the driven gear box into the transaxle, the gear box is now allowed to be collided.

Screw the gear ox	N·m	kg·m	1b—ft
bolt tightly.	4-7	0.4-0.7	3.0-5.0



1,Driven gear 2,Slotted spring pin 3,Driven gear box 4,Special tool 5, Special tool 6,O –seal ring 7,Gear box snap ring 8, Oil seal 9,Special tool

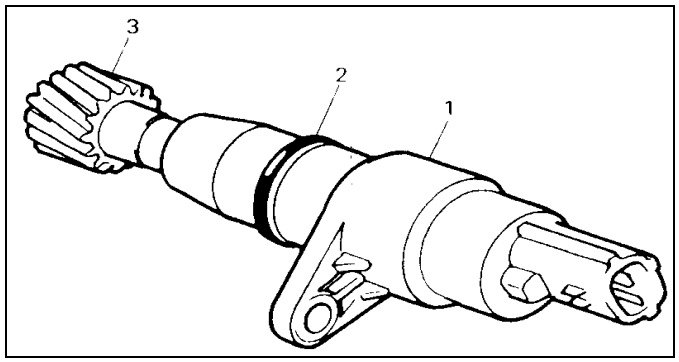
Fig.2-8

6. Check if the oil level is right.

Disassembly:

1. Disconnect the cathode of the battery.
2. Disconnect the speed sensor connect.

3. Remove the speed sensor



1-SPEED SENSOR

2- O--ring

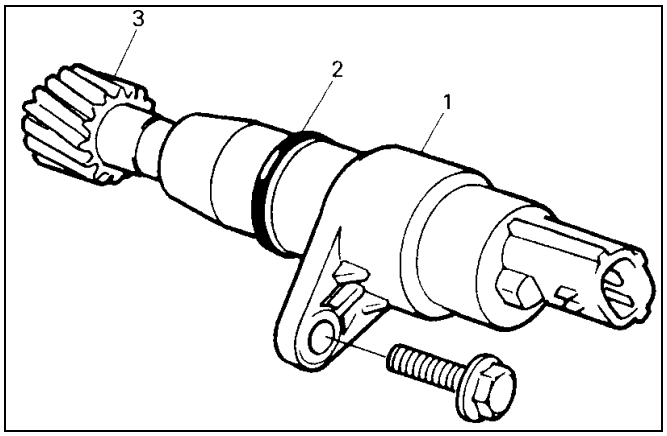
3-Speedometer driven gear

Fig.2-10

Installation:

1. Check if there is any crack and disfigurement on the surface of the o-ring and SPEED SENSOR case, spread lubricant on the o-ring and Speedometer driven gear, install them on the transaxle assembly.

Screw tightly the torque : 8--12N • m.



1- SPEED SENSOR

2- O-ring

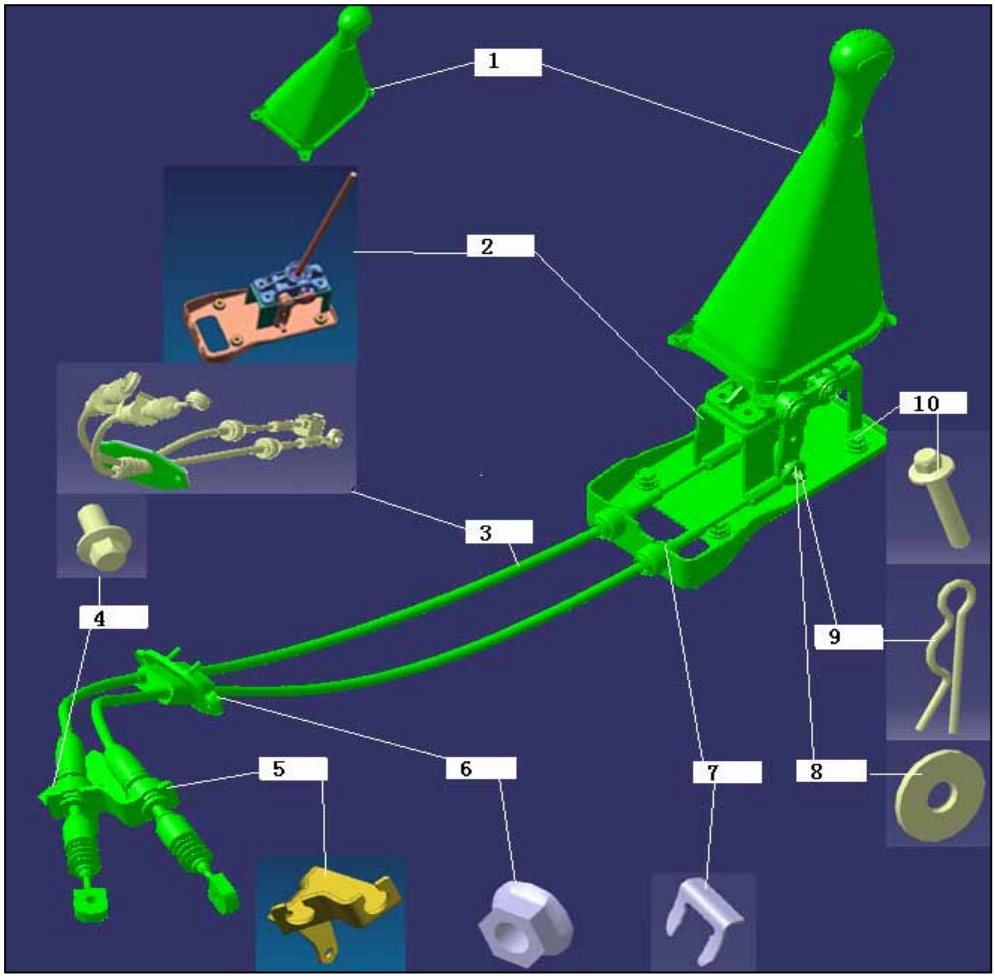
3- Speedometer driven gear

Fig.2-11

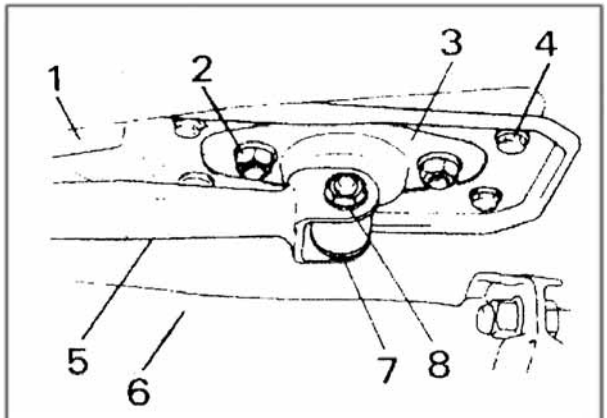
2.Connect the SPEED SENSOR connector.

3.Connect the cathode of the battery .

VI. Shift and select lever shaft control system



1.Shift handle assembly 2.Shift mechanism assembly 3.Shift cable assembly 4.Bolt 5.Bracket 6.Nut 7.Clip 8.Washer 9.Cotter pin 10.Bolt



1.Strengthen pole 2. Nut 3. Control shift lever retainer 4. Control shift lever retainer bolt 6.NO.1 exhaust pipe 5. Shift and select lever shaft 7. Shift lever 8. Shift and select lever shaft bolt and nut

Disassembly:

On the lift.

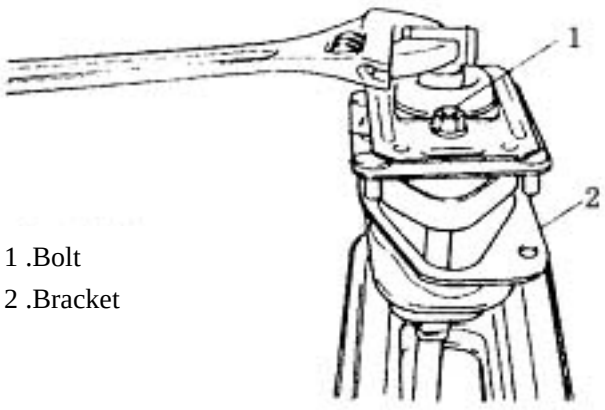
1． Remove the shift and select lever shaft bolt and nut, take apart the shift and select lever shaft from the shift lever.

2． Remove the 4 pieces of control shift lever retainer bolt. Demount the strengthen pole nut beside the transaxle, and move the strengthen pole aside.

In the cab.

1． Have shift lever shaft housing，disassembly 2 bolt from shift lever shaft housing.

2． Demount the 4 nuts on the shift lever assembly, push the shift lever into the floor hole and pull out the shift lever assembly from the floor.



1 .Bolt
2 .Bracket

On the workbench;

1． Use the clamp to fix the holder of the shift lever, demount the bolt, remove the shift lever.

2． Demount the 2 shift lever assembly nut, break down the shift lever .

Installation

1. According to the reverse demounting order, install the shift lever , if necessary, replace the used parts.

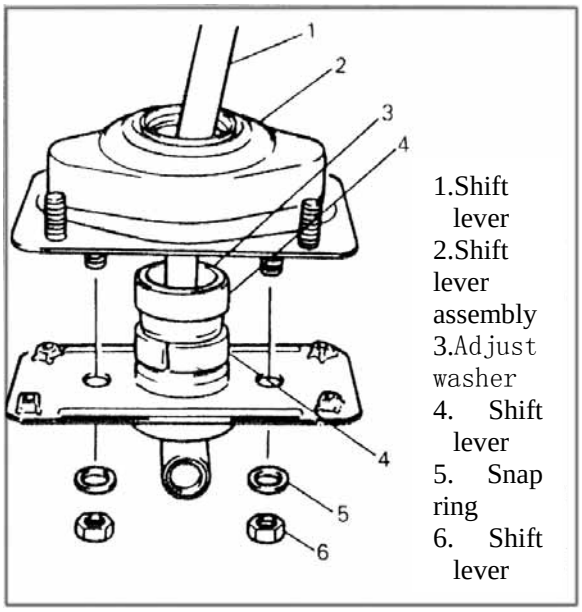
Notice:

After installation, please check if the shift lever works smoothly.

Shift lever vertical free play	0-0.2mm(0-0.007in)
Thickness of the optional adjust washer	0.8,1.0,1.2 and 1.4mm(0.03,0.04,0.05 and 0.06in)

2. Spread whorl glue, fix the handle on the shift lever ,check the handle level

3. Install shift lever assembly and the related parts on the original position. When fixing the position of the shift lever, first install the 4 pieces of control shift lever retainer bolt and 4 pieces of shift lever assembly nut, adjust the position of, screw the bolt and nut tightly.

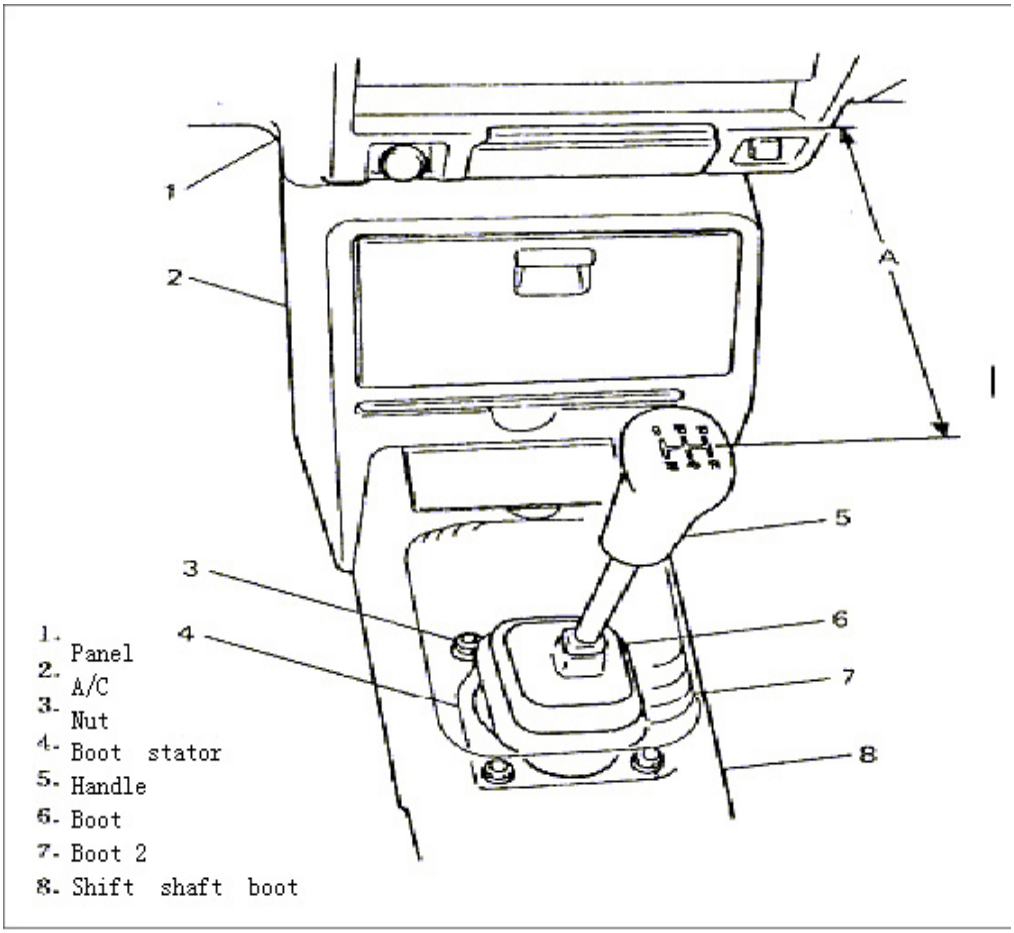


1.Shift lever
2.Shift lever assembly
3.Adjust washer
4. Shift lever
5. Snap ring
6. Shift lever

Notice:

- Do not spread lubricant on the strengthen pole spacer beside the transaxle.
- Spread lubricant on the shift and select lever shaft boot.
- Check if the boot has been installed correctly.

The position of the shift lever ： Distance from A	270mm



Section 3 Disassembly and installation of the transaxle

I Dismantle transaxle

Under the engine lid.

1. Disconnect the battery ground; remove the battery and the bracket.
2. Screw the clutch cable nut off, Remove the connector from the cable and dismantle the cable from the bracket.
3. Disconnect the wiring harness and connector.
4. Remove the speedometer cable boot, and dismantle the speedometer cable.
5. Remove the fixing transaxle bolt.
6. Remove the 2 starter bolt and starter, meanwhile disconnect the starter cable.
7. Disconnect the vacuum hose from the map.
8. Hang engine and bracket chain，keep engine calm.

Caution:

Put gasket under the chain in order to prevent the damage of the vehicle surface.

On the Lift:

1. Use 10mm special tool and spanner to let out the transaxle oil.

2. Screw off the shift and select lever shaft bolt and nut, remove the control from the shift shaft.

3. Screw off the strengthen pole nut, remove the strengthen pole and gasket.

4. Disconnect the exhaust pipe.

5. Meanwhile, remove the exhaust pipe nut。

6. Remove the clutch down clapboard.

7. Remove Ball joint bolt and nut from the Steering, then remove each Suspension arm.

8. Use big drive screw disassembly drive shaft snap ring from differential side.

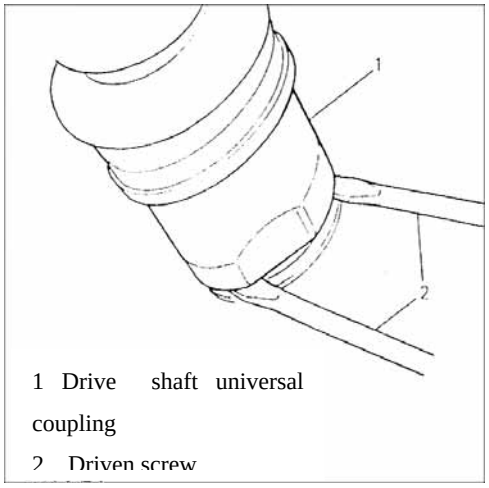
9. Screw the bolt and nut of the transaxle ,engine assembly.

10. Support the transaxle by transaxle jack.

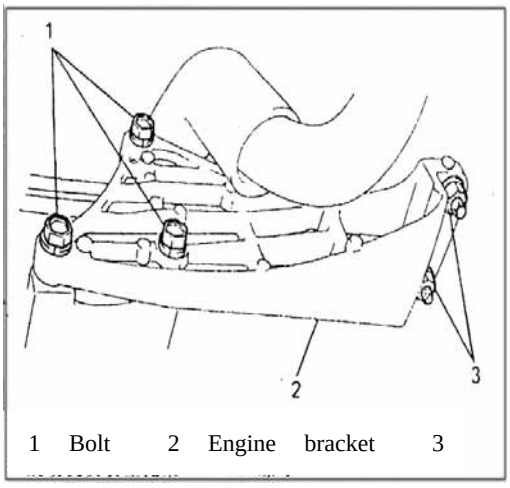
11. From engine retainer bracket，disassembly 2 blot。

12. First remove the 3 bolt and 2 nut, then remove the bracket.

13. Down the jack and the transaxle, disassembly the bolt between the engine and transaxle, separate input shaft and clutch disc, take the transaxle.



1 Drive shaft universal coupling
2 Driven screw



1 Bolt 2 Engine bracket 3

II, Install transaxle

The following Fig. Shows the fastened torque:

Torque	N·m	kg·m	1b·ft
• Transaxle, engine assembly bolt, nut。 • Engine nut • Engine bracket bolt • Exhaust pipe / nut • Exhaust pipe / muffler nut	40-60	4.0-6.0	29.0-43.0
Ball joint bolt nut	50-70	5.0-7.0	36.5-50.5
Strengthen pole nut	25-40	2.5-4.0	18.5-28.5
Shift and select lever shaft bolt , nut	15-20	1.5-2.0	11.0-14.5

• When lifting the transaxle, push drive shaft right universal coupling into differential.

• Push the drive shaft universal coupling to the right position, and joggle the Drive shaft and Differential.

Caution:

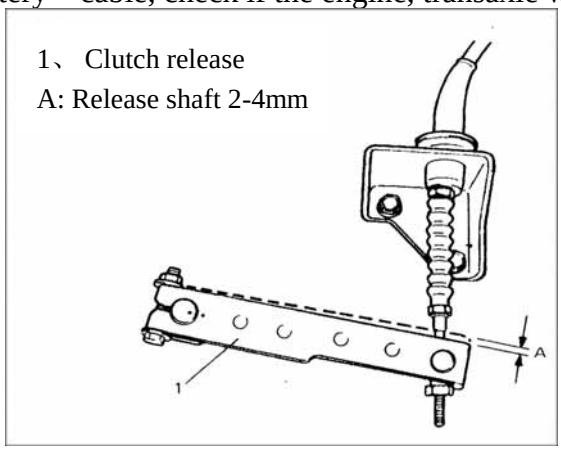
Spread lubricant on the shift and select lever shaft spacer, do not spread lubricant on the strengthen pole spacer.

Caution:

• When hang the transaxle，drive shaft, do not scrape oil seal.

• When put the drive shaft universal coupling on the differential gear, do not hammer the universal coupling.

- Clip wiring harness。
- After connecting the clutch cable, be sure to adjust the pedal free play .
- Fill oil in the transaxle .
- Connect the battery cable, check if the engine, transaxle work normally.

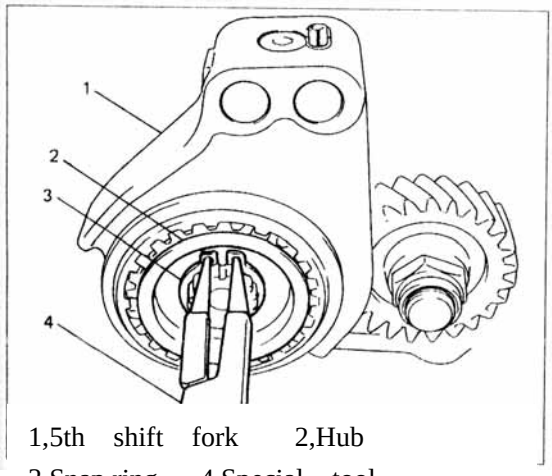


III, Transaxle disassemble

（1） 5th gear

1．Loosen 8 bolt, remove the transaxle left side case.

2．Remove snap ring use special tool.



1,5th shift fork 2,Hub

3,Snap ring 4,Special tool

Caution:

Do not distort the left side case.

3. Remove the 5th shift fork bolt and guide ball.

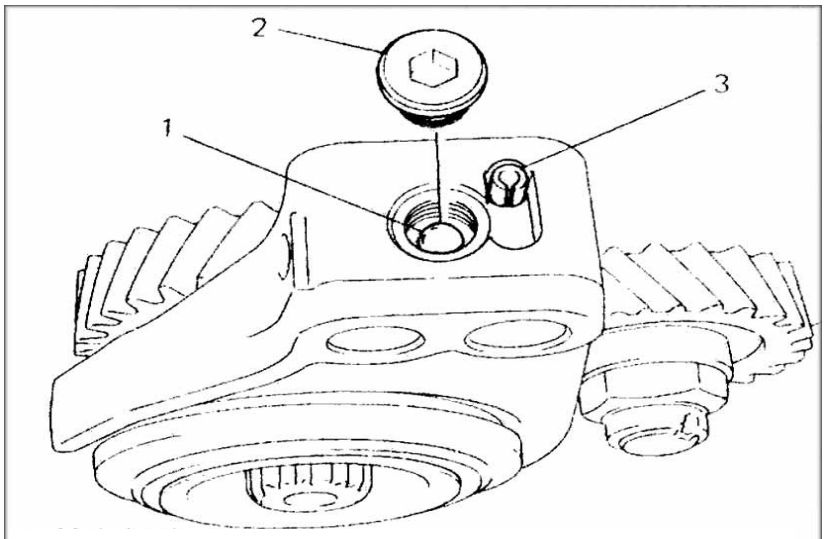
4. Hammer the slotted spring pin out.

Notice: It is much easier to magnetize the guide ball.

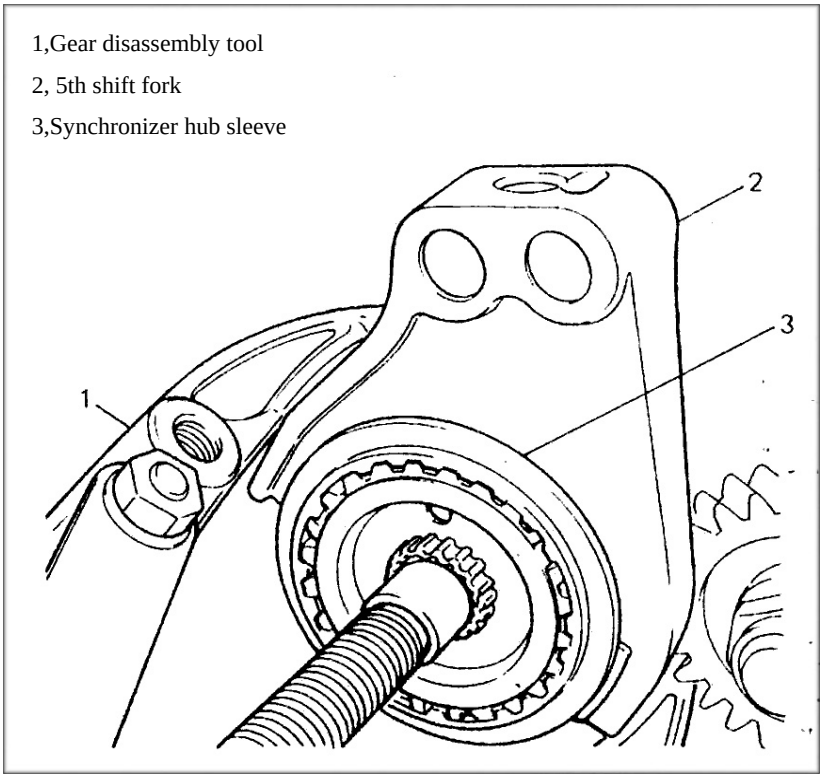
5. Remove the 5th shift fork, hub sleeve, synchronizer ring and 5th gear with professional tools。

Caution:

Be sure not to press the synchronizer ring spring tightly.



1, Guide ball
2, 5 th shift fork bolt
3,Slotted spring pin



Section 4 Maintenance of the transaxle

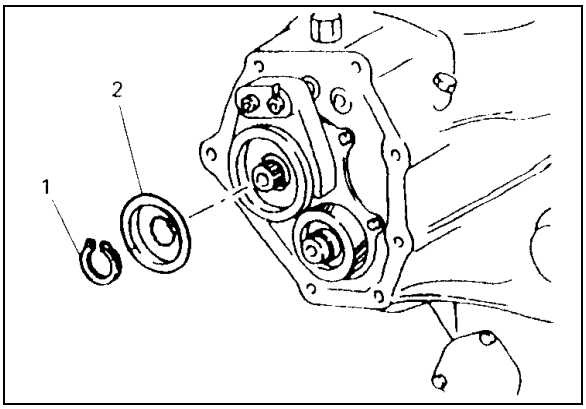
I, Disassemble

（1） 5th gear

1 Loosen 8 bolt , remove the rear gear box.

2 Remove the snap ring，thrust gasket.

Caution: do not distort the snap ring.



1- Snap ring

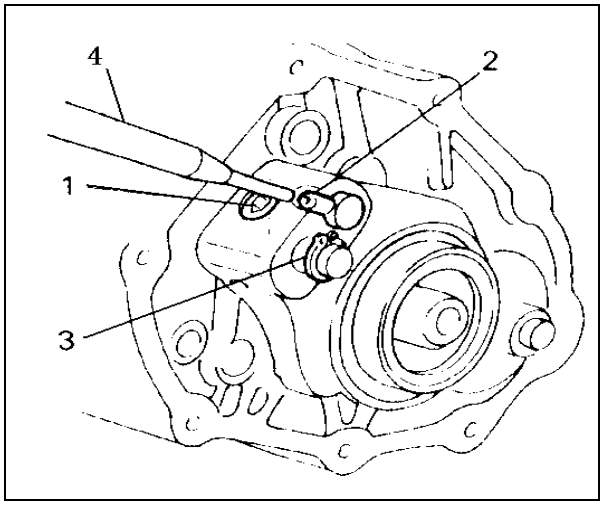
2-Thrust gasket

Fig.3-1

3 Remove the 5th shift fork bolt and placement.

It is much easier to magnetize the placement.

4 Remove the snap ring. and slotted spring pin.



1- 5th Shift fork bolt

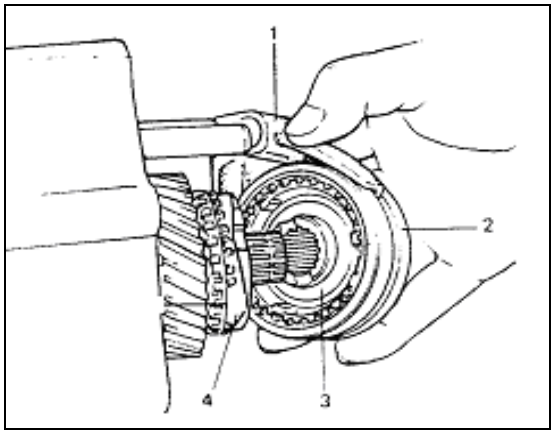
2- Slotted spring pin

3- Snap ring

4- Special tool

Fig.3-2

5 Remove the 5th Shift fork,5th synchronizer assembly, synchronizer ring.



1- 5th shift fork

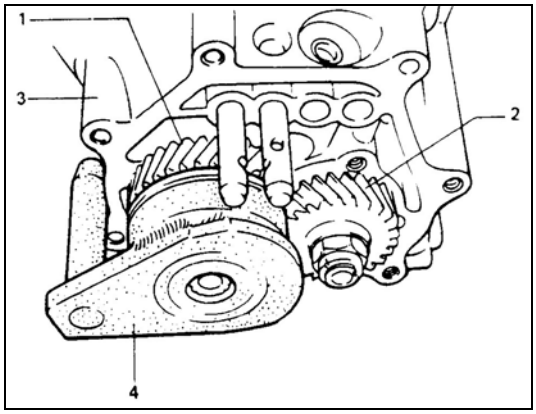
2- 5th hub sleeve

3- 5th hub

4-5th synchronizer ring

Fig.3-3

6 Fasten the input shaft, output shaft ， 5th gear, install special 5th gear lock tool on the input shaft 5th gear and transmission case.



1- 5th gear

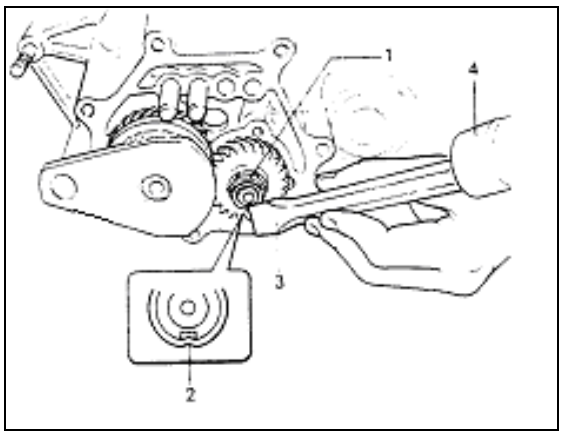
2- 5th driven gear

3- Transmission case

4- Special tool

Fig.3-4

7 The output shaft nut：Use chisel to loosen the welded part of the nut.



1- 5th lock nut

2-Nut

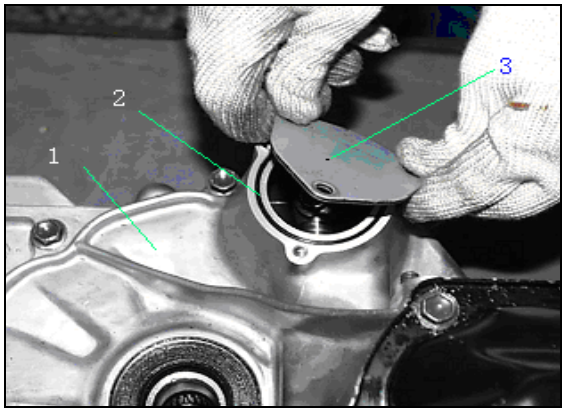
3- Chisel

Fig.3-5

8 Remove 5th driven gear,5th gear, transmission thrust board.

（**2**） Shift and select lever shaft **,input shaft, output shaft**

1 Loosen 3 bolt, remove the transmission cover board.



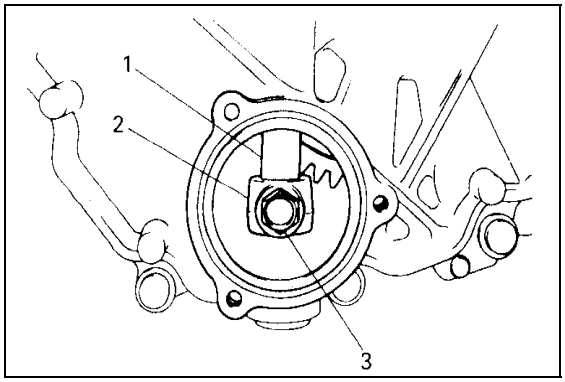
1- Transmission case

2- O-ring

3- Transmission cover board

Fig.3-6

2, Remove shift and select lever shaft fork.



1- Shift and select lever shaft

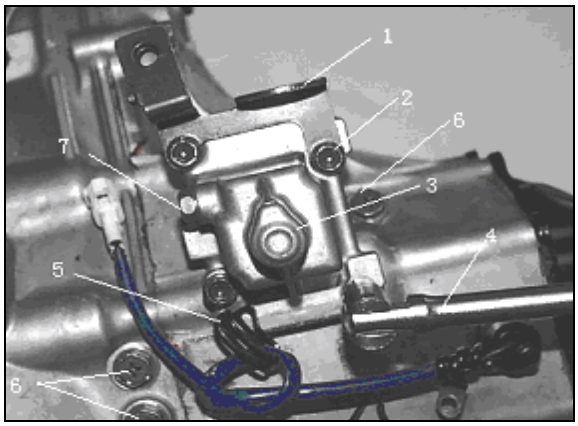
2- Shift and select lever shaft fork

3- Bolt

Fig.3-7

3 Remove the 3 shift fork shaft bolt and gasket, take out the spring and ball.

4 Loosen the 4 bolt on the case, take out the clip,stationary rings and case.



1-Stationary rings assembly

2-Bolt

3-Case

4- Special tool

5- Clip

6- Shift fork bolt

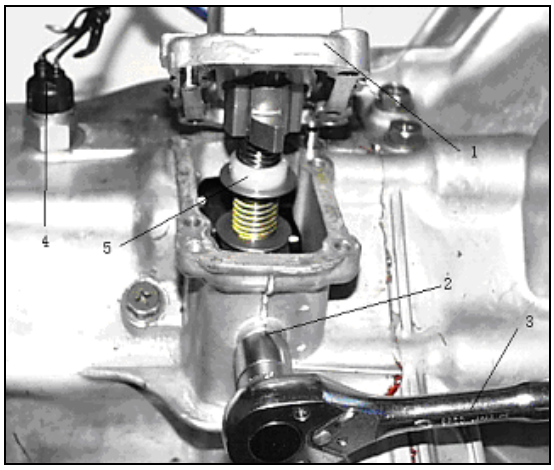
7-Reverse,5th Interlock roller

Fig.3-8

5 Screw off the restrict bolt and gasket.

6 Remove the backup light switch.

Notice: When removing the shift and select lever shaft assembly**, reserve , 5th** interlock roller **need not be removed.**



1-Case

2- Restrict bolt

3- Spanner

4- Backup light switch assembly

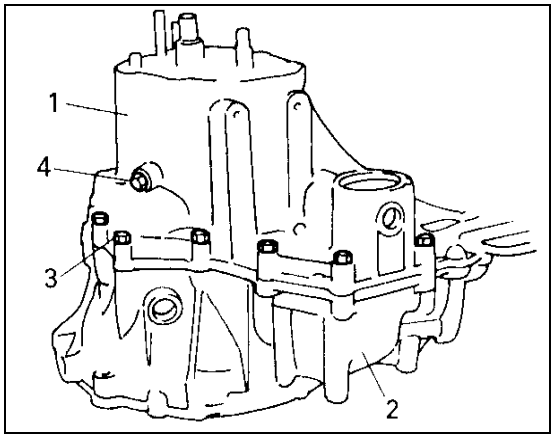
5- Shift and select lever shaft

Fig.3-9

7 Take out the shift and select lever shaft assembly.

8 Remove the reverse shaft bolt and gasket.

9 Loosen the 11 bolt from the case outer.



1-Transmission case

2- Clutch housing

3- Transmission case bolt

4- Reverse idler gear shaft bolt

Fig.3-10

10 Use screwdriver separate clutch housing and transmission case.

Caution: Do not insert the tools into the joint of the two crust, otherwise the joint can be damaged.



1- Aluminum Hammer

2- Special tool

3- Transmission case

Fig.3-11

11 Take apart the transmission assembly from the clutch case, lift the transmission assembly, now, all the parts such as input shaft, output shaft and differential still remain in the clutch case assembly.

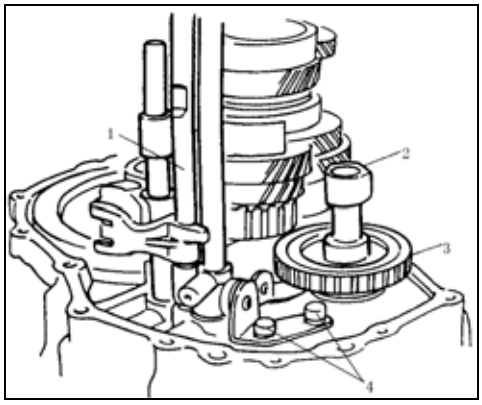


Fig.3-12

12 Loosen the 2 reserve shift fork bolt, remove the reserve shift fork assembly.

13 Remove the reverse idler gear shaft and gasket, take away the reverse idler gear shaft.

14 Remove the reserve,5th shift fork shaft assembly.



1-Reverse ,5th shift fork shaft assembly

2- Reverse idler gear shaft assembly

3- Reverse idler gear

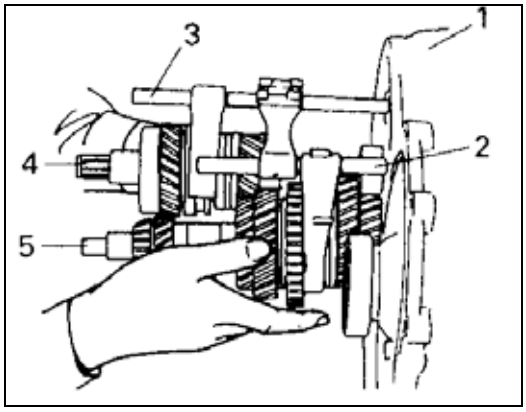
4-Reverse Shift fork bolt

Fig.3-13

15 Use a rubber hammer to hit the end of the input shaft lightly and force it out a little, take out the input shaft assembly, output shaft assembly,1st,2nd Shift fork assembly and 3rd,4th shift fork assembly together.

16 Remove the output shaft bearing outer race from the transmission case.

17 Remove the differential oil seal.



1- Clutch housing assembly
2- 1st 2nd shift fork shaft assembly
3- 3rd 4th shift fork shaft assembly
4- Output shaft assembly
5-Input shaft assembly

Fig.3-14

（3）Clutch case assembly

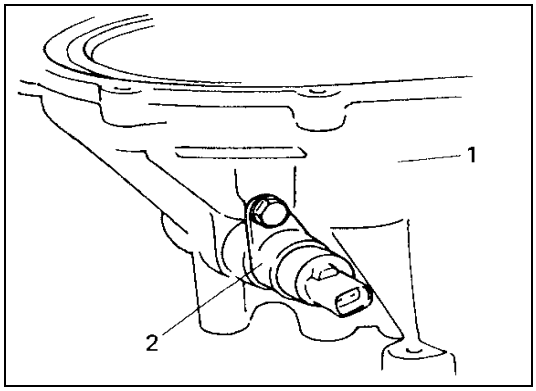
1. Remove the differential assembly from the clutch case.



1- Differential Assembly

Fig.3-15

2. Loosen the bolt, pull out the speedometer driven gear assembly.



1- Clutch case
2- Speedometer driven gear assembly

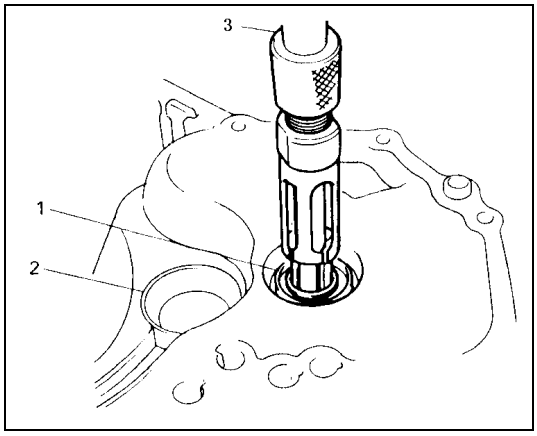
Fig3-16

Caution: Do not hurt speedometer case.

3.Remove the input shaft oil seal .

4.Remove the output shaft bearing outer race.

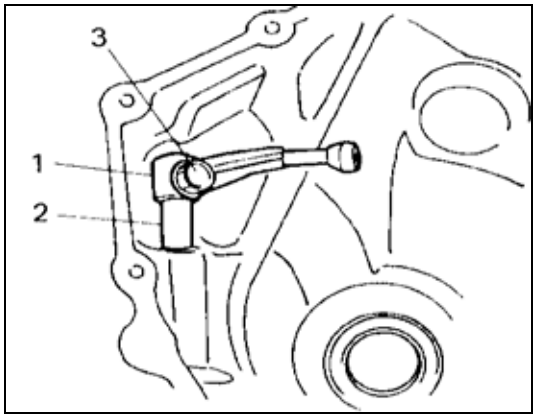
Notice: If the input shaft bearing still remains in the clutch case, use special tool to pull out the bearing.



1- Input shaft oil seal
2- Output shaft bearing outer
3- Special tool

Fig.3-17

5. Loosen the bolt, pull out the shift head.

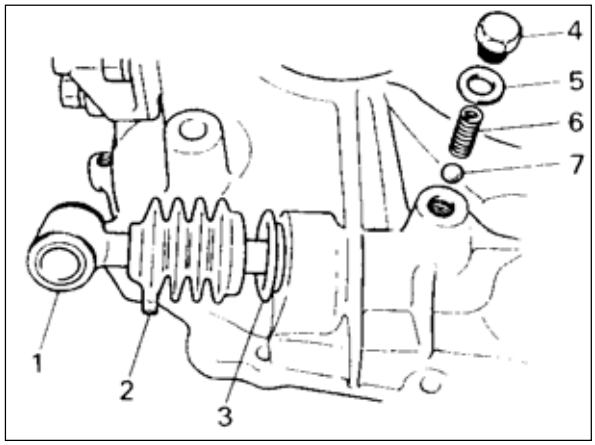


1- Shift head
2- Shift lever
3-Bolt

Fig.3-18

6. Loosen the shift lever bolt and gasket, take out the spring and ball.
7. Remove the shift lever, boot and oil seal.
8. Remove the differential oil seal from the clutch case.

Notice: The used oil seal cannot be used repeatedly.



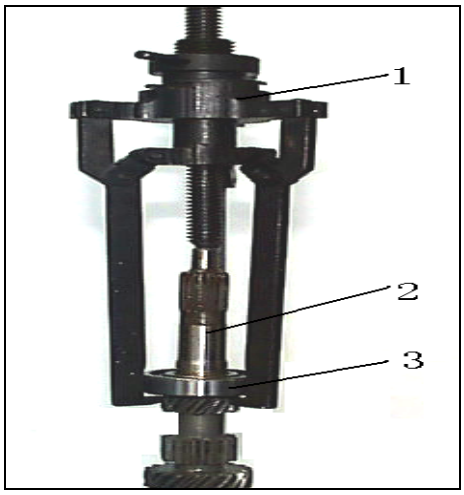
1- Shift lever
2- Boot
3- Oil seal
4- Blot
5- Gasket
6- Spring
7-Ball

Fig.3-19

（4） Input shaft assembly

Disassemble:

1. Use bearing puller to remove the input shaft right bearing.



1- Special tool

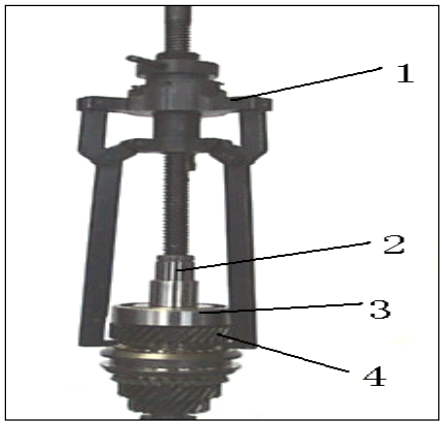
2- Input shaft

3- Right bearing

Fig.3-20

2. Use special tools to clip the 4th gear, pull it out with the 5th gear spacer, left bearing.

Caution: Do not clip the gear head, or the 4th gear may be hurt.



1- Special tool

2- Input shaft

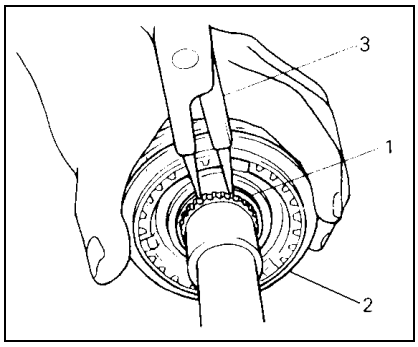
3- Left bearing

4-4th gear

Fig.3-21

3.Take out the 4th gear Needle roller bearing and Synchronizer ring.

4. Use special tool to remove the snap ring.



1- Snap ring

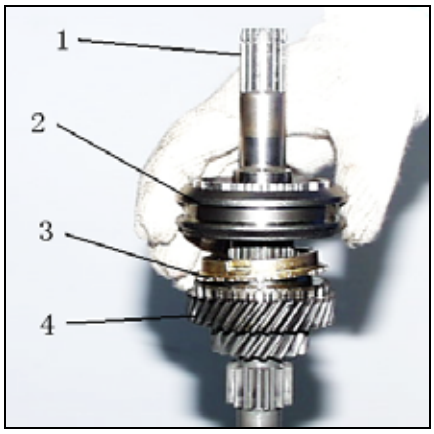
2- Synchronizer ring

3- Special tool

Fig.3-22

5.Remove the synchronizer assembly and 3rd gear.

6.Remove the 3rd gear needle roller bearing .



1- Input shaft

2- Synchronizer assembly

3- Synchronizer ring

4- 3rd gear

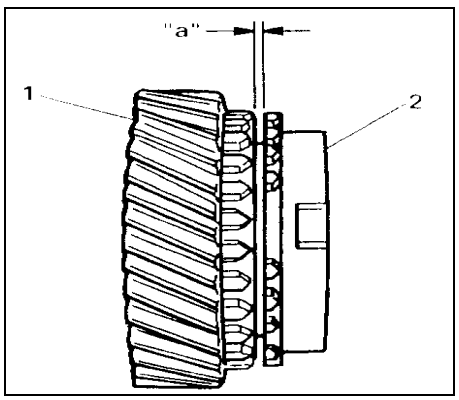
Fig.3-23

7. Disassemble the Synchronizer assembly.

Check and re-install:

1.Clean up all the parts, check if there is anything abnormal.

2.If Synchronizer components need repair， measure synchronizer ring clearance “a” to gear, then decide whether change it.

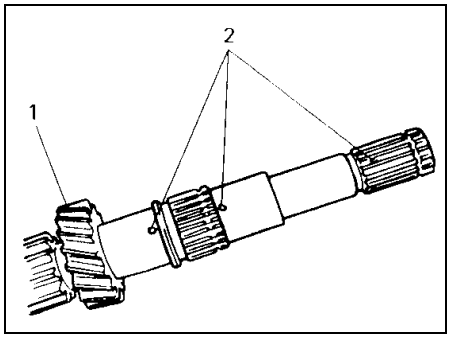


1- Gear

2-Synchronizer ring

Fig.3-24

3.Blow oil pipeline.

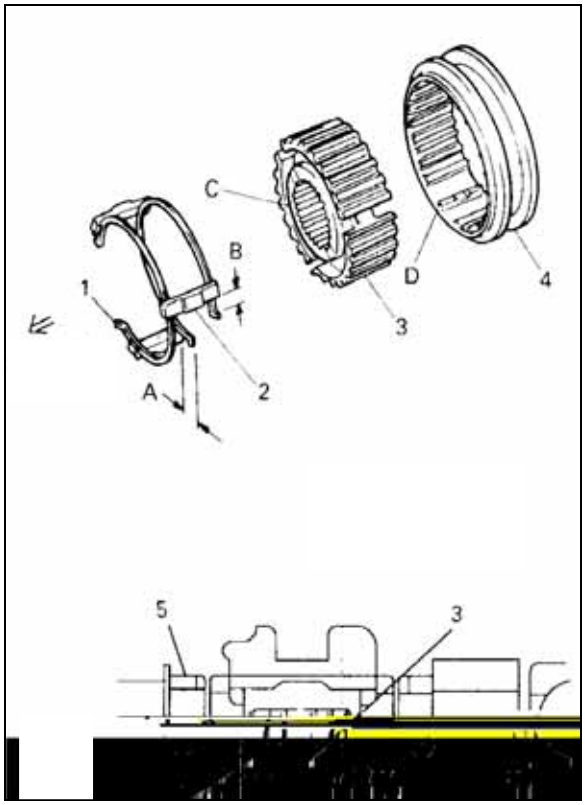


1- Input shaft

2- Oil pipeline

Fig.3-25

4. Assemble the synchronizer assembly, insert 3 synchronizer insert, and then install the spring according to the Fig.



1- Snap ring

2- Synchronizer insert

3-Hub

4- Hub sleeve outer race

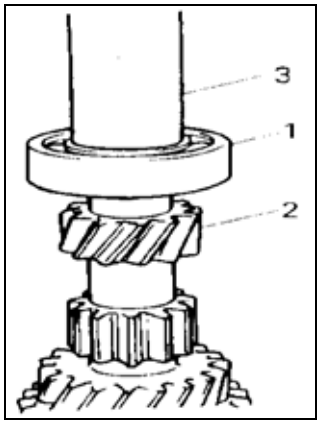
5-3rd gear

Fig.3-26

Notice:

- Keep right directions of every part.
- Pay more attention to the size differences of spring snap ring, synchronizer insert, hub sleeve and synchronizer assembly.

5. Use special tool to install right bearing of input shaft.



1- Right bearing

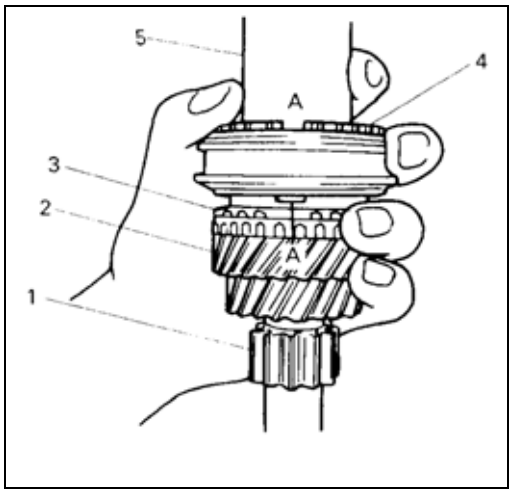
2- Input shaft

3- Special tool

Fig.3-27

6. Install the 3rd gear needle roller bearing，lubricate needle roller bearing；install 3rd gear and synchronizer ring。

7. Use hammer and special tool to install synchronizer assembly.



1- Input shaft

2- 3rd gear

3- Synchronizer ring

4- Synchronizer assembly

5- Special tool

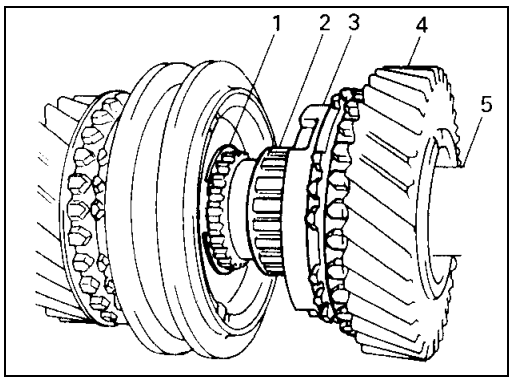
Fig.3-28

Notice:

- Be sure to keep the synchronizer insert of the synchronizer ring and the synchronizer insert of the synchronizer assembly in the right position when installing the synchronizer assembly.
- After finishing installation, check if the 3rd gear turns smoothly.
- 3rd needle roller bearing, synchronizer ring and 4th needle roller bearing, Synchronizer ring is same.

8. Spread lubricant on the needle roller bearing, and fix the snap ring, needle roller bearing.

Notice: Be sure the snap ring has been fixed in the snap ring slot on the input shaft.



1- Snap ring

2-Needle roller bearing

3- Synchronizer ring

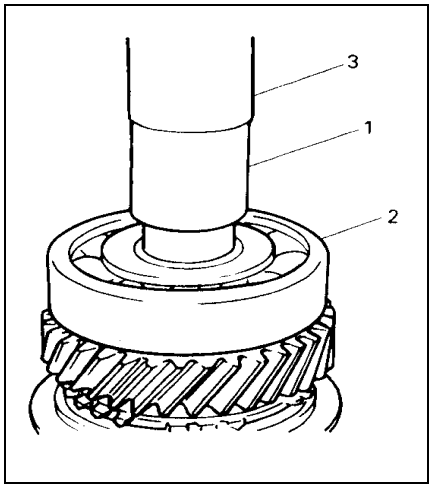
4- 4th gear

5-Input shaft

Fig.3-29

9. Use special tool and hammer to press the left bearing.

10 . Use special tool to press the 5th gear spacer.



1-5th gear spacer

2-Left bearing

3- Special tool

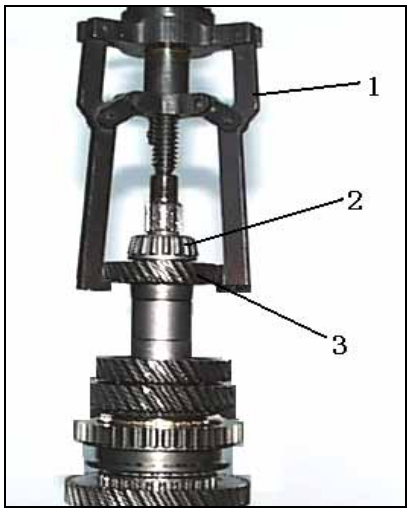
Fig.3-30

Notice : In order to avoid the 5th gear spacer pressure over，do not pressure left bearing together.

（5）Output shaft assembly

Disassemble:

1. Clip the 4th gear and pull it out with the left bearing together.



1- Special tool

2- Left bearing

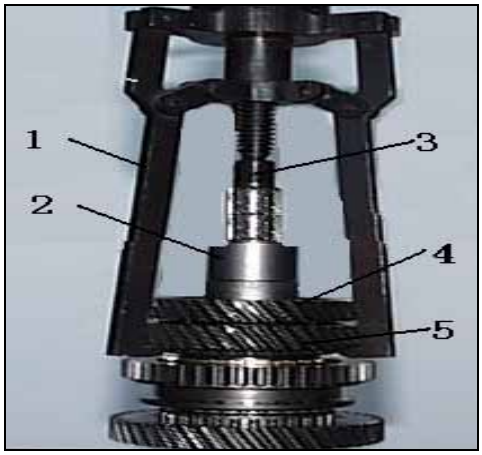
3-4th driven gear

Fig.3-31

Caution: In order to avoid breaking the 4th driven gear, do not clip the gear head.

2.Clip the 2nd driven gear, pull out the driven gear, 3rd driven gear with the Spacer together.

Caution: In order to avoid breaking the 2nd driven gear, do not clip the gear head.



1- Special tool

2- Spacer

3- Output shaft

4-3rd driven gear

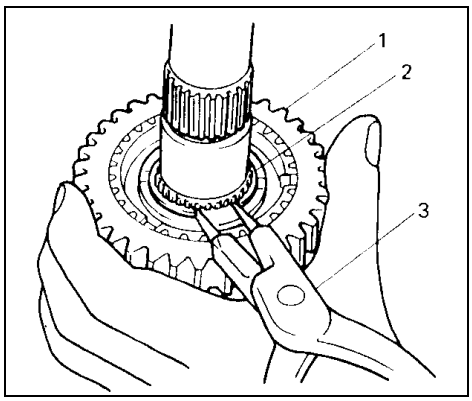
5-2nd driven gear

Fig.3-32

3. Remove the needle roller bearing and 2nd Synchronizer ring.

4. Remove the snap ring.

Caution: In order to remove the snap ring smoothly, be sure the special tool top is plane.



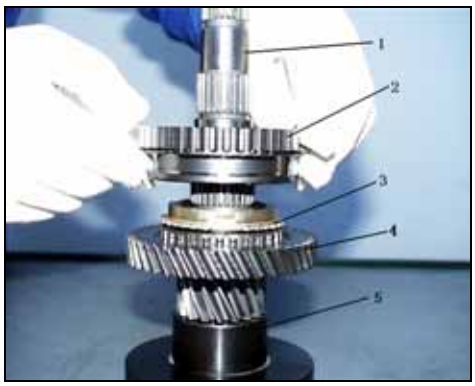
1- Hub sleeve outer race

2- Snap ring

3- Special tool

Fig.3-33

5. Remove the synchronizer assembly, 1st Synchronizer ring.
6. Remove the 1st driven gear and needle roller bearing.



1, Output shaft

2, Hub sleeve outer race

3, 1st synchronizer ring

4, 1st driven gear

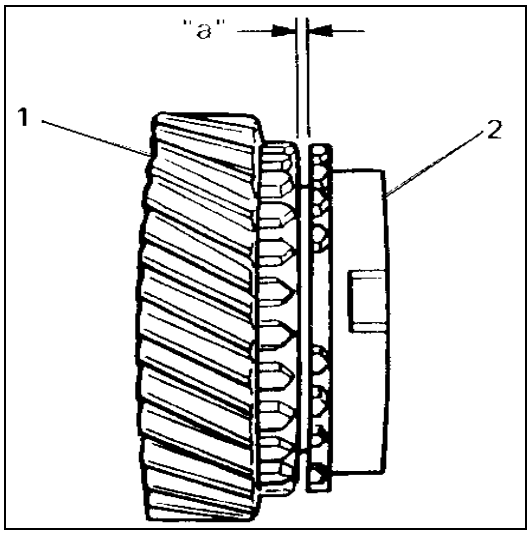
5, Special tool

Fig.3-34

Check and re-install:

1.Clear up all the parts, check if there is anything abnormal, if necessary, change the used parts.

2.If the synchronizer need repair, first check the clearance “a” between synchronizer ring and gear and the clearance between the angle and hub, and then decide if changed the used parts.



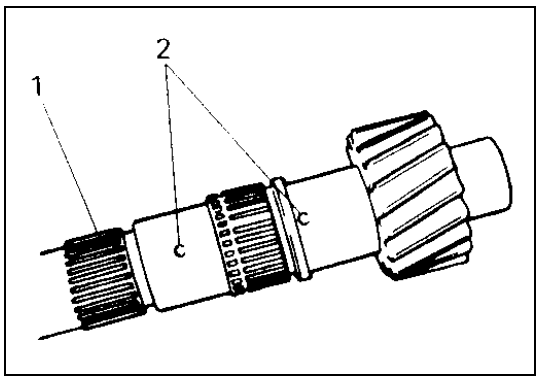
1- Gear

2- Synchronizer ring

Fig.3-35

Clearance “a”	Standard 1.0~1.4mm
	Use limit：0.5mm

3. In order to keep lubricate smoothly, blow the oil away, be sure there is not any backup in the oil way.

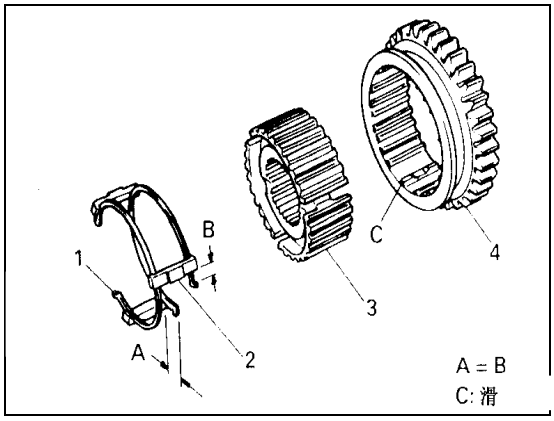


1- Output shaft

2- Oil way

Fig.3-36

4. Install the synchronizer assembly , insert 3 pieces of synchronizer insert, and then install the spring according to the figure.



1- Snap ring

2- Synchronizer insert

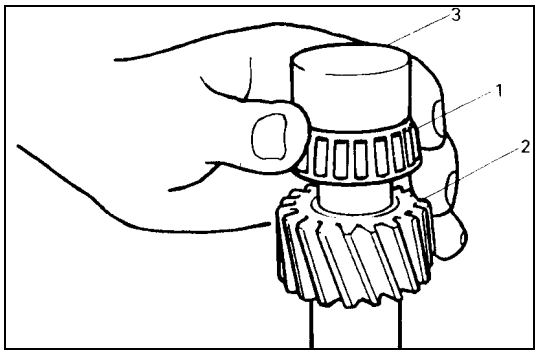
3- Hub

4- Hub sleeve outer race

Notice:

- Synchronizer insert is not on the right direction.
- Snap ring and synchronizer insert and synchronizer assembly, 5th synchronizer assembly compare is big.

5.Install the output shaft bearing.



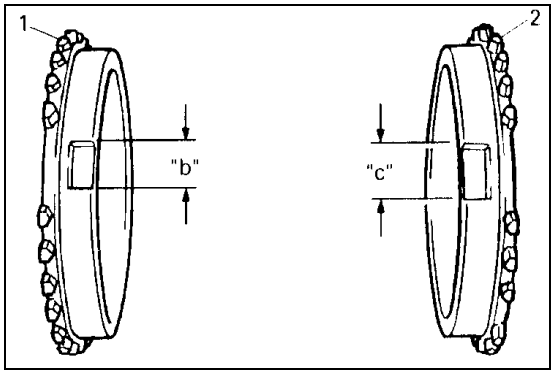
1-Output shaft right bearing

2- Output shaft

3- Special tool

Fig.3-38

6.Spread lubricant on the needle roller bearing, and then install the 1st driven gear and 1st synchronizer ring.



1-1st synchronizer ring

2-2nd synchronizer ring

Fig.3-39

Notice: The width of 1st synchronizer ring synchronizer insert is smaller than the width of the 2nd synchronizer ring synchronizer insert.

Width：“b” ：8.2mm

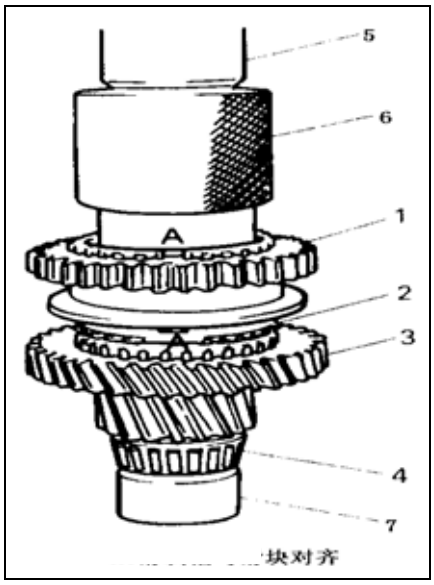
“c” ：8.8mm

- The width of the 1st and 2nd needle roller bearing is the same.

7. Hammer the synchronizer assembly.

Notice:

- Use special tool support right output shaft，avoid bearing holding race destroy。
- When installing the synchronizer assembly, keep the synchronizer insert and the synchronizer insert on the synchronizer assembly face to face.
- After installation, check if the 1st gear turns smoothly.



1- Synchronizer assembly

2-1st Synchronizer ring

3-1st driven gear

4- Right bearing

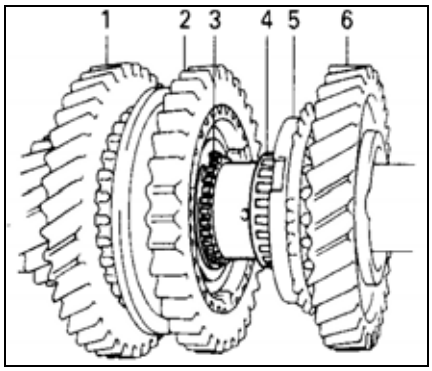
5- Special tool

6- Special tool

7- Special tool

Fig.3-40

8. Spread lubricant on the snap ring and needle roller bearing, and then install the 2nd synchronizer ring and 2nd driven gear.



1-1st driven gear

2- Synchronizer assembly

3- Snap ring

4- Needle roller bearing

5-2nd synchronizer ring

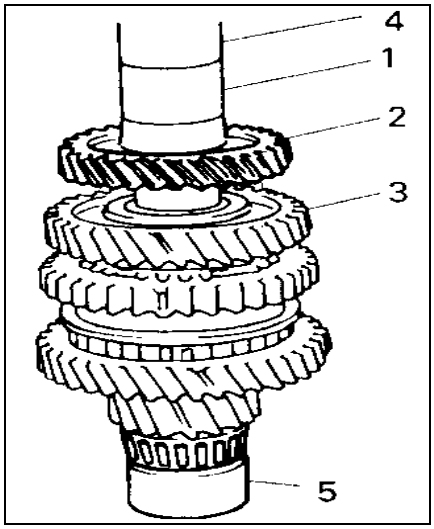
6-2nd driven gear

Fig.3-41

Notice: Be sure the snap ring has been installed in the clitellum.

9, Install the 3rd driven gear and spacer.

Notice: It is suggested that first install the 3rd driven gear and spacer , secondly install the 4th driven gear, in this way, the output shaft will not bear too much pressure.



1-3rd, 4th spacer

2-3rd driven gear

3- 2nd driven gear

4- Special tool

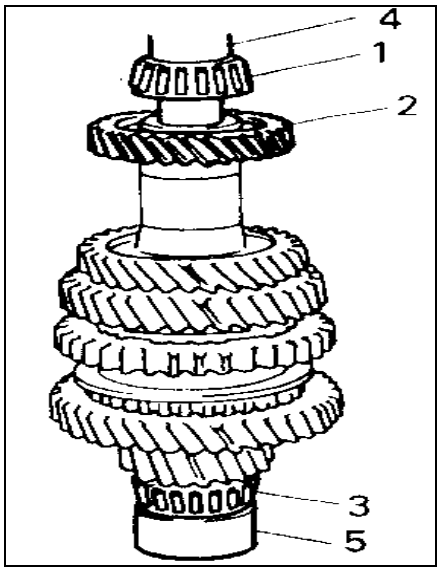
5- Special tool

Fig.3-42

10. Use the same special tools to install the 4th driven gear.

11. Use hammer or special tools to install the left bearing.

Notice: To protect the bearing, use the special tools (shown in the figure) to support the bearing.



1- Left bearing

2-4th driven gear

3-Right bearing

4- Special tool

5- Special tool

Fig.3-43

（**6**） Shift and select lever shaft control system

Shift and select lever shaft assembly:

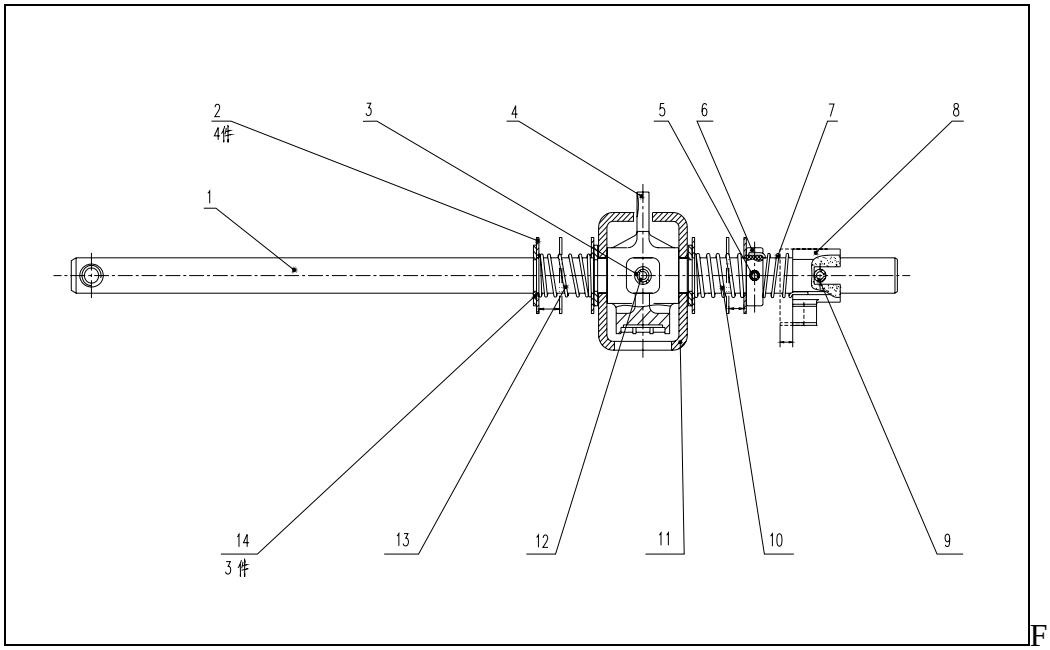


Fig.3-44 Shift and select lever shaft assembly

1- Shift and select lever shaft 2- Gasket 3- Slotted spring pin
4- Select lever shaft 5- Slotted spring pin 6- Spring
7- Shift cam spring 8- Shift cam 9- Slotted spring pin
10- Return spring 11- Interlock 12- Slotted spring pin
13- Return spring 14-E- snap ring

1.Use the professional tools to remove the 4 pin, 3 E- snap ring and component from the select lever shaft.

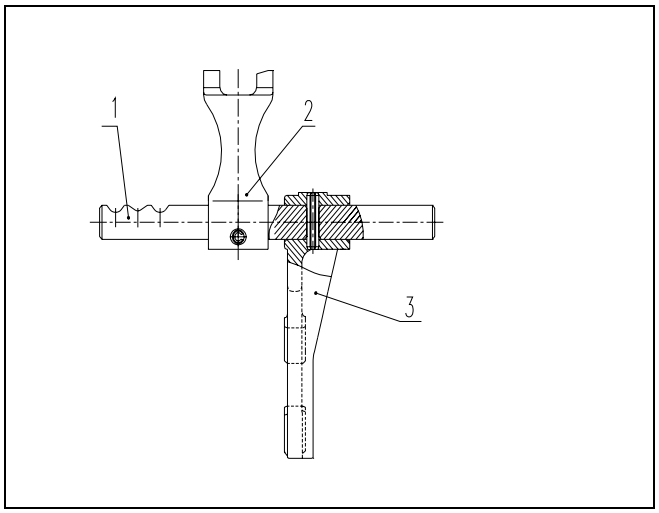
2. Clear up all the parts, if necessary, please replace the used parts.

3. Install according to the reverse process.

Notice:

- When hammering the slotted spring pin, use the wood block to support to prevent bending the shift and select lever shaft.
- When installing reverse, 5th interlock roller, first enlace the cam return spring, secondly hammer the slotted spring pin.
- Keep the identical directions of the select lever shaft, reverse, 5th shift cam and spring.

1st, 2nd shift fork shaft assembly and 3rd, 4th Shift fork shaft assembly.

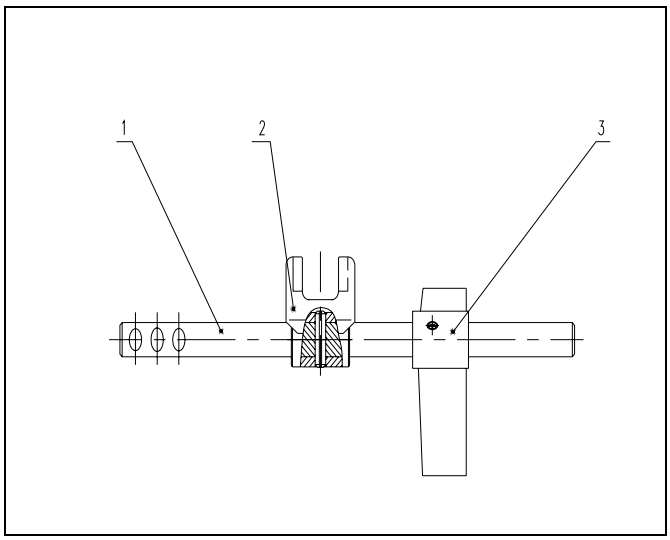


1-1st.2nd Shift fork shaft

2-1st .2nd Shift head

3-1st .2nd Shift fork

1st , 2nd Shift fork shaft assembly



1-3rd, 4th Shift fork shaft

2-3rd, 4th Shift head

3-3rd, 4th Shift fork

3rd, 4th Shift fork shaft assembly.

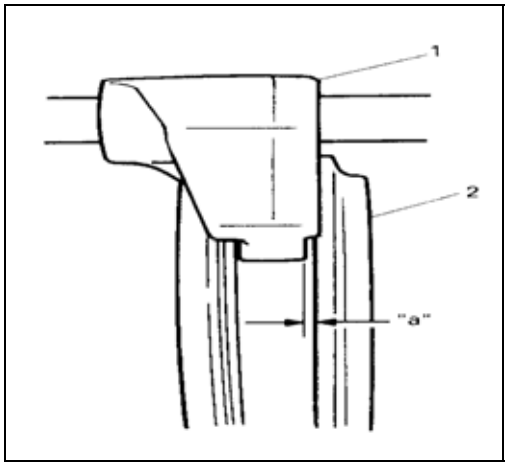
1.Use the professional tools to remove the 3 pin and component (from the select lever shaft assembly.

2.Clean up all the parts, if necessary, please replace the used parts.

3.Install according to the reverse process of disassembly.

Notice: When installing, Shift fork Slotted spring pin placket should stagger 180 °.

Check Shift fork and shift hub sleeve.



1- Shift fork

2- Hub sleeve

Fig.3-47

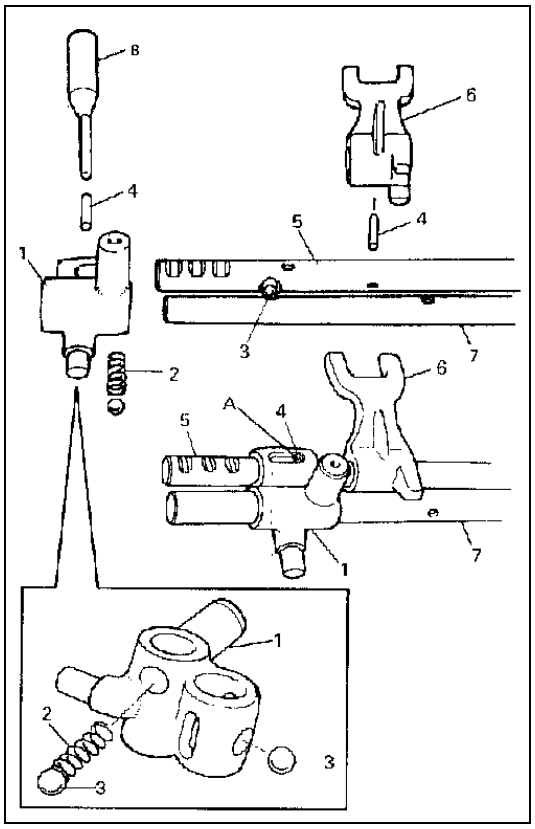
1.Use feeler gauge to check the clearance between shift fork and hub sleeve, if the clearance exceeds 1.0mm, please replace the parts.

Notice: Check the contact position of shift fork and hub sleeve carefully to determine if replace the parts.

Clearance“a”： Maintenance Limit: 1.0mm

2. Insert the shift lever into the hole of the case, check if it works smoothly, if there is any retardarce, please correct with winch or similar tools.

Reverse, 5th shift fork shaft assembly



1- Reverse Shift fork

2- Spring

3- Ball

4- Slotted spring pin

5-Reverse, 5th Shift fork

6-Reverse , 5th Shift head

7-Reverse , 5th guide shaft

A： Slotted spring pin placket forward

Fig.3-48

1.Remove the slotted spring pin and disassemble every part.

2.Clean every part thoroughly and determine if some parts need to be replaced.

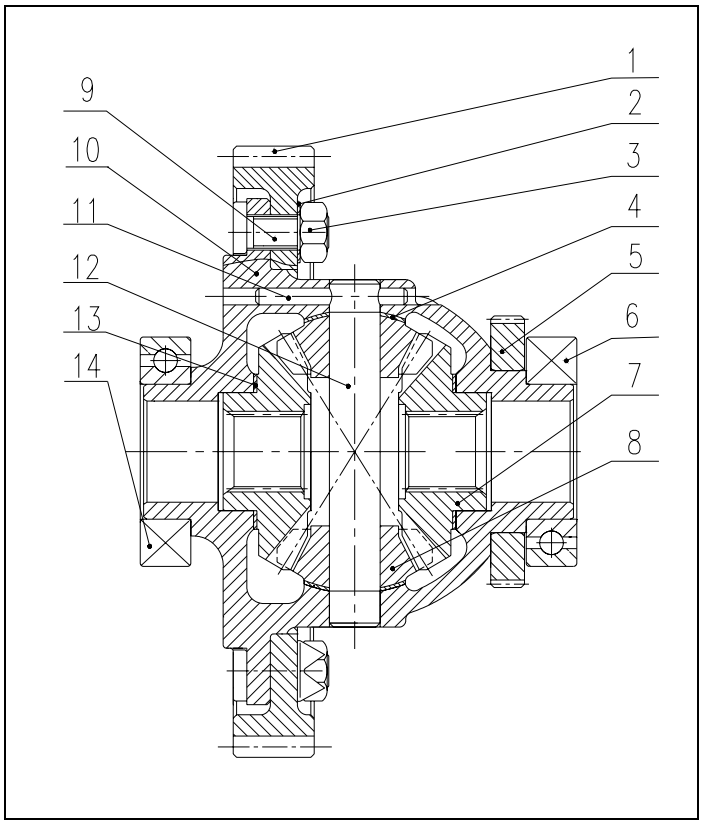
3.Install all the parts according to the figure and the installing order.

Notice:

- Division reverse shift fork spring and shift spring.
- Accurately install the reverse shift fork ball。
- Install the shift fork Slotted spring pin according to the reverse order.

（7）Differential Assembly

Disassembling:



1- Differential ring gear

2-Lock nut

3- Nut

4- Pinion gear gasket

5- Speedometer gear

6- Bearing

7- Side gear

8- Pinion gear

9- Differential bolt

10- Differential case

11-Pinion gear shaft pin

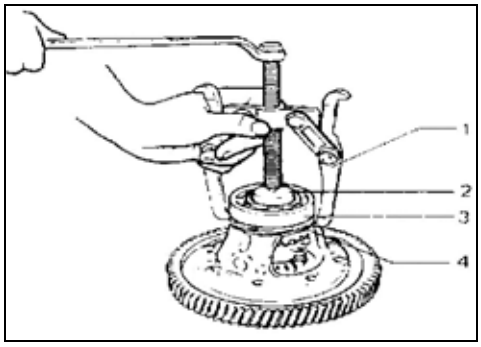
12-Pinion gear shaft

13-Side gear gasket

14-nearside bearing

Fig.3-49 Differential assembly

1. Remove the right-side bearing.
2. Pull out the speedometer gear.



1- Bearing puller

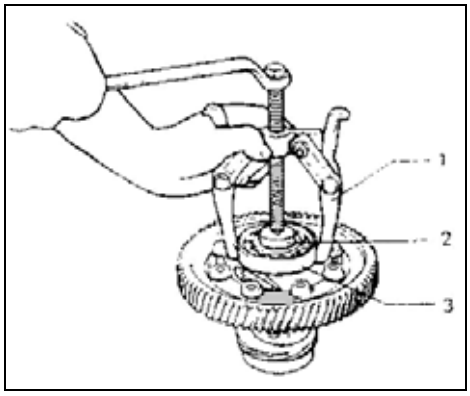
2- Special tool

3- Bearing

4-Speedometer gear

Fig.3-50

3. Remove the left-side bearing .



1- Bearing puller

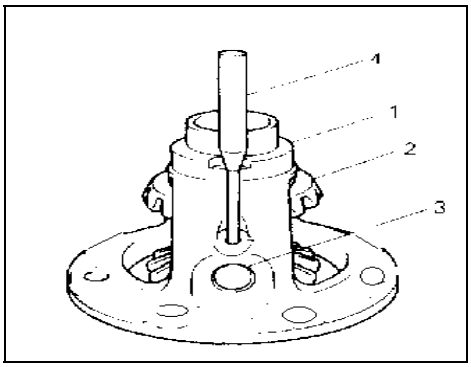
2- Special tool

3-Left bearing

Fig.3-51

4. Clip the differential case, remove the 8 nut, 8 Differential bolt and 4 lock nut.

5. Hammer off the slotted spring pin, remove the pinion gear shaft，pinion gear ，side gear.



1- Differential case

2- Side gear

3- Pinion gear shaft

4- Special tool

Fig.3-52

Adjustment and Re-installation:

After disassembling, check if there is any distortion and make a record. Replace the attainted parts, clean all the new parts and install.

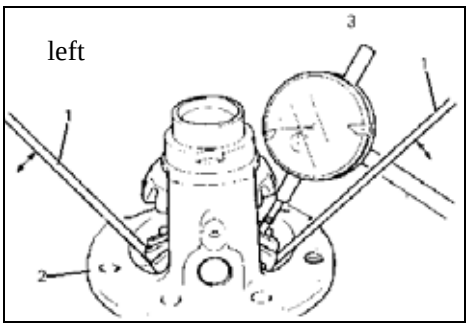
1, **Installation** side gear，measure the clearance of side gear. Install the side gear.

side gear clearance：0.03～0.40 mm。

Left Side:

Clip the differential case, put the end of the dial indicator on the top of the gear.

Use 2 screwdrivers to move the gear, read the reading on the dial indicator.



1-Screwdirver

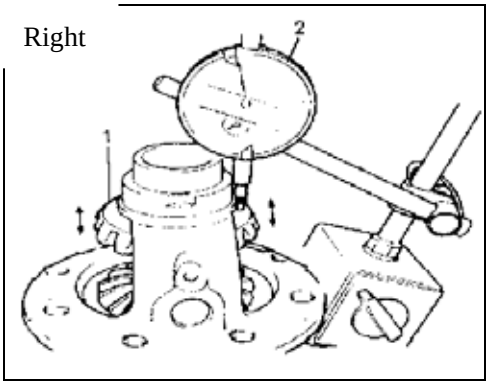
2- Side gear

3-Dial indicator

Fig.3-53

Right Side:

According to the same process above, put the end of the dial indicator on the step of the side gear.



1- Side gear

2-Dial indicator

Fig.3-54

2, If the clearance exceed the regulations, please choose suitable side gear adjust gasket to install once more and test to obtain the right gear clearance.

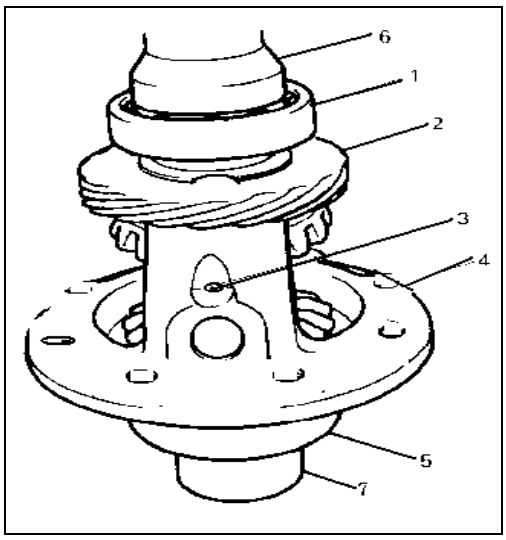
Selectable gear adjust gasket	mm
	0.70
	0.80
	0.90
	1.00
	1.10

Notice: Spread lubricant on the contact surface of side gear adjust gasket, pinion gear, pinion gear and pinion gear shaft, side gear and differential case.

3, Dive in the slotted spring pin, till the end of pin enter into the differential case thoroughly.

4, Install the left-side bearing.

5, Refer to the fig., install the speedometer driven gear，use special tool to support bearing，drift the lift-side bearing，and then install the right-side bearing according to the step 4。



1-Differential right bearing

2-Speedometer driven gear

3-Slotted spring pin

4-Differential case

5-Differential left bearing

6-Special tool

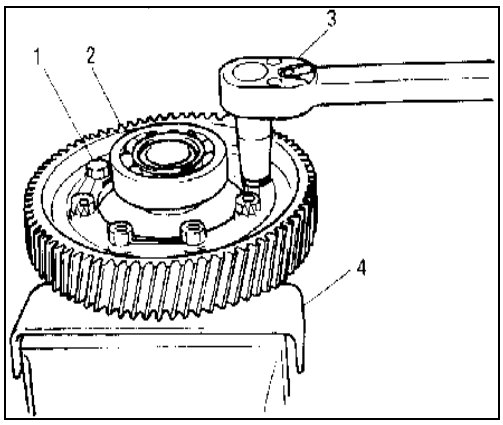
7-special tool

Fig.3-55

6, Clip the differential case ,install the differential ring driven gear, screw tightly the 8 differential ring driven gear bolt according to the torque,

Caution: Forbid to use non-professional bolt.

Torque ：80～100N・m



1-Driven gear bolt

2-Differential ring driven gear

3-Torque spanner

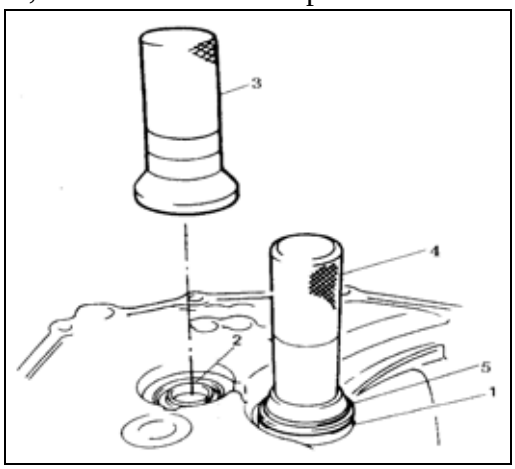
Fig.3-56

II: Installation

（1）Clutch case assembly

1, Use hammer and special tools to install the input shaft oil seal，keep the oil seal spring side upward and spread lubricant on the oil seal.

2, Use hammer and special tools .



1-output shaft taper bearing outer ring

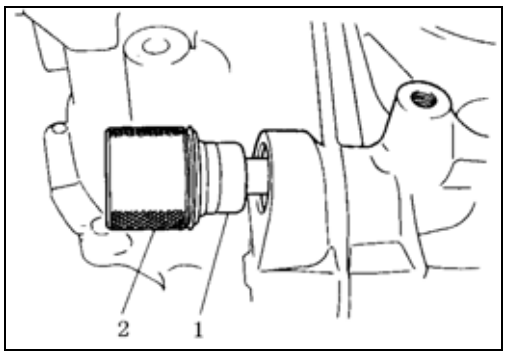
2-input shaft oil seal

3, 4, 5 -special tool

Fig.3-57

To install the right bearing outer ring of the output shaft.

3, Spread lubricant on the shift lever oil seal, use hammer and special tools to install the oil seal from the top down.



1-Shift lever oil seal

2-Special tool

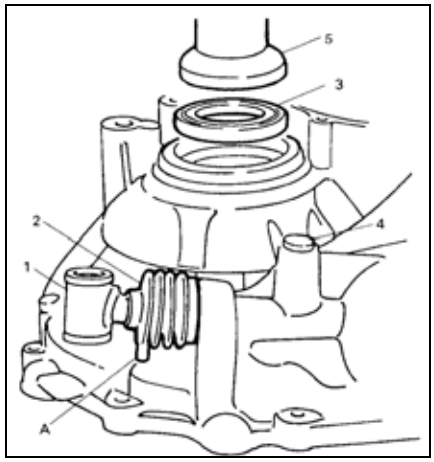
Fig.3-58

4, Install the shift lever, boot, ball, spring and screw down the bolt tightly. Torque ： 10--16 N • m

Notice: Keep the blow hole of the shift lever oil seal boot downward.

5, Use hammer and special tools to install the starboard oil seal keep the oil seal surface equal with case surface, and then spread lubricant on the oil seal.

Notice: Keep the differential oil seal spring side inward



1- Shift lever

2-Oil seal boot

3-Differential right oil seal

4-Shift lever bolt

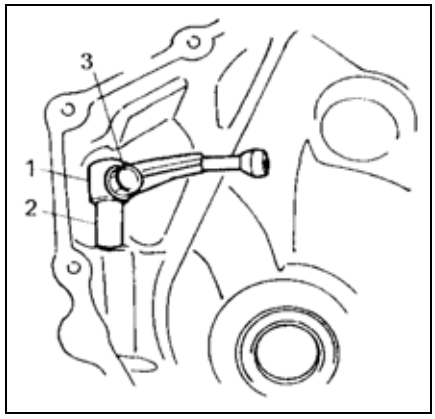
5-Special tool

A：Blow hole (downward)

Fig.3-59

6, Install the shift head on the shift lever.

Torque：31.5～35.5 **N • m**



1-Shift head

2-Shift lever

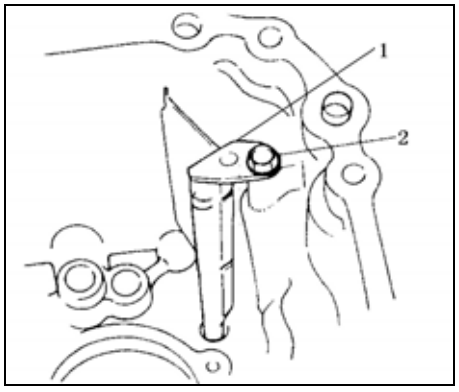
3-Bolt

Fig.3-60

（2）Transmission case

1, If remove the oil guide slot, when re-installing, screw down the torque.

Torque：8～12 **N • m**

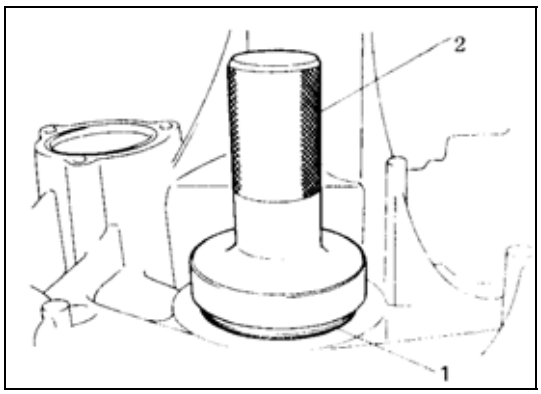


1-Oil guide slot assembly

2-Bolt

Fig.3-61

2, Use hammer and special tools to install the near side oil seal, keep the oil seal surface equal with the case surface and spread lubricant on the oil seal.

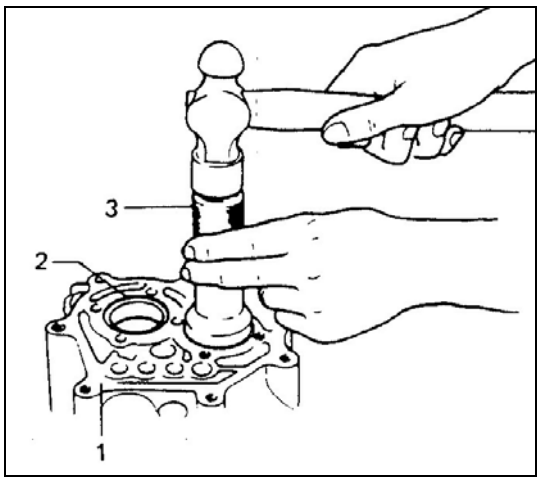


1-Differential left oil seal

2-Special tool

Fig.3-62

3, Use rubber hammer to knock the output shaft left bearing outer race and fix it.



1-Transmissan case

2-Bearing outer race

3-Special tool

Fig.3-63

（3）Transmission

1, Install the differential assembly on the clutch case.

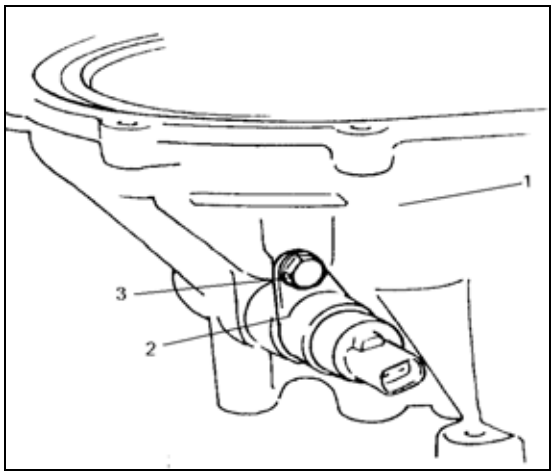


1-Differential assembly

Fig.3-64

2, Spread lubricant on the “O” ring and gear, install the speedometer driven gear assembly，and then screw down the torque.

Torque：8～12 **N • m**



1-Clutch case

2-Speedometer driven gear assembly

3-Bolt

Fig.3-65

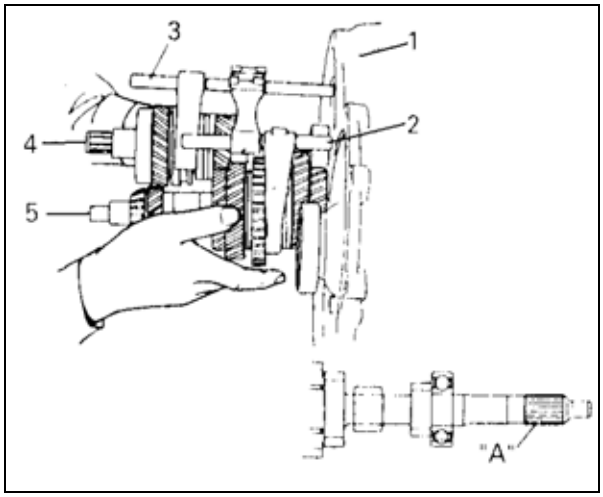
Notice: When installing speedometer driven gear, turn the differential ring driven gear lightly to joggle the gear. Do not knock the cracks on the speedometer case, otherwise the case may be broken.

3, Hold the input shaft assembly, output shaft assembly, 1st, 2nd shift fork assembly and 3rd, 4th Shift fork assembly and fix them on the clutch case.

Notice: Use hammer to rivet the input shaft right bearing into clutch case。

Be sure output shaft and differential ring driven gear are joggled。

Notice：In order to protect oil seal，twine the insulating tape to input shaft splined hub。



1-Clutch case

2-1st, 2nd Shift fork shaft assembly

3-3rd , 4th Shift fork shaft assembly

4-Input shaft assembly

5-Output shaft assembly

Fig.3-66

4, Install the reverse shift fork, screw down the bolt。

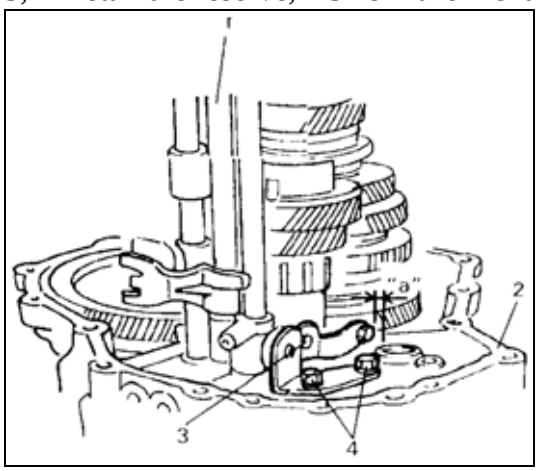
Torque ：18～28 **N • m**

Notice: When installing the reverse shift fork, keep the distance 5mm from the end of shift fork and the shaft hole.

Distance“a” ：5mm

The distance “a”is 5mm，reverse shift fork end and reverse idle gear clearance is 1mm 。

5, Install the reserve, 5th shift fork shaft assembly.



1-Reserve, 5th Shift fork shaft assembly

2-Clutch case

3-Reverse Shift fork assembly

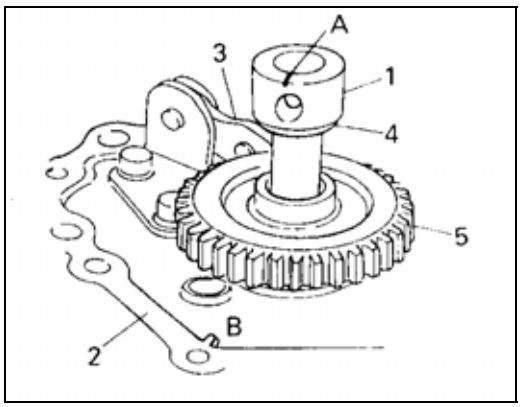
Fig.3-67

6, Install the reverse idle gear and reverse idle gear shaft, put the mark on the reverse idle gear shaft (Fig. A) and the step (Fig. B) on the clutch case in order.

Notice:

Be sure that reverse gear gasket has been fixed on the reverse gear.

Be sure that the distance between reverse shift fork free is 1mm



1-Reverse idle gear shaft assembly

2-Clutch case

3-Reverse Shift fork assembly

4-Reverse gear gasket

Fig.3-68

7, Clean the clutch and transmission surface, spread sealed adhesive on the surface of the transmission, and fix it with clutch.

Seal Adhesive： Seal adhesive（HZ1213Q/320222 YAP02-92）

8, Screw down the transmission bolt according to the correct torque .

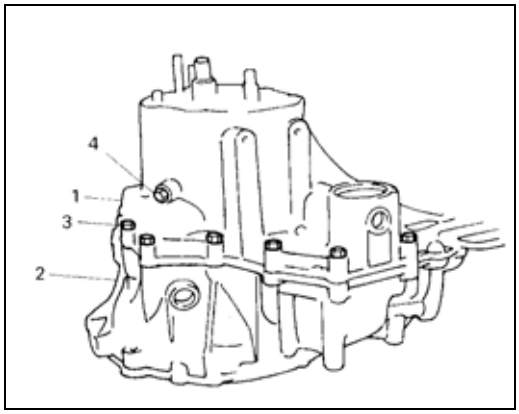
Torque：15～22 **N • m**

9, Install the reverse gear shaft bolt and aluminum gasket, screw down the bolt.

Torque ：18～28 **N • m**

10, Screw down the other 3 transmission bolt in the clutch.

Torque ：15～22 **N • m**



1-Transmissan case

2-Clutch case

3-Transmission bolt

4-Reverse idle gear shaft bolt

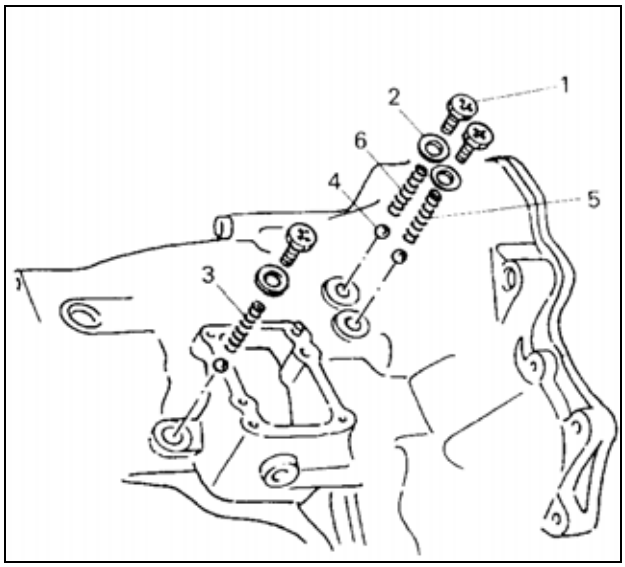
Fig3-69

11, Check-up shift fork shaft point spring worn.

Point spring free length	Standard	Use Limit
Reserve, 5th spring（Red）	33.8	32.7
Spring（Green）	33.6	32.5

12, Install the shift lever shift fork shaft ball, spring，bolt.

Torque ： 10～16 **N • m**



1-Bolt

2-Gasket

3- Point spring（Green）

4-Ball

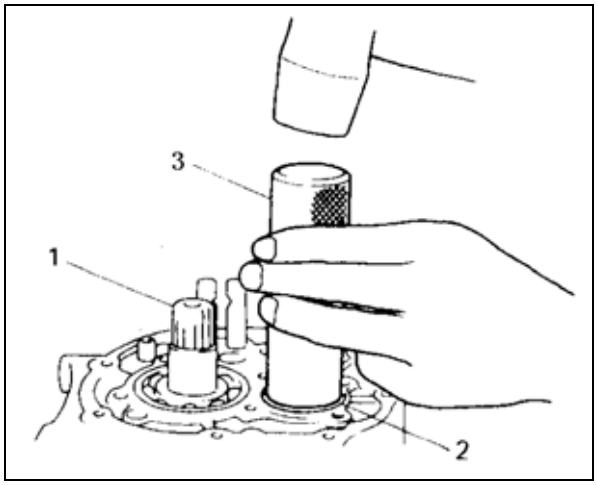
5- Point spring（Green）

6-Reserve, 5th point spring （Red）

Fig.3-70

（4）5th gear

1, Hammer the output shaft left bearing outer race lightly to the position of bearing.



1-Input shaft

2-Left bearing outer race

3-Special tool

Fig.3-71

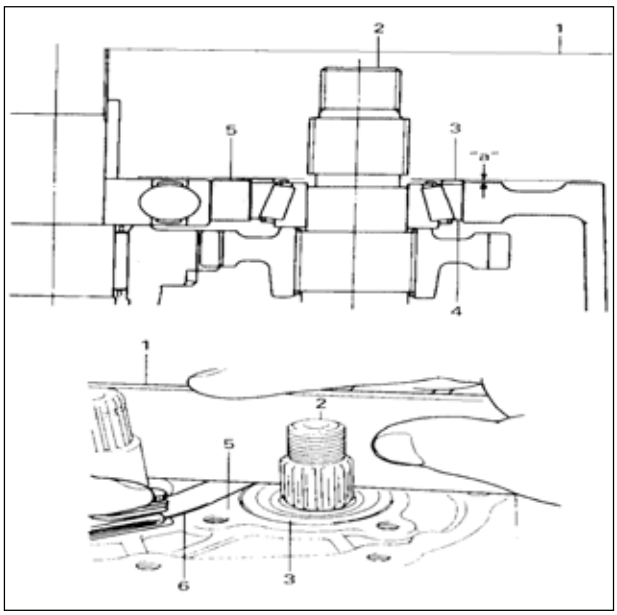
2, First put a adjust gasket on the bearing outer race and a ruler on the adjust gasket, use the press ruler to measure the clearance “a”(between case surface and the ruler)

Clearance “a” (adjust gasket)：0.08—0.12mm

3, Repeat the above steps, choose a suitable adjust gasket and put it on the bearing outer race.

Notice: Use 0.1mm Feeler gauge to determine if the gasket is suitable or not.

Bearing adjust gasket Thickness	0.40, 0.45, 0.50, 0.55, 0.60, 0.65, 0.70, 0.75, 0.80, 0.85, 0.90, 0.95, 1.00, 1.05, 1.10, 1.15



1-Ruler

2-Output shaft

3-Bearing adjust gasket

4-Bearing outer race

5- Case

6-Feeler gauge

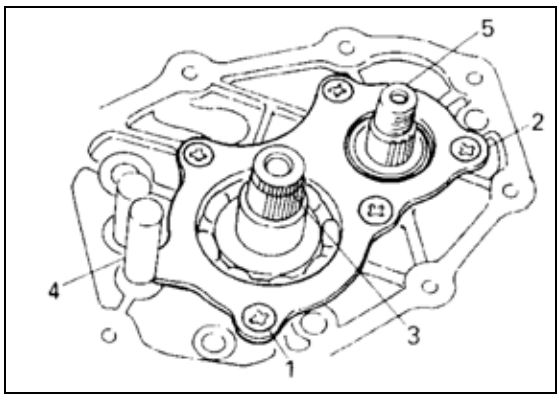
Fig.3-72

4, Install the bearing cover, insert the end of the bearing cover into the groove of the reserve, 5th guide shaft .Spread whorl glue on the bolt.

Notice: Turn the output shaft, to check if it turns smoothly.

Whorl glue：262 glue

Torque ：8～12 **N • m**



1-Bolt

2-Transmissan case

3-Input shaft

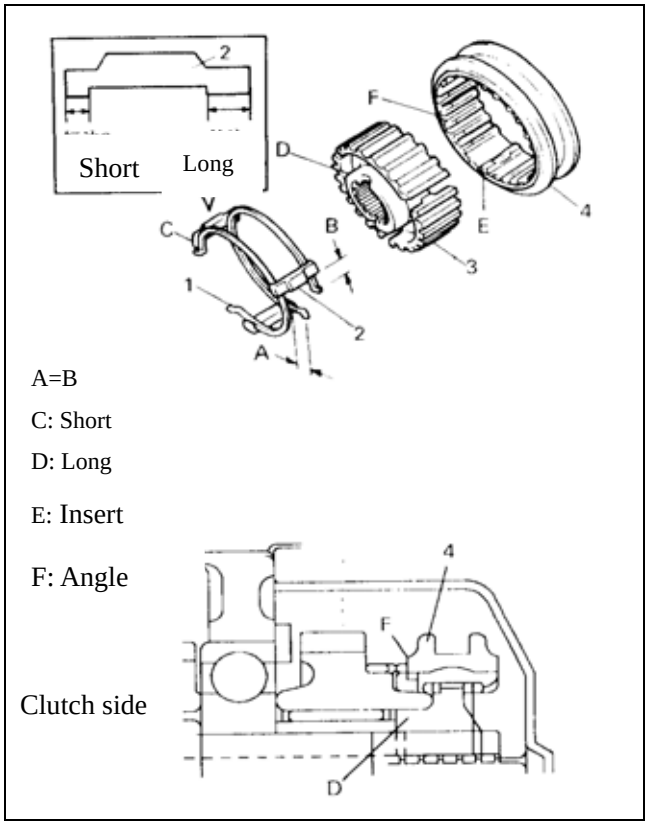
4-Reserve, 5th guide shaft

5-Output shaft

Fig.3-73

5, Install the 5th hub sleeve, 5th clutch hub, 5th Synchronizer, insert and 5th snap ring.

Notice: Keep the synchronizer insert short C, clutch hub D and hub sleeve F inward（5th gear side）.



1-5th Spring snap spring

2-5th Synchronizer insert

3-5th Clutch hub

4-5th Hub sleeve

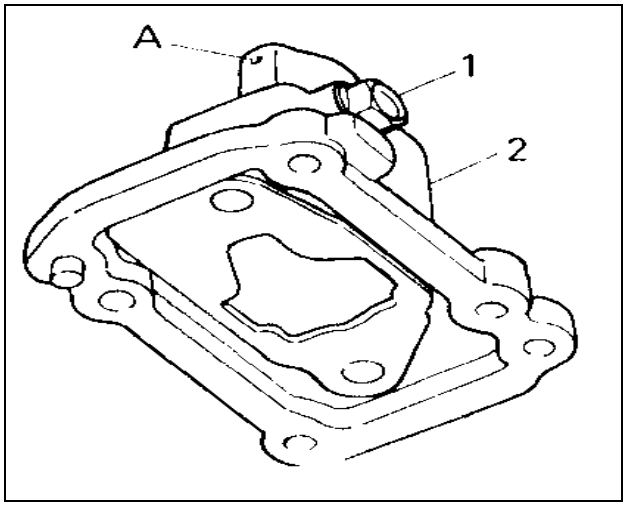
Fig.3-74

（5）Shift guide case assembly

1. In case of disassembly or installing， screw torque bolt，check-up blow hole straightway。

Torque : 8～12N • m

2. Clean case and transmission surface。



1-Reserve, 5th Interlock bolt

2-Shift guide case

A：Blow hole

Fig.3-81

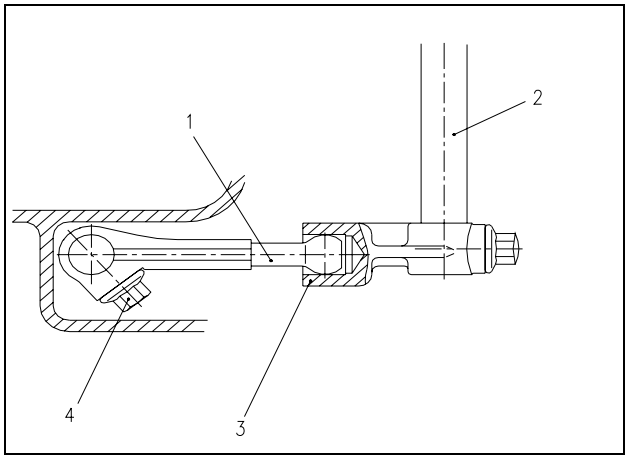
3. Install the select shaft assembly.

Notice: When installing shift select shaft assembly, keep the shift head in the middle position to prevent interlock bolt.

4. Connect the shift head and install the shift lever fork.

5. Screw down the shaft fork bolt.

Torque 32～36N • m



1-Shift head

2-Shift select shaft

3-Shift lever fork

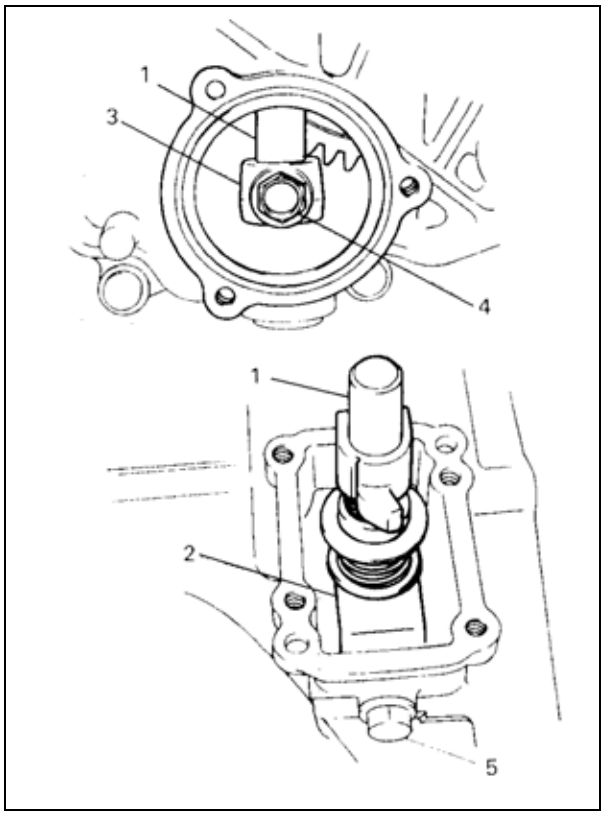
4-Fixup bolt

Fig.3-82

6. Fix the shaft restrict bolt.

Worm glue：262glue

Torque 18～28N • m



1-Shift select shaft

2-Interlock

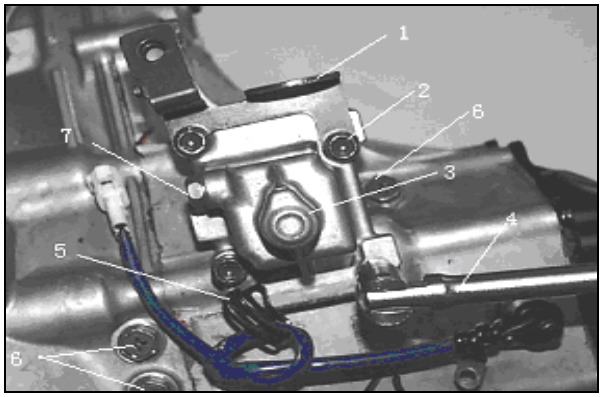
3-Shift lever fork

4- Bolt

5-Shaft restrict bolt

图 3-83

7. Clean the contacting interface and spread sealed adhesive evenly.
Sealed adhesive：seal glue（HZ1213Q/320222 YAP02-92）
8. Install the transmission case assembly, clip and hanger assembly,
Screw down the 4 bolt。
Torque 8～12N • m



1-Hang ring assembly

2-Bolt

3-Guide case assembly

4-Special tool

5-Clip

6-Shift Shift fork shaft bolt

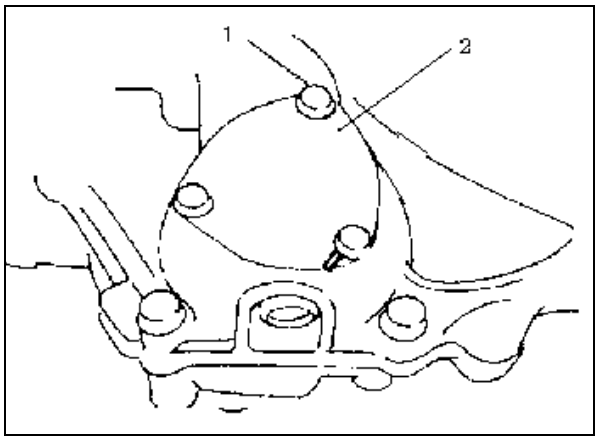
7-Reserve, 5th Interlock bolt

Fig.3-84

9. Install the reserve backup light switch assembly reserve backup light switch Torque 18～28N • m

10. Clean the interface of the transmission cover board and transmission, check the “O” ring and screw down the three bolts.

Torque 8～12N • m



1-Bolt

2-Transmission cover board

Fig.3-85

（6）Clutch release shaft system

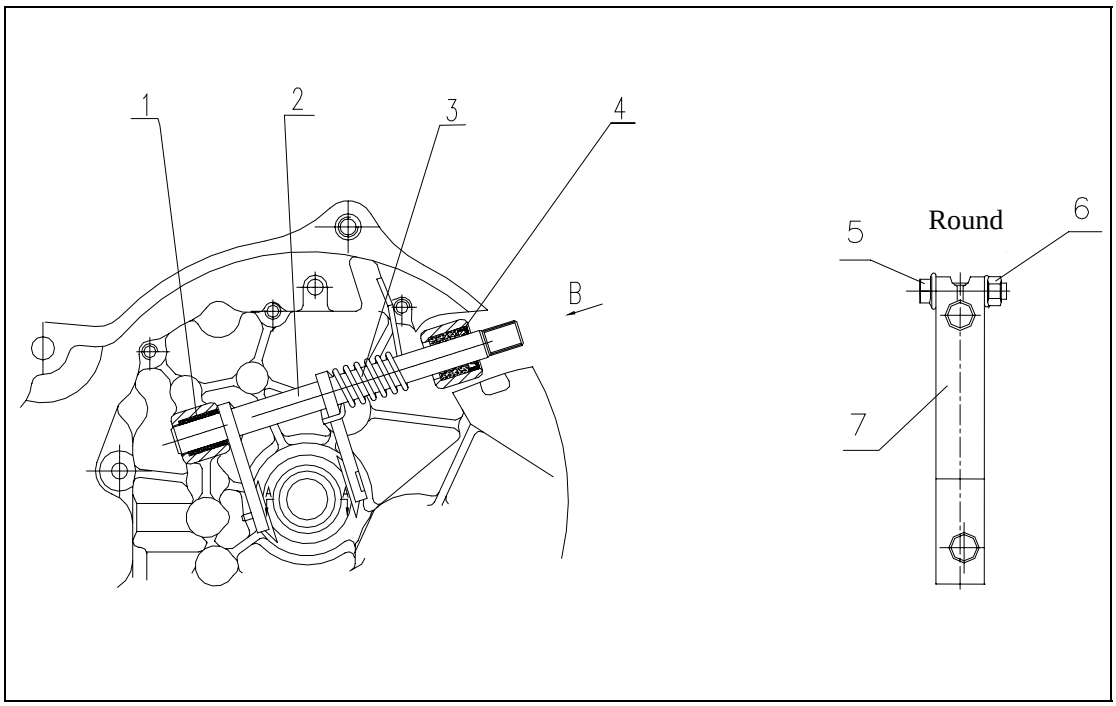


Fig.3-86 Clutch release shaft

1-Spacer1 2-Release shaft assembly 3-Release spring 4-Spacer 5-Bolt 6-Nut 7-Clip

Disassemble:

1, Disassemble the clip ,loosen the bolt, remove the clutch

2, Turn the release shaft, take out the release bearing.

3, Use plier disassembly release shaft return spring。

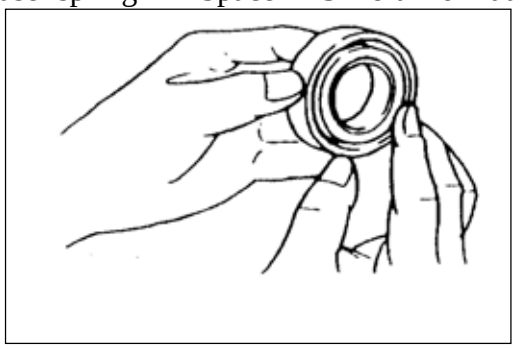


Fig.3-89

4, Use hammer to knock the spacer 2.

5, Remove the release shaft and return spring .

Clutch release shaft ：

Check if the release shaft and slotted spring pin have been declined and broken.

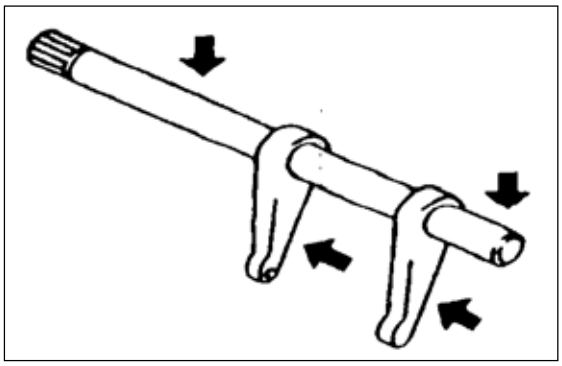
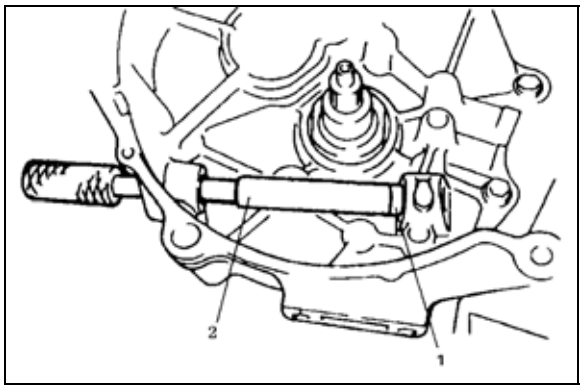


Fig.3-90

Installation：

1, Use special tool to drive in the sleeve 1 ,and spread lubricant.

2, Install the release shaft and return spring.



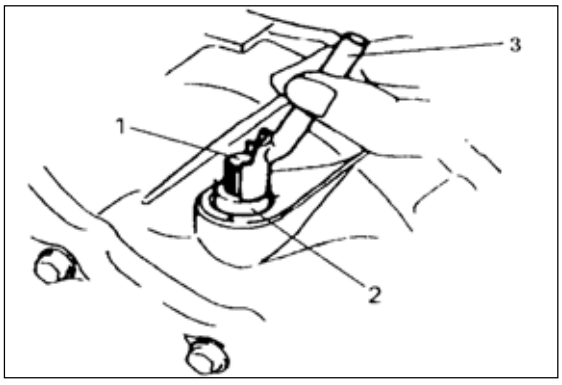
1-Spacer1

2-Special tool

Fig.3-91

3, Spread lubricant in the spacer2 and fix it.

4, Spread lubricant on the release shaft oil seal, keep the lip of oil seal downward and also keep the oil seal surface equal with the case.



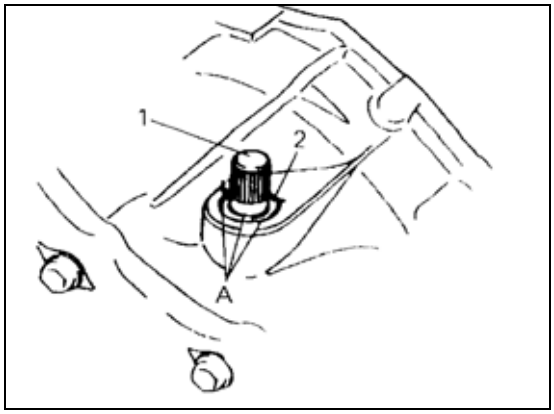
1-Clutch release shaft

2-Release shaft spacer 2

3-Special tool

Fig.3-92

5, Use hammer or special tools to punch 3 small holes.



1-Releaseshaft

2-Oil seal

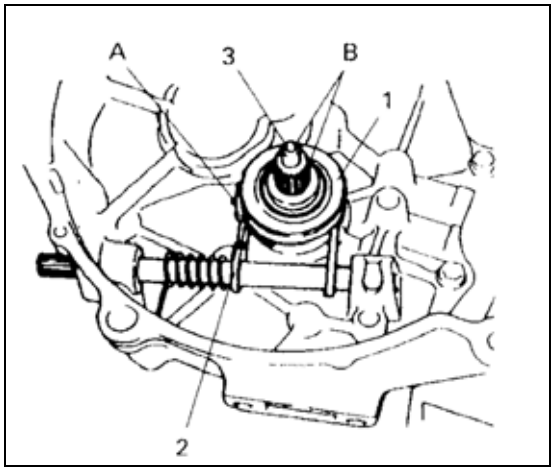
A ： Plug

Fig.3-93

6, Hang the return spring.

7, Spread lubricant inside the release bearing and on the release shaft, install the release bearing.

8, Spread a small quantity of lubricant on the end face of the input shaft splined hub.



1-Release bearing

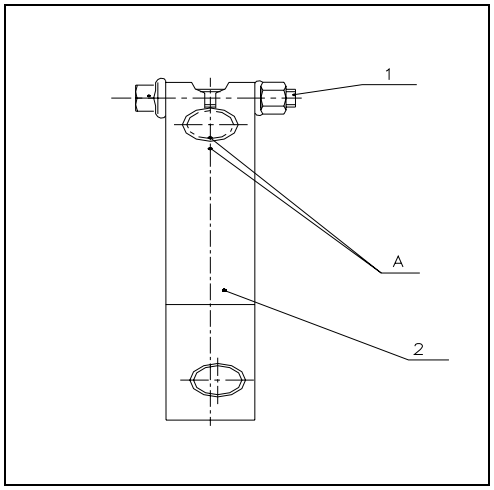
2-Release shaft

3-Input shaft

A, B ： Baste

Fig.3-94

9, Put the marks of clutch fork and release shaft in order, and then screw down the bolt.



1-Bolt

2-Clutch fork

A ： Punch

Fig.3-95

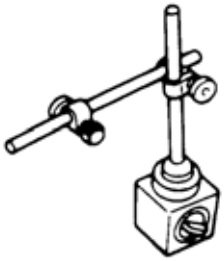
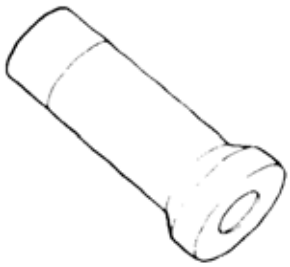
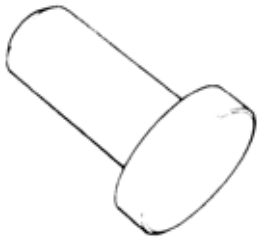
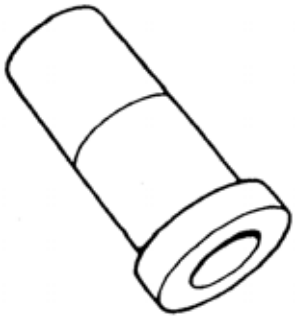
Chapter 3 Torque Stated

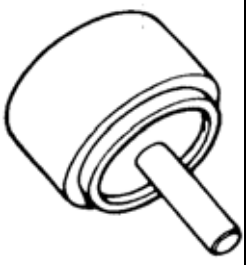
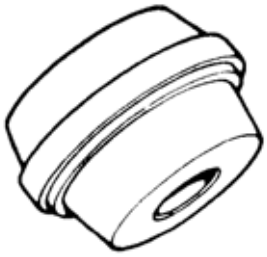
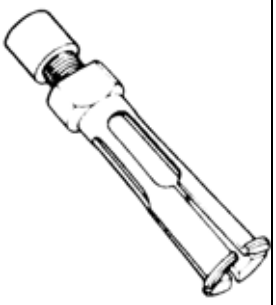
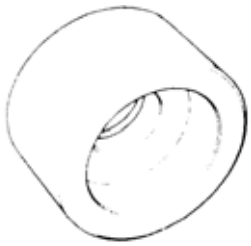
Position	Torque （N • m）
Drain plug	18—23
Shift lever bolt	32—36
Shift head bolt	31.5—35.5
Speedometer case bolt	8—12
Shift lever point bolt	10—16
Reverse Shift fork bolt	18—28
Transmission bolt	15—20
Guide case bolt（4）	8—12
Restrict bolt	18—28
Shift fork shaft point bolt（3）	10—16
Transmission bolt（14）	15—22
Transmission baffle bolt（3）	8—12
Bracket bolt	18—28
Bearing baffle bolt（5）	8—12
Output shaft lock nut	60—80
Gear box bolt（8）	8—12
Filler plug	18—23
Reverse output shaft bolt	18—28
Transmission oil baffle-wall bolt（3）	8—12
5^{th} Shift fork bolt	8—12
Oil baffle-wall bolt	8—12
Clutch fork nut	10—16

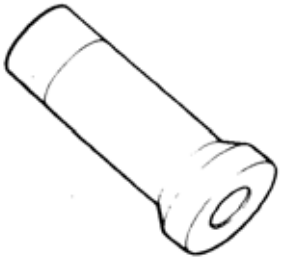
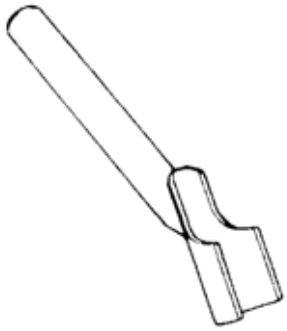
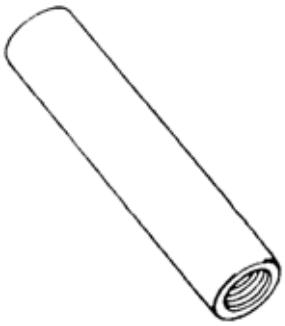
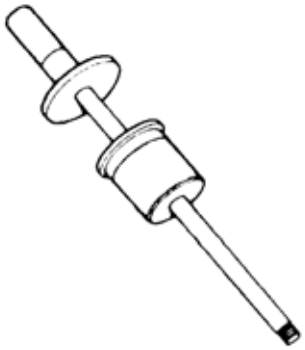
Chapter 4 Maintenance Materials Needed

Materials	Specifications	Use
Lubricant	Lithium 2# lubricant	● Oil seal ● Bearing ● Clutch release bearing ● Clutch Release shaft
	Lubricant	● Needle roller bearing ● Gear
Seal	Seal glue（HZ1213Q/320222 YAP02-92）	● Clutch case and transmission case surface ● Transmission case and gear case surface ● Transmission case and guide case surface
		● Filler plug ● Drain plug
Whorl glue	262glue	● 5^{th} Shift fork bolt ● Restrict pin bolt ● Transmission bolt ● Bracket bolt ● Shift head bolt

Chapter 5 Special Tools

 Snap ring pliers	 Dial indicator	 Dial indicator bracket
 Bearing install tool	 Bearing install tool	 Bearing install tool
 Bearing install tool	 Slotted spring pin disassembly tool	 Bearing disassembly tool

 Bearing tool	 Bearing install tool	 Oil seal install tool
 Bearing outer race install tool	 Slotted spring pin disassembly tool	 Bearing install tool
 Bearing install tool	 Bearing disassembly tool	 Spacer disassembly tool

 Bearing install tool	 Spacer disassembly tool	 Spacer disassembly tool
 Handle	 Puller slide hammer	 Puller
 5th gear lock tool	 E-ring install tool	

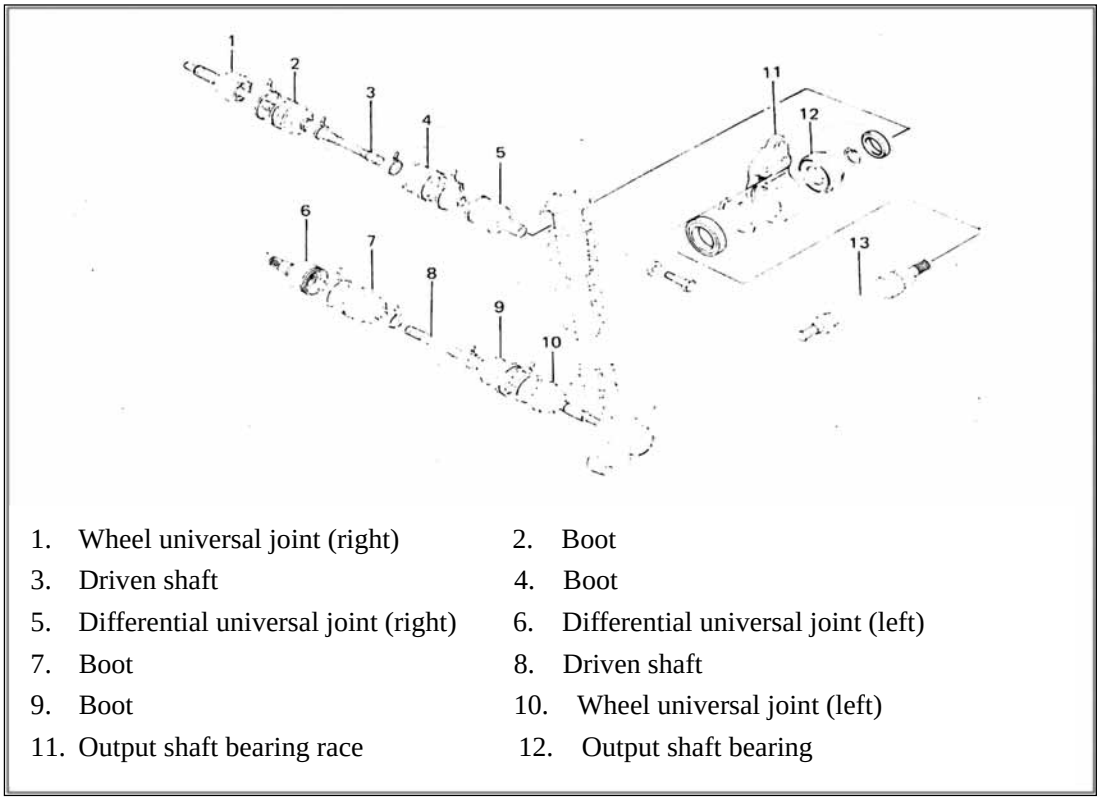
Chapter 6 Propeller Shaft

Universal joint

This propeller shaft is available for the vehicles with manual transaxles.

I. Summarization

The front wheel driven shaft adopts universal joint and the differential.



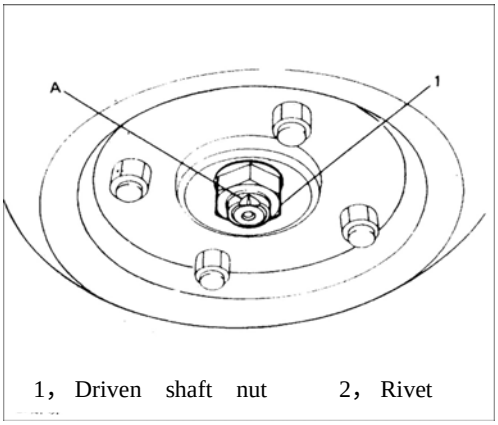
1. Wheel universal joint (right)
2. Boot
3. Driven shaft
4. Boot
5. Differential universal joint (right)
6. Differential universal joint (left)
7. Boot
8. Driven shaft
9. Boot
10. Wheel universal joint (left)
11. Output shaft bearing race
12. Output shaft bearing

II， Disassemble

1. Disassemble the left shaft.

On the ground:

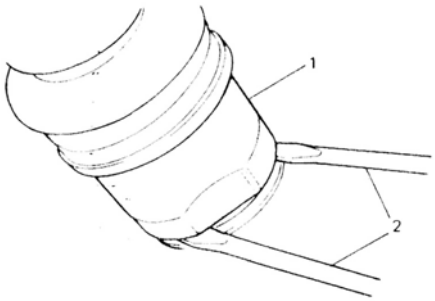
Loosen the rivet, remove the propeller shaft nut and gasket on the Lift



1，Driven shaft nut 2，Rivet

（1）Let out the transaxles oil.

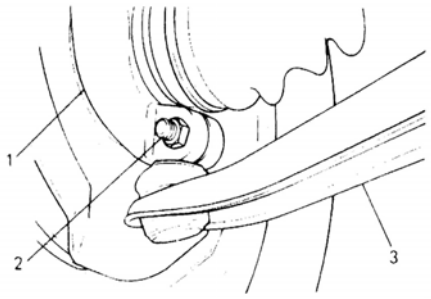
（2）Remove the driven shaft universal joint to make the snap ring. Break away from the differential universal joint splined hub.



1， Driven shaft universal joint （left）

（3） Remove the joint from the Suspension arm.

（4）Remove the ball joint bolt and nut and disconnect the suspension arm from the steering .

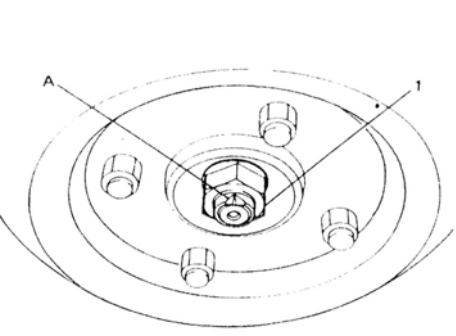


1， Steering

2， Ball joint bolt and nut

3、Suspension arm

（5） For disassembling the propeller shaft assembly, first pull out the inner universal joint, second pull out the wheel universal joint from the steering .



1， Driven shaft nut A， Rivet

Caution: When disassembling the propeller shaft assembly,
Be sure to prevent the rough touch and collision.

2. Disassembling the right shaft.

On the ground:

Loosen the rivet and remove the propeller shaft nut and gasket .



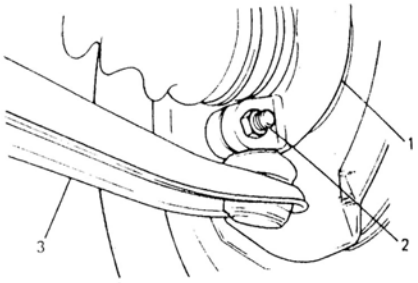
On the lift:

（1）Use plastic hammer to knock the propeller shaft universal joint to break the snap ring away from differential universal joint splined hub.

（2）Disconnect the joint from the suspension arm.

（3）Remove the ball joint bolt and nut, and then disconnect the suspension arm from the steering.

（4）For disassembling the propeller shaft assembly, first pull out the inner universal joint from the output shaft, secondly pull out the end of wheel universal joint from the universal joint.



1， Steering 2， Ball joint bolt and nut

Caution: When disassembling the propeller shaft assembly, be sure to prevent the rough touch and collision.

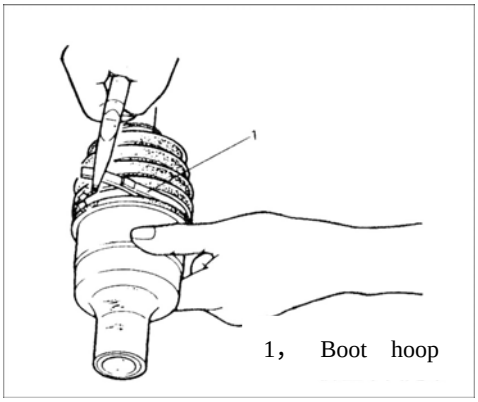
（5）Let out the transaxles oil.

（6） Loosen the central bearing seat bolt, remove the output shaft from differential side gear.

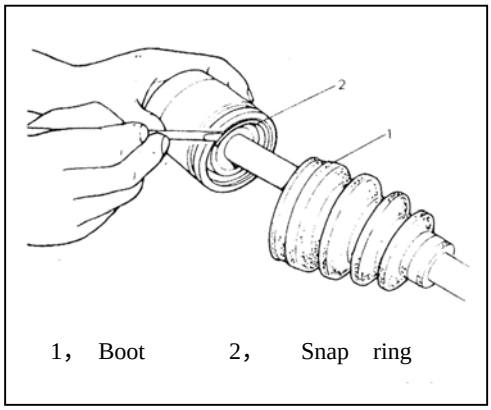


3. Disassemble the propeller shaft.

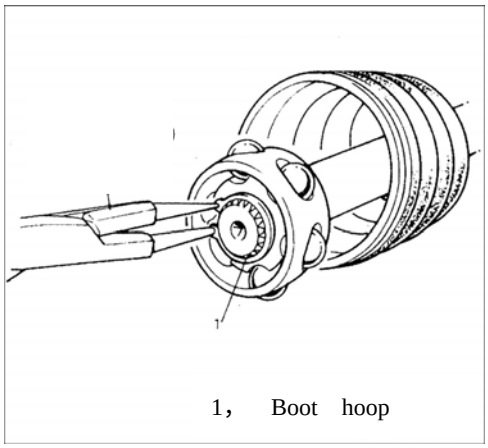
（1） Remove the differential universal joint boot hoop.



（2） Move the boot to the middle position and take out the shaft from the bell-mouthed.

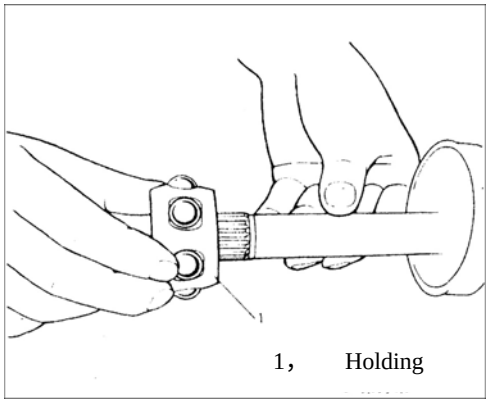


（3）Scrape off the lubricant and remove the holding snap ring with special tool (A).



1， Boot hoop

（4）Draw out the holding and boot.



1， Holding

Notice:
The end of wheel universal joint。

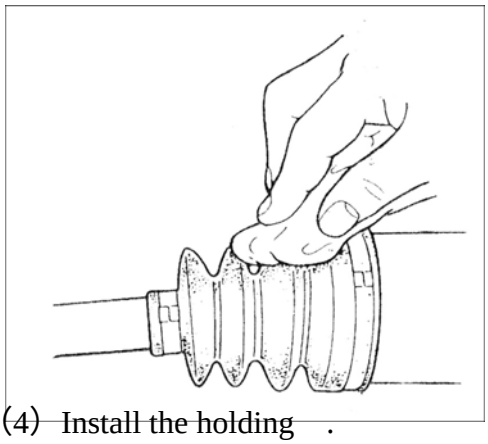
III， Installation

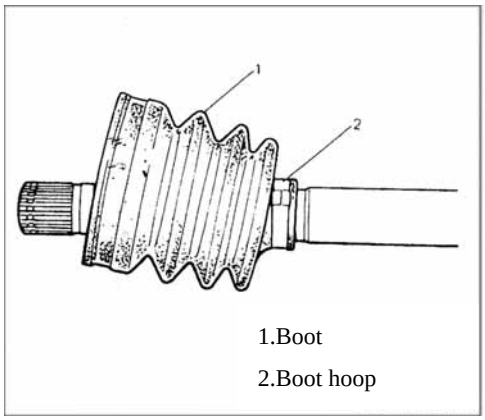
1， Installation of propeller shaft.

（1）Clean the parts (except the boot) and dry the parts with compressed air.

（2）Use a piece of clean and dry cloth to clean the boot, be sure not to use skim milk (such as gasoline or coal oil).

（3）Put the boot onto the axle till the small diameter set in the shaft slot and fix the hoop.

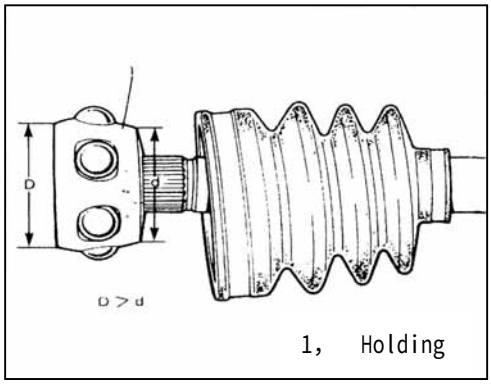




1.Boot
2.Boot hoop

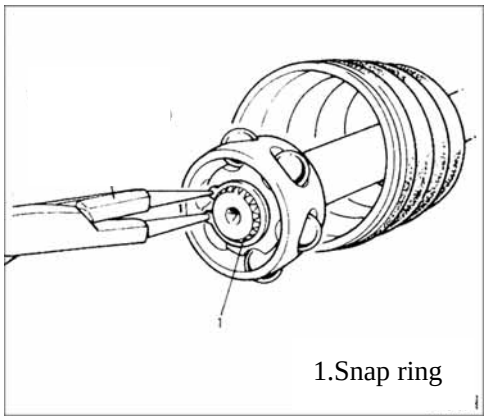
(4) Install the holding .

Caution: When installing the holding, keep the small diameter towards the shaft end.



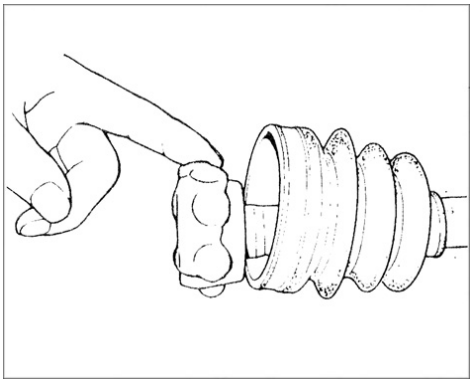
1, Holding

(5) Use special tool (A) to install the snap ring.



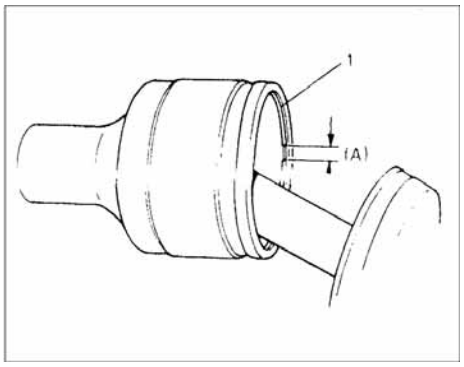
1.Snap ring

（6）Spread 30-40 g of SUZUKI high class grease H on the surface of the holding.

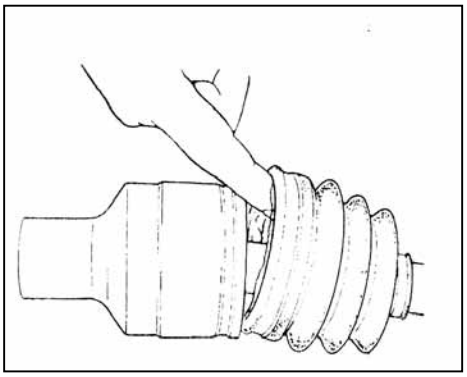


（7）. Put the holding into the bell-mouthed, and then put the snap ring in the snap ring slot.

Caution: snap ring hatch (A) can not aim at the ball.

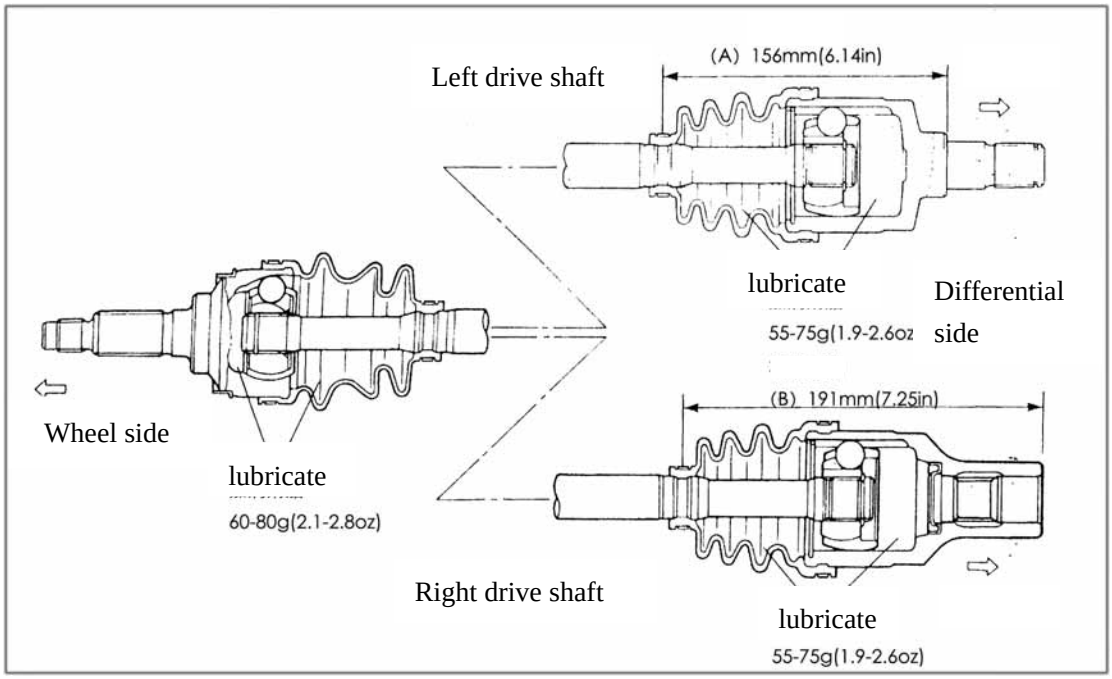


（8）Fill in 23-35g of SUZUKI high class grease H, put the boot on the bell-mouth, Then install boot on bell-mouth。



After installing the boot, insert a driven screw into bell-mouthed boot, send air into boot.

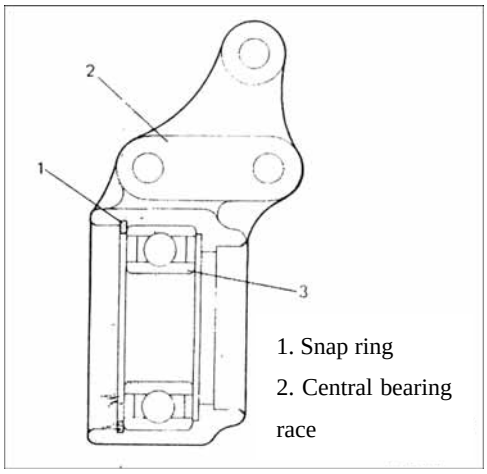
9. Fix the boot on the bell-mouthed. Adjust the measure (A) and (B) to accord with the fig. Below.

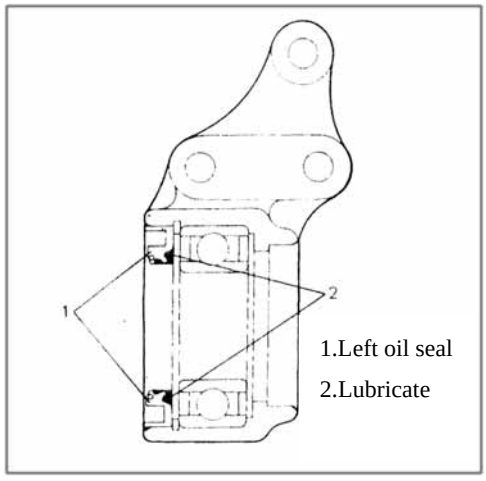


（2）install output shaft and bearing race.

Install the output shaft according to the reverse order and pay attention to the followings.

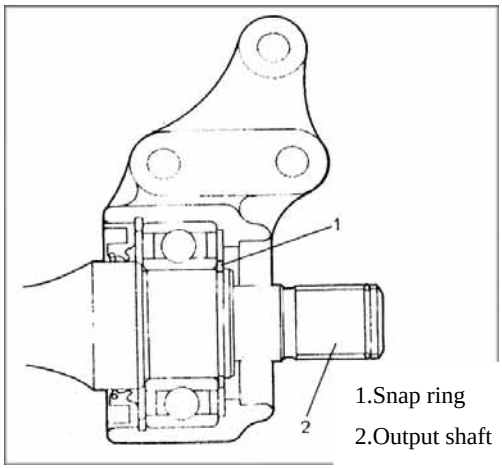
When installing the bearing race snap ring, be sure the snap ring has been fixed tightly in the central bearing race snap ring slot; keep the left oil seal in the right direction shown in the fig. below.



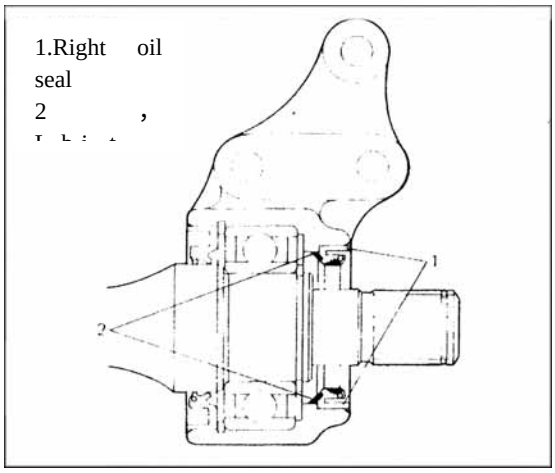


Fix the snap ring tightly in the snap ring slot.

When install the right oil seal, keep the right direction shown in the fig. below.



1.Snap ring
2.Output shaft



1.Right oil seal
2 ,

VI， Installation

Install the propeller shaft assembly according to the reverse order, clean the front wheel bearing oil seal and spread lubricant.

First install the end of wheel universal joint on the steering and then install the universal joint on the end of differential.

Manual transaxles drain plug seal。

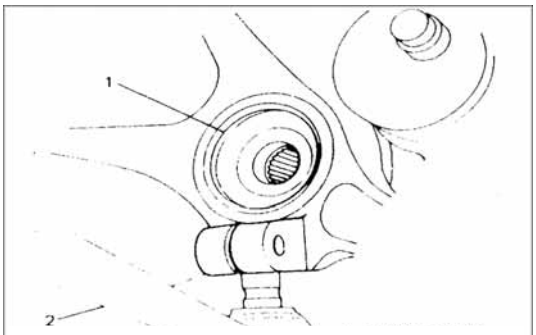
Fill up the transaxles.

Caution:

Do not hurt oil seal and boot.

Do not hammer the universal joint boot to adjust, use the hands to insert the universal joint.

Be sure the differential universal joint has been inserted to the right position and the snap ring has been placed on the original position.



1. Front wheel bearing seal
2. Suspension arm

V． Recommended Value of torque

Screw down parts		Torque		
		N·m	kg·m	1b-ft
Drain plug	Manual transaxles	25-30	2.5-3.0	18.5-21.5
	Automatic transaxles	18-23	1.8-2.3	13.5-16.5
Oil level, refill plug	Manual transaxles	36-54	3.6-5.4	26.5-39.0
Ball joint bolt and nut		50-70	5.0-7.0	36.5-50.5
Propeller shaft nut		150-200	15.0-20.0	108.5-144.5
Central bearing race bolt		40-60	4.0-6.0	29.0-43.0
Joint nut		18-28	1.8-2.8	13.5-20.0

Maintenance Materials Needed

Materials	Recommended SUZUKI Products	Used Parts
Lithium lubricator	**SUZUKI** lubricator A (99000-25010)	Oil seal
Seal sub	**SUZUKI** glue 1215 (99000-31110)	Manual transaxles Drain plug
Lubricator	**SUZUKI** lubricator (99000-25120)	Driven shaft universal joint

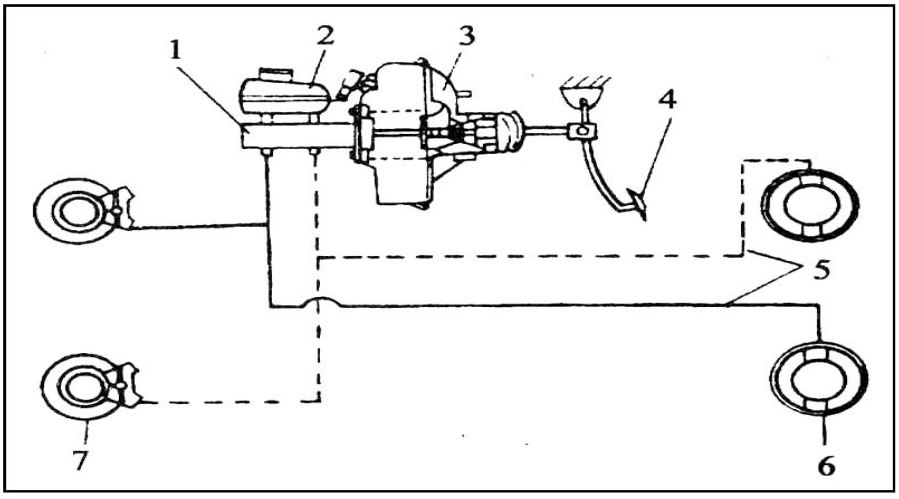
Chapter 1 Braking System

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.

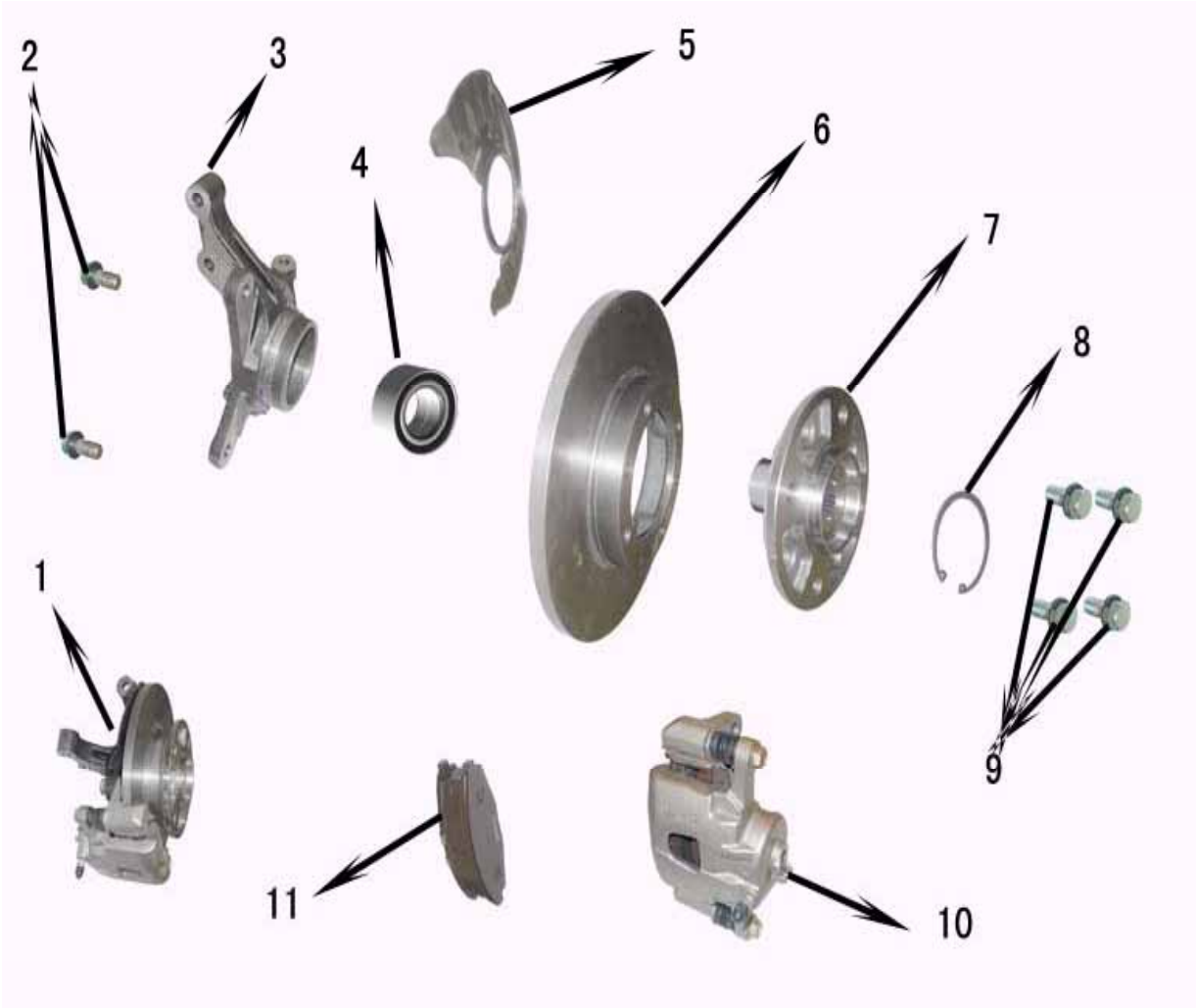


QQ Car Brake System

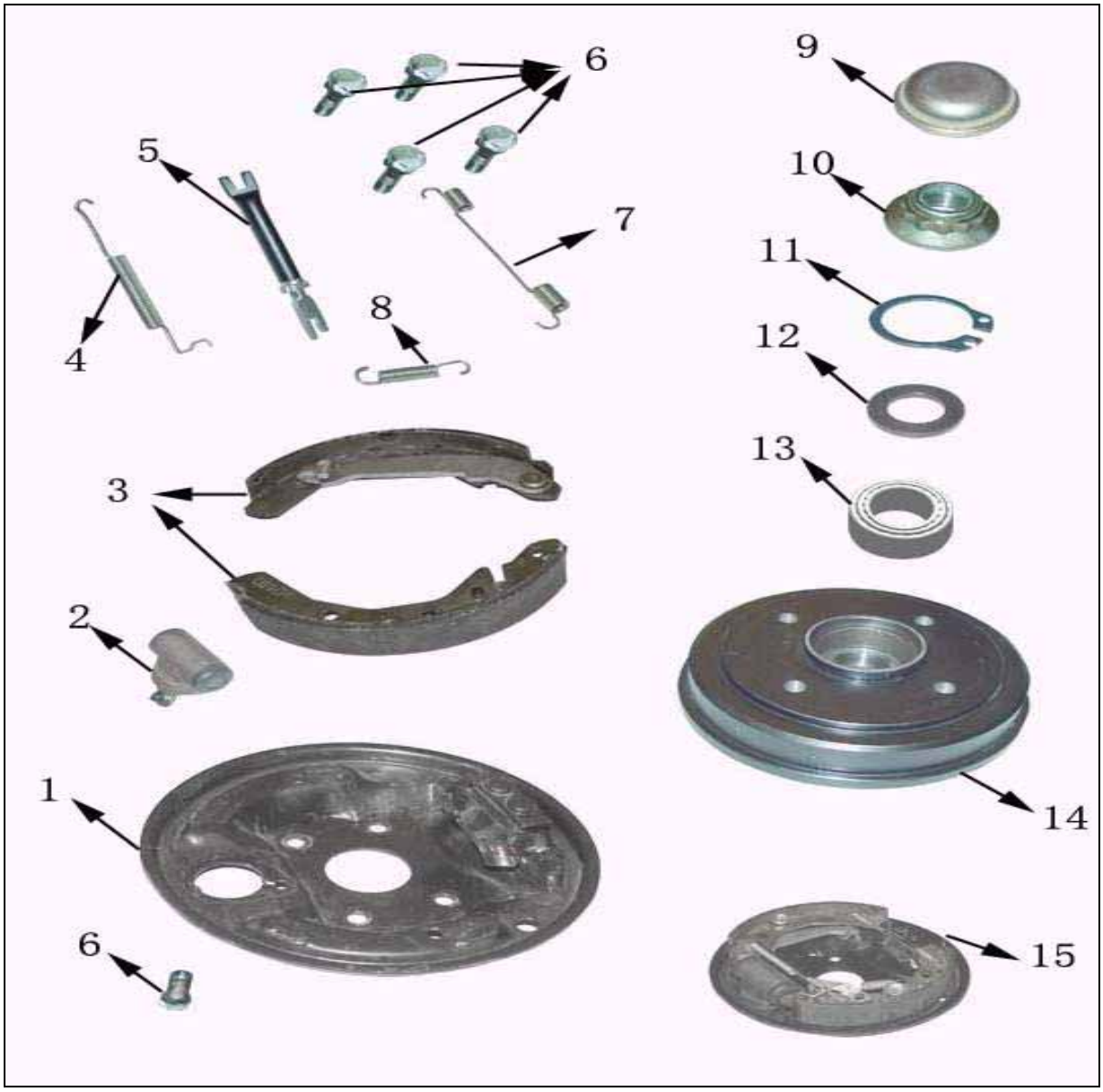
1-Brake mast cylinder; 2- Liquid storage tank;3 -Vacuum actuator; 4-Brake pedal;5-B raking line;6-Rear wheel drum type brake;7-Front wheel disc type brake;

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

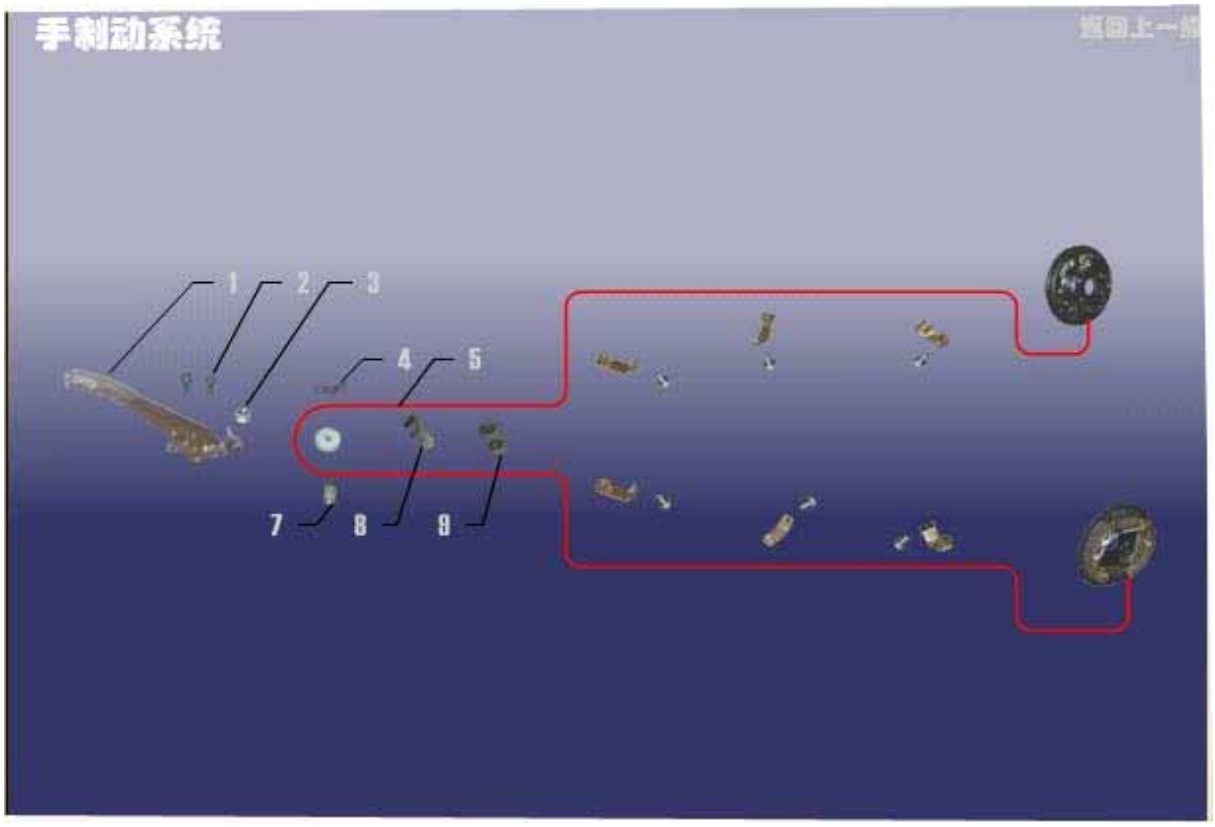
acts as the static status brake, featuring simple configuration and practicality as well as high efficiency in operations. The braking pipeline system of the QQ cars adopts the diagonally arrayed dual-loop braking system. The front chamber of the main cylinder is connected to the brake of the left front 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 leved
- 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 will lead to the slight lowering of the liquid level in the storage 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.

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 corrosions 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

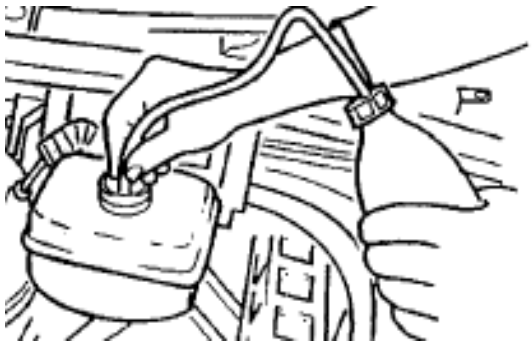
Clean the outer surfaces before opening the cover of the liquid storage tank so as to prevent the dust from entering the tank.

- 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.

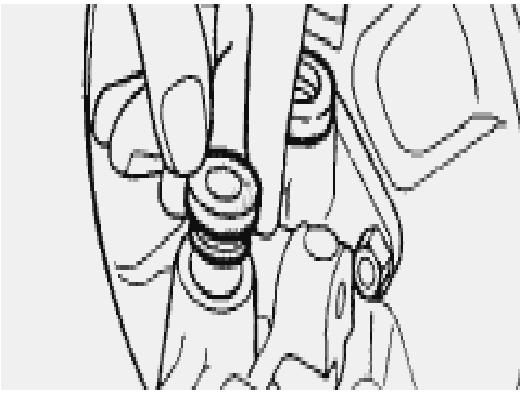
Make proper replacements if there are any damages as follows.

- 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.

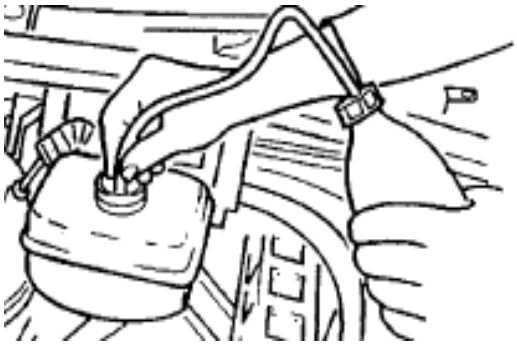


2. Fix the braking master pump and the storage tank with screws, and tighten the screw with a torque of 23-27N.m.
3. Connect the plug of the liquid level sensor of the storage tank.

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.



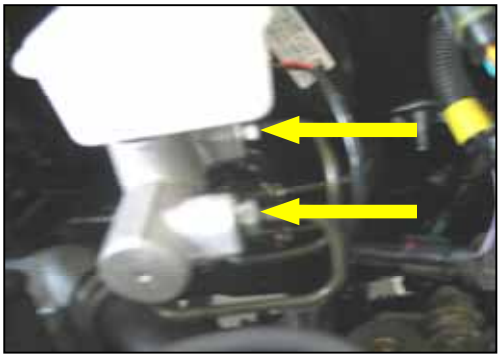
3) Dismounting and installation of the braking master pump



I. Dismounting of the master pump

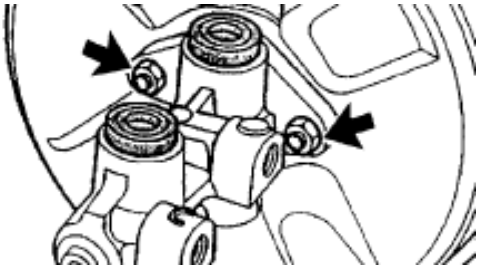
1. Remove the wire plug of the liquid level sensor of the storage tank.

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

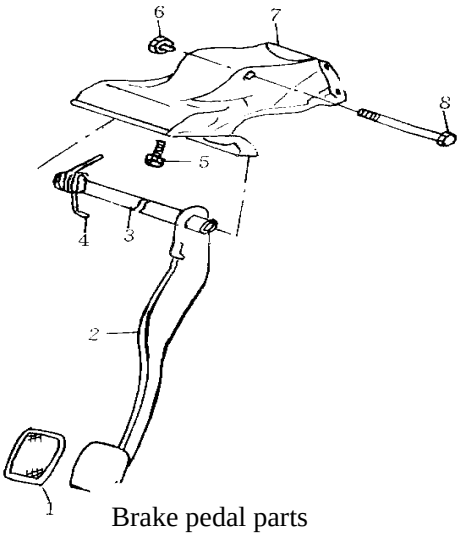
1、Removal stop lamp switch plug.
2、Remove the split pin for the brake pedal and the vacuum actuation pump, then take of the pin bolt
3. Loose brake pedal shaft lock nut, from right unsling pedal shaft
4. Removal pedal and spring

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.







Brake pedal parts

1.Pedal pad;2.Brake pedal;3.Gasket;4.Pedal return spring;5.Bolt;6.Nut;7.Pedestal.

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

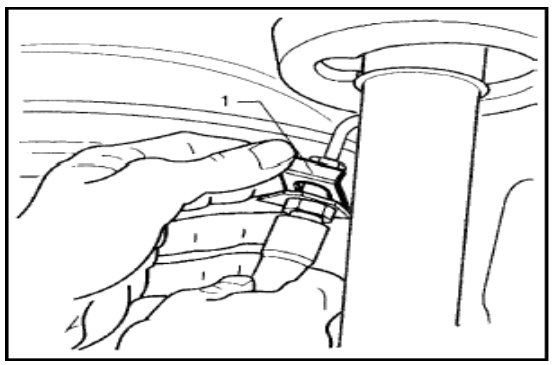
1. Install caliper 2
- Brake hose screw 4
- Hose 5
- Two new gaskets 3

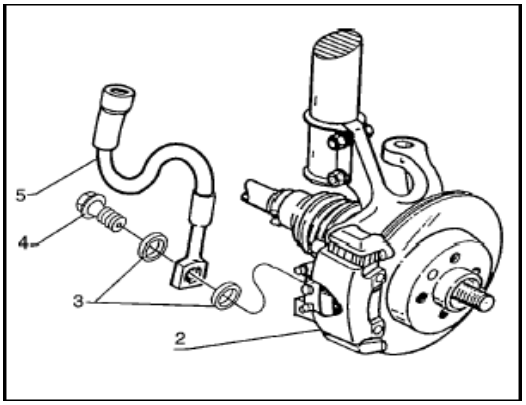
2.Use brake fluid to lubricate screw thread

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".

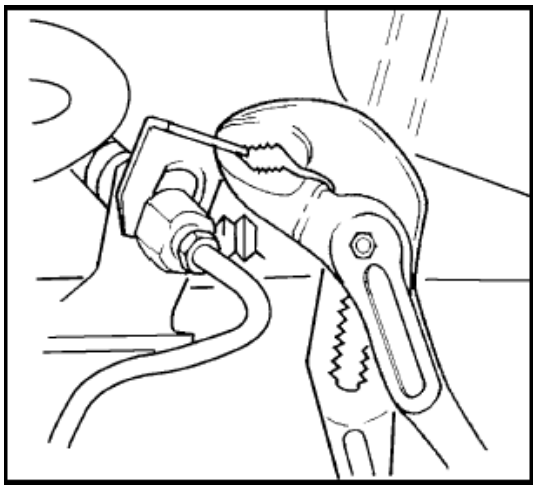
2) Rear wheel brake replace

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.



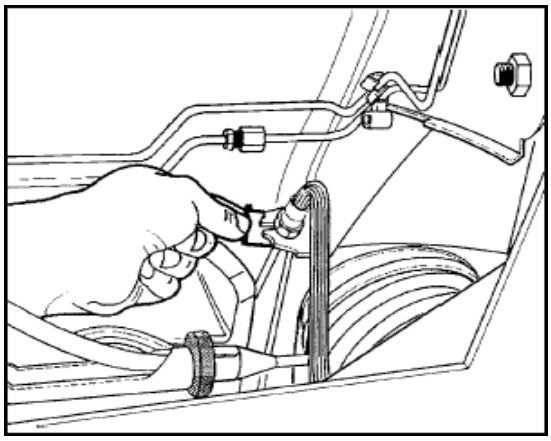
Steps of installation

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.

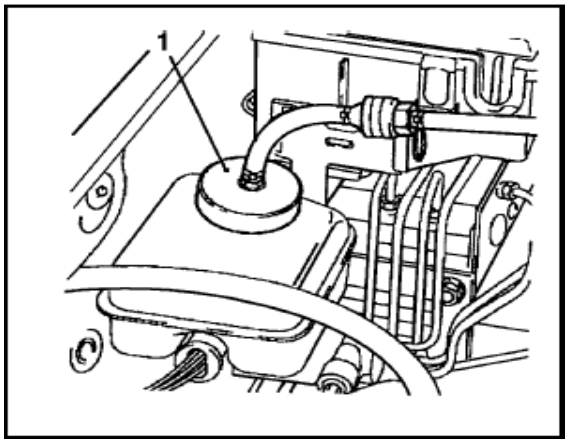
7. When no bubbles appear in the fluid, close brake pipe connector on ABS regulator.

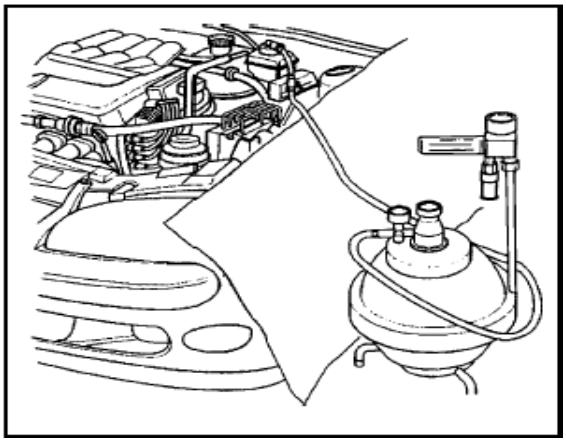
Fixture

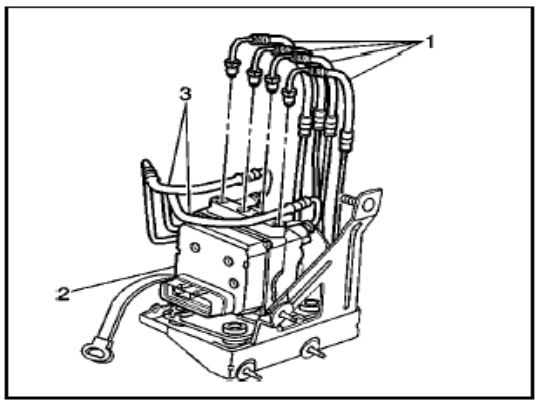
Screw brake pipe connector on ABS regulator to 8N.m.

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 6N.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.

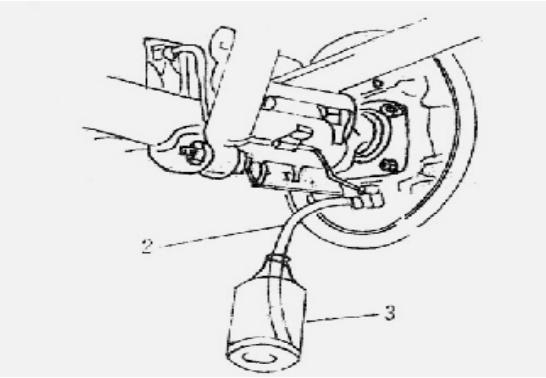
23. Turn off ignition switch.

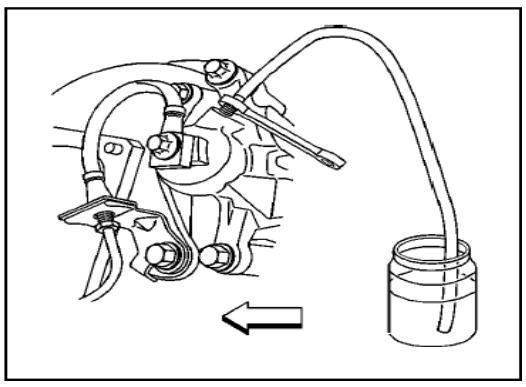
24. Check brake pedal vibration and stroke.

- 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

p 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.

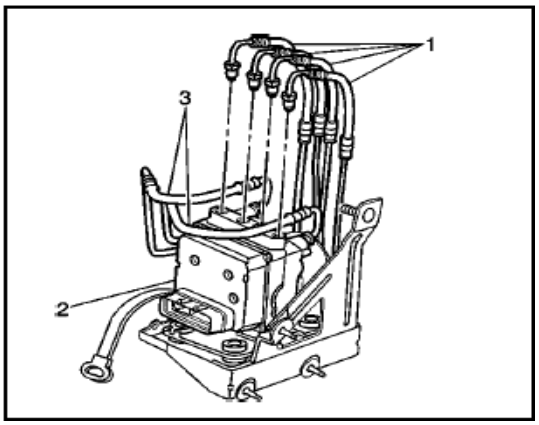
4. When no any bubbles in the fluid, close brake connector on ABS regulator

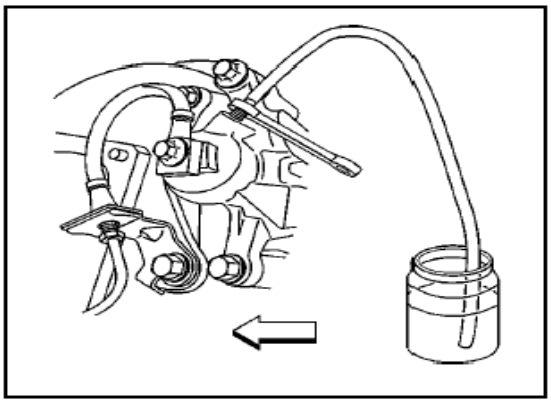
Fixture

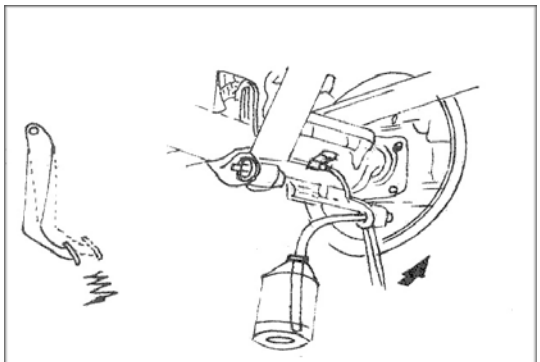
N.m。Screw brake pipe connector on ABS regulator to 16N.m.

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.







Exhaust operation (II)

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.

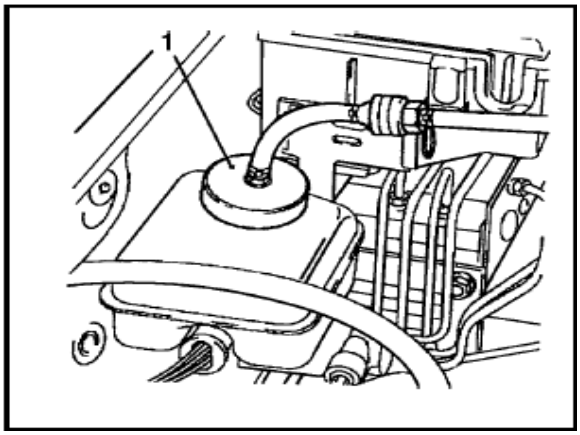
Warning: Don't fill fluid too much. It will flow out to engine exhaust parts to result fire.

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

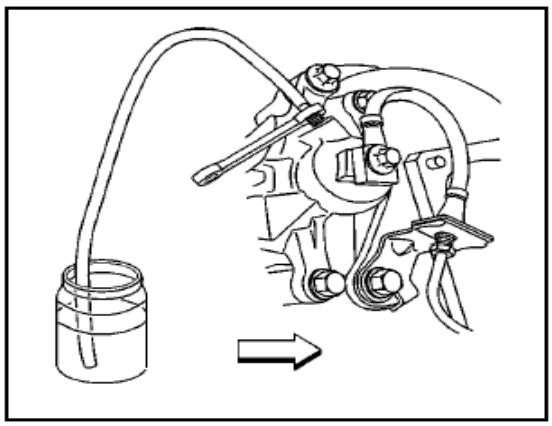
9. Install transparent plastic hose to right rear valve.
10. Put other end of hose into the container with clean fluid.
11. Slowly open the valve to flow out fluid.
12. Close the valve when no bubbles appear. fix the valve to 8 N.m.



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.

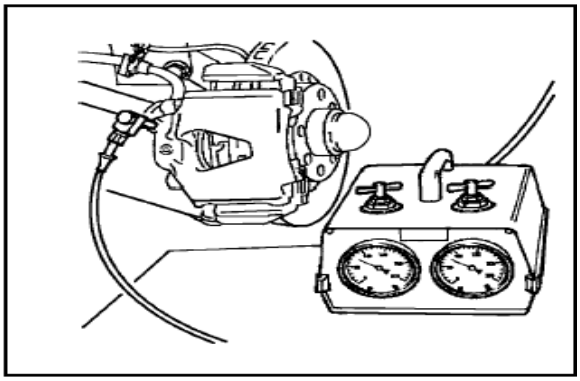
3. Repeat step down the pedal hard to set up 20 Pa pressure.

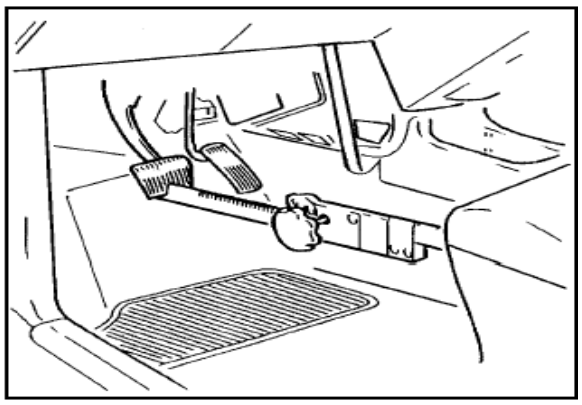
4. Install the pedal tensioner between driver seat and the pedal.

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.

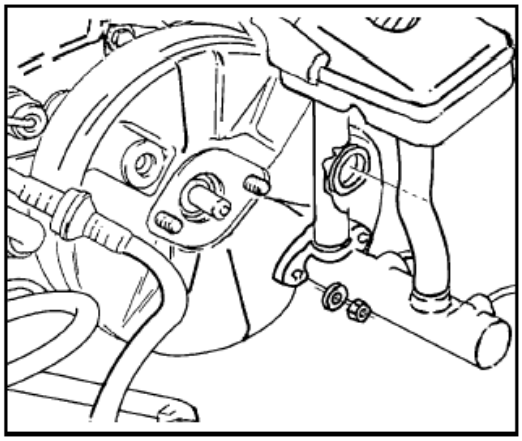
6、Pull out vacuum booster from left of engine.

Vacuum actuator check

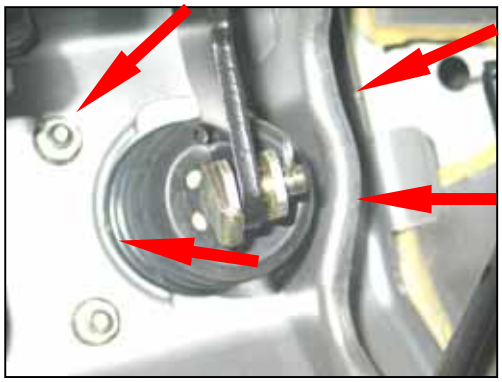
There are two methods for checking vacuum booster. One is to use tester. The other is confirming working condition without tester.

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.

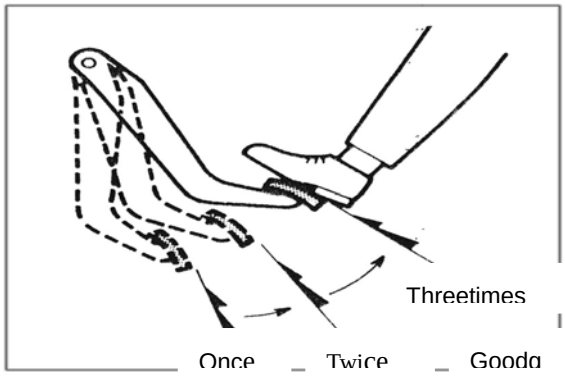
2、After the engine is started, step the pedal once again. If the stroke is slightly increased, the operation will be safe; if there is no replace in the stroke, please contact the maintenance station or the manufacturer.

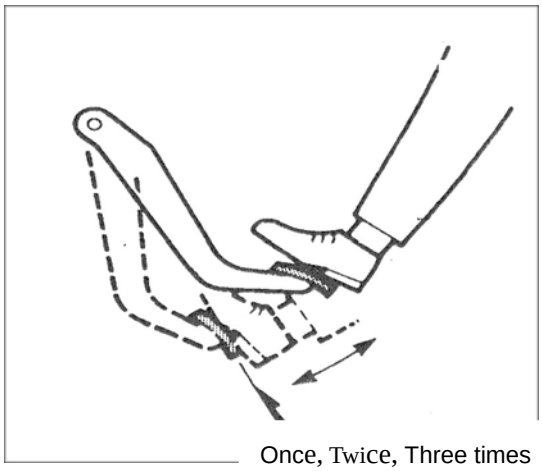
Attention:

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

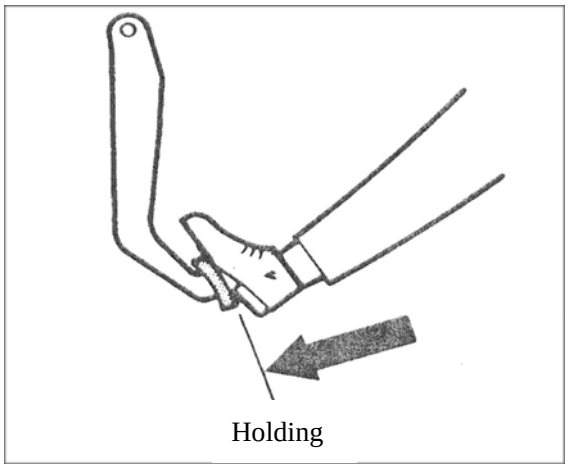
Make proper replacements of the defective parts.

Repeat all the tests after replacing the parts.

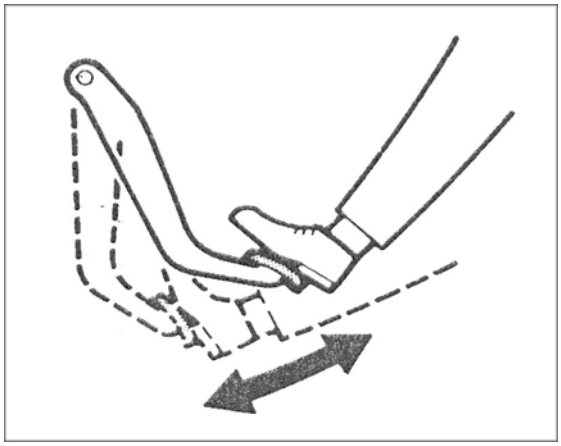


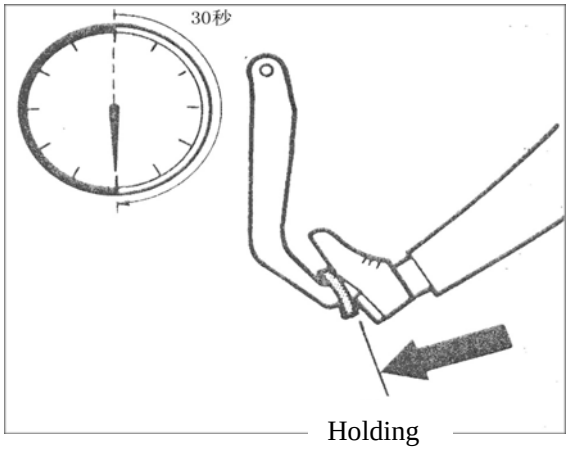


Once, Twice, Three times



Holding





Holding

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.

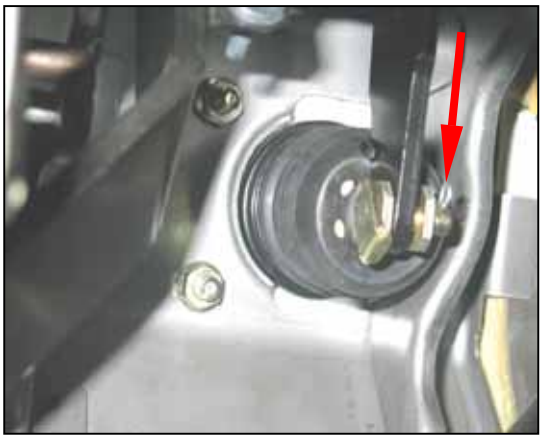
Attention: If the checks fail, the inspections on the vacuum tube and sealing parts will be needed.

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.

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

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.

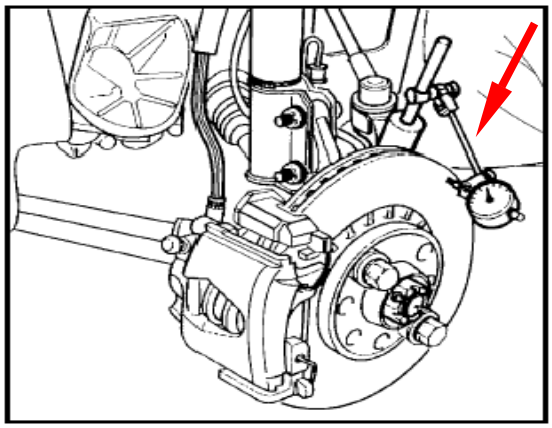
Disassembly procedure

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

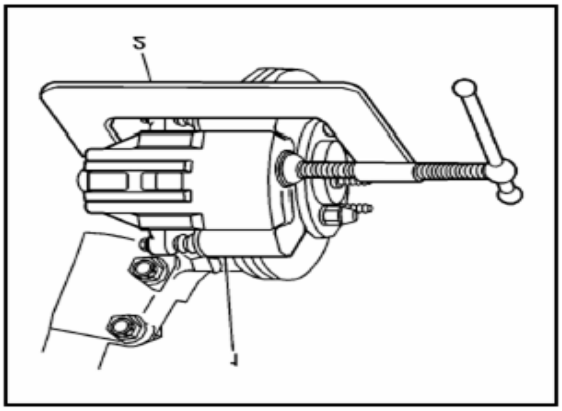
Disassembly procedure

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.



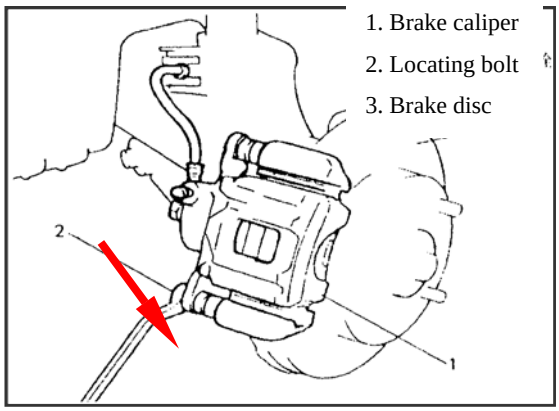
5. Remove bolts on lower end of caliper.

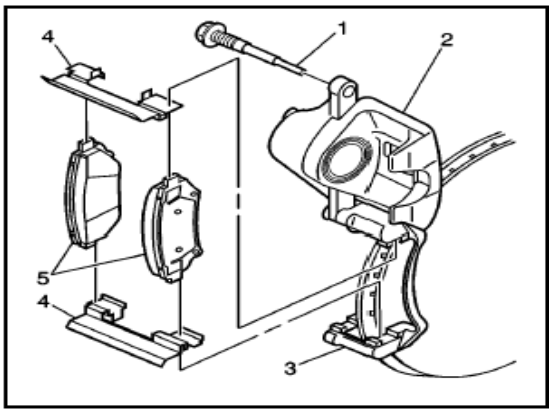
HINT: Turn caliper carefully to avoid damage bolt hood.

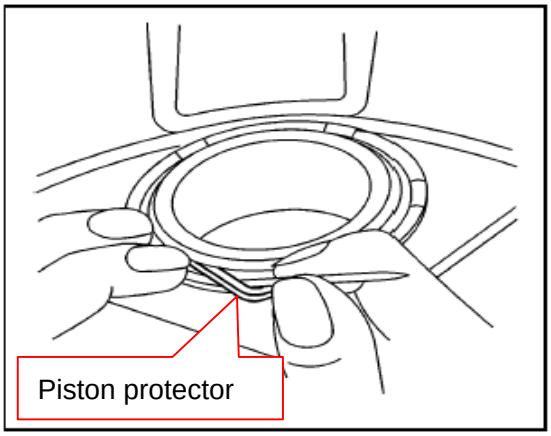
7. Turn caliper upwards to repair lining.
8. Remove lining from caliper support.
9. Remove two clamps from support.
10、Check if following parts is cut, crack or wear. Replace any damaged parts:
    - The support bolt hood.
    - Piston protector
11、Check if bolts are damaged. Replace new one if damaging.

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.







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.

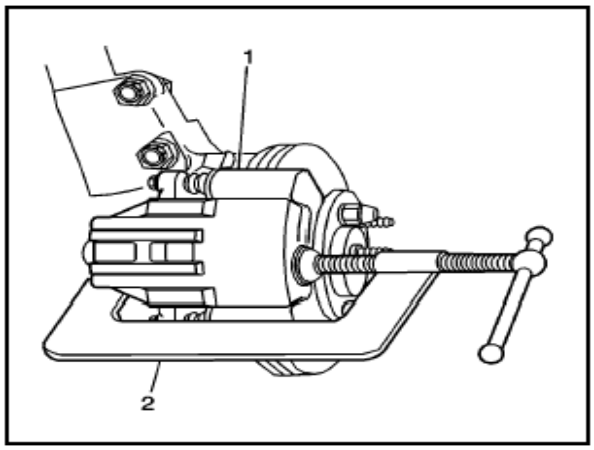
9. Removal caliper bolt

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.



4)Brake caliper replace

Disassembly procedure

1、Drain out 1/3 fluid in master cylinder.

2、Support and lift vehicle.

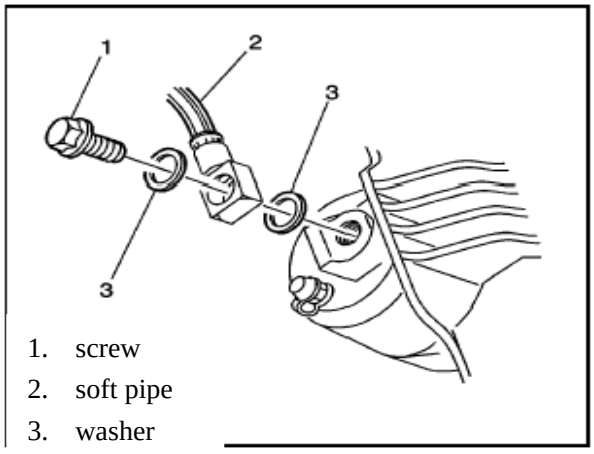
3、Mark the position of wheel to the wheel hub.

4、Remove front tire and wheel assembly. See “Remove and install tire and wheel”.

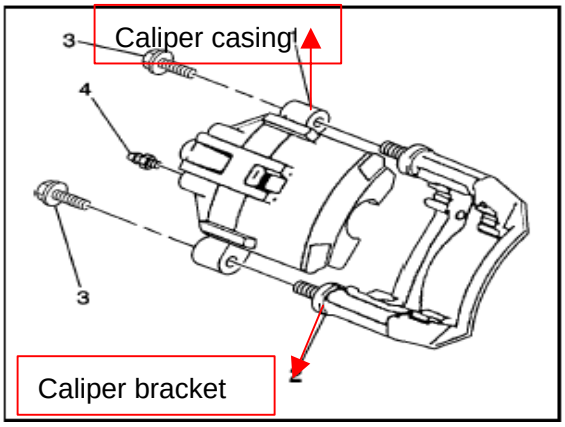
5、Install a big C caliper on top of shell to peak rear of outside lining.

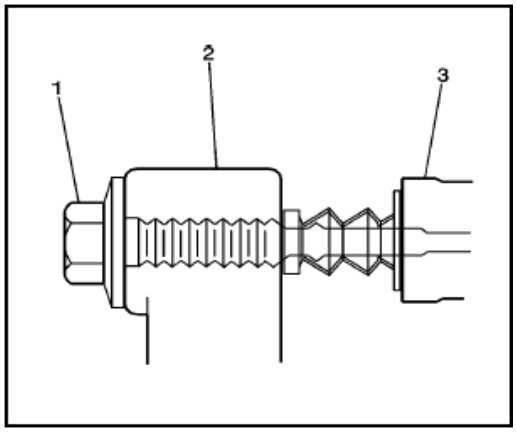
6、Slowly screw C caliper until the piston enters cylinder deep enough to pull out caliper from the disc.

HINT: Don’t use flexible hose to suspend caliper, otherwise it will



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

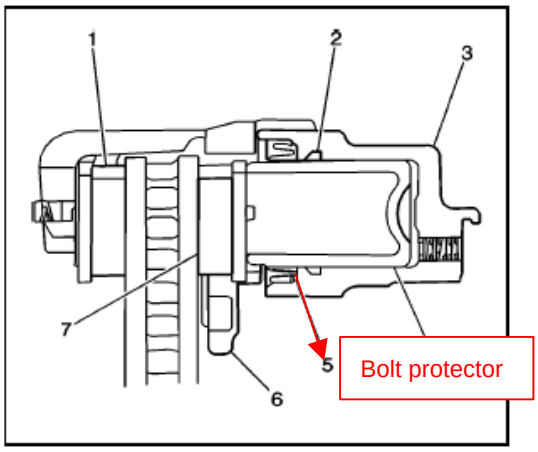
The hose bolt screw torque is 85N.m.

6. Remove wheel bolts

7、Remove front tire and wheel assembly. See “ Remove and install tire and wheel”.

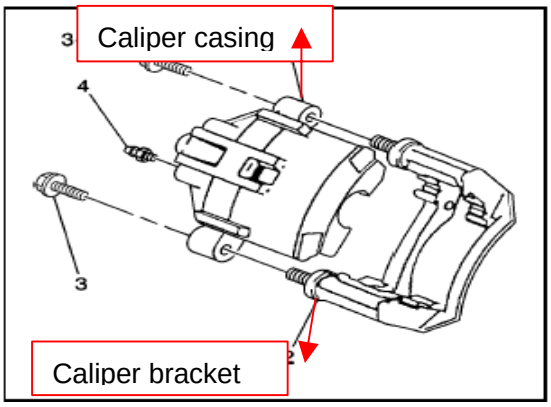
8. Lower vehicle

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

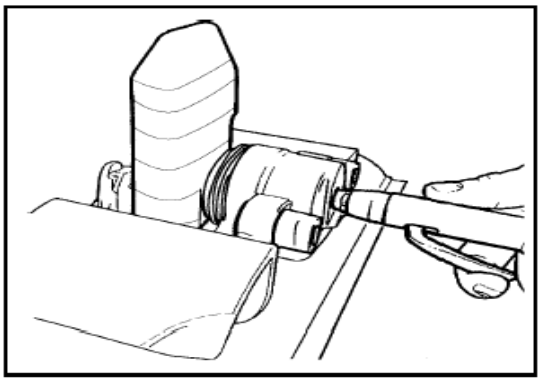
Remove brake caliper. See “ Remove brake caliper”

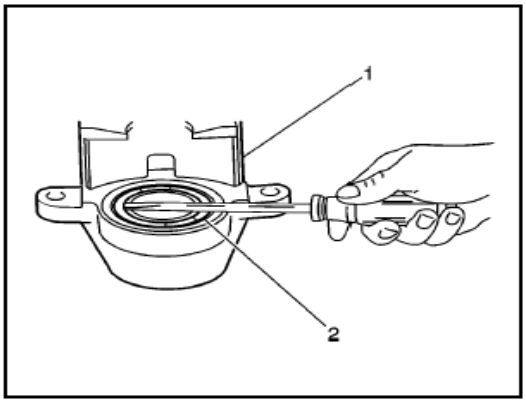
Warning: Don’t use fingers to hold piston, it will cause serious personal hurt.

Attention: Take care to remove piston from cylinder.

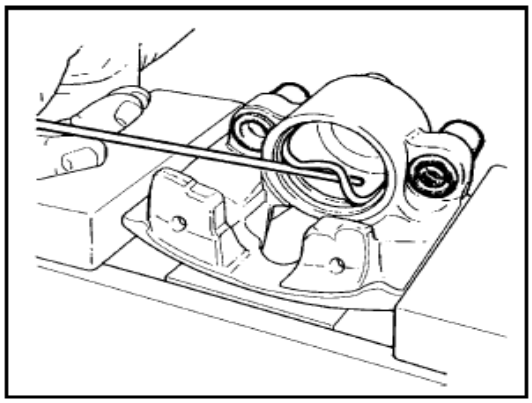
1、Remove piston. Clamp caliper. Use compressed air to remove piston from

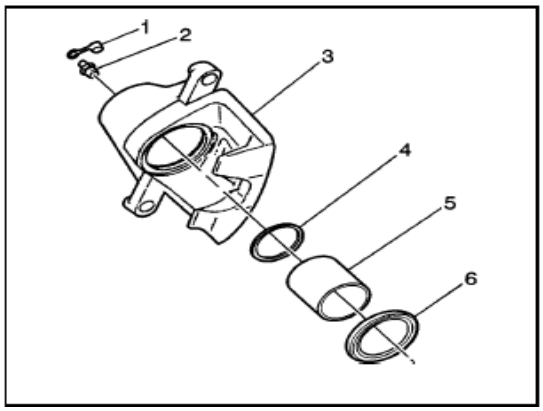
cylinder.
Attention: If piston is damaged, it must replace whole caliper.
Don't scratch cylinder during replacing.

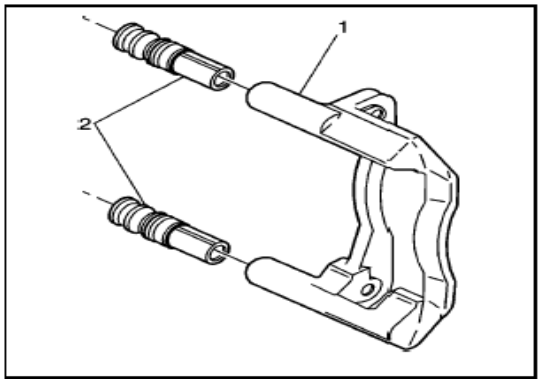




3、Use small wooden tool or plastic tool to remove seal ring.
Attention: Don't use metal tool to remove. It will scratch cylinder or seal groove.
4、Check if piston is cut, crack or wear. Replace any damaged piston.
5、Check if cylinder or seal groove are cut, crack or wear.
6、Use fine sands paper to polish 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.

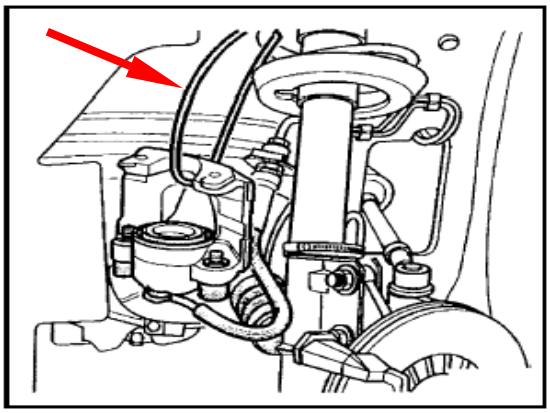
- Bolt protector
- Bush

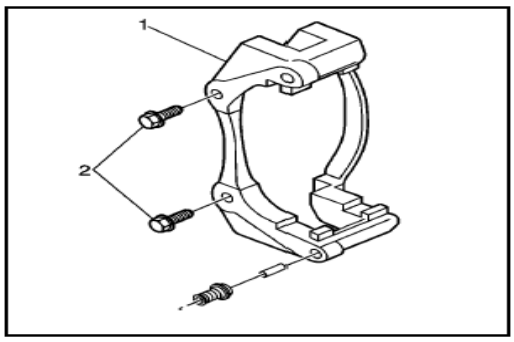
3、Screw bolts to fix caliper support.

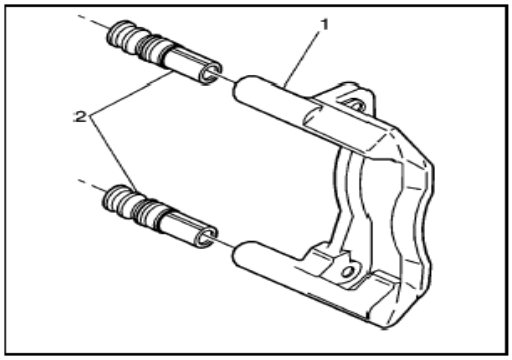
Fixture

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

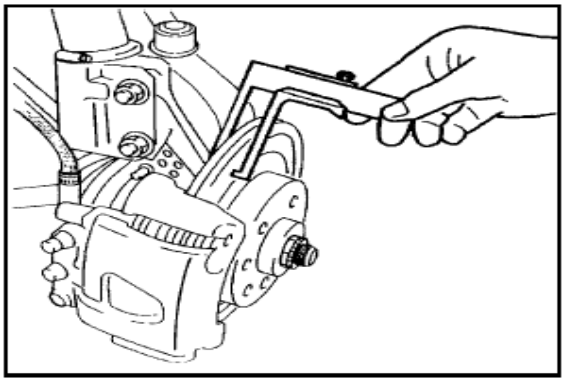
Screw bolts to 6 N.m.

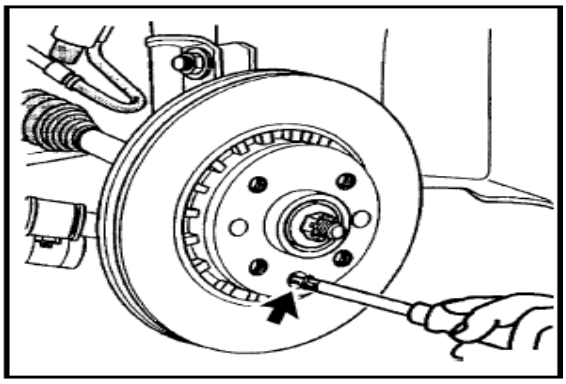
3、Install caliper.

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 loosing 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

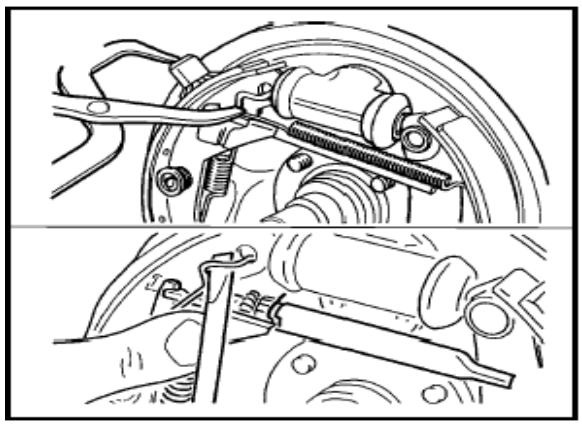
- Check brake lining when driving every 1.5000km.
- Check lining when removing wheel and tire.
- Remove the rubber cock on check hole of lining.
- Check the thickness of lining.
- Whenever the wear of lining depth exceeds 2mm, replace new lining. If fixing lining with rivet, when wear exceeds 0.5mm, replace new lining.

2)Brake scrape gasket replace

Disassembly procedure

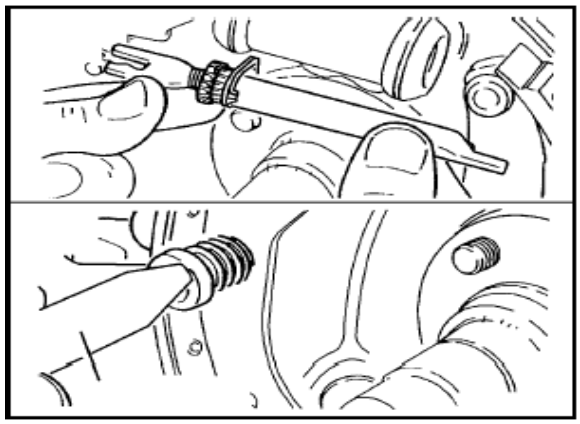
It recommends to use lining or other pats produced by Chery to keep front/rear brake function. The brake parts produced by Chery are selected carefully to offer best brake function.

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.

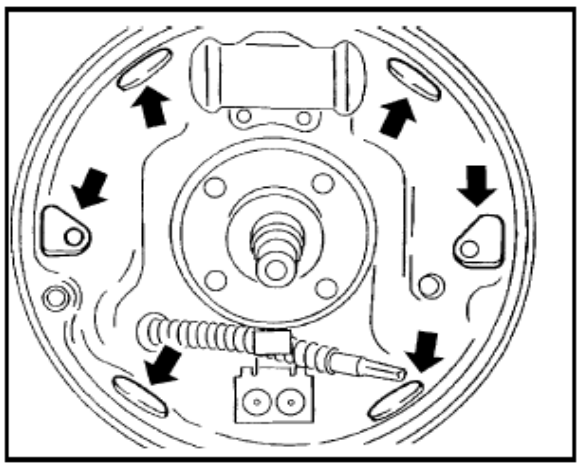


Steps of installation

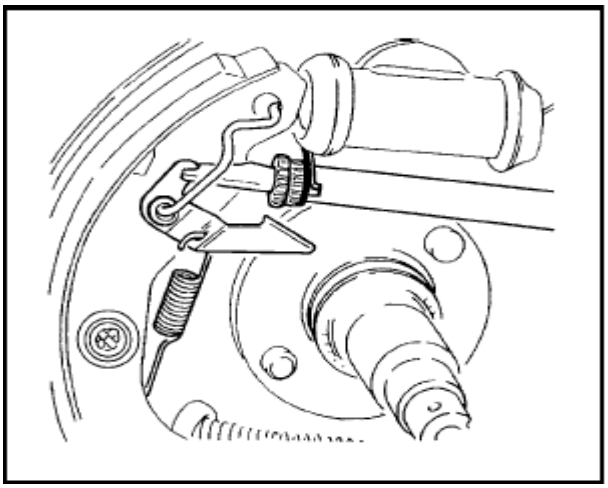
1. Clear surface of brake plate.
2. Use soft cloth as shown in the figure.
3. Connect park brake cable and park brake lever.
4. Install lining, spring and spring reed.
5. Install the returning spring and brake hoof.
6. Make sure the correct position of the cable as shown in figure.
7. Install slide lever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

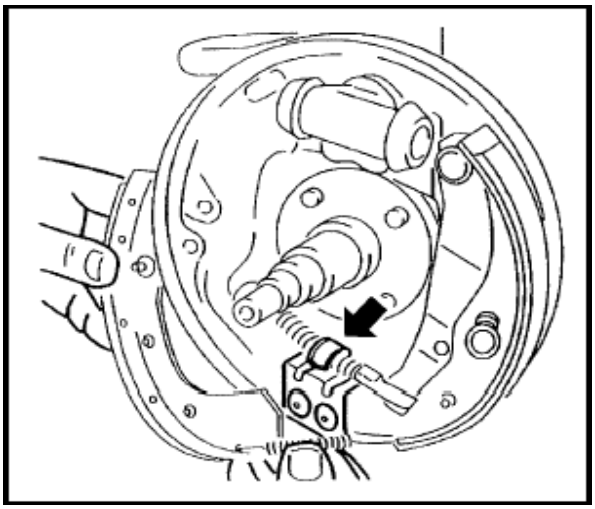


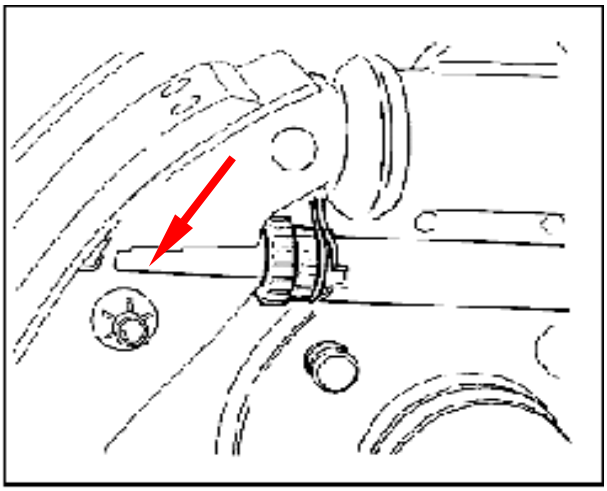
Points of attention: Make sure the small washer is mounted on lining, otherwise it will cause to damage brake or brake malfunction



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

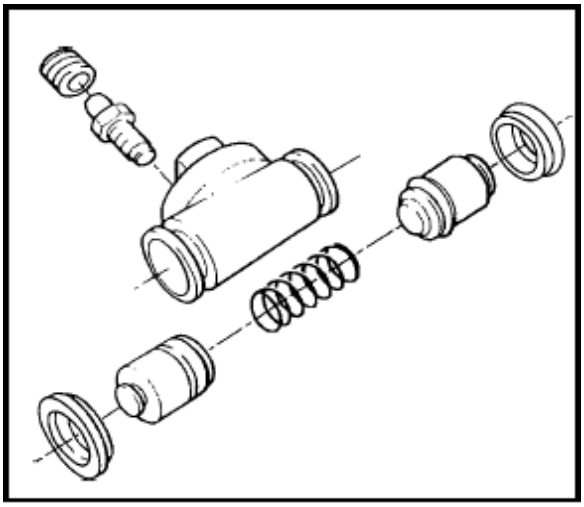
Disassembly procedure

1. Remove brake cylinder.
2. Remove cylinder hood.
3. Remove cylinder piston. Blow compressed air to inlet of cylinder, the piston will putout 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. f 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.

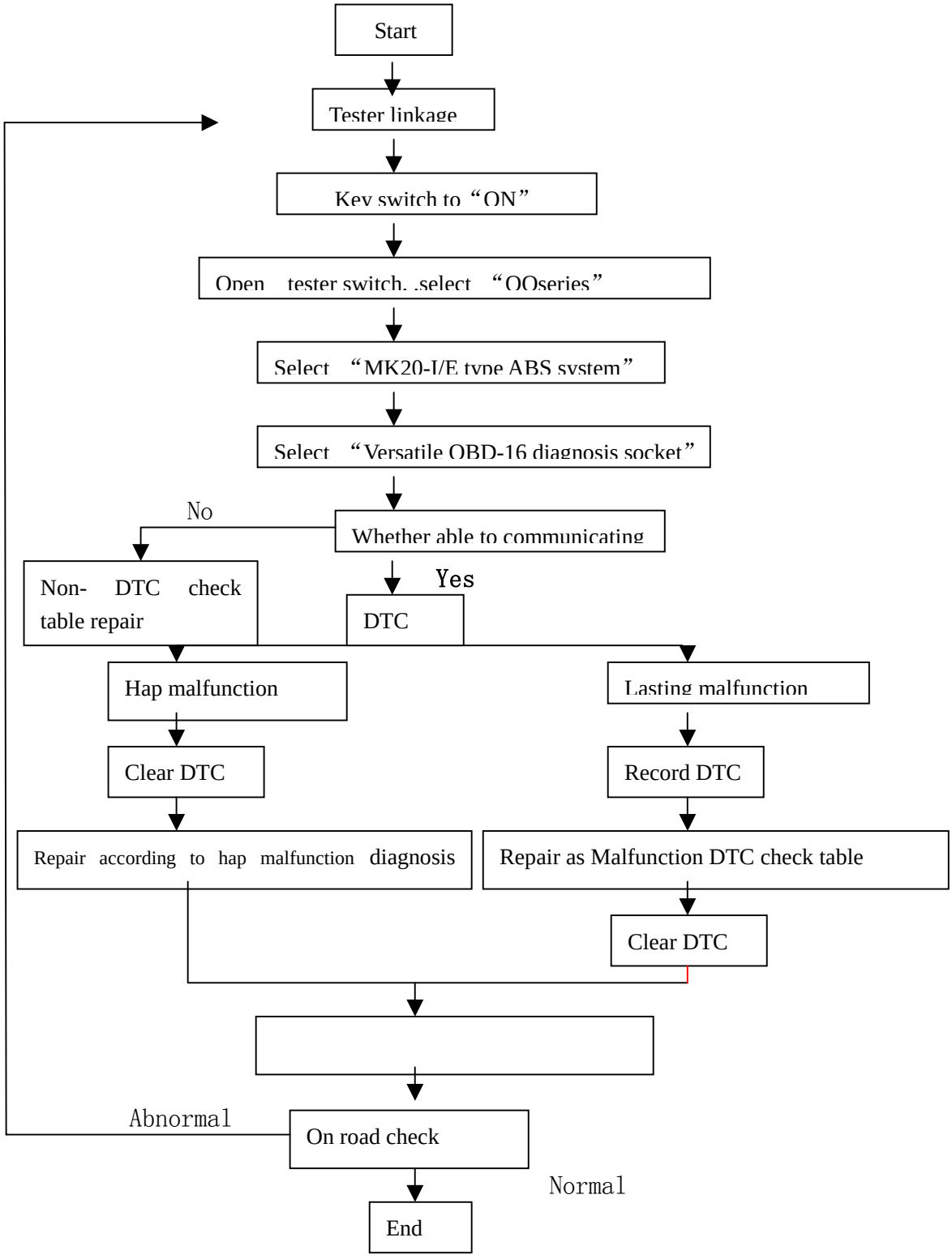
Fixture

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

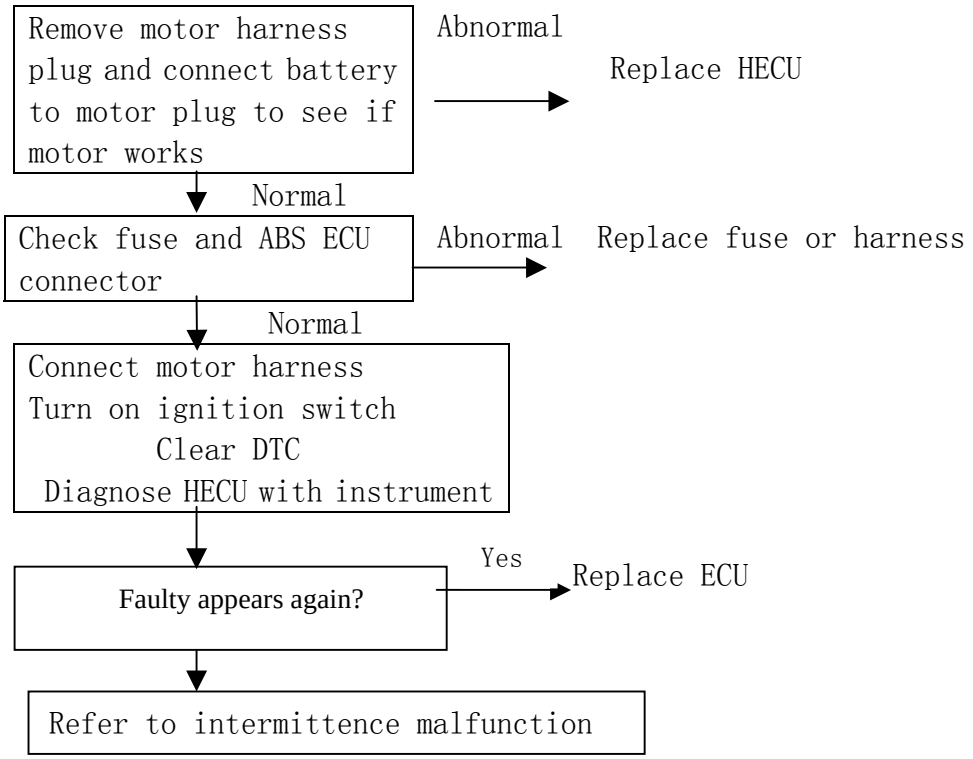
Symptom	
Turn on ignition switch, ABS light not up	
Start engine but warning light not turn off	
ABS abnormal	Uneven brake torque on both sides
	Brake torque not enough
	Step on pedal, ABS works (vehicle is stopping)
	Step on pedal, ABS works (vehicle is running)
	Pedal shocks badly when ABS works
Too 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

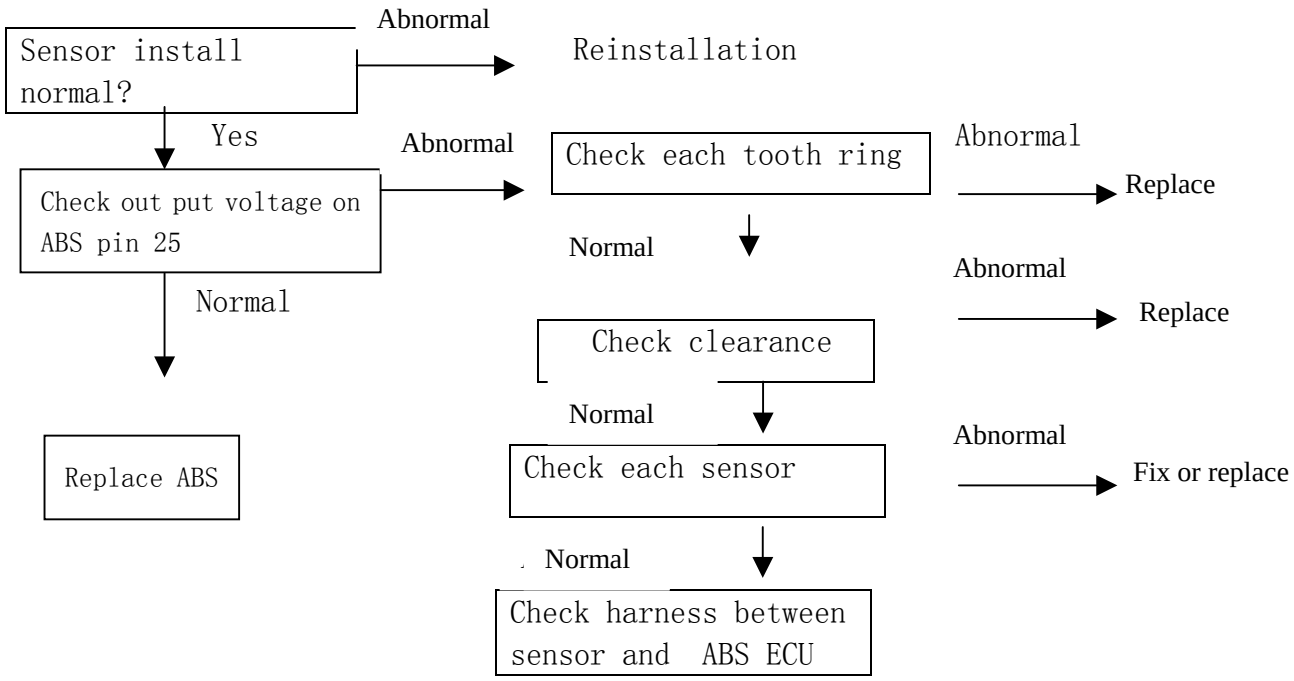
1、DTC 01276	Possible cause
It means ABS ECU find that motor cannot work normally at 20km/h Hint: Harness between motor and ECU is loose. Test with diagnosis instrument.	Source open or ground Motor harness loose Motor damage

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



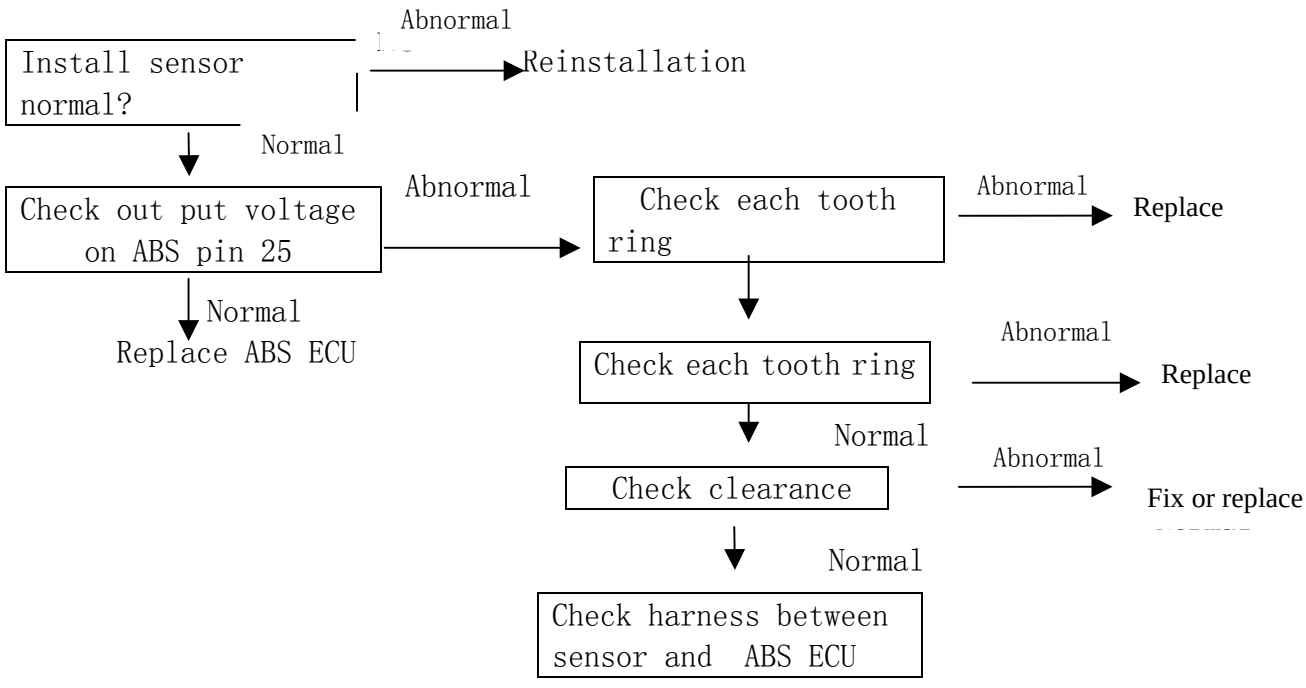
2、Wheel speed sensor：00283，00285，00290，00287

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



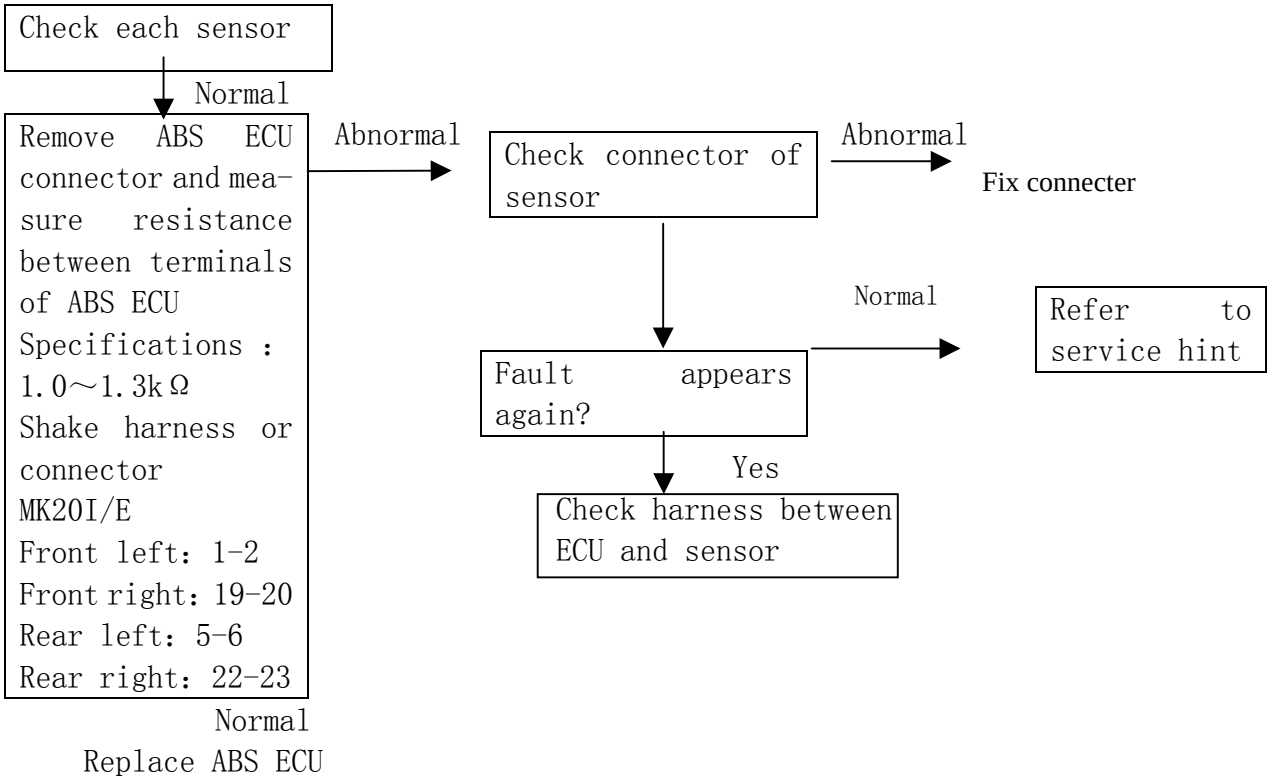
3、Wheel speed sensor

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



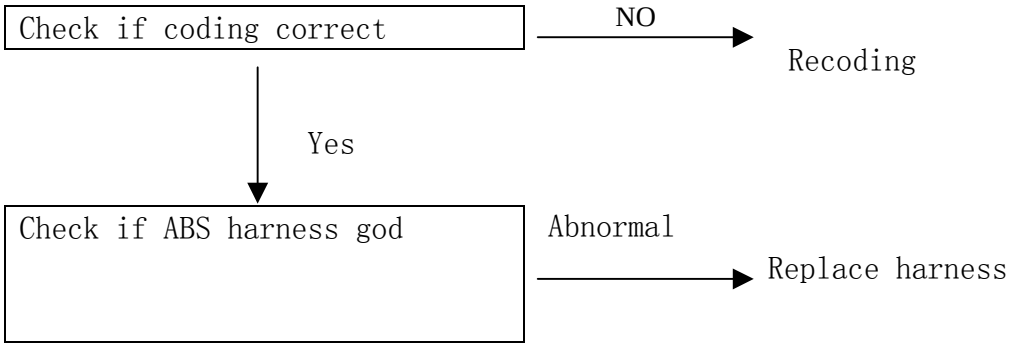
4、Wheel speed sensor

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



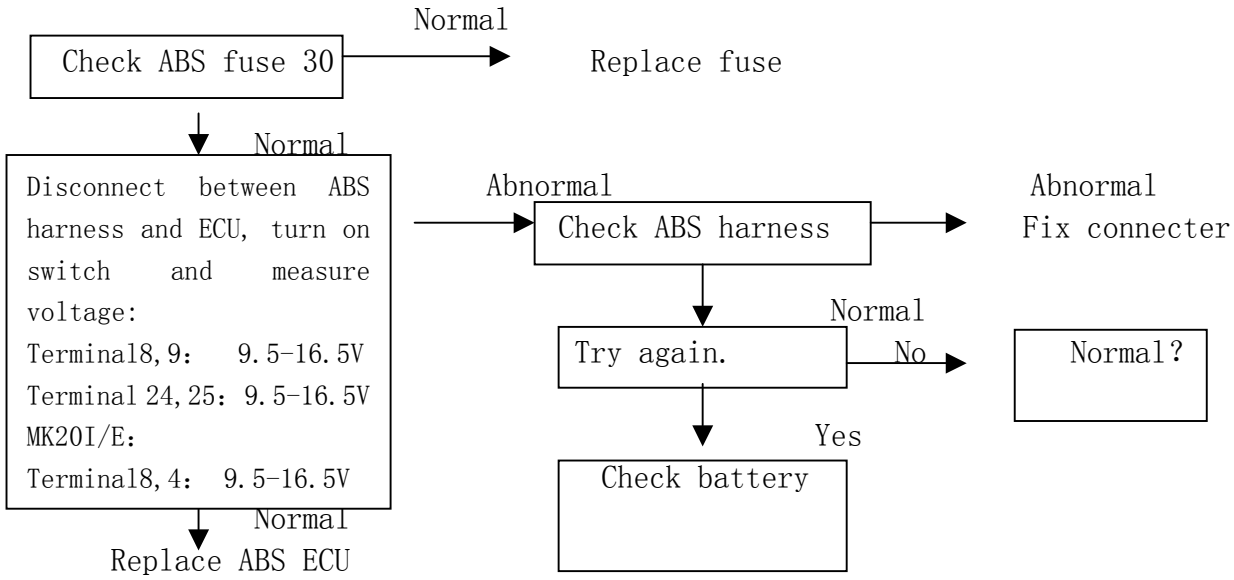
5、ABS coding err

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



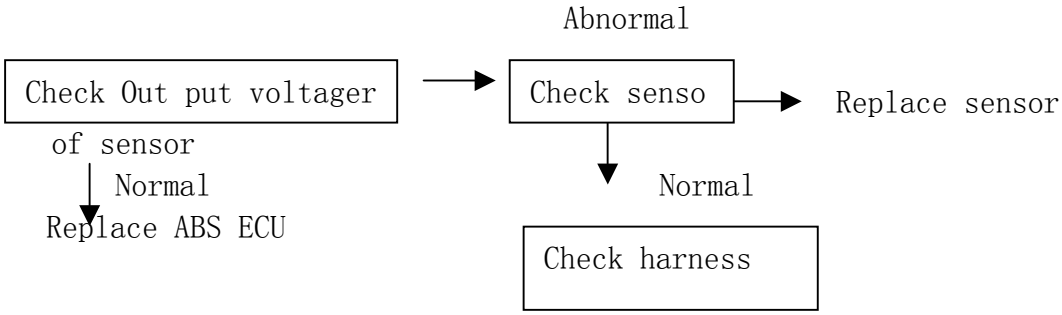
6、Supply terminal 30

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

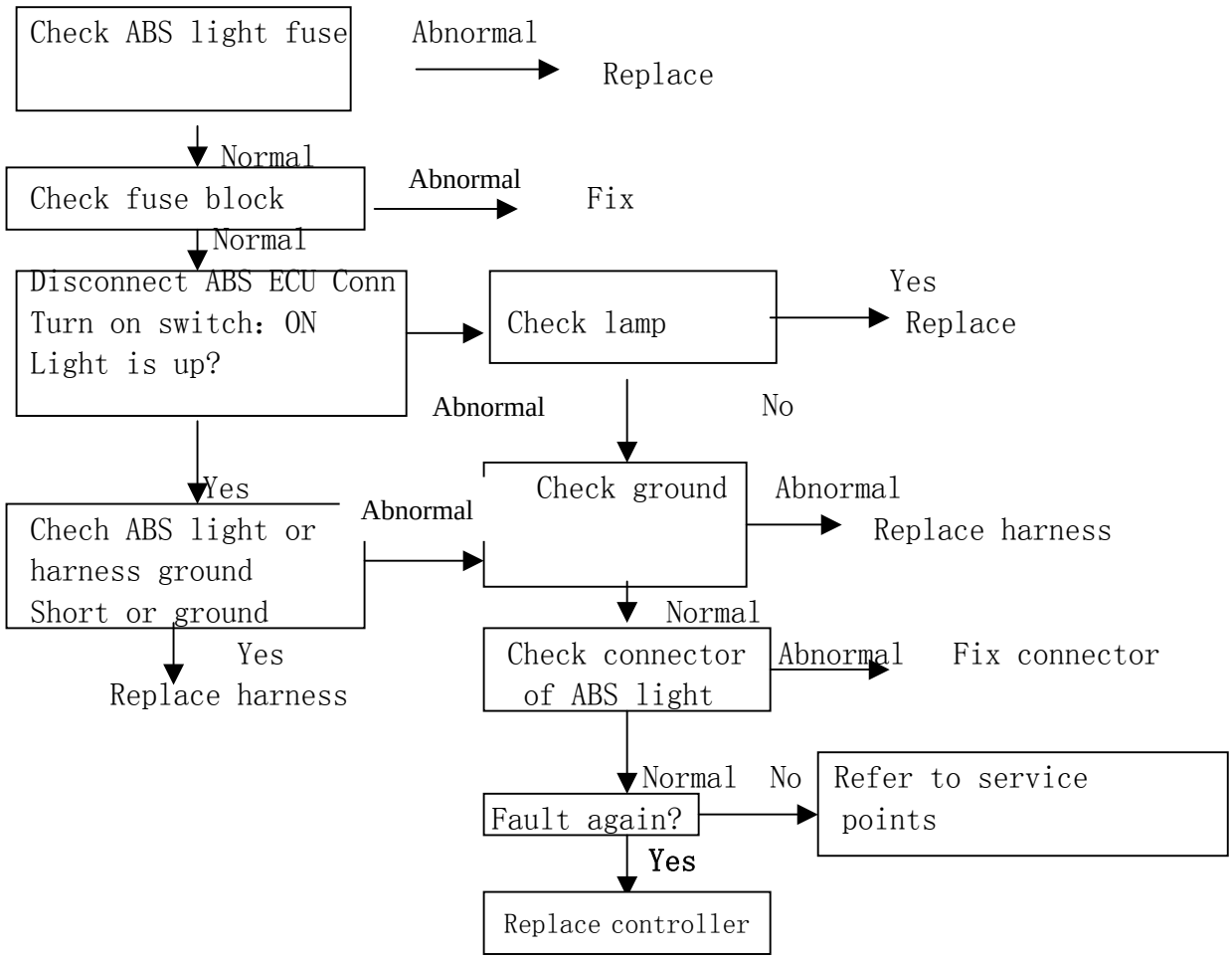
7、DTC 01130 Means interfere of high frequency or bad signal	Possible cause
	• Interfere of high frequency • Bad sensor or harness • ABS ECU damage



8、Non- DTC troubleshooting table

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

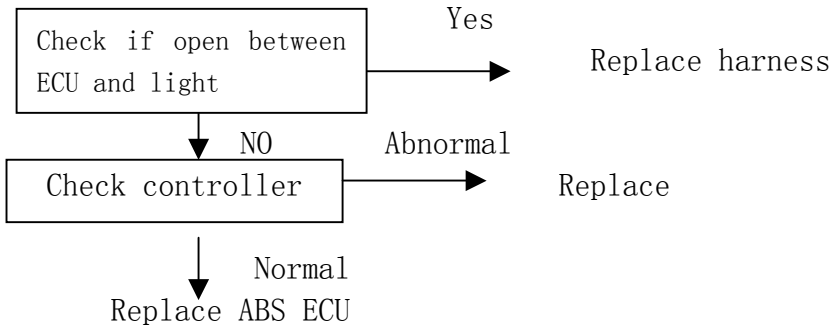
Means ABS light off, open light circuit, lamp burn out or light control unit damage	Possible cause
	• Fuse burn out • ABS lamp burn out • Open source circuit • ABS light control unit damage



(2) Engine start, light is on

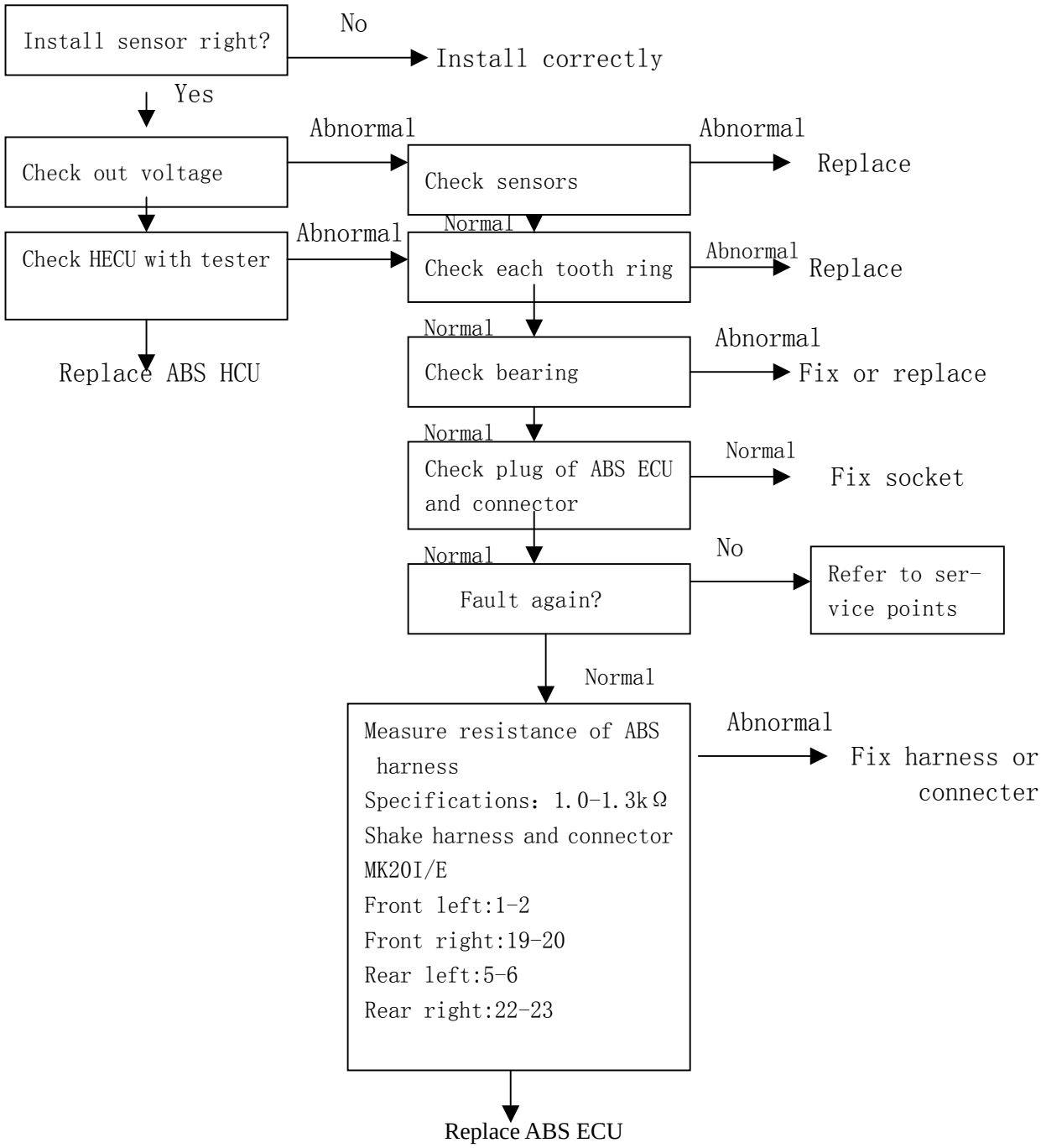
Means ABS light controller damage or open	Possible cause
	• Light controller damage • ABS light controller open • ABS ECU fault

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



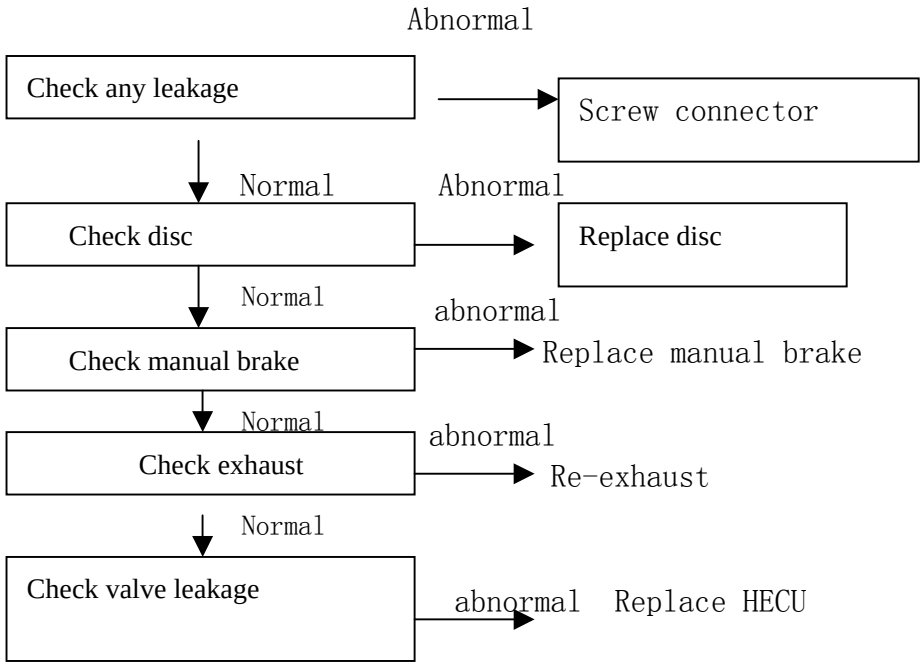
(3) ABS abnormal

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


Install sensor right?
No
Install correctly
Yes
Check out voltage
Abnormal
Check sensors
Abnormal
Replace
Check HECU with tester
Abnormal
Normal
Check each tooth ring
Abnormal
Replace
Replace ABS HCU
Normal
Check bearing
Abnormal
Fix or replace
Normal
Check plug of ABS ECU and connector
Normal
Fix socket
Normal
Fault again?
No
Refer to service points
Normal
Measure resistance of ABS harness
Specifications：1.0-1.3kΩ
Shake harness and connector
MK20I/E
Front left:1-2
Front right:19-20
Rear left:5-6
Rear right:22-23
Abnormal
Fix harness or connecter
Replace ABS ECU

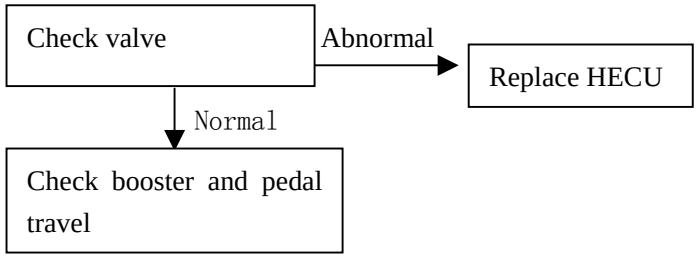
4、Too long for pedal travel

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



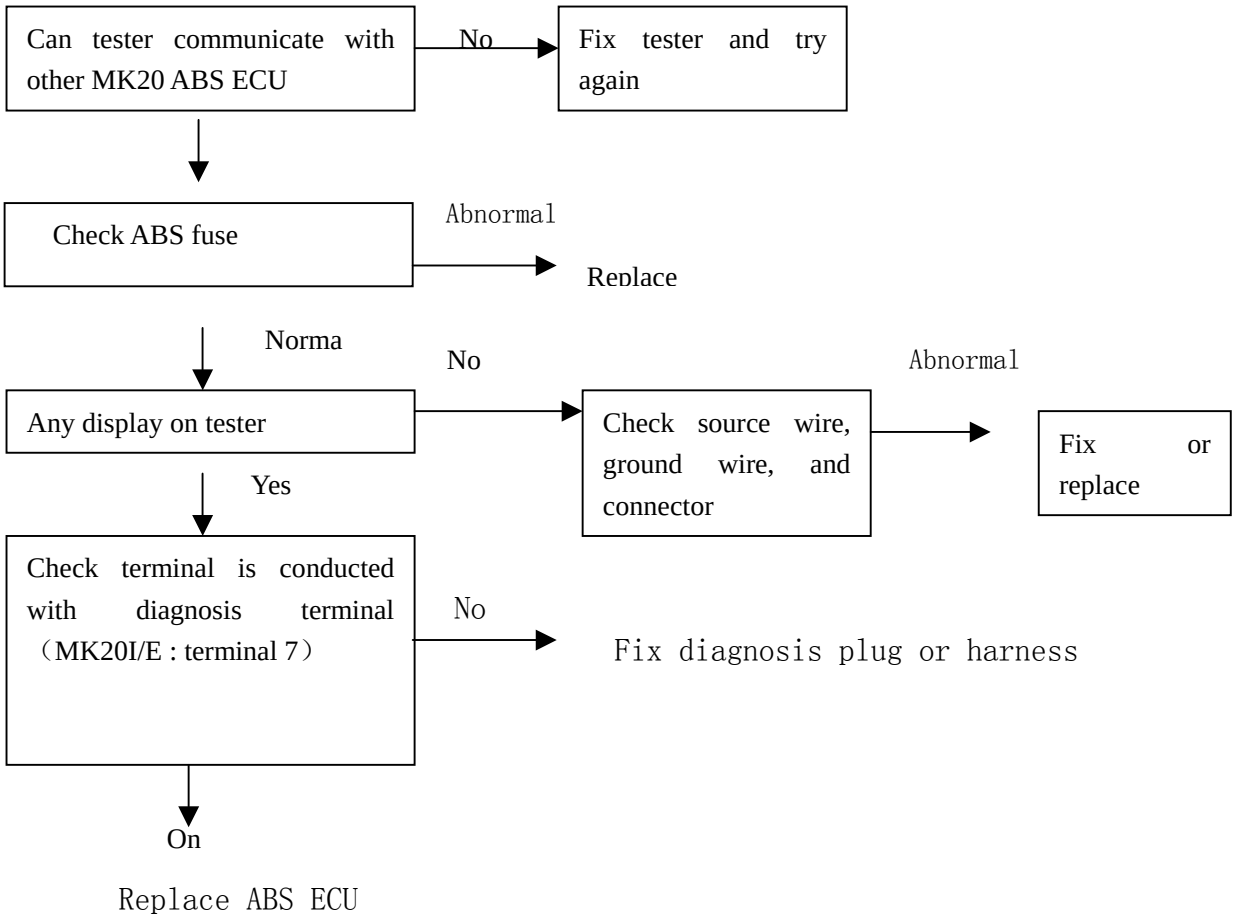
5、Must step on pedal hard

	Possible cause
Check booster or pedal travel with conventional way	• 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 MK20I/E	Specifications	Unit
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	KΩ
Front right sensor resistance	OFF	19-20	1.0-1.3	KΩ
Rear left sensor resistance	OFF	5-6	1.0-1.3	KΩ
Rear right sensor resistance	OFF	22-23	1.0-1.3	KΩ
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	$\frac{\text{Max peak voltage}}{\text{Min peak voltage}} \leqq 2$			

9、Check ABS

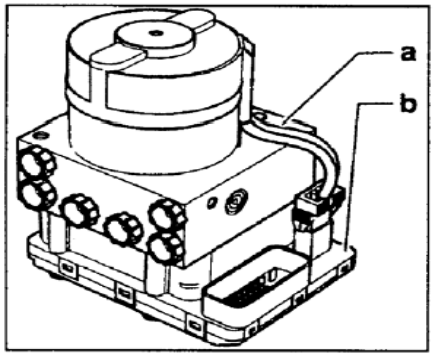
（1） Check the out put voltage of speed sensor

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	MK20 I/E
Front left wheel	terminal 4 - 11	terminal 1 - 2
Front right wheel	terminal 3 - 18	terminal 19 - 20
Rear left wheel	terminal 2 - 10	terminal 5 - 6
Rear right wheel	terminal 1 - 17	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.



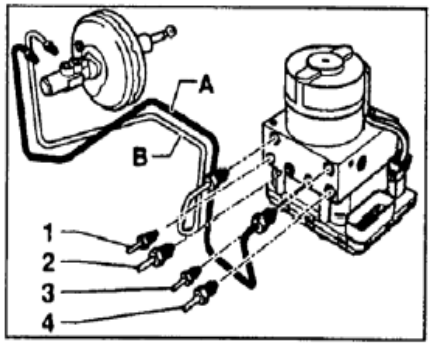
10、Removal and installation

(1)、 Spare parts offering

* HECU assembly dry type;
* HCU and ECU separate HCU wet type

(2)、Precaution on removing

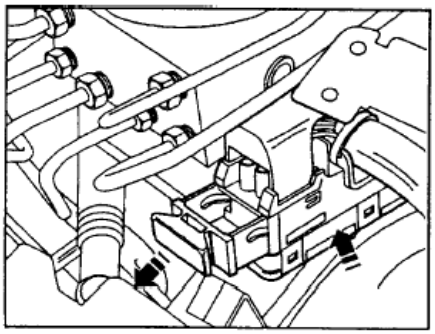
- Repair the faults after find the cause for malfunction with test instrument
- Only open the package before installation.
- Only use original parts.
- Only clean with soft cloth.
- Don’t use compressed air or move the vehicle when ABS is working.
- Block the outlet for each pipe after removing the parts.
- 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.



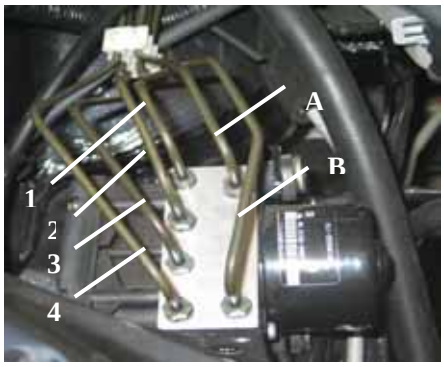
- Loosen the bolts fixing HECU to support.
- Remove HECU from support.

(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.



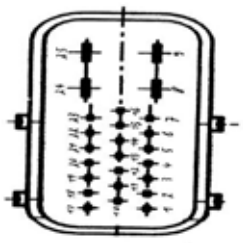
A.Front piston; B.Rear piston
1.Right front wheel;2.Left rear wheel
3.Right rear wheel;4.Left front wheel

(6)、Install ABS assembly again

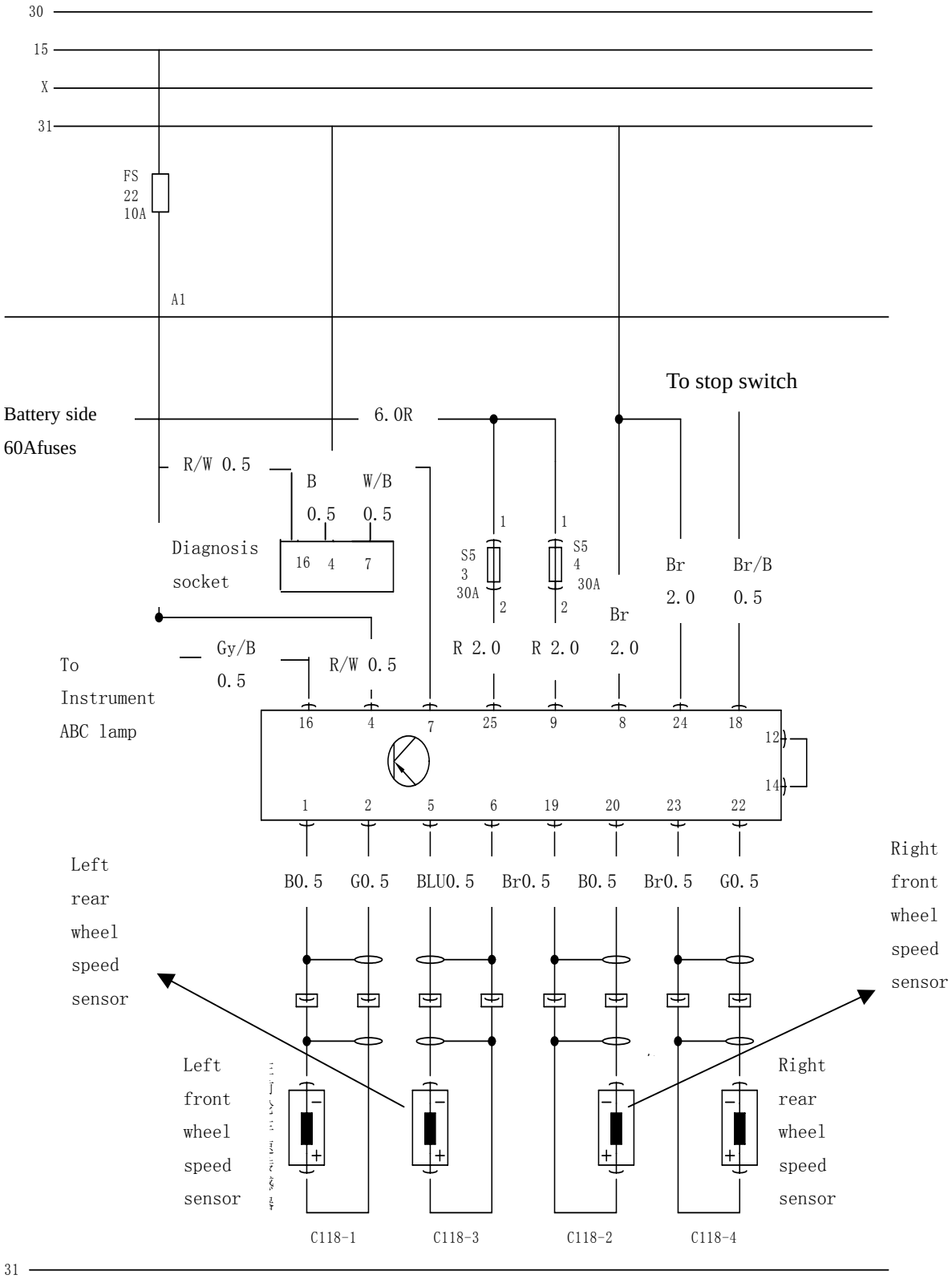
Attention：Only remove the cover on hydraulic outlet while install the brake pipe to prevent the matter dropping into system.

- 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.

11、ABS ECU Socket



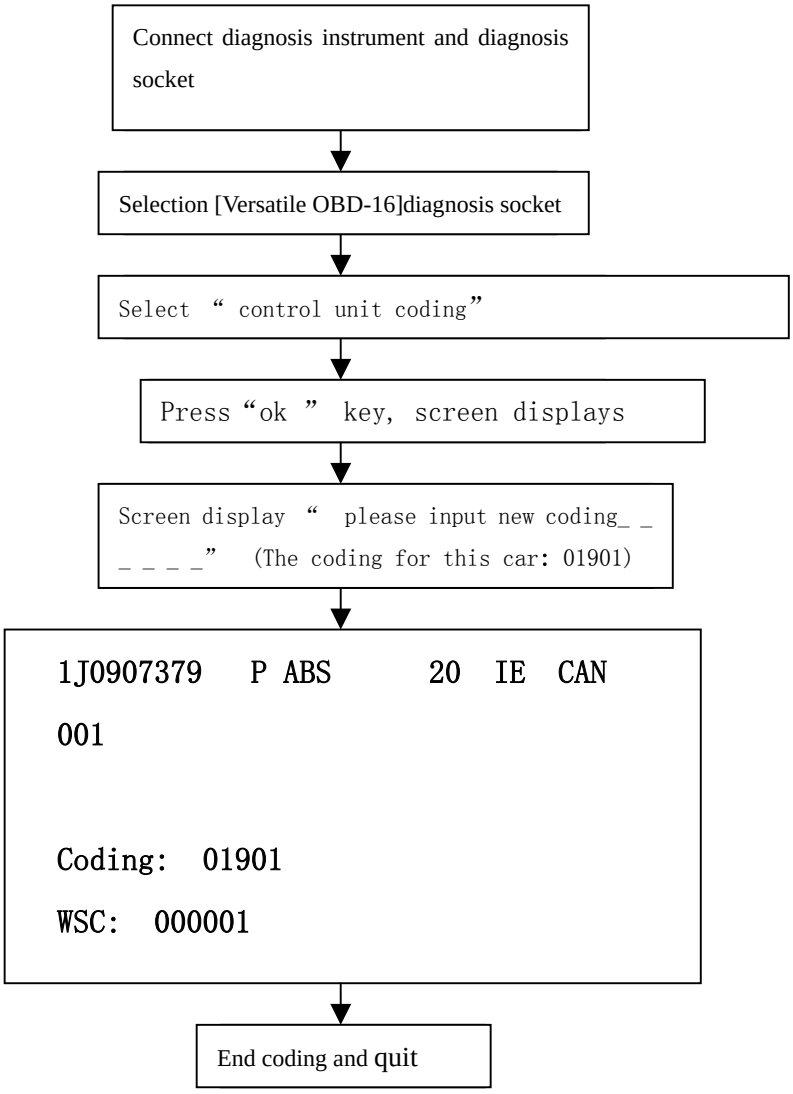
12、Electric circuit diagram MK20 I/E



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.

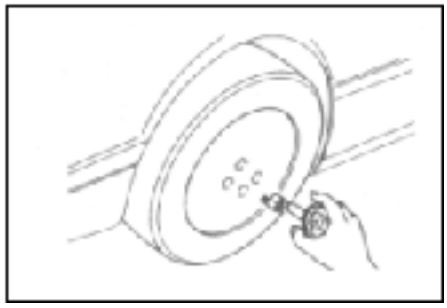
- Keep enough brake distance. When driving on good road, keep at least 3 s of braking from front vehicle. When driving on bad road, keep more time for braking.
- Practice ABS braking before driving. Get ready for pedal's vibration when ABS is working. Parking place and square are the best place for practicing.
- 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.

Chapter two Tests and Adjustments of Four-Wheel Positioning

Section One: Basic Tests and Checks

Preparations prior to adjustments



I. Checks prior to adjustments

（1）Checks on tire air pressure

（2）Checks on car body

1、Check the tire air pressure, and adjust to the specified pressure.

Standard air pressure for tires (kPa)

Item	Front wheel	Rear wheel	Spare tire
Zero load	220	220	250

2、Check the spacing of front wheel bearings, and replace the front wheel bearings when necessary;

3、Check the status of the wheel outer rims, as well as the status of the wheel sections and tires;

4、Check to see if the ball joint of the horizontal draw-bar for turning is too loose;

5、Place the car on a leveled ground without any luggage or passenger;

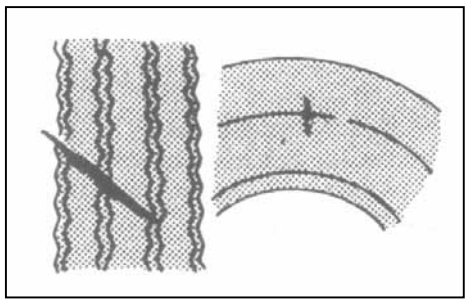
6、Make sure that the left and right heights from the wheel center line to the dasher do not exceed the standard heights;

7、Check to see if the absorber performance is normal.

II. Rim section and tire

1、Visual checks

Check the tires and rim sections, and make proper replacements if any cracks, damages, deformations or other defects are detected on the rim sections or tires.



Tears and wears of tire

2、Tire tears and wears

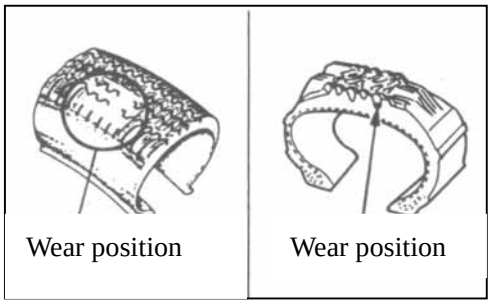
（1）Check the depth of the remaining tire textures.

The depth of the remaining tire textures (as shown in the Figure)

Standard tires: 1.6mm min.

Snow ground tires: 50 % tire textures

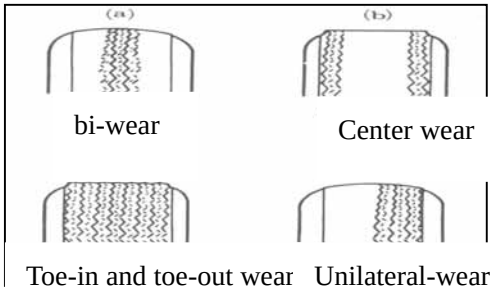
（2）In the case that the wear-and-tear indication belt is exposed, the tire must be replaced.



Indication points for tire tears and wears

3、Abnormal tears and wears of tires

The abnormal tears and wears of the tires as shown in the right figure might occur. Refer to the following table for the possible causes and the approaches for handling the trouble.



Tears and wears of tire

	Possible causes	Approaches for handling
(a)	* Insufficient tire air pressure (tears and wears on both sides)	* Test and adjust tire air pressure
	* Turning in fast speed	* Slow down car speed
	* Tire positions not re-adjusted	* Re-adjust tire positions
(b)	* Excessively high tire air pressure	* Test and adjust tire air pressure
	* Tire positions not re-adjusted	* Re-adjust tire positions
(c)	* Toe-in incorrect	* Adjust the toe-in
(d)	* Camber angle incorrect	* Adjust, repair or replace the parts of the axle and suspension system
	* Suspension system defective	* Repair or replace the suspension system
	* Tires not balanced	* Make dynamic balance of tires or replace the tire
	* Brake drum or disk not circular	* Make alignment or replacements
	* Other mechanic troubles	* Make alignment or replacements
	* Tire positions not re-adjusted	* Readjust the tire positions

4、Points of attention for the rim sections and tires

（1）Do not use the under-standard rim sections or tires;

（2）The aluminum alloy rims are easy to be damaged by scraps. Please use soft cloth when doing the cleaning. Never try to use steel brushes. If steam is used for cleaning the car, do not allow the boiling water to contact the rim sections;

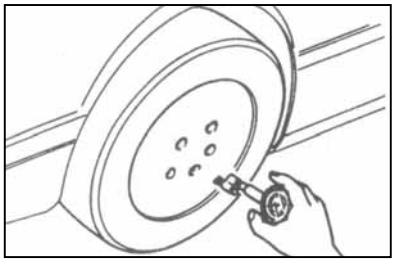
（3）In the case that some alkali chemical compounds (such as mud water, road surface mud, etc.) stain on the aluminum alloy rim sections, use the neutralizing agents to clean them off as soon as possible so as to avoid the rim sections from being damaged.

5、Tire replacements

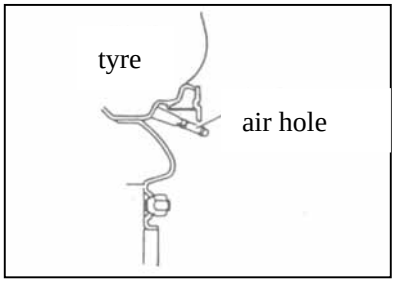
（1）Before installing the air valve nozzle, first check to see if the air valve opening on the tire is smooth and free of rags. Then apply some glycerin onto the surface of the air valve nozzle rubber or dip the air valve nozzle in the glycerin. Use the special tools to exert the air pressure of 200—400N so as to allow the positioning ring of the air valve nozzle to pass the hole on the wheel which complete the installation and positioning (soap solution can be used to substitute glycerin);

（2）Before installing the tires, apply glycerin or soap solution along the tire rings. Make sure that when there are light indication spot marks on the rims, the test marks for tire balance should be aligned with these light indication spot marks. When there are not light indication spot marks on the rim, the dynamic balance test marks of the tire should be aligned with the air valve nozzle position. If there are neither light indication spot marks on the rim nor dynamic balance test marks on the tire, but there are static balance test marks on the tire, make sure that the air valve nozzle is aligned with the static balance test marks.

6、Tire pressure



Check the air pressures of all the tires (including the spare tire) with the barometer. Make proper adjustments if the air pressure does not meet the specifications. Strictly follow the specified air pressure in filling the tires with air. During the air filling, the air pressure should not exceed the nominal air pressure by 10 %. The tire with filled air should be placed separate from the wheel mounted on the car. Before doing the positioning of the four wheels, please check the air pressures of the four wheels and make proper adjustments so as to meet the specified air pressure.



7、Air leakage

Make sure there is no air leakage at the air valve.

Checks of air valve nozzles

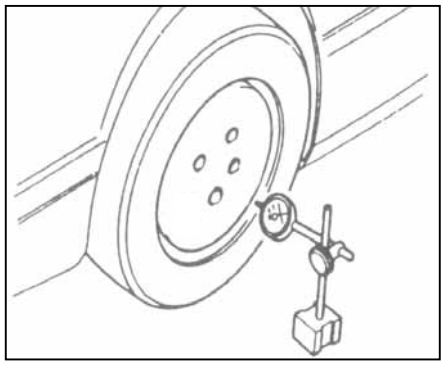
8、Rim sections and tires non-circularity

（1）Lift the car and support it securely;

（2）Place the probe of the dial gauge on the rim section and measure the extent of non-circularity for each turning of a circle.

Limit for non-circularity: Unit mm

Longitudinal	1.5(0.06)
Sideways	2.5(0.10) steel rim section 2.0(0.08) aluminum rim section



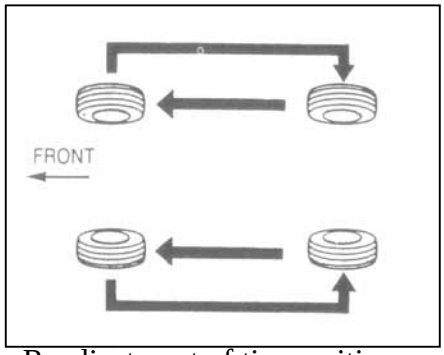
Inspection on the tire non-circularity

（3）Replace the tire if necessary

9、Readjustments of tire positions

In order to extend the operational life of tires and to determine the tears and wears of the tires, readjustments of tire positions should be carried out for every 6,000km (3,750 miles) of driving.

As shown in the Figure:



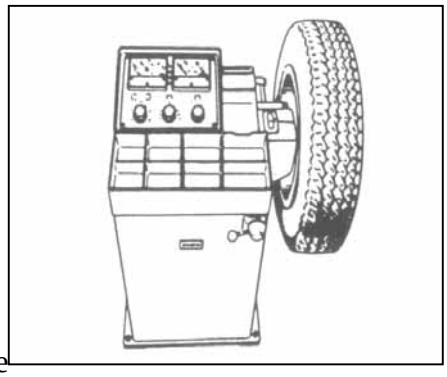
Readjustment of tire positions

Attention:

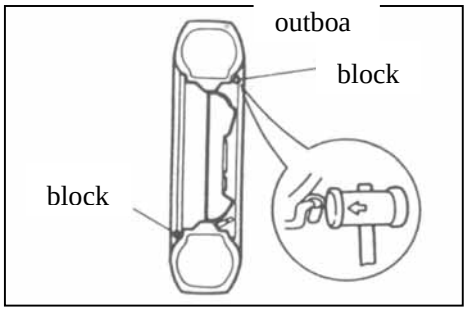
* Best-quality tires must be used for the front wheels;
* After readjustments of tire positions, make sure that the air pressures for the tires are adjusted to the specified air pressure values.

10、Adjustment of tire balance

After the tires are filled with air, fix the protective capsfor the air valve nozzles tightly and then make the testson dynamic balance. Place the balance blocks with appropriate weights on the inner and outer edges of the rims as required. According to the specifications, the imbalance of the final assembly should be no larger than 100g/cm, which is approximately equal to the 5g balance blocks on the inner and outer edges of the rims. It should be noted that at most one balancing block is allowed to be placed on each side of each wheel, with the maximum mass no larger than 70g. During the process of assembling, excessively heavy shocks should be avoided to the balancing blocks. In the case that excessive shocks are felt, the balancing blocks should be replaced in time. The balance blocks taken down in the replacement should not be used again.



11、Installation



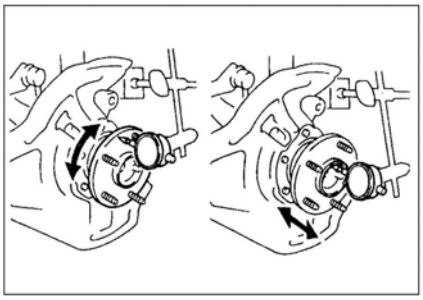
（1） When making the assembly of the wheels and tires, first fix the wheel screws onto the hubs manually and tighten them slightly. Then use special tools to tighten the screws in the diagonal sequence till the specified torque of 110±10N.m is applied. It is not allowed to use impact wrenches that might cause damages to the wheels, or insufficient tightness or excessive tightness. It is not allowed to apply lubricating grease onto the wheel screws. (For the completed assembly of wheels and tires, the wheel screws should be re-tightened after the car runs for 100km so that the specified torque is assured. The checks on the torque of the fixing screws are one of the routine maintenance items).



（2） When tightening the screw nuts, the cross approach is applied. The extent of tightness should be close to each other, and the wheels should be able to turn freely. When the final tightening is made, the wheels should be positioned on the ground.

（3）Install the decorated covers or place the decorative covers as needed. When the clip-type decorative covers are installed, they should be driven in either with hands or by way of rubber hammering tools.

III. Checks on the looseness of wheel bearings



1、Check the axial spacing of the bearings
Maximum: **0.05**mm
2、Check the bias of the bridge hub
Maximum: **0.05**mm

IV. Checks on the looseness of front suspension system

V. Checks on the looseness of turning transmission rod system

VI. Checks on ball joint looseness

VII. Checks on the normal performances of absorbers

1、Check to see if there is any oil leakage;
2、Check to see if there are any tears and wears of the assembly sheaths;
3、Check the resistance of the absorbers. Make proper replacement if any incompliance is detected.

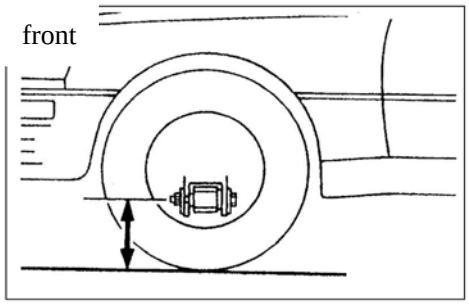
Section Two: Positioning of Rear Wheels

It is recommended to use the four-wheel positioning device for the chassis of this car model, which applies the positioning approach by way of axis thrust.
In the position adjustments by way of axis thrust, the toe-in of the rear wheels may have impacts upon the toe-in of the single front wheel. Therefore, when doing the four-wheel positioning, the adjustments of the rear wheels are generally done before the adjustments of the front wheels. Besides, the camber angle of the rear wheels is adjusted before adjusting the toe-in angle, followed by the adjustments of the camber angle and toe-in angle of the front wheels.

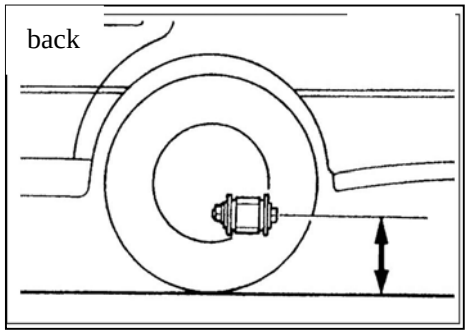
I. Measure the height of the car

Before measuring the height of the car, first increase the air pressure of the tires to the specified value (make sure that the air pressures for the left and right tires should be identical).

1、The front measuring point
The height of the center point from the ground to the link screw nut for the lower control arm assembly and the front turning joints is to be measures. The car body height of the left and right wheels should be basically the same.

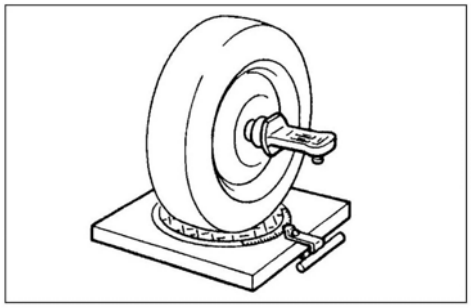


2、The rear measuring point
The height of the center point from the ground to link screwnut for the rear bridge and the absorber is to be measured.
The left and right body heights should be basically the same.



Attention: Before testing and checking the wheel positioning, the car should be first adjusted to the specified height.
If the car height does not meet the specification, check the front and rear suspension systems of the car to see if there are any damages or deformations.

II. Place the wheel positioning device or the positioning tester on the wheel



1、 Install the instruments in the way as specified by the manufacturer of the devices;
2、 Make tests and adjustments on the car as required by the equipment. The specifications for the positioning are as follows:

Rear wheel assembly toe-in	$20^1 \pm 40^1$
Single rear wheel toe-in	$10^1 \pm 20^1$
Rear wheel camber angle	$0^1 \pm 20^1$
Thrust angle	$-13^1 \sim +10^1$

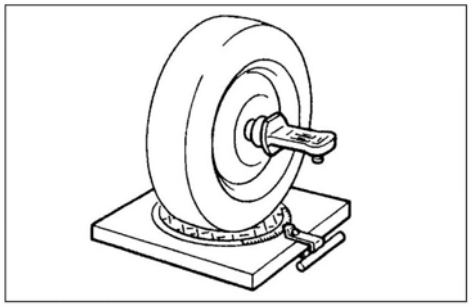
Section Three: Front Wheel Positioning

I. Measure the car height

Do the measuring and adjustments in the same procedures as the ones for the car height measurements for rear wheel positioning.

II. Place the wheel positioning device or the positioning tester on the wheel

Install the instruments in the way as specified by the manufacturer of the devices.



III. Check and adjust the front wheel main pin backward tilting angle, main pin interior falling-in angle, wheel camber angle as well as the wheel toe-in and steering angle

Specifications: The requirements for the front wheel positioning are as follows:

Main pin backward tilting angle	$3°.15^{1}\pm30^{1}$
Front wheel camber angle	[465]:$1°\pm30^{1}$
Single front wheel toe-in angle	$10^{1}\pm10^{1}$
Steering angle	Inner side：$35^{0}\pm4°$ Outer side：$31^{0}\pm4$

Note: The backward tilting angle is adjusted before adjusting the camber angle and the toe-in angle.

1、Main pin backward tilting angle

This angle is assured by way of the designed configuration, which makes the operational adjustments unnecessary.

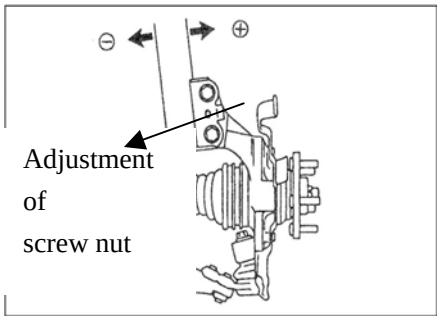
The impacts of backward tilting angle

The major function of the backward tilting angle is to keep the car moving in the straightly forward direction. If the backward tilting angle is positive, the inner side of the car will be lowered when the front wheel turns in directions, which results in the uprising of the chassis. That will increase the loads onto the knuckles. If the backward tiling angles of the two wheels are identical, the car will be back to the straightforward direction after turning the directions. The increase of the positive backward tilting angle will increase the stability of the steering wheel, but the turning forces will be increased as well. The decrease of the positive backward tilting angle will reduce the stability of the steering wheel but the turning forces will become reduced. The extent of the backward tiling angles will not have impacts upon the tears and wears of the tires. They are used to stabilize the driving directions and ensure the automatic returning to the straightforward direction after turning. If the car is equipped with the traditional mechanic steering devices, the backward tilting angle will be very small or even tending to be in the negative, which makes the turning of direction easier. If the car is equipped with the dynamic steering device, the backward tiling angle is generally set to be relatively large positive angle, which allows the driver to feel the turning of directions. The increase of the positive backward tiling angle will increase the forces for turning, and increase the stability in straightforward movement of the car.

2、Camber angle

Under normal circumstances, the camber angle does not have to be adjusted after the car is equipped with the independent suspension system and wheel knuckles. In the case that the wheel camber angle is detected to have bias from the allowances due to some reasons,

alignment can be made by way of adjusting the connecting screw nuts for the independent
suspension system and the knuckles.



(1) First check (visually) to see if there are any damages on the driving system parts and components before doing the alignment. Replace the damaged parts or components if there are any. The camber angle designed and set for the front wheels by the manufacturer cannot be adjusted;

(2) In the case that the front wheel camber angle is detected to exceed the allowed bias, loosen the connecting screw nuts for the front absorber and the knuckles, and move the wheel for proper alignments.

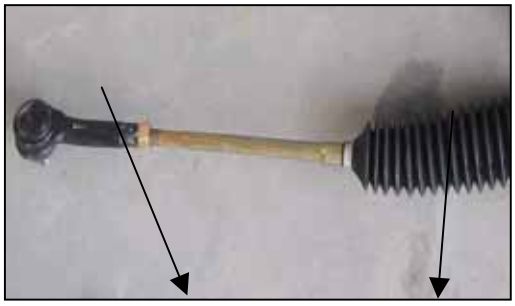
3、Toe-in

Special four-wheel positioning testers should be used to test and adjust the toe-in.

(1) Make preparations prior to the adjustments as required by the tester. Use the steering wheel limiter to fix the steering wheel in the straightforward direction (the steering wheel must be in the center position±5 degrees, and the lower clamping flange of the steering axle should keep horizontally leveled).

(2) Loosen the locking screw nuts (1) of the steering horizontal drawbar.

(3) Remove the elastic protective clip ring (2) with a pair of pliers.



(1) (2)

Attention: Replace the clipping ring if it is not elastic enough.

(4) Turn the toe-in adjustment rod to adjust the length as needed till it meets the specified value.

(5) Tighten the screw nut (1) and re-install the protective elastic clip ring (2), check to see if the locking screw nut is tight enough and if the position of the protective sheath is correct or not.

(6) Upon completion of the adjustments for the front wheel toe-in, check to see if the steering wheel is leveled. If not, loosen the locking screw nut of the steering wheel and adjust the steering wheel to the leveled position. Tighten the locking screw nut till it meets the torque specification (27-33Nm).

4、Check and test the front wheel steering angle

After the horizontal drawbar joint is replaced or the toe-in is adjusted, the steering angle should be checked. If it fails to meet the specifications, the length of the left and right horizontal drawbars should be checked and adjusted.

IV. The toe-in and camber angle of the rear wheels cannot be adjusted.

Check the camber angle and toe-in of the rear wheels. If they fail to be in the specified limits, check to see if there are any deformed parts. Replace the defective parts.

Section Four: Guide to Trouble-Shooting

Problem	Possible cause	Countermeasures
Excessive tear-and-wear or unevenly distributed tears and wears of tires	As indicated later	
Tears and wears of tires ahead of scheduled operational life	Incorrect tire pressure Incorrect wheel positioning parameters	Adjustment Adjustment
Tire noises	Incorrect tire air pressure Tears and wears of tire	Adjustment Check, adjustment, replacement
Road surface noises or vibration of car body	Insufficient tire pressure Imbalance of tires Deformed rim section or tire Unevenly distributed tears and wears of tire	Adjustment Adjustment Repair or replacement Check, adjustment, replacement

Vibration up and down of steering wheel	Excessive bias of tire and rim section Loose wheel screw nuts or axle heads Imbalance of tires Broken or damaged engine suspension rubber Broken or damaged gear box supporting stand rubber	Replacement Tightening Adjustment Replacement Replacement
Circling vibration of steering wheel	Excessive bias of tire and rim section Loose wheel screw nuts or axle heads Imbalance of tires Unevenly distributed tears and wears of tire Insufficient tire air pressure Broken or damaged front wheel bearings Faulty steering system Faulty suspension system	Replacement Tightening Adjustment Check Adjustment Replacement Check Check
Lopsidedness of steering wheel	Abnormal tire air pressure Excessive tears and wears of tires or unevenly distributed tears and wears Faulty steering system Faulty braking system Faulty suspension system	Adjustment Check Check Check Check
Unstable movement	Inconsistent air pressures for the tires on both sides Deformed rim section or tire Loose wheel screw nuts Faulty steering system Faulty suspension system	Adjustment Repair or replacement Tightening Check Check
Lopsided braking	Unbalanced tire air pressures on both sides Faulty braking system	Adjustment Check
Heavy steering wheel	Insufficient tire air pressure Faulty steering system Faulty suspension system Incorrect wheel positioning parameters	Adjustment Check Check Check
Poor operation of steering wheel to return to straight for-ward direction	Insufficient tire air pressure Faulty steering system Faulty suspension system Incorrect front wheel main pin backward tilting	Adjustment Check Check Adjustment

Chapter Three Suspension System

Section One Specifications

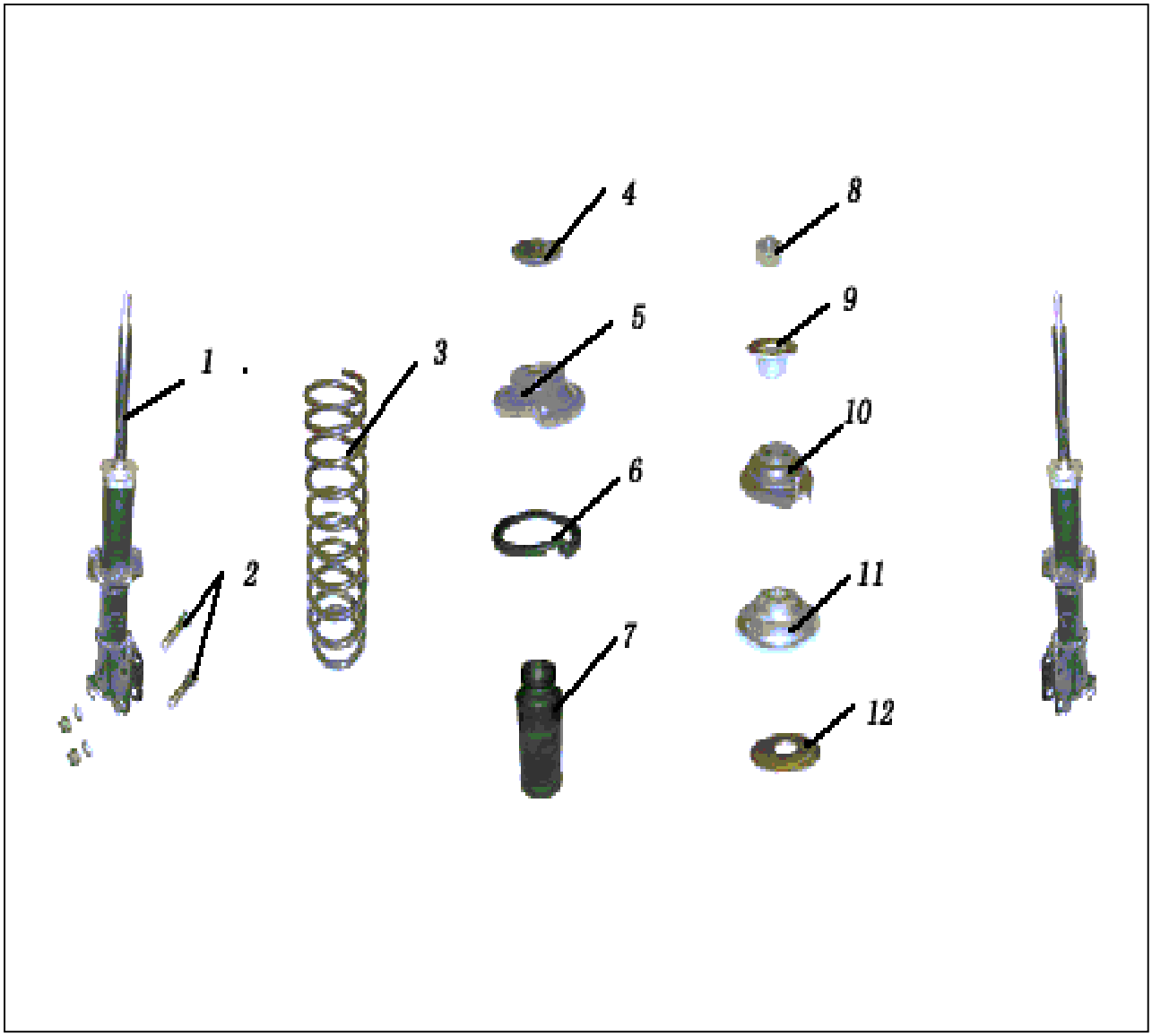
Tautness for Various Fasteners

Part No.	Description	Quantity	Installation position	Torque (N·m)
Q150B1010	Connecting bolts	2	Braking tube and clamp	13-17
Q151B1255	Bolts	3	Rear absorber and rear shaft M12×1.25, rear shaft horizontal supporting rod and car body	70-80
Q151B1285	Bolts	4	Rear towing arm and rear shaft	76-90
Q151B1290	Bolts	2	Lower swing arm and car body M12×1.25	76-90
Q151C1040	Bolts	2	Lower swing arm and knuckle M10×1.25	55-65
Q151C1080	Bolts	2	Lower swing arm and car body M10×1.25	60-70
Q151C1255	Bolts	4	Front sliding column and knuckle M12×1.25	78-90
Q1421030	Hexagon head bolts and spring washer assembly	2	Supporting frame and car body M10×1.25	35-45
Q1421035	Hexagon head bolts and spring washer assembly	4	Supporting frame fixing stabilizing rod M10×1.25	40-50
Q1440616	Screws	2	Supporting frame and car body	7-9
CQ32608	Screw nuts	6	Front sliding column and car body	22.5-27.5
CQ32610	Locking screw nuts	4	Suspended supporting frame and rear transit supporting frame M10×1.25	55-65
CQ32612	Screw nuts	2	Stabilizing rod and lower swing arm M12×1.25	60-70
Q1420820	Hexagon head bolts and spring washer assembly	8	Brake and rear shaft	22-26
Q361B12	Screw nuts	10	Rear absorber and car body; rear towing arm and car body; rear shaft horizontal supporting rod and car body; rear shaft horizontal supporting rod and rear shaft	70-80
S11-3301201	Screw nuts with washers	4	Rear towing arm and rear shaft	75-85

Section Two Front Suspension Frame

Maintenance of the front suspension frame

I. Configuration Diagram of Front Suspension Frame



1、 Dampener; 2、Joining bolt; 3、Spiral spring; 4、Thrust bearing; 5、Spring upper stand washer; 6、Spring lower stand washer; 7、Spacing block; 8、Screw nut;9、Washer; 10、External connection sleeve; 11、Dampening washer; 12、Thrust bearing stand

II. Removal and installation of the front balanced beam and the rubber sleeves for the balanced beam



Removal

1、Loosen the two fastening screw nuts of the supporting frame and car body. There is one supporting frame on either side.

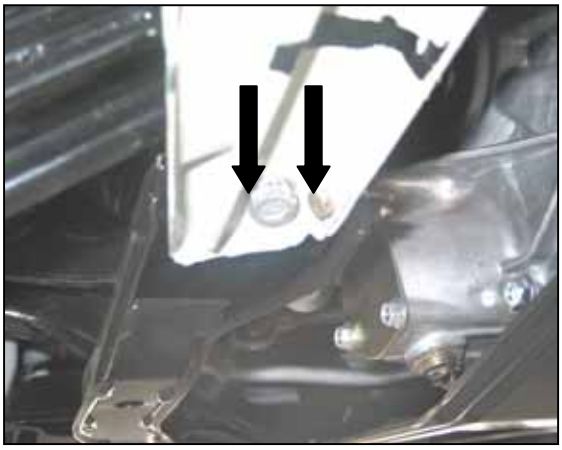
Attention: The fastening screws of the supporting frames and guard plates should be removed.



2、Loosen the two fastening screw nuts linking the balanced beam supporting frame with the car body.

3、 Remove the joining bolts of the balanced beam and the lower swinging arm.

4、Remove the balanced beam and the rubber sleeve.





Steps for installation:

1.Do the installation by referring to the dismounting steps.

2.Points of attention:

① In the screw tightening process, the fastening bolts controlled by torque + corner tightening submission limits should be replaced after each action of loosening.

.② The screws should be tightened to the specified torques after the installation.

III. Spiral spring and dampener (supporting column)

（I）Before removing the supporting column, check the performances of the supporting column

Check and adjust the tire air pressure as specified; push sidewise and shake the front part of the car for 3—4 times with equal forces applied to each pushing. When the action of pushing and bouncing back takes place, pay attention to the resistance of the supporting column and the frequencies of the back bouncing of the car body. Compare the resistances as well as the frequencies of bounces for the columns (dampeners) on the left and right sides, which should be identical. If the supporting column (dampener) works normally, the car will stop immediately as soon as the hand-push forces are released or after the back bounces for 1—2 times.

（II）Removal and installation of the front absorber assembly

Removal

1、Remove the wheels.

2、Remove the E-shaped ring for fastening the brake soft tube, and take off the tube from the supporting frame.

3、Remove the two fastening bolts for the absorber and car frame.

4、Remove the joining bolts for the absorber and the steering knuckle.

5、Remove the absorber assembly.







Steps for installation:

1.Do the installation by referring to the dismounting steps.

2.**Points of attention:**

①. In the screw tightening process, the fastening bolts controlled by torque + corner tightening submission limits should be replaced after each action of loosening.

② .The screws should be tightened to the specified torques after the installation.

（III）Inspections

1、Checking the dampener

Check to see if there is any oil leakage on the dampener. If any, replace the dampener. Check the dampening force of the dampener. If not qualified, replace the dampener.

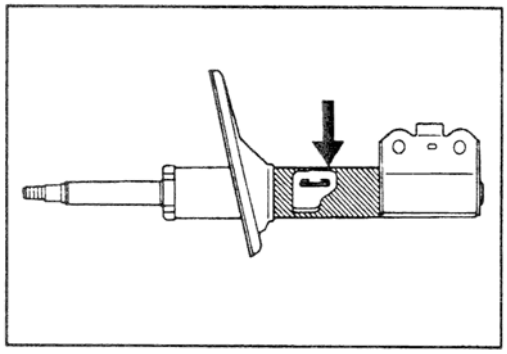
Check to see if the thrust bearing is excessively worn, has any abnormal operational noise or is jammed one way or the other. Check to see if the lower stand of the spring has any cracks or deformation. Check to see if the spacing block is damaged. Check to see if the suspension reset spring spacing washer is worn, cracked or deformed. If so, replace the defective parts.

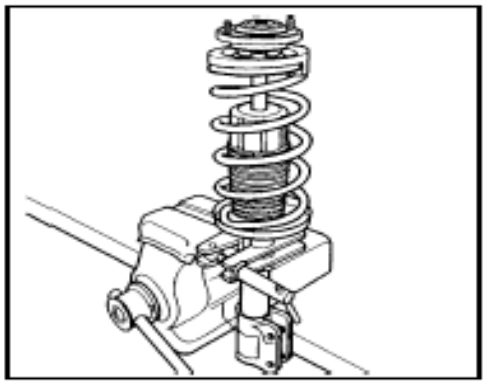
Attention: When disposing the dampener, please follow the procedures described below.

2、Disposal of the front dampener

（1）Stretch the dampener rod as much as possible.

（2）Drill hole to discharge the air inside the dampener cylinder.. Drill a hole on the cylinder body as shown in the figure to discharge the air inside.





Attention: The discharged air is harmless. But iron dusts may fly all around when the hole is drilled.

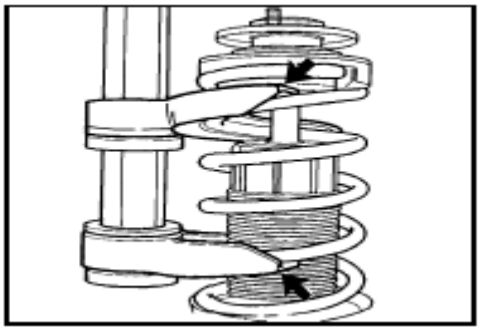
(IV)Dismounting and installation of absorption supporting columns, column parts and/or springs

1. If the installation fixtures are unable to be fastened onto the operation platform, they can be fastened in the bench vise.

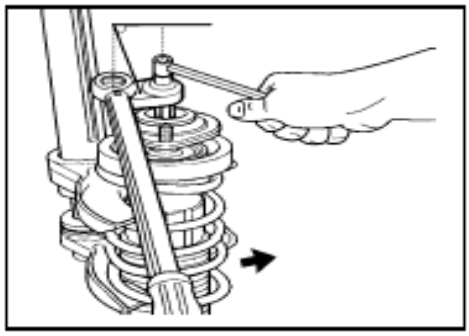
2. Install a pair of jaws with diameter matching that of the springs onto the spring compressor.

Removal

1. Loosen the spring compressor and place the jaws between the spring tops and bottoms (as shown by the arrow).



2. Press the spring till it is separated from the upper and lower spring stands.
3. Use the ratchet wrench (as shown in the Figure) to dismount the absorber supporting column stand restriction device and the washer from the piston connecting rod.
4. Remove the upper spring stand with absorption block.
5. Remove the spring compressor with the spring and the dustproof cover.
6. Dismount the baffle block.
7. Check the dismounted parts and components for the extent of tears and wears.

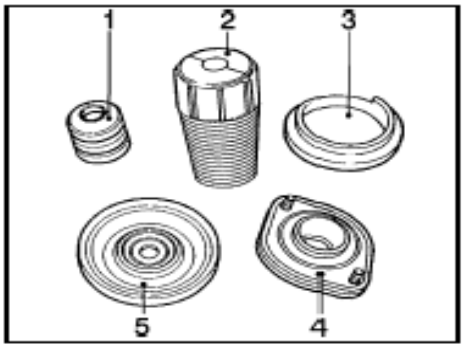


1） The baffle block

2） The dustproof cover

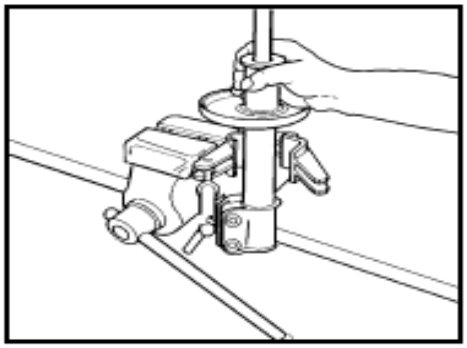
3) The absorption block

4） The absorber supporting column stand



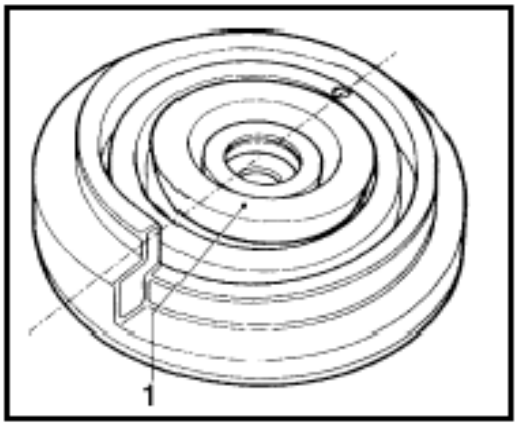
5） The upper spring stand with bearing and restriction device

8. In the case that the used absorber needs to be replaced, remove the absorber and then dismount the lower wheel speed sensor wire bundle frame from the used absorber and install it on the new absorber (if there is no wheel speed sensor wire bundle frame, the absorber can be replaced directly).



Steps of installation:

1. Install the new absorber in the installation fixture.
2. If the used spring needs to be replaced, loosen the spring and then take the used spring out from the spring compressor.
3. Insert the new spring into the spring compressor with a ring being left for the upper section and one and a half rings being left for the lower section.
4. Press the spring to make the spacing between the two jaws≤120 mm.

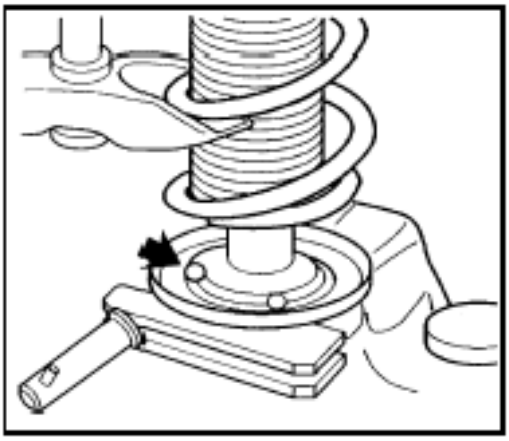


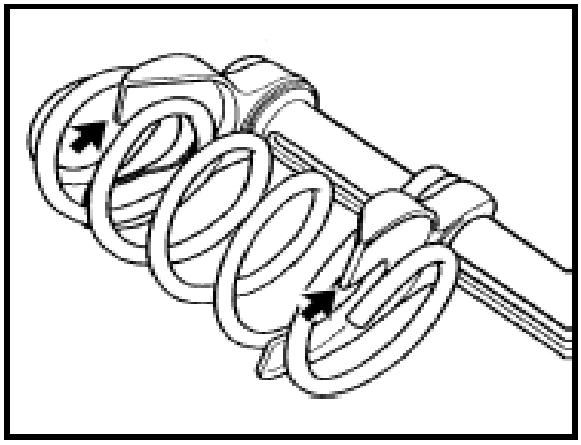
5. Make sure the position of the baffle block restriction device (1).
6. Install the baffle block and pull the piston rod to the bottom.
7. Place the spring onto the spring stand.

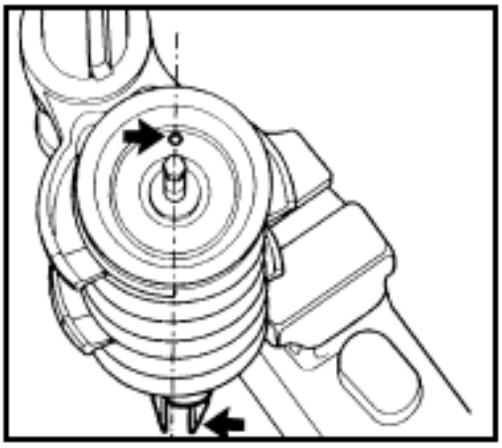
Cautions:

The end of the spring must be within the position restriction hole (as shown by the arrow).

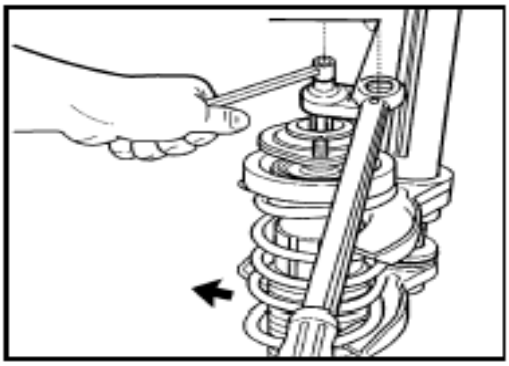
8. Install the upper spring stand with absorption block so as to make the punched hole have a 180 degree bias from the lower spring supporting column position(as shown by the arrow).







9. Install the separation sheath bearing and the positioning device.
10. Make use of new nuts for tightening against looseness.
11. Tighten the new screw nuts.
Cautions:
The torque wrench should be used in the perpendicular manner (as shown in the figure).



IV. Removal and installation of the lower swinging arm assembly

Removal

1）Remove the wheels.

2）Remove the balanced beam and rubber sleeve assembly.
Attention: When removing the balanced beam, the assembly is to be removed, and the supporting frame of the balanced beam is to be removed.

3）Remove the joining bolt for the steering knuckle and the lower swinging arm.

4）Remove the joining bolt for the car body and the lower swinging arm.

5）Remove the car body lower swinging arm assembly.
Steps of installation:
1. Do the installation by referring to the steps of dismounting.

2、Points of attention:

① In the screw tightening process, the fastening bolts controlled by torque + corner tightening submission limits should be replaced after each action of loosening

② The screws should be tightened to the specified torques after the installation.



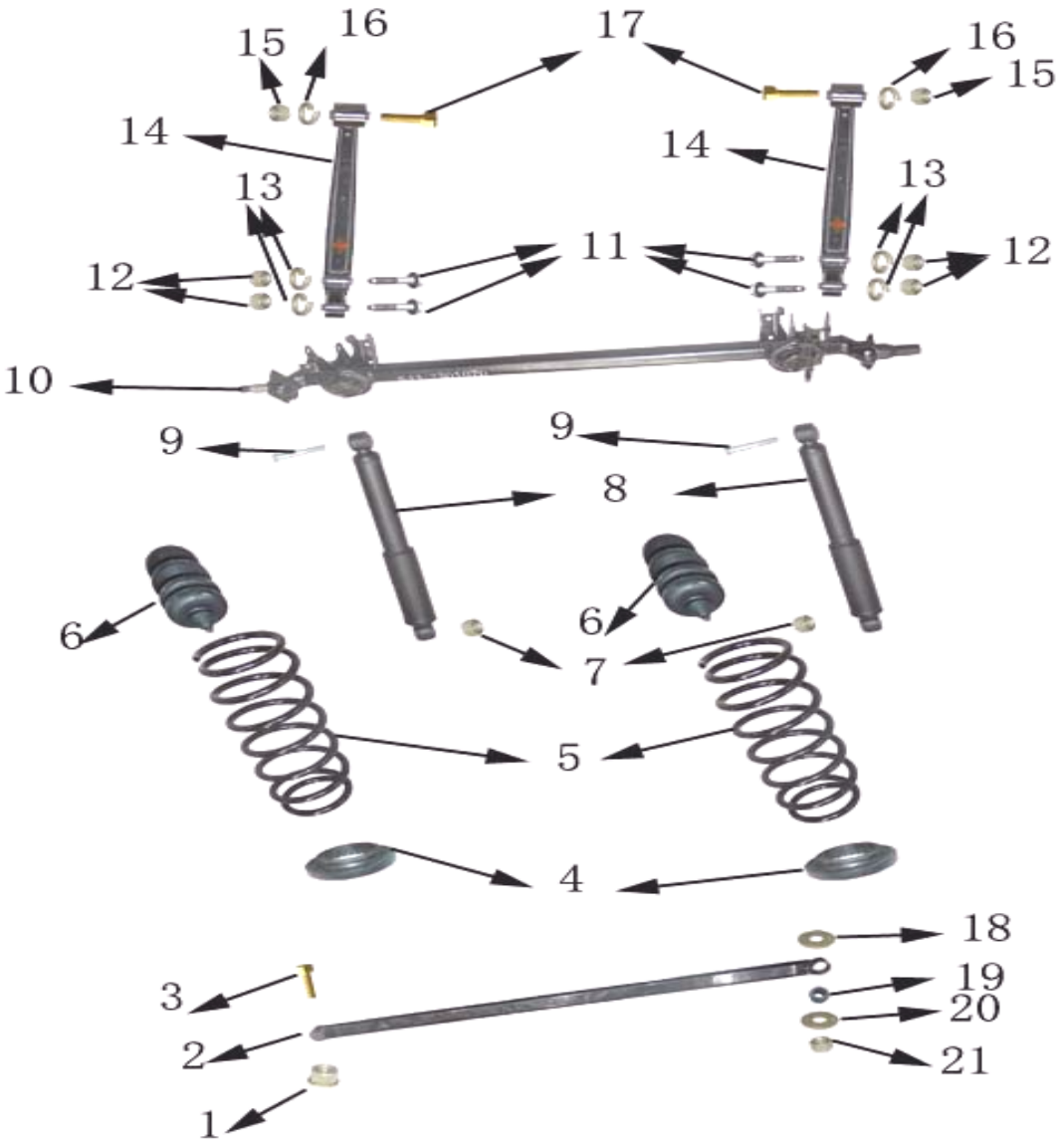




Section Three Rear Suspension Frame

Rear Suspension service

I . Rear Suspension parts



1. 7. 12. 15. 21. Screw nuts; 2. Horizontal stabilizing bar; 3. 9. 11. 17. Bolts; 4. Lower supporting stand; 5. Spiral spring; 6. Spacing block; 8. Dampener; 10. Rear bridge; 13.16. Spiral washer; 14. Left and right swinging arm; 18.20 Washers; 19 Sleeve

II. Dampener

Removal

1、Lift up the car and remove the bolts joining the dampener with the car bridge.

2、Remove the joining bolt for the dampener and the car body.

3、Remove the dampener assembly.





Steps of installation:

1. Do the installation by referring to the steps of dismounting.
2. Points of attention:

① In the screw tightening process, the fastening bolts controlled by torque + corner tightening submission limits should be replaced after each action of loosening.

②The screws should be tightened to the specified torques after the installation.

III. Vertical swinging arm and its sleeve

Removal

1、Remove the left and right rear wheels.



2、Remove the joining bolt for the vertical swinging arm and the rear bridge.



3、Remove the bolts fastening the vertical swinging arm and the car body.

4、Remove the rear swinging arm.

Steps of installation:

1. Do the installation by referring to the steps of dismounting.
2. Points of attention:

①In the screw tightening process, the fastening bolts controlled by torque + corner tightening submission limits should be replaced after each action of loosening.

②The screws should be tightened to the specified torques after the installation.



Inspections

Check to see if the swinging arm is damaged or deformed; check if there are any cracks or serious wears on the swinging arm sleeve.

The sequence for the installation procedures is the opposite to those for removal. Tighten the related bolts with the specified torques. Attention: when the front sleeve is installed, the cut slots on the sleeve should face forward and rearward

IV、Removal and installation of the horizontal stabilizing rod and rear bridge

Removal

1、Lift up the car and remove the rear wheels and the brake drums. Remove the E-shaped ring and brake soft tube from the rear bridge supporting frame. Remove the oil inlet pipe of the brake branch pump. Remove the rear brake base plate and the manual brake pulling wire. Use a jack lift to lift the center of the rear bridge.



2、Removal and installation of the rear bridge horizontal stabilizing rod

1）Remove the joining bolt for the horizontal stabilizing rod and the car body.



2) Remove the joining bolt for the horizontal stabilizingrod and t he rear bridge.



3) Remove the dampener and the spiral spring.



4) Remove the rear bridge assembly.

Steps of installation:

1. Do the installation by referring to the steps of dismounting.
2. Points of attention:

①In the screw tightening process, the fastening bolts controlled by torque + corner tightening submission limits should be replaced after each action of loosening.

② The screws should be tightened to the specified torques after the installation.

Chapter 4 Steering System

Torque specifications

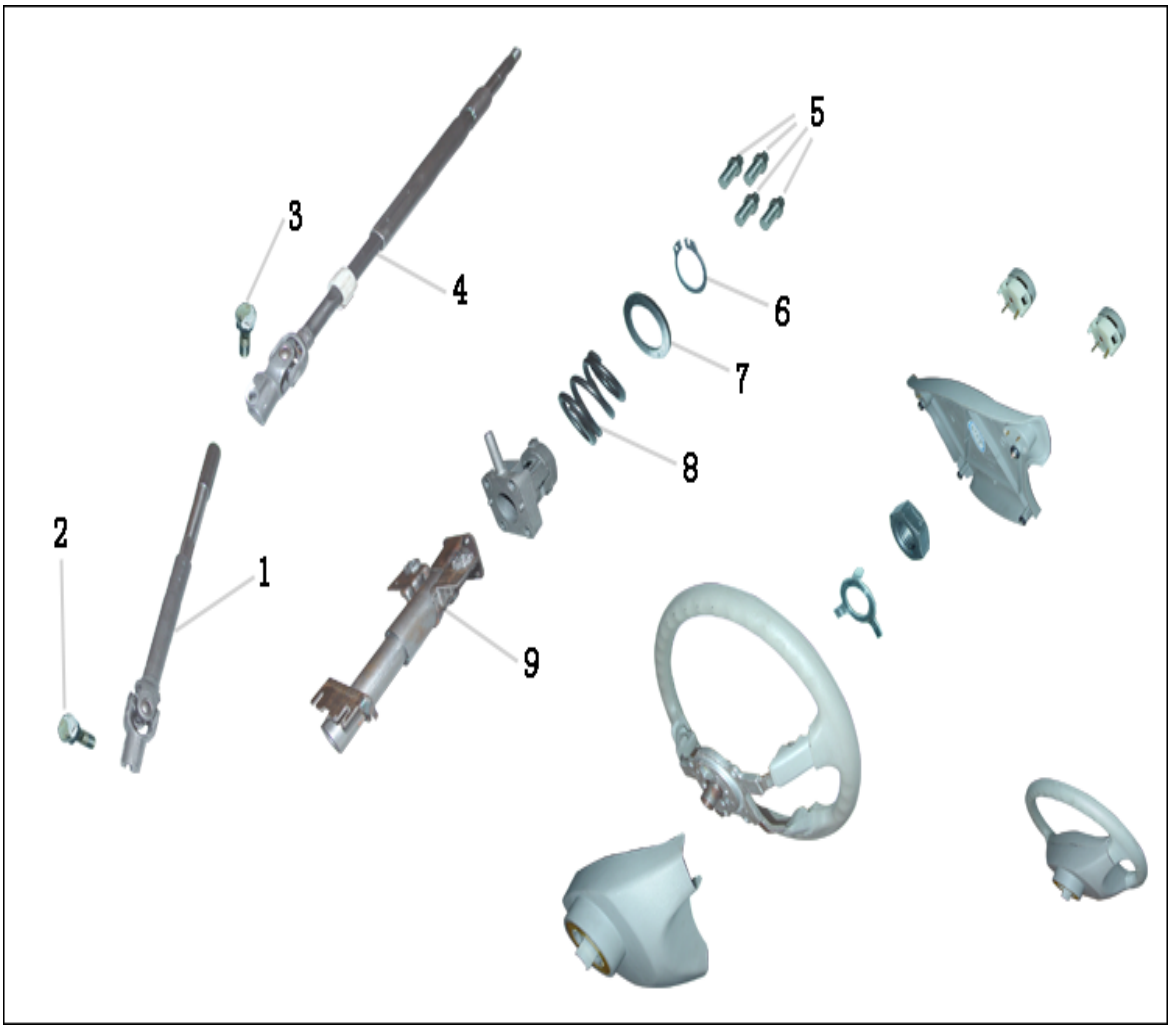
Application	Specifications
Steering box installation nut	70-80Nm
Tie rod and rack fixture nut	63-77Nm
Tie rod end plane and steering knuckle fixture nut	32-38Nm
Power steering pump installation bolt	22-28Nm
Steering column and crosstree	13-17Nm
Steering knuckle and steering box	22.5-27.5Nm
Steering wheel and steering shaft nut	27-33Nm
Steering shaft flange clamping bolt	22.5-27.5Nm

Nipple torque specifications

Application	Specifications
Power steering oil hosepipe and power steering pump socket	2-3Nm
Power steering oil hosepipe and power steering storage tank socket	2-3Nm
Power steering high pressure hosepipe and power steering pump socket	20-35Nm
Power steering high pressure hosepipe and power steering box inlet nipple	27-33Nm
power steering box oil inlet and power steering box socket	27-33Nm
power steering box gusher pipe and power steering box socket	27-33Nm
power steering box gusher pipe and power steering oil return pipe socket	27-33Nm

Manipulate part overhaul

Steering wheel and steering column decompose view



1. Steering universal coupling shaft and universal coupling； 2，3. Bolts；
4. Steering core shaft assembly； 5. Bolts； 6. Jump ring； 7. Washer； 8. Spring
9.Steering column

Steering wheel free-play inspection

In the assembled mode, check the free-play of the steering wheel while the car is driving in straight line. The free play of the steering wheel in the circumferential direction should be no larger than 0~30mm. In the case that the free play goes beyond the specified value, the following items should be checked to see: if the joint of the steering horizontal lever is worn out (when a torque of over 0.2N.m is applied, the joint should be moved); if the lower ball knuckle is worn out; if the steering shaft universal coupling is worn out; if the steering small gears or gear rack is worn out or damaged and if the fixture or joining of the parts is loose.



Control institute

Steering wheel Removal

Remove the battery jumper wires; remove the steering wheel label cover assembly; remove the steering shaft screw nut. To facilitate positioning in the installation, matching signs are to be made on the steering wheel and the steering shaft, then remove the steering wheel with the special purpose remover.





Removal of the steering column assembly

1) Remove the wire bundle of the steering wheel cover and horn switch.
2) Remove the fastening screw nuts the steering wheel.
3) Remove the combination switch assembly.
4) Remove the joining bolt for the steering column and steering power tilt.
5) Remove the four fastening screws for the steering column.



Inspection

1、The steering shaft and universal coupling: check to see if the steering shaft is bent, or if the spine is damaged; check to see if there are any cracks on the universal coupling, or if the free play is too large. If so, replace the universal coupling assembly.

2、Steering column: check all the covers of the steering column stand, with the spaces from the slot bottom within 1.00mm. If not, make proper replacements. Check to see if the steering column is bent, cracked or deformed.

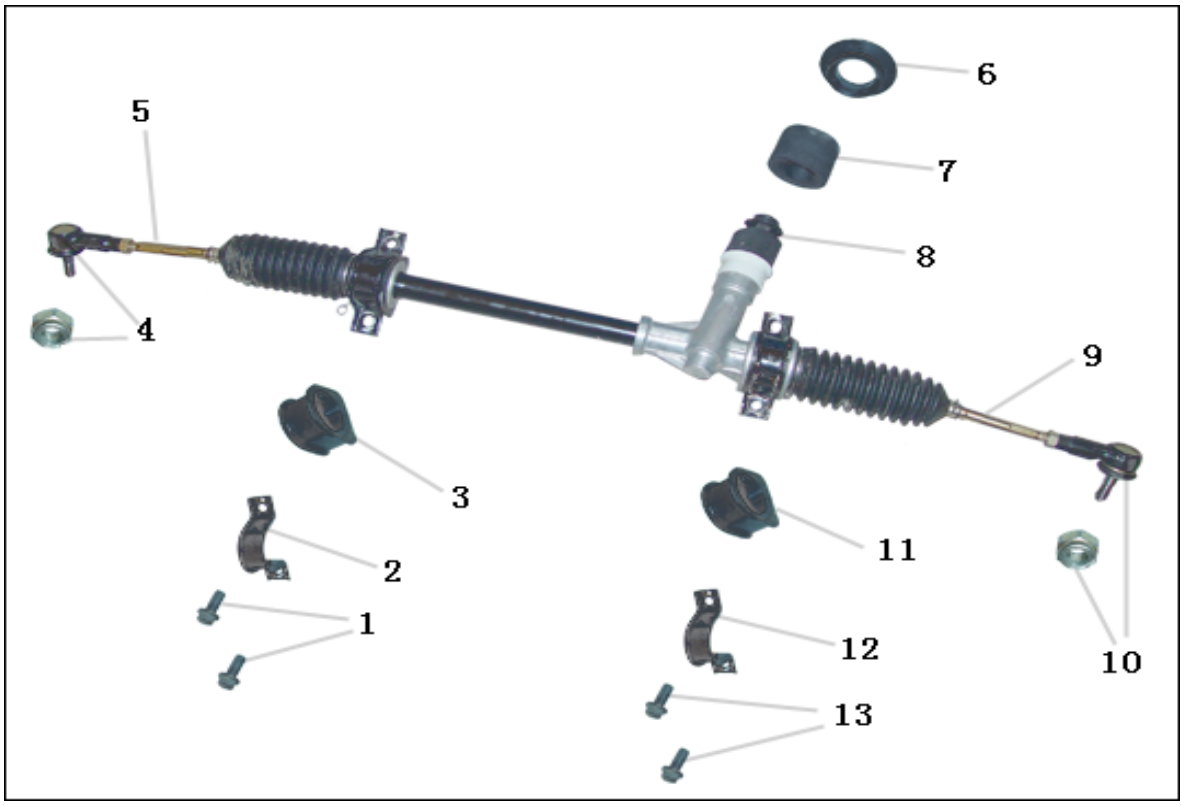
Installation

The order of installation steps is just the opposite to that for removal.

Attention: Apply alkali-based lubricating grease on the interior slot of the rubber sleeve of the steering column, and tighten the associated bolts and screw nuts with the specified torque.

Manual Steering Gear

Manual steering gear components



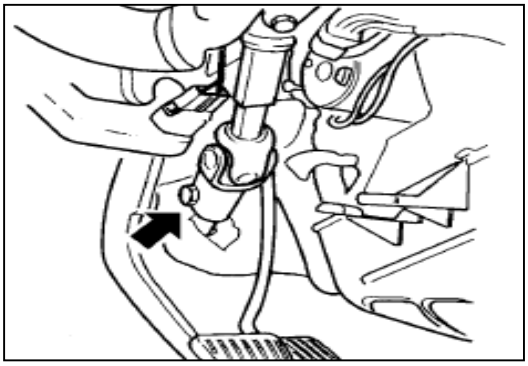
1. Bolts; 2. Right supporting frame; 3. Right supporting frame sleeve;4. Right steering horizontal lever joints assembly; 5. Right horizontal lever;6. Steering gear washer; 7. Gear bearing stopper; 8. O-shaped ring; 9. Left horizontal lever; 10. Left steering horizontal lever joints assembly; 11. Left supporting frame sleeve; 12. Left supporting frame; 13. Bolt

II、Removal of power steering gear assembly

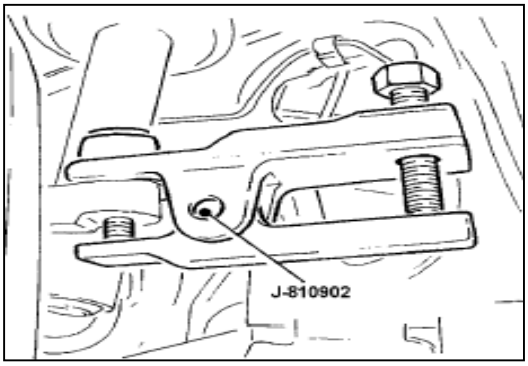
(I)Removal

Disassembly procedure

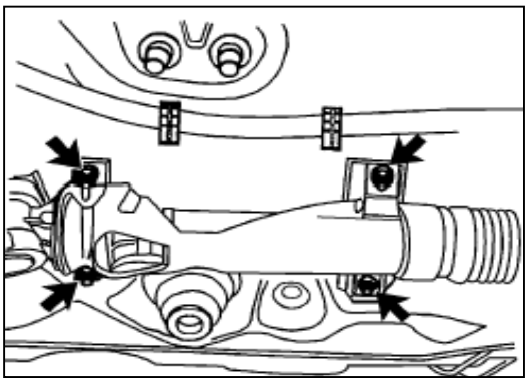
1. Put steering wheel forward and lock steering, remove steering shaft.



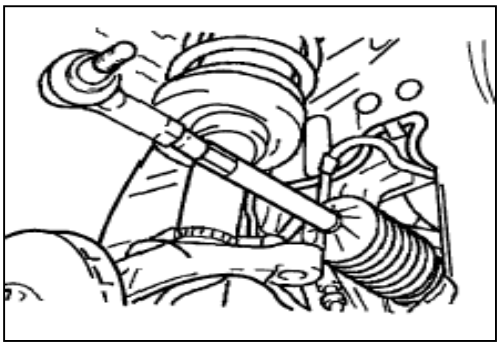
2. Loosen the nuts on two ends of steering transverse lever and push out the ends of lever from steering node.



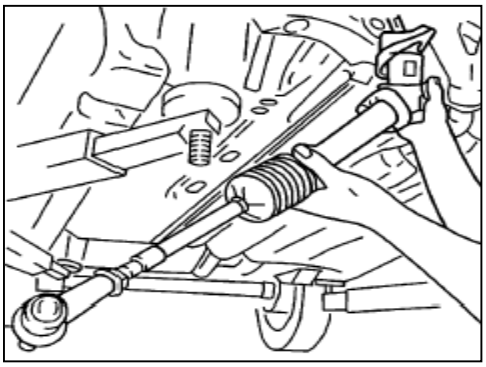
3. Loosen the support and remove out.



4. Turn steering pivot left into gap of wheel, pull the lever into engine compartment.

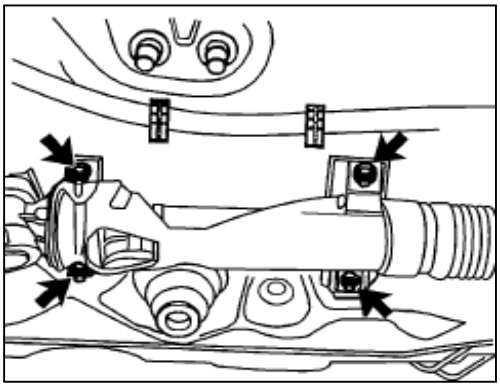


5. Push down and backwards to remove steering pivot.

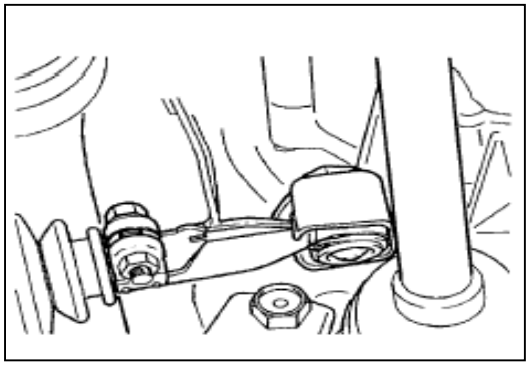


Steps of installation

1. Turn steering pivot upwards and push the pivot into gap of wheel
2. Insert pivot into front surround.
3. Screw the nuts between the support and front surround (not tighten).



Fixture
Install pivot on front surround with 70-80Nm.
Insert two ends of lever and screw with steering node.
(Use new nuts) with 32-38Nm.
4.Put the pivot forwards.
5. Install steering gimbal assembly.



Fixture
Screw steering gimbal assembly with 22.5-27.5Nm.

Description and operation
Instruction for steering system
The turning of steering will produce following actions:
1. The motion of steering will transfer to small gear
2. The motion of small gear will transfer to gear.
3. The teeth of small gear will be joggled with rack.
4. Rack will move under the force.
5. The force will transfer from transverse lever to steering node.
6. Steering knuckle turn wheel

Steering wheel and steering column
Common problem and treatment measure
Lock system incapable open lock

Problem	Measure
Lock core possible be damage	Check this part If need to replace part, refer " The ignition switch lock core replacing"
Ignition switch is wear out or damage	If need to replace part, refer " The ignition switch lock core replacing"

Lock system cannot lock u

Problem	Measure
Following parts possible be damage	Check unit If need to replace part, refer " The ignition switch lock core replacing"

On close and locking position, cannot pull out key

Problem	Measure
Ignition switch Lock core sets not correct	Demand adjust Lock core If need to replace part, refer " The ignition switch lock core replacing"
Lock core damage	If need to replace part, refer " The ignition switch lock core replacing"

On Close and locking position, demand larger locking force

Problem	Measure
Lock core damage	If need to replace part, refer " The ignition switch lock core replacing"

Steering wheel looseness

Problem	Measure
Steering wheel installation nut is loose	1.Check steering wheel installation , refer " The steering wheel replace" 2. To fix steering wheel installation nuts, refer " The steering wheel replace"
Steering wheel damage	1. Check steering wheel refer steering wheel replace 2. Steering wheel replace refer steering wheel replace
Steering intermediate shaft wear out or damage	Check steering intermediate shaft, refer " The power steering box replace" Replace steering intermediate shaft, refer " The power steering box replace"

Steering shaft check

Check steering shaft plastics pin whether sheering some symptom as follows
Steering shaft from flank slight dash have chatter When turning steering wheel , can feel clearance
If steering shaft pin is no serious damage , advise to replace steering shaft

Steering column looseness

Problem	Measure
Steering column installation bolt loose	Screw bolts to specified torque
Steering column stay unit loose or damage	1. Check steering column assembly 2. Repair or replace steering column assembly

Steering wheel looseness

Problem	Measure
Steering wheel installation nut looseness	1. Check Steering wheel installation 2. Fix steering installation nut again
Steering wheel damage	1. Check steering wheel 2. Replace steering wheel
Steering intermediate shaft wear or damage	Check steering intermediate shaft Replace steering intermediate shaft r

Service guide

Replace ignition switch core

Removal

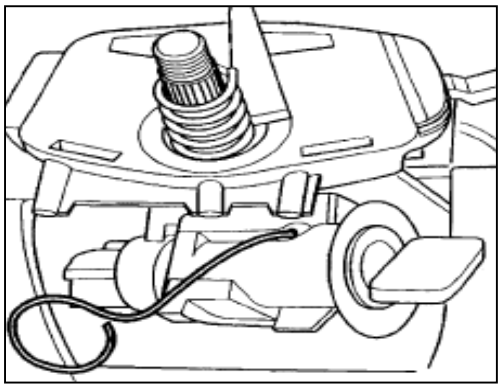
1. Remove plastic cover

2. Insert needle into lock hole and pull out the core from lock seat.

Steps of installation

1. Push the moving block to the direction shown in the figure.

2. Insert the core into the seat.



Steering shaft replace

Disassembly procedure

1. Remove steering wheel from shaft.

Points of attention

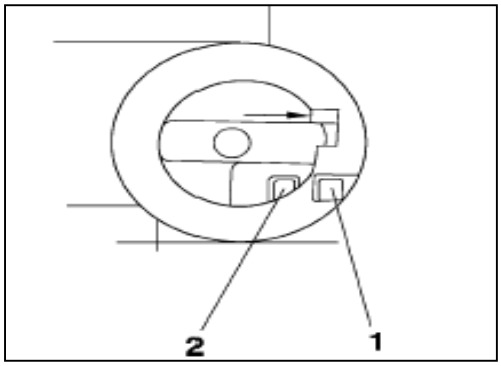
Don't knock steering when install or remove.

2. Loosen switch cover bolts. Remove signal switch (left) and wiper switch (right). Loosen the bolts between up/down shaft.

3.Loosen moving bolts on steering column under instrument cluster.

4. Remove steering column.

5. Remove up steering shaft



Points of attention

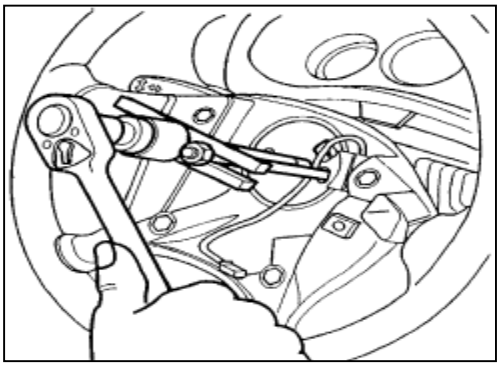
The lower guide bearing is a rubber bearing. Carefully remove the bearing.

Don't put steering lock in lock position.

Steps of installation

1. Insert new up shaft into steering column. Insert lower guide pipe into rubber bearing. Push the bearing to the end.
2. Connect separate block, support, lower support with bolts.

   Use new locknuts.



Fixture

Screw support and lower support with 13-17Nm.

3. Insert shaft flange and fix. Insert harness connector into signal switch and wiper switch. Fix signal switch cover.

Fixture

4. Install steering wheel in steering shaft

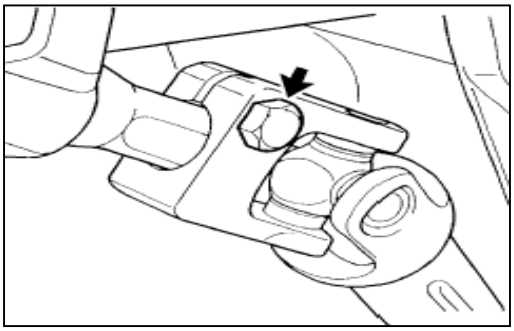
Screw bolts with 22.5-27.5 Nm.

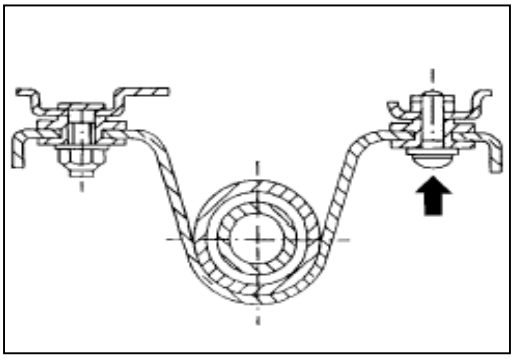
Screw bolts with 22.5-27.5 Nm.

Fixture

Screw steering nuts and shaft nuts with 27-33Nm.

5. Check forwards position of the steering institution.





Steering column replace

Points of attention

Observe safety regulation during operating air bag.

Remove procedure

1. Remove air bag unit and the steering wheel with air bag.
2. Loosen the bolts.
3. Loosen the safety bolts.

Drill holes on safety bolts with electric screwdriver to pull out the bolts.

4. Remove steering column.

Points of attention

Don't turn ignition switch in LOCK position.

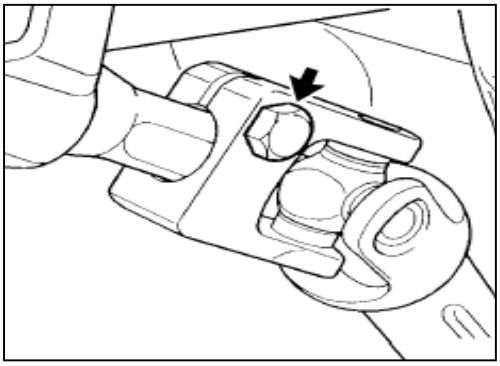
5. Remove up steering shaft and lower steering guide bearing from pillar.
6. Remove lower steering guide bearing from pillar.
7. Replace steering column.

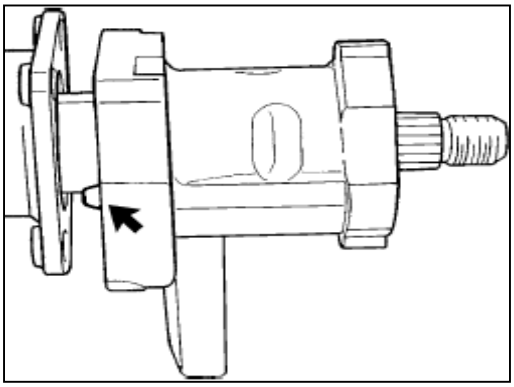
Steps of installation

1. Insert steering column screw.

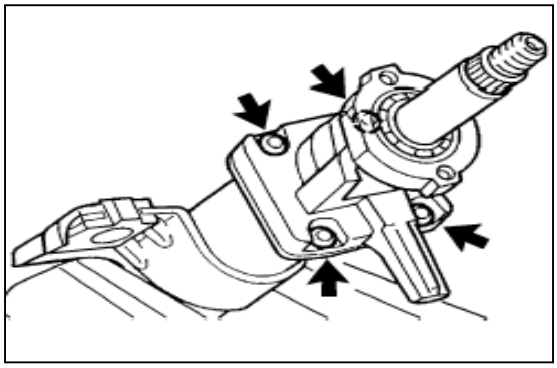
Points of attention

Note guide ears on shell.

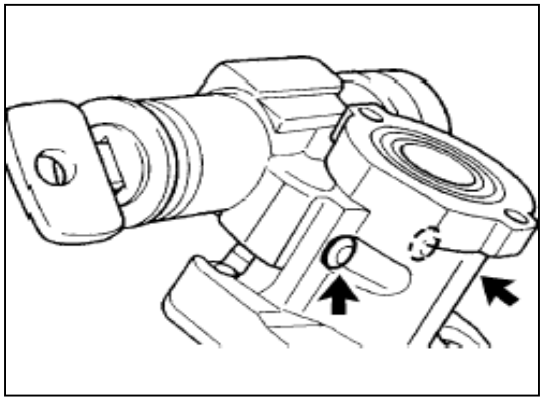




2. Use 4 bolts to fix the shell and pillar.



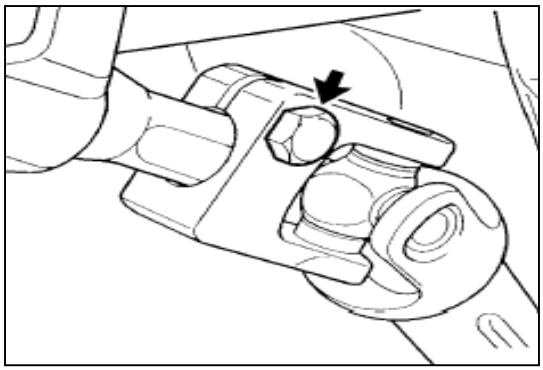
3. Use bolts to fix ignition lock shell and shaft shell.
4. Insert new shaft into pillar.



Points of attention

Don't turn steering and ignition lock in LOCK position.

5. Push guide bearing into pillar.
6. Insert and fix steering shaft.



7. Screw bolts.
8. Install steering wheel with air bag and air bag components.

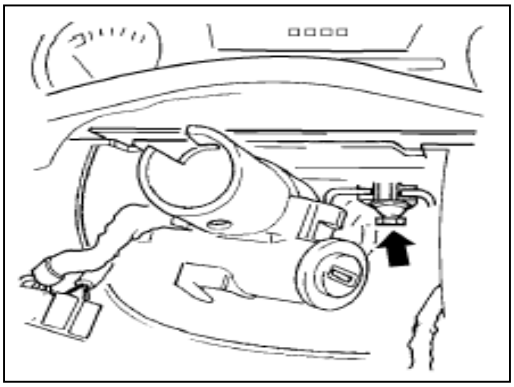
Fixture

Screw shaft flange bolts to 22.5-27.5Nm.
Screw gear flange bolts to 22.5-27.5 Nm.
Screw steering wheel and shaft bolts to 27-33Nm.
10. Check forwards position for steering mechanics.
Description and operation
Description Steering wheel and steering column
Steering component can realize the functions besides of steering.
1. Steering column
Steering can absorb energy. When crashing happens, the pillar will shrink to reduce the probability to hurt driver.
2. Ignition switch and steering lock Ignition switch and steering lock can prevent stealing vehicle.
3. Multi-purpose operation lever
Multi-purpose operation lever can control following parts:

- High beam of head lamp
- Windshield wiper and cleaner

Remove and re-install steering pillar
Use specified bolts to fix the pillar to make sure absorb engine action. Be careful to remove or transport the pillar.

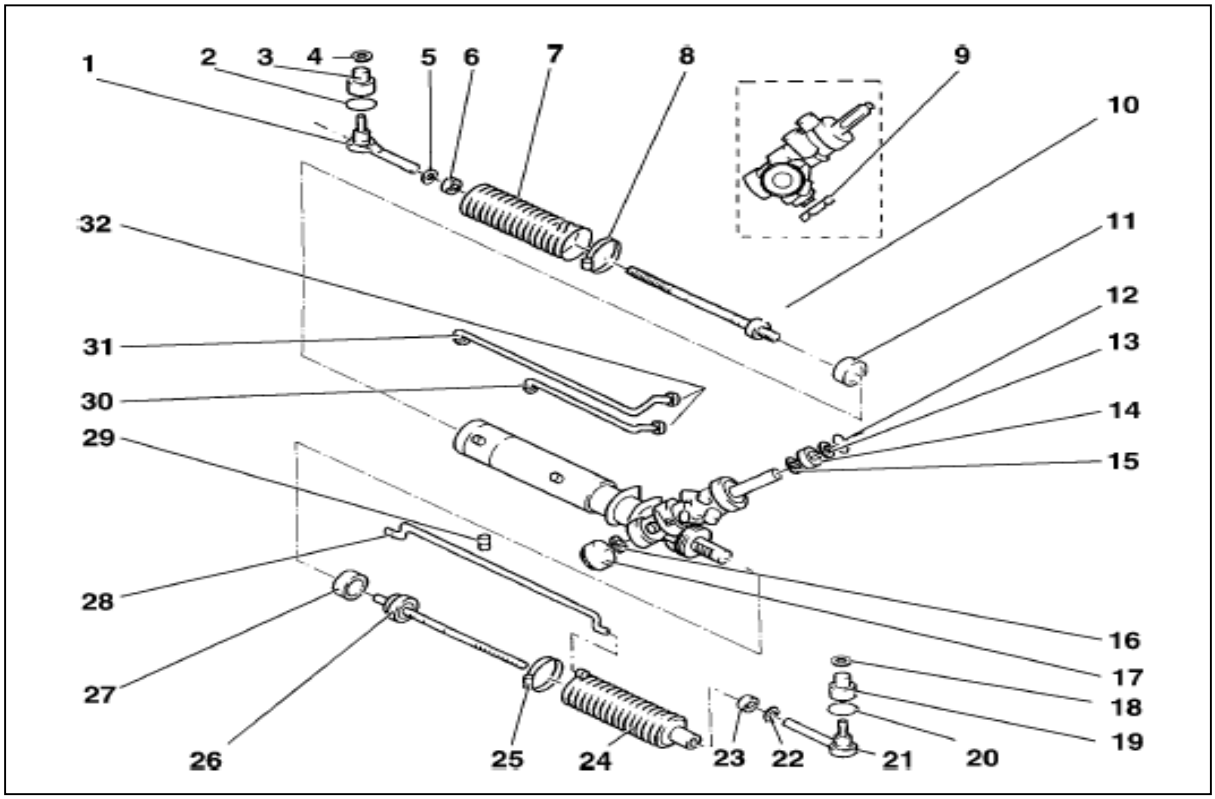
1. The drawer to remove steering wheel is not recommended one.
2. The top of pillar is knock badly.
3. Something leans against the pillar.
4. The pillar falls off.



Power steering system

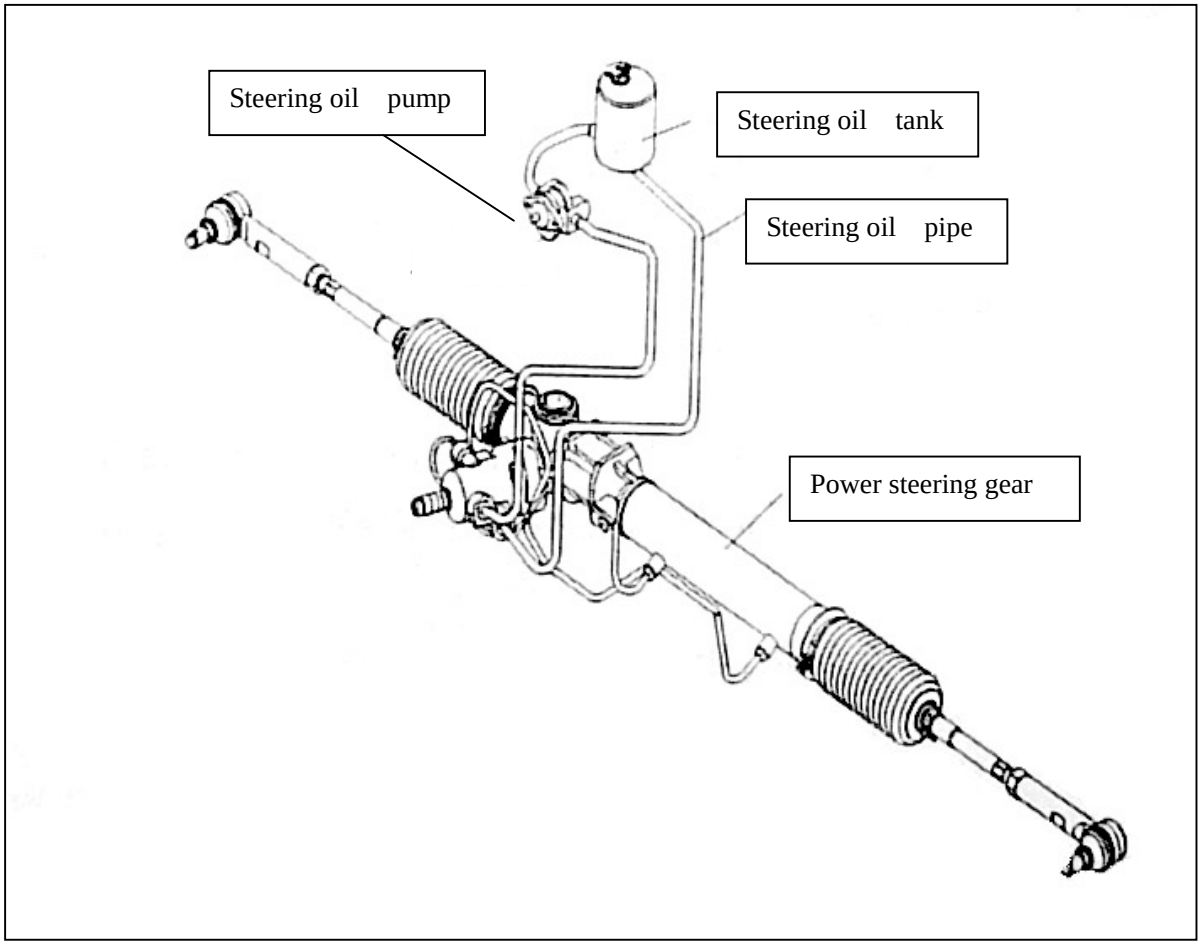
Exterior identify

Power steering box



(1) Steering tie rod socket unit
(2) Fixed ring
(3) Dust cap
(4) Lock
(5) Check nut
(6) Tie rod ripple cowl hoop
(7) Ripple cowl
(8) Steering box shell ripple cowl clamp
(9) Lock nut
(10) Tie rod in band ball
(11) Limiting stopper
(12) Circlet
(13) Facing ring
(14) Searing ring
(15) Bearing
(16) Nut
(17) Cover cap
(18) Lock nut
(19) Dust cap
(20) Circlet
(21) Tie rod end
(22) Check nut
(23) Tie rod ripple cowl hoop
(24) Ripple cowl
(25) Steering box
(26) Tie rod in band ball unit
(27) Limiting stopper
(28) Tube
(29) Oil pipe clip
(30) Hydraulic piping
(31) Hydraulic piping
(32) Trust sealing ring

Power steering service schematic diagram



Steering system fizzy noise

Step		Measure	Yes	No
Identification: Fizzy noise is heard during Engine running or steering wheel turning				
1	If the fizzy noise becomes loud When comparing with other normal vehicle?		TO step 2	System perfect
2	If the fizzy noise becomes loud? If steering fluid level is too low?		TO step3	TO step4
3	Fill fluid into the system. Does customer still complain?		TO step1	System perfect
4	Is the noise from inside of vehicle?		TO step5	TO step7
5	The noise may enter passenger compartment through outlet of front instrument panel.		TO step6	TO step7
6	Repair or replace steering pillar seal. Does customer still complain?		TO step1	System perfect
7	Make sure the lay for steering hose and pipe is correct (not touch with front instrument panel). Repair or replace hose and pipe if necessary. Does customer still complain?		TO step8	System perfect
8	Confirm The source of noise. Check steering pump and steering institute. Repair or replace parts if necessary. Does customer still complain?		TO step1	System perfect

Steering system chatter noise

State	Measure
Power steering system piping wear	Ensure power steering wear refer hydraulic piping replace
Steering box looseness	Fixture steering box nut torque refer fastener specifications
Tie rod one end or both ends looseness	Repair or replace tie rod end if necessary
Steering universal joint looseness	Repair or replace the universal joint refer if necessary

Power steering box diagnosis

Fizzy noise

Some noise will be heard during steering in fixed place under conventional condition.
Check if any leakage for system.
Check if air in system.
Turn sharply needs too much force in short time.
Check if any leakage for inner pressure.
Check if the pressure in the pump is nor enough.
Check if the fluid level is too low.

Power steering box and steering pump leak

Following symptoms show the leakage in system.
Obvious fluid leak on steering pivot or pump.
Loud noise is heard during park brake or cooling engine.
Lost power steering when park brake.
Heavy steering.
Check procedure
Go on following steps when check outside leak in system:

1. Wipe doubt section.
2. Check if too much fluid in the tank.
3. Check if following situations appear in system.

Air mixed in fluid.
Over flow.

4. Check following parts:

Hose connector.
O-ring

5. Confirm leaking position with following methods:

5.1 Turn off engine.
5.2 Wipe whole system.
5.3 Check fluid level in tank.
Fill fluid if necessary.
5.4 Start engine.

Points of attention:

Don't turn steering to the end and keep on. It will damage pump.
5.5 Ask assistant to turn steering left/right for several times.
5.6 Confirm leaking position and fix.
6. Go to following steps if repairing
6.1 Clean leaking position before removing
6.2 Replace the seal
6.3 Check if the seal is broken.
6.4 Screw bolts to specified torque.
6.5 Fill fluid to system.
Full filling/draining air
6.6 Draining air in system

Power steering box diagnosis procedure

1. Check if any leakage around connector.
2. Replace steering pivot if leak appears between following parts

Wrest lever
Input shaft

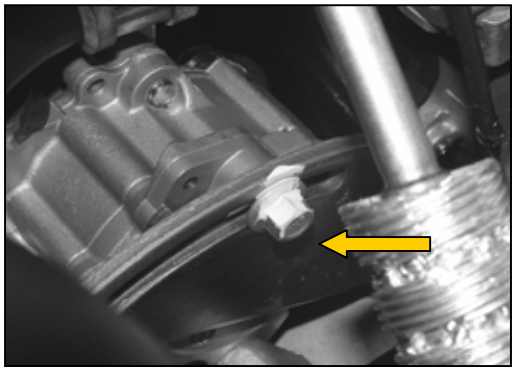
3. Replace pivot if leak appears on driver's side and is not affected by steering.
4. Replace pivot if leak appears on top cover and spray fluid when steering turn to left end.
Replace transmission shaft if there are serious corrosion dots on the shaft.
Clear the shaft surface with cloth if the corrosion on seal area is tiny.
Replace the shaft if there still is leakage after clearing.
Suggestion to replace seal
Following parts needs special seal:
Steering pivot
Drive shaft of pump
Go to following steps if one of above leaks appears:

1. Check seal section.
2. Clear seal section.
3. Replace seal.

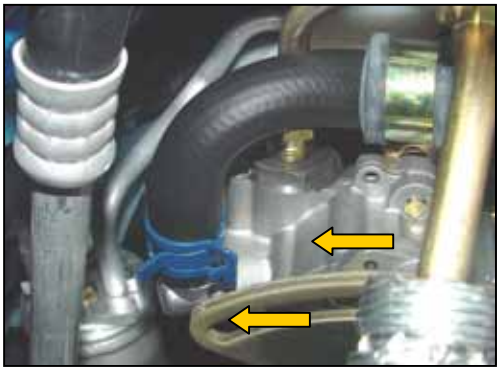
Power steering pump replace

Disassembly procedure

1. Remove transmission belt and loosen adjust bolts



2. Remove high-pressure hose and pipe from steering pump. The fluid will flow into the container. Please observe the safety regulation.
3. Remove the pump from front support.



Steps of installation

1. Put the pump on the support]

Fixture: 22-28Nm.

2. Install strengthen transmission belt.
3. Connect high-pressure hose and pipe on steering pump again.

Power steering

Disassembly procedure

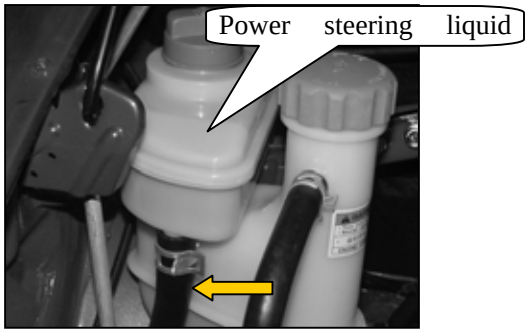
1. Loosen two connectors and remove out.
2. Remove tank from support.

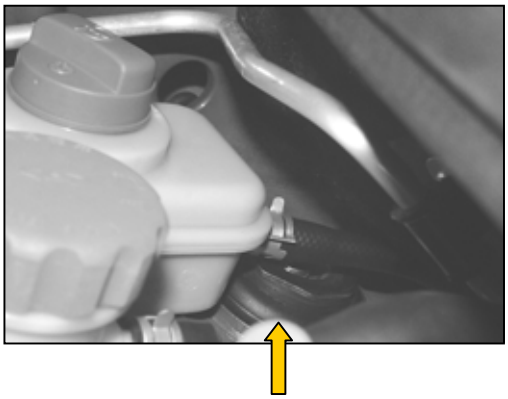
Points of attention

Residual fluid will flow out into the container.

Steps of installation

1. Put the tank into support and screw bolts. Connect two hoses and fix clamp.
2. Check if any leakage in system.







Rinse power steering system

Attention: Use suitable steering fluid when filling or replacing fluid, otherwise it will damage hose and seal.

1. Lift vehicle to run wheel freely.
2. Suck out fluid from tank.
3. Remove fluid hose from connector.
4. Insert outlet of hose into tank.
5. Put hose into container.
6. Run engine at idle. Ask assistant to fill fluid into tank.
7. Turn steering wheel left and right.

Attention: Don't turn to end for starring wheel to keep on. Otherwise it will cause over heat for system or damage pump and pivot.

8. Continues to drain out all old fluid.
9. Resin system with 0.9L new fluid.
10. Check if all fluid is drained out.
11. Remove the cock of pump.

Points of attention:

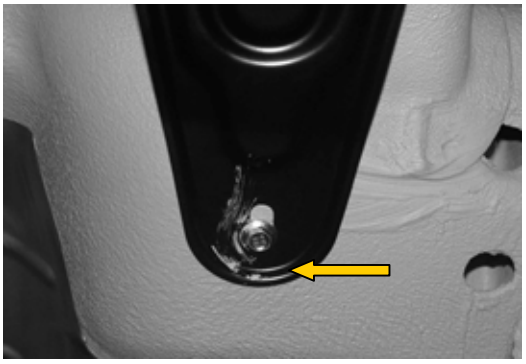
Don't use the fluid drained out.

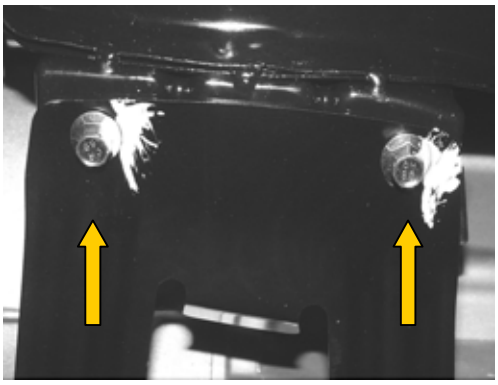
12. Connect hose and tank.
13. Turn off engine.
14. Fill fluid into tank.
15. Check if any leak in tank.
16. Drain out air of system.

Power steering box replace

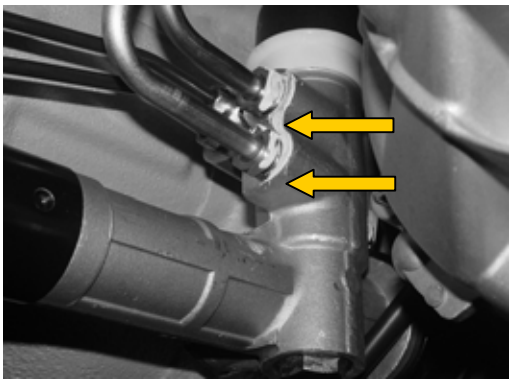
Disassembly procedure

1. Remove 3 bolts first.

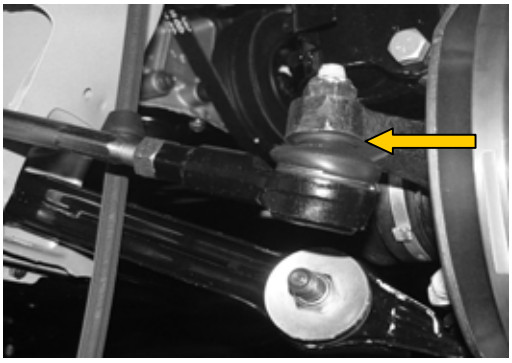


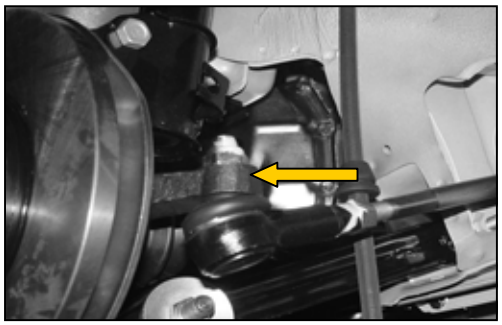


2. Loosen nuts on hose. Note to collect fluid.

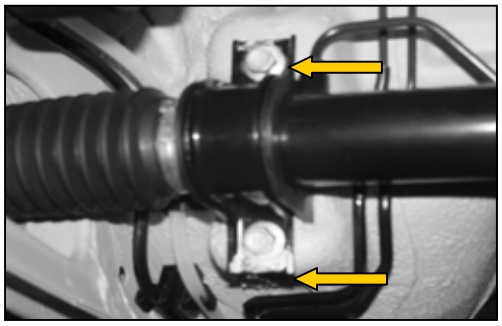


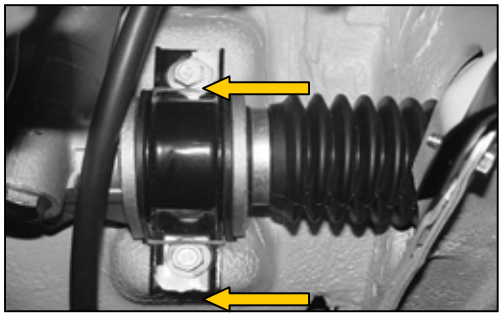
3. Remove bolts on left/right transverse lever.



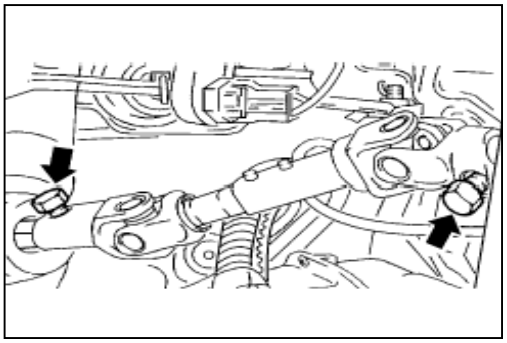


4. Remove bolts on pivot.

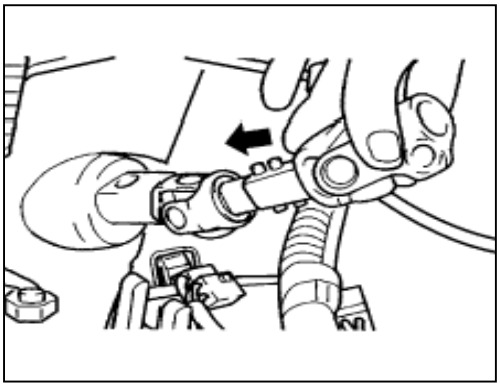




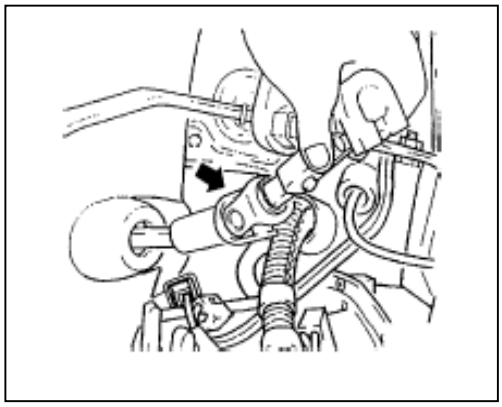
5. Loosen two bolts on steering node.



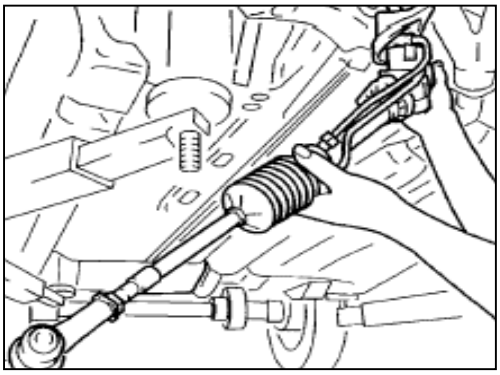
6. Push lower end of node to side of steering pivot to disconnect up end with steering pillar.



7. Remove steering node assembly.



8. Remove steering assembly.



Chapter 1 Start System

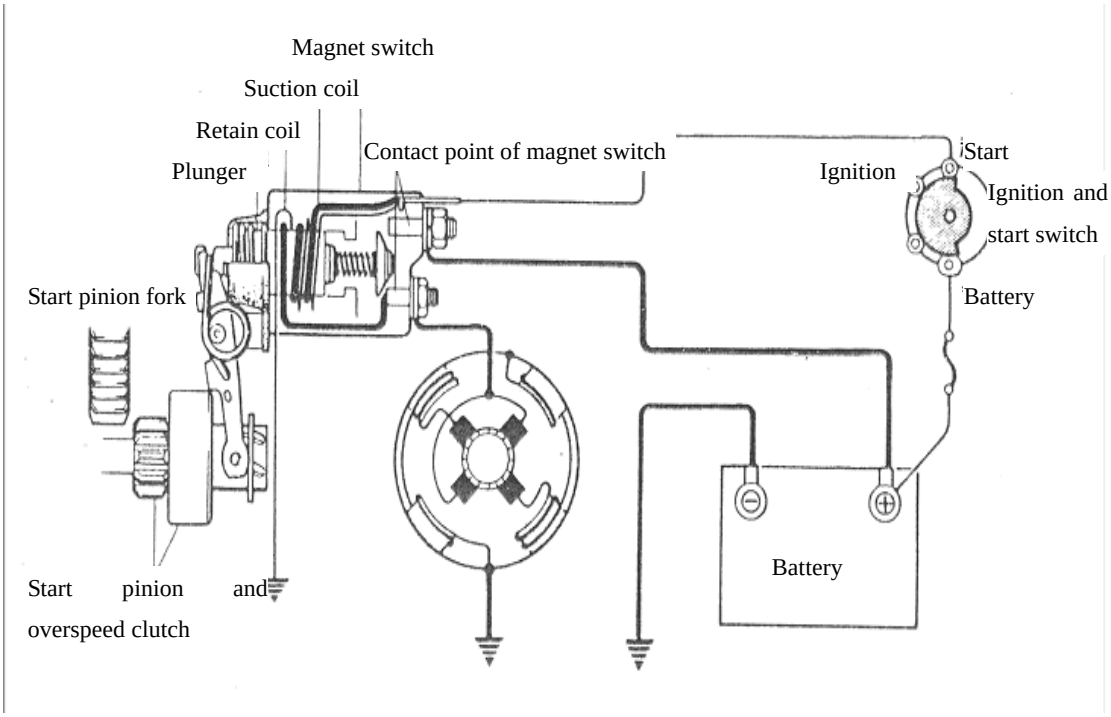
Section 1 Summary

Start circuit

Start circuit is composed of battery, start motor, ignition switch and relational circuit. The connection of these parts is shown in the following figure. This chapter only refers to start motor.

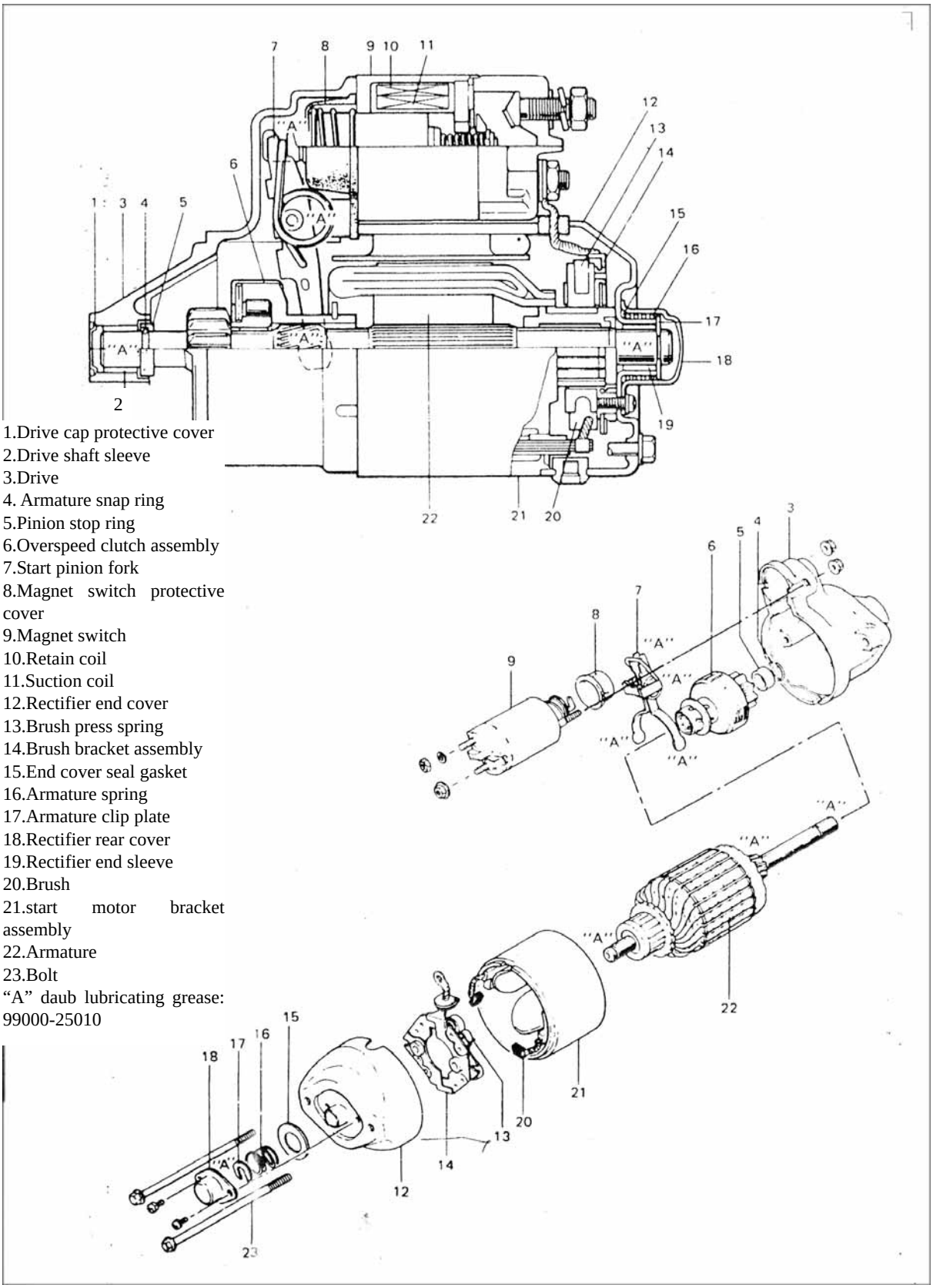
Starter motor

Starter motor is composed of start motor bracket, armature, overspeed clutch, magnet switch, end cover of rectifier, brush holder and start pinion fork.



In the circuit of following figure, when ignition switch is closed, magnet switch coil is magnetized, plunger and pinion fork moves, then start pinion mesh with the flywheel gear ring and magnet switch contact point close, so start is begin.

When engine starts, before magnet switch dose not cut off, overspeed clutch protect armature not overspeed. Here, return spring put the start pinion come away.



1.Drive cap protective cover
2.Drive shaft sleeve
3.Drive
4. Armature snap ring
5.Pinion stop ring
6.Overspeed clutch assembly
7.Start pinion fork
8.Magnet switch protective cover
9.Magnet switch
10.Retain coil
11.Suction coil
12.Rectifier end cover
13.Brush press spring
14.Brush bracket assembly
15.End cover seal gasket
16.Armature spring
17.Armature clip plate
18.Rectifier rear cover
19.Rectifier end sleeve
20.Brush
21.start motor bracket assembly
22.Armature
23.Bolt
"A" daub lubricating grease: 99000-25010

Section 2 Fault Diagnoses

The description of start system fault:

1. Starter motor dose not run (or run slowly)
2. Start motor can run but can not start the engine
3. Abnormal noise
4. Fault state
5. Battery connection post (include engine side earth wire link) and starter motor connection post is tightened or not.
6. Battery is charged or not.

It must put up correct diagnoses to ensure the fault position exactly ---battery, harness, starter motor, engine, or start switch. Don't removal starter motor vexedly when starter motor dose not run. You can check following items to lessen scope of fault reason.

Condition	Possible causes	Action
Starter motor dose not run	Magnet switch has no working sound	
	1.Battery is discharged	Charge the battery
	2.Owing to battery transformation, the voltage is too low	Replace the battery
	3.Battery post dose not connect well	Tighten or replace
	4.The connection of earth wire is loose	Tighten
	5.Fuse loose or break off	Replace
	6.Ignition switch contact not well	Tighten or replace
	7.Harness connector has not inserted in position	Inserted in position
	8.Ignition switch and magnet switch is open circuit	Inspect or replace
	9.Suction coil is turnoff	Repair
	10.Slippage of plunger is ineffective	Replace magnet switch
	11.Central guard against theft controller is in guard against theft state or central guard against theft controller has fault	Replace
Starter motor dose not run	Magnet switch has working sound	
	1.Battery is discharged	Charge the battery
	2.Owing to battery transformation, the voltage is too low	Replace the battery
	3.Battery wire connect loose	Tighten
	4.Magnet switch main contact point ablate or contact not well	Replace magnet switch

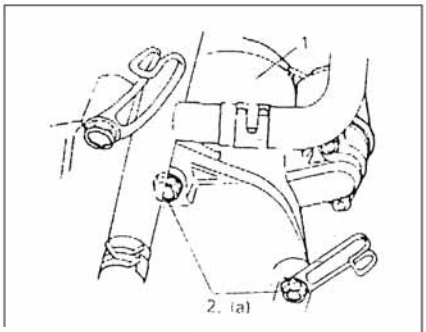
	5.Brush joint not well or wear and tear 6.Brush spring die down 7.Rectifier damage 8.Excitation coil connect earth not well 9.Armature layer short circuit 10. The running of crankshaft is not flexible	Repair or replace Replace Replace Repair Replace Repair
Starter motor run but slowly (Torque is small)	If battery connection normally, please check starter motor 1.Magnet switch main contact point contact not well 2.Armature layer short circuit 3.Rectifier burnout or wear and tear 4.Excitation coil connect earth not well 5.Brush wear and tear 6.Brush spring die down 7.Rectifier end cover damage or wear abnormally	 Replace Replace Repair or replace Repair Replace Replace spring Replace
Starter motor can run but can not start the crankshaft	1.Start pinion tooth tip wear and tear 2.Overspeed clutch slippage is not flexible 3.Overspeed clutch skid 4. Gear ring wear and tear	Replace Replace Replace Replace
Starter motor can not stop running	1.Magnet switch contact point melt and integrate 2.Magnet switch coil layer short circuit 3.Ignition switch can not return to original position	Replace Replace Replace

Section 3 disassemble and repair starter motor

Suggest: All the parts should be cleaned completely when check the starter motor, but starter motor bracket, armature, overspeed clutch, magnet switch and rubber parts should be cleaned by degrease fluid, and blown by compressed air, finally use cloth to rub-up.

Removal and installation

1. Disconnect the negative wire of the battery.
2. Disconnect the magnet switch and its wire from the connection post of starter motor.
3. Remove two fixing bolts.
4. Remove starter motor.
5. Installation is in reverse order of removal.



1.start motor
2.installation bolt

Tighten torque

(a):18~28N.m(1.8--2.8kg—m.13.5—20.01b—ft)

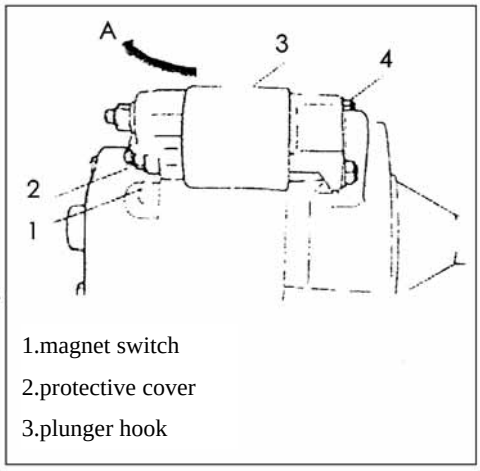
Magnet switch assembly

Disassembly

1. Loose the nut from the magnet switch then disconnect wire.

2. Take two nuts away, draw up the rear part of the magnet switch in order to separate the inner side hook and fork, then remove magnet switch.

Caution: Don't disassemble magnet switch, if necessary, please replace the whole assembly.



1.magnet switch
2.protective cover
3.plunger hook

Installation

1. If necessary, magnet switch or protective cover should be replaced by new parts, then daub lubricating grease on plunger.

2. Hook the plunger onto fork, then use nut to fix magnet switch.

3. Connect the wire, then check the working state of switch.

Notice:

Please check the plunger and fork is hooked firmly before install nut.

Protective cover ventilation side is downward.

Starter motor assembly

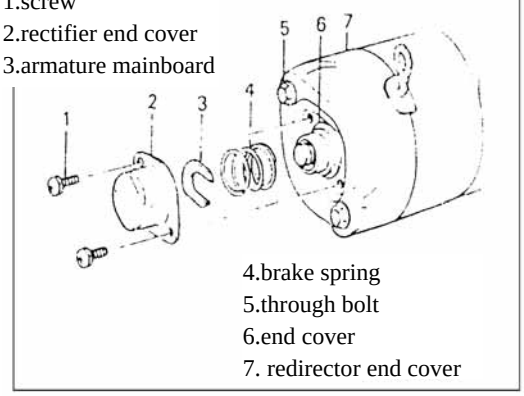
Disassembly

1. Remove magnet switch.

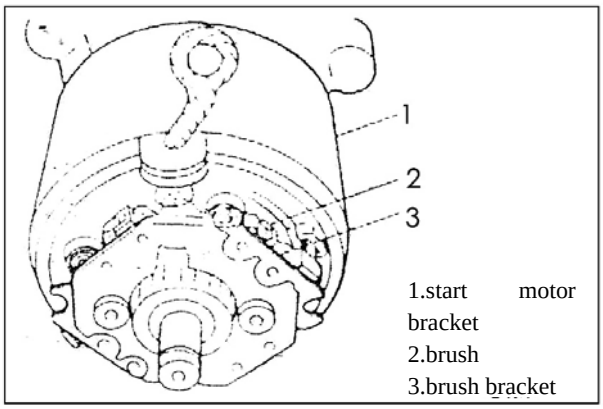
2. Remove two screws, take away the rectifier rear cover, armature retainer plate and braking spring.

3. Remove break through bolt, then draw out the rectifier end cover.

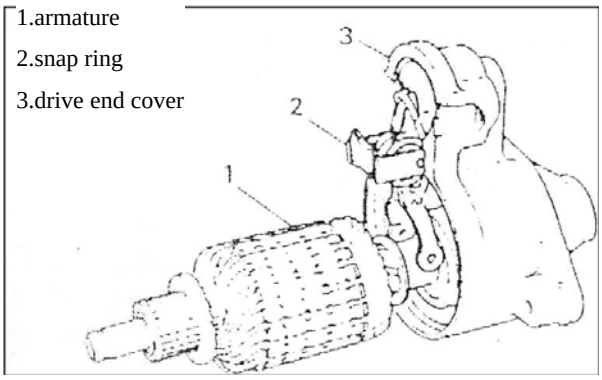
1.screw
2.rectifier end cover
3.armature mainboard



4.brake spring
5.through bolt
6.end cover
7. redirector end cover

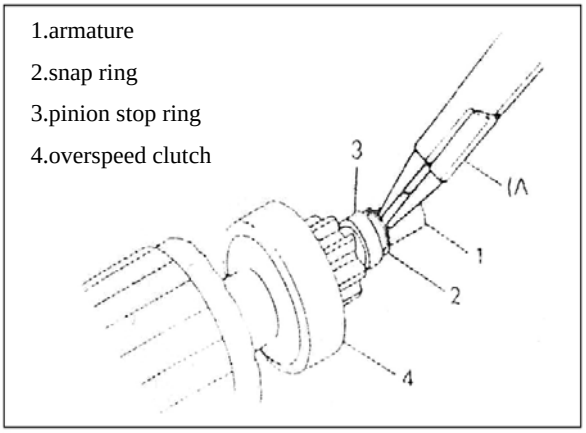


4. Use long-nose pliers to pull out the brush, then remove brush holder.



5. Remove starter bracket

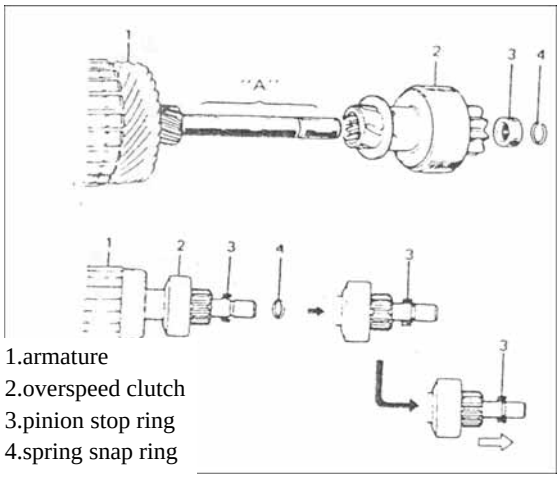
6. Use spring snap ring pliers and screwdriver to remove armature snap ring, then pull the pinion stop ring and overspeed clutch out.



Assembly

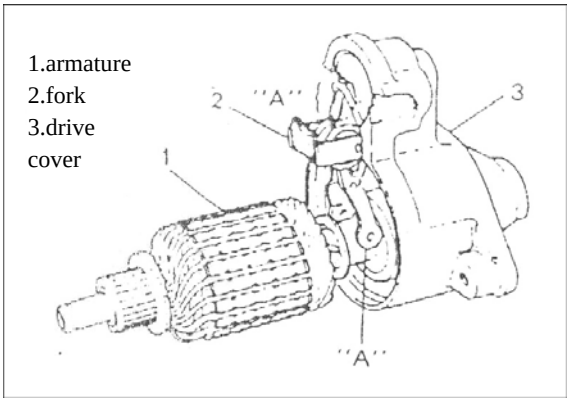
1. Check each part according to the method described in section “inspect and repair”, if necessary, please replace or repair it.

2. Daub lubricating grease according to the figure before install the overspeed clutch, then use spring snap ring to lock the stop ring.



1.armature
2.overspeed clutch
3.pinion stop ring
4.spring snap ring

3. Daub lubricating grease on the fork, and make a combination with armature, then assemble with drive cover.

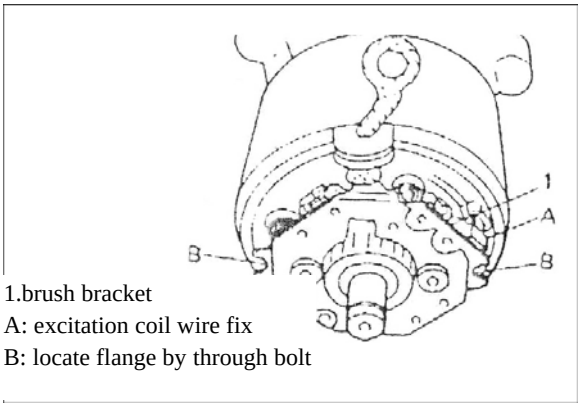


1.armature
2.fork
3.drive cover

4. Assemble starter motor bracket and brush holder, then install four brushes and spring.

Notice:

Please check armature and rectifier disengaged completely or not when install the brush holder.



1.brush bracket
A: excitation coil wire fix
B: locate flange by through bolt

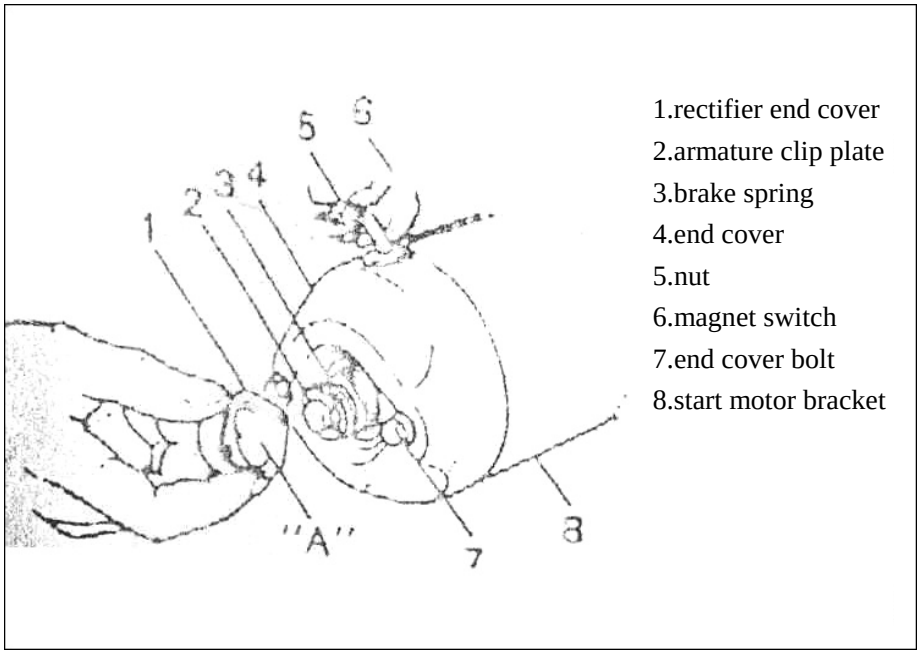
Check whether brush has unnecessary contact with other parts.

5. Daub lubricating grease on inside of the end cover, install rectifier end cover.

6. Install end cover sealing gasket and braking spring, then install armature retainer firmly, Daub lubricating grease on the 40% space before install the rear cover.

7. Install magnet switch.

8. After make a connection with battery, check the working condition of the starter motor is normal or not.

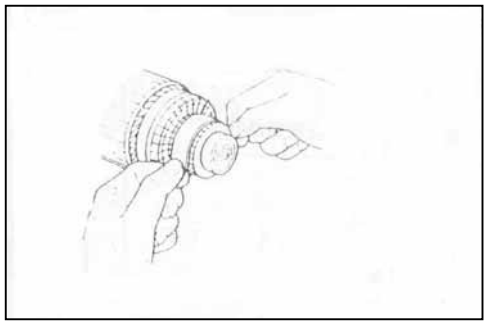


1.rectifier end cover
2.armature clip plate
3.brake spring
4.end cover
5.nut
6.magnet switch
7.end cover bolt
8.start motor bracket

Section 4 Check and Repair

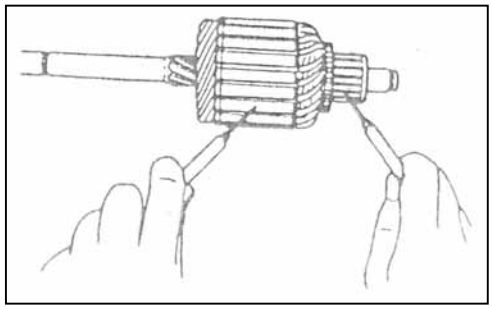
Armature

Check whether the rectifier is dirty or damaged. If need repair, repair it by sand paper or on the lathe.



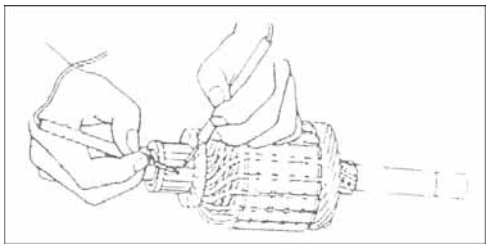
Earthing

It should be insulated between the rectifier plate and armature iron core, check it by ohmmeter.



Open circuit

Check whether it is connected between the rectifier plates, if it is not connected when you check in any test point, it shows that there is open circuit, you should replace the armature.

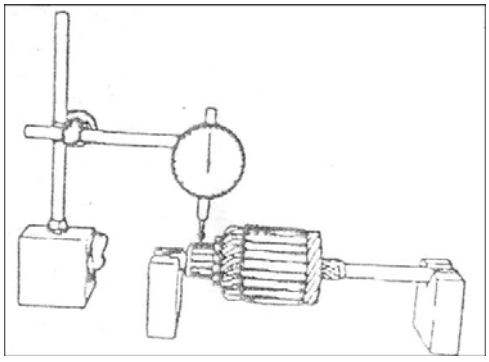


Jumpiness of the rectifier

Use V shape iron to support the armature, check the jumpiness of the rectifier. You can calibrate it on the lathe if necessary.

Radial jumpiness of the rectifier

Repair limit (max): 0.4mm (0.15in).

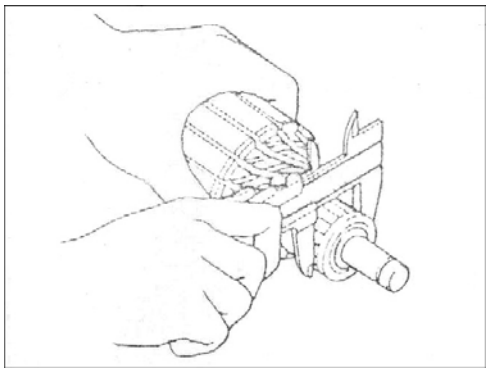


Diameter of the rectifier

Check whether the diameter of rectifier is worn; replace the armature if the diameter of rectifier is smaller than limit.

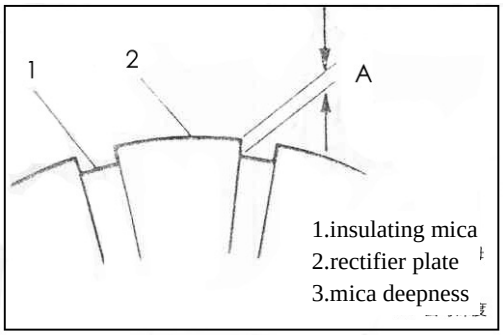
Diameter of the rectifier

Repair limit (min): 27mm (1.063in)



Surface of the rectifier

Use 100# emery cloth to trim and clean the surface of the rectifier, and check the deepness of the mica. If necessary, trim the deepness.

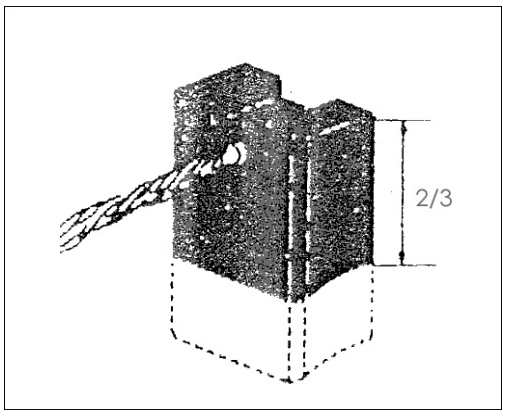


Deepness A of rectifier mica piece

Repair limit (min): 0.22mm (0.008in)

Starter motor bracket

Check the electric conduction of the excitation coil. It should be connected between the brush and the starter motor bracket body.



Check the brush

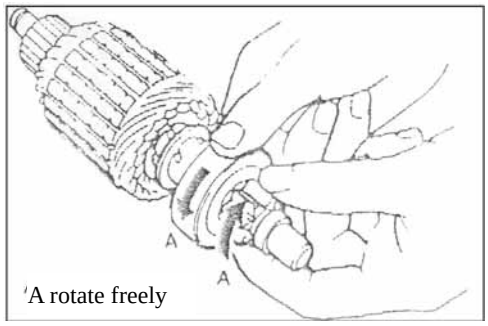
Measure the length of the brush, replace if necessary.

The length of the brush

Repair limit (min): 10.7mm (0.421in)

Brush holder

Check whether the brush spring is rubiginous or damaged. At the same time, check whether the brush holder is rubiginous and whether the positive plate is insulated. Replace the whole assembly if necessary.

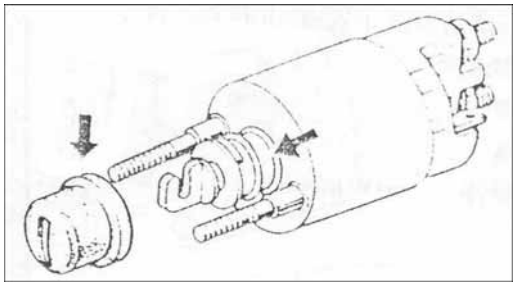


Overspeed clutch

Check whether the overspeed clutch can rotate freely in A direction and whether connected in the other direction. And check whether the pinion is worn abnormally. Replace the whole assembly if necessary.

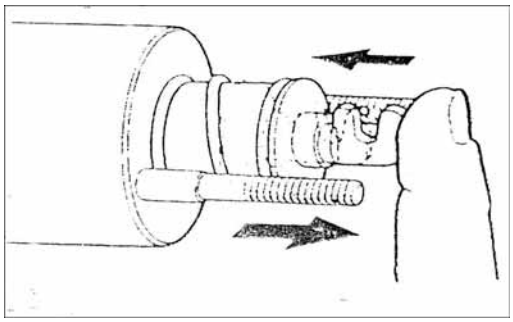
Magnet switch protective cover and plunger

Check whether magnet switch protective cover is damaged and whether plunger is worn or damaged, replace if necessary.



Magnet switch

Push plunger then loose hand, plunger should return to original position rapidly. Replace if necessary.



Motor shaft and shaft liner

Measure the clearance between the motor shaft and shaft liner, replace the shaft liner if the clearance exceed limit.



Notice:

1. The disassembly and assembly of shaft liner should use appropriate pressure machine.

2. After press the shaft liner in, then ream hole to make the clearance between shaft and liner is 0.05mm.

3. When replace front liner, protective cover of drive cover should be tightened.

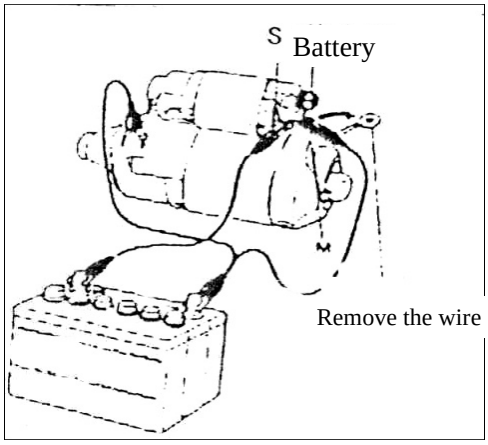
4. Use lubricating grease to lubricate shaft liner.

The clearance between shaft and liner operation limit A—B

0.22mm (0.008in)

Performance test

Caution: Each test should be finished in 3～5 seconds in order to avoid damaging coil.



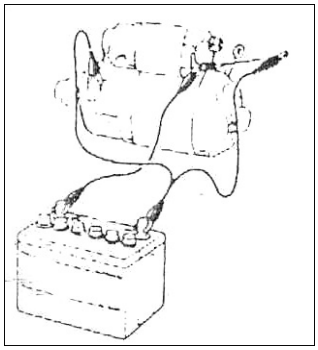
Attraction test

Connect test wire according to the figure. Check whether the pinion (overspeed clutch) bounce out. If don't bounce out, please replace magnet switch.

Caution: Disconnect the excitation coil wire at the connection post M before the test.

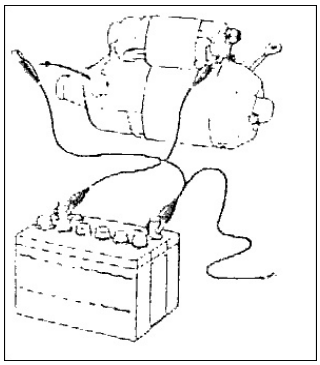
Retention test:

When connect wire according to state above, disconnect the negative wire at the connection post M and check whether pinion keep holding out, if not, please replace magnet switch.



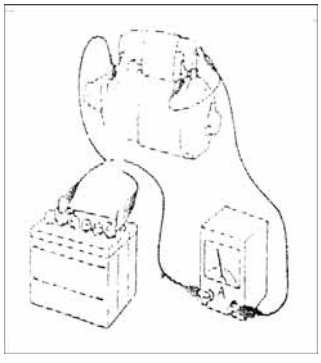
Pinion (plunger) return test

As the second step of above content, disconnect negative wire, check whether the pinion return to original position rapidly.



Empty load performance test

Connect test wire according to the figure，and check whether the starter motor can run normally when the pinion hold out. Meanwhile, check whether the indication current exceeds stated value.



Empty load current: The current is less than 55A when the battery voltage is 11V.

Starter technical data

Voltage		12V	
Output power		0.8 KW	
Start time		30 s	
Rotation direction		See from pinion side clockwise	
Brush length		19 ㎜（0.650in）	
Number of teeth of start pinion		9	
Characteristic		Condition	Ensure
Temperature 20℃（68℉）	Empty load	11V	Below 55A，above 5000 r/m
	Load	9.5V 0.7Kg・m	Below 270A，above 1200 r/m
	Braking	7.7V	Below 600A，above 1.3kg・m （94 pound/feet）
Magnet switch working voltage		Above 8V	

Chapter 2 Charging System

Section 1 Battery

Ⅰ. General Information

In the electric system, the battery has three functions. First of all, it is the energy source of starting engine and the car; Secondly, it acts as the voltage regulator of electric appliance system; Thirdly, when the load of electric appliance exceeds the output of generator, it can provide supplementary energy source for some time.

If the test result of the battery is good, but it is not satisfying during the use, it may result from the following factors:

1. The ancillary equipment keeps active.
2. The average traveling speed of the car keeps low for a long time.
3. The load of the electric appliance exceeds the output of generator, in particular while the additional equipment is added to the original configuration.
4. The charging system doesn't run well, e.g. resistance is too high, driving belt skids, the terminal post on the output end of the engine gets loose, generator or voltage regulator falls into malfunction.
5. The battery, including cable terminal post of it, has impurity on it, or it is not fastened, or the holding-down device of battery gets loose.
6. The electrical equipment has such mechanic problems as brittle failure or pinch-off of wire etc.

Visual Inspection

Check for obvious damage, such as cracking or breaking of shell and cover, which may cause the efflux of electrolyte. If such obvious damage exists, the battery should be replaced immediately. After the reason for such damage is found out, some modification should be made, if it is necessary. If the reason keeps unknown, further experiment shall be made to conduct further study.

Carrier and holding-down clamp

Before the battery is installed, the carrier and holding-down device should be cleaned. And they should be prevented from corrosion. The carrier should maintain a good status. Ensure that no other materials are on the carrier before the battery is installed. In order to prevent the battery from swinging in the carrier, the packing bolts should be reasonably tightened.

Sulfation

If the battery discharges for a long time, the lead sulfate will gradually become a kind of hard crystalline material, which doesn't tend to return to active material during the subsequent recharging. "Sulfation" just means such result and reaction process. This kind of battery can be recovered by means of slow charging. It can be recovered to the work level, however, its capacity is lower than before.

Solidification of electrolyte

The solidifying point of electrolyte is related to its specific density. The solidification may damage the battery, so it should be prevented from solidification by means of keeping full of charge. If the battery is frozen accidentally, it can't be charged before it warms up.

Maintenance of battery

1）Battery is a reliable component, but it needs regular maintenance. Keep the carrier of battery clean, prevent the terminal post from corrosion, and make the electrolyte level maximal. In addition, the liquid level of each unit should be basically equal.

2）Keep the cable plugging device of battery clean.

The cable plugging device, especially the positive terminal, is sure to become rusty. The rust on the fitting surface of conductor will hinder the circulation of electric current. It is usually because of the rust on the cable plugging device of battery that the engine can't be started, while the electromotor is activated. Regularly cleaning it and lubricating the plugging device may prevent them from corrosion.

Ⅱ. In-Vehicle Maintenance ("jumping" start in case of emergency)

With assistant battery

Caution:

Avoid pushing or pulling the car to start, which may cause the damage of exhaust gas purification system and/or other parts.

When the jumper cable is applied, carefully handle the assistant battery and the discharged battery. Avoid spark, and observe the following steps.

Warning:

※Any breach of the following conditions or steps may cause the following situations:

(1) Serious damage to person (especially the eyes) or materials, which result from the explosion of battery, combustion of acid liquor of battery and the electrified body.

(2) Damage to the electronic parts of car.

※Never place the battery in the place with electric spark, for the gas generated by battery is inflammable and explosive.

※Remove the jewelry, watch and other valuable goods, and wear protective glasses.

※Prevent the liquid of battery from directly touching eye, skin, fiber and varnish, because it is corrosive acid liquor. In case that it touches any parts, rinse them immediately.

※Take care that the metallic tools or jumper cable don't touch the positive terminal of battery (or the metals connecting with it) and other metals in the car, for it may cause short circuit.

※Keep the little children away from the battery.

1. Pull up the parking brake and put the gear shifter to the neutral position, switch off the igniter, lights and all other electric loads.

2. Connect one end of a jumper cable to the positive terminal of assistant battery, and the other end to the positive terminal of the discharged battery (jump-start the engine with 12v battery only).

3. Connect one end of the negative cable to the negative terminal of assistant battery, and the other end to the firm engine ground cable (e.g. in the exhaust manifold), which is at least 45cm(18in) away from the battery which starts the car.

Warning: avoid directly connecting the negative cable to the positive terminal of the

discharged battery.

4. Start the engine of the car preparing to jump-start, and switch off other electrical equipments. And then start the engine of the car with low-battery battery.

5. The step of disconnecting jumper cable must be exactly contrary to that of connecting. The first step is to disconnect the negative cable from the jump-started engine.

With charging equipment

Note: As to the jump-started engine with charging equipment, the applied equipment should be 12v, and the negative electrode should be connected to ground. Never adopt the 24v charging equipment, for use of such equipment may cause serious damage to the electrical system or electronic parts.

Ⅲ. Off-Vehicle Maintenance

Removal and Installation

1. Disconnect the negative cable.

2. Disconnect the positive cable.

3. Remove the clamper nut and clamper.

4. Remove the battery.

5. When installing, the sequence is the reverse procedure of removal,

6. Tight the fixing nut of the battery cable according to the set torque.

Note: Check and ensure an enough distance between grounding cable and engine cover beside terminal post.

Tightening torque: 6～10N·m

Charging the battery which voltage decrease greatly or which is fully discharged.

1. Measure the voltage of battery terminal post with the prepared voltmeter. If the voltage is less than 10v, the charging current is very low. So there is a certain time before the battery can accept the several-milliampere current. Such a low current won't be detected by the amperometer used on the spot.

2. Put the battery charger in a high pre-set place.

3. With the polar protective circuits, some chargers won't charge until the lead is appropriately connected to the terminal post of the battery. The fully discharged battery has not enough voltage to activate the whole circuit. Even though the lead is correctly connected, the battery can't accept charging current. So this circuit should be bypassed according to the special regulations of the charger manufacturer so as to switch on the charger and charge the low-voltage battery.

4. The voltages and current values provided by battery charger differ from each other. With each voltage, the measurable charging current that can be accepted by battery needs the following time:

Voltage： A：over 16…… 4 hours

B：14-15.9…… 8 hours

C：less than 13.9……16 hours

After the above-mentioned charging time ends, if the charging current can't be detected yet, the battery should be replaced; if the charging current can be detected, the battery is good, which can be charged in the normal way.

5. Always remember that only when the fully discharged battery is charged to enough ampere hour (AH) can it be used again. According to experience, the charging ampere hours basically equals the nominal AH plus an additional 30% of it, which is usually used to charge the normal battery. For example, the required AH for the 45AH battery fully charged is 45×1.3=58.5. So, you are recommended to charge with a low ampere but for a long time. For example:

3 ampere×20 hours…… 60AH or

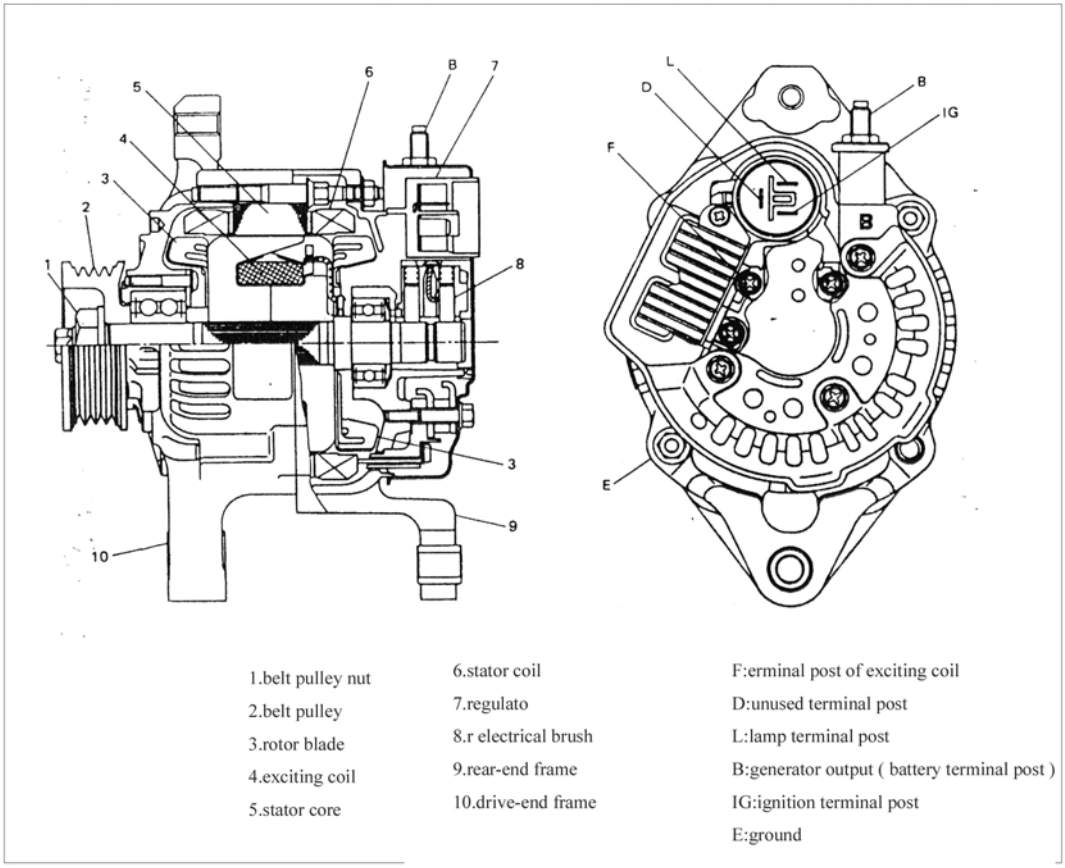
5 ampere×12 hour…… 60AH etc.

You are recommended to conduct load test to the battery recharged in this way so as to check its operational capability.

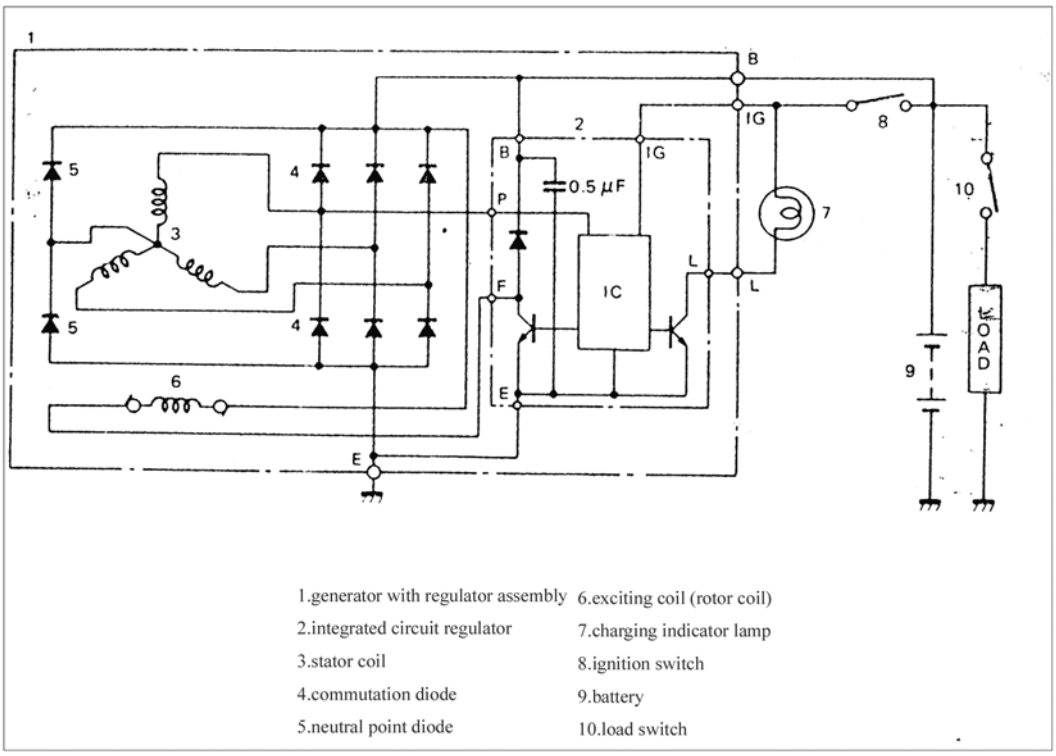
Section 2: Generator

Ⅰ. General Information

The main charging coefficient is just the charging coefficient of the regulator of integrated circuit. The electric connection of its internal elements is shown in the following figure.



1.belt pulley nut
2.belt pulley
3.rotor blade
4.exciting coil
5.stator core
6.stator coil
7.regulato
8.r electrical brush
9.rear-end frame
10.drive-end frame
F:erminal post of exciting coil
D:unused terminal post
L:lamp terminal post
B:generator output (battery terminal post)
IG:ignition terminal post
E:ground



1.generator with regulator assembly
2.integrated circuit regulator
3.stator coil
4.commutation diode
5.neutral point diode
6.exciting coil (rotor coil)
7.charging indicator lamp
8.ignition switch
9.battery
10.load switch

The characteristics of the generator are that a solid-state regulator is installed in it, and all the elements of the regulator are packed in a sealed case. The regulator, together with the brush carrier assembly, is installed in the slip ring and frame. The given voltage of generator can't be modified.

The generator rotor bearing contains enough grease, so it doesn't need regular lubricating. The two brushes make the current flow to the exciting coil in the rotor by means of two slip rings. Under normal circumstance, the brush will provide the long-term maintenance-free service.

The stator winding is installed in the laminated sheetiron strip that constitutes the frame of generator. The rectified current bridge connected to stator line set contains 6 diodes, which turns the alternating voltage in the stator into direct voltage on the output terminal post of generator. The neutral point diode is used to turn the wave of neutral point voltage into direct current so as to increase the output of generator.

The capacitor installed in the regulator assembly protects the diode from high voltage,

and restrains the radio noise.

Ⅱ. Trouble Shooting

In order to avoid the damage to generator the following items should be observed:

Attention:

※Never mix up the polarity of IG terminal post and L terminal post.

※Avoid the short circuit between IG terminal post and L terminal post. The two terminal posts should be connected through charging indicator light.

※Loads should always be connected between IG coil and E terminal post .

※Please see section “Battery” for how to connect charger or assistant battery to the battery of the car.

The charging system is in malfunction when any of the following situations emerge:

1. The fault indicator lamp comes up.

2. Start slowly, which indicates that the battery is not sufficiently charged.

3. Too much electrolyte is ejected from vent opening, which indicates that the battery is overcharged.

The noise generator may result from the following factors: the head pulley gets loose; construction bolt gets loose; the bearing is worn out or has some foreign material in it; diode or stator doesn’t work well.

Fault indicator comes on

Symptom	Possible Reasons	Measures
While the ignition switch is switched on and the engine is stopped, the charging indicator light doesn't light up.	●The fuse snaps. ●Something wrong with indicator lamp in the cluster gauge. ●The connection gets loose. ●Something wrong with the regulator of integrated circuit.	Check the fuse. Check the cluster gauge. Tighten what is loose. Replace regulator of integrated circuit.
When the engine runs, the charging indicator light doesn't go out, and the battery needs frequent recharging.	●The driving belt is loose or worn out. ●The battery cable gets loose, rusty or worn out. ●Regulator of integrated circuit or generator doesn't work well. ●Bad connection	Adjust or replace the driving belt. Repair or replace driving belt. Repair or replace cable. Check charging system. Repair the connection.

Unchargable Battery

The slow starting may result from one or some of the following factors, even though the indicator light works normally. Operate according to the following steps using voltmeter and ampere meter.

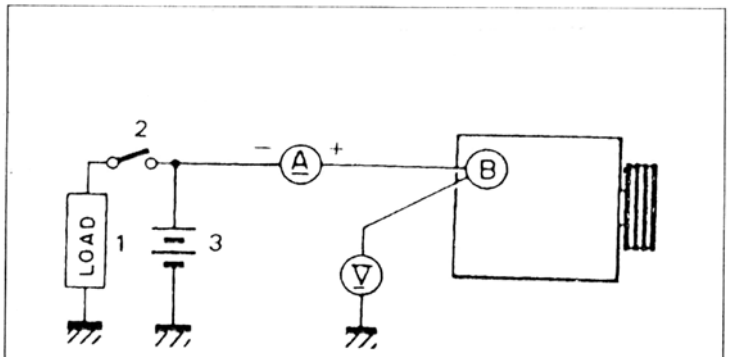
1. Ensure that being uncharged is not due to keeping the accessory equipment working.

2. Check the driving belt for degree of tightness.

3. If you doubt whether the battery works well, please see section "battery" for further details.

4. Check the connection for fault. Check whether all the connections are firm and clean, and check the cranking motor and ignition grounding cable.

5. Connect the voltmeter and ampere meter according to the following chart.



1.load
2.load switch
3.battery
A.100A direct-current ammeter
V.20V direct-current voltmeter
B.generator output terminal post

Voltmeter

Be connected between terminal post B of generator and the earthing.

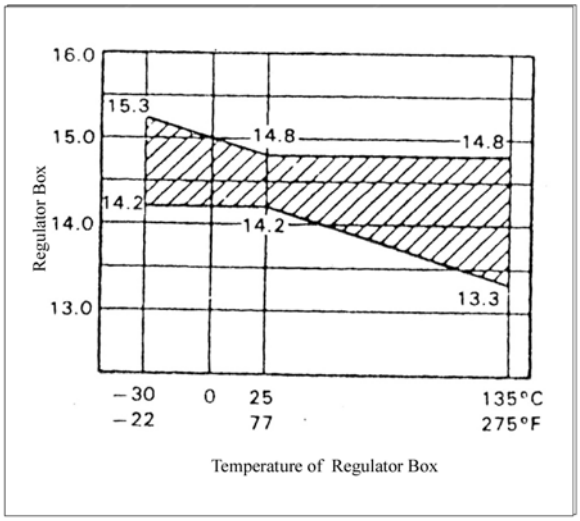
Ammeter

Be connected between terminal post B of generator and the positive terminal of battery.

6. Measure the voltage and current under each of the following circumstance.

Zero-load check

Make the engine run at idle speed to a speed of 2000r/min, and read the number in the gauge.



Note:

※Take into consideration that the voltage varies with the temperature of the regulator case.

※Before this test, the discharged battery must be fully charged.

Note: When the engine runs, never remove the terminal post of the battery, otherwise, the electronic parts may be damaged.

Standard current: 10A (max.)

Standard voltage: 14.2-14.8V in 25°C

Higher voltage

If the voltage is higher than the standard value, replace the regulator of integrated circuit.

Lower voltage

If the voltage is lower than the standard value, conduct the following check. Connect the F terminal post to the ground connection, start the engine, and then measure the voltage of B terminal post.

If the voltage goes up above the standard value, there is something wrong with the engine.

Loading check

Make the engine run at a rotation speed of 2000r/min, and switch on the head lights and the fan of heater system. And then measure the current. If the current is lower

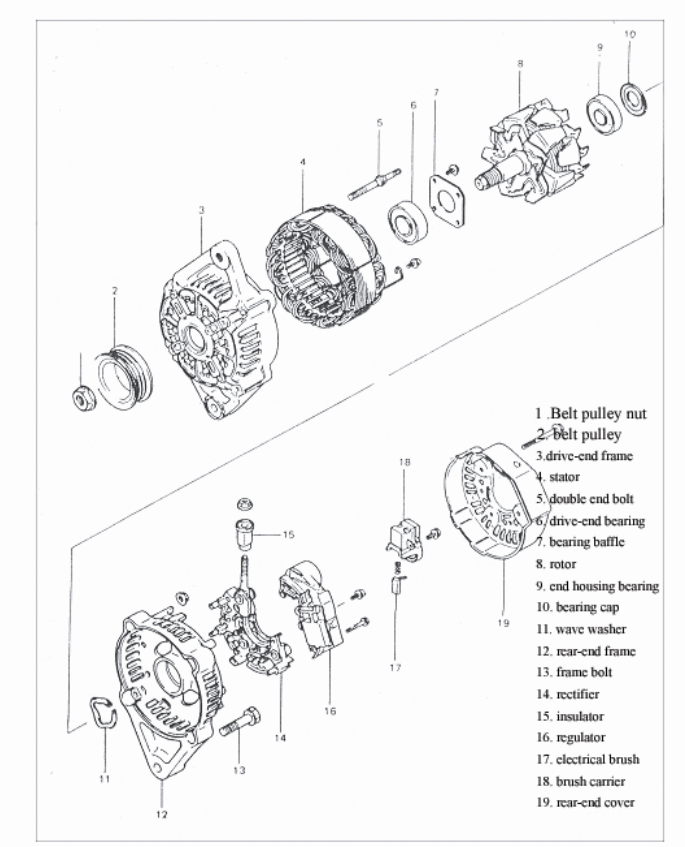
than 20A, repair or replace the generator.

Overcharged battery

1. Please see section "Battery" for ensuring the status of the battery.

2. The excessively effusion of electrolyte is the obvious indication of being overcharged. Then remove the generator to repair, and check the exciting coil winding for ground connection or short circuit. If any trouble exists, replace the rotor and check to ensure the output voltage is within the specified range.

Ⅲ. Overhaul



Removal and Installation

1. Remove negative cable from battery;

2. Disconnect the cable, which connects with terminal post B, and cable plugging device;

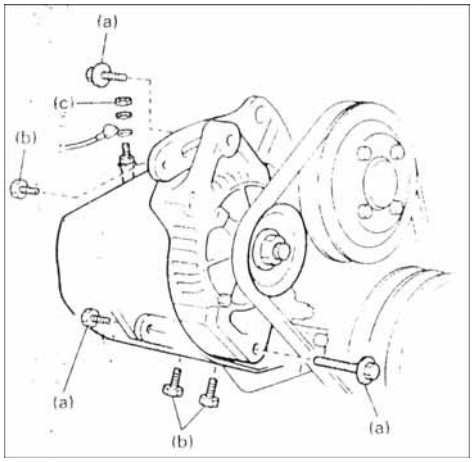
3. Remove the bolt of engine cover (upside);

4. Remove the adjusting bolt of driving belt of generator;

5. Remove the bolt of engine cover (downside), and then remove the cover;

6. Remove the construction bolt to take out the belt from the downside.

7. Install them in the step contrary to that of removal, and adjust the driving belt to the specified output tightness.



Tightening torque

（a）: 18～28N·m

（b）: 4～7 N·m

（c）: 6～10 N·m

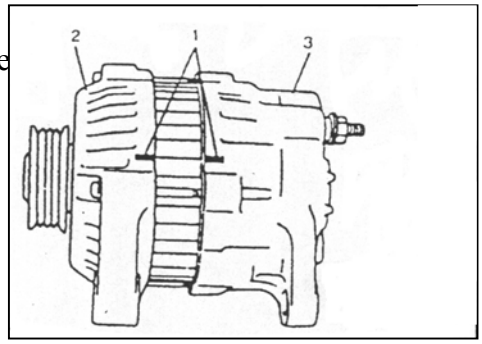
Disassembly

1.For convenience of installation, find out the alignme front cover and rear cover or make a fiducial mark.

（1）Alignment index line

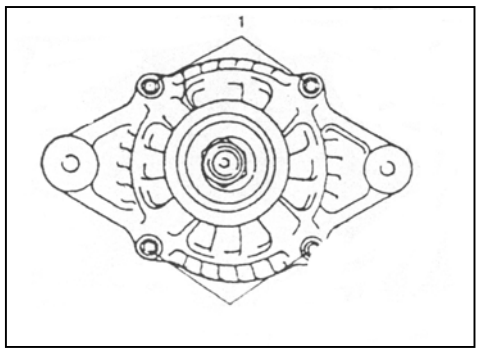
（2）Front cover

（3）Rear cover



2. Remove the bolt in the front cover from generator.

1 Bolt

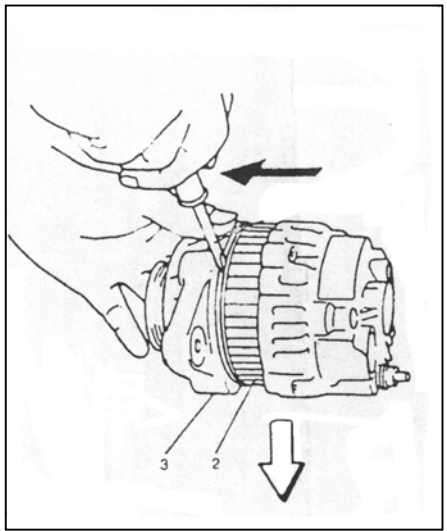


3. Insert a flat-head screwdriver or similar tool between stator core and front cover to divide the generator into two parts, front part and rear part.

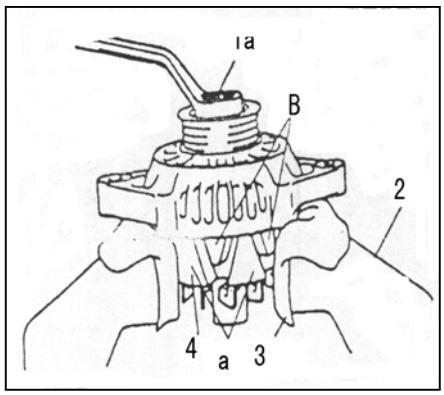
1. Flat-head screwdriver

2. Stator core

3. Front cover



4. Loosen the belt pulley nut with clamp and remove the belt pulley.



Note:

When the clamp is used, a piece of clean cotton cloth should be laid between rotor and clamp to avoid the damage to rotor.

Always clamp the part “A” instead of part “B”, for the structural strength of part B doesn't suit firm clamping.

1a： Belt pulley nut 2： Clamp 3； Belt pulley bolt 4： Cotton cloth

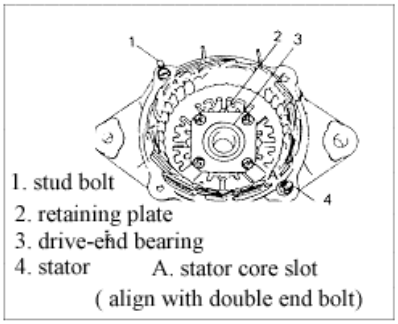
5： Rotor

5. Remove the nut of B terminal post and isolator.

6. Remove 3 bolts and take off the rear cover.

7. Remove 3 bolts and pull out the brush carrier assembly.

8. Remove 3 bolts and pull out the regulator of integrated circuit.

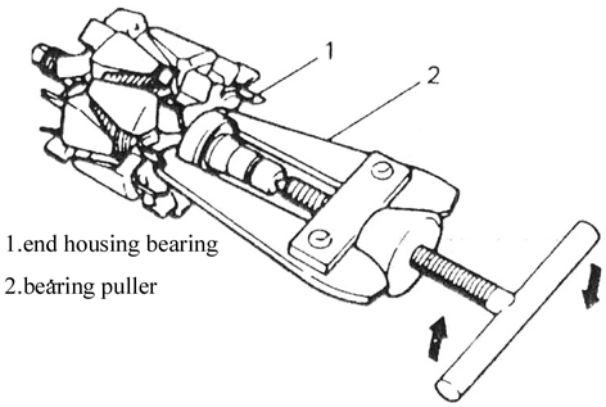


9. Remove 3 bolts and stretch the stator coil lead, and then take out the rectifier.

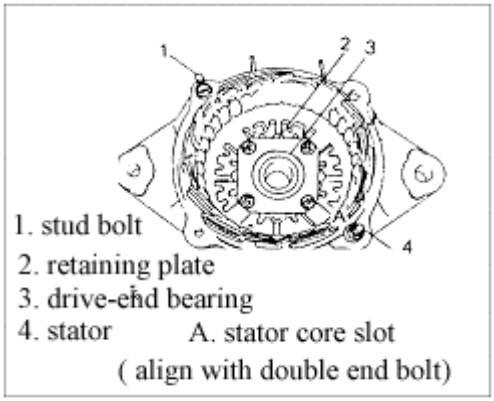
10. Remove the bolts and nuts in the rear frame, and then push out the rear frame with rotor.

11. Remove the end housing bearing with bearing puller.

Note: When the bearing puller is used, it is subject to careful operation to avoid deforming the cooling fan blade.



12. Remove 4 bolts and baffle and push out the bearing on the driving end.



13. If necessary, loosen stud bolts and pull out the stator.

Note: Heating the frame on the driving end may facilitate disassembling stator.

Assembling

Before disassembling，evaluate the faults. After that, find out the part subject to malfunction by means of careful check. Make available the parts for exchange use, and then assemble the generator in the step contrary to that of disassembling.

Note:

（1）When the stator coil is inserted into the frame on the driving end, the recess in the stator should be aligned with the stud bolts.

（2）When the brush carrier assembly is installed, the brush mush be thoroughly disengaged from slip ring.

Note:

※When the rectifier is installed, check whether there is an enough big gap between stator conductor and cooling fan blade.

※Avoid over-tightening the insulator nuts of terminal post.

Tightening torque of stud bolt: 7～8.8N.m,

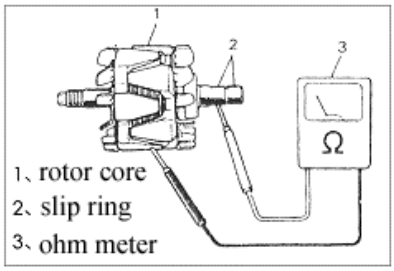
Tightening torque of frame bolt/nut and nut in the terminal post: 4～5N.m

Tightening torque of belt pulley nut: 95～130N.m

Check and Adjustment

Rotor ground

The slip ring and rotor core should be conductively closed, which should be checked by means of ohmmeter.

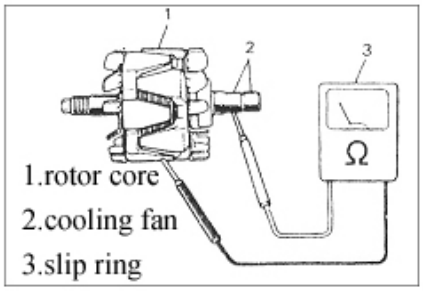


Open circuit

Connect the ohmmeter probe to the slip ring to check whether the exciting coil is current-carrying and its electric resistance value. If the value exceeds the specified one, replace the rotor.

The electric resistance value of exciting coil:

2.8-3.0Ω



Fan

The status of all the fan blades is good.

Bearing

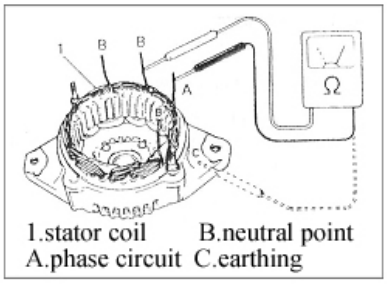
Check whether it rotates stably using hand.

Bearing of drive shaft

Before removeing it, rotate it with hand to see whether it rotates stably.

Stator Ground

Check the stator coil and magnetic core for insulation with ohmmeter.

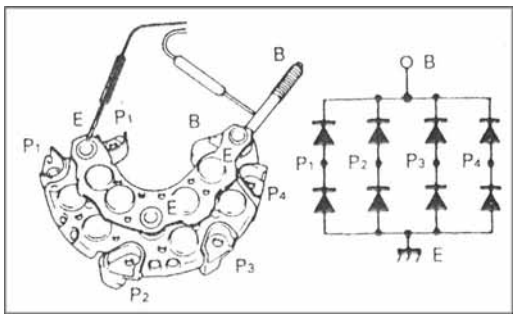


Open circuit

Check whether it is conductive between neutral point A and leg of circuit B.

Rectifier

With kΩohmmeter, check whether it is conduction between B terminal post and earth connection. Put one probe on B terminal post, and the other on the earth connection. And then



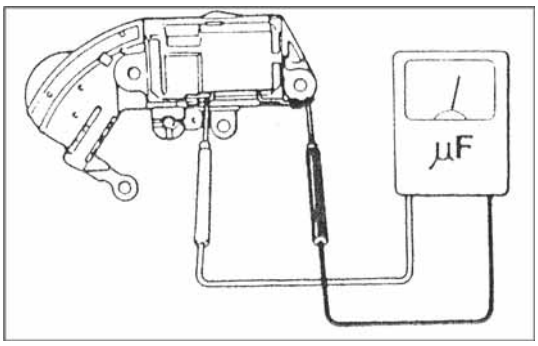
exchange the places of the two probes. Only one should be conductive, the other should be infinite. Otherwise, replace the rectifier assembly.

> **Note:**
> Never use a 500V megohmmeter to test the rectifier, because it may damage the diode of the rectifier.

Condenser

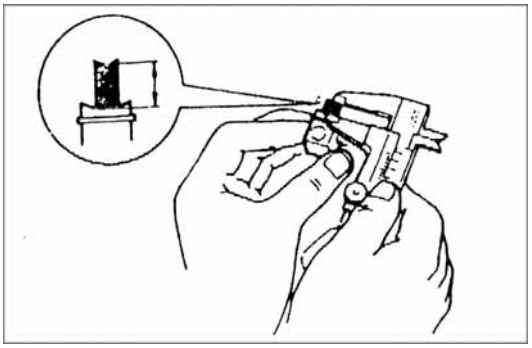
Use a capacitance measuring tester to check the capacitor state.

Condenser capacitance: 0.15μF.



Brush

Refer to the chart to measure the length of the brush, and check its worn condition. If its length has reached the maintenance limit value, it should be replaced, together with the brush.



Maintenance limit value of brush length (min.): 4.5mm（0.18in）

Ⅳ. Technical Data of Generator

Rated voltage	12V
Maximal output	50A（thermal state 13.5V）
Maximal tolerable speed	18.000r/min
No-load speed	1110 r/min
Set voltage	14.2 to14.8V （5000 r/min）

	10A25℃（77℉）
Tolerable ambient temperature	-30 to 90℃ -22 to 194℉
Polarity	Minus ground
Rotation direction	Clockwise, seeing from belt pulley

Chapter 3 Maintenance of Car Body Electric Equipment

Maintenance notice proceeding

When check, remove and replace car body electric equipment relating parts, please pay attention to the proceedings below.

1. Lighting equipment

There is sealed gas in halogen bulb, so please operate carefully. It maybe implode if drop; when you remove the bulb, take the bulb at the plastic part or metal part of the bulb, don’t touch glass part.

2. Air bag

Chery S11 equip air bag at the driver and copilot position. Improper maintenance will cause the incidental inflation of airbag and serious consequential accidents. So you should regard the warning content on SRS equipment before maintenance.

3. Acoustics equipment

If remove the negative wire from the battery, the frequency position of AM/FM1/FM2 will disappear, so please remember this position before remove, after grounding wire has been connected, then comeback to this position.

Section 1 Car Body Electric Equipment Common Fault Clearance

The cause analysis of car body electric equipment common fault can see in table 1.

Table 1 Car body electric equipment fault clearance

Fault system	Fault symptom or phenomenon	Possible fault position
Headlight and small lamp equipment	Dipped headlight dose not light	1. Lamplight control relay 2. Headlight change switch 3. Headlight switch 4. Dipped headlight fuse 5. Bulb 6. Harness
	High beam dose not light	1. Lamplight control relay 2. High beam fuse 3. Headlight change switch 4. Headlight switch 5. Bulb 6. Harness
	Lamplight can not change	1. Lamplight control relay 2. Headlight change switch (combination switch) 3. Bulb 4. Harness 5. Combination switch
	Small lamp dose not light	1. Headlight switch 2. Bulb 3. Lamplight fuse 4. Harness
	Lamplight dose not work	1. Lamplight fuse 2. Lamplight control relay 3. Headlight switch 4. Bulb 5. Harness
	Lamplight glitter	1. Bulb 2. Harness (whether contact well) 3. Grounding wire contact not well
	Lamplight dim	1. Bulb 2. Harness (whether ground well) 3. Grounding wire contact not well

	Only one small lamp light	1. Fuse 2. Harness 3. Bulb
	Small lamp dose not work (headlight is normal)	1. Small lamp fuse 2. Headlight switch 3. Harness 4. Small lamp bulb
	Rear combination light dose not light	1. Harness 2. Bulb 3. Headlight switch
Headlight beam height control equipment （lamplight work normally）	Headlight beam height control equipment dose not work	1. Headlight switch 2. Beam height control switch 3. Beam height control motor 4. Harness
	Operate abnormally	1. Headlight switch 2. Beam height control switch 3. Beam height control motor 4. Fuse 5. Harness
	Operate abnormally（one side）	1. Beam height control motor 2. Fuse 3. Harness
Front foglight equipment	Front foglight dose not light（small lamp and headlight is normal）	1. Front foglight switch 2. Power supply fuse 3. Front foglight relay 4. Bulb 5. Harness
	Front foglight dose not light （headlight and small light don’t light）	1. Headlight switch 2. Harness
	Only one foglight dose not light	1. Bulb 2. Harness
Rear foglight equipment	Rear foglight dose not light（small lamp and headlight is normal）	1. Foglight switch 2. Power supply fuse 3. Rear foglight relay 4. Bulb 5. Harness
	Rear foglight dose not light （headlight and small light don’t light）	1. Headlight switch 2. Harness
	Rear foglight light, front foglight dose not light	1. Foglight switch 2. Front foglight relay 3. Harness 4. Bulb

	Only one rear foglight dose not light	1. Bulb 2. Harness
Turning signal and hazard alarm equipment	Turning and hazard alarm light don't light	1. Hazard alarm light switch 2. Flasher 3. Fuse 4. Harness
	Flash frequency is abnormal	1. Bulb 2. Flasher 3. Harness
	Hazard alarm light dose not light（turning is normal）	1. Hazard alarm light fuse 2. Hazard alarm light switch 3. Harness
	One side of the hazard alarm light dose not light	1. Bulb 2. Harness
	No turning signal (combination instrument, wiper and syringe don't work)	1. Turning light switch 2. Power supply fuse 3. Harness
	No turning signal (combination instrument, wiper and syringe is normal)	1. Power supply fuse 2. Flasher 3. Turning switch 4. Harness
	One side of the turning signal dose not light	1. Turning switch 2. Bulb 3. Harness
	Only one bulb dose not light	1. Bulb 2. Harness
Interior light equipment	One lamp dose not light	1. Bulb 2. Harness
	All interior light don't light	1. Car inside fuse 2. Harness 3. Lamplight brightness regulation switch
	Interior light don't light	1. Fuse 2. Interior light switch 3. Lamplight brightness regulation switch 4. Bulb 5. Harness
Backup light equipment	Backup light dose not light	1. Backup light switch 2. Bulb 3. Harness
	Backup light always light	1. Backup light switch 2. Harness

	One lamp dose not light	1. Bulb 2. Harness
Braking light equipment	Braking light dose not light	1. Braking light fuse 2. Braking light switch 3. Bulb 4. Harness
	Braking light always light	1. Braking light switch 2. Harness
	One lamp dose not light	1. Bulb 2. Harness
Wiper and syringe equipment	Front wiper and syringe don't work	1. Wiper fuse 2. Wiper switch 3. Front wiper motor 4. Wiper intermittent relay 5. Front syringe motor 6. Harness
	Front wiper low speed or high speed gear dose not work	1. Wiper switch 2. Wiper fuse 3. Wiper intermittent relay 4. Front wiper motor 5. Harness
	Front wiper intermittent gear dose not work	1. Wiper switch 2. Wiper fuse 3. Wiper intermittent relay 4. Front wiper motor 5. Harness
	Front syringe motor dose not work	1. Wiper switch 2. Wiper fuse 3. Front syringe motor 4. Harness
	Syringe work, front wiper dose not work	1. Wiper intermittent relay 2. Wiper fuse 3. Wiper switch 4. Harness
	Rear wiper and syringe don't work	1. Rear wiper fuse 2. Wiper switch 3. Rear wiper motor 4. Rear syringe motor 5. Harness
	Rear syringe motor dose not work	1. Wiper switch 2. Rear syringe motor 3. Rear wiper fuse 4. Harness

	Syringe dose not work, rear wiper dose not work	1. Wiper switch 2. Rear wiper motor 3. Harness
	No cleaning solution sprayed	1. Syringe tube and nozzle 2. Syringe motor 3. Wiper switch 4. Syringe fuse 5. Harness
	Wiper contact car body when wiper in high speed gear	1. Wiper blade 2. Wiper connecting rod location
	Wiper blade dose not return to original position or return not completely when close the wiper	1. Power supply fuse 2. Wiper motor 3. Adjust improper 4. Harness
Instrument and illumination combination meter	Tachometer, fuel meter and coolant temperature meter don't work	1. Instrument fuse 2. Instrument circuitry template 3. Bulb 4. Harness 5. Sensor
	Speedometer dose not work	1. Vehicle speed sensor 2. Instrument circuitry template 3. Speedometer 4. Harness
	Tachometer dose not work	1. Engine ECU 2. Engine tachometer 3. Instrument circuitry template 4. Harness
	Fuel meter work abnormally or dose not work	1. Fuel meter 2. Fuel sensor 3. Instrument circuitry template 4. Harness
	Coolant temperature meter dose not work	1. Coolant temperature meter 2. Coolant temperature sensor 3. Instrument circuitry template 4. Harness
	Illuminating lamp dose not light	1. Small lamp fuse 2. Instrument circuitry template 3. Illuminating lamp dimmer 4. Bulb 5. Harness
	One illuminating lamp dose not light	1. Bulb 2. Harness 3. Corresponding function part

Warning lamp and indicator lamp	Engine fault warning lamp dose not light	1. Engine ECU 2. Instrument circuitry template 3. Harness
	Fuel fluid level warning lamp dose not light	1. Fuel fluid level warning switch 2. Instrument circuitry template 3. Bulb 4. Harness
	Oil pressure warning lamp dose not light	1. Bulb 2. Oil pressure switch 3. Instrument circuitry template 4. Harness
	ABS warning lamp dose not light	1. Bulb 2. ABS computer 3. Instrument circuitry template 4. Harness
	Seat belt warning lamp dose not light	1. Bulb 2. Instrument circuitry template 3. Buckle switch 4. Harness
	Braking warning lamp dose not light	1. Bulb 2. Parking brake switch 3. Brake fluid level warning lamp 4. Instrument circuitry template 5. Harness
	Air bag warning lamp dose not light	1. Bulb 2. Air bag sensor assembly 3. Instrument circuitry template 4. Harness
	Door open warning lamp dose not light	1. Vehicle interior fuse 2. Bulb 3. Gating switch 4. Instrument circuitry template 5. Harness
	Upper beam indicator lamp dose not light	1. Bulb 2. Instrument circuitry template 3. Headlamp switch 4. Harness
	Turning indicator lamp dose not light	1. Bulb 2. Instrument circuitry template 3. Turning switch and hazard warning switch 4. Harness

	Front foglight indicator lamp dose not light	1. Instrument circuitry template 2. Bulb 3. Harness
Electric window control equipment	Electric window equipment dose not work (all) (electric door lock dose not work)	1. Window control switch 2. Guard against theft computer 3. Harness 4. Power supply fuse of controller
	Electric window equipment dose not work (all) (electric door lock work normally)	1. Electric window control switch 2. Guard against theft computer 3. Harness
	Only one door glass dose not work	1. Electric window main switch 2. Electric window switch 3. Electric window motor 4. Harness
	Electric window lock equipment dose not work	Guard against theft computer
Electric door lock control equipment	Door lock equipment dose not work	1. Central control switch 2. Guard against theft computer 3. Remote controller 4. Door lock motor 5. Harness
	Manual door lock equipment dose not work	1. Central control switch 2. Guard against theft computer 3. Remote controller 4. Door lock motor 5. Harness
	Key can nor control door lock equipment	1. Door lock motor signal switch 2. Guard against theft computer 3. Dock lock is locked 4. Harness
	Driver side door two step open function failure	1. Door lock switch 2. Guard against theft computer 3. Harness
	Only one door lock dose not work	1. Door lock motor 2. Harness

Section 2 Lamplight System Operation Guide

Please abide by relating Highway Code when use lighting facilities below.

1. Small lamp, headlight switch



OFF – close vehicle outside lamp

1st gear - lighten parking lamp/sidelights, illuminating lamp of instrument and switch, license plate lamp.

2nd gear – lighten headlight (lower beam or upper beam).

Notice: only open the ignition switch, headlight can work. Headlight put out automatically if the ignition switch has been closed.

2. Headlight change beam switch



With headlight low beam on, headlight upper beam will be turned on when control

lever is pushed towards dashboard and upper beam indicator light will light up simultaneously. Headlight low beam will be lit up when control lever is pulled back to original position.。

3. Headlight glitter switch



If you want headlight glitter when you drive, you can pull control lever towards steering wheel to the change point, then control lever may be released. Repeat this action time after time, headlight can glitter continuously.

4. Front foglight / rear foglight switch



Front foglight switch and rear foglight switch are located on the headlight change beam switch and at left lower of the steering wheel.

With the headlight switch on, turn on the front foglight switch, front foglight can operate but rear foglight can not.

With the headlight switch on, turn on the rear foglight switch, rear foglight can operate with front foglight simultaneously.

When front foglight operate, the front foglight switch inner indicator lamp will illuminate.

Rear foglight are allowed to apply only when there is a very low visibility (with a visibility distance less than 50 meters) for their stronger dazzle.

5. Turn signal light switch



Turn signal lights may work only when ignition switch is turned on.

Left turn signal light—move the handle downwards

Right turn signal light—move the handle upwards

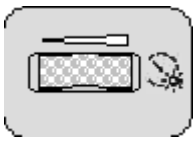
When turn signal light is turned on, turn signal indicator light flash simultaneously.

Change driveway signal light



Pull the handle upwards or downwards to change point and hold on, corresponding turning light will flash. At the same time, the turn signal indicator light of corresponding direction on the instrument panel will flash simultaneously.

6. Regulator of instrument illumination and headlight beam height



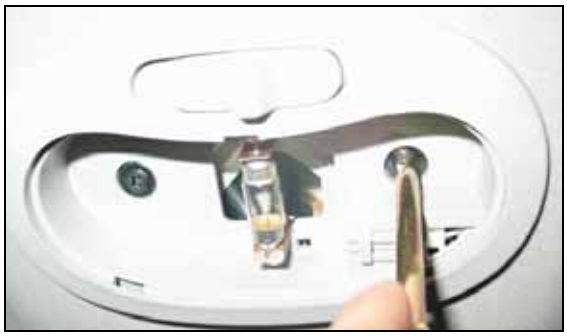


With the headlight switch on, you can use regulator to adjust the intensity of instrument panel indicator light.

When you operate the vehicle exterior lamp, you can use regulator to adjust the illumination intensity of instrument panel.

When you operate the lower beam light, you can use regulator to adjust the beam height of the headlight.

7. Interior ceiling light switch



OFF position：Interior ceiling light will not illuminate.

ON position：Interior ceiling light will remain on.

Middle position (door position)：Interior ceiling light will illuminate when vehicle door is opened. Interior ceiling light will still illuminate in 8 seconds after close the door in order to help passenger seating safely.

8. Luggage compartment illuminating lamp

Luggage compartment illuminating lamp will illuminate when luggage compartment lid is opened (this lamp is not controlled by ignition switch). Please close the luggage compartment lid after parking.

You can also make this lamp in close state. In other words, the lamp will not illuminate when luggage compartment lid is opened. Therefore, you can press the triggering switch to locking position, when you want turn on this lamp, you only use your hand to release the switch.

9. Hazard warning flashlight switch

When hazard warning flashlight switch on dashboard is pressed, hazard warning flashlight will be turned on and all turn signal light will light up simultaneously. After once more a press, all lights go out at the same time. Hazard warning flashlight may be operated on matter whether ignition switch is turned on. Apply hazard warning flashlight to warn other drivers and try to avoid stopping on driveway when an emergent parking or traffic handicapping is avoidless.



Section 3 Removal and installation of entire vehicle lighting assembly

Explanation of lighting system

Chery S11series passenger car entire vehicle lighting fitting includes illumination equipment and light signal equipment. It is used to guarantee the car's normal running and safe driving at night or in the fog. It includes: headlight (lower beam and upper beam), front turning light (including small lamp), front foglight, combination taillight (including backup lamp, turning light, braking/parking light, small lamp and so on), license plate lamp, interior ceiling light, luggage compartment lamp and rear foglight. Headlight apply half enclosed type lighting structure, it is convenient to examine and repair; use halogen bulb to reduce bulb black and increase illuminating intensity and extend the useful life of bulb.

Removal and installation of entire vehicle lighting assembly

1. Notice proceeding before removal:

a. Close control switch of corresponding lighting fitting, remove the wire connected to battery;

b. Please don't touch the bulb by your hands when replace the bulb, otherwise the fingerprint on the bulb will be heated and volatilize after light up the bulb, and then it will deposit on the lens surface, so the reflector will become dim.

2. Removal and installation of headlight



Please calibrate the headlight after remove and install the headlight every time.

Removal:

——Open the engine compartment hood;

——Pull out the harness plug ;

——Remove front bumper（see front bumper removal）;

——Loose three bolts (M6*10) fixed on the headlight cross member;

——remove headlight.





Installation:

a. Install headlight in corresponding position, ensure the bolt fixing hole and the headlight cross member welding nut are concentric;

b. Locate the headlight by three M6 bolts with the torque 1.6～2.0 N • m. Drop the engine compartment hood, verify and adjust the assembly position of headlight, headlight should protrude from engine compartment hood a little, you can feel that there is a radian between them by your hands, then tighten the fastener.

3. Removal and installation of front foglight

Removal:

If possible, you can raise the car first then remove form bottom.

——Loose the nut, take out the bolt

——Remove harness connect plug, take out the front foglight from the location hole of the front bumper



Installation:

——First ensure left and right (left lamp sign “L”, right lamp sign “R”), then put the foglight into installation hole from front, insert two locating pin into location notch and use bolt and nut to tighten it.

——Connect foglight harness butt joint;



4. Removal and installation of front turn signal lamp

Removal:

——Raise the vehicle and then remove from the bottom of the vehicle if possible.

——Loose two screws the take out the turn signal lamp

——Remove the harness connector, then take down the turn signal lamp from the location hole of the front bumper

Installation:

——First you should distinguish left and right(“L” mark in the left lamp, “R” mark in the right lamp), then put the turn signal lamp into the install hole, at last tighten two tapping screw on the install hole;

——Connect the turn signal lamp harness connector;

5. Removal and installation of combination tail lamp（include parking light/braking light, turn signal lamp, backup light）

Removal:

——Open the luggage compartment lid;

——Loose two tapping screw, then pull out the lamp;

——Pull down the lamp seat harness.





Installation:

——Connect the lamp seat harness;

——Put the bolt with expand nut into the location hole on the car body, then fix the lighting fitting with tapping screw;

——Connect lamp seat harness, install the carpet.

——Close the luggage compartment lid.

6. Removal and installation of license plate lamp protective board and license plate lamp

Removal:

1. Open the luggage compartment, remove trim board.
2. Loose the nut which to fix lock core.
3. Loose two tapping screw on the protective board then take them down.
4. Remove the tapping screw from license plate lamp.

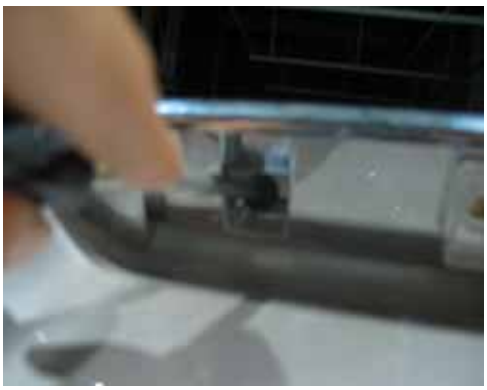
Removal of license plate lamp/protective board assembly

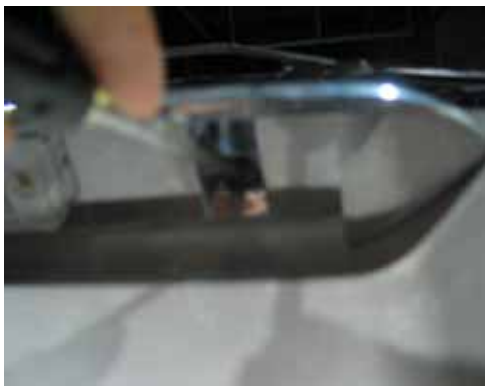
——Remove four fixing screws on the license plate lamp.

——Remove two fixing screws on the protective board.









Installation:

——Connect harness connector;

——Insert base line of the lamp into sheet-metal hole, screw hole on the lamp and screw hole on the sheet-metal is concentric, then tighten tapping screw.

——insert two bolts of license plate into sheet-metal hole, install the nut and tapping screw, adjust install position then tighten nut and tapping screw;

——Assemble the luggage compartment lid trim board, close the luggage compartment lid.

7. Removal and installation of rear foglight

Removal:



——Raise the vehicle and then remove from the bottom of the vehicle if possible.

——Loose two nuts then take out the foglight

——Remove the harness connector, then take down the foglight from the location hole of the front bumper

Installation:

——First you should distinguish left and right(“L” mark in the left lamp, “R” mark in the right lamp), then put the foglight into the install hole, insert two pins into location notch, then tighten it by bolt with nut;

——Connect the foglight harness connector;

8. Removal and installation of interior ceiling light

Removal:



——Insert flat-tip screwdriver between shade and shell, prize the shade carefully;

——Remove two tapping screw of front ceiling light by screwdriver.

——Disconnect lamp holder harness.

Installation:

——Connect the harness connector;

——put the lamp into top install hole in correct position and direction, tighten the tapping screw by screwdriver, then press the shade of ceiling light in by your hands.



9. Removal and installation of high-mounted stop lamp

Removal:

——Open the luggage compartment lid, remove the trim board, take out the wiper motor.

——Loose two fixing screw then pull out the shade downwards.

——Loose three bolt the take out the high-mounted stop lamp.

——Pull out the connector.



Installation:

——Connect the harness connector;

——Fix the lamp body by bolt;

——Install the luggage compartment trim board, close the luggage compartment lid;

Chapter 4 Inspection and Repair of BCM Computer Control System

Ⅰ.General

BCM is abbreviation of Body Control Module of Chery Automobile, which is also named antitheft computer control unit. It is a device designed to facilitate the driver and passengers to use some electric devices in the vehicle and simple maintenance.

BCM location, disassembly and assembly





Disassembly:

1. Remove the instrument and upper setscrews;
2. Remove the BCM module connector;
3. Remove the nut on it with M10 spanner.

Assembly:

Fix the setscrews with M10 spanner with securing moment at 2.5 -3.5 N·M and then insert the module connector.

Assembly the instrument.

Ⅱ.Introduction of antitheft control system

The vehicle antitheft control system is designed to implement central monitor with

integration of the antitheft device, power windows and central door lock module. The system is installed on the left side of the evaporator that is at the lower center of the central console. When the switch on the remote control device is pressed down, the central door lock system will enter a security mode with glass window automatically closed to avoid raining, wind or theft in case the user forgets to lock the windows. This function will greatly benefit users.

Ⅲ.Function theory of antitheft control system

1. Power window

① The main power of the control device is under control of the ignition switch. When the ignition switch is closed for 60 seconds, it will forbid the glass to rise or drop.

② The elevator control module controls four glass controllers that can sense whether the elevating device clamps any person or material. These devices are under protection by residual current breakers and the leakage limit will change according to the external voltage changes. Four window controllers have function of consecutive output of 8-second protection.

③ The safety switch can control whether the right front, left rear and right rear door switches can operate the corresponding glass elevator.

④ Operation mode: manual elevation, decline, and automatic decline.

Manual decline: pressing time ≥ 300ms

Automatic decline: pressing time ≤ 300ms.

Note: When the glass descends automatically, if the decline switch of the glass controller is pressed for over 300ms, the glass movement will be turned into the mode of manual decline; if the elevation switch of the controller is pressed for over 300ms, the glass movement will be turned into the mode of manual elevation. If the pressing time is no less than 300ms, the glass movement will stop.

2. Central door lock

① The left front door independently controls the locking and unlocking of central lock;

② It can lock and unlock remotely;

③ The central door lock cannot operate simultaneously together with the glass elevator.

The central door lock prevails when these two operations are in conflicts and the glass elevator stops. When the central door lock completes the glass elevator resumes the previous task.

3. Remote antitheft function

① The remote controller has two keys; one is for setting security mode and the other is to remove the mode.



② Security mode: Press the first key on the remote control, then the indicator flashes once, and the central door lock automatically locks. At the same time the engine is locked and the LED will flash slowly to indicate the system is on security mode. When the system is triggered, the turn signal lamp flashes.

③ Removing security mode: Press the second key on the remote control, and then the indicator flashes twice; simultaneously the lock will automatically unlock and remove the locking mode of the engine and the LED indicator turns off.

④ Two-stage removing security mode: when the system is triggered, pressing any key on the remote control will stop the alarm sound. However, the system is still on the alarm status and the doors locked. If the system continuously receives invading signals, the alarm will sound again after a short pause. The second key should be pressed once immediately after the alarm is removed for the first time so as to remove the alarm completely.

⑤ Secondary antitheft function: when the security mode is removed, the door is not opened and the ignition switch is not turned on within 30 seconds, the antitheft device will automatically resume the alarm mode and lock the door.

⑥ Automatic locking/unlocking function: the door will automatically lock five seconds later when the ignition switch is turned on and automatically unlock the door when the ignition switch is turned off. If the door is opened once five seconds after the ignition switch is turned on, the system will not automatically lock to prevent the driver being locked outside of the car.

⑦ The mainframe is apt to keep the memory of passwords.

⑧ Remote closing the window: when set the security mode remotely, the glass elevator

will automatically work to close the glass windows one by one if the glass window is not closed.

4. Code setting mode

① Turn on the ignition switch IGN ON/OFF for two times within 7 second and push IGN at ON position.

② LED flashes quickly for 3 seconds;

③ LED will pause 1 second after the above response;

④ When the flash time of LED equals to PIN CODE (PIN CODE =1), set the switch at IGN OFF;

⑤ When the ignition switch is set at IGN ON, press the first key to set the system;

⑥ Set the switch at IGN OFF;

⑦ When IGN is at OFF position for 10 seconds, it means the system has quit the code setting mode or you can immediately turn the IGN at ON position to enter software-switching application.

5. Engine control

When the ignition switch is set at ST position, the power is supplied through the fuse to BCM No. 2 Foot. The starting relay is embedded in the BCM computer. When the antitheft function fails, the starting relay controls operation of the engine.

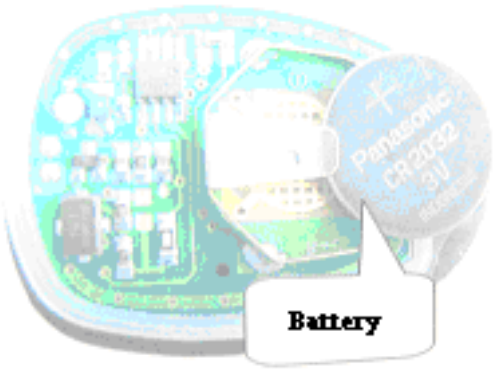
IV. Inspection and Repair of Antitheft Controller System

1. Check remote control

1) When you press down Unlock or Lock keys, central door lock fails to work. Firstly, remote control should be checked whether LED indicator light flashes or not when you press the button. If it flashes, something is wrong with antitheft computer, which will be then maintained or replaced. Otherwise, something is wrong with remote control. Then the battery should be checked. If there is power in the battery, remote control fails and shall be replaced. If out of power, the battery should be replaced.

2) Replace the battery in remote control. Unclench remote control first, and then change battery as shown in the figure below.

Note: Only the battery with regulated voltage (+3V) is available. Put in a proper manner according to positive and negative marks.



2. Check BCM computer

Terminal check of BCM computer is tabulated as below.

Terminal No.	Terminal Notes
A1	Signal for elevation of left front power window
A2	Ignition switch power supply +12V（F14）20A
A3	Field coil of starter’s electromagnetic switch
A4	Switch signal of central door lock (left front)
A5	Battery power signal +12V（F13）30A
A6	Battery power signal +12V（F13）30A
A7	Battery power signal +12V（F13）30A
A8	Grounding
A9	Grounding
A10	Antitheft alarm signal
A11	Control signal for motor lock of central door lock
A12	Control signal for motor unlock of central control door lock
A13	Antitheft indication signal to right turn indicator
A14	Signal for decline of left front power window
A15	Signal for elevation of right front power window
A16	Signal for decline of right front power window
A17	Signal for elevation of right rear power window
A18	Signal for decline of right rear power window
A19	Battery power signal +12V（F13）30A

A21	Grounding
A22	Signal for elevation of left rear power window
A23	Signal for decline of left rear power window
A25	Antitheft indication signal to left turn indicator
B1	Elevation signal to left front power window switch
B2	Decline signal to right front power window switch
B3	Elevation signal to right front power window switch
B4	Decline signal to right rear power window switch
B5	Elevation signal to right front power window switch
B6	Decline signal to left rear power window switch
B7	Elevation signal to left rear power window switch
B9	Decline signal to left front power window switch
B10	Switch of antitheft device
B11	Signal for boot switch
B13	Signal of antitheft indicator
B14	Signal for door switch
B16	Antitheft antenna

3．Inspection and repair of BCM computer (antitheft computer) circuit

Connect the plug on to BCM computer (antitheft computer). As shown in the figure above, check each circuit terminal, with the result as tabulated below.

Figure Check of BCM Computer (antitheft computer) Circuit

Connection Check	Condition	Standard Value
A1-Grounding	Ignition switch “ON”, power window switch “UP”	Power supply voltage
	Ignition switch “ON”, power window switch “DOWN”	Conducting
A2-Grounding	Ignition switch “ON”	Power supply voltage
	Ignition switch “Off”	Nonconducting
A3-Grounding	Ignition switch starts the motor, and makes it work	Power supply voltage
	Ignition switch starts the motor but fails	Nonconducting
A4-Grounding	Unlock door with key	Conducting
	Lock door with key	Nonconducting
A5-Grounding	Normal	Power supply voltage
A6-Grounding	Normal	Power supply voltage
A7-Grounding	Normal	Power supply voltage
A8-Grounding	Normal	Grounding
A9-Grounding	Normal	Grounding
A10-Grounding	Antitheft works	Power supply voltage
	Antitheft fails	Nonconducting
A11-Grounding	Central control lock “OFF”	Power supply voltage
	Central control lock “ON”	Conducting

A12-Grounding	Central control lock “ON”	Power supply voltage
	Central control lock “OFF”	Conducting
A13-Grounding	Antitheft works	Power supply voltage
	Antitheft fails	Nonconducting
A14-Grounding	Ignition switch “ON”, power window switch “UP”	Conducting
	Ignition switch “ON”, power window switch “DOWN”	Power supply voltage
A15-Grounding	Ignition switch “ON”, power window switch “UP”	Power supply voltage
	Ignition switch “ON”, power window switch “DOWN”	Conducting
A16-Grounding	Ignition switch “ON”, power window switch “UP”	Conducting
	Ignition switch “ON”, power window switch “DOWN”	Power supply voltage
A17-Grounding	Ignition switch “ON”, power window switch “UP”	Power supply voltage
	Ignition switch “ON”, power window switch “DOWN”	Conducting
A18-Grounding	Ignition switch “ON’, power window switch “UP”	Conducting
	Ignition switch “ON”, power window switch “DOWN”	Power supply voltage
A19-Grounding	Normal	Power supply voltage
A21-Grounding	Normal	Conducting
A22-Grounding	Ignition switch “ON”, power window switch “UP”	Power supply voltage
	Ignition switch “ON”, power window switch “Down”	Conducting

A23-Grounding	Ignition switch “ON”, power window switch “UP”	Conducting
	Ignition switch “ON”, power window switch “DOWN”	Power supply voltage
A25-Grounding	Antitheft works	Power supply voltage
	Antitheft fails	Nonconducting
B1-Grounding	Ignition switch “ON”, power window switch “UP”	Conducting
	Ignition switch “ON”, power window switch “DOWN”	Nonconducting
B2-Grounding	Ignition switch “ON”, power window switch “UP”	Nonconducting
	Ignition switch “ON”, power window switch “DOWN”	Conducting
B3-Grounding	Ignition switch “ON”, power window switch “UP”	Conducting
	Ignition switch “ON”, power window switch “DOWN”	Nonconducting
B4-Grounding	Ignition switch “ON”, power window switch “UP”	Nonconducting
	Ignition switch “ON”, power window switch “DOWN”	Conducting
B5-Grounding	Ignition switch “ON”, power window switch “UP”	Conducting
	Ignition switch “ON” power window switch “DOWN”	Nonconducting
B6-Grounding	Ignition switch “ON”, power window switch “UP”	Nonconducting
	Ignition switch “ON”, power window switch “DOWN”	Conducting
B7-Grounding	Ignition switch “ON”, power window switch “UP”	Conducting

	Ignition switch “ON”, power window switch “DOWN”	Nonconducting
B9-Grounding	Ignition switch “ON”, power window switch “UP”	Nonconducting
	Ignition switch “ON”, power window switch “DOWN”	Conducting
B10-Grounding	Ignition switch “ON”, antitheft switch “ON”	Conducting
	Ignition switch “ON, antitheft switch “OFF”	Nonconducting
B11-Grounding	Open the boot lid	Conducting
	Shut the boot lid	Nonconducting
B13-Grounding	Antitheft works	Power supply voltage
	Antitheft fails	Nonconducting
B14-Grounding	Open the door	Conducting
	Shut the door	Nonconducting
B16-Grounding	Normal	Nonconducting

In case of difference with the above, BCM computer (antitheft computer) should be maintained or replaced.

5). For power window control of antitheft computer, refer to “Power Window Maintenance”.

6). For central door lock control of antitheft computer, refer to of “Central Door Lock Maintenance”.

4. Division and match of QQ remote controls

QQ remote controls features two brands and three modules.

I) 9CG, two modules

1) Module 1



(Electrical parts and relay are set on the same side in the module. It has a small lock of remote control with projected mark, a red seal circle, and two batteries.)

2) Module 2



(Electrical parts and relay are set on different sides in the module. It has a small lock of remote control with projected mark, a black seal circle, and two batteries.)

II). 9AK, one module



(Electrical parts and relay are set on different sides in the module. It has a small lock of remote control with dented mark, a black seal circle, and three batteries.)

III). Match methods

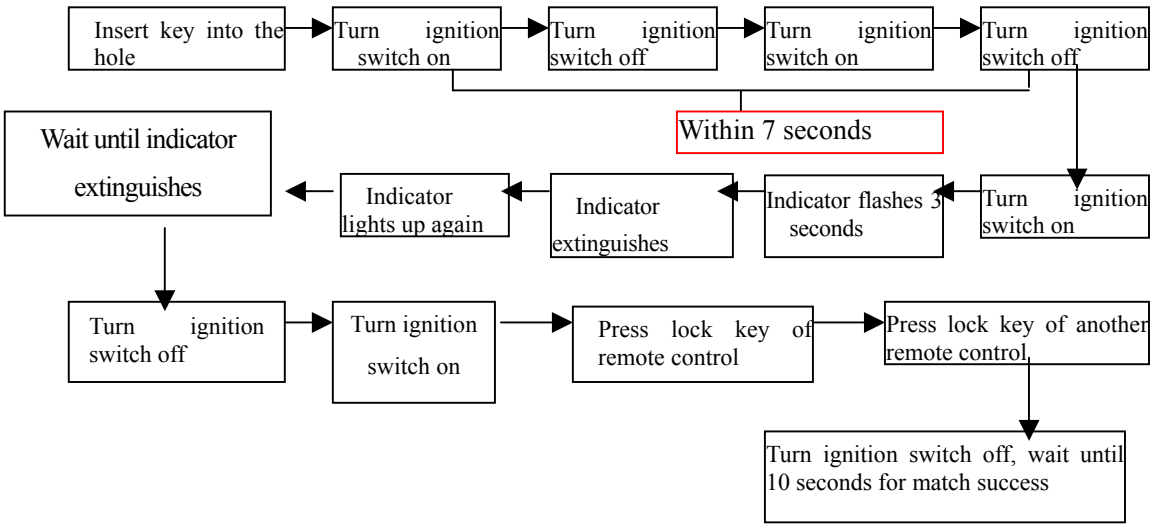
1. 9CG match methods

1) Turn ignition switch on three times within 7 seconds. Upon the third time (switch on), observe the antitheft indicator.
2) Antitheft indicator will flash three seconds, pause 1 second, and then light up again. Wait until it extinguishes and turn down ignition switch.
3) Turn ignition switch on again, and then press any key of remote control; meanwhile

antitheft indicator will flash once. This indicates this remote control has entered into the system.

Note: The first remote control is set into the system After Step 3). Following that, press any key of the second remote control to set it into the system. Many service stations only operate one remote control hereto. So, another control doesn't work after setting. Furthermore, the settings will definitely fail in case of improper process or operation. In this case, do not replace remote control or module casually. Be advised to try again strictly according to this operation process. Operate as in the figure below.

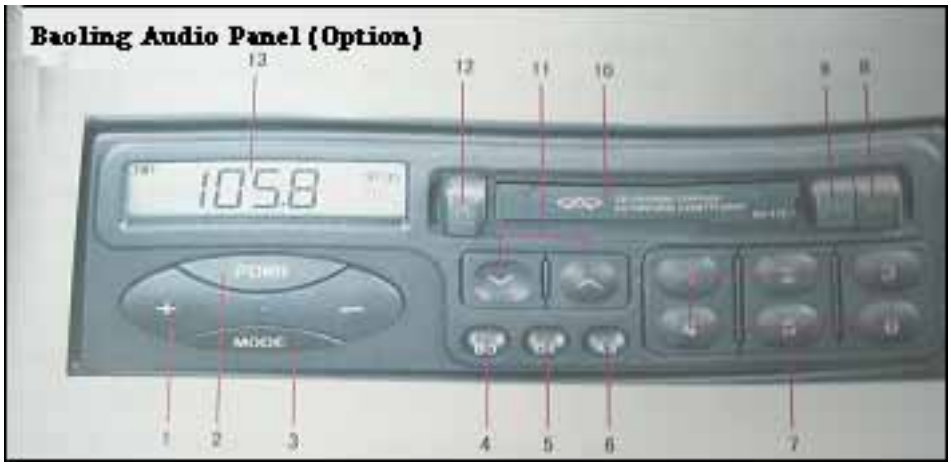
Operation process:



Chapter 5 Operation and Maintenance of Audio System

I. Audio system functions and operations (illustrated just by using Baoling Electronic Tuning Radio (ETR) and please refer to the supplied specifications for other radios).

(I) Panel of audio system and air conditioner (option)



Panel notes:

1 Volume
2 Power ON/OFF
3 Mode selection key
4 Waveband selection key
5 Clock key or CDMD key
6 Automatic Save key
7 Save key
8 Fast Forward key
9 Rewind key
10 Cassette compartment
11 Tuning key
12 Reject key
13 LCD display screen

1. Notes of key function

(1) Power ON/OFF (POWER)

Press (2) key to turn on and press it again to turn off the device (Note: the device is initialized when it is electrified for the first time because the power of the chip on the main processor is reset).

(2) Mode selection (MODE)

Press (3) key repeatedly and you will be able to select the function modes in the following order: VOL→BAS→TRE→BL→ FA→VOL.

In each mode, press "+" or "-" to adjust electrical frequency for each mode.

VOL
Press "+" or "-" to adjust volume electrical frequency in the range of 0-63.

BAS
Press "+" or "-" to adjust BAS volume in the range of –7 to 7.

TRE
Press "+" or "-" to adjust the volume of left or right sound track in the electrical frequency range of 15L to 15R.

FA

Press "+" or "-" to adjust the volume of left or right sound track in the electrical frequency range of 15L to 15R.

(3) Waveband function selection key (BD)

Press (4) key repeatedly to select the functions in the following order:

FM2 →FM2→ FM3→FM4 →AM1→ AM2

When the desired waveband is selected, press "∧" or "∨" to select radio stations manually or automatically. When the desired radio station is selected, press (3) and "+" or "-" to adjust volume.

(4) Clock function key (CLK)

Press (5) key to toggle between radio frequency and clock display. In the radio mode, press CLK, and the clock will be displayed for five seconds before the radio mode returns. Press this key for a long time and simultaneously press "∧" or "∨", and then the time (hour and minute) can be adjusted.

(5) Automatic Preset Save key (AS)

Press (6) key and hold for less than two seconds, and then the preset radio stations set by using this key will be displayed one by one. However, by pressing this key and hold for more than two seconds, you will have the character of "ATP" displayed and the device started to scan the radio status automatically. At the same time, six effective radio stations will be automatically saved and the device will start to repeat the order of the six stations until users select one of them by pressing a key (1-6).

(6) Save key (1-6)

Radio Save key (1-6) can save more than 30 radio stations (18 FM stations and 12 AM stations). When users need to save radio stations, they can do so by pressing "∧" or "∧" to select a desired station and then press the key (1-6) to save it to the key.

(7) Tuning key ("∧" or "∨")

By pressing "∧" or "∨" for a short time, users can search for radio stations manually (AM: 9KHZ and FM: 50HZ) until a desired station is reached. Then, when pressing "∧" or "∨" for more than one second, users can locate an ideal station. If "∧" or "∨" is pressed in the process of automatic search, the radio frequency will return to the last station frequency status.

2. Notes for radio operation

(1) Turn on: When POWER key (2) is pressed and characters are displayed, the device is in the mode of radio.

(2) Press BD key (4) to select FM2, FM2, FM3, AM1 and AM2.

(3) Tuning key: Pressing "∧" or "∨" to manually search for stations upward and downward. Press the key for more than one second, and then the automatic search will be triggered and continue until the desired station is selected.

(4) Manual station saving: Select a desired wave band station to save it to one of the six Save keys (1-6). Press this key (1-6) for two seconds, and then the selected station will be saved to it. The six keys can save one of the FM1, FM2, FM3, AM1 and AM2 stations.

(5) Audio adjustment: Press "MODE" key to display "VOL" and then press "+" or "-" within five seconds to adjust volume. If "+" or "-" is pressed within five seconds, the display will return to the main display status. This method applies to BAS, TRE, BL and FA, too.

(6) Automatic scanning save (six): After pressing this key for about two seconds, users can receive a signal that is used to confirm memory and displays and automatically saves six radio stations with strong radio signals. Pressing this key or one of the six numeric keys will stop this function. If the six saved stations cannot be found, these stations will disappear.

(7) Stereo: ST9 will be automatically displayed when a stereo station is received (stereo indication)

(8) Scan and save programs: By browsing the preset keys (1-6), the saved stations can be retrieved.

3. Notes for Tape player operation

(1) The turn-on operation is the same as in the radio mode.

(2) Insert gently a cassette with the open side on the right into the compartment. When the display shows TAPE and "◄" or "►", the device is in normal play status.

(3) Volume adjustment: the operation is the same as in the radio mode.

(4) Select songs: Press FF "►►" or FW "◄◄" to find desired programs quickly.

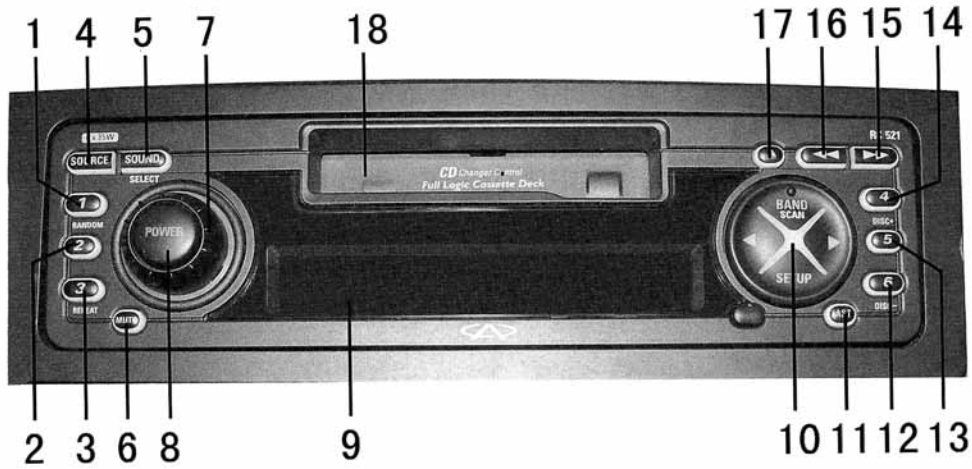
(5) Playing direction conversion: Press FF "►►" and FW "◄◄" at the same time to reverse the playing direction.

(6) Radio and player conversion: Just by inserting a cassette gently into the compartment will change the device from the status of radio to that of music player. Press Reject (12) to remove the cassette, and then the device changes to the status of radio.

Press FF or RW keys (when the operations of FF or RW complete, the device will automatically change from the status of radio to that of player).

II. CD player panel (Option)(illustrated just by using VDO CD player and please refer to the supplied specifications for other players)

Panel of VDO Audio System (Option)



Notes for function keys

1 Preset Key 1 RANDOM: CD player starts/stops random playing
2 Preset Key 2
3 Preset Key 3
4 Source: sound source
5 Sound: Press for a short time: sound effect mode Select: Press for a long time: Sound

setting mode

6 MUTE
7 Volume
8 Power switch
9 Display
10 BAND SCAN: Radio frequency scanning/CD player song scanning
◄ ►: High-end and low-end scanning (playing) Previous/next song (CD cassette)

Automatic music scan system

11 AST: automatic saving system
12. Preset key 6 DISC-: Choose forward discs 13. Preset key 5
14 Preset key 4 DISC+: Choose backward discs
15 Fast Forward ►►
16 Rewind
17 Reject ▲ Press for a short time to reverse the cassette Press for a long time to reject the cassette
18 Cassette compartment

Note: VDO CD player is optional. See supplied manuals for the information on use and maintenance of VDO CD players.

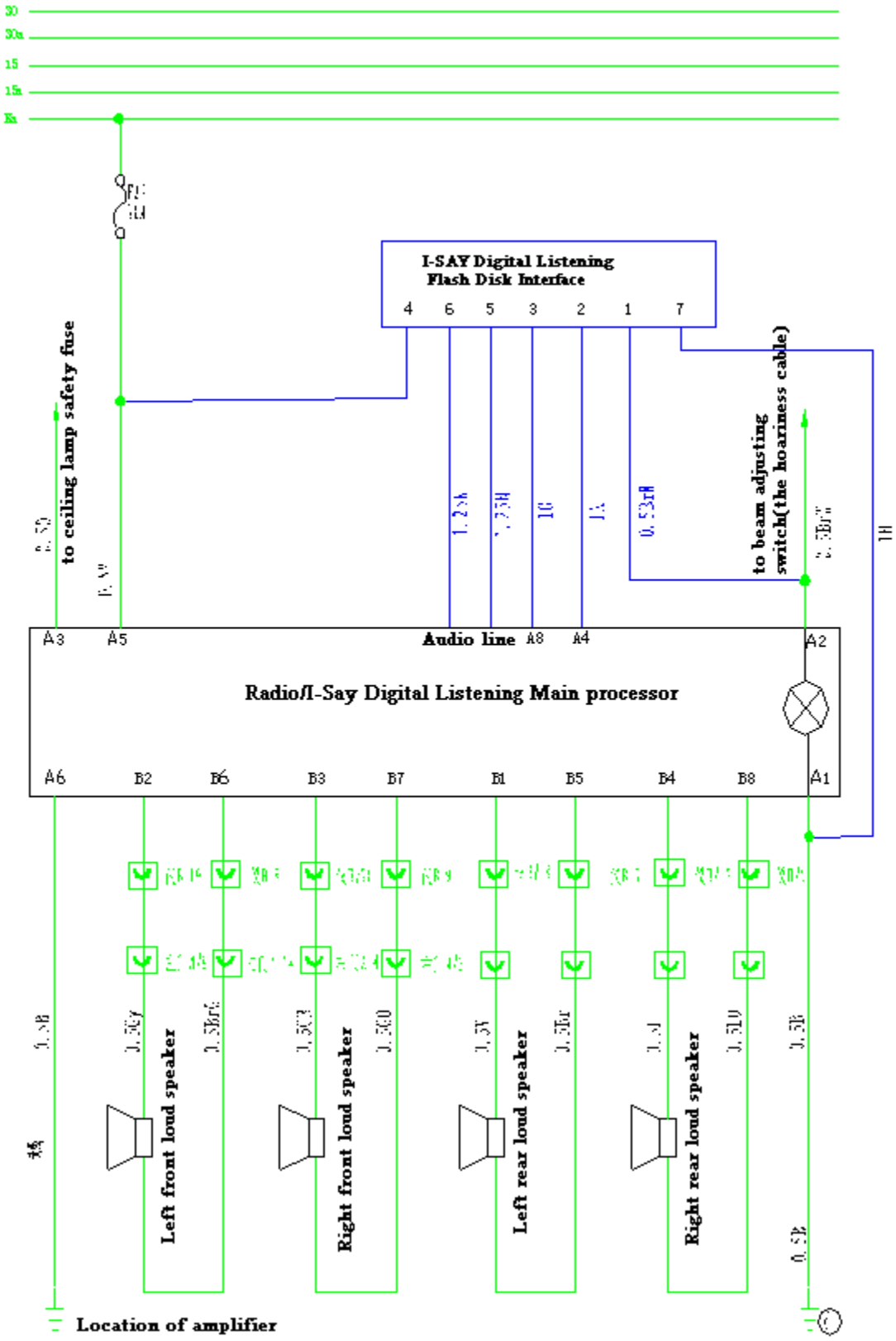
III. Audio system maintenance

1. Before the radio maintenance, shut off the ignition switch and disconnect the battery negative wire.

2. Common problems and troubleshooting

Symptom	Possible Cause	Solution
The main processor fails to be turned on	Fuse broken	Replace it with another fuse of the same type
	Wrong wiring	Check the wiring against the wiring diagram
The main processor works but without sound output	Speakers and wires	Check connections and speakers
	Main processor out of order	Consult a professional radio technician
Poor sound quality of the main processor, with interference	External signal antenna	Check the connection between the antenna and main processor or amplifier power.
	Dirty magnetic tapes and heads	Clean magnetic heads
Cassettes blocked	Tapes damaged	Replace the broken cassettes
	Main processor failure	Consult a professional radio technician

3. Audio circuit diagram



IV. Disassembly and assembly of the Audio system

1. Disassembly and assembly of the Audio system

Disassembly:

Turn off the power and ignition switch, and remove wires connected with the battery.

Remove the outer shield of the radio.



Loosen the two holding bolts on both sides of the main processor.





Remove wires connect with the main processor and take out the device.

Assembly: Reverse to the disassembly process.

2. Disassembly and assembly of speakers

Note: Do not touch its vibration membrane or other parts. Otherwise, the sound effect will be affected or damaged!

Disassembly of the front speaker

Remove the panel shield (see the notes for the vehicle body).

Remove the four holding bolts.

Take out the beam plug.
Remove the speaker.



Assembly: Reverse to the disassembly process.

3. Disassembly and assembly of the antenna

Disassembly: Remove the top light (refer to Disassembly of Top Light).
Loosen the bolts.
Remove the plug connected to signal reception lines to remove the antenna.

Assembly: Reverse to the disassembly process.

Chapter 6: Inspection and Repair of Other Accessories

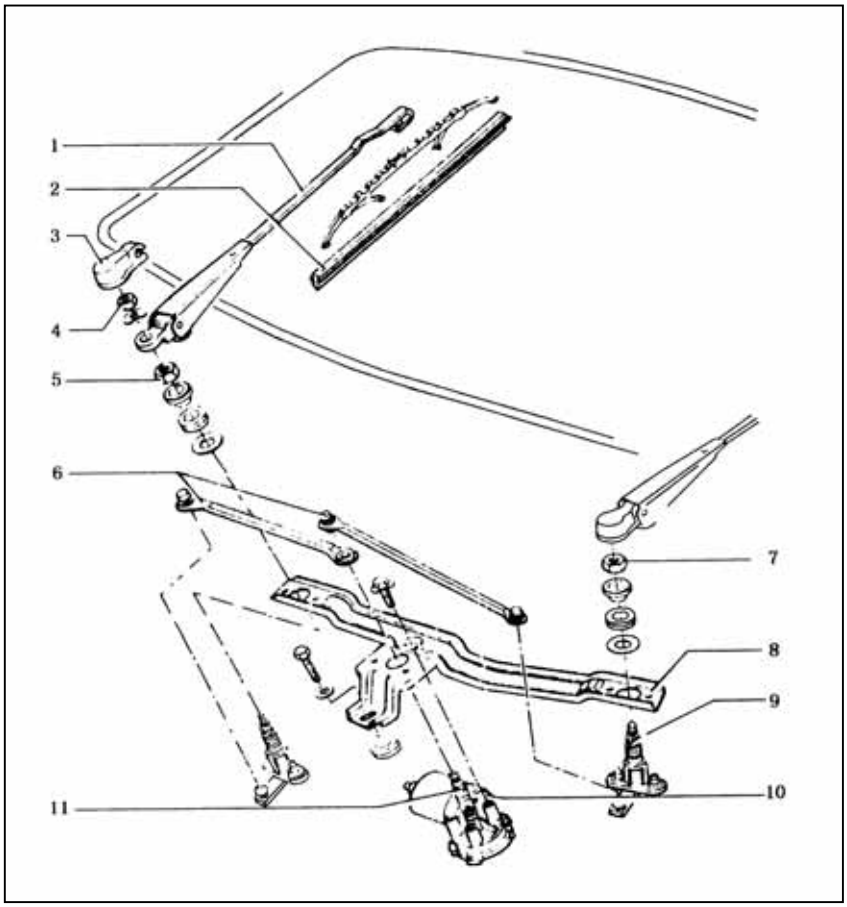
Ⅰ.The structure and maintenance of wiper and wash equipment

1. The structure of wiper and wash equipment

Wiper and washer equipment of Chery S11 consist of fuse, combination wiper switch with intermittent position, windshield wiper relay and motor, rear wiper motor, wiper abutment, connecting rod assembly, locating lever, wiper rubber strip, water injection pump, reservoir and nozzle etc. They are shown as follows:







Structure of the wiper

1- wiper arm 2- wiper rubber strip 3- protective cover

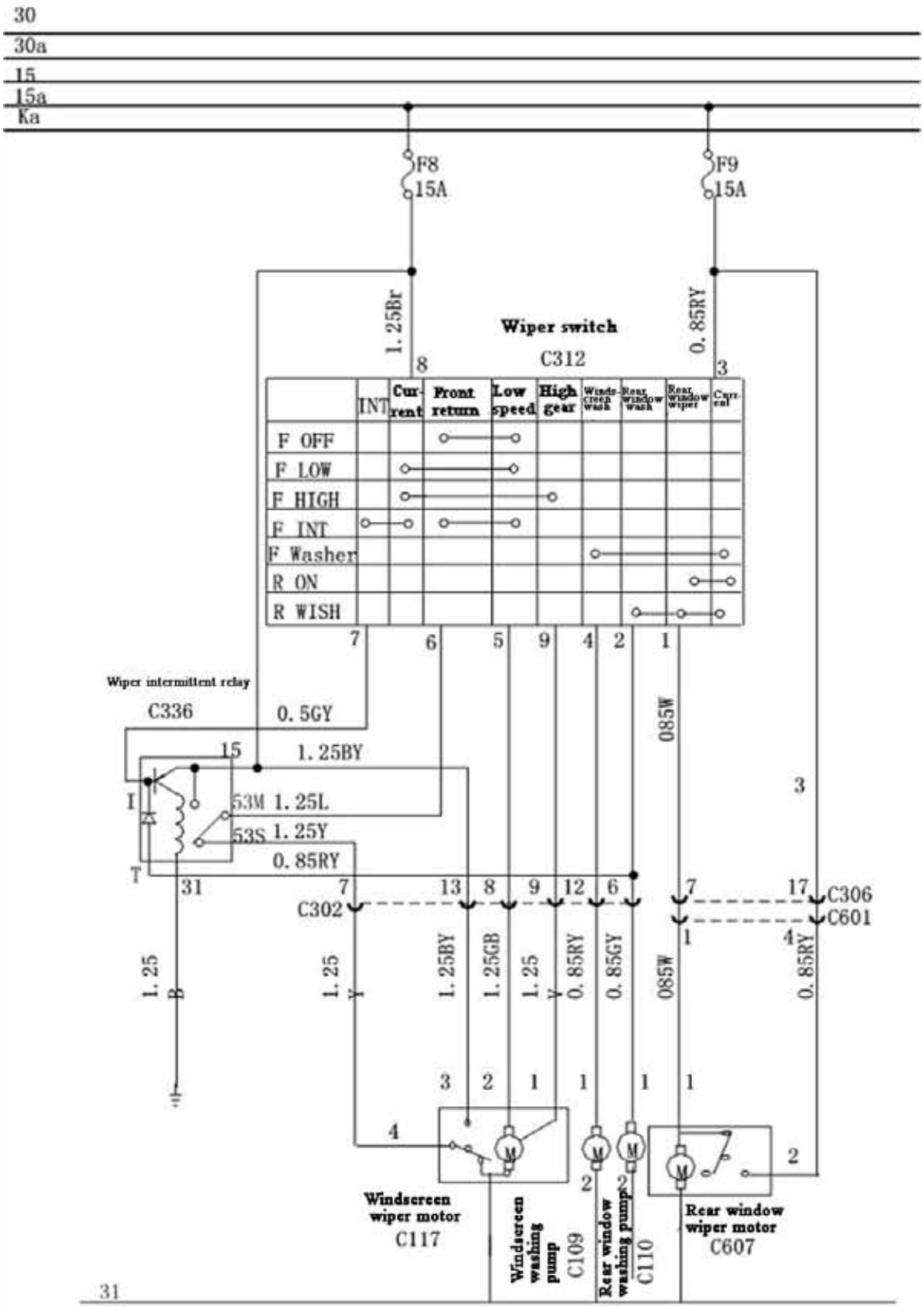
4、5、7- nuts 6- swing link 8- abutment 9- journal

10- motor 11- crankshaft

The circuit system for the wiper and wash equipment is shown in the figure. If the start-up switch is turned on, by switching the wiper switch between the positions thereof, the power supply controlled by the start-up switch can be connected directly to the wiper motor through the fuse (fast position) or can actuate the motor through the relay (slow position, intermittent position and water injection position).

When the wiper switch is in its lowest position, the wiper is out of operation. When the wiper switch is turned to the “2” position, the wiper operates in intermittent mode. Every some 6 seconds the wiper does one operating cycle. When the wiper switch is turned in the direction of the steering wheel, the front wiper is actuated, the water injection pump pumps water, the wiper moves to and fro for 3 to 4 times and stops. When the wiper

switch is in its “third” position, the wiper operates in the fast mode. When the wiper switch is turned in the direction of instrument panel to the last position, the rear wiper operates in its slow mode and the water injection pump injects water at mean time. Turning the turn button to “ON”, the rear wiper operates permanently.



Circuit diagram of the wiper and wash equipment

2. Inspection and Repair of wiper and wash equipment

（1）Removal of Wiping rubber Strip

①Hold the two steel straps on the sealed side of wiping rubber strip with slip-joint pliers, remove them from the upper clamp and draw the rubber strip together with the steel straps from the other clamps of wiper blade.

②Insert new wiper rubber strip in the lower clamp of the wiper blade and fasten it.

③Insert the two steel straps into the groove of the first wiper rubber strip, align them with the rubber strip and push them below the rubber strip lips in the groove.

④Press the steel straps together with the rubber strip, mount the upper clump by putting the lips on the both side of the clamp in the positioning groove of the wiping rubber strip.

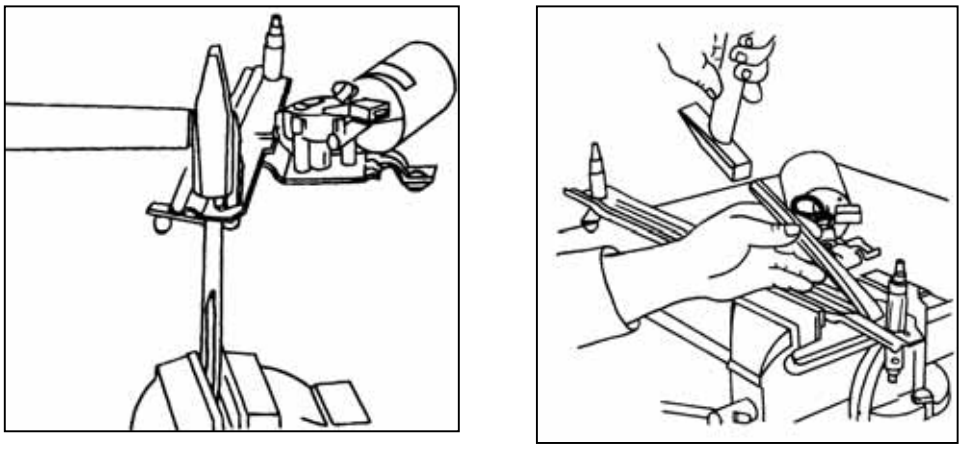
（2）Adjustment of the position of crankshaft

①Turn the wiper motor to the limit position.

②Install the crankshaft and adjust it until the tubular internal thread can be seen.

（3）Replacing the wiper abutment

Once the wiper abutment is removed, it should be replaced. During the removing of the wiper abutment, the rivet should be cut off with cutting knife. As shown in the figure, while installing the wiper abutment, the abutment should be abutmented securely.



Removal of the wiper abutment



Installation of the wiper abutment

（4）Inspection of conduction of wiper switch and washer switch

As shown in the figure, if the performance of conduction does not conform to the states shown in the figure, the wiper switch and the washer switch must be replaced.



Switch position	Connection inspection	Conductance
OFF	6-5	Yes
Front intermission (INT)	7-8 6-5	Yes
Front slow (LOW)	8-5	Yes
Front fast (HIGH)	8-9	Yes
Front washing (Washer)	4-3	Yes
Rear wiper (ON)	2-11	Yes
Rear washer in operating (WISN)	1-10-3	Yes

Figure Inspection of wiper and washer switches

（5）Inspection of the operation of the front washer

As shown in the figure, the terminals 8 and 5 are respectively connected to the positive and negative pole (anode and cathode) of the secondary cell, and the positive and negative probes of a voltmeter are respectively connected to the terminals 7 and 5. Turn on the washer switch, check up if the voltage changes as follows: after the washer switch was turned on for one second, the volt meter displays the supply voltage, and after turning off for 3 seconds, 0 voltage is displayed. If it is not the case, the wiper and washer switch should be replaced.

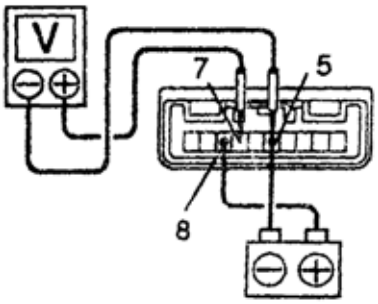


Figure Inspection of the operation of the front washer

（6）Inspection of the performance of the front wiper motor

The circuit arrangement is shown in the figure. Inspect the low speed performance of the front wiper motor, and replace it if necessary. It should be noted that the inspection should be accomplished as soon as possible, in order to prevent overheat (overburning) of the motor.

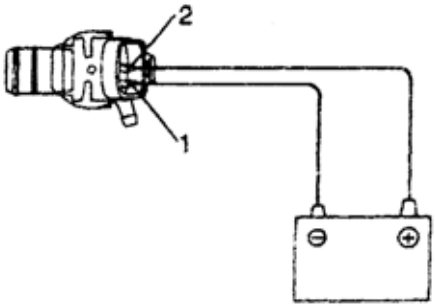


Figure Inspection of the performance of the front wiper motor

(7) Trouble-shooting of the wiper and wash equipment

Typical troubleshooting can be seen in the table

Trouble-shooting chart of wiper and washing equipment

Symptom	Possible causes	Solution
Start-up switch on, turning the wiper switch among the positions, but the wiper fails to work.	Fuse blowing out Wiper motor socket joint defective Internal circuit break rotor of wiper motor clamping	Replace Repair or replace Repair or replace
Wiper fails to work except in "slow" mode	Loose contact or circuit break of the connecting wire Relay damaged Wiper switch defective	Repair or replace connecting wire Replace Repair or replace
Wiper fails to work except in "fast" mode	Relay defective	Replace
Wiper works except in "int" mode	Loose contact or circuit break of the connecting wire Wiper switch defective Relay damaged	Repair or replace connecting wire Repair or replace Replace
In "water injection" position the wiper fails to wipe and inject water, while works well in the other positions	Loose contact or circuit break of the connecting wire Wiper switch defective Water injection motor or Water injection pump defective. Connecting pipe or nozzle blocked	Repair or replace Repair or replace Repair, replace or clean
Water marks remain on the window	Wiper rubber strip contaminated	Clean the wiper rubber strip with hard nylon brush and cleaning agent

	Rubber strip broken or damaged because of being abrasion on the edge Rubber strip aging, surface torn	Replace Replace
Water remains after wiping	Paint, polishing agent and oil, etc left on windshield	Wiping windshield with clean rag dipped in degreaser
Wiper blade works well on one side, and emits crack on the other side	Wiper rubber strip is deformed and fails to work Locating arm is distorted and wiper blade sideling gets stuck on windshield	Replace Carefully make the arm vertical
Part of surface can not be wiped	Wiper rubber strip is dropped out the groove wiper blade does not contact windshield uniformly, spring or steel strip get bent Wiper arm contacts with windshield under too great pressure	Insert the wiper rubber strip in the groove Replace Lubricate wiper lever joint and spring or replace the arm

Ⅱ. Inspection and Repair of Horns

Only one horn is used in Chery S11, it is installed to the inside of front left bumper beam, the current through the horn relay contacts is supplied by F4(10A)

Typical troubleshooting and solutions thereof are shown in the table

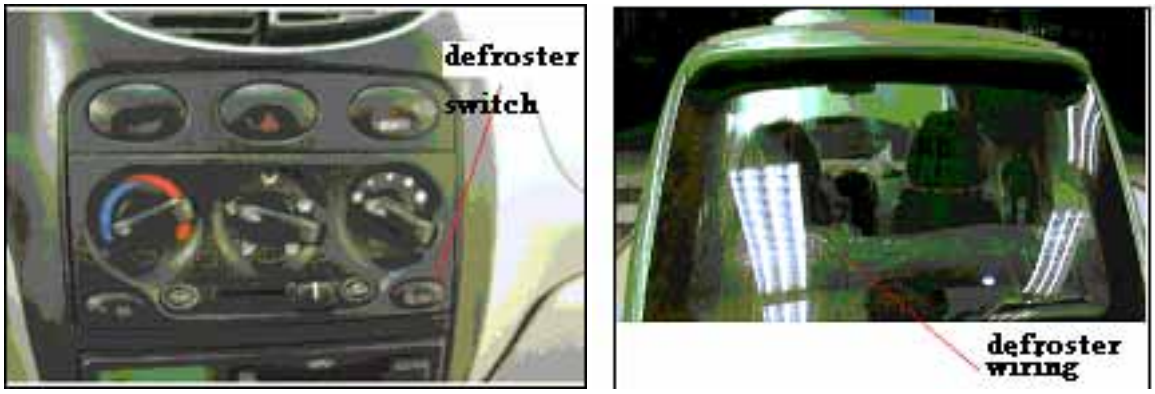
Table Typical troubleshooting and solutions of horn

Symptom	Causes	Solution
Horn does not work	Loose contact of the horn connector, Fuse blowing out Horn relay defective	Repair or replace Replace Replace

	Horn button wiring broken or loose contact thereof	Repair or replace
The sound of horn is low	Insufficient charge of secondary cell Horn defective Interference between horn and direction indicator lamp	Recharge or change the cell Replace Adjust
After releasing the horn button, the horn would not stop	Short in the horn button	Replace Repair

III. Inspection and Repair of the Defrost System

In figure defrost system is schematically shown.



Schematic view of the defrost system

1、Inspection of the conduction of the defroster switch

As shown in the table, if it does not conform to the table, change the defroster switch.

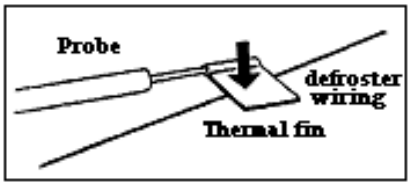
Inspection of the defroster switch

Switch position	Connection to the instrument	Conductance
Switch OFF	-	No

Switch ON	1-2	Yes

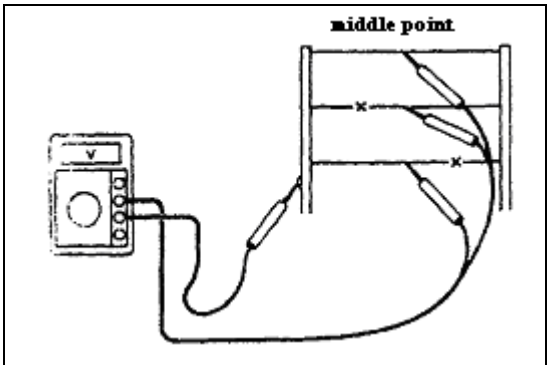
2、Inspection of defroster wiring

While cleaning the window, wipe with soft cloth along the line, don't damage the defroster wiring. Don't use cleaning agent or cleaning device, otherwise the surface will be damaged. While inspecting the voltage, insert the negative probe in an end of the thermal fin, and push the wiring with finger as shown.



Inspection of voltage

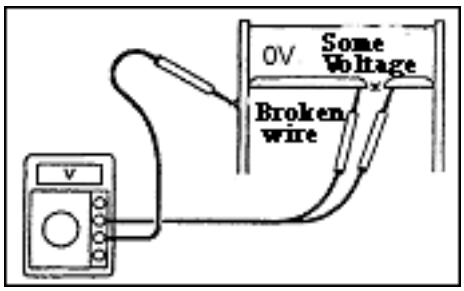
Turn the start-up switch to ON, turn the defroster switch to ON, check the voltage at the midpoints of each wire as shown. If the wire is broken, there is a voltage of about 10v between the positive terminal of the meter and the midpoints of the wire, there is no voltage between earth and the midpoints of wire.



Voltage	State
About 5V	Normal
About 10V or 0V	Broken

Inspection of voltage of midpoint of the defroster wire

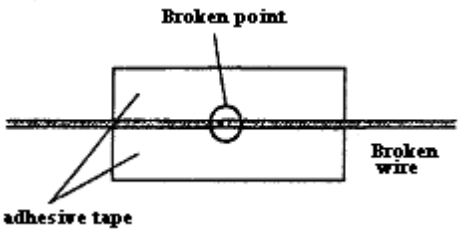
Connect the positive probe of the Voltage meter to positive terminal of the defroster, negative probe to the earth end. Press the positive probe on the hot wire and move it to the negative terminal. If the voltage springs from 0V to some V at some point, this point is the broken point, as shown in the figure. If the defroster wiring is not broken, at the positive terminal of the defroster wiring the volt meter shows 0V, and during the probe move to the other terminal, the voltage increases gradually to 12V.



Detection of the broken point of the defroster wiring

3、Repairing of the defroster wiring

Eliminate the tool cleaning broken point with lubricating grease (wax) and organosilicon, during the repairing, attach adhesive tape on the both side of the defroster wiring. After mixing of the repairing agent, drop the repairing agent to the broken point in appropriate amount with electric brush. Remove the adhesive tape after few minutes, as shown in the figure



Repairing of the defroster wiring

Ⅳ. Inspection and Repair of Control System of Power Windows

1. Operating mode of power windows

（1）the function of power windows timer

①After the start-up switch shut off, the power windows are operable within 30 seconds. If the doors are opened or closed in the period, the power windows can be operated within another 30 seconds.

②During lowering the power window, if an overload is detected, the power windows are operable within 30 secs.

③Within the last 6 seconds of above-mentioned period, if the door window switch is hold upwards for over 0.3 second, the door window then works in overloaded state to prevent that the door window stops in opened state.

（2）The function of power windows

①operating condition

In the ON state of the start-up switch, after the start-up switch is turned off(the operating time of the power window timer is within 30s)

②operating progress

The power window switch is actuated for over 0.3s, the door window rises and lowers automatically. During its operating, if the power window switch is actuated once again, the door window stops.

③stop conditions of the door windows

A. If the current through the door window motor is higher than 14.5A+1A, the door window stops after 0.7s operating time.

B. After operating for 6s (required by raising and lowering the door window), the operating stops.

※**Reference:** if raising or lowering not completed within 6s, check the overload current detecting function of door window motor or the installation of the door edging and door window regulator.

（3）stepping mode power window

①Operating condition: the same as that of power windows.

②Within 0.3s, if power window switch is in its raising or lowering position, the door window operates in stepping mode with the step length of 0.5s.

③If raising and lowering switch is actuated in same direction N times within 0.3s, the door window operates for a period of (0.5xN)s.

④Stop condition of the door windows: it is the same as that of power windows. In the stepping mode, once another switch is turned on, the operation (of lowering switch in raising operation/lowering switch/raising switch in raising operation) stops.

2. Supplying circuit of power window (see theftproof computer)

3. Inspection of the circuit of the power window

（1）In this circuit, for the BCM computer (theftproof computer) controlled power window, the direction of the current through the power window motor is changed automatically to make the motor rotating clockwise or anticlockwise, so that the door window is raised or lowered.

（2）If the start-up switch turned on, the BCM computer (theftproof computer) actuates the power window by supplying operating signal to the power window switch.

（3）If the start-up switch turned off, the BCM computer (theftproof computer) actuate the power window relay within the operating delay of 30s, i.e. after the start-up switch turned off, all the door windows can be actuated within 30s.

（4）Push the power window switch upward or downward (over 0.3s), the BCM computer (theftproof computer) instructs with signal to supply forward or backward current, so as to rotate the power window motor clockwise or anticlockwise.

（5）With the start-up switch on, push the power window switch upward or downward, check if there is forward or backward current output on the terminals of the BCM computer (theftproof computer). If not, the switch is defective, if voltage is output thereon, but the power window wouldn’t rise or lower, then the power window motor is defective.

The power window hoister

4. Inspection and Repair of Electric Components

（1）control device of the power window

Check the conductance of the power window main switch as shown in the figure. If it does not conform to the figure, replace the power window main switch.



switch	switch position	Connection to the instrument	conductance
Switch on the driver side	UP	13-12	Yes
	OFF	3-12	Yes
	DOWN	14-12	Yes
Switch on the by-driver side(window unlocked)	UP	5-12 3-12 5-3	Yes
	OFF	3-12	Yes
	DOWN	6-12 3-12 3-6	Yes
Switch on the by-driver side(window locked)	UP	5-12	Yes
	OFF	-	
	DOWN	6-12	Yes
Rear left switch(window unlocked)	UP	9-12 3-12 9-3	Yes
	OFF	3-12	Yes
	DOWN	10-12 3-12 3-10	Yes
Rear left switch(window locked)	UP	9-12	Yes
	OFF	-	
	DOWN	10-12	Yes
Rear right switch(window unlocked)	UP	1-12 3-12 1-3	Yes
	OFF	3-12	Yes
	DOWN	2-12 3-12 2-3	Yes
Rear right switch(window locked)	UP	1-12	Yes
	OFF	-	
	DOWN	2-12	Yes

Figure Inspection of conductance of power window main switch

(2) window secure switch



switch	position	connection to the instrument	conductance
Front driver side secure switch	ON	12-11	Yes
	OFF	3-12	Yes

On the door interior panel of the drive side, an rear window secure switch button is provided. Push the button, the power windows switches of the by-driver side and the both rear door windows are deactivated. Then the corresponding window switches can only be controlled from the window switch on the driver side.

Description of the switches

Among all the four doors, the control switch for the other three doors, rearview mirror adjust switch and secure switch are only provided on the front left door.

Note: with the secure switch the switched on the rear doors can be locked. Only when the secure switch is pulled out, the rear windows can be opened and closed with these switches.

（3）Check the conductance of switches on the passenger door window, rear left door window and rear right window as shown in the figure. If it does not conform to the figure, replace the power window switch.



Switch position	Connection to the instrument	Conductance
UP	1-5	Yes
OFF	-	
DOWN	3-5	Yes

Inspection of conductance of power window switch

（4）Inspection of conductance of power window motor on the front left door

Connected the terminal 1 to positive pole of the secondary cell, the terminal 2 to the

negative pole of the secondary cell, and check if the motor rotates clockwise as shown in the figure; connect the terminals reversely, check if the motor rotates anticlockwise. If the result is not as mentioned, replace the front left power window motor.

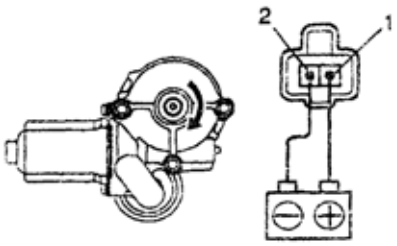


Figure Inspection of left front door motor

（5）Inspection of conductance of power window motor on the front right door

Connected the terminal 2 to positive pole of the secondary cell and the terminal 1 to the negative pole of the secondary cell, and check if the motor rotates clockwise as shown in the figure; connect the terminals reversely, check if the motor rotates anticlockwise. If the result is not as mentioned, replace the front left power window motor.

（6）Inspection of conductance of power window motor on the rear left door

Connected the terminal 1 to positive pole of the secondary cell, the terminal 2 to the negative pole of the secondary cell, and check if the motor rotates clockwise as shown in the figure; connect the terminals reversely, check if the motor rotates anticlockwise. If the result is not as mentioned, replace the rear left power window motor.

（7）Inspection of conductance of power window motor on the rear right door

Connected the terminal 1 to positive pole of the secondary cell, the terminal 2 to the negative pole of the secondary cell, and check if the motor rotates clockwise as shown in the figure; connect the terminals reversely, check if the motor rotates anticlockwise. If the result is not as mentioned, replace the rear left power window motor.

（8）Typical troubleshooting of power windows

Table Typical troubleshooting of power windows

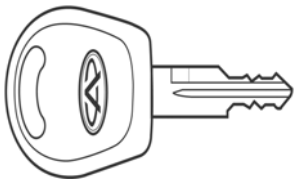
symptom	possible reasons	solution
Start up switch on, power window does not work	FuseFuse blowing out power window switch theftproof computer	replace repair or replace repair or replace

	connecting wire defective	repair or replace
None of the power windows works	connecting wire defective power window motor power window switch theftproof computer	repair or replace wire repair or replace repair or replace repair or replace
Power window does not lower	power window switch power window motor connecting wire defective	repair or replace repair or replace repair or replace
Power window does not rise	power window switch power window motor connecting wire defective	repair or replace repair or replace repair or replace
Power window rises slowly	connecting wire defective power window motor power window switch theftproof computer	repair or replace wire repair or replace repair or replace repair or replace
Power window does not lowers slowly	connecting wire defective power window motor power window switch theftproof comupter	repair or replace wire repair or replace repair or replace repair or replace

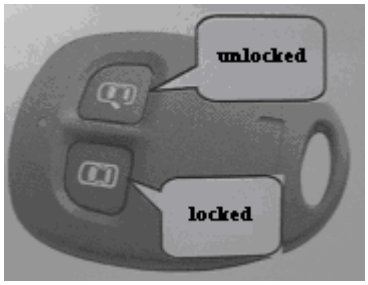
Ⅴ. Inspection and Repair of the control device of electric door lock

1.Description of the operation of central control door lock

Key



Remote controller



All the doors can be operated simultaneously with the key and the remote controller

All the doors can be locked or unlocked at the driver side door lock with the key.

While unlocking, secure buttons of all the doors move upward. While locking, secure buttons of all the doors move downward. The doors can also be locked by pushing the

secure button down.

Door lock

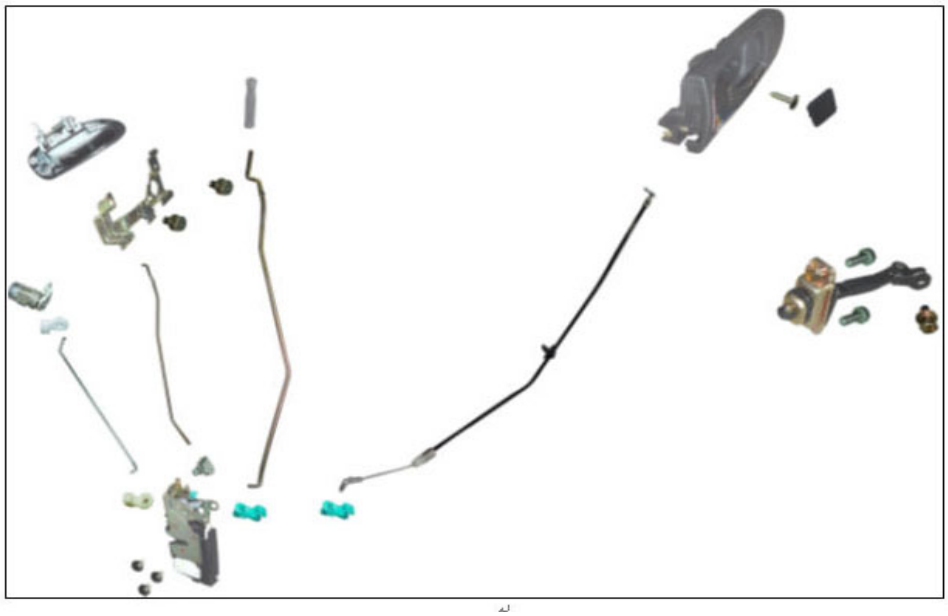
The front doors can be locked and unlocked from outside with the key and can be locked from inside with the door handle.

Before leaving the car, push down the locking rod down and close the door to lock it.

After entering the car and turning the start-up switch on, if the door is not locked or opened within 5min, it will be locked automatically. Once the start-up switch is off and the key is pulled out, the door lock will be unlocked automatically.

Operating mode

When the driver locks or unlocks the door lock, the door operating device installed on the side of driver seat, lock or unlock signal will be sent to the micro switch in the door lock. According to the lock or unlock signal sent by the door operating device, The BCM computer (theftproof computer) will activate the motor integrated in the door operating device. The built-in motor of the door operating device is controlled by the signal on the 201 terminal of the BCM computer (theftproof computer) to lock and unlock each door lock jointly. Or the rotating direction of the door lock motor is changed according to the direction of output current of BCM computer (theftproof computer)), whereby the door lock will be locked or unlocked through the connecting rod.



2. Inspection and Repair of the Central Control Door Lock

(1) BCM computer (theftproof computer)

The BCM computer (theftproof computer) is installed in the instrument panel on the left

side of the lower evaporation box. It gets power supply from the secondary cell, and receives opening and closing signal from the door lock device of the front left door to control the direction of the central door lock device. The BCM computer (theftproof computer) is in charge of controlling the central door lock and power window.

(2) Door lock operating device (driver seat side)

When the driver opens the front left door from outside, the micro switch inside the door lock operating device connects the circuit to the ground or disconnected it from the ground, and sends signals to the BCM computer (theftproof computer). When the driver opens the front left door from inside, by turning the start-up switch off and pulling the key out, the BCM computer (theftproof computer) will unlock the central control door lock automatically, or if the door on the driver side is open directly, the central controlled door lock will be unlocked.

(3) Door lock operating device (front passenger side door and rear doors)

Midget motors are provided in the three door lock operating devices. Both terminals of each of these motors receive positive or negative current from the BCM computer (theftproof computer), the rotating direction of the motors is changed, and the door locks are operated in opening or closing direction through the connecting rods.

(4) Inspection of the door lock motor

Malfunction of the door lock motor can be determined by checking the electric resistance. Specifically, check the electric resistance on the terminal 1 and 2 of the connector of the door lock operating device. If infinity shows, broken coil of the motor can be determined. A simple way of inspection is, supply instantaneous (within 0.3s) current to the terminal 1 and 2 of the connector of the door lock operating device, the motor should rotate; if reverse current is supplied, the motor should rotate in opposite direction. It should be noted, that the supply time should be short, otherwise the armature coil may be damaged due to overload.

①Inspection of the operating of motors

a、Connect the positive pole (+) to the terminal 1, and the negative pole (-) to the terminal 2, check if the door lock connecting rod moves to the “UNLOCK” position

b、Connect them reversely, check if the door lock connecting rod moves to the “LOCK” position. If it is not the case, replace the door lock assembly.

3. Circuit Diagram

Pages 107-108 show the circuit diagram of power supply of the power window

Ⅵ. The structure, Inspection and Repair of the power rearview mirror

1. Internal rearview mirror

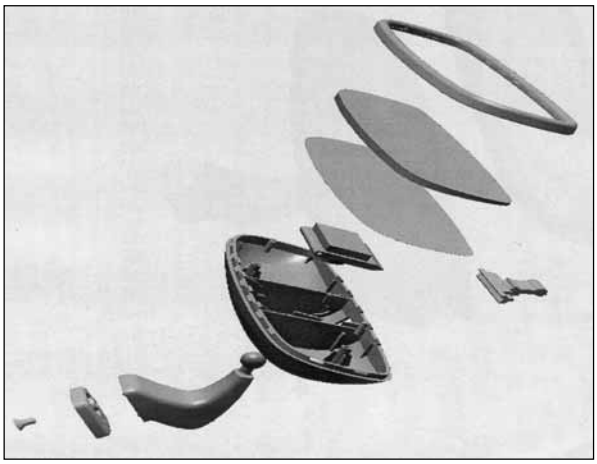
External appearance of the assembly



Technical parameter

No.	Parameter	Criterion
1	reflectivity of the mirror	≥40%
2	Angular of upward adjustment of the rearview mirror	≥22
	Angular of downward adjustment of the rearview mirror	≥28
	Angular of leftward adjustment of the rearview mirror	≥30°
	Angular of rightward adjustment of the rearview mirror	≥30°
3	Angular of adjustment of handle	4°30′

(1) Explosive view



(2)Usage/operation guide and warning

Usage/operation guide

①According to the different driver's visual, adjust the mirror angular of the assembly

②Turn the handle to adjust the mirror angular in the up and down direction to prevent dazzle.

Warning:

If the Number of manual adjusts excesses a predetermined value, operating force will lower.

3、Assemble, disassemble and warning

Steps of assemble and disassemble

（1）Prize off the mirror frame with tools, and remove damaged mirror

（2）Put new mirror in the mirror case in position, insert the mirror frame in the corresponding groove of mirror case assembly

Notice:

（1）Remove the mirror frame with caution, don't scratch or damage other parts

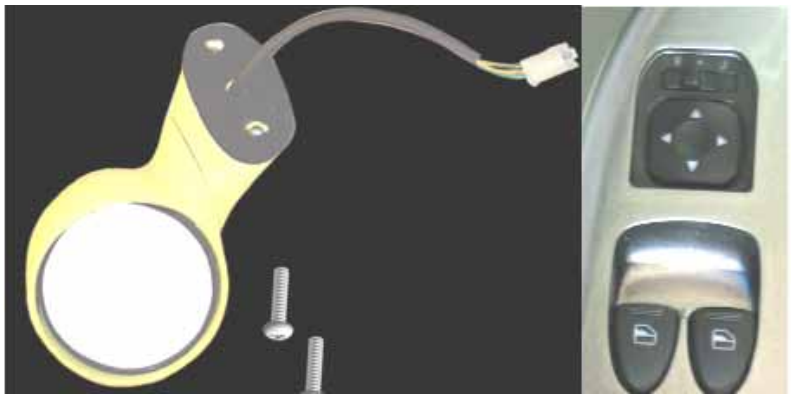
（2）Put the new mirror in the correct position of the mirror case, face the reflecting surface outward; Insert mirror frame in position.

2. Structure of power rearview mirror and control switch

The rearview mirror of Chery S11 is electric controlled. If the driver turns the turning switch on, turning light of the rearview mirror gives turning signal in the corresponding direction. Turn the adjust button in the car to adjust the angular of the mirror in upward, downward, leftward or rightward direction.

In the power rearview mirror on the both side, permanent magnet motors are provided, four currents, i.e. two positive and two negative, can be attained by switching the two motor switches, so that adjustment in different direction can be done.

The control switches are provided in the combination switch on the driver side. When the start-up switch is ON, operate the switches in the four directions to select the rearview mirror to be adjusted. On the control switch panel there are L, R printed, L stands for left rearview mirror, and R for right rearview mirror, stop operating is in the middle. After the mirror to be adjusted is selected, operate the switch in four directions above-mentioned, the space angle of the selected mirror is adjusted. After the adjustment, turn the switch back to the middle. In the figure power rearview mirror and the switches thereof are shown.



Power rearview mirror

1- Left rearview mirror assembly

2- Wire connector 3- Control switch

Notice：

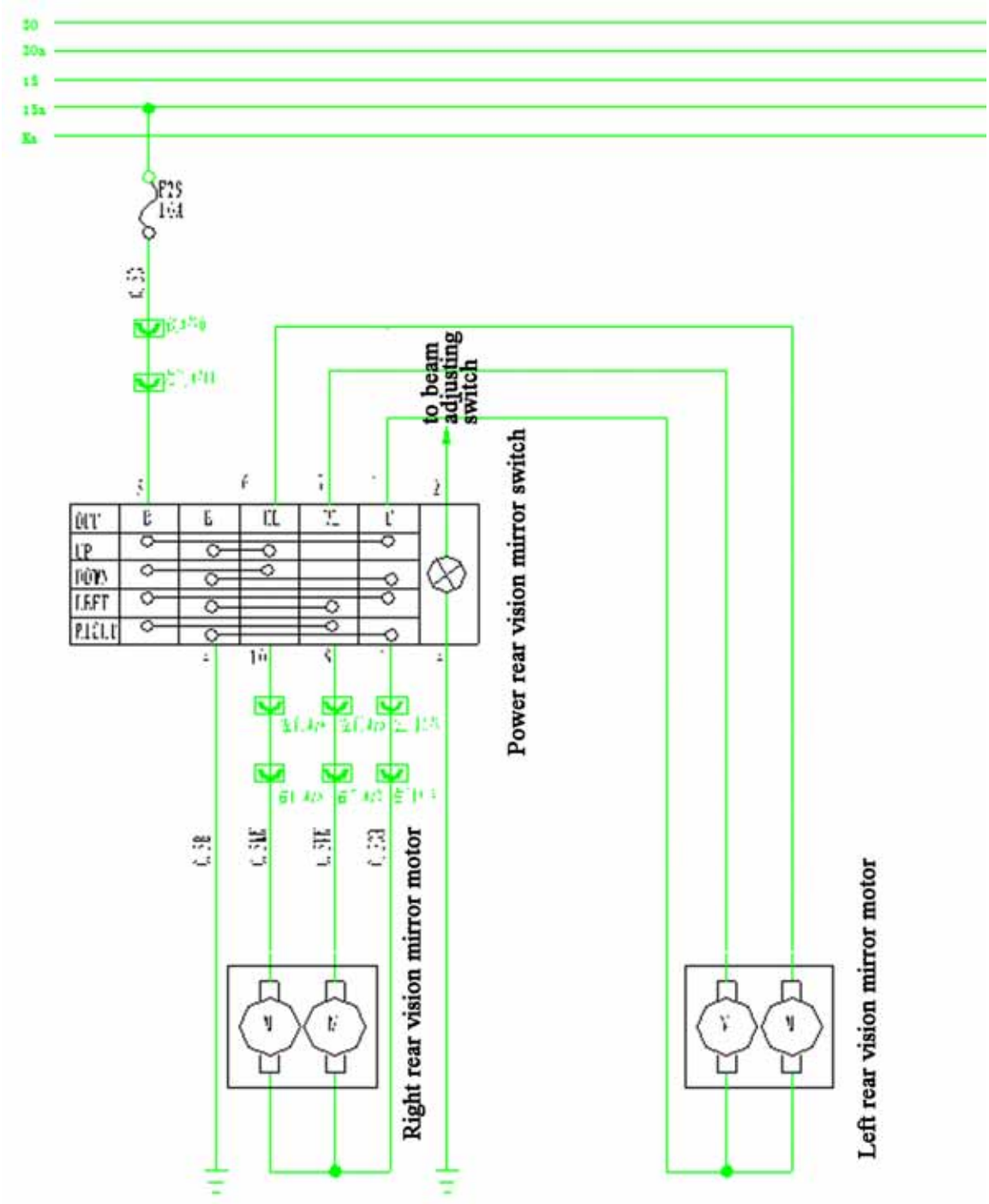
If adjust the rearview mirror manually, do not go beyond the range of adjust angle, otherwise the function or service life thereof will be influenced.

Technical parameter

No.	Parameter	Criterion
1	reflectivity of the mirror	≥40%
2	curvature of the mirror surface	Left：R1200～R2000 Right：R1200
3	upward/downward, leftward/rightward turning angle of the rearview mirror	≥7°
4	folding angle inward of left rearview mirror	Max 65°
	folding angle outward of left rearview mirror	Max 70°
5	folding angle inward of right rearview mirror	Max 70°
	folding angle outward of right rearview mirror	Max 70°

The power rearview mirror consists of mirror glass (reflecting surface), two motors, connecting member, driving unit and case etc. control switches include rotary switch, swing switch and wiring harness etc.

Electric circuit diagram of power rearview mirror



3. Inspection of power rearview mirror

(1)Power rearview mirror can only be operated in one direction

For example, the power rearview mirror can only turn left or turn up, defective switch can be

determined, replacement should be made. If motor or wiring is defective, power rearview mirror can not be operated in both directions; if the wiring is broken, no current flows through the motor, so the power rearview mirror cannot turn in any direction. If the coil or the brush of motor is defective, the power rearview mirror cannot turn in any direction either. It is impossible that the motor rotates only in one direction.

※**Reference:** if the electric control device that changes rotating direction of the motor (power window, motor circuit, power rearview mirror, electric driven seat etc.) can only operate in one direction, it is mainly because the defective switch.

(2)Power rearview mirror on right or left side doesn't work

The causes may be the defective switches of the right or left side, or may be defective wiring or motor on the side that power rearview mirror doesn't work.

①Remove the interior door panel on the defective side (to check the power rearview mirror connector)

②Remove power rearview mirror wiring connector

③Inspection of power rearview mirror on the left side: if the right/left angle can not be adjusted, after removing the wiring connector, connect a universal meter between the yellow wire and black-red wire, no matter on the right or the left side, push the angle adjusting switch down, and voltage of 12V will be shown (digital display). If voltage is shown, the switch and wiring are normal, the power rearview mirror should be replaced; if no voltage is detected, check if the wiring is broken. If the wiring is not broken, defective switch can be determined. If the up/down angle can not be adjusted, connect the universal meter between the green wire and black-red wire, make the inspection as above described and find out where is defective.

④Inspection of power rearview mirror on the right side: The inspection and decision are made in the same way as that of the left power rearview mirror, but the color of the wiring should be noted. if the right/left angle can not be adjusted, connect the universal meter between the grey wire and black-red wire; if the up/down angle can not be adjusted, connect the universal meter between the blue wire and black-red wire.

※ **Reference:** the color of wiring here mentioned is corresponding to that on the door wiring side, not to that on the power rearview mirror motor side.

(3) Right/left angle or up/down angle can not adjusted on the both sides.

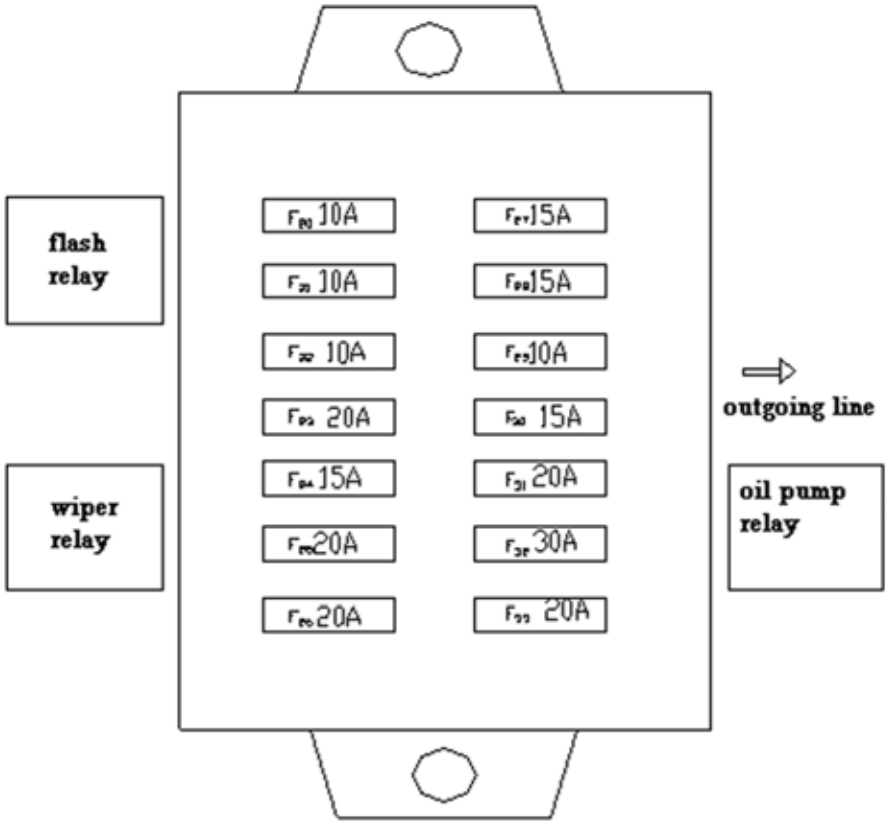
Almost all of this kind of problems is caused by defective switch. If the problem is not disappeared after the switch is replaced, it may be resulted from the short cut between the motor wiring and car body. After turning on the switch on, if the wiring that is short with car body is connected to the positive pole, the switch is cut off due the high current

between the wiring and the car body. If only the switch is replaced without eliminating the short cut, the switch will still be cut off. Therefore, under such circumstances, remove the power rearview mirror wiring connector instead of replacing the switch, check which wire among the yellow, green, blue, grey and black-red wires is short with car body. That is, these wires should be checked one by one with the universal meter. Find out the defective wire and fix it, and replace the switch (in the off state)

Ⅶ、Fuse and Relay

Fuse and relay boxes are installed rear left to the motor chamber and below the instrument console.

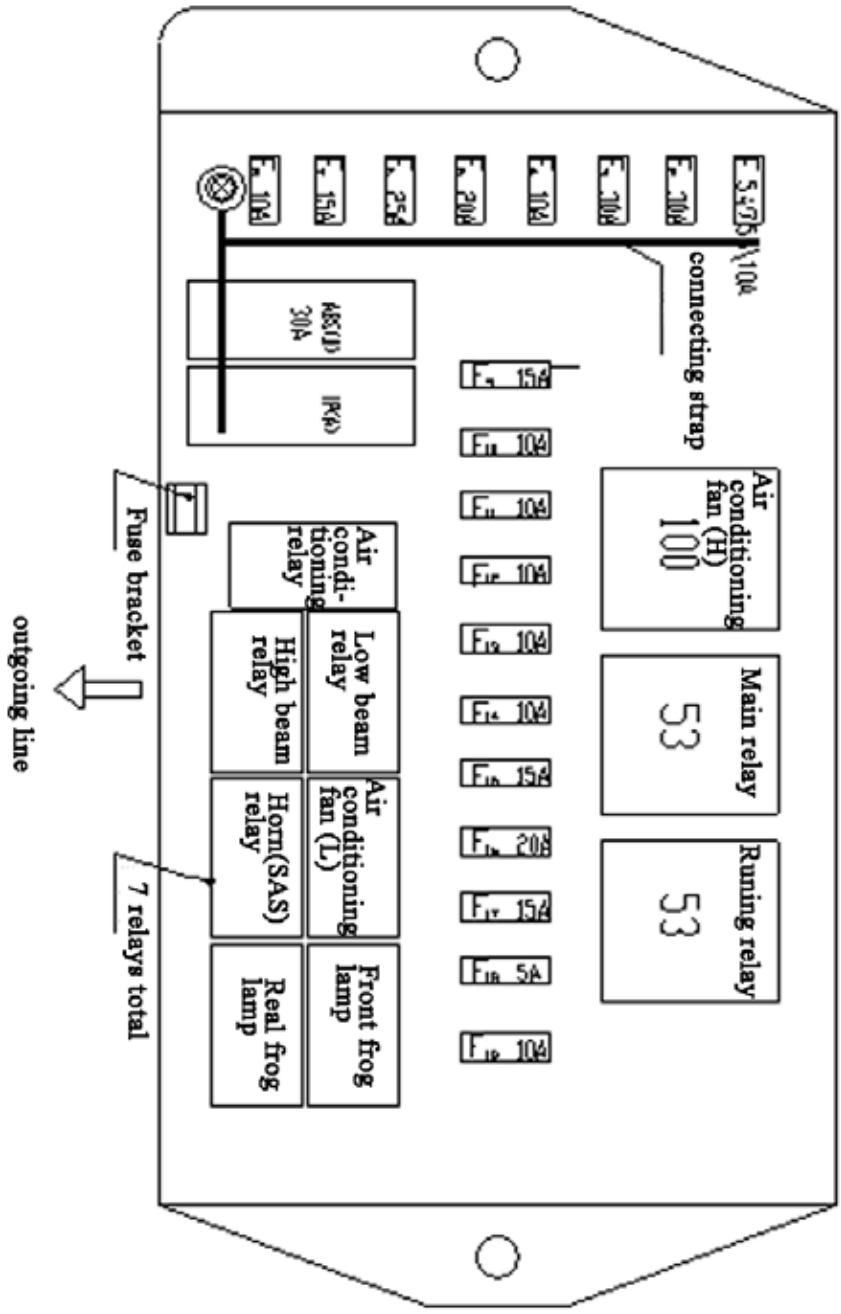
Internal fuse box below the instrument console



Description

F20 instrument, headlight switch signal (controlled by start-up switch)
F21 airbag
F22 direction indicator lamp
F23 oil pump
F24 brake light, headlight switch signal( )
F25 radio
F26 rear wiper
F27 front wiper
F28 rear wiper, front and rear washing pump
F29 power rearview mirror
F30 ceiling light, theftproof module, radio, trunk light, diagnosis ports
F31 alarm light, theftproof module
F32 central controlled door lock
F33 starter

Fuse and relay of the engine chamber



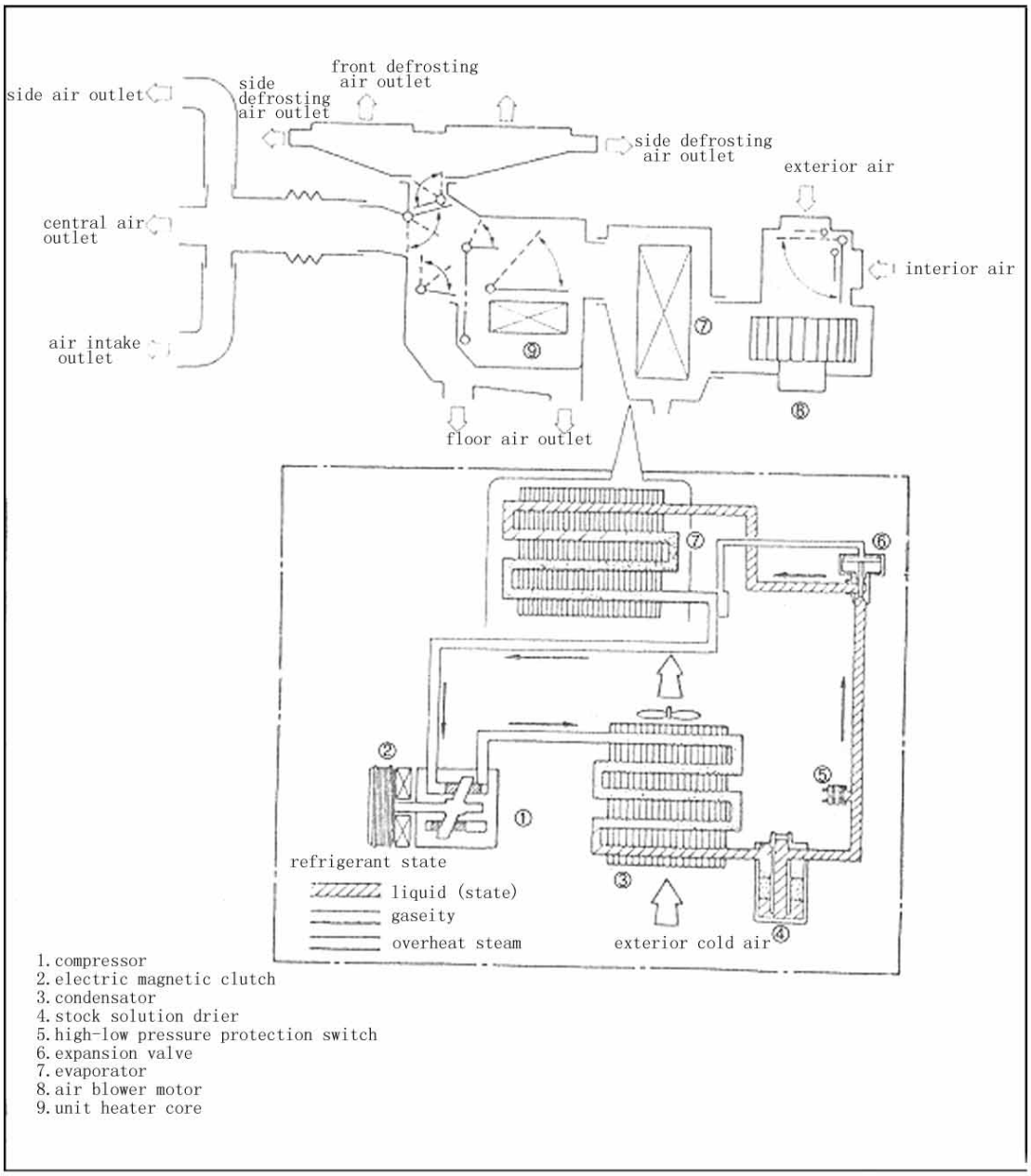
Description:

F1 ECU	F2 Fan	F3 ABS
F4 Horn	F5 Headlight	F6 Main relay
F7 Front fog light	F8 Rear fog light	F9 left small light
F10 right small light	F11 Left dim light	F12 Right dim light
F13 Left traffic beam	F14 Right traffic beam	F15 Defrosting
F16 Blower	F17 Back light, odometer sensor	
F18 ABS	F19 Ignition coil	

Chapter7 Air-conditioning

Section 1 General

I. Major parts of the air-conditioning and refrigerant flow chart.



II. Function descriptions of each part

1. Compressor

The compressor serves to compress the refrigerant that is evaporated as gaseous one in evaporator, so the compressed gaseous refrigerant is fed by force into condensator in which it is changed to liquid form, heat resulted from vaporization of liquid refrigerant can be reused. Compressor used in auto air conditioning can be classified as reciprocating, rotating blade and oblique disk style. This car adopts oblique disk style compressor that is characterized by little vibration and good durability. As the pictures show:



Assembly drawing for the compressor



Inside structure of the compressor1



Inside structure of the compressor 2



Inside structure of the compressor3

2. Electric magnetic clutch

In case of engine operating, when starting up air conditioning, the electric magnetic clutch engages, compressor runs. Otherwise, the electric magnetic clutch disengages,

compressor does not run. .

It is recommended to use high power electric magnetic clutches.



Diagram for the clutch fitted on the compressor

3. Condensator

A condensator serves to change the high temperature and high pressure refrigerant in gaseity to liquid one by taking away the heat of the refrigerant in gaseity by force. With similar structure as radiator, the condensator is installed at the most front of the car so as to upgrade heat dissipation rate and is forcedly cooled by cooling fan.



4. Receiver drier

Stock solution drier has 3 following functions:



dryer

A)A liquid reservoir is equal to a temporary buffer for liquefacient refrigerant in condensator, it used to provide evaporator with liquefacient refrigerant as per the need of cooling load.

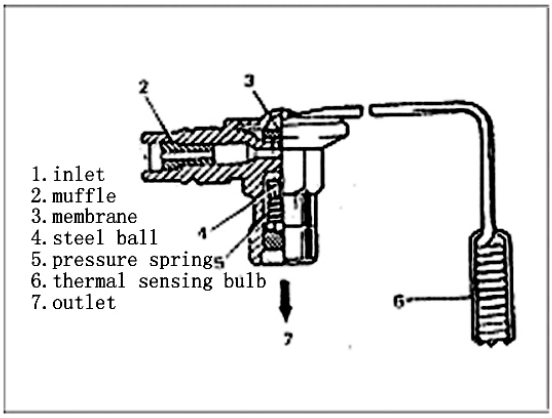
B)The drier serves to remove moisture and contamination in the refrigerant with the filter and desiccant sealed in itself.

5. High-low pressure protection switch

The high-low pressure protection switch is used for control. When there is abnormal pressure variation occurring in circular refrigerant, the switch will cut off the circuit of the electric magnetic clutch and the condensator's fan to stop the compressor.

6. Expansion valve

The expansion valve ejects the liquid refrigerant from a slim hole that pass through stock solution drier to expand it suddenly and produces low temperature and low pressure pulverization refrigerant.



7. Evaporator

The cooled pulverization refrigerant makes the temperature inside car lower through evaporator. Meanwhile the refrigerant turns to the thermal gaseous refrigerant and is supplied into the compressor. As far as function is concerned, evaporator is directly contrary to that of condensator (when refrigerant enters evaporator it is liquid. While it is in gaseity when exit.)



III. Function of each control element

1.Relay (condensator' fan/electric magnetic clutch)

The relay is used to control condensator fan motor and electric magnetic clutch respectively. As far as the air conditioning (compressor) is running, the condensator fan will work continuously.

2.Electric magnetic clutch

The electric magnetic clutch engages so as to start up the compressor only when air conditioning is turned on. The electric magnetic clutch is controlled by ECU.

3.Thermistor of the evaporator

When the evaporating temperature falls to 1℃(34 ° F) or below, the raditor fin of the evaporator will frost or freeze, which then results in air flow volume decreasing and ineffective refrigerating. Thermistor is a kind of sensor for avoiding frosting and icing. The thermistor fitted in the evaporator converts the vaporating temperature into resistance value which then is sent to amplifier of the air conditioner.

4.Cooling liquid (water) temperature sensor

When the temperature of the cooling water is too low, the ECU will stop the compressor by disconnecting the relay of the compressor clutch.

The high-low pressure protection switch is used for control. When the pressure of the circular refrigerant becomes too low or too high due to leakage or insufficient, the switch will turn off the compressor.

This high-low pressure protection switch is fitted in the high pressure pipe behind the stock solution drier.

5.Air conditioner on/off control

Refrigerant high pressure:

Over 3140kpa

(32kg/cm2,455 psi)…..off

Below 2250kpa

(26kg/cm2,370psi)…on

refrigerant lower than:

below 196kpa

(2.0 kg/cm2,28.4psi)….off

over 226kpa

(2.3kg/cm2,32.7psi)…on

Engine cooling water temperature

Over 110(230℃)…off

Below 103(230℃)…on

When starting engine makes the engine start…off

Evaporator temperature:

When the air conditioner's switch on

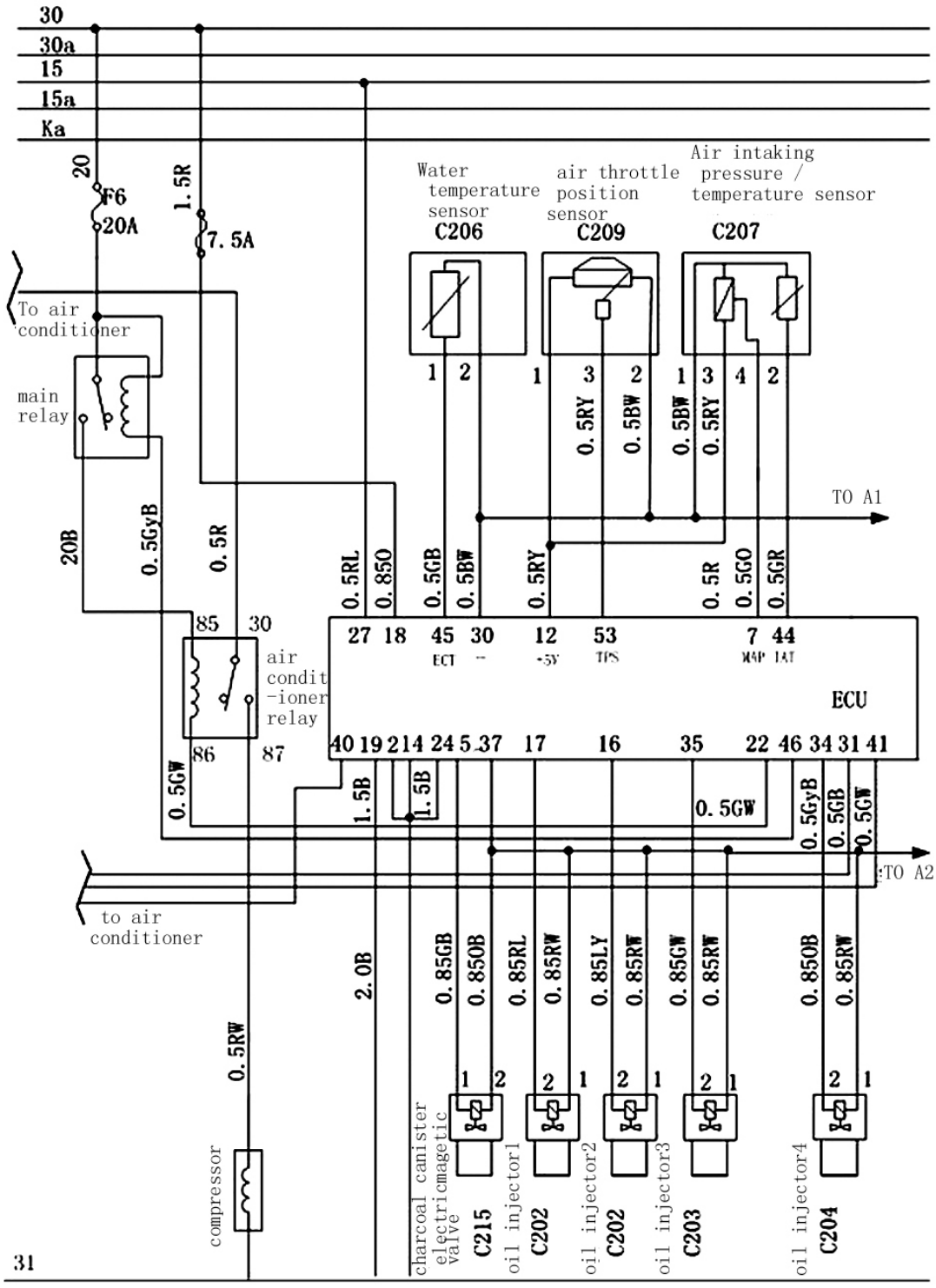
Over 2.5(36.5℉)…off

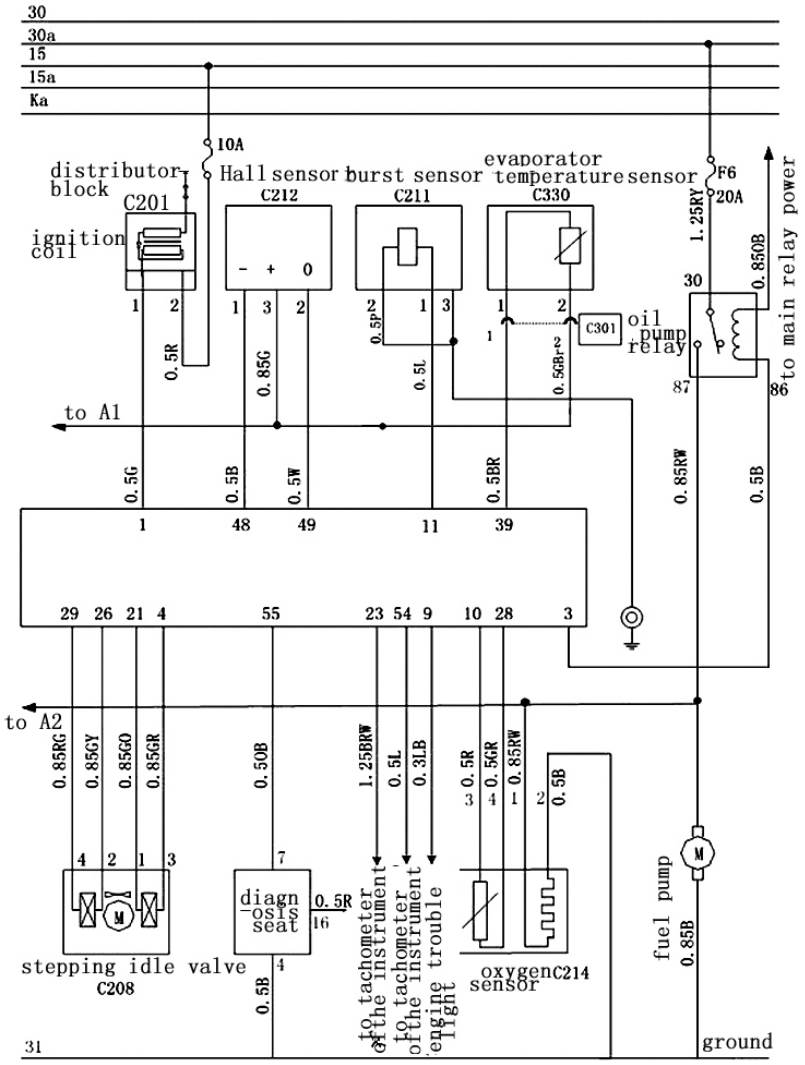
Below 4.0(39.2℉)…on

When accelerating quickly

(air throttle opening is up to 90% within 10 s)

IV. Engine computer air conditioning circuit diagram


30
30a
15
15a
Ka
20
F6
20A
1.5R
7.5A
To air conditioner
main relay
20B
0.5GyB
0.5R
85
30
86
87
air condit -ioner relay
0.5GW
to air conditioner
0.5RW
compressor
31
2.0B
Water temperature sensor
C206
air throttle position sensor
C209
Air intaking pressure / temperature sensor
C207
0.5RL
0.85O
0.5GB
0.5BW
0.5RY
0.5BW
0.5RY
0.5BW
0.5R
0.5GO
0.5GR
TO A1
27 18 45 30 12 53 7 44
ECT - -5V TPS MAP IAT
ECU
40 19 2 14 24 5 37 17 16 35 22 46 34 31 41
1.5B
1.5B
0.5GW
0.5GyB
0.5GB
0.5GW
:TO A2
0.85GB
0.85OB
0.85RL
0.85RW
0.85LY
0.85RW
0.85GW
0.85RW
0.85OB
0.85RW
charcoal canister electricmagetic valve
C215
oil injector1
C202
oil injector2
C202
oil injector3
C203
oil injector4
C204



1、principle of operation:

When startup a car, the ignition cell (+)12V will supply power to ECU, duty relay and the main relay coil respectively, the duty relay closes and ECU makes the main relay close after receiving the ignition signal.

+12V from the duty relay switch is divided into two lines. One line supplies power to defroster via F15(15A) to the back defrosting switch and grounds by connecting the back defrosting switch indicator. When the defrosting switch is on the back defroster will work normally. Connects the switch of the air blower and select different gear, the air blower will work at that gear. When close the air blower switch and the A/C switch singnal will be sent to ECU, then the air conditioner relay operates after the ECU receiving the signal and now the compressor works normally.

The ECU makes the low speed relay operating after receiving the A/C switch closed signal, then the fan begins to work. When the water temperature is higher than certain degree, ECU will make the fan‘s high speed relay operating automatically, then the high speed fan works.

The pressure switch in this circuit is fitted on the side of the high pressure loop (i.e. drying bottle mouth) of the air conditioning cooling midum loop, its function is to protect refrigeration loop when abnormal pressures occurs due to over-charged refrigerant or gas leakage. Pressure switch signals are sent to the ECU that will stop the compressor by disconnecting the air conditioner relay when the pressure switch disconnects for some reasons.

The temperature sensor in this circuit is an electric one (thermistor), the resistance value of which changes as temperature changes. So the thermistor connects or disconnects the electric magnetic clutch, drive or stop the compressor by sensing air temperature blew by air conditioner. Therefore it can control the interior temperature and avoid frosting to make a constant temperature.

The ECU controls the compressor’s electric magnetic clutch and condensator fan motor on basis of detecting the running condition for engine and signals from sensors. ECU will connect air conditioner and condensator fan only when the following conditions are met:

Engine rotate speed: 600-6000r/min

Engine cooling temperature:below 110℃

Evaporator temperature:over 4℃

Refrigerant pressure switch:on

AC switch and the air blower switch:on

Section 2 Safety Cautions for Air conditioning System

1. Do not deal with the refrigerant in closed place or colse to fire.
2. Be sure to take safety goggles.
3. Take good care of the refrigerant. Avoid the liquid refrigerant to splash into your

eyes and skin. If it occurs, wash with cooled water.

Warning: (a) Do not wipe your eyes or skin.

(b) Clean the oil on your skin properly

(c) Go to hospital for professional treatment at once

4. Do not heat container or put it close to fire.

5. Put the reservoir carefully and avoid it to be impacted with sharp object.

6. Refrigerating system used outdoor must have enough refrigerant, otherwise the compressor will burn due to thus insufficient lubricant oil. So you should take care of such case.

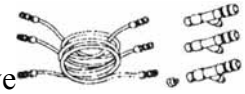
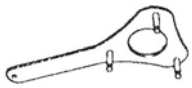
7. Do not turn on the pressure combined vaccum valve when compressor is running.
If the high-pressure valve is turned on the refrigerant will flow at inverse direction and result in breakdown of the chargeing cyliner body, therefore only the low pressure valve can be switched.

8. Do not make system with refrigerant overloaded.
If the refrigerating unit is overloaded, then a series of problems will take place. For example, insufficient refrigeration, reduction of fuel effitioncy, overheating of engine and etc.

9. Spare control system
This model of car is equiped with spare control system, such as air bag in drive cab and fore carriage.

In maintenance, in case of operatation not in order, the spare system will unfold, thus resulting in series of accidents. So maintenance workers should read carefully precautions of the air bag before operating (including movement, installation, check and removal for air bag).

Section 3 Items of Tools and Devices

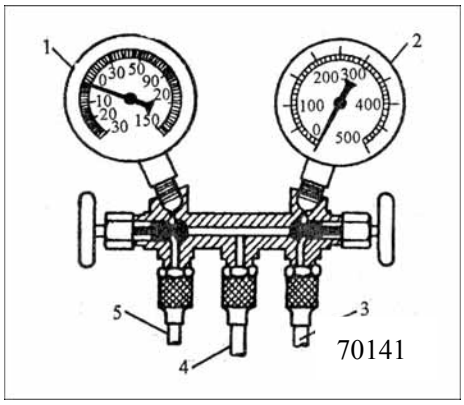
Maintenance kit for air conditioner 	
Spare valve for discharging refrigerant 	
Refrigerant charge meter 	
Refrigerant charge hose 	green
Refrigerant charge hose 	blue
Refrigerant charge hose 	orange
Disconnecting valve 	
Set of charge hoses with diconnecting valve 	if diconnecting valves are needed, please order (in set)
Disassembly tool for magnetic clutch 	
Retainer for magnetic clutch 	
Spring clasp clamp 	
Spring clasp clamp 	
Lip sealing protection 	

Section 4 Operating Method for the Manifold Pressure Meter

As shown in the fingure, the manifold pressure meter is the most common meter used for air conditioning unit maintenance. The low-pressure meter can show both pressure

and vacuum. The vacuum range is 0-5X10^{5}pa(0-760mmHg), the pressure scale starts from 0 and range is over 4.2X10^{5}pa(approximate 4.2kgf/cm^2). The high-pressure meter scale starts from 0 and range is over 21.1X10^{5}pa(approximate 21.1kgf/cm^2). These two meters are fitted on the same seat, each end of which has a manual valve and under which there are three path joint.

Joint of low-pressure meter, that connnects to low pressure pipe connector through a hose.



Manifold pressure meter

1- Lowe-pressure meter(blue) 2-high-pressure meter(red) 3- hose at high pressure side (red) 4- hose for maintainance (yellow) 5- hose at low pressure side (blue)

Joint for high-pressure meter connects to the high pressure pipe with a hose. The middle joint connects to the vaccum pump or refrigerant tank with a hose. Two manual valves combined with three hoses make the manifold pressure meter have four functions(as shown in below diagram)

Functions of the manifold pressure meter

positions of the high and low pressure valves	functions
high and low pressure valves off	Fault diagonosis for the refrigeration system
Low pressure valve on, high pressure valve off	Filling refrigerant or refrigerant oil in refrigeration system
Low pressure valve off, high pressure valve on	Check leakage of the refrigeration system and charge liquid quickly
high and low pressure valves on	Evacuate the refrigeration system

Note: high and low pressure valves are on, which means that the two meters are connect ed to refrigeration system and middle pipe respecdtively; high and low pressure valves are off, which means that the two meters are disconnected to the middle pipe but connected to refrigeration system.

Secion 5 Operating Method of the Recovery Device for Refrigerant

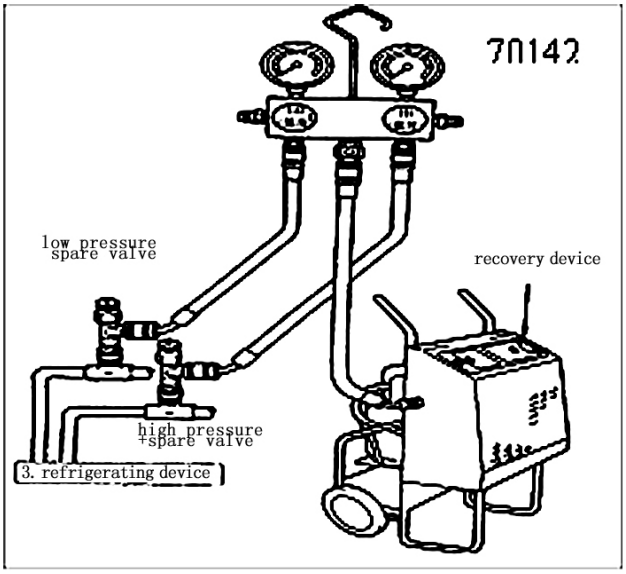
I. Recovery refrigerant from the refrigerating device

When refrigerant is discharged from the refrigerating device at following cases, a recovery device should be used to recovery refrigerant:

Before changing parts on refrigerant pipe.

When water vapor or air enter refrigerant pipe.

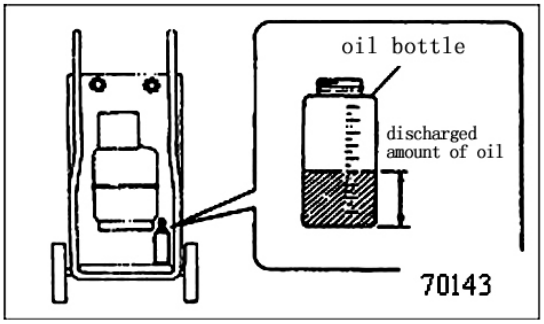
When refrigerant is overcharged.



Note:

（1） when using recovery device, you must follow the requirement in the specification.

（2） after recovery is finished, the discharged oil from compressor must be measured in order to charge the same amount of oil to refrigerating device later.



II. Operating method for recovery device

1. The manifold pressure meter set is installed on the spare valve.
2. Refrigerant is recovered from the refrigerating device.

(1) The middle hose is connected to recovery device.

(2) To operate recovery device.

(3) To open the manual high pressure and low pressure valves on the manifole pressure meter set.

3. Stop recovery device after recovery is finished.

4. The manifold pressure meter set is disassembled from the spare valve.

Section 6 Installation of Air-conditioning System

I. Preparation before installation

The following items should be checked and adjusted before installation:

（1） engine ignition timing

（2） engine cooling system

（3） accumulator electrolyte and charging system

（4） carriage seal

（5） fuel system

（6） general conditions of vehicle

II. Preparation for parts of air conditioner

Parts should be put according to the installation order after the package box for parts is open. At the same time, you must make sure that no part is missed or bad. When installing air conditioner, you must protect the fenders and seats with supplementary mats.

Cautions during installation：

（1）the negative lead of the accumulator should be removed.

（2）the air conditioner parts are fixed on engine with the supplied bolts according to required torque.

（3）when pipes and wire bundle for air conditioner are installed，pipe and wire arrangement should be right in order to avoid to be interferred with surrounding parts.

（4）when pipes and hoses are connected, 2-3 drops of refrigerant should be dropped on the pipe socket nut.

（5）two wrenches should be used when pipe joints are fixed or unscrewed to make the pipe line be supported during fixing or unscrewing.

（6）the pipe socket nut should be fixed according to the required torque.

（7）plugs at connected places should not be removed before all parts are not installed properly.

Note: The compressor is charged with a small amount of refrigerant before delivering to avoid the seal corruption. So it is necessory to remove the plug of the compressor carefully to let the refrigerant flow slowly.

（8）when using HFC-134a（R-134a）refrigerant, you must take the safety goggles and work carefully to avoid it to splash to your skin.

（9）HFC-134a（R-134a）can be put in hot water and keep it about 40℃(100℉).

（10）The air conditioning system should be installed according to the specification delivered with the spares.

Section 7 Recovery, Evacuation and Charge

I. Recovery of refrigerant

Refrigerant recovery unit must be used when the refrigerant for air conditioning is discharged. Directly discharging refrigerant into atmosphere will bring harmful effects on environment.

Note: when using recovery unit, you must follow the operating instruction of the device.

II. Evacuation

（1）air conditioning system must be evacuated with the vacuum pump whenever its joints are disconnected (exposed to air). The air conditioning system should be connected to manifold pressure meter and it will take about 15 mins to evacuate air.

Note: Do not evacuate air conditioning before refrigerant is recovered.

（2）connect the high/low pressure charge hoses for manifold pressure meter respectively as described in the following.

High pressure charge hose—discharging hose of the compressor

Low pressure charge hose—intaking hose of the compressor

（3）center charge hose of the manifole pressure meter is connected to vacuum pump.

（4）start the vacuum pump, then switch on the manual valve at the intaking side of manifold pressure meter（Lo）.

If the system is not blocked, there is indication on high-pressure meter.

When the indicator lights, switch on the manual valve at the other side（Hi）.

（5）if there is no leakage for about 10 mins, the low-pressure meter will indicate the vacuum pressure is lower than 760mmHg.

Note:

If vacuum is higher than 760mmHg, the manual valves should be turned off, the vacuum pump is stopped and the pointer swaying of low-pressure meter should be

observed.

If reading becomes greater, it indicates there is leakage. So the system must be repaired before evacuation operation continues.

If the reading keeps unchanged, it indicates there is no leakage. You can continue evacuation.

（6）the total evacuation time should be over 15 mins.

（7）continue evacuation untill the reading of low-pressure meter is lower than 760mmHg, then turn off the manual valves at both sides.

（8）stop vacuum pump, remove the center charge hose from the vacuum pump inlet, then refrigerant can be charged into the system.

III. Refrigerant charge

The air conditioning system is charged with HFC-134a（R-134a）

The part describes how to charge refrigerant into air conditioning system from the refrigerant tank.

When charging refrigerant which is recovered by the recovery and regenerative unit, you should follow the methods described in the instruction of device manufactory.

Warning:

Avoid liquid refrigerant to splash into eyes.

Occasionally some liquid refrigerant will exit, which means it’s temperature is lower than the freezing point. If liquid HFC-134a（R-134a）splashes into eyes, dangerous hurt will be caused. So you must take satety goggles to avoid these kinds of accidents. if the HFC-134a（R-134a）splashes into eyes, you should go to hospital for treatment at once.

Do not wipe your injured eyes by hand, but should wash the splashed part with large amount of cleaned cold water to increase temperature of the part up to freezing point. Accept treatment from doctors or ophthalmology professors as soon as possible.

If HFC-134a（R-134a）splashes on skins, treatment for frostbite should be adopted.

It is not allowed to deal with refrigerant at places where welding is being taken or there has vapor.

The refrigerant should be stored at cool and dark places. Do not put it at places of high temperature, such as the place directly under sunshine or close to fire or in the car (including trunk).

Avoid to breath in smoke from the burning HFC-134a (R-134a) which is harmful for health. The refrigerant must be charged at low pressure side, but absolutely not allowed at high pressure side.

Charge is not allowed when the compressor is heated. Follow related specification in operation instruction from manufactory when you fit the chargeg valve to the refrigerant tank and make a small hole in it.

Pressure meters must be used before and during charge.

The refrigerant tank should be emptied before it is abandoned.

It is not allowed to heat the refrigerant to over 40℃ and put the refrigrerant tank upside down during charge, otherwise the refrigerant will enter the compressor and result in troubles, such as compressing liquid refrigerant, etc..

IV. Refrigerant Charging Procedure

（1）make sure that the hoses are fitted properly after the system is evacuated (see the left diagram).

（2）connect the manifold pressure meter, then turn on the charge valve of refrigerant tank, wash the charge pipe and turn on the manual valve at low pressure side.

Warning: make sure that the manual valve at high-pressure side is turned off fixedly.

（3）start engine and keep the rotate speed 1000r/min, then turn on air conditioner.

（4）charge the gas refrigerant into air conditioning system. At this time the refrigerant tank should be kept straight.

（5）after refrigerant tank is emptied, change a new one as described in the following steps:

a. Switch the manual valve off at the low pressure side.

b. Replace the empty refrigerant tank with the newly charged one. When charge valve

of the refrigerant tank is used, replacement should be done according to method as described in the following.

① unscrew the plate nut，return the hole forming pin back and remove the charge valve of the refrigerant tank.

② install the removed charge valve on the new refrigerant tank.

③ as long as the refrigerant leaks from the gap between the refrigerant tank and the charge valve with sizzling noise, you should promptly fix the plate nut and the manual valve at low-pressure side of the manifold pressure meter.

④ turn the handle of the charge valve clockwise, screw the hole forming pin into the new refrigerant tank and perforate a pinhole to make the refrigerant flow.

⑤you should turn off the manual valve at the low side of the manifold pressure meter after the system is charged with the specified amount of refrigerant(650g or when the high/low pressure meters indicate the following specified values respectively.

When the specified amount of refrigerant is charged, the low-pressure meter indicates:

Approximately 245kPa（2.5kg/cm^2，35.5psi）

When the specified amount of refrigerant is charged, the high-pressure meter indicates:

Approximately 1470kPa（15kg/cm^2，213psi）

V. Remove **manifold pressure meter**

When the air conditioning system has been charged with the specified amount of the refrigerant, you could remove the manifold pressure meter as per the following steps.

（1）turn off the manual valve at the low side of the manifold pressure meter (the manual valve at the high side should not be turned off during refrigrant charge)

（2）turn off the charge valve of the refrigerant tank.

（3）stop the engine.

（4）wrap the charge hoses with cloth and remove it from the service pipe, which should be performed quickly.

Warning: the high side is naturally under high pressure, so you should take care of

your eyes and skin.

（5）fit the maintenance valve cover.

Section 8 Trouble-shooting

I. Trouble-shooting Chart

Fault	Possible reasons	Action
No cold or heat air	Electric magnetic clutch operating fault	
	a.fuse blowout or relay fault	Replace the fuse and check if short circuit occurs
	b.electric magnetic clutch fault	Check the clutch
	c.air conditioning system switch fault	Check the switch
	d.thermistor fault	Check thermistor
	e.high-low pressure protection switch fault	Check the switch
	f.wiring or grounding fault	Repair if necessary
	g.no refrigerant	Check the air conditioning pipe line
	h.ECU fault	Replace ECU
	Compressor runs abnormally	
	a.drive belt slacks or has cracking	Fasten or replace the belt
	b.compressor fault	Check the compressor
	Air blower fault	Check the air blower
	Expansion valve fault	Check expansion valve
	System leakage	Check leakage in system
	Fusible plug of the stock solution drier melts or is blocked	Check the stock solution drier
Discontinuous cold air	Electric magnetic clutch slides	Check the electric magnetic clutch
	ECU fault	Replace ECU
	Expansion valve fault	

	Improperly wiring in the circuit Over damp system	Check the expansion valve Repair if necessary evacuate and charge the system
cold air exists only at high speed	Condensator is blocked Drive belt trackslip Compressor fault Insufficient or over-charged refrigerant Air exists in the system	Check the condensator Check or replace the drive belt Check the compressor Check the refrigerant charge Evacuate and charge the system with refrigerant

Insufficient refrigeration	Condensator is blocked Drive belt trackslip Electric magnetic clutch fault Compressor fault Expansion valve fault Thermistor fault Insufficient or over-charged refrigerant Air exists in the system or excessive oil in the compressor Stock solution drier is blocked	Check the condensator Check or replace the drive belt Check the electric magnetic clutch Check the compressor Check the expansion valve Check the thermistor Check refrigerant charge Evacuate and charge the system Check the stock solution drier
Insufficient flow speed of cold air	Evaporator is blocked or frosts Air leakage in the cooling device or air ducts Air inlet is blocked Air blower motor fault	Check the evaporator Repair if necessory Repair if necessory Replace the air blower motor

II Trouble-shooting Chart（electron temperature control system）

Phenomenon	Possible position of the fault	Diagnosis and measurement	Result	Reason
The compressor does not work when the air conditioner switch is turned on	power source is out of condition	F6 （20A） fuse voltage 12V	F6 is out of condition	Without air conditioner relay power source
	air conditioner relay is out of conditon	No. 30, 87 pin voltates for relay operation are 12V	Relay is out of condition	Contacts is out of condition
	Air blower switch	Air blower switch disconnects the no.2 pin ground strap connection	Air blower switch is out of condition or no.1 pin does not ground	Without ground strap connection signal output
	A/C switch	A/C switch on no.1 pin	A/C switch or compression is out of condition	Without ground strap connection signal output
	pressure switch is out of condition	Remove the joint, direct cross connection	Switch is out of condition or insufficient pressure	Pressure switch can not be turned on
	temperature sensor for evaporator is out of condition	Resistance value is over 2KΩ	Sensor is out of condition or improper installation	Detection temperature is too low
	water temperature for engine is too low	Check the engine values	water temperature sensor is out of condition	water temperature is too low , compressor does not work
	The engine is accelerating	Gasoline throttle position sensor	normal	normal operation conditions
	ECU is out of condition	Measure the ECU no.41, 22 pins	ECU or wiring	ECU cannot deal with the A/C swich signals

Air blower does not	duty relay is out of condition	No.85, 86, 30, 87 pins of the relay	Wiring is out of condition	Without +12V supplied to air blower

work	resistance of air blower is out of condition	Measuring resistance is over 0Ω	Resistance is short circuit	Without speed governing signal
	Switch of air blower is out of condition	Measuring switch conduction	Switch is out of condition	Without control signal
	air blower is out of condition	Remove plug , power supply 12V	Air blower breaks down	replace
Fan does not work (high speed)	F2 fuse	+12V	Break down	replace
	High speed fan relay	measure the relay and the wiring	replace	Without +12V supplied to heat emission fan
	fan wiring is out of condition	pin measurement	repair	connection of the pins or wiring is out of condition
	air blower is out of condition	Remove the plug and test with power	replace	Air blower burns out
	water temperature sensor is out of condition	Check water temperature for engine	replace	Low water temperature for engine
	Pressure switch	Remove the plug, cross connection	insufficient pressure of the pressure switch or pressure	Without switch signals
	ECU	ECU no.31pin ground strap connection	ECU is out of condition	replace
insufficient refrigeration (clutch unmovable)	Refer to the diagonosis tables metioned above (reasons out of the electron temperature control system)			

Section 9 Maintenance On-board

Note: you should comply with the following rules when maintaining air conditioning system.

1. Wiring

（1）remove the accumulator's negative wire to avoid short circuit.

（2）the lead connector should be plugged fixedly.

（3） the gum cover should be fitted in panel holes before wiring arrangement to protect the wiring bundle.

（4）connect the wiring bundle of air conditioner to main wiring bundle with pdythene belt or original binding terminal block.

（5）if original wiring bundle is removed or stripped when maintaining, you should put it back to the place where it was.

（6）original binding terminal block and wiring bundle of the air conditioner should not be pressed during installation.

（7）when the leads are welded to the wiring bundle, the two leads should have the same diameters and the connection should be wrapped with insulated belt.

（8）the wiring bundle should keep away from the moving elements or high temperature places.

（9）it is not allowed that the connection parts is close to the fuel pipe.

（10）check the wiring bundle if it contacts with sharp edges and corners.

2. Refrigerating return pipe

（1）heating elbow bend pipe is absolutely impermissible。

The degree of bending should be as small as possible.

（2）parts in air conditioner should be kept dry and free of dirt.

When removing any pipe of the system, you should fit a cap on the joint of this pipe as soon as possible.

（3）when the hose and the metal pipe are interconnected, drops of refrigerating oil

should be dropped on the seat surface of the connecting nut and the O-shape of seal ring.

（4）when the joint is screwed or unscrewed, two wrenches should be used, one is for tightening, the other for supporting.

（5）inlet connecting pipe of the stock solution drier should be connected with the outlet connecting pipe of the condensator.

（6）tighten the pipe socket nut according to the following required tightening torque.

Tigntening torque for connecting nut：8 ㎜ pipe：12-15N·m

（1.2-1.5kg-m.8.6-11.01b-ft）1/2 inch pipe：20-25N·m

（2.0-2.5kg-m.14.5-18.0Ib-ft）5/8 inch pipe：30-35N·m

（3.0-3.5kg-m.22.0-25.3Ib-ft）

（7）water drain hoses should be arranged in the way that the drained water should not drop on the parts of the car.

3. Recovery of the refrigerant

Refrigerant recovery and regenerative unit must be used when refrigerant is discharged from air conditioning system. Directly discharging refrigerant HFC-134a（R-134a）into atmosphere will bring serious effects on environment.

Note: when using recovery and regenerative unit, you must follow the operating instruction of the device.

4. Management of refrigerant

（1）when dealing with refrigerant, you must take the safety goggles to protect your eyes.

（2）avoid to touch liquid refrigerant directly.

（3）the refrigerant tank should not be heated over to 40℃.

（4）it is not allowed to discharge the refrigerant to the atmosphere.

（5）it is not allowed to splash the refrigerant to the polishing metal surface because the corrosive combination of refrigerant and water can make the polishing metal surface dislustered (including chromium-coated part).

（6）after refrigerant of the system is recovered, lost oil in compressor must be

determined and make-up the same amout of oil.

Warning: if refrigerant HFC-134a（R-134a）splashes into eyes, you should go to hospital for treatment quickly.

It is not permissible to wipe your hurted eyes, but to wash them with a large amount of clean cold water to make the temperature of your hurted parts rise to the freezing point.

Must go to see doctors or ophthalmology professors for treatment. If HFC-134a（R-134a）liquid splashes on skin, the hurt should be treated in the same way as the frostbite treatment.

Section 10 Check Refrigerant System with Manifold Measurement Unit

I. This method serves to confirm the fault position with manifold measurement unit

Read the manifold pressure meter when the system reaches the following status:

（1）set the switch on the circular position， the supplying air temperature is 30-35 ℃

（2）the engine runs in 1500r/min.

（3）set the rotate speed control switch of supply fan at high speed.

（4）set the temperature control switch at the position where the cold air is most sufficient.

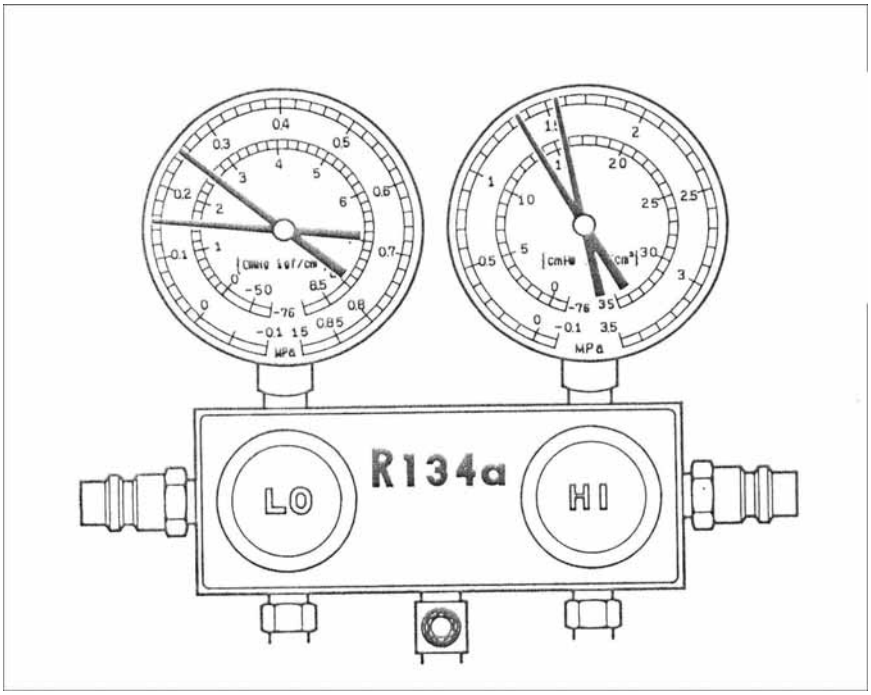
Note：It should be indicated that the readings of the meter will change slightly depending on the environment termperature.

1. Refrigeration system works normally

Reading on meter：

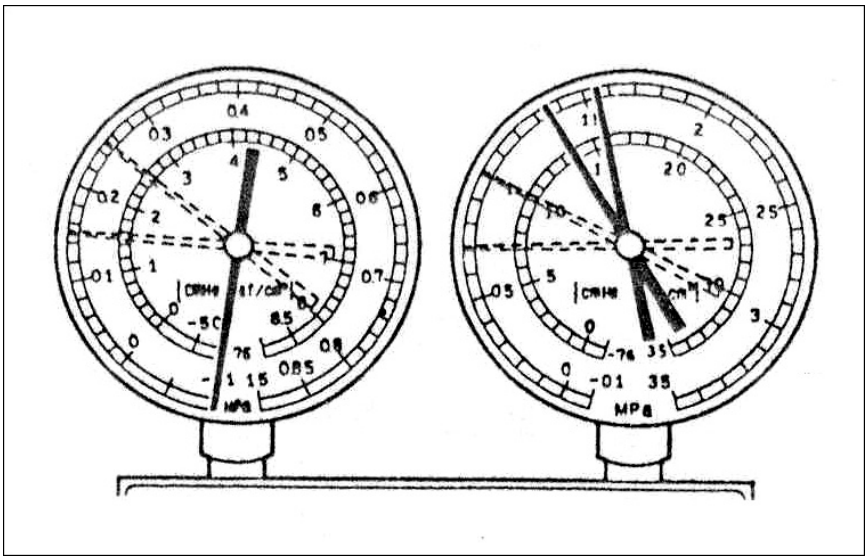
Low pressure side：0.15-0.25 MPa（1.5-2.5kg/cm^2）

High pressure side：1.37-1.57 MPa（14-16kg/cm^2）



2. Water vapor exists in the refrigeration system.

Symptom：discontinuous cold air to no cold air.

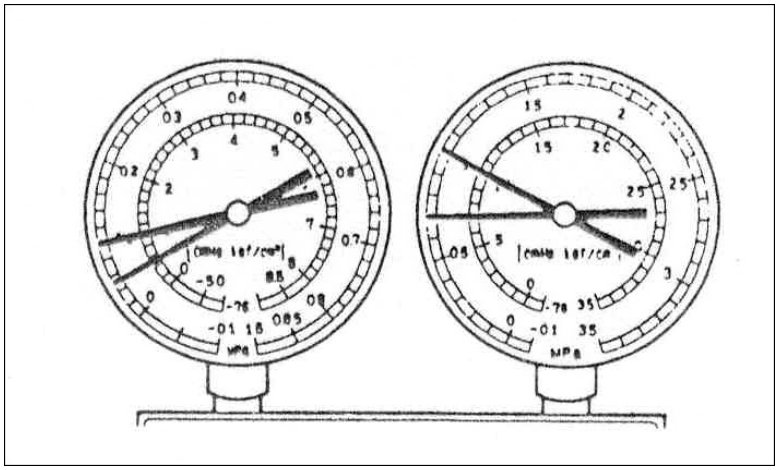


Fault symptom of refrigeration system	**Possible reasons**	**Fault diagonosis**	**Troubleshooting action**
When running, pressure	The vapor entering	Drier is in	（1）replace the stock

at low pressure side sometimes is normal, but sometimes vacuum.	the refrigeration system ices in the spraying hole of the expansion valve to make the circulation stop temperarily, but after the ice melts, it can work normally.	oversaturation ↓ Water vapor ices at the spraying hole of the expansion valve to block circulation of refrigerant.	solution drier (2) evacuate air repeatly to eliminate the vapor in the circulation. (3) charge appropriate amount of new refrigerant.

3. Insufficient refrigerant

Symptom：insufficient cold air

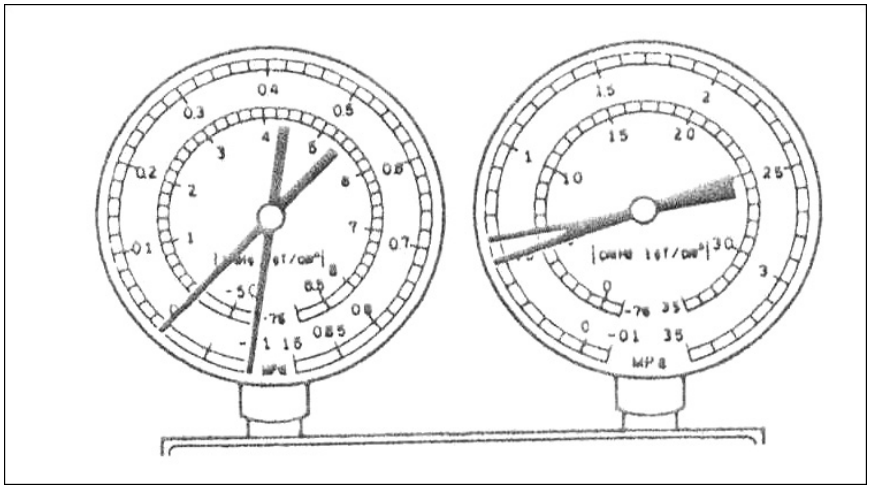


Fault symptom of refrigeration system	Possible reasons	Fault diagonosis	Trouble-shooting action
Low pressure at both low pressure side and high side bad cooling Performance	air leakage at somewhere in refrigeration system	Insufficient refrigerant in system ↓ Refrigerant leakage	（1）using air leakage detector to check where there is leakage. If necessary, repair it. （2）charge appropriate amount of refrigerant. （3）if the reading is about 0 after connecting the meter, the leakage positions should be

			found and repaired, then air in systemis evacuated.

4. Refrigerant circulation is out of condition

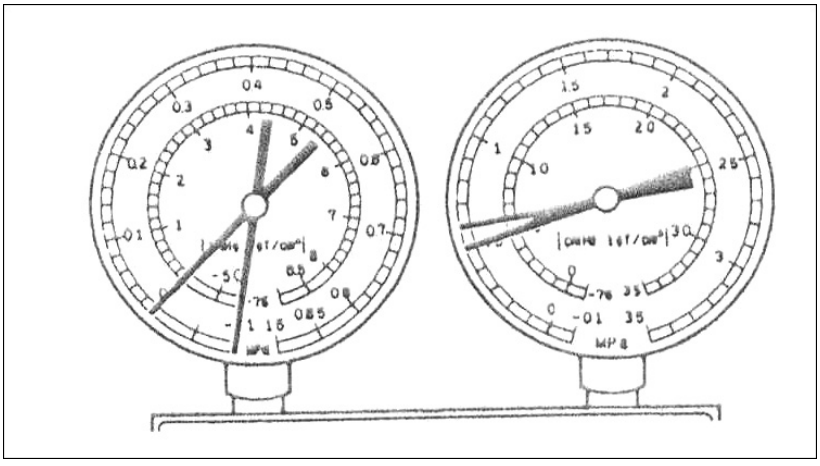
Symptom：insufficient cold air



Fault symptom of refrigeration system	**Possible reasons**	**Fault diagonosis**	**Troubleshooting action**
Low pressure at both low pressure side and high side There is frost between the reservoir and the assemby pipe.	Refrigerant can not flow due to the reservoir is blocked by dirt.	Reservoir is blocked.	replace the reservoir.

5. Refrigerant doesn't circulate

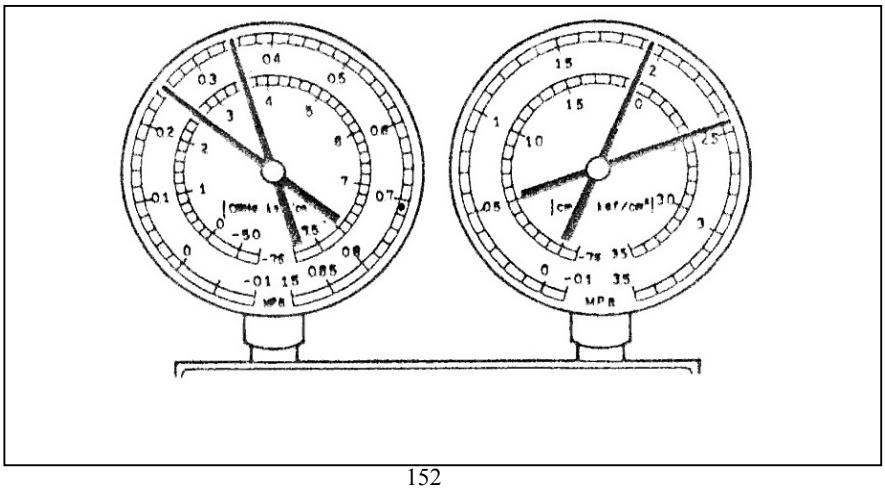
Symptom：without cold air (sometimes there has cold air)



Fault symptom of refrigeration system	**Possible reasons**	**Fault diagonosis**	**Troubleshooting action**
Low pressure side indicates vacuum and high pressure side indicates too low pressure. Frost or dew appears on the pipes before and behind the reservoir, drier and expansion valve.	Refrigerant can not flow because the water vapor or dirt block the refrigeration system Refrigerant can not flow because the thermal sensitive pipe of the expansion valve leaks air or is blocked.	Refrigerant doesn't circulate	（1）check the thermal sensitive pipe, expansion valve and pressure regulator of the evaporator. （2）blow out the dirt in the expansion valve with air （3）if the dirt can not be removed, expansion valve should be replaced. （4）evacuate air from system and charge appropriate amount of new refrigerant. If thermal sensitive pipe leaks air, the expansion valve should be replaced.

6. Excessive charge of refrigerant or insufficient refrigerating of condensator

symptom：insufficient cold air

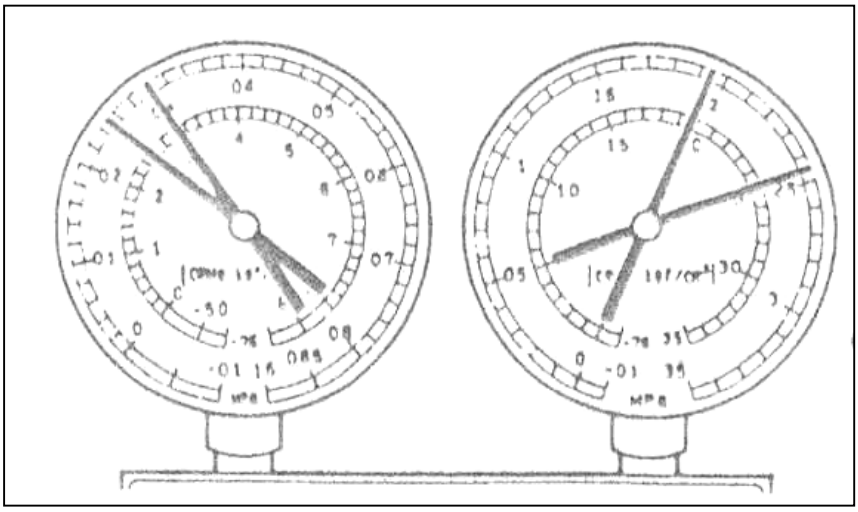


Fault symptom of refrigeration system	**Possible reasons**	**Fault diagonosis**	**Troubleshooting action**
High pressure at both the low and high pressure sides even if the engine runs at a very low rotation speed.	Good performance cannot be played due to excessive refrigerant in the system Insufficient refrigerating of condensator	Excessive refrigerant in circulation Excessive charge of refrigerant Insufficient refrigerating of condensator Radiator rib of condensator is blocked or the motor of fan has fault.	（1）clean the condensator （2）check the working conditions of fan's motor (3) if (1) and (2) is normal，check the amount of refrigerant and charge appropriate amount of refrigerant.

7. Air exists in refrigeration system

Symptom：inadequate temperature reduction

Note：



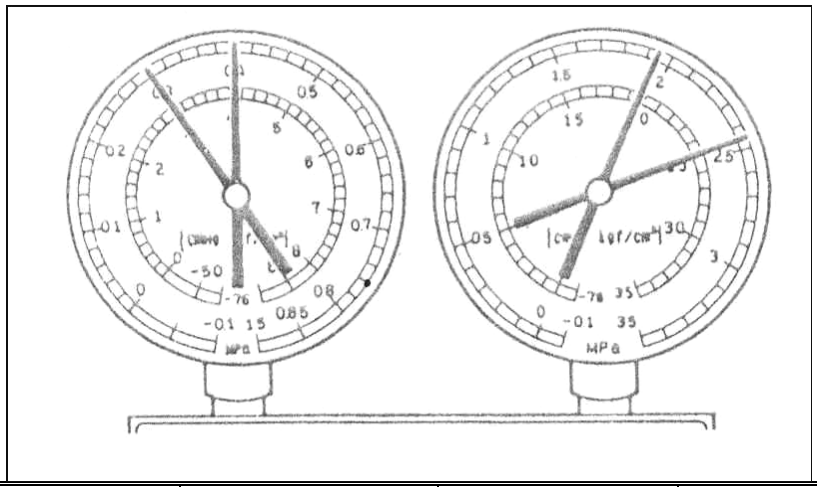
when refrigeration system is open to charge refrigerant without evacuating, the meter will show reading.

Fault symptom of refrigeration system	**Possible reasons**	**Fault diagonosis**	**Troubleshooting action**

High pressure at both the low and high pressure sides Low pressure pipe is too hot to be touched	Air enters refrigeration system	Air exists in the refrigeration system ↓ Inadequate vacuum	（1）check if the compressor oil is polluted or insufficient. （2）evacuate air in the system and charge new refrigerant.

8. Improper installation of expansion valve /breakdown of the thermal sensitive pipe（open too much）。

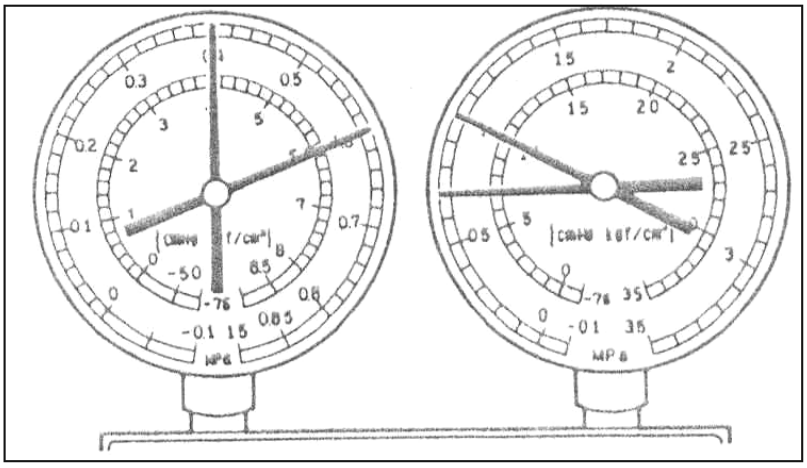
Symptom：inadequate cold air



Fault symptom of refrigeration system	Possible reasons	Fault diagonosis	Troubleshooting action
High pressure at both the low and high pressure side Frost or a large amout of dew at the low pressure pipe side.	Expansion valve has fault or improper installation of the thermal sensitive pipe	Excessive refrigerant in the low pressure pipe ↓ Expansion valve opens too much	（1）check the installation status of thermal sensitive pipe （2）if (1)is normal，check the expansion valve. If it is broken, replace it.

9. Compression of the compressor is out of condition

Symptom：without cold air



Fault symptom of refrigeration system	**Possible reasons**	**Fault diagonosis**	**Troubleshooting action**
Too high pressure at the low pressure side Too low pressure at the high pressure side	Leakage exists in the compressor	Ompression is out of condition ↓ Air valve leaks air or gets out order, part slides	Repair or replace compressor.

Section 11 Check and Maintenance for Refrigeration System

1. Condensator

Check

（1）whether the radiator rib of the condensator is blocked.

（2）whether leakage exists at joints of condensator.

（3）whether the radiator rib of the condensator is damaged. If the radiator rib is blocked you should wash it with water and dry it with compressed air.

Note：

Be careful not to damage the radiator rib of the condensator. If it becomes curved, a screwdriver or joint pliers should be used.

If leakage is found in joints or refrigerating pipes the condensator should be repaired or replaced.

2. Receiver drier

Check：

Check whether the gas refrigerant leaks with leakage detector.

Remove

（1）When refrigerant is recovered with the recovery and regenerative unit, you should follow the instruction of the device. You must measure the lost oil in compressor and make-up the same amount of oil.

（2）remove the liquid refrigerant pipe.

（3）remove the stock solution drier from the bracket

Installation

（1）when regrigerant is recovered with recovery and regenerative unit , you must follow the operating instruction of the device. The lost oil in compressor must be measured and make-up the same amount of oil.

（2）remove the liquid refrigerant pipe.

（3）remove the stock solution drier from the bracket.

Installation

（1）install the stock solution drier in the order contrary to removing .

Note：

Supply refrigerant oil of 10cc into the inlet of the compressor when replacing the stock solution drier.

It is not allowed to remove the cap before installing the stock solution drier.

（2）evacuate and charge the system in accordance with the above methods.

3. Evaporator（thermantidote）。

Remove

（1）remove the negative wire of the accumulator.

（2）prohibit the air bag system function.

（3）when regrigerant is recovered with recovery and regenerative unit , you must follow the operating instruction of the device. The lost oil in compressor must be measured and make-up the same amount of oil.

（4）remove the air blower motor and connector of the resistance lead.

（5）remove fresh air zipper from the air blower motor.

（6）remove the air blower motor after removing the tool kit

（7）remove the lead connector of the thermistor.

（8）remove the intaking tube of the compressor, the outlet pipe the stock solution drier and the discharging hose from the evaporator（thermantidote）.

Note：

As long as the hoses and metal pipes mentioned above are removd, the joints must be pluggedd with caps.

（9）remove the evaporator and the its enclosure.

Disassemble

（1）remove the fixing catch and separate the upper box from the lower one of the evaporator.

（2）remove the upper box and take the evaporator out.

（3）remove the following parts from the evaporator.

△expansion valve

△thermistor

Check

（1）whether the radiator rib of the evaporator is blocked. If obstruction occurs, radiator rib should be cleaned with compressed air.

Note：

It is not allowed to wash the evaporator with water.

（2）check whether cracks or scratches exists at joints of the inlet and outlet. If necessary, please repair it.

4. Expansion valve

Check before removal

（1）connect the manifold pressure meter to the service valve.

（2）make the engine run in a speed of 1000r/min and turn on the air conditioner.

（3）check whether the low pressure meter shows 0.5g（5.0kg/cm^2）.

If reading is too low（lower than 0.5kg/cm^2），the expansion valve and/or stock solution drier should be checked. If necessary, please replace it.

If reading is too high（higher than 0.5kg/cm^2），the thermal sensitive bulb bracket should be fastened or the expansion valve should be replaced.

Removal

See “remove and disassemble” in the previous section of evaporator (thermantidote) for details.

Installation

（1）install the expansion valve in the contrary order of removing it.

（2）restore the function of the air bag.

（3）evacuate and charge the system in accordance with the above methods.

5. Thermistor of the evaporator

Thermistor, a kind of temperature sensors, serves to sense the temperature of air discharged from the evaporator. Its electrical characteristics are as follows.

When the temperature is lower than the specified temperature, the ECU will make the electric magnetic clutch disconnect to avoid the evaporator frosting.

Temperature ℃	Resistance kΩ
0℃	6.65±5%
25℃	2.0+10%

Remove

See “remove and disassemble” in the evaporator section for details.

Installation

（1）install the thermistor in the order contrary to removing it.

（2）evacuate and charge the system according to the above described methods.

6. Refrigeration pipe

Check

（1）check whether the hoses and the metal tubes leak air with leakage detector.

（2）check whether each hose clamp or metal tube clamp is fastened. If not, please fasten them or replace the slack.

Remove

（1）when regrigerant is recovered with recovery and regenerative unit , you must follow the operating instruction of the device. The lost oil in compressor must be measured and make-up the same amount of oil.

（2）change the faulty hoses or metal tubes.

Note：

The above hoses and metal tubes should be covered with caps quickly when they are removed to avoid damp and dirt to enter.

Installation

（1）install the refrigeration pipes in the order contrary to removing it.

（2）evacuate and charge the system according to the above described methods.

7. Circuit elements

1）air conditioner switch

Check

（1）remove the negative wire of the accumulator

（2）remove the unit heater slider and the central decoration

（3）Remove the air conditioner switch connector, take down the air conditioner switch.

（4）check whether terminals’ conduction of the air conditioner switch is correct with ohm gauge

Switch	1	2	3	4	5
OFF					
ON	X				

If the air conditioner switch does not conduct, please replace it.

2）high-low pressure protection switch

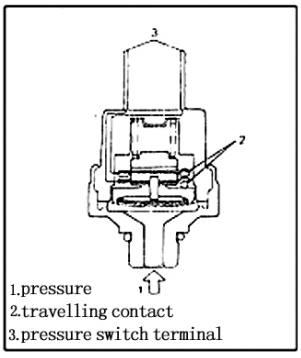
This car is equiped with the high-low pressure protection switch

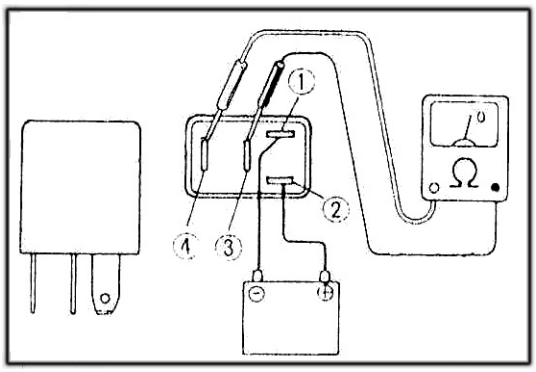
check

（1）check whether switches conduct at normal temperature of about 25℃ when the air conditioning system is charged with refrigerant properly and the compressor works.

（2）the switches should not conduct under the following pressures

Pressure at the high pressure side	Switch
Below 196kPa(0.2kg/cm^2)	non-conducting
Over 3140kPa(32kPa/cm^2)	





3）relay for fan

The relay for air conditioner is located in the box of the fore cabin fuse relay.

Check

（1）remove the negative wire of the accumulator.

（2）remove the relay connector and then remove the relay.

（3）wiring as shown in the diagram. Check whether the pins ③ and ① are conducting. If not, please replace the relay.

8. Compression system

Parts of the compressor must be free from dirt and foreign substance when the compressor is being maintained. For correct maintenance, the clean tools and work spots are the most important. The connections and surface of the compressor should be made clean before maintenance or removing the compressor on any car. Parts of the compressor should be kept clean at any time. Any resassembled parts must be washed with methane trioxide, crude gasoline, kerosene or other equivalent solution and then dried in dry air. Only napped cotton fabric can be used for wiping parts.

Without additional descriptions, removing the compressor from a car and overhauling it on the work table should follow the below operations. The parts should be prepared in the order of check. The remaining oil in the compressor should be drained out after the compressor is removed from a car for maintenance, then the compressor is charge with new refrigerant.

1）fault diagonosis

Item	Troubles	Possible reasons	Action
1	Compressor has noise	Piston, bearing, cylinder and/or crank shaft is out of condition	replace
2	Electric magnetic cluch has noise	Working face for bearing and/or clutch is out of condition	replace
3	Insufficient refrigeration	Gasket and/or reed valve is out of	replace

		condition	
4	No rotating	Due to item 1 locked	replace
5	Oil or air leakage	Seal is out of condition	replace

Light maintenance can be done onboard and the refrigerant needn't be discharged, while the refrigerant must be discharged in overhaul.

There are three main types of the compressor faults：air leakage, noise and underpressure. In most cases, air leakage always occurs at the shaft seal. Leakage detector must be used when leakage is checked. In case of a small amount of compressor oil leakage from the shaft seal, it is unnecessary to replace the shaft seal. A little bit of oil leakage from the shaft seal is designed to lubricate the system. So only when a large amount of oil leakage occurs or air leakage is found with leakage detector, you can replace the shaft seal. For noise and underpressure, repair should be done after the fault is confirmed.

2）check compressor

（1）install manifold pressure meter;

（2）run the engine with rapid idle speed.

（3）check the following items for the compressor.

① reading of the high pressure meter is not lower than the normal value and the reading of the low pressure meter is not higher than the normal value.

② metal noise.

③ leakage at the shaft seal.

The compressor should be repaired if any fault above occurs.

Remove

（1）run the engine with idle speed, turn on the air conditioner for about 10 mins.

（2）remove the negative wire of the accumulator.

（3）when regrigerant is recovered with recovery and regenerative unit , you must

follow the operating instruction of the device. The lost oil in compressor must be measured and make-up the same amount of oil.

（4） remove the electric magnetic clutch lead from the wiring bundle of air conditioner.

（5）remove the intaking hose and discharging hose from the compressor.

（6）take down the o-shape of seal ring from hose.

Note：cap the removed joints rapidly to avoid the system damp.

（7）lift the car and take the lower cover (right) of the engine down.

（8）slack the drive belt of the compressor, then remove the fixing bolts from compressor.

（9）remove the compressor with the electric magnetic clutch assembly from the engine stand.

（10）discharge the compressor oil and measure the discharged amount of oil.

Note：

When the compressor is removed, care should be taken to avoid radiator rib of the condensator to be damaged.

Chapter 8 Air Bag System

Maintenance and use of air bag

Diagnose

Inspection of SRS diagnostic system

When the SRS is powered on, airbag SDM will turn on warning light and start a self-checking, during which the warning light will flash for 6 seconds with a frequency of 1Hz. Any fault detected by SDM will activate airbag warning light, and the fault will be stored to SDM memory. SDM will check SRS fault each time it is powered on. A fault will be marked by SDM if it is detected consecutively for five times. A fault diagnosis testing cycle lasts for 400 ms, therefore it takes SDM 2 seconds (400ms X 5 times) to confirm a fault. If a marked fault continues, the warning light will keep on, this is called a “current fault”. If a marked fault does not appear in the following 25 consecutive testing cycle (400ms X 25 = 10 seconds), it will be unmarked, this is called a “historical fault”.

Diagnose with Diagnostic tester

Diagnostic tester reads data in SDM memory for continuous data communication. A diagnostic tester is able to read fault code in memory and clear part of stored data after maintenance, but is unable to clear internal faults such as collision record and arithmetic data fault.

To properly operate the diagnostic tester, first turn off ignition switch, and connect diagnostic tester with OBDII connector, then turn on ignition switch. Next steps please refer to instruction manual of diagnostic tester.

Maintenance and Service of SRS System

Warning:

In case engine is stopped and fuse is taken off, the SDM will provides sufficient voltage for 1 minute to activate airbag. If airbag is still connected, do not start maintenance operation within one minute after power supply to SDM is switched off. If airbag is disconnected, the maintenance may be started right away without waiting for 1 minute to be discharged. Any failure in temporary disconnection of SRS during maintenance will result in mistrigger of airbag, personal injuries and critical SRS damages.

Malfunction code	Fault signature	Alarm lamp
01	Resistance of ignition circuit for driver air bag is too high	A
02	Resistance of ignition circuit for driver air bag is too low	A
03	Ignition circuit for driver air bag is short circuit with earth	A
04	Ignition circuit for driver air bag is short circuit with battery	A
05	Resistance of ignition circuit for passenger air bag is too high	A
06	Resistance of ignition circuit for passenger air bag is too low	A
07	Ignition circuit for passenger air bag is short circuit with earth	A
08	Ignition circuit for passenger air bag is short circuit with battery	A
17	The connection between air bag ignition circuit for driver and passenger	A
23	Voltage of ignition input circuit is too high	B
24	Voltage of ignition input circuit is too low	B
25	Warning alarm lamp has malfunction	A
31	Inside of SDM has malfunction	C
32	SDM has bump record	D

Disconnecting Airbag

1. Turn steering wheel to central position
2. Turn ignition switch to locked position and take out the key
3. Take out airbag fuse from fuse box and wait for at least 1 minute to discharge SDM capacitor

Connecting Airbag

1. Insert airbag fuse into fuse box
2. Turn ignition switch to on position, airbag indicator light will be turned on for 6 seconds and then goes out. If the indicator light does not work in accordance with the foregoing, please refer to “Check with SRS Diagnostic System” part of this manual.

Warning: Keep away from airbag when turning on ignition switch to avoid personal injuries.

Operation, Installation and Diagnosis

- Airbag shall not be placed in ambient temperatures higher than 65° C (149° F)
- After falling from a height of 0.9 meter (3 feet) or higher, the airbag and SDM shall not be used again.
- When replacing SDM, the arrow on SDM shall always point to forward direction of vehicle.
- SDM must be installed horizontally on the installing surface, and must be parallel to vehicle body coordinate axes.
- To avoid diagnostic fault code, do not supply power to airbag before all system components are properly connected. Or the airbag shall be powered in accordance with special requirements of diagnostic tester if any.
- Any SRS system diagnosis must be started with SRS diagnostic system. SRS diagnostic system inspection will check for correct indicating functions and select correct method to diagnose any SRS fault. Omission of this step may result in longer diagnostic hours or inaccurate part replacement.

Repair and Check after Accident

Warning: any repair of vehicle structure shall resume the original shape. For triggered airbag, SDM and airbag shall be replaced with measurement of steering post dimension.

- Any damaged SRS part or mount point must be replaced.
- Never use SRS parts from other vehicles (except new SRS parts from the vehicle of the same model).
- Do not try to repair hairspring, airbag and safety belts. Should any defect be found, these parts must be replaced.

Check replaced SRS part number or marks. Airbag gas generator with the same look may have a different internal structure.

Replacing Airbag Parts after Activation in Accident

All SRS parts must be replaced after airbag is activated in a collision accident. Powder-like residue may be found on airbag surface after activation, which may include cereal starch and products of chemical reaction (used to lubricate airbag when inflating).

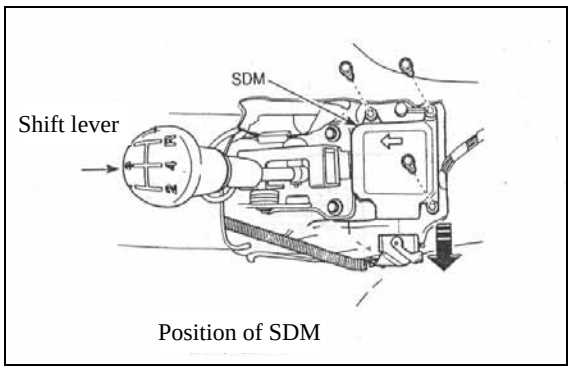
- SDM
- Air bag module
- SRS harness
- Hairspring

Checking Airbag Parts after Inactivation in Accident

The airbag must be checked after any collision accident, whether it is activated or not.

- Steering post must be measured for dimensions.
- Check dashboard and steering post cover for crack and other damages.
- Check dashboard support for deformation, bend, crack or other damages.
- Check safety belts and their fixing points.

Sensor and diagnostic module (SDM)



Position of SDM

Warning: Operate SDM with care when maintaining. Never knock or shake SDM. Do not connect SRS circuit before SDM is fixed onto vehicle. All SDM mounting bolts must be tightened with care. Always make the arrow on SDM point toward forward direction of the vehicle to ensure normal working of SRS. SDM may still work if powered before installation onto vehicle body, but potential mistrigger of airbag and injuries may be caused.

Precautions: SDM and SDM connector may need replacement in case water enters vehicle body due to leakage, passing through deepwater, flood or other reasons. Turn off ignition switch and check all SDM areas including carpet. If notable new or previous water soakage is found, clear the water and soaked parts and replace SDM and SDM connector. SRS must be shut down before above operation. Please refer to “Disconnecting Airbag” Part in this manual.

Disassembling Procedure

1. Disconnect SRS. Please refer to “Disconnecting Airbag” part of this manual;
2. Demount the left and right decorating plates of dashboard central control panel;
3. Loosen fuse lock of SDM wire harness connector;
4. Disconnect SDM wire harness connector;
5. Remove SDM fastening bolts;
6. Take off SDM.

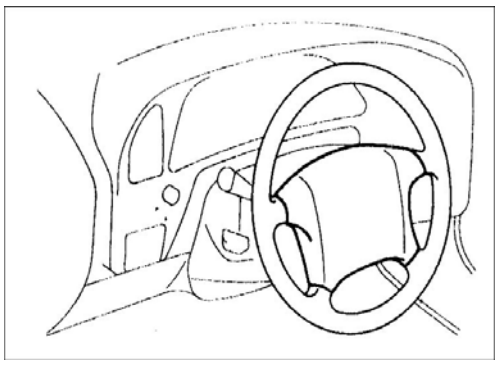
Assembling Procedure

1. Install SDM with arrow on SDM pointing forward direction of vehicle;
2. Fix SDM fastening bolts;

3. Tighten fastening bolts with torque of 8-12Nm.
4. Connect SDM wire harness connector;
5. Push connector fuse lock in position;
6. Fix the left and right decorating plates of dashboard central control panel;
7. Power on SRS. Please refer to “Connecting Airbag” part of this manual.

Warning: All SDM mounting bolts must be tightened with care. Always make the arrow on SDM point toward forward direction of the vehicle to ensure normal working of SRS. SDM may still work if powered before installation onto vehicle body, but potential mistrigger of airbag and injuries may be caused.

Air bag module of driver side



Disassembling Procedure

1. Disconnecting Battery Cathode (-)

Warning: In case engine is stopped and fuse is taken off, the SDM will provides sufficient voltage for 1 minute to activate airbag. If airbag is still connected, do not start maintenance operation within one minute after power supply to SDM is switched off. If airbag is disconnected, the maintenance may be started right away without waiting for 1 minute to be discharged. Any failure in temporary disconnection of SRS during maintenance will result in mistrigger of airbag, personal injuries and critical SRS damages.

2. Centering Steering Wheel

Warning: **Keep the module with the right side up when operating airbag to ensure sufficient room for mistriggered airbag. The airbag may fly toward persons or objects in case of insufficient spreading room and cause personal injuries or vehicle damages.**

3. Remove two airbag screws on steering wheel;
4. Disconnect airbag from horn and airbag wire harness connector;
5. Take off the airbag.

Assembling Procedure

Warning: **Keep the module with the right side up when operating airbag to ensure sufficient room for mistriggered airbag. The airbag may fly toward persons or objects in**

case of insufficient spreading room and cause personal injuries or vehicle damages.

1. Connect horn and airbag wire harness connector to airbag socket;
2. Install airbag module;
3. Fix airbag module screws
4. Tighten airbag screws with a tightening torque of 13-17Nm;
5. Connect battery cathode (-).

Hairspring

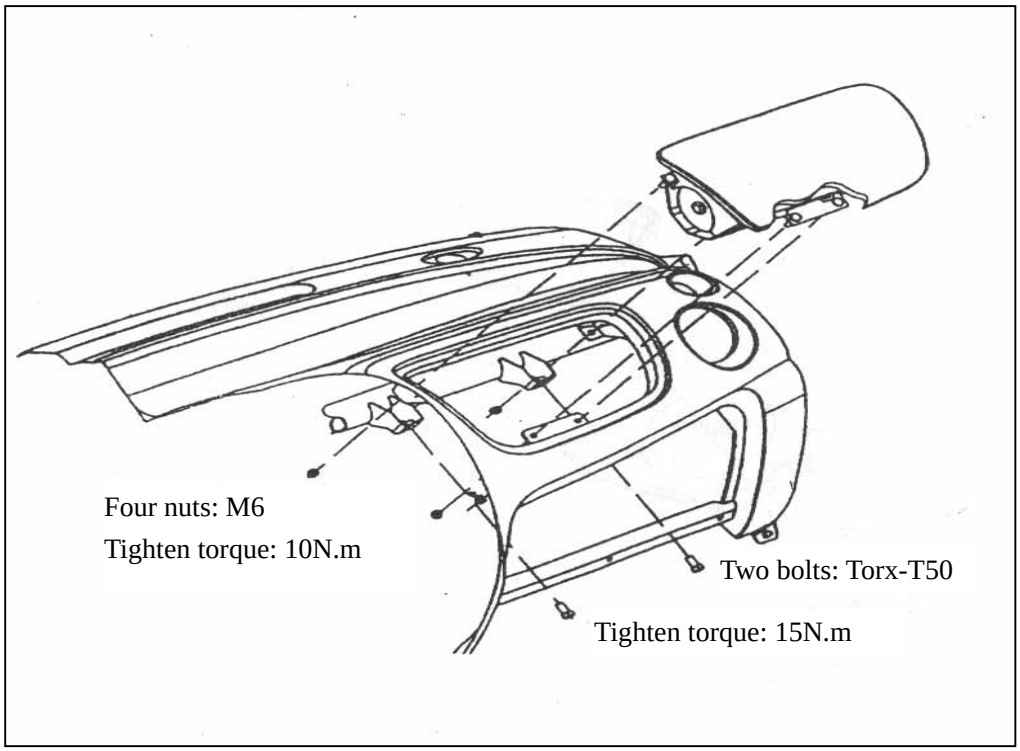


Assembling Procedure

Warning: if the hairspring does not locate exactly, steering wheel will can not rotate completely when turning. Restriction of turning ability may cause accident of vehicle, incorrect hairspring location also can restrain SRS to work, make air bag dose not work when a bump accident happened. The two instances above both can induce injury. Turning steering wheel clockwise or counterclockwise for more than 3 cycles will damage hairspring.

1. Adjust front wheel to just frontage
2. Install hairspring and spiral thread
3. Tighten the hairspring spiral thread by the tighten torque 3N.m
4. Rotate the hairspring overhang part clockwise to lock position
5. Rotate the hairspring overhang part three cycles counterclockwise to middle position, then the front wheel should at the just frontage position
6. Locate the mark on the hairspring correctly
7. Connect harness connector to the bottom of the steering column
8. Install steering wheel
9. Install driver side air bag module according to “driver side air bag module” part in the manual
10. Connect battery negative electrode (－)

Passenger side air bag module



Disassembling Procedure

Warning: In case engine is stopped and fuse is taken off, the SDM will provides sufficient voltage for 1 minute to activate airbag. If airbag is still connected, do not start maintenance operation within one minute after power supply to SDM is switched off. If airbag is disconnected, the maintenance may be started right away without waiting for 1 minute to be discharged. Any failure in temporary disconnection of SRS during maintenance will result in mistrigger of airbag, personal injuries and critical SRS damages.

1. **Disconnecting Battery Cathode (-)**
2. Remove glove box
3. Disconnect air bag yellow harness connector on passenger side
4. Remove the bolts on the instrument and on instrument panel inside cross member, then take out the air bag

Assembling Procedure

1. Install passenger side air bag module
2. Install tighten bolt of air bag module
3. Tighten the bolt on the instrument panel inside cross member by the tighten torque 18--26N.m, tighten the bolt on instrument panel by the tighten torque 5--11N.m
4. Connect air bag yellow harness connector on passenger side
5. Install glove box
6. Connect battery negative electrode (－)

Activating Airbag (inside vehicle)

Always activate an airbag before it is scrapped. If the whole vehicle is disposed of and disassembled, the airbag may be triggered inside the vehicle.

Disposal of Activated Airbag

Warning: Please take following precautions to avoid activation of airbag inside vehicle and consequential injuries.

- Remove all movable or loose parts within spreading coverage of airbag before activating airbag.
- Activate and spread the airbag with doors closed and side windows open.
- Spread the airbag only in the reserved spreading area. All necessary maintenance staff must stay at least 10 meters away from the vehicle in the front.
- Never apply voltage before all preparations are done.
- Cool the airbag down for at least 30 minutes before disposal of an activated airbag.
- Always wear gloves and eye shield during disposal.
- In case activation of airbag fails, disconnect power and wait for at least five minutes before approaching vehicle again.

Activating Procedure

Warning: In case engine is stopped and fuse is taken off, the SDM will provides sufficient voltage for 1 minute to activate airbag. If airbag is still connected, do not start maintenance operation within one minute after power supply to SDM is switched off. If airbag is disconnected, the maintenance may be started right away without waiting for 1 minute to be discharged. Any failure in temporary disconnection of SRS during maintenance will result in mistrigger of airbag, personal injuries and critical SRS damages.

1. Disconnect both poles of battery and take it 10 meters away from vehicle
2. Demount dashboard lower plate at the driver's side from steering post
3. Disconnect the two SRS wire harnesses with clock spring under steering post
4. Strip off 13mm of insulation sheath from the end of the wire harnesses connecting clock spring
5. Connect airbag with the battery activating airbag with two extra wire harnesses (10 meters each)
6. Strip off 13mm of insulation sheath from the end of the extra wire harnesses
7. Twist the exposed end of each extra wire harness together
8. Place the twisted end beside the activating battery without connection
9. Connect respectively the untwisted ends with wire harnesses of airbag
10. Wrap the joints with insulating tape
11. One end of each extra wire harness shall be connected with one of the two airbags wire harnesses, and the other ends of two extra wire harnesses shall be twisted together and laid beside the activating battery of airbag. Clear the site
12. Untwist the twisted ends beside the battery
13. Connect one end to battery cathode and the other to anode, the airbag will be activated.
14. Trigger air bag of passenger side by the same steps.
15. Dispose of the activated airbag in proper procedure with reference to “Disposal of

Activated Airbag".

Activating Airbag (outside vehicle)

For vehicles within warranty period, before activating airbag, please contact regional maintenance manager for approval or other specifications.

Please activate the airbag under following circumstances:

- Vehicle is to be disassembled. Please refer to "Spreading Airbag" part of this manual;
- Airbag is damaged during transportation, storage or maintenance.

Warning: to avoid personal injuries, please take the following precautions when activating airbag outside vehicle.

- Spread the airbag only in the reserved spreading area. All necessary maintenance staff must stay at least 10 meters away from the vehicle in the front;
- Never apply voltage before all preparations are done;
- Cool the airbag down for at least 30 minutes before disposal of an activated airbag;
- Always wear gloves and eye shield during disposal;
- In case activation of airbag fails, disconnect power and wait for at least five minutes before approaching vehicle again;
    1. Lay the airbag on an open place at least 10 meters away from persons or barriers with the front side upward;
    2. Place a vehicle battery at a place 10 meters away from the airbag;
    3. Activate and spread airbag.
    4. In case of absence of spreading tools, please take following steps:
    5. Disconnect the yellow wire harness connecting to airbag;
    6. Strip off 13mm of insulation sheath from the end of the wire harness connecting to airbag;
    7. Connect airbag with the battery activating airbag with two extra wire harnesses (10 meters each);
    8. Strip off 13mm of insulation sheath from the end of the extra wire harnesses;
    9. Twist the exposed end of each extra wire harness together;
    10. Place the twisted end beside the activating battery without connection;
    11. Connect respectively the untwisted ends with wire harnesses of airbag;
    12. Wrap the joints with insulating tape;
    13. One end of each extra wire harness shall be connected with one of the two airbags wire harnesses, and the other ends of two extra wire harnesses shall be twisted together and laid beside the activating battery of airbag. Clear the site;
    14. Untwist the twisted ends beside the battery;
    15. Connect one end to battery cathode and the other to anode, the airbag will be activated;
    16. Dispose of the activated airbag in proper procedure with reference to "Disposal of Activated Airbag".

Disposal of Activated Airbag

Warning: Please take following precautions to avoid activation of airbag inside vehicle and

consequential injuries.

Remove all movable or loose parts within spreading coverage of airbag before activating airbag.

Activate and spread the airbag with doors closed and side windows open.

Spread the airbag only in the reserved spreading area. All necessary maintenance staff must stay at least 10 meters away from the vehicle in the front.

Never apply voltage before all preparations are done.

Cool the airbag down for at least 30 minutes before disposal of an activated airbag.

Always wear gloves and eye shield during disposal.

In case activation of airbag fails, disconnect power and wait for at least five minutes before approaching vehicle again.

Activating Airbag before Disposal

This specification includes vehicles to be disposed of. For vehicles within warranty period, please contact regional maintenance manager for approval or other specifications before activation. Except for the following additional steps, activated airbags shall be disposed of with the same method with other disassembled parts.

1. Place the activated airbag in a firm plastic bag;
2. Make sure the plastic bag is sealed;
3. Carefully wash hands after disposal of activated airbag.

Maintenance of SRS Wire Harness

Maintenance of harness connector

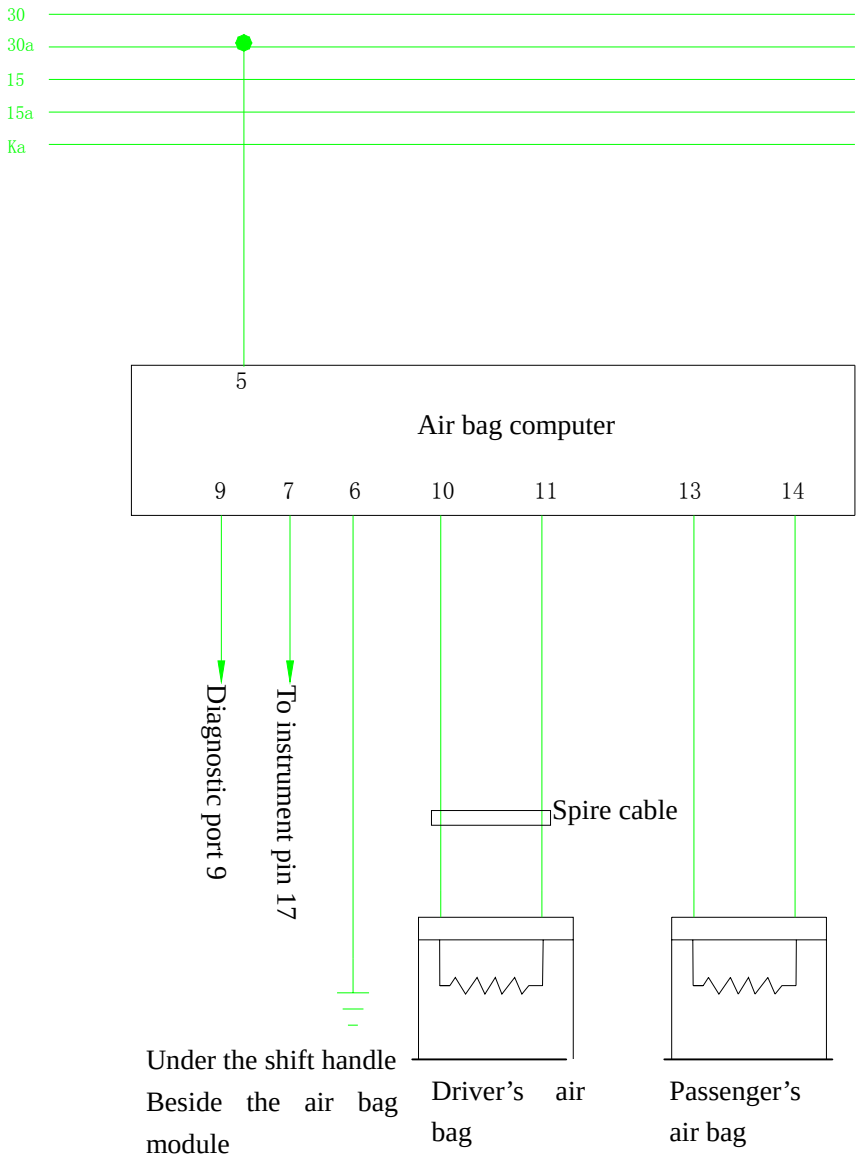
Warning: SRS must be shut down before any maintenance. Please refer to “Disconnecting Airbag” part of this manual.

Plug inside SRS is made of special material to ensure the favorable conductivity of low energy circuit, and once damaged the whole airbag wire harness assembly must be replaced. Do not replace the connector plug with any other plugs.

Maintenance of harness

Don’t try to maintain SRS system harness. Please use new harness to replace all the damaged harness.

Attached air bag system diagram:


30
30a
15
15a
Ka
5
Air bag computer
9
7
6
10
11
13
14
Diagnostic port 9
To instrument pin 17
Spire cable
Under the shift handle Beside the air bag module
Driver's air bag
Passenger's air bag

Chapter 9 Engine Hood and Luggage Compartment

Removal of the engine hood

1.Loosen four fixed bolts and lift the engine hood.



2. Unclench the engine hood rod.



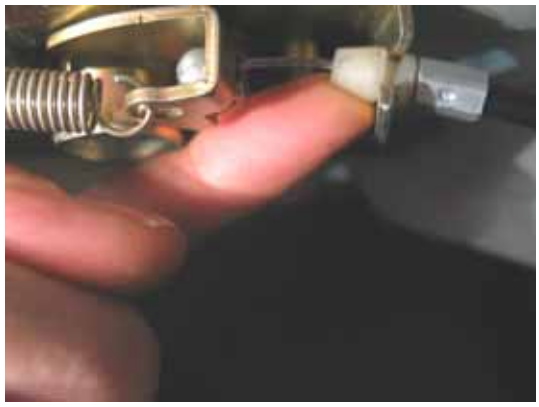
3. Loosen two fixed bolts to take out the upper lock.



4. Loosen two fixed bolts to take out the lower lock.



5. Loosen the engine hood cable.



6. Adjust left and right engine hood bolts to ensure normal gap.



Remove the engine hood hinge

1.Remove the fender (refer to “Remove Fender”)

2.Loosen four fixed bolts both left and right to take out the engine hood hinge.





Replace the engine hood support

1.Take the support out of engine hood

Screw out bolts, and get the support out of engine hood.

Note: Push against the engine hood with hand, and take the support out.

2.Remove the engine hood support from the body

Screw out bolts to take the support out.

3.Replace the engine hood support

Note: Be carefull when operating the absorber!

(1)There is compressed air in the absorber cylinder. Do not disassemble absorber.

(2)If replace the absorber, drill a small hole with diameter of 2.0-3.0 mm（0.079-0.118 inch） on the cylinder shell to fully release compressure, then abandon it .

(3)Be careful of sputtering iron scrap when drilling the hole.

(4)Air in the cylinder is colorless, smell-less, and nontoxic.

(5)Deal with absorber carefully. Do not drop paint or oil onto the piston rod.

(6)When the absorber fully extrudes, do not turn the piston rod or cylinder.

4.Install the engine hood support

Fix the engine hood support.

Torque: 22 Newton-meter (225 kg-cm, 16 pound-foot)

Adjust the engine hood

Loosen the hinge bolts, and adjust the engine hood in forward, backward and vertical directions.

Torque: 11.5 Newton-meter (115 kg-cm, 8.3 pound-feet)

Install the hood lock control assembly

1.Apply grease on the lock before parts installation.

Lay multifunctional grease on the sliding surface.

2.Install control cable of engine hood lock.

Note: Wrap the screwdriver end with adhesive tape before installation.

Prevent the screwdriver from damage the rubber seal.

(1)Push the back end of control wire through rubber seal.

(2)Push control cable block into rubber seal with screwdriver.

(3)Clench the front end of control cable onto connection box.

(4)Put the front end of control wire through the upper support of radiator.

3.Install the unfastening handle of engine hood lock

4.Check the performance of engine hood lock

Check the engine hood lock to ensure it works well. Then fasten nuts and bolts to fix the lock.

5.Install the following parts:

(1)Head lamps

(2)Front light shield

(3)Front fender lining

(4)Front fender fillet

(5)Radiator support cover

(6)Lower cover board of engine

Remove the Luggage Compartment

1. Loosen 5 bolts on the left lining board and take them out.



2. Disconnect the trunk cable set and loosen wiper pipe.



3. Hold the trunk and unfasten 4 fixed bolts on the hinge.



4. Remove hydraulic rod and take out luggage compartment assembly.



Remove the lock assembly(mechanical)

1.Detach the connectors.

2.Unfasten 2 fixed bolts and take out the lock.



Remove the lock assembly(electric)

1. Detach the connectors.



2. Unfasten 3 fixed bolts to take out the lock, and disconnect the motor wire.



Remove the electric switch

(1) Unfasten fixed bolts of the trunk.



(2) Detach the connecting rod on the lock switch of trunk.



(3) Unfasten 2 fixed bolts on the trunk lock.



(4) Take out the lock assembly.

Adjust the trunk door

1. Adjust the trunk door

(1)Loosen bolts, and adjust the door in forward/backward, and left/right directions.

(2)Increase or decrease the amount of washers between hinge and trunk door to adjust the front end in upward or downward directions.

Torque: 11.5 Newton-meter (115 kg-cm, 8.3 pound-foot)

2.Adjust the lock crossbar

Gently knock the crossbar with hammer or bronze bar for adjustment.

Torque: 5.4 N.m (55 kg-cm, 48 pound-inch)

Replace the trunk door support

1. Remove the trunk door support

(1)Unfasten the support bolts out of trunk door hinge.

(2)Turn the back end of the support downward, and take the support out of bracket.

2. Replace the trunk door support

Note: Be careful of when operating the support.

(1)There is compressed air in the support cylinder. Do not disassemble the support.

(2)If the support is to be replaced, drill a small hole with diameter of 2.0-3.0 m （0.079-0.118 inch）on the shadow area of cylinder to fully release compressure, then abandon it.

(3)Be careful of sputtering iron scrap when drilling the hole.

(4)Air in the cylinder is colorless, smell-less, and nontoxic

(5)Deal with the support carefully. Do not drop paint or oil on it.

(6)When the support fully extrudes, do not turn the piston rod or cylinder.

3. Install the trunk door support

(1)Apply adhesive agent on the bolts.

(2)Install the trunk door support.

Torque: 22 N.m(225 kg-cm, 16 pound-foot).

Chapter 10 Door

Disassembly of front door

Removal of inner door panel of front door

（1）Remove set bolt on the fixed handle base plate with cross screwdriver.



（2）Remove bolts of fixed handle with cross screwdriver.



（3）Remove 4 set bolts of inner door panel.









(4) Sway the door inner door panel from top to bottom by hand, take out the inner door panel upwards.

(5) From the rear of inner door panel, separate the connecting rod of fixed handle, then take out the fixed handle.





(6) Disconnect the wire harness plug of central lock main switch from the rear of door inner door panel, and then take out the base plate of door handle.





(7) Take out inner door panel.



Removal of Front door Horn

(1) Remove the inner door panel; See "removal of the interior decorative panel" for reference.

(2) Remove 4 set bolts of the horn.



(3) Remove the horn plug, take the horn out.

Removal of front indoor light

(1) Remove indoor lamp cover with flat screwdriver.

(2) Take the indoor lamp assembly out.



Removal of front door switch

（1）Remove set bolts of front door switch with Cross screwdriver.



（2）Take the door switch assembly out.

Removal of front door locks institution

（1）Remove 2 set bolts on the lock buckle with cross screwdriver.



（2）Take the lock buckle assembly out.

Removal of door check strap and set bolts of front door

（1）Remove Bolts on door check strap and vehicle body



（2）Take door check strap out.

（3）Remove front door set bolts



Adjustment of front door

1．Adjust front door frontward, backwards and vertically

Loosen the hinge bolts of body side with special tools and adjust the door.

2．Adjust the front door along left/right and vertical direction.

Loosen the hinge bolts of door side with SST and adjust the door.

3．Adjust front door lock hole

Hint: Wrap the tip of screwdriver with adhesive tape before use.

（1）Check if the door closes tightly; Check to see if the adjustment of connecting rod of door lock is right or not.

（2）Remove the cover of lock hole.

（3）Loosen the bolts and tap the hole with hammer to adjust the position of the hole, and then tighten the bolts.

（4）Install the bolt cover.

Removal of door glass

（1）Remove outside rearview mirror.

（2）Remove 2 set bolts of door glass guide rail.





（3）Separate door inner panel Assembly.

（4）Remove set bolts on upper part of door glass guide; Take out the door inner panel and glass guide rail.



（5）Loosen 2 set bolts of window winder and glass bracket.

（6）Take the glass out upwards.

Adjustment of door glass

Hint: Check the clearance between guide and block

（1） Lift glass completely; adjust the clearance between glass and the door inner

panel.

（2） Fix the guide, block and 2 nuts after adjustment.

（3）Lift glass again and check to see if the installation is good or not.

Removal of window winder

（1）Take out the door inner panel.

（2）Loosen 2 set bolts of the window winder and glass bracket

Hint: Stuff a piece of cloth inside the door inner panel, so as not to cut the surface of the glass.

（3）Loosen 6 set bolts of the window winder.

The tighten torque: 5.5N·m (56kg-m, 491b-ft)



（4）Loosen the harness connector of the window winder; Take the window winder assembly out.

Removal of front door weather strip

（1）Loosen screws and nuts.

（2）Take out the two sided adhesive tape from backward with scraper.

The installation sequence is in the reverse direction of the dismantle sequence.

As to dismantle of other door, you can see “dismantle of front door” for reference.

Chapter 11 Seat and Belt

Removal of front seat

（1）Remove 4 set bolts of front seat






（2）Take out the seat assembly

Removal of rear seat



1. Removal of rear left seat cushion

Loosen 4 set bolts, lift left rear seat cushion frontward and upward.

2. Removal of rear right seat cushion

Loosen 4 set bolts, lift right rear seat cushion frontward and upward.

3．Removal of backrest

（1）Draw back the buckle on rear seat, move seat cushion frontward from the rear.



（2）Draw back the left/right bolts, move the backrest frontward.



（3）Loosen 3 set bolts, take out backrest of rear Seat assembly.





4．Dismantlement of backrest lock

（1） Loosen outer cover of the seat.

（2）Loosen 2 set bolts, take out rear back lock.

5．Removal of safety belt of rear seat

（1）Draw back the buckle, move the seat pad frontward;

（2）Loosen set bolt of the safety belt handspike, take out the bolts.

（3）Loosen set bolts of the left/right safety belt;

（4）Use special tools to loosen the clamp buckle, move the footrest.

（5）Loosen 3 set bolts of the left/right acoustics horn, move the bolts. Loosen 2 upper and lower set bolts; take off the safety belt.

Chapter 12 Interior accessories

Removal of vehicle roof panel

（1）Pull out inner panel of A pillar on the left side.





（2）Loosen bolts on the sun shading panel with screwdriver.





(3) Loosen 3 handles on the roof panel.





(4) Open the 8 latch hooks with flat screwdriver.





(5) From top to bottom, pull out the roof panel assembly.

Removal of radio

(1) Loosen 2 set bolts of the radio.





(2) Take out the radio, disconnect the plug.

Removal of A/C panel

（1）Loosen 4 set screws.





（2）Open fixed clip　(make the mark) and loosen the cable on air outlet.

（3）Loosen plug, pull out the A/C panel

Removal of back light switch

Open the switch with a small Screwdriver.



Removal of fog lamp switch

Open the switch with a small Flat screwdriver.



Removal of antenna

（1）Remove set bolts of antenna.



（2）Remove the launching wire of the antenna.

The installation sequence is in the reverse direction of the dismantle sequence.

Chapter 13 Outside Accessories

Removal of rearview mirror

（1）Remove plastic protective Cover of the rearview mirror.



（2）Remove 2 set screws of the outside rearview mirror.



（3）Remove 3 set screws of rearview mirror plastic parts.



（4）Loosen the harness connector of the mirror from the door inner panel; take out the rearview mirror assembly.

Removal of headlamp

（1）Remove front bumper (see dismantlement of front bumper for reference)

（2）Loosen 3 set bolts, take out the head lamp.





Removal of horn

（1）Remove tire plate

（2）Loosen set bolts, take off the horn.



Removal of tail surface:

Loosen 3 set screws, take out tail wing



Removal of high-mount stop lamp



（1） Loosen 2 set screws, pull out lamp cover downwards



（2） Loosen 3 set screws, take out the high-mounted stop lamp.

Removal of number plate lamp/protective panel assembly

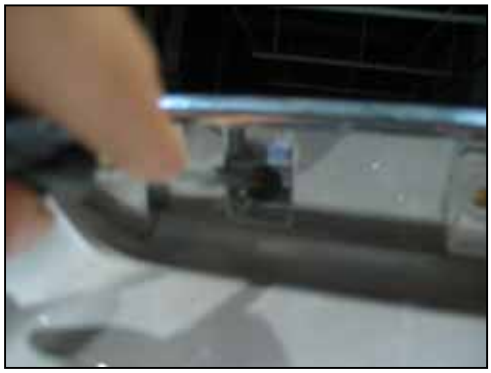


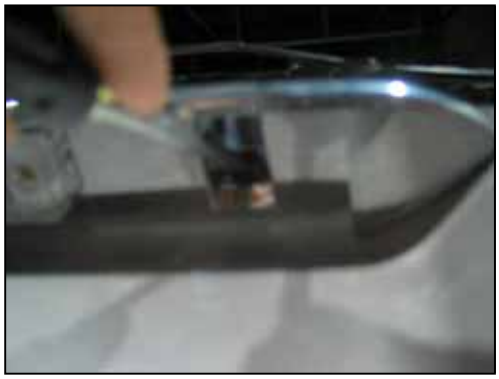
（1）Loosen 4 set screws of the license plate lamp with screw driver to take them off.





（2）Loosen 2 set screws on the protective panel, and then take off the screws.







Removal of fuel tank lid

Loosen set bolt of fuel tank lid; remove the fuel tank lid.

The installation sequence is just the reverse of dismantlement sequence

Chapter 14 Removing Windshield

1. Remove the following parts:

（1）front seat

（2）rear seat cushions

（3）bolts on the lower end of rear seat belt

（4）back of rear seat

（5）front door frame plate

（6）back door frame plate

（7）decorative side plate of rear seat

（8）upper parking lamp

（9）speaker mesh guard

（10）decorative board of glove compartment

(11）assistant grasp

(12）small rear seat lighting bulb

(13）interior roof lateral ornament

（14）middle pillar ornament

（15）front pillar ornament

(16) sun shading board and holder

（17）small illuminating light

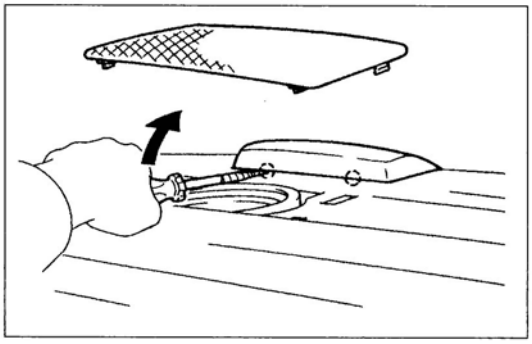
（18）middle sun shading boards

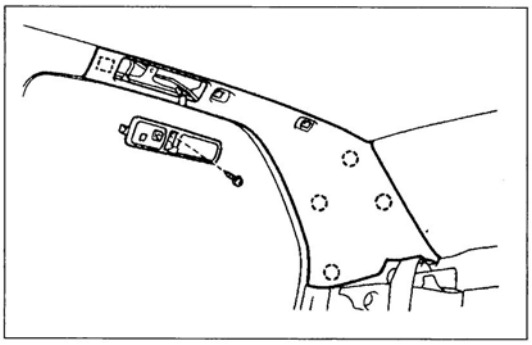
（19）interior rear-view mirror

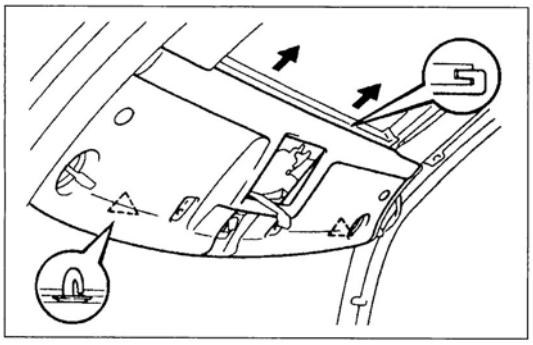
（20）front roof lining

（21）windshield wiper arms

（22）sealing strips for windshield

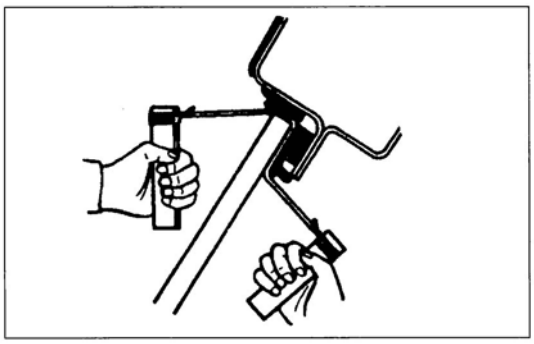






2. Remove front door sealing strips

Pull out sealing strips by hand

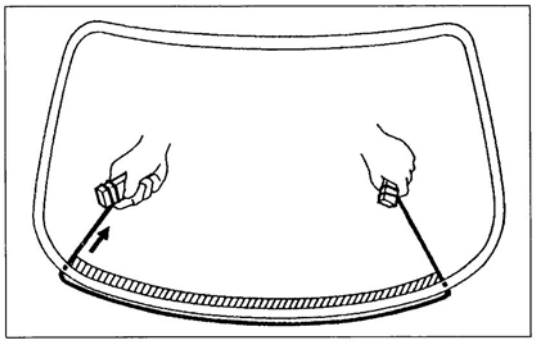


3. Remove outside inlaid strips

Take down screws and outside inlaid strips

4. Remove the upper inlaid strips on windshield

As showed in the figure：Cut off inlaid strips with knife



Attention：Do not let knife damage car body

5. Remove windshield

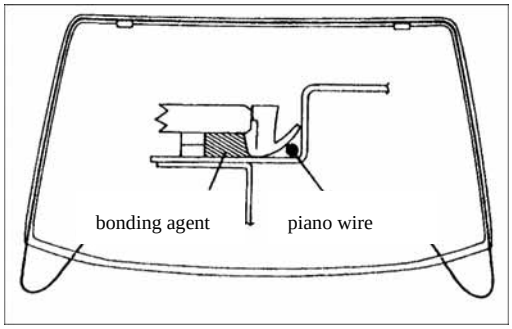
（1）Lead piano wire out between car body and windshield from interior car

（2）Bind up two wires ends with wood blocks or similar objects

Note：Stick a piece of adhesive tape outside to prevent windshield external surface from being scratched

Attention：

（1）Do not damage paint surface, internal and external ornaments when detaching windshield



（2）To avoid the scratch on dashboard, a sheet plastic can be placed between piano string and dashboard

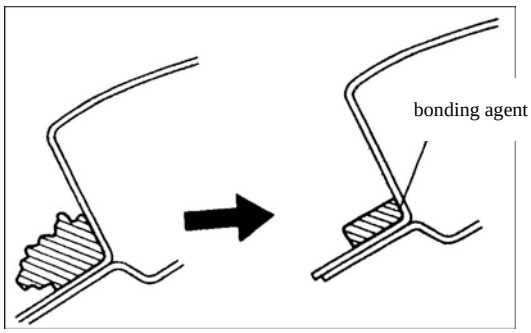
Drag the wire along all sides of windshield to cut off bonding agent to remove windshield

Attention：Bonding agent should be kept on car body as much as possible when cutting windshield joint

1. Installation of Windshield

（1） No touch on windshield surface after cleaning

(2) Cut roughness off bonding agent sticking to car body with knife



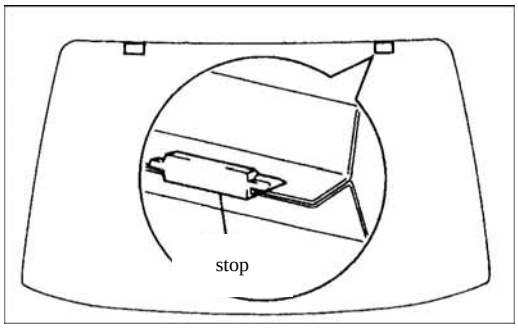
Note：Keep bonding agent on car body as much as possible

（3） Clean the cutting surface of bonding agent with a rag soaked in cleaning liquid

Note：Even though all of bonding agent is completely removed, car body surface must be cleaned

2. Remove block stop：

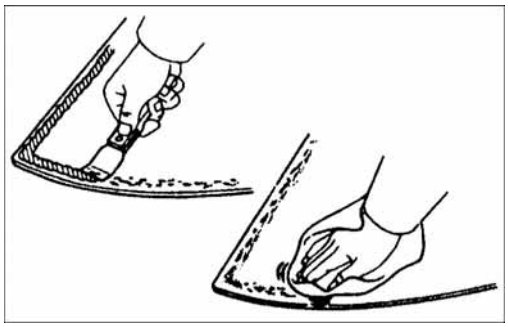
Remove block stop with knife



3. Clean the removed windshield

（1） Remove the bonding agent stuck on windshield with scraper

（2） Clean windshield with cleaning liquid



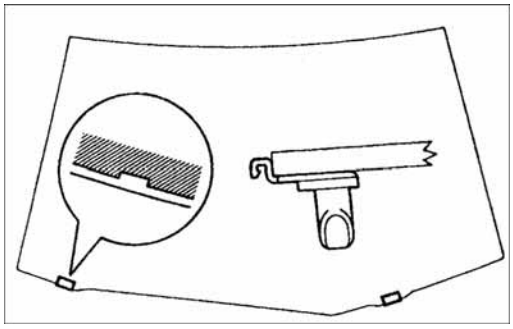
Attention：Do not touch windshield after cleaning

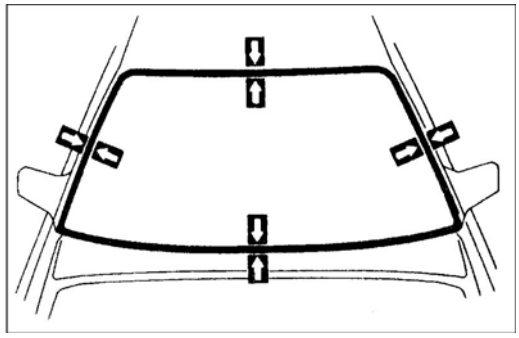
4. Replace clamps if necessary

（1） Remove stops with knife

（2） Take down used clamps

（3） Put new clamps on



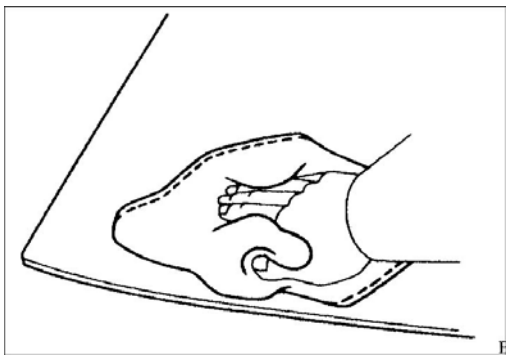


5. Position windshield

（1） Put windshield in right place

（2） Make reference marks on windshield and car body

（3） Remove windshield



6. Clean the joint surface of windshield

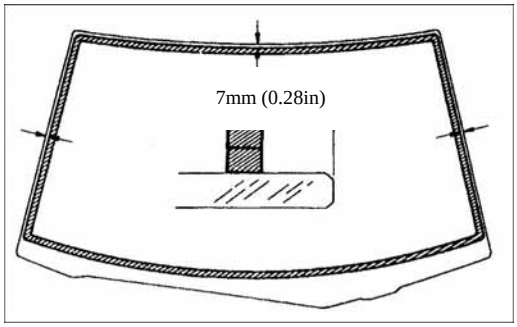
Clean the black dirt with clean liquid on the joint surface of windshield periphery

Attention：Do not touch windshield surface after cleaning

7. Install water-resisting chips

As showed in the drawing，fix water-resisting chips with double-side adhesive tape

Attention：Do not touch windshield surface after cleaning



8. Coat a layer of base paint M on the joint surface of car body

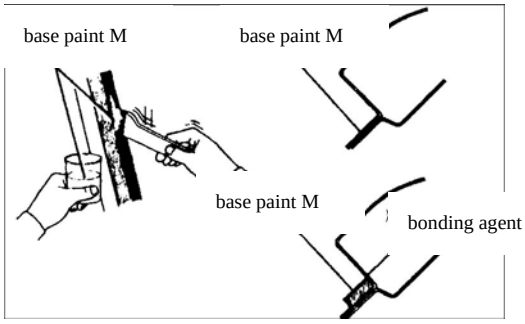
Brush a layer of base paint M onto the joint surface of car body

Attention：

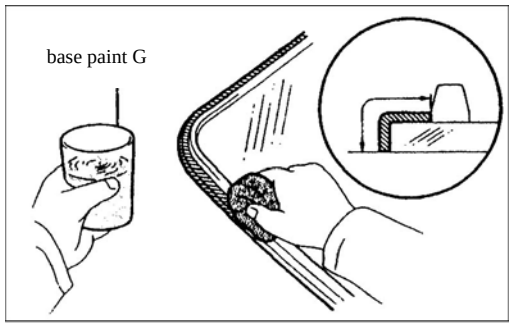
（1） Wait for base coating layer to dry over 3 minutes

（2） No coating on bonding agent

（3） Never reserve unsealed base paint M for later use



9. Coat a layer of base paint G on the contact surface of windshield



（1） Coat a layer of base paint G with brush or sponge on windshield periphery and joint surface

（2） Clear base paint with a clean rag before drying

Attention：

（1）Leave base paint layer dry for 3 minutes at least

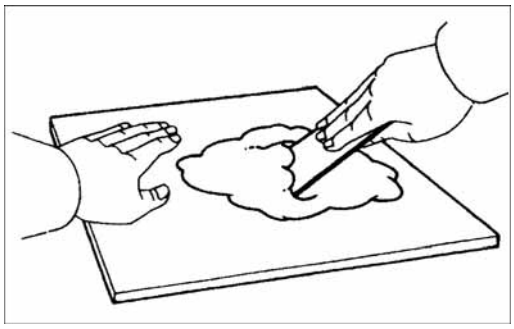
（2）No coating on bonding agent

（3）Never reserve unsealed base paint G for later use

10. Mix bonding agent

Attention：

A. Ensure the fixation of inlaid strip to finish within the applicable duration of bonding agent

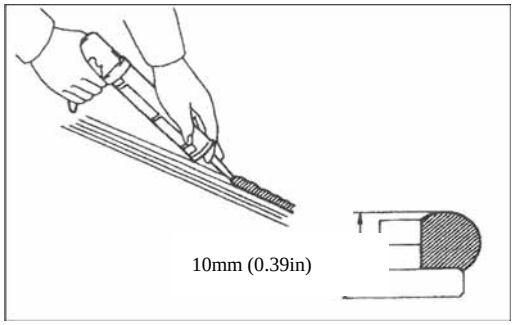


B. Mixing bonding agent must be completed within 5 minutes

（1） Clean glass plate and oil loam scraper thoroughly with solvent

(2) Fully mix 500g principal agent with 75g hardening agent with scraper on glass plate or similar object

11. Apply bonding agent



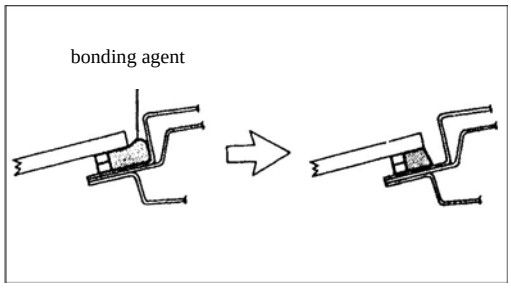
（1）Cut off the Note of tubular pot and fill bonding agent in the pot

（2）Put the pot into sealing glue gun

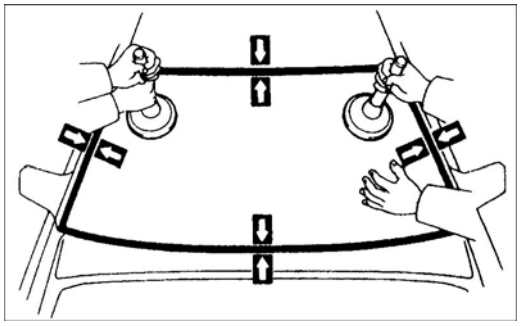
（3）Apply bonding agent on windshield as showed in the drawing

12. Install windshield

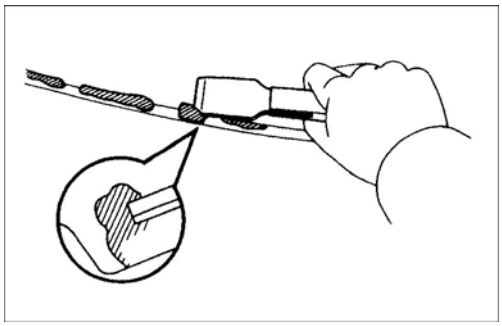
Note：Verify that water- resisting chips have been stuck on the face plate of car body as showed in the drawing



（1）When install windshield, align the reference marks on windshield and car body, then gently press in windshield towards periphery



（2）Smear windshield at periphery with bonding agent



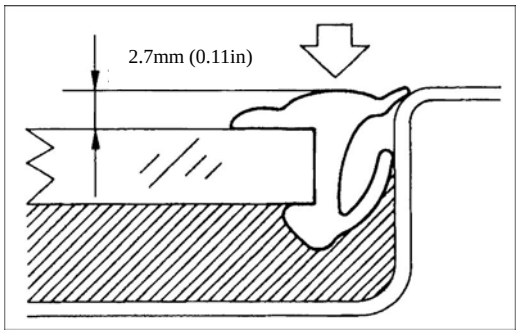
（3）Remove excess or spilled bonding agent with scraper

（4）Fasten windshield until bonding agent hardened

13. Water leakage checking and maintenance

（1）Water leakage test shall be conducted after hardening period

(2) Block up water leaking places with sealant



14.Install upper inlaid strips on windshield

Put upper inlaid strips on car body and pat the strips by hand to tighten

15. Fix outside inlaid strips

Fix screws and outside inlaid strips

16. Fix front door sealing strips

17. Install the following parts：

（1）front roof lining

（2）interior rear-view mirror

（3）middle sun shading boards

（4）small illuminating light

（5）sun shading boards and holder

（6）front pillar ornament

（7）middle pillar ornament

（8）inner roof lateral ornament

（9）small rear seat lighting bulb

（10）decorative board of glove compartment

（11）assistant grasp

（12）speaker mesh guard

（13）lateral ornament of rear seat at upper parking lamp

back door frame plate

back of rear seat

Torque：18 N.m（185 kgf/cm，13 lbf/in）

bolts on the lower end of rear seat belt

Torque：43 N.m，32 lbf/in）

rear seat cushions

front seats

Torque：37 N/m（375 kgf/cm，27 lbf/in）

windshield

sealing strips for windshield

windshield wiper arms

Remove rear window glass

1. Remove the following parts：

rear seat cushions

bolts on the lower end of rear seat belt

back of rear seat

speaker mesh guard

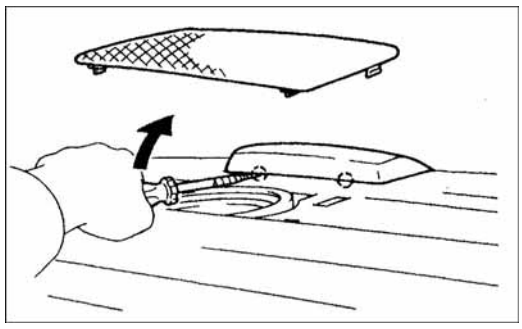
upper parking lamp

decorative board of glove compartment

assistant grasp

small rear seat illuminating light

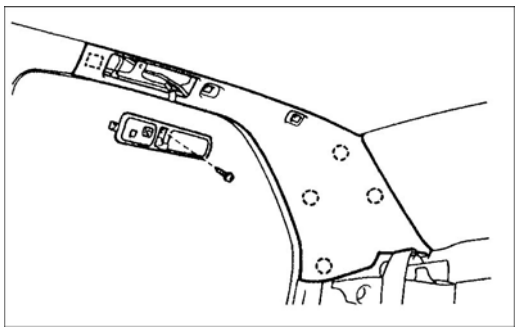
inner roof lateral ornament



2. Detach roof lining

3. Disconnect rear window connector

Disconnect rear window connector



4. Remove lower inlaid strips

As showed in the drawing, cut off the double-side adhesive tapes

on the two ends of inlaid strip with scraping cutter

Note: Before using, scraping cutter point shall be bandaged with adhesive tape

Prize out inlaid strips at six clamps and take the strips down

5. Remove rear window glass

Lead piano wire out between car body and glass

Bind up two wire ends with wood blocks or similar objects

Note：Do not let piano wire damage two stops

Remove the glass

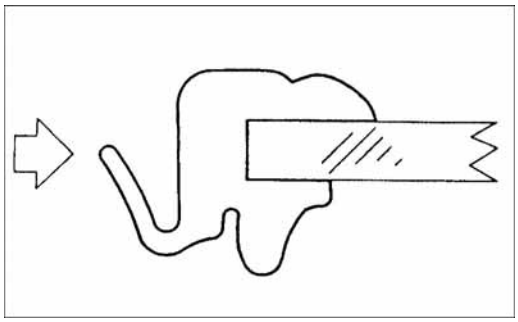
6. Remove rear window inlaid strips

Install rear window glass

1. Fixing rear window inlaid strips

Put inlaid strips on glass periphery and fix the strips by hand

Note：Rear window glass must be removed before fixing inlaid strips

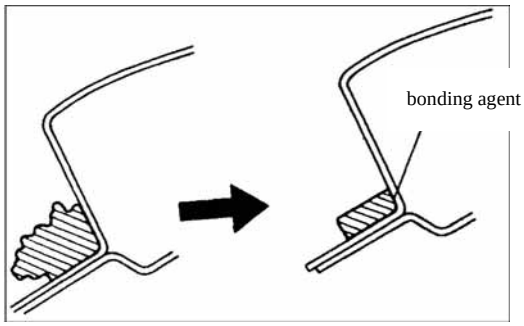


2. Clean and finish the joint surface of car body

Cut roughness off bonding agent sticking to car body with knife

Note：Keep bonding agent on car body as much as possible

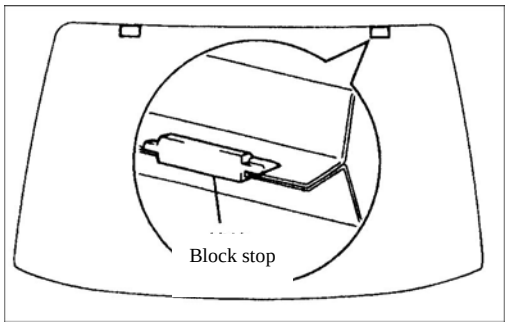
Clean the cutting surface of bonding agent with a rag soaked in cleaning liquid



Note：Even though all of bonding agent is completely removed, car body must be cleaned

3.Remove block stop：

Remove block stop by knife

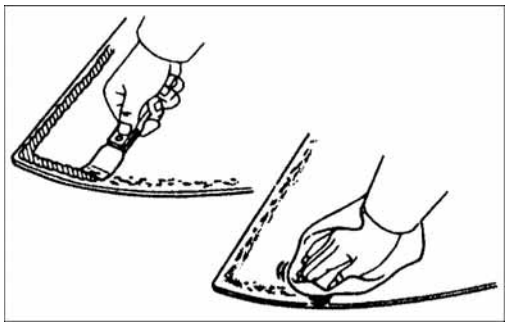


4. Clean removed glass

Remove the bonding agent stuck on glass with scraper

Remove block stop by knife

Clean glass with cleaning liquid



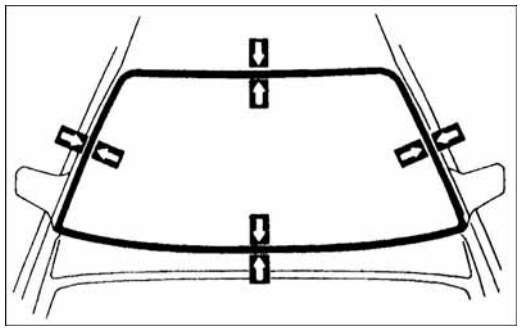
Attention：Do not touch glass after cleaning

5. Position glass

Put glass in right place

Make reference marks on glass and car body

Remove glass

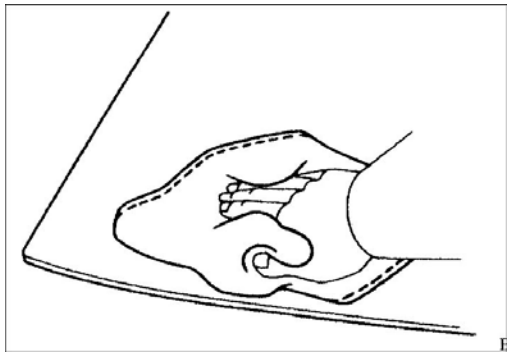


6. Clean the joint surface of glass

Clean the black dirt with clean liquid

on the joint surface of glass periphery

Attention：Do not touch glass surface after cleaning



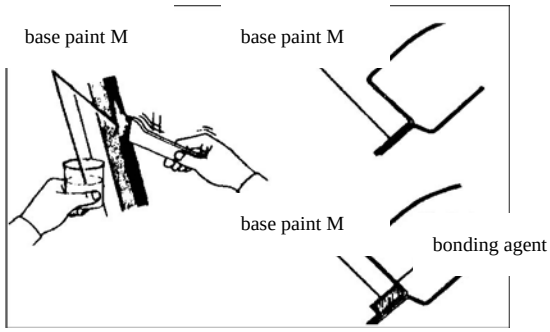
Coating a layer of base paint M on the joint surface of car body

Brush a layer of base paint M

onto the joint surface of car body

Attention：Leave base coating layer dry for 3 minutes at least

No coating on bonding agent

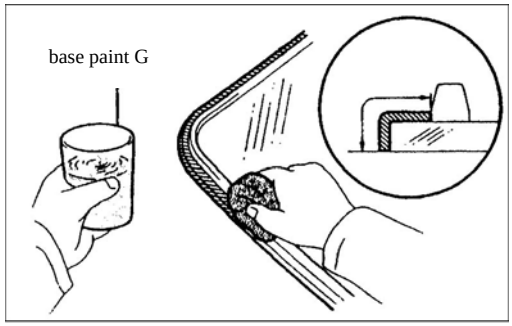


Never reserve unsealed base paint M for later use

7. Coat a layer of base paint G on the joint surface of glass

Coat a layer of base paint G with brush or sponge on glass periphery and joint surface

Clear base paint with a clean rag before drying

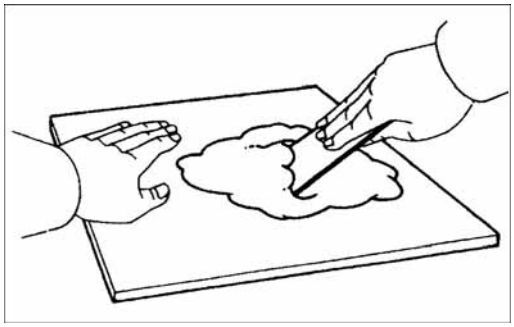


Attention：Leave base paint layer dry for 3 minutes at least

No coating on bonding agent

Never reserve unsealed base paint G for later use

8. Mix bonding agent



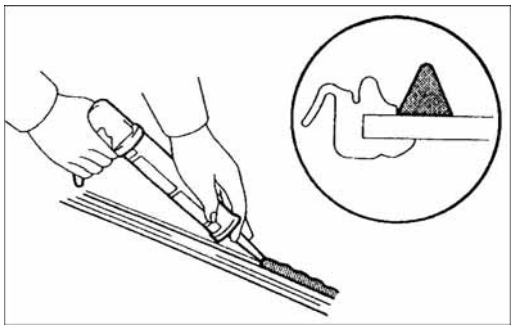
Attention :Ensure the fixation of inlaid strip to finish within the applicable duration of bonding agent

Mixing bonding agent must be completed within 5 minutes

Clean glass plate and oil loam scraper thoroughly with solvent

Fully mix 500g principal agent with 75g hardening agent with scraper on glass plate or similar object

9. Applying bonding agent

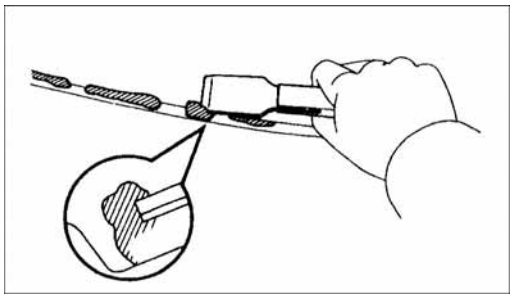


Cut off the tip of tubular pot and fill bonding agent in the pot

Put the pot into sealing glue gun

Apply bonding agent on glass as showed in the drawing

10.Install glass



When installing windshield, align the reference marks on glass and car body, then gently press in glass towards periphery

Smear glass at periphery with bonding agent using scraper

Remove excess or spilled bonding agent with scraper

Fasten glass until bonding agent hardened

11. Water leakage checking and maintenance

Water leakage test shall be conducted after curing time

Block up water leaking places with sealant

12. Fix lower outside filler strip on rear window

Put inlaid strips on car body and tighten the strap by patting

Attach wire connector for defroster

Install the following parts：

roof lining

inner roof lateral ornament

small rear seat illuminating light

assistant grasp

decorative board of glove compartment

upper parking lamp

speaker mesh guard

back of rear seat

Torque：18 N.m（185 kgf/cm，13 lbf/in）

bolts on the lower end of rear seat belt

Torque：43 N.m（440 kgf/cm，32 lbf/in）

rear seat cushions

When installing, the sequence is the reverse procedure of removal

Chapter 15 Wiper

Remove front windshield wiper assembly



（1） Pull out sealing strip

（2） Prize up decorative plate

（3）Loosen set bolts and take down wiper arm

（4）Loosen ten fixing screws to get out decorative plate

（5）Prize out link rod

（6）Loosen six fixing nuts on the left and right sides of link rod to take down link rod assembly

（7） Loosen four set bolts on wiper motor and take down the motor

Remove blade

Loosen seven set bolts and take down blade









Remove rear window wiper assembly

（1）Loosen eight screws on fastener and get out decorative plate

（2）Loosen three fixing screws on wiper motor and take down the motor







Remove jet washer

（1）Remove front bumper

（See the chapter on removal of front bumper）

（2）Loosen three set bolts and take down jet washer



（3） Loosen cable plug and move out and upward to get out front and rear jet

washer motors





Remove nozzle

Pull out the nozzle upwards to take apart with the tube

When assembling, the sequence is the reverse procedure of removal.

Chapter 16 Sun -Roof

Remove sun-roof assembly

（1） Unfasten twenty four fixing screws on sun-roof and car body



（2） Prize up and take down the plastic protective cover on sun-roof

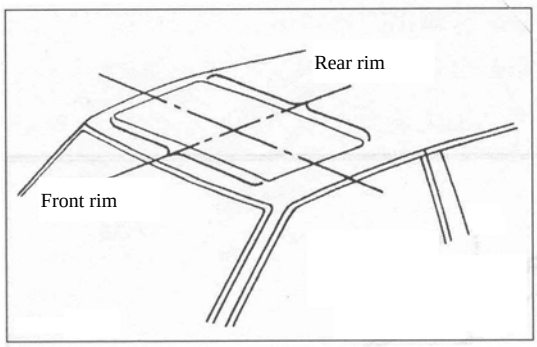


（3）Get sun-roof assembly out

Check the position of sun-roof glass

Check if there is water leakage when sun-roof is completely closed

Check if there is vertical separation between sealing strip and roof sheet



Front rim:

0±1.0 mm（0±0.039 in）

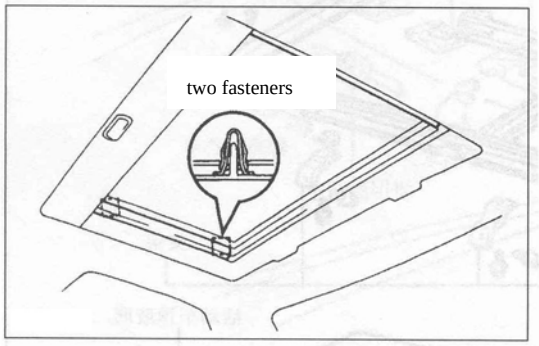
Rear rim：

0±1.0 mm（0±0.039 in）

Sun-roof adjustment

1.Remove sun-roof ornaments

Sun-roof ornaments on left and right sides must be firstly removed before adjustment



Note：**The ornaments will be repositioned after adjustment**

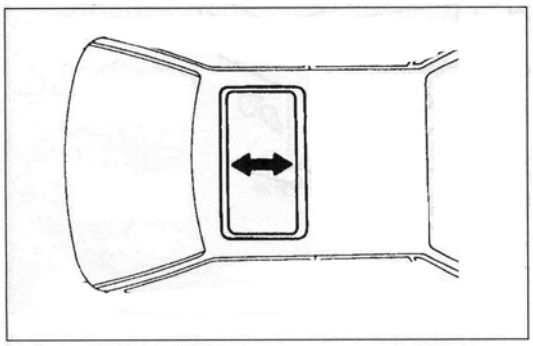
2. Upper and lower position adjustment

Tighten or Loosen bolts with torque screw driver to regulate vertical separation

Clearance：0±2.0 mm （0±0.079 in）

3. Front and back side adjustment

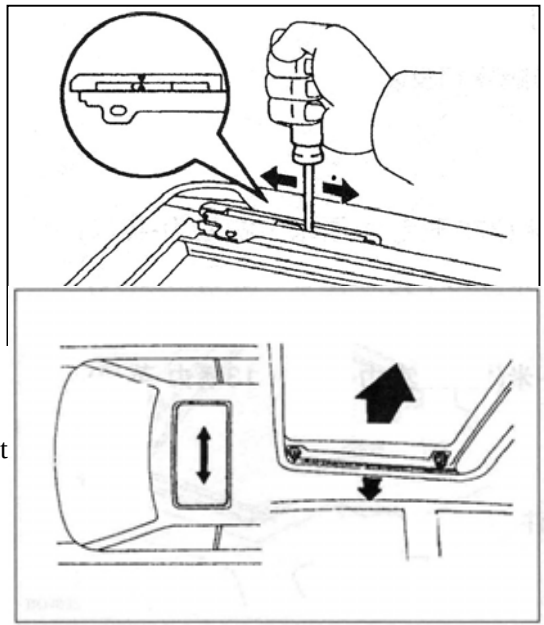
Loosen the fixing nuts on sun-roof and shift sun-roof bracket forward and backward to adjust



As showed in the drawing：

Make link rod slide forward and backward to align two marks

Slide by hand bracket to front terminal

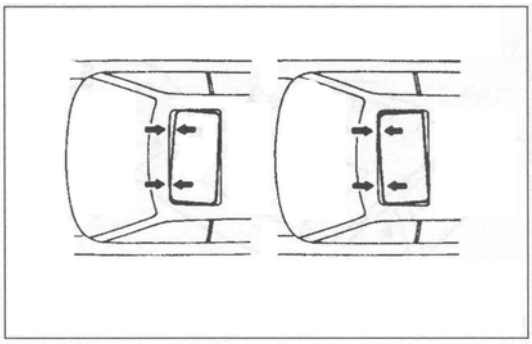


4. Left and right side adjustment

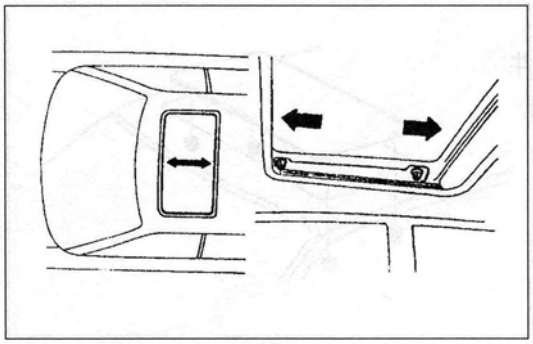
Loosen the fixing nuts at rear bearers on sun-roof and shift sun-roof left and right to adjust

5. Clearance adjustment

（clearance between left side and right side）



Loosen fixing nuts to readjust sun-roof to correct position



When assembling, the sequence is the reverse procedure of removal.

Chapter 17 Bumper

Remove front bumper

1. Remove baffle plates

（1）Loosen three fixing screws



（2）Loosen fixing screws and remove fasteners with unfastening tool



2. Remove splashers

（front-left and right）

（1）Loosen three fixinging screws on splasher



（2）Detach three fasteners with



screw driver and unfastening tool, and remove cover sheet

3. Remove front grid

Loosen two fixing screws and remove grid



4. Remove front bumper

（1）Loosen four fixing screws on inner left and right sides





（2）Detach seven fasteners with screw driver and unfastening tool



（3）Loosen the front screws beside the wires of fog lamp and turn signal light



5. Remove front fog light

Loosen two screws and remove front fog light



6. Remove front turn signal light

Loosen fixing screws and remove front turn signal light





7. Remove the grid cover on front bumper

（1） Loosen four screws on upper and lower sides



（2） Press down protecting fasteners and get grid cover out



8. Remove the reinforcement rods of front bumper（left and right）



Loosen four screws on upper side and take down the reinforcement rods

Remove inner bumper

① Take down the bundle of fog light

② Loosen four fixing nuts on left and right and take down inner bumper

Remove rear bumper

① Loosen two fixing screws on left and right (in boot)





② Loosen two cross recess head screws in tail part





③ Loosen four fixing screws on left and right





④ Loosen two set bolts on lower side and tremove rear bumper





Remove the small bulb on rear bumper

Loosen fixing screws and take down the small bulb



When assembling, the sequence is the reverse procedure of removel.

Attachment：

Maintenance Specification Torque Norm

Fastened Parts	N-m	kgf-cm	lbf-ft
engine hood	-	-	-
hood hinge ×hood	11.5	115	8.3
hood lock×body	7.8	80	69 lbf-in
hood suport×hood	22	225	16
hood suport×body	22	225	16
front door	-	-	-
power window×front door	5.5	56	49 lbf-in
door lock×front door	5.0	51	44 lbf-in
back door	-	-	-
power window×back door	5.5	56	49 lbf-in
door lock×back door	5.0	51	44 lbf-in
trunk	-	-	-
trunk hinge×trunk door	11.5	115	8.3
latch hole of trunk lock ×	-	-	-
trunk door	5.4	55	48 lbf-in
trunk door suport×trunk door hinge	22	225	16
windshield wiper×jet washer	-	-	-
motor and link rod assembly of windshield wiper×body	5.4	55	48 lbf-in
locating bolt for bar stay of auxiliary arm ×motor and link rod assembly of windshield wiper	5.4	55	48 lbf-in
wiper arm and blade assembly×motor and link rod assembly of winder screen wiper	22	225	16
seat	-	-	-
front seat	-	-	-
seat back assembly×seat cushion assembly	18	185	13
rear seat	-	-	-
back of rear seat×car body	18	185	13
seat-belt	-	-	-
front seat-belt	-	-	-
shoulder belt clip×adjuster clip	43	440	32
outer seat-belt clip×front seat	43	440	32
seat-belt retractor assembly×body（upper）	7.8	80	69 lbf-in
seat-belt retractor assembly× body（lower）	43	440	32
inner front seat-belt×power seat regulator	43	440	32
manual seat regulator×body	43	440	32
rear seat-belt	-	-	-
lower end of outer back seat-belt ×body	43	440	32
inner back seat-belt×body	43	440	32

Chapter 18 Explanation of S11 Entire Vehicle Circuitry and Pins

Chery S11 car electrical system adopt centric circuitry board mode, it means that the most part of relays and fuses are installed in the engine compartment relay box front side, main line connect each electric apparatus front back of the engine compartment relay box. In order to read the circuit diagram clearly, now give the explanation below:

（1）Entire vehicle electrical system positive power supply is divided into three ways, “30” is constant power supply line, “30a” which is through the fuse F20（40A）is also constant power supply, the voltage is 12V, it connect to battery directly, not through any switch, it always has electricity no matter the car is parking or the engine is turned off , it sends the power supply to the electric apparatus which need use power when engine is turned off, for example, parking lamp, alarm light, ceiling lamp and so on; “15”and “15a” is power supply line for the small capacity electric apparatus; it has electricity only the ignition switch is on II or III position. “Ka” is a power supply line for radio and cigarette lighter; it has electricity only the ignition switch is on ACC position. “X” is power supply line for starter pull-in winding.

（2）“F” stand for fuse, the number follow F stand for the fuse’s place in the central circuitry board ; For example, F9 means this fuse is in the ninth position of the relay box, the capacity of the fuse can judge by its color: red is 10A, green is 30A, yellow is 20A, blue is 15A.

（3）The ordinary color of wire is below:

W-white B-black R-red Br-brown O-orange

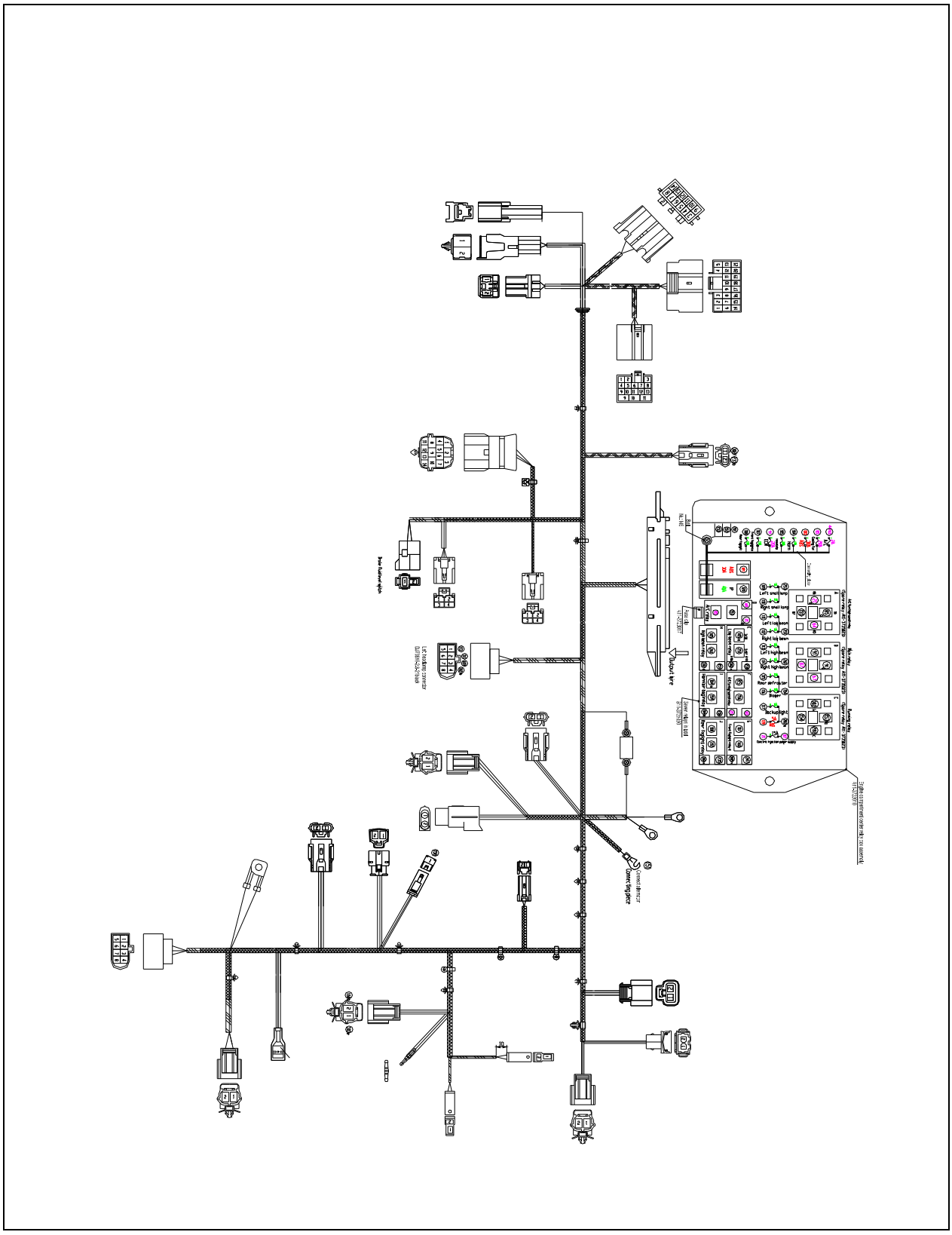
G-green L-blue Gy-gray V-violet Y-yellow

P- purple

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Section 1 Harness in engine compartment

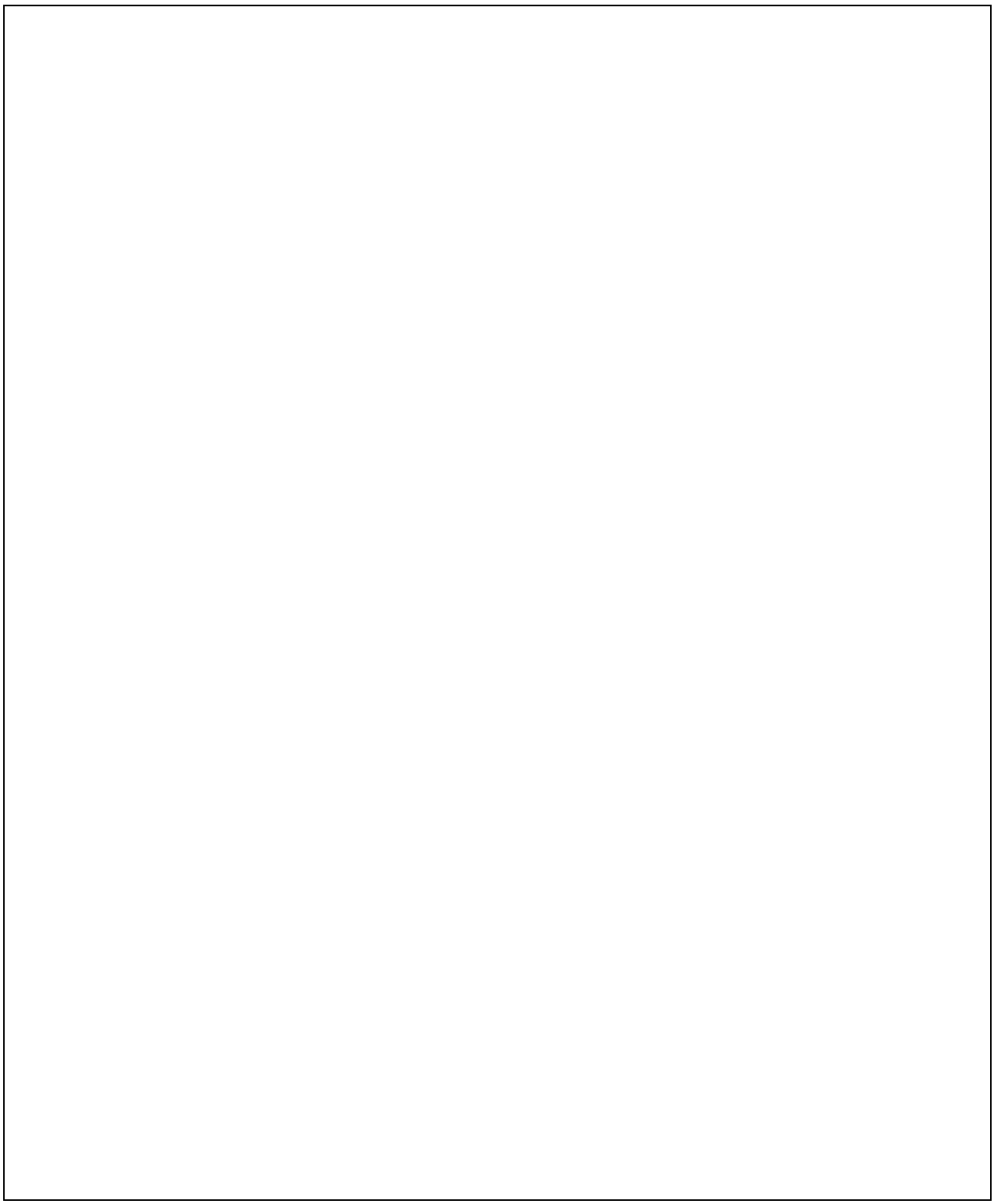
1. The distribution of engine compartment harness:



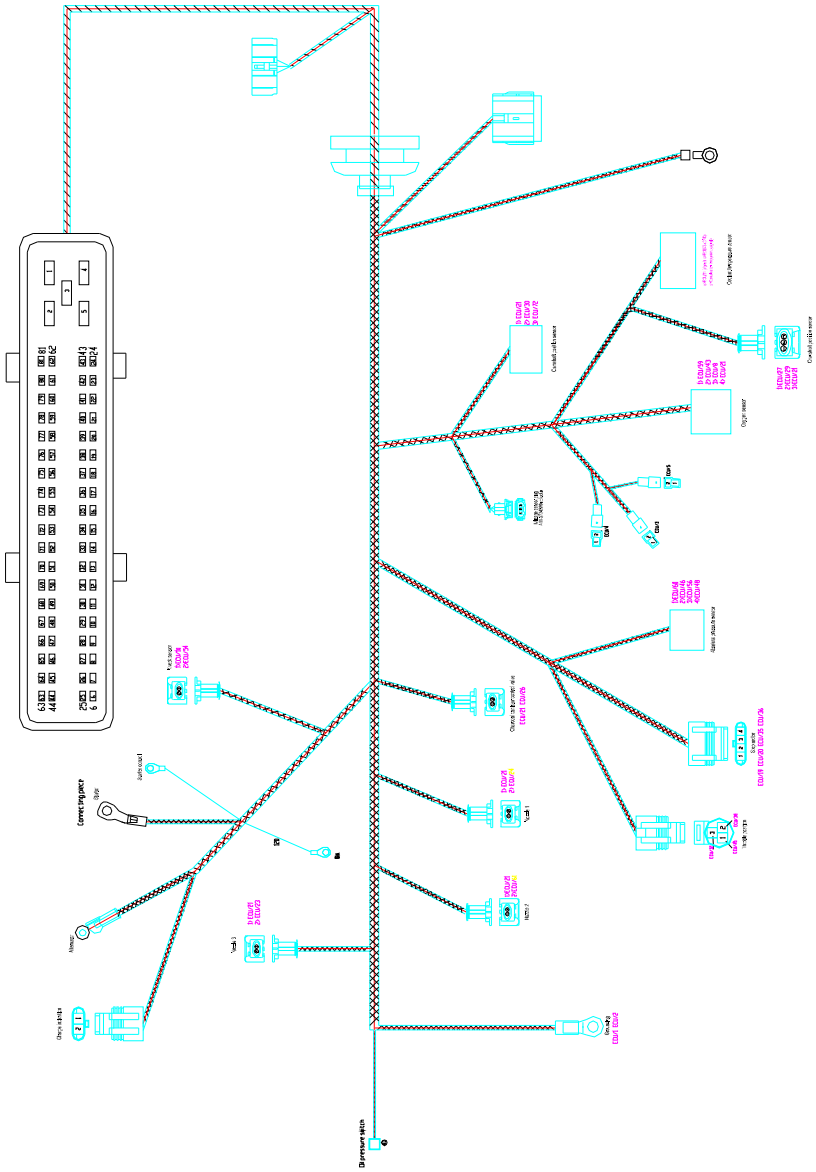
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Section 2 Engine harness

1. The distribution of engine harness:



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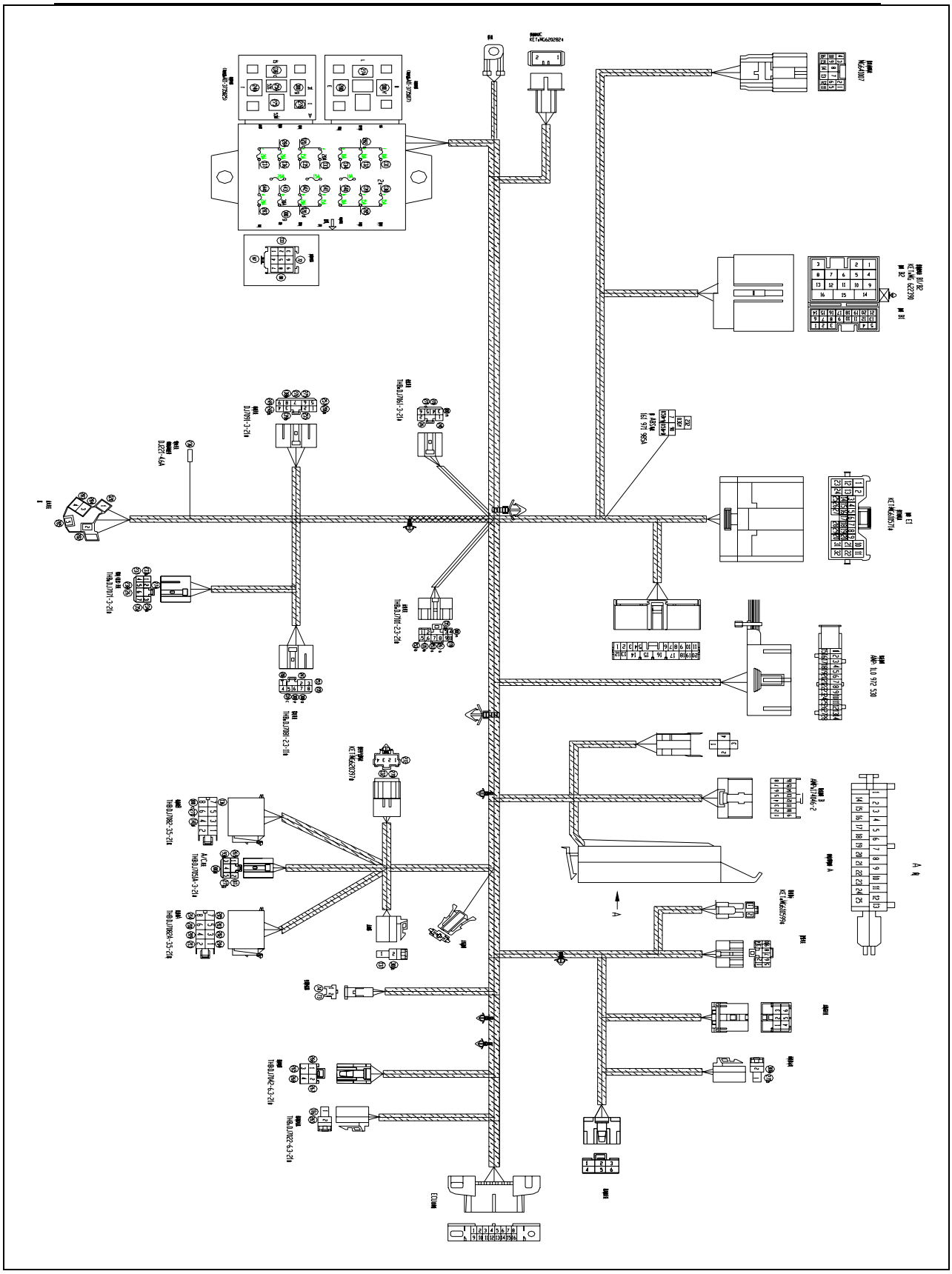


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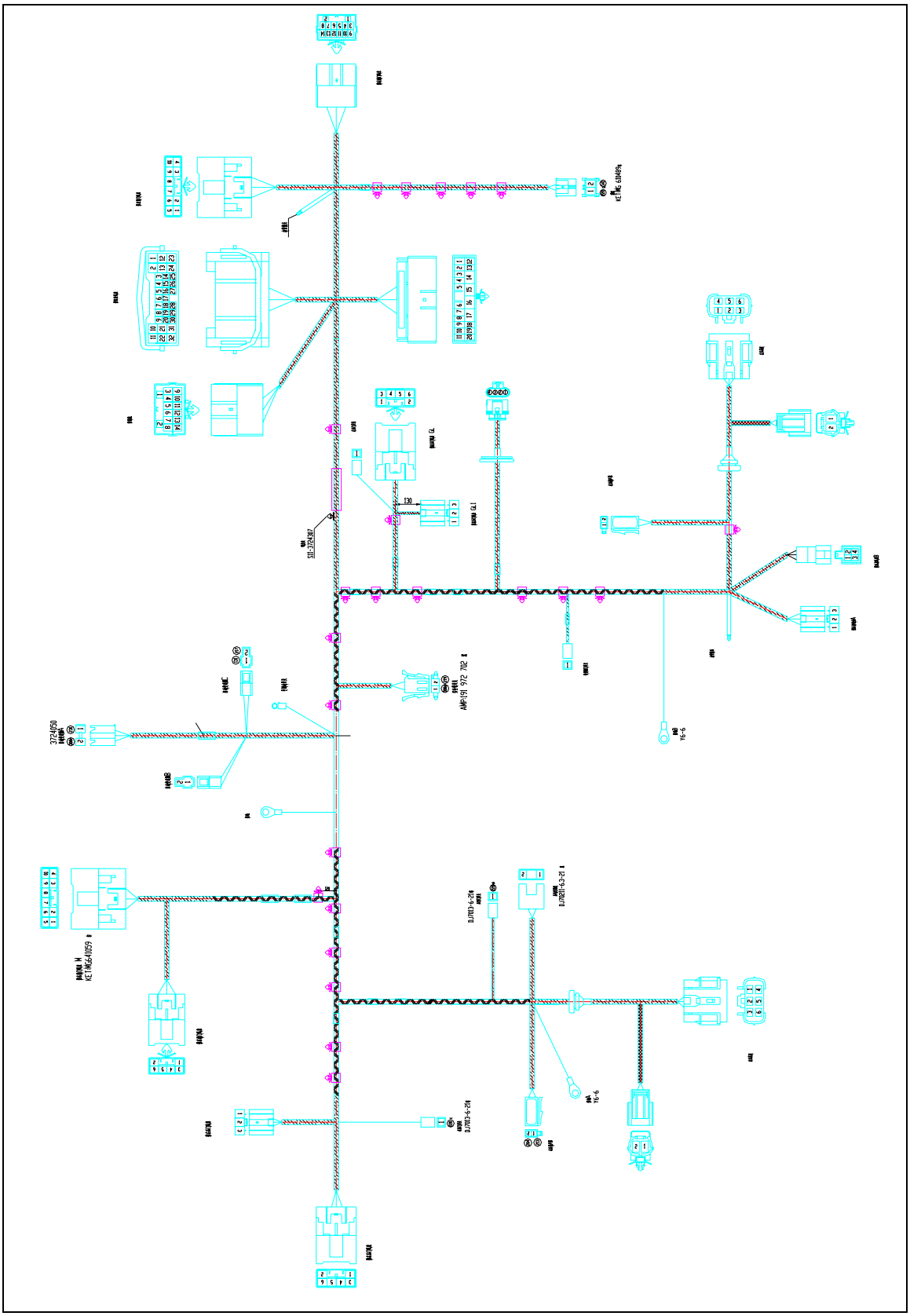
Section 3 Instrument Wire Harness

1. Arrangement of Instrument Wire Harness



Section 4 Interior Wire Harness

1. Arrangement of Interior Wire Harness



Chapter 2 Service of Car Body Sheet Metal Work

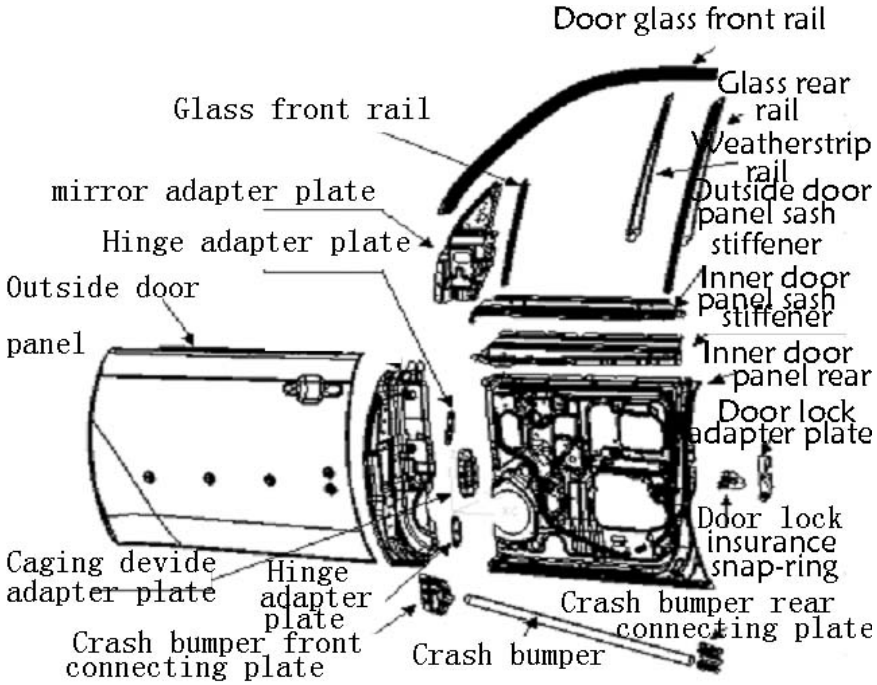
2.1 Overview of maintenance for four doors and two lids

Car body mainly consists of various kinds of framework parts, panels and other parts, technology of making door is the most complicated technology which touch upon parts stamping, parts welding, parts assembly and unit assembly, requested dimension coordination and process technique are very strict, therefore it is difficult to maintain the door, the standard of requested quality is much higher; enough understanding the structure of door is very important for the maintenance personnel to do the work smoothly.

2.1.1 Structure of door

Generally speaking, main components of door include accessories such as outside door panel、inner door panel 、door sash、glass run channel、door hinge、door lock and door window .Inner door panel is equipped with window lifter and door lock, partial inner door panel shall be strengthened for security of assembly. In order to ensure safety, bumper shall be installed inside the outside door panel. Combine inner door panel with outside door panel by means of revers, adhere and seam welding, in connection with different stand force, weight of outside door panel shall be light, stiffness of inner door panel shall be strong, so it can undertake considerable impulsive force.

Main components of door unit is relatively less in amount, it consists of outside door panel、inner door panel、glass slide、sash reinforcing slab 、door lock mount slab、hinge reinforcing slab and bumper unit in the ordinary way; A typical diagram of door's structure is illustrated as follows.



2.1.2 Technological process of door maintenance:

Generally speaking, basic method of four doors and two lids maintenance is the same as technology of common sheet metal work maintenance; the following procedures are introduced as follows:

(1) Initial check

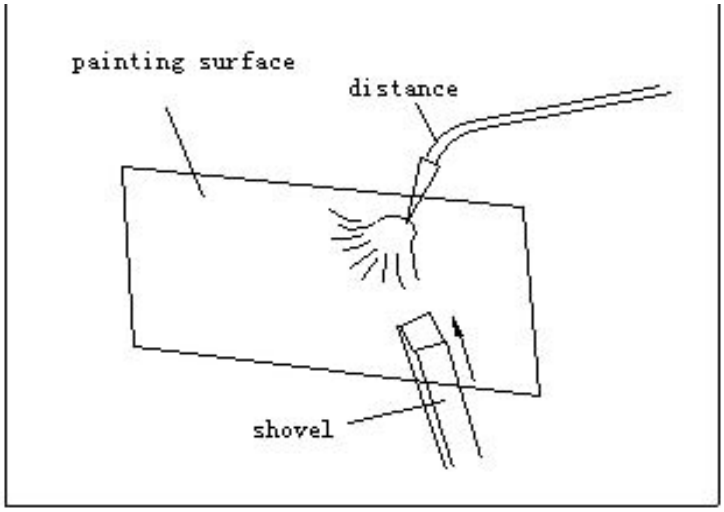
Measure the relative position and dimension between gaps for door and other car body unit.



(2) Clean the door .Clean dirt and grease stain off the door with water or detergent, make it fully dry and ready for inspection.

(3) Identification of maintenance estimation. Determine maintenance method, making estimation for the scope and degree of door's damage through inspection.

(4) Purge old painting .After cleaning or before repair, get rid of old painting according to actual condition, especially in the place of obvious rust 、gap and concave ;Methods of paint removing are introduced as follows: hand work method 、heating method、apparatus method、chemical method。



(5) Detect after disassemble. Generally speaking, it includes measurement for geometric dimensions between sheet metal parts of all kinds, inspect concrete location of damage, make clear the type of damage, analyze cause of damage, determine maintenance plan.

2.1.3 Main content of door maintenance

Generally speaking, cause of door damage has something to do with the following four aspects: defect in structural design, defect during the process of production, chemical damage while being used, physical damage while being used. Main damage causes are introduced as follows:

1. Abrasive wear. Caused by surface friction produced by relative movement because of sheet metal parts surface touch together and being weighted; for example, door is hanging down, coordination gap is enlarged because of long time abrasive wear between door hinge hole and spindle.

2. Corrosion

Oxidizing reaction of sludge-liquid and filth accumulated on surface of the metal; or rust produced by not adopting preservative treatment after welding repair or corrosion resulted by touching chemical substance. It occurs frequently in sandwich position and spot welding article joint .

3 Fissure or rupture

Fissure and rupture when it is serious, caused by sheet metal fatigue in the position of stress concentration and weak link of structure because sheet metal suffers from internal and external stress repeatedly.

4 The hollowness and fold damage.

The hollowness means that deformation of elasticity or plasticity because of collision and forcing of door panel.



5 The crooked and twisted damage. That kind of damage means crooked or twisted damage because the door undertakes too much burden.



2.2 Basic method of door maintenance

In view of above-mentioned damage type, main methods of doors and lids maintenance include sinking trim, flame straightening, weld, repair by embedding

2.2.1 Trimming the rough and uneven surface

You should correct the structural casting first then correct the crease or the hollowness of outside door panel if the rough and uneven surface of outside door panel is indirect damage because of structural casting damage or stiffening rib damage. You can carry out initial rough repair with hammer, beam pad or jimmy 、punch if you can touch the back of metal plank, you can carry out repair by means of slip hammer and peen hammer if it is difficult for you to touch the back or the metal plank is sealed.

The common rough and uneven surface trimming methods are introduced as follows:

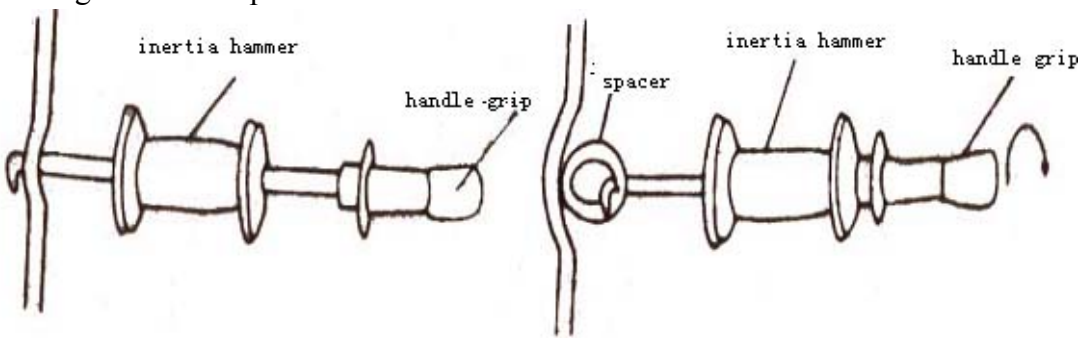
(1)Trimming the hollowness with beam pad and hammer. It is the most common method to knock the metal plank with hammer and beam pad.The two sides of metal plank which is to be trimmed must be applicable to hand holding beam pad.There are two operating methods to take the beam pad as supporter for hammer:

1) Knock on the beam pad with hammer. This method is applicable to the shaping to relative small and shallow hollowness and crease. You can knock the protruding from right side. The knock will result in metal plank contraction and make the metal plank to be smoothened gradually.





2)Not knocking the beam pad with hammer. This method means put the beam pad under the lowest place of the hollowness, knock the nearby place with hammer.
Generally speaking, while trimming the hollowness with hammer and beam pad ,the protruding side shall be knocked by the hammer, the other side shall be gasket ,you can make rough shaping with wooden hammer then make fine trimming with iron hammer.(see figure 7).In the case of hollowness with much bigger area, beam pad shall be put in the more shallow position of the hollowness, the hammer shall knock the much higher position of the protruding, iron hammer and wooden hammer shall be used alternately accordingly.
(2)Trim the hollowness with jimmy. jimmy can be self-made according to characteristic of the vehicle body, they are handwork tool in common use for door maintenance. can be used to put into the limited space of sandwich position of doors and lids ,it can prize open the hollowness, this kind of method can be applicable to the hollowness which is not easy for spacer and hammer to reach because of the narrow sandwich position of doors and lids, can be also used as the spacer to make the hitting power of the hammer spread in much larger area.
(3)Trim the hollowness with puller. puller can be used to trim the shallow hollowness which is difficult for other tools to touch upon, it is can be used inside the metal plank. There are two operating methods of puller in common use.

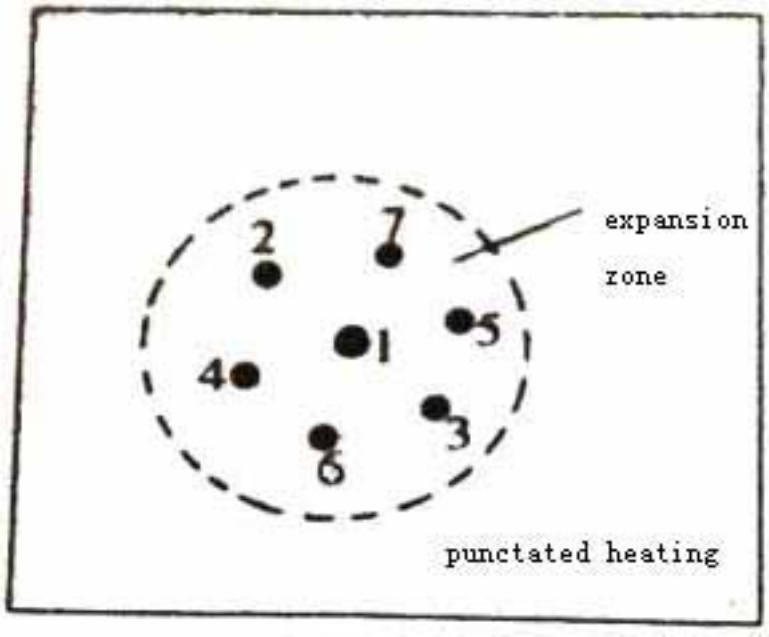


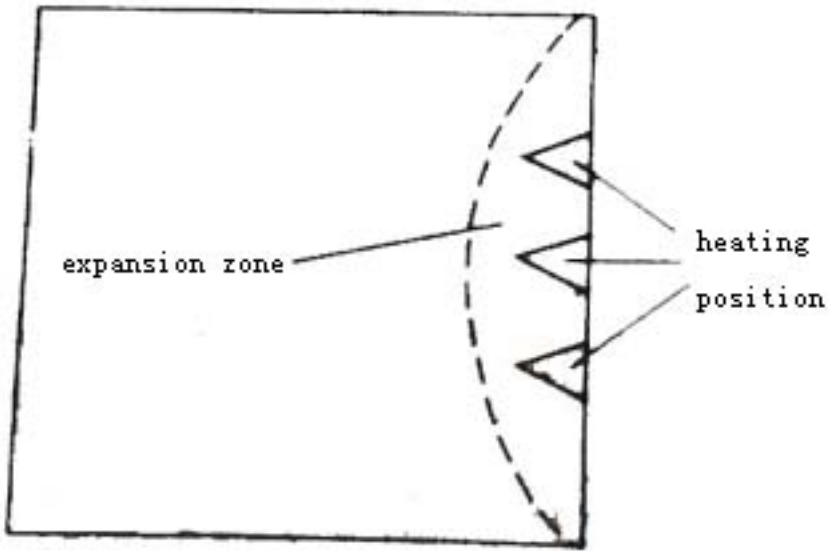
One is boring method. That means to drill a small hole in the hollowness with portable electric drill, then insert the withdrawal lever of thread summit or hook summit in the hole, draw the hollowness slowly through inertia hammer sliding on the metal withdrawal lever and colliding the handle repeatedly. You can drill more holes when necessary, fill and smooth the holes with tin-lead bonding after the hollowness is flattened.
The other method is electrode welding.That means welding the stud nail or spacer on the hollowness with special use spot welder, then pull the stud nail or spacer outwards withpuller,until the hollowness is flattened. You can weld more nails and spacer accordingly, pull the whole hollowness gradually. Finally, polish the welded mark and smooth it with grinder. This kind of method avoids making holes in the metal plank; eliminate the potential corrosion of metal.

2.2.2 Recovery of stretchable position

It happens frequently that sheet metal of the hollowness is stretched after being collided. It is not sure that the stretchable position can be recovered completely using the correct operational method during trimming process ,therefore, it is necessary for you to combine with heating contraction method to achieve the goal of trimming.

(1) Heating position and flame energy.
Effectiveness of flame straightening is up to heating position and flame energy, different heating position result in different straightening effectiveness. The maximum and longest deformation position shall be selected to be the heating position, that is to say the outside of deformation. Different flame energy heating results in different straightening ability. The more the flame energy, the more the heating speed, the stronger the contraction ability, the more concentrated the heating energy , it is ok to heat the low carbon sheet metal to cherry red color （600℃~800℃）.
(2) Heating mode
Heating mode which flame straightening method adopt in common use in vehicle body maintenance include:
1) Point -like heating, it means that heating area is the circle-like points within certain diameter scope, generally speaking, the diameter is 15-30mm,you can heat one point or more adopting quincunx distribution accordingly, it is often applicable to the contraction of protruding in the middle of the panel.
2) Triangle heating, it means that heating area representing triangle shape, it happens frequently in the deformation of strip material and panel edge.





trigon heating

(3) Cooling contraction mode

You can choose appropriate cooling mode according to stretchable degree of sheet metal after evacuation from flame, different cooling mode result in different shrinkage.

1) Natural cooling contraction. That means natural cooling in the air, which is applicable to deformation place with smaller shrinkage.

2) Water cooling. You can cover the heating area with wet cotton cloth in order to make cooling, the shrinkage is deeper in degree than natural cooling ones, but it is easy for the sheet metal to be tendering.

3) Combination natural cooling with hammer knocking, it happens frequently to use hand hammer and spacer, knock the surrounding of heating area promptly, enlarge the contraction stress and shrinkage, until beaten that position, you'd better use wooden hammer, you'd better not put more pressure, so that the sheet metal is not to be stretched once more.

2.2.3 Made-up in digging style and restore

If local part of door sheet metal piece rot away or the damage is too serious to be repaired, you shall dig that damaged part and enchase with relevant substitute materials. It includes pasting made-up and digging made-up:

(1) Check the circumstances of damage make clear the repair scope.

(2) Make paper sample in accordance with the defined repair scope.

(3) Scribe lay off on the sheet metal according to paper sample, leave appropriate processing.

(4)Adopt suitable shaping method, make the enchase piece tally with parts needing to be repaired.

(5)Keep the enchase pieces close to the requested position, draw the bordering line of the parts needing to be cut, then cut off the useless part, You can adopt method such as gas cutting、shear ,bring two things into contact properly.

(6) Weld the welded seam with oxygen acetylene weld or CO2 blocking welding. Weld properly

to take the small weld nugget as positioned weld according to interspaces of 30mm-50mm, carry out welding in order after knocking ,make the surface to be flattened. In the case of welded seam which needs high intensity, it is better for you to adopt two sided welding mothod.
(7) Flatten the welded seam with flat hammer, eliminate the welding pressure, then shaping it, and polish the welded seam with rotary sander.

2.2.4 Recovery of fold

Fold includes “live folding”and“dead folding”according to damage degree of sheet metal pieces, “live folding” means the slight fold which is can be eliminated directly by knocking the protruding with hammer. “dead folding”refers to the serious folded part which squeeze together tightly, two edges of the fold will become more and more “dead”, even cannot be relaxed if you directly knock the protruding with hammer, therefore it is called “dead folding”.In principle, recovery of fold is to open the “dead fold” first, make it unfolded gradually ,and make it become “living fold”, then change the“live folding”to rough and uneven in surface, recover the rough and uneven ones accordingly. The repair procedures are introduced as follows:
(1)Put the straightening force opposite to percussive force on the folded place adopting unfolding method, make the fold unfolded, make the fold relaxed.
(2) Dismantle the damage parts and put it on the surface plate, begin from inside of the fold, you can use suitable tools for prizing it open, heating with welding blow lamp while prizing it open, turn the “dead fold” to “living fold”.
(3) Flatten the “living fold” from inside fold area with hammer. The knocking point shall be put on the most protruding place. At the same time, it is necessary for you to make the surface plate to play the role of mat while knocking. After it is ok, you can rotate the parts to knock the other side until the folded parts are unfolded totally.
(4) Make it recover basically by means of heating and knocking while measuring with the sample.
(5) After installing the finished parts in the vehicle body, you can check it according to the sample; you can make further and finer straightening work in order to make it achieve the goal eventually.
(6)You can adopt digging recovery method if it is impossible for you to repair the serious folded damage in local position of sheet metal parts.

2.3 Welding of four doors and two lids

The following welding methods can be applicable to door welding: oxygen acetylene weld 、CO2 blocking welding、hand work arc welding、resistance spot welding、brazing .Furthermore, in order to not make the vehicle lower its own strength and durability, you’d better adopt the same welding method as original maker’s as possible as you can, size and type of all welding sockets shall be similar to the original maker’s.
In the case of appearance quality, defects such as burn-through, half point,fissure and large amounts of fins for weld nugget shall be prohibited, surface of weld nugget shall be smooth and good-looking, obvious twisted deformation shall not be allowed, depth of press mark shall be

less than 20% of the plate thickness; As to whether or not strength of weld nugget is strong

enough, you can make use of shovel and hammer to carry out negate damaging test. You can knock in between two weld nuggets with shovel,to see whether or not it will be sealing off, you can knock it with hammer for the recovery. Flash shall be prohibited in the case of welded seam, lapping welded seam shall be good looking, defects such as air hole and fissures on surface shall be prohibited, and defects such as undercutting, overlapping and burn-through shall be prohibited while welding.

2.4 Installation of four doors and two lids

Installation of door and lid mainly involve levelness, clearance and hinge moment of force, the concrete procedures are introduced as follows:

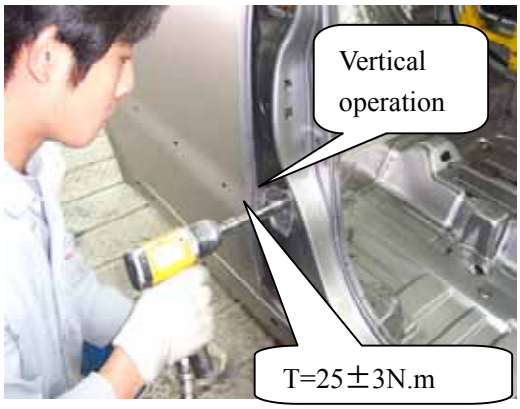
2.4.1 Put your right hand in the installation hole, hold the upper edge of door frame tightly with left hand; make lower edge of door panel and upper edge of wind hole touch tightly, then make the door panel and wind hole edge keep close together perfectly.

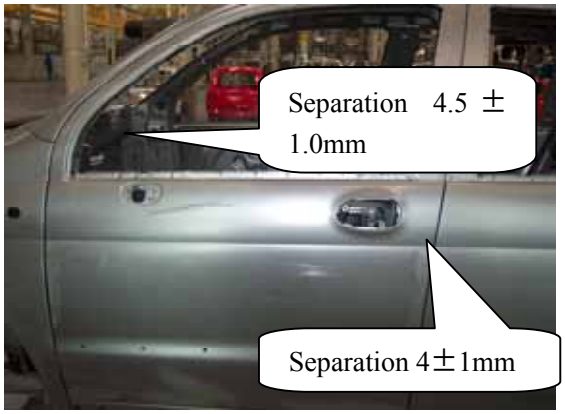


2.4.2 Put 4mm iron of plug and magnet on the illustrated position properly, iron of plug has clearance under control, magnet has levelness under control.



2.4.3 Tighten the M8×22 combination bolts in proper order by hand, then hold the front end of wrench by left hand shown as the illustration, hold the handle by right hand, operate vertically, make the door hinge and hull structure body tightened.



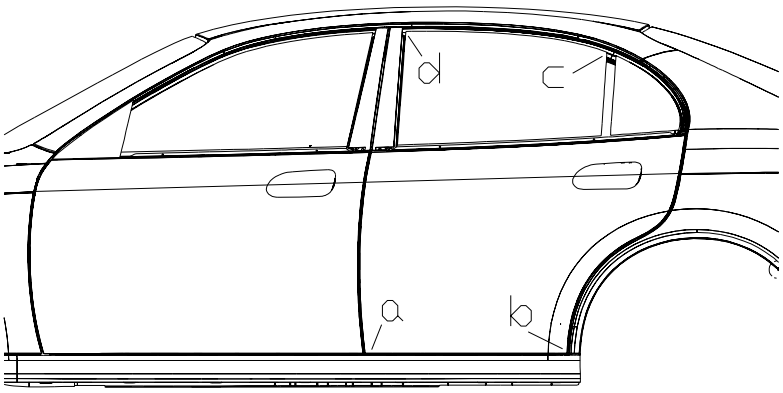


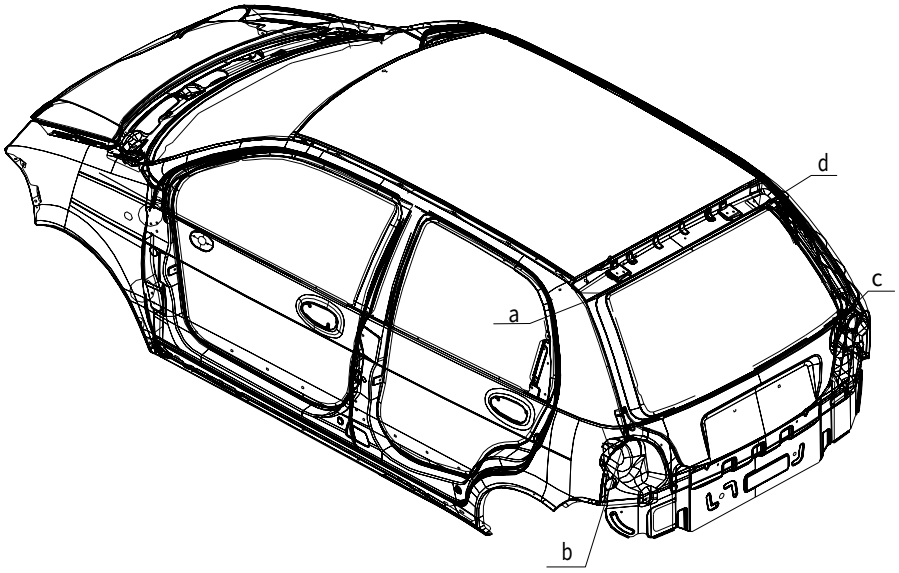
2.4.4 Adjustment: After adjusting the rear door assembly, it is necessary for you to tune-up the levelness, clearance and alignment between rear door assembly and the lateral enclosure, levelness of a～b is -1.3（0～0.5）mm, requested clearance is 4.0±0.5mm；levelness of b～c is 0,requested clearance is 4.0±0.5mm；Levelness of c～d is 0,requested clearance is 4±0.5mm；levelness of d～f is －0.7，requested clearance is 4.5±1.0mm；Alignment needs the door crest line is slightly higher 0.1～0.3mm than the crest line of lateral enclosure.

While adjusting front door assembly, it is necessary for you to tune-up the levelness and clearance between the front door assembly and upper part of lateral enclosure, the levelness is -1.3(0～0.5)mm，requested clearance is 4.5±1.0mm；Levelness and clearance between front door assembly and lower part of lateral enclosure, levelness is -0.7(-1.0～0)mm，requested clearance is 4.5±1mm；levelness, clearance and alignment between front door assembly and rear door assembly, levelness is -0.3(0～0.5)mm，requested clearance is 4±1mm,alignment of front door crest line is slightly higher 0.1～0.3mm than the crest line of rear door. Top of front door and rear door, alignment of front door and rear door bottom part is 0±1.0mm。

While adjusting the rear back door assembly, it is necessary to tune-up the levelness, clearance and alignment of rear back door assembly and the lateral enclosure, levelness above point a is ±0.5mm，requested clearance is 4.4±1mm；levelness below point b is 0.8（-0.5～0）mm, requested clearance is 5.4±1mm；levelness above point a～b is 3.5（-1～0）mm，requested clearance is 4.4±1mm；tune-up the levelness and clearance of rear back door and the roof, the levelness is 0.4（-0.5～0）mm, requested clearance is 0.4（-0.5～0）mm. Alignment between rear back door and rear wing is 0.

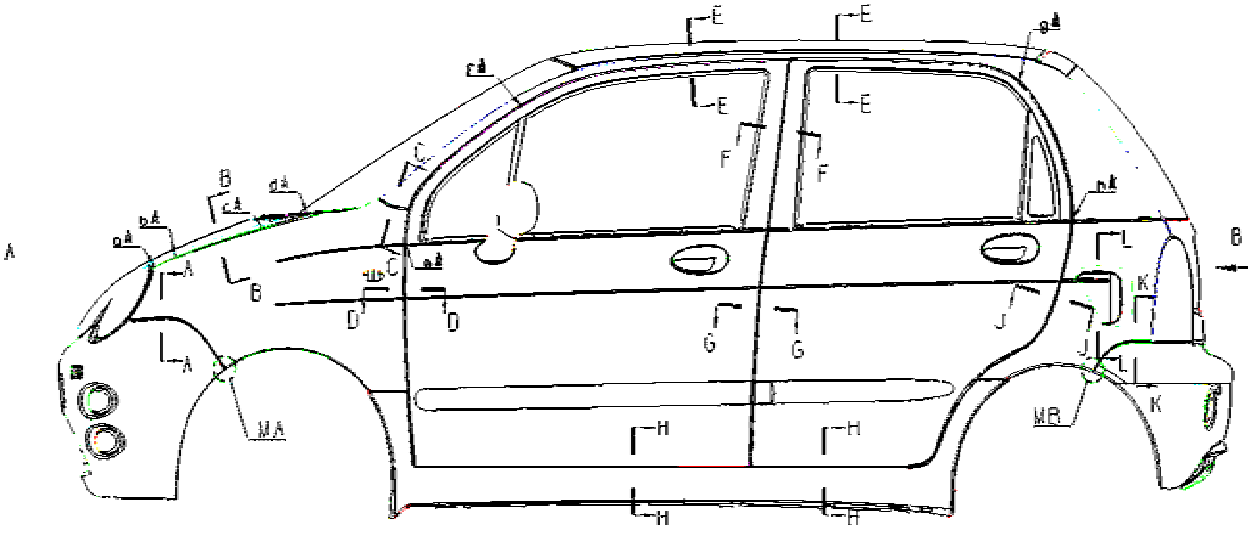
While adjusting the engine head assembly, tune-up properly the clearance, levelness and alignment between the engine head and the wing, clearance is 4±1mm，,requested levelness is 1±0.5mm；fix the engine head assembly on the hinge with M6×12 Allen bolts by hand, tighten it with pneumatic screwdriver (model: LUM 25 hr05),technological torque is T=10±1Nm；The engine head assembly and the wing are transitive smoothly; alignment of front end is 0±1mm.





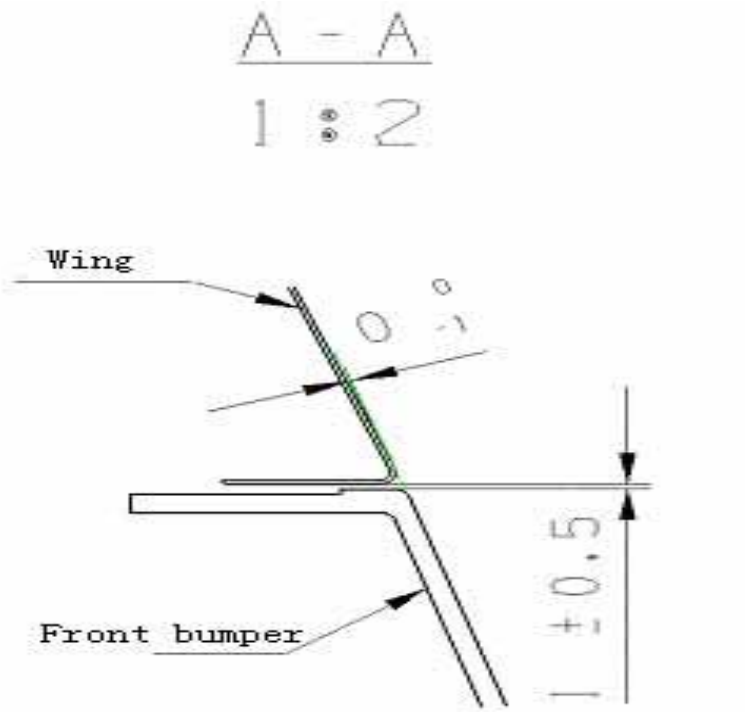
2.5.2 Dimension of vehicle body

2.5.2.1 Side view

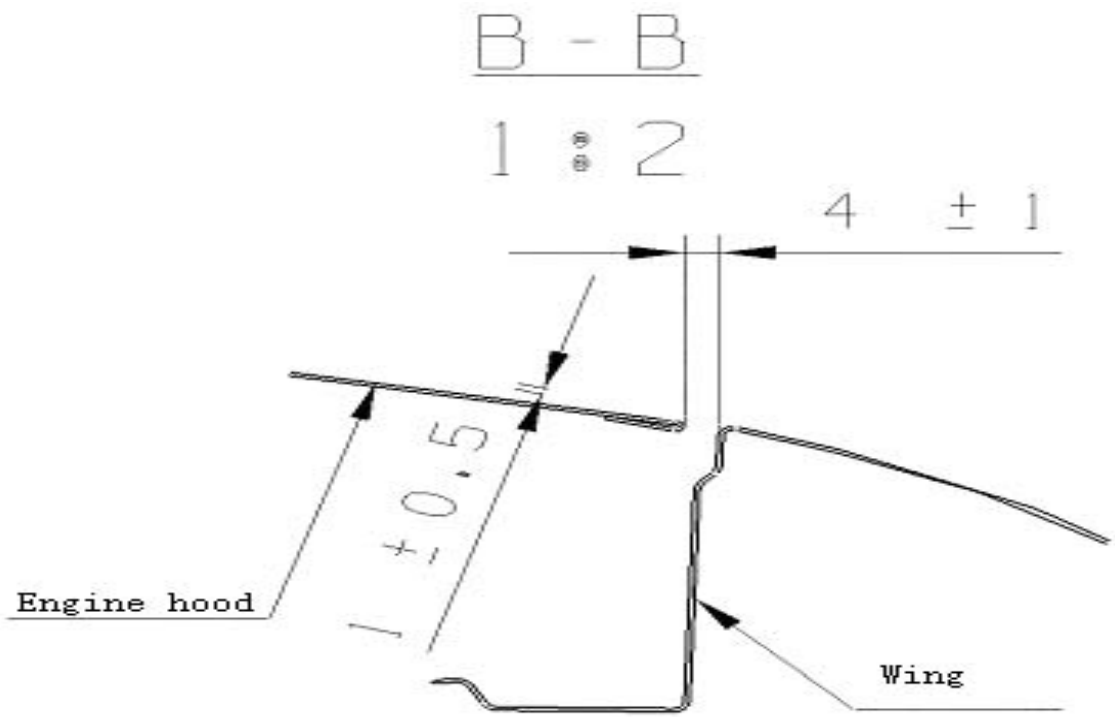


In the illustration: point a to point b, point d to point c, alignment is transitive evenly from 0 to 1,point e to point f, point h to point g, the clearance is transitive evenly from 4 to 4.5.other The cross section is introduced as follows:

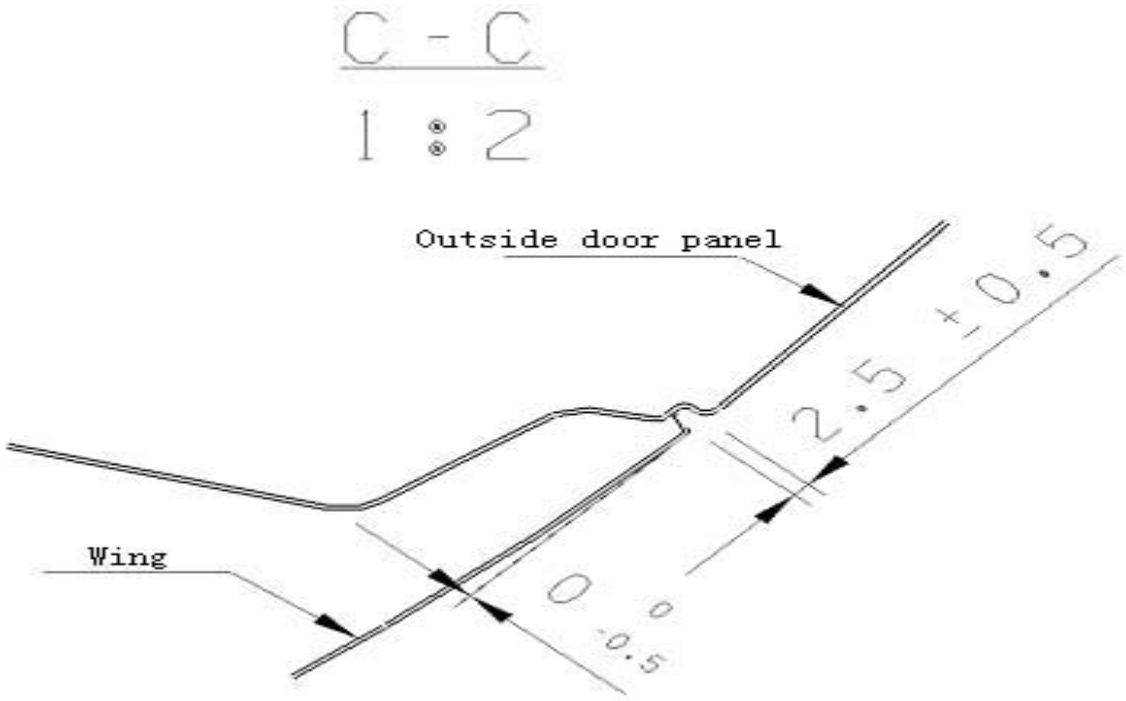
A-A The cross section, the request of clearance and plane



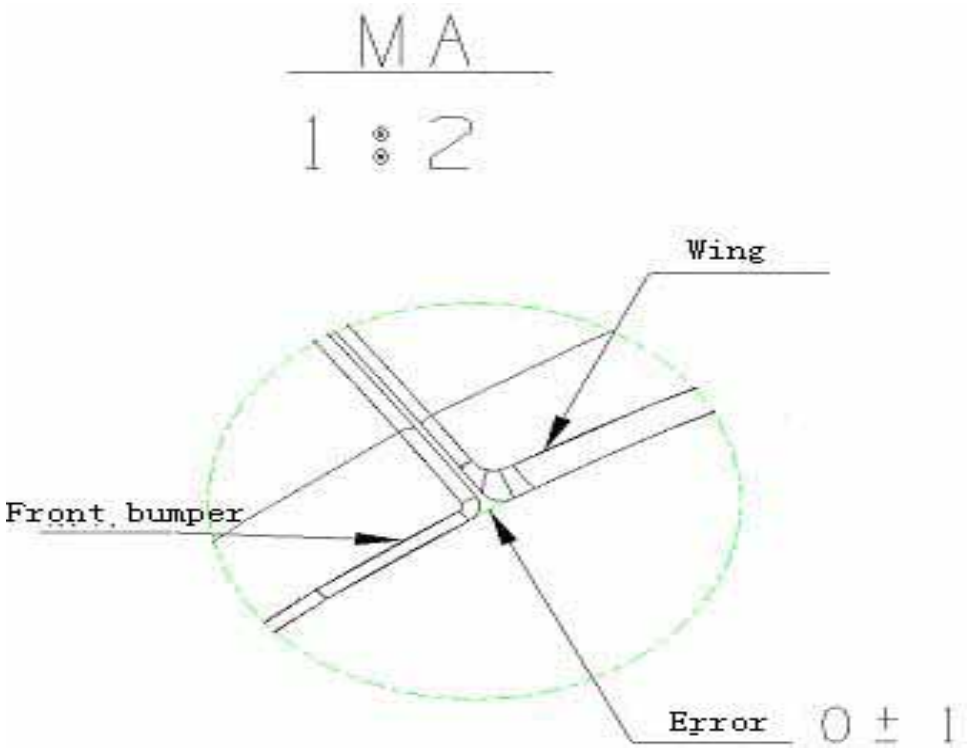
B-B The cross section, request of clearance and plane



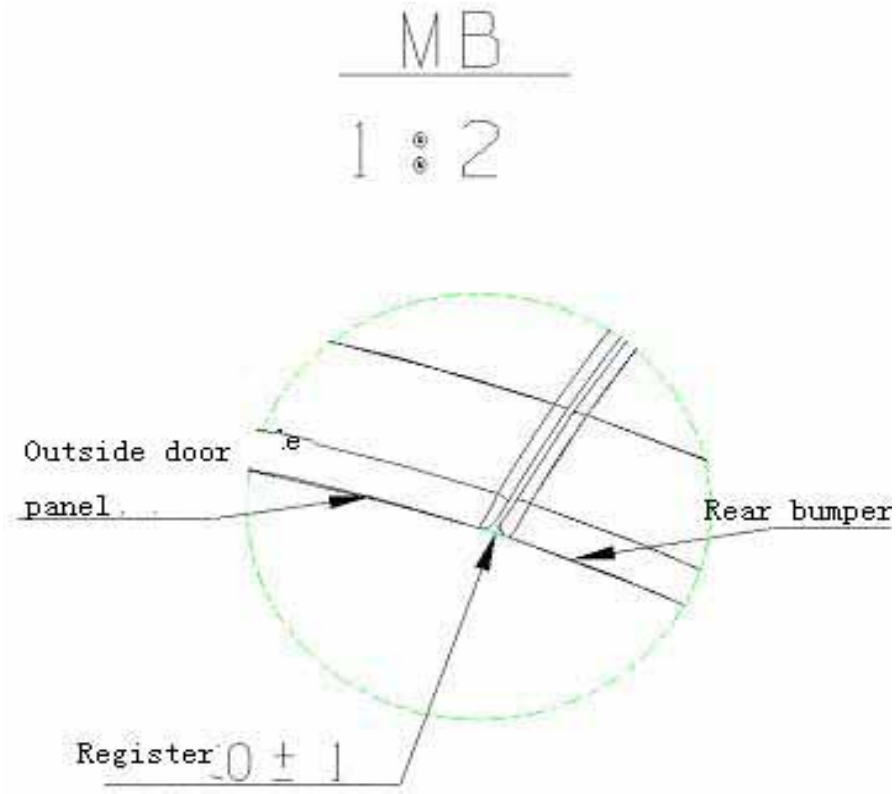
C-C The cross section, request of clearance and plane



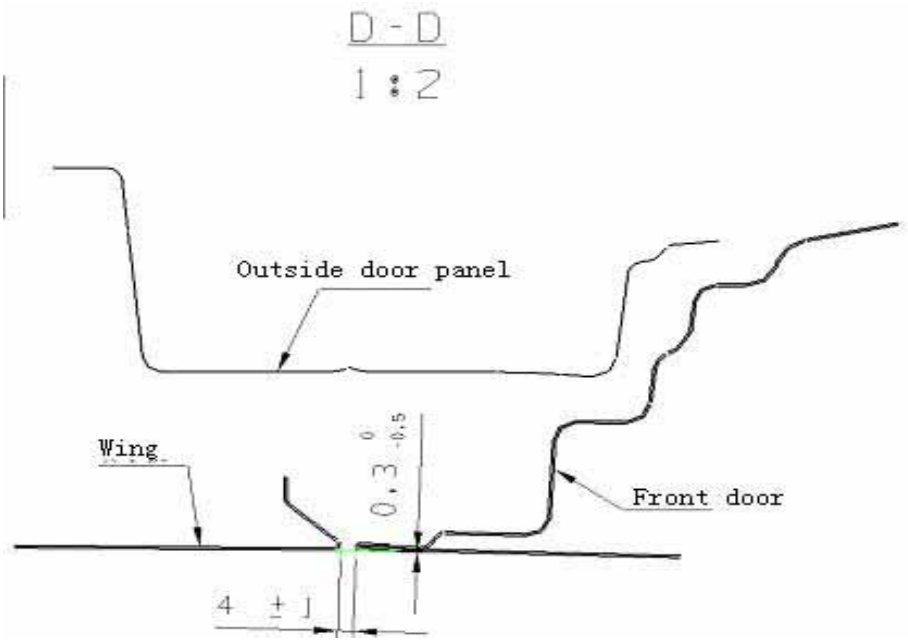
MA The cross section enlarging figure, request of plane is 0±1



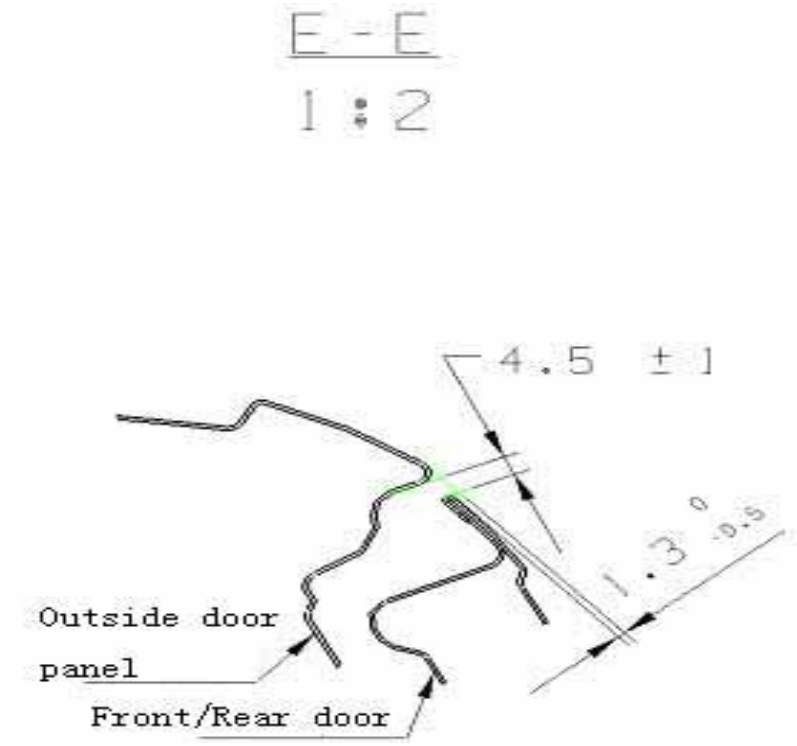
MB The cross section enlarging figure, request of plane is 0±1



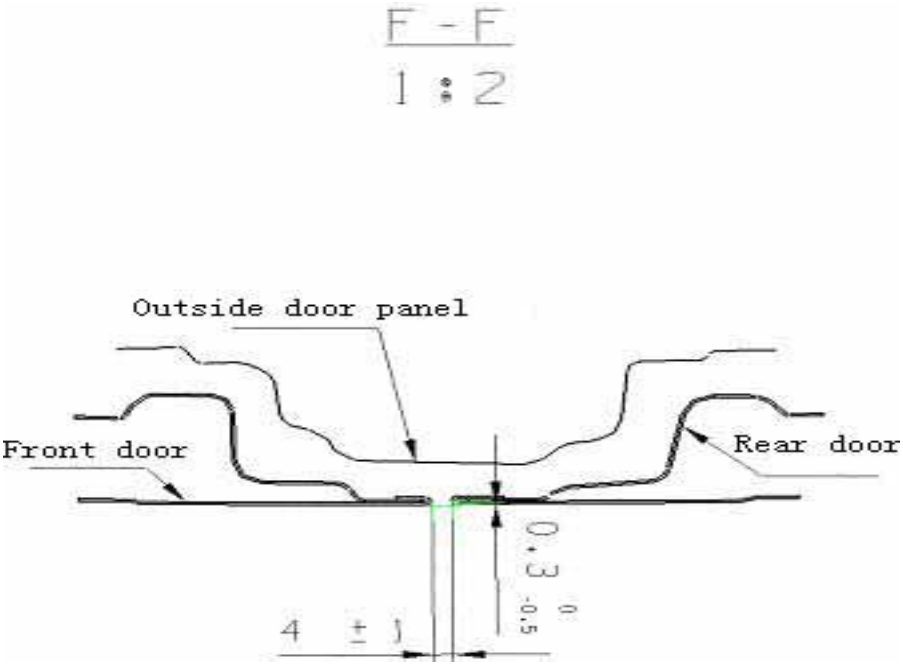
D-D The cross section, request of clearance and plane



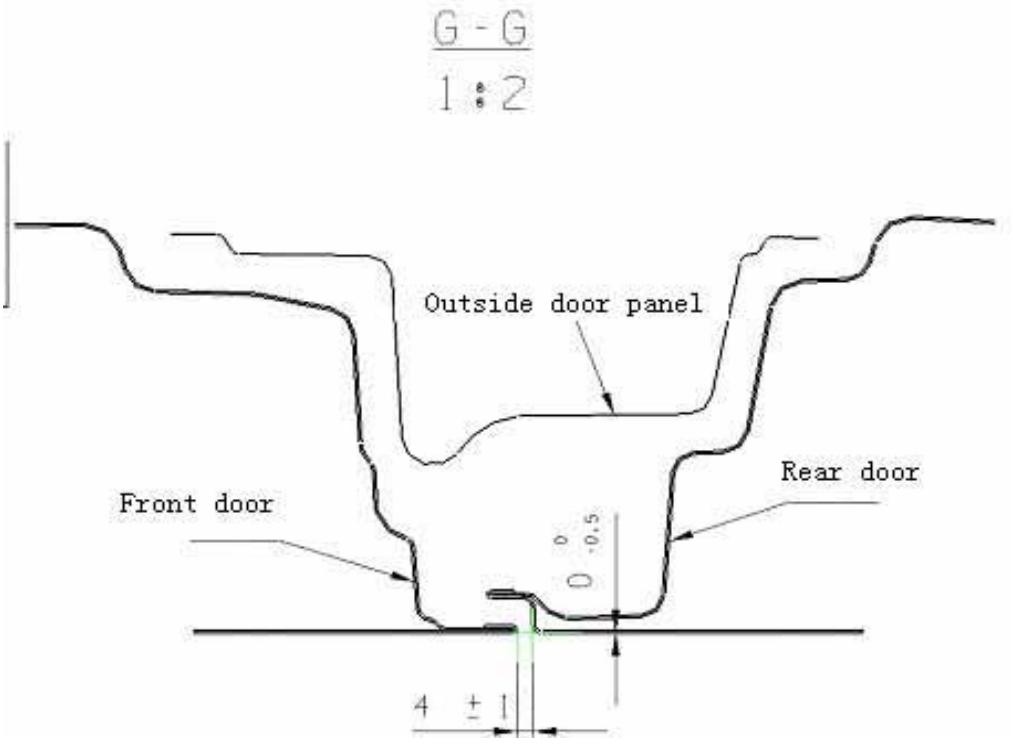
E-E The cross section, request of clearance and plane



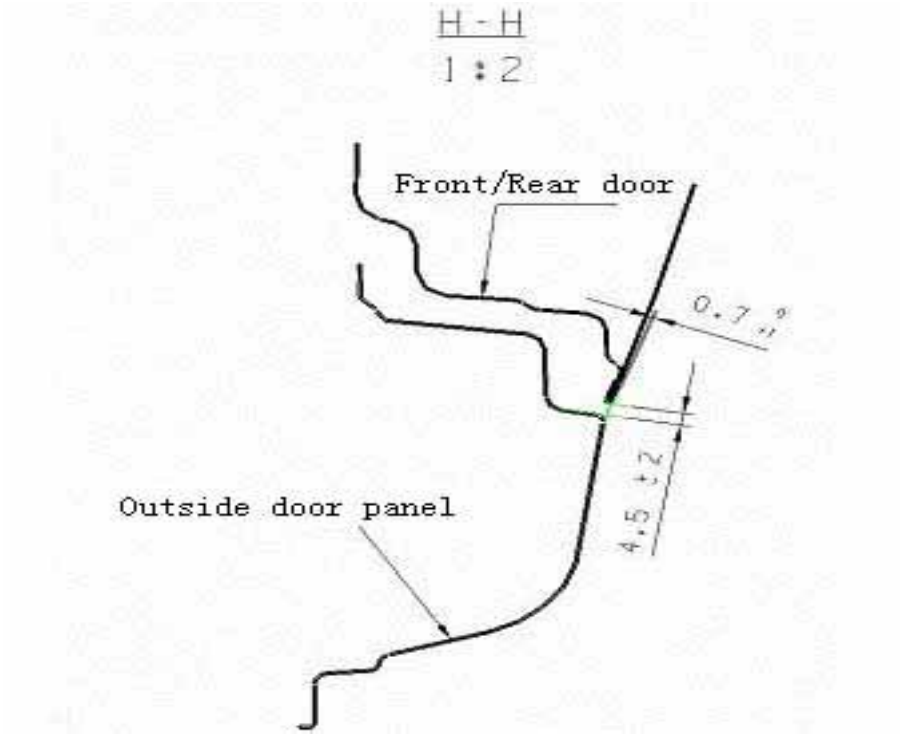
F-F The cross section, request of clearance and plane



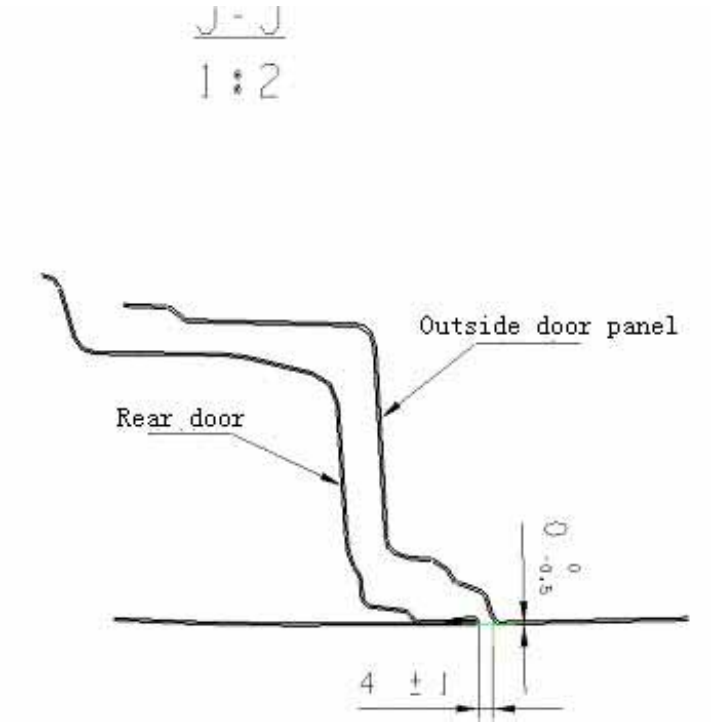
G-G The cross section, request or clearance and alignment



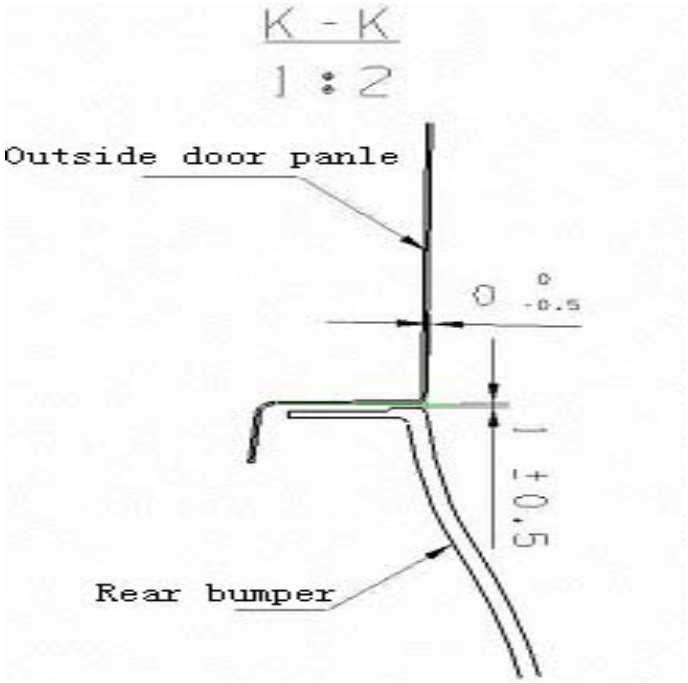
H-H The cross section, request of clearance and plane



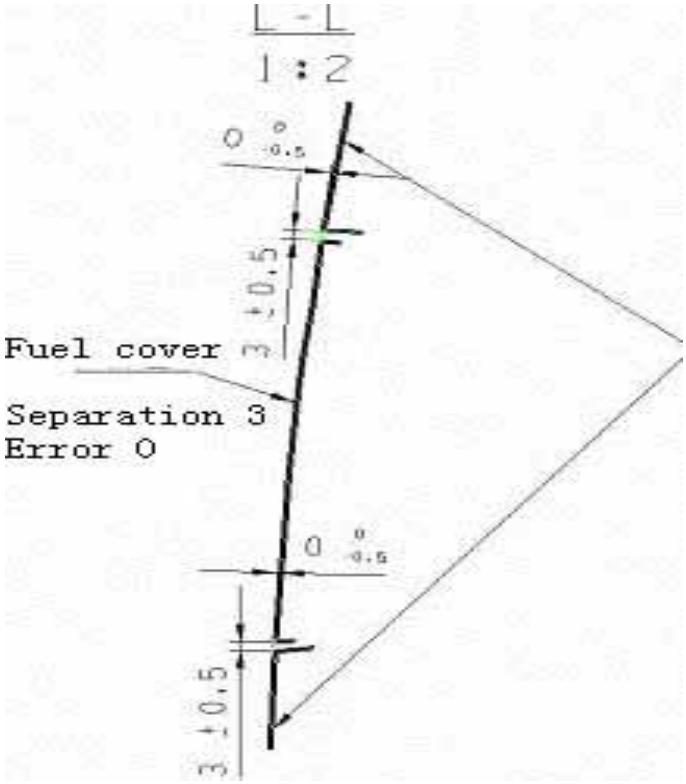
J-J The cross section, request of clearance and plane



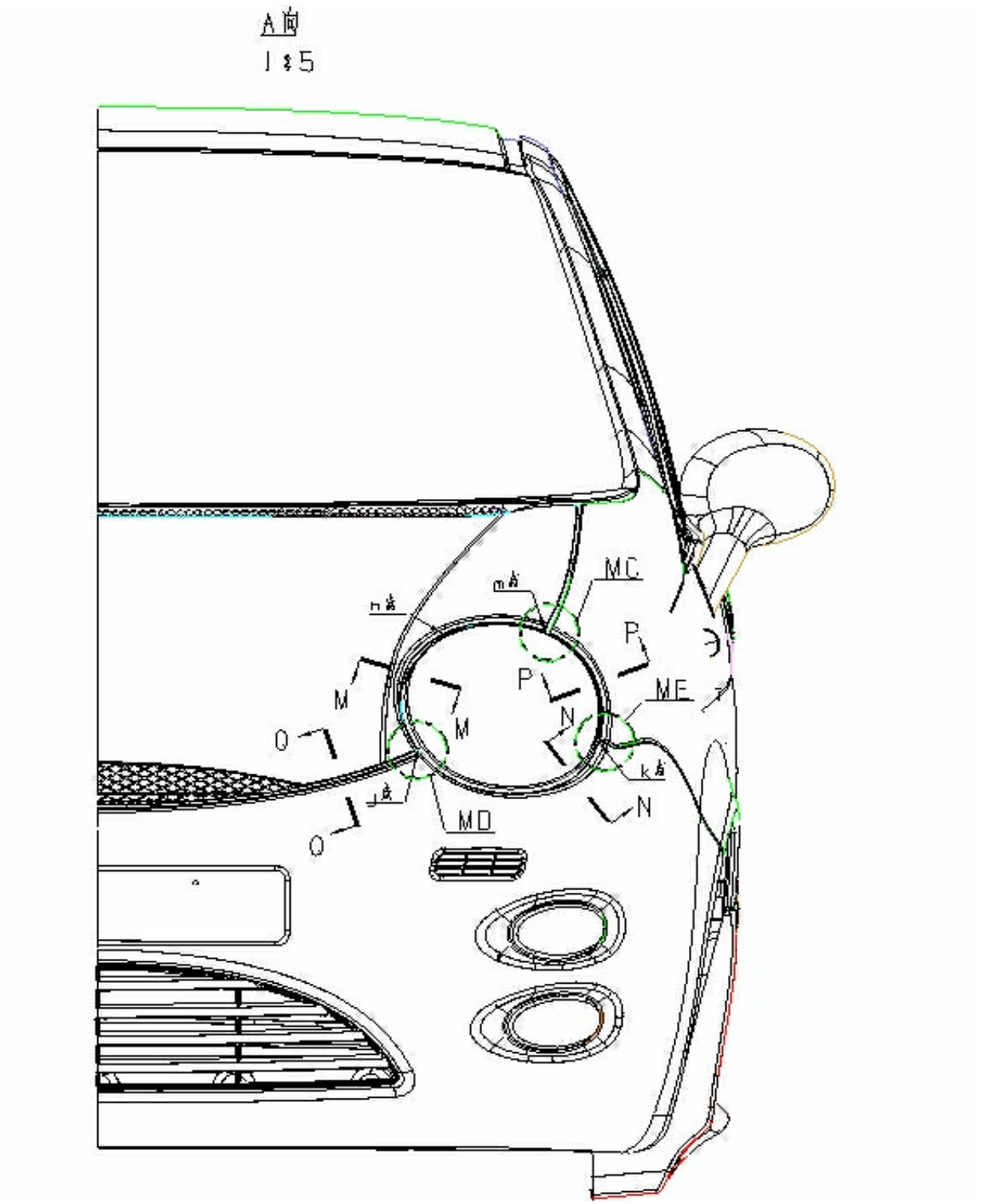
K-K The cross section, request of clearance and plane



L-L The cross section, request of clearance and plane

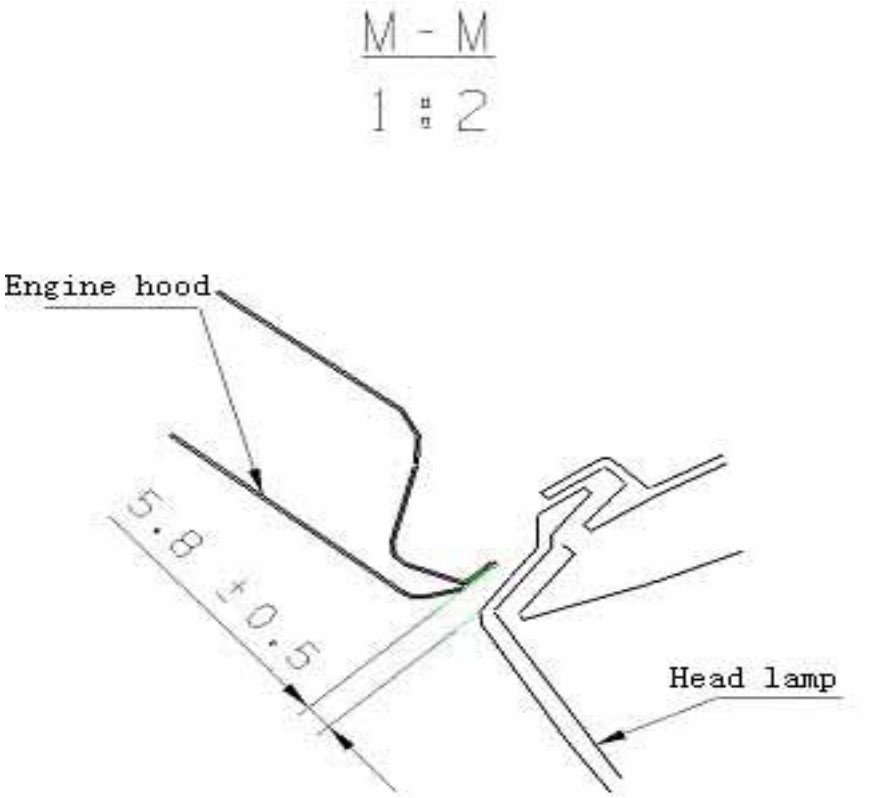


2.5.2.2 Front view figure

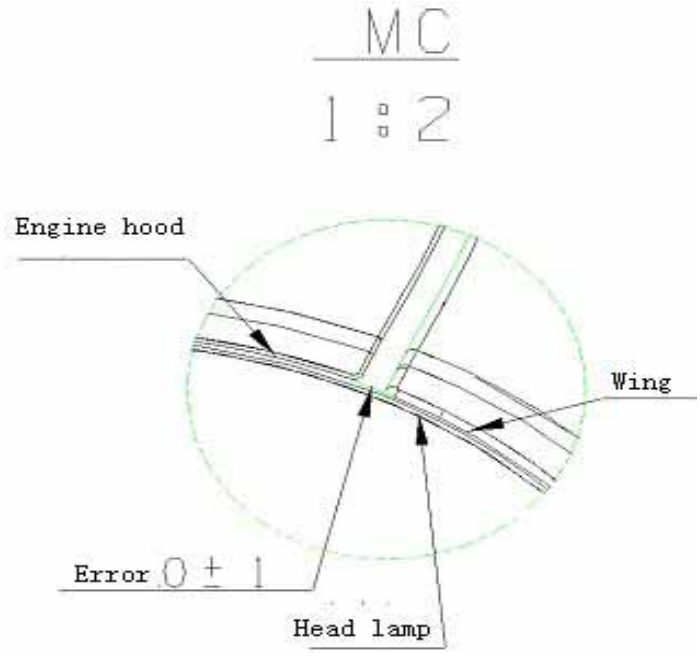


In the figure: From point m to point n, clearance is transitive evenly from 3.6 to 5.8,from point j to point k, the clearance is transitive evenly from 5.8 to 3.6.

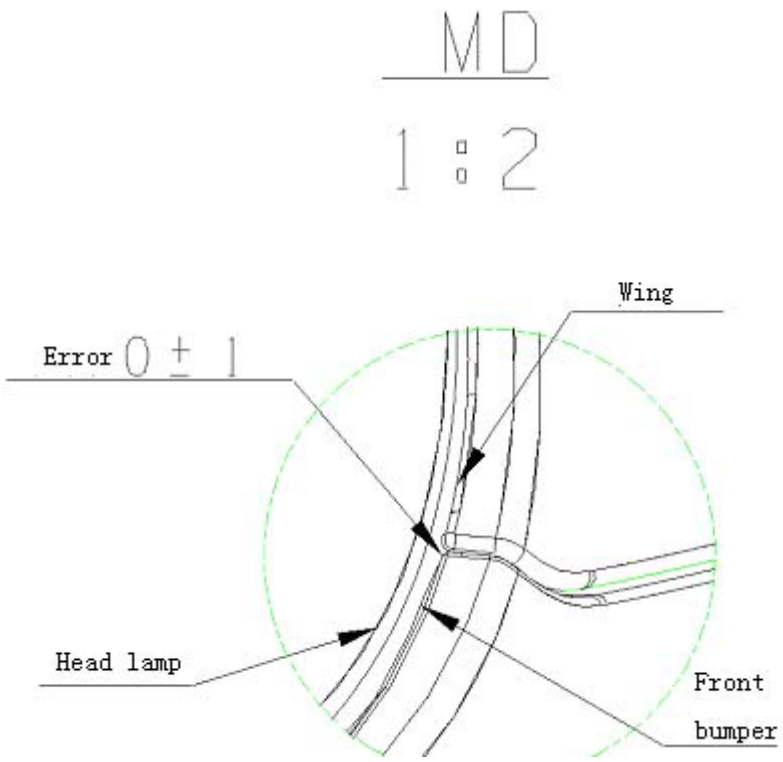
M-M The cross section, request of clearance and plane



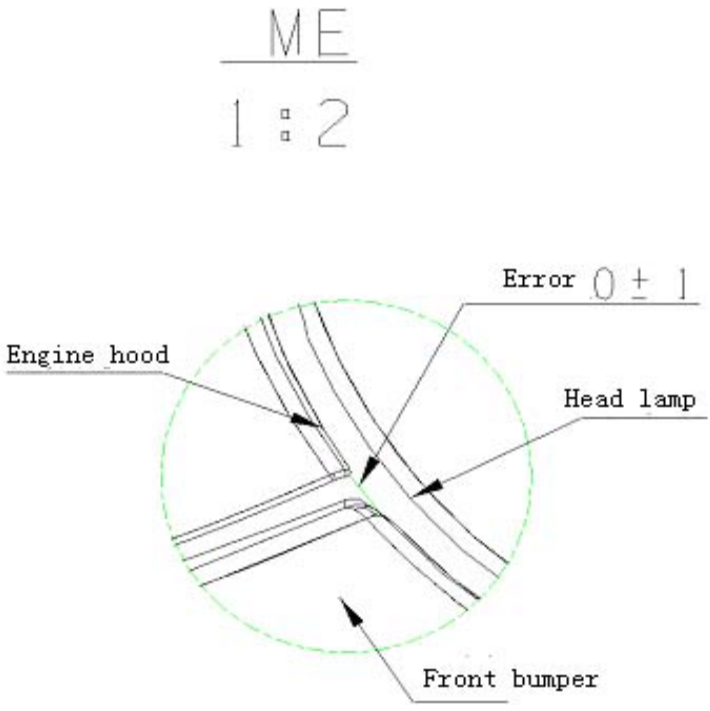
MC The cross section enlarging figure, request of plane 0±1



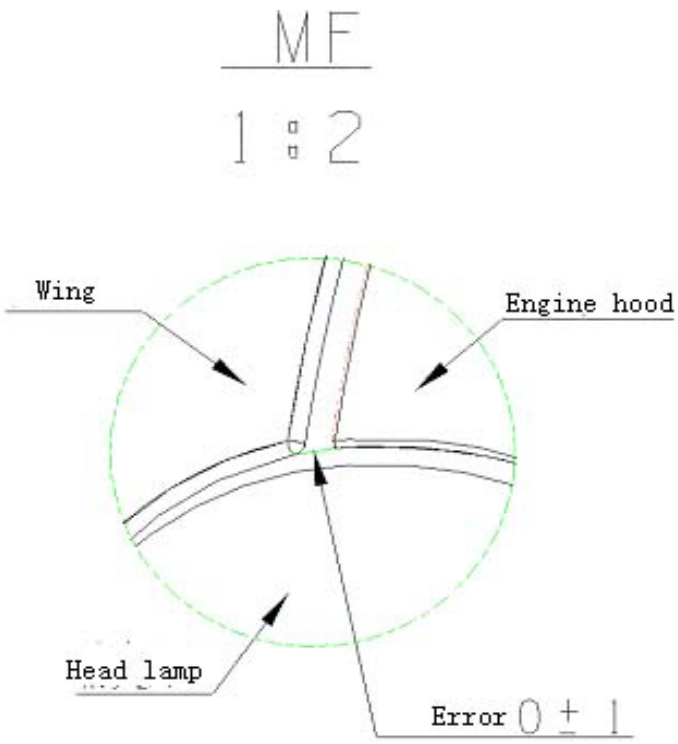
MD The cross section enlarging figure, request of plane is 0±1



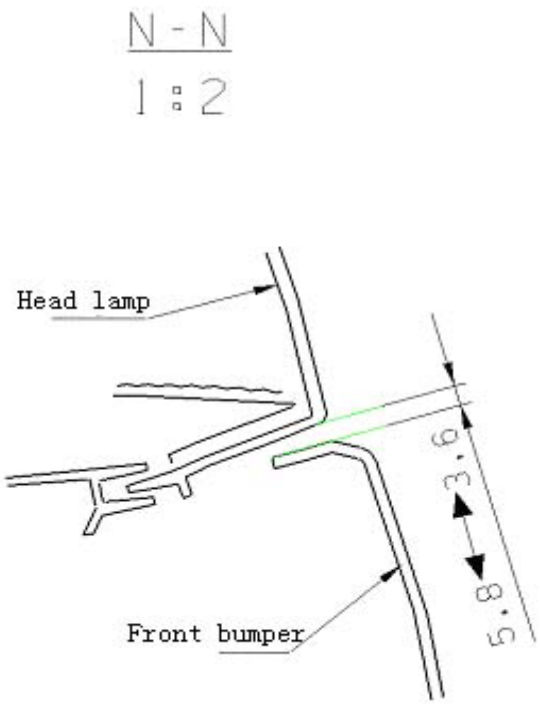
ME The cross section enlarging figure, request of plane is 0±1



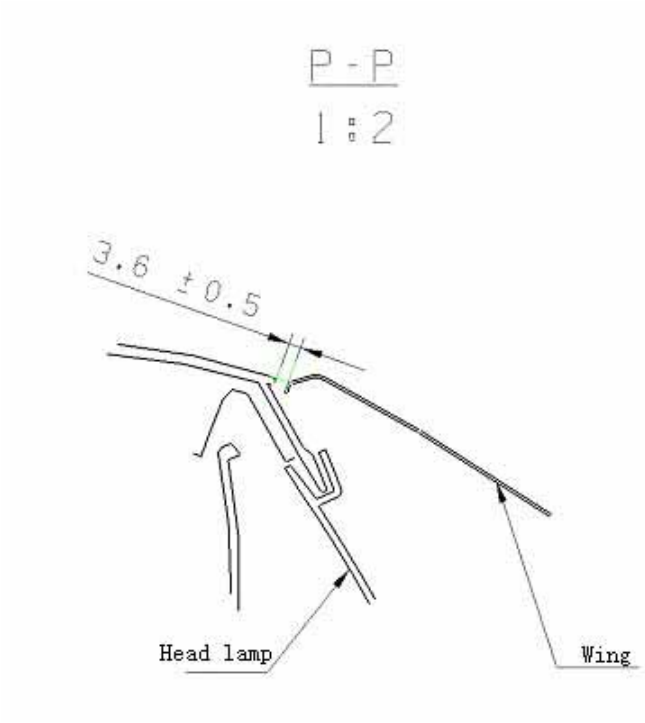
MF The cross section enlarging figure, request of plane is 0±1



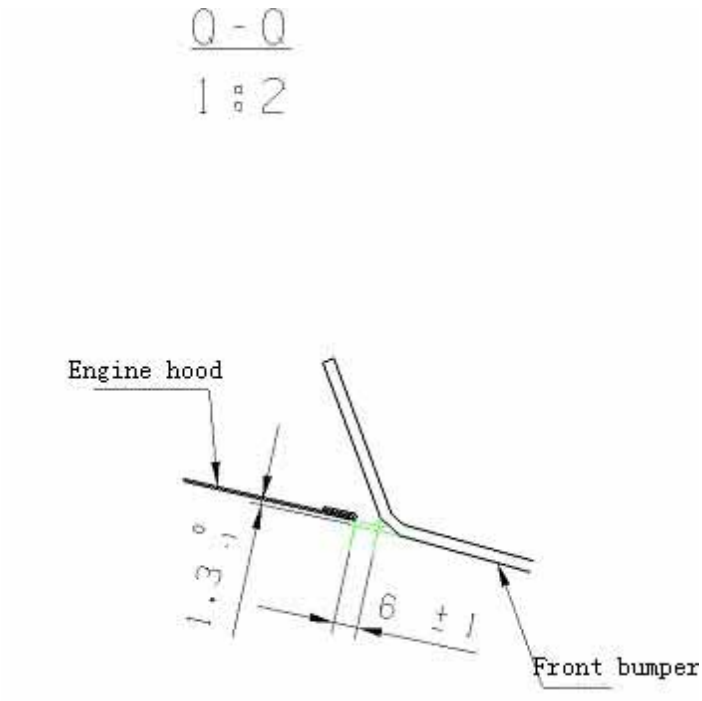
N-N The cross section, request of clearance and plane



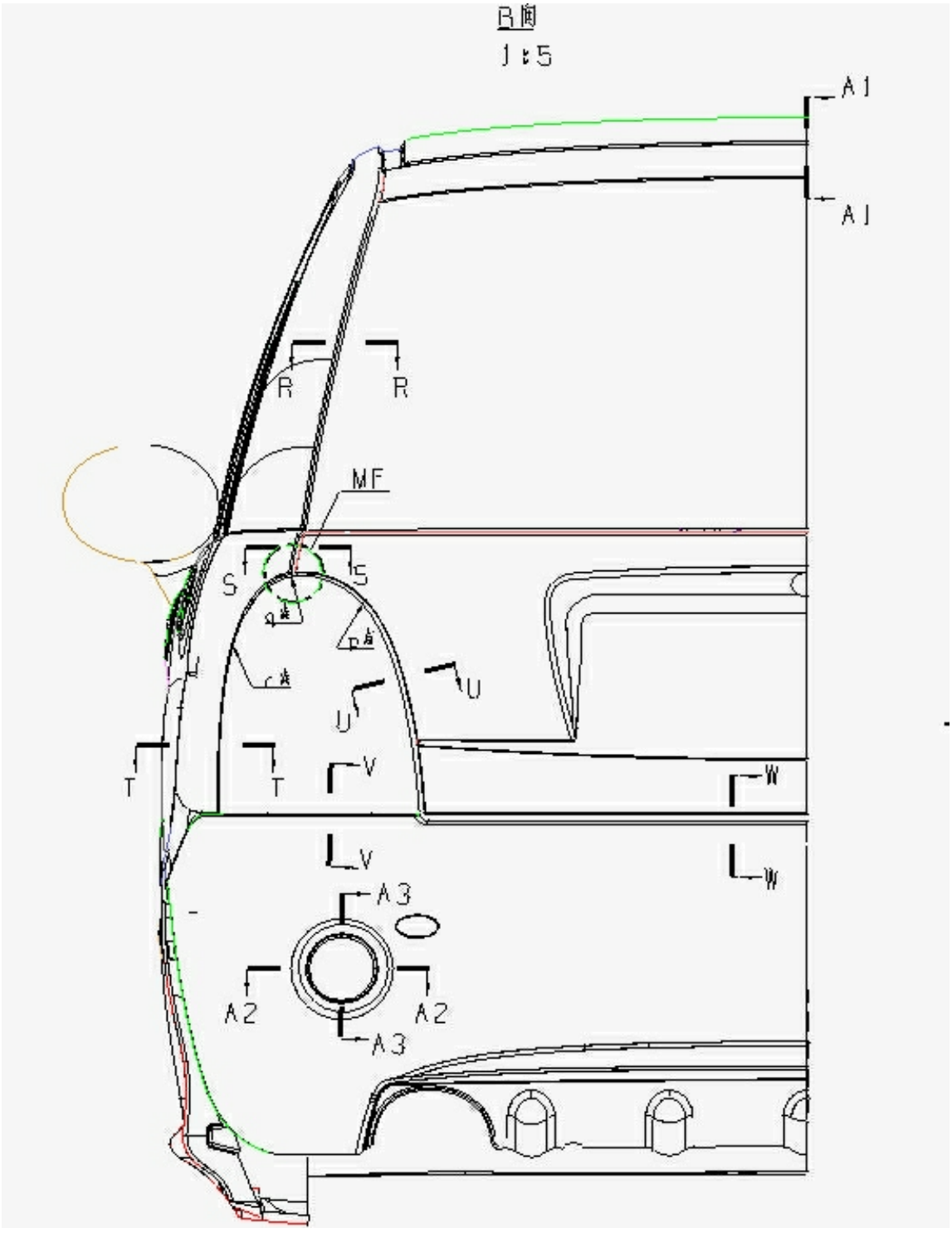
P-P The cross section, request of clearance and plane



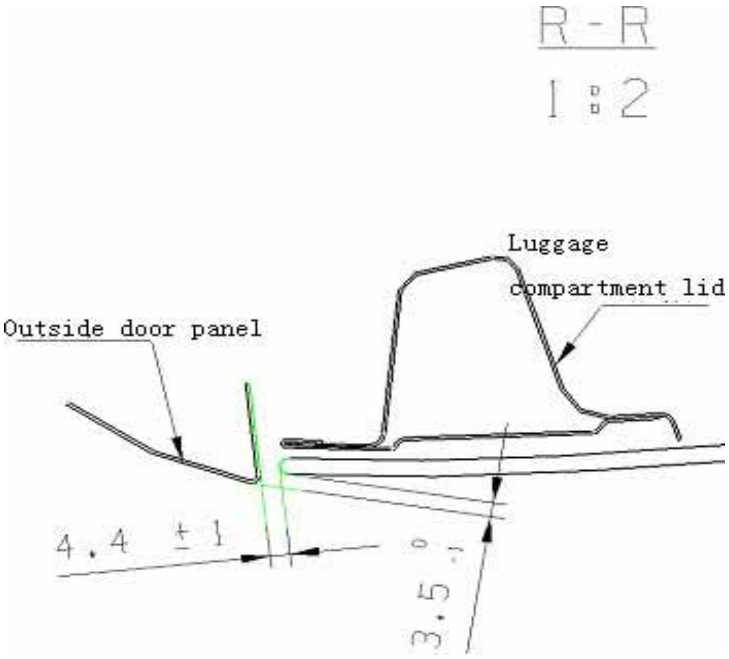
Q-Q The cross section, request of clearance and plane



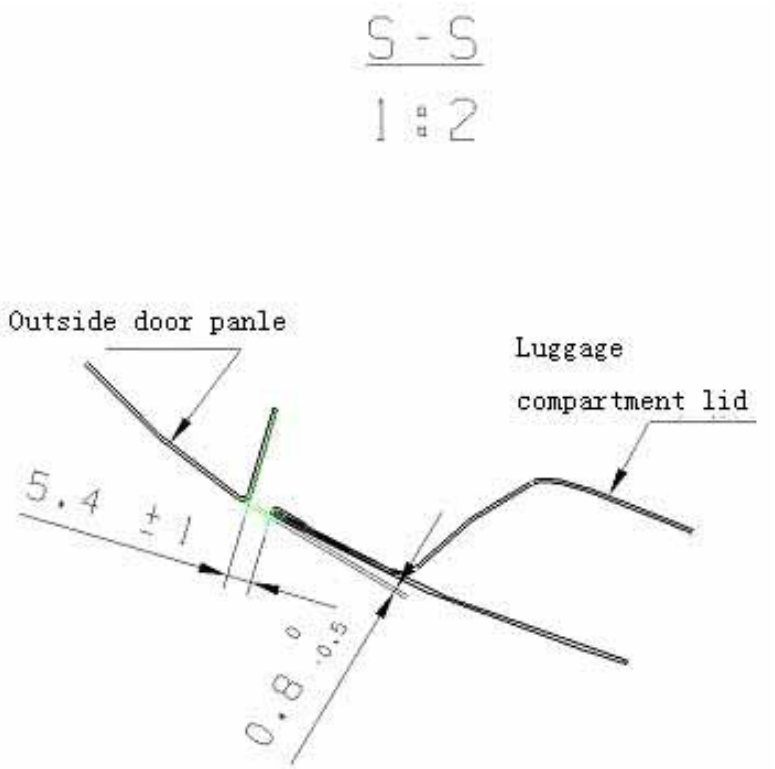
2.5.2.3 Rear view figure



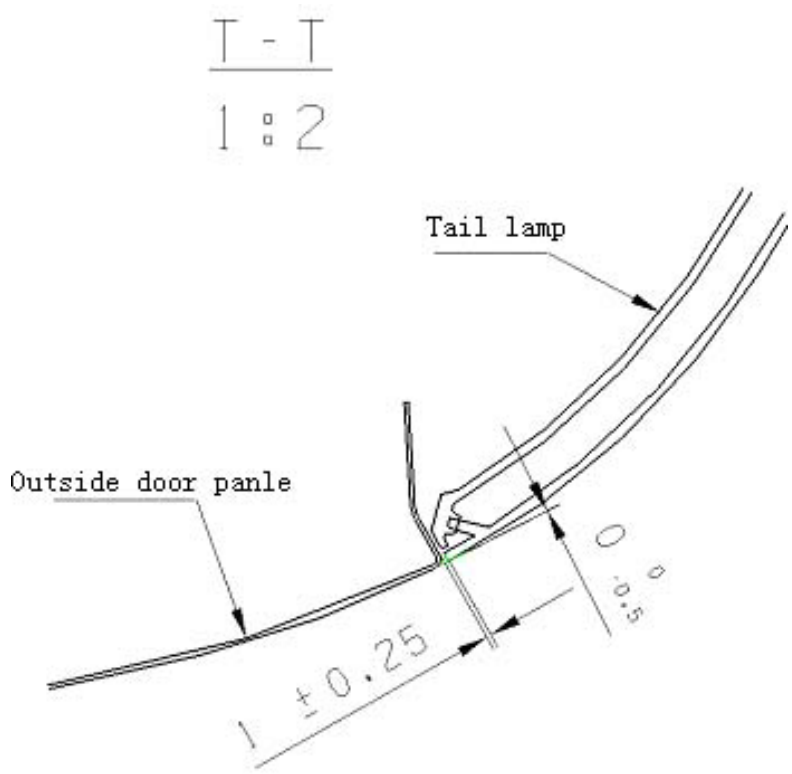
R-R The cross section, request of clearance and plane



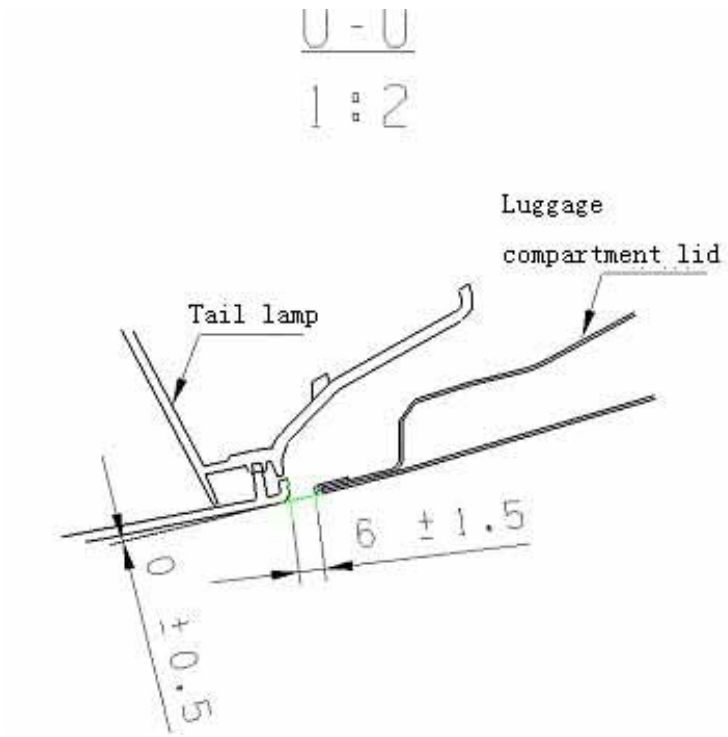
S-S The cross section, request of clearance and plane



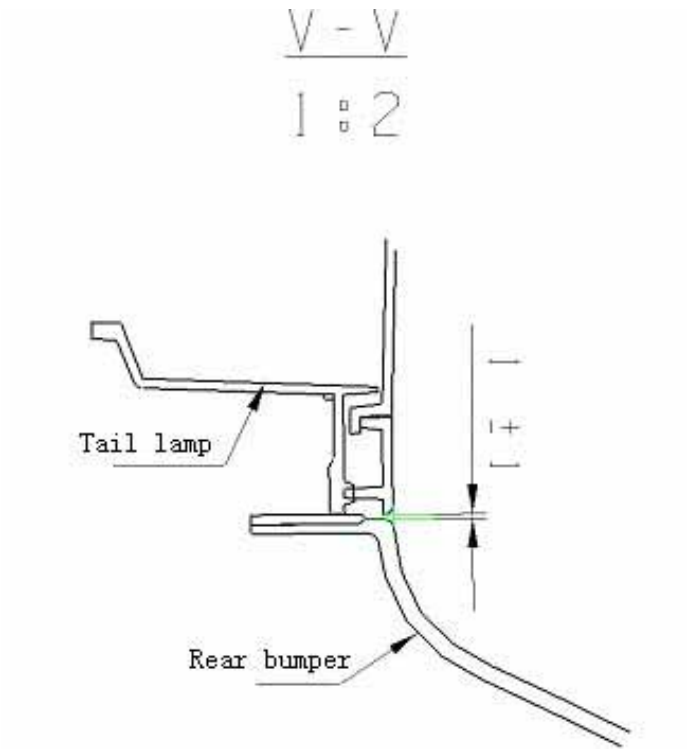
T-T The cross section, request of clearance and plane



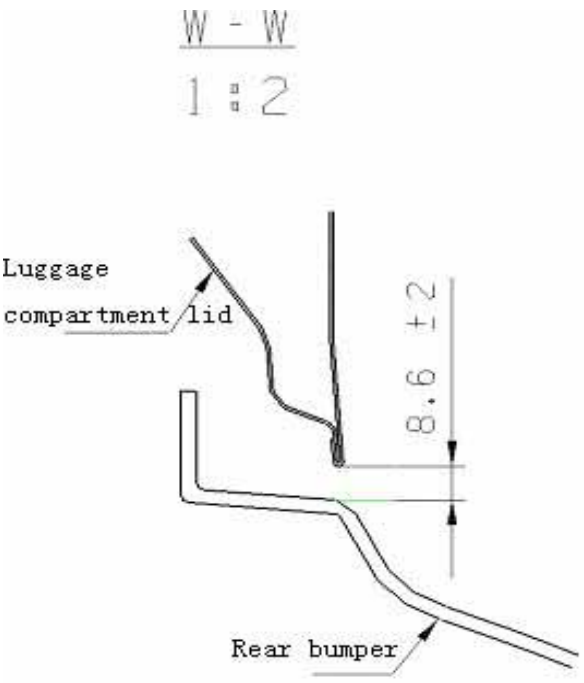
U-U The cross section, request of clearance and plane



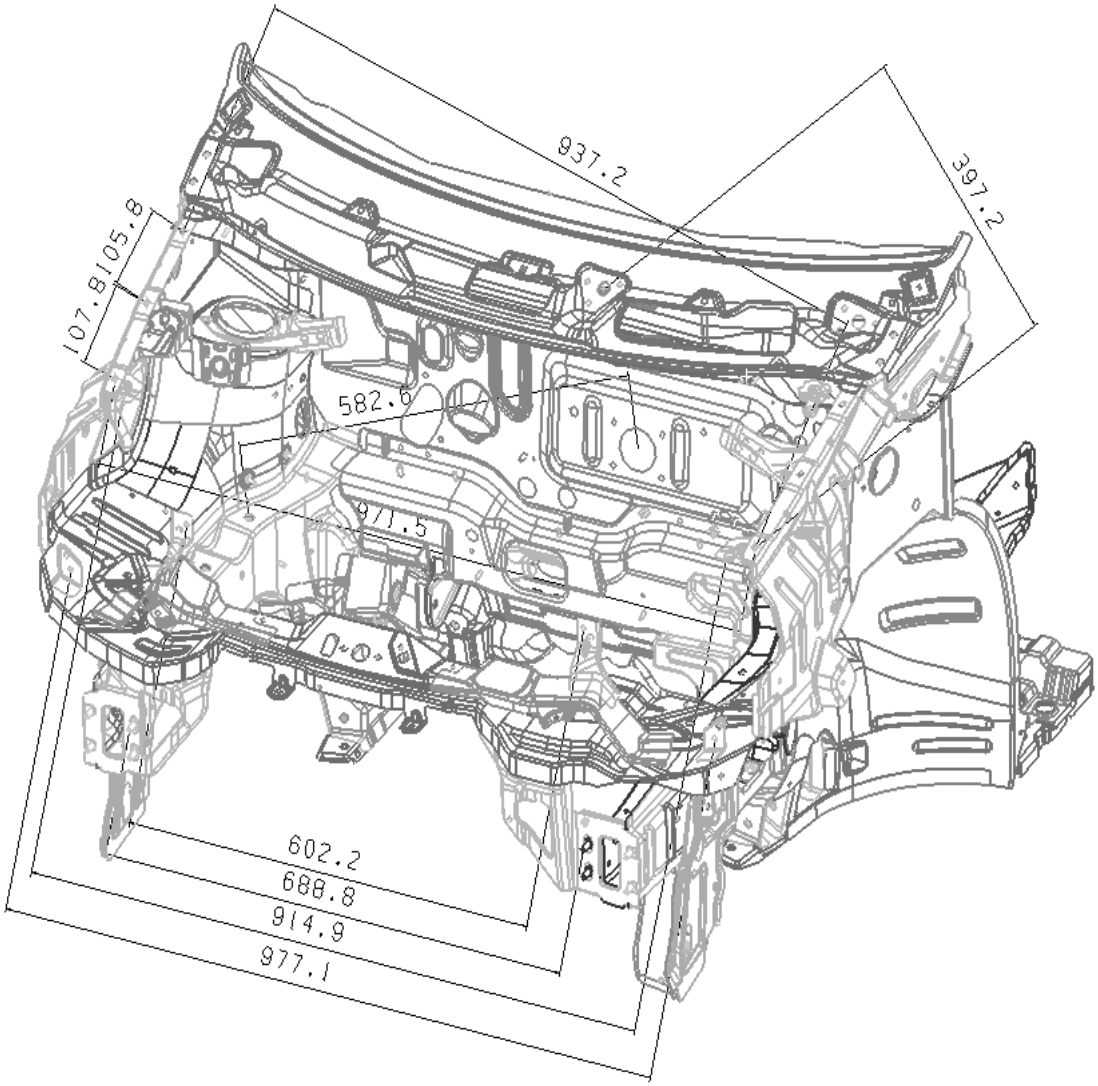
V-V The cross section, request of clearance and plane



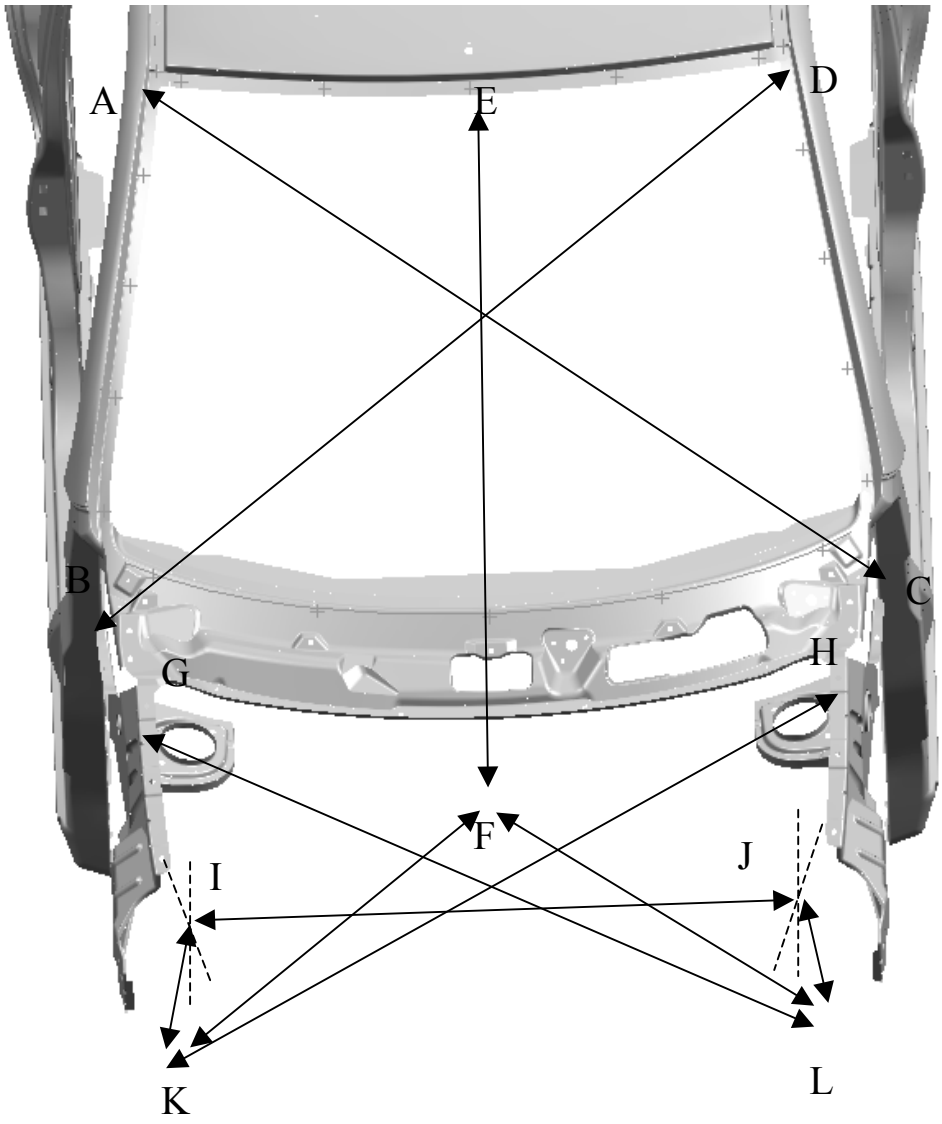
W-W The cross section, request of clearance and plane



2.5.2.4 Dimension of engine room

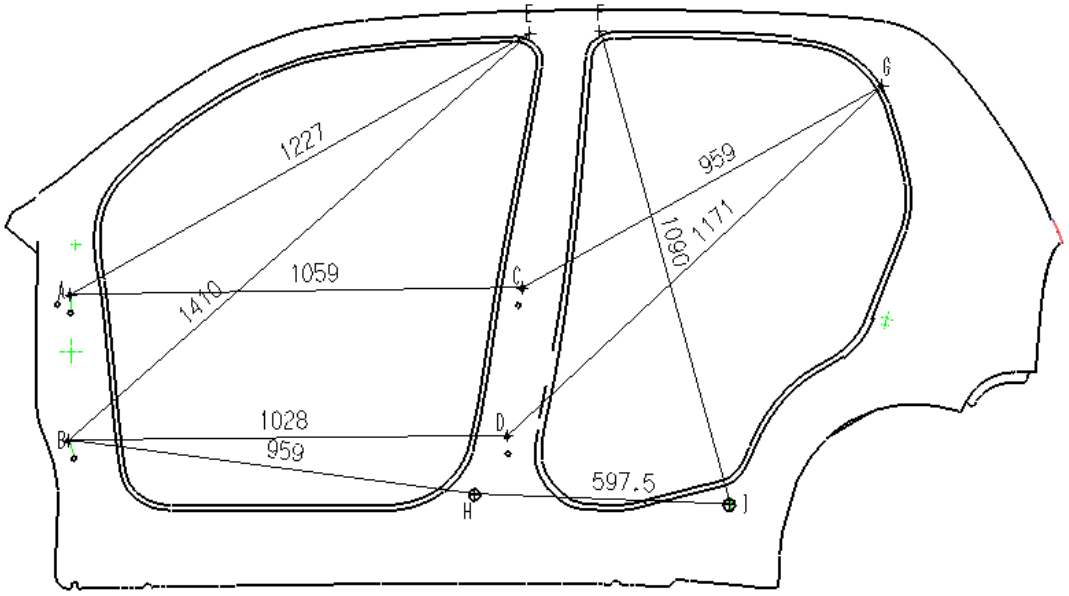


2.5.2.5 Distance dimension between two points of every part



No.	Control dimension	Remark
AC	1326.7±1.5	Front windshield diagonal
EF	908.8±1	Front windshield YO position distance
KI	345.7±1	Center distance between front shock absorber and front wheel housing outside panel front end port
KF	622.2±1	Center distance of front cover upper member body center pit and front wheel housing outside panel front end port
KH	1206.0±1.5	Diagonal distance from front cover upper member body port and front wheel housing outside panel front end port
IJ	971.6±1.5	Center distance of Left/Right front shock absorber port

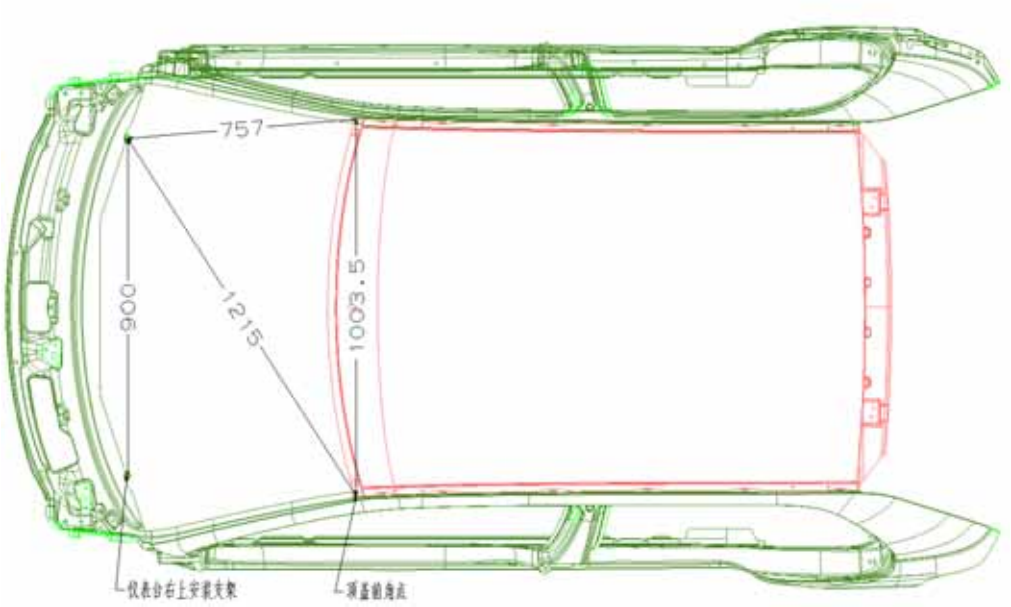
Note： AC=BD KI=LJ KF=LF DH=LG



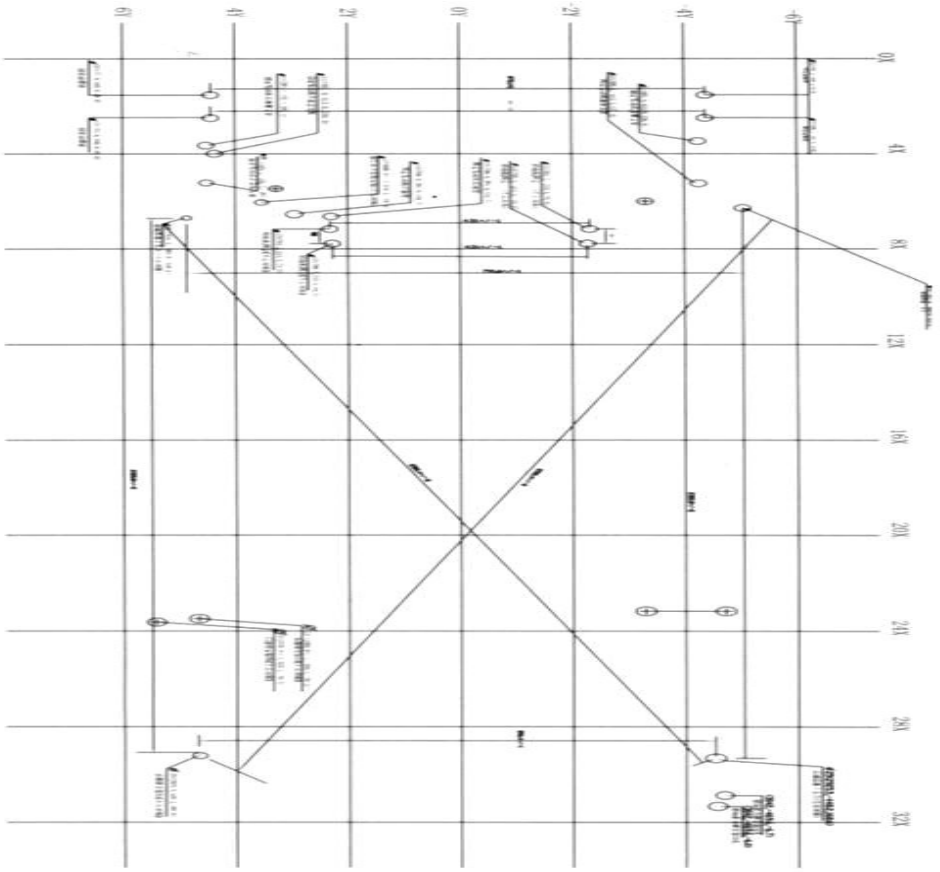
Dimension of vehicle body , Left/Right Remark: Capital letter English alphabet symbol shows right side of vehicle body , small letter shows left side of vehicle body (See from rear part of vehicle)

A-a	B-b	C-c	D-d	E-e	F-f	G-g	H-h	I-i
1323	1365	1356	1356	1049	1045	1137	1368	1363

Symbol	Name	Aperture	Symbol	Name	Aperture
Aa	Front door upper hinge mounting hole	11	Ff	Sidewall rear door hinge front upper angular point	
Bb	Front door lower hinge mounting hole	11	Gf	Sidewall rear door hinge rear upper angular point	
Cc	Rear door upper hinge mounting hole	11	Hh	Front door supporting point	23
Dd	Rear door lower hinge mounting hole	11	Ii	Rear door supporting point	28
Ee	Sidewall front door slide upper angular point				



2.5.2.6 Crossbeam size



2.5.2.7 Reference point --- symmetry

Symmetrical reference points

Symmetrical reference points refer to the two corresponding points which are located symmetrically on the centerline with same length, width and height; you can make use of the symmetrical reference points to carry out high-speed check-up, so as to make sure that the damage degree of bottom configuration parts of the vehicle body.

2.5.2.8 Reference points ___nonsymmetrical

Non-symmetrical reference points

The two points are non-symmetrical reference points when the two points possess different dimensions. If you carry out high-speed check and the result measuring values are different, you must check the measuring value according to the standard dimensions of vehicle body to see whether or not the measuring points are symmetrical.

2.5.3 Diagnostic information and procedures

2.5.3.1 Inspection of alignment

You should make sure the alignment of bottom vehicle body with measuring gauge, while carrying out the recommended measurement and check, measuring gauge assembly must include the vertical indicator which stretch out 914mm.The following measurement can be carried out with the measuring gauge:

● Point-to- point direct measurement

● Carry out computation measurement on the datum line of the level surface which is parallel to the bottom vehicle body.

Set up one of the following indicator accordingly for every measuring point:

- Height indicator
- Verticality indicator

Measure point-to-point distance on the following parts:

● Steering parts of front structure

● Suspension parts

Make sure that the vertical indicator is set up similarly

Under some certain circumstances, you can use one of the following tools to measure the point-to-point distance directly:

● Tape measure

● Suitable measuring tools

Measure the dimension from the hole to the following positions:

● Forward position or core of the hole

● Aligning with the neighboring surface metal see “measurement – bottom vehicle body” for reference, understand the following installation:

● measuring points arranged in alphabetical order

● Conversional data of dimension changing from the metric system to avoirdupois system

2.5.3.2 Inspection of alignment – bottom vehicle body

Three dimensional methods

It is necessary for the repair equipment to measure the length, height and width of many measuring points simultaneously, it is also necessary for it to measure 2/3 of the vehicle body to make things convenient for comparing the structure of vehicle body accurately.

General-purpose measuring system combines the use equipment with the technique to carry out dimensional measurement including measurement of length, width and height.

2.5.4 Explanation and operation

2.5.4.1 Explanation of datum

Datum

Datum line is parallel to the bottom vehicle body or frame, and the above-mentioned surface is the datum for all vertical measurement. Datum line is an imaginary level surface, it locates on the bottom vehicle body, at the same time, and it is parallel to the bottom vehicle body. The height results from distance measured from the datum line to the certain specified measuring point or reference point of bottom vehicle body by means of vertical measurement. Dimension of height is based on use equipment; it decides the position of datum line. Therefore, you can set different datum lines for the same vehicle, you can plus and subtract the same numerical value from all height to establish a new datum you need.

Centerline

Centerline is an imaginary vertical surface; it is vertical with the length direction of datum surface, and pass through the vehicle centre. Centerline refers to the arbitrary straight lines passing through the datum surface center of the vehicle.

Forming and perforation

Forming and perforation is a process of manufacture, which can form a region on the metal structure easy for you to carry out three dimensional measurements. You can perforate a hole or groove on that region easy for dimensional measurement and join together with other parts structurally. All measuring results can be read-out from the centerline of a formed surface and hole.

All dimensions can be measured from the following aspects:

- Length to the zero line (1)
- Height to the datum line (2)
- Width to the centre line (3)

All dimensions are symmetrical if there are no other regulations.

CHARACTERISTICS OF AUTOMATIC TRANSMISSION

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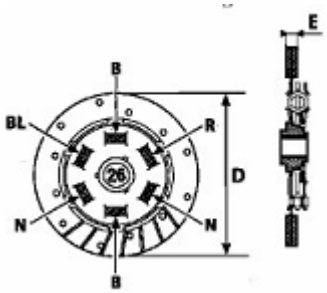
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CHARACTERISTICS OF THE CLUTCH

Vehicle model	Transmission model	Engine model	Mechanism	Brake disc
C06 0	JH1 003 JH2 002	D7F		26 – gear wheel E = 7.6mm D = 181.5mm BL: blue B: white N: black R: red  90693R14
C06 C	JH1 007	D4F	180DST 3500	76906R

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DRIVE RATIOS OF THE TRANSMISSION

JH1									
Transmission model	Vehicle model	Cylinder torque	Speed torque	The 1st gear	The 2nd gear	The 3rd gear	The 4th gear	The 5th gear	Reverse gear
002	C06 6	15/56	21/19	11/37	22/41	28/37	30/29	41/31	11/39
003	C06 6	15/58	21/19	11/37	22/41	28/37	30/29	39/32	11/39
007	C06 C	15/61	21/19	11/37	22/41	28/37	30/29	39/32	11/39

Transmission oil – Volume

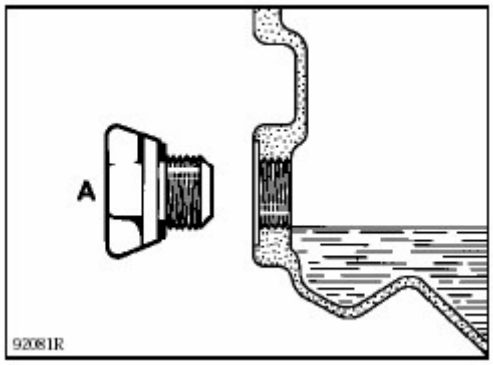
Volume

Five-gear transmission JH1 3,401

Thickness quality

TRX 75W 80W

Control of transmission oil level



Fill the transmission oil to the position of the inlet.

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PARTS RELATED TO MECHANICAL TRANSMISSION

Name	Related part
MOLYKOTE 33 (moderate) REF: 77 01 028 179	Control shaft's half-moon parts
FRENBLOC glue	Fixing bolt for brake ring

Frequently Changed Parts

Removed parts to be substituted:

- Automatic stop nut
- Seal ring
- Rubber ring

Hydraulic oil for the electronically controlled hydraulic unit

Every time that you perform check, you shall check on the hydraulic oil level. For the information about oil filling, refer to the section of "OIL TANK" in this document.

Special oil:

ELF RENAULTMATIC D3 SYN (purchase it from ELF), DEXRON III standard.

Volume measured with the unit of liter:

	Electronically controlled hydraulic unit
Total volume	0.6

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BRIEF INTRODUCTION TO MECHANICAL TRANSMISSION

Automated mechanical transmission is a manual mechanical transmission equipped with an electronically controlled hydraulic unit, in which an embedded computer controls both operating of the clutch and changing of the drive ratio. Thus, there is no need to provide a clutch pedal and speed control is implemented through an electronic contact lever, and the accelerator and brake pedals are electronically connected to the engine through the embedded engine computer. This not only reduces the gear shifting time but also ensures more comfortable feeling delivered to the driver and passengers.

Dialogue: (you shall do the following things every time you come to a workshop)

Check:

- Hydraulic oil level (refer to the section of “OIL TANK”)
- Horn performance
    - Pull up the hand brake
    - Start the vehicle
    - Provide the vehicle with a speed (the letter “A” will be shown on the instrument board)
    - Open the driver-side door

    The horn should be in good condition.
- Whether safety performance can prevent the vehicle from starting.
    - Pull up the hand brake
    - Provide the vehicle with a speed (do not step down the brake pedal)
    - Try to start the vehicle

    The starter should be incapable of working.

Towing:

If the transmission gets stuck at some gear position:

- Ignite the engine
- Step down the brake pedal
- Select the neutral position
- Check that the transmission is really in the neutral position (as you can push the vehicle)

If it is impossible to change the transmission to the neutral position, you shall suspend the front wheels and tow the vehicle.

The engine must be turned off when you tow the vehicle.

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SUGGESTIONS ABOUT MECHANICAL TRANSMISSION

Important:

Automated mechanical transmission

During any maintenance or repair of the electronically controlled hydraulic unit, it is a must to use detergent and compressed air for cleaning.

Do not let the hydraulic pipeline open; do not use any high-pressure cleaner for cleaning.

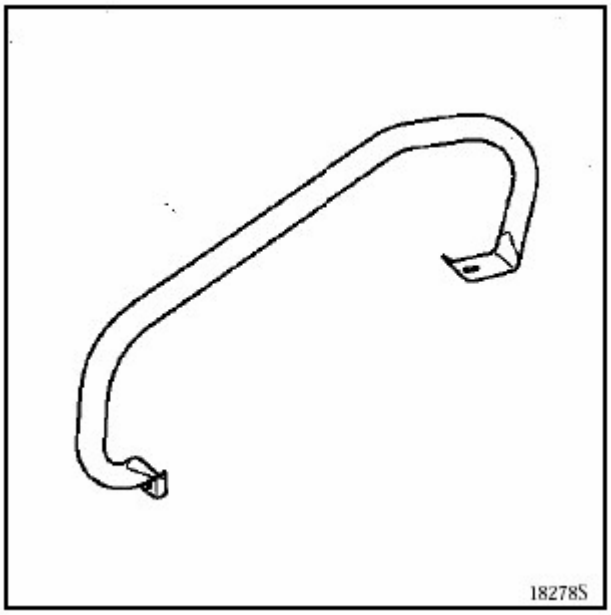
Throttle box

It is prohibited to remove or open the throttle box in any case.

Electronically controlled hydraulic unit

The accumulator shall be removed before maintenance of the entire system.

The carrying handle of the electronically controlled hydraulic unit shall be replaced to its former position after any removal of this unit.

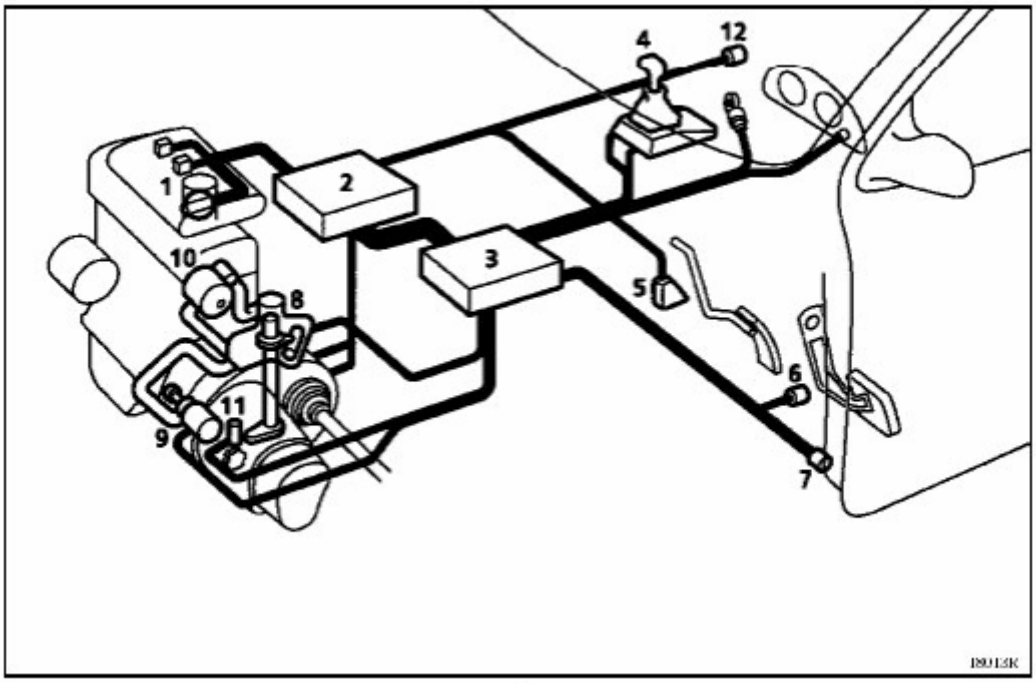


Automated mechanical transmission computer

Be sure to switch off the ignition firstly and remove the computer one minute later.

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SCHEMATIC DIAGRAM OF MECHANICAL TRANSMISSION



1. Throttle
2. Engine computer
3. Transmission computer
4. Gearshift handle
5. Position sensor for accelerator & brake pedals (load sensor)
6. Foot brake contact
7. Front-door contact
8. Transmission mechanism for gear position selection and speed change
9. Transmission mechanism of the clutch
10. Power supply pack
11. Original speed sensor
12. Handbrake contact

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MECHANICAL TRANSMISSION PERFORMANCE

The electronically controlled hydraulic system mounted on the transmission is comprised of two transmission mechanisms:

- à Transmission mechanism for gear position selection and speed change
- à Transmission mechanism for clutch and hydraulic unit

The entire hydraulic system is connected with transmission and engine computers.

Gear position selection is implemented through operating the gearshift handle:

- à Automatic mode: the transmission computer carries out speed change according to the predetermined vehicle control policy.
- à Manual mode: the driver sends a signal to the gearshift lever and further to the transmission computer for implementation of speed change.

When the vehicle speed is changed, the transmission computer will control the engine torque to restrict vibration so that the driver can place his/her foot onto the accelerator pedal.

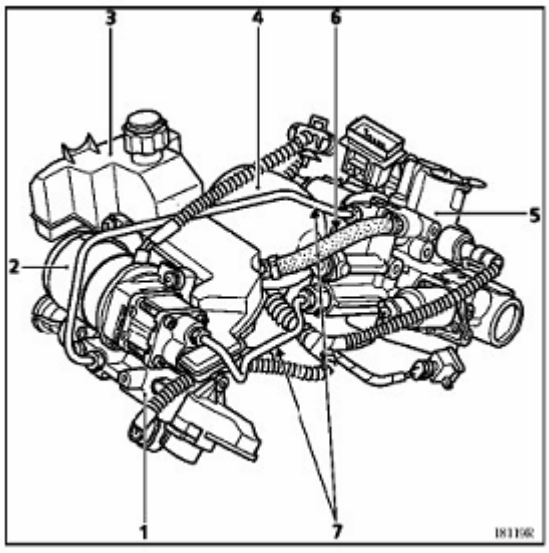
This automated mechanical transmission employs the automatic mode based on the DP0 design, which integrates control methods suitable for concrete drive modes and road surfaces.

The automated mechanical transmission is based on traditional manual transmission equipped with an electronically controlled hydraulic unit, thus realizing automatic five-speed transmission.

MECHANICAL TRANSMISSION – ELECTRIC CONTROLLED HYDRAULIC UNIT

Overview:

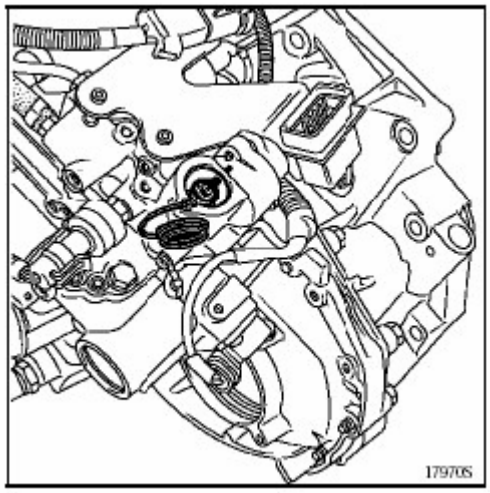
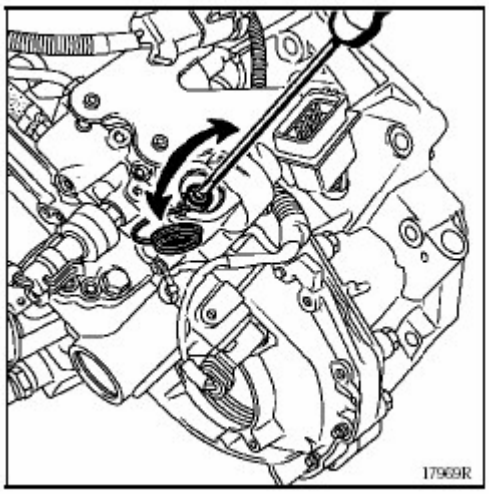
1. Clutch
2. Pump
3. Oil tank
4. Energy storage
5. Transmission module
6. Low-pressure pipeline
7. High-pressure pipeline



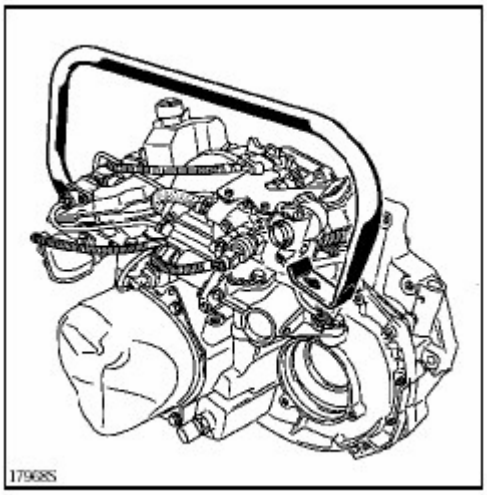
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MECHANICAL TRANSMISSION
– ELECTRONICALLY CONTROLLED HYDRAULIC UNIT

<table>
<tr><td>Tightening torque (unit: DAN.M)</td><td></td></tr>
<tr><td>M8 bolt for electric pump set 2.4
M10 bolt for electric pump set 4.4
Nut for drive mechanism module 2.1
Pin for drive mechanism module 0.8
High-press pipeline coupler 1.4</td><td></td></tr>
<tr><td>Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage.
When doing this, comply with the control procedure described in the section of “ENERGY STORAGE”.
Once accomplishing this procedure, the buzzer will make a buzzing sound.
In order to confirm that the pressure therein has dropped into the specified range, refer to the section of “PR018 HYDRAULIC SYSTEM” to know the standard resultant pressure range.
If you fail to do this, repeat the control procedure described in the section of “ENERGY STORAGE” until the pressure becomes very low and it has no risk to remove the high-pressure pipeline.

Removal:
Before removing the hydraulic unit, you shall remove its seat stand and the gearbox.
With regard to how to remove the seat stand, refer to Chapter 21 of Service Manual 305.
When removing the gearbox, you shall be careful not to damage the hydraulic unit.
Remove the electronically controlled hydraulic unit of the transmission.
Remove the clutch fork cable.
Remove the connector of the original speed sensor.
In order to loosen the speed transmission control shaft, rotate the shaft a quarter turns by using a screwdriver.</td><td> 
Lock the control shaft.
The clearance on the shaft should be aligned with the mark.
 
Loosen the control shaft.
The clearance on the shaft and the mark are at the right angle.</td></tr>
<tr><td>Handle used to fix the electronically controlled hydraulic unit.</td><td>Put two half-moon parts and circlip into the control shaft groove.
Smear MOLYKOTE 33 (moderate) onto the two half-moon parts.</td></tr>
</table>

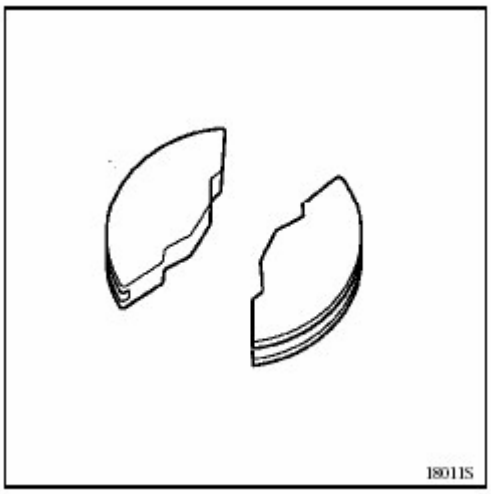
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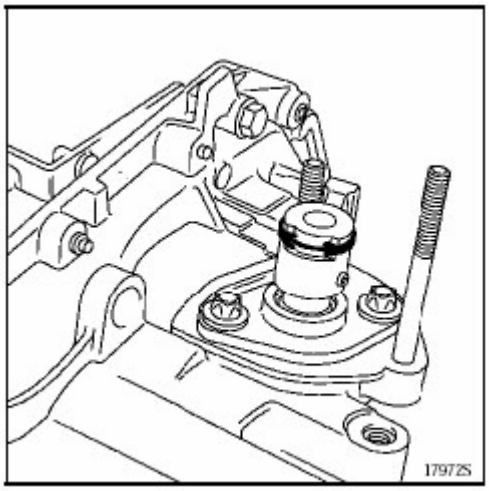


Unscrew the six fixing bolts and remove the hydraulic unit.

Replace the two half-moon parts:

Check whether their positions are correct.



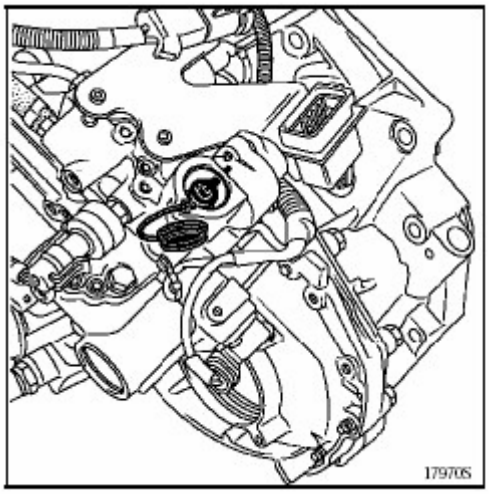


Place the control shaft onto the drive mechanism module and lock it.

Screwdriver impression and shaft pin should be aligned respectively with the marks.

Mount the flat washer.

Remount the hydraulic unit onto the transmission.

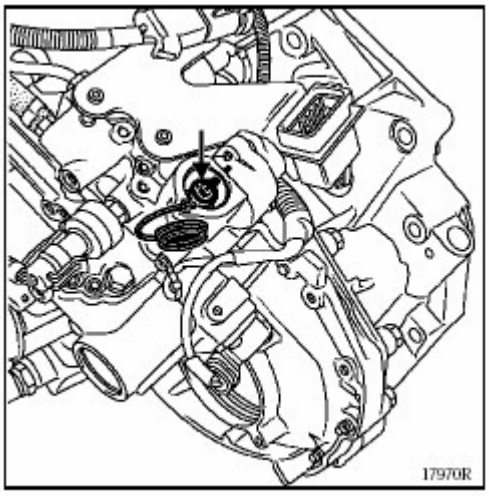


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MECHANICAL TRANSMISSION
– ELECTRONICALLY CONTROLLED HYDRAULIC UNIT

Remove the handle of this hydraulic unit.

Fix the hydraulic unit to the transmission by tightening the fixing bolts.



Place back the control shaft cover (lubrication washer).

It is easy to remount the hydraulic unit onto the transmission and you need only to carry out the procedure opposite to the removal procedure.

Remove the outside washer for oil tank cap.

Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line.

Perform the corresponding test by using a special tool. (Refer to the section "SPECIAL REQUIREMENTS ON CHANGE OF SYSTEM PARTS AND COMPONENTS")

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

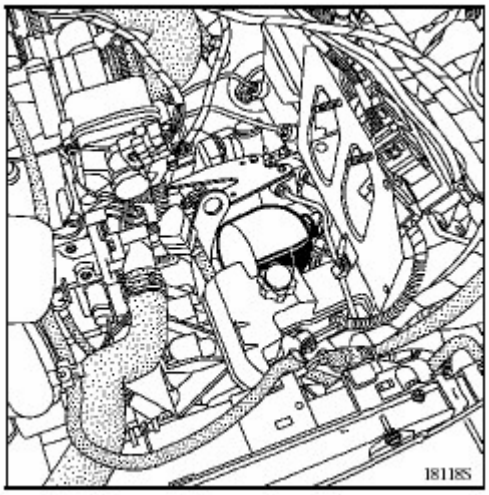
Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION – ENERGY STORAGE

Tightening torque (unit: DAN.M): Energy storage 4 Lifting ring fixing 2.1	
Operation: Energy storage is used to ensure that the pump runs intermittently. Its full inflation can guarantee three speed loads of clutch engagement/disengagement. Rated operation pressure: 200C: 45 to 50 bar -300C: 35 to 44 bar Remarks: Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage. When doing this, comply with the control procedure described in the section of "**ENERGY STORAGE"** (**AC081**). In order to confirm that the pressure therein has dropped into the specified range, refer to the section of "**PR018 HYDRAULIC SYSTEM"** to know the standard resultant pressure range. If you fail to do this, repeat the control procedure described in the section of "**ENERGY STORAGE"** until the pressure becomes very low and it has no risk to remove the high-pressure pipeline. The pressure reading should be nearly zero. Removal: Remove the battery. Use the injector to evacuate the oil tank. Remove: - Fasteners on the transmission housing - Energy storage	 Remounting: Stick the warning label onto the energy storage. Carry out the remounting procedure that is opposite to the removal procedure. Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line. Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section "special requirements on change of system parts and components of KIT electrically controlled hydraulic system") **Oil filling into oil tank** The mark shown on the oil tank is the lowest standard. Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line. **Important tip:** The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION – ELECTRIC PUMP SET

Tightening torque (unit: DAN.M)	
M8 bolt for electric pump set	2.4
M10 bolt for electric pump set	4.4
High-press pipeline coupler	1.4
Energy storage	4

Remarks:

Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage. (Refer to the section of "**ENERGY STORAGE**").

Removal:

Remove the battery.

Use the injector to evacuate the oil tank.

Remove:

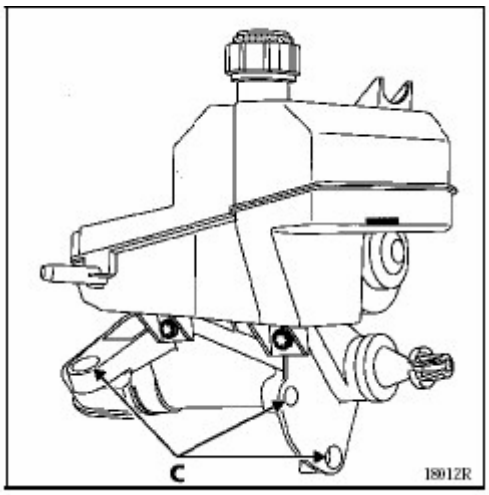
- The battery
- The air casing

Disconnect the clutch cable

Remove the electronic injection computer.

Remove:

- High-pressure pipeline
- Low-pressure pipeline
- Connectors
- Fasteners on the transmission housing
- Energy storage
- Three fixing bolts for electric pump set ©



Remounting:

Carry out the remounting procedure that is opposite to the removal procedure.

Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line.

Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section "special requirements on change of system parts and components of KIT electrically controlled hydraulic system")

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION – PUMP

Tightening torque (unit: DAN.M)	
M8 bolt for electric pump set	2.4
M10 bolt for electric pump set	4.4
High-press pipeline coupler	1.4
Energy storage	4
M6 bolt for electric pump	1

Remarks:

Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage (refer to the section of "ENERGY STORAGE").

Removal:

Remove the battery.

Use the injector to evacuate the oil tank.

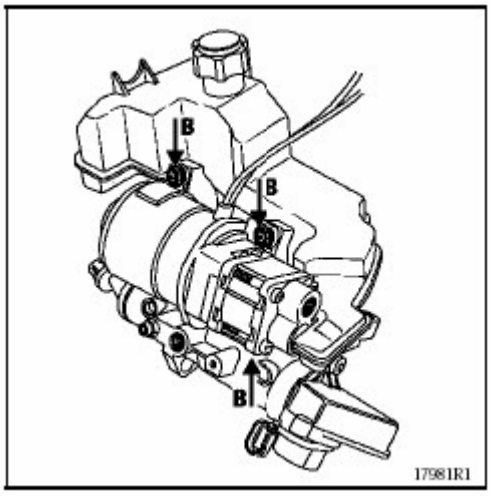
Remove:

- The battery
- The air casing

Disconnect the clutch cable.

Remove:

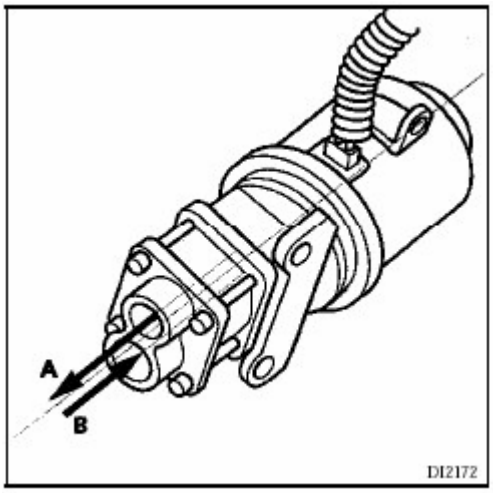
- Electronic injection computer
- High-pressure pipeline
- Low-pressure pipeline
- Connectors
- Fasteners on the transmission housing
- Energy storage
- Three fixing bolts for electric pump set © (see the last section)
- Oil tank
- Remove the pump through taking out the three bolts (B)



Remounting:

Carry out the remounting procedure that is opposite to the removal procedure.

Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line.



A: press out

B: suck in

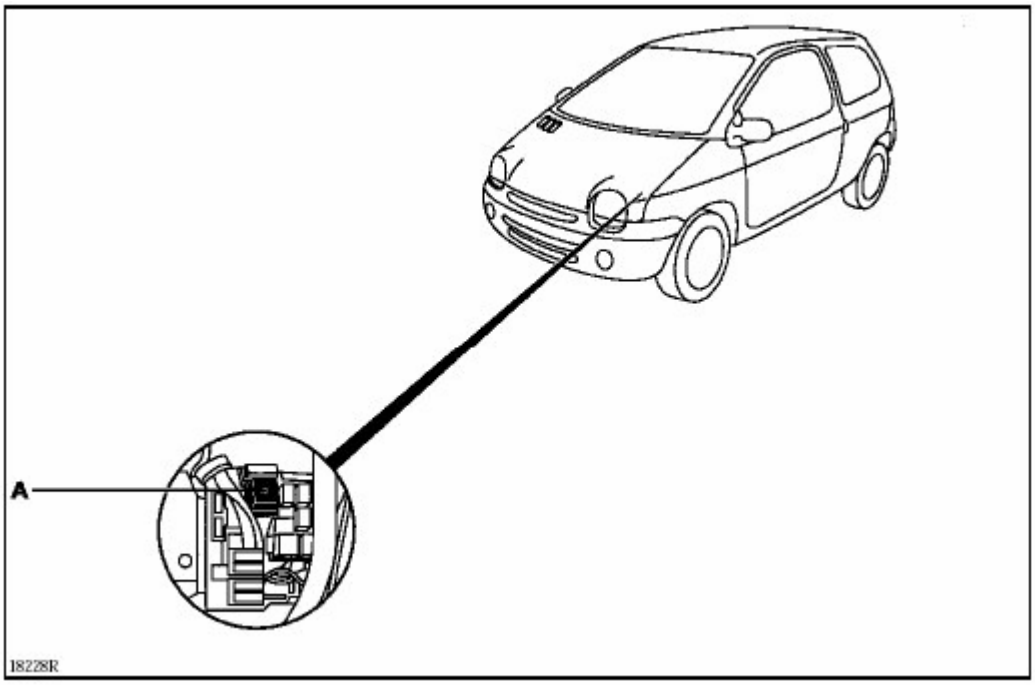
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Notice:

When you change the electric pump set, it is inevitable to change its relay.

The relay is probably damaged due to frequent ignition, and therefore if so, you shall replace the relay so as to avoid damaging the new electric pump set.

The relay (A) for electric pump set is within the interconnection box in the engine case.



Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section “special requirements on change of system parts and components of KIT electrically controlled hydraulic system”)

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION – OIL TANK

Tightening torque (unit: DAN.M)

Energy storage	4
High-pressure pipeline coupler	1.4
Lifting ring fixing nut	2.1

Remarks:

Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage (refer to the section of "**ENERGY STORAGE**").

Removal:

Remove the battery.

Use the injector to evacuate the oil tank.

Remove:

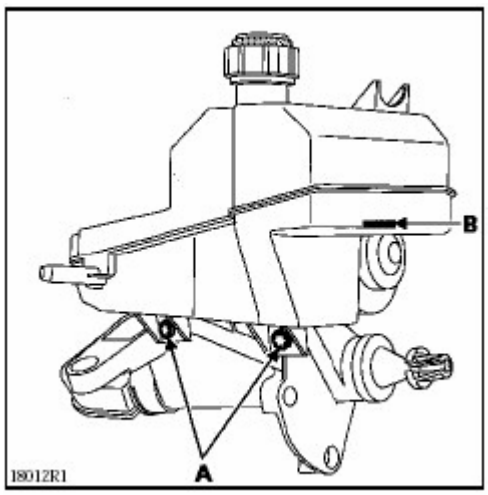
- Low-pressure pipeline
- High-pressure pipeline
- Transmission housing mounting bracket
- Energy storage
- Oil tank fixing bolts (A)

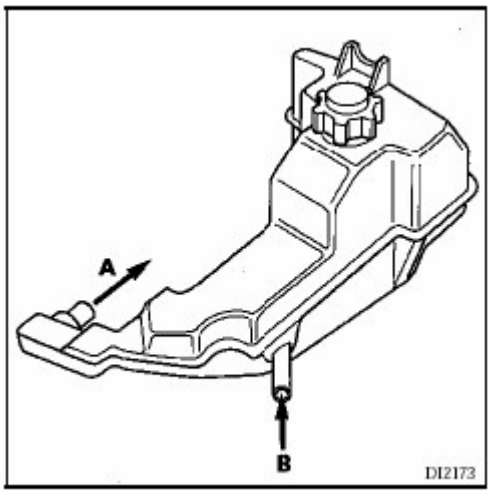
Disconnect the clutch cable.

Remove the electronic injection computer.

Remove:

- High-pressure pipeline
- Low-pressure pipeline
- Connectors
- Fasteners on the transmission housing
- Energy storage
- Three fixing bolts for electric pump set ©





A: suck in

B: flow back

Remounting:

Carry out the remounting procedure that is opposite to the removal procedure.

Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line.

Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section "special requirements on change of system parts and components of KIT electrically controlled hydraulic system").

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38mm higher than the lowest mark line.

Important tip:

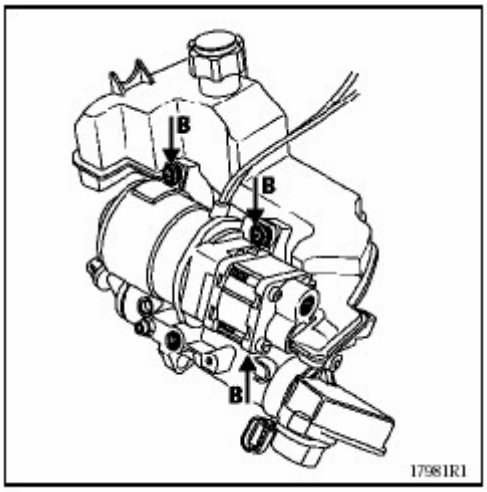
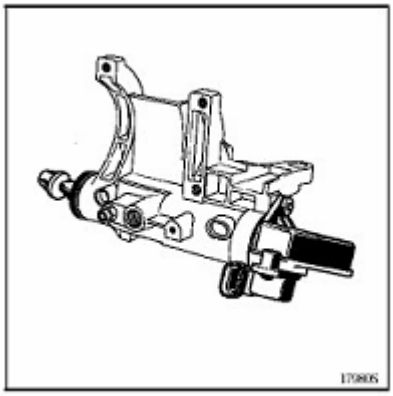
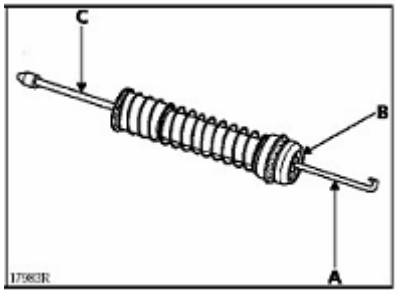
The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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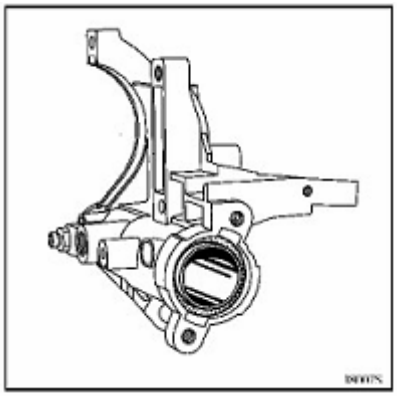
MECHANICAL TRANSMISSION – CLUTCH MODULE

<table>
<tr><td>Tightening torque (unit: DAN.M)</td><td></td></tr>
<tr><td>Energy storage 4
High-pressure pipeline coupler 1.4
Lifting ring fixing nut 2.1
M8 bolt for electric pump set 2.4
M10 bolt for electric pump set 4.4
M6 bolt for electric pump 1</td><td></td></tr>
<tr><td>Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage.

When doing this, comply with the control procedure described in the section of “Removal of Pressure Energy Storage”. (Refer to the section of "ENERGY STORAGE").

Removal:
It is necessary to firstly remove the electric pump set before the clutch module.
With regard to how to remove the electric pump set, refer to its removal procedure described on Page 12.
Remove:
- Oil tank
- The pump through taking off the three bolts (B)
  </td><td>Remove:
- Sleeve joint
- Dust boot
- Clutch position sensor (be careful to not disconnect the clutch cylinder)
 
Remove:
- Spring pin assembly
- Potentiometer control
- Piston (B) connector by using a screwdriver
- Clutch cable ©
  </td></tr>
<tr><td>Remove the bushing and washers on the clutch.</td><td>Remounting:
- The clutch cable in the piston ©
- Connector (B)
- Potentiometer control (A)</td></tr>
</table>

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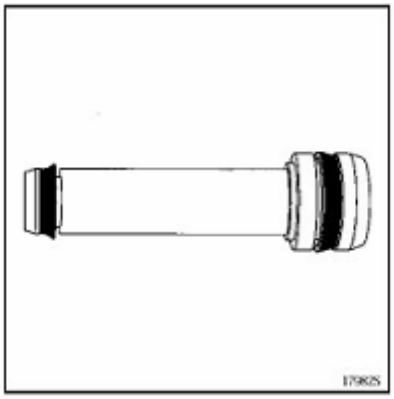


Remounting:

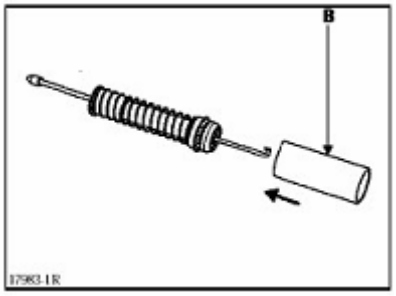
Notice:

Piston washer shall have a correct mounting direction due to its unusual lip shape.

Ensure that piston washer is in good condition.

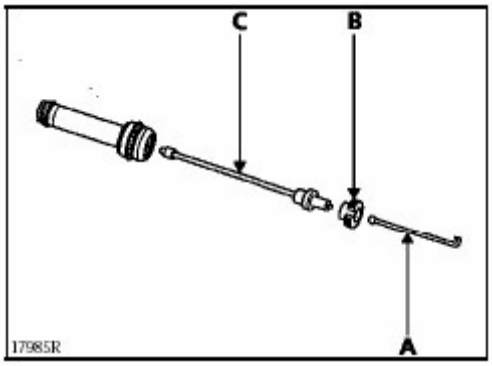


Remount the sleeve (B) on condition that the lip-shaped washer is mounted in the correct direction so as to not be damaged.



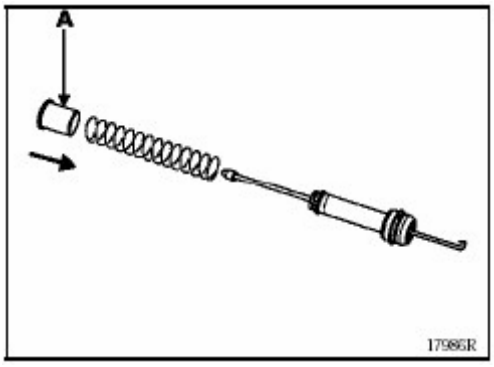
Remount:

- Sleeve/piston assembly in the clutch module
- Seal washer



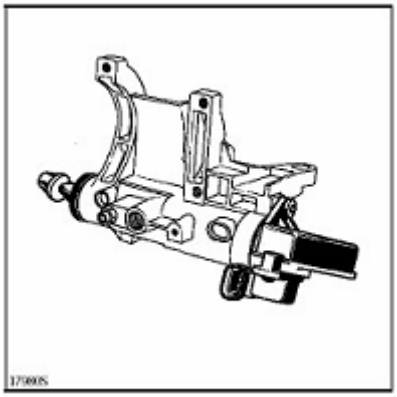
Remount:

- Spring
- Remount the sleeve on condition that the compression spring is mounted in the correct direction so as to damage the piston washer.

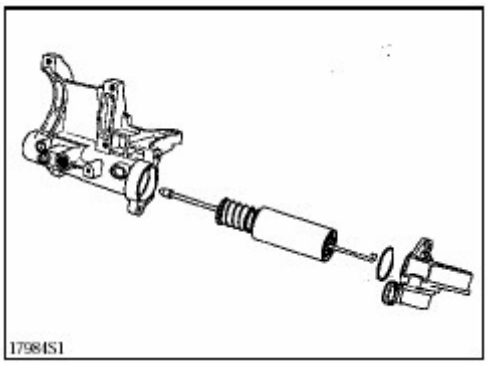


Remount:

- Dust boot
- Sleeve stop ring

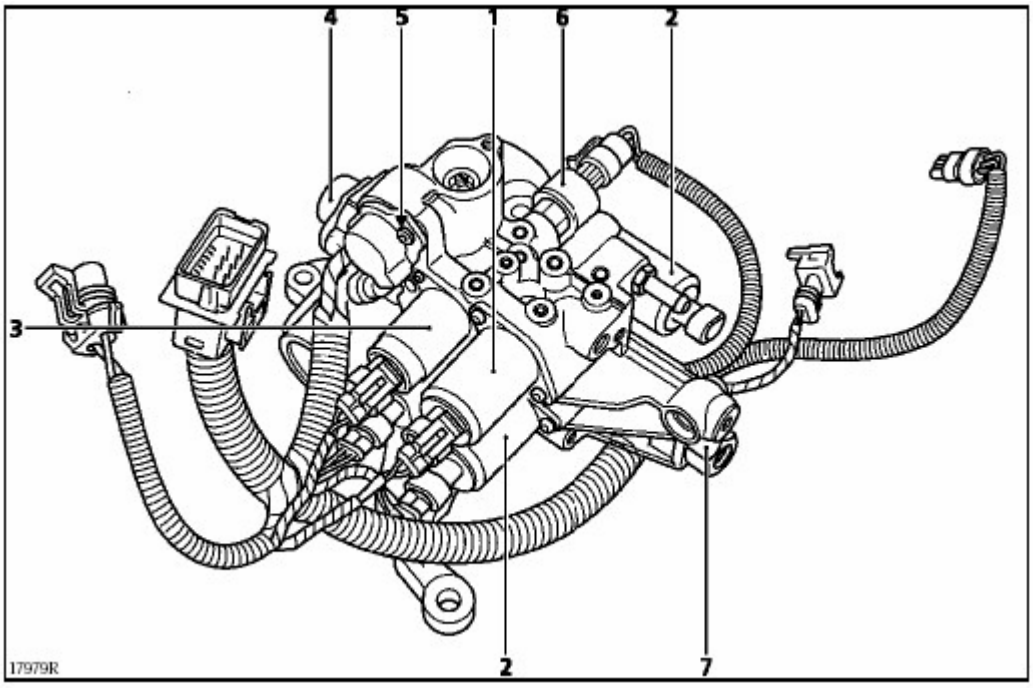


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Fix the potentiometer Tighten the potentiometer into the clutch module through the compression spring.  	Carry out the following steps according to the opposite sequence. Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line. Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section "special requirements on change of system parts and components of KIT electrically controlled hydraulic system") **Oil filling into oil tank** The mark shown on the oil tank is the lowest standard. Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line. **Important tip:** The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION – DRIVE MECHANISM MODULE



Instruction of part and component:

1. Electromagnetic valve for clutch
2. Electromagnetic valve for gear engagement
3. Electromagnetic valve for gear position selection
4. Engagement position sensor
5. Gear position sensor
6. Pressure sensor
7. High-pressure filter

Tightening torque (unit: DAN.M)		
Drive module pin	0.8	
Drive module nut	2.1	
Electromagnetic valve bolt	0.4	
Control shaft cover bolt	0.6	
High-pressure pipeline coupler	1.4	
Energy storage	4	
Remarks: **Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage. (Refer to the section of "Energy Storage").** Remove: – Battery – Air casing – Electronic injection computer – Clutch cylinder fasteners		– High-pressure pipeline – Low-pressure pipeline – Oil tank – Left headlight – Wheels – Lamp used to indicate that left wheel is stuck in mud – Transmission weight Mount the engine support MOT.1453

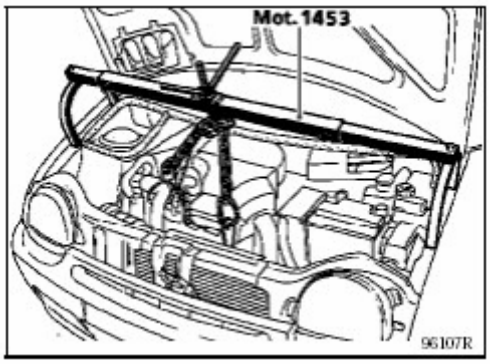
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– Supporting board for fasteners (A)

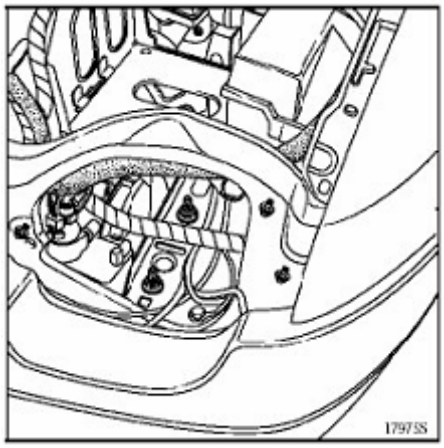


Remove:

– Mounting bracket for lifting ring (B)
– Energy storage ©

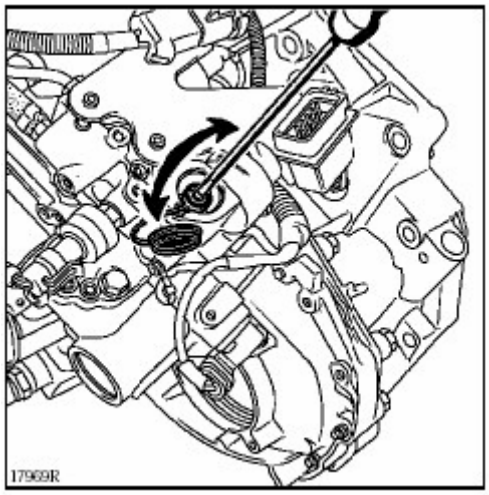


Remove the transmission support from the vehicle body.



Lower the transmission as possible as you can and take off the control shaft cover.

Rotate the control shaft a quarter turns by using a screwdriver so as to loosen it.

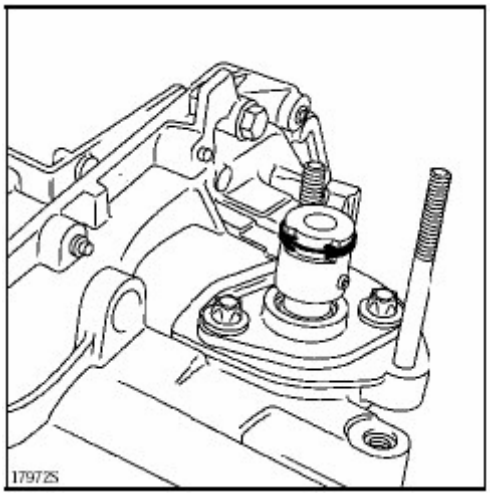


Remove the hydraulic unit

Remount it

Check whether positions of the two half-moon parts are correct.

Smear MOLYKOTE 33 (moderate) onto the two half-moon parts.



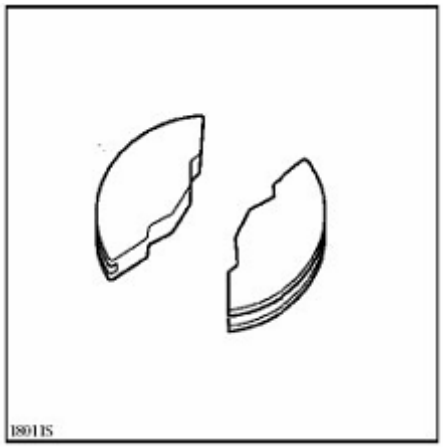
Place the control shaft onto the drive mechanism module and lock it.

Screwdriver impression and shaft pin should be aligned respectively with the marks.

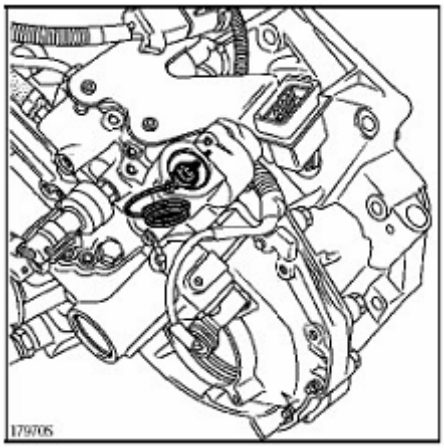
Put the flat washer in place.

Remount the hydraulic unit onto the transmission.

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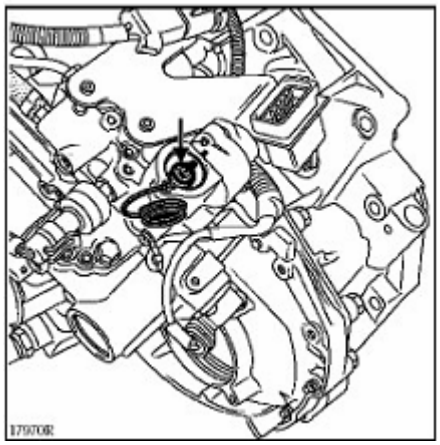


Put two half-moon parts and circlip into the control shaft groove.



Fix the hydraulic unit onto the transmission by screwing its fixing bolts.

Hold the control shaft with a screwdriver so as to lock the drive module.



Connect:

- The bus bar to the drive mechanism
- Fasteners

Remount:

- Control shaft cover (smear grease onto the washer)
- The transmission support onto the vehicle body

Remove the engine support MOT.1453's handheld tool.

It is easy to carry out the following assembly procedure, which is opposite to the disassembly procedure.

Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line.

Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section “special requirements on change of system parts and components of KIT electrically controlled hydraulic system”)

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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Tightening torque (unit: DAN.M)		
Energy storage	4	
High-pressure pipeline coupler	1.4	
Lifting ring fixing nut	2.1	
Electromagnetic valve bolt	0.4	

Remarks:

Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage (refer to the section of "ENERGY STORAGE").

Please refer to the related information in 21- 4.

Disconnect:

- Battery
- Hydraulic unit wire harness connectors

Remove:

- Air casing
- Air casing support
- Computer
- Transmission housing support
- Energy storage ©
- Hydraulic unit wire harness connector support (A)

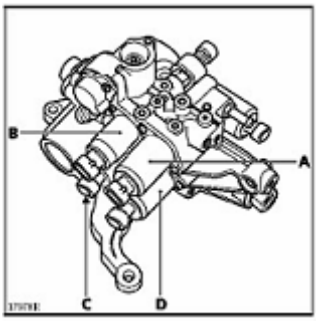


Remove:

- Lifting ring (B) mounting support
- Energy storage ©

Disconnect the related connections for electromagnetic valves.

Remove related electromagnetic valves according to the following removal sequence.



A: Electromagnetic valve (for the clutch)

B: Electromagnetic valve 4 (for gear position selection)

C: Electromagnetic valve 3 (for gear position selection)

D: Electromagnetic valve 1 (for gear engagement)

Remounting:

Carry out the remounting procedure that is opposite to the removal procedure.

Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line.

Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section “special requirements on change of system parts and components of KIT electrically controlled hydraulic system”)

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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Electromagnetic valve 2:

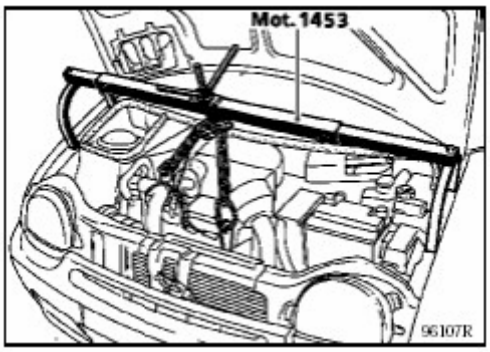
Removal:

It is necessary to lower the transmission to remove the clutch electromagnetic valve 2.

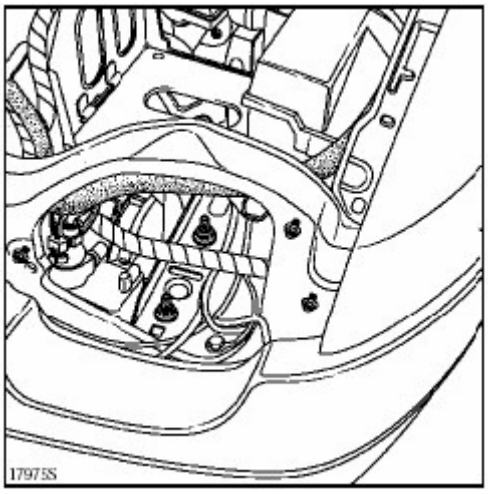
Remove:

- Battery
- Air casing
- Electronic injection computer
- Left headlight
- Wheels
- Lamp used to indicate that left wheel is stuck in mud
- Transmission weight

Mount the engine support MOT 1453.



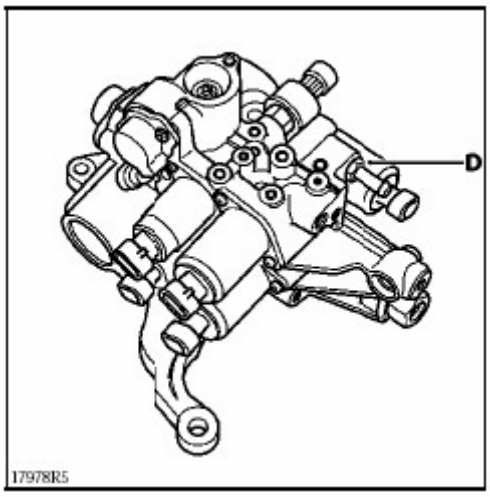
Remove the transmission support connections on the vehicle body.



Lower the transmission as possible as you can.

Disconnect the related connections for electromagnetic valves.

Remove the electromagnetic valve 2 (D).



Remounting:

Carry out the remounting procedure that is opposite to the removal procedure.

Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line.

Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section “special requirements on change of system parts and components of KIT electrically controlled hydraulic system”)

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION
– ENGAGEMENT POSITION SENSOR

Tightening torque (unit: DAN.M)	
Power on position sensor bolt	0.4
Drive mechanism module nut	2.1
Lifting ring fixing nut	2.1
High-pressure pipeline coupler	1.4
Energy storage	4

Disconnect the engagement position connector (A)
Remove the engagement position sensor (A)

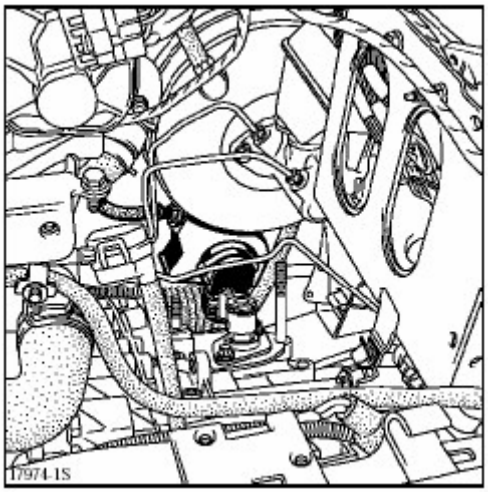
Remarks:

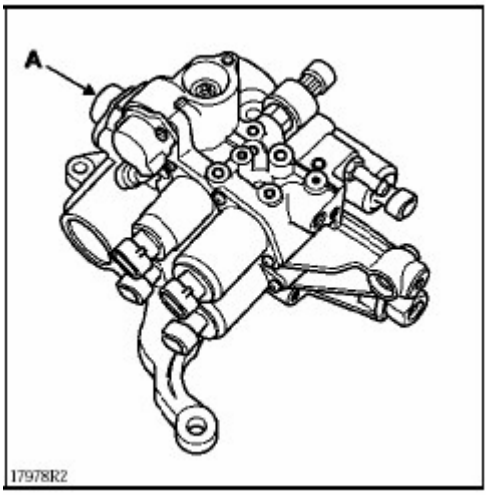
Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage (refer to the section of "ENERGY STORAGE").

When removing the engagement position sensor, it is unnecessary to remove the drive mechanism module.

Removal:

Remove the potentiometer for accelerator and footbrake and its support.





Remounting:

Carry out the remounting procedure that is opposite to the removal procedure.

Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section “special requirements on change of system parts and components of KIT electrically controlled hydraulic system”)

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION

– GEAR POSITION SELECTION SENSOR

Tightening torque (unit: DAN.M)	
Power on position sensor bolt	0.4
Electromagnetic valve	0.4
Lifting ring fixing nut	2.1
High-pressure pipeline coupler	1.4
Energy storage	4

Remarks:

Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage (refer to the section of "ENERGY STORAGE").

Before removing the gear position selection sensor, it is necessary to change to the 1st gear.

Removal:

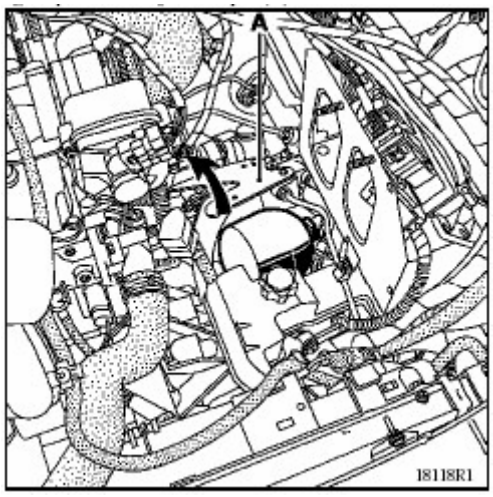
Disconnect the battery.

Remove:

- Air casing
- Air casing support

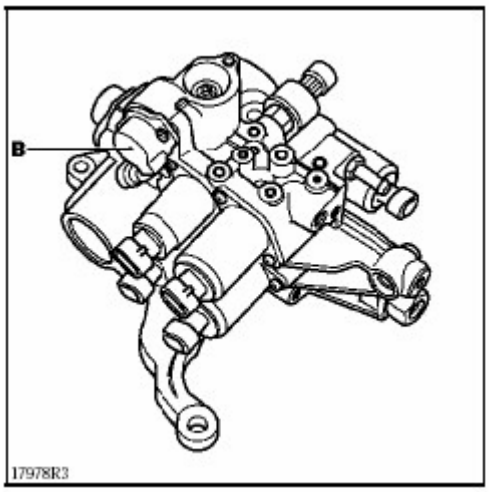
Disconnect the hydraulic unit wire harness connector (A).

Remove the hydraulic unit wire harness connector support (A).



Disconnect the gear position selection connector (B)

Remove the gear position selection sensor (B)



Remounting:

Check the capability of the selective sensor to rotate freely.

Carry out the following remounting procedure that is opposite to the removal procedure.

Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section “special requirements on change of system parts and components of KIT electrically controlled hydraulic system”)

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION
– CLUTCH POSITION SENSOR

Tightening torque (unit: DAN.M)	
Clutch position sensor bolt	0.4
M8 bolt for electric pump set	2.4
M10 bolt for electric pump set	4.4
High-pressure pipeline coupler	1.4
Lifting ring fixing nut	2.1
Energy storage	4

Remarks:

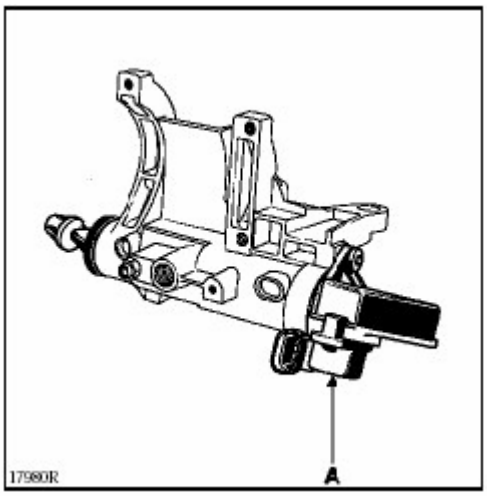
Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage (refer to the section of "ENERGY STORAGE").

Remove:

– Clutch actuator support

Disconnect the clutch position sensor connector.

Remove the clutch position sensor. (A)



Remounting:

Carry out the following remounting procedure that is opposite to the removal procedure.

Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section "special requirements on change of system parts and components of KIT electrically controlled hydraulic system")

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION – PRESSURE SENSOR

Tightening torque (unit: DAN.M)	
Position sensor bolt	0.4
Drive mechanism module nut	1.4
Lifting ring fixing nut	2.1
High-pressure pipeline coupler	1.4
Energy storage	4

Remarks:

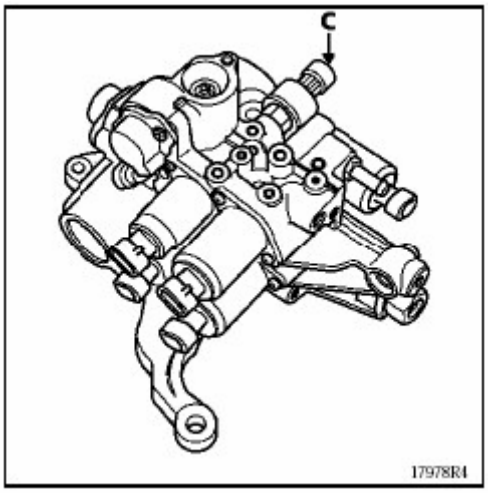
Before maintaining the entire automated mechanical transmission, use a special repair tool to remove the energy storage (refer to the section of "ENERGY STORAGE").

Removal:

Use an injector to evacuate the oil tank.

Disconnect the pressure connector©.

Use a 14 mm precision wrench to remove the pressure sensor (C).



Remounting:

Carry out the following remounting procedure that is opposite to the removal procedure.

Fill the ELF RENAULT MATIC D3 SYN DEXRON oil to the degree that the oil level is 32 to 38 mm higher than the lowest mark line.

Perform the corresponding test by using a special tool. (Refer to the page 21-36 of section "special requirements on change of system parts and components of KIT electrically controlled hydraulic system")

Oil filling into oil tank

The mark shown on the oil tank is the lowest standard.

Carry out the energy storage removal procedure. Make sure that the oil level is 32 to 38 mm higher than the lowest mark line.

Important tip:

The oil level will be at the position indicated by the mark line (MIN) when the energy storage has been fully inflated (15 seconds after ignition).

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MECHANICAL TRANSMISSION – CLUTCH SPEED SENSOR

After replacing the transmission's clutch speed sensor, it is necessary to start the vehicle so as to recover the fault light to the condition of being not illuminated due to being free from fault and delete all the memories of the computer.

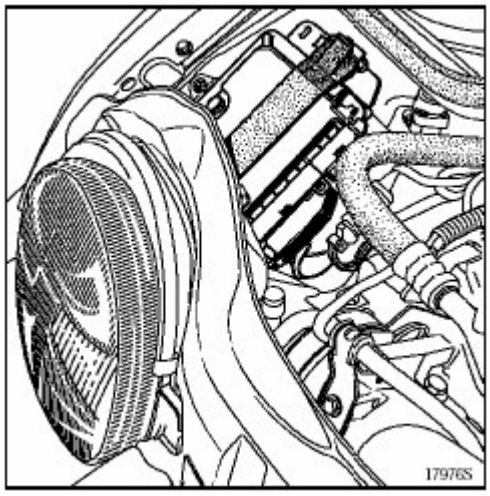
Only when the computer receives speed information from the clutch speed sensor, it will eliminate the fault(s).

MECHANICAL TRANSMISSION – COMPUTER

Position:

It is located on the front axle near the right front wheel within the engine compartment.

There are two connectors on it, i.e. 52-line connector and 28-line connector.



Removal and Installation:

Before maintaining the computer, you shall turn off the engine and cut off the battery.

Important tip:

After replacing it with a new computer, it is necessary to test it in advance.

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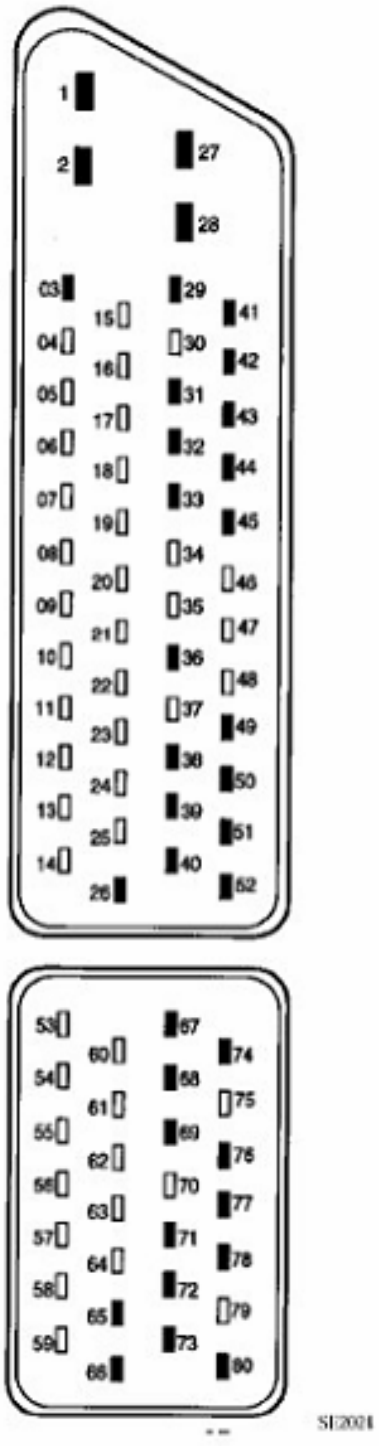
Line distribution:

52-line connector:

1 – power supply module 1
2 – power supply module 2
3 – gear position selection electromagnetic valve 4
26 <--- high drive ratio information
27 ---+ battery
28 ---+ after ignition
29 - à gear position selection electromagnetic valve 4
31 - à helix tube of power pump relay
32 - à gear engagement electromagnetic valve control 1
33 - à ß - acquire dialogue: CAN L connection
36 ß - vehicle speed signal
38 ß - junction box input speed sensor
39 ß - engagement position sensor signal
40 ß - pressure sensor signal
41 -- à fault confirmation
42 -- à helix tube of start-up device relay
43 -- à clutch electromagnetic valve control
44 -- à gear engagement electromagnetic valve control 2
45 -- à ß - acquire dialogue: CAN H connection
49 - à ß - dialogue line
50 ß - junction box input speed sensor
51 ß - gear position selection sensor signal
52 ß - engagement position sensor signal

28-line connector:

65 --- gearshift lever module
66 --- sensor module
67 ß - stable position information (spare)
68 ß - low drive ratio information
69 ß - footbrake connector
71 ß - handbrake connector
72 - à instrument information
73 --- sensor information
74 ß - information about changing to the neutral position
76 ß - main information after start-up
77 ß - automatic ignition
78 ß - door connector
80 ß - horn control



ß Input à Output

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MECHANICAL TRANSMISSION – RELAY

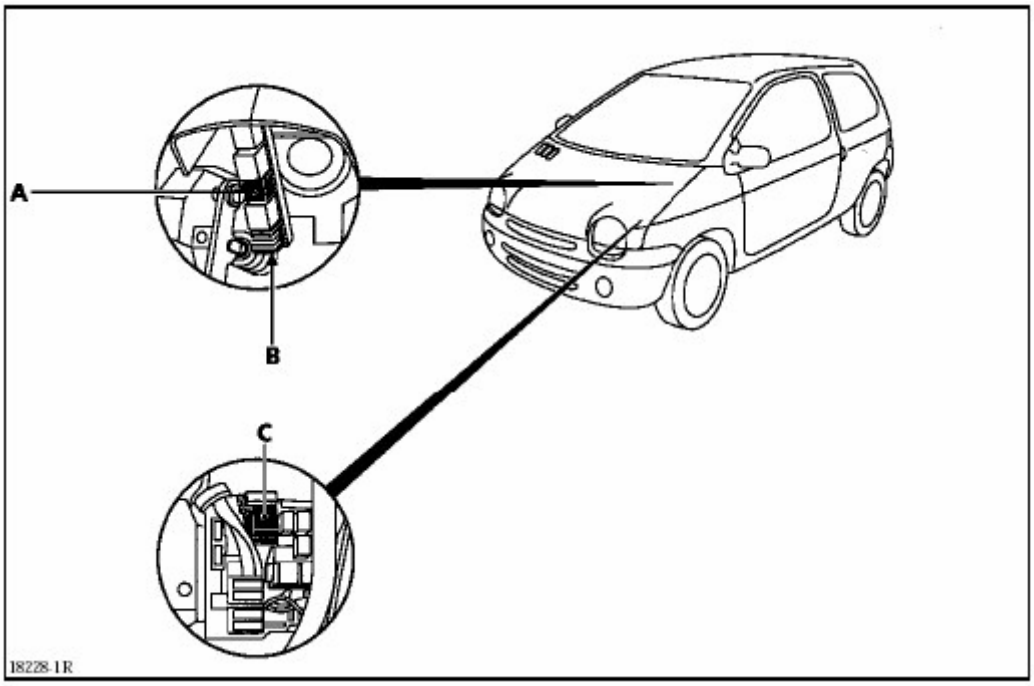
Position:

There are two relays that can be activated by the system:

- Start-up relay (A) near the buzzer under the instrument board (B).
- Pump relay © on the interconnection box within the engine compartment.

Removal and Installation

Before maintaining the system, you shall turn off the engine and cut off the battery.



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MECHANICAL TRANSMISSION – FUSE

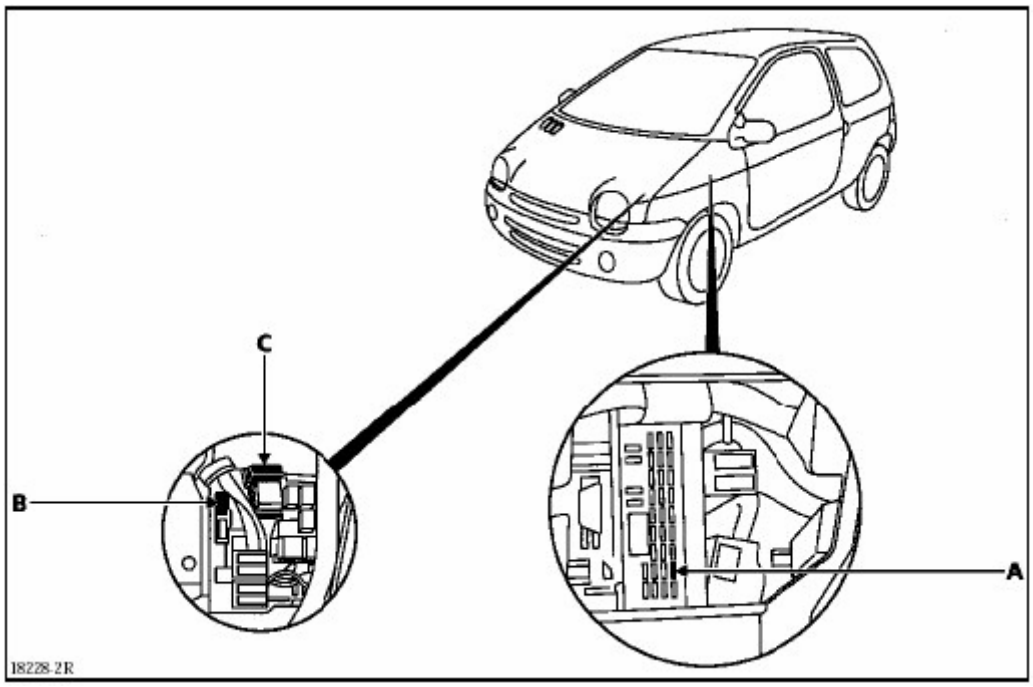
Position:

The system employs three fuses for power supply:

- 3A fuse (A) on the ignition switch's positive pole (+), located on the fuse side panel of driver compartment, connected to the main shaft 28 of the transmission computer connector.
- 20A fuse (B) on the battery's positive pole (+) within the interconnection box in the engine compartment, connected to the main shaft 27 of the transmission computer connector.
- 30A fuse (C) on the battery's positive pole (+) within the interconnection box in the engine compartment, used to supply the electric pump set with power.

Removal and Installation:

Before maintaining the system, you shall turn off the engine and cut off the battery.



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MECHANICAL TRANSMISSION – WIRE HARNESS

The wire harness is integrated with the hydraulic unit and bundles eleven connectors for different components.

Five main electromagnetic valves are placed together on one sleeve and the plate is fixed onto the hydraulic block.

The electric pump is mounted onto the clutch cylinder body.

Connection with the vehicle wire harness is implemented through the 24-line SICMA connector on the system.

Line distribution of the connector:

A8 - à control + electric pump set

B2 à control + clutch electromagnetic valve

B3 à control + gear engagement electromagnetic valve 2

B4 à control + gear position selection electromagnetic valve 3

B5 à control + gear engagement electromagnetic valve 1

B6 à control + gear position selection electromagnetic valve 4

Sensor:

– For power on

C1 --- – For clutch

– For pressure

C2 ß gear engagement sensor signal

C3 ß gear position selection sensor signal

C4 ß clutch sensor signal

C5 ß pressure sensor signal

C6 --- blocky – transmission input speed sensor

C7 ß signal + transmission input speed sensor

Control + sensor:

- For power on

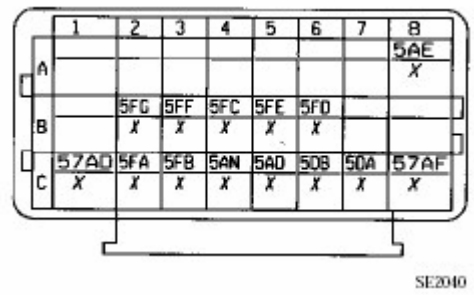
C8 - à gear position selection

– For clutch

– For pressure

ß - Input

- à Output



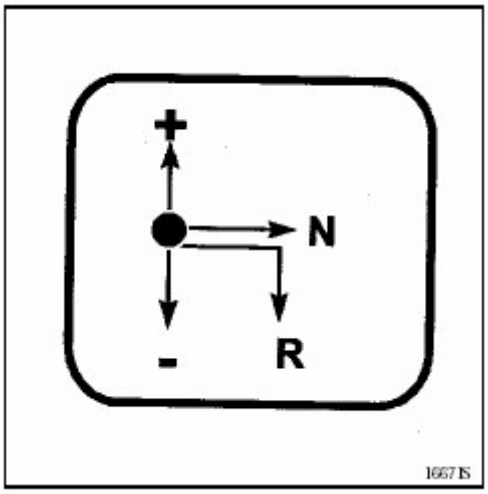
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MECHANICAL TRANSMISSION – GEARSHIFT LEVER

Method of application:

For control lever type gearshift, there is only one stable position.

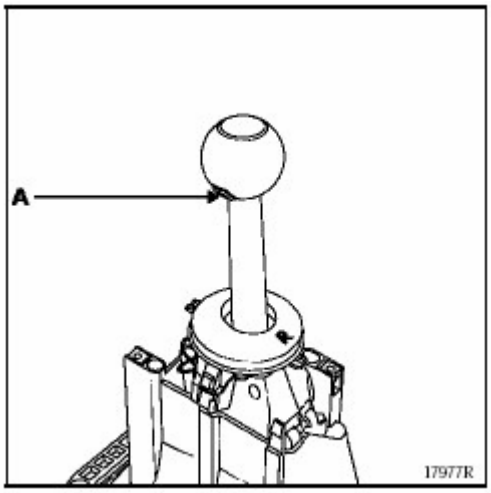
Any operation of the gearshift lever from this position will produce a pulse, which is also called "signal".



- Forwards (+): to high drive ratio
- Backwards (-): to low drive ratio
- Rightwards (N): to the neutral position
- Rightwards and backwards Ⓡ : to the reverse gear

The button "A" is used to activate or inactivate the automatic mode depending on what the driver needs.

The display in the center of the instrument board indicates the actual drive ratio in use. The letter Ⓡ on the base frame of the gearshift lever is used to indicate that changing to this position will change to the reverse gear.



Operation:

Its control of the automated mechanical transmission is an electric control.

Gearshift lever position is converted into electric signal through the connector located at the bottom of the control module and then sent to the transmission computer.

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Removal:

Disconnect the battery.

Remove:

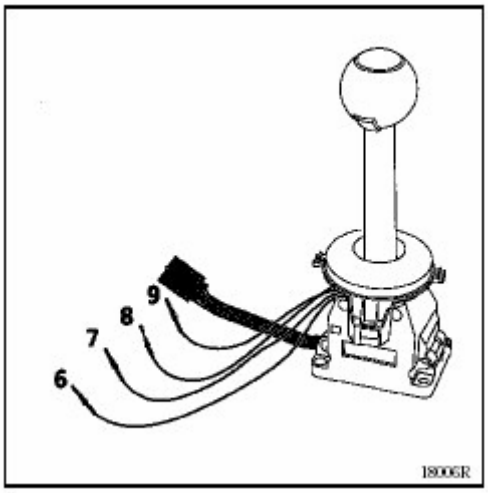
- Gearshift lever base frame dust boot
- Transmission base

Disconnect electric connection of the gearshift lever.

Take out the following two electric wires of the gearshift lever's electric connector:

Line 8 – power wire for the automatic operation button

Line 9 – power wire for the serial operation button



On the main shaft of the connector, line distribution (10 lines) is as follows:

Line 1: control lever mechanism

Line 2: information of changing to high drive ratio

Line 3: information of changing to low drive ratio

Line 4: stable position information (spare)

Line 5: information of changing to the neutral position

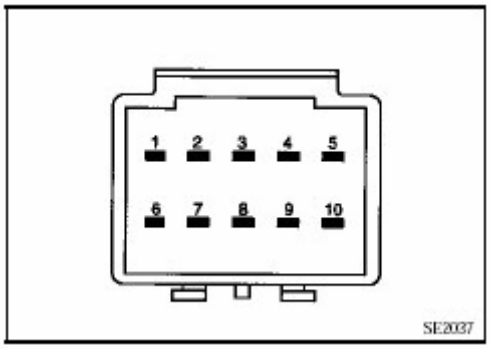
Line 6: whole module

Line 7: information of changing to the reverse gear

Line 8: whole module

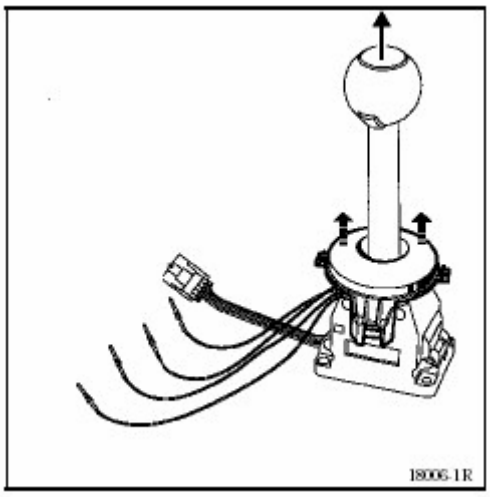
Line 9: information of changing to the automatic mode

Line 10: no connection



Undo the circlip that surrounds the gearshift lever base washer.

Remove the ball ring on the top of the gearshift lever by applying an upward force on it, as shown in the arrow.



Remove the four fixing bolts for gearshift lever base from its mounting base.

Replace any worn parts.

Reassembly:

It is easy to carry out the reassembly procedure, which is opposite to the disassembly procedure.

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MECHANICAL TRANSMISSION – SPECIAL REQUIREMENTS ON REPLACEMENT OF SYSTEM AND COMPONENTS

KIT hydraulic unit/computer/transmission/reprogramming

(A) Ignition
Re-initialization after all experiments (attempts) are carried out: **RZ002** "**attempt"**

(B) Title: control of **VP008** "**Gear position selection & gear engagement attempt"**
Wait until the program comes to an end
Turn off the engine
Wait for one minute
Ignite the engine (if any fault occurs, the buzzer will be started)
If the check result is **OK**, **ET061** "**Region Qualified**" will be shown. If the "**Region finished"** or **ET063** "**Electromagnetic valve is null"** is shown, repeat the procedure (B).

(C) Apply all drive ratios (the information shown on the display on the instrument board should be **OK**)

(D) Place the gearshift lever to the neutral position
Start the engine
Wait for ten seconds (used in important clutch experiments) and provide no speed.
If the check result is **OK**, **ET062** "**Important experiments finished"** will be shown. Otherwise, repeat the procedure (**D**).

(E) When the "clutch temperature" information **PR095** is less than **1800C**, repeat the engine start-up process with halfload five to six times (used in step-by-step attempt for clutch)
Turn off the engine
Wait for one minute
Ignite the engine
If the check result is **OK**, **ET065** "**Step-by-step attempt finished"** will be shown. Check whether the "Step-by-step" information is changing, and if not so, repeat the procedure (E).

(F) Title: control of **CF321** "**Transmission model" selection: short-size or long-size**
Check that the "**Transmission model"** information shown is really that model that the operator selected.

(G) Turn off the engine

Engagement position sensor/gear position selection sensor

(A) Ignition
Ensure no fault

(B) Title: Control of **VP008 "Gear position selection & gear engagement attempt"**
Wait until the program comes to an end
Wait for one minute
Ignition (if any fault occurs, the buzzer will be started)
If the check result is **OK, ET061 "Region Qualified"** will be shown. If the **"Region finished"** or **ET063 "Electromagnetic valve is null"** is shown, repeat the procedure **(B)**.
Apply all drive ratios (the information shown on the display on the instrument board should be OK)

(C) Turn off the engine

Clutch position sensor/clutch

(A) Ignition
Ensure no fault

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(B) Title: control of **RZ003 "Important Attempts"**

(C) Place the gearshift lever to the neutral position
Start the engine
Wait for ten seconds (used in important clutch experiments) and provide no speed.
If the check result is OK, ET062 "Important experiments finished" will be shown. Otherwise, repeat the procedure (**C**).

(D) When the "clutch temperature" information **PR095** is less than **1800C**, repeat the engine start-up process with halfload five to six times (used in step-by-step attempt for clutch).
Turn off the engine
Wait for one minute
Ignition
If the check result is **OK**, **ET065** "**Step-by-step attempt finished"** will be shown. Check whether the "Step-by-step" information is changing, and if not so, repeat the procedure (D).

(E) Turn off the engine

Pressure sensor

(A) Ignition
Ensure no fault

(B) Title: control of **AC011 "Hydraulic unit overflow port"**
Wait until the program comes to an end
Turn off the engine

Gear position selection electromagnetic valve/gear engagement electromagnetic valve

(A) Ignition
Ensure no fault

(B) Title: control of **AC001** "**Hydraulic unit overflow port screw plug"**
Wait until the program comes to an end
Turn off the engine

(C) Apply all drive ratios (the information shown on the display on the instrument board should be **OK**)

(D) Turn off the engine

Clutch electromagnetic valve

(A) Ignition
Ensure no fault

(B) Open the hydraulic unit overflow port screw plug

(C) Title: control of **AC009** "**The second-stage clutch pipeline overflow port"**
Wait until the program comes to an end (eight minutes)

(D) Title: control of **AC011** "**Hydraulic unit overflow port screw plug"**
Wait until the program comes to an end
Turn off the engine

Gear position selection/gear engagement/oil tank/energy storage/single pump

(A) Ignition
Ensure no fault

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(B) Title: control of **AC011** "**Hydraulic unit overflow port screw plug**"
Wait until the program comes to an end
Turn off the engine
Wait for one minute
Ignition (if any fault occurs, the buzzer will be started)
If the check result is **OK**, **ET061** "**Region Qualified"** will be shown. If the "**Region finished**" or **ET063 "Electromagnetic valve is null"** is shown, repeat the procedure (B).

(D) Apply all drive ratios (the information shown on the display on the instrument board should be **OK**)

(E) Turn off the engine

Clutch cylinder/liquid leakage during replacement of clutch sensor

(A) Ignition
Ensure no fault

(B) Open the hydraulic unit overflow port screw plug
Title: control of **AC008** "**The first-stage clutch pipeline overflow port"**
When there is any liquid flowing out without air bubble, close the overflow screw plug
Wait until the program comes to an end (six minutes)

(C) Title: control of **AC009 "The second-stage clutch pipeline overflow port"**
Wait until the program comes to an end (eight minutes)

(D) Title: control of **RZ003** "**Important Attempts"**

(E) Place the gearshift lever to the neutral position
Start the engine
Wait for ten seconds (used in important clutch experiments) and provide no speed.
If the check result is OK, **ET062 "Important experiments finished"** will be shown. Otherwise, repeat the procedure (E)

(F) Turn off the engine

High-pressure pipeline

(A) Ignition
Ensure no fault

(B) Open the hydraulic unit overflow port screw plug
Title: control of **AC008** "**The first-stage clutch pipeline overflow port"**
When there is any liquid flowing out without air bubble, close the overflow screw plug
Wait until the program comes to an end (six minutes)

(C) Title: control of **AC009** "**The second-stage clutch pipeline overflow port"**
Wait until the program comes to an end (eight minutes)
Turn off the engine

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CONTROL OF MACHINE PARTS – MAIN CYLINDER

Tightening torque (unit: DAN.M)	
M10×100	1.3
Main cylinder bolt	1.5
Servo brake bolt	2

Removal:

Disconnect the battery.

Remove:

- Battery mounting support
- Battery
- Plastic computer protection cover

Disconnect and remove the computer

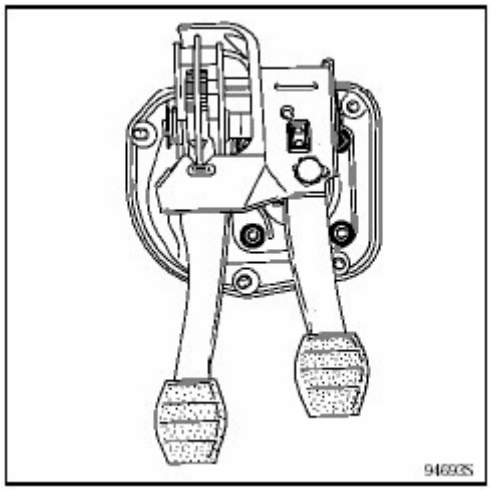
Use the injector to evacuate the brake oil tank.

Remove the oil tank and be careful to prevent the brake fluid from flowing out. Therefore, it is necessary that a rag is available in advance.

Remove:

- Two brake oil pipes and make corresponding marks
- Main cylinder fasteners

Loosen the four fixing fasteners for servo brake in the driver compartment.



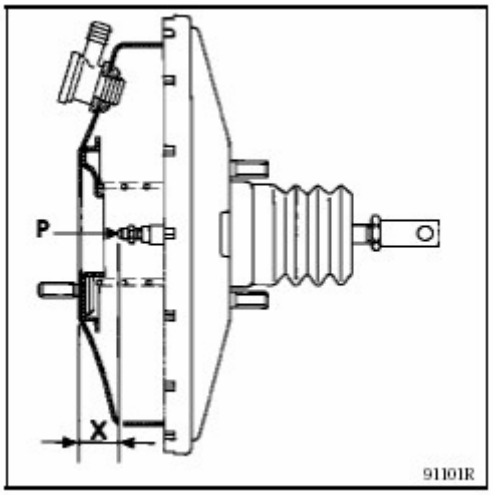
Rotate the servo brake downwards so as to take out the main cylinder.

Reassembly:

Check on the length of the pushrod.

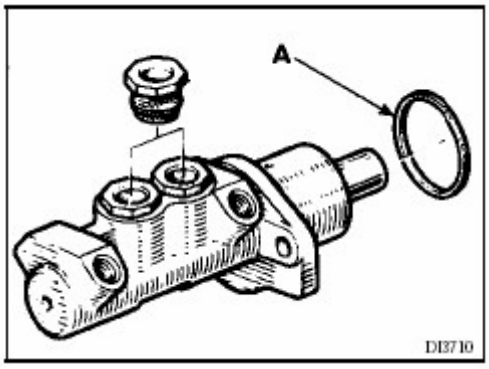
Size: X = 22.3MM

It can be adjusted by using the measuring rod (P) according to its particular model.



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Remarks: the vehicle is equipped with the master cylinder that is integrated with the servo brake. The servo brake sealing is directly associated with the master cylinder. It is necessary to substitute a new washer (A) when in repair. The master cylinder shall be placed in parallel to the servo brake, so that the pushrod (P) can accurately and directly move into the master cylinder body.



Reconnect:

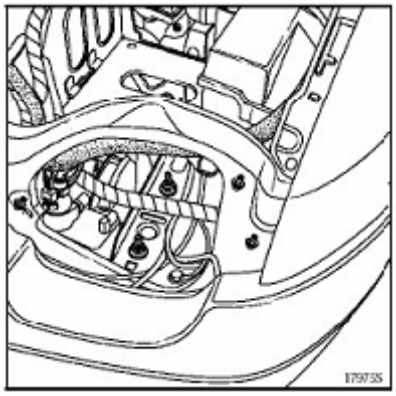
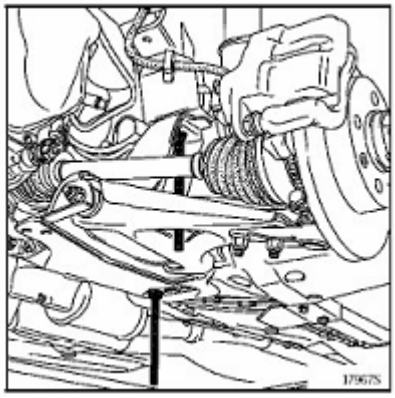
- The pipes **near the marks made when they were previously removed**.
- The compensation tank by pressing to make it well stuck in the master cylinder.

Clean the brake line.

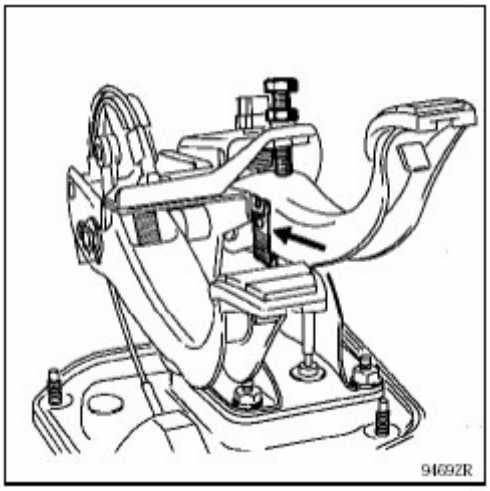
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CONTROL OF MACHINE PARTS – SERVO BRAKE

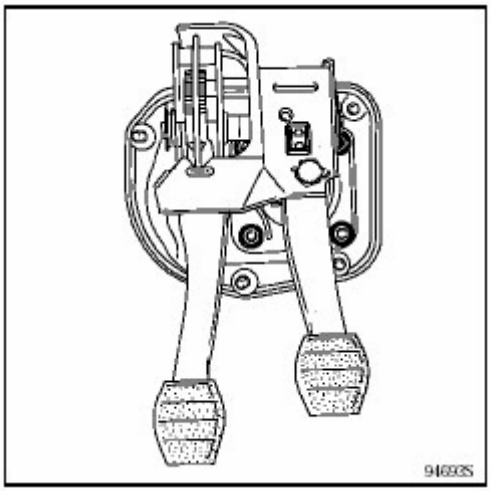
Indispensable special tools	
ELE 1294-01	Glass cleaning tool
MOT. 1453	Engine bracket
2* TAV. 1233-01	Seat frame tool

<table>
<tr><td>Tightening torque (unit: DAN.M)</td><td></td><td></td></tr>
<tr><td>M10×100
Main cylinder bolt
Servo brake bolt
Housing bracket bolt
Seat frame bolt
Nut for upper glass cleaning
Nut for lower glass cleaning</td><td>1.3
1.5
2
4.5
6.5
1.6
1.2</td><td rowspan="2"> 
Put the two AV. 1233-01 tools that have the same diameter of 8MM.
  </td></tr>
<tr><td colspan="2">Servo brake cannot be repaired and you can only maintain the following parts:
n Air filter
n Check valve
Disconnect the battery.
Reassembly:
Remove the main cylinder. See the disassembly procedure described on the previous page.
Use the tool ELE. 1294-01 to remove two fixing bolts for glass cleaning.
Disassembly:
n Air inlet DURIT
n Three fixing bolts for glass cleaning engine
n Glass cleaning engine
n Check valve on the servo brake
n Left front mirror
Keep the MOT.1453 bracket bolts in place.
Disassembly the housing bracket bolts.</td></tr>
<tr><td colspan="2">Disassembly:
– Remove the clip and then the bracket shaft connecting footbrake and pushrod.</td><td>Gradually lower the mechanical power set and its seat frame so as for the servo brake to be taken off.
Assembly:
Carry out the reassembly procedure, which is opposite to the removal procedure.
Before reassembly, you shall check:
Size, L = 94.5MM</td></tr>
</table>

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– Servo brake fixing bolts



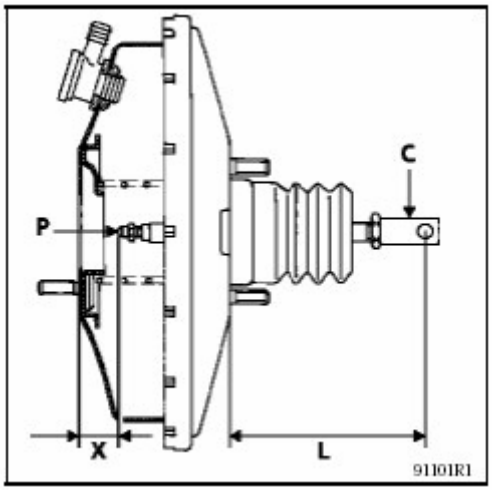
– Steering cover nut

– Two bolts for connecting rod used to gain force moment

It can be adjusted by using the measuring rod © according to its particular model.

Size: X = 22.3mm

It can be adjusted by using the measuring rod (P) according to its particular model.



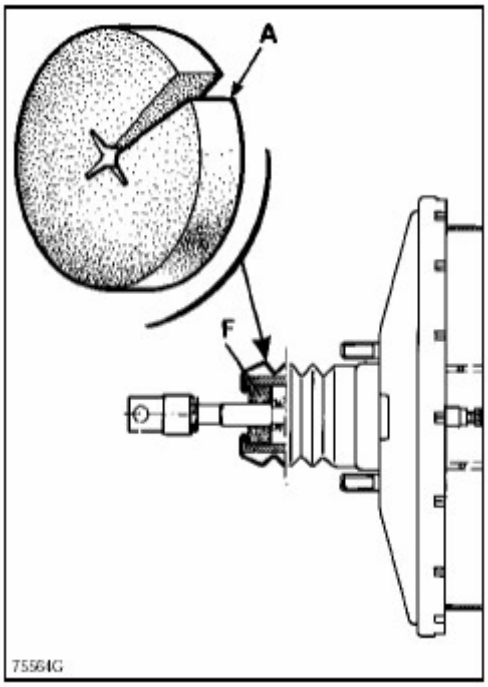
Put the master cylinder in place (refer to the relevant chapter).

Clean the brake line.

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CONTROL OF MACHINE PARTS
– AIR FILTER & SERVO BRAKE CHECK VALVE

Change of air filter

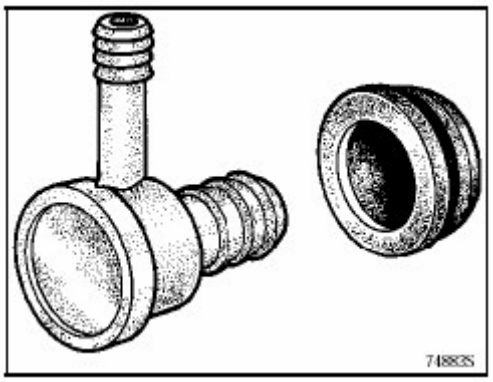


When replacing the air filter element, it is unnecessary to remove the servo brake.
Take out the worn filter element (F) from below the pedal support by using a screwdriver or metal hook.
Cut the new filter element into the shape "A" (see the figure), mount it around the pushrod, and sent it into the chamber slowly. Make sure that it shall fully stretch in the boring hole to prevent the unfiltered air from going through.

Replace the check valve

This operation can be carried out in the vehicle.

Disassembly:
Disconnect the servo relief inlet pipe.
Move the rubber seal ring by rotating the check valve and take it out.



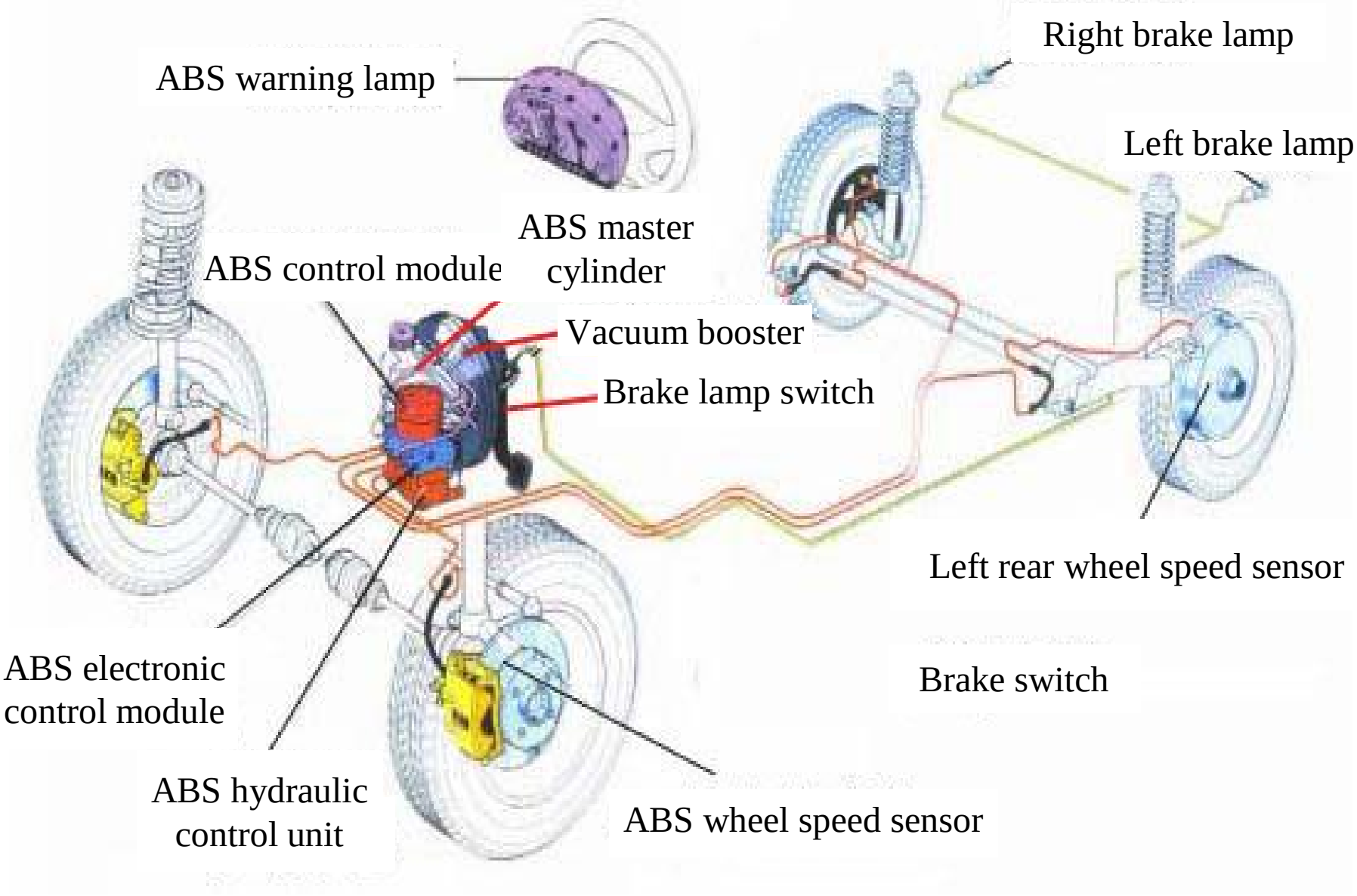
Reassembly:
Check the seal washer and check valve.
Replace any faulty parts.
Place back the assembly.

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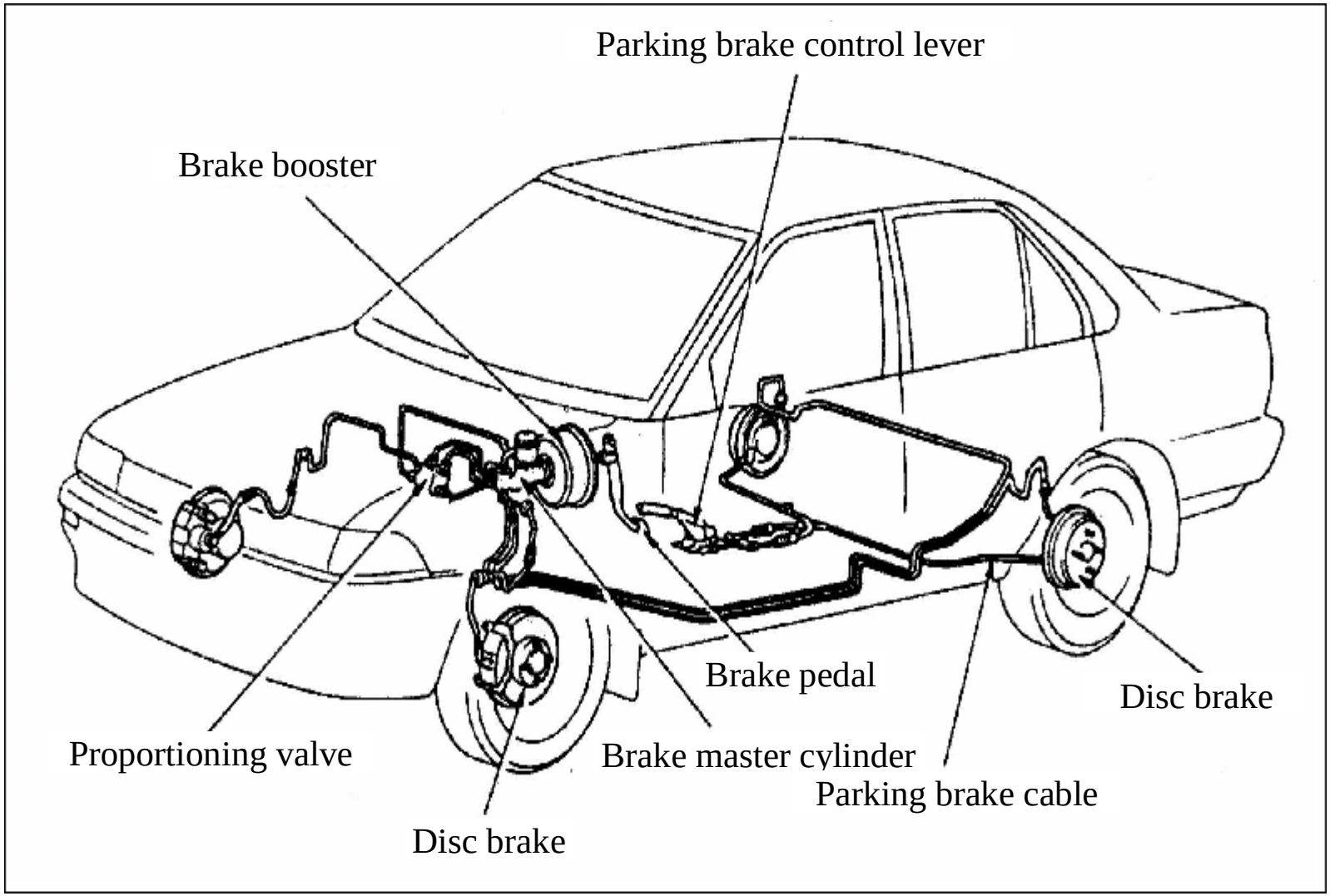
S11 Brake System



S11 Brake System Introduction

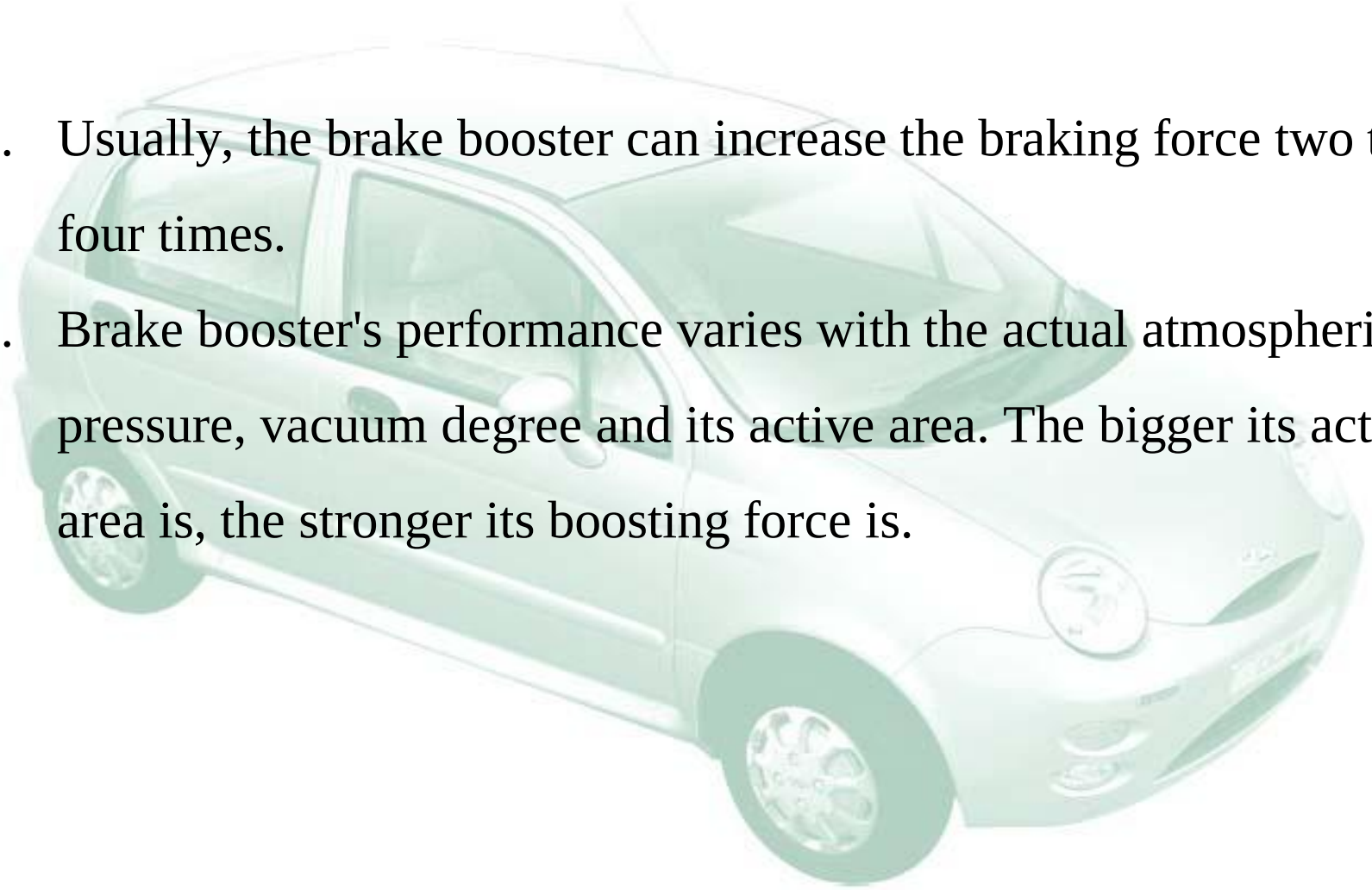


Composition of Ordinary Brake System

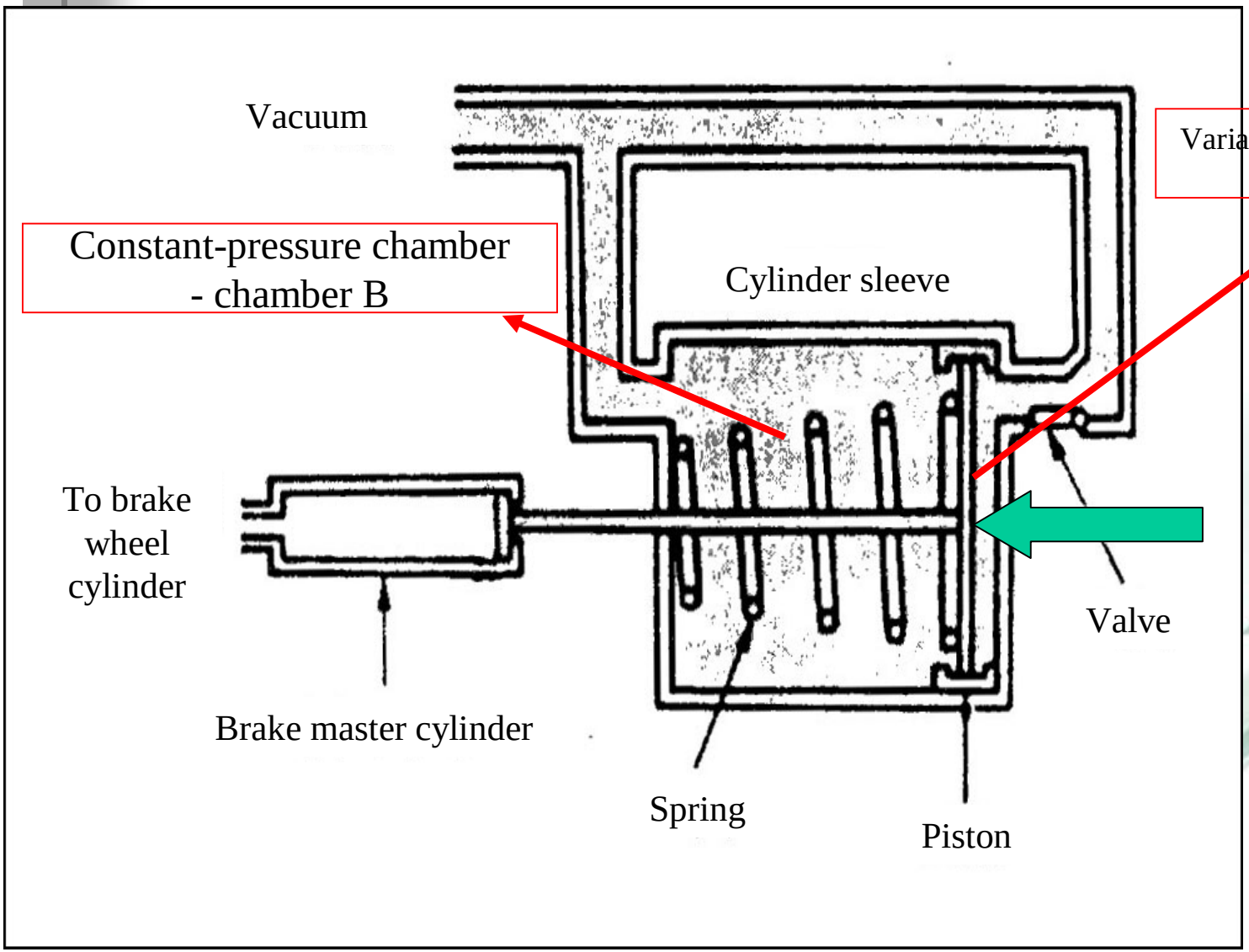


Brake Booster

1. Usually, the brake booster can increase the braking force two to four times.
2. Brake booster's performance varies with the actual atmospheric pressure, vacuum degree and its active area. The bigger its active area is, the stronger its boosting force is.



Brake Booster not in Braking



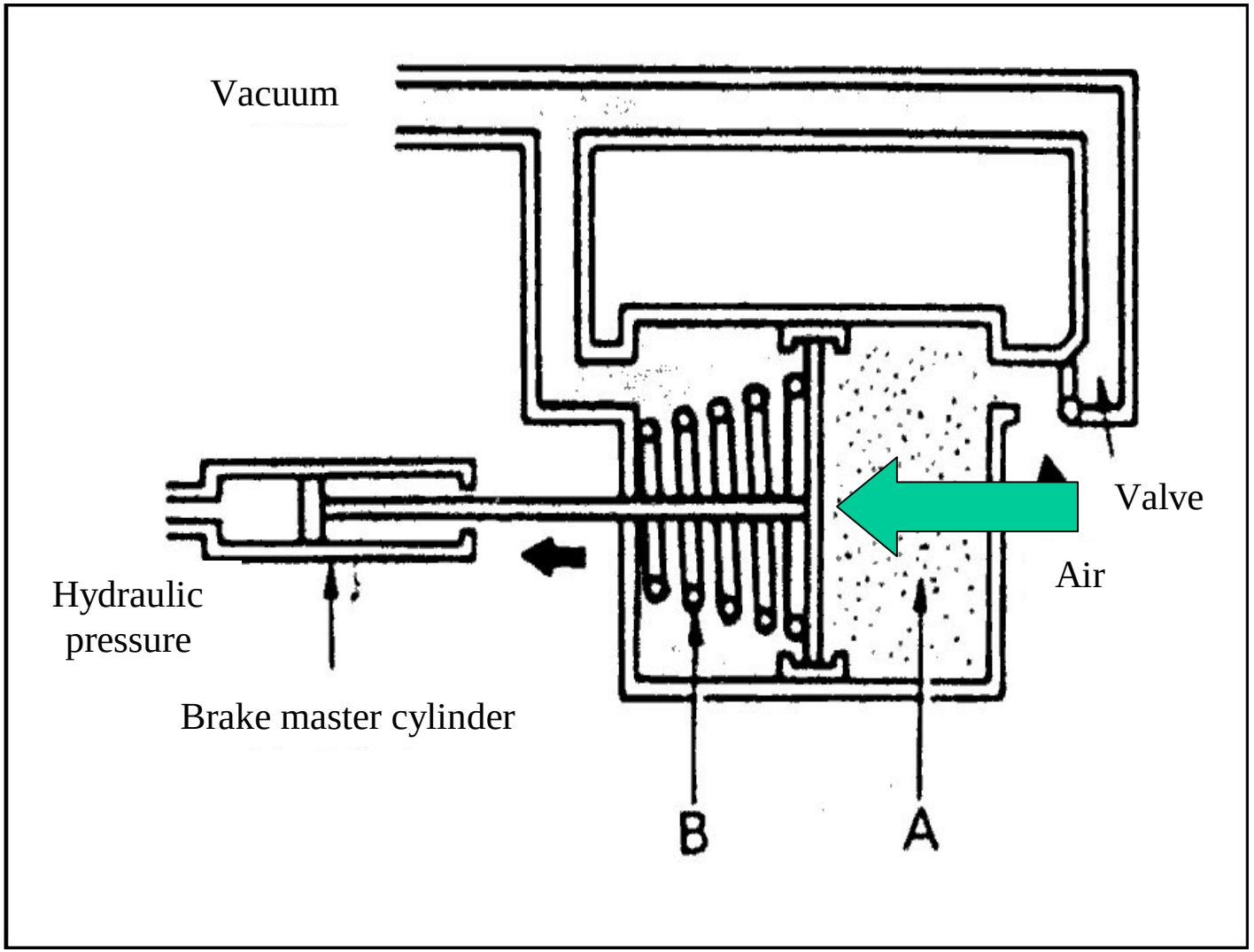
Relationship between $F_b + F_s$ and F_a

$F_b = F_a$
F_s pushes the piston to the right.

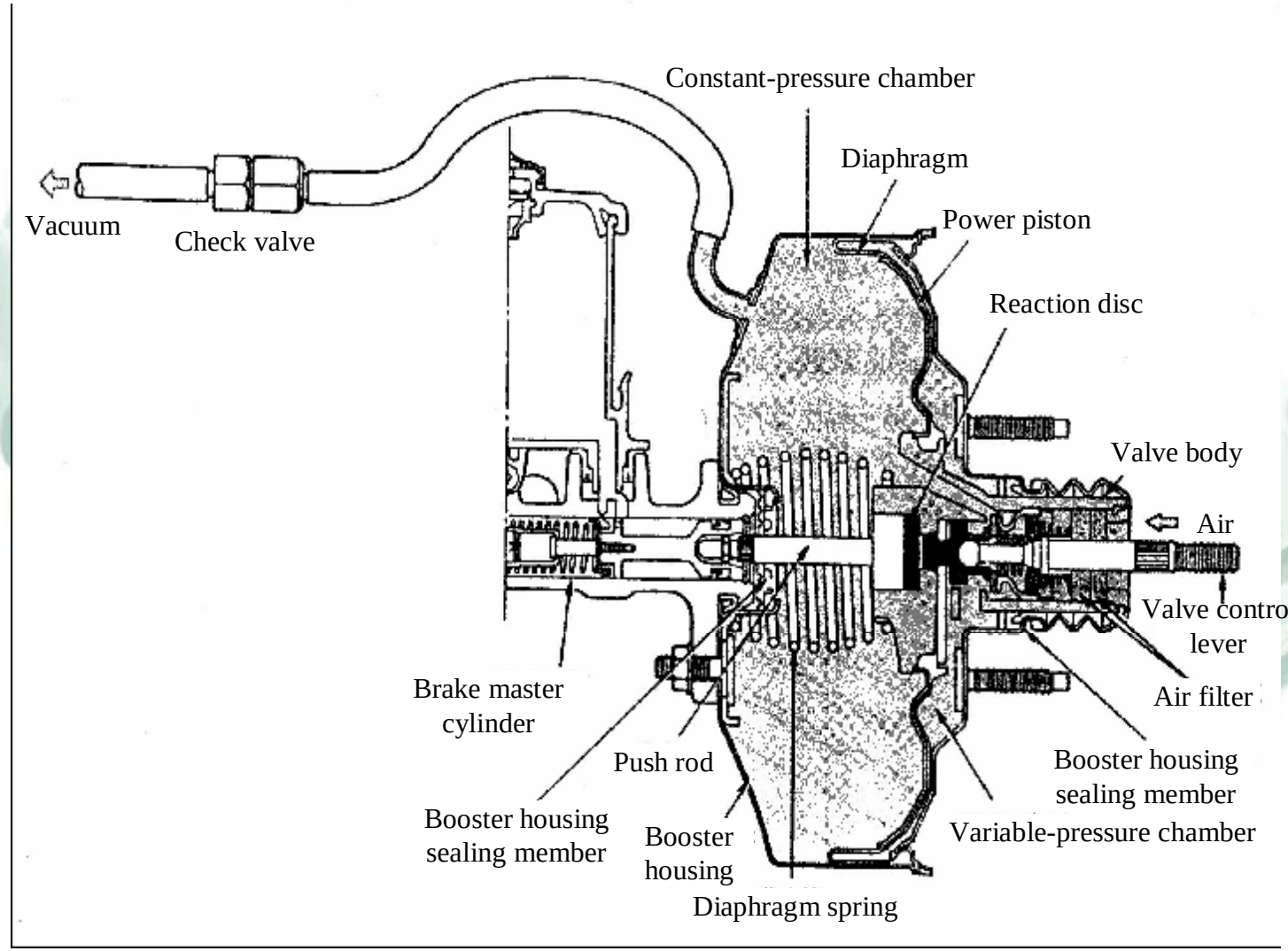
Brake Booster in Braking

Relationship between $F_b + F_s$ and F_a

$F_b + F_s < F_a$
F_a pushes the piston to the right



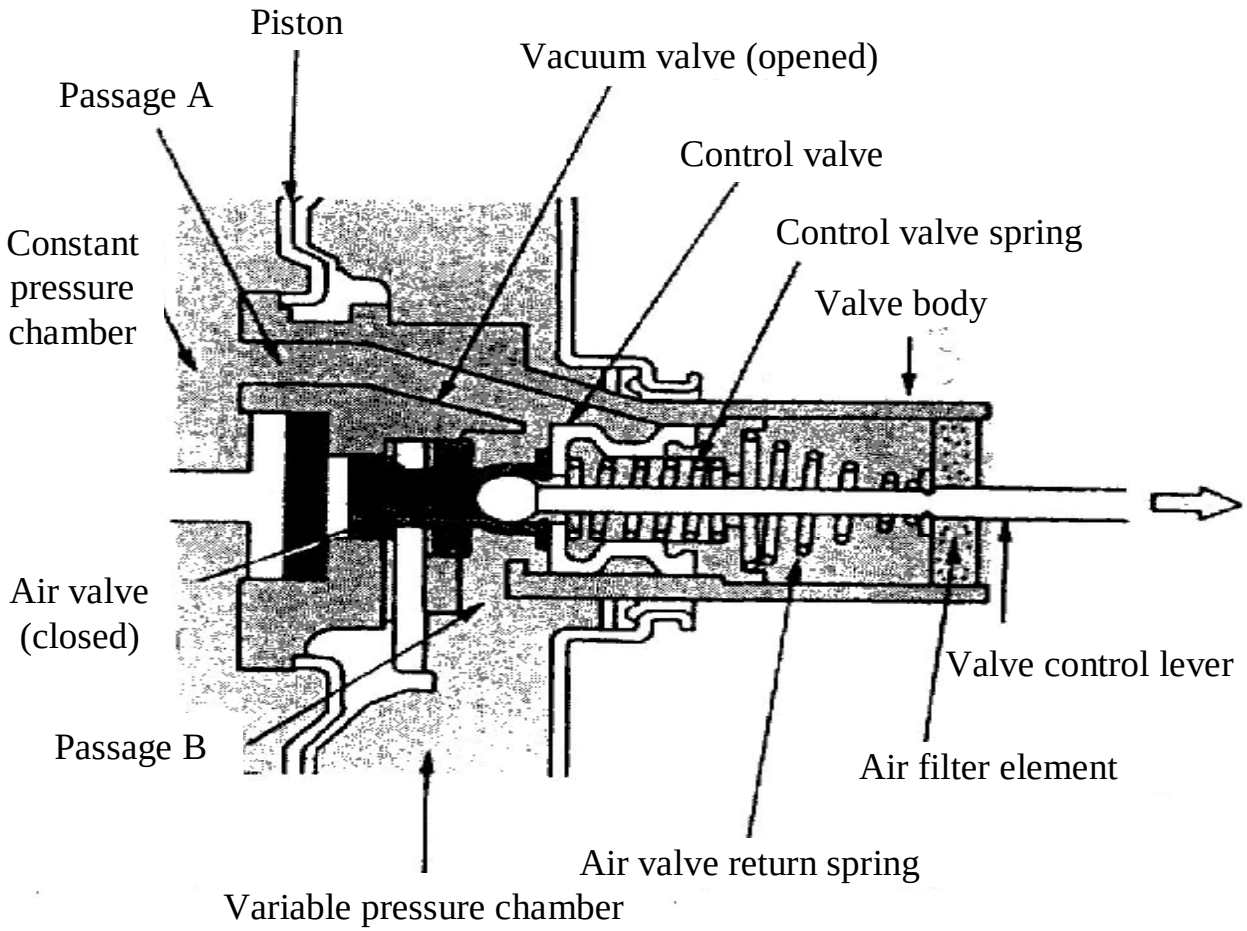
Brake Booster Structure



1. Brake Booster not in Braking

Opened vacuum valve & control valve

A is connected with B

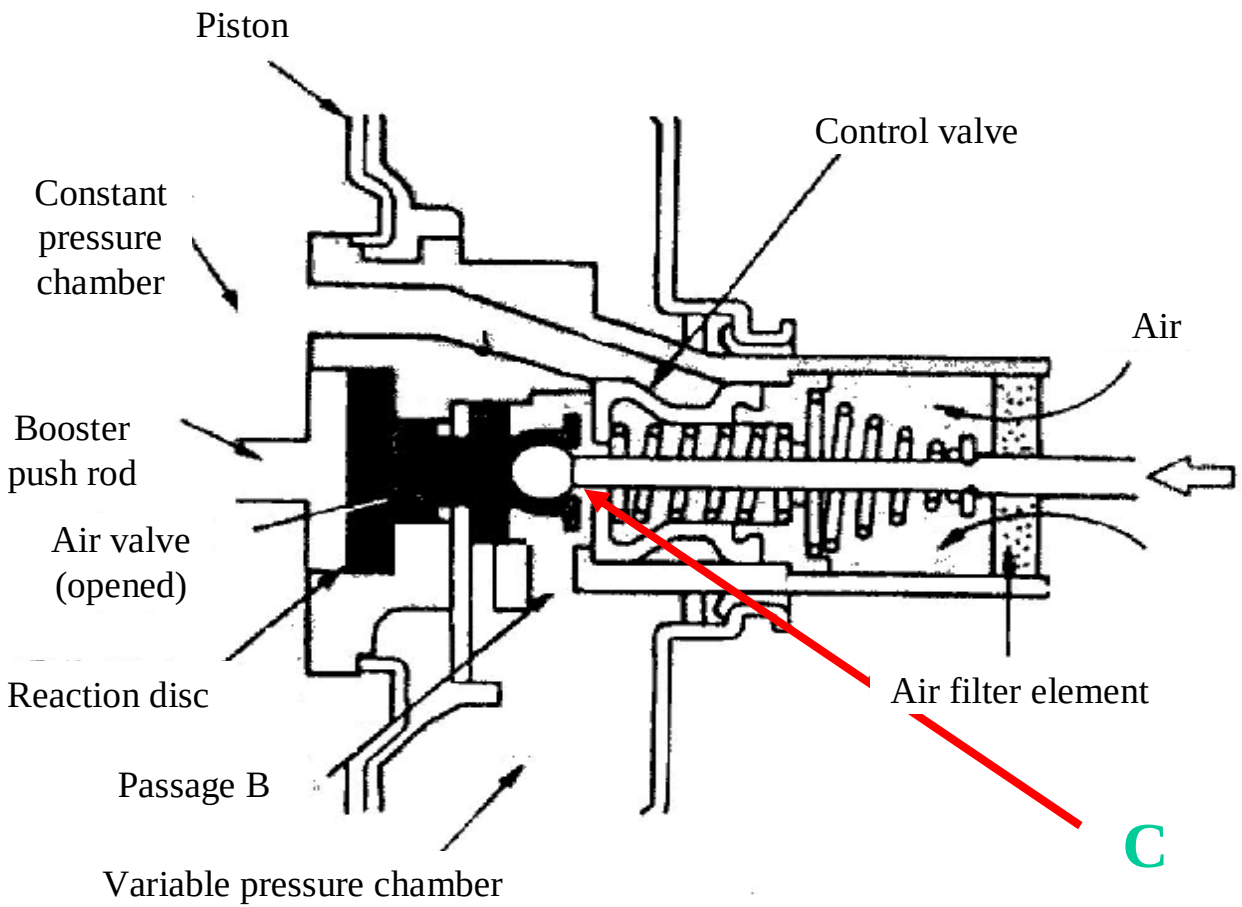


When not in braking

2. Brake Booster in Braking

Closed vacuum valve & control valve

A is not connected with B
B is connected with C

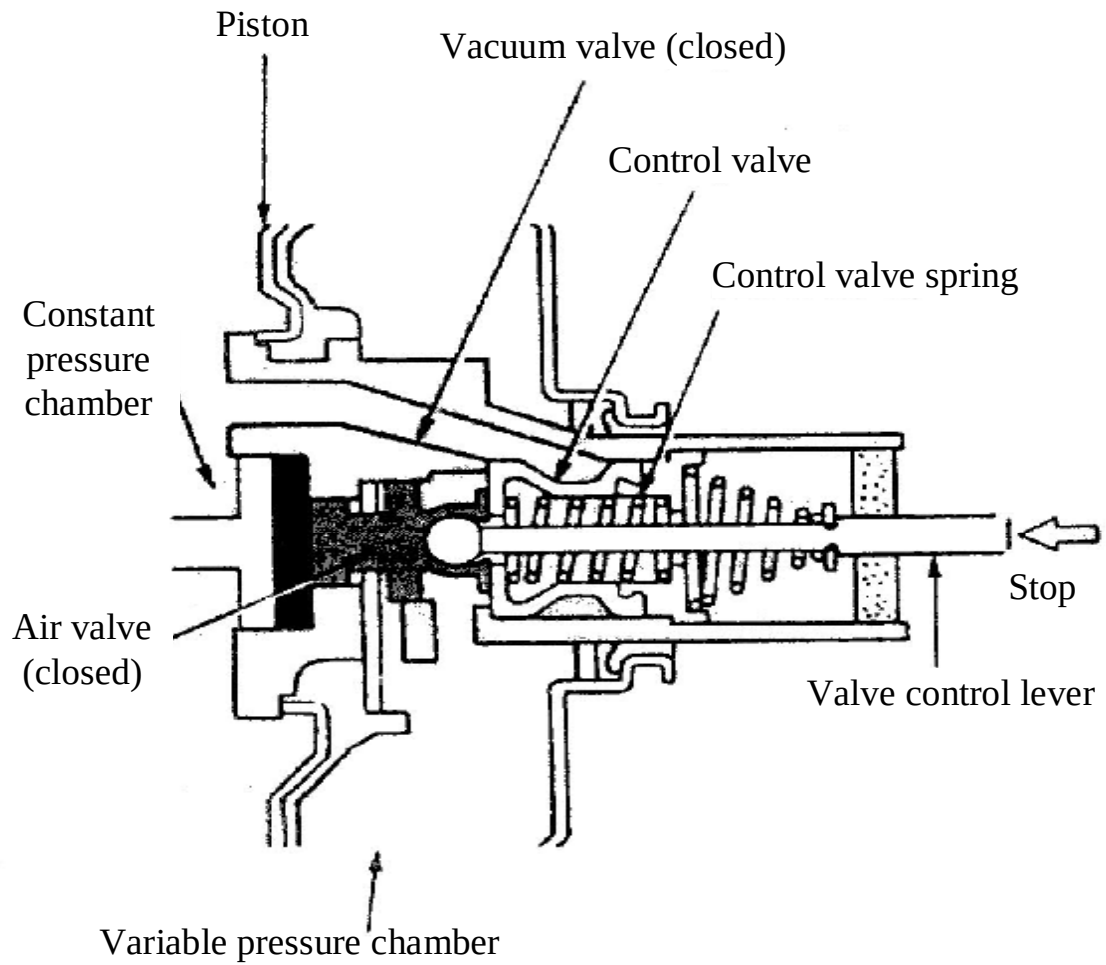


When not in braking

3. Brake Booster in the Retained Position

Closed vacuum valve & control valve

A is not connected with B or C

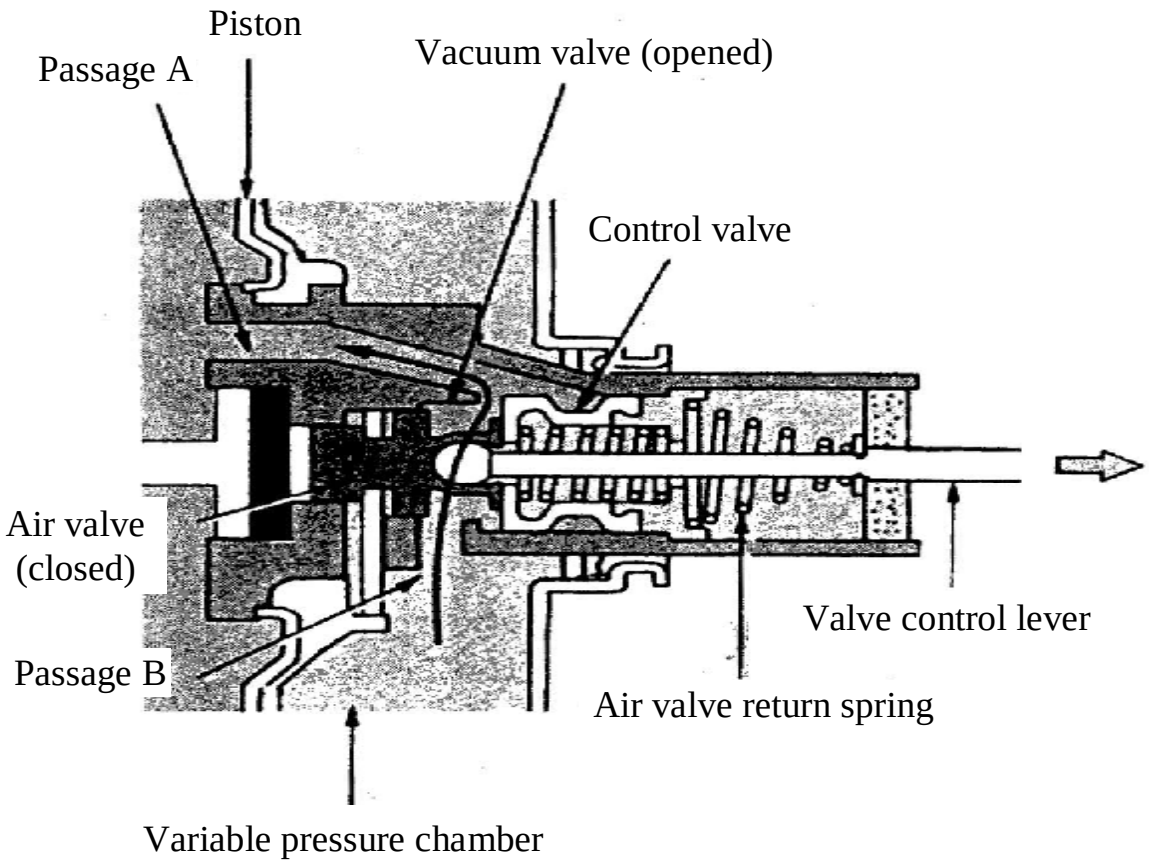


When in the retained position (brake force)

4. Brake Booster in the Released Position

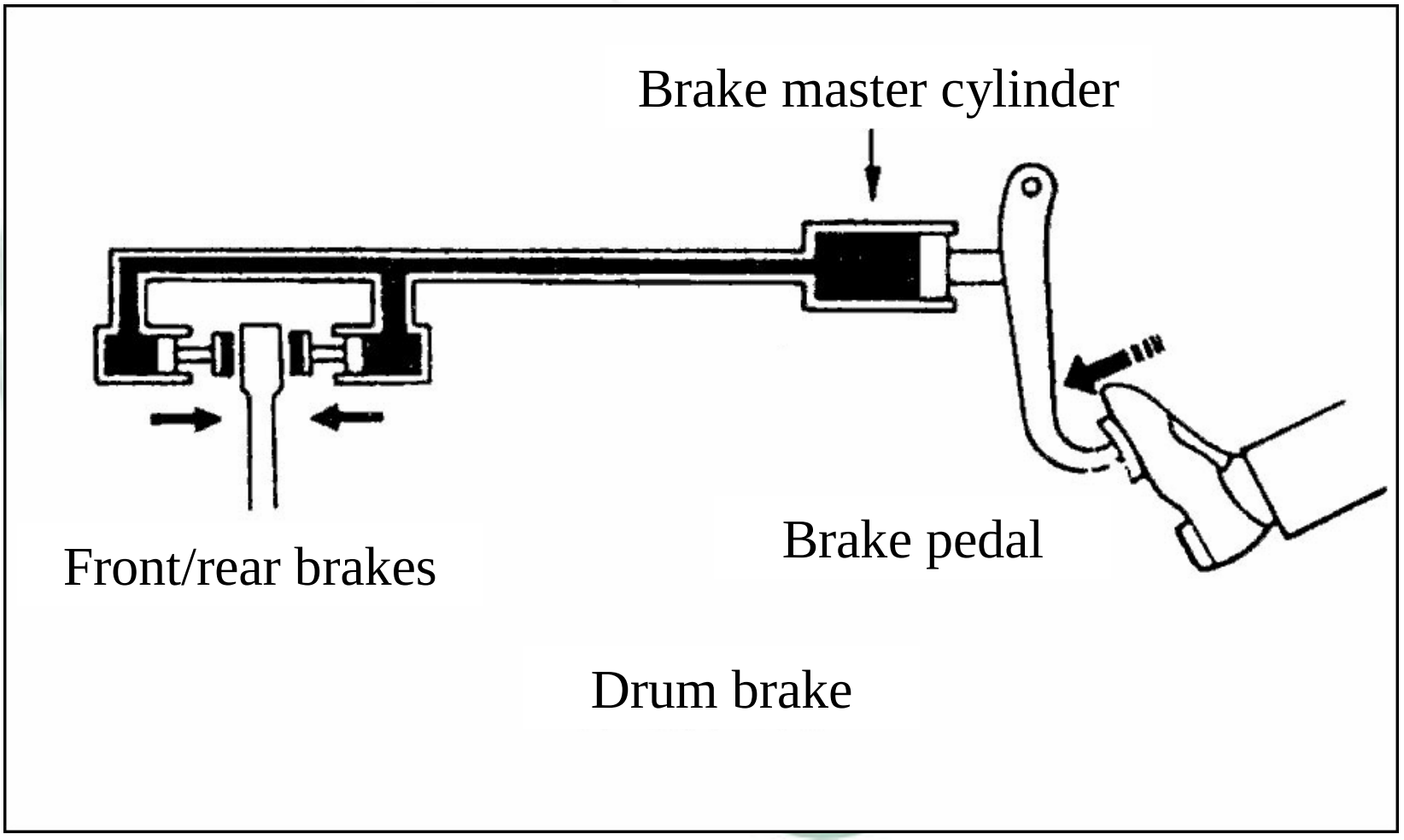
Opened vacuum valve & control valve

A is connected with B and C



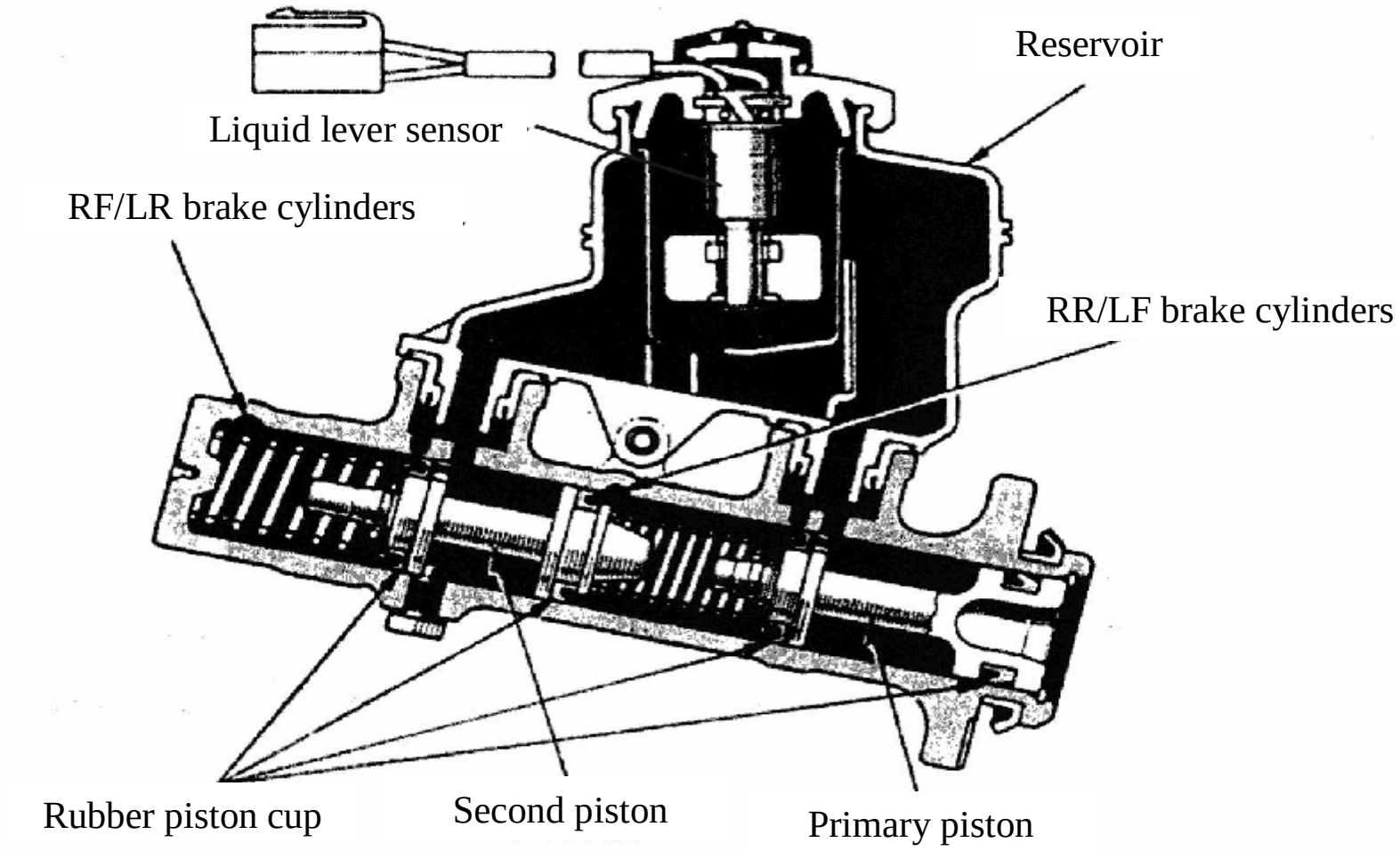
When in the released position (brake)

Purpose of Brake Master Cylinder



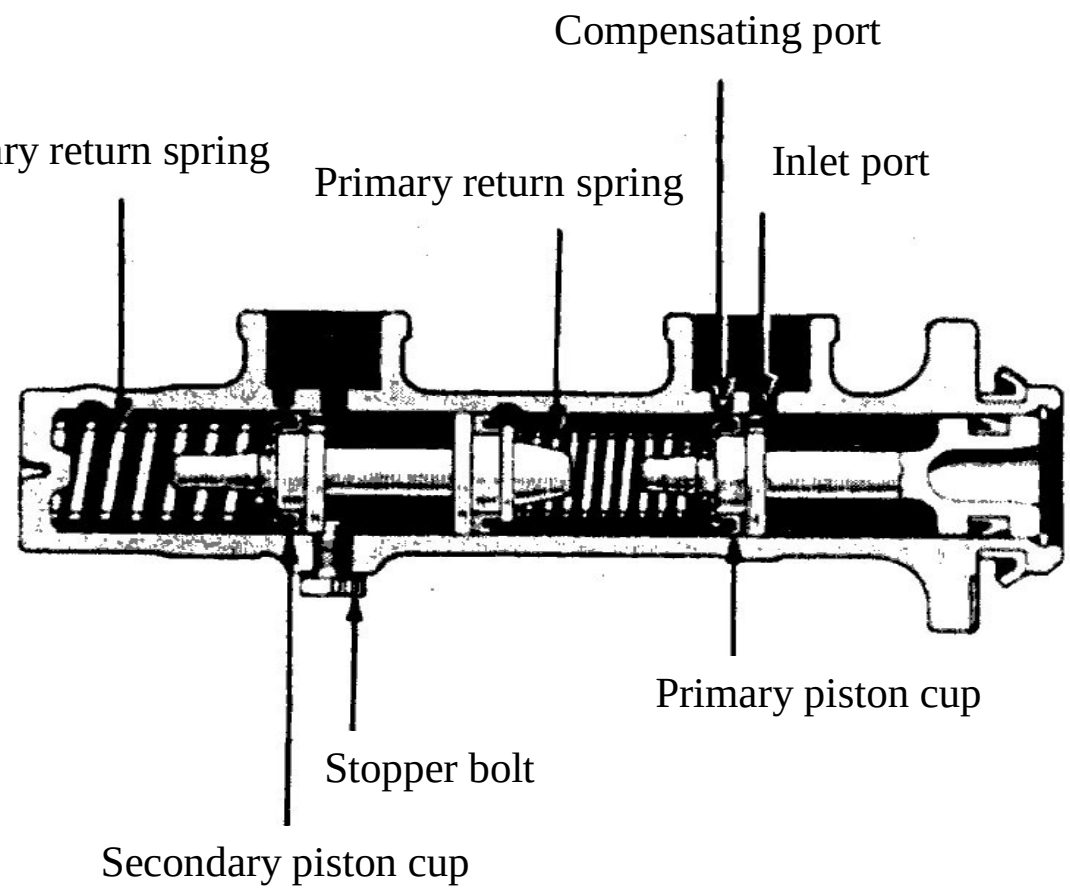
Drum brake

Brake Master Cylinder Structure



Tandem brake master cylinder

1. Brake Master Cylinder not in Braking

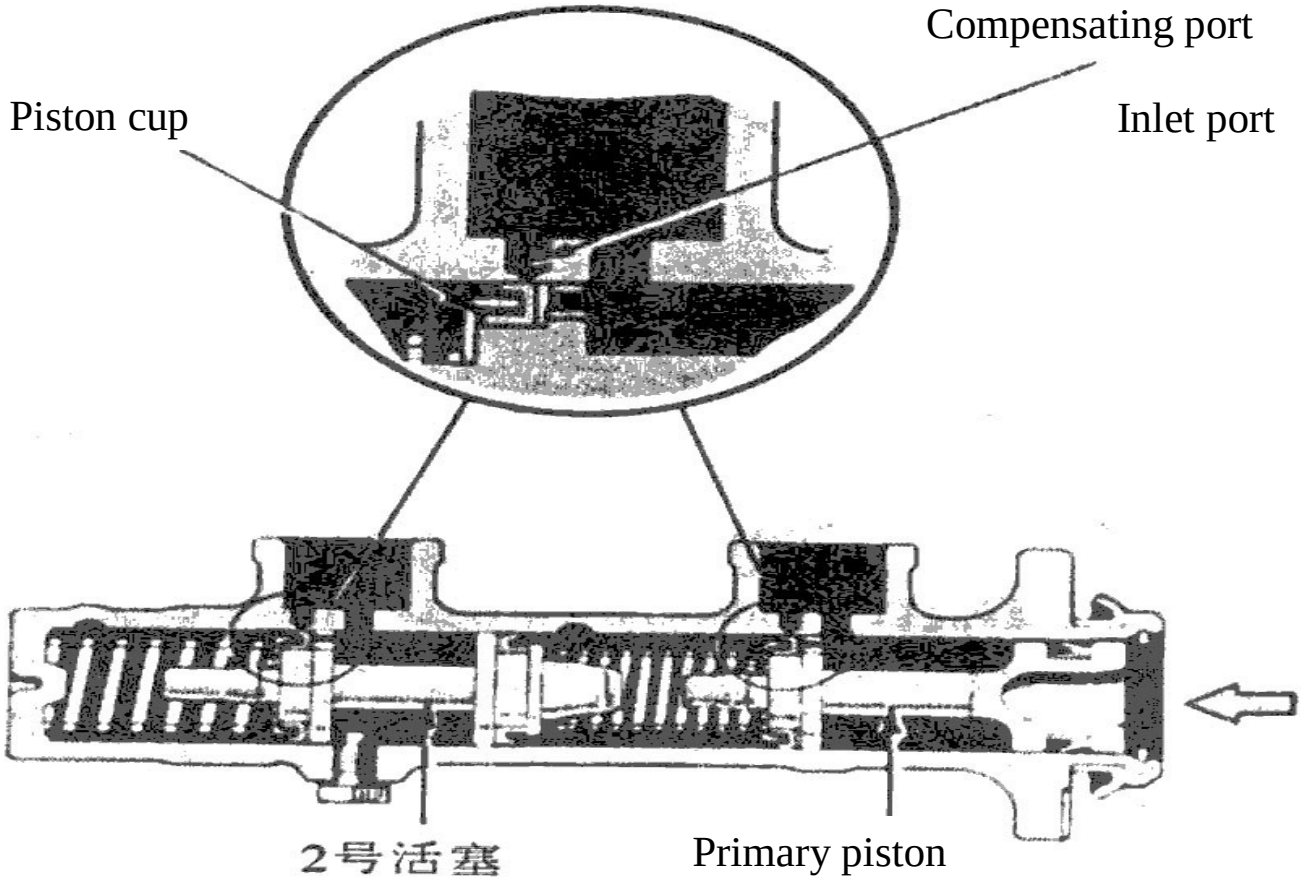


When not in braking

Piston cup is located between inlet port and compensating port

2. Brake Master Cylinder in Braking

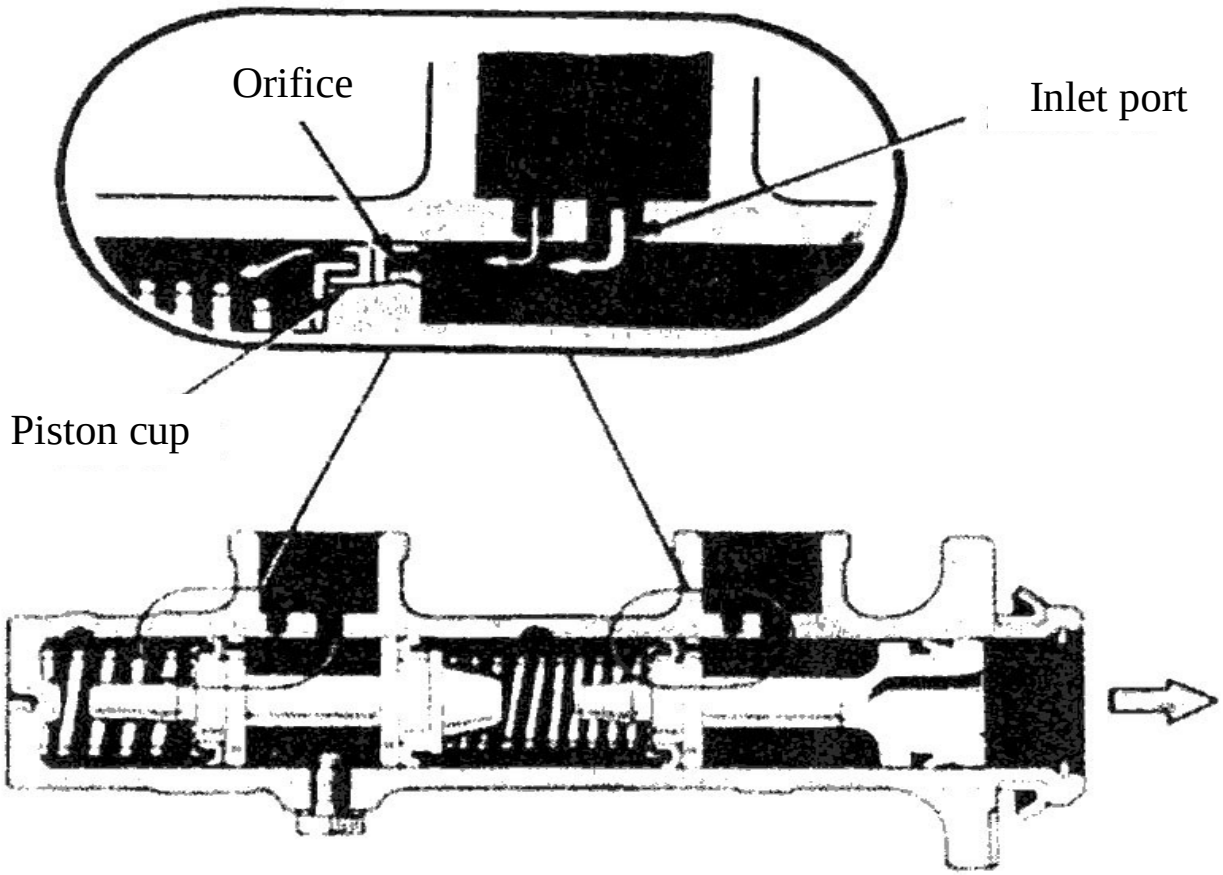
Both inlet port and compensating port are closed with the oil pressure increased



When in braking

3. Brake Master Cylinder when Released (1)

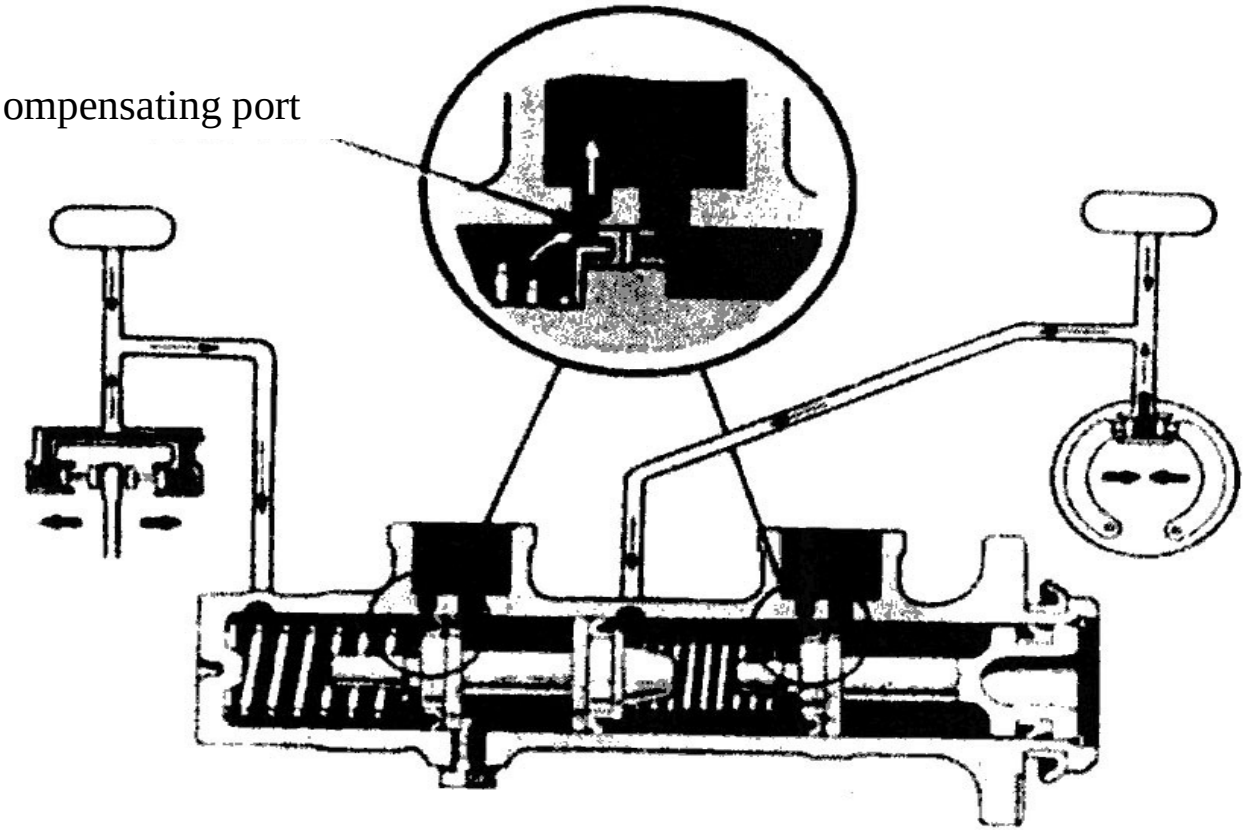
The orifice in the piston is opened and the brake fluid flows back to the piston-cup side



When brake pedal is released (1)

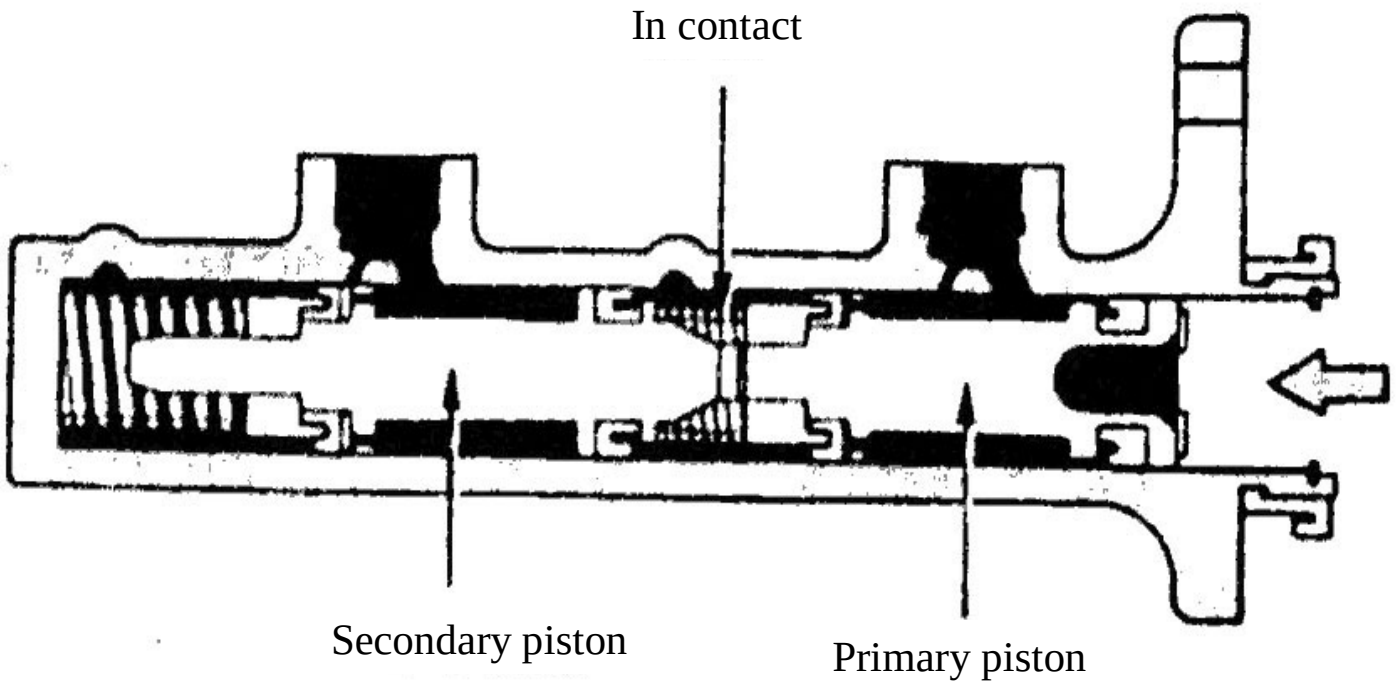
4. Brake Master Cylinder when Released (2)

The compensating port allows surplus fluid to flow back to the reservoir



When brake pedal is released (2)

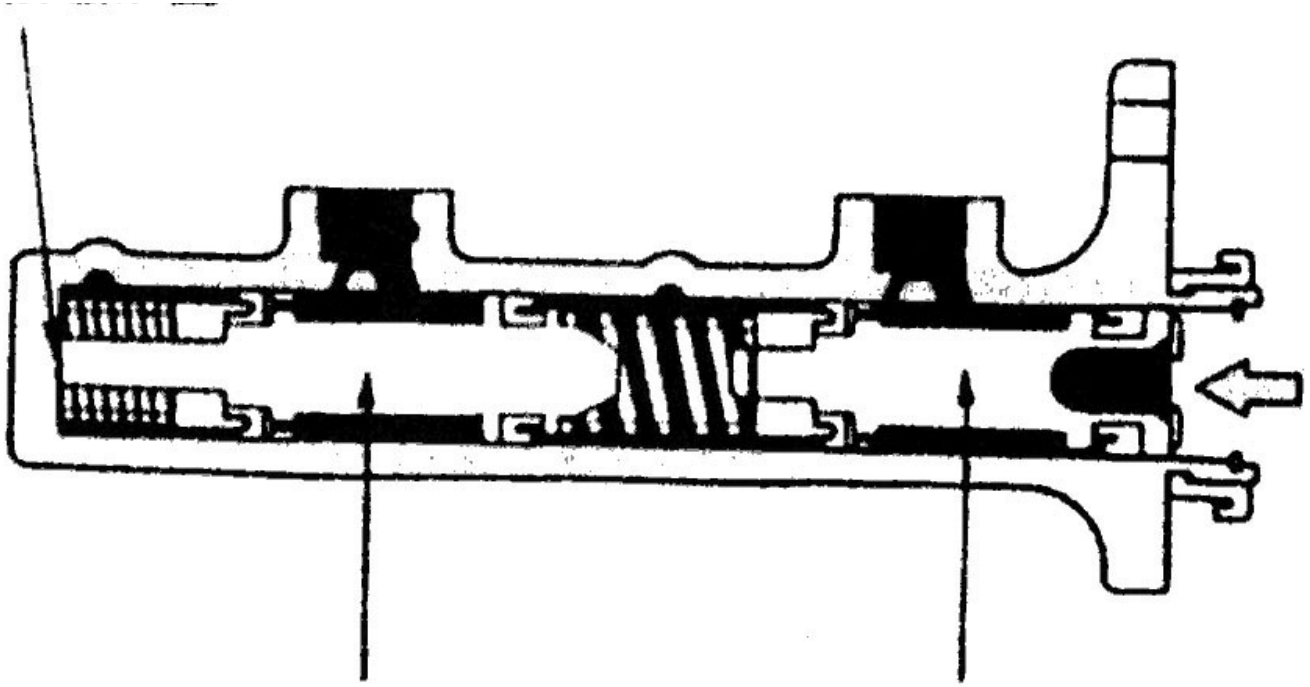
5. Rear-end Leakage



Rear-end leakage

6. Front-end Leakage

Piston contacts cylinder wall

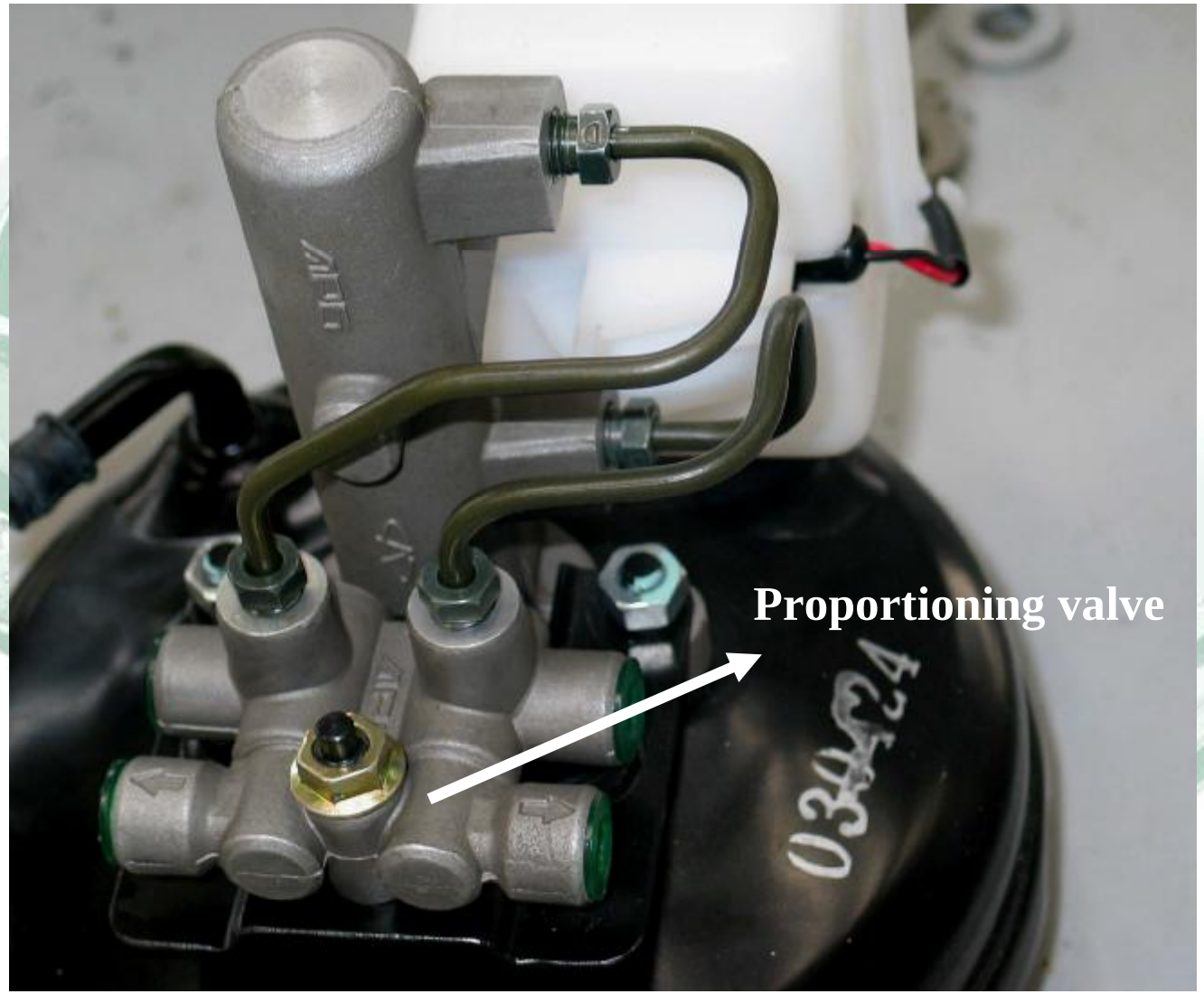


Secondary piston

Primary piston

Front-end leakage

Proportioning Valve



Importance of Proportioning Valve

1. Loads on front and rear wheels are different

The front wheels of the vehicle bear more of the vehicle weight than its rear wheels. In addition, its center of gravity will move forward when in braking, resulting in increased load on front wheels and reduced load on rear wheels. The bigger the braking force is, the more obvious this change is.

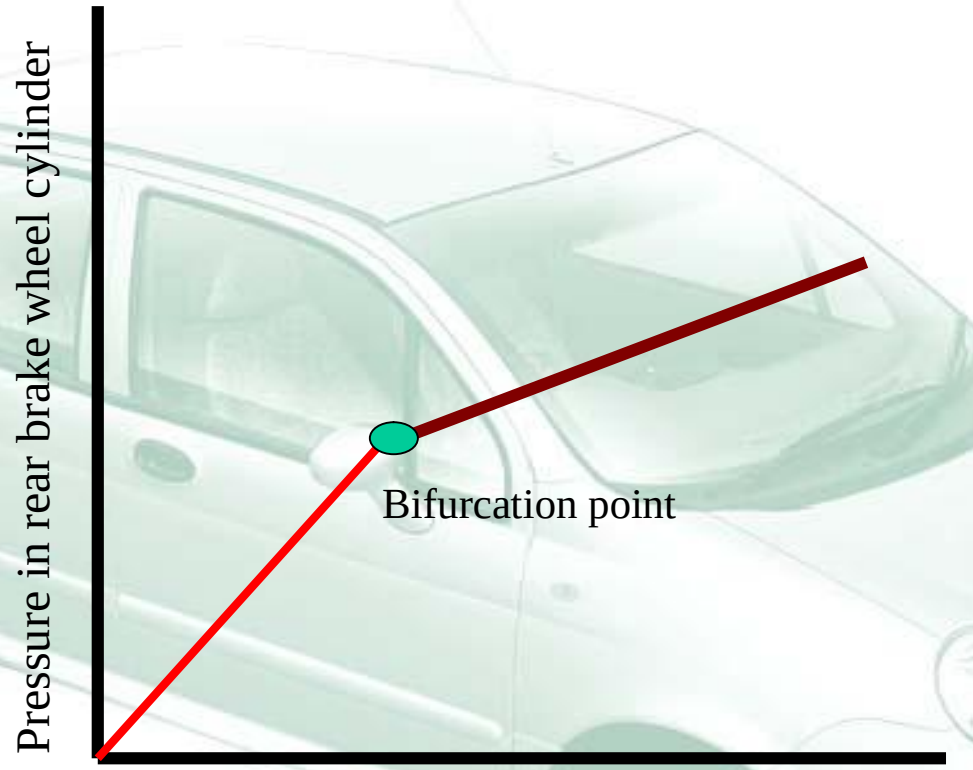
2. The risk of too early locking of rear wheels

When in braking, the load on rear wheels is light, and this causes them to be easily locked too early, thereby resulting in lateral sway of the vehicle body's rear half.

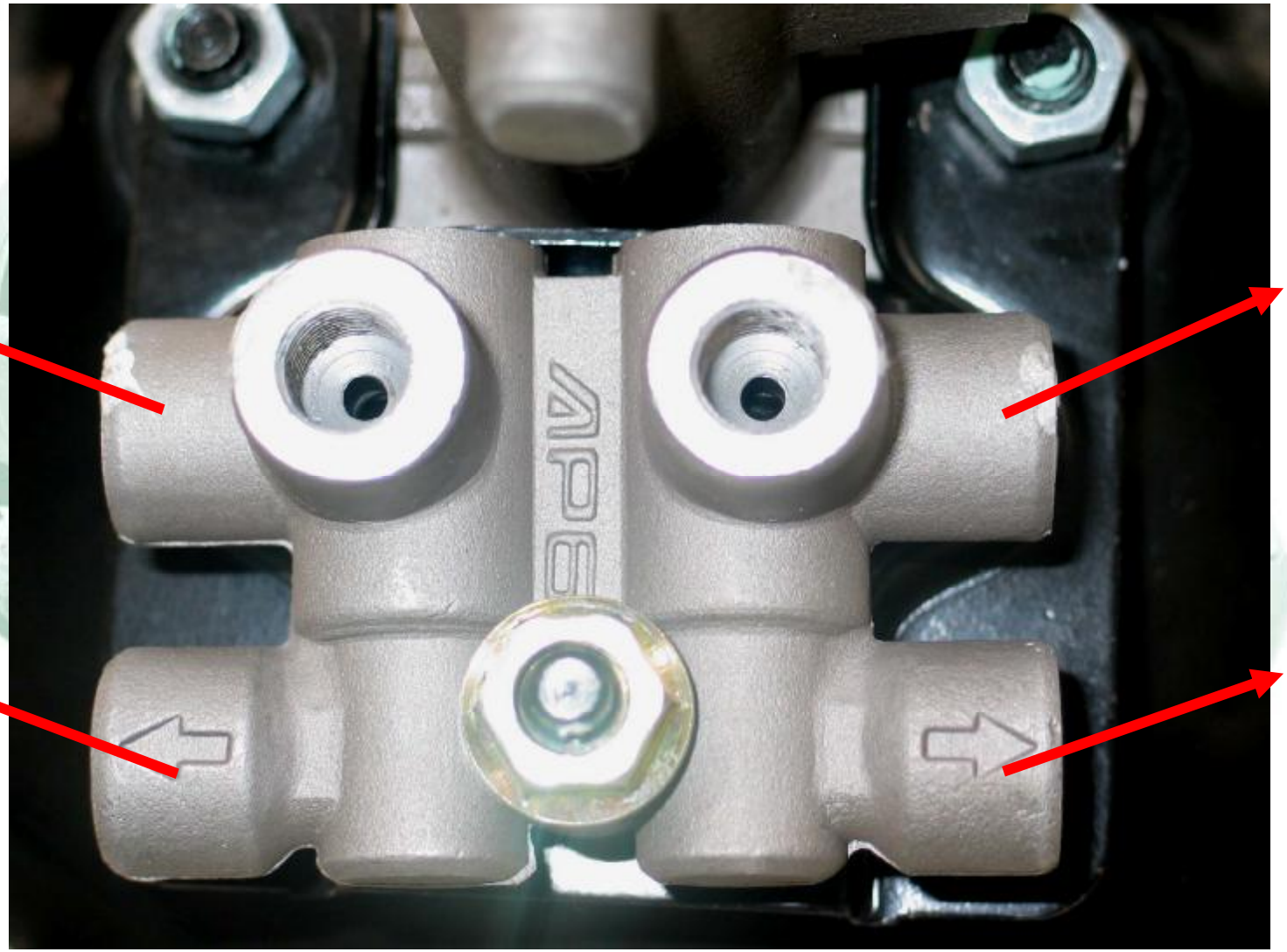
3. Measure to prevent the above problem from happening

Proportioning valve: to automatically reduce hydraulic pressures delivered from brake master cylinder to rear-wheel brake wheel cylinders. Pressure reduction is in proportion to the stepping force on the brake pedal.

Requirements on Rear-wheel Brake Force

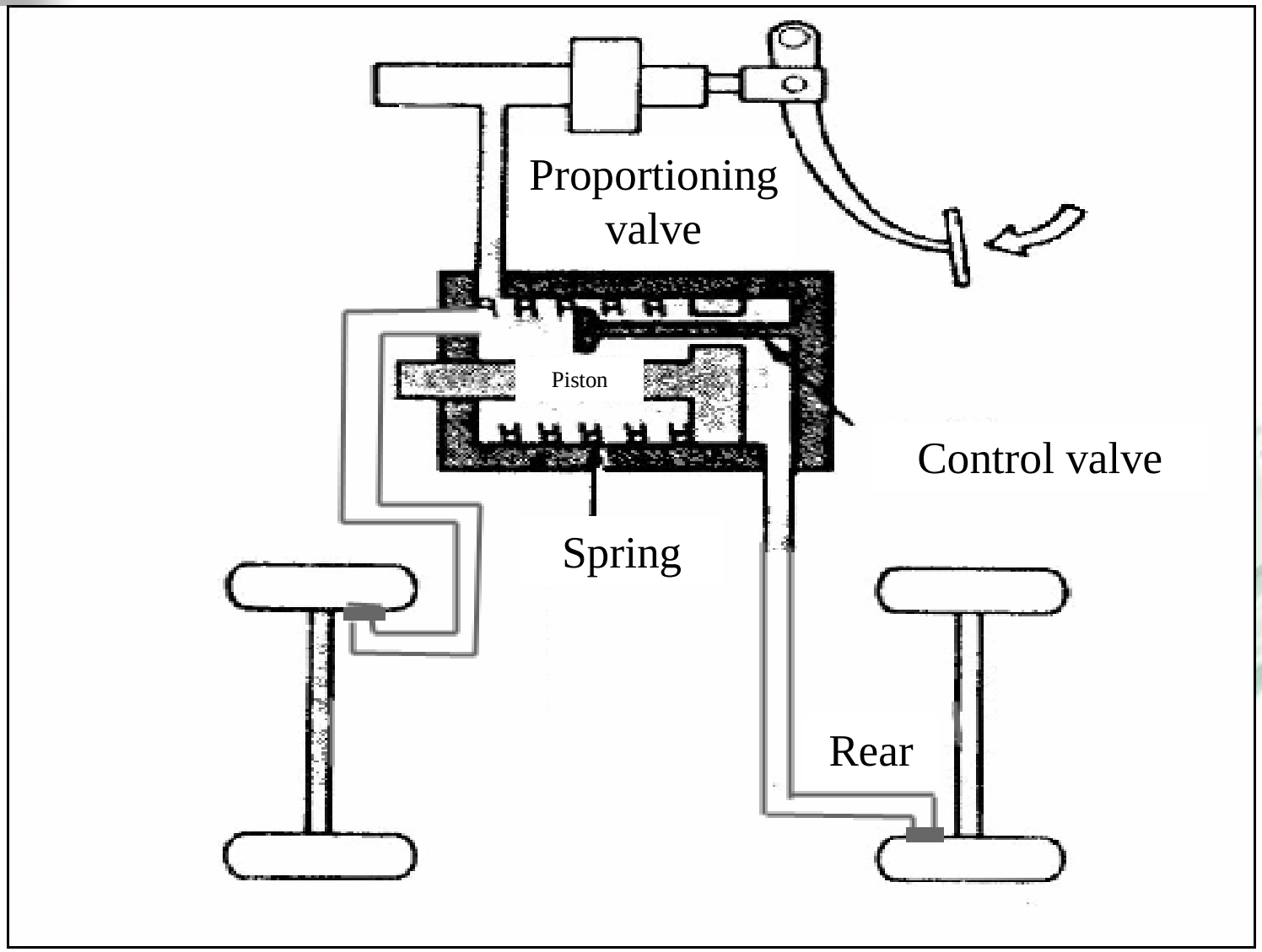


Proportioning Valve



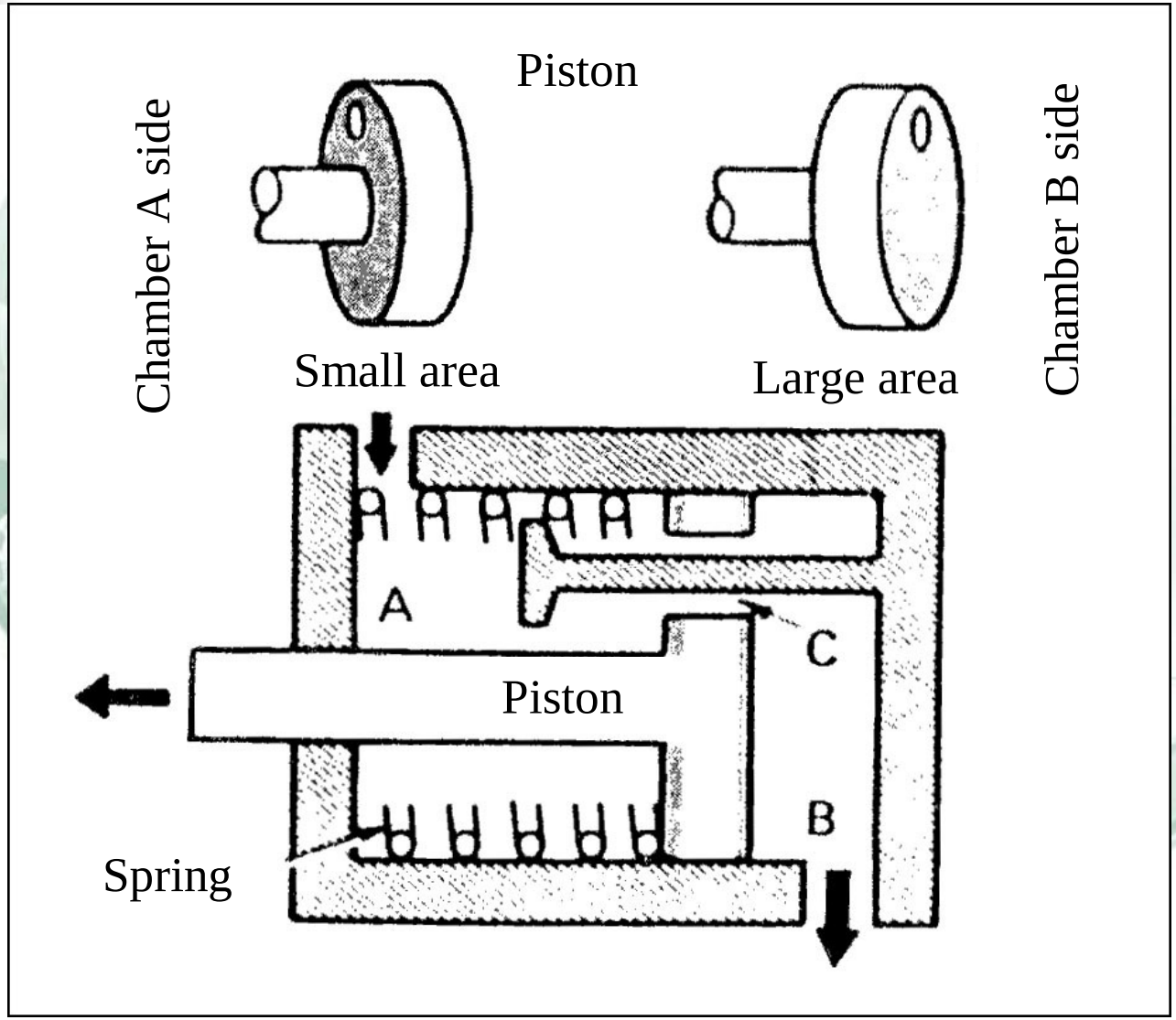
Working Principle of Proportioning Valve

— When the Pressure is zero



Working Principle of Proportioning Valve

— When the Pressure is Low



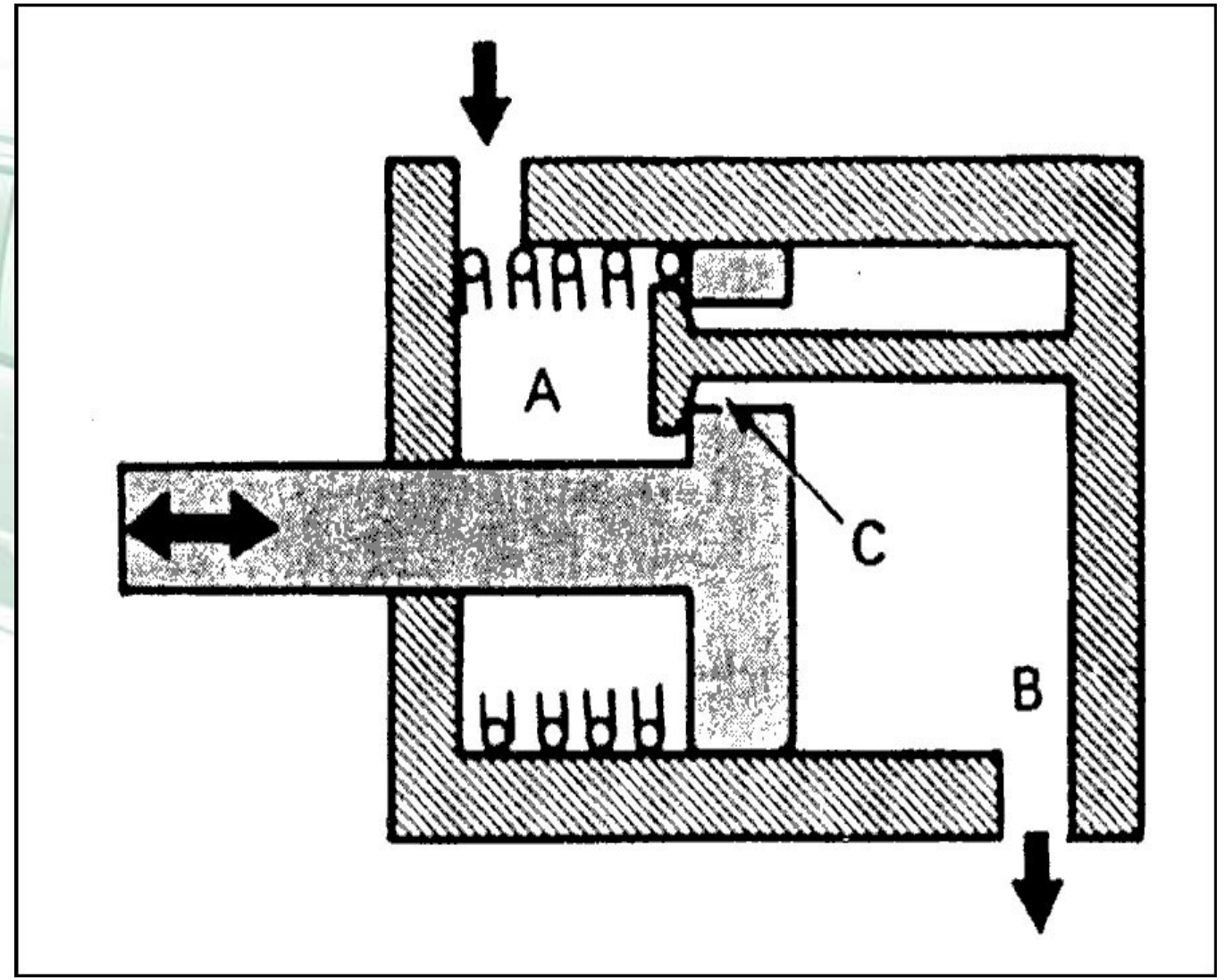
$F_a+F_s=F_b$

Working Principle of Proportioning Valve

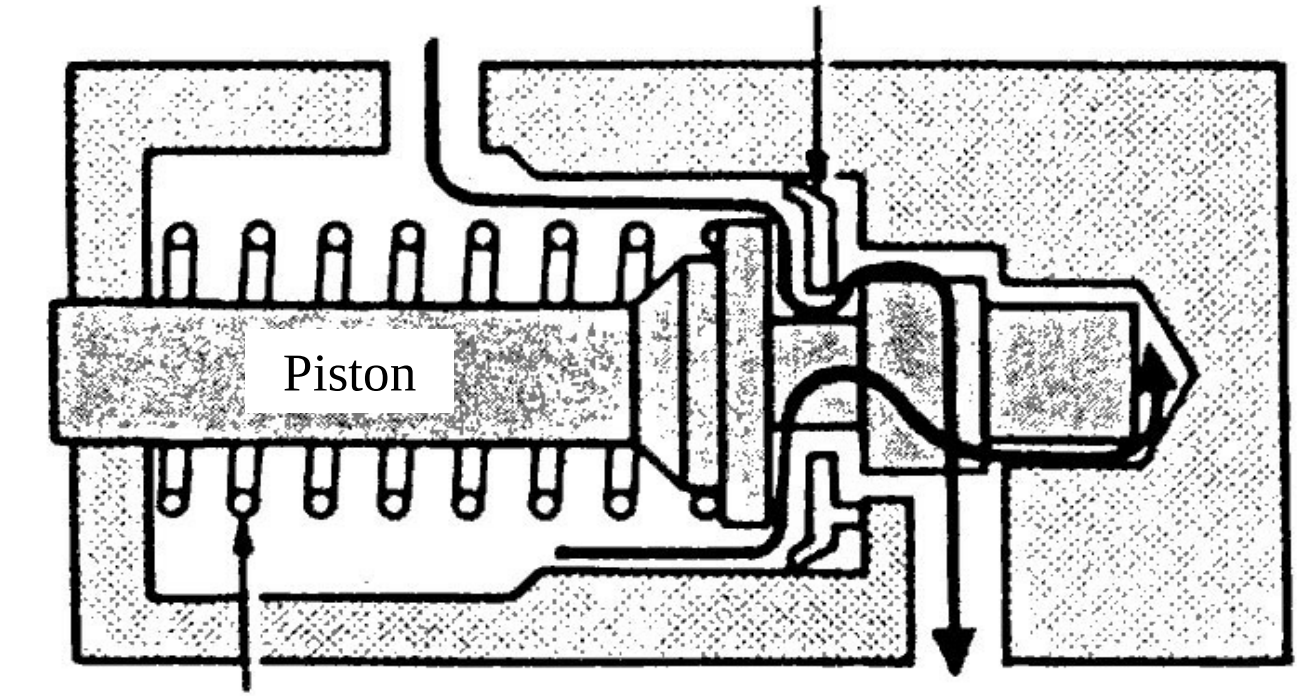
— When the Pressure is high

$F_a+F_s<F_b$

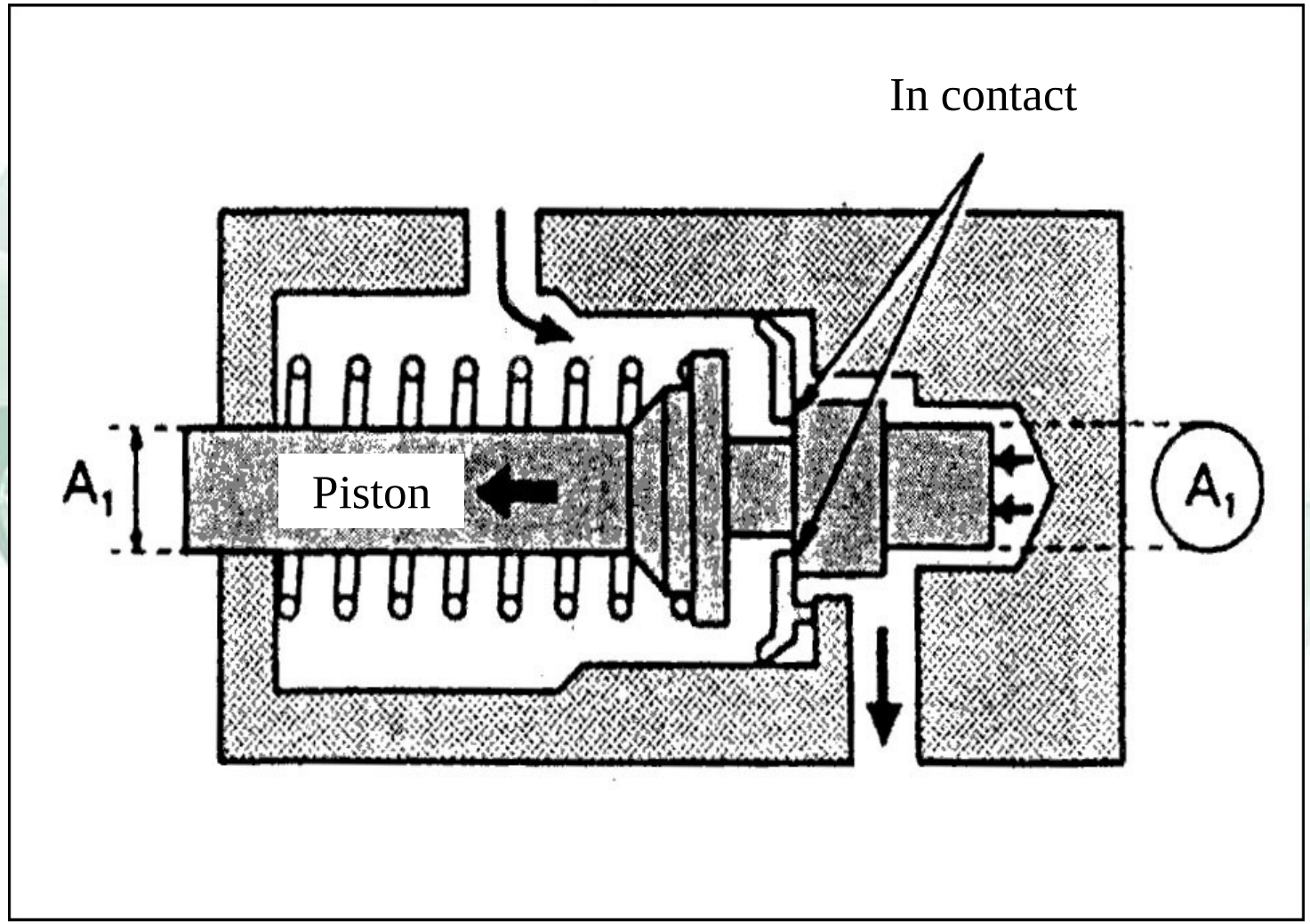
When the pressure is higher than some point, the difference between chambers A and B will overcome the spring's elastic force to make the piston move until the port C is closed.



1.When the Braking Pressure is Low

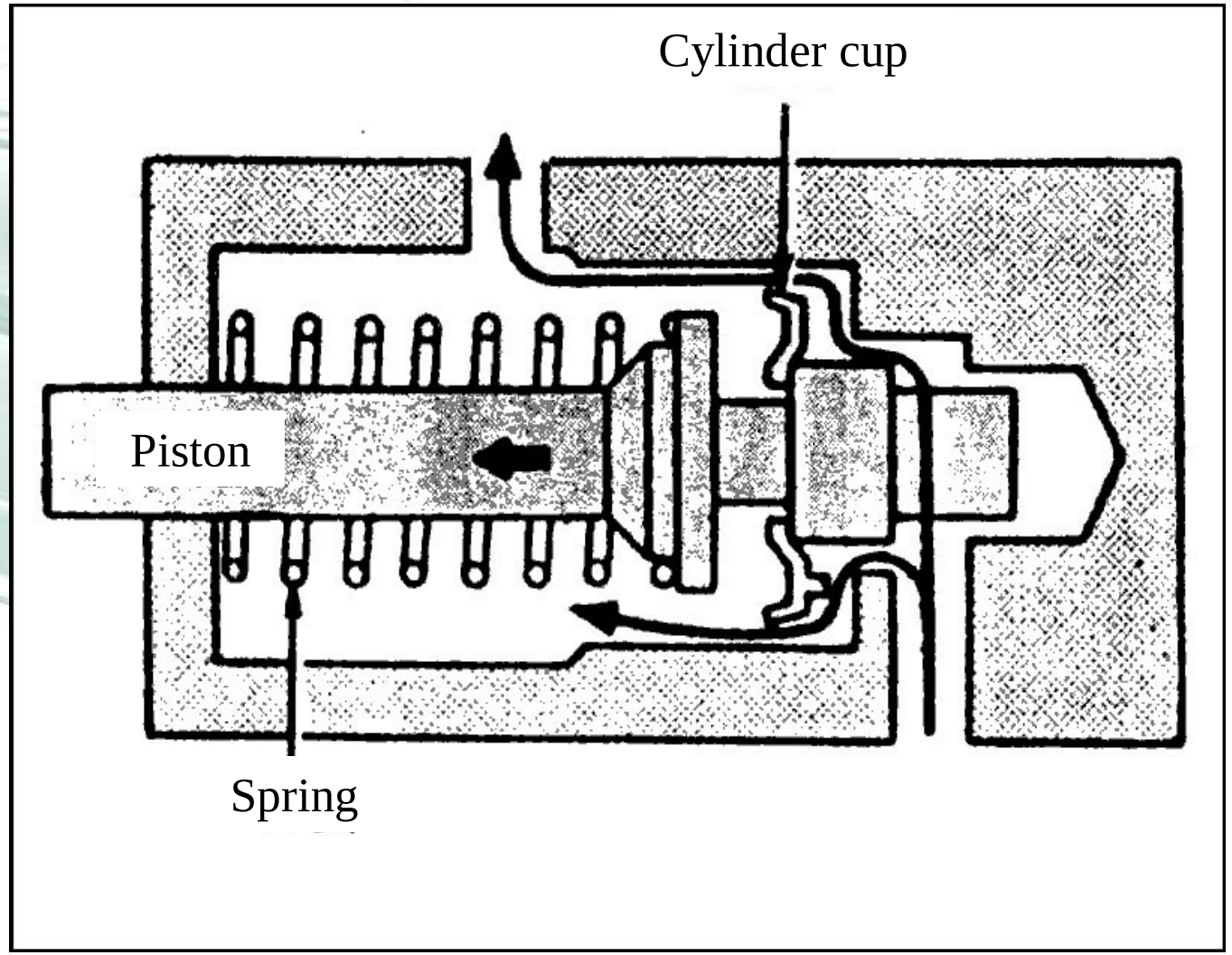


2.When the Braking Pressure is High

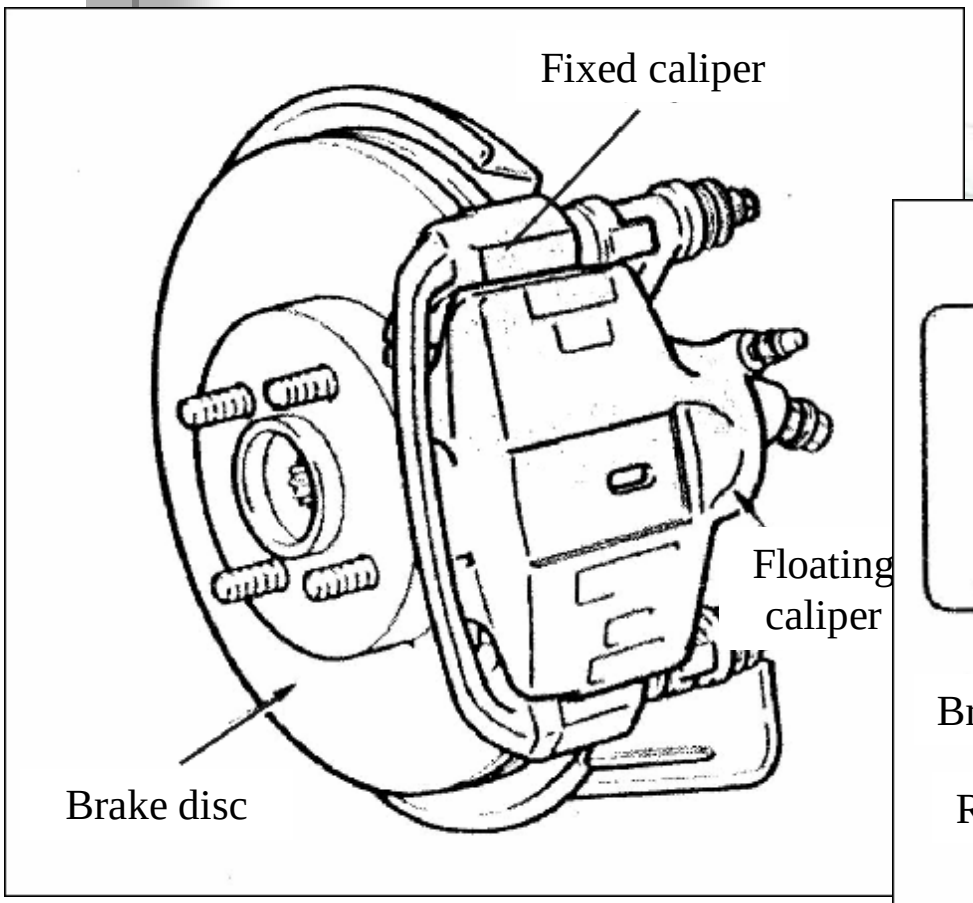


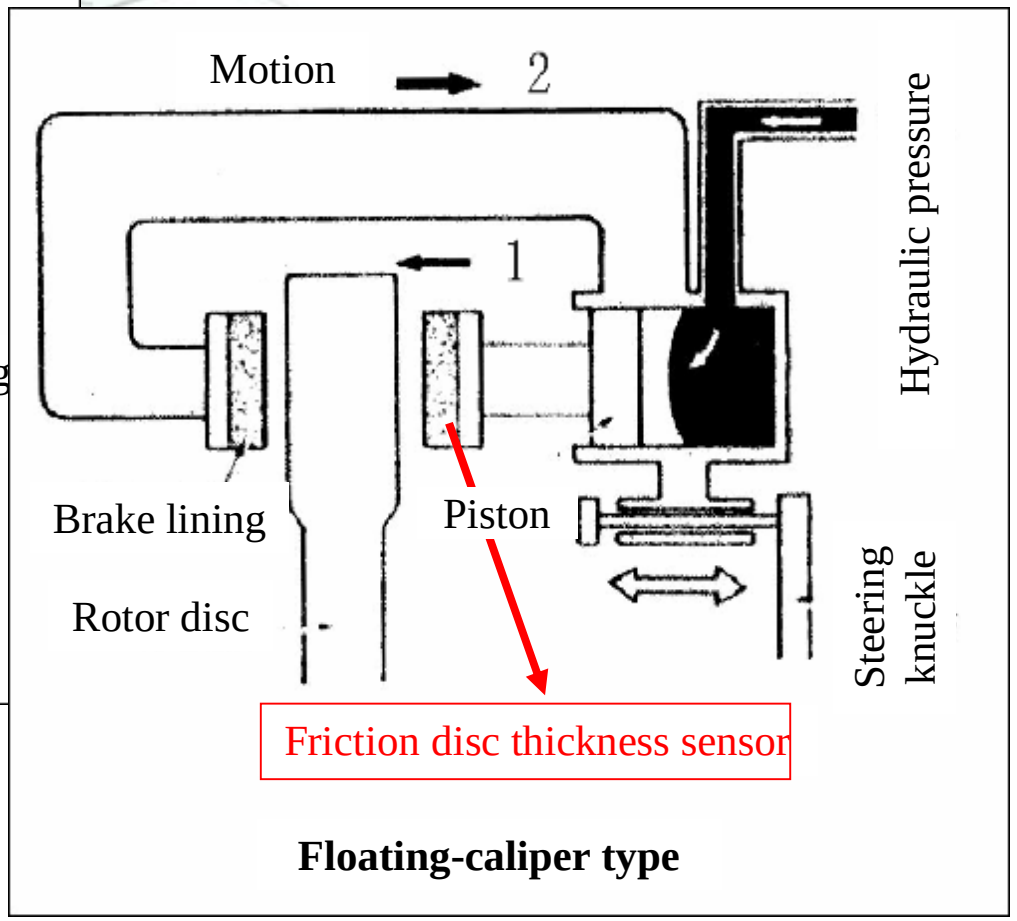
3.When the Brake Pedal is Released

When the brake pedal is released, the pressure drop in the left chamber will cause the piston to move to the left.



Disc Brake





Floating-caliper type

Front-wheel Brake



Rear-wheel Brake



TECHNICAL BULLETIN

Vehicle Model:	***No:*** TB-T0032
QQ	***Date:*** July 20, 2006
	Section: Transmission

Title:

Bulletin about QQ AMT Vehicle Transmission Clutch Self-detection

Affected range:

QQ AMT Vehicle

Description:

Recently, some dealers reflect that QQ AMT vehicle can't run correctly after being replaced electronic control parts (such as clutch or TCU) on transmission. Such problem can be solved by clutch self-detection.

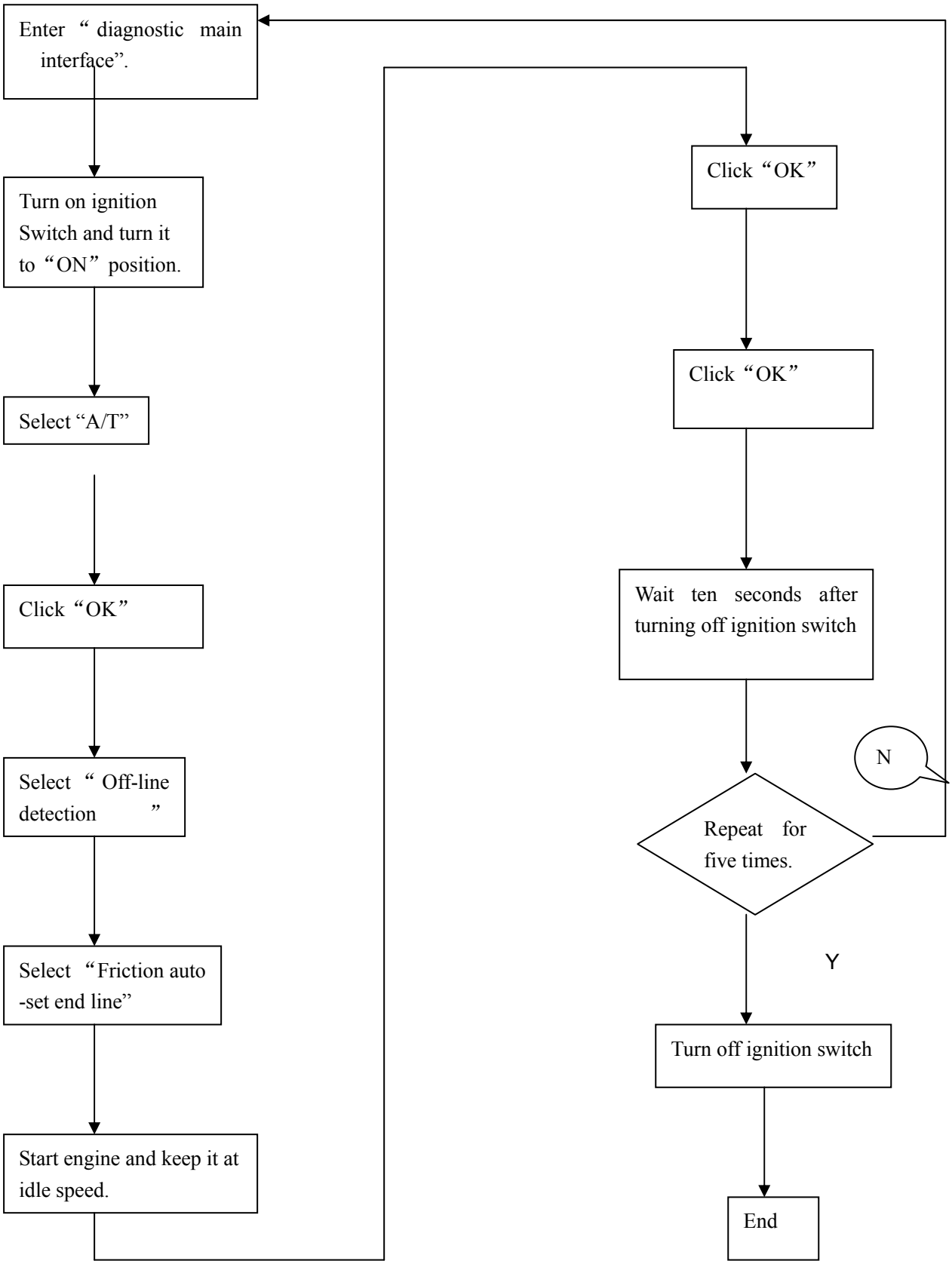
Please see the following attachment for the detailed procedure about AMT transmission clutch self-detection.

Compiled by:	Checked by:	Approved by:
Nicholas Wang	Tony Gu	Frank Ouyang

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Attachment：

Clutch Self-detection Flow Chart



TECHNICAL BULLETIN

Vehicle Model:	***No:*** TB-T0051
SQR7080T	***Date:*** August 24, 2006
	Section: TRANSMISSION

Title:
Technical Bulletin about Fault of S11+AMT Clutch Position Sensor

Affected range:
All S11+AMT Vehicle Models

Description:

The service stations reflect that S11+AMT clutch position sensor has water and dust, which causes AMT fault. Through analysis, installing seal washer on the sensor can solve the above problem. For the following common faults caused by its water and dust, service stations are suggested to first inspect and replace clutch position sensor, and install washers in order to reduce unnecessary claim for speed selectors.

Remove clutch position sensor first, inspect if there's water or dust on the sensor and if rotation axis doesn't work well. If so, it is suggested to clean the sensor installation position, replace clutch position sensor and install seal washer.

Fault 1: AMT self-detection fault lamp is always on, and the scanner detection fault code is P1743 or P1810;

Solution: Replace clutch position sensor and install seal washer in accordance with detection results.

Fault two: It can't shift gears, shift to reverse gear, start after shifting, and can shift to N gear automatically during driving.

Solution: Replace clutch position sensor and install seal washer in accordance with detection results.

Fault three: It can run automatically without depressing accelerator.

Solution: First, make self-learning of clutch meshing point, if it fails, replace clutch position sensor and install seal washer in accordance with detection results.

Fault four: When AMT enters self-protection mode, it can only shift to 1, 2, R gear, and can't shift to 3 gear.

Solution: Replace clutch position sensor and install seal washer in accordance with detection results.

The operational instruction for clutch position sensor replacement and seal washer installation is shown in the attachment as follows.

Compiled by:	Checked by:	Approved by:
Tailai Zhou	Lixin Zhang	Wesley Wang

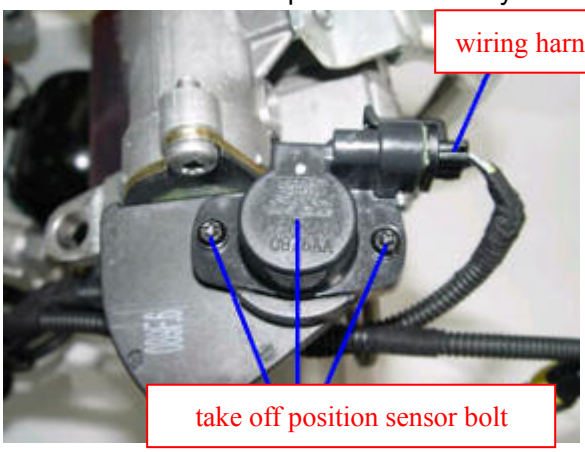
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Attachment:

The operational instruction:

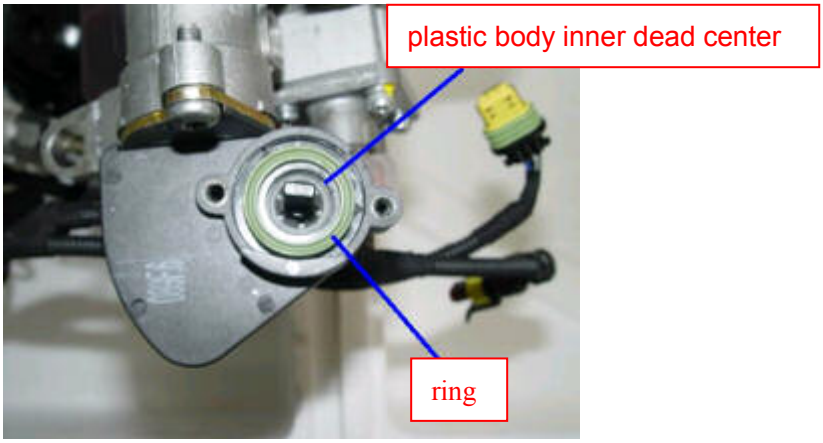
1. Remove position sensor

Take off harness connector for position sensor, remove the two self-tapping screws for tightening position sensor and then take off position sensor by hand gently.



2. Install seal washer

Use a seal (no directional) by hand to cover plastic body inner dead center evenly and press slightly by hand to make it flat (Note: Washer should be in the middle place.)



3. Install position sensor

- Remove clutch cable. When the connection line between the two holes of position sensor forms an angle of about 90 with plastics body bottom hole (The end of connector with wire is upwards), and cover plastic shift fork slantwise gently.
- Turn it to an angle of about 90 in a clockwise and make the two screw holes in one line, meanwhile, the rotor insides position sensors has been turned to a certain angle and is spingly by hand touching.
- Install the two self-tapping screws and then tighten them by a torque air screwdriver.



4. Connect position sensor harness connector.