SQR7161A2H/SQR7201A2F
BODY DIMENSION & ACCESSORIES

TABLE OF CONTENTS

CHAPTER ONE: FRONT ACCESSORIES 3

CHAPTER TWO: TRUNK LID 10

CHAPTER THREE: DOOR 14

CHAPTER FOUR: INTERIOR TRIM 27

CHAPTER FIVE: SUN ROOF 33

CHAPTER SIX: INSTRUMENT PANEL 39

CHAPTER SEVEN: DISASSEMBLY MANUAL FOR EVAPORATOR 48

CHAPTER EIGHT: WINDSHIELD 54

CHAPTER NINE: BODY DIMENSION 63

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APPEARANCE VIEW:

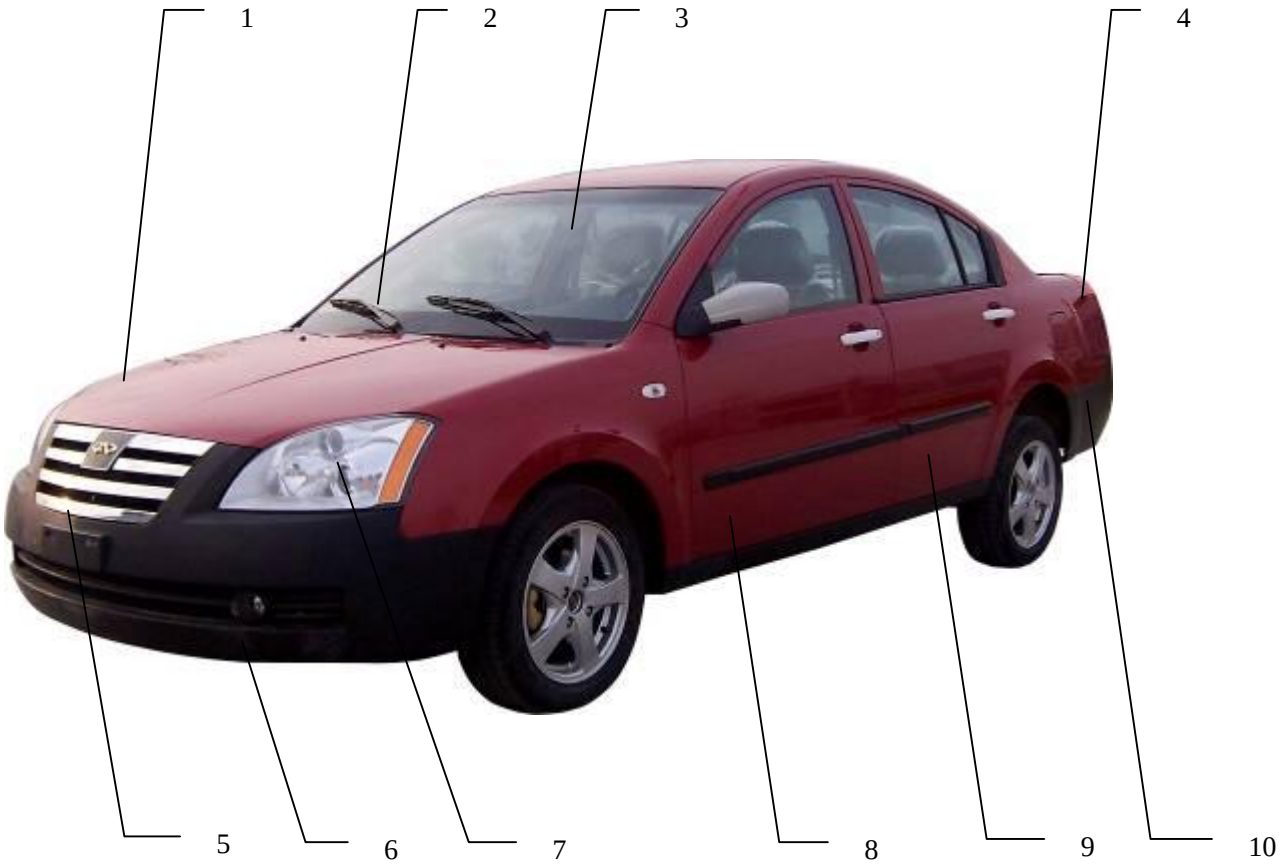


Figure 1

1. Engine Hood
2. Windscreen Wiper Arm
3. Front Windscreen
4. Tail Light Assembly
5. Air Inlet Grille Assembly
6. Front Bumper Assembly
7. Left Front Headlamp Assembly
8. Left Front Door
9. Right Front Door
10. Rear Bumper Assembly

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CHAPTER ONE FRONT ACCESSORIES

I. DISASSEMBLING THE ENGINE HOOD

1. Pry out the snap clips (7 total) with a screwdriver, and dismount the heat shield;



Figure 2

2. Loosen the washing hose, and then keep prying the spray nozzle clip to take out the spray nozzle from outside;



Figure 3

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

4. Adjusting the engine hood:

Replace the centering bolt with a washer accompanied bolt. (The centering bolt is the fixing bolt for the engine hood hinge, which must be replaced before adjusting the engine hood.)

Adjust the engine hood in front, back and vertical directions;

Unscrew the hinge bolts on the engine hood sides to adjust the engine hood.

Adjust the engine hood in vertical direction.

Turn the cushion to adjust the engine hood.



Figure 4

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II. DISASSEMBLING THE FRONT BUMPER

1. Remove the fastening screws on the air inlet grille to dismount the air inlet grille;



Figure 5

2. Remove the upper fastening bolts on the front bumper;



Figure 6

3. Remove the lower fastening bolts (each at left and right) and two bottom connecting bolts on the front bumper;



Figure 7

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4. Remove the screws with a club screwdriver, and pull out the lower fog light connecting plug to remove the front bumper.



Figure 8

III. DISASSEMBLING THE HEADLAMP:

1. To remove the headlamp, remove the four bolts and pull out the connecting harness;

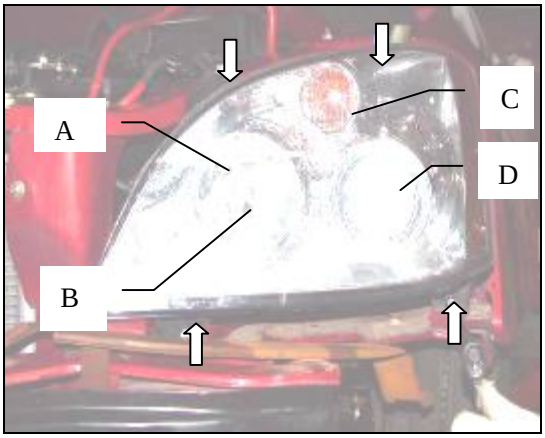


Figure 9

A Side Light: 12V 5W

B Headlamp Lower Beam: 12V 55W

C Turn Light: 12V 5W

D Headlamp High Beam: 12V 55W

2. Remove the lamp holder cover;



Figure 10

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3. Pull out the harness to back out the high beam bulb counter-clockwise;



Figure 11

4. Pull out the harness, open the circlip, and then back out the lower beam bulb counter-clockwise;



Figure 12

5. Pull out the side light directly;

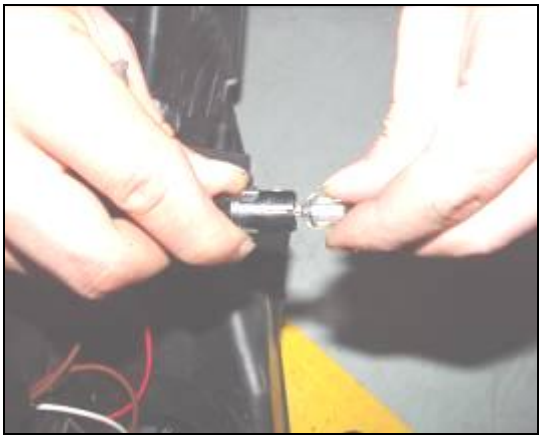


Figure 13

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6. Back out the turn light bulb counter-clockwise;



Figure 14

IV. DISASSEMBLING THE WIPER WASHING SYSTEM:

1. Remove the lower trim panel of the front windscreen;



Figure 15

2. To remove the wiper motor, unplug the electrical connector of the wiper motor and remove the fastening bolts;

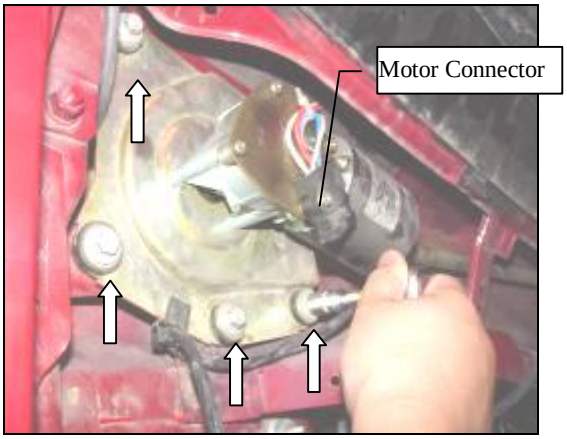


Figure 16

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3. To remove the wiper arm, remove the bolts;

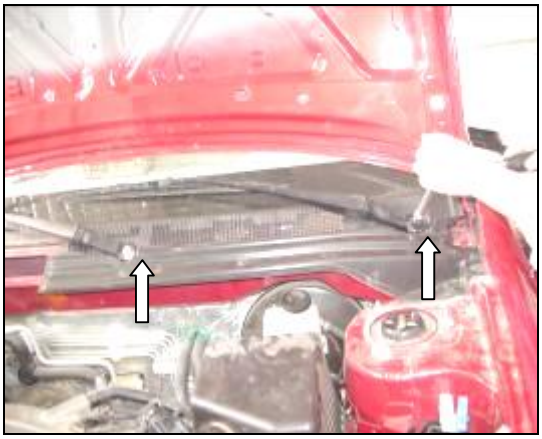


Figure 17

4. Remove the lower trim panel of the front windscreen;



Figure 18

5. To remove the wiper link, remove the bolts.

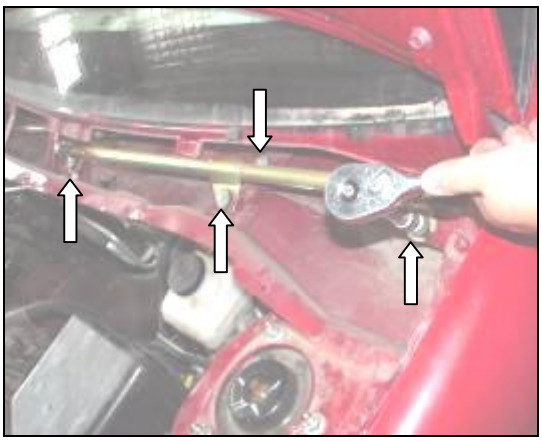


Figure 19

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6. Remove the bolts as shown;

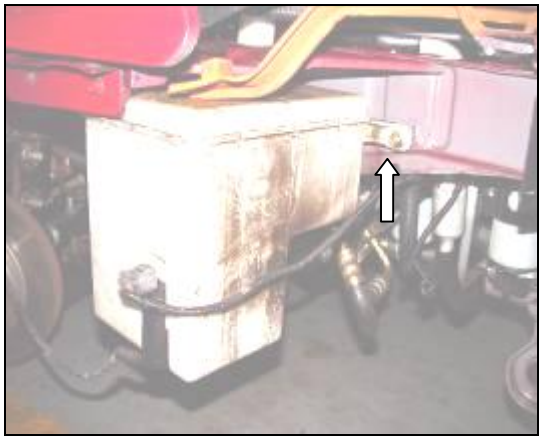


Figure 20

7. Then, remove the two bolts as shown to remove the washer fluid pot;

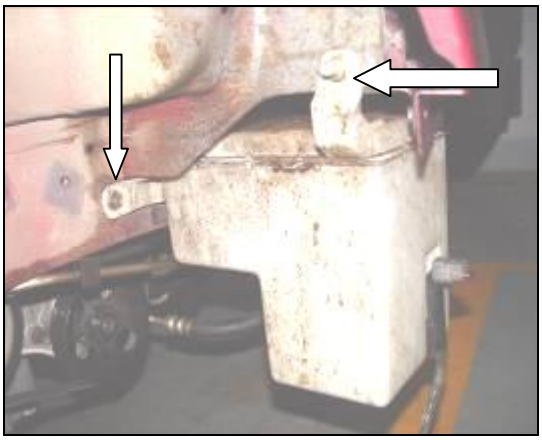


Figure 21

8. Remove the washer pump.



Figure 22

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V. DISASSEMBLING THE FENDER:

1. Remove the fastening bolts;

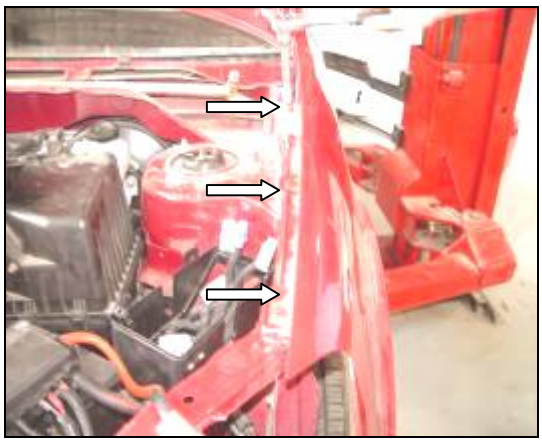


Figure 23

2. Remove the screws on the fender apron;

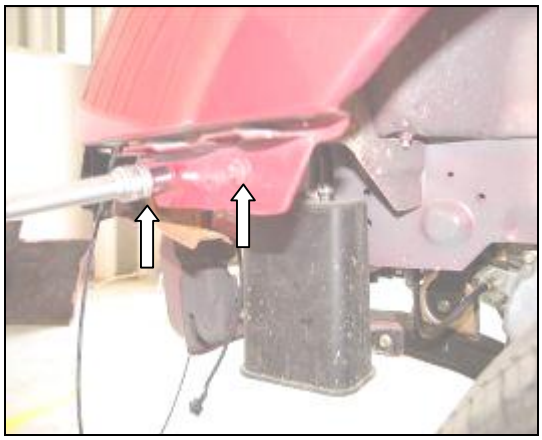


Figure 24

3. Move the trim panel, and remove the fastening bolts on the fender;



Figure 25

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Figure 26

4. Remove the bolts connecting the body from inside. (You can remove the tire when the operation space is too narrow).



Figure 27

VI. DISASSEMBLING THE ENGINE HOOD CONTROL CABLE:

1. Remove the left lower trim board of the instrument desk (see Disassembling the instrument desk)
2. Remove the lining of the left fender (see Disassembling the fender)
3. Remove the engine hood lock to loosen and take out the engine hood control cable



Figure 28

Assembly requirements: Adjust the front engine hood lock to make sure that the front engine hood peripheral clearance is uniform 9±1 mm with equal height at top and bottom.

The tightening torque of the front engine

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hood lock is 14±2N·m.

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CHAPTER TWO TRUNK LID

I. DISASSEMBLING THE LUGGAGE COMPARTMENT DOOR

1. Pry out the license plate light with a flat head screwdriver;



Figure 29

2. To pull out the harness from inside the luggage compartment, unplug the harness plug;



Figure 30

3. Detach the connecting link, and then unscrew the tightening screws of the lock actuator with a club screwdriver;



Figure 31

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4. To remove the luggage compartment lock, remove the bolts with a wrench;

Assembly requirements: Adjust the luggage compartment lock to make sure that the left and right clearance between the luggage compartment cover and the rear side enclosure is uniform 5±0.5 mm. The upper and lower height is basically uniform with a φ0.5 mm allowable deviation. The tightening torque for the lock striker is 9±1N·m.



Figure 32

5. Unscrew the bolts with a wrench, remove the luggage compartment lock, and then remove the latch;



Figure 33

6. Pry out the harness clip with a screwdriver;



Figure 34

7. Remove the four bolts (2 at left and right) to detach the luggage compartment door.

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II. DISASSEMBLING THE TAIL LIGHT ASSEMBLY

1. Remove the luggage compartment wheel house trim assembly and the floor mat;

Assembly requirements: The contact part of the carpet circumference and the luggage compartment weather strip should be wrapped into the lip of the weather strip with good matching. The contact part of the carpet circumference and the C pillar upper cover sheet should be placed inside the cover sheet. All parts should be installed in place and in perfect joint with the body. The luggage compartment carpet clip should be just placed into the room of the rear trim panel of the luggage compartment. The two sides of the carpet should be tightly stuck to the folds of the left/right trim of the luggage compartment wheel house and should be in perfect joint with the rear floor of the body after fitting.



Figure 35



Figure 36

2. Remove the tail light fixing bolts, pull out the harness, and then detach the tail light;

A Brake Lamp/Side Light Bulbs: 12V 21W/ 5W

B Turn, C Reversing, D Rear Fog Light Bulbs: 12V 21W

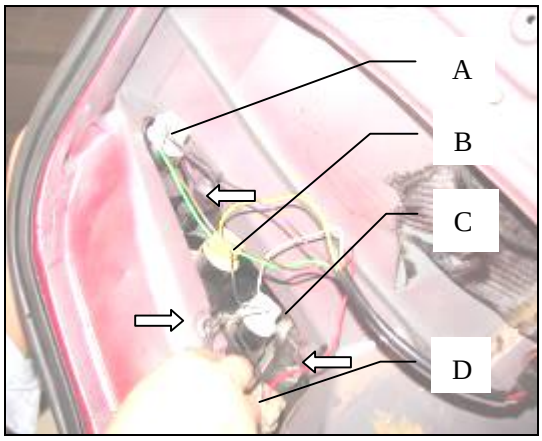


Figure 37

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III. DISASSEMBLING THE REAR BUMPER

1. Remove the three fastening screws to remove the rear cover of the trim panel;



Figure 38

2. Remove rear bump fastening screws and bolts to remove the rear cover of the trim panel;



Figure 39



Figure 40

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3. Remove the harness connector of the reversing radar to remove the rear bump.



Figure 41

IV. DISASSEMBLING THE WEATHER STRIP OF THE REAR LUGGAGE COMPARTMENT:

1. Disassemble the weather strip of the rear luggage compartment as shown in the right figure.
2. Note that the joint of the luggage compartment weather strip should be placed at the place where the luggage compartment lock locates. Every corner should be fitted in place and no folds are allowed. The hardness of the weather strip should be proper without great variation as the temperature changes.



Figure 42

V. REMOVING THE SPARE TIRE:

Lift the luggage compartment floor mat up to take out the spare tire;



Figure 43

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CHAPTER THREE DOOR

I. DISASSEMBLING THE LEFT FRONT DOOR

1. Remove the trim strip from the left front door;



Figure 44

2. Remove the outside weather strip from the left front door;



Figure 45

3. Remove the set screw. Pull out the harness and then remove the outside rear view mirror after detaches the door trim panel;



Figure 46

Assembly requirements: Make sure that the clearance between the rear view mirror rand and the door outside trim panel is uniform when fitting. The tightening torque for the screw is 5 ± 0.5N • m. The rear view mirror could be freely, flexibly and reliably adjusted after installation. The plug in unit of the rear view mirror should be fixed inside of the door trim panel.

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4. Unscrew the set screw on inside door handle to detach the bezel for the inside door handle;



Figure 47

5. Remove the screws and take out the arm rest cover. Pry out the window regulator switch and pull out the harness;



Figure 48

6. Remove the fixing bolts on the left front door trim panel (in figure 49 and 50) to detach the door trim panel.

Assembly requirements: Measures should be taken to prevent blurring the working area for cleaning when disassembling and installing. It is of great importance to keep clean during these jobs. The fit clearance between the door trim panel and the inner door panel should be uniform.



Figure 49

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Figure 50

7. Remove the protective film from the left front door;



Figure 51

8. Remove the set screw of inside door handle to loosen the inside control cable and the inner retention cable;

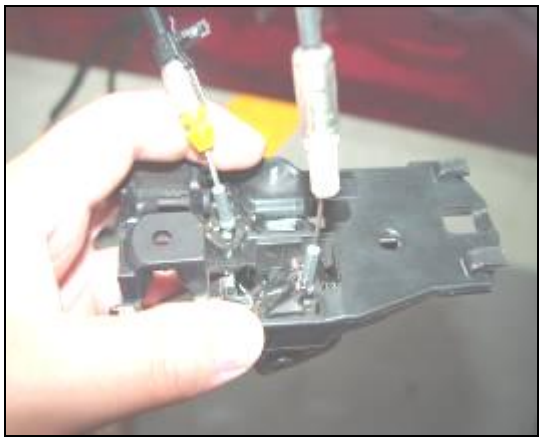


Figure 52

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9. Disassemble the set screws, pull out the harness, and then detach the speaker;

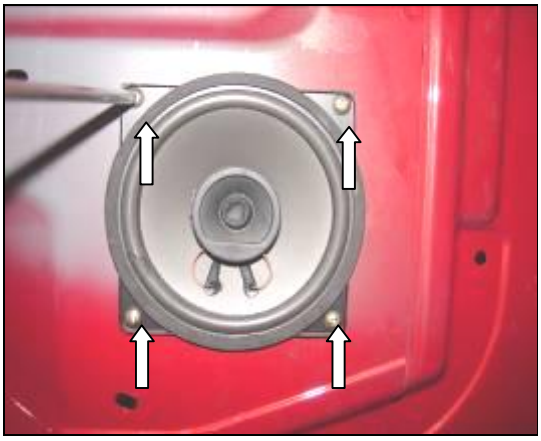


Figure 53

10. Unscrew the fixing bolts from the trim panel bracket and then dismount it;

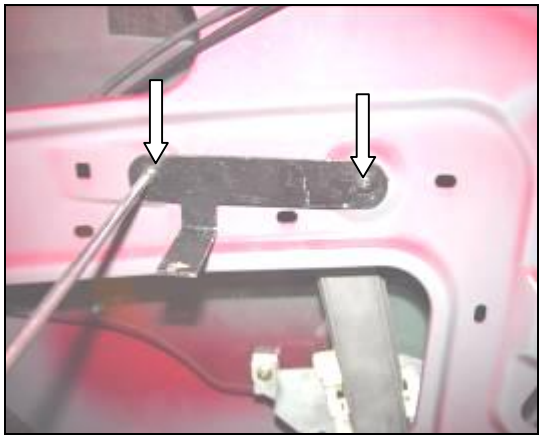


Figure 54

11. Lower the glass to a proper position, remove the fixing bolts, move the glass to the bottom of door, and then take out the glass slantways.

Assembly requirements: The glass should has a uniform upper and lower & left and right clearances to ensure an good fitting with the peripheral rubber strip. The sealing of the glass should be good without any leakage during the rain test.



Figure 55

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12. Unscrew the seven fixing nuts on the inner door panel;

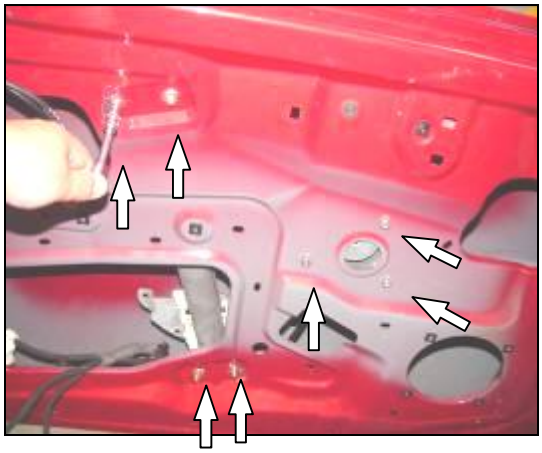


Figure 56

13. Take out the window regulator assembly;

Assembly requirements: M, the torque of the fixing bolt or nut should be 7±1 N •m. Make sure that the glass could rise and fall smoothly and easily without any swinging, flapping and shocking after installation and adjustment. Electric requirement: Time of rise/fall not more than 5s.



Figure 57

14. Unscrew the fastening screws from the left front door rear glass guide rail;



Figure 58

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15. Take out the rear guide rail of the glass from inside the door;

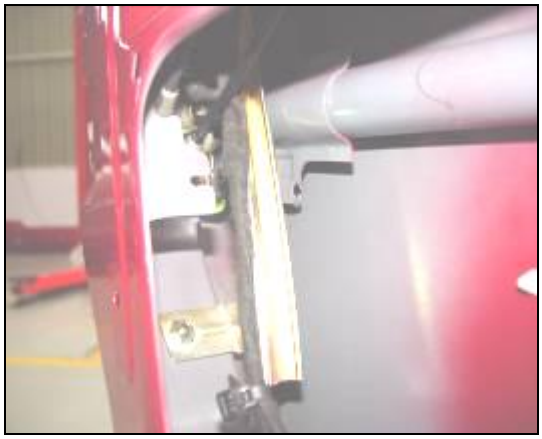


Figure 59

16. Unscrew the fastening bolts from the lock with an internal spline wrench;



Figure 60

17. Loosen the latch rod and opening out push rod of latch of the left front door to take out the lock;

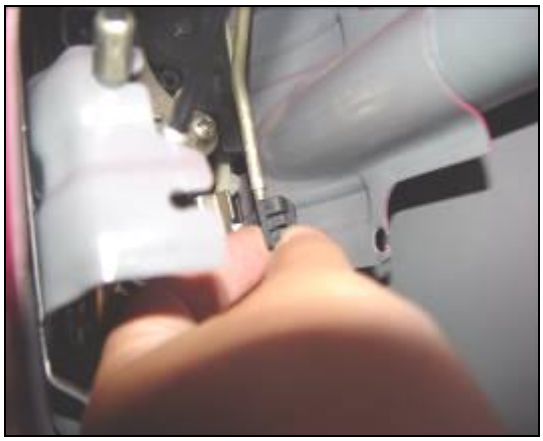


Figure 61

Assembly requirements: Lock sealant should be applied at the middle of the fixing bolts of the side door lock. The tightening torque for the bolt is 9±1N·m. The tightening torque for the inside door handle assembly screw is 1.5±0.15N·m while the value for the bolts of the outside door handle assembly is 9±1N·m. The side door should fit tightly with its handle with reliable sealing. Be sure to position the fastener (the tightening torque of which is 23±2N·m) in the center of the latch mechanism and the lock could open and close easily.

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18. The latch mechanism is as shown in the figure:

A: Locking cable

B: Opening out control cable

C: Link the opening out push rod

D: Link the latch pull rod

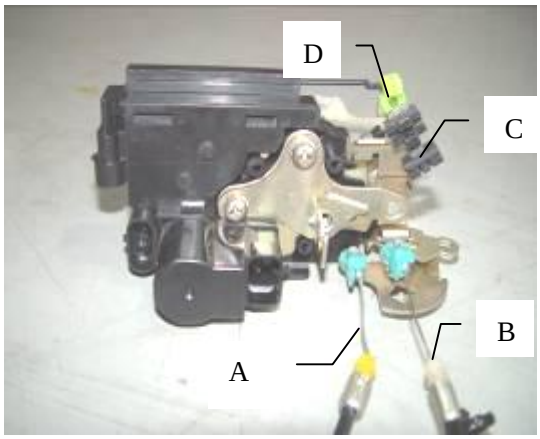


Figure 62

19. Unscrew the door handle bolt 1;

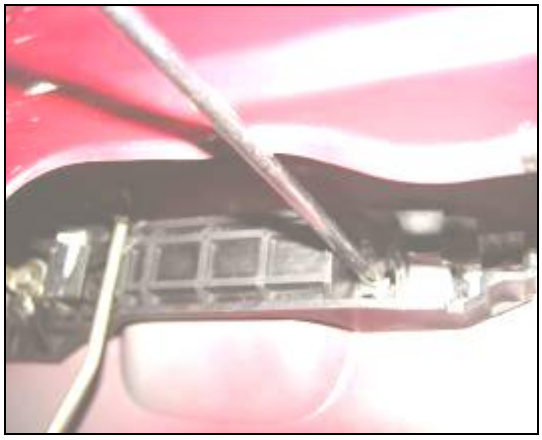


Figure 63

20. Unscrew the bolt 2;



Figure 64

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21. Take out the door handle;

A: Latch pull rod

B: Opening out push rod

C: Latch (could be replaced directly on the vehicle)

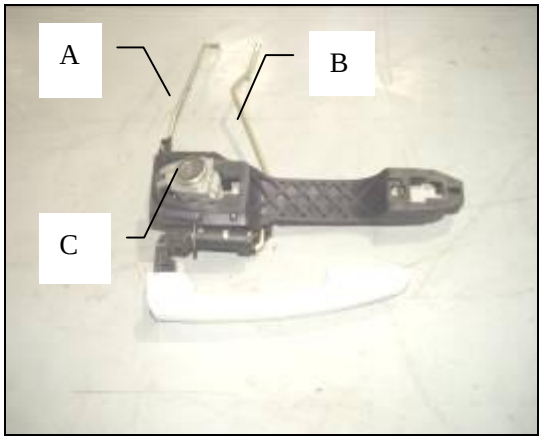


Figure 65

22. Remove the door check;

Assembly requirements: The tightening torque for the bolt is 7.2±0.7N·m and the value is 25±3 N·m while mounted on the door pillar and 9±1 N·m while mounted on the door. The door check should work easily, reliable without being hit and stuck. Grease should be applied into the room between the pull rod and the slider of the door check.

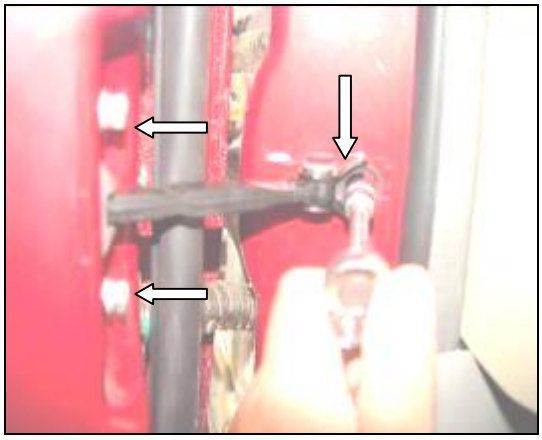


Figure 66

23. Remove the weather strip from the door opening;

During installation, every corner should be fitted in place and no folds are allowed. The joint of weather strip should be placed in the lower middle of the door opening. The weather strip should have a proper rigidity and should not interfere with the opening and closing of the door after the lock and hinge have been adjusted to the operating mode. The hardness of the weather strip should be proper without great variation with the temperature changes. The surface of the assembled rubber strip should not have any defects such as hammering imprint, deformation and warp etc.



Figure 67

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24. Remove the glass run;



Figure 68

25. The inner harness of the door could be taken out from outside;



Figure 69

II. DISASSEMBLING THE REAR DOOR

See left front door for considerations during disassembling the parts

1. Remove the trim strip from the left rear door;



Figure 70

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2. Unscrew the screws to detach the inner and outer trim panels of the triangle glass;

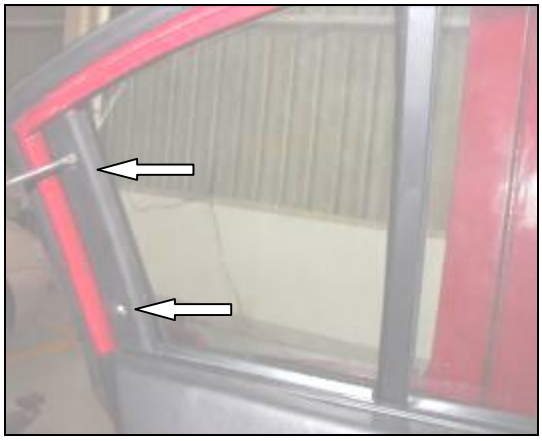


Figure 71

3. Unscrew the screw to detach the bezel for the inside door handle;



Figure 72

4. Unscrew the screw to detach the arm rest cover;



Figure 73

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5. Pry out the window regulator switch to pull out the harness;



Figure 74

6. The door trim panel could be removed;



Figure 75

7. Remove the protective film from the left rear door;



Figure 76

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8. Unscrew the fastening screw for the inside door handle to detach the handle;



Figure 77

9. Remove the fixing bolts from the trim panel bracket;



Figure 78

10. Lower the glass to a proper position, remove the set screws, move the glass to the bottom of the door, and then take out the glass slantways;



Figure 79

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11. Remove the fastening screws for the glass guide rail;



Figure 80

12. Remove the top screws to detach the glass rear guide rail and the triangle glass;



Figure 81

13. Remove the top fastening bolts from the window regulator;

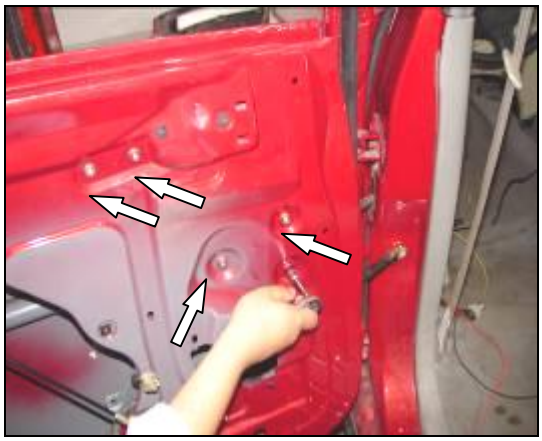


Figure 82

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14. Remove the lower bolts from the window regulator;



Figure 83

15. Remove the lock fastening screws with an internal spline socket;



Figure 84

16. Loosen the opening out pull rod from the door handle, pull out the harness, and then detach the lock;



Figure 85

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17. Remove the door handle bolt 1;



Figure 86

18. Remove the door handle bolt 2 to take out the handle;



Figure 87

18. Remove the door check;

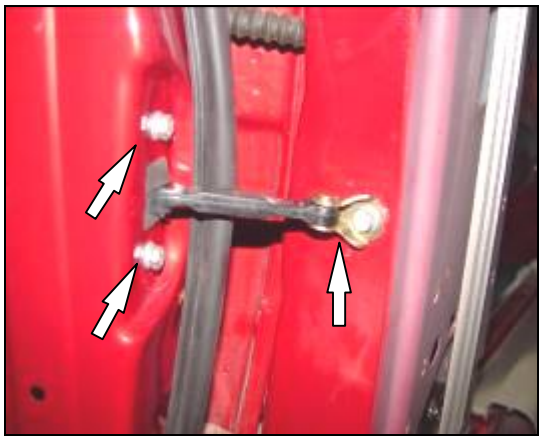


Figure 88

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19. Remove the weather strip from the door opening;



Figure 89

20. Pull out the inner harness of the door from outside;

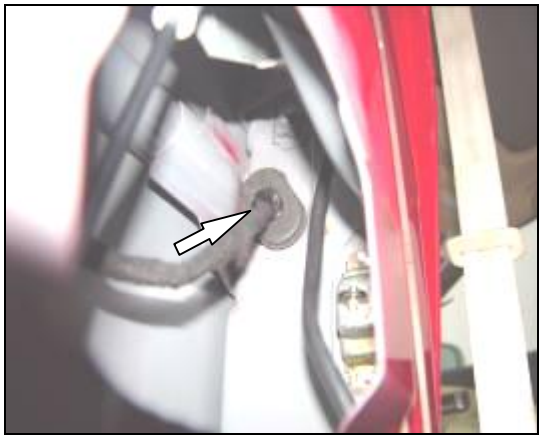


Figure 90

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ADJUSTING THE DOOR

I. ADJUSTING THE FRONT DOOR

Adjust the front door in front, back and vertical directions:

Unscrew the body hinge bolts to adjust the door with special tools for maintenance.

Adjust the door in left, right and vertical directions:

Unscrew the side hinge bolts for the door to adjust the door.



Figure 91

REPLACING THE DOOR HINGE

Remove the fender, support the door to unscrew the four fixing bolts from the upper and lower hinges, and then remove the hinges.

II. ADJUSTING THE REAR DOOR

Adjust the rear door in front, back and vertical directions:

Unscrew the body hinge bolts to adjust the door with special tools for maintenance.

Adjust the door in left, right and vertical directions:

Unscrew the side hinge bolts for the door to adjust the door.



Figure 92

REPLACING THE DOOR HINGE

Unscrew the door check bolts, support the door to unscrew the four fixing bolts from the upper and lower hinges, and then remove the hinges.

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CHAPTER FOUR: DISASSEMBLING THE INTERIOR TRIM

1. Remove the A-pillar trim panel;

Assembly requirement: the metal clips of the pillar trim panel should be installed in place without any looseness. The trim panel should be in good fitting with the roof and the weather strip.



Figure 93

2. Disassemble the scuff plate of the front door;



Figure 94

3. Disassemble the pedal pad for the left foot;



Figure 95

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4. Remove the cover, and then unscrew the fastening screws of the seat belt;



Figure 96

5. Remove the lower trim panel for B pillar;



Figure 97

6. Remove the fixing bolts for the seat belt;



Figure 98

Assembly requirements: The installation angle of the left/right front seat belt retractor assembly is 80°. The tightening torque for the catch bolt is 50±5N•m. The tightening torque for the fixing bolt of the slider track assembly is 50±5N•m. The tightening torque for the fixing bolt of the guide ring is 50±5N•m. The support for guiding should be fixed reliably with the tightening torque for the screw of which is 1.5±0.5 N•m. The tightening torque for the fixing bolt of the end piece is 50±5N•m. The lock striker assembly should be reliably positioned on the special

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bolts of the front row seats seat belts and make sure that the latch of the seat belts could be operated easily and the tightening torque for the fixing nuts is 50±5 N•m. (uniform thread fastening glue should be applied to all fasteners of this assembly before installing) The belts could extend and shrink easily and could not slack after the latch is fastened with the lock striker. The installation angle of the left/right rear seat belt retractor assembly is 90°. The tightening torque for all fasteners of this assembly is 50±5N•m and the fasteners should be applied with the thread fastening glue before installing. The belts could extend and shrink easily and could not slack after the latch is fastened with the lock striker. The catch bolts of the middle seat belt should be applied with thread fastening glue and the tightening torque of which is 50±5N•m. The lock screw of the double end clip ring should be applied with thread fastening glue and the tightening torque of which is 50±10N•m;

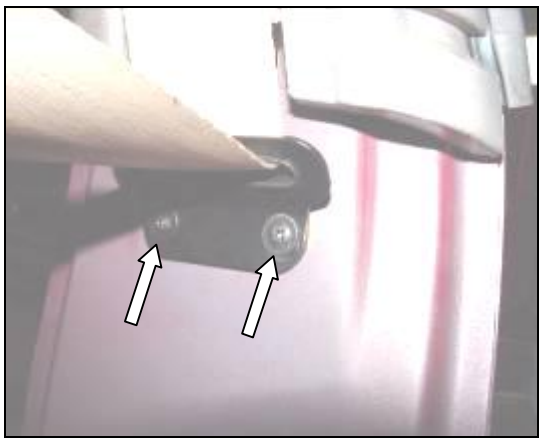


Figure 99

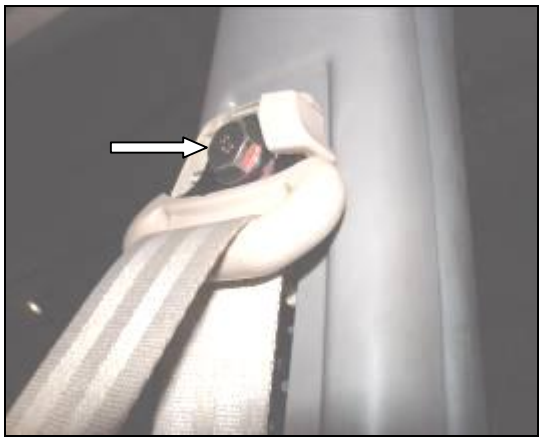


Figure 100

7. Remove the upper trim panel for B pillar;



Figure 101

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8. Remove the two bolts and slider track;



Figure 102

9. Remove the weather strip;



Figure 103

10. The inner harness connector on the left rear door as shown;

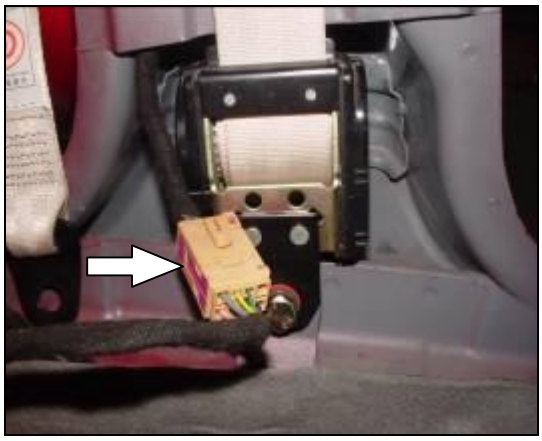


Figure 104

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11. From here outwards to pull out the harness;



Figure 105

12. Remove C pillar trim panel;



Figure 106

13. Remove the weather strip from the left rear door;



Figure 107

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14. Disassembling the passenger grab handle: lift the trim cover and unscrew the two set screws to detach the handle:



Figure 108

15. Disassembling the sun visor: unscrew the fastening bolts;

Assembly requirement: The tightening force for the screw should be proper and make sure that the sun visor could work normally without any looseness. The sun visor could move freely when working normally without any noise and being stuck.



Figure 109

16. Remove the fixing base;

Assembly requirement: The fixing base could seize the sun visor properly so as to prevent the sun visor from breaking away when being used.

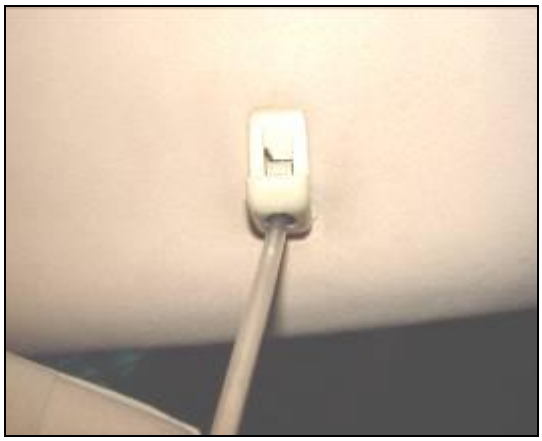


Figure 110

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17. Pry out the vanity mirror to replace the bulb in the right sun visor with a flat head screwdriver;



Figure 111

18. Pry out the lamp house, remove the screws, pull out the harness, and then detach the indoor front ceiling light;



Figure 112

19. Pry out the indoor rear ceiling light;



Figure 113

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20. Pry out the lamp house to replace the bulb;

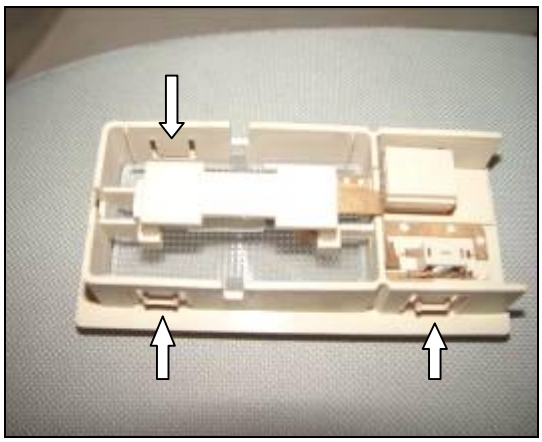


Figure 114

21. Pry out the snap clip to detach the roof;

Assembly requirements: The front end height of the roof should not interfere with the installation of the front windscreen. The front end roof corner should not be seen outside the car with a visual angle along the level direction the same height with the roof. The roof edge should be in good fitting with the weather strip of the door opening and the luggage compartment and exposure of the roof corner and non-tight edge holding down are not allowed. The roof corners are not allowed to raise outside and depress so as to prevent the weather strip layer from non-flat fitting. The roof edges should be in good fitting with the arcs of the upper trim panel of A, B, and C pillars with a fit clearance less than 0.2 mm.

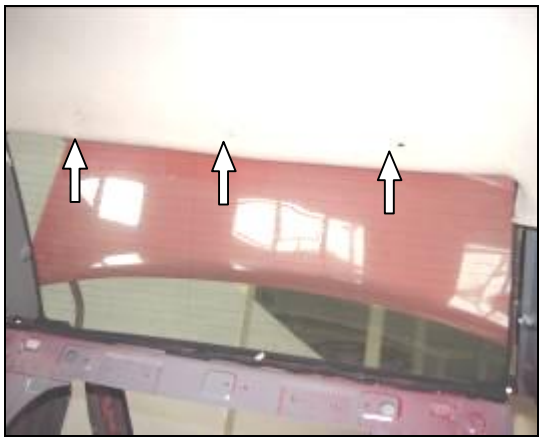


Figure 115

22. Remove the fastening bolts (9 bolts) to detach the sun roof assembly.

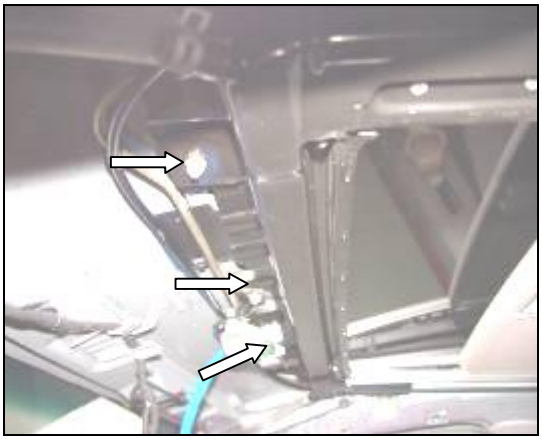
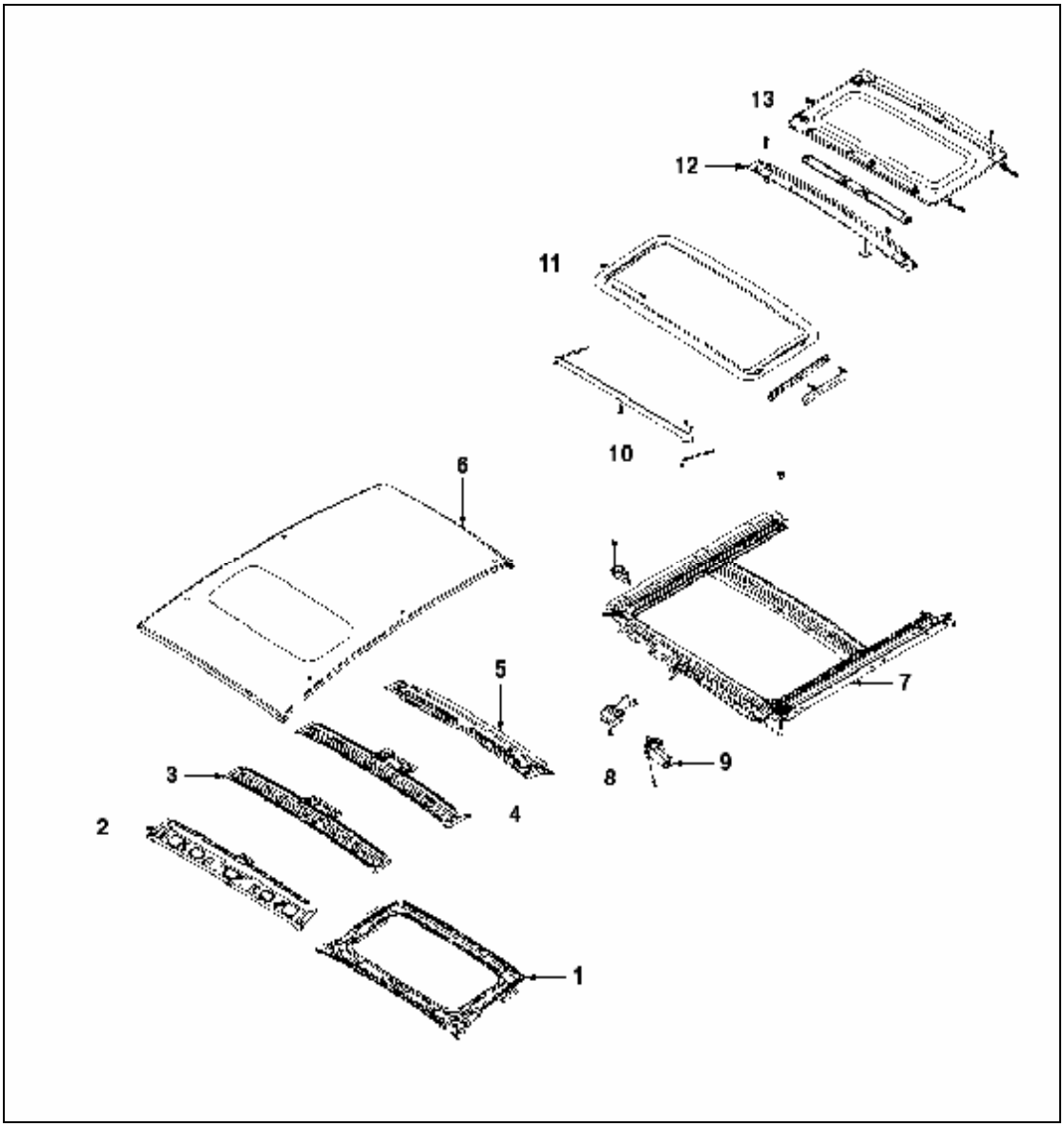


Figure 116

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CHAPTER FIVE DISASSEMBLING AND INSTALLATING THE SUN ROOF

1. STRUCTURAL DIAGRAM



1）Sun roof frame
2）Windshield frame
3）Sun roof central bracket
4）Sun roof back bracket
5）Rear roof frame
6）Car lining
7）Sun roof track
8）Sun roof module
9）Sun roof motor
10）Sun roof deflector
11）Sun roof glass
12）Guiding gutter
13）Sun visor

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2. NECESSARY TOOLS

Cross screwdriver, internal spline wrench, ratchet gear and ratchet rod



3. REPLACING THE SUN ROOF GLASS

3.1 Disassembling the sun roof glass

1) Turn on the power switch to lift up the sun roof in full tilt.

2) Push the inner trim strip (SIDE COVER INNER LH/RH) backwards to make it off.



3) Slowly unscrew the four screws and bolts fixing the glass.(Be sure not to make the glass off)



4) Simply take off the glass

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3.2 Installing the sun roof glass

1) Turn on the power switch to operate the sliding mechanism without glass to the full open position, and then place the glass in the middle of the support bar of the sliding mechanism.



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2) Reinforce slightly with four bolts. And then pull the glass forward lightly to reinforce other bolts slightly from the middle one by one.



3) Turn on the power switch to operate the sun roof to the full close position.

4) Began to adjust the four glass fastening screws while pulling the glass slightly forward.



5) Turn on the power switch to test if the on/off operation of the sun roof is normal. (Note: check and adjust the height/start-up noise/collision of the glass)

6) Turn on the power supply switch to lift up the glass to the full open position again, and then stick the inner trim strip to the support bar of the sliding mechanism.

7) Test the on/off operation, starting and running operation as well as the noise of the sun roof after installation to make sure that no abnormal condition existing.

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4. REPLACING THE SUN VISOR

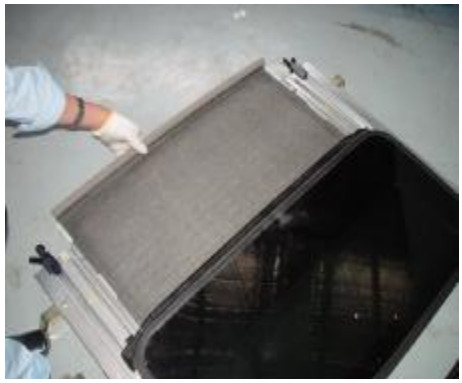
4.1 Disassembling the sun visor

1) Remove the roof. (See the disassembling methods in Body Accessories for detailed disassembling procedures.)

2) Remove the locating clip as shown in the figure. (Each at left and right)



3) Draw out the sun visor backwards.



4.2 Installation

The installing steps are reverse to those for removal.

5. REPLACING THE SUN ROOF MOTOR

5.1 Disassembling the sun roof motor

1) Turn on the power to run the sun roof to the full close position before disassembling. (i.e. the initial position of the sun roof)

2) Remove the roof interior trim/ceiling light. (See Service Manual for the Body Accessories for detailed disassembling methods.)

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3) Disconnect the power supply control line and the connecting wire between the motor and the sun roof control unit (SCU), and then cut off the band fixing the motor harness.



4) Remove the fixing bolts of the sun roof motor to detach the sun roof motor.



5.2 Installing the sun roof motor

The installing steps are reverse to those for removal.

6. REPLACING THE SUN ROOF CONTROL MODULE

6.1 Disassembling the sun roof control module

1) Turn on the power to run the sun roof to the full close position before disassembling. (i.e. the initial position of the sun roof)

2) Remove the roof interior trim/ceiling light. (See Service Manual for the Body Accessories for detailed disassembling methods.)

3) Disconnect the power supply control line and the connecting wire between the motor and the sun roof control unit

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(SCU).

4) Remove the connecting screws that attach the module to the roof to detach the sun roof module.

6.2 Installing the sun roof control module

The installing steps are reverse to those for removal.

7. DETECTING AND MAINTENANCE METHODS FOR FAILURES

Water leakage	Distribution pipe blocks or folds	Check the distribution pipe
	The distance between the sun roof glass and the roof hole is too big or the height of the glass is incorrect	Adjust the relative position of the glass
Wind noise	The distance between the sun roof glass and the roof hole is too big or the height of the glass is incorrect or the spoiler fails to work	Adjust the relative incorrect position of the glass
Abnormal starting and running	Connecting, fuse and ground wire incorrect	Check the connection, fuse and ground wire
	SCU, sun roof motor incorrect	Check and replace the SCU and sun roof motor
	Sun visor runs off the slide rail or trim strip breaks	Re-adjust the sun visor and install or replace the trim strip
	Foreign material on the slide rail	Inspect and clear the foreign material
Starting in error	The sun visor runs off the slide rail or the broken trim strip rubs the slide rail	Adjust and install the sun visor again and re-install the trim strip (also replace the broken parts)
	Anti stick (A.T.S.) function fails to work normally	Check for collision between the body and the spoiler, relax the stressed spring, inspect and clear the foreign material on the slide rail
	The sun roof motor incorrect	Replace the motor
Noise during staring and running	The sun visor runs off the slide rail or the broken trim strip hinders the running	Adjust and install the sun visor again and re-install the trim strip (also replace the broken parts)
	Distribution pipe collides with the body	Adhere the sponge buffer to around the distribution pipe
	Collision between the roof cover and the sun roof frame	Apply glass cement or plastic glue in the middle of the roof cover and the sun roof bracket
	The distance between the sun roof glass and	Re-adjust the height between the

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	the roof hole is too big or the height of the glass is incorrect	glasses and their relative positions

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8. TROUBLESHOOTING WHEN THE SUN ROOF IS OUT OF CONTROL

1) The sun roof module could not control the sun roof's status

   a) The full open function key fails to work, or pressing the power switch (One Touch) could not run the unit.

   b) The sun roof could not be opened, or could not be fully closed and opened.

2) Analysis for the basic reasons

   a) This occurs after replacing the battery when the sun roof is not at its initial position.

   b) After the sun roof module is powered on and its plug is pulled out when the sun roof is running.

   c) The sun roof unit controller could not restore to its normal position.

   d) The power supply plug of the sun roof is pulled out when the sun roof is running.

3) Troubleshooting: Restart the sun roof module to restore its initial memory

   a) Run the sun roof glass to the full tilt position and then keep pressing the tilt button continually over 15 seconds to restore.

   b) Make sure that when the full open function key could normally start, the SCU controller could also normally start and restore its initial position.

9. DETAILED SOLUTIONS FOR THE PROBLEMS

9.1 The sun roof loses its initial position:

Definition: When the sun roof could not be opened or closed normally or closed to the normal position as well as the sun roof could not perform its original movement course. When the failure of sun roof is like this, its movement procedure of it will become disorder.

See "**8. Troubleshooting when the sun roof is out of control**" for analyzing, detecting and disposal methods

9.2 The sun roof assembly leaks water:

Definition: Whenever water is present in the interior trim of the vehicle.

Analyze and detect: Check the clearance between the sun roof glass and the roof hole, and check the status of flow guiding water pipe and the water guiding system.

Solutions: 1. Refer to the procedures in "**replacing the sun roof glass**" to re-install the sun roof glass and make sure the clearance between the sun roof glass and the roof hole is in its normal range.

2. Re-adjust the connecting status of the four distribution pipes to make sure they are water-tight.

3. Check the water guiding system for damages and replace it.

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9.3 The sun roof produces abnormal sounds:

Definition: Whenever the sun roof produces abnormal sounds when running.

Analyze and detect: Check the sun roof for misalignment produced by the manual assembly and the clearance between the glass and the roof hole, check if the sun roof motor produces abnormal sounds, check if the mouldings damage and rub the rail, and then determine the reasons producing abnormal sounds.

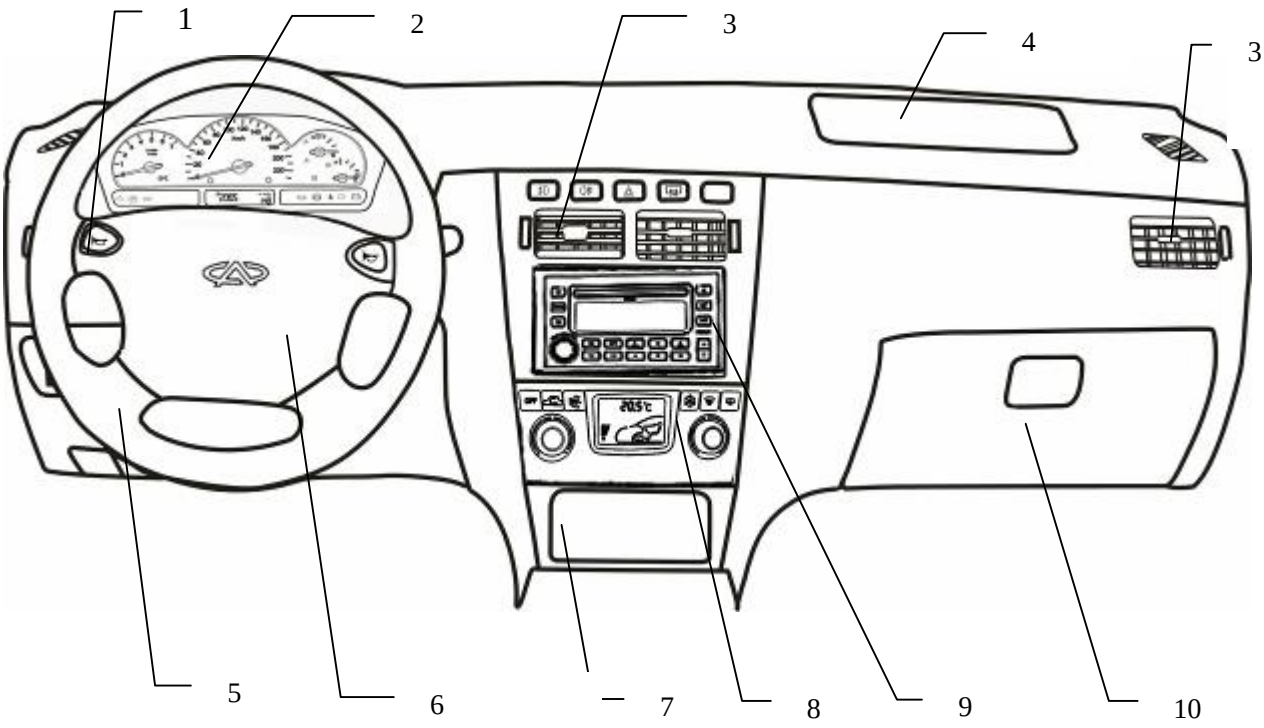
Solutions: 1. Refer to the procedures in "**replacing the sun roof glass**" to re-install the sun roof glass and make sure the clearance between the sun roof glass and the roof hole is in its normal range.

2. Replacing the motor producing abnormal sounds.

3. Replacing with new mouldings.

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CHAPTER SIX INSTRUMENT PANEL



1. Horn Switch
2. Combination Instrument
3. Vent of Air Conditioning
4. Air Bag for Front Passenger Side
5. Steering Wheel Assembly
6. Air Bag Assembly
7. Ashtray
8. Air Conditioner Control Panel
9. CD Player Assembly
10. Glove Box Assembly

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1. Remove the instrument mask;

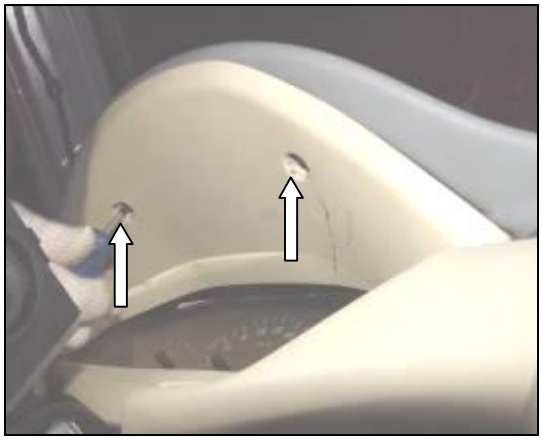


Figure 117

2. Remove the bolts as shown to remove the instrument;

Note: Clearing method for the instrument maintenance indicator lamp

① Turn off the ignition switch;

② Press down and hold the Mode switch, turn on the ignition switch, and release the Mode switch, touch the Mode switch and the Clock switch simultaneously in 30 seconds with a touch time less than 2 seconds to clear the mileages maintenance identification.

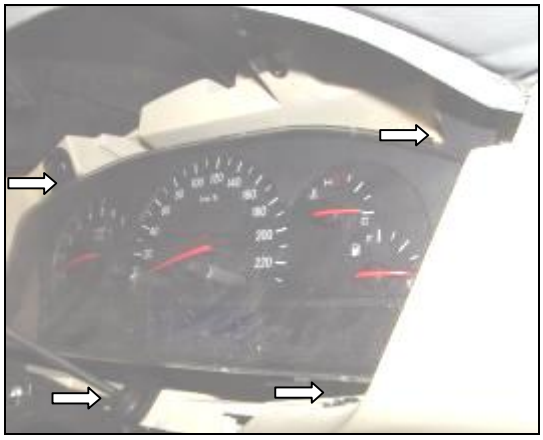


Figure 118

3. Unscrew the fastening screws (each at left and right) to remove the steering wheel cover;



Figure 119

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4. Unscrew the fastening screw to remove the steering switch. Remove the wiper switch with the same method;

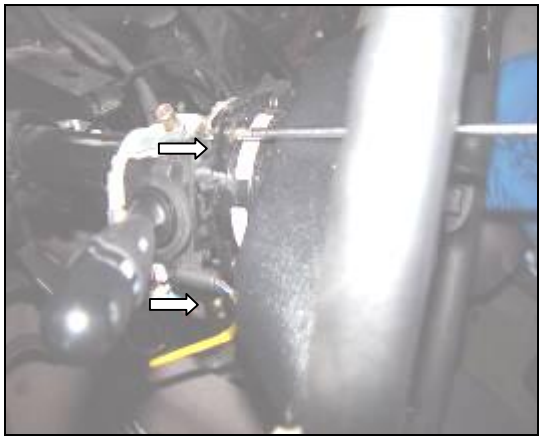


Figure 120

5. Unscrew the fastening bolts with internal spline to remove the air bag assembly;



Figure 121

6. Unplug the spiral cable connector; remove the steering wheel to take out the spiral cable;

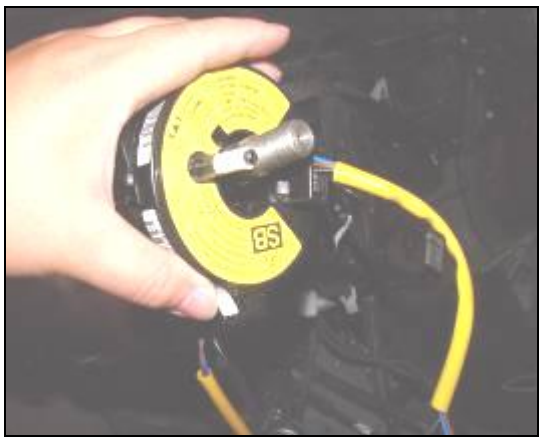


Figure 122

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7. Remove the right blanking cover assembly;



Figure 123

8. Remove the left lower trim panel assembly of the instrument panel;



Figure 124

9. Remove the glove box assembly;

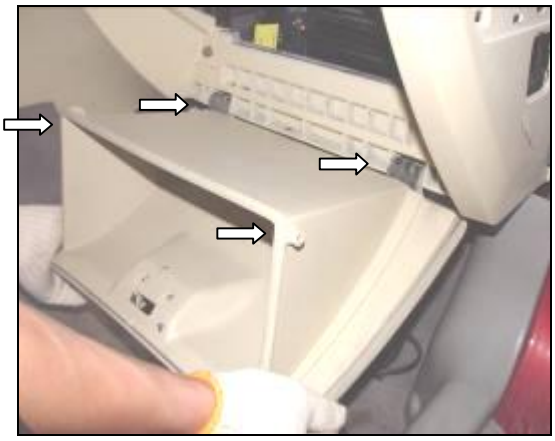


Figure 125

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10. Remove the trim strip;



Figure 126

11. Unscrew the fixing bolts;



Figure 127

12. Remove the bezel of the central control panel;



Figure 128

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13. Remove the fastening bolts, take out the CD player, and then pull out the harness;



Figure 129

14. Remove the fastening screw, take out the air conditioner control panel, and then pull out the harness;



Figure 130

15. Unscrew the fastening screw to take out the ashtray assembly;



Figure 131

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16. Remove the fastening screws and bolts as shown;

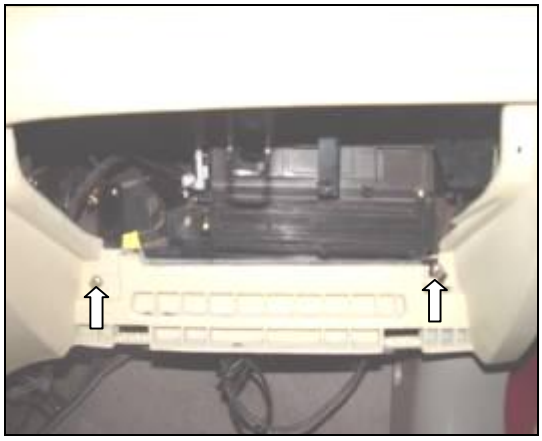


Figure 132

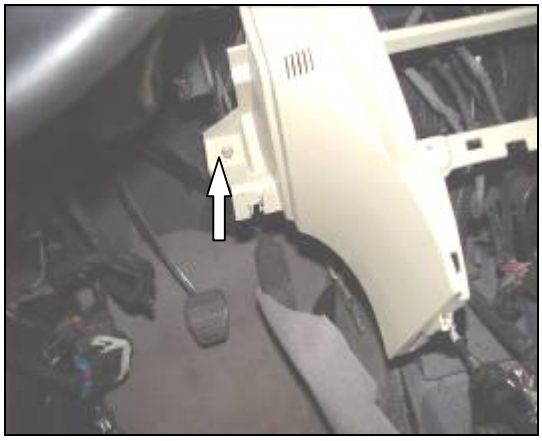


Figure 133

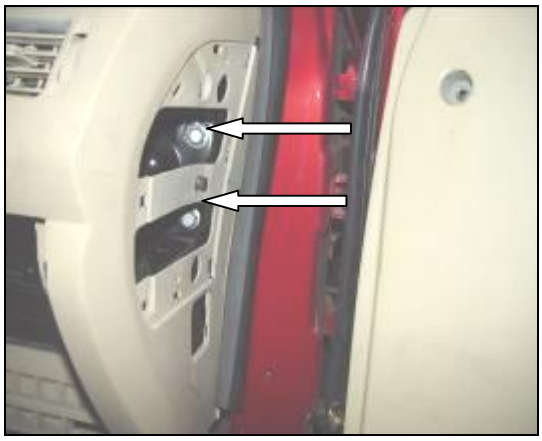


Figure 134

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17. Remove the bolts as shown to remove the instrument panel;



Figure 135

18. Unscrew the fastening bolts as shown;



Figure 136

19. Remove the fixing bolts at two sides to remove the beam;



Figure 137

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20. Remove the front ISU module as shown;



Figure 138

21. Let out the refrigerant, remove the fastening bolts on the expansion valve with an internal hexagonal socket to remove the expansion valve. Remove the two clamps with pliers to remove the water pipe. (Note: receive the coolant);

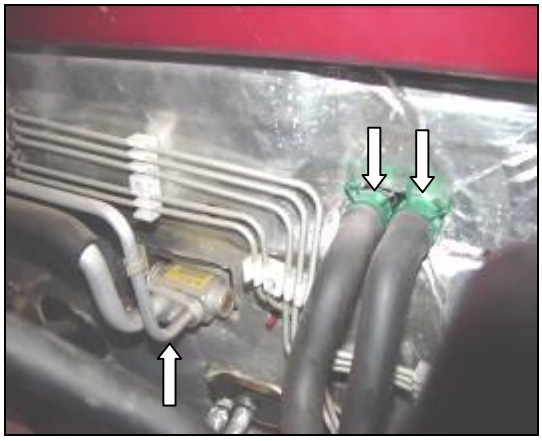


Figure 139

22. Remove the air outlet unit;



Figure 140

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23. Detach the evaporator assembly after removes the fastening bolts and the ground wire;

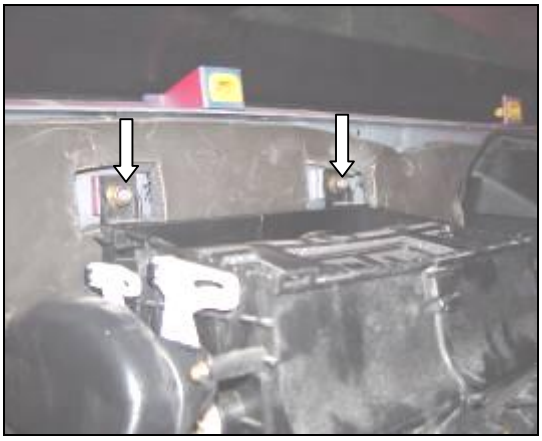


Figure 141



Figure 142



Figure 143

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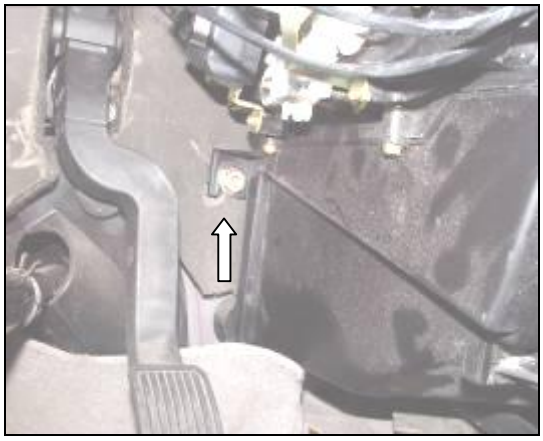


Figure 144

24. Detach the evaporator assembly after removes the fastening bolts and the ground wire;

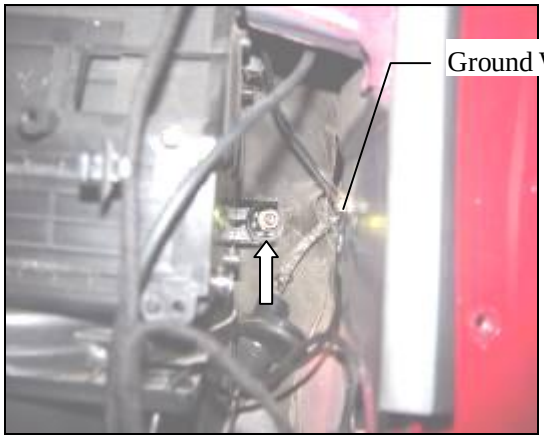


Figure 145

25. Remove the engine compartment shock pad.



Figure 146

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CHAPTER SEVEN DISASSEMBLING AND INSTALLING THE EVAPORATOR

1. Appearance view of A21 evaporator



2. Necessary tools for disassembling

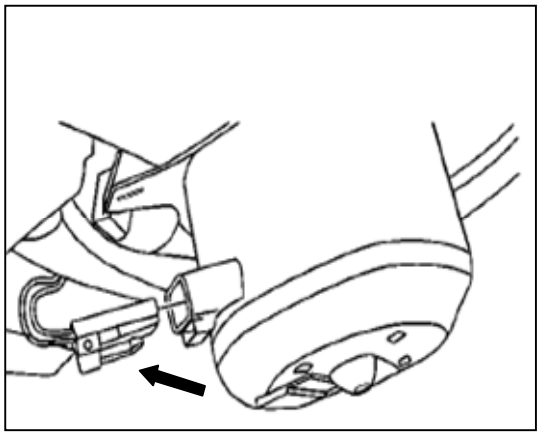
Cross screwdriver, vice, flat screwdriver, 8# socket, ratchet gear and ratchet rod.

3. Disassembling and installing the evaporator

3.1 Replacing the blower

3.1.1 Disassembling the blower

1) Disconnect the wire connector of the blower motor

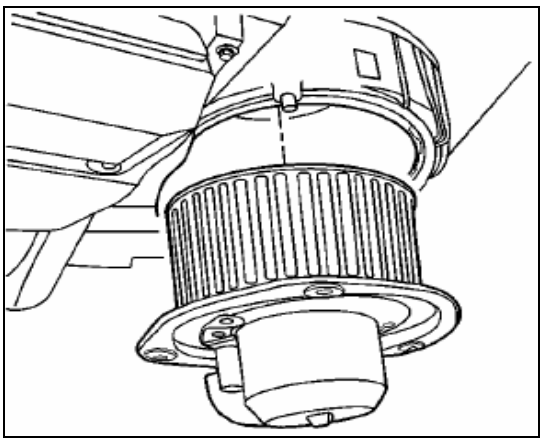


2) Remove the mounting bolts for the blower motor



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3) Pull out the blower.



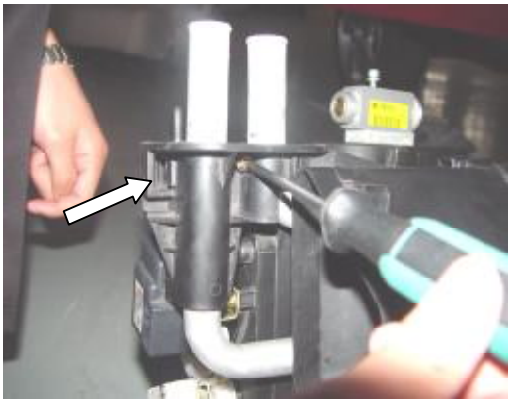
3.1.2 Installation

The installing steps are reverse to those for removal.

3.2 Replacing the heater water tank

3.2.1 Disassembling the heater water tank

1) Remove the bolts and clips as shown in the figure.



2) Pull out the heater water tank.



3.2.2 Installation procedures

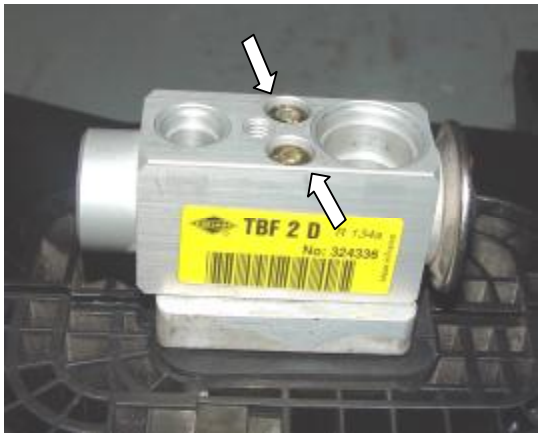
The installing steps are reverse to those for removal.

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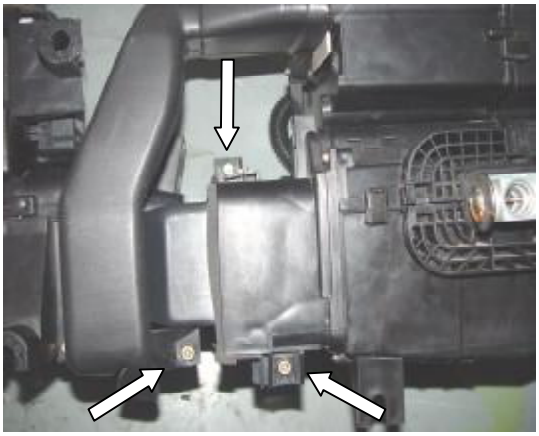
3.3 Replacing the evaporator core assembly

3.3.1 Disassembling the evaporator core assembly

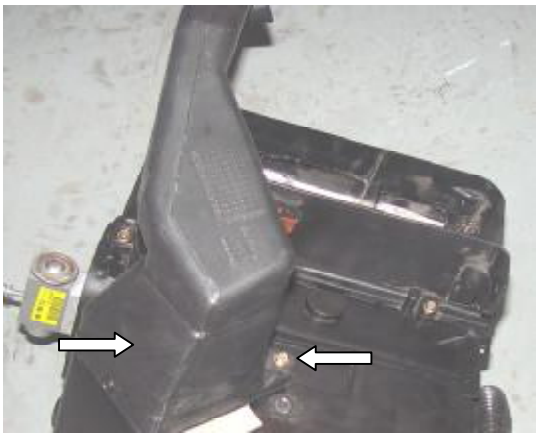
1) Remove the fastening bolts for the expansion valve and the evaporator core assembly with an Allen wrench.



2) Remove the three screws at the joint position of the blower and the evaporator housing.

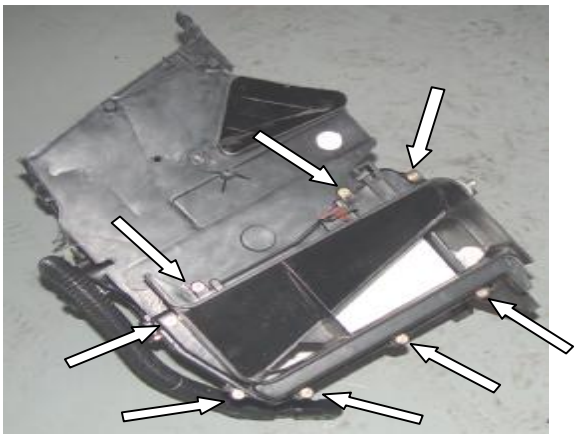


3) Remove the two screws on the rear vent air duct to detach the rear air duct.

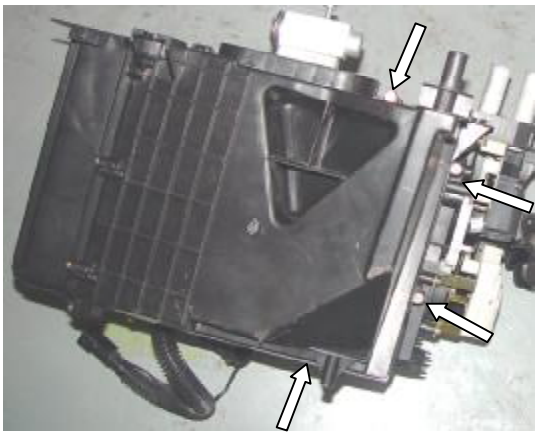


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4) Remove the screws as shown in the figure.



5) Remove the fastening screws on the trunk lid of the evaporator core assembly to detach the trunk lid, and then take out the evaporator core assembly.



3.3.2 Installing the evaporator core assembly

The installing steps are reverse to those for removal.

3.4 Replacing the speed regulating resistor of the blower fan

3.4.1 Disassembling the blower fan speed regulating resistor module

1) Unplug the plug connecting to the speed regulating resistor module.

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2) Remove the connecting screws that attach the speed regulating resistor module to the evaporator housing, and then pull out the speed regulating resistor module.



3.4.2 Installing the speed regulating resistor of the blower fan

The installing steps are reverse to those for removal.

3.5 Replacing the mixing damper servo motor



3.5.1 Disassembling procedures

Remove the pull rod connecting with the motor and remove the fastening screws connecting the motor with the bracket (3).

3.5.2 Installation procedures

The installing steps are reverse to those for removal.

Note: After installs the motor, connect the electrical connector, turn the ignition switch to ACC position, turn on the air conditioner (AC) and turn the AC temperature adjusting knob to HOTTEST or COLDEST, and close the AC panel until the motor stops. Adjust the mixing damper manually to HOTTEST or COLDEST position according to the status, and then adjust the pull rod to a proper position to connect with the motor.

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3.6 Replacing the mode damper servo motor

3.6.1 Disassembling procedures

Remove the pull rod connecting with the motor and remove the fastening screws connecting the motor with the bracket (3).



3.6.2 Installation procedures

The installing steps are reverse to those for removal.

Note: After installs the motor, connect the electrical connector, turn the ignition switch to ACC position, turn on AC and adjust its BLOW mode to FACE mode, and then close the AC panel until the motor stops. Adjust the mode damper manually to a required position according to the status, and then adjust the pull rod to a proper position to connect with the motor.

3.7 Replacing the inner and outer cycling servo motor



3.7.1 Disassembling procedures

Remove the pull rod connecting with the motor and remove the fastening screws connecting the motor with the bracket (3).

3.7.2 Installation procedures

The installing steps are reverse to those for removal.

Note: After installs the motor, connect the electrical connector, turn the ignition switch to IGN position, turn on the AC and adjust it to inner cycling or outer cycling mode, and then close the AC panel until the motor stops. Adjust the mode damper manually to a required position according to the status, and then adjust the pull rod to a proper position to connect with the motor.

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3.8 Replacing the indoor temperature sensor

3.8.1 Disassembling procedures

Disconnect the plug in unit of the sensor harness, remove the connecting screw that attach the hose to the housing and remove the hose, replace it.



3.8.2 Installation procedures

The installing steps are reverse to those for removal.

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CHAPTER EIGHT WINDSHIELD

I. DISASSEMBLING THE FRONT WINDSHIELD

1. Remove the wiper arm and the lower trim panel of the windshield;



Figure 147

2. Pull the piano wire through the body and the glass and tie both ends of the piano wire with wood block or similar;

Tip: Use adhesive tape on the outside to prevent the external surface from being scuffed.

Note: Make sure that not spoil the paint coat or inner or outer trim parts when separating the glass. Place a plastic piece between the piano wire and the instrument panel to prevent the instrument panel from being scuffed when disassembling the glass.

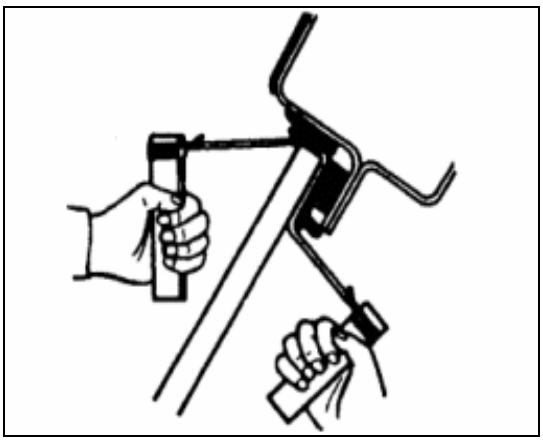


Figure 148

3. Pull the piano wire around the glass, and cut off the bonding agent to take out the glass;

Note: Leave bonding agent as much as possible on the body when cutting off the bonding part of the glass.

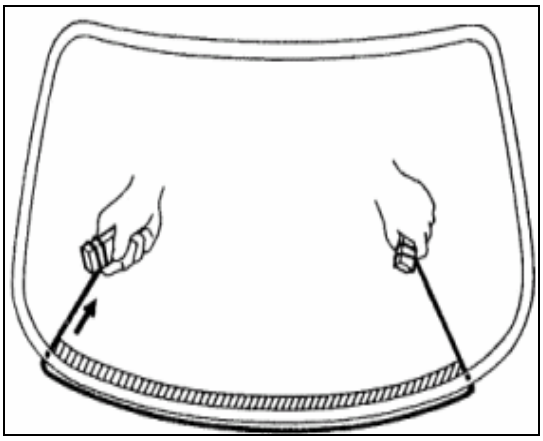


Figure 149

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INSTALLING THE FRONT WIND SHIELD

1. Cut away the rough parts on the body with a knife and clean the cut surface of the bonding agent with a rag soaked with washer fluid;

Tip: Even if the entire bonding agent has been cleared, you should also clean the body surface and do not touch the glass surface after cleaning.

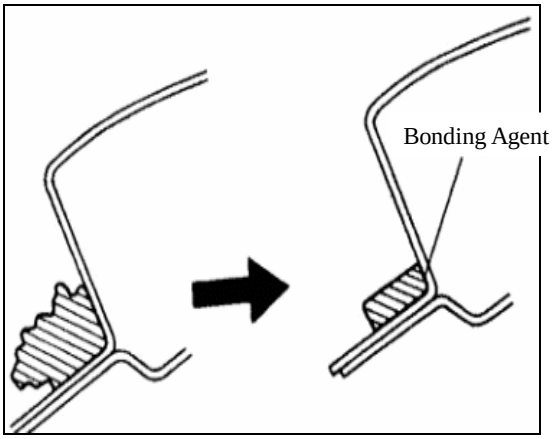


Figure 150

2. Remove the stopper with a knife;

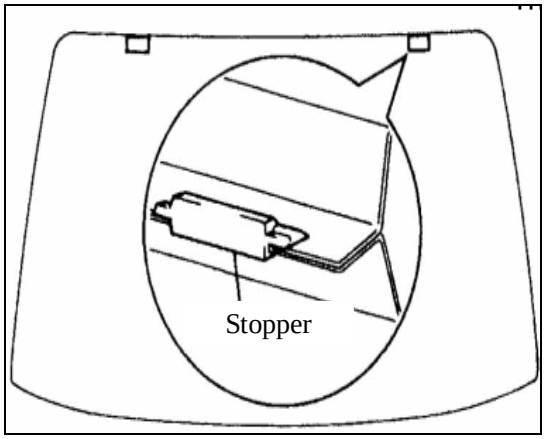


Figure 151

3. Clear the bonding agent adhered to the glass with a scraper and clean the glass with washer fluid;

Note: Do not touch the glass after cleaning.

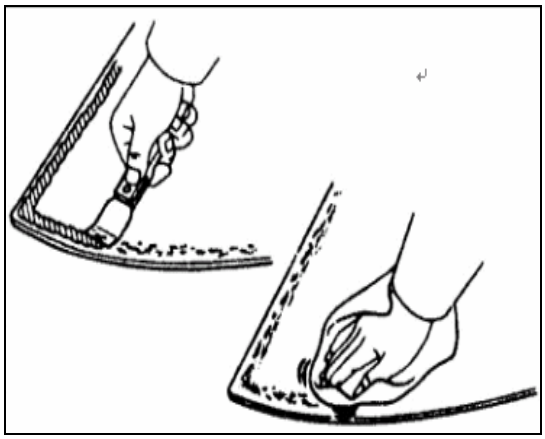


Figure 152

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4. Replacing the clamping piece if necessary;

① Remove the stopper with a knife

② Remove the old clamping piece

③ Replace with a new clamping piece

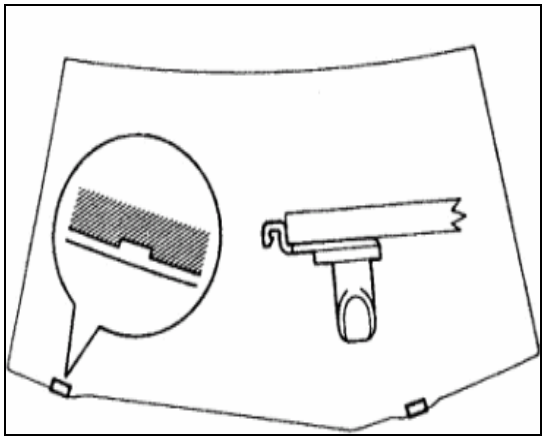


Figure 153

5. Position the glass;

① Place the glass at the proper position

② Make reference marks on the glass and the body

③ Remove the glass

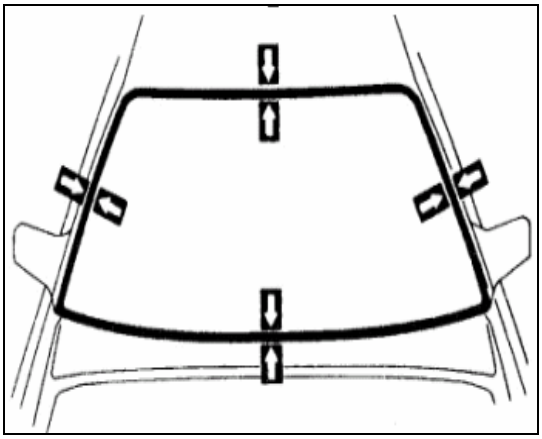


Figure 154

6. Clean the contact surface of the glass;

Clear the black dirt around peripheral contact face of the glass with washer fluid;

Note: Do not touch the glass surface after cleaning.

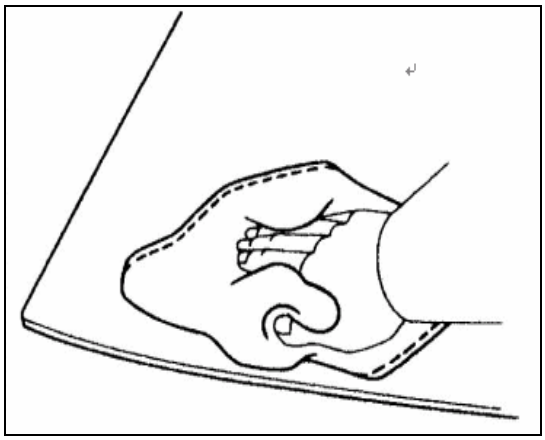


Figure 155

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7. Install the water resistance piece;

Install the water resistance piece using double face adhesive tape as shown in the figure

Note: Do not touch the glass surface after cleaning;

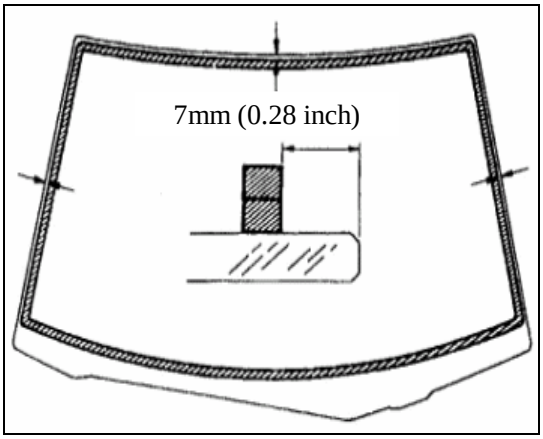


Figure 156

8. Apply a layer of primer M on the contact surface of the body and apply a layer of primer M on the contact face of the body with a brush;

Note: Let the primer coat dry for more than 3 minutes. Do not apply the primer on the bonding agent. Do not reserve the opened primer M for later use.

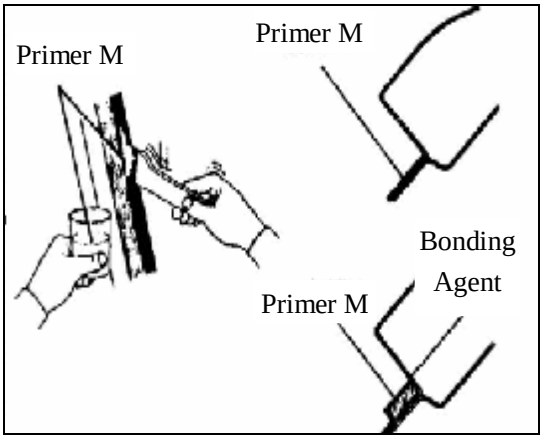


Figure 157

9. Apply a layer of primer G on the contact surface of the glass;

① Apply a layer of primer G on the edges and the contact surface of the glass with a brush or sponge.

② Wipe the primer off with a clean rag before it dries.

Note: Let the primer coat dry for more than 3 minutes. Do not apply the primer on the bonding agent. Do not reserve the opened primer G for later use.

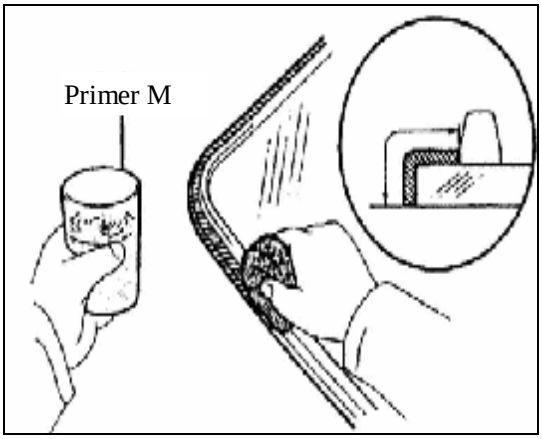


Figure 158

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10. Mixing the bonding agent;

Note: Make sure that the moulding be installed within the application period of the bonding agent, and the bonding agent should be mixed within 5 minutes.

① Clean the glass board and the putty knife completely with solvent

② Mix 500 grams host crystal with 75 grams hardener completely on a glass board or similar with a scraper

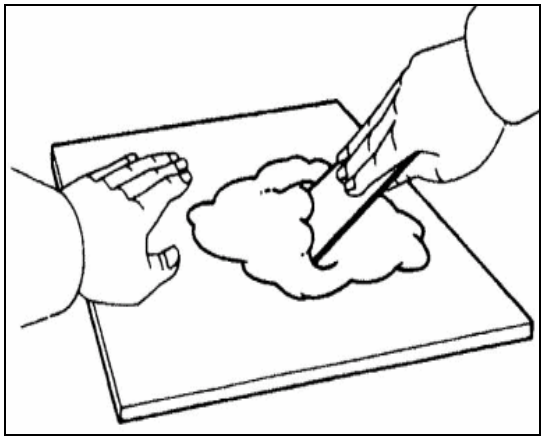


Figure 159

11. Applying the bonding agent;

① Cut off the pot tip and fill the bonding agent into the pot

② Place the pot into the sealant gun

③ Apply the bonding agent on the glass as shown in the figure

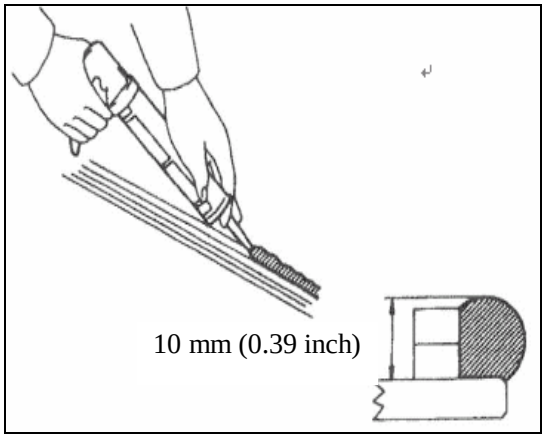


Figure 160

12. Installing the glass;

Tip: Make sure that the water resistant piece adhered to the panel of the body as shown in the figure

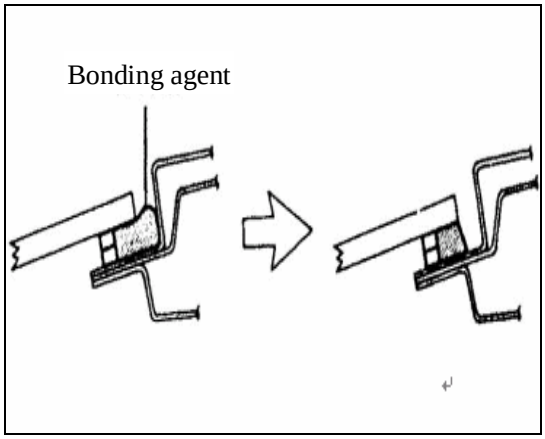


Figure 161

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Note: ① To install the glass, align the reference marks on the glass and the body and then lightly press the glass into from the edge.

② Apply the bonding agent on the edges of the glass with a scraper.

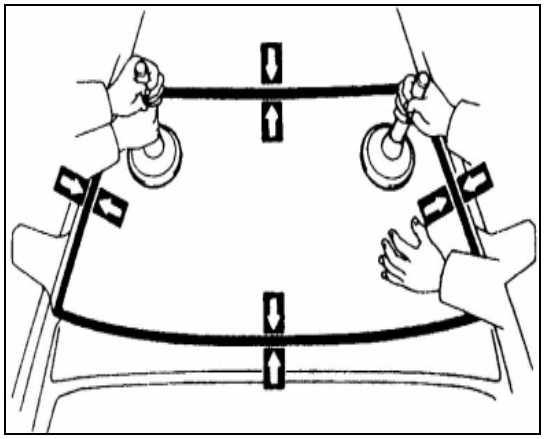


Figure 162

③ Clear the excessive or over flown bonding agent with a scraper.

④ Clamp the glass until the bonding agent is harden.

Check for water leakage and repair it:

① Perform the leakage test after the hardening period.

② Seal the leakage part with sealant

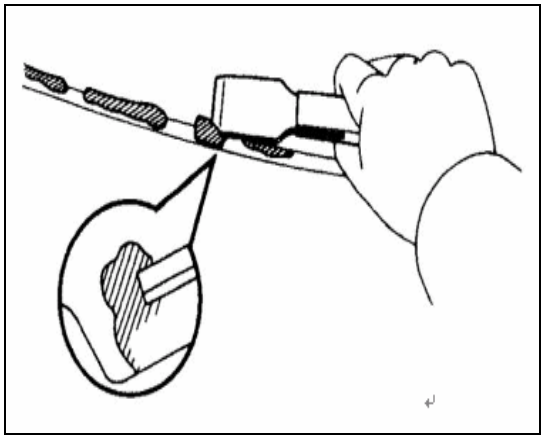


Figure 163

13. Install the upper moulding of the windshield;

Install the upper moulding on the body and tap it lightly to fasten it.

Install the outer moulding

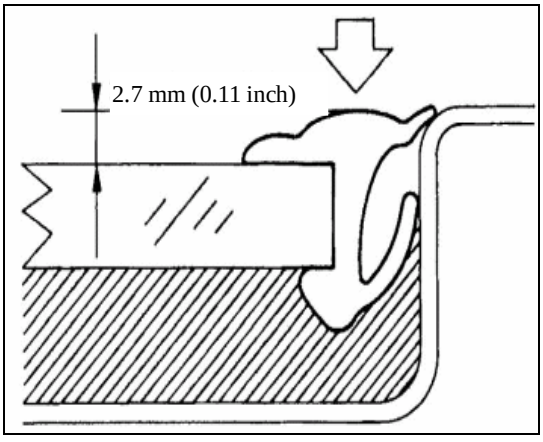


Figure 164

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II. DISASSEMBLING AND INSTALLING THE REAR WINDSHIELD

1. Lay down the seat back and remove the coat track;



Figure 165

2. Remove the lower moulding

Cut off the double face adhesive tape at both ends of the moulding with a scraper as shown in the figure;

Tip: Entangle the tip of the scraper with adhesive tape before starts.

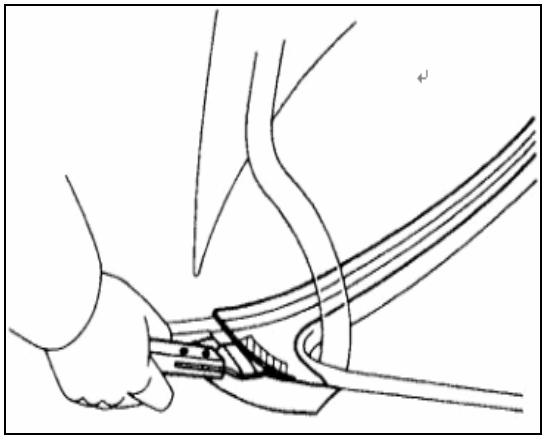


Figure 166

3. Remove the glass of the rear window

① Pull the piano wire through between the body and the glass from inside of the vehicle

② Tie both ends of the piano wire with wood block or similar

Tip: Use adhesive tape on the outside to prevent the external surface from being scuffed.

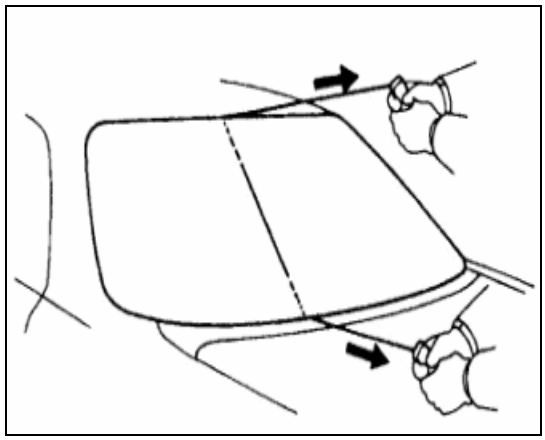


Figure 167

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③ Pull the piano wire along the bonding agent to cut it off.

Tip: Do not let the piano wire spoil the two stoppers.

④ Remove the glass, and then remove the moulding of the rear window

The installing steps are reverse to those for removal.

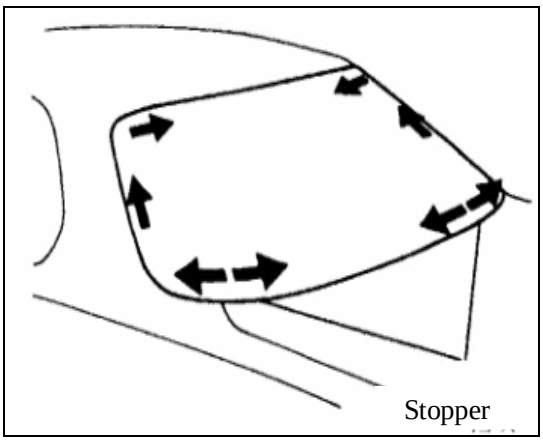


Figure 168

INSTALLING THE GLASS OF THE REAR WINDOW

1. Fitting the rear window moulding

Place the moulding around the glass and fit it manually.

Tip: Be sure to remove the glass of the rear window first before fitting the moulding

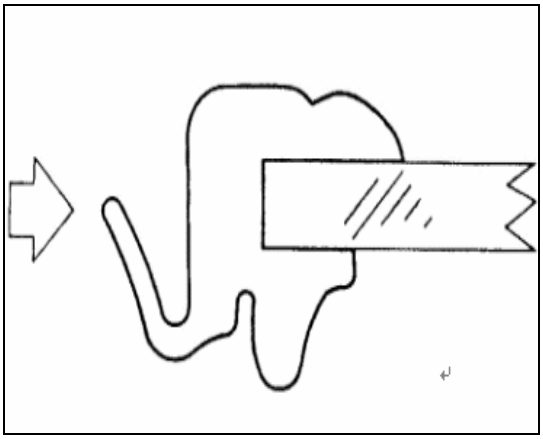


Figure 169

2. Clean and finish the contact surface of the body and cut off the rough parts on the body;

Tip: Leave bonding agent as much as possible on the body and clean the cut surface of the bonding agent with a rag soaked with washer fluid.

Tip: Even if the entire bonding agent has been cleared, you should also clean the body.

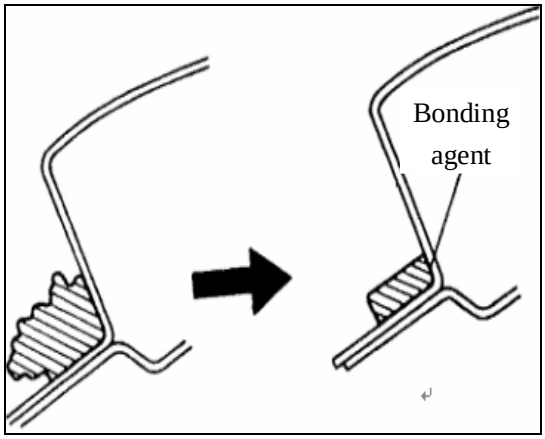


Figure 170

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3. Clean the glass removed

① Clear the bonding agent adhered to the glass with a scraper

② Remove the stopper with a knife

③ Clean the glass with washer fluid

Note: Do not touch the glass after cleaning

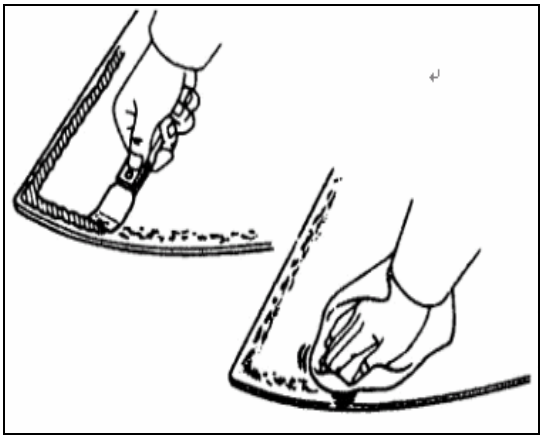


Figure 171

4. Position the glass

① Place the glass at proper position

② Make reference marks on the glass and the body

③ Remove the glass

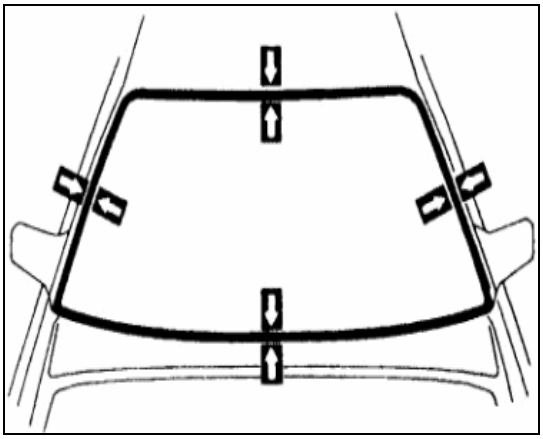


Figure 172

5. Clean the contact surface of the glass

Clear the black dirt around peripheral contact face of the glass with washer fluid

Note: Do not touch the glass surface after cleaning.

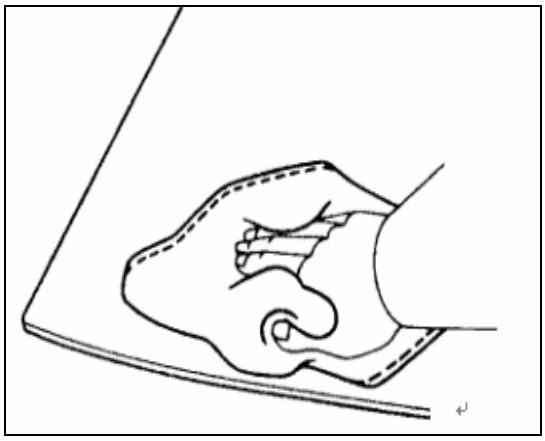


Figure 173

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6. Apply a layer of primer M on the contact surface of the body with a brush

Note: Let the primer dry for more than 3 minutes. Do not apply the primer on the bonding agent. Do not reserve the opened primer M for later use.

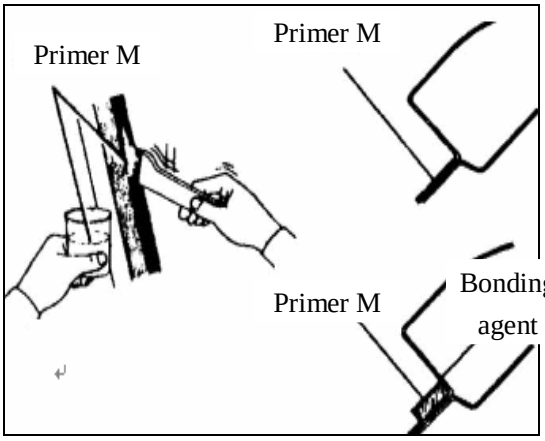


Figure 174

7. Apply a layer of primer G on the contact surface of the glass. Wipe the primer off with a clean rag before it dries.

Note: Let the primer coat dry for more than 3 minutes. Do not apply the primer on the bonding agent. Do not reserve the opened primer G for later use in bonding agent mixing.

Note: Make sure that the moulding is installed within the application period of the bonding agent, and the bonding agent should be mixed within 5 minutes.

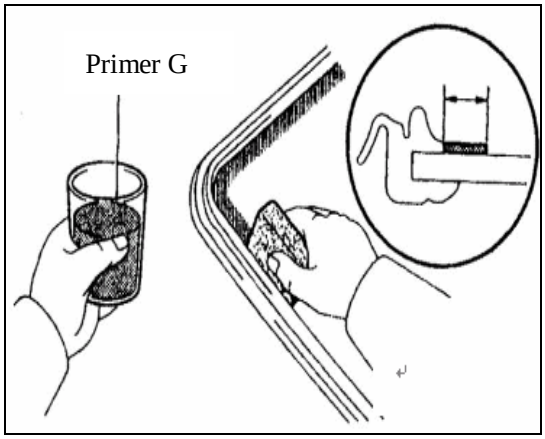


Figure 175

8. Completely clean the glass board and putty knife with solvent. Completely mix 500 grams host crystal with 75 grams hardener on a glass board or similar with a scraper;

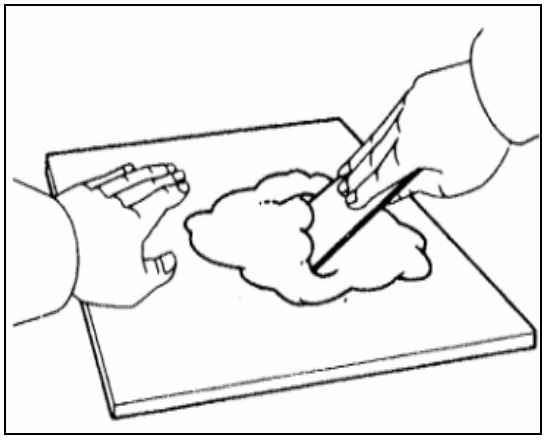


Figure 176

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9. Applying the bonding agent: Cut off the tip of the pot, fill the bonding agent into the pot, place the pot into the sealant gun, and then apply the bonding agent on the glass as shown in the figure;

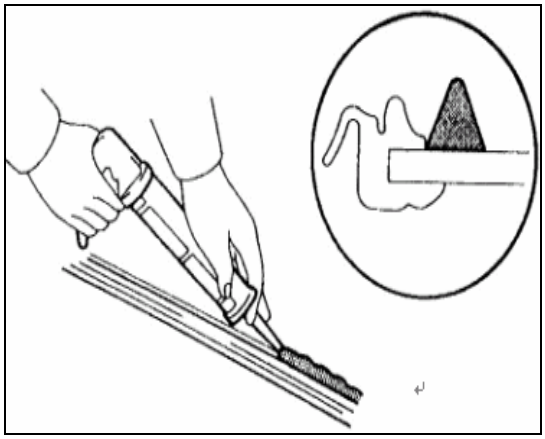


Figure 177

10. Installing the glass

① To install the glass, align the reference marks on the glass and the body, and then lightly press the glass into from the edge.

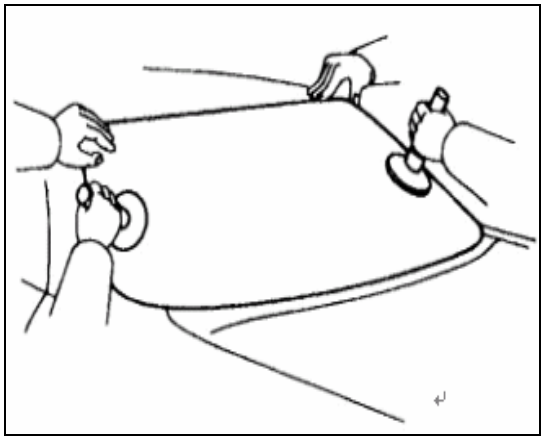


Figure 178

② Apply the bonding agent on the edges of the glass with a scraper

③ Clear the excessive or over flown bonding agent with a scraper

④ Clamp the glass until the bonding agent is harden

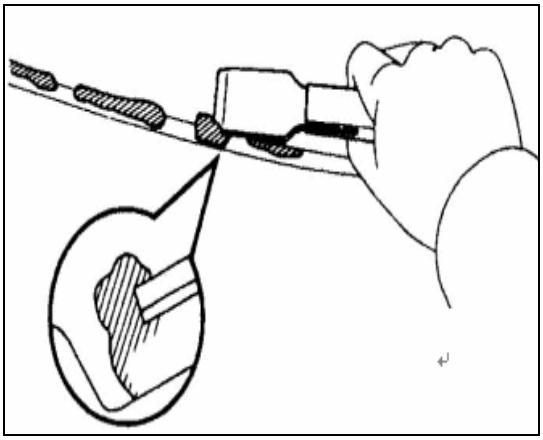


Figure 179

11. Check for water leakage and repair it

① Perform the leakage test after the hardening period

② Seal the leakage part with sealant

Fit the outer lower moulding of the rear window, fit the moulding on the body and tap it lightly to fasten it, connect the leads connector of the defroster, and last re-install the disassembled parts.

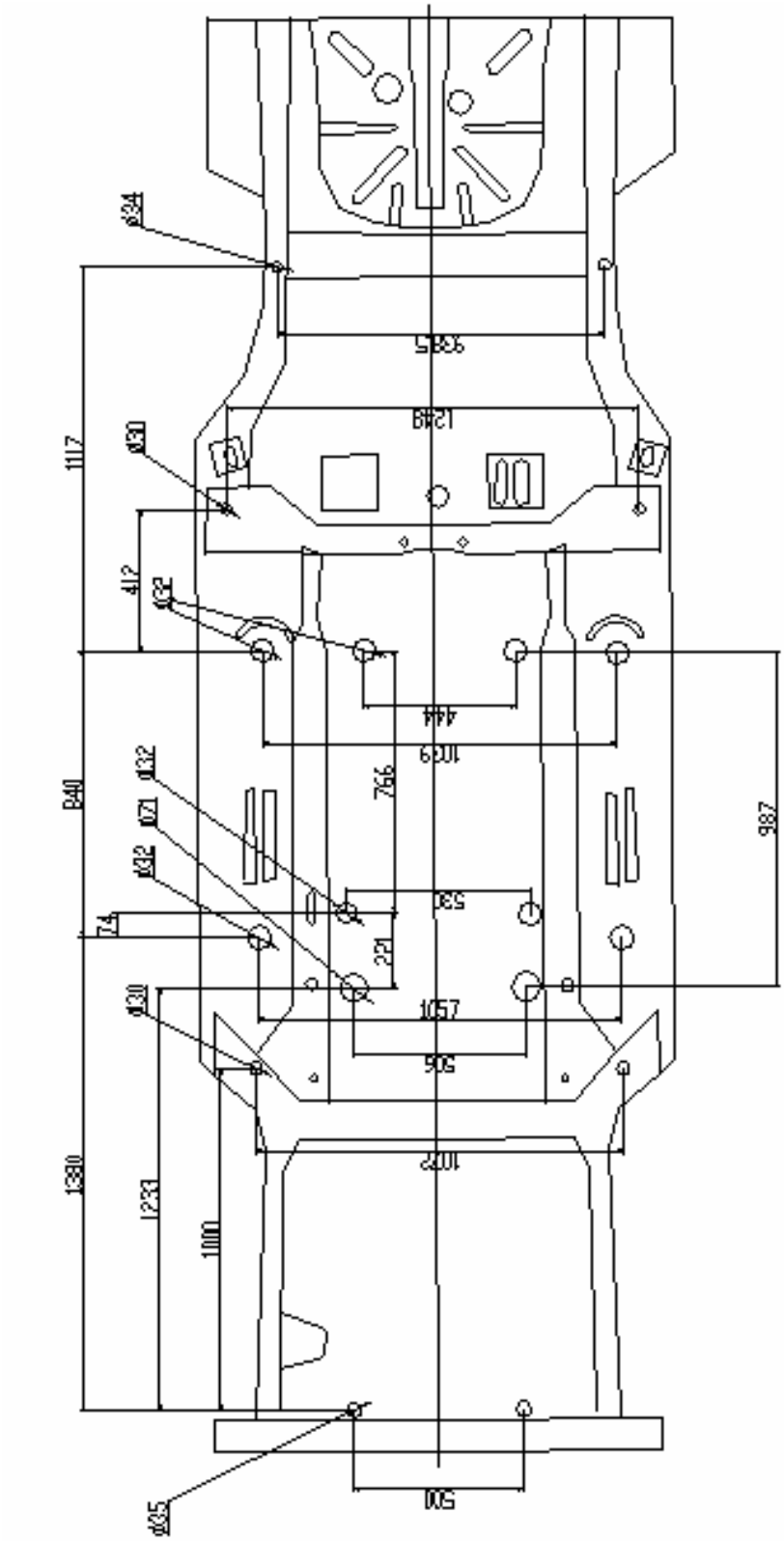
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CHAPTER NINE BODY DIMENSION

Dimension of the beam:

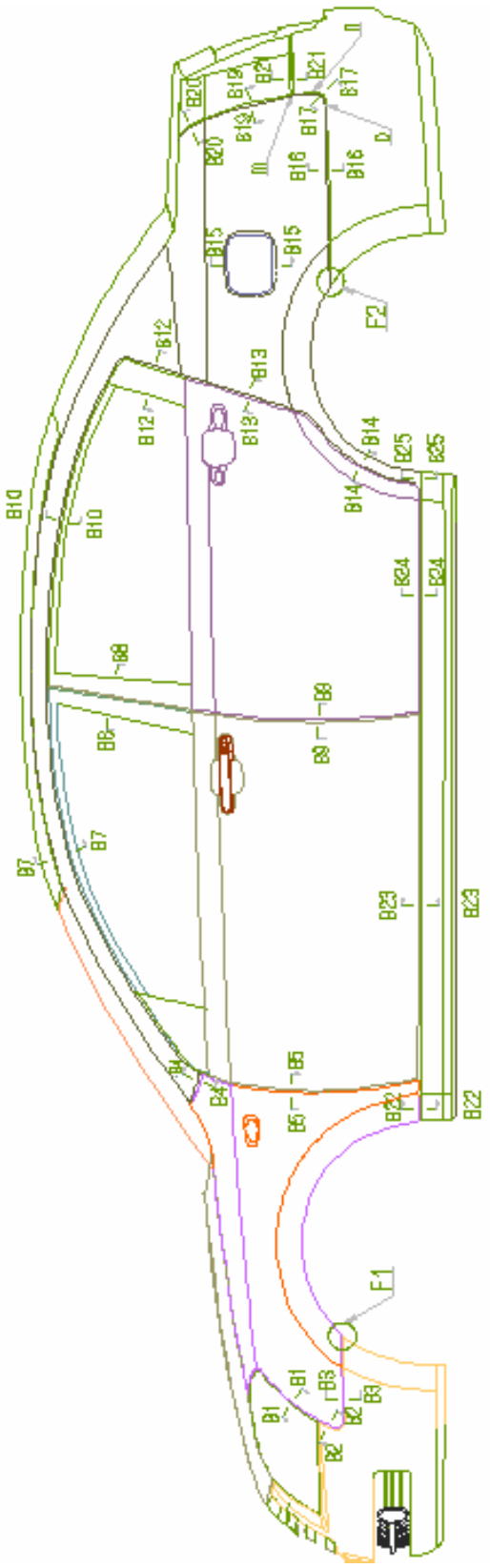
Unit: mm



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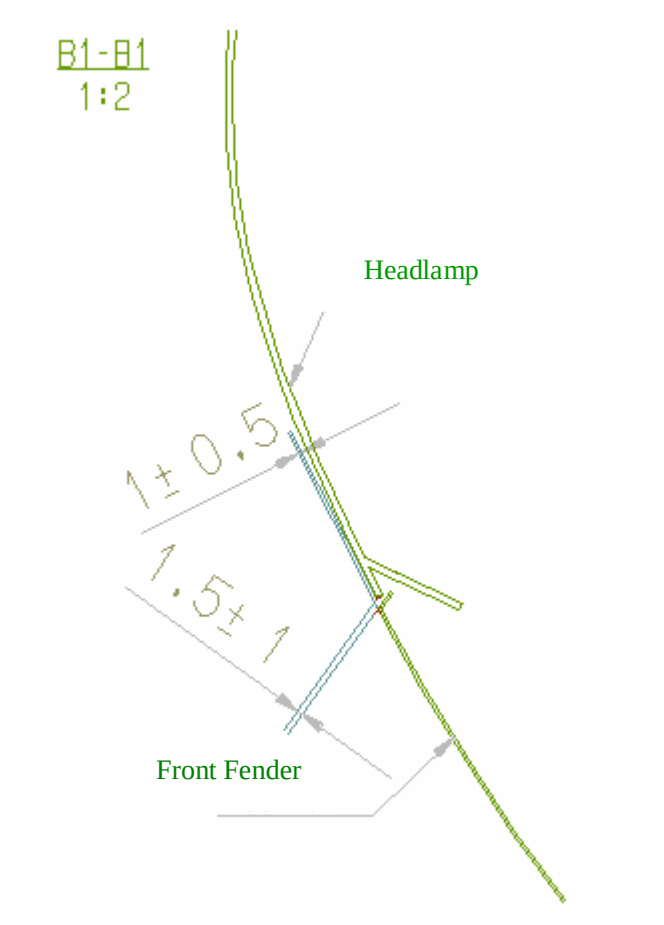
Assembly dimension of the body

Side view

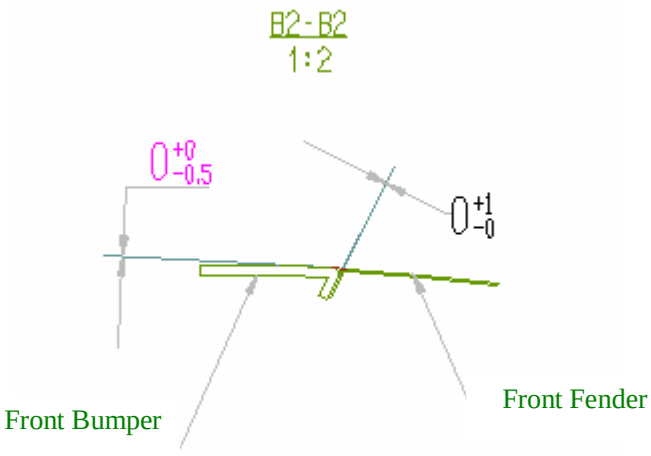


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The clearance between the front fender and the headlamp at B1-B1: 1.5 ± 1

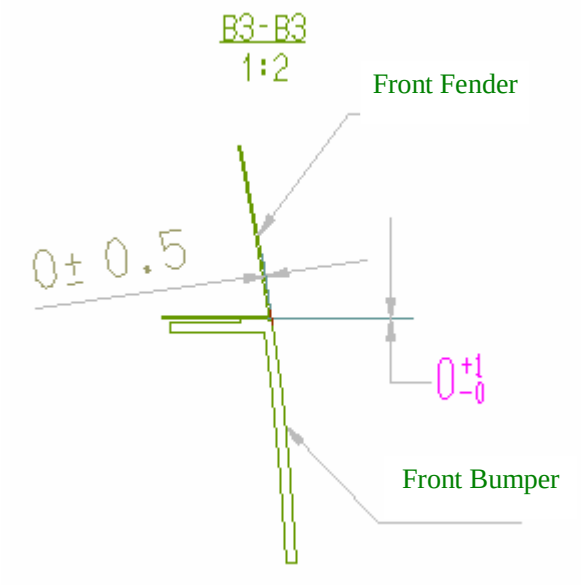


The clearance between the front fender and the front bumper at B2-B2: 0^{+1}_{-0}

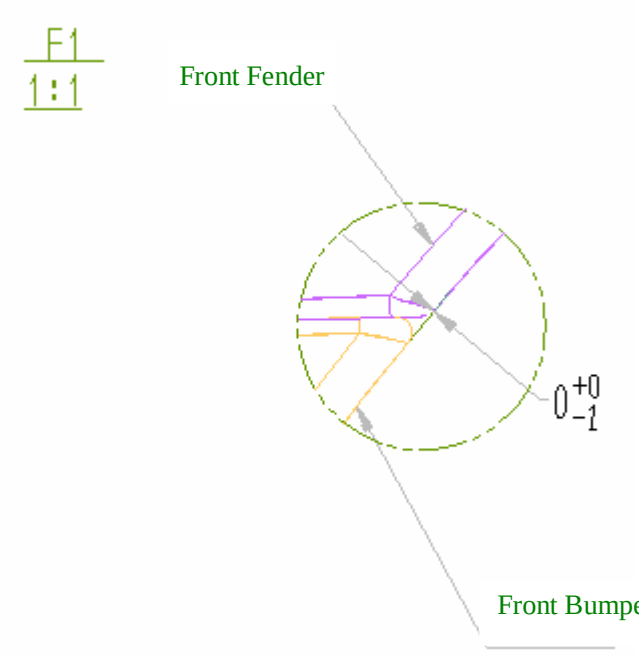


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The clearance between the front fender and the front bumper at B3-B3: 0^{+1}_{-0}

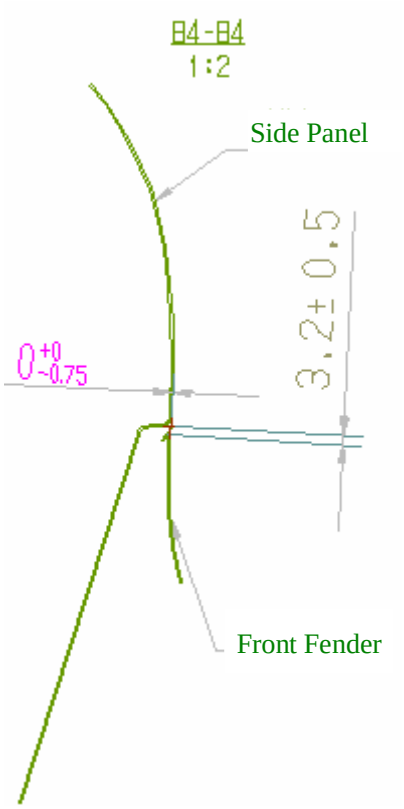


The allowable installation deviation between the front fender and the front bumper at F1: 0^{+0}_{-1}

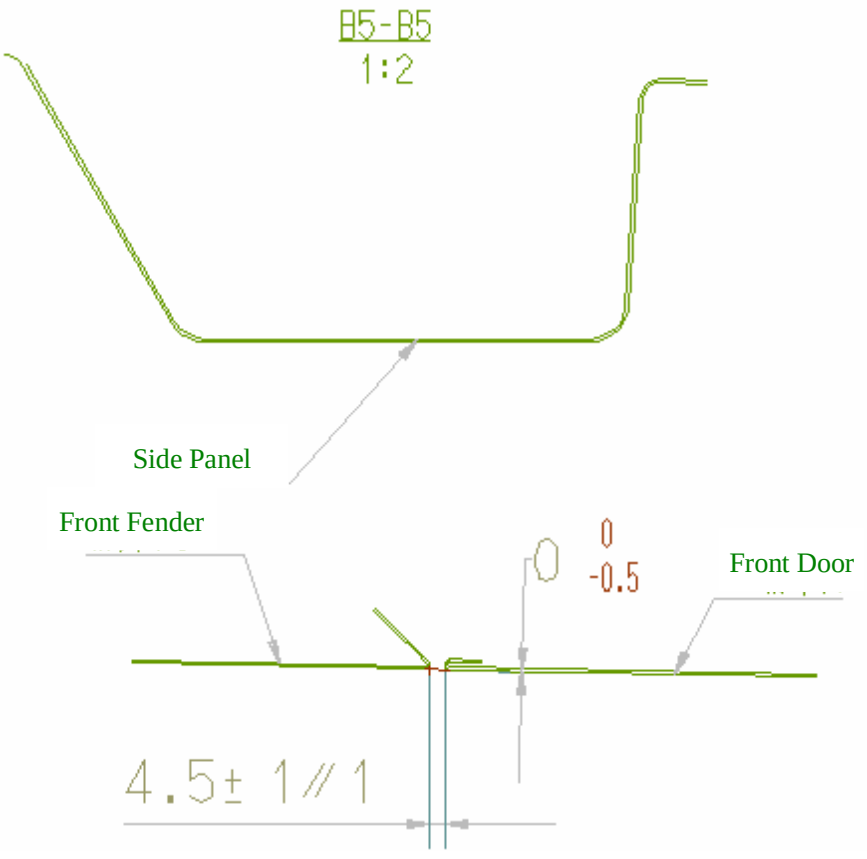


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The clearance between the front fender and the side panel at B4-B4: 3.2 ± 0.5

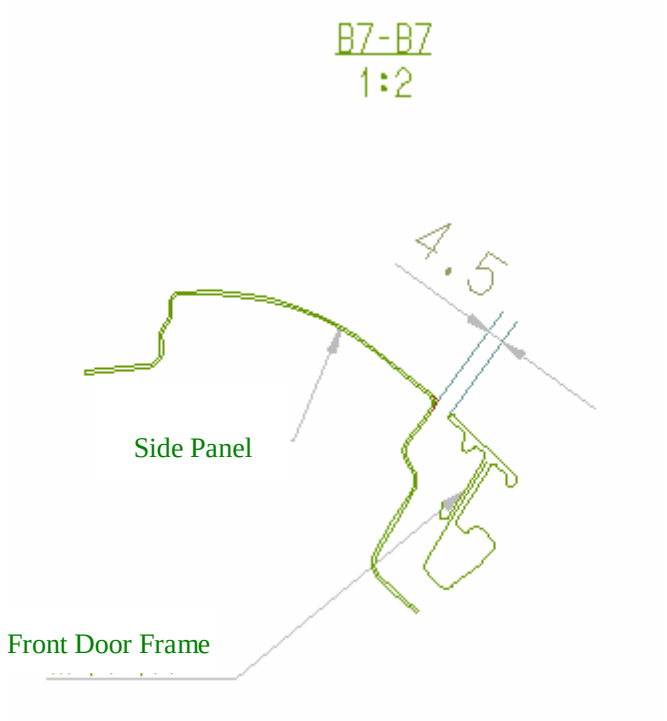


The clearance between the front fender and the front door at B5-B5: 4.5 ± 1

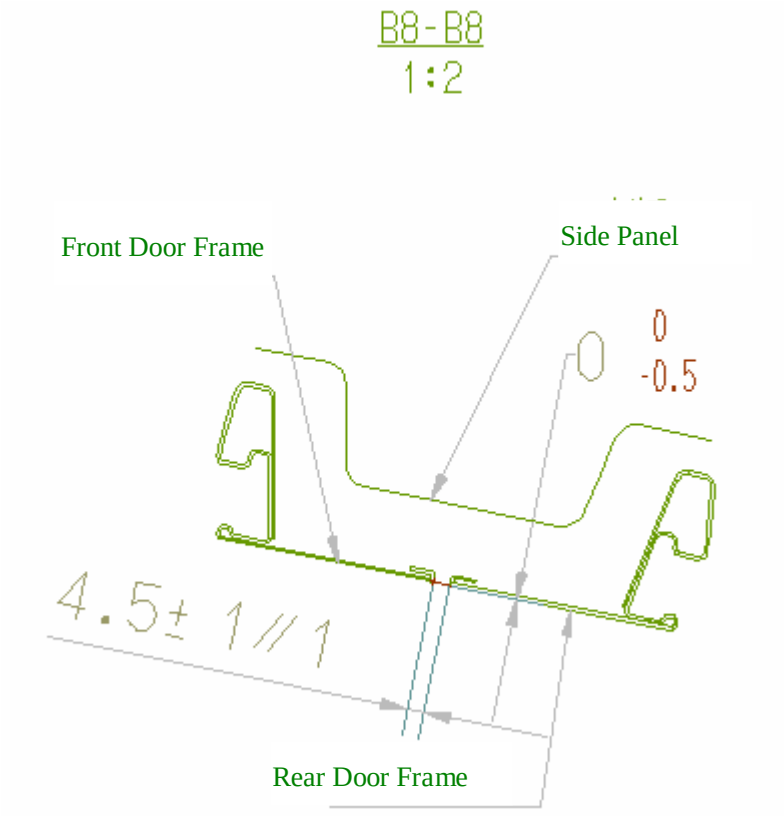


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The clearance between the side panel and the front door frame at B7-B7: 4.5

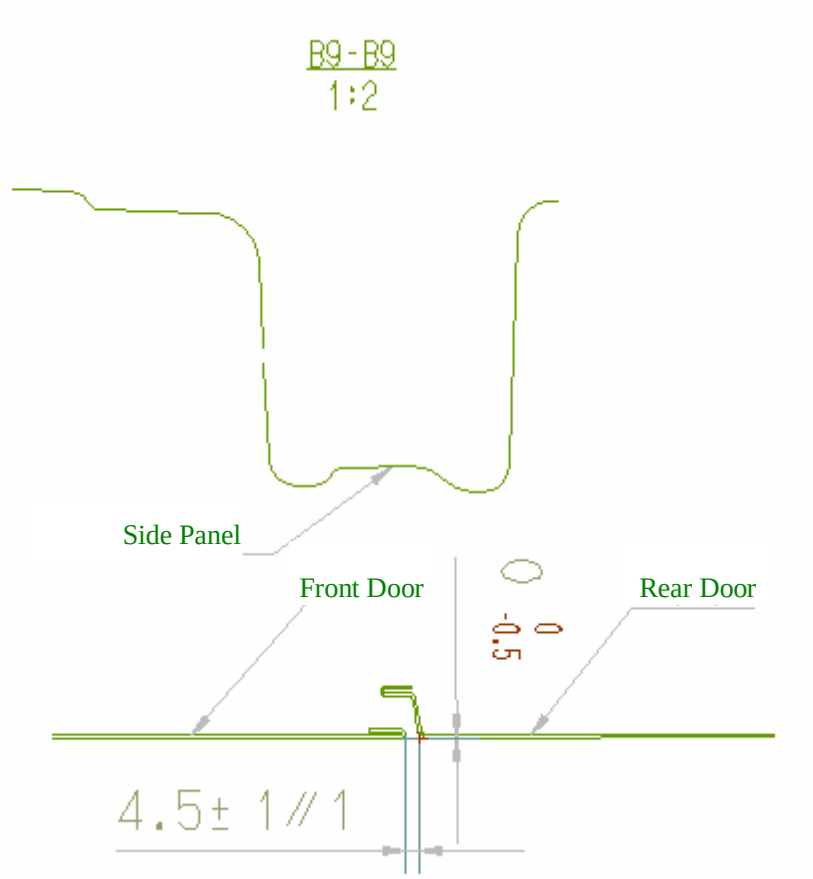


The clearance between the front door frame and the rear door frame at B8-B8: 4.5 ± 1

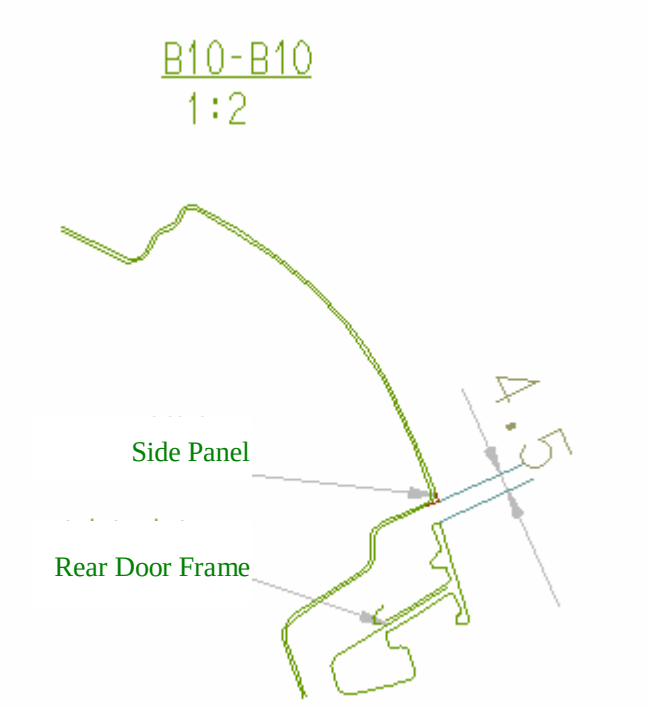


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The clearance between the front door and the rear door at B9-B9: 4.5 ± 1

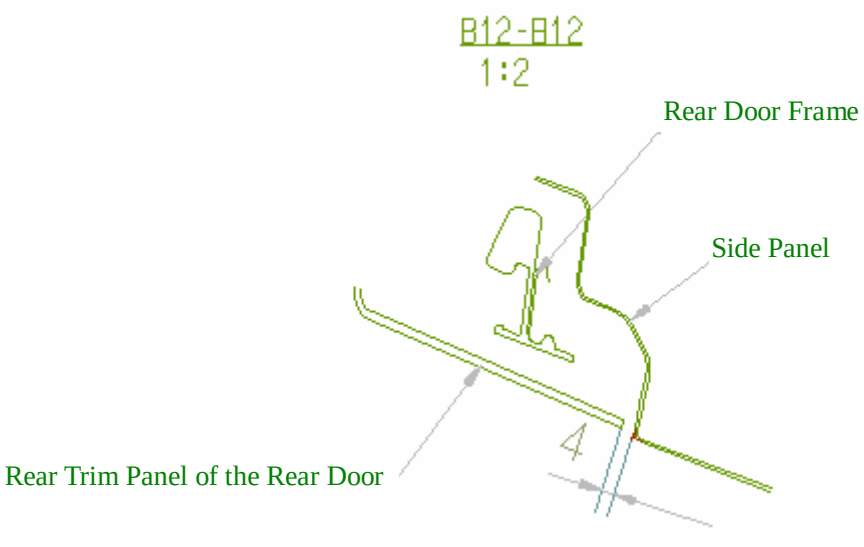


The clearance between the rear door frame and the side panel at B10-B10: 4.5

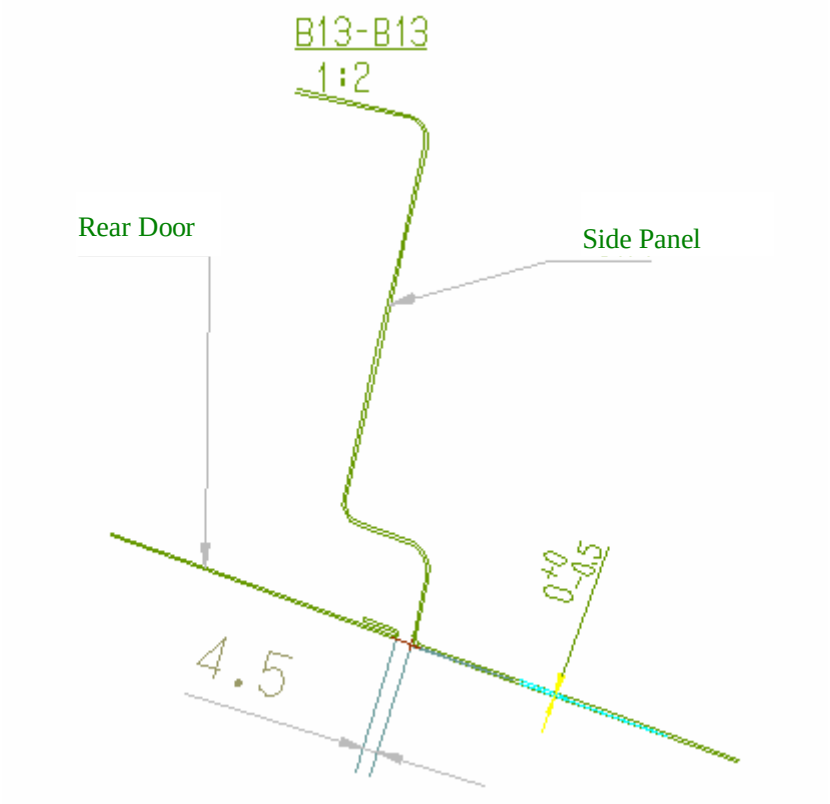


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The clearance between the rear trim panel of the rear door and the side panel at B12-B12: 4

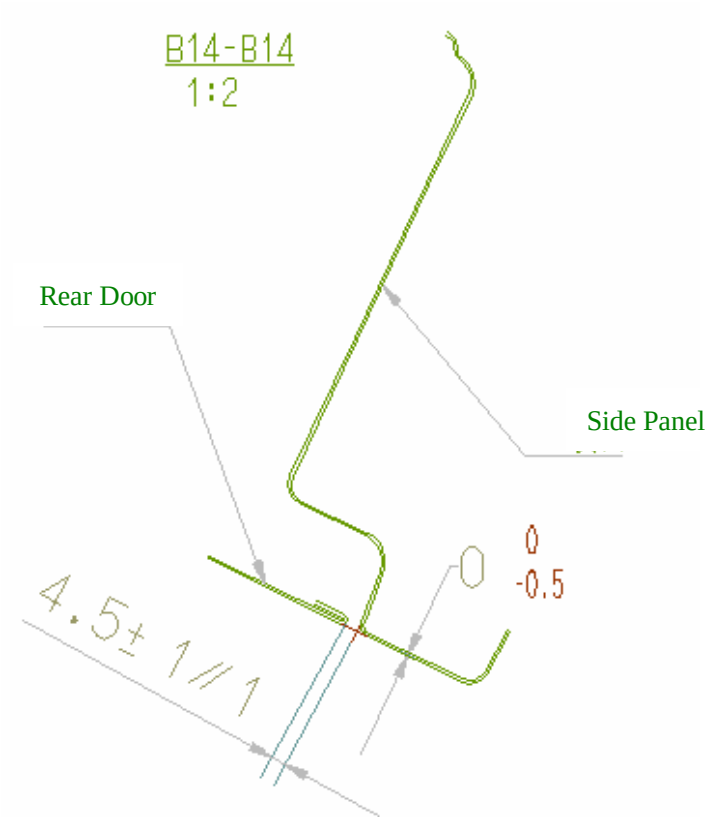


The clearance between the rear door and the side panel at B13-B13: 4.5

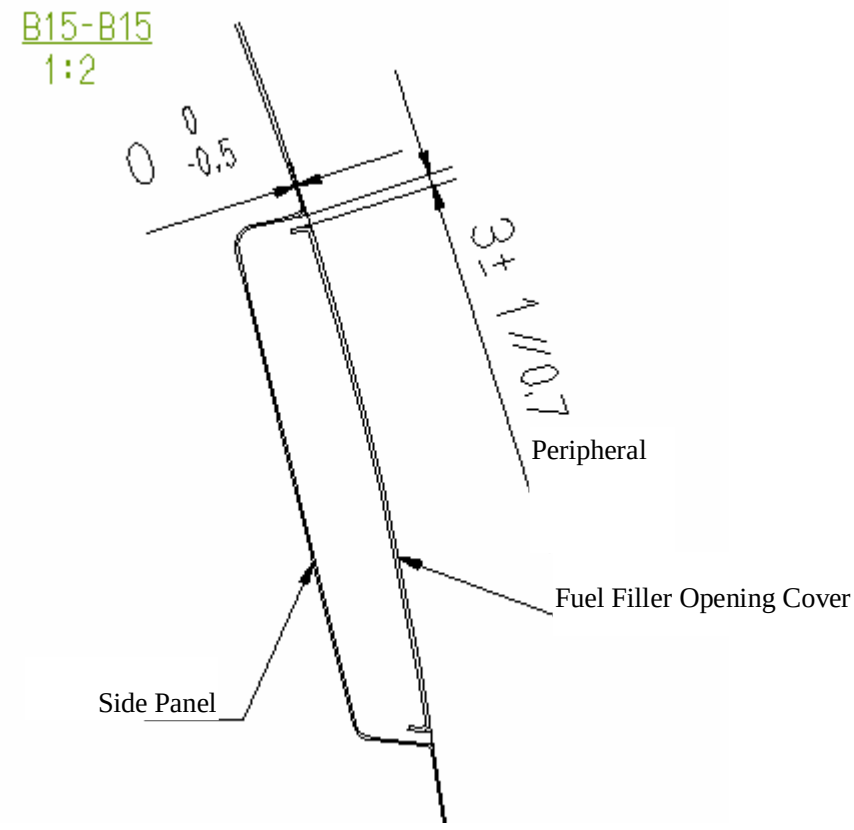


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The clearance between the rear door and the side panel at B14-B14: 4.5 ± 1

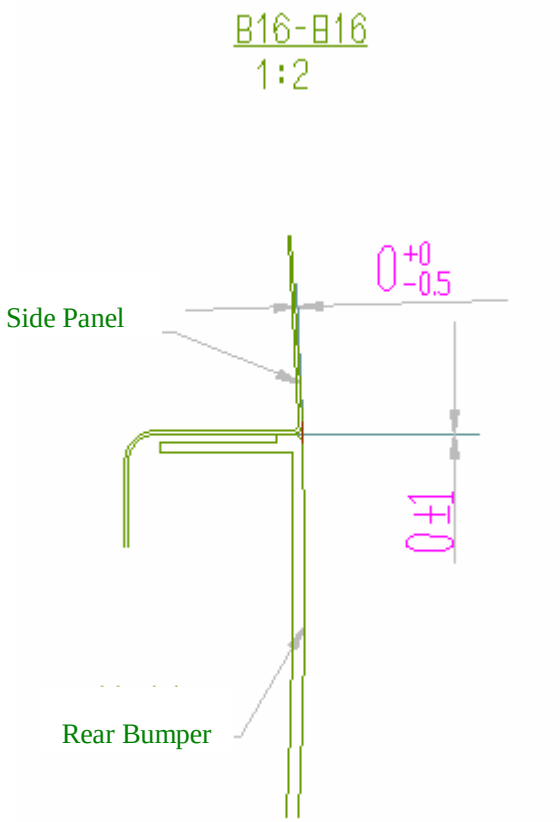


The clearance between the fuel filler opening cover and the side panel at B15-B15: 3 ± 1

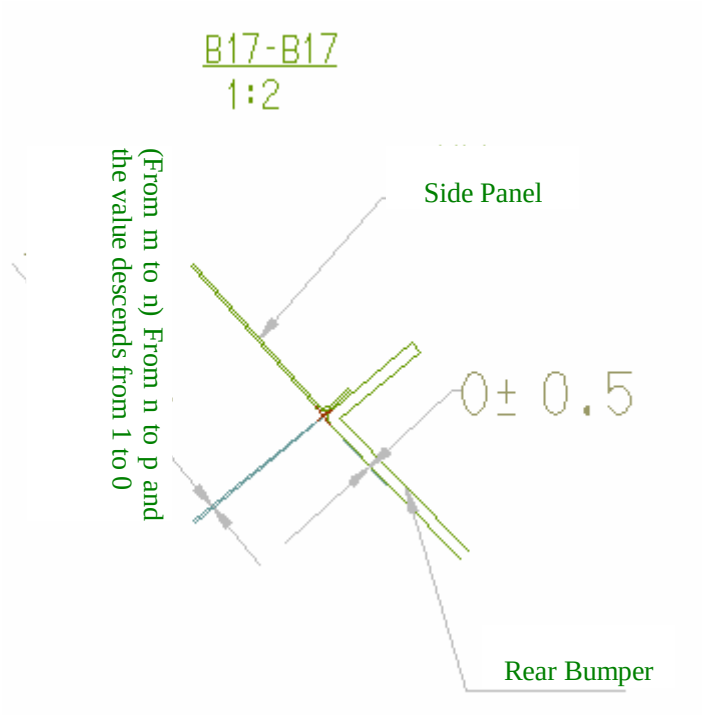


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The clearance between the rear bumper and the side panel at B16-B16: 0 ± 1

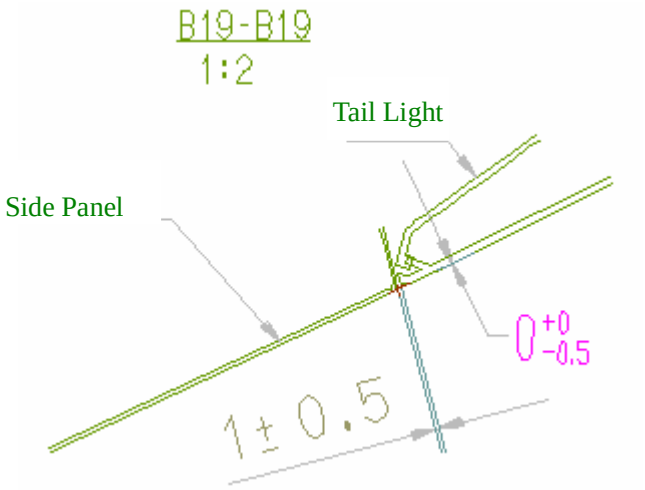


The clearance between the rear bumper and the side panel at B17-B17: 0±0.5

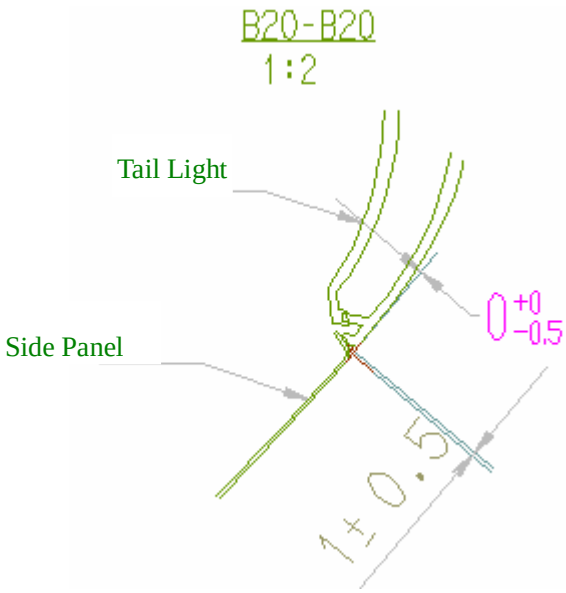


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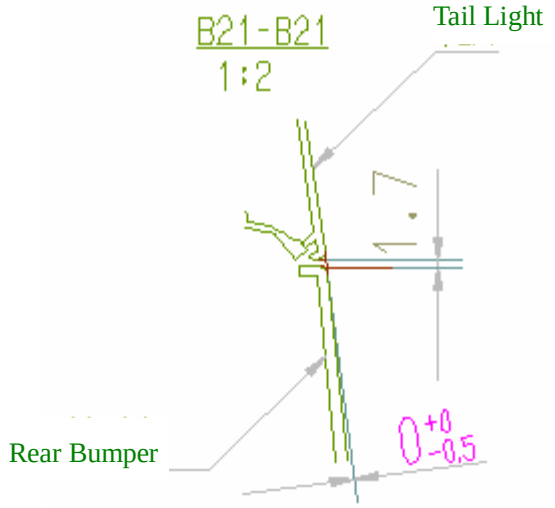
The clearance between the side panel and the tail light at B19-B19: 1 ± 0.5



The clearance between the side panel and the tail light at B20-B20: 1±0.5

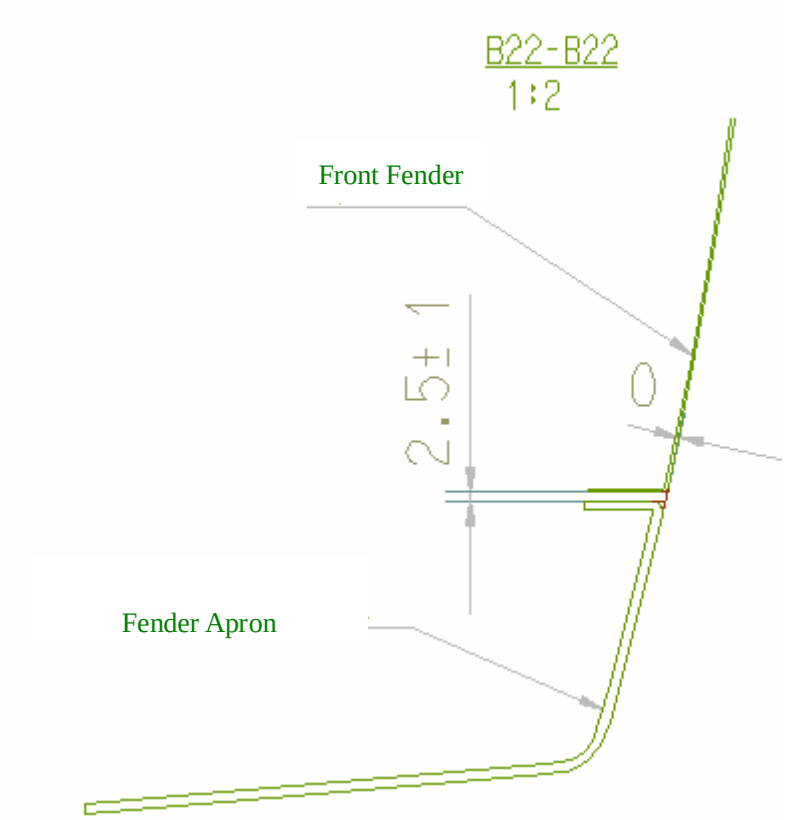


The clearance between the rear bumper and the tail light at B21-B21: 1.7

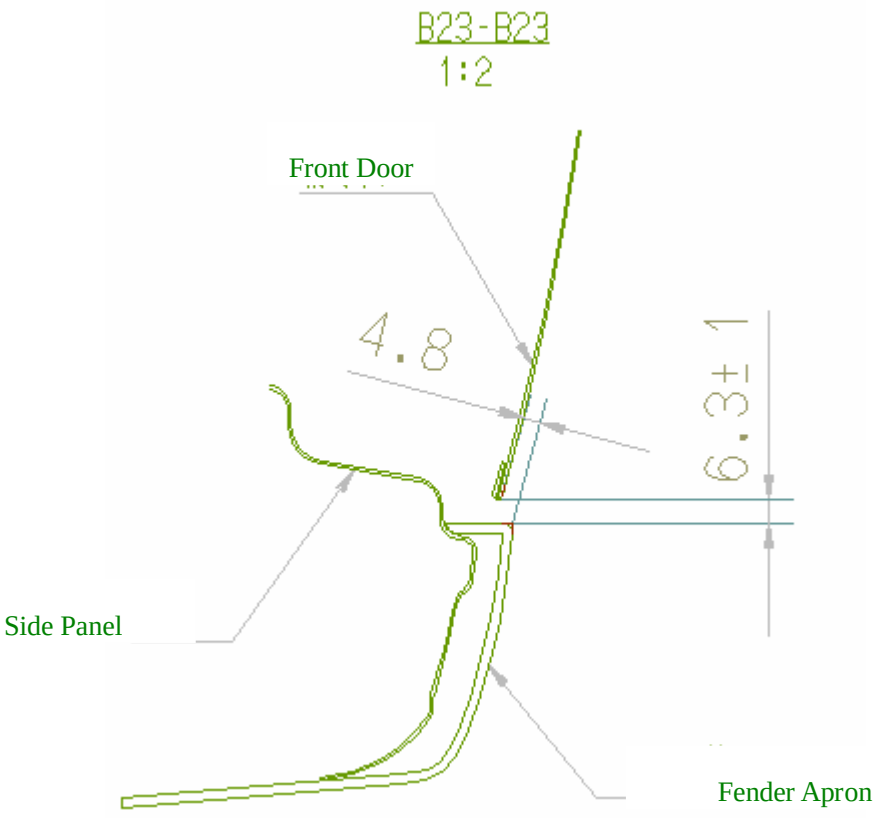


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The clearance between the front fender and the fender apron at B22-B22:2.5 ± 1

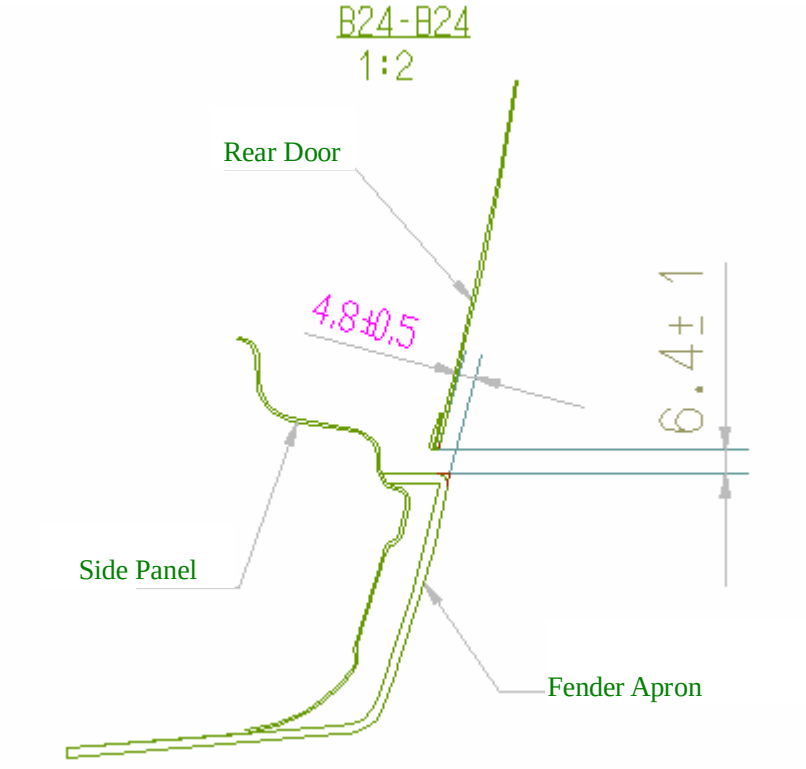


The clearance between the front door and the fender apron at B23-B23: 6.3 ± 1

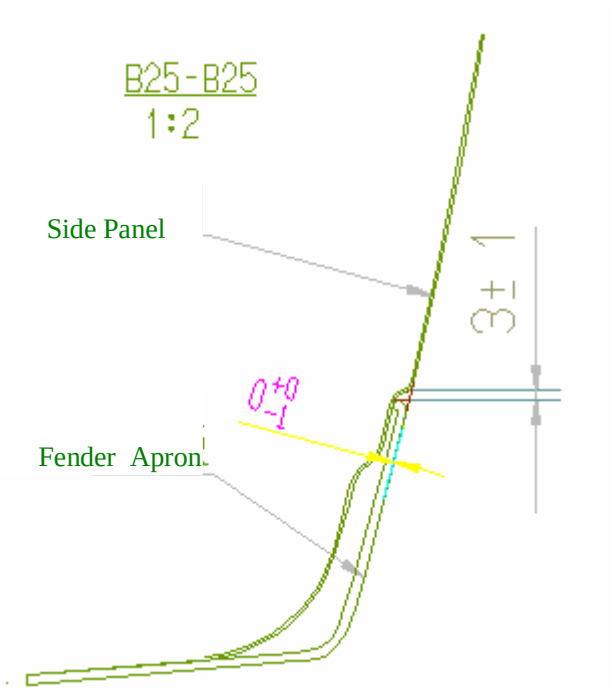


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The clearance between the rear door and the fender apron at B24-B24: 6.4 ± 1

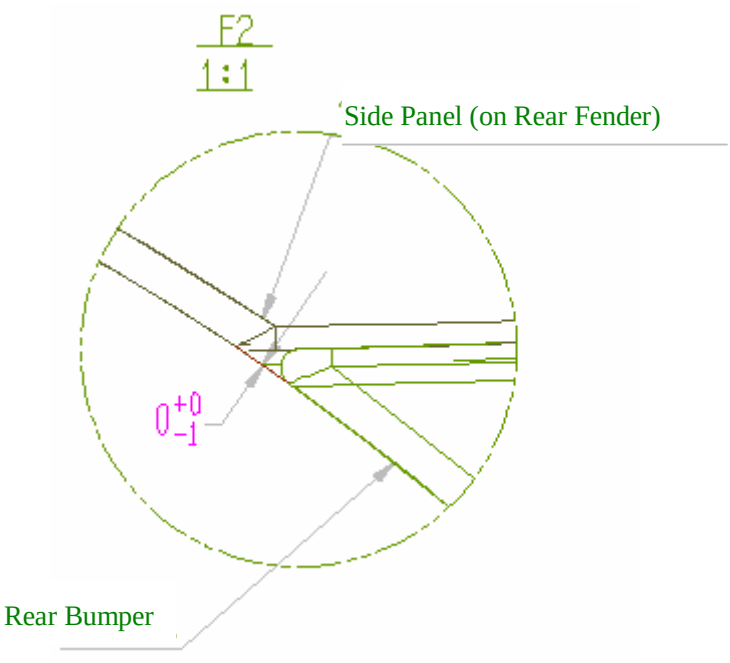


The clearance between the fender apron and the side panel at B25-B25: 3±1



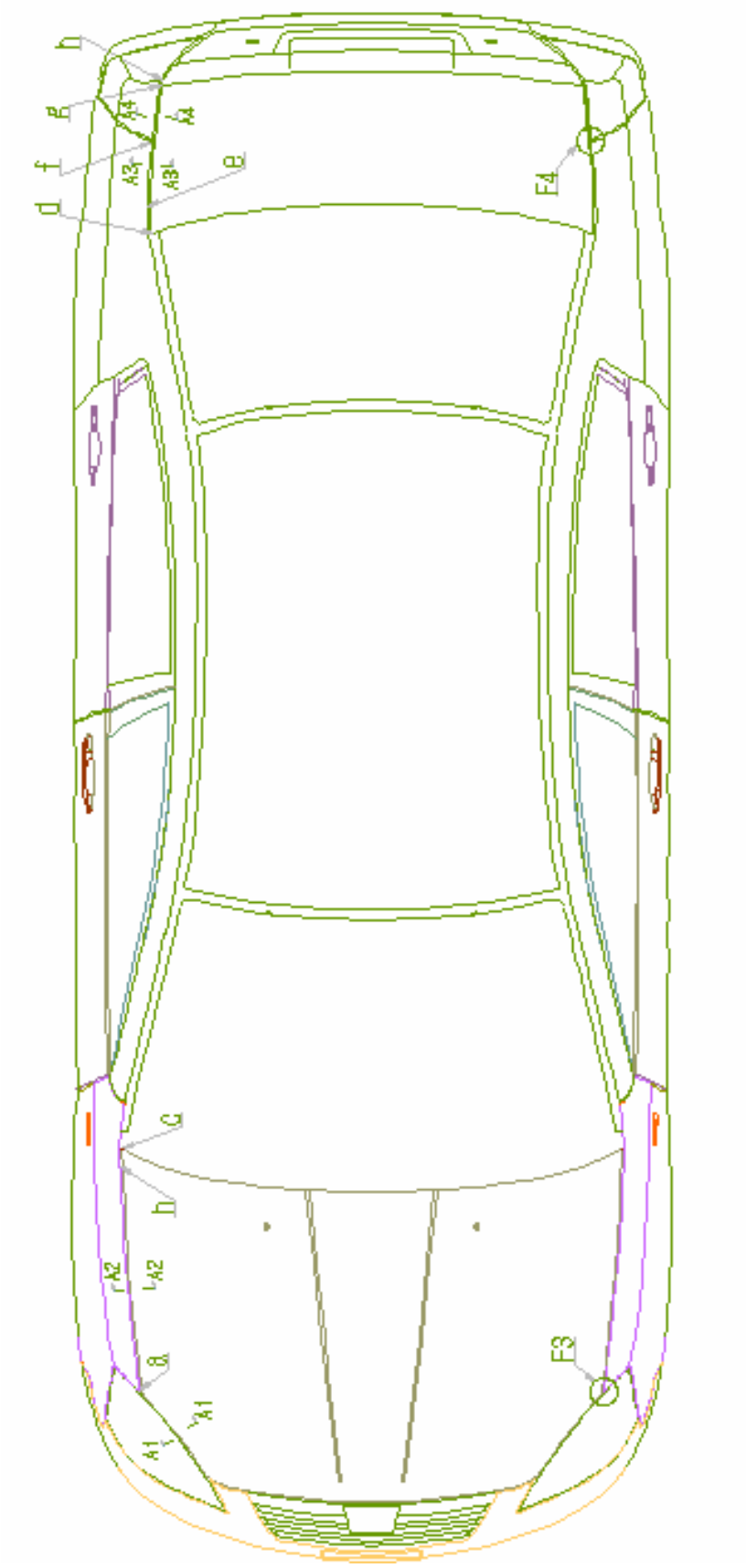
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The allowable installation deviation between the rear bumper and the side panel (on rear fender) at F2: 0^{+0}_{-1}



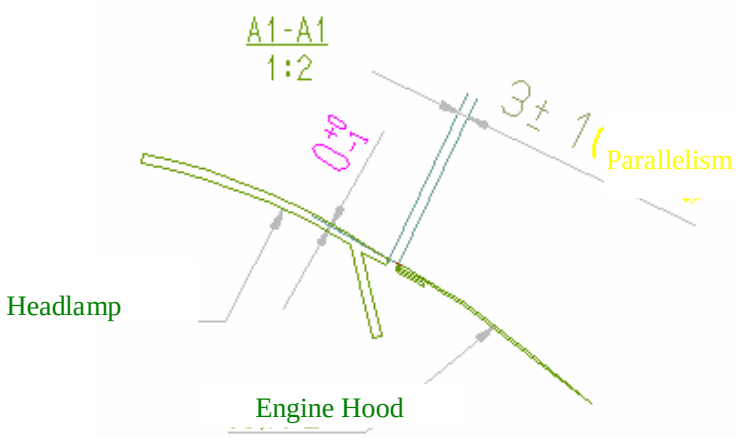
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Top view

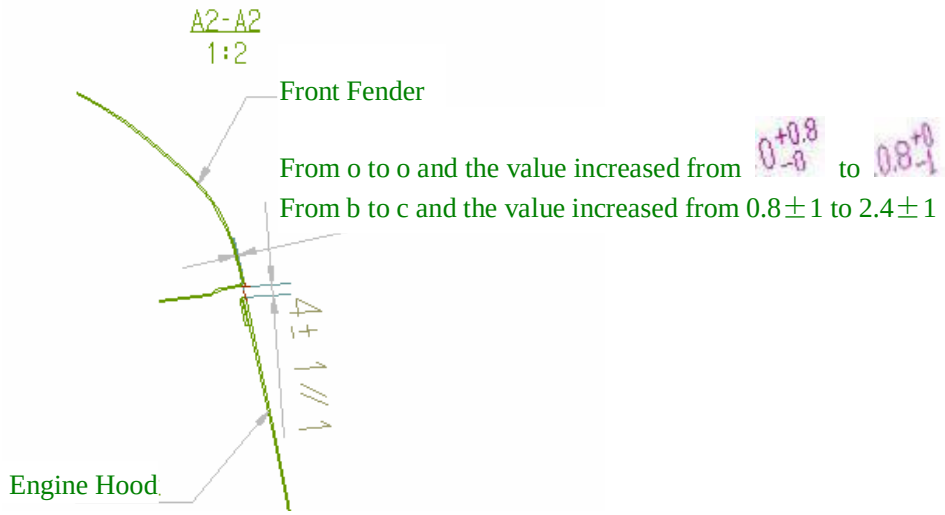


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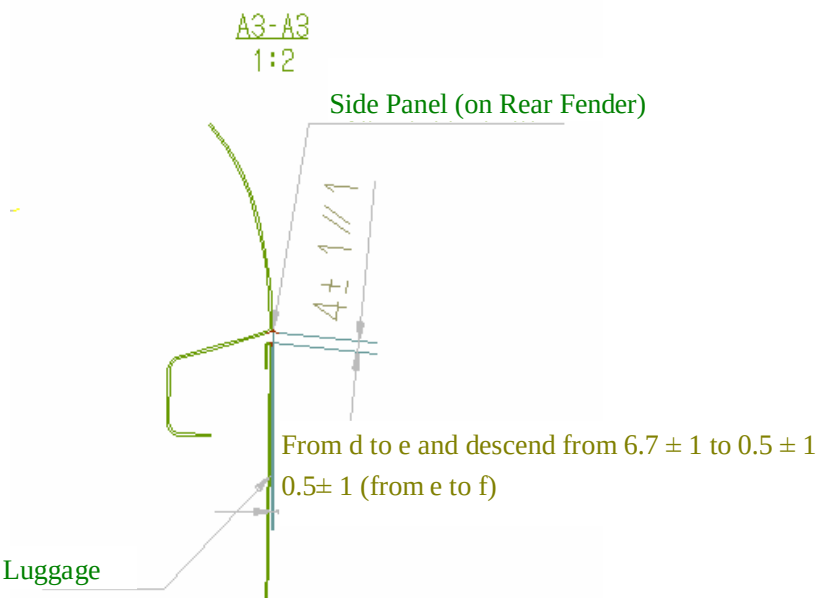
The clearance between the headlamp and the engine hood at A1-A1: 3 ± 1



The clearance between the front fender and the engine hood at A2-A2: 4 ± 1

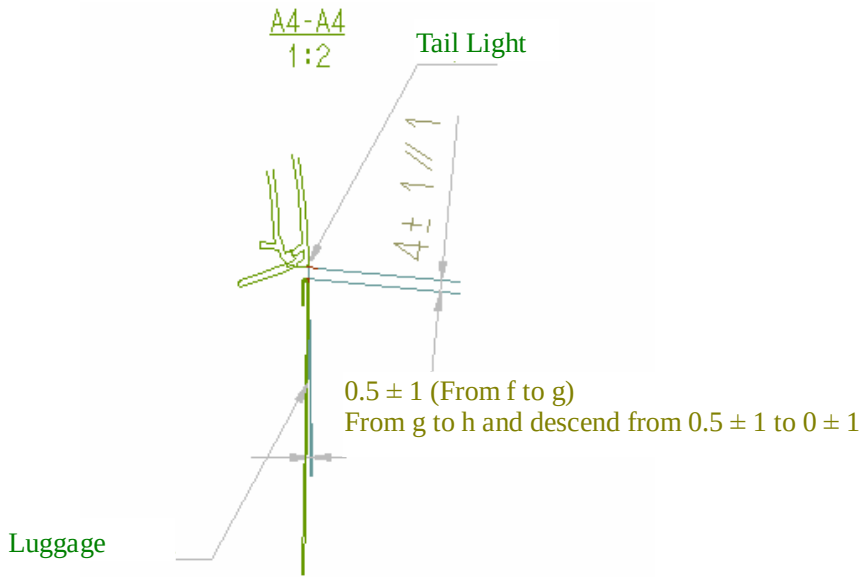


The clearance between the luggage compartment cover and the side panel (on rear fender) at A3-A3:4 ± 1

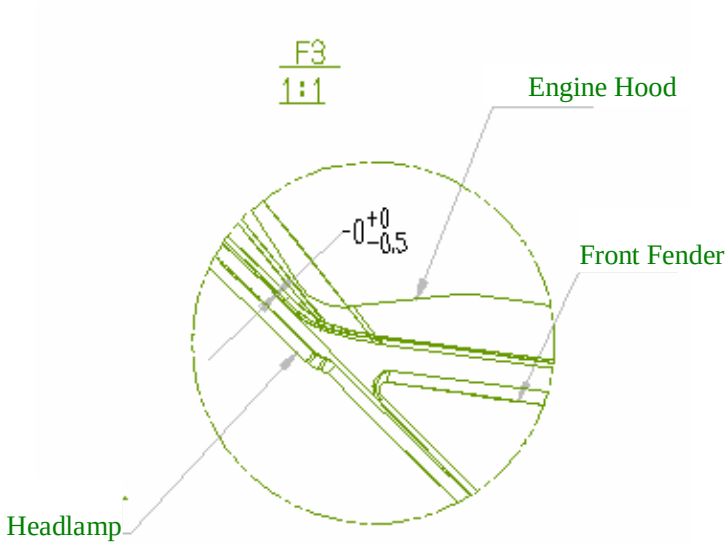


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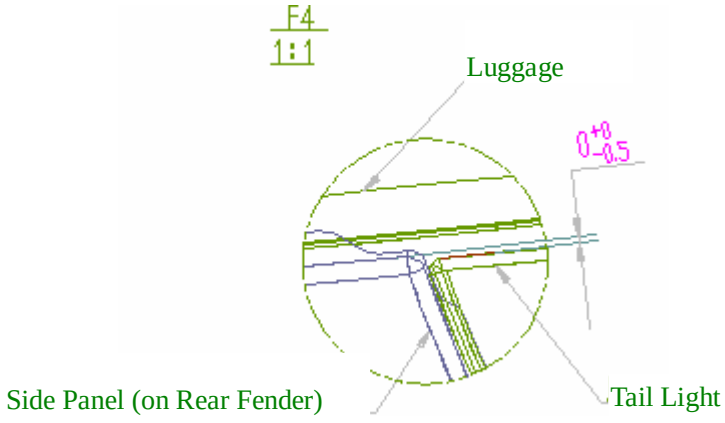
The clearance between the tail light and the luggage compartment cover at A4-A4: 4 ± 1



The clearance between the headlamp and the engine hood at F3: $0^{+0}_{-0.5}$

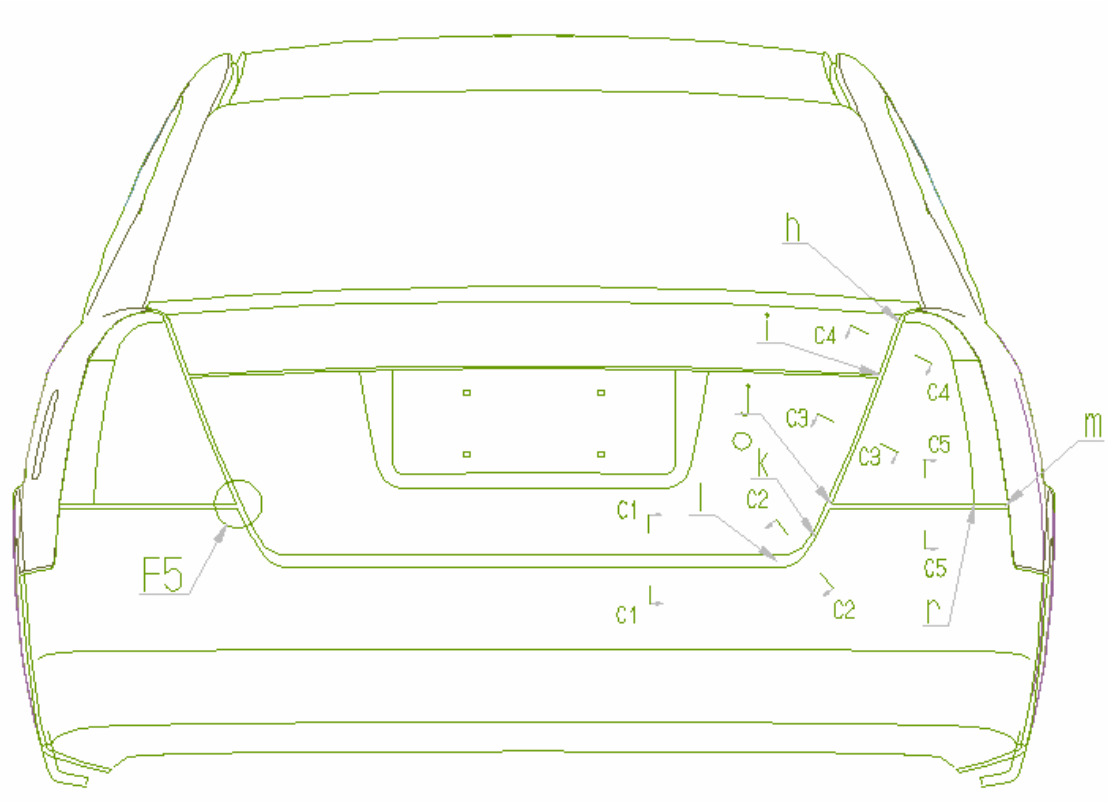


The clearance between the tail light and the luggage compartment cover at F4: $0^{+0}_{-0.5}$

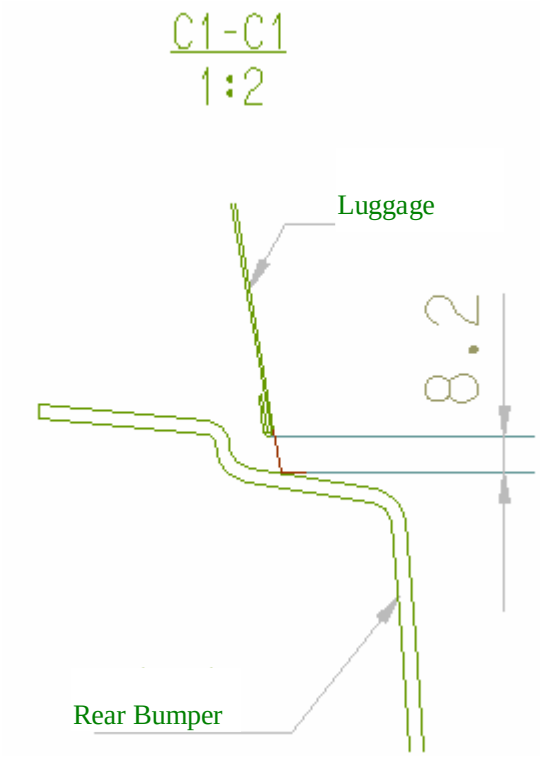


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Rear view

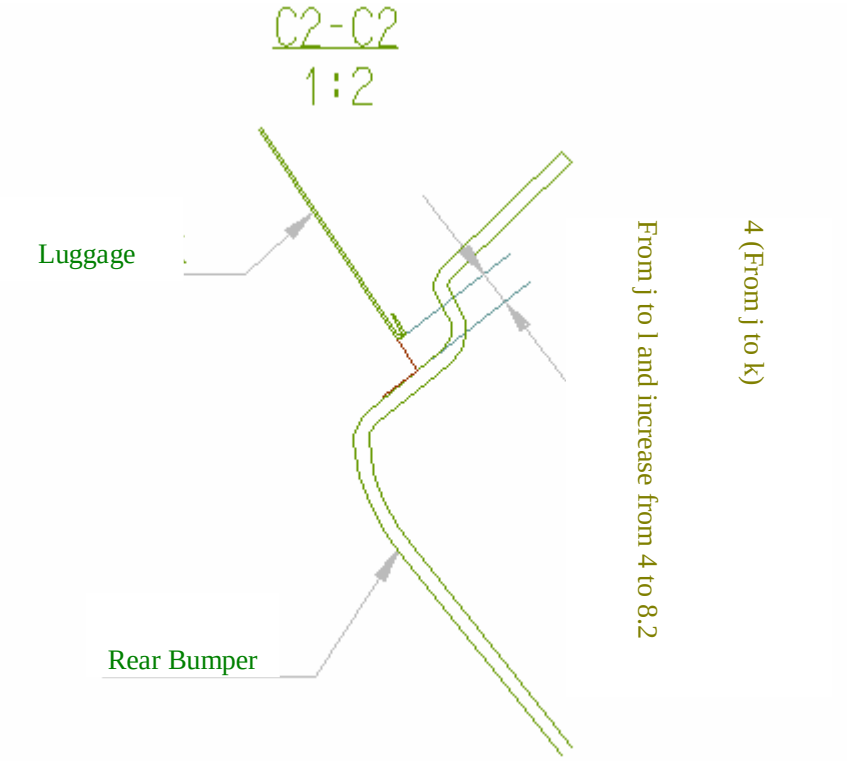


The clearance between the rear bumper and the luggage compartment cover at C1-C1: 8.2

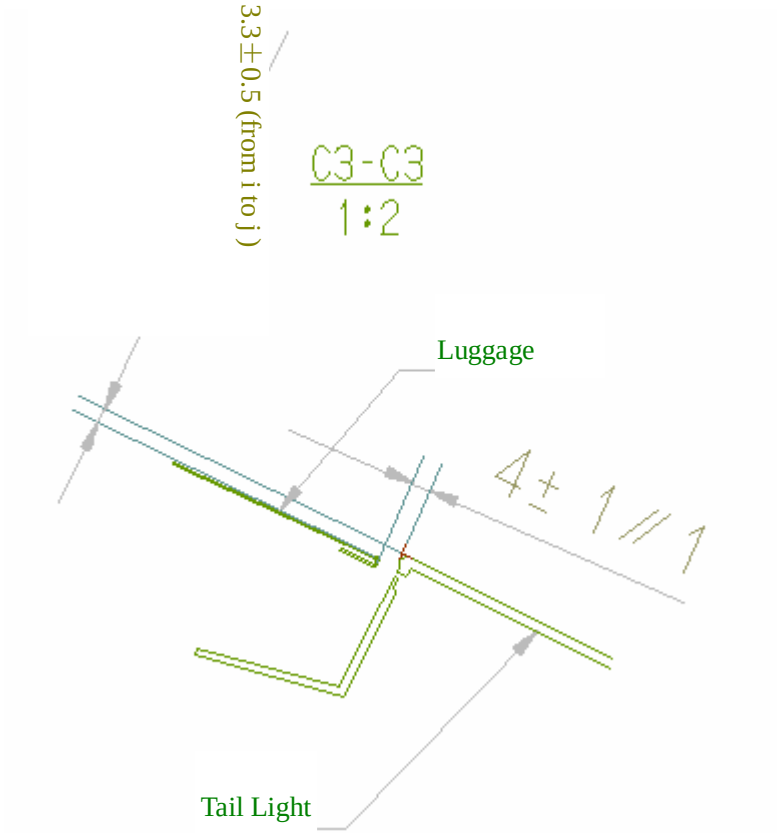


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The clearance between the rear bumper and the luggage compartment cover at C2-C2: 4

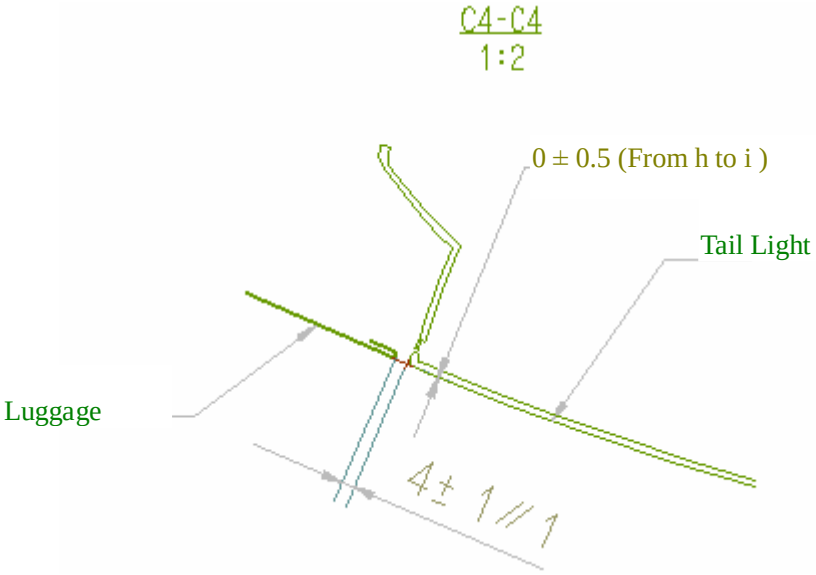


The clearance between the tail light and the luggage compartment cover at C3-C3: 4 ± 1

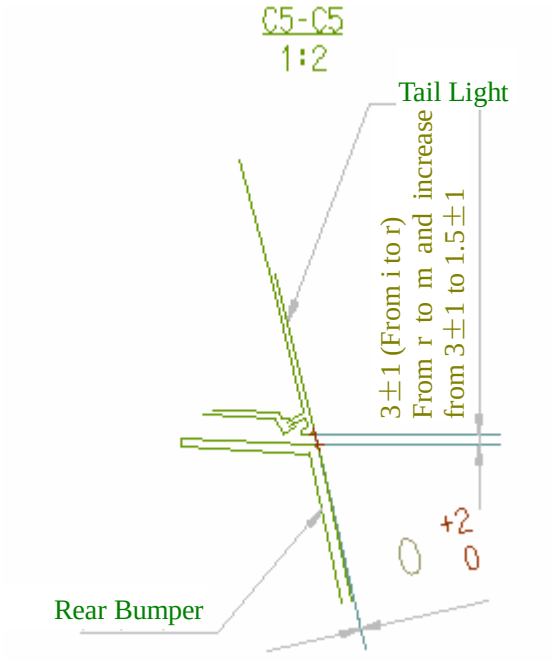


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The clearance between the tail light and the luggage compartment cover at C4-C4: 4 ± 1

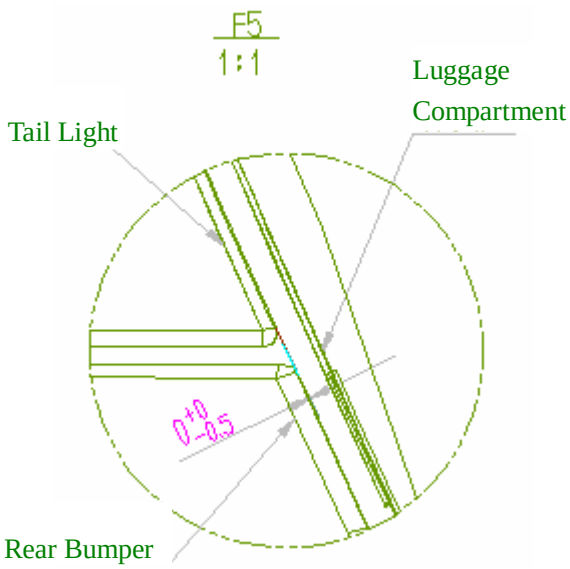


The clearance between the rear bumper and the tail light at C5-C5: 3±1

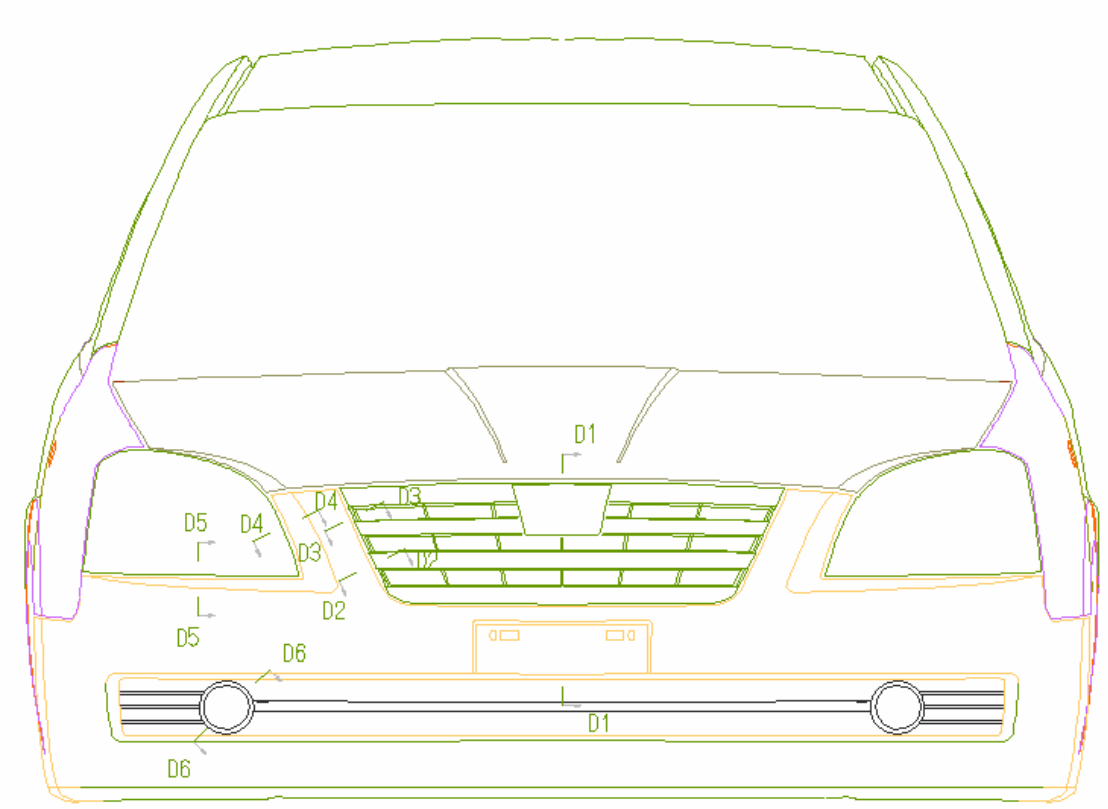


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The allowable installation deviation between the rear bumper and the luggage compartment cover at F5: $0^{+0}_{-0.5}$

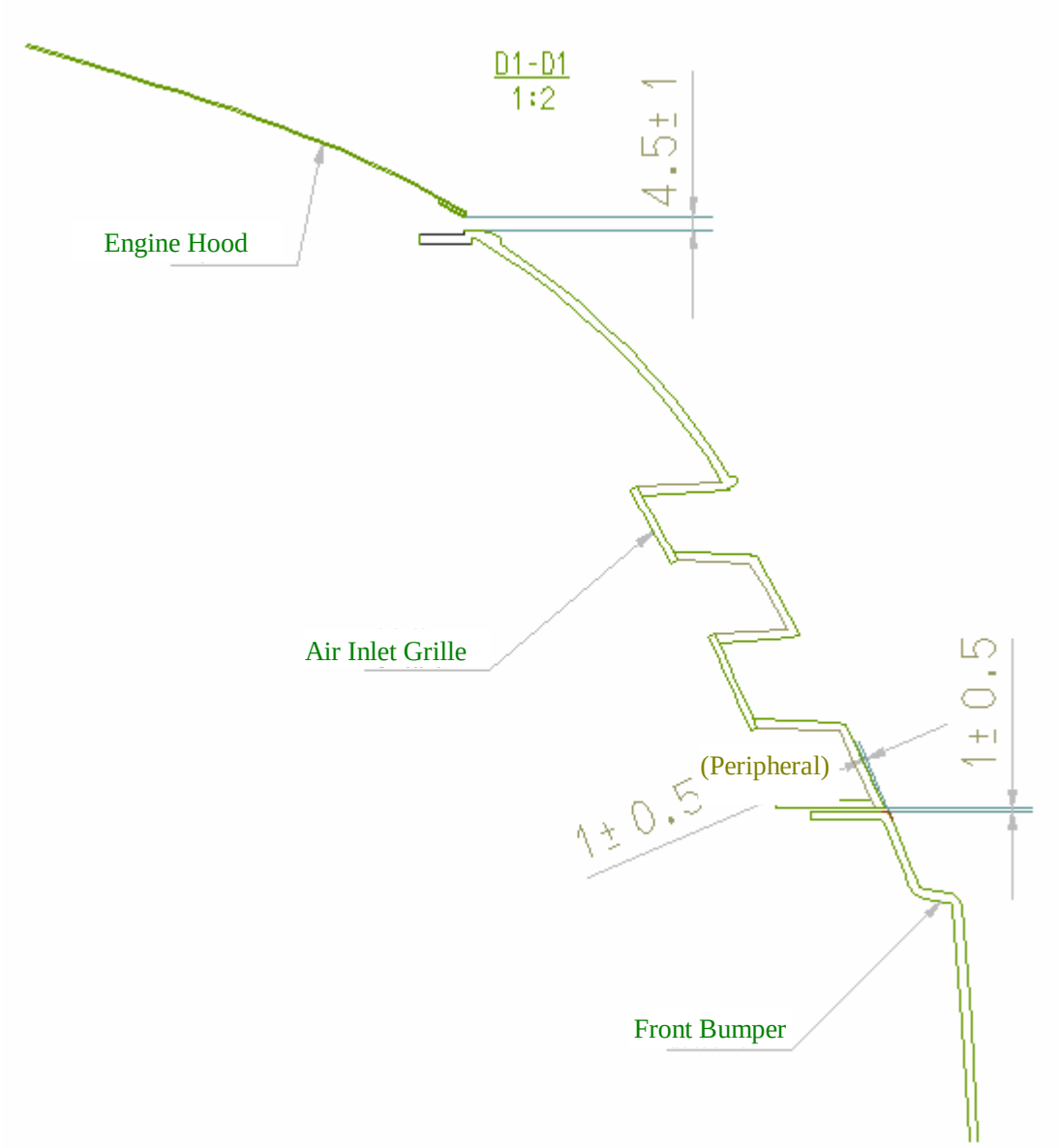


Front view



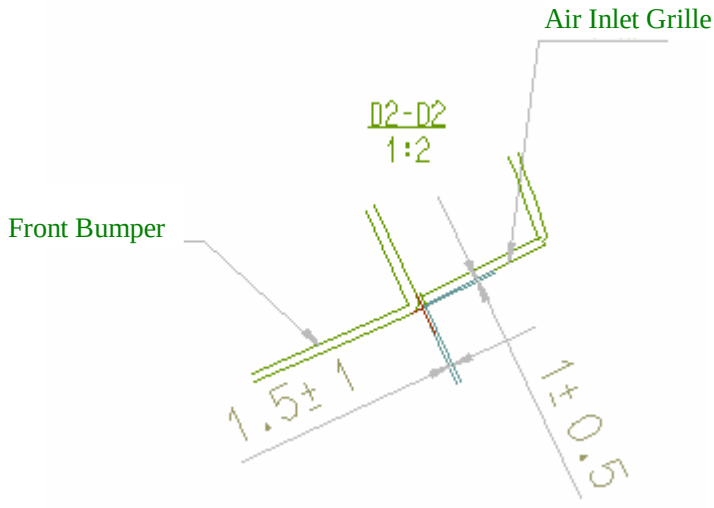
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The clearance between the engine hood and the air inlet grille at D1-D1 is 4.5 ± 1, while the clearance between the front bumper and the air inlet grille is 1 ± 0.5

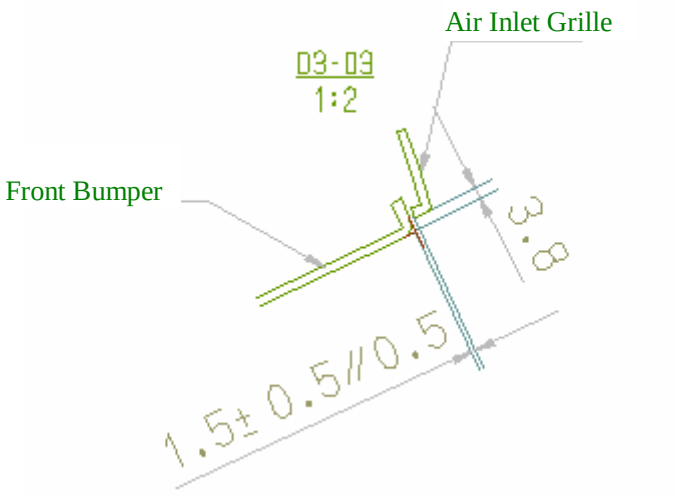


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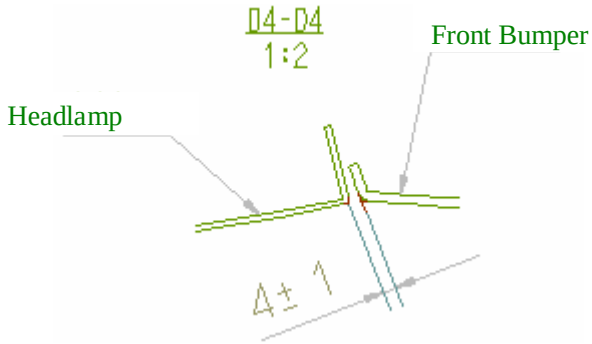
The clearance between the front bumper and the air inlet grille at D2-D2: 1.5 ± 1



The clearance between the front bumper and the air inlet grille at D3-D3: 1.5 ± 0.5

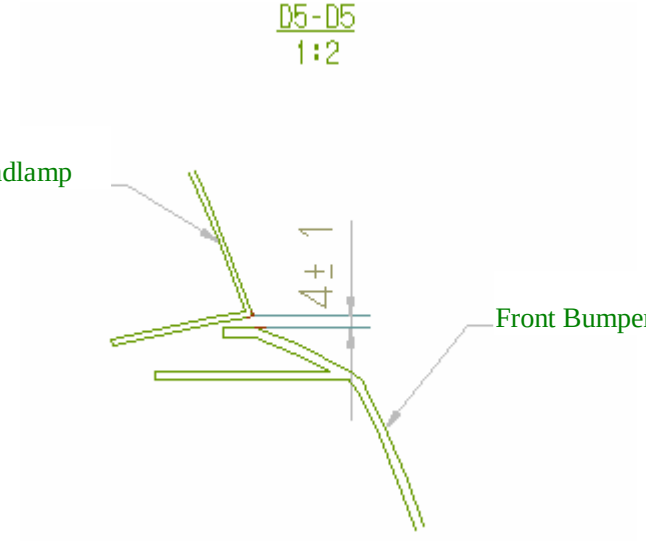


The clearance between the headlamp and the front bumper at D4-D4: 4 ± 1

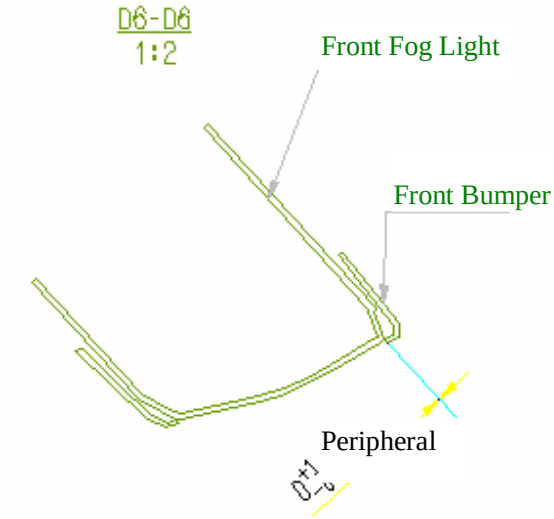


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The clearance between the headlamp and the front bumper at D5-D5: 4 ± 1

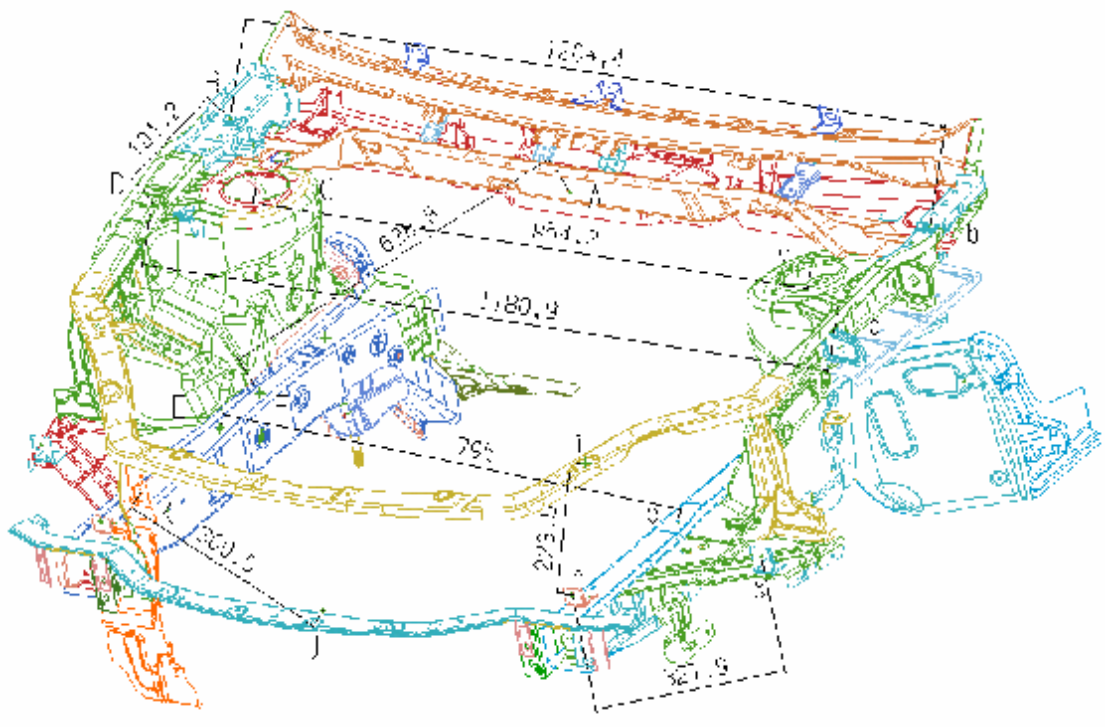


The clearance between the front fog light and the front bumper at D6-D6: $0^{+0}_{-0.5}$



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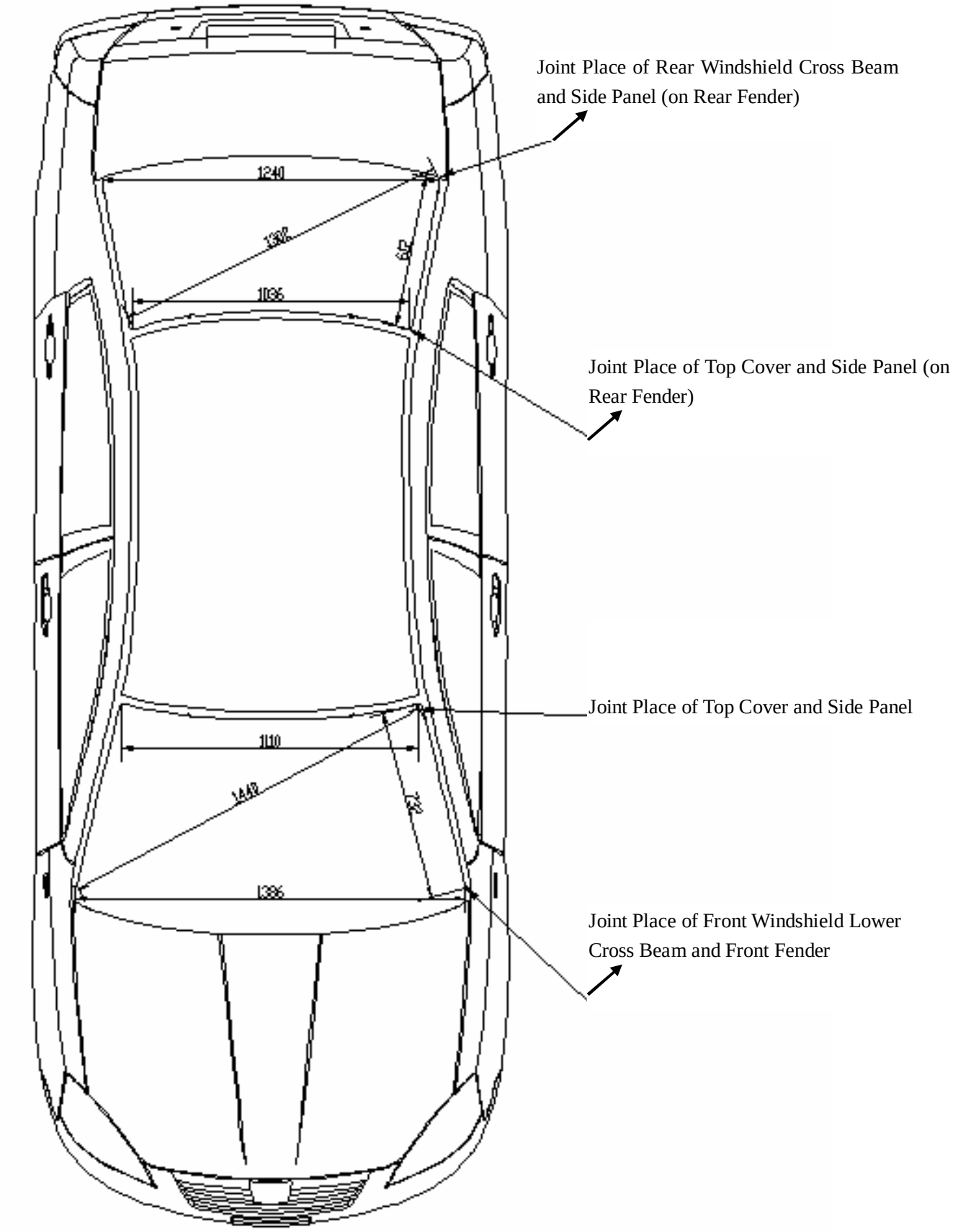
Dimension of the engine compartment:



Mark	Name	Diameter	Mark	Name	Diameter
A	Mounting hole for the body of cowl panel	7	F	Support hole for the right mounting bracket of the engine	11
Bb	Mounting hole for the fender	7	g	Hole for the headlamp	7
Cc	Via hole for the shock absorber	115	h	Hole for the headlamp	7
Dd	Mounting hole for the fender	7	i	Mounting hole for the lights	7
e	Mounting hole for the battery carrier	9	J	Hole for the bumper	9
E	Support hole for the right mounting bracket of the engine	11	K	Hole for the condenser	8X12

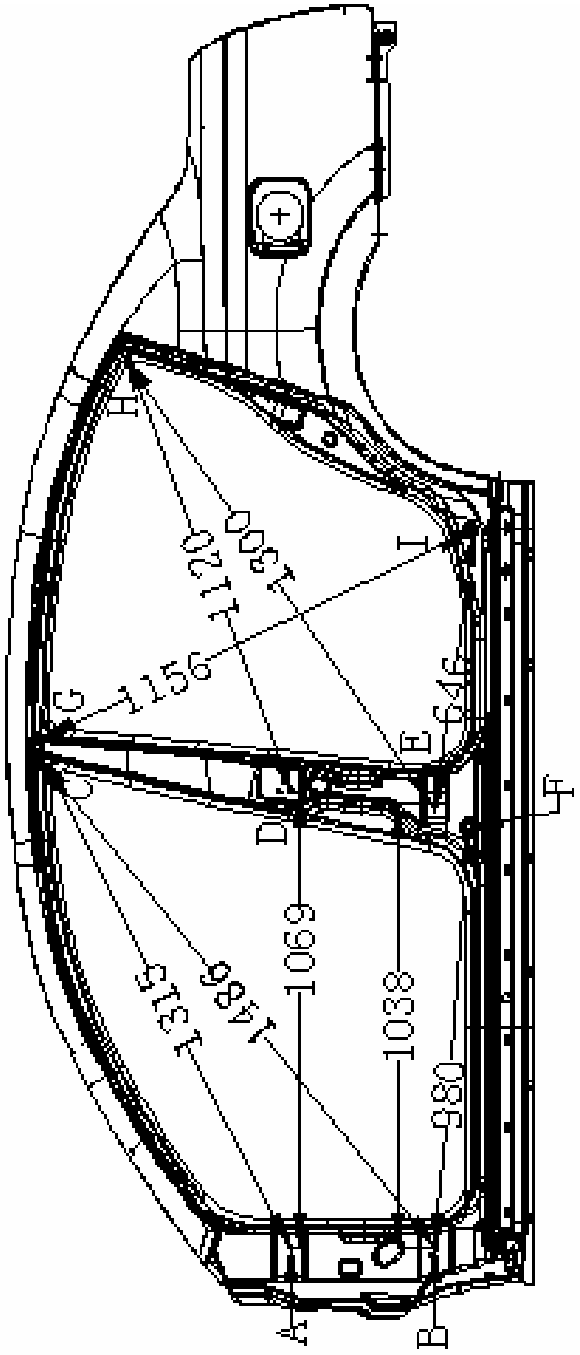
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Dimension of the windshield:



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Opening dimension of all the parts:



Dimension of the body, left-right Note: Symbols in uppercase English letter indicates the left of the body while lowercase English letter indicates the right of the body. (View from the rear of the vehicle)

Mark	Name	Diameter	Mark	Name	Diameter
Aa	Mounting hole for the upper hinge of the front door	11	Ff	Support point for the front door	
Bb	Mounting hole for the lower hinge of	11	Gg	Front upper corner point of the rear door	

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	the front door			guide rail of the side panel	
Cc	Upper corner point of the front door guide rail of the side panel		Hh	Rear upper corner point of the rear door guide rail of the side panel	
Dd	Mounting hole for the upper hinge of the rear door	11	Ii	Support point of the rear door	
Ee	Mounting hole for the lower hinge of the rear door	11			

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CHAPTER I BRAKE SYSTEM

SECTION I BRAKE SYSTEM PARAMETER

1) Check brake disc:

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

2) Check the thickness of brake disc:

Use caliber rule to check the thickness of brake disc.

The standard thickness of front disc (ventilation disc) is 22mm with its operating limit of 19mm; when exceeding the operating limit, the front disc should be replaced.

The standard thickness of the rear disc (solid disc) is 10mm with its operating limit of 7mm; when exceeding the operating limit, the rear disc should be replaced.

3) Check brake disc runout:

Use micrometer guage to check the runout degree of brake disc surface. The operating limits of front disc and rear disc are both 0.03mm respectively.

4) Check the thickness of brake lining:

The standard thickness of front brake lining is19.3mm and the operating limit is 9mm. The residual thickness of brake pad thickness limit should be not less than 1mm (coated plate: 5mm, noise insulator: 0.6m).

The standard thickness of rear-brake lining is 16mm with its operating limit of 8 mm. The residual thickness of brake pad thickness limit should be not less than 1mm (coated plate: 5.5mm, noise insulator: 0.3m).

5) Remark:

Before dismounting the wheel, you should check the thickness of external brake lining through the aperture in the wheel spoke, or dismount the wheel to have a check.

Important Notice:

- After replacing the friction lining or brake disc, you should step on the brake for several times in order to ensure a break-in between the brake lining and brake disc. Thus, the safety can be guaranteed.
- After replacing the brake lining, you should check whether the brake fluid level is positioning between MIN and MAX.

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SECTION II DISASSEMBLY AND ASSEMBLY OF REAR BRAKE

Needed tools: ratchet, ratchet rod, 8#, 13#, 15# and 20# sleeves, 13#, 14#, 17#, 30# box end wrenches, vice clamp, torque spanner and flat-tip screwdriver.

2.1 Disassembly sequence:

1) Screw off the tire clamp nut and dismount the tire.

Note: When dismounting the tire, you should firstly loosen the 4 clamp nuts for 1-2 folds, and then screw off the nuts. Do not scuff the bolt.

Torque: 110±10 N.m

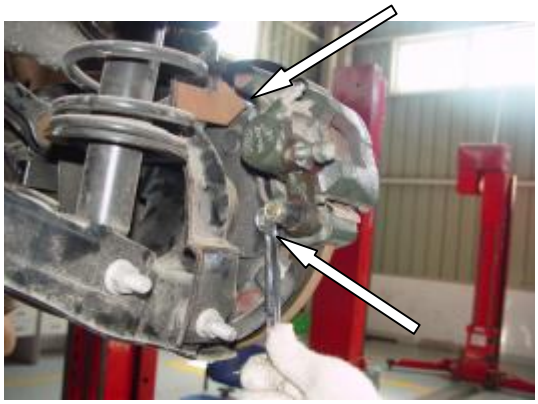


2) Use 13# box end wrench to screw off the nut connecting the brake oil pipe and the brake caliper, and discharge the brake fluid.

Note: Since the brake fluid is poisonous, you must keep your skin away from it.

Torque: 11-14 N.m

3) Use 13# box end wrench to loosen the bolts (2 pieces) connecting the brake caliper and brake backing plate. And then dismount the rear brake caliper assembly.



Torque: 63±3N.m

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4) Use 30# box end wrench to screw off the clamp nut of the wheel hub bearing unit.

Torque: 78±5N.m



5) Use 8# socket wrench to screw a M8 bolt into the bolthole illustrated in the figure, and pack out the brake disc.

Note: When replacing brake disc, please replace it in pair. No matter whatever happens, you are not allowed to use hammer or similar tools to hit the brake disc. If necessary, you can use rubber hammer to knock on the brake disc body.



6) Take out the rear brake disc. Check the thickness of brake disc, and replace the brake disc when its thickness is less than the specified minimum thickness.

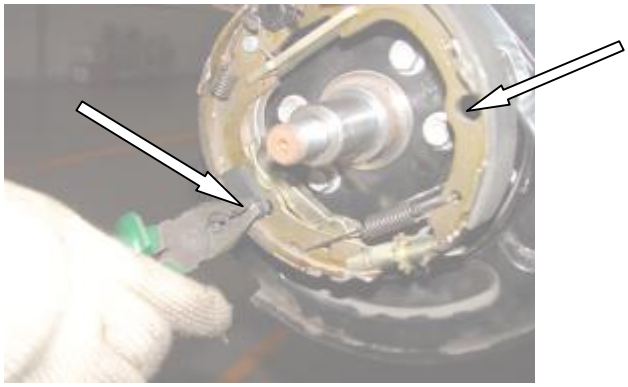


7) Use bearing puller to pull out the wheel hub bearing unit.



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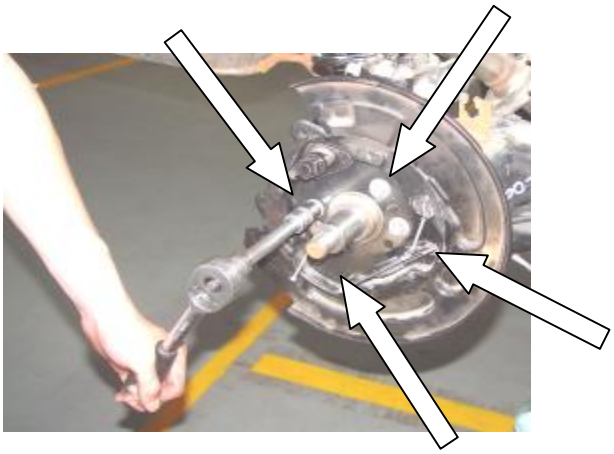
8) Use vice clamp to rotate the locating pin of handbrake shoe, and take out the hold-down spring seat (each for brake leading shoe and brake trailing shoe).



9) Dismount the return spring and handbrake control cable of handbrake shoe, and take down the handbrake shoe.

10) Use 15# socket wrench to loosen the fixed bolts (4 pieces) of brake backing plate, and dismount the brake backing plate.

Torque: 7-14N.m



2.2 Mounting of the rear brake assembly

Mount the rear brake assembly according to the reverse sequence of dismounting.

2.3 Disassembly of rear brake caliper

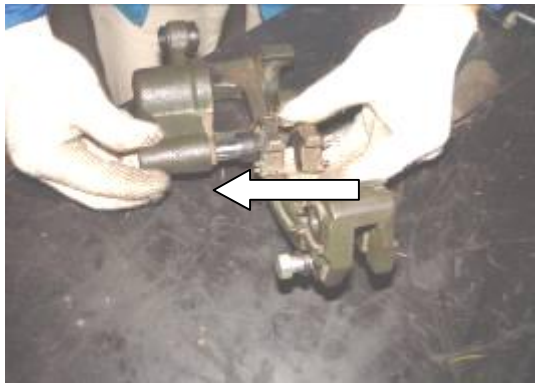
1) Use 17# box end wrench to dismount the connecting bolts of brake caliper.

Torque: 22—23N.m

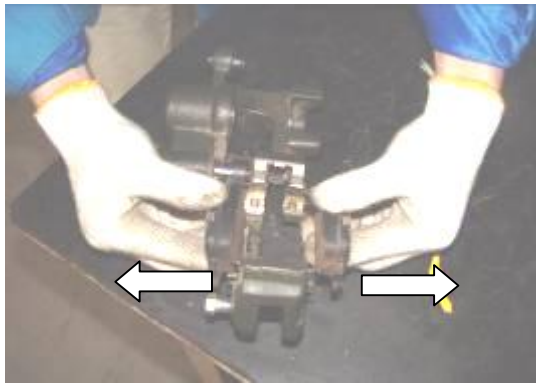


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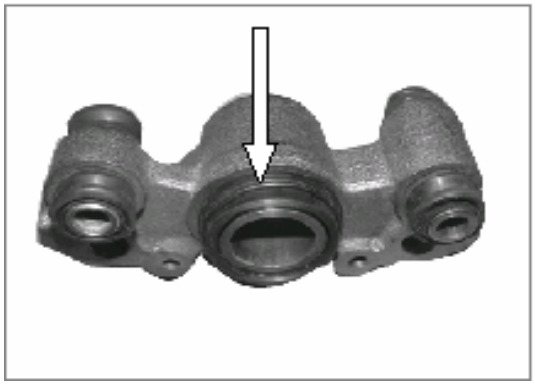
2) Take out the guide pin.



Note: When taking out the guide pin, you should avoid damaging the dust cover. If the dust cover is damaged, you should replace it immediately; otherwise, the piston alignment return shall not occur, leading to accidents. When mounting, you should equally paint lubricant onto the guide pin, but should not put the lubricant onto the brake lining. If lubricant grease splashes onto the brake lining, you should clean it and use sand paper to grind it slightly.



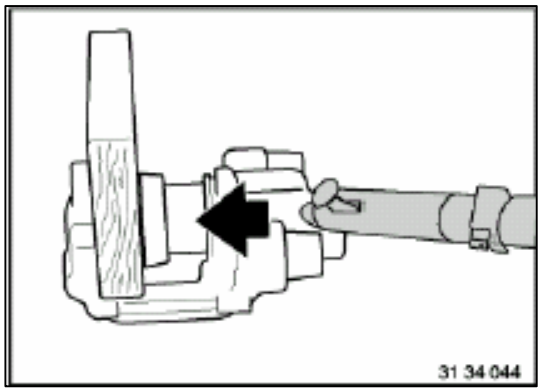
3) Dismount the brake lining to check its thickness. If one side of the brake lining is worn, you should not replace it. Only the thickness of brake disc is equal to or less than the specified minimum thickness, can you be allowed to replace it with new brake lining. Check the specified minimum thickness of brake lining, and clean it. Do not paint lubricant onto the backing plate of brake pad.



Note: When replacing brake lining, please replace it in pair.

4) Dismount the dust seal ring and check its damage. If necessary, you should replace it. Clean the contact surface of brake piston, and paint a thin layer of noise silencing paste onto it.

5) Dismount the piston. Use a board to shield off the piston, put the board between pistons and insert a pad at one end. Fill compressed air into the connecting hole to force off the piston. Put guard board (hard wood, etc) onto the notch of brake caliper in order to protect the piston.



Note: Do not use your finger to touch the piston in order to prevent your finger from being clamped.

The dismounting of brake caliper piston is strictly limited. Only professional personnel or

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the one who is under the guidance of professional personnel can dismount brake caliper piston.

2.4 Assembly of rear brake caliper

Assemble the rear brake caliper according to the reverse sequence of disassembly.

SECTION III DISASSEMBLY AND ASSEMBLY OF FRONT WHEEL BRAKE

Needed tools: ratchet, ratchet rod, 8#, 13#, 15#, 20# sleeves, 13#, 14#, 17#, 30# box end wrenches, vice clamp and torque spanner.

3.1 Assembly diagram of front wheel brake





3.2 Disassembly sequence of front wheel brake.

1) Use torque wrench or carry-on wrenches to unbolt the tire clamp nut and dismount the tire.

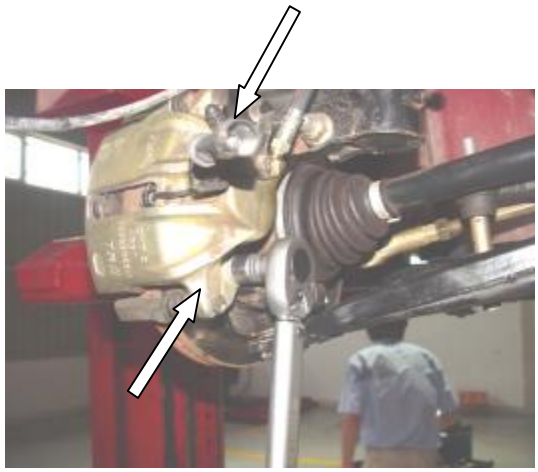
Torque: 110±10 N.m



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2) Use torque wrench and 17# sleeve to loosen the bolts connecting brake assembly and steering knuckle.

Torque: 85±5N.m



3) Use box end wrench to loosen the bolts connecting the brake hose and brake caliper. (If only friction disc needs to be replaced during maintenance, there is no need to dismantle the brake pipeline).



Note: Since brake fluid is poisonous, you should prevent the brake fluid from splashing onto your clothes or skin when dismounting the brake hose.

Torque:

4) Screw off the nuts and bolts mentioned in the 2nd and 3rd steps, remove the brake caliper from the steering knuckle, and isolate the brake caliper from the brake hose.

Note: Since brake fluid is poisonous, you should prevent the brake fluid from splashing onto your clothes or skin when dismounting the brake hose.

5) Use punch to rectify the notch as illustrated in the figure, and use 30# sleeve and torque wrench to dismount the clamp nut.

Torque: 78±5N.m



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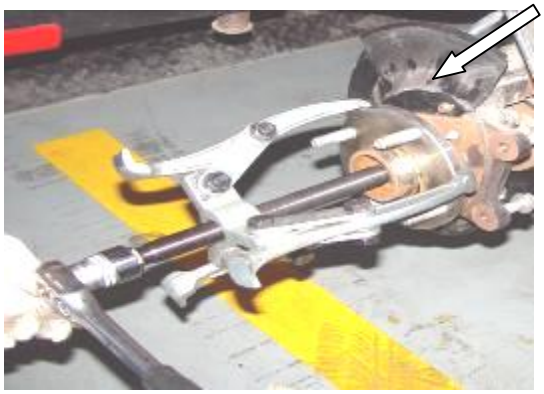
6) Use cross-head screwdriver to screw off the fastening screw of brake disc, and lift down the brake disc. Check the thickness of brake disc, and replace the brake disc if its thickness is less than the specified minimum thickness.



Note: When replacing the brake disc, please replace it in pair.

Torque: 7-9 N.m

7) Use 3-arm hub puller to pull out the wheel hub. Dismount the fastening bolt of splash shield, and remove the splash shield.



8) Use torque wrench and 18# sleeve to dismount the bolts connecting the steering knuckle and control arm.

Torque: 110±5N.m



9) Use torque wrench and 17# sleeve to dismount the bolts (3 pieces) that connect the ABS wheel-speed sensor unit and steering knuckle.

Torque:



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10) Disassemble the connectors of the ABS wheel-speed sensor unit and wire harness, and take out the ABS wheel-speed sensor unit.



3.3 Assembly of front wheel brake

The assembly sequence is opposite to disassembly sequence.

3.4 disassembly of front-wheel brake caliper

1) Remove the thickness monitoring harness of friction wafer from the bracket.



2) Use a 13# and a 15# open end wrench to dismount the fastening bolt of brake caliper bracket.

Torque: 22-23N.m



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3) Uplift the fixing bracket of brake caliper, and take out the brake lining.



Check the thickness of friction wafer, and replace it if it cannot meet the requirement.

Note: When replacing friction wafer, please replace it in pair.

4) Disassemble the brake cylinder. The disassembly sequence is as the same as that of the rear brake cylinder.

3.5 Assembly of brake caliper

The assembly sequence is opposite to disassembly sequence.

SECTION IV REPLACEMENT OF HANDBRAKE CONTROL CABLE

Needed tools: flat-tip screwdriver, ratchet wrench, ratchet rod, 10#, 13# sleeves, carry-on wrenches, torque wrench and vice clamp.

4.1 Disassembly sequence:

1) Use screwdriver to pry out the edges of central armrest box, and dismount the central armrest box.

2) Use cross-head screwdriver to loosen the fixed screws connecting the rear air outlet and bracket.



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3) Use ratchet wrench and 10#, 13# sleeves to loosen the fastening bolts connecting bracket and floor plate, and dismount the bracket.



4) Remove the brake cable from the cable connection.



5) Uplift the backseats and uncover the carpet.

Note: When uncovering the carpet, if the scuff plate stands in the way, you should dismantle the scuff plate firstly.



6) Unbolt the clamp nuts connecting the brake cable bracket and floor plate, and remove the brake cable from the bracket.



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7) Dismount the rear tire, and dismantle the rear brake assembly as the figure illustrated (Disassembly sequence is detailed in the “Dismounting of rear wheel brake assembly". Use vice clamp to dismount the return spring under the drum brake, and remove the push rod as illustrated in the figure.



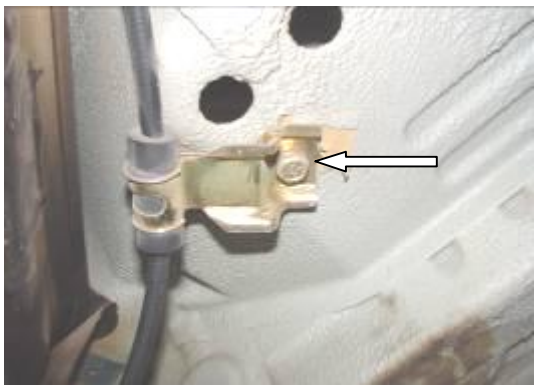
8) Take out the brake cable from brake arm.



9) Uplift the car, and use flat-tip screwdriver to pry out the brake cable from the brake backing plate.



10) Use ratchet wrench and 15# sleeve to dismount the bolts as shown in the following figure, and then pull out the brake cable.



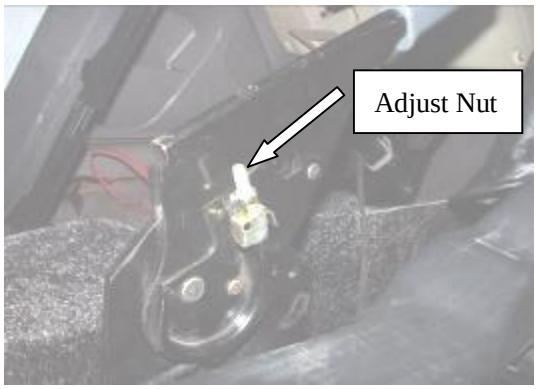
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4.2 Assembly sequence:

Assemble the handbrake control cable according to the reverse sequence of disassembly.

Note: After replacing brake shoe or handbrake control cable, you need to regulate parking brake:

- Loosen the parking brake handle.
- Heavily step on the brake pedal once.
- Pull up the parking brake handle for 4 gears.
- Fasten the adjusting nut until the two wheels cannot be rotated by hand.
- After finishing the above-mentioned sequences, you should loosen the parking brake and check whether the two rear wheels can rotate freely. Otherwise, repeat the above-mentioned steps.



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SECTION V REPLACEMENT OF HANDBRAKE HANDLE

Needed tools: ratchet wrench,10# sleeve, vice clamp, cross-head screwdriver, and slot-head screwdriver.

5.1 Disassembly sequence:

1) Use screwdriver to pry out the edges of central armrest box, and dismount the central armrest box.

2) Use ratchet wrench and 10# sleeve to dismount the handbrake fastening bolts (3 pieces).



3) Take out the brake cable from the cable connection.



4) Use cross-head screwdriver to dismount the earth screw of handbrake circuit, and then unbolt the handbrake.

5.2 Assembly sequence:

Assembly sequence is opposite to disassembly sequence.

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SECTION VI REPLACEMENT OF BRAKE MASTER CYLINDER

Needed tools: clamp pliers, 10#, 12# open end wrenches, 13# sleeve and ratchet wrench.

6.1 Disassembly sequence:

1) Pull out the plug of oil level sensor.

2) Use sucker to pump out the brake oil.

Note: Since the brake oil has strong corrosiveness, you should prevent the brake oil from splashing on your skin and lacquer finish.

3) Use clamp pliers to dismount the fastening clamp at the oil inlet pipe of clutch cylinder, and remove the oil inlet pipe of clutch.



4) Use 10# and 13# open end wrench to loosen the brake pipeline of brake master cylinder.



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5) Dismount fluid reservoir

Remark: Push the fluid reservoir upwards in order to remove it from the master cylinder and remove the O-shape seal ring from the groove of fluid reservoir. Check whether the fluid reservoir is cracked or deformed, and replace it if necessary. Use clean denatured alcohol to clean the fluid reservoir or use the compressed air containing no lubricant to clean the fluid reservoir.

6) Use 13# sleeve and ratchet wrench to dismount the fixing nut (each at both left and right side) of brake master cylinder, and take out the brake master cylinder.



6.2 Assembly sequence:

Assembly sequence is opposite to disassembly sequence.

SECTION VII REPLACEMENT OF BRAKE PEDAL AND VACUUM BOOSTER

Needed tools: ratchet wrench, ratchet rod, 13# sleeve, vice clamp, 10#, 12# open end wrenches and clamp pliers.

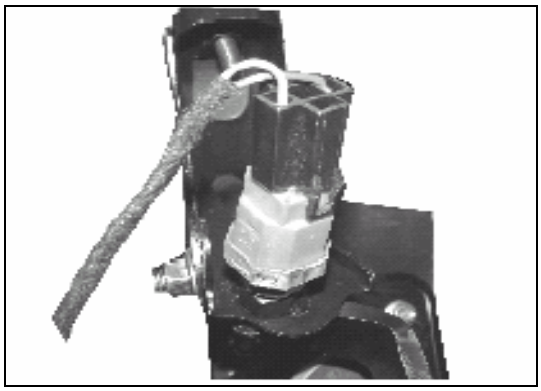
7.1 Disassembly sequence:

1) Disassemble the brake master cylinder. (The disassembly sequence is detailed in the “disassembly of brake master cylinder”).

2) Use clamp pliers to dismount the clamp nearby the hose connecting vacuum booster and engine.

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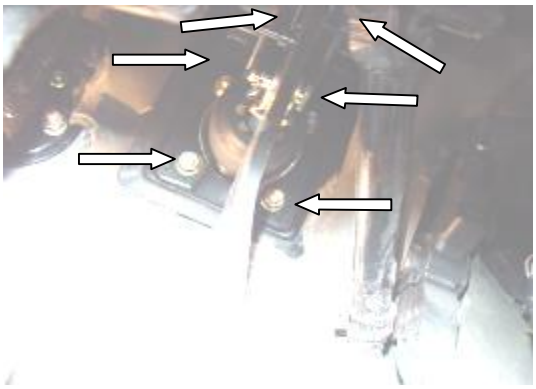
3) Dismount the brake light switch plug and remove the brake light switch.



4) Use vice clamp to dismount the pin connecting the vacuum booster pump to the brake pedal, and remove the connecting pin.

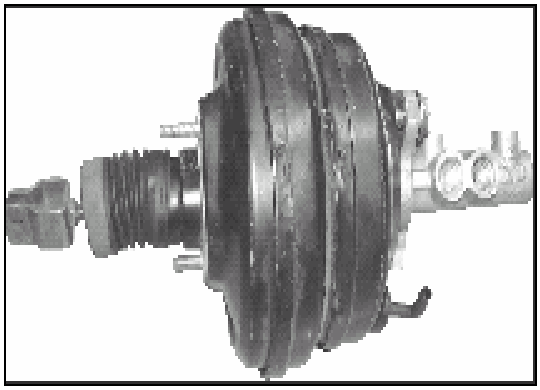


5) Dismount the four fixed bolts of the brake pedal bracket and the two bolts connecting the brake pedal and car body.



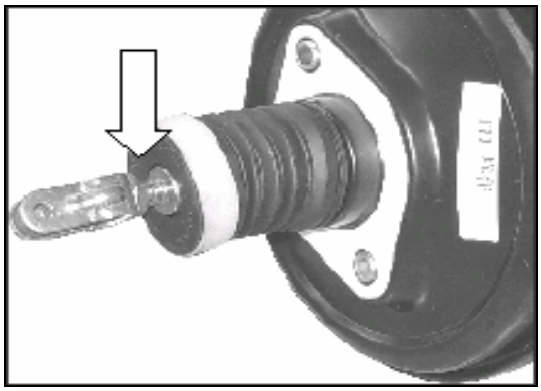
6) Take out the brake pedal and vacuum booster.

Note: The internal components of booster cannot be repaired and the booster case cannot be dismantled. The dismantling of booster case shall result in permanent deformation and improper capacity of thrust augmentation.



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7) Loosen adjusting bolt to regulate the brake pedal to standard height.



7.2 Assembly sequence:

The assembly sequence is opposite to disassembly sequence.

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SECTION VIII ABS SYSTEM MAINTENANCE

Needed tools: Chery-specific diagnostic tester, 10#, 13# open end wrenches, ratchet wrench and 10# sleeve

8.1 Precautions prior to maintenance

1) When the ignition switch is at the ignition position, you should not disassemble and assemble the electric components and harness connectors of the system in order to prevent the electronically controlled units (ECU) from being damaged. Before disassembling and assembling, you should turn off the ignition switch.

2) You are not allowed to supply extremely high voltage to ECUs, otherwise the ECUs shall be easily damaged.

3) Protect the ECUs from being impacted and knocked in order to avoid of damage.

4) High temperature environment is prone to damage ECUs; therefore, you should remove the ECUs from the car when baking paint for the car. In addition, when welding the system components or wire harness, you should also pull out the harness connectors from ECUs.

5) Prevent oil stain from splashing onto ECUs, especially the terminal. Otherwise, it shall lead to loose contact of terminal.

6) When the battery voltage is too low, the system cannot be operated. Therefore, you should check the battery voltage, especially at the circumstance that you launch the initial startup after stopping driving the car for a long time.

7) Prevent the wheel speed sensor and sensor gear ring from being polluted by oil stain or other dirties. Otherwise, the wheel speed sensor shall generate inaccurate wheel speed signal, which shall further impose influence on the accuracy of system control, and even lead to system failure. Furthermore, you are prohibited to knock the rotation speed sensor; otherwise, sensor-degaussing phenomenon may be prone to occur, which is unfavorable for the normal operation of system.

8) When repairing the hydraulic system, you should firstly discharge the high-pressure brake fluid of the energy accumulator completely in order to protect persons from being hurt by the splash of high-pressure brake fluid. In the case of discharging the high-pressure brake fluid of energy accumulator, you should firstly turn off the ignition switch, and repeatedly step on and loosen the brake pedal until it becomes very hard. Additionally, before the brake hydraulic system is well installed, you are not allowed to turn on the ignition switch with a bid to stop the electrically-driven pump from operating.

9) The brake system should use special pipeline, since brake system often has a very high pressure. If general pipeline is utilized, it shall be easily damaged.

10) Because the wheel speed sensor, ECUs and brake pressure adjusting devices of the antilock brake system (ABS) cannot be repaired, you should replace them completely if

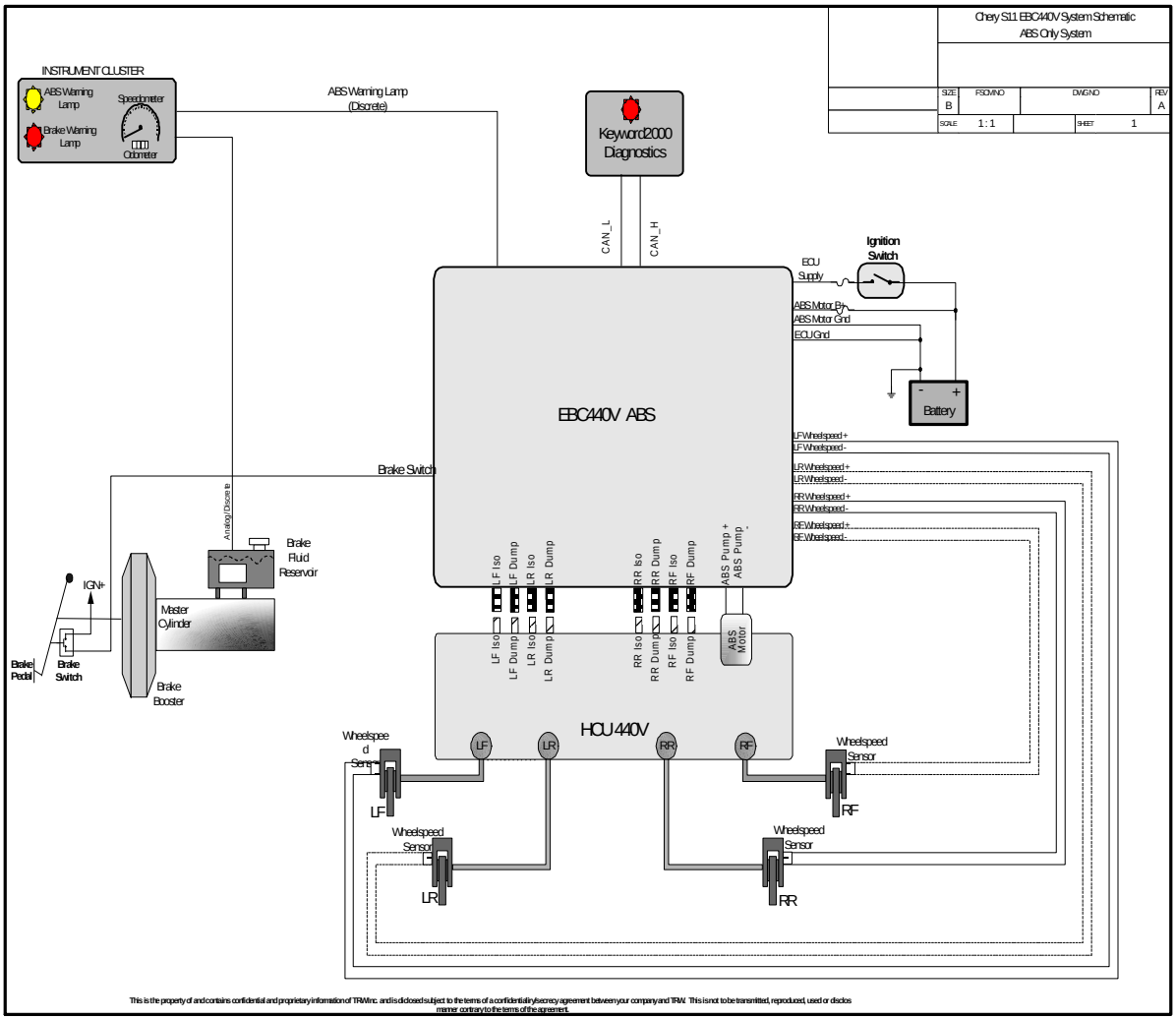
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they are damaged.

11) After repairing the brake hydraulic system or finding the brake pedal is becoming soft during operation, you should discharge the air from the brake system in accordance with required method and sequence.

12) You should try your best to select the tires recommended by the automobile manufacturers. If the using of tires in other types is necessary, you should select the tires with the outside diameter, traction performance and rotary inertia similar to the former ones, but should not select the tires with different specifications, which shall impose influence on the control effects of ABS.

8.2 Schematic diagram of abs control



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8.3 Disassembly and assembly sequence

1) Dismount the ABS module plug.

Push the white clip shown in the figure towards the arrow direction, and the ABS module plug shall recede.



2) Use 10#, 12# open end wrenches to dismount the nuts connecting ABS assembly and pipelines.

Note: When dismounting the pipeline, you should prevent the extraneous substances from falling into the ABS assembly. You'd better use clean gauze to block up the oil inlet of ABS while dismounting the pipeline.



3) Use ratchet wrench and 10# sleeve to dismount the bolts connecting ABS assembly and bracket ,and take out ABS assembly.



8.4 Assembly sequence:

The assembly sequence is opposite to the disassembly sequence.

Note: Turn on the power supply after completing installation, and connect diagnosis instruments to the system to access the failure code and then eliminate it. After these procedures are finished, the diagnostic tester shall carry out retest on the system.

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Section IX Brake Fluid Filling and Air Discharge

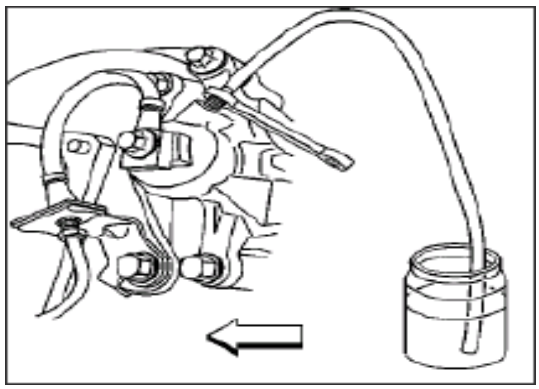
Needed tools: diagnosis instrument and 10# open end wrench

If air enters into the brake system in the case of brake component repairing or replacement, you should implement the complete air discharge process. Before the brake is air-discharged, the front and rear air-discharge cylinder piston must return to the highest position. The preferred method is to use failure diagnostic tester to make the cylinder piston return the highest position once again. If failure diagnostic tester cannot be used, you can adopt the second procedure, but you must carry out the operation in strictly accordance with the specified steps.

If air enters into the brake system due to too low liquid level or the cut-off of brake pipeline of the master cylinder, you must discharge the air from the four brake hydraulic systems. If the brake hose or brake is broken on certain wheel, you should only discharge the air from the wheel clamp. If brake pipe or hose is broken at any joint of mater cylinder and brake, you should only discharge the air from the brake systems related to the broken pipe or hose.

9.1 Air discharge of brake system

1) Uplift and support the car properly.
2) Install the transparent plastic exhaust hose onto brake caliper bleeder valve.
3) Put the other end of the transparent exhaust hose into the clean container containing some clean brakes.
4) Step on the brake pedal for 5-6 times, and open the exhaust valve to make the brake fluid flow.
5) Repeat above mentioned the fourth step until the there is no air bubble in the brake fluid, and close the exhaust valve when you feel more strength on step the brake pedal.
6) Dismount the transparent plastic exhaust hose from the exhaust valve.



Note: The above-mentioned steps are applicable for the air discharge of the brake pipeline of each brake.

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9.2 Air discharge sequence of brake system is:

Left back → right front → right back → left front. If the ABS system connects with failure diagnosis instrument, you can access the fluid filling and air release program, and discharge the air from the ABS system according to the steps prompted by the system.

9.3 Air discharge of brake loop

Connect the exhaust hose of container to the fluid and air discharge valve of the left-back brake caliper. Open the fluid and air discharge valve, and step on the brake pedal to the earth for at least 5 times. The discharged brake fluid must be clean and have no air bubble. Keep stepping on the brake pedal to the largest extent, close the fluid and air discharge valve and then loosen brake pedal. Similar operations can be applicable for the brake systems of other wheels.

9.4 Brake fluid filling

In order to ensure the reliability of brake system, you should check the brake fluid level at intervals or after finishing the air discharge of the brake system. If brake fluid is deficient, you should fill it instantly.

Note:

(1) Brake fluid should meet the standards stipulated by the Department of Transportation (DOT) (only DOT4 can be used), and should not be mixed with other types of brake fluid.

(2) Brake fluid has relatively strong water absorptivity. It should be put into the original sealed container when being recycled.

(3) Brake fluid has relatively strong corrosiveness. If it splashes onto your skin, you should instantly use wet cleaning cloth to wipe off the brake fluid, and then wash your skin by soapy water. Brake fluid is strongly corrosive to the car body paint; therefore, you should prevent the brake fluid from splashing onto the car body paint. If the brake fluid splashes onto the car body paint, you should wash it immediately.

(4) During the process of air discharge, you should pay more attention to the brake fluid level of fluid reservoir. If the brake fluid level is very low, you should refill it in time.

(5) Manual air discharge operation should be repeated for more times until the air in the brake system is completely discharged.

(6) After finishing the fluid filling and air discharge operation, you should check whether there is leakage in the brake system. If leakage phenomenon exits, you should eliminate it timely in order to ensure the safety of car driving.

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CHAPTER II STEERING SYSTEM

SECTION I INSTRUCTION AND OPERATION

I. SAFETY REGULATIONS ON POWER STEERING SYSTEM

If the risk of electrical short circuit exists in the operation process, the earthing lead should be cut off; the negative pole connector of the storage battery should be covered; internal screw threads should be recut onto the bolts using locking glue and the external threads should be cleaned up; and locking glue should be used in the case of bolt insertion and locknut should be regularly replaced.

Heat treatment should not be carried out on the components of steering system; otherwise, the possible variation of material feature shall impact a negative influence on the operation safety of vehicles.

Only approved special steering fluid can be used and the discharged steering fluid should not be reused.

In the wake of accident occurrence, not only the chassis alignment shall be inspected (chassis alignment should be inspected at any circumstance), but also other chassis components should be carried out visual inspection to see whether there is curve or bull crack.

II. INSTRUCTION ON POWER STEERING PUMP

Power steering pump is a vane pump, which shall provide hydraulic pressure to the system. Power steering pump consists of components as follows:

Drive shaft

Steering pump body

Steering pump ring

Pressure plate

Thrust plate

Flow control valve

Rotor

Vane

The aperture at the rear part of the steering pump body should include components as follows:

Steering pump ring

Pressure plate

Thrust plate

Rotor

Vane

End plate

The small aperture at the flank of the steering pump body should consist of components as follows:

High-pressure hose connector

Flow control valve

Spring

Flow control orifice is an integral part of high-pressure hose connector. The pressure relief valve in the flow control valve shall control the pressure of steering pump.

III. INSTRUCTION ON POWER STEERING GEAR

The movement of steering wheel shall play functions as follows:

1. The movement of steering wheel shall be passed to the pinion.
2. The movement of pinion shall be passed to the gear.

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3. The gear of pinion mesh with that of the gear rack.
4. This shall make the gear rack move.

Pinion and rack power steering system is furnished with a rotary valve type control valve, which facilitates the steering fluid to flow toward the rack piston. Monoblock rack piston is connected with gear rack and its functions as follows:

1. Rack piston converts hydraulic pressure into linear force.
2. Linear force makes the rack under side-to-side movement.
3. Linear force is passed to the internal and external steering tie rod and steering knuckle.
4. Steering knuckle rotates vehicle wheel.

Note: if there is no hydraulic power system, bigger steering force shall be needed.

IV. INSTRUCTION ON STEERING WHEEL AND STEERING COLUMN

The steering column components shall play the functions except for steering. The depicted functions shall be achieved by the steering column components as follows:

1. Steering column

Steering column absorbs energy. When frontal collision occurs, the steering column shall retract in order to reduce the probability of hurt to the driver.

2. Ignition switch and steering lock on the steering column.

The ignition switch and steering lock installed onto the steering column can lock the vehicle in an effort to prevent the vehicle from being stolen.

3. Combination switch

Multi-functional driving handle controls components as follows:

- Headlight high beam
- Windscreen wiper and washer

Steering column disassembly and reassembly adopt specified screws and bolts to ensure energy absorption to give an effect on the external force existing on the steering column. During the conveying after dismantling it from vehicle, special caution should be taken.

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SECTION II SPECIFICATIONS OF ASSEMBLY TORQUE

Tightening Torque	Number Of Vehicles	Affiliated Assemblies
25±3	3	Bracket And Low Right Bracket Of Secure Steering Column
25±3	1	Connection Universal Connector And Steering gear
10±1	4	Secure steering sleeve bracket
10±1	1	Secure Clamp A21-3406423
10±1	1	Secure Clamp Bracket Ⅰ
10±1	2	Secure Clamp Bracket Ⅱ
10±1	2	Secure Heat shield of Steering gear
35±3	2	Tie rod end And Steering Knuckle
75±5	4	Secure Steering gear And Subframe
75±5	2	Secure Steering gear And Subframe
25±3	2	Secure Steering oil reservoir
25±3	1	Secure clamping sleeve
25±3	1	Secure Steering Oil Pump
180±15	2	Subframe Front And Vehicle Body Connections
80~90	2	Subframe Rear And Vehicle Body Connections
80~90	2	Ball Pin Of Control Arm And Steering Knuckle
25±2	4	Stabilizer Bar Clamp
50±3	2	Connect Stabilizer Bar with Extension Bolts
60±5	2	Connect Rear Mounting with Transmission
70±5	4	Connect Rear Mounting with Subframe

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SECTION III DISASSEMBLY AND ASSEMBLY OF STEERING SYSTEM

DISASSEMBLY OF STEERING GEAR

DISASSEMBLY:

I. DISASSEMBLE UNIVERSAL CONNECTOR OF STEERING SHAFT

1. Loosen the fastening bolts of universal connector.



II. DISMOUNT SUBFRAME ASSEMBLY

1. Discharge the power steering system (Refer to steering system fluid)
2. Disassemble the power steering system pipeline.
3. Hoist the vehicle and dismount the two front wheels.

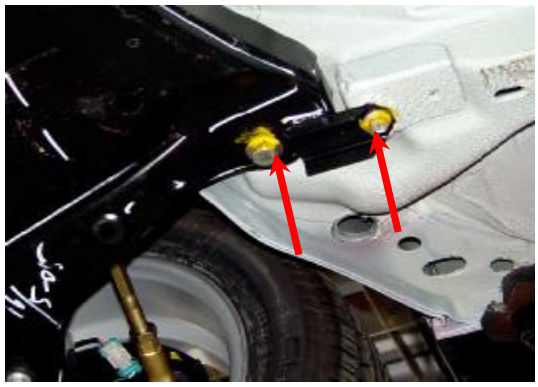


4. Loosen the fixed nuts of left and right tie rod ends.



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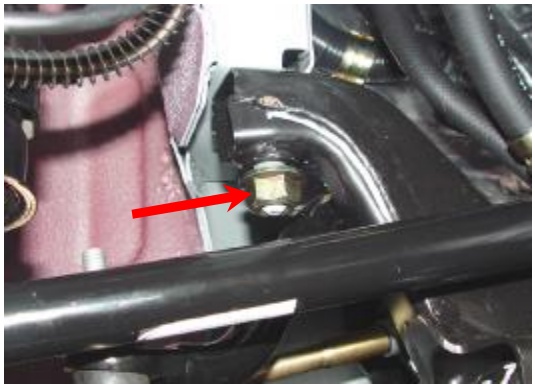
5. Loosen the fixed bolts at the both ends of left and right lower links.



6. Loosen the ball bolts on the left and right lower links.



7. Loosen the fixed bolts of subframe.



8. Lossen the fixed bolts of subframe.



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9. Loosen the fixed bolts of transmission's rear mountings.



10. Dismount the frame assembly.



III. DISMOUNT THE STEERING GEAR ASSEMBLY FROM THE SUBFRAME.

1. Dismount the fuel pipes of steering gear.

Loosen the fixed bolts of pipe clamp.



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Loosen the fixed bolts of pipelines on steering gear.

Dismount high-pressure oil pipe and oil return pipe.



2. Dismount stabilizer bar.

Loosen the extension bolts connecting the stabilizer bar to the lower link.

Note: Before disassembly, please pay attention to observing the relative positions of all washers and rubber cushions in order to carry out installation smoothly.

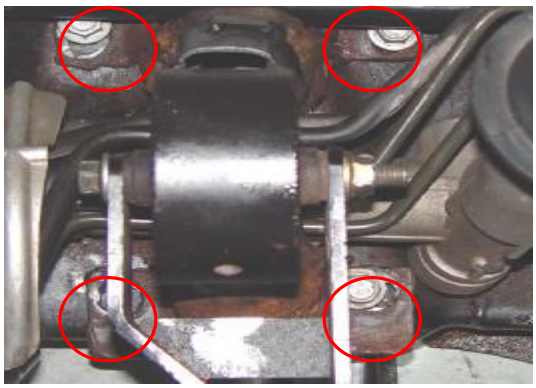


Loosen the fixed rubber sleeve bolts of stabilizer bar.

Dismount the stabilizer bar assembly.



3. Dismount the rear mounting bracket of engine.



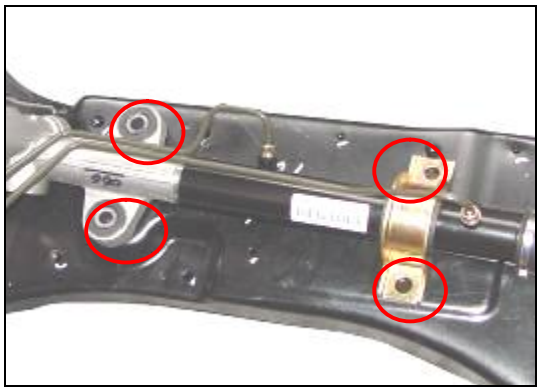
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4. Dismount thermal shield.



5. Remove the fixed bolts of steering gear.

Remove the steering mechanism assembly.



Assembly:

The installing steps are reverse to those for removal.

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SECTION IV MAINTENANCE MANUAL

LIQUID FILLING

LIQUID FILLING

Type: ATF-Ⅲ

Filling volume:1L

First of all, fill steering fluid to the Max position when the engine stops operating.

Start up the engine and fill steering fluid to the middle position between Max and Min.

Important Note:

Steering fluid pump is not allowed to operate when there is no steering fluid.

Slowly rotate the steering wheel to 45° to the left and to the right for 2-3 times, and then rotate to the largest extent for 2 times.

Modify the liquid level of the steering fluid in the liquid reserve bank.

Shut down the engine and check the liquid level.

The steering fluid shall approach to the Max position when the operating temperature is about 80℃.

LIQUID DISCHARGE

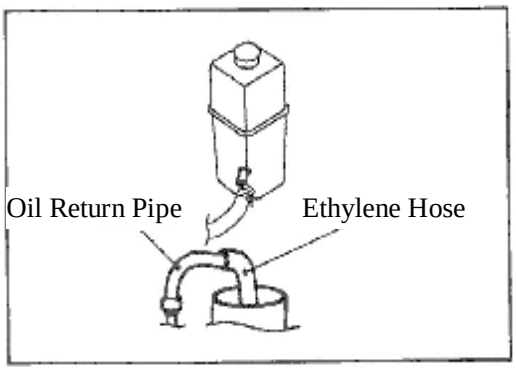
1. Uplift the front part of the vehicle in the air in order to ensure that the front wheels can rotate freely, that the power steering oil return pipe can be dismounted from the power steering liquid reservoir.
2. Put the oil return pipe into the large container that can contain the discharged steering fluid.
3. Start up the engine and make it under idle operation.
4. Rotate the steering wheel to the largest extent to the left and right direction.

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5. Ensure all old power steering fluid to be cleaned out from the power steering system.
6. Turn the ignition switch to the OFF (shut off) position.
7. If power steering fluid is polluted, the power steering system should be flushed out.
8. Reconnect to the power steering oil return pipe.

FLUSHING SYSTEM

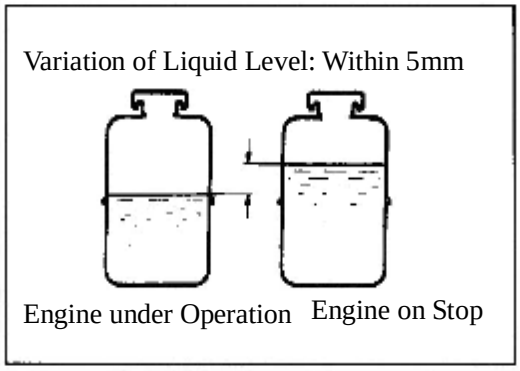
1. Uplift and uphold the vehicle in the air to ensure the front wheels can rotate freely.
2. Siphon out the polluted power steering fluid from the power steering liquid reservoir.
3. Remove the power steering oil return pipe from the power steering liquid reservoir.
4. Put the power steering oil return pipe into the large container that contains the discharged power steering fluid.
5. Start up the engine and make it under idle operation, and instruct the assistant to fill power steering fluid into the power steering liquid reservoir.
6. Rotate the steering wheel to the largest extent to the left and right directions.
7. About 1L power steering fluid should be needed until the liquid reservoir is rinsed clean.



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Inspection Method for Power Steering Oil

On the power steering system, you should take advantage of the engine power to drive the power steering oil to rotate, so that the pressure of power steering oil can generate steering driving force. If power steering oil is deficient, enough steering driving force cannot be obtained.



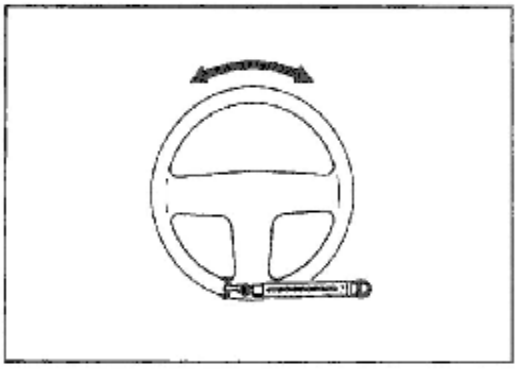
It is a very simple process to inspect the power steering oil volume. You only need to check the oil level of steering oil reservoir. If you are puzzled about anything, please refer to the operation manual of this vehicle. If the oil is found deficient, specified fuel must be filled. Note: A21power steering system adopts ATF-3 automatic transmission fuel.

The process for checking power steering oil is very simple, you only need to inspect this steering oil reservoir, but you should remember that the oil level is in close connection with the oil temperature. When the oil temperature is relatively high, the oil level shall approach to the “MAX” position. On the contrary, when the oil cools down, the oil level may approach to the “MIN” position.

If the power steering fluid is found deficient, you should firstly check the connection hose of the steering oil reservoir prior to the filling of power steering fluid, and inspect whether there is crack and oil leakage in the pipe or not. In addition, you should check whether there is oil leakage or oil impregnation in other positions.

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Inspection on Static Steering Force



1. Park the vehicle on the flat pavement, and rotate the steering wheel to the right ahead. Start up the engine and regulate the engine's rotation rate to 1000±100r/min.

Note: After checking the rotation rate of the engine, you must have it return to the standard idle speed.

2. Connect a spring balance to the circle outside the steering wheel, and measure the steering force for rotating the steering wheel to the left and right sides of the ahead position (within 1.5 turns). Moreover, you also need to check whether there is apparent fluctuation in the requiring steering force.

Normalized value: 25N

Allowed fluctuation: less than 5.9N

3. If the measured force exceeds the normalized value, please inspect and regulate in accordance with the "steering heaviness" specified in the "troubleshooting".

Precautions in System Utilization:

1. Do not confuse the power steering fluid and the brake fluid, otherwise the system shall malfunctions.

2. When the steering wheel rotates to the maximum steering position, the holding period should not preserve too long, namely, should not exceed 5 seconds. Otherwise, an extremely high system pressure shall result in the life shortening of steering oil pump.

3. Even the engine does not operate (drive by dragging), the power steering mechanism can still play steering

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function, but steering force must be boosted.

4. Since the power steering oil also serves as the lubricant of the system, therefore you are not allowed to drive your car when the liquid level is very low or there is no hydraulic oil in the liquid reservoir; driving at this time shall not only do serious damage to the steering oil pump and other spare parts, but may also lead to the malfunction of the steering system.

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SECTION V REGULAR TROUBLESHOOTING OF POWER STEERING SYSTEM

Atmosphere	Trouble Reason	Troubleshooting Method
Steering Heaviness	1. The tire pressure of steering wheel is very low.	1. Inflate the tire to normalized value.
	2. All connecting linkages and button heads are short of lubrication.	2. Fill lubricant grease to the suspension system and connecting linkages.
	3. Front wheel alignment distortion.	3. Check and regulate the front wheel alignment.
	4. The connecting linkages of steering system bend.	4. Check and calibrate the curving connecting linkages.
	5. Balls are worn.	5. Replace the seriously worn balls.
	6. The oil pump belt of the power steering mechanism is very loose or short of oil.	6. Regulate the tightness or refill hydraulic oil.
	7. The power steering mechanism is air-filled.	7. Discharge the air from the power steering mechanism.
	8. The oil pressure of power steering mechanism is extremely low.	8. Repair the power steering mechanism and regulate the system pressure.
UnsuitableBad Wheel Alignment	1. The tire pressure of steering wheel is deficient.	1. Inflate the tire until it reaches to the normalized value.
	2. Front wheel alignment distortion.	2. Check and regulate front wheel alignment.
	3. The gears of steering gear are improperly regulated or damaged.	3. Regulate the steering gear or replace the damaged gears.
Overlarge Gap Between Steering Wheels	1. The front wheel bearings are worn or improperly regulated.	1. Replace the bearing or regulate the tightness degree of bearing.
	2. Connection balls are worn or loosened.	2. Replace balls.
	3. The gears of steering gear are improperly regulated or worn.	3. Regulate the gap between gear meshes or replace gears.
Noise Generates When The Power Steering Mechanism Operates.	1. The power steering mechanism is lack of oil.	1. Fill hydraulic oil until it reaches to the normalized height.
	2. The power steering oil pump belt creeps.	2. Regulate the tightness degree of oil pump belt.

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	3. The power steering mechanism is air-filled.	3. Discharge the air from the power steering mechanism.
	4. Hydraulic oil emulsion or thickening	4. Replace hydraulic oil
	5. Abrasion and damage of redirector gear	5. Replace the redirector gear

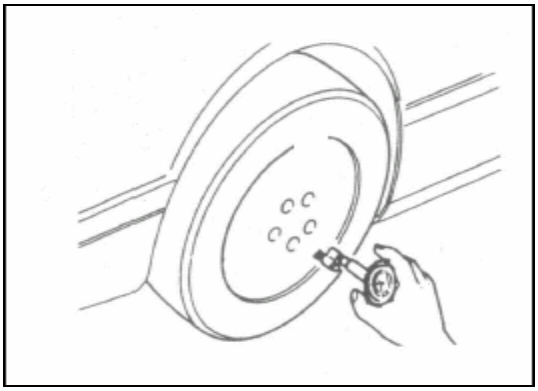
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CHAPTER III FOUR-WHEEL ALIGNMENT CHECK & ADJUSTMENT

SECTION I BASIC CHECK

ADJUSTMENT WORK PRIOR TO CHECK

I. PREPARATION WORK PRIOR TO ADJUSTMENT



1. Check tire pressure and adjust it to specified pressure

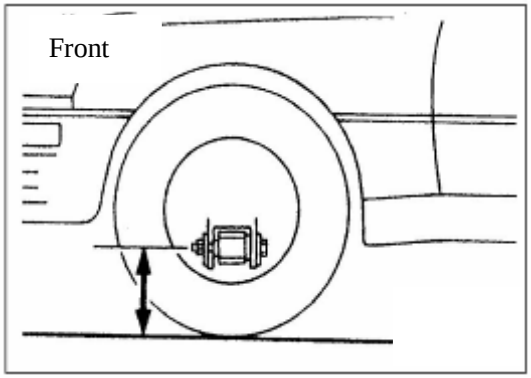
Standard inflation pressure of cold tire (Kpa)

Item	195/55R15	Spare tire
Front wheel	230	250
Rear wheel	210	

2. Check the height of vehicle body

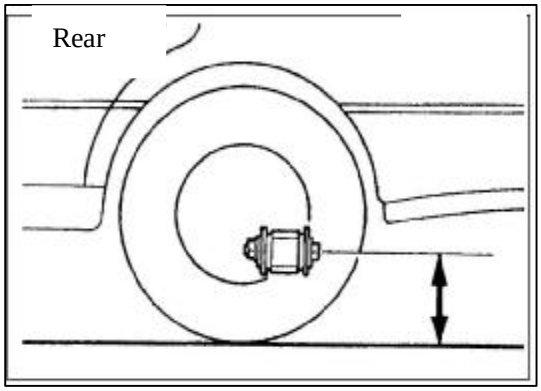
First of all, you should inflate the tire pressure to standard specified value before measuring the height of vehicle body (the pressures of the left and right tires should be consistent with each other.)

① Front measuring point



Measure the height from the ground to the central point of the bolt connecting the lower control arm assembly and the front steering knuckle. The height of the vehicle body at the left wheel side should be as basically same as that of the vehicle body at the right wheel side.

② Rear measuring point



Check the height from the ground to the central point of the bolt connecting the rear axle and the vibration damper. The height of the vehicle body at the left wheel side should be as basically same as that of the vehicle body at the right wheel side.

Note: Before checking the wheel alignment, you should regulate the car to specified height.

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If the car height cannot meet the standard, you should check whether there is damage or deformation on the front and rear suspensions.

3. **Check the wheel bearing clearance, and replace front wheel bearings when necessary.**
4. **Check the status of rims and tires.**
5. **Check the tightness degree of the steering linkage and ball joint.**
6. **Park the car on the flat ground, and carry no luggage or person.**
7. **Shake wheels to check the tightness of front suspensions.**
8. **Check whether the vibration damper can operate normally.**

1) Check whether there is oil leakage;

2) Check whether there is wearing in the assembly bushings;

3) Check the damping force of vibration damper, and replace the vibration damper if it disqualifies.

Note: The oil tank is semi-filled; the cooling water in the water tank and the engine oil reach up to the specified height, and the tire jack and other tools are in specified positions.

II. RIM AND TIRE

1. Visual inspection

Inspect tire and rim.

During the inspection, if you find any crack, damage, deformation and other problems on the rim or tire, you should replace them instantly. As the right figure illustrated:

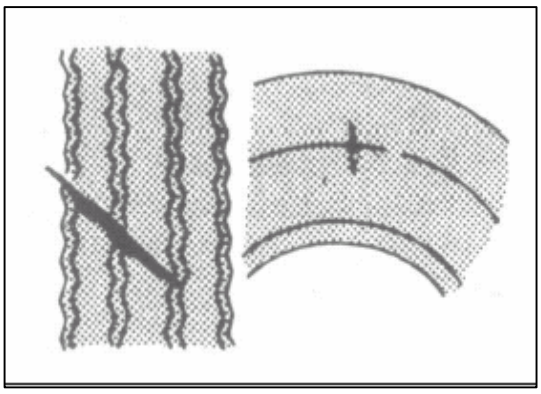


Fig. Tire Wearing

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2. Tire wearing

(1) Check the depth of left tire tread. As the right figure illustrated:

Standard tire: not less than 1.6mm.

Snow tire: 50% tire tread.

(2) If the pointed wearing phenomena occur, the tire should be replaced.

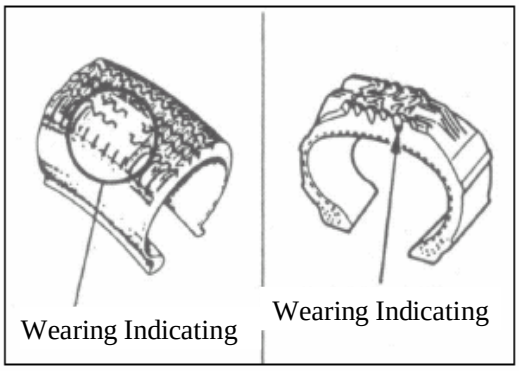


Fig. Tire Wearing

3. Abnormal tire wearing

Abnormal wearing examples are illustrated in the right figure.

The possible reasons and resolving methods are shown in the following table.

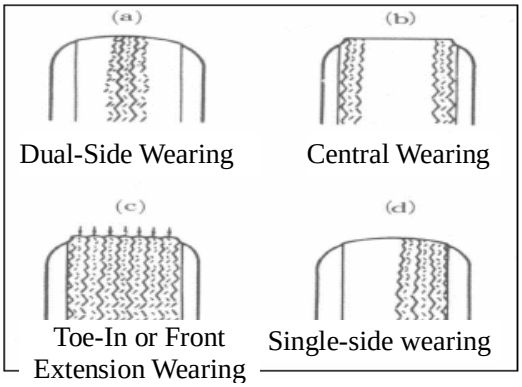


Fig. Tire Wearing

	Possible Reason	Resolving Method
(a)	* Deficient tire pressure (dual-side wearing) * High-speed turn * No tire alignment	* Measure &adjust tire pressure * Lower down vehicle speed * Tire alignment
(b)	* Too high tire pressure * No tire alignment	* Measure &adjust tire pressure * Tire alignment
(c)	* Improper toe-in	* Regulate toe-in
(d)	* Improper camber angle or caster angle * Suspension system failure * Imbalanced tire * Out-of-round brake drum or butterfly disk * Other mechanical problems * No tire alignment	* Regulate, repair or replace axle and suspension system components * Repair or replace * Ensure tire dynamic balance or replace * Rectify or replace * Rectify or replace * Tire alignment

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4. Precautions on tire and rim

(1) Disqualified tire and rim should not be used.

(2) Aluminum alloy rim is easily scored, therefore, soft cloth shall be used to clean up the rim, and steel brush shall be prohibited. If vapor is adopted to clean up the car, the boiling water shall be separated from the rim.

5. Tire replacement

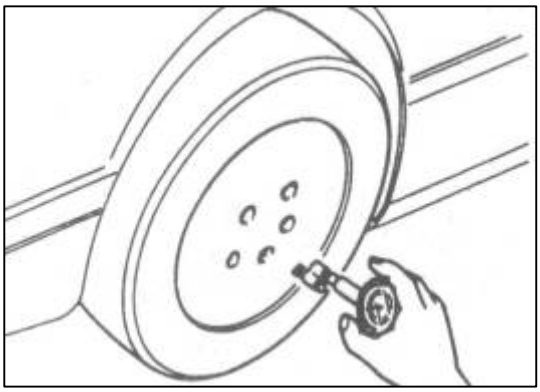
(1) Before assembling tire valve, you should firstly check whether the valve port of the wheel is smooth or burry. And then paste glycerin to the rubber surface of tire valve or put the tire valve into the glycerin for a while. Finally, you shall use special tools to generate 200N-400N air pressure so as to make the alignment ring pass the aperture of the wheel. In this way, the tire valve is installed (soapy water can be allowed to replace glycerin.).

(2) Before assembling tire, you should apply glycerin or soapy water to the rim edge. At the same time, you should pay attention to that: when there is dub marks on rim, you should put the homogeneity test mark in alignment with the dub mark. When there is no dub mark on rim, you should put the dynamic balance test mark in alignment with the position of tire valve. When there is no dub mark and dynamic balance test mark, but there is static balance test mark, you should put the tire valve in alignment with the static balance test mark.

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6. Tire pressure

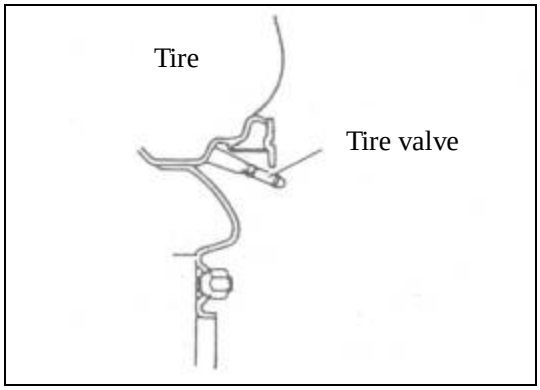
Use barometer to check the pressure of all tires (including spare tires), and regulate the pressure if necessary. Inflate the tire strictly in accordance with the specified pressure standard, and ensure the tire pressure not more than 10% rated air pressure during the process of inflation. The spare tires should have a rated inflation pressure of 2.5bar and shall be stored in other areas separate from the car's four wheels. Prior to the four-wheel alignment, you should check the tire pressure of the four wheels, and regulate the pressure: front wheel is 230Kpa, while rear wheel is 210Kpa. It is shown in the right figure:



Tire Pressure Inspection

7. Air leakage

Check whether there is air leakage on the tire valve. It is shown in the right figure:



8. Check the unevenness of rim

(1) Uplift the car and securely support it.

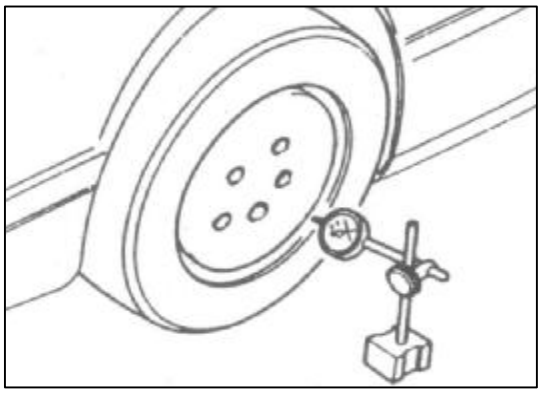
(2) Fix a micrometer guage(Φ10) furnished with cylindrical contact fingers on the edge of rim and measure its unevenness. It is shown on the right figure.

(3) Replace the rim if necessary.

Note: Allowed rim deformation:

On the both edges of rim, the allowed maximum average value of the unevenness depth should not exceed:

Steel rim: 5mm



Check the Unevenness of Rim

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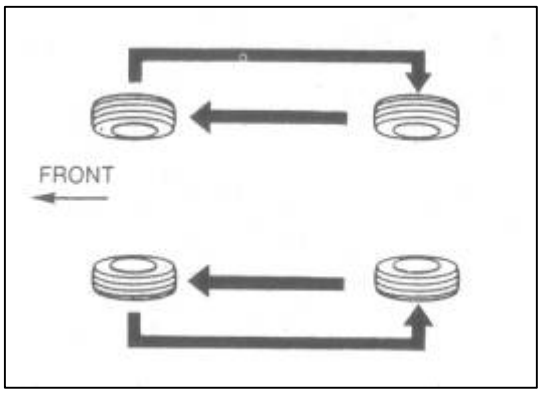
Aluminum-alloy rim: 3mm

9. Tire rotation

In order to prolong the operating life of tire and determine the tire wearing, tire rotation should be carried out when every 6000km is reached.

Note:

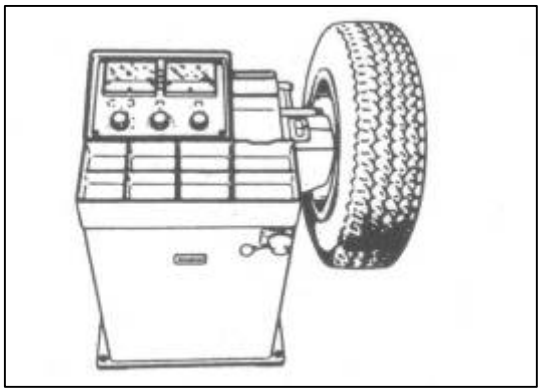
* The best tire must be selected for front wheel.
* After tire alignment, the tire pressure should be regulated to specified value.

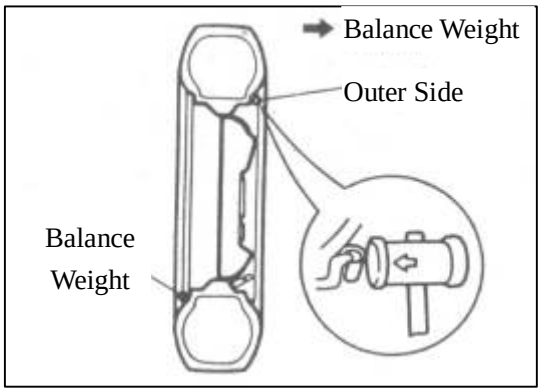


Tire Rotation

10. Wheel balance adjustment

After inflating the tire, you should screw up the hood of tire valve to carry out dynamic balance test, and install appropriate balance weights on the inner and outer edges of rim as per the requirement. The final total unevenness degree should be less than 100g.cm, that is, each balance weight on the inner and outer edges of rim is about 5g. Note: Not more than one balance weight can be furnished on each side of each wheel, with its maximum weight not exceeding 40g. During the process of assembly, you should prevent the balance weight from being heavily hit. If it is heavily hit, you should replace the balance weight timely. The replaced balance weight cannot be reused.





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11. Wheel disassembly



Disassembly sequence:

(1) Dismount the fastening bolt of wheel;

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(2) Unbolt the wheel.



Assembly process

(1) When installing the wheel and tire assembly, you should fasten the wheel bolts onto the wheel hub by using your hands, and then take special tools to fasten it tightly according to the diagonal process, with the tightening torque of 110±10 Nm. Impact wrench is prohibited to use in order to prevent the wheel from being damaged or screwed up too loose or too tight. Lubricant grease cannot be applied onto the wheel bolts. (After the initial driving of 100km, the bolts of the installed wheels and tire assembly should be fastened once to ensure the fastening torque. The inspection on the fastening torque of wheel bolts is one of the daily maintenance works).



(2) When fastening fixing nuts, you should adopt cross method. The fasten degrees of all fixing nuts should be similar, and wheels can rotate freely. Finally, when tightly fastened, the wheels should be on the ground.

(3) Furnish with decoration cover or deployed the decoration cover as per requirement. When installing card-typed decoration cover, you should slap by hand or use rubber tools to knock it in.

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SECTION II FRONT WHEEL ALIGNMENT

Kingpin caster angle	$2^0 50' \pm 30'$
Front wheel camber angle	$0^0 \pm 10'$
Front wheel toe-in	5′ 47" ±5′ (or 1mm)
Kingpin inclination angle	$12^0 35' \pm 30'$

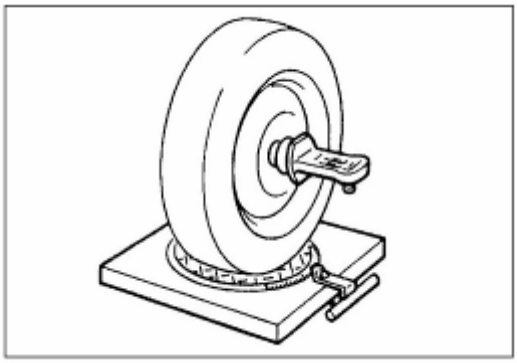
I. CHECK AND REGULATE THE FRONT-WHEEL KINGPIN CASTER ANGLE, FRONT-WHEEL CAMBER ANGLE, FRONT-WHEEL TOE-IN ANGLE AND STEERING ANGLE:

Criteria: Front wheel alignment should meet the requirements as follows:

II. FRONT WHEEL TOE-IN AND STEERING ANGLE ADJUSTMENTS

1. Front wheel toe-in

Toe-in adjustment can be done by use of optical test instrument or mechanical toe-in regulator. Wheel aligner or alignment tester should be installed on the wheels.



Installation should be carried out according to the concrete instructions of the equipment manufacturers.

(1) To meet the requirement of test instruments, you should make preparations for the wheel alignment, and use the steering wheel limiter purchased on the market to fix the steering wheel in the right ahead position .(The steering wheel must be at the central position ±5°, and the lower clamping flange bolts of steering shaft must be horizontal.)

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(2) Loosen the locknut of right steering tie rod and rubber sleeve clamp, and screw down the toe-in adjusting lever to regulate the length as per requirements until it reaches the specified numerical value.





(3) Fasten the locknuts, reinstall the rubber sleeve clamp, and check whether the locknut is fastened and the sheath is at the proper position.

(4) After the front wheel toe-in is well adjusted, you should check whether the steering wheel is horizontal or not. Otherwise, you should loosen the locknuts of steering wheel to regulate it to the horizontal position and fasten the locknuts to meet the torque requirement (30±3Nm).

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2. Check the front wheel steering angle

After replacing tie rod joints or regulate toe-in, you should check the steering angle. If the front wheel steering angle doesn't comply with relevant standards, you should check and regulate the length of left and right tie rods.

Maximum rotating angle of outer wheel	33^0
Maximum rotating angle of inner wheel	41^0

3. Kingpin caster angle

Kingpin caster angle is determined in design structure; therefore, it need not be regulated.

Influence of caster angle

The main functions of caster angle are to keep the car driving towards the right ahead. If the caster angle is of positive value, in the case of front wheel steering, the inner side of the car shall descend and the chassis shall ascend, which shall add loads to the steering knuckle. If the caster angles of front wheel and rear wheel are the same, the car shall return to the right ahead position after steering. The increasing of positive caster angle shall improve the stability of steering wheel, but the force shall become stronger in the case of steering; while the decreasing of positive caster angle shall lower down the stability of steering wheel, but the force shall become weaker in the case of steering. The degree of caster angle shall not impose influence on the tire wearing, which is used to stabilize the driving direction of car and make the car return to alignment automatically in the case of steering. If the car is quipped with traditional mechanical steering device, the degree of caster angle is very small and even inclines to negative caster angle, which can make it easy for steering. If the car is furnished with dynamic steering device, the caster angle is often designed as bigger positive angle, which can make the driver sensitive to steering. The increasing of positive caster angle shall

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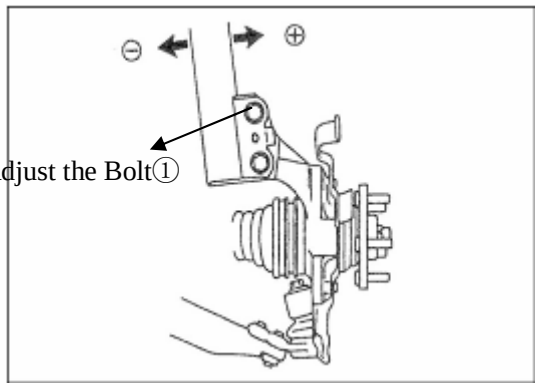
enhance the steering force, but can improve the stability of straight driving.

4. Camber angle

Under normal circumstances, there is no need to regulate the camber angle of the installed independent suspensions and wheel steering knuckle. If the wheel camber angle deviates from the tolerance range due to other reasons, the connecting bolt of independent suspension and steering knuckle can be used to rectify the camber angle.

(1) Prior to rectification, you should firstly inspect (visual inspection) whether the driving components are damaged, and replace the damaged components;

(2) If the front-wheel camber angle is found to exceed the deviation, you should loosen the connecting bolt① of front vibration damper and steering knuckle, and move the wheel to rectify the camber angle.



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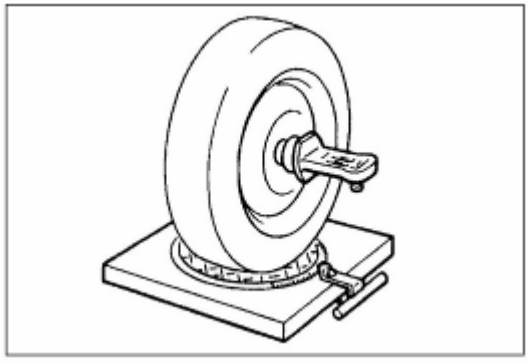
SECTION III REAR WHEEL ALIGNMENT

I. CHECK THE ADJUSTED REAR-WHEEL CAMBER ANGLE, AND REAR-WHEEL TOE-IN VALUES:

Criteria: Rear wheel alignment should meet the requirements as follows:

Rear wheel toe-in	17′20 " ±5′(or 3mm)
Rear wheel camber angle	$-0^0 40' \pm 10'$

II. REAR WHEEL TOE-IN AND REAR WHEEL CAMBER ANGLE ADJUSTMENT



1. Rear wheel toe-in adjustment

Toe-in adjustment can be done by use of optical test instrument or mechanical toe-in regulator. Wheel aligner or alignment tester should be installed on the wheels.

Installation should be carried out according to the concrete instructions of the equipment manufacturers.

(1) If the rear wheel toe-in is found not to meet relevant requirements, you can loosen the adjusting bolt 14 and adjusting nut 12 of the lower control arm as the figure illustrated. Note: prevent the nut from shedding out of the slot.



Adjusting Nut 12

(2) Screw the eccentric adjusting bolt 14 to alter the value of rear wheel toe-in until it complies with the requirements, and fasten the nut 12 to specified torque (100～120N.m).(The left and right sides are the same)



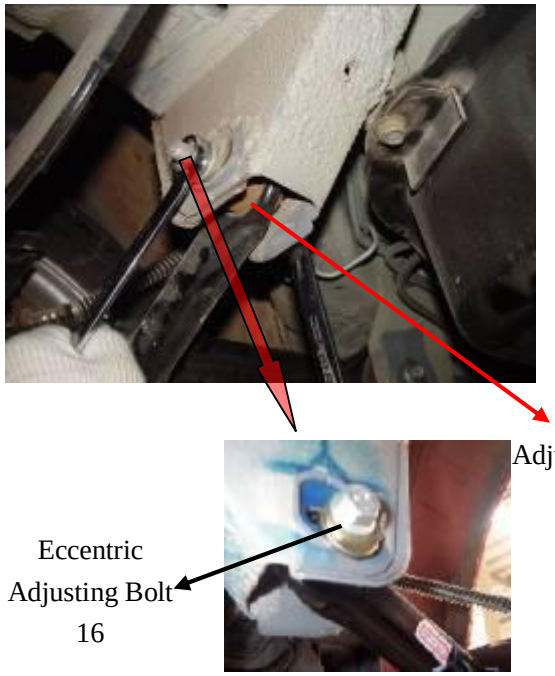


Adjusting Bolt 14

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2. Rear-wheel camber angle adjustment

(1) As the figure illustrated, loosen the adjusting bolt 16 and adjusting nut 4 of the upper control arm, and prevent the nut from shedding out of the slot.



(2) Loosen to alter the value of rear-wheel camber angle until it complies with relevant requirements, and then fasten the nut 4 to specified torque (100～120N.m).(The left and right sides are the same.)

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SECTION IV TROUBLESHOOTING MANUAL

Problem	Possible Reason	Countermeasures
Excessive tire wearing or asymmetric wearing	Shown in the following items.	
Early tire wearing	Improper tire pressure Improper wheel alignment parameters	Adjust Adjust
Tire noise	Improper tire pressure Tire wearing	Adjust Check, adjust and replace
Road noise or vehicle body vibration	Deficient tire pressure Unbalanced tire Deformation of rim or tire Asymmetric tire wearing	Adjust Adjust Repair or replace Check, adjust and replace
Up-down vibration of the steering wheel	Excessive deflexion of tire and rim Loose wheel nut or axle head Unbalanced tire Crack or wearing of engine mounting rubber Crack or wearing of transmission bracket rubber	Replace Fasten Adjust Replace Replace
Circular vibration of the steering wheel	Excessive deflexion of tire and rim Loose wheel nut or axle head Unbalanced tire Asymmetric tire wearing Deficient tire pressure Damage or wearing of front wheel bearing Failure of Steering system Failure of suspension system	Replace Fasten Adjust Check Adjust Replace Check Check
Steering wheel deflecting to single side	Improper tire pressure Excessive tire wearing or asymmetric wearing Failure of steering system Failure of braking system Failure of suspension system	Adjust Check Check Check Check
Unstable driving	Inconsistent pressure on both sides of tire Deformation of rim or tire Loose wheel nut Failure of steering system Failure of suspension system	Adjust Repair or replace Fasten Check Check
Brake deflecting to single side	Asymmetric pressure on both sides of the tire Failure of braking system	Adjust Check

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Heavy steering wheel	Deficient tire pressure Failure of steering system Failure of suspension system Improper wheel alignment parameters	Adjust Check Check Check
Bad alignment return of steering wheel	Deficient tire pressure Failure of steering system Failure of suspension system Improper front-wheel kingpin caster angle	Adjust Check Check Adjust

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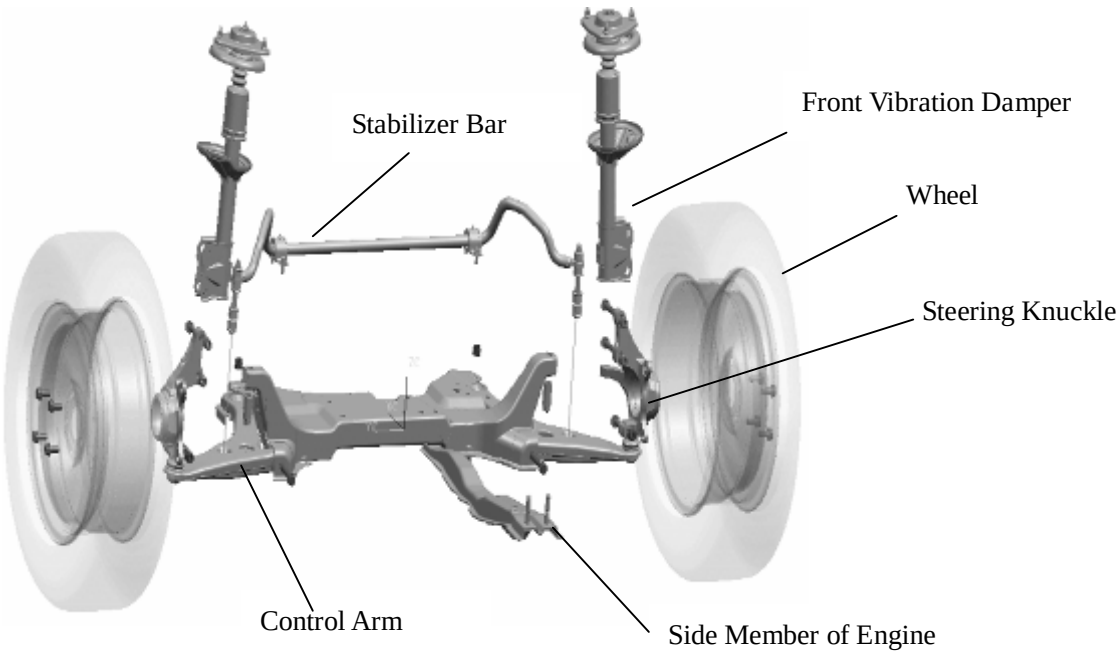
CHAPTER IV SUSPENSION DRIVE AND AXLE

SECTION I FRONT SUSPENSION

STRUCTURE FEATURE

Adopt McPherson independent suspension,accompanying with stabilizer bar, coil spring, double acting telescopic shock absorber.

McPherson suspension structure: In McPherson suspension, the coil spring combines with vibration damper, and the lower part of front strut tightly connects with the steering knuckle, so that the strut and the steering knuckle shall rotate simultaneously when the wheels are rotating. On the top, the rubber cushion directly connects with vehicle body. The rubber cushion can insulate some noise, and can damp the vibration passed from the road. Accordingly, the upper part of strut is fixed on the vehicle body, and moves slightly. However, the lower part of strut shall rotate simultaneously with the wheels and bounces up and down, thus the strut shall be influenced by the side force in the process of operation. The middle part of strut connects with coil spring as well as damping block and bearing parts. This structure features low cost, simple and compact structure, so that it can provide a large room to engine deployment.



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I. DISASSEMBLY AND ASSEMBLY OF FRONT VIBRATION DAMPER

Disassembly sequence: (Take the right vibration damper for example)

1. Use jack to uplift the car, dismount the two bolts connecting the vibration damper and steering knuckle.

Bolt mounting torque: 110±5Nm.



2. Put down the car, open the hood, dismount the three bolts connecting the vibration damper with vehicle body, and dismount the vibration damper and spring. Bolt mounting torque: 50±10Nm



Assembly sequence:

1. Assemble the front vibration damper according to the disassembly sequence.
2. Precautions:

① After assembly, all bolts must be fastened to reach up to specified torque.

② Please check four wheel alignment after assembly.

II. DISASSEMBLY AND ASSEMBLY OF CONTROL ARM

Disassembly sequence: (Take the right control arm for example).

1. Dismount tires, uplift the car, and remove the bolts and nuts connecting the control arm and steering knuckle.

Mounting torque: 110±5Nm (the left and right sides are the same.)



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2. Dismount the bolts connecting the control arm and stabilizer bar.



Mounting torque: 50±3Nm (The left and right sides are the same.)

3. Dismount the bolts connecting the control arm and vehicle body.



Bolt mounting torque: 180±15 Nm (The left and right sides are the same).

4. Dismount the bolts connecting the control arm and under-frame, and remove the control arm.



Mounting torque: 180±15N.m(The left and right sides are the same).

Prevent the control arm from dropping when loosening the bolts.

Assembly sequence:

1. Assemble the control arm according to the disassembly sequence.
2. After assembly, the bolts must be fastened to reach up to specified torque.

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III. DISASSEMBLY AND ASSEMBLY OF STEERING KNUCKLE

Disassembly sequence: (Take the right steering knuckle for example. The left and right steering knuckles have the same disassembly process.)

1. Dismount tire



Mounting torque: 110±10Nm

2. Dismount the plug of wheel speed sensor and plug of the brake-disk thickness alarm.



3. Dismount the brake oil pipe and avoid the loss of brake oil.



4. Dismount the bolts connecting the steering tie rod and the steering knuckle.



Mounting torque: 35±3N.m

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5. Dismount the bolts connecting the steering knuckle and the lower control arm.

Mounting torque: 110±5Nm



6. Dismount the two bolts connecting the steering knuckle and vibration damper.

Mounting torque: 110±5Nm



Assembly sequence:

Assemble the steering knuckle in the reverse sequence of disassembly.

Precautions:

① Supplement the brake oil in the braking system and carry out air-release adjustment.

② Check and regulate toe-in value.

③ Fasten the torque.

IV. DISASSEMBLY AND ASSEMBLY OF THE ENGINE SIDE MEMBER



Disassembly sequence:

1. Dismount the two bolts connecting the side member and vehicle body.

Mounting torque: 100-120 Nm

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2. Dismount the bolts connecting the side member and vehicle body.

Mounting torque: 100-120 Nm



3. Dismount the bolts connecting the side member and engine, and can remove the engine suspension bolts shown in the figure for easy disassembly.

Mounting torque: 65±5 Nm

Prevent the side member from dropping when loosening the bolts.



4. Dismount the side member.

Assembly sequence:

1. Assemble the side member according to the reverse sequence of disassembly.
2. After assembly, the side member must be fastened to reach up to specified torque.

V. DISASSEMBLY AND ASSEMBLY OF UNDERFRAME AND STABILIZER BAR

Disassembly sequence:

1. Dismount the clip connecting the steering column and steering device as well as the fastening bolt of steering column.

Mounting torque: 25±3 Nm.



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2. Uplift the car, and dismount the fastening nuts of under-frame and vehicle body.(the left and right sides are the same)

Mounting torque: 180±15Nm.



3. Dismount the bolts connecting the under-frame and control arm (the left and right sides are the same).

Mounting torque: 180±15Nm



4. Dismount the bolts connecting the stabilizer bar and control arm (the left and right sides are the same).

Mounting torque: 50±3Nm



5. Dismount the bolts connecting the under-frame, control arm and vehicle body. (the left and right sides are the same)

Mounting torque: 180±15Nm



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6. Dismount the bolts connecting the under-frame and vehicle body (the left and right sides are the same).

Mounting torque: 80--90 Nm



7. Dismount the four bolts connecting the suspensions and under-frame. But for easy disassembly and assembly, we suggest you dismount the rear suspension bolts shown in the right figure.



Mounting torque of the four assembling bolts: 70±5N.m

Mounting torque of rear suspensions: 60±5N.m

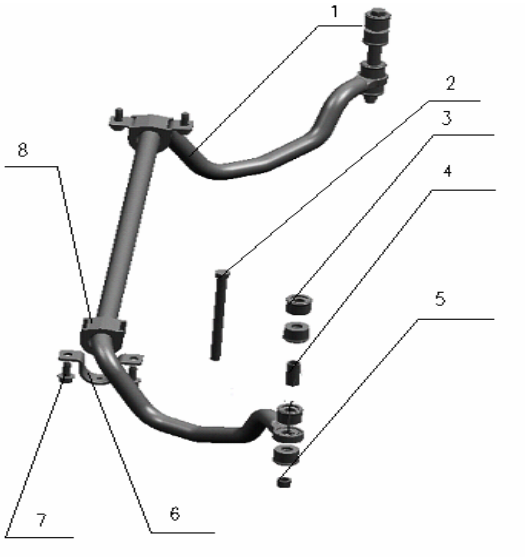
8. Dismount the under-frame, stabilizer bar and the assembly of steering device and tie rod.

Note: If the under-frame is not dismounted, the stabilizer bar cannot be removed from the car.

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VI. MOUNTING OF THE FRONT STABILIZER BAR ASSEMBLY

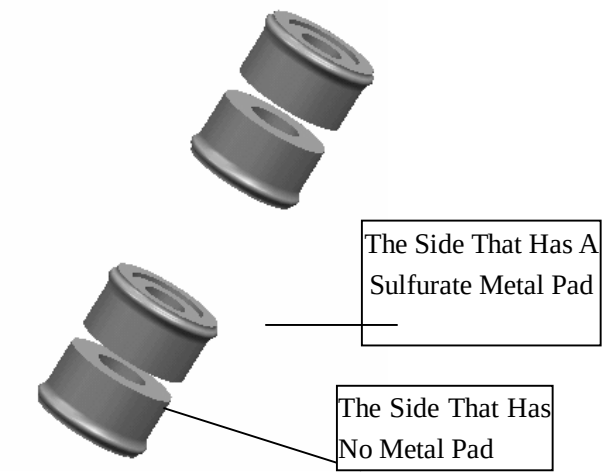
Serial No.	Name of Spare Parts	Quantity
1	Stabilizer bar	1×1
2	Extension bolt	1×2
3	Rubber pad	1×8
4	Metal sleeve	1×2
5	Nut	1×2
6	Clamp	1×2
7	Bolt	1×4
8	Rubber support	1×2



Put the rubber support sheath 8 onto the stabilizer bar1, install the clip 6 onto the rubber support sheath 8, and fix the central part of the entire stabilizer bar assembly onto the under-frame by use of bolt 7 with a specified torque of 25±2m. The both ends of stabilizer bar connect to the lower control arm through an extension bolt with a specified torque of 50±3m. The top and bottom surfaces of the connection joint of stabilizer bar end and lower control arm have a rubber pad 3 respectively, and there is a metal sleeve 4 between the second and third rubber pads of either end of stabilizer bar.

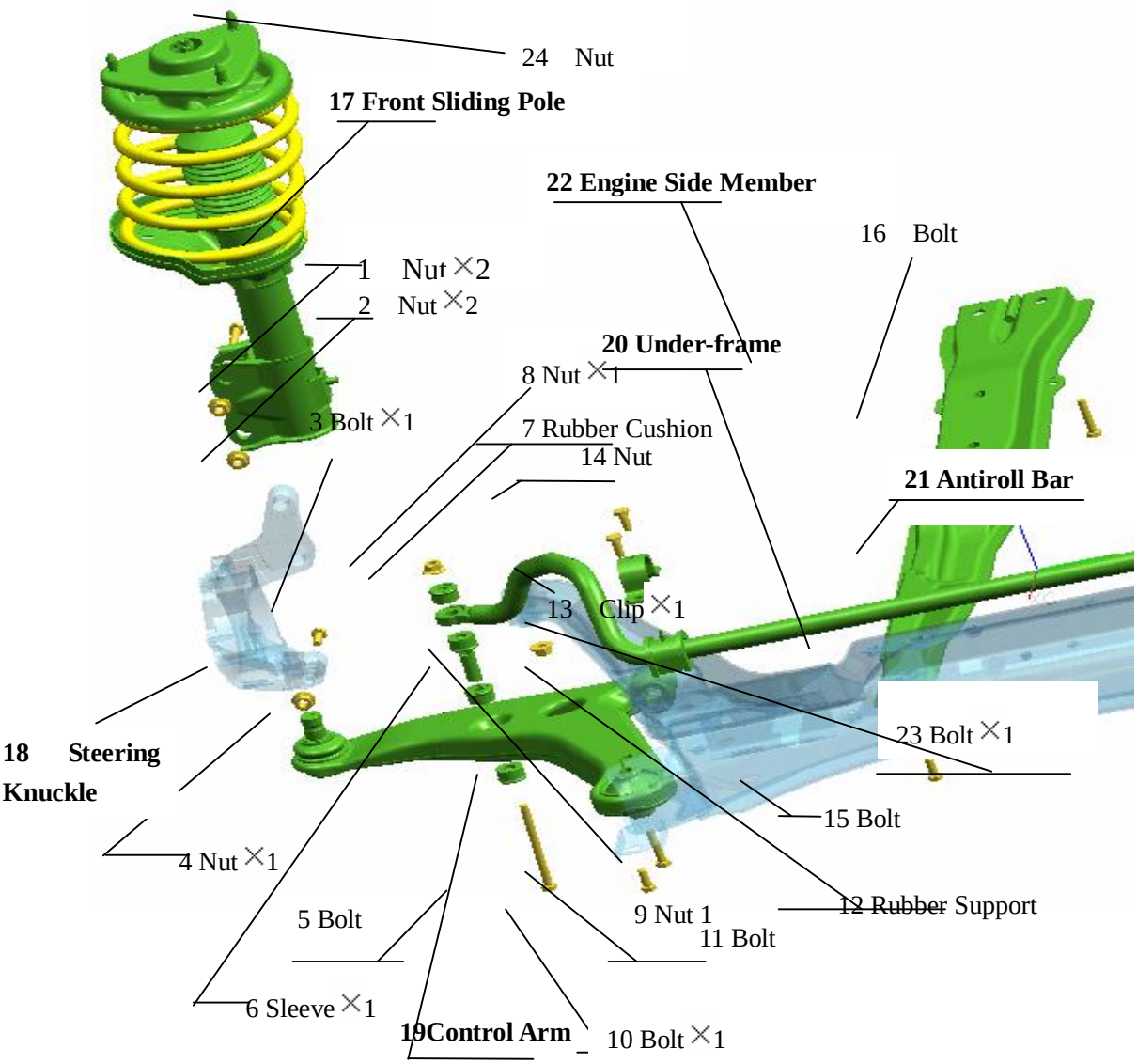
It is to be noted that all the rubber pads 3 are the same, but the top and bottom sides of each rubber pad are different, of which one side has a sulfurate metal pad, while the other has no such a metal pad. Thus, the each end of four rubber pads has obverse and reverse surfaces in the case of assembly.

Note: The four rubber pads of each end of the stabilizer bar must be mounted according to the sequence illustrated in the figure.



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VII. ASSEMBLY OF FRONT AXLE AND FRONT SUSPENSION



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——Use bolt 23 to connect the control arm assembly19 and under-frame 20 up to the specified fastening torque (bolt 23:180±15Nm). The left and right sides are the same.

——Use bolt 14 and installation clamp of stabilizer bar 13 to fix the stabilizer bar assembly 21 onto the rubber sleeve 12 up to specified fastening torque of 25±2 Nm. The left and right sides are the same

——Use bolt 5, stabilizer bar rubber pad7, metal sleeve 6 and nut 8 to fix the end of stabilizer bar assembly 21 onto the control arm19 up to specified fastening torque of 50±3Nm. The left and right sides are the same.

——Use nut 24 to connect the strut assembly 17 with the vehicle body to specified torque of 50±10 Nm. The left and right sides are the same.

——Use bolt 1, nut 2 to connect the strut assembly 17 with the steering knuckle 18 up to the specified fastening torque of 110±5Nm. The left and right sides are the same.

——Use nut9, bolt 10 and bolt 11 to connect the under-frame assembly 20 and vehicle body up to specified fastening torque (nut 9: 180±15 Nm, bolt 10: 80 －90 Nm, bolt 11: 180±15 Nm). The left and right sides are the same.

——Use bolt3 and nut 4 to connect the control arm19, steering knuckle18 and front strut up to specified fastening torque of 110±5Nm. The left and right sides are the same.

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SECTION II REAR SUSPENSION

STRUCTURE FEATURE

Adopt longitudinal trailing arm suspension, three-linkage rod, cylindrical coil spring, double-acting telescopic vibration damper.

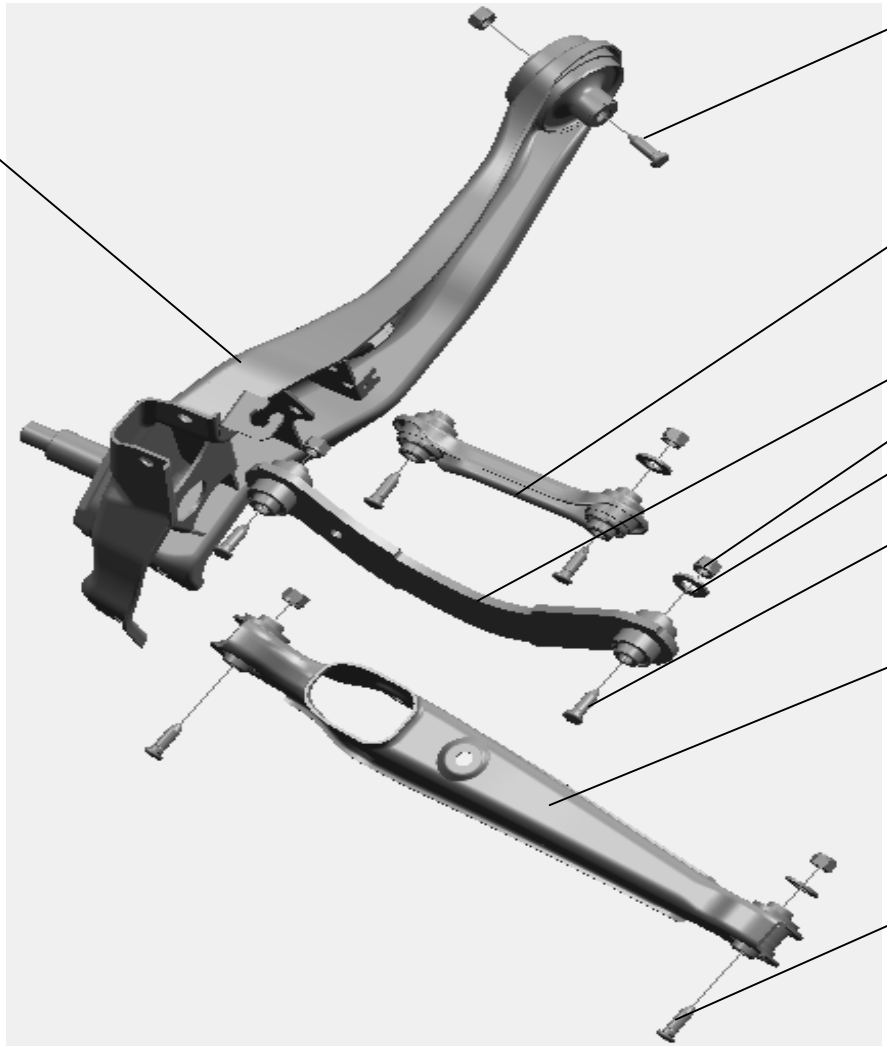
One end of longitudinal rear trailing arm connects with vehicle body through rubber hinge. This rubber hinge has different longitudinal rigidity. One end of the three horizontal oscillating arms connects with rear trailing arm by use of rubber bushing, while the other end connects with vehicle body through rubber bushing. The guide bar, rear lower oscillating arms connects with vehicle body through eccentric adjusting bolts. By adjusting the two eccentric adjusting bolts, we can regulate the rear wheel toe-in and camber angle. The three-linkage mechanism can facilitate the rear-wheel alignment parameters to generate smaller change and to have better operating stability.

The lower part of strut connects with rear lower control arm by use of rubber hinge, while the upper part directly connects with vehicle body through rubber cushion. The rubber cushion can not only isolate a portion of noise, but can also damp the vibration passing from the road. As a result, the upper part of strut is fixed onto the vehicle body and moves slightly. However, the lower part of strut shall bounces up and down simultaneously with the rear lower control arm. Compared with non-independent suspension, this vibration damper shall bear a minor side force. The middle part of strut connects with coil spring as well as damping block and bearing parts.

A minor unsprung mass; the suspension occupies a small space; elastic components only bear vertical force, thus spring with smaller rigidity can be used to reduce the vibration frequency of car and improve the smoothness of car driving; the left and right wheels move independently without influence on each other, which can not only reduce inclination and vibration of vehicle body, but can also boast a good surface adhesion on the bumpy road.

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Exploded View of Rear Trailing Arm Assembly



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I. DISASSEMBLY AND ASSEMBLY OF REAR VIBRATION DAMPER

Disassembly sequence:

1. Open the trunk lid; dismount the side enclosure to expose the bolts connecting rear strut assembly and vehicle body. Dismount the two connecting bolts. Mounting torque: 50±10 Nm.



2. Uplift the car. Dismount the bolts connecting the lower control arm and car body. Note: Since the helical damping spring has a very strong elasticity, it is very difficult to dismount the fixed bolts of the lower part of strut assembly due to the influence of the spring force. Therefore, you should firstly dismount the bolts connecting the rear lower control arm and vehicle body in order to reduce the bearing force of coil spring. Mounting torque: 100—120Nm.



3. Dismount the bolts connecting rear strut and lower oscillating arm. Mounting torque: 80±5 Nm
4. Remove the rear strut assembly.



Assembly sequence:

1. Assemble the rear vibration damper according to the reverse sequence of disassembly.
2. Precautions:

① After assembly, all bolts must be fastened up to specified torques.

② Please check the four wheel alignment parameters after assembly.

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II. CHECK VIBRATION DAMPER:

1. Check Vibration Damper

① Check the vibration damper to see whether there is oil leakage. If oil leakage exists, you should replace the vibration damper. Check the damping force of vibration damper to see if it qualifies. If it disqualifies, you should replace it.

② Check whether there is crack or deformation in the spring seat; Check whether the limit gear block is damaged; Check whether the limit gasket of suspending spring is worn, cracked or deformed. Replace defective spare parts.

Note: When laying aside vibration damper, you should abide by the following procedure:

2. Disposal

(1) Stretch the vibration damper lever as long as possible.

(2) Drill a hole to discharge the gas from vibration damper cylinder.

Note: The discharged gas is harmless, but you should prevent the splashing iron chips from hurting yourself when drilling.

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II. DISASSEMBLY AND ASSEMBLY OF REAR UPPER CONTROL ARM

Disassembly sequence:

1. Dismount the bolts connecting the upper control arm and vehicle body.

Mounting torque: 100~120Nm.



2. Dismount the bolts connecting the upper control arm and rear trailing arm.

Mounting torque: 90～100Nm



3. Take down the upper control arm.

Assembly sequence:

1. Assemble the rear upper control arm according to the disassembly sequence.
2. Precautions:

After assembly, all bolts must be fastened up to specified torques.

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III. DISASSEMBLY AND ASSEMBLY OF REAR LOWER CONTROL ARM

Disassembly sequence:

1. Dismount the bolts connecting the control arm and vehicle body.

Mounting torque: 100~120Nm



2. Dismount the bolts connecting the control arm and rear vibration damper.

Mounting torque: 80±5Nm



3. Dismount the bolts connecting the control arm and rear trailing arm.

Mounting torque: 90～100Nm

4. Dismount the lower control arm assembly.



Assembly sequence:

1. Assemble the rear lower control arm according to the disassembly sequence.
2. Precautions:

After assembly, all bolts must be fastened up to specified torques.

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IV. DISASSEMBLY AND ASSEMBLY GUIDE BAR

Disassembly sequence:

1. Dismount the four fastening bolts of wheel.

Mounting torque:110±10Nm



2. Take down the tire.



3. Dismount the bolts connecting guide bar and rear trailing arm assembly.

Mounting torque: 90～100Nm.



4. Dismount the bolts connecting guide bar and vehicle body.

Mounting torque: 100～120Nm



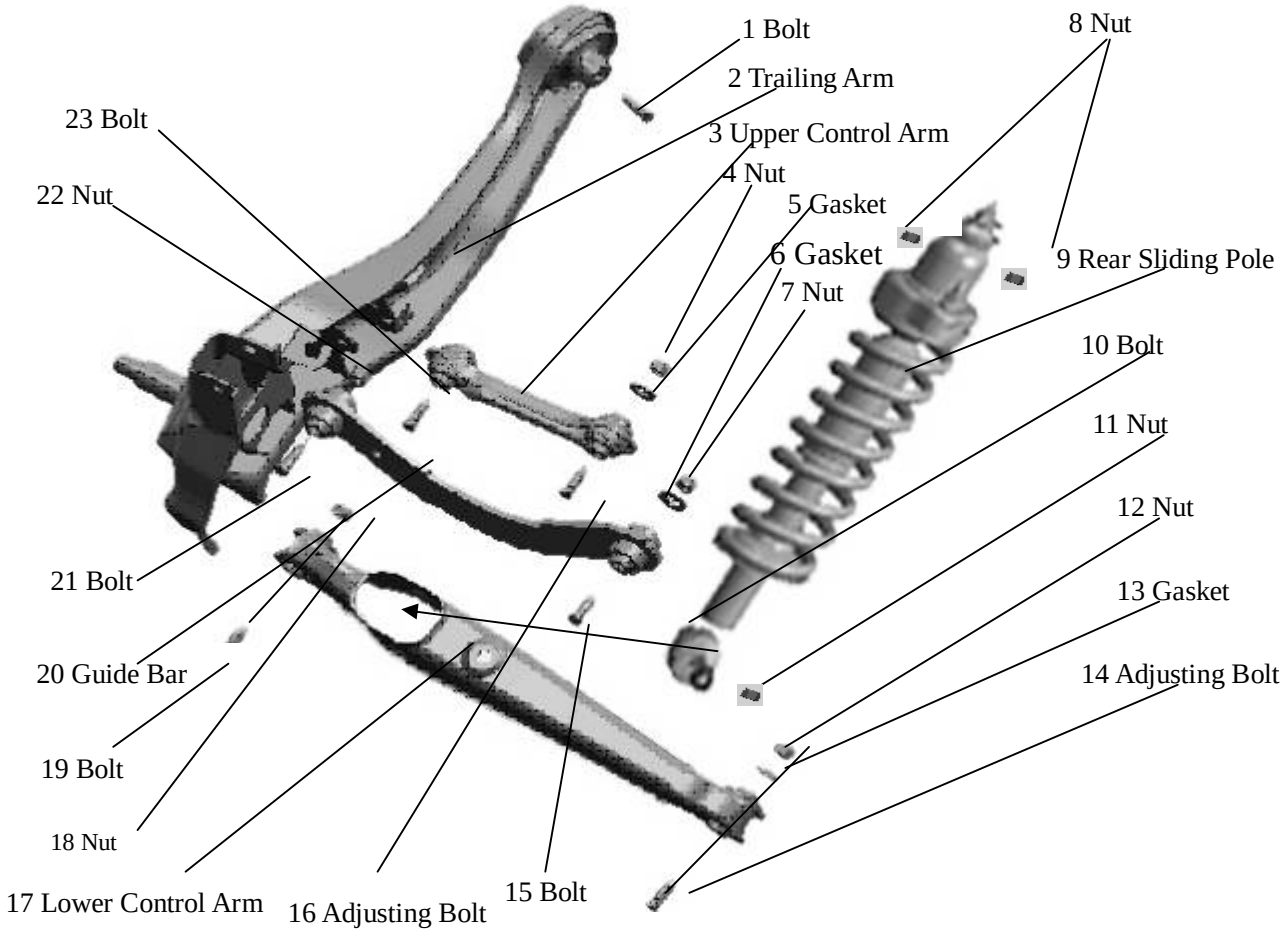
Assembly sequence:

1. Assemble the guide bar according to the disassembly sequence.
2. Precautions:

After mounting, all bolts must be fastened up to specified torques.

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V. ASSEMBLY OF REAR AXLE AND SUSPENSION SYSTEM



ASSEMBLY SEQUENCE:

—— Use bolt 23 to connect the upper control arm 3 and trailing arm 2(one weld nut installed on the rear trailing arm); The left and right sides are the same, and the fastening torque is 90～100 $N \cdot m$. Do not fasten the bolt at this time.

—— Use bolt 21 and nut 22 to connect the guide bar 20 and trailing arm 2. The left and right sides are the same, and the fastening torque is 90～100 $N \cdot m$.Don not fasten the bolt and nut at this time.

—— Use bolt 19 and nut 18 to connect the rear lower control arm 17 and trailing arm2. The left and right sides are the same, and the fastening torque is90～100 $N \cdot m$. Do not fasten the bolt and nut at this time.

—— Use nut 8(2 pieces) to connect the rear strut 9 and vehicle body. The left and right sides are the same and the fastening torque is $50 \pm 10\ N \cdot m$.

—— Use bolt 1 to connect the trailing arm and vehicle body (the vehicle body has one weld nut and include the well-connected upper and lower control arms and guide bar). The

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left and right sides are the same, and the fastening torque is 100～120 $N \cdot m$. Do not fasten the bolt at this time.

—— Use bolt 10 and nut 11 to fix the rear strut 9 and rear lower control arm17(fix them at the position as the arrow illustrated). The left and right sides are the same, and the fastening torque is $80 \pm 5\ N \cdot m$. Do not fasten the bolt and nut at this time.

—— Use adjusting bolt 16, gasket5 and nut 4 to connect the rear upper control arm and vehicle body. The left and right sides are the same, and the fastening torque is 100～120 $N \cdot m$. Do not fasten the bolt and nut at this time.

—— Use bolt 15, gasket 6 and nut 7 to connect the guide bar and vehicle body. The left and right sides are the same, and the fastening torque is 100～120 $N \cdot m$. Do not fasten the bolt and nut at this time.

—— Use adjusting bolt 14, gasket 13 and nut 12 to connect the rear lower control arm and vehicle body. The left and right sides are the same, and the fastening torque is 100～120 $N \cdot m$. Do not fasten the bolt and nut at this time.

—— Fasten the above-mentioned bolts and nuts to specified torques in turn.

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A21 ENGINE

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CHAPTER I ENGINE PARAMETER AND SPECIAL TOOL

I. TECHNICAL DATA DESCRIPTION

ENGINE FEATURE

Engine model	SQR481H
Engine type	Four cylinders, water-cooled, in-line double overhead camshaft, 16 valves, controllable burning rate (CBR) and variable valve timing (VVT)
Cylinder diameter (mm)	81
Piston stroke	77.5
Displacement	1.597
Compression ratio	10.5
Rated Power (net power)	87
Revolution at rated power(RPM)	6200
Maximum torque (Nm)	275
Revolution at max. torque (RPM)	4300
Minimum fuel consumption rate	275

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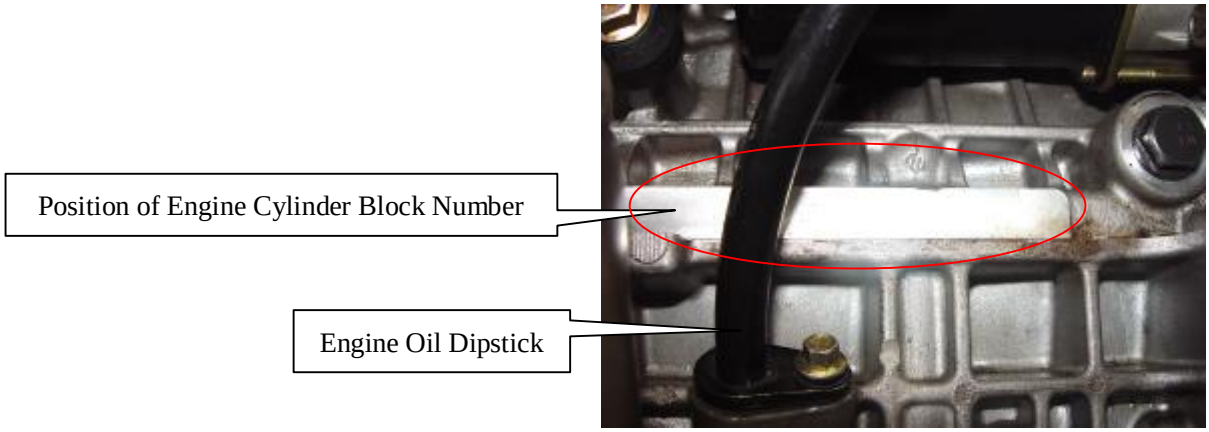
II. SPECIAL TOOL:

	Camshaft Timing Tool
	Crankshaft Timing Tool
	Flywheel Tool
	Guide Sleeve Of Crankshaft Oil Seal
	Guide Sleeve Of Camshaft Oil Seal
	Hydraulic Hoist

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III. ENGINE NUMBER POSITION



CHAPTER II ENGINE ACCESSORIES

SECTION I ENGINE TIMING CALIBRATION

1. Dismantle dynamo belt

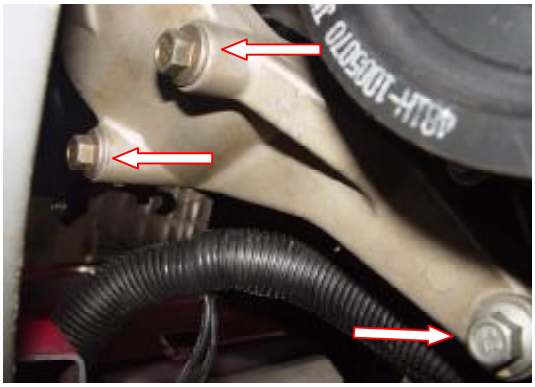
Use wrench to clamp the tension pulley bolt, screw it counterclockwise and dismantle the generator bolt.

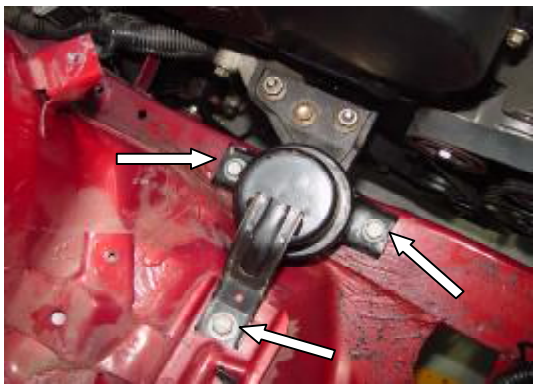


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2. Dismantle the right engine mounting bracket

Use small crane to hoist the engine, dismantle the bolts of right suspension and lift down the right mounting bracket.





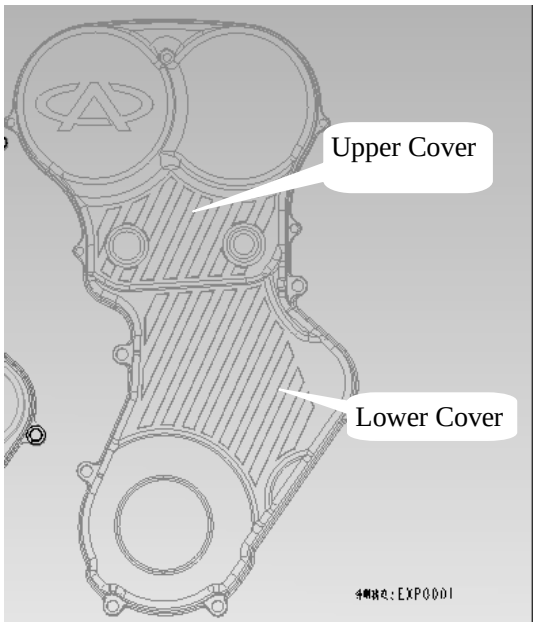
3. Dismantle crankshaft pulley

Shift the car into the 5th gear, step on the brake, and dismantle the fixed bolt of crankshaft pulley.



4. Dismantle the timing belt cover

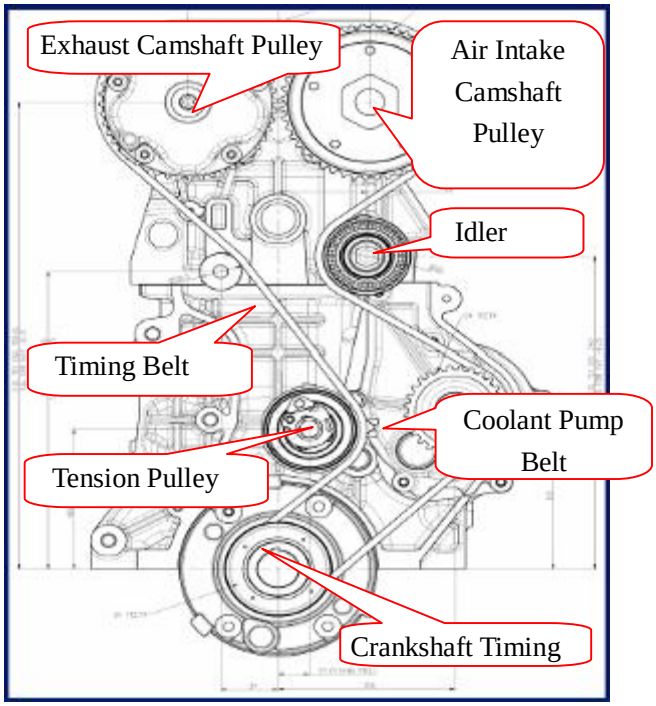
Dismantle the upper cover and lower cover of timing belt respectively.



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4. Dismantle timing belt

Loosen the central fixed bolt of tension pulley of timing belt, dismantle the timing belt. Meanwhile, loosen the hollow stay bolts connecting the air intake and exhaust camshaft pulleys and the camshafts.

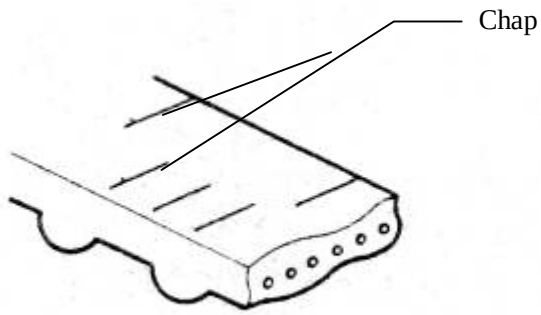


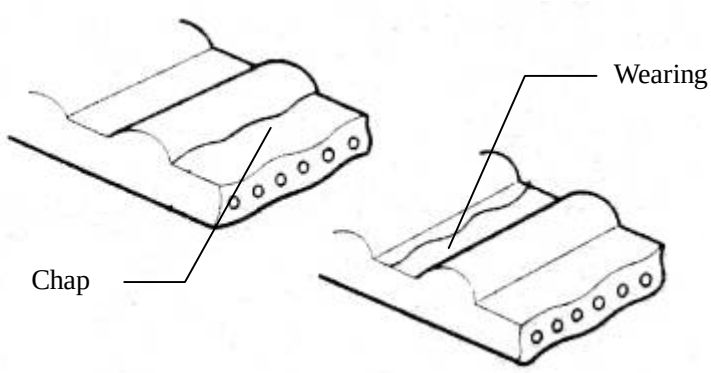
Carry out detailed inspection on various portions of timing belt. If any one shown in the figure occurs, you should replace with new spare parts.

(1) Chap of back-side rubber

(2) Chap of dedendum, chap of separated cord fabric.

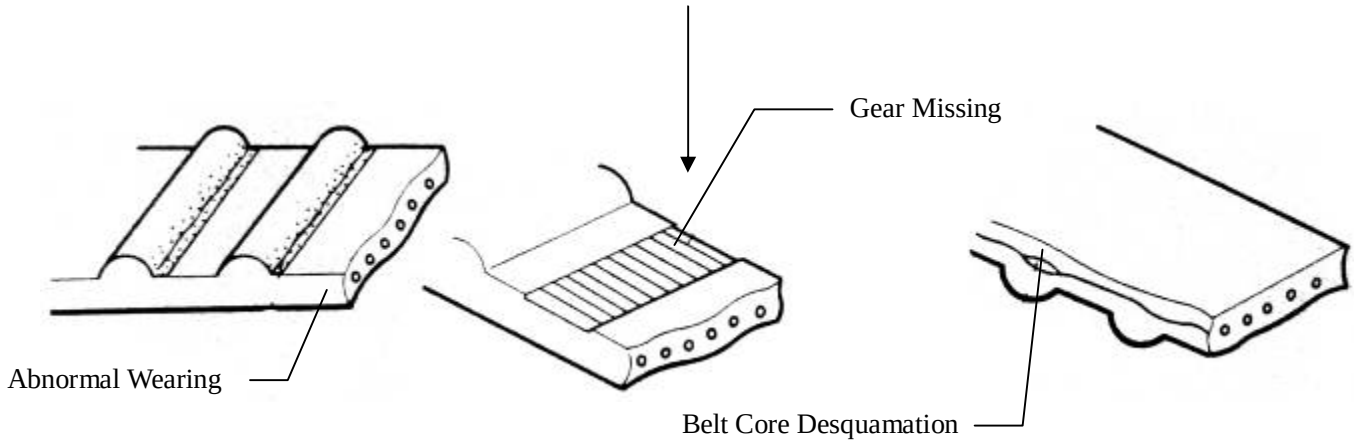
(3) Wearing, gear missing and incomplete gear of cord fabric.





(4) Abnormal wearing of belt flank.

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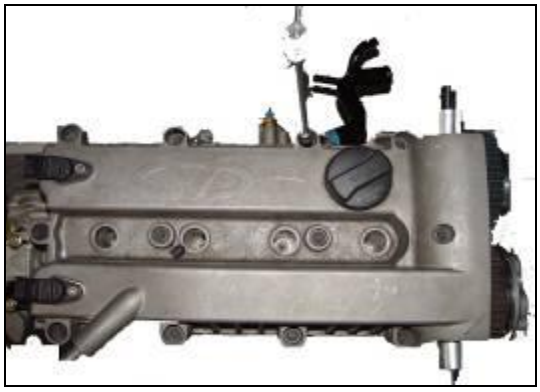
Even if no outer damage is confirmed, you should also replace the belt when any of the following conditions occurs.

(1) If the water in the coolant pump is leaked and more water should be filled continuously.

(2) If the belt is spotted with much oil stains, and the rubber may be damaged due to expansion, you should replace the belt.

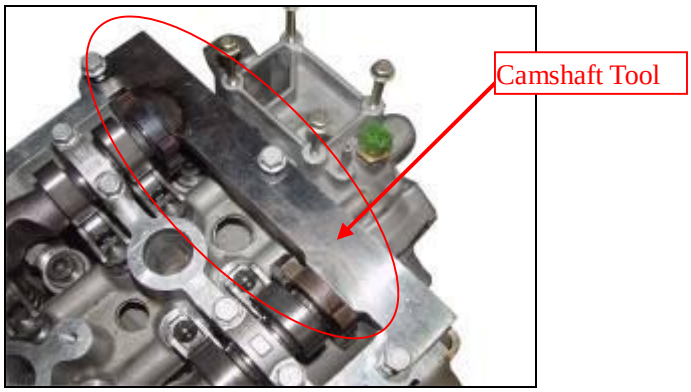
5. Dismantle the valve chamber cover

Loosen the fixed bolt of valve chamber cover, and lift down the valve chamber cover.



6. Camshaft phase alignment

Rotate the camshaft and clamp the camshaft tool into the eccentric groove of camshaft sensor signal pulley.

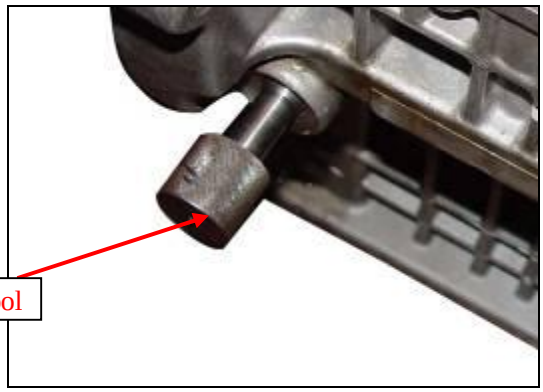


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7. Crankshaft phase alignment

Screw off the bulkhead of cylinder block, screw the crankshaft tool into it, rotate the crankshaft until the crankshaft tool completely clamps the crankshaft. At this time, the crankshaft cannot rotate clockwise and counterclockwise.



8. Mount and strain the timing belt

Mount the timing belt in the position shown in the figure, use allen wrench to rotate the tension pulley in order to strain the belt, fasten the tension pulley bolt. And fasten the fixed bolt of air intake and exhaust camshaft pulleys and the camshafts.

Torque:120±5Nm.

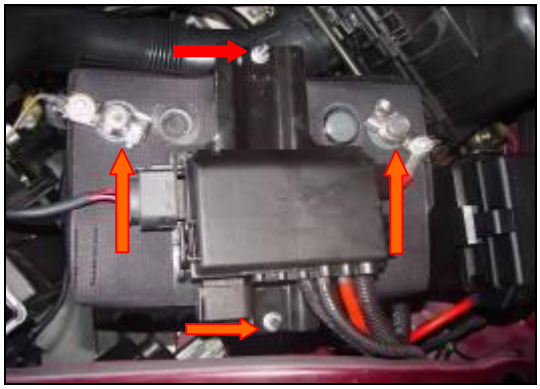


9. Lift down the special timing calibration tools, and then fasten the valve chamber cover, timing belt cover, the right engine mounting bracket of engine, and dynamo belt.

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SECTION II LIFTING AND INSTALLATION OF ENGINE

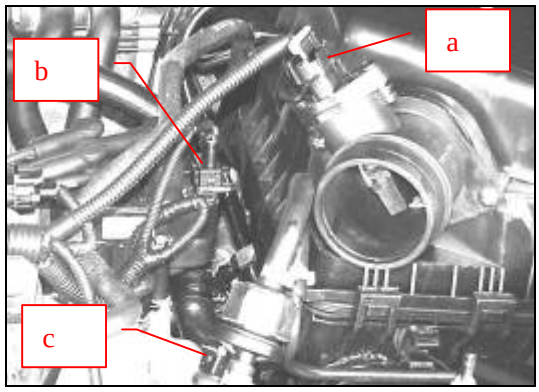
1. When the ignition switch is shut off, you can pull out the battery earth cable, loosen the fastening screw,and dismantle the battery.



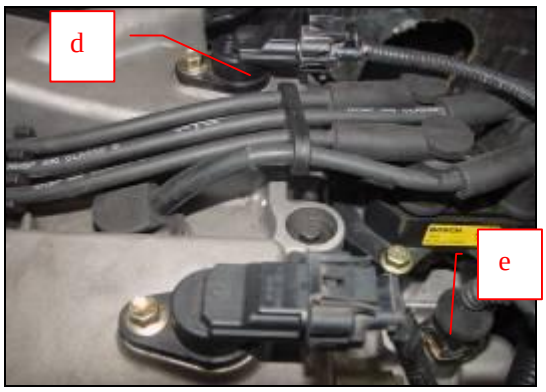
2. Loosen the condenser drainpipe, screw off the expanded pot lid, and discharge all the anti-freezing solution.



3. Dismantle the airflow lines between the throttle valve case and the air flow meter, dismantle the (a) lead connector of air flow meter, (b) lead connector of ignition coil,(c) lead connector of canister solenoid valve.



4. Remove the (d) the wire harness plug of water temperature sensor, and (e) wire harness plug of air intake and exhaust camshaft position sensor.

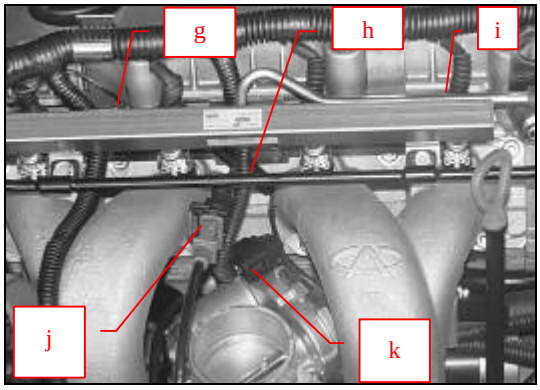


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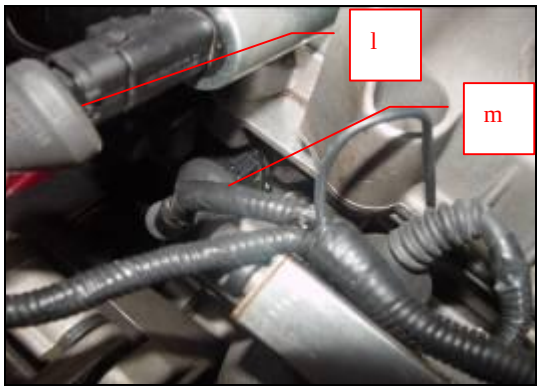
5. Remove the (f) the harness plug of CBR solenoid valve.



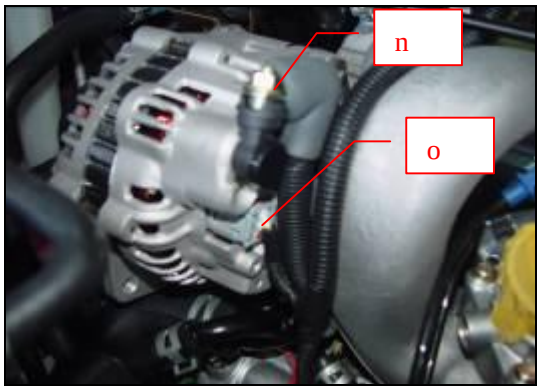
6. Dismantle (g) the earth cable bolt of cylinder head, remove (h) the wire harness plug of starter coil, (i) wire harness plugs of four oil injectors, (j) knock sensor plug, (k) wire harness plug of throttle valve controller.



7. Remove (l.) CBR solenoid valve plugs, and (m) oil temperature sensor plugs

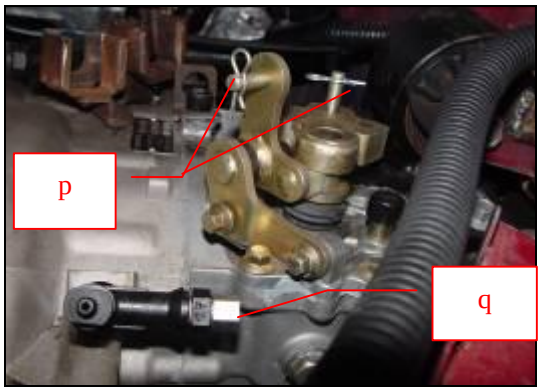


8. Loosen (n) generator positive pole output, pull out (o) exciting current harness plugs as well as the plugs of relevant parts of the A/C compressor, steering booster pump, oxygen sensor, and A/C high-low voltage switch.. Loosen the fixed bolt of starter harness to confirm the plugs of all parts are completely separated.

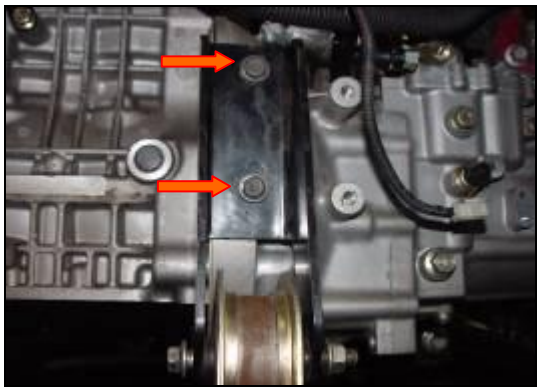


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9. Dismantle (p) transmission gearshift cable and (q) hydraulic pipe of clutch.



10. Use crane to hoist the engine hanger from the top, and dismantle the two hexagonal flange bolts of front suspension bracket.



11. Dismantle the hexagonal flange bolts of girder under the car body.



12. Remove the hexagonal flange bolts of rear suspension-cushion assembly of engine.

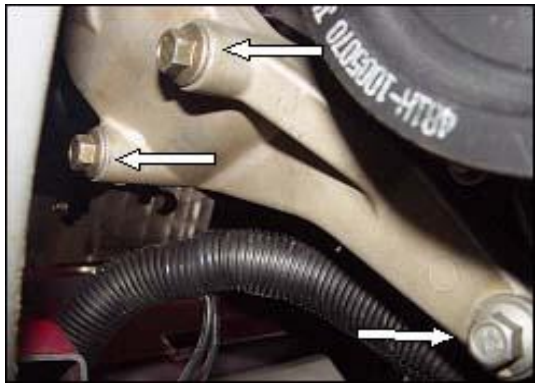


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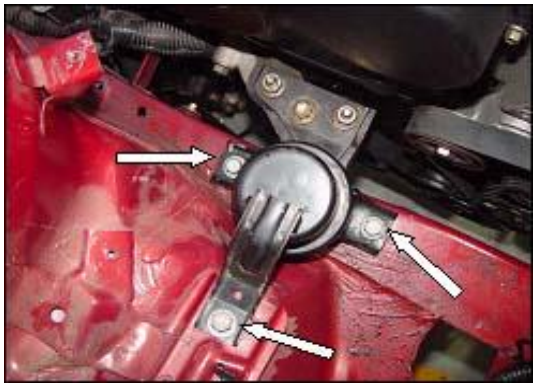
13. Dismantle the coolant reservoir and cleaning the reservoir.



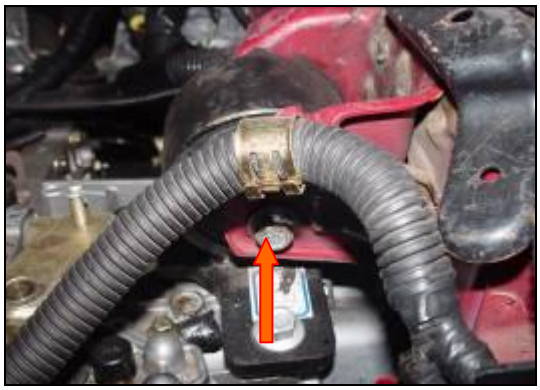
14. Loosen the three hexagonal flange bolts of engine's right bracket.



15. Loosen the three bolts of right suspension cushion, and dismantle the right suspension cushion assembly and bracket.



16. Dismantle the hexagonal flange bolts of left suspension cushion in order to ensure no connection between the engine and car body. Lift down the crane carefully and shift out the power assembly.



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SECTION III ENGINE ACCESSORIES

1 Replacement of Dynamo belt

1.1 Needed tools and auxiliary materials 13 #open end wrench and new dynamo belt

1.2 Process of removal

As the figure illustrated, rotate the13#open end wrench counterclockwise and recede the tension pulley. At the same time, the belt tension shall disappear, so you can dismantle the belt.



1.3 Installation steps

The installing steps are reverse to those for removal.

2 Replacement of Generator Assembly

2.1 Needed tools and auxiliary materials Allen wrench, ratchet wheel, 13# sleeve, 10# open end wrench.

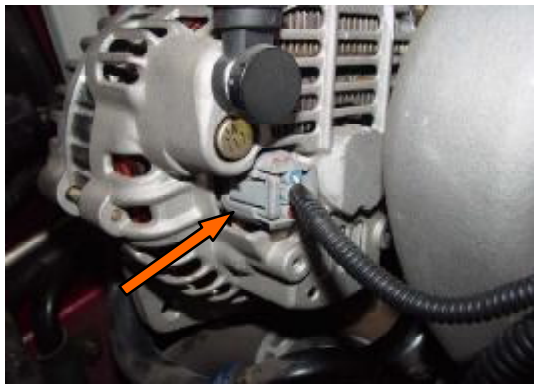
2.2 Process of removal:

1) Dismantle the negative pole harness of battery.

2) Dismantle the bolts connecting the generator and harness, and take out the harness.



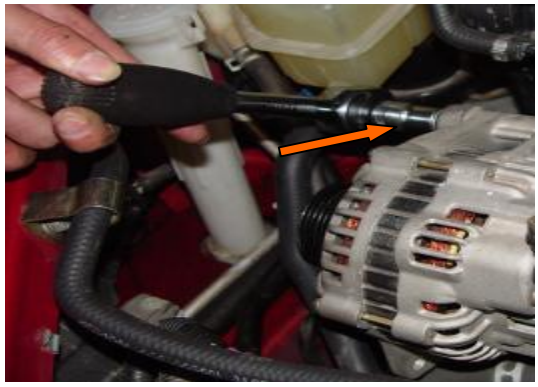
3) Pull out the harness plugs of generator regulator.



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4) Dismantle dynamo belt (Process of removal is shown in the “replacement of dynamo belt”).

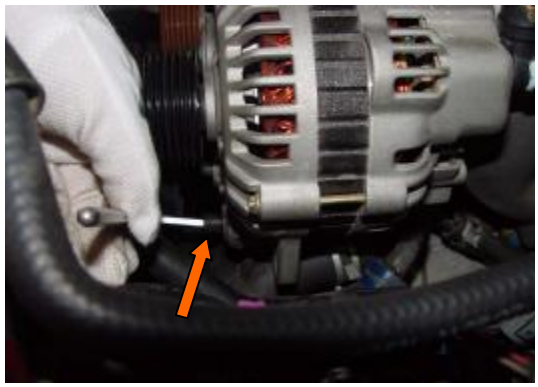
5) Use 13# sleeve to dismantle the bolt (I) connecting the generator and bracket.



2.3 Installation steps:

The Installation steps is opposite to Process of removal.

6) Use allen wrench to dismantle the bolt (II) connecting the generator and bracket, and then take out the generator.



3 Replacement of Air Conditioner Compressor

3.1 Needed tools and auxiliary materials

Small ratchet wheel, ratchet rod, 10# sleeve, big ratchet wheel, 13# sleeve, crosshead screwdriver, allen wrench coolant R134a, gauze, A/C pressure gauge

3.2 Process of removal:

1) Release Refrigerant for A/C compressor. Screw off the nuts in the test pressure port of high-pressure pipe, and use screwdriver to press down the central metal core in order to have the air conditioner pressure released completely.

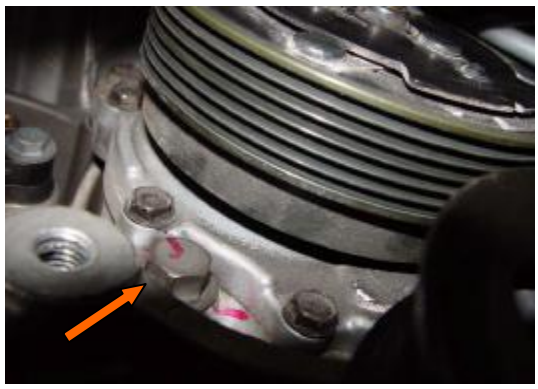
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2) Lift down the wire harness plug.

3) Dismantle the dynamo belt.（The removal methods are detailed in the “replacement of dynamo belt”.

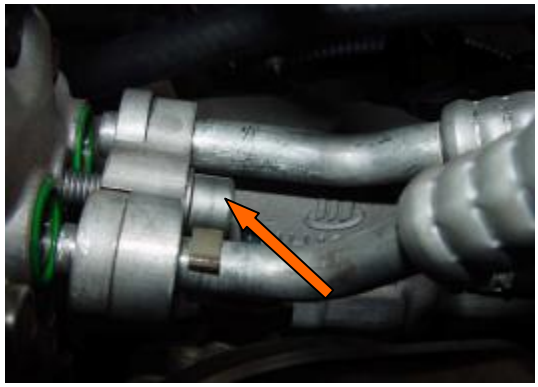
4) Dismantle the intake manifold. Detailed sequences are shown in “the removal of intake manifold ”.

5) Loosen the bolt (I) connecting the A/C compressor and fixed bracket.



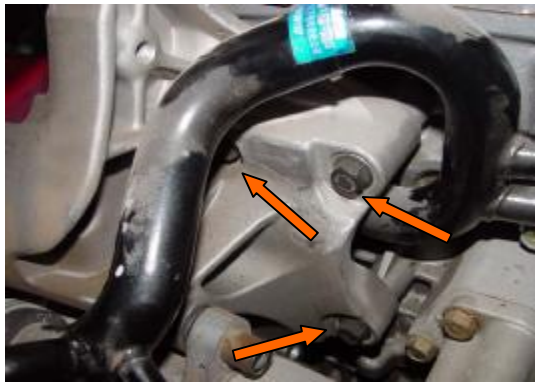
6) Loosen the bolt (II) connecting the A/C compressor and fixed bracket.

7) Use allen wrench to dismantle the bolts connecting the A/C compressor and pipes.



Note: After removing the A/C pipes, you should use clean gauze to block up the mouth of A/C pipes in order to prevent outer substances from falling into the A/C pipes.

8) Dismantle the three fixed bolts of A/C fixed bracket.



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9) Carefully handle the bracket and A/C compressor, and dismantle them.

3.3 Installation steps

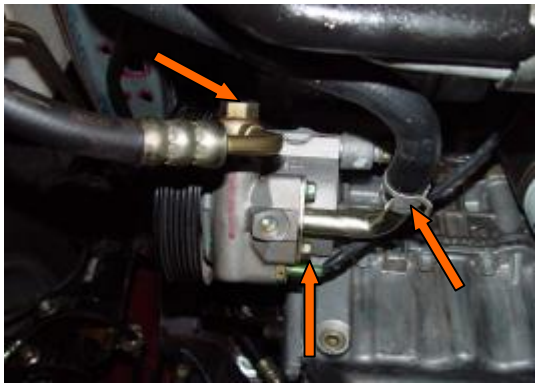
Installation steps is opposite to Process of removal.

4 Replacement of Power Steering Pump

4.1 Needed tools and auxiliary materials 17#open end wrench,ratchet wheel,ratchet rod, power steering oil.

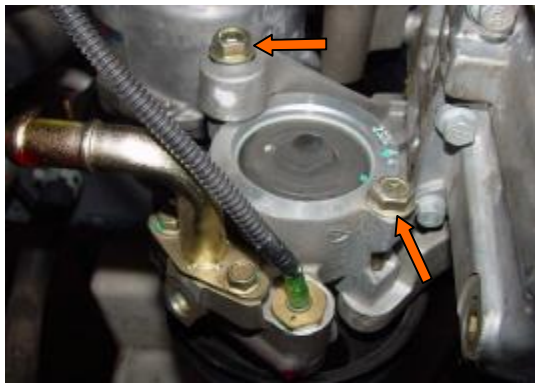
4.2 Process of removal

1) Pull out the harness plugs of power steering switch: use17#open end wrench and vice clamp to loosen the connecting bolts of oil pipe and clips, and discharge the power steering oil.



2) Dismantle the dynamo belt. Detailed removal methods are shown in the “displacement of dynamo belt”.

3) Dismantle the bolt connecting power steering oil pump and bracket.



4) otate the steering pump pulley to make the fixed bolt exposed, and then screw it off. At this time, you can dismantle the power steering pump.



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4.3 Installation steps

The installing steps are reverse to those for removal.

5 Replacement of Idler

5.1 Needed tools and auxiliary materials

Ratchet wheel wrench, 13# ,15# sleeves

5.2 Process of removal

1) Dismantle the dynamo belt. Detailed sequences are shown in the “removal of dynamo belt”.

2) Dismantle the bolts connecting the idler and engine/, and undo the idler wheel.



5.3 Installation steps

Installation steps is opposite to the Process of removal.

6 Replacement of Air Intake Flow Sensor

6.1 Needed tools

Ratchet wheel, ratchet rod, 10# sleeve, and slot head screwdriver.



6.2 Process of removal

1) Pull out the plugs connecting the sensor and wire harness, and use slot head screwdriver to loosen the clamp at the connection point of air intake hose and air cleaner.

2) Screw off the bolts connecting the sensor and air cleaner, and then dismantle the sensor.



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6.3 Installation steps

The installing steps are reverse to those for removal.

7 Replacement of Air cleaner Core

7.1 Needed tools

Right-angled screwdriver.

7.2 Process of removal

1) Undo the clips around the air cleaner case.

2) Uplift the filter case and take out the filter paper.

7.3 Installation steps

Installation steps are opposite to the process of removal.

8 Replacement of Ignition Coil

8.1 Needed tools

Ratchet wheel, ratchet rod, 10# sleeve.

8.2 Process of removal

1) Put the ignition switch key at the OFF position, and pull out the ignition coil plug.

2) Remove the high voltage cable from the ignition coil.



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3) Use 10# sleeve to dismantle the fixed bolts of ignition coil.



8.3 Installation steps

Installation steps is opposite to Process of removal.

9 Replacement of High Voltage Cable

9.1 Process of removal

1) Remove one end of the high voltage cable from the ignition coil.



2) Pull out the connection end of high voltage cable and sparking plug, and dismantle the high voltage cable.



Note: If the spare parts of high voltage cable corresponding to various cylinders are ordered, you can replace the high voltage cable of single cylinder; otherwise, you must replace the assembly.

9.2 Installation steps

The installing steps are reverse to those for removal.

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10 Replacement of Sparking Plug

10.1 Needed tools

Carry-on wrenches

10.2 Process of removal

1) Pull out the connection end of high voltage cable and sparking plug.

2) Use carry-on wrenches to screw off the sparking plug.



Torque:

10.3 Installation steps

The installing steps are reverse to those for removal.

11 Replacement of Camshaft Position Sensor

11.1 Needed tools

Allen wrench

11.2 Process of removal

1) Put the ignition key at the position of OFF, and shut off the sensor plug.

2) Use allen wrench to loosen the sensor fixed bolt



11.3 Installation steps

The installing steps are reverse to those for removal.

Installation precautions: In the case of installation, you should apply a layer of oil onto the O-type ring of sensor.

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12 Replacement of Starter

12.1 Needed tools and auxiliary materials

A set of open end wrenches and a set of sleeve wrenches.

12.2 Removal

1) Dismantle the conductor of engine oil dipstick. Loosen the bolts connecting the engine oil dipstick with cylinder block and intake manifold.

Note: After pulling out the conductor of engine oil dipstick, you should immediately use clean gauze to block up the hole in the cylinder block in order to prevent outer substances entering into the cylinder block.

2) Loosen the two bolts connecting the starter and transmission.

3) Take out the starter and remove the electric plugs of it.

12.3 Installation

The installing steps are reverse to those for removal.

13 Replacement of Oil Filter

13.1 Needed tools and auxiliary materials

Special tools for oil replacement, engine oil.

13.2 Removal

Use special tool to clamp the oil filter, and rotate it counterclockwise to dismantle it.

13.3 Installation

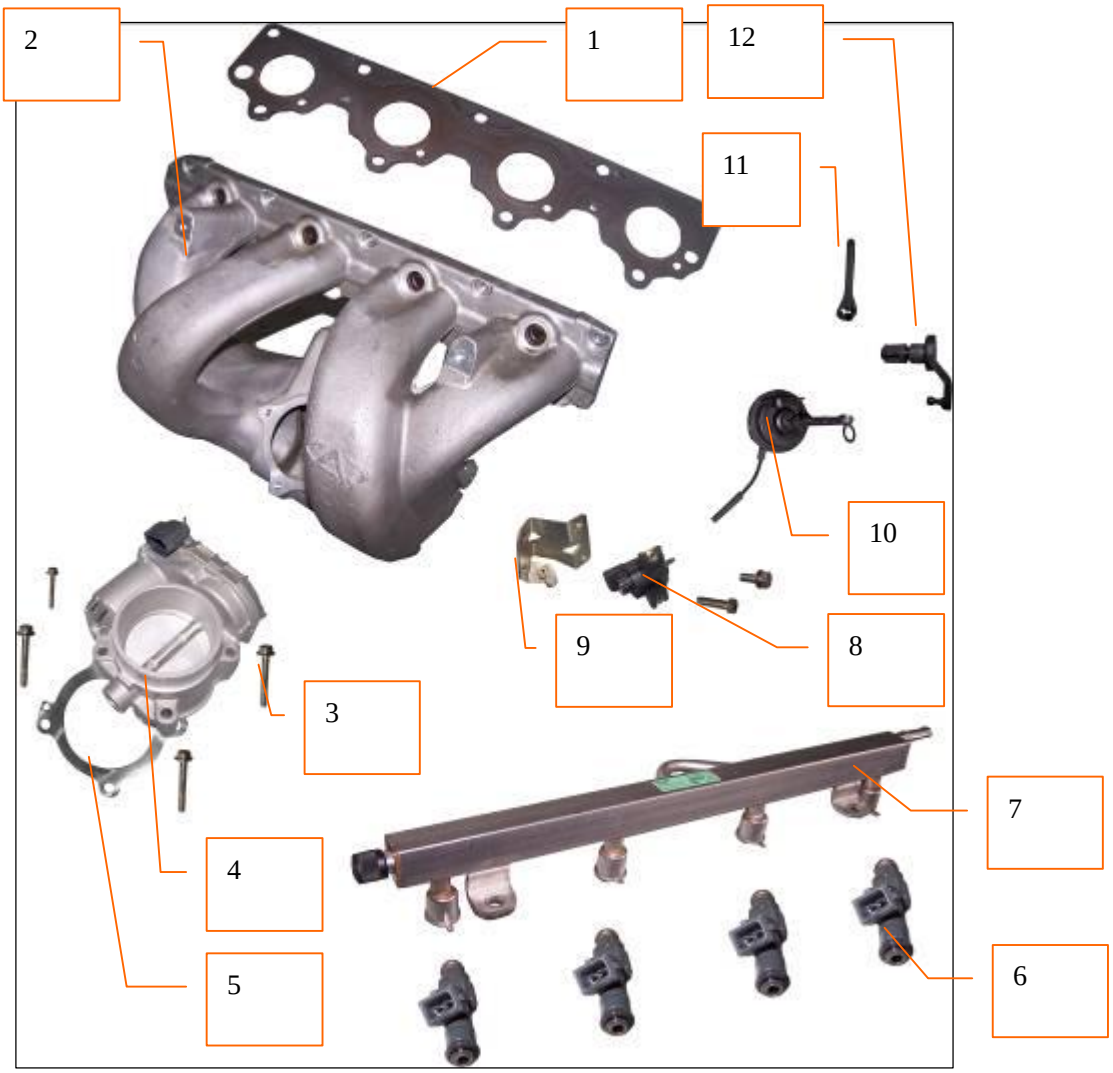
The installing steps are reverse to those for removal. Please fill adequate engine oil after assembling the oil filter.

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CHAPTER III ENGINE BLOCK

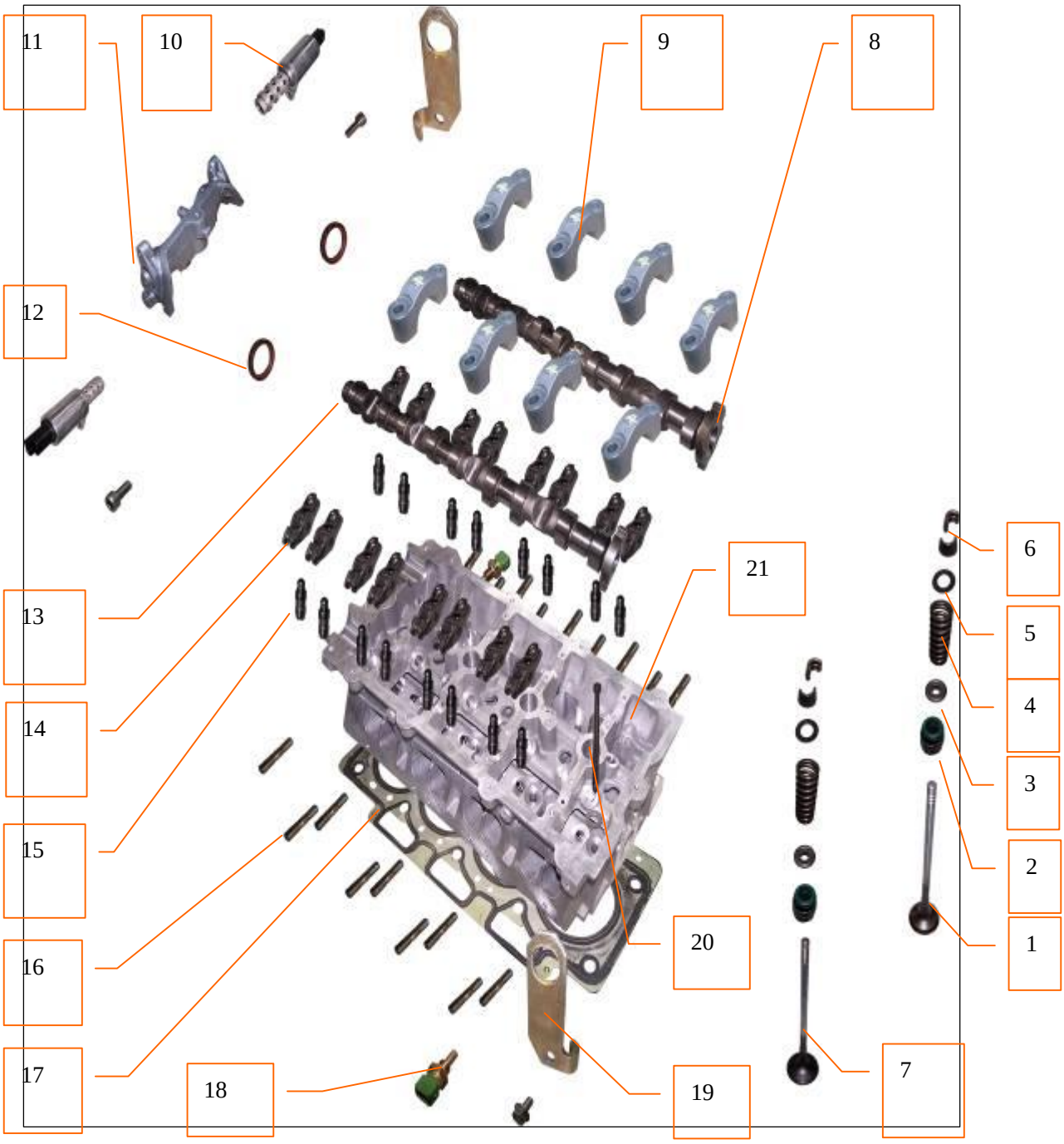
SECTION I ENGINE CYLINDER HEAD

1. Structure Diagram



1. Pad-Intake Manifold
2. Intake Manifold Assembly
3. Hexagonal Flange Bolt
4. Throttle Valve Assembly
5. Gasket-Throttle Body Assembly
6. Oil Injector Assembly
7. Fuel Delivery Pipe Assembly
8. CBR Position Sensor
9. Bracket-Actuator
10. Actuator
11. Rocker 2-CBR System
12. Rocker 1—CBR System

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1. Intake Valve
2. Valve Oil Seal
3. Spring Seat
4. Valve Spring
5. Spring Retainer
6. Keeper
7. Exhaust Valve
8. Intake Camshaft Assembly
9. Bearing Cap Assembly
10. Control Valve-Camshaft Phaser Assembly
11. First Bearing Cap Assembly
12. Front Camshaft Oil Seal
13. Exhaust Camshaft Assembly
14. Rocker Assembly
15. Hydraulic Tappet Assembly
16. Stud Bolt (9 Bars)
17. Cylinder Head Gasket
18. Temperature Sensor
19. Engine Hanger
20. Cylinder head Bolt
21. CBR Cylinder head Assembly

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2. Maintenance

2.1 Replace intake manifold, CBR control valve plate, delivery pipe, oil injector



2.1.1 Needed tools and auxiliary materials

Ratchet wheel, ratchet rod, 10# sleeve and crosshead screwdriver

2.1.2 Process of removal

1) Put the ignition key at the OFF position.

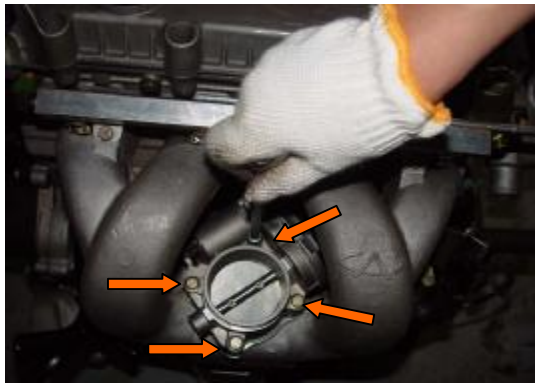
2) Loosen the oil injector plug.

3) Loosen the electric plug of CBR control valve, and dismantle the bolts connecting the engine oil dipstick and intake manifold.



4) Loosen the clamp at the connection end of air intake hose and valve body.

5) Dismantle the connecting bolts of valve body, and take out the valve body.



6) Loosen the joint of oil intake pipe.

7) Dismantle the fixed nut of intake manifold, and remove the intake manifold.



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2.1.3 Installation steps

The installing steps are reverse to those for removal.

Note: Pay more attention to the position of seal ring. There is a slot at the arrow pointing position.



2.2 Replace camshaft, bearing bushing, valve and valve oil seal

2.2.1 Needed tools and auxiliary materials

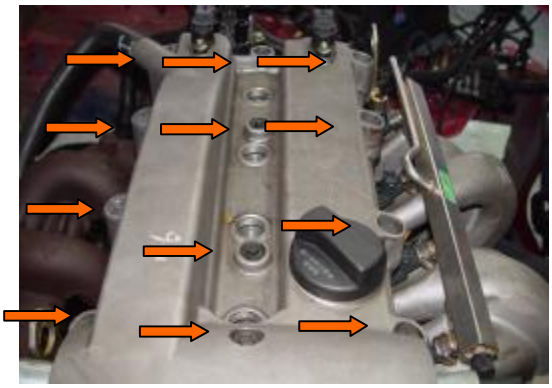
Special tool for valve oil seal, engine lubricant, a set of sleeve tools and one adjustable wrench, special timing tool, a set of allen wrenches.

2.2.2 Removal

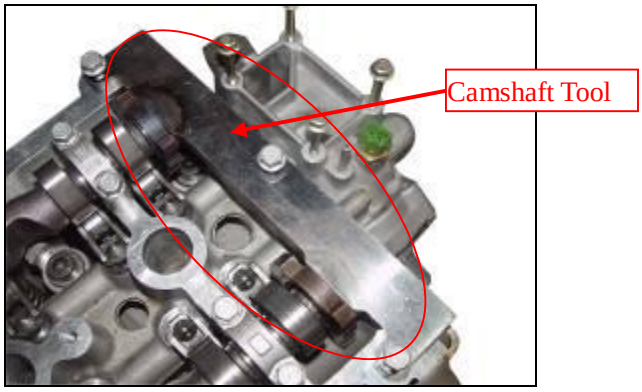
1) Dismantle the dynamo belt (detailed methods are shown in the “removal of dynamo belt ”).

2) Dismantle the timing belt (detailed method are shown in the “ replacement of engine timing belt and timing calibration”.

3) Dismantle the engine valve chamber cover.

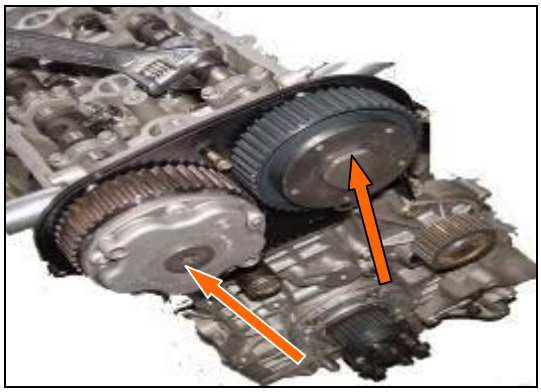


4) Clamp the engine timing special tool, the camshaft tool into the camshaft slot, and use bolts to fix it.



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5) Use torque wrench to remove the air intake and exhaust camshaft pulleys.



6) Dismantle the back cover of timing belt.



7) Dismantle the air intake and exhaust camshaft bearing caps in turn, and place them well in order.

Note: The second, third, fourth and fifth camshaft bearing caps are marked with I1, I2, I3, I4 (E1, E2, E3, E4), which stands for the corresponding bearing cap of 1, 2, 3, 4 cylinder respectively.



8) Take out the camshaft and hydraulic tappet.

9) Dismantle the valve spring. Use special tool to dismantle the valve spring.

10) Use special valve oil seal tool to dismantle the old valve oil seal.

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2.2.3 Check

1) Check the valve spring.

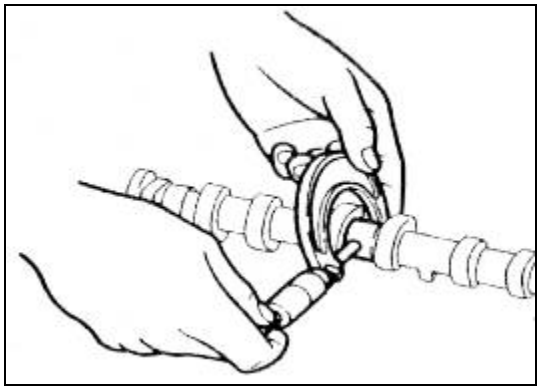
Use caliper rule to check the free length of valve spring and the length specified in special pressure.

	Standard Value(mm)	Limit value(mm)
Free length	47.7	
Length of 620N	32	

Replace with the new valve spring if the measured value exceeds the limit value.

2) Check camshaft

Use micrometer caliper to measure the diameter of camshaft.

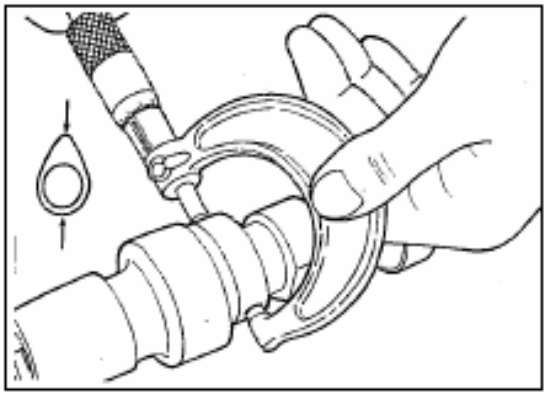


	Standard value(mm)	Limit value (mm)
Diameter	0.15	0.20

Replace with the new camshaft if the measured value exceeds the limit value.

3) Check the camshaft

Use micrometer caliper to measure the length of camshaft.



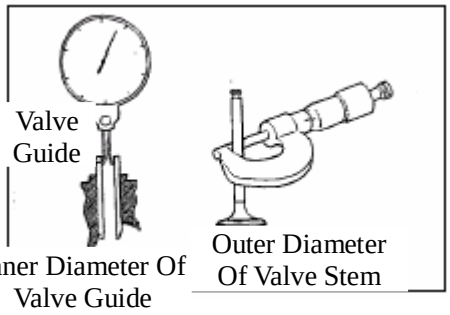
	Standard value (mm)	Limit value （mm）
Intake camshaft	0.15	0.20
Exhaust camshaft	0.15	0.20

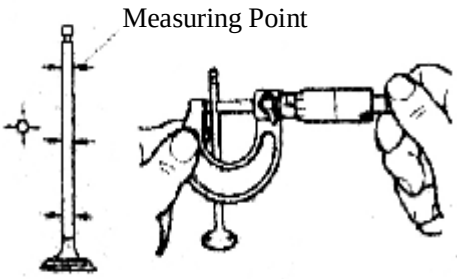
Replace with the new camshaft if the measured value exceeds the limit value.

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4) Check the diameter of value stem

a: Use micrometer caliper to measure the diameter of valve stem.

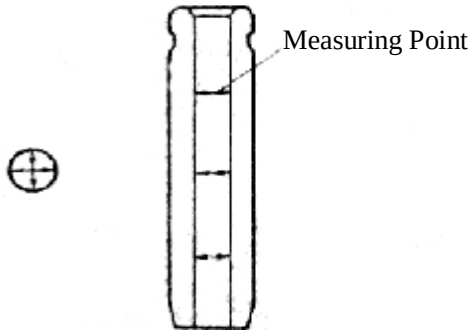




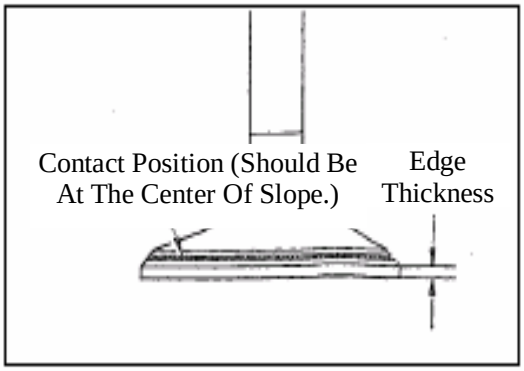
B: Use inner micrometer guage to measure the inner diameter of valve guide.

C: Calculate the difference of measured value and the clearance.

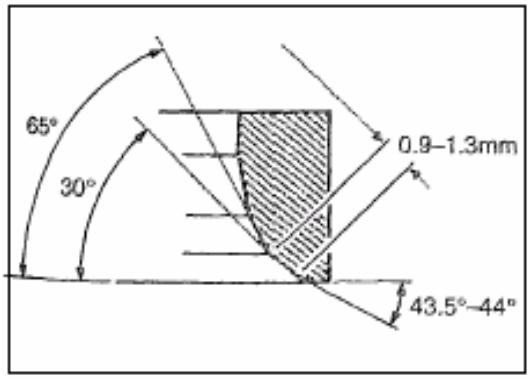
If they exceed the specified limit values, the value or guide shall be replaced more necessarily.



D: Check the contact bandwidth of valve.



E: Check the valve seat insert.



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		Standard value	Limit value
Outer diameter of valve stem (mm)	IN	¢5.98±0.008	
	EX	¢5.96±0.008	
Inner diameter of valve guide (mm)	IN	¢5.4±0.1	
	EX	¢5.4±0.1	
Clearance (mm)	IN	0.02	
	EX	0.04	
Thickness of value top （mm）	IN	0.3±0.15	
	EX	0.3±0.15	

2.2.3 Installation

The installing steps are reverse to those for removal.

Note:

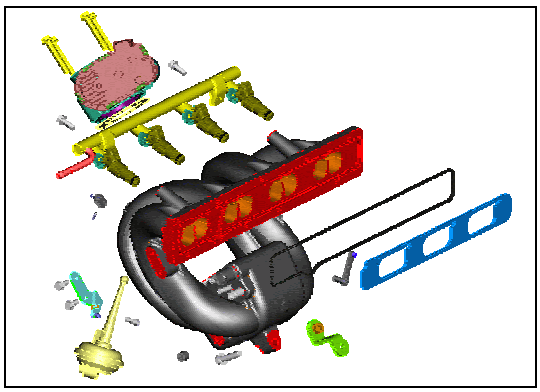
1) Dismantle the valve springs in two groups with 1st and 4th cylinders in one group, 2nd and 3rd cylinders in the other group. When the piston runs tothe top dead center of 1st and 4th pistons, you should dismantle the valve springs of the 1st and 4th cylinders, replace the valve oil seal, and mount valve springs immediately. When the piston runs to the top dead center of2nd and 3rd cylinders, you should replace the valve oil seal. Thus, you can prevent the valve from falling into the cylinders, reducing unnecessary troubles.

2) Apply engine lubricant onto the oil seal lip when installing the valve oil seal.

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SECTION II INTRODUCTION TO NEW ENGINE TECHNOLOGIES——CBR& VVT

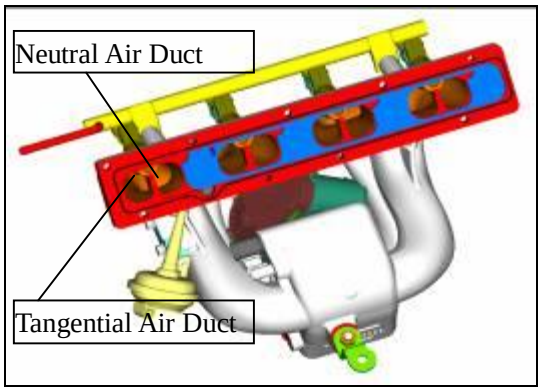
1. CBR PROFILE



CBR principle and structure

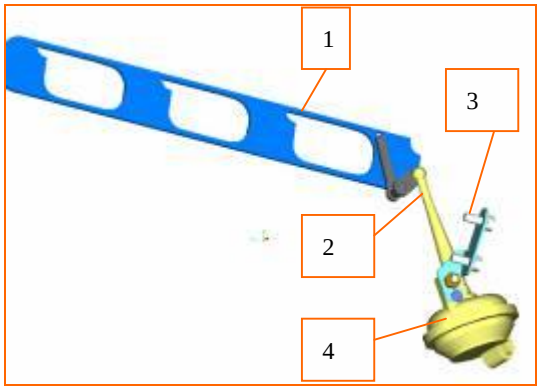
By controlling the organization modes of air flow (eddy flow and turbulent flow), CBR (Controlled Bum Rate) can improve the burn rate, reduce displacement, and boost the economical efficiency of fuel.

This engine adopts sliding plate CBR.



- When the engine operates at low speed, the vacuum actuator shall drag the sliding plate to move towards the direction shown in the figure by use of rocker assembly, and the neutral air passage shall be shut off basically (there is only a gap on the top right corner). The mixing of oil mist and air mainly depends on the eddy flow of air intake provided by tangential air duct, thus improving the combustion status.
- When the engine operates at high speed, CBR control valve shall cut off the vacuum condition of vacuum actuator; thanks to the spring functions, the sliding plate shall return to the position illustrated in the figure, and the neutral air duct shall also be opened, which increases the turbulent flow of air intake and improve the maximum power.

Structure of sliding plate



1) Sliding plate
2) Rocker and shaft assembly
3) Bracket
4) Vacuum actuator

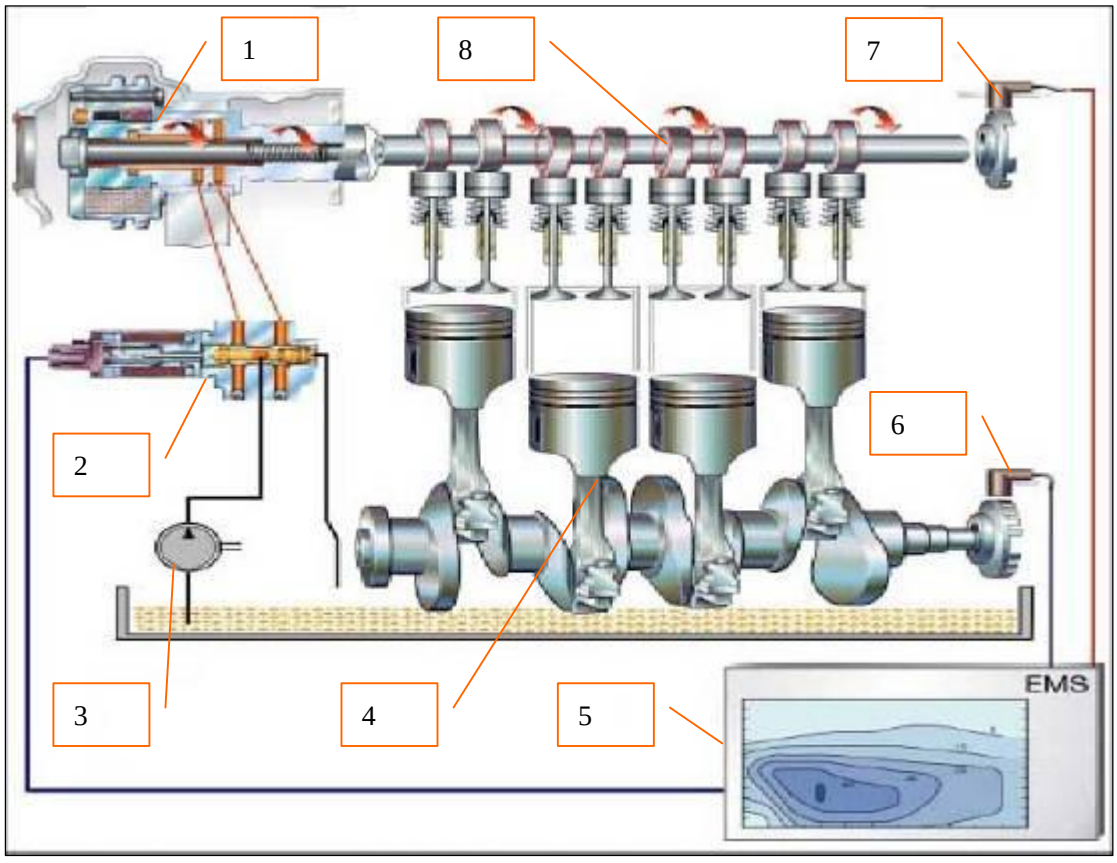
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2.VVT PROFILE

VVT Principle

VVTi is the abbreviation of variable valve timing with intelligent. During the operation of engine, the valve opening time is called as valve timing. When the engine operates at different rotation speeds, we need different valve timings to provide the optimal valve closing control, so that the power and combustion efficiency can achieve the best effect. For this purpose, we shall install VVTi mechanism onto the camshaft controlling the air intake valve to regulate valve timing. The VVTi system installed on the air intake camshaft of engine is equipped with oil- pressure clutch device between the camshaft and drive sprocket, which can alter the rotation phase difference between the air intake camshaft and drive sprocket. The controlled oil pressure mechanism connects with the engine oil system, and can be regulated by solenoid valve and control loop. When the engine operates at different rotation speeds, there are different angles between the camshaft and sprocket, which facilitates the air intake valve to open and close at different times in an effort to achieve variable valve timing. On the other hand, when the engine operates at different rotation speeds, abundant and appropriate oil gas can be supplied to generate mighty power.

When the car engine equipped with VVT-I system fails abnormally, ECUs controlled by the engine shall automatically lock the preset parameter value (come-home function), ensuring the driver to drive the car to the maintenance station. This kind of engine lodges a strictly demand for the quality of petroleum and lubricant; therefore, you must adopt the standard materials in compliance with the stipulations of original car manufacturer in order to avoid unnecessary damages.

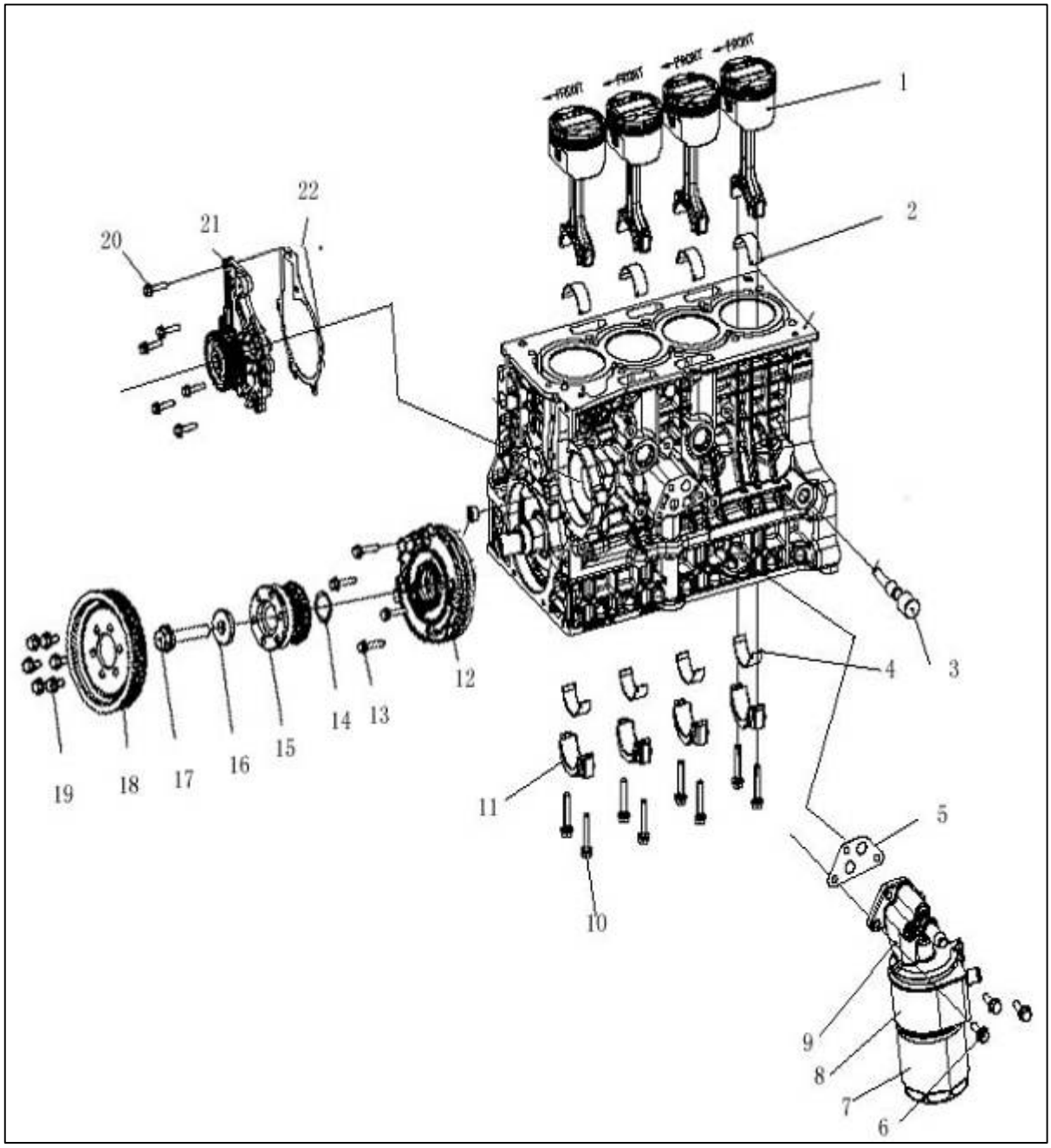


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1. Camshaft Phaser Assembly
2. Control Valve-Camshaft Phaser Assembly
3. Oil Pump Assembly
4. Engine Piston
5. Engine ECU
6. Crankshaft Position Sensor
7. Camshaft Position Sensor
8. Camshaft

SECTION III SHORT ENGINE

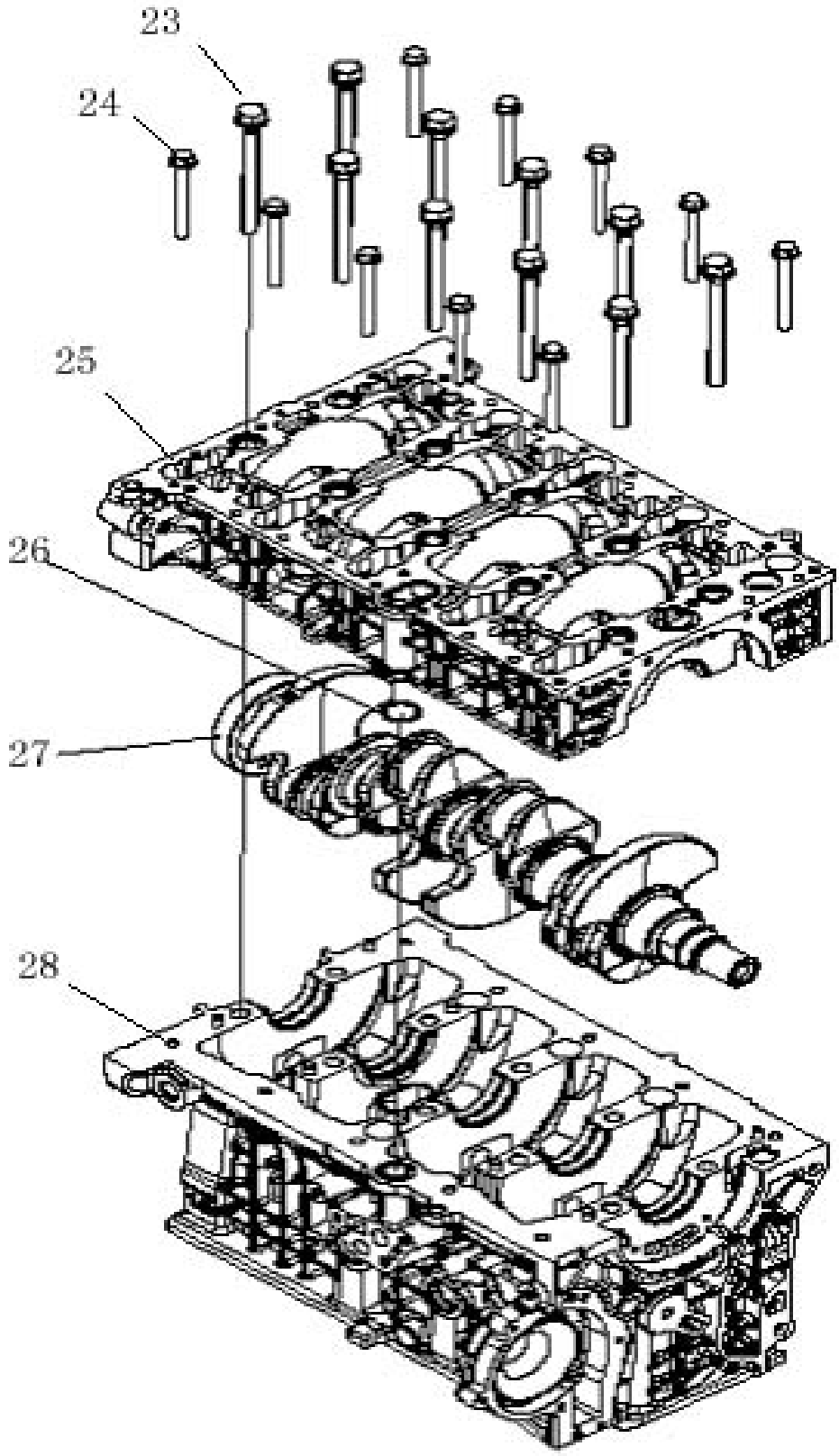
I. STRUCTURE DIAGRAM



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1. Piston
2. Connecting Rod Upper Bearing
3. Timing Hole Plug
4. Connecting Rod Lower Bearing
5. Pad
6. Bolt (M)
7. Oil Filter
8. Oil Cooler
9. Oil Filter Seat
10. Connecting Rod Bolt
11. Connecting Rod Bearing Cap
12. Oil Pump
13. Bolt
14. Gasket
15. Crankshaft Timing belt pulley
16. Gasket
17. Bolt
18. Crankshaft Pulley
19. Bolt
20. Bolt
21. Coolant pump
22. Coolant Pump Gasket

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23. Crankshaft Main Bearing Bolt
24. Frame Bolt
25. Frame
26. O-Type Ring
27. Crankshaft
28. Cylinder Block

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II. MAINTENANCE

1. Replacement of Oil Pan

1.1 Needed tools and auxiliary materials 10# open end wrench, 10#, 15#, 17# sleeves, ratchet wheel, ratchet rod, Le Tai 5901 Glue and engine oil.

1.2 Process of Replacement

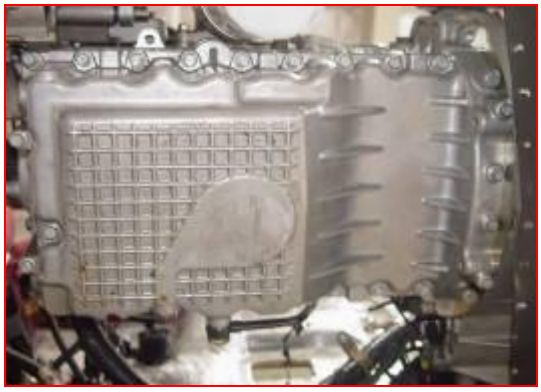
1.2.1 Process of removal

1) Loosen the oil discharge bolt of oil pan to discharge the engine oil.



Note: Engine oil should be stored in special container. And Pay attention to environment protection.

2) Use 10#open end wrench and 10 # sleeve to dismantle the fixed bolt of oil pan (18 M7×25, 3 7×40 and 4 M7×95).

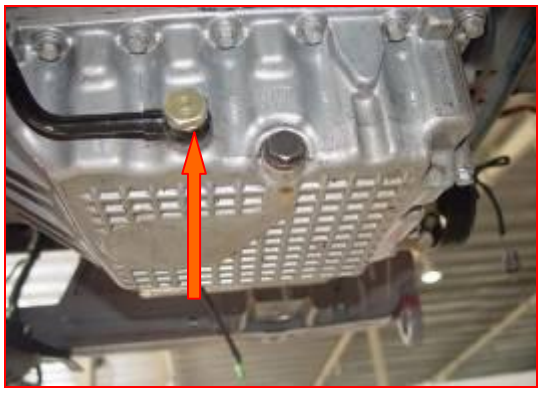


3) Use 17# sleeve wrench to dismantle the bolts (2 pieces, black) connecting the oil pan and transmission housing.



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4) Use 15# sleeve wrench to dismantle the bolts connecting the oil return pipe of PVC valve and oil pan



5) Use rubber pestle to knock the edge of oil pan, and dismantle the oil pan.

Note: Pay more attention to safety precaution, since the oil pan may fall down during the knocking process.

6) Use right-angled tools to clean up the old Le Tai Glue stained onto the engine frame.

Note: Do not scuff the frame surface.



1.2.2 Installation

1) Apply Le Tai 5910 Glue onto the connection surface of engine frame edges and oil pan to close up the oil pan, and then mount fixed bolts for oil pan.

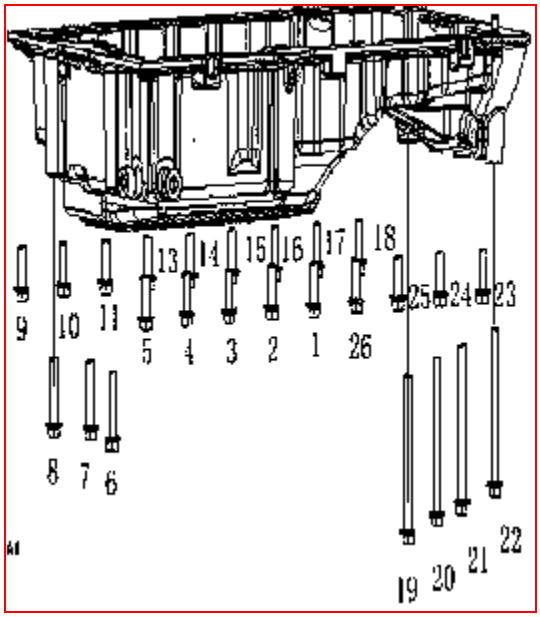
Note: Spread glue to the inner of hole for installing bolt on the oil pan!

2) Fasten the bolt. Firstly fasten it slightly to press fit, and then fasten it up to the specified torque.

Fastening method for bolt:

a: Firstly screw in the oil pan bolt, and let it not be pre-fastened.

b: Pre-fasten the bolt from the central part



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clockwise.

c: Fasten the bolt up to specified torque from the central part to both sides clockwise. （As the figure illustrated）.

Torque: 15±3NM

3) Fill engine oil up to specified volume.

2 Replacement of Oil Strainer

2.1 Needed tools and auxiliary materials

10#open end wrench, 10#, 15#, 17# sleeves, ratchet wheel, ratchet rod Le Tai 5901 Glue,engine oil.

2.2 Process of replacement

2.2.1 Process of removal

1) Dismantle oil pan (removal method is shown in the “replacement of oil pan”).

2) Use 10# sleeve wrench to dismantle the bolts (8 pieces) connecting the oil strainer and engine frame.



3) Pull out the oil strainer carefully.

2.2.2 Installation

1) Spin the nozzle of engine oil strainer into the frame carefully.

2) Mount the 8 bolts for the strainer and fasten them.

Note: All bolts should be pasted with Le Tai 243 Glue.

Torque: 8±3Nm

3) Installation of oil pan (detailed methods are shown in the installation of oil pan).

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3 Replacement of Piston, Piston Ring, Piston Pin and Connecting Rod Bearing

3.1 Needed tools and auxiliary materials

10#open end wrench, 10#,15#,17# sleeves, ratchet wheel , ratchet rod, Le Tai 5901 Glue,engine oil, torque wrench, special piston mounting tools, feeler gauge, clearance gauge, micrometer caliper

3.2 Process of replacement

3.2.1 Process of removal

1) Dismantle the timing belt (detailed methods are shown in the section of timing belt assembly in the " replacement of timing belt").

2) Dismantle the oil pan (detailed methods are shown in the section of " replacement of oil pan ").

3) Dismantle the cylinder head(detailed methods are shown in the" removal of cylinder head").

4) Dismantle the oil strainer(detailed methods are shown in the "replacement of oil strainer".

5) Loosen the bolts of connecting rod big end.



6) Dismantle the lower cover of connecting rod journal.



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7) Use wood stem to uplift the connecting rod and piston slightly, and then dismantle the piston and connecting rod assembly.



8) Take down the piston ring.

9) Take down the retainer ring of piston pin, and pull out the piston pin.

Note: Since the tension force of retainer ring is very strong, you should do the removal work carefully in order to avoid hurting person.

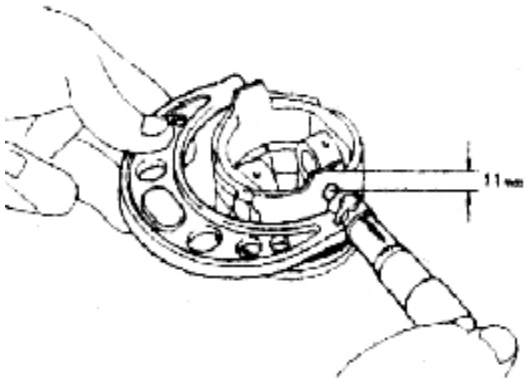


3.2.2 Inspection

I. Check the piston

1) Check the piston diameter.

Use micrometer caliper to carry out measurement at the position 11mm away from the lower part of piston skirt section a and along the vertical direction of piston pin.



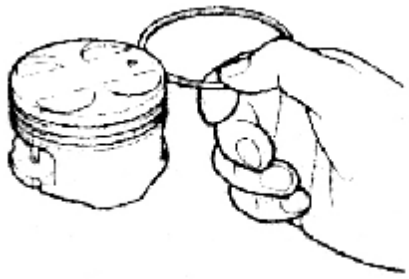
Cylinder No.	Standard Size	Wearing Limit
1	80.46±0.009	
2	80.46±0.009	
3	80.46±0.009	
4	80.46±0.009	

Please replace the piston when it exceeds the wearing limit.

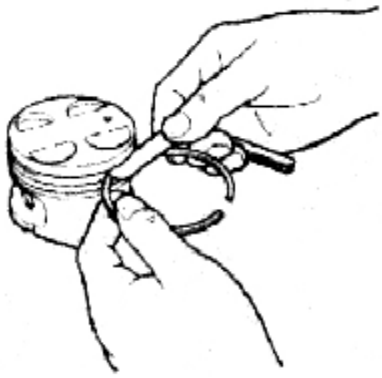
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2) Check the clearance between piston ring and ring slot.

a. Use piston ring to clean up the carbon deposit in the ring slot.



b. Use feeler gauge to measure the clearance between the piston ring and ring slot.

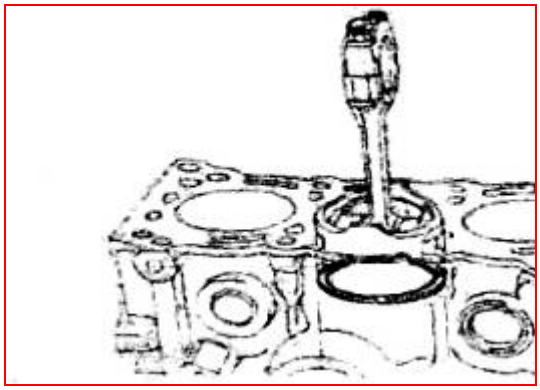


	Standard value(mm)	Wearing limit (mm)
First ring	0.04--0.08	
Second ring	0.01--0.025	

If the measured clearance exceeds wearing limit, please replace it with new piston.

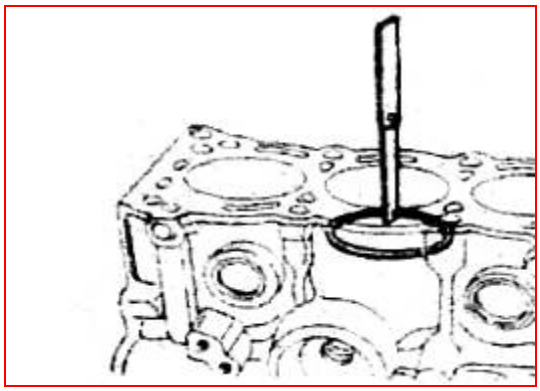
3) Check the end clearance of piston ring

a. Put the piston ring at the position 45mm below the top surface of cylinder aperture, and push the piston ring into cylinder with piston.



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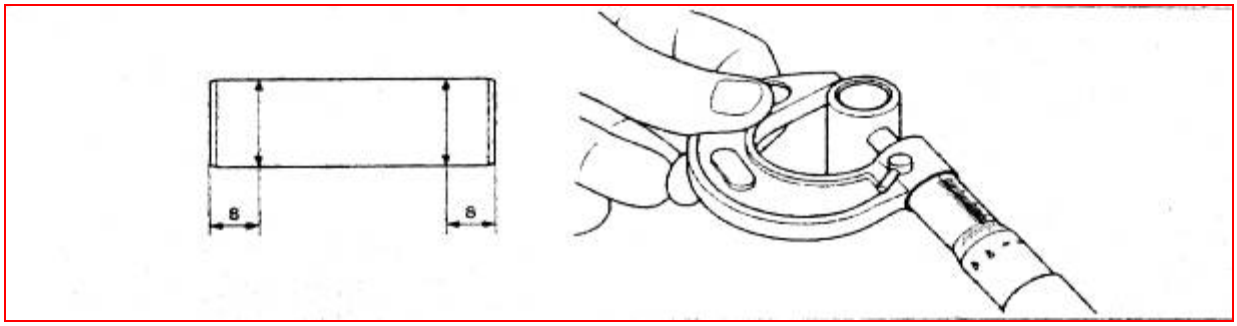
b. Use feeler gauge to measure the orifice.



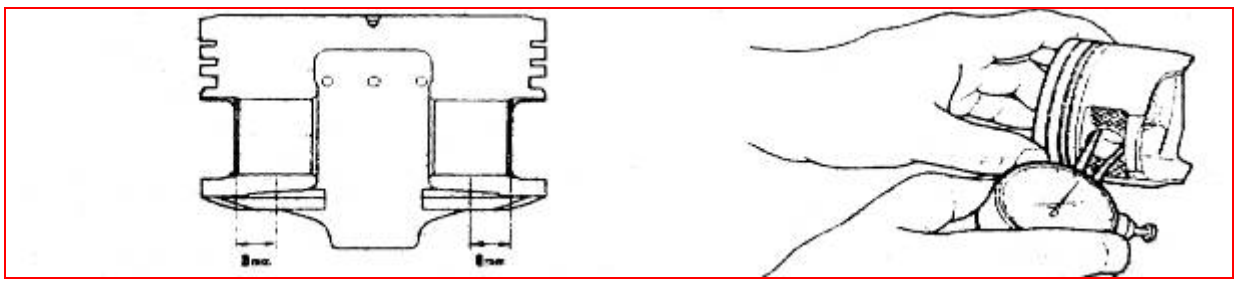
	Standard value (mm)	Limit (mm)
First ring	0.2-0.4	
Second ring	0.4-0.6	
Oil ring	0.2-0.9	

4) Check the piston pin and the diameter of piston pin

a. Use micrometer caliper to measure the outer edges of the part shown in the following figure, and select the maximum value as the diameter size of piston pin.



b. Use inner micrometer caliper to measure the outer edges of the parts of the piston pin hole shown in the following figure, and select the minimum value as the diameter size of piston pin hole.



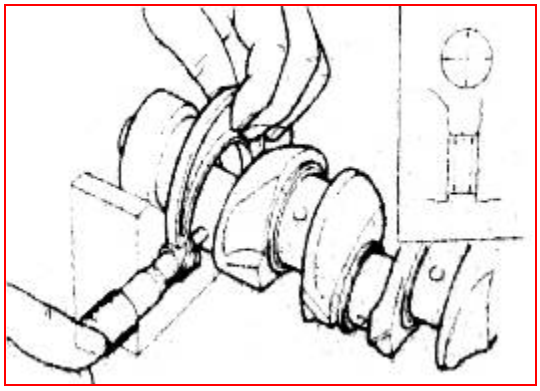
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	Standard size	Wearing limit
Clearance between piston pin and piston pin hole	0.002-0.013	

5) Check the connecting rod journal and the connecting rod bearing.

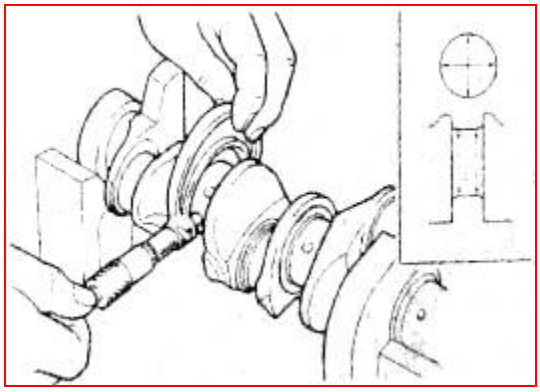
a. Check the diameter of connecting rod journal.

Use micrometer caliper to measure the connecting rod journal.



Rotate the crankshaft for 90°, and carry out measurement.

Calculate the roundness and cylindericity after two measurements.

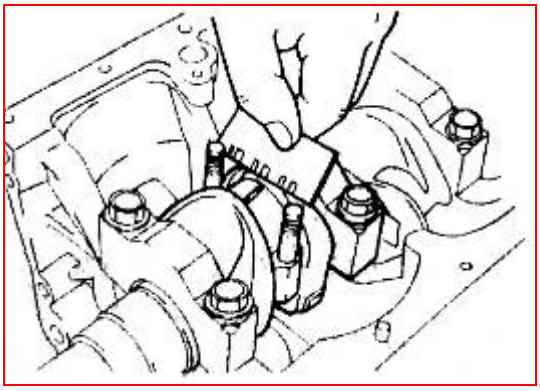


	Standard value	Wearing limit
Diameter		
Roundness		
Cylindericity		

b. Check the radial clearance of connecting rod bearing.

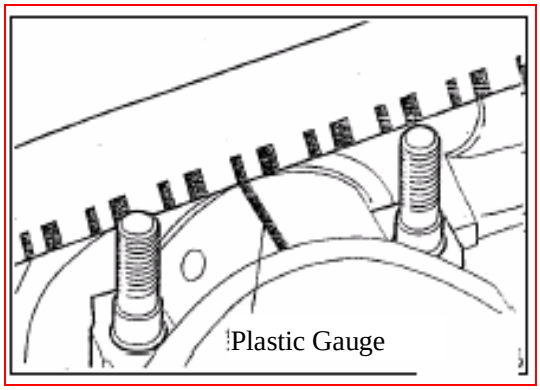
Use clearance gauge to measure the radial clearance of connecting rod bearing. Firstly clean the connecting rod journal and connecting rod bearing, and then put the clearance gauge onto the journal, and fasten the bearing bush to specified torque.

Note: The crankshaft should not be rotated during this process.



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Loosen the connecting rod bolt, dismantle the bearing cap; and use the measuring rule on the clearance gauge packaging bag to measure the width of the widest portion of the flattened clearance gauge, and get the clearance value.



	Standard value	Wearing limit
clearance	0.15	0.50

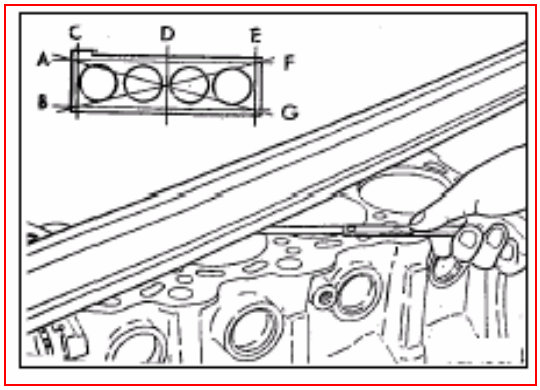
If the measured clearance exceeds limit, you should replace the connecting rod bearing.

Note: When replacing bearing bushing, you should use the specified brand and model of the same manufacturer.

6) Check the flatness of the cylinder block surface.

a: Clean the cylinder block surface.

b: Use ruler and feeler gauge to check whether the cylinder block surface is warped or not.



	Standard value	Limit value
warping amount	0.04	

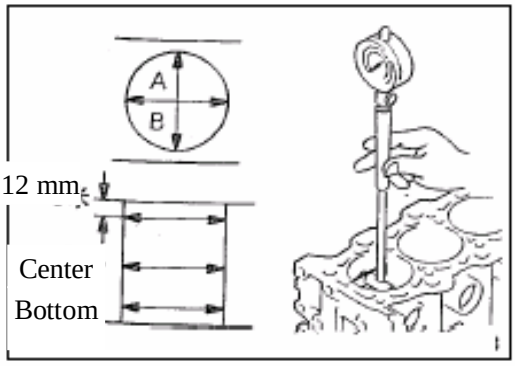
C: If the warping amount is excessive, please rectify it.

If it exceeds the limit, please replace the cylinder block.

The maximum summation of the permitted worn thickness of the cylinder block and cylinder head is:

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7) Check the cylinder block



a: Check whether there is scuffing or piston scraping on the cylinder wall. If the defect exits, please dissection the cylinder or and set with bushing or replace it.

b: Use cylinder gauge to measure the inner diameter and cylindericity.

	Standard value	Limit value
Cylindericity		

Cylindericity=max. cylinder diameter-min. cylinder diameter.

Measure the cylinder diameter in the A and B directions, and calculate the cylindericity in the two directions and select the max value.

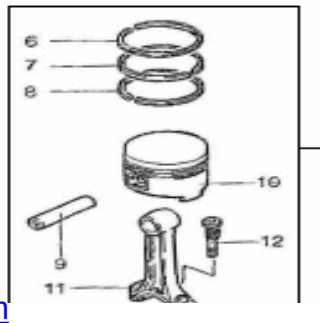
3.2.3 Installation

1) Apply oil onto the piston pin and in the piston pin hole, and use piston pin to connect the piston with the connecting rod, and then mount the piston pin circlip.



2) Mount piston ring. Mount all the rings onto the piston according to the sequence: the bushing ring of oil control ring upper and lower blades, second air ring, first air ring. Observe the piston ring direction when mounting various rings: those with “TOP” onto it shall be positioned upwards. Form an angle by crossing the two blades and the bushing ring, with the closed angle at the bushing ring joint pointing at the piston top, and the first ring and second ring intersecting with the blades for 1200.





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3) Mount the connecting rod upper bearing and connecting rod together.



Note: The bearing notch should be in alignment with the notch on the connecting rod.

4) Apply engine lubricant onto the engine cylinder, use special tools to clamp the piston ring, and use wood handle to slightly knock on the piston head so as to mount the piston connecting rod assembly.



Note: The end of the connecting rod with points should point at the 1st engine cylinder, and be consistent with the direction of arrow at the piston top surface.



5) Mount the connecting rod lower bearing and connecting rod cap together, and apply engine lubricant onto the bearing.



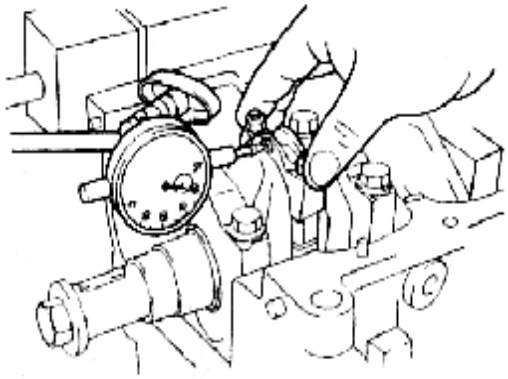
Note: The bearing notch should be in alignment with the connecting rod notch.

6) Latch on the connecting rod cap and fasten the bolt.

Torque: 25±3N•m, and then screw it for 90°±5°.

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7) Check the axial clearance of connecting rod Use micrometer caliper or feeler gauge to measure the axial clearance.



	Standard value（mm）	Limit value (mm)
Clearance	0.15	0.50

8) Mount oil strainer.

9) Mount oil pan.

10) Mount cylinder.

11) Mount timing belt.

4.Replacement of Front crankshaft oil seal

4.1 Needed tools and auxiliary materials

Ratchet wheel, ratchet rod, 13#, 15#, 17#, 22# sleeves, 13#open end wrench, allen wrench, engine lubricant, special tools for assembly oil seal.

4.2 Process of replacement

4.2.1 Process of removal

1) Dismantle the timing belt (detailed Process of removals are shown in the “replacement of timing belt”).

2) Shift the car into the 5th gear and step on the brake, use torque wrench to dismantle the bolts connecting the timing belt pulley and crankshaft, and then take down the timing belt pulley.



Torque: 130±10, and then screw for 65°±5°.

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3) Use slot-head screwdriver to pry out the old oil seal

Note: Be careful when dismantling the oil seal, and avoid scuffing the oil seal seat ring.

4.2.2 Installation

1) Clean up the dirt and stain on the oil seal seat ring, and apply a layer of lubricant onto the seat ring.

2) Apply a layer of engine lubricant onto the oil seal lip.



3) Fit the lubricant-applied new oil seal into special tool.



4) Press the oil seal into the oil seal seat ring carefully, and use hammer to knock it to the specified position.



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5 Replacement of Oil Pump

5.1 Needed tools and auxiliary materials

A set of big sleeve tools, a set of small sleeve tools, and a set of open end wrenches

5.2 Process of replacement

5.2.1 Process of removal

1) Dismantle the timing belt(detailed methods are shown in the “removal of engine timing belt”).

2) Shift the car into 5th gear and step on the brake, and dismantle the timing belt pulley.

3) Use 10# sleeve to dismantle the fixed bolt of oil pump, and remove the oil pump.



Torque: 8+3NM

4) Pry out the oil seal.

5) Clean the seat ring of oil pump.

5.2.2 Installation

1) Apply oil onto the oil pump gasket.

2) Mount the oil pump into the seat ring of oil pump.

Note: The bulging portion of oil pump should point downward.

When the position is not correct, the bolt cannot be screwed in.

3) Mount oil seal.

4) Mount other components.

6 Replacement of Crankshaft Rear Oil Seal

6.1 Needed tools and auxiliary materials

A set of sleeve tools, a slot head screwdriver, a small crane, engine oil.

6.2 Process of removal

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1) Lift down the engine assembly from the car(detailed methods are shown in the “lifting and installation of engine assembly”.

2) Dismantle he clutch pressure plate.

3) Dismantle the flywheel. Firstly use special tool to clamp the flywheel, and then use sleeve wrench to dismantle the fixed bolts.

4) Use slot head screwdriver to pry out the old oil seal.

Note: Avoid scuffing the oil seal seat ring.



6.2 Installation

1) Clean the oil seal seat ring. Use clean gauze to suck some engine oil to clean up the foreign substances in the oil seal seat ring.



2) Apply a layer of oil onto the front oil seal lip of crankshaft equally. Fit the oil seal onto the special tool, and then press it into the oil seal seat ring.



3) Install flywheel and clutch pressure plate, and assemble the engine into the car.

Torque: 25±5N.M, and then screw for 30°±5°.

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7 Replacement of Crankshaft and Thrust Washer

7.1 Needed tools and auxiliary materials

A set of open end wrenches, a set of sleeve tools, one small crane, Le Tai glue, engine oil, feeler gauge and micrometer guage.

7.2 Process of removal

1) Lift down the engine (detailed methods are shown in the “lifting and installation of engine”).

2) Discharge the engine oil.

3) Dismantle the engine timing belt (detailed methods are shown in the “ replacement of timing belt”).

4) Dismantle the engine accessories such as engine A/C compressor, power steering pump and bracket.(detailed methods are shown in the “replacement of engine accessories”).

5) Dismantle the engine cylinder head assembly (detailed methods are shown in the “replacement of cylinder head”).

6) Dismantle the clutch pressure plate, flywheel and timing belt pulley.

7) Dismantle the oil pan and oil strainer.(detailed methods are shown in the “ replacement of oil span and strainer”.

8) Dismantle the piston connecting rod assemblies of four cylinders, place them well in order.

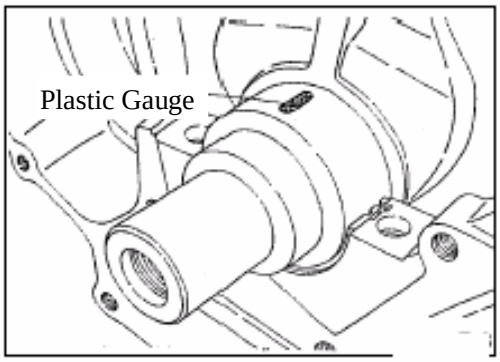
9) Dismantle the oil pump assembly

10) Dismantle the lower frame of cylinder block, and then you can take out the crankshaft and thrust washer.

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7.3 Check

1) Check the oil clearance of crankshaft main journal.



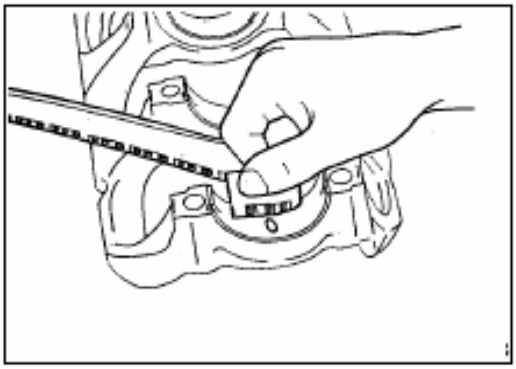
a) Clean the journal and bearing bushing.

b) Installation of crankshaft

c) Cut the plastic gauge to make it have the same length with that of the bearing, and then put it onto the crankshaft journal to make it parallel with the central line of shaft.

d) Install the master bearing cap carefully, and fasten the bolts to specified torque.

e) Dismantle the master bearing cap carefully.



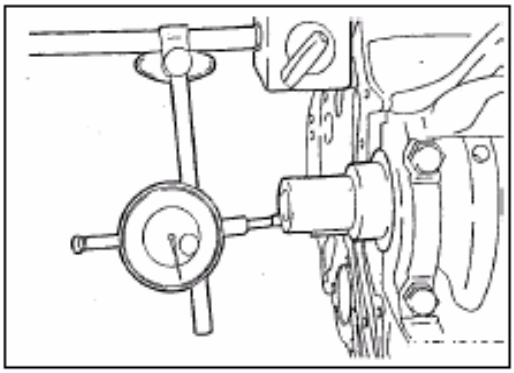
f) Use the measuring rule on the packaging bag of plastic gauge to measure the width of the widest portion of flattened plastic wire, and get the clearance value.

	Standard value	Limit value
Clearance	0.022	0.058

If the clearance value exceeds the limit value, please replace the bearing bushing.

Note: When replacing the bearing bushing, you must replace the whole group of bearing bushings.

2) Measure the axial clearance of crankshaft After mounting the crankshaft, you can use micrometer guage to measure the axial clearance.



	Standard value	Limit value
Clearance	0.07	0.265

If the measured value exceeds the limit value, please replace the thrust washer.

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7.4 Installation

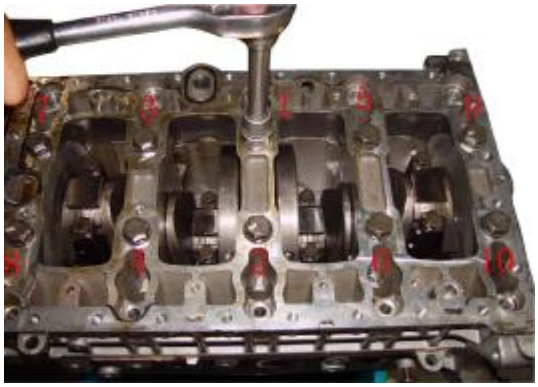
1) Clean up the short engine, and apply engine lubricant.

2) Install the crankshaft correctly, and mount the thrust washer in proper position.

3) Latch on the cylinder block frame, and fasten the crankshaft fixed bolts.



The fastening sequence is illustrated in the figure.



Torque:

4) Mount the bolts onto the frame periphery, and fasten them.

Torque:

5) Mount oil strainer, oil pan, front and rear oil seals of crankshaft and oil pump.

6) Mount engine accessories, lift and install the engine onto the car, mount water pipe, and insert all electrical plugs.

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MECHANISM OF 2.0NA ENGINE

CONTENT

CHAPTER 1 ENGINE PARAMETER AND SPECIAL MAINTENANCE TOOLS 2

SECTION 1 TECHNOLOGY DATA INSTRUCTION 2

SECTION 2 SPECIAL TOOLS 5

SECTION 3 ENGINE NUMBER POSITION 6

SECTION 4 COLLATING METHOD OF ENGINE TIMING 7

CHAPTER 2 ENGINE BODY 9

SECTION 1 WHEEL TRAIN 9

SECTION 2 CYLINDER HEAD 14

SECTION 3 SHORT ENGINE 26

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CHAPTER 1 ENGINE PARAMETER AND SPECIAL MAINTENANCE TOOLS

SECTION 1 TECHNOLOGY DATA INSTRUCTION

ENGINE CHARACTER

Engine Model		SQR481H
Engine Type		4-Cylinder, Water Cooled, In-line Double Overhead Camshaft, 16 Valve, Controllable Burning Rate, Variable Valve Timing
Cylinder Diameter（mm）		83.5
Piston Stroke (mm)		90
Displacement (L)		1.971
Compression Ratio		10
Rated Power（Kw）		95
Rev at Rated Power（r/min）		5500
Max. Torque（N●M）		180
Rev at Max. Torque（r/mim）		4000
Minimum Fuel Consumption Rate（g/Kw.h）		301
Cylinder Pressure（Bar）		10±0.2
Fuel Pressure（Bar）		4
Engine Oil Pressure（Bar）	Low Idle Speed（800±50r/min）	
	High Idle Speed（2000r/min）	
	High Speed（4000r/min）	
A/C Circuit Pressure（Bar）	High Pressure Circuit	2--3
	Low Pressure Circuit	12---16
Expansion Tank Cap（kpa）	Pressure Relief Valve（Release Pressure to Outside）	88±14.5
	Vacuum Valve（Lead Air into Tank）	-10~~~~-2
Thermostat Working Temperature（℃）	Start Working Temperature	87
	Full Working Temperature	104

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TECHNOLOGY DATA INSTRUCTION

Item			Standard Value
Camshaft	Cam Height	Intake cam	37.15
		Exhaust cam	37.05
	Camshaft Diameter	Intake cam	$24^{-0.040}_{-0.053}$
		Exhaust cam	$24^{-0.040}_{-0.053}$
	Axial clearance of Camshaft	Intake cam	0.15--0.20
		Exhaust cam	0.15--0.20
Cylinder Head	Plane Degree of Lower Surface		0.04
	Whole Height		140±0.41
	Surface Grind Limit* Total Grinding Quantity of Cylinder Block and Head		
Valve	Fringe Thickness on Top of Valve	Intake Valve	0.3±0.15
		Exhaust Valve	0.3±0.15
	Valve Stem Diameter	Intake Valve	5.98±0.008
		Exhaust Valve	5.96±0.008
	Seal Bandwidth	Intake Valve	
		Exhaust Valve	
	Gap Between Valve Stem And Guide	Intake Valve	0.02
		Exhaust Valve	0.04
	Tilt Angle	Intake Valve	65°
		Exhaust Valve	68°
	Height	Intake Valve	107.998
		Exhaust Valve	106.318
Valve Spring	Free Height		47.7
	Working Tension in Advance/ Working Height Kg /mm		620N/32mm
	Vertical Degree		
Valve Guide	Valve Guide Length		38±0.25
	Inside Diameter		5.4±0.1

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	Outer Diameter		$11^{+0.051}_{+0.040}$
	Pressure Height		16±0.3
	Protruding Part of Valve Stem		47.5
Piston	Piston Skirt Diameter		83.46±0.009
Piston Ring	Side Clearance	1st Ring	0.04--0.08
		2nd Ring	0.01--0.025
	End Play	1st Ring	0.2--0.4
		2nd Ring	0.4--0.6
	Height	1st Ring	$1.2^{+0.05}_{+0.03}$
		2nd Ring	$1.5^{+0.04}_{+0.02}$
		Oil Ring	$2.5^{+0.03}_{+0.01}$
Ring Groove	Height/ Depth	1st Ring	$1.2^{-0.01}_{-0.03}$
		2nd Ring	$1.5^{-0.005}_{-0.030}$
		Oil Ring	2.5
Piston Pin	Diameter		$21^{0}_{-0.005}$
	Length		60
	Diameter of Piston Pin Hole		$21^{0.008}_{0.002}$
Crankshaft	Axial Clearance		0.076--0.265
	Radical Clearance		-0.0375
	Crankshaft Mainshaft Diameter	Coaxial Degree	0.05
		Cylindricity	0.008
		Roundness	0.005
	Connecting Rod Journal Diameter	Cylindricity	
		Roundness	
Cylinder	Whole Height		218±0.05
	Cylinder Hole Roundness / Straightness Accuracy		0.008 / 0.01
	Upper Surface Planeness		0.04
Connecting Rod	Radial Clearance of Connecting Rod Bearing		0.016--0.051
	Axial Clearance of Big End		0.15--0.4

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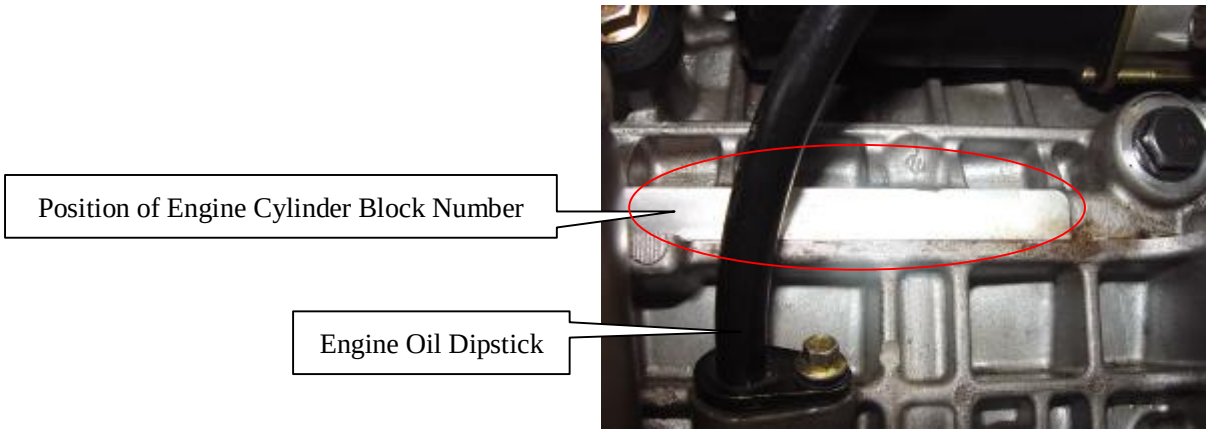
SECTION 2 SPECIAL TOOLS

	Camshaft Timing Tool
	Crankshaft Timing Tool
	Flywheel Tool
	Guide Sleeve of Crankshaft Oil Seal
	Guide Sleeve of Camshaft Oil Seal
	Hydraulic Hoist

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	Fuel Pressure Gauge
	Cylinder Pressure Gauge: when measure the cylinder pressure, firstly remove the spark plug, screw the pipe end of instrument instead of it, and operate the engine by starter, then take the maximum value in cylinder pressure gauge as cylinder pressure.

SECTION 3 ENGINE NUMBER POSITION



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SECTION 4 COLLATING METHOD OF ENGINE TIMING

1. Remove the upper cover of engine timing belt.



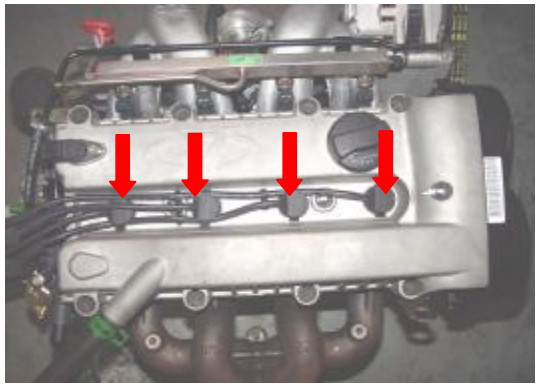
2. Remove the lower cover of engine timing belt.



3. Loosen the central bolt of timing belt tension pulley and remove the timing belt.

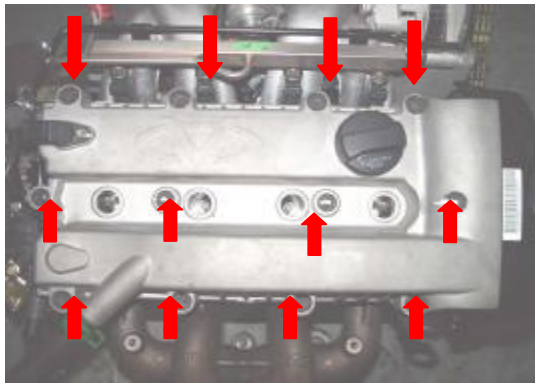


4. Draw out the high voltage ignition cable.

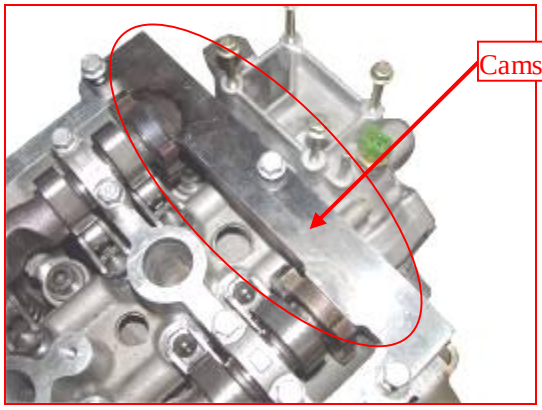


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5. Loosen the bolt of valve cover and remove the valve cover.

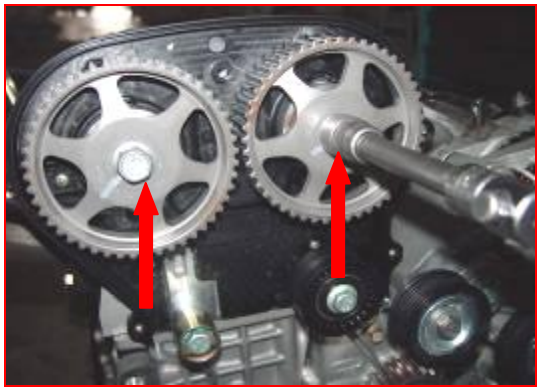


6. Rotate the camshaft in order to clip the camshaft tool into the slot at the end of camshaft.



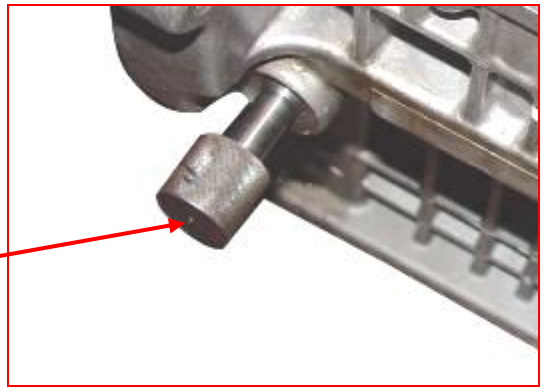
7. Loosen the bolts of air intake and exhaust camshaft tension pulleys with torque wrench.

Note: It is not to remove but loosen.



8. Revolving the crankshaft, you may rotate in the crankshaft tool so as to it cannot move in both direction.

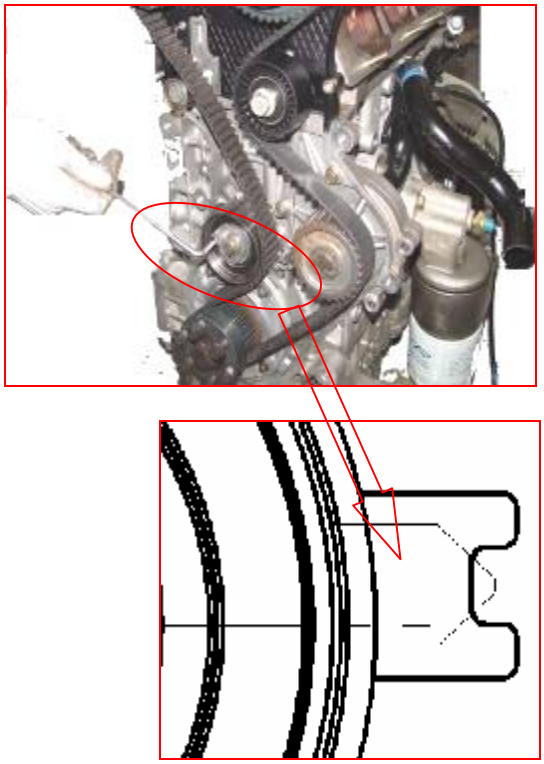
Note: Do it with patience and carefulness lest the crankshaft should be broken.



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9. Mount the timing belt and rotate tension pulley with Allen wrench in order to tension the belt and make the finger of tensioner point to the middle of U slot opening. Fasten the bolt of tension pulley, the fastening bolts of air intake and exhaust camshaft tension pulleys and camshaft.

Torque: 120±5Nm.

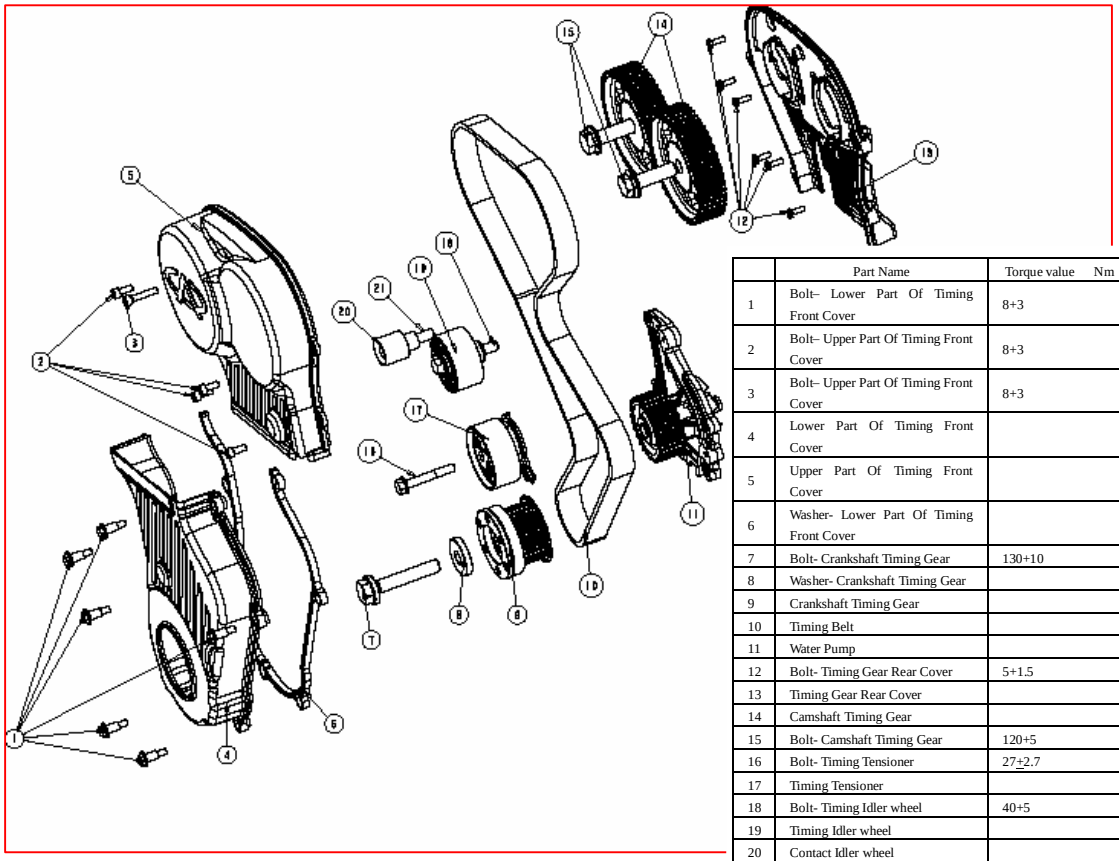


10. Remove the special timing tool, and mount the valve cover, the high voltage ignition cable and the timing belt cover.

CHAPTER 2 ENGINE BODY

SECTION 1 WHEEL TRAIN

I. STRUCTURAL DIAGRAM



	Part Name	Torque value Nm	Re-screw angle
1	Bolt– Lower Part Of Timing Front Cover	8+3	
2	Bolt– Upper Part Of Timing Front Cover	8+3	
3	Bolt– Upper Part Of Timing Front Cover	8+3	
4	Lower Part Of Timing Front Cover		
5	Upper Part Of Timing Front Cover		
6	Washer- Lower Part Of Timing Front Cover		
7	Bolt- Crankshaft Timing Gear	130+10	65+5
8	Washer- Crankshaft Timing Gear		
9	Crankshaft Timing Gear		
10	Timing Belt		
11	Water Pump		
12	Bolt- Timing Gear Rear Cover	5+1.5	
13	Timing Gear Rear Cover		
14	Camshaft Timing Gear		
15	Bolt- Camshaft Timing Gear	120+5	
16	Bolt- Timing Tensioner	27±2.7	
17	Timing Tensioner		
18	Bolt- Timing Idler wheel	40+5	
19	Timing Idler wheel		
20	Contact Idler wheel		
21	Bolt- Contact Idler wheel	40+5	

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II. MAINTENANCE

1. Replace upper and lower covers of timing belt

1.1 Needed tools and auxiliary materials

Allen wrench, 10#, 13# sleeve, ratchet wheel and ratchet rod.

1.2 Removal

1) Loosen the five bolts on the upper cover with Allen wrench.

2) Remove the upper cover of timing belt.



3) Clip the flywheel with flywheel tool.

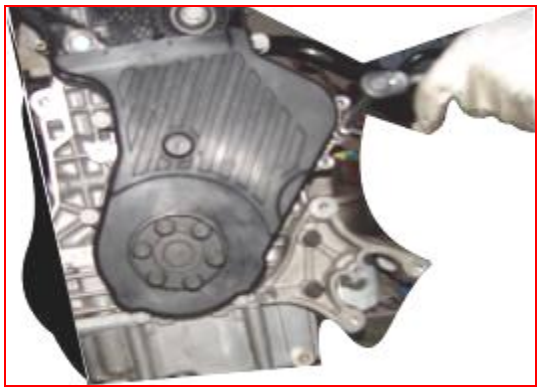


4) Remove the crankshaft pulley with 13# sleeve.



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5) Remove the 5 bolts on the lower cover of timing belt with 10# sleeve, ratchet wheel and ratchet rod.



6) Remove the lower cover.



1.3 Inspection

Observe the timing cover and the timing belt. Replace the timing belt cover or adjust the position of timing belt if any trail from crack or friction is found.

1.4 Installation

The installing steps are reverse to those for removal.

Note: Install the lower cover first and then install the upper one.

2. Replace timing belt

2.1 Needed tools and auxiliary materials

Allen wrench, 10#, 13# sleeve, ratchet wheel and ratchet rod.

2.2 Removal

1) Remove the upper and lower covers of timing belt (see “replace covers of

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timing belt" for details).

2) Loosen the central bolt of tension pulley and remove the timing belt.

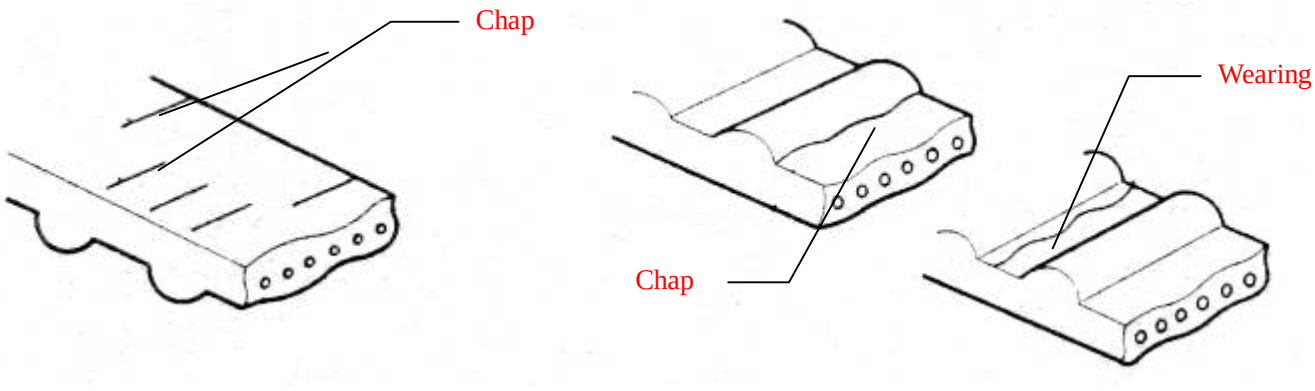
2.3 Inspection

Check the timing belt carefully; replace the parts if any following situation occurs.

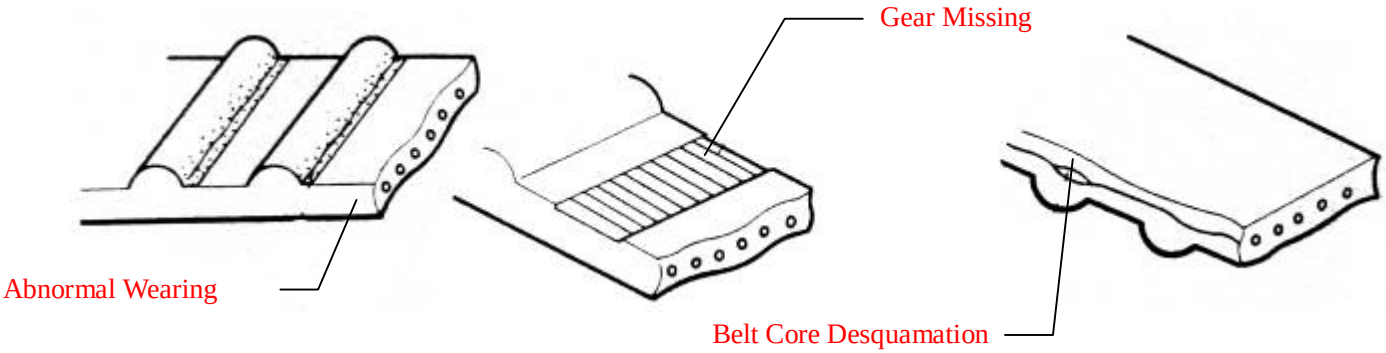
(1) Chap of back-side rubber

(2) Chap of dedendum, chap of separated cord fabric.

(3) Wearing, gear missing and incomplete gear of cord fabric.



(4) Abnormal wearing of belt flank.



Replace the belt as any following situation occurs, even though abrasion cannot be found directly.

1) The water pump leaks water out, and requires continuing infusion.

2) If the belt is spotted with much oil stains, and the rubber may be damaged due to expansion, you should replace the belt.

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2.4 Installation

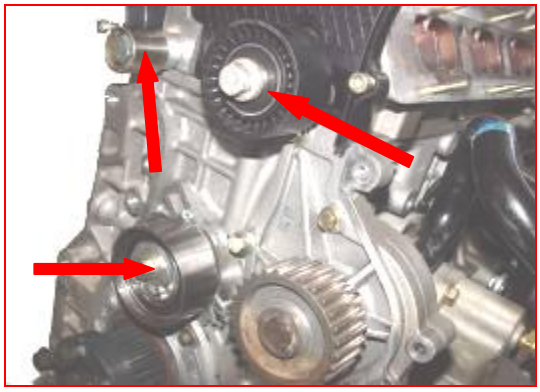
The installing steps are reverse to those for removal.

Note: Do engine timing.

3. Replace idler wheel, tensioner and contact belt pulley

3.1 Needed tools and auxiliary materials

Allen wrench, 10#, 13# and 15# sleeve, ratchet wheel and ratchet rod.



3.2 Removal

1) Remove the timing belt (see “replace timing belt” for details).

2) Remove idler wheel, tension pulley and contact belt pulley.

3.3 Inspection

1) Check from appearance

Check idler wheel, tension pulley and contact belt pulley carefully for any damages, such as sunken trace and sliding damage etc.

2) Check performance

Revolve tension pulley, idler wheel and contact belt pulley respectively to insure that they can run freely without stagnancy.

Replace it with the spare part if any above problem is found.

3.4 Installation

1) The installing steps of tension pulley, idler wheel and contact belt pulley are reverse to those for removal.

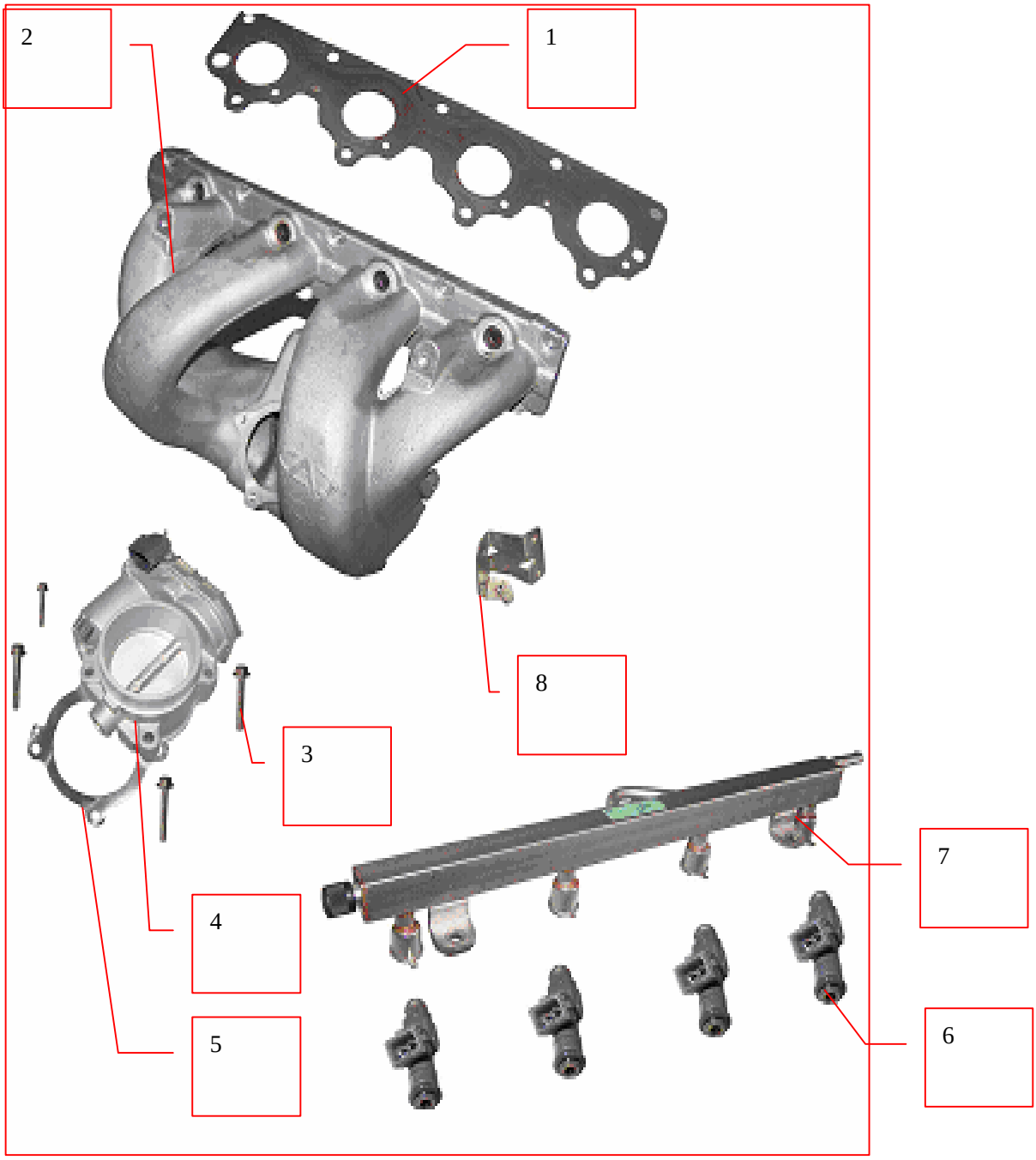
2) Mount the timing belt and collate engine timing.

3) Mount other parts.

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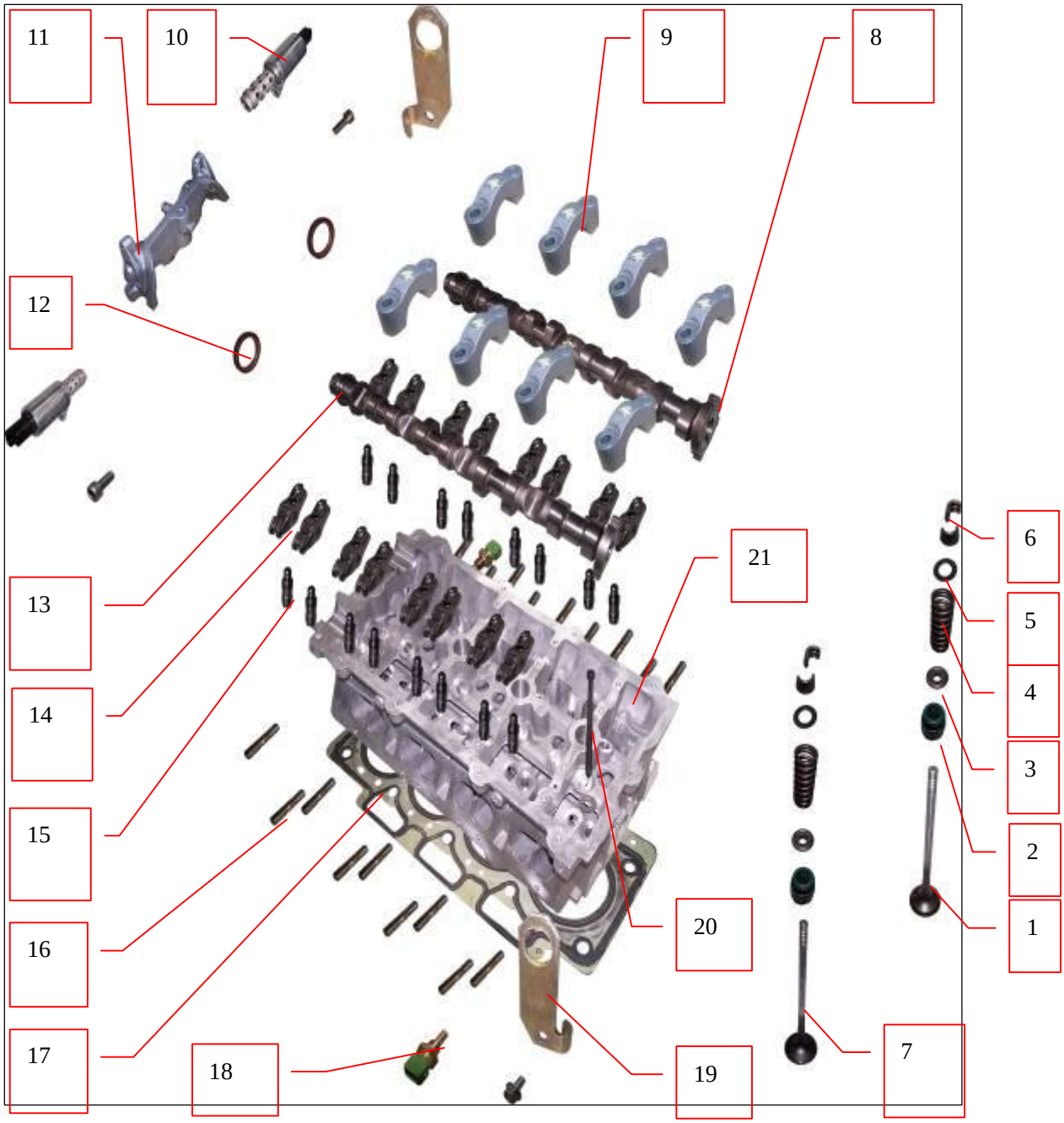
SECTION 2 CYLINDER HEAD

I. STRUCTURAL DIAGRAM



1. Gasket—Intake Manifold
2. Intake Manifold Assembly
3. Hexagonal Flange Bolt
4. Throttle Valve Body Assembly
5. Gasket—Throttle Valve Body Assembly
6. Oil injector Assembly
7. Fuel Distribution Pipe Assembly
8. Bracket

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1. Intake Valve
2. Valve Oil Seal
3. Valve Spring Seat
4. Valve Spring
5. Valve Spring Retainer
6. Keeper
7. Exhaust Valve
8. Intake Camshaft Assembly
9. Bearing Cap Assembly
10. Control Valve-Camshaft Phaser Assembly
11. First Bearing Cap Assembly
12. Front Camshaft Oil Seal
13. Exhaust Camshaft Assembly
14. Rocker Arm Assembly
15. Hydraulic Tappet Assembly
16. Stud Bolt (9 Bars)
17. Cylinder Head Gasket
18. Temperature Sensor
19. Engine Hanger
20. Cylinder Head Bolt
21. Cylinder Head Assembly

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II. MAINTENANCE

2.1 Replace intake manifold, delivery pipe and oil injector



2.1.1 Needed tools and auxiliary materials

Ratchet wheel, ratchet rod, 10# sleeve and crosshead screwdriver

2.1.2 Process of removal

1) Put the ignition key at the OFF position.

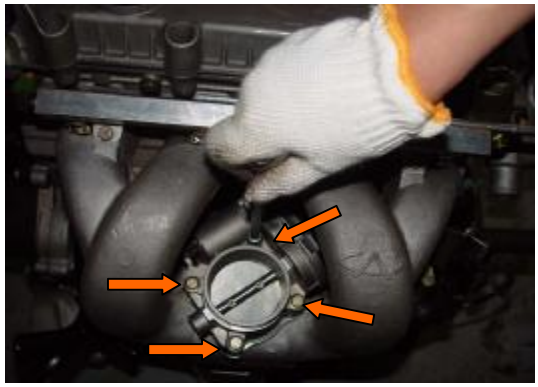
2) Loosen the plug of oil injector.

3) Remove the connecting bolt between engine oil dipstick and intake manifold.



4) Remove the clamp between intake hose and throttle valve body.

5) Remove the connecting bolt of throttle valve body, and take out throttle valve body.



Note: Because this throttle valve body is electronic, do not force the middle vanes turning manually or with other objects.

6) Loosen the joint of oil intake pipe.

7) Remove the fastening nut of intake manifold and take out the intake manifold.



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2.1.3 Installation steps

The installing steps are reverse to those for removal.

2.2 Replace camshaft, bearing bushings, valve and valve oil seal.

2.2.1 Needed tools and auxiliary materials

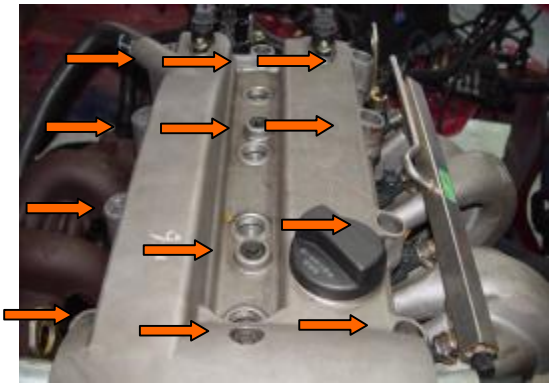
Special tools for valve oil seal, engine transmission oil, a set of sleeve tools, an adjustable spanner, special tools for timing and a set of Allen wrenches

2.2.2 Removal

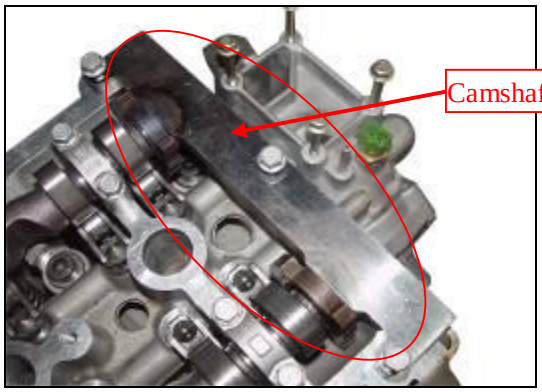
1) Remove the dynamo belt (see “removal of dynamo belt” for details).

2) Remove the timing belt (see “replacement of engine timing belt and timing calibration” for details).

3) Remove the cover of engine valve chamber.



4) Clamp the timing special tool into camshaft slot and fasten the bolt.



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5) Dismantle the belt pulley of air intake and exhaust camshafts with torque wrench.



6) Remove the back cover of timing belt.



7) Dismantle the bearing caps of air intake and exhaust camshaft respectively and put them down in the sequence.

Note: The second, third, fourth and fifth camshaft bearing caps are marked with I1, I2, I3, I4 (E1, E2, E3, E4), which stands for the corresponding bearing cap of 1, 2, 3, 4 cylinder respectively. (“I” refers to intake camshaft, “E” refers to exhaust camshaft).

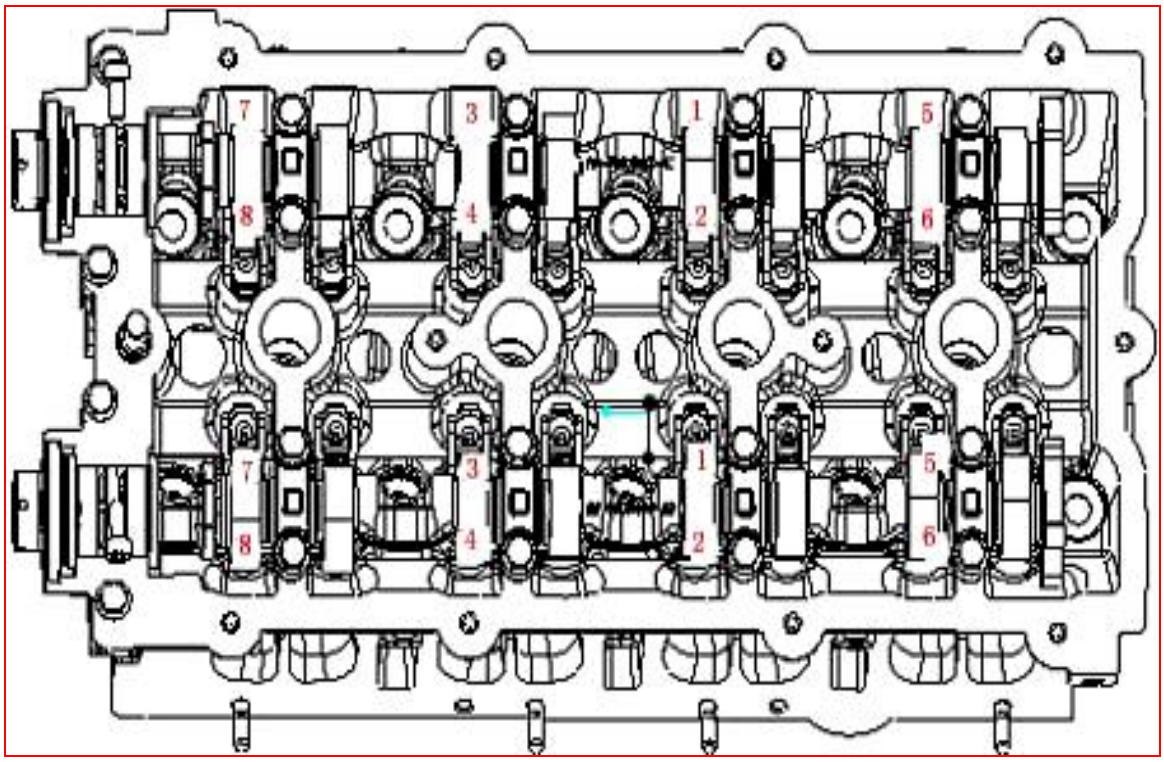
Torque:





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See the following picture for removal sequence of intake and exhaust camshaft-bearing caps:



8) Take out the camshaft and the hydraulic tappet.

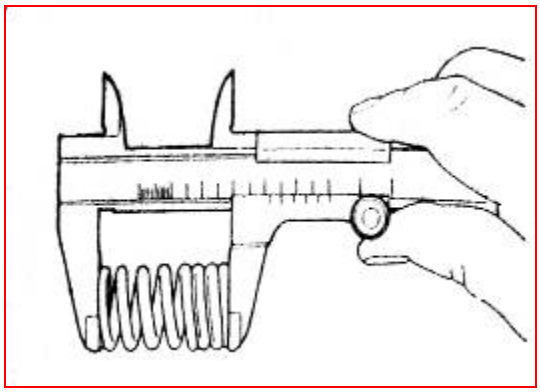
9) Remove the valve spring with special tools. (Picture is unavailable)

10) Remove the used valve oil seal with special tools. (Picture is unavailable)

2.2.3 Inspection

1) Check the valve spring.

Measure the free length, the verticality and the length under special pressure with caliper.



	Standard Value(mm)
Free length	47.7
Length of 620N	32

Replace with the new valve spring if the measured value exceeds the limit value.

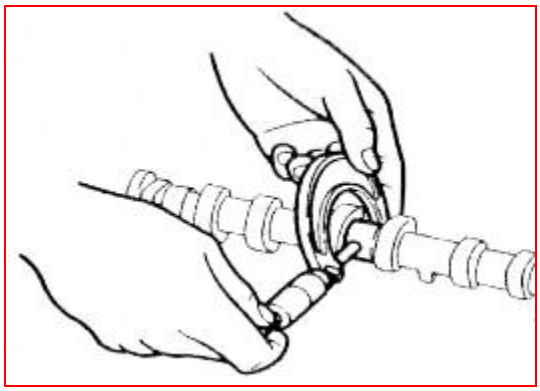
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2) Check camshaft

Measure the camshaft diameter with micrometer caliper.

	Standard Value （mm）	Limit Value (mm)
Diameter	$\phi 24_{-0.053}^{-0.040}$	

Replace with the new camshaft if the measured value exceeds the limit value.

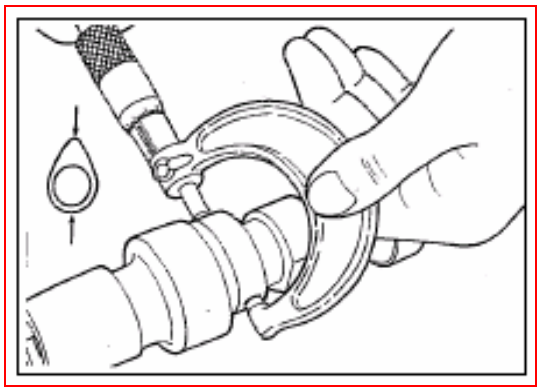


3) Examine camshaft

Measure the high of cam with micrometer caliper.

	Standard Value （mm）	limit value （mm）
Intake Cam	37.15	
Exhaust Cam	37.05	

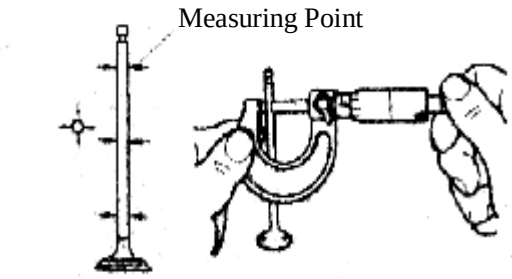
Replace with the new camshaft if the measured value exceeds the limit value.

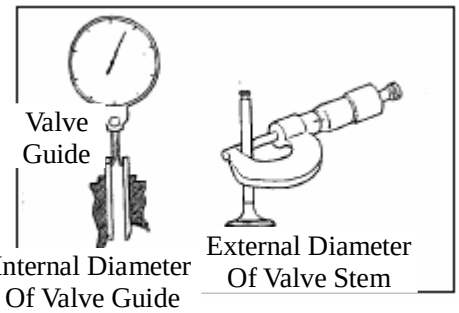


4) Examine diameter of valve stem

a: Measure the diameter of valve stem with micrometer caliper.

See the picture for measuring points: they are 26, 52, and 78 mm from measure positions to bottom of valve.



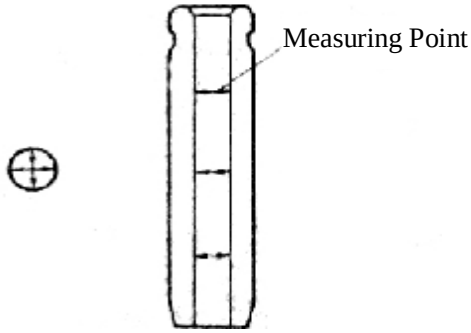


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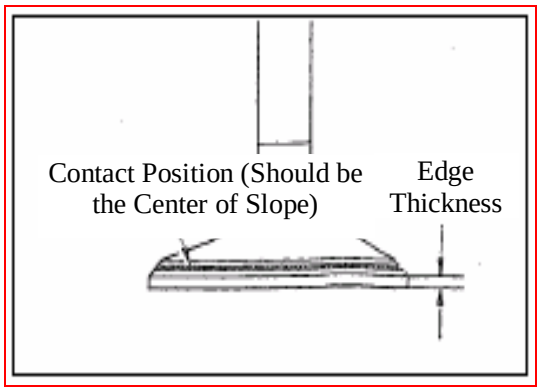
b: Use internal micrometer guage to measure the internal diameter of valve guide and the measuring point is a quartering point of guide.

c: Calculate the difference of measured value and the clearance.

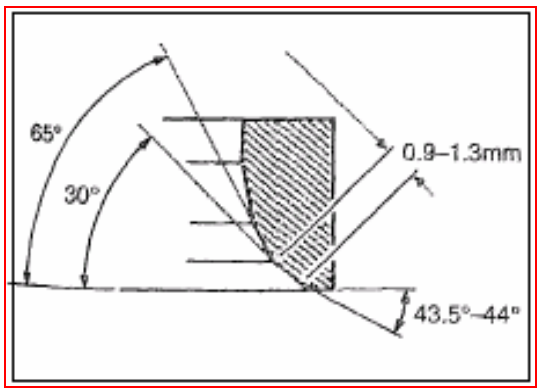
Replace the valve or the guide if the value exceeds the limit value.



d: Examine the contact bandwidth of valve.



e: Check the valve seat insert.

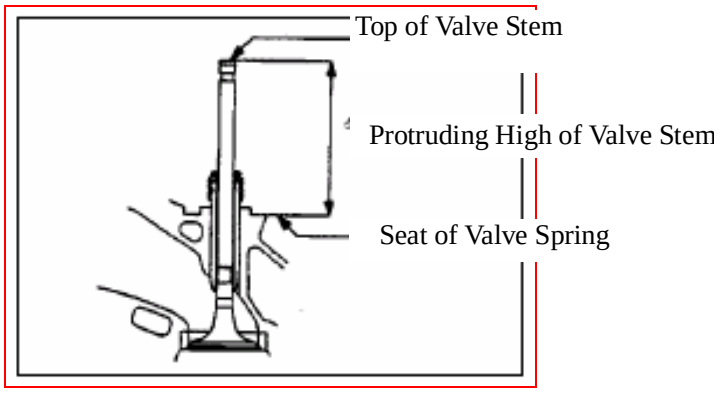


		Standard Value
Outer Diameter of Valve stem (mm)	IN	¢5.98±0.008
	EX	¢5.96±0.008
Inner Diameter of Valve guide (mm)	IN	¢5.4±0.1
	EX	¢5.4±0.1
Clearance (mm)	IN	0.02
	EX	0.04
Thickness of Valve Top （mm）	IN	0.3±0.15
	EX	0.3±0.15
Seal Bandwidth （mm）	IN	1.158
	EX	1.306

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f: Examine the protruding capacity of valve stem.

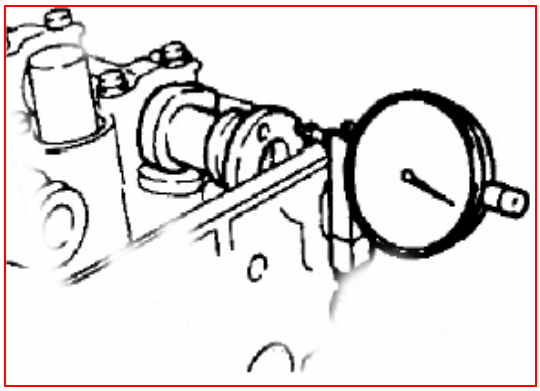
And Examine the protruding high of valve stem with vernier caliper.（See picture）



	Standard Value（mm）
Protruding Capacity Of Intake Valve stem	47.5
Protruding Capacity Of Exhaust Valve stem	47.5

5) Examine the axial clearance of camshaft.

Replace the camshaft if the value of axial clearance exceeds the normal value.

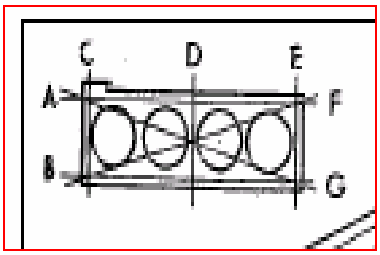


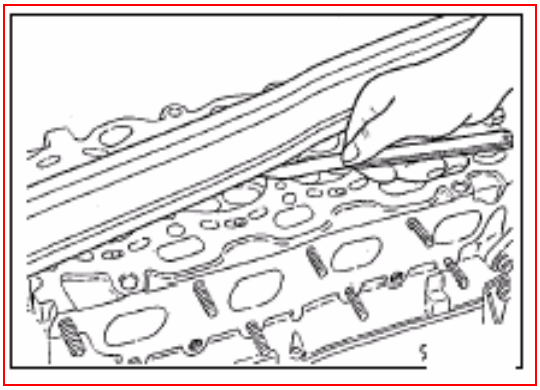
	Standard Value
Intake camshaft	0.015—0.02
Exhaust camshaft	0.015—0.02

6) Examine the planeness of cylinder

a: Clear the lower surface of cylinder head.

b: With the help of ruler and feeler gauge, check whether the lower surface of cylinder head is warped.(Measure it in the sequence of A, C, D, E, F, G in the picture)





	Standard Value
Cylinder head planeness	0.04

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C: Revise it if the planeness exceeds, and replace when it exceeds the limit value.

The permitted maximum abrading thickness between cylinder block and cylinder head is:

2.2.3 Installation

The installing steps are reverse to those for removal.

Note:

1) Dismantle valve springs into groups. The 1st and 4th cylinders are in one group and the 2nd and 3rd ones are in the other group. Then put the piston to the upper point of 1st and 4th cylinders in order to dismantle the valve spring of 1st and 4th cylinders, replace their valve oil seal and mount the spring immediately. And put the piston to the upper point of 2nd and 3rd cylinders in order to replace the other valve oil seal. Those steps prevent from that the valve falls into cylinder and the unanticipated trouble occurs.

2) Wipe the engine transmission oil on the opening of oil seal when mounting the valve oil seal.

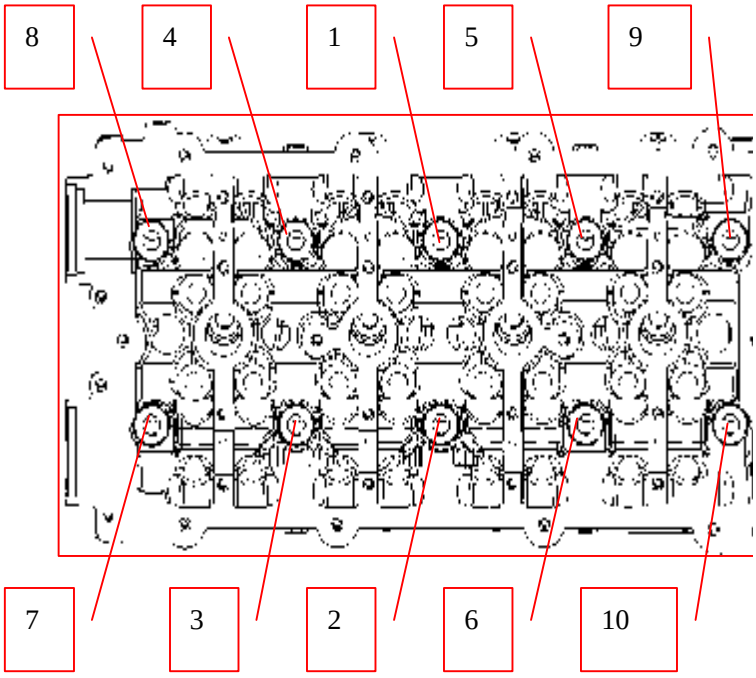
3) Fasten the cylinder bolt as the following process.

A: Smear some oil on the top and root of bolt.

B: Fasten to 40±5NM in sequence.

C: Fasten 90±5 degree clockwise.

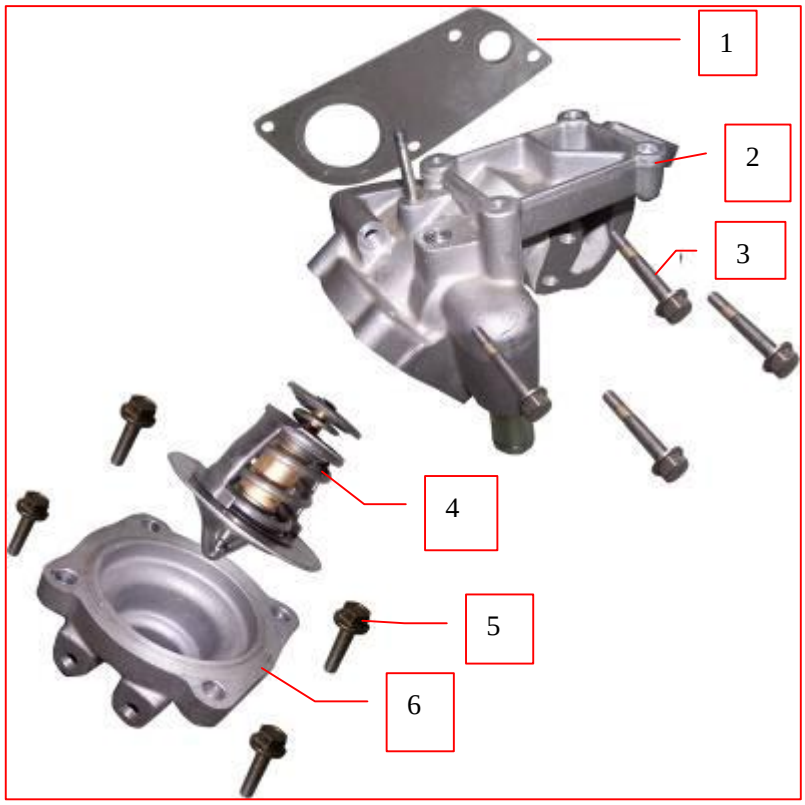
D: Fasten 90±5 degree clockwise.



2.3 Replace thermostat

2.3.1 Structural diagram

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1. Pad—Thermostat Seat
2. Thermostat Seat
3. Hexagonal Flange Bolt
4. Thermostat Assembly
5. Hexagonal Flange Bolt
6. Cover—Thermostat Seat

2.3.2 Needed tools and auxiliary materials

Hatch clamp,10# sleeve, ratchet wheel and wrench

2.3.3 Removal

1) Loosen the clamp of thermostat water exhaust pipe with hatch clamp to release the coolant.

Note: Do it after the temperature decreased to prevent scald.

2) Remove the 4 bolts of thermostat cover with 10# sleeve wrench.

3) Take out the thermostat.

2.3.4 Inspection

Put the thermostat in the boiling water and use it with thermometer. Then observe the temperatures when the thermostat is turning on and fully opened.

	Temperature value
Regular unlocking temperature	87℃
fully opened temperature	104℃

Replace the new thermostat if the measured value is abnormal.

2.3.5 Installation

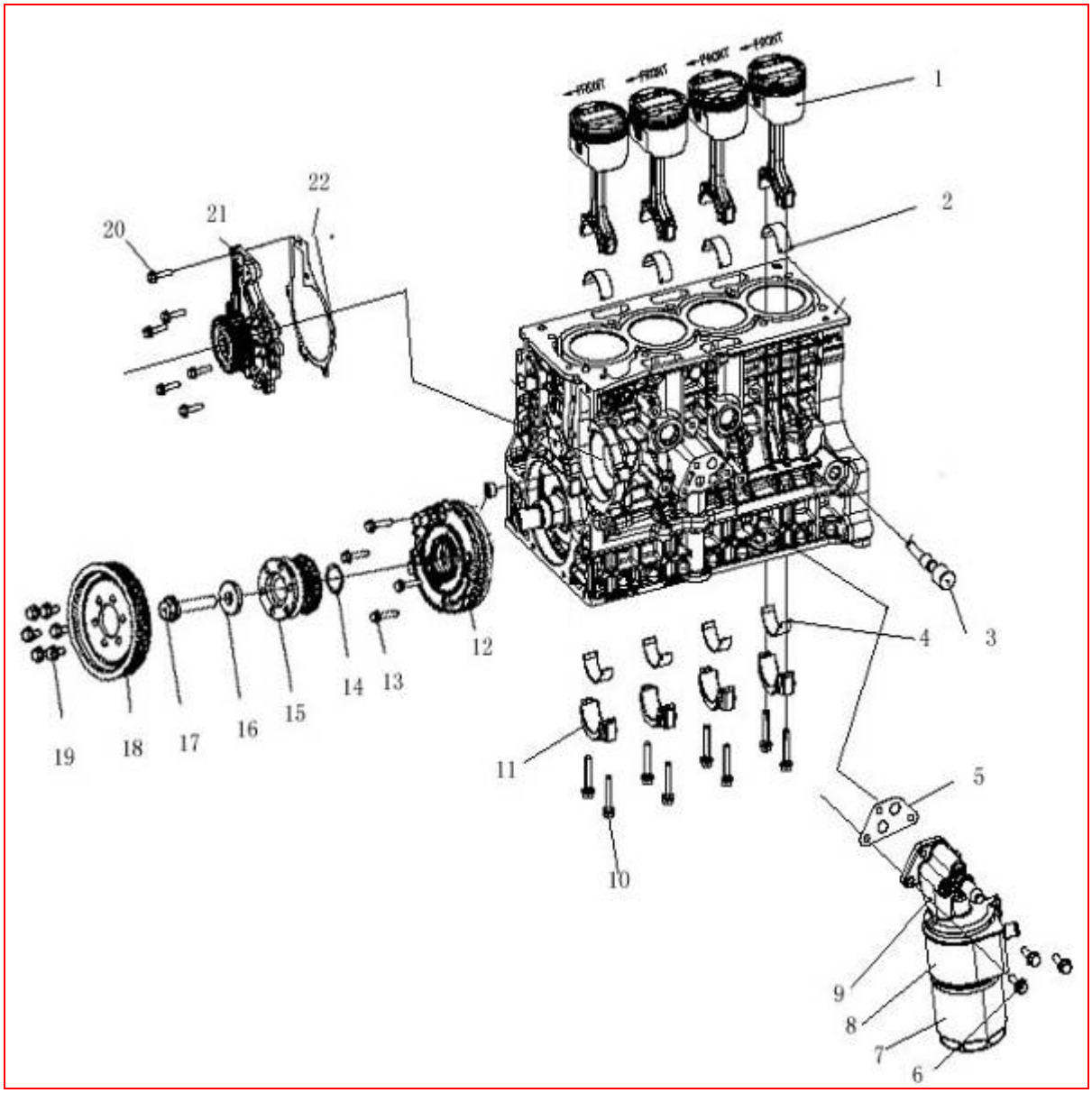
The installing steps are reverse to those for removal.

Note: Fill in the engine coolant with fixed quantity after installation.

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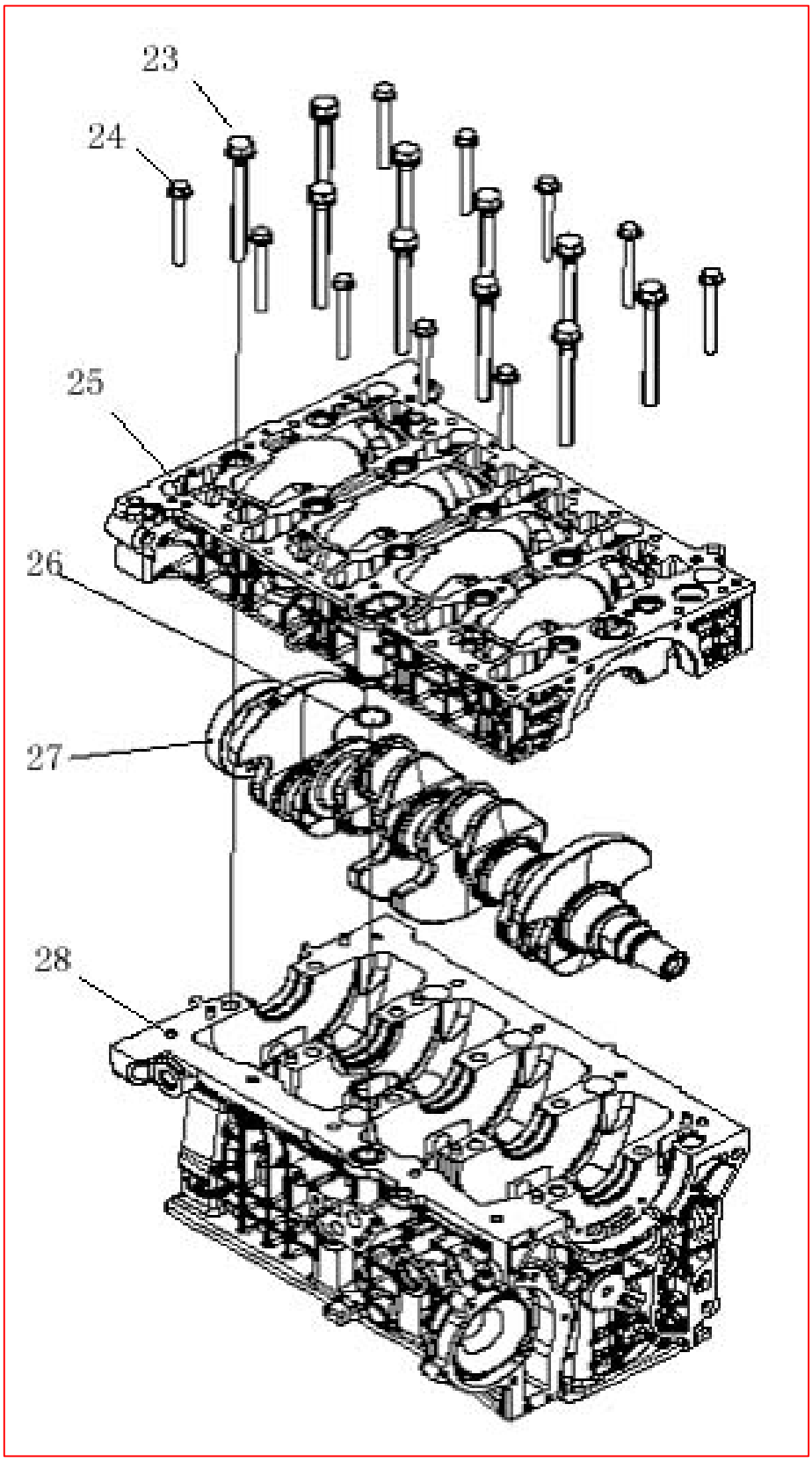
SECTION III SHORT ENGINE

I. STRUCTURE DIAGRAM



1. Piston
2. Connecting Rod Upper Bearing
3. Timing Hole Plug
4. Connecting Rod Lower Bearing
5. Pad
6. Bolt
7. Oil Filter
8. Oil Cooler
9. Oil Filter Seat
10. Connecting Rod Bolt
11. Connecting Rod Bearing Cap
12. Oil Pump
13. Bolt
14. Gasket
15. Crankshaft Timing belt pulley
16. Gasket
17. Bolt
18. Crankshaft Pulley
19. Bolt
20. Bolt
21. Coolant pump
22. Coolant Pump Gasket

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23. Crankshaft Main Bearing Bolt
24. Frame Bolt
25. Frame
26. O-Type Ring
27. Crankshaft
28. Cylinder Block

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II. MAINTENANCE

1. Replace oil pan

1.1 Needed tools and auxiliary materials

10# open end wrench, 10#, 15# and 17# sleeve, ratchet wheel and ratchet rod, Le Tai 5901 Glue, engine oil

1.2 Process of Replacement

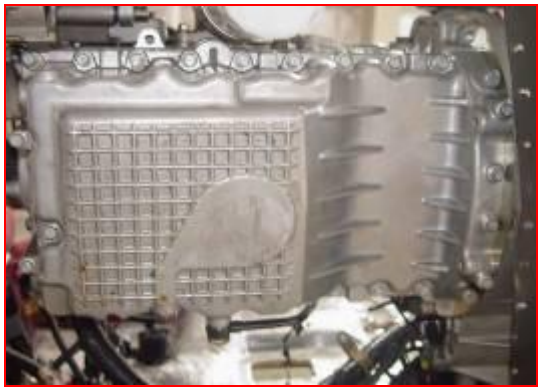
1.2.1 Process of removal

1) Loosen the oil discharge bolt of oil pan to discharge the engine oil.

Note: Engine oil should be stored in special container. And Pay attention to environment protection.



2) Remove the fastening bolt of oil pan with 10# open end wrench and 10# sleeve.（18 bars of M7×25, 3 bars of M7×40,4 bars of M7×95）

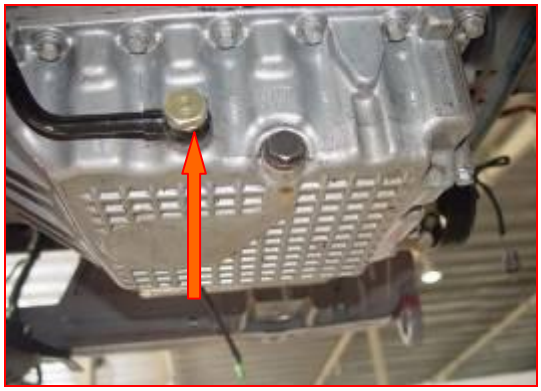


3) Remove the connecting bolt (2 bars, black) between oil pan and transmission housing with 17# sleeve wrench.



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4) Remove the connecting bolt between the oil return pipe of PVC valve and the oil pan with 15# sleeve wrench.



5) Tap the edge of oil pan with rubber pestle, and then remove the oil pan.

Note: Pay attention to safety because the oil pan might fall down when being tapped.

6) Clean the engine frame with right-angled tool to get rid of old Le Tai glue.

Note: Do not lacerate the frame surface.

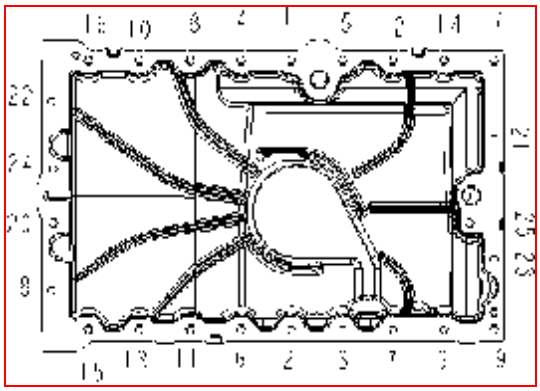


1.2.2 Installation

1) Spread Le Tai 5910 glue on the connection surfaces of frame and oil pan, close the oil pan and fasten the fastening bolt of oil pan.

Note: Spread glue to the inner of hole for installing bolt on the oil pan!

2) Screw the bolt. Screw to combine enough at first then to get specified Torque.



See the diagram for screwing sequence.

Torque: 15±3NM

3) Infuse engine oil to specified capacity.

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2 Replace the engine oil strainer

2.1 Needed tools and auxiliary materials

10# open end wrench, 10#, 15#, 17# sleeve, ratchet wheel and ratchet rod, Le Tai 5901 Glue, engine oil

2.2 Process of replacement

2.2.1 Process of removal

1) Remove the oil pan.（See “replace oil pan” for details）

2) Remove the connecting bolt between engine oil strainer and frame with 10# sleeve wrench.（total 8 bars）



3) Draw out the engine oil strainer carefully.

2.2.2 Installation

1) Spin the nozzle of engine oil strainer into the frame carefully.

2) Mount the 8 bolts for the strainer and fasten them.

Note: the bolts should be mounted with Le Tai 243 glue.

Torque: 8±3Nm

3) Install oil pan (See “installation of oil pan” for details).

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3 Replace the piston, piston ring, piston pin and connecting rod bearing

3.1 Needed tools and auxiliary materials

10# open end wrench, 10#, 15#, 17# sleeve, ratchet wheel and ratchet rod, Le Tai 5901 Glue, engine oil, torque wrench Special tools for installing piston, feeler gauge, clearance gauge, micrometer caliper

3.2 Process of replacement

3.2.1 Process of removal

1) Dismantle the timing belt (see "dismantle the timing belt" in the section of "replacement of engine timing belt" for details).

2) Remove the oil pan（see REPLACE OIL PAN for details.

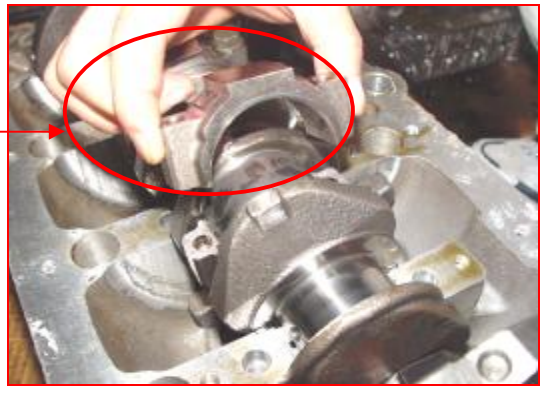
3) Remove the cylinder head. (see "removal of cylinder head" for details).

4) Dismantle the engine oil strainer (see the "replacement of engine oil strainer" for details).

5) Loosen the big bolt on connecting rod.



6) Remove the connecting rod bearing lower cover.



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7) Uplift the connecting rod and the piston with a wooden stem and then remove the connecting rod and piston assembly.



8) Remove the piston ring.

9) Remove the retainer ring of piston pin and draw out the piston pin.

Note: With large tension, the retainer ring may hurt people in the process of removal.

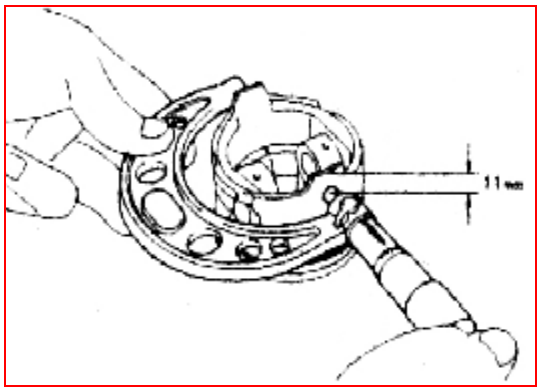


3.2.2 Inspection

I. Check piston

1) Examine the diameter of piston.

Measure the diameter along the vertical direction to piston pin and at the place 11mm under piston skirt with micrometer caliper.



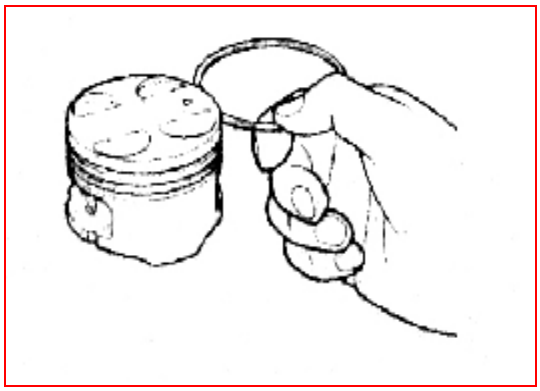
Cylinder No.	Standard Size
1	83.46±0.009
2	83.46±0.009
3	83.46±0.009
4	83.46±0.009

Replace with the new one if the part cannot be worn and torn any longer.

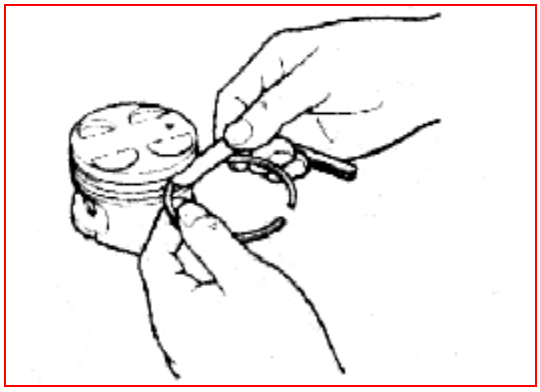
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2) Examine the clearance between piston ring and ring groove.

a. Clean up the accumulated carbon in the ring groove with piston ring.



b. Examine the clearance between piston ring and ring groove with feeler gauge.

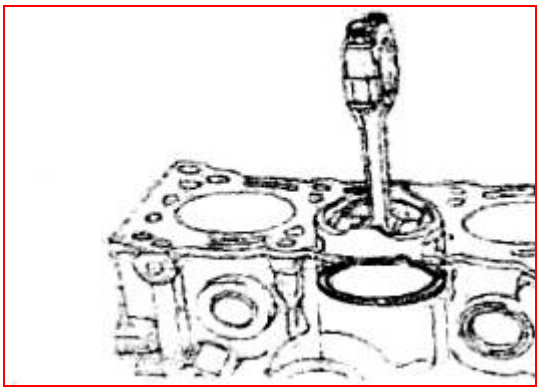


	Reference Value（mm）
1st Ring	0.04--0.08
2nd Ring	0.01--0.025

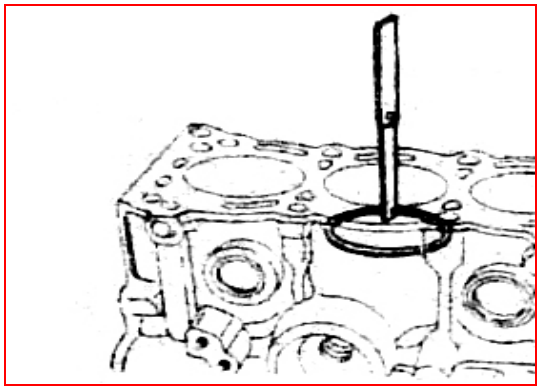
Replace with the new one if the examined clearance cannot be worn and torn any longer.

3) Inspect the end clearance of piston ring.

a. Put the piston ring at the position 45mm below the top surface of cylinder aperture and push the piston ring into cylinder with piston.



b. Measure the opening with feeler gauge.

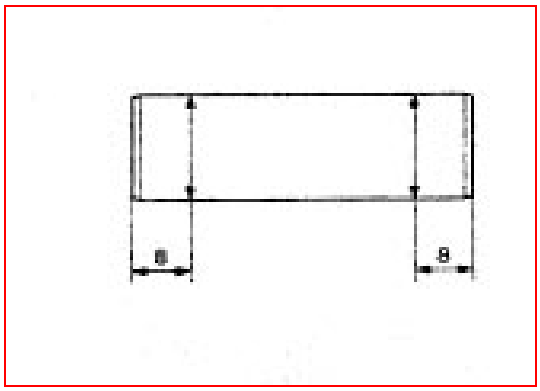


Replace with the new piston if the examined clearance exceeds the limit.

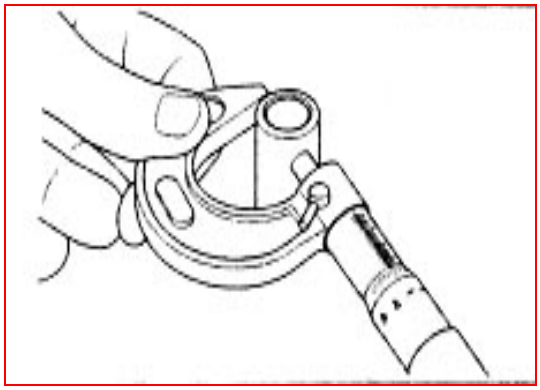
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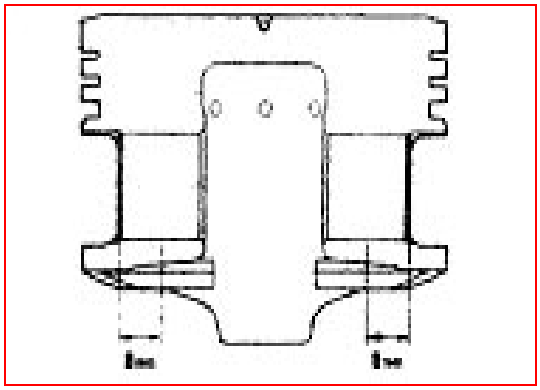
4) Inspect the diameter of piston pin and piston pin hole.

a. As the following picture, measure the piston pin position around with micrometer caliper. And take the maximum value as the diameter of piston pin.

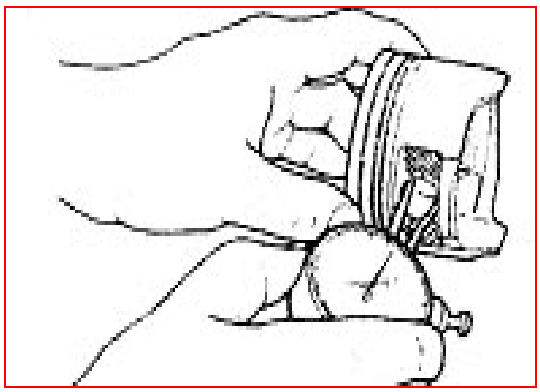


b. Measure the diameter of piston pin hole around with micrometer guage for inside diameter, as the following picture, and take the minimum value as the diameter of pin hole.





	Standard Size
Diameter of piston pin	$21^{0}_{-0.005}$
Diameter of piston pin hole	$21^{0.008}_{0.002}$



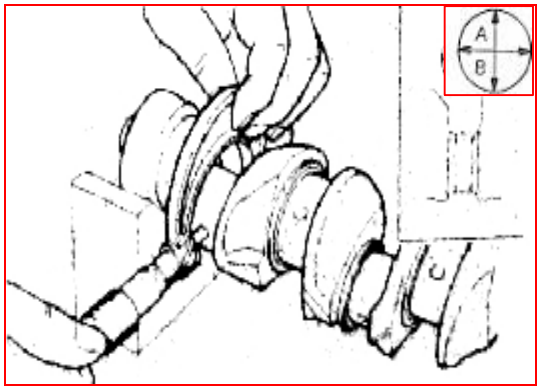
Replace with the new piston and pin if the examined clearance exceeds the limit.

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5) Inspect the connecting rod journal and connecting rod bearing

a. Examine the diameter of connecting rod journal.

Measure the axle diameter of connecting rod with micrometer caliper.

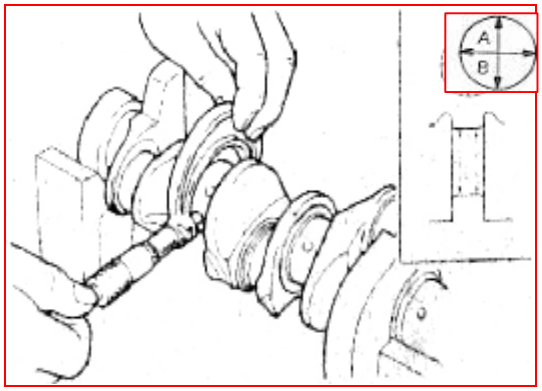


Rotate the crankshaft 90° and measure it again.

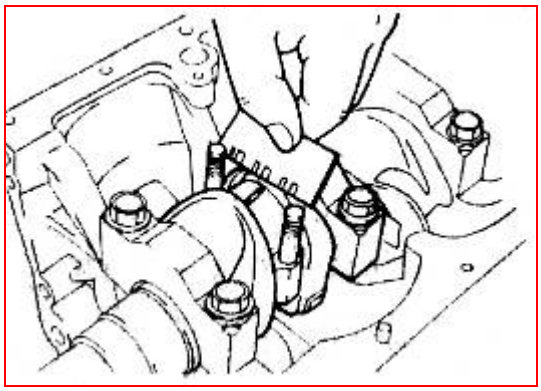
Work out the Roundness and cylindricity through twice measuring.

① Roundness=Max. diameter — Min. diameter /2 as the picture, take the vertical diameters on the same plane, subtract the half of Minimum from the Maximum to get roundness.

② cylindricity= Maximum bore — Minimum bore/2 As the picture, measure the bores of 3 planes along both A direction and B direction respectively. Get the maximum and the minimum from 6 values, and then subtract the half of Minimum from the Maximum to get cylindricity;



	Standard Value
Diameter	$47.9^{0}_{-0.016}$
Roundness	——
Cylindricity	——



b. Inspect the radial clearance of connecting rod bearing

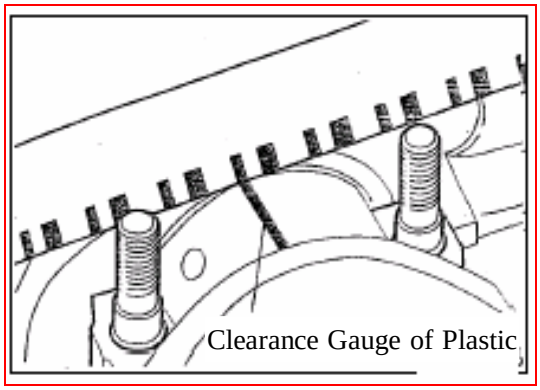
Inspect the radial clearance of connecting rod bearing with clearance gauge. Clean up the connecting rod journal and connecting rod bearing. And put clearance gauge on the journal, fasten bearing bushing and fasten the bolt according to set torque.

Note: Do not rotate the crankshaft during the process.

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Loosen the connecting rod bolt, remove the cap, and measure the maximum width of pressed clearance gauge with the ruler on its package to get the clearance value.

	Standard Value	Abrasion Limit
Clearance	0.016—0.051	


Clearance Gauge of Plastic

Replace with the new connecting rod bearing if the examined clearance exceeds the limit.

Note: Use the same brand consistent with assorting sign when you replace the bearing bushing.

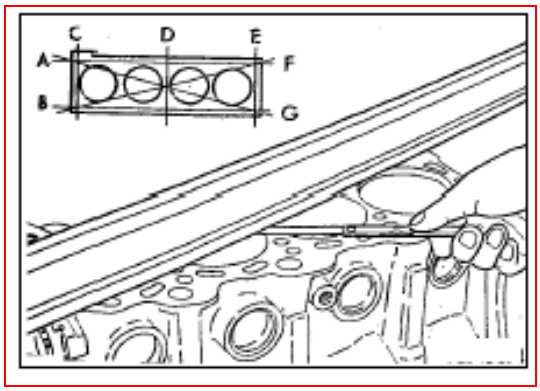
Selection of connecting rod bearing:

You may select the connecting rod bearing by observing the sign on the first balance weight at the front end of crankshaft.（see picture, unavailable）

6) Inspect the planeness of cylinder block surface.

a: Clean the upper surface of cylinder block.

b: Check with ruler and feeler gauge whether the surface of cylinder block is warped. (Measure it in the sequence of A, C, D, E, F, G in the picture)



	Standard Value	limit value
warping amount	0.04	

C: Revise it if the warping amount is excessive.

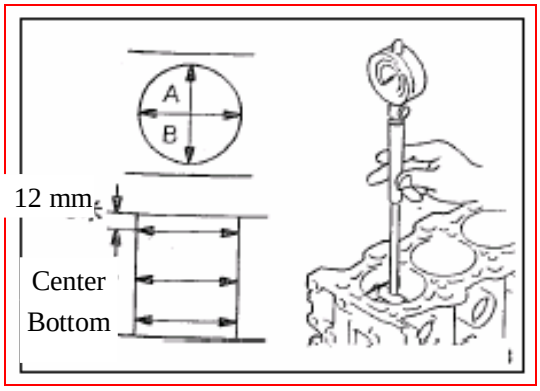
Replace with the new cylinder if it exceeds the limit. The maximum for the sum of permitted abrading thickness of cylinder block and cylinder head is:

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7) Inspect cylinder

a: Inspect if the cylinder wall is scratched or scored. If there are cylinder scoring and scratching you need to hone cylinder wall, replace cylinder liner or replace cylinder block.

b: Examine the inner diameter and cylindricity of cylinder with cylinder gauge.



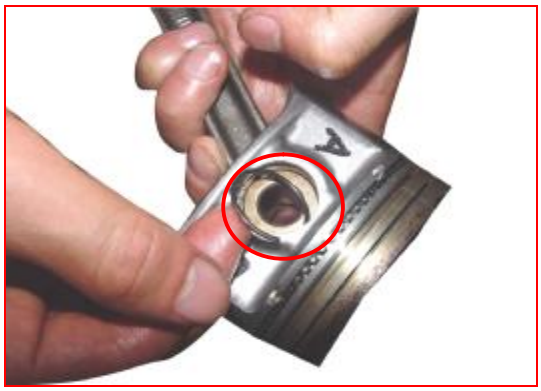
	Standard value
Inner diameter	83.5
cylindricity	0.008

cylindricity= Maximum bore — Minimum bore/2

As the picture, measure the bores of 3 planes along both A direction and B direction respectively. Get the maximum and the minimum from 6 values, and then subtract the half of Minimum from the Maximum to get cylindricity;

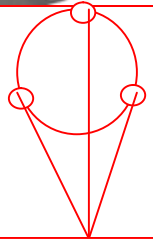
3.2.3 Installation

1) Spread oil on the piston pin and in the piston pin hole, connect the piston and connecting rod with piston pin, and mount the piston pin circlip.



2) Mount the piston ring. Mount the rings on the piston in the sequence of oil ring expander, upper and lower segments, 2nd air ring and 1st air ring; Pay attention to the direction of piston ring, the side with "TOP" should be upward. The two segments and expander are staggered. The angle of expander connector points to the top of piston, and the 1st ring and 2nd ring form 120° with the upper expander.





The Openings Of Rings Form 120°With Each Other

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3) Mount the upper bearing of connecting rod and the connecting rod together.

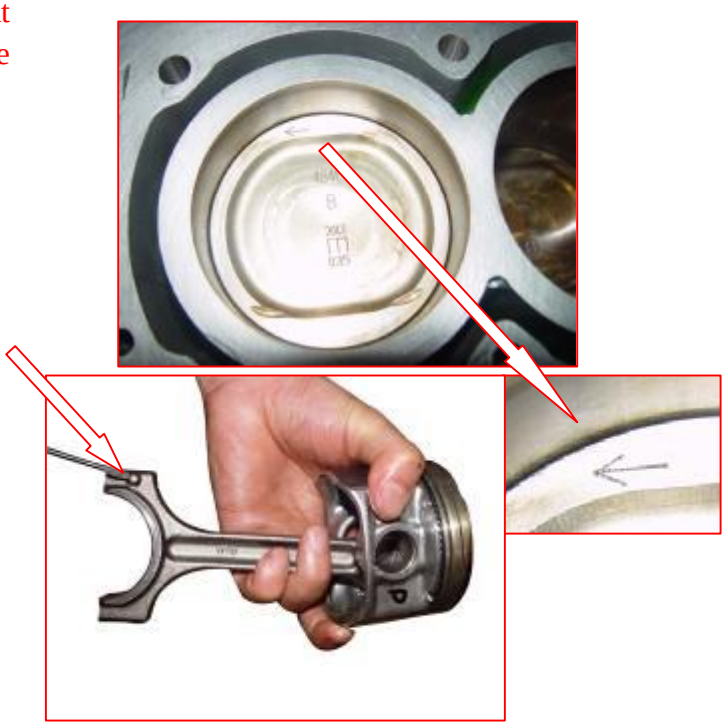
Note: the gap on bushing should be orderly with that of connecting rod.



4) Spread the engine transmission oil in the engine cylinder, clasp the piston ring with special tool, tap the piston head with wooden handle and encase the piston connecting rod assembly.



Note: the end of connecting rod with a point should face the cylinder and consists with the arrowhead on the top side of piston.



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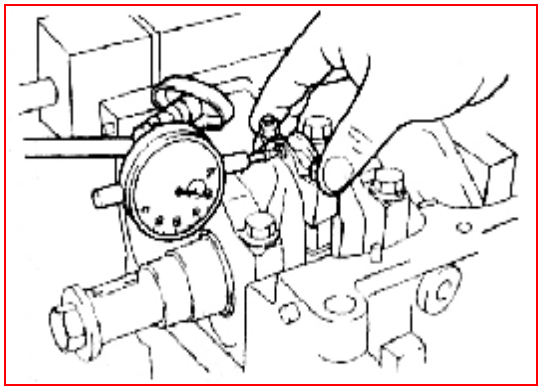
5) Mount the lower bearing of connecting rod and the connecting rod cap together. Then spread engine transmission oil.

Note: the gap on bushing should be orderly with that of connecting rod.



6) Close the connecting rod cap and screw down the bolt.

Torque: 25±3N•m, then screw 90°±5°



7) Examine the axial clearance of connecting rod.

Examine the axial clearance with micrometer guage or feeler gauge.

	Standard Value（mm）
Clearance	0.15—0.50

8) Mount the engine oil strainer.

9) Mount the oil pan.

10) Mount the cylinder head.

11) Mount the timing belt during timing adjusting.

4.Replace front oil seal of crankshaft

4.1 Needed tools and auxiliary materials

Ratchet wheel and ratchet rod, 13#, 15#, 17#, 22# sleeve, 13# open end wrench, allen wrench, engine transmission oil and guide sleeve of crankshaft oil seal



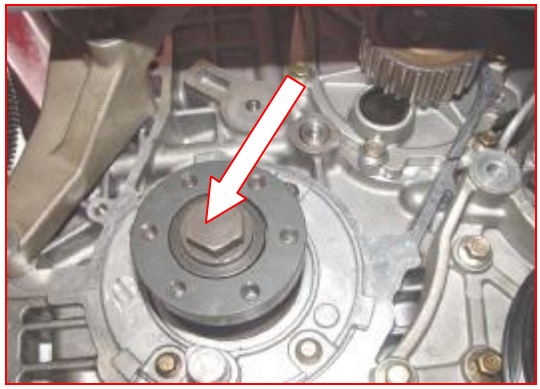
4.2 Process of Replacement

4.2.1 Process of Removal

1) Dismantle the timing belt (See “replacing the timing belt” for details).

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2) Engage the gear to 5th, then press the brake with toes, Dismantle the connecting bolt of timing belt pulley and crankshaft with torque wrench. Remove the timing belt.



Torque:130±10,then screw 65°±5°

3) Pry out the old oil seal with right-angled screwdriver carefully.

Note: Be careful in dismantling the oil seal not to damage the oil seal seat ring.

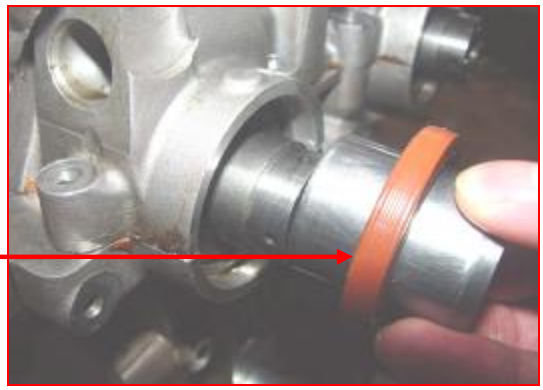
4.2.2 Installation

1) Clean the oil seal seat ring and spread transmission oil on the seat ring

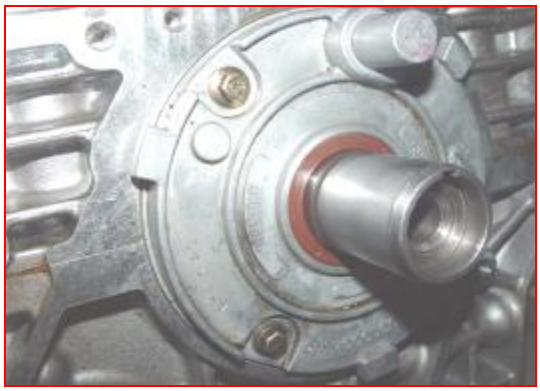


2) Spread transmission oil at the seal lip.

3) Enclose the guide sleeve of crankshaft oil seal, special tool, with that oil seal.



4) Press the oil seal into oil seal seat ring and knock it to right position with hammer.



5. Replacement of oil pump

5.1 Needed tools and auxiliary materials

A set of big sleeves, a set of small sleeves and a set of open end wrench

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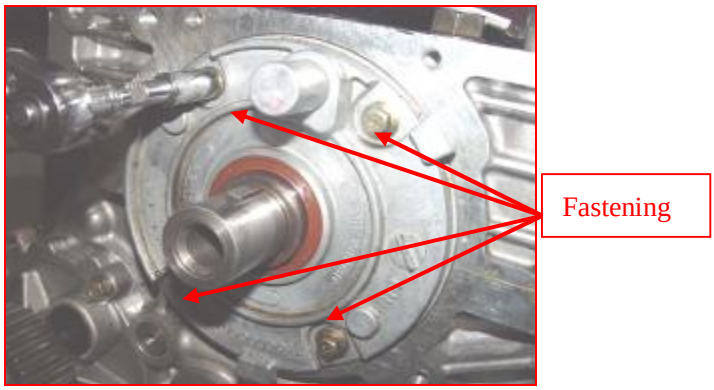
5.2 Process of Replacement

5.2.1 Process of Removal

1) Dismantle the timing belt (See “removal of timing belt” for details).

2) Engage the gear to 5th, then press the brake with toes, and remove the timing belt pulley.

3) Dismantle the fastening bolt of oil pump with 10# sleeve and take out the oil pump. Torque:8+3NM



4) Pry out the oil seal.

5) Clean the seat ring of oil pump.

5.2.2 Installation

1) Spread oil on the gasket of oil pump.

2) Mount the oil pump in its seat ring.

Note: The bulge of oil pump should be put downwards because the wrong position can not make the bolt be screwed in.

3) Mount the oil seal.

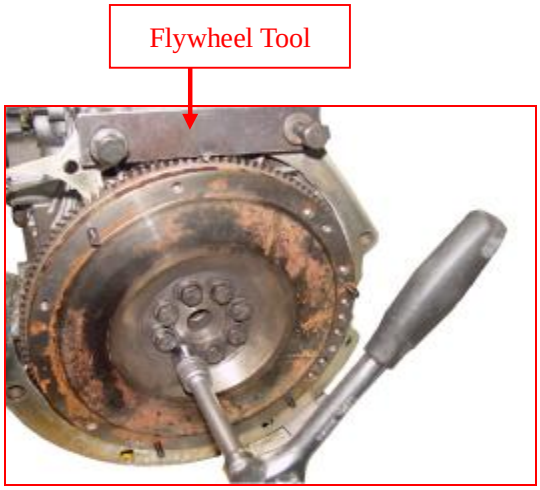
4) Mount the other parts.

6. Replacement of crankshaft rear oil seal

6.1 Needed tools and auxiliary materials

A set of big sleeves, a right-angled screwdriver, a small hoist and engine oil

6.2 Process of Removal



1) Suspend the engine assembly from vehicle (See “suspending of engine assembly” for details）.

2) Remove the clutch pressure plate.

3) For removing the flywheel, lock the flywheel with special tool and then screw off the fastening bolt with sleeve wrench.

4) Pry the old oil seal with the right-angled screwdriver.

Note: Do not damage the oil seal seat ring.

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6.2 Installation

1) Clean the oil seal seat ring. Clean the oil seal seat ring with clean oiled gauze.



2) Spread the oil at the lip of crankshaft front oil seal.

Enclose the guide sleeve of crankshaft oil seal, special tool, with that oil seal. Then press it into oil seal seat ring.



3) Mount the flywheel and the clutch pressure plate, and then mount the engine on the vehicle.

Torque:25±5N.M, then screw 30°±5°.

7. Replace crankshaft and thrust washer

7.1 Needed tools and auxiliary materials

A set of open end wrenches, a set of sleeve tools, a small hoist, Le Tai glue, Engine oil, feeler gauge, feeler gauge, micrometer gauge.

7.2 Process of Removal

1) Suspend the engine assembly from vehicle (See “suspending of engine assembly” for details）.

2) Drain out the engine oil.

3) Remove the timing belt (see “replace timing belt” for details).

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4) Dismantle the accessories, such as dynamo, A/C compressor, power steering pump and bracket.（See the “replacement of engine accessory” for details）

5) Dismantle the engine cylinder head assembly.（See the “replacement of cylinder head” for details）

6) Dismantle the engine clutch pressure plate, the flywheel and the timing belt pulley.

7) Remove the oil pan and engine oil strainer.（See the “replacement of oil pan and strainer” for details.）

8) Remove the piston connecting rod assemblies for 4 cylinders and Put them in order.

Note: You’d better stick the number on each piston connecting rod assembly to prevent from wrong mounting.

9) Dismantle engine oil pump assembly.

10) Dismantle the frame assembly under cylinder block and remove the crankshaft and thrust washer.

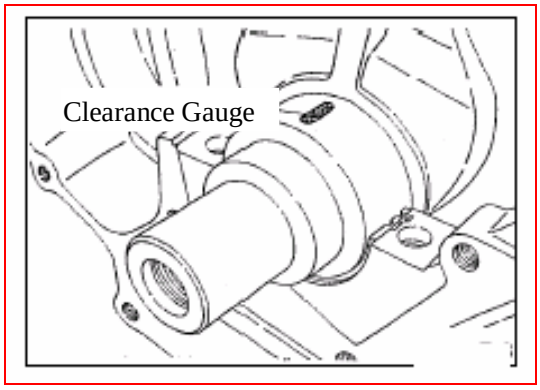
7.3 Inspection

1) radial clearance of crankshaft

a): Clean the journal and bearing bushing.

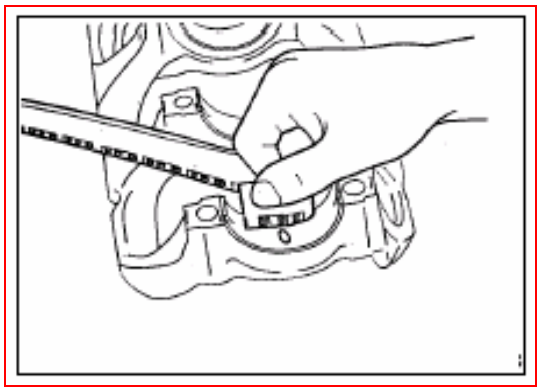
b): Install crankshaft

c): Make the length of plastic clearance gauge equal to the width of bearing. Then put it on the journal paralleling the axis.



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d): Mount the main bearing cap carefully and screw down the bolt with specified torque.



e): Dismantle the main bearing cap carefully.

f): Measure the width at the most bread part of pressed plastic line with ruler on plastic clearance gauge package, then get clearance value.

	Standard Value
Clearance	-0.0035-0.034

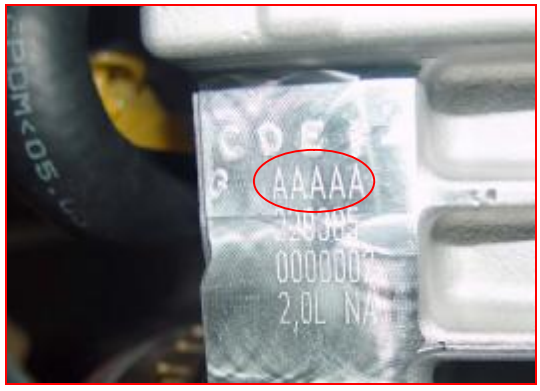
Replace the new bearing bushing if the measured clearance value exceeds the limit value.

Note: Replace the whole group when replacing bearing bushing.

Selecting method of main bearing bushing:

By observing the sign on cylinder (see the picture), we could see 5 As which correspond to bearing bushings respectively.

There two kinds of signs on this vehicle, A and B, corresponding to two kinds bushing, red one and blue one (the color can be recognized on the new bushing but it is possible unrecognized the color on the old one.) A corresponds to red bushing, and B corresponds to blue bushing.



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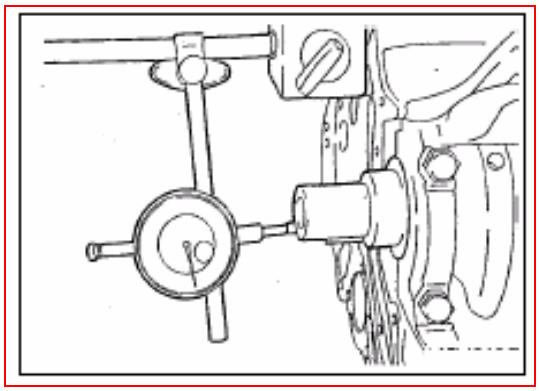
2) Inspect the crankshaft axial clearance

Mount the crankshaft and measure its radical clearance with micrometer guage.

	Standard Value
Clearance	0.076—0.265

Replace the new thrust washer if the measured value exceeds the limit value.

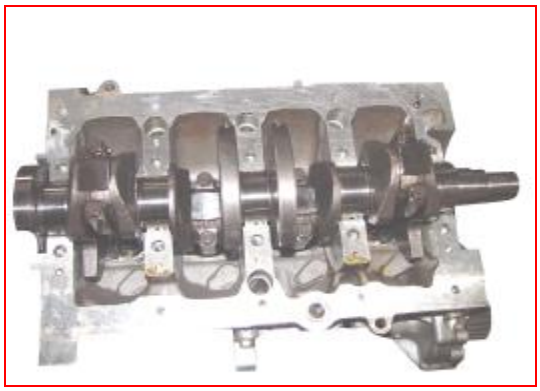
Standard thickness of thrust washer:



7.4 Installation

1) Clean the engine and spread the engine transmission oil on the crankshaft journal.

2) Mount the crankshaft correctly and then mount the thrust washer.



3) Mount the cylinder frame and screw down the crankshaft fastening bolt.

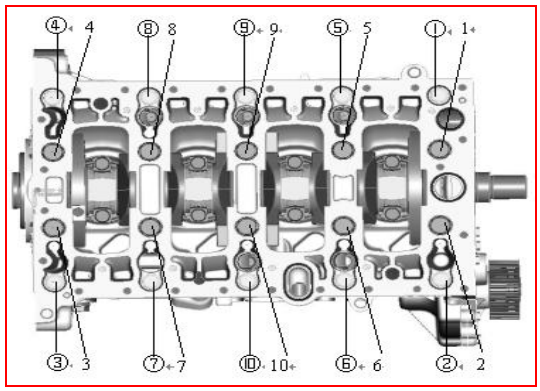
See the picture for the screwing sequence

Screwing way and Torque:

A: Pre-fasten the bolt according to the sequence in the picture.

B: Screw the bolt as the sequence on the picture to 45±5 N.m.

C: Screw 180±5°



4) Mount and screw down the bolt of frame periphery.

Torque: 23N.m

5) Mount the engine oil strainer, oil pan, crankshaft front and rear oil seal and oil pump.

6) Mount the engine accessories, suspend the engine assembly from vehicle and

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mount the water pipe and insert electric connector.

8 Replace coolant pump

8.1 Needed tools and auxiliary materials

A box sleeve wrench, a set of open end wrench, allen wrench, coolant

8.2 Removal

1) Remove the engine timing belt.（see “engine timing calibration” for details.）

2) Loosen the engine water exhaust pipe, and exhaust coolant.

3) Removal the coolant pump.

8.3 Installation

The installing steps are reverse to those for removal.

Infuse enough coolant after installation.

Note: Do not splash the coolant on the timing belt and skin.

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CONTENT

1. NOTICE TO THE EFI SYSTEM SERVICE 3
1.1. GENERAL SERVICE 3
1.2. NOTICE DURING THE SERVICE 3
1.3. SERVICE TOOLS 4
1.4. EXPLANATIONS OF THE ABBREVIATION IN THE MANUAL 6
2. ME7.9.7 SYSTEM INTRODUCTION 6
2.1. SYSTEM BASIC PRINCIPLE 6
2.1.1 SYSTEM GENERAL INTRODUCTION: ME7.9.7-MOTRONIC EMS 6
2.2. CONTROL SIGNAL: ME7.9.7 SYSTEM INPUT/OUTPUT SIGNAL 8
2.3. INTRODUCTION OF SYSTEM MALFUNCTION DIAGNOSIS FUNCTION 9
2.3.1. MALFUNCTION INFORMATION RECORD 9
2.3.2, CONTROL STRATEGY OF FAILURE LAMP 9
2.3.3, DIAGNOSIS METER CONNECTION 10
2.3.4, READ MALFUNCTION INFORMATION BY WINK CODE 10
3. WORKING PRINCIPLE AND CHARACTER OF EFI SYSTEM ELEMENT 10
3.1 ELECTRONIC CONTROL UNIT - ECU 10
3.2 COOLANT TEMPERATURE SENSOR 14
3.3 KNOCK SENSOR 15
3.4 OXYGEN SENSOR 16
3.5 SPEED SENSOR (CRANKCASE POSITIONING SENSOR) 17
3.6 PHASE SENSOR (CAM SHAFT POSITIONING SENSOR) 19
3.7 ELECTRIC FUEL PUMP 20
3.8 ELECTROMAGNETIC INJECTOR 21
3.9 AIR FLOW SENSOR 22
3.10 DOUBLE SPARK IGNITION COIL 23
3.11 CARBON CANISTER SOLENOID VALVE 25
3.12 FUEL PRESSURE REGULATOR 26
3.13 ELECTRONIC THROTTLE VALVE AND ACCELERATOR 27
3.14 FAN CONTROL 28
3.15 AIR CONDITIONER CONTROL 29
4 ME7 SYSTEM TEST AND REPAIR ACCORDING TO TDC 30
4.1 ENGINE DTC (DIAGNOSTIC TROUBLE CODE) LIST 30
4.2 DIAGNOSIS FLOW WHEN THERE IS DIFFERENT DTC 32
5. TYPICAL FAILURE AND ITS DIAGNOSIS FLOW 52
5.1 EXPLANATION 52
5.2 TYPICAL FAILURE DIAGNOSIS FLOW 53
1. The engine does not rotate or rotate slowly when it is started 53
2. The engine can draw rotating but can not start successfully when it is started. 54
3. It is hard to start the heating car. 55
4. It's hard to start the cold car. 56
5. Normal engine speed but hard to start at any time. 57
6. Regular starts but the idle speed is not steady at any time. 58
7. Regular starts but the idle speed is not steady during engine heating. 59

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8. Regular starts but idle speed is not steady after the engine heating......60
9. Regular starts but idle speed is not steady or dying out when there is partial loading. ...61
10. Regular starts with high idle speed. 62
11. Low engine speed or dying out exists when it is accelerated......63
12. React slowly when it is accelerated......64
13. The performance is poor when it is accelerated......65

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EFI SERVICE MANUAL

A21 car is equipped with ME7.9.7 EFI system which developed by UAES. This manual will introduce the general service and the operational principle and character of sensor elements of EFI system in detail. At last there will be some diagnostic method and flow for the typical problems.

1. NOTICE TO THE EFI SYSTEM SERVICE

1.1. GENERAL SERVICE

- Digital multimeter is the only permitted instrument to inspect the EFI system.
- Please use the quality spare parts for service, otherwise can not make sure the EFI work properly.
- Please use lead free gasoline during service.
- Please be obedient to the service and diagnose flow.
- It is forbidden to disassembly the EFI part during service.
- It should be careful to take the electronic component (ECU, sensor, etc.) for preventing from dropping to the ground.
- Please protect the environment, deal with the rejectamenta carefully and effectively.

1.2. NOTICE DURING THE SERVICE

- Do not disassemble any part or inserts of the EFI system from its original position at random to prevent from damaging parts or that moisture and dirt oil come into the inserts. And that will keep the system from working properly.
- Please leave the ignition switch at shut off position when you disconnect and connect the inserts otherwise it will damage the electric element.
- It is must keep the ECU under 80℃, when you do the work of hot status simulation and other works which may cause the temperature increase.
- The supplying oil pressure is high(around 300kPa), all the fuel pipe is made up of anti high pressure pipe. There is high pressure in fuel pipe even the engine does not run. So do not disassemble the fuel pump at random when carrying out service for fuel system. Before disassemble the fuel pipe please carry out discharge pressure procedure. The method is as below: Disassemble the fuel pump relay (or disconnect the connector plug), start engine at its idle running and it dies out by itself. After the service supply fuel to engine fuel pipe at first, the method is: turn ignition key to ON position and wait a while, repeat this four or five times. Disassembly of fuel pipe and fuel filter should be carried out at a place with good ventilation and done by professional maintainer.
- Do not give electricity to fuel pump when the electrical pump is taken out of fuel tank in order to prevent from electrical spark and cause fire.
- Fuel pump is not allowed to carry out running test at dry or water situation, which will

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decrease its life. And do not exchange anode and cathode of the pump.

- Carry out jump spark inspection at necessary time when inspect the ignition system, and the time to inspect must be short. Do not open the throttle valve to prevent a lot of unburned gasoline entering exhaust pipe and damage the 3-way catalytic converter (It is better to take off the corresponding injector insert during the jump spark testing)
- The adjustment of idle speed is done completely by EFI without manual work. The accelerator stop screw of throttle valve has been fixed well in advance by manufacturer so that it is not allowed to change it original position by the customer.
- Do not exchange the anode and cathode of the accumulator to prevent damaging the electronic component. This system uses cathode ground.
- Do not disassemble accumulator cable when the engine is running.
- Disassemble the cable of accumulator anode and cathode, and ECU when there is welding work on the car.
- Do not inspect the input and output signal of component by impaling the lead surface.

1.3. SERVICE TOOLS



Tool name:

EFI system diagnostic tester

Function:

Read/clear the breakdown code in EFI and inspect data, test part motion.



Tool name:

Ignition timing lamp

Function:

Inspect engine ignition timing.

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Tool name:

Digital multimeter

Function:

Inspect the character parameter of voltage, current, resistance.



Tool name:

Fuel pressure gauge

Function:

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



Tool name:

Pressure gauge for cylinder

Function:

Inspect the pressure in every cylinder.



Tool name:

Fuel injector cleaner and analyzer

function:

Analyze and clean the injector.



Tool name:

Vacuum meter

function:

Inspect the pressure of intake manifold



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1.4. EXPLANATIONS OF THE ABBREVIATION IN THE MANUAL

DG Speed Sensor

DR Fuel Pressure Regulator

ECU Electronic Control Unit (Computer)

EMS Engine Management System

LSH Heating Oxygen Sensor

KSZ Fuel Distributing Pipe Assembly

ROV Ignition System with Distributor

RUV Ignition System without Distributor

TF-W Coolant Temperature Sensor

HFM Air Flow Sensor

DVE Electronic Throttle Valve

FPM Accelerator Pedal

EKP Fuel Pump

EV Fuel Injector

KS Knock Sensor

KVS Fuel Distributing Pipe

PG Phase Sensor

TEE Oil Pump Bracket Assembly

TEV Purge Canister Control Valve

ZSK Ignition Coil

2. ME7.9.7 SYSTEM INTRODUCTION

2.1. SYSTEM BASIC PRINCIPLE

2.1.1 SYSTEM GENERAL INTRODUCTION: ME7.9.7-MOTRONIC EMS

Engine management system (EMS)is composed mainly by three components: sensor, ECU, and actuator. And these three parts control the intake air quantity, fuel injection quantity and ignition advance angle. The basic frame is shown in chart 2.1.

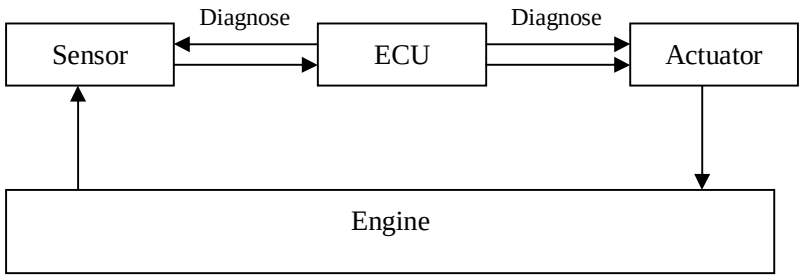


Chart 2.1 compose of engine electronic control system

In engine electronic control system, the sensor is the input part used for measuring all kinds of physics signal (temperature and pressure etc.) and change them to corresponding electronic signal; the function of ECU is accepting the signal and calculate it according to the programmed program and generate corresponding output signal to power drive circuit; and the power drive circuit makes the engine running according to established strategy by driving every actuator to do different action; at the same time the malfunction diagnosis system of ECU monitors all parts or control function, and if a malfunction is detected and confirmed it will memorize malfunction code, transferring “ limping home” function, and when the malfunction is deleted, the normal value will be desterilized.

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Engine electronic control system schematic of ME7.9.7 chart 2.2

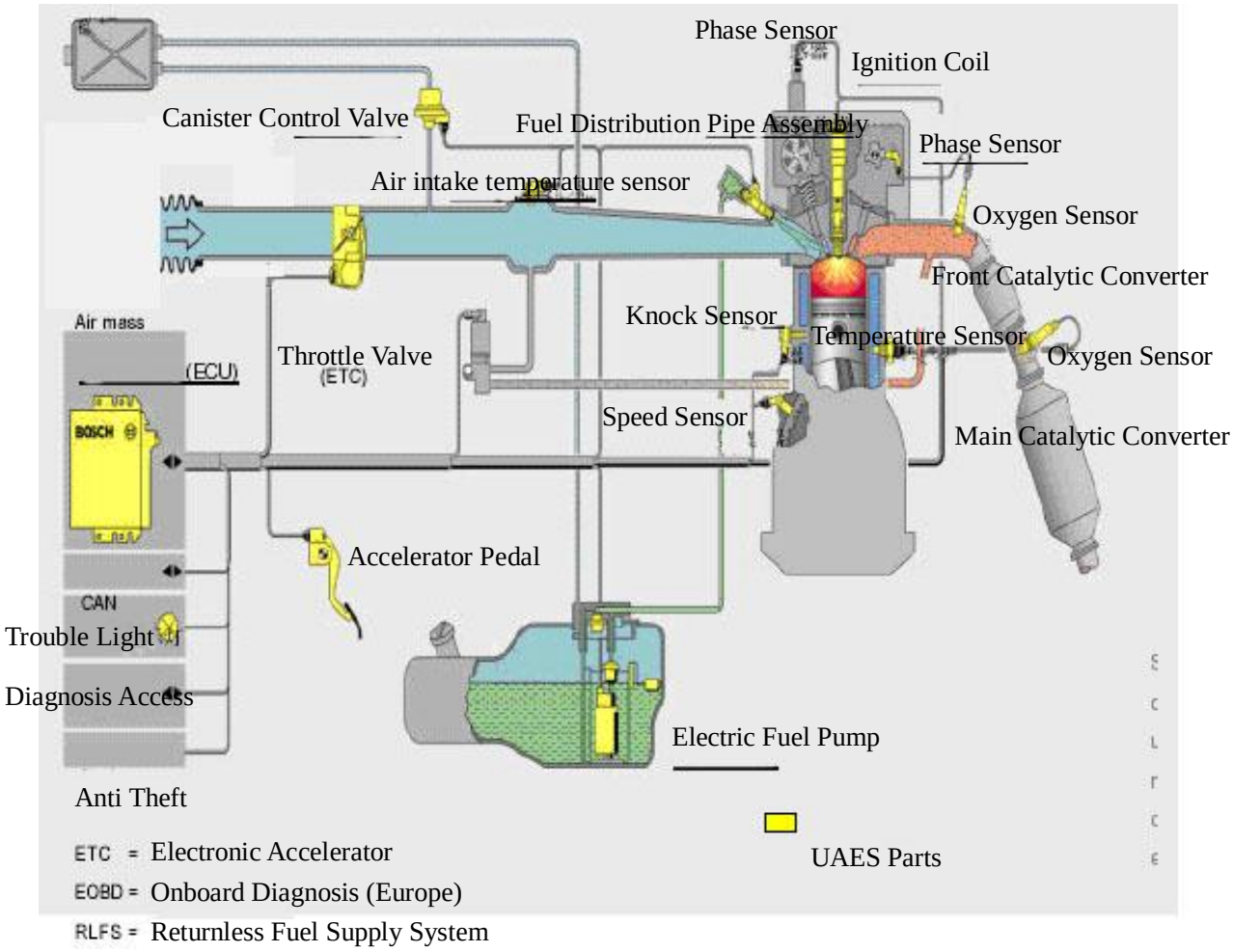


Chart 2.2

The basic component of ME7.9.7 engine electronic control system:

Electronic Control Unit(ECU)	Accelerator	Electronic Throttle Valve
Air Quality Flow Meter	Injector	Electronic Fuel Pump
Coolant temperature sensor	Fuel Pressure Regulator	Throttle position sensor
Fuel Pump Bracket	Camshaft Position Sensor	Fuel Distributing Pipe
Speed Sensor	Oxygen Sensor	Canister Control Valve
Knock Sensor	Ignition Coil	

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ME7.9.7 engine management system is an electronic gasoline control system, and it can provide lots of control characters about operator and vehicle or equipment. The system adopts a combination method of open loop and closed loop (feed back) control to provide all kinds of control signal to engine. The main function of the system:

1) The basic functions of applying physics mode engine

- For the system structure based on torque, the airflow sensor will confirm the loading of cylinder and improve the mixture air control function closed loop control.
- Fuel injects ignition timing on the order of cylinder order, including knock control and emission control functions.
- 3 way catalytic convert heating
- Canister control
- Idle speed control
- Limping home

2.2. CONTROL SIGNAL: ME7.9.7 SYSTEM INPUT/OUTPUT SIGNAL

The main sensor input signal of ECU of ME7 system:

- Air flow signal
- Throttle valve corner signal
- Coolant temperature signal
- Engine speed signal
- Phase signal
- Knock sensor signal
- Oxygen sensor signal
- Speed signal
- Air conditioner pressure signal

The above information after the transaction of ECU, there will generate required actuator control signal, and this signal will be magnified in output driving circuit and was transferred to its corresponding actuator. The signals include below information:

- Injection timing and injection continuous time
- Fuel pump relay
- Opening degree of canister control valve
- Ignition coil closing angle and ignition angle of advance
- Air conditioner compressor relay

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- Cooling fan relay

2.3. INTRODUCTION OF SYSTEM MALFUNCTION DIAGNOSIS FUNCTION

2.3.1. MALFUNCTION INFORMATION RECORD

The ECU monitors sensor, actuator, related circuit, malfunction indicator and accumulator voltage etc., and 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, coolant temperature, knock control, idle engine speed and accumulator voltage etc.). ECU will set the malfunction record on RAM malfunction memory immediately once the malfunction or the unlikelihood signal is detected. The malfunction information is recorded by malfunction code and displayed according to its appeared order, dividing malfunction into "steady malfunction" and "contingency malfunction" (for example the malfunction is caused by short time cable braking or bad contact of the inserts) according to its appeared frequency.

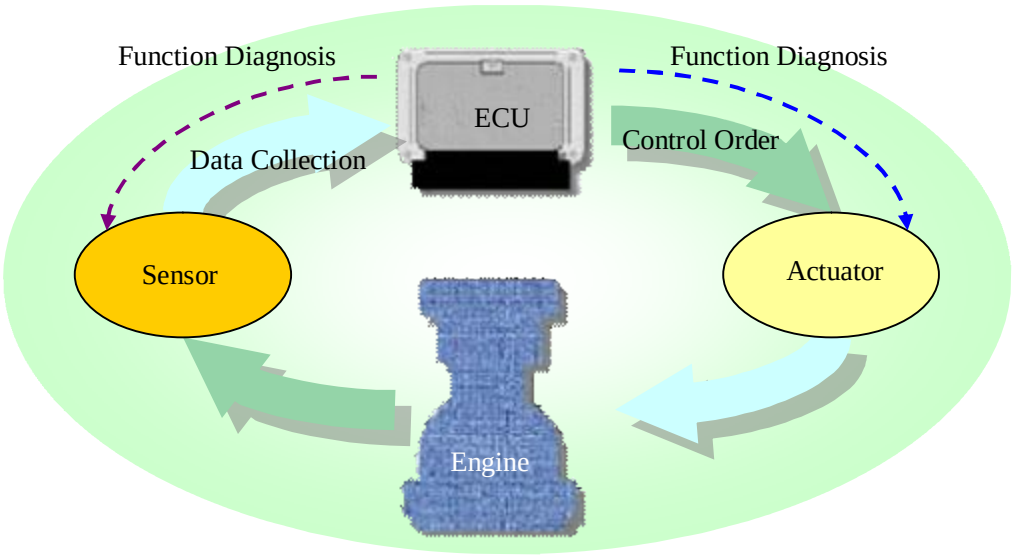


Chart 2.4 EFI System Malfunction Diagnosis Principle Chart

2.3.2, CONTROL STRATEGY OF FAILURE LAMP

When there is no trouble:

★ The failure lamp is lighting and die out within 4 seconds after the ignition switch is ON

★ Starting within 4 seconds, the failure lamp dies when the engine speed signal is found;

★ The failure lamp winking at 2HZ frequency when the K cable contact to ground more than 2.5 seconds.

When there is a trouble:

★ The failure lamp always on light when the ignition switch is ON;

★ Start and die out when the engine speed signal is detected; if the failure lamp was defined as lighting mode, it will always on light after reach its confirmed conditions;

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★ Output winking code that is P-CODE value after the K cable contact with the ground more than 2.5 seconds. For example: the winking mode of P0203 is: wink 10 times continuously – intermission – wink 2 times continuously – intermission - wink 10 times continuously – intermission – wink 3 times continuously.

2.3.3, DIAGNOSIS METER CONNECTION

This system adopts "K" cable communication protocol and use ISO 9141-2 standard diagnosis joint, please see chart 2.5. This standard diagnosis joint is connected to engine harness fixed. The pins of No.4, 7 and 16 on the standard diagnosis joint are used for EMS. The pin of No. 4 on standard diagnosis joint is ground wire; Pin of No.7 is connecting to No.71 pin of ECU, which is engine data "K" cable; No.16 pin is connecting to accumulator anode.

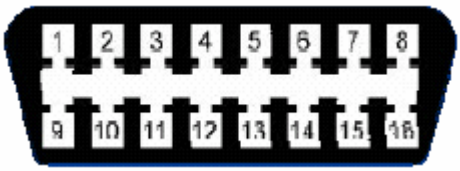


Chart 2.5 ISO9141-2 Standard Diagnosis Joint

2.3.4, READ MALFUNCTION INFORMATION BY WINK CODE

Switch on ignition switch and use engine data K cable(that is standard diagnosis joint 7#)to ground(use one lead connect pin of diagnosis joint 4# and pin of 7#) more than 2.5 seconds, if there are malfunction code in ECU malfunction memorizer, the malfunction light wink code of engine now is P-CODE value. Such as: P0203 winking type is: wink 10 times continuously – intermission – wink 2 times continuously – intermission - wink 10 times continuously – intermission – wink 3 times continuously.

3. WORKING PRINCIPLE AND CHARACTER OF EFI SYSTEM ELEMENT

3.1 ELECTRONIC CONTROL UNIT - ECU

1)Exterior drawing

2)Purpose: ECU accepts and deals with engine status signals inputted from sensors and drives the actuators to work. Making engine working as the established program, insure power good, fuel consuming effectively and low emission.

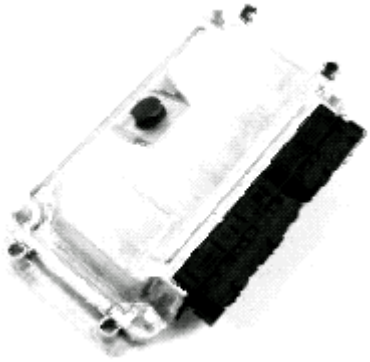
3)Mounting position: Passenger compartment

4)Functions

- **Multipoint injection in order**
- **Control ignition**

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- **Idle speed control**
- **Knock control**
- **Provide sensor power: 5V/100mA**
- **Closed loop control**
- **Control carbon canister solenoid valve**
- **Air conditioner switch**
- **engine malfunction indicator**
- **Fuel fix quantity modification**
- **Engine speed signal output(TN signal)**
- **Input of speed signal**
- **Malfunction self diagnosis**
- **Accept engine loading signal etc.**



5)Definition of pin

Pin	point	Pin	Connection point
1	Oxygen sensor heating	42	Air intake temperature
2	Ignition coil 2	43	
3	Ignition	44	Non persistent power
4	Oxygen sensor heating	45	Non persistent power
5	Ignition coil 1	46	Canister valve
6	Injection nozzle 4(cylinder No. 2)	47	Injection nozzle 3(cylinder No.4)
7	Injection nozzle 2(cylinder No.3)	48	
8	Engine speed	49	
9	Coolant temperature	50	Fan control 1
10	Fuel consuming	51	electronically 2
11	Trouble light	52	
12	Persistent power	53	electronically 1
13	Ignition coil	54	Electronic throttle valve position
14	Main relay	55	Downstream oxygen sensor
15	Engine speed sensor A	56	

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16	Accelerator position sensor	57	
17	Sensor 1	58	Brake switch
18	Upstream oxygen sensor	59	Speed signal
19	Knock sensor A	60	Medium switch
20	Knock sensor B	61	Power 1
21	Brake light	62	CAN communication
22		63	Non persistent power
23	Accelerating sensor	64	Electronic throttle valve
24		65	Electronic throttle valve
25		66	Electronic throttle valve
26		67	Electronic throttle valve
27	Injection nozzle 1(cylinder No.1)	68	Cooling fan
28		69	Air conditioner relay
29		70	Fuel pump relay
30		71	Diagnosis K cable
31	EOBD inspection light	72	
32	5V power supply 2	73	Anti theft device
33	5V power supply 1	74	Clutch switch
34	Engine speed sensor B	75	Air conditioner switch
35	Sensor 3	76	Power steering switch
36	Sensor 2	77	Headlamp switch
37	Air flow sensor	78	Sensor
38	Electronic throttle valve control	79	Phase sensor
39	Engine coolant temperature sensor	80	Power 2
40	Accelerator position sensor	81	CAN communication
41	Air conditioner pressure		

6)Normal working voltage: 9--16V

Normal working temperature: -40--70℃

7)Malfunction phenomena and diagnosis method

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- **Malfunction phenomena:** idle speed not stable, accelerating not good, can not start, idle speed is too high, exhaust gas exceed standard, difficult to start, air conditioner failure, injector control failure, engine dies out etc..
- **Reasons for general malfunction:** 1, ECU component was burnt down caused by overloading of the exterior connected electrical device; 2, circuit board was rust and erode caused by water in ECU.
- **Service notice:** 1, do not disassemble ECU at random during the service; 2, disassemble accumulator 5 minutes prior to disassemble ECU; 3, keep the disassembled ECU carefully; 4, prohibit to connect any circuit to ECU connecting line.
- Simple measurement method:

1、(connect ECU joint)Read engine malfunction record by K line.

2、(disassemble ECU joint)Check the connecting line of ECU, and pay more attention to check the power supply and ground line of ECU;

3、Check the working conditions of exterior sensor and its output signal and its circuit;

4、Check actuator and its circuit;

5、At last change ECU and have a test.

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3.2 COOLANT TEMPERATURE SENSOR

1)exterior drawing and pin

This sensor has two exchangeable pins.

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

3)Installation position

Coolant temperature sensor was installed on the water outlet of cylinder block and the copper heat conducted socket was inserted into water. 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 moment is 20Nm.

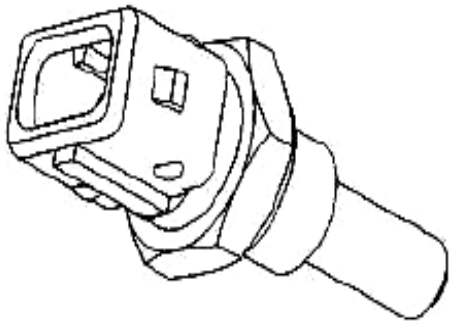
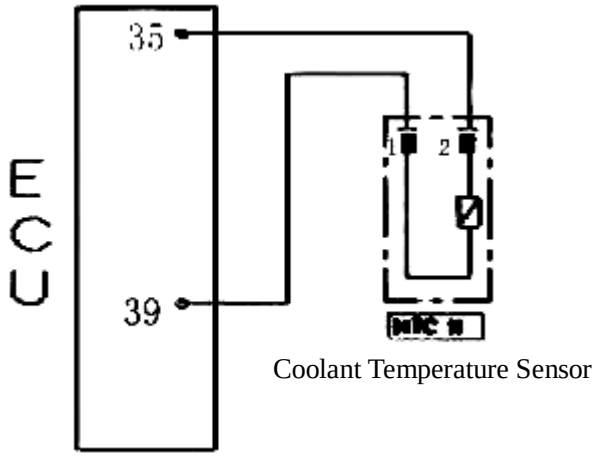


Chart 3-2 Outlook drawing of the coolant temperature sensor

4)Working principle

This sensor is a thermistor of negative temperature coefficient (NTC), and its value will decrease with the coolant temperature increasing but the changes are not linearity. There are several different resistance values at different temperature:

T(℃)	Resistance value(kΩ)
-10	8.62----10.28
20	2.37----2.63
80	0.299----0.345



Coolant Temperature Sensor

Chart 3-3 Circuit diagram of coolant temperature sensor

5)Normal working temperature: -30----130 ℃

Normal working voltage: 5V DC

6)Malfunction phenomenon and diagnosis method

- **Malfunction phenomenon**: Difficult to start.
- Reasons of malfunction: man made
- Simple measurement method:

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(Disassemble the joint)leave the digital multimeter at ohm shift and contact the No.1 and No. 2 pin of the sensor by its two meter pens. When it is 20℃Rated the resistance is 2.5kΩ±5%. The other temperature can get reference from above chart.

3.3 KNOCK SENSOR

1)Exterior drawing and pin

This sensor has three pins; No.1 and No.2 pin connect with ECU, and No. 3 pin connects with shield.

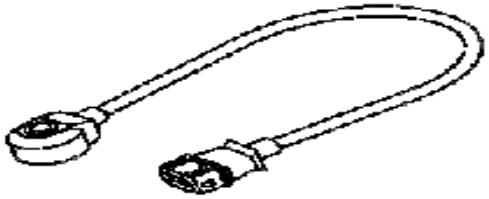


Chart 3-4 Exterior drawing of knock sensor

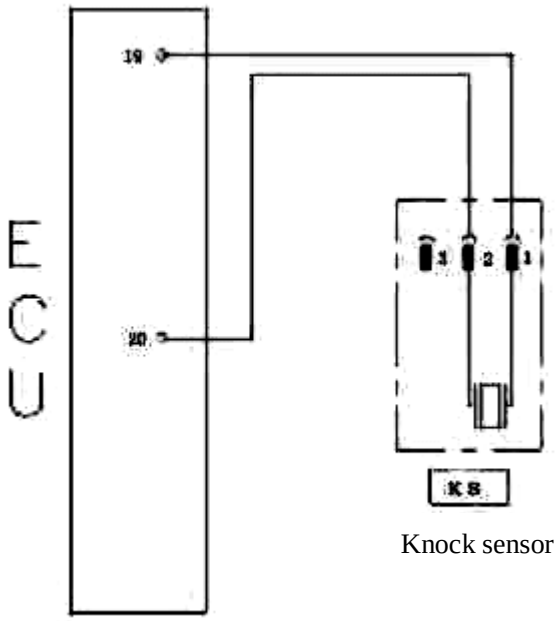
2)Purpose: This sensor provides engine knock information to ECU, and carries out knock control.

3)Installation position

There is a hole in the middle of knock sensor, and the sensor is assembled on the block between No.2 and No.3 cylinder head. For the aluminum alloy block, using long bolt with 30mm long; for the casting iron, using 25mm long bolt. And the moment is 20±5Nm.

4)Working principle

Knock sensor is a kind of vibrating acceleration sensor and is assembled on cylinder block. The sense organ of the sensor is a piezoelectric element. The vibration of cylinder block is transferred to piezoelectric crystal by mass block inside of sensor. The piezoelectricity crystalloid gets pressure from mass block vibration, producing voltage on two polar and transferring vibration signals to voltage signal and output it. Because the frequency of knock vibration signal is much higher than the normal engine vibration signal, the ECU can separate the signal into knock signal and non knock signal.



Knock sensor

Chart 3-5 circuit diagram of knock sensor

5)Normal working temperature: -40--130℃

6)Malfunction phenomenon and diagnosis method

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- Malfunction phenomenon: badness accelerating.
- Normal malfunction reason: all kinds of liquid such as oil, coolant, braking liquid and water contact with sensor for a long time and erode the sensor.
- Simple measuring method: (disassemble 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 at normal conditions. Leave the digital multimeter at millivolt shift, and tap around the sensor using little hammer, there should be voltage signal output.

3.4 OXYGEN SENSOR

1)Exterior drawing and pin

There are 4 pins on this oxygen sensor

No. 1 connect to heating power anode (white)

No. 2 connects to heating power cathode (white)

No. 3 connects to signal cathode (gray)

No. 4 connects to signal anode (black)

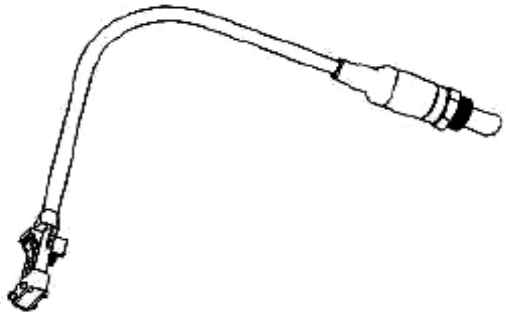


Chart 3-6 Exterior drawing of oxygen sensor

2)Installation position: Assemble it on the top of exhaust pipe.

3)Purpose: The oxygen sensor checks the oxygen percent in exhaust gases and transfer the signal to ECU, and ECU will control the fuel closed loop according to this information. This will make engine working at its optimum conditions. And transfer and purify CO, HC, NO_x compound in 3-way catalytic converter of the tail gas maximally.

4)Working principle

Sensing element of oxygen sensor is a kind of ceramic tube with holes, and outside of tube walls are surrounded by engine exhaust gas and inside is air. Ceramic sensor element is a kind of solid state electrolyte with electrical heating

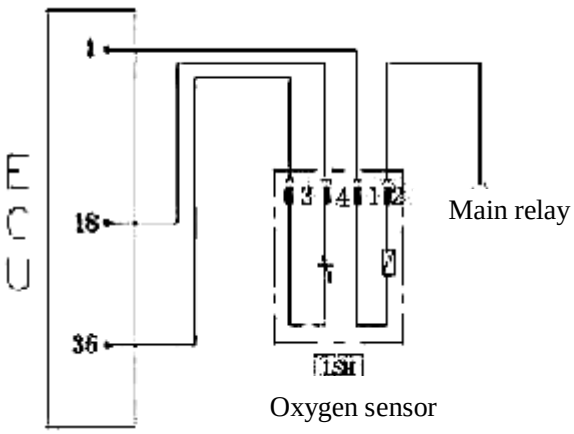


Chart 3-7 circuit diagram of oxygen sensor

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tube inside. The working of oxygen sensor is carried out by transferring the concentration difference of the oxygen ion outside of ceramic tube to voltage (100mv—900mv)signal and output.

5)Working voltage:12—14V

6)Malfunction and diagnosis method

- **Malfunction:** badness idle speed, badness acceleration, badness tail gas, over fuel consume etc.
- **Reason:** 1, moisture entering inside of sensor, and when the temperature is changed pin is broken; 2, sensor poisoning(Pb,S,Br,Si)
- **Notice:** it is forbidden to use cleaning liquid, oiliness liquid or volatility solid during service.
- **Measuring method:** a) disassemble joint, put digital multimeter to ohm shift, connect meter pen to No.1(white) and No.2(white) pins of the sensor. Normally the resistance value is 1~6Ω. b) Connect the joint and keep it at idle speed status. When the oxygen sensor reaches to its working temperature 350℃, keep digital multimeter to DC volt shift and connect meter pen to No.3 (gray) and No.4 (black) pins of sensor. Now the voltage should be fluctuate between 0.1- 0.9V quickly (the data also can be gotten from data flow inspected by diagnosis meter).

3.5 SPEED SENSOR (CRANKCASE POSITIONING SENSOR)

1)Exterior drawing and pin

No.1pin connects to shield

No.2 and No.3 pin provide signal to ECU.

2)Installation position: on the flywheel plane at rear of engine.

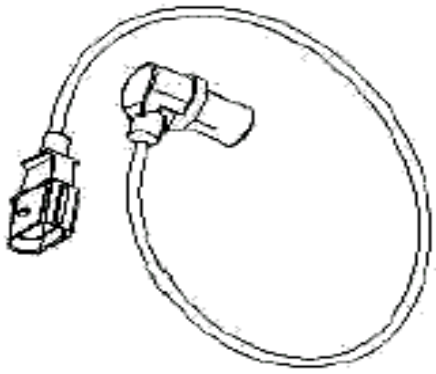


Chart 3-8 Exterior Drawing Of Speed Sensor

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Service notice:

- For the inductive engine speed sensor, it is permitted to take out from its pack before it is assembled to the auto or testing device right away.
- Inductive engine speed sensor is assembled by press in method but not hammer tapping.
- Tightening torque is 8.2Nm. Gas clearance between inductive engine speed sensor and pulse disc is 0.8 - 1.2mm.

3)Purpose: Speed sensor provides engine speed, crankshaft angle and top dead center signal to ECU. That will control engine ignition and injection timing.

4)Working principle: The inductive engine speed sensor work together with pulse disc, it is used in ignition system without distributor providing engine speed and crank shaft top dead center information. Speed sensor 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 tip of the tooth passed the end of inductive engine speed sensor, the magnet pulse disc incises the magnetic line of force, generating rotating speed signal and output.

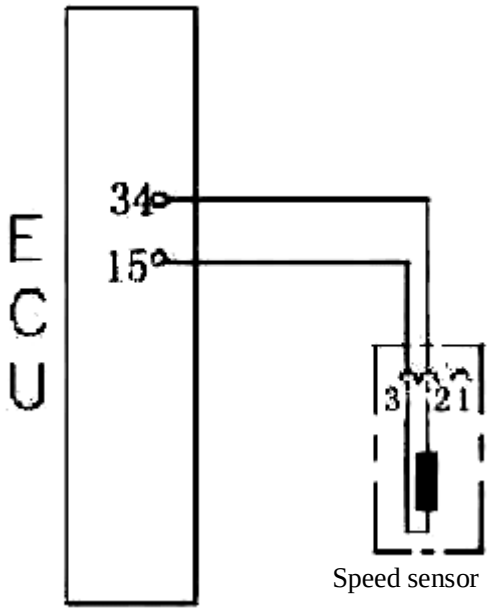


Chart 3-9 Circuit diagram of speed sensor

5)Working temperature:-40--120℃

Resistance of coil in room T:731--989Ω

6)Malfunction and diagnosis method:

- Malfunction: can not start etc.
- Reason: man failure
- Service notice: use pressing method but not a hammer to install it.
- Simple measure method: disconnect the joint, put digital multimeter to ohm shift, connecting two meter pen to No. 2 and No.

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3 sensor connectors. The rated resistance is 860Ω±10% When it is 20℃

3.6 PHASE SENSOR (CAM SHAFT POSITIONING SENSOR)

1)Exterior drawing and pin

This sensor has three pins: No. 1 grounding, No. 2 for signal output and No. 3 connecting to power anode.

2)Installation position: on the valve cover. There is only one hole on this sensor casing for tightening M6, and the torque is: 8±0.5Nm.

3)Purpose: This sensor provides crankshaft phase information to ECU, that is to say, to separate crankshaft compression top dead center and exhaust top dead center.

4)Working principle

It is a Hall sensor.

5)Working temperature: -30--130℃

Working voltage: 4.5—16V

Trigger gap: 0.1—1.8mm

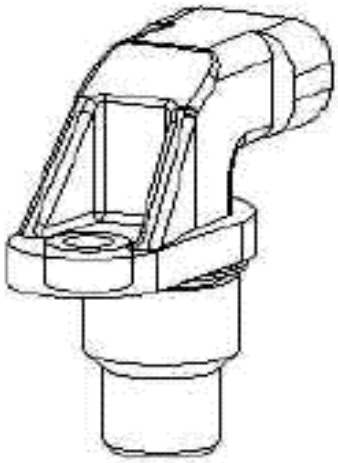


Chart 3-10 Exterior drawing of phase sensor

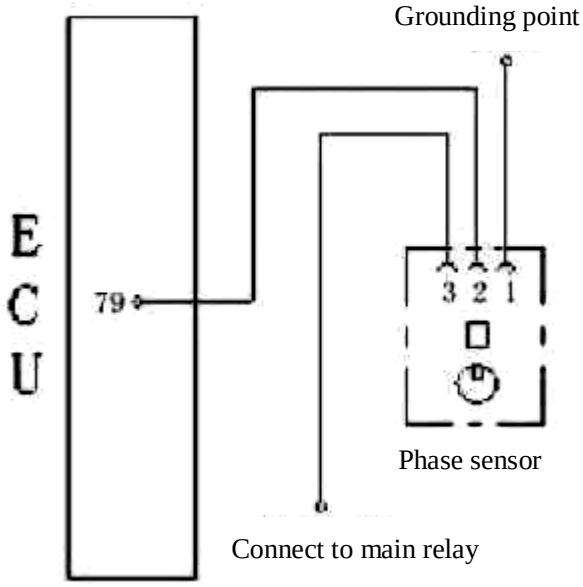


Chart 3-10 Exterior drawing of phase sensor

6)Malfunction and diagnosis method

- Malfunction: can not start, emission exceed standard, fuel consume increased.
- Reason: Man made.
- Simple measuring method: (connect the joint) switch on ignition switch but do not start the engine; put digital multimeter on DC volt, connect two meter pen to No. 3 and No. 1 sensor connectors and make sure there is 12V reference voltage. Start the engine, checking if it is in good conditions of No. 2 pin by oscillograph on vehicle.

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3.7 ELECTRIC FUEL PUMP

1)Exterior drawing and pin

The electric fuel pump has two pins connecting to pump relay. There are "+"and "-" showing anode and cathode on the pump housing near to pins.

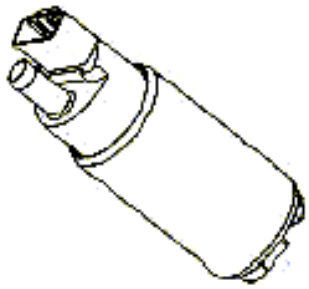


Chart 3-12 Exterior Drawing of Electric Fuel Pump

2)Installation position: inside fuel tank

3)Purpose: Deliver the fuel to engine fuel supplying pipe at certain flow and fuel pressure and keep the stable fuel pressure (realized by fuel pressure regulator)

4)Working principle

The electric fuel pump is made up of DC electromotor, vane pump and end cover (it's an integration of check valve, relief valve and an anti electromagnetic interference element). Pump and electromotor are coaxial assembly and within the same casing. The pump and electromotor are full of gasoline for coolant and greasing inside of the casing. The accumulator provide power to electric fuel pump via 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.

5)Working voltage:8—14V

Working temperature:-30--70℃

System pressure: 300KPa

6)Malfunction and diagnosis method

- Malfunction: big running noise, badness acceleration, can not start (difficult to start) etc..
- Reason: use of low quality fuel and cause 1, colloid became insulation layer; 2, fuel pump bushing and armature come to together; 3, components of fuel level sensor eroded.
- Service notice: 1, the electric fuel pump can

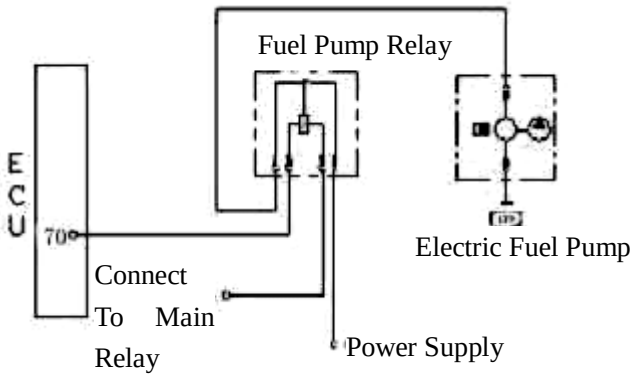


Chart 3-10 Exterior Drawing Of Phase Sensor

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has different flow according to the requirement of engine, but with the same exterior looking.

The pump which can be assembled to perhaps is not the fittest. For service the replaced electric fuel pump must has the same part number as the original pump; 2, do not change the pump at dry status to prevent the pump from accident; 3, when it needs changing fuel pump, please clean fuel tank and fuel filter.

- Simple measuring method: (disconnect joint) leave digital multimeter at ohm shift, connect two meter pen to two pins of pump, measure the resistance, it is not zero or infinite(that is non short circuit, open circuit).(connect the joint)connect the fuel pressure meter to fuel intake pipe and start the engine, observing if the fuel pump works; If it is not running, check if there is power or not on the pin of"+"; if it is running, at the condition of idle speed, check the fuel pressure if it is around 260kPa; plug off the fuel pressure regulator vacuum pipe if it is around 300kPa.

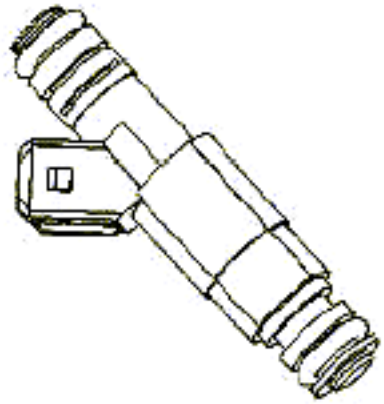


Chart 3-14 Exterior Drawing of Injector

3.8 ELECTROMAGNETIC INJECTOR

1)Exterior drawing and pin

There are two pins on each injector. One of them is No. 87 pin aside of casing marked with plus and connected to main relay output; and another o connect with ECU No. 27,6,7,47 pins.

2)Installation position: On the air intake manifo near the end of air intake port. Wh you .disassemble and reassemble the fuel inject the O ring must be changed. And pay attention n to damage the sealing surface of the injector.

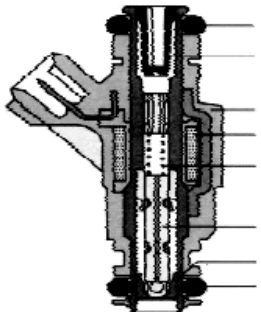


Chart 3-15 Cutaway View Of Injector

3)Purpose: Inject some fuel to its correspondent cylinder at proper time to meet the engine requirement of different power and different torque.

4)Working principle: ECU sends electrical impulse to injector coil and form magnetic field force. When magnetic field force increase to

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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.

5)Working voltage:6—16V

Working injection pressure: 350KPa

6)Malfunction and diagnosis method

- Malfunction: badness idle speed, badness acceleration, can not start (difficult to start) etc..
- Reason: lack of maintenance causes invalid by the colloid inside of injector became insulation layer.
- Simple measure method: (disconnect the joint) leave digital multimeter at ohm shift, connect the meter pen to the two pins of injector. The rated resistance should be 11 - 13Ωwhen it is 20℃.

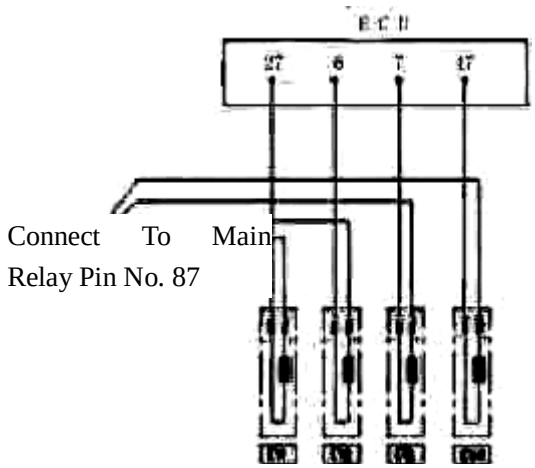


Chart 3-16 Circuit Diagram of Injector

3.9 AIR FLOW SENSOR

1)Exterior drawing and pin definition

This sensor is 5 pins: No. 1 is intake temperature pressure signal; No. 2 is accumulator pressure; No. 3 is grounding; No. 4 is reference voltage 5V; No. 5 is intake airflow signal output.

2)Installation position

It is behind the air cleaner of the air intake tube.

3)Purpose:

This sensor is hot cable airflow sensor, which check the temperature and air intake flow entering to cylinder and provide evidence to ECU to calculate fuel injection quantity.

4)Working principle

If there are no airflow passing when the air quality and flow meter works, temperature grads of both sides of the heating area spread symmetry, and temperature of these two points are same. When the air passes here just one way, the air will be heated when it passes the central heating area and this will

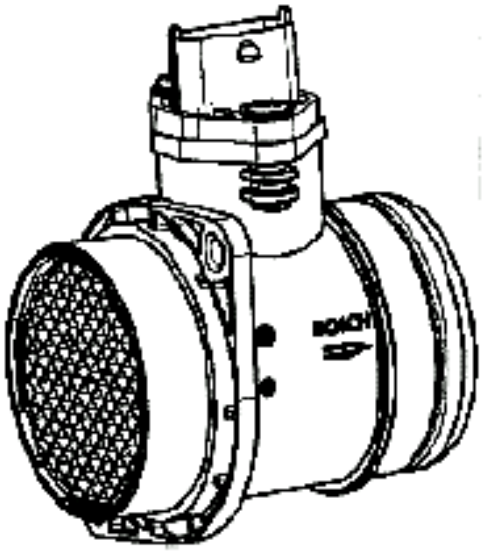


Chart 3-17 Exterior Drawing of Airflow Sensor

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make the heat exchange different of the heat diaphragm of both sides.

This will make the temperature of two sensing element measuring point inside of the flowmeter Changes differently and appears difference in temperature. And the difference of the temperature will increase with the increase of the airflow. Big/small and positive/negative of the temperature difference improved the quality and direction of the airflow. And the inside evaluate circuit will transfer the temperature difference to voltage signal and output.

5)Working temperature:-40--125℃

6)Malfunction and diagnosis method

- Reason: sensing element is polluted by the dust particle, oil and water and causes the part invalid.
- Service notice: 1, it is prohibited to use erosion liquid to clean sensing element during service; 2, not to use high pressure air to impact sensing element; 3, make sure there are no dust into air pipe when you change air cleaner and no unqualified air into air cleaner.
- Simple measuring method: **static measurement**: (zero flow measurement) No. 3 grounding; No. 4 input 5V reference voltage; No.2 input 14V rated voltage; check No. 5 output voltage, if the output is bigger than 1.025V, we can confirm the function of this sensor is not qualified. **Dynamic measurement**: if it is confirmed the sensor is broken, connect a tail gas analysis meter to exhaust pipe and check it by using “two working conditions method”: 1, idle speed working conditions; 2, 2000rpm stable working conditions. Check the reading of HC 、CO、CO_2, normally HC<100ppm CO<0.5%,CO_2 >13.5%

3.10 DOUBLE SPARK IGNITION COIL

1)Exterior and pin definition

No. 1 coil primary winding connect with No.5 pin of ECU; No. 2 coil primary winding connect with No. 2 pin of ECU; No. 3 and No.4 pins connect with power

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anode.

2)Installation position: on the engine

3)Purpose: Ignition coil transfers the low voltage of primary winding to high voltage of secondary winding, and produce spark by spark plug discharging then burning the combustible gas inside of the cylinder.

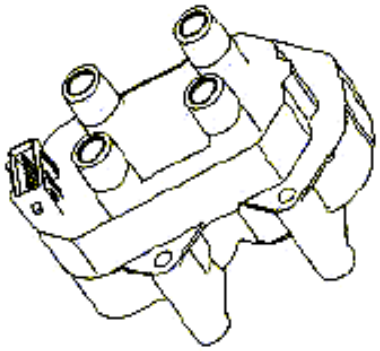


Chart 3-18 Exterior Drawing of Ignition Coil

4)Working principle

Ignition coil ZS - K22 is made up of two primary windings, two secondary windings, mandrel, and casing. When one of the primary windings grounding chunnel is connected, the primary winding is in charging. Once the circuit is cut off by ECU, the charging is 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 - K22, there is one spark plug on both side of the secondary winding, and the both spark plugs can ignite at the same time. These two primaries connect and disconnect to power alternatively. And correspondently these two secondary windings discharge alternatively.

5)Working voltage:14V

Working temperature:-40—120℃

6)Malfunction and diagnosis method

- Malfunction: can not start.
- Reason: current is too big and got burnt, damage by outside force etc..
- Service notice: forbid to use "short circuit test igniting method" to test ignition function, prevents the electronic controller from damaging.
- Simple measuring method: (disassemble the joint) leave digital multimeter at ohm shift, connect two meter pen to two pins of primary winding, the resistance value is 0.42- 0.58Ωwhen it is 20℃; secondary winding resistance value is 11.2-14.8kΩ.

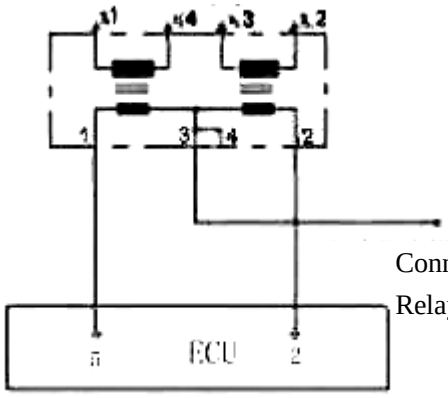


Chart 3-19 circuit Diagram of Ignition Coil

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3.11 CARBON CANISTER SOLENOID VALVE

1)Exterior drawing and pin definition

Canister control valve only has two pins; one is connect to No.87 pin of main relay output end; and another pin connected to No. 5 pin of ECU.

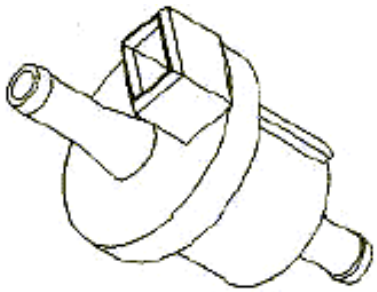


Chart 3-20 Exterior Drawing of Canister Solenoid

2)Installation position: Canister vacuum pipe of intake manifold

3)Purpose: Control the quantity of the cleaning flow from canister to air intake chief pipe. The absorption of the canister is limited so if the gasoline vapor adhesive to canister can not be consumed the gasoline vapor will volatility to outside and pollute the air.

4)Working principle

Canister is made up of electromagnetic coil, armature and valve etc.. There is strainer on the intake. The flow quantity passes canister valve is correlate not only to electrical impulse duty ratio of canister control valve output by ECU, but also to the pressure difference between canister valve intake and outlet. When there is no electronic impulse, the canister control valve will shut down.

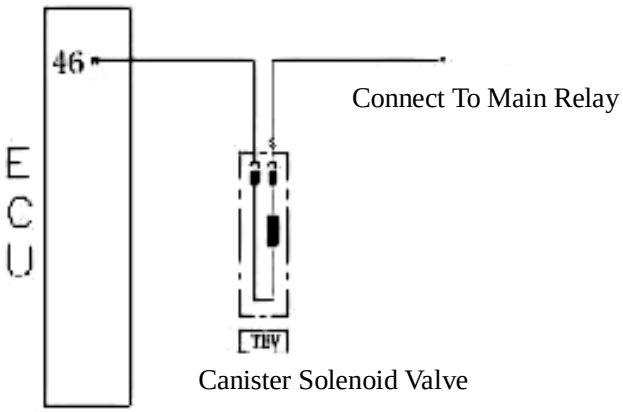


Chart 3-21 Circuit Diagram of Canister Solenoid

5)Working voltage:9—16V

Working temperature:-30--120℃

6)Malfunction and diagnosis method

- Malfunction: Function invalidation.
- Reason: some particle coming to inside of valve causes erosion or poor sealing.
- Service notice: 1, let the airflow direction be accord with the regulation; 2, when there are black particle inside of valve and causes the control valve invalidation, the valve need to be changed, please check the canister working conditions; 3, avoid the water, fuel and other liquid into valve during the service; 4, hang the valve on the tube to avoid the transferring of solid sound.
- Simple measurement method: (disassemble the

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joint) leave digital multimeter to ohm shift, two meter pen connect to the pins of canister valve, it is 26±4 Ω when it is 20℃.

3.12 FUEL PRESSURE REGULATOR

1)Exterior drawing

2)Installation position: Fuel bracket assembly

3)Purpose: Adjust the pressure inside of fuel pipe, keep the System pressure around 350Kpa.

4)Working principle: See chart 3- 23, one piece of flexible film made up of rubber and fiber separate the fuel pressure regulator into two compartments. The upper compartment communicates to the air, and there is spring inside. The lower compartment is full of fuel entering from the fuel intake under the fuel pressure regulator. The lower part of the film gets the pressure from fuel and the upper part gets the pressure from air and spring. The film can distort and drive valve seat making the valve open and close, but the distortion is smaller the acting force of the spring may be seemed as not changed. So the opening and closing of the valve is decided by the pressure difference of the fuel pressure from lower compartment and the air pressure from the upper compartment. If the valve is closed at first, then the fuel pressure increased causing the pressure difference between upper and lower compartments increased. At last the film was raised up by the fuel pressure and valve is opened. The fuel return to fuel tank from oil return port of pressure regulator, the fuel pressure decreased until the valve is closed. If the engine changes its working conditions now, the pressure difference of fuel system and the air pressure is about the same.



Chart 3-22 Fuel Pressure Regulator

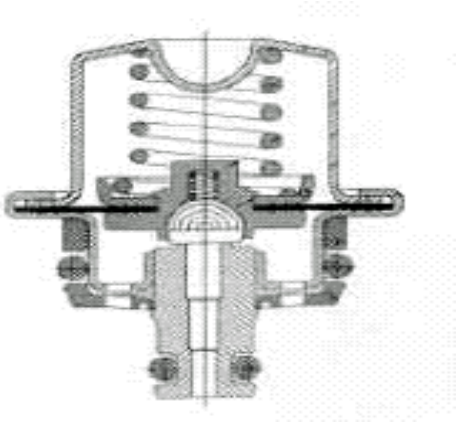


Chart 3-23cutaway View of Fuel Pressure Regulator

5)Malfunction and diagnosis method

- Malfunction: fuel pressure is too high or too low, difficult to start.
- Reason: long time using without maintenance causing: 1, strainer jammed; 2, particle causes big leaking; 3, man made mechanical damages.
- Service notice: 1, prohibit to use high pressure air blowing film element; 2, Forbid using strong

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causticity liquid to wash it; 3, avoid it from distorting by outside force.

Simple measurement method: connect fuel pressure gauge at fuel intake pipe, start the engine and make the engine running at idle speed; check the fuel pressure around 350kPa or not; step on the gas until the engine speed to 2500rpm,and observe if the fuel pressure at around 350kPa.

3.13 ELECTRONIC THROTTLE VALVE AND ACCELERATOR

1)Exterior drawing and pin

- Accelerator pin definition

  Pin No.1 and No.2 is the anode of the 5V reference voltage

  Pin No.3 and No.5 is the cathode of 5V reference voltage

  Pin No. 4 and No. 6 is output voltage signal

- Electronic throttle valve pin definition

  Pin No. 1 is motor anode.

  Pin No. 2 is potentiometer anode.

  Pin No. 3 is potentiometer cathode.

  Pin No. 4 is motor cathode.

  Pin No. 5 is signal output 1.

Pin No. 5 is signal output 2.

2)Installation position: Electronic throttle valve: front end of intake manifold; accelerator: driver cockpit.

3)Working principle: The engine on time torque requirement was transferred from accelerator to ECU, and ECU sends impulse electronic signal to electronic throttle valve according to torque requirement information; the motor is running and drive throttle valve to its opening required degrees; this throttle valve can stay at one fixed position or change to another position upon required to meet the

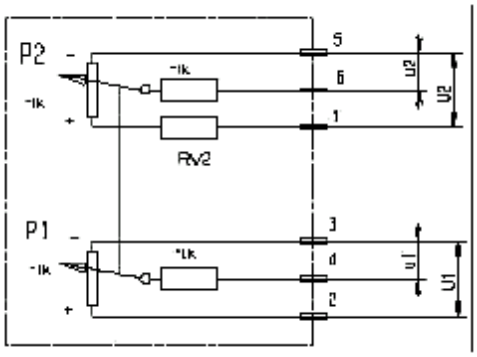


Chart 3-25 Circuit Diagram of Accelerator

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requirement of the engine working conditions according to the impulse signal frequency and width of impulse.

3.14 FAN CONTROL

ECU control the fan according to water temperature of the engine and the requirement signal and control the fan system delay at the fit conditions.

1) Conditions for fan running at low speed:

a) Engine coolant temperature between 96℃ to 102℃.

b) There is air conditioner requirement and the air conditioning compressor begins to work.

2) Conditions for fan running at high speed:

a) Engine coolant temperature sensor broken

b) Engine coolant temperature higher than 102℃.

3) Conditions of fan continue to work after the engine stops working

A) Engine air intake temperature sensor is broken and delay 60 seconds.

B) Engine coolant temperature sensor is broken and delay 60 seconds.

C) Engine coolant temperature higher than 100.5℃, high speed delay 60 seconds.

D) Temperature of intake air more than 70.5℃, delay 60 seconds.

4) Malfunction diagnose

Short circuits from high relay line to power supply

Short circuits from high-speed relay line to ground

Open circuits of high-speed relay line

Short circuits from low-speed relay to power supply

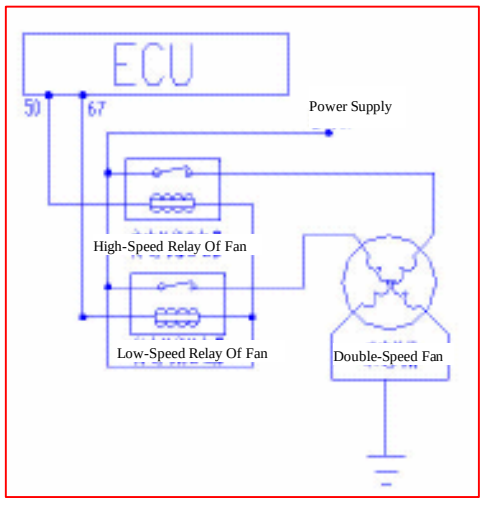


Chart 3-26 Fan control schematic

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Short circuits from low-speed relay line to ground

Open circuits of low-speed relay line

Engine coolant temperature sensor failure

Engine intake air temperature sensor failure

3.15 AIR CONDITIONER CONTROL

1)Working principle

Switch on the air conditioner and blower; air conditioner pressure is regular; evaporator temperature sensor inspect the right data; requirement signal of air conditioner is sending by these switches to ECU, and ECU controls air conditioning relay attracting and provide rotating speed signal to step motor and open the electronic fan and air conditioning chart to work.

2)Air conditioner control strategy

a) The air condition can be switched on after 5 seconds of the engine starts.

b) Cut off the air conditioner when temperature of intake air higher than 140.3℃.

c) Cut off air conditioner when the coolant temperature higher than 114.8℃; resume the air conditioning control after its lower than 11.8℃.

d) Cut off air conditioner when the engine speed is higher than 6520rpm or lower than 520rpm.

e) Cut off air conditioner when the pressure inside of air conditioner high pressure pipe is higher than 20bar and resume the control when the pressure is lower than 9.5bar.

f) Cut off air conditioner when the evaporator temperature is lower than 1.5℃; and resume the control when it is higher than 4.5℃.

g) Cut off air conditioner when the system pressure is lower than 8.04V; consume the control when it is higher than 10.01V.

3) Malfunction diagnosis

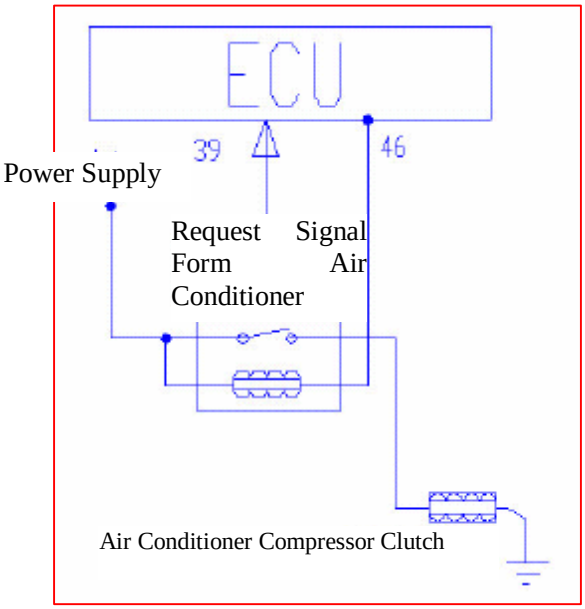


Chart 3-27 Air conditioner control schematic

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Blower circuit malfunction (fuse is burnt, relay circuit is open circuit or short circuit)

Irregular pressure of air conditioner (much higher of the high voltage or the much lower of the low voltage)

Malfunction of evaporator temperature sensor

Air conditioner relay circuit is failure (short circuit to ground, short circuit to power supply, open circuit).

4 ME7 SYSTEM TEST AND REPAIR ACCORDING TO TDC

Explanation:

1. When it is confirmed that malfunction is steady we can carry out the test and repair as below, otherwise this will cause wrong diagnosis.
2. There is multimeter mentioned below, it is referred to digital multimeter; prohibit to use finger multimeter check the EFI system.
3. Check and repair the vehicle with anti theft system please re-program the replaced ECU when there is the occasion of changing the ECU at “flow up steps”.
4. In this items when the TDC of P0171、P0172、P0335、P0336、P1651 existing, the engine trouble light will not light on.
5. If it shows much lower of the voltage in some circuit in DTC explanation, it refers to perhaps there is ground short circuit inside of this circuit; If it shows much higher of the voltage in some circuit in DTC explanation, it refers to perhaps there is power supply short circuit inside of this circuit; If it shows circuit failure in DTC explanation, it refers to perhaps there is open circuit or multi circuit malfunction inside of this circuit.

Diagnosis help: 1. DTC can not be deleted; it is steady failure; if it is occasional failure, check if it is because of the loosening of cable joint.

2. Check according to the above steps and find noting wrong;
3. During check and repair pay attention that the influence of vehicle maintenance, cylinder pressure and mechanical ignition timing to the system;
4. Change ECU and test it. If the DTC can be deleted, the malfunction is inside of ECU; if the DTC can not be deleted, change back to the original ECU and check it again according to above items.

4.1 ENGINE DTC (DIAGNOSTIC TROUBLE CODE) LIST

DTC	Definition	DTC	Definition

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P0107	Much lower voltage of the air intake pressure sensor	P0340	Phase sensor signal failure
P0108	Much higher voltage of the air intake pressure sensor	P0342	Much lower voltage of the phase sensor
P0112	Indicated temperature is much lower of the air intake temperature sensor	P0343	Much higher voltage of the phase sensor
P0113	Temperature is much higher indicated by the air intake temperature sensor	P0443	Canister control valve drive grade control circuit failure
P0117	Temperature is much lower indicated by engine coolant temperature sensor	P0444	Much lower voltage of canister control valve drive grade control circuit
P0118	Temperature is much higher indicated by engine coolant temperature sensor	P0445	Much higher voltage of canister control valve drive grade control circuit
P0122	The circuit voltage of throttle position sensor is much lower	P0480	Air conditioner condenser cooling fan relay control circuit failure
P0123	The circuit voltage of throttle position sensor is much higher	P0500	Unreasonable failure of speed signal
P0130	Unreasonable failure of the upstream oxygen sensor signal	P0506	Rotating speed of idle speed is lower than target idle speed
P0132	Much higher voltage of upstream oxygen sensor	P0507	Rotating speed of idle speed is higher than target idle speed
P0134	Signal failure of upstream oxygen sensor	P0508	Idle speed regulator control circuit voltage is too low
P0135	Heating circuit failure of upstream oxygen sensor	P0509	Idle speed regulator control circuit voltage is too high
P0171	Closed loop air fuel ratio control self adapting exceeds it maximum limit	P0511	Idle speed regulator control circuit failure
P0172	Closed loop air fuel ratio control self adapting exceeds it minimum limit	P0560	System voltage signal unreasonable
P0201	The 1st cylinder injector circuit failure	P0562	System voltage is too low
P0202	The 2nd cylinder injector circuit failure	P0563	System voltage is too high
P0203	The 3rd cylinder injector circuit failure	P0601	ECU testing code failure
P0204	The 4th cylinder injector circuit failure	P0602	ECU diagnosis data ID code failure
P0230	Fuel pump control circuit failure	P0645	Air conditioner compressor relay control circuit failure
P0325	Knock sensor circuit failure	P0646	Much lower voltage of air conditioner compressor relay control circuit
P0335	Crank shaft position sensor signal failure	P0647	Much higher voltage of air conditioner compressor relay control circuit
P0336	Crank shaft position sensor signal	P1651	Trouble light control circuit failure

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	unreasonable failure		

4.2 DIAGNOSIS FLOW WHEN THERE IS DIFFERENT DTC

P0107 Much lower voltage of the air intake pressure sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Observe "air intake pressure" item in data flow, if it is about 101kpa (specific data is correlated to that time air pressure).	Yes	To step No. 5
		No	Next steps
3	Take off the joint of cable air intake pressure sensor, check the voltage between pin No. 3 and pin No. 1 by multimeter and look if it is around 5V.	Yes	To step No. 5
		No	Next step
4	Check if it is short circuit to ground between ECU pin No. 17, No. 33, No. 37 and sensor connector No.1, No.3 and No. 4.	Yes	Repair or replace cable
		No	Next step
5	Start the engine at idle speed. Step on the accelerator slowly approach to open completely and observe the value changes of diagnostic tester "air intake pressure", the changes should be not big; step on the accelerator quickly to complete open, the displayed value should be reach up to 90kpa instantaneous.	Yes	Diagnosis help
		No	Replace the sensor

DTC: P0108 Much higher voltage of the air intake pressure sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Observe "air intake pressure" item in data flow, if it is about 101kpa(specific data is correlated to that time air pressure)	Yes	To step No. 5
		No	Next steps
3	Take off the joint of cable air intake pressure sensor, check the voltage between pin No. 3 and pin No. 1 by multimeter and look if it is around 5V.	Yes	To step No. 5
		No	Next step
4	Check if it is open circuit or short circuit to power supply between ECU pin No. 17, No. 33, No. 37 and sensor connector No.1, No.3 and No. 4.	Yes	Repair or replace cable
		No	Next step
5	Start the engine at idle speed. Step on the accelerator slowly approach to open completely and observe the value changes of diagnostic tester "air intake pressure", the changes should be not big; step on the accelerator quickly to complete open, the displayed value should be reach up to 90kpa instantaneous.	Yes	Diagnosis help
		No	Replace the sensor

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DTC P0112 Circuit voltage is much lower of the throttle position sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Observe "air intake temperature" item in data flow, if it is same temperature with air intake pipe(specific data is correlated to the engine temperature at that time) Notice: if the value is - 40℃ there is perhaps open circuit failure in the circuit.	Yes	To step No. 5
		No	Next step
3	Take off the joint of cable air intake temperature sensor, check the resistance values using multimeter between sensor connector No. 1 and No. 2 and check if it is corresponding to its temperature (please reference the related section of this service manual)	Yes	Next step
		No	Replace sensor
4	Take off the joint of cable air intake temperature sensor, check the voltage between pin No.1 and pin No.2 by multimeter and look if it is around 5V.	Yes	To step 5
		No	Next step
5	Check if it is open circuit or short circuit to power supply between ECU pin No. 17, No. 40 and sensor connector No.1, No.2	Yes	Repair or replace cable
		No	Next step
6	Start the engine at idle speed. Observe the value changes of diagnostic tester "air intake temperature", the value should increase with the increase of the engine intake air.	Yes	Diagnosis help
		No	Replace the sensor

DTC: P0113 Temperature is much higher indicated by the air intake temperature sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Observe "air intake temperature" item in data flow, if it is same temperature with air intake pipe(specific data is correlated to the engine temperature at that time) Notice: if the value always is - 40℃ there is perhaps open circuit failure in the circuit.	Yes	To step No. 5
		No	Next step
3	Take off the joint of cable air intake temperature sensor, check the resistance values using multimeter between sensor connector No. 1 and No. 2 and check if it is corresponding to its temperature (please reference the related section of this service manual).	Yes	Next step
		No	Replace sensor
4	Take off the joint of cable air intake temperature sensor, check the voltage between pin No.1 and pin No.2 by multimeter and look if it is around 5V.	Yes	To step 5
		No	Next step

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5	Check if it is short circuit to ground between ECU pin No. 17, No. 40 and sensor connector No.1, No.2	Yes	Repair or replace cable
		No	Next step
6	Start the engine at idle speed. Observe the value changes of diagnostic tester “air intake temperature”, the value should increase with the increase of the engine intake air.	Yes	Diagnosis help
		No	Replace the sensor

DTC: P0117 Temperature is much lower indicated by engine coolant temperature sensor.

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Observe “coolant temperature” item in data flow, if it is same temperature with engine temperature (specific data is correlated to the engine temperature at that time). Notice: if the value always is - 40℃ there is perhaps open circuit failure in the circuit.	Yes	To step 6
		No	Next
3	Take off the joint of coolant temperature sensor on the cable, check the resistance values using multimeter between sensor connector No. 1 and No. 2 and check if it is corresponding to its temperature (please reference the related section of this service manual).	Yes	Next step
		No	Replace sensor
4	Take off the joint of coolant temperature sensor on the cable, check the voltage between pin No.1 and pin No.2 by multimeter and observe if it is around 5V.	Yes	To step 6
		No	Next step
5	Check if it is open circuit or short circuit to power supply between ECU pin No.39, No. 35 and sensor connector No.1, No.2.	Yes	Repair or replace cable
		No	Next step
6	Start the engine at idle speed. Observe the value changes of diagnostic tester “coolant temperature”, the value should increase with the increase of the engine coolant temperature.	Yes	Diagnosis help
		No	Replace sensor

DTC: P0118 Temperature is much higher indicated by engine coolant temperature sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Observe “coolant temperature” item in data flow, if it is same temperature with engine temperature (specific data is correlated to the engine temperature	Yes	To step 6
		No	Next

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	at that time). Notice: if the value always is - 40℃ there is perhaps open circuit failure in the circuit.		
3	Take off the joint of coolant temperature sensor on the cable, check the resistance values using multimeter between the sensor connector No. 1 and the No. 2 and check if it is corresponding to its temperature (please reference the related section of this service manual).	Yes	Next step
		No	Replace sensor
4	Take off the joint of coolant temperature sensor on the cable, check the voltage between pin No.1 and pin No.2 by multimeter and observe if it is around 5V.	Yes	To step 6
		No	Next step
5	Check if it is short circuit to ground between ECU pin No.39, No. 35 and sensor connector No.1, No.2.	Yes	Repair or replace cable
		No	Next step
6	Start the engine at idle speed. Observe the value changes of diagnostic tester “coolant temperature”, the value should increase with the increase of the engine coolant temperature.	Yes	Diagnosis help
		No	Replace sensor

DTC: P0122 Indicated temperature is much lower of the air intake temperature sensor.

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Observe “throttle valve absolute opening” item in data flow, check the value if it is between 4% and 10% (specific data is correlated to the vehicle type).	Yes	Next step
		No	To step No. 5
3	Step on the accelerator slowly to complete opening and observe “throttle valve absolute opening” item in data flow, check if the value is increased to around 85-90% with the opening of the throttle valve (specific data is correlated to the vehicle type).	Yes	Next step
		No	To step No. 5
4	Repeat step 3 and observe “throttle valve absolute opening” item in data flow, and check if there is jump during the changes.	Yes	Replace the sensor
		No	Next step
5	Take off the joint of throttle valve positioning sensor on the cable, check if there is short circuit to ground between pin No.17, No.32, No.16 of ECU and pin No.1, No.2, No.3.	Yes	Repair or replace cable
		No	Next step
6	Check the voltage between pin No.1 and pin No.2 by multimeter and observe if it is around 5V.	Yes	Replace sensor
		No	Diagnosis help

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DTC: P0123 Circuit voltage is much higher of the throttle position sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Observe "throttle valve absolute opening" item in data flow, check the value if it is between 4% and 10% (specific data is correlated to the vehicle type).	Yes	Next step
		No	To step No. 5
3	Step on the accelerator slowly to complete opening and observe "throttle valve absolute opening" item in data flow, check if the value is increased to around 85-90% with the opening of the throttle valve (specific data is correlated to the vehicle type).	Yes	Next step
		No	To step No. 5
4	Repeat step 3 and observe "throttle valve absolute opening" item in data flow, and check if there is jump during the changes.	Yes	Replace the sensor
		No	Next step
5	Take off the joint of throttle valve positioning sensor on the cable, check if there is open circuit or short circuit to power supply between pin No.17, No.32, No.16 of ECU and pin No.1, No.2, No.3 of sensor	Yes	Repair or replace cable
		No	Next step
6	Check the voltage between pin No.1 and pin No.2 by multimeter and observe if it is around 5V.	Yes	Replace sensor
		No	Diagnosis help

DTC: P0130 Unreasonable failure of the upstream oxygen sensor signal

(Notice: below diagnosis process is fit for those without P0135 at the same time; if there is P0135 failure, please deal with P0135 failure at first and then check as below.)

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Start the engine and leave it at idle speed until its coolant reaches to the normal value. Observe the value changes of "oxygen sensor voltage" item on diagnostic meter, the displayed value should change rapidly from 100mV-900mV.	Yes	Diagnosis help
		No	Next step
3	Check if there is short circuit to ground between pin No.36, No.18, of ECU and pin A (opposite to oxygen sensor gray connecting line), B (opposite to oxygen sensor black connecting line).	Yes	Repair or change cable
		No	Next step

DTC: P0132 Much higher voltage of upstream oxygen sensor

(Notice: below diagnosis process is fit for those without P0135 at the same time; if there is P0135 failure, please deal with P0135 failure at first and then check as below.)

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No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Start the engine and leave it at idle speed until its coolant reaches to the normal value. Observe the value changes of “oxygen sensor voltage” item on diagnostic meter, the displayed value should change rapidly from 100mV-900mV.	Yes	Diagnosis help
		No	Next step
3	Check if there is short circuit to power supply between pin No.36, No.18, of ECU and pin A (opposite to oxygen sensor gray connecting line), B (opposite to oxygen sensor black connecting line).	Yes	Repair or change cable
		No	Diagnosis help
4	A, check if the exhaust system is jammed B, check if the injector is leaking C, check if the fuel pressure is over higher D, check if the valve clearance is over smaller etc.	Yes	Check and repair according to diagnosis
		No	Diagnosis help

DTC: P0134 Signal failure of upstream oxygen sensor

(Notice: below diagnosis process is fit for those without P0135 at the same time; if there is P0135 failure, please deal with P0135 failure at first and then check as below.)

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value. Observe the value changes of “oxygen sensor voltage” item on diagnostic meter, the displayed value should change rapidly from 100mV-900mV.	Yes	Diagnosis help
		No	Next step
3	Check if there is open circuit between pin No.36, No.18, of ECU and pin A (opposite to oxygen sensor gray connecting line), B (opposite to oxygen sensor black connecting line) of sensor joint.	Yes	Repair or change cable
		No	Diagnosis help

DTC: P0135 Heating circuit failure of upstream oxygen sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Take off the oxygen sensor joint on the cable and check the voltage between the pins of C (opposite to oxygen sensor white connecting line) and D (opposite to oxygen sensor white connecting line) by multimeter, and observe if it is about 12V.	Yes	Next step
		No	To step No.4
3	Check the resistance value between oxygen sensor	Yes	Next step

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	connectors C (white) and D (white) using multimeter, and observe if it is 2-5Ω when it is 20℃.	No	Change sensor
4	Check the fuse inside of oxygen sensor heating circuit and observe if it is blow.	Yes	Change fuse
			Next step
5	Check if there is open circuit or short circuit to power supply between ECU pin No.1, main relay sensor No.87 and pin C (opposite to oxygen sensor white connecting line), D (opposite to oxygen sensor white connecting line) of sensor joint.	Yes	Repair or change cable
		No	Diagnosis help

DTC: P0171 Closed loop air fuel ratio control self adapting exceeds it maximum limit

(Notice: below diagnosis flow is fit for when air intake pressure sensor failure, canister control valve failure and oxygen sensor failure are not appeared at the same time; if there are failures existing at the same time please deal with other failures at first and then do as below.)

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value. Observe the value changes of “oxygen sensor voltage” item on diagnostic meter, and the displayed value keeps around the value of 100mV at some working conditions.	Yes	Next step
		No	Diagnosis help
3	Connect the fuel pressure meter (connection position is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check the fuel pressure at idle speed conditions if it is around 260kpa; take off the vacuum pipe on fuel pressure regulator, check the pressure and observe if it is around 300kpa.	Yes	Repair or replace the cable
		No	Next step
4	Check if there is short circuit to ground between ECU pin No.36, No.18 and pin A (opposite to oxygen sensor gray connecting line), pin B (opposite to oxygen sensor black connecting line) of sensor joint.	Yes	Repair or replace cable
		No	Next step
5	A, check if there is a heavy leaking in air intake system B, check if the injector is jammed C, check if the clearance of spark plug is too big D, check if the sub live wire resistance is too big E, check if the valve clearance is too big etc.	Yes	Repair according to diagnosis data
		No	Diagnosis help

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DTC: P0172 Closed loop air fuel ratio control self adapting exceeds it minimum limit

(Notice: below diagnosis flow is fit for when air intake pressure sensor failure, canister control valve failure and oxygen sensor failure are not appeared at the same time; if there are failures existing at the same time please deal with other failures at first and then do as below.)

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value. Observe the value changes of "oxygen sensor voltage" item on diagnostic meter, and the displayed value keeps around the value of 900mV at some working conditions.	Yes	Next step
		No	Diagnosis help
3	Connect the fuel pressure meter (connection position is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check the fuel pressure at idle speed conditions if it is around 260kpa; take off the vacuum pipe on fuel pressure regulator, check the pressure and observe if it is around 300kpa.	Yes	Repair or replace the cable
		No	Check and repair fuel system
4	Check if there is short circuit to power supply between ECU pin No.36, No.18 and pin A (opposite to oxygen sensor gray connecting line), pin B (opposite to oxygen sensor black connecting line) of sensor joint.	Yes	Repair or replace cable
		No	Next step
5	A, check if the injector is leaking B, check if the exhaust pipe is jammed C, check if the valve clearance is too small etc.	Yes	Repair according to diagnosis data
		No	Diagnosis help

DTC: P0201 The 1st cylinder injector circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the 1st cylinder injector joint from the cable, check the voltage value between this joint pin No.1 and the power cathode by multimeter and observe if it is 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between the 1st injector joint pin No.1 and main relay.	Yes	Repair or replace the cable
		No	Next step
4	Check the resistance value by multimeter between 1st cylinder injector pin No.1 and No.2, and observe if it is 11-13Ω when it is 20℃.	Yes	Next step
		No	Change injector
5	Check the voltage value by multimeter between 1st cylinder injector pin No.2 and power supply cathode,	Yes	Repair according to diagnosis data

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	and observe if it is around 3.7V.	No	Diagnosis help
6	Check if there is open circuit or short circuit to ground between 1st cylinder injector joint pin No.2 and the ECU pin No.27.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0202 The 2nd cylinder injector circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the 2nd cylinder injector joint from the cable, check the voltage value between this joint pin No.1 and the power cathode by multimeter and observe if it is 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between the 2nd injector joint pin No.1 and main relay.	Yes	Repair or replace the cable
		No	Next step
4	Check the resistance value by multimeter between 2nd cylinder injector pin No.1 and No.2, and observe if it is 11-13Ω when it is 20℃.	Yes	Next
		No	Change injector
5	Check the voltage value by multimeter between 2nd cylinder injector pin No.2 and power supply cathode, and observe if it is around 3.7V.	Yes	Diagnosis help
		No	Next step
6	Check if there is open circuit or short circuit to ground between 2nd cylinder injector joint pin No.2 and the ECU pin No.6.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0203 The 3rd cylinder injector circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the 3rd cylinder injector joint from the cable, check the voltage value between this joint pin No.1 and the power cathode by multimeter and observe if it is 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between the 3rd injector joint pin No.1 and main relay.	Yes	Repair or replace the cable
		No	Next step
4	Check the resistance value by multimeter between 3rd cylinder injector pin No.1 and No.2, and observe if it is 11-13Ω when it is 20℃.	Yes	Next step
		No	Change injector
5	Check the voltage value by multimeter between 3rd cylinder injector pin No.2 and power supply cathode, and observe if it is around 3.7V.	Yes	Diagnosis help
		No	Next step
6	Check if there is open circuit or short circuit to ground	Yes	Repair or replace

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	between 3rd cylinder injector joint pin No.2 and the ECU pin No.7.		cable
		No	Diagnosis help

DTC: P0204 The 4th cylinder injector circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the 4th cylinder injector joint from the cable, check the voltage value between this joint pin No.1 and the power cathode by multimeter and observe if it is 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between the 4th injector joint pin No.1 and main relay.	Yes	Repair or replace the cable
		No	Next step
4	Check the resistance value by multimeter between 4th cylinder injector pin No.1 and No.2, and observe if it is 11-13Ω when it is 20℃.	Yes	Next step
		No	Replace injector
5	Check the voltage value by multimeter between 4th cylinder injector pin No.2 and power supply cathode, and observe if it is around 3.7V.	Yes	Diagnosis help
		No	Next step
6	Check if there is open circuit or short circuit to ground between 4th cylinder injector joint pin No.2 and the ECU pin No.47.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0230 Fuel pump control circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF"		Next step
2	Take off the fuel pump relay and put ignition switch to "ON"; check the voltage separately between fuel pump relay power supply ends - that is relay pin No. 30 and No.86 and power supply cathode, and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the relay power supply ends circuit.	Yes	Repair or replace the cable
		No	To step No.2
4	Check the voltage by multimeter between fuel pump relay control ends that is relay pin No. 85 and power supply cathode and observe if it is around 3.7V.	Yes	Replace fuel pump relay
		No	Next step
5	Check if there is open circuit or short circuit to ground or to power supply between relay control ends that is relay pin No.85 and ECU pin No.69.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0325 Knock sensor circuit failure

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No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”		Next step
2	Take off the knock sensor joint from the cable; check the resistance value by multimeter between knock sensor connector No.1and No.2 and observe if it is 1MΩ.	Yes	Next step
		No	Change sensor
3	Check if there is open circuit or short circuit to ground or to power supply between circuit of knock sensor joint No.1, No.2 and ECU pin No.19, No. 20	Yes	Repair or replace the cable
		No	To step No.2
4	Replace the knock sensor according to the regulation; try running the vehicle and make the engine speed exceed 2200rpm. Check if the DTC P0325 will appear again.	Yes	Diagnosis help
		No	Check if it is a occasional fault

DTC: P0335 Crank shaft position sensor signal failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”		Next step
2	Take off the speed sensor joint from the cable; check the resistance value by multimeter between speed sensor connector No.2and No.3 and observe if it is around 770-950MΩwhen it is 20℃	Yes	Next step
		No	Replace sensor
3	Check if there is open circuit or short circuit to ground or to power supply between circuit of speed sensor joint No.2, No.3 and ECU pin No.34, No. 15	Yes	Repair or replace the cable
		No	Next step
4	Check the flywheel signal disc if it is in good conditions.	Yes	Diagnosis help
		No	Replace signal disc

DTC: P0336 Crank shaft position sensor signal unreasonable failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”		Next step
2	Take off the speed sensor joint from the cable; check the resistance value by multimeter between speed sensor connector No.2and No.3 and observe if it is around 770-950MΩwhen it is 20℃	Yes	Next step
		No	Replace sensor
3	Check if there is open circuit or short circuit to ground or to power supply between circuit of speed sensor joint pin No.2, No.3 and ECU pin No.34, No. 15	Yes	Repair or replace the cable
		No	Next step
4	Check the flywheel signal disc if it is in good conditions.	Yes	Diagnosis help
		No	Replace signal disc

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DTC: P0340 Phase sensor signal failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”		Next step
2	Take off the phase sensor joint from the cable; check the voltage value by multimeter between phase sensor joint pin No.3 and No.1; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between circuit of phase sensor joint pin No.3 and main relay pin No.87; check if there is bad contact of phase sensor connector No.1.	Yes	Repair or replace the cable
		No	Next step
4	Check the voltage if it is around 9.9V between phase sensor joint pin No.2 and power supply cathode.	Yes	To step 6
		No	Next step
5	Check if there is open circuit or short circuit to power supply or to ground between phase sensor joint pin No.2 and ECU pin No.79.	Yes	Repair or replace cable
		No	Next step
6	Check the camshaft signal disc if it is in good conditions.	Yes	Diagnosis help
		No	Replace signal disc

DTC: P0342 Much lower voltage of the phase sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”		Next step
2	Take off the phase sensor joint from the cable; check the voltage value by multimeter between phase sensor joint pin No.3 and No.1; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between circuit of phase sensor joint pin No.3 and main relay pin No.87; check if there is bad contact of phase sensor connector No.1.	Yes	Repair or replace the cable
		No	Next step
4	Check the voltage if it is around 9.9V between phase sensor joint pin No.2 and power supply cathode.	Yes	To step 6
		No	Next step
5	Check if there is open circuit or short circuit to power supply or to ground between the circuit of phase sensor joint pin No.2 and ECU pin No.79.	Yes	Repair or replace cable
		No	Next step
6	Check the camshaft signal disc if it is in good conditions.	Yes	Diagnosis help
		No	Replace signal disc

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DTC: P0343 Much higher voltage of the phase sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”		Next step
2	Take off the phase sensor joint from the cable; check the voltage value by multimeter between phase sensor joint pin No.3 and No.1; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between circuit of phase sensor joint pin No.3 and main relay pin No.87; check if there is bad contact of phase sensor connector No.1.	Yes	Repair or replace the cable
		No	Next step
4	Check the voltage if it is around 9.9V between phase sensor joint pin No.2 and power supply cathode.	Yes	To step 6
		No	Next step
5	Check if there is open circuit or short circuit to power supply or to ground between the circuit of phase sensor joint pin No.2 and ECU pin No.79.	Yes	Repair or replace cable
		No	Next step
6	Check the camshaft signal disc if it is in good conditions.	Yes	Diagnosis help
		No	Replace signal disc

DTC: P0443 Canister control valve drive grade control circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”		Next step
2	Take off the canister control valve joint from the cable; check the voltage value by multimeter between this joint pin No.1 and power supply cathode; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the canister control valve power supply ends circuit.	Yes	Repair or replace the cable
		No	To step No.2
4	Check the resistance value if it is around 22-30Ωwhen it is 20℃ between canister control valve pin No.1 and pin No.2.	Yes	Next step
		No	Replace the valve
5	Check the voltage if it is around 3.7V between canister control valve joint pin No.1 and power supply cathode.	Yes	Diagnosis help
		No	Next step
6	Check if there is open circuit between the circuit of canister joint pin No.2 and ECU pin No. 46.	Yes	Repair or replace cable
		No	Diagnosis help

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DTC: P0444 Much lower voltage of canister control valve drive grade control circuit

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the canister control valve joint from the cable; check the voltage value by multimeter between this joint pin No.1 and power supply cathode; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the canister control valve power supply ends circuit.	Yes	Repair or replace the cable
		No	To step No.2
4	Check the resistance value if it is around 22-30Ω when it is 20℃ between canister control valve pin No.1 and pin No.2.	Yes	Next step
		No	Replace the valve
5	Check the voltage by the multimeter if it is around 3.7V between canister control valve joint pin No.1 and power supply cathode.	Yes	Diagnosis help
		No	Next step
6	Check if there is short circuit to ground between the circuit of canister joint pin No.2 and ECU pin No. 46.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0445 Much higher voltage of canister control valve drives grade control circuit

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the canister control valve joint from the cable; check the voltage value by multimeter between this joint pin No.1 and power supply cathode; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the canister control valve power supply ends circuit.	Yes	Repair or replace the cable
		No	To step No.2
4	Check the resistance value if it is around 22-30Ωwhen it is 20℃ between canister control valve pin No.1 and pin No.2.	Yes	Next step
		No	Replace the valve
5	Check the voltage by the multimeter if it is around 3.7V between canister control valve joint pin No.1 and power supply cathode.	Yes	Diagnosis help
		No	Next step
6	Check if there is short circuit to power supply between the circuit of canister joint pin No.2 and ECU pin No. 46.	Yes	Repair or replace cable
		No	Diagnosis help

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DTC: P0480 Air conditioner condenser cooling fan relay control circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”		Next step
2	Take off the air conditioner condenser cooling fan relay; put the ignition switch to “ON” position, and check the voltage value by multimeter between this relay power supply end that is relay pin No.30, No.85 and power supply cathode if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the air conditioner cooling fan relay power supply end circuit.	Yes	Repair or replace the cable
		No	To step No.2
4	Check the voltage by the multimeter if it is around 3.7V between air conditioner condenser cooling fan relay control ends that is relay pin No.86 and power supply cathode.	Yes	Replace relay
		No	Next step
5	Check if there is open circuit or short circuit to power supply or to ground between the circuit of relay control end pin No.86 and ECU pin No. 50.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0500 Unreasonable failure of speed signal

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”.		Next step
2	If it is a vehicle with ABS, please check if there is ABS DTC.	Yes	Check and repair ABS system
		No	Next step
3	Check if the speedometer finger works normally.	Yes	Next step
		No	Check the speedometer line
4	Check if the speed sensor works normally.	Yes	Next step
		No	Replace speed sensor
5	Check if there is open circuit or short circuit to power supply or to ground between the circuit of speed sensor and ECU pin No. 59.	Yes	Repair or replace cable
		No	Diagnosis help

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DTC: P0506 Rotating speed of idle speed is lower than target idle speed

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”.		Next step
2	Check if the throttle valve adjusting screw, accelerator cable and throttle valve working in good conditions.	Yes	Next step
		No	Carry out the necessary repair and maintenance
3	Check if the idle speed regulator works in good conditions.	Yes	Next step
		No	Carry out the necessary repair and maintenance
4	E, check if the pressure of the fuel supplying system is too low F, check if the injector is jammed G, check if the exhaust system is not straightway	Yes	Next step
		No	Replace speed sensor

DTC: P0507 Rotating speed of idle speed is higher than target idle speed

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”		Next step
2	Check if the throttle valve adjusting screw, accelerator cable and throttle valve working in good conditions.	Yes	Next step
		No	Carry out the necessary repair and maintenance
3	Check if the idle speed regulator works in good conditions.	Yes	Next step
		No	Carry out the necessary repair and maintenance
4	A, check if the system is leaking; B, check if the injector is leaking; C, check if the pressure of fuel supplying system is too high	Yes	Carry out the necessary repair and maintenance
		No	Diagnosis help

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DTC: P0508 Idle speed regulator control circuit voltage is too low

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Take off the idle regulator joint and Check the resistance value between idle speed regulator pin A and pin D, pin B and pin C if it is around 53±5.3Ω when it is 20℃.	Yes	Next step
		No	Replace step motor
3	Check if there is short circuit to ground between the circuits of idle speed regulator joint pin A, B, C, D and ECU pin No. 65, No.66, No.67. No.64.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0509 Idle speed regulator control circuit voltage is too high

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Take off the idle regulator joint and check the resistance value by multimeter separately between idle speed regulator pin A and pin D, pin B and pin C if it is around 53±5.3Ω when it is 20℃.	Yes	Next step
		No	Replace step motor
3	Check using multimeter separately if there is short circuit to power supply between the circuits of idle speed regulator joint pin A, B, C, D and ECU pin No. 65, No.66, No.67. No.64.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0511 Idle speed regulator control circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Take off the idle regulator joint and check the resistance value by multimeter separately between idle speed regulator pin A and pin D, pin B and pin C if it is around 53±5.3Ω when it is 20℃.	Yes	Next step
		No	Replace step motor
3	Check using multimeter separately if there is open circuit between the circuits of idle speed regulator joint pin A, B, C, D and ECU pin No. 65, No.66, No.67. No.64.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0560 System voltage signal unreasonable

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”.		Next step
2	Check the accumulator voltage by multimeter if it is around 12V.	Yes	Next step
		No	Replace accumulator

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3	Check if there is open circuit or short circuit to ground between the circuits of ECU pin No.44, No.45, No.63 and main relay pin No.87.	Yes	Repair or replace cable
		No	Next step
4	Start the engine and check if the entire generator recharging voltage is around 9-16V at the different engine speed.	Yes	Next step
		No	Replace generator
5	Check the engine cable harness contact position if it is in good conditions.	Yes	Diagnosis help
		No	Repair or replace cable

DTC: P0562 System voltage is too low

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”.		Next step
2	Check the accumulator voltage by the multimeter and observe if it is around 12V.	Yes	Next step
		No	Replace accumulator
3	Check if the resistance is over big between the circuits of ECU pin No.44, No.45, No.63 and main relay pin No.87.	Yes	Repair or replace cable
		No	Next step
4	Start the engine and check if the entire generator recharging voltage is around 9-16V at the different engine speed.	Yes	Next step
		No	Replace generator
5	Check the engine cable harness contact position if it is in good conditions.	Yes	Diagnosis help
		No	Repair or replace cable

DTC: P0563 System voltage is too high

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”.		Next step
2	Check the accumulator voltage by the multimeter and observe if it is around 12V.	Yes	Next step
		No	Replace accumulator
3	Start the engine and check if the entire generator recharging voltage is around 9-16V at the different engine speed.	Yes	Next step
		No	Replace generator
4	Check the engine cable harness contact position if it is in good conditions.	Yes	Diagnosis help
		No	Repair or replace cable

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DTC: P0601 ECU testing code failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Clean up the DTC and check the failure once again if it is a steady failure.	Yes	Next step
		No	System if correct
3	Replace ECU	Finish	

DTC: P0602 ECU diagnosis data ID code failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Clean up the DTC and check the failure once again if it is a steady failure.	Yes	Next step
		No	System if correct
3	Replace ECU	Finish	

DTC: P0645 Air conditioner compressor relay control circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”.		Next step
2	Take off air conditioner compressor relay; put ignition switch to “ON”; check the voltage value between relay power supply ends that relay pin No.30, No.85 and power cathode and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the relay power supplying ends circuit.	Yes	Repair or replace cable
		No	To step No.2
4	Check the voltage value by the multimeter between air conditioner compressor relay control ends that is relay pin No.86 and power cathode and observe if it is around 3.7V.	Yes	Replace relay
		No	Next step
5	Check if there is open circuit between the circuit of air conditioner compressor relay control ends that is relay pin No.86 and ECU pin No.70.	Yes	Repair or replace cable
		No	Diagnosis help

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DTC: P0646 Much lower voltage of air conditioner compressor relay control circuit

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”.		Next step
2	Take off air conditioner compressor relay; put ignition switch to “ON”; check the voltage value between relay power supply ends that relay pin No.30, No.85 and power cathode and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the relay power supplying ends circuit.	Yes	Repair or replace cable
		No	To step No.2
4	Check the voltage value by the multimeter between air conditioner compressor relay control ends that is relay pin No.86 and power cathode and observe if it is around 3.7V.	Yes	Replace relay
		No	Next step
5	Check if there is short circuit to ground between the circuit of air conditioner compressor relay control ends that is relay pin No.86 and ECU pin No.70.	Yes	Repair or replace cable
		No	Diagnosis help

DTC: P0647 Much higher voltage of air conditioner compressor relay control circuit

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”.		Next step
2	Take off air conditioner compressor relay; put ignition switch to “ON”; check the voltage value between relay power supply ends that relay pin No.30, No.85 and power cathode and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the relay power supplying ends circuit.	Yes	Repair or replace cable
		No	To step No.2
4	Check the voltage value by the multimeter between air conditioner compressor relay control ends that is relay pin No.86 and power cathode and observe if it is around 3.7V.	Yes	Replace relay
		No	Next step
5	Check if there is short circuit to power supply between the circuit of air conditioner compressor relay control ends that is relay pin No.86 and ECU pin No.70.	Yes	Repair or replace cable
		No	Diagnosis help

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DTC: P1651 Trouble light control circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Carry out action test to engine trouble light by using diagnostic meter "actuator action test" item; and observe the indicator if it is always at the status of extinguishing or lighting on.	Yes	Next step
		No	System is correct
3	Check if there is open circuit or short circuit to ground of the engine trouble light power supplying circuit.	Yes	Repair or replace cable
		No	Next step
4	Check if there is open circuit or short circuit to power supply or short circuit to ground between the circuit of engine trouble light control ends and ECU pin No. 28.	Yes	Repair or replace cable
		No	Diagnosis help

5. TYPICAL FAILURE AND ITS DIAGNOSIS FLOW

5.1 EXPLANATION

Carry out the primary inspection before start the diagnosing according to the engine failure phenomenon.

1) Make sure the engine trouble light is working properly;

2) Make sure that there is no failure information record checked by diagnostic meter;

3) Make sure that the failure phenomenon exists according to the customers' complaints, and confirm the conditions causing the failure.

Then carry out the exterior inspection:

（1） Check if there is any fuel pipe is leaking;

（2） Check if the vacuum pipe is broken, kinked up or linked correctly;

（3） Check if the air intake pipe is jammed, leaking, staved or damaged;

（4） Check the high voltage line of ignition system if it is broken or aging and if the ignition order is correct;

（5） Check the cable grounding place if it is clean and fastness;

（6） Check the sensor and actuator joint if it is loosening or bad contact.

Important notice: if the above phenomenon is appeared, you should repair the above the failure at first otherwise it will influence the later service.

Diagnosis help:1 Confirm there is no engine failure record;

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2 Confirm that the failure exists before the customer complaints;

3 Inspect the engine according to the above steps and find nothing wrong;

4 During the service please do not ignore the influence from vehicle maintenance, cylinder pressure, mechanical ignition timing and fuel conditions;

5 Replace ECU and carry out test. If the failure is deleted, the failure is in ECU; if the failure can not be deleted, replace back to the original ECU and repeat the flow and check and repair it again.

5.2 TYPICAL FAILURE DIAGNOSIS FLOW

1. The engine does not rotate or rotate slowly when it is started

The normal failure component: 1) accumulator; 2) starting motor; 3) cable or ignition switch; 4) mechanical part of the engine.

The general diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check the voltage value between the two wiring terminals of the accumulator by multimeter; check if it is around 8-12V when the engine is starting.	Yes	Next step
		No	Replace accumulator
2	Put the ignition switch at start position, checking the anode terminal of starting motor by multimeter and observe the voltage if it is above 8V.	Yes	Next step
		No	Repair or replace cable
3	Disassemble the starting motor and check its working conditions. Check if there is open circuit or jammed by poor lubricating.	Yes	Repair or replace starting motor
		No	Next step
4	If the failure is happened in winter time, check if it is because of the wrong engine lubricant and gearbox oil causes the big resistance of the starting motor.	Yes	Change to correct lubricant
		No	Next step
5	Check the mechanical resistance inside of the engine if it is too big causes the starting motor can not rotate or rotate slowly.	Yes	Repair the engine inside resistance
		No	Repeat the above steps

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2. The engine can draw rotating but can not start successfully when it is started.

General failure component: 1) no fuel in fuel tank; 2) fuel pump; 3) speed sensor; 4) ignition coil; 5) engine mechanical part.

Diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Connect the fuel pressure meter (connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); starting the engine by starter and check fuel pressure if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
2	Connect EFI diagnostic meter; observe “engine speed” data item and start the engine and check if there is rotation speed signal is output.	Yes	Next step
		No	Repair the sensor cable
3	Pull off one of the cylinder separating line and take off this cylinder injector joint and connect spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine by starter and check if there is blue and white high pressure fire.	Yes	Next step
		No	Repair the ignition system
4	Check the pressure of each engine cylinder; check if there is engine cylinder insufficient pressure.	Yes	Eliminate engine mechanical failure
		No	Next step
5	Check if the power supply to ECU pin No.12, 13, 44, 45, 63 is correct; check if the pin armature of No. 3, 51, 53, 61, 80 are working correctly.	Yes	Diagnosis help
		No	Check the corresponding line

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3. It is hard to start the heating car.

General failure component: 1) water inside of fuel; 2) fuel pump; 3) coolant temperature sensor; 4) fuel pressure regulator vacuum pipe; 5) ignition coil.

General diagnostic flow

No.	Operating steps	Result	Follow up steps
1	Connect the fuel pressure meter (connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); starting the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
2	Pull off one of the cylinder separating line and connect spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine and check if there is blue and white high pressure fire.	Yes	Next step
		No	Repair the ignition system
3	Take off the coolant temperature sensor joint and start the engine; observe if the engine can be started successfully. (or serial connecting a 300Ωresistance at the joint of coolant temperature sensor; observe if we can start the engine)	Yes	Repair circuit or replace sensor
		No	Next step
4	Check if there if loosen or leaking of the fuel pressure regulator vacuum pipe..	Yes	Repair or replace
		No	Next step
5	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Diagnosis help
6	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
			Check correspond circuit

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4. It's hard to start the cold car.

General failure component: 1), water in the fuel; 2), fuel pump; 3), coolant temperature sensor; 4), injector; 5), ignition coil; 6), throttle valve and idle speed by pass port; 7), engine mechanical part.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Connect the fuel pressure meter (connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
2	Pull off one of the cylinder separating line and connect spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine and check if there is blue and white high pressure fire.	Yes	Next step
		No	Check and repair ignition system
3	Take off the coolant temperature sensor joint and start the engine; observe if the engine can be started successfully. (or serial connecting a 2500Ωresistance at the joint of coolant temperature sensor; observe if we can start the engine)	Yes	Repair circuit or replace sensor
		No	Next step
4	Step on the accelerator slightly and observe if it is easy to be started	Yes	Clean throttle valve and idle speed air port
		No	Next step
5	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Yes	Replace the part
		No	Next step
6	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Next step
7	Check pressure conditions of every cylinder and observe if there is insufficient pressure	Yes	Trouble shoot
		No	Next step
8	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Check correspond circuit

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5. Normal engine speed but hard to start at any time.

General failure component: 1), water in fuel; 2), fuel pump; 3), coolant temperature sensor; 4), injector; 5), ignition coil; 6), throttle valve and idle speed by pass port; 7), air intake port; 8), ignition timing; 9), spark plug; 10), engine mechanical part.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed; check the air intake port if it is leaking.	Yes	Repair the air intake system
		No	Next step
2	Connect the fuel pressure meter (connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
3	Pull off one of the cylinder separating line and connect spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine and check if there is blue and white high pressure fire.	Yes	Next step
		No	Check and repair ignition system
4	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
5	Take off the coolant temperature sensor joint and start the engine; observe if the engine can be started successfully.	Yes	Repair circuit or replace sensor
		No	Next step
6	Step on the accelerator slightly and observe if it is easy to be started easily.	Yes	Clean throttle valve and idle speed air port
		No	Next step
7	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Yes	Replace the part
		No	Next step
8	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Next step
9	Check pressure conditions of every cylinder and observe if there is insufficient pressure	Yes	Trouble shoot
		No	Next step
10	Check the engine ignition order and ignition timing if it is accord with the regulation.	Yes	Next step
		No	Repair the ignition timing

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6. Regular starts but the idle speed is not steady at any time.

General failure component: 1), water in fuel; 2), injector; 3), spark plug; 4), throttle valve and idle speed by pass port; 5), air intake port; 6), idle speed regulator; 7), ignition timing; 8), spark plug; 9), engine mechanical.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed; check the air intake port if it is leaking.	Yes	Repair the air intake system
		No	Next step
2	Check idle speed regulator if it is partial blocked	Yes	Clean or replace
		No	Next step
3	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
4	Check the throttle valve and idle speed by pass if there is carbon deposition.	Yes	Cleaning
		No	Next step
5	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Yes	Replace part
		No	Next step
6	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Next step
7	Check pressure conditions of every cylinder and observe if there is big pressure difference between the cylinders.	Yes	Trouble shoot
		No	Next step
8	Check the engine ignition order and ignition timing if it is accord with the regulation.	Yes	Next step
		No	Repair the ignition timing
9	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

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7. Regular starts but the idle speed is not steady during engine heating.

General failure component: 1), water in fuel; 2), coolant temperature sensor; 3), spark plug; 4), throttle valve and idle speed by pass port; 5), air intake port; 6), idle speed regulator; 7), engine mechanical.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed; check the air intake port if it is leaking.	Yes	Repair the air intake system
		No	Next step
2	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
3	Disassemble the idle speed regulator and check the throttle valve and idle speed by pass port if there is carbon deposition	Yes	Cleaning the related parts
		No	Next step
4	Pull off coolant temperature sensor joint and start the engine; observe the engine if it is idle speed unsteady during warming up the engine.	Yes	Repair the line or replace sensor
		No	Next step
5	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed or overflowing.	Yes	Replace part
		No	Next step
6	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Next step
7	Check pressure conditions of every cylinder and observe if there is big pressure difference between the cylinders.	Yes	Trouble shoot
		No	Next step
8	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

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8. Regular starts but idle speed is not steady after the engine heating.

General failure component: 1), water in fuel; 2), coolant temperature sensor; 3), spark plug; 4),throttle valve and idle by pass port; 5), air intake port; 6), idle speed regulator; 7), engine mechanical part.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed; check the air intake port if it is leaking.	Yes	Repair the air intake system
		No	Next step
2	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
3	Disassemble the idle speed regulator and check the throttle valve and idle speed by pass port if there is carbon deposition	Yes	Cleaning the related parts
		No	Next step
4	Pull off coolant temperature sensor joint and start the engine; observe the engine if it is idle speed unsteady during warming up the engine.	Yes	Repair the line or replace sensor
		No	Next step
5	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed or overflowing.	Yes	Replace part
		No	Next step
6	Check fuel conditions and check if the failure is appeared just after the fuel refilling	Yes	Change fuel
		No	Next step
7	Check pressure conditions of every cylinder and observe if there is big pressure difference between the cylinders.	Yes	Trouble shoot
		No	Next step
8	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

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9. Regular starts but idle speed is not steady or dying out when there is partial loading.

General failure component: 1) air conditioner system; 2) idle speed regulator; 3) injector.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Disassemble the idle speed regulator and check the throttle valve and idle speed by pass port if there is carbon deposition.	Yes	Cleaning the related parts
		No	Next step
2	Observe if the engine output power increased when the air conditioner is switched on, that is using EFI system diagnosis meter observing ignition angle of advance, fuel injection pulse width and changes of air intake flow.	Yes	To step No.4
		No	Next step
3	Connect EFI system adaptor; break connecting line of ECU pin No.75; check the cable end if it is up level signal when the air conditioner is switched on.	Yes	Next step
		No	Repair air conditioning system
4	Check air conditioning system pressure; check the compressor solenoid clutch and air conditioner compressor pump fuel conditions and check if it is working correctly.	Yes	Next step
		No	Repair the air conditioning sys.
5	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed or overflowing.	Yes	Replace fault part
		No	Next step
6	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

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10. Regular starts with high idle speed.

General failure component: 1) throttle valve and idle speed by pass port; 2) vacuum pipe; 3) idle speed regulator; 4) coolant temperature sensor; 5) ignition timing.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check accelerator cable if it is blocked or over tightening	Yes	Adjust
		No	Next step
2	Check the air intake system and its connecting vacuum pipe if it is leaking.	Yes	Repair the air in taking system
		No	Next step
3	Disassemble the idle speed regulator and check the throttle valve and idle speed by pass port if there is carbon deposition	Yes	Clean related part
		No	Next step
4	Take off the coolant temperature sensor joint; start the engine and observe if it has high idle speed.	Yes	Repair line or replace sensor
		No	Next step
5	Check the engine ignition timing if it is accord with the regulations.	Yes	Next step
		No	Repair the ignition timing
6	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

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11. Low engine speed or dying out exists when it is accelerated.

General failure component: 1) water in fuel; 2) air intake pressure sensor and throttle position sensor; 3) spark plug; 4) throttle valve and idle speed by pass port; 5) air intake port; 6) idle speed regulator; 7) injector; 8) ignition timing; 9) exhaust pipe.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed.	Yes	Repair the air intake system
		No	Next step
2	Connect the fuel pressure meter (connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
3	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
4	Disassemble idle speed regulator and check throttle valve, idle speed regulator and idle speed by pass port if there is carbon deposition.	Yes	Clean related part
		No	Next step
5	Inspect air intake pressure sensor, throttle position sensor and its line if it is working correctly.	Yes	Next step
		No	Repair line or replace sensor
6	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Yes	Replace fault part
		No	Next step
7	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Replace fuel
		No	Next step
8	Check the engine ignition order and ignition timing if it is accord with the regulation.	Yes	Next step
		No	Repair ignition timing
9	Check the exhaust pipe if the air exhausting is smooth	Yes	Next step
		No	Repair or replace exhaust pipe
10	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair corresponding line

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12. React slowly when it is accelerated.

General failure component: 1) water in fuel; 2) air intake pressure sensor and throttle position sensor; 3) spark plug; 4) throttle valve and idle speed by pass port; 5) air intake port; 6) idle speed regulator; 7) injector; 8) ignition timing; 9) exhaust pipe.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed.	Yes	Repair the air intake system
		No	Next step
2	Connect the fuel pressure meter (connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
3	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
4	Disassemble idle speed regulator and check throttle valve, idle speed regulator and idle speed by pass port if there is carbon deposition.	Yes	Clean related part
		No	Next step
5	Inspect air intake pressure sensor, throttle position sensor and its line if it is working correctly.	Yes	Next step
		No	Repair line or replace sensor
6	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Yes	Replace fault part
		No	Next step
7	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Replace fuel
		No	Next step
8	Check the engine ignition order and ignition timing if it is accord with the regulation.	Yes	Next step
		No	Repair ignition timing
9	Check the exhaust pipe if the air exhausting is smooth	Yes	Next step
		No	Repair or replace exhaust pipe
10	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair corresponding line

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13. The performance is poor when it is accelerated.

General failure component:1) water in fuel; 2) air intake pressure sensor and throttle position sensor; 3) spark plug; 4) ignition coil; 5) throttle valve and idle speed by pass port; 6) air intake port;7) idle speed regulator; 8) injector; 9) ignition timing; 10) exhaust pipe.

General diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check if there are failures like clutch skidding, low tyre pressure, brake dragging, wrong tyre size, and wrong four wheel positioning etc..	Yes	Repair
			Next step
2	Check the air cleaner if it is jammed.	Yes	Repair the air intake system
		No	Next step
3	Connect the fuel pressure meter (connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
4	Pull off one of the cylinder separating line and connect spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine and check the high pressure fire strength if it is regular.	Yes	Next step
		No	Repair ignition system
5	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
6	Disassemble idle speed regulator and check throttle valve, idle speed regulator and idle speed by pass port if there is carbon deposition.	Yes	Clean related part
		No	Next step
7	Inspect air intake pressure sensor, throttle position sensor and its line if it is working correctly.	Yes	Next step
		No	Repair line or replace sensor
8	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Yes	Replace fault part
		No	Next step
9	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Replace fuel
		No	Next step
10	Check the engine ignition order and ignition timing if it is accord with the regulation.	Yes	Next step
		No	Repair ignition timing

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11	Check the exhaust pipe if the air exhausting is smooth	Yes	Next step
		No	Repair or replace exhaust pipe
12	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair corresponding line

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QR519 TRANSMISSION SERVICE MANUAL

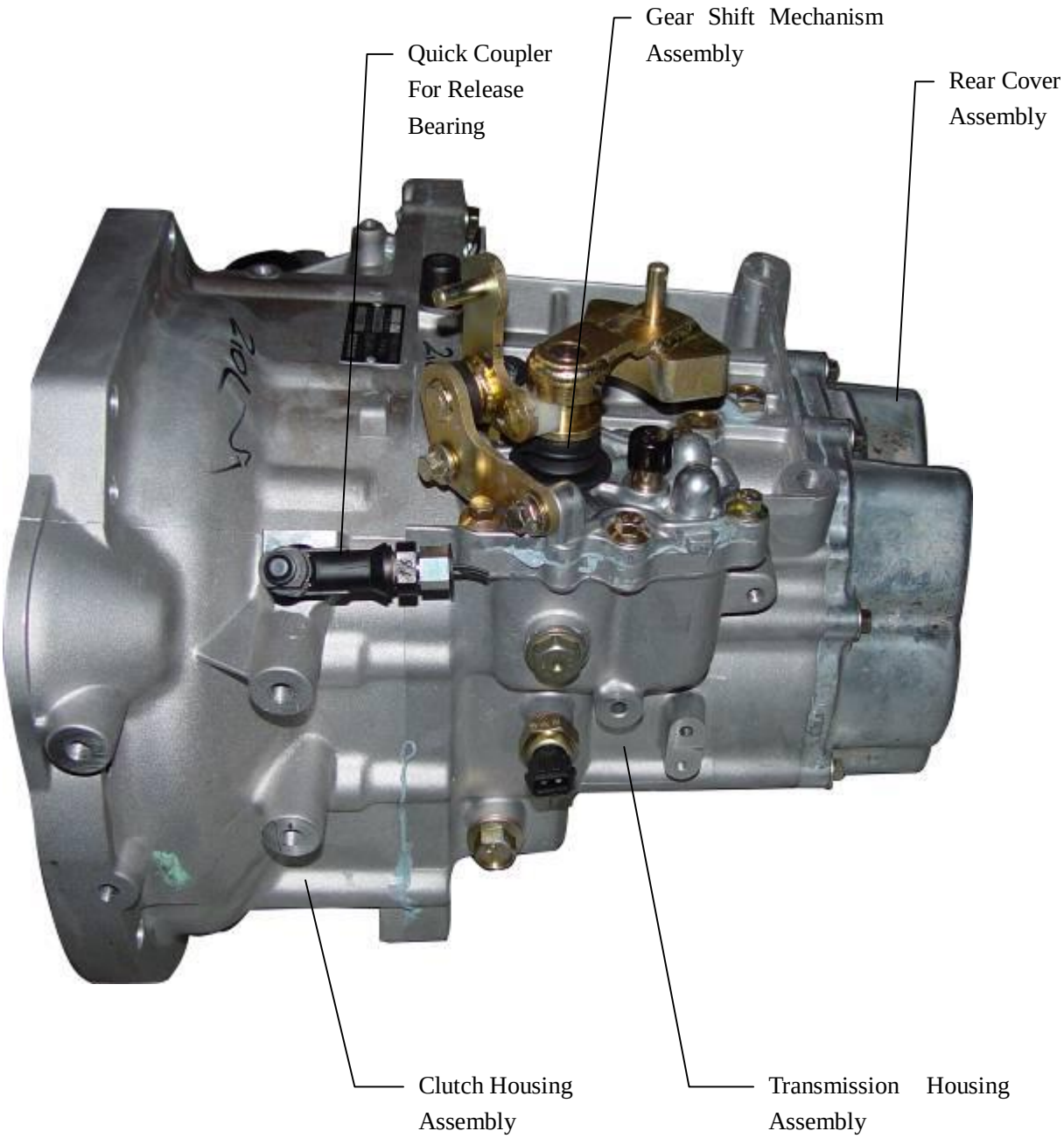
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CONTENTS

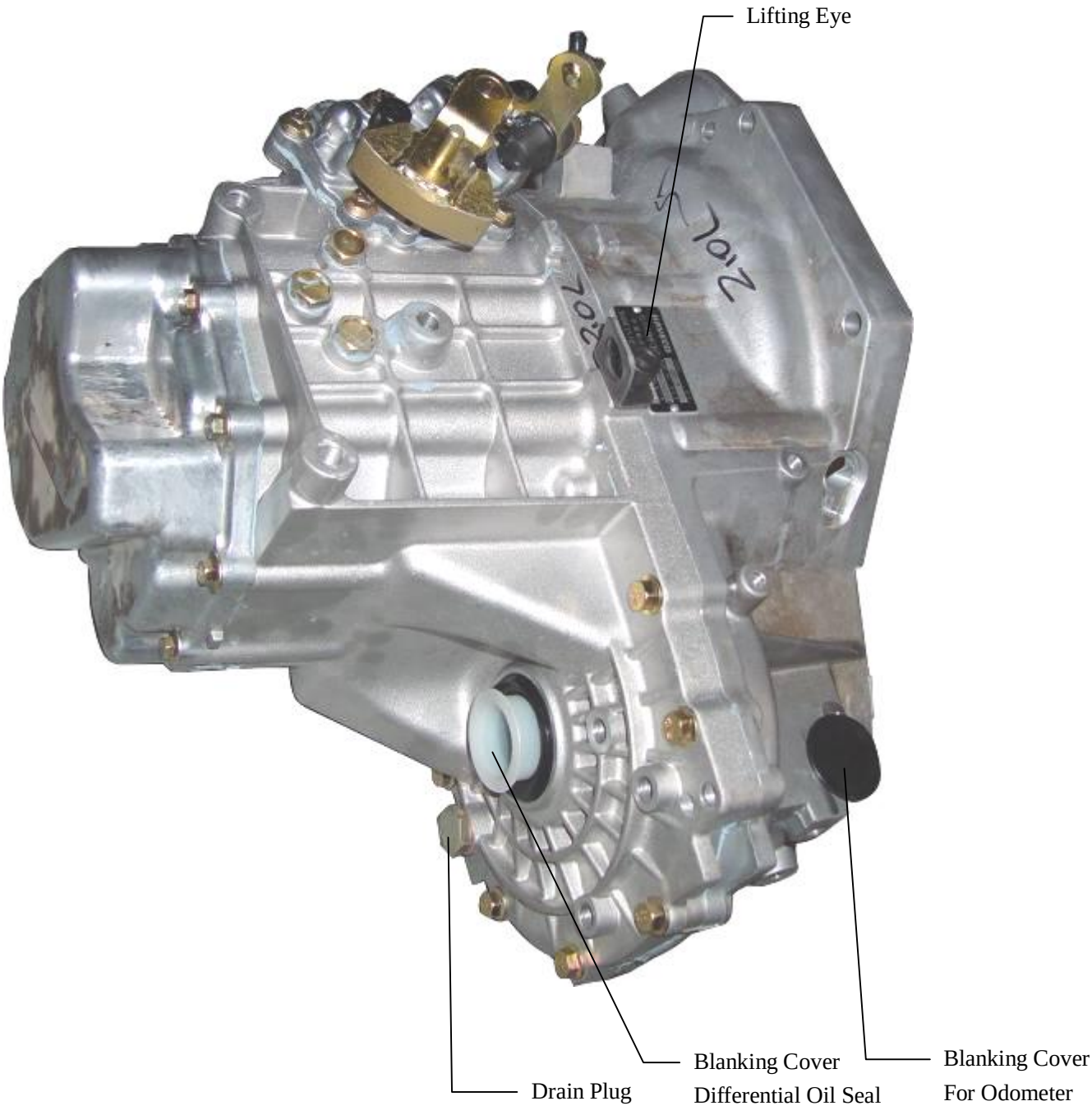
I OUTSIDE VIEW AND FUNCTIONAL DIAGRAM OF ASSEMBLY 3
II FUNCTIONAL DIAGRAM OF ASSEMBLY 5
III TRANSMISSION SERIAL NUMBER 6
IV TECHNICAL PARAMETERS 6
V TIGHTENING TORQUE FOR ASSEMBLY 7
VI DISASSEMBLY PROCEDURE & NOTICE 8
VII STRUCTURAL DISASSEMBLY DIAGRAM 17
VIII TRANSMISSION ASSEMBLY & NOTICE 37
IX AIR EXHAUST METHOD OF HYDRAULIC CLUTCH 37
X USE/OPERATION METHOD & NOTICE 38
XI COMMON FAULTS & TROUBLESHOOTING 39
XII LIST OF WEARING PARTS 40

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I OUTSIDE VIEW AND FUNCTIONAL DIAGRAM OF ASSEMBLY

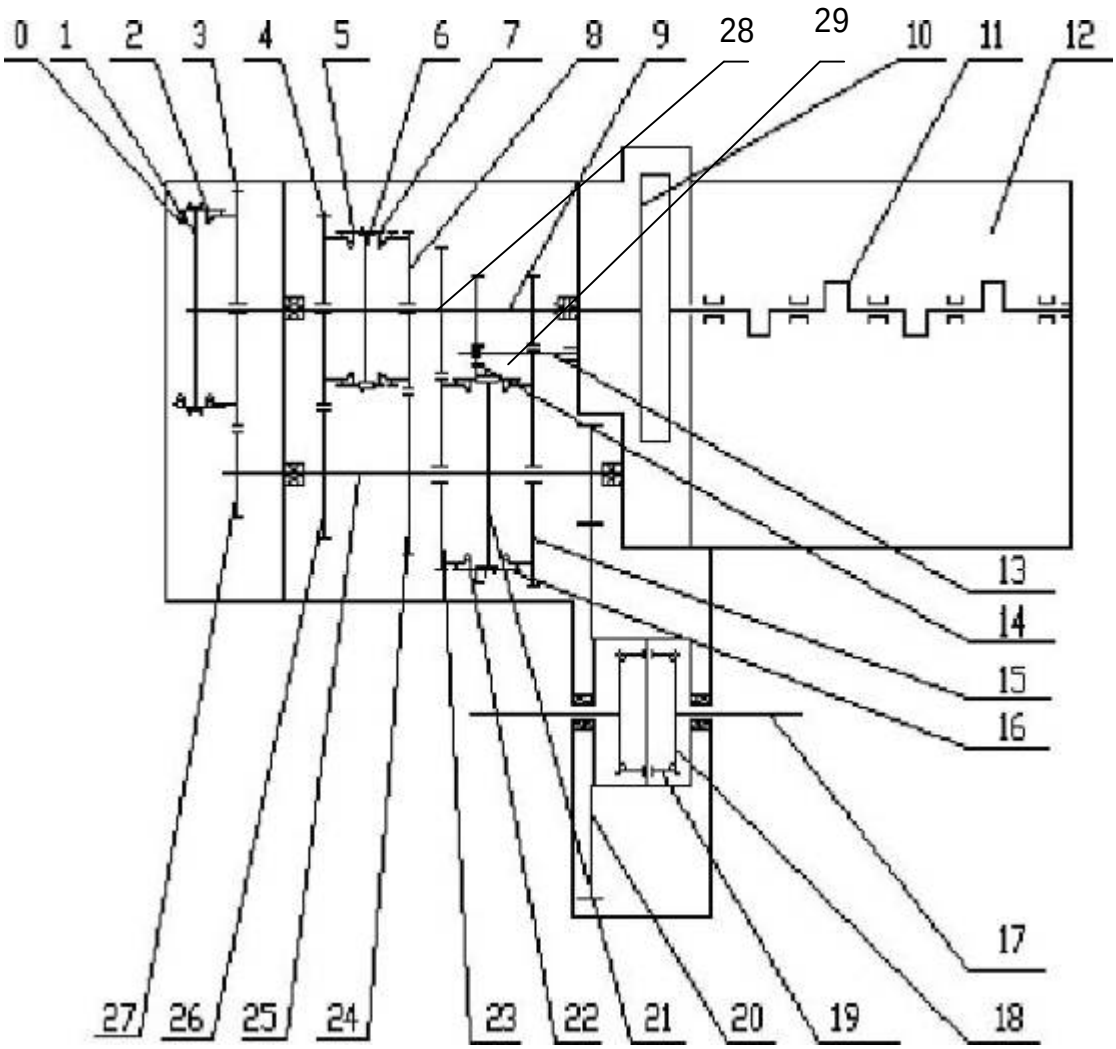


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II FUNCTIONAL DIAGRAM OF ASSEMBLY

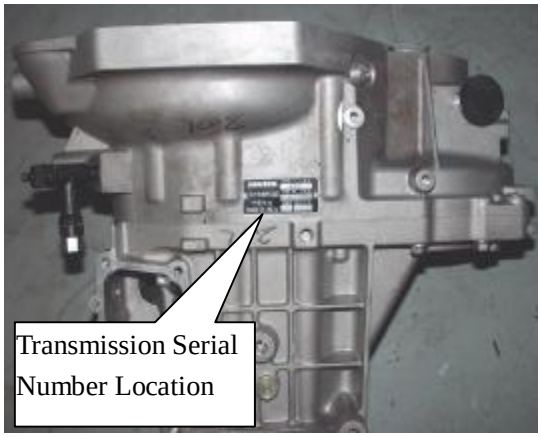


0. Synchronizer Ring -Reverse Synchronizer
1. 5th Synchronizer
2. 5th Synchronizer Ring
3. 5th Driving Gear
4. 4th Driving Gear
5. 4th Synchronizer Ring
6. 3rd-4th Synchronizer
7. 3rd Synchronizer Ring
8. 3rd Driving Gear
9. Input Shaft
10. Clutch
11. Crankshaft
12. Engine
13. Idler Gear Shaft
14. Idler Gear
15. 1st Driven Gear
16. 1st Synchronizer Ring
17. Axle Shaft
18. Side Gear
19. Planetary Gear
20. Final Drive Driven Gear
21. 1st-2nd Synchronizer
22. 2nd Synchronizer Ring
23. 2nd Driven Gear
24. 3rd Driven Gear
25. Output Shaft
26. 4th Driven Gear
27. 5th Driven Gear
28. 2nd Driving Gear
29. 1st Driving Gear

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III TRANSMISSION SERIAL NUMBER

The transmission serial number is inscribed on the transmission nameplate close to the gear shift mechanism on top of the transmission, i.e. the third row of data on the nameplate (as shown in the right-hand figure).



IV TECHNICAL PARAMETERS

Parameter \ Model		QR519MHA	
Gear ratio (Z2:Z1)	Final transmission ratio	67：16=4.2	
	1st gear	39：11=3.546	
	2nd gear	43：21=2.048	
	3rd gear	35：26=1.346	
	4th gear	36：35=0.972	
	5th gear	38：31=0.816	
	Reverse gear	40：12=3.333	
Transmission oil type		API 75W-90 GL-4 gear oil	
Transmission oil volume		2.1L	
Rated torque		190 N·m	
Rated speed		5500 r/min	
Rated power		95 KW	
Center distance		72 mm	
Input shaft spline		Number of teeth	18
		Modulus	1.0583
		Pressure angle	37.5 °
		Major diameter	$\varphi 20.1^{0}_{-0.25}$
		Minor diameter	$\varphi 17.67^{0}_{0.16}$
Outline dimensions		388.2X474.6X263.5	

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V TIGHTENING TORQUE FOR ASSEMBLY

Name	Torque for assembly (N·M)
Differential bolt M10X1.25	93.2 – 104.9
Drain plug assembly M18X1.5-6h	29.4 – 49
Oil-limiting plug M18X1.5-6h	29.4 – 49
Bolt for oil retainer & oil-receiving trough assembly M6 X12	6.9 – 9.8
5th-reverse return spring seat retainer bolt M6 X12	6.9 – 9.8
Reverse shift arm bracket bolt M8	14.7 – 21.5
Screw plug for fixing 1st-2nd, 3rd-4th and 5th-reverse fork shafts M10X1.25-6h	6.9 – 9.8
Fixing bolt for idler gear shaft M8X1.25-6h	22 – 26
Assembly bolt for clutch and transmission housings M8X40	14.7 – 21.5
Socket head cap screw for rear bearing retainer M6X1-6h	9.5 – 12
Stud bolt for left mounting bracket M10	19.6 – 29
Gland nut for 5th driven gear M16X1.5-6h	88.9 – 108.5
Friction ball blanking cover for 5th shift fork M10X1-6h	5.8 – 8.8
Bolt for connecting rear cover and transmission housing M6-6h	6.9 – 9.8
Clutch release lever bolt M8X35	29.4 – 49
Bolt for connecting gearshift mechanism and transmission housings M8X1.25-6h	14.7 – 21.5
Bolt for connecting gear selector arm and its bracket M8X75	14.7 – 21.5
Backup lamp switch assembly M14X1.5-8g	29.4 – 49
Odometer fixing bolt M6X16	6.9 – 9.8
Blanking cover for multifunctional switch sample block M8X1.25-6h	14.7 – 21.5
Lock screw for reverse gear M8X1.25-6h	14.7 – 21.5
Stud bolt for front end surface of clutch housing M10X35	19.6 – 29
Assembly stud bolt for clutch and transmission housings M8	14.7 – 21.5
Stud bolt for connecting rear cover and transmission housing M6-6h	6.9 – 9.8
Fixing bolt for gearshift mechanism M10X1.25-6h	19.6 – 29

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VI DISASSEMBLY PROCEDURE & NOTICE

DISASSEMBLY OF TRANSMISSION ASSEMBLY

1. Place the transmission on the workbench, screw off the oil drain plug and then rotate the transmission to drain the transmission oil as possible as you can;

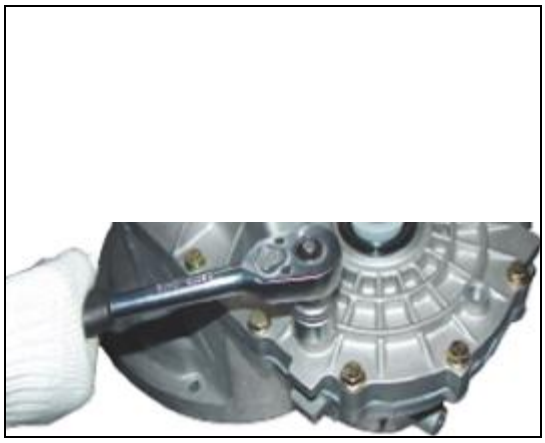


Figure 1

2. Undo the clip for fastening the release bearing (it is unnecessary to take it off);

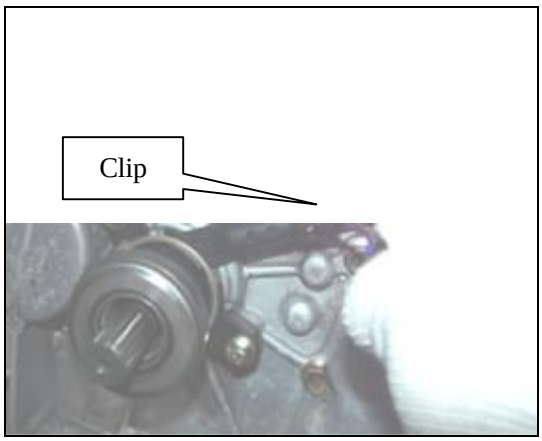


Figure 2

3. Disassemble the hydraulic release bearing seat and the quick coupler for release bearing;

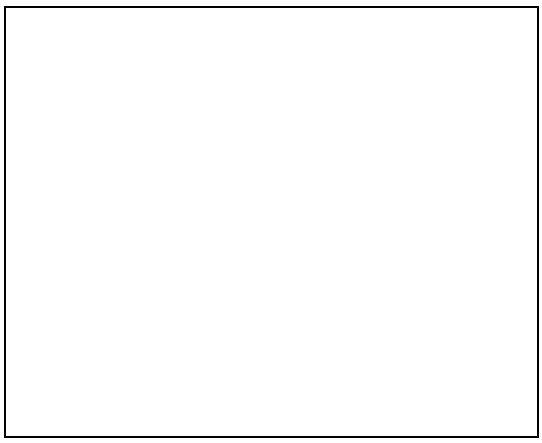


Figure 3

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4. Release joint assembly as shown in the figure;

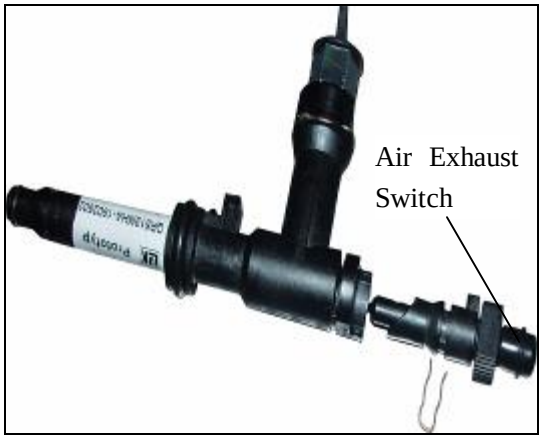


Figure 4

5. Disassemble the release bearing bolts and remove the release bearing;



Figure 5

6. Screw off the rear cover bolts and remove the rear cover;

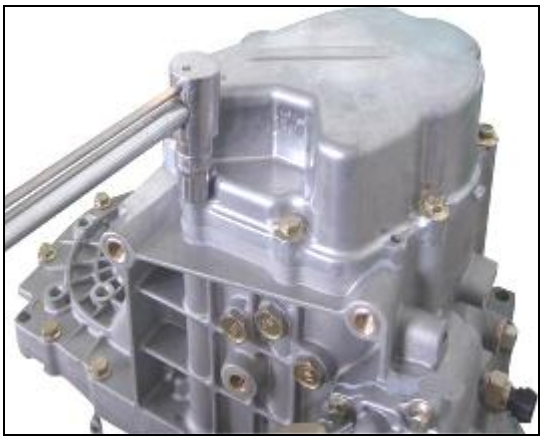


Figure 6

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7. Directly take out the reverse synchronizer ring;

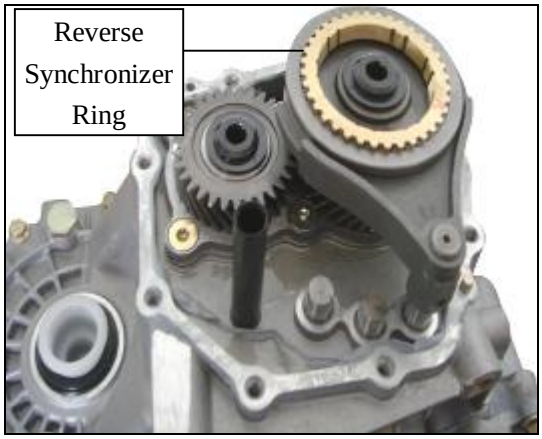


Figure 7

8. Engage some forward gear, and then remove the elastic lock pin by using a punch before moving down the 5th shift fork and gear. Once the input shaft interlocks with the output shaft, use a torque wrench to screw off the tight nut for the 5th driven gear counterclockwise.

(**Note:** alternatively, you can engage the 5th gear and put a thin copper bar (or any other low-hardness metal bar) between the 5th driving and driven gears, and then use a torque wrench to screw off the tight nut for the 5th driven gear counterclockwise.)

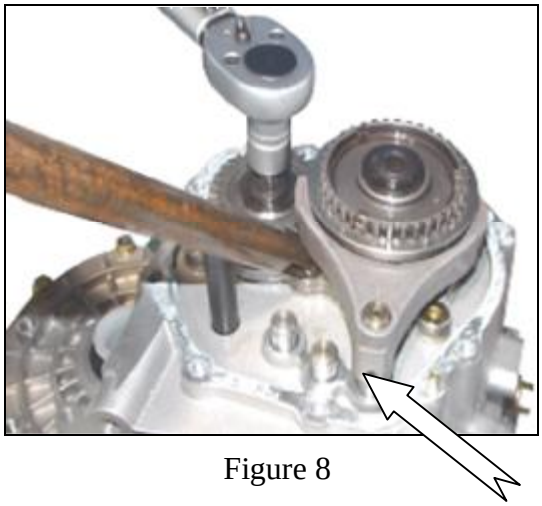


Figure 8

9. Similarly, use the torque wrench to screw off the tight nut for the 5th driving gear counterclockwise;



Figure 9

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10. Remove the elastic lock pin with the punch; engage the reverse gear and take out the 5th-reverse shift fork;

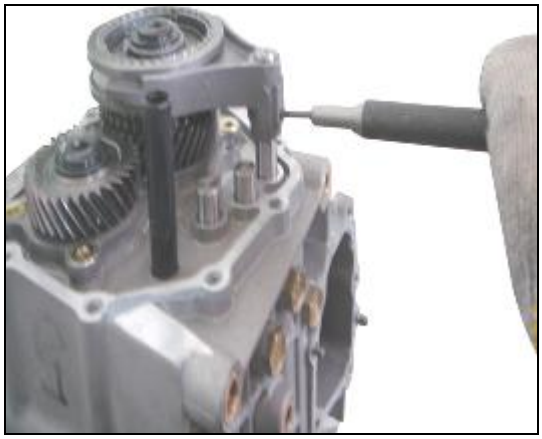


Figure 10

11. Remove the 5th synchronizer along with the 5th driving and driven gears;



Figure 11

12. Remove the needle roller bearing;

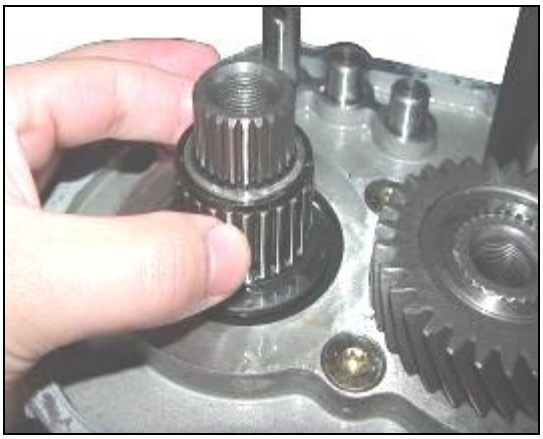


Figure 12

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13. Screw off the bearing retainer bolts with a hexagonal socket wrench and remove the bearing retainer;



Figure 13

14. Take out the adjusting washer for rear output shaft bearing by using a caliper;

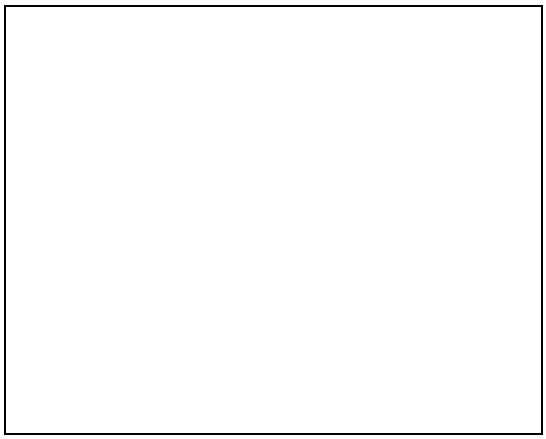


Figure 14

15. Similarly, take out the adjusting washer for rear input shaft bearing;



Figure 15

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16. Screw off the gearshift mechanism housing bolts;

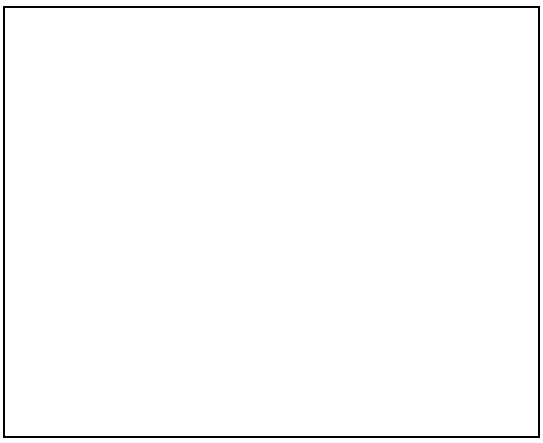


Figure 16

17. Screw off the shifting finger locating base;



Figure 17

18. Remove the backup lamp switch; now, you can directly pull the control mechanism assembly out of the transmission housing;

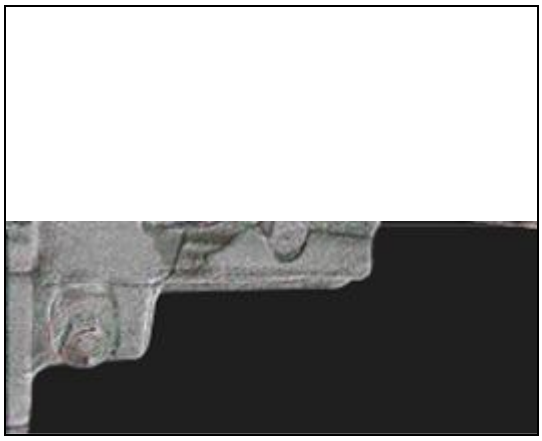


Figure 18

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19. Screw out the three fixing bolts as shown in Figure 19 (1. The 5th/reverse shift fork locating base; 2. The 3rd/4th shift fork locating base; 3. The 1st/2nd shift fork locating base). Note: the bolt to the 1st/2nd shift fork locating base is relatively long;

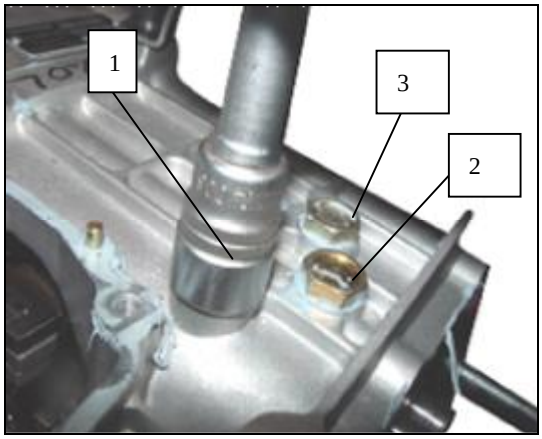


Figure 19

20. Screw off the idler gear shaft fixing screw with the hexagonal socket wrench;

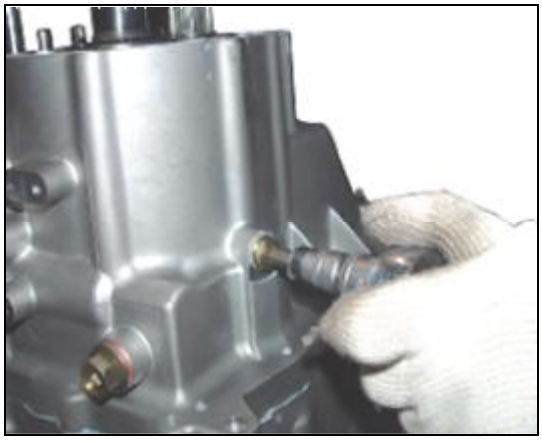


Figure 20

21. Screw off the transmission housing bolts;



Figure 21

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22. Screw off the clutch housing bolts;

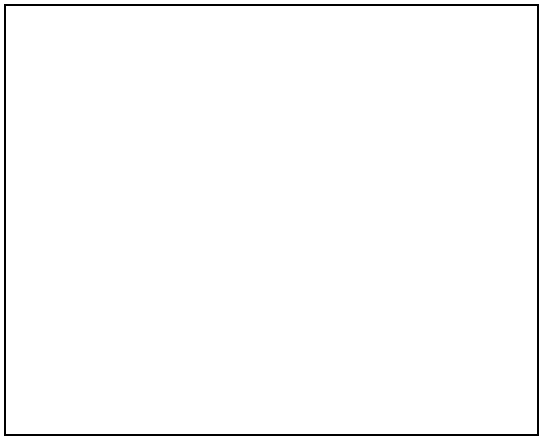


Figure 22

23. Manually lift up the transmission housing so as to suspend the transmission assembly and then use the copper bar to hit the input and output shafts; and remove the transmission housing as well as the 5th collar;



Figure 23

24. Remove the reverse idler gear assembly;

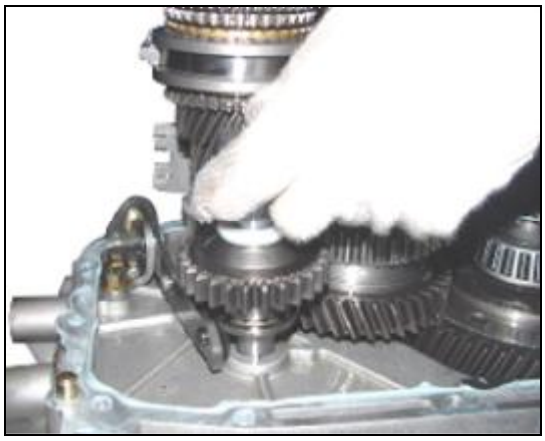


Figure 24

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25. Screw out the reverse shift fork mechanism assembly bolts and remove the reverse shift fork;

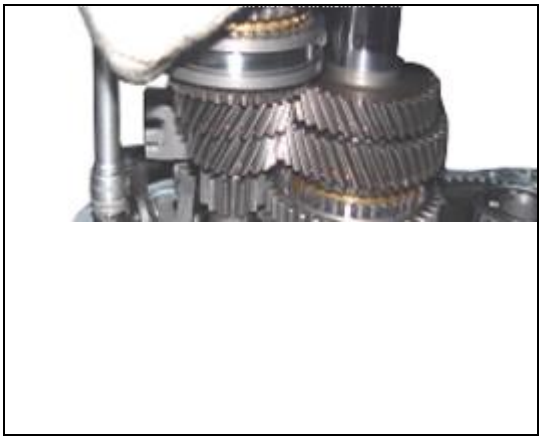


Figure 25

26. Remove the split baffle ring with a caliper;



Figure 26

27. Take hold of the input shaft assembly, output shaft assembly, 1st-2nd shift fork, 3rd-4th shift fork and 5th-reverse fork shaft together with your hands and take them out; finally, take out the differential assembly;



Figure 27

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VII EXPLODED VIEW

INPUT SHAFT ASSEMBLY

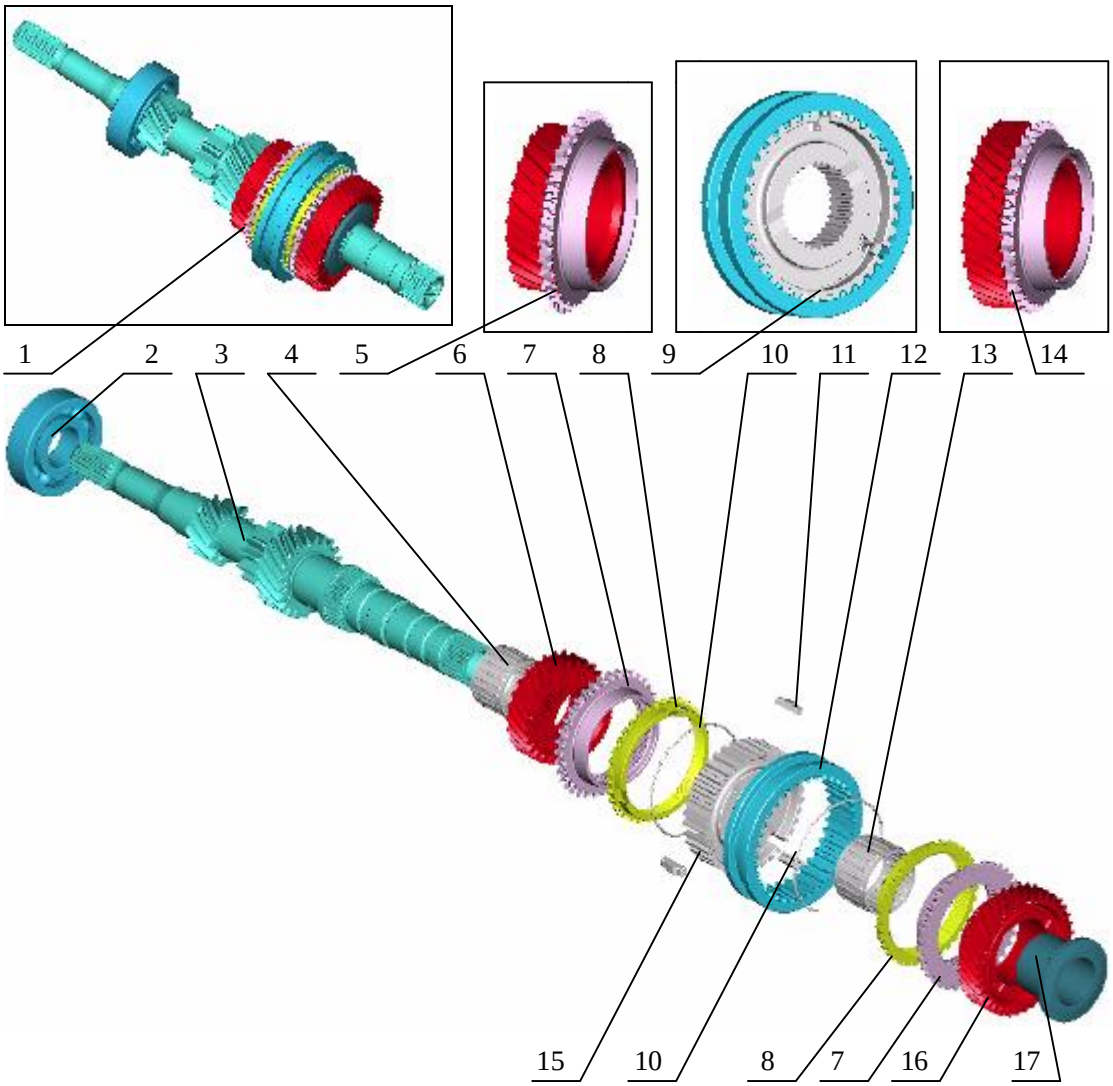


Figure 28

1. Input shaft assembly
2. Front input shaft bearing
3. Input shaft
4. 3rd-5th needle roller bearing
5. 3rd driving gear assembly
6. 3rd driving gear
7. 3rd-4th synchronizer cone
8. Synchronizer ring- 3rd-4th synchronizer
9. 3rd-4th synchronizer assembly
10. Steel wire spring for 3rd-4th synchronizer
11. Guide block for 3rd-4th synchronizer
12. Gear sleeve for 3rd-4th synchronizer
13. 4th gear needle roller bearing
14. 4th driving gear assembly
15. Gear hub for 3rd-4th synchronizer
16. 4th driving gear
17. 4th-collar

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DISASSEMBLY:

If a special tool is available, you can directly use it to disassemble the input shaft assembly. Otherwise, use the detacher to carefully pull out the 4th-collar, 4th driving gear, 4th gear needle roller bearing, 3rd-4th synchronizer assembly and 3rd driving gear in sequence.

In addition, pull out the front input shaft bearing from the front end of input shaft.

NOTICE FOR INSTALLATION:

(1) Clean all components.

(2) Check the input shaft:

① Check whether there is any damage, abnormal wear or lockup of the needle roller bearing's outer-diameter portion to be mounted.

② Check whether there is any damage or wear of the spline.

Check the needle roller bearing – whether the input shaft and gears are correctly assembled, whether the gears can rotate smoothly, and whether there is any part looseness or noise.

Check the 3rd and 4th driving gears:

① Check whether there is any damage or wear on tooth surfaces of helical gear (A in Figure 29) and clutch gear (B in Figure 29).

② Check whether there is any damage, wear or coarsening on the synchronizer's conical surface.

③ Check whether there is any damage or wear on their inner-diameter, front and rear surfaces.

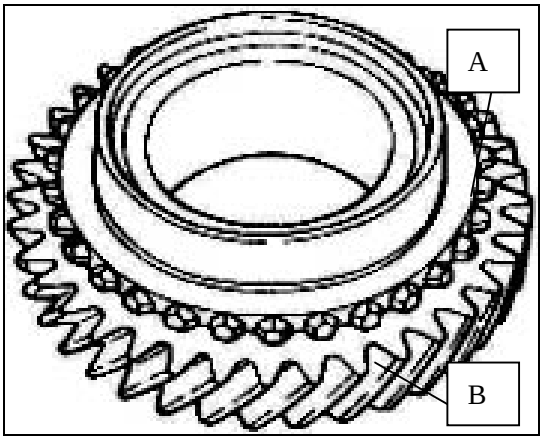


Figure 29

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Check the gear sleeve and gear hub of the 3rd-4th synchronizer:

① Assemble the gear sleeve and gear hub together and check whether they can slide smoothly or whether they are locked up (as shown in Figure 30).

② Check whether there is any damage in the front and rear of the gear sleeve's inner surface.

Note: if it is necessary to replace the gear sleeve or hub, you shall use a new complete set of these components for substitution.

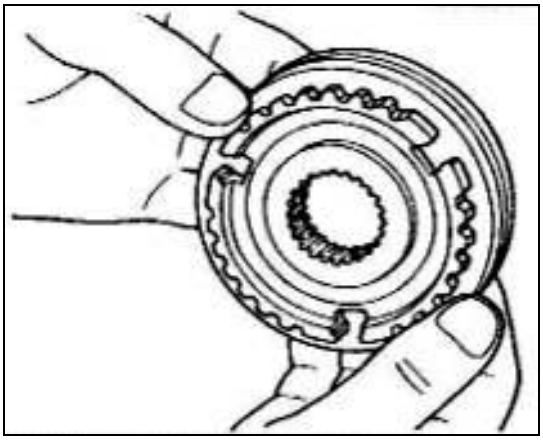


Figure 30

(3) Clean the inner conical surfaces of synchronizer rings by steel wire brush (as shown in Figure 31).

Check whether there is any damage or wear on the gear tooth surfaces of the synchronizer ring, whether there is any damage or wear on the inner-diameter surface of the synchronizer's conical portion, and whether the screw thread is damaged due to crushing.

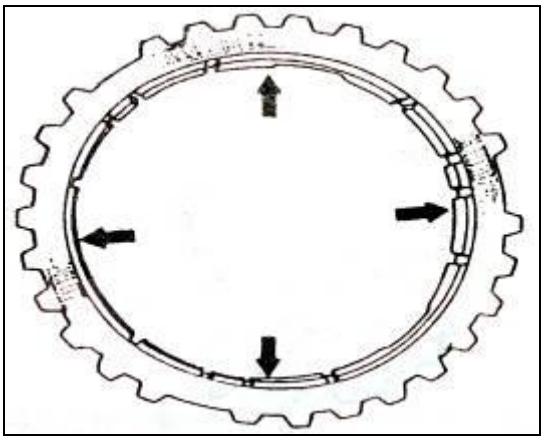


Figure 31

(4) Press the synchronizer rings in turn onto their respective gears' conical surfaces and check the values of the clearance "A". The standard values of A are as shown in the following table (unit: mm):

Synchronizer Ring	Value of A	Wearing Limit
1st-2nd gear	1.10-1.17	0.05
3rd-4th gear	1.35-1.90	0.05
5th gear	1.10-1.17	0.05

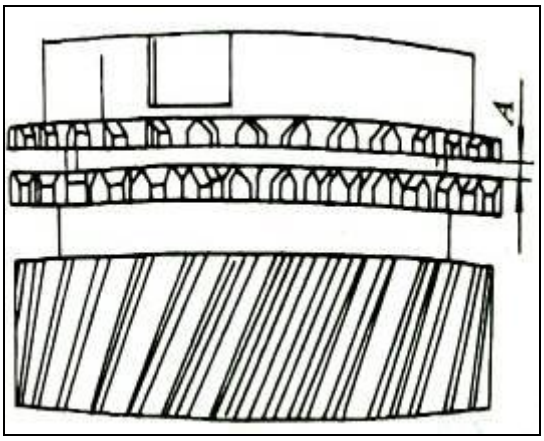


Figure 32

INSTALLATION:

The procedure to assemble the input shaft assembly is opposite to its disassembly procedure.

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OUTPUT SHAFT ASSEMBLY

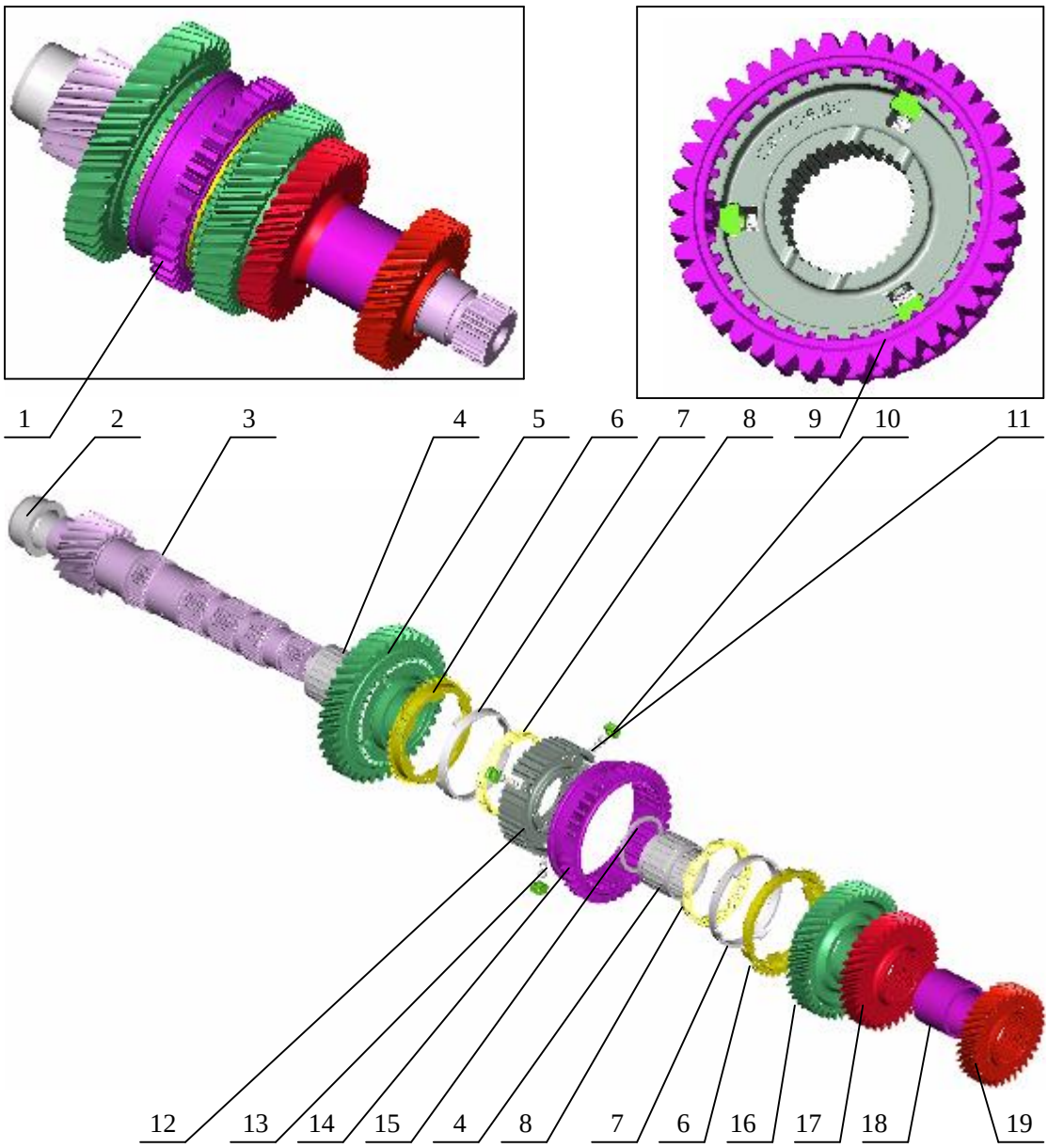


Figure 33

1. Output Shaft Assembly
2. Front Bearing Inner Race for Output Shaft
3. Output Shaft
4. 1st-2nd Needle Roller Bearing
5. 1st Driven Gear
6. 1st-2nd Synchronizer Cone Ring
7. 1st-2nd Synchronizer Ring (Outer)
8. 1st-2nd Synchronizer Ring (Inner)
9. 1st-2nd Synchronizer Assembly
10. Guide Block for 1st-2nd Synchronizer
11. Spring – 1st-2nd Synchronizer
12. Gear Hub – 1st-2nd Synchronizer
13. Ball – 1st-2nd Synchronizer Guide Block
14. Gear Sleeve – 1st-2nd Synchronizer
15. Snap Ring – 1st-2nd Synchronizer Gear Hub
16. 2nd Driven Gear
17. 3rd Driven Gear
18. 3rd-4th Driven Shaft Sleeve
19. 4th Driven Gear

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DISASSEMBLY:

(1) Use a puller to pull out the rear output shaft bearing and the 4th driven gear;

(2) Take out the 3rd-4th driven collar;

(3) Successively take out the 3rd driven gear, 2nd driven gear, 1st/2nd synchronizer cone ring, out synchronizer ring, inner synchronizer ring and 2nd needle roller bearing;

(4) Use a snap ring plier to take out the snap ring for 1st-2nd synchronizer gear hub (as shown in Figure 33);

(5) Pull out the 1st-2nd synchronizer assembly and remove the 1st driven gear and 1st needle roller bearing;

(6) Pull out the front output shaft inner bearing from the front end of output shaft.



Figure 34

NOTICE FOR INSTALLATION:

(1) Clean all the components.

(2) In the same way as for the input shaft, successively check the following items: output shaft, needle roller bearing, 1st driven gear, 2nd driven gear, and 1st-2nd synchronizer gear sleeve and hub.

(3) Check the outer synchronizer ring, inner synchronizer ring and synchronizer cone ring:

① Check whether there is any damage on the tooth surfaces and conical surface.

② Mount the outer and inner synchronizer rings and put them into the state of pressing on the respective gears, and measure the values of clearance "A". If the value of A is less than the corresponding specified limit value, it is

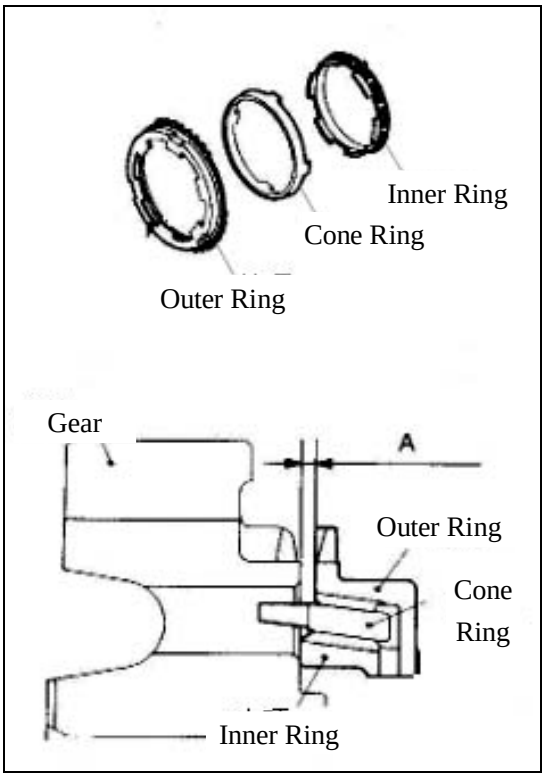


Figure 35

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necessary to change them.

For the specified limit values, refer to the table in Page 15.

Note: if it is necessary to change the outer synchronizer ring, inner synchronizer ring or synchronizer cone ring, you shall use a new complete set of these components for substitution.

INSTALLATION:

The procedure to assemble the output shaft assembly is opposite to its disassembly procedure.

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IDLER GEAR ASSEMBLY

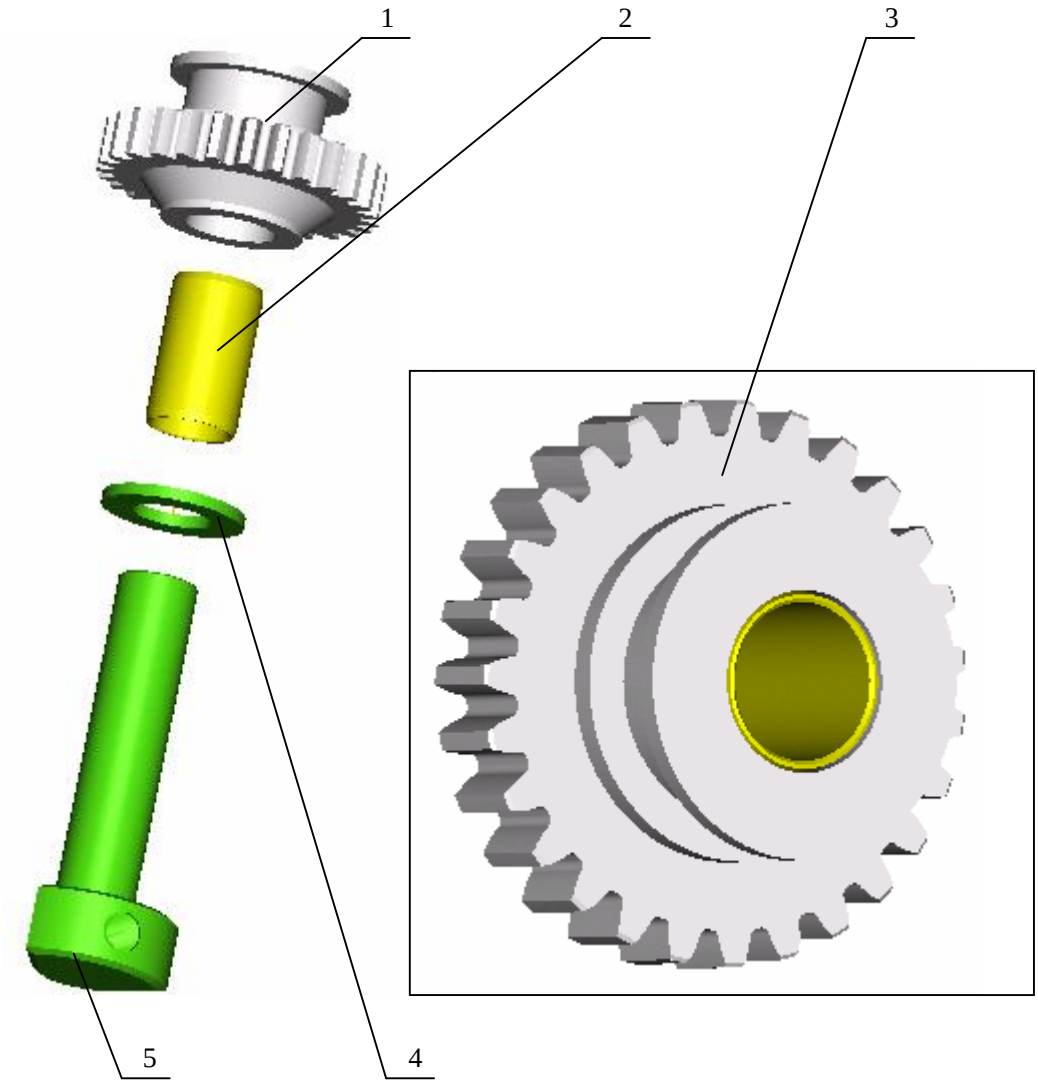


Figure 36

1. Reverse Idler Gear
2. Bushing – Reverse Idler Gear
3. Idler Gear Assembly
4. Idler Gear Gasket
5. Idler Gear Shaft

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REVERSE SHIFT FORK MECHANISM ASSEMBLY

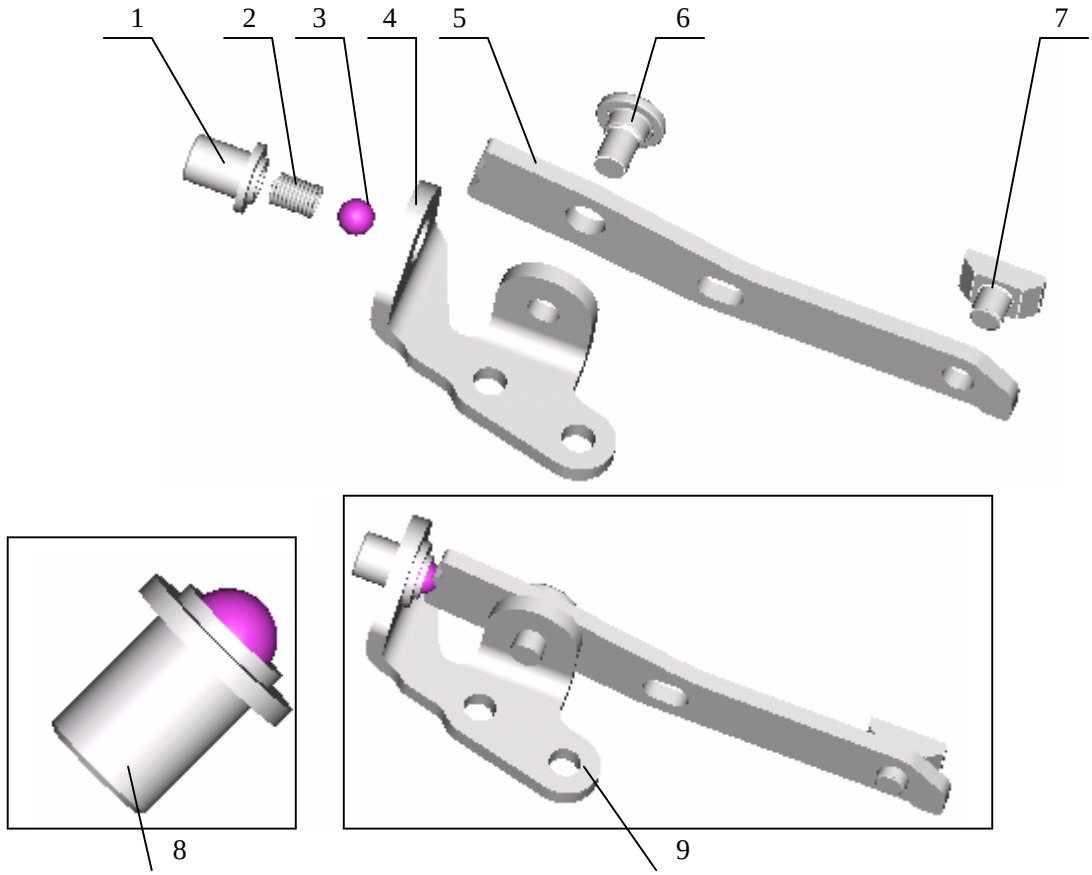


Figure 37

1. Housing for Reverse Locating Base
2. Spring for Reverse Locating Base
3. Ball for Reverse Locating Base
4. Reverse Shift Arm Bracket
5. Reverse Shift Arm
6. Pin Shaft – Reverse Shift Arm Bracket
7. Drive Pin – Idler Gear
8. Reverse Locating Base
9. Reverse Shift Fork Mechanism Assembly

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1ST/2ND SHIFT FORK ASSAMBLY

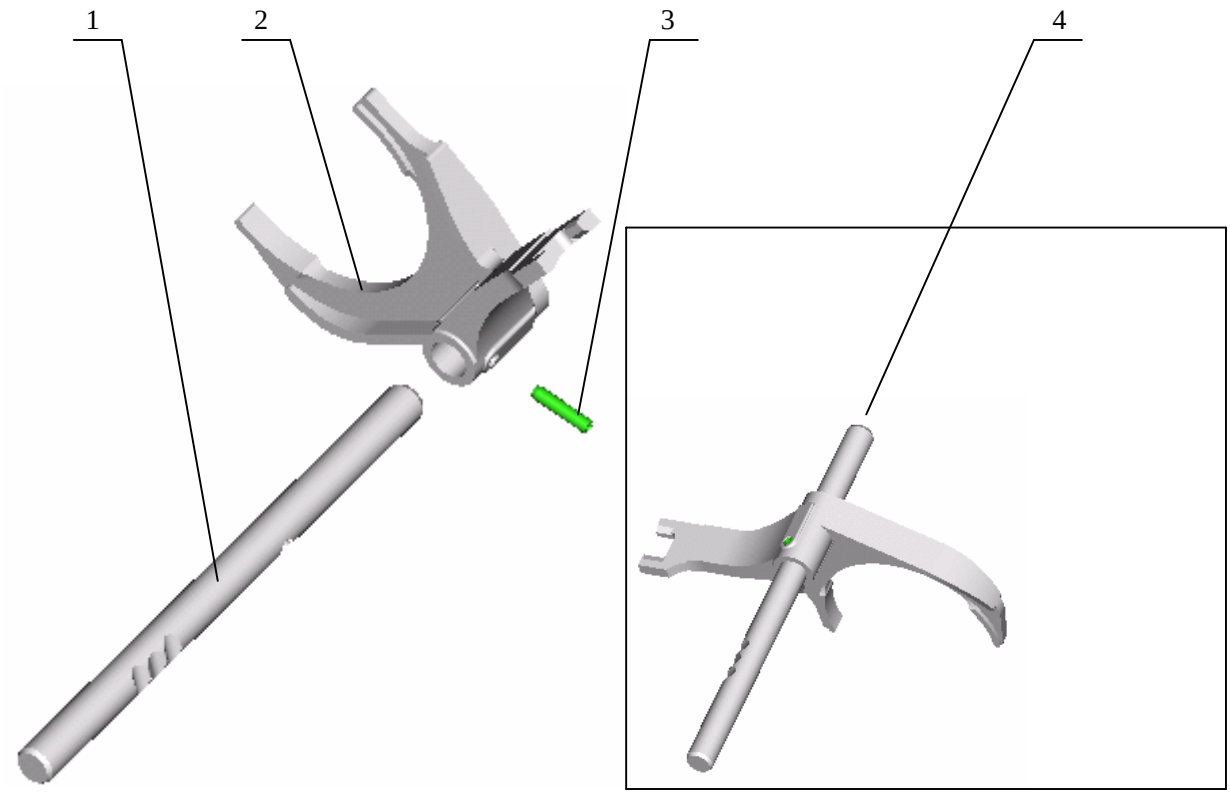


Figure 38

1. 1st-2nd Shift Fork
2. 1st-2nd Fork Shaft
3. Spring Pin
4. 1st-2nd Shift Fork Assembly

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3RD, 4TH, 5TH & REVERSE FORK SHAFT COMPONENTS

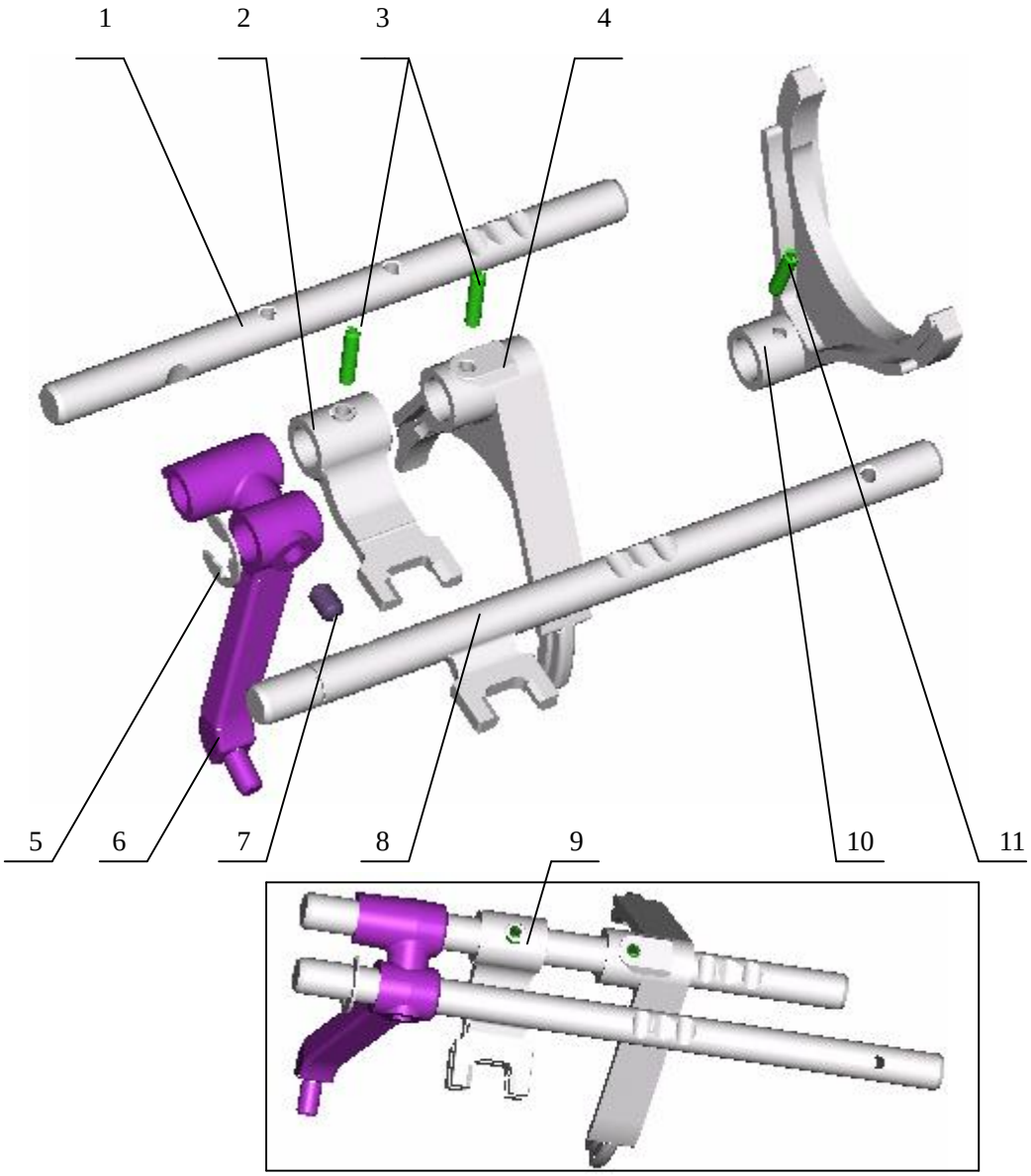


Figure 39

1. 3rd-4th Fork Shaft
2. 3rd-4th Fork Bracket
3. Spring Pin
4. 3rd-4th Shift Fork
5. Split Baffle Ring
6. Reverse Pin
7. Interlock Pin
8. 5th-Reverse Fork Shaft
9. 3rd, 4th, 5th and Reverse Fork Shaft Components
10. 5th-Reverse Shift Fork
11. Spring Pin for Fork Shaft

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GEAR SELECTION & SHIFT MECHANISM ASSEMBLY

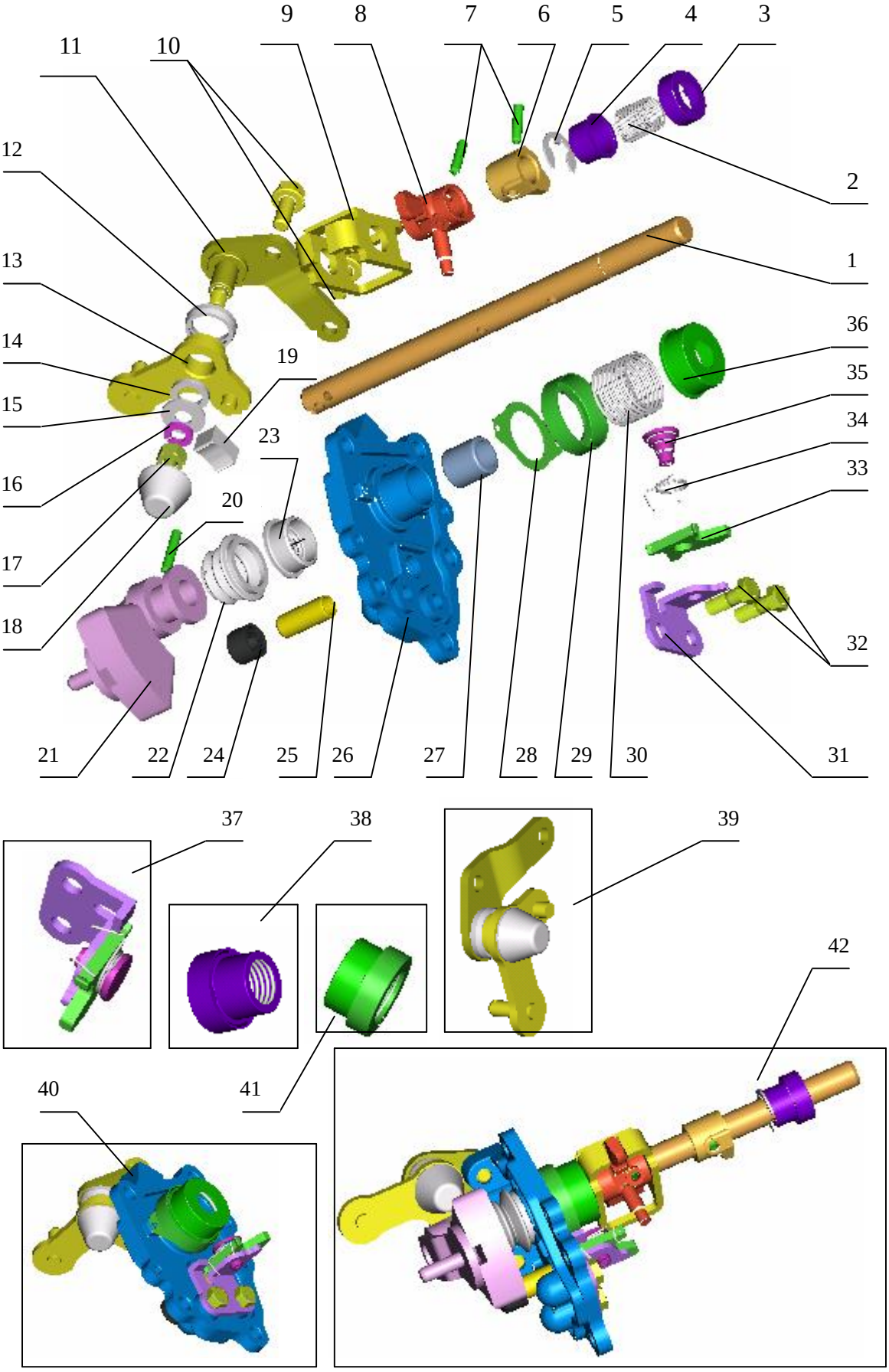


Figure 40

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1. Gear Selection & Shift Shaft
2. 1st-2nd Return Spring
3. Top Base For 1st-2nd Return Spring
4. Bottom Base For 1st-2nd Return Spring
5. Split Baffle Ring –1st-2nd Return Spring Assembly
6. Backup Lamp Switch Gate Block
7. Spring Pin
8. Shift Finger
9. Interlock Plate
10. Selector Lever Bracket Bolt
11. Selector Lever Bracket Assembly
12. Boot –Selector Lever
13. Selector Lever Assembly
14. Small Gasket – Selector Lever
15. Large Gasket – Selector Lever
16. Spring Washer – Selector Lever
17. Nut
18. Sleeve – Selector Lever Nut
19. Slide Block – Selector Lever
20. Spring Pin
21. Selector Lever Assembly
22. Boot –Gear Selection & Shift Shaft
23. Oil Seal –Gear Selection & Shift Shaft
24. Air Duct Cap
25. Air Duct
26. Gear Selection & Shift Mechanism Housing
27. Linear Bearing
28. 5th-Reverse Return Spring Retainer
29. Bottom Base For 5th-Reverse Return Spring
30. 5th-Reverse Return Spring
31. Reverse Lock Plate Bracket
32. Bolts –Reverse Lock Mechanism
33. Reverse Lock Plate
34. Torsion Spring – Reverse Lock Mechanism
35. Pin Shaft – Reverse Lock Mechanism
36. Top Base For 5th-Reverse Return Spring
37. Reverse Lock Mechanism Assembly
38. 1st-2nd Return Spring Assembly
39. Selector Lever & Bracket Assembly
40. Gear Selection & Shift Mechanism Housing Assembly
41. 5th-Reverse Return Spring Assembly
42. Gear Selection & Shift Mechanism Assembly

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NOTICE FOR INSTALLATION:

Press in the linear bearing so that the side of its model number inscribed is on the side of controller housing. Smear the transmission oil onto the oil seal lip.

Transmission oil:

Use hypoid gear oil complying with the API classification GL-4 or above.

SAE 75W~85W

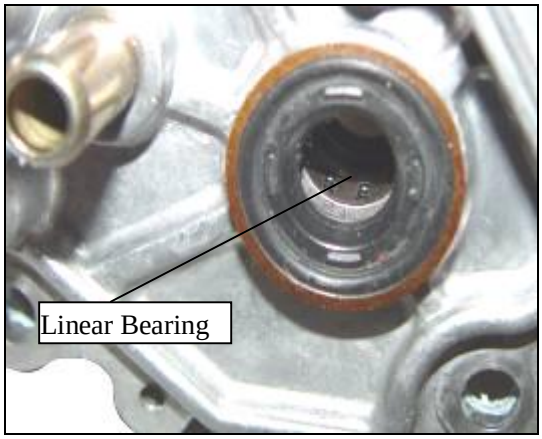


Figure 41

MOUNTING THE AIR VENT:

(1) Smear sealant onto its inserted portion.

Specified sealant: Mobilux EP2

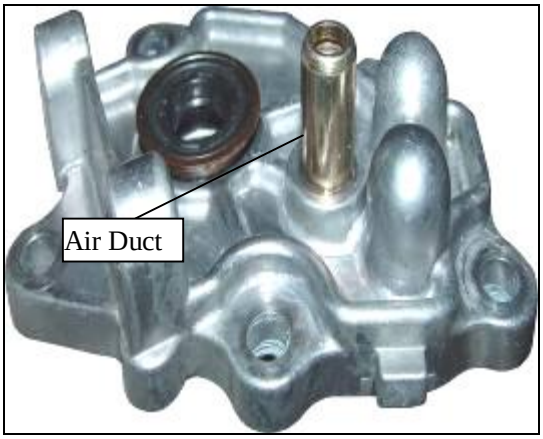


Figure 42

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DIFFERENTIAL ASSEMBLY

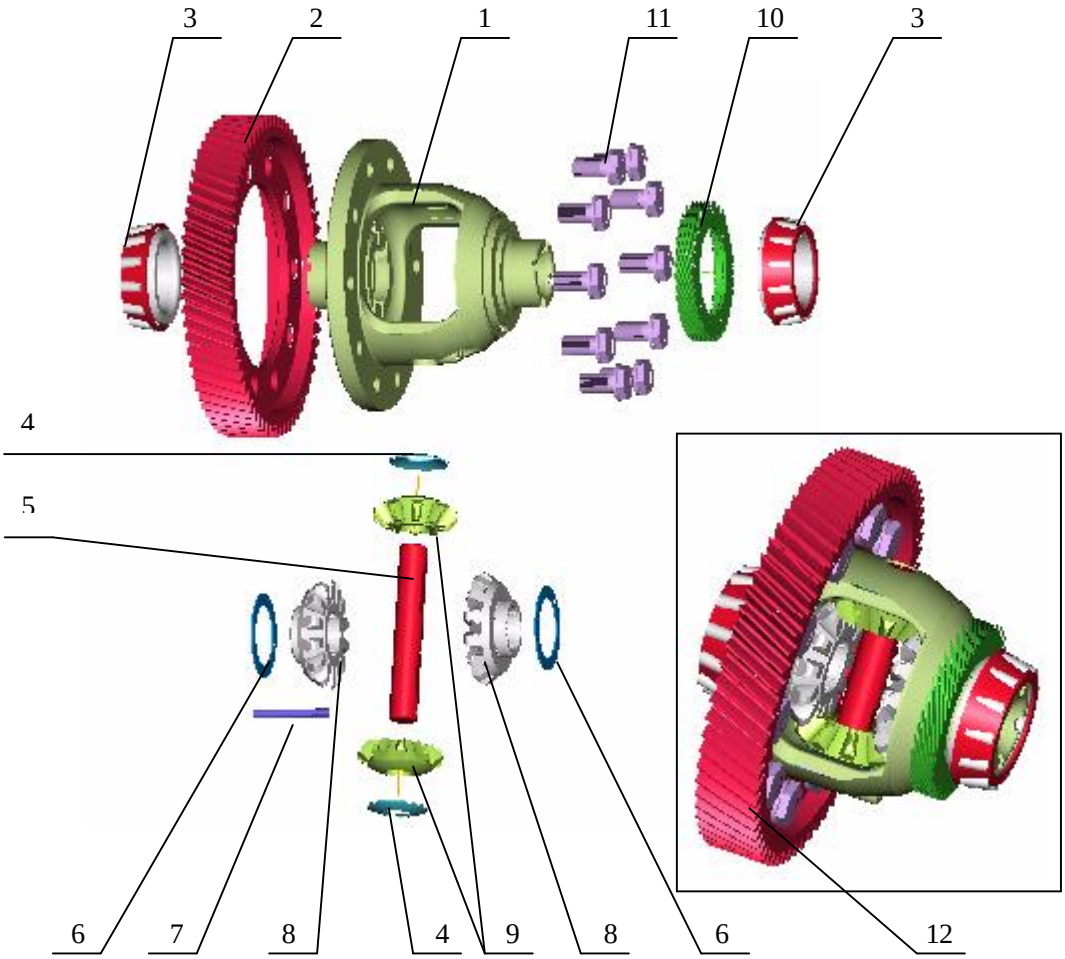


Figure 43

1. Differential Housing
2. Final Drive Driven Gear
3. Front/Rear Differential Bearing
4. Spherical Washer –Planetary Gear
5. Planetary Gear Shaft
6. Adjusting Washer – Side Gear
7. Fixing Pin – Planetary Gear
8. Side Gear
9. Planetary Gear
10. Driving Gear – Odometer
11. Bolts – Final Drive Driven Gear and Differential Housing
12. Differential Assembly

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NOTICE FOR INSTALLATION:

Installation of the adjusting washers, side gears, spherical washers, planetary gears and the planetary gear shaft:

(1) Assemble the adjusting washers respectively on the backs of the side gears and put the side gears in place within the differential.

Remark: the adjusting washer for any new side gear shall have an appropriate thickness (0.93-1.00 mm).

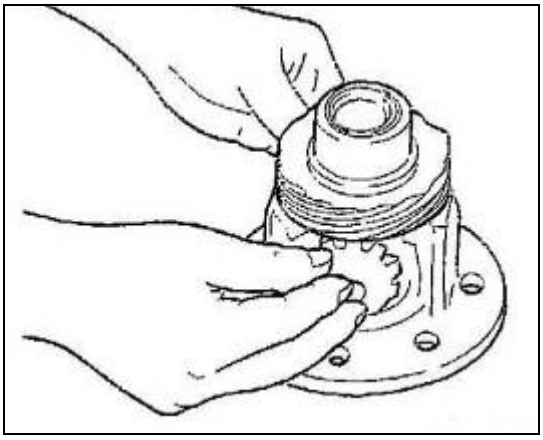


Figure 44

(2) Engage two planetary gears with side gears behind the spherical washers on the backs of the planetary gears. When rotating any of these gears, you shall put it into appropriate place.

(3) Insert the planetary gear shaft.

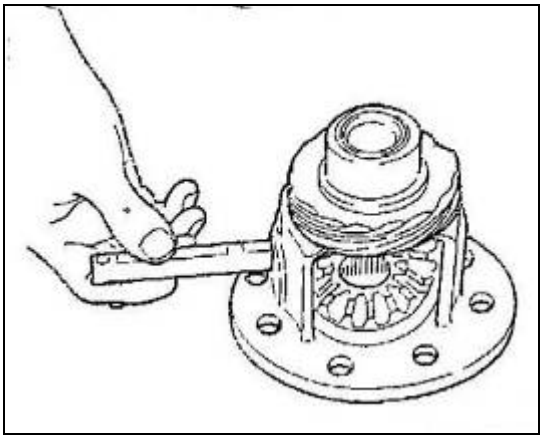


Figure 45

(4) Measure the clearances between side gear and planetary gear.

Standard value: 0.025-0.150 mm

(5) If any measured clearance does not measure up, please select and install the appropriate adjusting washer(s) and then measure the clearances again.

Remark: adjust the clearances on both sides so as for them to be equal.

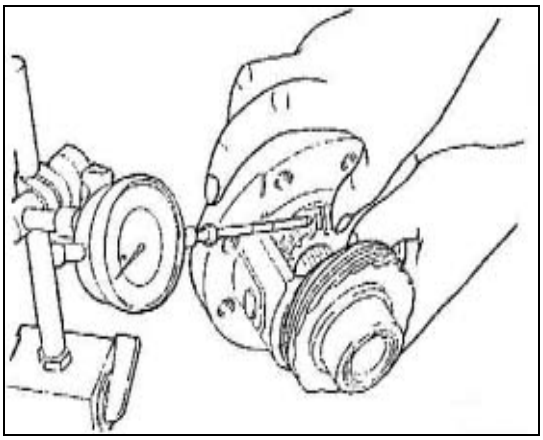


Figure 46

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FIXING THE LOCK PIN

Install the fixing pin to the place as shown in Figure 43.

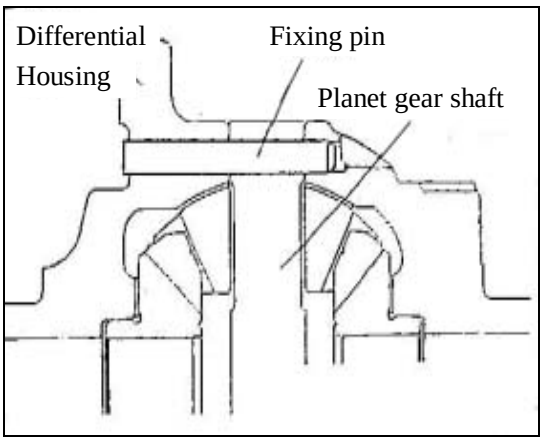


Figure 47

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CLUTCH HOUSING ASSEMBLY

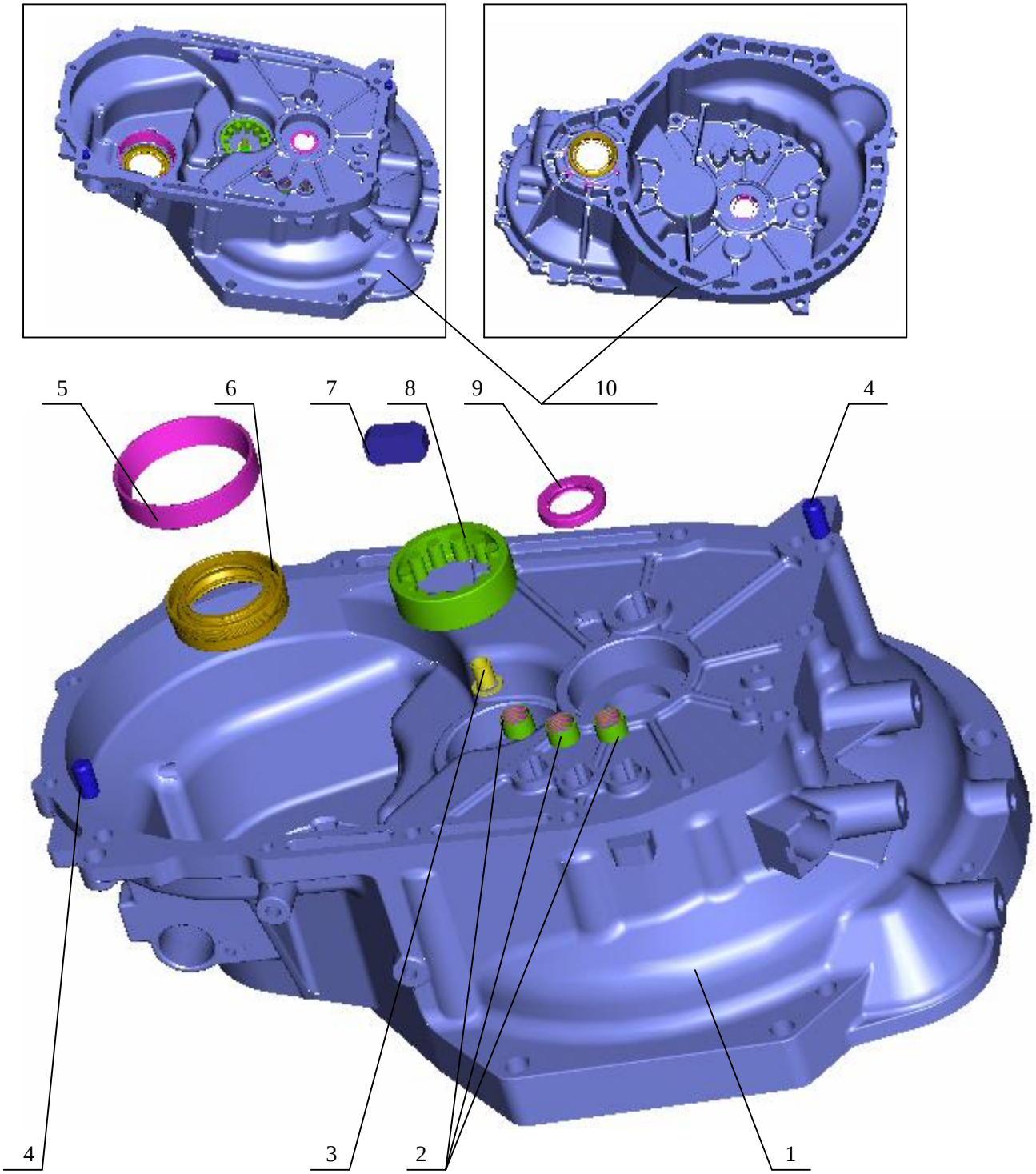


Figure 48

1. Clutch Housing
2. Collar 161410
3. Oil Drain Channel
4. Fixing Pin
5. Front/Rear Differential Bearing Outer Ring
6. Oil Seal – Differential
7. Magnet
8. Front Output Shaft Bearing Outer Ring
9. Oil Seal – Input Shaft
10. Clutch Housing Assembly

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TRANSMISSION HOUSING ASSEMBLY

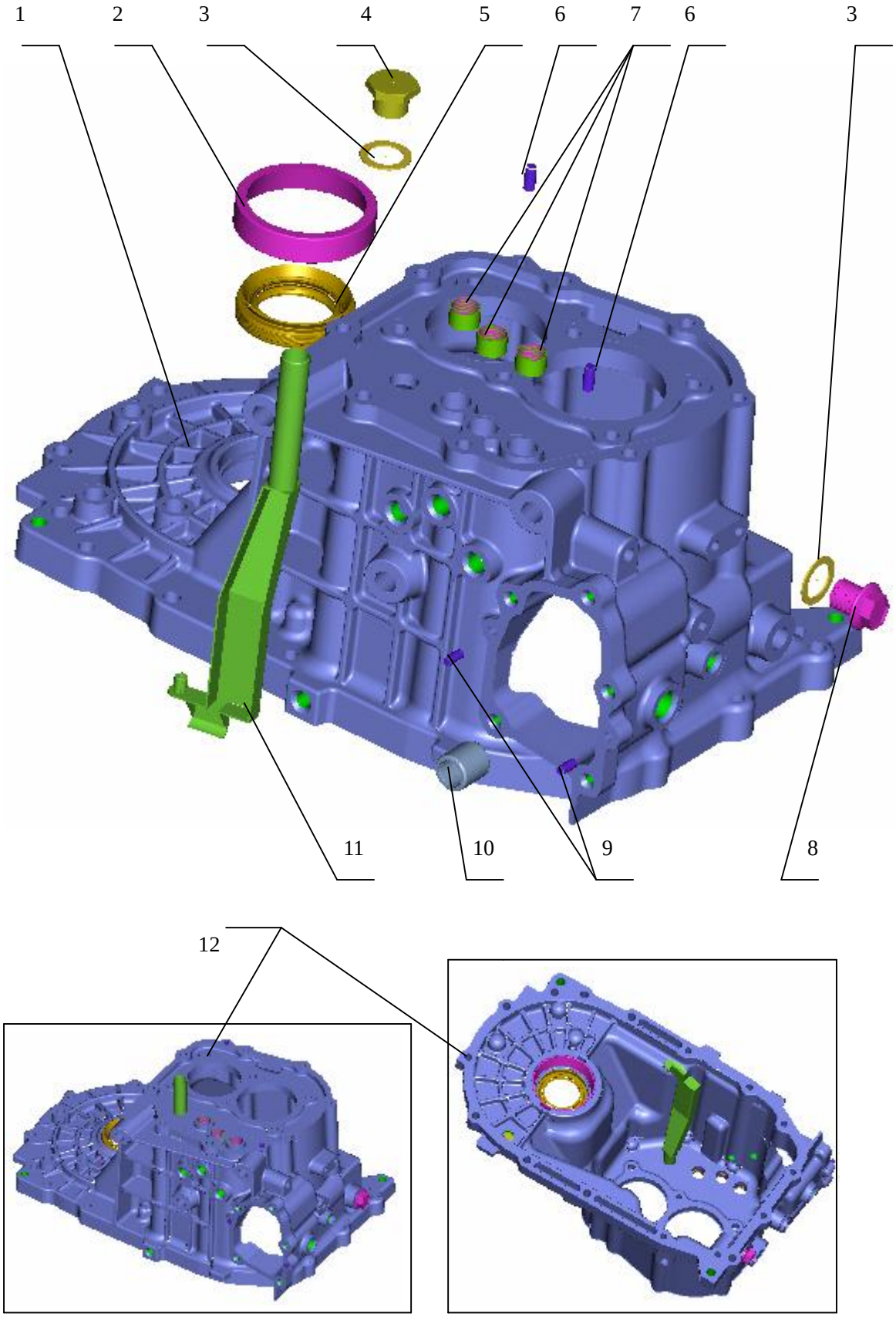


Figure 49

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1. Transmission Housing
2. Differential Bearing Outer Ring
3. Washer – Oil-Limiting/Drain Plug
4. Drain Plug
5. Oil Seal – Differential
6. Fixing Pin – Rear Cover
7. Collar
8. Oil-Limiting Plug
9. Fixing Pin – Gearshift Housing
10. Linear Bearing
11. Oil-Receiving Tube
12. Transmission Housing Assembly

NOTICE FOR INSTALLATION:

Installation of linear bearing

Press the linear bearing in so as for it to be aligned with the housing surface and make sure that the model number is inscribed in the position as shown in Figure 46.



Figure 50

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REAR COVER ASSEMBLY

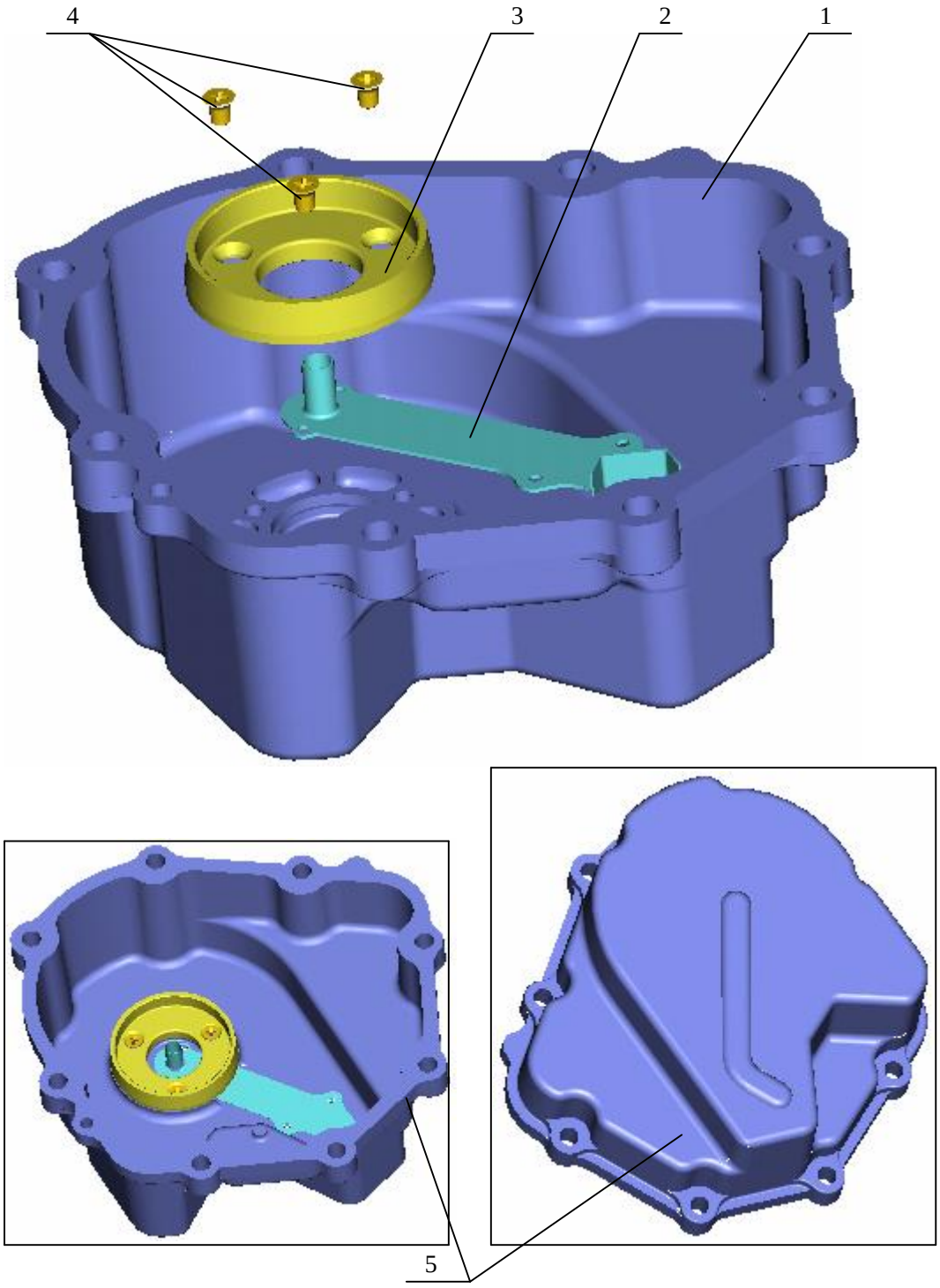


Figure 51

1. Rear Cover
2. Oil Drain Tube for Input Shaft
3. Reverse Synchronizer Cone
4. Screw – Reverse Synchronizer Cone
5. Rear Cover Assembly

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VIII TRANSMISSION ASSEMBLY & NOTICE

The transmission assembly procedure is reverse to its disassembly procedure, and the followings need attention:

1. It is necessary to use Mobilux EP2 (sealant) for the rear cover assembly, clutch housing assembly and gearshift mechanism assembly.
2. Installation of the output shaft adjusting washers:

After fixing the transmission housing, make sure that the bearing outer ring has a full contact with the roller, and the pre-tightening torque of the shaft with the washers is 0.8-1.5N•m after assembly.

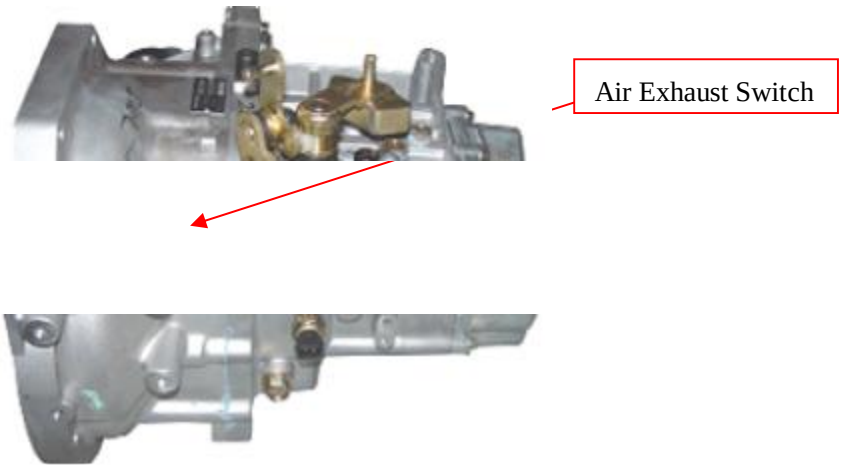
3. Installation of the adjusting washer for input shaft rear bearing:

The thickness range of adjusting washer is A2-0.1≤S2＜A2, in which A2 is the channel width and S2 is the thickness of adjusting washer. Use six M6x1-16 countersunk head screws to fix the rear bearing retainer and their tightening torque is 10.5N•m;

4. When installing the input shaft oil seal and differential oil seal, you shall smear lubricating grease onto their lips and use a special tool to press them into the transmission housing sufficiently.

IX AIR EXHAUST METHOD OF HYDRAULIC CLUTCH

QR519MHA transmission adopts full hydraulic clutch mechanism and thus its air exhaust can be easily done. When implementing air exhaust with regard to an finished vehicle, firstly remove the black plug from the hydraulic release bearing coupler and turn on the switch on it (i.e. rotate it 90 degrees), and then step the clutch pedal to the bottom for some times until all of the air flows out of the hydraulic release bearing coupler. Note: the switch can only be turned off in case of stepping on the clutch pedal to the bottom. If you feel strong resistance force when stepping on the clutch pedal, it is indicated that the air has been exhaust entirely.



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X USE/OPERATION METHOD & NOTICE

1. Employ the Double-Clutching method for upshifting and downshifting. When you shift gear, please depress the clutch pedal to the bottom and rapidly control the gearshift lever after the transmission is free from torque force of the engine.
2. When the vehicle runs downhill or makes a turn, please shift into some low gear and it is not allowed that the vehicle coasts under the condition that the clutch is released.
3. Trip stop is not allowed during the upshifting procedure; otherwise the service life of the synchronizers will be reduced.
4. It is prohibited to start the engine by using synchronizer to force into gear in the condition of flameout & neutral gear; otherwise the service life of the synchronizers will be reduced.
5. No flap (i.e. rapid push and release) is allowed for gear shifting and you shall hold the shift lever all the time during the procedure so as to considerably reduce the sliding friction time of synchronizer locking ring as well as their wear and tear.
6. During the driving, you shall not put your hand onto the gearshift lever; otherwise it will cause the shift forks to be rapidly worn.
7. If the transmission sends out any abnormal sound, it is obviously difficult to control the shift lever, etc. during its use, you shall immediately stop and check the vehicle. You can drive again only after the troubleshooting.

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XI COMMON FAULTS & TROUBLESHOOTING

Fault	Possible cause	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)	Replacement
	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	Replacement
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	Replacement
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	Replacement
	Insufficient lubrication or unqualified transmission oil	Replacement
	Using of unqualified bearing(s)	Replacement

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XII LIST OF WEARING PARTS

Number	Name	Quantity
1	Needle roller bearing for 1st/2nd gears	2
2	Needle roller bearing for 3rd/4th/5th gears	3
3	Front input shaft bearing	1
4	Rear input shaft bearing	1
5	Front output shaft cone bearing	1
6	Rear output shaft cone bearing	1
7	Front differential bearing	1
8	Rear differential bearing	1
9	Clutch bearing assembly	1
10	Synchronizer ring for 1st/2nd gears	2
11	Synchronizer ring for 3rd/4th/5th gears	3
12	Seal gasket for clutch and transmission housings	1
13	Seal gasket for gearshift mechanism and transmission housings	1
14	Snap ring for 3rd-4th synchronizer	1
15	Snap ring for 1st-2nd synchronizer	1
16	Snap ring for 5th synchronizer	1
17	Snap ring for reverse fork shaft	1
18	Interlock plate snap ring	3
19	Dust-proof oil seal for release shift fork assembly	1
20	Input shaft oil seal	1
21	Front differential oil seal	1
22	Rear differential oil seal	1
23	Dust-proof oil seal for gearshift shaft	1

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Table of Contents

1. Diagram explanation 01-03
2. Connector Note.....04-06
3. Start & charging system.....07
4. ABS system.....08
5. Power windows and center lock system 09
6. Instrument system 10
7. Auto A/C system 11
8. Manual A/C system 12
9. Heater seats system 13
10. Seat adjusting system 14
11. Wiper system 15
12. Radio system 16
13. Air bag system 17
14. Sun roof and cigarette system 18
15. Power rearview mirror system 19
16. ECU (ME797) system 20
17. ECU (M797) system 21
18. ISU (front) system 22
19. ISU (rear) system.....23
20. Fuse box system 24

Diagram explanation

1. Instruction of Power supply and Earth Wire

30：Power line from the battery
15：From the ignition switch（IGN1）
ACC1：From the ignition switch（Supply A/C system）
ACC2：From the ignition switch（Supply wiper system ,Cigarette system,）
ILLUM：Power supply for noctilucence illumination
31：GROUND

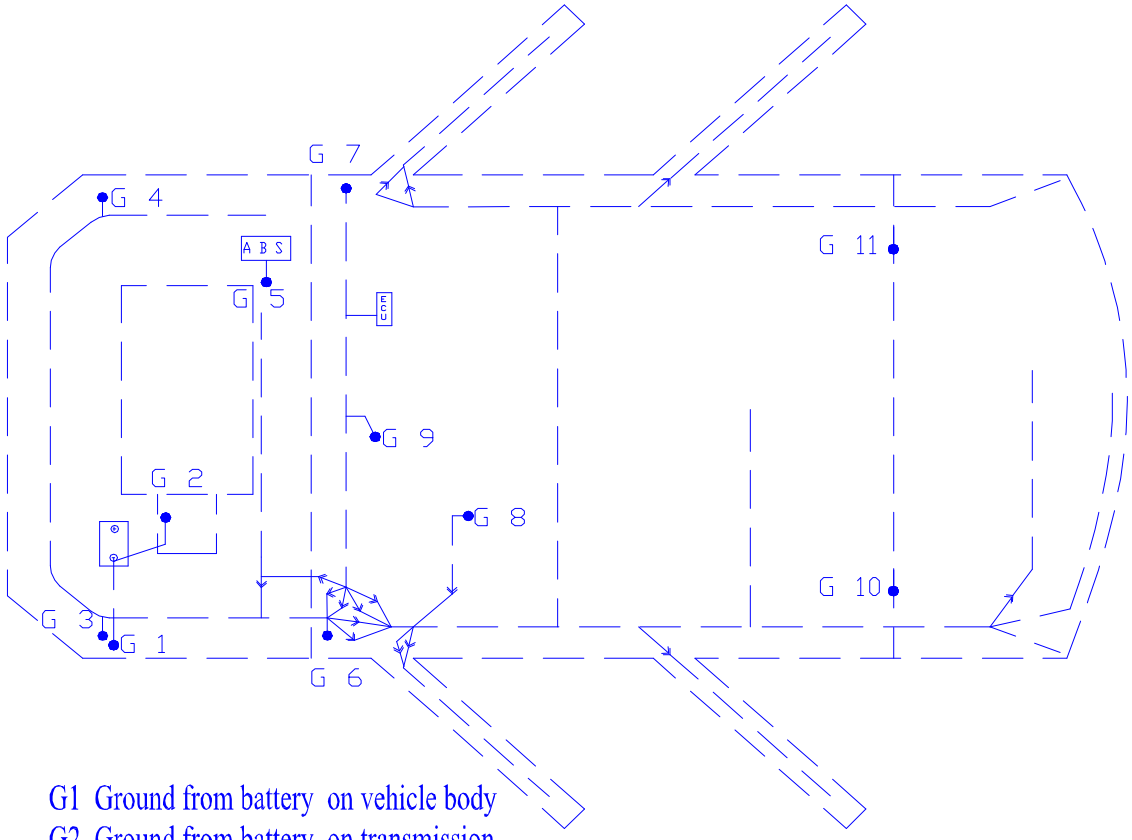
2. Instruction of Main Circuit Symbols

Symbol	Meaning	Symbol	Meaning
	Wiring joint	M	Motor
FUSE 7 10A	Fuse position and speaification		Bulb
ENG CONT RLY	Relay		Switch control
ZE10	Shield		Resistance unit
	Shield		Electromagnetic coil
			LED
	Connector		Ground

Note: Please validata specifically the real articles with the circuits for other symbols

Diagram explanation

3. Distribution of Various Earth Points and Main Modules



G1 Ground from battery on vehicle body
G2 Ground from battery on transmission
G3 Under the LF lamp
G4 Under the RF lamp
G5 Near the ABS punp
G6 Under the left A pillar
G7 Under the right A pillar
G8 Under the driver seat
G9 Under the CONTROL SHIFT ASSY
G10 Under the left C pillar
G11 Under the right C pillar

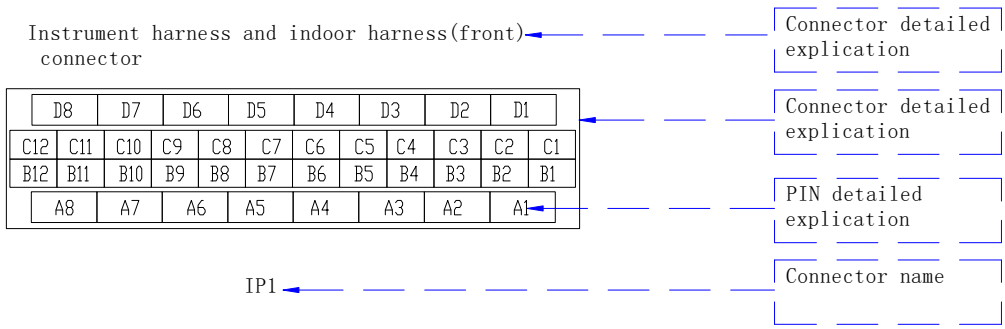
Diagram explanation

4. Fuse Number

The fuse number within the front compartment relay box is expressed by "FB+number"and "SB+number".
"FB+number" is small fuse
"SB+number"is big fuse

5. PIN Definition Explanation

The PIN definition of the circuit theory diagram:
For instance as follows:



"To IP A /5" indicates "to #5 PIN of plug A of IP module"

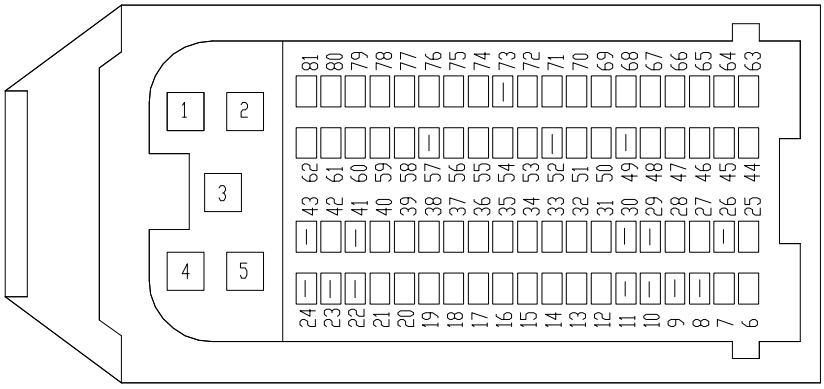
"To ECU5" indicates "to #5 PIN of ECU"

6. Note

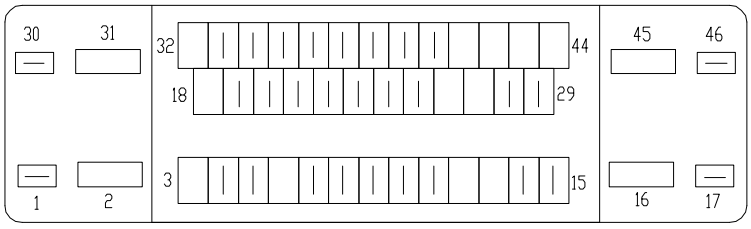
This circuit diagram is mainly designed to provide refreence for model 2.0/1.6automatic basic configuration type.As limited time is likely to give rise to some mistakes, as a consequence please contact service department of chery international.
Contact person: Mr Yaozhikun &Mr Hujian
Email: yaozhikun@mychery.com&hujian@mychery.com

CONNECTOR NOTE

ECU Connector(ECU)

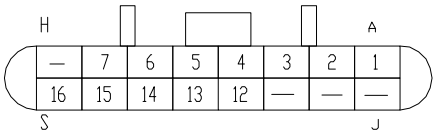


ABS Connector (ABS)



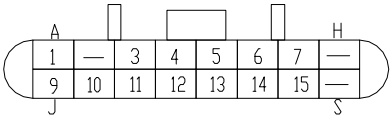
CONNECTOR NOTE

ECU Harness and instrument harness connector



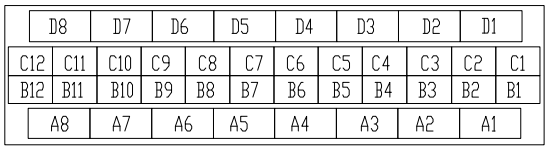
ECU/A1

ECU Harness and instrument harness connector



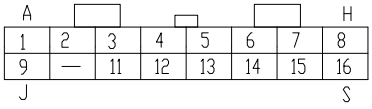
ECU/A2

Instrument harness and indoor harness(front) connector



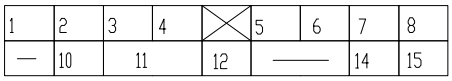
IP1

Instrument harness and indoor harness(front) connector



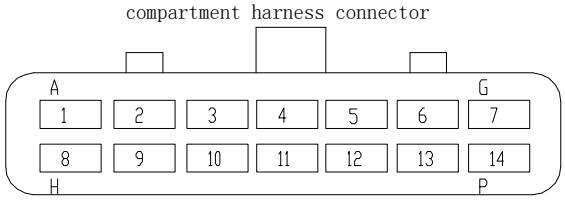
IP2

Instrument harness and A/C harness connector



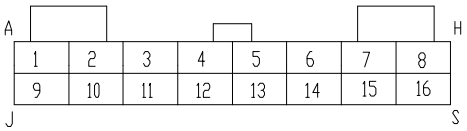
A/C

Indoor harness(front) and front compartment harness connector



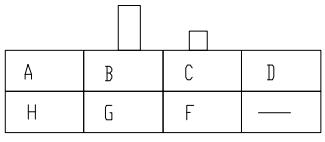
CO

Engine harness and indoor harness(front) connector



ECU/FG

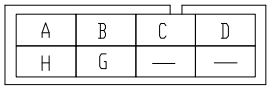
Indoor harness(front) and roof light harness connector



RO

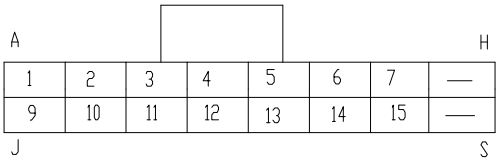
CONNECTOR NOTE

Indoor harness(fornt) and indoor harness(rear) connector



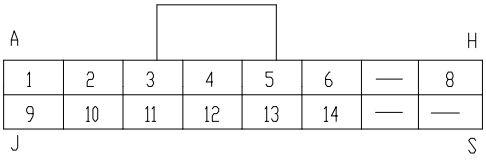
FR1

Indoor harness(fornt) and indoor harness(rear) connector



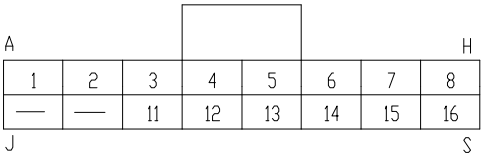
FR2

Indoor harness(front) and LFdoor harness connector



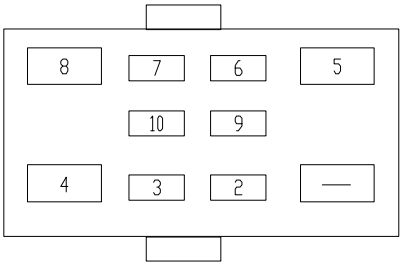
LF1

Indoor harness(front) and LFdoor harness connector



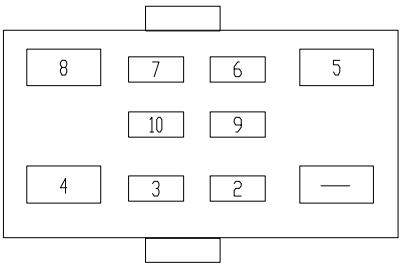
LF2

Indoor harness(rear) and LRdoor harness connector



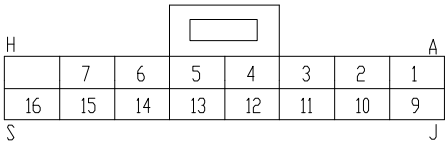
LR

Indoor harness(rear) and RRdoor harness connector



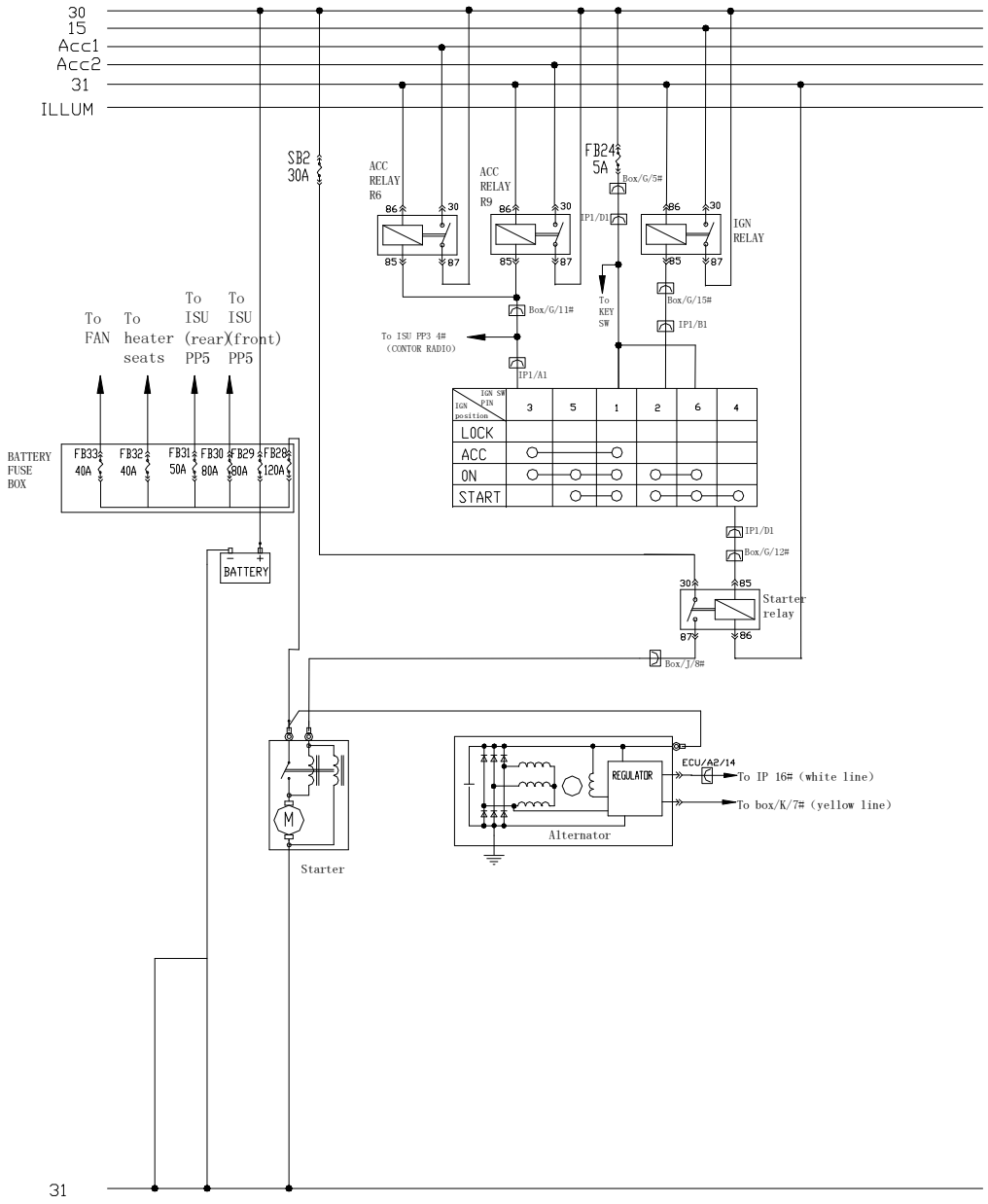
RR

Indoor harness(front) and RFdoor harness connector

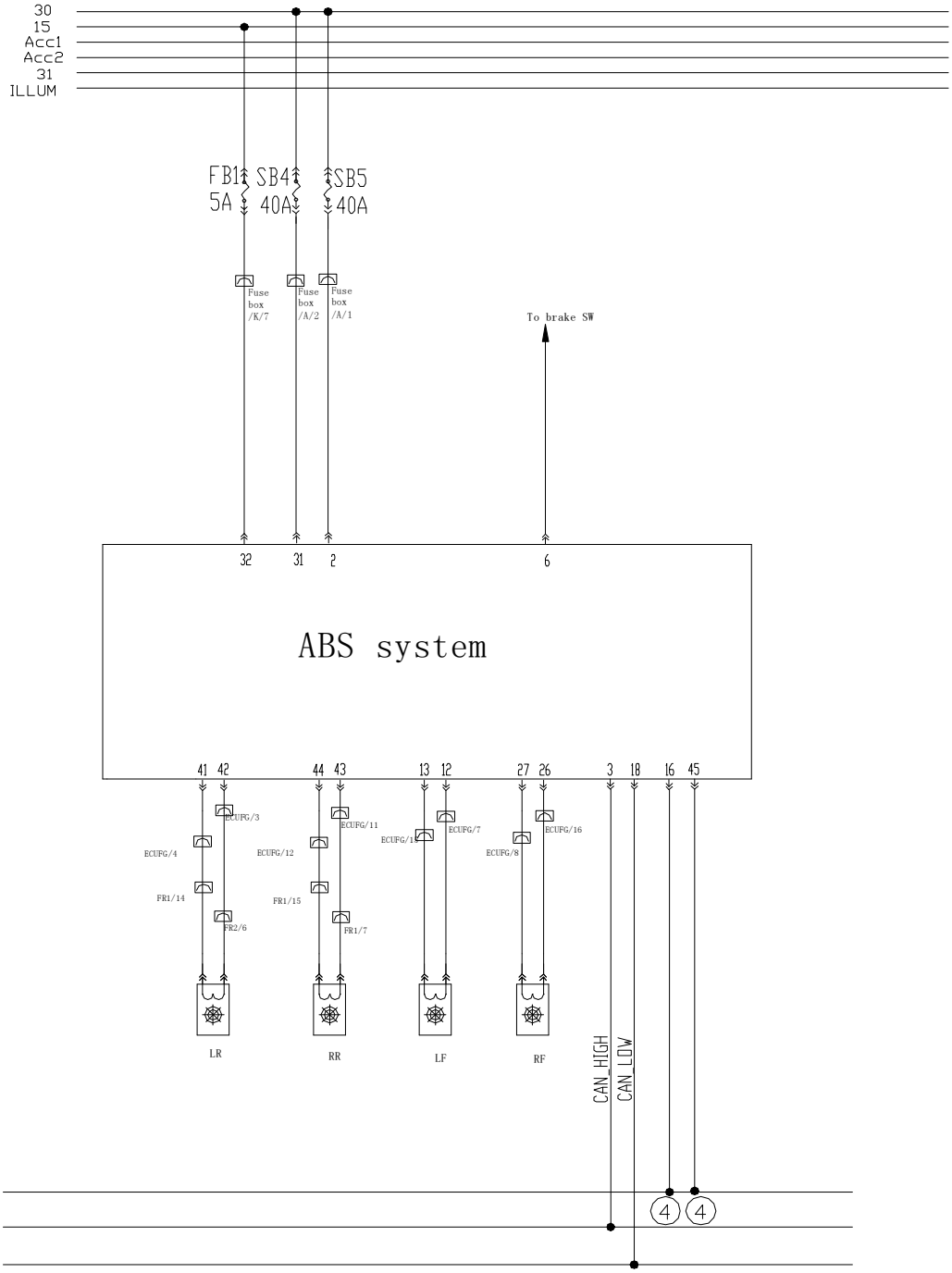


RF

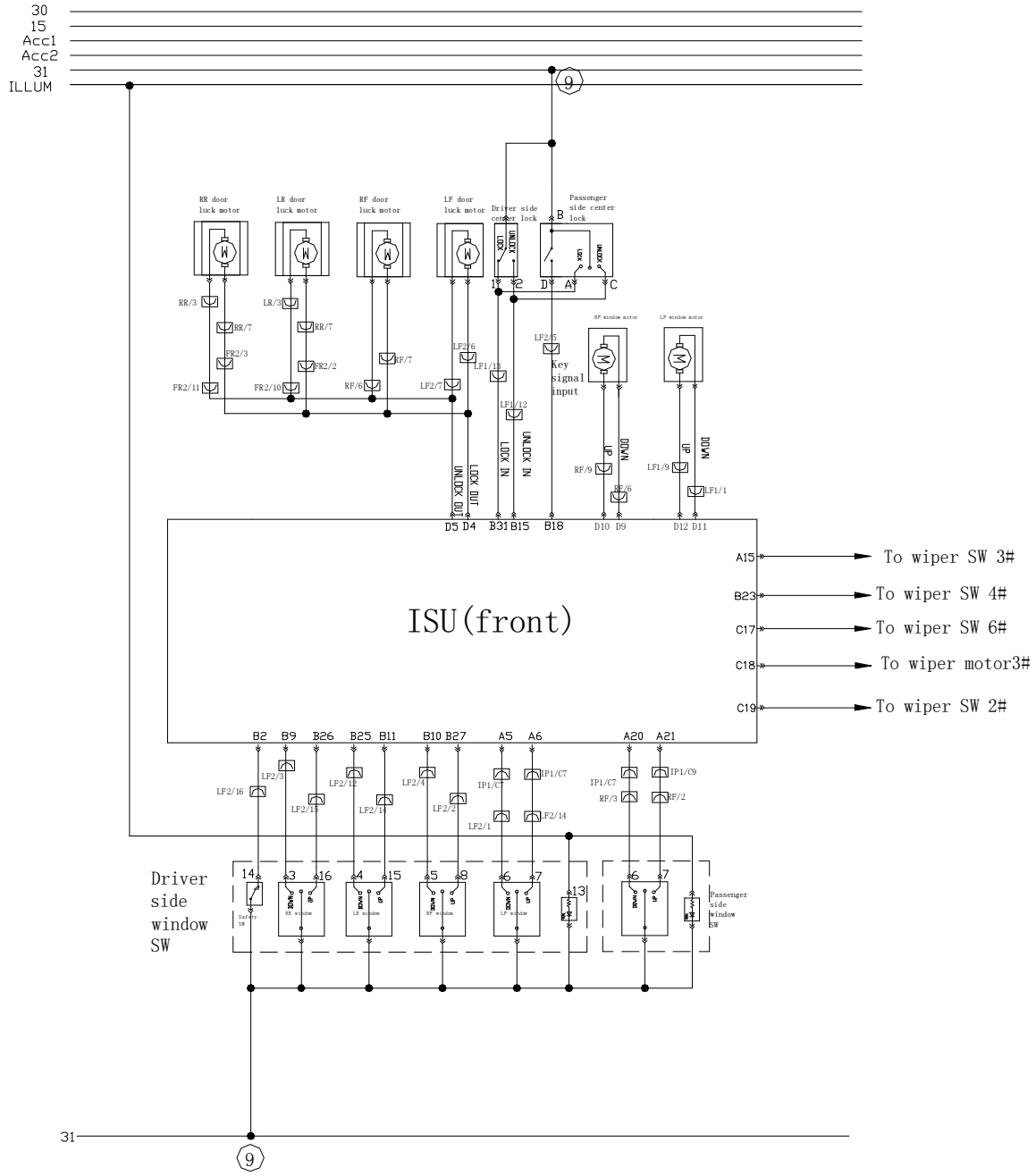
Start & charging sysytem



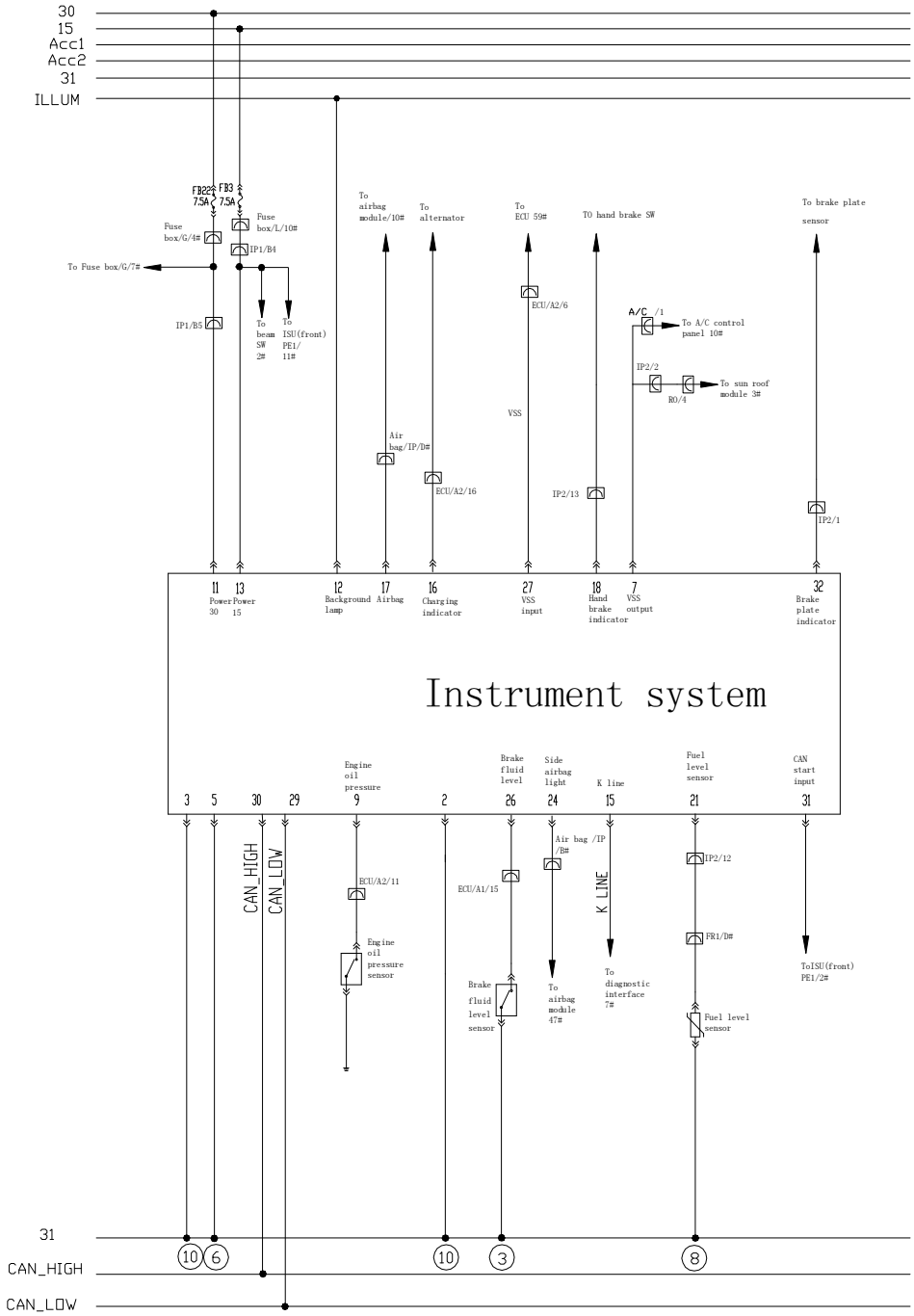
ABS system


30
15
Acc1
Acc2
31
ILLUM
FB1
5A
SB4
40A
SB5
40A
Fuse box /K/7
Fuse box /A/2
Fuse box /A/1
To brake SW
32
31
2
6
ABS system
41 42
44 43
13 12
27 26
3 18
16 45
ECUFG/3
ECUFG/4
FR1/14
FR2/6
ECUFG/11
ECUFG/12
FR1/15
FR1/7
ECUFG/7
ECUFG/8
ECUFG/16
LR
RR
LF
RF
CAN_HIGH
CAN_LOW
4
4

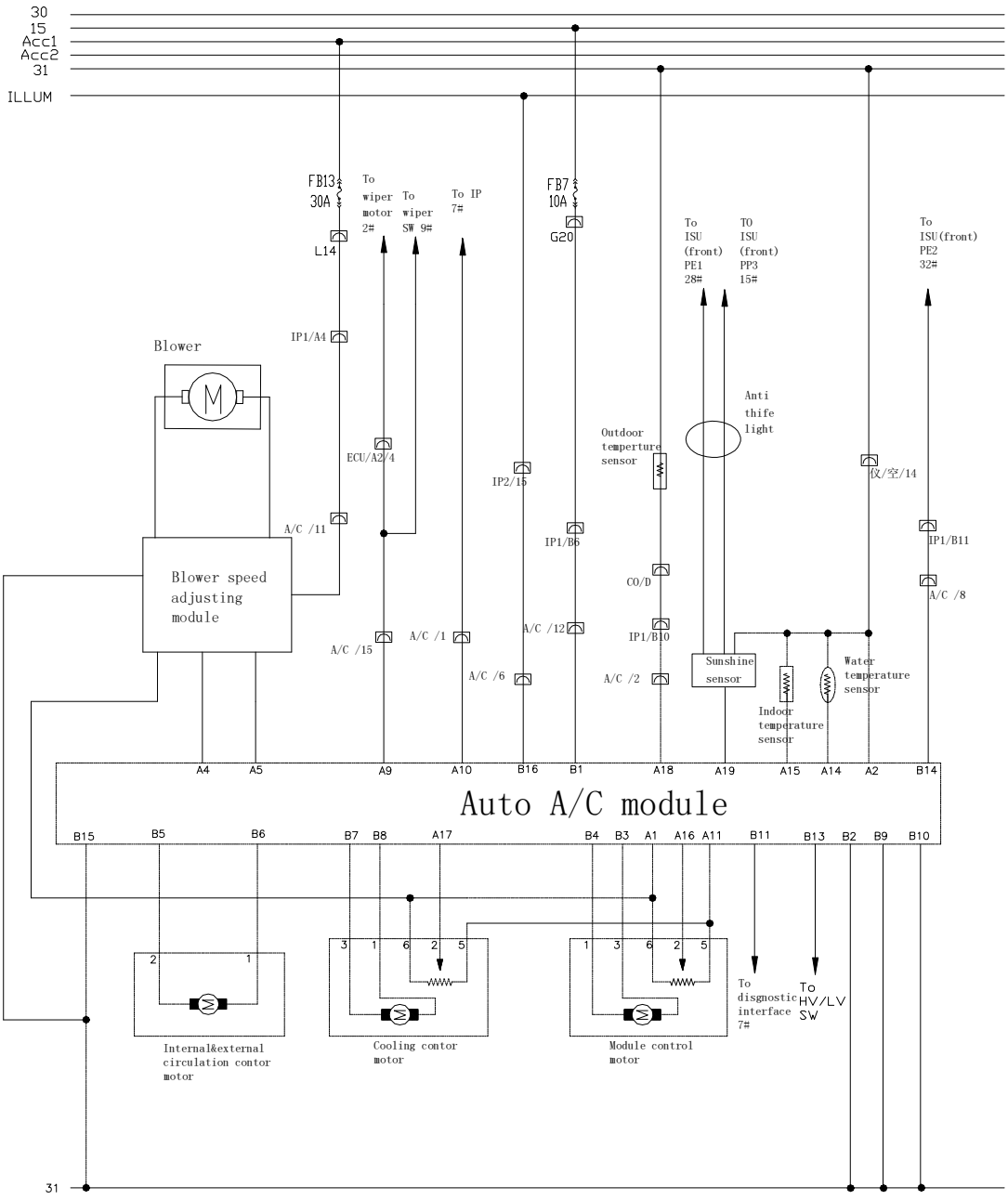
Power windows and center lock



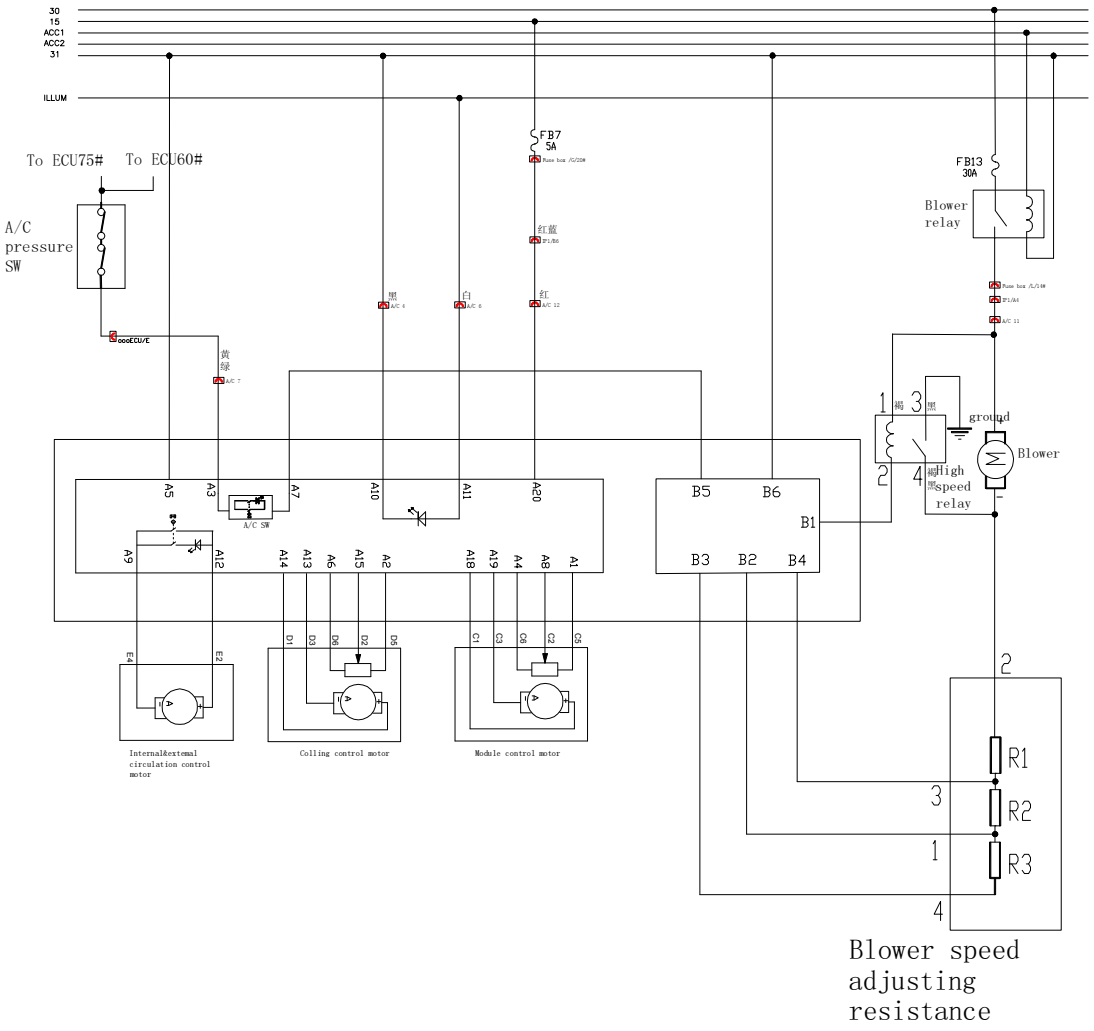
Instrument system



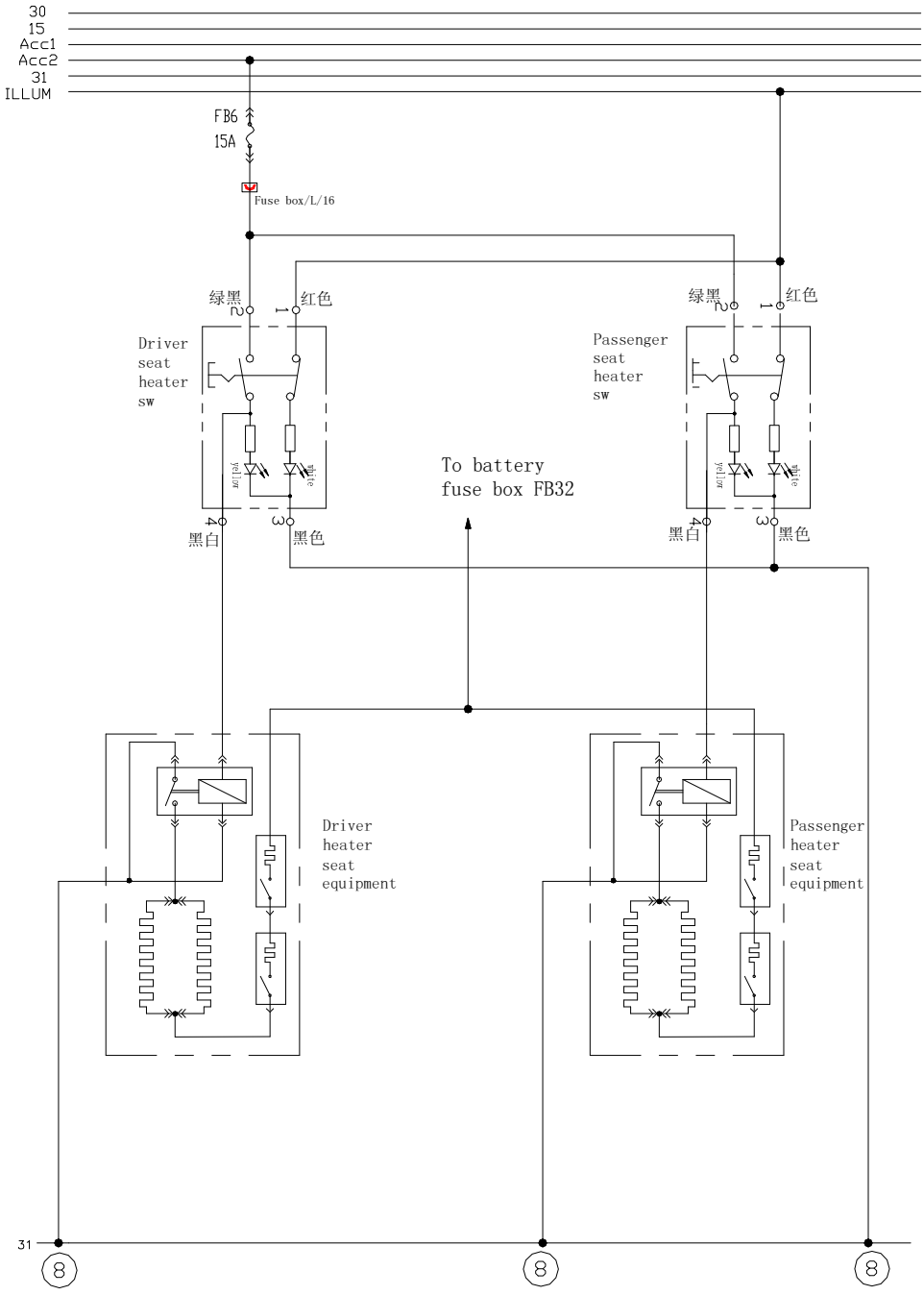
Auto A/C system (A/Cmoudle big connector is A, small connector is B)



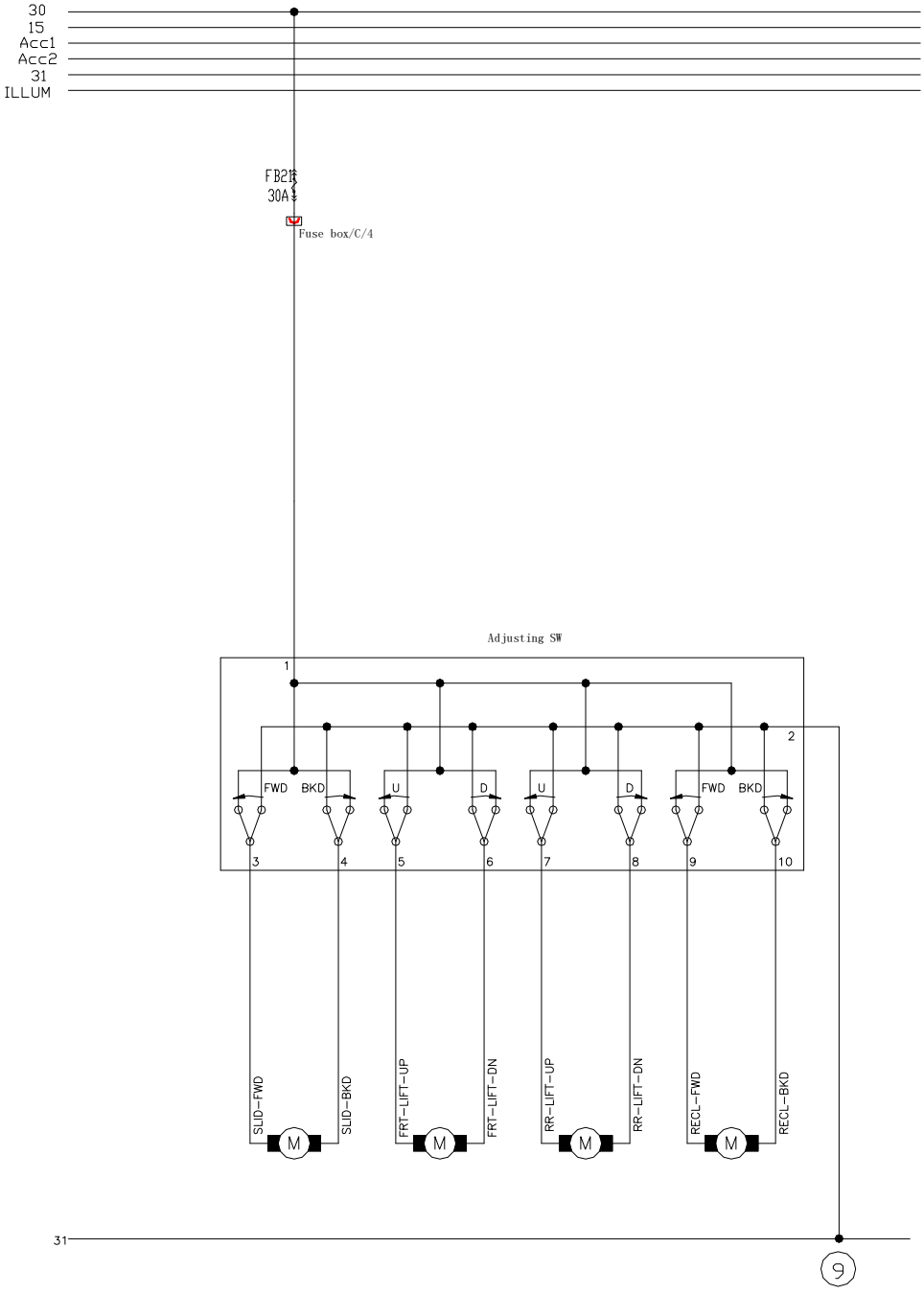
Manual A/C system (A/Cmoudle big connector is A, small connector is B)



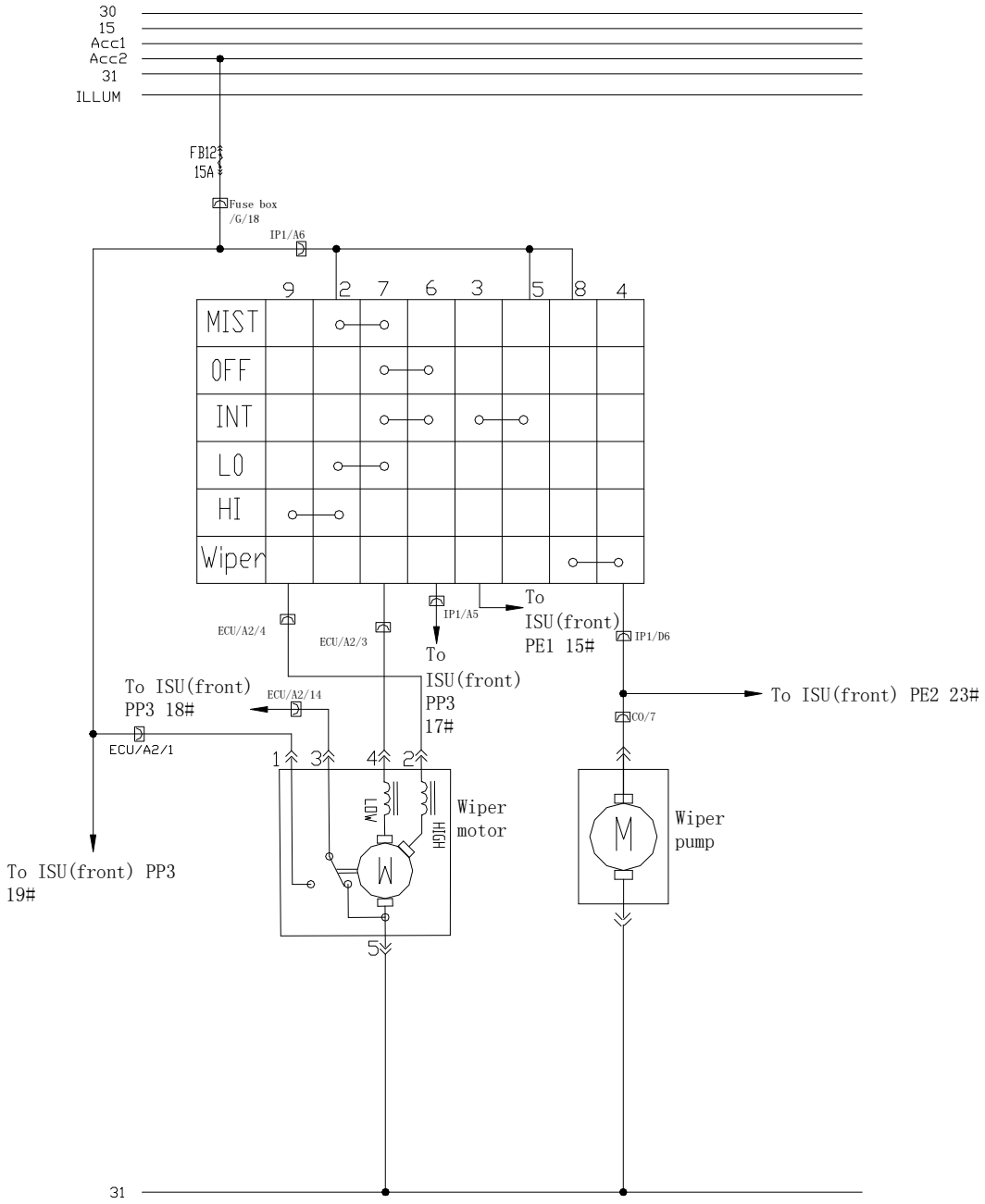
Heater seats system



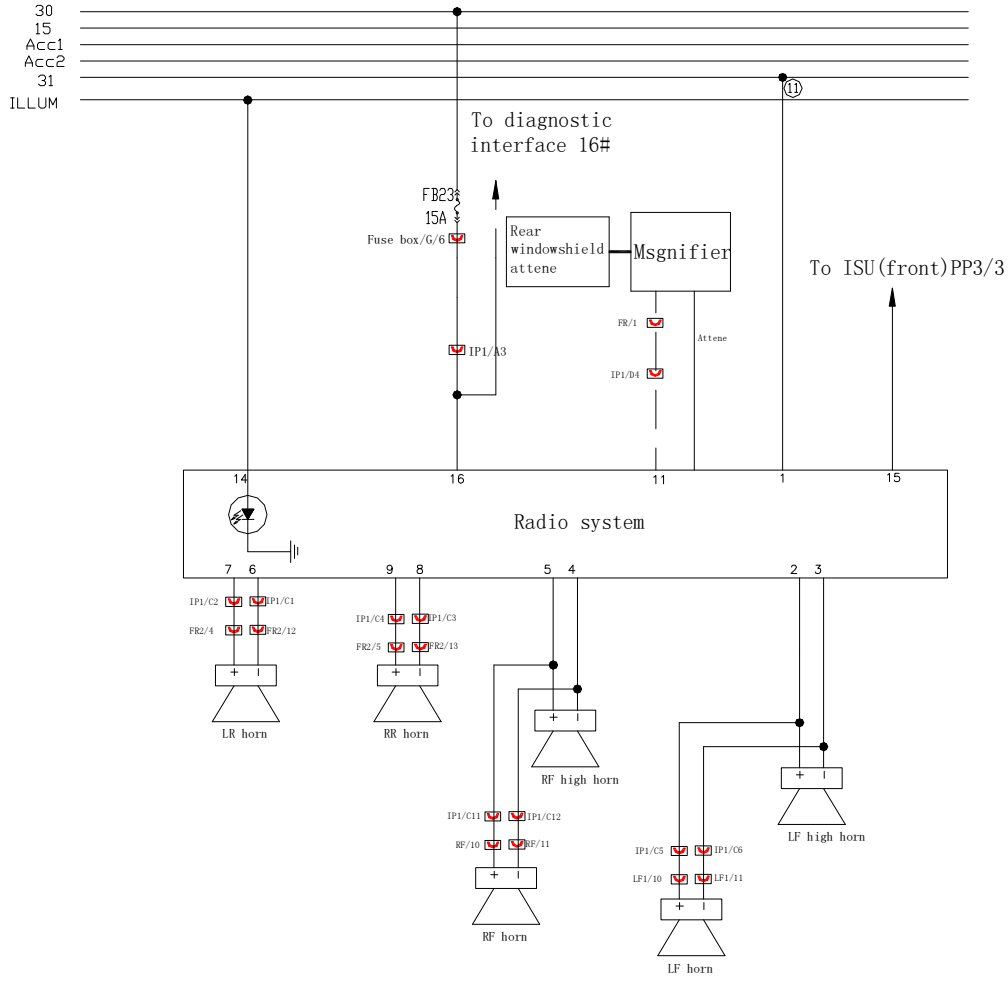
Seat adjusting system



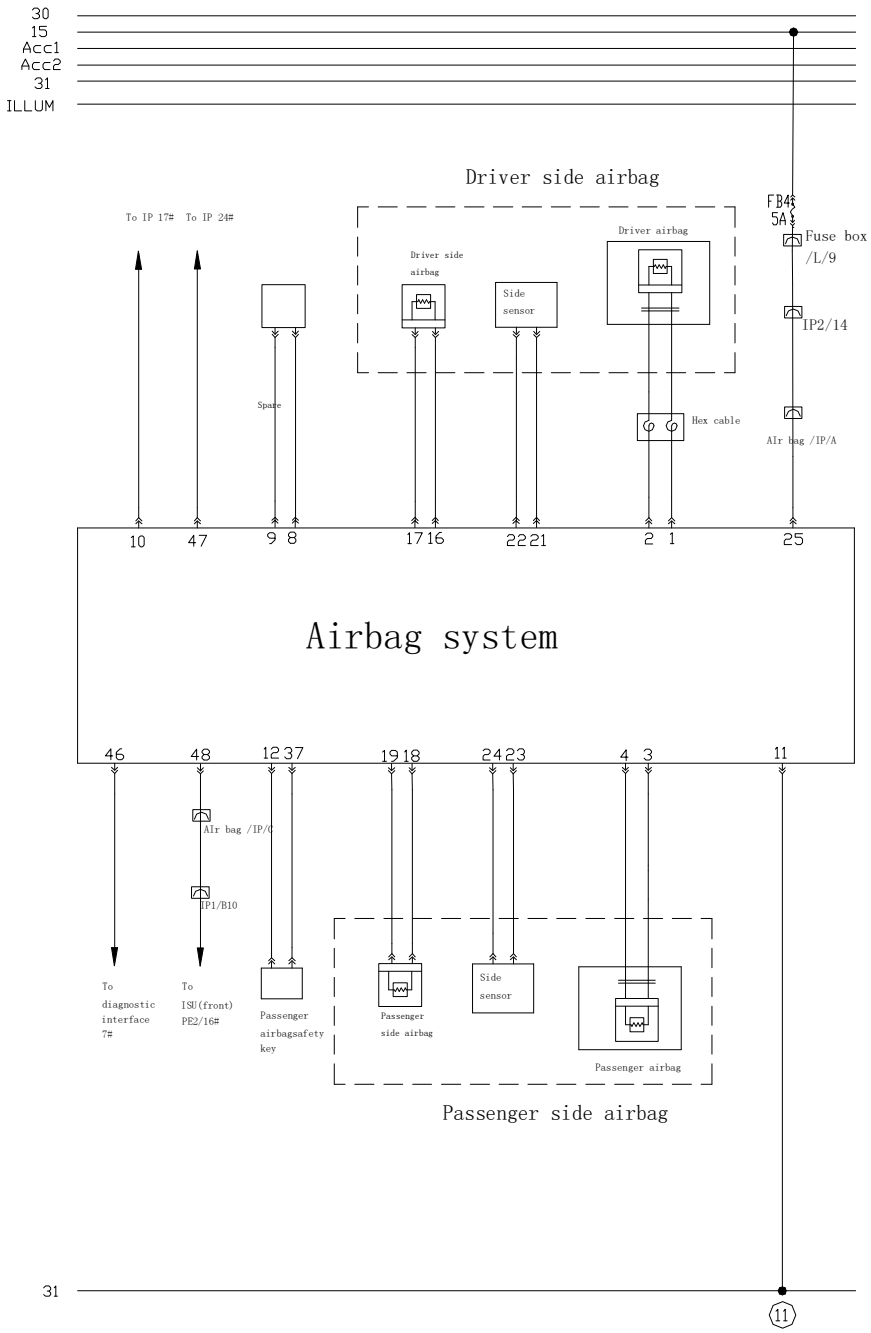
Wiper system



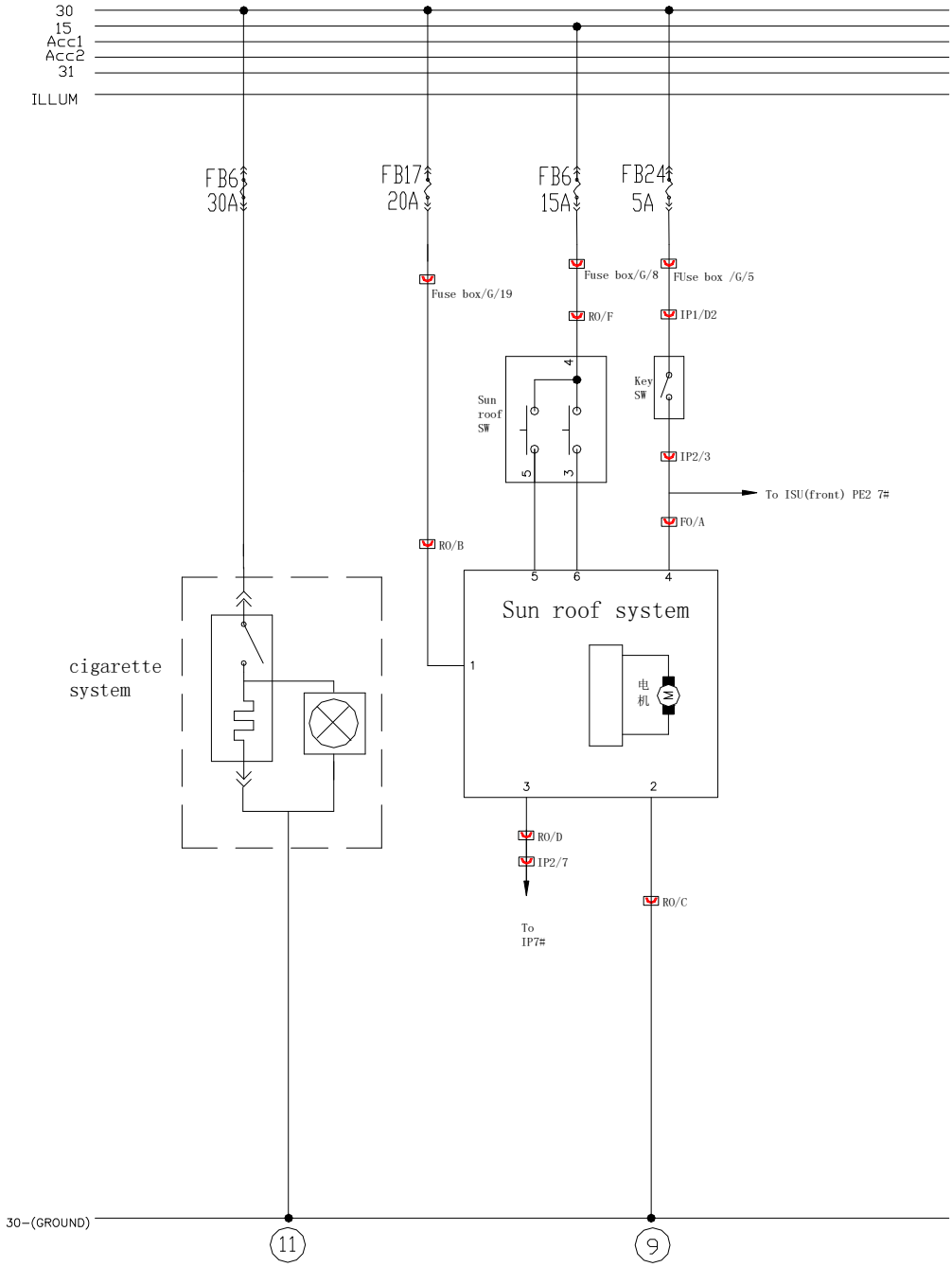
Radio system



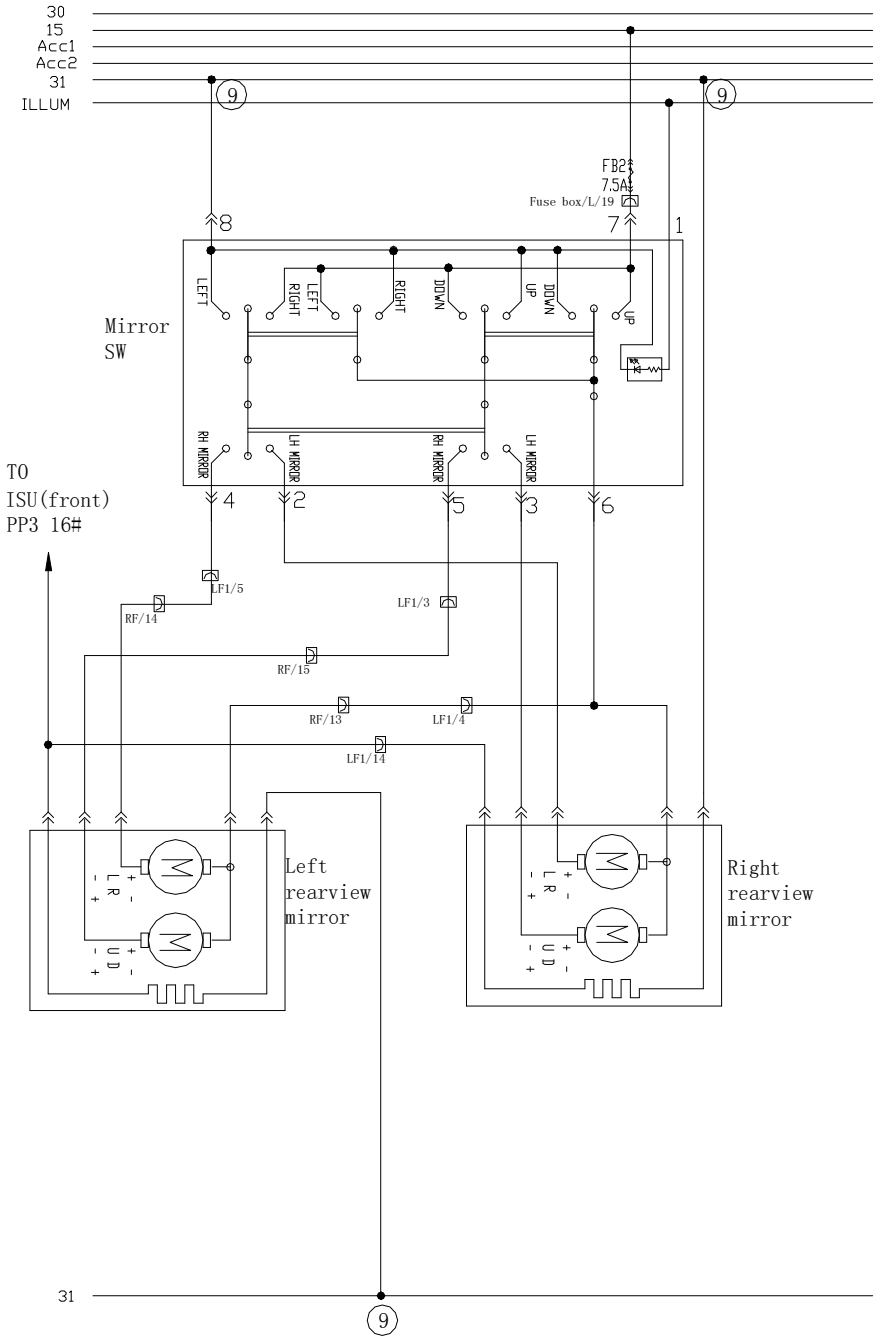
Airbag system



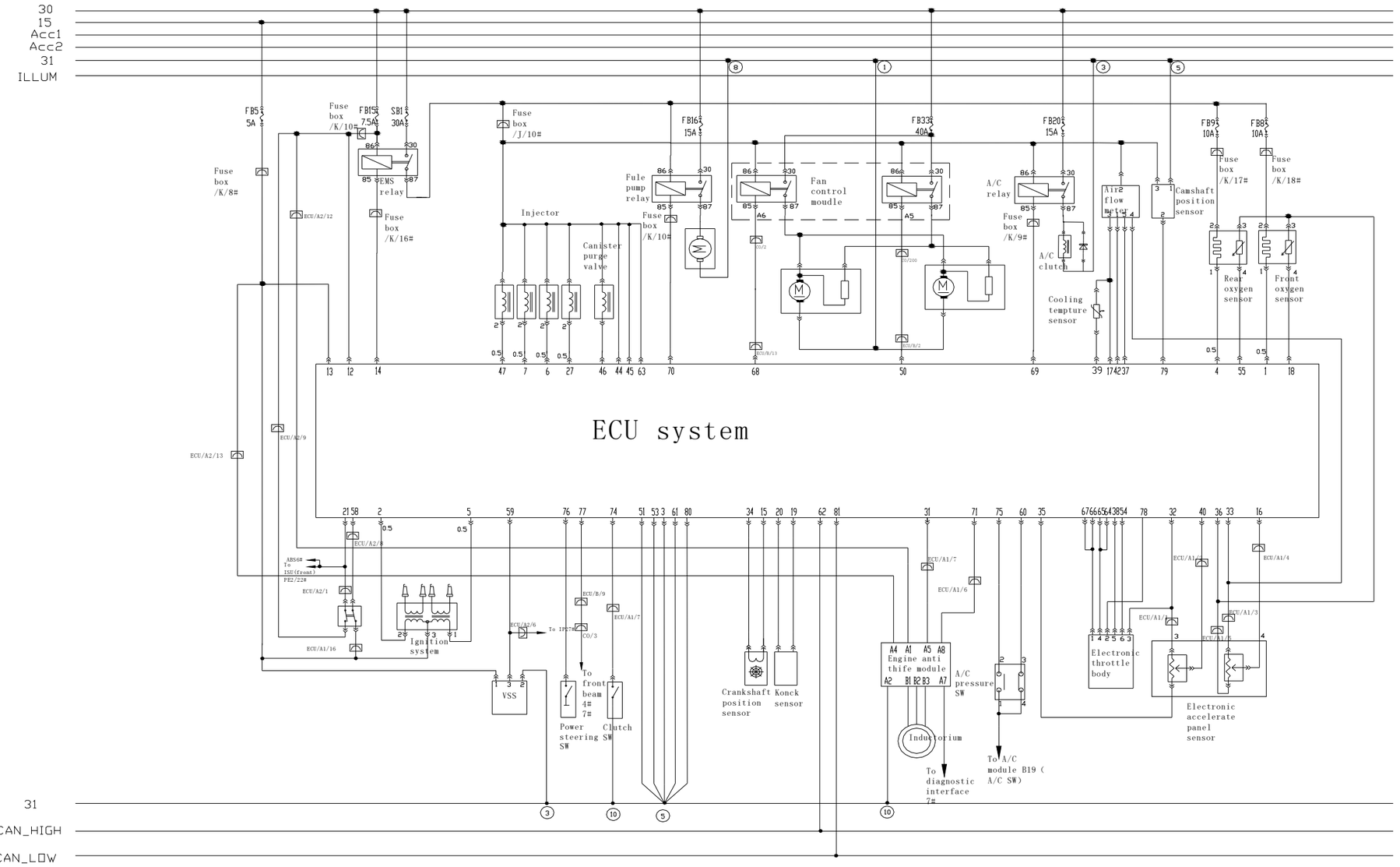
Sun roof and cigarette system



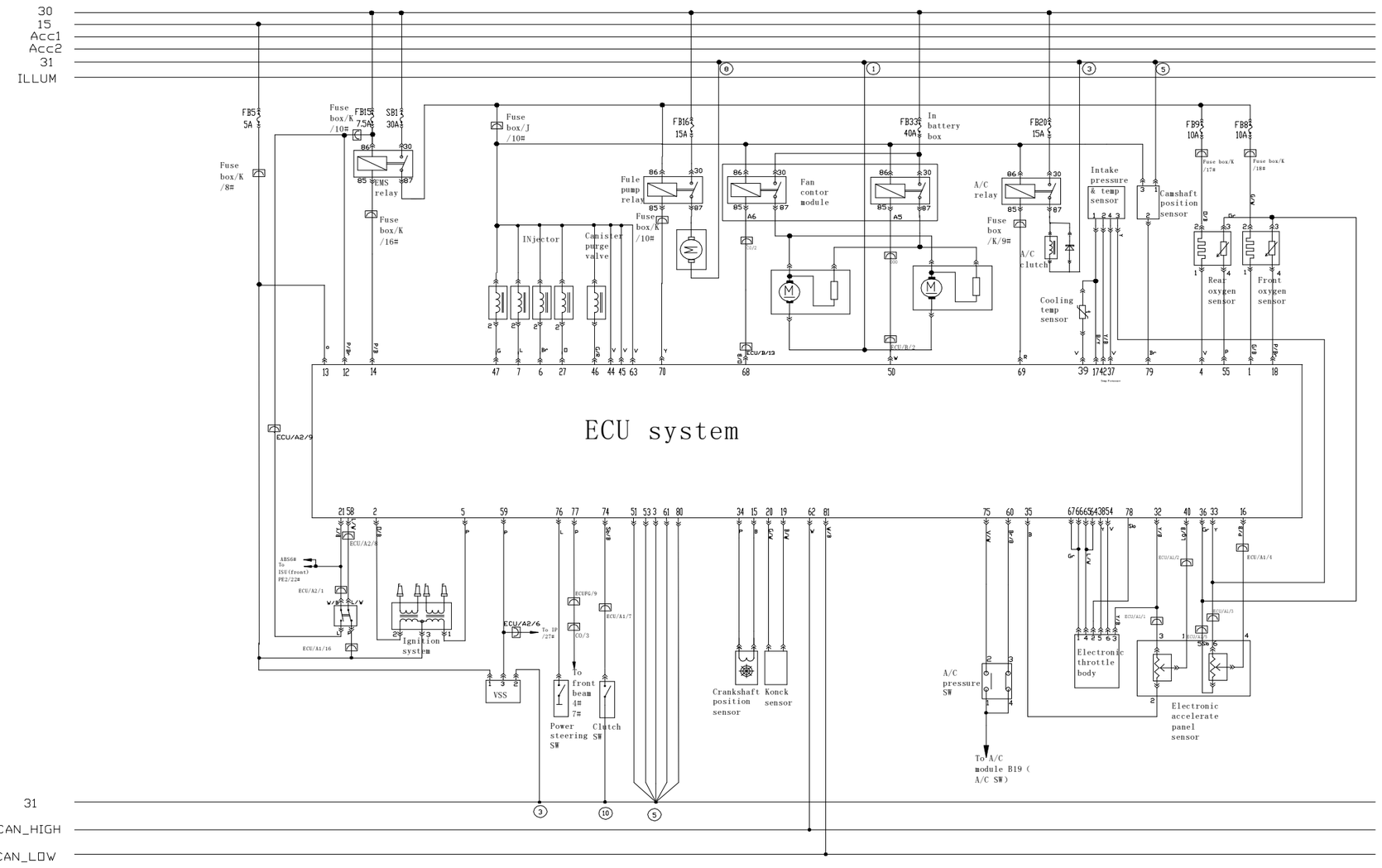
Power rearview mirror system



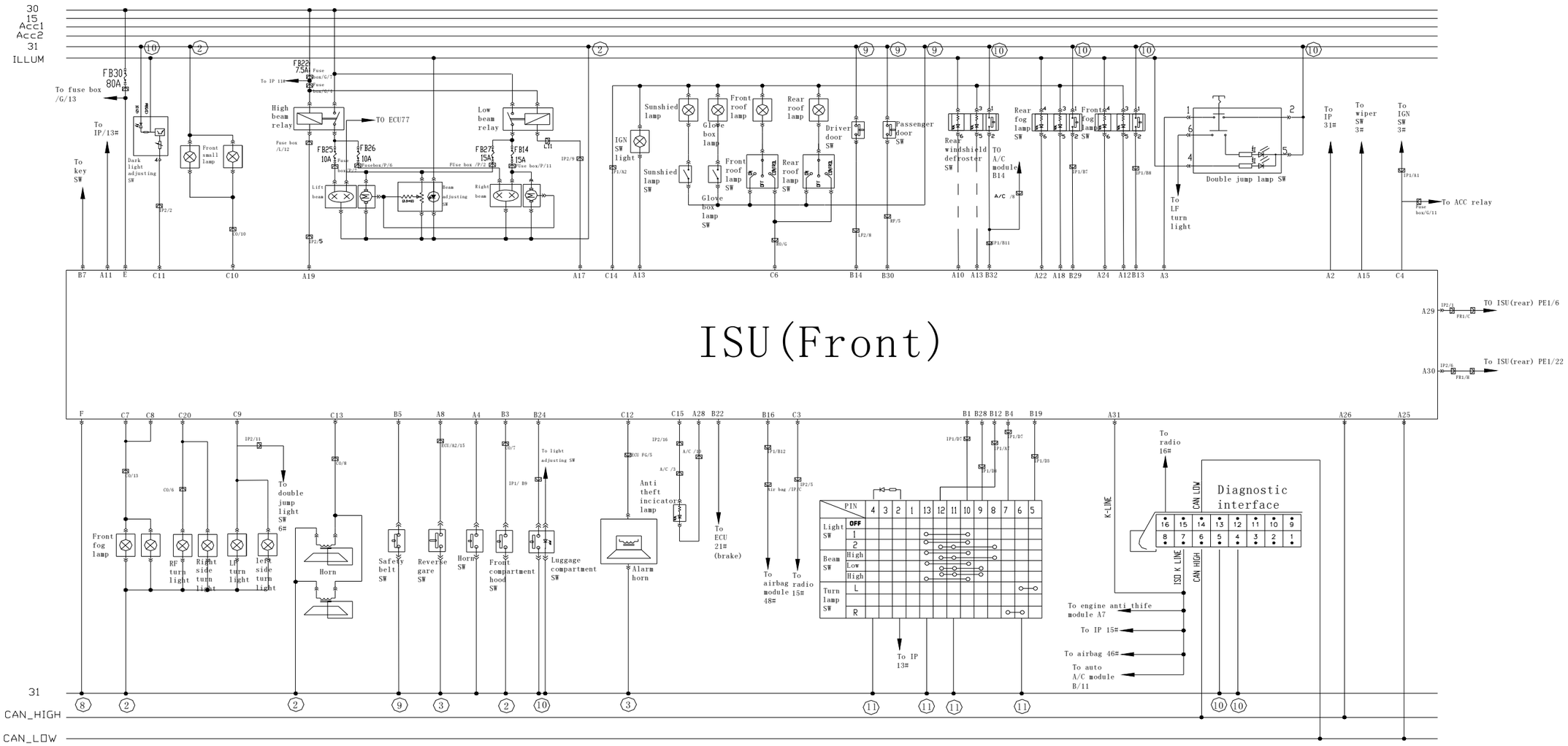
ECU system(ME797)



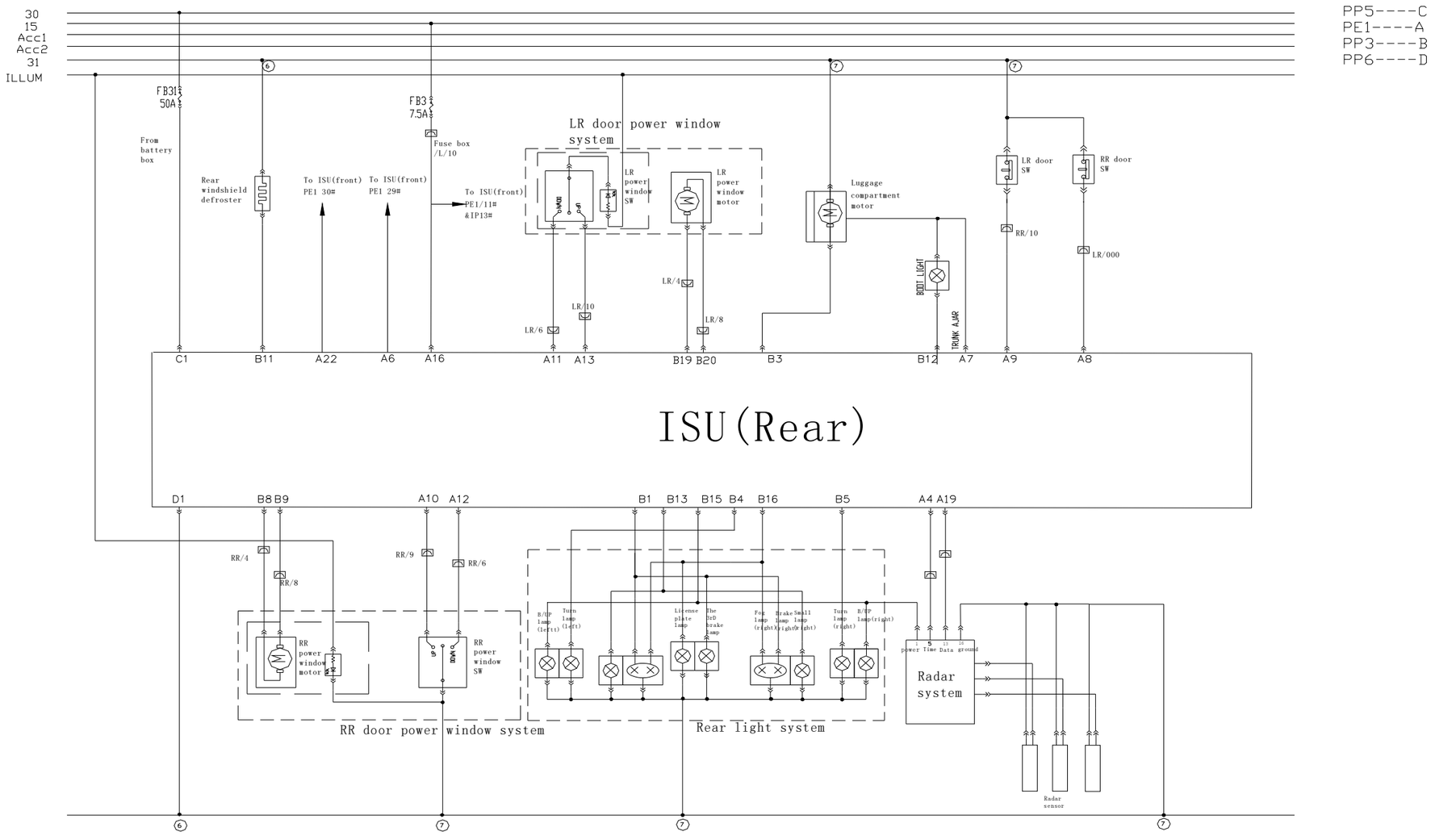
ECU system(M797)



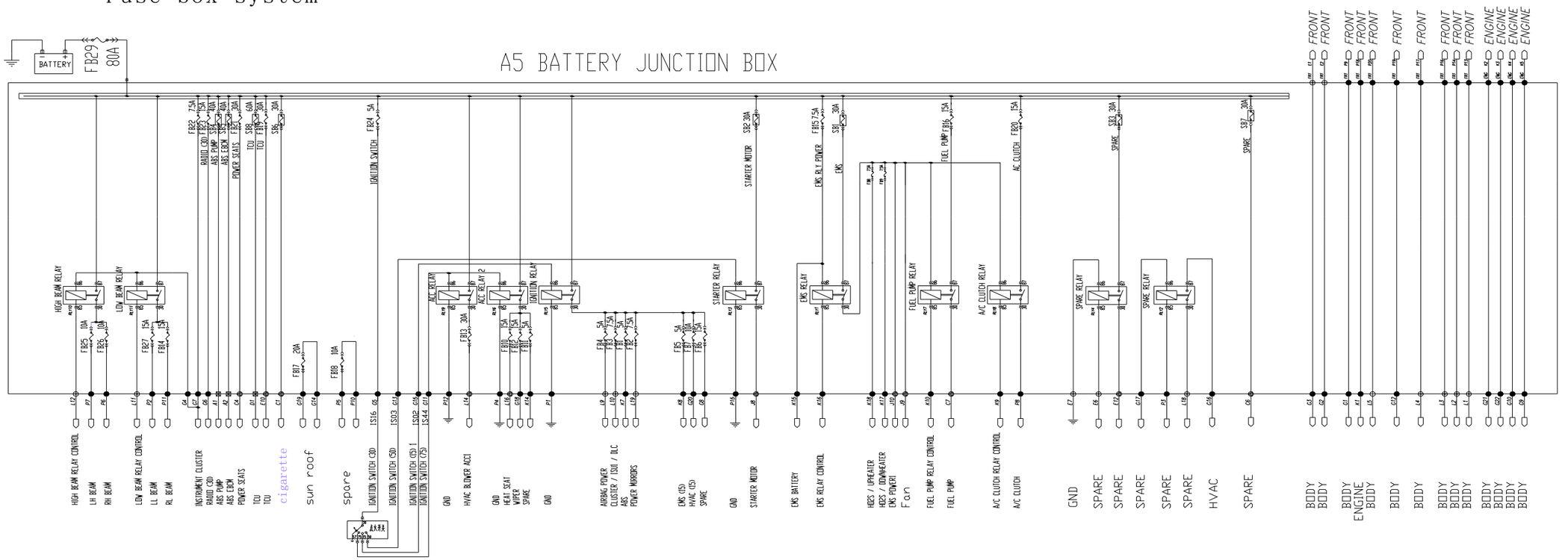
ISU(front) system

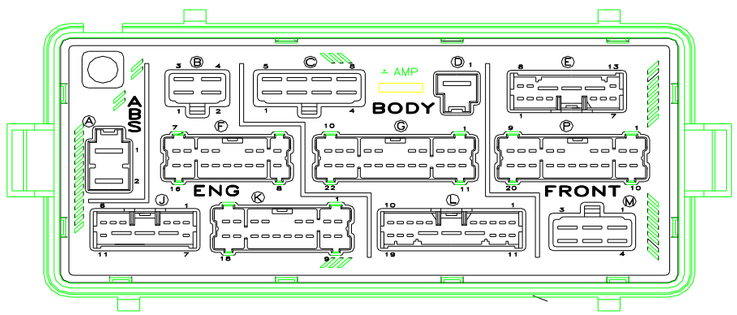


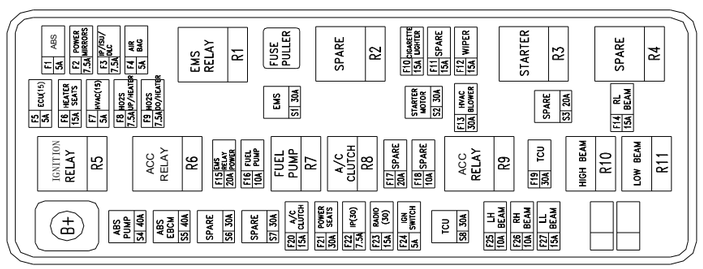
ISU(rear) system



Fuse box system





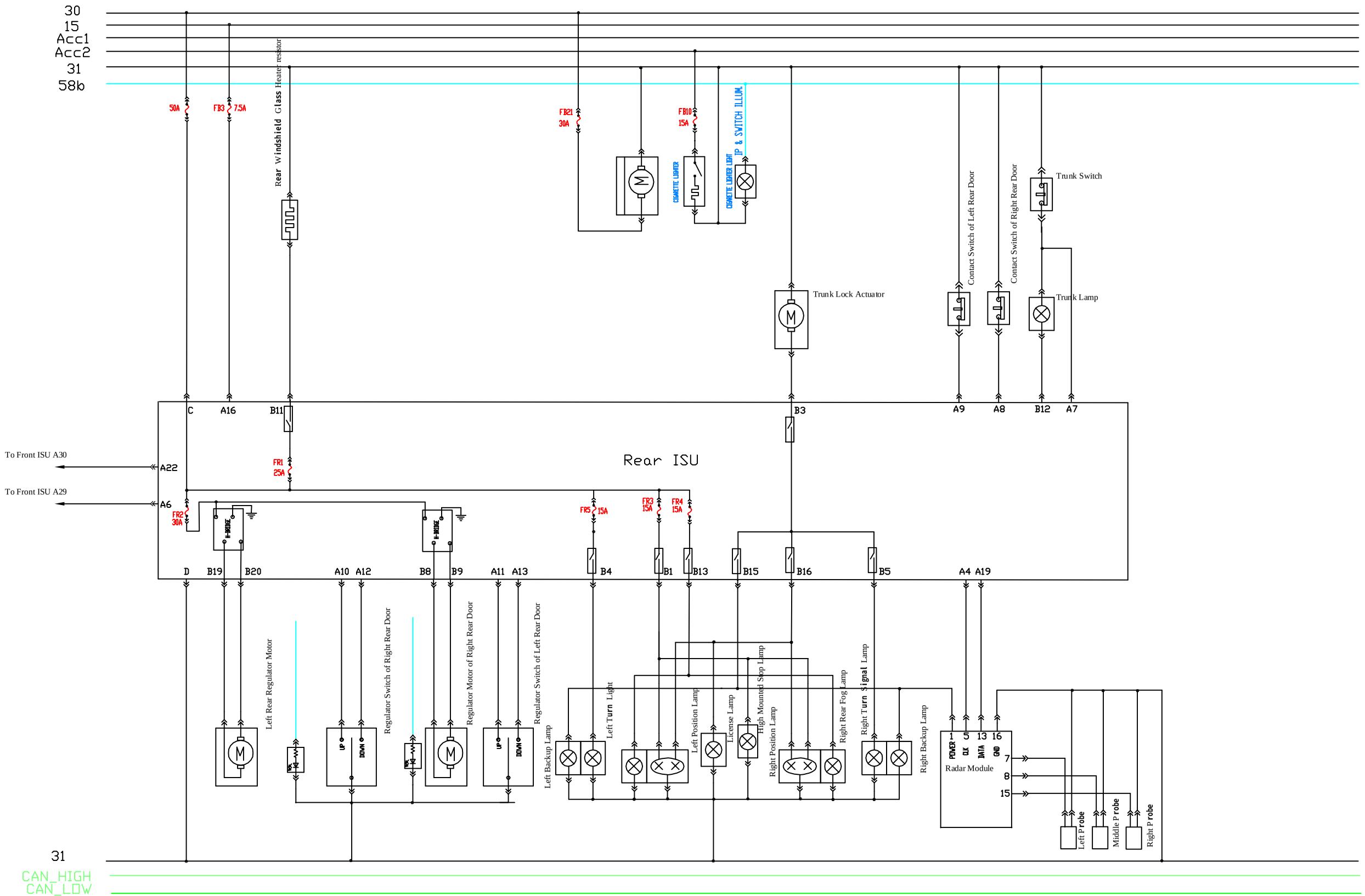


READING INSTRUCTION

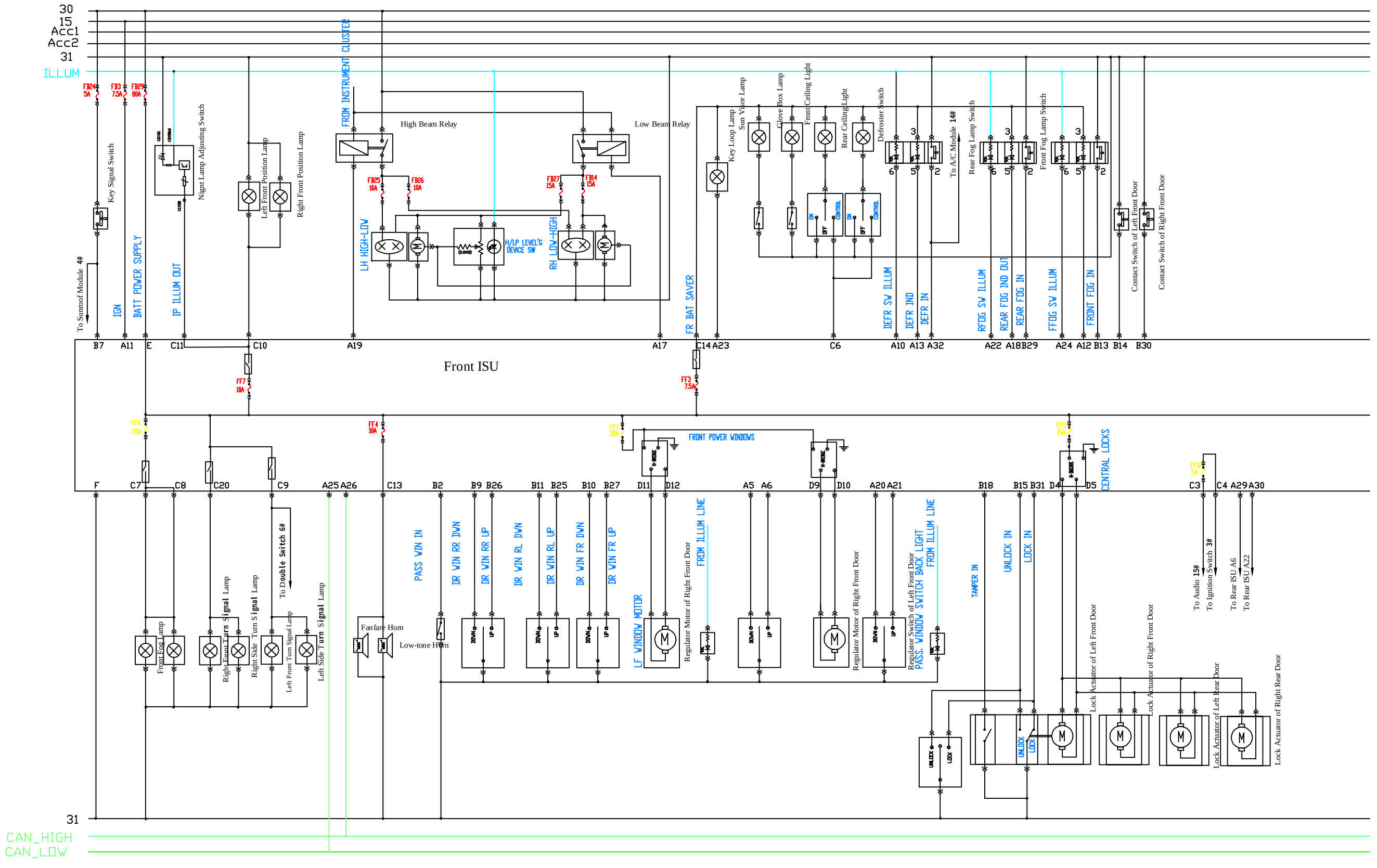
1. NO. of relay circuit:
   30：Coming from storage battery
   15：Controling by ignition switch
   ACC：Ignition switch radio set
   31：Ground
   58b：Luminous regulating line

2. This circuit diagram is suitable to configuration of A21 1.6 and 2.0. Considering the time limit, it is liable to mistakes or omissions. Please contact with Service Technology Dep. of sales company if any unconformity is found.
   TEL：0553-5922392
   FAX：0553-5840795

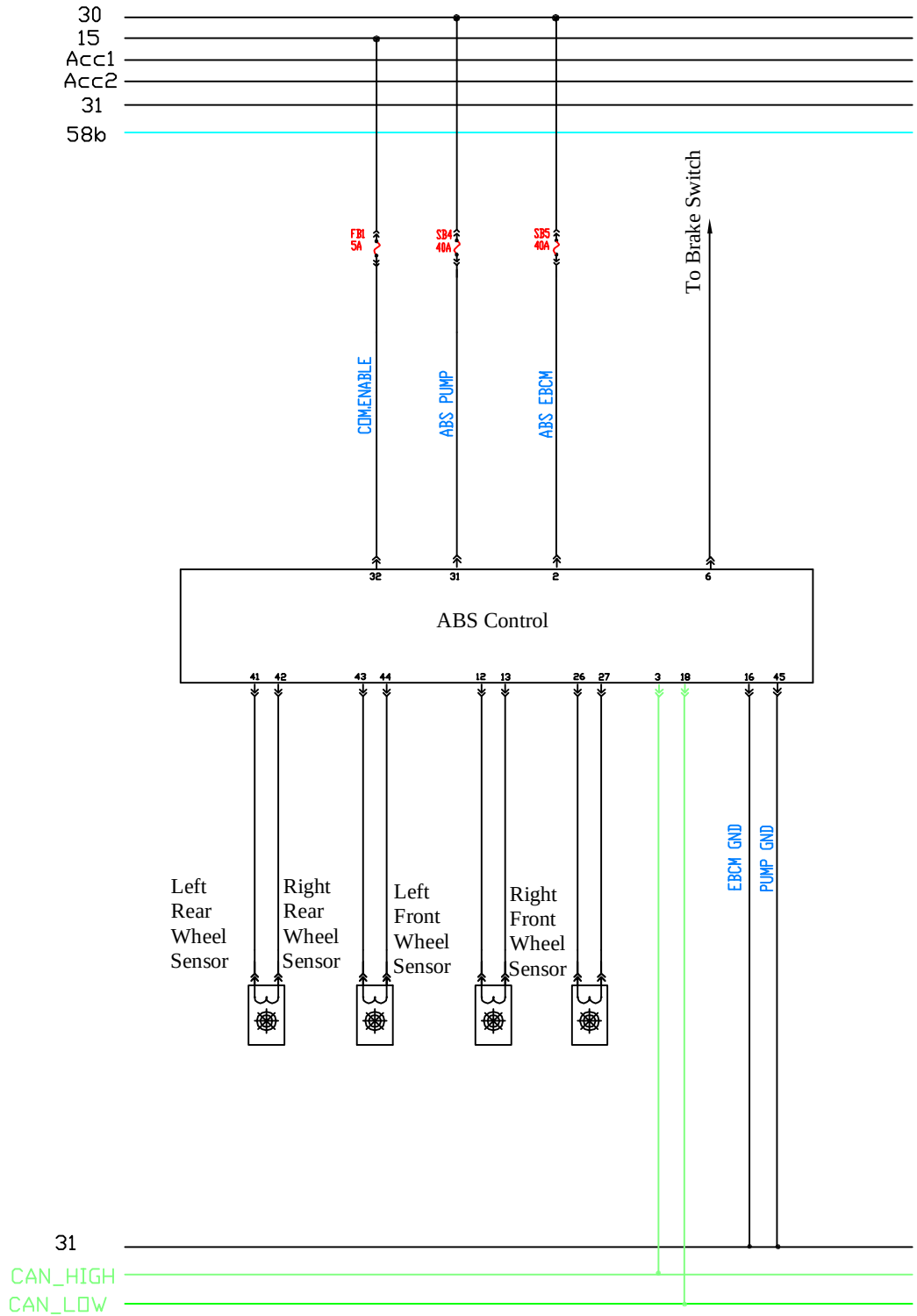
REAR ISU SYSTEM



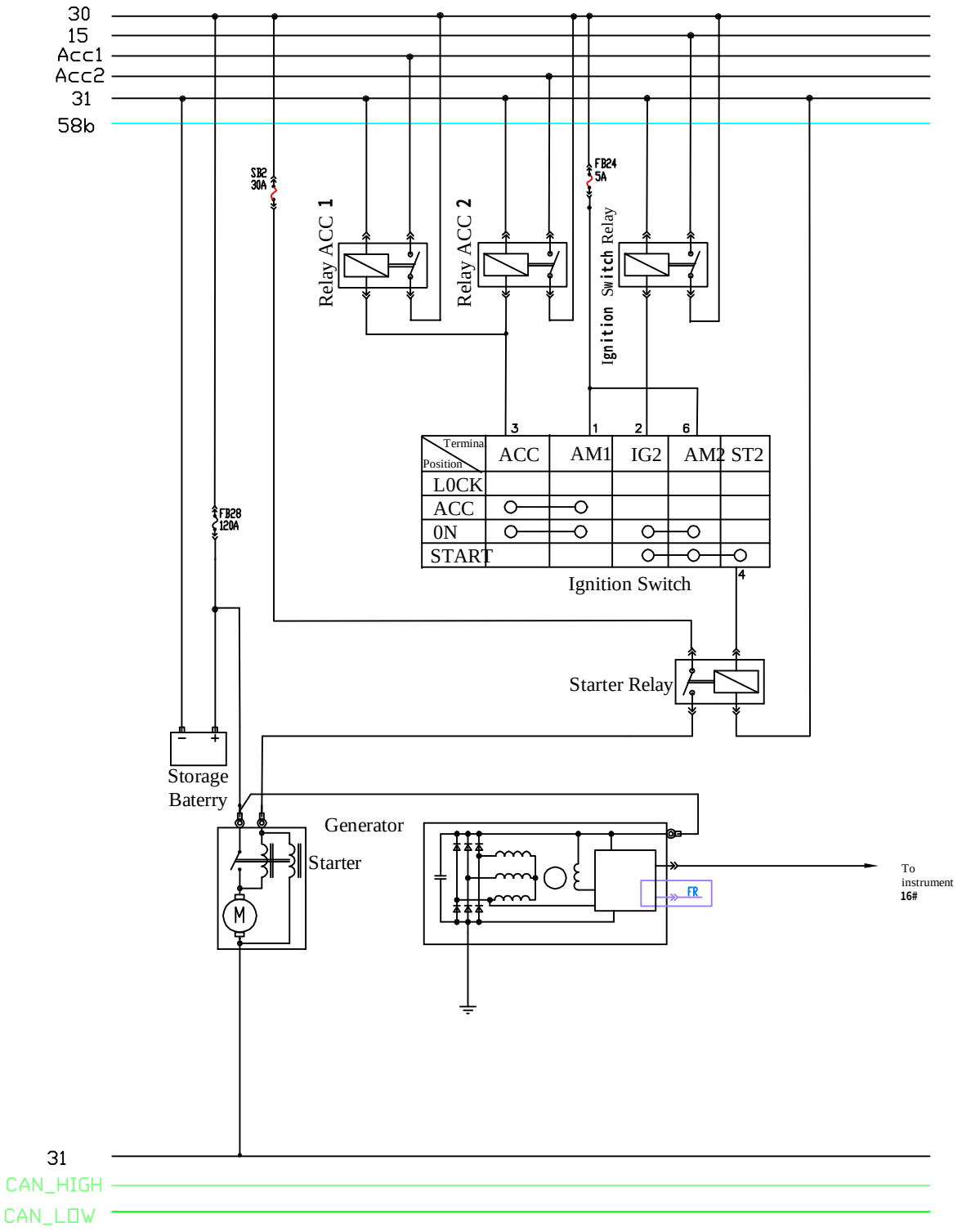
FRONT ISU


30
15
Acc1
Acc2
31
ILLUM
FB24 5A
FB3 7.5A
FB29 80A
Key Signal Switch
Night Lamp Adjusting Switch
Left Front Position Lamp
Right Front Position Lamp
FROM INSTRUMENT CLUSTER
High Beam Relay
Low Beam Relay
FB25 10A
FB26 10A
FB27 15A
FB14 15A
LH HIGH-LOW
RH LOW-HIGH
H/LP LEVEL'G DEVICE SW
Key Loop Lamp
Sun Visor Lamp
Glove Box Lamp
Front Ceiling Light
Rear Ceiling Light
Defroster Switch
To A/C Module 14#
Rear Fog Lamp Switch
Front Fog Lamp Switch
To Sunroof Module 4#
IGN
BATT POWER SUPPLY
IP ILLUM OUT
FR BAT SAVER
DEFR SW ILLUM
DEFR IND
DEFR IN
RFOG SW ILLUM
REAR FOG IND OUT
REAR FOG IN
FFOG SW ILLUM
FRONT FOG IN
Contact Switch of Left Front Door
Contact Switch of Right Front Door
B7 A11 E C11 C10 A19 A17 C14 A23 C6 A10 A13 A32 A22 A18 B29 A24 A12 B13 B14 B30
Front ISU
FF7 10A
FF3 7.5A
FF6 25A
FF4 10A
FF1 30A
FRONT POWER WINDOWS
FF5 15A
CENTRAL LOCKS
FF8 5A
F C7 C8 C20 C9 A25 A26 C13 B2 B9 B26 B11 B25 B10 B27 D11 D12 A5 A6 D9 D10 A20 A21 B18 B15 B31 D4 D5 C3 C4 A29 A30
To Double Switch 6#
Front Fog Lamp
Right Front Turn Signal Lamp
Right Side Turn Signal Lamp
Left Front Turn Signal Lamp
Left Side Turn Signal Lamp
Fanfare Horn
Low-tone Horn
PASS WIN IN
DR WIN RR DWN
DR WIN RR UP
DR WIN RL DWN
DR WIN RL UP
DR WIN FR DWN
DR WIN FR UP
LF WINDOW MOTOR
Regulator Motor of Right Front Door
FROM ILLUM LINE
Regulator Motor of Right Front Door
Regulator Switch of Left Front Door
PASS. WINDOW SWITCH BACK LIGHT
FROM ILLUM LINE
TAMPER IN
UNLOCK IN
LOCK IN
Lock Actuator of Left Front Door
Lock Actuator of Right Front Door
Lock Actuator of Left Rear Door
Lock Actuator of Right Rear Door
To Audio 15#
To Ignition Switch 3#
To Rear ISU A6
To Rear ISU A22
31
CAN_HIGH
CAN_LOW

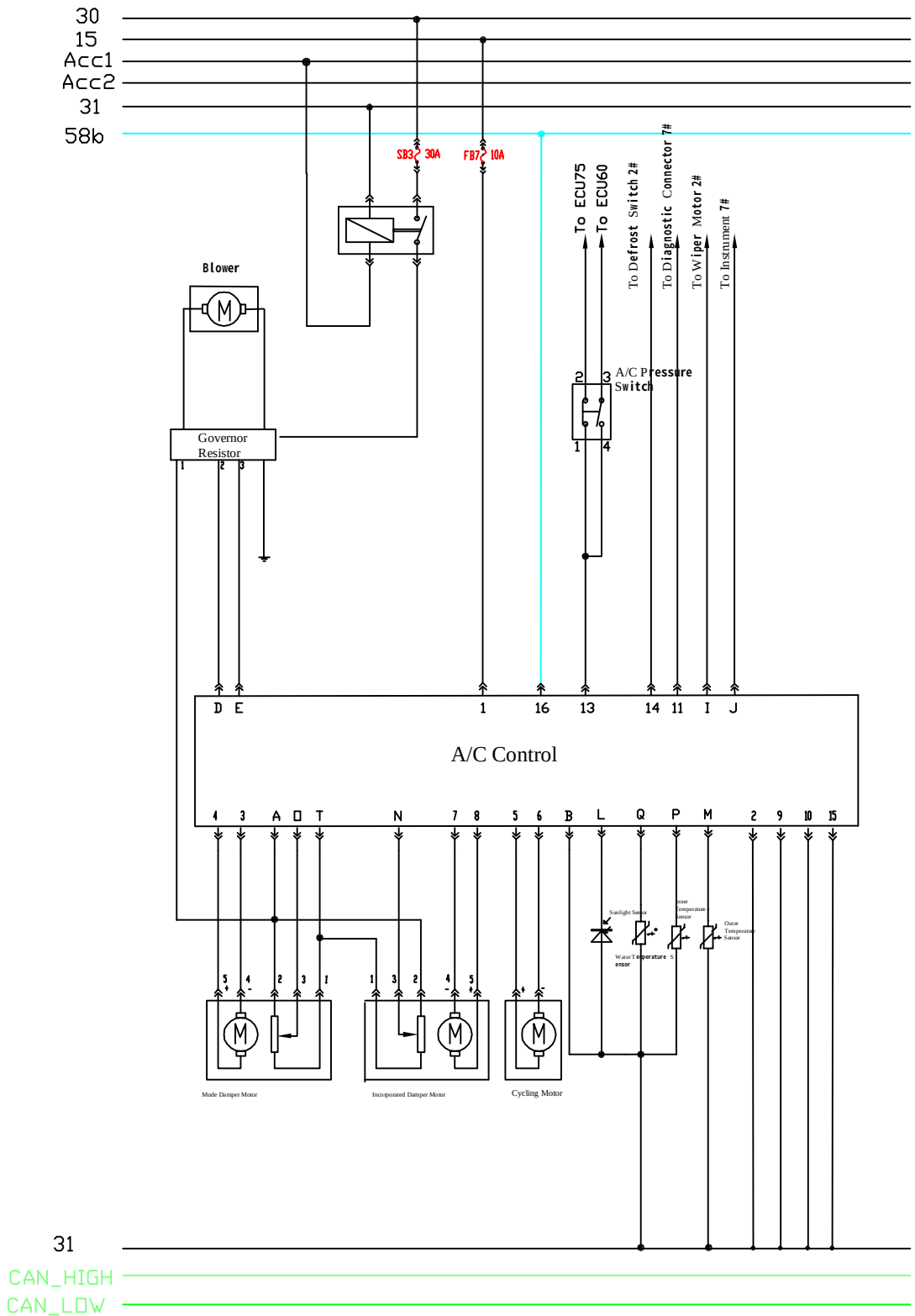
ABS SYSTEM


30
15
Acc1
Acc2
31
58b
FB1
5A
SB4
40A
SB5
40A
To Brake Switch
COM.ENABLE
ABS PUMP
ABS EBCM
32
31
2
6
ABS Control
41
42
43
44
12
13
26
27
3
18
16
45
Left
Rear
Wheel
Sensor
Right
Rear
Wheel
Sensor
Left
Front
Wheel
Sensor
Right
Front
Wheel
Sensor
EBCM GND
PUMP GND
31
CAN_HIGH
CAN_LOW

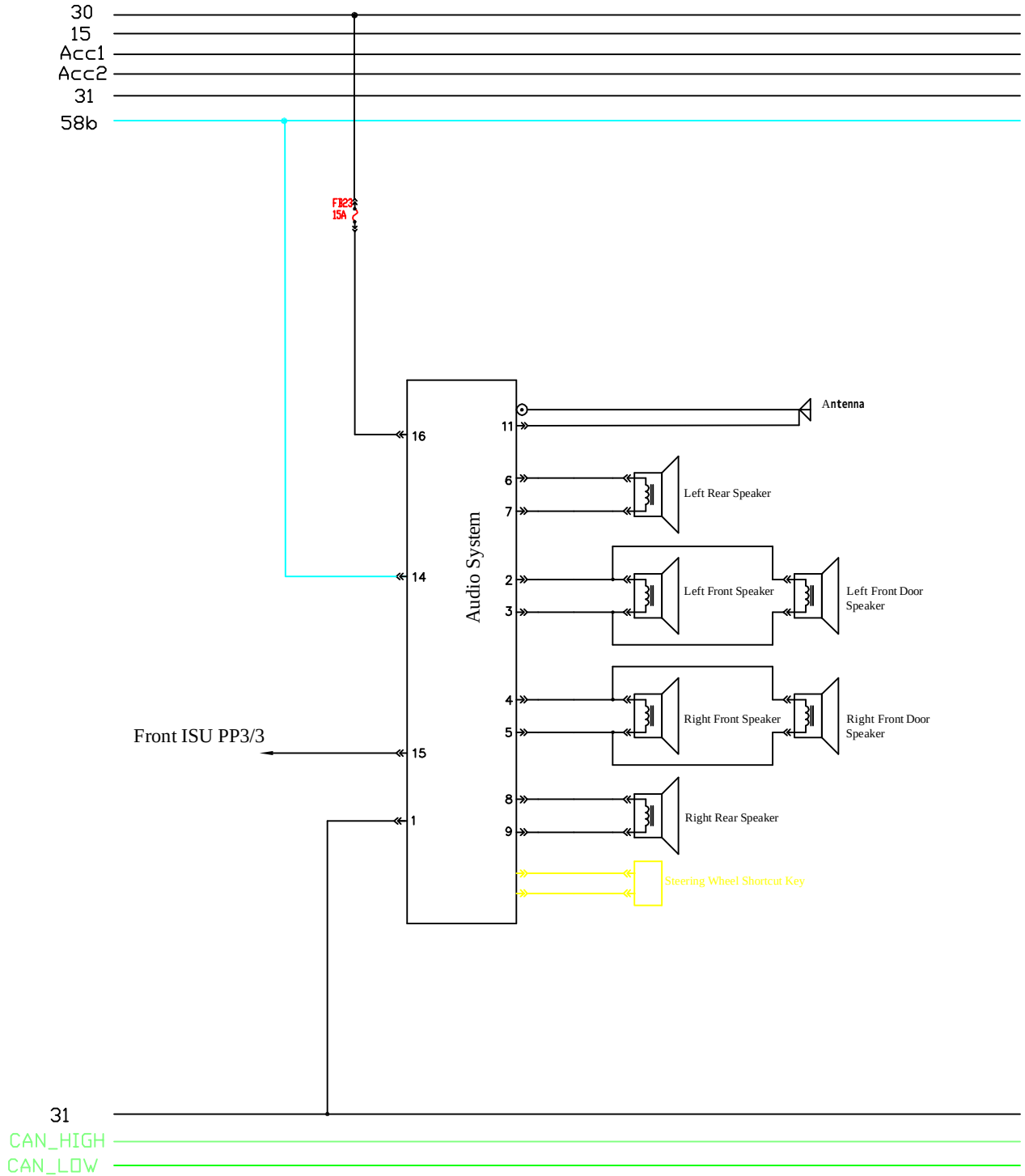
START AND CHARGE SYSTEM



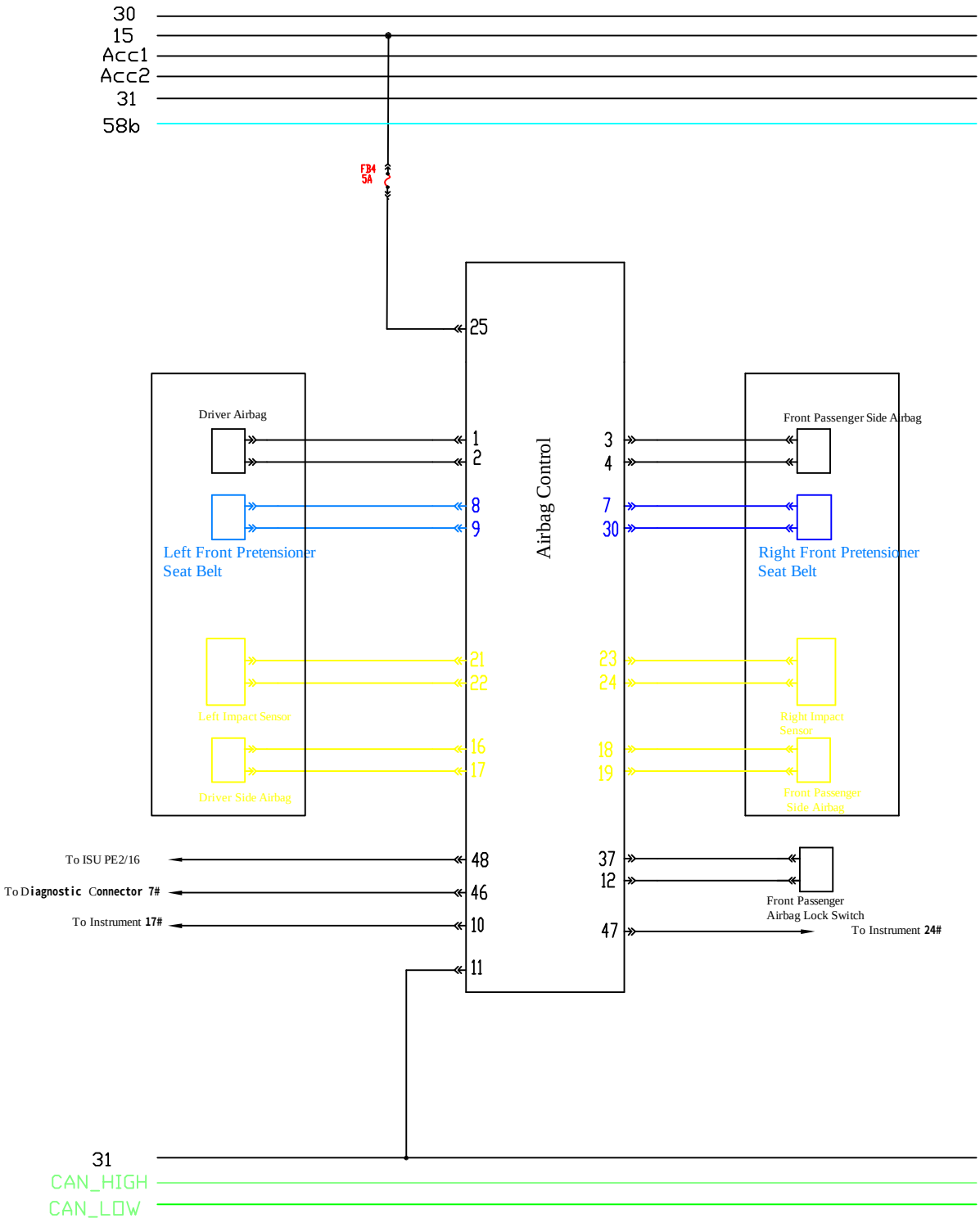
AIR CONDITIONING SYSTEM



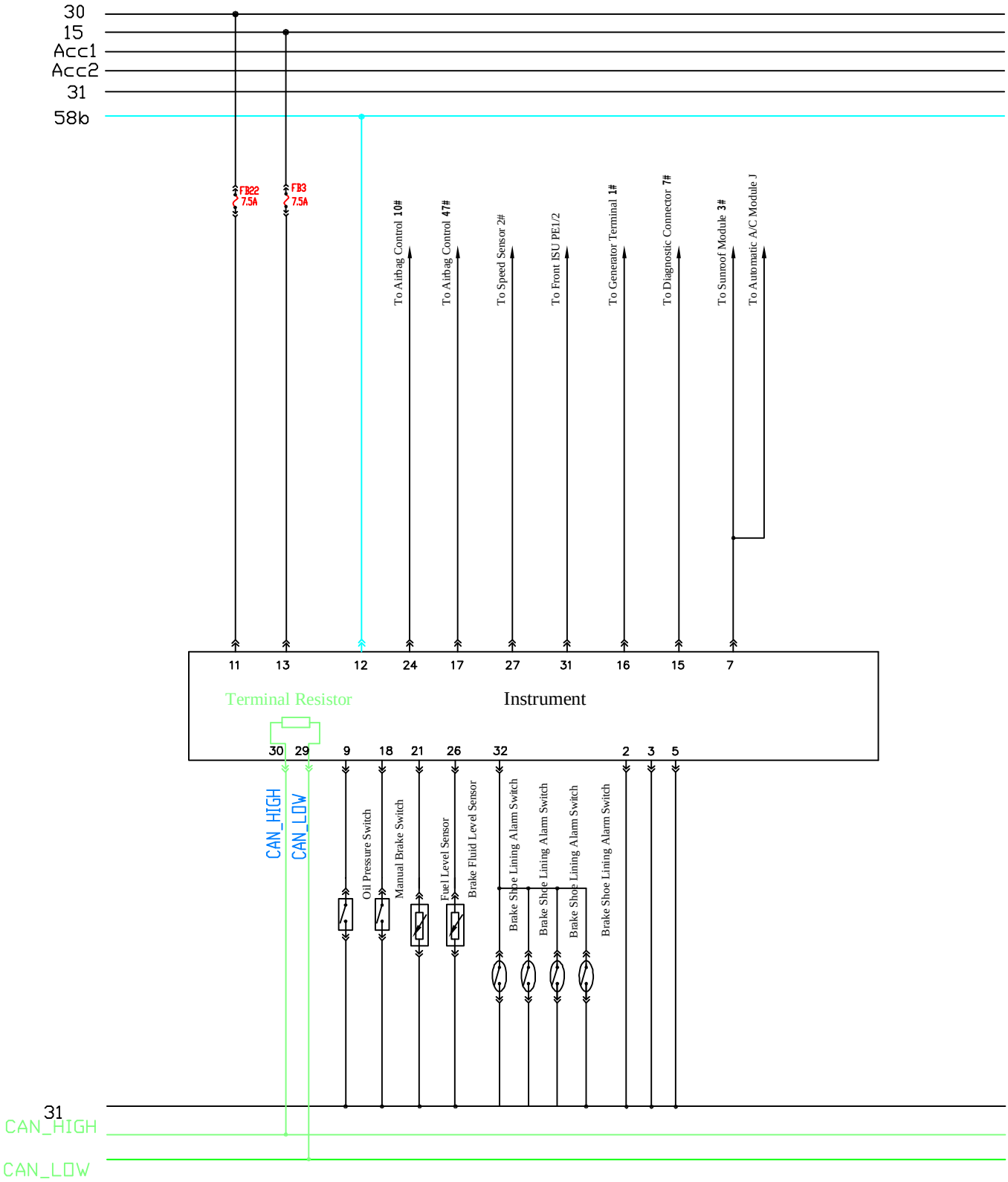
AUDIO SYSTEM



AIR BAG SYSTEM



INSTRUMENT SYSTEM



ENGINE SYSTEM

