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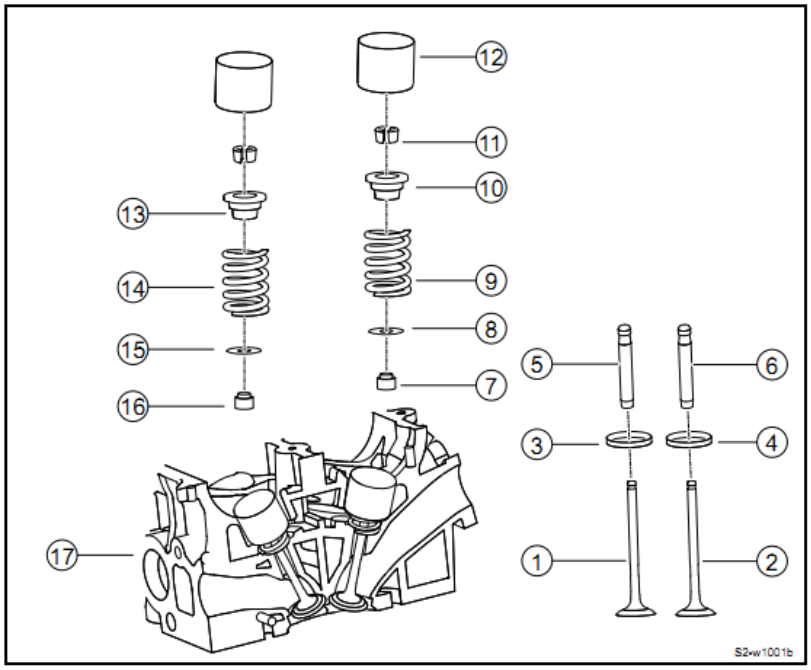
Engine Mechanical System

I. Summary

(I) structure overview

break-down table

Cylinder cover



1. Exhaust valve
2. Intake valve
3. Intake Valve Seat
4. Intake Valve Seat
5. Intake Valve pipe
6. Exhaust valve pipe
7. Intake valve oil seal
8. Intake valve spring shim
9. Intake valve spring
10. Intake valve spring seat
11. Valve lock clamp
12. Mechanic tappet
13. Exhaust valve spring seat
14. Exhaust valve spring
15. Exhaust valve spring shim
16. Exhaust valve oil seal
17. Cylinder cover

(II) System theory

Working principle of reciprocating piston engine

- Intake stroke:Piston moves from TDC to BDC under the drive of CrankshaftAt this time, exhaust valve closes, intake valve opensWhen piston is moving, volume of cylinder is increasing, which creates kind of vacuum inside of cylinder.ECM controls oil injector and spray oil into intake pipe, now intake valve opens,

the mixture of air and oil is sucked into the cylinder through intake valve, and creates mixed air which can burn inside of cylinder.

- Compression stroke: After the intake stroke, crankshaft will continuouslly take piston to move from BDC to TDC.Now, intake valve and exhaust valve are all closed, along with movement of piston, the volume of cylinder is decreasing. Because air can be compressed, and temperature will rise after compression.

- Power stroke: When the compression stroke is finished, ECM controls the initial coil circle of ignition coil to disconnect, and creates high-voltage power at secondary polar, the high-voltage power is quickly conducted to piston on top of cylinder cover, finally high voltage breakthrough the interval of spark plug, and ignite the mixed air inside the cylinder. The flame will spread to the whole combustor quickly, and unleash much heat. Volume of the burning gas will expand dramatically, pressure and temperature will rise samutanuously, the expansion power act on surface of piston, push piston move from TDC to BDC, transform the piston from reciprocating movement to rotational motion through connecting rod. At the same time, intake and exhaust valves are still closed.

- exhaust stroke：when exhaust stroke starts, intake valve is still closed, the crankshaft takes piston to move from BDC to TDC through connecting rod, now, expanded burning gas, under the push power of self pressure and piston, is exhausted out of cylinder through exhaust valve. When piston arrives to TDC, the exhaust stroke finishes, exhaust valve closes. But in reality, intake valve opens before TDC and closes after the BDC.

Purpose of this kind of design is for sufficient intake and to decrese the power consumption during intake period. During exhaust period, exhaust valve opens before the BDC, and closes after the TDC. The purpose is to decrese the mixed gas inside cylinder and decrease the power consumption during intake period, at the same time, because intake and exhaust valve has certain overlapped angle, which means within certain crankshaft angle intake and exhaust valve open samutanuously, and because already burnt gas has been exhausted through exhaust valve, creating

inertia, which can take mixed gas in, which is beneficial to air intaking to some extent. However, it is not always good to have bigger overlapped angle, requirements for overlapped angle under different conditions are different. Therefore, this engine adopts VVT technology, whose purpose is to satisfy the need to open angel of intake valve under different conditions, and this function is realized through OCV.

OCV system working principle

VVT is the abbreviation of Variable Valve Timing. All the objects with mass have inertia，including the air which is intaken into the engine cylinder，air still has the trend of getting in after the air intake stroke. Now, if the valve closure time postpones，cylinder can intake more air, which can improve the volume efficiency.

The result is: the more time postponed when valve closes, the higher performance is under high rpm situation; Otherwise, if the valve closes in advance, performance under low rpm is much stable, torque is much bigger.

(III)technical parameters、maintenance parameters

Technical specifications

type	HFC4GB2.3D
Engine type	In-line 4 cylinder、double overhead camshafts、16 valves、VVT
Whole car carry type	Horizonontally
Cylinder number	4
Cylinder diameter(mm)	75
troke(mm)	84.8
displacement(L)	1.499
Compression ratio	10:1
cylinder liner type	Dry (aluminium cover)
ignition order	1-3-4-2
Rated power(kW)	83
Rated rotation speed(r/min)	6000

type	HFC4GB2 .3D		
Max torque(N m)	1 4 6		
Max torquerpm(r/min)	3500~4 500		
idle(r/min)	750 ±30		
full load min fuel consumption(g/kw.h)	2 4 5		
engine oil consumption ratio at rated power	≤0.15%		
crankshaft rotation direction(facing power output)	anticlockwise		
Starting method	Electric starting		
Lubrication method	Mixed Type of pressure and spatter		
Cooling method	Water cooling		
New engine oil filling volume(L)	4		
Outside dimension (length×width×hight)mm	560×543×608		
Net weight(kg)	8 8		
Fuel type	93# and above		
Engine oil type	Engine oil type	Environment temperature	Quality degree
	SAE 5W/30	-30℃~30℃	SJ and above
	SAE 15W/40	-20℃~40℃	SJand above

Main parts specs

Part name	Technical characteristics
Engine oil filter	full flow type filter thread specsM20×1.5-6H
oil pump	Inner meshing rotors type
cooling water pump	centrifugal
Thermostat	wax type, initial temperature:82℃ ; full open temperature:95℃
Generator	Built-in regulator alternator specs 14V 90A
starter	Permanent magnet decelerating type starting voltage 12V, power 1.2kW
ignition plug	Iridium platinum alloy type
Oil pressure guide rail	No oil back

items		Standard value	Extreme rate
camshaft			
Camshaft height(mm)	Air intake	44.7054±0.1mm	
	Air exhaust	44.2836±0.1mm	
Cylinder cover and valve			
Cylinder pad surface flatness(mm)		Under 0.03	0.1
Cylinder cover whole height(mm)		112.9～113.1	

Items		Standard value	Extreme rate
valve edge thickness(mm)	Intake valve	1.35	0.85
	Intake valve	1.85	1.35
valve stem diameter(mm)		φ5.5	
clearance between the valve guide and valve stem(mm)	Intake	0.020～0.036	0.10
	Intake	0.030～0.045	0.15
Valve taper angle		45°～45.5°	
Valve length(mm)	Intake valve	89.61	89.11
	Intake valve	90.94	90.44
Valve spring free height(mm)		43.1	42.7
Valve spring load/installation height(N)/(mm)		152/33.4	
		310/25.2	
Valve springs verticality		小于2°	4°
Contact width of the valve seat(mm)		0.9～1.3	
valve guide inner diameter(mm)		φ5.5	
Valve guide projection amont(mm)		13±0.3	
Oil pump gear tip clearance(mm)		0.06～0.18	0.2
Oil pump side clearance(mm)		0.04～0.11	0.15
Oil pump shell clearance(mm)		0.10～0.18	0.2
Piston skirt diameter(mm)		74.968～74.978	
Top compression ring side clearance(mm)		0.03～0.07	0.10
Second compression ring side clearance(mm)		0.02～0.06	0.1
Top compression ring opening clearance(mm)		0.15～0.30	0.8
Second compression ring opening clearance(mm)		0.30～0.50	0.8
compound oil ring opening clearance(mm)		0.20～0.50	1.0
piston pin outer diameter(mm)		18.002～18.005	
Connecting rod journal clearance(mm)		0.02～0.04	0.1
Connecting rod big head clearance(mm)		0.10～0.25	0.4
Crankshaft axial clearance(mm)		0.09～0.27	
crankshaft main journal diameter(mm)		46.004～46.029	
Connecting journal diameter(mm)		39.982～40.0	
crankshaft main journal neck clearance(mm)		0.02～0.04	
Cylinder pad surface flatness(mm)		0.03以下	
Cylinder total height(mm)		280	
Cylinder cylindricity(mm)		0.007	
bore inside diameter(mm)		75.000～75.015	
Clearance between the piston and cylinder(mm)		0.02～0.04	

Main inspection and adjustment parameters

Valve clearance(mm)	Intake valve0.22±0.03 exhaust valve0.30±0.03
emission standard	euro V
Oil pressure	Idle oil pressure >100kPa
Oil temperature	≤135℃
Water temperature	≤110℃
Spark plug electrode clearance	0.7～0.8mm

Sealant

Seal location	No.	Sealant
Crankshaft rear oil seal component- body	1	DowCorning3-0115Gasket sealant adhesive
	2	Threebond 1217G
	3	Ksetra-ksetrajna new1590
oil sump-engine body-Crankshaft rear oil seal component	4	DowCorning3-0115Gasket sealant adhesive
	5	Threebond 1217G
	6	Ksetra-ksetrajna new 1590
Sprocket wheel cover–engine body–cylinder cover	7	DowCorning3-0115Gasket sealant adhesive
	8	Threebond 1217G
	9	Ksetra-ksetrajna new 1590
Bowl type plug-cylinder cover	10	Loctite12086 bowl type plug sealant
Crankshaft signal wheel bolt	11	Loctite 262threaded fastening adhesive
water temperature sensor	12	Ksetra-ksetrajna new 1243 thread sealant
oil pressure switch	13	Ksetra-ksetrajna new 1243 thread sealant

Lubricant

Engine oil type	Environment Temperature	Quality degree
SAE 5W/30	-30℃~30℃	SJ and abve
SAE 15W/40	-20℃~40℃	SJ and abve

(IV)Torque parameter

Key parts torque table

No.	item	torque (N·m)	remark
1	Main bearing cap bolt	(35±2)N·m+60°~64°	M9×1.25×74.5
2	connecting rod bolt	5N·m→10N·m→ 13N·m+45°+45°	M6×0.75×33
3	The camshaft bearing cover bolts	11±1	M6×1×35
4	The camshaft front end bearing cap bolts	20±1	M8×1.25×30

No.	item	torque (N m)	remark
5	Cylinder cap bolt	(24.5±2)N m+180°~184°	M9×1.25×143.5
6	The crankshaft pulley bolt	(50±2)N m+(60±2)°	M14×1.5×54
7	Flywheel bolt	100±5	M11×1.25×25
8	Exhaust camshaft sprocket bolt	88±10	M12×20
9	Valve timing adjuster bolt	70±5	M10×41
10	Crankshaft rear oil seal bolt	7.6±0.6	M6×10 E8
11	Rear ear stud	18.4±1.4	M8×20 E10
12	Intake manifold bolt	18±1.0	M8×40 E10
13	Oil sump bolts	11±1.0	M6×12 E8
14	Sprocket cover bolts Ⅰ	39.5±3.0	M10×90 E14
15	Sprocket cover bolts Ⅱ	39.5±3.0	M10×50 E14
16	Sprocket cover boltsⅢ	8.4±0.6	M6×30 E10
17	M6×20 E10 type bolt	8.4±0.6	M6×20 E10
18	M6×12 E10 type bolt	8.4±0.6	M6×12 E10
19	M6×45 E10 type bolt	8.4±0.6	M6×45 E10
20	M6×25 E10 type bolt	8.4±0.6	M6×25 E10
21	M6×12 E8 type bolt	8.4±0.6	M6×12 E8
22	Cylinder head cover bolt	9±1.0	M6×27 E10
23	Oil filter Bracket bolt	20±1	M8×30 E12
24	Warm wind backwater pipe bolt	7.6±0.6	M6×20 E8
25	Oil pressure guide rail bolt	18.4±1.4	M8×35 E12
26	Main oil passage clogging Ⅰ	60±5	内 VI角 M20
27	Main oil passage clogging Ⅱ	35±5	内 VI角 M12
28	drain screw	25±5	内 VI角 M12
29	oil passage clogging	20±2	内 VI角 M10
30	VVToil passage clogging	44±5	M14×1.5×14
31	Oil drain plug	39±5	M14×1.5×14
32	Fixed rail bolt components	10±2	M6×1×12
33	Moving rail bolt components	23.5±4.5	M8×1.25×15
34	Starter bolt	24±3	M8×55
35	oil pressure switch	10±2	R 1/8
36	Spark plug	25～30	M 14
37	Exhaust manifold double-headed stud	12±2	M8×1×12
38	Q1840816(Exhaust manifold bracket bolts)	20～25	M8×16
39	Catalysts insulation cap nut	10±1	M6 ×1
40	The crankshaft signal wheel bolt	12.5±2.5	M 6

41	water temperature sensor	20±4	

No.	Item	Torque (N m)	remark
42	Hall sensor bolt	8~10	Inner six flower M6×1×16
43	knock sensor bolts	20±4	Inner six flowerM8×1.25×30
44	Exhaust manifold nut	35±2	M8
45	Throttle self-drilling bolt	8~10	Inner six flowerM6×1×25
46	square-head bolt	47±5	M10×1.25×90
47	idle pulley bolt	49±9	M10×1.25×38
48	Oil filter	After Installation surface contact, rotate 3/4 rounds or (11±1)N m	
49	idle pulley assembly	50±5	M10×1.5

Standard component torque

No.	item	torque(N m)	remark
1	M6	9～11	
2	M8	20～25	
3	M10	30～50	
4	M12	60～80	

(V)Precautions of maintenance

general precautions

1. Precautions of exhausting engine coolant

   1). Exhaust engine coolant after engine cools off.

2. Precautions of disconnecting fuel pipe

   1). Make sure there is no matters that could trigger spark or fire before working.

   2). Release fuel pressure before disconnecting and dissolving.

   3). After disconnecting pipe, gag the opening in case fuel will leak.

3. Precautions of removing and disassembly.

   1). Please use special maintenance tools when it is required. Be safe, do not disobey the instructions.

   2). Be careful enough not to damage the matching surface and sliding suface.

   3). If necessary, gag the opening of engine system with adhesive tape or something similar in case foreign matters will get inside.

4). Label and tidy the dissolved components in order, which is helpful to troubleshoot and reassembly.

5). The basic principle of loosening nut and screw is: loosen the outer ones first, then those on the diagonal, and so on. Please follow the appointed order if it is instructed.

4. Precautions of inspection /maintenance and replacement

1). Check the components thoroughly before maintenance or replacement. Please replace if necessary.

5. Precautions of assembly

1). Use torque wrench to tighten nut and screw.

2). The basic principle of tightening nut and screw is: tighten the center ones first, then those on the diagonal, with the same force. Please follow the appointed order if it is instructed.

3). Replace new pad, oil seal or "O"type ring.

4). Wash, clear and dry every component thoroughly. Check carefully if engine oil or coolant pipe is blocked.

5). Try not to damage sliding surface or matching surface, clear foreign matters like kerf or dust thoroughly. Smear sliding surface with engine oil before assembly.

6). When refill engine coolant after drilling, release air in the pipe.

7). Start the engine and increase the rpm to check if there is leakage with engine coolant, fuel engine oil and intake/exhaust after maintenance.

6. Those parts need to be tightened with certain degree

1). Tighten the following engine parts finally with angle wrench:

Cylinder cap bolt

·Main bearing cap bolt

·Rod cap nut

2). Please do not tighten finally according to torque value.

3). Torque of these components is applicable for pre –tighten procedures.

4). Make sure the clear thread and base surface and smear engine oil

Precautions of sealant

1. Remove sealant

1). After removing fixing nut and screws, separate matching surface with scraper and remove the old sealant.

△Caution Be careful not to damage matching surface. Insert scraper, and then knock side surface to slide as per the drawing. Please use rubber hammer knock component slightly to remove when it is hard to use scraper. Please be careful not to damage matching surface if it is unavoidable to use tools like screwdriver.

2. Employing procedures of sealant

1). Clear the old sealant sticked to the application surface and matching surface of gasket with scraper.

△Caution Clear the old sealant thoroughly off the groove of application surface of sealant, fixed bolts and bolt hole.

2). Wipe the application surface and matching surface of sealant with unleaded gasoline, clear attached water, grease and foreign matter.

3). Put the sealant with appointed size at appointed place.

△Caution 。If there is groove to put sealant, please put the sealant in the groove. Generally,

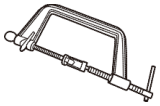
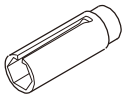
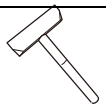
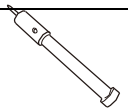
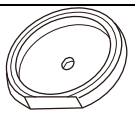
put the sealant into the inner side of bolt hole, occasionally, outside, for the bolt hole. Install and connect components within 5 mins after smear the sealant. Please clear the blot if there is blot on the sealant. Please do not tighten again bolt and nut after installation.

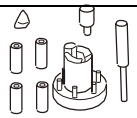
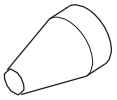
Refill engine oil and engine coolant 30 mins after installation

△Caution Please operate according to the instruction if there is special instruction.

(VI)Special tool

No.	Tool	Outside figure	Instruction
1	fork clamp		Fixed camshaft timing gear
2	pin		use with fork clamp

No.	Tool	shape drawing	Description
3	The flywheel stop		Fixed flywheel
4	Valve spring compressor		Compression valve spring
5	Oxygen sensor sleeve		Remove and install the oxygen sensor
6	oil sump disassemble tool		Disassemble oil sump
7	Valve oil seal installer		Install valveoil seal
8	Crankshaft front oil seal guide		Play the role of guiding when installing crankshaft front oil seal
9	Crankshaft front oil seal installer		Install engine crankshaft front oil seal
10	Crankshaft rear oil seal installer		Install crankshaft rear oil seal

No.	Tool	shape drawing	Description
11	Piston pin location tool		Install and disassembly piston pin
12	guide sleeve		Use together with piston pin location tool

II failure diagnosis

(I)Diagnosis analysis table

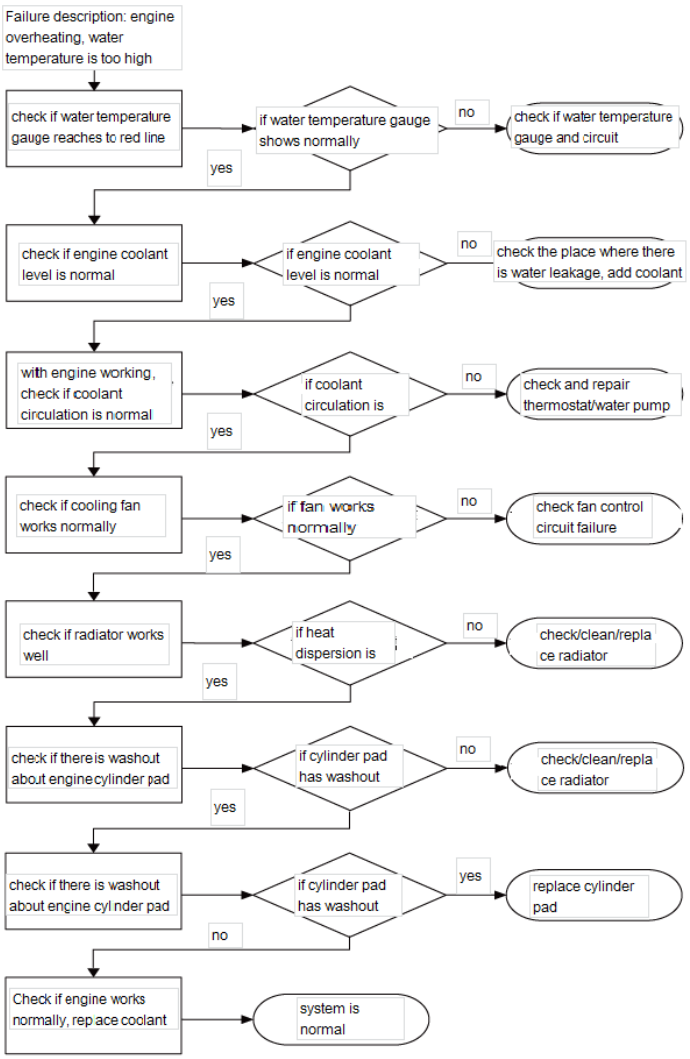
No.	Failure description	Reason analysis	Solution	
1	Starter does not rotate	The connection of battery electrode becomes loose or battery is low	tighten or charge	
		circuit is disconnected	check and repair	
		Starter has damage	Repair or change	
2	Spark plug does not ignite	ground connection is poor	repair	
		Ignition coil damage	change	
		spark plug clearance is not appropriate or burnt	Adjust or change	
		Electronic ignition system has fault	Repair or change	
3	failure in oil supply system	gasoline pump is insufficient in oil supply	Repair or change	
		Petrol hose and fuel filter clogging	Clear	
4	Cylinder compression pressure decreases	cylinder pad rupture	replace	
		Valve clearance adjustment is improper or damaged	adjust/ repair or change	
		piston/ piston ring/cylinder wear	Repair or change	
		valve seal is poor	Repair	
5	underpower during running	the adjustment between acceleration pedal and Throttle Valve is not appropriate	Adjust	
		cylinder compression pressure decreases	1. check if valve/spark plug/cylinder pad leaks	
			2. cylinder grind	
		fuel supply not sufficient	Adjust or repair	
		air intake not sufficient	check intake system	
		exhaust clogging	check exhaust system, and clear the carbon deposition	
		spark plug clearance inappropriate or damaged	adjust or change	
6	There is combustion knock inside the engine	bearing bush wear/ crankshaft cam wearing	Replace	
		Crankshaft/connecting rod axial diameter and piston pin wear off greatly	Replace or repair	
		Piston ring damage	change	

		valve clearance is inappropriate	Adjust	
		crankshaft thrust clearance is too big	Adjust	

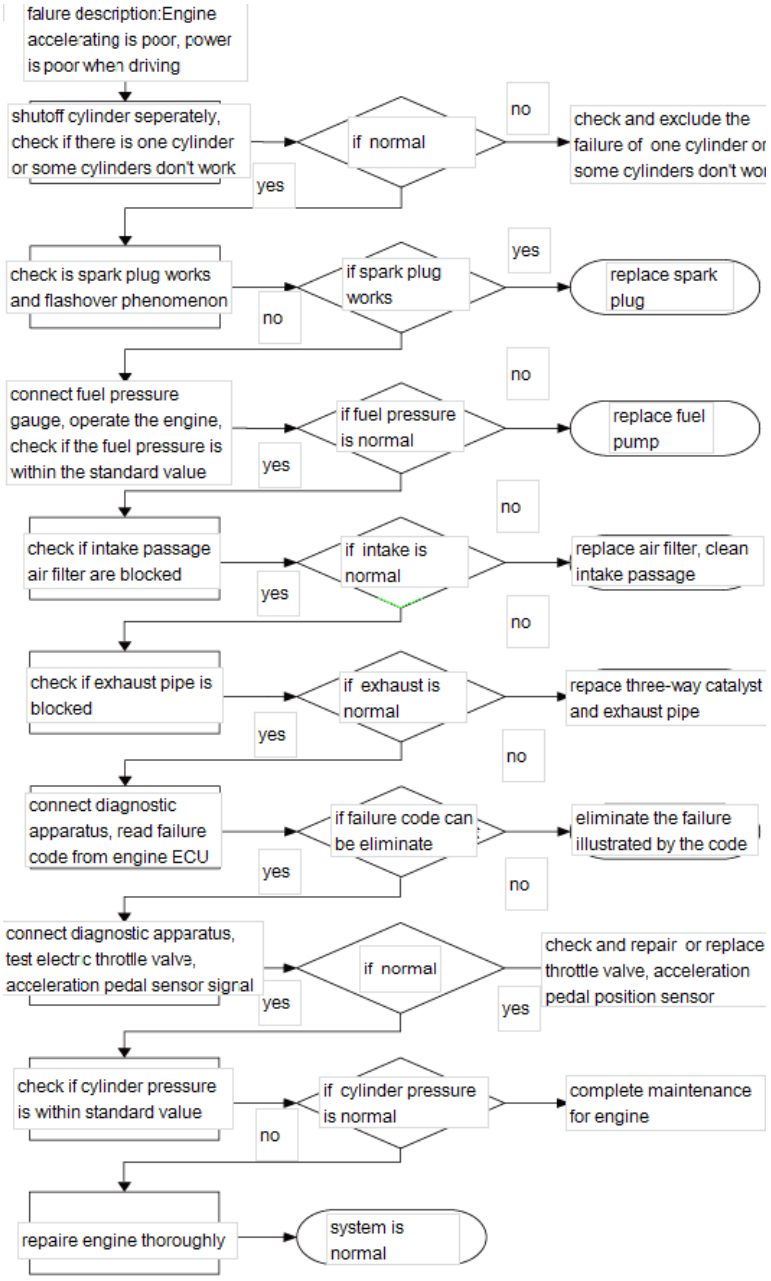
No.	Failure description	Reason analysis	soluti on	
7	engine overheating	Thermostat failure	Change	
		generator belt(water pump belt) tensile force not enough	Adjust	
		coolant not enough or water pipe block	Supplement or clear	
		Water pump clearance inappropriate or damaged	Repair or replace	
		Radiator is blocked by incrustation	Repair or replace	
		Engine oil not enough	supplement	
		oil circuit blocked or oil pump damaged	clear or replace	
		spark plug clearance inappropriate or there is carbon deposition	clear or adjust	
		exhaust pipe blocked	tighten or clear	
		cylinder pad damaged	Replace	
		clutch slide	repair or replace	
8	Excessive consumption of engine oil	valve oil seal wear or damaged	Replace	
		Valve and valve duct wear	Replace	
		Oil ring wear or damaged	Replace	
		piston ring is wrongly opened according to regulation	Replace	
		cylinder pad damaged	Replace	
		engine overheating、 inner pressure increase、 part of the engine oil drained out through exhaust exit	check related parts and excluded	
		oil return is not smooth in respiratory system of cylinder cover shield, leading engine oil goes into intake system through respiratory hose	replace or clear cylinder cover shield	

(II)diagnose flow chart

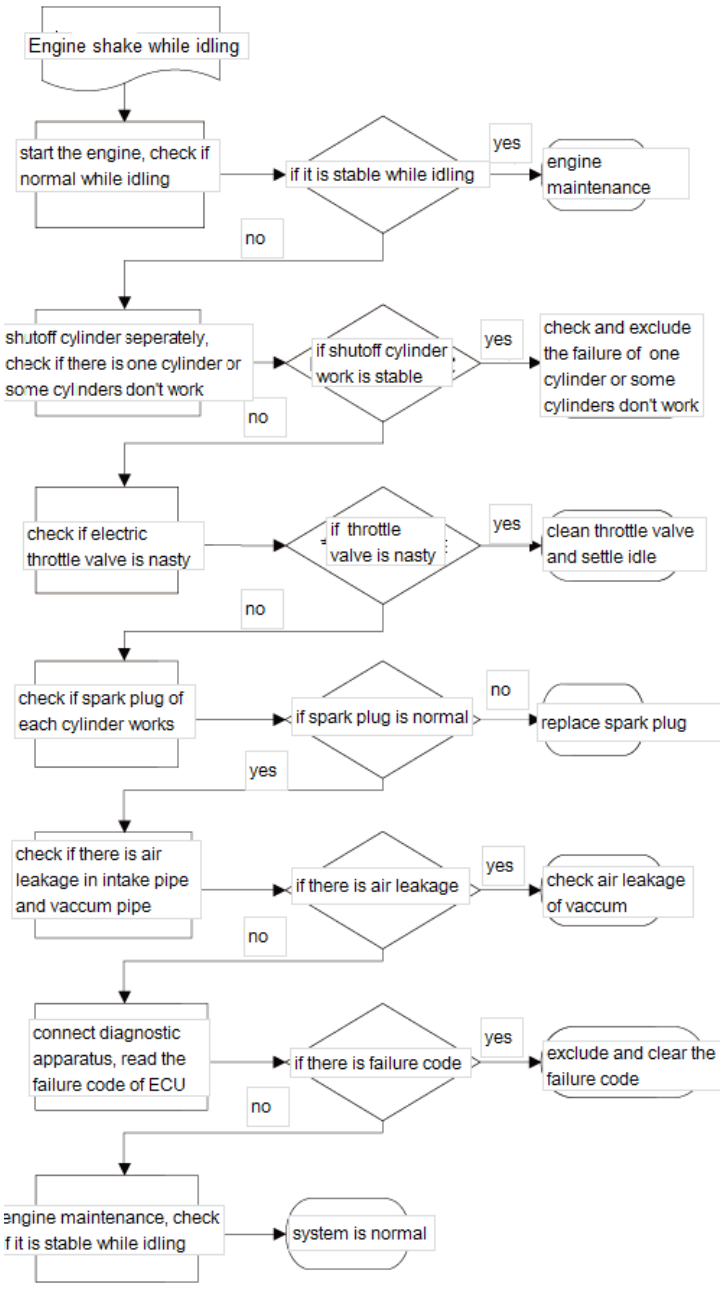
Engine overheating



Engine accelerating is poor



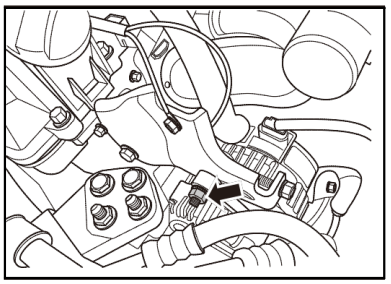
Engine shake while idling


Engine shake while idling
start the engine, check if normal while idling
if it is stable while idling
yes
engine maintenance
no
shutoff cylinder seperately, check if there is one cylinder or some cylinders don't work
if shutoff cylinder work is stable
yes
check and exclude the failure of one cylinder or some cylinders don't work
no
check if electric throttle valve is nasty
if throttle valve is nasty
yes
clean throttle valve and settle idle
no
check if spark plug of each cylinder works
if spark plug is normal
no
replace spark plug
yes
check if there is air leakage in intake pipe and vaccum pipe
if there is air leakage
yes
check air leakage of vaccum
no
connect diagnostic apparatus, read the failure code of ECU
if there is failure code
yes
exclude and clear the failure code
no
engine maintenance, check if it is stable while idling
system is normal

III、Alternator belt

(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble alternator belt
   1). Mark on relative location of alternator and upper bracket of alternator;
   2). Loosen alternator adjusting nut;
   3). Adjust belt tension, remove alternator belt.



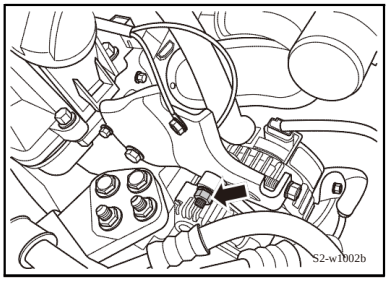
(II)Check

1. Check alternator belt
   1). Check if the belt is worn/cracked/oil stains. If necessary, please replace.

   Δcaution Please operate after engine is off.

(III)Installation

1. Install alternator belt
   1). Install belt, tighten alternator adjusting nut torque (22.5±2.5)N·m

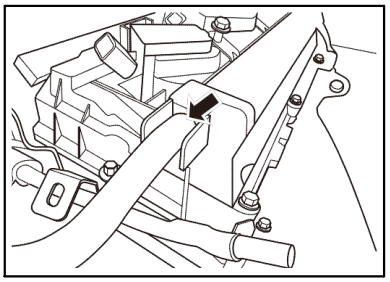


2. Connect battery cathode cable
3. Close engine cover

IV、Cylinder cover shield component

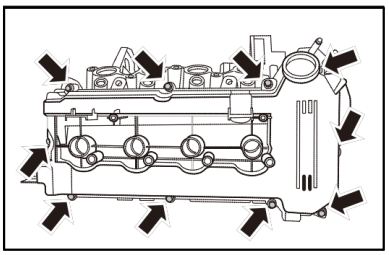
(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble ignition coil, refer to ignition coil
4. Disassemble spark plug, refer to spark plug
5. Disassemble air filter assembly, refer to air filter assembly
6. Disassemble air filter bracket I, refer to air filter bracket
7. Disassemble PCV valve, refer to PCV valve
8. Disassemble cylinder cover shield component
   1). Disconnect respirator ventilation ducting and cylinder cover shield component



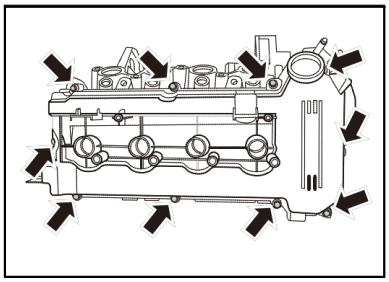
   2). Disassemble 10 fixing bolt of cylinder cover shield component
   3). Remove f cylinder cover shield component and cylinder cover shield seal ring

-w1003b

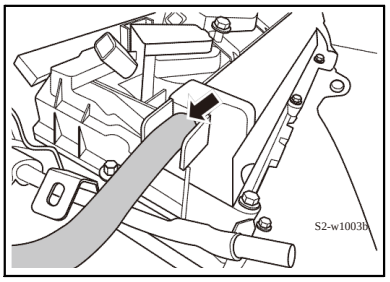


(II)Installation

1. Install cylinder cover shield component
   1). Replace with new cylinder cover shield seal ring, install it to cylinder cover shield component
   2). Smear sealant equably to cylinder cover shield seal ring
   3). Install cylinder cover shield component, tighten fixing nut



4).Connect respirator ventilation hose and cylinder cover shield component



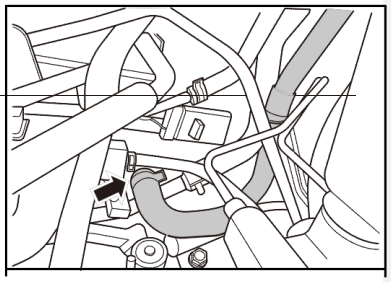
2. Install PCV valve
3. Install air filter bracket I
4. Install air filter assembly
5. Install spark plug
6. Install ignition coil
7. Connect battery cathode cable
8. Close engine cover

V、engine assembly

(I)Disassembly

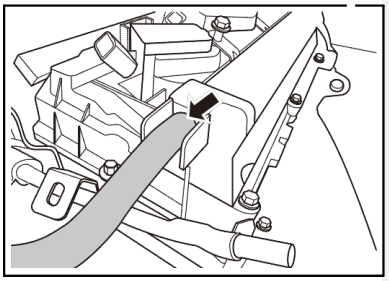
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Release fuel system pressure, refer to release fuel system pressure
4. Disassemble engine left front cover, refer to engine cover
5. Disassemble engine right front cover, refer to engine cover
6. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
7. Drain transmission lubricant, refer to the drain and fill of transmission lubricant.
8. Drain engine oil, refer to the drain and fill of engine oil
9. Drain coolant, refer to the replacement of coolant
10. Recycle freon/ refrigerant oil, refer to freon/ refrigerant oil
11. Disassemble intake hose, refer to intake hose assembly
12. Disassemble pipe and expansion valve assembly, refer to pipe and expansion valve assembly
13. Disassemble water inlet and outlet assembly of warm wind, refer to disassemble water inlet and outlet assembly of warm wind
14. Disassemble air filter assembly, refer to air filter assembly
15. Disassemble battery, refer to battery
16. Disassemble battery tray, refer to battery tray
17. Disassemble back-up lamp switch, refer to back-up lamp switch
18. Disassemble clutch working cylinder, refer to clutch working cylinder and oil inlet assembly
19. Disassemble starter, refer to starter
20. Disassemble left front wheel, refer to wheel
21. Disassemble right front wheel, refer to wheel
22. Disassemble left driving axle assembly, refer to axle assembly
23. Disassemble right driving axle assembly, refer to axle assembly
24. Disassemble transmission assembly, refer to transmission assembly
25. Disassemble engine assembly

1). Disconnect water inlet and outlet assembly of warm wind and cylinder cover.

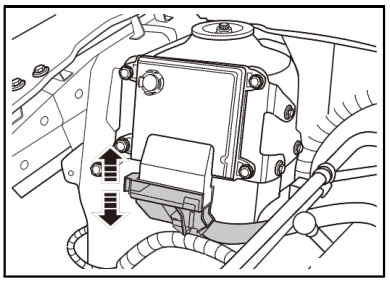


S2-w1005b

2). Disconnect cylinder cover and respirator ventilation hose.

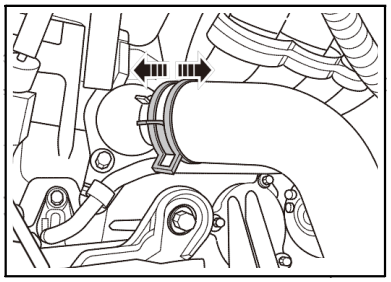


3).Disconnect engine harness and ECM.

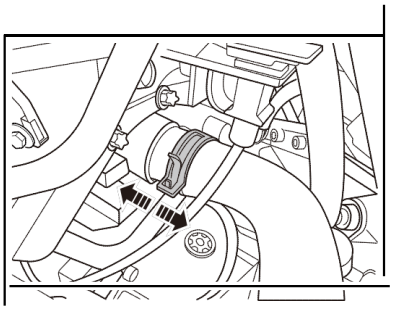


S2-w1006b

4). Cut the connection between radiator outlet pipe and water pump inlet.

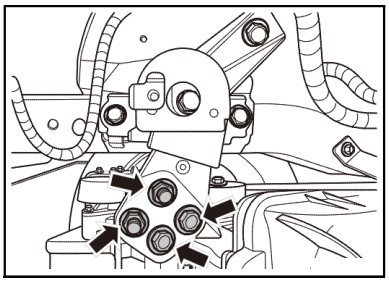


5). Cut the connection between radiator inlet pipe and cylinder cover.



6). Disassemble the screw bolts and nuts connecting engine right suspension and engine.

7). Desend engine assembly.

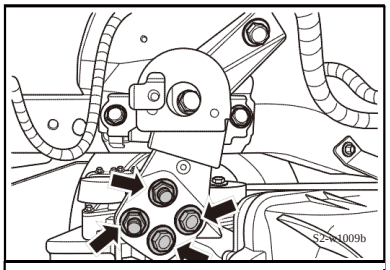


(II)Installation

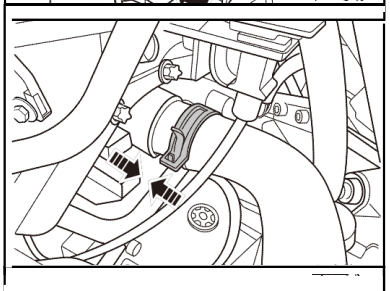
1. Install engine assembly

1). Put the engine assembly under the engine compartment, lift up the engine assembly

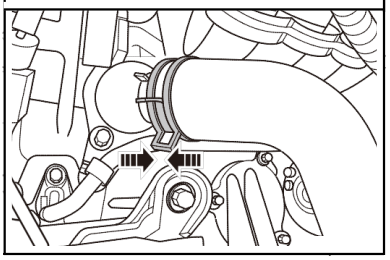
2). Install the 2 nuts and 2 bolts connecting engine right suspension and engine.



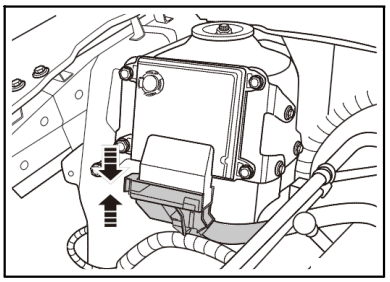
3). Connect radiator inlet pipe and cylinder cover.



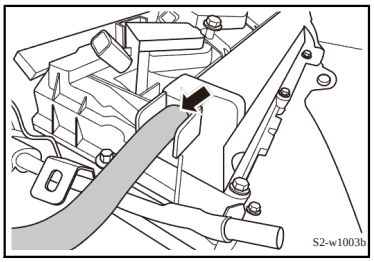
4). Connect radiator outlet pipe and water pump inlet.



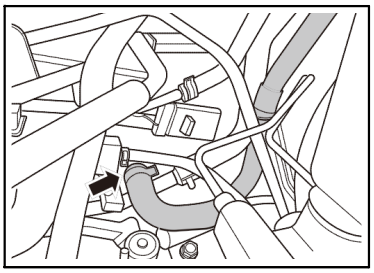
5). Connect engine compartment harness and ECM.



6). Connect cylinder cover and the ventilation hose of respirator



7). Connect inlet and outlet pipe assembly of warm wind and cylinder cover.

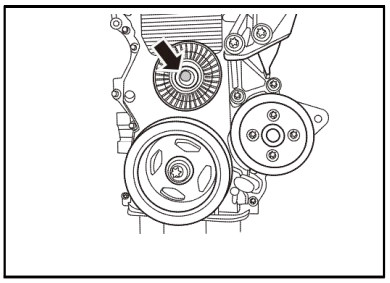


2. Install transmission assembly
3. Install right driving axle assembly
4. Install left driving axle assembly
5. Install right front wheel
6. Install left front wheel
7. Install starter
8. Install clutch working cylinder
9. Install back-up lamp switch
10. Install battery tray
11. Install battery
12. Install air filter assembly
13. Install water inlet and outlet assembly of warm wind
14. Install pipe and expansion valve assembly
15. Install intake hose
16. Fill Freon, refrigerant oil
17. Fill coolant
18. Fill engine oil
19. Fill transmission lubricant
20. Fill clutch hydraulic oil
21. Install engine right front cover shield
22. Install engine left front cover shield
23. Connect battery cathode cable
24. Close engine cover

VI、Idle wheel

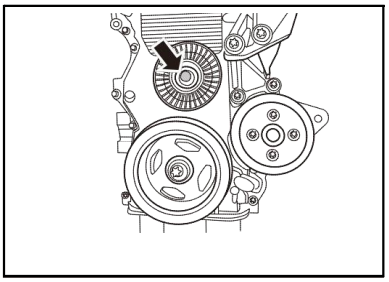
(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble alternator belt, refer to alternator belt
4. Disassemble idle wheel
   1). Disassemble 1 fixing bolt
   2). Remove idle wheel



(II)Installation

1. Install idle wheel
   1). Install idle wheel to chain wheel compartment cover, tighten bolt.

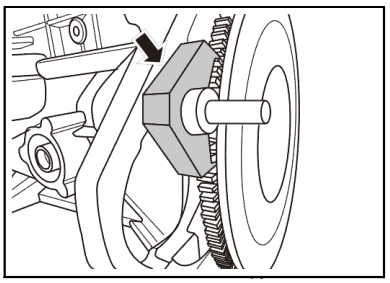


2. Install alternator belt
3. Connect battery cathode cable
4. Close engine cover

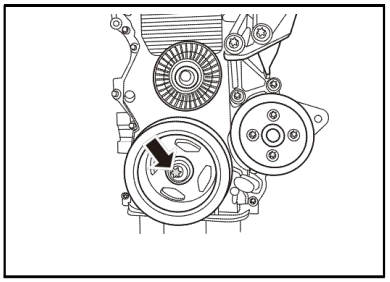
VII、Crankshaft pulley

(I)Disassembly

1. Open engine cover
2. Connect battery cathode cable, refer to battery cable disconnect and connect
3. Release fuel system pressure, refer to release fuel system pressure
4. Disassemble engine left front cover, refer to engine cover
5. Disassemble engine right front cover, refer to engine cover
6. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
7. Drain transmission lubricant, refer to the drain and fill of transmission lubricant.
8. Drain engine oil, refer to the drain and fill of engine oil
9. Drain coolant, refer to the replacement of coolant
10. Recycle freon/ refrigerant oil, refer to freon/ refrigerant oil
11. Disassemble intake hose, refer to intake hose assembly
12. Disassemble pipe and expansion valve assembly, refer to pipe and expansion valve assembly
13. Disassemble water inlet and outlet assembly of warm wind, refer to disassemble water inlet and outlet assembly of warm wind
14. Disassemble air filter assembly, refer to air filter assembly
15. Disassemble battery, refer to battery
16. Disassemble battery tray, refer to battery tray
17. Disassemble back-up lamp switch, refer to back-up lamp switch
18. Disassemble clutch working cylinder, refer to clutch working cylinder and oil inlet assembly
19. Disassemble starter, refer to starter
20. Disassemble left front wheel, refer to wheel
21. Disassemble right front wheel, refer to wheel
22. Disassemble left driving axle assembly, refer to axle assembly
23. Disassemble right driving axle assembly, refer to axle assembly
24. Disassemble transmission assembly, refer to transmission assembly
25. Disassemble engine assembly, refer to engine assembly
26. Disassemble alternator belt, refer to alternator belt
27. Disassemble crankshaft pulley
    1). Use flywheel stop to fix flywheel

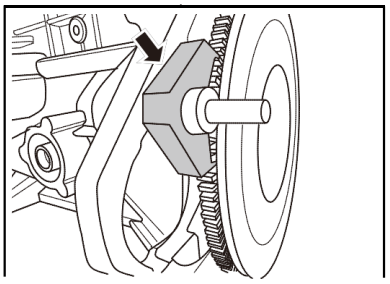


2). Remove 1 fixing bolt
3). Remove crankshaft pulley

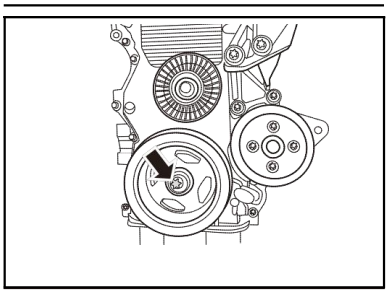


(II)Installation

1. Installation crankshaft pulley
   1). Use flywheel stop to fix flywheel



2). Install crankshaft pulley to chain wheel compartment cover, tighten fixing bolt.
torque (100±5)N m+(90±2)°

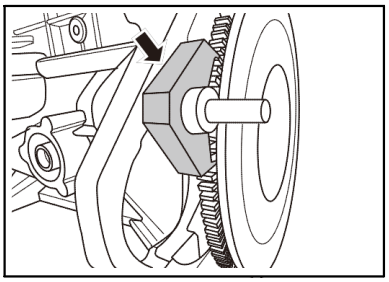


2. Install alternator belt
3. Install engine assembly
4. Install transmission assembly
5. Install right driving axle assembly
6. Install left driving axle assembly
7. Install right front wheel
8. Install left front wheel
9. Install starter
10. Install clutch working cylinder
11. Install back-up lamp switch
12. Install battery tray
13. Install battery
14. Install air filter assembly
15. Install water inlet and outlet pipe assembly of warm wind
16. Install pipe and expansion valve assembly
17. Install intake hose
18. Fill Freon/refrigerant oil
19. Fill cooling liquid
20. Fill engine oil
21. Fill transmission lubrant
22. Fill clutch hydraulic oil
23. Install engine right front cover
24. Install engine left front cover
25. Connect battery cathode cable
26. Close engine cover

VIII、Flywheel component

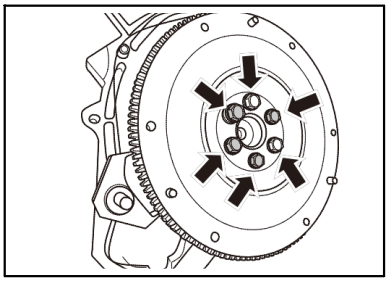
(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble engine left front cover, refer to engine cover
4. Disassemble engine right front cover, refer to engine cover
5. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
6. Drain transmission lubricant, refer to the drain and fill of transmission lubricant
7. Disassemble battery, refer to battery
8. Disassemble battery tray, refer to battery tray
9. Disassemble back-up lamp switch, refer to back-up lamp switch
10. Disassemble clutch working cylinder, refer to clutch working cylinder and oil intake pipe assembly
11. Disassemble starter, refer to starter
12. Disassemble left front wheel, refer to wheel
13. Disassemble right front wheel, refer to wheel
14. Disassemble left driving axle assembly, refer to driving axle assmbly
15. Disassemble right driving axle assembly, refer to driving axle assmbly
16. Disassemble transmission assembly, refer to transmission assembly
17. Disassemble clutch cover and platen assembly, clutch driven plate, refer to Disassemble clutch cover and platen assembly, clutch driven plate
18. Disassemble flywheel component



1). Use flywheel stop to fix flywheel

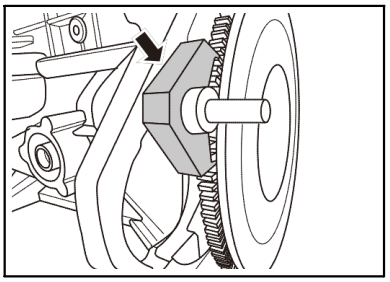
2). Disassemble 6 fixing bolts
3). Remove flywheel component



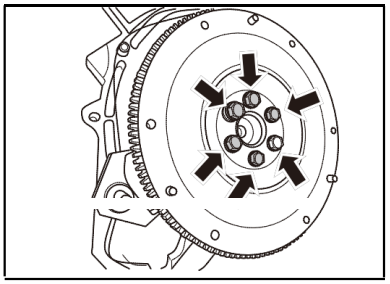
(II)Installation

1. Install flywheel component

1). Use flywheel stop to fix flywheel



2). Install 6 fixing bolts of flywheel.

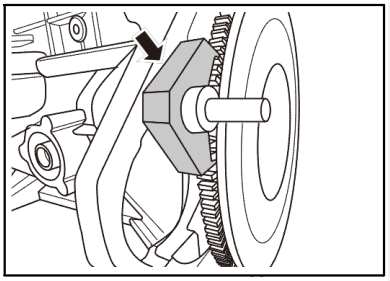


2. Install clutch cover and platen assembly, clutch driven plate
3. Install right driving axle assembly
4. Install left driving axle assembly
5. Install right front wheel
6. Install left front wheel
7. Install starter
8. Install clutch working cylinder
9. Install back-up lamp switch
10. Install battery tray
11. Install battery
12. Fill transmission lubricant
13. Fill clutch hydraulic oil
14. Install engine right front cover shield
15. Install engine left front cover shield
16. Connect battery cathode cable
17. Close engine cover

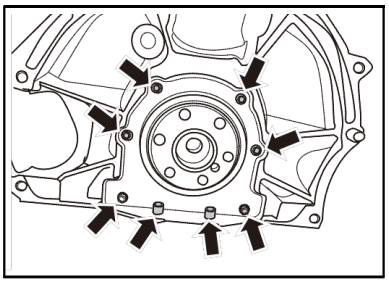
IX、Crankshaft rear oil seal and cover plate

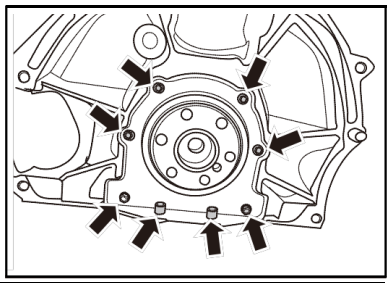
(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble engine left front cover, refer to engine cover
4. Disassemble engine right front cover, refer to engine cover
5. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
6. Drain transmission lubricant, refer to the drain and fill of transmission lubricant
7. Disassemble battery, refer to battery
8. Disassemble battery tray, refer to battery tray
9. Disassemble back-up lamp switch, refer to back-up lamp switch
10. Disassemble clutch working cylinder, refer to clutch working cylinder and oil intake pipe assembly
11. Disassemble starter, refer to starter
12. Disassemble left front wheel, refer to wheel
13. Disassemble right front wheel, refer to wheel
14. Disassemble left driving axle assembly, refer to driving axle assmbly
15. Disassemble right driving axle assembly, refer to driving axle assmbly
16. Disassemble transmission assembly, refer to transmission assembly
17. Disassemble clutch cover and platen assembly, clutch driven plate, refer to Disassemble clutch cover and platen assembly, clutch driven plate



18. Disassemble flywheel component
19. Disassemble Crankshaft rear oil seal and cover plate
    1). Disassemble 8 fixing bolts of crankshaft rear oil seal and cover plate
    2). Remove crankshaft rear oil seal and cover plate





(II)Installation

1. Install crankshaft rear oil seal and cover plate
   1). Smear DowCorning 3-0115 sealant or relevant products to the installation surface on the back side of cylinder.
   2). Smear lubricant to the connection part of oil seal mouth and

crankshaft, please be careful not to scratch oil seal while installation.

3). Install fixing bolts of crankshaft rear oil seal and cover plate

Torque (7.6±0.6) N m

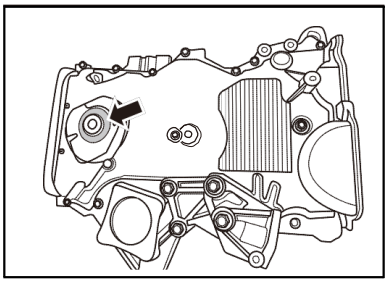
2. Install flywheel component
3. Install clutch cover and platen assembly, clutch driven plate
4. Install right driving axle assembly
5. Install left driving axle assembly
6. Install right front wheel
7. Install left front wheel
8. Install starter
9. Install clutch working cylinder
10. Install back-up lamp switch
11. Install battery tray
12. Install battery
13. Fill transmission lubricant
14. Fill clutch hydraulic oil
15. Install engine right front cover
16. Install engine left front cover
17. Connect battery cathode cable
18. Close engine cover

X、Crankshaft front oil seal

(I)Disassembly

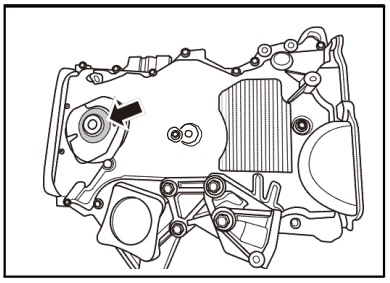
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Release fuel system pressure, refer to release fuel system pressure
4. Disassemble engine left front cover, refer to engine cover
5. Disassemble engine right front cover, refer to engine cover
6. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
7. Drain transmission lubricant, refer to the drain and fill of transmission lubricant
8. Drain engine oil, refer to drain and fill of engine oil
9. Drain coolant, refer to replace coolant
10. Recycle freon, refrigerating oil, refer to freon, refrigerating oil
11. Disassemble intake hose, refer to intake hose assembly
12. Disassemble pipe and expansion valve assembly, refer to pipe and expansion valve assembly
13. Disassemble water inlet and outlet assembly of warm wind, refer to disassemble water inlet and outlet assembly of warm wind
14. Disassemble air filter assembly, refer to air filter assembly
15. Disassemble battery, refer to battery
16. Disassemble battery tray, refer to battery tray
17. Disassemble back-up lamp switch, refer to back-up lamp switch
18. Disassemble clutch working cylinder, refer to clutch working cylinder and oil intake pipe assembly
19. Disassemble starter, refer to starter
20. Disassemble left front wheel, refer to wheel
21. Disassemble right front wheel, refer to wheel
22. Disassemble left driving axle assembly, refer to driving axle assmbly
23. Disassemble right driving axle assembly, refer to driving axle assmbly
24. Disassemble transmission assembly, refer to transmission assembly
25. Disassemble engine assembly, refer to engine assembly
26. Disassemble alternator belt, refer to alternator belt
27. Disassemble crankshaft pulley, refer to crankshaft pulley

28. Disassemble crankshaft front oil seal
    1). Pry off crankshaft front oil seal



(II)Installation

1. Install crankshaft front oil seal
   1). Put into crankshaft front oil seal



2. Install crankshaft pulley
3. Install alternator belt
4. Install engine assembly
5. Install transmission assembly
6. Install right driving axle assembly
7. Install left driving axle assembly
8. Install right front wheel
9. Install left front wheel
10. Install starter
11. Install clutch working cylinder
12. Install back-up lamp switch
13. Install battery tray
14. Install battery
15. Install air filter assembly
16. Install water inlet and outlet assembly of warm wind
17. Install pipe and expansion valve assembly
18. Install intake hose
19. Fill Freon and refrigerant oil
20. Fill coolant
21. Fill engine oil
22. Fill transmission lubricant
23. Fill clutch hydraulic oil
24. Install engine right front cover
25. Install engine left front cover
26. Connect battery cathode cable
27. Close engine cover

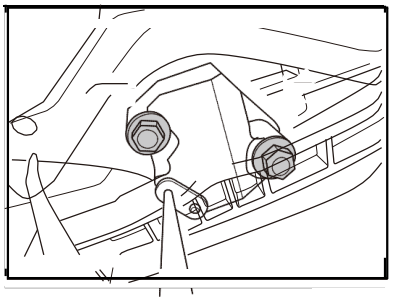
XI、Timing chain

(I)Disassembly

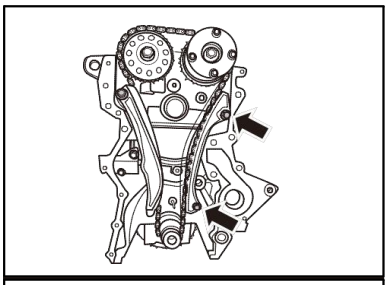
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Release fuel system pressure, refer to release fuel system pressure
4. Disassemble engine left front cover, refer to engine cover
5. Disassemble engine right front cover, refer to engine cover
6. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
7. Drain transmission lubricant, refer to the drain and fill of transmission lubricant
8. Drain engine oil, refer to drain and fill of engine oil
9. Drain coolant, refer to replace coolant
10. Recycle freon, refrigerating oil, refer to freon, refrigerating oil
11. Disassemble intake hose, refer to intake hose assembly
12. Disassemble pipe and expansion valve assembly, refer to pipe and expansion valve assembly
13. Disassemble water inlet and outlet assembly of warm wind, refer to disassemble water inlet and outlet assembly of warm wind
14. Disassemble air filter assembly, refer to air filter assembly
15. Disassemble battery, refer to battery
16. Disassemble battery tray, refer to battery tray
17. Disassemble back-up lamp switch, refer to back-up lamp switch
18. Disassemble clutch working cylinder, refer to clutch working cylinder and oil intake pipe assembly
19. Disassemble starter, refer to starter
20. Disassemble left front wheel, refer to wheel
21. Disassemble right front wheel, refer to wheel
22. Disassemble left driving axle assembly, refer to driving axle assmbly
23. Disassemble right driving axle assembly, refer to driving axle assmbly
24. Disassemble transmission assembly, refer to transmission assembly
25. Disassemble engine assembly, refer to engine assembly
26. Disassemble alternator belt, refer to alternator belt
27. Disassemble alternator, refer to alternator
28. Disassemble compression assembly, refer to compression assembly
29. Disassemble idle wheel, refer to idle wheel
30. Disassemble water pump pulley, refer to water pump pulley
31. Disassemble crankshaft pulley, refer to crankshaft pulley
32. Disassemble oil level gauge component, refer to oil level gauge component
33. Disassemble oil sump assembly, refer to oil sump assembly
34. Disassemble cylinder cover assembly, refer to cylinder cover assembly
35. Disassemble crankshaft front oil seal, refer to crankshaft front oil seal
36. Disassemble chain wheel compartment cover, refer to chain wheel compartment cover

37.Disassemble timing chain

1). Disassemble 2 fixing bolts of automatic take-up, remove automatic take-up



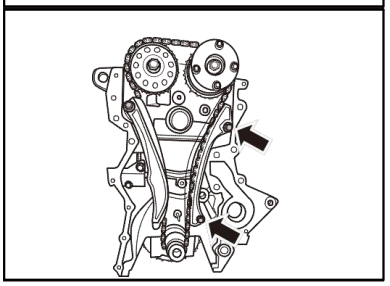
2). Disassemble 1 fixing bolts of dynamic rail components, remove dynamic rail components.



3). Disassemble 2 fixing bolts of orbit determination

4). Rotate crankshaft to loosen timing chain

5). Remove orbit determination

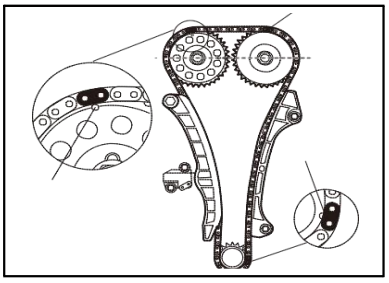


38.Disassemble exhaust crankshaft chain

1). Disassemble 1 fixing bolt of exhaust crankshaft chain wheel.

2). Remove exhaust crankshaft chain wheel

3). Remove timing chain

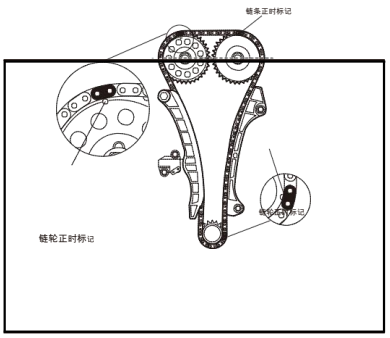


(II)Installation

1. Install timing chain

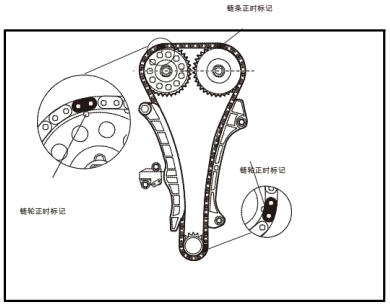
1). Adjust the TDC mark of cylinder 1 of crankshaft signal wheel to vertical direction

2). Confirm 3 chain marks of timing chain.



3). Install timing chain, mark the first timing when aligning to crankshaft timing chain.

4). Adjust timing chain, mark the second timing when aligning to valve timing adjuster.

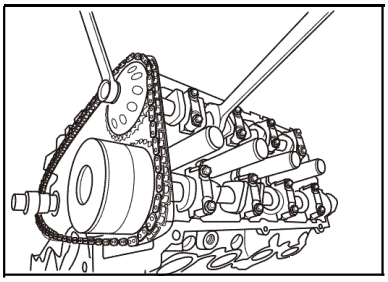


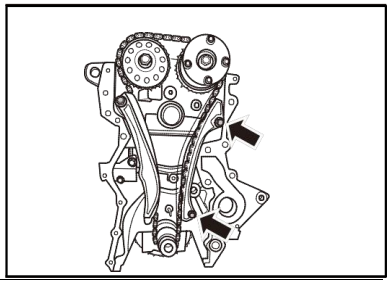
2. Install exhaust cam shaft chain

1). Install fixing bolts of exhaust cam shaft chain, rotate exhaust cam shaft, align to the third timing mark.

ΔCaution there is only one circle on exhaust cam shaft chain, which should be aligned to timing chain, not 2 circles.

Torque (88±10)N m





2). Install orbit determination

3). Tighten fixing bolts

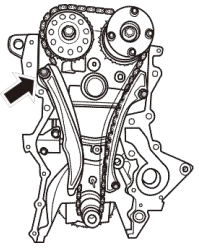
Torque (10±2)N m

4). Install dynamic rail components
5). Tighten fixing bolts
Torque (23.5±4.5)N m

6). Install automatic take-up, tighten bolts.

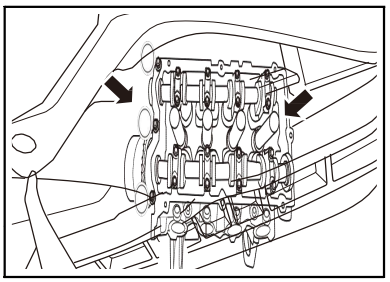
Δcaution when installing automatic take-up, please be sure to avoid slippage phenomenon of timing chain, check if 3 timing marks are aligning to each other, making sure timing chain isn't malposition.

Torque (10±1)N m



3. Install chain wheel compartment cover
4. Install crankshaft front oil seal
5. Install cylinder cover component
6. Install oil sump assembly
7. Install oil level gauge pipe component
8. Install crankshaft pulley
9. Install water pump pulley
10. Install idle wheel
11. Install compression assembly
12. Install alternator
13. Install alternator belt
14. Install engine assembly
15. Install transmission assembly
16. Install right driving axle assembly
17. Install left driving axle assembly
18. Install right front wheel
19. Install left front wheel
20. Install starter
21. Install clutch working cylinder
22. 关 Install back-up lamp switch
23. Install battery tray
24. Install battery
25. Install air filter assembly
26. Install water inlet and outlet assembly of warm wind
27. Install pipe and expansion valve assembly
28. Install intake hose
29. Fill Freon/ refrigerant oil
30. Fill coolant

31.Fill engine oil
32.Fill transmission lubricant
33.Fill clutch hydraulic oil
34.Install engine right front cover
35.Install engine left front cover
36.Connect battery cathode cable
37.Close engine cover



XII、camshaft

(I)Disassembly

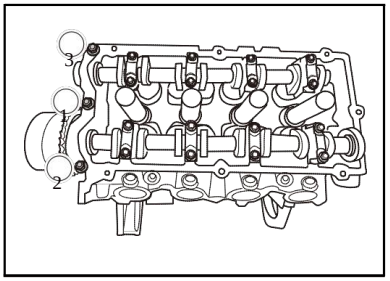
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Release fuel system pressure, refer to release fuel system pressure
4. Disassemble engine left front cover, refer to engine cover
5. Disassemble engine right front cover, refer to engine cover
6. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
7. Drain transmission lubricant, refer to the drain and fill of transmission lubricant
8. Drain engine oil, refer to drain and fill of engine oil
9. Drain coolant, refer to replace coolant
10. Recycle freon, refrigerating oil, refer to freon, refrigerating oil
11. Disassemble intake hose, refer to intake hose assembly
12. Disassemble pipe and expansion valve assembly, refer to pipe and expansion valve assembly
13. Disassemble water inlet and outlet assembly of warm wind, refer to disassemble water inlet and outlet assembly of warm wind
14. Disassemble air filter assembly, refer to air filter assembly
15. Disassemble battery, refer to battery
16. Disassemble battery tray, refer to battery tray
17. Disassemble back-up lamp switch, refer to back-up lamp switch
18. Disassemble clutch working cylinder, refer to clutch working cylinder and oil intake pipe assembly
19. Disassemble starter, refer to starter
20. Disassemble left front wheel, refer to wheel
21. Disassemble right front wheel, refer to wheel
22. Disassemble left driving axle assembly, refer to driving axle assembly
23. Disassemble right driving axle assembly, refer to driving axle assembly
24. Disassemble transmission assembly, refer to transmission assembly
25. Disassemble engine assembly, refer to engine assembly
26. Disassemble alternator belt, refer to alternator belt
27. Disassemble alternator, refer to alternator
28. Disassemble compression assembly, refer to compression assembly
29. Disassemble idle wheel, refer to idle wheel
30. Disassemble water pump pulley, refer to water pump pulley
31. Disassemble crankshaft pulley, refer to crankshaft pulley
32. Disassemble oil level gauge component, refer to oil level gauge component
33. Disassemble oil sump assembly, refer to oil sump assembly
34. Disassemble cylinder cover assembly, refer to cylinder cover assembly
35. Disassemble crankshaft front oil seal, refer to crankshaft front oil seal
36. Disassemble chain wheel compartment cover, refer to chain wheel compartment cover

37. Disassemble timing chain, refer to timing chain

38. Disassemble camshaft

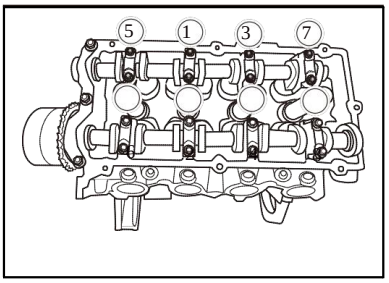
1). According to the opposite order of the table, remove 3 bearing cap bolts of the front camshaft.

2). Remove camshaft front bearing cap.



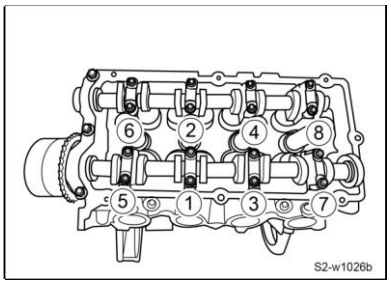
3). According to the opposite order of the table, loosen exhaust camshaft bearing cap one by one, loosen from half round to one round.

4). Disassemble exhaust camshaft bearing cap, remove exhaust camshaft.



5). According to the opposite order of the table, loosen intake camshaft bearing cap one by one, loosen from half round to one round.

6). Disassemble intake camshaft bearing cap.

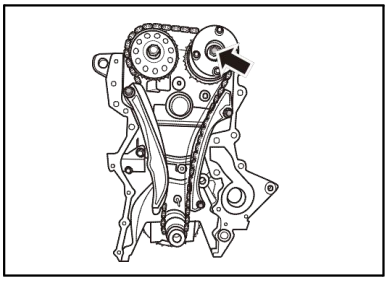


39.Disassemble valve timing adjuster

1). Disassemble 1 fixing bolt of valve timing adjuster.

2). Remove valve timing adjuster.

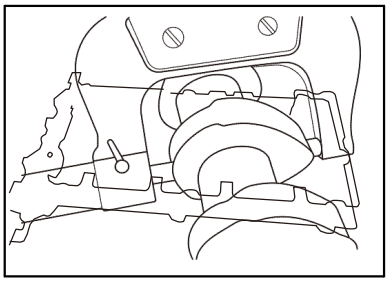
3). Remove intake camshaft.



40.Disassemble mechanic tappet

1). Remove 16 mechanic tappets

△caution In case forget the location of tappet, mark on the removed tappet and at the location of relevant installing location.



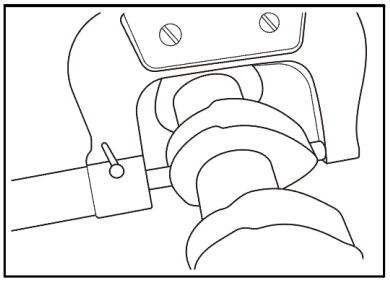
(II)Check

1. Measure the height of camshaft

2). Intake：(44.7054±0.1)mm；

Exhaust：(44.2836±0.1)mm

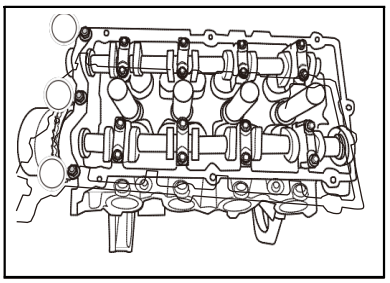
Please replace camshaft if the measured values doesn't conform with the above standard values.



(III)Installation

1. install mechanic tappets

1).Put the mechanic tappets into the cylinder according to the mark

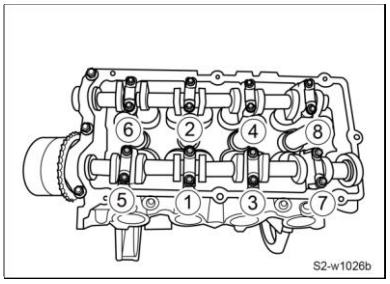


2. Install camshaft

1). Smear engine oil to the journal and cam of camshaft.

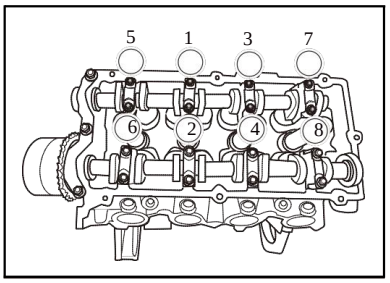
2). Install intake camshaft, tighten fixing bolts of intake camshafat bearing cap according to the order in the table.

Torque (11±1) N·m。



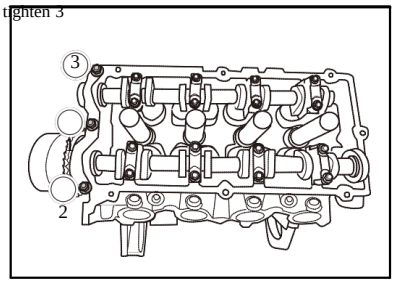
3).Install exhaust camshaft, tighten fixing bolts of exhaust camshafat bearing cap according to the order in the table.

Torque (11±1) N·m



4). Install camshaft front bearing cap according to the order in the table, tighten 3 bolts.

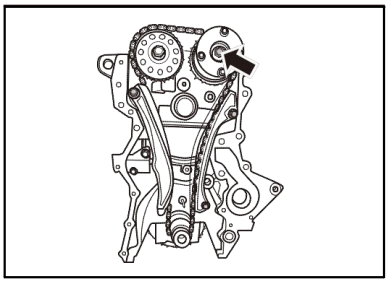
Torque (20±1) N·m



3. Install valve timing adjuster

1). Install the fixing bolts of valve timing adjuster

Torque (70±5)N·m



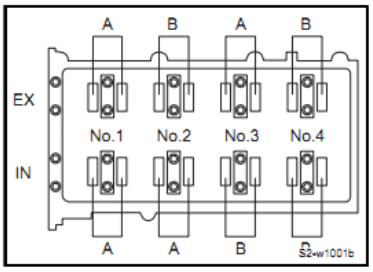
4. check valve clearance

1). Measure valve clearance at A position in the drawing.

2). If valve clearance isn't within the standard, need to be adjusted.

3). Rotate crankshaft 360 ℃lockwise, making 4 cylinders piston at the compression TDC position.

4). Measure valve clearance at B position in above drawing.



EX

ΔCaution Be sure to note down measure value, which is key parameters for calculating the suitable tappet mark.

5. Check mechanic tappet

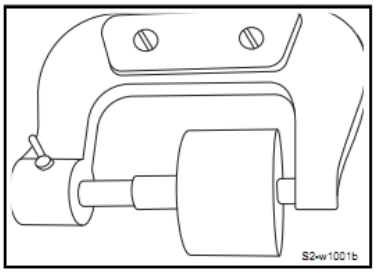
1). Remove the mechanic tappet where the valve clearance is disqualified, and adjust the valve clearance.

2). Use micrometer caliper, measure the thickness of removed mechanic tappet.

3)。 According to the measured valve clearance and thickness of old tappet, calculate the thickness of new tappet, to make sure valve clearance reaches within the regulated range.

Intake thickness of new tappet=thickness of old tappet+[measured valve clearance-0.22mm]

Exhaust thickness of new tappet= thickness of old tappet +[measured valve clearance-0.30mm]



6. Install timing chain
7. Install chain wheel compartment cover
8. Install crankshaft front oil seal
9. Install cylinder cover shield component
10. Install oil sump assembly
11. Install oil level gauge component
12. Install crankshaft pulley
13. Install water pump pulley
14. Install idle wheel
15. Install compressor assembly
16. Install alternator
17. Install alternator belt
18. Install engine assembly
19. Install transmission assembly
20. Install right driving axle assembly
21. Install left driving axle assembly
22. Install right front wheel
23. Install left front wheel
24. Install starter
25. Install clutch working cylinder
26. Install back-up lamp switch
27. Install battery tray
28. Install battery
29. Install air filter assembly
30. Install water inlet and outlet assembly of warm wind
31. Install pipe and expansion valve assembly
32. Install intake hose
33. Fill Freon, refrigerant oil
34. Fill coolant
35. Fill engine oil
36. Fill transmission lubricant
37. Fill clutch hydraulic oil
38. Install engine right front cover shield
39. Install left front cover shield
40. Connect battery cathode cable
41. Close engine cover

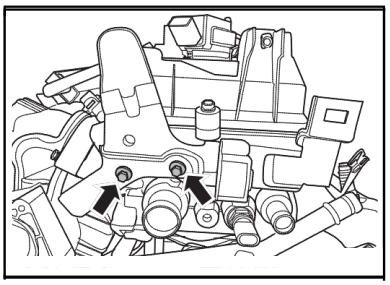
XIII、Cylinder cover assembly

(I)Disassemble

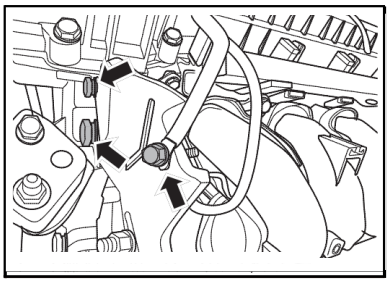
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Release fuel system pressure, refer to release fuel system pressure
4. Disassemble engine left front cover, refer to engine cover
5. Disassemble engine right front cover, refer to engine cover
6. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
7. Drain transmission lubricant, refer to the drain and fill of transmission lubricant
8. Drain engine oil, refer to drain and fill of engine oil
9. Drain coolant, refer to replace coolant
10. Recycle freon, refrigerating oil, refer to freon, refrigerating oil
11. Disassemble intake hose, refer to intake hose assembly
12Disassemble pipe and expansion valve assembly, refer to pipe and expansion valve assembly
13. Disassemble water inlet and outlet assembly of warm wind, refer to disassemble water inlet and outlet assembly of warm wind
14. Disassemble air filter assembly, refer to air filter assembly
15. Disassemble battery, refer to battery
16. Disassemble battery tray, refer to battery tray
17. Disassemble back-up lamp switch, refer to back-up lamp switch
18. Disassemble clutch working cylinder, refer to clutch working cylinder and oil intake pipe assembly
19. Disassemble starter, refer to starter
20. Disassemble left front wheel, refer to wheel
21. Disassemble right front wheel, refer to wheel
22. Disassemble left driving axle assembly, refer to driving axle assembly
23. Disassemble right driving axle assembly, refer to driving axle assembly
24. Disassemble transmission assembly, refer to transmission assembly
25. Disassemble engine assembly, refer to engine assembly
26. Disassemble ignition coil, refer to ignition coil
27. Disassemble spark plug, refer to spark plug
28. Disassemble oil pressure guide rail component, refer to oil pressure guide rail component
29. Disassemble air filter bracket I, refer to air filter bracket I
30. Disassemble intake manifold, refer to intake manifold
31. Disassemble exhaust manifold, refer to exhaust manifold
32. Disassemble camshaft position sensor, refer to camshaft position sensor
33. Disassemble PCV valve, refer to PCV valve
34. Disassemble pressure regulation valve, refer to pressure regulation valve
35. Disassemble water temperature sensor, refer to water temperature sensor
36. Disassemble alternator belt, refer to alternator belt
37. Disassemble alternator, refer to alternator
38. Disassemble compression assembly, refer to compression assembly
39. Disassemble idle wheel, refer to idle wheel
40. Disassemble water pump pulley, refer to water pump pulley
41. Disassemble crankshaft pulley, refer to crankshaft pulley
42. Disassemble oil level gauge component, refer to oil level gauge component
43. Disassemble oil sump assembly, refer to oil sump assembly
44. Disassemble cylinder cover assembly, refer to cylinder cover assembly
45. Disassemble crankshaft front oil seal, refer to crankshaft front oil seal
46. Disassemble chain wheel compartment cover, refer to chain wheel compartment cover

47.Disassemble timing chain, refer to timing chain
48.Disassemble camshaft, refer to camshaft

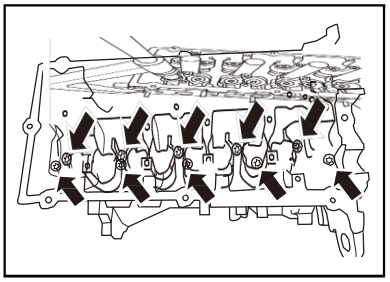
49. Disassemble engine rear lifting lug
   1). Disassemble 2 fixing bolts of rear lifting lug.
   2). Remove rear lifting lug



50.Disassemble alternator adjusting arm bracket
   1). Disassemble bonding bolts, Release bonding wire.
   2). Disassemble 2 alternator adjusting arm brackets
   3). Remove alternator adjusting arm bracket

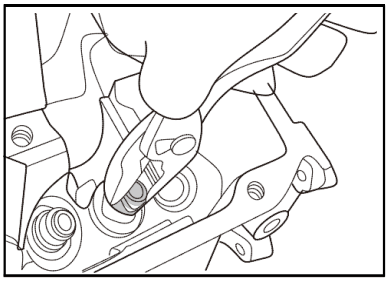


51.Disassemble cylinder cover assembly
   1). Loosen 10 bolts of cylinder cover, disassemble cylinder cover.
   2). Remove cylinder cover and cylinder cover pad



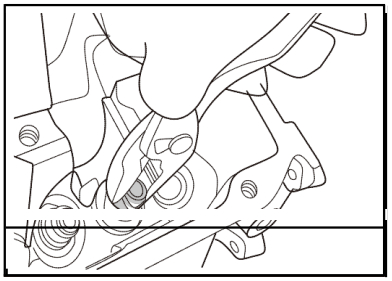
52.Disassemble valve
   1). Remove valve with valve spring compressor

   ΔCaution Mark cylinder no. and location on disassembled valve/ valve spring and other components, store them well.



53.Disassemble valve

1). Disassemble valve lock, valve spring and valve spring retainer.
2). Disassemble valve oil seal
3). Disassemble valve retainer
4). Disassemble valve guide pipe



(II)Check

1. Check cylinder cover

1). Check if there is crack or other damage on cylinder cover.
2). Check is there is jam on water channel and oil channel of cylinder cover, please clean if yes.
3). Check the flatness of cylinder cover. Measure the flatness of 6 directions at multiple locations of cylinder bottom.

Standard value: below

0.03mmlimiting value：

0.10mm

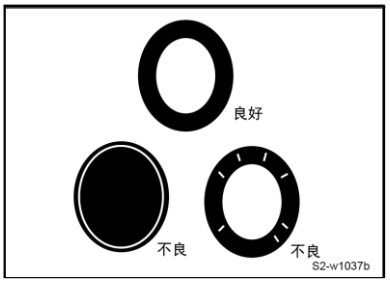
Height of cylinder cover(new)：(113±0.1)mm

If it is higher than standard value, please grind according to the standard; if it is higher than limiting value, please replace according to the specification.

Δcaution The total margin to grind of matching surface of cylinder cover and cylinder is less than 0.2mm.

2. Check valve

1). Check if the valve surface is connected correctly. If the connection is uneven or incomplete, please repair the valve retainer surface again.

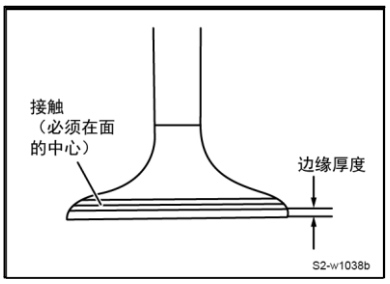


2). Check margin thickness of valve. If it is smaller than limiting value, please replace the valve. intake：Standard value：1.35mm

limiting value：0.85mm

exhaust：Standard value：1.85mm

limiting value：1.35mm



3). Check the total length of valve. If it is smaller than limiting value, please replace valve.

intake：

Standard value:89.61mm

limiting value:9.11mm

exhaust：

Standard value: 90.94mm

limiting value: 90.44mm

3. Check valve spring

1). Check the unsupported height of valve spring. If it is higher than limiting value, please replace valve spring.

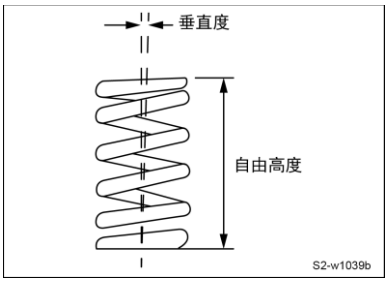
Standard value：43.1mm

limiting value：42.7mm

2). Check the perpendicularity of valve spring. If it is higher than limiting value, please replace valve spring.

Standard value： ＜2°

limiting value：4°



(III)Installation

1. Assemble valve

1). Install valve guide pipe

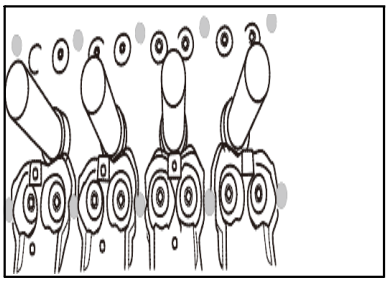
2). Install valve retainer

3). Install valve oil seal

4). Install valve spring bottom seat

5). Install new valve oil seal with special tools

Δcaution Valve oil seal can't be used repeatedly. Must use special tools to install valve oil seal.



2. Install valve

1). Install valve with valve spring compressor.

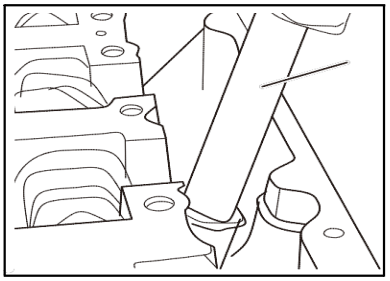
2). Install valve spring

Δcaution Install the one with oil paint mark upwards

3). Install valve spring upper seat.

4). Install spring lock

5). To check installation, knock valve stem margin with rubber hammer slightly after installation.



3. Install cylinder cover

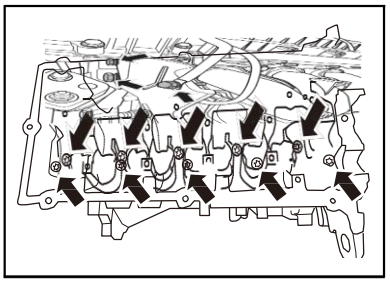
1). Wipe the engine oil on cylinder cover and clean the sealant and carbon deposit.

Δcaution Be careful not to let impurity fall into water pump and oil pump of cylinder cover.

2). Install new cylinder pad

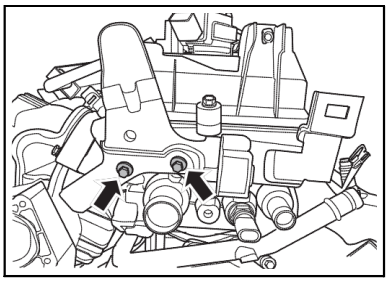
3). Smear engine oil to thread of bolts of cylinder cover and pads. Tighten fixing bolts of cylinder cover.

Torque (24.5±2)N m



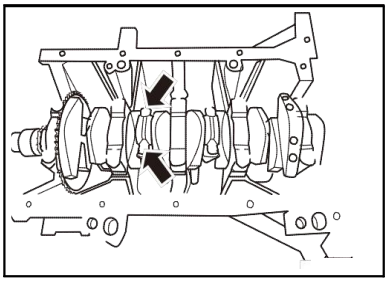
4. Install engine adjusting arm bracket

1). Install engine adjusting arm bracket to cylinder cover, tighten fixing bolts.



5. Install engine rear lifting lug

1). Install engine rear lifting lug to cylinder cover, tighten fixing bolts.



6. Install camshaft
7. Install timing chain
8. Install chain wheel compartment cover
9. Install crankshaft front oil seal
10. Install cylinder cover shield component
11. Install oil sump assembly
12. Install oil level gauge component
13. Install crankshaft pulley
14. Install water pump pulley
15. Install idle wheel
16. Install compressor assembly
17. Install alternator
18. Install alternator belt
19. Install water temperature sensor
20. Install PCV valve
21. Install pressure regulating valve
22. Install camshaft position sensor
23. Install exhaust manifold
24. Install intake manifold
25. I Install air filter bracket I
26. Install spark plug
27. Install ignition coil
28. Install engine assembly
29. Install transmission assembly
30. Install right driving axle assembly
31. Install left driving axle assembly
32. Install right front wheel
33. Install left front wheel
34. Install starter
35. Install clutch working cylinder
36. Install back-up lamp switch
37. Install battery tray
38. Install battery
39. Install air filter assembly
40. Install water inlet and outlet assembly of warm wind
41. Install pipe and expansion valve assembly
42. Install intake hose
43. Fill Freon, refrigerant oil
44. Fill coolant
45. Fill engine oil
46. Fill transmission lubricant
47. Fill clutch hydraulic oil
48. Install engine right front cover shield
49. Install left front cover shield
50. Connect battery cathode cable
51. Close engine cover

XIV、Cylinder assembly

(I)Disassemble

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Release fuel system pressure, refer to release fuel system pressure
4. Disassemble engine left front cover, refer to engine cover
5. Disassemble engine right front cover, refer to engine cover
6. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
7. Drain transmission lubricant, refer to the drain and fill of transmission lubricant
8. Drain engine oil, refer to drain and fill of engine oil
9. Drain coolant, refer to replace coolant
10. Recycle freon, refrigerating oil, refer to freon, refrigerating oil
11. Disassemble intake hose, refer to intake hose assembly
12. Disassemble pipe and expansion valve assembly, refer to pipe and expansion valve assembly
13. Disassemble water inlet and outlet assembly of warm wind, refer to disassemble water inlet and outlet assembly of warm wind
14. Disassemble air filter assembly, refer to air filter assembly
15. Disassemble battery, refer to battery
16. Disassemble battery tray, refer to battery tray
17. Disassemble back-up lamp switch, refer to back-up lamp switch
18. Disassemble clutch working cylinder, refer to clutch working cylinder and oil intake pipe assembly
19. Disassemble starter, refer to starter
20. Disassemble left front wheel, refer to wheel
21. Disassemble right front wheel, refer to wheel
22. Disassemble left driving axle assembly, refer to driving axle assmbly
23. Disassemble right driving axle assembly, refer to driving axle assmbly
24. Disassemble transmission assembly, refer to transmission assembly
25. Disassemble engine assembly, refer to engine assembly
26. Disassemble ignition coil, refer to ignition coil
27. Disassemble spark plug, refer to spark plug
28. Disassemble oil pressure guide rail component, refer to oil pressure guide rail component
29. Disassemble warm wind backwater pipe, refer to warm wind backwater pipe
30. Disassemble vacuum servo steel tube, refer to vacuum servo steel tube
31. Disassemble air filter bracket I, refer to air filter bracket I
32. Disassemble air filter bracket II, refer to air filter bracketII
33. Disassemble intake manifold, refer to intake manifold
34. Disassemble exhaust manifold, refer to exhaust manifold
35. Disassemble PCV valve, refer to PCV valve
36. Disassemble carbon tank solenoid valve, refer to carbon tank solenoid valve
37. Disassemble electronic throttle valve, refer to electronic throttle valve
38. Disassemble absolute pressure transducer, refer to absolute pressure transducer
39. Disassemble water temperature sensor, refer to water temperature sensor
40. Disassemble camshaft position sensor, refer to camshaft position sensor
41. Disassemble crankshaft position sensor, refer to crankshaft position sensor
42. Disassemble knocking sensor, refer to knocking sensor
43. Disassemble pressure regulating valve, refer to pressure regulating valve
44. Disassemble engine oil pressure switch, refer to engine oil pressure switch
45. Disassemble alternator belt, refer to alternator belt
46. Disassemble alternator, refer to alternator

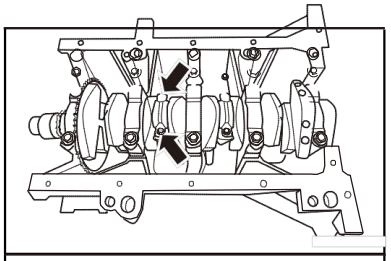
47.Disassemble compression assembly, refer to compression assembly
48.Disassemble idle wheel, refer to idle wheel
49.Disassemble alternator, refer to alternator
50.Disassemble compression assembly, refer to compression assembly
51.Disassemble idle wheel, refer to idle wheel
52.Disassemble water pump pulley, refer to water pump pulley
53.Disassemble crankshaft pulley, refer to crankshaft pulley
54.Disassemble oil level gauge component, refer to oil level gauge component
55.Disassemble oil sump assembly, refer to oil sump assembly
56.Disassemble cylinder cover assembly, refer to cylinder cover assembly
57.Disassemble crankshaft front oil seal, refer to crankshaft front oil seal
58.Disassemble chain wheel compartment cover, refer to chain wheel compartment cover
59.Disassemble timing chain, refer to timing chain
60.Disassemble camshaft, refer to camshaft
61.Disassemble engine rear lifting lug, refer to engine rear lifting lug
62.Disassemble alternator adjusting arm bracket, refer to alternator adjusting arm bracket
63.Disassemble cylinder cover assembly, refer to cylinder cover assembly

64.Disassemble piston connecting rod assembly

1). Rotate crankshaft, make cylinder 2/3 at the BDC, disassemble connecting rod bearing cap bolt of cylinder 2.

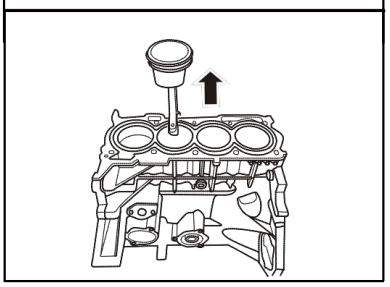
2). Hold connecting rod bolts with hand, take out connecting rod bearing cap bolt of cylinder 2, and mark position of cylinder 2 on the bearing cap.

3). Disassemble the piston connecting rod bearing cap of cylinder 1/3/4 respectively with the same method.



4). Push out piston connecting rod components of cylinder 1 with wooden handle, and mark the position of cylinder 2 on the piston and connecting rod components.

5).Disassemble the piston connecting rod assembly of cylinder 1/3/4 respectively with the same method.

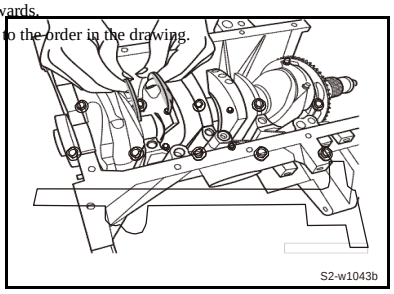


65.Disassemble crankshaft

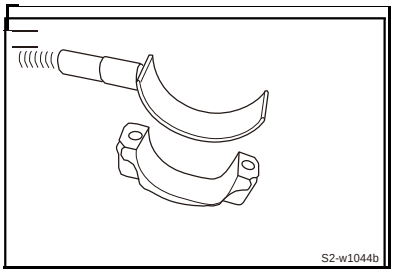
1). Rotate the rotating handle of rack, making bottom of engine face upwards.

2). Loosen and disassemble 10 main bearing cap bolts evenly according to the order in the drawing.

3). Remove main bearing cap.



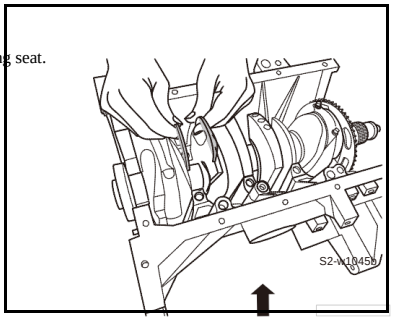
4). Disassemble the main shaft bushing of main bearing cap.



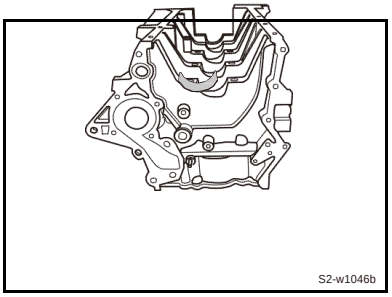
5). Disassemble the thrust bearing of crankshaft on the forth main bearing seat.

△Caution While disassembling thrust bearing, you can rotate crankshaft, letting them out together with thrust bearing, which is convenient to disassemble.

6). Remove crankshaft

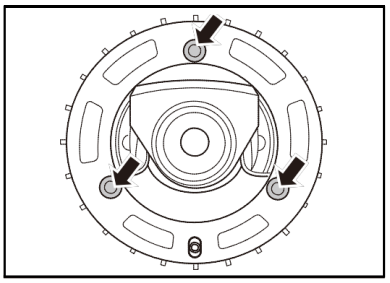


7). Disassemble main bearing upper tile



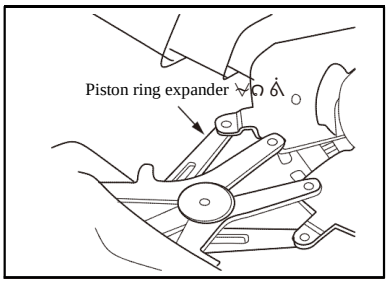
66. Disassemble crankshaft signal wheel

1). Disassemble the fixing bolts of crankshaft signal wheel
2). Remove crankshaft signal wheel



67.Disassemble piston connecting rod component

1). Disassemble piston ring with piston ring expander.



2). Disassemble piston from connecting rod.

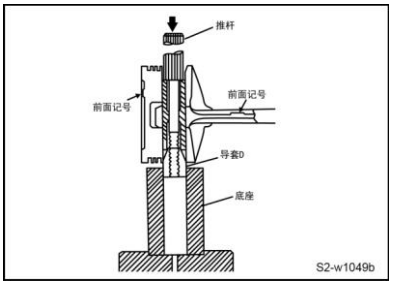
a.Insert push rod(special tool) at the mark from front, then install guide sleeve D

b. Put the mark front of piston upwards, install piston and connecting rod to the foundation (special tool) of piston pin.

c.Press out the piston pin with pressure machine.

d.Separate connecting rod and piston from piston and connecting rod assembly.

Δcaution After removing piston pin, put piston/piston pin and connecting rod of the same cylinder together, please do not mix with those from other cylinders.



3). Remove pitman box

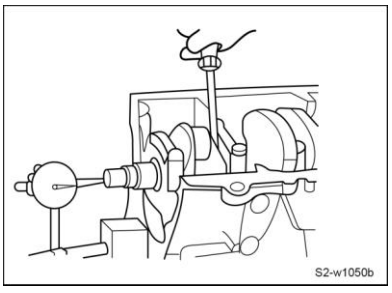
(II)Check

1. Check crankshaft axial clearance

1). Pry crankshaft with opener, and record the readings from dial indicator.

Standard：0.09～0.27mm

If the measured value is out of the standard range, please replace thrust plate, and measure again. If it's still out of the standard range, please replace crankshaft.



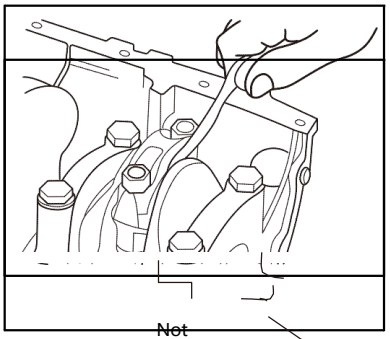
2. Check connnecting rod big end clearance

1). Measure the clearance of connnecting rod and crank arm with feeler gauge. standard：

0.10～0.25mm

limitation：0.4mm

If the measured value exceeds the limitation, please replace connnecting rod and measure again. If it still exceeds the limitation, please replace crankshaft.



3. Check the backlash of piston ring

1)。 Measure the backlash of piston ring and piston ring groove with feeler gauge.

standard：

first：0.03～0.07mm

second ： 0.02 ～ 0.06mm

limitation：

first：0.10mm

second：0.10mm

If the measured value exceeds the limitation, please replace the piston ring and measure again. If it still exceeds the limitation, please replace the piston.

4. Check the piston ring end gap

1). Lubricate piston and piston ring with engine oil, then insert piston ring til center of cylinder, measure the end gap of piston ring with feeler gauge.

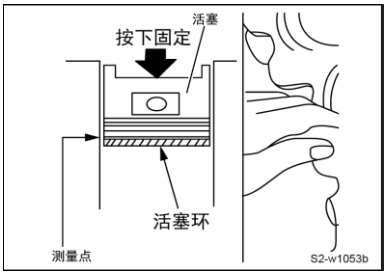
standard：

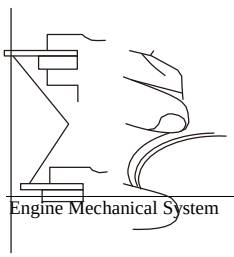
first：0.15～0.30mm

second：0.30～0.50mm

compound oil ring：0.20～0.50mm

limitation：





first：0.8mm

second：0.8mm

compound oil

ring：1.0mm

If the measured value exceeds the limitation, please replace the piston ring and measure again. If it still exceeds the limitation, please replace the cylinder.

5. Check the flatness of cylinder

1). Clean the pad on surface of cylinder, and engine oil, incrustation, carbon or other pollutants.

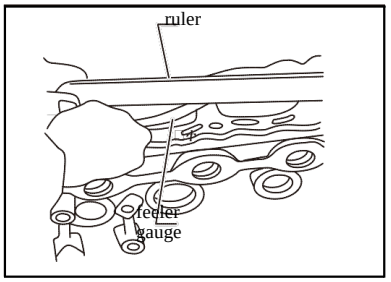
ΔCaution Be careful not to let Gasket sheet fall into engine oil or engine coolant.

Measure flatness of cylinder for different directions of 6 postions with ruler and feeler gauge.

Standard value：lower than 0.03mm

Limitating value：lower than 0.1mm

If it exceeds the limitation, please replace cylinder.



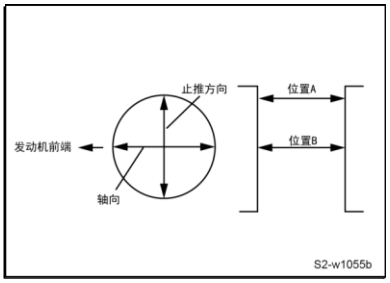
6. Check cylindricity of cylinder

1). Measure the cylinder diameter of thrust direction and axle direction at position A and B of each cylinder with dial indicator.

Standard value：cylinder inner diameter：75.000 ~ 75.015mm

cylindricity：Less than 0.007mm

Replace cylinder if the average cylinder diameter of 4 positions exceeds the maximum.

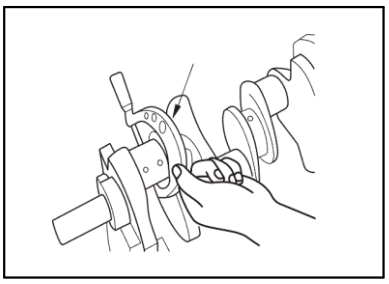


7. Check piston skirt diameter.

1). Check if piston skirt distorts with outside micrometer

Standard value：(74.973±0.005)mm

Replace piston if it exceeds the standard value.



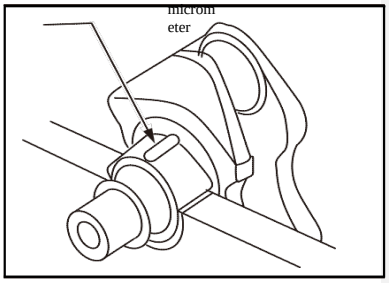
8. Check the clearance between piston and cylinder diameter

1). Measure through piston skirt and cylinder inner diameter.

(clearance)=(cylinder inner diameter)-(diameter of piston skirt)

Standard value：0.02～0.04mm

If the calculated value exceeds the limitation, please replace piston and piston ring assembly.



9. Check the diameter of main journal of crankshaft

1). Measure the diameter of main journal of crankshaft with outside micrometer.

standard：46.004 ~ 46.029mm

Please replace the main shaft bushing if it exceeds the standard.

10. Check the diameter of rod journal

1). Measure the diameter of rod journal with outside micrometer

Standard value：39.982 ~ 40.000mm

Please replace connecting rod bearing shell if it exceeds the standard.

11. Check the clearance of rod journal

1). Wipe off all the engine oil on rod journal and pitman box.

2). Put plastic guage on rod journal, cut the length same with the width of bearing bush. Plastic guage should be at the center of rod journal, and parallel with its axis.

3). Put connecting rod cap at its position lightly, and tighten the bolts to the regulated torque.

4). Remove the bolt, remove the connecting rod cap slowly.

5). Measure the extruded part of plastic gauge at its widest point with scaleplate printed on plastic guage bag.

Standard value：0.02～0.04mm

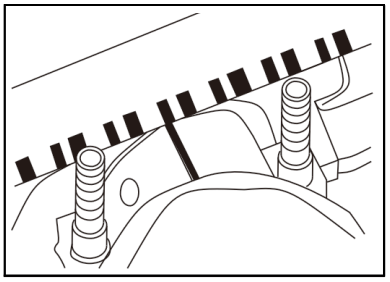
Limitating value：0.10mm

6). Remove thoroughly the clearance gauge after measurement. If the clearance is bigger than limitating value, replace connecting rod bearing shell. If necessary, replace crankshaft.

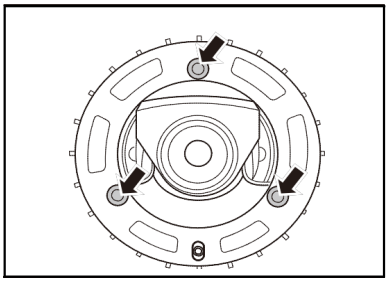
ΔCaution Measure with plastic gauge

12. Check the radial clearance of main axis of crankshaft

1). Wipe the engine oil on crankshaft journal and on the inner surface of bearing bush.
2). Install bearing bush
3). Cut the length of plastic gauge, making sure it matches the width of bearing bush. Then put it on the journal along its axial direction
4). Install the crankshaft bearing bush cap lightly, and tighten the bolts to regulated torque.
5). Remove the bolts, and remove crankshaft bearing bush cap lightly.
6). Measure the extruded part of plastic gauge at its widest point with scaleplate printed on plastic guage bag. Standard value：0.02～0.04mm;limitating value：0.10mm



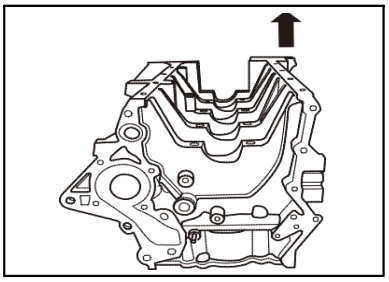
if the clearance exceeds the maximum, , replace main bearing bush。If necessary, replace crankshaft.



(III)Installation

1. Install crankshaft signal wheel
   1). Smear loctite 262 thread fastening sealant or similar product onto screw of crankshaft signal wheel
   2). Tighten the fixing bolts of crankshaft signal wheel

   ΔCaution be sure there is no engine oil inside the thread hole of crankshaft signal wheel while installation.



2. Fix cylinder body
   1). Clean all related components.
   2). Install the cylinder body to rack.
   3). Rotate the rotating handle of rack, making sure the bottom of cylinder upwards.
3. Install crankshaft
   1). Blow out the engine coolant and oil out of cylinder block and cylinder bore, clean foreign matter

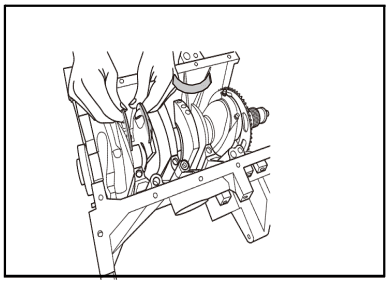
   ΔCaution Protect your eyes with goggle

2). Install the chosen crankshaft main bearing, install the main bearing upper tile with engine oil groove onto cylinder block.

3). Drip 2-3 drops of engine lubricating oil onto each main bearing upper tile

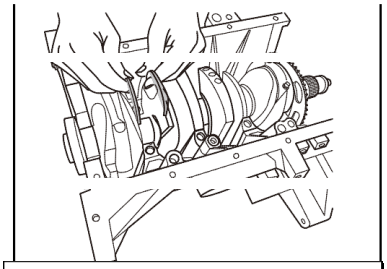
ΔCaution Align the embossing of bearing bush with the notch of main bearing cap.

ΔCaution Make sure engine oil hole on the cylinder block is in alignment with the engine oil hole of corresponding bearing bush.



4). Install the crankshaft to cylinder block. While rotating the crankshaft with hands, please check if the rotation is flexible.

5). Install the thrust bearing smeared with engine oil to side(forth gear) of the main bearing with installation groove, make the side with groove face bore hole.

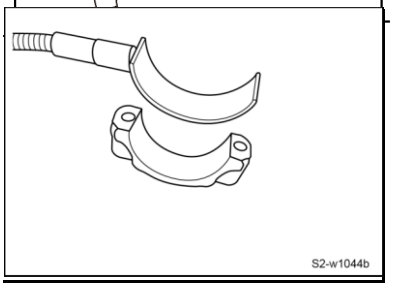


6). Check crankshaft axial clearance, confirm if it conforms to the standard of crankshaft axial clearance.

crankshaft axial clearance:0.09 ~ 0.27mm

7). Drip 2-3 drops of engine oil onto crankshaft journal.

8). Install main bearing lower tile to main bearing.



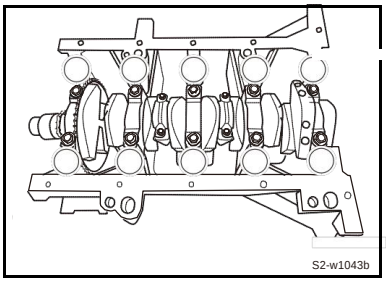
9). Install main bearing cap and 10 fixing bolts

ΔCaution Recognize main bearing cap through identification marking.

ΔCaution Install main bearing cap according to order, starting from front(timing belt side)

ΔCaution Arrow must be towards front.

10).Rotate crankshaft 2-3 rounds, making sure engine oil is lubricant and even.

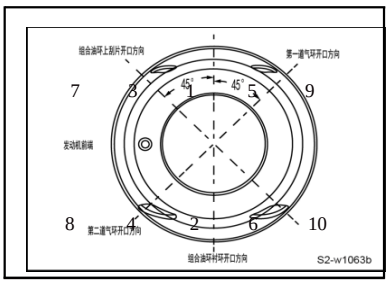


11).Tighten the bolts of crankshaft bearing cap according to the order.

12).Smear the thread and fixing surface of bolts of main bearing cap with engine oil. Tighten main bearing cap screws step by step.

Torque (35±2)N·m+60°~64°

13).After installing main bearing cap screws, make sure crankshaft can be rotated by hands flexibly.



4. Assemble piston connecting rod components

1). Smear the engine oil to the outer circle of piston pin.

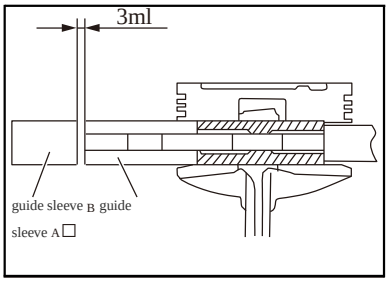
2). Install piston and connecting rod to piston pin installation base.

ΔCaution While installing piston pin, make sure the direction mark of piston top is the same with the direction of connecting rod.

3). Install piston pin with press machine

ΔCaution If the Pressure distribution load exceeds the regulation, please replace piston pin and piston assembly and connecting rod, or replace both.

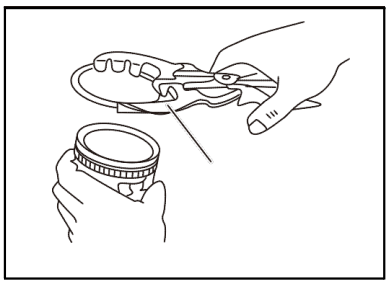
Standard value：(108±54)N·m



4). Install piston ring with piston ring expander

ΔCaution Be careful not to damage piston while installing piston ring.

ΔCaution Be careful not to damage piston due to excessive expansion



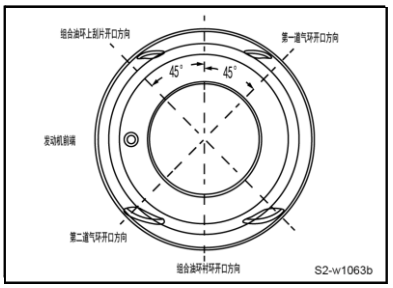
Piston expander

5). Install grommet of oil ring into piston ring groove, then install annulus of oil ring.

ΔCaution Do not use piston expander to hold loop, otherwise it may cause scraper to crack.

6). After installing oil ring body, check if it can slide towards 2 directions.

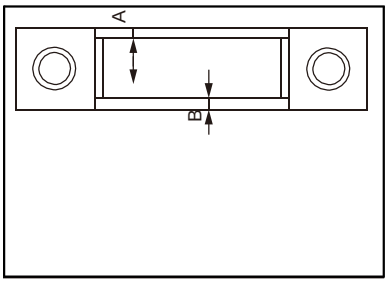
7). Install gaseous ring with piston expander, the identification sign on the gaseous ring should be towards top of piston.



8). Install pitman box to connecting rod and connecting rod cap.

Δ Caution Before installing pitman box, smear its surface with engine oil.

Δ Caution should use special tools to install the pitman box to guarantee the installation location: as shown in the following drawing , the length difference between A and Bis less than 0.5mm。



5. Install piston connecting rod component

1). Rotate the crankshaft journal of the to-be-installed connecting rod to the bottom center.

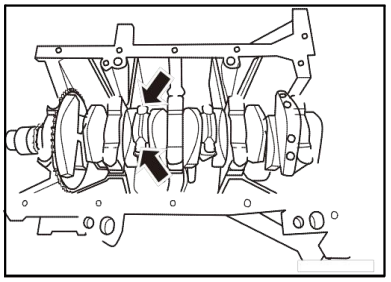
2). Smear the cylinder bore/piston and crankshaft journal with engine oil.

3). Install the connecting rod to the corresponding cylinder hole according to the mark on the connecting rod.

ΔCaution Make sure the forward mark on top of piston towards front.

4). Use piston guiding tool, put the piston connecting rod assembly from cylinder fire surface into the guiding tool, and press the piston into cylinder with rubber stick.

ΔCaution Please do not let the connecting rod big end damage cylinder wall and crankshaft journal.



5). Install the connecting rod bearing cap of cylinder 2 which is marked with no. 2.

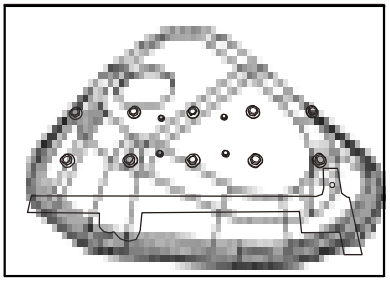
6). Install and tighten the bolts of connecting rod bearing cap of cylinder 2.

Torque 5N m→10N m→13N m+45+45°

7). Install the piston connecting rod component of other 3 cylinders in the same way.

ΔCaution Before installing bolts, smear engine oil to its thread and base surface.

ΔCaution After installing piston connecting rod assembly, rotate crankshaft to check if it can be rotated flexibly.



6. Install cylinder cover assembly
7. Install alternator adjusting arm bracket
8. Install engine rear lifting lug
9. Install camshaft
10. Install timing chain
11. Install chain wheel compartment cover
12. Install crankshaft front oil seal

13.Install cylinder cover shield component
14.Install oil sump assembly
15.Install oil level gauge component
16.Install crankshaft pulley
17.Install water pump pulley
18.Install idle wheel
19.Install compressor assembly
20.Install alternator
21.Install alternator belt
22.Install engine oil pressure switch
23.Install pressure regulating valve
24.Install knocking sensor
25.Install crankshaft position sensor
26.Install camshaft position sensor
27.Install water temperature sensor
28.Install absolute pressure sensor
29.Install electronic throttle valve
30.Install carbon tank solenoid valve
31.Install PCV valve
32.Install exhaust manifold
33.Install intake manifold
34.Install air filter bracket II
35.Install air filter bracket I
36.Install vacuum servo steel tube
37.Install warm wind backwater pipe
38.Install oil pressure guide rail component
39.Install spark plug
40.Install ignition coil
41.Install engine assembly
42.Install transmission assembly
43.Install right driving axle assembly
44.Install left driving axle assembly
45.Install right front wheel
46.Install left front wheel
47.Install starter
48.Install clutch working cylinder
49.Install back-up lamp switch
50.Install battery tray
51.Install battery
52.Install air filter assembly
53.Install water inlet and outlet assembly of warm wind
54.Install pipe and expansion valve assembly
55.Install intake hose
56.Fill Freon, refrigerant oil
57.Fill coolant
58.Fill engine oil
59.Fill transmission lubricant
60.Fill clutch hydraulic oil
61.Install engine right front cover shield
62.Install left front cover shield
63.Connect battery cathode cable
64.Close engine cove

Engine lubricating system

I. Overview

(I) Structure overview

System description

The air intake system consists of oil sump, engine oil filter and engine oil pressure switch.

1. The oil sump is installed at the bottom of crankcase and the oil pump abstracts the engine oil from the sump that flows through 2 oil galleries to cylinder and cylinder head respectively after the oil filter. The oil in one gallery flows to connecting rod then to piston and cylinder through crank oil passage; the other one flow to camshaft lubricating air valve assy then returns to the sump in the end.

2. This model has adopted the rotary fuel pump, its shell, inner and outside roller and relief valve are integrated on the cover of sprocket wheel housing, and the inner rotor is driven by the gear installed on crankshaft. The oil pump extracts the oil from the sump and transports it to every part of engine. A filtering net is installed at the inlet of oil pump, the congestion of filter will cause oil pump unable to feed oil further to cause the lubricating system failure in working, under this case, it would cause the engine mechanical parts damaged. When the engine rotation speed is too high, the output pressure of oil pump exceeds the limits; the relief valve will open when the surplus oil flows back to the oil inlet chamber of pump. In normal oil-supply conditions, the relief valve stays closed.

(II) System principle

Lubricating system description

The oil filter is installed on cylinder body and the engine oil flows upward through filter from the down oil gallery, after being filtered clean, the oil returns to cylinder body through the upper gallery. The front oil gallery feeds oil to each cylinder head, main bearing oil gallery, OCV solenoid valve, camshaft position actuator.

The oil gallery of each cylinder head distributes the oil to cylinder head and camshaft bearing journal. The

engine oil reaches to the OCV solenoid valve actuator through the OCV filter and oil chamber. The OCV solenoid valve is for controlling the air inlet camshaft position actuator while the ECM controls OCV solenoid valve. When the OCV is power on, it directs the engine oil up flowing through cylinder head and front camshaft bearing cover. The engine oil gets into the holes drilled on camshaft journal through the oil gallery of camshaft bearing cover and flows into the front part of the mounting surface of air inlet camshaft; then it flows to the oil gallery of camshaft position actuator.

The OCV solenoid valve directs the pressurized engine oil to the relative galleries working on the inner blades of camshaft position actuator that will cause the air-inlet camshaft rotating against sprocket wheel. During idling, the inner lock pin fixes the inner rotor at the outside shell of air-inlet camshaft position actuator and during start-up, it maintains the air-inlet camshaft position actuator at the original place. The OCV solenoid valve directs engine oil to release lock pin and starts working of air-inlet camshaft position actuator.

Lubricating system schematic diagram



(III) Technical and service data

Item Specification

Tooth tip clearance 0.06 ～ 0.18mm

Side clearance 0.04 ～ 0.11mm

Shell body clearance 0.10 ～ 0.18mm

Output pressure of oil pump 0.6MPa (87psi)

Relief valve opening pressure 0.4~0.5MPa (58~72.5psi)

(IV) Torque parameters

Key component torque table

SN	Item	Torque (N·m)	Remarks
1	Pressure switch	10±2	
2	Drain plug	39±5	
3	Engine oil filter	11±1	
4	Oil suction filter fixed bolt	8.4±0.6	
5	Oil sump bolt	11±1	
6	Oil dipstick tube components	8.4±0.6	

II. Failure diagnosis

(I.) Diagnosis analysis table

SN	Failure phenomenon	Failure causes analysis	Solution	
1	Engine oil leakage	Oil level too high	Drain out the excessive oil	
		Oil of over-high pressure	Check oil filter or pressure by-pass valve for congestion or failure	
		Engine ventilation system gets congested or has failure	Check and clean the PCV valve and its relevant tubes	
		Improper tightening of fasteners	Change the damaged parts and tighten them at the	
		Relative parts has rupture or crack	Change the damaged parts	
		Sealing surface wearout, sealing mat in poor installation	Repair or replace the damaged parts	

(II) Diagnosis procedures table

Engine oil of over-low pressure

Engine oil over-consumption

III. Engine oil drainage and filling

1. Open engine hood

2. Disconnect the cathode wires of battery

3. Drain out the engine oil

1). Screw off the cover of engine oil port on cylinder head.

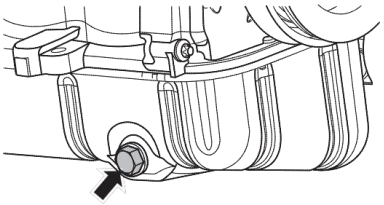
2). Take down the drain plug and gasket and drain the oil into the container

Attention: The engine oil temperature may be high and be careful with burning.

Attention: The draining-out time shall be more than 15min.

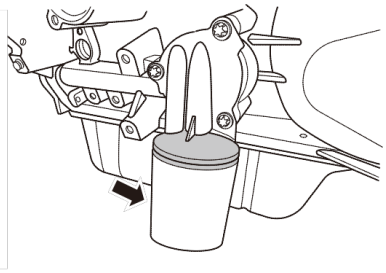
3). Clean drain plug and change the new liner during installation.

Tighten torque(39±5)N•m



4. Dismantle the oil filter

1). Take down the oil filter by the wrench



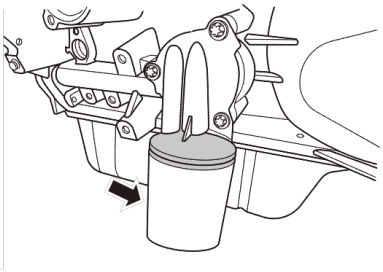
5. Install oil filter

1). Smear few engine oil on the O type ring of oil filter.

2). When the O type ring gets contact with the flange of filter bracket and screw in 3/4 round by the

special wrench.

Tightening torque (11±1)N•m



6. Filling engine oil

1). Fill in the clean engine oil

2). Install oil filling port cover.

7. Check if the engine oil has leakage

1). Start the engine.

2). Check if the filter and drain plug have oil leakage

IV. Engine oil pressure switch

(I) Dismantlement

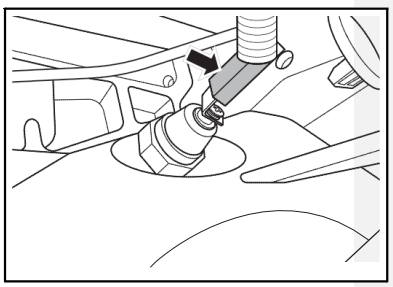
1. Open the engine hood.

2. Disconnect the cathode wires of battery

3. Dismantle the air filter assy

4. Dismantle the electric throttle

5. Dismantle the air-intake manifold

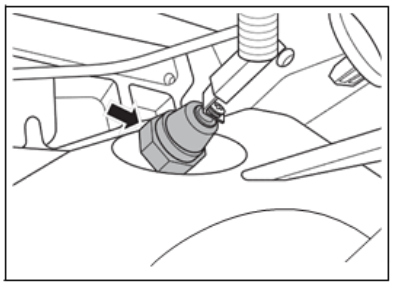


6. Dismantle the engine oil pressure switch

1). Disconnect the wires connector of engine oil pressure switch

2). Dismantle the oil pressure switch by the special sleeve.

3). Take down the oil pressure switch.



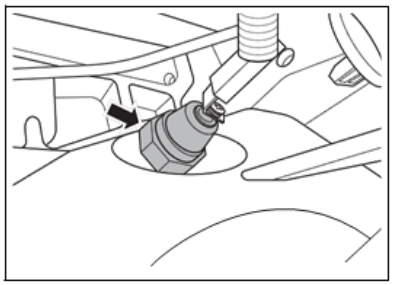
(II) Installation

1. Install the oil pressure switch

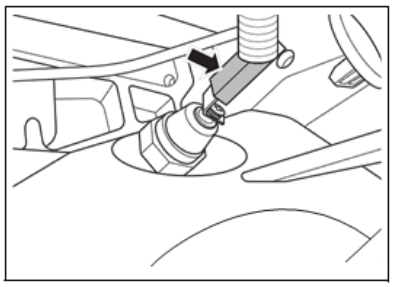
1). Smear the sealing glue on the thread of oil pressure switch.

2). Tighten the oil pressure switch

Tighten torque (10±2)N•m



3). Connect the wires connector of oil pressure switch and check and make sure it's in good connection.



2. Install air intake manifold

3. Install the electric throttle.

4. Install the air filter assy

5. Connect the cathode wires of battery

6. Close the engine hood

V. Oil filter

(I) Disassembly

1. Open the engine hood

2. Disconnect the cathode wires of battery

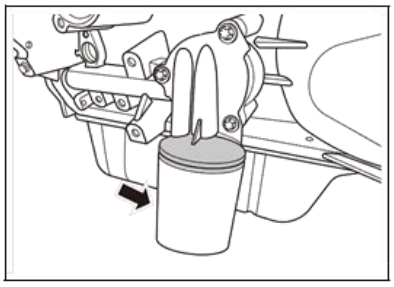
3. Dismantle the oil filter

1). Dismantle the oil filter by the special wrench

Attention: Use the JAC original oil filter

Attention: Be caution of the hot engine oil.

Attention: Prepare a wiping cloth for wiping off the splash-out or leaked out engine oil



(II) Installation

1. Install the engine oil filter

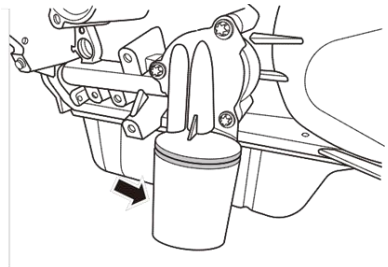
1). Smear few engine oil on the O type ring of oil filter.



2). When the O type ring gets contact with the flange of filter bracket and screw in 3/4 round by the special wrench.

Tightening torque (11±1)N•m

Attention: It must use the special wrench to tighten the oil filter. It may have the leakage problem due to insufficient torque as tighten the filter manually.



2. Connect the cathode wires of battery

3. Close the engine hood.

VI. Oil filter components

(I) Disassembly

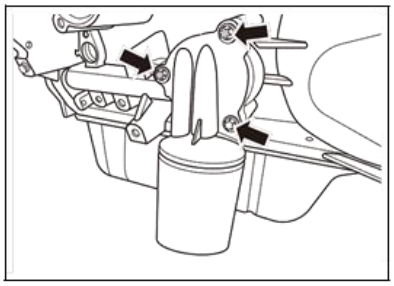
1. Open the engine hood

2. Disconnect the cathode wires of battery

3. Dismantle the oil filter components

1). Screw off the 3 fixed bolts

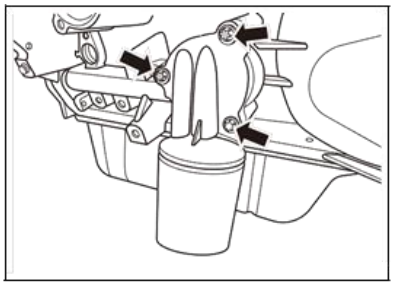
2). Take down the oil filter components and its bracket mat.



(II) Installation

1. Install the oil filter components

1). Install the 3 fixed bolts



2. Connect the cathode wires of battery

3. Close the engine hood

VII. Oil sump assy

(I) Disassembly

1. Open the engine hood

2. Disconnect the cathode wires of battery

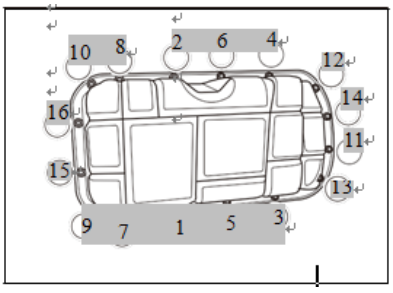
3. Dismantle the front left cover of engine

4. Dismantle the front right cover of engine

5. Drain out the engine oil

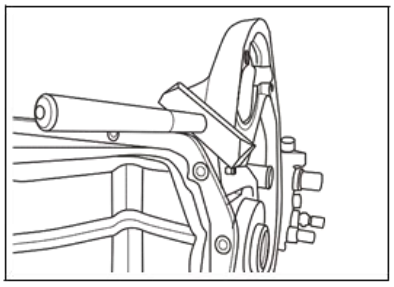
6. Dismantle the oil sump assembly

1). Loosen the 16 fixed bolts at the reverse sequence of the shown in below diagram



2). Take down the oil sump by the special device

Attention: Do not damage the matching surface



(II) Installation

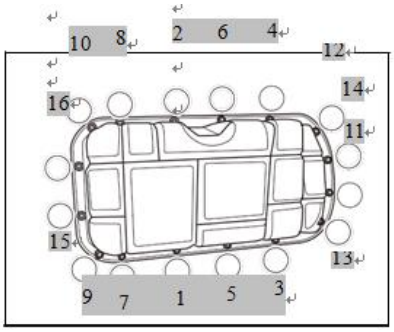
1. Install the oil sump assy

1). Clean the shell and mounting surface.

2). Smear the sealing glue on oil sump

3). Tighten the 16 fixed bolts and nuts according to the sequence shown by the below diagram

Tighten torque: (11±1)N•m



2. Fill in the engine oil

3. Install the front left cover of engine

4. Install the front right cover of engine

5. Connect the cathode wires of battery

6. Close the engine hood

VIII. Suction filter

(I) Disassembly

1. Open the engine hood

2. Disconnect the cathode wires of battery

3. Dismantle the front left cover of engine

4. Dismantle the front right cover of engine

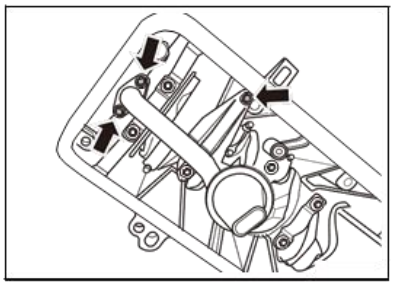
5. Drain out the engine oil

6. Dismantle the oil sump assy

7. Dismantle the suction filter

1). Screw off the 3 fixed bolts

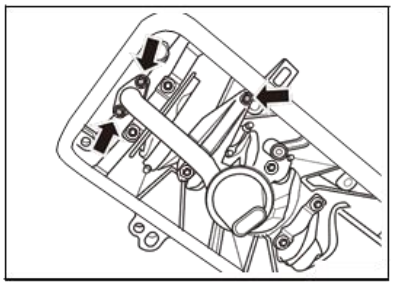
2). Take down the suction filter



(II) Installation

1. Install the suction filter

1). Install the fixed bolts of suction filter



2. Install the oil sump assy

3. Fill in engine oil

4. Install the front left cover of engine

5. Install the front right cover of engine

6. Connect the cathode wires of battery

7. Close the engine hood

IX. Engine oil dipstick tube components

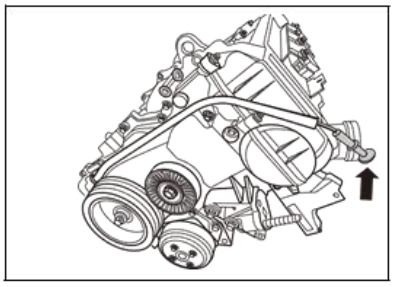
(I) Disassembly

1. Open the engine hood

2. Disconnect the cathode wires of battery

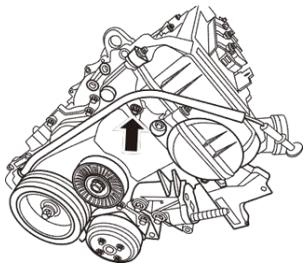
3. Dismantle the dipstick tube components

1). Pull out the dipstick



2). Screw off the fixed bolts

3). Take down the dipstick tube components

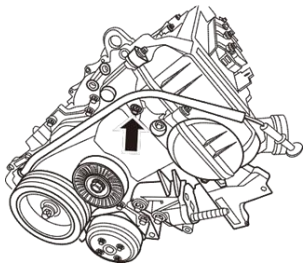


(II) Installation

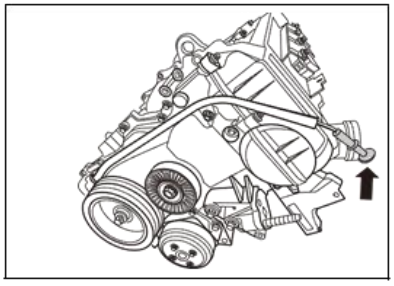
1. Install the dipstick tube components

1). Install the fixed bolts

Tightening torque 8.4±0.6 N•m



2). Insert the dipstick



2. Connect the cathode wires of battery

3. Close the engine hood

X. Oil pump assy

(I) Disassembly

1. Open the engine hood

2. Disconnect the cathode wires of battery

3. Release the pressure of fuel system

4. Dismantle the front left cover of engine

5. Dismantle the front right cover of engine

6. Drain out the clutch oil

7. Drain out the transmission oil

8. Drain out the engine oil

9. Drain out the coolant

10. Recycle the refrigerant and refrigerant oil.

11. Dismantle the air intake manifold

12. Dismantle the tubes and expansion valve assy

13. Dismantle the water inlet and outlet tube assy

14. Dismantle the air filter

15. Dismantle the battery

16. Dismantle the battery tray

17. Dismantle the reversing light switch

18. Dismantle the clutch working cylinder

19. Dismantle the starter

20. Dismantle the front left wheel

21. Dismantle the front right wheel

22. Dismantle the left driving axle assy

23. Dismantle the right driving axle assy

24. Dismantle the transmission assy

25. Dismantle the engine assy

26. Dismantle the belt of generator

27. Dismantle the generator

28. Dismantle the compressor assy

29. Dismantle the idler assy

30. Dismantle the belt pulley of water pump

31. Dismantle the water pump

32. Dismantle the belt pulley of crankshaft

33. Dismantle the dipstick components

34. Dismantle the oil sump assy

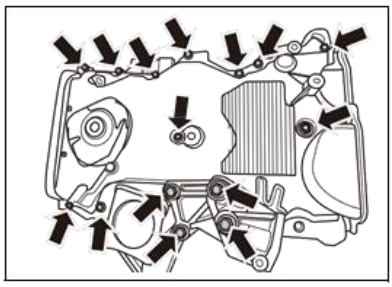
35. Dismantle the suction filter

36. Dismantle the cylinder head cover components

37. Dismantle the front oil seal of crankshaft

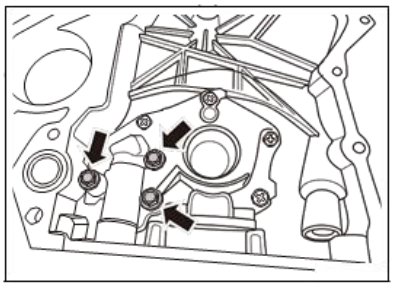
38. Dismantle the sprocket housing cover.

1). Screw off the 15 fixed bolts and take down the sprocket housing cover.



39. Dismantle the oil pump assy

1). Screw off the 3 fixed bolts.



2). Screw off the 4 fixed nuts

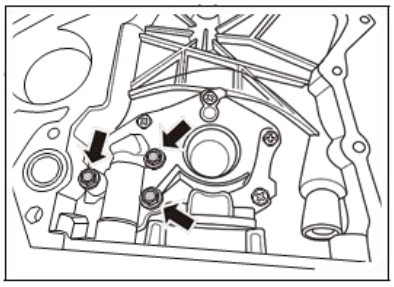
3). Take down the oil pump assy

(II) Installation

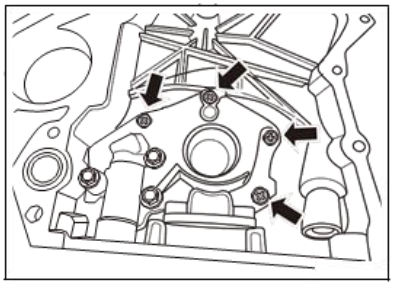
1. Install the oil pump assy

1). Align the oil pump assy with the mounting holes and screw into the bolts and nuts

2). Tighten the fixed bolts



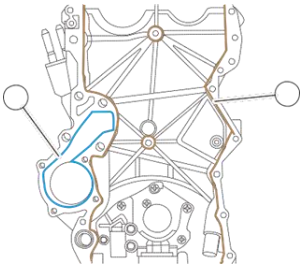
3). Tighten the fixed nuts



2. Install the sprocket housing cover

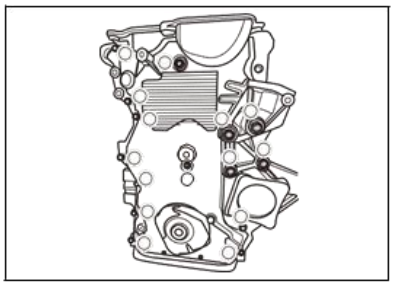
1). Clean the surface free from engine oil and dirt and smear the sealing glue of KANGNING 3-0115 according to the instruction of the below diagram.

The strip diameter is 2mm±0.5mm at place A and the strip diameter is 1.5mm±0.5mm at place B.



2). Align the sprocket housing cover with mounting holes and tighten the bolts according to the below

diagram.



Tightening torque Big bolt (39.5±3.0) N•m

Tightening torque Small bolt (8.4±0.6) N•m

3. Install the front oil seal of crankshaft

4. Install the cylinder head cover components

5. Install the suction filter

6. Install the oil sump assy

7. Install the dipstick tube components

8. Install the belt pulley of crankshaft

9. Install the water pump

10. Install the belt pulley of water pump

11. Install the idler

12. Install the compressor assy

13. Install the generator

14. Install the belt of generator

15. Install the engine assy

16. Install the transmission assy

17. Install the right driving axle assy

18. Install the left driving axle assy

19. Install the front right wheel

20. Install the front left wheel

21. Install the starter

22. Install the working cylinder of clutch

23. Install the reversing light switch

24. Install the battery tray

25. Install the battery

26. Install the air filter assy

27. Install the water inlet and outlet tube of warmer

28. Install the tubes and expansion valve assy

29. Install the air inlet tube

30. Fill in refrigerant and refrigerant oil

31. Fill in coolant

32. Fill in engine oil

33. Fill in the lubricant oil of transmission

34. Fill in the clutch oil

35. Install the front right cover of engine

36. Install the front left cover of engine

37. Connect the cathode wires of battery

38. Close the engine hood

Engine cooling system

I、Summary

(I)structure overview

System description

Intake system is composed of water pump, thermostat components, water temperature sensor, water pipe, radiator, cooling fan assembly, expansion tank assembly (with overflow pipe), etc.

1、Radiator: it is the cooling component of cooling system, release

the heat of cooling liquid into air.

2、Cooling fan introduction: cooling fan assembly can

improve the air volume going through the radiator,
increase radiating efficiency.

3、expansion tank

The main function of expansion tank assembly (with overflow pipe) is to provide expansion space for cooling liquid, release the air in the cooling liquid and the vapor caused from heated engine timely, so the radiation function can be used efficiently to improve cooling efficiency.

(II)system principle

Cooling system description

Small recycle

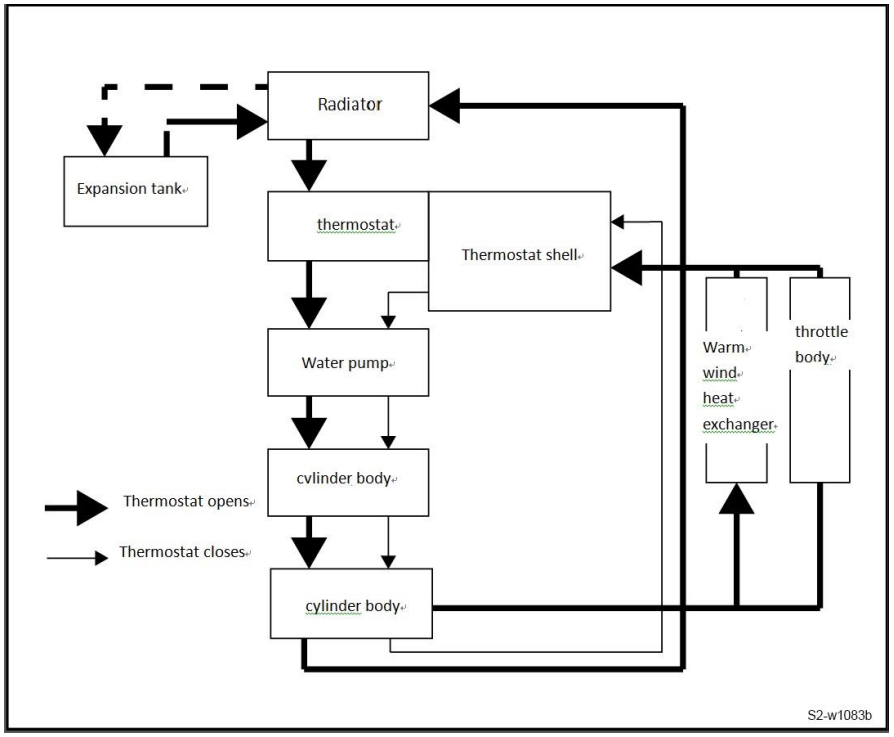
When thermal load of engine is small, water pump, as power source, pushes cooling liquid flow through cylinder, cylinder cover, and finally go back to water pump, which forms small recycle.

Big recycle

When thermal load of engine is big, thermostat opens, water pump sucks cooling liquid into engine and compress, flow through cylinder, cylinder cover, thermostat, water pipe and then into radiator, after cooling down, cooling liquid will flow back to water pump.

Thermostat : the open and close of thermostat is decided by the temperature of its surrounding cooling liquid, when temperature gradually increases, thermostat opens until fully, at the same time, engine cooling liquid changes from small recycle into big recycle.

Principle chart of cooling system



(III)Technical parameter、maintenance parameter

Application specification

Application	specification
Cooling method	water-cooling
engine cooling liquid specs/brand	JAC original engine cooling liquid
Engine cooling liquid volume(expansion tank assembly)	6.5L(11.44pt)
type of thermostat	Wax-type thermostat
type of water pump	Centrifugal
number of cooling fan blade	7
opening temperature of thermostat	82 ℃(181.4 ℉)
Full opening temperature of thermostat	95 ℃(203℉)
Biggest stroke of thermostat valve rod	≥8mm

(IV)Torque parameter

Torque table of key parts

No.	item	Torque(N·m)	Remarks
1	Fixing bolts of water pump	8.4±0.6	
2	Fixing bolts of water pump belt pulley	8.4±0.6	

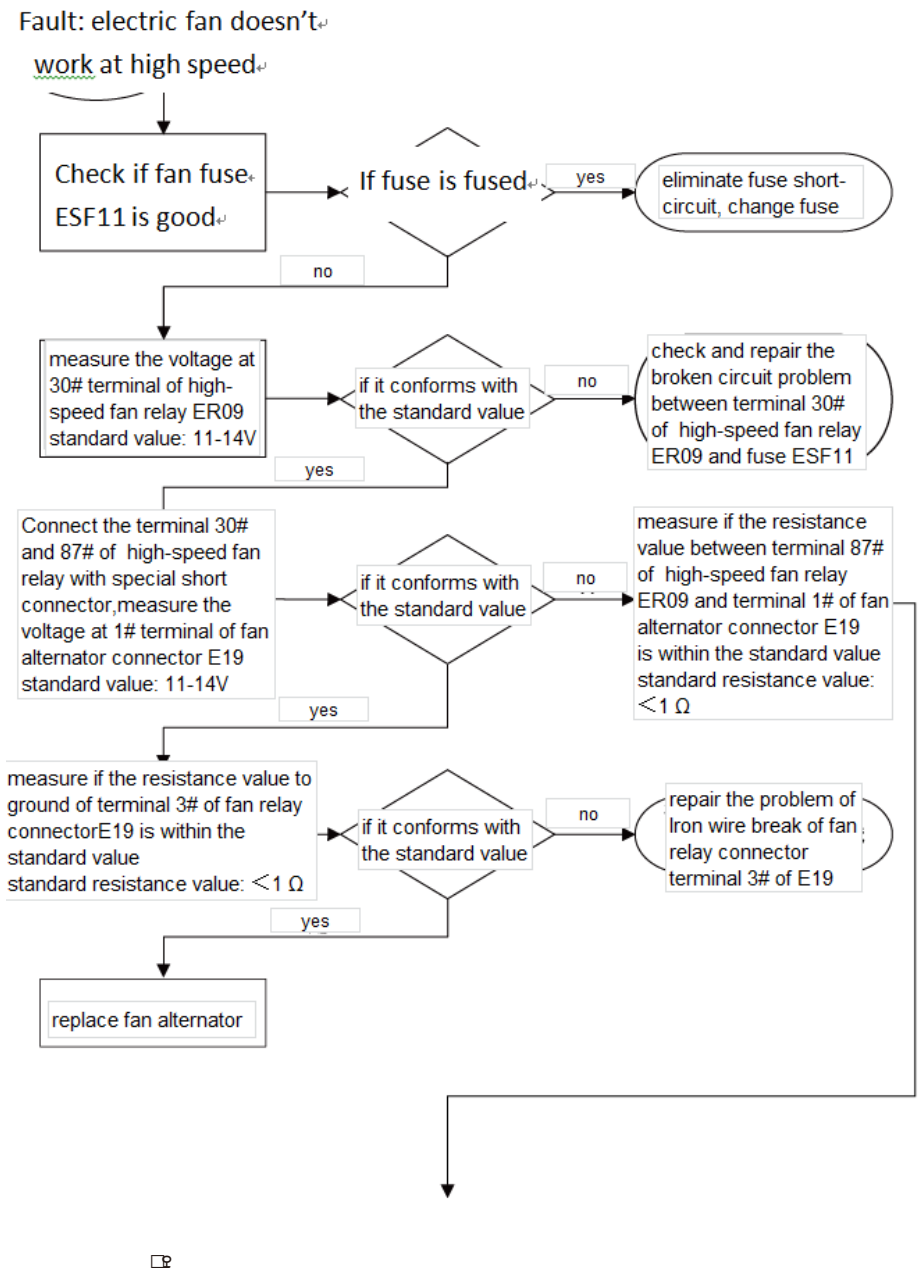
II、Fault diagnosis

(I)Fault diagnosis table

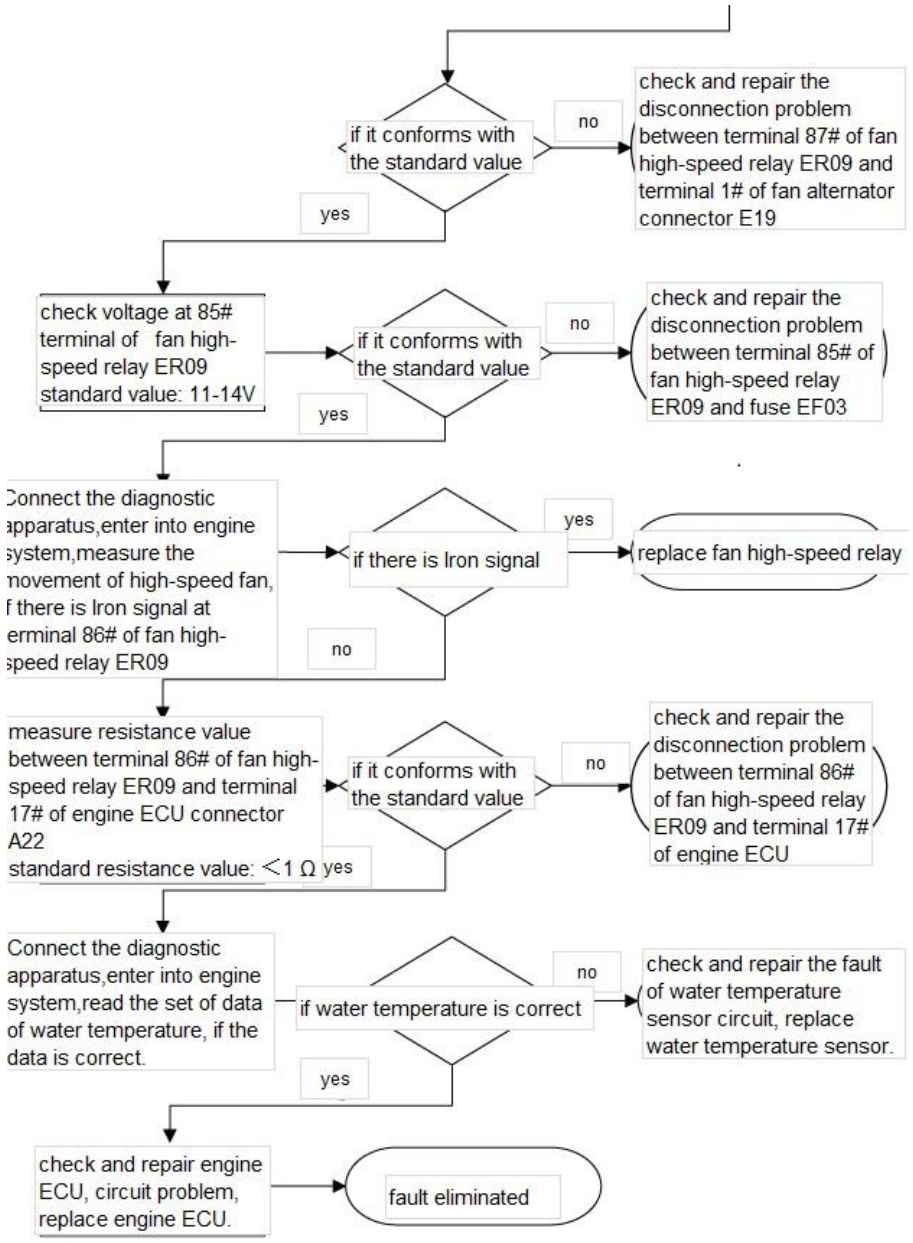
No.	Fault description	Reason analysis	Solution	remarks
1	Poor radiation	Water pump fault	check if driving belt is worn or loose	
		Thermostat is stuck at the closing position	repair or replace thermostat	
		cooling fin is damaged, blocked with dust or papers scrap	clean radiator	
		cooling fin has mechanical damage	replace radiator	
		cooling fan doesn't work	Check fan circuit, replace cooling fan if necessary	
		fan rotates with excessive resistance		
		fan blade damage	replace cooling fan	
		cooling liquid mixture proportion is not accurate	replace cooling liquid	
		Engine cooling liquid has poor quality (Engine cooling liquid is thick)	replace cooling liquid	
2	Engine cooling liquid not enough	cooling liquid hose hoop is loose	tighten cooling liquid hose hoop	
		cooling liquid hose crack	Replace cracked hose	
		Poor water pump seal	install again, replace water pump if necessary	
		Radiator cap is loose	install again	
		Poor radiator cap seal	install again or replace radiator cap	
		Radiator crack	Replace radiator	
		liquid storage pot spills out	tail gas released to cooling system	
		Cylinder body blocked and leak	Replace cylinder body block	

No.	Fault description	Reason analysis	Solution	remarks
3	temperature of cooling system is too high	engine rotation is too high while idle, drive too long, drive high speed	Normal driving	
		driving system fault	check related parts, replace if necessary	
		install the wrong wheel and tire	replace the right tire from jac	
		Braking blocked	Check braking system	
		electronic spark timing is wrong	check spark timing, replace related parts if necessary	
		bumper ventilation exit is blocked, air flow is not fluent	clear related parts	
		radiator grilling blocked, air flow is not fluent	clear related parts	
		radiator blocked, air flow is not fluent	clear related parts	
		condenser blocked, air flow is not fluent	clear related parts	

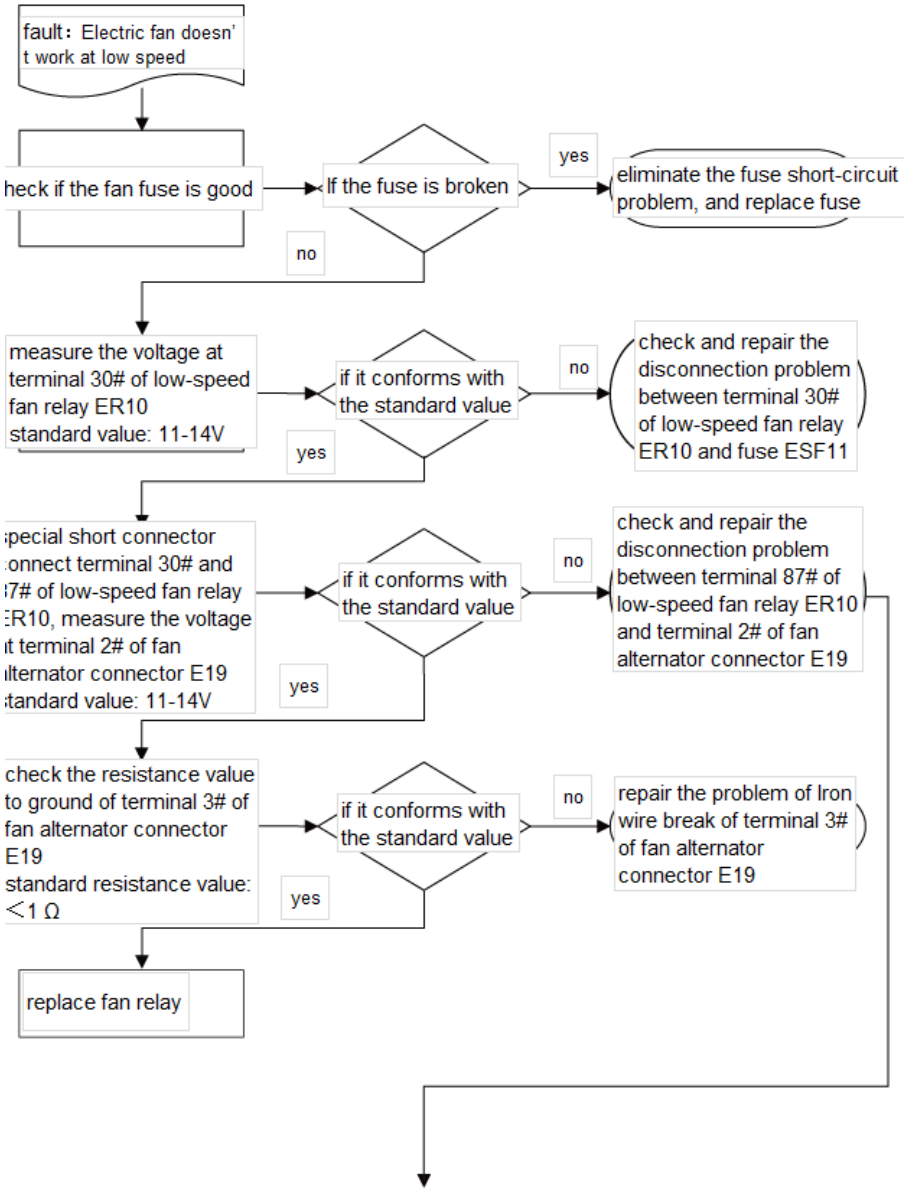
(II)Flow scheme of diagnosis



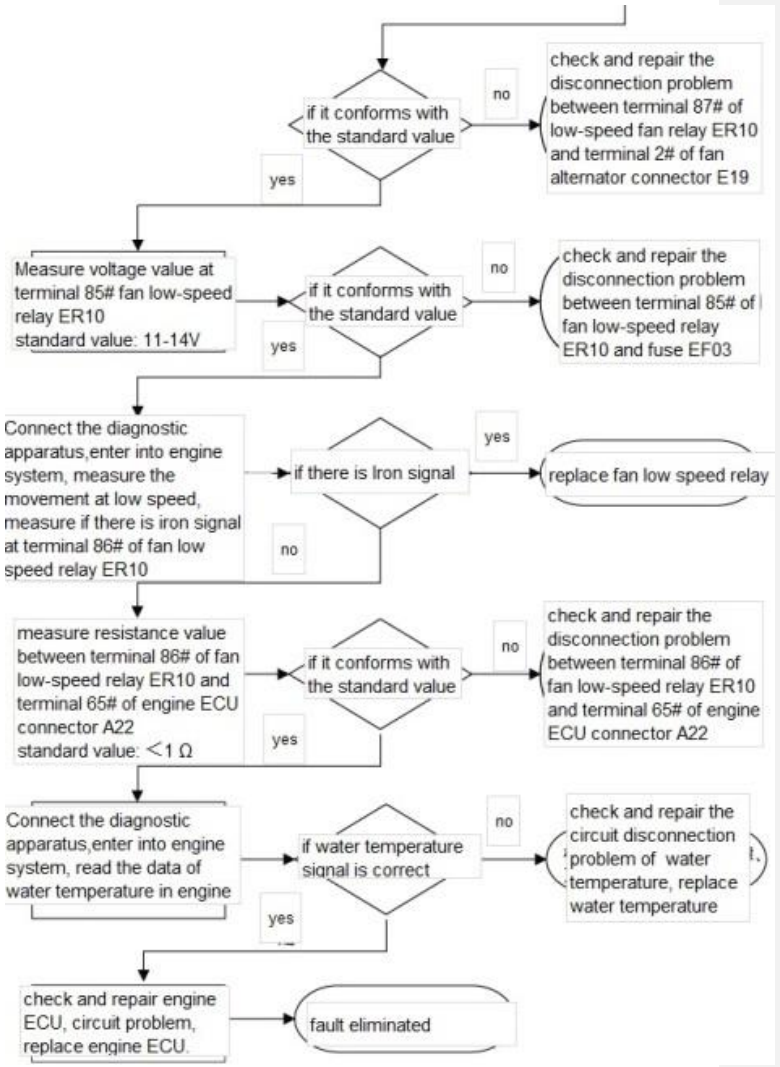
Electric fan doesn't work at high speed(continue)



Electric fan doesn't work at low speed



Electric fan doesn't work at low speed(continue)

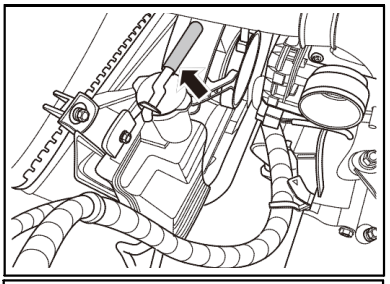


III、Expansion kettle assembly

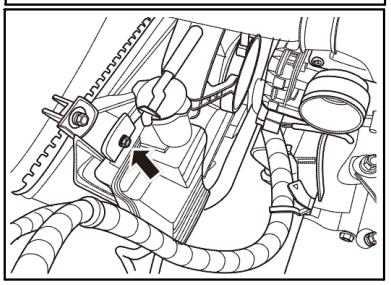
(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassembly engine left front cover, refer to engine front cover
4. Disassembly expansion kettle assembly

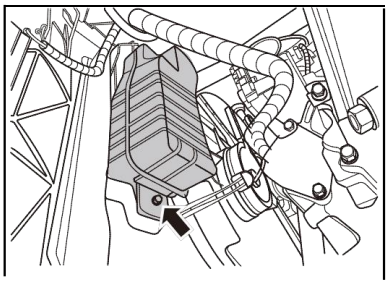
1). Disconnect radiator venting hose and expansion kettle assembly



2). Disassembly fixing bolts on top of expansion kettle.



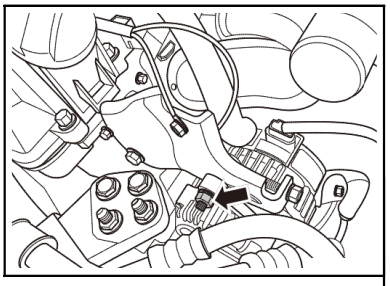
3). Disassembly fixing bolts at bottom of expansion kettle, remove expansion kettle assembly.



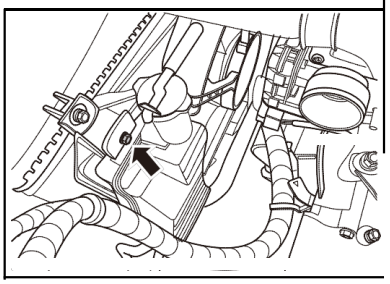
(II)Installation

1. Install expansion kettle assembly

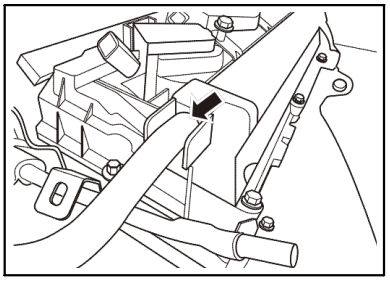
1). Install expansion kettle assembly to fan, tighten the fixing bolts at the bottom.



2). Install the fixing bolts on top of expansion kettle



3). Connect radiator venting hose to expansion kettle assembly.



2. Install engine left front cover
3. Connect battery cathode cable
4. Close engine cover

IV、Replace cooling liquid

(I)Disassembly

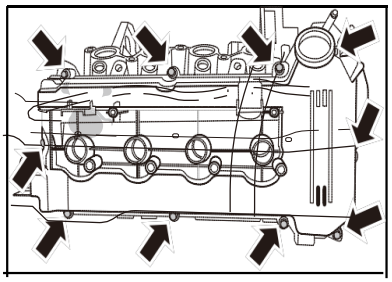
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble engine left front cover, refer to engine front cover
4. Disassemble engine right front cover, refer to engine front cover
5. Drain cooling liquid

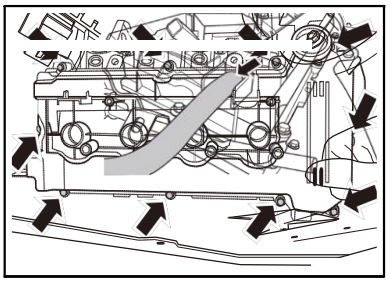
1). Open radiator cover.

ΔCaution To avoid scald, please do not replace cooling liquid while engine temperature is too high.

ΔCaution thick cloth wrap over radiator, loosen carefully. Release pressure inside radiator first, then open fully the cap.

Δ Caution Please be careful not to let engine cooling liquid spill to driving belt.





2). Open the draining plug at the bottom of radiator, collect the released engine cooling liquid.

3). Check if there is rust or color change in the released engine cooling liquid.

(II)Installation

1. Fill cooling liquid

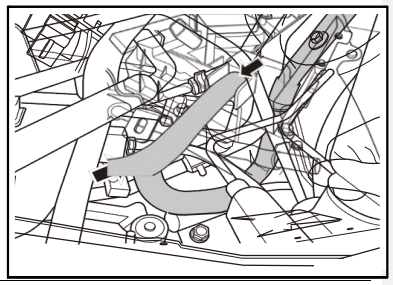
1). Tighten draining plug of radiator.

tightening torque: 2N m

ΔCaution please clean the draining plug and install new “O”ring

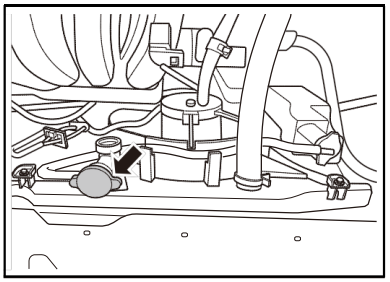
2). Fill cooling liquid to radiator until the regulated level, fill it slowly, so air in the system can be drained out gradually.

3). Press intake and exhaust pipe of radiator with hands many times, check the level of cooling liquid.



ΔCaution connect again if engine cooling liquid spills out of warm braw exhaust hose and continue to fill engine cooling liquid,

4). Install radiator cap.

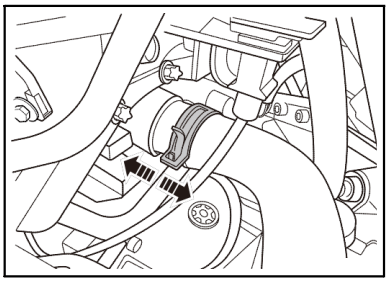


2. Connect battery cathode cable
3. Install engine left front cover
4. Install engine left front cover
5. Close engine cover

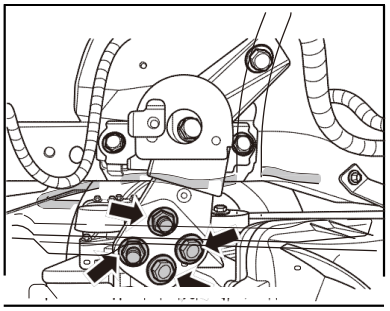
V、Radiator venting hose

(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble radiator venting hose
   1). Disconnect radiator venting hose and expansion kettle.

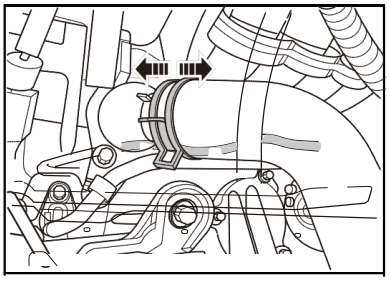


   2). Disconnect radiator venting hose and radiator cap, release radiator venting hose.

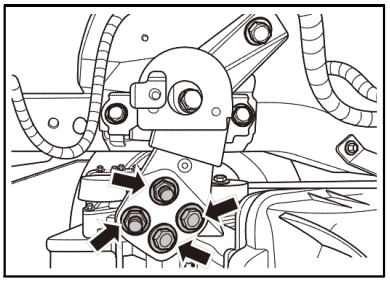


(II)Installation

1. Install radiator venting hose
   1). Connect radiator venting hose and radiator cap.



2). Connect radiator venting hose and expansion kettle.



2. Connect battery cathode cable

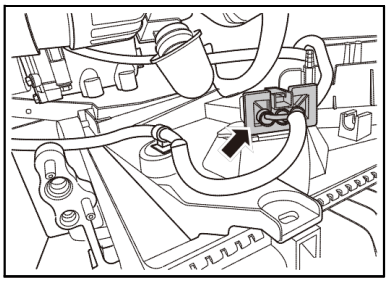
3. Close engine cover

VI、Radiator fan assembly

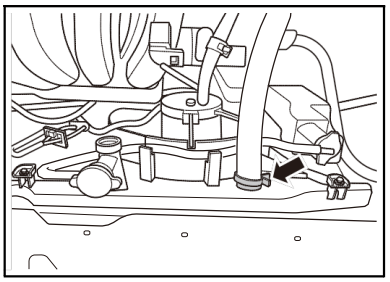
(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Drain engine coolant, refer to the replacement of coolant
4. Disassemble radiator venting hose, refer to radiator venting hose
5. Disassemble engine left front cover, refer to engine cover
6. Disassemble engine right front cover, refer to engine cover
7. Disassemble expansion kettle assembly, refer to expansion kettle assembly
8. Disassemble radiator fan assembly

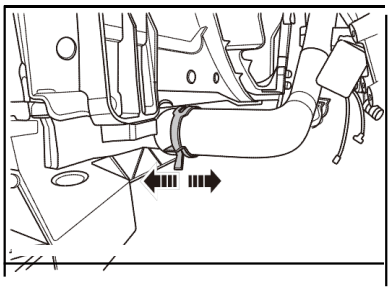
1). Disconnect the harness connector of radiator fan assembly.



2). Disconnect radiator intake hose and radiator fan assembly.

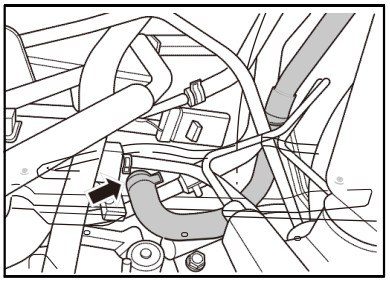


3). Disconnect radiator exhaust hose and radiator fan assembly.



4). Disassemble the fixing bolts of radiator fan assembly
5). Remove radiator fan assembly from bottom of vehicle.

△Caution Need to move radiator to the direction of engine compartment some distance to remove fan assembly.



(II)Check radiator fan assembly

1. Check radiator fan assembly

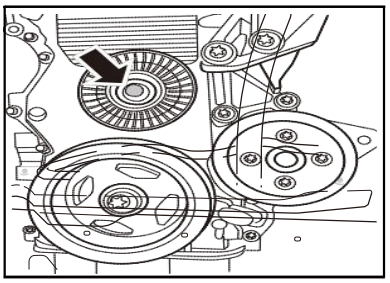
1). Check if there is crack or abnormal bending of radiator fan. If yes, please replace radiator fan.
2). Connect power at the terminal of motor, check the rotating condition of fan alternator.
3). Check if there is abnormal noise while alternator working.

(III)Installation

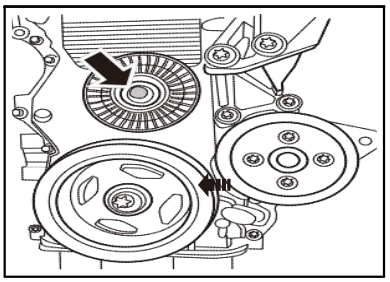
1. Install radiator fan assembly

1). Install radiator fan assembly into installation hole, tighten 2 fixing bolts

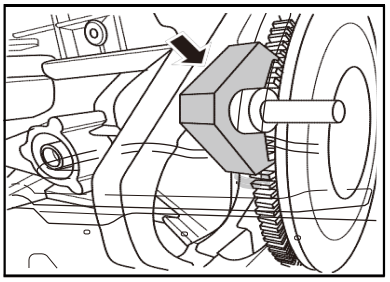
Tightening torque 9±0.5N m



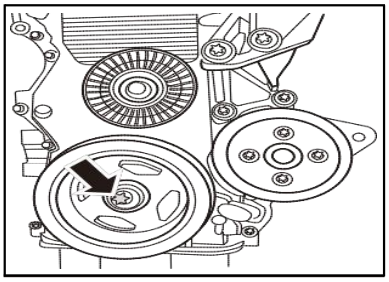
2). Connect radiator water exhaust pipe and radiator fan assembly



3). Connect radiator water intake pipe and radiator fan assembly



4). Connect harness connector of radiator fan assembly.

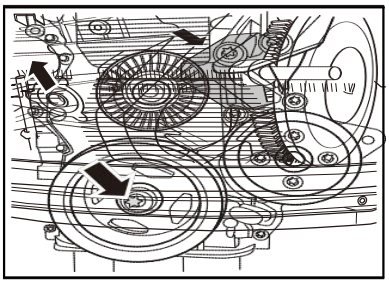


2. Install expansion kettle assembly
3. Install engine left front cover
4. Install engine right front cover
5. Install radiator venting hose
6. Fill engine coolant
7. Connect battery cathode cable
8. Close engine cover

VII、Radiator assembly

(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Drain engine coolant, refer to replacement of coolant
4. Disassemble left and right front fog assembly, refer to front fog assembly
5. Disassemble left and right DRL assembly, refer to DRL assembly
6. Disassemble upper cover of front bumper, refer to upper cover of front bumper
7. Disassemble front bumper assembly, refer to front bumper
8. Disassemble radiator venting hose, refer to radiator venting hose
9. Disassemble engine left front cover, refer to engine cover
10. Disassemble engine right front cover, refer to engine cover
11. Disassemble expansion kettle assembly, refer to expansion kettle assembly
12. Disassemble radiator fan assembly, refer to radiator fan assembly
13. Disassemble radiator assembly
    1). Disassemble fixing bolts on both sides of radiator
    2). Remove radiator assembly



(II)Check

1. Check radiator assembly
   1). Check if there is mud or block in radiator. If necessary, clean radiator surface according to the following method.

   ΔCaution Be careful not to bend or damage radiator core

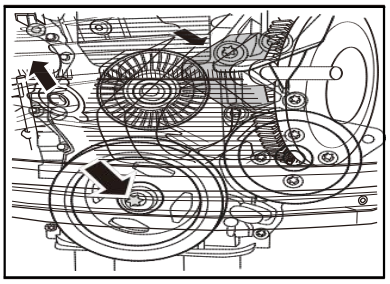
   ΔCaution use adhesive plaster to wrap harness and electric connector in case of water gets in.
   2). Water hose faces radiator vertically and wash its back surface of radiator core from up to bottom.
   3). Wash each surface of radiator core every 1 min.
   4). Stop washing if no dirt is washed out from radiator.
   5). Use compressed air blow the back surface of radiator core vertically facing down.
   6). Use compressed air below 490 kPa, and keep the distance of more than 30cm.
   7).Use compressed air blow each surface of radiator core every 1 min, until there is no water blown out.

(III)Installation

1. Install radiator assembly

   1). Install radiator assembly into installation hole, tighten 2 fixing bolts.

2. Install radiator fan assembly
3. Install expansion kettle assembly
4. Install engine left front cover shield
5. Install engine right front cover shield
6. Install radiator venting hose
7. Install front bumper assembly
8. Install upper cover of front bumper
9. Install left and right DRL assembly
10. Install left and right fog lights assembly
11. Fill engine coolant
12. Connect battery cathode cable
13. Close engine cover

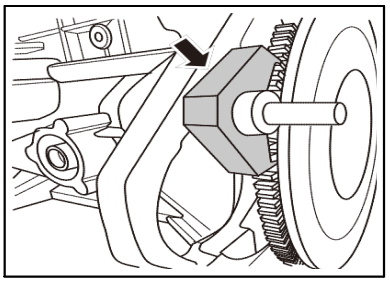


VIII、Water exhaust pipe and pipe clamp assembly

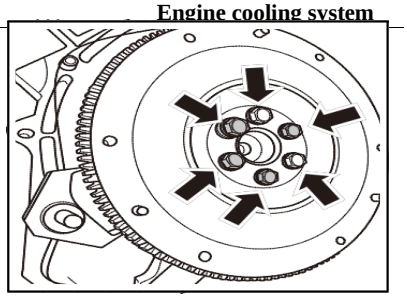
(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble air filter assembly, refer to air filter assembly
4. Disassemble electronic throttle valve, refer to electronic throttle valve
5. Disassemble intake manifold, refer to intake manifold
6. Disassemble engine left front cover, refer to engine cover
7. Disassemble engine right front cover, refer to engine cover
8. Disassemble water exhaust pipe and pipe clamp assembly

1). Release hoop, disconnect radiator water exhaust pipe and radiator.



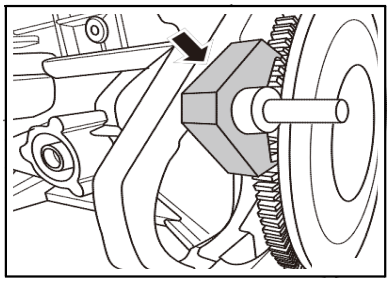
2). Release hoop, disconnect radiator water exhaust pipe and water pump intake entrance, remove water exhaust pipe and pipe clamp assembly.



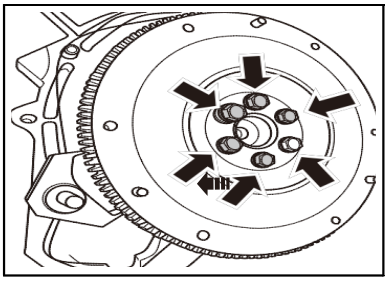
(II)Installation

1. Install water exhaust pipe and pipe clamp assembly

1). Connect radiator water exhaust pipe and water pump intake entrance



2). Connect radiator water exhaust pipe and radiator assembly

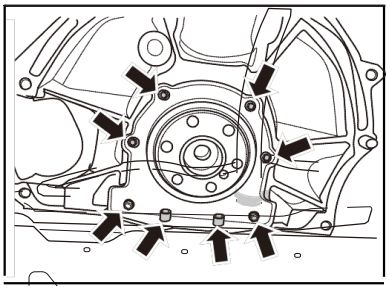


2. Install air intake manifold
3. Install electronic throttle valve
4. Install air filter
5. Install engine left cover shield
6. Install engine right cover shield
7. Connect battery cathode cable
8. Close engine cover

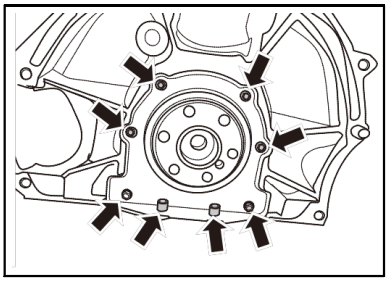
IX、Water intake pipe and pipe clamp assembly

(I)Disassembly

1. Open engine cover
2. Disassemble water intake pipe and pipe clamp assembly
   1). Release hoop, disconnect radiator water exhaust pipe and radiator assembly.

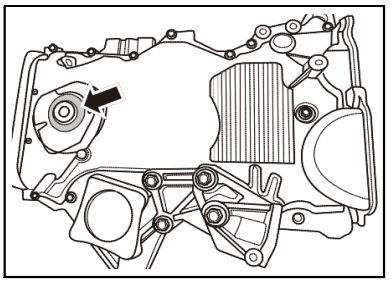


   2). Release hoop, disconnect radiator water intake pipe and cylinder cover, remove water intake pipe.

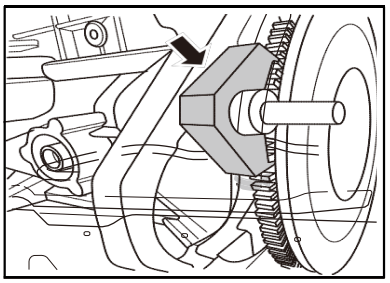


(II)Installation

1. Install water intake pipe and pipe clamp assembly
   1). Connect radiator water intake pipe and cylinder cover.



2). Connect radiator water intake pipe and radiator fan assembly

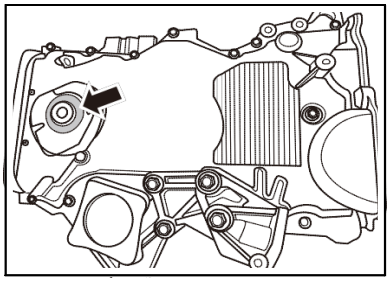


2. Close engine cover

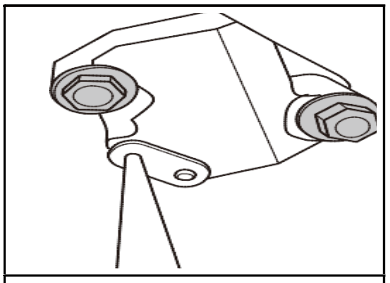
X、inlet of water pump

(I)Disassembly

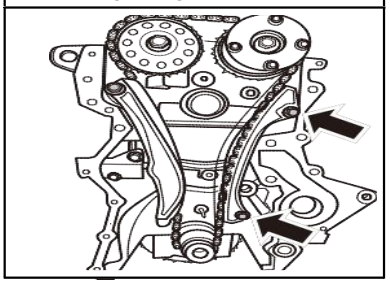
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Drain coolant, refer to replace coolant
4. Disassemble inlet of water pump
   1). Disconnect inlet of water pump and radiator water exhaust pipe



   2). Disconnect 2 fixing bolts of inlet of water pump, remove inlet of water pump.



5. Disassemble thermostat
   1). Take out thermostat from water pump



(II)Check

1. Check thermostat
   1). Check open degree of thermostat at normal temperature.
   The opening temperature of thermostat is: 82℃(initial open), 95℃(full open)

   2). The closing temperature of thermostat：>77℃

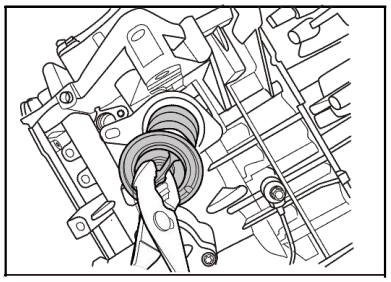
△Caution If measured value exceeds regulated range, please replace thermostat.

3). Check the biggest lift stroke
of thermostat valve：≥8mm。

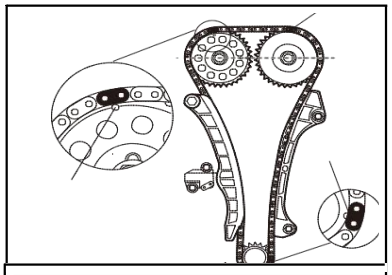
Δ Caution If measured value exceeds regulated range, please replace thermostat.

(III)Installation

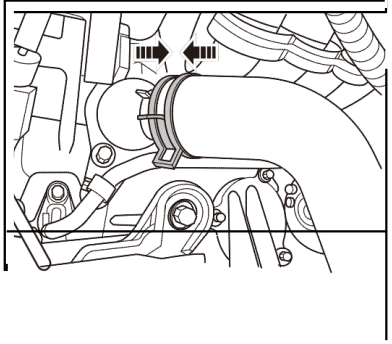
1. Install thermostat
   1). Replace thermostat seal ring, install thermostat into installation hole.



2. Install inlet of water pump
   1). Clean the connection surface of inlet of water pump and cylinder body.
   2). Install water pump water inlet onto cylinder body, tighten fixing bolts.



   3). Connect inlet of water pump and outlet of radiator.

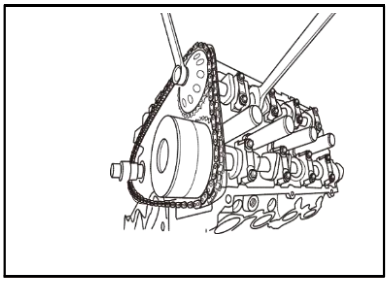


3. Fill cooling liquid
4. Connect battery cathode cable
5. Close engine cover

XI、Pulley of water pump

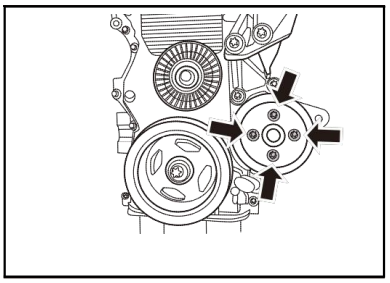
(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Release fuel system pressure, refer to release fuel system pressure
4. Disassemble engine left front cover, refer to engine cover
5. Disassemble engine right front cover, refer to engine cover
6. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
7. Drain transmission lubricant, refer to the drain and fill of transmission lubricant
8. Drain engine oil, refer to drain and fill of engine oil
9. Drain coolant, refer to replace coolant
10. Recycle freon, refrigerating oil, refer to freon, refrigerating oil
11. Disassemble intake hose, refer to intake hose assembly
12. Disassemble pipe and expansion valve assembly, refer to pipe and expansion valve assembly
13. Disassemble water inlet and outlet assembly of warm wind, refer to disassemble water inlet and outlet assembly of warm wind
14. Disassemble air filter assembly, refer to air filter assembly
15. Disassemble battery, refer to battery
16. Disassemble battery tray, refer to battery tray
17. Disassemble back-up lamp switch, refer to back-up lamp switch
18. Disassemble clutch working cylinder, refer to clutch working cylinder and oil intake pipe assembly
19. Disassemble starter, refer to starter
20. Disassemble left front wheel, refer to wheel
21. Disassemble right front wheel, refer to wheel
22. Disassemble left driving axle assembly, refer to driving axle assembly
23. Disassemble right driving axle assembly, refer to driving axle assembly
24. Disassemble transmission assembly, refer to transmission assembly
25. Disassemble engine assembly, refer to engine assembly
26. Disassemble alternator belt, refer to alternator belt
27. Disassemble water pump pulley
    1). Disassemble 4 fixing bolts of water pump pulley
    2). Remove water pump pulley



(II)Installation

1. Install water pump pulley
   1). Put water pump pulley onto cylinder body, tighten fixing bolts.
   Tightening torque: 8.4±0.6N·m

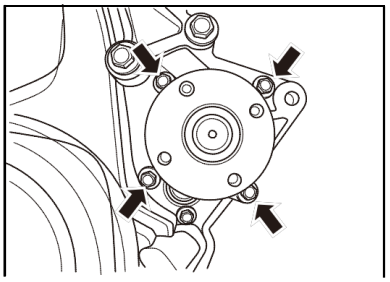


2. Install alternator belt
3. Install engine assembly
4. Install transmission assembly
5. Install right driving axle assembly
6. Install left driving axle assembly
7. Install right front wheel
8. Install left front wheel
9. Install starter
10. Install clutch working cylinder
11. Install back-up lamp switch
12. Install battery tray
13. Install battery
14. Install air filter assembly
15. Install water inlet and outlet assembly of warm wind
16. Install pipe and expansion valve assembly
17. Install intake hose
18. Fill Freon, refrigerant oil
19. Fill coolant
20. Fill engine oil
21. Fill transmission lubricant
22. Fill clutch hydraulic oil
23. Install engine right front cover shield
24. Install left front cover shield
25. Connect battery cathode cable
26. Close engine cover

XII、water pump

(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Release fuel system pressure, refer to release fuel system pressure
4. Disassemble engine left front cover, refer to engine cover
5. Disassemble engine right front cover, refer to engine cover
6. Drain clutch hydraulic oil, refer to the drain and fill of clutch hydraulic oil
7. Drain transmission lubricant, refer to the drain and fill of transmission lubricant
8. Drain engine oil, refer to drain and fill of engine oil
9. Drain coolant, refer to replace coolant
10. Recycle freon, refrigerating oil, refer to freon, refrigerating oil
11. Disassemble intake hose, refer to intake hose assembly
12. Disassemble pipe and expansion valve assembly, refer to pipe and expansion valve assembly
13. Disassemble water inlet and outlet assembly of warm wind, refer to disassemble water inlet and outlet assembly of warm wind
14. Disassemble air filter assembly, refer to air filter assembly
15. Disassemble battery, refer to battery
16. Disassemble battery tray, refer to battery tray
17. Disassemble back-up lamp switch, refer to back-up lamp switch
18. Disassemble clutch working cylinder, refer to clutch working cylinder and oil intake pipe assembly
19. Disassemble starter, refer to starter
20. Disassemble left front wheel, refer to wheel
21. Disassemble right front wheel, refer to wheel
22. Disassemble left driving axle assembly, refer to driving axle assembly
23. Disassemble right driving axle assembly, refer to driving axle assembly
24. Disassemble transmission assembly, refer to transmission assembly
25. Disassemble engine assembly, refer to engine assembly
26. Disassemble alternator belt, refer to alternator belt
27. Disassemble water pump pulley, refer to water pump pulley
28. Disassemble water pump
    1). Disassemble 4 fixing bolts of water pump
    2). Take off water pump and seal ring

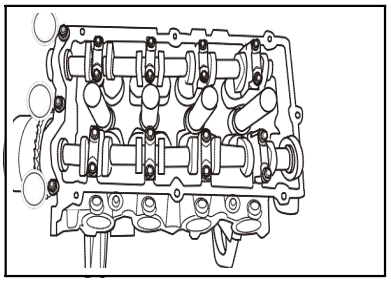


(II)Check

1. Check water pump
   1). Check if there is severe rust, water seal leakage or corrosion in water pump.
   2). Check if there is poor operation caused by big clearance.
   3). Check if bearing of water pump is blocked or damaged, please replace if necessary.

(III)Installation

1. Install water pump
   1). Clean seal surface of water pump.
   2). Replace with new seal ring of water pump.
   ΔCaution Seal ring of water pump is one-off component, must replace new seal ring of water pump whenever disassembly or installation.
   3). Tighten 4 fixing bolts of water pump.

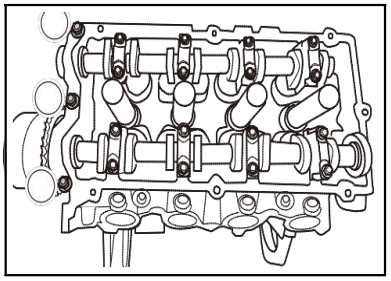


2. Install water pump pulley
3. Install alternator belt
4. Install engine assembly
5. Install transmission assembly
6. Install right driving axle assembly
7. Install left driving axle assembly
8. Install right front wheel
9. Install left front wheel
10. Install starter
11. Install clutch working cylinder
12. Install back-up lamp switch
13. Install battery tray
14. Install battery
15. Install air filter assembly
16. Install water inlet and outlet assembly of warm wind
17. Install pipe and expansion valve assembly
18. Install intake hose, refer to intake hose assembly
19. Fill Freon, refrigerant oil
20. Fill coolant
21. Fill engine oil
22. Fill transmission lubricant
23. Fill clutch hydraulic oil
24. Install engine right front cover shield
25. Install left front cover shield
26. Connect battery cathode cable
27. Close engine cover

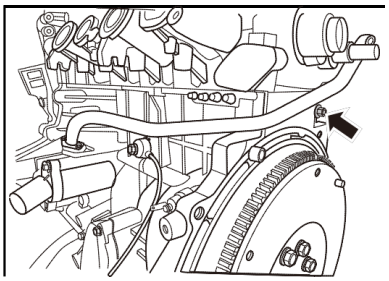
XIII、warm wind backwater steel tube

(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble air filter assembly, refer to air filter assembly
4. Disassemble air filter bracket II, refer to air filter bracketII
5. Disassemble electronic throttle valve, refer to electronic throttle valve
6. Disassemble intake manifold, refer to intake manifold
7. Disassemble warm wind backwater steel tube
   1). Disassemble 2 bolts connecting warm wind backwater steel tube and water pump.



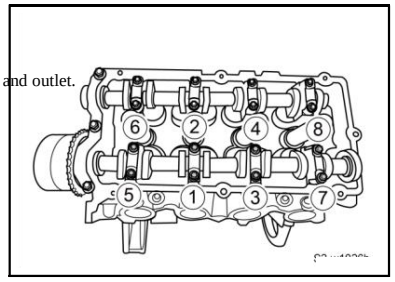
   2). Disassemble 1 bolts connecting warm wind backwater steel tube and cylinder cover.

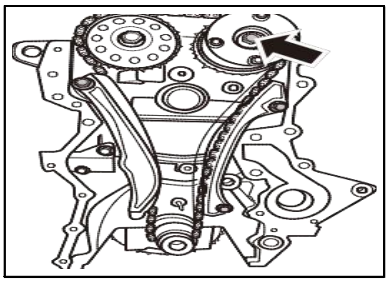


   3). Disconnect warm wind backwater steel tube and warm wind water inlet and outlet.
   4). Take off warm wind backwater steel tube.

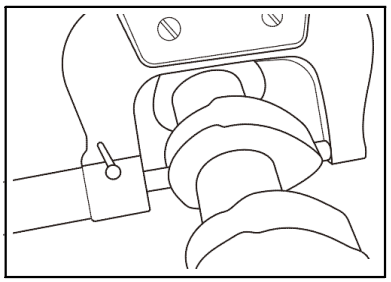
(II)Installation

1. Install warm wind backwater steel tube
   1). Connect warm wind backwater steel tube and warm wind water inlet and outlet.

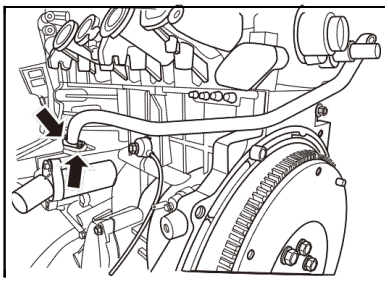




   2). Install bolts connecting warm wind backwater steel tube and cylinder cover.



   3). Install bolts connecting warm wind backwater steel tube and water pump.



2. Install intake manifold
3. Install electronic throttle valve
4. Install air filter bracket II
5. Install air filter assembly
6. Connect battery cathode cable
7. Close engine cover

Engine intake system

I、Summary

(I)structure overview

System description: Intake system is composed by air filter, throttle valve, intake manifest and related pipes. Intake control system is to accomplish tasks like idle control, variable valve control and electronic throttle valve control through control air intake volume, so as to improve the stability while engine idle working, or improve power, reduce oil consumption and exhaust pollution.

Idle control：electronic control system can control idle working of engine automatically, ECU can measure many factors like engine working temperature and loading through various sensors, define the best idle rotation, and control the air intake volume while idle through electronic throttle valve automatically, finally control idle rpm. Which enables engine with stable idle rpm under all kinds circumstances, avoid unstable idle or motor shut down, try to lower the oil consumption while idle and control exhaust.

Electronic throttle valve control： in all engines equipped with electronic throttle valve, ECM can measure the operation to pedal by driver through all kinds of sensors, meanwhile, through engine rpm and speed, calculate and define the best valve opening degree under that condition, control its open through electronic throttle valve operator, making sure car gets the most efficient oil consumption, improve safety and comfort. Besides, gasoline engine electric control system can also allow TCS/CC through electronic throttle valve.

(II)system principle

air filter can filter the air into the engine by filter the impurity out, which can protect engine.

Electronic throttle valve provides the best control method through ECM according to driver's intension, insures engine's fuel economy.

Intake of engine is a very complicated process, the smoothness of air can influence the efficiency of engine. Eddy intake manifold used on our engine is convenient for engine to form eddy, improve its volumetric efficiency.

(III)torque parameter

Key parts torque table

No.	Item	torque(N m)	Remark
1	air filter installation bolts	8	
2	hoop	4	
3	Fixing bolts of intake manifold and and intake manifold bracket	2	
4	Fixing bolts of intake manifold	1	

(IV)Fault diagnosis

Diagnosis table

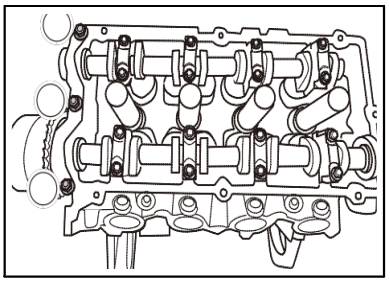
No.	Fault description	Reason analysis	Solution	

1	Leakage in intake system	sealing gasket of intake manifold and cylinder cover is damaged intake manifold	replace	
		intake manifold and electronic throttle valve is damaged	replace	
		seal ring of intake pressure temperature sensor is damaged	replace	
		connecting surface of flange is irregular	If necessary, repair or replace related parts	
		leakage in connecting position between parts in intake system	Replace the leaked parts	

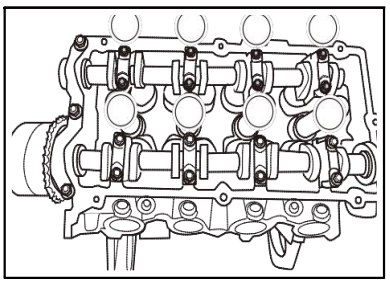
II、Intake manifold assembly

(I)Disassembly

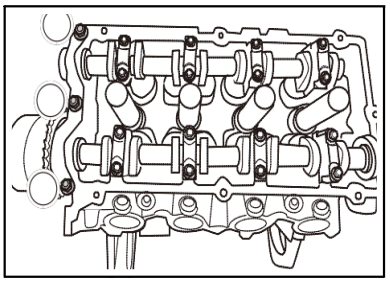
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble upper cover of front bumper, refer to upper cover of front bumper
4. Disassemble intake rigid tube
   1). Disconnect the connecting hoop of intake rigid tube and intake hose.



   2). Disassemble 2 fixing bolts between intake rigid tube and front bumper.
   3). Take off intake rigid tube.

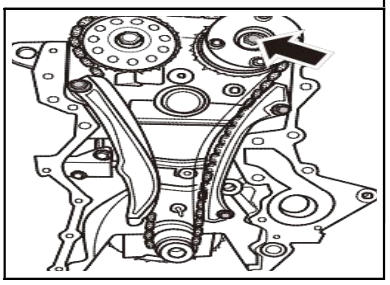


5. Disassemble intake hose
   1). Disconnect the connecting hoop between intake hose and lower cap of air filter.
   2). Take off intake hose.

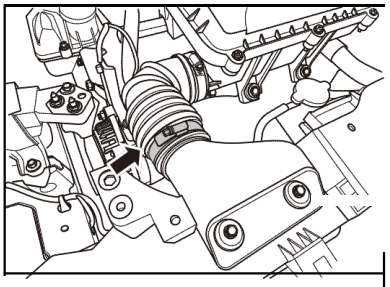


(II)Installation

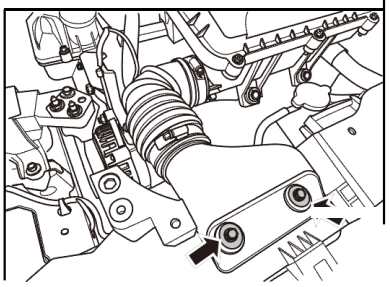
1. Install intake hose
   1). Install intake hose to the lower cap of air filter, tighten hoop.
   Tightening torque: 4～6 N·m



   2). Connect the intake rigid tube and intake hose, tighten hoop.



2. Install intake righd tube
   1). Put intake righd tube into intake righd tube installation hole, tighten fixing bolts.
   Tightening torque: 8～12 N·m

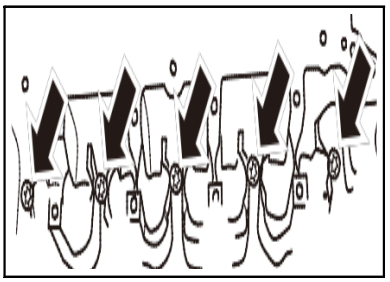


3. Install upper cover of front bumper
4. Connect battery cathode cable
5. Close engine cover

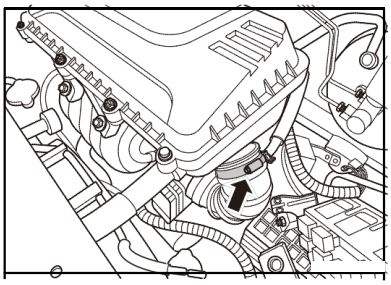
III、Air filter assembly

(I)Disassembly

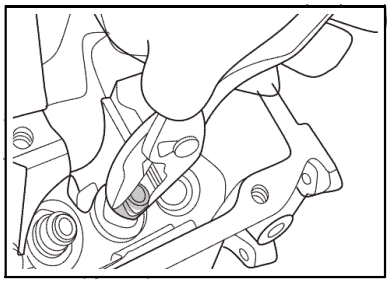
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble air filter assembly
   1). Disconnect the connecting hoop between intake hose assembly and air filter.



2). Loosen the connecting hoop of air filter assembly and air filter assembly exit pipe, disconnect them.

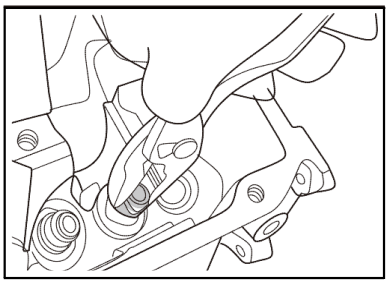


3). Disassemble 2 fixing bolts of air filter assembly and air filter bracket II.



4). Disassemble2 fixing bolts of air filter assembly and air filter bracket I.

5). Take off air filter assembly

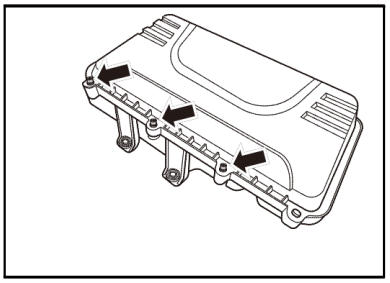


(II) Disassembly

1. Disassemble air filter assembly
   1). Disassemble the connecting bolts of upper and lower shell of air filter, take out the air filter core.

   ΔCaution Need to take out the air filter core slowly, avoiding dust scattered.

   ΔCaution Cover filter body with wet cloth while cleaning the filter core.



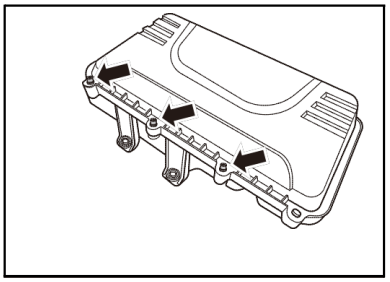
(III)Check

1. Check air filter core
   1). See by eyes if the intake side of filter core is too dirty, if yes, blow clear the filter core from the exhaust side or change filter core.

(IV)Assembly again

1. Assemble air filter assembly
   1). Install air filter core, connect upper and lower shell of air filter with screws and tighten.

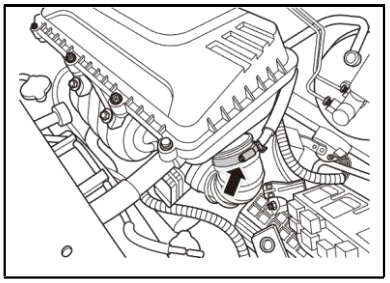
   Tightening torque: 8～12 N m



(V)Installation

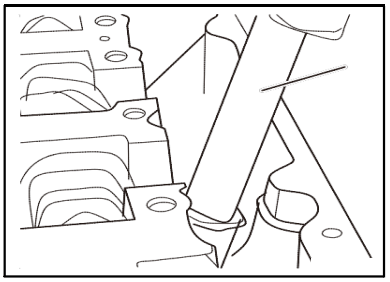
1. Install air filter assembly
   1). Connect air filter assembly and air filter exhaust pipe assembly, tighten hoop.

   Tightening torque: 4～6 N m



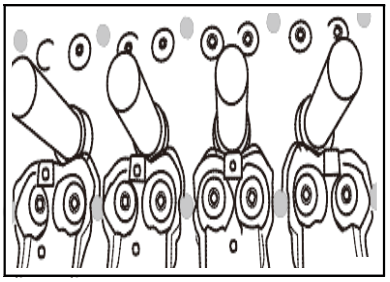
2). Put the air filter assembly into its installation hole, tighten fixing bolts connecting air filter and air filter bracket I.

Tightening torque: 8 ~ 12 N m



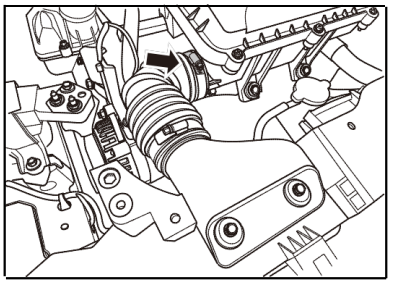
3). tighten fixing bolts connecting air filter and air filter bracket II.

Tightening torque: 8 ~ 12 N m



4). Connect air filter assembly and intake pipe assembly, tighten hoop.

Tightening torque: 4 ~ 6 N m

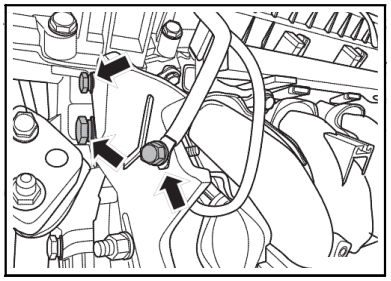


2. Connect battery cathode cable
3. Close engine cover

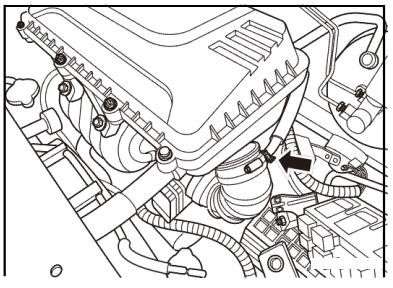
IV、Air filter exhaust pipe assembly

(I)Disassembly

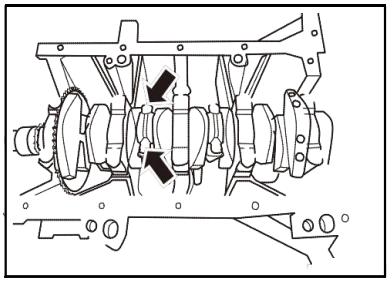
1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble air filter exhaust pipe assembly
   1). Loosen the connecting hoop of air filter assembly and air filter exhaust hose, disconnect them.



   2). Loosen the steel-belt-type elastic strap, remove respirator ventilation ducting out of air filter exhaust pipe.



   3). Loosen ring clamp, take off air filter exhaust pipe assembly from electronic throttle valve.



(II) Check

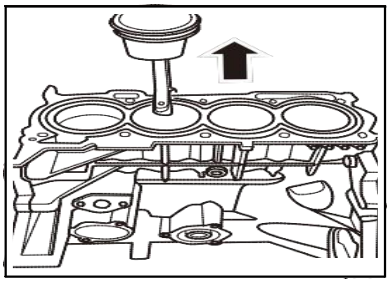
1. Check air filter exhaust pipe assembly
   1). Check if air filter exhaust pipe is cracked, damaged or worn, replace if necessary.

(III) Installation

1. Install air filter exhaust pipe assembly

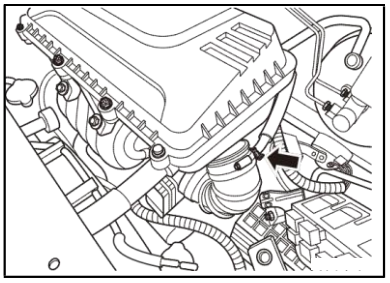
1). Install air filter exhaust pipe to electronic throttle valve, tighten ring clamp.

Tightening torque: 4～6 N m



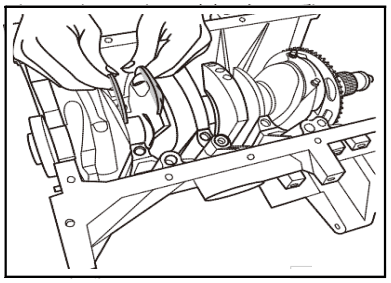
2). Connect respirator connecting hose and air filter exhaust pipe, fix with steel-belt-type elastic strap.

Tightening torque: 4～6 N m



3). Connect air filter exhaust pipe and air filter assembly, and tighten hoop.

Tightening torque: 4～6 N m

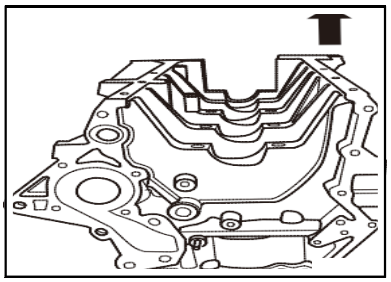


2. Connect battery cathode cable
3. close engine cover

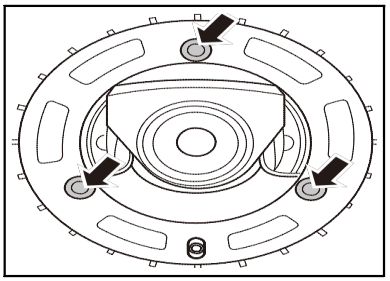
V、Air filter bracket

(I) Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble air filter assembly, refer to air filter
4. Disassemble air filter bracket I
   1). Disassemble 2 fixing bolts of air filter bracket I



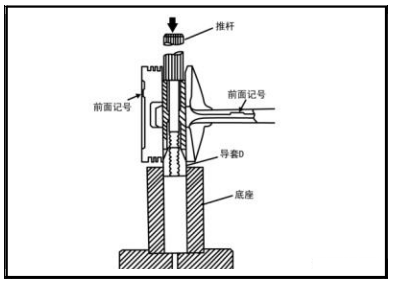
5. Disassemble air filter bracket II
   1). Disassemble fixing bolts of air filter bracket II



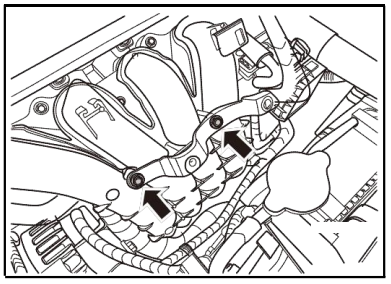
(II) Installation

1. Install air filter bracket I
   1). Install fixing bolts of air filter bracket I

   Tightening torque: 8～12N m



2. Install air filter bracket II
   1). Install fixing bolts of air filter bracket II
   Tightening torque: 8～12N·m

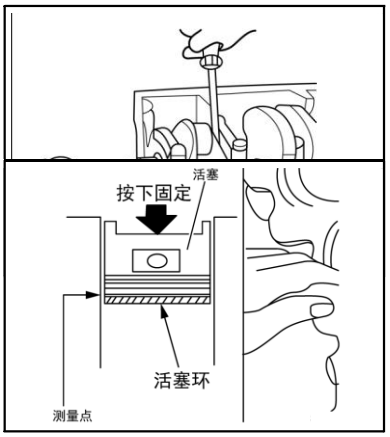


3. Install air filter assembly
4. Connect battery cathode cable
5. Close engine cover

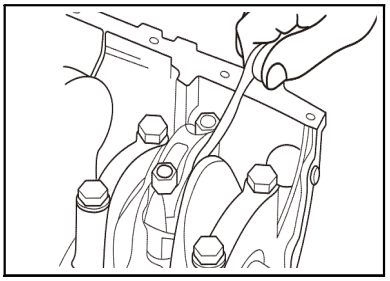
VI、Intake manifold

(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble air filter assembly, refer to air filter assembly
4. Disassemble air filter bracket II, refer to air filter bracket II
5. Disassemble electronic throttle valve, refer to electronic throttle valve
6. Disassemble intake manifold
   1). Disconnect harness connector of absolute pressure sensor.

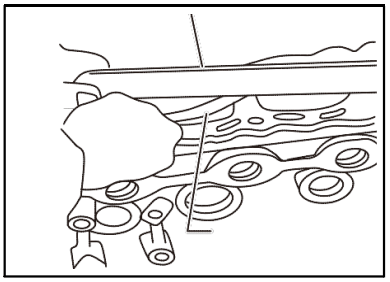


   2). Disconnect the connecting hose of PCV valve.

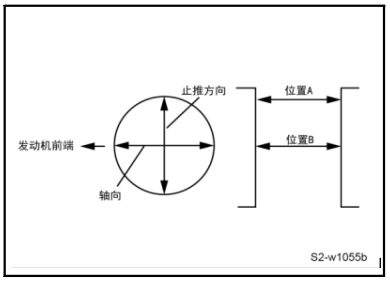


   3). Disconnect the vacuum servo connecting hose.

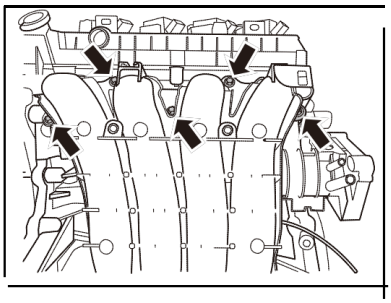
4). Disconnect the connecting hose of valve EGR.



5). Remove 3 fixing bolts of intake manifold bracket, take off intake manifold bracket.



6). Remove 5 fixing bolts of intake manifold, take off intake manifold.



(II)Check

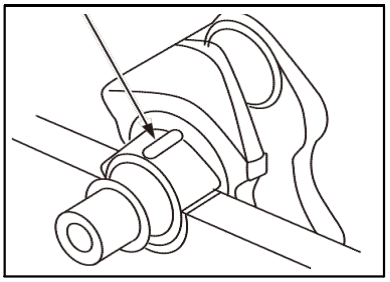
1. Check intake hose
   1). Check if intake hose is cracked or damaged, if its matching surface shape is changed, if the seal ring of intake manifold and intake seal ring of throttle is damaged. If yes, please repair or replace.

(III)Installation

1. Install intake manifold

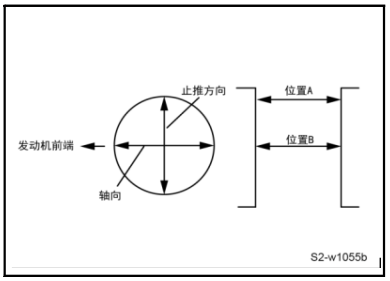
1). Install and tighten fixing bolts of intake manifold.

Tightening torque: (18±1.0)N m

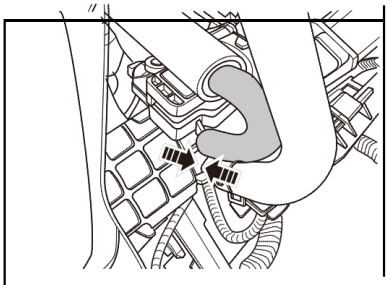


2). Install and tighten bolts of intake manifold bracket.

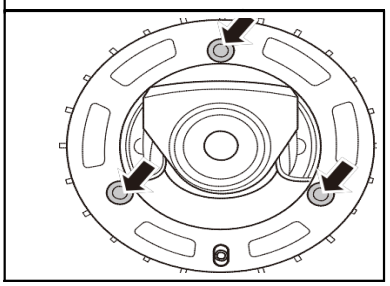
Tightening torque: (22.5±2.5)N m



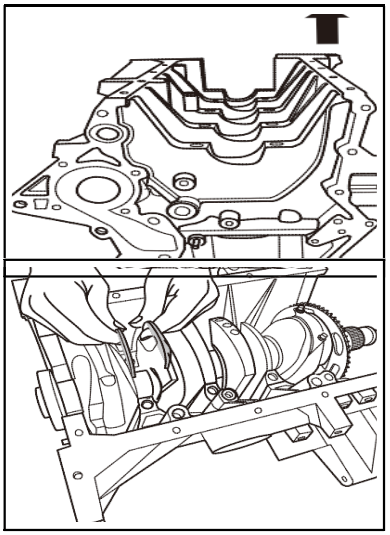
3). Connect connecting hose of valve EGR



4). Connect vacuum servo connecting hose.



5). Connect connecting hose of PCV valve.



6). Connect harness connector of absolute pressure sensor.

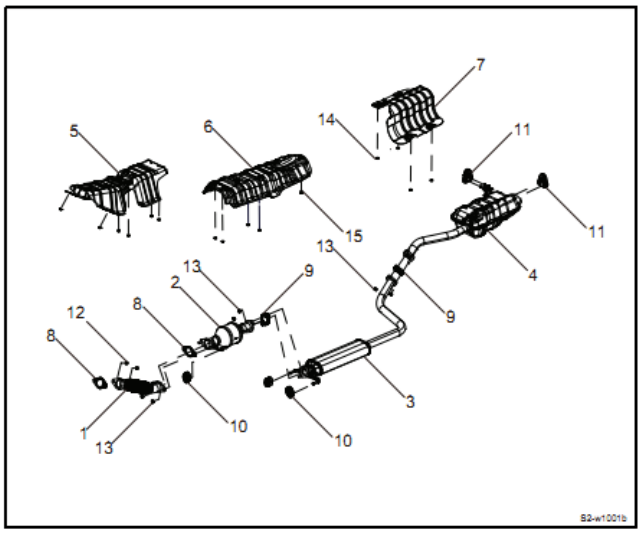
2. Install electronic throttle valve
3. II Install air filter bracket II
4. Install air filter assembly
5. Connect battery cathode cable
6. Close engine cover

Engine exhaust system

I、Summary

(I)structure overview

Break-down table



1. Front exhaust pipe assembly
2. II level Catalyst assembly of
3. I level Muffler assembly of
4. II level Muffler assembly of
5. Thermal baffleI
6. Thermal baffleII
7. Thermal baffleIII
8. Seal gasket
9. Seal gasketII
10. Lifting eye I
11. Hang soft cushion
12. Heat-resisting locknut
13. 1 type all-metal locknut of hexagon nut
14. Flange face locknut of hexagon nut
15. Molectron of Hexagon nut and flat gasket

System description

Aftertreatment of exhaust of three-way catalyst is the efficient way of reducing the concentration of hazardous substance in exhaust gas. Three-way catalyst can reduce 98% or even more HC, CO and NOx, turn them into H2O, CO2, N2. But only within small range near engine excess air coefficient λ=1, can reach this high efficiency, goal of λ closed-loop control is guarantee mixed air is within this range. Closed-loop control system can only work when equipped with oxygen sensor.

Oxygen sensor monitors oxygen content of exhaust gas at one side of three-way catalyst, thin mixed air(λ>1)produces sensor voltage at around 100mV, thick mixed air produces sensor voltage at around 900mV. When λ=1, sensor voltage has one saltus. Λ closed-loop control makes response to input signal(λ>1 means mixed air is too thin, λ<1 means mixed air is too thick) and modify control variable, producing correction factor as multiplier to correct lasting time of oil injection.

(II)torque parameter

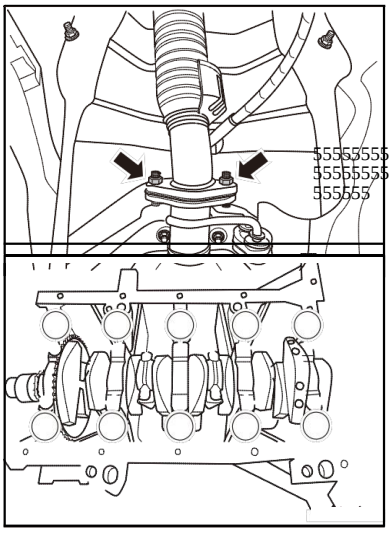
Key parts torque table

No.	items	Torque(N·m)	remark
1	exhaust manifold stud	1	M8×1×12
2	Q1840816(exhaust manifold bracket bolts)	22.5	M8×16
3	Catalyst thermal shroud nut	1	M6×1
4	exhaust manifold nut	3	M8
5	Connecting bolt of catalyst level II and muffler level I	5 0 ±	
6	Thermal baffle installation bolts	6	
7	Exhaust manifold bracket bolts	22.5	
8	Connecting bolt of three-way catalyst and exhaust manifold	4 5 ±	

II、Front exhaust pipe assembly

(I) Disassembly

1. Lift vehicle
2. Disassemble front exhaust pipe assembly
   1). Disassemble 2 fixing bolts of front exhaust pipe assembly and II level catalyst assembly.

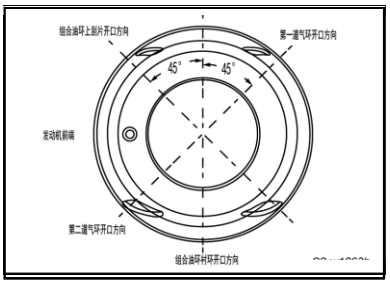


   2). Disassemble 2 fixing bolts of front exhaust pipe assembly and exhaust manifold assembly.
   3). Take off front exhaust pipe assembly.
3. Disassemble seal gasket

1). Take off seal gasket from front exhaust pipe assembly

(II)Installation

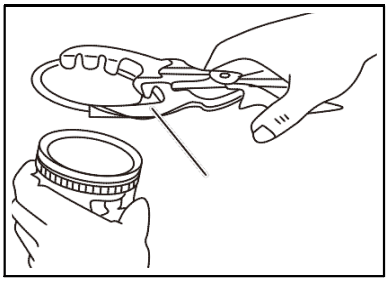
1. Install seal gasket
   1). Install seal gasket to front exhaust pipe assembly.
2. Install front exhaust pipe assembly
   1). Install 2 fixing bolts of front exhaust pipe assembly and exhaust manifold.
   Tightening torque: 6±1N m



2). Install 2 fixing bolts of front exhaust pipe assembly and II level catalyst.

Tightening torque: 6±1N m

G



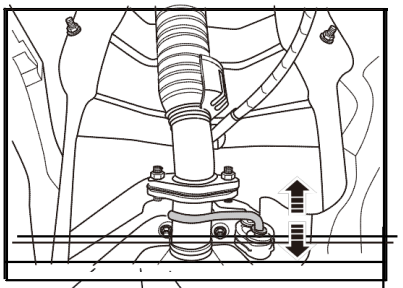
3. Get vehicle down

III、II level catalyst assembly

(I)Disassembly

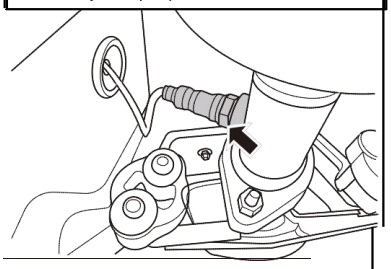
1. Lift vehicle
2. Disassemble II level catalyst assembly

1). Disassemble the 1 lifting eye connecting II level catalyst and car body.



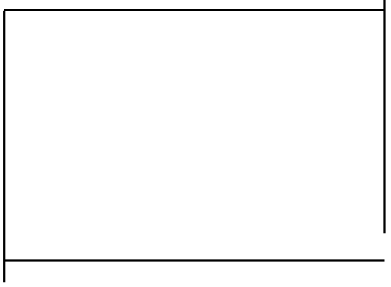
2). Disassemble 2 fixing bolts connecting II level catalyst and front exhaust pipe assembly.

3). Disconnect rear oxygen sensor and II level catalyst.



4). Disassemble 2 fixing bolts connecting II level catalyst and I level muffler.

5). Take off II level catalyst assembly.



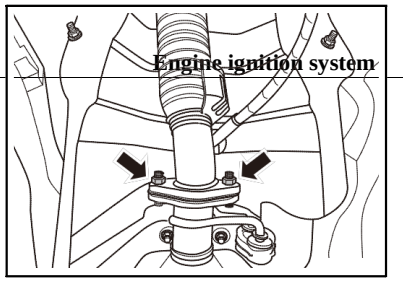
3. Disassemble seal gasket.

1). Take off seal gasket from II level catalyst.

(II)Installation

1. Install seal gasket

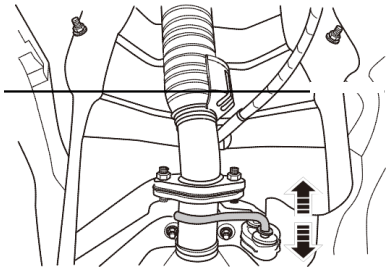
1). Install seal gasket to II level catalyst



2. Install II level catalyst assembly

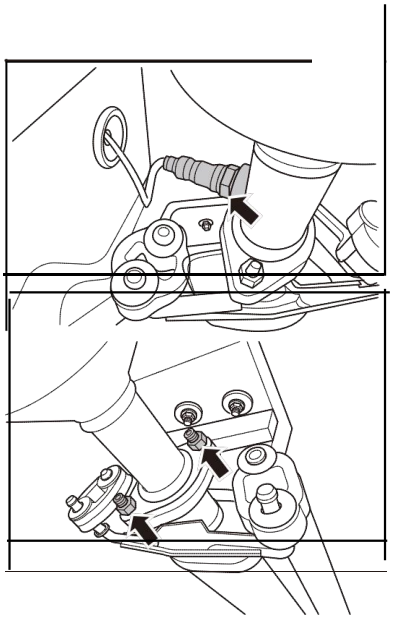
1). Install II level catalyst to rubber bearing of car body.

2). Install 2 fixing bolts connecting II level catalyst and front exhaust pipe assembly.
Tightening torque: 6±1N·m



3). Install rear oxygen sonsor, tighten connecting bolts.

4). Install 2 fixing bolts connecting II level catalyst and I level muffler.
Tightening torque: 6±1N·m

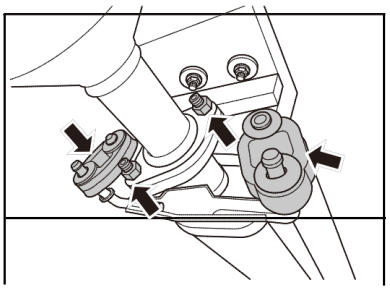


3. Get the car down

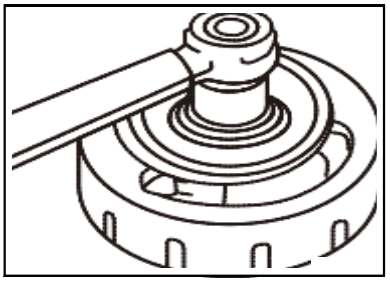
IV、I level muffler assembly

(I)Disassembly

1. Lift car
2. Disassemble I level muffler assembly
   1). Disassemble 2 lifting eyes connecting I level muffler and car body.
   2). Disassemble 2 fixing bolts connecting I level muffler and II level catalyst.



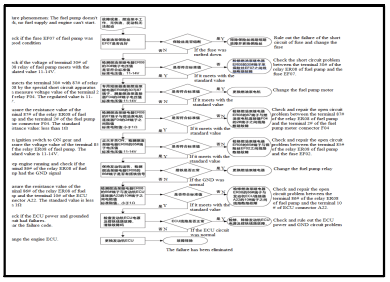
   3). Disassemble 2 fixing bolts connecting I level muffler and II level muffler.
   4). Take off I level muffler.



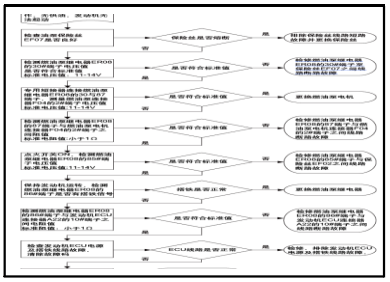
3. Disassemble seal gasket II
   1). Take off seal gasket II from I level muffler

(II)Installation

1. Install seal gasket II
   1). Install seal gasket II to I level muffler.
2. Install I level muffler assembly
   1). Install I level muffler to car rubber bearing, install lifting eye.
   2). Install 2 fixing bolts connecting I level muffler and II level catalyst
   Tightening torque: 6±1N·m



3). Install 2 fixing bolts connecting I level muffler and II level muffler.
Tightening torque: 6±1 N m

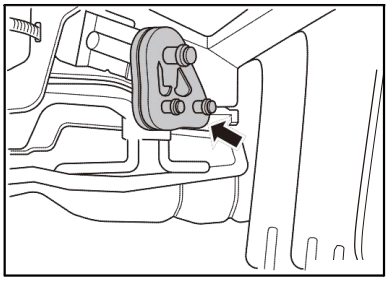


3. Get the car down

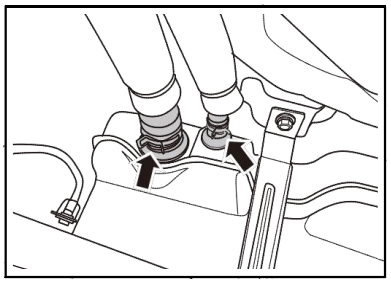
V、II level muffler assembly

(I)Disassembly

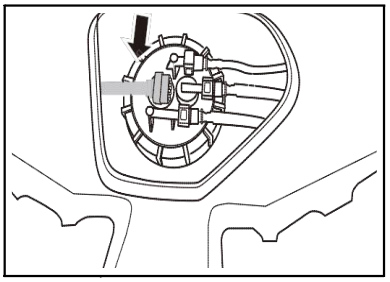
1. Lift car
2. Disassemble II level muffler assembly
   1). Disassemble 1 hang soft gasket (near car rear) connecting II level muffler and car body.



   2). Disassemble 1 hang soft gasket (near middle of the car) connecting II level muffler and car body.



   3). Disassemble 2 fixing nuts connecting I level muffler and II level muffler.
   4). Take off II level muffler.

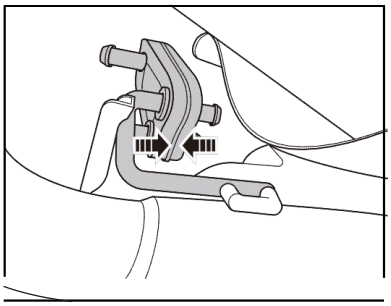


3. Disassemble seal gasket II
   1). Take off seal gasket II from II level muffler.

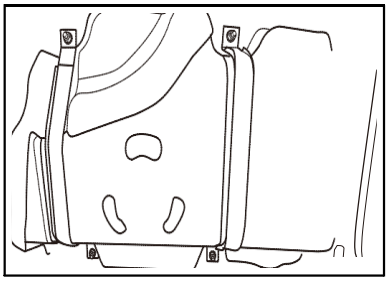
(II)Installation

1. Install seal gasket II
   1). Install seal gasket II to II level muffler.

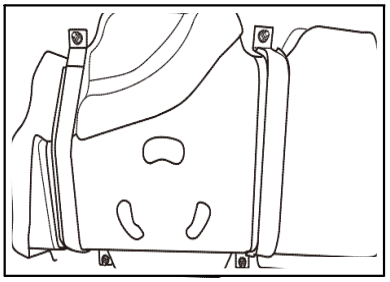
2. Install II level muffler assembly
   1). Install II level muffler assembly to hang soft gasket on the car body(near middle of the car).



   2). Install II level muffler assembly to hang soft gasket on the car body(near car rear)



   3). Install 2 fixing nuts connecting I level muffler and II level muffler.
   Tightening torque: 6±1N·m

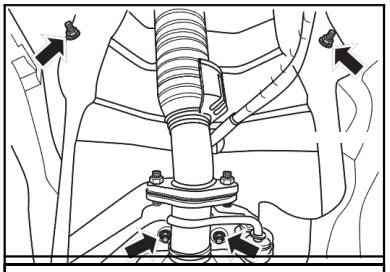


3. Get the car down

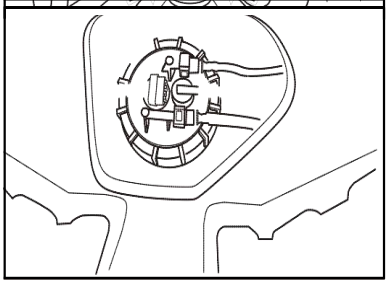
VI、Thermal baffle assembly

(I)Disassembly

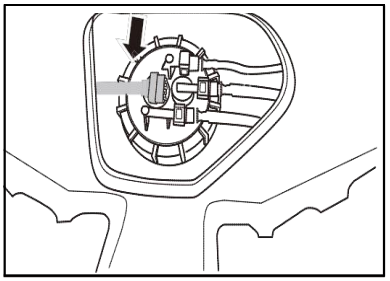
1. Lift car
2. Disassemble thermal baffle I
   1). Disassemble 4 fixing nuts of thermal baffle I and car body(near front exhaust pipe assembly) .



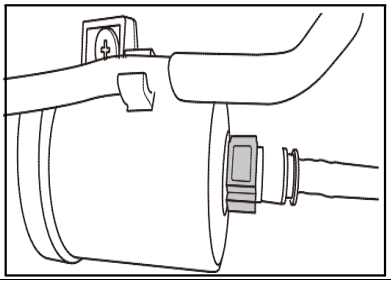
   2). Disassemble 2 fixing nuts of thermal baffle I and car body(near II level catalyst)
   3). Take off thermal baffle I.



3. Disassemble thermal baffle II
   1). Disassemble 2 fixing nuts of thermal baffle II and car body(on top of I level muffler)

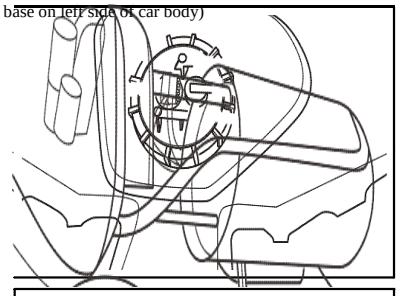


   2). Disassemble 2 fixing nuts and 1 bolts of thermal baffle II and car body.
   3). Take off thermal baffleII。



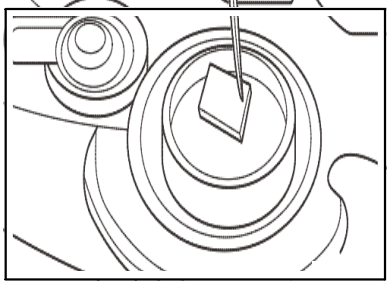
4. Disassemble thermal baffle III

1). Disassemble 2 fixing nuts of thermal baffle III and car body(chassis base on left side of car body)



2). Disassemble 2 fixing nuts of thermal baffle III and car body(chassis base on right side of car body)

3). Take off thermal baffleIII。

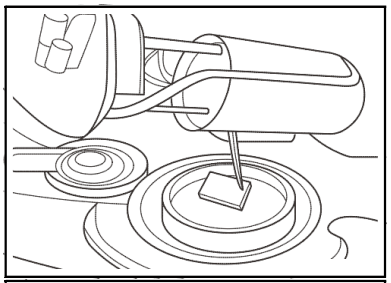


(II)Installation

1. Install thermal baffle III

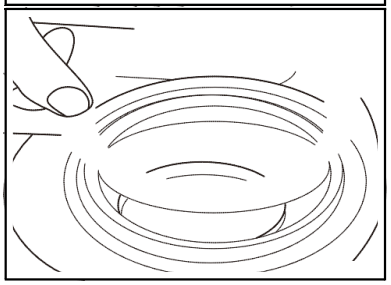
1). Install2 fixing nuts of thermal baffle III and car body(chassis base on right side of car body)

Tightening torque: (6±1)N·m



2). Install2 fixing nuts of thermal baffle III and car body.(chassis base on left side of car body)

Tightening torque: (6±10 N·m

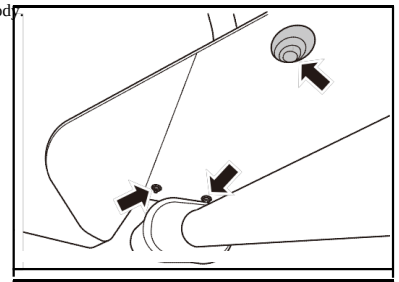


2. Install thermal baffleII

1). Install 2 fixing nuts and 1 fixing bolts of thermal baffle II and car body.

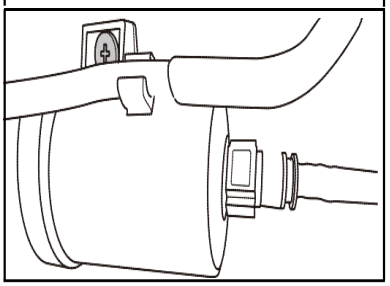
Tightening torque: (6±1)N·m

Tightening torque: (45~55)N·m



2). Install 2 fixing nuts of thermal baffle II and car body(on top of I level muffler).

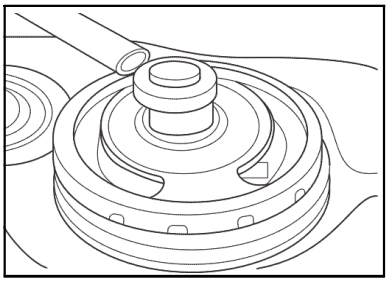
Tightening torque: (6±1)N·m



3. Install thermal baffleI

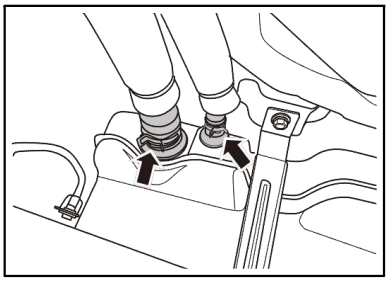
1). Install 2 fixing nuts of thermal baffle I and car body(near II level catalyst).

Tightening torque: (6±1)N·m



2). Install 4 nuts of thermal baffle I and car body(near front exhaust pipe assembly)

Tightening torque: (6±1)N·m

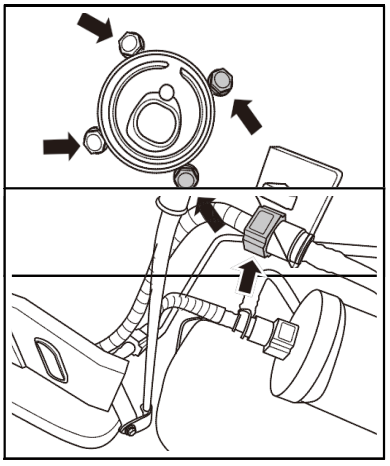


4. Get the car down

VII、Exhaust manifold

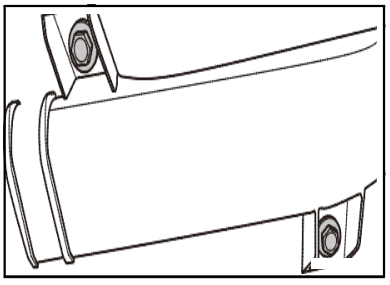
(I)Disassembly

1. Open engine cover
2. Disconnect battery cathode cable, refer to battery cable disconnect and connect
3. Disassemble front oxygen sensor, refer to front oxygen sensor
4. Disassemble thermal shroud of front exhaust manifold
   1). Disassemble 5 fixing bolts of upper thermal shroud of exhaust manifold, take off upper thermal shroud of exhaust manifold.



5. Disassemble exhaust manifold bracket
   1). Disassemble 4 fixing bolts of exhaust manifold bracket
   2). Take off exhaust manifold bracket

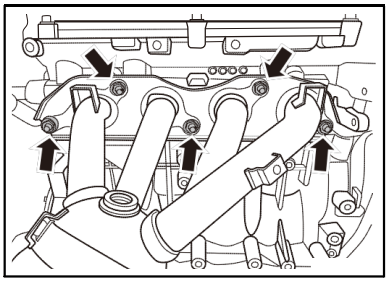
6. Disassemble exhaust manifold and exhaust manifold gasket
   1). Disassemble 2 fixing bolts of exhaust manifold and front exhaust pipe assembly, disconnect exhaust manifold and front exhaust pipe assembly.



2). Disassemble 5 fixing nuts connecting exhaust manifold and cylinder cover, take off exhaust manifold components and exhaust manifold gasket.

△Caution Disassemble bolts of exhaust manifold while its hot, may damage bolts or cylinder cover, so must wait to disassemble after engine cools off!

3). Take off exhaust manifold and exhaust manifold bracket.

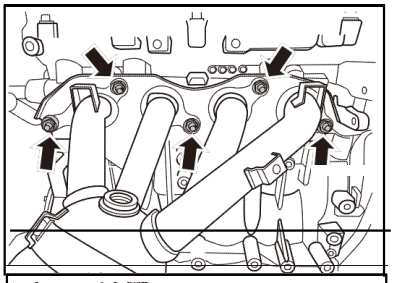


(II)Check

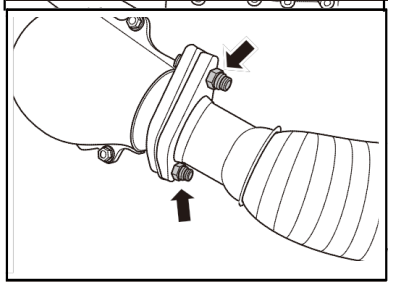
1. Check exhaust manifold
   1). Check if matching surface of exhaust manifold is misshaped.

(III)Installation

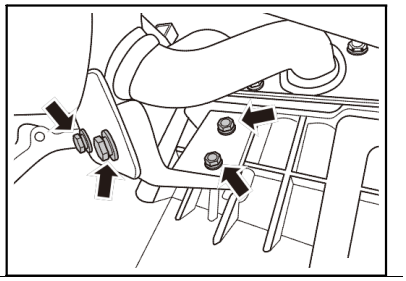
1. Install exhaust manifold and exhaust manifold bracket
   1). Replace with new exhaust manifold seal gasket and exhaust manifold, tighten 5 fixing nuts of exhaust manifold and cylinder cover.
   Tightening torque: 35±2N·m



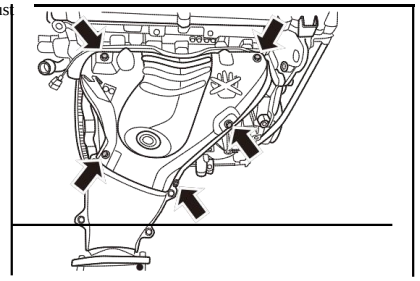
   2). Replace the seal gasket between exhaust pipe and exhaust manifold, install and tighten 2 fixing nuts of front exhaust pipe and exhaust manifold.
   Tightening torque: 45±7N·m



2. Install exhaust manifold bracket
   1). Install 4 fixing bolts of exhaust manifold bracket
   Tightening torque: 22.5±2.5N·m



3. Install upper thermal shroud of exhaust manifold
   1). install and tighten 5 fixing bolts of upper thermal shroud of exhaust manifold.
   Tightening torque: 10±1N·m



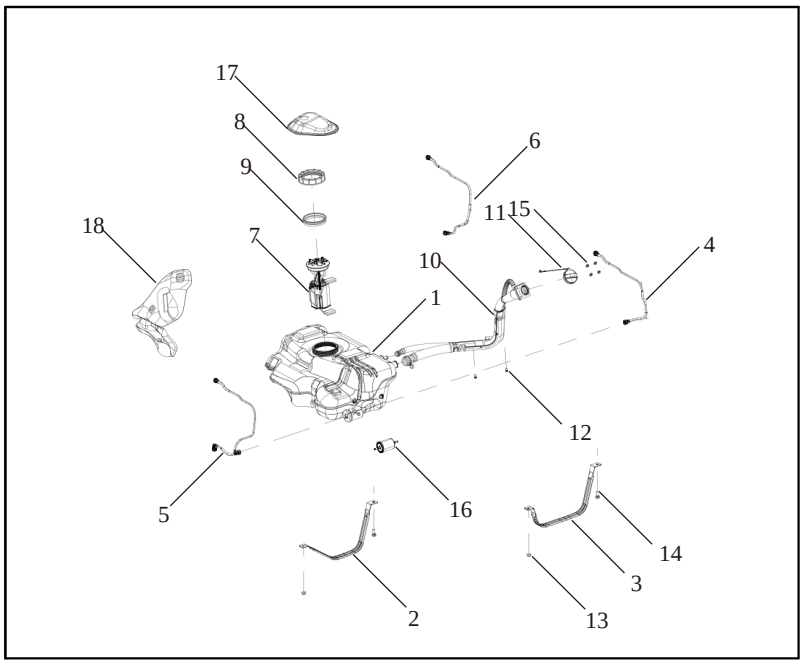
4. Install front oxygen sensor
5. Connect battery cathode cable
6. Close engine cover

Engine fuel system

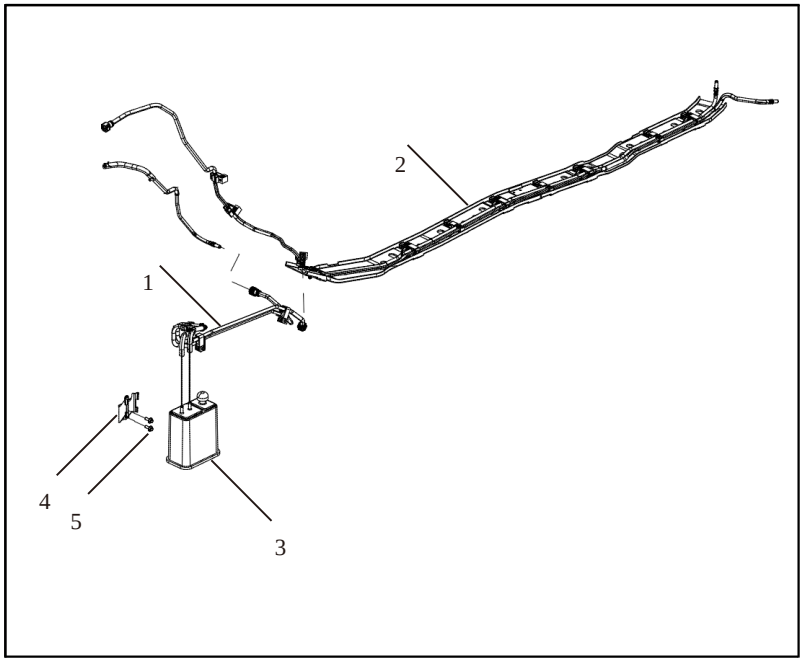
I. Overview

(I.) Structure overview

Exploded diagram



1.Fuel tank assy
2. I Fuel tank strap I
3. II Fuel tank strap II
4. Fuel inlet tube assy
5. Fuel return nylon tube assy
6. Fuel evaporation nylon tube assy
7. Fuel pump assy
8. Fixing snap ring of fuel pump
9. Flange sealing ring of fuel pump
10. Fuel filling tube assy
11. Plastic fuel cap assy
12. Hexagon bolt and spring washer combination component
13. Metal hexagon flange locknut
14. Hexagon bolt and spring washer combination component
15. Binding bolt of filling port
16. Fuel filter assy
17. Fuel access cap
18. Fuel heat insulation panel



1. Fuel pipleline assy I
2. Fuel pipeline assy II
3. Carbon tank assy
4. Carbon tank bracket
5. Hexagon bolt and spring washer combination component

System description

The fuel supply system is to supply fuel to engine under various conditions through the fuel injector. The electric fuel pump inside the fuel tank has pumped the fuel into distribution pipeline and then the fuel pressure adjuster has adjusted the pressure to meet with the injector requirement.

1. Fuel tank

The fuel tank is made of HDPE materials and fixed to the chassis by 2 metal straps.

2. Filling cap of fuel tank

Attention:

Make sure use the same functional filling cap with the original cap during replacement; otherwise it may cause the major failure of fuel system.

The filling tube has a one-way filter on filling cap.

3. Fuel pump

The electric turbo fuel pump inside the modular fuel transmitter is controlled by the ECM through

its relay. It will supply the fuel in advance to ensure the fuel pressure inside tube meeting with the system requirement. It carries with independent fuel reservoir can in order to guarantee the normal supply of fuel during low level fuel or violent operation.

4. Fuel pressure adjustor assy

The fuel pressure adjuster integrated in the fuel pump is mainly for adjusting the fuel volume flew into the tube so that control the pressure at injector.

5. Electric fuel pump filter screen

The filter screen has the below functions as the primary filter

- Filter off pullutants
- Enlong the fuel pump service life.

It should clean or replace the filter screen when the output pressure of fuel pump was unduly low.

6. Fuel filter assy

The fuel filter assy fixed on fuel tank at the left side of chassis consists of paper filter core, which can filter off particles inside fuel that may damage the fuel system.The fuel filter can stand with the maximum fuel system pressure, temperature variation and fuel additives.

7. Fuel level sensor assy

The fuel level sensor assy consists of 1 floater and the wires arm assy and is fixed on fuel tank. It transmits the variable circuit resistance to the instruments meter according to the contact position of sliding plate. The circuit wires harness stretches from variable resistance plate to the connector of fuel pump.

8. Fuel distribution tube

The fuel distribution tube consists of the below parts

- Tube of distributing and transporting fuel to each injector
- 4 independent injectors.

The fuel distribution tube has been installed on intake manifold and works for distributing the fuel to each injector corresponded with each cylinder.

9. Fuel Injector

The fuel injector is a solenoid valve controlled by the ECU of engine. The constant closed ball valve will be opened to let fuel flow through the director panel to the outlet of injector when the injector coil is powered on by engine ECU. The fluid director panel controls the fuel volume and generates dual thin cone fuel mist around the outlet of injector through the holes on it. The fuel has been injected further from the outlet to 2 intake valve channels where make the fuel a further step of gasification. If the fuel injector had the below problems, it would cause the power failure

- The fuel injector can’t be opened
- The fuel injector gets stuck in the opening position
- The fuel injector has leakage
- The resistance of injector coil is unduly low. The normal resistance range: 11.6~12.4Ω

(II) System theory

Fuel evaporation system theory

The fuel evaporation system is to reduce the quantity of hydrocarbon exhausted into air by the force of active carbon stored in the carbon tank.

When the engine is off or filling fuel into the tank, the fuel steam evaporated in the confined fuel tank would be sucked and stored into the carbon tank. When the engine is on, the fuel steam inside carbon tank has been transported to intake manifold through the cleaning tube. The flow rate of fuel steam controlled by solenoid valve of carbon tank is in proportion to air flow rate. The solenoid valve of carbon tank is controlled by ECU.

During deceleration and idling, the solenoid valve of carbon tank will close the cleaning tube.

The fuel steam control valve is installed on fuel pump to prevent from over fuel steam getting into carbon tank.

(III) Torque parameters

Kep components torque table

SN	Item	Torque (Nm)	Remarks
1	Fuel pressure guiding rack bolt	18.4±1.4	M8×35 E12
2	Master fuel passage plug I	60±5	Inner hexagonal M20
3	Master fuel passage plug II	35±5	Inner hexagonal M12
4	VVT fuel passage plug	44±5	M14×1.5×14

(IV) Service attention matters

Warning

It must abide by the below regulation during replacing or dismantling the parts of fuel system.:

1. Place the warning label “NO SMOKING” in working place
2. Make sure the good ventilation condition and prepare the carbon dioxide extinguisher
3. The discharged fuel must be filled into the container and store at a safe place.
4. Dismantle the fuel tube parts, please carry out the below operations
1) Disconnect the cathode wire of battery
2) Release the fuel pressure inside tube
5. Do not twist the fuel tube during installation.
6. Carry out operations on the flat ground.
7. Make sure the fuel tube joint connected tightly and free from interference with other adjacent parts.
8. Do not tighten the jump ring of tube overly

9. Check and confirm if it had fuel leakage at each joints by the below steps after the fuel tube connected

1) Turn the ignition key to ON gear and then check if it had leakage at each joint

2) Starting engine and ratcheting up the RPM to check if it had leakage at each joint

10. Prepare the wiping cloth and container in advance in case of fuel leakage

11. Avoid the open fire and spark

12. Please stay away from the fire source for the dismounted parts

13. Keep the junction place clean and cover it by plastic bag keeping from impurities getting inside.

14. Only use the genuine fuel system parts provided by JAC.

(V) Special tool

SN	Tool	Diagram	Description
1	Fuel pressure gauge		To measure fuel pressure
2	Lock nut fixing plate		Dismount the locknut of fuel pump

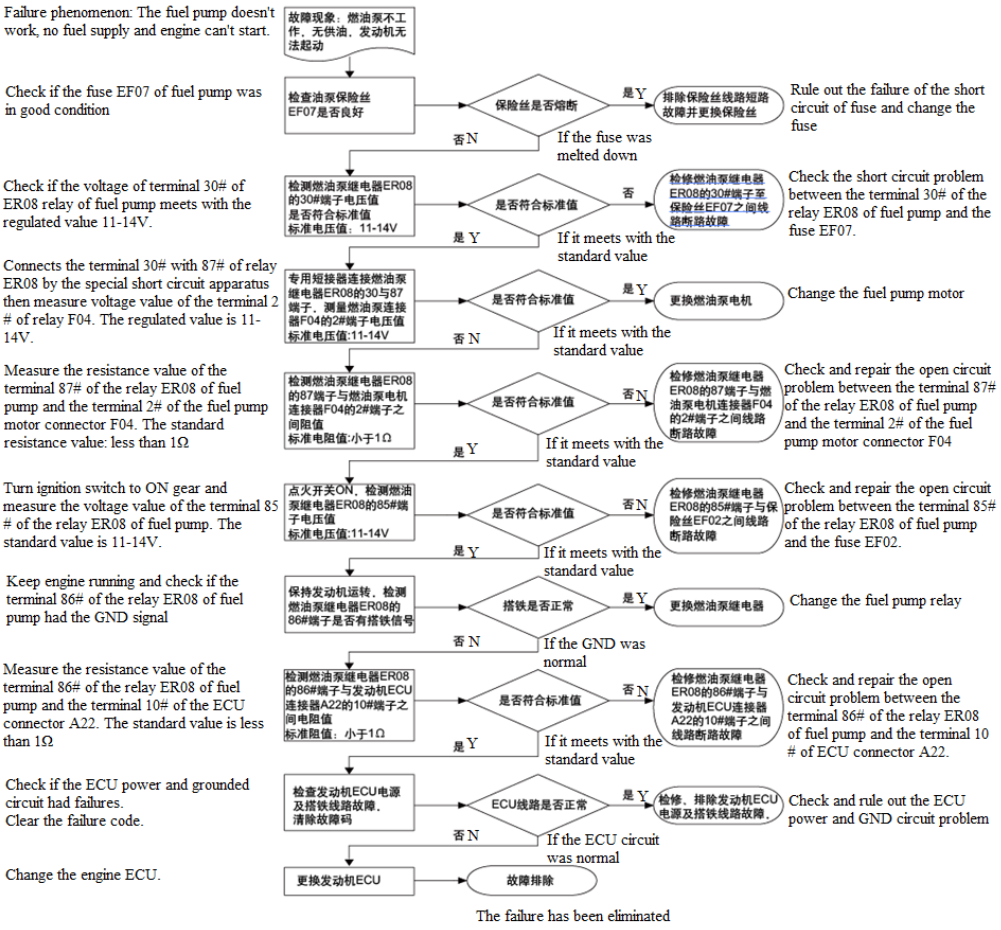
II. Failure diagnosis

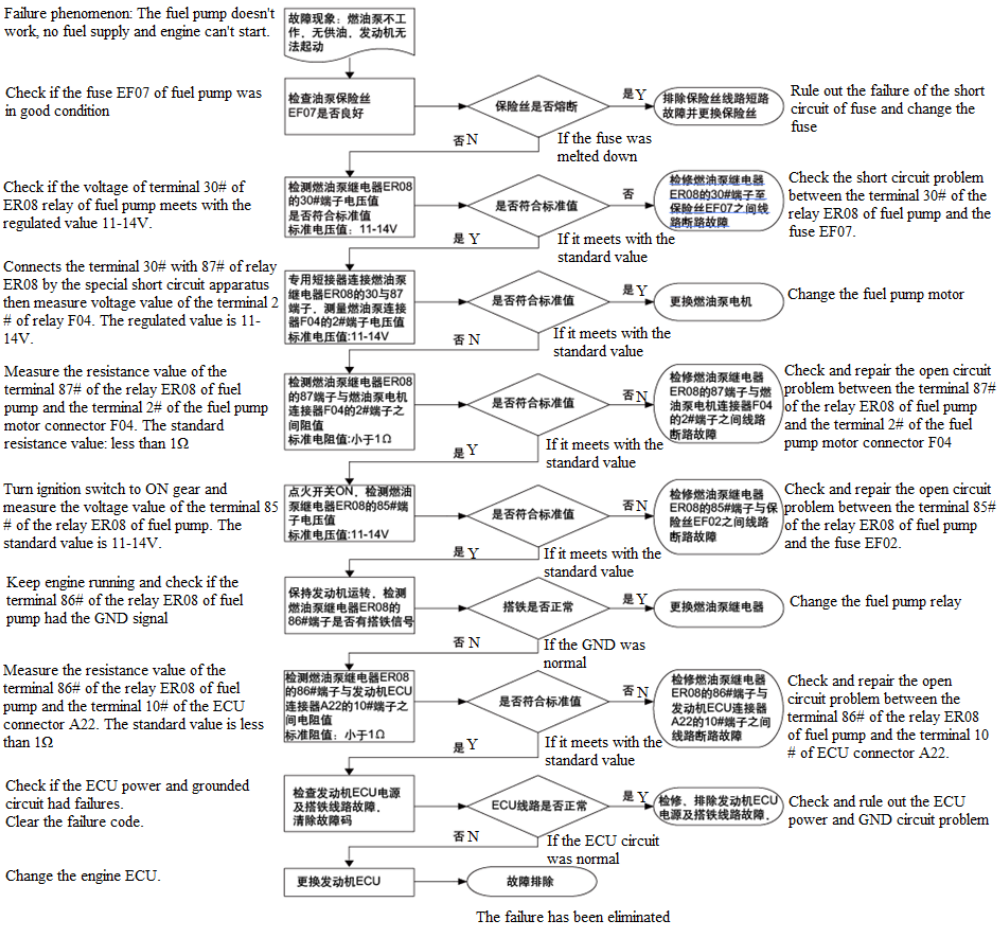
(I) Diagnosis analysis table

SN	Failure phenomenon	Failure cause analysis	Solution
1	Fuel supply system failure	Insufficient fuel supply by pump	Repair or replace
		Fuel tube and filter congestion	Clean
2	Insufficient power during running	Improper adjustment of acceleration pedal and throttle valve	1. Check if the throttle, ignition plug and cylinder head gasket have leakage
		The compressing pressure of cylinder deminution	2. Cylinder grinded
		Insufficient supply of fuel	Adjust or repair
		Insufficient air intake	Check the air intake system
		Exhaust congestion	Check the exhaust system and clear the carbon deposit
		Improper ignition plug clearance or ignition plug damaged	Adjust or repair

(II) Diagnosis procedures table

The fuel pump doesn't work




Failure phenomenon: The fuel pump doesn't work, no fuel supply and engine can't start.
故障现象：燃油泵不工作，无供油，发动机无法起动
Check if the fuse EF07 of fuel pump was in good condition
检查油泵保险丝EF07是否良好
保险丝是否熔断
是 Y
排除保险丝线路短路故障并更换保险丝
Rule out the failure of the short circuit of fuse and change the fuse
否 N
If the fuse was melted down
Check if the voltage of terminal 30# of ER08 relay of fuel pump meets with the regulated value 11-14V.
检测燃油泵继电器ER08的30#端子电压值是否符合标准值
标准电压值：11-14V
是否符合标准值
否
检修燃油泵继电器ER08的30#端子至保险丝EF07之间线路断路故障
Check the short circuit problem between the terminal 30# of the relay ER08 of fuel pump and the fuse EF07.
是 Y
If it meets with the standard value
Connects the terminal 30# with 87# of relay ER08 by the special short circuit apparatus then measure voltage value of the terminal 2 # of relay F04. The regulated value is 11-14V.
专用短接器连接燃油泵继电器ER08的30与87端子，测量燃油泵连接器F04的2#端子电压值
标准电压值:11-14V
是否符合标准值
是 Y
更换燃油泵电机
Change the fuel pump motor
否 N
If it meets with the standard value
Measure the resistance value of the terminal 87# of the relay ER08 of fuel pump and the terminal 2# of the fuel pump motor connector F04. The standard resistance value: less than 1Ω
检测燃油泵继电器ER08的87端子与燃油泵电机连接器F04的2#端子之间阻值
标准电阻值:小于1Ω
是否符合标准值
否 N
检修燃油泵继电器ER08的87端子与燃油泵电机连接器F04的2#端子之间线路断路故障
Check and repair the open circuit problem between the terminal 87# of the relay ER08 of fuel pump and the terminal 2# of the fuel pump motor connector F04
是 Y
If it meets with the standard value
Turn ignition switch to ON gear and measure the voltage value of the terminal 85 # of the relay ER08 of fuel pump. The standard value is 11-14V.
点火开关ON，检测燃油泵继电器ER08的85#端子电压值
标准电压值:11-14V
是否符合标准值
否 N
检修燃油泵继电器ER08的85#端子与保险丝EF02之间线路断路故障
Check and repair the open circuit problem between the terminal 85# of the relay ER08 of fuel pump and the fuse EF02.
是 Y
If it meets with the standard value
Keep engine running and check if the terminal 86# of the relay ER08 of fuel pump had the GND signal
保持发动机运转，检测燃油泵继电器ER08的86#端子是否有搭铁信号
搭铁是否正常
是 Y
更换燃油泵继电器
Change the fuel pump relay
否 N
If the GND was normal
Measure the resistance value of the terminal 86# of the relay ER08 of fuel pump and the terminal 10# of the ECU connector A22. The standard value is less than 1Ω
检测燃油泵继电器ER08的86#端子与发动机ECU连接器A22的10#端子之间电阻值
标准阻值：小于1Ω
是否符合标准值
否 N
检修燃油泵继电器ER08的86#端子与发动机ECU连接器A22的10#端子之间线路断路故障
Check and repair the open circuit problem between the terminal 86# of the relay ER08 of fuel pump and the terminal 10 # of ECU connector A22.
是 Y
If it meets with the standard value
Check if the ECU power and grounded circuit had failures.
Clear the failure code.
检查发动机ECU电源及搭铁线路故障，清除故障码
ECU线路是否正常
是 Y
检修，排除发动机ECU电源及搭铁线路故障，
Check and rule out the ECU power and GND circuit problem
否 N
If the ECU circuit was normal
Change the engine ECU.
更换发动机ECU
故障排除
The failure has been eliminated

III. Release the fuel system pressure

(I) Release the fuel system pressure
Attention: After releasing the fuel system pressure, please use the towel to wrap the joints when detaching it in case of the surplus fuel overflew.

1. Release the fuel system pressure

1) Turn the ignition switch to OFF gear and detach the cathode wire of battery.

2) Dismantle the relay of fuel pump.

Attention: It may appear the failure code when dismantling the relay of fuel pump, please use the diagnosis device to clear the code after releasing the fuel system pressure.

3) Connect the cathode wire of battery.

4) Start up engine and keep it at idling state, turn the ignition switch to OFF gear when the engine is OFF automatically.

5) Disconnect the cathode wire of battery then install the relay of fuel pump.

6) Connect the cathode wire of battery.

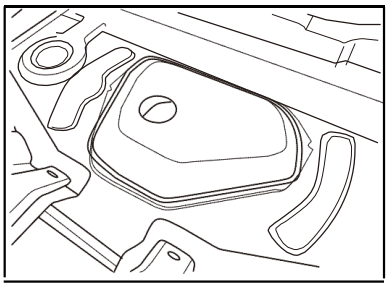
7) Use the diagnosis device to clear the failure code relative with the relay of fuel pump (if necessary).

IV. Fuel tank assy

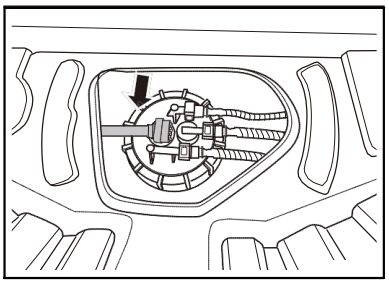
(I) Disassembly

1. Open the engine hood
2. Release the fuel system pressure
3. Disconnect the cathode wire of battery.
4. Dismantle the rear seats cushion assy
5. Dismantle the fuel tank assy

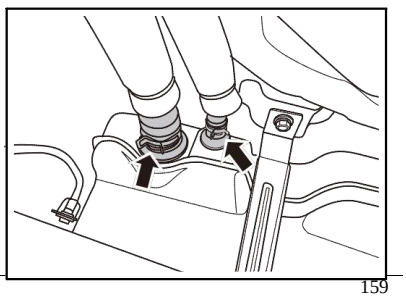
1) Pry up the access cap of fuel tank by the slot screwdriver.



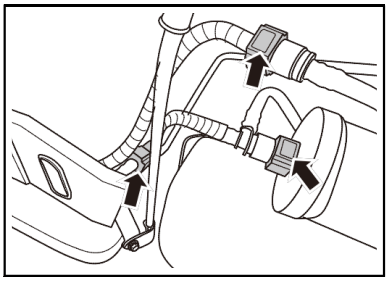
2) Disconnect the wires connector on fuel pump



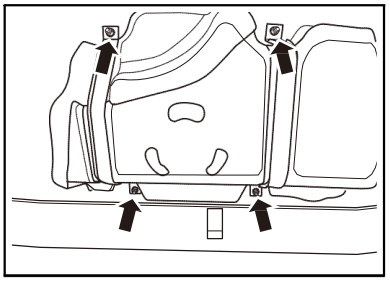
3) Loosen the clamp of fuel filling tube and fuel tank then pull out the filling tube.



4) Disconnect the fuel tank tube with the tube installed in fender.



5) Screw off the fixed bolt of the front and rear strap of fuel tank.
6) Lower down the fuel tank slowly as support the tank by tray

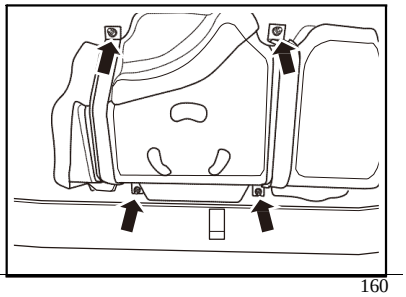


(II) Check

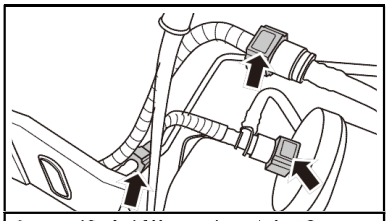
1. Check the fuel tank assy
1) Check if it has damage or severe deformation of fuel tank surface.

(III) Installation

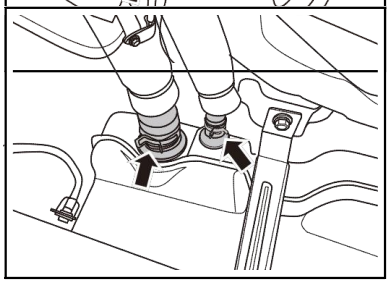
1. Install the fuel tank assy
1) Hoist the tank to the installation position and install the front and rear strap and tighten the bolts for fixing the tank.



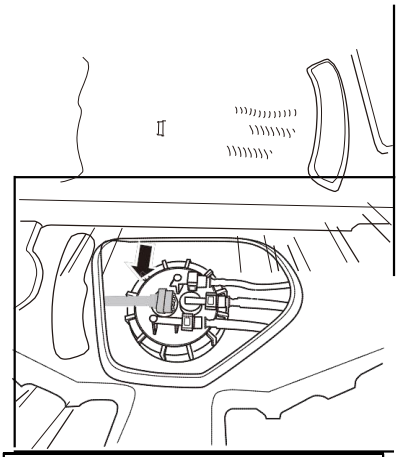
2) Connect the fuel tank tube with the tube inside fender



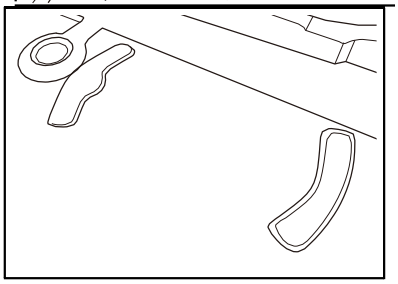
3) Connect the fuel filling tube with tank and tighten the clamp



4) Connect the wires connector



5) Install the access cap of fuel tank

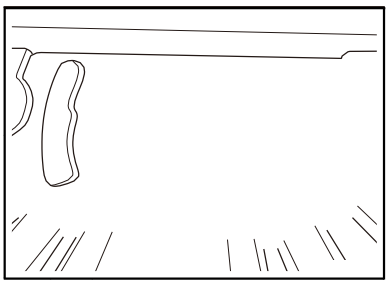


2. Install the rear seat cushion assy
3. Descend the car
4. Connect the cathode wire of battery
5. Close the engine hood.

V. Fuel evaporation nylon tube assy

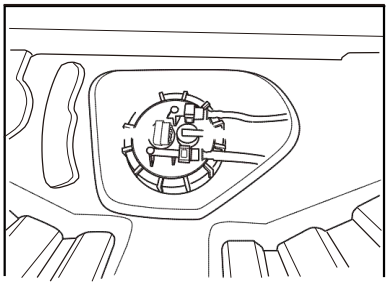
(I) Disassembly

1. Open the engine hood
2. Release the fuel system pressure
3. Disconnect the cathode wire of battery.
4. Dismantle the rear seats cushion assy
5. Dismantle the fuel tank assy
6. Dismantle the fuel evaporation nylon tube assy
1) Disconnect the fuel evaporation nylon tube assy with the fuel tank.
2) Take down the fuel evaporation nylon tube assy



(II) Installation

1. Install the fuel evaporation nylon tube assy
1) Connect the fuel evaporation nylon tube assy with the fuel tank



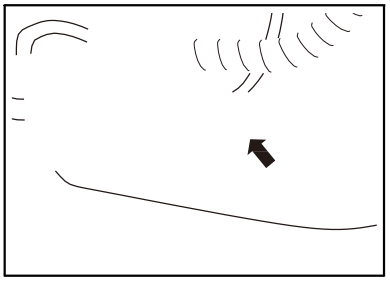
2. Install the fuel tank assy
3. Install the rear seat cushion assy
4. Connect the cathode wire of battery
5. Close the engine hood

VI. Fuel inlet nylon tube assy

(I) Disassembly

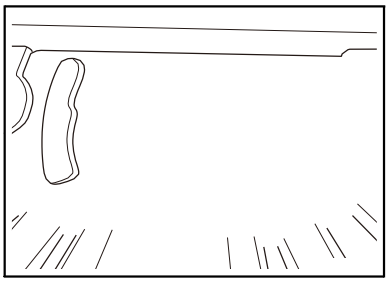
1. Open the engine hood
2. Release the fuel system pressure
3. Disconnect the cathode wire of battery.
4. Dismantle the rear seats cushion assy
5. Dismantle the fuel tank assy
6. Dismantle the fuel inlet nylon tube assy

1). Disconnect the fuel inlet nylon tube assy with fuel filter



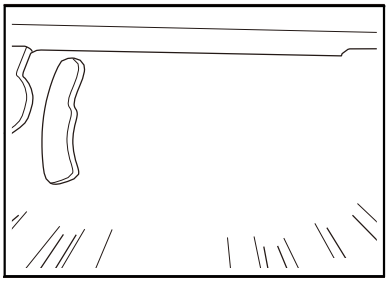
2) Disconnect the fuel inlet nylon tube assy with fuel tank.

3) Take down fuel inlet nylon tube assy.

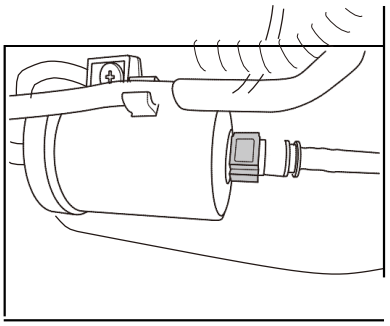


(II) Installation

1. Install fuel inlet nylon tube assy
1) Connect the fuel inlet nylon tube with fuel tank



2) Connect the fuel inlet nylon tube with fuel filter

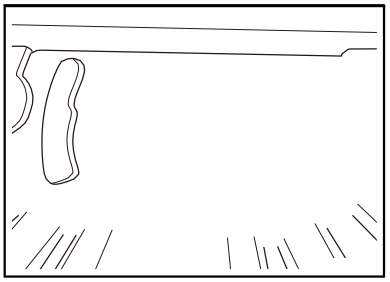


2. Install the fuel tank assy
3. Install the rear seat cushion assy
4. Connect the cathode wire of battery
5. Close the engine hood

VII. Fuel return nylon tube assy

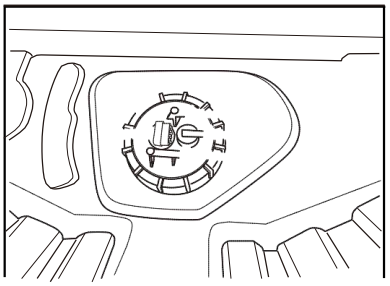
(I) Disassembly

1. Open the engine hood
2. Release the fuel system pressure
3. Disconnect the cathode wire of battery.
4. Dismantle the rear seats cushion assy
5. Dismantle the fuel tank assy
6. Dismantle the fuel return nylon tube assy
1) Disconnect the fuel return nylon tube with fuel tank
2) Take down the fuel return nylon tube assy.



(II) Installation

1. Install fuel return nylon tube assy
1) Connect the fuel return nylon tube with fuel tank assy



2. Install the fuel

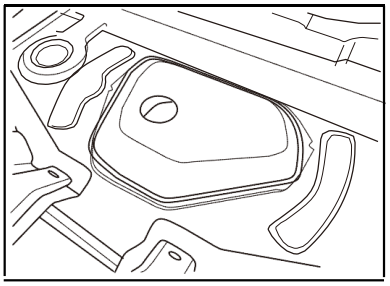
tank assy
3. Install the rear seat cushion assy
4. Connect the cathode wire of
battery
5. Close the engine hood

VIII. Fuel delivery pump assy

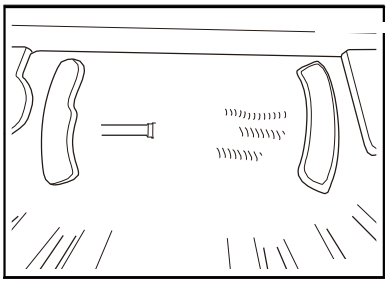
(I) Disassembly

1. Open the engine hood
2. Release the fuel system pressure
3. Disconnect the cathode wire of battery.
4. Dismantle the rear seats cushion assy
5. Dismantle the fuel delivery pump assy

1) Pry up the access cap of fuel tank by the slot screwdriver.

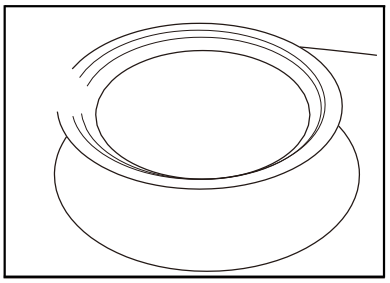


2) Disconnect the wires connector of fuel delivery pump
Attention: Do not use any tool to disconnect the joint
Attention: Cover the junction place by plastic bag in case of other impurities getting inside.

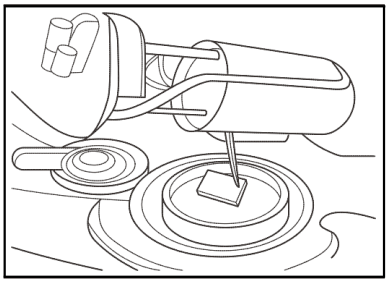


3) Loosen the snap ring of fuel pump by the special tool

4) Take down the flang sealing ring of fuel pump



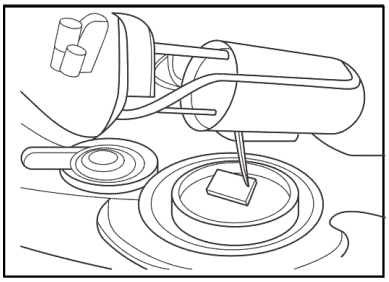
5) Take out the fuel pump
Attention: Please maintain at the skew position when take out the fuel pump so as to avoid damaging the fuel level sensor.



(II) Check

1. Check the fuel delivery pump assy
1). Check if it has damage or fuel particles, if has, clean or change it.
2). Resistance check.Connect the 2 pins at the right side of connector on pump then measure the resistance value of the fuel level sensor at the lowest and highest condition, the lowest resistance value is 200Ω±5Ω and the highest resistance value is 25Ω±3Ω.
3). Do not keep running for long time to avoid pump core damage.

2. Check Y sealing ring
1) Check if it has rupture or defects.
3. Check the fixed snap ring of pump
1). Check if it has deformation, crack, defects, damage and check if the mounting thread has damage.
4. Check the fuel level sensor
1). Check if the floater has deformation and if its surface has dirts

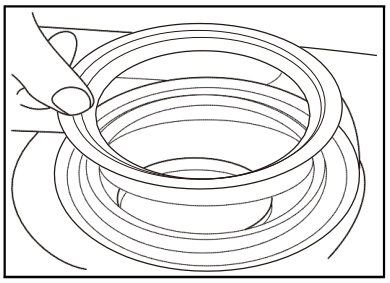


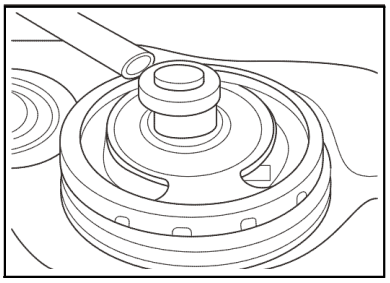
(III) Installation

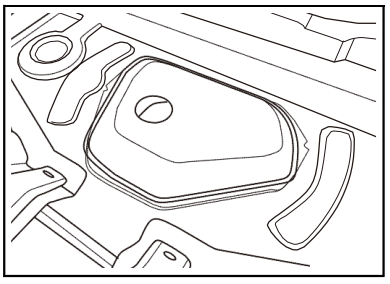
1. Install
fuel delivery pump assy
1) Put the pump inside fuel tank
Attention: Put in the pump at a skew position and make sure the
Assembly direction is correct.

2) Install the flange sealing ring of fuel pump
Attention: The sealing ring needs to be matched with fuel tank completely and without turnup.

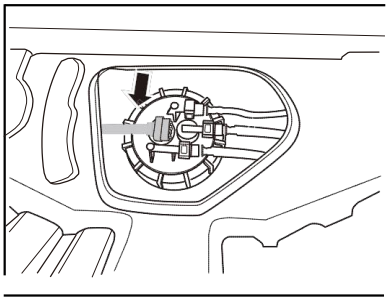
3). Install the fixed snap ring of fuel pump
Tighten torque: 75N.m±5N ṁ
Attention: Please pre-tighten and then screw it tightly







4). Connect the pump wires connector
Attention: Make sure the joint has beenconnected tightly by pulling the tube forcibly



5) Install the access cap of fuel tank

. Install the rear seat cushion assy
3. Connect the cathode wire of battery
4. Close the engine hood

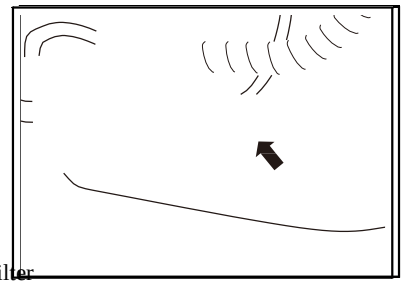
IX. Fuel filter assy

(I) Disassembly

1. Open the engine hood
2. Disconnect the cathode wire of battery
3. Release the fuel system pressure
4. Dismantle the fuel filter assy

1) Disconnect the fuel return nylon tube with the fuel filter.

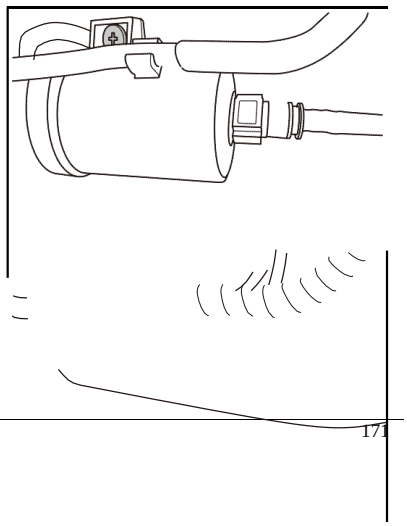
Attention: Use the towel to wrap the fuel filter to avoid the left fuel spill-out.



2) Disconnect the fuel inlet nylon tube with the fuel filter

3). Screw off the fixed bolts of fuel filter

4). Take out the filter after opening the cover.



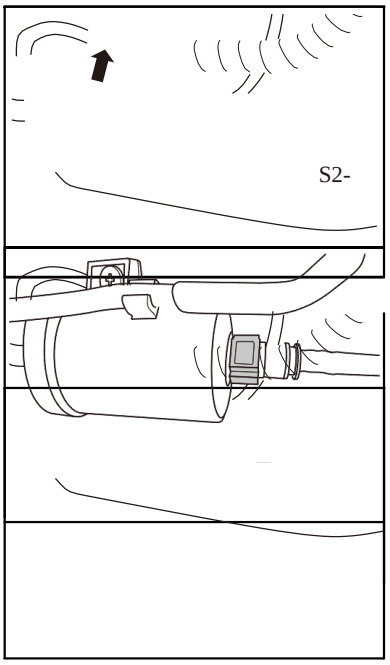
(II) Check

1. Check the fuel filter assy

1). Check if the filter surface has scratch or severe deformation.

(III) Installation

1. Install the fuel filter assy
1) Put the filter into the cover
Attention: Make sure the installation direction is correct; put the arrow toward the wider open end of the cover.
2) Screw in the fixed bolts of the fuel filter.



3) Connect the filter with the fuel inlet nylon tube

4). Connect the filter with fuel return nylon tube

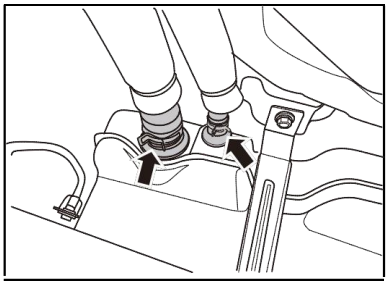
2. Connect the cathode wire of battery
3. Close the engine hood

X. Feul filling tube assy

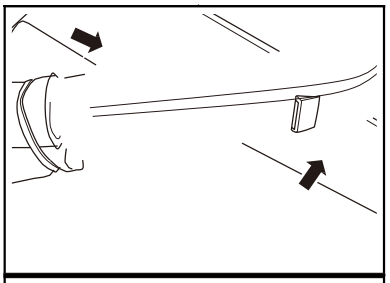
(I) Disassembly

1. Open the engine hood.
2. Disconnect the cathode wire of battery
3. Release the fuel system pressure
4. Dismantle the rear wheel cover
5. Dismantle the fuel filling tube assy

1) Disconnect the fuel filling tube with fuel tank.



2) Screw off the 2 mounting bolts of the fuel filiing tube fender and detach the fender from the vehicle body



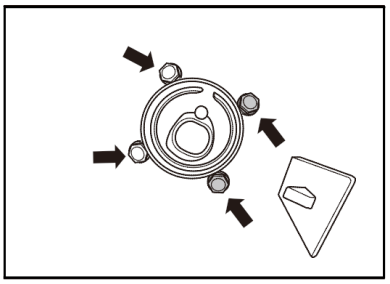
3) Open the filling port cover and screw off the fuel filling cap then screw off the 4 mounting bolts for taking out the fuel filling tube.

(II) Check

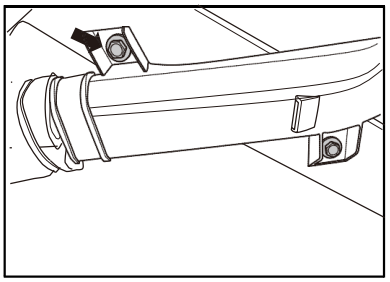
1. Check the fuel filling tube assy
1) Check if the fender or tube has damage, if has, please replace it

(III) Installation

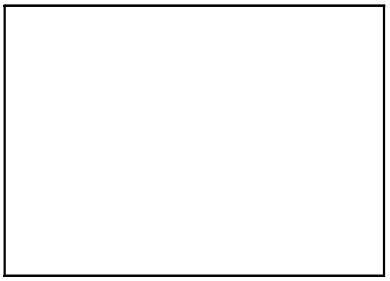
1. Install fuel filling tube assy
1). Screw in the 4 fixed bolts of fuel filling cap
Tighten torque: 4~6Nm.



2). Hoist the car
3). Screw in the 2 fixed bolts of the fender.
Tighten torque: 8~12Nm.



4). Connect the fuel filling tube with the tank and tighten the clamp

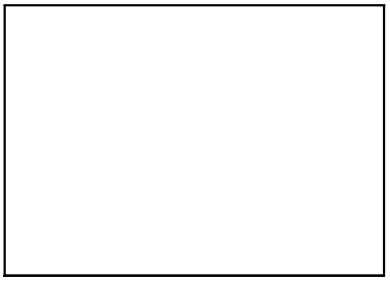


2. Install the rear wheel cover
3. Connect the cathode wire of battery
4. Close the engine hood

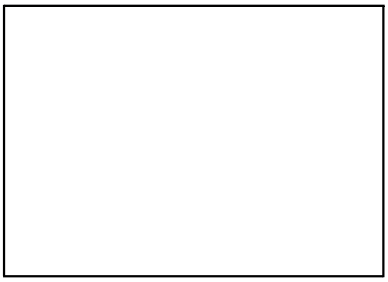
XI. Fuel tube assy

(I) Disassembly

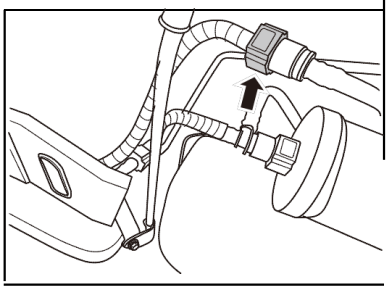
1. Open the engine hood
2. Disconnect the cathode wire of battery
3. Dismantle the tubes fender
1). Pry up the dent to detach the fender from the bottom of vehicle then take the fender down.



4. Dismantle fuel tubes assy I
1). Disconnect the fuel tubes assy I from the carbon tank.
2). Detch the fuel tubes assy I from the fixed buckle.

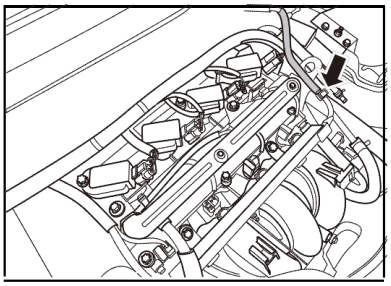


3). Disconnect the fuel tubes I with the fuel evaporation nylon tube
4). Take down the fuel tubes assy I



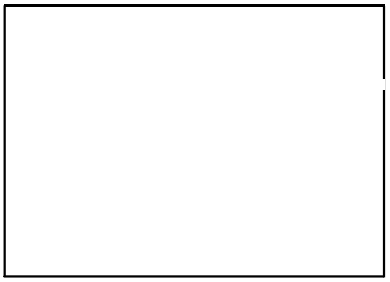
5. Disassemble fuel tubes assy II

1). Disconnect the fuel tubes assy II with the fuel pressure guiding rail components



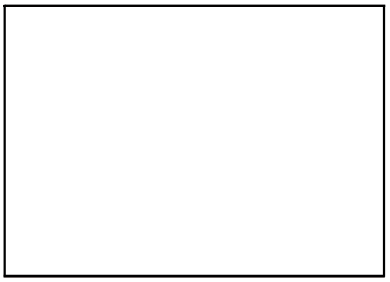
2). Disconnect the fuel tubes assy II with the fuel return nylon tube assy

3). Take down the fuel tubes assy II.



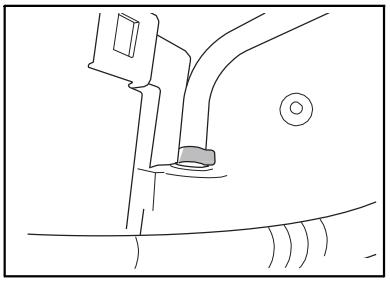
6. Disassemble the fuel tubes assy III

1). Disconnect the fuel tubes assy III with the carbon tank.



2). Disconnect the fuel tubes assy III with the solenoid valve of carbon tank.

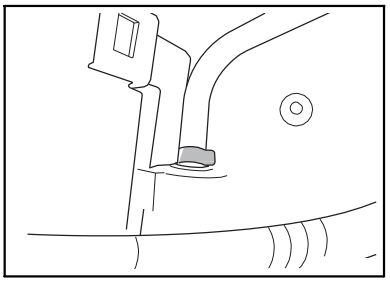
3). Take down the fuel tubes assy III.



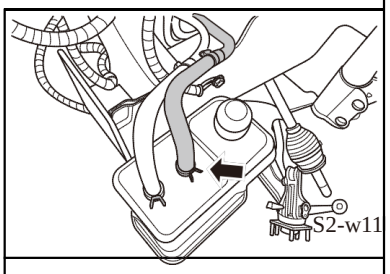
(II) Installation

1. Install the fuel tubes assy III

1). Connect the fuel tubes assy III with the solenoid valbe of carbon tank.



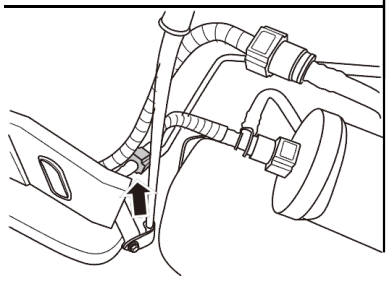
2). Put the tubes on the fixed buckle then connect the fuel tubes assy III with the carbon tank.



2. Install the fuel tubes assy II

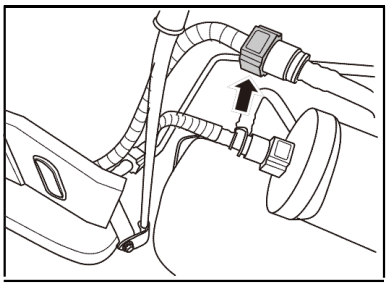
1). Put in the fixed buckles and install to the bottom of vehicle body.

2). Connect the fuel tubes assy II with the fuel return nylon tube assy.



3). Connect the fuel tubes assy II with the fuel pressure guiding rail components.

3. Install the fuel tubes assy I
   1). Connect the fuel tubes assy I with the fuel evaporation nylon tube assy.



   2). Put in the fixed buckles and installed to the bottom of vehicle.
   3). Connect the fuel tubes assy I with the carbon tank.

4. Install the tubes fender
   1). Install the fuel tubes assy on the fender
   2). Install the fender to the bottom of vehicle.

5. Connect the cathode wire of battery
6. Close the engine hood

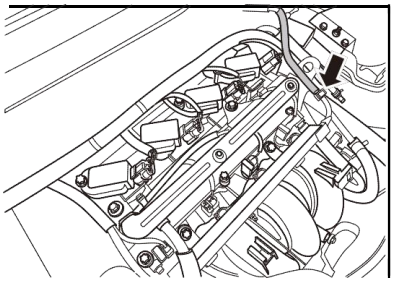
VII. Fuel pressure guiding rail components

(I) Disassembly

1. Open the engine hood
2. Disconnect the cathode wire
3. Release the fuel system pressure
4. Dismantle the air filter assy
5. Dismantle the fuel pressure guiding rail components

1). Disconnect the fuel inlet tube with the guiding rail components

Attention: Hold pressing down the safety device at the mouth of fuel inlet tube then pull out the tube.



2). Disconnect the wires connector of the 4 injectors

Attention: Pull up the gray self-lock device and hold it then it can disconnect the connector.

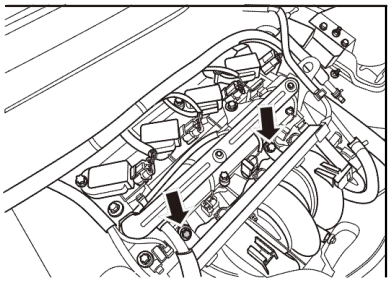
3). Screw off the 2 compression bolts
4). Take down the guiding rail components.

(II). Check

1. Check the fuel pressure guiding rail components
   1). Measure the magnetic coil resistance by DMM, the standard value: 11~16Ω.
   2). Check if the injector has carbon deposition.

(III) Installation

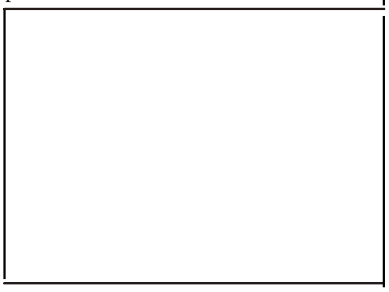
1. Install the fuel pressure guiding rail components
   1). Install the fuel pressure guiding rail components and tighten the bolts



2). Connect the wires connector of injector.



3). Connect the fuel inlet tube with the guiding rail components



2. Install the air filter assy
3. Connect the cathode wire of battery
4. Close the engine hood

Engine ignition system

I. Overview

(I) Structure overview

The ignition system consists of ignition switch, ECM and ignition coil, 3 components. The sensors related with ignition control are included with crankshaft position sensor, air inlet temp& pressure sensor, water temp sensor, throttle position sensor. The function of the ignition control system is to control the ignition advance angle of engine through the ignition coil; this is also one of the major functions of engine electric control system.

The ECM will calculate and choose the best suitable ignition angle for the current condition based on the comprehensive signals like engine rotation speed, throttle openness, water temperature, air inlet temperature& pressure and knocking received from the sensors so that to achieve the fuel economy, power performance and low emission as well as to prevent from knocking. The close angle refers to the rotation angle of crankshaft or camshaft during the switch-on period of the ignition coil. For the inductive energy storage ignition system, the inductive voltage generated by the ignition coil is determined by the current flew through coil at the instant moment that the primary coil switches off, the bigger current, the bigger inductive voltage. Due to the inductive effect of coil, the current flew through coil is with exponential increase under the consistent voltage of power since the switch-on of primary coil and gradually goes to the saturation state. As the close-angle stays unchanged, the switch-on time of primary coil decreases gradually with the increase of engine rotation speed. In order to meet the requirement of ignition voltage and energy, ECM will control the close-angle automatically according to the RPM of engine; it will increase the close-angle when the RPM goes up to guarantee the enough switch-on time of primary coil for the close to saturation current and vice versa.

(II) System theory

Ignition
switch
control

The engine rotation speed sensor is magnetic induction type. The signal plate attaches to the flywheel, so when the engine is running, the senser emits the corresponding alternating signal that is transmitted to ECM. Then ECM calculates the crank angle and determines the top dead center of piston, which will directly affect the preciseness of ignition advance angle control. So this one is a

very important input signal and the ignition system is not able to work when the ECM fails to receive this signal.

(III) Technical and service data

Service data

Ignition wire	Primary coil resistance	0.77～0.95Ω
Spark	Ignition plug clearance	0.7～0.8mm

(IV) Torque data

Important components torque table

	Item	Torque (N m)	Remarks
1	Ignition plug	25～30	M1

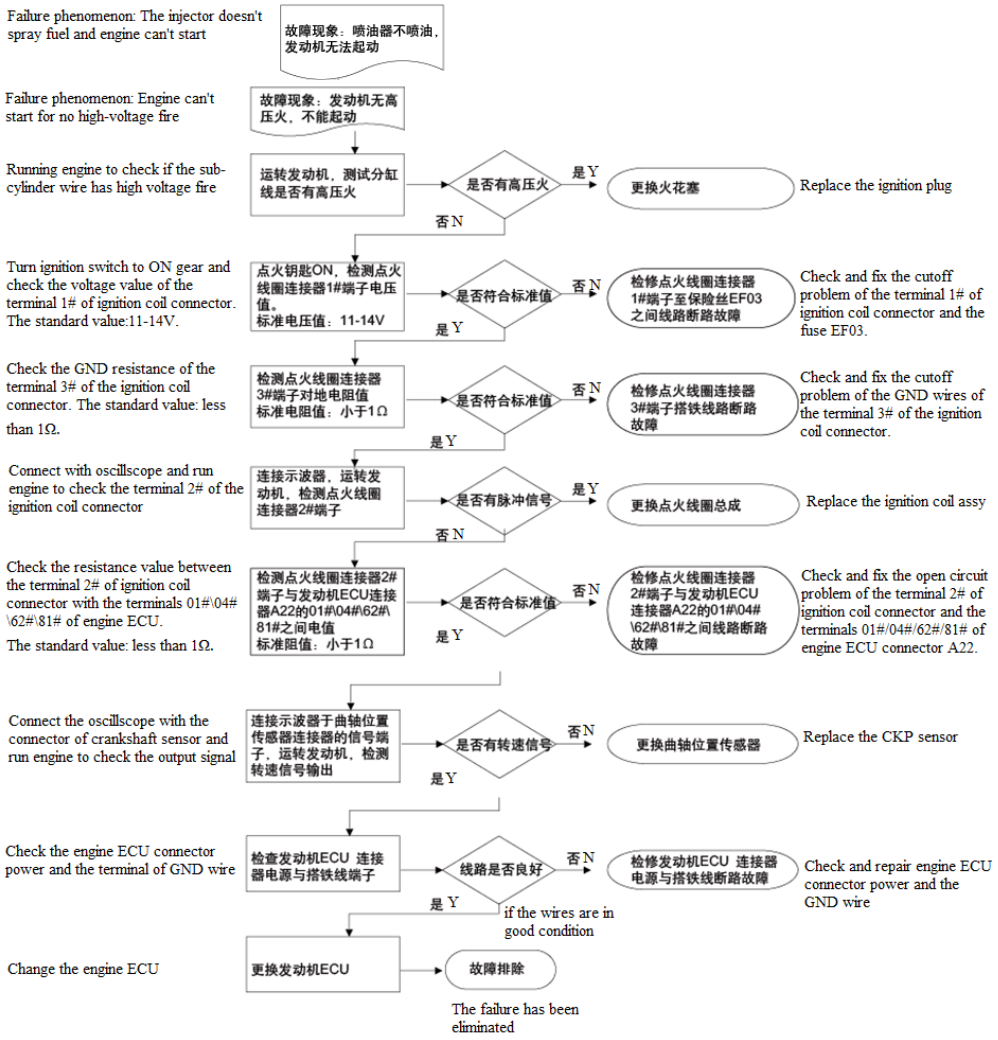
II. Failure diagnosis

(I) Diagnosis analysis table

SN	Failure phenomenon	Failure causes analysis	Solution	Remarks
1	Engine can't start or start difficultly	Ignition coil or ignition switch failure	Check or replace the ignition coil or ignition switch	
		Ignition plug failure	Check or replace the ignition plug	
		High voltage wire breaks off or unconnected	Check the high voltage wire	
2	Unstable idling	High voltage wire or ignition plug failure	Check or replace the high voltage wire or ignition plug	
		Ignition coil failure	Check or replace the ignition coil	
3	Engine in viberation or lack of power in acceleration	High voltage wire failure	Check or replace the high voltage wire	
		Ignition plug failure	Check or replace the ignition plug	
4	Poor fuel economy	Ignition plug failure	Check or replace the ignition plug	

(II) Diagnosis procedures table

Withou high voltage ignition, engine can't start



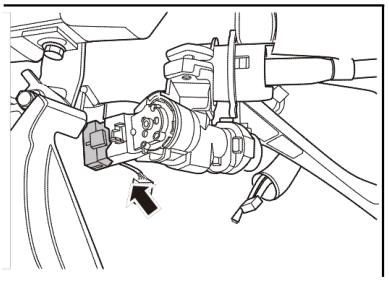
The injector doesn't work

III. Ignition lock assy

(I) Disassembly

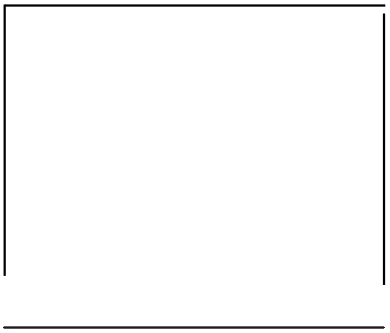
1. Open the engine hood
2. Disconnect the cathode wire of battery
3. Dismantle the driver's airbag assy
4. Dismantle the steering wheel assy
5. Dismanlte the upper and down shell of steering column
6. Dismantle the clock spring
7. Dismantle the combination switch
8. Dismantle the anti-theft coil
9. Dismantle the ignition lock assy

1). Disconnect the wires connector of the ignition lock assy



2). Screw off the 2 nuts of ignition switch assy

3). Take down the ignition lock and its base



(II) Installation

1. Install the ignition lock assy
   1). Screw into the 2 nuts of ignition lock and its base tightly

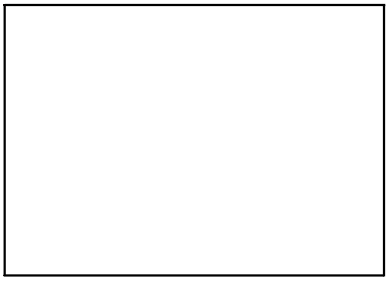
2). Connect the wires connector of ignition lock assy.

2. Install anti-theft coil
3. Install combination switch
4. Install clock spring
5. Install the upper and down shell of steering column
6. Install steering wheel assy
7. Install the driver’s airbag
8. Connect the cathode wires of battery
9. Close the engine hood

IV. Ignition coil

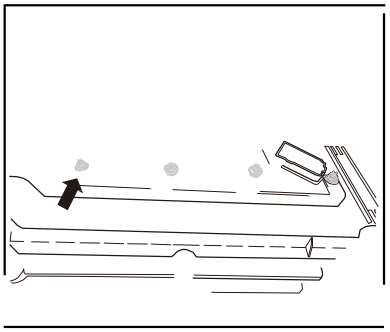
(I.) Disassembly

1. Open the enginie hood
2. Disconnect the cathode wires of battery
3. Dismantle the ignition coil
   1). Disconnect the wires connector of ignition coil



   2). Screw off the 4 fixed bolts of ignition coil and the wires bracket in engine compartment

   3). Take down the ignition coil

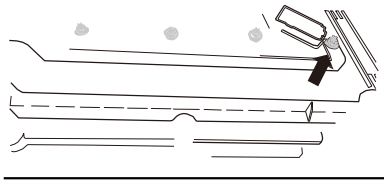


(II.) Check

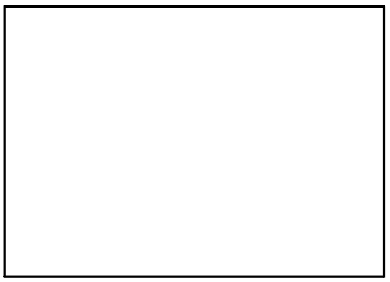
1. Ignition coil
   Check the primary coil resistance between terminals, the value shall be 0.77~0.95Ω

(III) Installation

1. Install ignition coil
   1). Smear little insulation grease on the head of ignition coil and install ignition coil.
   2). Screw the fixed bolts of the ignition coil tightly
   Tighten torque: (8±2)N m



3). Connect the ignition coil wires connector



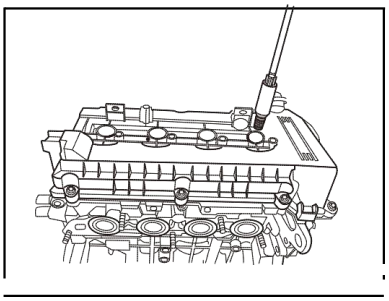
2. Connect the cathode wires of battery
3. Close the engine hood

V. Ignition plug

(I) Disassembly

1. Open the engine hood
2. Disconnect the cathode wires of battery
3. Dismantle the ignition coil
4. Dismantle the ignition plug

1). Dismantle the ignition plug by the sleeve.



(II) Check

1. Check the ignition plug

a. Check if the thread or insulation body of the ignition plug has damage or rupture

b. Check if the ignition plug has carbod deposition or fuel/engine oil sediment. The normal porcelain small head of ignition plug is between the white/slight yellow and gray or brown.

c. Check if the electrode of ignition plug has been damaged

d. Check the ignition plug clearance by the ruler. The standard value: 0.7~0.8mm.

e. Check the jump spark ability of ignition plug. Put the ignition plug on cylinder head and attach the high voltage wires to the binding posts of the ignition plug, if it gives out the “pa-pa” sound between the posts, it means the ignition plug works well and vice versa.

(III) Installation

1. Install ignition plug

1). Insert the ignition plug and tighten to the regulated torque by the special tool.

Tighten torque: 25~30Nm

2. Install the ignition coil
3. Connect the cathode wires of battery
4. Close the engine hood.

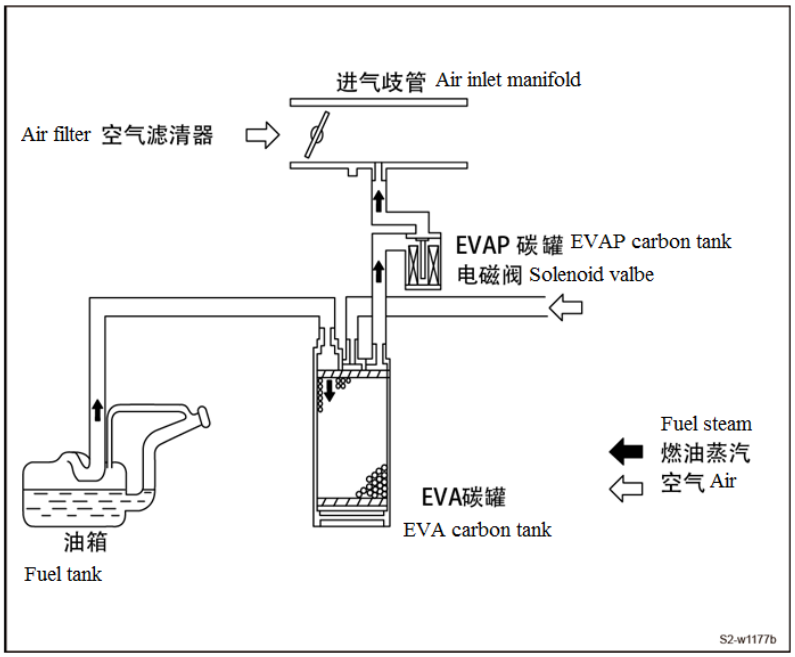
Engine auxiliary exhausts system

I. Overview

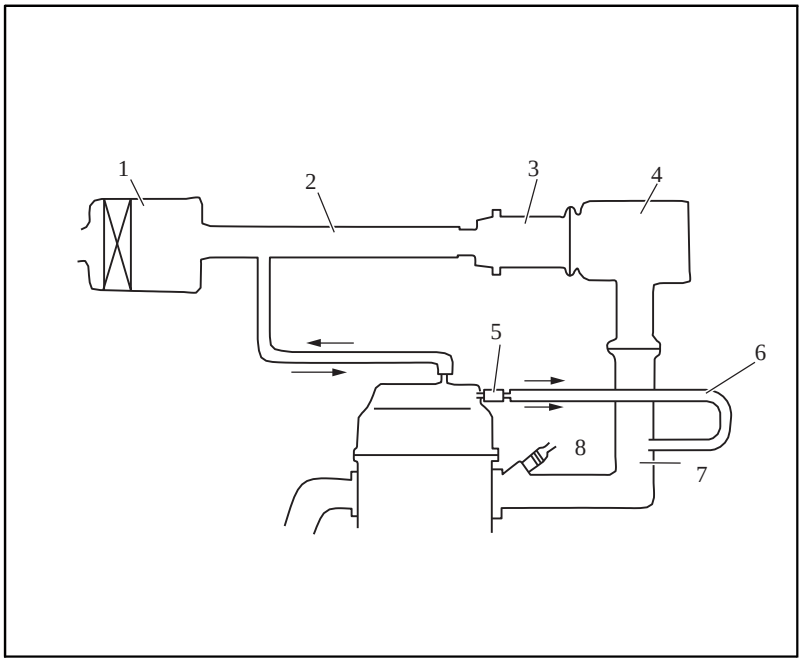
(I.) Structure overview

System diagram

Fuel evaporation and exhausts system



Crankcase mandatory ventilation system



1. Air filter
2. Air inlet tube
3. Throttle valve body
4. Purification tank
5. PVC valve
6 Connection tube of PVC valve
7. Air inlet manifold
8. Injector

System description

Fuel evaporation and exhausts control system

The fuel steam recycling device is to recycle the gasoline steam inside the fuel tank and transfer to air inlet tube of engine where mix with the fresh air and enter into cylinder for burning, by that prevent gasoline steam from exhausting into air and causing pollution.

The fuel steam recycling device consists of the active carbon tank, solenoid valve of active carbon tank, one-way valve and the relative steam tubes and vacuum tubes.

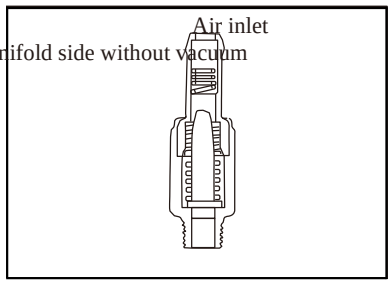
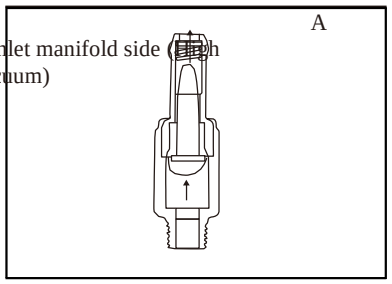
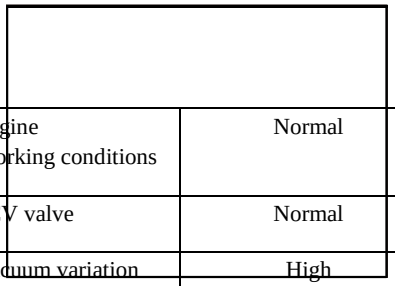
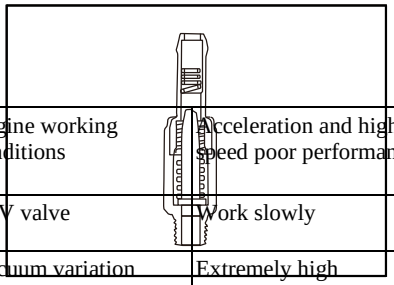
Crankcase mandatory ventilation system

The crankcase mandatory ventilation system is to send the cylinder blowby back to air inlet manifold.

The carankcase mandatory ventilation valve (PCV) sends the cylinder blowby back to the air inlet manifold. The air inlet manifold sucks into the crankcase blowby through PCV valve when the throttle is partially opened. While the normal ventilator capacity of PCV valve is enough to suck in the blow by and little ventilation air completely. The ventilation air is sucked into crankcase through air inlet tube. During this process, the air comes through the connection tube of air inlet tube and rocker arm cover. When the throttle is fully open, the vacuum degree of air inlet manifold is not enough for opening PCV valve and sucking into crank blowby. The air will flow at a reverse direction through connection tube. The PCV valve is not capable on the serious crank blowby cars because part air flows into air inlet tube through connection tube under any circumstances.

(II) System theory

PCV valve working theory

Air inlet manifold side without vacuum		Air inlet manifold side (with vacuum)	
			
Engine Working conditions	Not running	Engine working conditions	Idling or decelaration
PCV valve	Not working	PCV valve	Fully open
Vacuum variation	Restricted		Slightly
Air inlet manifold side with suitable vacuum		Air inlet manifold side without vacuum	
			
Engine Working conditions	Normal	Engine working conditions	Acceleration and high speed poor performance
PCV valve	Normal	PCV valve	Work slowly
Vacuum variation	High variation	Vacuum variation	Extremely high variation

(III) Torque parameters

Key components torque table

SN	Item	Torque (N·m)	Remarks
1	M6×20 E10bolt	8.4±0.6	M6×20 E10
2	M6×12 E10 bolt	8.4±0.6	M6×12 E10
3	M6×45 E10 bolt	8.4±0.6	M6×45 E10
4	M6×25 E10 bolt	8.4±0.6	M6×25 E10
5	M6×12 E8 bolt	8.4±0.6	M6×12 E8
6	Oxygen sensor	35±5	

Standard parts torque

SN	Item	Torque (N m)	Rem arks
1	M6	9～11	
2	M8	20～25	
3	M1	30～50	
4	M1	60～80	

(IV) Service attention matters

Regular attention matters

1. Discharging engine coolant attention matters
   1). after engine cooled down, then discharge the coolant.
2. Disconnect fuel tube attention matters
   1). Before startring, make sure no flammable objects in the working area.
   2). Release the fuel pressure before disconnection or disassembly.
   3). Insert a plug in the front opening after disconnecting the joint.
3. Disconnection and disassembly attention matters
   1). Work safely and follow the instructions and use the special tool according to the request.
   2). Be careful with matching face and sliding face protection.
   3). Use tape or something similar to seal the front opening of engine to prevent from impurities.
   4). Lable and sort out the parts in order and category for the trouble shooting and re-assembly.
   5). The principle for loosening bolts and nuts: Firstly loosen the one at the most outset then loosen the one at its diagonal end and goes one in this sequence. If it has the designated loose sequence, follow it.
4. Check, repair and replace attention matters
   1). Check the part completely before repairing or replacing. Please change the part if necessary.
5. Assembly attention matters
   1). Use the torque wrench to tighten nut and bolt.
   2). The principle for tightening bolt and nut: Firstly tighten the central one by multi steps at the same torque each time then tighten the ones at the inner and outer diagonal line. If it has designated sequence for tightening, please follow it.
   3). Replace with the new gasket, oil seal and O type ring.
   4). Flush and clean and dry eack parts completely. Check if the engine oil or coolant tubes have congestion.
   5). Do not damage the matching face or sliding face. Clean the dust or scraps completely. Smear the sliding face by engine oil before assembly.
   6). Release the tube air firstly for re-charging engine coolant.
   7).After repairing, running the engine and ratcheting up the RPM to check if the coolant, fuel, engine oil and air inlet and outlet had leakage.
6. Parts needed to be tightened at a certain angle

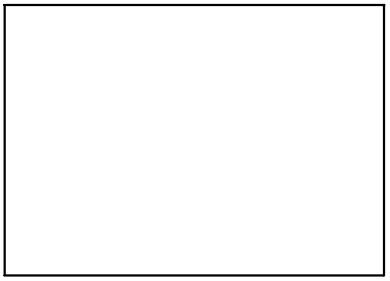
1). The below engine parts
- Cylinder head bolts
- Master bearing cap bolts
- Connecting rod cap nuts

2). Do not carry the final tighten at the requested torque
3). These parts torque requestion are applied for the pre-tightening.
4). Make sure the thread and base are clean and with engine oil smeared.

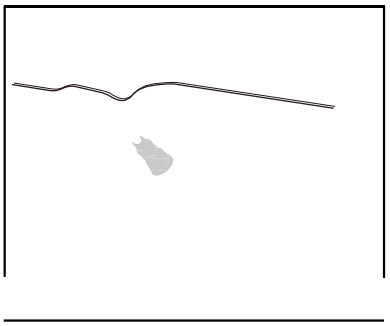
II. Front oxygen sensor

(I) Disassembly

1. Open the engine hood.
2. Disconnect the cathode wire of battery
3. Dismantle the front oxygen sensor.
   1). Disconnect the front oxygen sensor wires connector



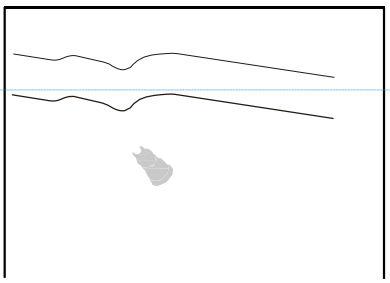
   2). Screw off the front oxygen sensor.



(II) Installation

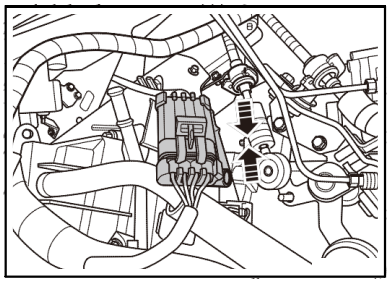
1. Install the front oxygen sensor
   1). Tighten the front oxygen sensor

Tighten torque: (35±5)N·m



批注 [MeMeX1]: March 9 target

2). Connect the front oxygen sensor wires connector.



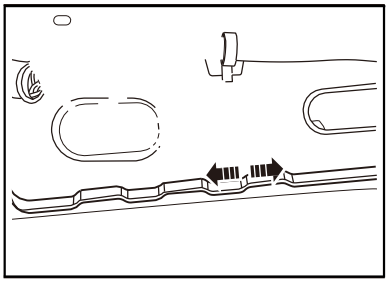
2. Connect the cathode wires of the battery
3. Close the engine hood.

III. Rear oxygen sensor

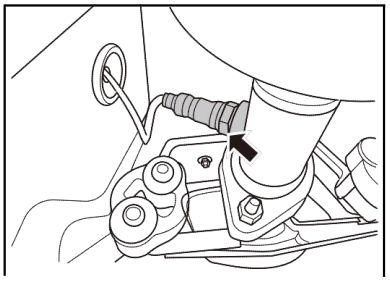
(I) Disassembly

1. Open the engine hood
2. Disconnect the cathode wires of battery.
3. Dismantle the rear oxygen sensor.

1). Disconnect the rear oxygen sensor wires connector.
2). Hoist up the car.



3). Dismantle the rear oxygen sensor.
4). Take out the rear oxygen sensor.



(II) Check

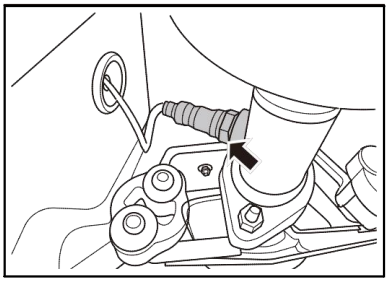
1. Check the heating resistance of rear oxygen sensor
   1). Turn the ignition switch to OFF gear and pull out the wires connector of oxygen sensor, then use the Ohm gear of DMM to measure the resistance of terminal C and D , the resistance value should be around 9.6Ω.
   2). Turn on the ignition switch and use the voltage gear of DMM to measure the voltage of heating

power, it should be 12V.

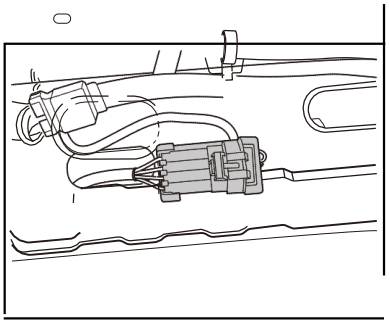
3). Check the wires on sensor were well connected and if it had open circuit or short circuit.

(III) Installation

1. Install the rear oxygen sensor
   1). Install and tighten the rear oxygen sensor.
   2). Lower down the car.



   3). Connect the wires connector of rear oxygen sensor.



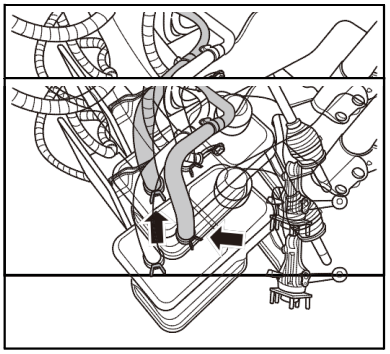
2. Connect the cathode wires of battery.
3. Close the engine hood.

IV. Carbon tank and its bracket

(I.) Disassembly

1. Open the engine hood.
2. Disconnect the cathode wire of battery.
3. Release the pressure of fuel system.
4. Dismantle the carbon tank and its bracket.

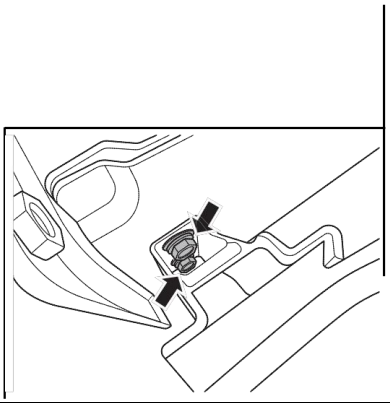
1). Disconnect the fuel tank tube I from carbon tank.



2). Disconnect the fuel tank tube III from carbon tank.

3). Screw off the 2 fixed bolts of carbon tank bracket and the left longeron of engine compartment.

4). Take down carbon tank and its bracket.

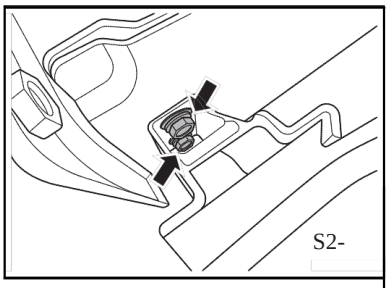


(II) Check

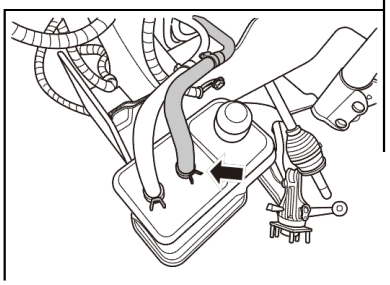
1. Check the carbon tank
   1). Visual check if the carbon tank has crack or damage.
   2). Check the sealingness and flowability of carbon tank according to the relative materials.

(III) Installation

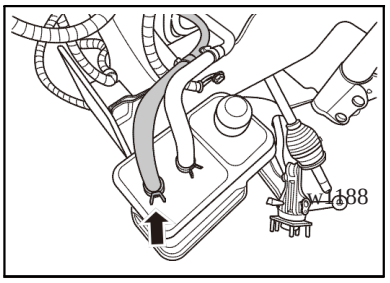
1. Install carbon tank and its bracket
   1). Install carbon tank and its bracket onto the left longeron of engine compartment and tighten the 2 bolts.



   2). Connect carbon tank and fuel tank tube III.



   30. Connect carbon tank and fuel tank tube I.

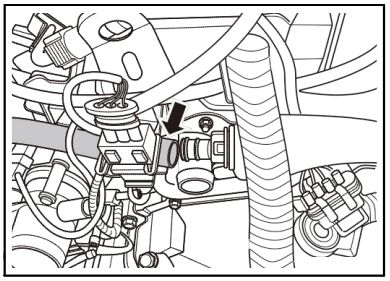


2. Connect the cathode wires of battery.
3. Close the engine hood.

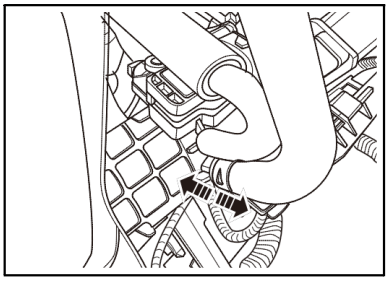
V. Carbon tank solenoid valve connection tube

(I) Disassembly

1. Close the engine hood.
2. Disconnect the cathode wires of battery.
3. Dismantle ait filter assy.
4. Dismantle the connection tube of carbon tank solenoid valve.
   1). Disconnect the tube from carbon tank solenoid valve.

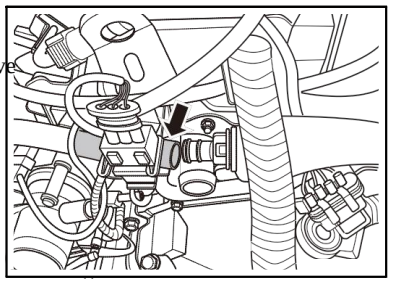


   2). Disconnect the tube of carbon tank solenoid valve with air inlet manifold.
   3). Take down the connection tube of carbon tank solenoid valve.

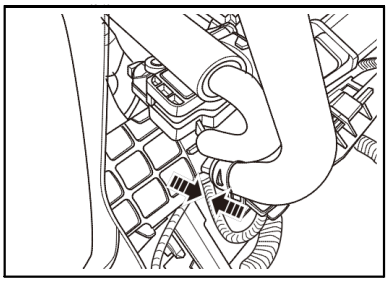


(II) Installation

1. Install the connection tube of carbon tank solenoid valve.
   1). Connect the tube with carbon tank solenoid valve.



2). Connect the tube of carbon tank solenoid valve with air inlet manifold.



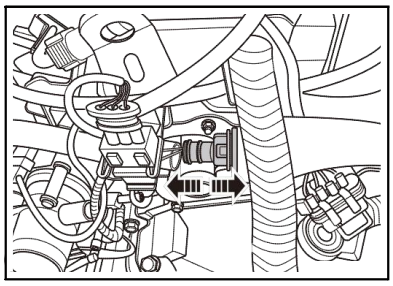
2. Install air filter assy
3. Connect the cathode wire of battery
4. Close the engine hood.

VI、Carbon Canister Electromagnetic Valve

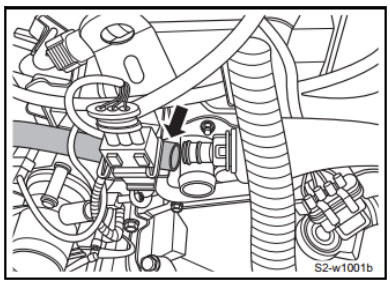
(I)Removal

1. Open engine compartment cover
2. Disconnect battery negative electrode Refer to “Disconnection and connection of battery electrode”
3. Remove carbon canister electromagnetic valve

1). Disconnect wiring harness connector of carbon canister electromagnetic valve;

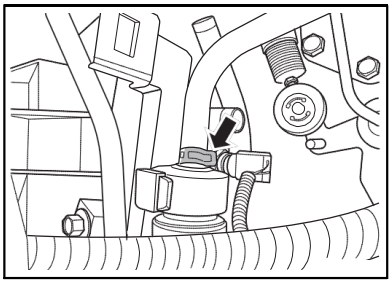


2). Disconnect connection of connecting hose of carbon canister electromagnetic valve and carbon canister electromagnetic valve;



3). Disconnect connection of carbon canister electromagnetic valve and fuel tank pipe Ⅲ;

4). Take down carbon canister electromagnetic valve from bracket of carbon canister electromagnetic valve;

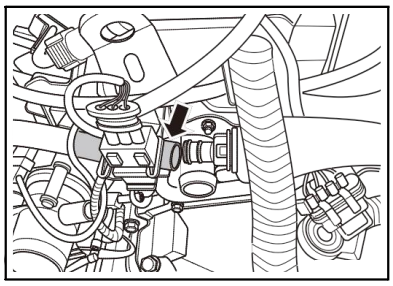


(II)Installation

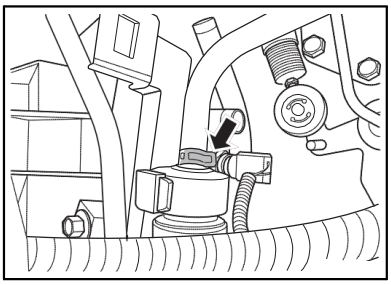
1. Install carbon canister electromagnetic valve

1). Install carbon canister electromagnetic valve to bracket of carbon canister electromagnetic valve;

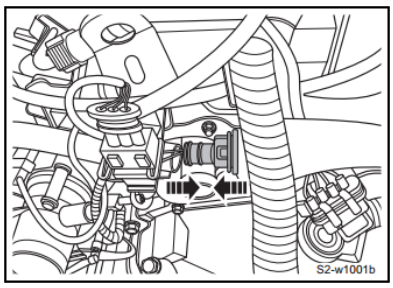
2). Connect connecting hose of carbon canister electromagnetic valve and carbon canister electromagnetic valve;



3). Connect carbon canister electromagnetic valve and fuel tank pipe Ⅲ;



4). Connect wiring harness connector of carbon canister electromagnetic valve;

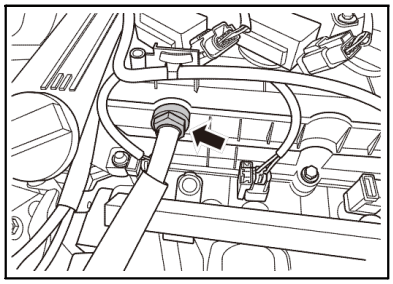


2. Connect battery negative electrode
3. Close engine compartment cover

VII、PCV Valve

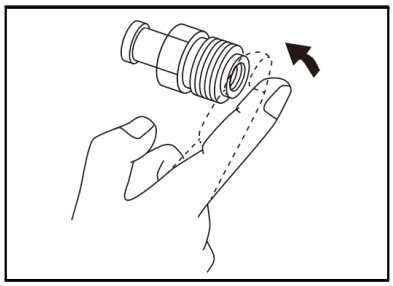
(I)Removal

1. Open engine compartment cover
2. Disconnect battery negative electrode Refer to “Disconnection and connection of battery electrode”
3. Remove PCV valve
   1). Disconnect connection of connecting hose of PCV valve and PCV valve;
   2). Screw out PCV valve from cylinder cover hood;



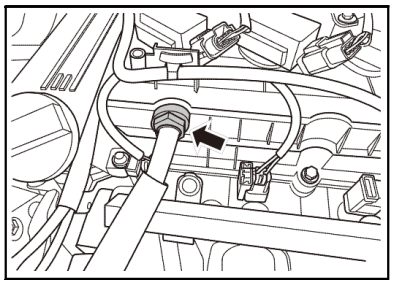
(II)Check

1. Check PCV valve
   1). Normal valve will make sibilant noise when there is airflow passing by. When put finger to valve entrance, you will feel very strong vacuum pressure;



(III)Installation

1. Install PCV valve
   1). Install PCV valve to cylinder cover hood;
   2). Connect connecting hose of PCV valve and PCV valve;

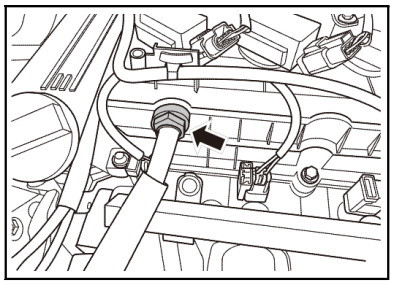


2. Connect battery negative electrode
3. Close engine compartment cover

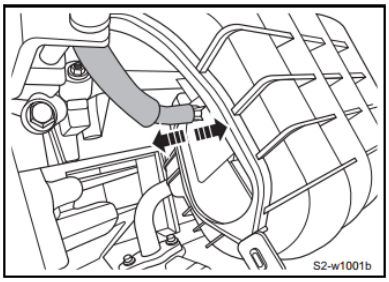
VIII、Connecting Hose of PCV Valve

(I)Removal

1. Open engine compartment cover
2. Disconnect battery negative electrode Refer to “Disconnection and connection of battery electrode”
3. Remove connecting hose of PCV
   1). Disconnect connection of connecting hose of PCV valve and PCV vlave;



   2). Disconnect connection of connecting hose of PCV valve and intake manifold, and take down connecting hose of PCV valve;

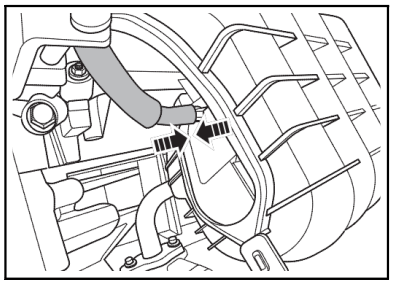


(II)Check

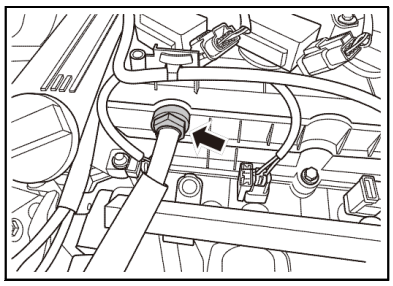
1. Check connecting hose of PCV valve
   1). Check whether hose and hose connector is leaking;
   2). Disconnect all hoses and clean with compressed air. If can’t clear obstruction in hose, please replace.

(III)Installation

1. Install connecting hose of PCV valve
   1). Connect connecting hose of PCV valve and intake manifold;



2). Connect connecting hose of PCV valve and PCV valve;

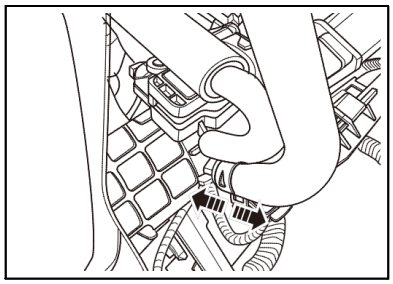


2. Connect battery negative electrode
3. Close engine compartment cover

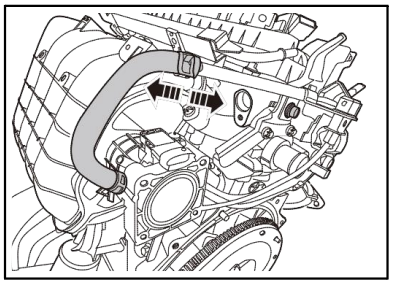
IX、Vacuum Boost Connecting Hose

(I)Removal

1. Open engine compartment cover
2. Disconnect battery negative electrode Refer to “Disconnection and connection of battery electrode”
3. Remove air filter assembly air filter assembly Refer to ““ air filter assembly
4. Remove vacuum boost connecting hose
   1). Remove fixed clamp of vacuum boost connecting hose and intake manifold;

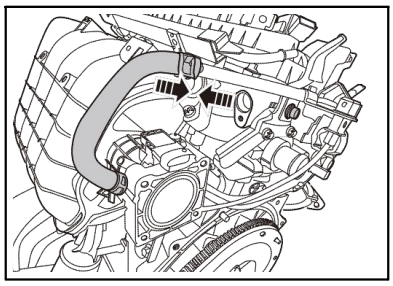


   2). Remove connecting clamp of vacuum boost connecting hose and vacuum boost steel pipe;
   3). Take down vacuum boost connecting hose;

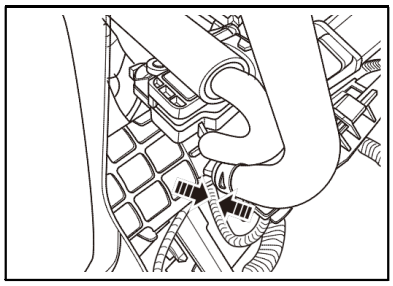


(II)Installation

1. Install vacuum boost connecting hose
   1). Connect vacuum boost connecting hose and vacuum boost steel pipe;



2). Connect vacuum boost connecting hose and intake manifold;



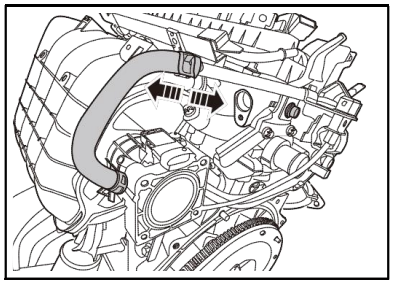
2. Install air filter assembly
3. Connect battery negative electrode
4. Close engine compartment cover

X、Vacuum Boost Steel Pipe

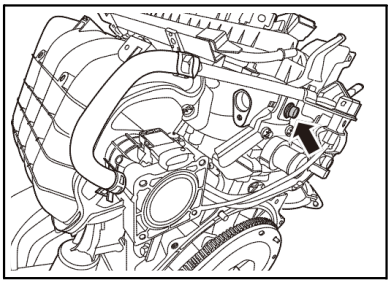
(I)Removal

1. Open engine compartment cover
2. Disconnect battery negative electrode Refer to “Disconnection and connection of battery electrode”
3. Remove air filter assembly Refer to “air filter assembly”
4. Remove vacuum boost steel pipe

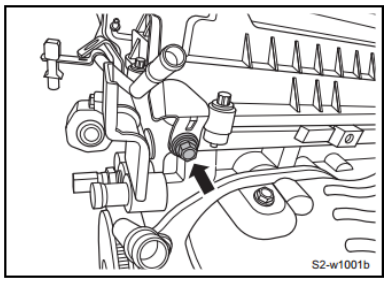
1). Remove connecting clamp of vacuum boost connecting hose and vacuum boost steel pipe, and disconnect vacuum boost hose;



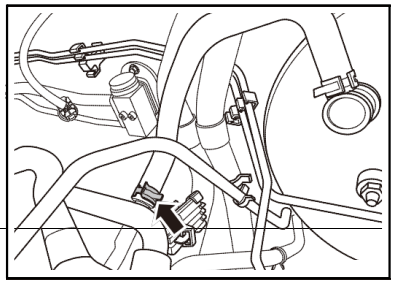
2). Remove fixed bolt of vacuum boost steel pipe and engine shackle;



3). Remove fixed bolt of vacuum boost steel pipe and cylinder head;

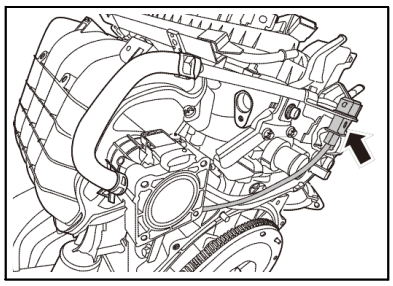


4). Disconnect connection of vacuum boost steel pipe and vacuum hose;



5). Disconnect knock sensor;

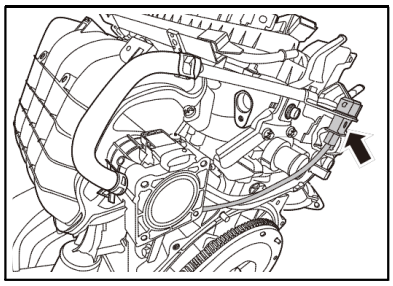
6). Take down vacuum boost steel pipe;



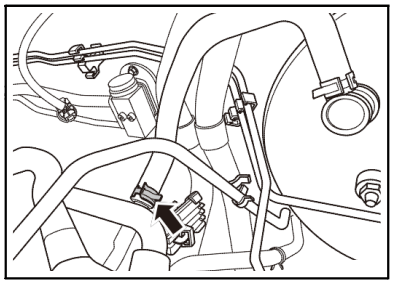
(II)Installation

1. Install vacuum boost steel pipe

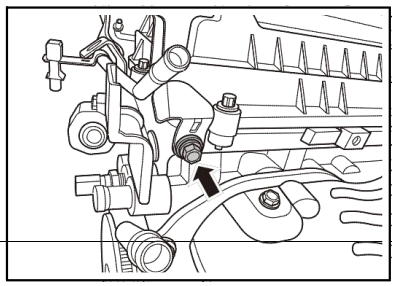
1). Connect knock sensor connector to vacuum boost steel pipe;



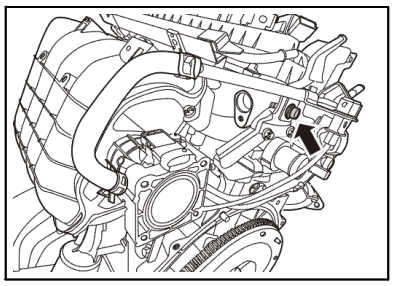
2). Connect connection of vacuum boost steel pipe and vacuum hose;



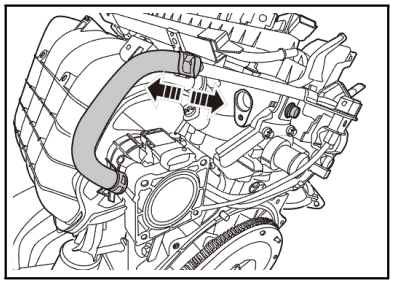
3). Install fixed bolt of vacuum boost steel pipe and cylinder head;



4). Install fixed bolt of vacuum boost steel pipe and engine shackle;



5). Connect vacuum boost steel pipe and vacuum boost connecting hose, and tighten clamp;

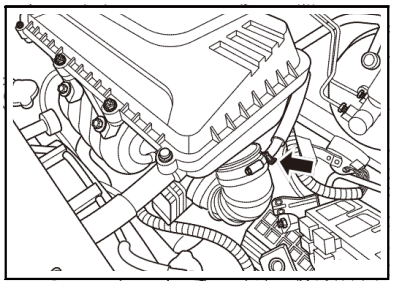


2. Install air filter assembly
3. Connect battery negative electrode
4. Close engine compartment cover

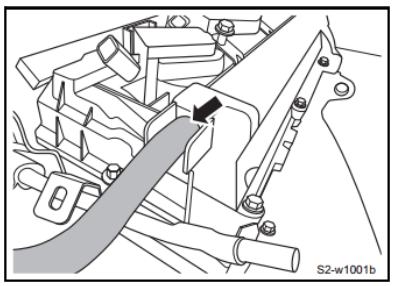
XI、Ventilator Ventilation Hose

(I)Removal

1. Open engine compartment cover
2. Disconnect battery negative electrode Refer to “Disconnection and connection of battery electrode”
3. Remove ventilator ventilation hose
   1). Disconnect connection of ventilator ventilation hose and air filter outlet pipe assembly;

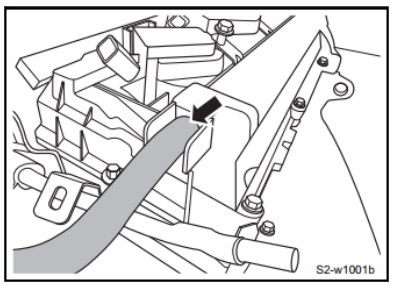


   2). Disconnect connection of ventilator ventilation hose and cylinder head cover;
   3). Take down ventilator ventilation hose;

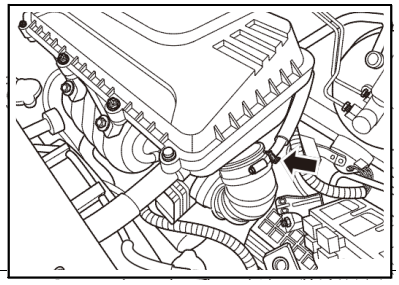


(II)Installation

1. Install ventilator ventilation hose
   1). Connect ventilator ventilation hose and cylinder head cover;



   2). Install ventilator ventilation hose and air filter outlet pipe assembly;



2. Connect battery negative electrode

3. Close engine compartment cover

Engine Control System

I、Summary

(I)Structure Overview

Electrical Control System Constitution Function

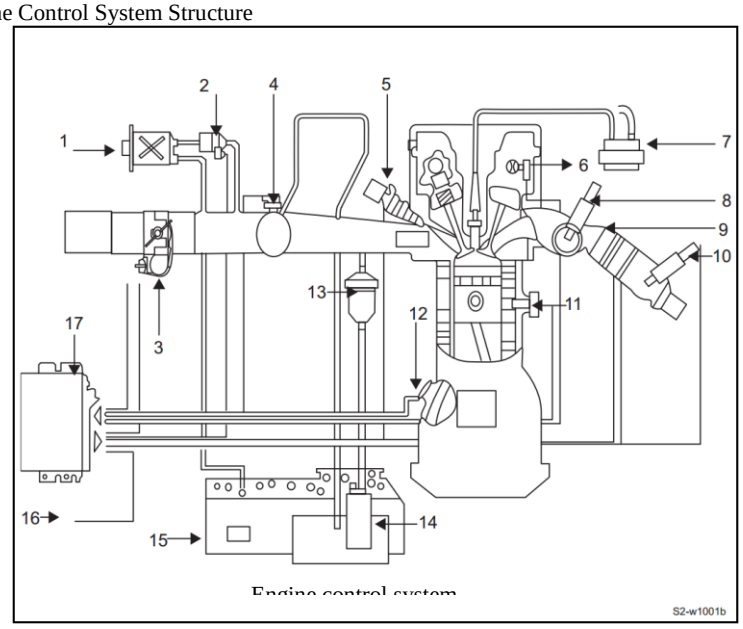
Engine electrical control system is generic terms of all electronic control device installed in engine (or connected to engine), its function is to control operation of all engine systems to make engine have well power performance, fuel economy and emission performance.

Engine electrical control system is consist of three parts, namely sensor, ECM and actuator. ECM is the control center of engine electrical control system, all sensors in engine electrical control system measure parameters of engine speed, throttle valve opening degree, coolant temperature, intake temperature, analyze, judge and calculate according to setting program in ECM, and send out instruct signal to actuators of fuel injector, ignition coil, fuel injector, OCV valve according to calculated result, to control all systems operation of engine.

Control range of control system has already extended to all systems of engine fuel injection system, ignition system, intake system, emission system. Therefore, control system can be consisted of fuel control system, ignition control system, intake control system, emission control system, fault self-diagnosis system, crankshaft ventilation system according to its control function.

(II)System Principle

Engine Control System Structure



Engine control system

1. Carbon canister
2. Carbon canister electromagnetic valve
3. Electronic throttle valve assembly
4. Intake pressure temperature sensor
5. Fuel injector
10. Rear oxygen sensor
11. Engine coolant temperature sensor
12. Crankshaft position sensor
13. Fuel filter
14. Electrical power fuel pump

6. Camshaft position sensor
7. Ignition coil
8. Front oxygen sensor
9. Three-way catalytic converter
15. Fuel tank
16. Diagnosis connector
17. Engine Control Module

On Vehicle Diagnosis System

1. Instruction

On vehicle diagnosis system (shorted from OBD system), is integrated in engine control system, and it's a diagnosis system that can monitor faulted components which influence exhaust gas emission and engine main function state. It has the function of identification, storage and displaying fault information by self-diagnosis malfunction indicating light (MIL).

2. Function Introduction

Function of diagnosis system mainly has monitoring function, storing fault code and note function, lose efficacy protection function and data output function.

(1)Monitoring Function

Objects of diagnosis system mainly are sensors, actuators in electrical control system and control process of electrical control system, fault self-diagnosis system monitors electrical control system related signal when vehicle is running, when some signal exceed pre-setting range, and this phenomenon don't disappear in some time, fault self-diagnosis system judges related circuit or component of the signal has fault.

(2)Storing Fault Code and Note Function

Once fault self-diagnosis system detecting there is fault in electrical control system, fault indicating light in meter will be on, remaindering driver to go to 4S shop to check and maintain, to avoid more damage.

Fault self-diagnosis system will monitor fault content and store in ECM memorizer in fault code. When maintaining, maintenance personal can read fault code stored in ECM to supply accurate basis for finding faulted components.

(3)Lose Efficacy Protection Function

To different monitoring object, fault self-diagnosis system will adopt different lose efficacy protection mode when detecting fault.

(4)Data Storage Output Function

Units stored data in ECM are ROM and RAM, stored program in memorizer ROM is based on accurate calculation and a large number of experiment data; the program compares and calculates to collected sensor signals constantly to control engine.

There is a special diagnosis connector in vehicle electrical control system, as long as connect vehicle ECM decomplier to the diagnosis connector, you can visit vehicle ECM storage unit, and read stored fault code.

Besides, fault self-diagnosis system can output stream reflecting working condition of vehicle electrical control system by diagnosis connector.

Engine Electronic Component Structure Principle

Electronic components of electrical system mainly include sensor, actuator and ECM.

Generally, there are 3 wires, namely power supply, signal, grounding in sensor basic circuit. Some sensors don't need power supply, or place power supply circuit in ECM, therefore there are only signal and grounding two wires; if applies outer housing grounding, it may have only one signal wire connected to ECM, thus make circuit very simple, but some sensor circuits are very complicate. Complicate range of sensor circuit depends on sensor type and structure principle; sensors of engine electrical control system mainly have switch type, resistance type, impulse type, voltage type.

Switch type sensor is a sensor of simplest structure, generally has two connected pins; its circuit has two kinds, namely grounding type and power supply type, in which one pin of grounding type circuit is grounding, one pin of power supply type circuit is connected to power supply.

Resistance type sensor is most used sensor in electrical control system, its structure has variable resistance type, potentiometer type; generally uses principle of direct current circuit distributing voltage to produce electronic signal; to ensure accuracy of signal, ECM supplies constant reference voltage as its working voltage (generally is 5V).

Variable resistance type sensor generally has 2 connecting pins, generally uses grounding type circuit, which one pin is signal, the other pin is grounding; Potentiometer type sensor generally has 3 pins, namely power supply pin, signal pin and grounding pin. Impulse type sensor has all kinds of principles and structure types, such as electromagnetic type using electromagnetic induce principle, photoelectricity type using photoelectricity principle, Hoare type using Hall effect, magnetic resistance using magnetic resistance principle, and its circuit are fairly complicate.

Voltage type sensor generally transforms change of detected parameter using electrochemistry principle, piezoelectricity effect to change of voltage. Most voltage-type sensors don't need working power supply.

Actuators of electrical control system mainly have electromagnetic valve, electrical power motor, relay, triode switch circuit and indicating light. Actuator circuit usually is simple, generally has power supply and grounding two wires. ECM controls most actuators by grounding method, power supplies of these actuators come from battery, grounding wires connect to ECM.

Engine Electronic Component Structure Instruction

Intake Temperature Pressure Sensor

1. Component Instruction

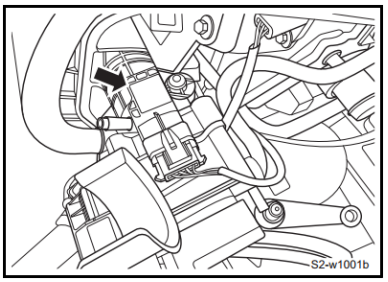
1). MT22.1 electrical control fuel injection system applies speed density air metric method, detects air amount getting into engine, thus controls fuel injection pulse width, and accurately controls engine power output. Sensors are consist of intake absolute pressure sensor and intake temperature sensor.

2). Intake absolute pressure sensor (MAP) is a pressure sensitive variable resistor. Pressure diaphragm in intake pressure sensor connects to one magnet core in coil, when intake pressure in intake pipe changes, diaphragm drive magnet core to move, at this time output voltage of sensor changes, ECM calculates engine intake amount according to output voltage of sensor, and engine bases on the signal, refer to other signal, controls fuel injection amount of engine. MAP sensor is also used to measure atmosphere pressure when starting, and in some condition permit ECM automatically adjusts in different altitude height. ECM supplies MAP sensor 5V voltage, and receives voltage through signal line. Sensor supplies one line to grounding by its variable resistor. Input signal of MAP sensor affects ECM control of fuel output and ignition timing.

3). Intake temperature sensor is a negative temperature coefficient (NTC) thermal resistor, resistance value decreases along with intake temperature increasing, a comparison circuit in engine ECM monitors change of intake temperature.

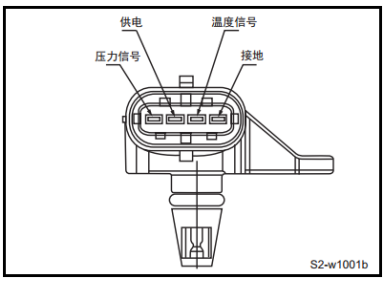
2. Component installation position

Installed in intake manifold.



3. Component Circuit Diagram

Pin No.	Function
Power supply	5V power supply voltage signal
Pressure signal	Manifold pressure sensor signal
Grounding	Power supply grounding
Temperature signal	Intake temperature sensor signal



Item	Standard value
Working voltage	5±0.1V
Working pressure range	10kPa～115kPa
Working temperature range	-40～125℃

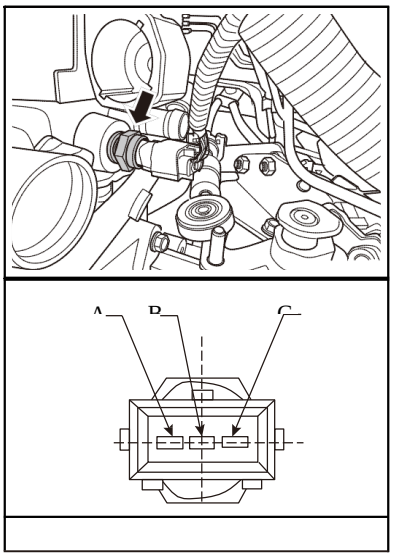
Coolant Temperature Sensor

1. Component Instruction

Engine coolant temperature sensor detects engine coolant temperature, and transmits signal to ECM to control ignition timing and fuel injection pulse width when starting, idling and normal running, and supply coolant temperature signal to meter to display coolant temperature in meter. It uses a negative temperature coefficient thermal resistor, resistance value of thermal resistor decreases along with temperature increases. ECM judges coolant temperature by output voltage of sensor, and supply mixture gas of optimum air-fuel ratio.

2. Installation Position

Installed in side of cylinder head.



3. Component Circuit Diagram

Instruction: This vehicle is equipped with three-line-type coolant temperature sensor.

Pin	Function
Pin A:	Output coolant temperature signal
Pin C:	Grounding
Pin B	Connect to coolant temperature gauge

Temperature	Standard resistance (Ω)
-10	16120
25	2795
85	283
115	115.7

Electronic Throttle Valve

1. Component Instruction

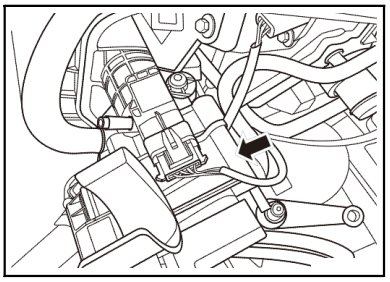
Electronic control throttle valve assembly is one of the main parts of intake control management system in current engine management system. It directly controls intake amount of engine, thus control engine speed and output power.

Electronic control throttle valve cancels machinery control mechanism of mechanism control type throttle valve, adds drive motor, drive gear wheel mechanism, necessary transmission component and special throttle valve position sensor with more stronger function and reliability.

As one of safety guarantee of system, system setting has dual output throttle valve position sensor, one throttle valve position sensor increases along with opening degree of throttle valve, but output signal of the other throttle valve position sensor decreases along with opening degree of throttle valve.

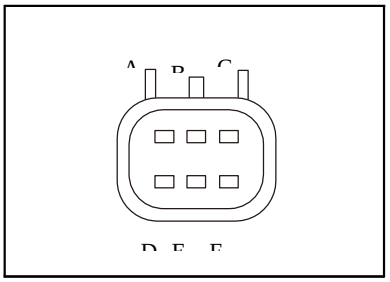
2. Installation position

Installed in intake manifold.



3. Component Circuit Diagram

Pin No.	Function
A	5V power supply
B	Throttle valve motor
C	Throttle valve motor
D	TPS1 signal
E	TPS2 signal
F	Grounding



Item	Standard value
Measured range of throttle valve position sensor	When in idling condition: TPS1 is 6%～14%; TPS2 is 86% ～ 94%. When in totally open condition: TPS1 is 86% ～ 94%.
Throttle valve response time	Totally open to totally closed: ≤ 100ms Totally closed to totally open: ≤ 150ms

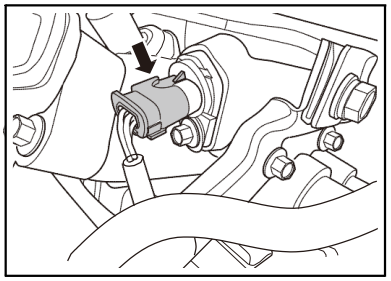
Hoare Sensor

1. Component Instruction

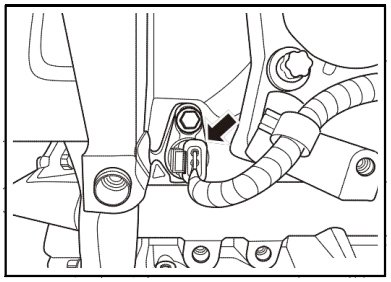
Camshaft position sensor and crankshaft position sensor are Hoare sensor, working together with signal wheel on camshaft and crankshaft, signal wheel corresponding to specified position of engine, ECM conforms engine working condition through digital voltage signal of the sensor, and control one-for-one.

2. Installation Position

Camshaft position sensor is installed in cylinder head nearby camshaft.

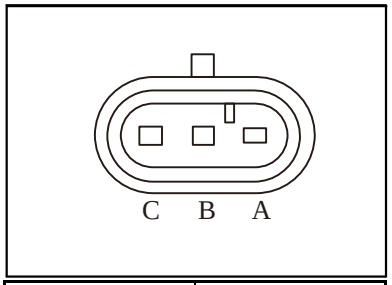


Crankshaft position sensor is installed in cylinder body nearby crankshaft.



3. Component Circuit Diagram

Pin number	Function
A	Output
B	Grounding
C	Power supply



Item	Standard value
Working temperature:	-40～150℃
System input voltage:	5.0V (Supply power by controller)
Working intermittence:	0.1-1.5mm

Oxygen Sensor

1. Component Instruction

Oxygen sensor is used to supply information of whether oxygen is excess after

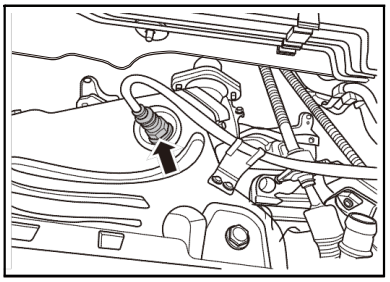
ECM controls closed loop control of fuel quantify by this information, makes three main toxic ingredients in engine exhausting gas at utmost be transformed and purified in three-way catalyst converter.

Its sensor assembly is a ceramic tube with pore, outside of tube wall is surrounded with engine exhausting gas, inside is connected to atmosphere. Sensor indirectly calculates pulse width of fuel injection according to oxygen concentration difference of inside and outside, transmits to ECM, and ECM control fuel injection again. At the same time it detects rear oxygen sensor output data, compares data of front and rear oxygen sensor in ECM, and monitor whether three-way catalyst converter is working well.

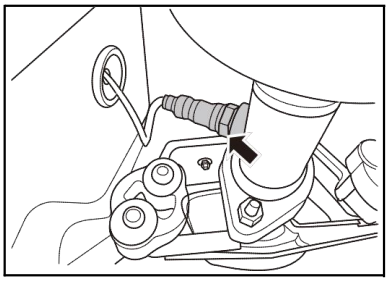
Working voltage of oxygen sensor is 0.1-0.9V, change 5-8 times every 10s; if lower than the frequency value, it indicates sensor is aging and needs to be replaced, and the sensor can't be repaired.

2. Installation position

Front (upper) oxygen sensor is installed in exhausting manifold of three-way catalyst converter.

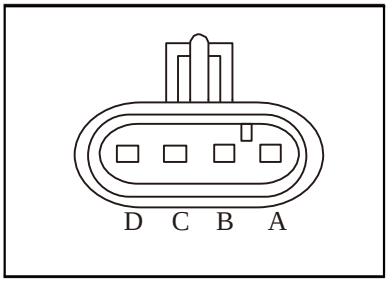


Rear (lower) oxygen sensor is installed behind three-way catalyst converter.



3. Component Circuit Diagram

Pin number	Function
A	Signal grounding
B	Signal output
C	Heating
D	Heating terminal+



Item	Standard value
Working voltage	0.1-0.9V

Fuel Injector

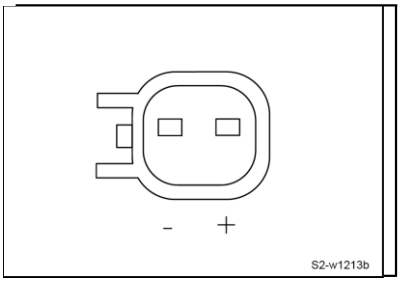
1. Component Instruction

Fuel pumped from fuel pump is stored and distributed through fuel pressure guide rail assembly, supply fairly steady pressure environment for fuel system, make fuel supplying pressure and fuel supplying amount of all cylinders be balanced, and engine running steadily. Fuel injector injects fuel according to transmitted signal from ECM, and ensure fuel injector amount by opening time of fuel injector electromagnetic valve.

2. Installation Position

Installed in fuel rail.

3. Component Circuit Diagram



Item	Standard value
Standard resistance value between two pins	11~16Ω

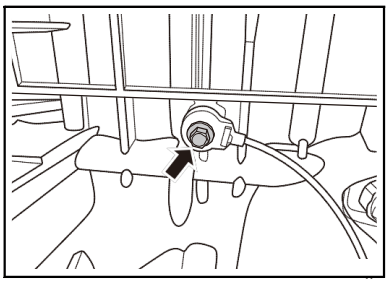
Knock Sensor

1. Component Instruction

Knock sensor is installed in side of cylinder body, generally between 2nd cylinder and 3rd cylinder, and it's in favor of engine knock balance. ECM outputs knock frequency signal by knock sensor, and then gets through ECM interior filter, and then judges whether there is knock in engine; when detecting knock signal, ECM will decrease ignition advance angle gradually until there is no knock, and then recover gradually until to knock edge, thus repeatedly.

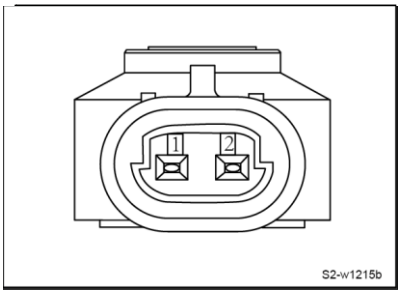
2. Installation Position

Installed in cylinder body, between 2nd cylinder and 3rd cylinder.



3. Component Circuit Diagram

Pin	Function
1	Signal grounding
2	Signal output



Continuous Variable Cam Phase Regulator and Its Control Valve

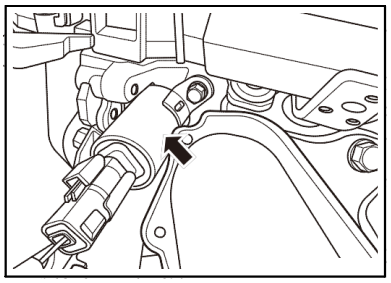
1. Component Instruction

Continuous variable cam phase regulator is used to change timing of valve mechanism. It realizes control of valve phase by continuously regulating phase relationship of camshaft and crankshaft according to requirement of control system.

VVT pressure regulating control valve is a four-way pulse width control electromagnetic valve, which can move in double directions and it can control oil flow rate by axial direction motion of plunger valve. Engine ECM changes oil flow rate passing to two sides of rotor vane to control timing and phase position of cam relative to crank by air-fuel ratio of pulse width regulating.

2. Installation Position

Installed in cylinder head in side of generator belt wheel.



3. Component parameter

Working condition of VCP

Item	Standard value
Input voltage	11.5~18.0V
Average working current when keep position	1.0A
Max current	In the condition of 100% air-fuel ratio, -40℃, 15.5V, it's 2.5A
Environment temperature	-40 ~ 150℃
Temperature in hood	-40 ~ 150℃
Electromagnetic valve temperature	-10 ~ 150℃

Working condition of OCV valve

Type	Oil pressure control electromagnetic valve
Coil impedance	Standard value: 5.6 Ω(-30 ℃) 7.0 Ω(20 ℃) 10.6 Ω(150 ℃)
Required min current of plunger valve whole stroke	1A
Input voltage (through coil)	Standard value: 13±0.5V, Min: 11.0V, Max:18.0V
Response when starting in normal input voltage	<50ms When T_{Coil}<65oC
Close response	<50ms When T_{Coil}<65oC

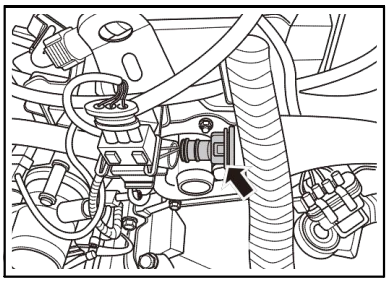
Carbon Canister Electromagnetic Valve

1. Component Instruction

Gasoline vapour produced in fuel tank gets into activated carbon canister by pipe, activated carbon canister can absorb gasoline molecule in gasoline vapour. The other outlet hose of activated carbon canister connects to engine intake pipe. Carbon canister electromagnetic valve in middle of hose controls whether the pipe is connected. When engine running, if electromagnetic valve is open, air gets into from lower part of carbon canister in the influence of vacuum suction in intake pipe, and gets through activated carbon, gets into engine intake pipe from upper part outlet through hose, and make gasoline molecule absorbed to surface of activated carbon evaporate again, and then be absorbed into engine to be burnt with air to make the best of fuel; at the same time it can make activated carbon in carbon canister recover absorbed ability, and won't lose efficacy due to using too long.

2. Installation Position

Installed in intake manifold bracket.



Engine Control Module (ECM)

1. System instruction

Delphi MT22.1 engine control system takes MT22.1 engine control module (ECM) as core, its feature is computer close-loop control, several-points fuel sequence injection, directly ignite with no distributor group and three-way catalytic converter aftertreatment.

ECM MT22.1 uses latest electronic hardware technology, has higher cost performance; hardware uses 16 bits microprocessor, has enough storage, high calculation speed, can flexibly define I/O input/output port; software uses second control software programmed by Delphi modularization C language; has all technical specifications that satisfy current Euro-Ⅳ and OBD emission laws and regulations required.

1)ECM has the following functions:

·Vehicle main power supply relay control

·Speed density air flow rate method

·Close-loop control several-points sequence fuel injection (including MAP CID pressure judging cylinder)

Close-loop control several-points sequence fuel injection

·Has different fuel supplying method, return fuel, no return fuel and half no return fuel

·Fuel pump working control

·Directly ignite with no distributor, there is ignition module in ECU, 4 cylinders ignite in order

·Control intake air flow by electronic throttle valve, response quickly, accurately, realize torque control by ECU, increase reliability

·VVT-i (electronic-control-type intake phase variable cam regulating device) control intake air amount of engine, increase torque and power

·Knock control

·Carbon canister electromagnetic valve control

·A/C, coolant trunk fan control

·Mileage memory

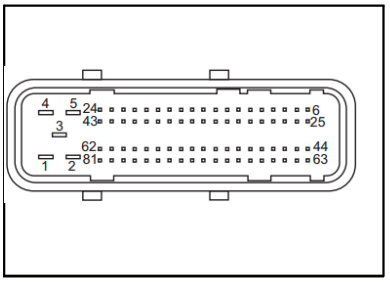
·Over-voltage protection

·Electronic anti-theft

·CAN-BUS communication connector can communicate with automatic transmission control module or ABS system

·Open, modularization C language program

2. Component Circuit Diagram



3. Pin Definition List of ECM

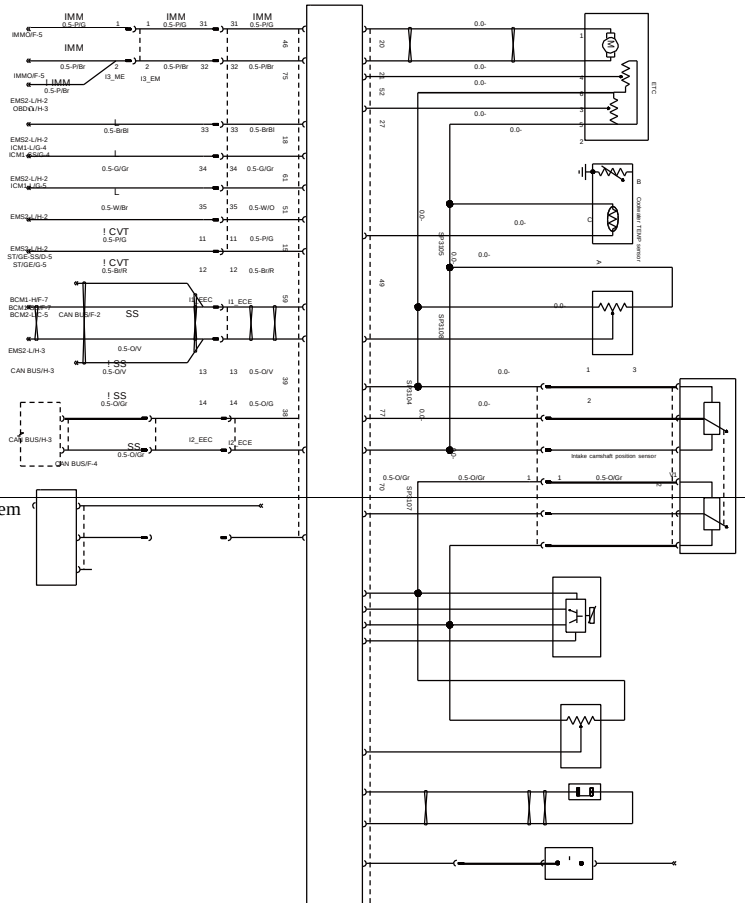
Pin	Function	Pin	Function	Pin	Function	Pin	Function
1	Ignition coil B driving (3rd cylinder)	2	Power supply grounding	3	Power supply grounding	4	Ignition coil A driving (1st cylinder)
5	ETC supply power	6	1st cylinder fuel injector	7	3rd cylinder fuel injector	8	2nd cylinder fuel injector
9	A/C switch signal	10	Fuel pump relay	11	Spare pin	12	Spare pin
13	Spare pin 1	14	Spare pin	15	Spare pin	16	Spare pin
17	High speed fan	18	Spare pin	19	Spare pin	20	Throttle valve motor-

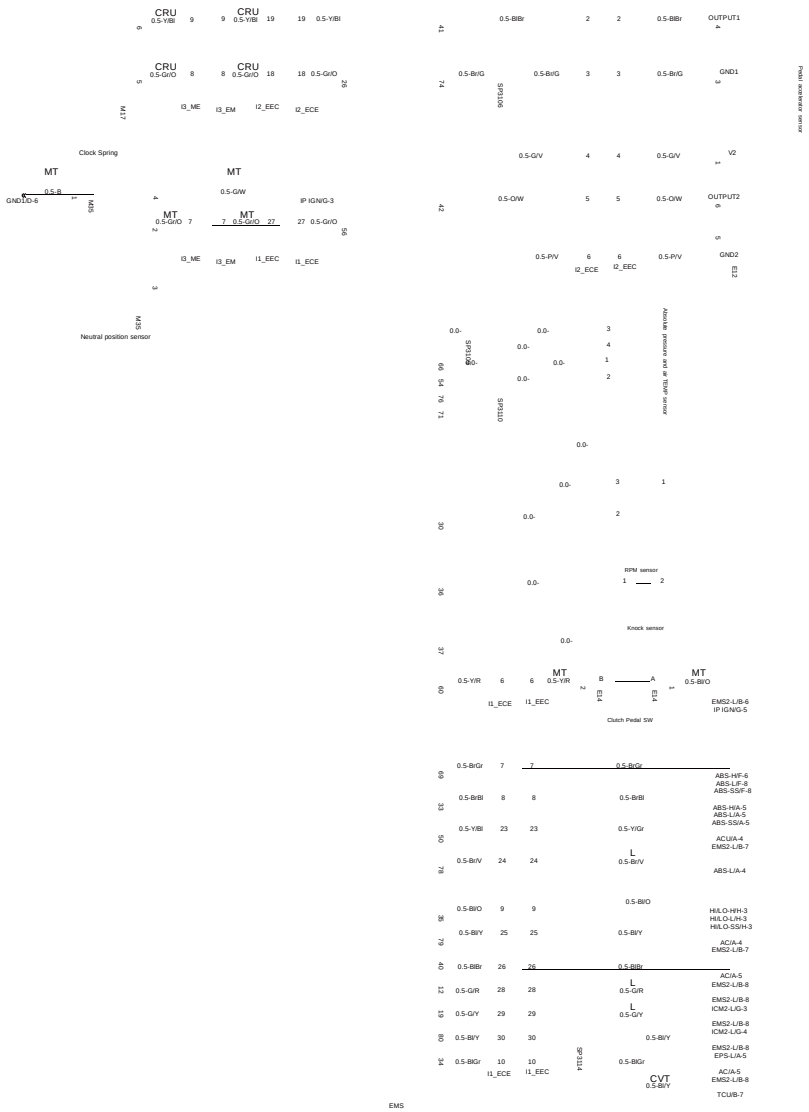
21	Throttle valve motor+	22	Spare pin	23	Rear oxygen sensor heating	24	Front oxygen sensor heating
25	4th cylinder fuel injector	26	Spare pin	27	Throttle valve position sensor 2	28	Spare pin
29	Spare pin	30	Crankshaft position sensor signal	31	Spare pin	32	Spare pin
33	Brake signal light	34	Spare pin	35	Power load 1	36	Knock sensor +
37	Knock sensor -	38	CAN low	39	CAN high	40	A/C middle pressure switch
41	Accelerator pedal position sensor 1	42	Accelerator pedal position sensor 2	43	VVT 1	44	Main relay
45	Spare pin	46	Anti-theft request	47	Front oxygen sensor signal	48	Rear oxygen sensor signal
49	Coolant temperature sensor	50	ENS	51	Spare pin	52	Throttle valve position sensor 1
53	Spare pin	54	Absolute pressure sensor	55	Spare pin	56	Spare pin
57	Spare pin	58	Spare pin	59	Spare pin	60	Compressor
61	Spare pin	62	Ignition coil C driving (4th cylinder)	63	Spare pin	64	Carbon canister electromagnetic valve
65	Low speed fan	66	5V reference voltage #2	67	Supply power	68	Ignition signal
69	Brake signal	70	5V reference voltage #2	71	Intake temperature	72	Spare pin
73	Oxygen sensor low signal	74	5V grounding 1	75	KWP2000 communication	76	5V grounding 2
77	Camshaft position sensor	78	Spare pin	79	A/C request signal	80	Vehicle speed signal
81	Ignition coil D driving (2nd cylinder)	90	Oxygen sensor B heating control	91	Spare pin	92	(Emission) Malfunction indicating light

Specific pin number refer to wiring harness principle diagram (spare pin is vain pin)

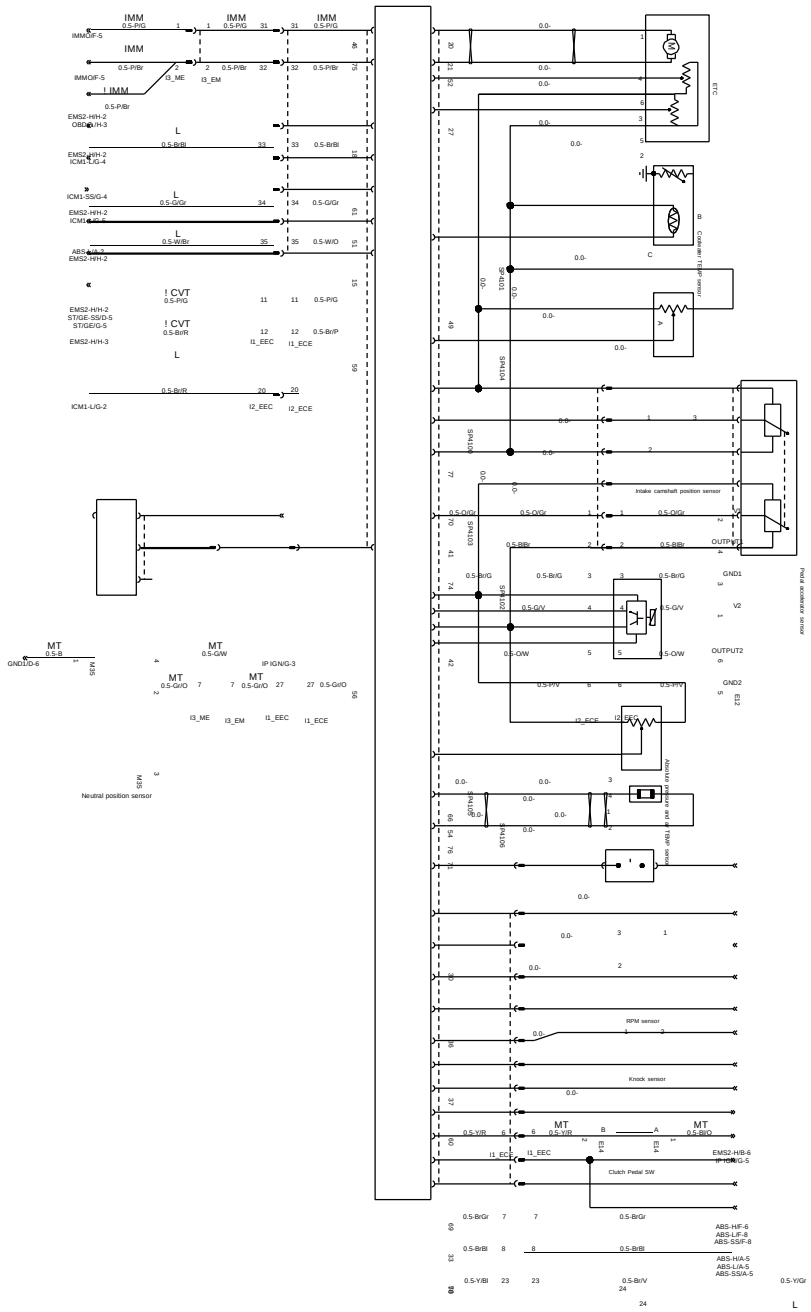
4. Principle Diagram

High configuration vehicle type




CRU
CRU
Clock Spring
MT
MT
Neutral position sensor
Pedal stroke sensor
OUTPUT1
GND1
V2
OUTPUT2
GND2
Ambient pressure and TEMP sensor
RPM sensor
Knock sensor
Clutch Pedal SW
CVT
EMS
ABS-H/F-6
ABS-L/F-8
ABS-SS/F-8
ABS-H/A-5
ABS-L/A-5
ABS-SS/A-5
ACU/A-4
EMS2-L/B-7
ABS-L/A-4
HI/LO-H/H-3
HI/LO-L/H-3
HI/LO-SS/H-3
AC/A-4
AC/A-5
EMS2-L/B-8
ICM2-L/G-3
ICM2-L/G-4
EPS-L/A-5
TCU/B-7
EMS2-L/B-6
IP IGN/G-5

Low configuration vehicle




0.5-Br/V
ACU/A
-4
EMS2-
H/B-7
ABS-
L/A-4
35
79
40
12
19
69
34
SHA103
EMS

(III)Technical parameters, maintenance parameters

Technical parameters

Items	Maintenance standard value
assembly clearance of Hall sensor	0.5 ~ 1.5mm
Standard resistance between two terminals of oil injector	11~16Ω
resistance between two terminals of Canister Purge Solenoid	19~22Ω
resistance between two terminals of OCV	7~8Ω
Resistance of oil injector solenoid coil	11~16Ω

(IV)Torque parameters

No.	Items	(N·m) Torque	Remarks
1	Tap bolt of inlet air temperature pressure sensor	6±0.5	
2	Coolant temperature semsor	20±4	
3	Fixing bolt of electronic throttle	10±1	
4	Fixing bolt of Hall sensor	10±1	
5	Front and rear oxygen sensor	35±5	
6	Knock sensor bolt	22.5±2.5	
7	OCV bolt	6±1	

(V)Maintenance precautions

Precautions of electronic control system

Malfunction of any conponents in electronic control system, like sensors, actuators, control circuit, ECM, will

affect the running of engine. Since ECM can do fault self-diagnosis, so we can connect ECM with computer monitor to find the reason of fault by reading the fault code or data flow.

In order to prove the reliability of gasoline engine electronic control system, most of components in this system are designed as sealed, nondecomposable or cannot be repaired after damage. So the main task of electronic control system maintenance is to find faulted component and change it.

During the maintenance of electronic control system, please pay attention to the following items or they may cause damage of ECM or controlling components.

1. You can ONLY use digital electric meter to check the electronic control system (for example, digital multimeter, oscilloscope for vehicle, diagnostic apparatus and etc.).
2. Please use JAC genuine components during maintenance or it cannot guarantee the normal work of system.
3. You can ONLY use unleaded gasoline during maintenance.
4. Please obey normative maintenance and diagnosis flow to do the service.
5. DO NOT disassemble any components in system during maintenance.
6. During maintenance, please be careful when take out or put down electronic element (ECU, sensors), DO NOT let them fall down.
7. Please establish the sense of environmental protection, and effectively dispose the waste in maintenance.
8. When ignition switch is on, DO NOT take out or insert ECM harness connector which can avoid electric elements in system generate induced voltage at the moment of cut off or connect the power which can damage the ECM.
9. Please connect the ECM harness connector reliably, or it may damage ECM.
10. When remove the battery or use external battery to junp start, you must turn off the ignition switch first and then do the removal or jump starting. Pay attention to connect the positive and negative poles in right positions.
11. DO NOT start the engine when battery connector has not been tightened. And DO NOT remove battery cable when engine is running. Or the charging pressure of engine will be too high to damage elements in this electronic control system.

1. While running the engine to check compression pressure of air cylinder, please cut off the power of oil injector or plug out all connectors of injector, in order to avoid injected oil come into exhaust pipe before burning which can cause damage of three-way catalyst.

2. When check the ignition system, you can only do arcing check if it's necessary and keep the time as short as possible, or it may cause a lot of unburned oil get into exhaust pipe to damage the three-way catalyst.

3. During hot working condition simulation for fault or service work which can cause increasement of temperature, please make sure the temperature of ECM be under 80 ℃.

4. Please let professional serviceman remove oil pipes and change fuel filter at well-ventilated palce.

5. DO NOT detect input and output signal of components by impaling surface of wires.

Precautions of engine OBD system

ECM is equipped with an OBD (on-board diagnosis) system, and the fault lamp will be on if there is any fault caused by aging of exhaust system.

1. Before any service anc check, please turn the ignition switch to OFF, and cut off the connection with battery negative pole. Open circuit or short circuit of relative switches, sensors and solenoids can light the fault indicating lamp.

2. After service work, please connect and lock the connectors reliably. Loose (unlocked) connectors may cause open circuit which will light the fault indicating lamp. (Make sure there is no water, lubrication grease, dirt on connector, and no bend or crack of stitch inside the connectors);

3. After service work, please arrange and fix wirings correctly. If the brackets have interference with wiring, it may cause short circuit which will light the fault indicating lamp.

4. After service work, please connect the rubber pipes correctly. If they are not well connected, it may cause fault on EVAP system and injection system which will light the fault indicating lamp.

5. Before deliver the vehicle to customer, please eliminate all useless fault info in ECM (repair is done);

6. You must use 12V battery as power supply.

7. DO NOT cut off the connection with battery when the engine is running.

8. Before connect or cut off the connection of ECM harness, please turn the ignition switch to OFF and cut off the connection of battery negative pole. Or it may damage ECM, because battery still supplies power to ECM even when the ignition switch is turned to OFF.

9. Before disassemble components, please turn the ignition switch to OFF and cut off the connection of battery negative pole.

10. DO NOT disassemble ECM;

11. If any battery cable is cut off, the Memory will back to ECM initial value. ECM will do self-control according to this initial value. When the battery terminal is cut off, the rotating of engine will change a little. But it is not a fault. Please do not change components because of this subtle change.

12. When you connect the ECM wiring connectors, please push the lever to the end so that the ECM can be locked reliably.

13. When insert or pull out the pin connector from ECM, pay attention to not damage the terminal

(bending or cracked). When you connect the pin connector, please pay attention that the ECM pin terminal is not bended or cracked.

14. Connect the ECM wiring connectors tightly. Poor connection can cause extremely high voltage on coil and condenser which will damage ECM.

15. Keep components and wiring of engine electronic control system dry.

16. Even a very small leakage of air inlet system can cause serious fault, so DO NOT change inlet air pressure sensor randomly.

17. DO NOT wobble or shake camshaft position sensor (phase), and crankshaft position sensor (location);

18. When you use circuit tester to measure ECM, DO NOT let these two gauges touch with each other.

19. Accidental contact of engine electronic control connectors will cause short circuit, and damage ECM power transistor.

20. When you measure input/ output voltage, please DO NOT use the ECM grounding terminal. Or it may damage ECM power transistor. Please use other to connect to ground except ECM terminal.

21. If there is no fuel in fuel pipe, DO NOT use fuel pump.

22. Please tighten the fuel hose clamp to specified torque.

23. DO NOT step on accelerator pedal in starting.

24. DO NOT increase the engine speed immediately after starting.

25. DO NOT speed up just before shut down the engine.

26. Please turn off the ignition switch first before cut off wires connected to battery. If cut off the wires while the engine is running or opening ignition switch, it may cause damage of ECM.

27. Wiring harness between ECM and sensors should use same shielding bond strap with vehicle body to shield, in order to avoid ignition system interference and radio interference. If the shield wiring harness does not work, please change it.

28. While checking the charging state of electric generator, DO NOT cut off the battery positive pole which can avoid the damage of ECM.

29. Whe use external charger to charge the battery, please cut off the battery connection which can avoid the damage of ECM.

II、Fault Diagnosis

(I)On-Board Diagnostics

1Instruction

On-Board Diagnostics system (OBD system for short), is intergrated in engine controlling system, and it can monitor faulted components which may affect exhaust emission and state of engine' s min function. It can identify, store and show fault information through Malfunction Indicator Light (MIL).

2.I ntroduction of functions

The main functions of this sytem are monitoring, storing fault code, notifying, fail-safe and data outputting.

(1) Monitoring: the main objects this system monitors are sensors, actuators and controlling process of gasoline engine electronic control system. OBD system keeps monitoring relative signal of electronic control system during driving, and when a signal goes beyond the set value and remained for a period, OBD system will make the judgement that the corresponding circuit or components of this signal has fault.

(2) Restore fault code and noticing function: once the OBD system finds any fault in electronic control system, the indicator light will be on immediately to remind the driver to send the vehicle for repair before bigger damage produced.

OBD system can also read the fault and store it as fault code in ECM storage. During service, serviceman can read the fault code from ECM to find some evidence for locating the fault.

(1) Fail-safe: OBD system will adopt different fail-safe modes for different monitoring objects.

(2) Data storing and outputting: units for ECM to store data are ROM and RAM. Program stored in ROM is based on refined calculation and experiments. This inherent program will keep comparing and calculating different signals from sensors while the engine is working, inorder to control the engine.

All circuits of electronic control system are set specialized diagnostic sockets, just connect ECM decoder with this socket, you can easily visit ECM storage unit and read stored fault code.

Beside, OBD system can also output data flow which shows working condition of electronic control system through the diagnostic sockets.

3.Instruction of MIL and controlling strategy

1)MIL: indications for relative components of exhaust system and failure of system. MIL is normally an indicator light showed on dashboard and is also comply with legislations.

2)Activation of MIL should obey the following items:

Ignition switch is ON (does not start), MIL keeps lightening;

After 3s starting the engine, if there is no fault request to light MIL in fault storage, MIL will die out.

If there is fault requests to light MIL in fault storage or from outside of ECM, MIL will be lighted up.

When there is request from outside of ECM or get fire or from fault storage, MIL will glitter with 1HZ frequency.

4.Trouble shooting steps:

1). Connect the diagnostic tester with diagnostic connectors, then turn on the tester.

2). 。 Turn on the ignition switch.

3). Read relative information (fault code, freeze frame); consult the service book to confirm faulted components and type; make service proposal according to information and experience.

4). Shoot the trouble.

5). Eliminate fault storage; appropriately drive the vehicle under the condition which meets corresponding fault diagnosis; read fault info to make sure the fault is solved.

5.Instruction of detection and diagnosis equipment

Maintenance mode of electronic control system is quite different with mechanical system; it relies on electric equipment and use OBD system to do trouble shooting. Normal equipments used in electronic control system include auto computer detector, digital multimeter and etc.

You can build connection with ECM by connect the computer detector with diagnostic socket, and visit relative fault diagnosis data in ECM storage, including fault code and data flow, in order to know the monitoring results and system working situation which will provide evidence for trouble shooting. Besides, it also can do movement test.

(1)Read and eliminate fault code

You can easily read fault code stored in ECM by connect the computer detector with diagnostic socket. The computer detector will display the code and its meaning on screen. By reading the code, serviceman can handle faults like short circuit and open circuit of most sensors and controlling circuits in electronic control system.

(2)Read data flow

Connect the computer detector and electronic control system to read ECM working situation and transient data of input, output signal (signal of sensors, calculation results of ECM, controlling modes, control signal transmitted to actuators and etc.). Serviceman can judge if the system works normally according to changes of different datas, or compare the signal value under specified conditions to standard value, in order to correctly judge the type and position of fault.

(3)Movement test

Movement test: Computer detector gives commands to ECM to drive or stop some work of actuators, for detecting actuator’ s working condition and finding the faulted actuators or controlling circuits.

6. ECU common fault code and instruction

Lighting principles of MIL and SVS: different set of fault types will have different lighting timing and method. And the fault types can be classified as A, B, C, D, E and Z by degree of influence on exhaust emission, the definition and lightening rules are as followed:

MIL (relative components of exhaust control) activation rules:

A: as long as the fault occurs, system will light up MIL and record fault code

B: only when the fault occurred in consecutive two emission monitoring process, system will light up MIL and record fault code

E: only when the fault occurred in consecutive three emission monitoring process, system will light up MIL and record fault code

Notice A emission monitoring process is a working cycle that all OBD functional tests can be done. It is also based on EⅢ emission test program.

SVS (relative components of exhaust control) activation rules:

C: record the fault code when it occurred, and light up SVS indicator light, but not the MIL.

Z: fault diagnosis system didn’ t do any analysis to this type of faults

(II)Diagnostic analysis table

No.	Fault	Analysis of reason	How to solve	
1	engine cannot start	no oil in tank	add some	
		oil pump does not work	check the circuit; change the oil pump if necessary	
		oil injector dose not work	check the circuit; change the oil pump if necessary	
		ignition system does not work	check the ignition system	
		oil pressure is too low	check the oil pipes and oil pump	
		ignition angle of advance is wrong	Check VVT and OCV to see if they need any change	
		high pressure spark is too weak	change the sparking plug	
		leakage of oil injector	change the oil injector	
		ECM does not work	change the ECM	

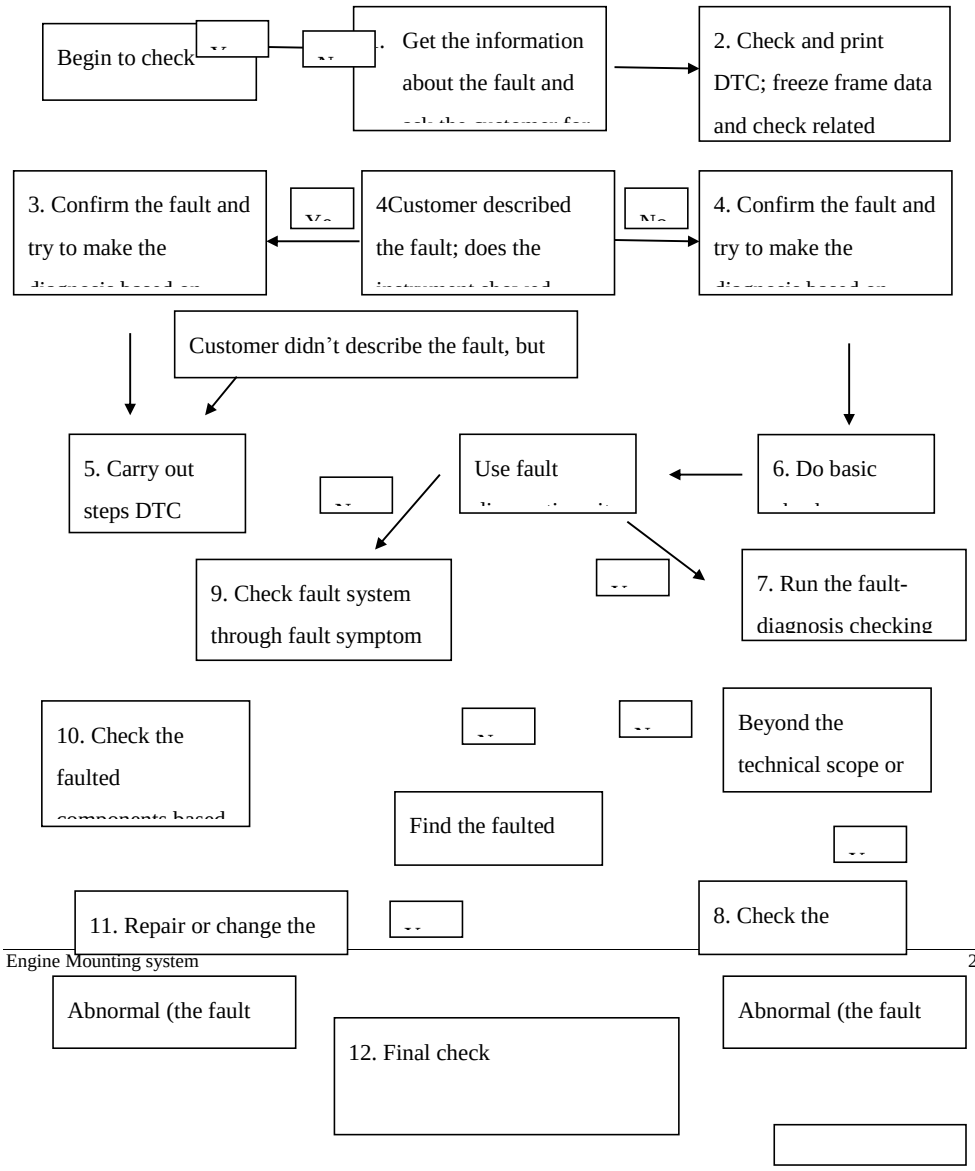
No.	Fault	Analysis of reason	How to solve
2	Engine is hard to start	oil pressure is too low	check the oil pipes and oil pump
		water temperature sensor has fault	change a sensor
		leakage of oil injector	change the oil injector
		oil injector is plugged	clean the oil injector, or change it if necessary
		ignition timing is abnormal	check the OCV; change it if necessary
		bad performance of ignition plug and ignition coil	change the ignition plug and ignition coil
		harness of power supply has fault	chaeck the harness
		pressure of cylinder is too low	check the pressure of cylinder, if the pressure is lower than 1.1Mpa, that means there is fault and you should disassemble and check the engine
		ECM does not work	change the ECM
3	idle speed is not stable	oil pressure is too low	check the oil pressure, if it' s too low, please check if the oil pump works normally or the oil filter be plugged
		bad atomization, leakage or block of oil injector	change the oil injector
		bad performance of ignition plug	check if the ignition plug is too old or has serious carbon deposition or the clearance is too big; and change it if necessary

		inlet air temperature pressure sensor has fault	change the inlet air temperature pressure sensor
		canister purge solenoid works in idle speed	check the canister purge solenoid if necessary
		air pressure is too low in cylinder or the difference of pressure in each cylinder is too big	check the pressure of cylinder, if the pressure is lower than 1.1Mpa, that means there is fault and you should disassemble and check the engine
4	Rotate speed of idle speed is too high	throttle fault	change the throttle
		leakage of air inlet pipe	tightening some parts
		accelerator pedal fault	change the accelerator pedal
		water temperature sensor fault	change the water temperature sensor
		canister purge solenoid fault	change the canister purge solenoid
5	怠速转速波动过大	bad atomization or block of oil injector	change the oil injector
		bad performance of ignition plug	change the ignition plug
		signal of water temperature sensor is wrong	change the water temperature sensor
		oxygen sensor fault	change the oxygen sensor
		electronic throttle or control circuit fault	change the electronic throttle

No.	Fault	Analysis of reason	How to solve	
6	vehicle will easily be shut down in idle speed	ignition system does not work normally	k related parts according to fault codes	
		oil system does not work normally	check oil pressure, if it is abnormal, please check related parts of oil system	
		electronic throttle fault	change the electronic throttle	
		bad contact of harness connector in controlling system	tightening the harness connector of controlling sytem	
7	动力不足 lack of power	block of air filter	clean the air filter	
		drop at joints of air inlet pipes	solve the drop problem	
		electronic throttle fault	change the electronic throttle	
		oil pressure is too low	check the oil pipes and oil pump; change it if necessary	
		bad atomization or block of oil injector	check oil injector to see if there are faults like serious carbon deposition; change it if necessary	
		water temperature sensor fault	change the water temperature sensor	
		fault of inlet air temperature pressure sensor	change the inlet air temperature pressure sensor	
		ignition timing is wrong	check OCV; change it if necessary	

		pressure in cylinder is abnormal	check the pressure of cylinder, if the pressure is lower than 1.1Mpa, that means there is fault and you should disassemble and check the engine

(III)Fault-diagnosis flow chart



(Ⅳ)Fault Code Table

Overview

1、 Instruction

1) Unless it is confirmed to be steady state fault, the following service can be started, or it may cause false diagnosis.

2) The ‘multimeter’ mentioned in the following means digital multimeter. DO NOT use pointer multimeter to check circuits of electronic control system.

3) If you are checking a vehicle with anti-theft system, and have to change ECM in ‘next steps’, please pay attention to do matching work after the change.

4) If the fault code says the circuit has too-low voltage, that may implies that there is short circuit or open circuit in this circuit; if the fault code says the circuit has too-high voltage, that may implies that there is short circuit to power in this circuit; if the fault code says it’s circuit fault, that may implies that there is open circuit or multi-fault in this circuit.

2、Diagnosis support

1) If the fault code cannot be eliminated, that is steady state fault; if it is occational fault, you shoud mainly check whether the connectors are loosen up.

2) During the service, please also pay attention to the Influence of vehicle maintenance condition, cylinder pressure and mechanical ignition timing on the system.

3、Fault Code Diagnosis

ECM pins mentioned in the following should be subjected to practical wiring diagram.

4、MT22.1 ECM controlling system common fault code sheet

No.	Fault code	Fault code information	Type of fault
1	P 0012	big phase error of air inlet VCP camshaft	E
2	P 0016	learning deviation of air inlet VCP cam wheel is out of range	A
3	P 0026	vise of air inlet VCP hydraulic control valve	E
4	P 0031	front oxygen sensor heater short-circuit to low voltage	A
5	P 0032	front oxygen sensor heater short-circuit to high voltage	A
6	P 0037	rear oxygen sensor heater short-circuit to low voltage	A
7	P 0038	rear oxygen sensor heater short-circuit to high voltage	A

8	P 0068	electronic throttle valve air mass flow fault	A
9	P 0076	low voltage or open circuit of air inlet VCP hydraulic control valve coil	A
10	P 0077	high voltage of air inlet VCP hydraulic control valve coil	A
1	P 0105	signal vise of air inlet pressure sensor	E
1	P 0106	inlet air pressure/accelerator pedal position	E
13	P 0107	low voltage circuit or open circuit of inlet air pressure sensor	A
1	P 0108	high voltage circuit of inlet air pressure sensor	A
1	P 0112	ow voltagecircuit l of inlet air temperature sensor	E
16	P 0113	high voltage or open circuit of inlet air temperature sensor	E
17	P 0117	low voltage circuit of coolant temperature sensor	E
18	P 0118	high voltage or open circuit of coolant temperature sensor	E
19	P 0122	low voltage circuit of electronic throttle valve position sensor 1#	A
20	P 0123	high voltage circuit of electronic throttle valve position sensor 1#	A
2	P 0131	front oxygen sensor short-circuit to low voltage	E
2	P 0132	front oxygen sensor short-circuit to high voltage	E

No.	Fault code	Fault code information	Type of fault
23	P 0133	too-low reacting of front oxygen sensor	E
24	P 0134	short-circuit of front oxygen sensor	A
25	P 0137	rear oxygen sensor short-circuit to low voltage	E
26	P 0138	rear oxygen sensor short-circuit to high voltage	E
27	P 0140	short-circuit of rear oxygen sensor	E
28	P 0171	too lean of oil system under non-idle speed	E
29	P 0172	too rich of oil system under non-idle speed	E
30	P 0222	low voltage circuit of electronic throttle valve position sensor 1#	A
31	P 0223	high voltage circuit of electronic throttle valve position sensor 1#	A
32	P 0230	oil pump relay fault	A
33	P 0261	low voltage circuit fault of 1st cylinder nozzle	A
34	P 0262	high voltage circuit fault of 1st cylinder nozzle	A
35	P 0264	low voltage circuit fault of 2nd cylinder nozzle	A
36	P 0265	high voltage circuit fault of 2nd cylinder nozzle	A
37	P 0267	low voltage circuit fault of 3rd cylinder nozzle	A
38	P 0268	high voltage circuit fault of 3rd cylinder nozzle	A
39	P 0270	low voltage circuit fault of 4th cylinder nozzle	A
40	P 0271	high voltage circuit fault of 4th cylinder nozzle	A
41	P 0300	single or multi cylinders are on fire	A/B
42	P 0324	block control system fault	C
43	P 0325	block sensor fault	C
44	P 0335	no signal of circuit of crankshaft position sensor	A
45	P 0336	signal interference circuit of crankshaft position sensor	E
46	P 0340	no signal of circuit of camshaft position sensor	E
47	P 0341	fault of circuit reasonability of camshaft position sensor	E
48	P 0340	state diagnosis of air inlet VCP camshaft position sensor	A
49	P 0341	diagnosis fault of air inlet VCP target wheel	A
50	P 0351	1st cylinder ignition coil fault	A
51	P 0352	2nd cylinder ignition coil fault	A

52	P 0353	3rd cylinder ignition coil fault	A
53	P 0354	4th cylinder ignition coil fault	A
54	P 0420	low efficiency of catalytic converter	A
55	P 0458	canister purge solenoid short-circuit to low voltage or open circuit	E
56	P 0459	canister purge solenoid short-circuit to high voltage	E
57	P 0480	low-speed fan fault	C
58	P 0481	high-speed fan fault	C
59	P 0502	no signal of speed sensor	E

No.	Fault code	Fault code information	Type of fault
60	P 0504	correlative fault of brake switch	C
61	P 0506	idle speed is too low	E
62	P 0507	idle speed is too high	E
63	P 0562	system voltage is too low	C
64	P 0563	system voltage is too high	C
65	P 0571	on-off state of brake light didn’ t change while braking	E
66	P 0602	ECM programming error (mismatch of software version)	A
67	P 0606	ECM processor fault	A
68	P 0606	ECM processor fault	A
69	P 0606	ECM processor fault	A
70	P 0606	ECM processor fault	A
71	P 0606	ECM processor fault	A
72	P 060A	ECM processor fault	A
73	P 060A	ECM processor fault	A
74	P 060A	ECM processor fault	A
75	P 0616	low voltage of starter relay	A
76	P 0617	high voltage of starter relay	A
77	P 0633	non-learning fault of burglar alarm	C
78	P 0641	ETC reference voltage A# amplitude fault	A
79	P 0646	short circuit to low voltage or open circuit of AC clutch relay circuit	C
80	P 0647	short circuit to high voltage of AC clutch relay circuit	C
81	P 0650	fault indicator light failure	C
82	P 0651	ETC reference voltage B# amplitude fault	A
83	P 0685	main relay fault	A
84	P 0685	main relay fault	A
85	P 0831	signal of clutch switch circuit is often low (short circuit to ground or open circuit)	C
86	P 0832	signal of clutch switch circuit is often high (short circuit to ground or open circuit)	C
87	P 1167	front oxygen is too rich during deceleration fuel cutoff	E
88	P 1171	front oxygen is too thin during acceleration enrichment	E
89	P 1336	58 tooth gear error non-learning	A

90	P 1397	no signal of wheel speed sensor	C
91	P 1516	diagnosis error for ETC drive steady state	A
92	P 2101	diagnosis error for ETC drive second order	A
93	P 2104	forced idle of engine	A
94	P 2105	forced stop of engine	A
95	P 2106	engine performance limitation	A
96	P 2110	engine power management	A

No.	Fault code	Fault code information	Type of fault
97	P 2119	electronic throttle valve return fault	C
98	P 2122	low voltage of electronic accelerator pedal position sensor 1# circuit	A
99	P 2123	high voltage of electronic accelerator pedal position sensor 1# circuit	A
100	P 2127	low voltage of electronic accelerator pedal position sensor 2# circuit	A
101	P 2128	high voltage of electronic accelerator pedal position sensor 2# circuit	A
102	P 2135	correlative fault of electronic throttle valve position sensor 1#, 2# circuit	E
103	P 2138	correlative fault of electronic accelerator pedal position sensor 1#, 2# circuit	A
104	P 2187	too-thin fuel system under idling condition	E
105	P 2188	too-rich fuel system under idling condition	E
106	P 2A01	slow response of rear oxygen sensor during deceleration fuel cutoff	E
107	U 0167	(C167) no response of burglar alarm	C
108	U 0426	(C426) burglar alarm authentication failure	C
109	B 0010	(8010) fault of crash fuel cutoff rationality	C

Fault Code ：P0012

fault code	P0012	air inlet VCP cam phase is big		
setting emergency control scheme		light up fault lamp until it is off		
connection terminal		MT22.1	VPC control	normal measurement signal
variable timing control signal		43	B	0～1000mV
main relay		\	A	12V
judging criteria	possible fault reason		referenced trouble shooting scheme	
engine running fault lasts for more than 2 seconds	1. poor connecting of connectors		1. connect again	
	2. open circuit of variable timing control signal		2. repair wiring harness	
	3. short circuit of variable timing control signal		3. repair wiring harness	

	4. circuit fault of main relay	4. repair wiring harness
	5. sensor damage	5. change the sensor
	6. timing control signal inputing port fault on ECM	6. change the ECM

Fault Code:P0026

fault code	P0026	air inlet VCP hudraulic control valve vise		
setting emergency control scheme		light up fault lamp until it is off; turn off the air inlet VCP hudraulic control valve		
connection terminal		MT22.1	VPC control	normal measurement signal
variable timing control signal		\	A	12V
main relay		43	B	0-12V
judging criteria	possible fault reason		referenced trouble shooting scheme	

fault code	P0026	air inlet VCP hudraulic control valve vise
lasts for more than 2 seconds	1. hydraulic control valve drive circuit got short circuit to system power positive	1. repair wiring harness
	2. hudraulic control valve damage	2. change the control valve
	3 ECM fault	3. change the ECM

Fault Code P0107

fault code	P0107	open circuit or low voltage of air inlet pressure sensor circuit	
setting emergency control scheme		light up fault lamp until it is off; engine is stop: 100kPa; engine is in idle: ≈ 32kPa engine is running: manifold pressure changes with the opening of throttle valve	
connection terminal		MT22.1	pressure sensor	normal measurement signal
5V reference voltage		66	3	5V
manifold pressure signal		54	4	0.5～4.5V
sensor signal ground		76	1	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
engine is running without TPS fault MAP<14.017KPa RPM<1050rpm TPS>18.75 % the fault lasted for more than 2.5 seconds	1. poor connecting		1. connect it again	
	2. open circuit of harness pressure signal circuit		2. repair wiring harness	
	3. short circuit to ground of harness pressure signal circuit		3. repair wiring harness	
	4. open circuit of 5V reference voltage circuit		4. repair wiring harness	
	5.open circuit of sensor signal ground circuit		5. repair wiring harness	
	6. harness of 5V reference voltage circuit is in reverse with reference ground wire (this fault can cause damage of sensor)		6.repair wiring harness	
	7. sensor damage		7. change the sensor	
	8. MAP signal inputing port fault on ECM		8. ECM change the ECM	

Fault Code:P0108

fault code	P0108	high voltage of air inlet pressure sensor circuit		
setting emergency control scheme		light up fault lamp until it is off; engine is stop: 100kPa; engine is in idle: ≈ 32kPa engine is running: manifold pressure changes with the opening of		
connection terminal		MT22.1	pressure sensor	normal measurement signal
5V reference voltage		66	3	5V
manifold pressure signal		54	4	0.5 ~ 4.5V
sensor signal ground		76	1	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
engine is running without TPS fault MAP>98.117kPa TPS<19.141% the fault lasted for more than 2.5 seconds	1. pressure signal circuit got short circuit to 5V reference voltage or power positive pole		1 repair wiring harness	
	2. sensor damage		2.change the sensor	
	3. pressure signal inputing port fault on ECM		3.change the ECM	

Fault Code:P0112

fault code	P0112	low voltage of air inlet temperature sensor circuit		
setting emergency control scheme		light up fault lamp until it is off; inlet air temperature is equal to coolant temperature but lower than 44.25 degree		
connection terminal		MT22.1	temperature sensor	normal measurement signal
inlet air temperature signal		71	2	0.5 ~ 4.5V
sensor signal ground		76	1	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
running time of engine is longer than 120 seconds; MAT is lower than -38.25 degree; fault lasted for more than 2.5 seconds	1. poor connecting		1. connect it again	
	2. open circuit of temperature signal ground circuit		2. repair wiring harness	
	3. open circuit of sensor signal ground circuit		3. repair wiring harness	
	4. temperature signal circuit got short circuit to power positive pole		4. repair wiring harness	
	5. sensor damage		5. change the sensor	
	6. signal inputing port fault on ECM		6. change the ECM	

Fault Code:P0113

fault code	P0113	high voltage of air inlet temperature sensor circuit		
setting emergency control scheme		light up fault lamp until it is off; inlet air temperature is equal to coolant temperature but lower than 44.25 degree		
connection terminal		MT22.1	temperature sensor	normal measurement signal
inlet air temperature signal		71	2	0.5 ~ 4.5V
sensor signal ground		76	1	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
running time of engine is longer than 60 seconds; MAT is	1. temperature signal circuit got short circuit to ground		1. repair wiring harness	
	2. sensor damage		2. change the sensor	

higher than 148.5 degree; fault lasted for more than 2 seconds	3. signal inputing port fault on ECM	3. change the ECM

Fault Code:P0117

fault code	P0117	low voltage of coolant temperature sensor circuit		
setting emergency control scheme		light up fault lamp until it is off; use inlet air temperature when starting, and fix the temperature when it increased to 79.5 degree		
connection terminal		MT22.1	coolant temperature sensor	normal measurement signal
coolant temperature signal		49	A	0.5 ~ 4.5V
sensor signal ground		74	C	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	

fault code	P0117	low voltage of coolant temperature sensor circuit
running time of engine is longer than 10 seconds; MAT is lower than -38.25 degree; fault lasted for more than 2 seconds	1. poor connecting	1. connect it again
	2. open circuit of temperature signal ground circuit	2. repair wiring harness
	3. open circuit of sensor signal ground circuit	3. repair wiring harness
	4. temperature signal circuit got short circuit to power positive pole	4. repair wiring harness
	5. sensor damage	5. change the sensor
	6. signal inputing port fault on ECM	6. change the ECM

Fault Code:P0118

fault code	P0118	high voltage or open circuit of coolant temperature sensor circuit		
setting emergency control scheme		light up fault lamp until it is off; use inlet air temperature when starting, and fix the temperature when it increased to 79.5 degree		
connection terminal		MT22.1	coolant temperature sensor	normal measurement signal
coolant temperature signal		49	A	0.5 ~ 4.5V
sensor signal ground		74	C	0V
judging criteria	possible fault reason	referenced trouble shooting scheme		
running time of engine is longer than 2 seconds; CTS is higher than 135 degree; fault lasted for more than 2 seconds	1. temperature signal circuit got short circuit to ground	1. repair wiring harness		
	2. sensor damage	2. change the sensor		
	3. signal inputing port fault on ECM	3. change the ECM		

Fault Code:P0122

fault code	P0122	low voltage of ETC throttle valve position sensor 1# circuit

setting emergency control scheme	light up fault lamp until it is off; set the opening of throttle valve position sensor to be 0% in idle speed; opening in other rotating speeds will change with the corresponding speeds suspend auto-zero of throttle valve position sensor suspend clearing function			
connection terminal		MT22.1	throttle valve position sensor	normal measurement signal
5V reference voltage		70	A	5V
throttle valve position 1 signal		52	D	0.5 ~ 4.5V
sensor signal ground		74	F	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
engine is running, but the speed is slower than 3000rpm; no MAP fault and MAP is lower than 70kpa; the fault lasted for more than 2 seconds	1. sensor signal circuit got short circuit to power positive pole or reference voltage		1. repair wiring harness	
	2. sensor damage		2. change the sensor	
	3. signal inputing port fault on ECM		3. change the ECM	

Fault Code:P0123

fault code	P0123	high voltage or open circuit of ETC throttle valve position sensor 1# circuit		
setting emergency control scheme		light up fault lamp until it is off; set the opening of throttle valve position sensor to be 0% in idle speed; opening in other rotating speeds will change with the corresponding speeds suspend auto-zero of throttle valve position sensor suspend clearing function		
connection terminal		MT22.1	throttle valve position sensor	normal measurement signal
5V reference voltage		70	A	5V
throttle valve position 1 signal		52	D	0.5 ~ 4.5V
sensor signal ground		74	F	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
the fault lasted for more than 2 seconds	1. poor connecting		1. connect it again	
	2. open circuit of sensor signal ground		2. repair wiring harness	
	3. sensor signal circuit got short circuit to ground		3. repair wiring harness	
	4. sensor damage		4. change the sensor	
	5. signal inputing port fault on ECM		5. change the ECM	

Fault Code:P0131

fault code	P0131	front oxygen sensor is short-circuit to low voltage		
setting emergency control scheme		light up fault lamp until it is off and turn off the ignition switch closed-loop working time of system postponed		
connection terminal		MT22.1	heating oxygen sensor	normal measurement signal
main power of system		\	D	12V
heat driving		24	C	0V
oxygen sensor high signal		47	B	0 ~ 1000mV fluctuation
oxygen sensor low signal		73	A	0V

judging criteria	possible fault reason	referenced trouble shooting scheme
the fault lasted for more than 1 seconds	1. heat driving circuit got short circuit to power positive pole	1. repair wiring harness
	2. sensor damage	2. change the sensor
	3. signal outputing port fault on ECM	3. change the ECM

Fault Code:P0132

fault code	P0132	front oxygen sensor is short-circuit tohigh voltage		
setting emergency control scheme		light up fault lamp until it is off and turn off the ignition switch closed-loop working time of system postponed		
connection terminal		MT22.1	heating oxygen sensor	normal measurement signal
main power of system		\	D	12V
heat driving		24	C	0V

fault code	P0132	front oxygen sensor is short-circuit tohigh voltage		
oxygen sensor high signal		47	B	0 ~ 1000mV fluctuation
oxygen sensor low signal		73	A	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
fault of without main relay lasted for more than 1 seconds	1. poor connecting		1. connect it again	
	2. open circuit of heat driving circuit		2. repair wiring harness	
	3. heat driving circuit got short circuit to ground		3. repair wiring harness	
	4. sensor damage		4. change the sensor	
	5. signal outputing port fault on ECM		5. change the ECM	

Fault Code :P0133

fault code	P0133	too-slow response of front oxygen sensor		
setting emergency control scheme		light up fault lamp until it is off and turn off the ignition switch closed-loop working time of system postponed		
connection terminal		MT22.1	heating oxygen sensor	normal measurement signal
main power of system		\	D	12V
heat driving		24	C	0V
oxygen sensor high signal		47	B	0 ~ 1000mV fluctuation
oxygen sensor low signal		73	A	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
fault of without main relay lasted for more than 1 seconds	1. poor connecting		1. connect it again	
	2. open circuit of heat driving circuit		2. repair wiring harness	
	3. heat driving circuit got short circuit to ground		3. repair wiring harness	
	4. sensor damage		4. change the sensor	
	5. signal outputing port fault on ECM		5. change the ECM	

Fault Code :P0137

fault code	P0137	rear oxygen sensor is short-circuit to low voltage		
setting emergency control scheme		light up fault lamp until it is off and turn off the ignition switch closed-loop working time of system postponed		
connection terminal		MT22.1	heating oxygen sensor	normal measurement signal
main power of system		\	D	12V
heat driving		23	C	0V
oxygen sensor high signal		48	B	0 ~ 1000mV fluctuation
oxygen sensor low signal		73	A	0V

fault code	P0137	rear oxygen sensor is short-circuit to low voltage
judging criteria	possible fault reason	referenced trouble shooting scheme
fault lasted for more than 1 seconds	1. heat driving circuit got short circuit to power positive pole 2. sensor damage 3. signal outputing port fault on ECM	1. repair wiring harness 2. change the sensor 3. change the ECM

Fault Code :P0138

fault code	P0138	rear oxygen sensor is short-circuit to high voltage		
setting emergency control scheme		light up fault lamp until it is off and turn off the ignition switch closed-loop working time of system postponed		
connection terminal		MT22.1	heating oxygen sensor	normal measurement signal
main power of system		\	D	12V
heat driving		23	C	0V
oxygen sensor high signal		48	B	0 ~ 1000mV fluctuation
oxygen sensor low signal		73	A	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
fault of without main relay lasted for more than 1 seconds	1. poor connecting		1. connect it again	
	2. open circuit of heat driving circuit		2. repair wiring harness	
	3. heat driving circuit got short circuit to ground		3. repair wiring harness	
	4. sensor damage		4. change the sensor	
	5. signal outputing port fault on ECM		5. change the ECM	

Fault Code :P0222

fault code	P0222	low voltage of ETC throttle valve position sensor 2# circuit

setting emergency control scheme		light up fault lamp until it is off; set the opening of throttle valve position sensor to be 0% in idle speed; opening in other rotating speeds will change with the corresponding speeds suspend auto-zero of throttle valve position sensor	
connection terminal		MT22.1	throttle valve position sensor	normal measurement signal
5V reference voltage		70	A	5V
throttle valve position 2 signal		27	E	0.5 ~ 4.5V
sensor signal ground		74	F	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	

fault code	P0222	low voltage of ETC throttle valve position sensor 2# circuit	
engine is running, but the speed is slower than 3000rpm; no MAP fault and MAP is lower than 70kpa; the fault lasted for more than 2 seconds	1. sensor signal circuit got short circuit to power positive pole or reference voltage	1. repair wiring harness	
	2. sensor damage	2. change the sensor	
	3. signal inputing port fault on ECM	3. change the ECM	

Fault Code :P0223

fault code	P0223	high voltage or open circuit of ETC throttle valve position sensor 2# circuit		
setting emergency control scheme		light up fault lamp until it is off; set the opening of throttle valve position sensor to be 0% in idle speed; opening in other rotating speeds will change with the corresponding speeds suspend auto-zero of throttle valve position sensor		
connection terminal		MT22.1	throttle valve position sensor	normal measurement signal
5V reference voltage		70	A	5V
throttle valve position 2 signal		27	E	0.5 ~ 4.5V
sensor signal ground		74	F	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
the fault lasted for more than 2 seconds	1. poor connecting		1. connect it again	
	2. open circuit of sensor signal ground circuit		2. repair wiring harness	
	3. sensor signal circuit got short circuit to ground		3. repair wiring harness	
	4. sensor damage		4. change the sensor	
	5. signal inputing port fault on ECM		5. change the ECM	

Fault Code :P0230

fault code	P0230	fault of fuel pump relay
setting emergency control scheme		light up fault lamp until it is off

connection terminal	MT22.1	fuel pump relay	normal measurement signal
main power of system	\	refer to instruction of electric system	12V
sensor signal ground	10	refer to instruction of electric system	0V(Work), 12V(Stop)
judging criteria	possible fault reason	referenced trouble shooting scheme	

fault code	P0230	fault of fuel pump relay
the fault lasted for more than 1.5625 seconds	1. poor connecting	1. connect it again
	2. the circuit connected to main system power is open	2. repair wiring harness
	3. relay drive circuit got short to system power negative pole	3. repair wiring harness
	4. relay drive circuit is open	4. repair wiring harness
	5. relay damage	5.change the relay
	6. signal outputing port fault on ECM	6. change the ECM

Fault Code :P0325

fault code	P0325	fault of knock sensor		
setting emergency control scheme		light up fault lamp until it is off use safety ignition angle of advance		
connection terminal		MT22.1	knock sensor	normal measurement signal
knock high signal		36		0-1V
knock low signal		37		0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
engine speed is slower than 2000rpm; MAP is lower than 50kpa; the fault lasted for more than 5 seconds	1. poor connecting		1. connect it again	
	2. knock signal circuit is open		2. repair wiring harness	
	3. sensor signal ground is short-circuit		3. repair wiring harness	
	4. sensor signal circuit is short to other circuits		4. repair wiring harness	
	5. sensor damage		5. change the sensor	
	6. signal outputing port fault on ECM		6. change the ECM	

Fault Code:P0336

fault code	P0336	signal interference of crankshaft position sensor circuit
setting emergency control scheme		light up fault lamp until it is off

connection terminal	MT22.1	crankshaft position sensor	normal measurement signal
sensor signal	30	A	sine wave (with sensor B)
pressure signal	66	C	sine wave (with sensor A)
system ground wire	76	B	0V

judging criteria	possible fault reason	referenced trouble shooting scheme
engine is running; after 5 consecutive loop, the number of tooth to get into ECM is not equal to 58	1. poor shielding of signal circuit	1. use shield wire
	2. 58x tooth ring has metal foreign matter	2. clean 58x tooth ring

Fault Code:P0337

fault code	P0337	no signal of crankshaft position sensor circuit		
setting emergency control scheme		light up fault lamp until it is off engine cannot start		
connection terminal		MT22.1	crankshaft position sensor	normal measurement signal
sensor signal		30	A	sine wave (with sensor B)
pressure signal		66	C	sine wave (with sensor A)
system ground wire		76	B	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
start the engine; no engine speed; MAP decreased; 2.9509kpa; system voltage decreased 0.8V; vehicle speed is slower than 4lm/h; fault lasted for more than 2 seconds	1. poor connecting		1. connect it again	
	2. reverse connection of high and low signal		2. repair wiring harness	
	3. signal circuit is open		3. repair wiring harness	
	4. signal circuit is short to other circuits		4. repair wiring harness	
	5. sensor damage		5. change the sensor	
	6. signal inputing port fault on ECM		6. change the ECM	

Fault Code :P0341

fault code	P0341	fault of camshaft position sensor rationality		
setting emergency control scheme		light up fault lamp until it is off thers is 50% that probability that fuel injection sequence has 360 degree malposition		
connection terminal		MT22.1	camshaft position sensor	normal measurement signal
5V reference voltage		70	C	5V
camshaft signal		77	A	0-5V方波 square wave
sensor signal ground		74	B	0V

judging criteria	possible fault reason	referenced trouble shooting scheme
发动机运转 engine is running	1. poor connecting	1. connect it again
	2. reference voltage circuit is open	2. repair wiring harness
	3. signal ground is open-circuit	3. repair wiring harness
	4. camshaft signal is open-circuit	4. repair wiring harness
	5. sensor damage	5. change the sensor
	6. fault of ECM port	6. change the ECM

Fault Code：P0340

fault code	P0340	no signal of camshaft position sensor		
setting emergency control scheme		light up fault lamp until it is off thers is 50% that probability that fuel injection sequence has 360 degree malposition		
connection terminal		MT22.1	camshaft position sensor	normal measurement signal
5V reference voltage		70	C	5V
凸轮轴信号： camshaft signal		77	A	0-5V方波 square wave
sensor signal ground		74	B	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
发动机运转 engine is running	1. poor connecting		1. connect it again	
	2. reference voltage circuit is open		2. repair wiring harness	
	3. signal ground is open-circuit		3. repair wiring harness	
	4. camshaft signal is open-circuit		4. repair wiring harness	
	5. sensor damage		5. change the sensor	
	6. fault of ECM port		6. change the ECM	

Fault Code：P0351

fault code	P0351	fault of 1# ignition coil		
setting emergency control scheme		light up fault lamp until it is off stop the injection to 1st cylinder increase the objected idle speed to 1200rpm		
connection terminal		MT22.1	ignition coil	normal measurement signal
system main power		\		12V
1st cylinder drive		04		0-12Vnear to inductive peak of square wave）300V
judging criteria	possible fault reason		referenced trouble shooting scheme	
fault lasted for 1.25 seconds	1. 1st cylinder drive circuit is short to power positive pole		1. repair wiring harness	

	2. ignition coil damage	2. change the ignition coil
	3. ECM fault	3. change the ECM

Fault Code：P0352

fault code	P0352	fault of 2# ignition coil		
setting emergency control scheme		light up fault lamp until it is off stop the injection to 1st cylinder increase the objected idle speed to 1200rpm		
connection terminal		MT22.1	ignition coil	normal measurement signal
system main power		\		12V

fault code	P0352	fault of 2# ignition coil		
2nd cylinder drive		81		0-12Vnear to inductive peak of square wave〉300V
judging criteria	possible fault reason		referenced trouble shooting scheme	
fault lasted for 1.25 seconds	1. 2nd cylinder drive circuit is short to power positive pole		1. repair wiring harness	
	2. ignition coil damage		2. change the ignition coil	
	3. ECM fault		3. change the ECM	

Fault Code：P0353

fault code	P0353	fault of 3# ignition coil		
setting emergency control scheme		light up fault lamp until it is off stop the injection to 1st cylinder increase the objected idle speed to 1200rpm		
connection terminal		MT22.1	ignition coil	normal measurement signal
system main power		\		12V
3rd cylinder drive		01		0-12Vnear to inductive peak of square wave〉300V
judging criteria	possible fault reason		referenced trouble shooting scheme	
fault lasted for 1.25 seconds	1. 3rd cylinder drive circuit is short to power positive pole		1. repair wiring harness	
	2. ignition coil damage		2. change the ignition coil	
	3. ECM fault		3. change the ECM	

Fault Code:P0354

fault code	P0354	fault of 4# ignition coil		
setting emergency control scheme		light up fault lamp until it is off stop the injection to 1st cylinder increase the objected idle speed to 1200rpm		
connection terminal		MT22.1	ignition coil	normal measurement signal

system main power	\		12V
4th cylinder drive	62		0-12V near to inductive peak of square wave〉300V

judging criteria	possible fault reason	referenced trouble shooting scheme
fault lasted for 1.25 seconds	1. 4th cylinder drive circuit is short to power positive pole	1. repair wiring harness
	2. ignition coil damage	2. change the ignition coil
	3. ECM fault	3. change the ECM

Fault Code :P0458

fault code	P0458	canister solenoid circuit is short to low voltage		
setting emergency control scheme		light up fault lamp until it is off close the canister solenoid		
connection terminal		MT22.1	canister solenoid	normal measurement signal
system main power		\	B	12V
canister solenoid drive		64	A	0-12V方波
judging criteria	possible fault reason		referenced trouble shooting scheme	
fault lasted for more than 2 seconds	1. solenoid drive circuit is short to power positive pole		1. repair wiring harness	
	2. solenoid damage		2. change the solenoid	
	3. ECM fault		3. change the ECM	

Fault Code:P0459

fault code	P0459	canister solenoid circuit is short to high voltage		
setting emergency control scheme		light up fault lamp until it is off close the canister solenoid		
connection terminal		MT22.1	canister solenoid	normal measurement signal
system main power		\	B	12V
canister solenoid drive		64	A	0-12V
judging criteria	possible fault reason		referenced trouble shooting scheme	
fault lasted for more than 5 seconds	1. poor connecting		1. connect it again	
	2. solenoid drive circuit is short to power negative pole		2. repair wiring harness	
	3. solenoid drive circuit is open		3. repair wiring harness	
	4. the circuit connected to system main power is open		4. repair wiring harness	
	5. solenoid damage		5. change the solenoid	
	6. ECM fault		6. change the ECM	

Fault Code：P0480

fault code	P0480	fault of low speed fan		
setting emergency control scheme		light up fault lamp until it is off fan does not work (open circuit); and the fan always work when the water temperature reached 98 degree (short to ground)		
connection terminal		MT22.1	low speed fan relay	normal measurement signal
battery		\	factory will provide the instructions	12V
relay drive		65	factory will provide the instructions	0V(Work), 12V (Stop)
judging criteria	possible fault reason		referenced trouble shooting scheme	

fault code	P048	fault of low speed fan
fault lasted for more than 3 seconds	1. poor connecting	1. connect it again
	2. relay drive circuit is short to power negative pole	2. repair wiring harness
	3. relay drive circuit is open	3. repair wiring harness
	4. the circuit connected to battery is open	4. repair wiring harness
	5. relay damage	5. change the relay
	6. ECM fault	6. chane the ECM

Fault Code：P0481

fault code	P0481	fault of high speed fan	
setting emergency control scheme		light up fault lamp until it is off fan does not work (open circuit); and the fan always work when the water temperature reached 98 degree (short to ground)	
connection terminal	MT22.1	low speed fan relay	normal measurement signal
battery	\	factory will provide the instructions	12V
relay drive	17	factory will provide the instructions	0V(Work), 12V (Stop)

judging criteria	possible fault reason	referenced trouble shooting scheme
fault lasted for more than 3 seconds	1. poor connecting	1. connect it again
	2. relay drive circuit is short to power negative pole	2. repair wiring harness
	3. relay drive circuit is open	3. repair wiring harness
	4.the circuit connected to battery is open	4. repair wiring harness
	5. relay damage	5. change the relay
	6. ECM fault	6. chane the ECM

Fault Code：P0502

fault code	P0502	no signal of speed sensor

setting emergency control scheme	light up fault lamp until it is off			
connection terminal		MT22.1	speed sensor	normal measurement signal
sensor signal ground		80	/	0-12Vsquare wave
judging criteria	possible fault reason		referenced trouble shooting scheme	

fault code	P0502	no signal of speed sensor
engine is running, and spees is lower than 2kph; MAP<25.82Kpa MAP is lower than 25.82Kpa; engine speed is between 1200rpm and 5000rpm; close the throttle valve the fault lasted for more than 5 seconds	1. poor connecting	1. connect it again
	2. circuit from transmission to instrument signal is open	2. change the flexible shaft or signal wire
	3. wiring harness from instrument to ECM is open	3. repair wiring harness
	4. speed sensor damage	4. change the speed sensor
	5. instrument fault	5. repair or change the instrument
	6. ECM fault	6. chane the ECM

Fault Code：P0562

fault code	P0562	system voltage is low	
setting emergency control scheme		light up fault lamp until it is off system stopped the fuel injection	
connection terminal		MT22.1	ignition switch normal measurement signal
点火开关：ignition switch		68	refer to electric system instruction 12V
judging criteria	possible fault reason		referenced trouble shooting scheme
turn on ignition switch; fault lasted for 5 seconds	1. generator regulator damage		1. change damaged voltage regulation
	2. misuse the low-voltage battery		2. use correct battery

Fault Code：P0563

fault code	P0563	system voltage is high		
setting emergency control scheme		light up fault lamp until it is off system stopped the fuel injection		
connection terminal		MT22.1	ignition switch	normal measurement signal
点火开关：ignition switch		68	refer to electric system instruction	12V
judging criteria	possible fault reason		referenced trouble shooting scheme	
turn on ignition switch system voltage is higher than 17.2V fault lasted for 5 seconds	1. generator regulator damage		1. change damaged voltage regulation	
	2. misuse the high-voltage battery		2. use correct battery	

Fault Code：P0571

fault code	P0571	fault of brake light switch		
setting emergency control scheme		does not light (open circuit) always light (short-circuit to ground)		
connection terminal		MT22.1	system fault indicator light	normal measurement signal
ignition switch		\	refer to electric system instruction	12V
indicator light drive		33	refer to electric system instruction	OFF=12V， ON=0V
judging criteria	possible fault reason		referenced trouble shooting scheme	

fault code	P0571	fault of brake light switch	
fault lasted for more than 2 seconds	1. poor assembly of fault light	1. assemble the light again	
	2. fault of ignition switch circuit	2. repair wiring harness	
	3. drive circuit is short to the power negative pole	3. repair wiring harness	
	4. damage of the light	4. change the light	

Fault Code：P0601

fault code	P0601	ROM verification fault	
setting emergency control scheme		light up fault lamp until it is off	
connection terminal		MT22.1	ECM	normal measurement signal
ECM：		refer to electric system instruction	\	
judging criteria	possible fault reason		referenced trouble shooting scheme
fault	ECM fault		change the ECM

Fault Code：P0646

fault code	P0646	AC clutch circuit is short to low voltage	
setting emergency control scheme		light up fault lamp until it is off cut off the clutch relay circuit	
connection terminal		MT22.1		normal measurement signal
system main power		\		12V
AC clutch signal		09		0-12V square wave
judging criteria	possible fault reason		referenced trouble shooting scheme
fault lasted for more than 2 seconds	1. clutch drive circuit is short to power positive pole		1. repair wiring harness
	2. damage of AC clutch		2. change the AC clutch
	3. ECM fault		3. change the ECM

Fault Code：P0647

fault code	P0647	AC clutch circuit is short to high voltage		
setting emergency control scheme		light up fault lamp until it is off cut off the clutch relay circuit		
connection terminal		MT22.1		normal measurement signal
system main power		\		12V
AC clutch signal		09		0-12V square wave
judging criteria	possible fault reason		referenced trouble shooting scheme	

fault code	P0647	AC clutch circuit is short to high voltage	
fault lasted for more than 5 seconds	1. poor connecting	1. connect it again	
	2. clutch drive circuit is short to power negative pole	2. repair wiring harness	
	3. clutch drive circuit is open	3. repair wiring harness	
	4. circuit connected to system main power is open	4. repair wiring harness	
	5. damage of AC clutch	5. change the AC clutch	
	6. ECM fault	6. change the ECM	

Fault Code：P1397

fault code	P1397	no signal of wheel speed sensor	
setting emergency control scheme		light up fault lamp until it is off	
connection terminal		MT22.1	speed sensor	normal measurement signal
sensor signal ground		80	/	0-12V square wave
judging criteria	possible fault reason	referenced trouble shooting scheme	
engine is running, and spees is lower than 2kph; MAP<25.82Kpa MAP is lower than 25.82Kpa; engine speed is between 1200rpm and 5000rpm; close the throttle valve the fault lasted for more than 5 seconds	1. poor connecting	1. connect it again	
	2. circuit from transmission to instrument	2. change the flexible shaft or signal wire	
	3. wiring harness from instrument to ECM is	3. repair wiring harness	
	4. speed sensor damage	4. change the speed sensor	
	5. instrument fault	5. repair or change the instrument	
	6. ECM fault	6. chane the ECM	

Fault Code :P2122

fault code	P2122	low voltage or open circuit of electronic accelerator pedal position sensor 1# circuit		
setting emergency control scheme		light up fault lamp until it is off		
connection terminal		MT22.1	1 accelerator pedal position sensor 1	normal measurement signal
5V reference voltage		70	2	5V

1 : accelerator pedal signal 1	41	4	0.5 ~ 4.5V
sensor signal ground	74	3	0V

judging criteria	possible fault reason	referenced trouble shooting scheme
engine is running fault lasted for more than 2.5 seconds	1. accelerator pedal position sensor signal circuit is short to 5V reference voltage or power positive pole	1.repair wiring harness
	2. sensor damage	2.change the sensor
	3. fault of pressure signal inputting port on ECM	3. chane the ECM

Fault Code:P2123

fault code	P2123	high voltage of electronic accelerator pedal position sensor 1# circuit		
setting emergency control scheme		light up fault lamp until it is off		
connection terminal		MT22.1	1 accelerator pedal position sensor 1	normal measurement signal
5V reference voltage		70	2	5V
1 : accelerator pedal signal 1		41	4	0.5 ~ 4.5V
sensor signal ground		74	3	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
engine is running fault lasted for more than 2.5 seconds	1. poor connecting		1. connect it again	
	2. sensor signal circuit is open		2. repair wiring harness	
	3. sensor signal circuit is short to ground		3. repair wiring harness	
	4. sensor damage		4. change the sensor	
	5. fault of this signal inputting port		5. change the ECM	

Fault Code:P2127

fault code	P2127	low voltage or open circuit of electronic accelerator pedal position sensor 2# circuit		
setting emergency control scheme		light up fault lamp until it is off		
connection terminal		MT22.1	2 accelerator pedal position sensor 2	normal measurement signal
5V reference voltage		66	1	5V
2 : accelerator pedal signal 2		42	6	0.5 ~ 4.5V
sensor signal ground		76	5	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	
engine is running fault lasted for more than 2.5 seconds	1. accelerator pedal position sensor signal circuit is short to 5V reference voltage or power positive pole		1.repair wiring harness	
	2. sensor damage		2.change the sensor	

	3. fault of pressure signal inputting port on ECM	3. chane the ECM

Fault Code:P2128

fault code	P2128	high voltage of electronic accelerator pedal position sensor 2# circuit		
setting emergency control scheme		light up fault lamp until it is off		
connection terminal		MT22.1	2 accelerator pedal position sensor 2	normal measurement signal
5V reference voltage		66	1	5V
2 : accelerator pedal signal 2		42	6	0.5 ~ 4.5V
sensor signal ground		76	5	0V
judging criteria	possible fault reason		referenced trouble shooting scheme	

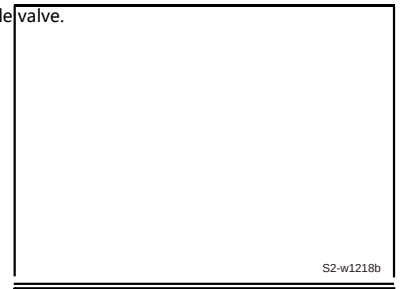
fault code	P2128	high voltage of electronic accelerator pedal position sensor 2# circuit
engine is running fault lasted for more than 2.5 seconds	1. poor connecting	1. connect it again
	2. sensor signal circuit is open	2. repair wiring harness
	3. sensor signal circuit is short to ground	3. repair wiring harness
	4. sensor damage	4. change the sensor
	5. fault of this signal inputting port	5. change the ECM

III、Electronic Throttle Valve

(I)Disassemly

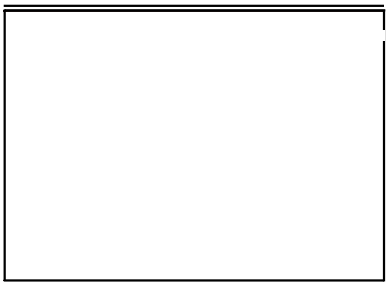
1. Open the engine cover
2. Cut off the battery negative cable. Please refer to cut-off and connection of battery cables
3. Disassemble air filter a ssenmly. Please refer to air filter assembly
4. disassemble the electronic throttle valve

1). Cut off the wiring harness connection of electronic throttle valve.

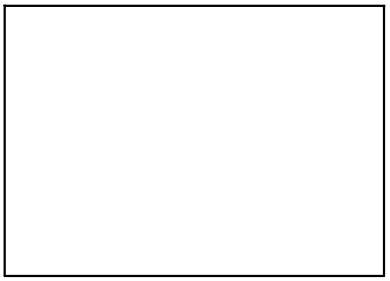


S2-w1218b

2). Cut off the conection between electronic throttle valve and air outlet pipe of air filter



3). Remove the four fixed bolts on electronic throttle valve, and take out the valve from intake manifold.



S2-w1219b

(II)Check

1. electronic throttle valve appearance check

1). Check if the sensor' s harness connectors are well-connected and firm; if the sensor is loosen up or fallen off; if the appearance is ok or is there any crack trace. Stir the valve block to see whether it rotate smoothly or not. Check if there is too much carbon deposition in throttle valve

2. Check the circuit

1). turn off the ignition switch, unplug the harness connector at sensor end;

2). open the ignition switch, use digital multimeter to measure every terminals of sensor harness connector;

3). When you measure the power terminal of sensor, please use 5V voltage as the standard. If the voltage is different, that means there is fault in controlling circuit or ECM, and you should do further test;

4). When you measure the grounding terminal of sensor, it should be in breakover with battery negative pole. If it is not, please check the grounding circuit.

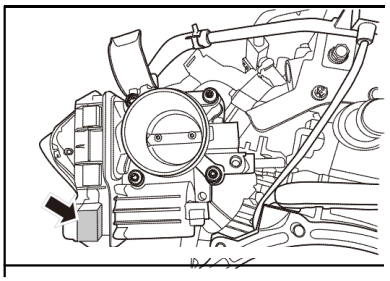
(III)Assembly

1. assemble the electronic throttle valve

1). Assemble the 4 fixing bolts of electronic throttle valve and tighten them.

2). Connect the electronic throttle valve an air filter outlet pipe assembly; then tighten the clamp.

3). Connect the electronic throttle valve harness connector.



2. Assemble the air filter assembly.

3. Connect the cable of battery negative pole.
4. Close the engine cover.

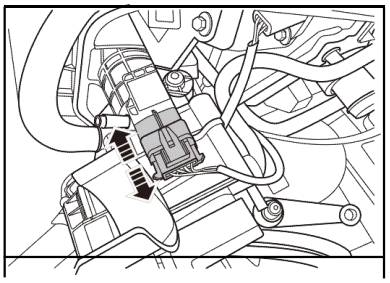
S2-w1219b

S2-w1218b

IV、Absolute pressure sensor

(I)Disassembly

1. Open the engine cover.
2. Cut off the cable of battery negative pole. Please refer to Cut-off and Connection of Battery Cable.
3. Remove the air filter assembly. Please refer to air filter assembly.
4. Disassemble the absolute pressure sensor.
   1). Cut off the harness connector of throttle valve sensor.



   2). Remove one fixing bolt.
   3). Take out the absolute pressure sensor.

(II)Check

1. Appearance check
   1). Check if the sensor' s harness connectors are well-connected and firm; if the sensor is loosen up or fallen off; if the appearance is ok or is there any crack trace. Check if the sensor inspection hole is plugged.
2. Circuit check
   1). Turn off the ignition switch; unplug the harness connector at sensor end;
   2). Open the ignition switch, use digital multimeter to measure every terminals of sensor harness connector;
   3). When you measure the power terminal of sensor, please use 5V voltage as the standard. If the voltage is different, that means there is fault in controlling circuit or ECM, and you should do further test;
   4). When you measure the grounding terminal of sensor, the resistance between the grounding terminal and battery negative pole should be lower than 3Ω. If the resistance is abnormal, please check the grounding circuit.

5). If results of above checks are abnormal, please turn off the ignition switch, plug out the ECM harness, and check of the harness between sensor terminal and ECM terminal is open or short-circuit.

(III)Assembly

1. Assemble absolute pressure sensor

1). Assemble absolute pressure sensor fixing bolts.
tightening torque 6±0.5N.m

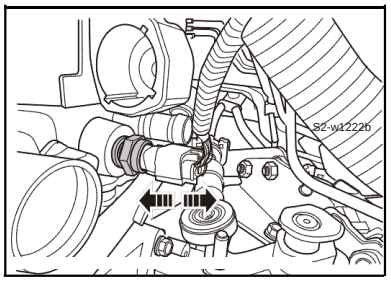
2). Connect the harness connector of absolute pressure sensor.

2. Assemble air filter assembly
3. Connect cable of battery negative pole
4. Close the engine cover

V、Water temperature sensor

(I)Disassembly

1. Open the engine cover
2. Cut off the cable of battery negative pole. Please refer to Cut-off and Connection of Battery Cable.
3. Drain off the coolant. Please refer to Change the Coolant.
4. Disassemble water temperature sensor
   1). Cut off the harness connector of water temperature sensor.



   2). Disassemble water temperature sensor.
   3). Take out the water temperature sensor.

(II)Check

1. Appearance check
   1). Check if the sensor' s harness connectors are well-connected and firm; if the sensor is loosen up or fallen off; if the appearance is ok or is there any crack trace.
2. Circuit check
   1). Turn off the ignition switch; unplug the harness connector at sensor end;
   2). Open the ignition switch, use digital multimeter to measure every terminals of water temperature sensor harness connector;
   3). When you measure the power terminal of sensor, please use 5V voltage as the standard. If the voltage is different, that means there is fault in controlling circuit or ECM, and you should do further test;
   4). When you measure the grounding terminal of sensor, the resistance between the grounding terminal and battery negative pole should be lower than 3Ω. If the resistance is abnormal, please check the grounding

circuit.

(III)Assembly

1. Assemble the water temperature sensor
   1). On the occasion that the sealing ring of water temperature sensor is in good condition, please smear a little sealing glue on sensor thread and sealing gasket; then assemble and tighten the water temperature sensor.

   tightening torque 20±4N·m

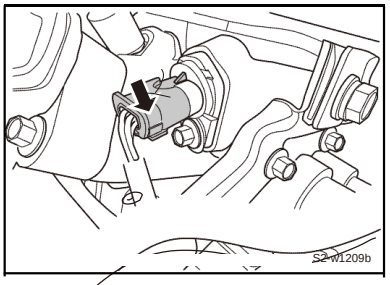
   2).Connect the harness connector of water temperature sensor.
2. Check and fill the coolant to proper level
3. Connect the cable of battery negative pole
4. Close the engine cover

S2-w1223b

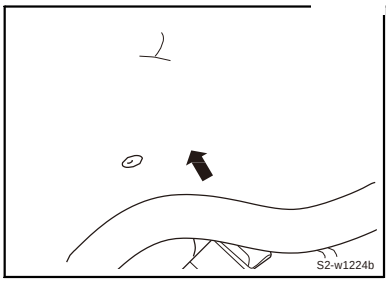
VI、Camshaft position sensor

(I)Disassembly

1. Open the engine cover
2. Cut off the cable of battery negative pole. Please refer to Cut-off and Connection of Battery Cable.
3. Remove the air filter assembly. Please refer to air filter assembly.
4. Disassemble the camshaft positon sensor
   1). Cut off the harness connector of camshaft positon sensor.



   2). Remove one fixing bolt of camshaft positon sensor.
   3). Take out the camshaft positon sensor.



(II)Check

1. Appearance check
   1). Check if the sensor' s harness connectors are well-connected and firm. And check if the distance between Hall elements and signal wheel is accord with the standard. Please also check if there is dirt or iron filling between them, and clean them if it is.
2. Circuit check
   1). Turn off the ignition switch; unplug the harness connector at sensor end;
   2). Open the ignition switch, use digital multimeter to measure every terminals of sensor harness connector;

3). When you measure the power terminal of sensor, please use 5V voltage as the standard. If the voltage is different, that means there is fault in controlling circuit or ECM, and you should do further test;

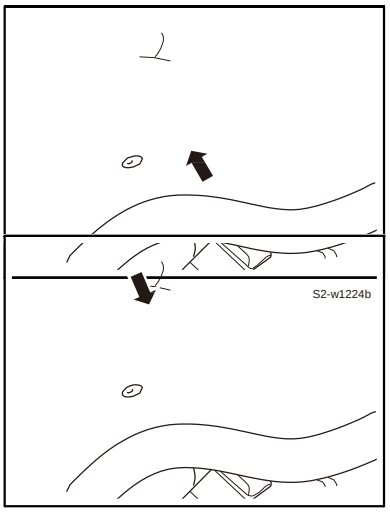
4). When you measure the grounding terminal of sensor, it should be in breakover with battery negative pole. If it is not, please check the grounding circuit.

5). If results of above checks are abnormal, please turn off the ignition switch, plug out the ECM harness, and check of the harness between sensor terminal and ECM terminal is open or short-circuit.

(III)Assembly

1. Assemble the camshaft positon sensor

1). Assemble the camshaft positon sensor on engine, and tighten the fixing bolts.
tightening torque 9~11N·m



S2-w1209b

2). Connect the harness connector of camshaft positon sensor.

2. Assemble air filter assembly

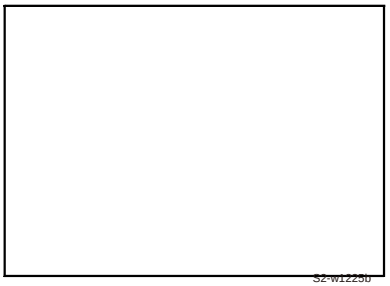
3. Connect the cable of battery negative pole

4. Close the engine cover

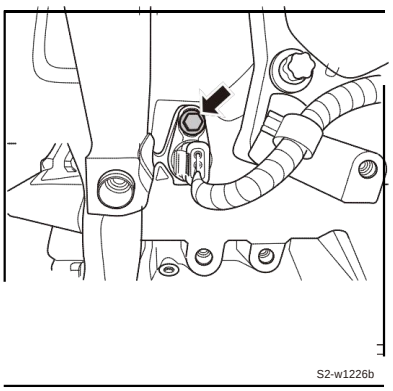
VII、Crankshaft position sensor

(I)Disassembly

1. Open the engine cover
2. .Cut off the cable of battery negative pole. Please refer to Cut-off and Connection of Battery Cable.
3. Remove the right front cover of engine. Please refer to Engine Front Cover.
4. Remove the dynamo belt. Pleasr refer to Dynamo Belt.
5. Remove the compressor assembly. Please refer to Compressor Assembly.
6. Disassemble the crankshaft position sensor
   1). Cut off the harness connector of crankshaft positon sensor.



   2). Remove the fixing bolts of cranshaft positon sensor.
   3). Take out the crankshaft positon sensor.



(II)Check

1. Appearance check
   1). Check if the sensor’ s harness connectors are well-connected and firm. And check if the distance between Hall elements and signal wheel is accord with the standard. Please also check if there is dirt or iron filling between them, and clean them if it is.

2. Circuit check

1). Turn off the ignition switch; unplug the harness connector at sensor end;

2). Open the ignition switch, use digital multimeter to measure every terminals of sensor harness connector;

3). When you measure the power terminal of sensor, please use 5V voltage as the standard. If the voltage is different, that means there is fault in controlling circuit or ECM, and you should do further test;

4). When you measure the grounding terminal of sensor, it should be in breakover with battery negative pole. If it is not, please check the grounding circuit.

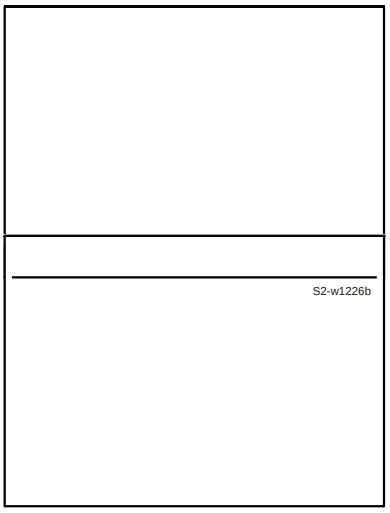
5). If results of above checks are abnormal, please turn off the ignition switch, plug out the ECM harness, and check of the harness between sensor terminal and ECM terminal is open or short-circuit.

(III)Assembly

1. Assemble the crankshaft positon sensor

1). Assemble the crankshaft positon sensor in the mounting hole, and tighten the fixing bolts.

tightening torque 9~11N·m



S2-w1226b

2). Connect the harness connector of crankshaft positon sensor.

S2-w1225b

2. Assemble the compressor assembly
3. Assemble the dynamo belt
4. Assemble the right front engine cover
5. Connect the cable of battery negative pole
6. Close the engine cover

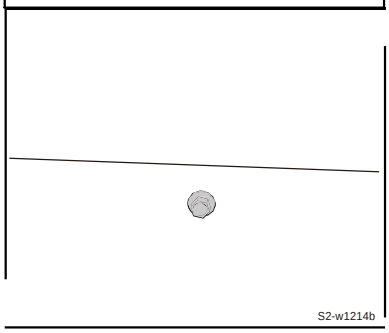
VIII、Knock sensor

(I)Disassembly

1. Open the engine cover
2. Cut off the cable of battery negative pole. Please refer to Cut-off and Connection of Battery Cable.
3. Remove the air filter assembly. Please refer to air filter assembly.
4. Remove the electronic throttle valve. Please refer to Electronic Throttle Valve.
5. Remove the inlet manifold. Please refer to Inlet Manifold.
6. Disassemble the knock sensor
   1). Cut off the harness connector of knock sensor.



   2). Remove the fixing bolts of knock sensor and take it out.



(II)Check

1. Appearance check
   1). Check if the fastening bolts are tightened according to requirements, and if there is something on junction surface of sensor and cylinder.
2. Circuit check
   1). Turn off the ignition switch and unplug the harness connector of knock sensor. Check if the circuit between signal wire and ECM terminal is open or

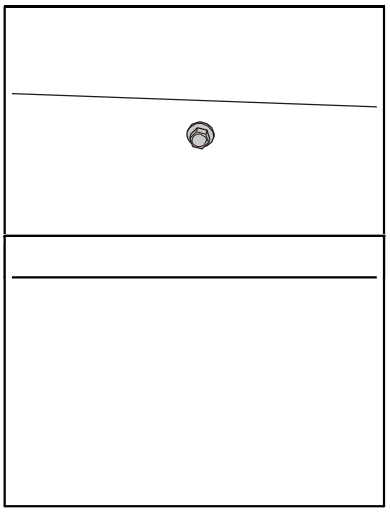
short-circuit. If the result is abnormal, please do the service.

3. Performance check

1). Cut off the harness connector of knock sensor; use small hammer to tap the cylinder of knock sensor accessory and at the same time, use millivolt of digital multimeter to measure the voltage between signal outputting end and grounding end of sensor. If there is voltage generated when you tap the cylinder, that means the sensor is in good condition, otherwaise, you should change the sensor.

(III) Assembly

1. Assemble the knock sensor
   1). Put the knock sensor in cylinder block.
   2). Tighten the fixing bolts.
   tightening torque 22.5±2.5N·m



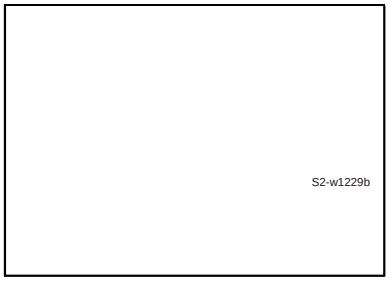
3).Connect the harness connector of knock sensor.

2. Assemble the inlet mainfold
3. Assemble the electronic throttle valve
4. Assemble air filter assembly
5. Connect the cable of battery negative pole
6. Close the engine cover

IX、 Pressure regulating valve

(I)Disassembly

1. Open the engine cover
2. Cut off the cable of battery negative pole. Please refer to Cut-off and Connection of Battery Cable.
3. Disassemble the pressure regulating valve
   1). Cut off the harness connector of pressure regulating valve.



   2). Remove the fixing bolts of pressure regulating valve.
   3). Take out the pressure regulating valve.

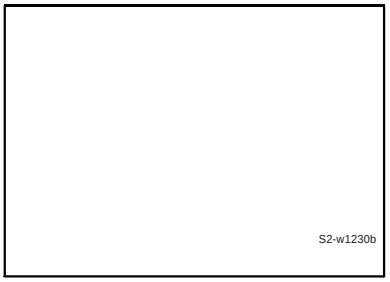


(II)Check

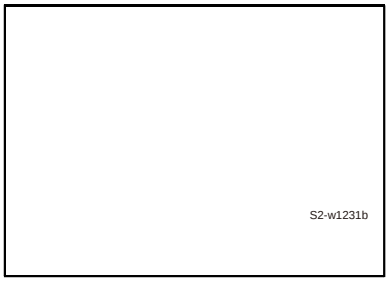
1. Check the pressure regulating valve
   1). Use multimeter to measure the resistance between two terminals of pressure regulating valve, and the resistance should be between 7 to 8Ω.
   2). Electrify the pressure regulating valve terminal with 12V to see if there is the column-type slide valve in pressure regulating valve slides smoothly.

(III)Assembly

1. Assemble the pressure regulating valve
   1). Make sure that the new pressure regulating valve seal ring is in good condition, and then smear a little engine lubrication oil on it.
   2). Assemble the pressure regulating valve and tighten the fixing bolts.
   tightening torque 6±1N·m



3). Connect the harness connector of pressure regulating valve.



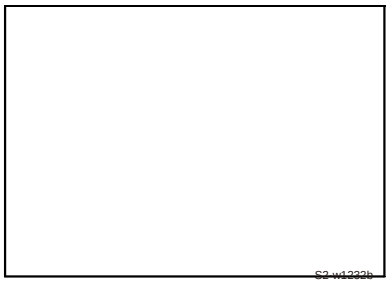
2. Connect the cable of battery negative pole

3. Close the engine cover

X、 ECM controller

(I) Disassembly

1. Open the engine cover
2. Cut off the cable of battery negative pole. Please refer to Cut-off and Connection of Battery Cable.
3. Disassemble the ECM controller
   1). Cut off the harness connector of the ECM controller.



   2). Remove four fixing bolts of ECM controller and take it out.



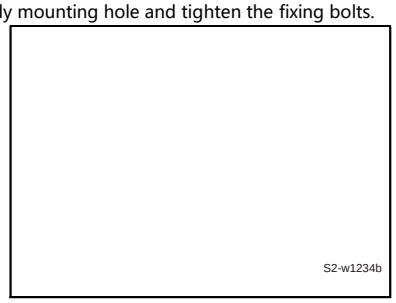
4. Disassemble the ECM controller bracket
   1). Disassemble the three fixing bolts of ECM controller bracket
   2). Take out the ECM controller bracket.



(II) Assembly

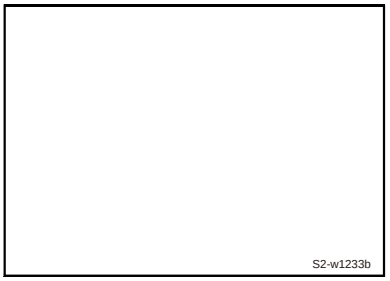
1. Assemble the ECM controller bracket

1). Assemble the ECM controller bracket on the vehicle body mounting hole and tighten the fixing bolts.

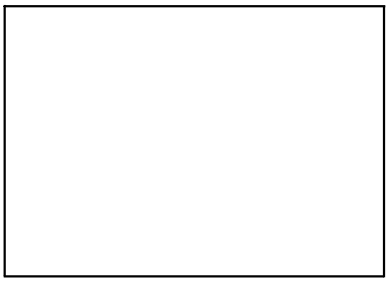


2. Assemble the ECM controller bracket

1). Mount the ECM controller on the bracket and tighten the four fixing bolts of ECM controller.



2). Connect the harness connector of ECM controller.

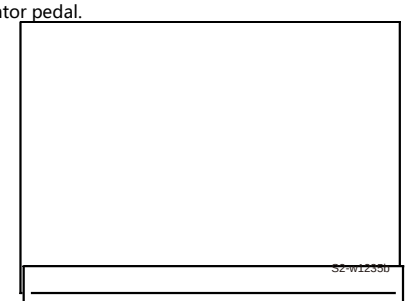


3. Connect the cable of battery negative pole
4. Close the engine cover

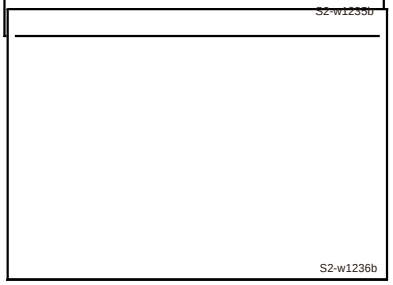
XI、 Electronic accelerator pedal assembly

(I) Disassembly

1. Open the engine cover
2. Cut off the cable of battery negative pole. Please refer to Cut-off and Connection of Battery Cable.
3. Disassemble the electronic accelerator pedal
   1). Cut off the harness connector of the electronic accelerator pedal.



   2). Remove the three fixing bolts of electronic accelerator pedal on vehicle body.
   3). Take out the electronic accelerator pedal.

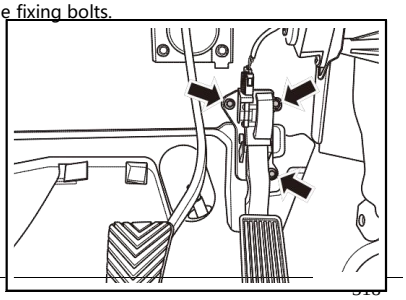


(II) Check

1. Assemble the electronic accelerator pedal
   1). Check if there is any crack on pedal and if the movement is flexible.

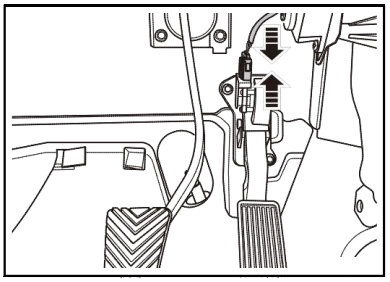
(III) Assembly

1. Assemble the electronic accelerator pedal assembly
   1). Assemble the electronic accelerator pedal and tighten the fixing bolts.
   tightening torque 7~11N·m



S2-w1236b

2). Connect the harness connector of electronic accelerator pedal.

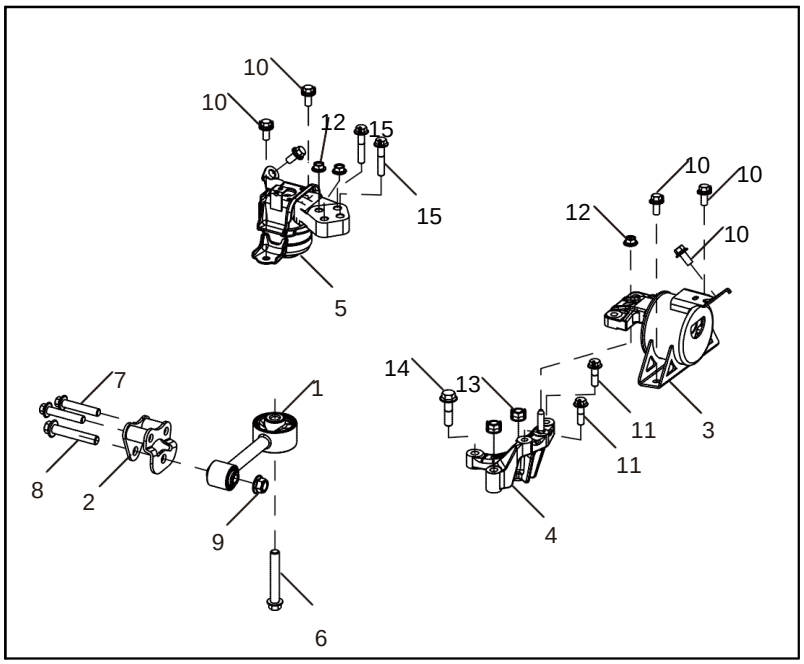


2. Connect the cable of battery negative pole
3. Close the engine cover

The Engine mounting system

I. Overview

(I) Structure overview



S2-w1238b

1. Rear mounting assy
2. Connection bracket of rear mounting
3. Left mounting assy
4. Connection bracket of left mounting
5. Right mounting assy
6. Hexagon flange blot
7. Hexagon flange blot
8. Hexagon flange blot
9. All metal hexagon Flange locknut
10. Hexagon bolt and flat washer component
11. Hexagon flange blot
12.Hexagon flange blot
13. Hexagon flange blot
14. Hexagon flange blot
15.Hexagon flange blot
16.Hexagon flange blot

(II) Torque parameters

Key component torque table

SN	Item	Torque(Nm)	Remark
1	The joint bolt and nut of rear mounting and its connection bracket	M14	120~140
2	The fixed bolt of rear mounting and subframe	M14	130~150
3	The connection bolt of rear mounting bracket and transmission	M12	70~80
4	The connection bolt of left mounting and vehicle body	M10	50~60

SN	Item	Torque(Nm)	Remark
5	The connection bolt and nut of left mounting bracket and transmission	M12	70~80
6	The connection bolt and nut of left mounting and its bracket	M10	55~65
7	The connection bolt of right mounting and vehicle body	M10	50~60
8	The connection bolt and nut of right mounting bracket and engine	M10	55~65

(III) Attention matters for service

1. It needs to hoist the corresponding end of transmission and engine by jack when changing the left and right mounting.
2. It needs to remove and disconnect the connection tubes, wires of engine before removing the left and right mounting when dismantling the power train.
3. The rubber parts of mounting system shall avoid from contacting with lubricants like brake fluid, engine oil, power steering fluid, transmission oil, lubricating grease, coolant, gasoline/diesel and degreaser, if get contacted, clean it immediately.
4. Not recommend the second use of the nuts with sawtooth and the bolts with washer.
5. Check if the tightening torque of fastener meets with standard after assembly.

II. Failures diagnosis

(I) The diagnosis table

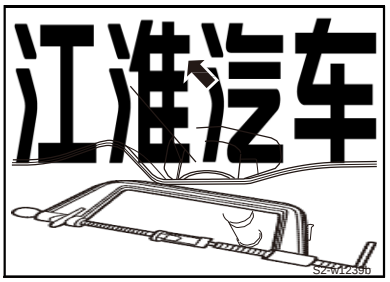
SN	Failure phenomenon	Causes analysis	Solution
1	The viberation of the whole car gets	The rupture of mounting rubber mat	Replace
		The liquid leakage of right mounting	Replace

	worse	mat	
		The tightening bolt gets loose	Re-tighten
		The mounting mat and bracket get deformation	Replace
2	The severe engine shaking	The rupture of rear mounting rubber mat	Replace

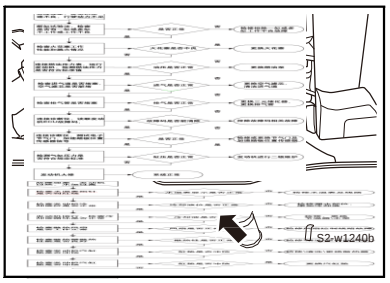
III. The rear engine mounting assy

(I) Disassembly

1. Open the engine hood
2. Detach from the cathode of battery, referring to the disconnection and connection of the battery wires.
3. Dismantle the rear mounting assy of engine
   1). Dismantle the connection bolt of the rear engine mounting and its bracket after hoisting the car.



   2). Dismantle the fixed bolt of the rear engine mounting and subframe then take down the rear mounting.



(II) Check

1. Check the rear engine mounting assy
   1). Check if the rubber lining has crack, damage or aging.
   2). Check if the skeleton of mounting lining has deformation or damage.

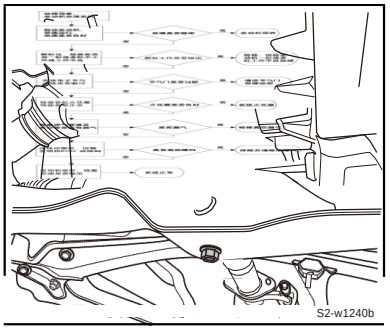
(III) Installation

1. Install the rear engine mounting assy

1). Install the fixed bolt of

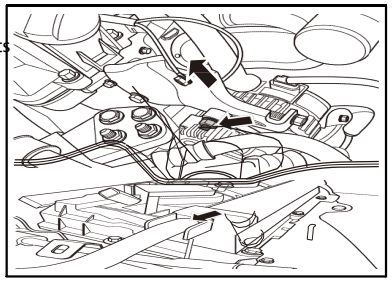
the rear engine mounting and subframe

Tightening torque: 130~150 N·m



2).
Install the connection bolt of the rear engine mounting and its bracket

Tightening torque: 120~140 N·m



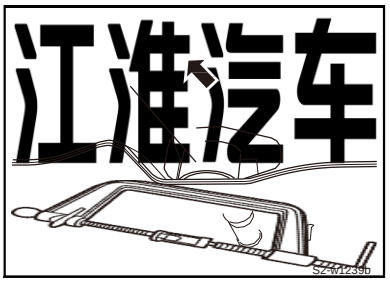
S2-w1239b

2. Connect the cathode wires of battery
3. Close the engine hood

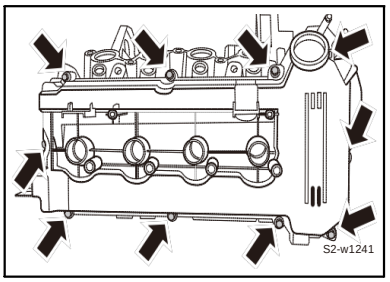
IV. The rear engine mounting connection bracket

(I) Disassembly

1. Open the engine hood
2. Disconnect the cathode wire of battery, referring to the disconnection and connection of the battery wires.
3. Dismantle the connection bracket of the rear engine mounting
   1). Dismantle the connection bolt of the rear engine mounting and its bracket after hoisting the car.



   2). Dismantle the 2 fixed bolts of the rear engine mounting bracket and transmission then take down the bracket.



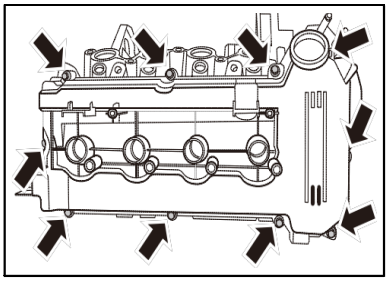
(II) Check

1. Check the connection bracket of the rear engine mounting
   1). Check if it has deformation or damage

(III) Installation

1. Install the connection bracket of the rear engine mounting

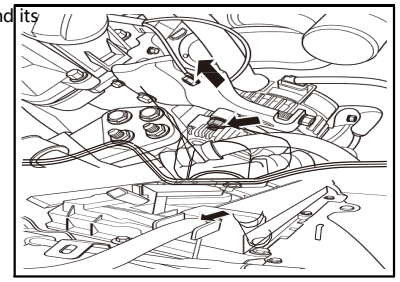
1) Install the connection bracket of the rear engine mounting
And the fixed bolt of transmission.
拧紧力矩 Tightening torque: 70~80 N·m



S2-w1241b

2).Install the connection bolt of the rear engine mounting and its bracket

Tightening torque: 120~140 N.·m



S2-w1239b

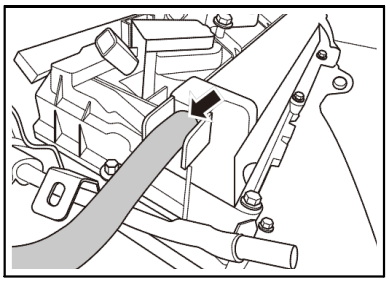
2. Connect the cathode wire of battery
3. Close engine hood

V. The left engine mounting assy

(I) Disassembly

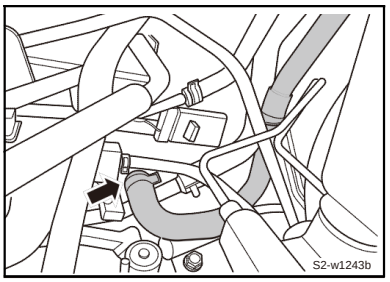
1. Open the engine hood
2. Disconnect the cathode wire of battery. Refer to the connection and disconnection of battery wires.
3. Dismantle the left mounting assy of engine

1). Dismantle the connection bolt of battery tray and fuse box.



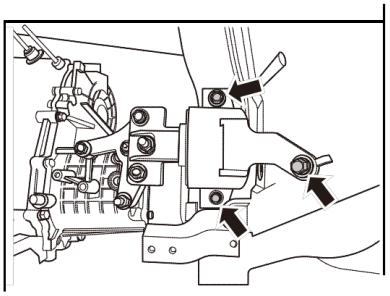
S2-w1242b

2). Screw off the 2 connection bolt and 1 nut of the left engine mounting and its bracket.



S2-w1243b

3). Screw off the 3 bolts of the left engine mounting and the vehicle body then take down the left engine mounting.



(II) Check

1. Check the left engine mounting assy
   1). Check if the rubber lining has crack, damage or aging.
   2). Check if the skeleton of mounting lining has deformation or damage.

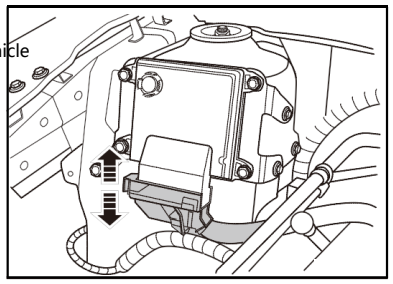
(III)Installation

1. Install the left engine mounting assy

1). Install the

Connection bolt and nut of the left engine mounting and vehicle Body.

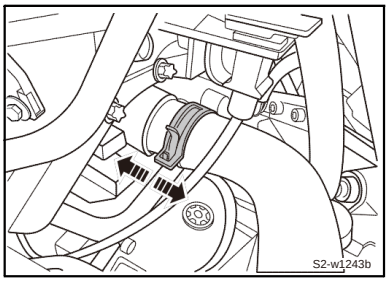
Tightening torque: 50~60N·m



S2-w1244b

2). Install the connection bolt and nut of the left engine mounting and its bracket.

Tightening torque: 55~65N·m

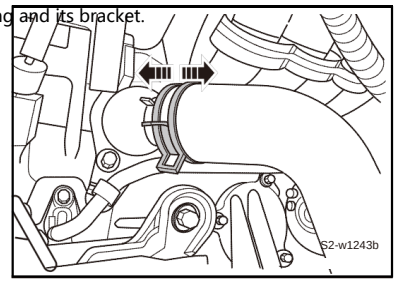


2. Connect the cathode wires of battery.
3. Close engine hood.

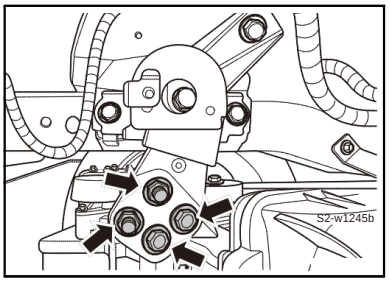
VI. The left engine mounting connection bracket

(I) Disassembly

1. Open engine hood.
2. Disconnect the cathode wire of battery. Refer to the connection and disconnection of battery wires.
3. Dismantle the connection bracket of the left engine mounting
   1). Screw off the 2 bolts and 1 nut of the left engine mounting and its bracket.



   2). Screw off the 1 bolt and 2 nuts of the left engine mounting bracket and transmission.

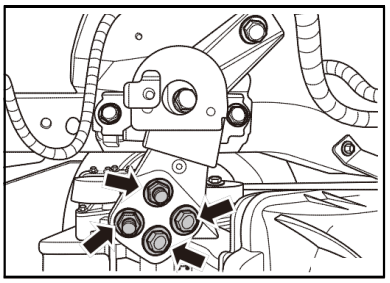


(II) Check

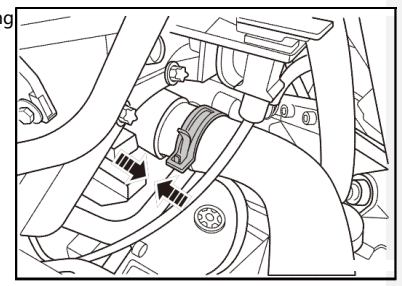
1. Check the connection bracket of the left engine mounting
   1).Check if the bracket has doformation or damage

(III) Installation

1. Install the connection bracket of the left engine mounting.
   1). Install the
   Connection bolt and nut of the left engine mounting bracket
   And transmission.
   Tightening torque: 70~80 N·m



   2). Install the connection bolt and nut of the left engine mounting and its bracket.
   Tightening torque: 55~65 N·m



S2-w1243b

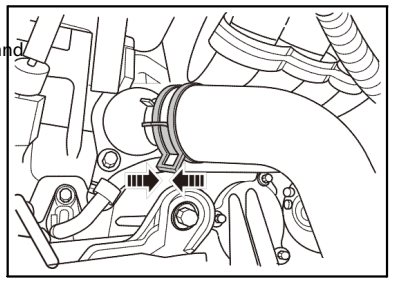
2. Connect the cathode wire of battery.
3. Close the engine hood.

(VII) The right engine mounting assy

(I) Disassembly

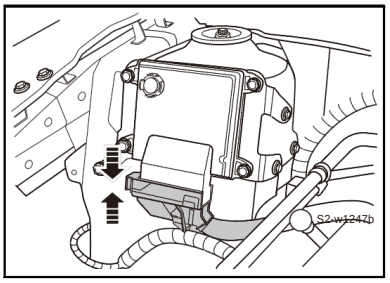
1. Open engine hood.
2. Disconnect the cathode wire of battery. Refer to the connection and disconnection of battery wires.
3. Dismantle the right engine mounting assy.

   1).Screw off 2 connection bolts and 2 nuts of the right engine mounting and Engine.



S2-w1246b

   2). Screw off the 3 bolts of the right engine mounting and vehicle body then take down the right engine mounting.

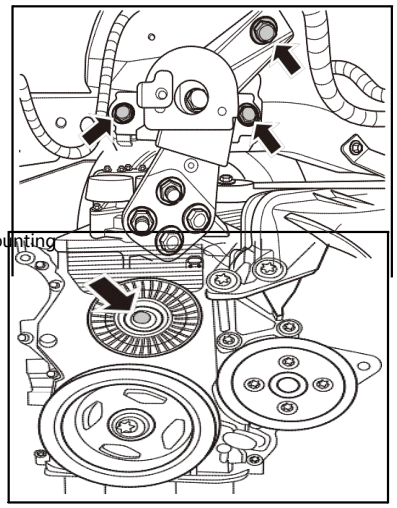


(II) Check

1. Check the right engine mounting assy
   1). Check if the hydraulic mounting has crack, damage, leakage or aging.
   2). Check if the skeleton of mounting lining and bracket has deformation or damage.

(III) Installation

1. Install the right engine mounting assy
   1). Install the connection bolt
   Of the right engine mounting and vehicle body.
   Tightening torque: 50~60 N·m



   2). Install the connection bolt and nut of the right engine mounting
   And engine.
   Tightening torque: 55~65 N·m

2. Connect the cathode wire of battery.
3. Close the engine hood.