

Preface

This service manual is intended for maintenance technicians to provide information on diagnosis, maintenance procedures, adjustment and specifications of F0. If necessary, please use this manual together with the structural drawings.

We recommend you to contact BYD Auto Co., Ltd. to obtain information on product brands, part number or professional tools mentioned in this manual. All information, illustrations and product description included in this manual are valid as of the date when this manual is published. However, our Company reserves the right to amend this manual at any time without prior notice.

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BYD Auto Co., Ltd.
Month AUG, Date 22, 2009

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Caution

WARNING: In order to reduce the risk of human injuries and/or property damage, please strictly follow the instructions below:

1. Provided by BYD Auto Co., Ltd., this manual is compiled for qualified professional technicians. Repair or maintenance without proper training and proper tools and equipments may cause injury to the maintenance staff or others. Also, it may cause damage or improper operation to the vehicle.
2. Correct vehicle repair and maintenance is very important for both the personal safety of the maintenance staff and the safe, reliable operation of the vehicle. To replace a certain component, please use the same component or the component specified by BYD Auto Co., Ltd. Do not use the replacement components unaccepted by BYD Auto Co., Ltd.
3. Maintenance procedures recommended and introduced in this manual are effective methods for repair and maintenance. Some procedures need special tools.

Therefore, before using the replacement components, maintenance procedures or tools which are not recommended or accepted by BYD Auto Co., Ltd., first please make sure that no danger will be caused to the personal safety or the safe operation of the vehicle.

4. Please strictly follow the various “**Warnings**”, “**Special Precautions**” and “**Precautions**” included in this manual so as to reduce the risk of human injuries in repair or maintenance. Improper repair or maintenance will cause damage or potential safety concerns to the vehicle. Those “**Warnings**”, “**Special Precautions**” and “**Precautions**” do not contain full details. BYD Auto Co., Ltd. will not give warnings and compensations for all potential risks caused by disobeying those instructions.
5. This manual includes the maintenance procedures for vehicles equipped with SRS system (“airbag” below). Please refer to “**Warnings**”, “**Special Precautions**”, “**Precautions**”, and “**Warnings**” in “Protective Device”. Before doing repairs on or near the airbag components and wires, please refer to the airbag components and wires layout in “Protective Device”. Disobeying those “**Warnings**” may lead to airbag unfolding, human injuries or unnecessary repairs for the airbag.

If both the airbag and any other vehicle system need repairs, it is advised to repair the airbag first in order to avoid the airbag unfolding unexpectedly or injuring any person.

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Manual Introduction:

(1) This manual is compiled in accordance with the national standards and BYD Auto Co., Ltd. technical standards.

(2) Maintenance operation is divided into the following principal procedures:

① Diagnosis

Dismantling/installing, replacing, disassembling/assembling, inspecting, and adjusting.
Final Inspection

(3) This manual introduces the first two principal procedures of the maintenance operation, without any introduction for “Final Inspection”.

(4) The following basic operations must be strictly executed in actual practice, though they are not introduced in this manual: ① Use jack or lifting jack.

② If necessary, wash the disassembled components.

③ Visual Inspection

(2) Preparations

Sometimes maintenance may need special tools and special servicing materials. Please use special tools and special servicing materials if necessary, and strictly follow the correct steps to do the maintenance operation. Refer to the descriptions in the maintenance operation section of this manual.

3. Maintenance Steps

(1) As required, each chapter contains components drawing.

(2) Detailed descriptions for the non-reusable components, lubricating fittings, pre-coating parts, and torque requirements are given in the components drawing.

(3) Fastening torque, lubricating fittings, and non-reusable components

are all introduced as the key points in maintenance steps

(4) Dismantling steps are opposite to the installation steps. Therefore,

only the extra installation steps are specified.

(5) As for text, only key points are specified. The specific steps and other details are illustrated graphically.

(6) The steps are given one by one in this manual.

① The illustrations indicate what to do and where to do it.

② The title indicates the item to be done.

③ The explanatory words tell how to finish the work, and provide other information such as specifications description, warnings, etc.

4 Maintenance Norm

“Specifications Description” is given in boldface where necessary in this manual.

5 Definitions of Terms

Warning – serious personal injury may be caused to the maintenance staff.

Special Precautions – damage may be caused to the components of the vehicle being maintained.

Precautions – it can help you finish the maintenance in more effective ways.

6 National Standard Units

The units in this manual adopt national standard units.

Section 1 Technical Specifications and Parameters of the Finished Vehicle

Main Technical Parameters of the Finished Vehicle

Item	Design Parameter		
Internal Code	F1		
Model No.	QCJ7100L / QCJ7100L1 / QCJ7100L2		
Basic Type	Integral Body Construction, with Five Doors, Two Carriages, and Five Seats		
Drive Type	Front Engine, Transverse Engine, Front-wheel Drive		
External Dimension (mm)	Length	3460±30	
	Width	1618±10	
	Height	1465±10	
Axle Distance (mm)		2340±10	
Wheel Distance (mm)	Front	1420±10	
	Rear	1410±10	
Front Suspension (mm)		655±5	
Rear Suspension (mm)		465±4	
Minimum Ground Clearance		≥120 (No Load) / ≥90 (Full Load)	
Mass Parameter (kg)	Complete Vehicle curb Mass	870	
	Total Mass	1245	
Loading Mass (kg)	375		
Load Distribution (kg)	No Load	Front	525
		Rear	345
	Full Load	Front	635
		Rear	610
Trafficability (Full Load)	Approach Angle	≥17°	
	Departure Angle	≥31°	
Minimum Turning Diameter (m)	≤10		
Luggage Compartment Capacity (L) ≥	140±5		
Maximum Speed (km/h) ≥	151		
Maximum Gradeability (%) ≥	30		

Engine Specifications and Parameters:

Item	Unit	Type and Parameter
Model No.		BYD371QA
Type		3-Cylinder in Line /12 Valves, DOHC (Double Overhead Camshaft)
Electronic Injection System Form		Multi-point Fuel Injection System
Cylinder Diameter	mm	71
Distance	mm	84
Displacement	L	0.998
Compression Ratio		10.5 : 1
Rated Power	kW	50
Maximum Torque	N·m	90 (4000r/min ~ 4500 r/min)
Minimum Fuel Consumption	g/kW·h	≤250+10
Fuel Supply Mode		Electronic Fuel Injection
Ignition Type		Spark Ignition Type

Engine Accessories, Chassis, and Body Main Assembly Type and Parameters:

Assembly		Structural Parameter	
Exhaust System		With first grade muffler, first grade three-way catalytic device	
Air Intake System		With air deflecting tube, air resonance cavity, air filter	
Fuel Supply System		Including fuel pump, fuel filter, accelerator pedal etc, oil tank 30L	
Cooling System		Water-cooled, engine electronic drive fan	
Clutch		Dry-type, single-disk, diaphragm spring	
Transmission	Type	Manual transmission MT	
	Gear Speed Ratio	First Gear	3.545
		Second Gear	1.913
		Third Gear	1.310
		Fourth Gear	1.027
		Fifth Gear	0.850
		Reverse Gear	3.214
Driving Shaft	Type	Disconnected	

Main Speed Reducer	Type	Single stage
	Speed Ratio	3.55
Suspension	Front Suspension	MacPherson independent suspension
	Rear Suspension	Tow arm with torsion beam semi-independent rear suspension
Wheels and Tires	Tire type	Radial ply tire without inner tube
	Tire Size	165/60R14 75H
Steering	Steering Gear Type	Rack-and-pinion mechanical steering (realistic type), hydraulically assisted steering (comfortable and luxury type)
	Steering Apparatus	Three-spoke steering wheel, external diameter $\varnothing 370\text{mm}$, pipe column angle adjustable
Wheel Alignment	Front Wheel Camber	$-1^{\circ}32' \sim -0^{\circ}02'$
	Toe-in of front wheel	$(-0.9 \sim 3.1) \text{ mm}$
	Kingpin Inclination	$9^{\circ}33'$
	Kingpin Caster	$+2^{\circ}02' \sim +3^{\circ}32'$
	Rear Wheel Camber	$-0^{\circ}56'$
	Toe-in of rear wheel	$(+1.4 \sim +5.8) \text{ mm}$
Brake System	Structural Type	Hydraulic double circuit, with vacuum booster, antilock brake system (ABS)
	Service Brake	X dual circuit, hydraulic braking
	Parking Brake	Mechanical cable braking
Air Conditioning System	Structural Type	Cooling: vapor compression cooling; Heating: water-heated heating
	Manipulation	Manual control
	Refrigerant	HFC-134a (R-134a)
	Performance Parameter	Refrigerating capacity: 3.45kw

Section 2 Vehicle Identification

1. Vehicle Identification Number (VIN)

VIN Description:

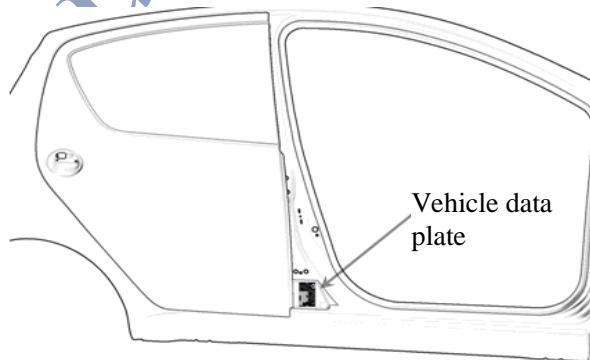
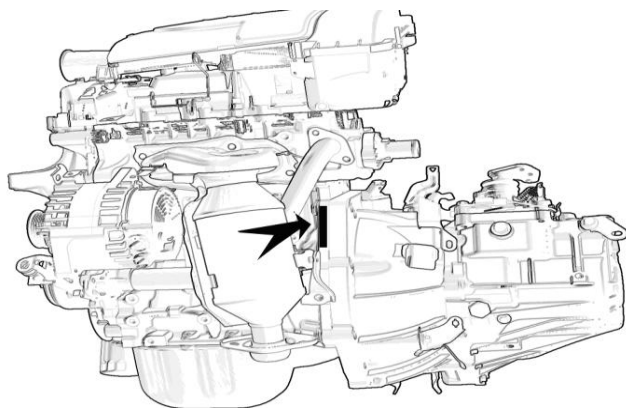
L	G	X	C	1	4	D	A	6	8	1	0	0	2	0	5	6
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Manufacturer		Vehicle Brand		Transmission Type and Drive Mode		Body Type	Restraint System Type	Engine Feature	Check Digit	Year	Assembly Plant	Production Sequence Number				

Identification Number Position:

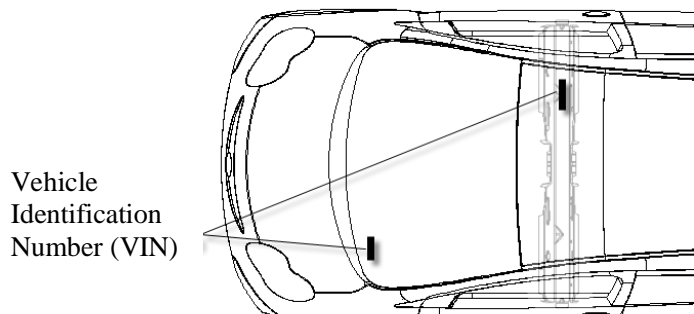
There are several identification numbers in different positions of your vehicle.

1. Engine Type / Engine Number are inscribed on the engine block.

marked with Vehicle Identification Number (VIN), engine type, vehicle model No., engine displacement, engine rated power, total mass, ex-factory date, etc.



Vehicle Identification Number (VIN) is stuck to the instrument panel at the lower left corner of the front windshield, and also inscribed on the floor beam under the co-driver.



3 Vehicle nameplate is stuck to the lower part of the outside plate for body right pillar B. Vehicle nameplate is

Section 3 Service Rules

I. Warnings and Precautions

1 The definitions of “Warnings”, “Special Precautions” and “Precautions”.

The diagnosis and maintenance procedures in the Service Manual of BYD Auto include both general and specific warnings, special precautions, and precautions. BYD Auto Co., Ltd. will endeavor to provide maintenance information to help the maintenance staff diagnose and maintain the system, so that the vehicle can run normally. However, if the maintenance staff does not operate in the recommended methods, some procedures may cause danger to the maintenance staffs. Warnings, special precautions, and precautions are compiled with the purpose of avoiding the above danger, but not all dangers are predictable.

Such information is located in the conspicuous position of the Service Manual. Such information is compiled for the sake of preventing the following cases:

- 1) Serious personal injury to the maintenance staff
 - 2) Damage to the vehicle
 - 3) Unnecessary vehicle maintenance
 - 4) Unnecessary components replacement
 - 5) Improper maintenance or replacement for the vehicle components
- Any warning or special precaution occurring in general information is quoted from the related maintenance category.

2 Definition of Warning

Warning: you should take the necessary measures or not take the forbidden measures. Ignoring the “Warning” will lead to the following consequences:

- 1) Serious personal injury to the maintenance staff
- 2) Serious personal injury to other maintenance staff in the work area
- 3) Serious personal injury to the vehicle driver and/or passengers caused by improper repair

3 Definition of Special Precautions

“Special Precautions” calls your special attention to the necessary measures or forbidden measures. Ignoring the “Special Precautions” will lead to the following consequences:

- 1) Damage to the vehicle
- 2) Unnecessary vehicle maintenance
- 3) Unnecessary components replacement
- 4) Abnormal operation or performance for the repaired system or components
- 5) Damage to any system or component whose normal running depends on the repaired system or components
- 6) Abnormal operation or performance for any system or component whose normal running depends on the repaired system or components
- 7) Damage to the fasteners, basic tools, or special tools

8) Coolant, lubricating oil, or other main fluid leakage

4 Definition of Precautions

“Precautions” declares and emphasizes the necessity for a certain diagnosis or maintenance procedure.

“Precautions” declares the following purposes:

- 1) Make clear the procedure
- 2) Provide additional information so as to finish a procedure
- 3) Clarify the reasons for operating in accordance with the recommended procedure
- 4) Provide information to help finish the procedure in more effective ways

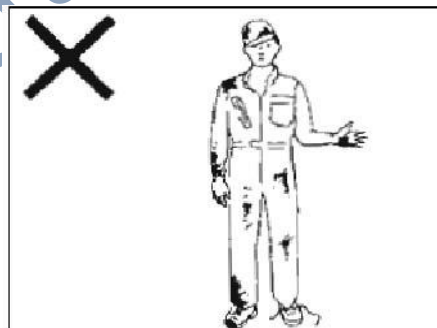
Provide the previous experience information to the maintenance staff so as to finish the procedure more easily.

II. Precautions

1 Basic Maintenance Tips

(1) Operational Requirements

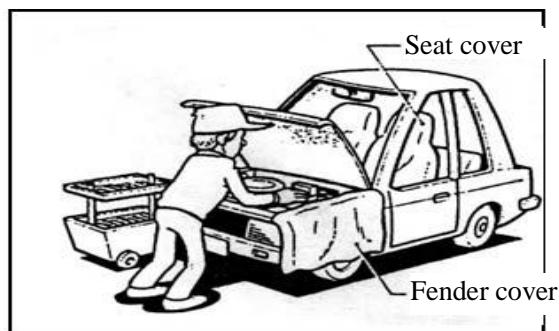
- 1) Dressing: keep high-standard cleanliness
 - ▲ Pay special attention to the technicians':
 - ◇ Work Clothes ◇ Shoes ◇ Hands



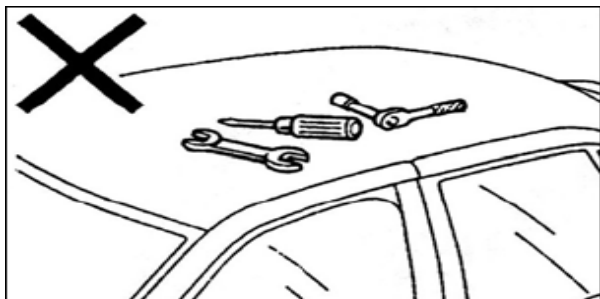
2) Vehicle Protection

▲ Before operation, get the items below ready:

- ◇ Floor Mat ◇ Steering Wheel Cover ◇ Seat Protector
- ◇ Fender Cover ◇ Radiator Grid Cover
- ◇ Door Edge Protective Device



▲ Do not put the tools or components on the vehicle top, engine cover, or luggage compartment cover.



▲ Avoid exposing the metal or hard objects to the inside or outside of the work clothes. For example:

- ◇ Belt Buckle ◇ Key Chain ◇ Button
- ◇ Tools in Pocket (such as Spanner) ◇ Watch

▲ Do not lean the human body on the vehicle; do not put the leg on the bumper.

▲ Enough distance should be kept between two vehicles.

▲ Do not put paper on the surface of the vehicle for writing; do not use vehicle accessories like cigarette lighter, either.

▲ Enough space is necessary for opening the door so that the door will not knock into:

- ◇ Wall ◇ Toolbox ◇ Table

3) Safe Operation

▲ When two or more persons work together, please take care of other persons' safety.

▲ If you work when the engine is running, make sure the vehicle is well-ventilated.

▲ To repair the high temperature, high pressure, rotating, mobile, or vibrating components, please equip yourself with proper safety apparatus. Be highly careful not to hurt yourself or others.

▲ To lift the vehicle, please use safety equipment.

▲ To jack-up the vehicle, please use safety bearing to support the specified positions.

4) Prepare the Repair Tools and Measuring Instrument

Before operation, you should get ready the tool rack, special fault diagnostic instrument, gauge, related tools and instruments, engine oil, rag, and parts for replacement.

5) Dismantle/Installation, Disassembly/Assembly Operation

▲ Make thorough diagnostic analysis for the fault, and then conduct related operation.

▲ Before dismantling the parts, check the assembly installation condition, and also the appearance deformation and damage conditions.

▲ If the assembly is complex, like a great many of electrical joints, bolts or disassembly pipelines, the marks are necessary for reassembly. If necessary, please make temporary marks for the pipelines and

related interfaces.

▲ If necessary, please clean the disassembled parts and do through inspection to them before installation.

6) Disassembled Parts

▲ Disassembled parts should be put in order so as to avoid messing or smearing the new parts.

▲ For those non-reusable parts, such as gasket, O-ring, locknut etc, please make replacement as specified in the manual.

▲ Please keep the disassembled parts for the user, if necessary.

(2) Jack-up and Support the Vehicle

Be highly careful when the vehicle is jacked-up and supported. Make sure the vehicle is jacked-up and supported in the right position.

(3) Pre-coated Parts

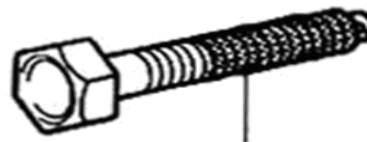
① Pre-coated parts refer to the bolts and nuts coated with lockup sealant in production.

② When the pre-coated parts are loose or disassembled, please recoat them with the specified lockup sealant to refasten them..

② To reuse the pre-coated parts, please get rid of the old sealant and blow dry the parts by compressed air. Then coat the bolts, nuts etc. with the lockup sealant.

Special Attention: Fastening should be based on the upper limit of the torque tolerance.

Some lockup sealants may get cured slowly. Please wait a moment until they are cured.



Lockup Sealant

(4) Gasket

Coat the gasket with sealant so as to avoid leakage.

(5) Bolt, Nut, and Screw

▲ Please strictly abide by all the instructions concerning fastening the torque.

▲ Torque wrench must be used.

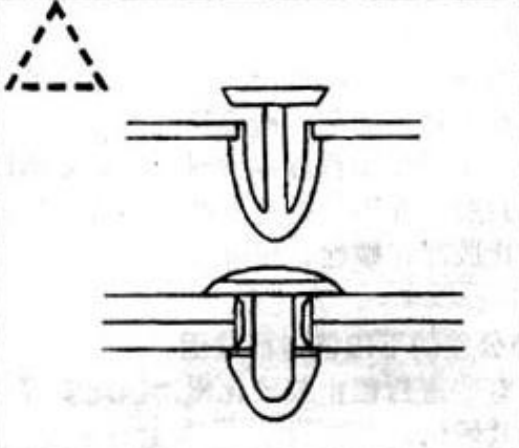
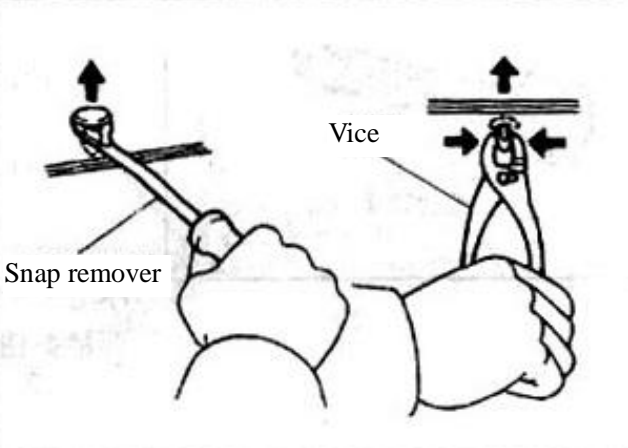
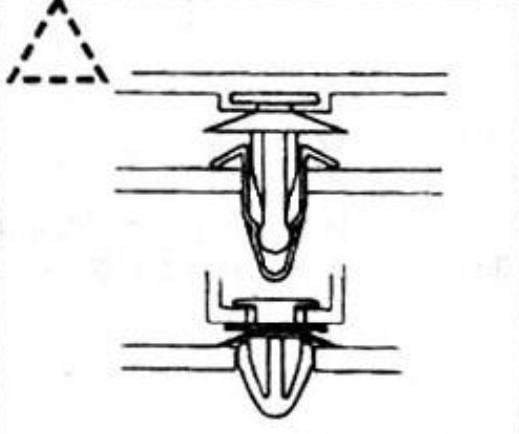
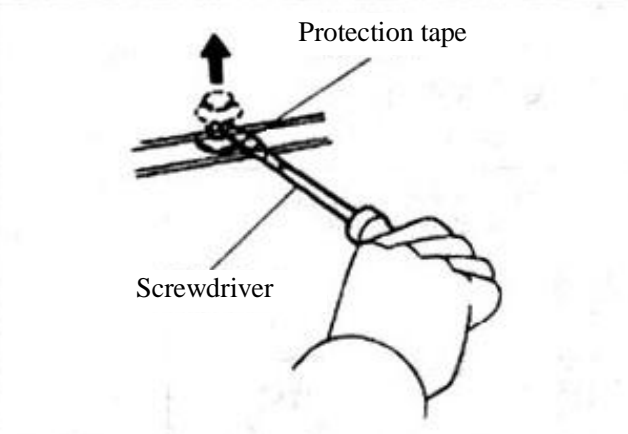
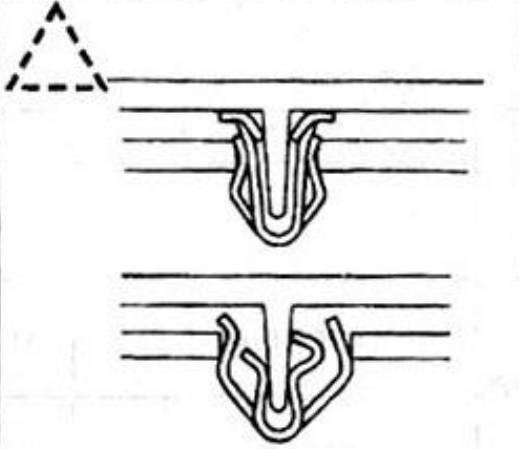
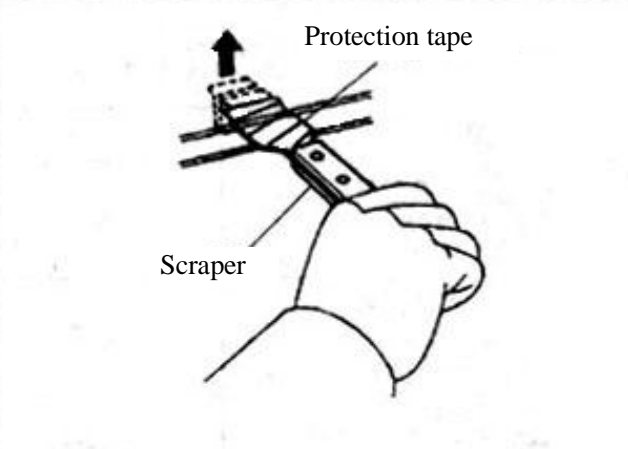
(6) Fuse

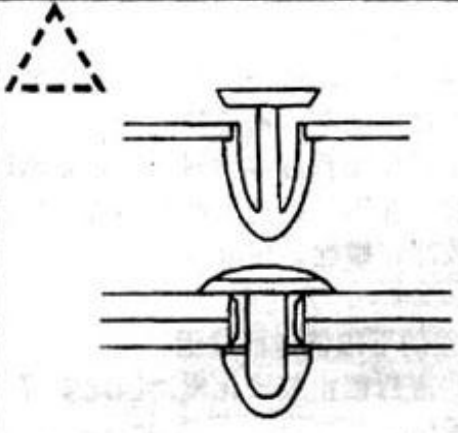
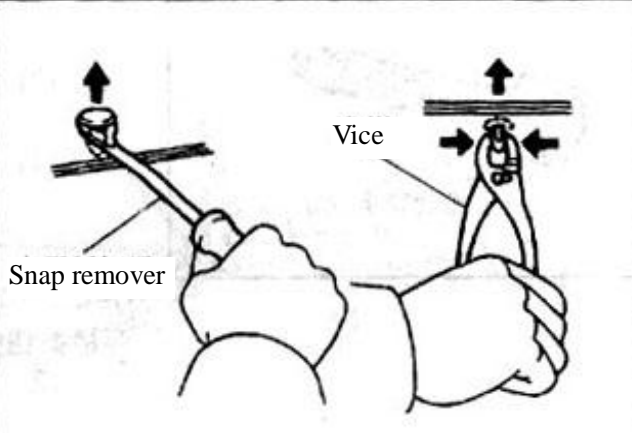
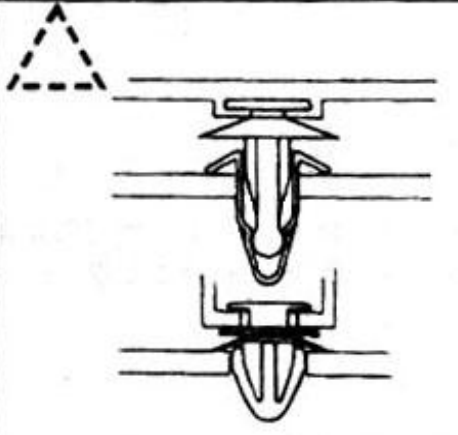
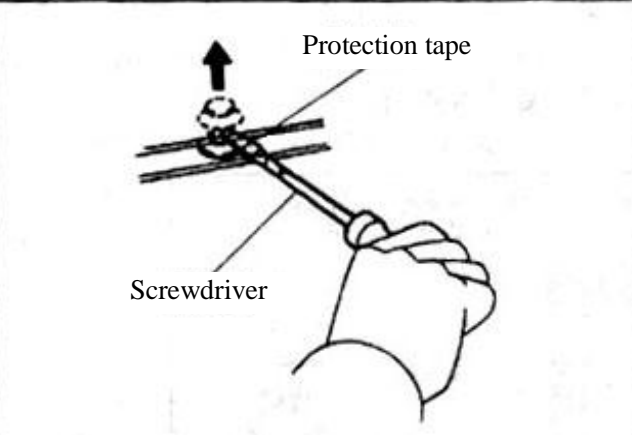
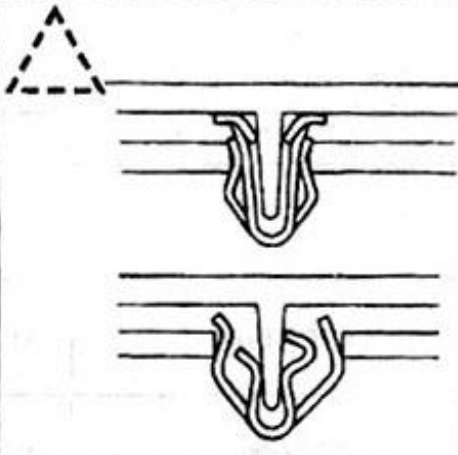
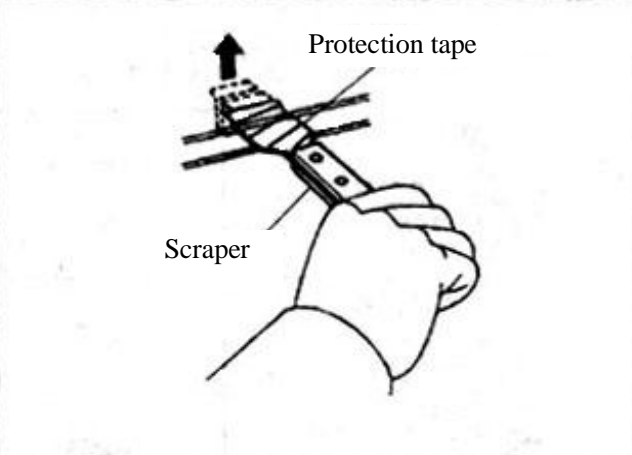
To replace the fuse, please use the new fuse with properly rated current. The rated value can not be too high or too low.

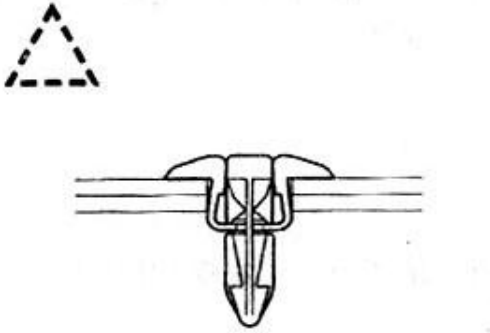
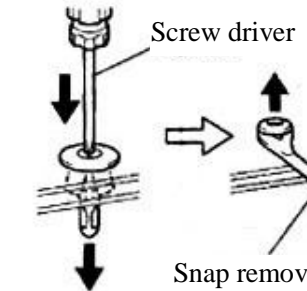
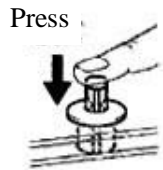
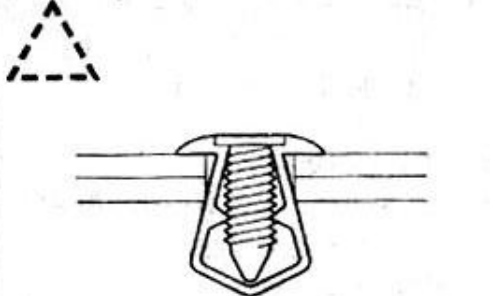
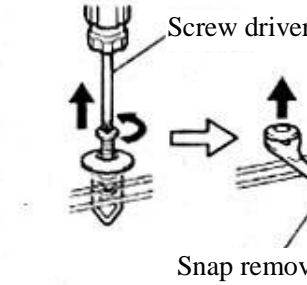
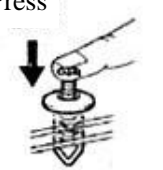
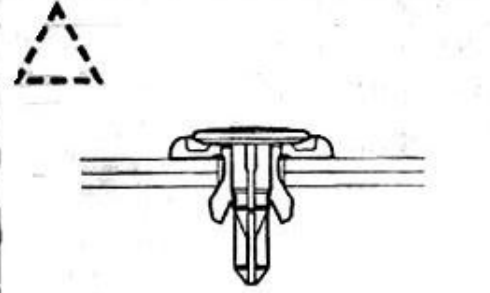
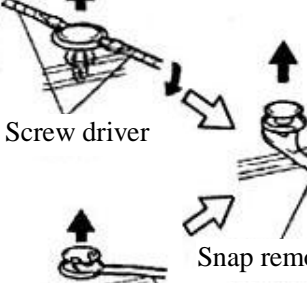
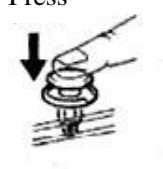
(7) Snap

The method of dismantling and installing the body trim snaps is shown as follows:

Special Attention: If these snaps are damaged in the process of dismantling, please replace them with new snaps.

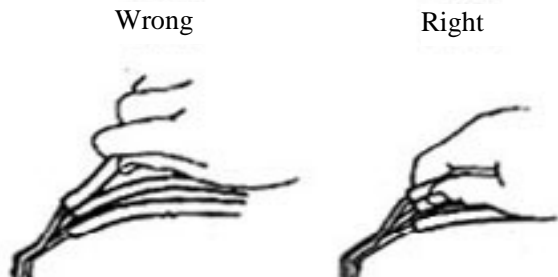
Shape (example)	Disassemble/Assemble
	 <p>Snap remover</p> <p>Vice</p>
	 <p>Protection tape</p> <p>Screwdriver</p>
	 <p>Protection tape</p> <p>Scraper</p>

Shape (example)	Disassemble/Assemble
	 <p>Snap remover</p> <p>Vice</p>
	 <p>Protection tape</p> <p>Screwdriver</p>
	 <p>Protection tape</p> <p>Scraper</p>

Shape (example)	Disassemble/Assemble
	<div style="display: flex; justify-content: space-between;"> <div data-bbox="776 258 1112 598"> <p>Disassemble</p>  </div> <div data-bbox="1112 258 1404 598"> <p>Assemble</p>  </div> </div> <p>Push out the main pin and remove it, then unclench off the pin bushing</p>
	<div style="display: flex; justify-content: space-between;"> <div data-bbox="776 714 1112 1050"> <p>Disassemble</p>  </div> <div data-bbox="1112 714 1404 1050"> <p>Assemble</p>  </div> </div> <p>Unscrew the main pin and unclench the pin bushing</p>
	<div style="display: flex; justify-content: space-between;"> <div data-bbox="776 1169 1112 1501"> <p>Disassemble</p>  </div> <div data-bbox="1112 1169 1404 1501"> <p>Assemble</p>  </div> </div> <p>Unclench the main pin, remove the clinch and then unclench the pin bushing</p>

(8) Disassembly and Assembly of Hose

▲ To disconnect the hose, please hold its end and pull it down by twisting. Do not hold the middle part of the hose or pull it down forcibly, or the hose may be damaged.



▲ In order to reassemble the hose, you should put the label in disconnecting for easy identification.

▲ When the above steps are finished, please check the hose carefully and make sure it is connected correctly.

▲ While using measuring instrument, do not connect the hose to oversize joint forcibly. The joint size should be adjusted gradually. Note: Once the hose is straightened, air leakage may occur.

2. Vehicles Equipped with SRS

BYD F1 is equipped with Supplementary Restraint System (SRS).

If the servicing of Supplementary Restraint System is done with incorrect operation procedures, the airbag may unfold accidentally to cause serious accidents.

If misoperation occurs during the system servicing, probably the system will not unfold normally. Therefore, before servicing (like disassembling and assembling the parts, doing inspection or replacement), please read the following precautions carefully and comply with the correct operation procedures:

(1) General Precautions

① Because it is difficult to confirm the SRS fault symptom, DTC becomes the most important servicing basis. While making the corrective maintenance for SRS, please record the system status before dismantling the negative earth cable of the battery. Because when you dismantle the negative earth cable of the battery, DTC for other systems may get lost.

② Before conducting the specific maintenance operations, please turn the ignition switch to "LOCK" and dismantle the negative earth cable of the battery. After 90 seconds, the maintenance operations can be executed. Otherwise, the airbag may unfold accidentally. In addition, please use insulating tape to twine the dismantled negative pole for the sake of insulation.

When the battery connecting wire is disconnected, the storage contents of the clock and sound system will be deleted. Therefore, please record the storage content of each memory before starting to work. When the system maintenance is finished, you can reset the clock and sound system as usual.

③ After a slight impact, please inspect the SRS even if the airbag is not unfolding.

④ It is prohibited to use the SRS components disassembled from other vehicles. To do component replacement, please use new components.

⑤ If servicing other systems or components of the vehicle may cause vibration to the vehicle, please disassemble the SRS ECU before servicing.

⑥ It is prohibited to dismantle and repair DAB or PAB, or install the components like SRS ECU, for the sake of reuse or other reasons.

⑦ If such components as DAB, PAB, and SRS ECU fall on the ground, suffer vibration or knock, or have crackles, dents, or other damages on the shell, bracket, or connector, please replace them with new components.

⑧ It is prohibited to expose such components as DAB, PAB, and SRS ECU directly to the hot air or flame.

When paint spraying operation may cause effect because of overheating (over 93°C), please remove and well keep such components as SRS ECU, DAB, PAB, and clock spring etc.

⑨ Please use high-impedance voltmeter and ohmmeter (minimum 10kΩ/V) for testing, rather than detecting light, normal voltmeter and ohmmeter. Do not use ohmmeter on DAB and PAB.

It is not allowed to make any circuit testing for SRS by electrical testing device, unless specified in this manual.

⑩ There are warning labels stuck to the SRS components and other related positions inside the vehicle. Please follow the instructions on those labels for operation.

⑪ Before and after replacing any component, please conduct the system self-diagnostic operation so as to thoroughly check the system function normality.

Warnings for SRS Special Tools

In order to avoid the airbag unfolding accidentally in the event of SRS fault, please use the tools and devices specified in this manual and follow the instructions in this manual. If you do not use the tools and devices specified here, there could be SRS unfolding, personal injury to yourself and others, and unnecessary SRS servicing.

- Normal service life of the airbag is 10 years. Beyond this service life, please replace the airbag and label.

(2) Clock Spring

The steering wheel must be installed on the steering column correctly so that the clock spring cable will be located in the center. Otherwise, there could be cable disconnection or other faults.

(3) Driver Airbag (DAB), Passenger Airbag (PAB)

① In the process of SRS servicing, the airbag module must be equipped into the vehicle immediately after it is removed from the transport container. When operation suspension is necessary, please put the airbag back into the transport container. It is not allowed to put the airbag in an unattended place. Be highly careful to store the disassembled airbag module. Collision and vibration are not allowed. Before switching on the system power:

- ◇ Wipe all dusts and lubricating grease from the installation surface.

- ◇ Put the airbag module on the installation surface horizontally.

- ◇ Make the arrow on the airbag module oriented to the vehicle front.

- ◇ Fasten all the fasteners, bracket fasteners of airbag module to the specified torque value.

② Do not measure the resistance of the airbag module explosive device. Or the airbag may unfold to cause severe personal injuries.

③ Do not smear any kind of grease on the steering wheel, or use any kind of detergent to clean the pad.

④ Airbag expansion device contains sodium azide and potassium nitrate. These substances are noxious and easy to burn. When they encounter with acid, water, or heavy metal, harmful irritant gas (easy to become sodium hydroxide in moist places) or flammable compound will be produced. SRS contains compressed argon gas. Therefore, do not try to disassemble the SRS or damage the airbag expansion device; do not pierce or burn SRS; do not connect SRS to electricity, and do not keep SRS in the environment beyond 93°C.

⑤ No matter which part of the vehicle is to be welded electrically, please disconnect the SRS before operation so as to avoid explosion.

⑥ In order to avoid the airbag module unfolding accidentally and causing personal injuries, please do not dispose of the folding airbag module in the general way of waste disposal. If the airtight container is damaged in disposal, some substances contained in the folding airbag module may result in serious illnesses or personal injuries. Please dispose of the folding airbag module safely in accordance with the unfolding procedures in the text. Failure to comply with the disposal procedures may violate the applicable regulations and result in personal injuries.

⑦ When the airbag is inflated, please replace the damaged instrument panel if any.

⑧ After the maintenance of SRS, do not be anxious to put the airbag module in circuit. First please inspect electricity and then connect it to the airbag module after confirmation.

(4) SRS Electronic Control Unit (ECU)

① It is prohibited to reuse the ECU disassembled from other vehicles.

② Before conducting the specific maintenance operations, please turn the ignition switch to "LOCK" position, and dismantle the negative earth cable of the battery. After 90 seconds, the maintenance operations can be executed. Otherwise, the airbag may unfold accidentally.

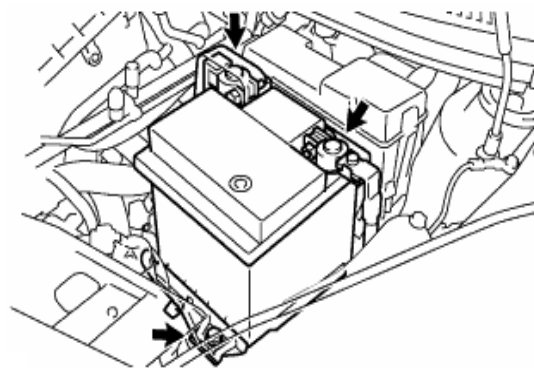
③ The SRS ECU connector, clock spring connector, DAB connector, and PAB connector are all equipped with protection mechanism to prevent the airbag unfolding accidentally.

(5) Wiring Harness and Joint

All wiring harness and joints in this system are standard yellow. If the system wiring harness is disconnected or the joint broken due to the accident or other reasons, replacement is necessary.

3 Electric Control

(1) Disassembly and Assembly of the Battery



① Before servicing any electrical component, please cut off the battery cathode cable so as to avoid the tools or devices touching the exposed terminal with electricity and thus resulting in a short circuit. Or there could be personal injuries and/or damage to the vehicle control system control module or other electrical components.

② To connect or disconnect the battery cable, battery charger, or jumper cable, the ignition key and all the electrical loads must be closed unless otherwise specified in the operational procedures.

③ To connect or disconnect the battery cable, battery charger, or jumper cable, please close the ignition key, unscrew the cable terminal nut, remove the cathode cable from the battery terminal post, and then disconnect

the anode cable. For a recovery, the anode cable should be connected first, followed by the cathode cable. It is prohibited to twist or pry the cable terminal.

④ When the battery cable is removed, all the clock device, sound system, and other data are cleared. Please record the necessary data before removing the battery cable.

⑤ The battery contains corrosive acid and thus can produce explosive gas. The current generated by the battery is intense enough to cause burns. Therefore, in order to reduce the risk of personal injury incurred in the operations nearby the battery, please follow the guidance below:

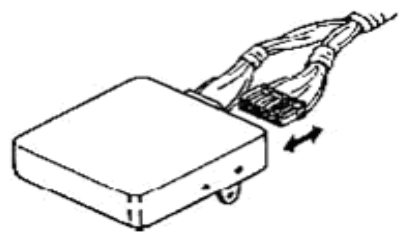
- ◇ Please do wear the safety protection glasses.
- ◇ Try all your best to avoid bending over the battery.
- ◇ Do not keep the battery nearby open flame or spark.
- ◇ Do not allow the battery acid fluid to touch your eyes or skin.
 - Use water to rinse the accessed parts immediately.
 - Go and see the doctor ASAP.

(2) Disassembly and Assembly of the Electronic Components

① Special Precautions for ESD Sensitive Components Handling

Electro-Static Discharge (ESD) will damage a lot of solid-state electrical components. The components easy to be affected by electro-static discharge are not necessarily marked with "ESD". Deal with all electrical components carefully. Please follow the safety instructions below so as to avoid damage to the electro-static discharge:

- ◇ Before servicing any electronic component, especially after sliding on the vehicle seats to produce friction, please touch the metallic ground point first to let the static out of your body.
- ◇ Do not touch the bare terminal. The terminal may be connected to the circuit susceptible to electro-static discharge.
- ◇ While servicing the connector, please do not let the tool touch the bare terminal.
- ◇ It is prohibited to remove the component from its protective shell, unless required in this wise.
- ◇ Please avoid the following operations, unless otherwise required by the diagnostic procedure:
 - Get the component or connector bridged or grounded.
 - Connect the test equipment probe to the component or connector. To use the test probe, please connect the ground lead first.
- ◇ Before opening the protective shell of component, please make grounding first. It is not allowed to put the solid-state components on the metallic workbench or top of the TV set, radio, or other electrical devices.



② To cut off the joint of an electronic part, please unplug the joint itself. It is prohibited to slide the cable.

③ Pay attention and do not drop, knock on, or vibrate any electronic part like sensor or relay. In any similar case, please replace the part with a new one.

④ To clean the engine by means of such liquid as water or steam, please carefully protect the electronic part, air filter, and discharging element against water.

⑤ Do not use the impact method to assemble or disassemble any electronic part.



⑥ When checking the conductivity of electronic part joint, please handle the probe with care to avoid bending the terminal.

4. Assembly and Disassembly of the Fuel System Components

(1) The Assembly and Disassembly Site for Fuel System Components

① Gasoline or gasoline vapor is highly flammable. It can build a fire upon any source of ignition. In order to avoid the risk of fire or explosion, it is prohibited to use any open-top container for discharging or storing the gasoline or diesel oil. Please work in the place free of electric welder, grinder, electric drill, electric motor, stove, or other sources of ignition. Please prepare one dry chemical fire extinguisher (grade B) nearby.

② Do not work in concave pits or nearby so as to avoid the fuel vapor being accumulated in such areas.

(2) Assembly and Disassembly of the Fuel System Components

① Before servicing the fuel system, please relieve the fuel system pressure first – power off the fuel pump and start the vehicle until it stalls, or disconnect the fuel pipe joint, in order to reduce the risk of personal injuries. When the fuel system pressure is relieved, a little bit fuel will spill during the servicing of fuel pipeline, fuel injection pump, or joint. In order to reduce the risk of personal injury, please use silk rag to cover the fuel system components before disconnecting the pipeline or

joint so that the leaked fuel can be absorbed. After the disconnecting, put the silk rag into the permitted container.

② To service the fuel system, please do wear the safety protection glasses so as to avoid the fuel splashing into your eyes.

③ Fuel pressure in the fuel system should not exceed the limit value; or the fuel pressure regulator or fuel pressure gauge may be damaged.

④ In order to reduce the risk of fire and personal injury, please comply with the following points during the servicing of fuel and vapor discharging pipe:

◇ During assembly, please replace all the fuel pipes with crack, scratch, or damage.

Do not try to repair the fuel pipe section.

◇ While assembling the new fuel pipe, do not use the hammer to knock directly on the fuel pipe clip. Any damage to the fuel pipe may lead to fuel leakage.

◇ When you do heating and servicing near the vapor discharging pipe, please cover the vapor discharging pipe with a wet towel. Do not expose the vehicle to the environment with a temperature of over 85°C for more than one hour or to the environment with a temperature of over 60°C for long.

◇ Before connecting the fuel pipe joint, please do keep it clean so that there will be a good connection free of any possible fuel leakage.

⑤ Be careful not to breathe the air from the vapor discharging pipe or hose. The fuel vapor from the vapor discharging pipe may cause personal injuries.

⑥ While servicing the fuel tank, please tighten the strap fasteners gradually and alternately until the specified torque value is reached. If you fail to tighten the strap fasteners in accordance with the standards, the fuel tank bottom may bend upward. And the fuel gauge will still indicate the existence of fuel when there is actually no fuel in the fuel tank.

⑦ Do not use fuel containing the methanol, in order to avoid damage or corrosion to the fuel system.

⑧ Do not try to straighten any twisted nylon fuel pipe. Instead, please replace the twisted nylon fuel pipe to avoid damage to the vehicle.

⑨ To avoid the static, please get the fuel pump, fuel tank, and the vehicle grounded. Do not sprinkle water in such areas so as to prevent slipping. Do not use water to wash the spillage or gasoline either, or there could be a risk of fire caused by pervasion. Meanwhile, please leave the rag with oil inside the fireproof container.

⑩ It is prohibited to use the electrical equipments, like electric motor and work light, or hammer to avoid the possible spark or high temperature.

5. Disassembly and Assembly of the Engine Parts

(1) Special Precautions for Engine Lifting

To lift or support the engine for whatever reasons, please do not locate the jack under the oil pan, any metal

plate, or crankshaft belt pulley for supporting. Lifting the engine in a wrong way may cause damage to the components.

(2) Special Precautions for Engine Bearer

If the engine bearer is broken, certain parts of the transmission system may be dislocated. When the parts of transmission system are dislocated, they may be damaged ultimately.

Special Precautions: When one engine bearer is broken, the stress imposed on other engine bearers will increase. And the rest engine bearers may be broken, too.

(3) Special Precautions for Fault Diagnostic Instrument Fault

Please do use the special fault diagnostic instrument designated by BYD Auto, and give feedback for the fault diagnostic instrument fault in use. Using the fault diagnostic instrument with fault will lead to misdiagnosis and unnecessary part replacement.

(4) Cooling Fan

① To avoid personal injury and vehicle damage, please do replacement in case of any bending, crack, or damage to the fan blade or fan cover.

② Even if the engine is not running, the electronic fan inside the engine compartment may start up to cause personal injuries. Please keep your hands, clothes, and tools away from the electronic fan inside the engine compartment.

⑤ While servicing the engine cooling system, it is prohibited to disassemble the radiator cap, fluid reservoir cap, or pipe joint before the engine is cooled, in order to avoid the scald. If you open the radiator cap, fluid reservoir cap, or pipe joint when the engine and radiator are still not cooled, the cooling system will relieve the scalding high-pressure liquid and vapor.

(6) Air Intake System Parts

① While servicing the air intake system, please use the clean rag, tape, or other appropriate materials to cover the air intake system opening and engine opening, in order to avoid foreign objects entering the system during the installation.

② When it is necessary to disassemble the air filter assembly during the servicing operations, please do cover the inlet of throttle body in order to avoid foreign objects entering the engine.

③ The compressed valve spring will pose a very high tension on the valve spring compressor. If the valve spring is compressed or released improperly with the valve spring compressor, the valve spring will bounce off the valve spring compressor violently. Therefore, be highly careful to compress or release the valve spring and disassemble or assemble the valve stem key, with the valve spring compressor. Careless manipulation may result in personal injury.

(7) Check the Transmission Oil

To disassemble the transmission oil fill plug, please

keep the vehicle in stationary and level state, otherwise excessive amount of oil may run away. The transmission oil might be very hot, and the oil fill plug may inject hot transmission oil. Be careful not to be scalded. Please keep your body away while disassembling the oil fill plug, since you do not know the actual fluid level. Get the container ready for receiving the oil outflows.

(8) Clutch

(1) While servicing the clutch component, please do not grind or polish the clutch plate, nor use dry brush or compressed air to clean the component, because such operations will result in dusts. Please use the wet rag (not soaked). The clutch plate contains asbestos fiber. If dust is generated in the process of servicing, those fibers will be mixed with the air. Breathing the dust with asbestos fiber will cause serious physical impairment.

(2) It is prohibited to use the mineral oil or paraffin oil in the clutch hydraulic system. Such oil will damage the rubber parts inside the oil cylinder.

(9) Emission System

① In order to avoid the scald, please do not repair the exhaust system when it is very hot. Do repairs only when the exhaust system is cooled.

② Any adaptation to the engine or its components may affect the emission control of vehicle and turn on the fault indicator light as well. Because of adaptation, the vehicle may not pass the emission examination / maintenance test.

Any adaptation to the systems below may affect the emission control system of vehicle and turn on the fault indicator light as well:

◇ Engine ◇ Transmission ◇ Exhaust System ◇ Fuel System

If the performance standard of the replacing tire is inconsistent with that of the original one, the emission control of vehicle may be also affected.

If you adapt those systems or install the improper tire whose performance standard is inconsistent with that of the original tire, a repair beyond the warranty range may be needed. And thus the vehicle may not pass the emission examination / maintenance test.

(10) Knock Sensor

Thermal engine coolant may result in serious scald. Although the cooling system becomes empty, there is still coolant left in the engine water jacket. When you disassemble the knock sensor, such coolant will be discharged.

(11) Catalytic Converter

① In order to avoid damage to the joint or inside of the catalytic converter assembly, please support the converter. While moving the catalytic converter assembly, please avoid crash or knock.

② When a lot of mixed gas enters the catalytic converter, overheating and fire risk may be caused to the catalytic converter. To avoid these phenomena taking

place, please do abide by the following precautions:

- ◇ Only the recommended oil can be used.
- ◇ Avoid keeping idle speed for more than 20 minutes.
- ◇ Avoid the jump-spark test.

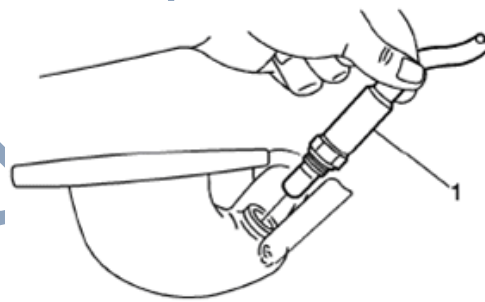
The jump-spark test can be done only when it is very necessary, and you should finish it within the shortest time.

- Do not let the engine run in high speed during the test.

◇ Avoid doing pressure measurement for the engine for long. Please finish it within the shortest time, if necessary.

◇ When the fuel tank is about to be empty, do not let the engine run. Otherwise, the engine may misfire and thus additional burden will be imposed on the catalytic converter.

(12) Heated Oxygen Sensor and Oxygen Sensor



① Take and lay the oxygen sensor with care in order to avoid damage to the parts. Do not drop or mishandle the oxygen sensor.

② Make sure the electrical connector and exhaust entrance end are not stained with any pollutant. Do not use any detergent for the sensor.

③ Do not repair the lead wire, connector, or terminal. If the lead wire, connector, or terminal is damaged, please replace the oxygen sensor.

④ While servicing the oxygen sensor, please abide by the following principles:

◇ Do not disassemble or abolish the ground wire of oxygen sensor (if any). Vehicles equipped with ground sensor are likely to rely on this ground wire which serves as the only ground contact point for the sensor. Disassembling the ground cable may also lead to poor engine performance.

◇ Make sure that the peripheral sealing of the vehicle wiring harness connector is intact so as to avoid the damage caused by water penetration.

◇ It is prohibited to adopt the welding process for servicing in any case, or damage will be caused to the service part.

6. Disassembly and Assembly of the Brake System Components

(1) Only the brake fluid kept in clean sealed container or the BYD DOT3 or DOT4 equivalent can be used. Do not use the brake fluid from the open-top container, because it may be already affected with damp at this moment.

Any other brake fluid beyond the recommended types or any polluted brake fluid may cause damage to the hydraulic brake system components or braking failure and thus result in accidents with personal injury.

Brake fluid is irritant to eyes and skin. In case of any contact, please take the following measures:

- ◇ Eye Contact - rinse them thoroughly with water.
- ◇ Skin Contact – use soap and water to wash it.
- ◇ Swallow – go and see the doctor immediately.

(2) Do not use the container filled with petroleum base brake fluid, because petroleum base brake fluid may make the rubber parts inside the hydraulic brake system inflate and age, and the mixture of water and brake fluid will depress the boiling point. All the brake fluid containers should be covered firmly in order to avoid the pollution.

(3) While servicing the wheel brake parts, please avoid the following operations:

- ◇ No grinding is allowed for the brake lining.
- ◇ Do not use the sand paper to polish the brake

lining.

◇ It is prohibited to use dry brush or compressed air to clean the wheel brake parts.

(4) To service the brake caliper, please use one steel wire to support it in order to avoid damage to the brake pipe.

(5) Avoid the brake fluid splashing onto the paint surfaces, electrical joints, lead wires, or cables. The brake fluid may damage the paint surfaces and cause corrosion to the electrical components. If the brake fluid contacts the paint surface, please rinse the contact part with water immediately. If the brake fluid contacts the electrical joints, lead wires, or cables, please use repairing rag, proper container, or fender cover to prevent the brake fluid contacting the surface. You must reseal and wipe the brake fluid container to avoid overflow.

(6) Certain components in the Antilock Brake System (ABS) can not be repaired alone. Any attempt to disassemble or disconnect those system components will lead to personal injury and/or abnormal system operation. You can only repair the components allowed to be disassembled or installed.

7. Disassembly and Assembly of the Steering System Parts

(1) Before disconnecting the steering column or countershaft from the steering gear, make sure the wheels are oriented right ahead and the steering column is in LOCK position. Otherwise, the clock spring inside the steering column may deviate from the central position and thus may be damaged.

(2) Before disconnecting the following components, the steering column must be in LOCK position:

◇ Steering Column ◇ Countershaft ◇ Lower Steering Shaft

After disconnecting the above components, please do not move the front tire and wheel. Any failure to follow these procedures may cause the inaccurate positioning for some components during the assembly.

(3) The duration for the steering wheel to stay in the extreme position should not be longer than 3 seconds, or the steering pump may be damaged.

(4) If the power steering system is repaired, the air inside the power steering system should be discharged completely so as to get the accurate steering fluid level reading. The air inside the steering fluid may cause cavity noise to the steering pump and even damage the steering bump after a period of running.

(5) Do not start the vehicle if any inlet or outlet hose of the power steering gear is disconnected. Please plug up or cover all the component openings when the hose is disconnected. Otherwise, the power steering fluid may be polluted or lost and the system may be damaged.

(6) To add or replace the steering fluid, please do use the steering fluid or equivalent which meets the DEXRON III specifications.

Improper steering fluid may cause damage to the power steering hose and sealing element and result in steering fluid leakage and steering fluid pump fault.

8. Air Conditioning System

(1) Avoid breathing the air conditioning system refrigerant 134a (R-134a) and the lubricant steam or oil mist. Contacting these liquid will irritate your eyes, nose, and pharynx. Please work in the well-ventilated area. To clear the R-134a away from air conditioning system, please use the servicing equipment (R-134a regeneration equipment) certified by the SAE J2210. If the system has an accidental leakage, please get the workspace well ventilated before further servicing. You can obtain other related health and safety information from the manufacturer of refrigerant and lubricant.

(2) If the cracked glass falls into the air outlet of defroster, it may be blown into the passenger compartment and thus cause personal injury.

9. Disassembly and Assembly of the Body and Accessories

(1) While disassembling or connecting the engine bonnet brace, the pressure can be only posed on its ends. It is prohibited to pose the pressure on the middle part of the brace; or it may cause damage or bending.

(2) While disassembling or assembling the engine-compartment cover brace, please use other devices to support the engine-compartment cover in order to avoid the vehicle damage or personal injury.

(3) If any door or windscreen has cracks but is still intact, please stick the protective tape to the door or windscreen in cross form in order to avoid the further damage of the door or windscreen and the risk of personal injury.

(4) While assembling the front windscreen, please do not use the gasket. The stress generated by the gasket will damage the front windscreen.

(5) In order to avoid personal injury and vehicle damage, please use the carpet with the same thickness and dimension as the original one, while repairing or replacing the carpet. Do install the carpet to the original position.

(6) Be careful to use the shaver blade, other sharp tools, or cotton cloth to erase the adhesive or foreign objects stuck to the vehicle body, or the body surface may be damaged.

10. For the Vehicles Equipped with Mobile Communication System

(1) While assembling the antenna, please try your best to keep it away from the ECU and sensor of the vehicle electronic system.

(2) While assembling the antenna feeder, please keep it at least 20cm away from the ECU and sensor of the vehicle electronic system.

(3) Keep the antenna and feeder away from other electric wires. In this way, no interference will be generated between the signal sent by communication equipment and that sent by other equipments of the vehicle.

(4) Check whether the antenna and antenna feeder are debugged properly.

(5) Do not install the high-power mobile communication system.

11. Others

(1) While executing this procedure, please do wear the safety protection glasses and gloves allowed in order to reduce the risk of personal injury.

(2) In order to avoid harming human body due to exposure to welding ray or toxic fume from metal plating during polishing/cutting any kind of metal or compound die part, work in the area where it is well-ventilated, and wear the authorized gas mask, safety eye shields, earplug, welding gloves and get protective clothing dressed.

(3) When working around operating engines, avoid contacting moving parts and hot surface to avoid injury.

(4) Concreting of servicing materials needs at least 24 hours to complete. Before the concreting is complete, do not touch any servicing position. It will cause personal injury if the adhesive does not concrete completely.

(5) Use correct fasteners at right positions. Parts number of fastener replaced must be accurate, and it is applicable to specific applications. Parts that need thread adhesive sealant, lubricant, preservative or sealant, will be indicated in maintenance procedures. Unless otherwise specified, do not use paint, lubricant or preservative on fasteners or fastener joint faces. These materials will affect the fastener torque and joint clamp force, and may lead to damage of fasteners. When assembling the fasteners, use the correct fastening sequence in order to avoid damaging spare parts and systems

(6) When moving flexible separating connectors from normal installation position, do not over bend or damage flexible separating connectors. The maximum curvature of the flexible separating connector is 6° , which equals to 1inch movement of 1feet pipe section. A 3inch pipe's maximum amount of movement can not exceed 3 inches.

(7) The hose can not be twisted during assembling. Do not make the hose bending or deforming in favor of the assembly. Otherwise, damage of parts may be caused.

(8) In order to avoid injury to personal and/or damage to parts, use proper tools to disassemble the damper coil spring. If not any spring tension is released, the coil spring will be under extreme pressure and may cause ejection, when springs are separated from the damper.

(9) When the maintenance staff inspects the trouble location which needs repairing, the vehicle should be driven by designated personnel. Otherwise, an accident will occur.

(10) When executing required special tests in the workshop, one or multiple standards described below are applicable:

◇ When the test requires a jack to lift the vehicle and rotation of the driving wheel, please follow safety instructions below:

– When keeping one driving wheel rotating, and another still, the speed can not exceed 56 kilometers per hour.

– In above mentioned condition, tachometer only indicated half of the actual speed, thus, this limitation is very necessary. Excessive wheel rotation may cause injury to persons.

If all driving wheels rotate at the same speed, the speed can not exceed 112 kilometers per hour. Excessive wheel rotation may cause injury to personal.

Relevant personnel should stay away from rotating components and counterweight positions to avoid the injury personal.

When the engine requires long-term operation, do not get the engine and transmission overheated.

◇ When testing requires running the vehicle after lifting the vehicle and disassembling the wheel and brake disc,

Please observe the following safety instructions:

Support the suspension at normal ride height.

Do not use the brake after the brake disc is disassembled.

Turn off the ignition switch in order to stop the power transmission assembly.

(11) You should make the road test under safety conditions and observe traffic regulations. Do not try any operation which may jeopardize the vehicle control. Violating the above safety instructions will lead to serious accident and vehicle damage.

12. Vehicle Lifting

(1) When starting to lift the vehicle or before lifting the vehicle notice:

◇ Weight class of lifting or hoisting equipment must meet or exceed the vehicle weight.

◇ Lifting or hoisting equipment must be operated according to operation standard by lifting or hoisting equipment manufacturers.

◇ Lift or hoist the vehicle on clean, solid and dry level ground.

◇ Lift vehicles at appointed hoisting or lifting points only. The lifting or hoisting equipment is prohibited to contact any other component of vehicle.

(2) When starting to lift the vehicle or before lifting the vehicle, pay attention to the vehicle condition:

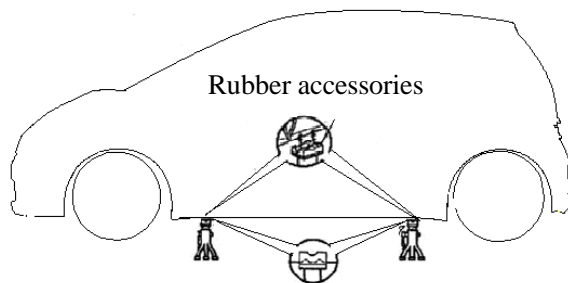
◇ Make sure that the car is not loaded; take out or fasten all articles inside in order to prevent the vehicle from moving in the process of lifting or hoisting.

◇ Disassembling the main components from the vehicle and supporting the vehicle on a lifting device may cause shift of vehicle's center of gravity. In order to hold the vehicle, place counterweights to avoid swing or shifting. Support opposite side of vehicle to parts that need to be disassembled with a jack pad assembly.

(3) Precautions for using jack and safety shelf

◇ In maintenance, use car chock blocks in smooth positions all the time.

◇ Use a safety shelf with rubber accessories.



◇ When using jack and rigid support, support at stated positions.

◇ Before lifting the front wheel, release the stop brake, and put the chock block behind the rear wheel; while lifting the rear wheel, put the chock block in front of the front wheel.

◇ A jack can not be used without a rigid support.

◇ When lowering a vehicle with its front wheel lifted, release the stop brake, and put the chock block in front of the rear wheel.

(4) Precautions for using the four-post car lift

◇ Follow safe procedures listed in this manual.

◇ Use supporting arms with rubber accessories

◇ Handling Precautions: the center of car lifts should get as close as possible to vehicle's center of gravity (length "L" should be as short as possible).

◇ Keep the vehicle on the lift as horizontal as possible, and make the groove of the lift and support position of rigid support in align position.

◇ Before and during the lifting, the supporting arm must be locked up.

◇ While lifting the vehicle off the ground, shake the vehicle to check the stability from a safe distance.

◇ Take precautions to prevent supporting arm from damaging tire, wheel and body.

If above steps are not followed, damage of hoisting, lifting equipment, or vehicle may result.

Section 4 Inspection regulations

1. Troubleshooting

(1) Enquiry Diagnostics

◇ During inquiry, you should be earnest, responsible and kindly and listen carefully.

◇ The inquiry shall be made with a comprehensive perspective with focus on key points, and get deep understanding of the history and frequency of failures

◇ Make analysis, judgment, and preliminary orientation through phenomenon of failure described by the vehicle owner.

(2) Observation Diagnosis

◇ Combine artificial observation with the failure.

Observe not only the whole system, but also particular items. Process in a certain order.

◇ Make external inspection, and carefully observe the water circuit, gas circuit, oil circuit and electrical circuit of the car.

◇ Inspect related instruments and apparatuses used in the car, and determine the failure cause.

◇ Carefully observe phenomenon, DTC, sound etc in failure and make judgment.

(3) Part substitution method

◇ Replace suspicious parts with new parts.

◇ Make further confirmation by assembling failure parts into another vehicle.

◇ Replace a part accordingly. Do not replace parts blindly.

(4) Case application method

◇ Apply the result of typical cases, and search reasons for troubleshooting directly, to reduce unnecessary inspections.

◇ It is only applicable for failures with same phenomenon in a same model vehicle or a homogeneous system.

◇ Common faults, even if the symptom is the same, may be caused by different causes. This method is inapplicable.

(5) Empirical method

◇ Apply the previous result of trouble shooting, and gather experience continuously, to improve troubleshooting abilities.

◇ According to similarities and differences of troubles, you should apply the previous experiences to make judgment flexibly.

◇ As for special, typical troubles, you should make summary and record the gain and loss of troubleshooting in order to optimize the experience.

(6) Logic reasoning method

◇ According to test data and system operational principle, make analysis of the failure, and deduce the fault point.

◇ Master the operational principle, function of the engine, fuel injection system and parts.

◇ It is very necessary to make the inference and analysis for some failures

(7) Backward inference method

◇ If one part fails, the symptoms can be inferred..

◇ Gathering, summarizing symptoms that occur when parts are damaged, will make searching of fault points easy.

(8) Flowchart analysis method

◇ This is the method which is used for complex failures.

◇ Follow the given flowchart to operate, and to find out the fault point.

◇ While operating, other methods can be used to help the analysis and judgment.

2. Electronic control system

Large numbers of ECU control systems are applied in BYD F1. Generally, the ECU is deemed as a very complicated system, and it requires high level of knowledge and skills to make the troubleshooting. In fact, if you can fully understand this kind of system and has electrician basic knowledge, you can make accurate judgment and necessary maintenance in troubleshooting. Please refer to related chapters for details of BYD F1 ECU system

(1) Inspection instrument usage

① Before using the inspection instrument, the operation staff must read its instructions or operation manual carefully.

② After connecting the inspection instrument to the system, switch on ignition key and start the inspection instrument.. If the instrument can not communicate with ECU system, the vehicle or instrument has failed.

◇ When the communication is normal between instrument and other vehicles, check the diagnostic data cable or vehicle's ECU circuit.

◇ When the communication is abnormal between the instrument and other vehicle, the instrument might has failed. Please read the manual or contact the manufacturer.

(2) How to Make Troubleshooting

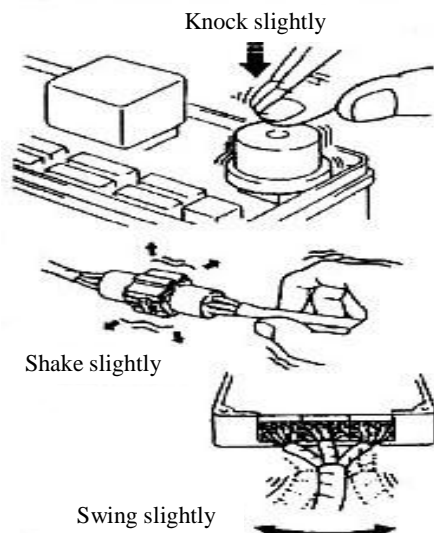
The basic step is to determine the steps of troubleshooting of related electrical circuit before shooting the circuit fault.

(3) Fault Simulation

During troubleshooting, the most difficult situation is no failure symptom is found. Under this circumstance, make intensive analysis for the described failure, and simulate the same or similar status and the environment in which the vehicle goes wrong. If the technicians, no matter how experienced they are, or how highly skilled they are, do not make correct analysis and confirmation of failure symptoms, delay of maintenance, omission of maintenance or misoperation will be caused.

When making the failure symptom simulation, determine the failure symptom, and find out trouble positions or spare parts. Firstly, it can narrow down the suspicious area. Connect the diagnostic scanner to make the symptom simulation test, and judge the damage status for the inspected system, and confirm the failure symptom in the same time. Then, you should refer to DTC table to find out the cause.

① Vibration Method



This method can be used in the case where vibration looks like the main reason for the fault.

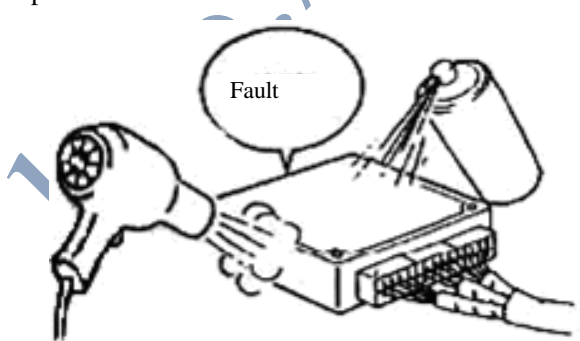
A. Parts and Sensor: use your hands to knock on the suspicious parts gently in order to check whether there is any fault. If you vibrate the relay forcibly, it may be opened.

B. Joint: shake the joint up and down gently.

C Wiring Harness: swing the wiring harness up and down gently. Pay attention that the joint connection and the swinging pivot are the focal points for inspection.

② Heating Method

This method can be used in the case where certain parts fault is probably caused by the increasing temperature.



Use hair dryer or equivalent to heat the suspicious parts, and check whether there is any fault.

Note:

A. The heating temperature can not be higher than 60°C or the particular value.

B. Do not directly heat the ECU components.

③ Spraying Method

This method can be used in the case where fault is probably caused by the rainy day or high humidity.

While spraying water onto the vehicle, please note:

A. Do not spray water onto the engine directly, but you can spray water onto the front end of radiator in order to change the temperature and humidity indirectly.

B. It is strictly prohibited to spray water onto the electronic components directly.

C. If the vehicle leaks rain now or before, damage will be caused to the ECU electronic components or joints. Please pay special attention during the test.

④ High-voltage Load Method

This method can be used in the case where fault is probably caused by over load of the electronic components.

Turn on the fan heater, headlight, rear windscreen defroster, and all other electrical equipments to check whether there is any fault.

(4) Circuit Inspection

① Basic Inspection

□ Resistance Measuring Condition for Electronic Components

Unless otherwise specified, all resistances should be measured in the condition of 20°C indoor temperature. Because when the vehicle is started, the temperature will increase to a very high level. If you do measurement at this moment, the data measured will go beyond the particular value. Therefore, resistance should be measured when the engine is cooled. 12

□ Disassembly and Assembly of the Joint

◇ To disconnect the joint, please use your hands to press the two ends of joint.

Press the lock claw after releasing the lock catch, and then unlock the joint.

◇ While disconnecting the joint, it is prohibited to pull the wiring harness. Please hold and disconnect the joint directly.

◇ Before connecting the joint, please check whether the joint is deformed or damaged and whether the port is lost.

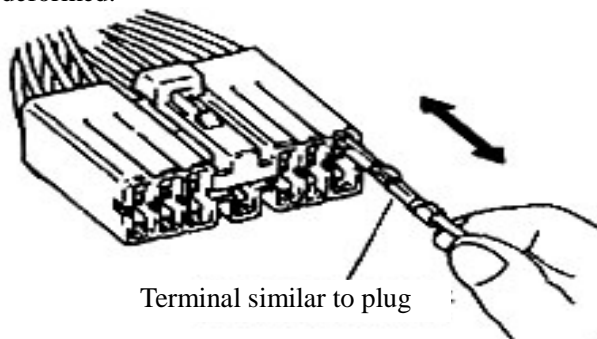
◇ While connecting the joint, if you hear the crack sound, that means the connection is successful.

◇ When you need to use the probe to test the joint on the joint back (wiring harness side), please note that the waterproof joint can not be tested from the back. You should do the test by connecting the separated wiring harness. While moving to insert the probe, be careful not to damage the terminal.

□ Joint Inspection

- ◇ While connecting the joint, please press its two ends until they are inserted thoroughly and locked up.
- ◇ While disconnecting the joint, you can find the unengaged, dropped, or loose terminals, or damaged wires by pulling the wiring harness gently from the joint back.

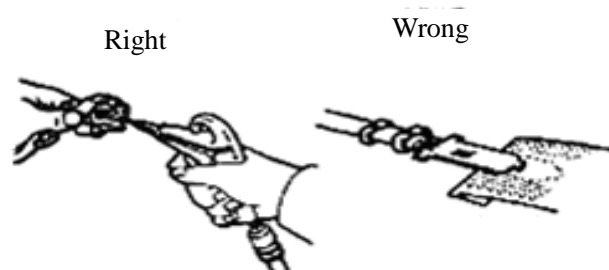
In addition, please check visually whether there is any corrosion, metal chip, foreign object, or water, and whether the terminal is bent, rusty, overheated, polluted, or deformed.



□ Check the Contact Pressure of Terminal

Prepare one plug matching the joint port, and inset it into the socket. Check whether there is a good tension when the plug is inserted and engaged completely to the socket.

□ Repair Method for the Joint Terminal



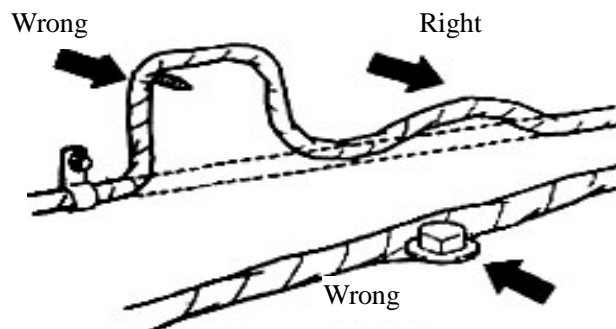
◇ If there is dust on the terminal, please use air gun or rag to clean the contact point. Do not use the sand paper to wipe, or the protective coating may be damaged.

◇ If the contact pressure is abnormal, please replace the socket. For a replacement, please use the plug or socket of the same kind.

◇ Any damaged, deformed, or corroded terminal should be replaced. If the terminal is not locked in the shell, please replace the shell.

□ Disassembly and Assembly of the Wiring Harness

◇ Before disassembling or assembling the wiring harness, please check the wiring harness connection and fastening state in order to make the correct reassembly.



◇ It is prohibited to loosen the wiring harness by twisting or stretching it.

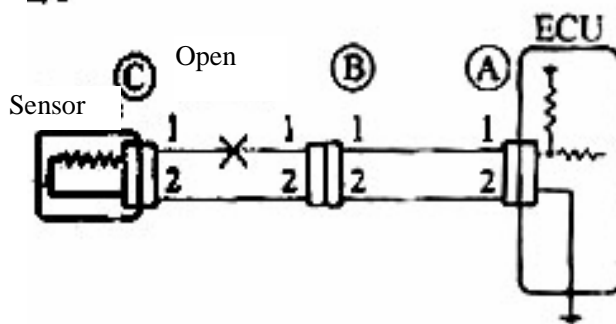
◇ It is prohibited to let the wiring harness contact the high-temperature, rotating, moving, vibrating, or sharp-angled parts. Please also avoid it contacting the panel edge, screw head, or other similar objects.



◇ While assembling the part, it is prohibited to mix it with the wiring harness.

◇ It is prohibited to cut or tear the wiring harness sleeve. When it is necessary to cut or tear the sleeve during the maintenance, please replace the sleeve with a new one or use PVC tape or similar materials to repair it.

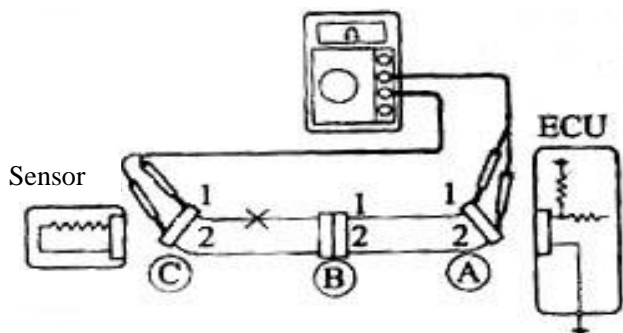
②



② Open Circuit Inspection

□ To make the open circuit inspection for the wiring harness in the figure below, please make the conductivity and voltage inspection in order to find the off-position.

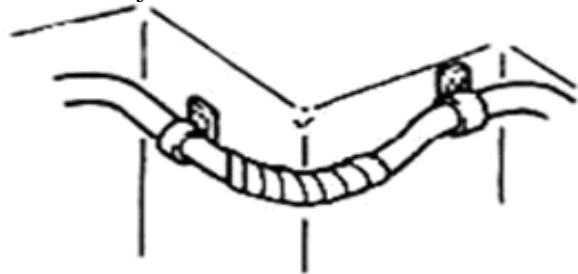
□ Resistance Inspection



- ◇ As shown in the figure, disconnect the joint A and C, and measure the resistance between them: this value should be lower than 10Ω. Note: please shake the wiring harness gently during the inspection.

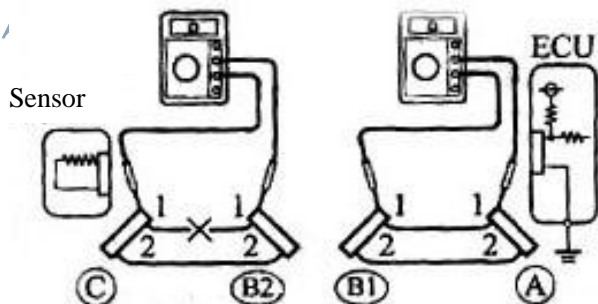
Test the Connection	Specified Condition
Joint A Terminal 1 – Joint C Terminal 1	10kΩ or higher
Joint A Terminal 2 – Joint C Terminal 2	< 1Ω

If the result conforms to the above example, that means there is an open circuit between the joint A terminal 1 and joint C terminal 1.



Disconnect the joint B, and measure the resistance between joints.

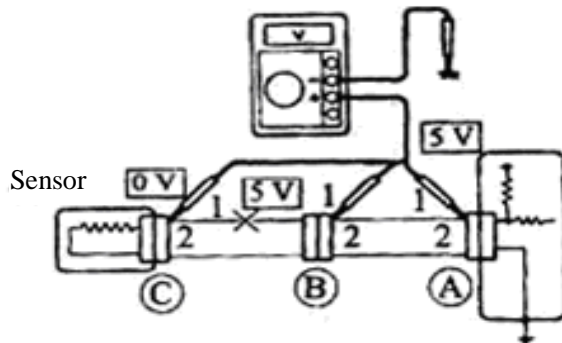
Test the Connection	Specified Condition
Joint A Terminal 1 – Joint B1 Terminal 1	< 1Ω
Joint B2 Terminal 1 – Joint C Terminal 1	10kΩ or higher



If the result conforms to the above example, that means there is an open circuit between the joint C terminal 1 and joint B2 terminal 1.

□ Voltage Inspection

◇ When the circuit is connected to the power (ECU joint terminal is connected to the power),



You can check whether the circuit is open by making a voltage inspection.

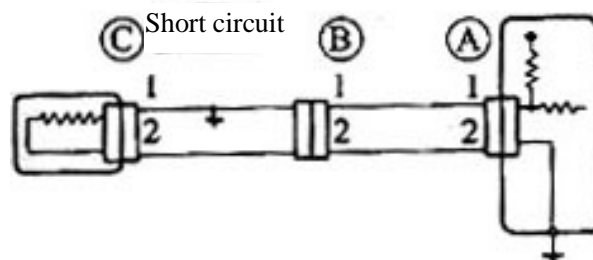
As shown in the figure, when all joints are connected, please measure the voltage respectively between the ECU 5V output terminal joint A terminal 1, joint B terminal 1, or joint C terminal and the body grounding.

◇ Result Example:

Test the Connection	Specified Condition
Joint A Terminal 1 – Body Grounding	5V
Joint B Terminal 1 – Body Grounding	5V
Joint C Terminal 1 – Body Grounding	5V

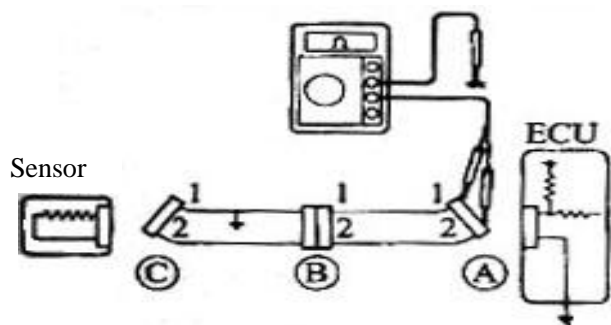
If the result conforms to the above example, that means there is an open circuit between the joint B terminal 1 and joint C terminal 1.

③ Short Circuit Inspection



□ If the wiring harness grounding has a short circuit (as shown in the figure), please make the resistance inspection for the body grounding to find out the position where short circuit occurs.

□ Inspect the conductivity of body grounding



- ◇ Disconnect the joint A and C, and measure the resistance respectively between joint A terminal 1 or 2 and the body grounding: 10kΩ or higher.

Note: please shake the wiring harness gently during the inspection.

Test the Connection	Specified Condition
Joint A Terminal 1 – Body Grounding	< 1Ω
Joint A Terminal 2 – Joint C Terminal 2	10kΩ or higher

If the result conforms to the above example, that means there is an open circuit between the joint A terminal 1 and joint C terminal 1.

- ◇ Disconnect the joint B, and measure the resistance respectively between the joint A terminal 1 and the body grounding, and between the joint B2 and the body grounding.

Test the Connection	Specified Condition
Joint A Terminal 1 – Body Grounding	10kΩ or higher
Joint B2 Terminal 1–Body Grounding	< 1Ω

If the result conforms to the above example, that means there is an open circuit between the joint B2 terminal 1 and joint C terminal 1.

④ ECU Inspection and Replacement

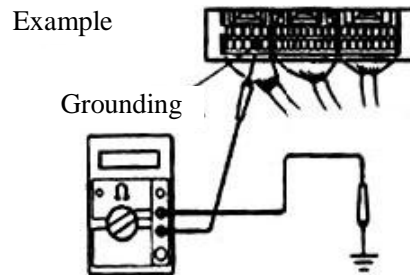
□ Note:

◇ After connecting the joint to ECU, make an inspection for the joint commencing from the back of the joint on one side of the wiring harness.

◇ If there are no special requirements for the inspection condition, please stall the engine, turn the ignition switch to ON and then start the inspection.

◇ Check whether the joints are all connected well and whether the wiring harness is loose, corroded, or damaged.

□ ECU Ground Wire Inspection



ECU Side



W/H Side

Grounding



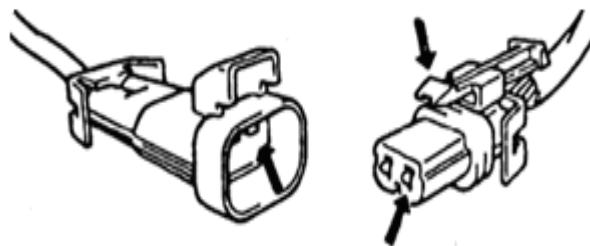
If the circuit has a fault, please repair it. If it is normal, that means the ECU may have a fault, please replace the ECU with a new one and check whether the symptom remains.

◇ Measure the resistance between ECU grounding terminal and body grounding: lower than 1 ohm.

◇ Disconnect the ECU joint, and check whether the grounding terminal is bent, corroded, or stained with foreign matter. Finally, please inspect the contact pressure of the socket.

⑤ Intermittent Contact and Poor Contact

Intermittent contact is caused by the abnormal connection between the electric components and electrical wires, although sometimes the magnetic breaker or solenoid may be also in abnormal condition. While inspecting the poor contact, please carefully check the problematic circuit.



□ The joint and plug are fit poorly, or the terminal post is not completely situated inside the socket connector (exit).

□ The terminal post is dirty or eroded. Please do keep the terminal post clean, free of any other matter which may disturb the normal connection of terminal post. However, it is prohibited to use the sand paper or similar materials to clean the terminal post.

□ **Socket Connector Damage:** It is because the terminal post is exposed to the moist and dirty environment, or the position between the terminal post and the assisting socket connector or component is incorrect.

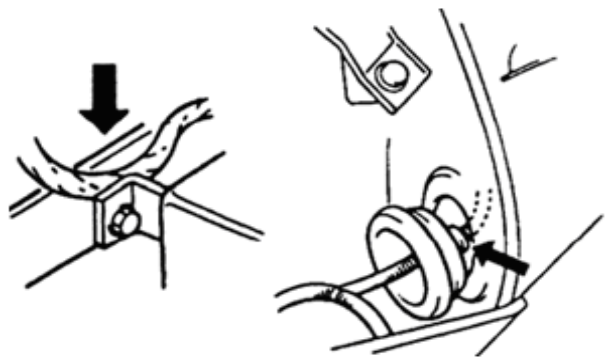
□ **Incorrect or Damaged Terminal Post**

Use the terminal post which cooperates with the corresponding socket connector to check the terminal post of each socket connector in the faulty circuit and make sure the contact pressure is sufficient. If the contact is loose, you can adjust the terminal post or replace it in order to increase the contact pressure.

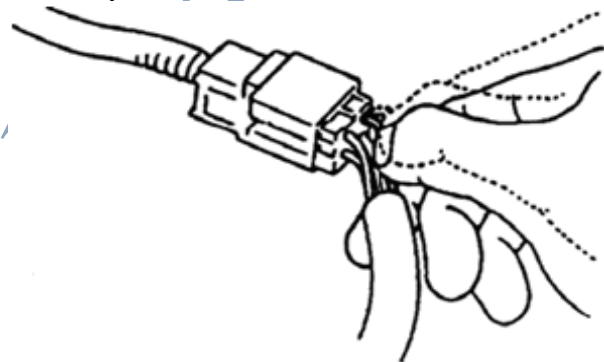
□ **Poor Contact between the Terminal Post and the Wire**

Use your hands to shake the electrical wiring harness gently so as to check the poor contact in the faulty circuit. In case of any abnormal phenomenon, please do repairs or replacement immediately.

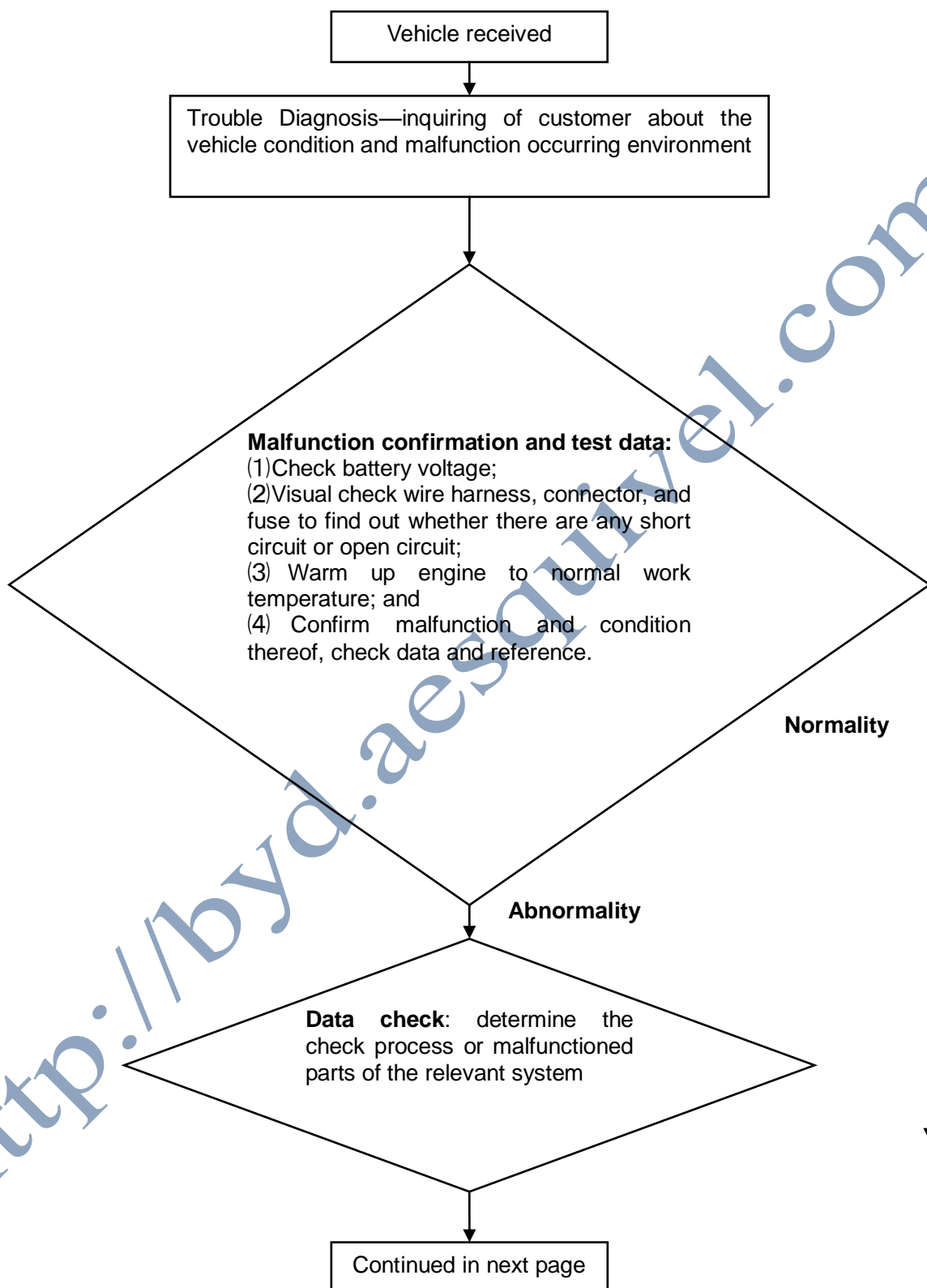
- Due to the abrasion of electrical wire insulating layer, the contact between its exposed part and other electrical wires or other parts will lead to intermittent short circuit.

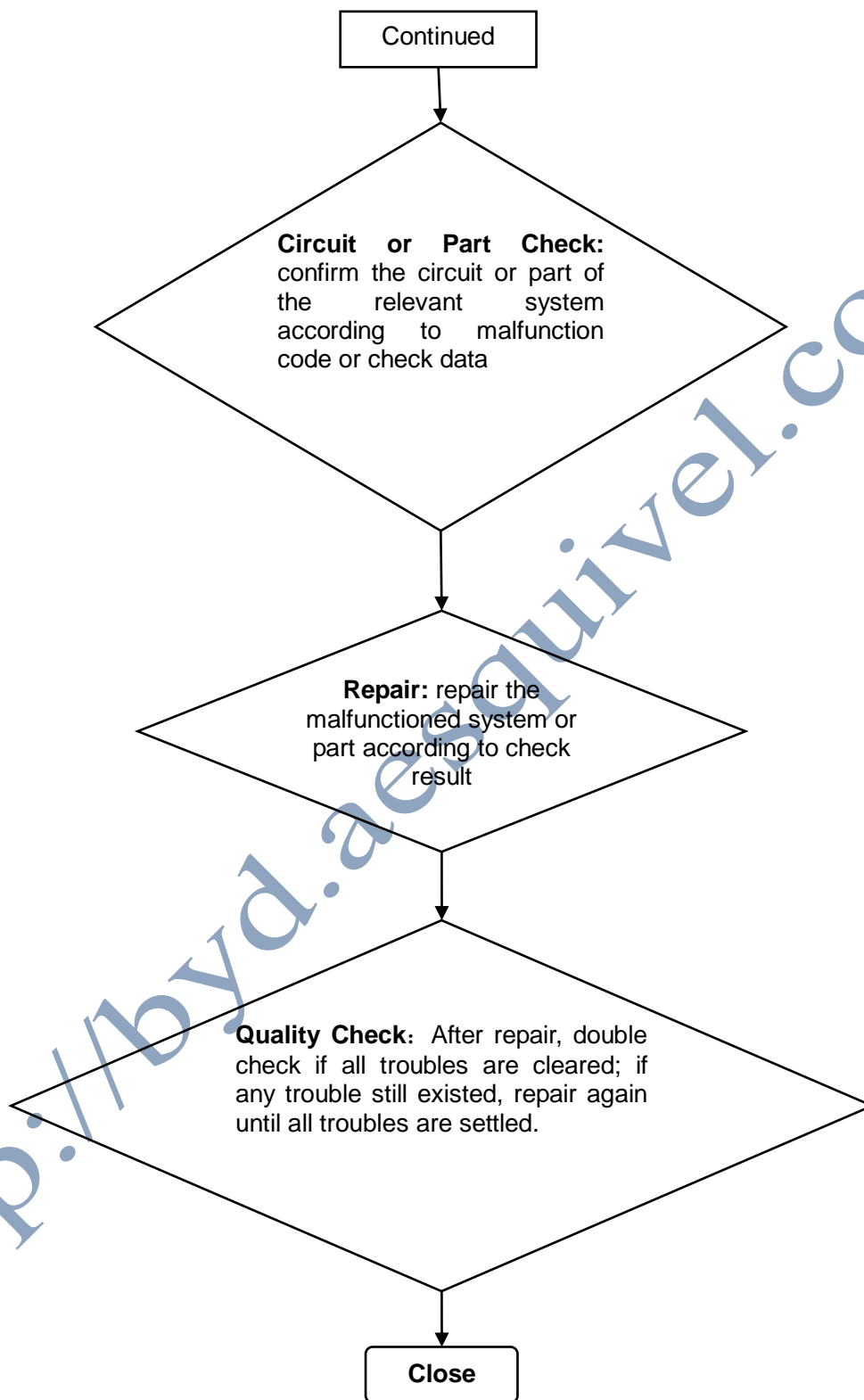


□ The electrical wire inside the insulating layer is broken. In this case, you'd better make the conductivity inspection. However, maybe only one or two strands of the multi-strand wire are in good condition, so the resistance may be very high. In case of any abnormal phenomenon, please do repairs or replacement immediately.



3. Trouble Shooting Process:





Section 5 Abbreviations and Wire Color Marks

1. Abbreviation Format: Song Typeface, Little Four, Bold

Contents

Vehicle English Abbreviations List (may be used in the factory regulation)

ABS	Antilock Brake System
A/C	Air Conditioner
ACL	Air Cleaner
A/F	Air-Fuel Ratio
ALT	Alternator
AMP	Ampere
ANT	Antenna
API	American Petroleum Institute
APPROX	Approximate
ASSY	Assembly
ATDC	After Top Dead Center
ATT	Attachment
AUTO	Automatically
AUX	Auxiliary
BARO	Barometric Pressure
BAT	Battery
BDC	Bottom Dead Center
BTDC	Before Top Dead Center
CAT/CATA	Catalytic Converter
CHG	Charge
CKG	Crankshaft Speed Fluctuation
CKP	Crankshaft Position
CO	Carbon Monoxide
COMP	Complete
CPU	Central Processing Unit
CYL	Cylinder
CYP	Cylinder Position

DIFF	Differential
DLC	Data Link Connection
DOHC	Double Overhead Camshaft
DPI	Double Points Fuel Injection
DPSF	Duplex Pump System Fluid
DTC	Diagnostic Trouble Code
EBD	Electronic Brake Distribution
ECM	Engine Control Module
ECT	Engine Coolant Temperature
ELD	Electric Load Detector
EPR	Evaporator Pressure Regulator
EPS	Electric Power Steering
EVAP	Evaporation
EX	Exhaust
F	Front
FIA	Fuel Injection Air
FL	Front Left
FP	Fuel Pump
FR	Front Right
FSR	Fail-Safe Relay
FWD	Front Wheel Drive
GAL	Gallon
GND	Ground
GPS	Global Positioning System

H/B	Hatchback (body)
HC	Hydrocarbon
HID	High Intensity Discharge
HO2S	Heated Oxygen Sensor
IAB	Intake Air Bypass
IAC	Idle Air Control
IACV	Idle Air Control Valve
IAR	Intake Air Resonator
IAT	Intake Air Temperature
ICM	Ignition Control Module
ID	Identification
ID or I.D.	Inside Diameter
IG or IGN	Ignition
IMA	Idle Mixture Richness Adjustment
	Integrated Engine Assist System
IMMOBI.	Immobilization
IN	Intake
INJ	Injection
INT	Intermittency
KS	Knock Sensor
L	Left
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LEV	Low Emission Vehicle
LF	Left Front
LH	Left Handle
LHD	Left Handle Drive
LR	Left Rear
LSD	Limited Slip Differential
L-3	3-cylinder in line (engine)
MAP	Manifold Absolute Pressure
MAX	Maximum
MCK	Motor Check
MCU	Momentary Control Unit
MIL	Malfunction Indicator Light

MIN	Minimum
MPI	Multipoint Fuel Injection
M/S	Manual Steering
M/T	Manual Transmission
N	Neutral
NOX	Nitrogen Oxide
OBD	Onboard Diagnostic
O2S	Oxygen Sensor
OD or O.D.	Outside Diameter
P	Parking
PAIR	Pulse Auxiliary Air Injection
PCM	Power Control Module
PCV	Positive Crankcase Ventilator
	Proportion Control Valve
PDU	Power Drive Unit
PGM-FI	Programmed Fuel Injection
PGM-IG	Programmed Ignition
PH	High Pressure
PL	Indicator, Low Pressure
PMR	Pump Motor Relay
P/N	Part Number
PRI	Primary
P/S	Power Steering
PSF	Power Steering Fluid
PSP	Power Steering Pressure
PSW	Pressure Switch
Qty	Quantity
R	Right
REF	Reference
RH	Right Handle
RHD	Right Handle Drive
RL	Left Rear
RON	Research Octane Number
RR	Right Rear
SAE	Society of Automotive Engineers

SCS	Service Check Signal
SEC	Second
	Secondary
SOL	Solenoid Valve
SPEC	Specifications
SRS	Supplemental Restraint System
STD	Standard
SW	Switch
T	Torque
TB	Throttle Body
T/B	Timing Belt
TDC	Top Dead Center
TFT	Thin Film Transistor
T/N	Tool Number
TP	Throttle Position
TWC	Three-Way Catalytic Converter
VIN	Vehicle Identification Number
VSC	Net Volume
VSS	Vehicle Speed Sensor
W	Equipped with
W/O	Equipped without
WOT	Wide Open Throttle
2WD	Two-Wheel Drive

5MT	Five-gear Manual Transmission
R	Reverse
1 st	First Gear
2 nd	Second Gear
3 rd	Third Gear
4 th	Fourth Gear
5 th	Fifth Gear