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QQ6

Reparación y Servicio

en inglés

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Service Manual For CHERY QQ6

(Body Accessories and Dimensions)

After Sales Service Department of Chery Automobile Sales Co., Ltd

Chapter 1 Engine Hood and Luggage Compartment

I. Removal of Engine Hood

1. Preparation

Tool: flat head screwdriver, pliers, wrench

2. Precautions

2.1. During the removal, pay more attention to the application of appropriate strength.
No rude operation.
2.2. During the removal/reassembly of trim, especially pay more attention to the protection of surface ornaments so that any ornament may not be damaged.

3. Disassembly/Reassembly of engine hood accessories

3.1. Removal Step

3.1.1. Remove the clip from the heat insulation washers (19 pcs in total) with a flat head screwdriver, and detach the heat shield from the engine compartment.

3.1.2. Pull off the washing liquid hose.

3.1.3. Detach two water spray nozzle clips from the bottom of engine hood, push the nozzle from the bottom of engine hood, and take out the nozzle from the outside.

3.2. Installation Step

The installing steps are reverse to those for removal.

4. Disassembly and adjustment of the engine hood assy.

Preparation of tool(s): 13# wrench

4.1. Take off four adjusting bolts from engine hood. And remove the engine hood.

At the same time, unscrew four adjusting bolts to adjust the front/rear position and right/left position of the engine hood.

4.2. Installation of engine hood assy.:

The installing steps are reverse to those for removal.

Installation torque is 30±1Nm

5. Disassembly and assembly of air intake grille assy.

Preparation of tool(s): cross screwdriver, socket wrench

5.1. Removal Step

5.1.1. Open the engine hood by hand.

5.1.2. Use a cross screwdriver to remove the fix screw from the intake grille.

5.1.3. Utilize a socket wrench to remove the fixing bolts from the intake grille.

5.1.4. Detach the intake grille.

5.2. Installation Step

The installing steps are reverse to those for removal.

Installation torque is 5±1Nm

6. Adjustment and assembly of the engine hood lock

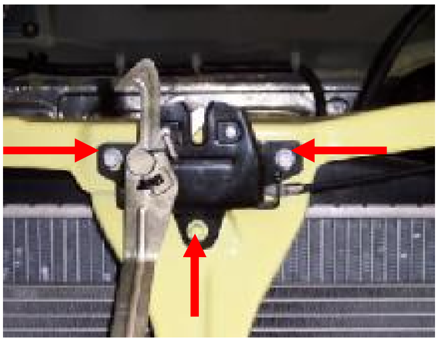
Preparation of tool(s): 10# wrench

6.1. Removal Step

6.1.1. Unscrew three centering bolts from the engine hood, and then remove the engine hood lock.

Also unscrew these three bolts to adjust the position of engine hood lock.

Torque: 9±1 Nm



6.1.2. Remove the lock cable of front engine hood from engine hood lock assy.

6.2. Installation of engine hood lock

The installing steps are reverse to those for removal.

Installation torque is 9±1Nm

7. Removal of hood lock control cable

Preparation of tool(s): 8# wrench, 10# wrench, flat head screwdriver

7.1. Removal Step

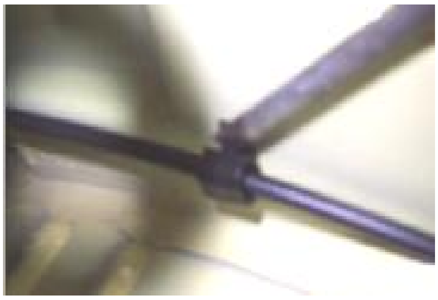
7.1.1. Open the engine hood inside the driver's cab, and remove two fixing bolts from the handle.

Installation torque is 9±1Nm

7.1.2. Remove the front hood cable from the hood.

7.1.3. Remove the hood lock and detach the engine hood lock control cable from the hood lock assy..

7.1.4. Remove three clips used to fix the control cable by hand or with a flat head screwdriver.

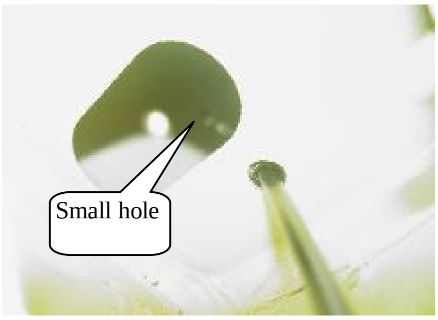


7.1.5. Draw out the control cable from the engine compartment.

7.2. Installation Step

The installing steps are reverse to those for removal.

CAUTION: In case of installation, the groove on control cable shall be inserted into the pull groove; the control cable penerates into driver's cab through the engine compartment, and shall passes through a small hole and then enters into the cab, as shown in the figure.



II. Disassembly/Reassembly of rear boot lid

1. Preparation

Tools: Flat head and cross screwdriver, socket wrench, open-end wrench

Materials: clip

2. Removal of Trunk Lid Ornament Plate

2.1. Removal Step

2.1.1. Remove the screws from the fixed luggage boot internal guard plate with a cross screwdriver.

2.1.2. Remove the disposable clips from the fixed luggage boot internal guard plate with a flat head screwdriver, and then remove the luggage boot internal guard plate.

2.2. Installation Step

The installing steps are reverse to those for removal.

3. Installation of luggage boot lock

3.1. Removal Step

Preparation of tool(s): 10# wrench

3.1.1. Detach the connectors of the luggage boot lock body motor.

3.1.2. Detach two locating bolts from the luggage boot lock (the installation torque is 9±1 Nm)

3.1.3. Remove the luggage boot lock core.

3.1.4. Remove two fixing bolts from the trunk (i.e. luggage boot) lock body with a socket wrench.

3.1.5. Take off the trunk lock body.

3.2. Installation Step

The installing steps are reverse to those for removal.

Precautions on installation of luggage boot lock: check whether the lock column is deformed, whether the riveted connections are in its proper positions, and whether the lock tongue can open or close flexibly, smoothly.

4. Removal of license plate lamp

Preparation of tool(s): cross screwdriver, open-end wrench.

4.1. Removal Step

4.1.1. Remove the trunk internal ornament plate (see *Removal of trunk lid ornament plate*)

4.1.2. Remove two fixing bolts from the license plate lamp with an open-end wrench.

4.1.3. Disconnet the connecting plugs from the right and left license plate lamps and then take off the license plate lamp assy.

4.1.4. Remove two fix screws from the license plate lamp with a cross screwdriver.

4.1.5. Take off the license plate lamp

4.1.6. Take off the bulb from the license plate lamp.

4.2. Installation Step

The installing steps are reverse to those for removal.

Chapter 2 Disassembly/Reassembly of Interior Decorations

I. Disassembly/Reassembly of Seat Belt

1. Preparation

Tools: flat head screwdriver, wrench, sleeve.

Parts: disposable clips.

2. Precautions

Keep the seat belt clean, avoid the oil stain, and check whether the seat belt is damaged.

3. Removal Step (Driver's seat belt is taken as an example)

Prize the front threshold pressing plate carefully with a flat head screwdriver.

3.2. Remove the weatherproof rubber strip of the front door opening.

3.3. Remove the rear scuff plate.

3.4. Remove the weatherproof rubber strip of the rear door opening.

3.5. Remove the seat belt lower ornament cover.

3.6. Unscrew the fixing nuts with a 17# sleeve, and detach the B pillar lower trim.
Installation torque is 50±5Nm

3.7. Unclench the ornament cover on the seat belt regulator with a flat head screwdriver.
CAUTION: Pay attention to the breakage of clip inside the regulator.

3.8. Loosen the fixing nuts with a 17# sleeve, and then take off the seat belt.
Installation torque is 50±5Nm

3.9. Unclench the B pillar trim with a right-angled screwdriver.

3.10. Take off the B pillar trim.

3.11. Remove the fix screws from the seat belt with a cross screwdriver.

3.12. Loosen the fixing nuts with a 17# sleeve, and then take off the seat belt.

4. Installation Step

The installing steps are reverse to those for removal.

Note:

4.1. Keep the seat belt clean, avoid the oil stain, and check whether the seat belt is damaged.

4.2. The pillar trim shall securely fit with the body, without any loose symptoms; and the trim shall fit well with the ceiling and rubber strip.

4.3. The seat belt adjusting slide baffle on the B pillar upper trim shall move freely, without any influence on the adjustment of seat belt, and the fit clearance of lower trim shall be even and below 1mm;

4.4. The fit clearance between B pillar low trim and front/rear scuff plate shall be even and less than 1mm;

II. Disassembly/Reassembly of Seat

Tool: 16# sleeve

1. Front passenger seat removal step

1.1. Pull the moveable handle under the left seat to move the left seat backwards and reveal the fixing bolts under the seat.

1.2. Remove two fixing bolts before the seat. by sleeve

1.3. Turn the moveable handle and pull forwards the seat, and expose two fixing bolts on the rear of seat.

1.4 Disassemble two fixing bolts at the back of seat with sleeve.

1.5 Pull off the inserter under seat and take away the seat.

2. Rear passenger seat removal step

2.1 Lift up the rear passenger seat cushion by hand, and then take out the cushion from the clips of chassis and body.

2.2. Directly take out the seat cushion by both hands.

2.3. Loosen the front fixing bolts at the right side of rear right seat with an open-end wrench.

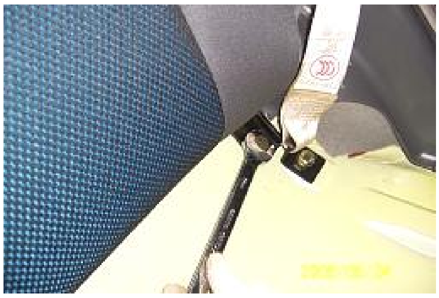
2.4. Loosen the front fixing bolts at the left side of rear right seat with an open-end wrench.

2.5. Pull up the ring-pull of rear right seat, and lay down the seat forwards.

2.6. Loosen the rear fixing bolts at the right side of rear right seat with an open-end wrench.

2.7. Loosen the rear fixing bolts at the left side of rear right seat with an open-end wrench, and then remove the rear right seat.

2.8. Loosen the front fixing bolts of rear right seat with a open-end wrench.



2.9. Pull up the ring-pull of rear left seat, and lay down the seat forwards.

3.0. Loosen the rear fixing bolt of rear left seat with a sleeve, and then remove the rear left seat.

3. Installation Step

The installing steps are reverse to those for removal.

Installation torque is 25±3Nm

III. Disassembly/Reassembly of Console

Tool: cross head screwdriver

1. Removal Step

1.1. Remove each two bolts at left and right sides with a cross screwdriver, these bolts of which are used to joint the console and front lower guard plate.
(The tightening torque is 2±0.5N.m)

1.2. Remove the bolts used to joint the console and body lower guard plate with a cross screwdriver.
(The tightening torque is 2±0.5N.m)

1.3. Detach the console hand brake ornament plate by hand.

1.4. Pull out the cigarette lighter plug on the console by hand.

1.5. Take off the console.

2. Installation Step

The installing steps are reverse to those for removal.

IV. Disassembly/Reassembly of Carpet

Tool: flat head screwdriver, cross head screwdriver; sleeve

1. Removal Step

1.1. Remove the seat. (See *Disassembly of Seat*)

1.2. Remove the scuff plate, lower trims of B and C pillars.
(See *Disassembly of B and C Pillars*)
1.3. Remove the A pillar lower trim.

1.4. Remove the armrest box and console. (See *Disassembly of Armrest Box and Console*)

1.5. Prize the cover on the driver pedal with flat head screwdriver.

1.6. Remove two fixing nuts from the driver's pedal with a socket wrench, and then take off the pedal.
Installation torque: 7±1N.m

1.7 Take off the carpet after Pull off the carpet connectors

2. Installation Step

2.1. Place the carpet into the vehicle, tightedly press the carpet near the central passage, and expose the corresponding hole from the carpet hole, and lay the carpet reliably.

2.2. Lay the left central rear part of carpet according to the shape of the vehicle bottom, and reveal the installation holes of front left seat and lay the carpet reliably.

2.3. Lay the right central rear part of carpet according to the shape of the vehicle bottom, and reveal the installation holes of front right rear seat and lay the carpet reliably.

2.4. Lay well the rear part of carpet according to the shape of vehicle bottom.

V. Removal of Cushion Pad

1. Removal Step

1.1. Disassemble the carpet (See disassembly of carpet)

1.2. Take off all cushion pads.

2. Installation Step

2.1. The installing steps are reverse to those for removal.

2.2. Precautions on reassembly of cushion pad:

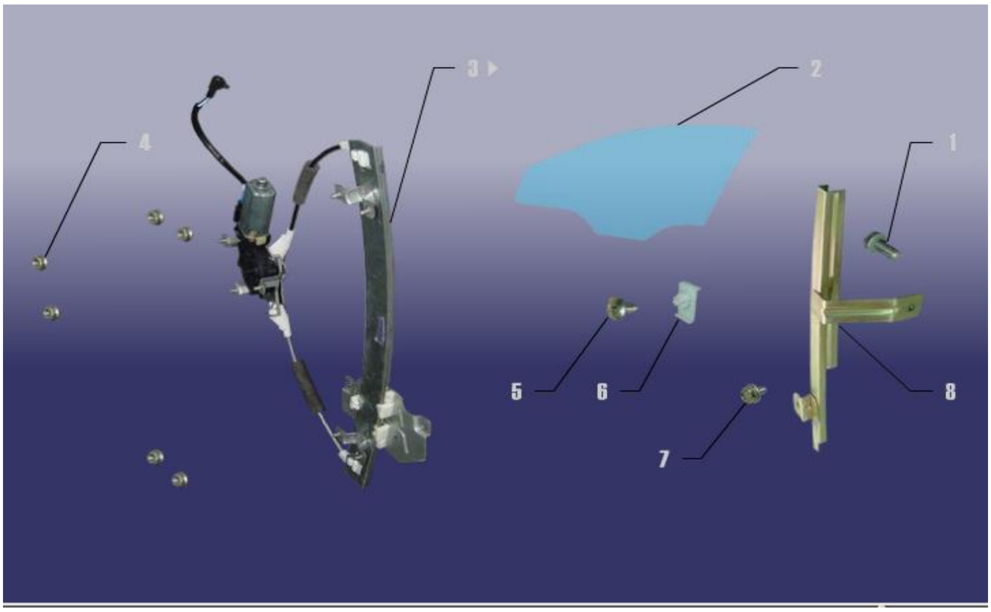
2.2.1. Take out the connector harness from the seat and rear oxygen sensors when the cushion pad is laid.

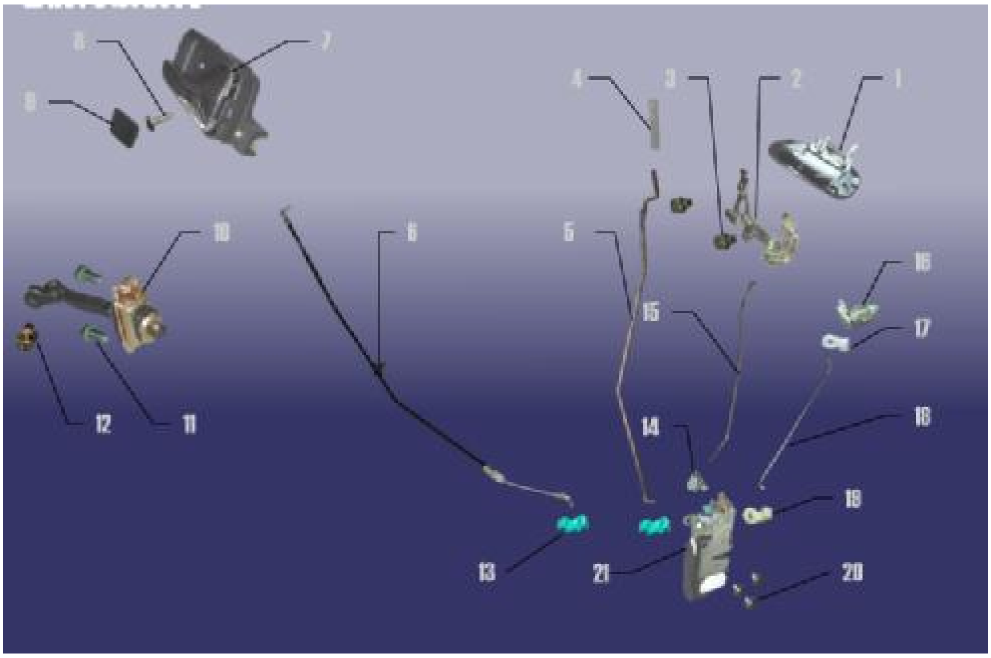
2.2.2. Make the shock absorber lower surface joint tightly with plate work.

Chapter 3   Removal and Maintenance of Door

I. Disassembly/Reassembly and Maitenance of Front Door

1. System Composition Diagram





2. Preparation

Tools: right-angled screwdriver, cross screwdriver, 7#, 10# and 13# sleeves, plier.

3. Precautions

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 Power off accumulator to avoid damage the electrical units.
3.3 Use the correct method to disassemble and assemble the glass to avoid damage.

4. Disassembly/Reassembly Step

4.1. Unclench the protecting cover of glass drive switch on the door inner guard plate with a right-angled screwdriver.

4.2. Pull out the connector from the glass drive switch by hand..

4.3. Unscrew the fix screws of front door inner handle with a cross screwdriver.

4.4. Take off the inner handle frame by both hands.

4.5. Separate the inner bar from the inner handle with a right-angled screwdriver.

4.6. Remove the fix screws from the front door inner guard plate with a cross screwdriver.

4.7. Lift up the door inner guard plate from the lower to upper by both hands.

4.8. Directly take out the door inner guard plate by both hands.

4.9. Tear down front door water-proof plastic clothing.

4.10. Take off the interior set square of the exterior rear-view mirror by hand.

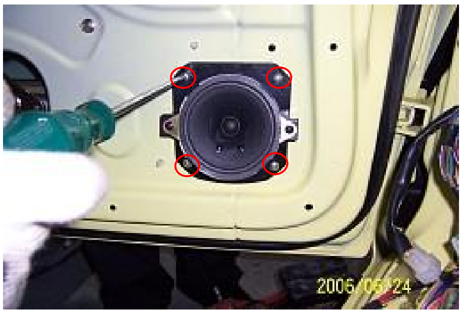
4.11. Pull out the connector of the exterior rear-view mirror by hand.

4.12. Remove three fix screws from the exterior rear-view mirror with a sleeve.

4.13 Remove three fix screws from the exterior rear-view mirror with a sleeve.

4.14 Take off the exterior rear-view mirror assy by hand.

4.15. Unscrew four fixing screws from front door sound box by cross head screwdriver.
Take out sound box assy.



4.16 Pull out the connector of the front door sound box.

4.17 Reinsert the glass drive switch into the harness, and descend the front door glass down to its lowest position.
4.18. Loose two fixing screws on the glass by cross head screwdriver.
And take out the glass assembly.
Torque: 4.5±0.5 N.m.

4.19 When the glass assy is being taken, erect the glass assy so as to easily take off it.

4.20 Remove six fixing bolts from the window glass regulator with a 10# sleeve.
Torque: 9±1 N·m.

4.21 Pull out the connector of window glass regulator by hand.

4.22 Take off the window glass regulator assy.

4.23 Separate the upper fixing clips of front door lock core rod from the lock by hand.

4.24 Separate the lower fixing clips of front door lock core rod from the lock by hand.

4.25 Loosen the fix screws of front door exterior handle with a sleeve.

4.26. Take out lock core and handle assy.

4.27 Remove three fix screws from the front door lock core with a cross screwdriver.
Installation torque: 9±1 Nm

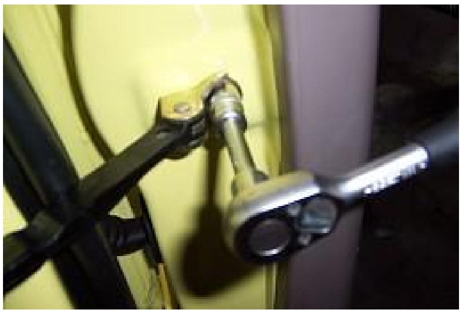
4.28 Pull out the fastener connector and then take off the fastener.

4.29 Loosen two upper fixing bolts of front door hinge from the door with a 13# wrench.
Torque: 36±4N.m.

4.30 Loosen two lower fixing bolts of front door hinge from the door with a 13# wrench.
Torque: 36±4N.m.

4.31 Remove the fixing bolts of door limiter from the door with a 10# sleeve.
Torque: 10±1 N.m

4.32 Remove the fixing bolts of door limiter from the body with a 10# sleeve, and then take off the door limiter.
Torque: 10±1 N.m



4.33 Pull out the door harness, and then take off the door body.

5. Installation and Adjustment Step

5.1. The installing steps are reverse to those for removal.

5.2. Adjustment of door

5.2.1. After the installation of door, check the horizontial and vertical clearances and the closing force of door. If the clearance is incorrect and the closing force is big, timely adjust the clearnace and force. See *Body Dimension* for the adjustment of door clearance.

5.2.2. The door clearance is adjusted by regulating the fixing bolts of hinge at the body.

5.2.3. The closing force of door can be slightly adjusted by regulating the position of front door lock column.

Torque: 9±1Nm.

5.3. Adjustment of door glass regulator system.

5.3.1. Check the window regulator system after this system is assembled. The duration of window glass lifting from the lowest position to the highest position shall be approximate 7 s.

If the time is too long, check the regulator in time.

5.3.2 Check window regulator motor.

5.3.3. Check whether there is oil or dust in the glass run channel which may result that the resistance is overhigh when the window glass is rising.

CAUTION: DO NOT apply any lubricating grease on the glass run channel or glass so as to avoid the adhesion of dust.

5.3.4. Check whether the installation of glass guide is deviated from its proper position, which may result that the glass is clamped due to the nonuniform arc scale when the glass is rising. The position of glass guide can be adjusted by the guide fixing bolts.

II. Disassembly/Reassembly and Maintenance of Rear Door

1. Preparation

Flat head screwdriver, cross head screwdriver, No.7, 10, 13 sleeves and pliers.

2. Precautions

2.1 Please wear necessary labor protection supplies to avoid accidents.

2.2 Power off accumulator to avoid damage the electrical units.

2.3 Use the correct method to disassemble and assemble the glass to avoid damage.

3. Removal Step

3.1. Prize two rear door glass slot protecting boards with flat head screwdriver.

(See front door disassembly to disassemble weather strip)

3.2. Unscew the fix screws of rear door inner handle with a cross screwdriver.

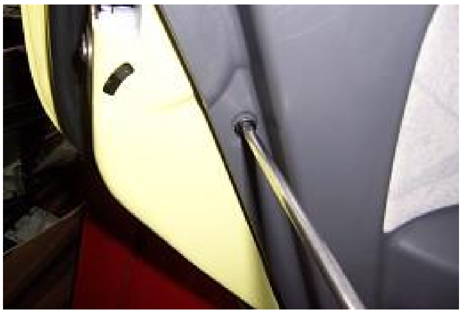
3.3. Take off the inner handle frame by both hands.

3.4. Separate the inner bar from the inner handle with a right-angled screwdriver.

3.5. Unclench the protecting cover of glass drive switch from the door inner guard plate with a right-angled screwdriver.

3.6. Pull out the connector of glass drive switch by hand.

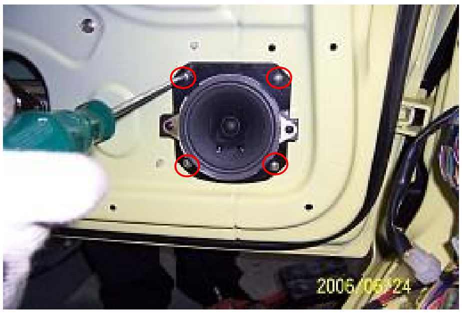
3.7. Remove the fix screws from the front door inner guard plate with a cross screwdriver.



3.8. Directly take off the door inner guard plate by both hands.

3.9. Tear down front door water proof plastic clothing.

3.10. Unscrew four fixing screws from front door sound box with cross head screwdriver.
Take out sound box assembly.



3.11. Pull out the connector of front door sound box.

3.12. Reinsert the glass drive switch into the harness, and then descend the front door window glass down to its lowest position.
3.13 Loosen two fixing screws on the glass with cross head screwdriver.
And take out the glass assembly.
Torque: 4.5±0.5 N.m.

3.14. When the glass assy is being taken, erect the glass assy so as to easily take off it.

3.15. Remove six fixing bolts from the window glass regulator with a 10# sleeve.
Torque: 7±1 N·m.

3.16. Pull out the connector of window glass regulator by hand.

3.17. Take off the window glass regulator assy.

3.18. Push aside the fixed mounting of lock core rod from the door with a right-angled screwdriver.

3.19. Separate the fixing clips of lock core rod from the lock by hand.

3.20. Take off the lock core rod by hand.

3.21. Separate the upper fixing clips of front door lock core rod from the lock by hand.

3.22. Separate the lower fixing clips of front door lock core rod from the lock by hand.

3.23. Loosen the fix screws of front door exterior handle with a cross screwdriver.

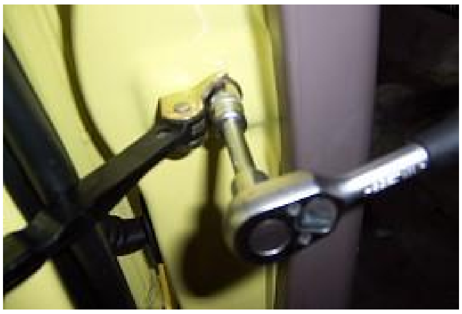
3.24. Take out lock core and handle assy.

3.25. Remove three fix screws from the front door lock with a cross screwdriver.

3.26. Pull out the fastener connector, and then take off the fastener.

3.27. Remove the fixing bolt from the door limiter with a 10# sleeve.
Torque: 10±1 N.m

3.28. Remove the other fixing bolt from the door limiter with a 10# sleeve, and then take off the door limiter.
Torque: 10±1 N.m



3.29. Loosen two upper fixing bolts of front door hinge from the door with a 13# wrench.
Torque: 36±4N.m.

3.30. Loosen two lower fixing bolts of front door hinge from the door with a 13# wrench.
Torque: 36±4N.m.

3.31 Pull out the door harness, and then take off the door body.

4. Installation and Adjustment Step

4.1. The installing steps are reverse to those for removal.

4.2. Adjustment of door

4.1.1 Rear door clearance can not be adjusted by hinge adjustment. If the door clearance is improper, correct the body only to ensure the clearance.

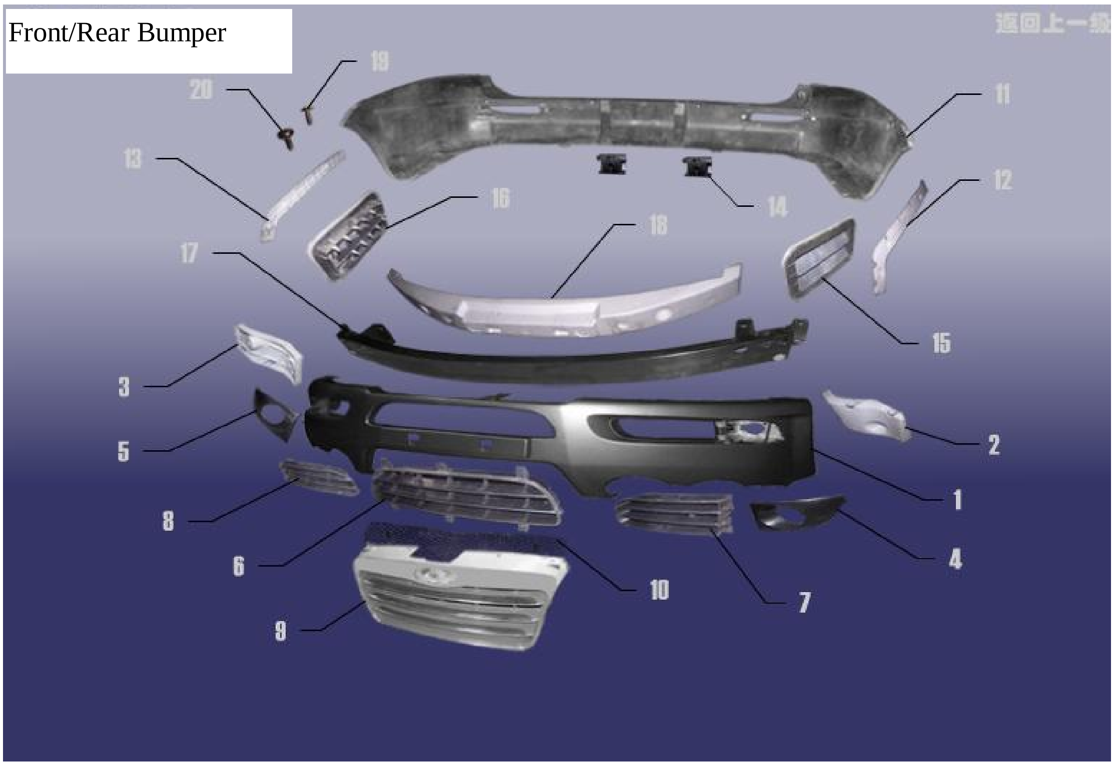
(See *Body Dimension*)

4.1.2 Please refer to Front Door Adjustment.

Chapter 4 Disassembly/Reassembly and Maintenance of Front/Rear Bumper

I. Disassembly/Reassembly and Maintenance of Front Bumper

1. System Composition Diagram



2. Preparation

No.7 and No10 sleeve, cross head screwdriver and flat head screwdriver.

3. Precautions

3.1. Please wear necessary labor protection supplies to avoid accidents.
3.2. To prevent scratch the bumper surface paint.
3.3. Carry out the disassembly and assembly at low temperature environment, do not use big force, otherwise the bumper will be broken.

4. Removal Step

4.1 Open the front engine hood by hand.

4.2 Loosen the fixing bolts of front bumper from the right and left sides of radiator cross beam with a 10# sleeve. (The left side is taken as an example)
Torque: 11N·m

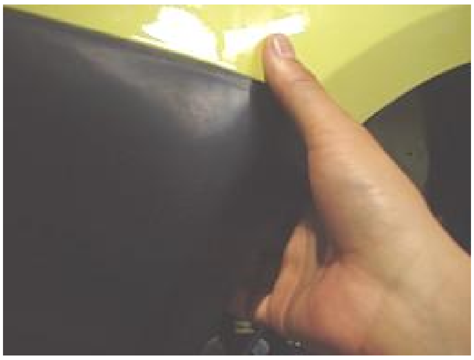
4.3 Loosen the fixing bolts of front bumper from the intermediate part of radiator cross beam with a 10# sleeve.
Torque: 11N·m

4.4 Loosen two fixing bolts under the bumper from the mud guard with a 7# sleeve.
Installation torque: 2±0.5 **Nm**

4.5. Unscrew mudguard fixing bolt beside the bumper with No.7 sleeve.
Installation torque: 2±0.5N.m

4.6 Remove the fixing bolts of mud guard from the side of bumper with a cross screwdriver.

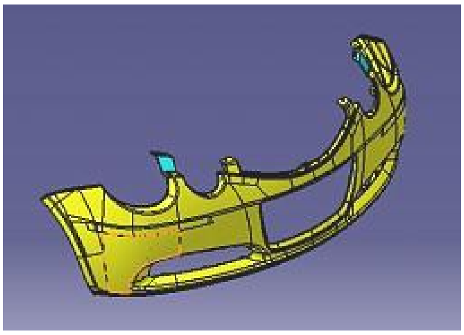
4.7 Pull out the bumper from the fixed mounting at the fender by hand.



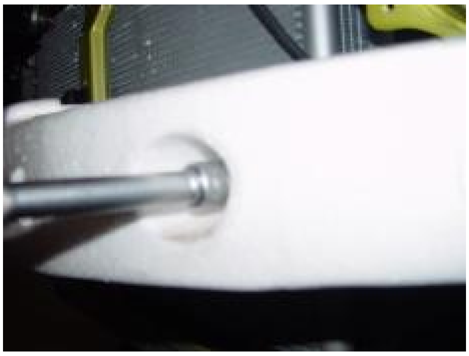
4.8. Pull out fog lamp plug by hand, and take out bumper assy.

4.9 Remove three screws applied to joint the fog lamp and bumper with a cross screwdriver.

4.10 Remove the bumper body assy.



4.11 Loosen three fixing bolts and a fixing nut used to secure the front bumper stiffening beam with a 13# sleeve.
Torque: 25±3N.m



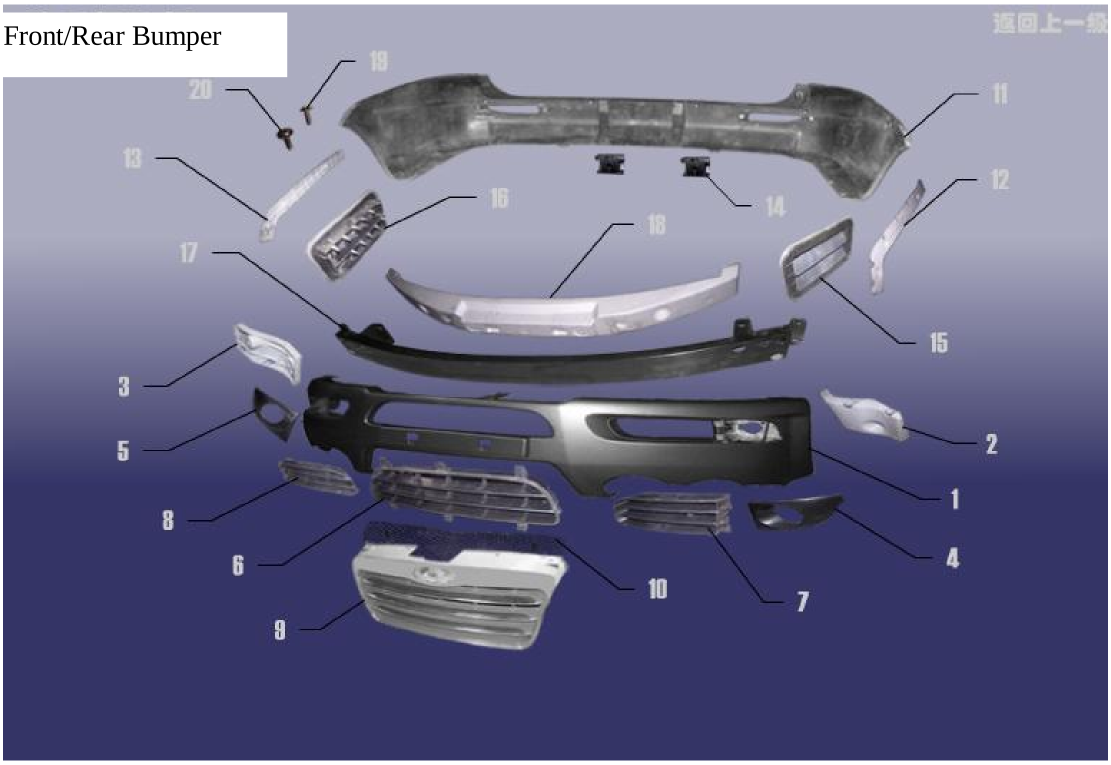
4.12 Loosen intake grille fixing screws from both sides of bumper with a cross screwdriver.

5. Installation and Maintenance

5.1. The installing steps are reverse to those for removal.

II. Disassembly/Reassembly and Maintenance of Rear Bumper

1. System Composition Diagram



2. Preparation

Tools: cross screwdriver, 7# sleeve.

3. Precautions

3.1. Please wear necessary labor protection supplies to avoid accidents.
3.2. To prevent scratch the bumper surface paint.
3.3. When the rear bumper is disassembled/reassembled in the low temperature environment, the force applied can’t be big so as to avoid the breakage of the bumper.

4. Removal Step

4.1. Open the luggage boot lid, and loosen two fixing clips from the rear bumper with a cross screwdriver. See right figure.

4.2. Loosen the fix screws and clips of rear bumper and rear mud guard with a 7# sleeve.
Torque: 7N·m

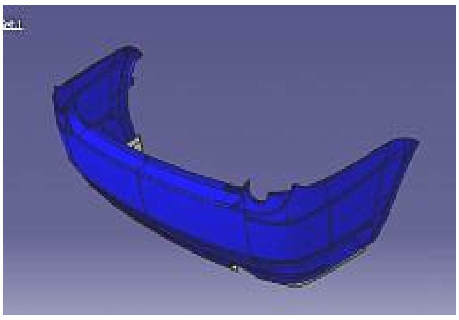
4.3. Loosen the fix screws at the left side of rear mud guard and rear bumper with a 7# sleeve.

4.4. Loosen the fix screws at the right side of rear mud guard and rear bumper with a 7# sleeve.

4.5. Push out the fixing clips of rear bumper from the rear mud guard by hand.

4.6 Pull out the bumper from the fixed mounting at the fender by hand.

4.7. Take off rear bumper assy.

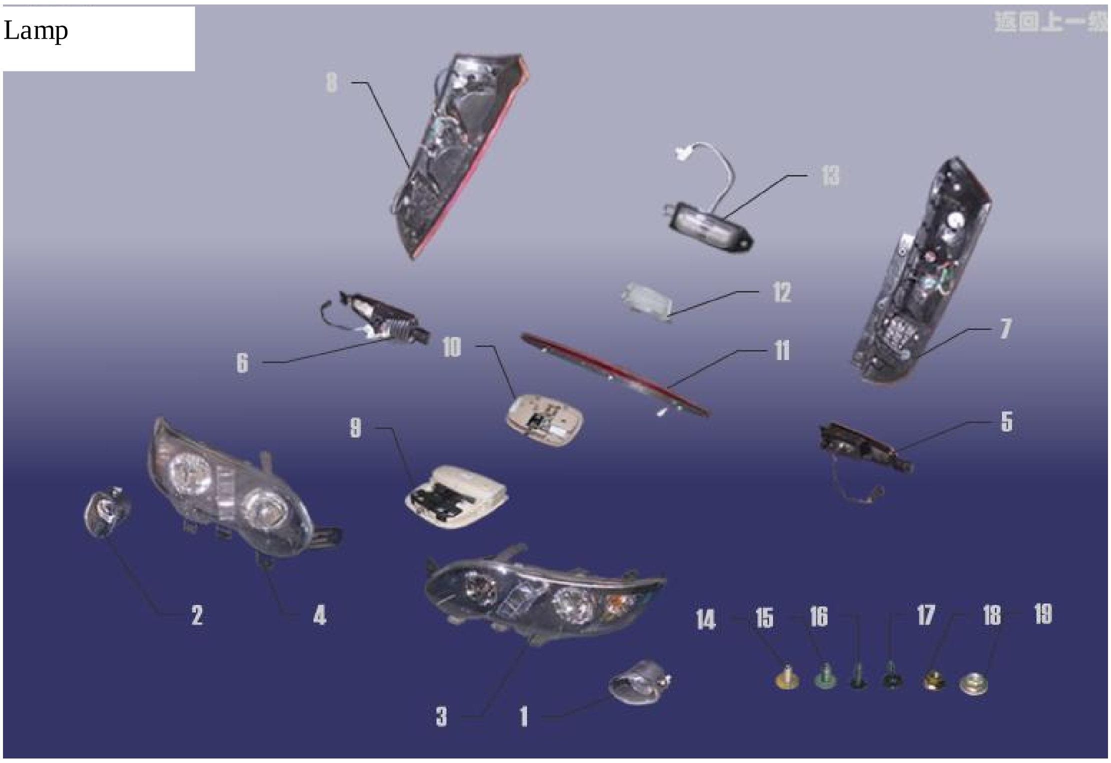


5. Installation Step

The installing steps are reverse to those for removal.

Chapter 5 Disassembly/Reassembly and Maintenance of Headlamp and Fog Lamp

1. System Composition Diagram



2. Preparation

No.10 sleeve and No.7 open end wrench, cross head screwdriver and flat head screwdriver.

3. Precautions

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 To prevent scratch the bumper surface paint.
3.3. In case of disassembly/reassembly in the low temperature environment, the force applied can’t be big so as to avoid the breakage of the bumper. Disconnect the control switch of corresponding lamps, and remove the wire connected to the battery.
3.4. When the headlamp is being removed, pay more attention to its clips on the bumper. The big force may damage the clips.
3.5 Pay attention to not scratch the headlamp surface when disassemble and place.

4. Removal Step of Headlamp

4.1. Disassemble front bumper assy first. (See disassembly/assembly of bumper)
4.2. Loosen headlamp two fixing bolts on engine hood cross beam with No.10 sleeve.
Torque: 3.5±0.5N·m

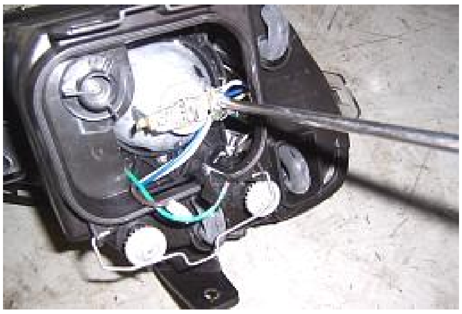
4.3. Remove the fixing bolts under the headlamp with a cross screwdriver.
Torque: 1.8±0.2N·m

4.4. Pull out the plug from the headlamp, and then take off the headlamp assy.

4.5. Open the lamp holder clips by hand.

4.6. Pull out two harness connectors by hand.

4.7. Remove two fix screws with a cross screwdriver.



4.8. Hold the bulb seat by hand, and take off the bulb from the headlamp.

CAUTION: In case that the bulb is replaced, DO NOT contact the bulb by hand, otherwise the fingerprint remained on the bulb is heated and volatilzes after the lamp lights, and then deposits on the mirror surface, which may result that the reflector darkens.

4.9. Screw off headlamp high beam seat cover.

4.10. Pull out two harness connectors by hand.

4.11. Remove two fix screws with a cross screwdriver.

4.12. Hold the bulb seat by hand, and take off the bulb from the headlamp.

CAUTION: In case that the bulb is replaced, DO NOT contact the bulb by hand, otherwise the fingerprint remained on the bulb is heated and volatilzes after the lamp lights, and then deposits on the mirror surface, which may result that the reflector darkens.

5. Removal of Fog Lamp

5.1. Remove the bumper assy. Refer to Disassembly of Bumper.
5.2. Pull out the plug of fog lamp.

5.3. Unscrew three fixing nuts from the fog lamp with a cross screwdriver.

5.4 Take off the fog lamp assy.

6. Installation and Adjustment of Headlamp

6.1. headlamp Installation Step

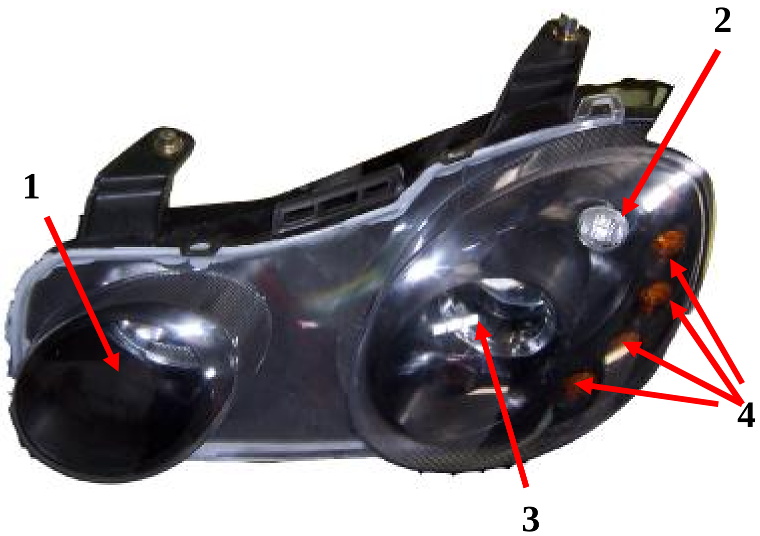
The installing steps of headlamp are reverse to those for removal.

6.2. Introduction to headlamp function

6.2.1. Front view

See right figure:

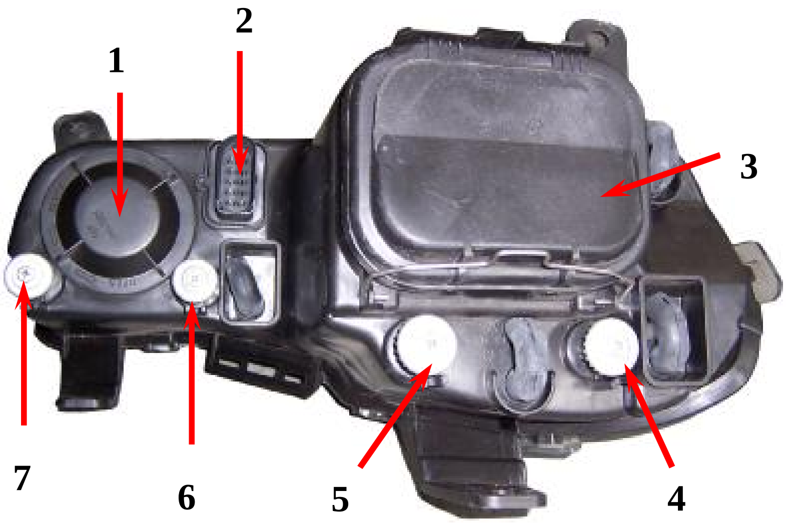
1 Low beam light
2 Position light
3 High beam
4 Turn light



6.2.2. Back view

See right figure:

1 Low beam light holder
2 Headlamp's plug
3 High beam light holder
4 High beam up/down adjusting nut
5 High beam left/right adjusting nut
6 Low beam up/down adjusting nut
7 Low beam left/right adjusting nut



6.3. Adjustment of headlamp light

Headlamp uses half closed light combination type. So it is easy to be maintained; it is halogen light with less mechanism and high luminous intensity, which will prolong bulb life.

The correctness of headlamp adjustment will influence the driving safety. So it needs special device to adjust the beam. Pay attention to law regulations and verify the following items before adjustment:

a. Tire pressure should be conformity with standard;
b. Car is unload (except for spare tire and equipped tools, and include driver weigh for sedan);
c. Park the car on horizontal road or workplace;
d. The lens surface of headlamp should be clean;
e. Check the power supplies if is working correctly, and the bulb installed correctly.

Adjust the governing mechanism equipped on the lamps to implement the adjustment rightward and leftward, upward and downward of the lamp beam, according to the required values in national standards. The coarse and fine adjustment upward and downward is integrated into one entity, which is located at the upper edge of housing while the rightward and leftward adjustment mechanism is located at the central lower edge of the housing.

It needs take off headlamp cover to adjust right headlamp. The left headlamp and right headlamp adjusting mechanisms are arranged symmetrically, with the same adjustment method is the same.

6.3.3. The beam of headlamp can be adjusted with the light adjusting nut or electric adjusting pushbutton (if equipped).

6.3.3.1. Insert a cross screwdriver into the corresponding adjustment hole to adjust the beam.

6.3.3.2. Height of CHERY S21's standard headlamp reference center:

Low beam: 717 mm; High beam: 755 mm.

6.3.3.3. The headlamp light beam shall be adjusted according to the data specified in the national stardards:

When checking the dip beam (i.e. low beam) headlamp position, project the headlamp on a screen 10 m away, the dark and bright changing line angle or central height shall be 0.7H – 0.9 H (H is the height of the headlamp reference center, the same below) for passenger cars, it shall be 0.6H – 0.8 H for other motor vehicles (excluding transportation tractor combinations). The horizontal deviation to the left of the dipped headlamp for motor vehicles (except the vehicle with only one headlamp) shall not exceed 10 mm and the right deviation shall not exceed 350 mm.

(From national standard)

6.3.3.5. Please input the standard data obtained into the headlamp beam regulator for the convenience to use in the furture.

7. Tail Lamp Removal Step

7.1. Remove the fix screws from the tail lamp with a cross screwdriver.

7.2. Open the trunk, and lift up the carpet of trunk.

7.3. Remove the upper seat fixing nuts from tail lamp with a fix wrench.

7.4. Remove the lower seat fixing nuts from tail lamp with a fix wrench.

7.5. Pull out the tail lamp harness connector, and the take off the tail lamp assy.

Chapter 6 Disassembly/Reassembly of Ceiling

1. Preparation

Tools: socket wrench, cross screwdriver, flat head screwdriver

2. Precautions

2.1. During the disassembly/reassembly, pay more attention to the application of appropriate force, without crude operation.

2.2. During the disassembly/reassembly of interior ornaments, especially pay more attention to the protection of surface ornaments so as to avoid the damage of the ornaments.

3. Disassembly/Reassembly of Sun Visor

3.1. Removal Step

3.1.1. Loosen two fixing screws on left front sun visor with a cross head screwdriver
Torque: 3±1Nm

3.1.2. Take off the front left sun visor.

3.2. Installation Step

The installing steps are reverse to those for removal.

3.3. Refer to Disassembly/Reassembly of Front Left Sun Visor for the disassembly/reassembly of front right sun visor.

4. Disassembly/Reassembly of Roof Hand-Hold

4.1. Removal Step

4.1.1. Remove the right/left fix screws with a cross screwdriver.

Torque: 9±3Nm

4.1.2. Take off the hand-hold.

4.2. Installation Step

The installing steps are reverse to those for removal.

4.3 Refer to Disassembly/Reassembly of Front Right Hand-Hold for other hand-holds.

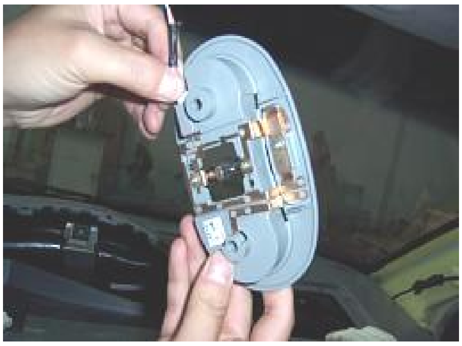
5. Disassembly/Reassembly of Front Ceiling Lamp

5.1. Removal Step

5.1.1. Remove the front ceiling lamp cover with a flat head screwdriver.
Note: do not scratch part surface.

5.1.2. Loosen the front ceiling lamp fixing bolt.
Torque: 1.5±0.5Nm

5.1.3. Pull out the harness connector, and then take off the front ceiling lamp assy.



5.2. Installation Step

The installing steps are reverse to those for removal.

6. Disassembly/Reassembly of A Pillar Trim

6.1. Removal Step

6.1.1. Prize A pillar protective board with a flat head screwdriver.

6.1.2. Take off the A pillar trim.

6.2. Installation Step

The installing steps are reverse to those for removal.

7. Disassembly/Reassembly of B Pillar Trim

7.1. Removal Step

7.1.1 Remove B pillar lower protective board (refer to Disassembly/Assembly of Seat Belt)

7.1.2. Remove the B pillar upper trim with a flat head screwdriver.
Note: protect the trim part surface from scratching.

7.2. Installation Step

The installing steps are reverse to those for removal.

8. Disassembly/Reassembly of C Pillar Trim

8.1. Removal Step

8.1.1. Refer to Disassembly/Reassembly of Rear Passenger Seat and Seat Belt.

8.1.2. Remove the C pillar upper trim with a flat head screwdriver.

8.1.3. Remove the C pillar lower trim with a flat head screwdriver.

8.2. Installation Step

The installing steps are reverse to those for removal.

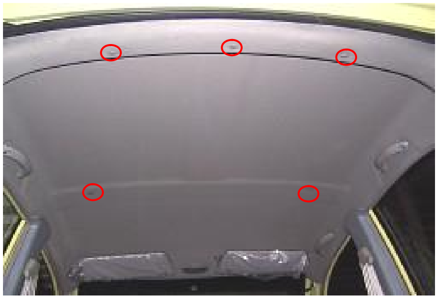
9. Disassembly/Reassembly of Ceiling

9.1. Removal Step

9.1.1 Remove the left and right sun visors.(Refer to Disassembly/Reassembly of Sun Visor)
9.1.2. Remove the front ceiling lamp. (Refer to Disassembly/Reassembly of Front Ceiling Lamp)
9.1.3 Remove all the roof hand-hold.(Refer to Disassembly/Reassembly of Roof Hand-Hold)

9.1.4. Remove the A/B/C pillar trim. (Refer to Disassembly/Reassembly of A/B/C Pillart Trim)

9.1.5. Remove the ceiling clips (5 pcs in total) with a flat head screwdriver.



9.1.6. Remove the wheatherproof rubber strip of four door opening by hand.

9.1.7. Open the trunk, and then remove the ceiling. It is convenient to take off the ceiling from the trunk and not easy to damage the ceiling.

9.2. Installation Step

The installing steps are reverse to those for removal.

Chapter 7　Disassembly/Reassembly of Instrument Panel

I. Removal of Instrument Panel Accessories

1. Preparation

Tool: socket spanner, cross head screwdriver, flat head screwdriver
Note: disconnect accumulator cathode before disassemble electrical parts

2. Disassembly/Reassembly of Central Console Panel, Audio Unit, Emergency Switch, A/C Control Switch, Ashtray

2.1. Removal Step

2.1.1. Remove the central console panel by hand.

2.1.2. Remove four fix screws used to joint the audio unit and instrument panel body with a cross screwdriver.
Torque: 9±3 Nm

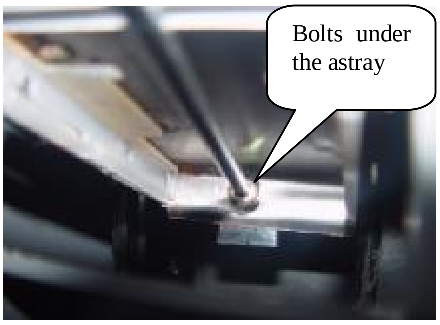
2.1.3. Remove two fix screws applied to joint the emergency switch and instrument panel body with a cross screwdriver.
Torque: 1.5±0.5Nm

2.1.4. take off the emergency switch and pull out the wire harness.

2.1.5. take off the audio and pull out the wire harness.

2.1.6. Remove four fix screws used to joint the A/C control switch and instrument panel body with a cross screwdriver.
Torque: 3.5±0.5 Nm

2.1.7. Remove the fix screws (at the bottom of ashtray) from the console, take off the cigarette lighter connecting wire, and remove the console assy.



2.1.8. Remove the A/C control switch cable and harness, and then take off the A/C control switch.

2.2. Installation Step

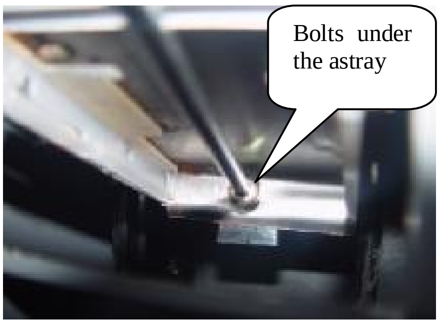
The installing steps are reverse to those for removal.

3. Disassembly/Reassembly of Front Ashtray

3.1. Removal Step

3.1.1. Draw out the front ashtray.

3.1.2. Remove one fix screw from the bottom of front ashtray guide run with a cross screwdriver.
Torque: 10±1 Nm



3.1.3. Remove two fix screws from the front of front ashtray guide run with a cross screwdriver.
Torque: 3±1 Nm

3.1.4. Take off the front ashtray guide run.

3.2. Installation Step

The installing steps are reverse to those for removal.

4. Disassembly/Reassembly of Glove Case

4.1. Removal Step

4.1.1. Unclench the long clip core at the right lower part of glove case with a screwdriver, and take off the clips.
4.1.2. Swing and take off the glove case.

4.2. Installation Step

The installing steps are reverse to those for removal.

5. combination instrument Disassembly/Reassembly of

5.1. Removal Step

5.1.1. Remove the central console panel, and then remove the combination instrument ornament frame.

5.1.2. Remove four fix screws from the combination instrument with a cross screwdriver.

Torque: 2±0.3Nm

5.1.3. Disconnec to the combination instrument harness connector, and then take off the combination instrument.

5.2. Installation Step

The installing steps are reverse to those for removal.

6. Disassembly/Reassembly of Combination Switch, Wiper Switch, Ignition Switch, Heliax Cable

Please refer to Disassembly/Reassembly of Steering Column in the Service Manual of Chassis.

II. Removal of Instrument Panel

1. Disassembly/Reassembly of Instrument Panel

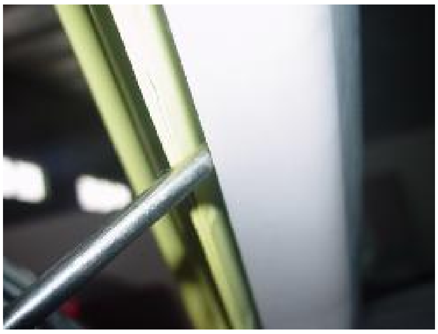
1.1. Removal Step

1.1.1. Remove the steering wheel and combination switch (see *Removal of Steering Wheel*).

1.1.2 Remove glove box (Refer to Removal of glove box)

1.1.3. Remove the console panel, audio unit, emergency switch, A/C control switch, ashtray, console (refer to Disassembly/Reassembly and Removal of Console Panel, Audio Unit, Emergency Switch, A/C Control Switch, Ashtray).

1.1.4 Disassemble combined instrument (Refer to Disassembly of Combined Instrument)



1.1.5. Remove the right/left A pillar upper and lower trims.

1.1.6. Remove the weatherproof rubber strips from the left front and right front door openings.

1.1.7. Remove the left and right air outlet covers and exterior rear-view mirror regulating switch with a flat head screwdriver.

1.1.10. Take off the ornament cover, and remove two fix screws from the right and left front parts of upper instrument panel body and seven fix screws from the lower instrument panel body with a cross screwdriver, and then take off the upper instrument panel assy together with the right and left air outlets.

Torque: 3±0.5 Nm

1.1.11. Remove the right and left four cross beams from the instrument panel and the fixing bolts from the both sides of vehicle body with a 10# sleeve.

Torque: 23±2 Nm

1.1.12. Remove two cross beams from the instrument panel and the fixing bolts from the soleplate with a 10# sleeve.
Torque: 10±1 Nm

1.1.13. Obliquely place the instrument panel and instrument panel cross beam, remove the fixing bolts from the left, middle and right sides of instrument panel with a 10# sleeve, and take off the bond strap.
Torque: 4±0.5 Nm

1.1.12. Detach any related harness connector.

1.1.13. Lift out the instrument panel and instrument panel cross beam by two operators.

1.2. Installation Step

The installing steps are reverse to those for removal.

Note:

1.2.1. The instrument panel dual-vent and A/C vent shall be fit well, without the improper installation and air leakage. The instrument panel air duct and instrument panel cross beam, evaporator and other parts shall NOT interfere and affect the installation of instrument panel, which may result the improper installation of instrument panel and its accessories.

1.2.2. The instrument panel and front windscreen shall NOT interfere and affect the installation of instrument panel and front windscreen, and the clearance between front windscreens shall be uniform.

1.2.3. The clearance between the instrument panel and both sides of body shall be uniform and can meet the assembly of weatherproof rubber strip of door opening.

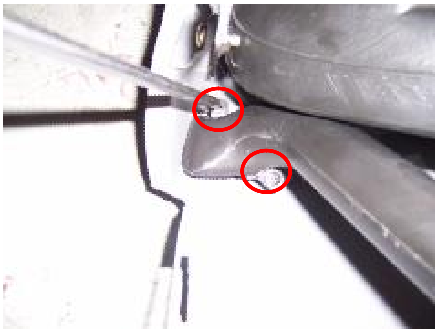
1.2.4. The glove case switch shall be flexible, without the interference, clamped or locking untightened symptom.

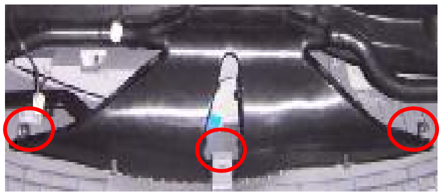
2. Removal of Instrument Panel cross beam

2.1. Removal Step

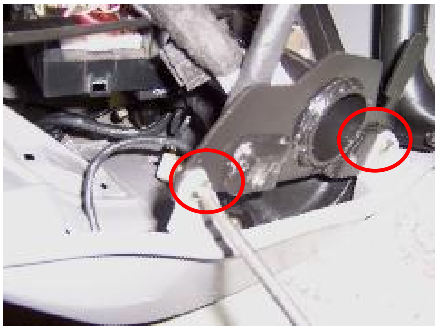
2.1.1. Disassemble instrument panel assembly (Refer to Disassembly of Instrument Panel)

2.1.2. Remove seven fix screws from the air duct as shown in the figure, and then take off the air duct.





2.1.3. Remove the four fix screws from both sides of instrument panel and cross beam with a cross screwdriver.
Torque: 3±1 **Nm**



2.1.4. Take off the cross beam and air duct.

2.1.5. Remove two screws used to fasten the air duct from the cross beam with a cross screwdriver.
Torque: 3±1 **Nm**

2.1.6. Take off the air duct, and detach the harness as required.

2.2. Installation Step

Refer to Removal Step and install it in reverse order.

Chapter 8 Air Conditioning (A/C) System

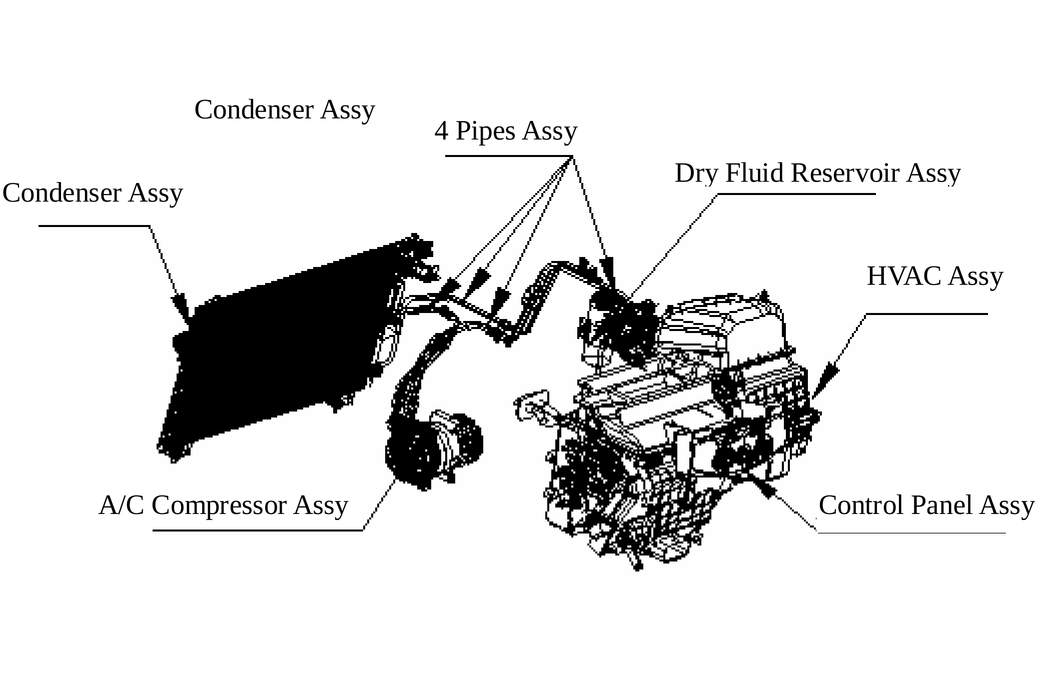
I. System Composition

Air adjustment and distributing system: HVAC air mixing and distributor part, inside/outside circulation air inlet, air outlet, outside circulation air filter.

Control system: control panel assy, wire drawing, micro-motor, fan, resistor, high/low voltage switch

Heating system: heater, hot water pipe, engine cooling water system.

Cooling system: compressor, condenser, reservoir dryer, expansion valve, evaporator, and pipe.



II. Removal of Evaporator Assy

1. Preparation

Tool: cross head screwdriver, carp pliers, socket spanner

Auxiliary material: refrigerant, antifreeze, sponge rubber strip

2. Disassembly/Reassembly Step

2.1 Recycling the refrigerant by refrigerant recycling machine

Note:

(1) DO NOT dispose the coolant in a sealed location or near fire.

(2) Do not splash the refrigerant into eyes and skin.

2.2. Disassemble instrument panel assy and front cross beam. Pull out the related electrical connectors.

2.3. Loose fixing bolts on high/low pressure pipe with spanner.

Torque: 5±1 **Nm**

2.4. Loosen two fixing bolts used to connect the high/low pressure pipe to the expansion valve, and pull outwards the high/low pressure pipe.

Torque: 8±1 **Nm**

2.5. Loosen three fixing bolts of evaporator and front side.

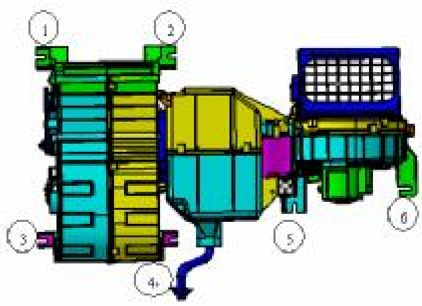
Torque: 3.5±0.5 **Nm**

2.6. Remove the inlet/outlet pipe snap rings from the evaporator radiator with a plier, and pull out the water pipe.

CAUTION: The coolant may flow out from the water pipe, and pay attention to the recovery of coolant.

2.7. Loosen six fixing bolts of evaporator assy fixed on the paintwork from the engine compartment, and the fixed position is as shown in the right figure.

Installation torque: 5±0.5 **Nm**



2.8. Take out evaporator and AC cable assy from cab

3. Installation of Evaporator Assy

The installing steps are reverse to those for removal.

4. Disassembly/Reassembly of Evaporator Interior

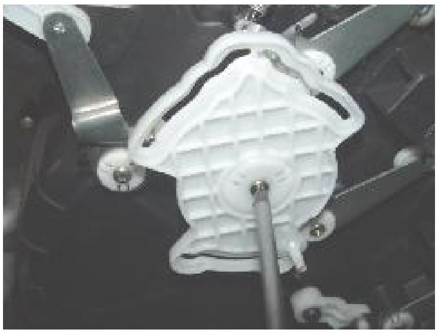
Preparation of tool(s): cross screwdriver, socket wrench

4.1. Removal Step

4.1.1. Refer to the Removal of Evaporator Assy, and take off the evaporator assy.

4.1.2. Remove the harness and connector from the evaporator.

4.1.3. Remove three screws from the intermediate part of the evaporator, and partition the evaporator into two parts.



4.1.4. Remove the air direction regulating mechanism from the distributor with a cross screwdriver (as shown in the figure).
Torque: 1.5±0.5 **Nm**

4.1.5. Remove eight housing connection screws from the distributor with a cross screwdriver (as shown in the figure).
Torque: 1.5±0.5 **Nm**

4.1.6. Detach the distributor. In this case, take off the air baffle from the interior.

4.1.7Remove four fix screws from the air inlet with a cross screwdriver, and take off the air inlet.
Torque: 1.5±0.5 Nm

4.1.8 Remove the fixing screws from the inner-outer recirculating air control mechanism with a cross screwdriver, and then take off the inner-outer recirculating air control mechanism.
Torque: 1.5±0.5 Nm

4.1.9. Remove nine housing connection screws from the other side of the evaporator with a cross screwdriver (as shown in the figure).
Torque: 1.5±0.5 Nm

4.1.10. Remove four screws from two fixed iron sheets of A/C heater pipe with a cross screwdriver.

4.1.11. Remove two clips from the evaporator with a flat head screwdriver.

4.1.12. Separate the upper part of the housing from the lower part by both hands.

4.1.13. Take off the evaporator and expansion valve from the lower housing.

4.1.14. Remove the fixing nuts from the fan impeller with a 10# sleeve, and take off the fan impeller.
Torque: 5±0.5 Nm

4.1.15. Remove the fix screws from two fan motors with a cross screwdriver.
Torque: 5±0.5 Nm

4.1.16. Pull out the fan motor by hand.

4.2. Installation Step

The installing steps are reverse to those for removal.
Carry out checks for system evacuating, keep pressure, antifreeze leakage.
Check if the radiator is blocked. If the radiator is blocked, utilize the compressed air to clean it.

III. Troubleshooting

Types of pressure deviation	Possible causes	Method for troubleshooting
1. The pressure at the high pressure side remains unchanged or just slightly rises (compared with the value when the engine stalls); the pressure at the low pressure side is within or under the range as shown; the air conditioner is under refrigeration. 2. The pressure at the high pressure side is normal; the pressure at the low pressure side is within the range as shown; the air conditioner is under refrigeration.	Lack of refrigerant or the expansion valve fails	Evacuate the refrigerant ● If the volume of the refrigerant is normal 1. Replace the expansion valve 2. Refill the refrigerant to the system 3. Test the pressure again ● If the volume of the refrigerant is short 1. Check if there is leaking, if there is fix it 2. Refill the refrigerant to the system 3. Test the pressure again
The pressure at the high pressure side is higher than the specified value; the pressure at the low pressure side falls rapidly to within or under the range as shown; the air conditioner is under refrigeration.	The blockage or throttling occur somewhere in the refrigerant pipelines The expansion valve fails	Touch the pipelines to feel the temperature change ● If there exists temperature differences on several parts of a certain component 1. Utilize the compressed air and nitrogen gas to dredge the pipeline and replace the expansion valve 2. Replace the parts blocked ● If no trouble found 1. Dredge the pipelines with compressed air and nitrogen 2. Test the pressure again
Initially, the pressures at the high and low pressure sides are normal, but after a period of time, the pressure at the high pressure side is higher than the specified value and the pressure at the low pressure side is within or	The expansion valve fails There exists vapor in the refrigerant pipelines	Check for dirt or rust in the expansion valve and replace it when necessary ● Dredge the pipelines with compressed air and nitrogen

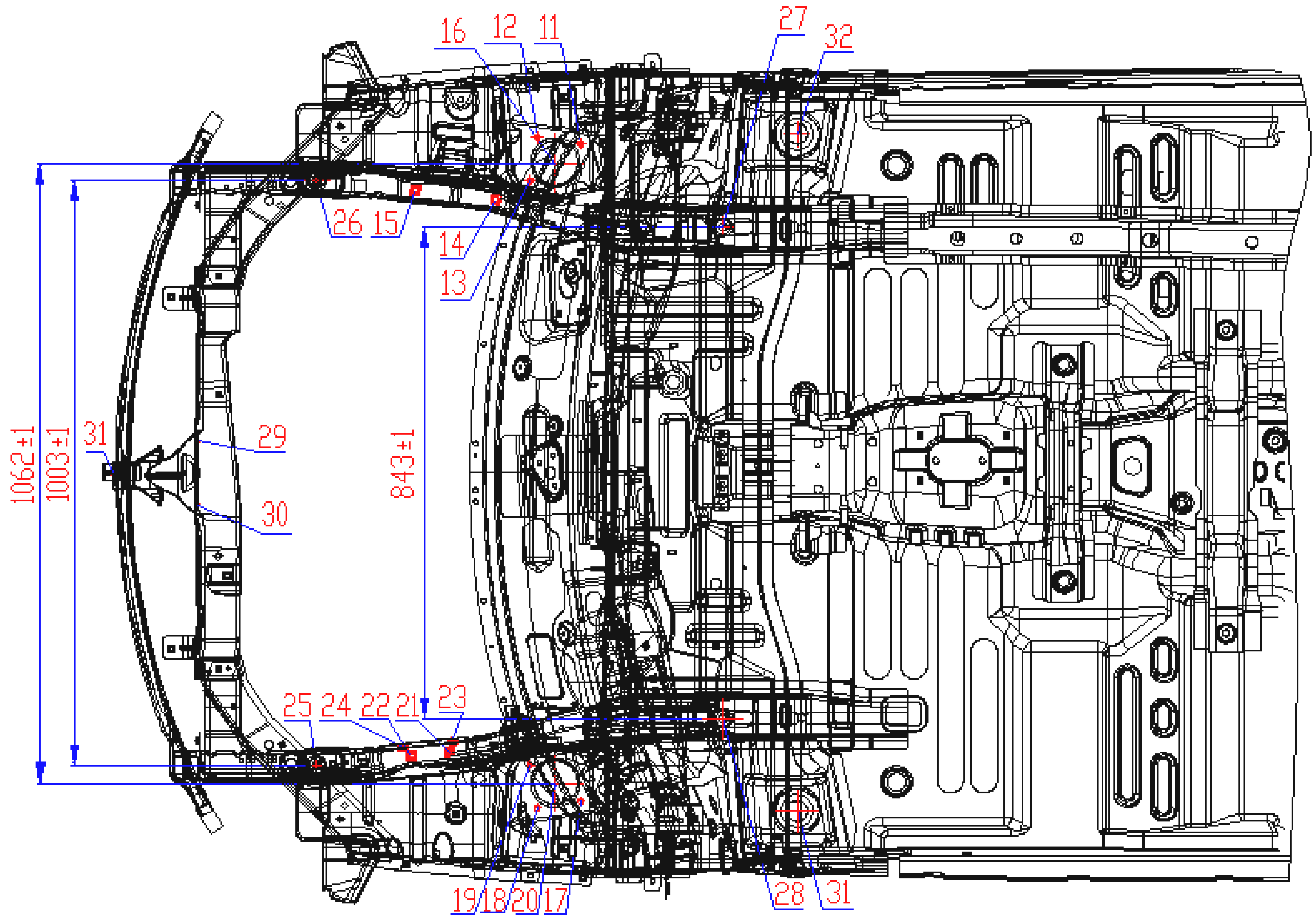
under the range as shown; the air conditioner is under refrigeration.		
The pressure at the high pressure side is higher than the specified value or is too high; the pressure at the low pressure side is too high; the air conditioner is under refrigeration; the compressor makes exceptional sounds (especially when just starts the engine).	The refrigerant in the refrigerant pipelines is excessive The expansion valve fails or the compressor is disabled	Evacuate the refrigerant ● If the volume of the refrigerant is normal 1. Replace the expansion valve 2. Refill the refrigerant to the system 3. Test the pressure again ● If the refrigerant is obviously excessive 1. Refill the coolant into the system 2．Test the pressure again Note: If the system is still off normal after retesting the pressure, install the expansion valve replaced again and dredge the pipelines with compressed air and nitrogen, and then further replace the compressor and the fluid reservoir and drying chamber.
When turning off the engine, the pressure at the high pressure side slightly rises while the pressure at the low pressure side slightly falls; the air conditioner is under refrigeration.	The compressor is disabled	Dredge the pipelines with compressed air and nitrogen Replace the compressor and the fluid reservoir and drying chamber
High pressure side is correct, low pressure side is too low, AC refrigerating correct, sometimes the evaporator has ice(even the refrigerant quantity is correct)	The expansion valve fails or the compressor is disabled	Replace the expansion valve Note: If the system is still off normal after retesting the pressure, install the expansion valve replaced again and dredge the pipelines with compressed air and nitrogen, and then further replace the compressor and the fluid reservoir and drying chamber.
1. High/low pressure sides are correct, AC refrigerating deficiency. 2. High/low pressure sides are correct, the sound of compressor is abnormal (especially when the engine is started), AC refrigerating good	The transmission oil in the air conditioner pipelines is excessive	Evacuate the refrigerant ● Dredge the pipelines with compressed air and nitrogen Note: Adjust the volume of the lubricant when replacing such component of the air conditioner system as the compressor
The reservoir can not be used	• Perforated • The sealed position is damaged • Thread of fasten part is damaged, outside air entering to system	Replace it

Chapter 9   Body Dimension

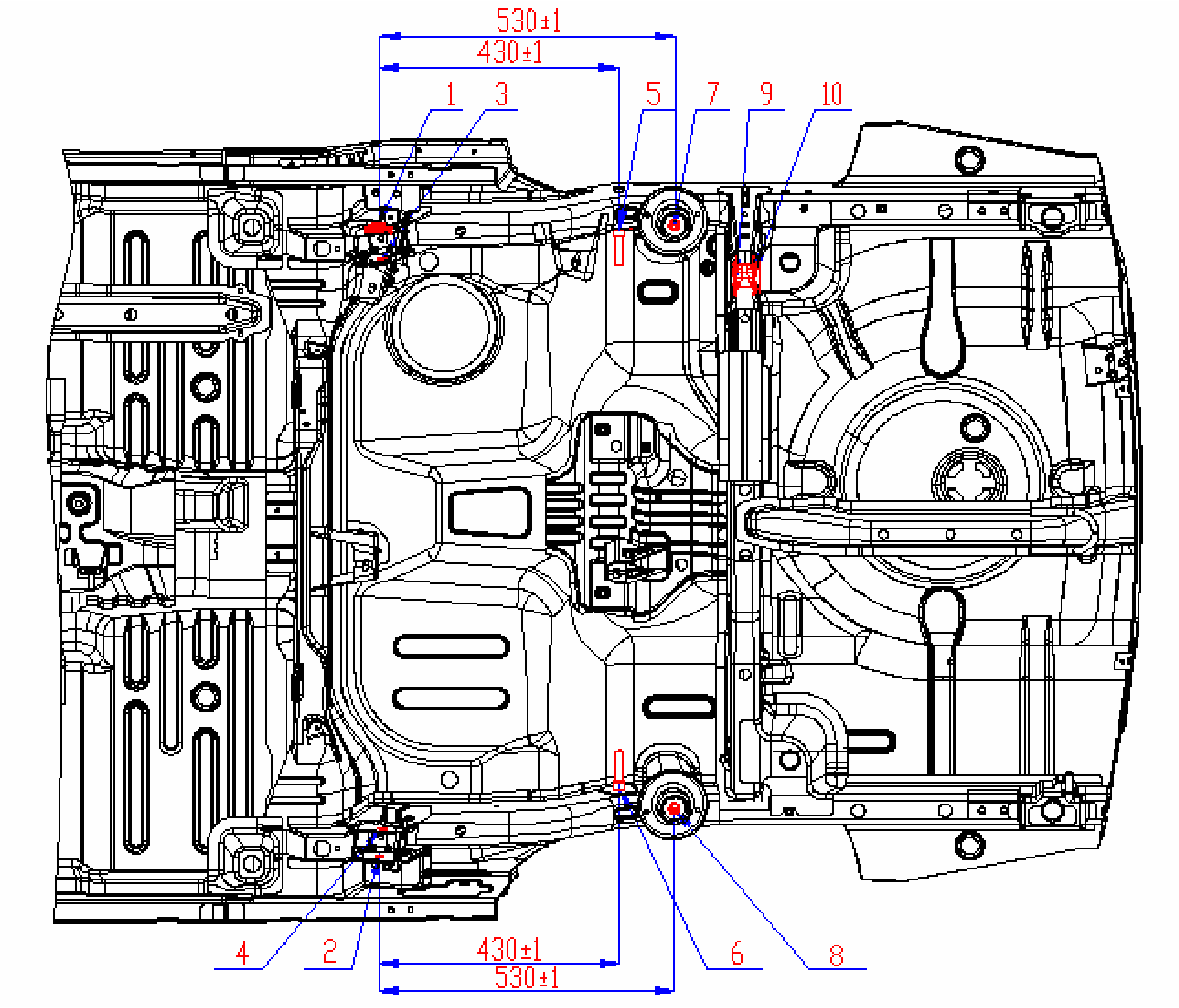
I. Chassis Control Point

Unit: mm

1. Front



2. Rear



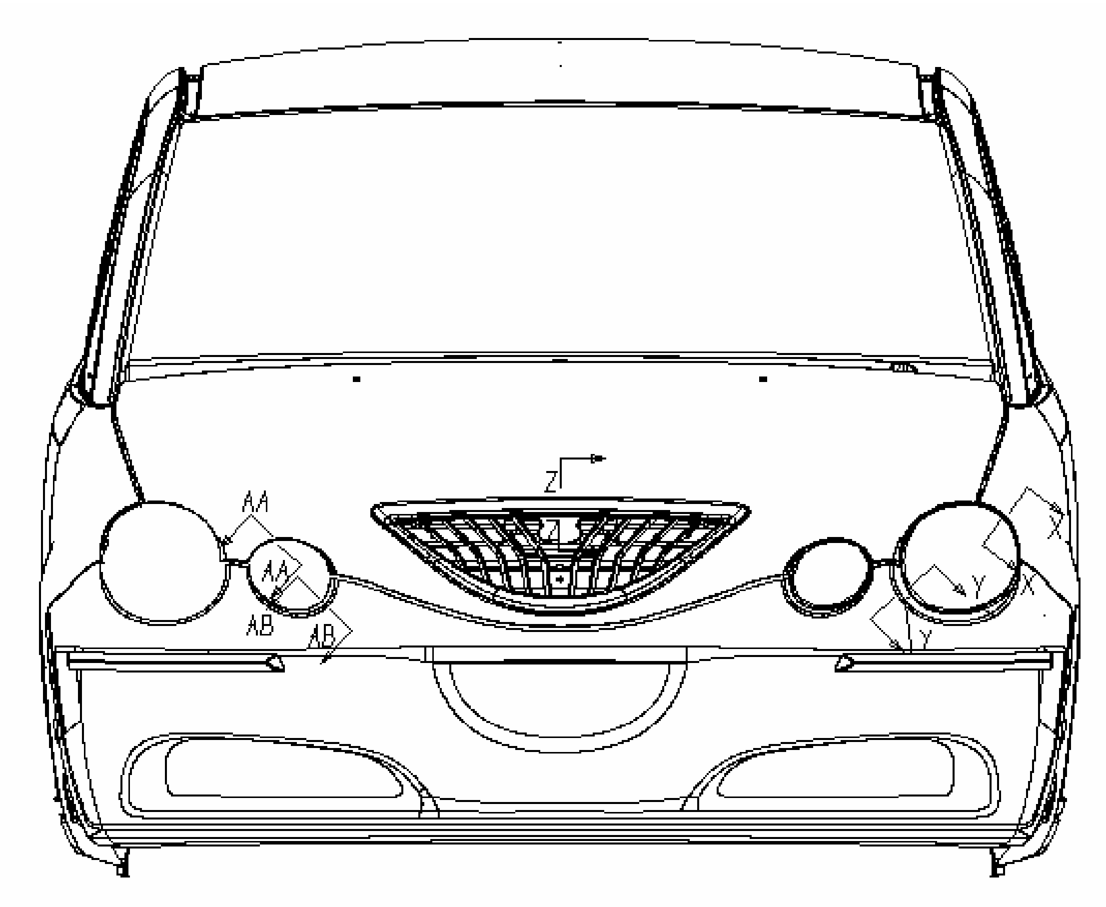
3. Size of Control Point

S/N	1	3	2	4	5	6	7	8	9	10	11	12	13	14	15
Name / Coordinate	Rear Left Trailing Arm Hole		Rear Right Trailing Arm Hole		Rear Bumper Installation Hole		Rear Bumper Block Hole		Rear Crossbearer Installation Hole		Bumper Spring Hole			Engine Suspension Installation Hole	
Size of Hole	Ø12.5		Ø12.5		Ø20		Ø14.5		Ø12.5		Ø9			Ø13	
X	1789.1	1794.1	1789.1	1794.1	2219.9	2219.9	2319.8	2319.8	2428.3	2463.7	75.5	1	-11.3	-70.3	-207.8
Y	-587.6	-522.8	587.6	522.8	-516.1	516.1	-536.0	536.0	-502.5	-502.5	563.4	574.9	501	467.3	483.8
Z	-61.9	-61.9	-61.9	-61.9	247.0	247.0	166.3	166.3	-5.0	-5.0	511.90	518.4	508.10	261.7	255.9

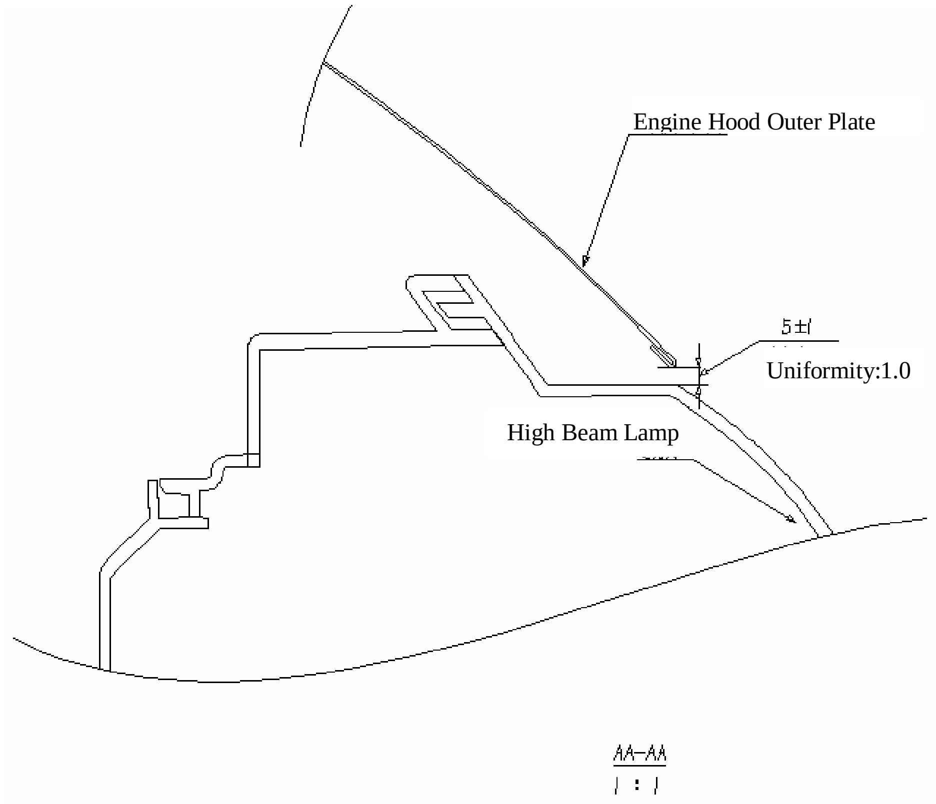
S/N	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Name / Coordinate	Bumper Spring Hole			Bumper Hole	Engine Suspension Installation Hole				Sub-frame Installation Hole				Radiator Upper Crossbeam Mid-bearer Installation Hole		Paintwork Process Hole	
Size of Hole	Ø9			Ø76	Ø13				Ø18				Ø18		Ø30	
X	75.5	1	-11.3	32.6	-149.7	-215.2	-143.4	-229.8	-337.0	-337.0	320.0	320.0	-585.9	-585.9	447.5	447.5
Y	-563.4	-574.9	-501	-513	-478.4	-485.6	-455.5	-464.6	-501.5	501.5	421.5	-421.5	55	-55	-580.6	580.6
Z	511.90	518.4	508.10	517.9	258.5	255.6	201.7	201.7	-6.4	-6.4	-23.0	-23	478.8	478.8	-71.3	71.3

II. Body Assembly Dimension

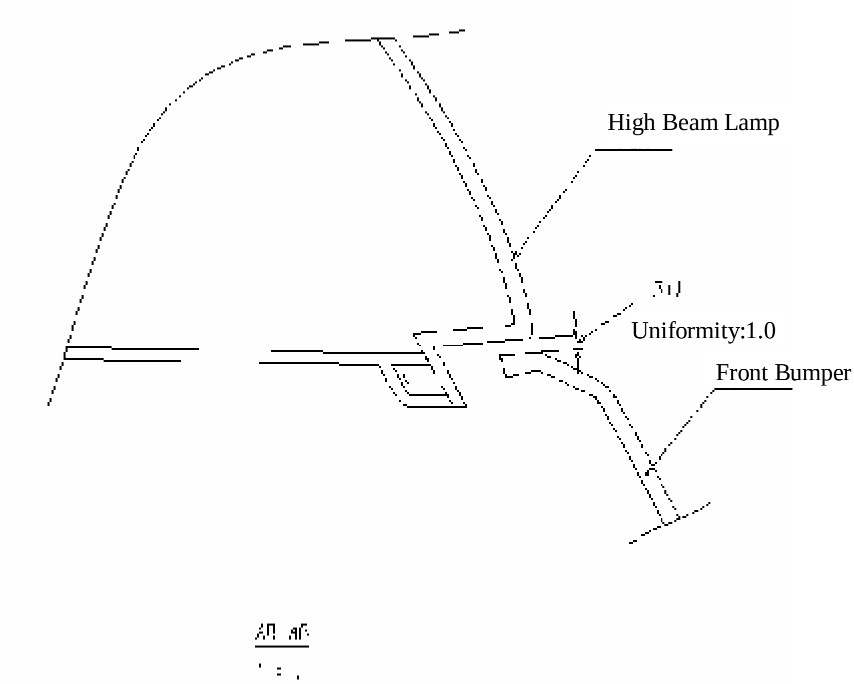
1. Front View



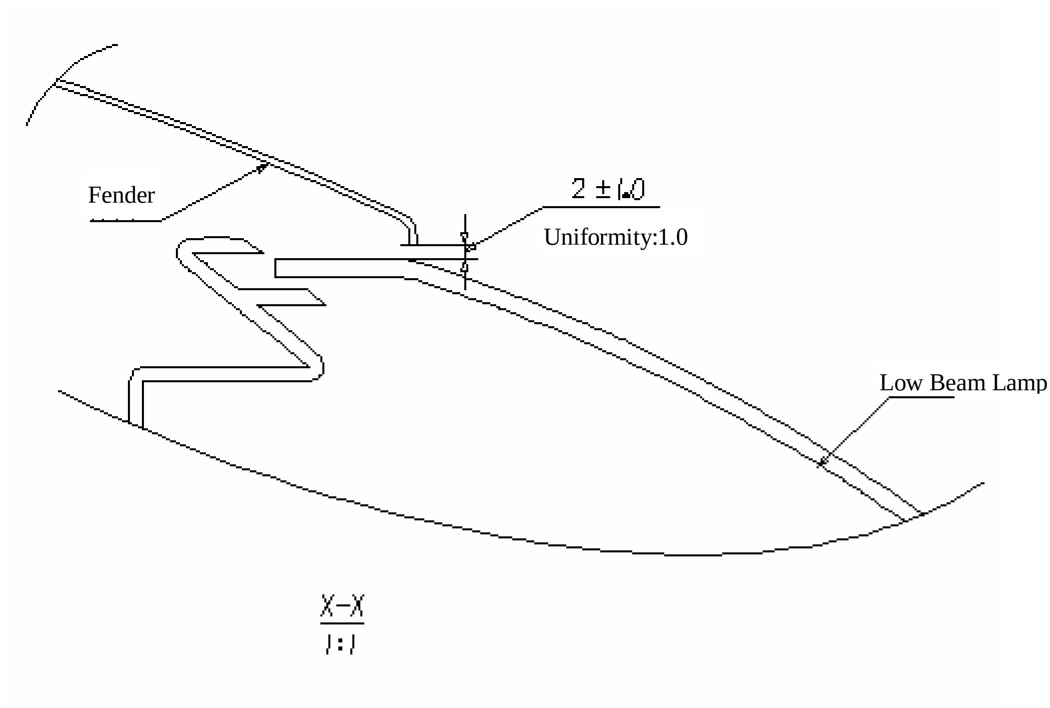
1.1 Clearance between high beam lamp and engine hood at AA-AA: 5±1 mm



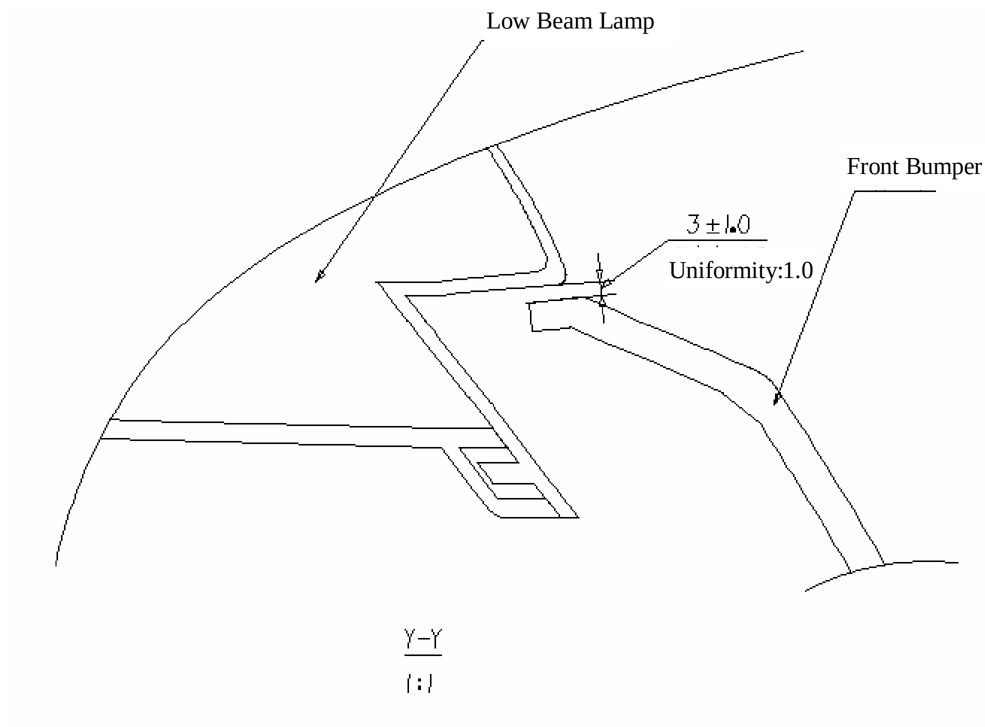
1.2 Clearance between high beam lamp and front bumper at AB-AB: 3±1mm



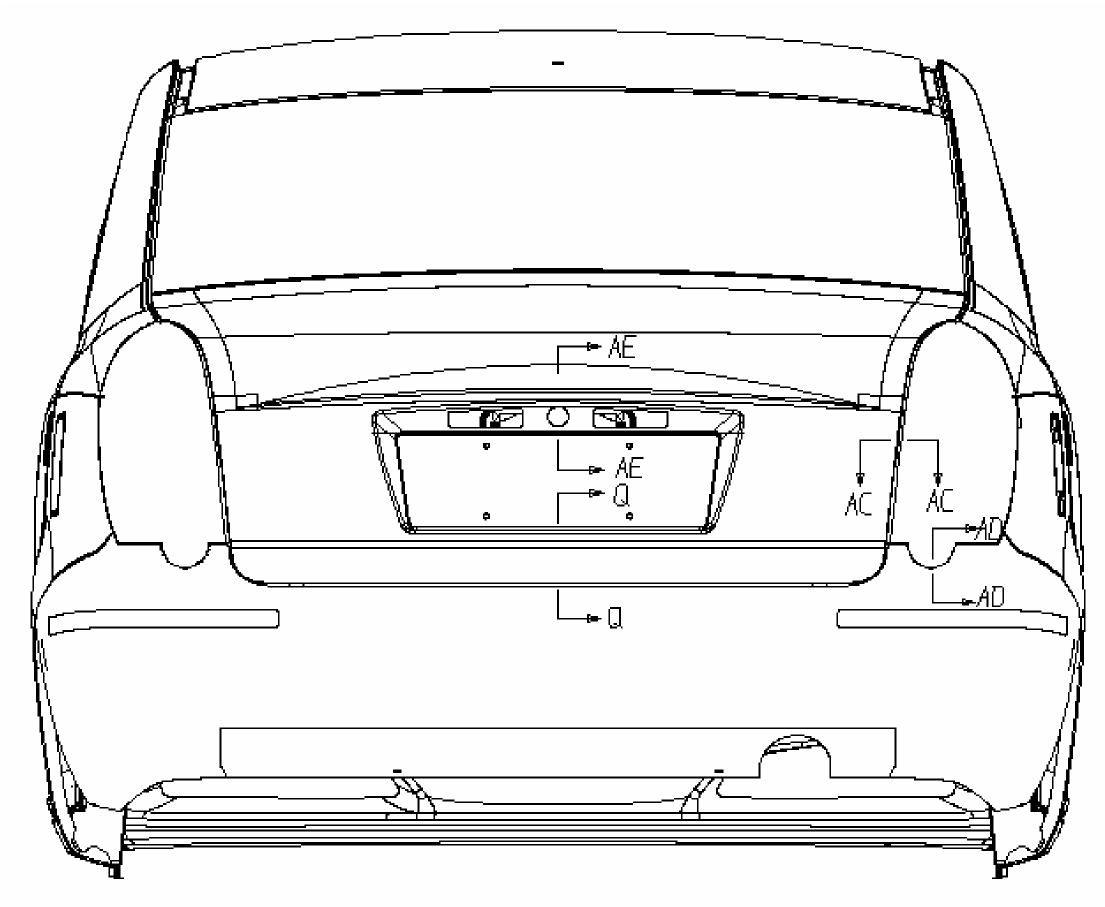
a) Clearance between low beam lamp and front fender at X-X: 2±1mm



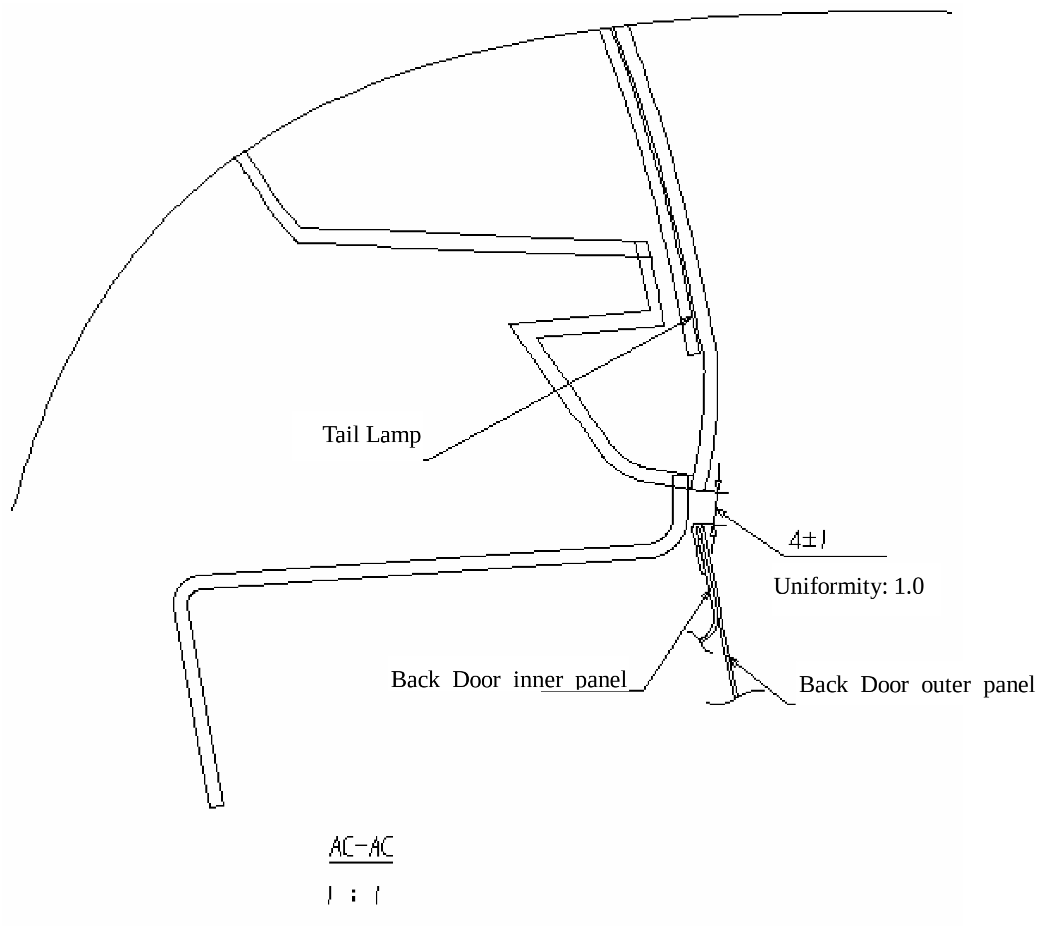
1.4 Clearance between low beam lamp and front bumper at Y-Y: 8±1mm



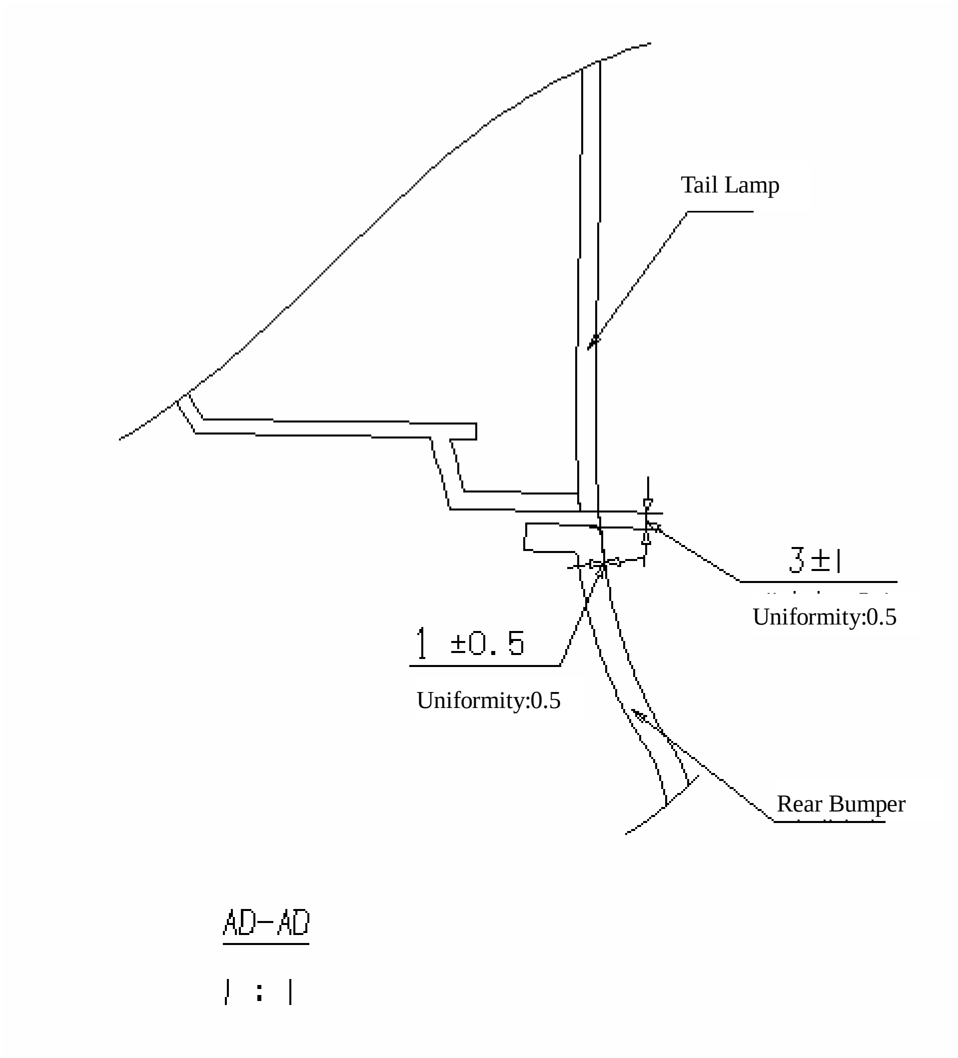
2. Rear View



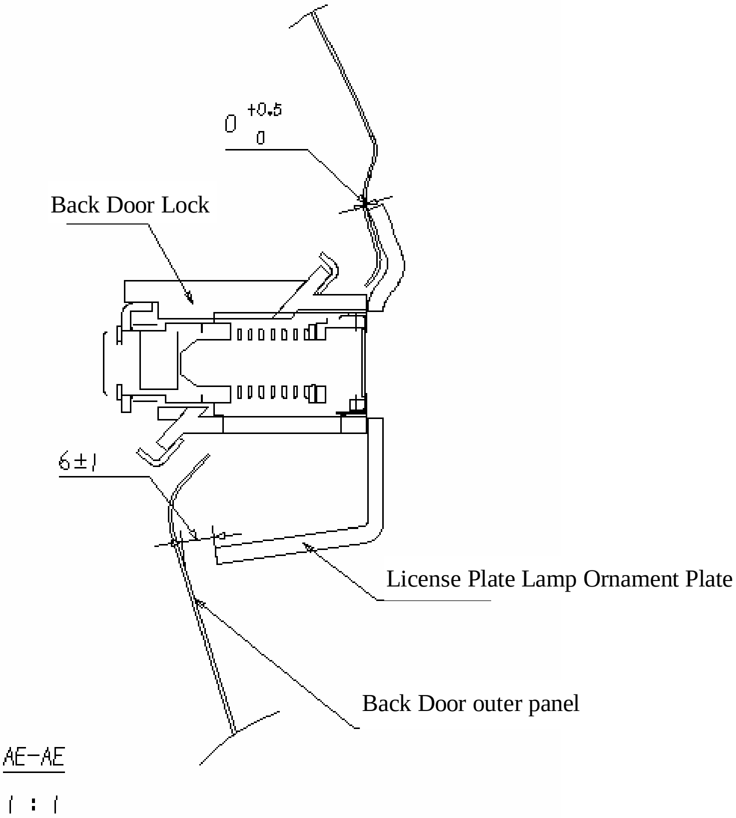
a) Clearance between tail lamp and back door at AC-AC: 4±1mm



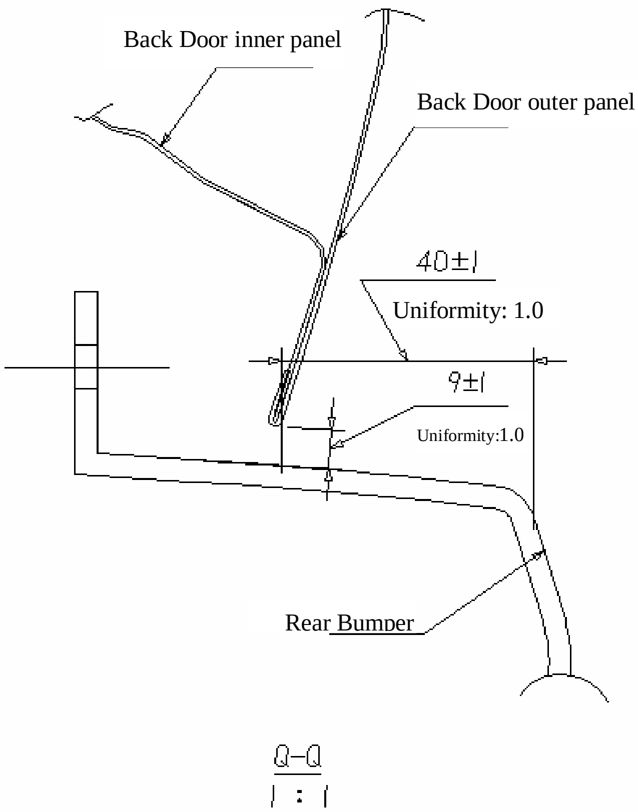
2.2 Fit clearance between tail lamp and rear bumper at AD-AD: 3±1mm



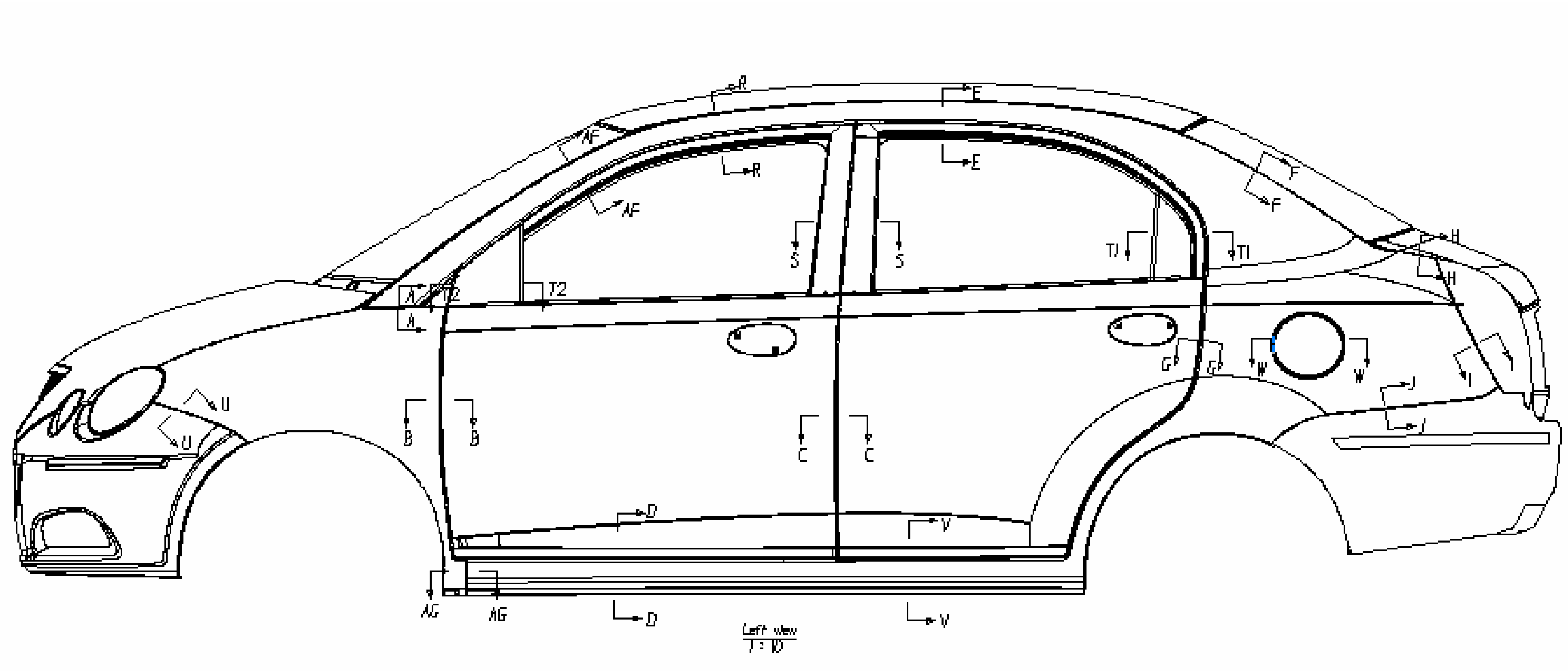
2.3 Fit clearance between license plate lamp trim board and back door outer panel at AE-AE: 6±1mm



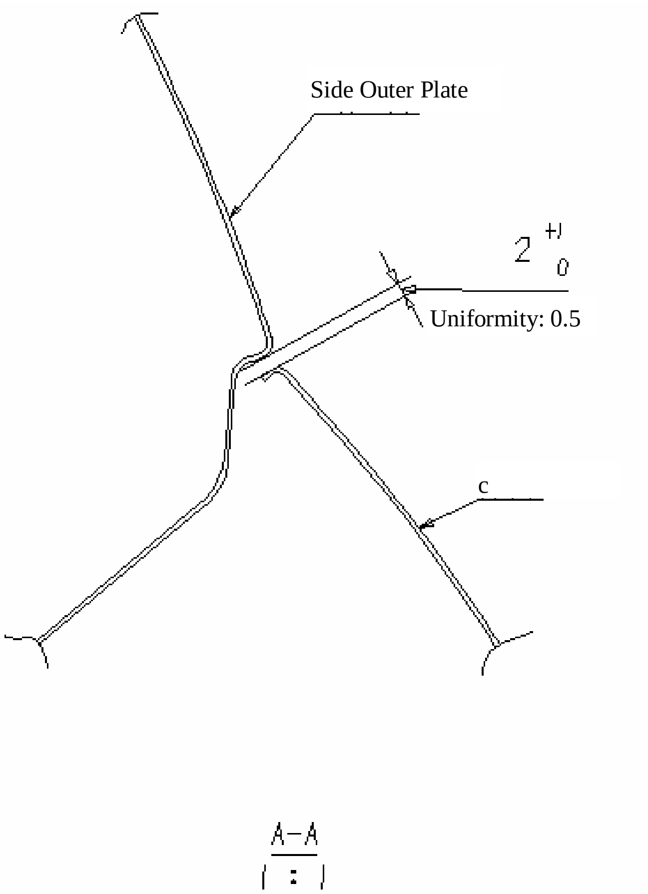
2.4 Fit dimension of back door and body at Q-Q:



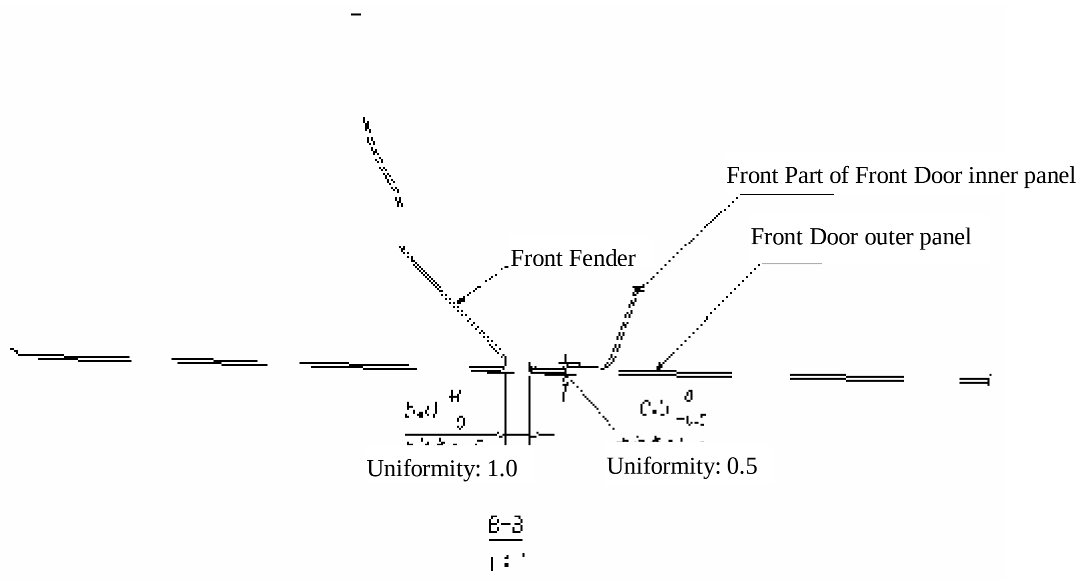
3. Left View



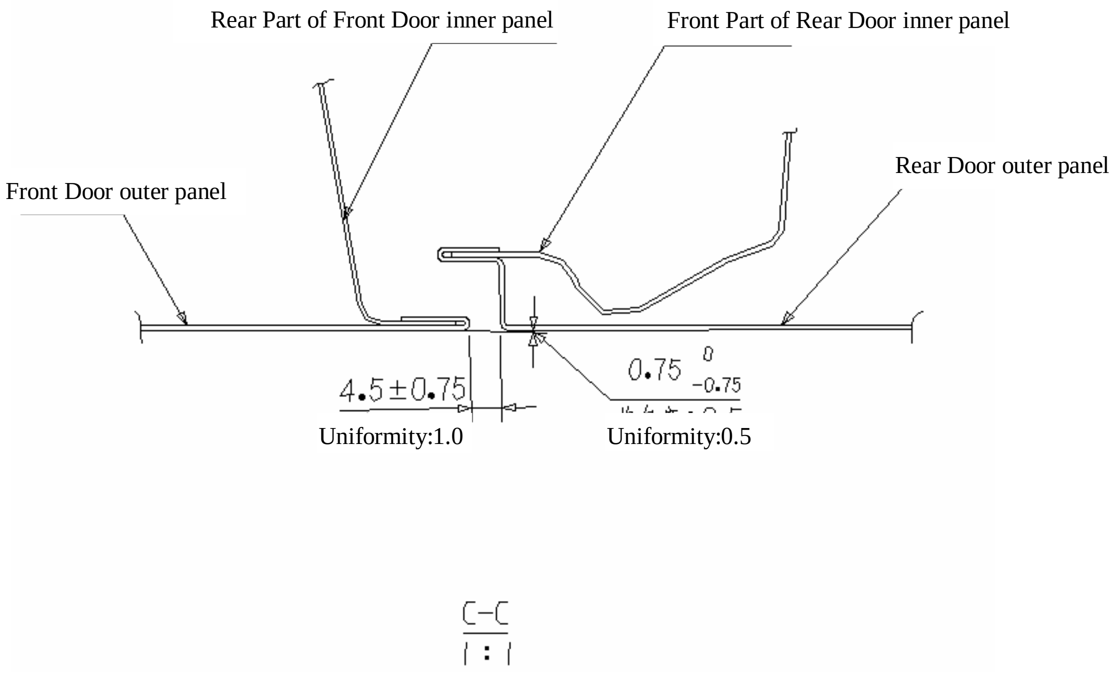
3.1 Clearance between side outer plate and fender at A-A: 2.5±0.5mm



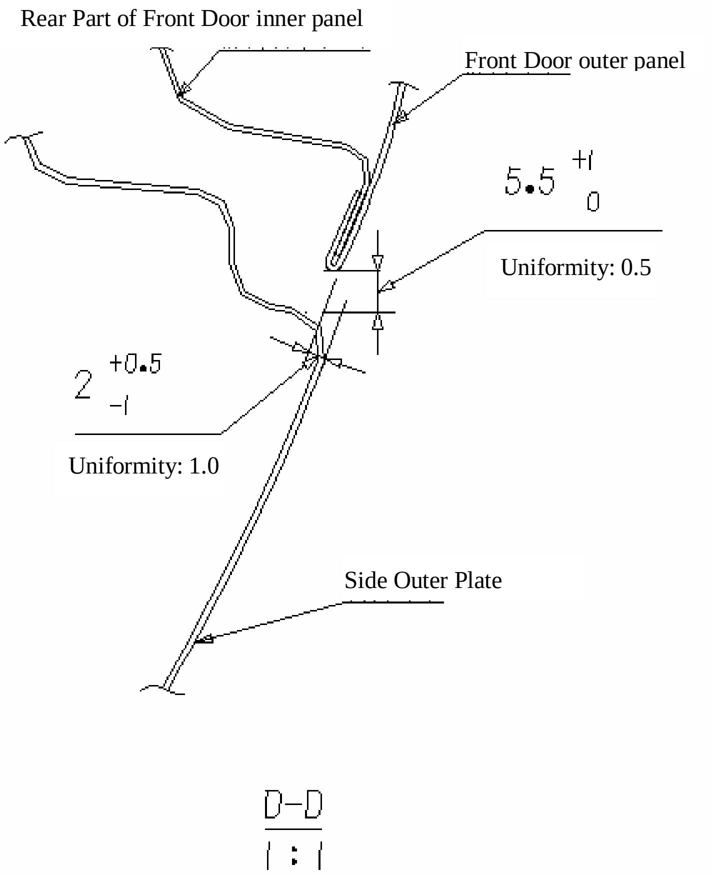
3.2 Clearance between front fender and front door outer panel at B-B: 5.5±0.5mm



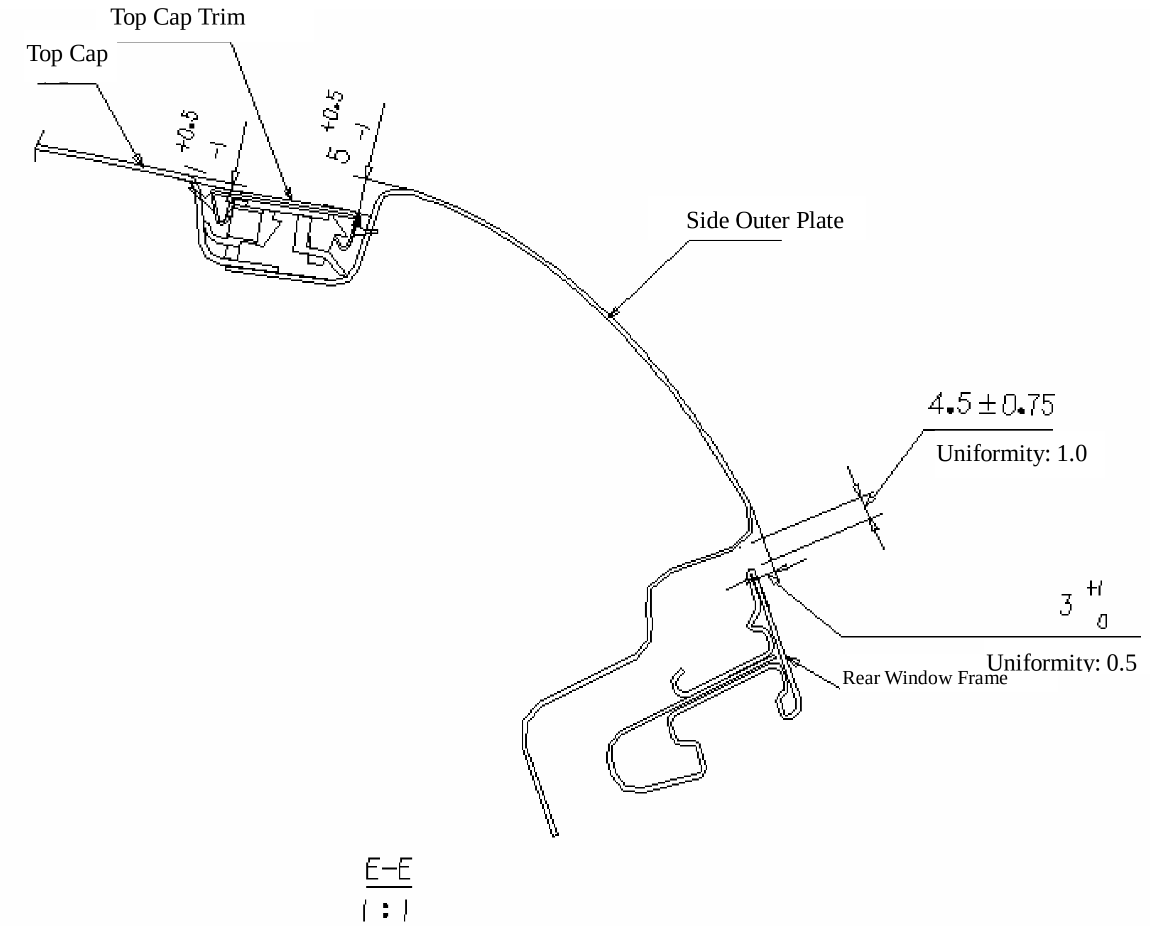
3.3 Clearance between the front door outer panel and rear door outer panel at C-C: 4.5±0.75mm



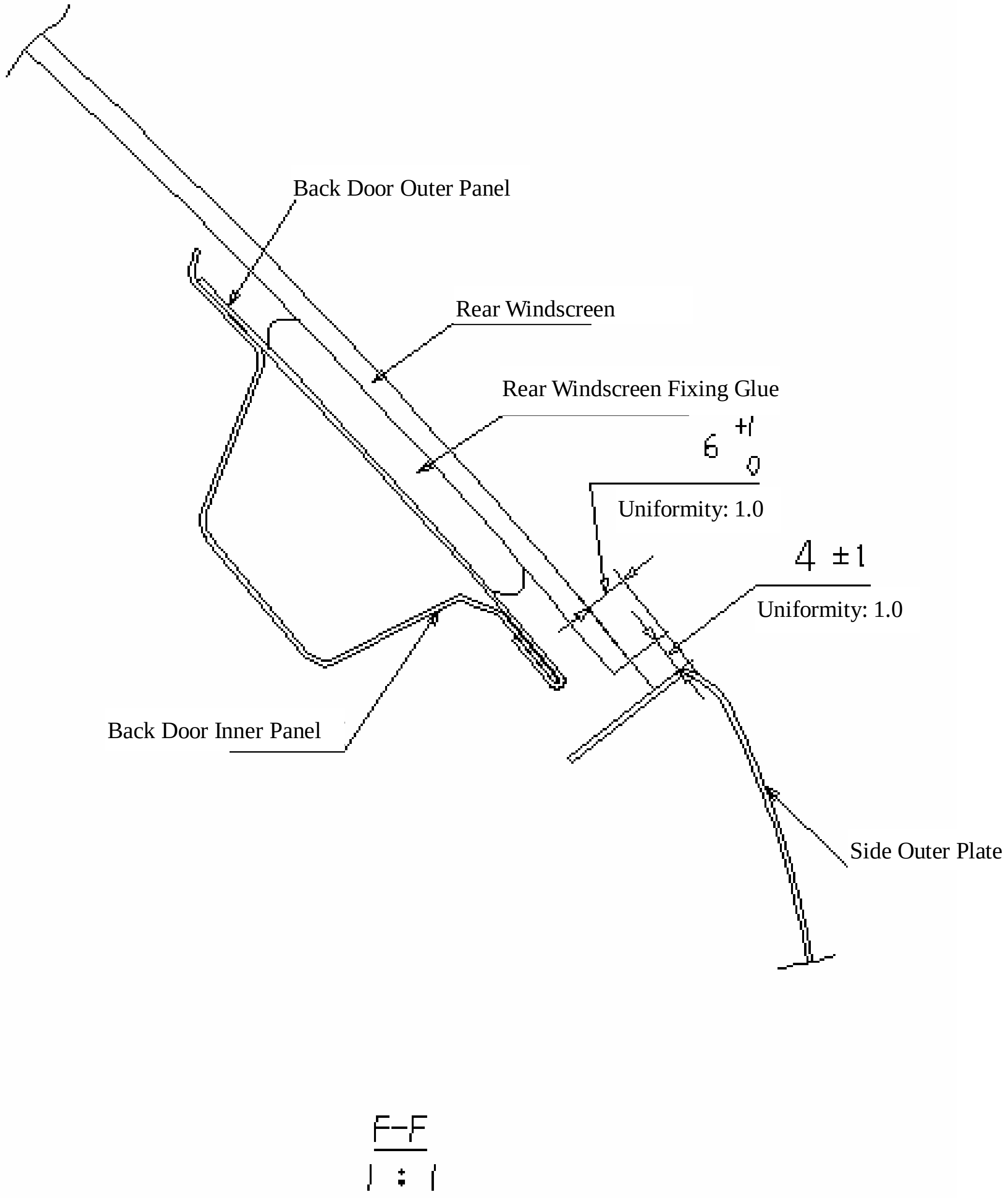
3.4 Clearance between the A pillar and small quarter window glass at D-D: 3±1mm



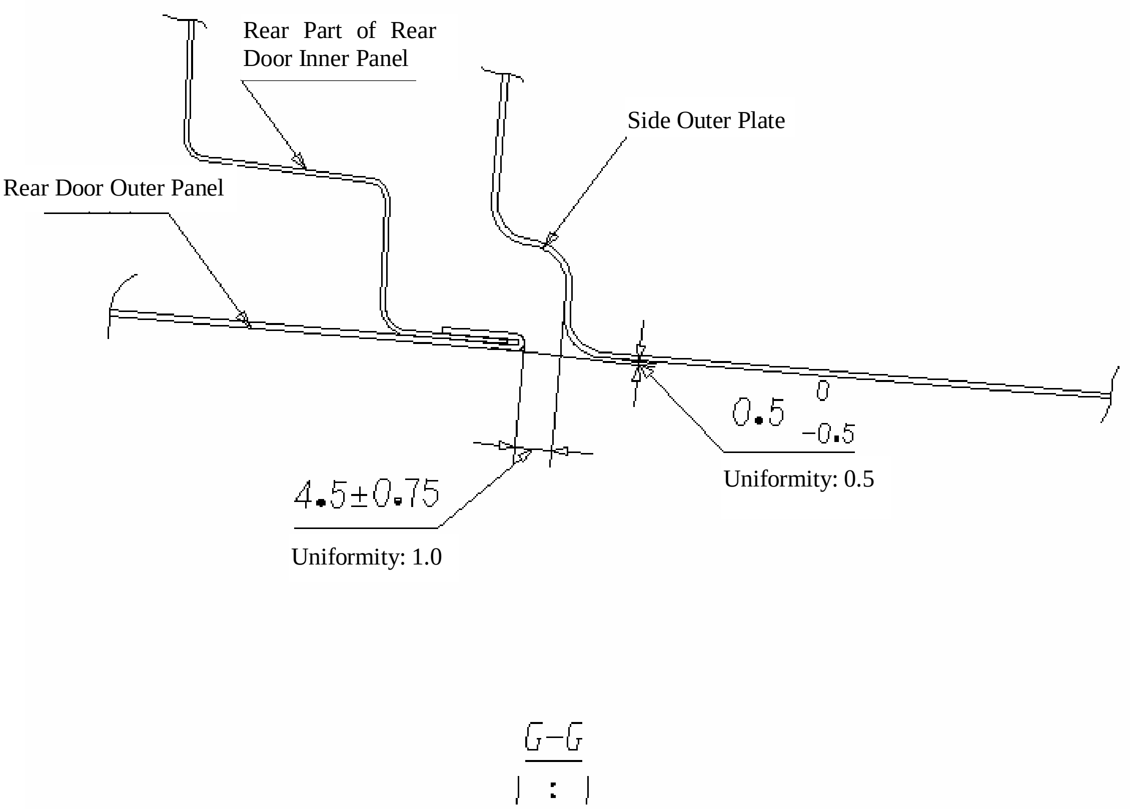
3.5 Installation dimension of top cap and top cap trim at E-E: 0.75±0.75mm
Installation dimension of side outer plate and top cap trim: 4.75±0.75mm
Installation dimension of side outer plate and rear door window frame: 4.5±0.75mm



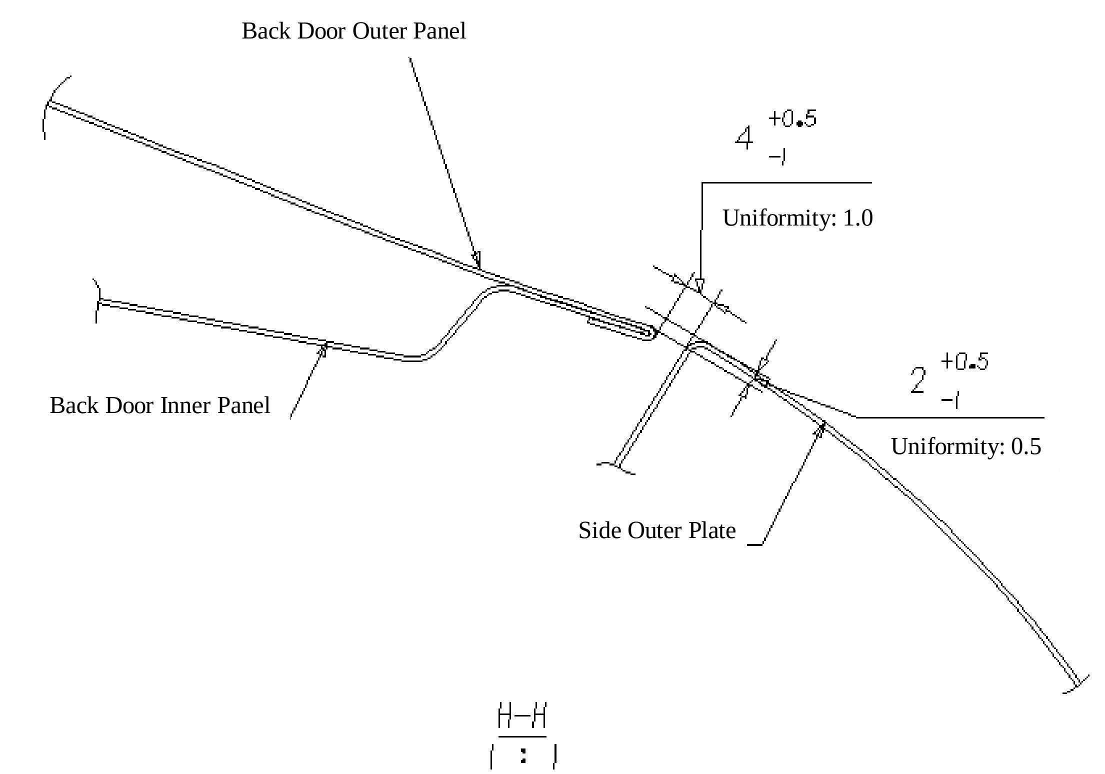
3.6 Clearances of rear windscreen and side outer plate at F-F are: 5.5±0.5 mm; 4±1mm, respectively.



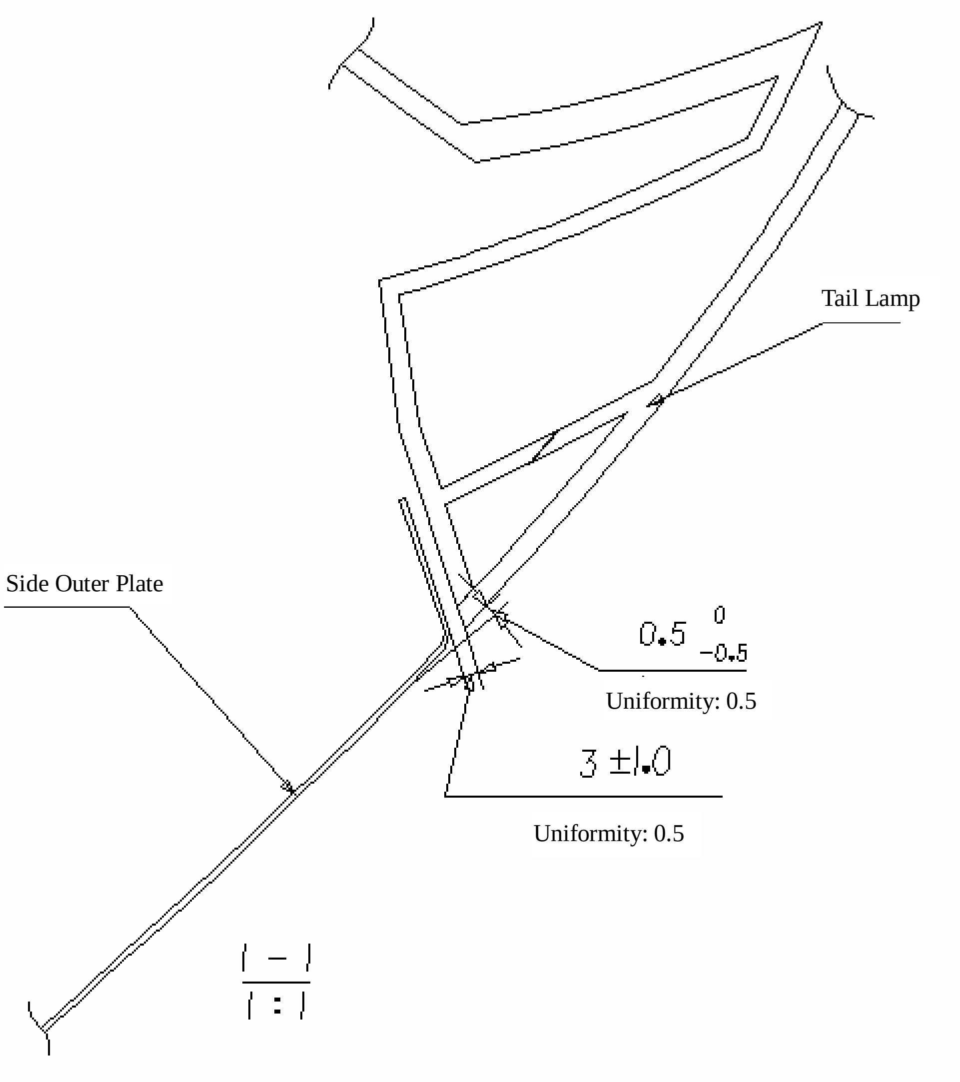
3.7 Clearance between rear door outer panel and side outer plate at G-G: 4.5±0.75mm



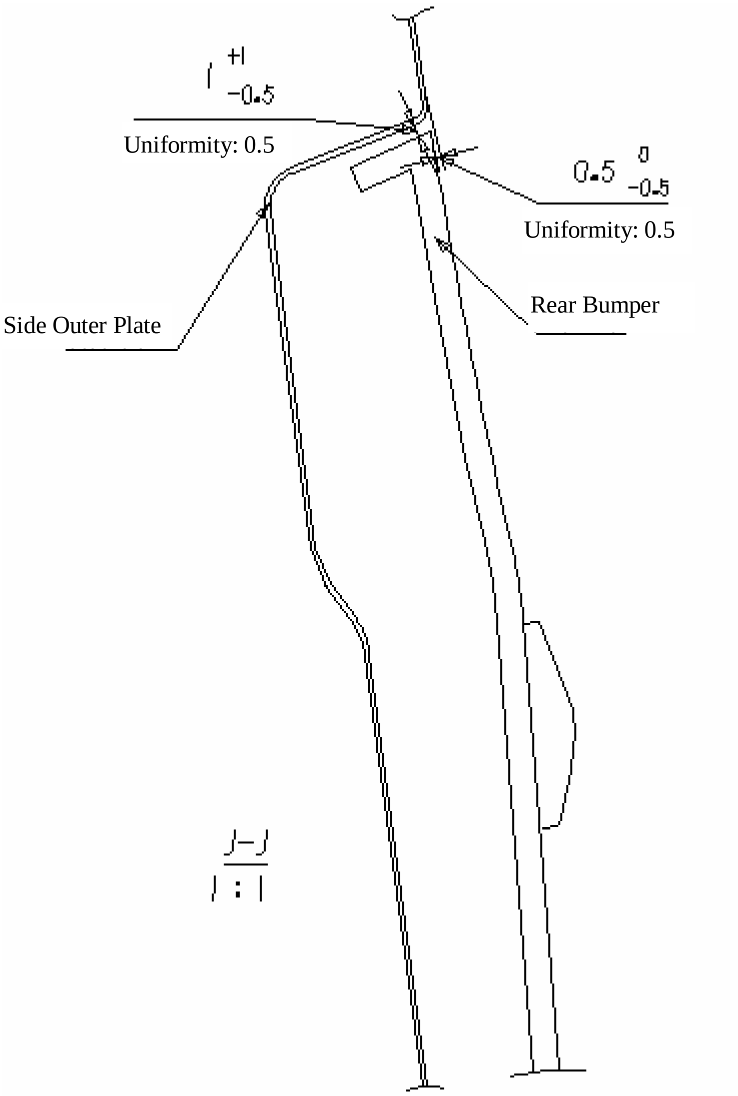
3.8 Installation clearances of back door outer panel and side outer plate at H-H are: 3.75±0.75 mm; 1.75±0.75 mm, respectively.



3.9 The clearances of tail lamp and side outer plate at I-I are: 3±1mm; 0.25±0.25mm, respectively.



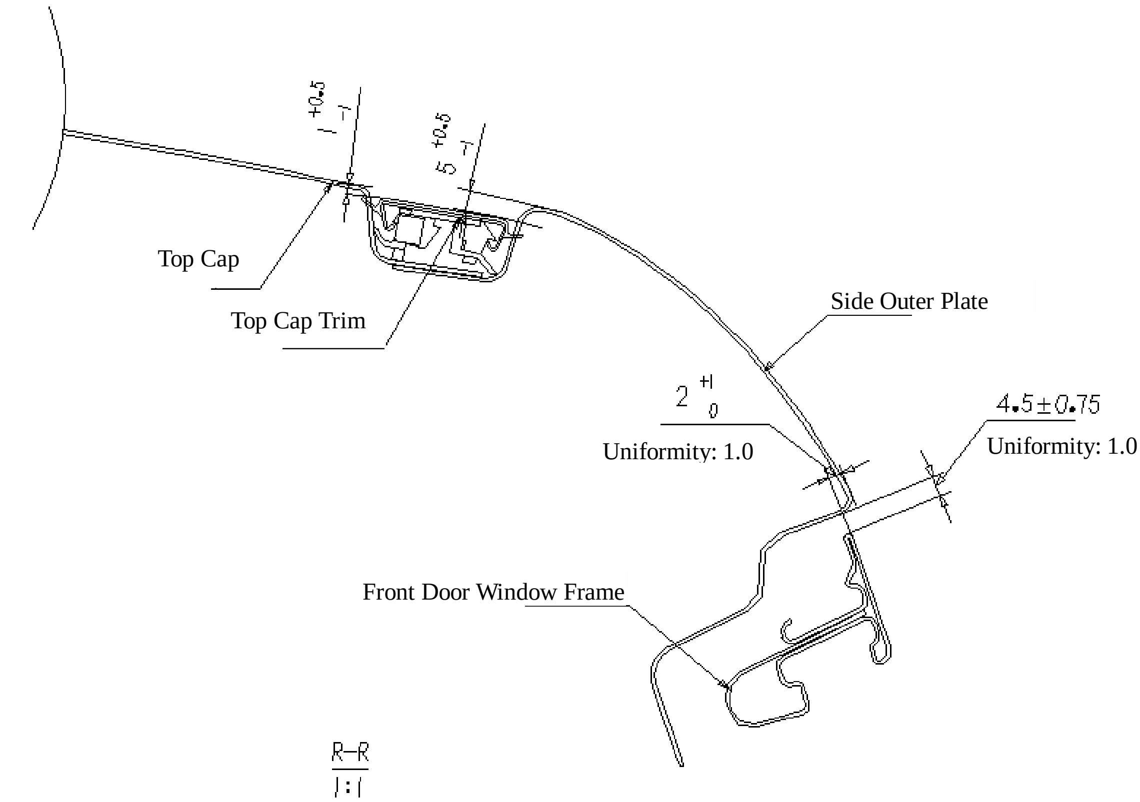
3.10 The installation clearances of side outer plate and rear bumper at J-J are: 1.25±0.75mm; 0.25±0.25mm, respectively.



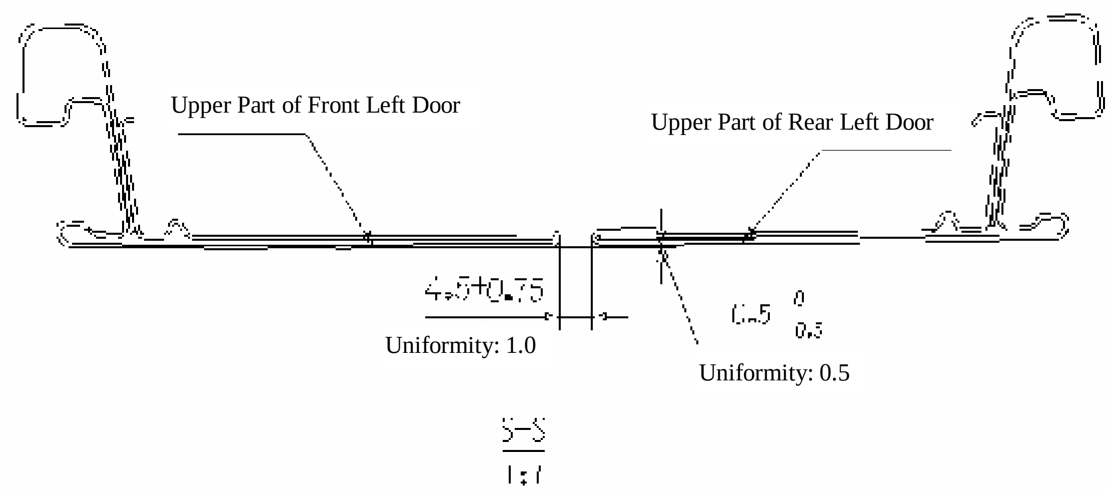
3.11 Installation dimension of top cap and top cap trim at R-R: 0.75±0.75mm

Installation dimension of side outer plate and top cap trim: 4.75±0.75mm

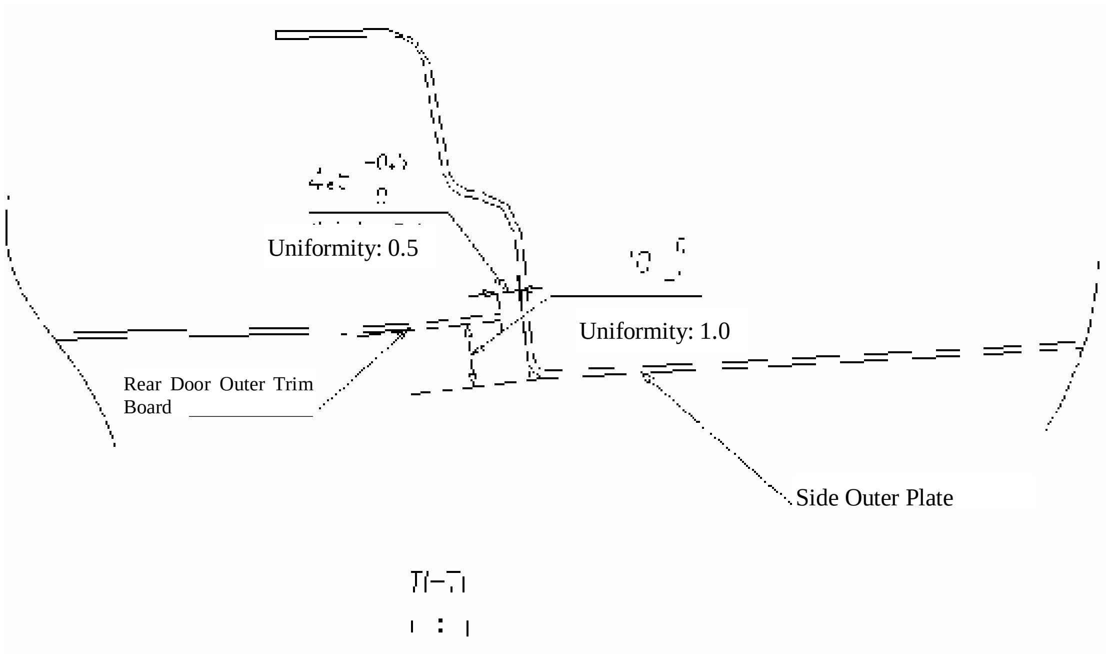
Installation dimension of side outer plate and front door window frame: 2.5±0.5mm; 4.5±0.75mm, respectively



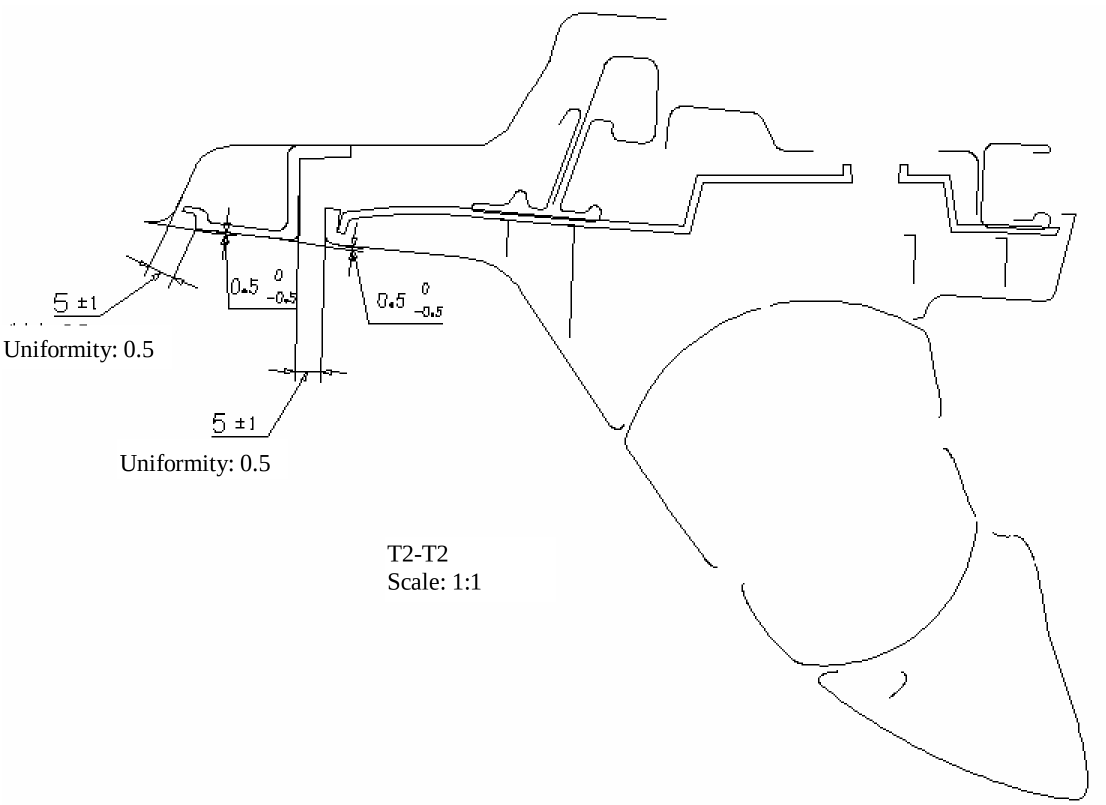
3.12 Clearance between the upper part of front left door and the upper part of front right door at S-S: 4.5±0.75mm



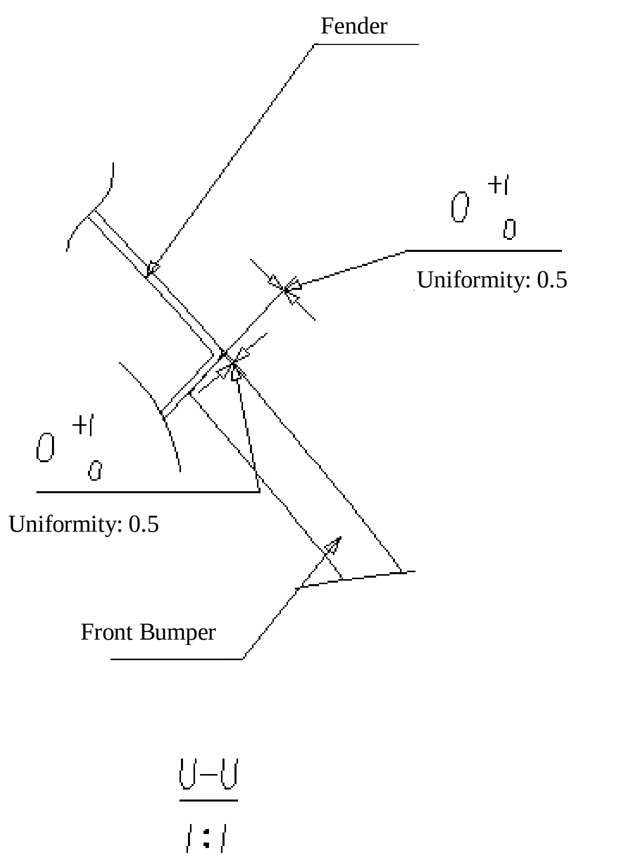
3.13 The fit clearances of rear door outer trim board and side outer plate at T1-T1 are: 4.75±0.25mm; 9.5±0.5mm, respectively.



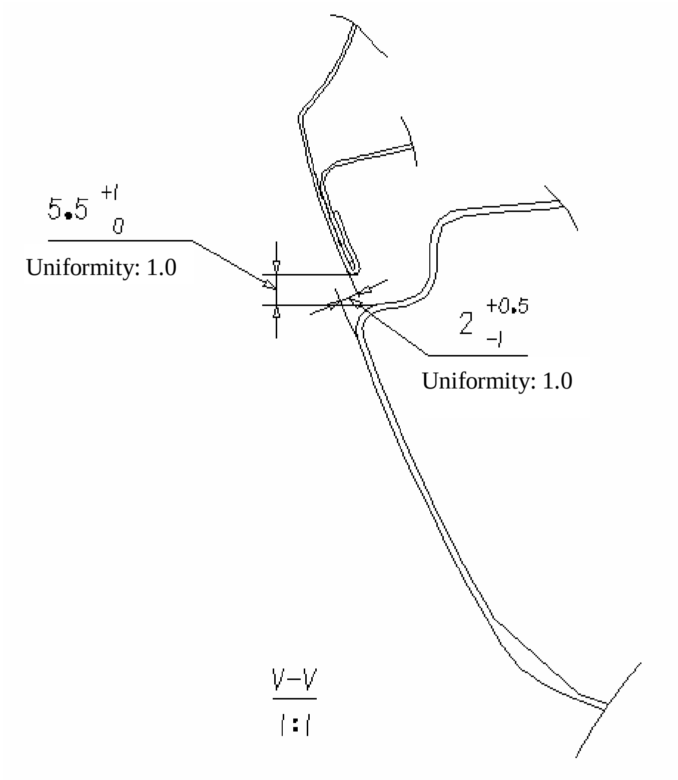
3.14 The fit dimensions of front door outer quarter window and front door window frame at T2-T2 are: 5±1mm; 5±1mm, respectively.



3.15 The clearance between the fender and bumper at U-U: 0.5±0.5mm



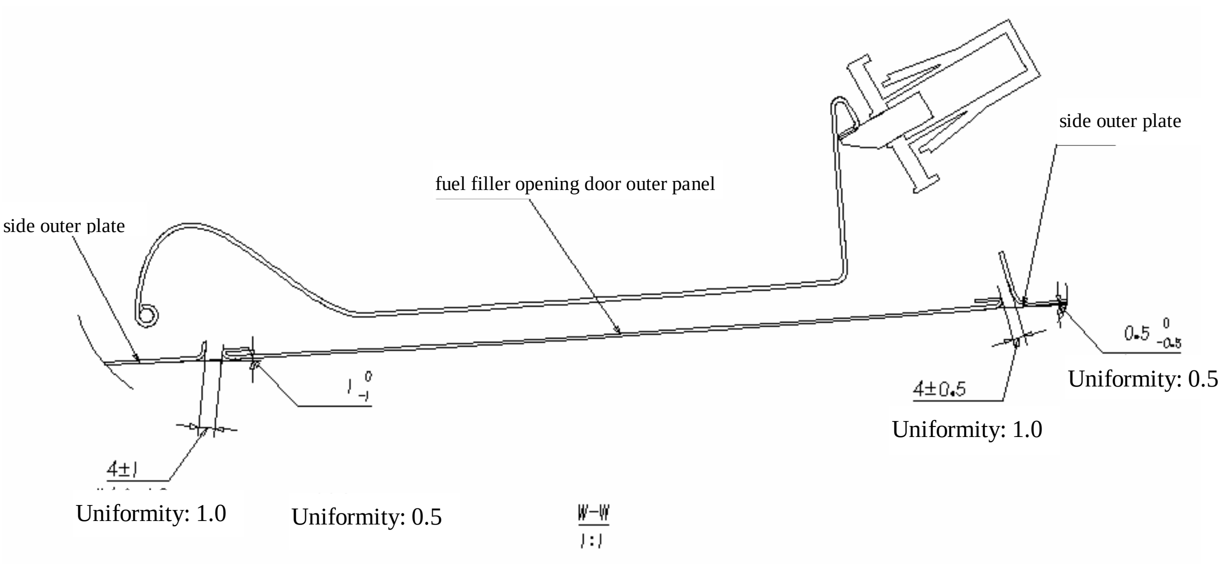
3.16 The fit clearances of rear door outer panel and side skirt outer plate at V-V are: 6±0.5mm; 1.75±0.75mm, respectively.



3.17 The fit dimensions of side outer plate and fuel filler opening door outer panel at W-W are: 4±1mm;

4±0.5mm;

0.25±0.25mm, respectively



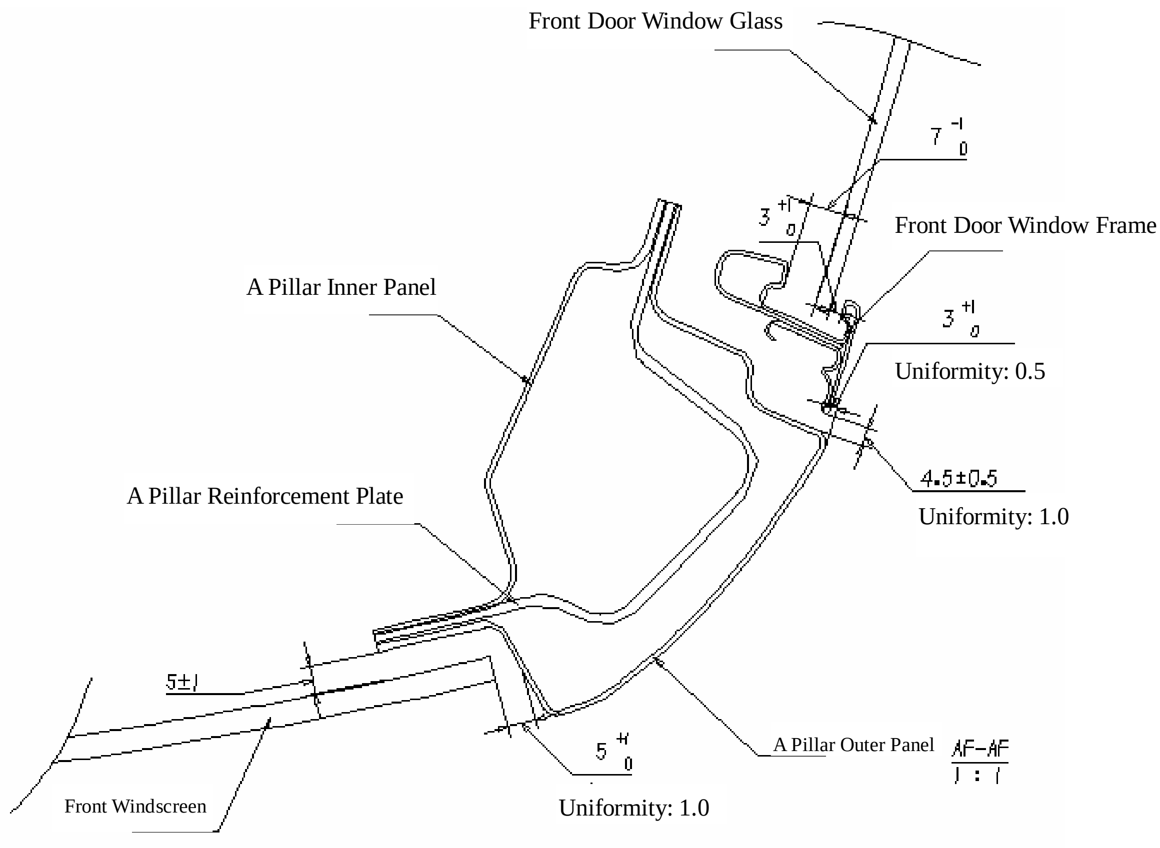
3.18 The fit dimensions of front door window glass and front door window frame at AF-AF are: 3.5±0.5mm;

6.5±0.5mm;

2.5±0.5mm, respectively;

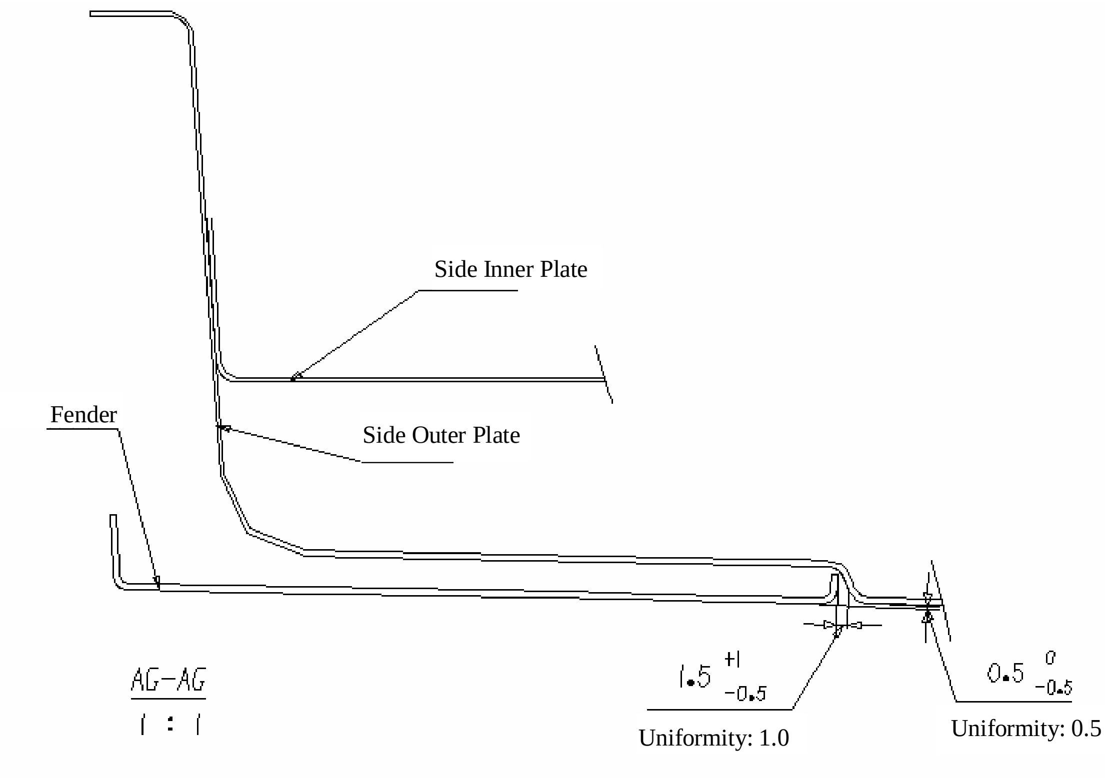
The fit dimensions of front door window frame and A pillar outer panel are: 4.5±0.5mm

The fit dimensions of front windscreen and A pillar outer panel are: 4.5±0.5mm; 5±1mm

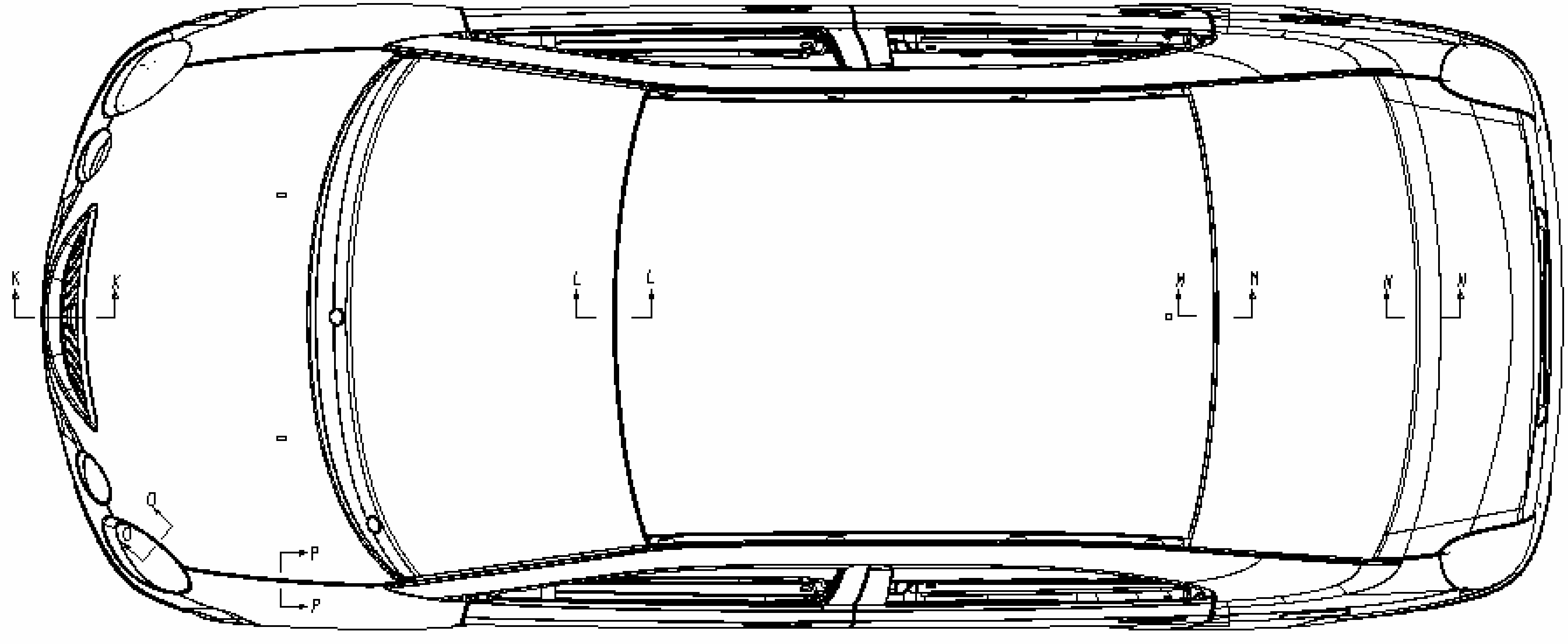


The uniformity at the right and left symmetrical positions doesn't exceed 1 mm.

3.19 The fit dimensions of side outer plate and fender at AG-AG are: 1.75±0.75mm; 0.25±0.25mm, respectively.

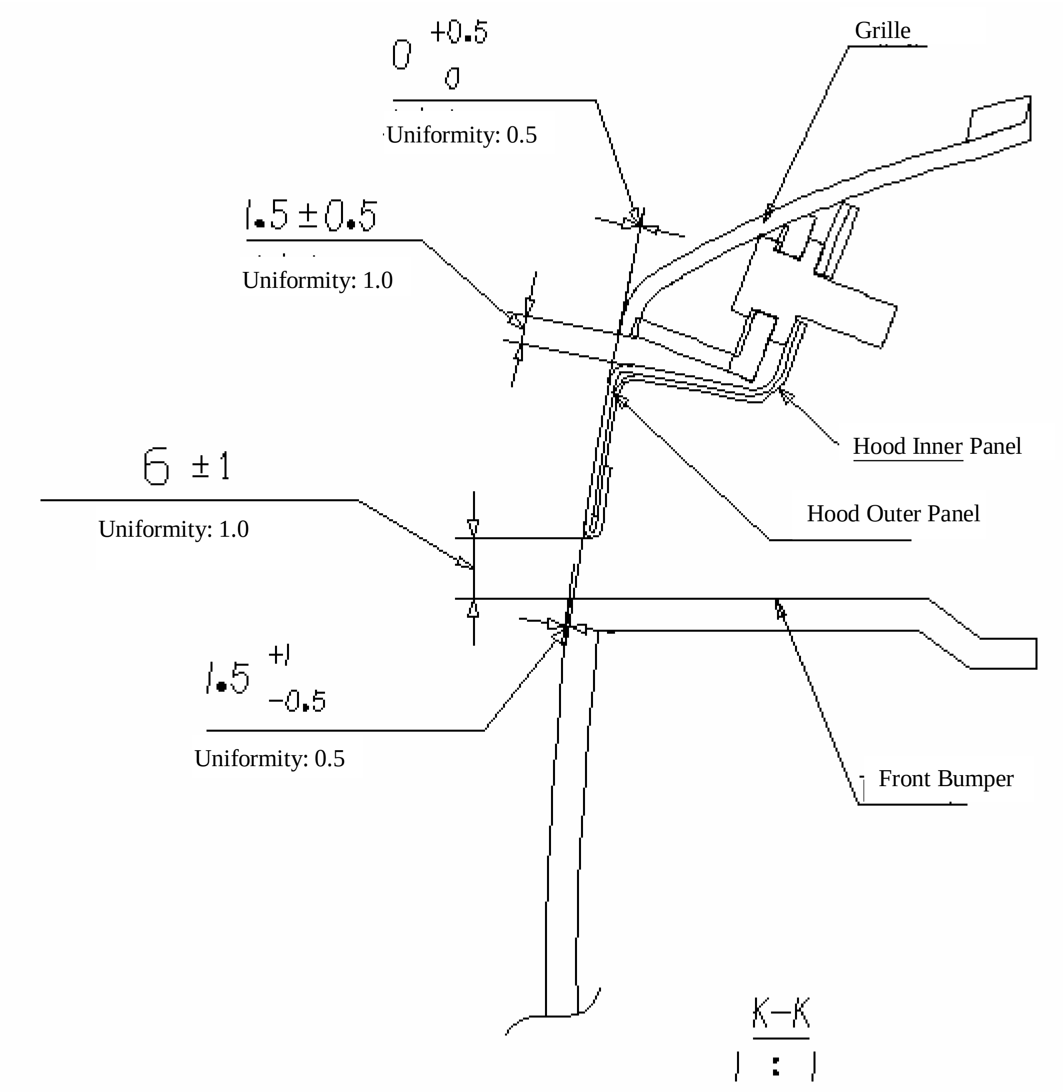


4. Top View

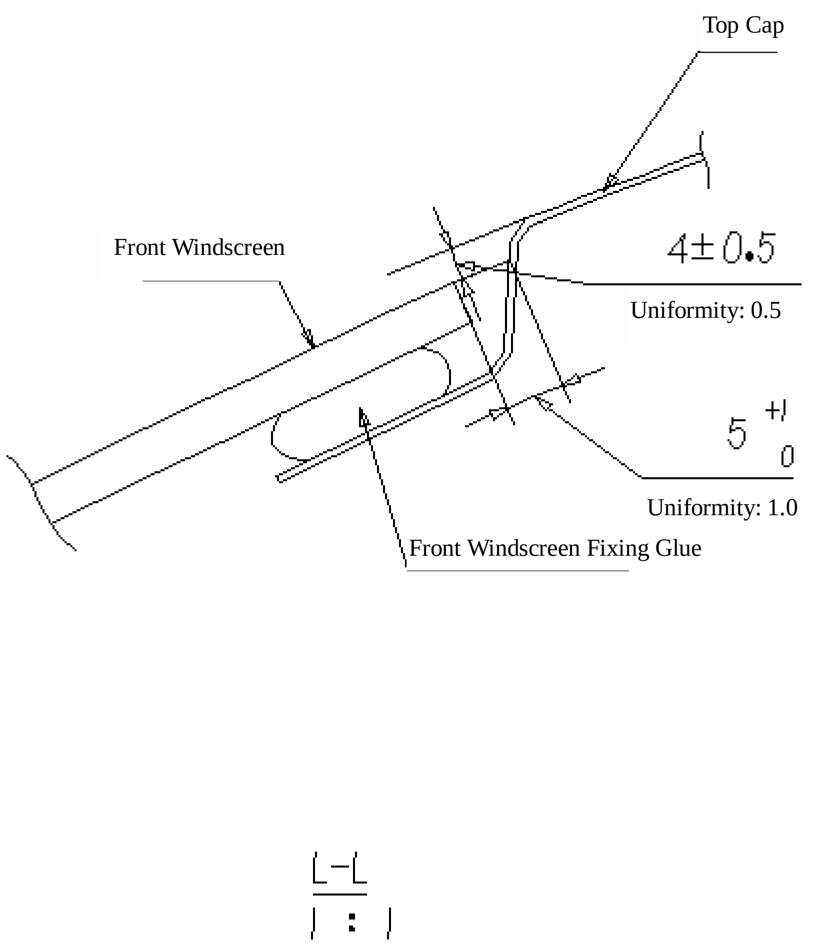


4.1 Clearances of grille and hood outer panel at K-K are: 0.25±0.25mm; 1.5±0.5mm, respectively.

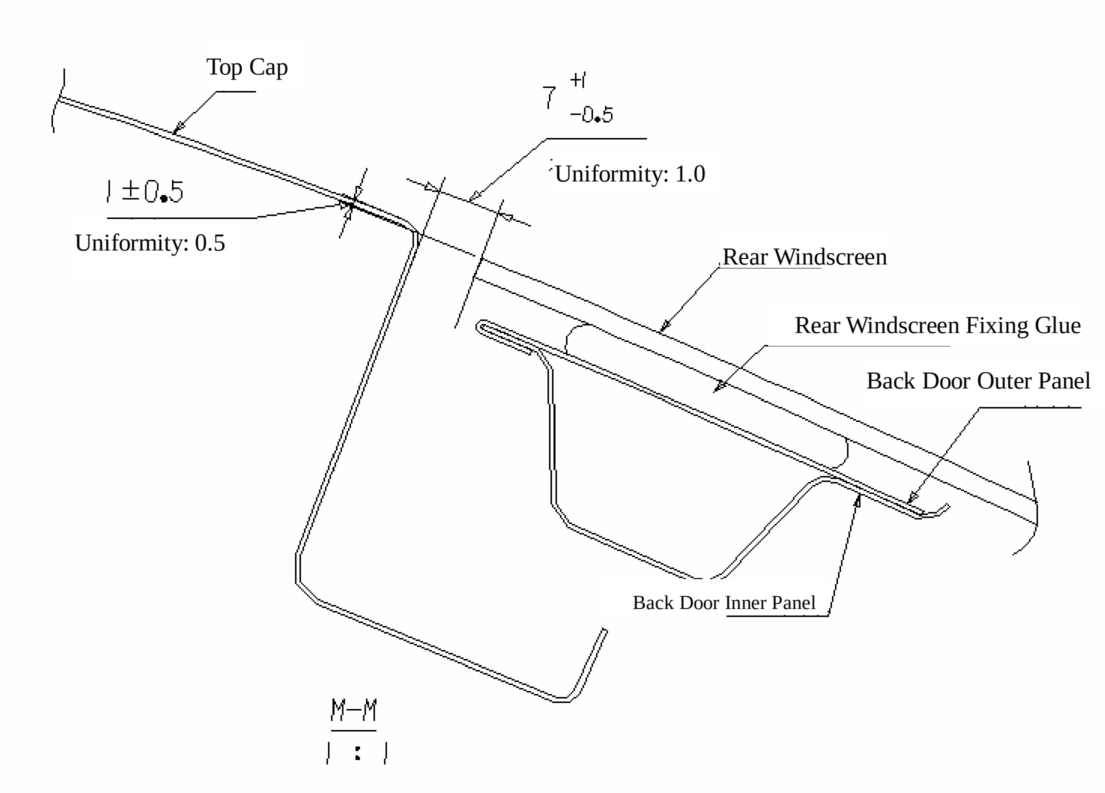
Clearances of hood outer panel and front bumper are: 6±1mm; 1.75±0.75mm, respectively.



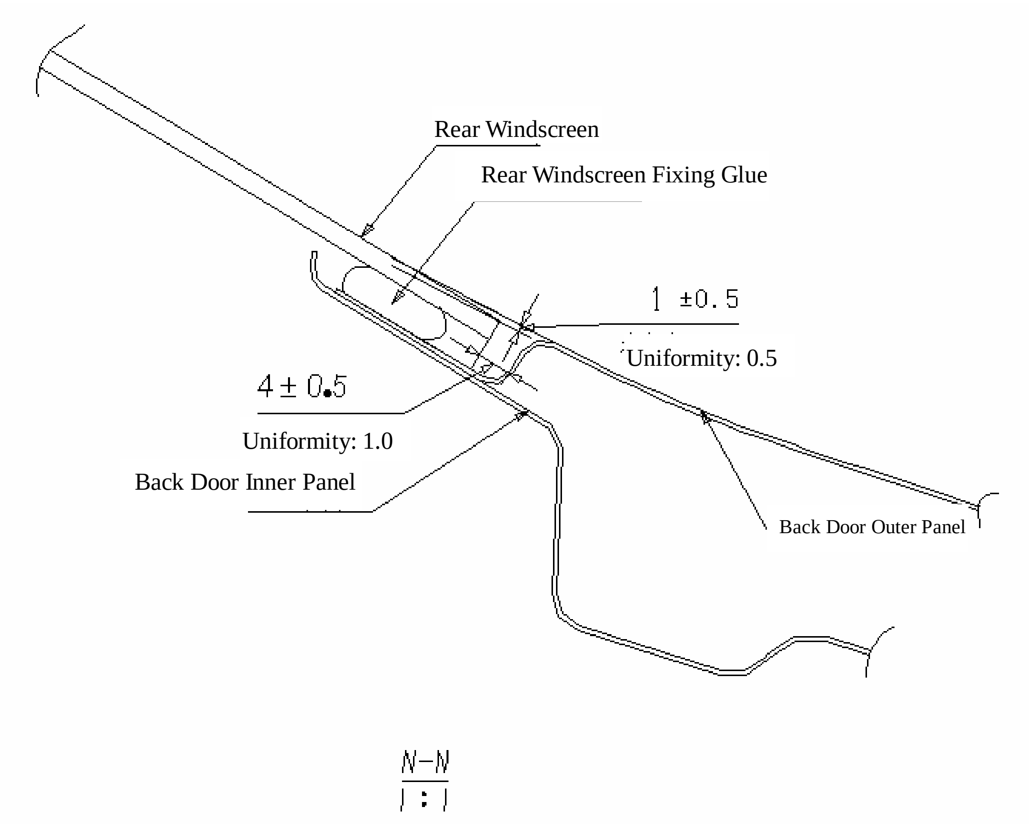
4.2 The fit clearances of top cap and front windscreen at U-U are: 4±0.5mm; 4.5±0.5mm, respectively.



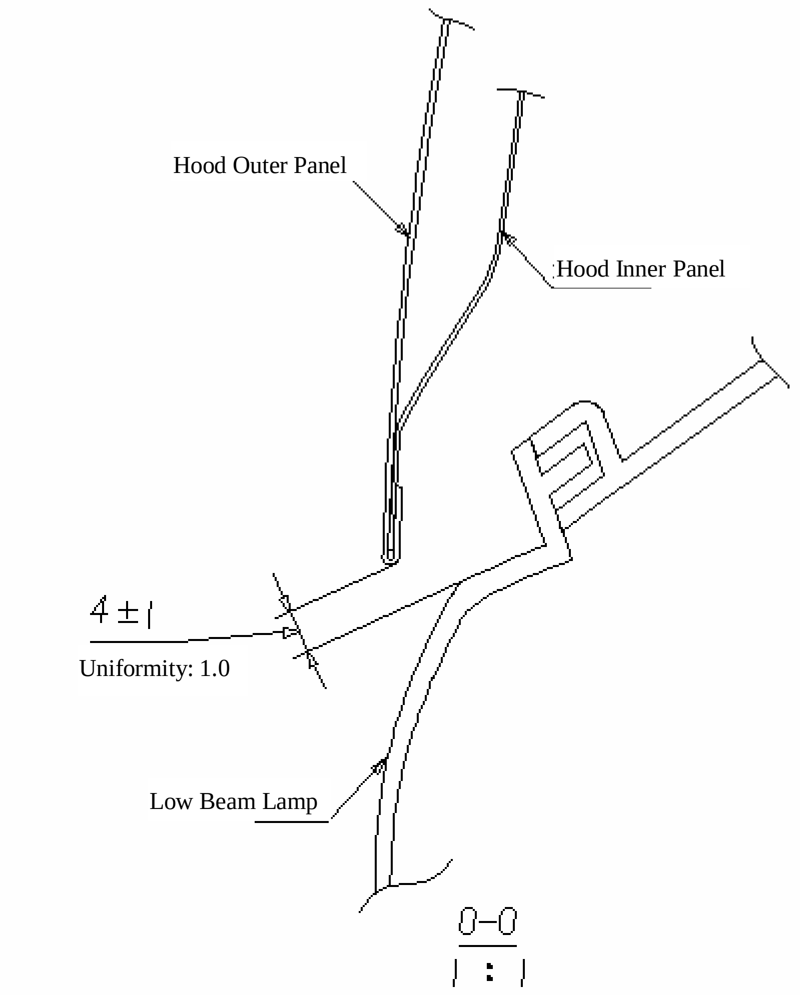
4.3 Clearance of top cap and rea windscreen at M-M are: 1±0.5mm; 6.75±0.75mm respectively.



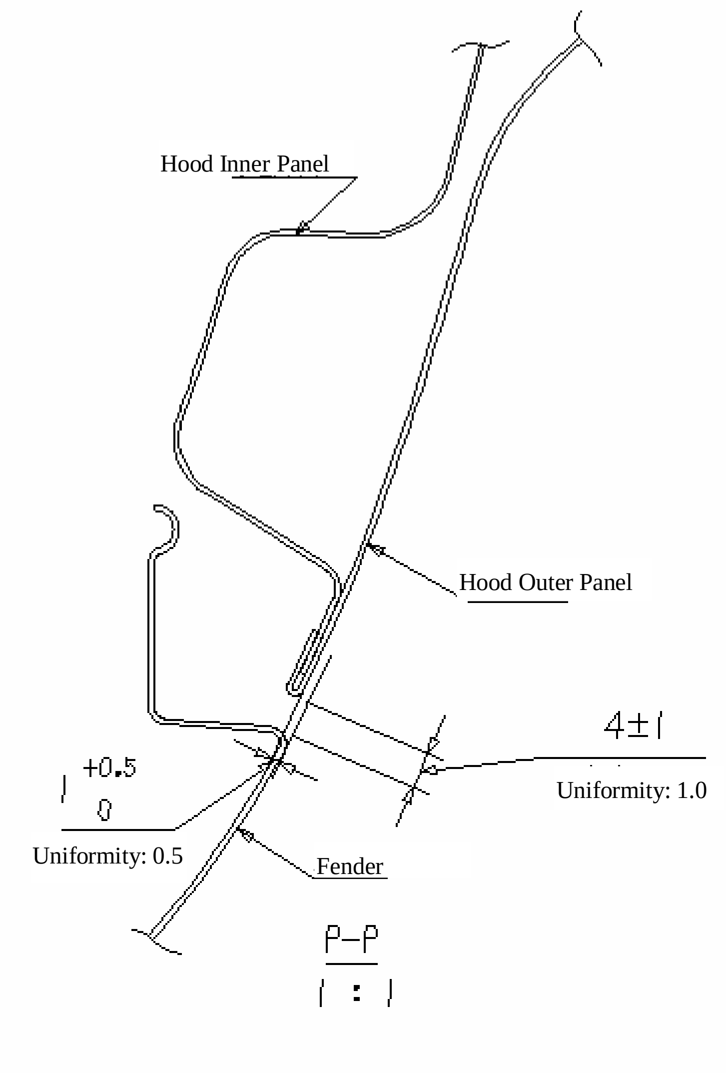
4.4 Clearances of rear windscreen and back door outer panel at N-N are: 1±0.5 mm; 4±0.5 mm respectively.



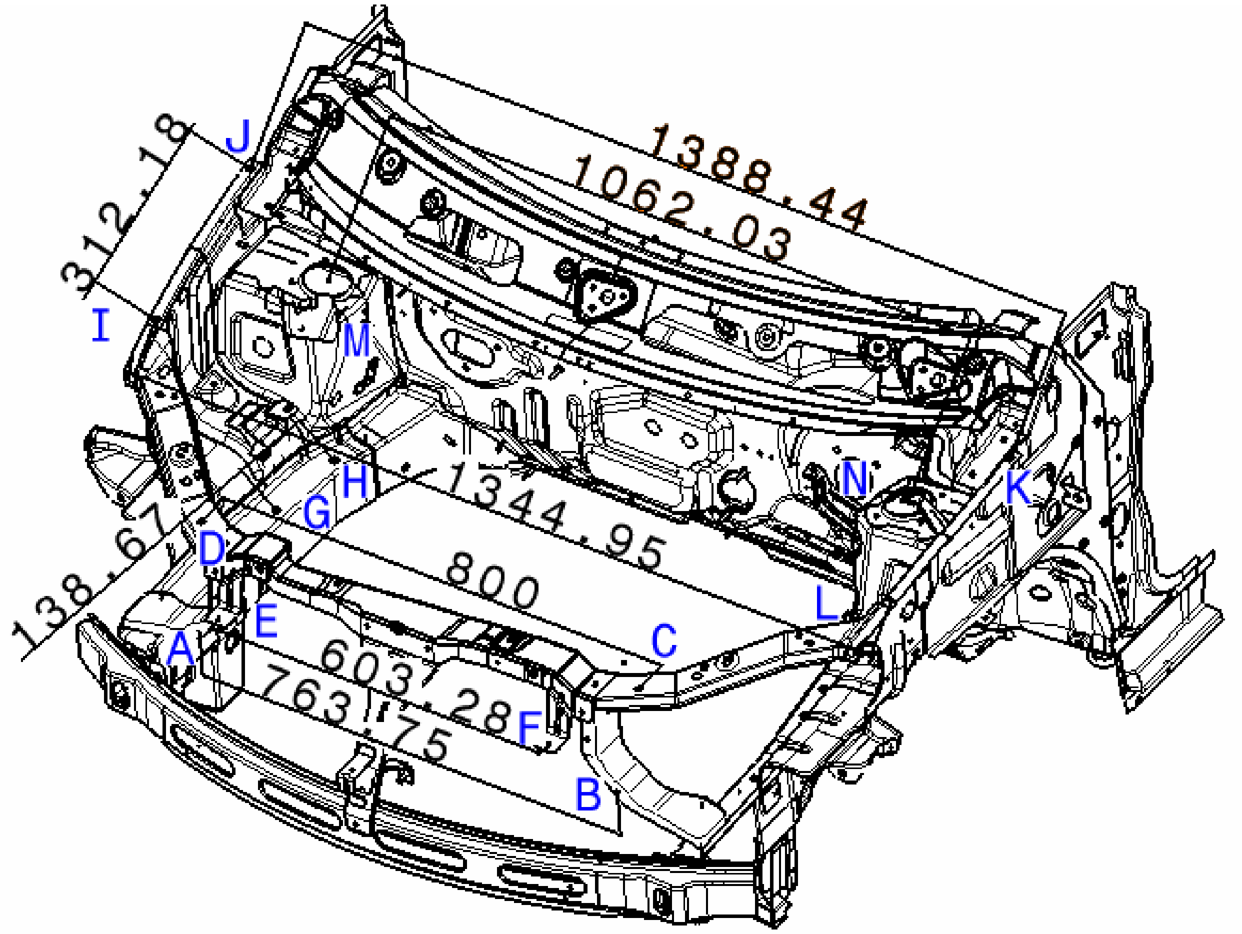
4.5 Clearance between the hood outer panel and low beam lamp at O-O: 4±1mm



4.6 Clearances of Hood Outer Panel and fender at P-P are: 4±1mm; 0.75±0.75mm.

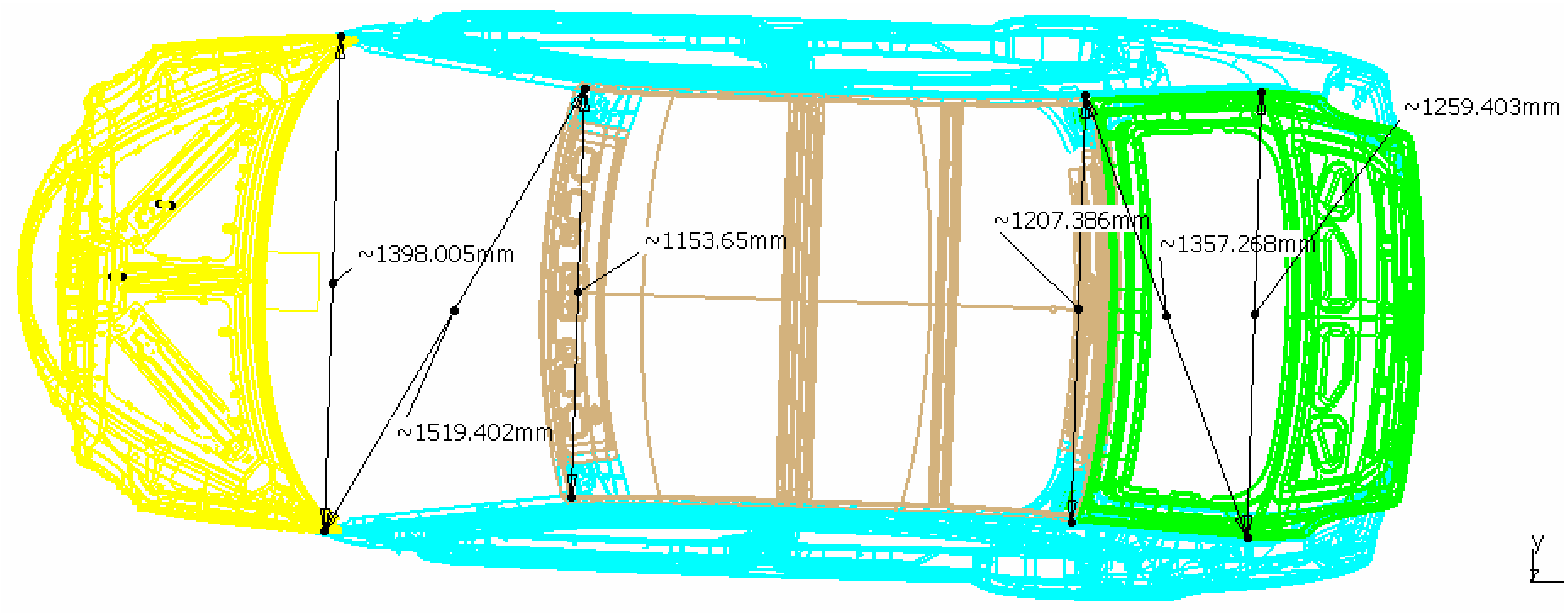


III. Dimension of Engine Compartment

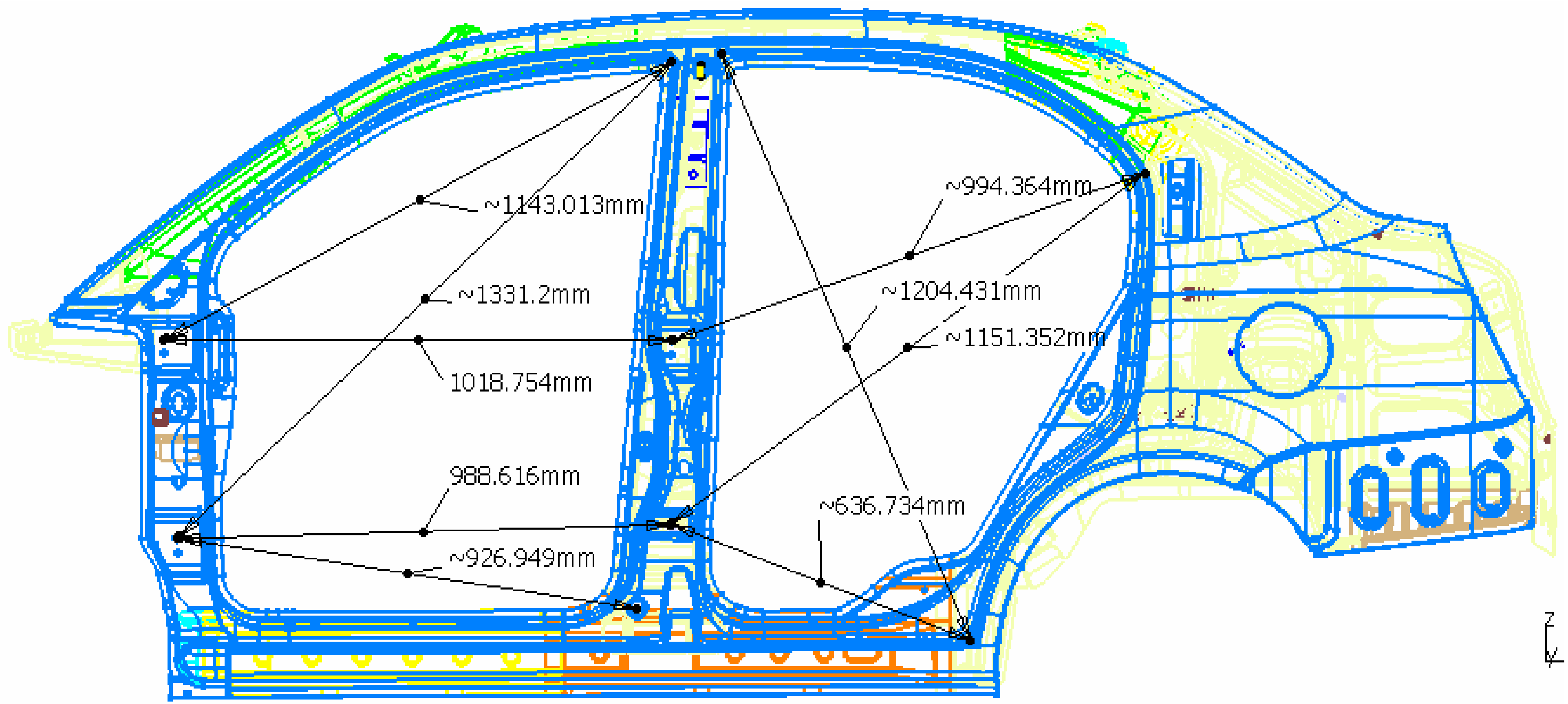


No	Name	Hole Diameter (mm)
A/B/C/D	Headlamp assembly hole	7
E/F	Bumper cross beam installation hole	7
G/H	Engine right suspension bracket assembly hole	13
I/J/K/L	Fender installation hole	7
M/N	Shock absorber assembly hole	76

Windscreen Dimension



V. Dimension of Opening of Each Part



Chapter 10 Wire Harness

Section 1 Battery Negative Electrode Harness

I. Schematic Diagram of Harness

Eyelet Terminal

Body Ground

II. Main Connectors Description

No	Connector Description	Number of Pin	Connection	Remark
1	Eyelet terminal	1	Battery negative	
2	Body ground	1	Body	Under the front left fender

III. Disassembly/Reassembly of Battery Harness

Part Number: S21-3724040

(I). Preparation

Tools: socket wrench

(II). Precautions

Power OFF before the electrical elements and harnesses are removed.
The ignition switch must be in OFF state.

(III). Removal Procedure

1. Removal
1.1. Remove the Battery Positive .

1.2. Remove the negative of battery.

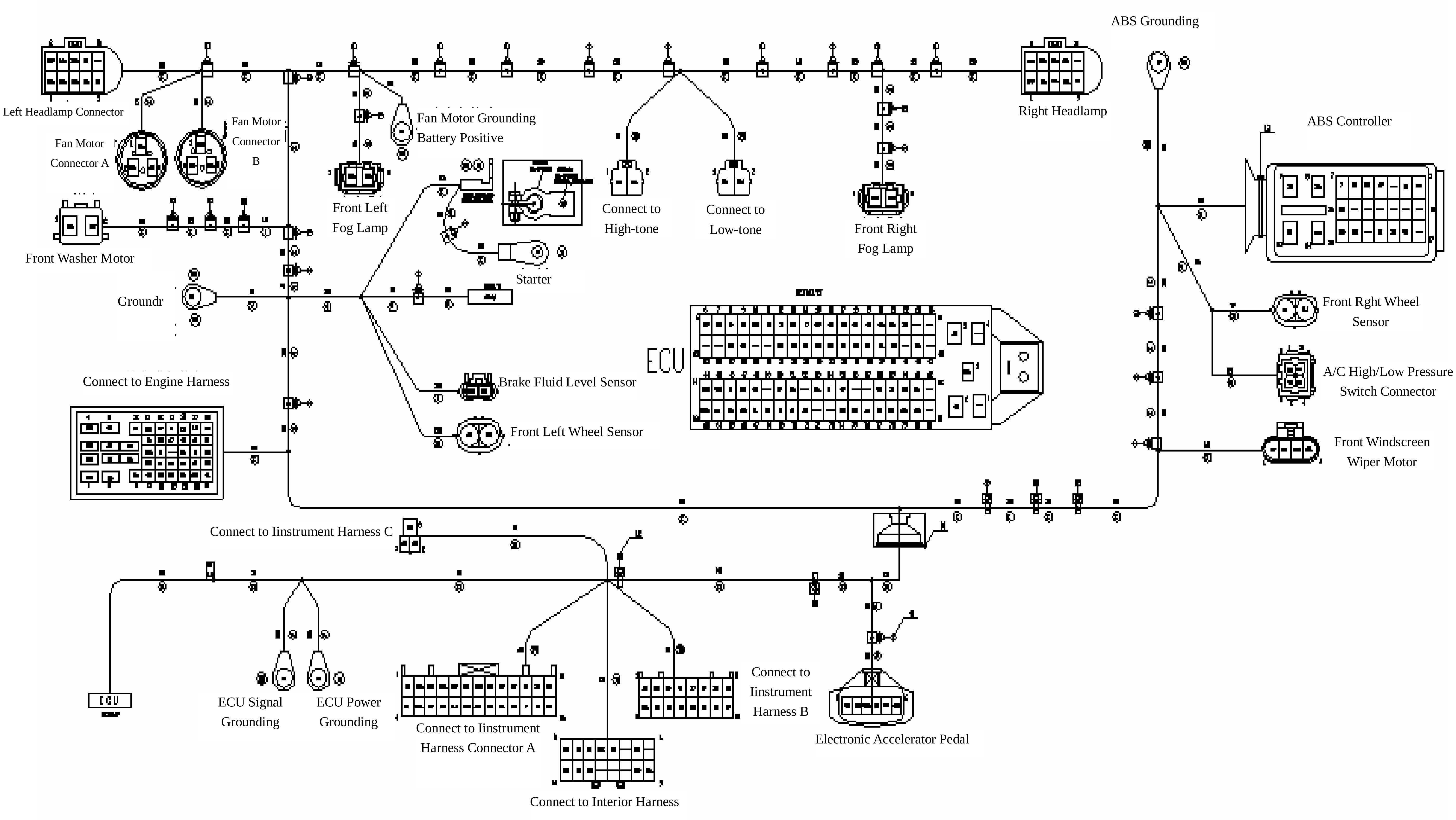
1.3. Remove the grounding point of battery negative harness at the body, and take off the battery negative harness.

2. Installation

Install it in the reverse order of removal.

Section 2 Engine Compartment Harness

I. Schematic Diagram of Harness



II. Main Connectors Description

No	Connector Description	Number of Pin	Connection	Remark
1	Left headlamp connector	10	Left headlamp	
2	Fan motor connector A	3	Fan motor A	
3	Fan motor connector B	3	Fan motor B	
4	Front washer motor connector	2	Front washer motor	
5	Ground connector	1	Body	At front left side member (near cansiter)
6	Engine harness connector	42	Engine Harness	
7	Front left fog lamp connector	2	Front left fog lamp	
8	Fan motor grounding point	1	Body	At front left side member
9	Front left wheel sensor connector	2	Front left wheel sensor	
10	Brake fluid level sensor connector	2	Brake fluid level sensor	
11	Starter connector	1	Starter	
12	Battery positive connector	1	Battery positive	
13	High-tone horn connector	2	High-tone horn	
14	Low-tone horn connector	2	Low-tone horn	
15	Front right fog lamp connector	2	Front right fog lamp	
16	Right headlamp connector	10	Right headlamp	
17	ECU connector	81	ECU	
18	ECU signal connector	1	Body	Under the left A pillar
19	ECU power connector	1	Body	Under the left A pillar
20	Iinstrument harness C connector	3	Instrument harness C	
21	Instrument harness A connector	26	Instrument harness A	
22	Interior harness connector	16	Interior Harness	
23	Instrument harness B connector	16	Instrument harness B	
24	Electronic accelerator pedal connector	6	Electronic accelerator pedal	
25	ABS ground connector	1	Body	At the front right wheelhouse
26	ABS controller connector	25	ABS	
27	Front right wheel sensor connector	2	Front right wheel sensor	
28	A/C high/low pressure switch connector	4	A/C high/low pressure switch	
29	Front windscreen wiper motor connector	4	Front windscreen wiper motor	

III. Disassembly/Reassembly of Engine Compartment Harness

Part Number: S21-3724010

(I). Preparation

Tools:
socket wrench, cross screwdriver, flat head screwdriver

(II). Precautions:

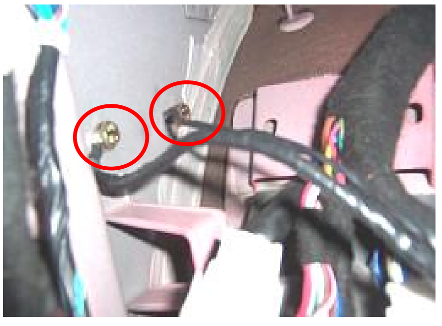
Power OFF before the electrical elements and harnesses are removed.
The ignition switch must be in OFF state.

(III). Removal Procedure

1. Removal
1.1.1. Remove the lower left guard plate from the instrument panel. (See *Disassembly/Reassembly of Instrument Panel*)
1.1.2. Pull out the ECU's connector.

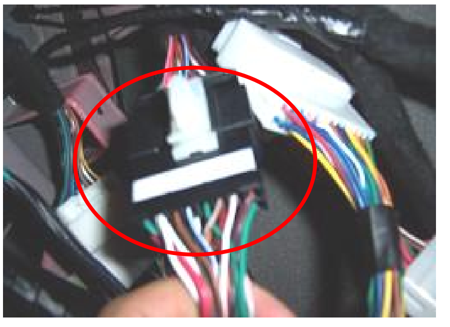
1.1.3. Remove the A pillar lower trim with a cross screwdriver.

1.1.4. Remove the ECU's two grounding points.



1.1.5. Pull out the connector to the instrument harness connector A.

1.1.6. Pull out the connector to instrument harness connector B.



1.1.7. Pull out the connector to instrument harness connector C.

1.1.8. Pull out the connector of interior harness.

1.1.9. Pull out the connectorof electronic accelerator pedal.

1.1.10. Pull out the connector of wiper motor.

1.1.11. Pull out the connector of A/C high/low pressure switch.

1.1.12. Pull out the connector of right front wheel sensor.

1.1.13. Pull out the connector of ABS controller.

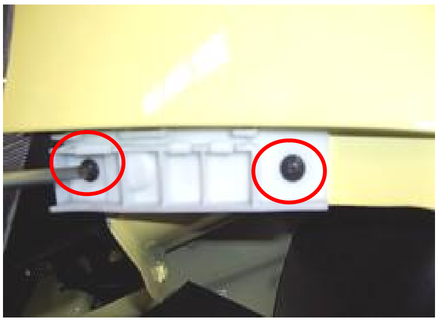
1.1.14. Remove the ABS controller, Remove the ABS grounding point.

1.1.15. Remove the upper fixing bolts from the left fender with a 10# socket wrench.

1.1.16. Remove the lower fixing bolts from the left fender with a 10# socket wrench.

1.1.17. Remove the fixing bolts from the exterior rear-view mirror support at the left fender with a10# socket wrench.

1.1.18. Remove the front bumper mounting with a cross screwdriver.



1.1.19. Pull out the connector of washer motor.

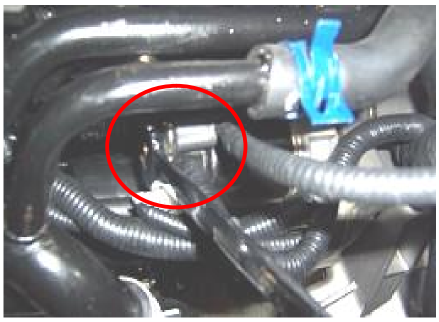
1.1.20. Remove the grounding point from the left side member. (Near the cansiter)

1.1.21. Pull out the connector of front left wheel sensor.

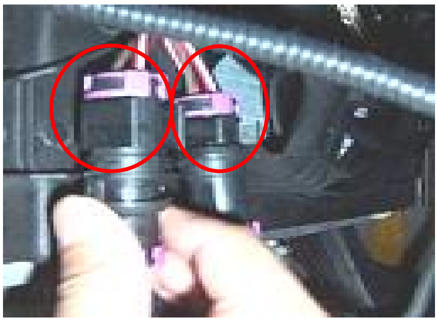
1.1.22. Pull out the connector of brake fluid level sensor.

1.1.23. Remove the battery positive connector.

1.1.24. Remove the connector to the starter.



1.1.25. Pull out two connectors A and B from the fan motor.

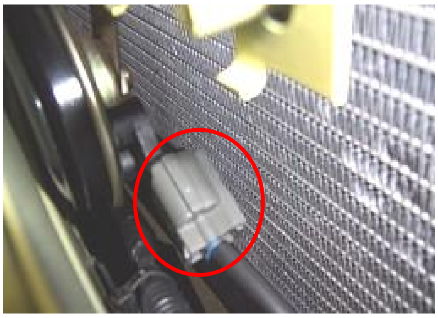


1.1.26. Pull out the connector of left headlamp.

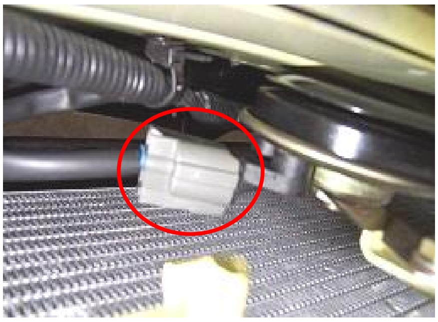
1.1.27. Pull out the connector of front left fog lamp.

1.1.28. Remove the grounding point of fan motor. (At the front part of left side member, and near the headlamp)

1.1.29. Pull out the high-tone horn connector.



1.1.30. Pull out the low-tone horn connector.



1.1.31. Pull out the right fog lamp connector.

1.1.32. Pull out the right headlamp connector.

1.1.33. Pull out the engine compartment harness and engine electronic injector harness connectors.

1.1.34. Remove the bolts used to secure the left side of fuse box with a socket wrench.

1.1.35. Remove the bolts used to secure the right side of fuse box with a socket wrench.

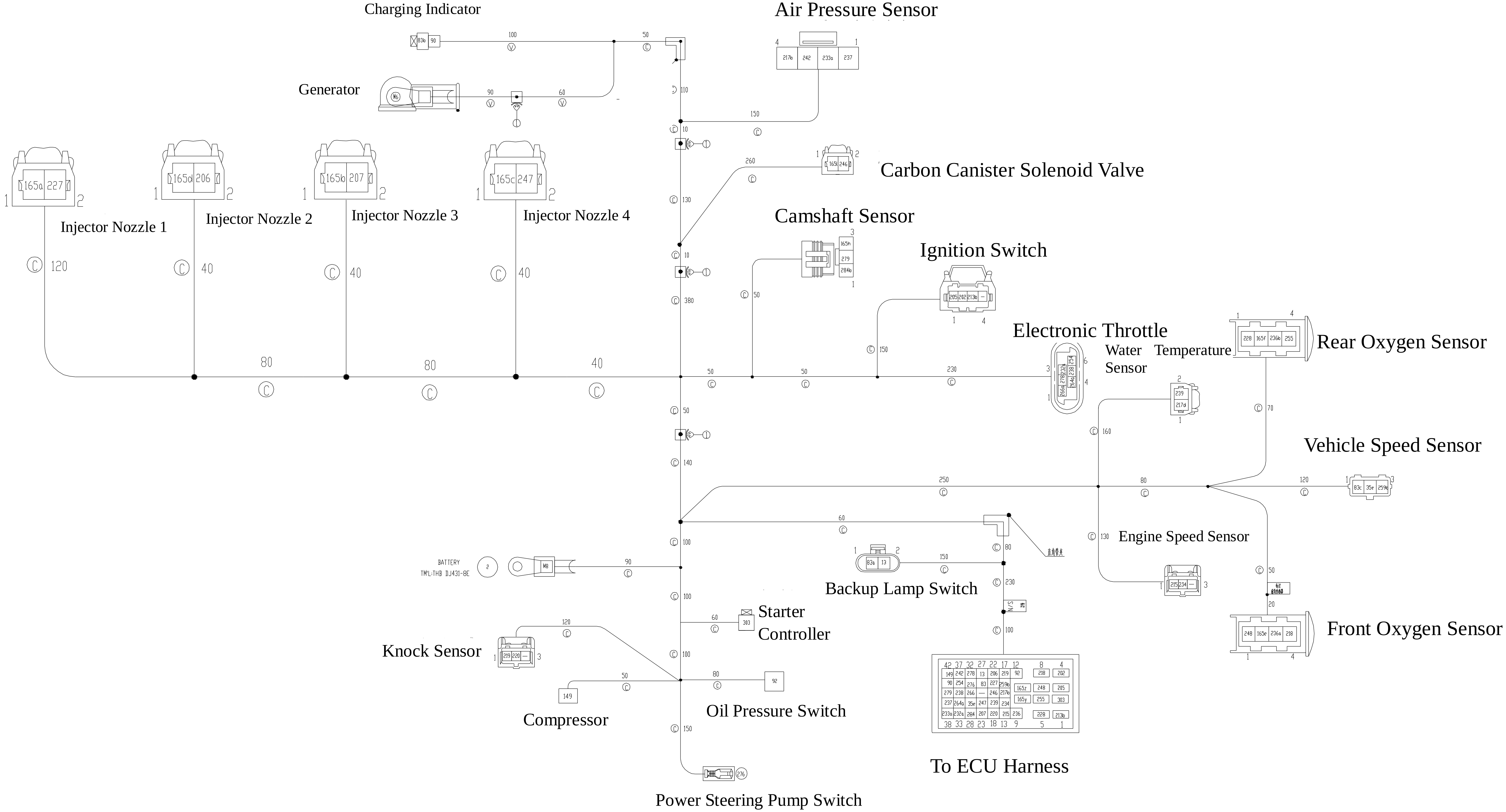
1.1.36. Take off the engine compartment harness.

2. Installation

Install it in the reverse order of removal.

Section 3 Electronic Injector Harness

I. Schematic Diagram of Harness



II. Main Connectors Description

No	Connector Description	Number of Pin	Connection	Remark
1	Charging indicator connector	1	Charging indicator	
2	Generator connector	1	Generator	
3	Injector nozzle 1 connector	2	Injector nozzle 1	
4	Injector nozzle 2 connector	2	Injector nozzle 2	
5	Injector nozzle 3 connector	2	Injector nozzle 3	
6	Injector nozzle 4 connector	2	Injector nozzle 4	
7	Air pressure sensor connector	4	Air pressure sensor	
8	Carbon canister solenoid valve connector	2	Carbon Canister Solenoid Valve	
9	Camshaft sensor connector	3	Camshaft sensor	
10	Ignition coil connector	4	Ignition Coil	
11	Electronic throttle sensor connector	6	Electronic throttle sensor	
12	Engine battery connector	1	Starter	
13	Knock sensor connector	3	Knock Sensor	
14	A/C compressor connector	1	A/C compressor	
15	Starter controller connector	1	Starter controller	
16	Oil pressure switch connector	1	Oil pressure switch	
17	Power steering pump connector	1	Power steering pump	
18	Backup lamp switch connector	2	Backup Lamp Switch	
19	ECU connector	42	Engine compartment harness connector	
20	Water temperature sensor connector	2	Water temperature sensor	
21	Engine speed sensorconnector	3	Engine speed sensor	
22	Rear oxygen sensorconnector	4	Rear oxygen sensor	
23	Vehicle speed sensor connector	3	Vehicle speed sensor	
24	Front oxygen sensor connector	4	Front oxygen sensor	

III. Disassembly/Reassembly of Engine Harness

Part Number: S21-3724180

(I). Preparation

Tools:
socket wrench, cross screwdriver, flat head screwdriver

(II). Precautions

Power OFF before the electrical elements and harnesses are removed.
The ignition switch must be in OFF state.

(III). Removal Procedure

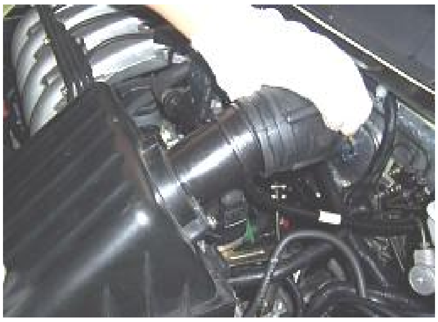
1. Disassembly/Reassembly of Battery and Air Cleaner.
1.1.1. Remove the positive of battery.

1.1.2. Remove the negative of battery, and take off the battery assy.

1.1.3. Loosen the fixing nuts of air cleaner with a sleeve.

1.1.4. Loosen the fixing nuts of air cleaner inlet with a sleeve.

1.1.5. Pull out the hose used to connect the air cleaner with engine intake manifold by hand.



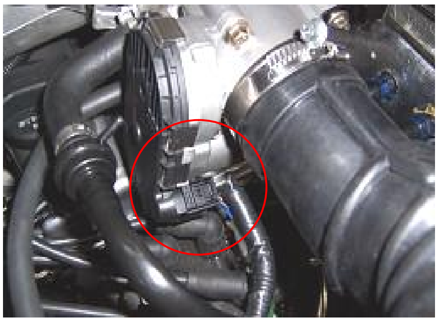
1.1.6. Take off the air cleaner .

1.1.7. Remove the fixed seat from the battery.

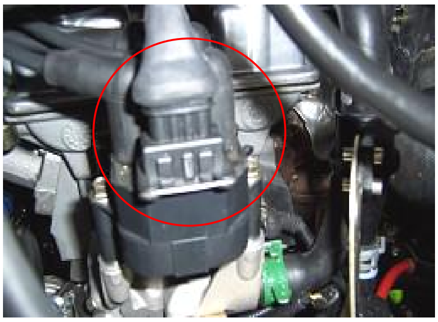
1.2. Installation
Install it in the reverse order of removal.

2. Disconnect the connection of all engine harness connectors.
2.1.1. Remove the connectors from the electronic injector harness and engine compartment harness.

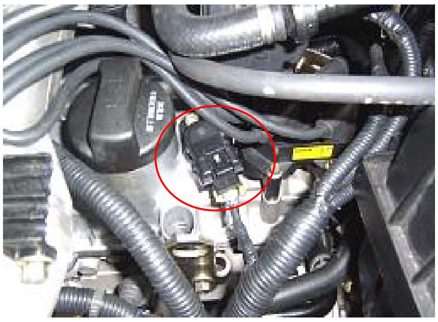
2.1.2. Remove the connector from the electronic throttle.



2.1.3. Remove the connectors from the ignition coil.



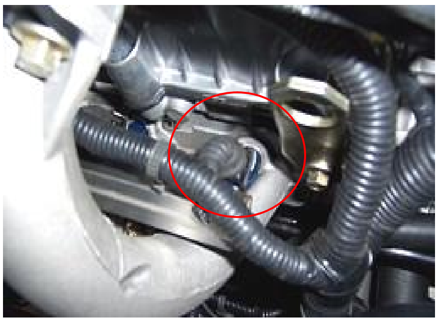
2.1.4. Remove the connector from the camshaft sensor.



2.1.5. Remove the connector from the cansiter solenoid valve connector.

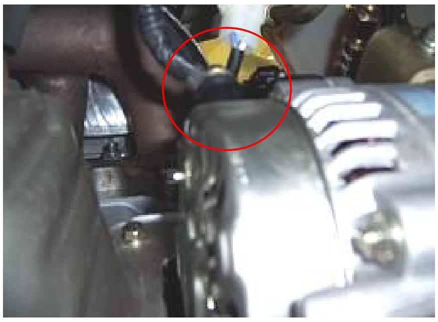
2.1.6. Remove the connector from the air pressure sensor.

2.1.7. Remove four connectors from the injector nozzle.

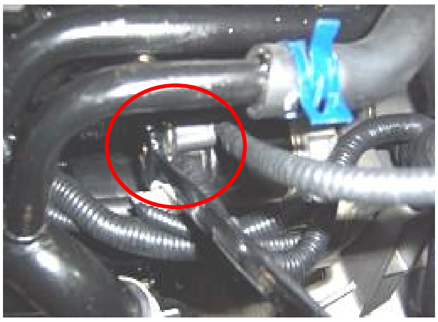


2.1.8. Remove the connector from the charging indicator.

2.1.9. Remove the connector from the generator.



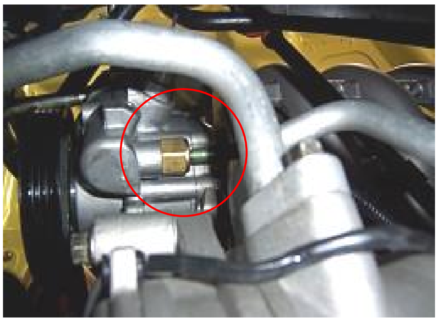
2.1.10. Remove the starter connector and battery connector.



2.1.11. Pull out the connector from the A/C compressor.

2.1.12. Remove the connector from the oil pressure switch.

2.1.13. Remove the connector from the power steering pump.

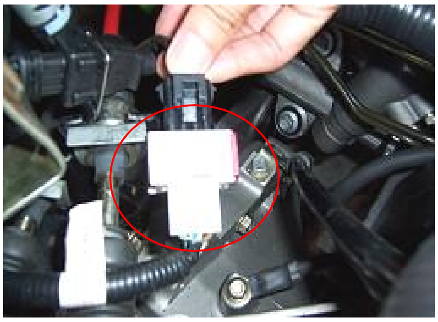


2.1.14. Remove the connector from the knock sensor.

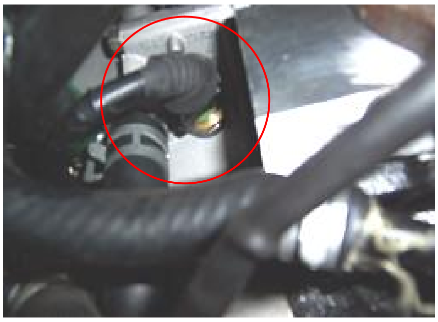
2.1.15. Remove the connector from the backup lamp switch.

2.1.16. Remove the connector from the water temperature sensor.

2.1.17. Remove the connector from the front rear oxygen sensor.



2.1.18. Remove the connector from the vehicle speed sensor.



2.1.19. Remove the connector from the engine speed sensor.

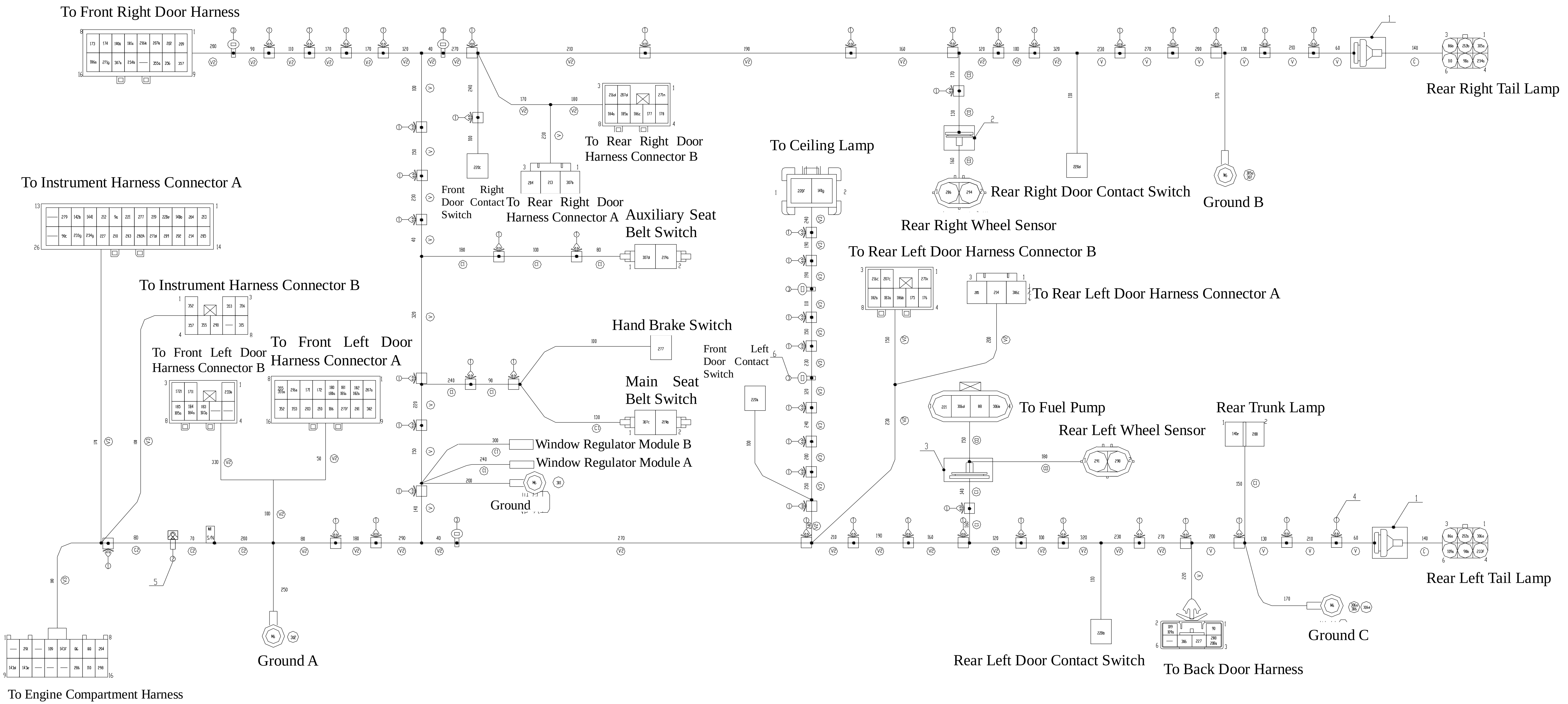
2.1.20. Take off the electronic injector harness assy.

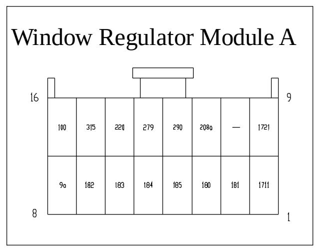
2.2. Installation

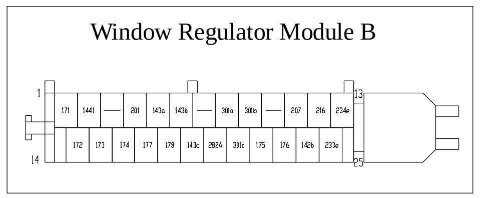
Install it in the reverse order of removal.

Section 4 Interior Harness

I. Schematic Diagram of Harness







II. Main Connectors Description

No	Connector Description	Number of Pin	Connection	Remark
1	To front right door harness connector	16	Front right door harness	
2	Right tail lamp connector	6	Right tail lamp harness	
3	Front right door contact switch connector	1	Front right door contact switch	
4	To rear right door harness connectorA	3	Rear right door harnessA	
5	To rear right door harness connectorB	8	Rear right door harnessB	
6	Rear right wheel sensor connector	2	Rear right wheel sensor	
7	Rear right door contact switch connector	1	Rear right door contact switch	
8	Ground B	1	Body	At upper of rear right wheelhouse paintwork
9	To instrument harness connectorA	26	Instrument harness A	
10	To instrument harness connectorB	8	Instrument harness B	
11	To engine compartment harness connector	16	Engine compartment harness	
12	To front left door harness connector B	8	Front left door harness B	
13	To front left door harness connector A	16	Front left door harness A	
14	Ground A	1	Body	Under left A pillar
15	Auxiliary seat belt switch connector	2	Auxiliary seat belt switch	
16	Hand brake switch connector	1	Hand brake switch	
17	Main seat belt switch connector	2	Main seat belt switch	
18	Window Glass Regulator Module B connector	25	Window Glass Regulator Module B	
19	Window Glass Regulator Module A connector	16	Window Glass Regulator Module A	
20	Ground D	1	Body	At left side of window regulator module
21	Connect to ceiling lamp connector	2	Ceiling lamp harness	
22	Front left door contact switch connector	1	Front left door contact switch	
23	To rear left door harness connector B	8	Rear left door harness B	
24	To rear left door harness connector A	3	Rear left door harness A	
25	To fuel pump connector	4	Fuel pump harness	
26	Rear left wheel sensor connector	2	Rear left wheel sensor	
27	Rear left door contact switch connector	1	Rear left door contact switch	
28	Rear trunk lamp connector	2	Rear trunk lamp harness	
29	To back door harness connector	6	Back door harness	
30	Ground C	1	Body	At rear paintwork of rear left wheelhouse
31	Left tail lampconnector	6	Left tail lamp harness	

III. Disassembly/Reassembly of Interior Floor Harness

Part Number: S21-3724050

(I). Preparation

Tools:

Socket wrench, cross screwdriver, flat head screwdriver

(II). Precautions

Power OFF before the electrical elements and harnesses are removed.

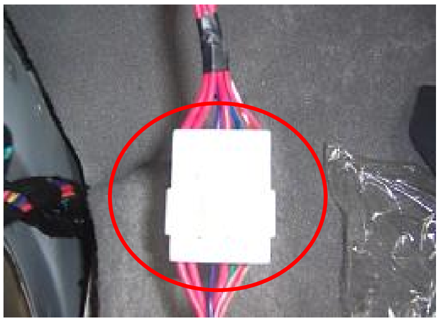
The ignition switch must be in OFF state.

(III). Removal Procedure

1. Removal of Harness at Left Side of Interior Floor.

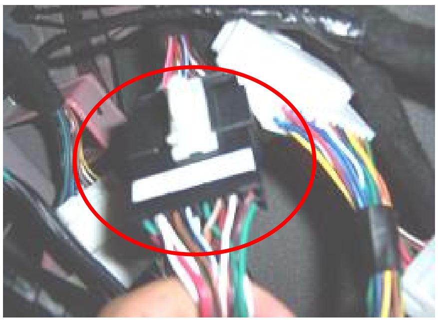
1.1.1. Remove the lower left guard plate from the instrument panel. (See *Disassembly/Reassembly of Instrument Panel*)

1.1.2. Pull out the connector to the engine compartment harness.



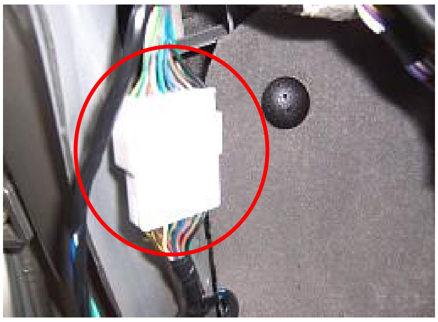
1.1.3. Pull out the connector A to the instrument harness.

1.1.4. Pull out the connector B to the instrument harness.



1.1.5. Remove the A pillar lower trim with a cross screwdriver.

1.1.6. Pull out the connector of front left door harness A.



1.1.7. Pull out the connector of front left door harness B.

1.1.8. Remove the grounding point. (under the A pillar)

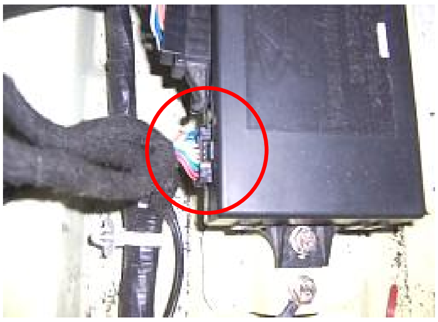
1.1.9. Remove the console. (See *Disassembly/Reassembly of Console*)

1.1.10. Remove the connector from the hand brake switch.

1.1.11. Remove the connector from main seat belt switch.

1.1.12. Remove the seat and carpet. (See *Disassembly/Reassembly of Seat and Carpet*)

1.1.13. Pull out two connectors A and B of the window regulator.



1.1.14. Remove the grounding point.

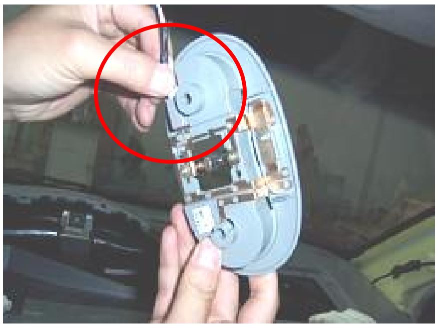
1.1.15. Remove the B pillar trim. (See *Disassembly/Reassembly of Seat Belt*)

1.1.16. Remove the front left door contact switch.

1.1.17. Pull out the connectors A and B to the right and left rear door harnesses.

1.1.18. Remove the ceiling. (See *Disassembly/Reassembly of Ceiling*)

1.1.19. Pull out the ceiling lampconnector.



1.1.20. Remove the rear seat. (See *Disassembly/Reassembly of Rear Seat*)

1.1.21. Take off the upper protecting cover of oil pump.

1.1.22. Pull out the connector to the fuel pump.

1.1.23. Pull out the connector of rear left wheel speed sensor.

1.1.24. Remove the C pillar trim. (See *Disassembly/Reassembly of Ceiling*)

1.1.25. Pull out the rear left door contact switch.

1.1.26. Pull out the connector to the back door harness.

1.1.27. Pull out the connector of rear trunk lamp.

1.1.28. Remove the left grounding point from the luggage boot.

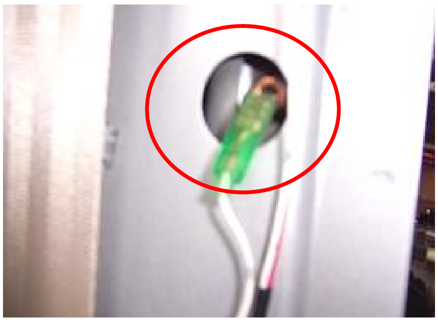
1. 1.29. Remove the connector of left tail lamp.

1.2 Install it in the reverse order of removal.

2. Removal of harness at right side of interior floor.

2.1.1. Remove the glove case. (See *Disassembly/Reassembly of Instrument Panel*)
2.1.2. Pull out the connector of front right door harness.

2.1.3. Remove the right B pillar trim. (See *Disassembly/Reassembly of Seat Belt*)
2.1.4. Pull out the connector of front right door contact switch.



2.1.5. Pull out the connectors A and B of rear right door harness.

2.1.6. Pull out the connector of auxiliary seat belt switch.

2.1.7. Pull out the connector of rear right wheel speed sensor.

2.1.8. Remove the C pillar trim. (See *Disassembly/Reassembly of Ceiling*)

2.1.9. Pull out the rear right door contact switch.

2.1.10. Remove the grounding point.

2.1.11. Take off the upper protecting cover of oil pump.

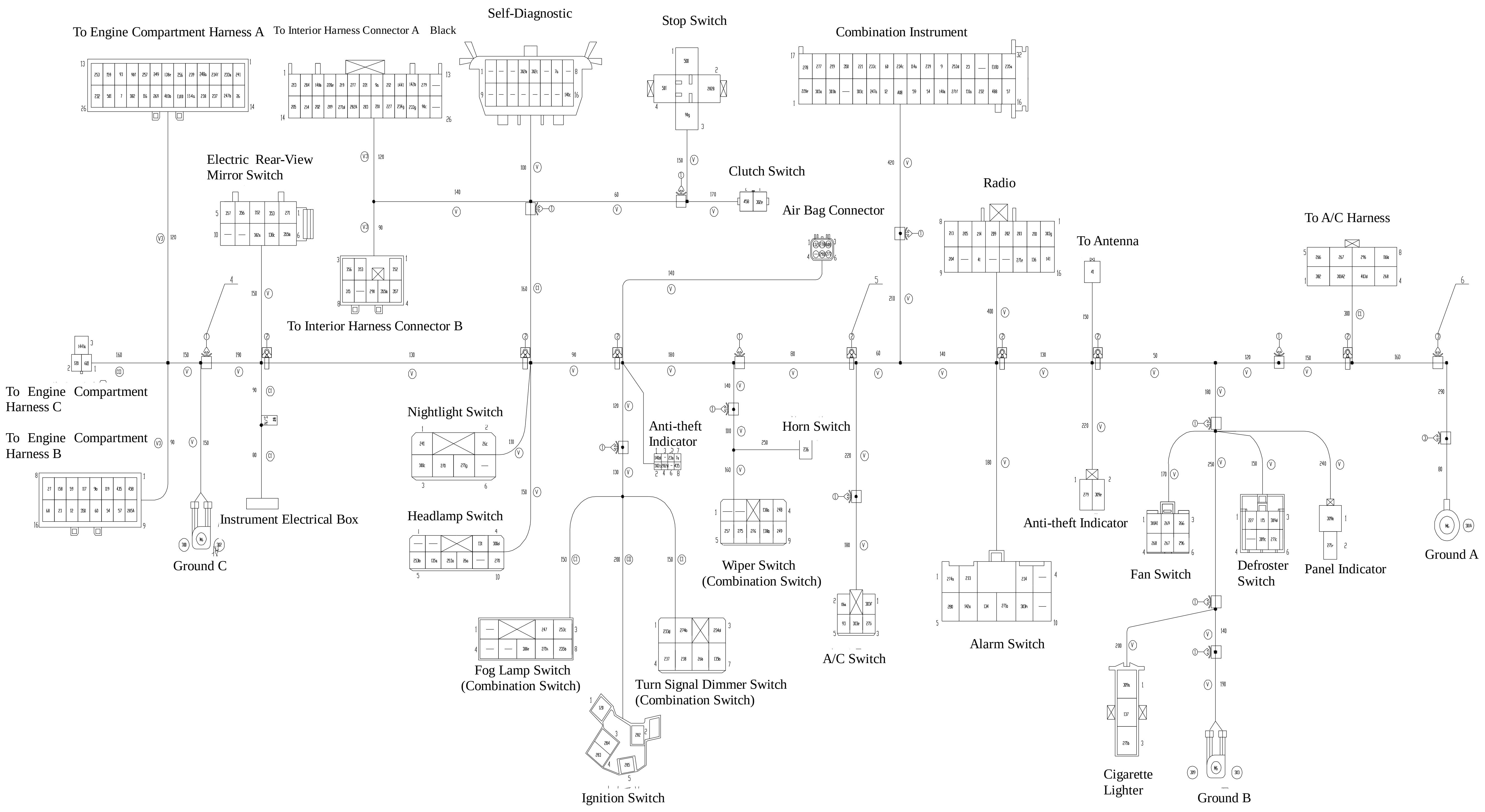
2.1.12. Pull out the connector of right tail lamp.

2.2. Installation.

Install it in the reverse order of removal.

Section 5 Instrument Harness Assy

I. Schematic Diagram of Harness



II. Definition of Main Connectors

Connector	Pin	Connect to
Connect to engine compartment harness A	1	Nightlight Switch
	2	233(JOINT: Ground or power positive, the same below)
	3	234(JOINT)
	4	248(JOINT)
	5	Combined Instruments
	6	Wiper Intermittern Relay
	7	138(JOINT)
	8	Wiper Switch(combination switch)
	9	Wiper Switch(combination switch)
	10	90(JOINT)
	11	A/C Switch
	12	Connect to the instrument electrical box
	13	253(JOINT)
	14	253(JOINT)
	15	247(JOINT)
	16	Turn signal dimmer switch (combination switch)
	17	Turn signal dimmer switch (combination switch)
	18	Combined Instruments
	19	Combined Instruments
	20	Connect to A/C harness
	21	Fan Switch
	22	116(JOINT)
	23	Connect to A/C harness
	24	Punch the card at the location near the diagnostic connector
	25	Brake lamp Switch
	26	Combined Instruments
Connect to engine compartment harness C	1	Instrument Electric Device Box
	2	Ignition Switch
	3	Instrument Electrical Box f18
Connect to engine compartment harness B	1	Clutch switch
	2	Punch the card at the location near the diagnostic connector
	3	Instrument Electrical Box f13
	4	9(JOINT)
	5	Instrument Electrical Box f12
	6	Combined Instruments
	7	To Instrument Electrical Box
	8	Instrument Electrical Box f14
	9	Instrument Electrical Box f16

	10	Combined Instruments
	11	Combined Instruments
	12	Combined Instruments
	13	Combined Instruments
	14	Combined Instruments
	15	Combined Instruments
	16	Instrument Electric Device Box
Electric Rearview Mirror Switch	1	271(JOINT)
	2	Connect to interior harness B
	3	Connect to interior harness B
	4	Connect to interior harness B
	5	Connect to interior harness B
	6	Connect to interior harness B
	7	138(JOINT)
	8	302(JOINT)
	9	——
	10	——
Connect to the interior harness connectorA (black)	1	Audio device
	2	Audio device
	3	140(JOINT)
	4	Combined Instruments
	5	Combined Instruments
	6	Combined Instruments
	7	Combined Instruments
	8	9(JOINT)
	9	Instrument Electric Device Box
	10	Instrument Electrical Box f18
	11	142(JOINT)
	12	Anti-theft indicator
	13	——
	14	Audio device
	15	Audio device
	16	Audio device
	17	Audio device
	18	271(JOINT)
	19	Instrument Electrical Box f17
	20	Audio device
	21	Audio device
	22	Defroster Switch;
	23	234(JOINT)
	24	233(JOINT)
	25	90(JOINT)
	26	——

Connect to the interior harness connectorA	1	Electric Rearview Mirror Switch
	2	Electric Rearview Mirror Switch
	3	Electric Rearview Mirror Switch
	4	Electric Rearview Mirror Switch
	5	Electric Rearview Mirror Switch
	6	Connect to air bag harness
	7	——
	8	Punch the card at the location near the diagnostic connector
Self-diagno stic	1	CAN (LOW) High Line
	2	Function Reserved
	3	Function Reserved
	4	302(JOINT)
	5	302(JOINT)
	6	CAN (HIGH) High Line
	7	K Line
	8	IGNITION ON(+15)
	9	CAN (LOW) Low Line
	10	Function Reserved
	11	Function Reserved
	12	Function Reserved
	13	Function Reserved
	14	CAN (HIGH) Low Line
	15	L Line
	16	Battery Positive
Nightlight Switch	1	Connect to engine compartment harness A
	2	26(JOINT)
	3	300(JOINT)
	4	Headlamp switch
	5	271(JOINT)
	6	——
Headlamp Switch	1	——
	2	——
	3	Instrument Electrical Box f11
	4	300(JOINT)
	5	253(JOINT)
	6	135(JOINT)
	7	253(JOINT)
	8	26(JOINT)
	9	——

	10	Nightlight Switch
Brake lamp Switch	1	Instrument Electrical Box f5
	2	Instrument Electrical Box f17
	3	90(JOINT)
	4	Connect to engine compartment harness A
Clutch switch	1	302(JOINT)
	2	Connect to engine compartment harness B
Air Bag Connector	1	Instrument Electrical Box f15
	2	Combined Instruments
	3	Combined Instruments
	4	——
	5	Connect to interior harness B
	6	Punch the card at the location near the diagnostic connector
Anti-theft Module	1	
	2	302(JOINT)
	3	——
	4	
	5	
	6	
	7	Punch the card at the location near the diagnostic connector
	8	Punch the card at the location near the diagnostic connector
Fog lamp Switch	1	——
	2	247(JOINT)
	3	253(JOINT)
	4	——
	5	——
	6	300(JOINT)
	7	271(JOINT)
	8	235(JOINT)
Ignition Switch	1	Connect to engine compartment harness C
	2	Instrument Electric Device Box
	3	Instrument Electric Device Box
	4	Instrument Electric Device Box
	5	Instrument Electric Device Box
Turn Signal Dimmer Switch	1	233(JOINT)
	2	274(JOINT)
	3	234(JOINT)
	4	Connect to engine compartment harness A
	5	Connect to engine compartment harness A
	6	26(JOINT)
	7	135(JOINT)
Horn switch	1	Instrument Electric Device Box
Wiper	1	——

Switch	2	——
	3	138(JOINT)
	4	248(JOINT)
	5	Connect to engine compartment harness A
	6	Wiper Intermittern Relay
	7	Wiper Intermittern Relay
	8	138(JOINT)
	9	Connect to engine compartment harness A
A/C Switch	1	303(JOINT)
	2	116(JOINT)
	3	271(JOINT)
	4	303(JOINT)
	5	Connect to engine compartment harness A
COMBINED INSTRUMENTS	1	Connect to interior harness A
	2	303(JOINT)
	3	303(JOINT)
	4	——
	5	303(JOINT)
	6	247(JOINT)
	7	Connect to engine compartment harness B
	8	Connect to air bag harness
	9	Connect to engine compartment harness B
	10	Connect to engine compartment harness B
	11	140(JOINT)
	12	271(JOINT)
	13	Instrument Electrical Box f11
	14	Connect to engine compartment harness A
	15	Punch the card at the location near the diagnostic connector
	16	Connect to engine compartment harness B
	17	Connect to air bag harness
	18	Connect to interior harness A
	19	Connect to interior harness A
	20	Connect to engine compartment harness B
	21	Connect to interior harness A
	22	233(JOINT)
	23	Connect to engine compartment harness B
	24	234(JOINT)
	25	Connect to engine compartment harness A
	26	Connect to engine compartment harness A
	27	9(JOINT)
	28	253(JOINT)
	29	Connect to engine compartment harness B
	30	——

	31	Connect to engine compartment harness A
	32	235(JOINT)
Audio device	1	303(JOINT)
	2	Connect to interior harness A
	3	Connect to interior harness A
	4	Connect to interior harness A
	5	Connect to interior harness A
	6	Connect to interior harness A
	7	Connect to interior harness A
	8	Connect to interior harness A
	9	Connect to interior harness A
	10	——
	11	Connect to antenna
	12	——
	13	——
	14	271(JOINT)
	15	Instrument Electrical Box f8
	16	Instrument Electrical Box f6
Alarm Switch	1	274(JOINT)
	2	233(JOINT)
	3	234(JOINT)
	4	——
	5	Turn Signal Switch
	6	142(JOINT)
	7	Instrument Electrical Box f16
	8	271(JOINT)
	9	303(JOINT)
	10	——
Connect to antenna	1	Audio device
Anti-theft indicator	1	Connect to interior harness A
	2	309(JOINT)
Fan Switch	1	301(JOINT)
	2	Connect to interior harness A
	3	Connect to A/C harness
	4	Connect to A/C harness
	5	Connect to A/C harness
	6	Connect to A/C harness
Defroster Switch;	1	Connect to interior harness A
	2	Instrument Electrical Box f10
	3	309(JOINT)
	4	——
	5	309(JOINT)

	6	271(JOINT)
Panel Indicator Light	1	309(JOINT)
	2	271(JOINT)
Cigar Lighter	1	309(JOINT)
	2	Instrument Electrical Box f9
	3	271(JOINT)
Connect to A/C harness	1	Connect to engine compartment harness A
	2	301(JOINT)
	3	Connect to engine compartment harness A
	4	Fan Switch
	5	Fan Switch
	6	Fan Switch
	7	Fan Switch
	8	116(JOINT)

III. Disassembly/Reassembly of Instrument Harness

(I). Preparation

Tools:
10＃/13＃ socket wrench, cross screwdriver, flat head screwdriver

(II). Precautions

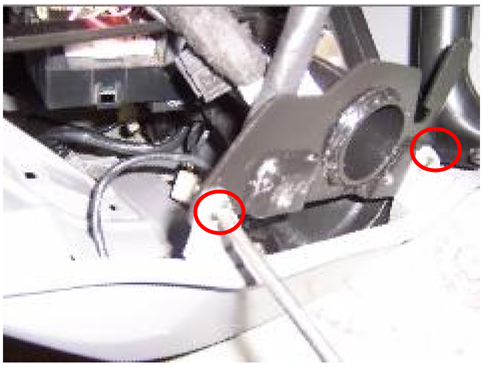
Power OFF before the electrical elements and harnesses are removed.
The ignition switch must be in OFF state.

(III). Removal Procedure

1. Removal
1.1. Remove the console.
1.2. Remove the instrument panel. (See *Disassembly/Reassembly of Instrument Panel*)
1.3. Pull out the related connectors connected with the instrument harness.
1.4. Take off the instrument panel and cross beam.

1.5. Loosen thefix screws of front air duct, and take off the front air duct.

1.6. Loosen four screws used to fix the instrument panel from the both sides.



1.7. Take off the cross beam and rear air duct.

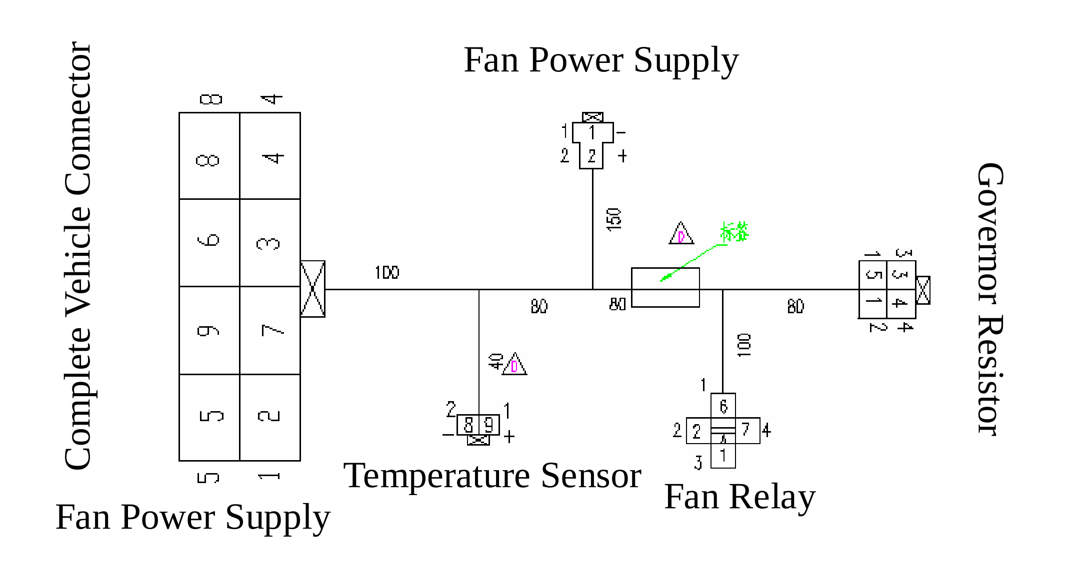
1.8. Remove the harness with 10＃socket wrench and flat head screwdriver.

2. Installation

Install it in the reverse order of removal.

Section 6 Evaporator Harness

I. Schematic Diagram of Harness



II. Definition of Main Connectors

Connector	Pin	Connect To
Complete Vehicle Connector	1	Fan motor + terminal
	2	Fan position switch HI position
	3	Governor resistor ML position
	4	Governor resistor MH position
	5	Governor resistor LO position
	6	Sensor signal ground wire
	7	Power ground wire
	8	Sensor signal
Temperature Sensor,	1	ECU(17)
	2	ECU(22)
Fan Power Supply	1	Motor – terminal
	2	Motor + terminal
Fan Relay	1	Power ground wire
	2	Fan motor + terminal
	3	Fan motor - terminal
	4	Fan position switch HI position
Governor Resistor	1	LO position
	2	HI position
	3	M1 position
	4	M2 position

III. Disassembly/Reassembly of Evaporator Harness

(I). Preparation

Tools:
8＃/10＃socket wrench, flat head screwdriver

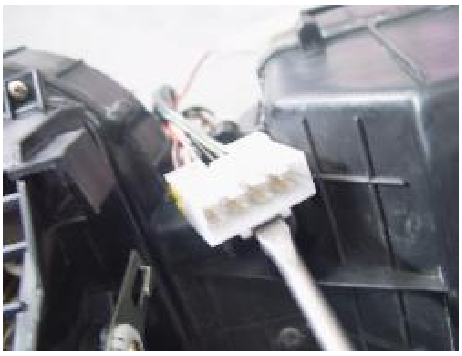
(II). Precautions

Power OFF before the electrical elements and harnesses are removed.
The ignition switch must be in OFF state.

(III). Removal Procedure

1. Removal
1.1. Remove the instrument panel assy. (See *Disassembly/Reassembly of Instrument Panel*)
1.2. Remove the evaporator assy. (See *Disassembly/Reassembly of Evaporater*)

1.3. Unclench the evaporator harness connector with a flat head screwdriver.



1.4. Pull out the all sensor, actuator connectors.

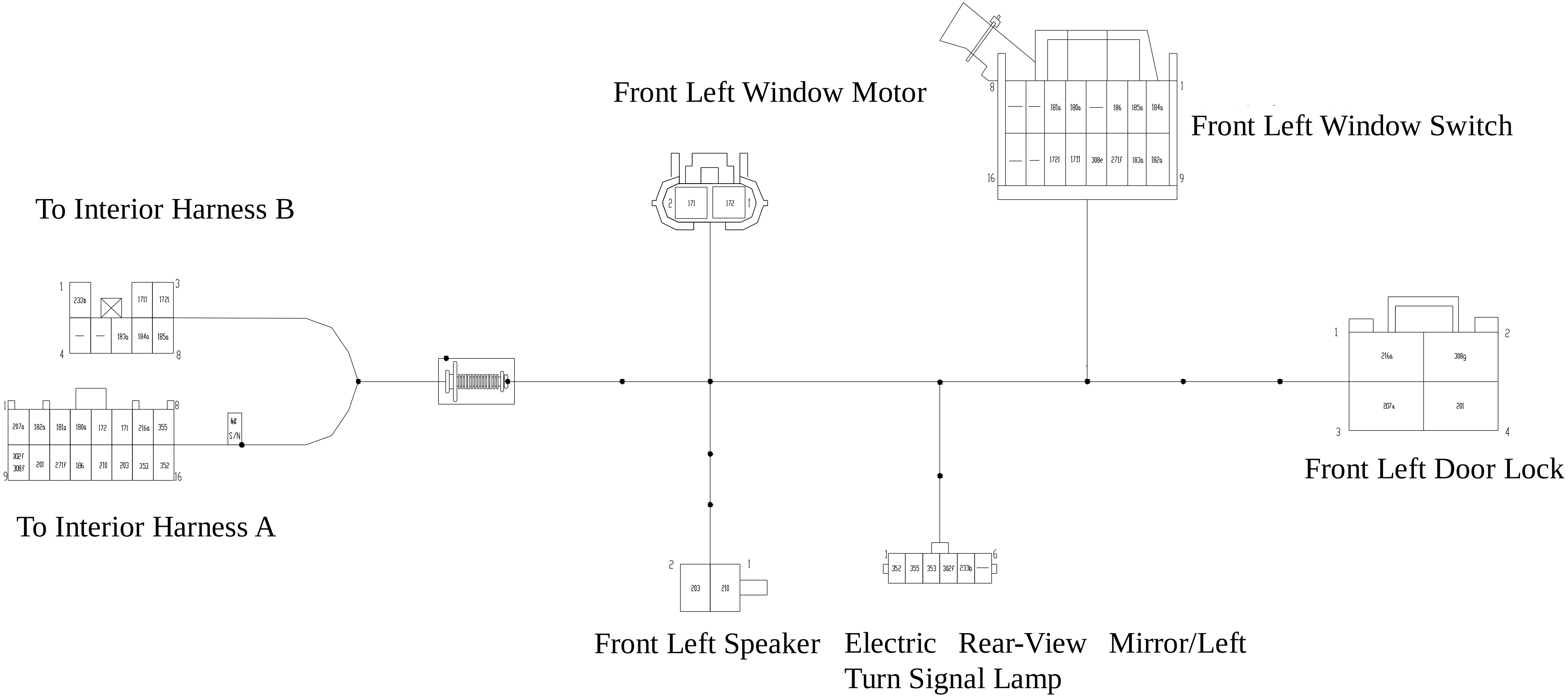
1.5. Take off the evaporator harness.

2. Installation

Install it in the reverse order of removal.

Section 7 Front Left Door Harness

I. Schematic Diagram of Harness



II. Main Connectors Description

No	Connector Description	Number of Pin	Connection	Remark
1	Connect to interior harness Bconnector	8	Interior harness B	
2	Front left window motor connector	2	Front left window motor	
3	Front left window switch connector	16	Front Left Window Switch	
4	Connect to interior harness Aconnector	16	Interior harness A	
5	Left/front speaker connector	2	Left/front speaker	
6	Electric rear-vew mirror/left turn signal lamp connector	6	Electric rear-vew mirror/left turn signal lamp	
7	Front left door lock connector	2	Front left door lock	

III. Disassembly/Reassembly of Front Left Door Inner Harness

Part Number: S21-3724070

(I). Preparation

Tools:
socket wrench, cross screwdriver, flat head screwdriver.

(二) , Precautions

Power OFF before the electrical elements and harnesses are removed.
The ignition switch must be in OFF state.

(III). Removal Procedure

1. Removal
1.1. Remove the door inner guard plate. (See *Removal of Door Inner Guard Plate*)
1.2. Take off the door inner protective film.

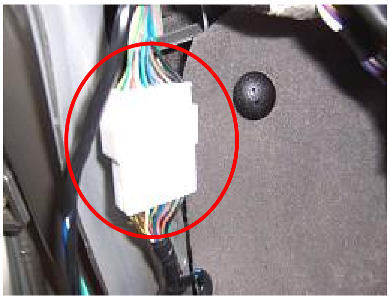
1.3. Pull out the lift motor connector.

1.4. Pull out the door lockconnector. (See *Disassembly/Reassembly of Door Lock*)

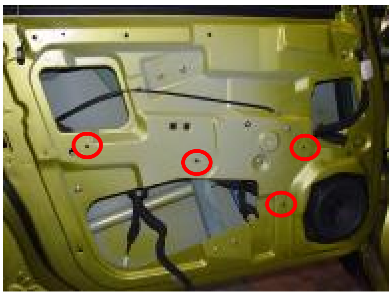
1.5. Pull out the exterior rear-view mirror harness connector.

1.6. Pull out the connector of front door sound box.

1.7. Pull out the door inner harness and interior floor harness connector. (See *Disassembly/Reassembly of Interior Harness*)



1.8. Unclench the harness fixing clips with a screwdriver.



1.9. Take off the door inner harness protector.

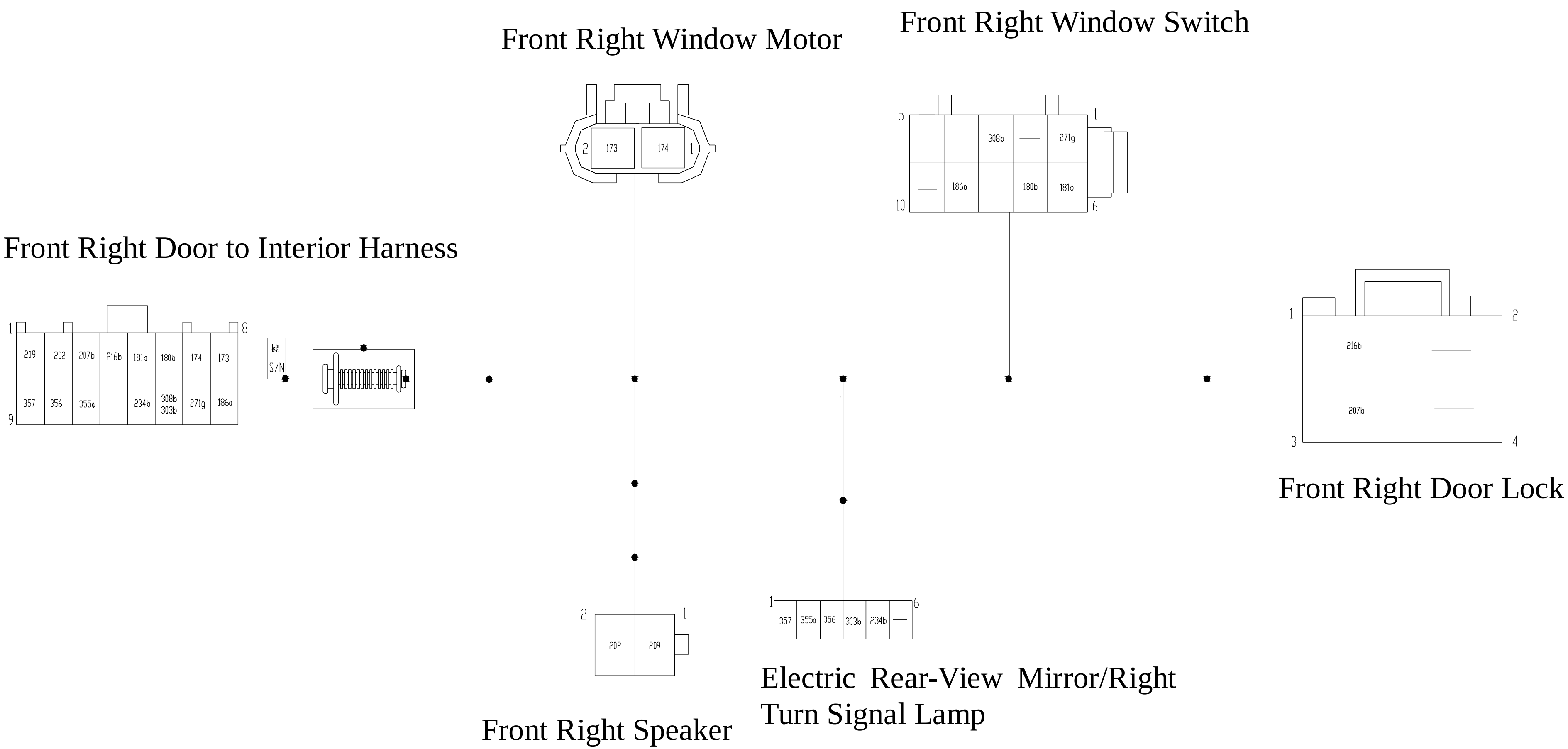
1.10. Take off the door inner harness assy from the interior of door.

2. Installation.

Install it in the reverse order of removal.

Section 8   Front Right Door Harness

I. Schematic Diagram of Harness



II. Main Connectors Description

No	Connector Description	Number of Pin	Connection	Remark
1	Front right door-to-interior harness connector	16	Interior Harness	
2	Front right window motor connector	2	Front right windowmotor	
3	Front right window switch connector	10	Right Front Window Switch	
4	Front right door lock connector	4	Front right door lock	
5	Right/front speaker connector	2	Right/front speaker	
6	Electric rear-vew mirror motor/ right turn signal lamp connector	6	Electric rear-vew mirror motor/right turn signal lamp	

III. Disassembly/Reassembly of Front Right Door Inner Harness

Part Number: S21-3724080

1. Removal Step

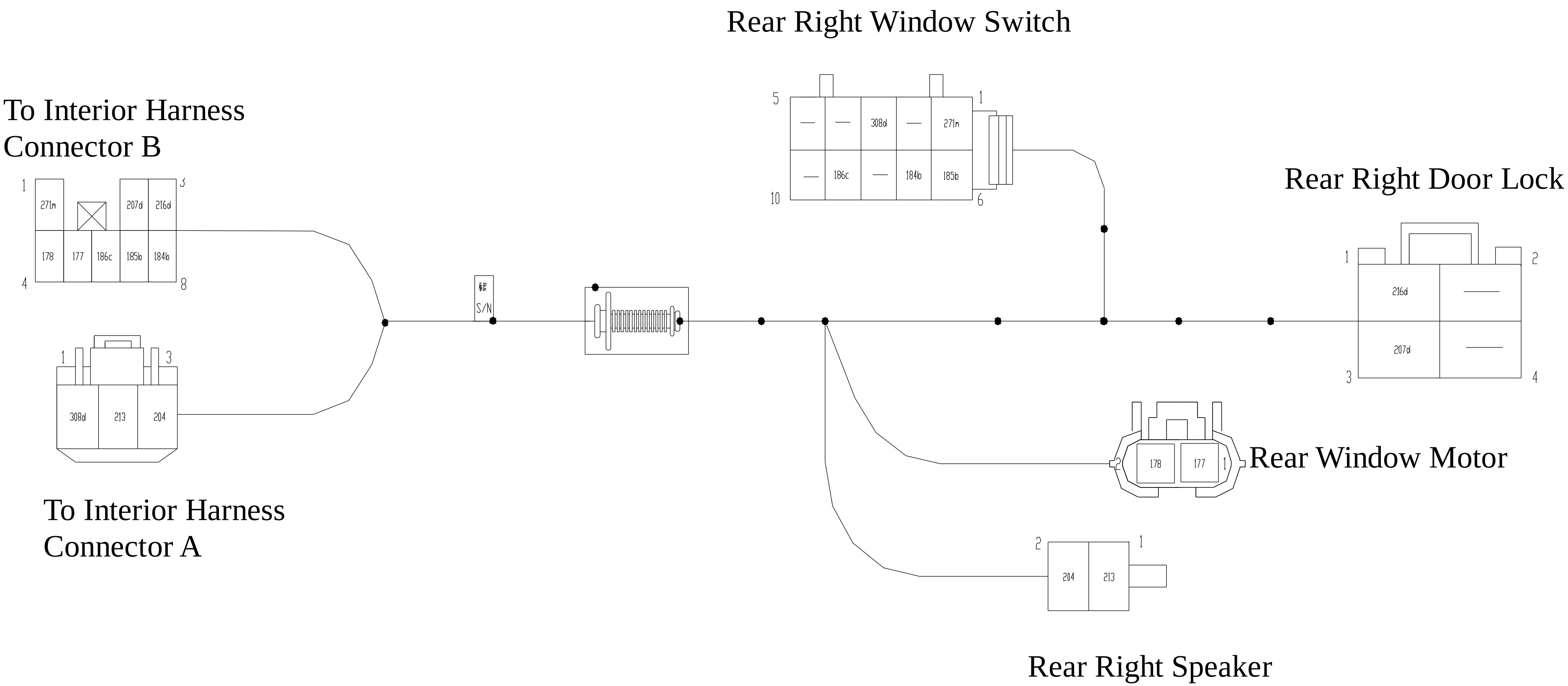
Refer to Removal of Front left Door Inner Harness.

2. Installation Step

Install it in the reverse order of removal.

Section 9 Rear Door Harness

I. Schematic Diagram of Harness



II. Main Connectors Description

No	Connector Description	Number of Pin	Connection	Remark
1	Connect to interior harness connector B	8	Interior harness B	
2	Right rear window switch connector	10	Right Rear Window Switch	
3	Rear right door lock connector	4	Rear right door lock	
4	Connect to interior harness connector A	3	Interior harness A	
5	Right rear speaker connector	2	Right rear speaker	
6	Rear window motor connector	2	Rear window motor	

III. Disassembly/Reassembly of Rear Left Door Inner Harness

Part Number: S21-3724180

(I). Preparation

Tools:
socket wrench, cross screwdriver, flat head screwdriver

(II). Precautions

Power OFF before the electrical elements and harnesses are removed.
The ignition switch must be in OFF state.

(III). Removal Procedure

1. Removal.
1.1. Remove the rear left door inner guard plate . (See *Disassembly/Reassembly of Door Inner Guard Plate*)
1.2. Take off the rear left door inner protective film.

1.3. Pull out the lift motor connector.

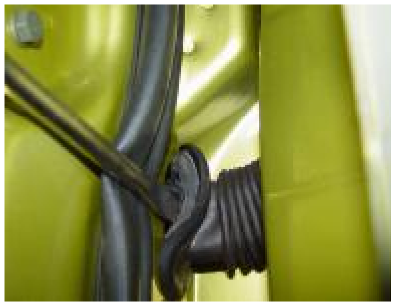
1.4. Pull out the door lock harness connector.

1.5. Pull out the Door Inner harness and vehicle interior harness connectors.

1.6. Unclench the harness fixing clips.

1.8. Unclench the Door Inner harness rubber jacket.

1.9. Take off the harness assy. from the internal of door.



2. Installation.

Install it in the reverse order of removal.

IV. Disassembly/Reassembly of Rear Right Door Inner Harness

1. Removal.

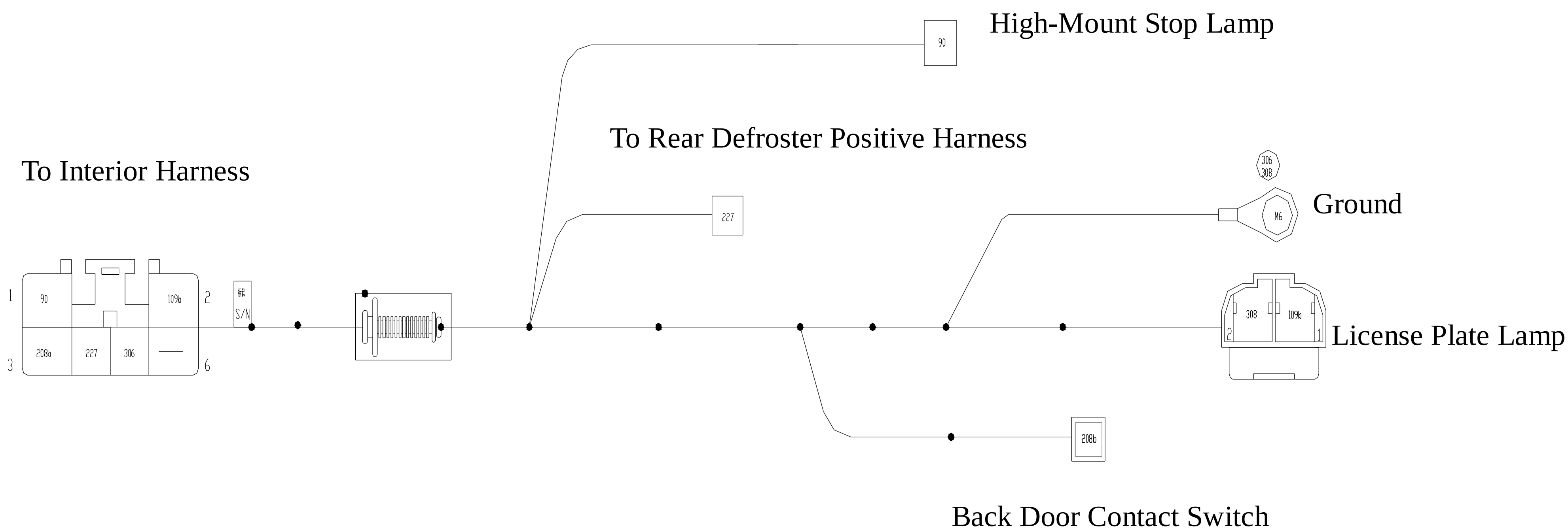
Refer to Removal of Rear Left Door Inner Harness.

2. Installation.

Install it in the reverse order of removal.

Section 10 Back Door Harness

I. Schematic Diagram of Harness



II. Main Connectors Description

No	Connector Description	Number of Pin	Connection	Remark
1	Connect to interior harness connector	6	Interior Harness	
2	High-mount stop lamp connector	1	High-mount stop lamp	
3	Connect to rear defroster positive harness connector	1	Rear defroster positive harness	
4	Back door harness ground	1	Body	At back door paintwork
5	License plate lamp connector	2	Side license plate lamp	
6	Back door contact switch connector	1	Back door contact switch	

III. Disassembly/Reassembly of Back Door Inner Harness

Part Number: S21-3724160

(I). Preparation

Tools:

socket wrench, cross screwdriver, flat head screwdriver

(II). Precautions

DO NOT apply too big force when the harness is going across the body paintwork hole so as to avoid the harness breakage and short-circuit.

Power OFF before the electrical elements and harnesses are removed.

The ignition switch must be in OFF state.

(III). Removal Procedure

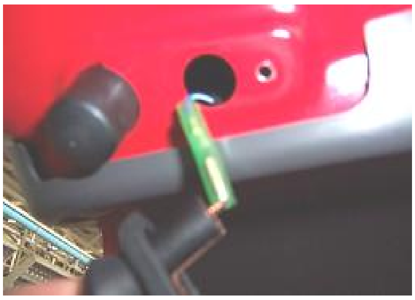
1. Removal.

1.1.1. Remove the C pillar trim. (See *Disassembly/Reassembly of Ceiling*)

1.1.2. Pull out the back door harness connector.

1.1.3. Remove the fix screws from the rear door contact switch with a cross screwdriver.

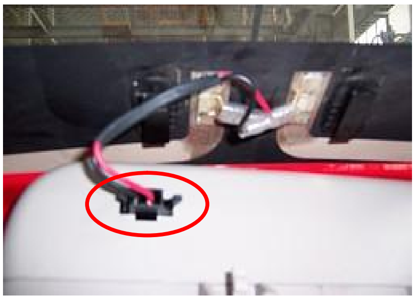
1.1.4. Pull out the connector of rear door contact switch.



1.1.5. Remove the back Door Inner ornament plate. (See *Disassembly/Reassembly of Luggage Boot*)

1.1.6. Pull out the connector of rear defroster positive harness, and connector to the high-mount stop lamp circuit.

1.1.7. Pull out the connector of high-mount stop lamp, and then remove the harness from high-mount stop lamp.



1.1.8. Pull out the connector to the license plate lamp.

1.1.9. Remove the grounding point from the back door harness.

1.1.10. Remove the fixing clips used to fasten the back door harness.

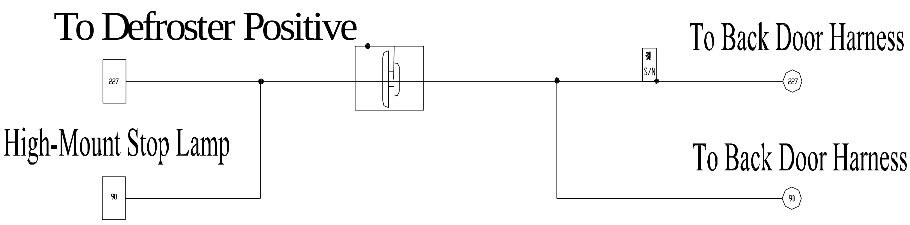
1.1.11. Take off the back door inner harness.

2. Installation.

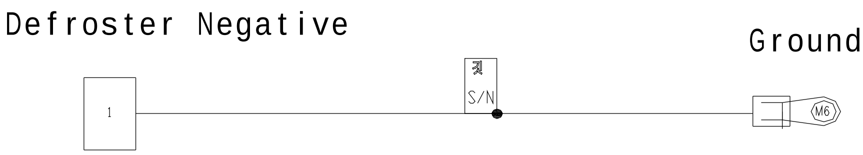
Install it in the reverse order of removal, and implement this installation with a special auxiliary tool (small steel wire) and other tools.

Section 11 Defroster Harness

I. Schematic Diagram of Defroster Positive Harness



II. Schematic Diagram of Defroster Negative Harness



III. Main Connectors Description

No	Connector Description	Number of Pin	Connection	Remark
1	Defroster positive connector	1	Defroster positive	
2	High-mount stop lamp connector	1	High-mount stop lamp	
3	Back door harness connector	1	Back door harness	
4	Back door harness connector	1	Back door harness	
5	Defroster negative connector	1	Defroster negative	
6	Body ground		Body	At the back door

IV. Disassembly/Reassembly of Rear Defroster Harness

Defroster harness positive (+), part number: S21-3724530

Defroster harness negative (-), part number: S21-3724540

(I). Preparation

Tools:

socket wrench, cross screwdriver, flat head screwdriver

(II). Precautions

Power OFF before the electrical elements and harnesses are removed.

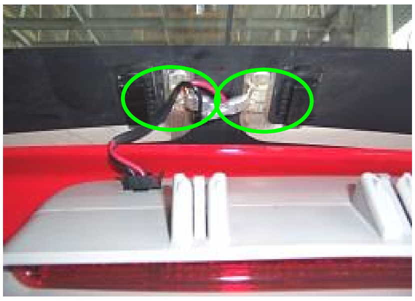
The ignition switch must be in OFF state.

(III). Removal Procedure

1. Removal of Defroster Positive Harness

1.1.1、 Pull out the connector of rear defroster positive harness, and the connector to the high-mount stop lamp circuit. (See *Disassembly/Reassembly of Dack Door Harness*)

1.1.2. Two connectors to back door harness. (Since the circuit is a printed one, there is no actual harness.)



1.2 Installation

Install it in the reverse order of removal

2. Removal of Defroster Negative Harness

2.1.1. Remove the back door Inner ornament plate. (See *Disassembly/Reassembly of Luggage Boot*)

2.1.2. Remove the defroster negative connector and grounding point.

2.2 Installation

Install it in the reverse order of removal.

Service Manual For CHERY QQ6

(Chassis)

After Sales Service Department of Chery Automobile Sales Co., Ltd

Chapter 1 Brake System

I. System Maintenance Parameters

1. Brake disc check:

The friction surface of brake disc should be flat and has no apparent grooves; otherwise, replace it.

2. Thickness check

The standard thickness of front disc (ventilation disc) is 17 mm with service limit of 15 mm; when exceeding the service limit, replace it.

3. Brake lining thickness check

Standard thickness of front brake lining shall be 10 mm, service limit shall be 3 mm, and the remaining thickness of limit of brake pad thickness shall be not less than 3mm.

Standard thickness of rear brake lining shall be 5 mm, service limit shall be 1 mm, and the remaining thickness of limit of brake pad thickness shall be not less than 1 mm.

4. Brake disc runout check

Check the brake disc side face runout with a dial gauge. The service limit of front disc is 0**.03**mm, and, if exceeding the limit, replace the disc.

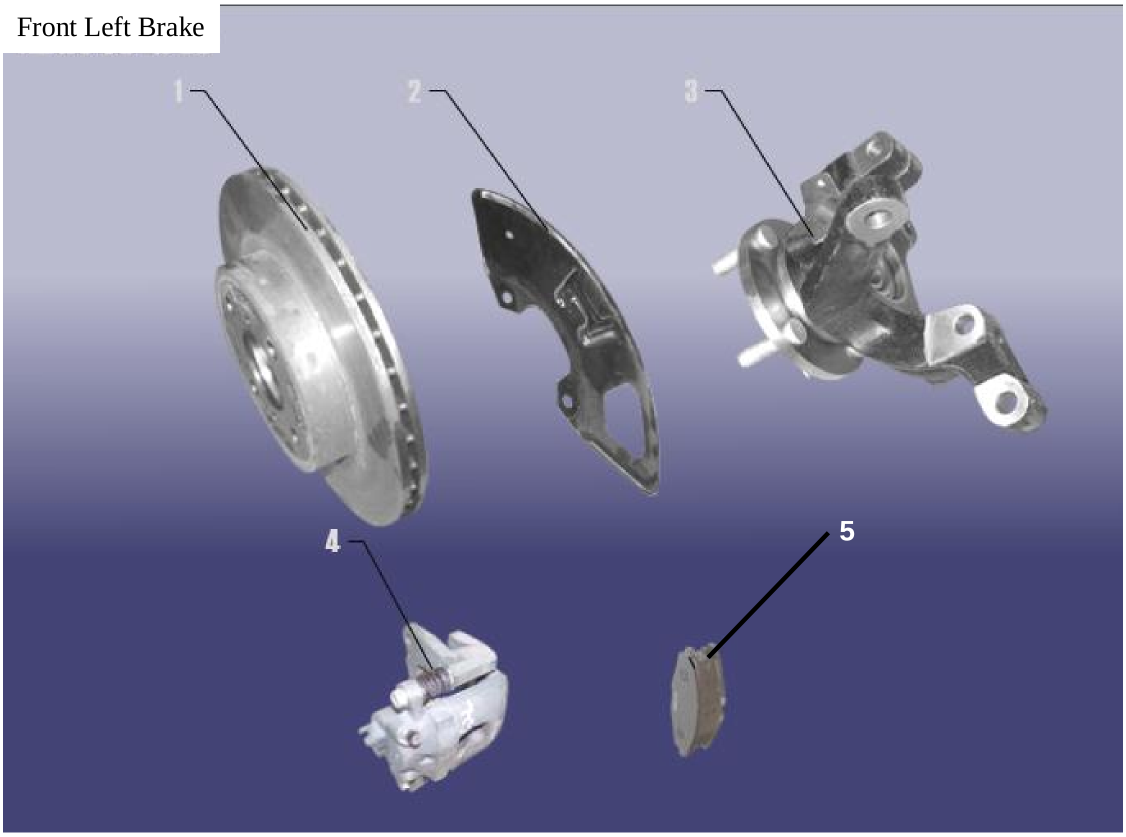
Important notice:

After completion of replacing friction lining or brake disc, stop down brake for several times to enable breaking-in between brake lining and brake disc. Make sure safety!

After replacing brake lining, check brake fluid level if is between MIN and MAX.

Disassembly/Reassembly and Maintenance of Front Brake and Brake Caliper

1. Structural Diagram of System



Structural Diagram of Front Brake Assy

(1) Brake Disc
(2) Dust Cover
(3) Wheel Hub Bearing Unit
(4) Caliper Assy
(5) Friction Lining
(6) Steering Knuckle

2. Preparation

Tools: ratchet wheel, lug bar, 13#, 14#, 16#, 18#, 19#, 32# sleeves, 10#, 13#, 14#, 16# box wrenches, vice, torque spanner, surveying rod.
Accessories: brake fluid

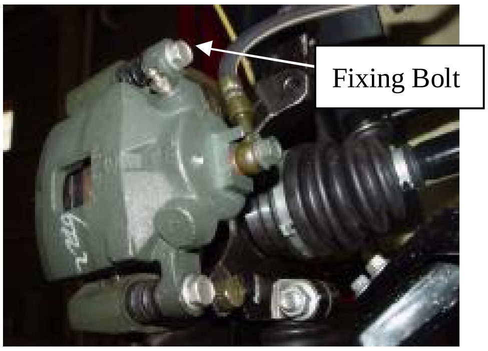
3. Precautions

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 The brake fluid is noxious. If it contacts your skin or eye(s) by careless, please use a lot of clean water to wash the skin or eye(s), and go to see a doctor in time, if necessary.
3.3 Waste brake fluid shall be put in vessels. DO NOT pour the fluid into the sewage system or store the fluid together with the domestic wastes.
3.4 DO NOT step on the brake pedal and move the vehicle during the disassembly/reassembly operation.
3.5 DO NOT make the friction lining or friction disc stained with the oil/fluid which may reduce the braking effeciency.

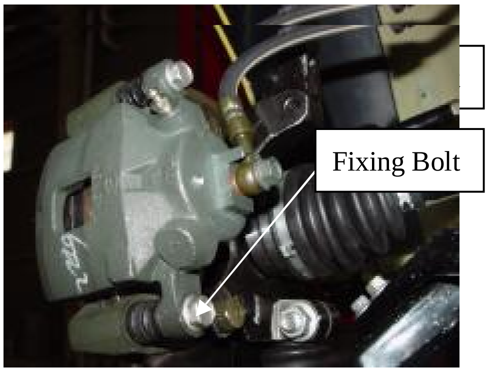
4. Removal and Maintenance

4.1 Remove the tightening nuts from tire with a 19# torque spanner or attached wrench, and the take off the tire.
Torque: 110±10N.m.

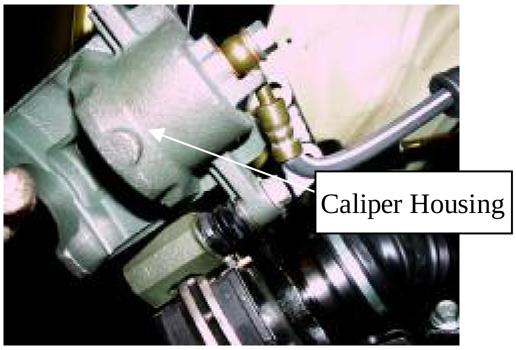
4.2 **(Check the thickness of friction lining)** Unscrew the fixing bolt as shown in the picture with a 14# torque spanner and a sleeve.
Torque: 22-23N.m.



4.3 Unscew the fixing bolt as shown in the picture with a 14# torque spanner and a sleeve.

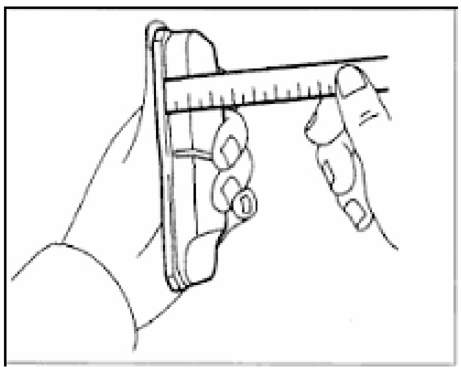


4.4 Unscrew the brake caliper housing.

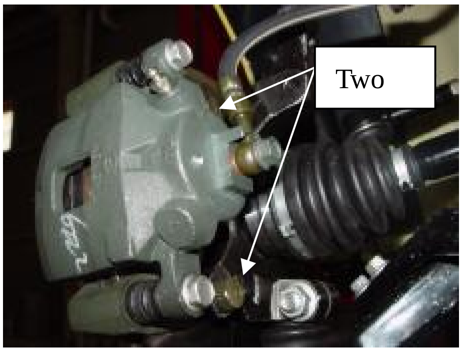


4.5 Take off two friction linings.

4.6 Measure the thickness of friction lining. If the thickness is below 3 mm, **please replace it in time, and the lining shall be replaced in pairs.**

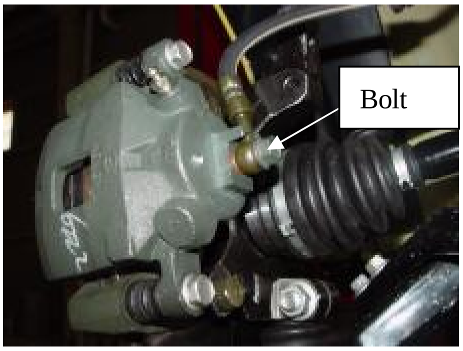


4.7 **(Maintenance of brake wheel cylinder)** Unscrew two fixing bolts as shown in the picture below with a 18# torque spanner and a sleeve.
Torque: 74-91 N.m



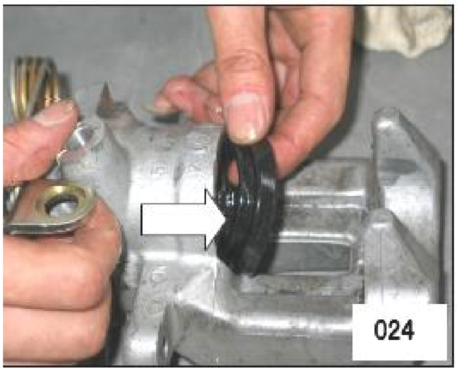
4.8 Unscrew the bolt as shown in the picture below with a 13# torque spanner, and then take off the caliper assy.

CAUTION: The brake fluid is noxious. DO NOT splash the brake fluid to your cloth or skin when the brake hose was removed

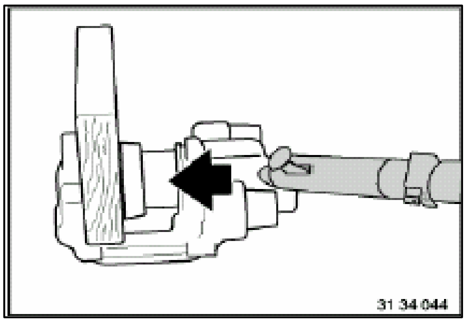


4.9 Detach the caliper assy with a 14# spanner.

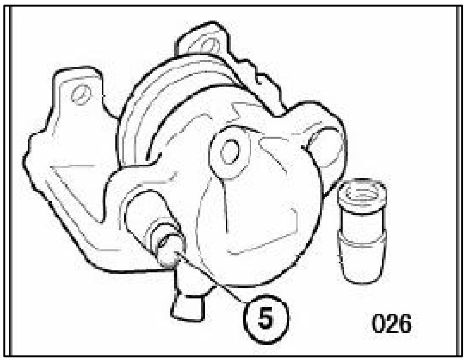
4.10 Remove the dustproof seal and check the damage of dustproof seal. If necessary, replace it. Clean the contact surface of brake piston and apply a thin layer of muffler paste. Attention that the dustproof seal is NOT allowable to contact the muffler paste because it may make the seal swell.



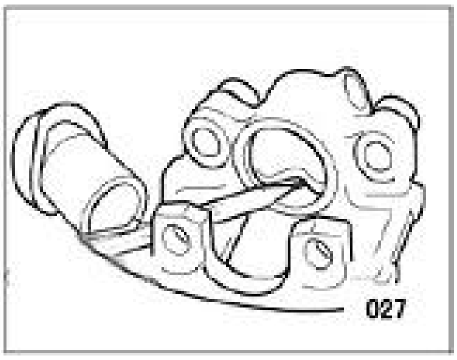
4.11 Remove the piston. Prepare a wood plate applicable to block the piston, and place the plate into the position between the piston and caliper wall. Carefully press out the piston via the connecting hole with the compressed air. Place a protective plate (hard wood, etc) into the notch of brake caliper to protect the piston.
CAUTION: DO NOT hole the piston with your fingers—Clamped Hazard! It is unallowable to remove the caliper piston as desired. It can be removed and reinstalled only by profeesionals or under the dirctions of professionals.



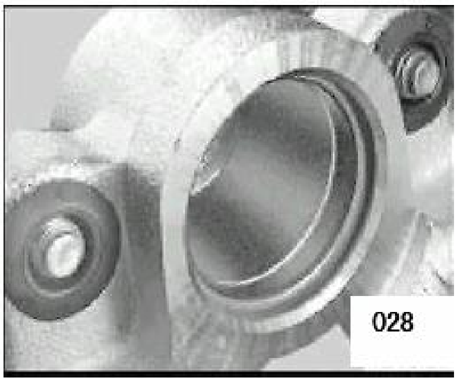
4.12 Check the guide sleeve. Push the guide sleeve by hand, and the sleeve shall move flexibly and freely. If clamped or inflexible, replace it. Attention that lubricating grease shall be applied on the guide sleeve when reassembling.



4.13 Carefully remove the seal ring with a plastic needle, and clean the brake cylinder and parts with alcohol. And dry them with the compressed air. Carefully check the brake cylinder, piston and flange surface. It is unallowable to machine the brake cylinder and piston.



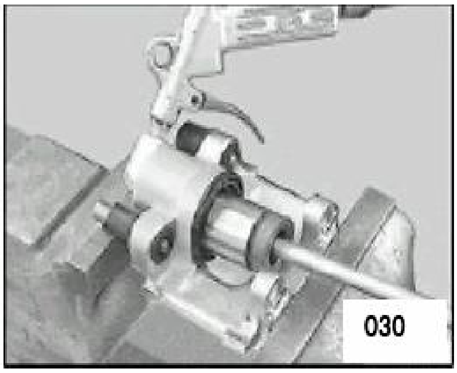
4.14 **(Installation of brake wheel cylinder)** Apply a thin layer of brake cyliner paste on the cylinder body, plunger and seal collar. Install the seal ring into the ring groove at the rear of brake cyliner. Install the dustproof seal into the front ring groove, and press it completely into the groove.



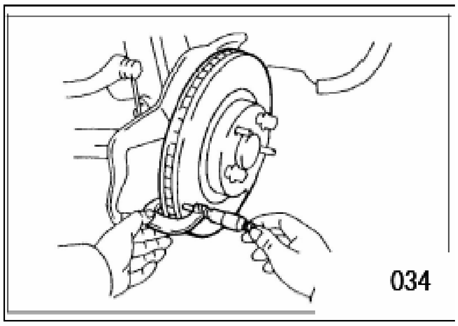
4.15 Keep the area between dustproof seal and caliper housing dry. DO NOT contact the brake cylinder paste or brake fluid in order to ensure the proper position of dustproof seal.

4.16 Secure the brake piston with the reinforcement parts which is sold in market, and slightly press it to the dustproof seal. Apply the compressed air (max. 3.0Bar) to blow the dustproof seal, and then cover the piston with a ring.

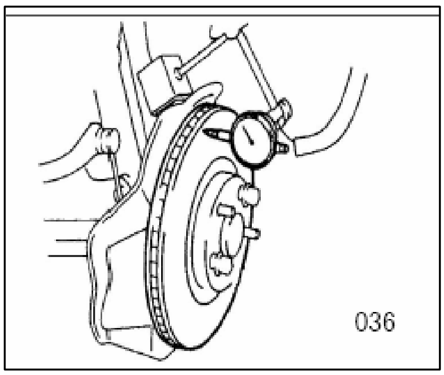
CAUTION: IMMERSE THE DUSTPROOF SEAL AND PISTON WITH THE BRAKE FLUID TO MAKE THE SEAL MORE EASILY THROUGH.



4.17**(Brake disc check)** Check the thickness of brake disc. If below the min. thickness, replace it. CAUTION: Replace two brake discs on the same axle at the same time. Replace the friction lining at the same time when replacing it with a new brake disc.



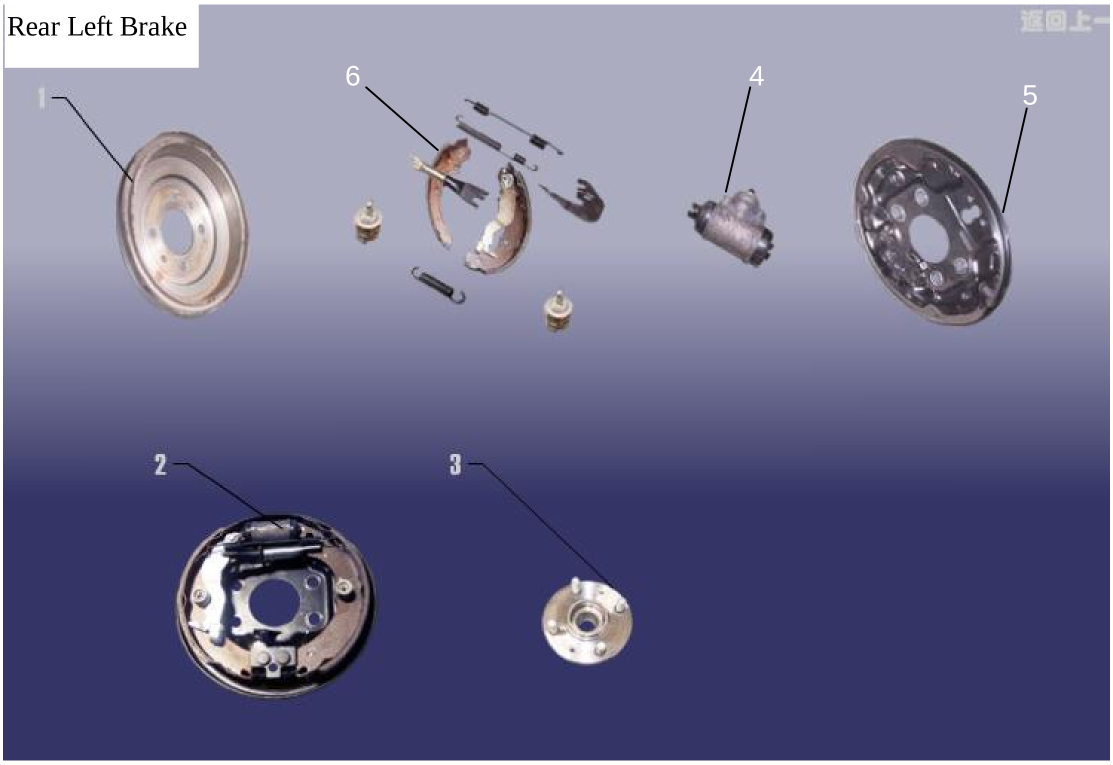
4.18 Check the max brake disc face circular runout with a dial gauge. If the runout exceeds 0.03 mm, please replace it. (Also machine the disc to satisfy the max circular runout under the premise of ensurance of brake disc thickness.)



4.19 Install the other parts according to *Removal Step*.

III. Disassembly, Reassembly and Maintenance of Rear Brake

1. Structural Diagram of System



Structural Diagram of Rear Brake Assy

(1) Brake Drum
(2) Rear Brake Assy
(3) Wheel Hub Bearing Unit
(4) Brake Wheel Cylinder
(5) Dust Cover
(6) Rear Brake Shoe

2. Preparation

Tools:
ratchet wheel, lug bar, 10#, 19#, 32# sleeve, 10# box wrench,
vice, torque spanner, right-angled screwdriver.
Accessories: brake fluid

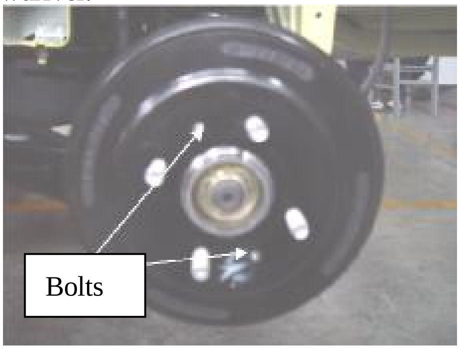
3. Precautions

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 The brake fluid is noxious. If it contacts your skin or eye(s) by careless, please use a lot of clean water to wash the skin or eye(s), and go to see a doctor in time, if necessary.
3.3 Waste brake fluid shall be put in vessels. DO NOT pour the fluid into the sewage system or store the fluid together with the domestic wastes.

3.4 DO NOT step on the brake pedal and move the vehicle during the disassembly/reassembly operation.
3.5 DO NOT make the friction lining or friction disc stained with the oil/fluid which may reduce the braking effeciency.

4. Removal Step

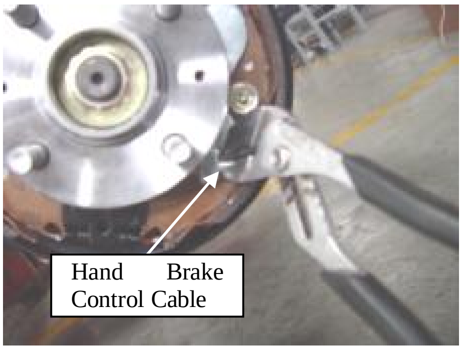
4.1 Remove the rear wheel (refer to the Removal Step for front wheel).
4.2 Remove two brake drum locating bolts with a cross screwdriver.



4.3 Swing the brake drum, and take off it.

4.4 Observe the structure of rear brake.

4.5 Remove the hand brake control cable with a caliper.



4.6 Remove the upper return spring with a caliper.

4.7 Remove the lower return spring with a caliper.

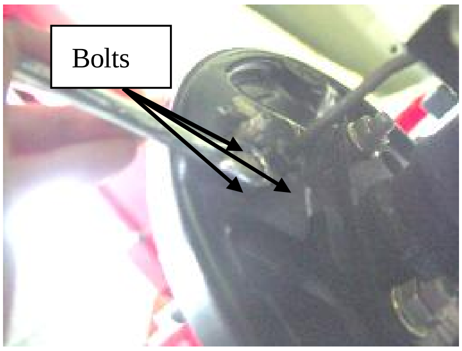
4.8 Press down the brake shoe locating bar spring leaf by both hands (with glove) and turn it 90° in clockwise or anticlockwise direction, and then remove two brake shoe locating bars.

4.8 Take off two brake shoes.

4.9 Detach the spring and disassemble the brake shoes.

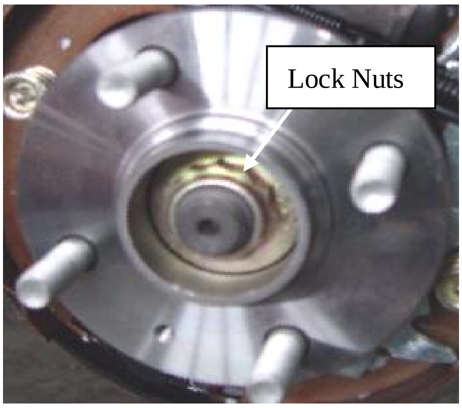
4.10 If the rear brake is found too tight during driving, adjust the length of push rod: Turn it in the cloclwise direction to eliminate the friction.

4.11 Remove three bolts as shown in the picture wit a 10# box wrench.



1.12 Take off the brake wheel cylinder, and detach and check whether it is in good condition.

4.13 If it is necessary to check the brake drum bearing, remove the lock nuts as shown in the picture with a 32# sleeve and a torque spanner, and take off the brake drum bearing.
Torque: 250±10 N.m

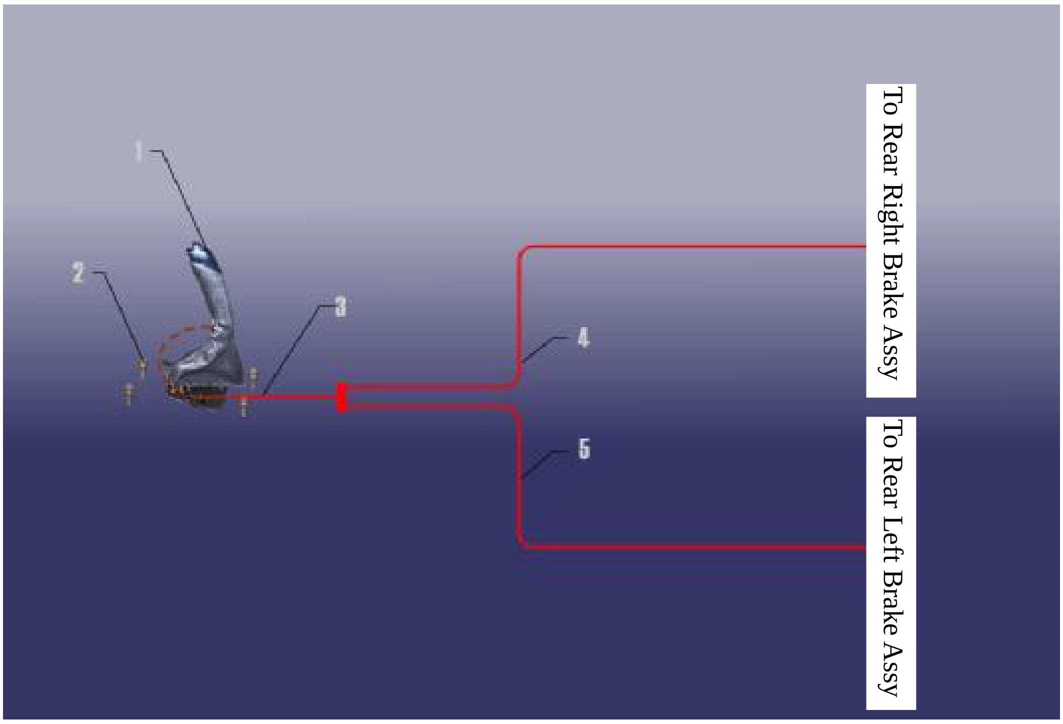


5. Installation Step

Refer to *Removal Step*.

IV. Adjustment and Replacement of Hand Brake

1. System Composition Diagram



1. Handle 2. Fixing Bolt 3. Control Cable 4. 5. Rear Right/Left Wheel Control Cable

2. Preparation

Tools: ratchet wheel, lug bar, 10#, 13#, 14#, 16# sleeve, 10#,
13#, 14# box wrench, vice, torque spanner, right-angled screwdriver.

3. Precautions

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 When carrying out disassembly and assembly of elastic element, avoid the bounce that will cause injury.
3.3 If the hand brake is removed or reinstalled near the exhaust pipe, wait for a period of time until the temperature of exhaust pipe falls down to the normal value so as to avoid the injury.

4. Removal/Installation Step

4.1 Refer to the removal/installation step of rear brake, and loosen the hand brake control cable.

4.2 Remove the bolt here from the hand brake control cable fixed support with a 13# box wrench.

4.3 Remove the other bolts from the hand brake control cable fixed support with a 10# box wrench or a 10# socket wrench.

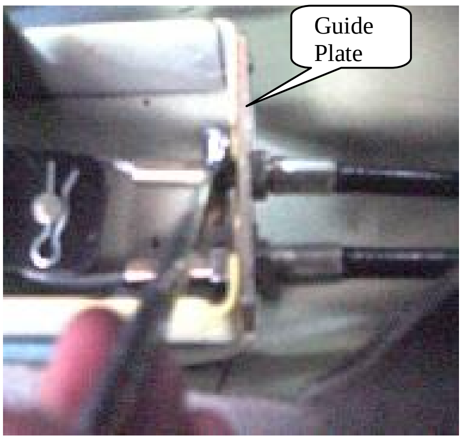
4.4 Remove the hand brake control cable at the other side with the same method.

4.5 Remove two fixing bolts from the driver’s seat with a 16# socket wrench, and then take off the seat.

4. 6 Remove all fix screws from the auxiliary instrument panel assy with a cross screwdriver, and then take off the auxiliary instrument panel assy.

4.7 Remove two hand brake fixing bolts as shown in the picture with a 10# socket wrench.

4.8 Loosen two control cable fixing screws with a 14# box Wrench, and then take off the guide plate.

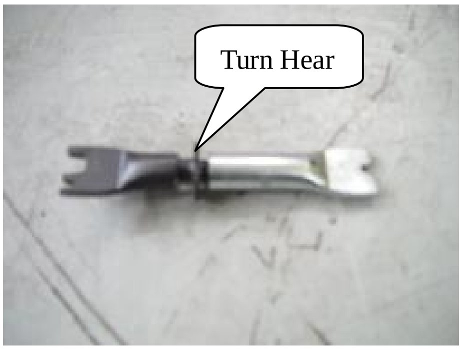


4.9 Remove the pin clip with a screwdriver

4.10 Take off the control cable take-up pulley.

4.11 Draw out the hand brake control cable from the bottom of vehicle body.

4.11 **(Adjustement of hand brake)** The design length of this vehicle's hand brake control cable is fixed. Refer to the rear brake removal step for the adjustment of hand brake. Adjusting the length of jogger (loosening it in clockwire direction; tightening it in anticlockwise direction) can implement the adjustment of hand brake.



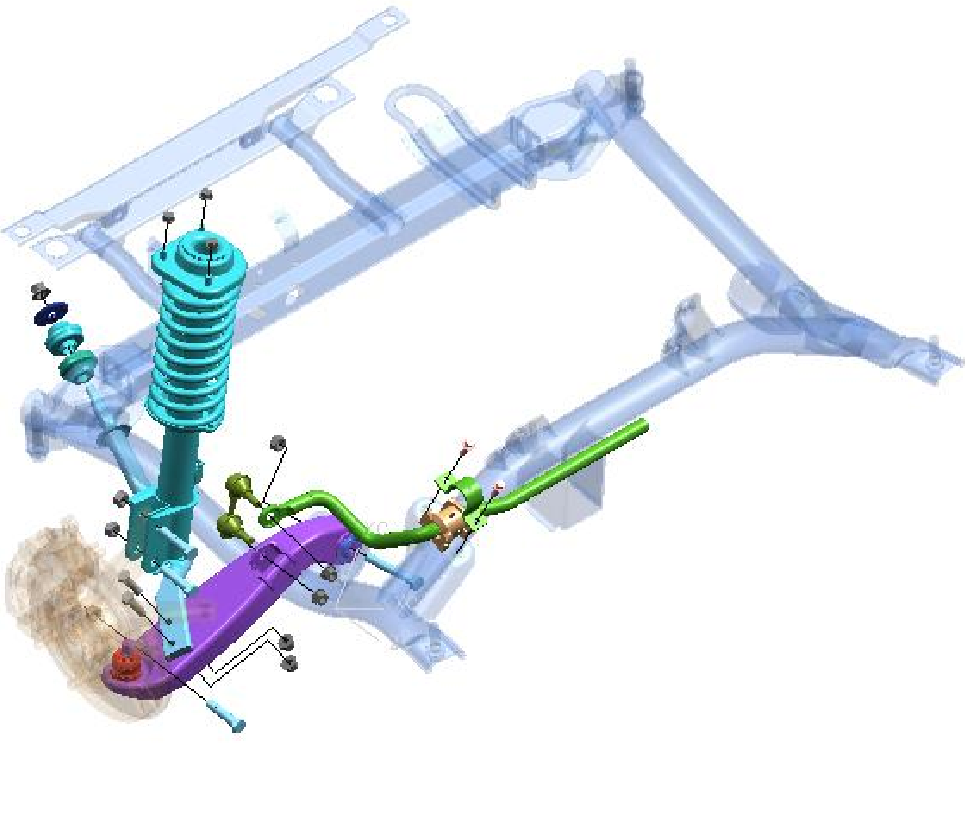
4.12 Refer to the removel step for the installation step.

Chapter 2 Adjustment of Suspension System and Four-Wheel Alignment System

I. Disassembly, Reassembly and Maintenance of Front Axle and Suspension System

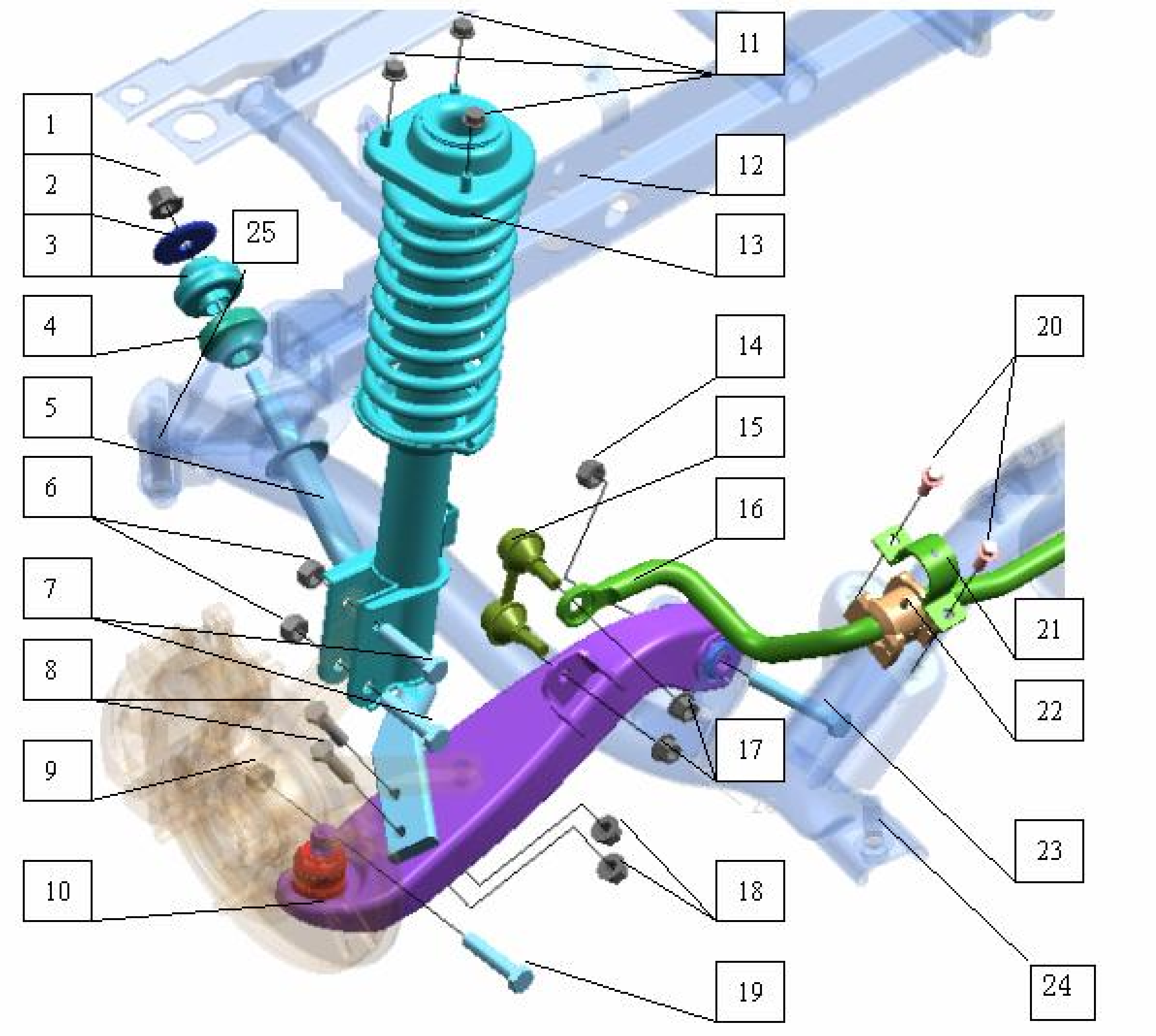
1. Structural Diagram of System

The CHERY S21 car adopts the divided steering drive axle, with a McPherson independent suspension. The upper of the suspension connects to the body while the lower to the subframe. The McPherson independent suspension bears the drive and steering functions. Subframe connects with vehicle body via elastic element, which improves diving stability and ride comfortability.



Structural diagram of Front Axle and Suspension System

Details of Front Axle and Suspension System Composition Diagram



1	Nut	9	Nut	17	Nut
2	Gasket	10	Left Control Arm	18	Nut
3	Rubber joint I	10	Right Control Arm	19	Bolt
4	Rubber joint II	11	Nut	20	Bolt
5	Left Push Rod Welding Assy	12	Subframe	21	Clamp
5	Right Push Rod Welding Assy	13	Front Strut Assy.	22	Rubber Bush
6	Nut	14	Nut	23	Bolt
7	Bolt	15	Front Connecting Rod Assy.	24	Bolt
8	Bolt	16	Front Stabilizer Bar	25	Bolt

2. Preparation

Tools: 8#, 15#, 18#, 19# sleeves; 10#, 13#, 15# wrenches.

3. Precautions

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 Please attention whether the safety lock of lifter is locked when maintaining the chassis.
3.3 When carry out disassembly and assembly to shock absorber spring, prevent spring ejection from being injured.
3.4 It is unallowable to weld and correct the load-carrying parts of wheel suspension and the guide parts of wheel.
3.5 Update the locknut and rusty nuts when the chassis parts are removed, which the objective is to ensure the safety.

4. Removal/Installation Step

4.1. Removal of shock absorber assy

4.1.1 Remove the tightening nuts from the tires with a 19# sleeve or attached wrench, and then remove the tires (Left side as an example).
Torque: 110±10N.m

4.1.2 Take off the ABS harness from the fixed seat by hand.

4.1.3 Remove the fixing bolts from the steering knuckle and shock absorber with a 18# sleeve.
Torque: 110±10 N.m

4.1.4 Remove three fixing bolts to the frame from the shock absorber assy with a 15# sleeve.
Torque: 60±5N.m

4.1.5 Remove the shock absorber assy.

4.2. Removal of control arm assy

4.2.1 Remove the fixing bolts to the control arm from the front connecting rod assy with a 15# sleeve.
Torque: 100±10 N.m

4.2.2 Remove the connecting bolts of front push bar and control arm with a 15# wrench.
Torque: 75±5 N.m

4.2.3 Remove the ball bolts from the control arm and steering universal joint assy with a 18# sleeve.
Torque: 100±10N.m

4.2.4 Remove the connecting bolts from the control arm and front axle with a 18# sleeve, and then take off the control arm assy.
Torque: 150±10 N.m

4.3. Removal of front axle

4.3.1 Remove the fixing bolts from the mud guard of chassis with a 8# sleeve, and then take off the mud guard assy.
Torque: 3±0.5 N.m

4.3.2 Remove the front bracket bolts to the subframe from the transmission with a 19# sleeve.
Torque: 110±10N.m

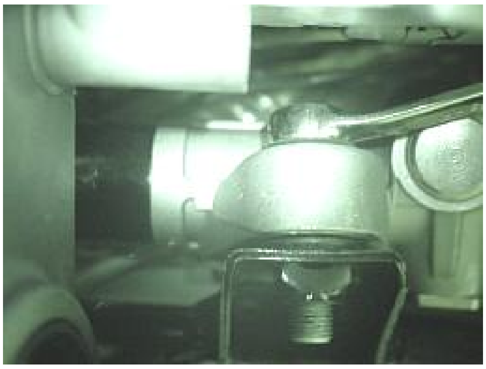
4.3.3 Remove the rear bracket bolts to the subframe from the transmission with a 19# sleeve.
Torque: 110±10N.m

4.3.4 Remove two connecting bolts from the exhaust manifold with a 15# sleeve.
Torque: 50±5Nm.

4.3.5 Remove two connecting bolts used to connect the exhaust manifold and rear muffler with a 15# sleeve.
Torque: 50±5Nm.

4.3.6 Remove the fixing bolts from the right side of power assist steering wheel with a 15# wrench.
Torque: 75±5 N.m

4.3.7 Remove the fixing bolts from the left side of power assist steering wheel with a 15# wrench.
Torque: 75±5 N.m



4.3.8 Remove the fixing bolts used to connect the push bar and subframe with a 19# sleeve.
Torque: 105±10 N.m

4.3.9 Remove the fixed support from A/C pipeline on the subframe with a 10# wrench.
Torque: 25±2.5 N.m

4.3.10 Remove the fixed support from the condenser and subframe with a 13# wrench.
Torque: 45±5 N.m

.

4.3.11 Remove four nuts used to connect the subframe and body with a 18# sleeve, and then take off the front axle assy.
Torque: 150±10 N.m

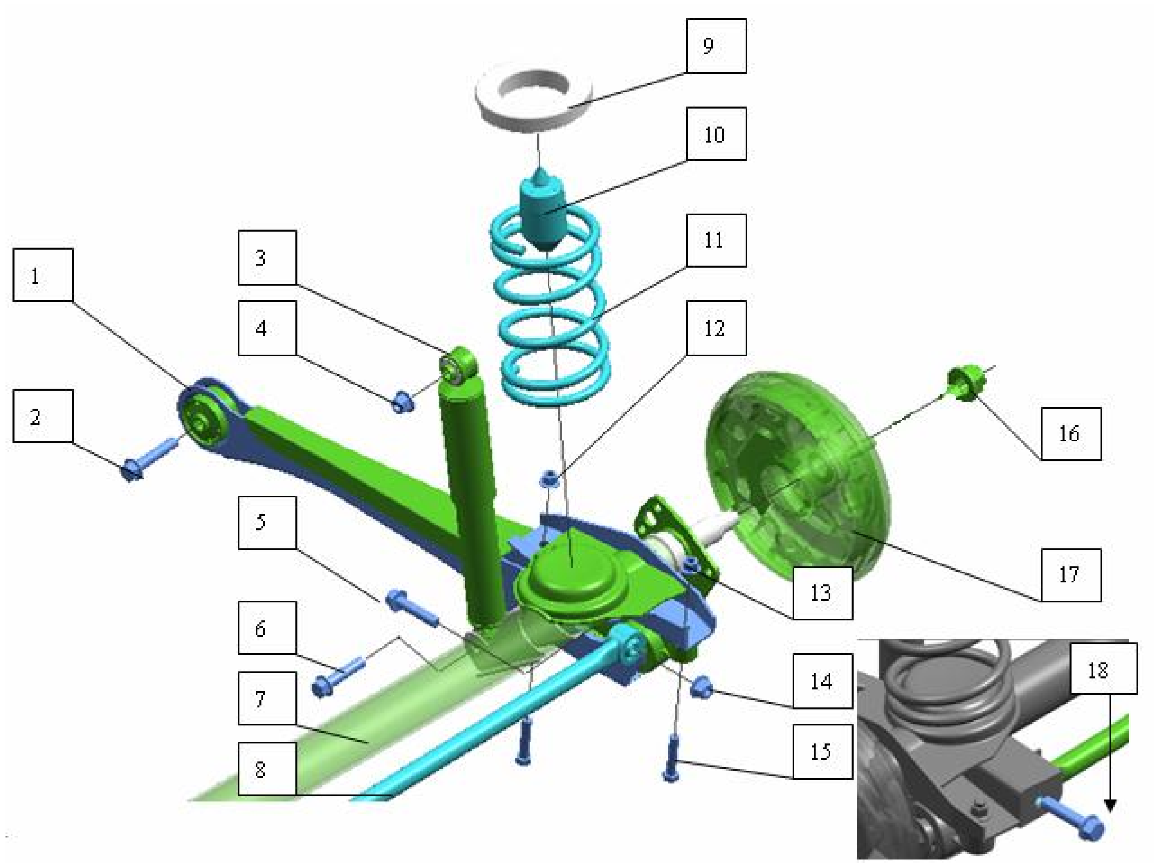
4.3.12 Remove the fixing bolts and nuts from gum cover of stabilizer rod with a 13# sleeve.
Torque: 50±5Nm.

5. Installation Step

Refer to *Removal Step of Front Axle and Front Suspension System*.

II. Disassembly, Reassembly and Maintenance of Rear Axle and Suspension System

1. Structural Diagram of System



1	Rear Trailing Arm Assy	7	Rear Shaft Welding Assy	13	Nut
2	Bolt	8	Lateral Support Bar Assy	14	Nut
3	Rear Shock Absorber Assy	9	Rear Spring Cushion	15	Bolt
4	Nut	10	Rear Bumper Block	16	Lock Nut
5	Bolt	11	Rear Coil Spring	17	Rear Brake With Drum Assy
6	Bolt	12	Nut	18	Bolt

Structural diagram of Rear Axle and Suspension System

2. Preparation

Tools: 11#, 13#, 15#, 18#, 19#, 30# sleeve; right-angled screwdriver;
pincers.

3. Precautions.

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 Please attention whether the safety lock of lifter is locked when maintaining the chassis.
3.3 When carry out disassembly and assembly to shock absorber spring, prevent spring ejection from being injured.

4. Removal/Installation Step

4.1. Removal of shock absorber assy and absorber spring

4.1.1 Remove the tightening nuts from the tires with a 19# torque spanner or attached wrench, and then take off the tires (left side as an example).
Torque: 110±10N.m

4.1.2 Remove the connecting bolts from the shock absorber assy and rear axle with a 15# sleeve.
Torque: 100±10 N.m

4.1.3 Remove the connecting bolts of the shock absorber assy and body with a 18# non-adjustable wrench, and then take off the shock absorber assy.
Torque: 100±10 N.m

4.1.4 Unclench the rear helical spring with a screwdriver.

4.1.5 Forcefully swing leftwards and rightwards the rear bumper block by hand and then take off the block.

4.2. Removal of lateral support bar assy

4.2.1 Remove the connecting bolts from the left side of body and lateral support bar with a 15# sleeve.
Torque: 100±10N.m

4.2.2 Remove the connecting bolts from the right side of body and lateral support bar with a 15# sleeve, and then take off the lateral support bar assy.
Torque: 100±10N.m

4.3. Removal of rear trailing arm assy

4.3.1 Remove the connecting bolts from the rear of rear axle and trailing arm assy with a 13# sleeve.
Torque: 100±10N.m

4.3.2 Remove the connecting bolts from the intermediate of rear axle and trailing arm assy with a 13# sleeve.
Torque: 100±10N.m

4.3.3 Remove the connecting bolts from the trailing arm and body with a 15# wrench, and then take off the rear trailing arm assy.
Torque: 100±10N.m

4.4. Removal of rear axle assy

4.4.1 Remove the connecting bolts from the brake pipeline and rear axle with a 11# wrench. Attention to storage of brake fluid.
Torque: 45±5 N.m

4.4.2 Remove the rear brake with drum assy by hand.

4.4.3 Remove the hand brake control cable with a plier.

4.4.4 Remove the lock nuts from the rear brake with drum assywith a 30# combination sleeve, and then take off the rear brake with drum assy.
Torque: 180±10N.m

4.4.5 Remove the rear axle assy.

5. Installation Step

The installation step is reverse to that of removal.

III. Adjustment of Four-Wheel Alignment System

Please check and adjust the parameters with the help of the four-wheel alignment system recommended by the CHERY Automobile Co.. Ltd.

S21 standard four-wheel alignment system parameters:

Item		Parameter	
Model		SQR7130S21	SQR7110S21
Front Wheel	Front Wheel Camber Angle	0.87°±50′	0.87°±50′
	Kingpin Caster Angle	3.4°±30′	3.4°±30′
	Kingpin Inclination Angle	12.7°	12.7°
	Front Wheel Toe-In	6′±6′	6′±6′
Rear Wheel	Rear Wheel Camber Angle	0°±30′	0°±30′
	Rear Wheel Toe-In	0°±10′	0°±10′
Sideslip		≤ 3m/km	≤ 3m/km

1. Adjustment of Front Wheel Toe-In

The toe-in can be adjusted using an optical tester or a mechanical toe-in regulator.

1.1 On the basis of requirement of the tester, position the wheels and conduct the preparation work before adjusting.

1.2 Loosen the lock nut and of the elastic protective sleeve snap ring right steering tie bar. Turn the toe-in regulator lever as required to regulate the length until it reaches the specified value; and the toe-in value: 6′±6′.

1.3 Tighten the lock nut, reinstall the elastic snap ring of protective sleeve, and then check whether the lock nut is tightened and whether the position of protective sleeve is proper;

Torque: 35±3Nm

1.4 After adjusting toe-in of front wheel, check whether the steering wheel is horizontal.

Otherwise, loosen the lock nut of steering wheel, regulate the steering wheel to the horizontal position, and then tighten the steering wheel lock nut to the specified torque.

2. Adjustment of Front Wheel Camber Angle

2.1 In the normal case, after the independent suspension and wheel steering knuckle are assembled, it is unnecessary to adjust the camber angle. If the wheel camber angle is found deviated from the tolerance range due to the other causes, apply the connecting bolts of independent suspension and steering knuckle to correct the camber angle.:

Front wheel camber angle: 0.87°±50′

2.2 Before correction, check (visually) whether the parts of running system is damaged, and repalce the damaged parts;

2.3 If the front wheel camber angle is found out of the tolerance range, loosen the connecting bolts of front shock absorber and steering knuckle, and move the wheel to correct the angle.

3. Adjustment of Kingpin caster and inclination angles

The Kingpin caster and inclination angles are guaranteed by the design structure, without adjustment in service. The Kingpin caster angle: 3.4°±30′, Kingpin inclination angle: 12.7°. If any parameter exceeds the specified range, replace thesteering knuckle only.

4. Adjustment of rear wheel positional parameters

All of the rear wheel alignment parameters shall be guaranteed through design process.
4.1 Rear wheel camber angle: 0°±30′
4.2 Rear wheel toe-in: 0°±10′
4.3 If the rear wheel alignment parameters change due to the deformation of rear axle which is subject to the very big impact force, and these parameters exceed the specified range, correct or replace the rear axle only.

IV. Installation of Tire and Regulation of Air Pressure

1. Assembly of Tire Valve

Prior to the assembly of tire valve, firstly check the valve port to ensure whether it is smooth and free from burr, and then apply glycerol on the rubber body surface, or soak the tire valve into glycerol. Pull or press using special tools with 200 - 400N to make the locating ring of the valve can go through the wheel holes, to this point, the assembly is completed (soap water is allowed to substitute glycerol).

2. Assembly of Tire

Before assembly of the tire, apply glycerol or soap water along the cycle of tire bead, meanwhile, note that:
2.1 If the wheel rim has the dot marks, align the uniformity testing marks with the dot marks of the wheel rim.
2.2 When without dot marks on the wheel rim, align the dynamic balance testing mark of tire to valve position.
2.3 When without dot marks on the wheel rim, additionally, there is no dynamic balance testing mark, however, static balance testing mark is available, align the valve to the static balance testing mark.
2.4 The description concerning the uniformity, dynamic balance and static balance testing marks

for tires will be additionally provided in written forms by product division of Chery Company or suppliers, and indicated on process sheet.

2.5 Carry out tire inflation strictly in accordance with specified pressure. During inflating process, air pressure shall not exceed 10% of rated pressure. When performing separate packaging to spare wheel assembly, the rated inflation pressure shall be 3.0 bar, and the spare wheel assembly shall be stored separately from four wheels. Before the four-wheel alignment work, check the air pressure of tires of four wheels and regulate the pressure: 2.3 bar for front wheel, and 2.1bar for rear wheel.

3. Tire Inflation

After completion of tire inflation, screw up the protective cap of valve, and then carry out dynamic balancing test. Fit appropriate balance weight at the internal and external fringe of wheel rim as required. It is required that the unbalancedness of the final assembly shall be less than 100 g·cm, which is approximately equivalent to a 5g balance weight at the internal and external fringe of wheel rim. Note: each wheel and each side can use only one balance weight. Additionally, its maximum mass shall not be more than 70g. During assembling process, never hit the balance weight too heavy. Otherwise, replace balance weight in time. In addition, never use the replaced balance weight again.

4. Installation of Wheel and Tire Assy

When install wheel and tire assy, firstly, manually screw up the wheel bolt onto the hub for pretension, then use special tools for tightening in accordance with diagonal process. Tightening torque shall be 110±10N.m. It is prohibited to use impact wrench to cause wheel damage, over loose or over tight. It is not allowed to apply grease on wheel bolt. (For the newly-installed wheel and tire assy, after the initial mileage of 100 km, tighten the wheel bolts once to ensure the tightening torque. Checking the tightening torque of wheel bolts is one of routine maintenance.)

5. Method to Tighten the Wheel Nut

Tighten the fixing nut in a decussate way, the tightening force shall be approximately equal, then wheel shall be able to turn freely. When carry out final tightening, the wheel shall be on the ground.

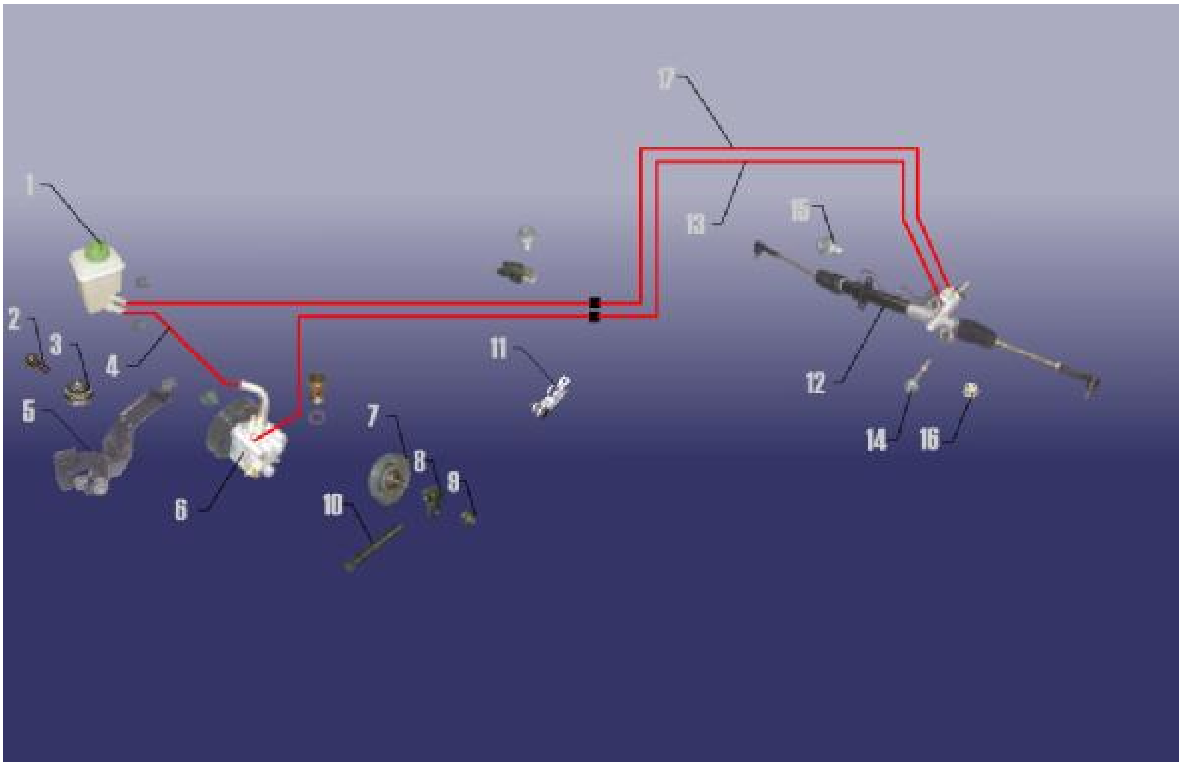
6. Installation of Trim Cover

Install trim cover or place trim cover as required. When fitting clip- type trim cover, place knock in position by hand or via rubber tools.

Chapter 3 Disassembly/Reassembly and Maintenance of Steering System

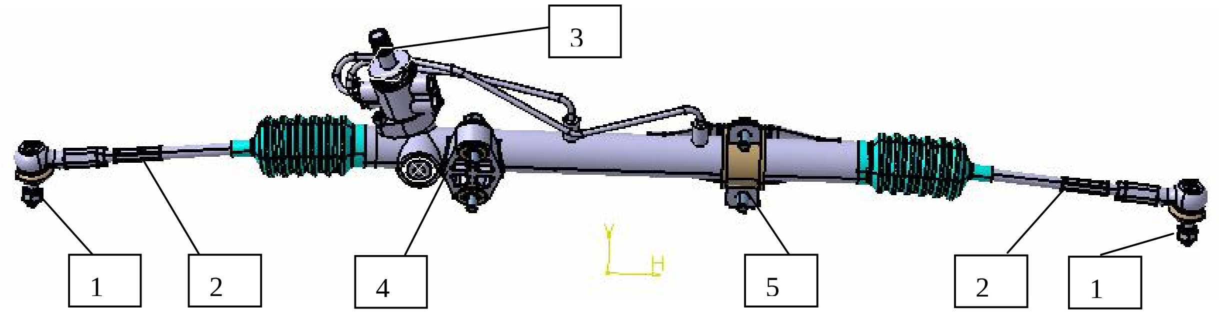
I. Removal/Installation of Steering Wheel

1. System Composition Diagram



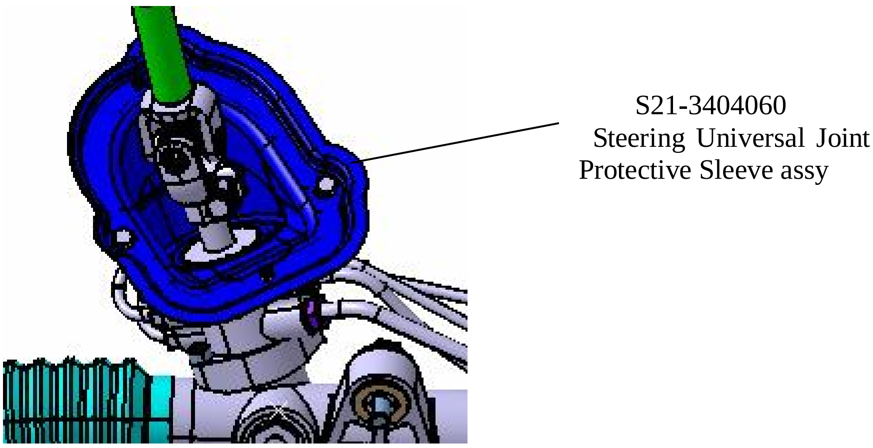
1. Power Assist Steering Fluid Reservoir	2. Support Fixing Bolt
3. Support Fixing Nut	4. Oil Output Pipeline
5. Fluid Reservoir Fixed Support	6. Steering Pump
7. Tensioner Pulley	8. Lock Nut
9. Adjusting Nut	10. Adjusting Bar
11. Pipe Clamp	12. Steering Wheel
13. Oil Output Pipe	14. 15. Fixing Bolt
16. Fixing Nut	17. Oil Return Pipe

2. Decomposition Diagram of Steering Wheel



1-Lock Nut 2-Lateral Tie Bar 3-Input Shaft 4-Left Installation Support 5--Right Installation Support

3. Schematic Diagram of Steering Universal Joint and Protective Sleeve



2. Preparation

Tools: 15#, 19# socket wrenches , 13#, 18# non-adjustable wrenches.
Accessories: power steering fluid

3. Precautions

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 Avoid steering fluid to contact with skin or eyes when disassembling steering system.

4. Removal/Installation Step

4.1 Remove the fixing bolts from the right and left sides of steering ball pin with a 19# sleeve.
Torque: 40±5 N.m

4.2 Loosen the fixing bolts from the lower of power assist steering oil pipe with a 18# non-adjustable wrench.
Torque: 25±5 N.m

4.3 Loosen the fixing bolts from the upper of power assist steering oil pipe with a 13# non-adjustable wrench.
Torque: 25±5 N.m

4.4 Remove the fixing bolts and nuts from the upper of right support of the power assist steering wheel with a 15# sleeve.
Torque: 100±10 N.m

4.5 Remove the fixing bolts and nuts from the lower of right support of the power assist steering wheel with a 15# sleeve.
Torque: 100±10 N.m

4.6 Remove the fixing bolts and nuts from the upper of left support of the power assist steering wheel with a 15# sleeve. Torque: 100±10 N.m

4.7 Remove the fixing bolts and nuts from the lower of left support of the power assist steering wheel with a 15# sleeve. Torque: 100±10 N.m

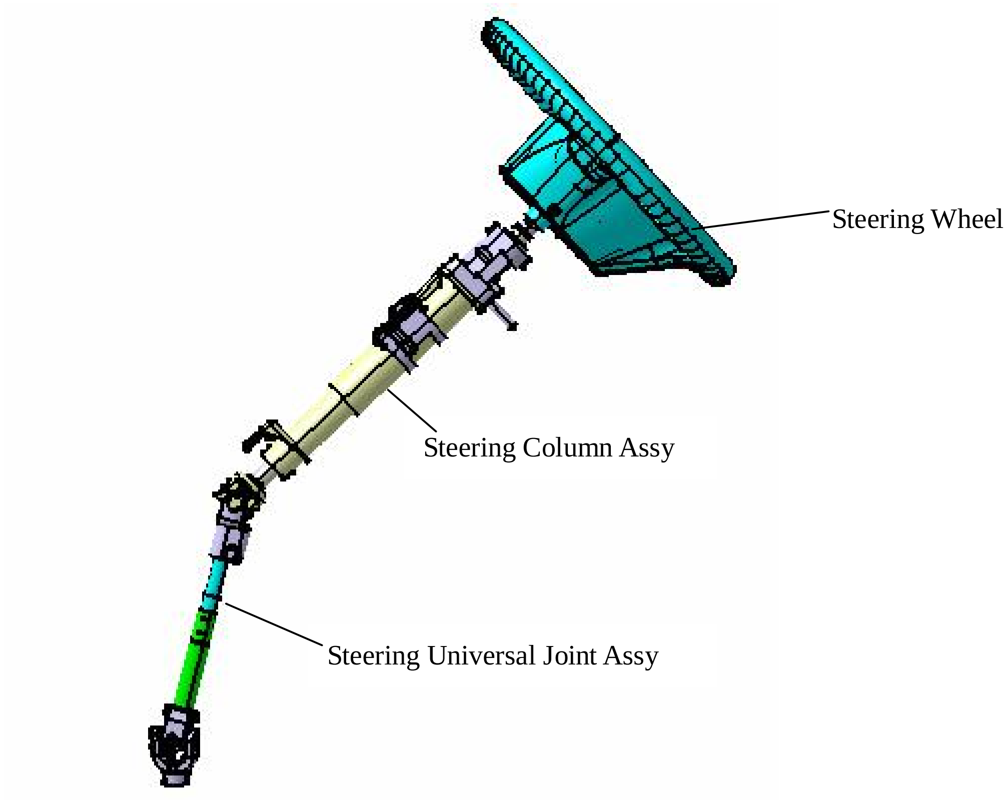
4.8 Remove the fixing bolts from the steering universal joint by hand. Then remove the steering wheel assy.

5. Installation Step

Refer to *Removal Step*.

II. Removal/Installation of Steering Column

1. System Composition Diagram



1- Steering Wheel   2- Steering Column Assy   3- Steering Universal Joint Assy

2. Preparation

Tools: Flat head screwdriver, cross screwdriver, 5# allen wrench, 8#, 10#, 13#, 22# socket wrenches.

3. Precautions

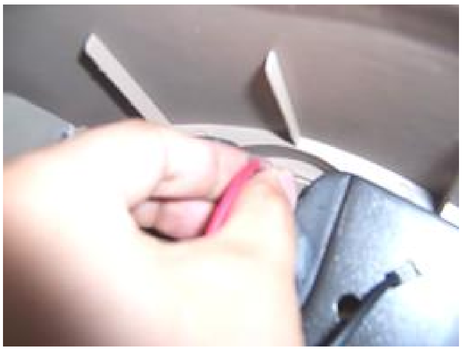
3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 Avoid steering fluid to contact with skin or eyes when disassembling steering system.
3.3 Before the removal of the steering wheel, disconnect the negative of battery first to avoid the explosion of air bag.

4. Removal Step

4.1 Take off the horn hood of steering wheel by hand.

4.2 Pull out the connector of horn wire behind the horn hood by hand.

4.3 Pull out the connectors of horn wire and steering wheel mount by hand.



4.4 Remove the fixing nut from the steering wheel with 21# sleeve.
Torque: 35±3 N.m

4.5 Take off the steering wheel by both hands.

4.6 Remove the five fixing bolts from the protective cover of combination switch with a cross screwdriver.
Torque: 1.5±0.5Nm

4.7 Remove the four fixing bolts from the combination switch with a cross screwdriver.
Torque: 1.5±0.5Nm

4.8 Pull out the connectors of ignition switch and combination switch.

4.9 Pull out the connector of combination switch.

4.10 Pull out the connector of combination switch.

4.11 Take off the combination switch by both hands.

4.12 Pull out the connector of ignition switch.

4.13 Remove the ignition lock body assy with an allen wrench.
Torque: 25±3 Nm

4.14 Remove the two upper fixing nuts from steering column with 13# sleeve.
Torque: 25±3 Nm

4.15 Remove the two lower fixing nuts from the steering column with a 13# sleeve.
Torque: 25±3 Nm

4.16 Remove the connecting nuts of the steering column and steering universal joint with a 13# sleeve, and then remove the steering column assy.
Torque: 25±3 Nm

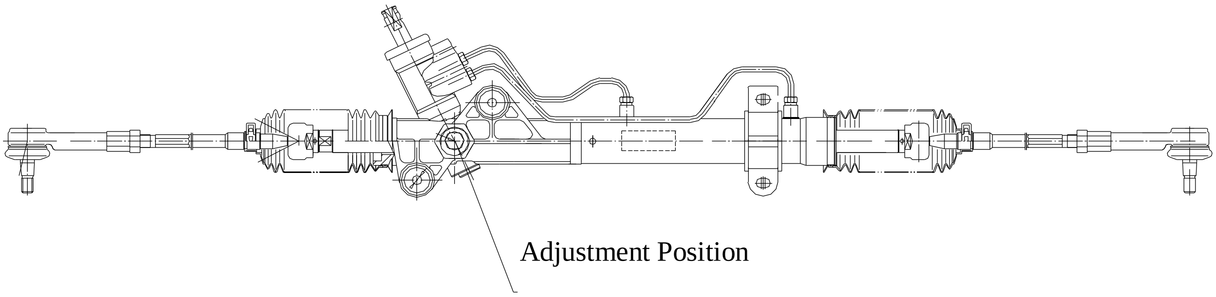
4.17 Take off the connecting bolts from the steering universal joint and steering wheel. Take out the steering universal joint assy.

5. Installation Step

Refer to Removal Step.

III. Adjustment of Clearance of Steering System

1. Maintain vehicle wheel at straight line traveling position;
2. Turn the steering wheel towards the both sides;
3. If heard steering gear noise, adjust the bolt position as shown in the figure until no impinging noise is heard while turning steering wheel;
4. Tighten up the bolt for another 1/8 circle (about 45º);
5. Road test;
6. If the steering mechanism can not return to the central position by itself, then loosen the bolt for 15º;
7. Road test.



IV. Adjustment of Power Steering System

1. Correctly connect power steering oil pipe, where the tightening torque for the connector of steering gear with oil return pipe, high-pressure oil pipe should be 35±3N.m, and the tightening torque of hollow bolt connecting high-pressure oil pipe and power steering pump shall be 45±3N.m. When filling power steering oil, it is recommended to use special purpose vacuum pumping oil. The specifications for filling power steering hydraulic fluid and exhaustion are shown as below:

Fill power steering hydraulic fluid into steering reservoir assy to the maximum level, start engine at low speed (idle speed) to drive the steering pump, the steering system will be quickly full of hydraulic fluid. In the oil filling process, only let engine run at idle speed to drive vane pump. Meanwhile, continuously add hydraulic fluid to prevent vane from sucking air due to oil level drops.

2. When hydraulic fluid in the oil tank presents emulsification state, or the pump emits excessive noise (under normal condition, max. noise shall be 80 db), it must carry out exhaustion process. The exhaustion procedure is described as below:

Jack the front part of the vehicle till two front wheels are hung up, start the engine, turn the steering wheel to right and left till reach limit position (caution: after come to the limit position, try not to stop, even if stop, never maintain over 2 seconds). Repeat above action for several times, until the air in the system is gradually exhausted from the oil reservoir. In this process, with the drop of oil level, continuously supplement hydraulic fluid until the oil comes to specified level.

3. Regularly check and adjust the tension of power steering belt: vertically apply a 100N force at the middle of the belt, the max. deflection of belt shall be less than 5 mm, otherwise adjust the belt tension until meet the above requirement via adjusting tension bolt.

4. When in operation, it is prohibited to turn the steering wheel to limit position, even if it has to do so, never maintain at this position over 10 seconds. It is strictly prohibited to use power steering pump without oil. If the driver suddenly feels the steering heavy in operation, immediately stop the vehicle to make removal and repair accordingly.

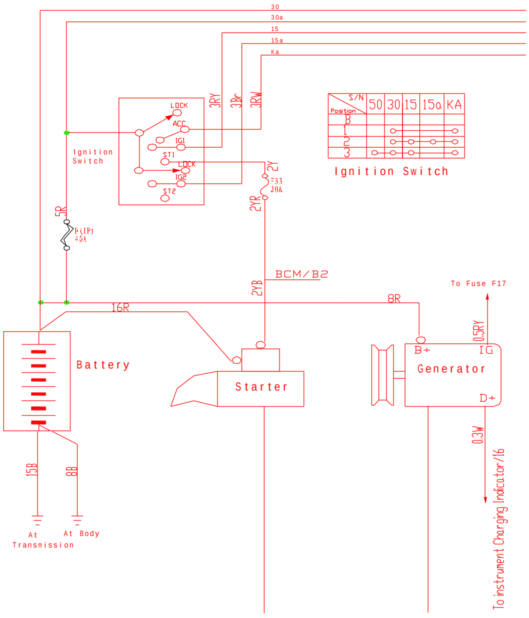
Service Manual for Chery QQ6

(Electrical, Circuit)

After Sales Service Department of Chery Automobile Sales Co., Ltd

Chapter One Control Principle of Some Systems

I. Control Principle of Starting System



1. Starting System

When the ignition switch is turned to ST position, the pull-in winding of the starter powers on, and then the starting gear of stater motor is pushed to and engaged with the gear of flywheel. At the same time, when the gears engage, the contact on the pull-in winding works and connects the power supply from the battery to the starter motor so as to turn the motor and start up the engine. When the ignition key returns back to the IG position, the holding coil of the starter powers off, and under the action of spring force of the gear the motor disengages from the flywheel and the flywheel of starter motor disconnects at the same time. The starting signal is transmitted to BCM at the same time. The BCM utilizes the starting signal to determine that the system is in the starting condition. In this case, the BCM will stop the action of motor of window glass regulator so as to ensure that there is electric engergy enough to be supplied to starter motor.

2. Charging System

When the ignition switch is in IG position, the power supply from the ignition switch F17 is used to excite the generator so as to ensure that it can generate electric power during the generator is operating. When the generator itself can generate electric power, the system will switch to the self-excitation mode. In addition, when the generator is generating electric power, it gives a signal to the relevant instrument via the D+ terminal. After the instrument receive the signal from the generator, the battery indicator on the instrument will be extinguished.

3. Troubleshooting and Elimination

3.1. The starter not operate, low power output or its fuse burnout

Not operate: When the key is in starting position, if the sound of action of pull-in winding can be heard while the motor doesn't operate, this may be caused due to the battery no power output, contact in pull-in winding failure or starter ground poor.
Low power output: The starter can operate while with low power output. The cause may be low power output of battery, or high resistance of engine mechanical parts.
Fuse burnout: If the fuse burns out frequently when starting, it may be caused due to the starter ground poor, wire connection poor or starter interior and engine interior resistance overhigh.

3.2. Generator not work or low power output

Generator not work: Generator's not working may make an influence on many systems, and also result that the battery is used out rapidly. The cause to result the generator doesn't work may be the exciting circuit work poor, and also may be the rotor, carbon brush or rectification regulator inside generator failure. Of course, the generator is now unallowable to be repaired. If the trouble is caused due to the generator problem, please replace the generator assy..

Power output low or overhigh: When the generator's power output is low, it may result that the system voltage is low and many systems fail to work normally. For the vehicle equipped with ABS system, the ABS system is very sensitive to the power output of generator. In case that the power output is low, the system immediately changes to the failure mode. The main cause to result the low power output may be the reguator inside the generator work poor or generator's belt loose and etc. The power output overhigh generally means that the voltage is overhigh, which easily damages the electical devices. This is a very dangerous failure which may result the electrical harness catches a fire. The generator voltage overhigh is mainly caused due to the regulating circuit inside the generator work poor.

II. BCM Control

1. Ceiling Lamp Control

- When any door opens, the ceiling lamp lights automatically, and then extighuishes 15 minutes later after the door opens.
- The ignition switch is placed to OFF position, and, 8s later after all four doors close, the ceiling lamp gradually extinguishes, with duration of 2s.
- During the ceiling lamp delays 8s, if the ignition switch changes OFF position to ON position, the ceiling lamp extinguishes immediately.
- If the ignition switch is in ON position and all four doors close, after any door opens and then closes, the ceiling lamp immediately extinguishes without time delay.
- When all four doors close and the ceiling lamp lights, press down the LOCK button on the remote controller and then the lamp immediately extinguishes.
- Press the UNLOCK button once, then the ceiling lamp lights and keeps lighting for 8s, and the lamp extinguishes slowly within the subsequent 2 s.

Note: When the switch of ceiling lamp is placed to the controlled position, the ceiling lamp control function is available.

2. Window Glass UP/DOWN Function

- The electric window control is allowable only when the ignition switch is in ON position, or only within 1 minute after the ignition key changes from ON to OFF, otherwise, the electric window control is prohibited.
- Temporarily stop the lifting of window glass when starting
- Automatic/manual control

  Manual control UP: If the driver-side door or passenger-side door window UP switch is pulled up, the window will be driven by a motor and lift.

  Note: Without the automatic window lift function, only with the manual lift function).

  Automatic/manual DOWN: If the switch input time t < 300 ms, the window will aumatically fall down. When t is greater than or equal to 300 ms, the window will manually fall down.
- Press the LOCK pushbutton for 2s every time to remote control the lifting of window glass, and releasae the pushbutton to stop the lifting of window glass.

3. Central Door Lock

- The front left door key independently control the unlocking/locking of the central door lock.

- The door lock and window glass regulator can't act at the same time, and the former is preferred if conflict.
- Automatic door lock control (pre-reserved signal, suitable for the speed locking of vehicle equipped with air bag and the unlocking after the air bag explodes).

4. Anti-theft Alarm System

4.1. Door lock remote control function

When the remote control key's UNLOCK/LOCK pushbutton is pressed down, the door lock motor will act 0.6 s ± 50 ms.

When the door unlocks, the right/left turn signal lamp flashes: 0.5s ± 50ms On; 0.5s ± 50ms Off; 0.5s ± 50ms On. And then it extinguishes.

When the door locks, the right/left turn signal lamp flashes: 0.5s ± 50ms.

4.2. Vehicle safety system has five modes:

- **Arming mode** – When a driver presses down the ALARM button, the vehicle is in arming condition.
- **Disarm mode** – The arming mode is removed by the driver.
- **Alarm mode** – When a invasion event is detected, the system may give an alarm (not give an alarm for the vehicle without the alarm horn).
- **Disalarm mode** – The driver returns back to the side of vehicle and turns off the alarm.
- **Arming failure mode** – The vehicle fails to successfully establish the arming condition.

4.3. Arming mode:

a) How to enter into the arming mode:

Condition: ① Four doors close; ② Front hood and rear trunck close.

Operation : Press down the "LOCK" button on the remote controller.

b) Representation when entering into the arming mode:

Before the body enters into the normal arming mode: ① the left/right turn signal lamp flashes once; ② the body anti-theft horn gives an alarm once (not give an alarm for the vehicle without the alarm horn).

c) Specific representation when the failure to enter into the arming mode:

When the failure to enter into the arming mode, the system will has the following representations: ① the left/right turn signal lamp continuously flashes twice; ② the body anti-theft horn doesn't give an alarm (not give an alarm for the vehicle without the alarm horn).

d) Body state after entering into the arming mod:

After the body enters into the normal arming mode: ① the four doors are locked; ② the arming indicator light continuously flashes; ③ if the ceiling lamp switch is in the controlled position and the ceiling lamp is in OPEN position, the ceiling lamp closes.

4.4. Disarm mode:

a) How to disarm:

Condition: The body is in the normal arming mode.

Operation: Press down the “UNLOCK” button on the remote controller.

b) Representation when disarming:

Before the body changes from the normal arming mode to the disarm mode: ① the left/right turn signal lamp continuously flashes twice; ② the body anti-theft horn continuously gives an alarm twice (not give an alarm for the vehicle without the alarm horn).

c) Body state after disarming:

After the body is disarmed: ① the four doors can be freely opened; ② the arming indicator light stops flashing; ③ the ceiling lamp automatically extinguishes within 8 s after it turns on.

(CAUTION: If no action on the body is implemented within 28 s after disarming, 28 s later, the body control module will automatically make the body enter again into the arming condition.

4.5. Alarm mode:

a) How to trigger the alarm mode:

Condition: The body is in the normal arming mode.

Operation: ① Enfocedly open any of four doors; ② enforcedly open front hood or trunk; ③ turn on the ignition switch.

b) Representation when entering the alarm mode:

After the body enters into the alarm mode: ① the left/right turn signal lamp continuously flashes for 28 s; ② the body anti-theft horn continuously give an alarm for 28 s; ③ after stopping alarming, 28 s later, if four door, front hood and trunk close and then open, the left/right turn signal lamp and the body anti-theft horn will be triggered for 28 s, and cycles; ④ if the door open or “ignition” state exists at all times, the alarm is given ten cycles and then stops, with the cycle interval of 2 s (not give an alarm for the vehicle without the alarm horn).

4.6. Disalarm mode

a) How to disalarm:

After the body enters into the alarm mode: ① press down any pushbutton on the remote controller.

b) Body state after disalarming:

1. If the triggered alarm door is in open state (not give an alarm for the vehicle without the alarm horn).

Press down the UNLOCK pushbutton on the remote controller to ① disalarm; ② unlock the central door lock.

Press down the LOCK pushbutton on the remote controller to ① disalarm; ②enable the arming to be failed.

2. If the triggered alarm door is in close state (not give an alarm for the vehicle without the alarm horn):

Press down the LOCK pushbutton on the remote controller to ① disalarm; ② disarm, and carry out the secondary arming after 28 s.

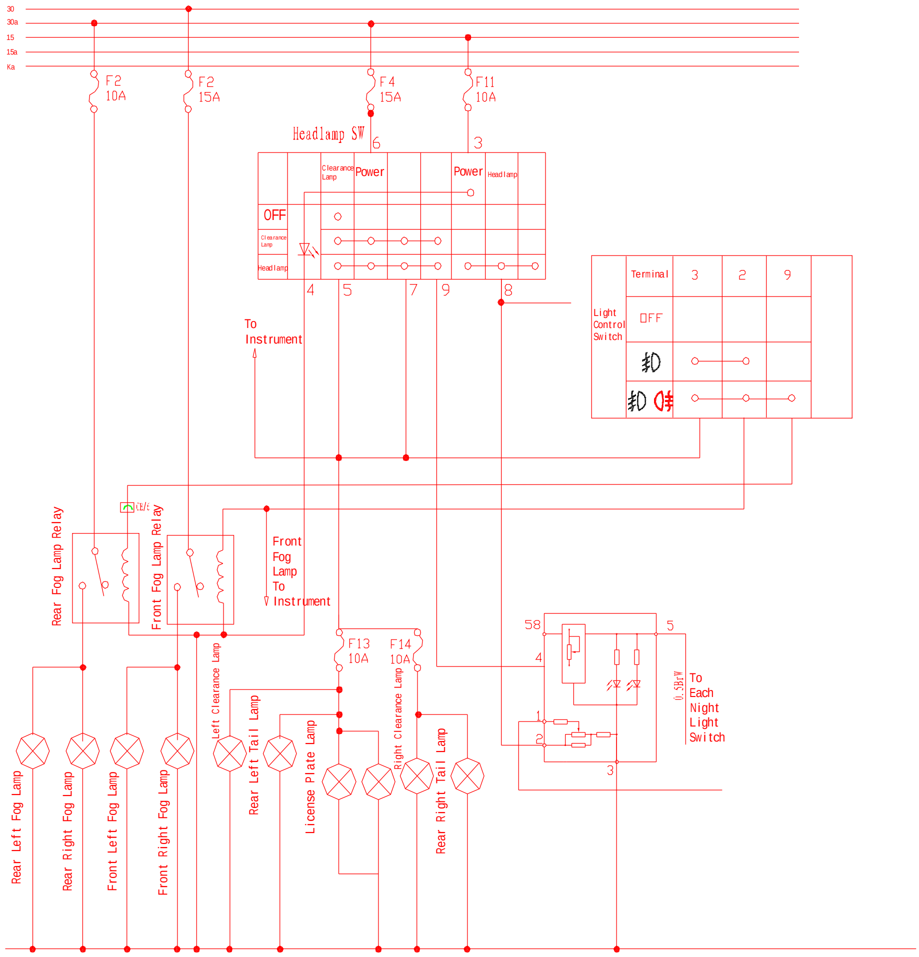
Press down the LOCK pushbutton on the remote controller to ① disalarm; ② enter into the arming mode.

4.7. Arming failure mode

a) If door, engine hood, trunk fail to close at the same time, pressing the Arm key can’t set up the arming condition:

After the failure of body arming: ① the left/right turn signal lamp lights.

III. Fog and Position Lamps Control



1. Principle of Fog Lamp Control

The fog lamp is controlled by the combination light switch which is used to control the open/close of the fog lamp relay. When the light switch is turned to the clearance lamp position, the electric power from the fuse F4 is supplied to the fog lamp switch via the angle 7#. When the fog lamp switch is in the front fog lamp position, the 3# terminal of the fog lamp switch is successfully connected to the 2# terminal to make the front fog lamp relay engaged and thus light up the front fog lamp. When the fog lamp switch is in the rear fog lamp position, all terminals 3#, 2# and 9# of the fog lamp switch turn on, and the rear fog lamp relay also engages. In this case, the front and rear fog lamps light at the same time. So, the principle of the fog lamp control is just to turn on the clearance lamp (position lamp) and then turn on the front fog lamp, and the rear fog lamp can be turned on only after the front fog lamp turns on (this is implemented using the switch).

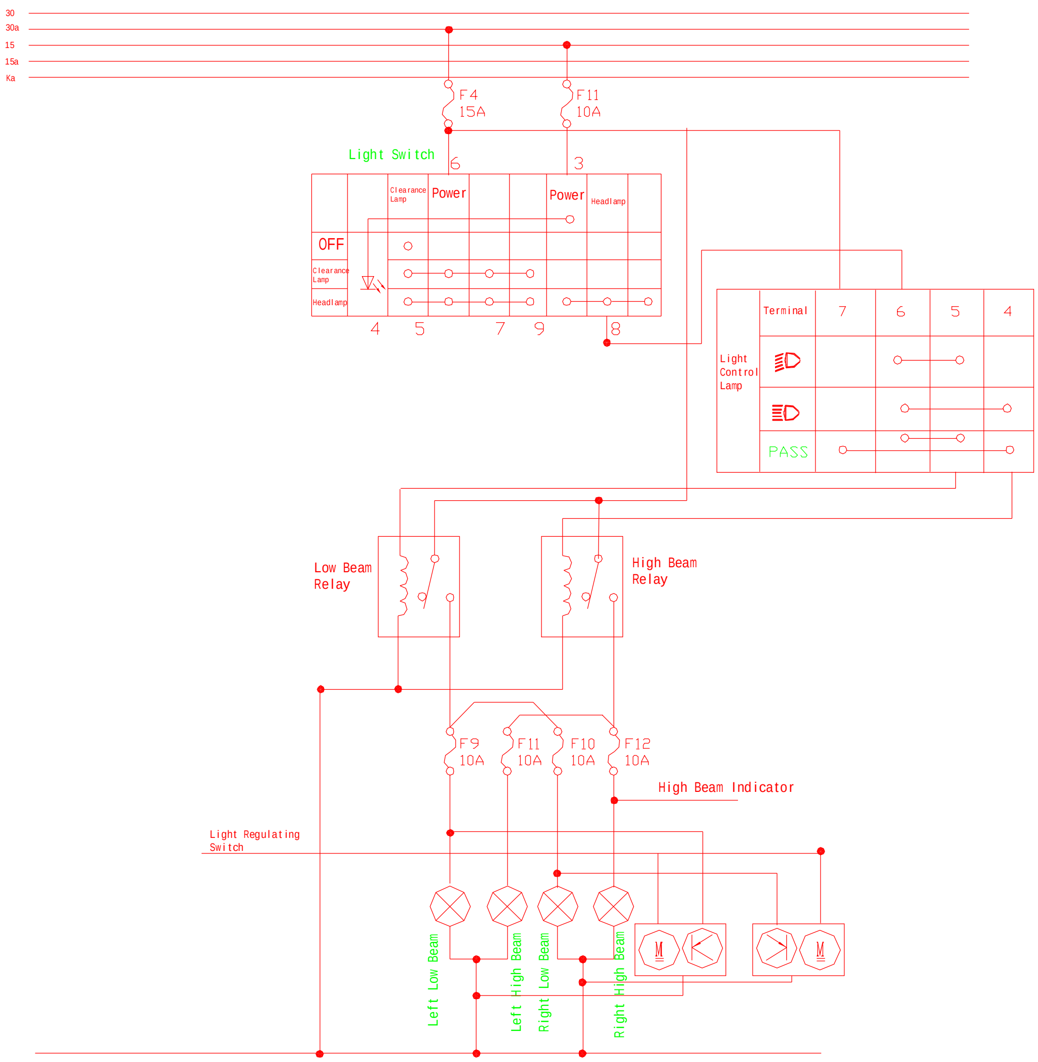
2. Principle of Clearance Lamp Control

The clearance lamp is controlled using a light switch. When the switch is in the clearance lamp position, the terminals 5# and 6# of the light switch will be turned on to make the power supply from the fuse F4 get to the clearance lamp via the angle 5#, and the front and rear clearance lamps connect to the fuses F13 and F14 respectively. In addition, the license plate lamp also lights.

3. Night Light and Electric Headlamp Control

When the light switch is in the clearance lamp position, the terminals 6# and 9# of the light switch are turned on, which supplies the electric power to the terminal 4# of the nightlight regulating switch and thus makes all nightlight circuit power on. Surely, the brightness is controlled by the regulation resistance mounted on the nightlight switch. When the light switch is in the headlamp position, the power supply from the fuse F11 is connected via the angles 3# and 8# of the headlamp switch which are used to supply the electric power to the electric switch and headlamp relay. In this case, the electric switch can employ its slide resistor to control the operation of electric motor. So, from the principles above, it can be concluded that the night light works only when the light switch is in the clearance lamp or headlamp position, and the electric headlamp can be adjustable only when the light switch is in the headlamp position.

IV. Headlamp Control



1. Principle of low beam lamp control

When the light switch is in the headlamp position, the terminal 8# of the light switch offers the light control switch's 6# terminal the electric power. When the light control switch is in the low beam position, the switch will turn on the terminals 6# and 5# to make the low beam relay close and thus light up the low beam lamp.

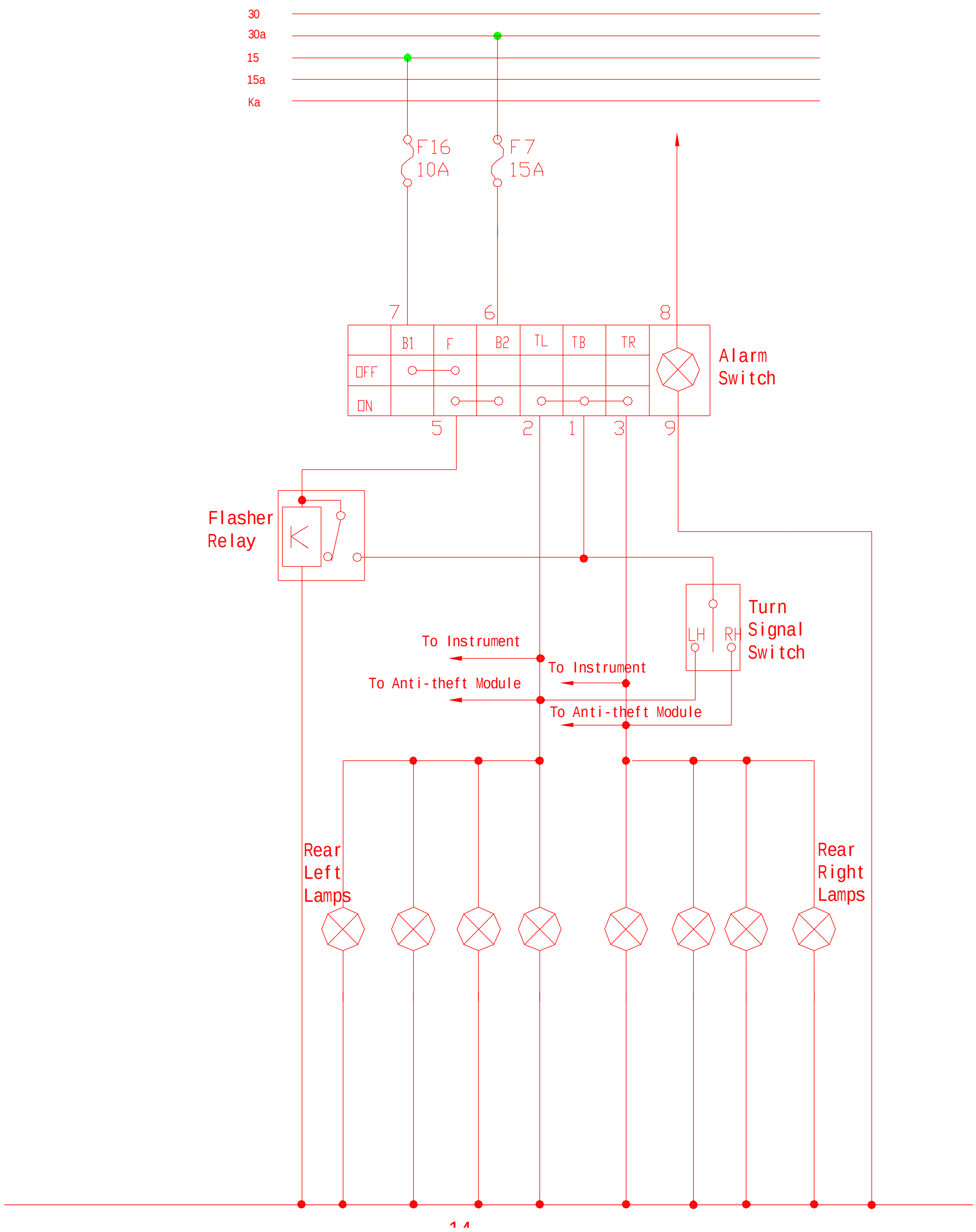
2. Principle of high beam lamp control

When the light control switch is in the headlamp position, the switch will connect the power supply from the terminal 8# of the light switch and the terminal 4# of light control switch, which makes the high beam relay close and thus lights up the high beam lamp.

3. Principle of the passing lamp control

When the light control switch is in PASS position (passing lamp position), the switch directly offers the high beam relay the electric power from the fuse F4, without via the light switch, which lights up the high beam lamp. So, it is unnecessary to open the light switch when the passing lamp is in service.

V. Turn Signal Lamp Control



1. Principle of turn signal lamp control

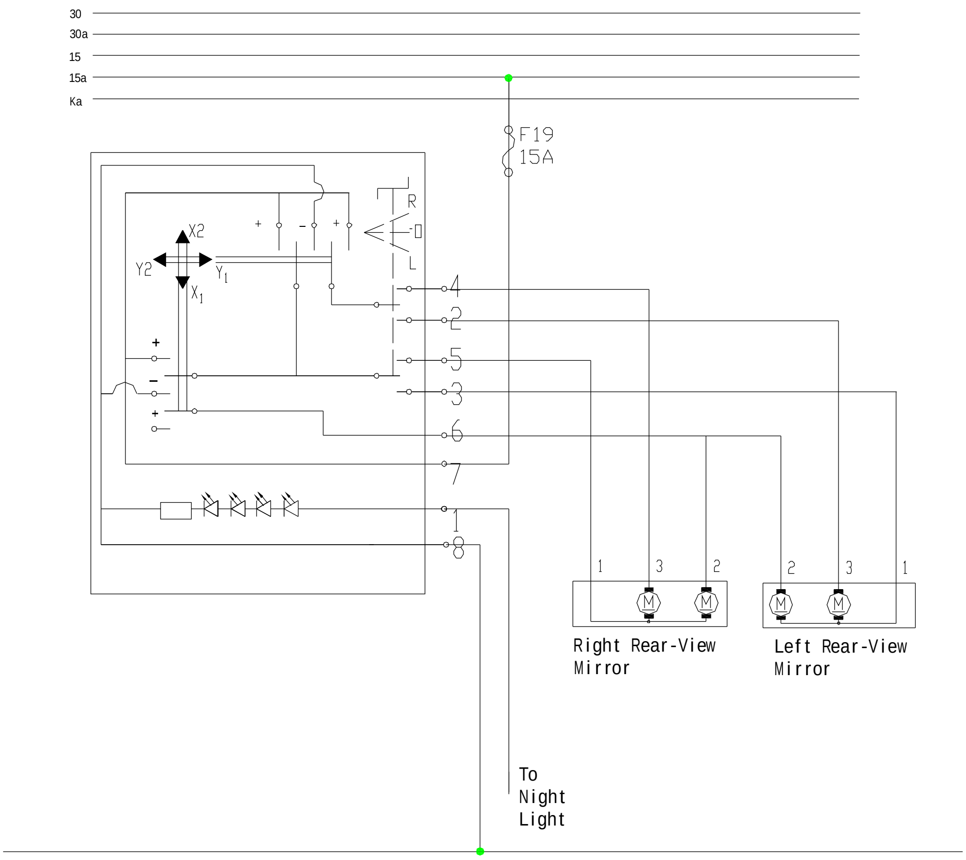
The turn signal lamp control is divided into three categories while the final control is implemented by the flasher relay.

Alarm switch control: The alarm switch has the power supply from the battery F7 fuse. So, it ensures that the switch can work in case that the ignition switch doesn't turn on. When the alarm switch is in ON position, the flasher relay is powered by the terminals 5# and 6# of the alarm switch. In this case, the emitter electrode of the relay will provide a intermittent voltage signal, and the terminals 1#, 2# and 3# of two alarm switches utilize this intermittent signal to turn on the turn signal lamp and make the turn signal lamp work.

Turn signal lamp control: When the alarm switch is out of service, the electric power of flasher relay base electrode is supplied from the terminal F16 of the ignition switch. In case that the turn signal lamp switch turns on the left or right circuit, the intermittent power supply from flasher relay will enable the corresponding turn signal lamp to work. So, the turn signal lamp control is just the direct switch control.

BCM control: For the sake of body anti-theft requirement, the turn signal lamp is required to work when remote control of arming and the elimination of anti-theft. So, BCM also controls the turn signal lamp. This control is not via the alarm and turn signal switches, and its intermittent signal is implemented with its internal circuit.

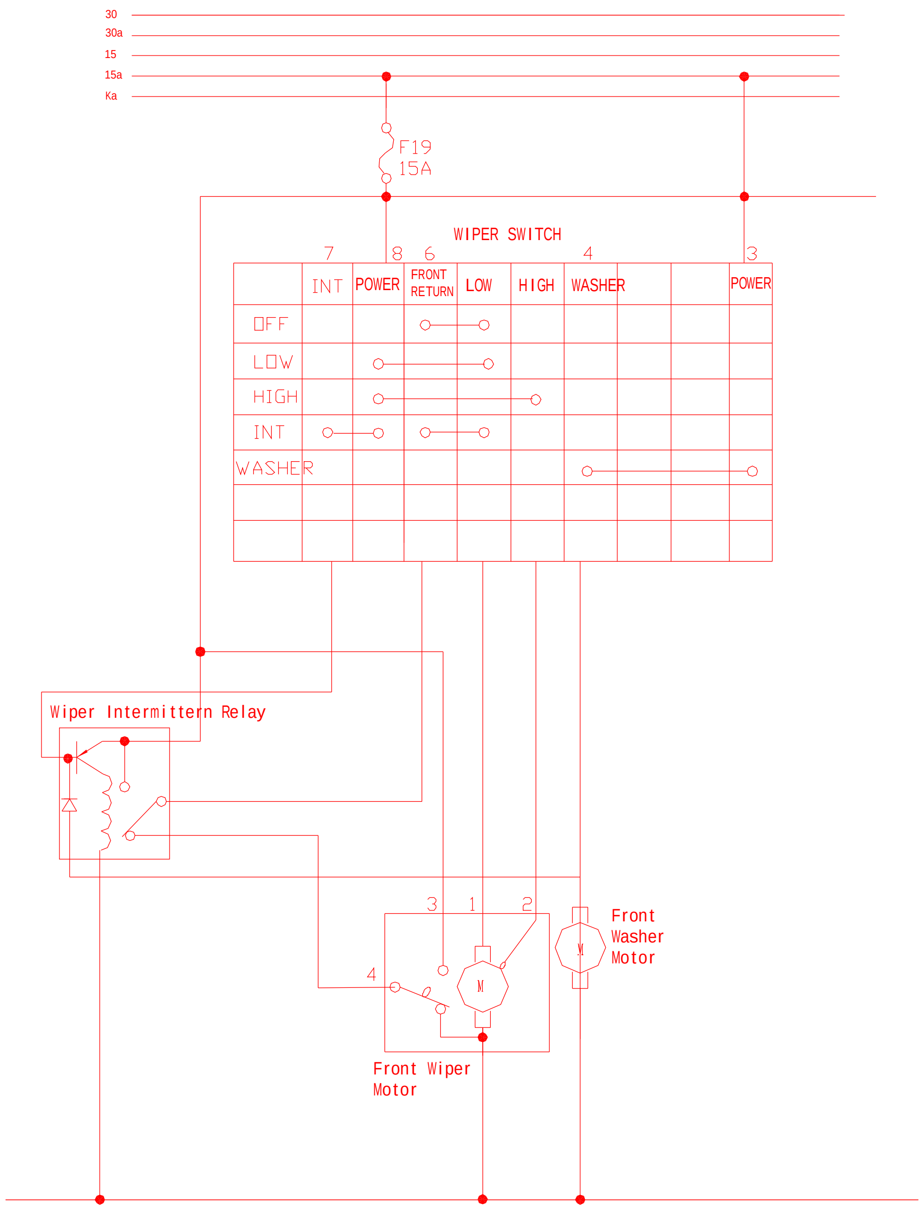
VI. Electric Rear-View Mirror



1. Control principle

The electric rear-view mirrorr is controlled by a switch, without any relay. When the L position is selected, the Nos 2 and 3 circuits form a loop respectively with the internal circuit of the switch. Take the Y1 direction as an example, when pushing the switch in the Y1 direction, the switch connects to the power supply from F19 while the power supply connects with the No 2 circuit (with Nos 2 and 3 circuits when the switch is in L position). So, the current flows across the motor, goes through No 3 circuit and then gets to the ground. Similarly, when the switch is in R position, the Nos 4 and 5 circuits connect to the corresponding circuit and form a loop.

VII. Wiper Motor Control



1. Control principle

This wiper system's control is a switch type one while the intermitten control adopts the intermitten relay. The wiper motor is grounded itself. When the switch is in the Low Speed position, the wiper switch is used to connect the power supply from F19 with the No 1 terminal of the wiper motor, and the wiper starts to operate at low speed. When the switch is in the High Speed position, the wiper switch is employed to connect the power supply from F19 with the No 2 terminal of wiper motor so as to enable the wiper motor to operate at high speed. When the switch is in the Intermittent posistion, the wiper switch is used to connect the power supply from F19 with the No 7 terminal of the switch, which offers the base electrode of triode of intermittent relay the power supply. The triode controls the internal switches to make the power supply of wiper motor 3 go through No 4 circuit and via the intermitten relay controlled switch and then get to the wiper switch 6. Then, through the low speed circuit, the wiper motor is intermittently controlled.

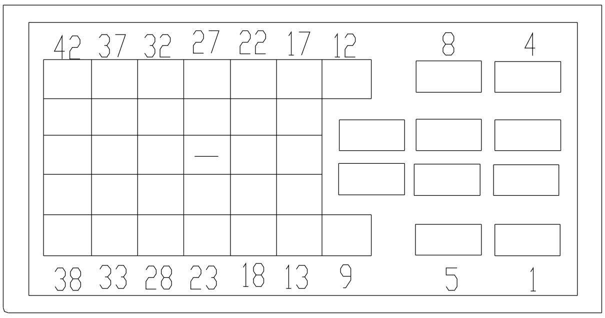
2. Wiper return and stop function

In order to ensure that the wiper can return back to its original position when the wiper stops working, there are two sets of contact mechanisms inside the wiper motor: one is return contact, and the other is stop contact. When the wiper operates at low or high speed, both sets of contacts are out of service. However, when the low or high speed power supply of the wiper disconnects, the wiper motor is powered by the No 3 power supply of motor and keeps continuous operation. When the motor operates to the specified position (the wiper blade returns back to the original position), the No 3 power supply of wiper motor is disconnected while the No 4 applies the power supply from F19 on the normal low level side of the wiper motor by turning on the intermittent relay switch. In this case, it enable the motor to produce the trend of rotation in reverse. This trend just counteracts the movement of wiper motor generated due to the inertia after power off, which makes the motor braked immediately and stop operation.

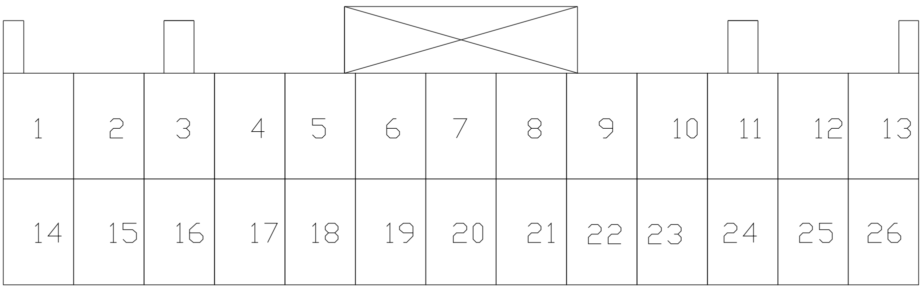
Chapter Two Schematic Diagrams of Circuit Control

I. Definition of Main Harness Connectors

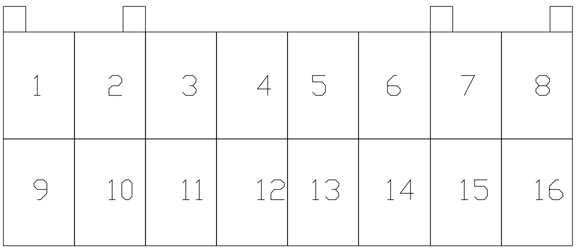
Engine/Compartment (Engine and Compartment Harness's Connector)



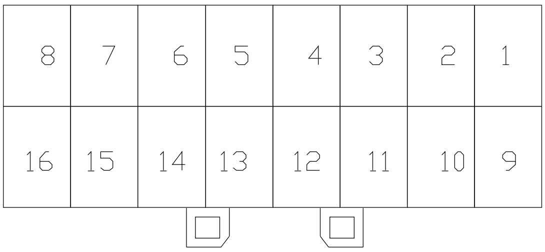
Compartment /Instrument A (Compartment and Instrument Harness's A Connector



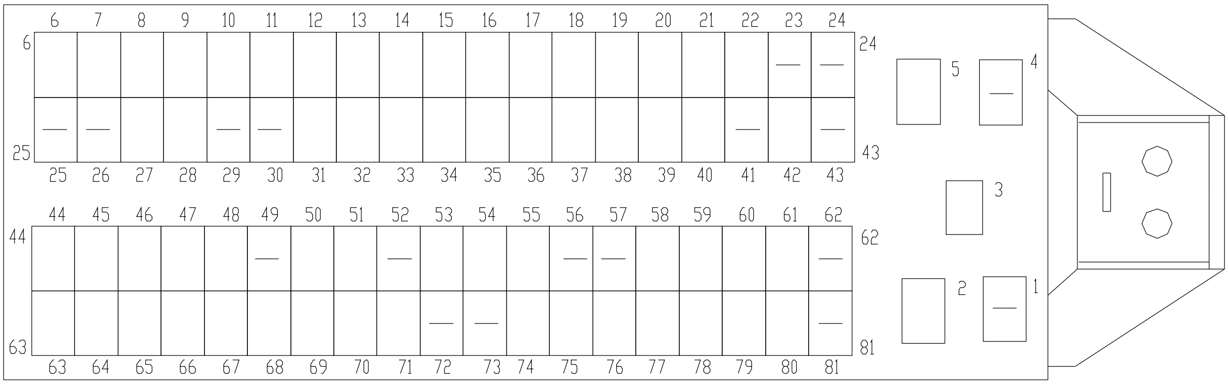
Compartment /Instrument B (Compartment and Instrument Harness's B Connector)



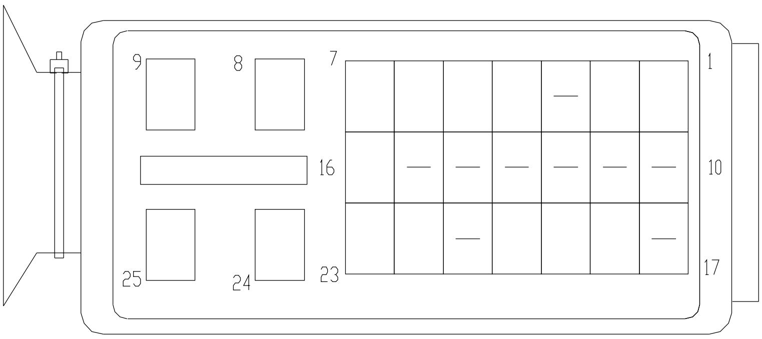
Compartment /Interior (Compartment and Interior Harness's Connector)



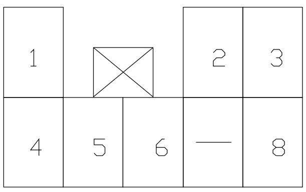
Definition of ECU Pin



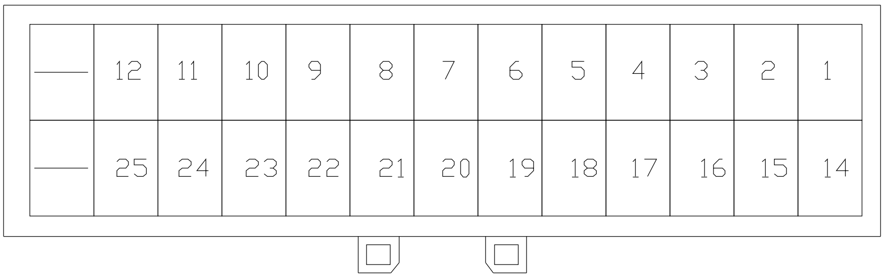
Definition of ABS Pin



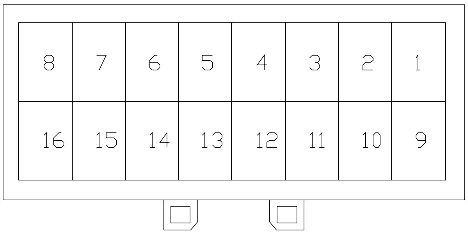
Interior/Instrument B (Interior Harness and Instrument Harness's A Connector)



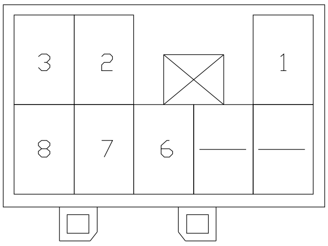
Interior/Instrument A (Interior Harness and Instrument Harness's A Connector)



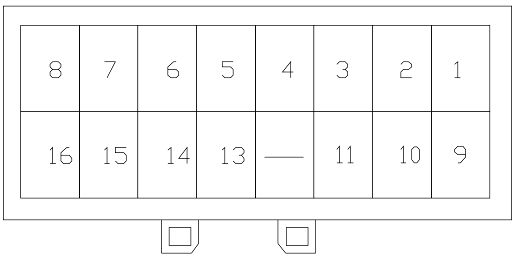
Interior/FL A (Interior Harness and Front Left Door Harness's A Connector)



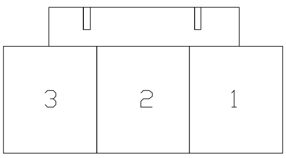
Interior/FL B (Interior Harness and Front Left Door Harness's B Connector)



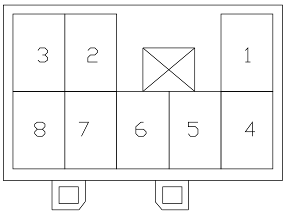
Interior/FR A (Interior Harness and Front Right Door Harness's Connector)



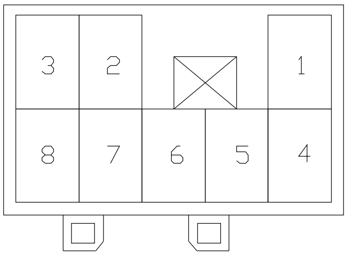
Interior/RL A (Interior Harness and Rear Left Door Harness's A Connector)



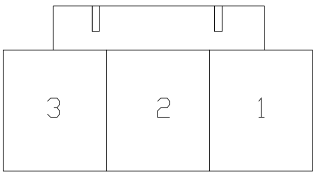
Interior/RL B (Interior Harness and Rear Left Door Harness’s B Connector)



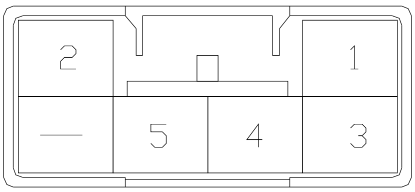
Interior/RR B (Interior Harness and Rear Right Door Harness’s B Connector)



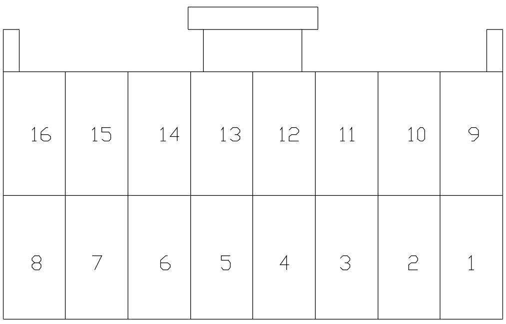
Interior/RR A (Interior Harness and Rear Right Door Harness’s A Connector)



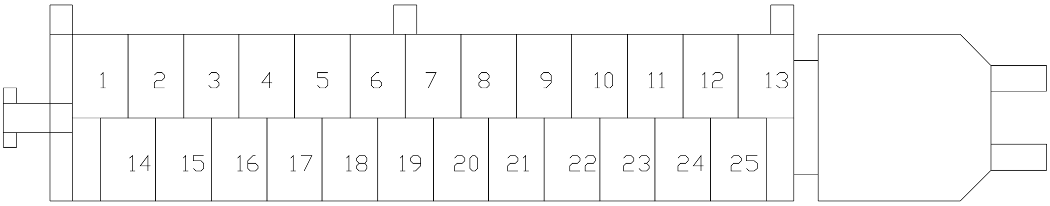
Interior/B (Interior Harness and Back Door Harness’s Connector)



BCMA (BCMA Connector Pin Definition)

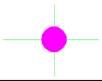
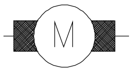
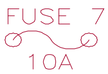
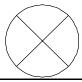
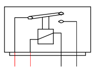
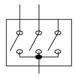
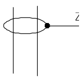
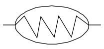
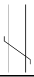
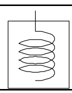
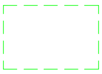
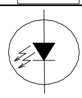
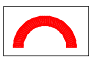
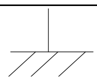


BCMB (BCMB Connector Pin Definition)



II. Drawing Description

1. Main Symbol Description

Symbol	Meaning	Symbol	Meaning
	Circuit Connection		Motor
	Fuse Position and SPecification		Bulb
	Relay		ON/OFF Control
	Shielded Wire		Resistor Element
	Shielded Wire		Solenoid
	This section is not involved in this system		LED
	Connector		Ground

Remark: Please refer to circuit and real object to confirm another symbols.

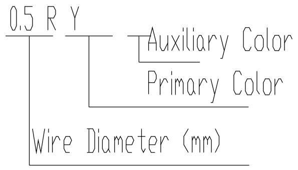
2. Drawing Description

30: Main positive wire from the battery
30a: Main positive wire from the battery
15: From the ignition switch (IGN1)
15a: From the ignition switch (IGN2)
ka: From the ignition switch (ACC, disconnect it when starating)
58b(RHEO): Power supply for night lighting

31– (GROUND): ground cable, from the negative electrode of the battery

Wire diameter and color:

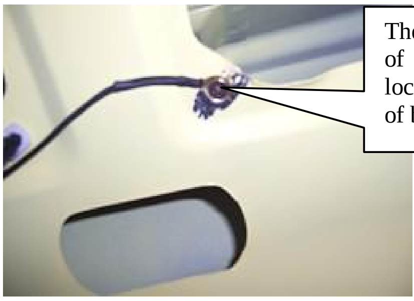
R Red; O Orange; W White; B Black; Y Yellow; V Violet;
G Green; L Blue; Br Brown; Gr Grey; P Pink; Lg Ligth green;



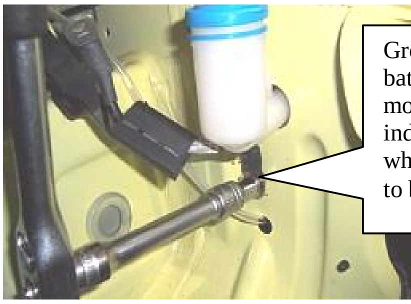
3. Definition of Main Controller

In this schematic diagram of circuit control, “CE/” means the instrument electrical box integrated with relay connector;
In this schematic diagram of circuit control, “ECU” means the engine control computer;
In this schematic diagram of circuit control, “BCM” means body control computer.

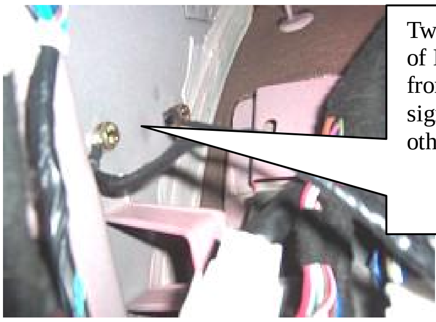
4. Position of Body Grounding Points



The grounding point of back door is located in the inside of back door.



Grounding position of battery negative. In this model, there is no independent electric unit which directly connects to battery negative.



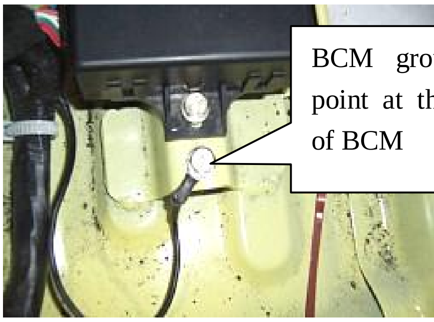
Two grounding points of ECU at the inside of front left fender: one is signal ground, the other is power ground.

ABS grounding point is located at the bottom of ABS controller and under A/C high/low pressure switch.

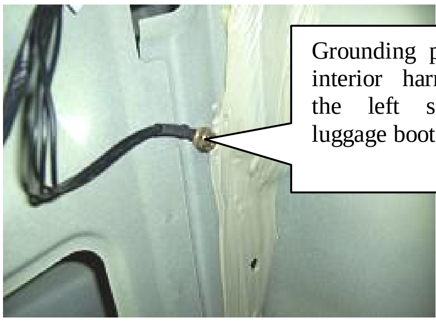
Grounding point of engine hood harness at the canister.

Grounding point of fan motor, at the left side member and near headlamp.

Grounding point of interior harness under the left A post.

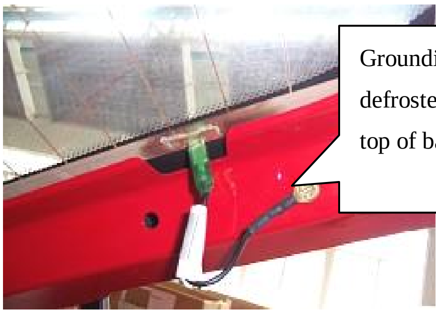


BCM grounding point at the side of BCM



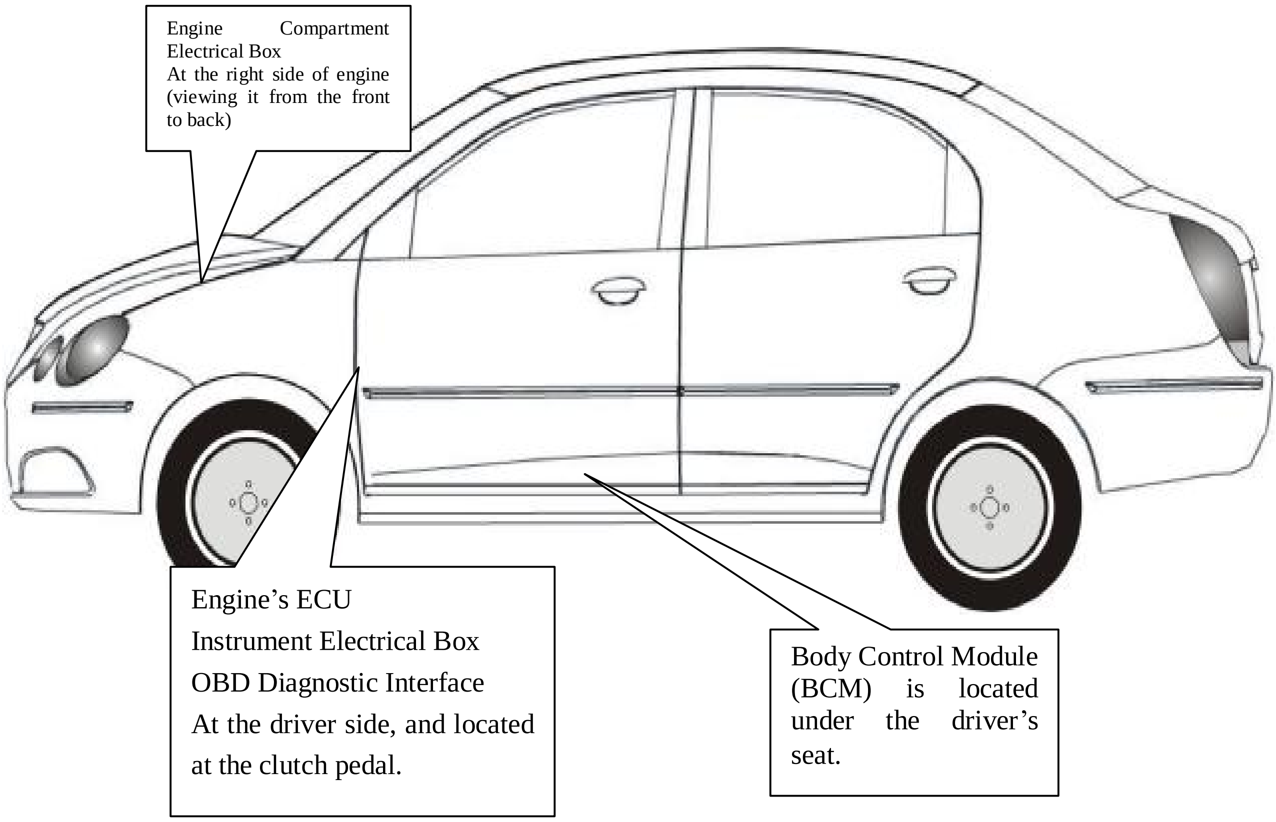
Grounding point of interior harness at the left side of luggage boot.

Grounding point of interior harness at the inside of rear right fender.



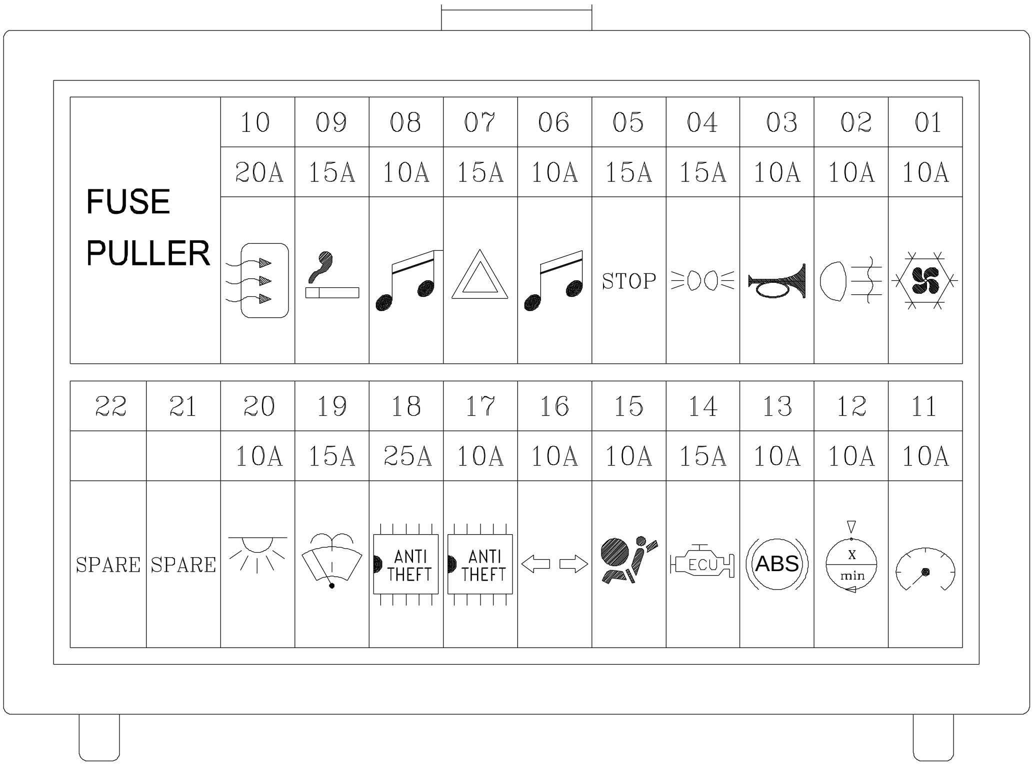
Grounding point of defroster harness at the top of back door.

III. Schematic Diagram of Main Electric Box and Module Position

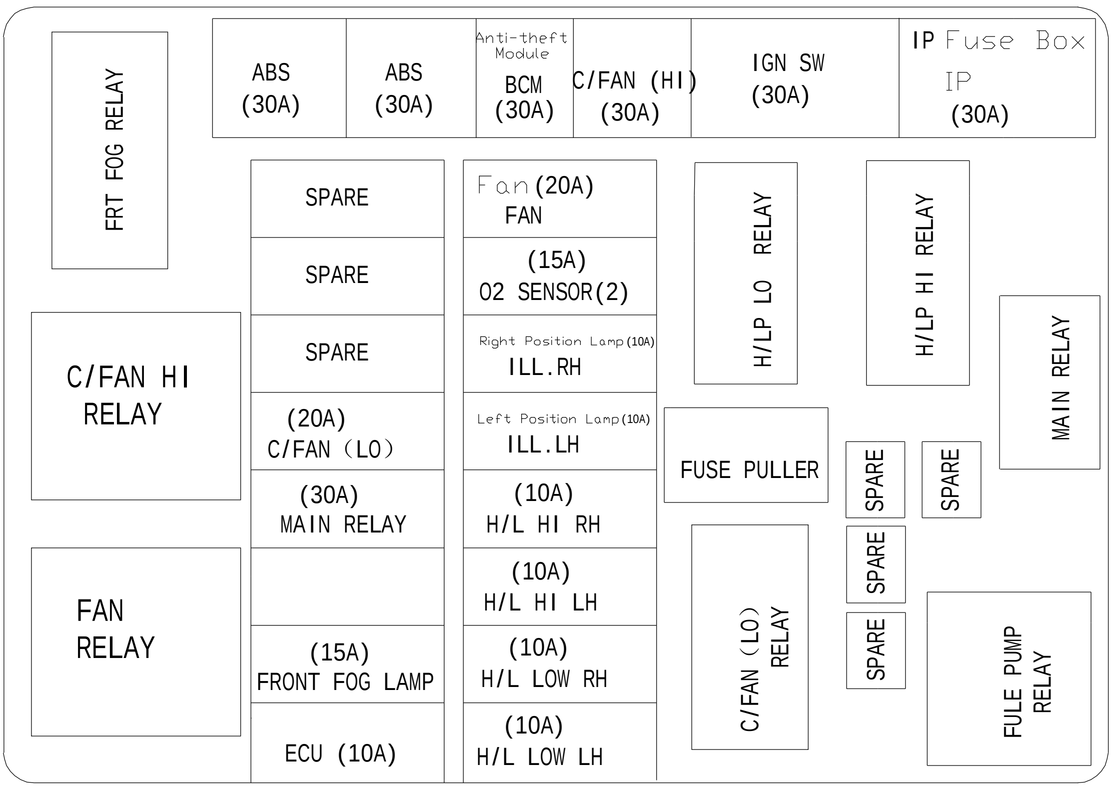


IV. Electrical Box Description

1. Instrument Electrical Box

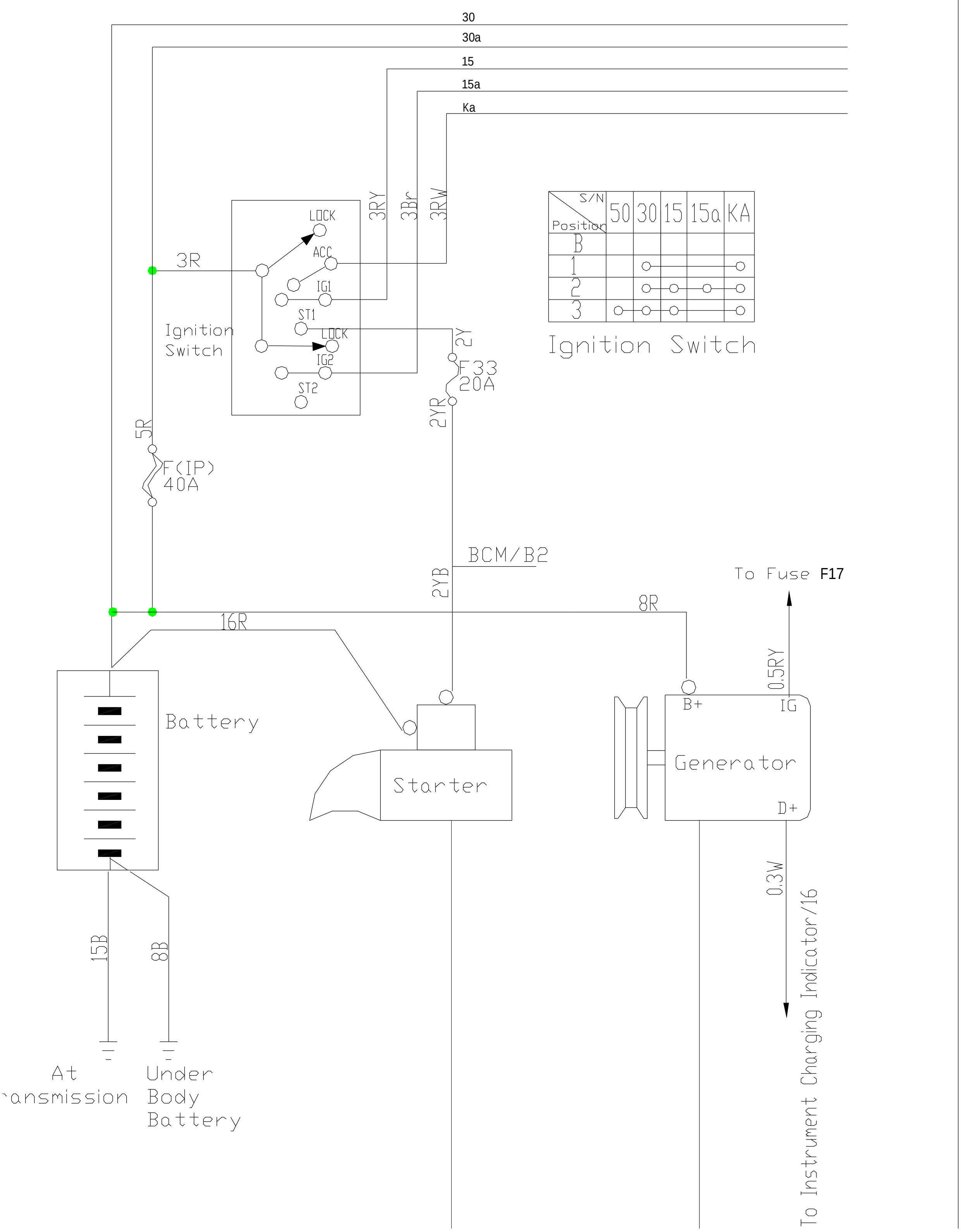


2. Compartment Electrical Box

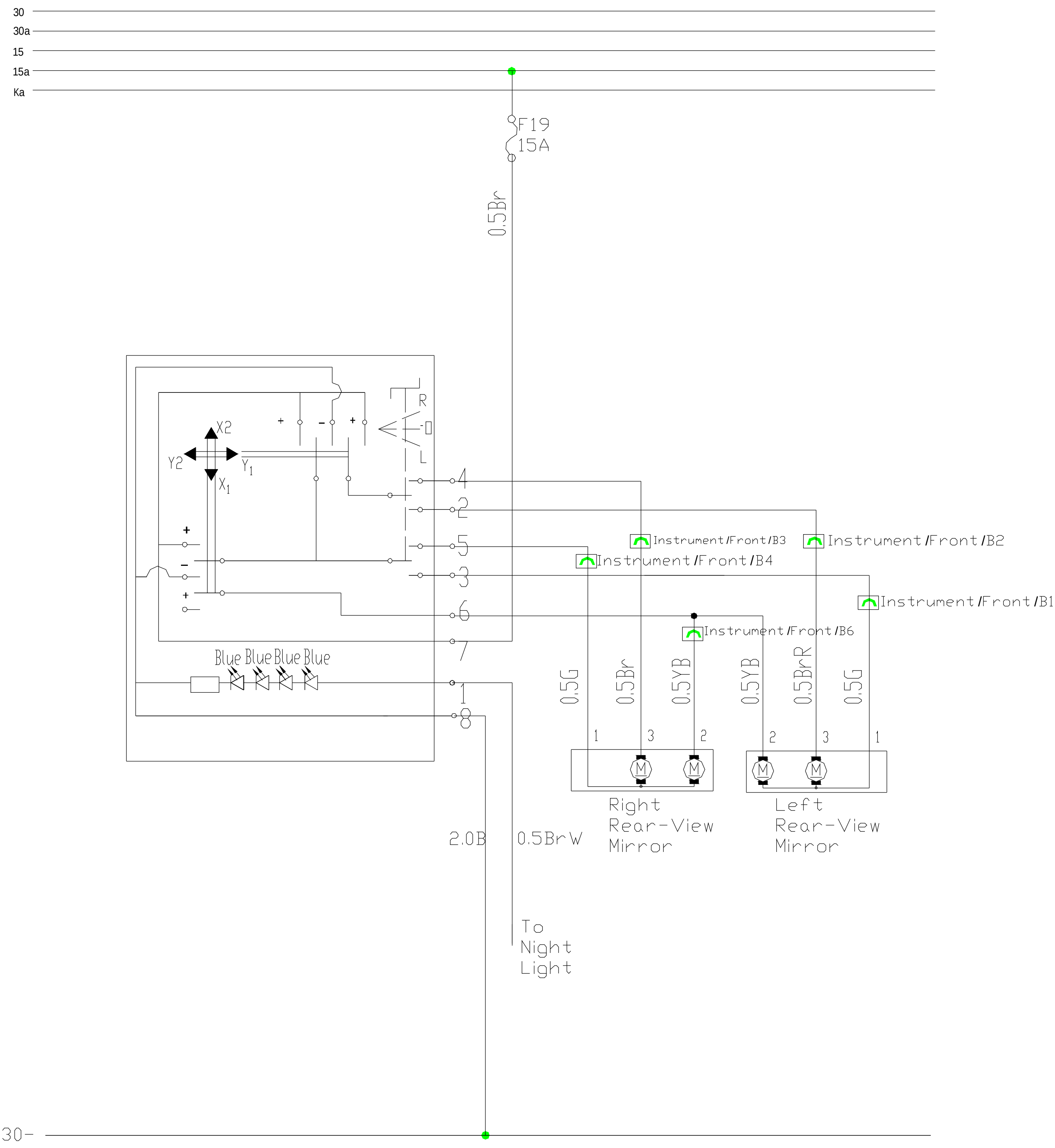


V. Schematic Diagrams of Circuit Control

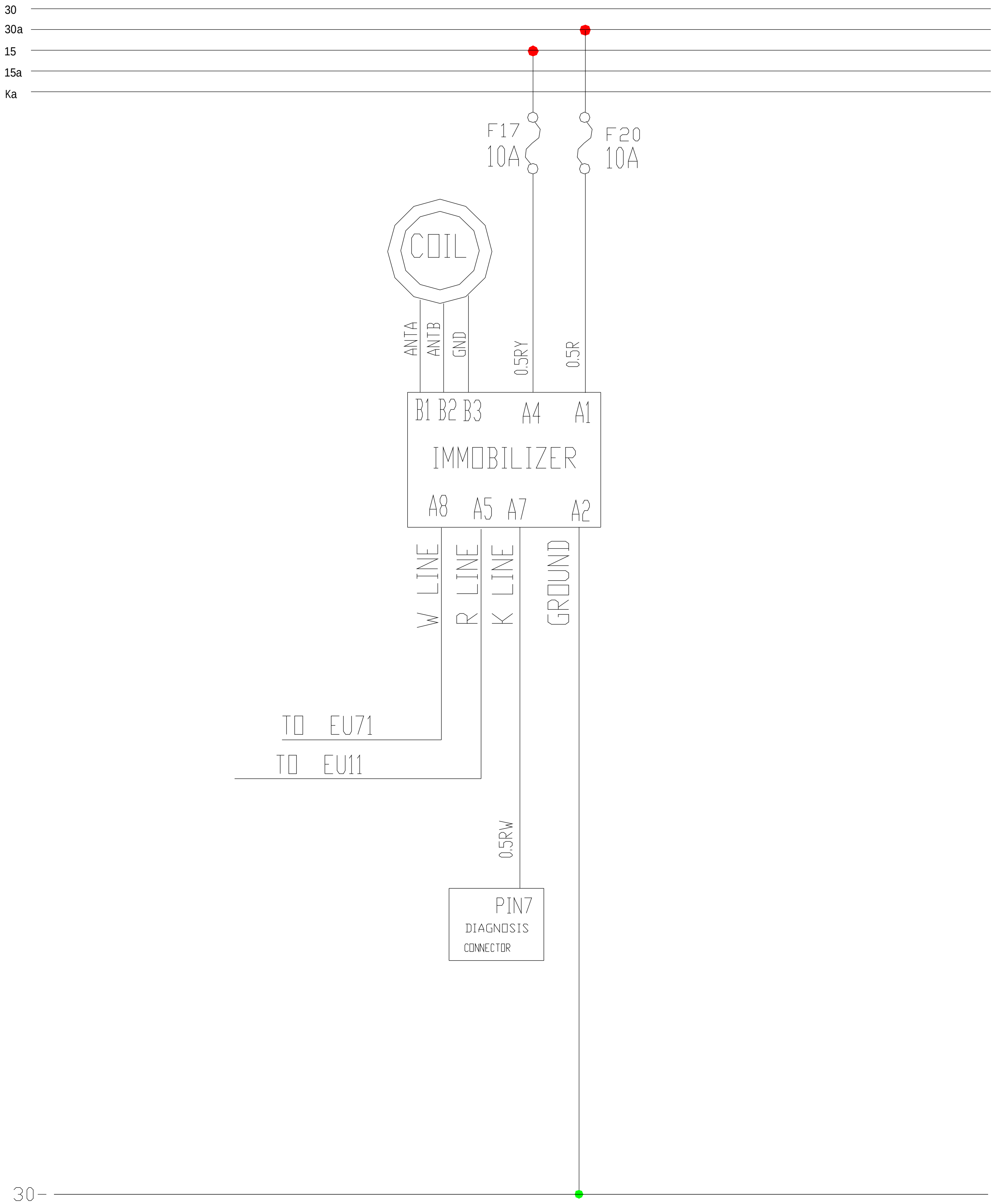
1. Starting and Charging System



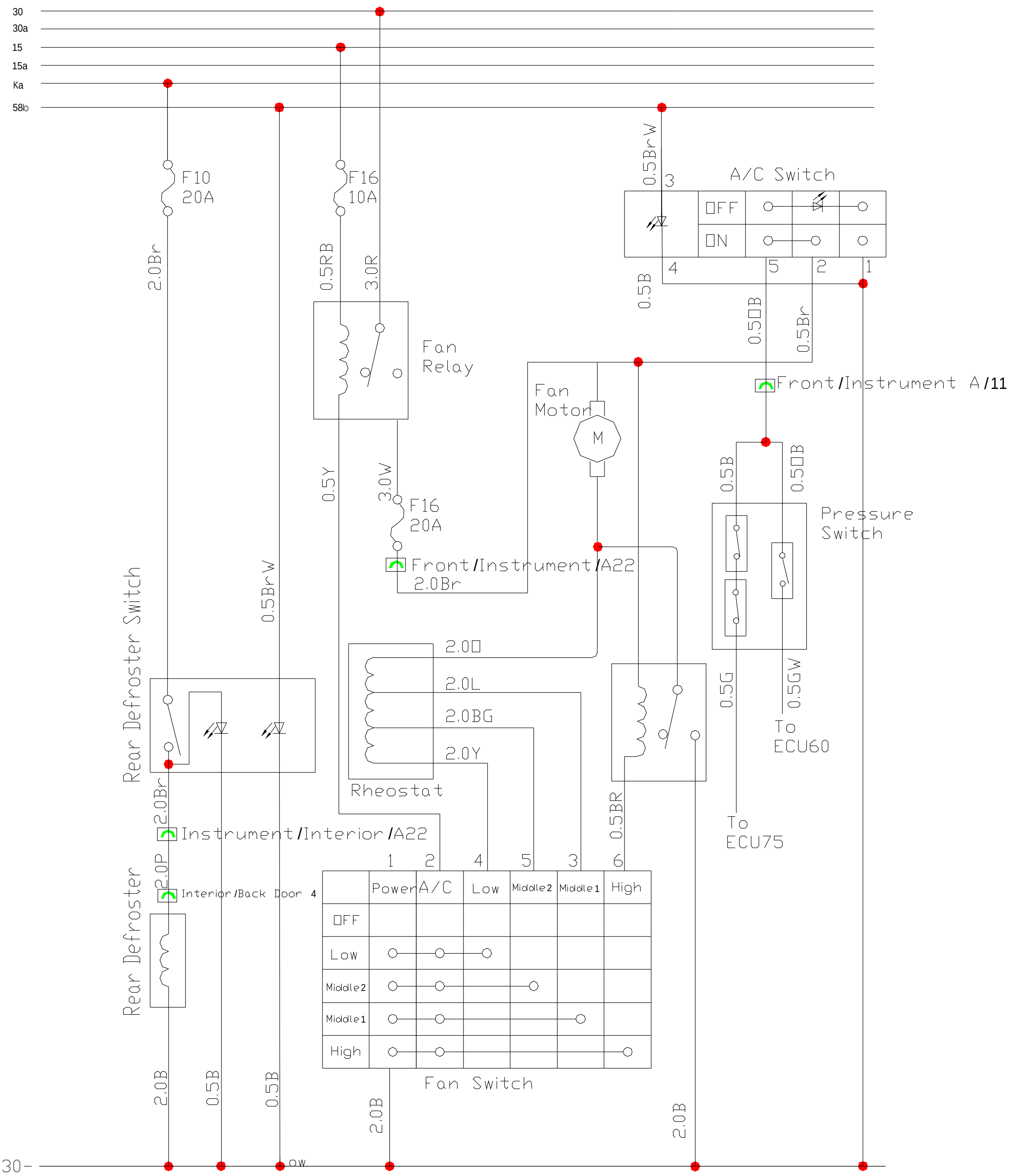
2. Electric Rear-View Mirror



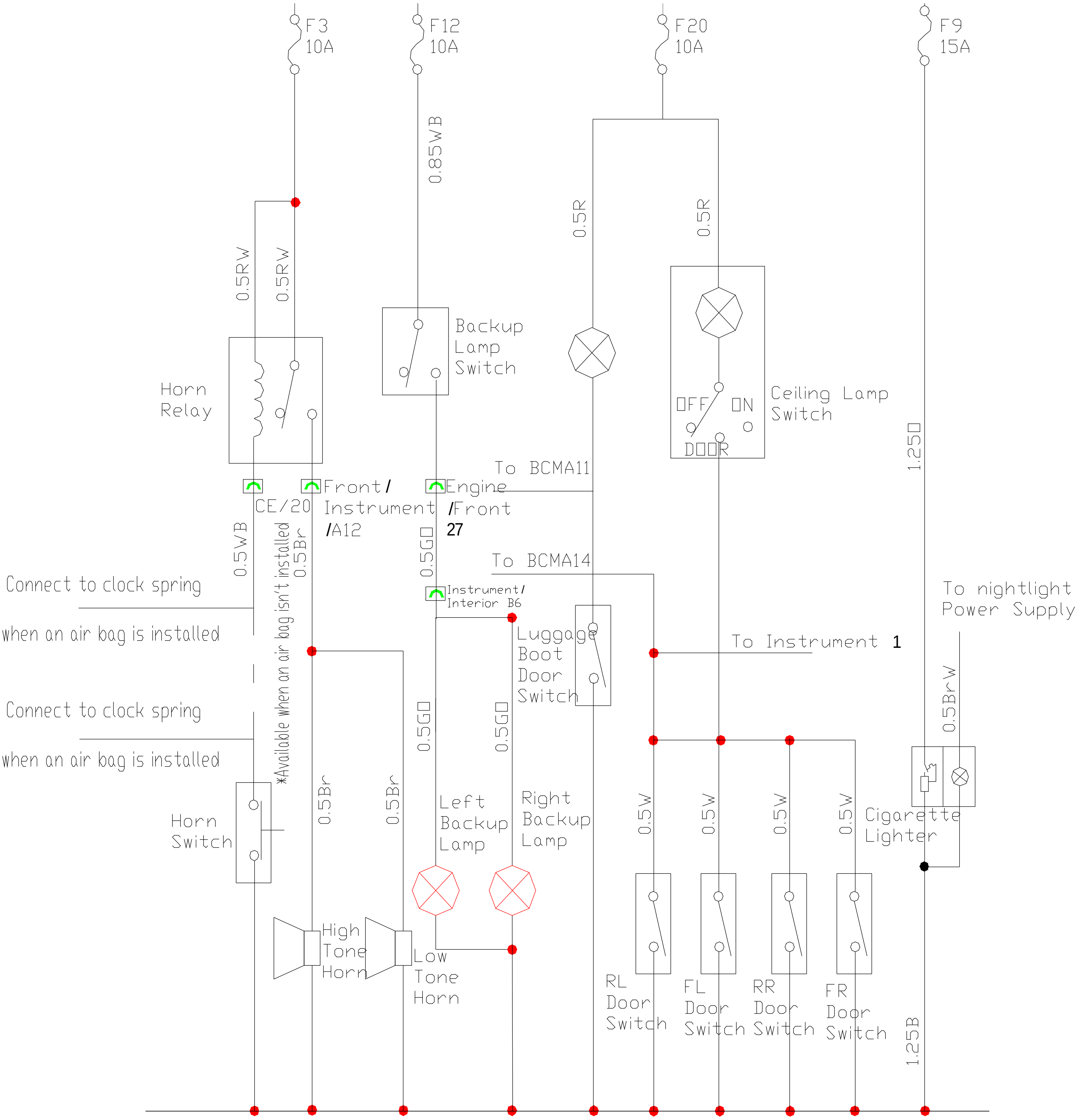
3. Engine's Anti-Theft System



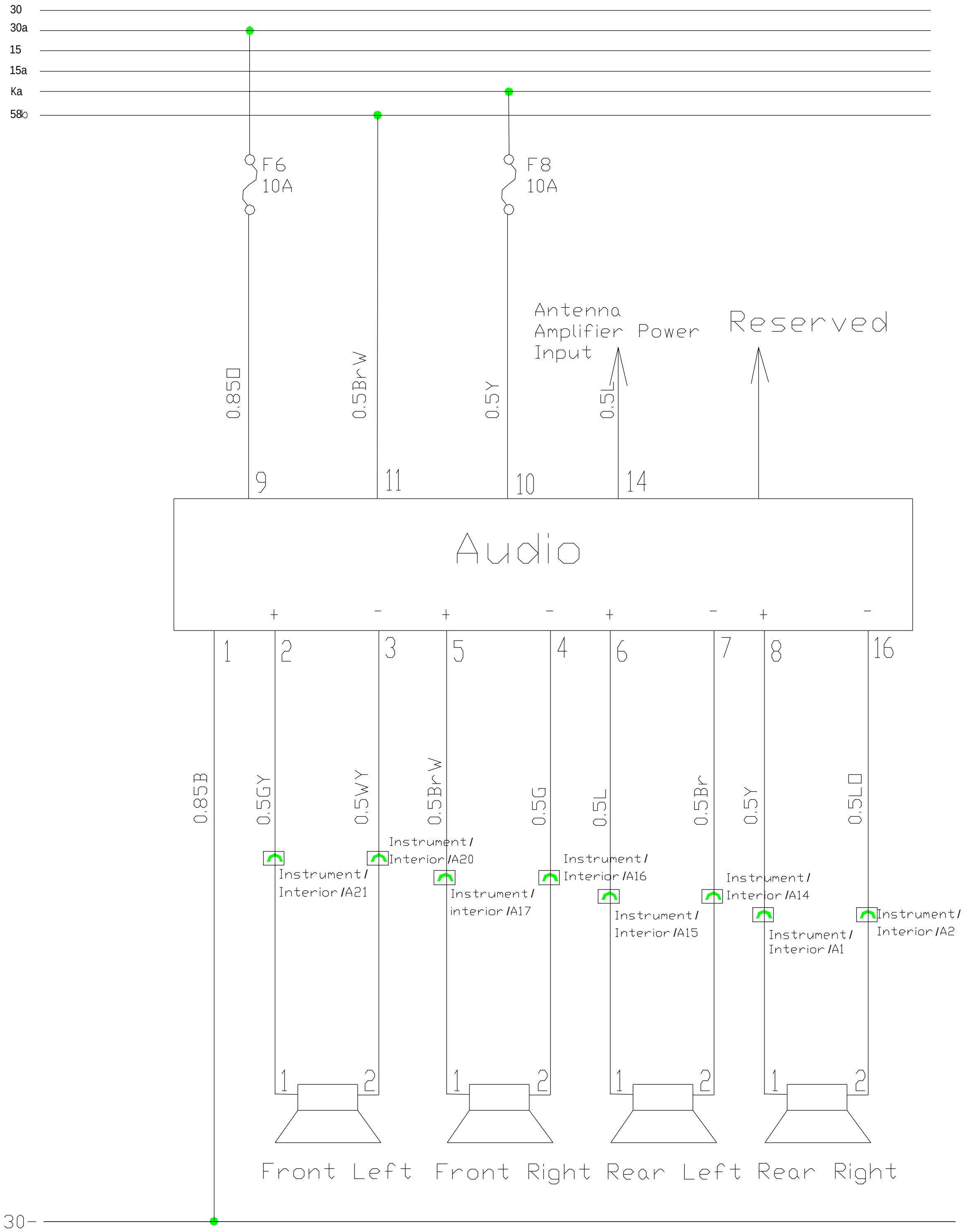
4. A/C and Defrost Systems



5. Horn, Backup Lamp, Cigarettter Lighter, Ceiling Lamp and Luggage Boot Light

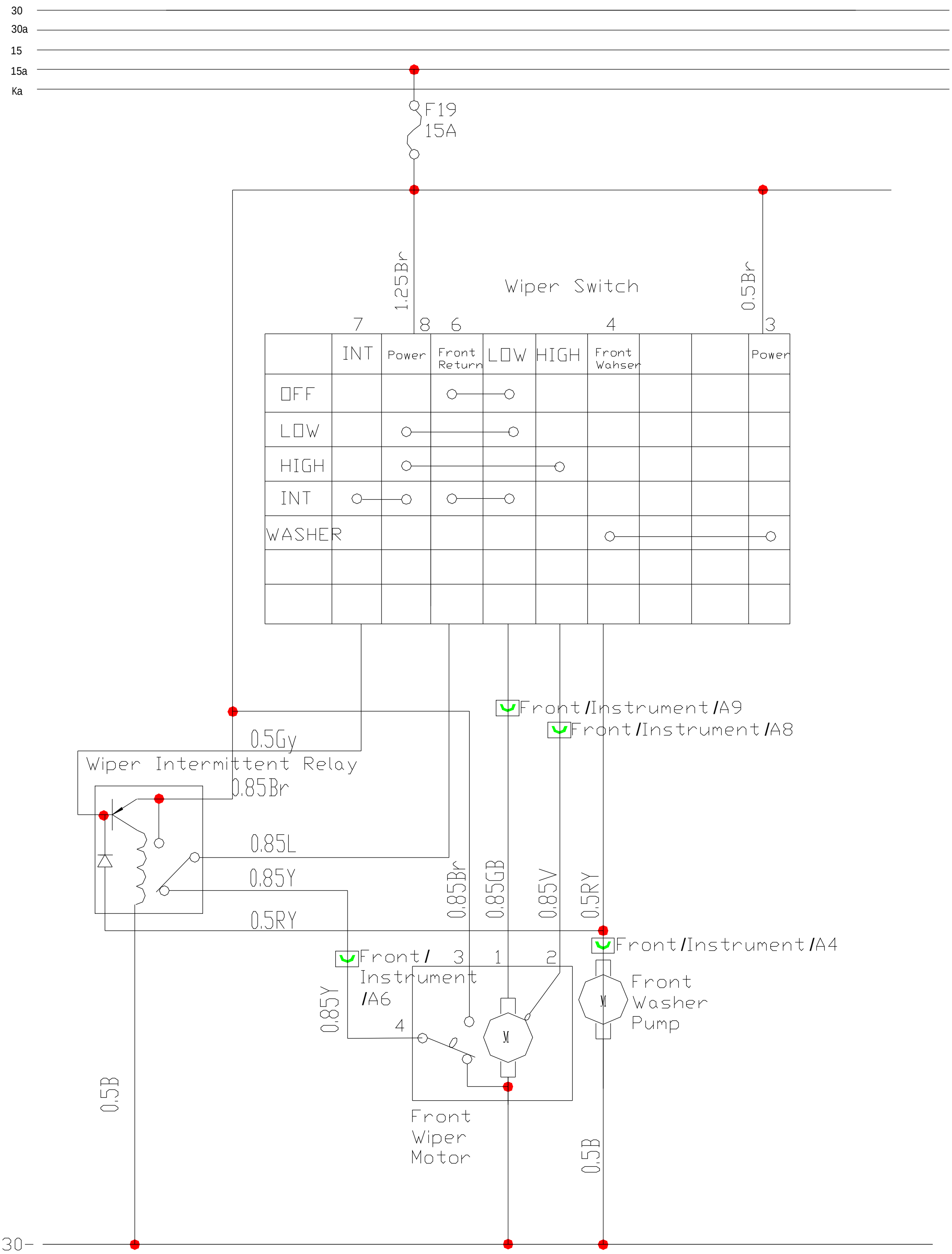


6. Radio

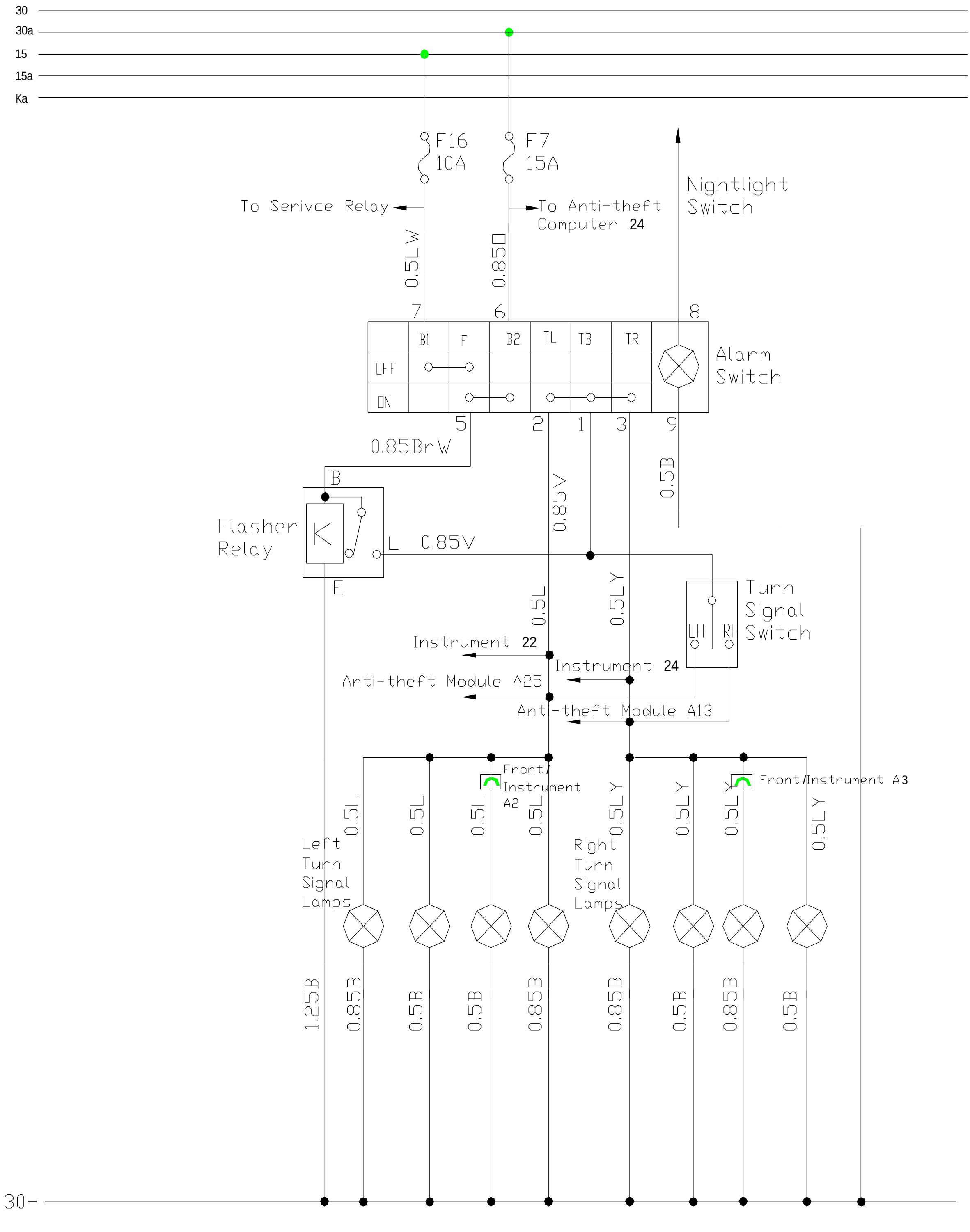


30
30a
15
15a
Ka
58
F6
10A
F8
10A
0.85
0.5BrW
0.5Y
0.5L
Antenna
Amplifier Power
Input
Reserved
9
11
10
14
Audio
1
2
3
5
4
6
7
8
16
0.85B
0.5GY
0.5WY
0.5BrW
0.5G
0.5L
0.5Br
0.5Y
0.5L
Instrument/
Interior/A21
Instrument/
Interior/A20
Instrument/
interior/A17
Instrument/
Interior/A16
Instrument/
Interior/A15
Instrument/
Interior/A14
Instrument/
Interior/A1
Instrument/
Interior/A2
Front Left
Front Right
Rear Left
Rear Right
30-

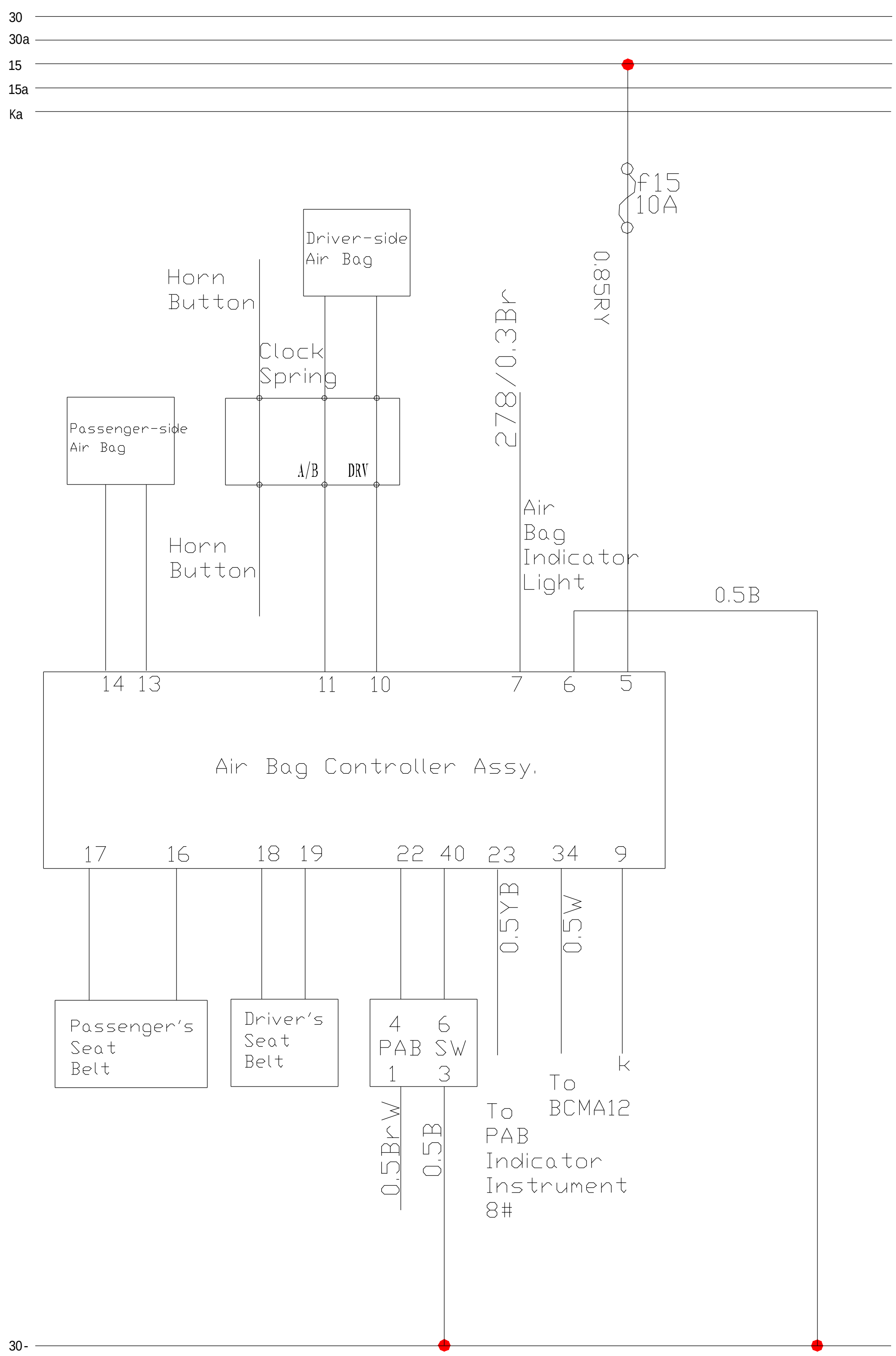
7. Front/Rear Wiper



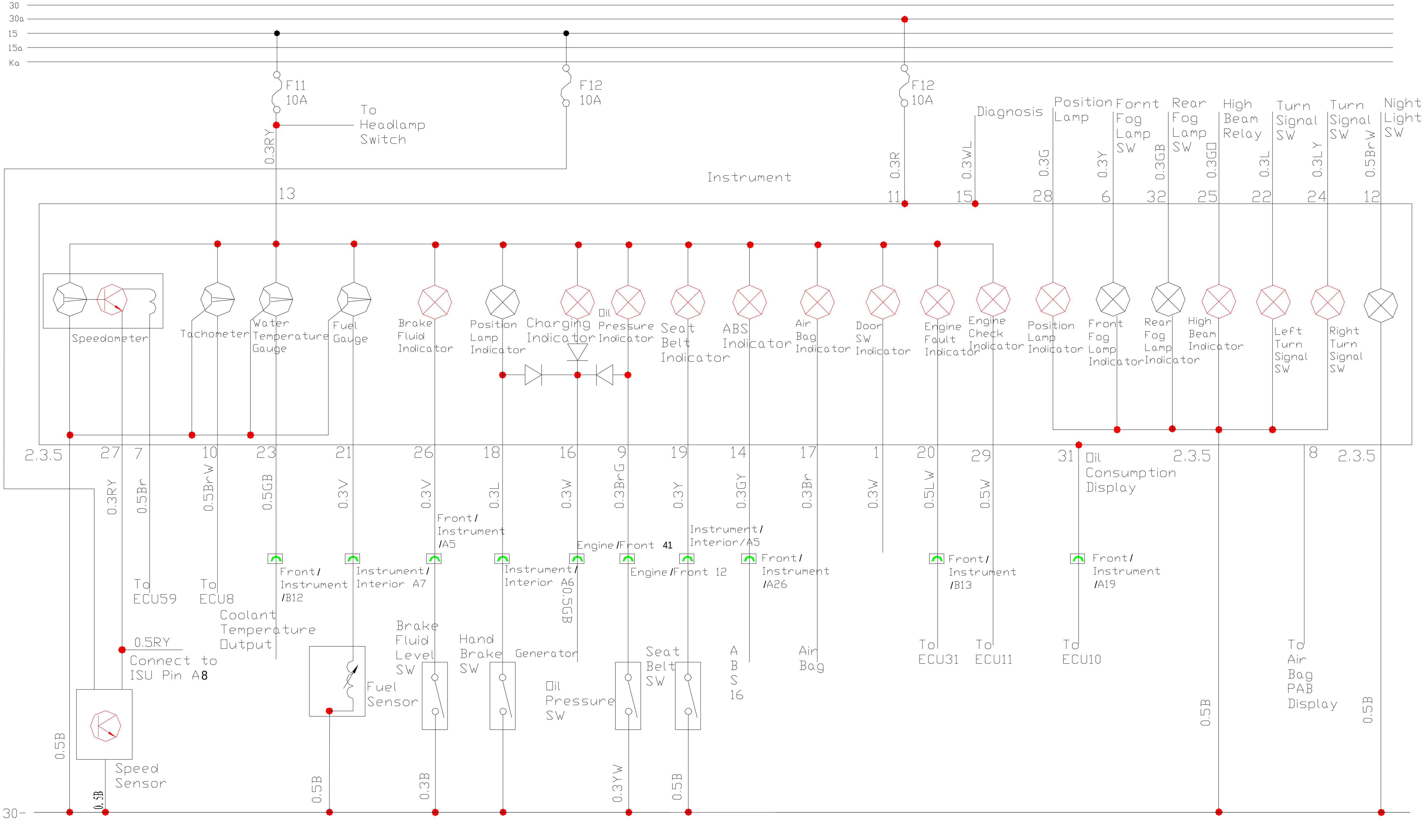
8. Turn Signal Lamp System



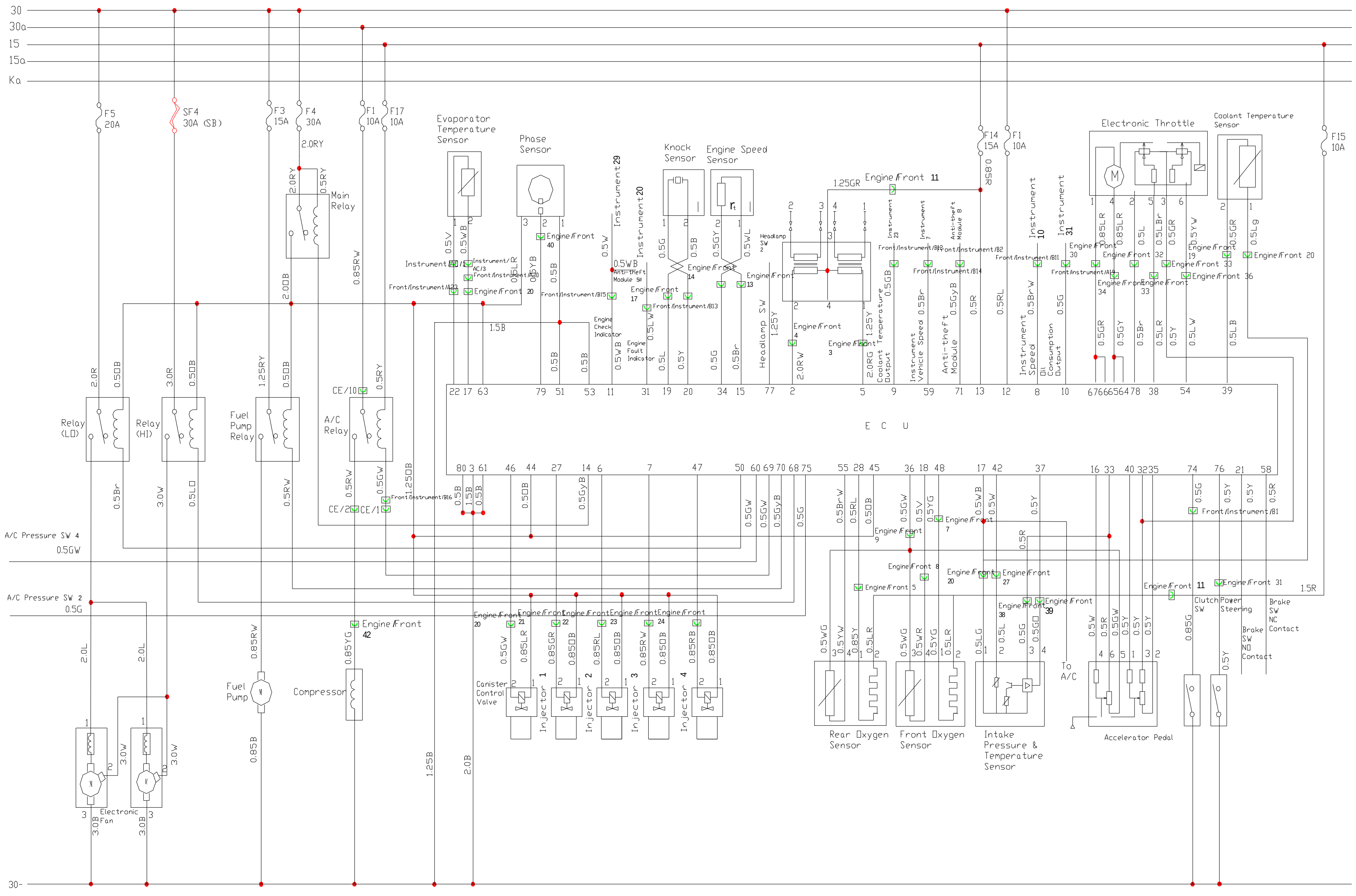
9. Air Bag


30
30a
15
15a
Ka
f15
10A
0.85RY
Driver-side Air Bag
Horn Button
Clock Spring
A/B
DRV
278/0.3Br
Passenger-side Air Bag
Horn Button
Air Bag Indicator Light
0.5B
14 13 11 10 7 6 5
Air Bag Controller Assy.
17 16 18 19 22 40 23 34 9
0.5YB
0.5W
Passenger's Seat Belt
Driver's Seat Belt
4 6 PAB SW 1 3
k
To BCMA12
To PAB Indicator Instrument 8#
0.5BrW
0.5B
30-

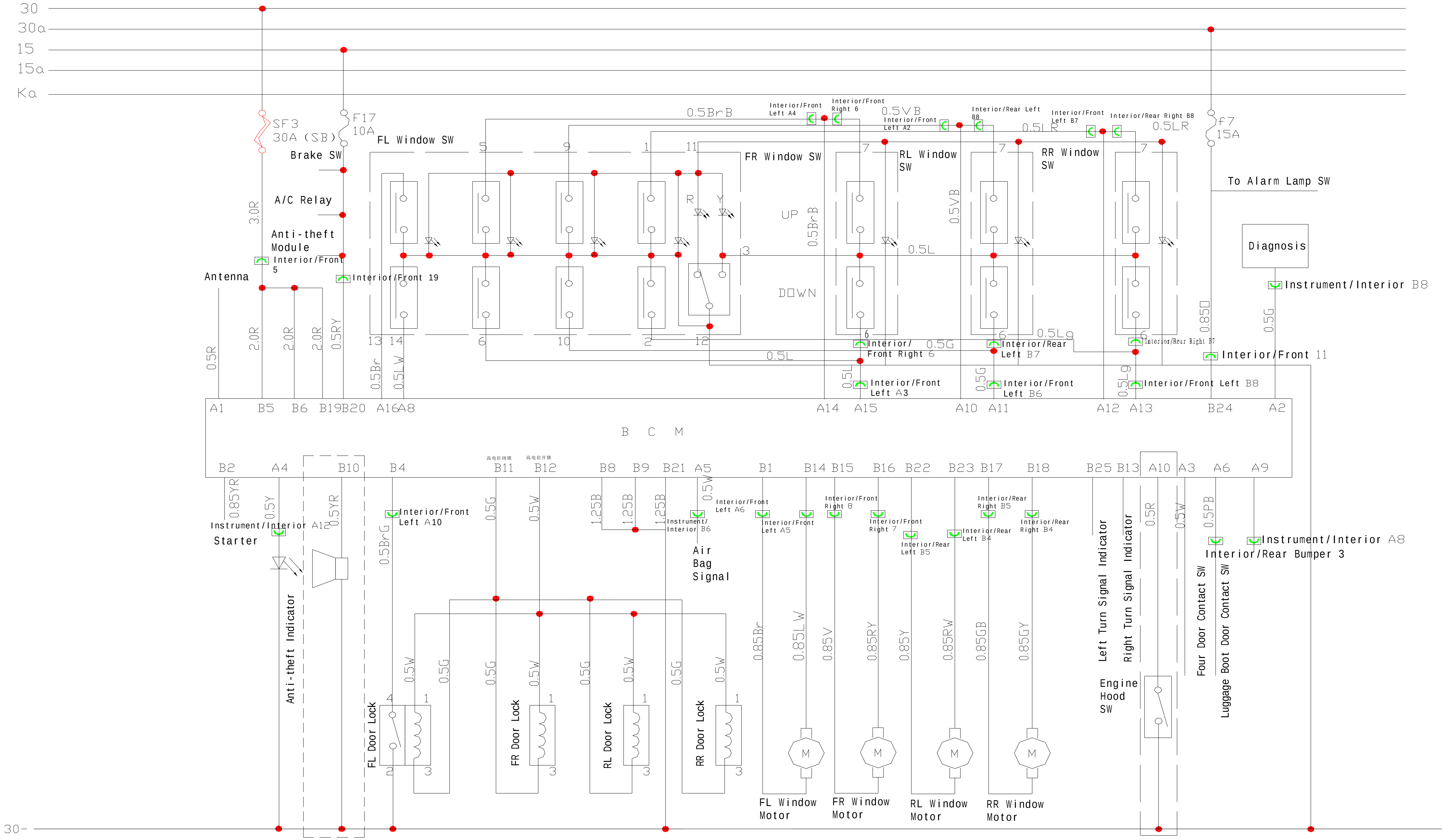
10. Instrument System



11. Engine's Electronic Fuel Injection System



12. BCM system



Service Manual For CHERY QQ6

(Maintenance And Care)

After Sales Service Department of Chery Automobile Sales Co., Ltd

Chapter 1 Overview of Vehicle

1. Overview of Engine

The QQ6 car is equipped with a engine of 1.3L or 1.1L displacements which is developed and produced by CHERY Automobile Co.. Ltd. The models of the eninge are: SQR473 F and SQR472 F respectively. Two kinds of engines have the following characteristics:

SQR473 F series:

Vertical, four cylinders, water-cooled, 4 strokes, in-line, double overhead camshaft, 4 valves, multipoint electronic gasoline injection.

SQR472 F series:

Vertical, four cylinders, water-cooled, 4 strokes, in-line, double overhead camshaft, 4 valves, multipoint electronic gasoline injection.

2. Overview of Transmission

QQ6 car is equipped with two kinds of manual transmissions developed by CHERY Automobile Co.. Ltd.: QR513MHA and QR512. These transmissions have the following characteristics:

QR513MHA:

Integrated variable differential transmission, two shafts, five gears (five forward gears, one reverse gear), five forward gears have a synchronizer.

QR512:

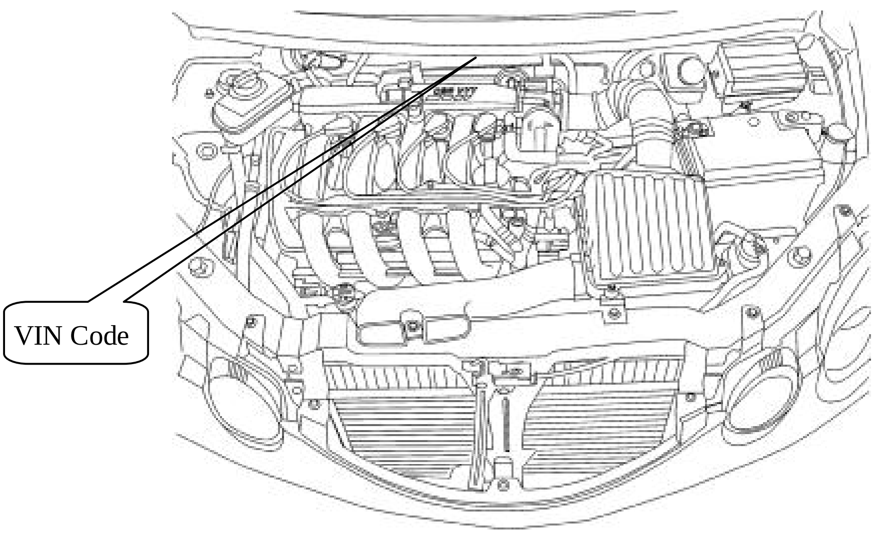
Integrated variable differential transmission, two shafts, five gears (five forward gears, one reverse gear), five forward gears have a synchronizer.

3. Rubbing Numbers

3.1. Vehicle Identification Number (VIN)

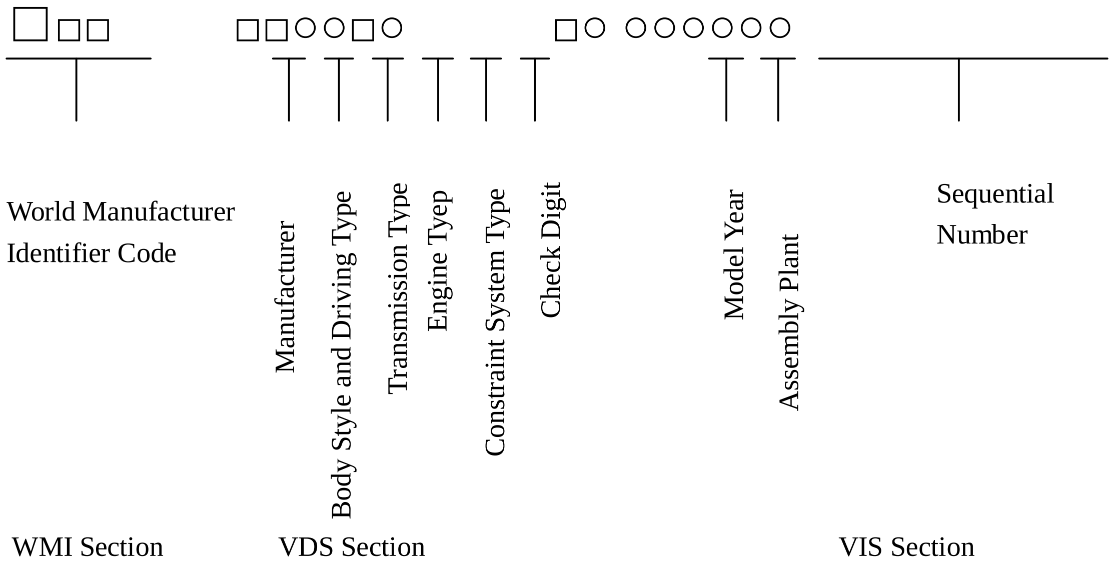
3.1.1. VIN position

VIN code is engraved on the lower of gutter channel at front side of the vehicle, as shown in the figure below:



3.1.2. Meaning of VIN code

1) The VIN code is structured according to the requirements of GB16735.



2) The application for the World Manufacturer Identifier (WMI) Section is submitted by the CHERY Company to the Bureau of Automotive Industry of the Ministry of Machinery Industry. P.R China. Now, the CHERY Automobile Co., Ltd.'s WMI code is LVV.

3) The Vehicle Descriptor Section (VDS) consists of manufacturer, body style and driving type, transmission type, engine type, constraint system type and check digit.

i. The first character of VDS section identifies the make of the vehicle, and the CHERY brand vehicle is represented as the character D.

ii. The second character of VDS section represents the body style and driving type: A for the three-compartment fiver-door 4×2 type; B for the two-compartment five-door 4×2 type; C for the three-compartment four-door 4×2 type: D for the two-compartment five-door 4×4 type; E for the two-compartment four-door 4×2 type, F for the three-compartment two-door 4×2 type; and G for the two-compartment three-door 4×2 type.

iii. The third character of VDS section means the transmission type, where the digit 1 represents the manual transmission and 2 for automatic transmission.

iv. The fourth character of VDS section represents the engine type, where the digit 1 represents the 1.5L - 2.0L (2.0L exclusive) series EFI gasoline engine; digit 2 for the 1.5L (1.5L exclusive) or below EFI gasoline engine; digit 4 for the 2.0L - 2.5L (2.5L exclusive) series EFI gasoline engine.

v. The fifth character of VDS section identifies the constraint system, where the character A represents the seat belt, and the character B for the seat belt + air bag.

4) The sixth character of VDS section is the check digit whose purpose is to provide a means for verifying the accuracy of any VIN transcription. After the other 16 characters in VIN have been determined, the check digit shall be calculated.

The Vehicle Indicator Section (VIS) consists of vehicle model year, plant of manufacture, and sequential number.

① The first character of VIS section represents the vehicle model year. The year shall be designated as indicated in Table 1 as follows:

Table 1

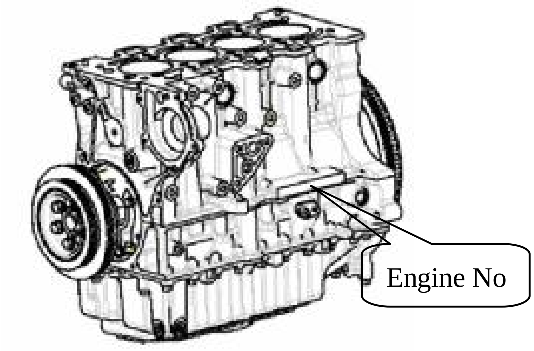
Year	Code	Year	Code	Year	Code	Year	Code
1999	X	2002	2	2005	5	2008	8
2000	Y	2003	3	2006	6	2009	9
2001	1	2004	4	2007	7	2010	A

② The second character of VIS section represents the plant of manufacture. The CHERY Automobile Co., Ltd. is represented as the character D.
③ The third through the eighth of VIS section represents the number sequentially assigned by the manufacturer in the production process. The number is assigned yearly, starting from 000001.

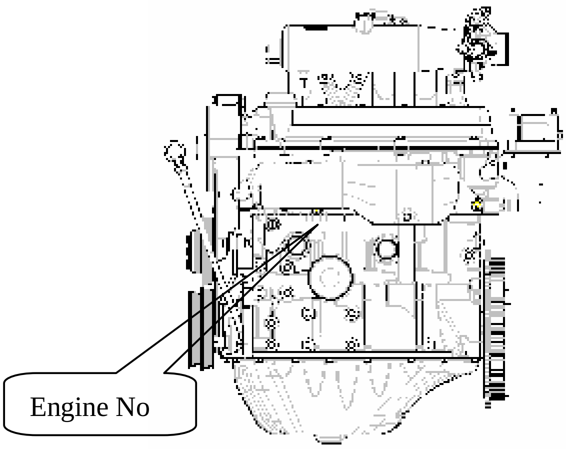
3.2. Engine Number

3.2.1. Engine number position

1). Number of SQR473F series engine is printed on the boss of cylinder body near the engine exhaust side oil cleaner (as shown in the figure below).



2). Number of SQR472F series engine is printed on the boss of cylinder body over the engine exhaust side oil cleaner (as shown in the figure below).



3.2.2. Meaning of Engine Number

As shown in the figure above, the engine number located at the engine block consists of engine type and serial sumber.

1. Engine type

The engine type conforms to the requirements of GB725, which consists of enterprise code, number of engine cylinders, bore, feature code and differentiation code.

A complete engine type is structured as follows:

□□□ ○ ○○ □ □

Differentiation code
Feature Code
Bore
Number of Cylinders
Enterprise Code

where, ○ represents an arabic numeral, and □ represents an alphabetic character.

1.1 The enterprise code is fixed as SQR;

1.2 The number of engine cylinders is a 1 to 2-digit integer;

1.3 The bore is the diameter of cylinder barrel, expressed by a 2 to 3-digit integer, and its decimal is rounded to ainteger with the unit of mm according to the rounding principle.

1.4 Feature code: Represent the basic feature of an engine, expressed with a capital English alphabet, and its meaning is shown in Table 1. If multiple features in Table 1 appear at the same time, a feature code is choosed in turn according to the sequence specified in Table 2. In case that the line engine's basic feature code L is omitted, the other feature codes in Table 2 can be choosed in turn according to the sequence of these codes.

Table 1 Feature Code of Engine

Engine Characteristics	Line engine	V-engine		
Feature Code	L	V		
Engine Characteristics	Direct injection	Gasoline combustion rate variable valve timing		
Feature Code	J	H		
Engine Characteristics	Diesel natural aspirationi	Diesel turbo	Diesel turbo intercooler	Gasoline turbo intercooler
Feature Code	D	T	A	B
Engine Characteristics	Carburetor	Single point injection	Two-valve multipoint injection	Four-valve multipoint injection
Feature Code	C	M	E	F

Table 2 Sequence of Engine Feature Code Optional

1st	Structure	Line L (omitted)	V		
2nd	Special technique	J	H		
3rd	Air intake	D	T	A	B
4th	Fuel supply	C	M	E	F

1.5 Differentiation code: Expressed with a capital English alphabet, used as a complementary code to differentiate the type of engine when all the number of engine cylinders, bore and feature code are the same while the structure, main parameter(s) or fuel supply method and etc change (e.g., the change of engine stroke, bifuel engine, etc). For the change of engine's peripheral parts (such as intake and exhaust manifolds), the engine type is invaried but differeniated by changing the number of engine assy.

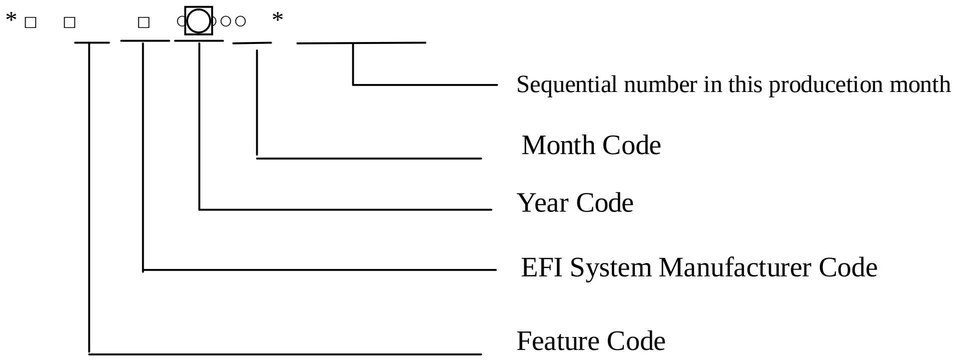
1.6. Example of engine type:

"SQR473F" means a 4-cylinders, 73 mm bore , line gasoline engine manufactured by the CHERY Automobile

Co., Ltd., which is a four-valve multipoint injection engine (the line gasoline engine feature code “L” is omitted and then is occupied by the “four-valve multipoint injection, and the first structure differentiation code A is also omitted).

2. Serial number

The serial number of an engine consists of engine feature code, EFI system manufacturer code, manufacture year code, month code, the number sequentially assigned by the manufacturer of the engine in the production month of this type of engines and the start/end symbol *. A complete serial number for an engine is as follows:



where ○ represents an arabic numeral, □ represents an alphabet, ◯ represents an arabic numeral or alphabet.

2.1. The engine feature code is performed according to the provisions in paragraph 2.1.4.

2.2. EFI system manufacturer:

C – Motorola; D – Marelli; E – Delphi; F – United Automotive Electronic Systems (UAES) Co., Ltd.;

G – Siemens; H – TROITEC Automotive Electronics Co., Ltd.; B – Bosch

2.3. The year and month codes are performed in accordance with Tables 3 and 4 respectively.

Table 3 Characters used for designating the year (recycleable)

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Code	1	2	3	4	5	6	7	8	9	A
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Code	B	C	D	E	F	G	H	J	K	L
Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	M	N	P	R	S	T	V	W	X	Y

Table 4 Characters used for designating the month

Month	January	February	March	April	May	June	July	August	September	October	November	December
Code	A	B	C	D	E	F	G	H	J	K	L	M

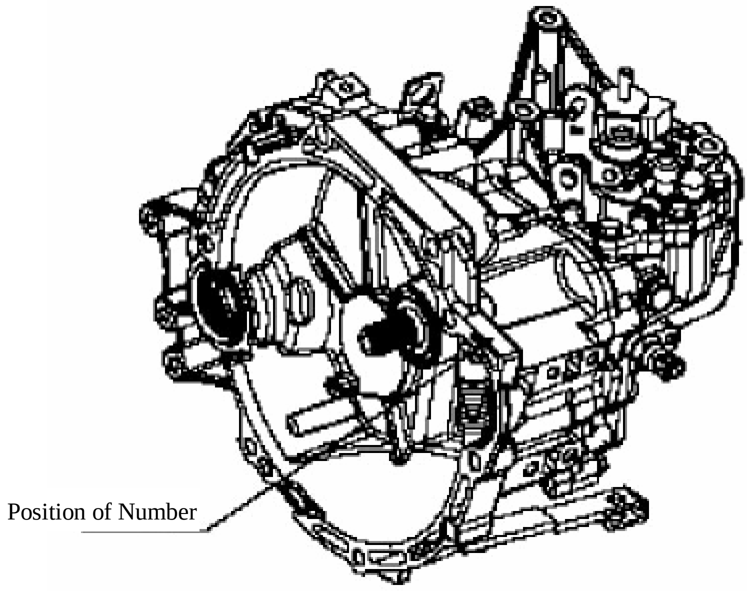
2.4. Example of serial number

“＊FF5H00106＊” means the 106th UAES four-valve multipoint EFI engine manufactured in August 2005.

3.3. Transmission Number

3.3.1. QR513 series transmission nubmer position

The position of QR513 series transmission number is as shown in the figure:



3.3.2. Meaning of QR513 series transmission number

The number of QR513 series transmission consists of transmission type and serial number.

1). Transmission type

The transmission type consists of code QR, number of transmission gears, max transmission torque, feature code and structure differentiation code.

A complete transmission type is as follows:

□□ ○ ○○ □□ □

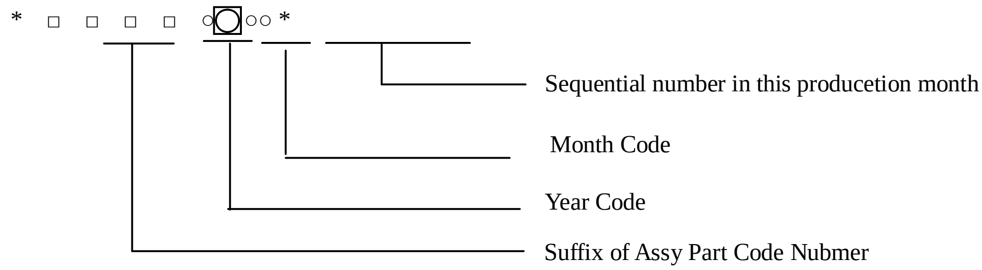
- □□ — Code QR
- ○ — Number of Transmission Gears
- ○○ — Max Transmission Torque (kg·m)
- □□ — Feature Code
- □ — Structure Differentiation Code

where, ○ represents an arabic numeral, and □ represents an alphabet.

2). Serial number

The serial number consists of the suffix of assy part code number (AA for the part code number without suffix), manufacture year code, month code, the number sequentially assigned by the manufacturer of the transmission in the production month of this type of transmission and the start/end symbol *. The year and month codes are performed according to Tables 3 and 4 respectively.

A complete seiral number for a transmission is as follows:



where, ○ represents an arabic numeral, □ represents an alphabet, and ◯ represents an arabic numeral or alphabet. The suffix is located the last portion of the part code number, and unavailable for the basic type transmission.. In case that its structure, dimension, materials, heat treatment requirements, surface treatment and etc of part and assy are changed on basis of the original products, the suffix shall be modified. In the codes, the English alphabets shall be capital ones, and used in ture starting from A. To avoid the confusion, the alphabets “I”, “O” and “X” shall not be used. When the modification makes no influence on the interchangeability, the alphabet A shall take the lead; and if the modification makes an influence on the interchangeability, the alphabet A shall be neglected and B takes the lead.

Table 5 Characters used for designating the year

Year	Code	Year	Code
1999	X	2015	F
2000	Y	2016	G
2001	1	2017	H
2002	2	2018	J
2003	3	2019	K
2004	4	2020	L
2005	5	2021	M
2006	6	2022	N
2007	7	2023	P
2008	8	2024	R
2009	9	2025	S
2010	A	2026	T
2011	B	2027	V
2012	C	2028	W
2013	D	2029	X
2014	E	2030	Y

Table 2 Characters used for designating the month

Month	Code	Month	Code
January	A	July	G
February	B	August	H
March	C	September	J
April	D	October	K
May	E	November	L
June	F	December	M

3). Example

For example: QR513MHA MH5H00001 means the first model QR513MHA transmission manufactured in August 2005.

Chapter 2 Technical Specifications

1. Specification Table

1.1. Engine specification table

Model	SQR473F	SQR472F
Bore (mm)	73	72
Piston Stroke (mm)	77.5	66.5
Displacement (ml)	1297	1083
Compression Ratio	10	9.5:1
Rated Power (kw)	61	50
Speed at rated power (r/min)	6000	6000
Max. Torque (N·m)	114	90
Speed at Max. Torque (r/min)	3800 - 4500	3500 - 4000
Min Fuel Consumption (g/kw▪h)	280	275

1.2. Transmission specification table

Model / Gear Shift	QR513MHA	QR512
1st Gear	3.545	3.818
2nd Gear	2.050	2.158
3rd Gear	1.423	1.400
4th Gear	1.065	1.029
5th Gear	0.865	0.838
Reverse Gear	3.364	3.583
Final Drive Ratio	4.056	4.111

2. Oil/Fluid Capacity Table

Engine Oil (Including strainer)	SQR473F series: 4.0L±0.5 L SQR472F series: 3.5 L
M/T (Manual Transmission)	QR513MHA: 1.8±0.1L QR512: 2.1L
Power Assisted Steering	MAX mark
Cooling System	1.3L displacement: 6.5 L 1.1L displacement: 6.0 L
Windscreen Cleaning System	MAX mark
Brake Fluid /Clutch Oil Reservoir	MAX mark

3. Oil/Fluid Specifications Table

Item	**Oil/Fluid**
SQR473F	API SJ SAE 10W-40
SQR472F	API SF SAE 10W-30
QR513MHA	75W-90
QR512	75W-90
Power steering oil	ATF-3
Brake fluid	Dot 4

Chapter 3 Basic Operation and Adjustment

1. Vehicle Delivery Check

1.1. Interior and exterior

(1) Interior and appearance defects
(2) Paintwork, electroplated parts and interior ornaments
(3) Attached articles, tools, spare tire, jack, user’s manual, warranty manual, attached keys.

1.2. Engine compartment section

(1) Engine hood lock and hinge
(2) Battery motor
(3) Electrolyte level
(4) Main ground wire
(5) Main fuse and spare parts
(6) Engine oil level
(7) Coolant level and water quality
(8) Power steering fluid level
(9) A/T oil level
(10) Glass cleaning fluid level
(11) Tension of driving belts (power steering, generator, compressor)
(12) Accelerator pedal control cable (A/T control cable)

1.3. Manipulation and control section

(1) Clutch pedal height and free travel
(2) Transmission pedal height and free travel
(3) Accelerator pedal
(4) Check the interior fuses and spare parts
(5) Check the radio/recorder/CD player and antenna
(6) All warning lights, generator, hand brake, oil pressure, brake failure, AT gear position display, ABS, SRS
(7) AT starter protectors

1.4. Engine startup check

(1) Working condition of battery and starter and the display of all warning lights
(2) Working condition of front washer

(3) Working condition of front wiper
(4) Turn signal indicator lamps and its automatic releasing
(5) Working condition of side lamps and number plate lamp
(6) Working condition of headlamps and high beam (high beam indicator lamp)
(7) Working condition of fog lamp
(8) Working condition of stop and backup lamps
(9) Working condition of instrument light and dimmer
(10) Working condition of horn
(11) Working condition of cigarette lighter
(12) Operation of sunroof
(13) Working condition of rear window defroster and its indicator light
(14) Performance of A/C system at any gear position (cooling, air delivery)
(15) Working condition of the cycling switch
(16) Working condition of electric rear-view mirror
(17) Clock setting and check

1.5. Engine shutdown check

(1) "Lamp ON" warning light

1.6. Each light turnoff check

(1) Steering wheel self-locking function
(2) Hand brake regulating function
(3) Steering wheel's angle regulating function
(4) Sun visor function
(5) Central door lock and remote control (warning) function
(6) Interior lights function
(7) Read light function
(8) Front/rear seat belt function
(9) Seat backrest's angle, seat regulating function
(10) Luggage boot lid (rear door) unlock function
(11) Luggage compartment light function
(12) Filler cap unlock and fuel designation
(13) Luggage boot lid (rear door) close and lock function

1.7. All doors open check

(1) Manual window function
(2) Rear door's child lock function
(3) Refill the lubrication oil into lock/hinge
(4) Check the installation of all doors after closing

1.8. Vehicle uplift check

(1) The wear or damage of bottom, engine, brake and fuel pipes
(2) Suspension fixing and its bolts
(3) Transmission oil level

1.9. Vehicle jackdown c.Check

(1) Confirm the torque of all wheel nuts
(2) Tire pressure label
(3) Tire pressure (including spare tire)
(4) Tools and jack
(5) Driving performance
(6) Noise from the interior, suspension and brake
(7) Brake and hand brake function
(8) Steering wheel automatic return function
(9) Steering wheel vibration and position
(10) Transmission gear shift (UP, DOWN)
(11) Odometer reading and cancel

1.10. Final check

(1) Working condition of cooling fan
(2) Idling/exhaust
(3) Leakage of fuel, engine oil, coolant and exhaust gas
(4) Hot start performance
(5) Check the performance of ABS with a tester

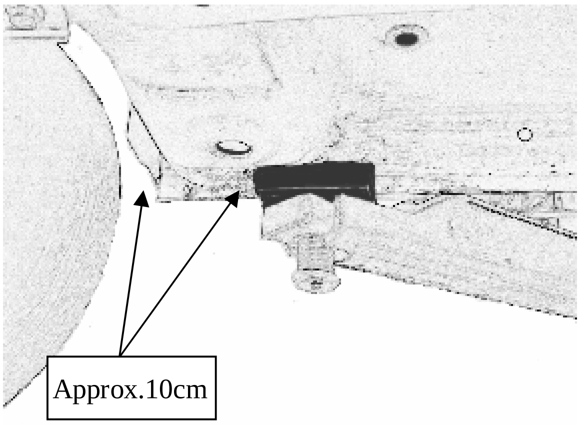
1.11. Final preparation

(1) Wash the interior and exterior of the vehicle
(2) Check whether the water enters into the interior including the luggage compartment

2. Vehicle Jack Lift Points

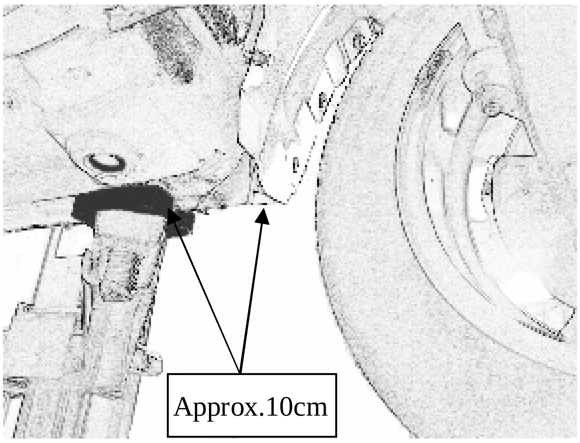
2.1. Position of front jack lift point

The front jack lift point is located at the convex edge of the lower front part of the vehicle, 10 cm away from the extreme point, and the points at the left and right sides are the same. The figure below shows the right front jack lift point where a jack supports the vehicle:



2.2. Position of rear jack lift point

The rear jack lift point is located at the convex edge of the lower rear part of the vehicle, 10 cm away from the extreme point, and the points at the left and right sides are the same. The figure below shows the right rear jack lift point where a jack supports the vehicle:

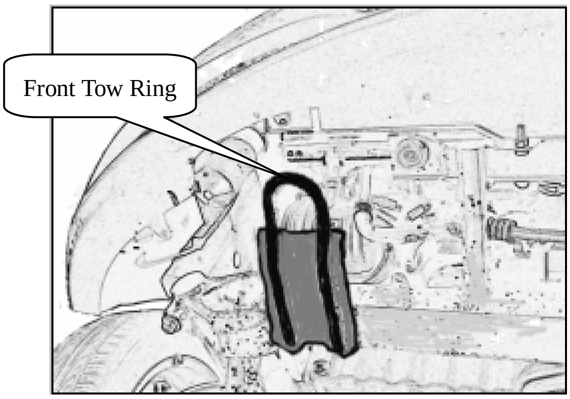


3. Towing

3.1. Towing position

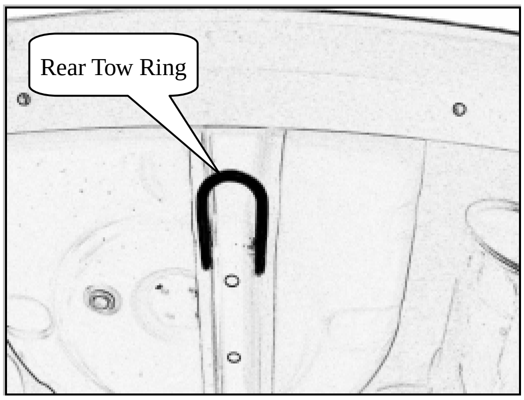
3.1.1. Front tow ring

The front tow ring is located under the right front of body, as shown in the figure below:



3.1.2. Rear tow ring

The rear tow ring is located under the rear of body, as shown in the figure below:



3.2. Towing method

3.2.1. The vehicle with manual transmission

The vehicle with manual transmission can be directly towed by the front tow ring of tractor, and, at the same time, the traveling direction of the vehicle towed shall be controlled by a driver; and if the vechile is a tractor, please ensure that the towing rope connect reliably with the rear tow ring.

3.2.2. The vehicle with automatic transmission (＊)

Two front wheels of the vehicle with automatic transmission are trailed by a tractor so as to tow the vehicle. Please DO NOT directly tow the vehicle; and if the vechile is a tractor, please ensure that the towing rope connect reliably with the rear tow ring.

4. Instrument Setting

4.1. Clock setting

Time is displayed on the left side of odometer in two modes: pointer and digital. The clock can be adjusted by pressing the control button on the speedometer for a long time.

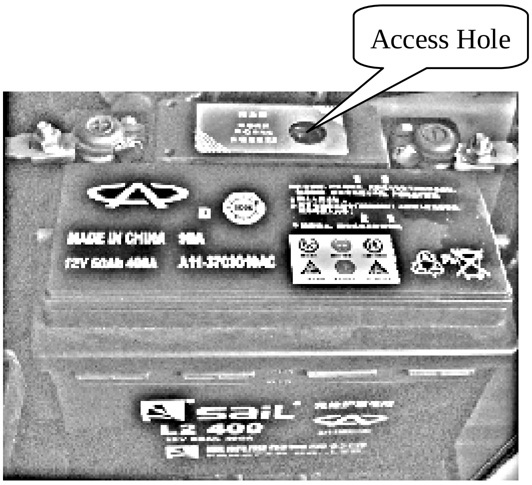
4.2. Mileage setting

The upper right of the odometer displays the one-way mileage (switchable), and the lower right displays the total mileage. In the case of vehicle equipped with reversing radar, when the reverse gear is engaged, the distance behind the vehicle can be displayed on the upper right of odometer.

4.3. Maintenance indicator light reset

In case that the ignition switch turns off, press the regulating button, 3 s later, after the ignition switch turns on, release the button,, and then the indicator light automatically resets.

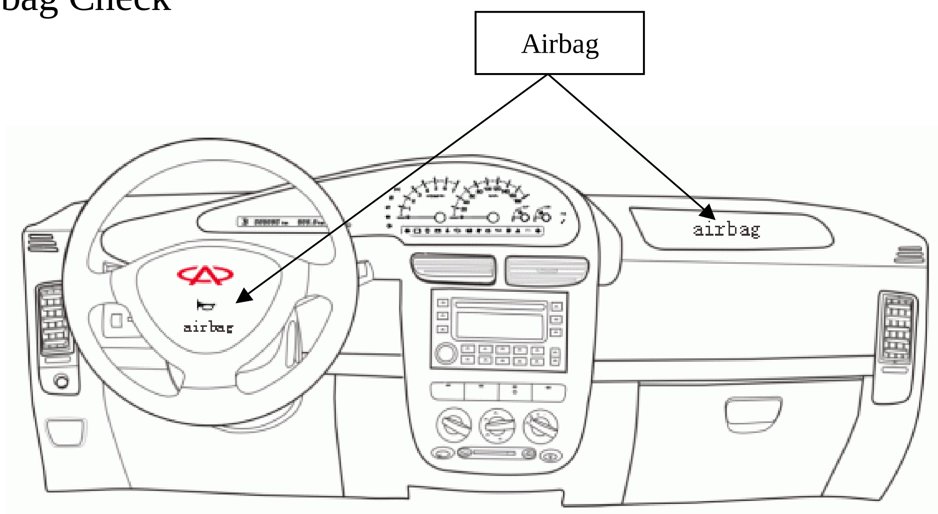
5. Battery Check



Check whether the connection of battery is secure and reliable; observe the prompt in the battery status access hole, and charge or replace the battery if necessary.

The vehicle equipps with the maintenance-free battery, and it is not recommended to use other types of batteries. If it is necessary to replace the battery, the current and capacity of a new battery must conform to that of old battery or CHERY’s specifications available.

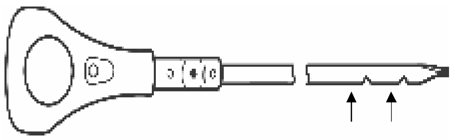
6. Airbag Check



The air bag is an optional configuration. If your vehicle is equipped with the air bags, please ensure that there is clean and no damage in the "air bag" positions shown in the figure above. DO NOT let any cleaning fluid or liquid enter into the aribags.

7. Engine Oil Check

7.1. Oil level check



Engine oil consumption is affected by many factors. A new engine reaches the normal value only after the mileage of approx. 5,000 KM. More engine oil might be consumed under the high-load of engine.

Stop your vehicle on a level surface before the engine oil check. Turn off the ignition switch and wait for a few minutes to let the engine oil flows into the oil pan (it may spend more time if the exterior temperature is low or the temperature of engine does not reach the normal working temperature). Before the engine oil check, please DO NOT start up the engine in the cold state. Pull out the dipstick and clean it with a flannelette-free cloth, and then fully insert the dipstick into the tank and pull it out again.

If the oil level is between MIN and MAX marks at the lower of dipstick, DO NOT refill the oil. The hot engine oil may exceed the upper mark several millimeters due to its thermal expansion.

7.2. Method to replace the engine oil

In case that the engine oil is replaced, it is necessary to wait until the engine cools down to the normal temperature, and then replace the engine oil according to the following procedures:

- Stop the vehicle over a jack, and then unscrew the filler cap (the cap is shown in the figure below);
- Lift the vehicle up to an appropriate height, unscrew the drain plug with a torque wrench, and flow the used engine oil into a container at the same time.;
- Then, tighten the drain plug with the torque wrench to the specified torque (25±3Nm);
- Jack down the vehicle, and then refill proper quantity of new engine oil according to the specifications;
- Screw up the filler cap.

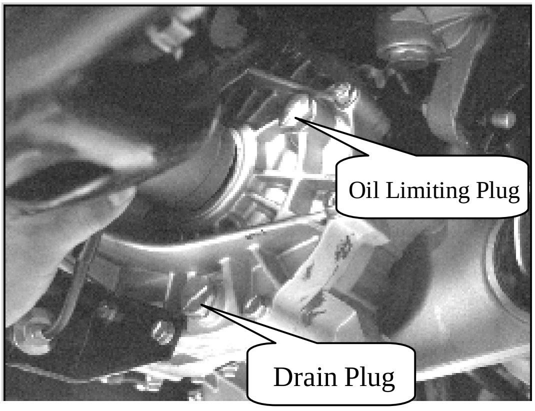
The oil refilled shall not exceed the upper limit.

Note: Please refill the engine oil conforming to the CHERY's specifications only to the level between MIN and MAX marks.

8. Transmission Oil Check

8.1. Oil level check

Shut down the engine and wait for several minutes, and then lift up the vehicle with a jack, unsrew the oil limiting plug with a torque wrench, and check the transmission oil level. If the distance between the oil level and filler opening is large, please appropriately refill the transmission oil (until the oil level increases up to the filler opening), and then tighten the oil limiting plug with a torque wrench to the specified torque. (The tightening torque of **44Nm** for QR513MHA, and tightening torque of **30Nm** for QR512.)



8.2. Method to replace the transmission oil

Shut down the engine and wait for several minutes, and then lift up the vehicle with a jack, unsrew the refiller plug with a torque wrench, and then carefully unscrew the drain plug and collect the used transmission oil with a container. In case that the used transmission oil nearly drains away, tighten the drain plug with a torque wrenchto the specified torque; and then refill the transmission oil specified by the CHERY Company (until the oil level increases up to the filler opening according to the specified quantity). Then tighten the refiller plug with a torque wrench to the specified torque.

9. Trouble Diagnosis of Electronic Control System

Please utilize the CHERY Company's special diagnostic testers X431 and K81/K61 to diagnose the electronic control system, and the updated version of program of the diagnostic testers is also required at the same time.

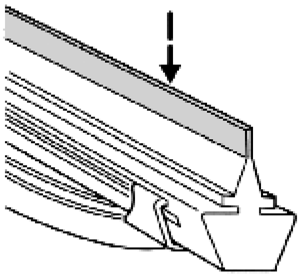
10. Lubrication and Maintenance of All Hinges and Door Locks

All the hinges and door locks are the maintenance-free products. Please make certain that the bush of any hinge is in good condition. If damaged, replace it in time.

11. Wiper System Check

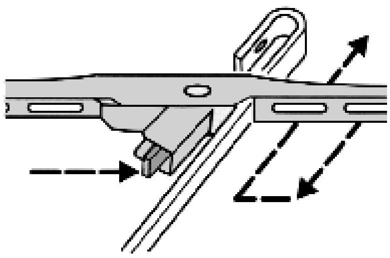
11.1. Wiper blade check and maintenance

Check wiper blade



Slide the tip of your finger on the edge of a wiper blade to check the roughness of the blade. The butter, silicone resin and fuel may enable the wiper blade not to normally work. It is recommended that the glass cleaning fluid is applied to clean the wiper blade.

Replace the wiper blade



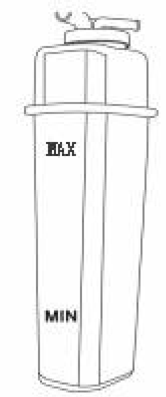
Lift the wiper arm and make it perpendicular to the wiper blade. To remove the wiper blade, press down the retaining clip according to the arrow as shown in the figure, loosen the wiper blade and then pull out the wiper arm in the reverse direction.

11.2. Nozzle check and adjustment

Keep the nozzle clean. If the spraying angle is improper, please insert the needle-like article into the nozzle to adjust the spraying angle. If the spraying angle can’t be adjusted to its proper position, adjust it again.

12. Coolant Check

QQ6 engine has a main radiator and an auxiliary radiator.
Check whether the auxiliary radiator's coolant level is between the MAX and MIN marks. If below the MIN mark, please refill the coolant.



CAUTION: Please DO NOT refill the coolant when the engine is in hot state. Please refill the coolant after the engine cools down.
When refilling the coolant, pay attention to the following methods:

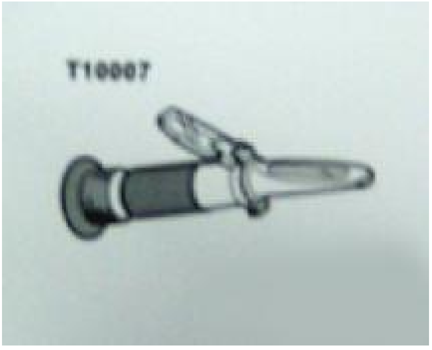
Method to refill the coolant at the filler cap: In case of the engine's cold state and standstill, turn the filler cap in the clockwise direction and apply the pressure on the cap to open it, and then refill the coolant until it can be seen viewing from the filler opening. Tighten the filler cap in the anticlockwise direction, start up the engine and let it operate at the idle speed for about 1 minute, and then shut down the engine. Open the filler cap and continuously refill the coolant until it can be visiable viewing from the filler opening.In case that the engine's water temperature is high or in case of each maintenance, note that the coolant is refilled in time from the filler cap.

Method to refill the coolant into an auxiliary radiator: In case of the engine's cold state and standstill, pull upwards and open the auxiliary radiator filler cap. The capacity of coolant refilled must exceed the MIN mark and below the MAN mark. Regularly observe the capacity of coolant in the auxiliary radiator. Refill the coolant in time if below the MIN mark. The coolant level can be checked through the semi-transparent auxiliary radiator. When the engine is in the cold state, the coolant level shall be between the MIN and MAX marks.
If it is necessary to refill the coolant when the engine is hot, wait for 10 minutes first to cool the engine. Loosen the filler cap one quarter turn to release the pressure. Wait for a period of time, and then fully open the cap to refill the coolant which conforms to the specifications of this vehicle.

Using the coolant with the proper concentration can't only protect the engine free from be frozen in winter, but also provide the corrossion protection all the year around. Now, the engine can operate under very high temperature but the bad coolant can't provide the cooling system the proper corrosion protection. So, please use the coolant conforming to the CHERY's specifications. DO NOT substitute the coolant with the main water.

If refilling the antifreeze fluid into the vehicles in the cold region, please select the antifreeze fluid which has proper antifreezing capacity.

Antifreeze fluid testing tool: T10007 refractometer



Directions for use of T10007 refractometer 明:

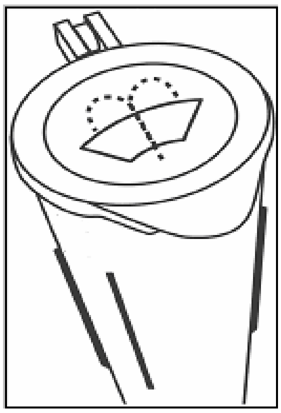
Refer to the user's manual, properly dip the T10007 refractometer into the antifreeze fluid and directly read out the temperature of antifreeze, and then refill the proper antifreeze fluid according to the antifreezing temperature required.

CHERY's special antifreeze fluid:

Part Number of Antifreeze	Antifreezing Temperature	Capacity per barrel
A11-8BE47041113520	-35℃	2 L
A11-8BE47041114520	-45℃	2 L

Total antifreeze fluid refilled: 1.3L displacement model: 6.5 L; and 1.1L displacement model: 6.0 L.

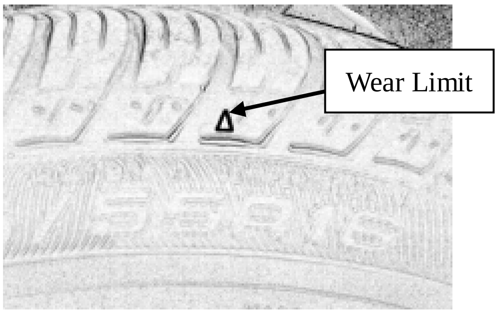
13. Check and Maintenance of Windscreen Cleaning Fluid



The windscreen cleaning fluid is a kind of consumptive fluid. Please regularly check the fluide (every two weeks or one month). If shortage, please refill the fluid (up to approx. 10 cm away from the opening). If ncessary, refill the clean water and windscreen cleaning fluid according to the concentration of (1: 20). Please close the cover of reservoir after refilling.

14. Tire Check

14.1. Pattern depth check



The related regulations specify the depth of the tire surface. When the remaining depth of tire pattern reaches the limit of 1.6 mm or the tire pattern is worn to the tip of triangular mark as shown in the figure above, a wear strip will appear on the tire tread, which indicates the performance and safety of tire here considerably reduce and the tire must be replaced.

14.2. Tire pressure check

Tire Pressure:

Item		**Tire Pressure (kPa)**	**Spare Tire**
Front Wheel	Unloaded/Semi-loaded	230	**230**
	Laden	230	
Rear Wheel	Unloaded/Semi-loaded	210	
	Laden	210	

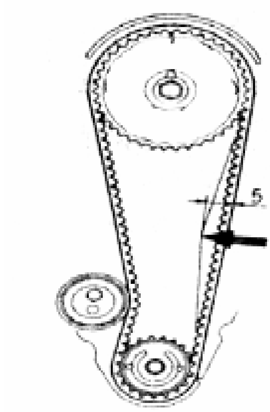
Precautions on tire pressure

The pressure values listed in the table above are applicable to the tire in cold state. The aire pressure will slightly increase if the tire is heated, but it is unnecessary to reduce the air pressure; and the pressure values listed in the table above shall increase by 20Kpa if the winter tire is available.

In order to facilitate your search of specified charging pressure value, there is a self-adhesive label attached to the inner side of the filler cap, on which is printed with the specified value of tire charging pressure.

15. Timing Belt Check

Check its wear and tension of the timing belt, and regulate or replace it if necessary. The tension requirement after the timing belt is regulated: In the intermediate position of two wheels at the timing belt pulled side, when the timing belt is pressed down approx. 5 mm by hand, the force required is: 19.6 - 29.4 N (2.0 - 3.0 kg), and its schematic diagram is shown below;



16. Check and Maintenance of Engine Accessaries' Belts

Wedge belt: Check its tension, and regulate or replace it if necessar. Refer to the "Timing belt" for the requirement on tension after regulating;

17. Check and Adjustment of Clutch

Check whether the travel of clutch pedal is proper. If not, regulate the clutch control cable under the transmission to adjust the travel of pedal. The regulating position is shown in the figure below:

The regulating method.: The clutch control cable regulating nut is a lock nut. In case of regulating, push outwards the control cable to make the regulating nut have a proper clearance away from the clutch separation arm. In this case, the travel of clutch can be adjusted only. Turn the nut in the clockwise direction to reduce the free travel; and turn the nut in the anticlockwise direction to increase the free travel.

18. Check and Maintenance of Brake System

18.1. Brake master cylinder and vacuum booster with brake master cylinder

Check the brake fluid level, and check the leakage of brake master cylinder and vacuum booster with brake master cylinder.

18.2. Disc brake

18.2.1. Thickness of brake disc

The standard thickness of front brake disc (ventilation disc) shall be 17 mm with the serviceability limit of 15 mm; and if above the limit, the front brake disc shall be replaced.

18.2.2. Thickness of brake lining

The standard thickness of front brake lining shall be 10 mm, with the serviceability limit of 3 mm, and the remaining thickness while the brake lining thickness limit shall not be less than 3mm.

The standard thickness of rear brake lining shall be 5 mm, with the serviceability limit of 1 mm, and the remaining thickness while the brake lining thickness limit shall not be less than 1 mm.

18.3. Brake disc runout check

Check the brake disc face runout with a dial gauge. The serviceability of front brake disc shall be 0.03 mm. If above the limit, replace it.

IMPORTANT NOTICE:

After the completion of replacement of friction lining or brake disc, step on the brake several times to enable the brake lining to run-in with the brake disc. Caution the safety!

After the replacement of brake lining, check whether the brake fluid level is between MIN and MAX marks.

18.4. Brake fluid check and replacement

The brake fluid reservoir is located at the right rear portion of engine compartment. The fluid level must be between the MIN and MAX marks at the side of the fluid reservoir. If the fluid level falls down to the MIN mark, the brake fluid level warning light will light. In this case, please refill the brake fluid conforming to the CHERY's specification, and check the leakage of this system.

In case that the brake fluid is refilled, make certain that it is absolutely clean.

19. Check and Maintenance of Vehicle Bottom

19.1. Bolt torque check

Check the torque of chassis bolts one-by-one with a torque wrench. The reference torques are as shown in the table below:

Part Description	**QTY per singlel vehicle**	**Remark**	**Torque (Nm)**
Bolt	2	Used to secure the steering wheel and subframe (right)	100±10
Bolt	2	Used to secure the steering wheel and	100±10

		subframe (left)	
Nut	2	Used to secure the tie rod and steering knuckle	35±3
Bolt	2	Lower swing arm and subframe connecting rod (left, right)	100±10
Flange face metal retaining nut	2	Lower swing arm and subframe connecting rod (left, right)	100±10
Bolt	2	Subframe and body (front)	150±10
Bolt	2	Subframe and body (rear)	150±10
Bolt	1	Lateral suport bar and body	100±10
Nut	1	Lateral suport bar and body	100±10
Bolt	1	Lateral suport bar and rear shaft	100±10
Bolt	2	Rear trailing arm and body	100±10
Bolt	4	Rear trailing arm hinge and rear shaft	60±5
Nut	4	Rear trailing arm hinge and rear shaft	60±5
Flange face metal retaining nut	4	Sliding column and steering knuckle	100±10
Bolt	4	Sliding column and steering knuckle	100±10
Nut	4	Stabilizer bar and lower swing	60±5
Bolt	4	Installed to the subframe	25±5
Flange face metal retaining nut	2	Push bar and subframe	100±10
Flange face metal retaining nut	4	Push bar and lower swing	60±5
Flange face metal retaining nut	4	Push bar and lower swing	100±10
Nut	2	Used to connect the rear shock absorber and body	100±10
Bolt	2	Used to connect the rear shock absorber and rear shaft	100±10
Wheel nut	16	Used to secure the tire and brake	110±10
Self-locking nut	2	Used to secure the drive shaft and tire (front)	270±10
Lock nut	2	brake drum and rear shaft	250±10

19.2. Rubber parts check

Check the ageing or damage of the rubber parts at the bottom of vehicle. If aged or damaged, replace it in time.

19.3. Ball pin check

Check the crack and other possible defects of ball pin. If any abnormal symptom is found, replace it in time.

20. Check and Maintenance of Intake and Exhaust Systems

Check the cleanness of air cleaner element, and replace it as required;
Check the leakage and clogging of intake and exhaust systems;
Check the damage of precatalytic converter assy, three-way catalytic converter assy, front muffler assy, and rear muffler assy. If damaged, replace it.

21. Check and Maintenance of Fuel System

Check the ageing, breakage and leakage of fuel pipes. If the symptom(s) occur, please replace the related pipe;
Check the fuel pressure of fuel system.

22. Check and Maintenance of Steering System

Check the torque of bolts of steering system. The reference torques are shown in the table below:

Part Description	QTY per singlel vehicle	Remark	Torque (Nm)
Bolt	1	Used to secure the steering wheelinput shaft and universal joint	25±5
Steering wheel installation nut	1	Steering wheel fixing nut	35±3
Nut	4	Used to secure the steering column and IP cross beam	25±5
Bolt	3	Used to secure the universal joint protective sleeve and front side	9±3
Bolt	2	Used to secure the steering wheel and subframe (right)	100±10
Bolt	2	Used to secure the steering wheel and subframe (left)	100±10
Nut	2	Used to secure the tie rod and steering knuckle	35±3
Bolt	2	Used to secure the single pipe clamp to the suspension support, and secure the high-pressure pipe to the vehicle body	9±3

Check the leakage of power steering pump and its pipes; and check the power steering oil level.

23. Check and Maintenance of A/C System

In case of the maintenance of the vehicle A/C system, the following procedures shall be conducted: first, listen; second, look; third, touch; and fourth, check. Its specific content is:

First, listen:

Determine the operating condition of compressor according to the sound from the compressor. For the normal operating, only the even valve plate motion sound from the compressor can be heard. If the slap sound can be heard, it is generally the fluid slugging sound or hammering of the coolant. If a serious friction sound is emitted from the machine body and the clutch sometimes gives out the friction sound and is heated, it is caused due to the excessive load of compressor, shortage of lubrication oil or oil-break, and the slippage of the clutc. If there is a slap sound in the exterior of the vehicle, it is caused due to either the belt loose, or the serious wear.

If the continuous impact sounds of the motion parts in the machine body can be clearly heard during the shutdown of the machine, it is caused due to the serious wear of interior motion parts, which results that the clearance between the shaft and bearing, piston and cylinder body, and connecting rod and shaft is large or loose.

Second, look:

Check the cleanness of surface of the condenser first, avoid that the foreign materials and mud acttach to the condenser, which may make an influence on the cooling effect. In general, regularly rinse the condenser with water. CAUTION: When the condenser is rinsing, DO NOT touch the fins to deform them. For the deformed fins, carefully correct them with a long nosed pliers.

At the air inlet of vehicle air conditioner's evaporator, some air filters are generally installed. Regularly check the evaporator every week, clear the foreign materials, and clean the mud from the evaporator surface with the high-pressed air so as to avoid that the heat transfer coefficient falls down and the A/C air is contaminated. The contents checked regularly are:

- Check whether there are some oil stains in all connecting sections of the A/C cooling system. If there are some oil stains, it indicates that the leakage may occurs here. Immediately remove the trouble A.S.A.P. For the cooling sytem, the leakage position(s) must be mainly inspected. The mainly-inpsected positions also include: compressor shaft seal, front and rear cover plate gasket, safety valve and etc.
- Check the wear, ageing, blister, crack and leaky oil stains of all hoses. Since the vehicle's cooling and heating systems adopt a lot of rubber hoses, these hoses may be worn due to contact with the vehicle body during the vehicle is traveling and vibrating. The brake hoses in the engine compartment are subject to the high temperature ageing, and easily have alligatoring symptom, which may result that the brake fluid and coolant drain out but the moisture, air and dust enter into the hoses to damage the compressor and all parts. So, it is very important to regularly check these rubber hoses. If it is found that the rubber hose contact the engine, separate the rubber hose from the engine in time, and reliably secure the rubber hose. The rubber hose goes across the metal plate, in general, with a protective sleeve. Otherwise the metal may cut the rubber hose.

Third, touch:

Touch the pipes and all parts of the A/C system which is working, and determine its temperature. In the normal condition, the temperature of pipes at the high pressure end shall be 55℃ - 65℃ while the low pressure pipes are in the low temperature state and there are some water dews on the parts, pipes and joints at the low pressure end. Touch the high pressure area, especially the metal parts at the high pressure end, such as compressor's exhaust pipe, condenser, stock fluid dryer and etc, and find these sections are hot. Be care! If you touch these positions and find that your hand is hot but doesn't feel burning, it is normal; and if your hand feels hurning, check whether the condenser is in the good cooling conditio, the surface of condenser is clean without foreign materials, and etc.

If your hand feels that the temperature is not high at the high pressure end, it indicates that the coolant level is low; and if there is no temperature which can be felt by your hand, it indicates that the coolant fully leaks.

If the frosting symptom or water dews can be found on the fluid reservoir, it indicates that the dessicant is broken and blocks the pipe from which the coolant flows and the temperature of high pressure area at the front end of this reservoir is very high. In this case, solve the clogging problem A.S.A.P, replace it with a new dryer and clean the system at the same time.

The temperature of the expansion valve is special when you feel it by hand: its coolant inlet joint is hot while its outlet joint is cold, with some water dews. If the frosting symptom is found at the outlet of the expansion valve, it indicates that the expansion valve port is clogged. It may be caused due to either the foreign materials or the ice generated by the moisture which enters into the cooling system. The trouble must be handled immediately: either clean the system, replace it with a new dryer and expansion valve, or revacuumize it and remove the moisture.

Touch the low-pressure reservoir and find your hand feels cold, with water dews but without frosting symptom. If there is the frosting symptom, it indicates that the system has trouble. Find out the reason. Touch the intake and exhaust pipes of the compressor, and find that the temperature your hand feels shall be considerably different. If not, it indicates that the coolant has fully leaked; and if the difference is not big, it indicates that the coolant level is low.

IMPORTANT: When the A/C system is touched by hand, absolutely pay more attention to the safety, and avoid the injured by the belt and other motion parts.

Fourth, check:

1. Check the tensile force of belt first. The tensile force of new and old belts is different. Even if it is a new belt, its tensile force may also change considerably after the use of 5 minutes. As a newly-installed belt, it must be regulated twice: After the first installation of the belt, its tensile force must be regulated to the specified value; and after it operates for 30 minutes, it must be regulated for the second time.
2. Check the magnetic clutch
3. Check the A/C blower
4. Check the high/low pressure switch and overheat protector
5. Check the heating system
6. Check the expansion valve

With the check above-metioned, make certain that the A/C system is in good working condition.

24. Check and Replacement of Three Filters

The three filters means the air cleaner, oil cleaner, and gasoline filter. These three filters are checked and replaced as follows:

Air cleaner

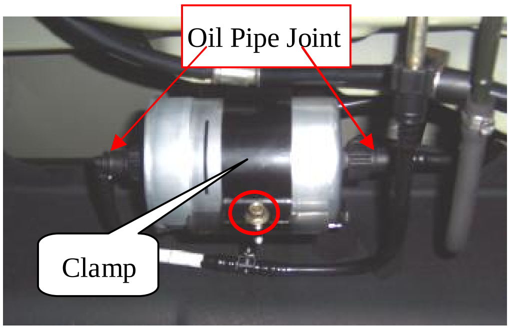
Remove two screws as shown in the figure below with a cross screwdriver, take off the element of air cleaner and then replace the element, and then reinstall the air cleaner after the replacement of the element.

Engine oil filter

Fully drain out the engine oil, and then remove and replace the filter with a special oil filter spanner. To ensure the sealing effect, it is best to appropriately apply a little of engine oil on the screwed end of the new oil filter, and then reinstall it.

Fuel filter

Remove the bolts as shown in the figure below, take off the clamp from the gasoline filter, and then remove the oil pipe joints from the both extremes, install a new gasoline filter in the reverse order.



25. Four-Wheel Alignment Check

Please refer to *Service Manual For Chassis*, and check the four-wheel alignment parameters with a four-wheel alignment machine according to the parameters listed in the table below. If not conforming to the specifications in the table below, please properly adjust the wheels.

<table>
<tr><td colspan="2">Item</td><td colspan="2">Parameter</td></tr>
<tr><td colspan="2">Model</td><td>SQR7130S21</td><td>SQR7110S21</td></tr>
<tr><td rowspan="4">Front Wheel</td><td>Front Camber Angle</td><td>0.87°±50′</td><td>0.87°±50′</td></tr>
<tr><td>Kingpin Caster Angle</td><td>3.4°±30′</td><td>3.4°±30′</td></tr>
<tr><td>Kingpin Inclination</td><td>12.7°</td><td>12.7°</td></tr>
<tr><td>Front Wheel Toe-In</td><td>(1±3)mm</td><td>(1±3)mm</td></tr>
<tr><td rowspan="2">Rear Wheel</td><td>Rear Camber Angle</td><td>0°±30′</td><td>0°±30′</td></tr>
<tr><td>Rear Wheel Toe-In</td><td>0°±10′</td><td>0°±10′</td></tr>
<tr><td colspan="2">Sideslip</td><td>≤ 3m/km</td><td>≤ 3m/km</td></tr>
</table>

26. Lamp Check

26.1. Position Lamp:

Shift the headlamp switch on the instrument panel to the 1^{st} gear position, i.e., the clearance lamp position. In this case, the front and rear position lamps, and number plate lamp are turned on at the same time. And, after the clearance lamp turns on, all nightlights of instrument, audio, air conditioner, switch and etc light; and the interior backlight can be adjusted by manipulating the nightlight regulating switch.

26.2. Low beam lamp:

After the clearance lamp turns on, if the low beam lamp switch turns on, the low beam lamp shall light;

26.3. High beam lamp:

If the high beam lamp switch turns on, the high beam lamp shall light, and the instrument shall display the symbol of high beam lamp at the same time;

Fog lamp:

The front fog lamp can turns on only after the clearance lamp turns on, and the rear fog lamp can turns on only after the front fog lamp turns on;

26.4. Turn signal lamp:

A. In case that the left turn signal lamp turns on, all the left front/left/left rear turn signal lamps shall light at the same time;
B. In case that the right turn signal lamp turns on, all the right front/right/right rear turn signal lamps shall light at the same time;

26.5. Hazard waring light:

In case that the warning light switch turns on, six turn signal lamps shall light at the same time, and the warning light switch flashes, the left and right turn signal indicator lights on the instruement panel shall flash;

26.6. Stop lamp:

In case that the stop lamp switch is stepped on, the stop lamp and high mount stop lamp shall light at the same time;

26.7. Rear luggage compartment light:

In case that the rear luggage compartment opens, this light shall light;

26.8. Door lamp:

After the door opens, the door contact switch turns on, and then the door lamp shall light.

27. Exhaust Emission

Standard(s) applicable:

Type I test – Exhaust contaminant emission test after cold starting.

Euro II emission standard:

Type I Test Emission Limit Unit: g/km

Limit	
Carbon Monoxide (CO) L_1	Hydrocarbons +Nitrogen oxides (HC+NOx) L_2
2.2	0.5

Euro III emission standard:

Type I Test Emission Limit Unit: g/km

Limit		
Carbon Monoxide (CO) L_1	Hydrocarbons (HC) L_2	Nitrogen oxides (NOx) L_3
2.3	0.2	0.15

Chapter 4 Regular Maintenance Specifications

1. Regular Maintenance Schedule

Maintenance Item	**Mileage (Km)**		
	5000	**15000**	**30000**
Lighting, warning flasher devices, horn: Check its performance		★	★
Wiper and cleaning devices: Check its performance, and refill the cleaning fluid, if necessary		★	★
Check the free travel and liquid level of clutch, and adjust it if necessary		★	★

Maintenance Item	Mileage (Km)		
	5000	15000	30000
Engine oil: Replace it	★	★	★
Oil cleaner: Replace it	★	★	★
Transmission oil: Check the oil level, quality, color, and refill it, if necessary	★	★	★
Engine: Check the leakage (engine oil, antifreeze fluid, fuel, A/C system, etc)	★	★	★
Battery: Check the electrolyte level, and refill the distilled water if necessary (equipped with the maintenance-free battery)		★	★
Timing belt: Check the wear and tension, and adjust or replace it if necessary			★
Engine hood hinge and lock body: Lubricate it	★	★	★
Door hinge and door stopper: Lubricate it	★	★	★
Spark plug: Check it, and replace it, if necessary		★	★
Air cleaner: Clean its housing, clear the element, and replace its element, if necessary	★	★	★
A/C filter: Check its cleanness, and replace it, if necessary		★	★
Ignition timing: Check it	★	★	★
Fuel cleaner: Replace it			★
Wedge-shaped belt: Check its tension, and adjust or replace it, if necessary		★	★
Transmission: Check its leakage or damage		★	★
Dust cap of constant velocity universal joint: Check its damage	★	★	★
Steering tie rod end: Check its free play and the damage of dust cap	★	★	★
Protective sleeve of steering universal joint assy: Check its dislocation or damage		★	★
Hand brake: Check its travel and adjust it, if necessary		★	★
Brake lining/shoe: Check its thickness, and replace it, if necessary	★	★	★
Brake disc/drum: Check its working condition, damage, and replace it, if necessary		★	★
Vehicle bottom protector: Visually check its damage			★
Seat belt: Check its damage		★	★
Toe-in value, camber angle: Check it, and adjust it, if necessary		★	★
Ball pin: Check its clearance		★	★
Rubber rear axle hingle: Check its damage		★	★
Steering knuckle/front wheel bearing: Check the looseness of connection, abnormal sound			★
Engine oil pan bolt: Check its looseness, and tighten it if necessary			★
Control arm rubber sleeve: Check its damage		★	★
Brake hose: Check its ageing, damage		★	★
Brake pipe: Check its damage, corrosion and the leakage at any joint		★	★
Suspension components: Check its abnormal looseness or friction, damage, and normal working	★	★	★
All joints of fuel system: Check its ageing, damange, abnormal looseness or friction			★

Maintenance Item	Mileage (Km)		
	5000	**15000**	**30000**
Exhaust system: Check its leakage and damage, adjust or replace it, if necessary		★	★
Steering system: Check the power steering fluid level, whether the clearance between the racks of steering wheel's gear is proper, the connection condition of all linkages, whether the system works normally, and repair or replace it, if necessary		★	★
Cooling system: Check the antifreeze fluid level, the status of all connecting pipes, leakage, and replace it, if necessary	★	★	★
Brake system: Check the brake fluid level, the status of all connecting pipes, damage and leakage, the working condition of the system, and repair or replace it, if necessary	★	★	★
A/C system: Check whether its pressure is normal, damaged, has abnormal sound, odor, and works normally	★	★	★
Tire (including spare tire): Check the depth of tire pattern, regulate the air pressure of tire, and check the tightening torque of wheel bolt.	★	★	★
Tire position change		★	★
Chassis and body connecting bolt: Check its looseness, and tighten it, if necessary	★	★	★
Wheel: Check its looseness	★	★	★
Engine idling check: Check whether the engine working condition of the engine, parameters of electronic fuel injector, and its exhaust are normal when the engine operates at the idle speed, adjust it, if necessary	★	★	★
Trail driving: Check whether the functions of all mechanisms are normal or not, adjust it, if necessary	★	★	★
Note: For the manual transmission, the transmission gear oil shall be replaced every one-year of traveling or the mileage of 30,000 KM, and the brake fluid must be replaced every two-year of travelling or the mileage of 50,000 KM.			

2. Regular Maintenance Process

2.1. Standard first maintenance (5,000 KM) work procedure

2.1.1. Receive the vehicle to be maintained, wear the "four-piece series" (seat cover, steering wheel cover, shift lever cover, driver's foot pad) on the vehicle, drive the vehicle to the lifting jack, and support the vehicle;
2.1.2. Prepare for the related tools and special devices;
2.1.3. Wear the left and right fenders protective covers and front protective covers on the vehicle to be maintained;
2.1.4. Replace the engine oil, and oil cleaner (refer to the replacement above-mentioned in this manual);
2.1.5. Check transmission oil: Check the leakage of transmission oil viewing from the engine

compartment; and then lift up the vehicle and check the leakage of transmission oil viewing from the bottom of vehicle;

2.1.6. Check the oil/fluid: Check the levels of brake fluid, antifreeze fluid, glass cleaning fluid and power steering oil, and the leakage of the related pipelines;

2.1.7. Check the door lock, hinge and stopper: Check the working condition of all door locks, hinges and stoppers, and appropriately add the lubrication oil if there is abnormal sound or the resistance is big;

2.1.8. Check the air cleaner: Clean the element (with the high-pressure air), and replace it, if necessary;

2.1.9. Check the dislocation or damage of the dust cap of constant velocity joint;

2.1.10. Check the damage of steering tie rod end and its dust cap;

2.1.11. Check the thickness of brake lining/shoe, and replace it, if necessary. The standard thickness of front brake lining is 10 mm, with the serviceability limit of 3 mm, and the remaining thickness while the brake lining thickness limit shall not be less than 3 mm; and the standard thickness of rear brake lining is 5 mm, with the serviceability limit of 1 mm, and the remaining thickness while the brake lining thickness limit shall not be less than 1 mm;

2.1.12. Check the suspension components: Check its abnormal looseness or friction, damage, and the working condition;

2.1.13. Check the brake system: Check the brake fluid level, the status of all connecting pipes, leakage and damage, the working condition of the system, and repair or replace it, if necessary;

2.1.14. Check the A/C system: clean the element (with the high-pressure air), check its pressure (it is different according to the various working conditions, etc, and the reference value while idling is:low pressure: 2.5 - 3.0 Bar; high pressure: 15 - 17 Bar), the leakage, abnormal sound, odor, and the working condition;

2.1.15. Check tire (including spare tire): Check the depth of tire pattern, which the depth of tire pattern shall not be less than 1.6 mm; regulate the air pressure of tire: 230kPa for front wheel, 210 kPa for rear wheel, and 230 kPa for spare tire; and check the wheel bolt tightening torque (110±10Nm);

2.1.16. Check the chassis bolt: Check the chassis bolts one-by-one with a torque wrench, and tighten it to the specified torque if loose ;

2.1.17. Check the engine while idling: Check the engine's working condition,electronic fuel injector parameters and exhaust whiling idling, and adjust it, if necessary;

2.1.18. Lower the vehicle, and take off the "four-piece series" and the protective covers of left and right fenders and the front protective cover;

2.1.19. Trial driving: Check the display status of combination instrument, the working condition of four-door regulator, and the function of the steering, braking and gear shifting mechanisms, pay attention to the abnormal sound from the engine and body, and examine and repair it, if necessary;

2.1.20. Look around the vehicle, and wash it if there is no abnormal symptom, then deliver the vehicle to its owner.

2.2. Standard 15,000 KM maintenance work procedure

2.1.1. Receive the vehicle to be maintained, wear the "four-piece series" (seat cover, steering wheel cover, shift lever cover, driver's foot pad) on the vehicle, drive the vehicle to the lifting jack, and support the vehicle;

2.1.2. Prepare for the related tools and special devices;

2.1.3. Wear the left and right fenders protective covers and front protective covers on the vehicle to be maintained;

2.1.4. Replace the engine oil, and oil cleaner(refer to the replacement above-mentioned in this manual);

2.2.5. Check transmission oil: Check the leakage of transmission oil viewing from the engine compartment; and then lift up the vehicle and check the leakage of transmission oil viewing from the bottom of vehicle;

2.2.6. Check the free travel of clutch,and regulate it, if necessary;

2.2.7. Check the oil/fluid: Check the levels of brake fluid, antifreeze fluid, glass cleaning fluid and power steering oil, and the leakage of the related pipelines;

2.2.8. Battery: Check the electrolyte level, and refill the distilled water if necessary (the maintenance-free battery exclusive);

2.2.9. Wiper and cleaning equipment: Check its working condition;

2.2.10. Check the door lock, hinge and stopper: Check the working condition of all door locks, hinges and stoppers, and appropriately add the lubrication oil if there is abnormal sound or the resistance is big;

2.2.11. Check the air cleaner: Clean the element (with the high-pressure air), and replace it, if necessary;

2.2.12. Check the dislocation or damage of the dust cap of constant velocity joint;

2.2.13. Check the damage of steering tie rod end and its dust cap;

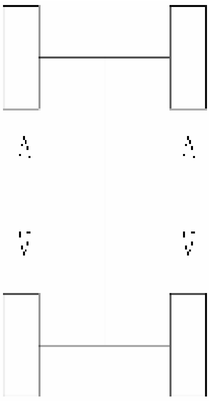
2.2.14. Ball pin: Check its looseness and scratch;

2.2.15. Check the thickness of brake lining/shoe, and replace it, if necessary. The standard thickness of front brake lining is 10 mm, with the serviceability limit of 3 mm, and the remaining thickness while the brake lining thickness limit shall not be less than 3 mm; and the standard thickness of rear brake lining is 5 mm, with the serviceability limit of 1 mm, and the remaining thickness while brake lining thickness limit shall not be less than 1 mm;

2.2.16. Brake disc/drum: Check its working condition, the damage, and replace it, if necessary;

2.2.17. Hand brake: Check its travel, and regulate it, if necessary;

2.2.18. Tire position change: Change the position of tires according to the description as shown in the figure, and note that the status of tire of the front wheel shall be better than that of rear wheel after position changing;



2.2.19. Brake hose: Check its ageing and damage;

2.2.20. Brake pipe: Check its damage, corrosion and the leakage of all joints;

2.2.21. Check the suspension components: Check its abnormal looseness or friction, damage, and the working condition;

2.2.22. Rear shaft rubber hinge: Check its damage;

2.2.23. Control arm rubber sleeve: Check its damage;

2.2.24. Check the brake system: Check the brake fluid level, the status of all connecting pipes, leakage and damage, the working condition of the system, and repair or replace it, if necessary;

2.2.25. Check the A/C system: clean the element (with the high-pressure air), check its pressure (it is different according to the various working conditions, etc, and the reference value while idling is:low pressure: 2.5 - 3.0 Bar; high pressure: 15 - 17 Bar), the leakage, abnormal sound, odor, and the working condition;

2.2.26. Check tire (including spare tire): Check the depth of tire pattern, which the depth of tire pattern shall not be less than 1.6 mm; regulate the air pressure of tire: 230kPa for front wheel, and 210 kPa for rear wheel; and check the wheel bolt tightening torque (110±10Nm);

2.2.27. Check the chassis bolt: Check the chassis bolts one-by-one with a torque wrench, and tighten it to the specified torque if loose ;

2.2.28. Toe-in value and camber angle: Check the toe-in value, camber angle, and adjust it if necessary (refer to the parameters above for the adjustment);

2.2.29. Check the spark plug: Check whether the spark plug has the carbon deposits, ablation symptom, etc, and replace it if necessary (the service life of a spark plug is in general 30,000 KM);

2.2.30. Wedge belt: Check its tension, and regulate or replace it if necessar.Refer to the “Timing belt”in the *Standard 30,000 KM maintenance work procedure* for the tension requirement after regulating;

2.2.31. Check the engine while idling: Check the working condition of the engine while idling,check the working condition of electronic fuel injector parameters and exhaust, and adjust it if necessary;

2.2.32. Exhaust system: Check its leakage and damage, and regulate or replace it if necessary;

2.2.33. Lower the vehicle, and take off the “four-piece series” and the protective covers of left and right fenders and the front protective cover;

2.2.34. Check the lighting, warning flasher devices, horn: Check its working condition;

2.2.35. Seat belt: Check its damage;

2.2.36. Trial driving: Check the display status of combination instrument, the working condition of four-door regulator, and the function of the steering, braking and gear shifting mechanisms, pay attention to the abnormal sound from the engine and body, and examine and repair it, if necessary;

2.2.37. Look around the vehicle, and wash it if there is no abnormal symptom, then deliver the vehicle to its owner.

2.3. Standard 30,000 KM maintenance work procedure

2.1.1. Receive the vehicle to be maintained, wear the “four-piece series” (seat cover, steering wheel cover, shift lever cover, driver’s foot pad) on the vehicle, drive the vehicle to the lifting jack, and support the vehicle;

2.1.2. Prepare for the related tools and special devices;

2.1.3. Wear the left and right fenders protective covers and front protective covers on the vehicle to be maintained;

2.1.4. Replace the engine oil, and oil cleaner(refer to the replacement above-mentioned in this manual);

2.3.5. fuel filter: refer to the replacement above-mentioned in this manual;

2.3.6. All joints of fuel system: Check its ageing, damage, abnormal looseness or friction;

2.3.7. Check transmission oil: Check the leakage of transmission oil viewing from the engine compartment; and then lift up the vehicle and check the leakage of transmission oil viewing from the bottom of vehicle;

2.3.8. Check the free travel of clutch,and regulate it, if necessary;

2.3.9. Check the oil/fluid: Check the levels of brake fluid, antifreeze fluid, glass cleaning fluid and power steering oil, and the leakage of the related pipelines;

2.3.10. Battery: Check the electrolyte level, and refill the distilled water if necessary (the maintenance-free battery exclusive);

2.3.11. Wiper and cleaning equipment: Check its working condition;

2.3.12. Check the door lock, hinge and stopper: Check the working condition of all door locks, hinges and stoppers, and appropriately add the lubrication oil if there is abnormal sound or the resistance is big;

2.3.13. Check the air cleaner: Clean the element (with the high-pressure air), and replace it, if necessary;

2.3.14. Check the dislocation or damage of the dust cap of constant velocity joint;

2.3.15. Check the damage of steering tie rod end and its dust cap;

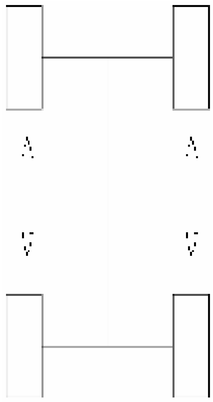
2.3.16. Ball pin: Check its looseness and scratch;

2.3.17. Check the thickness of brake lining/shoe, and replace it, if necessary. The standard thickness of front brake lining is 10 mm, with the serviceability limit of 3 mm, and the remaining thickness while the brake lining thickness limit shall not be less than 3 mm; and the standard thickness of rear brake lining is 5 mm, with the serviceability limit of 1 mm, and the remaining thickness while brake lining thickness limit shall not be less than 1 mm;

2.3.18. Brake disc/drum: Check its working condition, the damage, and replace it, if necessary;

2.3.19. Hand brake: Check its travel, and regulate it, if necessary;

2.3.20. Tire position change: Change the position of tires according to the description as shown in the figure, and note that the status of tire of the front wheel shall be better than that of rear wheel after position changing;



2.3.21. Brake hose: Check its ageing and damage;

2.3.22. Brake pipe: Check its damage, corrosion and the leakage of all joints;

2.3.23. Check the suspension components: Check its abnormal looseness or friction, damage, and the working condition;

2.3.24. Steering knuckle/front wheel bearing: Check the looseness of joint, and the abnormal sound;

2.3.25. Rear shaft rubber hinge: Check its damage;

2.3.26. Control arm rubber sleeve: Check its damage;

2.3.27. Check the brake system: Check the brake fluid level, the status of all connecting pipes, leakage and damage, the working condition of the system, and repair or replace it, if necessary;

2.3.28. Check the A/C system: Check its pressure, the leakage, abnormal sound, odor and the working condition;

2.3.29. Check tire (including spare tire): Check the depth of tire pattern, which the depth of tire pattern shall not be less than 1.6 mm; regulate the air pressure of tire: 230kPa for front wheel, and 210 kPa for rear wheel; and check the wheel bolt tightening torque (110±10Nm);

2.3.30. Check the chassis bolt: Check the chassis bolts one-by-one with a torque wrench, and tighten it to the specified torque if loose ;

Body bottom protector: Visually check its damage;

2.3.31. Toe-in value and camber angle: Check the toe-in value, camber angle, and adjust it if necessary (refer to the parameters above for the adjustment);

2.3.32. Check the spark plug: Check whether the spark plug has the carbon deposits, ablation symptom, etc, and replace it if necessary (the service life of a spark plug is in general 30,000 KM);

2.3.33. Wedge belt: Check its tension, and regulate or replace it if necessar.Refer to the “Timing belt” for the tension requirement after regulating;

2.3.34. Timing belt: Check its wear and tension, and regulate or replace it if necessary. The tension requirement after the timing belt is regulated: In the intermediate position of two wheels at the timing belt pulled side, when the timing belt is pressed down approx. 5 mm by hand, the force required is: 19.6 - 29.4 N(2.0 - 3.0 kg);

2.3.35. Check the engine while idling: Check the working condition of the engine while idling,check the working condition of electronic fuel injector parameters and exhaust with the CHERY Company's special tester, and adjust it if necessary;

2.3.36. Exhaust system: Check its leakage and damage, and regulate or replace it if necessary;

2.3.37. Lower the vehicle, and take off the "four-piece series" and the protective covers of left and right fenders and the front protective cover;

2.3.38. Check the lighting, warning flasher devices, horn: Check its working condition;

2.3.39. Seat belt: Check its damage;

2.3.40. Trial driving: Check the display status of combination instrument, the working condition of four-door regulator, and the function of the steering, braking and gear shifting mechanisms, pay attention to the abnormal sound from the engine and body, and examine and repair it, if necessary;

2.3.41. Look around the vehicle, and wash it if there is no abnormal symptom, then deliver the vehicle to its owner.

Service Manual for Chery QQ6

(QR513 Transmission Case)

After Sales Service Department of Chery Automobile Sales Co., Ltd

Foreword

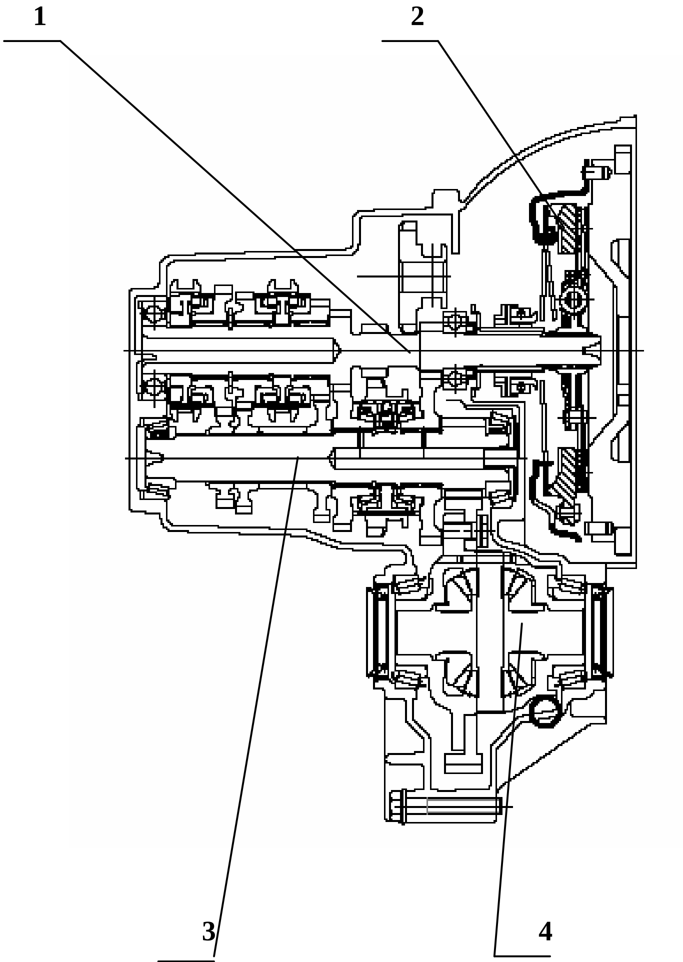
1. This service manual applies to use and maintenance of QR513 transmission manufactured by Chery Automobile Co., Ltd.

2. ***Service Manual for QR513 Transmission*** describes relations among various parts and assemblies of this transmission, which provide the maintenance personnel with a reference when maintaining and repairing QR513 transmission.

3. Due to restrictions of the compiler's level and other conditions, errors and imperfections may exist in this service manual. During maintenance and use, please inform us of any problem in and improvement idea on QR513 transmission and this service manual, so that we can correct and perfect this service manual, for which we express our thanks herein.

Chapter One Introduction of QR513 Transmission

I. Assembly Drawing of QR513 Transmission



1. Input shaft 2. Clutch 3. Output shaft 4. Differential

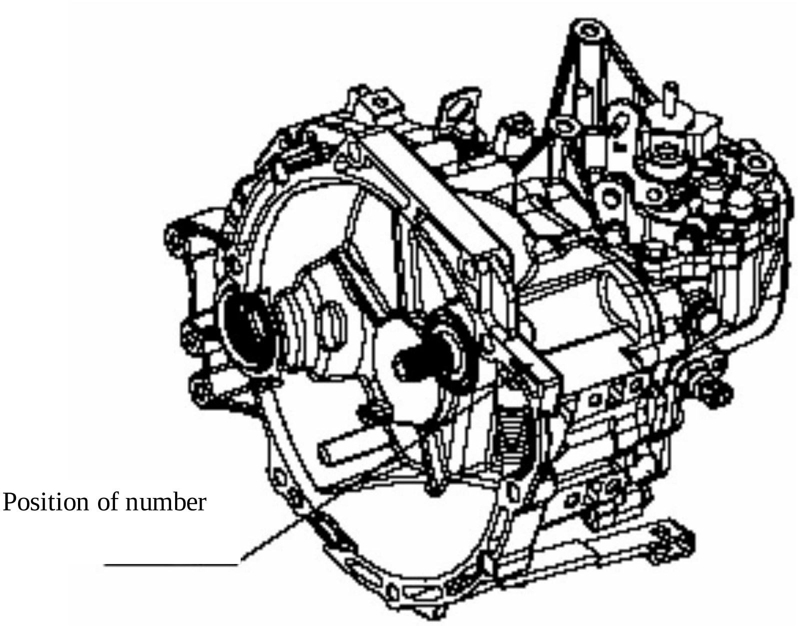
II. Driving Characteristics of QR513 Transmission

This transmission achieves five forward gears and one reverse gear through three groups of synchronizers and two shafts-input shaft and output shaft; all forward gears adopt conventional engagement system while reverse gear adopts a gliding idler device. The synchronizers of the first and second gears are installed on output shaft while the synchronizers of the third, fourth and fifth gears are installed on input shaft. When the transmission is shifted to various gears, these synchronizers will engage with corresponding gear hub to enable transmission of power, and then the driving gear of main decelerator will drive the driven gear of main decelerator and differential assembly to rotate, which will drive the drive shaft to drive the wheels to rotate.

III. SN of QR513 Transmission

1. Print position of SN of QR513 transmission

The print position of SN of QR513 series transmission is as shown in the figure:



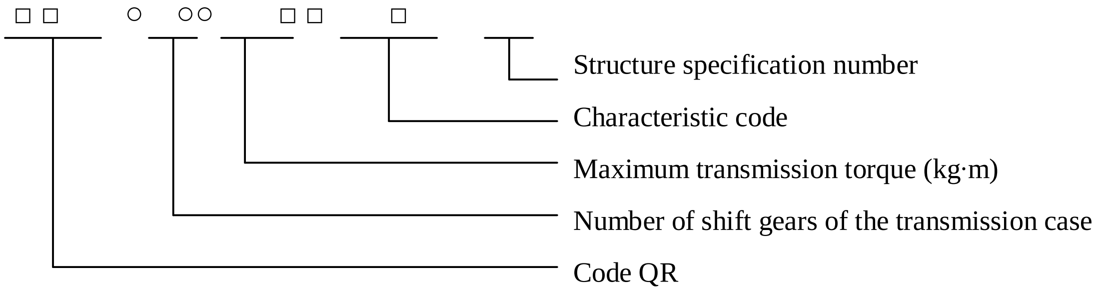
2. Composition and connotation of SN of QR513 transmission

SN of QR513 series transmission is consisted of model and leaving factory number of the transmission case.

1) Model of the transmission case

Model of the transmission case is composed of code QR, number of shift gears of the transmission, maximum transmission torque, characteristic code and structure specification number.

A complete transmission case model is as follows:

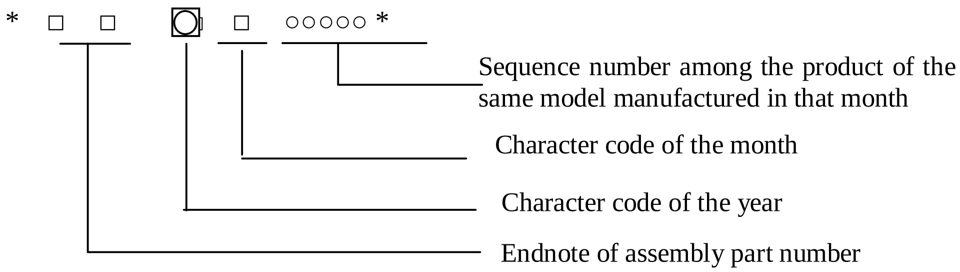


Among which, ○ indicates an Arabic numeral while □ indicates a letter.

2) Leaving factory number

Leaving factory number is composed of endnote of assembly part number (for that without endnote, us AA), character code of the year of production, character code of the month of production, sequence number of this transmission case among the transmission cases manufactured in that month and start stop sign "*". See Table 1 and Table 2 for check list of character codes of the year and of the month.

Complete form of leaving factory number of a transmission case is as follows:



Among which, ○ indicates an Arabic numeral, □ indicates a letter and indicates an Arabic numeral or a letter. The endnote locates at tail end of the part code, for a fundamental model, no endnote. The endnote should be modified when modification is made to structure, dimension, material, heat treatment requirements and surface treatment etc. of the part or assembly on the basis of original product. The English letter in the code should be upper case letter (use in sequence with "A" as the first), in order to avoid confusion, do not use "I", "O" and "X". When the modification does not affect interchangeability, use "A" as the first; when the modification affects interchangeability, skip "A", use "B" as the first.

Table 1 Character Codes Indicating the Years

Year	Code	Year	Code
1999	X	2015	F
2000	Y	2016	G
2001	1	2017	H
2002	2	2018	J
2003	3	2019	K

2004	4	2020	L
2005	5	2021	M
2006	6	2022	N
2007	7	2023	P
2008	8	2024	R
2009	9	2025	S
2010	A	2026	T
2011	B	2027	V
2012	C	2028	W
2013	D	2029	X
2014	E	2030	Y

Table 2 Character Codes Indicating the Months

Month	Code	Month	Code
January	A	July	G
February	B	August	H
March	C	September	J
April	D	October	K
May	E	November	L
June	F	December	M

3) Illustration

For example: QR513MHA MH5H00001 indicates the first transmission case with the model as QR513MHA manufactured in August, 2005.

IV. Specification of QR513 Transmission

	QR513 Series Transmission			
Type	Machine Gear Mesh			
Model	QR513MHA		QR513MHB	
Gear shift	Velocity Ratio	Teeth Ratio	Velocity Ratio	Teeth Ratio
First Gear	3.545	39/11	3.167	38/12
Second Gear	2.05	41/20	2.05	41/20
Third Gear	1.423	37/26	1.423	37/26
Fourth Gear	1.065	33/31	1.065	33/31
Fifth Gear	0.865	32/37	0.865	32/37
Reverse Gear	3.364	37/11	3.364	37/11
Main reduction ratio	4.056	73/18	75	16

Speedometer	0.806	29/36	0.806	29/36
Largest input torque	130 Nm			
Lubricant oil type	GL-4 75W-90			
Volume of lubricant	1.8L			

V. Maintenance Instruction

- In order to ensure maintenance quality of the transmission, when operating, please be careful and ensure cleanness of each part of the transmission.
- Use appropriate tools or special tools.
- Strictly follow the specification to assembly or adjustment to maintain so as to ensure that the transmission can accomplish a favorable working position.

Chapter Two Decomposition of QR513 Transmission

I. Decomposition Process for QR513 Transmission

1. Bleeding lubricant in transmission

First, drive the vehicle onto a maintenance platform or hoist the vehicle and keep it on a horizontal plane, screw off the bleeding plug as shown by the arrowhead, and then use a clean container to accommodate lubricant of the transmission to completely bleed the lubricant in the transmission.

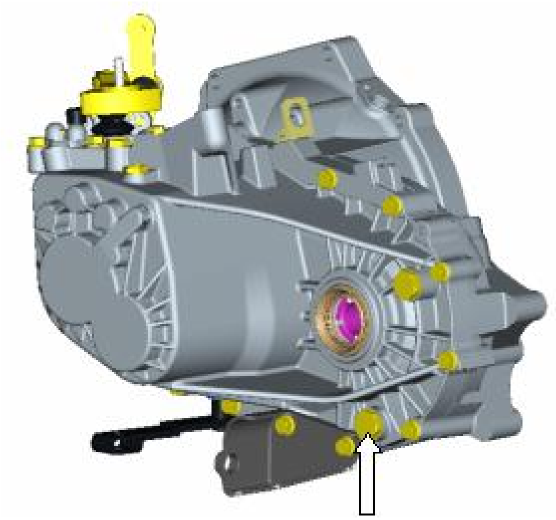


Figure 1

2. Disassembly of external parts of transmission

Switch the transmission to NEUTRAL position; use an appropriate tool to remove the locating seat of the fork shaft as shown in Figure 2; Connecting bolts for gearshift housing and transmission housing and the screws for backup lamp switch and idler shaft.

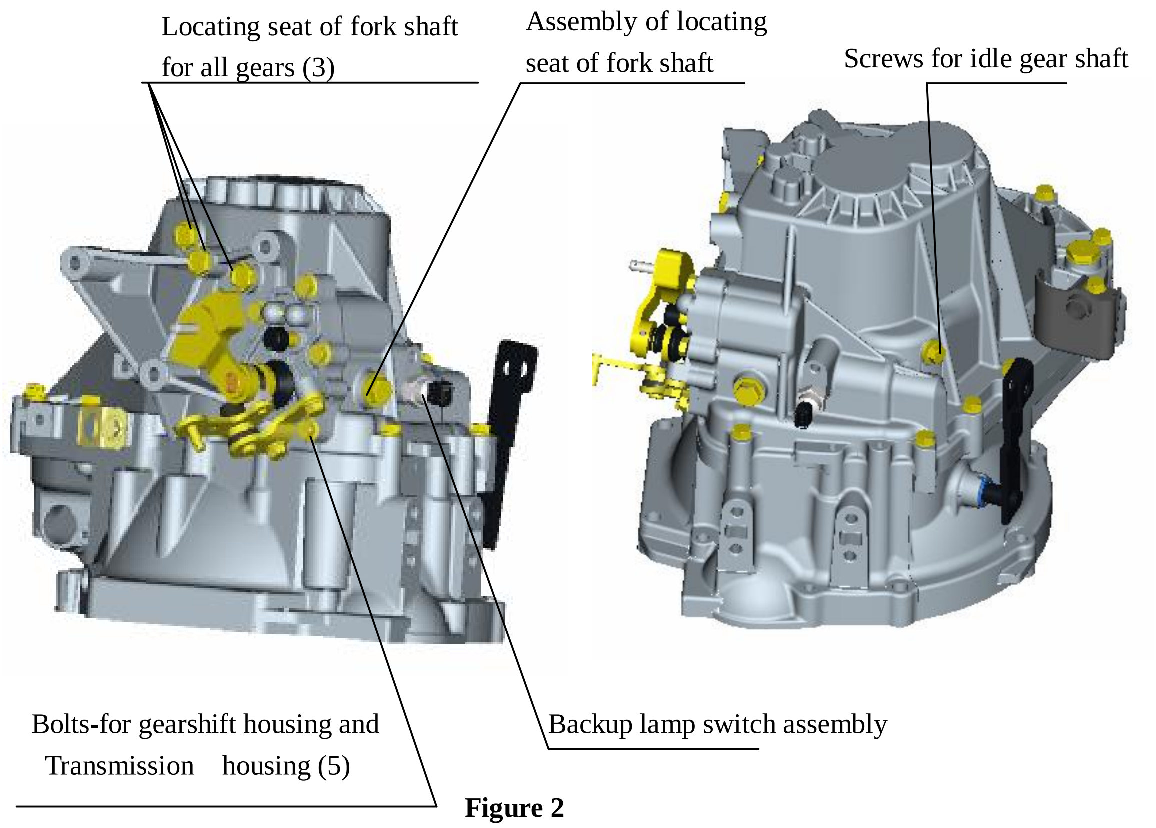


Figure 2

3. Separation of gear shift mechanism and transmission

Remove the gearshift mechanism assembly from the place as shown in Figure 3; as a result of sealant, the disassembly process may be difficult, so, use such tools as a hand hammer etc. to knock on the bulge at flank of housing of the gearshift mechanism, and then take out the whole gearshift mechanism assembly until the two housings completely separate; remember to be slow when taking out the gearshift mechanism assembly, so as to prevent the return spring as shown in the figure from dropping out inside the transmission; during disassembly, be careful not to damage the junction planes of the two housings, so as to avoid oil leak after re-assembly.

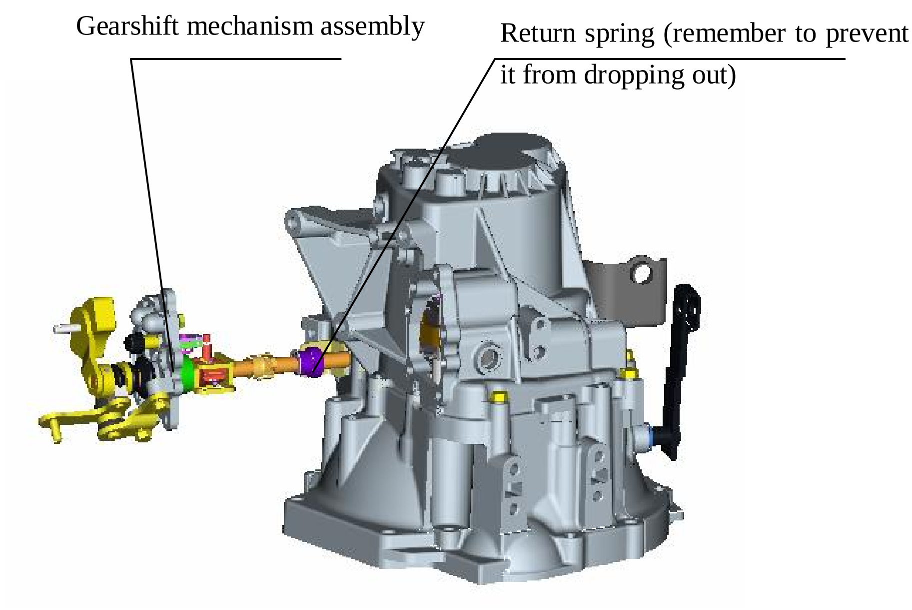


Figure 3

4. Disassembly of the connecting bolts for clutch and transmission housings

Use a tool to remove the connecting bolts for transmission and clutch housings as shown in Figure 4. Remember to remove the bolts both inside and outside the clutch housing when disassembling, and a sleeve with long connecting rod is required when removing the bolts inside the clutch.

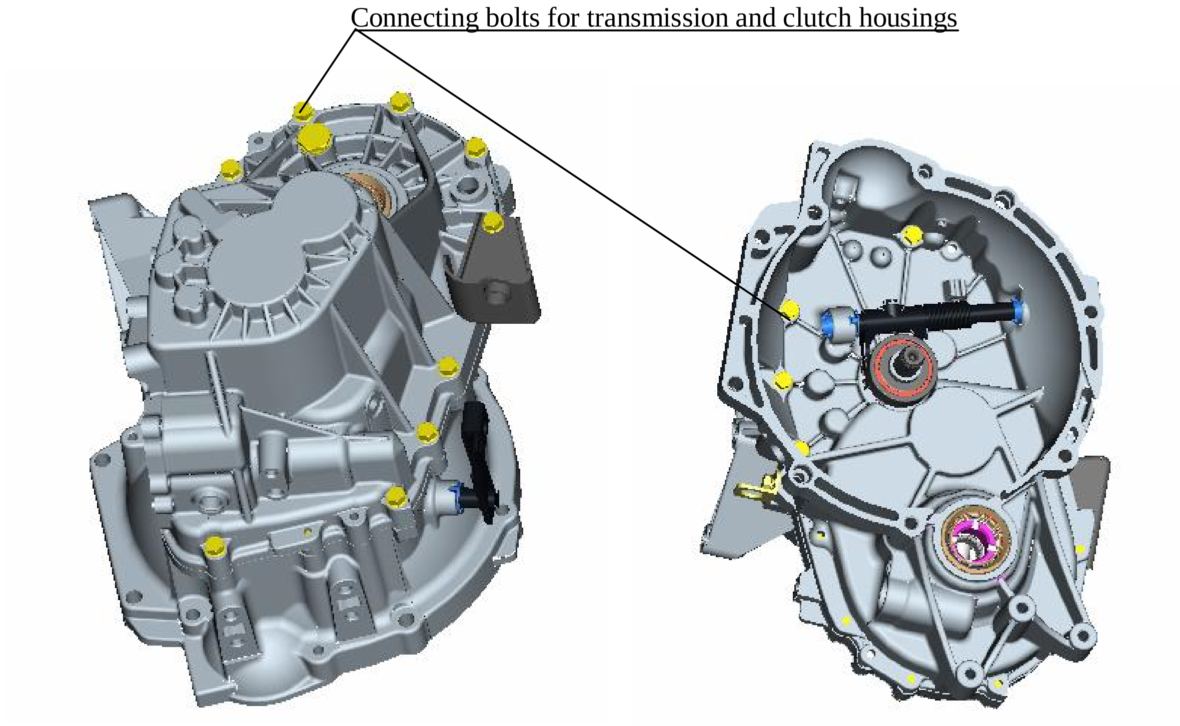


Figure 4

5. Separation of transmission and clutch housings

After the bolts for transmission and clutch housings are removed, separate clutch housing and transmission housing (Figure 5). as a result of sealant, the separation process may be difficult, so, use such tools as a hand hammer etc. to knock on the bulge at flank of housing of the transmission, and then take out the whole transmission housing until the two housings completely separate; during disassembly, be careful not to damage the junction planes of the two housings, so as to avoid oil leak of the transmission after re-assembly.

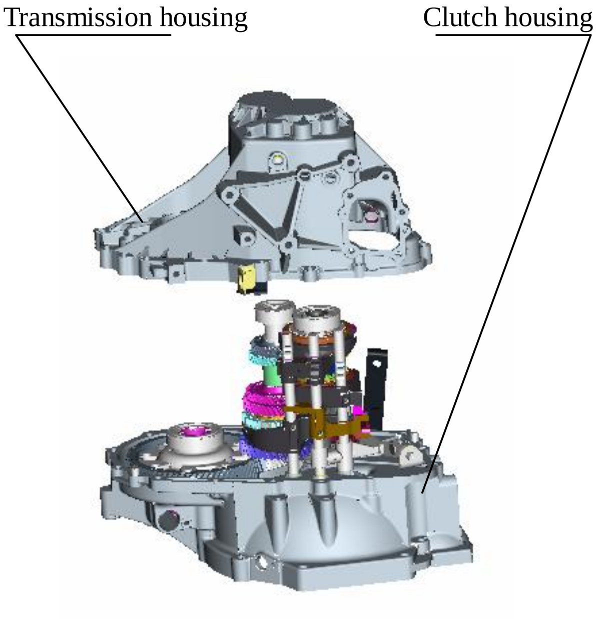


Figure 5

6. Separation of interior transmission parts and fork module from the housing

After transmission housing and clutch housing are separated, keep the clutch housing flat at the place as shown in Figure 6, remove the bolts for bracket of reverse gear rocker arm, take out the reverse gear rocker arm assembly and the pin on idler drive, and then take out input shaft, output shaft and fork mechanism together (when taking out, gently shake, meanwhile, press the driven gear of main decelerator along the direction of arrowhead as shown in the figure to take out the assembly of input shaft, output shaft and idler as well as fork mechanism); when taking out, remember to avoid interference between bearing retainer of output shaft and big gear ring of differential and prevent the bearing retainer from damage.

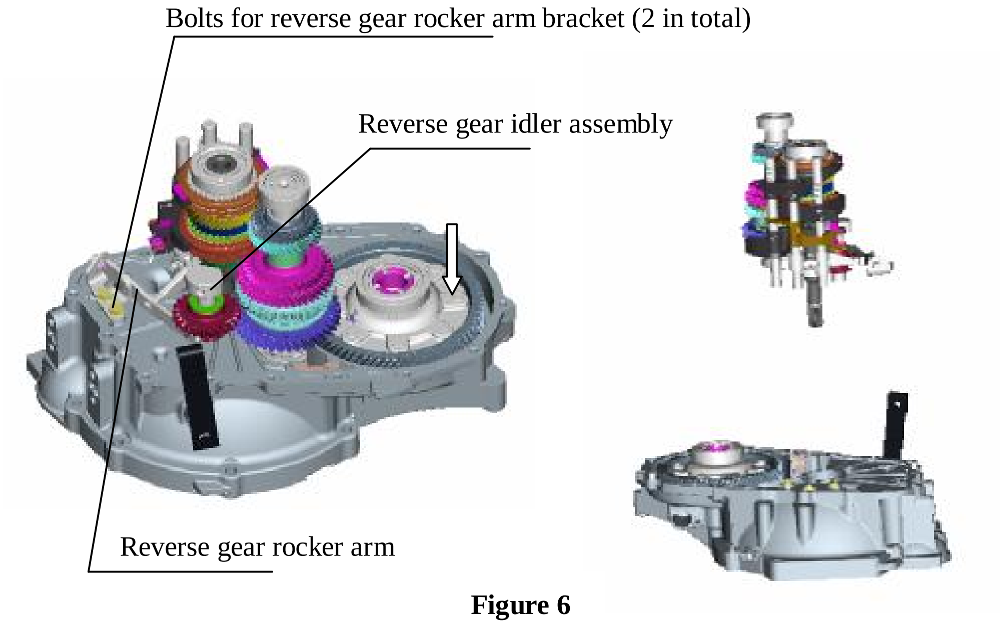


Figure 6

7. Separation of differential assembly and clutch housing

Separate differential assembly and clutch housing, and then simply take out the differential assembly as shown in Figure 7.

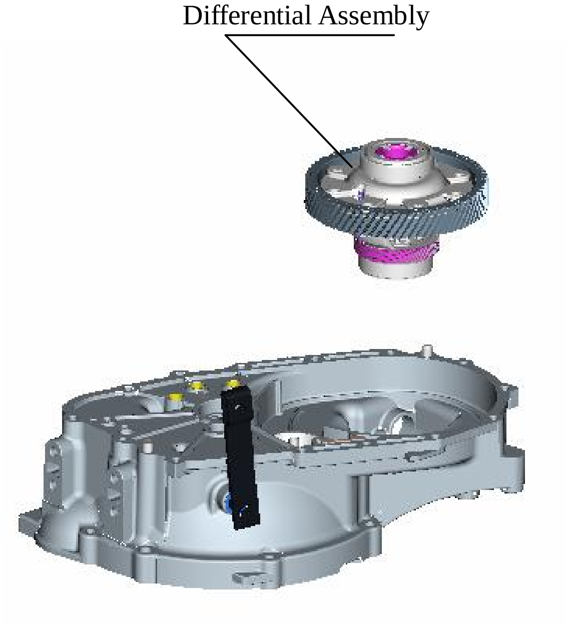


Figure 7

8. Disassembly of gearshift fork mechanism

Use a hammer and a special tool to knock off all spring pins and then use a snap ring pliers or other special tool to take the split washer off the fork shaft (when taking off the split washer, prevent it from deformation), and then disassemble each part of the gearshift mechanism.

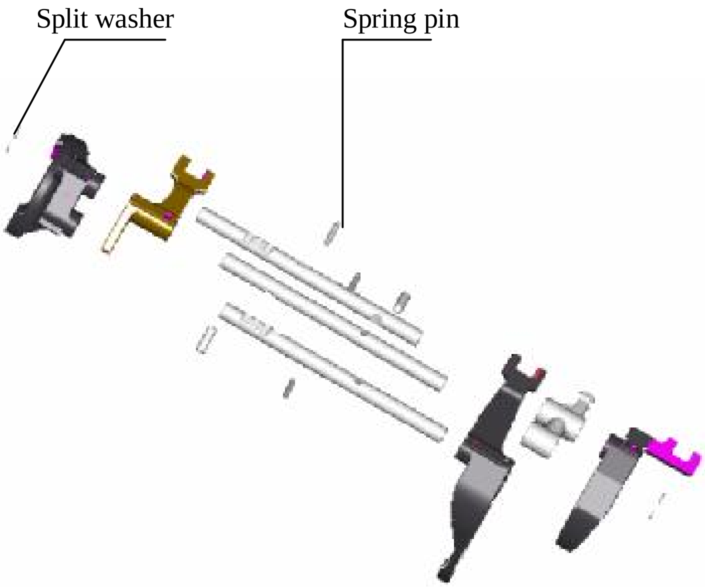


Figure 8

9. Disassembly of gearshift mechanism

As shown in Figure 9, remove the gearshift arm bracket bolts and reverse gear lockup mechanism bolts first, use a hammer and a special tool to knock off all spring pins, use a special tool to remove the split washer, and then disassemble each part of the gearshift mechanism.

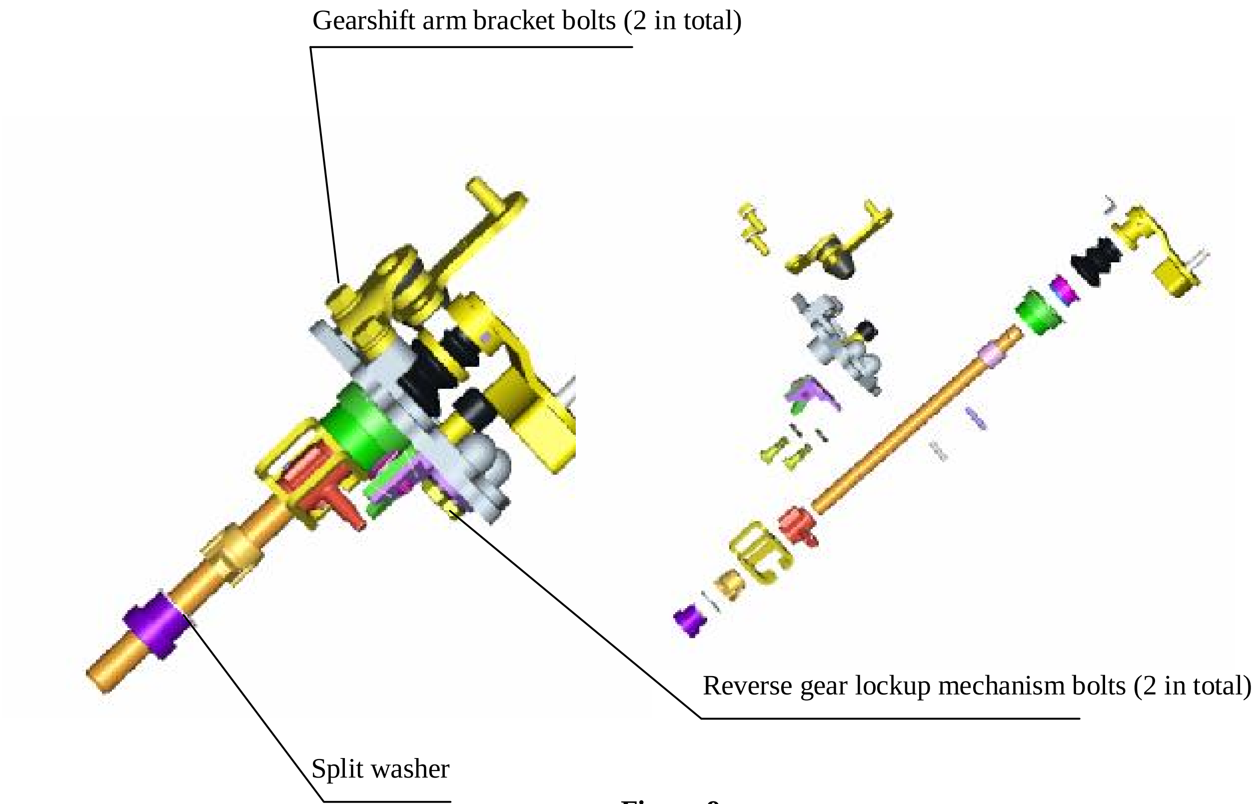


Figure 9

10. Disassembly of input shaft

As shown in Figure 10, Use a special tool (such as bearing remover etc.) to remove the two bearings on the input shaft first, use a special tool to remove the rear snap ring, and then take off the fifth gear synchronizer assembly.

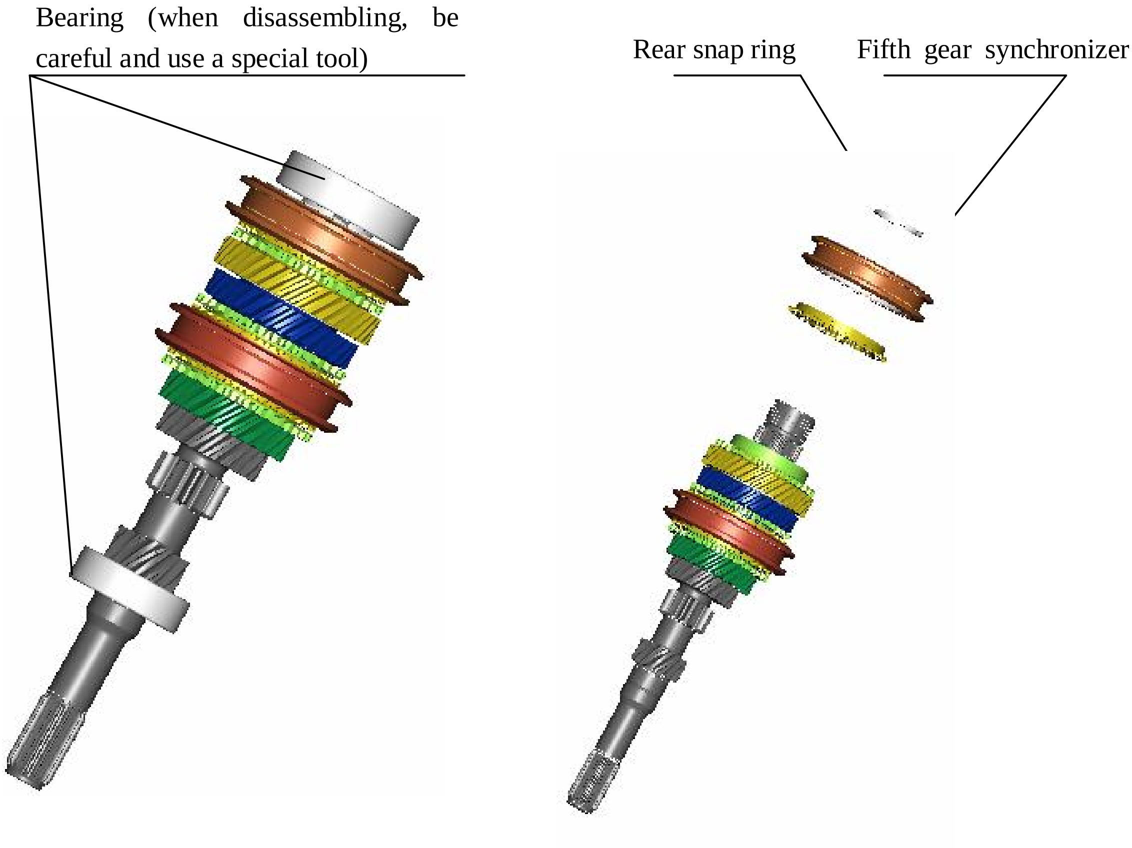


Figure 10

After the fifth gear synchronizer assembly is removed, remove the remaining parts such as shift gears, needle bearings and synchronizers in turn as shown in Figure 11; when disassembling, be sure to keep the synchronizer of each gear concurrent with its corresponding synchronizer ring.

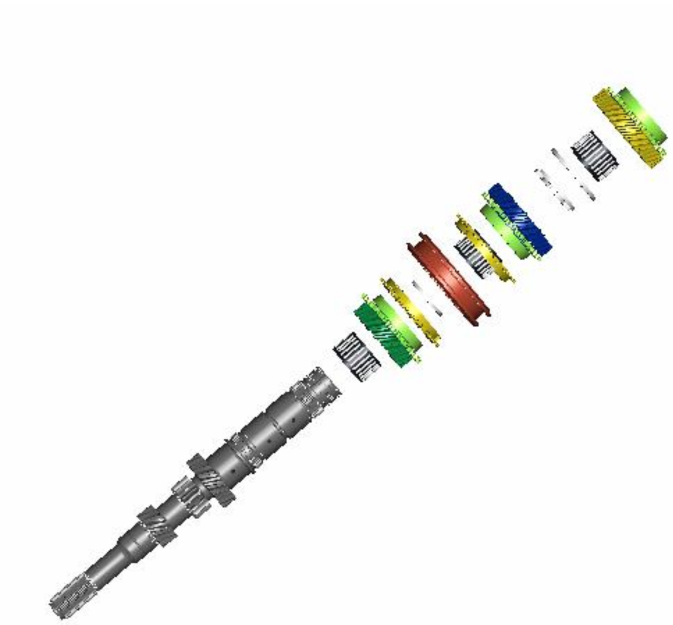


Figure 11

11. Disassembly of output shaft

The method and process for disassembly of output shaft are basically the same as those for input shaft and the output shaft can be disassembled to the status as shown in Figure 12.

Figure 12

12. Disassembly of differential

As shown in Figure 13, use a special tool to take off the two bearings first, remove the bolts for driven gear and differential housing, remove the driven gear, knock off the fixing pin of the planetary gear, and then take out every part inside the differential (Figure 14).

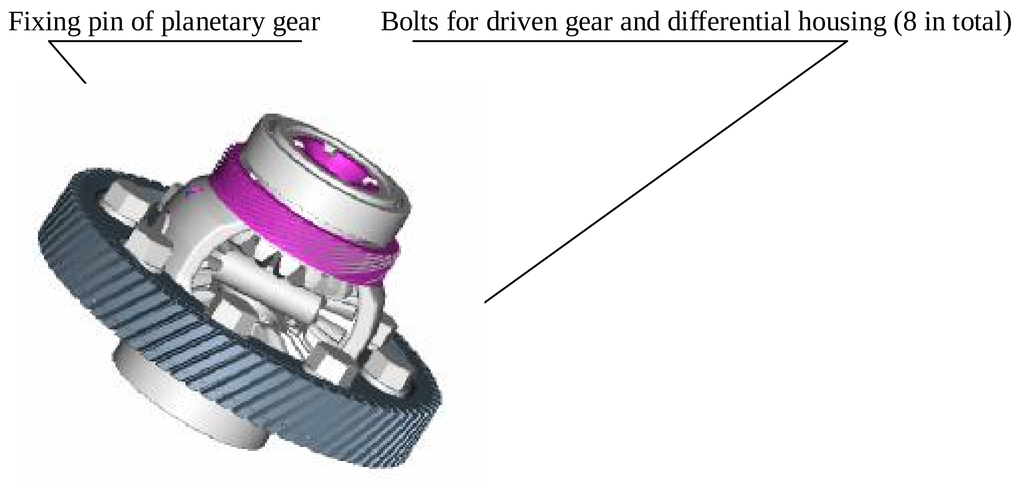


Figure 13

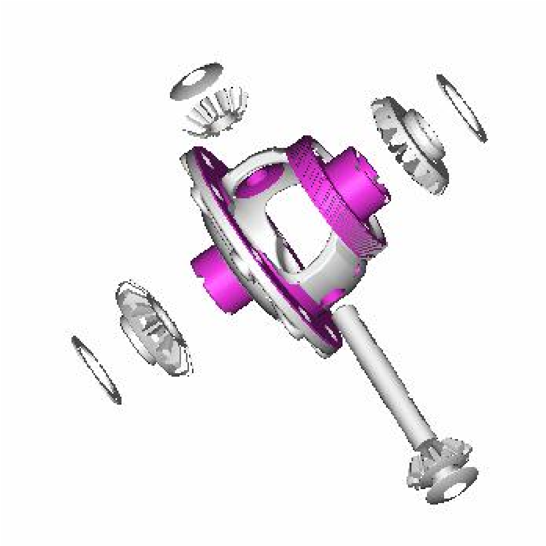


Figure 14

13. Disassembly of release mechanism of clutch

As shown in Figure 15, take off release bearing of the clutch first, remove the bolts for release fork, and then draw the release shaft assembly off the clutch housing (during the drawing off process, be sure to prevent the release return spring from ejection); also, remove the bush and dismount release mechanism of the clutch from the clutch housing.

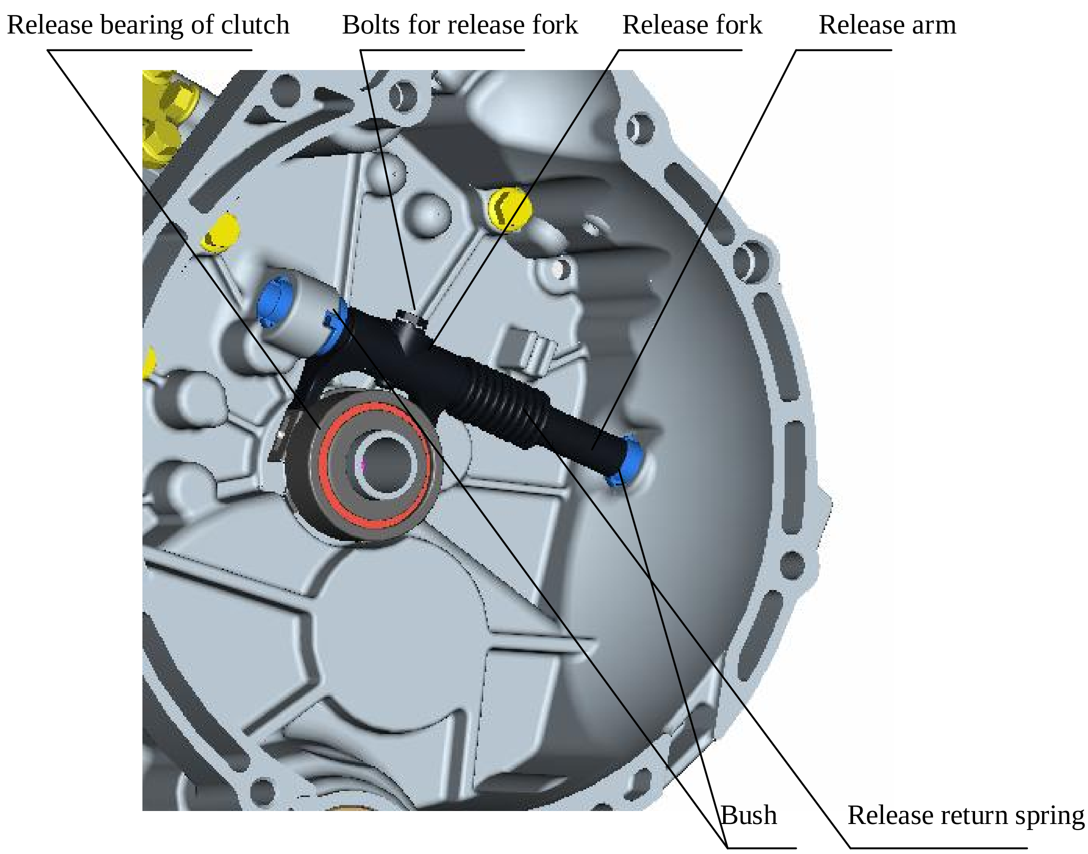


Figure 15

Be sure to use special tool and be careful to remove the oil seal on the clutch housing, because excessive deformation or damage of the oil seal may result in oil leak of the transmission. Use a special tool to remove the two oil seals on the clutch housing, and then remove the remaining bushes, oil ducts and outer rings of bearings as shown in Figure 16. Replacing with new oil seals after the former ones are removed is recommended.

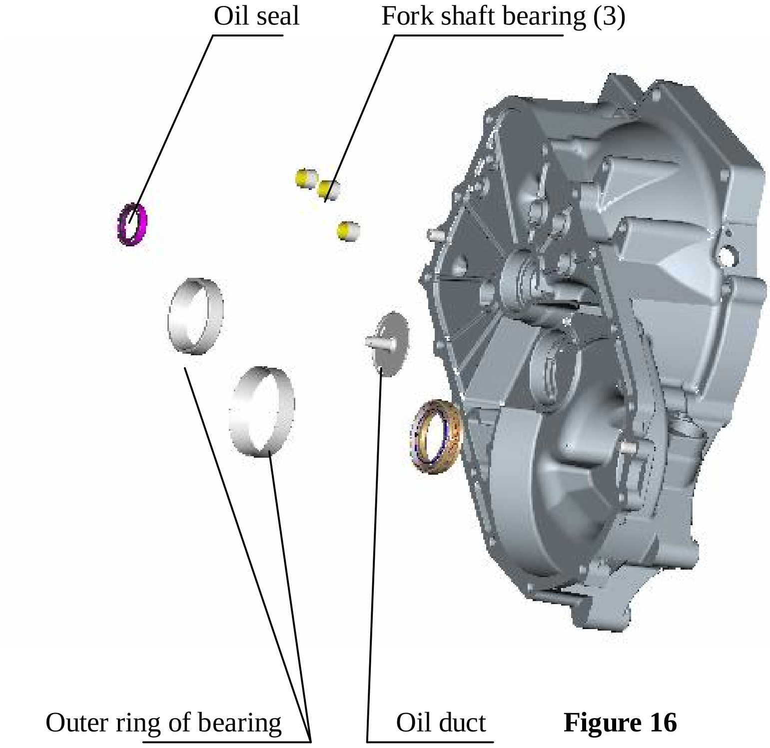


Figure 16

14. Disassembly of transmission housing

As shown in Figure 17, use a special tool to remove the oil seal of transmission housing, and then remove oil drain channel, fork shaft bush and linear bearing.

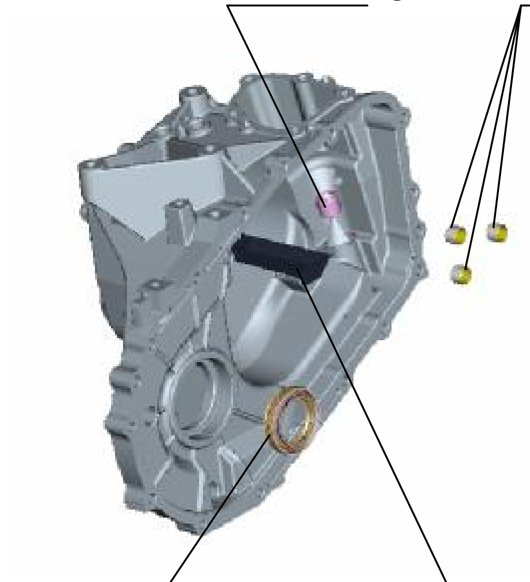


Figure 17

Chapter Three Assembly and Regulation of QR513 Transmission

I. Assembly of QR513 Transmission

After disassembly, visually inspect parts for any abnormal condition such as deformation etc, and make records; Replace the damaged parts, clean and wash all parts, then reassemble.

1. Assembly of differential assembly

Fit adjustment gaskets respectively at backsides of the two half axle gears, and then install the two half axle gears together with their gaskets into the differential. When fitting adjustment gaskets for the half axle gears, select the gasket with thickness as 1.2mm first. Fit spherical washers for the planetary gear, and then simultaneously engage the two planetary gears with the two half axle gears (fit them to correct positions while turning the gears). Insert the planetary gear shaft; note that the fixing pin hole on the shaft should align correctly with that on the differential housing both in the position and along the direction. Measure the clearance between the half axle gear and the planetary gear, and the normalized value should be **0.025~0.150mm**; if the clearance does not conform to the normalized value, replace the adjustment gaskets for the half axle gear, and then re-measure the clearance until it conforms to the standard with uniform clearance at both sides. Drive down the fixing pin of planetary gear shaft from the fixing pin hole at the side of differential housing with flange with the pin with end surface of the pin hole. Install driven gear of main decelerator and ensure that the installation end surface of the gear fits well with the end surface of the differential housing, and then fix the driven gear of main decelerator with bolts (apply sealant to full thread of the bolt before installation); screw the bolts home with the torque as **130±5Nm** cornerwise and alternately; respectively press in an inner ring of front and rear bearings from each of both ends of the differential housing and check if it has been pressed to the designated position. Note that the lubricant applied onto adjustment gaskets for half axle gears, planetary gear gaskets, junction surface of planetary gear and planetary gear shaft, junction surface of half axle gear and differential housing should be the same as that used inside the transmission. Refer to Figure 18.

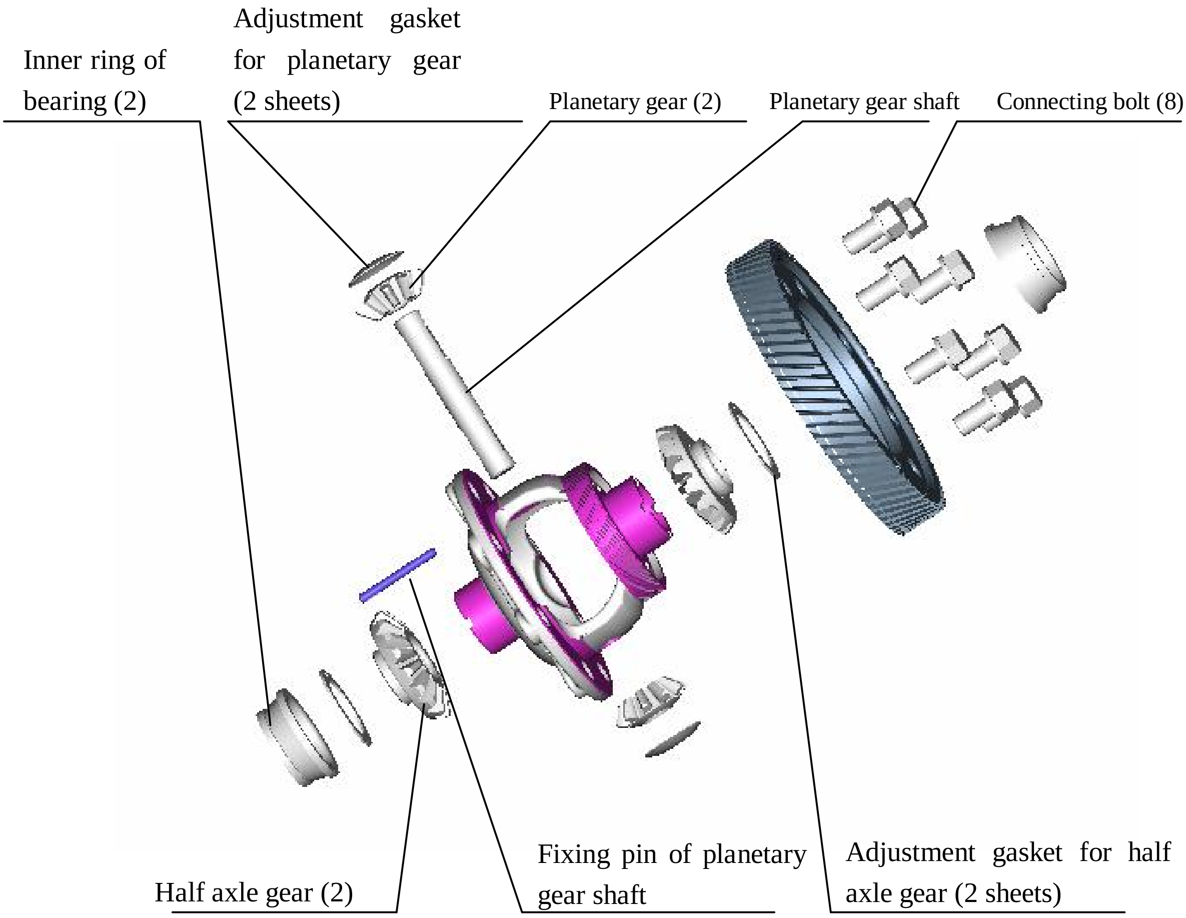


Figure 18

2. Assembly of clutch housing

Use a hammer and a special tool to fit oil seal of input shaft with spring side of the oil seal up and grease applied to lip of the oil seal. Use a special tool and a hamper to fit right side oil seal of differential with end surface of the oil seal flush with the housing surface, and then apply grease to lip of the oil seal. See Figure 19.

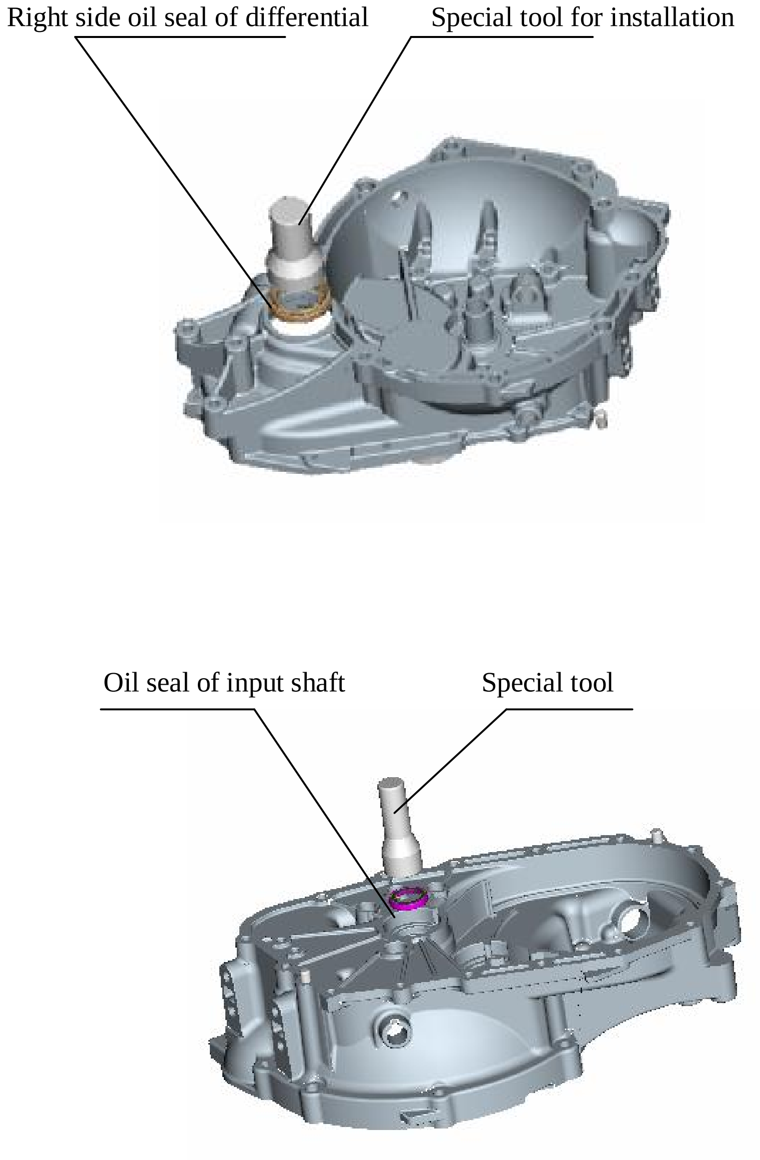


Figure 19

First, install the oil duct of output shaft to its designated position as shown in Figure 20 (note that the oil inlet and outlet of the oil duct should align with those on the housing), and then use a special tool to respectively install the outer rings of the front bearing of output shaft and the differential bearing.

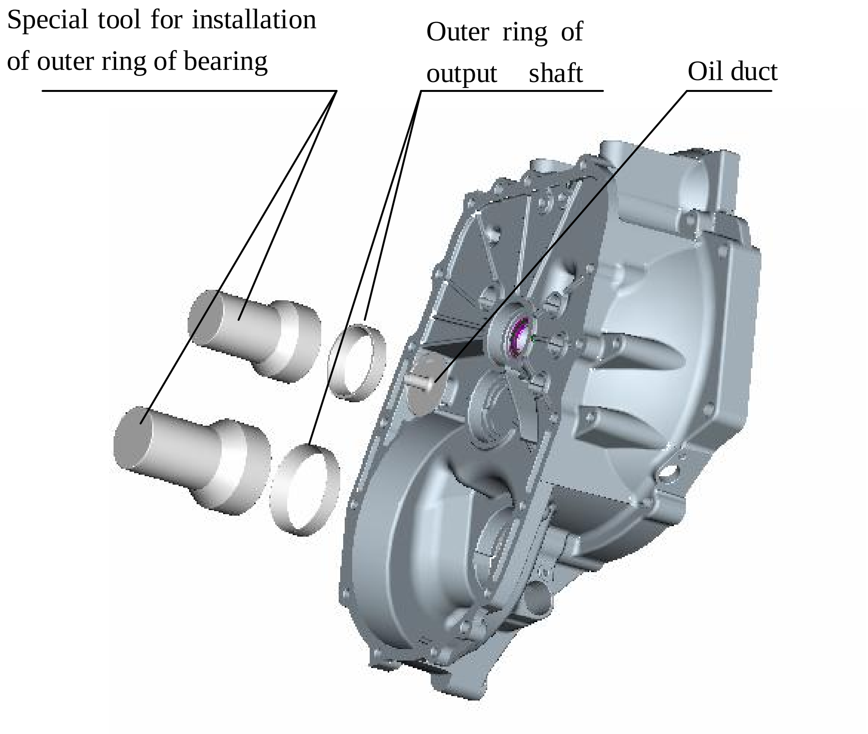


Figure 20

The tool for installation of oil seal can be used to install the three bushes. When installing the bushes, stagger the gap on the bush and that on the clutch housing (the two gaps can not coincide), as shown in Figure 21.

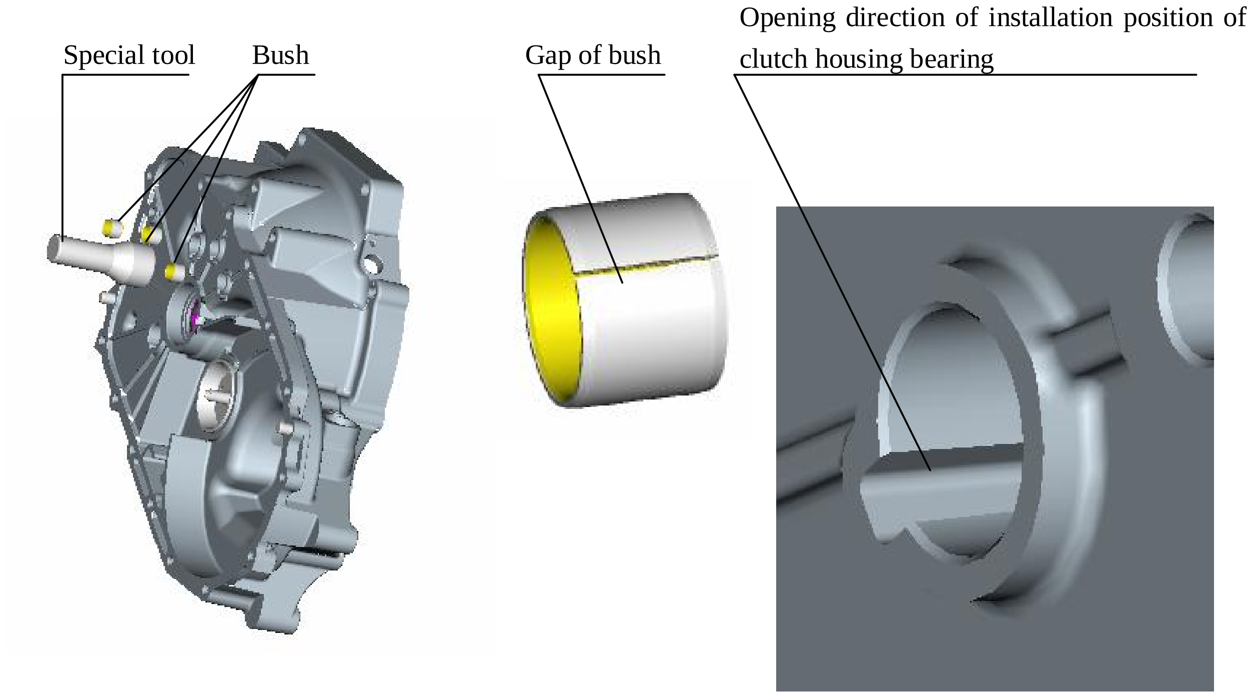
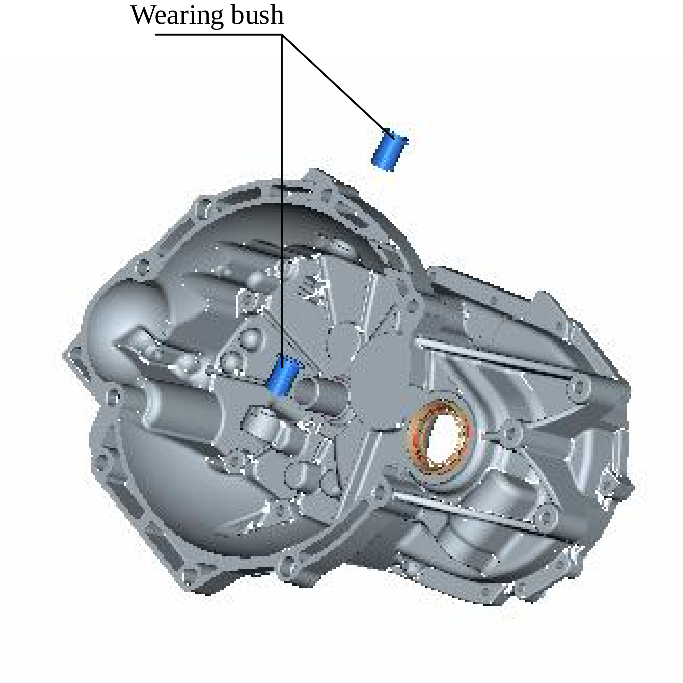


Figure 21



Now start to install release bearing assembly and release bearing as shown in Figure 22. First, install the two wearing bushes to their designated positions, and then put the release bearing through bush, release return torsion spring, release fork (release fork and release bearing should be assembled properly in advance, and then set the release bearing onto the housing) and bush in turn up to its designated position, finally, tighten the release arm bolts (with torque as **20±2Nm**). See Figure 23.

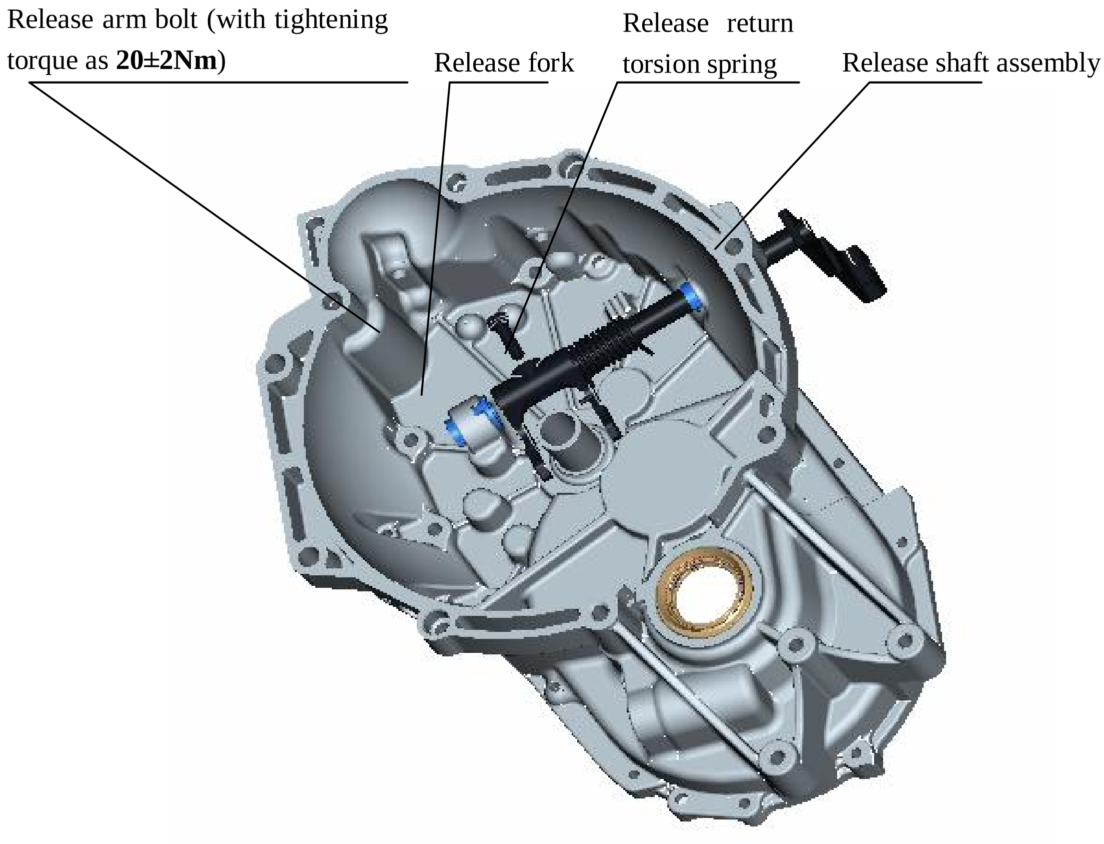


Figure 23

3. Assembly of transmission housing

First, use a special tool to fit oil seal of the differential to its designated position (when fitting the oil seal, care should be taken to prevent oil leak in the future, and replacement with new oil seal is recommended), and then respectively install oil drain channel, bush (**note:** the installation process for this bush is the same as that for the bush of clutch housing above), linear bearing etc. to their designated positions. See Figure 24.

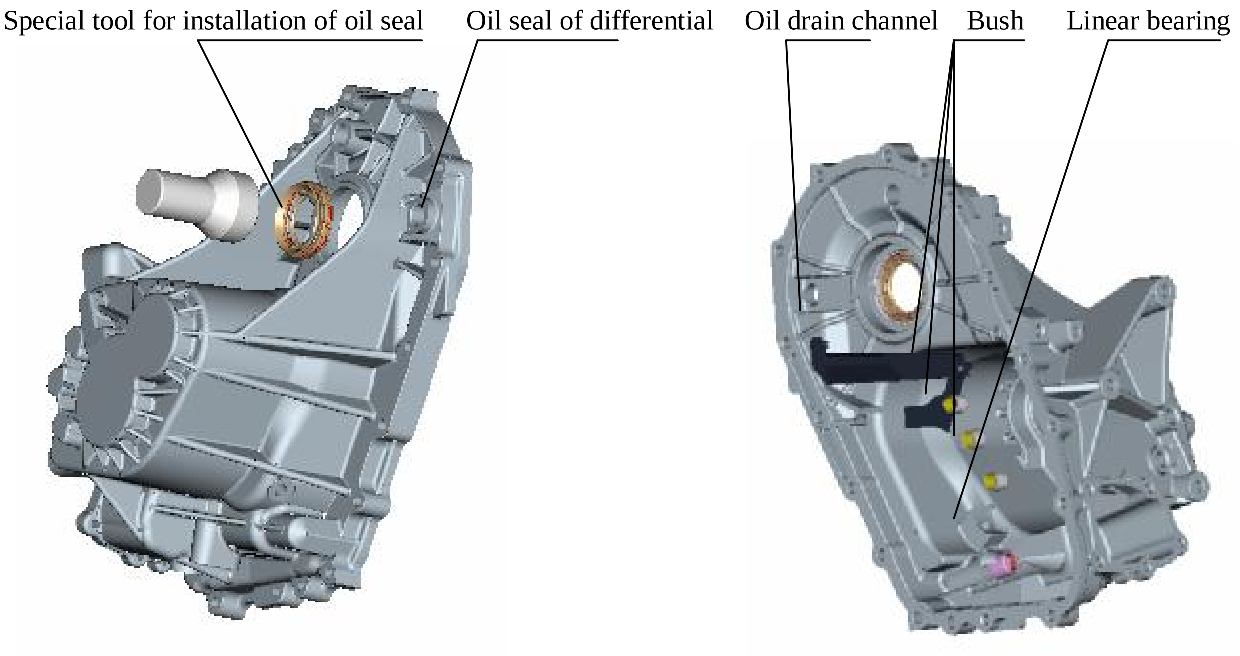


Figure 24

4. Assembly of gearshift mechanism assembly

Assembly of gearshift mechanism assembly is comparatively simple, which can refer to the disassembly process of the gearshift mechanism assembly. Remember to check the amount of parts to prevent neglected installation. Please refer to Figure 25 for tightening torque of the bolt.

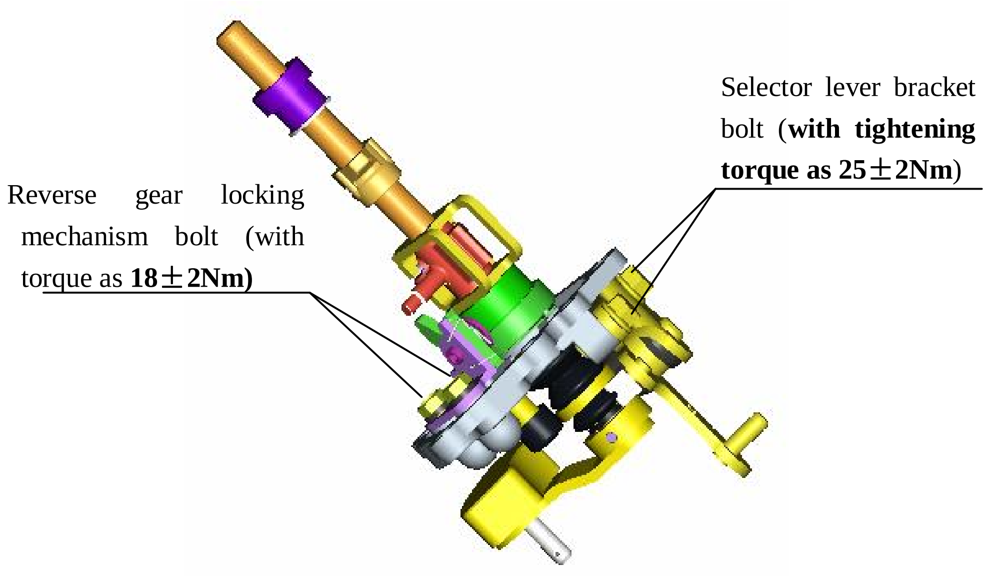


Figure 25

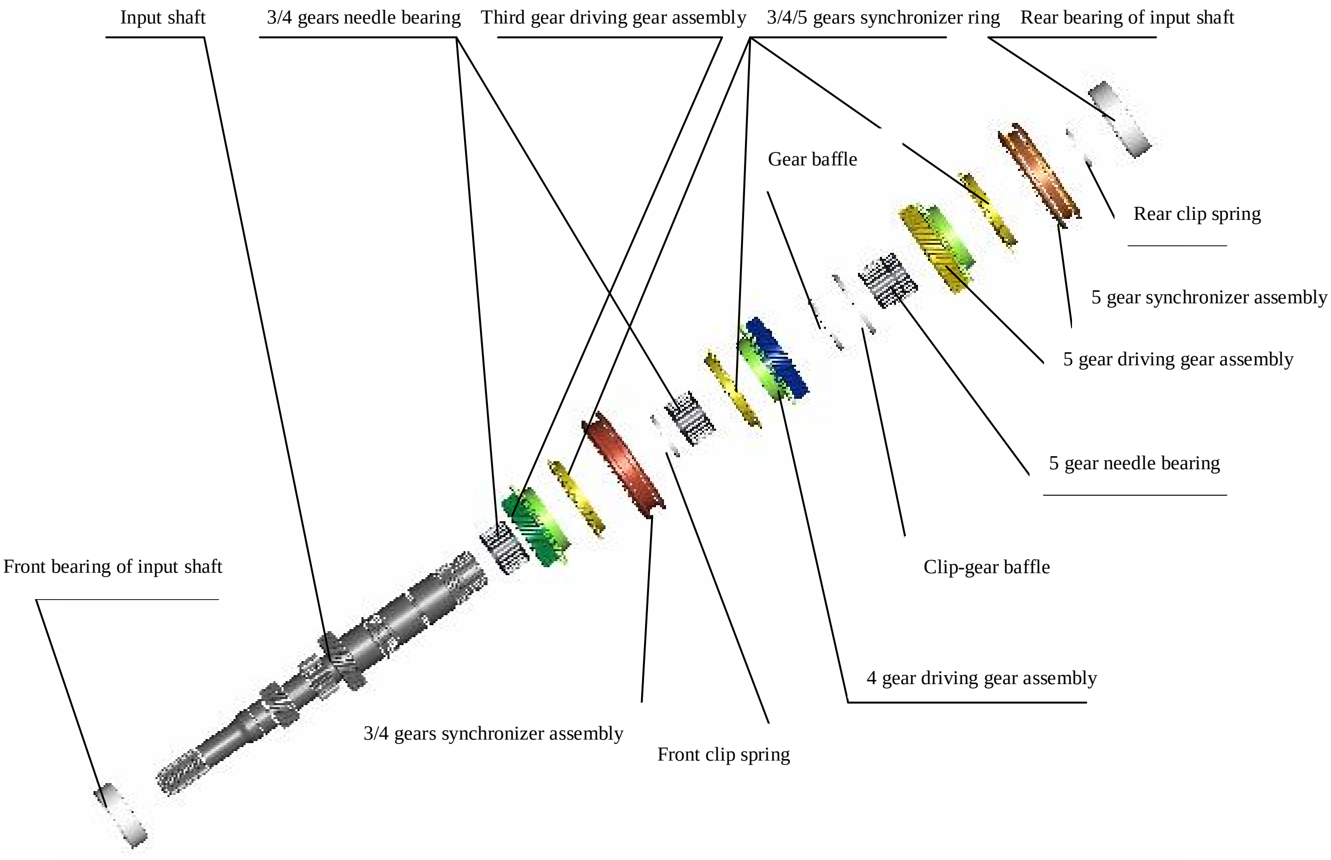
5. Assembly of gearshift fork assembly

Assembly of gearshift fork assembly is comparatively simple, which can be assembled with reference to the disassembly drawing.

6. Regulation and assembly of input shaft assembly

Place the input shaft with its end with clutch spline down, and then set the third gear needle bearing applied with the gear oil of the same designation as that used inside the transmission assembly onto the input shaft. Set the third gear driving gear assembly in from upside of input shaft with the end with synchronizer cone of the gear assembly up, and then check and make sure that the gear assembly can rotate freely. Set a 3/4/5 gears synchronizer ring in from upside of input shaft with conical surface of the synchronizer ring applied with the gear oil of the same designation as that used inside the transmission assembly, and then check and make sure that the synchronizer ring should envelop loosely on synchronizer cone of the third gear driving gear assembly and can rotate relative to the synchronizer cone. Press 3/4 gears synchronizer assembly onto the input shaft with the end surface of gear hub with two oil grooves down, turn the synchronizer ring to make its guide block completely enter the groove corresponding to the gear hub, and then make sure that the synchronizer ring is not locked. Fit front snap ring of input shaft; when fitting, try to use the thicker snap ring, if really unsuitable, select the snap ring of next thinner level, and then check if the snap ring has really enter the groove with the clearance between the snap ring and the groove not exceeding 0.05mm. Set a 3/4 gears needle bearing applied with the gear oil of the same designation as that used inside the transmission assembly onto the input shaft from upside of the input shaft. Set a 3/4/5 gears synchronizer ring applied with the gear oil of the same designation as that used inside the transmission assembly in from upside of the input shaft. Set the fourth gear driving gear assembly in from upside of input shaft with the end with synchronizer cone of the gear assembly down (the guide block of 3/4 gears synchronizer ring should completely enter the groove corresponding to the gear hub), and then make sure that the gear assembly can rotate freely. Set friction ball of gear, fender and clamp in from upside of input shaft, and then perform axial orientation for the fourth gear driving gear. Set fifth gear needle bearing applied with the gear oil of the same designation as that used inside the transmission assembly onto the input shaft from upside of the input shaft. Set fifth gear driving gear assembly in from upside of input shaft with the end with synchronizer cone of the gear assembly up, and then make sure that the gear assembly can rotate freely. Set a 3/4/5 gears synchronizer ring in from upside of input shaft with conical surface of the synchronizer ring applied with the gear oil of the same designation as that used inside the transmission assembly, and then check and make sure that the synchronizer ring should envelop loosely on synchronizer cone of the fifth gear driving gear assembly and can rotate relative to the synchronizer cone. Press fifth gear synchronizer assembly onto the input shaft with the end surface of gear hub with oil groove down, turn the synchronizer ring to make its guide block completely enter the groove corresponding to the gear hub, and then make sure that the synchronizer ring is not locked. Fit rear snap ring of input shaft; when fitting, try to use the thicker snap ring, if really unsuitable, select the snap ring of next thinner level, and then check if the snap ring has really enter the groove with the clearance between the snap ring and the groove not exceeding 0.07mm. Simultaneously press front and rear bearings of input shaft onto the input shaft with the side of front bearing of input shaft having word down and the side of rear bearing of input shaft having word up, and then check and make sure that the outer rings of the bearings can rotate freely. Refer to Figure 26.

Note: There are two friction balls between the bearing baffles (2 sheets). Be careful to install them in full.



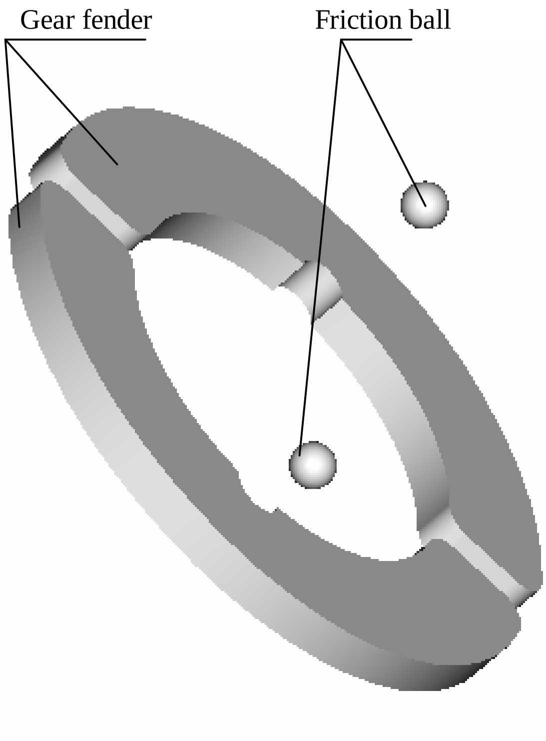


Figure26

7. Regulation and assembly of output shaft assembly

With the end of output shaft with driving gear of main decelerator down, set first gear needle bearing in onto output shaft from upside of the output shaft; before installation of the needle bearing, apply the gear oil of the same designation as that used inside the transmission assembly on it. Set first gear driven gear assembly in from upside of output shaft with the end with synchronizer cone of the gear assembly up, and then check if the gear assembly can rotate freely. Set a 1/2 gears synchronizer ring assembly in from upside of output shaft and the three finger jaws of balking ring of the synchronizer ring should completely enter the three corresponding grooves on the first gear driven gear assembly; before installation of the synchronizer ring assembly, apply the gear oil of the same designation as that used inside t Clamp-gear fender bly on three conical surfaces of the sync 3/4 gears synchronizer assembly that the synchronizer ring assembly envelops loosely on the synchronizer cone of the first gear driving and driven gears assembly and can turn a certain angle relative to the synchronizer cone. Press 1/2 gears synchronizer assembly onto the input shaft with the end of external gear of 1/2 gears hub sleeve with section down, turn the synchronizer ring to make its guide block completely enter the groove correspond Front snap ring and then make sure that the synchronizer ring is not locked. Fit front snap ring of output shaft; when fitting, try to use the thicker snap ring, if really unsuitable, select the snap ring of next thinner level, and then check if the snap ring has really enter the groove with the clearance between the snap ring and the groove not exceeding 0.05mm. Set a 1/2 gears synchronizer ring assembly in from upside of output shaft; before installation of the synchronizer ring assembly, apply the gear oil of the same designation as that used inside the transmission assembly on three conical surfaces of the synchronizer ring. Set a second gear needle bearing onto output shaft from upside of the output shaft; before installation of the needle bearing, apply the gear oil of the same designation as that used inside the transmission assembly on it. Set second gear driven gear assembly in from upside of output shaft with the end with synchronizer cone of the gear assembly down (the three grooves on the gear assembly should completely envelop the three corresponding finger jaws on 1/2 gears synchronizer cone), and then check and make sure that the gear assembly can rotate freely. Set the third gear driven gear in from upside of output shaft with the end with boss of the gear up, and then check and make sure that the 1/2 gears synchronizer ring assembly is not locked. Set 3/4 gears driven gear bush and then fourth gear driven gear in from upside of output shaft, with the end with boss of the gear down. Set fifth gear driven gear in from upside of output shaft with the end with boss of the gear up. When fitting, try to use the thicker snap ring, if really unsuitable, select the snap ring of next thinner level, and then check if the snap ring has really enter the groove with the clearance between the snap ring and the groove not exceeding 0.05mm. Simultaneously press inner rings of front and rear bearings of output onto the output shaft. See Figure 27.

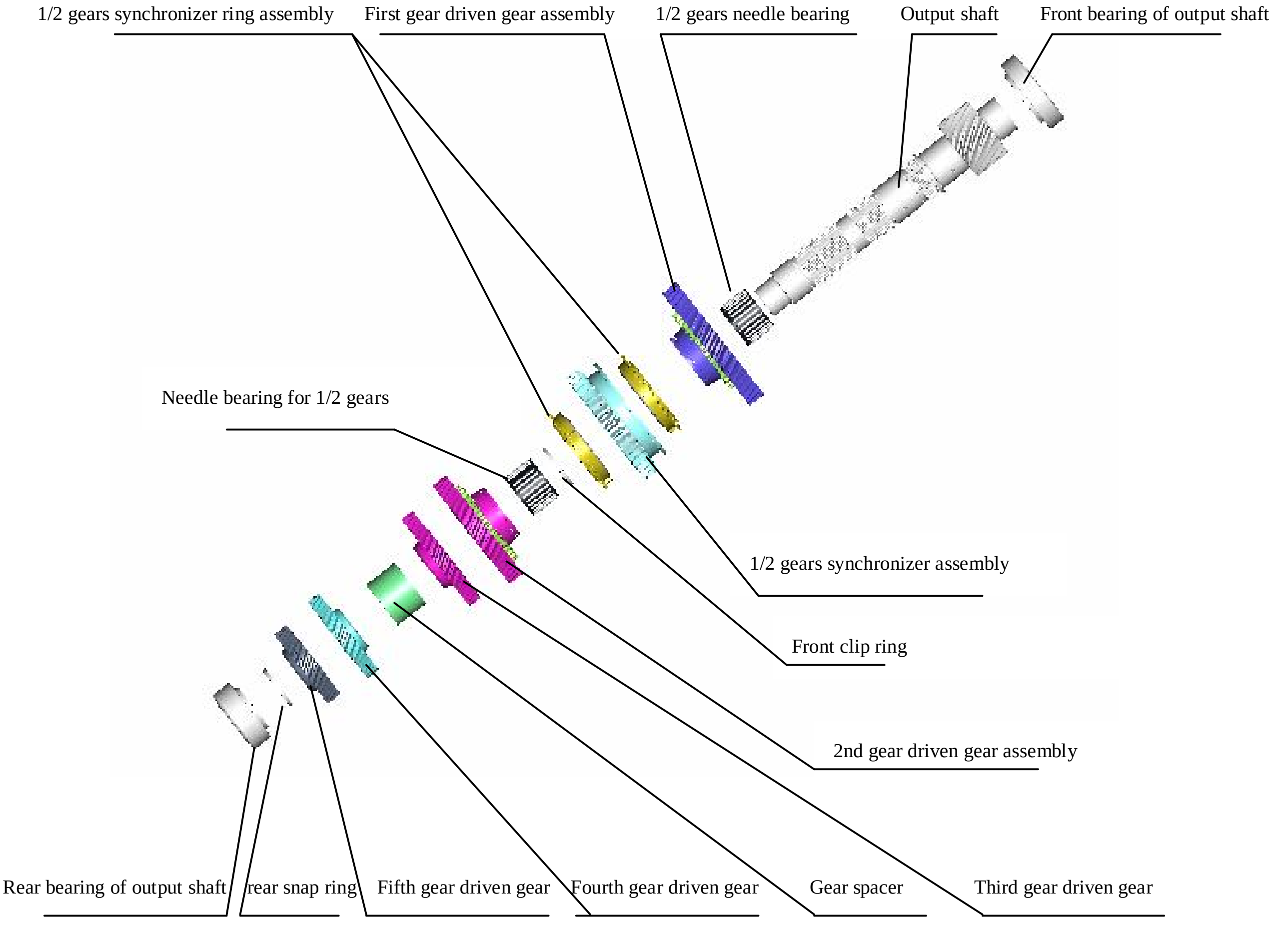


Figure 27

8. Assembly and regulation of transmission assembly

Place the clutch as shown in Figure 28 first, and then assemble the differential assembly to its designated position.

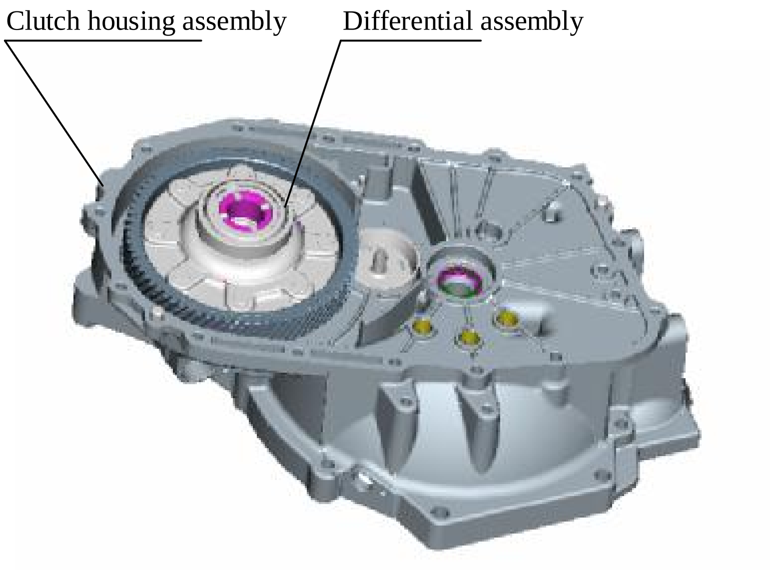


Figure 28

Assemble gearshift fork assembly, input shaft assembly and output shaft assembly together as shown in Figure 29, and then install them together onto clutch housing assembly. When assembling, wrap front end spline of input shaft with polyvinyl chloride adhesive tape to prevent damage to oil seal. After installation, turn each gear to ensure favorable engagement.

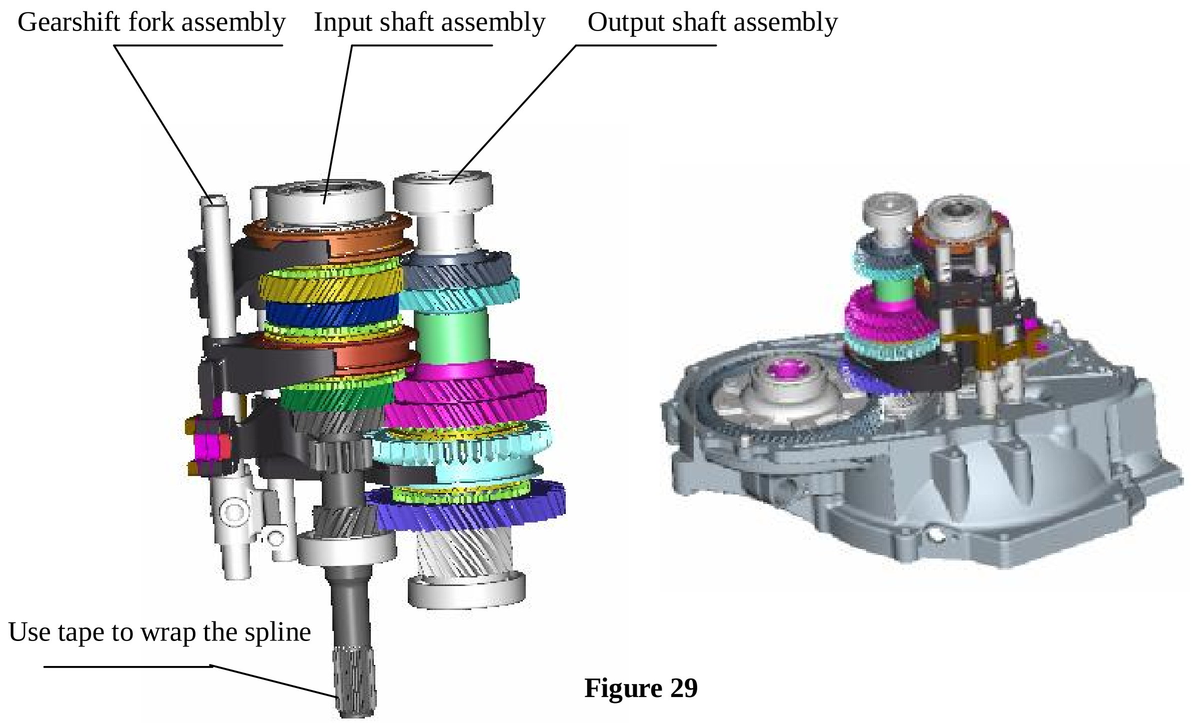
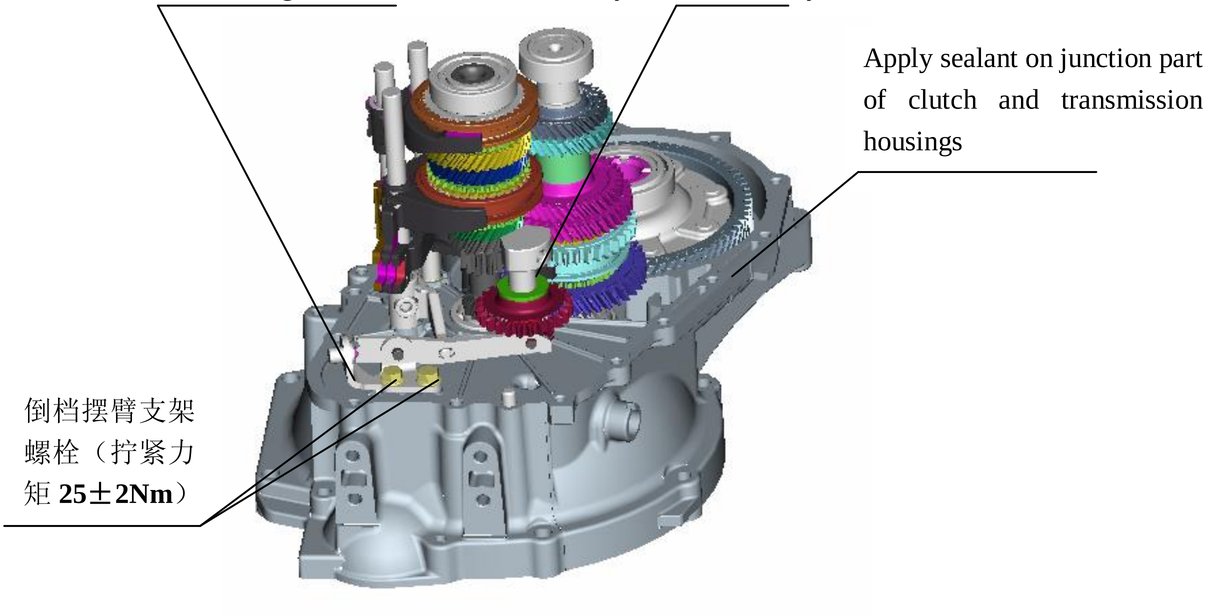


Figure 29

Install the assembled idler assembly (assembly of idler assembly is comparatively simple, please refer to its disassembly process) onto clutch housing, and then install reverse gear fork mechanism assembly with tightening torque of the two reverse gear rocker arm bracket bolts as **25±2Nm**. Clean the junction part of clutch and transmission housings and apply sealant (oil resistance silicone sealant, HZ1213Q/320222 YAP02-92) on it, and then install the magnet. See Figure 30.



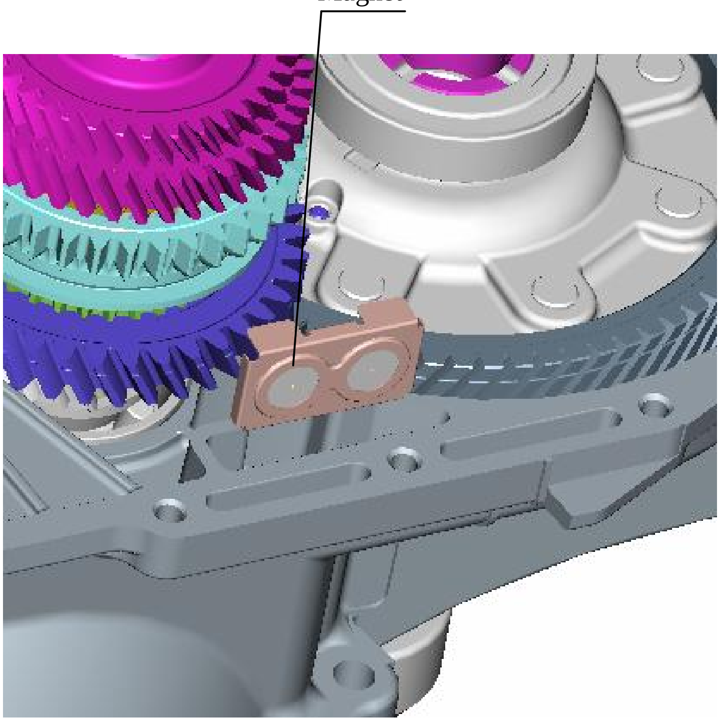


Figure 30

Assemble transmission housing and clutch housing together and then fasten them with connecting bolts. Before fastening, apply **thread locking glue (262 type anaerobic adhesive)** on the bolts properly. Tighten the diagonal bolts first as possible to ensure favorable fastening and sealing effects, and the tightening torque for the bolts are **25±2Nm**. **Note: the two connecting bolts at oil drain hole are a little longer than other connecting bolts, and the bracket should be installed first.** See Figure 31.

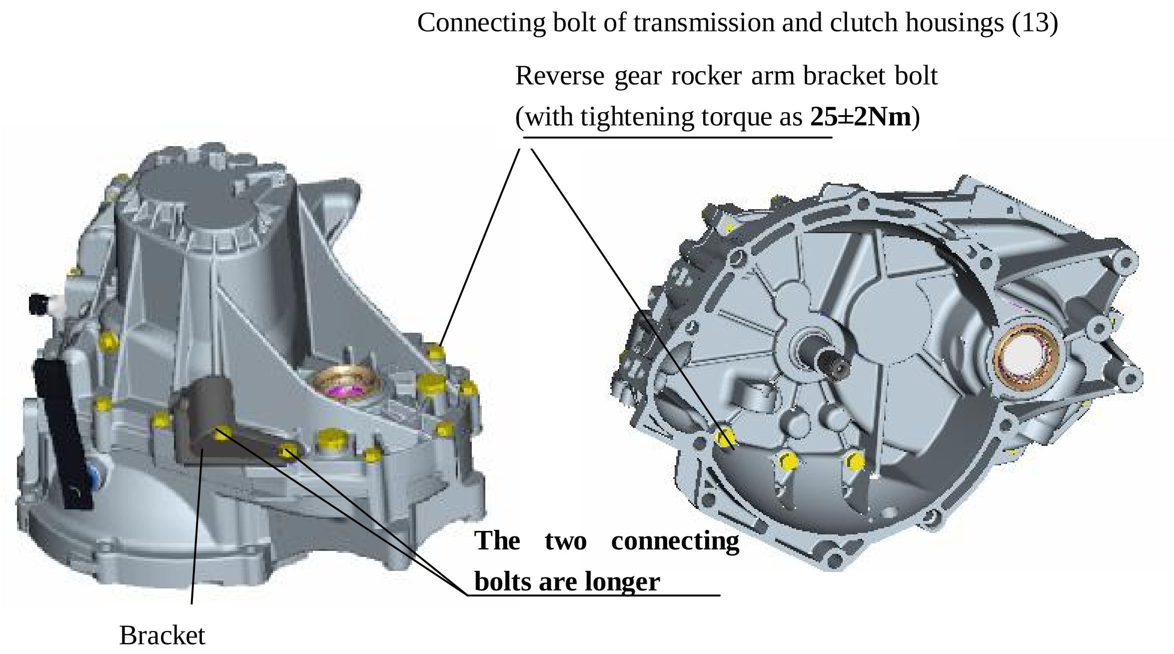


Figure 31

To install the assembled gearshift mechanism assembly onto the transmission, clean the junction part of gearshift housing and transmission housing and apply sealant on it (oil resistance silicone sealant, HZ1213Q/320222 YAP02-92), align one end of gearshift shaft with the linear bearing inside the transmission and align the locating hole on gearshift housing with the locating pin on transmission housing, and then tighten the connecting bolts of gearshift housing and transmission housing with the tightening torque as **25±2Nm**. See Figure 32.

Connecting bolts of gearshift housing and transmission housing
(5, tightening torque: **25±2Nm**)

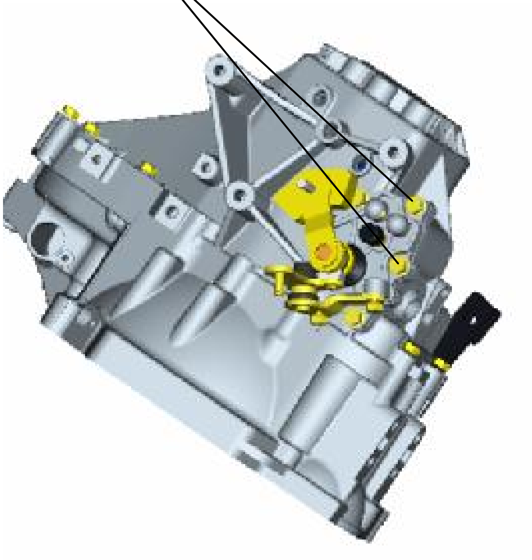


Figure 32

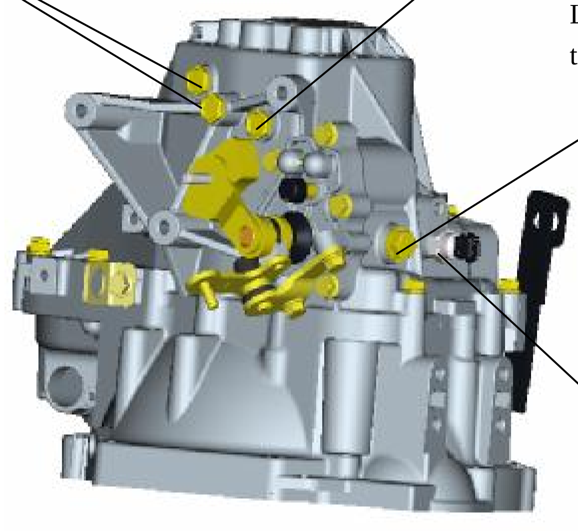
9. Disassembly of external accessories of transmission

Respectively install locating seats of 1/2 gears fork shaft and 3/4/5 gears fork shaft. Before installation, apply **thread fastening glue (262 type anaerobic adhesive)** on the thread, and the tightening torque for the bolts are **20±2Nm**. **Note: the locating seat of 1/2 gears fork shaft is longer than that of 3/4/5 gears fork shaft.** Then install locating seat of gearshift shaft, before installation, apply **thread fastening glue (262 type anaerobic adhesive)** on the thread, and the tightening torque for the bolts are **32±2.5Nm**; and install backup lamp switch assembly, before installation, apply **thread fastening glue (262 type anaerobic adhesive)** on the thread, and the tightening torque for the bolts are **20±2Nm.** See Figure 33**.**

Locating seat of 3/4/5 gears fork shaft (with tightening torque as **20±2Nm**)

Locating seat of 1/2 gears fork shaft (with tightening torque as **20±2Nm**)

Locating seat of gearshift shaft (with tightening torque as **32±2.5Nm**)



Switch assembly of backup light (with tightening torque as **20±2Nm**)

Figure 33

Follow by installation of screw of reverse gear idler shaft. Align the screw of reverse gear idler shaft with the threaded hole on the idler shaft, and then tighten it with the tightening torque as **38±2.5Nm**; after that, tighten bleeding plug with tightening torque as **44±3Nm**; finally, install oil limit plug onto the transmission, but do not tighten it then. See Figure 34.

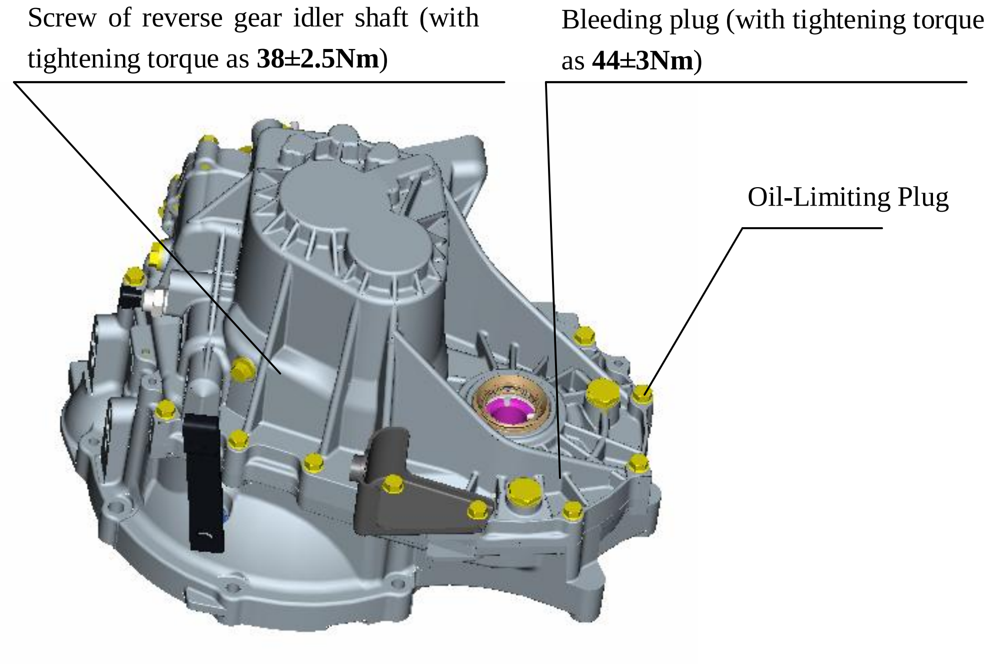


Figure 34

10. Refilling and volume regulation of transmission lubricant

After the transmission is installed onto the vehicle, park the vehicle on a flat road surface, then use the tool for refilling to refill transmission lubricant. The lubricant refilled should at least conform to API GL-4 SAE 75W-90 specification. Refill through installation hole of speed sensor as shown in Figure 35 with the refilling volume as 1.8L. after refilling, open the oil limit plug to regulate the lubricant to specified volume, and then tighten the oil limit plug with the tightening torque as **44±3Nm**.

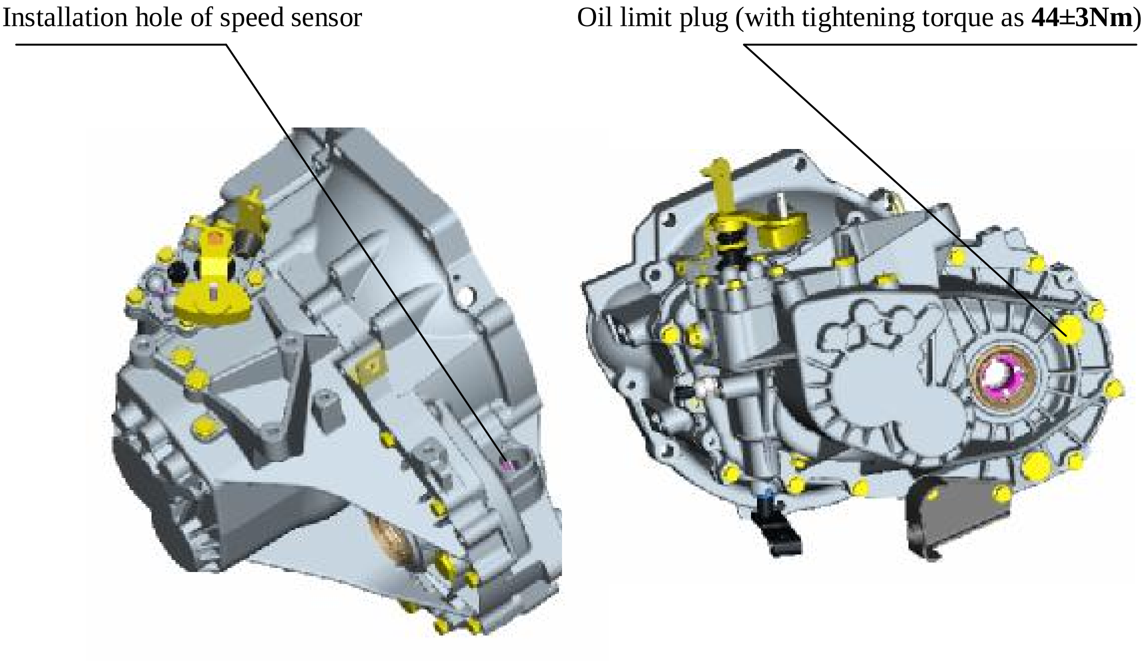


Figure 35

After the above steps, assembly and regulation to the transmission assembly are accomplished.

II. Tightening Torque Table for Fasteners

Position	Tightening torque (N.m)
Reverse gear rocker arm bracket bolt	25±2
Connecting bolts for clutch and transmission housings	25±2
Reverse gear idler shaft screw	38±2.5
Connecting bolts for gearshift and transmission housings	25±2
Gearshift shaft locating seat assembly	32±2.5
Reverse switch assembly	20±2
Fork shaft locating seats of gears	20±2
Bleeding\oil limit plug	44±3
Clutch release fork bolt	20±2
Clutch release arm bolt\nut	20±2
Selector Lever Bracket Bolt	25±2
Main decelerator driven gear bolt	130±5
Reverse gear lockup mechanism bolt	18±2

Chapter Four General Failures and Troubleshooting

Failure status	Possible reason	Troubleshooting
Excessive or abnormal noise	Damaged input or/and output shaft bearing(s)	Replace the bearing
	Gear tooth faces damaged due to knocking, burr or pit corrosion existing, or poor contact between them.	Repair or replace the gear
	Incorrect gear shaft position and clearance	Check and adjust
	Low oil level, insufficient lubrication	Fill oil to the specified level
	Foreign matter(s) existing in the assembly	Check and remove
Oil leakage	Excessively worn or damaged oil seal(s)	Replace
	Uneven sealant smearing or damaged seal gasket(s)	Replace the seal gasket(s) or sealant
	Failure to timely recondition junction surface(s) damage due to knocking	Check and repair
	Damaged differential bearing	Replace
Difficult to implement gear shift	Improper clutch adjustment and incomplete release.	Adjustment
	Improper gearshift transmission system adjustment or movement obstruction occurring	Check and adjust
	Synchronizer ring(s) fails to work	Replace
Gear jump	Worn synchronizer gear sleeve(s) or tooth cone surface(s) of gear junction	Replace related components
	Improper gearshift transmission system adjustment	Check and adjust
No gear	Loose gearshift transmission system	Overhauling
	Loose gearshift arm of transmission	Repair
Abnormally damaged bearing(s)	Metal impurities contained in transmission oil	Replace
	Insufficient lubrication or unqualified transmission oil	Replace
	Using of unqualified bearing(s)	Replace

Service Manual for Chery QQ6

(SQR473F Engine-Mechanical)

After Sales Service Department of Chery Automobile Sales Co., Ltd

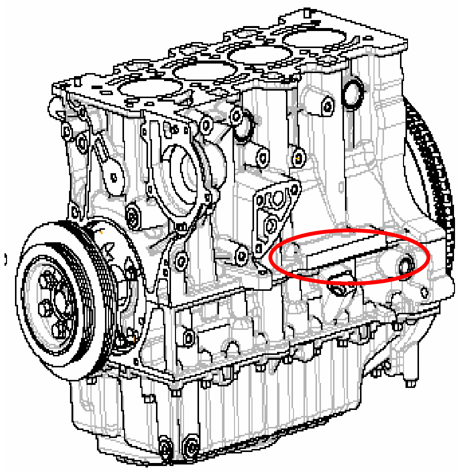
Chapter One Introduction of Characteristics

I. Overview

SQR473F engine is one of the ACTECO series engines that are jointly designed and developed by Chery company and AVL-a world famous engine design company. This engine adopts such advanced technologies as overhead double camshaft structure, 4 air valves, electronic throttle body and electronic accelerator pedal etc. In terms of such mandatory standard indexes as emission and noise, this engine is outdoes national standard and has reached overseas advanced stage.

II. Number Position of the Engine

Number of the engine locates at right side of oil filter where bearing shell cover and cylinder block join.



III. Connotation of Engine Number

Each engine has a unique number, from which you can know some characteristics and information of the engine. Engine model should conform to requirements in GB725 and is consisted of enterprise code, number of cylinders of the engine, bore, characteristic code and specification code.
A complete engine model is as follows:

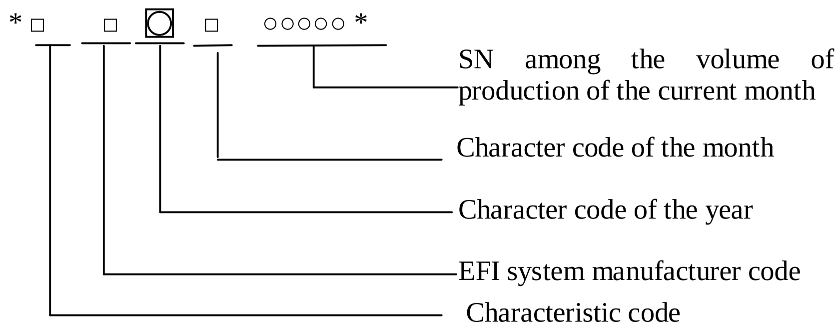
□□□ ○ ○○ □ □

Specification code
Characteristic code
Cylinder bore
Number of cylinders
Enterprise code

Among which, ○ indicates an Arabic numeral while □ indicates a letter.
The enterprise code is stipulated as SQR;
Number of cylinders of engine is a 1-2 digit integer;

The bore refers to diameter of cylinder sleeve, which is specified by a 2-3 digit integer with the decimal part rounded and millimeter as unit.
Characteristic code: indicates the most basic characteristics of an engine and is specified by 1 digit upper case English letter.
Specification code: specified by 1 digit upper case English letter, which is used as an additional distinguish code when distinguish is required in case structure, principal parameter or oil supply mode etc. has changed (for example, the stroke of engine has changed or the engine is a dual fuel engine) with number of cylinders, bore and characteristic code of the engine unchanged. For changes of peripheral parts of the engine (such as intake and exhaust manifolds), the engine model will keep unchanged, and engine assembly number will be changed for distinguish. Among the engines of the same series, the specification code will be used with “B” as the first (among which, do not use such letters as “I”, “O”, “Q”, “X” and “Z”). The default specification code for the first fundamental structure is “A”, which is omitted. The specification also can quote the characteristic code to express specific characteristics.
Position of engine model

The engine model should be printed at an obvious part on engine cylinder block and please see provisions in ***Assembly and Regulation Instruction of Engine*** for the specific position.
Leaving factory number of engine is composed of characteristic code of engine, EFI manufacturer code, character code of the year of production, character code of the month of production, sequence number of this engine among the engines of this model manufactured in that month and start stop sign “*”. Complete form of leaving factory number of a engine is as follows:



Among which, ○ indicates an Arabic numeral, □ indicates a letter and ▢ indicates an Arabic numeral or a letter.
The characteristic code of engine should conform to above provision.
EFI system manufacturers: C-Motorola; D-Marelli; E-Delphi; F-UAES; G-Siemens; H-Troitec; B-Bosch

Chapter Two Specification

I. Engine Type and Major Parameters

No.	Item	Basic Parameters	
		SQR473	
	Type	SQR473H	SQR473F
		Vertical type, 4 cylinder, water cooling, 4 stroke, in-line double overhead camshaft, controlled burn rate, variable valve timing	Vertical type, 4 cylinder, water cooling, 4 stroke, in-line double overhead camshaft
1	Model	SQR473H	SQR473F
2	Fuel Supply Mode	Multi point electric control gasoline injection	
3	Cylinder Diameter (mm)	73.0	
4	Piston Stroke (mm)	77.5	
5	Working volume (L)	1.297	
6	Compression Ratio	10.0	
7	Type of Combustion Chamber	Ridge type	
8	Ignition Sequence	1-3-4-2	
9	Fuel Designation (not less than)	93# lead-free gasoline	
10	Volume of Engine Oil (L)	3.5 (new engine oil filter)	
11	Engine Oil Designation	SAE10W-40 (grade SJ or above)	
12	Crankshaft Rotational Direction	Clockwise (see from engine belt)	
13	Starting Mode	Electric starting	
14	Cooling Mode	Mandatory circulating antifreeze cooling	
15	Lubricating Mode	Combined type (pressure and splash lubrication)	
16	Net Mass (kg)	105	100

17	Crank Angle with Intake Valve Opening as 1mm (°)	400	369
	Crank Angle at 1mm before Intake Valve Closing (°)	610	569
	Crank Angle with Exhaust Valve Opening as 1mm (°)	200	140
	Crank Angle at 1mm before Exhaust Valve Closing (°)	390	350
18	Ignition Advance Angle (°CA)	12±5	12±5
19	Cylinder Compression Pressure (MPa) (200~300r/min)	1.00～1.35	
20	Overall Dimension (length×width×height)	613×507×734	
21	Electronic fuel injection system	UAES	

II. Major Maintenance Parameters of Engine

No.	Name	Dimension and tolerance	Fit clearance
1	473 engine cylinder hole	φ73.005±0.005	0.04
2	Piston skirt of 473 engine	φ72.965±0.009	
3	Main bearing saddle width of cylinder	$19.5^{0}_{-0.05}$	0.07~0.265
	Thickness of thrust plate	$2.4^{+0.05}_{0}$	
	Crankshaft main journal	$24.5^{+0.015}_{-0.030}$	

No.	Name	Dimension and tolerance	Fit clearance
4	Thickness of connecting rod big end	$22^{0}_{-0.1}$	0.15~0.4
	Width of crankshaft connecting rod journal	$22^{+0.30}_{+0.15}$	
5	First piston ring groove height	$1.2^{+0.05}_{+0.03}$	0.035~0.08
	Top compression ring height	$1.2^{-0.005}_{-0.03}$	
6	Second piston ring groove height	$1.5^{+0.04}_{+0.02}$	0.025~0.07
	Second compression ring height	$1.5^{-0.005}_{-0.030}$	
7	piston oil ring groove height	$2.5^{+0.03}_{+0.01}$	0.02~0.18
	Blade height of steel strip composite type oil ring	0.46±0.02	
	Bracing spring height of steel strip composite type oil ring	1.5±0.03	
8	Crankshaft key groove width	$5^{+0.014}_{-0.010}$	
9	Diameter of crankshaft front oil seal	$\Phi 36^{0}_{-0.1}$	
10	Diameter of crankshaft rear oil seal	$\Phi 75^{0}_{-0.1}$	
11	Outside diameter of engine oil dipstick tube	$f16.7^{0}_{-0.1}$	
	Diameter of cylinder block scale tube orifice	$f16.7^{+0.043}_{0}$	
12	Diameter of cylinder head valve guide orifice	φ6+0.015	
	Outside diameter of valve guide	φ11x6	-0.022～ -0.050
	Diameter of cylinder head valve guide bottom orifice	φ11H7	
13	Outside diameter of intake valve stem	φ5.98±0.008	+0.012～ +0.043
	Diameter of cylinder head intake valve guide orifice	φ6+0.015	
14	Exhaust valve stem diameter	φ5.96±0.008	+0.032～ +0.063
	Diameter of cylinder head exhaust valve guide orifice	φ6+0.015	
15	Diameter of camshaft first journal	$f\,32e6\left(^{-0.050}_{-0.066}\right)$	+0.050～ +0.090
	Diameter of cylinder head first bearing hole	$\varnothing 32\ H7\left(^{+0.025}_{0}\right)$	
16	Diameter of camshaft second journal	$f\,24e6\left(^{-0.040}_{-0.053}\right)$	+0.040～ +0.074
	Diameter of cylinder head second bearing hole	$f\,24H7\left(^{+0.021}_{0}\right)$	
17	Diameter of camshaft third journal	$f\,24e6\left(^{-0.040}_{-0.053}\right)$	+0.040～

No.	Name	Dimension and tolerance	Fit clearance
	Diameter of cylinder head third bearing hole	$f\,24H7\left(^{+0.021}_{0}\right)$	+0.074
18	Diameter of camshaft fourth journal	$f\,24e6\left(^{-0.040}_{-0.053}\right)$	+0.040～+0.074
	Diameter of cylinder head fourth bearing hole	$f\,24H7\left(^{+0.021}_{0}\right)$	
19	Diameter of camshaft fifth journal	$f\,24e6\left(^{-0.040}_{-0.053}\right)$	+0.040～+0.074
	Diameter of cylinder head fifth bearing hole	$f\,24H7\left(^{+0.021}_{0}\right)$	
20	Camshaft thrust groove width	$30.65H7\left(^{+0.025}_{0}\right)$	+0.15～+0.20
21	Outside diameter of camshaft oil seal	$f\,50^{+0.4}_{+0.2}$	-0.005～-0.40
	Diameter of cylinder head oil seal hole	$f\,50H7\left(^{+0.025}_{0}\right)$	
22	Diameter of cylinder head jib hole	$f\,12G7\left(^{+0.024}_{+0.006}\right)$	+0.006～+0.035
	Outside diameter of hydraulic jib	φ12-0.011	
23	Diameter of crankshaft timing gear segment	Φ28f7	
	Bore diameter of crankshaft timing gear	φ28＋0.030	
24	Key groove dimension of crankshaft timing gear	$5^{+0.030}$	0~0.06
	Key groove width of crankshaft gear	$5^{+0.030}$	
	Semicircular key width	$5^{0}_{-0.030}$	
25	Bore diameter of crankshaft pulley	$\varphi 74^{+0.046}$	0.096~0.126
26	Outside diameter of timing gear	$\varphi 74^{-0.05}_{-0.08}$	

III. Primary Fit Clearance

Name	Fit Clearance
Axial clearance of crankshaft	0.07～0.265mm
Axial Clearance of Camshaft	0.15～0.20mm
Axial clearance of connecting rod	0.15～0.4mm
Fit clearance of connecting rod bearing	0.023～0.058mm
Fit clearance of main bearing	0.035～0.075mm
Fit clearance between intake valve stem and valve	0.012～0.043mm

guide	
Fit clearance between exhaust valve stem and valve guide	0.032～0.063mm
Fit clearance between hydraulic jib and cylinder head hole	0.006～0.035mm

IV. Engine Primary Tightening Torque Table

No.	Connection part	Part name	Bolt (thread specification)	Number of bolts/ gaskets (piece)	Tightening torque Nm (primary tightening)	Multiple steps tightening (torque + angle)		
						First step tightening torque (Nm)	Second step angle (°)	Third step angle (°)
1	Cylinder block main oil passage screw plug 1	Hexagonal socket head plug	M18×1.5	2	20+5	——	——	——
2	Cylinder block main oil passage screw plug 2	Hexagonal socket head plug	M10×1.5	1	20±3	——	——	——
3	Main bearing cap	Hexagon bolt	M11×1.5	4	——	45±5	180±10	——
4	Main bearing cap	Hexagon bolt	M11×1.5X92.5	6	——	45±5	180±10	——
5	Framework-cylinder block	Hexagon bolt	M8×1.25×55	10	20+3	——	——	——
6	Knock sensor-cylinder block	Hexagonal flange bolt	M8×1.25×35	1	20+0.5	——	——	——
7	Connecting rod cap-connecting rod body	Hexagon bolt	M8×1	8	——	25±3	90±5	——
8	Oil pump assembly-cylinder block	Hexagon bolt	M6×35	4	8+3	——	——	——
9	Engine oil collector bracket, separator-framework	Hexagonal flange bolt	M6×12	9	8+3	——	——	——
10	Bleeding plug-oil pan	Hexagon bolt	M16×1.5	1	25±3	——	——	——
11	Oil pan-framework	Hexagonal flange bolt	M7×20	18	15+3	——	——	——
12	Oil pan-framework	Hexagonal flange bolt	M7×35	3	15+3	——	——	——
13	Oil pan-framework	Hexagonal flange bolt	M7×90	4	15+3	——	——	——
14	Water pump-cylinder block	Hexagon bolt	M6×25	5	8+3	——	——	——
15	Cylinder head oil passage throttle bolt	Hexagon throttle bolt	M14×1.5	2	15+3	——	——	——
16	Camshaft bearing cap-cylinder head	Locating bolt	M6×1×30	18	9.5±1.5	——	——	——
17	Camshaft bearing cap-cylinder head	Hexagonal flange bolt	M6×1x30	2	9.5±1.5	——	——	——

No.	Connection part	Part name	Bolt (thread specification)	Number of bolts/ gaskets (piece)	Tightening torque Nm (primary tightening)	Multiple steps tightening (torque + angle)		
						First step tightening torque (Nm)	Second step angle (°)	Third step angle (°)
18	Phaser control valve-first camshaft cap	Inner hexagonal bolt	M6×1×15	2	8+3	——	——	——
19	Cylinder head-cylinder block	Inner hexagonal bolt	M10×1.5	10	——	50±5		
20	Valve cover assembly-cylinder head	Damping unit-valve cover	M6×1×30	12	8+3	——	——	——
21	Camshaft position sensor-valve cover	Inner hexagonal bolt	M6×1×15	2	8+0.5	——	——	——
22	Hanger-cylinder head	Hexagonal flange bolt	M8×14	2	20+5	——	——	——
23	Rear housing of timing gear-cylinder head	Cross head screw	M5×15	6	5+2	——	——	——
24	Phaser-camshaft	Inner TORX hollow bolt	M12×1.25	2	120±5	——	——	——
	Timing gear-camshaft	Bolt	M12×1.25	2	120±5	——	——	——
25	Inlet cam phaser cap-inlet cam phaser	Hexagon bolt		1	30	——	——	——
26	Exhaust cam phaser cap-exhaust cam phaser	Inner TORX bolt		1	30	——	——	——
27	Oil filter assembly-oil filter seat	Screw sleeve	M20×1.5	1	25±3	——	——	——
29	Oil filter joint		M20×1.5	1	25±3	——	——	——
30	Oil filter seat-cylinder block	Inner hexagonal bolt	M8×25	3	20+5	——	——	——
31	Oil pressure switch-oil filter		M14×1.25×12 （13×13）	1	12±2	——	——	——
32	Thermostat assembly-cylinder head	Hexagon bolt	M6×60	3	8+3	——	——	——
33	Thermostat cover-thermostat case	Hexagonal flange bolt	M6×20	4	8+3	——	——	——
34	Coolant senser-thermostat shell		M12×1.5	1	20+5	——	——	——
35	Crankshaft timing gear-crankshaft	Hexagonal flange bolt	M13×1.5	1	——	130±10	65±5	——
36	Crankshaft pulley-crankshaft timing gear	Hexagonal flange bolt	M8×1×15	6	——	25±5	30±5	——
37	Flywheel-crankshaft	Hexagonal flange bolt	M8×1.25	8	——	15±5	30±5	——
38	Signal wheel-flywheel	Hexagon bolt	M8×1.25	6	8±2	——	——	——
39	Timing belt-tensioner assembly-cylinder block	Hexagonal flange bolt	M8×55	1	27±3	——	——	——
40	Timing belt-idler assembly-cylinder head	Hexagonal flange bolt	M10×60	1	40+5	——	——	——
41	Bulkhead-crankshaft locating pin hole	Hexagonal flange bolt	M16×1.5	1	25±3	——	——	——

No.	Connection part	Part name	Bolt (thread specification)	Number of bolts/ gaskets (piece)	Tightening torque Nm (primary tightening)	Multiple steps tightening (torque + angle)		
						First step tightening torque (Nm)	Second step angle (°)	Third step angle (°)
42	Front lower cover of timing gear-engine	Hexagonal flange bolt	M6×24	5	8+3	——	——	——
43	Front upper cover of timing gear-engine	Inner hexagonal bolt	M6×30	1	8+3	——	——	——
44	Front upper cover of timing gear-engine	Hexagon bolt	M6×16	4	8+3	——	——	——
45	Air compressor bracket-cylinder block	Hexagonal flange bolt	M8×25	1	10+3	——	——	——
46	Air compressor bracket-cylinder block	Hexagonal flange bolt	M8×65	3	30+3	——	——	——
47	Power steering pump-steering pump bracket	Hexagonal flange bolt	M8×125	1	20+5	——	——	——
48	Power steering pump-steering pump bracket	Hexagonal flange bolt	M8×25	1	20+5	——	——	——
49	Power steering pump-steering pump bracket	Hexagonal flange bolt	M8×80	1	20+5	——	——	——
50	A/C compressor assembly-air compressor bracket	Hexagonal flange bolt	M8×100	1	20＋5	——	——	——
51	Air compressor assembly-air compressor bracket	Hexagonal flange bolt 1	M8×30	1	20+5	——	——	——
52	Generator assembly-generator bracket	Hexagonal flange bolt	M10×90	1	30＋5	——	——	——
53	Generator lower bracket-cylinder block	Hexagonal flange bolt	M10×45	2	40＋5	——	——	——
54	Ignition coil assembly-bracket	Hexagon bolt	M6×1×50	4	8+3	——	——	——
55	Spark plug-cylinder head	Hexagon bolt	M14×1.25	4	30+3	——	——	——
56	Intake manifold-cylinder head	Stud bolt	M6×1×25	9	3+2	——	——	——
57	Intake manifold-cylinder head	Hexagon nut	M6	9	8+3	——	——	——
58	Delivery pipe assembly-air intake pipe	Hexagonal flange bolt	M6×20	2	8+3	——	——	——
59	Throttle body assembly-air intake pipe	Hexagon bolt	M6×1×50	4	8+3	——	——	——
60	Bracket-air intake pipe	Hexagon bolt	M8×30	2	20+5	——	——	——
61	Bracket-air intake pipe	Hexagonal flange bolt	M8×40	2	20+5	——	——	——
62	Engine oil dipstick tube-air compressor bracket	Inner hexagonal bolt	M6×16	1	8+3	——	——	——
63	Engine oil dipstick tube-framework	Hexagon bolt	M6×16	1	8+3	——	——	——

No.	Connection part	Part name	Bolt (thread specification)	Number of bolts/ gaskets (piece)	Tightening torque Nm (primary tightening)	Multiple steps tightening (torque + angle)		
						First step tightening torque (Nm)	Second step angle (°)	Third step angle (°)
64	Exhaust manifold-cylinder head	Stud bolt	M8×1×46	9	12+3	——	——	——
65	Exhaust manifold-cylinder head	Hexagon nut	M8	9	20+5	——	——	——
66	Exhaust pipe thermal shield-exhaust pipe	Hexagon bolt	M8×12	3	20+5	——	——	——
67	Oil return pipe bracket-cylinder block	Hexagon bolt	M8×20	1	20+5	——	——	——
68	Oil return pipe hollow screw		M14×1.5	1	15+3	——	——	——
69	Bracket-oil-gas separator	Inner hexagonal bolt	M5×14	2	6+2	——	——	——
70	Bracket-oil-gas separator	Inner hexagonal bolt	M6×14	2	8+3	——	——	——
85	Other		M4		2.5±0.5	——	——	——
			M5		5±1.5	——	——	——
			M6		8±3	——	——	——
			M7		15±3	——	——	——
			M8		20±5	——	——	——
			M10		40±5	——	——	——

V. The Parts where Lubrication are Required during Assembly of Engine

No.	Lubrication parts	Type of lubricant
1	Piston pin and pin hole	SJ10W-40
2	Piston ring groove	SJ10W-40

3	Connecting rod bearing shell and connecting rod journal	SJ10W-40
4	Cylinder sleeve hole	SJ10W-40
5	Main bearing lining and crankshaft main journal	SJ10W-40
6	Crankshaft thrust sheet (at oil groove side) and thrust surface	SJ10W-40
7	Head and thread of connecting rod bolt	SJ10W-40
8	Head and root of main bearing cap bolt	SJ10W-40
9	Rear oil seal edge and crankshaft oil seal journal	SJ10W-40
10	Head and root of cylinder head bolt	SJ10W-40
11	Valve guide orifice	SJ10W-40
12	Valve stem	SJ10W-40
13	Valve oil seal lip	SJ10W-40
14	Valve seat insert	SJ10W-40
15	Valve keeper ring groove	SJ10W-40
16	Cam and journal of camshaft	SJ10W-40
17	Camshaft bearing hole	SJ10W-40
18	External surface and base plane of hydraulic jib	SJ10W-40
19	Hydraulic jib hole and valve rocker arm head	SJ10W-40
20	Outer ring of oil pump	SJ10W-40
21	Edge or journal of camshaft oil seal	SJ10W-40
22	Intake and exhaust phaser control valve gaskets	SJ10W-40
23	Journal of intake and exhaust phaser	SJ10W-40

VI. The Parts where Rubber Coating are Required during Assembly of Engine

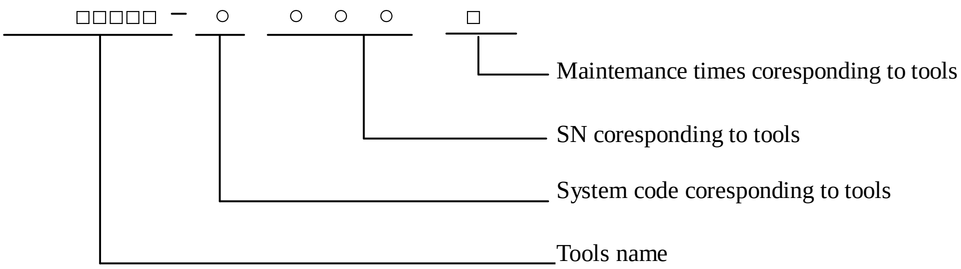
No.	Parts where rubber coating are required	Type of sealant
1	Cylinder block bowl plug	Loctite 648
2	Cylinder block main oil passage plug	Loctite 243
3	Junction plane of framework and cylinder block	Loctite 515
4	Outer ring of crankshaft rear oil seal	Loctite 243
5	Framework and oil pan	Loctite 5910
6	Cylinder head bowl plug	Loctite 648
7	Main oil passage screw plug	Loctite 243
8	Base plane of first bearing cap	Loctite 574
9	Water temperature sensor	Loctite 243
10	Oil pressure switch	Loctite 243
11	Flywheel bolt	Loctite 243
12	Oil pan main oil passage plug	Loctite 243
13	Engine oil collector separator bolt	Loctite 243

Chapter Three Special Tools

Please use the special tools that we designated to perform maintenance, otherwise it will cause accident or damage the machine.

I. Connotation of Special Tool Number

In order to know or find the tool clearly according to parts number and improve maintenance efficiency, special tools numbering is stipulated as follows:



□ indicates a letter ○ indicates an Arabic numeral

Nomenclature of the tool: for a standard part, please use the brand and model recommended by Chery company as reference. For example, CH indicates a non standard part, which means it is a special tool for repair of this part verified by After Sales Service Department of Chery Automobile Sales Co., Ltd. HAZET indicates a standard tool produced by this company.

Connotation of system code corresponding to the tool:

Number	Position
1	Chassis
2	Engine
3	Transmission
4	Accessory
5	Body

Corresponding series number of tools: from 001 to 999.

Times of modifications of the tool:

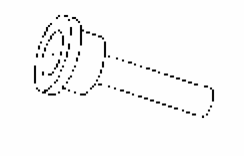
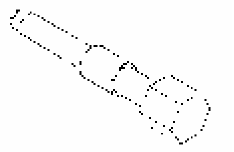
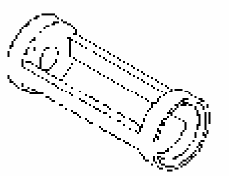
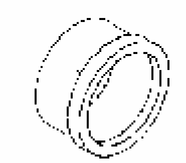
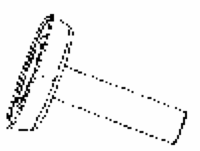
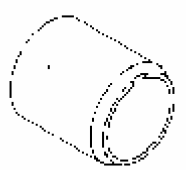
Number	Modification
A	First modification
B	Second modification
C	Third modification
D	Fourth modification

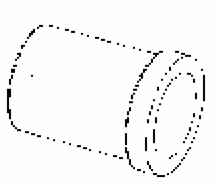
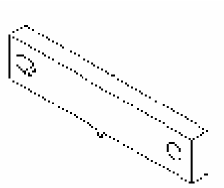
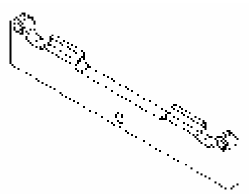
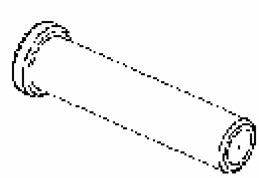
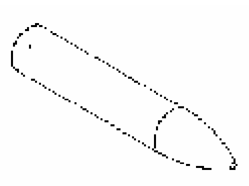
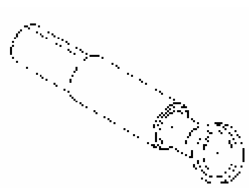
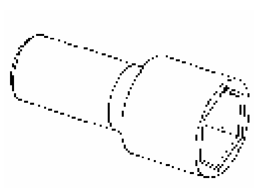
Note: In alphabetical order. Bigger SN means more modification times.

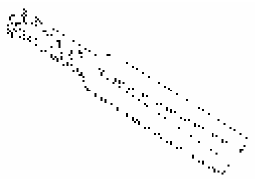
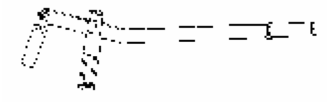
For example: CH-1002A means it is the 2# special tool for repair of chassis system that has been verified by After Sales Service Department of Chery Automobile Sales Co., Ltd., who commits production of this tool to other manufacturer. This tool is of the first modification.

HAZET-6290-1CT means it is a standard tool produced by HAZET company with its model as 6290-1CT.

II. Special Tools Chart

CH-20002 	Installation tool for camshaft oil seal: used to install camshaft oil seal.	Same as A5
CH-20003 	Engine timing tool: used to time crankshaft.	Same as A5
CH-20004 	Adaptor: used to install and remove valve spring (match with Eastar special tool MLR-MD998772A).	Same as A5
CH-20005 	Installation tool for crankshaft rear oil seal: used to install crankshaft rear oil seal.	Same as A5
CH-20006 	Installation handle for crankshaft rear oil seal: used to install crankshaft rear oil seal.	Same as A5
CH-20007 	Installation sleeve for crankshaft front oil seal: used to install crankshaft front oil seal.	Same as A5

CH-20008 	Installation sleeve for crankshaft front oil seal	Same as A5
CH-20009 	Locating tool for flywheel: used to locate flywheel.	Same as A5
CH-20010 	Camshaft timing tool: used to time camshaft.	Same as A5
CH-20011 	Installation tool for camshaft oil seal: used to install camshaft oil seal.	Same as A5
CH-20012 	Valve oil seal guide sleeve: used to install valve oil seal.	Same as A5
CH-20013 	Valve oil seal remover: used to remove valve oil seal.	Same as A5
CH-20015 	Belt pulley bolt remover: used to remove belt pulley clip.	Same as A5

CH-20017 	Installation tool for valve keeper: used to install valve keeper.	Same as A5
CH-20018-A 	Valve spring remover: used to remove valve spring.	Same as A5

Recommended tools

	Loop wheel machine: used to raise engine.
	Engine maintenance workbench: the workbench for disassembly and assembly of engine.
	Fuel pressure gauge: used to measure oil pressure of engine.

	Pressure gauge for cylinder: used to measure cylinder pressure. When measuring, remove spark plug first, screw instrument pipe orifice into the position of spark plug, use starter to drag the engine to rotate, and then fetch the maximum reading of the pressure gauge for cylinder as cylinder pressure of this cylinder.

Chapter Four Measurement of Cylinder Pressure

I. Detection of Cylinder Pressure

Measurement of cylinder pressure is the major index for judgment of engine working condition, through which, we can definitely judge if a certain system of engine works well. Therefore, during maintenance of engine, measurement of cylinder pressure is indispensable.

1. Measuring process

Please select a cylinder pressure gauge with accurate reading and let its pointer return to zero; otherwise, it may affect accuracy of reading.

1.1 Turn off ignition switch, pull out all ignition cables from spark plug side, and then pull out harness connector of injection nozzle.

1.2 Use a spark plug sleeve to loosen the spark plug whose cylinder will be measured. **Explanation:** do not remove the spark plug whose cylinder will not be measured.

1.3 Screw the cylinder pressure gauge joint slowly and vertically into the spark plug hole. Do not screw too tightly for fear that it may be difficult to disassemble.
1.4 Step down clutch pedal, start the engine and let it run for about 5-6s, then fetch the numerical value.

2. Judgment of cylinder pressure value

2.1 Correct cylinder pressure
The standard cylinder pressure value should be 10-13.5bar. With use of engine, this value will fall, but it should not be below 9bar with the pressure difference among cylinders not exceeding 3bar.
2.2 In case cylinder pressure of engine is below the standard value, it indicates deficiency of cylinder pressure, the main cause of which may be untight piston ring seal or valve. Please further analyze and check.

When starting the engine, ensure adequate quantity of electricity. Correct cylinder pressure can only be measured out with revolution of engine as 200-300r/min.

Chapter Five Disassembly of Power-assisted Steering System

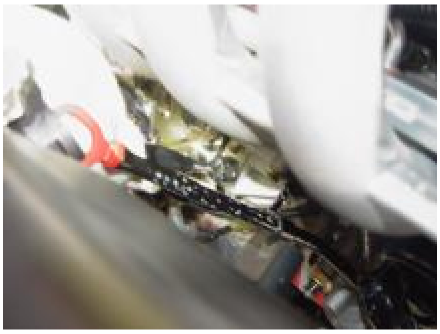
I. Disassembly Procedure

1. Use a snap ring pliers to loosen the clamp on connecting hose of steering fluid reservoir and steering pump. Use a clean container to reclaim the steering fluid.

2. Use a 21# sleeve to remove the fixing bolt of steering pump oil pipe.
Torque: 20+5Nm.

3. Use a 10# sleeve to loosen the (upper) fixing bolt of steering pump adjusting bracket.
Torque: 20+5Nm.

4. Use a 10# sleeve to loosen the (lower) fixing bolt of steering pump adjusting bracket.
Torque: 20+5Nm.



5. Use a 10# open end wrench to loosen the adjusting bolt of steering pump bracket, and then pull the steering pump upwards to loosen and take off the belt.

6. Use a 10# sleeve to loosen the connecting bolt of steering pump and compressor bracket, pull out harness connector, and then dismount the steering pump assembly.

Note: when dismounting the steering pump, please block the oil pipe joint with clean cotton cloth.

II. Overhaul

Steering pump can not be repair, if such failure as abnormal noise or oil leak exists, replace the assembly.

III. Installation of the Steering Pump

1. Follow the order adverse to that of disassembly to install.
2. After installation of steering oil pump, duly adjust tightness of belt through adjusting bolt.
3. After power steering pump is properly installed, refill with special steering pump oil, and then bleed air for the power steering pump after the engine starts.
4. Air bleeding method:
4.1 Hoist the vehicle to let its front wheels leave ground.
4.2 Turn the steering wheel left and right to the ends (duration for each time should not exceed 5s, otherwise, the power steering pump is likely to be burnt out) until the oil pump does not make sound. Note that oil storage kettle should not be lack of steering pump oil.

Chapter Six Disassembly of A/C Compressor

I. Disassembly Procedure

Before disassembling the compressor, disassemble the steering oil pump first.

1. Use a 12# sleeve and a universal joint connecting rod to loosen the connecting bolt of A/C high and low pressure pipelines. (**Note:** if there is R134a in the condenser, use a special equipment to reclaim first.)

After the pipeline is loosened, immediately block high and low pressure holes of the compressor with clean cotton cloth to avoid entry of foreign material into the compressor!

2. Hoist the vehicle and then use a 13# sleeve to loosen the fixing bolt of the compressor from underside.

Torque: 20+5Nm.

3. Lower the vehicle and then use a 13# sleeve to loosen the fixing bolt of the compressor from upside. Use a 13# sleeve to loosen the fixing bolt at middle of the compressor, and then dismount the compressor assembly.

Torque: 20+5Nm.

II. Overhaul of Compressor

Inside of the compressor are assembled with highly machined fine parts, in case abnormal noise or internal failure is found, replace the assembly.

III. Installation procedure

For the installation order, please refer to the disassembly order, and then follow the order adverse to that for disassembly to install. It should be noted that, when installing the A/C pipeline joint on the compressor, be sure to replace with a new gasket and tight the joint at specified torque to avoid leak.

Chapter Seven Disassembly of Generator

I. Disassembly Procedure

Before disassembling the generator, remove the connecting line of battery first.

1. Use a 10# sleeve to remove the connecting line of battery.

2. Use a 10# sleeve to loosen the fixing bolt of generator adjusting bracket, and then take off the adjusting bracket. Torque: 30+5Nm.

3. Use a 13# sleeve to remove lower fixing bolt of the generator.
Torque: 40+5Nm.

4. Use a 10# sleeve to remove the fixing bolt of generator anode harness, pull out the harness connector, remove the belt and then take out the generator.

II. Overhaul of Generator

In case the generator makes abnormal noise or its yield is too high or too low, replace the assembly.

III. Installation Procedure

The installation order of the generator is adverse to that for its disassembly. After the generator is installed, adjust deflection of the belt.

Chapter Eight Replacement of Engine Timing Belt

I. Disassembly Procedure

In order to ensure normal and highly effective working of the engine, replacing the timing belt at 50,000km mileage is recommended.

1. Disassembly of engine timing belt:

1.1 Follow the disassembly methods for power-assisted steering pump, compressor and generator to disassemble the generator and compressor belt.

1.2 Use a 5mm hexagon wrench to remove the five fixing bolts on timing upper cover.	
1.3 The positions of the five fixing bolts on timing upper cover are shown by the red circles in the figure.	
1.4 Use a 13# sleeve to loosen the crankshaft timing adjusting hole bolt. (The adjusting bolt is at upside of the starter)	

1.5 Insert the special tool CH-20003 into the timing hole and tighten, use a wrench to turn the big nut in the crankshaft pulley to make the crankshaft rotate, at the same time, slowly screw in CH-20003 until the crankshaft can not rotate back and forth any longer.	
1.6 Use a 13# sleeve to remove the six fixing bolts of crankshaft pulley and take out the crankshaft pulley. Torque: 55+5 Nm.	
1.7 Use a 10# sleeve to remove the six fixing bolts on timing lower cover.	
1.8 The positions of the six fixing bolts on timing lower cover are shown by the red circles in the figure.	
1.9 It should be specially explained that, the position of the fixing bolt at left upside on the lower cover is very occult, for removal of which, use of universal joint connecting rod is required. Alternatively, use a 13mm sleeve to remove the three bolts of suspension bracket to take off the suspension bracket.	

1.10 Use a 10# sleeve to loosen the fixing bolt of the tension pulley to take off the timing belt.

Torque: 27±3 Nm.

Note:

when taking off the timing belt, pay attention to running direction of the belt and refer to running direction of the engine crankshaft and the arrowhead direction on the belt.

II. Installation of Timing Belt

1. Loosen the fixing bolt of tension pulley and turn the tension pulley to minimum tension position.
2. Install the belt.
3. Use a 5mm hexagon wrench to turn the tension pulley, when it turns to a position that the hexagon wrench and the fixing bolt are roughly on the same horizontal line, stop and tighten the fixing bolt.
4. Install timing lower cover.
5. Install crankshaft pulley.
6. Install relevant accessories and check deflection of the belt.
7. Install timing upper cover.
8. The installed timing belt is as shown in the figure.

Note:

During the disassembly process, be sure not to turn crankshaft/camshaft; otherwise, ignition timing will need re-check.

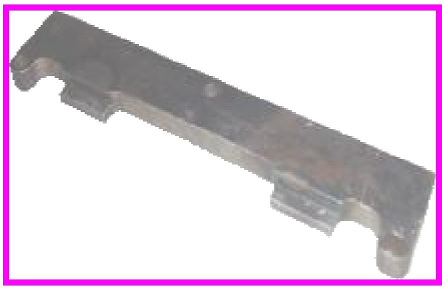
III. Adjustment of Timing (general overhaul)

1. Turn the crankshaft to make the four pistons align on a horizontal line in the cylinders, screw the special tool into the crankshaft timing adjusting hole at left rear of the cylinder (last segment of the crankshaft), and then make the crankshaft unable to turn left and right (the bolt of the special tool must enter into the screw hole plane of the cylinder).
2. After intake and exhaust camshaft is installed properly, install the camshaft timing gear, turn the groove at tail of intake and exhaust camshaft to horizontal direction, and then insert the special tool into the groove and fix.
3. After crankshaft and camshaft have been fixed according to requirements, install timing belt. In order to facilitate installation of timing belt, temporarily do not tighten the bolt fixing the timing gear onto camshaft and let it rotate freely, then fix the timing gear bolt after the tensioner pulley has fastened the timing belt to the specified value. After that, install other parts.

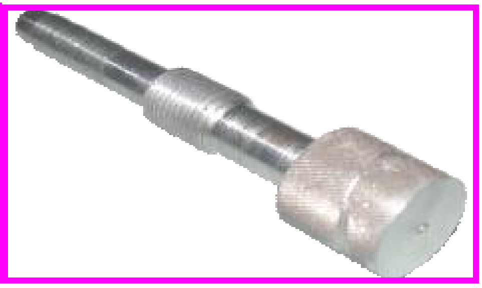
IV. Adjustment of Timing (minor overhaul)

Replace valve spring, grind valve and replace camshaft (do not raise the engine).

1. Remove the valve cover.
2. Remove the timing gear cover. Turn the timing gear.
3. Let the groove at tail of intake and exhaust camshaft on a horizontal line, then insert the projecting portion of the special tool into the groove and fix.
4. Turn the crankshaft, screw the special tool into the crankshaft timing adjusting hole at left rear of the cylinder (last segment of the crankshaft), and then make the crankshaft unable to turn left and right (if the cylinder head is removed, it can be found that the pistons of the four cylinders now align at a horizontal position).
5. Install timing belt and make tightness of the belt conform to requirements.
6. Fasten the fixing bolt of timing gear.
7. Install other accessories, such as timing cover and belt pulley etc.



Special tool for camshaft timing check (CH-20010)



Special tool for crankshaft timing check (CH-20003)

Chapter Nine Disassembly of Engine Assembly

I. Disassembly Procedure

Note:

Please use regular equipment, especially for such equipment as crane etc., so as to avoid occurrence of accident.

Before any disassembly job, disassemble cathode of battery first, so as to protect safety of electricity consumption equipment.

When disassembling engine suspension, pay attention to disassembly order, so as to avoid occurrence of accident.

1. Disassembly of engine wire harness

1.1 Pull out the connecting plug of engine wire harness.

1.2 Use a 10# sleeve to loosen the fixing bolt of engine ground.

2. Use a 10# sleeve to remove the fixing bolt and bearer of battery.

3. Use a 13# sleeve to remove the bolt of battery support fixed mount.

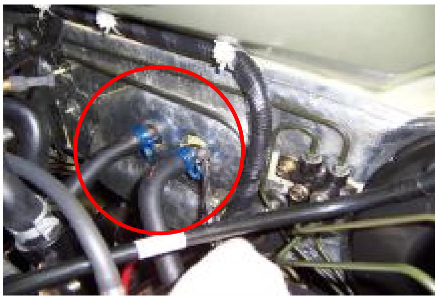
4. Disassembly of cooling system.

4.1 Hoist the vehicle, place away a coolant collector, unscrew bleeder bolt of the water tank to discharge the coolant.

4.2 Use the snap ring pliers to loosen the clamp on connecting pipe of water tank.

4.3 Use the snap ring pliers to loosen the connecting water pipe of A/C heating water tank.

4.4 Use the snap ring pliers to loosen other connecting water pipes.



5. Disassembly and installation of water pump assembly:

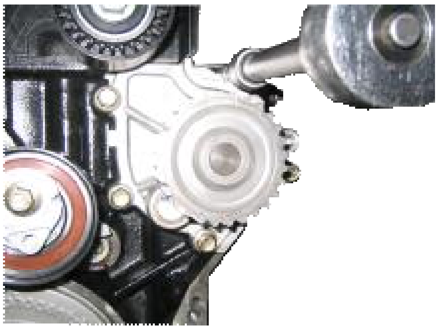
5.1 Remove upper and lower covers of timing gear (refer to disassembly and installation of gear and belt of timing gear).

5.2 Use a caliper to take off the clamps on the three discharging tubes and then pull out the rubber hoses.

5.3 Use a 10mm sleeve to remove the fixing bolt of discharging tube of water pump and then pull out the discharging tube.

Note: in case the O-ring on discharging tube of water pump is loose, broken or aging, be sure to replace.

5.4 Use a 10mm sleeve to remove the fixing bolt of water pump and then take out the water pump assembly; when removing, be careful not to damage cushion of the water pump, if damaged, replace with a new one. The water pump can not be decomposed to maintain.



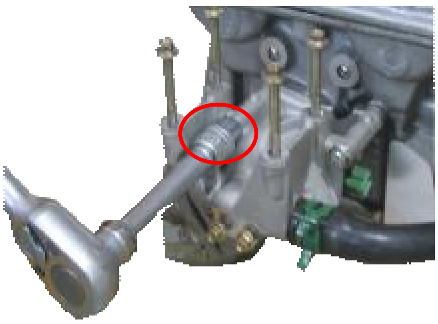
5.5 Check water seal of the water pump for water leak; if water pump bearing is loose, replace the assembly. Follow the order adverse to that for disassembly of the water pump to install it.

5.6 Disassembly and installation of thermostat

5.7 Use a caliper to take off the clamps on the two discharging tubes and then pull out the rubber hoses.

5.8 Use a 10mm sleeve to remove the fixing bolt of thermostat cover and then take out the thermostat.

5.9 Use a 10mm socket wrench to remove the thermostat seat. Be careful not to damage the thin sheet gasket.



6. Inspection of thermostat:

(1) Under normal temperature, inspect seating status of the valve and it should tightly seat.

(2) Inspect opening temperature and maximum stroke of the valve.

Opening temperature of the valve is 87±2℃

Maximum stroke of the valve is 8mm

Full opening temperature of the valve is 104℃

(3) Then check if the valve closes at the temperature 5℃ lower than the opening temperature. If not compliant, replacement with a new thermostat is required. Follow the order adverse to that for disassembly of the thermostat to install it. When installing, check if the gasket of the thermostat is damaged, if thermostat seat and thermostat cover casing plane are satisfactory. Check the sealing gasket for damage, if damaged, replace with new sealing element.

7. Disassembly of A/C pipeline

See **Disassembly of A/C Compressor** for disassembly of A/C pipeline.

8. Disassembly of power-assisted steering pipeline.

See **Disassembly of Power-assisted Steering Oil Pump** for disassembly of power-assisted steering pipeline.

9. Disassembly of intake and exhaust manifold.

9.1 Use a 10# sleeve to remove the fixing bolt of air intake pipe.

9.2 Use a cross-head screwdriver to loosen the clamp connecting intake hose and electronic throttle body.

9.3 Use a 13# sleeve to remove the connecting bolt of three-way catalytic converter and exhaust intermediate pipe.
Torque: 60±5 Nm.

9.4 Use a 10# sleeve to remove heat insulating mattress of exhaust pipe.

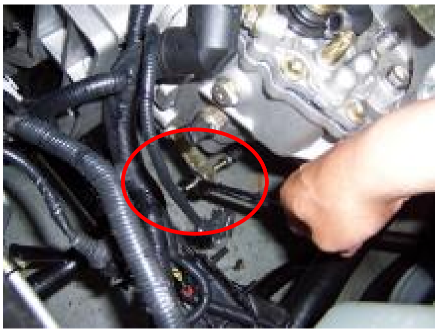
9.5 Use a 13# sleeve to remove the connecting bolt of exhaust manifold and three-way catalytic converter.
Torque: 60±5 Nm.

9.6 Use a 13# sleeve to remove the fixing bolt of exhaust manifold.

10. Disassembly of connecting portion of transmission case.
10.1 Use pliers to remove the fixing steel wire clip of gearshift control cable.

10.2 Use pliers to remove the fixing clip of gearshift control cable outer case and then take off the gearshift control cable.

10.3 Use a 13# sleeve to loosen the adjusting screw of clutch control cable and then take off the clutch control cable.



10.4 Use a 13# sleeve to loosen the fixing bolt of clutch control cable on the transmission case.

10.5 Use a 17# wrench to loosen the bleeding bolt of transmission case to discharge the gear oil.
10.6 See **Service Manual for Chassis** for disassembly of suspension travel portion.
10.7 Use a crow to pry out the half shaft.
11. Disassembly of suspension portion
11.1 Use a 13# sleeve to remove the fixing bolt for rear engine mount bracket of transmission case.
Torque: 60±5Nm.

11.2 Use a 18# sleeve to loosen the fixing bolt for front engine mount bracket.
Torque: 80±5 Nm.

11.3 Use a crane to hoist the engine until the iron chain just bears tensile force.

11.4 Use a 15# sleeve to loosen the fixing bolt for right engine mount bracket. (at rear of transmission)
Torque: 100±5 Nm.

11.5 Use a 13# sleeve to loosen the three connecting bolts for right engine mount bracket.
Torque: 65±5Nm.

11.6 Use a 13# sleeve to loosen the three connecting bolts for left engine mount bracket.
11.7 Pull out oil pipe connector and junctions of relevant pipelines. Make sure that relevant junction parts have all detached.
11.8 Hoist the engine up.

12. Separation of transmission case assembly and engine

12.1 Use a 10# sleeve to remove the gearshift control cable bracket on the transmission case.

12.2 Use a 13# sleeve to loosen the four fixing bolts for front engine mount bracket.

Torque: 65±5Nm.

12.3 Use a 13# sleeve to remove the connecting bolt of transmission case and engine, and then make the engine and the transmission separate.

Torque: 100±10 Nm.

II. Installation Procedure

1. Please follow the order adverse to that for disassembly to install, but care should be taken for the following matters.

(1) When hoisting, do not install exhaust manifold first, because the longitudinal separation of engine compartment is not big enough; otherwise, it may affect the assembly.

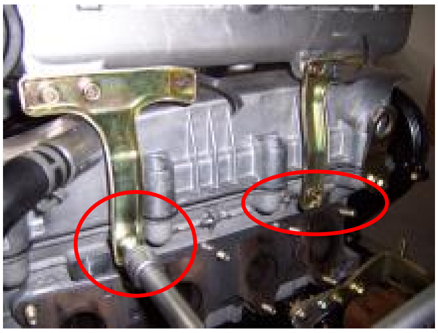
(2) After installation, please adjust the stroke of clutch pedal. When adjusting, adjust it to a proper position according to the corresponding requirements, in case of a too big free stroke of clutch, it may make sound when shifting gear or fail to release; while in case of a too small stroke, wear of friction plate may be accelerated and travel weakness may occur, if severely, the friction plate may be burnt out.

Chapter Ten Disassembly of Intake Manifold

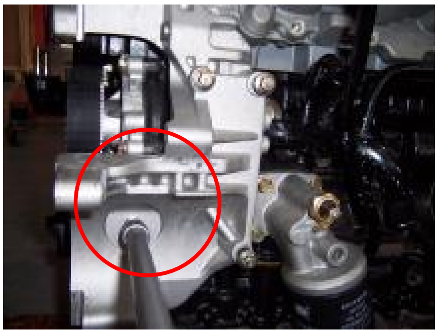
I. Disassembly Procedure

1. Use an 8# sleeve to remove the four fixing bolts of ignition coil and then remove such connections as ignition cable/injection nozzle harness etc.

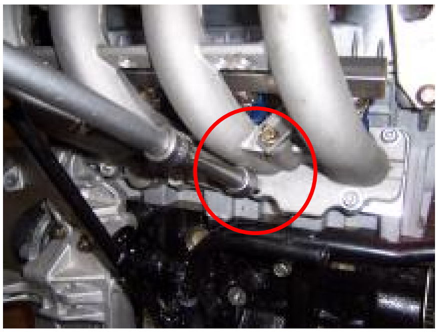
2 Use a 10# sleeve to remove the bolt of intake manifold fixing bracket.



3. Use a 10# sleeve to remove the fixing bolt of compressor bracket.
Torque: 30±3 Nm.



4 Use a 10# sleeve to remove the fixing bolt of intake manifold and then take off the intake manifold assembly.
Torque: 8+3Nm.

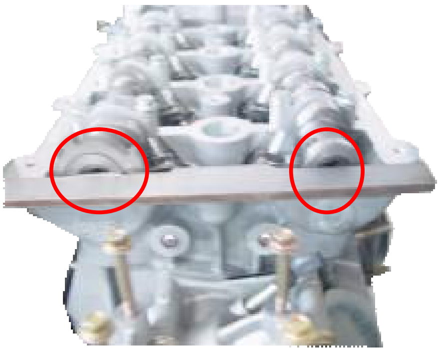


Chapter Eleven Disassembly of Cylinder Head

I. Disassembly Procedure

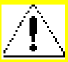
1 Use a 10# sleeve to remove the fixing bolt of valve cover.
Torque: 8±3 Nm.

2. Get the special tool CH-20010 stuck into the groove on camshaft.



3. Use a 18# sleeve to loosen the fixing bolt of camshaft timing gear.

Torque: 120±5Nm.



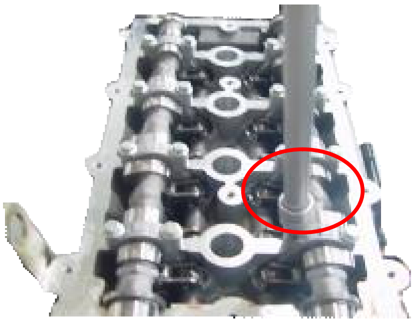
Note:

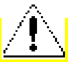
There is no difference between intake camshaft and exhaust camshaft, they can be interchanged.

4. Use a cross-head screwdriver to loosen the fixing bolt on inner fender of timing gear and then take out the inner fender of timing gear.

5. Use a 10# sleeve to remove the fixing bolt of camshaft bearing, take out the camshaft assembly and then the hydraulic tappet system.

Torque: 9.5±1.5 Nm.





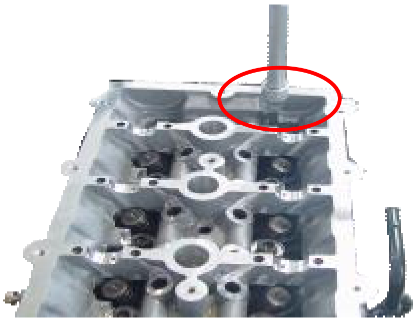
Note:

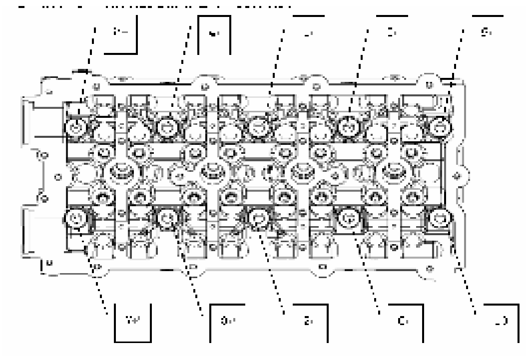
The positions of both camshaft bearing and bolts, including the order of camshaft bearing, are unchangeable, and should be conformity with the marks during assembly/disassembly.

6. Use an hexagon torque wrench to loosen the fixing bolt of cylinder head and then take off the cylinder head assembly.

Torque: 50±5 Nm.

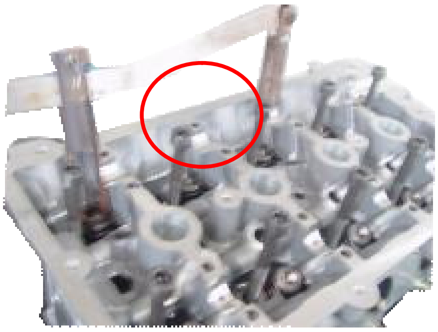
> **Note:**
> Follow the order as shown in the figure to loosen the fixing bolts of cylinder head.





7. Disassembly of valve

7.1 Use a special tool to press down the valve spring, take out the locking plate, and then take off valve spring, valve and valve seat insert.



7.2 Use a special tool to pull out the valve oil seal.

II. Overhaul of Cylinder Head System

1. Detection of camshaft

1.1 Measurement of height of cam. Use an outside micrometer to measure wheel height of the cam.

Wheel height of the intake camshaft: 37.11mm.

Wheel height of the exhaust camshaft: 37.09mm.

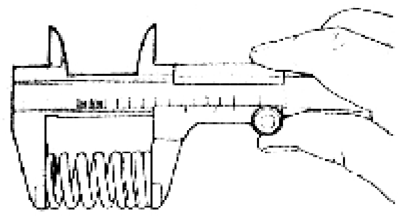
1.2 Inspection of camshaft journal. Use an outside micrometer to measure each journal of the camshaft, please see **Specification Table** for specific data.

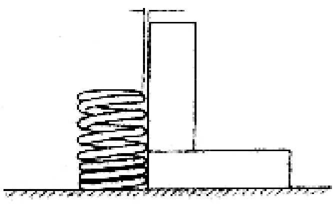
2. Detection of valve

2.1 Detection of valve spring. Two items of data of valve spring should be measured.

Length of the spring: 49mm

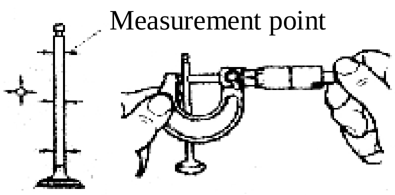
Squareness of the spring: 1.2mm (limit)





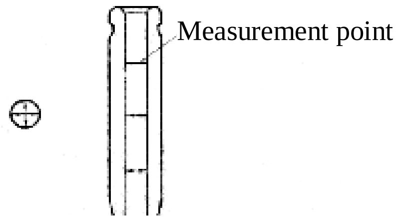
2.2. Detection of valve.

2.2.1 Measurement of diameter of valve stem



2.2.2 Measurement of valve guide inside diameter

Use an inside micrometer to measure inside diameter of the guide.



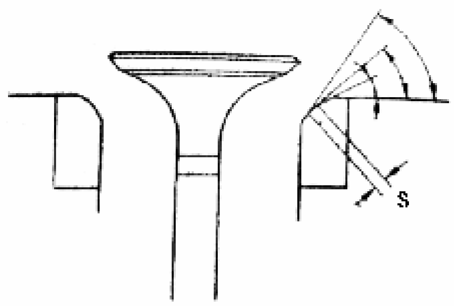
> **Note:**
>
> If abnormal noise is generated due to serious wear of valve guide, do not replace the valve guide, because the assembly technique requirements to valve guide is very strict; please replace the cylinder head assembly.

Fit clearance between intake valve stem and valve guide: 0.012~0.043mm

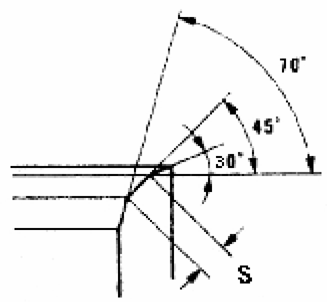
Fit clearance between exhaust valve stem and valve guide: 0.032~0.063mm

2.3 Boring and grinding valve seat insert

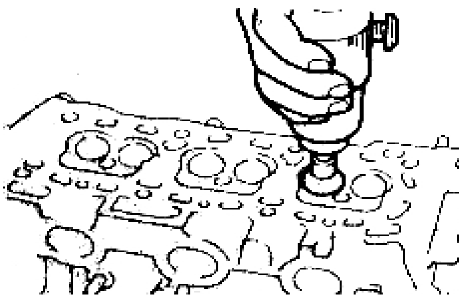
2.3.1 Inspection of fitting surface of valve. Apply a circle of red lead on the valve sealing strip and then gently place the strip onto the valve seat insert, softly and forcibly press it down, but do not turn it. Take out the valve, observe if there is broken part on the red lead, if any, boring and grinding the valve seat insert is required.



2.3.2 Select an appropriate reamer, use 45° conical surface as cooperate standard value to check valve cooperation position: the optimal position is the center of the valve, if not so, be sure to revise. Cut on the conical surface 70° inward and 30° outward at the center of the cooperation position.

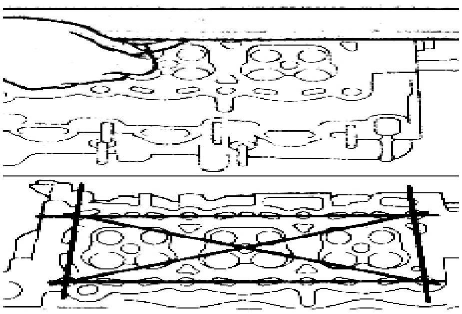


2.3.3 Perform seat grinding for the valve sealing strip with polishing compound



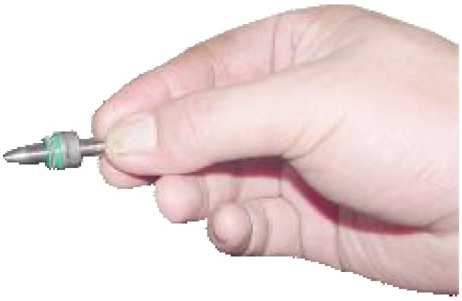
2.3.4 Detection of planeness of cylinder head

Follow the method as shown in the figure to measure planeness of the cylinder head with a feeler gauge; the planeness of the cylinder should not exceed 0.05-0.10mm, if exceeding this valve, replace the cylinder head assembly.



III. Assembly of Cylinder Head Assembly

1. Please follow the order adverse to that for disassembly of cylinder head to install, but care should be taken for the following matters during installation.
2. Use the special tool CH-20012 to install new valve oil seal onto the guide first.



3. Insert big end of the guide onto the valve guide.

4. Envelope the special tool onto CH-20012, and then softly and forcibly compact.

5. Use a hammer to knock the valve oil seal installation tool, when a metal crash sound is heard, take out CH-20012.

6. The methods for installation and assembly of valve spring are the same. Then install valve, spring, keeper, top barrel and rocker arm. (when installing the top barrel, add a little engine oil into the hole).

7. Install camshaft and camshaft bearing shell cover assembly.

Note:
When installing, remember to differentiate intake camshaft from exhaust cam. The intake camshaft has a gear at tail, and pay attention to the diacritical marks on camshaft bearing shell covers.

8. Installation of camshaft and oil seal

8.1 After adding engine oil on the camshaft bearing shell, place intake and exhaust camshafts, cover bearing shell covers properly, install the fixing bolts for the bearing shell covers, and then use a 10mm sleeve to hold down the bearing shell covers step by step (the two bolts on the one and the same bearing shell cover should be tightened at the same time). Torque: 8.5±1.5 Nm.

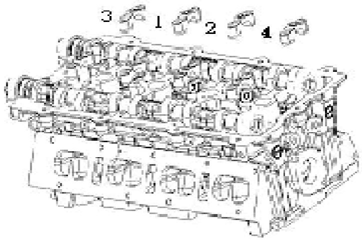
9. Remember to apply sealant to the position as shown in the figure when installing the first bearing shell.

10. Tightening order of camshaft bearing shell cover.

Tighten the camshaft bearing shell cover as shown in the figure.

Installation of camshaft oil seal:

Apply a little engine oil on the camshaft oil seal, envelop the oil seal onto the camshaft, and then install use the special tool.



11. Remember to check elasticity of valve cover gasket for aging and breakdown, if any, replace with new one. When installing, pay attention to installation position.

12. Tighten the valve cover bolt.

Chapter Twelve Disassembly and Installation of Oil Pump and Lubrication System

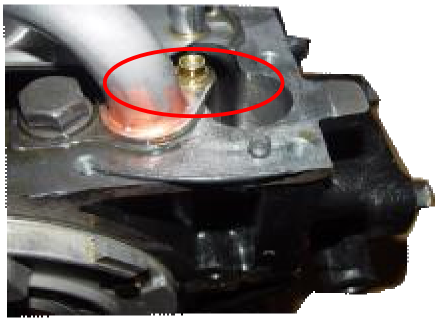
I. Disassembly Procedure

1. Roll over the engine and use a 10# sleeve to remove the fixing bolt of oil pan.
Torque: 15+3 Nm

2. Use a screwdriver to pry out the oil pan at the given position for prying out on the oil pan.

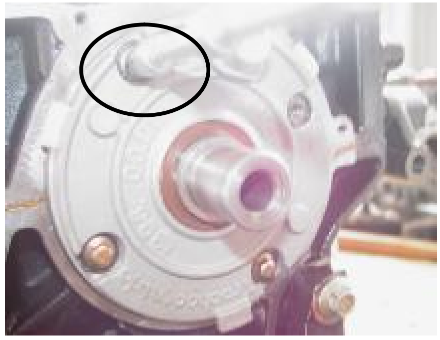
Note:
Because the oil pan and cylinder block are sealed with glue, so, do not knock with such hard articles as hammer etc. when disassembling, use a rubber hammer to slowly strike at left and right instead.

3. Use a 10# sleeve to remove the fixing bolt of engine oil strainer.



4. Use an 8# sleeve to remove the fixing bolt of engine oil guard board.

5. Use an 8# sleeve to remove the four fixing bolts of oil pump.
Torque: 8+3Nm



6. Take off the oil pump assembly and then the oil pump shim.

Note:
Do not split the oil pump shim forcibly when disassembling for fear to cause leak.

7. Use an hexagon wrench to remove the two connecting bolts of oil pump.

8. Use a screwdriver to pry the crankshaft front oil seal and then take out the oil seal.

II. Overhaul of Oil Pump

if it is suspected that engine oil pressure may has problem, disassemble the oil pump and check elastic force of relief valve spring and if the valve is locked.

> Note:
> The oil pump is of inner rotor type, which can not be maintained under normal conditions, because its finish size and material ensure its reliability.

III. Installation Procedure

The installation order is adverse to that for disassembly, but care should be taken for the following matters.

1. The installation direction of oil pump relief valve is as shown in the figure.

2. Completely and softly shovel off the glue on the surface of oil pan with a flat shovel and then apply new sealant uniformly (see the table above for type of the sealant).

Note:

As soon as new sealant is applied properly, assemble at once; otherwise, the sealant may freeze, which may affect the sealing effect.

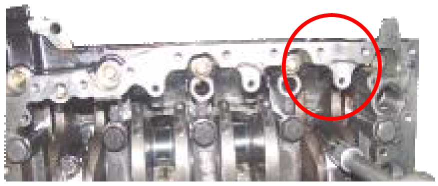
Chapter Thirteen Disassembly of Crank-Connecting Rod Mechanism

I. Disassembly Procedure

1 Use a 13# sleeve to remove the fixing bolt of clutch cover.
Torque: 23±2 Nm

2. Use the special tool CH-20009 to lock the crankshaft and then use a 13# sleeve to remove the connecting bolt of flywheel and crankshaft.

3. Use a 13# sleeve to loosen the fixing bolt of connecting rod bearing cylinder by cylinder and then take off the piston and connecting rod assembly.



Note:

After the pistons are taken out of the cylinders, reset and connect the bearing caps of connecting rod big end and bolts properly and then put them by order.

4. Use a 10# sleeve to remove the fixing bolt of crankshaft lower bearing cap and cylinder block.

5. Use a 19# sleeve to remove the fixing bolt of crankshaft main bearing cap.

Note:
The surface between cylinder block and bearing cap is ensured by high precision machining plane, so, do not use any hard article to scuff this surface.

6. Take off crankshaft rear oil seal assembly, remove bearing shell cover, and then take off crankshaft assembly.

II. Overhaul of Crank-Connecting Rod System

1. Detection of crankshaft.

1.1 Detection of crankshaft main journal: use an outside micrometer to measure main journal of crankshaft and the normal value should be 46.01mm.

1.2 Detection of connecting rod journal: use an outside micrometer to measure connecting rod journal of crankshaft and the normal value should be 44.485-44.495mm.

1.3 Measurement of main journal clearance: place a plastic feeler gauge on the crankshaft main journal, tighten the main bearing shell cover to specified torque and then loosen it, use the thickness check list on the plastic feeler gauge to read the value. The normal value should be: 0.02-0.06mm. Use the same method to measure connecting rod journal clearance.

1.4 Measurement of crankshaft axial clearance: tighten the main bearing shell cover to specified torque and then use a dial gauge to measure the crankshaft axial clearance. When measuring, push the crankshaft off the dial gauge first and keep the dial gauge has certain amount of compression, set the pointer to zero, and then push the crankshaft to the adverse direction and the numerical value fetched from the dial gauge will be the crankshaft axial clearance. The normal value should be 0.02-0.30mm. If exceeding this scope, replace the crankshaft thrust sheet or the crankshaft.

2. Detection of piston

2.1 Detection of piston diameter: use an outside micrometer to measure the piston diameter. When measuring, remember to measure at the place about 11mm up from lower end of the piston. The normal value should be φ72.965±0.009.

2.2 The piston pin is of semi-floating type, which can not be disassembled during maintenance, because it can not be assembled using common machining technique after disassembled. If abnormal noise occurs due to improper piston pin clearance, replace the piston assembly.

2.3 Measurement of piston ring.

2.3.1 Measurement of piston ring end play: first, place the piston ring into cylinder.

2.3.2 Push the piston head vertically against the piston ring in the cylinder and let the piston ring be on a plane.

2.3.3 Use a feeler gauge to measure the gap between piston ring ends and the normal value should be: 0.2mm.

2.3.4 Measurement of piston ring side clearance: place the removed piston ring into the ring groove (lean to one side as possible) and then place a feeler gauge into the other side to measure the clearance; certain resistance feeling after the feeler gauge is placed in indicates that the measurement with feeler gauge will be correct. The normal value should be 0.03mm. Unit: mm

Contents	First ring	Second ring	Third ring
End play	0.2	0.4	/
Side clearance	0.03	0.03	/
Thickness	1.2	1.6	/

3. Measurement of roundness and cylindricity of cylinder

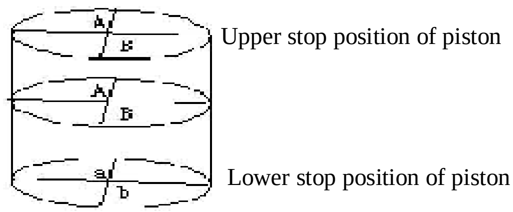
3.1 Select appropriate cylinder gauge and outside micrometer.

3.2 Use a vernier caliper to measure rough diameter of the cylinder hole.

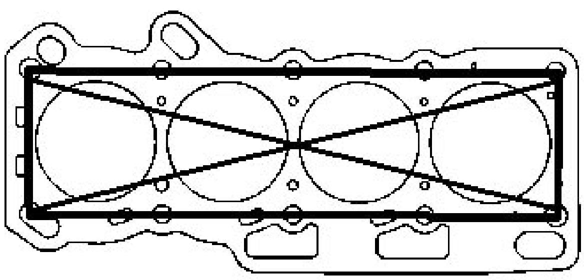
3.3 Adjust the outside micrometer to the data measured out by the vernier caliper, select the splicing pole suitable to the range of the cylinder gauge, and then set the outside micrometer to zero according to this data.

3.4 Place the cylinder gauge into the cylinder to measure; when measuring, the yawing angle of cylinder gauge should not exceed 15º. Fetch the maximum numerical value.

3.5 The measuring position of the cylinder gauge in cylinder is as shown in the figure.
Calculation method for roundness: A-B or a-b
Calculation method for cylindricity: the difference of maximum diameter subtracting minimum diameter among A, a, B, and b.
The normal value should be: if roundness or cylindricity exceeds the range, replace with new cylinder block or install new cylinder sleeve.



3.6 Measurement of planeness of cylinder block: use steel rule and feeler gauge to measure planeness of the cylinder block. If the planeness exceeds the range, replace the cylinder block.



III. Installation of Crank-Connecting Rod System

The installation order is adverse to that for disassembly, but care should be taken for the following matters. 1. Installation of crankshaft thrust sheet.

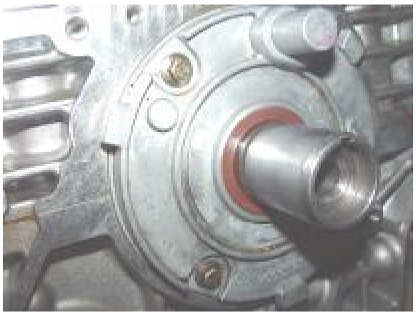
When installing the crankshaft thrust sheet, leave the side with oil groove outwards.

2. Installation of crankshaft front oil seal

2.1 Clear smudge on oil seal seat ring, and then apply a layer of lubricant on the seat ring.

2.2 Apply a layer of engine lubricant on the oil seal lip.

2.3 Enclose the new oil seal with lubricant applied into the special tool. Press the special tool against the oil seal seat ring and softly strike to compact.

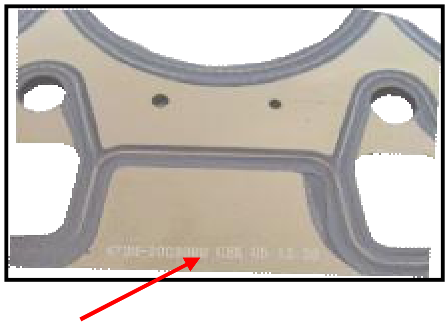


3. Installation of crankshaft rear oil seal

3.1 Clean the oil seal seat ring. Dip engine oil with a piece of gauze and then use it to clear the impurities inside the oil seal seat ring.

3.2 Apply a layer of engine oil uniformly on crankshaft rear oil seal lip and a little engine oil uniformly on outer ring of oil seal. Envelope the oil seal onto the special tool and then press it into the oil seal seat ring.

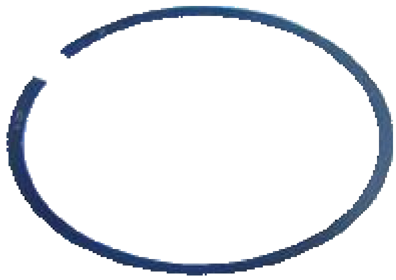
4. When installing cylinder cushion, install it with the side with word up.



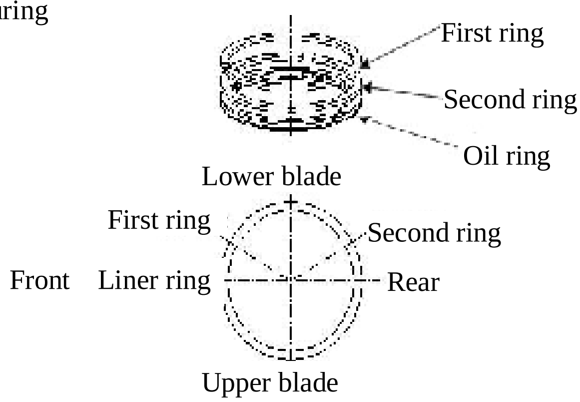
Note:

The cylinder cushion has been applied with sealant, so, providing that the cylinder head or cylinder block has been disassembled, be sure to replace the cylinder cushion.

5. When installing piston ring, remember to leave the side of the second ring with word up.



6. The opening position of the piston ring during installation is as shown in the figure.



7. The label on piston head prompts direction and position of installation.

8. Use a special tool to install the piston ring.

9. When installing connecting rod bearing shell, pay attention to installation mark.

10. Method for shell matching.

Note:

The machining technique for connecting rod and connecting rod shell cap adopts Instantly Swell and Break machining method, so, each machined surface maintains the shape of original material. When installing, keep any sundries out of this machined surface. In addition, only the two machined surface of the same connecting rod can completely engage.

The tightening torque for installing the fixing bolt of connecting rod bearing is 25±3Nm (then turn 90±5° clockwise).

11. Use the piston installation special tool to install the piston.

12. Tighten the fixing bolt of connecting rod bearing cap.

Tightening torque:

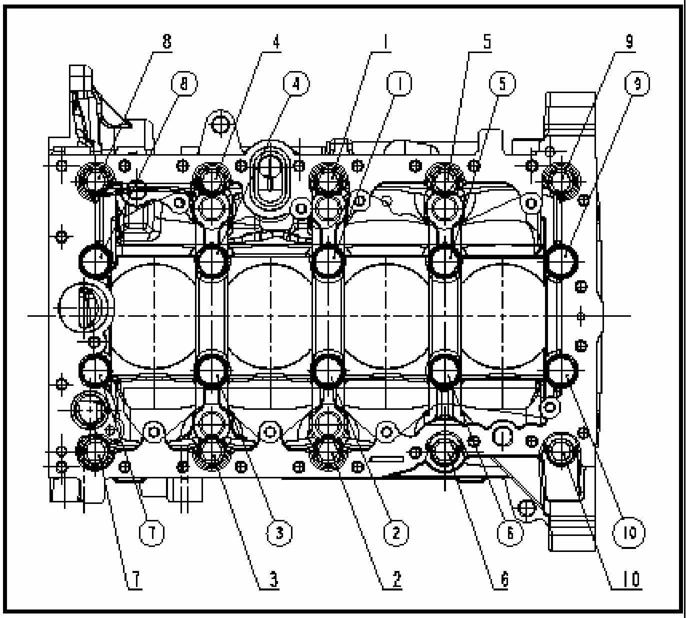
First time: 25±3Nm. Second time: turn 90±5 °.

13. Install the main bearing cap and then follow the order as shown in the figure to tighten the bolt.

Tightening torque:

First time: 45±5Nm.

Second time: turn 180±10°.



14. Tighten the fixing bolt of main bearing cap and cylinder block.

Torque: 20+3 Nm.

Service Manual for Chery QQ6

(UMC EFI for 473F Engine)

After Sales Service Department of Chery Automobile Sales Co., Ltd.

Chapter One Disassembly and Installation of Electronic Fuel Injection System

I. Disassembly and Installation of Components of Electronic Fuel Injection System

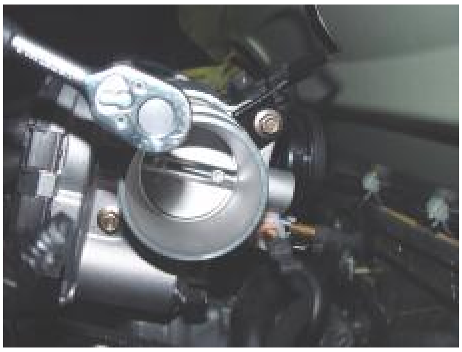
1. Disassembly and installation of engine control unit (ECU).

2. Position and disassembly of intake air pressure sensor.

3. Position and disassembly of camshaft position sensor.

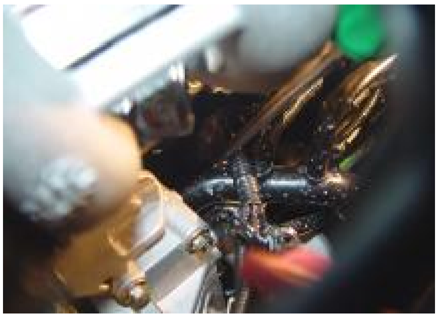
4. Remove fixing hoop of intake hose.

5. Remove the four fixing bolts of electronic throttle body.
Pull out the connector and take out the electronic throttle body.



6. Use a screwdriver to press down the fixed clip of the injection nozzle connector and then pull out the connector.

7. Use a screwdriver to press down the fixed clip of the knock sensor connector and then pull out the connector.



8. The water temperature sensor is behind the thermostat seat.

9. Pull out the connector of the ignition primary coil by hand.

10. Pull out the connector of the engine tachogenerator by hand.

Chapter Two Principle of Electronic Fuel Injection System

I. Overhaul of System Components

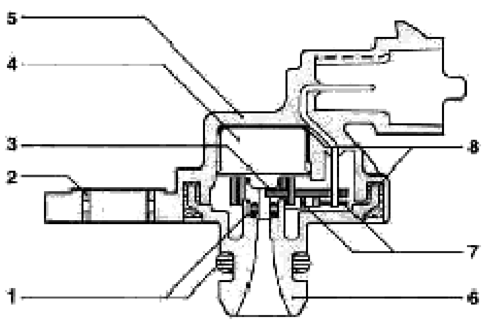
1. Intake Air Temperature Pressure Sensor

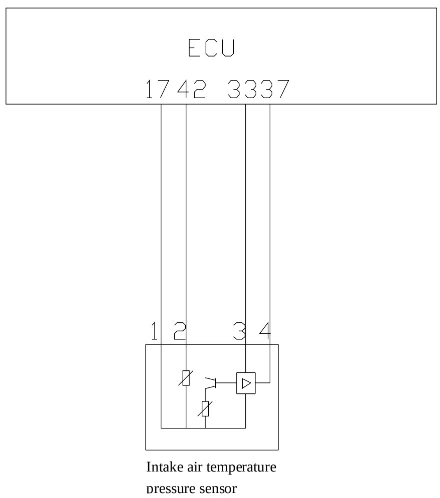
1.1 Function of the sensor:

Detect air intake pressure and temperature in air intake manifold, which will be provided to ECU as main load signal of engine; ECU will calculate injection pulse-width based on this signal.

1.2 Principle of the sensor:

Intake air temperature pressure sensor is a sensor that integrates an intake air pressure sensor and an intake air temperature sensor. Absolute pressure sensor element of intake manifold is composed of a silicon chip. A pressure diaphragm is etched on the silicon chip. On the pressure diaphragm, there are 4 piezo-resistances, which serve as strain sensors and constitute a Wheatstone bridge. In addition to this pressure diaphragm, a signal processing circuit is also integrated on the silicon chip. The silicon chip and a metal housing constitute a closed reference, where the absolute pressure of the gas inside approaches to zero. Thus, a micro-electronic mechanical system is formed. The active face of the silicon chip stands a pressure close to zero, while its back face stands the pending measuring intake manifold absolute pressure introduced by a connecting pipe. The thickness of the silicon chip is merely several µm, so the absolute pressure change in intake manifold will bring mechanical deformation to the silicon chip. The 4 piezo-resistances will accordingly deform and their resistances also change. The voltage signal in linear relation to the pressure is formed after process by the signal processing circuit on the silicon chip. The intake temperature sensor element is a negative temperature coefficient (NTC) resistance, which will change with the intake temperature. This sensor sends out a voltage indicating the intake temperature change to the controller.





Cross-section view for sensor of air absolute pressure and temperature in intake manifold

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

1.3 Parameters of technical features

This sensor is designed to be mounted on the plane of auto engine intake manifold. The pressure connecting pipe together with the temperature sensor protrudes inside the intake manifold and an O gasket is used to enable atmosphere-proof.

If it is mounted on an auto through an appropriate method (picks up pressure from the intake manifold and the pressure connecting pipe tilts down etc.), it can be ensured that no condensed water will be formed on the pressure-sensitive element.

Drilling and fixing on the intake manifold must be carried out according to the supply drawing so as to ensure a long seal and a good tolerance to fretting by agent.

The reliable contact of electric connection of a joint will mainly be affected by the joints of components and parts, and it is also in relation to the material quality and dimensional precision of the joint fitted with it on the harness.

1.4 Failure effects and judgment method

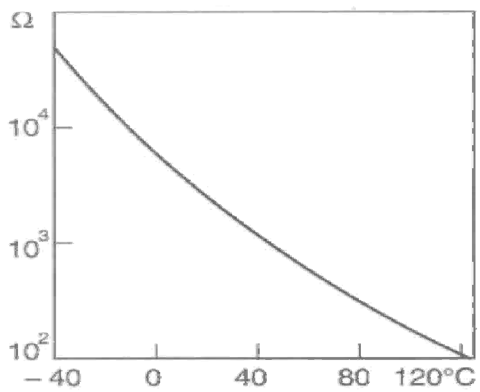
- Failure effects: spark extinction and poor idling etc.
- General Failure Reason:
  1. Abnormal high voltage or inverse strong current occur during working;
  2. The vacuum element is damaged during maintenance.
- Maintenance precautions: during maintenance, impinge using high pressure gas toward the vacuum element is prohibited; when replacing the sensor after a failure is found, remember to check if output voltage and current of the generator is normal.
- Simple measurement method:

1.4.1 Temperature sensor:

With the joint removed, turn the digital multimeter to Ohm shift, and then connect the two meter pens respectively to 1# and 2# pins of the sensor; At 20℃, the rated resistance should be 2.5 kΩ±5%, and the other corresponding resistances can be measured out from the characteristic curve in above chart. Analogue method can also be used when measuring, i.e., use an electric drier to blow the sensor (be careful not to be too close to the sensor), and then observe the change of the sensor resistance. At this point, the sensor resistance should fall.

1.4.2 Pressure sensor:

With the joint connected, turn the digital multimeter to DC Voltage shift, and then connect the black pen to ground while the red pen respectively to 3# and 4# pins. Under idle speed state, 3# pin should have a 5V reference voltage while the voltage on 4# pin should be around 1.3V (the actual value depends on the model); Under no load state, when opening the throttle slowly, the voltage on 4# pin may change little; when opening the throttle rapidly, the voltage on 4# pin may reach around 4V instantly (the actual value depends on the model) and then fall to around 1.5V (the actual value depends on the model).



2. Tachogenerator of Engine

2.1 Function of the sensor:

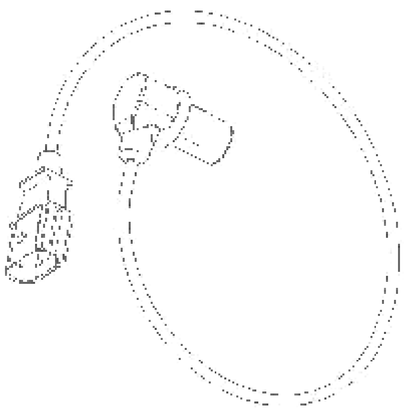
As one of the uppermost sensors of engine, the tachogenerator of engine provides ECU with rev signal, acceleration signal and crank angle signal etc. of engine. ECU will calculate injection pulse-width, injection time and ignition timing through these signals and provide the instruments with rev signal of engine.

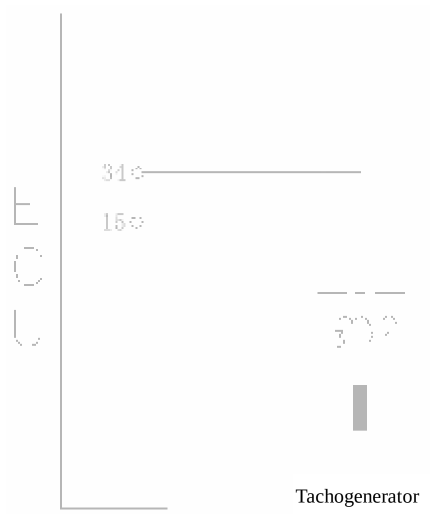
2.2 Principle of the sensor:

The inductive tachogenerator work together with pulse disc, it is used in ignition system without distributor providing engine speed and crank shaft top dead center information.

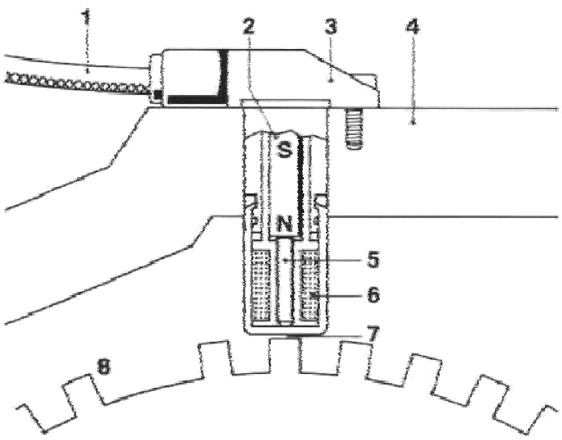
Inductive tachogenerator is made up of a permanent magnet and coil outside of magnet.

Pulse disc is a tooth disc with 60 teeth originally but there are two teeth opening. Pulse disc is assembled on crank shaft and rotate with crankshaft. When the tooth tip passes through closely the end of the inductive engine tachogenerator, the pulse disc made of the ferromagnetic material will cut the line of magnetic force of the permanent magnet in the inductive engine tachogenerator to generate inductive voltage in the coil as engine speed signal output.





Tachogenerator



1. Shielded wire 2. Permanent magnet
3. Housing of sensor 4. Installation bracket
5. Soft magnet core 6. Coil
7. Air gap 8. 60-2 gear ring

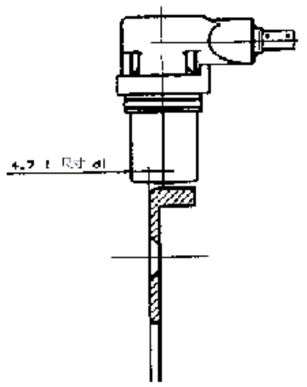
2.3 Parameters of technical features

Item	Value			Unit
	Min.	Typical	Max.	
Resistance under a room temperature of 20°C	774	860	946	Ω
Inductance	310	370	430	mH
Output voltage at a crankshaft revolution of 416rpm	>1650			mV

2.4 Installation attentions:

- For the inductive tachogenerator, it is permitted to take out from its pack before it is assembled to the auto or testing device right away.
- Inductive tachogenerator is assembled by press in method but not hammer tapping.
- Partly micro-encapsulated bolt M6×12 for fixing of the inductive engine tachogenerator is recommended.
- The tightening torque is 8±2Nm.
- Gas clearance between inductive tachogenerator and pulse disc tip is **0.8-1.2mm**.

Dimension d (see the figure below): 4.7mm.



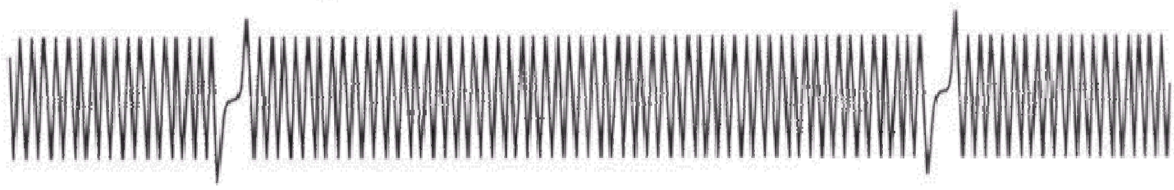
Installation of the tachogenerator

2.5 Failure effects and judgment method:

- Failure effects: start failure etc.
- General cause of the failure: man induced failure.
- Maintenance precautions: during maintenance, the tachogenerator should be installed by using press-in method instead of hammering method.
- Simple measurement method:

1. With the joint removed, turn the digital multimeter to Ohm shift, and then connect the two meter pens respectively to 2# and 3# pins; At 20℃, the rated resistance should be 860Ω±10%.

2. With the joint connected, turn the digital multimeter to AC Voltage shift, and then connect the two meter pens respectively to 2# and 3# pins of the sensor; start the engine and voltage output should be present at this point. (Inspection with vehicle oscilloscope is recommended).



Oscillogram in Test

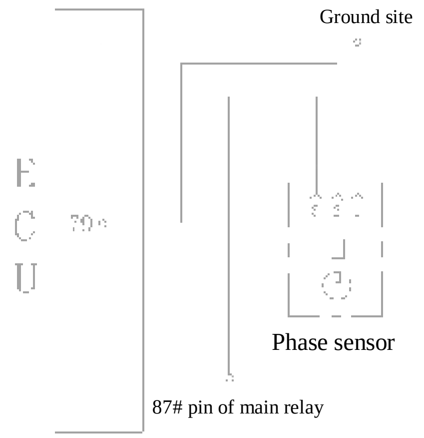
3. Phase Sensor

3.1 Function of the sensor:

Provide ECU with phase signal, i.e. help crankshaft position sensor of engine to judge it is then at compressing top dead center or air exhaust top dead center.

3.2 Principle of the sensor:

The phase sensor is consisted of the Hall generator installed on the valve cover and the signal wheel machined on the intake camshaft. When the camshaft rotates, the signal wheel will make the magnetic flux passing the Hall generator change, thus generating a variable Hall signal.



3.3 Effects and judgment method:

- Failure effects: over proof emission and fuel consumption rise etc.
- General cause of the failure: man induced failure.
- Simple measurement method:

(connect the joint) switch on ignition switch but do not start the engine; put digital multimeter on DC volt shift, connect two meter pen to No. 1 and No. 3 sensor connectors and make sure there is 12V reference voltage. Start the engine, check if it is in good conditions of No.2 pin by oscillograph on vehicle.

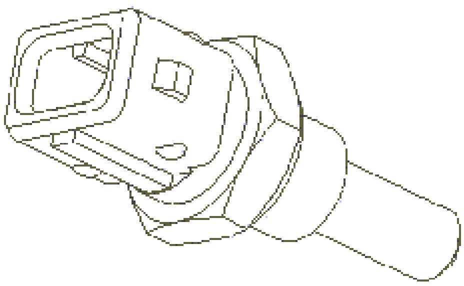
4. Water Temperature Sensor

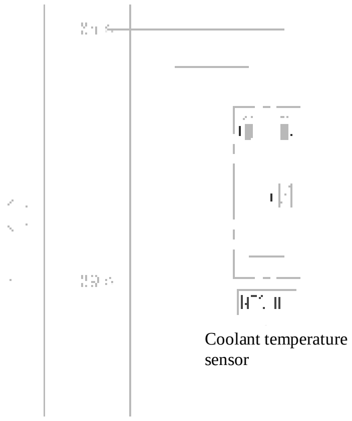
4.1 Function of the sensor:

The water temperature sensor simultaneously provides ECU and instruments with water temperature signal. ECU will calculate and regulate injection pulse-width and ignition advance angle through water temperature signal. In addition, through water temperature signal, ECU also can control turn-on and turn-off of cooling fan to prevent engine from damage caused by overheat.

4.2 Principle of the sensor:

The water temperature sensor is a minus temperature coefficient type electric resistance model sensor; the higher the temperature is, the less the resistance will be. But, temperature rise and resistance fall are not in linear relation.





4.3 Parameters of technical features

(1) Data limit

Item	Value	Unit
Rated voltage	Can only be run by ECU	
Rated resistance at 20℃	2.5±5%	kΩ
Range of running temperature	-30 to +130	℃
Max. measuring current passing the sensor	1	mA
Permissible vibration acceleration	600	m/s^2

4.4 Installation attentions

Coolant temperature sensor is installed on the cylinder body and the copper heat conducted socket is inserted into coolant. There are thread on the socket, and screw in coolant temperature sensor onto the threaded hole on cylinder block by the hexagon head of the socket. The maximum permissible tightening torque is 15Nm.

4.5 Failure effects and judgment method

- Failure effects: starting difficulties etc.
- General cause of the failure: man induced failure.
- Simple measurement method:

With the joint removed, turn the digital multimeter to Ohm shift, and then connect the two meter pens respectively to 1# and 2# pins of the sensor; At 20℃, the rated resistance should be 2.5kΩ±5% and the others can be measured out from the characteristic curve in above chart. Analogue method can also be used when measuring, i.e., dip the working area of the sensor in boiled water (dip for adequate time), observe the resistance change of the sensor, at this point, the resistance should fall to 300Ω-400Ω(the actual value depends on the temperature of the boiled water).

5. Knock Sensor

5.1 Function of the sensor:

The knock sensor provides ECU with knock signal. When the engine generates knock, ECU will control to gradually reduce ignition advance angle to eliminate the knock; when no knock occurs during certain strokes, ECU will gradually increase ignition advance angle to enable the engine to obtain max. torque.

5.2 Principle of the sensor:

Knock sensor is a kind of vibrating acceleration sensor and is assembled on cylinder block. Either single or multiple can be installed. 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. See the following frequency response characteristic curve. 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.

5.3 Attentions

Knock sensor has a hole in the middle, through which it is fastened on the cylinder by a M8 bolt. For the aluminum alloy block, using long bolt with 30 mm; for the casting iron, using 25mm bolt. The tightening torque is 20±5Nm. The installation position should ensure that the sensor is liable to receive vibration signals from all cylinders. Decide the optimal installation position of knock sensor through modal analysis to the engine body. Generally, for a 4-cylinder engine, the knock sensor is installed between 2# cylinder and 3# cylinder; for a 3-cylinder engine, it is installed at the center of 2# cylinder. Do not let liquid such as engine oil, coolant, brake fluid and water etc. contact the sensor long. Use of gasket of any type is not allowed in installation. The sensor must cling to the cylinder tightly through its metal surface. During wiring of sensor signal cables, do not make the signal cables resonate; otherwise, they may break. Be sure to prevent turning on of high voltage between 1# and 2# pins of the sensor; otherwise, damage to the piezoelectric element may occur.

5.4 Effects and judgment method

Failure effects: poor acceleration etc.

- Reasons for general failures: long time contact of liquid such as engine oil, coolant, brake fluid and water etc. with the sensor, which may corrode the sensor.
- Maintenance precautions: (see installation attentions)
- Simple measurement method: (remove the joint) put digital multimeter at ohm shift, and contact the No. 1, No. 2 and No. 3 pin with its two meter pens. The resistance value should be more than 1MΩ¸ under normal temperature. Leave the digital multimeter at millivolt shift, and tap around the sensor using little hammer, there should be voltage signal output.

6. Electric Throttle Body

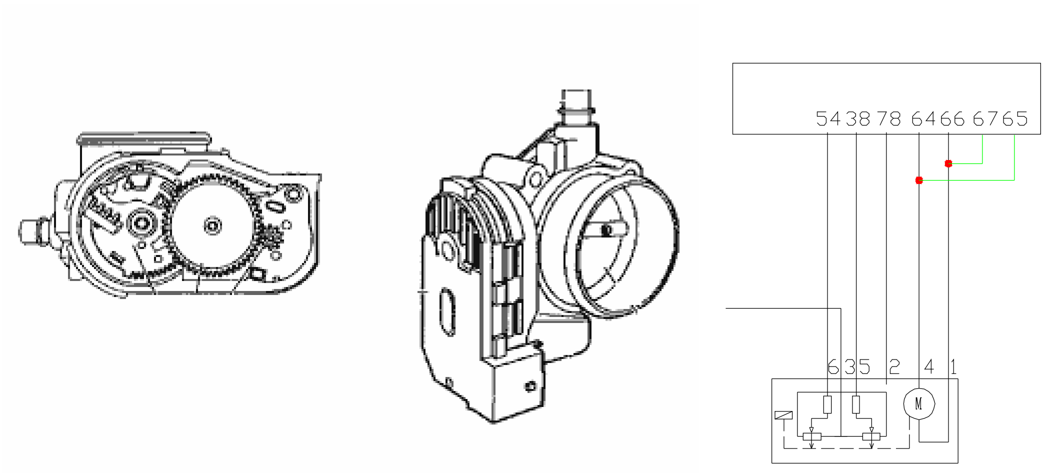
6.1 Function:

The electronic throttle body can automatically open or close the throttle according to the driver's will to apply the accelerator pedal to let the engine work under the corresponding operating mode. The electronic throttle has cancelled the conventional throttle guy and the opening of throttle is controlled by ECU based on the signal from accelerator pedal and other signals (such as A/C, power assisted steering, back and gearshift etc.) through an electronic step motor inside the electronic throttle body. In addition to cancel of conventional idle speed by-pass and idle speed step motor, there are also throttle position sensors on the electronic throttle body to feed back the opening of the throttle. This suite of throttle position sensor is different from the common one; totally two suites of throttle position sensors are installed inside the electronic throttle body to monitor rationality of the signals from the latter; when any problem occurs in a certain signal, ECU can still use the other suite of signals to work on.

6.2 Working principle:

The throttle driving motor is a micro motor, which is composed of multi steel stators in a circle and a rotor, with one coil on each steel stator. The rotor is a permanent magnet with a nut at its center. All stators coils are constantly power on. As long as the direction of current of one coil is changed, the rotor will turn a certain angle. When the directions of current of all stator coils is changed in a proper order, a rotating magnetic field is formed, which will drive the rotor made from permanent magnet rotate along a certain direction. Its principle is just that of a micro direct current motor.

This motor drives a suite of special gear reducing mechanism and a bidirectional spring; when the system is under power off condition, this mechanism can ensure that the opening of throttle valve plate maintains at a safe position where is bigger than that for idle speed but not too high, so that the vehicle can continue to run; if engine ECU has entered this failure mode, when applying the accelerator pedal, the valve plate of the electronic throttle body will no longer act.



Electronic throttle

6.3 Failure diagnosis:

ECU can monitor short-circuit and break of coil of the throttle driving motor, and light the engine failure light in case of such failure to let the engine enter failure mode, when the engine fails to accelerate, has very poor driving performance and needs maintenance immediately.

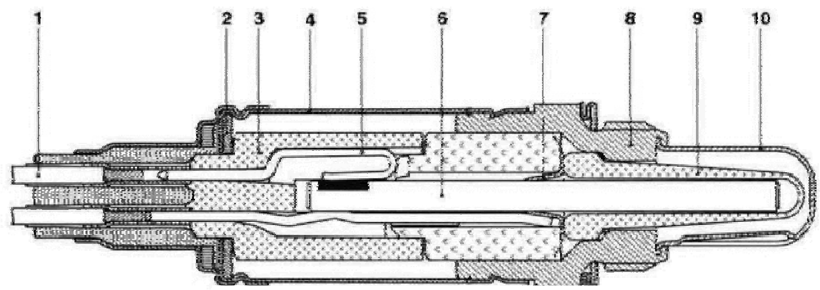
7. Oxygen Sensor

7.1 Function of the sensor:

Oxygen sensor is one of the principal sensors on modern autos; it can feed back the mixture strength by detecting oxygen content in exhaust gas. ECU will correct the mixed gas based on the signals fed back by the oxygen sensor, i.e. control injection pulse-width to let the mixed gas always maintain an approximately ideal air-fuel ratio (14.7:1).

7.2 Principle of the sensor:

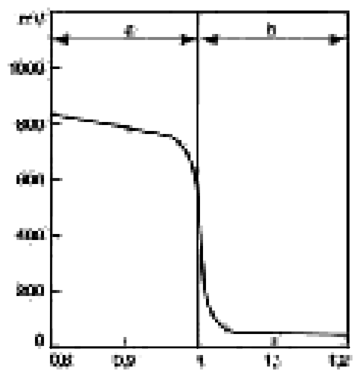
Sensing element of oxygen sensor is a kind of ceramic tube with holes, and outside of tube walls are surrounded by engine exhaust gas and inside is air. Ceramic sensor element is a kind of solid state electrolyte with electrical heating tube inside (as shown in the figure).



Cross-section view of oxygen sensor

1. Cable 2. Dish washer 3. Insulation bush 4. Protective bush
5. Clamp fitting of heating element 6. Heating rod 7. Contact pad
8. Sensor seat 9. Ceramic probe 10. Protection sleeve

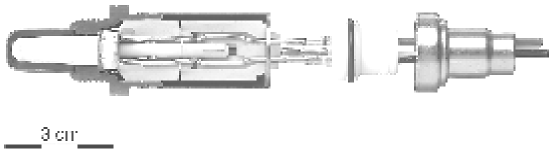
Output voltage V

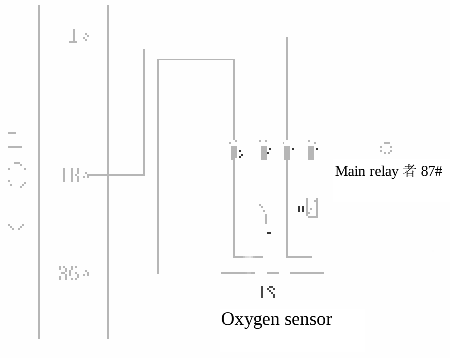


Excessive air-fuel ratio λ

Characteristic Curve of oxygen sensor at 600°C

The operation of the oxygen sensor is achieved by converting the concentration difference of oxygen ion between inside and outside of the ceramic sensor element to the voltage signal output. It bears the characteristic of solid electrolyte once the temperature of the ceramic sensor element reaches 350℃. Because of the particularity of its materials, the oxygen ion can pass the ceramic sensor element freely. Taking advantage of this characteristic, the concentration difference will be converted to electric potential difference to form electric signal output. If the mixed gas is comparatively thick, the oxygen ion thickness difference between inside and outside of the ceramic tube will be higher and the potential difference will also be higher, then a mass of oxygen ion will move from inside to outside, so, the output voltage is comparatively high (close to 800mV-1000mV); If the mixed gas is comparatively thin, the oxygen ion thickness difference between inside and outside of the ceramic tube will be smaller and the potential difference will also be smaller, then just a few of oxygen ion will move from inside to outside, so, the output voltage is comparatively low (close to 100mV). The signal voltage will mutate near theoretical equivalent air-fuel ratio (λ=1), see the figure above.





Every oxygen sensor bears a cable and the other end of the cable is the wire connector. The wire connector of oxygen sensor produced by our company 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).

7.3 Parameters of technical features

- The requirement to exhaust pipe: the segment of exhaust pipe in the area before the oxygen sensor must be heated up rapidly. If possible, the exhaust pipe should be designed to be tilting down to avoid accumulation of condensed water in front of the oxygen sensor.
- Do not inappropriately heat up the metal snap ring of the cable at oxygen sensor side, especially after the engine is shut down.
- Do not apply purge fluid, oiliness fluid or volatile solid on connector of the oxygen sensor.
- The screw thread of the oxygen sensor is M18×1.5.
- The size of the hexagonal head wrench for the oxygen sensor is 22-0.33.

The tightening torque for the oxygen sensor is 40-60Nm.

7.4 Failure effects and judgment method

- Failure effects: poor idling, poor acceleration, over proof tail gas and excessive fuel consumption etc.
- General causes of the failure:

1. Moisture entering inside of sensor, and when the temperature is changed, the pin will be broken;

2. The oxygen sensor “intoxicates”. (Pb, S, Br, Si)

Maintenance precautions: application of cleaning fluid, oiliness fluid or volatile solid on the oxygen sensor during maintenance is prohibited.

- Simple measurement method:

1. Remove joint, put digital multimeter to ohm shift, connect meter pen to No.1 (white) and No.2 (white) pins of the sensor. The resistance value is 1~6Ω at constant temperature.

2. With the joint connected, under idle speed state, when the working temperature of the oxygen sensor reaches 350℃, turn the digital multimeter to DC Voltage shift and connect the two meter pens respectively to 3# (gray) and 4# (black) pins; at this point, the voltage should fluctuate rapidly between 0.1-0.9V.

8. Fuel Pump Assembly

8.1 Function of fuel pump:

Fuel pump is used to deliver the fuel in the fuel tank to inside the engine at a certain pressure for combustion. It also needs to regulate the fuel pressure duly as required by system pressure (non fuel return type). Generally, the system fuel pressure provided by fuel pump is around 3.5-4bar.

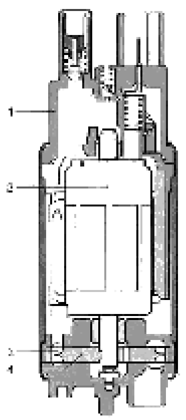
8.2 Operating principle of fuel pump:

The electrical fuel pump is comprised of the DC motor, vane pump and end cover (integrates check valve, relief valve and anti-electromagnetic interference element) as shown in following figure.

The pump and the motor are installed on the same shaft within same closed housing. 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 fuel pump relay, and the relay switches on electric fuel pump only when engine starting and running. When the engine stops for some reason, the pump will stop to run by itself.

The max pressure at the outlet of the electrical fuel pump shall be between 450 and 650 kPa, depending on the relief valve. Because the system is a non fuel return system, the pressure of the whole fuel system will be controlled by the fuel pressure regulator. The value is 400KPa in general.

The electric fuel pump has different flow to the engine’s request. In order to facilitate the production, the electromotor revolutions of EKP13 series electric fuel pumps of the same structure are adjusted by changing the coil’s number of turns, and thus the flow is adjusted. Therefore, do not apply an electric fuel pump for one model to another at will.



1. End cover of oil pump
2. Electromotor
3. Oil passage
4. Paddle pump

Cross-section view of electric fuel pump

8.3 Parameters of technical features

Under certain fuel supply pressure, the flow of the electric fuel pump is in direct proportion to voltage. The fuel pumps used by complete vehicle manufacturers are different.

8.4 Installation attentions

EKP13 series electric fuel pump can only be used inside fuel tank. When installing the fuel pump, the filter net at fuel inlet with mesh size not bigger than 60μ or arranged with the customer must be installed. Be careful not to let the fuel jet from air vent spray on the filter net at fuel inlet, fuel pump bracket or fuel tank wall. Be careful when carrying the fuel pump. First, be sure to protect the filter net at fuel inlet from load and impact. The fuel pump should be taken out of the plastic wrapping material with care only when installing. The viser can be taken off only when the fuel pump is to be installed. Takeoff of the filter net at fuel inlet is absolutely not allowed. The foreign material that enters the fuel inlet of the fuel pump or the filter net may lead to damage of the fuel pump.

8.5 Failure effects and judgment method

- Failure effect: strong running noise, poor acceleration, failure to start (starting difficulties) etc.
- Reasons for general failures: use of inferior fuel leads to:

  1. Accumulated colloid became insulation layer;
  2. Fuel pump bushing and armature blocked;
  3. Components of fuel level sensor eroded.

- Maintenance precautions:

1. The electric fuel pump has different flow according to the requirement of engine. The pump with same shape and possible to assemble perhaps is not available. For service, the part number of replaced fuel pump must be in conformity with the original ones;

2. Do not run the pump at dry status to prevent the pump from accident;

3. Please pay attention to take cleaning measures for fuel tank and pipeline and replace fuel filter in case replace fuel pump.

Simple measurement method:

1. With the joint removed, swift the digital multimeter on ohm shift, connect the two meter pens to two pins of pump respectively to measure the inner resistance, it is indicated that is not at zero or infinite (that is non short circuit, open circuit status).

2. With the joint connected, connect the fuel pressure gauge onto the sucker, start the engine and then observe if the fuel pump works; if the fuel pump does not run, check if mains voltage is present at "+" pin; if the fuel pump works, under idling mode, check if the fuel pressure is about 400kPa.

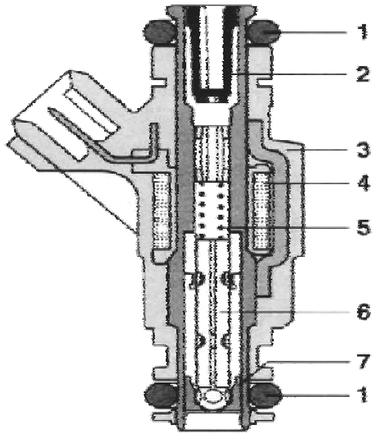
9. Injector

9.1 Function of injector:

ECU controls the coil of the injector through pulse to make the injector open or close, so that, appropriate fuel will be injected into air intake pipe in due time to mix with air.

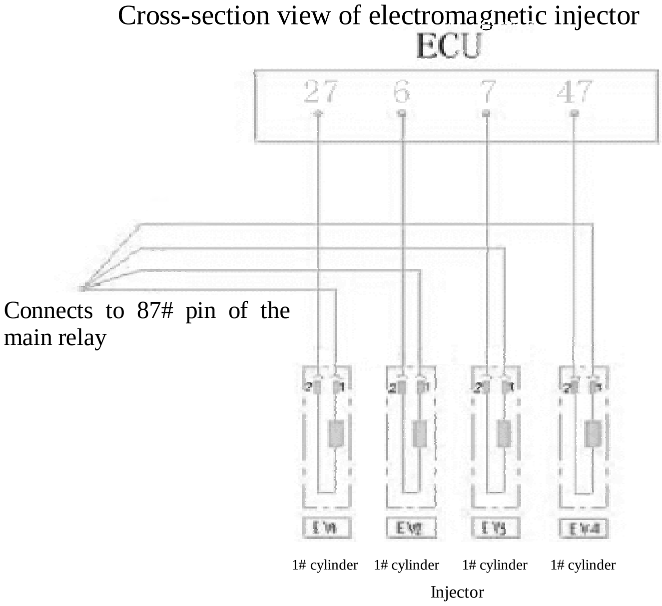
9.2 Working principle:

ECU sends electrical impulse to injector coil to form magnetic field force. When magnetic field force increase to resultant force that enough to conquer return spring pressure, needle valve gravity and friction force, the needle valve begin to rise up and start the injection process. The pressure of return spring makes needle valve close again when the injection impulse is stopped.



1. O-ring
2. Filter net
3. Injector body with electric connector
4. Coil
5. Spring
6. Valve needle with coil armature
7. Valve seat with nozzle plate

Cross-section view of electromagnetic injector



Circuit diagram of electromagnetic injector

9.3 Parameters of technical features

Item	Value			Unit
	Min.	Typical	Max.	
Operating pressure (pressure difference)		350		KPa
Injector electric resistance at 20℃	11		16	Ω

Allowable fuel:

The injector can only use the fuel in compliance with the provisions in GB 17930-1999 (for vehicle unleaded gasoline) and GWKB 1-1999 (harmful substance control standard for vehicle gasoline), and detergent is required to be added into gasoline. It should be specially pointed out that too long storage of gasoline may make it deteriorate. Especially, the taxi with a (LPG and gasoline) dual-fuel engine uses LPG as fuel long and gasoline is only used for startup, so, daily consumption of gasoline is little. However, because the fuel pump runs long, so the temperature of fuel tank is quite high. If gasoline is stored in the fuel tank of such auto, it may quite liable to oxidation and deterioration, which may lead to choke even damage of injector.

9.4 Installation attentions

- Use specific connector for certain injector and no mixed use will be allowable.
- For installation convenience, it is recommended to daub silica-free clean engine oil on the

surface of the O-ring at the upside of the injector where it connects with the fuel distributing pipe. Be careful not to let engine oil contaminate inside of the injector and the nozzle.

- Place the injector in its bracket vertically along injector bracket, then fix it to the bracket with retaining clips. Note:

① By location mode, the remaining clips for injector fall into axial location remaining clip and axial and radial location remaining clip; misuse should be avoided.

② For installation of an axially located injector, make sure that the bayonet at middle of the remaining clip is completely locked into the groove of the injector and the grooves at both sides of the remaining clip are completely locked into the outskirt flanging of the injector seat.

③ When installing an injector that both axial and radial locations are required, use an axial and radial location remaining clip and place the locating piece of the injector and the locating pin of the injector seat respectively into the corresponding grooves on the location remaining clip.

④ If the injector has two grooves, be careful not to place by mistake, refer to the installation site of the original.

- Installation of injector should be done by hand and knocking the injector with such tools as hammer etc. is prohibited.
- When disassemble/reassemble the fuel injector, the O ring must be replaced. And pay attention to not damage the sealing surface of the injector.
- Do not pull the support gasket of O-ring out of the injector. When installing, avoid damage to fuel inlet end, support ring, nozzle plate and electric connector of the injector. If damaged, use is prohibited.
- After installation of injector, perform leakproofness detection for fuel distributing pipe assembly. It is acceptable only when no leakage exists.
- The failure part must be disassembled by hand. Remove remaining clip of the injector first, and then pull out the injector from the injector seat. After disassembly, ensure cleanliness of the injector seat and avoid contamination.

9.5 Failure effects and judgment method

- Failure effects: Poor idling, poor acceleration, failure to start (starting difficulties) etc.
- Reasons for general failures: failure caused by colloid accumulation inside the injector due to lack of maintenance.
- Maintenance precautions: (see installation attentions)
- Simple measure method:

(remove the joint) swift the digital multimeter on ohm shift, connect the meter pens to the two pins of injector. The rated resistance should be 11 - 16Ω¸ when it is 20℃.

Suggestion: regularly wash and analyze the injector using a special washer analyzer for injector.

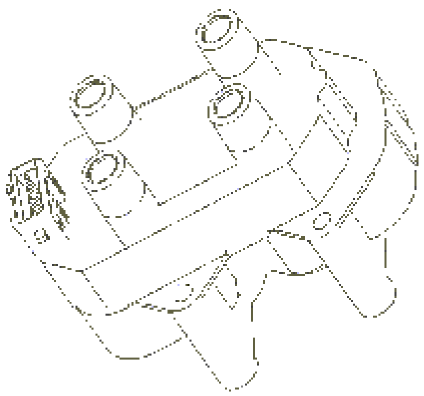
10. Ignition Coil

10.1 Function of ignition coil:

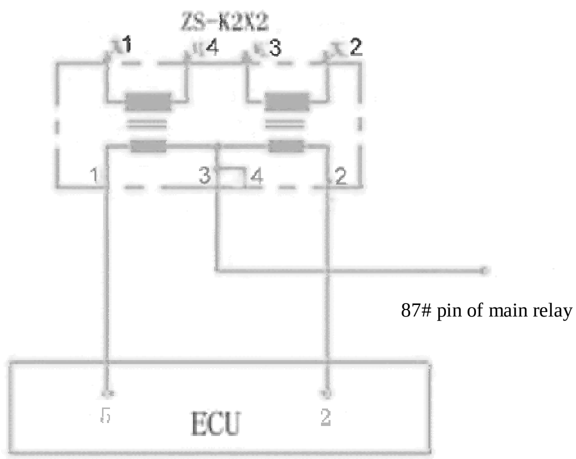
Primary and secondary circuits are integrated inside the ignition coil; when ECU controls on-off of current in the primary coil, a high voltage as high as thousands volts will be generated in the secondary coil, which will then generate spark through ignition cable and spark plug to ignite the mixed air in the cylinder.

10.2 Working principle

Ignition coil ZS - K2×2 consists of two primary windings, two secondary windings, mandrel, and casing. When one of the primary windings grounding channel is connected, the primary winding is in charging. Once the primary winding circuit is cut off by ECU, the charging will be stopped. At the same time, the high voltage is sensed in the secondary winding and making the spark plug discharging. There is a different with the distributor ignition coil: for the ignition coil ZS - K2×2, there is one spark plug on both side of the secondary winding, so the both spark plugs can ignite at the same time. These two primary windings power on/off alternatively, correspondently, these two secondary windings discharge alternatively.



Double spark ignition coil



10.3 Technical characteristic

Item		Value			Unit
		Min.	Typical	Max.	
Nominal voltage			14		V
Resistance (20 to 25℃)	Primary winding	0.42	0.5	0.58	Ω
	Secondary winding	11.2	13.0	14.8	kΩ
Inductance (20 to 25℃)	Primary winding	3.4	4.1	4.8	mH
	Secondary winding	26.5	32.0	37.5	H
Voltage produced	50pF load	30			kV
	50pF//1MΩ load	23			kV

10.4 Failure effects and judgment method

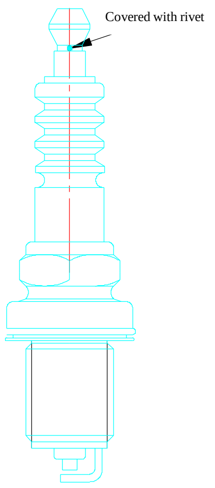
- Failure effects: start failure etc.
- Reasons for the failures: burn out due to too strong current, damage by external force etc.
- Maintenance precautions: use of “test ignition by short circuit” to test the ignition function is prohibited during maintenance to avoid damage to the electronic controller.
- Simple measurement method:

With the joint removed, turn the digital multimeter to Ohm shift, and then connect the two meter pens respectively to the two pins of primary winding. At 20℃, the resistance should be 0.42-0.58Ω, while this value of secondary winding should be 11.2-14.8kΩ.

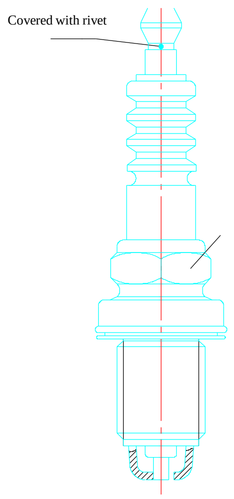
11. Spark Plug

The operating conditions of spark plug is extremely inclement, it is exposed to high pressure, high temperature and impact as well as strong corrosion from combustion product; therefore, it is a wearing part.

11.1 Outline drawing



Mono-pole



Triple-pole

11.2 Thermal performance

The spark plug must maintain a proper temperature to keep good working order. Practically, when insulator skirt of the spark plug maintains a temperature of 500-700℃, the oil drop that falls on the insulator can be burnt away immediately without carbon deposit formed. This temperature is called "self cleaning temperature of spark plug". With a temperature below this scope, the spark plug is liable to carbon deposit and electric leakage, thus causing ignition failure; with a temperature above this scope, when the mixed air is contacting with the red-hot insulator, pre-ignition may occur to produce knock, even it may burn in intake stroke and cause backfire.

11.3 Potential failures due to fall of ignition performance of spark plug

Starting difficulties, unsteady speed, chatter of engine, black smoke out of exhaust pipe, high fuel consumption and poor power.

11.4 Judge if the vehicle status matches with the spark plug type through color of spark plug

Yellow, brown yellow   normal   indicates that the combustion status of mixed air is normal

Black with carbon deposit   carbon deposit   check if the spark plug type matches and then replace with the spark plug with lower heat value (slow heat radiation).

Black with blot   soot   clean if the injector nozzle is dirty

Dilute if the mixture ratio of oil gas is too big.

Check ignition coil etc. if the high voltage is poor.

Black with oil stain   combustion of engine oil   check sealing status of the seal ring and if scratch is present on the cylinder wall.

Pearl overheating check if the spark plug type matches, and then replace with the spark plug with lower heat value (rapid heat radiation).

11.6 Regular replacement and use overdue

The spark plug is the low-value consumption goods. Though cheaper compared with other matching parts, its ignition performance directly affects the performance of the engine. Therefore, it needs regular replacement. For the spark plug used in our vehicles, we suggest that you should replace the spark plug at the following mileages: 10,000-15,000 km (single electrode); 15,000-25,000 km (multi electrode).

Ignition performance fall of spark plug will make fuel consumption rise and power drop off. The economic loss caused by excessive fuel consumption unconsciously will even afford to hundreds of new spark plugs. Use overdue makes the working condition of the engine poor in long term and brings some damage to the engine.

11.7 Inspection and maintenance of the spark plug

The inspection items for spark plug mainly include carbon deposit, electrode burn through, gap, and sealing and spark jump performances of the spark plug etc.

The electrode gap of the spark plug should be 0.7-0.9mm. Too small electrode gap will reduce the breakdown voltage and weaken the spark intensity; while too big electrode gap will increase the voltage required by the spark plug and cause spark out, especially when the ignition coil is aging and the ignition system is in poor maintenance, spark out is more liable to occur.

Common failures of spark plug: fall in sealing performance, air leak and soot at the air leakage position. The above failures can be inspected and judged through sealing performance test and spark jump test. Both sealing performance test and spark jump test can be conducted on a spark plug cleaning tester.

It is unscientific that some drivers and maintenance professionals remove the spark plug from the engine, place it on the cylinder head and inspect if it is in sound conditions using high voltage of the vehicle. In this test, the spark plug electrode is under an atmosphere other than a gas pressure of over 800KPa, its working pressure. Therefore, spark jump of a spark plug under an atmosphere does not indicate that it will also reliably produce spark jump under a high pressure conditions in the cylinder.

It is required that carbon deposit disposal and proper adjustment of spark plug gap should be done after a mileage of 10,000-15,000 km in its lifetime. When the temperature in cylinder rises, the electrode gap should be increased properly. That is, increase the electrode gap in summer while reduce it in winter. If the mixed air is strong, the electrode gap should be increased; otherwise, decreased. In plain region, the electrode gap should be decreased while in plateau region, increased.

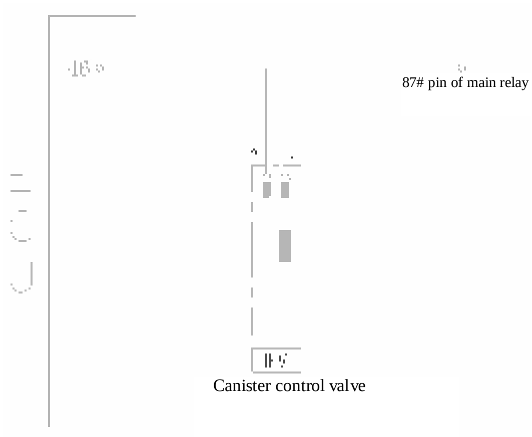
12. Carbon Canister Solenoid Valve Control

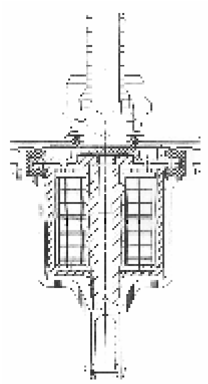
12.1 Function:

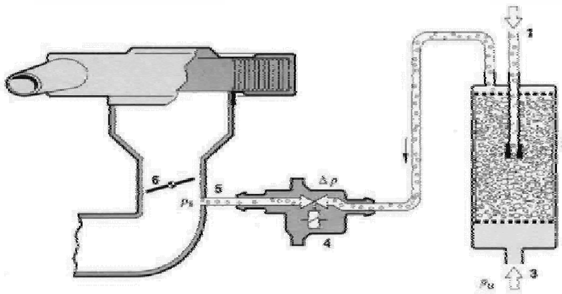
Carbon canister solenoid valve is a device used to enable the fuel steam in fuel tank to enter cylinder to combust through control of ECU. Through controlling duty cycle of a solenoid valve, ECU can accomplish open and close of the solenoid valve.

12.2 Working principle:

The canister control valve is composed of solenoid, armature iron and valve etc. There is a filter net at the inlet. The airflow through the canister control valve at one hand depends on the duty cycle of the electric pulse output of canister control valve by ECU, and at another hand depends on the pressure difference between the inlet and the outlet of the canister control valve. The canister control valve will be closed when there is not any electric pulse.







1 From fuel tank
2 Canister
3 Atmosphere
4 Canister control valve
5 To intake manifold
6 Throttle

ΔP is the difference between environmental pressure Pu and intake manifold pressure Ps

Cross-section view of canister control valve

Installation drawing of canister control valve

12.4 Installation attentions

See above installation drawing for connection among canister control valve, carbon canister and intake manifold.

- In order to avoid transfer of solid borne noise, floating installation of the canister control valve on the hose is recommended.
- During installation, make sure that the airflow direction meets the specification.
- Appropriate measures such as filtering and purge etc. must be taken to prevent such foreign material as particles from entry into the canister control valve from carbon canister or hose.

It is recommended that a corresponding protective strainer (size of grid<50μm) should be installed on outlet of carbon canister.

12.5. Failure effects and judgment method

- Failure effects: Failure of functions etc.

Reasons for general failure: corrosion or poor sealing performance etc. due to entry of foreign material into inside of the valve.

- Maintenance precautions:

1. During installation, make sure that the airflow direction meets the specification;
2. In case of control valve failure due to black particle inside the valve body, when replacement of the control valve is required, check the status of the canister;
3. During maintenance, try to avoid entry of such liquid as water and oil etc. into the valve;
4. In order to avoid transfer of solid borne noise, floating installation of the canister control valve on the hose is recommended.

- Simple measurement method:

With the joint removed, turn the digital multimeter to Ohm shift, and then connect the two meter pens respectively to both pins of the canister control valve. The rated resistance at 20℃ should read 26±4Ω.

13. Electronic Accelerator Pedal

13.1 Function:

The electronic accelerator pedal has cancelled the conventional throttle guy and the position of accelerator pedal is fed back to ECU by means of electronic signal, through which ECU can calculate and control the action of the electronic accelerator pedal. Two sets of Hall sensors are integrated in the pedal; ECU can compare and analyze the two signals, if one signal is improper, ECU will duly access the other signal and light the failure indicator.

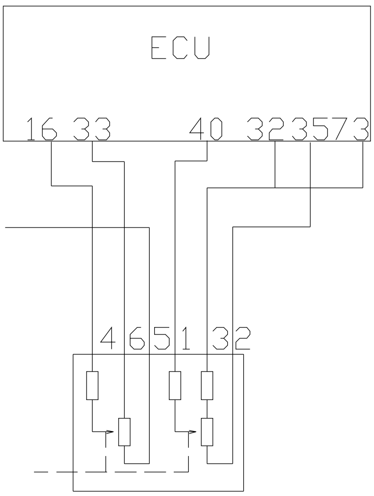
13.2 Working principle:

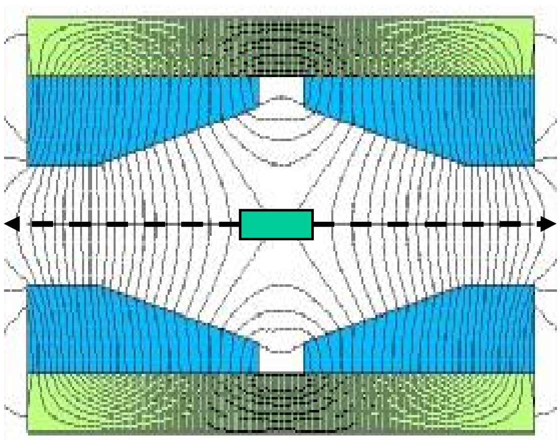
The pedal is a Hall sensor. The fixed Hall generator and signal processing circuit are installed on fixed mounting of the pedal. The two permanent magnets with different magnetic sheet thickness act together with the pedal. When the pedal acts, the magnetic flux passing the Hall generator will also change accordingly, the signal processing circuit will process these signals and then send them to ECU.

13.3 Detection:

The relationship between the two signals of the accelerator pedal is that signal 1 is equal to signal voltage.

At idle speed position, the voltage of signal 1 is 4.59 and that of signal 2 is 4.30. When the pedal is at middle position, the voltage will be the minimum; when the pedal is at either end position, the voltage will be the maximum.





14. Three-way Catalytic Converter

14.1 Function:

Three-way catalytic converter is used to convert the noxious gas in tail gas into such innocuous gases as carbon dioxide and water etc. At 300-800℃, the conversion efficiency of three-way catalytic converter is maximum; with a temperature below this scope, the conversion efficiency will be very poor, while, with a temperature above this scope, the three-way catalytic converter may be burnt out. Three-way catalytic converter can exert better conversion efficiency only when the oxygen sensor works. In control strategies of ECU, there are several protective modes for three-way catalytic converter, and ECU can protect the three-way catalytic converter by regulating air-fuel ratio and ignition advance angle.

15. Fan Control

15.1 Function:

In order to abstract heat from engine system and from condenser with A/C turned on, fan control is affected by the signal to ECU sent by water temperature sensor; When water temperature is high (above the threshold value set by ECU), the fan will run, and when water temperature is low (below the threshold value set by ECU), the fan will also run; with A/C turned on, the fan will run at low speed.

15.2 Composition:

DC electric motor double fan (high and low speed change).

15.3 Installation requirements:

The fan is installed between the rear of radiator and the engine, be careful when installing: not to damage fin of fan blade, otherwise, running noise of the fan will increase, if serious, it may lead to sharp fall of heat radiation effect of the engine.

15.4 Failure diagnosis:

Fan control circuit is a short or open circuit to ground;
The fan has failure itself;
Too loud fan noise;
Failure in power supply circuit of fan.

15.5 Troubleshooting:

First, validate whether it is a high speed fan system problem or a low speed fan system problem. Provided that this is a fan control system problem, use a diagnostic tester to locate the failure point, and then validate whether it is a short-circuit or a break in control circuit.

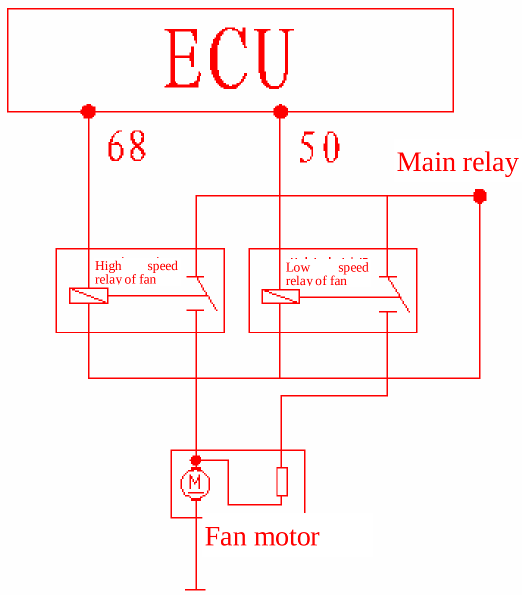
Failure symptom: the fan failure may result in rise of engine coolant temperature and poor refrigeration of A/C system.

15.6. Fan Control:

Turn-on of low gear of fan:
1. Temperature of engine coolant: 96℃-102℃;
2. On request for A/C, the fan will start up;
3. When driving speed is too high, the fan will start up;

High speed startup of fan:
1. Engine coolant temperature sensor failure;
2. Air flow meter failure;
3. Engine coolant temperature exceeds 102℃.

Pins:



Brief sketch map of fan control

1. High speed fan control (corresponds to ECU50#);
2. Low speed fan control (corresponds to ECU68#);

The operating mode of fan after engine stops:
1. Failure of intake air temperature sensor of engine, delay 60s;
2. Failure of intake air temperature sensor of engine, delay 60s;
3. Engine coolant temperature exceeds 100.5℃, delay 60s;
4. Engine coolant temperature exceeds 70.5℃, delay 60s.

16. Position Sensor of Double Brake Pedal

16.1 Function:

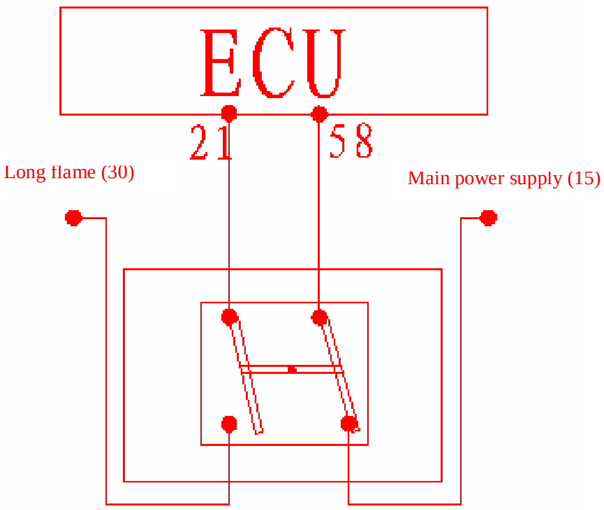
制动开关传感器是将刹车信号送给 ECU，ECU 根据（原文不全）

16.2 Working principle:

Inside the brake switch, there are two mutually independent switches with one normal close and the other normal open. After applying the accelerator pedal, the former normal close switch turns to be normal open, while the normal open one turns to be normal close. Both signals will be sent to ECU to be used to control other systems. Whenever the two signals disaccord, ECU will enter failure mode, the electronic throttle will not respond when applying the accelerator pedal and the engine will maintain idle speed working state.

Composition: the double brake switch is installed on the bracket of the brake pedal and contains two independent switches inside.

Installation requirement: the assembly is installed on the pedal and there is a thread adjusting mechanism on the switch for stroke adjustment of the switch and effective stroke adjustment of the brake switch.



Double brake switch

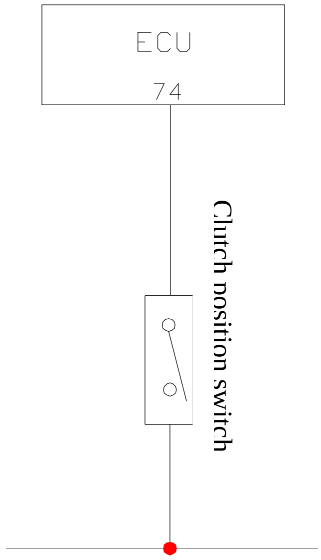
17. Clutch Position Sensor

17.1 Function:

Clutch position switch provides ECU with the signal of clutch position, but this signal can only be used to distinguish between disengaging and engaging positions of the clutch.

17.2 Working principle:

ECU provides clutch position switch with a 12V power supply; when the clutch is under disengaging state, the power supply will ground and ECU will lose 12V high potential signal, by which the position of the clutch can be judged.



18. A/C Control

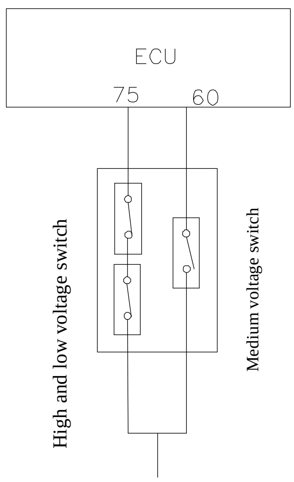
By receiving the A/C signal from A/C switch, ECU can control working of A/C compressor. ECU also can receive the signals from high and low pressure switches of A/C to ensure safety of A/C system. When A/C signal is sent to ECU through high and low pressure switches, if the low pressure switch breaks, ECU will not receive the A/C signal; the compressor is thus unable to work. If A/C system has a too high pressure, the high pressure switch will break and A/C signal can not be provided to ECU; so, ECU will immediately cut off the compressor. When system pressure is normal or a little higher (medium pressure), the medium pressure switch will cut in; thus, ECU can control the fan to run immediately at high speed to ensure a system pressure within the normal range.

Cut off pressure of the low pressure switch: 0.12Mpa

Cut-in pressure of the medium voltage switch: 1.6Mpa

Cut off pressure of the high pressure switch: 3.2Mpa

Through evaporator temperature sensor of the A/C system, ECU can also protect the A/C system and prevent evaporator case from freezing. When the temperature provided by the evaporator temperature sensor is blow 3.75℃, ECU will cut off the compressor; when the temperature is above this degree, ECU will automatically engage the compressor to let it work.



A/C switch

Chapter Two Fundamental Principle for Failure Diagnosis of Electronic Fuel Injection System

1. Failure Information Records

The ECU monitors sensor, actuator, related circuit, malfunction indicator and battery voltage etc., and even EUC itself continuously. At the same time, the ECU inspect the reliability test on sensor signal output, actuator driving signal and internal signal (e.g.: closed loop control, knock control, idle speed control and accumulator voltage control etc.). ECU will set the malfunction record on RAM malfunction memory immediately once the malfunction or the unlikelihood signal is detected. The failure information records are stored in the form of diagnostic trouble code (DTC) and are displayed in the precedence order of occurrence of the failures.

Failures can be divided into "stable state failures" and "random failures" (for example, caused by transient open circuit of wires or poor contact of inserted parts) by failure frequency.

2. Failure State

Once duration of occurrence of an identified failure exceeds the given stabilization time for the first time, ECU will account it as a stable failure and then store it as a "stable state failure". If this failure disappears, it will be stored as a "random failure" and "non-existent". If this failure is identified again, it will still be a "random failure", but a "existent" early failure that will not affect average service of the engine.

3. Failure Types

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

4. Failure Frequency Counter

- For every identified failure, a separate frequency counter numerical value (Hz) will be set.
- This numerical value (Hz) for frequency counter determines the time this failure

information record will be stored in memory after the identified failure disappears (after troubleshooting).

- When a failure is identified for the first time, Hz will be set as its initial value 40. If failure status does not change, then this numerical value will maintain all along.
- Once it is identified that this failure has disappeared and the state has held for a certain time, whenever the engine starts with success (its engine speed has exceeded the value at end of starting) once, Hz will decrease by 1. At this point, ECU will believe that this failure has disappeared, but the failure information record still exists.
- If a failure (for example, as a result of poor contact) frequently appears and disappears, then Hz will increase by 1, but will not exceed its given upper limit value 100.
- If value of Hz has been decreased to zero, the failure information records in this failure memory will be completely cleared.

5. Limp Home

For some identified significant failures, when duration exceeds the given stabilization time, ECU will take appropriate software countermeasures, for example, closing some control functions such as closed loop control of oxygen sensor etc. and setting substituted values for some data that are considered to be suspect and so forth. At this point, though the working condition of the engine is comparatively poor, the auto can still run. The purpose to do this is to enable the auto limply run home or to a service station for overhaul, so as to avoid the embarrassment that the auto breaks down on highway or afield. Once it is identified that the failure has disappeared and Hz has fell to below 40, use of normal data will be resumed again.

6. Failure Alert

In the electric control system, when failure take places in any of such important parts as ECU, absolute pressure sensor in intake manifold, throttle position sensor, coolant temperature sensor, knock sensor, oxygen sensor, phase sensor, injector, two driver stages of step motor of idle speed actuator, canister control valve, or fan relay at corresponding failure location, ECU will give an alarm through lightening of failure indicator lamp until this failure location restores.

7. Readout of Failure

The failure information records can be called out of ECU through a trouble diagnosis tester. If the failure relates to the function of mixed air (fuel and air) proportional regulator, then the engine must at least run for 4 minutes before reading out failure information records; especially for failure in oxygen sensor, be sure not to detect data until the engine runs and warms up.

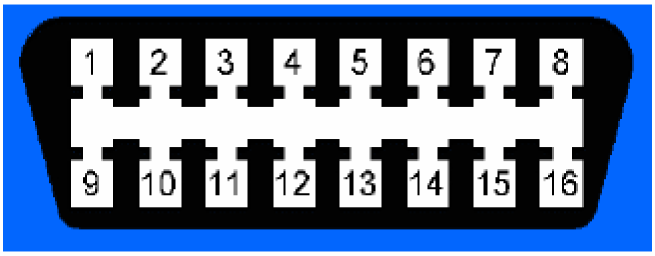


Figure 3-1 ISO 9141-2 Standard Diagnostic Connector

8. Clearing Failure Information Records

After the failure is removed, the failure information records in memory should be cleared. The diagnostic trouble code can be cleared through the following approaches:

- When the numerical value of frequency counter in ECU reaches zero, the failure information records in failure memory will be automatically cleared.
- Employing fault diagnostic tester to clear records of failure with the instruction of "reset memory for records of failure".
- Pulling out connectors of ECU or disconnecting wires of battery to clear records of failure in external ram.

9. Failure Locating

After obtaining failure information records through above means, only rough location where the failure takes place is aware, but this does not mean that the failure has been located; because the cause that triggers a piece of failure information may be damage of electric element (such as sensor, actuator or ECU etc.), lead break, lead short-circuit to ground or anode of battery, even may be mechanical failure.

The failure is intrinsic and the result of its extrinsic representations is a variety of symptoms. After a symptom is found, first, check for failure information records with a trouble diagnosis tester or based on the flash code, after that, remove the correlated failure in accordance with the failure information, and then locate the failure based on symptom of the engine.

10. Failure Code Table

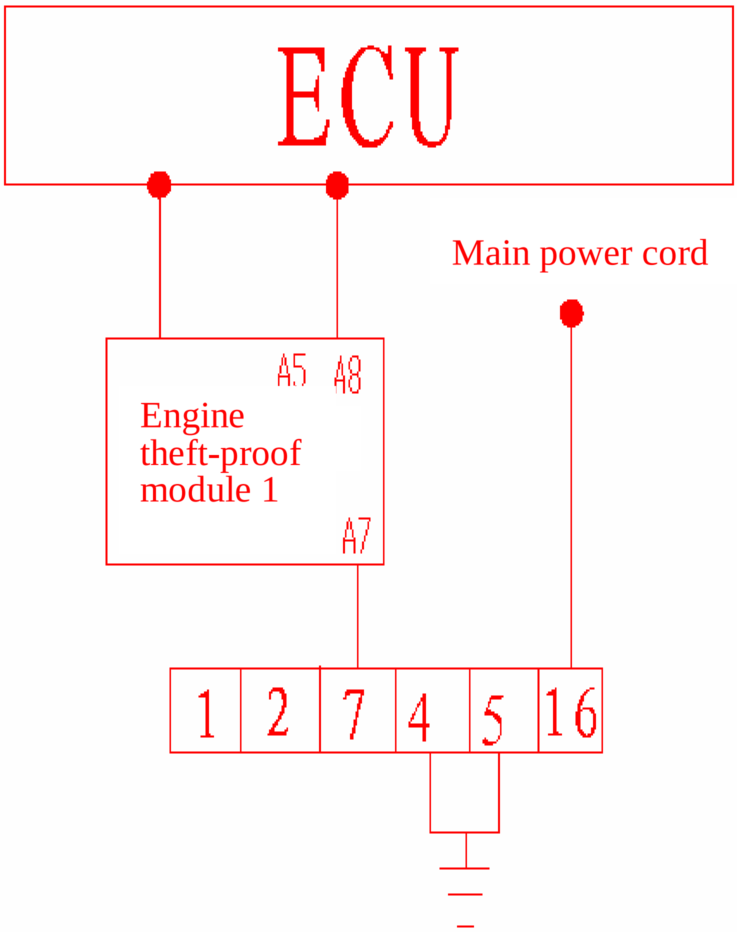
No.	DTC	Explanation	Failure class
1	P0016	Improper relative installation position between camshaft and crankshaft	class5
2	P0030	Failure in heating control circuit of upstream oxygen sensor	class31
3	P0031	Too low voltage in heating control circuit of upstream oxygen sensor	class31

4	P0032	Too high voltage in heating control circuit of upstream oxygen sensor	class31
5	P0105	Signal failure of intake air pressure sensor	class31
6	P0106	Improper signal from intake air pressure sensor	class31
7	P0107	Too low voltage in signal circuit of intake air pressure sensor	class31
8	P0108	Too high voltage in signal circuit of intake air pressure sensor	class31
9	P0112	Too low voltage in signal circuit of intake air temperature sensor	class5
10	P0113	Too high voltage in signal circuit of intake air temperature sensor	class5
11	P0117	Too low voltage in signal circuit of engine coolant temperature sensor	class31
12	P0118	Too high voltage in signal circuit of engine coolant temperature sensor	class31
13	P0121	Improper signal from electronic throttle position sensor 1	class34
14	P0122	Too low voltage in signal circuit of electronic throttle position sensor 1	class34
15	P0123	Too high voltage in signal circuit of electronic throttle position sensor 1	class34
16	P0130	Improper signal from upstream oxygen sensor	class31
17	P0131	Too low voltage in signal circuit of upstream oxygen sensor	class31
18	P0132	Too high voltage in signal circuit of upstream oxygen sensor	class31
19	P0134	Failure in signal circuit of upstream oxygen sensor	class31
20	P0201	Failure in 1# cylinder injector control circuit	class5
21	P0202	Failure in 2# cylinder injector control circuit	class5
22	P0203	Failure in 3# cylinder injector control circuit	class5
23	P0204	Failure in 4# cylinder injector control circuit	class5
24	P0219	Engine revolution exceeds the maximum revolution limit	class5
25	P0221	Improper signal from electronic throttle position sensor 2	class34
26	P0222	Too low voltage in signal circuit of electronic throttle position sensor 2	class34
27	P0223	Too high voltage in signal circuit of electronic throttle position sensor 2	class34
28	P0261	Too low voltage in 1# cylinder injector control circuit	class5
29	P0262	Too high voltage in 1# cylinder injector control circuit	class5
30	P0264	Too low voltage in 2# cylinder injector control circuit	class5
31	P0265	Too high voltage in 2# cylinder injector control circuit	class5
32	P0267	Too low voltage in 3# cylinder injector control circuit	class5
33	P0268	Too high voltage in 3# cylinder injector control circuit	class5
34	P0270	Too low voltage in 4# cylinder injector control circuit	class5
35	P0271	Too high voltage in 4# cylinder injector control circuit	class5
36	P0321	Improper signal of crankshaft top dead center	class33
37	P0322	Engine speed signal failure	class33
38	P0324	Failure in knock signal processing chip and its circuit	class5
39	P0327	Too low voltage in signal circuit of knock sensor	class31
40	P0328	Too high voltage in signal circuit of knock sensor	class31

41	P0340	Failure in signal circuit of phase sensor	class5
42	P0341	Improper signal from phase sensor	class5
43	P0342	Too low voltage in signal circuit of phase sensor	class5
44	P0343	Too high voltage in signal circuit of phase sensor	class5
45	P0444	Failure in control circuit of canister control valve	class31
46	P0458	Too low voltage in control circuit of canister control valve	class31
47	P0459	Too high voltage in control circuit of canister control valve	class31
48	P0480	Failure in relay control circuit of electronic cooling fan (low speed)	class5
49	P0481	Failure in relay control circuit of electronic cooling fan (high speed)	class5
50	P0501	Improper speed signal	class5
51	P0504	Improper signal of brake pedal A/B	class5
52	P0506	Engine speed under idle speed control is below the target idle speed	class5
53	P0507	Engine speed under idle speed control is above the target idle speed	class5
54	P0537	Too low voltage in signal circuit of evaporator temperature sensor	class5
55	P0538	Too high voltage in signal circuit of evaporator temperature sensor	class5
56	P0560	Improper system voltage signal	class33
57	P0562	Too low system voltage signal	class33
58	P0563	Too high system voltage signal	class33
59	P0571	Failure in signal circuit of brake pedal	class5
60	P0601	Failure in EEPROM of ECU	class33
61	P0602	Unprogrammed failure in ECU	class33
62	P0604	Failure in RAM of ECU	class34
63	P0605	Failure in ROM of ECU	class34
64	P0606	Safety monitoring function failure of electronic throttle	class34
65	P0627	Failure in control circuit of fuel pump relay	class33
66	P0628	Too low voltage in control circuit of fuel pump relay	class33
67	P0629	Too high voltage in control circuit of fuel pump relay	class33
68	P0645	Failure in control circuit of A/C compressor relay	class5
69	P0646	Too low voltage in control circuit of A/C compressor relay	class5
70	P0647	Too high voltage in control circuit of A/C compressor relay	class5
71	P0688	Improper output voltage of main relay	class33
72	P0689	Too low output voltage of main relay	class33
73	P0690	Too high output voltage of main relay	class33
74	P0691	Too low voltage in relay control circuit of electronic cooling fan (low speed)	class5
75	P0692	Too high voltage in relay control circuit of electronic cooling fan (low speed)	class5
76	P0693	Too low voltage in relay control circuit of electronic cooling fan (high speed)	class5

77	P0694	Too high voltage in relay control circuit of electronic cooling fan (high speed)	class5
78	P0704	Improper clutch pedal signal	class5
79	P1336	Restrictive effect of safety monitoring torque of electronic throttle	class34
80	P1545	The deviation between physical location and target location of electronic throttle overruns	class34
81	P1558	Too large opening resistance of electronic throttle	class34
82	P1559	Failure in self-study process of electronic throttle	class34
83	P1564	System voltage fails to meet the conditions for self-study of electronic throttle	class34
84	P1565	Failure in self-study of initialization of lower limit position of electronic throttle	class34
85	P1568	Too large restoration resistance of electronic throttle	class34
86	P1579	Fails to meet the conditions for self-study of electronic throttle	class34
87	P1604	Failure in self-study of gain adjustment of electronic throttle	class34
88	P1610	Unprogrammed error in Secret Key and Security Code	class39
89	P1611	Security Code acceptance error	class39
90	P1612	Challenge request failed	class36
91	P1613	Immo Code request failed	class36
92	P1614	Transponder check error	class36
93	P1677	Too high voltage in control circuit of detector lamp (SVS)	class5
94	P1678	Too low voltage in control circuit of detector lamp (SVS)	class5
95	P1679	Failure in control circuit of detector lamp (SVS)	class5
96	P2106	Failure in driver stage of electronic throttle	class34
97	P2122	Too low voltage in signal circuit of electronic accelerator pedal position sensor 1	class34
98	P2123	Too high voltage in signal circuit of electronic accelerator pedal position sensor 1	class34
99	P2127	Too low voltage in signal circuit of electronic accelerator pedal position sensor 2	class34
100	P2128	Too high voltage in signal circuit of electronic accelerator pedal position sensor 2	class34
101	P2138	Improper signal from electronic accelerator pedal position sensor	class34
102	P2177	Self-study value of closed loop air fuel ratio control is above the upper limit (normal load zone)	class5
103	P2178	Self-study value of closed loop air fuel ratio control is below the lower limit (normal load zone)	class5
104	P2187	Self-study value of closed loop air fuel ratio control is above the upper limit (idle speed zone)	class5
105	P2188	Self-study value of closed loop air fuel ratio control is below the lower limit (idle speed zone)	class5

106	P2191	Self-study value of closed loop air fuel ratio control is above the upper limit (heavy load zone)	class5
107	P2192	Self-study value of closed loop air fuel ratio control is below the lower limit (heavy load zone)	class5



Electrical Schematic Diagram of Diagnostic Interface

11. The Steps for Implementation of Failure Diagnosis According to Failure Information Records

11.1 Electronic Throttle Failure

Failure codes: P012, P0122, P0123, P022, P0222, P0223, P1336, P154, P1558, P1559, P1564, P1565, P1568, P1579, P1604

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON".		Next step
2	Pull out the joint of throttle position sensor on harness; use a multimeter to check if the magnitude of voltage between its 3# and 5# pins is around 12V and if a 5V voltage is present between 6# and 2# pins.	Yes	Next step
		No	5
3	Use a multimeter to check if the resistance values between 1#, 4# and 6# pins of the sensor are between 0.5kΩ and 1.6kΩ.	Yes	Next step
		No	Replace the sensor
4	Meanwhile, use a multimeter to check if it is break or short circuit between 1#, 4# and 6# pins of throttle position sensor and ECU38#, 54#, 36#; or, turn blade of the throttle to observe if its resistance value jumps and if the resistance values between 1#, 4# and 6# change accordingly with rotation of throttle.	Yes	Replace the sensor
		No	Replace ECU
5	Connect an adaptor between ECU and harness, use a multimeter respectively check if it is break or short circuit between 1#, 2#, 6# and 4# pins of the sensor and 10#, 32#, 36# and 54# pins of ECU joint.	Yes	Repair or replace wire harness
		No	Replace ECU

Note: This auto adopts the electronic throttle body and has cancelled former step motor, and the functions that were accomplished by the stop motor on a common throttle body are now completely accomplished by the throttle driving motor. The electronic throttle can not be repaired and failure rate of the throttle body is very low, if damaged, replacing the assembly is the only choice to deal with the problem.

Special attention: The electronic throttle body can not be disassembled and repaired at service station; in addition, after replacing electronic throttle body, be sure to let it carry out self-study; otherwise, unsteady working at idle speed of engine may occur. See also the section about electronic throttle for detailed study scheme. Maintenance of the throttle body is analogous to that of the common valve body.

11.2 Knock Sensor failure

Failure codes: P0324, P0327, P0328

No.	Operating steps	Result	Follow up steps
1	Close the ignition switch, and the engine stops.		Next step
2	Pull out the joint of knock sensor on harness, use a multimeter to check if both resistance values between 1# and 2# pins and between 1# pin and shielded wire (sensor shield) pin of knock sensor are more than 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 1# and 2#.	Yes	Next step
		No	Replace the sensor
4	Turn on the ignition switch but do not start the engine.		Next step
5	Connect an adaptor between ECU and harness, use a multimeter respectively check if it is break or short circuit between 19#, 20# pins of ECU and 1#, 2# pins of sensor joint.	Yes	Repair or replace wires
		No	Replace ECU

Note: Generally, knock sensor is not liable to damage. When disassembling and installing the knock sensor, be careful not to leave dirt on the contact surface of the sensor and the engine body and do not add any gasket. If the sensor is damaged, it will have an comparatively great effect on economical efficiency and emission of the engine. After the knock sensor is damaged, the electric control system of the engine will lock ignition advance angle of the engine at a fixed ignition angle, so, the acceleration performance of the engine will fall and economical efficiency and emission of the engine will also be greatly affected.

11.3 Air Pressure Sensor Failure

Failure codes: P0102, P0103, P0112, P0113

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”.		Next step
2	Pull out joint of intake air pressure sensor on harness; use a multimeter to check if a 5V voltage is present between 2# and 3# pins of the joint.	Yes	4
		No	Next step
3	Between ECU and harness, use a multimeter to respectively check if it is break or short circuit between 42# and 33# pins of ECU and 1#, 2#, 3#, 4# pins of sensor joint.	Yes	Repair or replace harness
		No	Next step
4	Replace the intake air temperature pressure sensor.		Next step

Note: In case the sensor shorts to 5V or 12V power supply or ground, the engine may not start up or stop running.

11.4 Front Oxygen Sensor Failure

Failure codes: P0130, P0131, P0132, P0134, P0135

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”.		Next step
2	Pull off the connector of harness of oxygen sensor. Check the voltage between pin 1# (+) and 2# (-) with multimeter and detect if it is around 12V.	Yes	Next step
		No	4
3	Use a multimeter to check if the resistance value between 1# and 2# pins of the oxygen sensor is between 2Ω and 5Ω at 23℃.	Yes	Replace ECU
		No	Replace the sensor
4	Check if heating circuit of the oxygen sensor is normal.	Yes	Next step
		No	Check the circuit
5	Check if it is short circuit or break circuit between the pin 2# of oxygen sensor and main relay 87# pin and between the sensor connector 1# pin and ECU 1# pin with multimeter.	Yes	Repair or replace harness
		No	Next step
6	Connect the oxygen sensor connector of harness and use neutral. Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value.		Next step
7	Pull off the oxygen sensor connector of harness. Check the battery output voltage between pin 3# (+) and pin 4# (-) of the sensor with multimeter and detect if it is from 0.1 to 0.9V (after the engine warms up).	Yes	Next step
		No	Replace the sensor
8	Connect the adaptor between ECU and harness. Check if it is short circuit or break circuit between the pin 36# and pin 13# of ECU and the sensor connector pin 3# and pin 4# respectively with multimeter.	Yes	Repair or replace harness
		No	Replace ECU
9	Plug in the oxygen sensor connector of harness and use neutral. Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value.		Next step
10	Connect special diagnostic tester for Chery to read part of data stream of the engine, and then observe if part of data stream of the sensor fluctuates between 100mv and 900mv.	Yes	Next step
		No	Replace the sensor
11	Start the engine and let it run at idle speed until coolant temperature reaches normal value.		Next step

12	Connect special diagnostic tester for Chery to read part of data stream of the engine, and then carefully observe part of data stream of the sensor; apply the accelerator pedal to bottom and then rapidly release it, observe if the output voltage of the oxygen sensor can reach below 100mv.	Yes	Check other part
		No	Replace the sensor

Note: when checking data flow of the oxygen sensor, be sure to note working position of the engine and let the working temperature of the engine reach the normal value, because the oxygen sensor only can start to work normally when the temperature is over 300℃.

11.5 Rear Oxygen Sensor Failure

Failure codes: P0136, 0137, 0138, 0036, 0037, 0038, 0054

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”.		Next step
2	Pull off the oxygen sensor connector of harness. Check the voltage between pin 1# (+) and 2# (-) with multimeter and detect if it is around 12V.	Yes	Next step
		No	4
3	Use a multimeter to check if the resistance value between 1# and 2# pins of the oxygen sensor is between 2Ω and 5Ω at 23℃.	Yes	Replace ECU
		No	Replace the sensor
4	Check if heating circuit of the oxygen sensor is normal.	Yes	Next step
		No	Check the circuit
5	Check if it is short circuit or break circuit between pin 2# of oxygen sensor and main relay 87# pin and between the sensor connector 1# pin and ECU 1# pin with multimeter.	Yes	Repair or replace harness
		No	Next step
6	Connect the oxygen sensor connector of harness and use neutral. Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value.		Next step
7	Validate if the three-way catalytic converter works normally.	Yes	Next step
		No	Replace the three-way catalytic converter
8	Pull out the oxygen sensor joint on harness. Rapidly apply the accelerator pedal for several times, and then use a multimeter to check if a output voltage between 0.1V and 0.9V is present between 3# (+) and 4# (-) pins of the sensor (after the engine warms up).	Yes	Next step
		No	Replace the sensor
9	Connect the adaptor between ECU and harness. Check if it is short circuit or break circuit between the pin 36# and pin 55# of ECU and the sensor connector 3# and 4# pins respectively with multimeter.	Yes	Repair or replace harness
		No	Replace ECU
10	Connect the oxygen sensor connector of harness and use neutral. Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value.		Next step
11	Connect special diagnostic tester for Chery to read	Yes	Next step

	part of data stream of the engine, and then observe if part of data stream of the oxygen sensor is around 100 under standard idling operation.	No	Replace the sensor or the three-way catalytic converter
12	Start the engine and let it run at idle speed until coolant temperature reaches normal value.		Next step
13	Connect special diagnostic tester for Chery to read part of data stream of the engine, and then carefully observe part of data stream of the sensor; rapidly apply the accelerator pedal for several times and observe if the output voltage of the oxygen sensor fluctuates within a comparatively large scope.	Yes	Check other part
		No	Replace the sensor

Note: The characteristics and operating principle of rear oxygen sensor is basically the same as those of front oxygen sensor, in special conditions, they can be interchanged to use. The only difference between them is their different installation sites (working atmospheres), therefore, during maintenance and diagnostic processes of the vehicle, please pay attention to some inspection techniques for front and rear oxygen sensors.

11.6. Coolant Temperature Sensor Failure

Failure codes: P0112, P0113

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON".		Next step
2	Pull out joint of coolant temperature sensor on harness; use a multimeter to check if the magnitude of voltage between 1# (+) and 2# (-) pins of this joint is around 5V.	Yes	Next step
		No	4
3	Use a multimeter to check if the resistance value between 1# and 2# pins of the sensor is in proportion to its temperature (refer to relevant part in this service manual).	Yes	Replace ECU
		No	Replace the sensor
4	Use a multimeter to check if it is break or short circuit between 17# and 29# pins of ECU and 2# and 1# pins of sensor joint.	Yes	Repair or replace harness
		No	Replace ECU
5	Start the engine, while engine coolant temperature rises, check if the voltages on two wires of the sensor falls as water temperature of the engine rises.	Yes	Next step
		No	Replace the sensor
6	Start the engine, disconnect the connector of water temperature sensor, and then observe if cooling fan of the engine starts up and runs at high speed.	Yes	Check other part
		No	Replace the ECU or the circuit

11.7 Failure in Driver Stage of Injector

Failure codes: P0201, P0202, P0203, P0204, P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271

No.	Operating steps	Result	Follow up steps
1	Close the ignition switch, and the engine stops.		Next step
2	Pull out each electromagnetic injector joint on harness in turn, and then lap the two pins of multimeter between 2# pin of the joint and the engine.		Next step
3	Put the ignition switch to “ON”. Observe if, at the instant when the ignition switch cuts in, the multimeter displays an around 12V voltage value of battery (mainly check if the injector has power supply, which is provided by main relay).	Yes	Repeat 2
		All yes	6
		No	Next step
4	Use a multimeter to check in turn if it is break or short circuit between 87# pin of output terminal of main relay of the engine and 1# pin of each electromagnetic injector joint.	Yes	Repair or replace harness
		No	Next step
5	Repair or replace fuel pump relay and main relay and their circuits.	Yes	Repair or replace harness
6	Connect the adaptor between ECU and harness; use a multimeter to check in turn if it is break or short circuit between 27#, 7#, 47# or 6# pins of ECU and 2# pin of each corresponding electromagnetic injector joint on harness.	No	Next step
7	Use a multimeter to check in turn if a resistance between 12Ω and 16Ω is present at 20℃ between 1# and 2# pins (and resistance value of injector) of the electromagnetic injectors.	Yes	Repeat 7
		All yes	Next step
		No	Replace the electromagnetic injector
8	Re-plug all electromagnetic injector joints, engage the gear to neutral position, start the engine, and then let it run at idle speed. Pull out all electromagnetic injector joints on harness in turn. Whenever a joint is pulled out, observe if engine vibration is aggravated accordingly (equivalent to spark out experiment).	Yes	Repeat 8
		No	Replace ECU

Note: The damage probability of injector is very low; its main failure is carbon deposit in injection nozzle, which may result in atomization of fuel injection, poor spray and unsteady idle speed of engine; therefore, when inspecting, above failure should be inspected as an emphasis.

11.8 Failure in Driver Stage of Canister Control Valve

Failure codes: P0443, 0444, 0445

No.	Operating steps	Result	Follow up steps
1	Start the engine and let it run at idle speed until engine coolant temperature reaches normal value.		Next step
2	Pull out canister control valve joint on harness; use a multimeter to check if an around 8.6V battery voltage is present between two pins of this joint.	Yes	Next step
		No	5 (check positive wire)
3	Re-plug the canister control valve joint on harness, increase engine revolution to 2000rpm, and then touch the valve body by hand to check if the canister control valve has slight vibration and impact (frequency control).	Yes	Next step
		No	7 (check ground wire)
4	Use a multimeter to check if the resistance value between A# and B# pins of the canister control valve is around 25Ω (20℃).	Yes	Replace ECU
		No	Replace the canister control valve
5	Check if it is short circuit or break circuit between the pin of main relay 87# and the pin of canister control valve 1# with multimeter.	Yes	Repair or replace the harness
		No	Next step
6	Repair or replace the main relay and the circuit.		
7	Cut off the engine; connect the adaptor between ECU and harness, and use a multimeter to check if it is break or short circuit between 46# pin of ECU and A# pin of the canister control valve.	Yes	Repair or replace harness
		No	Replace ECU
8	With ignition switch ON, disconnect canister control valve joint, and then use a multimeter to check the A# and B# pins at harness end of solenoid valve.		Next step
9	Use a multimeter to check if an around 12V battery voltage is present between B# pin and ground wire.	Yes	Next step
		No	Check feed circuit
10	Use a multimeter to check if an around 3.6V battery voltage is present between A# pin and ground wire.	Yes	Check other part
		No	Check ECU circuit or replace the ECU

Note: The carbon canister solenoid valve is used for the emission control system, a system set up for environmental protection and air pollution prevention. When engine runs at idle speed or under heavy load operating mode, the solenoid valve will not participate in the work. A malfunction of this solenoid valve will result in unsteady operating mode of the engine. These details should be noted during maintenance process.

11.9 Failure in Driver Stage of Malfunction Indicator Lamp (MIL)

Failure codes: P1677, P1678, P1679

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON"		Next step
2	Disassemble the dashboard, and then use a multimeter to check if it is break or short circuit between 29#, 30# pins at instrument end and 62#, 81# pins of ECU.	Yes	Check the circuit
		No	Next step
3	Replace the instrument and then check if it is normal	Yes	Next step
		No	Replace the instrument
4	Replace ECU, and then re-check if it works normally.	Yes	Replace ECU
		No	Check other part
5	Check CAN circuit for the place where is grounding or short.	Yes	Replace the harness
		No	Check other part

Note: The malfunction indicator lamp is controlled by ECU. When a failure occurs in the system, ECU will control the malfunction indicator lamp to light. There are two kinds of malfunction indicator lamps on this auto (engine failure indicator lamp and EPC), but the engine failure indicator lamp on the instrument may be shielded in the system, that is, when a failure occurs, EPC lamp will light, which should be noted during maintenance process.

11.10 Failure in Driver Stage of 1#, 2# Coils of Step Motor

Failure codes: P1682, 1683

No.	Operating steps	Result	Follow up steps
1	Turn on the ignition switch but do not start the engine.		Next step
2	Pull out connector of the electronic throttle, and then check if the resistance value between 5# and 3# pins of the connector is around 6.1Ω.	Yes	Next step
		No	Replace the electronic throttle body
3	Pull out the connector, and then use a multimeter to check if a 12V alternate voltage is present between 5# and 3# connectors of the electronic throttle.	Yes	Next step
		No	Check the circuit
4	Use a multimeter to check if a 12V voltage is present between the connector of the harness and ground when the key is ON.	Yes	Replace the idle speed actuator
		No	Next step
5	Between ECU and harness, use a multimeter respectively to check if it is break or short circuit between 67#, 65# pins of ECU and 5# pin of the connector and between 66#, 64# pins of ECU and 3# pin of the connector.	Yes	Repair or replace the harness
		No	Replace ECU

Note: Much about failure diagnosis for other parts has been involved above.

11.11 Crankshaft Position Sensor Failure

Failure code: P0016

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”.		Next step
2	Pull out camshaft position sensor joint on harness, and then use a multimeter to check if the voltage between 1# pin of this joint and ground wire is around 12V (battery voltage).	Yes	Next step
		No	Check circuit and main power supply
3	Pull out camshaft position sensor joint on harness, and then use a multimeter to check if the voltage between 2# pin of this joint and ground wire is around 11.5V (power supply from ECU and the voltage is below the battery voltage).	Yes	Next step
		No	Check circuit and ECU
4	Use a multimeter to check if it is break or short circuit between 79# pin of ECU and 2# pin of sensor joint.	Yes	Repair or replace the harness
		No	Next step
5	Pull out camshaft position sensor joint on harness, and then use a multimeter to check if it is conducting between 3# pin of this joint and ground wire.	Yes	Next step
		No	Replace the sensor
6	Connect the sensor connector and start the engine.		Next step
7	Use a oscillometer to check if an around 6V square wave signal output is present in 2# signal cable.	Yes	Check other part
		No	Replace the sensor

Note: The camshaft position sensor is an auxiliary sensor and has great effect on emission of the system. When failure occurs in this sensor, the vehicle will be difficult to start; though the vehicle will be basically normal after startup, driving restrictive practice will be found on the engine and the maximum revolution of engine can not exceed 4000rpm.

11.12 Craftshaft Position Sensor Failure

Failure codes: P0321, P0322, P0219

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON".		Next step
2	Pull out crankshaft position sensor joint on harness, use a multimeter to check if it is short or break circuit between 1# pin of this joint and 34# pin of ECU.	Yes	Check the circuit
		No	Next step
3	Pull out crankshaft position sensor joint on harness, use a multimeter to check if it is short or break circuit between 3# pin of this joint and 15# pin of ECU.	Yes	Next step
		No	Check circuit and ECU
4	Use a multimeter to check if it is break or short circuit between 79# pin of ECU and 2# pin of sensor joint.	Yes	Repair or replace the harness
		No	Next step
5	Pull out crankshaft position sensor joint on harness, and then use a multimeter to check if the two signal cables on the sensor has a resistance value of around 1000Ω.	Yes	Next step
		No	Replace the sensor
6	Connect the sensor connector and start the engine.		Next step
6	Use an oscillometer to check if signal waveform output is present in signal cable.	Yes	Check other part
		No	Replace the sensor

Note: Crankshaft position sensor is the main sensor of electronic control unit of engine. If crankshaft position sensor failure occurs, the engine will be difficult to start; acceleration performance of the engine will be greatly restricted after startup; the maximum revolution of the engine can not exceed 3800rpm; meanwhile, emission of the engine will deteriorate.

11.12 Ignition Coil Failure

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON".		Next step
2	Pull out ignition coil joint on harness, and then use a multimeter to check if the voltage between 3# pin of this joint and ground wire is an around 12V battery voltage.	Yes	Next step
		No	Check the circuit
3	Pull out ignition coil joint on harness, and then use a multimeter to check if it is short or break circuit between 1# pin of this joint and 5# pin of ECU.	Yes	Check circuit and ECU
		No	Next step
4	Pull out ignition coil joint on harness, and then use a multimeter to check if it is short or break circuit between 2# pin of this joint and 2# pin of ECU.	Yes	Check circuit and ECU
		No	Next step
5	Check if the resistance of primary coil of the sensor is around 0.9Ω.	Yes	Next step
		No	Replace the ignition coil
6	Check if the resistance of secondary coil of the sensor is around 14.5kΩ.	Yes	Next step
		No	Replace the ignition coil
7	Use an oscillometer to check if secondary ignition waveform of ignition cable of ignition system is normal.	Yes	Check other part
		No	Replace the ignition coil

Note: The ignition coil is mainly used to provide ignition system of engine with ignition energy. The failure rate of the coil itself is very low, but its failure probability can not be completely excluded. When failure occurs in ignition coil, the ignition energy of engine will be deficient, which may further lead to such failures as unsteady idle speed of engine and emission deterioration.

11.13 Accelerator Pedal Position Sensor Failure

Failure codes: P2106, P2122, P2123, P2127, P2128, P2138

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON".		Next step
2	Pull out accelerator pedal position sensor joint on harness, and then use a multimeter to check if an around 5V voltage signal is present between 3#, 6# pins of this joint and ground wire.	Yes	Next step
		No	Check the circuit
3	Pull out accelerator pedal position sensor joint on harness, and then use a multimeter to check if it is short or break circuit between 3#, 6# pins of this joint and 32#, 33# pins of ECU.	Yes	Check the circuit
		No	Next step
4	Pull out accelerator pedal position sensor joint on harness, and then use a multimeter to check if it is short or break circuit between 2#, 5# pins of this joint and 36#, 35# pins of ECU.	Yes	Check the circuit
		No	Next step
5	Pull out accelerator pedal position sensor joint on harness, and then use a multimeter to check if it is short or break circuit between 4#, 1# pins of this joint and 16#, 40# pins of ECU.	Yes	Check the circuit
		No	Next step
6	Use a diagnostic tester to read signal output of accelerator pedal position sensor, and then check if signal 1 increases as opening of accelerator pedal increases.	Yes	Next step
		No	Replace the sensor assembly
7	Use a diagnostic tester to read signal output of accelerator pedal position sensor, and then check if signal 2 increases as opening of accelerator pedal increases.	Yes	Check other part
		No	Replace the sensor assembly

Note: This pedal is an integrated circuit device, which can not be processed through repair; therefore, during maintenance process, the service station can maintain it by means of part replacement and can not disassemble the sensor.

11.14 Double Brake Switch

Failure codes: P0571, P0504

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”.		Next step
2	Pull out brake switch joint on harness, and then use a multimeter to check if it is short or break circuit between 1#, 2# pins of this joint and 21#, 58# pins of ECU.	Yes	Next step
		No	Check the circuit
3	Close the ignition switch, and then check if an around 12V battery voltage is present on 3# pin of the switch joint.	Yes	Next step
		No	Check the circuit
4	Open the ignition switch, and then check if an around 12V battery voltage is present on 4# pin of the switch joint.	Yes	Next step
		No	Check the circuit
5	Release brake pedal, disconnect sensor connector, and then check if 1# and 3# pins cut off.	Yes	Next step
		No	Replace the brake switch
6	Release brake pedal, disconnect sensor connector, and then check if 2# and 3# pins conducts.	Yes	Next step
		No	Replace the brake switch
7	Apply brake pedal, disconnect sensor connector, and then check if 1# and 3# pins conducts.	Yes	Next step
		No	Replace the brake switch
8	Apply brake pedal, disconnect sensor connector, and then check if 2# and 4# pins cut off.	Yes	Check other part
		No	Replace the brake switch

11.15 Theft-proof Control System Failure

No.	Operating steps	Result	Follow up steps
1	Insert the ignition key into the ignition lock.		Next step
2	Put the ignition switch to ON position, and then observe if engine failure indicator lamp or EPC lamp works normally (quick flash of failure indicator lamp or EPC lamp indicates a abnormal condition).	Yes	Check other part
		No	Next step
3	Connect a diagnostic tester to the system, and then enter corresponding diagnostic program unit to check if DTC exists in the system.	Yes	Remove the failure and clear the DTC
		No	Next step
4	Pull out theft-proof module joint on harness, and then use a multimeter to check if an around 12V operating voltage is present on A1#, A4# pins of the joint when ignition switch is under ON state.	Yes	Next step
		No	Check the circuit
5	Pull out theft-proof module joint on harness, and then use a multimeter to check if such electric and circuit failures as short circuit and break circuit exist in the circuit between A5#, A8# pins of this joint and 31# and 71# pins of ECU.	Yes	Check the circuit
		No	Next step
6	Pull out theft-proof module joint on harness, and then use a multimeter to check if poor contact exists between A2# pin of this joint and ground wire of the vehicle.	Yes	Check the circuit
		No	Next step
7	Pull out theft-proof module joint on harness, and then use Ohm Shift of the multimeter to check if the circuit between B1#, B2#, B3# pins of this joint and the coil exists.	Yes	Check the circuit
		No	Replace the theft-proof module

12. Steps for Implementation of Failure Diagnosis by Engine Symptom

12.1 Perform Preliminary Inspection First before Following the Steps for Implementation of Failure Diagnosis by Engine Symptom.

(1) Make sure that ECU and failure indicator lamp (or EPC lamp) have no off-normal phenomenon (excluding the models that have no failure indicator lamp).
(2) Use a failure diagnostic tester to check and make sure no failure information record exists.
(3) Employ failure diagnostic tester to check that hot idle data from electronic control system fall within normal scope.

Hot idle speed parameter table:

Name	Parameter
Air intake temperature	20-70℃
Battery voltage	12-14V (affected by engine revolution)
Temperature of engine coolant	80-90℃ (normal operating temperature)
Position of accelerator pedal	0%~99.00%
Air-fuel ratio control integrator	5%-5%
Ignition advance angle	5-10° (may change with fluctuation of engine revolution)
Outer corner of throttle	0%~99.61%
Fuel injection time	2-7ms (has a strong relation with engine revolution)
Engine revolution n	Expected idle speed ± 50rpm
Duty cycle of canister control valve	0%~99.9%
Self-adapting value of air-fuel ratio control	0.95-1.05
Self-adapting value of air-fuel ratio control	120-140
Intake manifold absolute pressure	350-650hPa
Voltage of oxygen sensor	Quickly fluctuates at 0.1-0.9V
Air intake pressure	

(4) Validate that the failure effect the owner complained exists and then locate the exact position of the symptom. Please note that the information provided by the customer is very important, especially the failure symptoms, occurrence time, position and if any other failure symptoms occurred before; these information can help technical personnel rapidly and effectively judge the failure, thus increasing maintenance speed and improving maintenance quality.
Then check the appearance:

- Check that grounding of wire harness is clean and firm.
- Check that vacuum pipeline 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.

12.2 The Engine Does not Rotate or Rotates Slowly when Starting

No.	Operating steps	Result	Follow up steps
1	Use a multimeter to check if a voltage around 10-12.5V is present between two battery terminals.	Yes	Next step
		No	Repair or replace the battery
2	Put the ignition switch to "ON". Use a multimeter to check if a battery voltage around 10-12.5V is present on the terminal on the ignition switch that connects with anode of battery.	Yes	Next step
		No	Repair wiring terminal or replace cable
3	Maintain ignition switch at START position, and then use a multimeter to check if a voltage above 8V is present on the terminal on the ignition switch that connects with pull in winding of starting motor.	Yes	Next step
		No	Replace the ignition switch
4	Put the ignition switch at start position, check the anode terminal of starting motor by multimeter and observe the voltage if it is above 8V.	Yes	Next step
		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 the starting motor
		No	Next step
6	Check if there is jammed by poor lubricating.	Yes	Troubleshootin g
		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	Replace with appropriate oil
		No	Check if other systems are normal

Note: When this problem occurs, mainly inspect voltage, starter and ground system. In modern sedan, lubricant has little effect on startup of the vehicle, so, basically, it needs not to allow for lubricant problem, but the problem if the engine has too large self resistance should be taken into consideration.

12.3 When Starting, Engine Can be Dragged to Rotate but Can not Start with Success.

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”. Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Pull out cylinder distribution wire, connect spark plug with the distance between electrode of spark plug and engine body as 8-10mm, use the starting motor to drag the engine to rotate, and then check if blue-white high-voltage spark occurs (disconnect all injection nozzles on the engine).	Yes	8
		No	Next step
3	Check if resistance value of ignition cable is normal (can not exceed 16kΩ).	Yes	Next step
		No	Repair, replace the ignition cable.
4	Check ignition coil and ignition cable for burn through, damage and crack.	Yes	Replace
		No	Next step
5	Check if ignition cable is normal.	Yes	Replace
		No	Next step
6	Check if the ignition coil is working normally.	Yes	Next step
		No	Replace
7	Check if connectors of ignition coil and ignition cable are connected properly.	Yes	Next step
		No	Connect the connectors properly
8	Put the ignition switch to “ON”. Check if fuel pump relay and fuel pump can keep working for a period of time.	Yes	Next step
		No	Overhaul the fuel pump circuit
9	Connect fuel manometer valve. Short 30# and 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 400kPa.	Yes	Next step
		No	13
10	Pull off the fuel distributing pipe and the fuel injector; pull off the joints of fuel injector on the harness 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	12
		No	Next step
11	Clean out the fuel injector and observe if it can	Yes	Next step

	work correctly.	No	Replace the fuel injector
12	Check if fuel is bad or moisture.	Yes	Replace fuel
		No	18
13	Check if the fuel pressure value is below 400 kPa.	Yes	Next step
		No	17
14	Close the fuel manometer valve. Re-engage the ignition switch to let the fuel pump run for a period of time, and then check if fuel pressure can be built up.	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.	Yes	Check other part
		No	Repair or replace the fuel pump
16	Check if there is leakage or jam in oil intake pipe.	Yes	Repair or replace oil intake pipe
		No	Replace oil pump
17	Check if the oil return pipe is bended or jammed.	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator
18	Check if it is break or short circuit between 1#, 2# pins of crankshaft position sensor and 34#, 15# pins of ECU.	Yes	Repair or replace the harness
		No	Next step
19	Check if the part of air intake system is leaking.	Yes	Repair
		No	Next step
20	Check if air flow meter works normally.	Yes	Repair or replace
		No	Next step
21	Check if the coolant temperature sensor is working correctly.	Yes	Next step
		No	Repair or replace
22	Check if the reason for the failure on starting is about mechanism, such as much cylinder clearance, cylinder leaking, and so on.	Yes	Remove the mechanical failure
		No	Replace ECU

Note: When checking this problem, if all parts in electronic fuel injection system are normal, consider if mechanical part of the engine works normally, or if cylinder pressure is normal and if air leakage exists and so forth.

12.4 Warm Starting Difficulty

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON". Use a special diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Connect fuel manometer valve. Short 30# and 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 400kPa.	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 around 300 kPa after an hour.	Yes	Next step
		No	Repair the fuel system to avoid leakage
4	Put the connecting oil pipe through, use fuel tube clamp to intercept the oil return pipe, meanwhile, close the fuel manometer valve. Turn off the ignition switch, after one hour, observe if pressure of fuel system still can maintain at around 400kPa.	Yes	Replace fuel pressure regulator
		No	Next step
5	Check if there is fuel leakage of fuel injector and oil pipe.	Yes	Replace the injector and fuel pipe
		No	Next step
6	Pull out water temperature sensor joint and start the engine. Observe if the engine can start with success.	Yes	Check coolant temperature and circuit
		No	Next step
7	Connect an adaptor between ECU and harness, check if a voltage around 5V is present on 39#, 17# pins, meanwhile, check if the resistance value of water temperature sensor is within normal scope.	Yes	Next step
		No	Repair or replace the harness
8	Replace ECU and perform warm start again; 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	Try to replace the fuel pump and see if the system can return to normal.	Yes	Next step
		No	Replace fuel pump

12	Check if the fuel pump is stopped up.	Yes	Replace fuel pump
		No	Replace ECU

Note: Warm starting difficulty is in connection with many systems, such as battery, throttle body and water temperature sensor etc. as well as mechanical part of the engine, such as valve sealing. Thermal expansion of engine under warm state may lead to rise of engine resistance.

12.5 Engine Speed is Normal, but it is Difficult to Start at any Time

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to “ON”. Use a special diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
3	After starting successfully, check if air intake consumption of the engine at idle speed is around 300Kg/h (remember to check if cylinder pressure is normal).	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 the electronic throttle body
5	Connect fuel manometer valve. Short 30#, 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 400kPa.	Yes	Next step
		No	9
6	Use a special joint to directly supply a 12V voltage and intermittent ground wire from battery to injector and check if the injector works normally (work intermittently).	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 8, and check if the fuel is deteriorated or moisture.	Yes	Replace fuel
		No	14
9	Check if the fuel pressure value is below 300 kPa.	Yes	Next step
		No	13
10	Close the fuel manometer valve. Re-engage the ignition switch to let the fuel pump run for 3s, and then check if fuel pressure can be built up.	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.	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 oil return pipe is bended or jammed.	Yes	Repair or replace oil return pipe

		No	Replace fuel pressure regulator
14	When engine coolant is at low temperature, pull out electronic throttle body on harness and observe if engine revolution will rise.	Yes	Next step
		No	Check electronic throttle body for damage
15	Put the ignition switch to "ON". Check if voltage on the following pins of ECU is normal: if it is a battery voltage around 12V on 12#, 14#, 15# pins; if the voltage between 51#, 53#, 3#, 61#, 80# pins and the wire is zero.	Yes	Next step
		No	Check wires and plugs
16	Check if ignition advance angle is normal.	Yes	Next step
		No	Check other systems
17	Check if cylinder compression pressure of engine is normal, if low, add a little engine oil into each cylinder and re-measure if the cylinder pressure is normal.	Yes	Next step
		No	Troubleshooting
18	If air cleaner or airflow sensor is choked.	Yes	Repair or replace
		No	Next step
19	Check if the coolant temperature sensor is working correctly.	Yes	Replace ECU
		No	Repair or replace

Note: Note if theft-proof system has started up. After theft-proof system has started up, when starting the engine, the staring motor can run normally, but the engine can not start; therefore, please note if this system can work normally.

12.6 Cold Starting Difficulty

No.	Operating steps	Result	Follow up steps
1	Put the ignition switch to "ON". Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Use a multimeter to check if the coolant temperature sensor is normal. (A 2.8KΩ electric resistance can also be connected in series between 39# and 17# pins of ECU to start the engine in stead of the coolant temperature sensor. If the engine can start, it indicates off normal of coolant temperature sensor.)	Yes	Next step
		No	Replace the sensor
3	Put the ignition switch to "ON". Check if voltage on the following pins of ECU is normal: if it is a battery voltage around 12V on 12#, 14#, 15# pins; if the voltage between 51#, 53#, 3#, 61#, 80# pins and the wire is zero.	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 successfully, check if air intake consumption of the engine at idle speed is around 300Kg/h (remember to check if cylinder pressure is normal).	Yes	Next step
		No	Eliminate the leakage failure of air intake system
6	Step on the throttle slightly and observe if it is easy to be started easily.	Yes	Check the electronic throttle
		No	Next step
7	When engine coolant is at low temperature, pull out electronic throttle body joint on harness and observe if engine revolution will rise.	Yes	Next step
		No	Check the electric throttle body
8	Connect fuel manometer valve. Let 86# pin of fuel pump relay directly ground. Turn on ignition switch to make fuel pump relay and fuel pump work, and then check if fuel pressure is at around 400kPa.	Yes	Next step
		No	12
9	Use a special joint to directly provide a 12V electricity and ground wire from battery to injector and check if the injector works normally.	Yes	11
		No	Next step
10	Clean out the fuel injector and look if it can work correctly.	Yes	Next step
		No	Replace fuel injector
11	Check if fuel is deteroprated or moisture.	Yes	Replace fuel

		No	17
12	Check if the fuel pressure value is below 300 kPa.	Yes	Next step
		No	16
13	Close the fuel manometer valve. Re-engage the ignition switch to let the fuel pump run for a period of time, and then check if fuel pressure can be built up.	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.	Yes	Check fuel pressure regulator and 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 the oil return pipe is bended or jammed.	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator or fuel pump
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	If air cleaner or airflow sensor is choked.	Yes	Repair or replace
		No	Replace ECU

Note: The cold starting problem relates to more failure points, among which water temperature sensor is comparatively important, because it is the major parameter for determination of injection pulse-width when starting the engine. In case of a water temperature sensor failure or it generates a false signal, the system can not judge the temperature and starting difficulty may occur.

12.7 Unsteady Idle Speed at Any Time

1	Put the ignition switch to “ON”. Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Check if electronic throttle system of engine works normally.	Yes	Repair or replace the electronic throttle
		No	Next step
3	Turn on ignition switch, connect an adaptor between ECU and harness, and then check if the voltage between 17# and 42# pins of ECU, between 39# and 17# pins of ECU (signal output terminal of intake air temperature sensor and coolant temperature sensor) as well as 64#, 65#, 66#, 67# pins of ECU (for control of DC motor) is normal.	Yes	Check wires and plugs
		No	Next step
4	Let engine run at idle speed, spark out cylinder in turn, and observe if engine revolution will fall and fluctuate (cut fuel to injector).	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 resistance value of ignition cable of each cylinder is normal (can not exceed 16kΩ).	Yes	Next step
		No	Replace
7	Check if ignition system works normally.	Yes	Maintain
		No	Next step
8	Check if the spark plug is in right conditions.	Yes	Next step
		No	Replace spark plug
9	Connect fuel manometer valve. Short 30# and 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 400kPa.	Yes	Next step
		No	13
10	Use a special joint to directly provide a 12V power supply and intermittent ground wire signal from battery to injector and check if the injector can work intermittently.	Yes	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 deteroprated or moisture.	Yes	Replace fuel
		No	18

13	Check if the fuel pressure value is below 300kPa.	Yes	Next step
		No	17
14	Close the fuel manometer valve. Re-engage the ignition switch to let the fuel pump run for a period of time, and then check if fuel pressure can be built up.	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.	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 the oil return pipe is bended or jammed.	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	Use detergent to wash
		No	Next step
19	Let engine run at idle speed, after coolant temperature reaches the active temperature of closed loop control, observe if the oxygen sensor works normally (rapidly fluctuate between 0.1V and 0.9V).	Yes	Next step
		No	Check the oxygen sensor and harness
20	Check if the engine air intake system is leaky.	Yes	Remove leakage
		No	Next step
21	Check if the pressure of cylinder is normal.	Yes	Next step
		No	Troubleshooting
22	Let engine run at idle speed, after coolant temperature reaches normal value, then use a special diagnostic tester to check if ignition advance angle is within the standard scope.	Yes	Replace ECU
		No	Check other part

Note: Unsteady idle speed relates to many systems, such as air leak, carbon deposit and throttle body etc.; before replacing a part, make sure that air cleaner, spark plug and ignition system of engine are normal.

12.8 Unsteady Idle Speed during Warming up Process

1	Put the ignition switch to “ON”. Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
3	After starting successfully, check if air intake consumption of the engine at idle speed is around 300Kg/h (remember to check if cylinder pressure is normal).	Yes	Next step
		No	Eliminate the leakage failure of air intake system
4	Turn on ignition switch, connect an adaptor between ECU and harness, and then check if the voltage between 17# and 42# pins of ECU, between 39# and 17# pins of ECU (signal output terminal of intake air temperature sensor and coolant temperature sensor) as well as 64#, 65#, 66#, 67# pins of ECU (for control of DC motor) is normal.	Yes	Next step
		No	Overhaul
5	Before finish of warming up of engine, pull out the joint on electronic throttle body and observe if engine revolution will change.	Yes	Next step
		No	Check the electric throttle body
6	Check if the coolant temperature sensor is working correctly.	Yes	Next step
		No	Replace
7	Let engine run at idle speed, after coolant temperature reaches normal value, then use a special short diagnostic tester to check if ignition advance angle is normal.	Yes	Replace ECU
		No	Check the ignition timing mechanism

Note: Unsteady idle speed occurs seldom during warming up process, its troubleshooting is similar to that for previous case, but validate if water temperature sensor works normally in advance.

12.9. Unsteady Idle Speed after Warming up

1	Put the ignition switch to "ON". Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Turn on ignition switch, connect an adaptor between ECU and harness, and then check if the voltage between 17# and 42# pins of ECU, between 39# and 17# pins of ECU (signal output terminal of intake air temperature sensor and coolant temperature sensor) as well as 64#, 65#, 66#, 67# pins of ECU (for control of DC motor) is normal.	Yes	Next step
		No	Repair or replace the harness
3	Turn off the engine. Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
4	After starting successfully, check if air intake consumption of the engine at idle speed is around 300Kg/h (remember to check if cylinder pressure is normal).	Yes	Next step
		No	Eliminate the leakage failure of air intake system
5	Connect fuel manometer valve. Short 30# and 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 400kPa.	Yes	Next step
		No	9
6	Use a special joint to directly provide a 12V power supply and intermittent ground wire from battery to injector and check if the injector can work intermittently.	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 deteroprated or moisture.	Yes	Replace fuel
		No	14
9	Check if the fuel pressure value is below 300kPa.	Yes	Next step
		No	13
10	Close the fuel manometer valve. Re-engage the ignition switch to let the fuel pump run for a period of time, and then check if fuel pressure can be built up.	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.	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 oil return pipe is bended or jammed.	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator
14	Let engine run at idle speed, after coolant temperature reaches normal value, then use a diagnostic tester to check if ignition advance angle is normal.	Yes	Next step
		No	Check other systems
15	Pull off the coolant temperature sensor and observe if the engine is in right conditions.	Yes	Replace the coolant temperature sensor
		No	Next step
16	Check if the compression pressure of cylinder is normal.	Yes	Next step
		No	Troubleshooting
17	Check if resistance value of ignition cable of each cylinder is normal (can not exceed 16kÙ).	Yes	Next step
		No	Replace
18	Check if ignition coil and ignition cable system works normally and if crack exists on ignition coil.	Yes	Replace
		No	Next step
19	Check if the spark plug is in right conditions.	Yes	Replace ECU
		No	Replace spark plug

Note: After finish of warming up, engine will enter normal idle speed state, under which, unsteady revolution is in connection to many factors, such as spark plug, ignition cable, ignition coil, if air leak exists in the system, if carbon deposit exists in the system and if cylinder pressure is normal an so forth.

12.10 Unsteady Idle Speed or Extinguish with Load (A/C etc.)

1	Put the ignition switch to "ON". Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Turn on A/C switch, connect an adaptor between ECU and harness, and then measure 75# pin of ECU to see if input signal is present (high potential signal loaded by A/C switch through high and low voltage switches).	Yes	Next step
		No	Check and repair air conditioning circuit
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	Check the voltage on 64#, 65#, 66# and 67# pins of ECU (for control of DC motor) as well as corresponding pins on valve body is normal.	Yes	Next step
		No	Check controlling circuit
5	Remove electronic throttle body and check if throttle is locked or is dumb to run.	Yes	Check the electric throttle body
		No	Next step
6	Start engine, turn on A/C, use a failure diagnosis tester to read such signals as air intake flow and engine revolution and check if engine acceleration occurs.	Yes	Replace ECU
		No	Replace the electronic throttle body

Note: 75# pin is the up level request signal. When turning on A/C switch, an up level signal will be sent to ECU through this pin, and then ECU will further check other systems of A/C. If all systems are normal, ECU will control A/C relay to ground and A/C system will start to work. 60# pin of ECU is medium voltage signal input; when high potential signal is loaded on this pin, cooling fan will start and run at high speed.

12.11 Periodic Unsteadiness (Have to Perform Self-study again after ECU is Power off)

1	Put the ignition switch to "ON". Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Check the air cleaner and look if it is open.	Yes	Next step
		No	Replace
3	After starting successfully, check if air intake consumption of the engine at idle speed is around 300Kg/h (remember to check if cylinder pressure is normal).	Yes	Next step
		No	Check and repair air intake and leak
4	Let engine run at idle speed, spark out cylinder in turn, and observe if engine revolution will fall and fluctuate (it is prohibited to carry out spark out experiment by disconnecting ignition cable).	Yes	7
		No	Next step
5	Turn on ignition switch, connect an adaptor between ECU and harness, and then check if the voltage between 17# and 42# pins of ECU, between 39# and 17# pins of ECU (signal output terminal of intake air temperature sensor and coolant temperature sensor) as well as 64#, 65#, 66#, 67# pins of ECU (for control of DC motor) is normal.	Yes	Next step
		No	Repair or replace cable
6	Let engine run at idle speed, after coolant temperature reaches normal value, then use a diagnostic tester to check if ignition advance angle of the system is normal.	Yes	Next step
		No	Check other part
7	Check air intake system for such failures that may affect working of engine as blocking and air leak etc.	Yes	Sweep
		No	Next step
8	Check if fuel is deteroprated or moisture.	Yes	Replace fuel
		No	Next step
9	Use a special joint to directly provide a 12V power supply and intermittent ground wire from battery to injector and check if the injector can work intermittently.	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
		No	Next step

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

Note: For periodic unsteadiness, mainly check air intake system for air leak or electronic throttle body for failure. Following are the steps for inspection of electronic throttle body: while turning on ignition key, throttle may jiggle; during self-checking procedure, throttle should act with actions of accelerator pedal.

12.12 Too High Idle Speed (Have to Perform Self-study again after ECU is Power off)

1	Put the ignition switch to "ON". Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	Check if throttle valve plate is locked and if failure exists in electronic throttle body.	Yes	Adjust or replace
		No	Next step
3	Check if the canister control 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 the vacuum booster
		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 control valve pipe and observe if the idle speed becomes normal.	Yes	Replace the canister control valve
		No	Next step
8	Check if electronic throttle body is dumb or locked.	Yes	Repair or replace
		No	Next step
9	Check other parts of air intake pipe for leakage.	Yes	Repair or replace
		No	Next step
10	Check if the gasket of fuel injector is in good condition.	Yes	Next step
		No	Replace the gasket
11	Check air intake system for air leak and air flow meter for normal working.	Yes	Replace ECU
		No	Replace the sensor

Note: Check if the system goes through self-study, if not, the system will be under failure mode or an uncertain state all the time, which may result in too high idle speed of engine. The other cause is air leak in the system, if air leakage in the system is too large and exceeds regulation and control range of ECU, idle speed fluctuation may occur.

12.13. Engine Revolution Speed is too Low or Flameout

1	Put the ignition switch to "ON". Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		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, overhaul with reference to idle speed failure entries
4	After starting successfully, check if air intake consumption of the engine at idle speed is around 300Kg/h (remember to check if cylinder pressure is normal).	Yes	Next step
		No	Overhaul
5	Let engine run at idle speed, after coolant temperature reaches normal value, then use a diagnostic tester to check if ignition advance angle of the system is normal.	Yes	Next step
		No	Check other systems
6	Connect fuel manometer valve. Short 30# and 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 400kPa.	Yes	Next step
		No	10
7	Use a special joint to directly provide a 12V power supply and intermittent ground wire from battery to injector and check if the injector can work intermittently.	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 350 kPa.	Yes	Next step
		No	14
11	Close the fuel manometer valve. Re-engage the ignition switch to let the fuel pump run for a period of time, and then check if fuel pressure can be built up.	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	Yes	Replace fuel pressure regulator

	not return. Check if the oil pressure occurs immediately.	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 the oil return pipe is bended or jammed.	Yes	Repair or replace oil return pipe
		No	Replace fuel pressure regulator
15	Put the ignition switch to "ON". Check if voltage on the following pins of ECU is normal: if it is a battery voltage around 12V on 12#, 14#, 15# pins; if the voltage between 51#, 53#, 3#, 61#, 80# pins and the wire is zero.	Yes	Next step
		No	Repair or replace cable
16	Check if ignition coil, ignition cable and spark plug are normal.	Yes	Replace ECU
		No	Adjust or replace the parts involved

Note: This phenomenon indicates a comparatively obvious failure and some minute details, such as if strainer of the system or exhaust pipe is blocked and so forth, should also be checked. For other causes, check spark plug and ignition cable etc.

12.14 Slow Response when Accelerating

1	Put the ignition switch to “ON”. Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		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	Overhaul
5	Put the ignition switch to “ON”. Check if it is break or short circuit between 38#, 32#, 54#, 36# pins on ECU connector and 1#, 2#, 4#, 6# pins of throttle position sensor of electronic throttle valve body.	Yes	Next step
		No	Repair or replace Harness
6	Let engine run at idle speed, after coolant temperature reaches normal value, then use a diagnostic tester to check if ignition advance angle is normal.	Yes	Next step
		No	Check other part
7	Connect fuel manometer valve. Short 30# and 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 4000kPa.	Yes	Next step
		No	11
8	Use a special joint to directly provide 12V power supply and intermittent 12V power supply from battery to injector and check if the injector can work intermittently.	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 300 kPa.	Yes	Next step
		No	15
12	Close the fuel manometer valve. Re-engage the ignition switch to let the fuel pump run for a period of time, and then check if fuel pressure can be built up.	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.	Yes	Replace the 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 the pressure regulator
16	Check if the exhaust system and three-way catalytic converter are jammed.	Yes	Replace or clean
		No	Replace ECU

Note: For slow response when accelerating, mainly check air intake pressure and injection pulse-width etc.; choked exhaust pipe and smudgy air cleaner may be causes for this problem. In addition, spark plug and ignition cable problems may also be causes.

12.15 Poor Performance and Disability when Accelerating.

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 electronic throttle can be full opening.	Yes	Next step
		No	Repair or replace the throttle
3	Put the ignition switch to "ON". Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
4	Let engine run at idle speed, after coolant temperature reaches normal value, then use a diagnostic tester to check the ignition advance angle.	Yes	Next step
		No	Check the parts involved
5	Put the ignition switch to "ON". Check if it is break or short circuit between 38#, 32#, 54#, 36# pins on ECU connector and 1#, 2#, 4#, 6# pins of throttle position sensor of electronic throttle valve body. check if the voltage between 17# and 42# pins of ECU, between 39# and 17# pins of ECU (signal output terminal of intake air temperature sensor and coolant temperature sensor) as well as 64#, 65#, 66#, 67# pins of ECU (for control of DC motor) is normal.	Yes	Next step
		No	Repair or replace Harness
6	Run the engine at idle speed and check if the air intake pressure is from 35 to 65kPa.	Yes	Next step
		No	Overhaul
7	Connect fuel manometer valve. Short 30# and 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 400kPa.	Yes	Next step
		No	11
8	Use a special joint to directly provide a 12V power supply and intermittent ground wire from battery to injector and check if the injector can work intermittently.	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 deteroprated or moisture.	Yes	Replace fuel
		No	16
11	Check if the fuel pressure value is below 300 kPa.	Yes	Next step
		No	15

12	Close the fuel manometer valve. Re-engage the ignition switch to let the fuel pump run for a period of time, and then check if fuel pressure can be built up.	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.	Yes	Replace the 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 the pressure regulator
16	Check if leak and blocking exist in air intake system and if air flow meter works normally.	Yes	Next step
		No	Replace the sensor
17	Check if spark plug, ignition cable and ignition coil are normal.	Yes	Next step
		No	Replace or adjust
18	Check if it results from air conditioning system.	Yes	Check A/C system
		No	Replace ECU

Note: Poor acceleration of system relates to many factors, such as problem in mechanical part of the engine itself, cylinder pressure and carbon deposit on valve etc. In addition, it is also in connection with other systems, such as power steering system and A/C system.

12.16 Unable to Reach the Maximum Revolution when Accelerating

1	Put the ignition switch to “ON”. Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	With engine off, check if air cleaner is smooth (can not simply rely on visualization, remove the air cleaner and then perform test drive again) and if air intake system is chocked.	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	After starting successfully, check if air intake consumption of the engine at idle speed is around 300Kg/h (remember to check if cylinder pressure is normal).	Yes	Next step
		No	Overhaul
5	Put the ignition switch to “ON”. Check if it is break or short circuit between 38#, 32#, 54#, 36# pins on ECU connector and 1#, 2#, 4#, 6# pins of throttle position sensor of electronic throttle valve body.	Yes	Next step
		No	Repair or replace Harness
6	Let engine run at idle speed, after coolant temperature reaches normal value, then use a diagnostic tester to check if ignition advance angle is normal.	Yes	Next step
		No	Check other part
7	Connect fuel manometer valve. Short 30# and 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 400kPa.	Yes	Next step
		No	11
8	Check if working positions of camshaft position sensor and crankshaft position sensor are normal.	Yes	Next step
		No	Replace the parts involved
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 deteroprated or moisture.	Yes	Replace fuel
		No	16
11	Check if the fuel pressure value is below 300 kPa.	Yes	Next step
		No	15
12	Check if the exhaust system and three-way	Yes	Replace or clean

	catalytic converter are jammed.	No	Replace ECU

Note: In case the engine is unable to reach its maximum revolution when accelerating, mainly check if exhaust pipe is chocked and air cleaner is smudgy. In addition, for electric control system of A21, in case of a failure in crankshaft or camshaft position sensor, ECU will take restrictive driving measures to restrict engine revolution to exceed certain value, which should be noted during maintenance process.

12.17 When Releasing Accelerator Pedal after Acceleration, Unsteady Idle Speed Occurs at Instant, even Extinguishes.

1	Put the ignition switch to "ON". Use a failure diagnostic tester to check if any failure information record exists.	Yes	Remove the failure displayed
		No	Next step
2	With engine off, check if air cleaner is smooth (can not simply rely on visualization, remove the air cleaner and then perform test drive again) and if air intake system is chocked.	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	After starting successfully, check if air intake consumption of the engine at idle speed is around 300Kg/h (remember to check if cylinder pressure is normal).	Yes	Next step
		No	Overhaul
5	Put the ignition switch to "ON". Check if it is break or short circuit between 38#, 32#, 54#, 36# pins on ECU connector and 1#, 2#, 4#, 6# pins of throttle position sensor of electronic throttle valve body.	Yes	Next step
		No	Repair or replace Harness
6	Let engine run at idle speed, after coolant temperature reaches normal value, then use a diagnostic tester to check if ignition advance angle is normal.	Yes	Next step
		No	Check other part
7	Connect fuel manometer valve. Short 30# and 87# pins of fuel pump relay to make the fuel pump run, and then check if fuel pressure is around 400kPa.	Yes	Next step
		No	11
8	Remove air intake hose, check if carbon deposit or other soil (this may result in air intake system of engine being chocked when the valve plate closes) exists.	Yes	Clear carbon deposit
		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 deteroprated or moisture.	Yes	Replace fuel
		No	16
11	Check if the fuel pressure value is below 400	Yes	Next step

	kPa.	No	15
12	Check if the exhaust system and three-way catalytic converter are jammed.	Yes	Replace or clean
		No	Replace ECU

Note: For an electric control motor with the electronic throttle body, the main actuators of its air intake system are air flow meter and electronic throttle body. Air flow meter has very high operational reliability and very low failure rate, while, due to particularity of road status in China and affected by operating environment, choke is liable to occur between valve plate and valve body of the electronic throttle body, which may obstruct air from entering the engine and result in extinguish of engine.

12.18 A/C System Failure

1	Check if there is enough coolant, if the A/C belt, the A/C clutch and the pressure switch are in good condition.	Yes	Next step
		No	Troubleshooting
2	Let engine run at idle speed and turn on A/C switch. Enter A/C self diagnosis mode to check the A/C system for failure.	Yes	Remove the failure displayed
		No	Next step
3	Turn on the A/C switch and connect an adaptor between ECU and harness. Measure 75# pin (A/C switch) of ECU and see if there are input signals on it.	Yes	Next step
		No	Check the harness
4	If this vehicle adopts low level control, check if the air condition is working still even though it is turned off.	Yes	Replace or repair the harness
		No	Next step
5	Check if there is low level output at ECU pin No.69 (connect to the ground of pull in winding of A/C relay).	Yes	Repair the A/C replay and harness
		No	Replace ECU

Note: Different from the controlling means of other models, the A/C control system of A21 adopts the automatic A/C and uses double-pressure switch to control incorporation of the A/C system and the fan after A/C starts up.

13. Safety Precautions for System Maintenance

13.1 Safety Precautions for Diagnosis and Maintenance of Gasoline Injection Electronic Control System

(1) Disassembly and assembly requirements for electronic control unit (ECU):

- Controllers shall be removed before welding or paint-baking;
- When disassembling and installing the controller, be sure to set ignition switch to CLOSE position and disconnect the battery with the system for fear to damage the engine control unit during disassembly and installation.
- Power supply wires shall not be removed from battery when engine is in operation or electric system is in use;
- Do not use such heavy current equipment as charger etc. to start the engine by direct bridging;
- Note that the ambient temperature for the controller should not exceed 80℃.

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

- The parts removed should be place at a clean site and covered properly; do not use the cloth (cotton cloth and gauze) with falling off fibre;

(3) Connect and disconnect the connectors of all sorts of harnesses and the connectors of failure diagnosis testers only after the ignition switch is turned off.

- When measuring mains voltage or ground wire grounding of the electronic control system, be sure to check if the connection order and mode are correct;
- Disconnect power cord or ground wire of battery from the system and disconnect harness connector of ECU; both operation modes above may cause loss of information about diagnosis and self-study stored in ECU (the retention time of information after the ECU installed is power off depends on the model).

(4) **Attentions during maintenance of fuel feed system (fuel feed line, fuel pump and fuel injection system):**

Disassembly or installation of oil pump on the tank full of oil or partly full of oil, please note:

- Before operation, get material ready near the fuel tank opening for absorption of heavy discharging fuel, so that, the fuel discharged can be duly absorbed;
- Avoid skin from direct contact with gasoline as best as you can;
- Before loosening a connection part, thoroughly clean this part and the area around the connecting pieces;
- Dishcloth shall be placed around the connecting part for avoide oil-spraying;

- If disassembled parts can not be repaired or for other processing immediately, store them properly.
- The spare parts can be taken out of their package only when they are to be installed; do not use the spare parts without package or with package heavily damaged;
- When installing an injector, be careful not to damage the O-gaskets at both ends of the injector; for installation convenience, apply a little lubricant on the O-gaskets.
- After fuel and fuel feed systems are disassembled, avoid use of compressed air and move of the vehicle as best as you can.

(5) **Safety precaution**

In order to avoid maintenance technical personnel from being injured and fuel injection and ignition devices from being damaged, please note:

In case the engine is running or under starting speed, disconnection of ignition harness is forbidden. Checking the engine for poor working of single cylinder **by means of spark test with ignition cable disconnected is not allowed**;

if it is required to drag the engine by the starter without starting the engine itself, for example, in the case of inspection of cylinder pressure of engine etc., disconnect the harness connectors on engine revolution sensor and camshaft (phase) sensor and connect each sensor properly after the corresponding job has finished, and then use a special diagnostic tester for Chery to clear the failure codes in the system;

When the engine is running at high speed, touching wheel train of engine and revolving parts are forbidden;

When the engine reaches normal operating temperature, both water temperature and pressure of cooling system are very high; therefore, in case maintenance for the cooling system of engine is required, perform corresponding operations only after the engine has stopped and the cooling system has been fully cooled.

When maintaining fuel system of engine, if maintenance for engine compartment is involved, perform the operations only after temperature inside engine compartment of the vehicle has adequately fell;

Under a state that power on of the system is normal, do not touch cooling fan of the engine by hand at any time, because the cooling fan may start up abruptly.

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Garantice su trabajo siguiendo las instrucciones de los fabricantes...