

# Owner's manual Parts manual

# JNSZ2000SR

READ THIS MANUAL CAREFULLY.  
IT CONTAINS IMPORTANT SAFETY INFORMATION.

MINIMUM  
RECOMMENDED  
OPERATOR AGE

# 16



### **FOR OFF-ROAD USE ONLY**

This vehicle is designed and manufactured for off-road use only.

USA only;

It does not conform to federal motor vehicle safety standards, and operation on public streets, roads, or highways is illegal.

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# Warranty policy

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## WORLDWIDE

*Team Joyner Middle East*

*Team Joyner Canada*

*Team Joyner Germany*

*Team Joyner Spain*

*Team Joyner Italy*

*Team Joyner China*

*Team Joyner United Kingdom*

### Liability Release of Joyner Recreational Vehicles

#### Warranty Disclosure

#### Warranty Parts Order Form

#### Service Record

### Preventative Maintenance and Service Log

1. **Liability Release** needs to be signed by the dealer and purchaser then faxed back to Joyner at 480-813-6379
2. **Service Record Form** must be filled out and signed off by the dealer and the purchaser and faxed back to Joyner to activate warranty.
3. **Pre-Delivery Inspection** is to be completed by a qualified technician. It must be initiated and signed off by the technician. At the same time, the consumer needs to initial off and confirm that each item of the 120 point check is operational.
4. **Customer Sign Off** must be initiated by customer after receiving PDI with dealership and confirming the vehicle is fully operational.
5. **Operator Maintenance** should be conducted by an individual that has knowledge of vehicle and has completely read and understand the operator's manual.

**Effective 3-15-08**

All warranty claims must be processed through an authorized Joyner dealer. A copy of all documentation must be on file with Team Joyner USA, Inc.

Protect your vehicle and your safety. Follow the schedule listed within.

[WWW.TEAMJOYNERUSA.COM](http://WWW.TEAMJOYNERUSA.COM)

Toll Free 1-866-441-6363

After completing assembly and PDI Fax to 480-813-6379

•1510 W. Bell Dr. Mar. Dr. Tempe, AZ. 85283 • Phone: 480.813.6363 • Fax: 480.813.6379 •



This release covers Joyner vehicles, dealers, and all affiliates of Castle Financial Corporation.

## Liability Release of Joyner Recreational Vehicles

Please Initial and Sign

- \_\_\_\_ 1) Jumping the vehicle can cause serious damage to the drive train (axle, transmission, suspension)
- \_\_\_\_ 2) Injury or death can result from jumping vehicle. Do not jump.
- \_\_\_\_ 3) I understand that the roll bars are cosmetic and a roll over could cause death or serious injury. The seller is not liable for death or injury.
- \_\_\_\_ 4) I have inspected all machines for any cosmetic damage and found them to be satisfactory. I further understand that cosmetic damage is NOT covered by any factory warranties and unless noted here are deemed acceptable by me.
- \_\_\_\_ 5) Off-roading is dangerous. Death or injury could occur. The seller is not liable for injury or death.
- \_\_\_\_ 6) I understand all sales are final and that there is no right of rescission, no option for return or exchange for any vehicle purchase; and that the titled and registered machines were effectively purchased when I signed the title application.
- \_\_\_\_ 7) I understand the warranty is 90 days manufacturer defect only. Parts are covered but no labor.
- \_\_\_\_ 8) I understand that although some lending institutions do not require insurance, state law DOES require liability insurance and a driver's license. I also understand that some of the products offered by the dealer constitute insurance and a separate policy would have to be purchased from an outside source to protect my purchase and fulfill state requirements.
- \_\_\_\_ 9) I have also been shown the VIN number for each machine and they match this form and all paperwork received.
- \_\_\_\_ 10) I understand that I have only 72 hours to notify the seller of any issues to the paperwork of the vehicle. After 72 hours it will be accepted by the purchaser.
- \_\_\_\_ 11) Off Road use only. Driving on paved roads can cause axle or transmission damage. Both tires terms qualify, this is not a limited slip differential. Injury or death can occur from operating a non-DOT vehicle on public roads.
- \_\_\_\_ 12) **Promise to pay** - by signing this contract buyer agrees to pay Seller the "Total Due."
- \_\_\_\_ 13) **Time of Essence** - Time is of the essence of this contract. Seller's acceptance of partial payments shall not in any manner modify the terms of this contract and such acceptance shall not be construed as a waiver of any subsequent defaults on Buyer's part nor shall it waive the "time is of the essence" provision.
- \_\_\_\_ 14) **Notice** - A my notice required to be given to Buyer shall be deemed a reasonable notification if (1) mailed by ordinary mail, postage prepaid, to Buyer's mailing address as shown on this contract or to Buyer's most recent address as shown by a "notice of change of address" on file with Seller, whether or not such notice is actually received by Buyer, or (2) if given in any other manner which results in Buyer's actual receipt of such notice.
- \_\_\_\_ 15) **Bad Check** - If Buyer pays Seller with a check that is dishonored or unpaid for any reason, Seller may, at Seller's sole option, terminate this contract and retain the vehicle, or make claims against Buyer on the check. In addition, Seller will charge a \$25 returned check charge plus any actual charge assessed by Seller's financial institution resulting from such returned check.
- \_\_\_\_ 16) **Attorney Fees** - If it is necessary for Seller to take legal action to enforce any of Seller's rights under this contract, Buyer agrees to pay to the extent permitted by law, the Seller's reasonable attorney's fees and court costs.
- \_\_\_\_ 17) **General** - This contract is governed by applicable federal law and the laws of the state of Arizona. Any provisions found to be invalid shall not invalidate the remainder hereof. Waiver of any default shall not constitute waiver of any subsequent default. All words used herein shall be construed to be of such gender and number as the circumstances require. The contract shall be binding upon Buyer's heirs, personal representatives, successors and assigns and shall inure to the benefit of Seller's successors and assigns. This contract constitutes the entire agreement between the parties with respect to the subject matter herein, and may not be altered or amended unless made in writing and duly executed by the seller.
- \_\_\_\_ 18) **Cash Deposit** - If Buyer fails or refuses to accept delivery of any Vehicle or product or fails to comply with this contract, Seller may keep any cash deposit as liquidated damages, to the extent not prohibited by law. The deposit may also be used to reimburse Seller for any expenses and losses Seller incurs or suffers as a result of Buyer's failure or refusal to accept delivery of the Vehicle or product or to comply with this contract. Such expenses and losses may include Seller's reasonable attorney's fees.
- \_\_\_\_ 19) **Non-Delivery** - Seller is not liable for failure to deliver or for delay in delivering the Vehicle or other product where such failure or delay is due, in whole or in part, to any cause beyond Seller's control or without Seller's fault or negligence.
- \_\_\_\_ 20) **Risk of Loss Insurance** - The risk of loss to the vehicle or any other items covered by this invoice passes to Buyer upon delivery of the vehicle or other goods to the Buyer at the address set forth on this invoice for shipment to Buyer or such other place of receipt designated by the Buyer. Buyer is responsible for maintaining its own theft and liability insurance coverage for the vehicle.
- \_\_\_\_ 21) **Age** - Buyer represents and warrants to Seller that buyer is over the age of majority and is fully competent to enter into this contract. Buyer acknowledges that Seller is relying on this representation in entering into and performing this contract.
- \_\_\_\_ 22) **Limitation of Damages** - It is understood and agreed that Seller's liability and Buyer's sole remedy, whether in contract, under any warranty, in tort (including negligence) in strict liability or otherwise shall not exceed the return of the amount of the purchase price paid by the Buyer, and under no circumstances shall Seller be liable for any special, incidental, punitive or consequential damages, including, but not limited to, property damage, damage to or loss of equipment, lost profits or revenues, costs of sending replacements and other additional expenses, even if Seller has been advised of the possibility of such damages.
- \_\_\_\_ 23) **No liability for Buyer's negligence** - Seller shall not be liable for any damages, losses or expenses as a result of Buyer's negligence, whether deemed active or passive and whether or not any such negligence is the sole cause of any such damage, loss or expense.
- \_\_\_\_ 24) **Conditions of Sale**
- \_\_\_\_ 25) It is the responsibility of the Buyer to insure the safety and safe operation of all items sold to Buyer.
- \_\_\_\_ 26) The mechanical fitness of the machine is the sole responsibility of the Buyer and operator.
- \_\_\_\_ 27) Buyer acknowledges that there are dangers and risks inherent in the operation and use of all off-road vehicles, including but not limited to the danger and risk of collision with natural and man-made objects and with other vehicles and recreational users. Buyer understands that personal injury, death, dismemberment, or property damage can occur from any type of operation of an off-road recreational vehicle. Buyer accepts and assumes full responsibility for all such dangers and risks and the possibility of personal injury, death, property damage, or loss resulting therefrom and from unsafe operation.
- \_\_\_\_ 28) It is highly recommended that the Buyer or operator of this vehicle: (i) wear a helmet and safety belts at all times during operation of the vehicle and (ii) attend a safety course in operating ATV's, Dirt Bikes, UTV's, or Dune Buggies.

Customer Signature \_\_\_\_\_ Date \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_ Phone \_\_\_\_\_

Dealer Signature \_\_\_\_\_ Date \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_ Phone \_\_\_\_\_

Vehicle \_\_\_\_\_ VIN # \_\_\_\_\_ Year \_\_\_\_\_

+1510 W. Bell De Mar Dr. Tempe, AZ. 85283 • Phone: 480.813.6363 • Fax: 480.813.6379 •

Must be on file to order parts

## Team Joyner USA Limited Manufacturer's Defect Warranty

Team Joyner USA hereby warrants that new Joyner Off-Road Vehicle purchased from an authorized Joyner dealer worldwide including the United States, Middle East, Europe, Canada, Germany, Spain, or wherever Joyner recreational vehicles are sold by an authorized dealer will be free from defects in material and workmanship for the period of time stated herein, subject to certain stated limitations. Purchasing a Joyner vehicle from a non-authorized Joyner dealer will be without a warranty.

The Period of Warranty for Joyner Off-Road Vehicles shall be ninety (90) days from the date of purchase. The warranty can be voided during the 90 days if found that you have violated any of the below requirements.

During the Period of the Warranty any authorized Joyner dealer will evaluate, repair or replace any part adjudged defective by Joyner due to faulty workmanship or material from the factory. Parts used in warranty repairs will be warranted for the balance of the product's warranty period. All parts replaced under warranty become property of Team Joyner USA. Warranty only covers defective parts, no labor is included. Consumer will pay Joyner dealer direct for any labor charges.

General Exclusions from this warranty that will void the entire warranty shall include any failures caused by:

- a. Competition or racing use.
- b. Installation of parts or accessories that is not qualitatively equivalent to genuine Joyner parts.
- c. Abnormal strain, neglect, or abuse.
- d. Lack of proper maintenance.
- e. Accident or collision damage.
- f. Modification to original parts.
- g. Damage due to improper transportation.
- h. Adjustments from operations.
- i. Damage caused by exceeding travel of vehicle.
- j. Altering the vehicle in any manner.
- k. Placing additional seats.
- l. Turbo chargers and super chargers.
- m. Adding electrical devices that cause electrical failure.
- n. Damage caused by debris; rocks, riverbed, trees, etc.
- o. Damage caused by rollovers due to improper operation of vehicle.
- p. Climbing beyond the capacity of the vehicle.
- q. Operating differential lockers in excess speed of 20 mph.
- r. Abuse and improper operations.
- s. Increasing size of the tire or wheel from the Joyner standard tire and wheel package.
- t. Towing an additional vehicle using a winch for other uses other than pulling the vehicle it is attached to.

Specific Exclusions from this warranty shall include parts replaced due to normal wear or routine maintenance, such as spark plugs, oil, oil filter, air filter, brake shoes, CV Joints, CV Boots, Universal Joints, Cables, water damage to electrical equipment, clutches pressure plates and transmission gear from neglect or miss shifting.

The Customer's Responsibility under this warranty shall be to:

1. Operate and maintain the off road vehicle as specified in the appropriate owner's manual;
2. Give notice to an authorized Joyner dealer of any all apparent defects within ten (10) days after delivery, and make the machine available at that time for inspection and repairs at such dealer's place of business.
3. To operate to the intent of the vehicle use
4. Not to travel in and out of water that is more than twelve (12) inches deep.
5. To not operate at any time in salt water.
6. Not to jump the machine in any manner.
7. To follow all local and state safety regulations.
8. Not to alter the vehicle in any manner.
9. Not to install any additional seating.
10. To check all bolts and nuts prior to any ride.
11. Properly clean and protect the cosmetics of the vehicle.

Additional Warranty Requirements:

1. An authorized Joyner dealer to perform a break in service at ten (10) hours or two hundred and fifty (250) miles which ever comes first. There must be a record that this has been conducted by an authorized dealer in order to obligate Joyner to use the warranty on the vehicles or parts.
2. A record of complete operator maintenance must be kept and at any time a Joyner dealer may request this record to qualify the repair under warranty.
3. All fluid must be changed per the operator's manual. On all transmission or engine failures, this record will be requested.
4. Pre-Delivery Inspection (PDI)  
On each Joyner vehicle a pre delivery inspection form is required. A Joyner dealer is required to perform his procedure with the consumer signing off on all items of the PDI form. It is the Joyner dealer's responsibility to ensure and sign off on the vehicle to its mechanical fitness and make sure all safety equipment is installed

correctly. The dealer, during their pre delivery inspection is required to use Tamper Proof paint in red, orange, or white to ensure all nuts and bolts are tightened to specifications. The form can be downloaded at [www.teamjoynerusa.com](http://www.teamjoynerusa.com) or request them to be FedExed to you. It is also the consumer's responsibility that the dealer has performed this procedure. Consumers must, within ten (10) days after accepting the vehicle, notify Joyner at 1-866-441-6363 or email [PDI@teamjoynerusa.com](mailto:PDI@teamjoynerusa.com) or fax to 480-813-6379 in writing that the dealer failed to properly deliver the vehicle to you on an authorized pre delivery inspection form. Failure to properly notify Joyner of this can void the warranty or cause serious injury, death, dismemberment, or damage to the vehicle. Joyner is not responsible for the fitness of the vehicle or the safety of the vehicle if the PDI is not performed by the dealer.

**Warranty Notification Procedures-**

Joyner will only accept warranty claims on its prescribed form with an authorized dealer signing off that in fact the part should be covered under warranty. This form must be e-mailed or faxed in signed by a dealer. A current PDI form must be on file with Joyner with a dealer's signature and consumer signature accepting delivery of the vehicle order and agreeing to the mandatory liability releases. If dealer determines that the part is not under warranty, you have ten (10) days to dispute this in writing to dealer and Joyner. Consumers can not order warranty parts only authorized Joyner dealerships can.

**Safety-** You should acknowledge that you are entering a very hazardous sport and you could be injured, dismembered, or even loose your life. This could occur from operation failure to completely conduct operator's maintenance or failure to have your vehicle properly delivered to you on an authorized dealer Joyner PDI form. It is not the responsibility of Joyner or any of its affiliates to ensure your vehicle will not cause you to be injured, dismembered, or even loss of life. You, without any guaranty of warranty, enter into full awareness of the hazards. It is recommended that you wear proper protection to include Helmet, safety belt, safety netting over doorways and even hand and arm restraints to keep your full body inside the vehicle in case of a roll over. Joyner can not be responsible for any losses of life, limbs, or serious injury. It is recommended that you attend an off road safety course prior to operating this vehicle, or you have agreed to take all responsibilities of operator and passengers.

This warranty is not transferable

**Emission Control System Warranty** – Team Joyner USA also warrants to the ultimate purchaser and each subsequent purchaser of each 2006 and later model Joyner off road vehicles covered by this warranty that the vehicle is designed, built, and equipped so as to conform at the time of sale with all U.S. emissions standards applicable at the time of manufacture and that it is free from defects in materials and workmanship which would cause it not to meet these standards within the period listed immediately below. Failures other than those resulting from defects in material or workmanship which arise solely as a result of owner abuse and/or lack of proper maintenance are not covered by this warranty.

All models-thirty (30) months from the original purchase date.

If at anytime the emission related parts have been altered or removed, or the removal of the certificate that is fixed to the vehicle, the warranty will be null and void. This vehicle must conform to the regulations per EPA and CA Air Resource Board.

Team Joyner USA makes no other warranty of any kind, expressed or implied. All implied warranties of merchantability and fitness for a particular purpose which exceed the obligations and time limits stated in this warranty are hereby disclaimed by Team Joyner USA and excluded from this warranty.

Some States do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Also excluded from this warranty is any incidental or consequential damages including loss of use. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

**Authorized Dealership**

**Team Joyner USA**  
1510 W. Bell De Mar Dr  
Tempe, AZ 85242  
1-866-441-6363

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City, State, Zip \_\_\_\_\_  
Phone \_\_\_\_\_  
Signature \_\_\_\_\_

**Parts Order Form  
Warranty Claim Form**  
www.teamjoynerusa.com  
90 Day Manufacturer Defects Only  
Fax# (480) 813-6379  
Email: parts@teamjoynerusa.com

OFFICE USE ONLY

**Parts Department**  
Date Received: \_\_\_\_\_  
Date Processed: \_\_\_\_\_  
Date Shipped: \_\_\_\_\_  
Order Complete  
Yes  No   
Invoiced to Factory  
Yes  No



Dealer: \_\_\_\_\_  
Contact Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ ST: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_

Customer Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ ST: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_

SALE DATE	DELIVERY DATE	YEAR	MODEL	VIN#	COLOR

SYMPTOMS: \_\_\_\_\_  
\_\_\_\_\_

QTY	ITEM #	PG. #	PART #	DESCRIPTION	COST	TOTAL	WARRANTY YES OR NO

Payment Method: Cash  Check  Visa  Mastercard  Discover   
Drivers License # \_\_\_\_\_ ST: \_\_\_\_\_ EXP: \_\_\_\_\_  
Card# \_\_\_\_\_ EXP: \_\_\_\_\_ ZIP: \_\_\_\_\_ CVC# \_\_\_\_\_  
1 authorize Team Joyner USA to charge my credit card.  
Signature: \_\_\_\_\_ Date: \_\_\_\_\_

SUBTOTAL: \_\_\_\_\_  
TAX: \_\_\_\_\_  
SHIPPING COST: \_\_\_\_\_

**SHIPPING IS NOT INCLUDED ON PARTS ORDERS**

Shipping Method: Ground  2Day  Overnight  Rush Service \$25 Fee

Dealers Signature: \_\_\_\_\_ Date Submitted: \_\_\_\_\_  
Print Name Sign

Exceeding the capability of the machine can cause damage and will not be covered under warranty. Abuse or misuse will not be covered under warranty. The 90 day manufacturers warranty is for defective parts only, not parts that become inoperative from use.

It is the purpose of this form to determine that the customer is qualified for warranty parts. Please note that the following parts are not covered under warranty and are considered as wear parts.

CLUTCH CABLE, THROTTLE CABLE, CLUTCH, BRAKE PADS, MUFFLERS, SHOCKS, LIGHT BULBS, DIRT IN FUEL TANK, DIRT IN CARBURETOR, DAMAGE FROM JUMPING OR EXCEEDING TRAVEL OF MACHINE, THERMOSTAT, TIRES AND WHEELS, ELECTRICAL PARTS SUCH AS: ALTERNATOR, VOLTAGE REGULATOR.

**WE ONLY ACCEPT FAX OR EMAIL ORDERS FOR PARTS-NO PHONE ORDERS!**

**NO ORDERS WILL BE PROCESSED WITH INCOMPLETE INFORMATION**

OFFICE USE ONLY

APPROVED or DECLINED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
Yes  No  Yes  No  PRINT NAME SIGN

REMARKS: \_\_\_\_\_

Operational Failure  Out of Warranty Period  Operational Wear  Pictures Required/Retrieve Part

**PDI MUST BE ON FILE TO PROCESS**



# SERVICE RECORD

Fax to 480-813-6379

No warranty parts can be ordered if not on file authorized pre-paid service program at a participating dealership near you. You can purchase the first year service programs that include 10, 40, 80, and 120 hour services. Inquire with your dealer. We recommend that you follow this service schedule to ensure safety and mechanical fitness of your Joyner recreational vehicle. Failure to have your vehicle serviced by an authorized service center or dealership can result in injury, death, or dismemberment.

Customer Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
 Email \_\_\_\_\_ Phone \_\_\_\_\_

Vehicle Information  
 Model \_\_\_\_\_ Year \_\_\_\_\_  
 Vin # \_\_\_\_\_ Color \_\_\_\_\_

	Date	Sign off	Miles	Remarks	Name	Phone	Date
Assembly							
EPA and CARB stickers							
Pre Delivery Inspection							
Customer Sign Off							
10 hour or 250 miles							
40 hour or 250 miles							
40 hour or 500 miles							
80 hour or 750 miles							
120 hour or 1000 miles							

Monthly checks	Date	Date	Date	Date
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____

**Selling Dealership**  
 Dealership Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
 Phone \_\_\_\_\_

**This activates Warranty**  
 Date of Purchase \_\_\_\_\_  
 Customer Signature \_\_\_\_\_  
 By signing you have agreed to all liability releases and understand warranty.

# Preventative Maintenance and Service Log

 <b>120 Point Check</b> Engine	Dealership Responsibilities		Recommended Authorized Joynner Dealer or Service Center					Operators Responsibilities Also check prior to each ride			
	Assembly	Pre Delivery Inspection	Customer Initials	10 hour or 250 miles	40 hour or 500 miles	80 hours or 750 miles	120 hours or 1000 miles	Weekly	Monthly	Quarterly	Yearly
1) Drive Belt				TA	TA	TA	TA		TA	TA	TA
2) Tighten Bolts On Engine				TA	TA	TA	TA	TA	TA	TA	TA
3) Engine Oil				RC	LF	LF	RC	LF	LF	LF	RC
4) Exhaust				TA	TA	TA	TA	TA	TA	TA	TA
5) Air Filter				RC	LF	LF	RC	LF	LF	LF	RC
6) Manifold Bolts				TA	TA	TA	TA	TA	TA	TA	TA
7) Pulley Bolts				TA	TA	TA	TA	TA	TA	TA	TA
8) Engine Mounts				TA	TA	TA	TA	TA	TA	TA	TA
9) Engine Breather Tube				IC	IC	IC	IC	IC	IC	IC	IC
10) Carburetor				TA	TA	TA	TA	TA	TA	TA	TA
11) All Nuts And Bolts				TA	TA	TA	TA	TA	TA	TA	TA
<b>Transmission</b>											
12) Transmission Fluid				RC	LF	LF	RC	LF	LF	LF	RC
13) Clutch Pedal				LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA
14) Clutch							RC				RC
15) Shifter				LF/TA	LF/TA	LF/TA	LF/TA		LF/TA	LF/TA	LF/TA
16) Transmission Function				IC	IC	IC	IC	IC	IC	IC	IC
17) Clutch Mount				TA	TA	TA	TA	TA	TA	TA	TA
18) Shifter Cables				LF/TA	LF/TA	LF/TA	LF/TA		LF/TA	LF/TA	LF/TA
19) Transmission Mounts				TA	TA	TA	TA	TA	TA	TA	TA
20) All Nuts And Bolts				TA	TA	TA	TA	TA	TA	TA	TA
<b>Ignition</b>											
21) Coil				IC	IC	IC	IC	IC	IC	IC	IC
22) Distributor For Ignition				IC	IC	IC	IC	IC	IC	IC	IC
23) Plug Wires				IC	IC	IC	IC	IC	IC	IC	IC
24) Throttle Choke Cable				LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA
25) Idle				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA
26) All Nuts And Bolts				IC	IC	IC	IC	IC	IC	IC	IC

IC= Inspect And Clean, TA: Tighten And Adjust If Needed, LF= Lubricate And Fill, RC= Replace Or Change  
 After completing make a copy for your records and fax to 480-813-6379

	Dealership Responsibilities			Recommended Authorized Joyner Dealer or Service Center					Operators Responsibilities Also check prior to each ride			
	Assembly	Pre Delivery Inspection	Customer Initials	10 hour or 250 miles	40 hour or 500 miles	80 hours or 750 miles	120 hours or 1000 miles	Weekly	Monthly	Quarterly	Yearly	
<b>Cooling System</b>				IC/LF	IC/LF	IC/LF	RC	IC/LF	IC/LF	IC/LF	RC	
27) Coolant Level												
28) Coolant Hose And Clamps				IC	IC	IC	IC	IC	IC	IC	IC	
29) Radiator Mount Bolts				TA	TA	TA	TA	TA	TA	TA	TA	
30) Radiator Cap				TA	TA	TA	TA	TA	TA	TA	TA	
31) Fan				IC	IC	IC	RC	IC	IC	IC	RC	
32) Hose Clamps				TA	TA	TA	TA	TA	TA	TA	TA	
<b>Fuel System</b>												
33) Fuel Tank Cover				TA	TA	TA	TA	TA	TA	TA	TA	
34) Breathe Hose And Joint				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	
35) Fuel Hose				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	RC	
36) Fuel Hose Clamps				TA	TA	TA	TA	TA	TA	TA	TA	
37) Fuel Tank				IC	IC	IC	IC	IC	IC	IC	IC	
38) Fuel Filter				IC	IC	RC	IC	IC	IC	IC	RC	
39) Fuel Regulator				TA	TA	TA	TA	TA	TA	TA	TA	
40) Fuel Pump				IC	IC	IC	RC	IC	IC	IC	RC	
<b>Drive Train</b>												
41) Axles				IC	IC	IC	IC	IC	IC	IC	IC	
42) Cv Joint				IC	IC/LF	IC	RC	IC	IC	IC	RC	
43) Drive Shaft				LF	LF	LF	LF	LF	LF	LF	LF	
44) Cv Boutts				IC	IC	IC	RC	IC	IC	IC	RC	
45) Spindle				TA	TA	TA	TA	TA	TA	TA	TA	
46) Bearings				IC/LF	IC/LF	IC/LF	RC	IC	IC	IC	RC	
47) Castle Nuts				TA	TA	TA	TA	TA	TA	TA	TA	
48) Cotter Pins				RC	RC	RC	RC	RC	RC	RC	RC	
49) Differential Front				TA	TA	TA	TA	TA	TA	TA	TA	
50) Differential Front Cable				TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	
51) Front Gear Oil				RC	LF	RC	LF	LF	RC	RC	RC	

IC= Inspect And Clean, TA: Tighten And Adjust If Needed, LF= Lubricate And Fill, RC= Replace Or Change

	Dealership Responsibilities			Recommended Authorized Joyner Dealer or Service Center							Operators Responsibilities Also check prior to each ride			
	Assembly	Pre Delivery Inspection	Customer Initials	10 hour or 250 miles	40 hour or 500 miles	80 hours or 750 miles	120 hours or 1000 miles	Weekly	Monthly	Quarterly	Yearly			
52) Differential Breather Tub Front				IC	IC	IC	IC	IC	IC	IC	IC			
53) Differential Rear				TA	TA	TA	TA	TA	TA	TA	TA			
54) Differential Rear Cable				TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF			
55) Differential Breather Tub Rear				IC	IC	IC	IC	IC	IC	IC	IC			
56) Rear Gear Oil				RC	LF	RC	LF	LF	RC	RC	RC			
57) Axle Nuts				TA	TA	TA	TA	TA	TA	TA	TA			
58) Wheel Studs Nuts				TA	TA	TA	TA	TA	TA	TA	TA			
59) Ball Joint Bolts				TA	TA	TA	TA	TA	TA	TA	TA			
60) 4x4 Lockers				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA			
Brakes														
61) Brake Pads				IC	IC	IC	RC	IC	IC	IC	RC			
62) Brake Fluid Level				LF	LF	LF	RC	LF	LF	LF	RC			
63) Rotors				IC	IC	IC	IC	IC	IC	IC	IC			
64) Calipers				IC/TA	IC/TA	IC/TA	IC/TA	IC	IC/TA	IC/TA	IC/TA			
65) Brake Lines				IC	IC	IC	IC	IC	IC	IC	IC			
66) Master Cylinder				IC/TA	IC/TA	IC/TA	IC/TA	IC	IC/TA	IC/TA	IC/TA			
67) Brake Pedal				LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA			
68) Emergency Brake				IC	IC	IC	IC	IC	IC	IC	IC			
69) Emergency Brake Cable				LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA			
70) Emergency Brake Pads				IC	IC	IC	RC	IC	IC	IC	RC			
71) Emergency Brake Fluid				LF	LF	LF	RC	LF	LF	LF	RC			
72) Three Way Brake Valve				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA			
73) All Nuts And Bolts				TA	TA	TA	TA	TA	TA	TA	TA			
74) Wire And Plugs				IC	IC	IC	IC	IC	IC	IC	IC			
Electrical														
75) Battery				IC/LF	IC/LF	IC/LF	RC	IC/LF	IC/LF	IC/LF	RC			
76) motor				IC	IC	IC	IC	IC	IC	IC	IC			
77) Starter				IC	IC	IC	IC	IC	IC	IC	IC			

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	Dealership Responsibilities		Recommended Authorized Joyner Dealer or Service Center					Operators Responsibilities Also check prior to each ride			
	Assembly	Pre Delivery Inspection	Customer Initials	10 hour or 250 miles	40 hour or 500 miles	80 hours or 750 miles	120 hours or 1000 miles	Weekly	Monthly	Quarterly	Yearly
78) Connection				IC	IC	IC	IC	IC	IC	IC	IC
79) Voltage Regulator				IC	IC	IC	IC	IC	IC	IC	IC
80) Gauges				IC	IC	IC	IC	IC	IC	IC	IC
81) Lighting				IC	IC	IC	IC	IC	IC	IC	IC
82) All Nuts And Bolts				TA	TA	TA	TA	TA	TA	TA	TA
83) Horn				IC	IC	IC	IC	IC	IC	IC	IC
Suspension											
84) Tires				IC	IC	IC	IC	IC	IC	IC	IC
85) Tire Air Pressure				TA	TA	TA	TA	TA	TA	TA	TA
86) Wheels And Bearing				LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA	LF/TA
87) A-Arms				TA	TA	TA	TA	TA	TA	TA	TA
88) Swing Arms				TA	TA	TA	TA	TA	TA	TA	TA
89) Shocks Rear				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA
90) Tighten Nuts On The Hub And Wheel				TA	TA	TA	TA	TA	TA	TA	TA
91) Shock Bolts				TA	TA	TA	TA	TA	TA	TA	TA
92) A-Arm Bolts				TA	TA	TA	TA	TA	TA	TA	TA
93) Tie Rod				TA	TA	TA	TA	TA	TA	TA	TA
94) Ball Joint				TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF
95) Hein Joints				TA	TA	TA	TA	TA	TA	TA	TA
96) Shocks Front				TA	TA	TA	TA	TA	TA	TA	TA
97) Nitrogen				TA	TA	TA	TA	TA	TA	TA	TA
98) All Nuts And Bolts Steering				TA	TA	TA	TA	TA	TA	TA	TA
99) Steering Wheel				TA	TA	TA	TA	TA	TA	TA	TA
100) Steering Box				TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF
101) Steering Rod Bolts				TA	TA	TA	TA	TA	TA	TA	TA
102) Ball Joints				TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF	TA/LF
103) Rod Ends				TA	TA	TA	TA	TA	TA	TA	TA
104) Hein Joint				TA	TA	TA	TA	TA	TA	TA	TA
105) All Nuts And Bolts				TA	TA	TA	TA	TA	TA	TA	TA

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	Dealership Responsibilities			Recommended Authorized Joyner Dealer or Service Center					Operators Responsibilities Also check prior to each ride			
	Assembly	Pre Delivery Inspection	Customer Initial	10 hour or 250 miles	40 hour or 500 miles	80 hours or 750 miles	120 hours or 1000 miles	Weekly	Monthly	Quarterly	Yearly	
Chassis				IC	IC	IC	IC	IC	IC	IC	IC	
106) Welds				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	
107) Roll Bar Connection				TA	TA	TA	TA	TA	TA	TA	TA	
108) Floor Panels				TA	TA	TA	TA	TA	TA	TA	TA	
109) Skid Plates				IC	IC	IC	IC	IC	IC	IC	IC	
110) Winch Function				TA	TA	TA	TA	TA	TA	TA	TA	
111) Winch Mount				TA	TA	TA	TA	TA	TA	TA	TA	
112) Seat Belts				TA	TA	TA	TA	TA	TA	TA	TA	
113) Seat Belt Mounts				TA	TA	TA	TA	TA	TA	TA	TA	
Cosmetics												
114) Body Kits				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	
115) Hood				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	
116) Dump Bed				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	
117) Safari Rack				IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	IC/TA	
118) Light Bar Rack				TA	TA	TA	TA	TA	TA	TA	TA	
119) Dash Panel				TA	TA	TA	TA	TA	TA	TA	TA	
120) Seats				TA	TA	TA	TA	TA	TA	TA	TA	

IC= Inspect And Clean, TA: Tighten And Adjust If Needed, LF= Lubricate And Fill, RC= Replace Or Change

Warranty can be voided by Joyner or dealership if the proper maintenance and service has not been conducted  
The service record must be faxed in when requesting warranty parts effective 2-15-08. No exceptions!!!!

Fax 480-813-6379

Release of liability required to be on file to order parts.  
We reserve the right at any time to not sell or supply parts to the dealer or consumer for any reason.

## **OWNER'S MANUAL FOREWORD**

Thank you for choosing Joyner off high way recreational vehicle. We hope you will have fun with it. Before you start to operate the off high way recreational vehicle, please read through this Owner's Manual carefully as it contains important safety and maintenance information. Failure to follow the warnings contained in this manual can result in serious injuries.

Be sure to follow the recommended maintenance schedule and service your vehicle accordingly. Preventative maintenance is extremely important to the longevity of your off high way recreational vehicle.

JOYNER believes in conservation and protection of earth's natural resources. To that end, we encourage every vehicle owner to recycle, trade in, or properly dispose of, as appropriate, used motor oil, coolant, and other fluids, batteries, and tires.

We hope you will have a pleasant experience with our products and thanks again for choosing JOYNER OFF HIGH WAY RECREATIONAL VEHICLE.

## A FEW WORDS ABOUT SAFETY

In order to keep everyone safe, you must take responsibility for the safe operation of your OFF HIGH WAY RECREATIONAL VEHICLE.

To help you make informed decisions about safety, we have provided operating procedures and other information on labels and in this manual. This information alerts you to potential hazards that could hurt you or others.

It is not practical or possible to warn you about all hazards associated with operating or maintaining a OFF HIGH WAY RECREATIONAL VEHICLE. You must use your own good judgment.

You will find important safety information in a variety of forms, including:

**Safety Labels** - On the VEHICLE.

**Safety Messages** – Preceded by a safety alert symbol  and one of two signal words: **WARNING**, or **CAUTION**.

**These signal words mean:**



Physical harm may result from failure to adhere to the instructions that are described within the WARNING labels.

**Safety Headings** --- such as Important Safety warnings or Important Safety Precautions.

**Instructions** --- how to use this OFF HIGH WAY RECREATIONAL VEHICLE correctly and safely.

This entire manual is filled with important safety information----please read it carefully.

## **IMPORTANT SAFETY INFORMATION**

Your OFF HIGH WAY RECREATIONAL VEHICLE will provide you with many years of service and pleasure. Providing you take responsibility for your own safety and understand the challenges you can meet while driving.

There is a lot you can do to protect yourself when you drive. You'll find many helpful recommendations throughout this manual. The following are a few that we consider most important.

### **Follow the Age Recommendation**

It is strongly recommended that no one under the age of 16 be permitted to drive this OFF HIGH WAY RECREATIONAL VEHICLE without adult supervision.

### **Always Wear a Helmet**

It's a proven fact: helmets significantly reduce the number and severity of head injuries. Always wear an approved motorcycle helmet. We also recommend that you wear eye protection, sturdy boots, gloves, and other protective gear.

### **Drive Off-Road Only**

Your OFF HIGH WAY RECREATIONAL VEHICLE is designed and manufactured for off-road use only. The tires are not made for pavement, and the OFF HIGH WAY RECREATIONAL VEHICLE does not have turn signals and other features required for use on public roads. If you need to cross a paved or public road, get off and walk your OFF HIGH WAY RECREATIONAL VEHICLE across.

### **Take Time to Learn & Practice**

Even if you have driven other OFF HIGH WAY RECREATIONAL VEHICLE, take time to become familiar with how this OFF HIGH WAY RECREATIONAL VEHICLE works and handles. Practice in a safe area until you build your skills and get accustomed to this OFF HIGH WAY RECREATIONAL VEHICLE's size and weight.

Because many accidents involve inexperienced or untrained drivers, we urge all drivers to take a training course approved by the OFF HIGH WAY RECREATIONAL VEHICLE Safety Institute. Check with your dealer for more information on training courses.

### **Be Alert for Off-Road Hazards**

The terrain can present a variety of challenges when you drive off-road. Continually "read" the terrain for unexpected turns, drop-offs, rocks, ruts, and other hazards. Always keep your speed low enough to allow time to see and react to hazards.

### **Drive within Your Limits**

Pushing limits is another major cause of OFF HIGH WAY RECREATIONAL VEHICLE accidents. Never drive beyond your personal abilities or faster than conditions warrant. Remember that alcohol, drugs, fatigue, and inattention can significantly reduce your ability to make good judgments and driver safely.

### **Don't Drink and drive**

Alcohol and driving don't mix. Even one drink can reduce your ability to respond to changing conditions, and your reaction time gets worse with every additional drink. So don't drink and drive, and don't let your friends drink and drive either.

**Never run your OFF HIGH WAY RECREATIONAL VEHICLE indoors.**

The exhaust from the engine contains a tasteless, odorless and poisonous gas called carbon monoxide.

## **IMPORTANT SAFETY INFORMATION**

**Keep away from moving parts of the OFF HIGH WAY RECREATIONAL VEHICLE**

The operator of the OFF HIGH WAY RECREATIONAL VEHICLE should never place their hands or other parts of their body near any moving part of the OFF HIGH WAY RECREATIONAL VEHICLE. Failure to adhere to this warning will cause physical harm to your body.

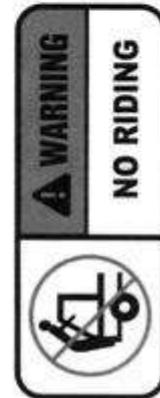
### **Skidding or Sliding**

The terrain surface can be a major factor affecting turns, Skidding a turn is more likely to occur on slippery surfaces such as snow, ice, mud and loose gravel. If you skid on ice, you may lose all directional control. To avoid skidding on slippery terrain, keep you speed low and drive carefully.

# SAFETY LABELS

This section presents some of the most important information and recommendations to help you drive your OFF HIGH WAY RECREATIONAL VEHICLE safely, please take a few moments to read these pages.

The labels are considered permanent parts of the OFF HIGH WAY RECREATIONAL VEHICLE. If a label comes off or becomes hard to read, contact your dealer for warning labels replacements.



## ARE YOU READY TO DRIVE?

Before each drive, you need to make sure you and your OFF HIGH WAY RECREATIONAL VEHICLE are both ready to drive. To help get you prepared, this section discusses how to evaluate your driving readiness, what items you should check on your OFF HIGH WAY RECREATIONAL VEHICLE, and adjustments to make for your comfort, convenience, or safety.

Before you drive your OFF HIGH WAY RECREATIONAL VEHICLE for the first time, we urge you to:

- Read this owner's manual and the labels on your OFF HIGH WAY RECREATIONAL VEHICLE carefully.
- Make sure you understand all the safety messages.
- Know how to operate all the controls.
- Never drive this OFF HIGH WAY RECREATIONAL VEHICLE if under 16 years old.

Before each drive, be sure:

- You feel well and are in good physical and mental condition.
- You are wearing an approved motorcycle helmet (with chin strap tightened securely), eye protection, and other protective clothing.
- You don't have any alcohol or drugs in your system.

### Protective Apparel

For your safety, we strongly recommend that you always wear an approved motorcycle helmet, eye protection, boots, gloves, long pants, and long-sleeved shirt or jacket whenever you drive.

Although complete protection is not possible, wearing proper gear can reduce the chance of injury when you drive.

The following suggestions will help you choose the proper driving gear.

### Helmets and Eyes Protection

Your helmet is your most important piece of driving gear because it offers the best protection against head injuries. A helmet should fit your head comfortably and securely.

An open-face helmet offers some protection, but a full-face helmet offers more. Regardless of the style, look for a DOT (Department of Transportation) sticker in any helmet you buy. Always wear a face shield or goggles to protect your eyes and help your vision.

Operating this OFF HIGH WAY RECREATIONAL VEHICLE without wearing an approved motorcycle helmet, eye protection, and protective clothing could increase your chances of head and/or eye injury, possibly death in the event of severe accident.



**WARNING**

Always wear approved motorcycle helmet that fits properly and wear eye protection (goggles or face shield), gloves, boots, long-sleeved shirt or jacket and long pants.

## ARE YOU READY TO DRIVE?

### Additional Driving Gear

In addition to a helmet and eye protection, we also recommend:

- Sturdy off-road motorcycle boots to help protect your feet, ankles, and lower legs.
- Off-road motorcycle gloves to help protect your hands.
- Driving pants with knee and hip pads, a driving jersey with padded elbows, and a chest/shoulder protector.

### Drive Training

Developing your driving skills is an on-going process. Even if you have driven other VEHICLES, take time to become familiar with how this VEHICLE works and handles. Practice driving the VEHICLE in a safe area to build your skills. Do not drive in rough terrain until you get accustomed to the OFF HIGH WAY RECREATIONAL VEHICLE's controls, and feel comfortable with its size and weight.

#### **WARNING**

Operating OFF HIGH WAY RECREATIONAL VEHICLE without proper instruction could increase your risk of an accident which could lead to serious injury or death.

#### **WARNING**

Attempt supporting with your hands to the ground when the OFF HIGH WAY RECREATIONAL VEHICLE turning over could lead to serious injury or death. Never support with your hands to ground when the OFF HIGH WAY RECREATIONAL VEHICLE will turn over.

### Age Recommendation

It is strongly recommended that no one under the age of 16 be permitted this OFF HIGH WAY RECREATIONAL VEHICLE without adult supervision.

#### **WARNING**

A child driving a OFF HIGH WAY RECREATIONAL VEHICLE that is not recommended for his/her age could lose OFF HIGH WAY RECREATIONAL VEHICLE control and result in severe injury or death.  
A child under 16 should have adult supervision when operate on the OFF HIGH WAY RECREATIONAL VEHICLE.

### No Alcohol or Drugs

Alcohol, drugs and OFF HIGH WAY RECREATIONAL VEHICLES don't mix. Even a small amount of alcohol can impair your ability to operate a vehicle safely. Likewise, drugs, even if prescribed by a physician, can be dangerous while operating a vehicle. Consult your doctor to be sure it is safe to operate a vehicle after taking medication.

 **WARNING**

Operating this OFF HIGH WAY RECREATIONAL VEHICLE after consuming alcohol or drugs can seriously affect your judgment, because you to react more slowly, affect your balance and perception, and could result in serious injury or death.

Never consume alcohol or drugs before or while operating this OFF HIGH WAY RECREATIONAL VEHICLE.

## IS YOUR VEHICLE READY TO DRIVE?

Before each drive, it is important to inspect your OFF HIGH WAY RECREATIONAL VEHICLE and make sure any problems you find are corrected. A pre-drive inspection is a must, not only for safety, but because having a breakdown, or even a flat tire, can be a major inconvenience.

If your OFF HIGH WAY RECREATIONAL VEHICLE has overturned or has been involved in a collision, do not drive it until your OFF HIGH WAY RECREATIONAL VEHICLE has been inspected by your dealer, there may be damages or other problems you cannot see.

 **WARNING**

Improperly maintaining this OFF HIGH WAY RECREATIONAL VEHICLE or failing to correct a problem before driving can cause a crash in which you can be seriously hurt or died.

Always perform a pre-drive inspection before every drive and correct any problems.

### Pre-drive Inspection

Check the following items before you get on the OFF HIGH WAY RECREATIONAL VEHICLE:

#### Engine Oil

Check the level and add oil if needed. Check for leaks.

#### Coolant

Check the coolant and add coolant if need. Check for the leaks.

#### Fuel

Check the level and add fuel if needed. Also make sure the fuel fill cap is securely fastened. Check for leaks.

#### Tires

Use a gauge to check the air pressure. Adjust if needed. Also look for signs of damages or excessive wear.

#### Nuts & Bolts

Check the wheels to see that the axle nuts are tightened, Use a wrench to make sure all accessible nuts, bolts, and fasteners are tight.

### Pre-drive Inspection

#### ■ Underbody & Exhaust System

Check for, and remove any dirt, vegetation or other debris that could be fire hazard or interfere with the proper operation of the OFF HIGH WAY RECREATIONAL VEHICLE.

#### ■ Air Cleaner

- Check the air filter. Replace it if needed.
- Leaks, Loose Parts  
Walk around you OFF HIGH WAY RECREATIONAL VEHICLE and look for anything that appears unusual, such as a leak or loose cable.
  - Lights  
Make sure the headlight, brake light and tail light are working properly.
  - Throttle  
Check the free play and adjust if needed. Press the throttle to make sure it moves smoothly without sticking, and snaps back automatically when it is released.
  - Clutch cable  
Check the free play of clutch cable and adjust if needed. Press the clutch cable to make sure it moves smoothly without sticking, and snaps back automatically when it is released.
  - Brakes  
Press the brake pedal several times, check for proper brake pedal free play. Make

## IS YOUR VEHICLE READY TO DRIVE?

- Sure there is no brake fluid leakage.
- Engine Stop  
When engine is running, turn the switch key counterclockwise. Make sure engine stops.
  - Steering Wheel  
Check that the wheels turn properly as you turn the steering wheel.
  - Cable  
Check the cable housing for wear. Check the fittings are tight. Replace or tighten as needed.
  - Tie rod  
Check the tie rod housing for wear. Check the fittings are tight. Replace or tighten as needed.

### Off-Road Use Only

Your vehicle and its tires are designed and manufactured for off-road use only, not for pavement. Driving on pavement can affect handling and control. You should not drive your OFF HIGH WAY RECREATIONAL VEHICLE on pavement.



**Operating this OFF HIGH WAY RECREATIONAL VEHICLE on paved surfaces may seriously affect handling and control of the OFF HIGH WAY RECREATIONAL VEHICLE, and may cause the vehicle to go out of control.  
Never operate the OFF HIGH WAY RECREATIONAL VEHICLE on any paved surfaces, including sidewalks, driveways, parking lots and streets.**

When driving off-road, also remember to always obey local off-road driving laws and regulations. Obtain permission to drive on private property. Avoid posted areas and obey “no trespassing” signs.

You should never drive your OFF HIGH WAY RECREATIONAL VEHICLE on public streets, roads or highways, even if they are not paved. Drivers of street vehicles may have difficulty seeing and avoiding you, which could lead to a collision. In many states it is illegal to operate OFF HIGH WAY RECREATIONAL VEHICLES on public streets, roads and

highways.



**Operating this OFF HIGH WAY RECREATIONAL VEHICLE on public streets, roads or highways can cause collision with other vehicle.**

**Never operate this OFF HIGH WAY RECREATIONAL VEHICLE on any public streets, roads or highways, even dirt or gravel one.**

### **Keep Hands and Feet on Controls**

Always keep both hands on the steering wheel and both feet on the foot controls. When driving your OFF HIGH WAY RECREATIONAL VEHICLE. It is important to maintain your balance and control of the OFF HIGH WAY RECREATIONAL VEHICLE. Removing hands or feet away from the controls can reduce your ability to react and control the vehicle.



**Removing hand from Steering wheel or feet from foot controls during operation can reduce your ability to control the OFF HIGH WAY RECREATIONAL VEHICLE or could cause you to lose your balance and fall off the OFF HIGH WAY RECREATIONAL VEHICLE.**

**Always keep both hand on the steering wheel and both feet on the foot controls of your OFF HIGH WAY RECREATIONAL VEHICLE during operation.**

## **SAFE DRIVING PRECAUTIONS**

### **Control Speed**

Driving at excessive speed increases the chance of an accident. In choosing a proper speed, you need to consider the capability of your OFF HIGH WAY RECREATIONAL VEHICLE, the terrain, visibility and other operating conditions, plus your own skills and experience.



**Operating this OFF HIGH WAY RECREATIONAL VEHICLE at excessive speeds increases your chances of losing control of the OFF HIGH WAY RECREATIONAL VEHICLE, which can result in an accident.**

**Always drive at a speed that is proper for your OFF HIGH WAY RECREATIONAL VEHICLE, the terrain, visibility and other operating conditions, and your experience.**

### **Use Care on Unfamiliar or Rough Terrain**

Before driving in a new area, always check the terrain thoroughly. Don't drive fast on unfamiliar terrain or when visibility is limited. (It's sometimes difficult to see obstructions like hidden rocks, bumps, or holes in time to react).

 **WARNING**

Failure to use extra care when Operating this OFF HIGH WAY RECREATIONAL VEHICLE on unfamiliar terrain could result in the OFF HIGH WAY RECREATIONAL VEHICLE overturning or going out of control.  
Go slowly and be extra careful when operating on unfamiliar terrain.  
Always be alert to changing terrain conditions when operating the OFF HIGH WAY RECREATIONAL VEHICLE.

Never drive past the limit of visibility. Maintain a safe distance between your OFF HIGH WAY RECREATIONAL VEHICLE and other off-road vehicles. Always exercise caution and use extra care on rough, slippery and loose terrain.

 **WARNING**

Failure to use extra care when operating on excessively rough, slippery or loose terrain could cause loss of traction or vehicle control, which could result in an accident, including an overturn.  
Do not operate on excessively rough, slippery or loose terrain until you have learned and practiced the skills necessary to control the OFF HIGH WAY RECREATIONAL VEHICLE on such terrain. Always be especially cautious on these kinds of terrain.

**Do Not Perform Stunts**

You should always operate your OFF HIGH WAY RECREATIONAL VEHICLE in a safe and reasonable manner. When driving, always keep all four wheels on the ground.

 **WARNING**

Attempting wheelies and other stunts increases the chance of an accident, including an overturn.  
Never attempt stunts, such as wheelies or jumps. Don't try to show off.

# SPECIFICATIONS

## DIMENSIONS

Overall Length	151in. (3837mm)
Overall Width	88.5 in. (2250mm)
Overall Height	74in. (1880mm)
Wheelbase	103.5in. (2630mm)
Front Track	68.9 in. (1750mm)
Rear Track	72.4in. (1840mm)
Ground Clearance	14.4in. (365mm)

## ENGINE

Type	4-Bore,4-Stroke, Liquid-cooled
Bore x Stroke	93.5mmx90mm
Displacement	1971 cc
Compression ratio	10:1
Carburetor	Electric fuel injection system
Rated Power	95kw/5750rpm
Maximum Torque	180/4300-4500Nm/r/min
Starting	Electric
Ignition	C.D.I
Lubrication	Force & Splash
Transmission	hydraulic clutch, 4 shift/Reverse
Spark Plug	A11-3707110CA
Fuel type	RQ90 (unleaded)
Lubricate oil	SAE 15W-40

## CAPACITIES

Maximum load	400kg
Fuel tank	34.0L
Engine oil	4500ml
Coolant	6000ml
Starting	<10s
Climbing	≥15°
Battery	12V45Ah
Head Light	12V 55/55W/Both
Tail Light	12V10W/5W/21W/Both
Spot light	12V35W/Four
Main Fuse	50A

## SPECIFICATIONS

Brake Track	< 7m @ 20miles/h
Top speed	≥62 miles/h (or limited as customers require)

## CHASSIS

Front, Rear brake	Hydraulic disc, right foot control
Front tire	27x7.5-15
Rear tire	28x13-15
Front Suspension	Independent Dual A-Arm
Rear Suspension	Longitudinal Control Arm
Final Drive	shaft driven

## TIRE PRESSURE

Front	115kpa 1.15kg/c m <sup>2</sup> 16psi
Rear	115kpa 1.15kg/c m <sup>2</sup> 16psi

## WEIGHT

Net Weight	780kg
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## WARRANTY

Parts and workmanship	90 Days
-----------------------	---------

## Operation

**WARNING**-Do not attempt to start or operate the engine until completely familiar with the location and use of each control necessary to operate this vehicle. The operator must know how to stop this machine before starting and driving it.

## Throttle

The right foot pedal is the throttle that controls the OFF HIGH WAY RECREATIONAL VEHICLE speed. To disengage the clutch at any time, allow the throttle to return to the idle position. (See Fig. 1)

### **WARNING**

Each time prior to starting the engine, check the throttle assembly to ensure that when pedal is pushed all the way forward the assembly is working smoothly and returns to idle when released. Do not operate if pedal or engine throttle linkage fail to return to idle. If unable to correct the problem through lubrication, adjustment or replacement of worn parts, contact your dealer for assistance.

## Brake

The brake is located on the middle of the three control pedals (See Fig. 1). Applying pressure to the pedal applies pressure to the brake caliper around the brake disc at the front and rear wheels and slows or stops the vehicle.

## Clutch

The left foot pedal controls the clutch cable (See Fig. 1). With the pedal down, you can shift the shift lever.

### **WARNING**

Improper operation of the clutch will lead to excessive wear of the clutch friction surface.

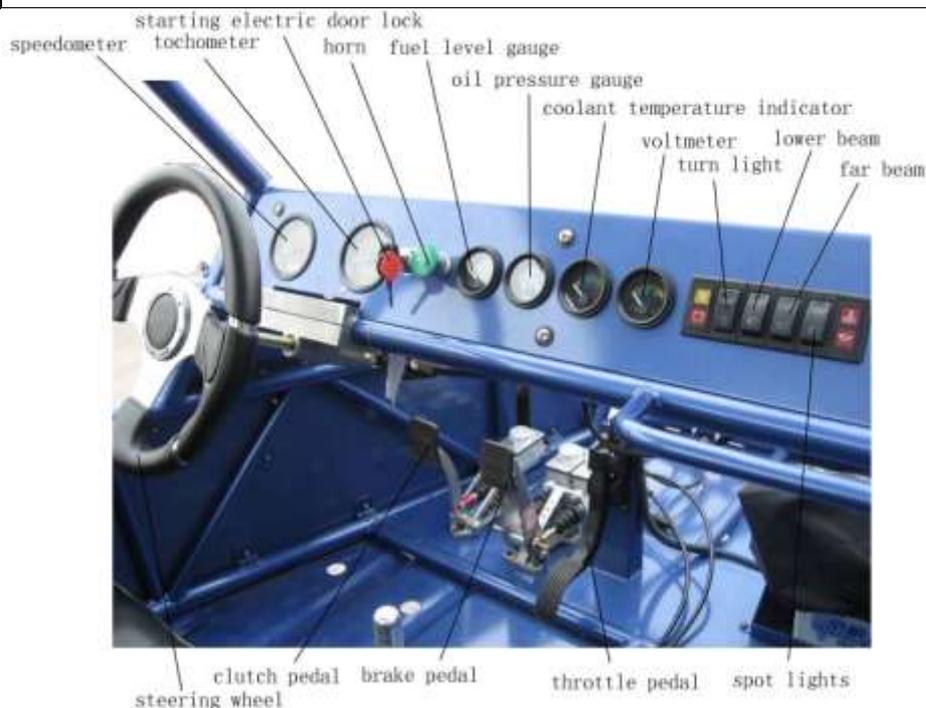


Fig. 1

## Start engine

1. Press the clutch pedal down; put the gear shift lever in neutral
2. Insert the key into the starting electric door lock.

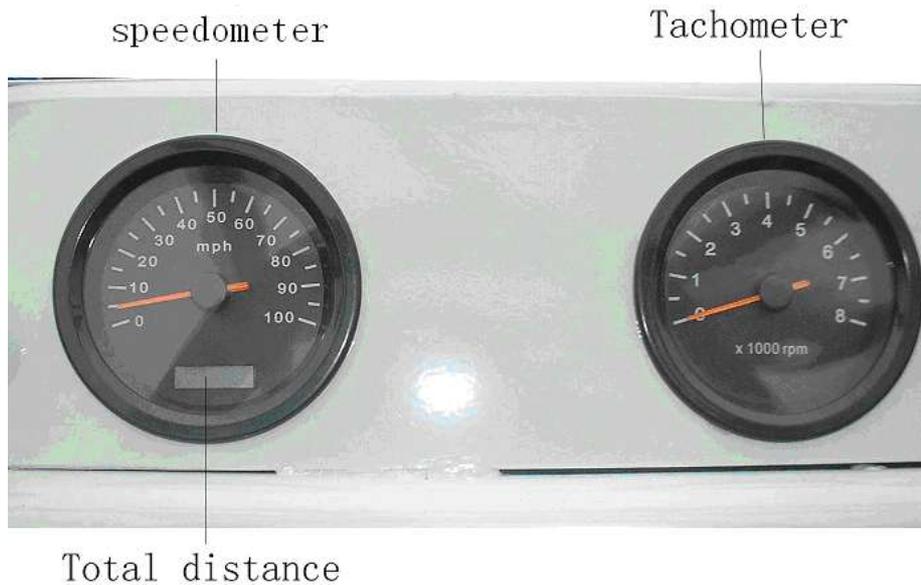


Fig. 2

### If the engine is cold;

1. Press down the clutch pedal
2. Turn the key clockwise to the “on” position. Release the key and the clutch pedal when the engine starts.



Fig. 3

### If the engine is warm;

Press the throttle slightly and turn the key clockwise to the “on” position, release the key and the throttle when the engine starts.

## ⚠ WARNING

Each time prior to starting the engine, check the throttle assembly to ensure that when pedal is pushed all the way forward the assembly is working smoothly and returns to idle when released. Do not operate if pedal or engine throttle linkage fail to return to idle. If unable to correct the problem through lubrication, adjustment or replacement of worn parts, contact your dealer for assistance.

**WARNING**

Before you start the engine, check that the parking brake is engaged, and the gear shift lever is in neutral. Trying to start the engine in gear may damage the starter motor, clutch or gearbox.

**WARNING**

Release the key at once if the engine starts. Holding the key in start position when the engine is running will cause damage to the starter motor.

**WARNING**

If the engine does not start after 10 seconds, a second attempt to start the engine can be allowed. Improper operation will damage the engine.

## Engine stop key

### Stop-key test.

Before driving this vehicle, test the Engine Stop key to assure that it is operating properly. With the engine running, turn the key counterclockwise to the “off” position for the engine to shut down.

## Passengers

The vehicle allows for **two riders** only.  
Combined maximum weight of driver  
And the passenger should not exceed 300kg  
/ 661 Lbs.

## Seat Adjustment

The seat must always be securely fastened in the position which best allows the operator control of the foot pedals, steering wheel, and the remote Stop key.



Fig. 4

- a. Pull seat adjustment handle upward to disengage seat slide.
- b. Move seat to desired position.
- c. Be sure seat adjustment handle snaps back into place and that seat is locked into position. (See Fig. 4 )

**WARNING**

Before attempting to adjust the seat ensures that engine of the OFF HIGH WAY RECREATIONAL VEHICLE is stopped.

**WARNING**

Never operate this OFF HIGH WAY RECREATIONAL VEHICLE when the provided seat is not securely fastened, to do so could result in a strong possibility of severe personal injury or loss of life. Before attempting to adjust the seat ensures that engine of OFF HIGH WAY RECREATIONAL VEHICLE is stopped.

## Gear Shift Adjustment

1. Loosen the nuts.
2. Press down the clutch pedal fully.
3. Operate the shift lever as to change gearshift from 1 to 4 and reverse smoothly.
4. First, tighten nut 1 with thread glue. Then second, tighten nut 2 with thread glue. (See Fig. 7)

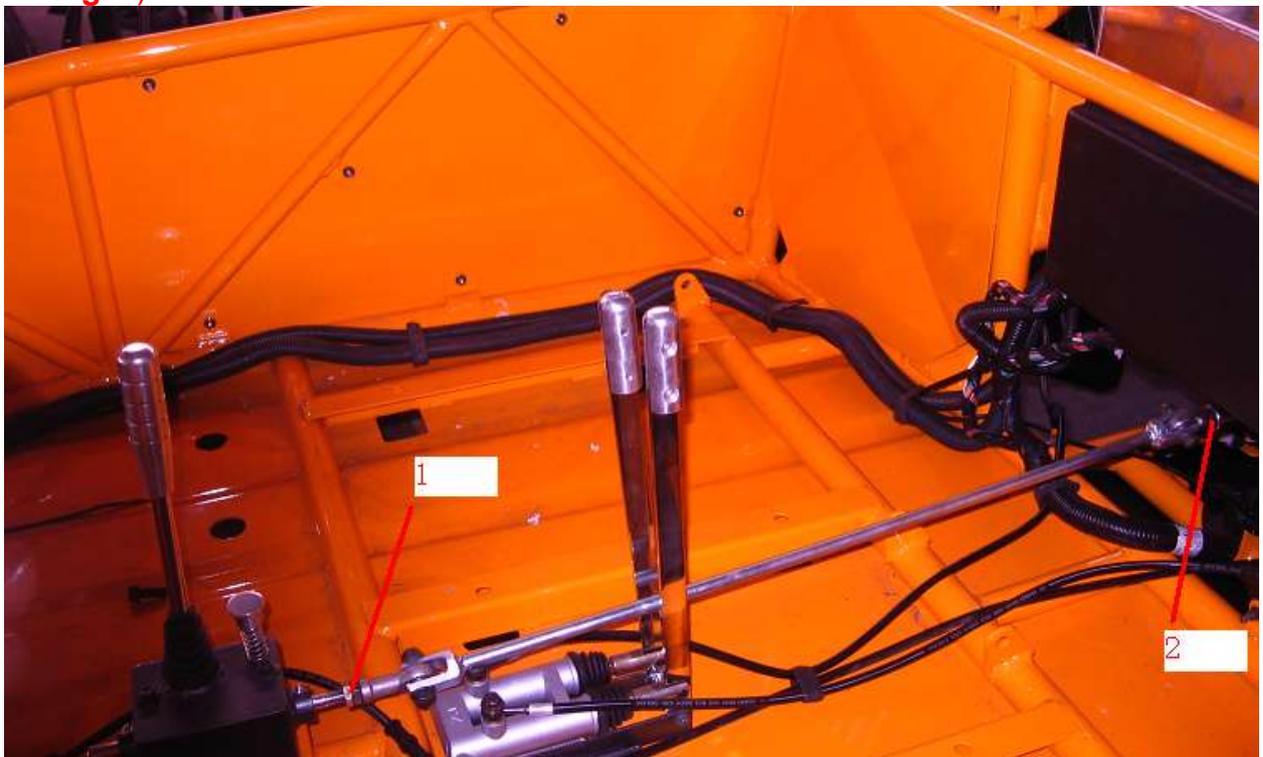


Fig. 7

## Break-in

The first month is most important in the life of your vehicle. Proper operation during this break-in period will help assure maximum life and performance from your new vehicle. The following guidelines explain proper break-in procedures.

1. After the engine starts, the engine is not allowed in high speed in the neutral gearshift.
2. Drive vehicle from stop to low speed slowly.
3. Avoid braking strongly.

4. Do not exceed the vehicle speed on the below schedule

The speed of vehicle	The first 1000 km		
Max speed in each gear	1 <sup>st</sup>	Gear	25km/h
	2 <sup>nd</sup>	Gear	45km/h
	3 <sup>rd</sup>	Gear	70 km/h
	4 <sup>th</sup>	Gear	100km/h

## Starting And Operating Instructions

- Before starting the engine, be sure that the driver is seated properly in the OFF HIGH WAY RECREATIONAL VEHICLE and tighten the seatbelt.
- Testing the OFF HIGH WAY RECREATIONAL VEHICLE in an open place at the beginning to learn how to start, turn and stop.
- Operate the OFF HIGH WAY RECREATIONAL VEHICLE slowly until you are familiar with it.
- The turning radius of this OFF HIGH WAY RECREATIONAL VEHICLE is small and agile**, so the centrifugal force is very high when turning at high speed. Slow down to a more controllable speed when turning to prevent the OFF HIGH WAY RECREATIONAL VEHICLE from rolling over.
- To prevent vehicle from rolling over, be sure to only turn the vehicle at a slow more controllable speed.

## Pre-Drive Inspection



**Perform this pre-drive inspection every day before driving vehicle. If not performed, serious damage to the vehicle or personal injury may result.**

- Check for Engine Oil Level. Check for transmission Oil Level. Check for leaks, add oil if required.
- Check the coolant. Check for leaks, add the coolant if required.
- Check for Fuel Level. Add fuel as necessary and do not overfill. Check for leaks.
- Check for Brakes. Depress the brake pedal several times, and then check for proper brake pedal free play. Make sure there is no brake fluid leakage. Adjust if necessary.
- Check the clutch cable, Assure the cable snaps back and has a smooth operation. Ensure the clutch can operate smoothly. Adjust if necessary, or replace the clutch if necessary.
- Check Tires. Check tires condition and pressure. The pressure on both Front and Rear tire is 16psi.**
- Check Throttle. Check for smooth operation. Ensure the throttle “snaps” back to idle.
- Check Engine Stop key. Perform engine stop key test. Repair as necessary.
- Check all Nuts, Bolts, and fasteners. Check wheels to see that all axle nuts and lug nuts are tightened properly. Check and tighten as necessary all other fasteners to specified torque.
- Check rolls cage cars. Ensure all protective roll cage bars are in place before operating the OFF HIGH WAY RECREATIONAL VEHICLE.

11. Check Brake Light. Check for proper operation.
12. Check Wheels. Check for tightness of wheel nuts and axle nuts; check that axle nuts are secured by cotter pins.
13. Check Steering. Check for free operation and for any unusual looseness in any area.



**Always follow rules for safe operation and wear a helmet.**

# SERVICE INSTRUCTIONS

## Service Air Filter

Service air filter refer to preventative maintenance log

NOTE: Service more often under dusty conditions.

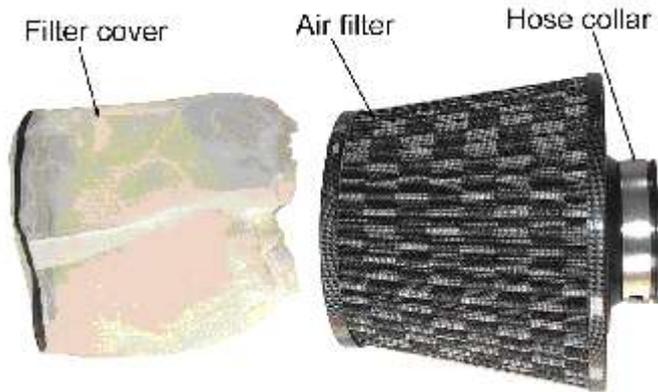


Fig.8

- a. Remove filter cover(See Fig. 8)
- b. Check the filter cover and the air filter, if the filter cover and the air filter is dusty, please clear the filter cover and replace with a new air filter.

## B. Engine Lubrication

### Engine oil replacement

You must change the oil in the crankcase refer to maintenance log. That will insure proper lubrication of internal parts and prevent costly repairs due to excessive wear.



engine oil outlet

Fig. 9

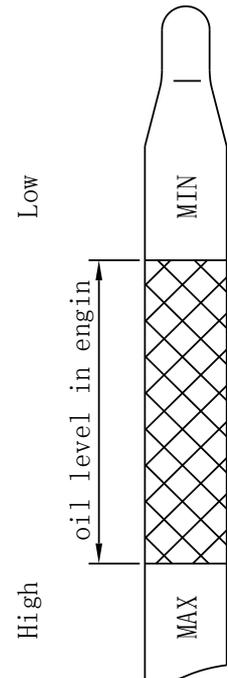


engine oil inlet

Fig. 10



**Fig. 11**



**Fig. 12**

- With the engine warm, put the vehicle on the level ground.
- Shut down the engine; put a collecting oil plate under the engine oil outlet. Loosen the oil outlet plug in the warm engine. Let the engine oil out fully (**see Fig. 9**).
- Tighten the engine oil outlet plug.
- Remove the oil filler cap (see Fig. 10), fill oil (SAE 10W/30-50) about 3.86 liters to the engine.**
- Pull out the engine oil dip stick (**see Fig. 11**), confirm the corrective oil level in the crankcase (**see Fig. 12**).

### **Check engine oil and recharge**

- If the color of engine oil changes, you need to replace the engine oil. Replace the engine oil as above.
- Check the engine oil level, change if necessary from **d** as above.

## Transmission lubrication

You must change the oil in the transmission after the first 5 hours of operating of your new engine and after 10 hours of use thereafter. That will insure proper lubrication of internal parts and prevent costly repairs due to excessive wear.



transmission oil inlet

**Fig. 13**



transmission oil outlet

**Fig. 14**

- Put the vehicle on the level ground.
- Shut down the engine; put a collecting oil plate under the transmission oil outlet. Loosen the oil outlet plug in the warm engine. Let the transmission oil out fully (**see Fig. 14**).
- Remove the iron dust plug, this plug has a magnet on it. Iron dust caused by moving parts will stick to the plug. Clean the iron dust from this dust plug (**see Fig.14**).
- Tighten the transmission oil outlet plug (**see Fig. 14**).
- Remove the plug (**see Fig. 13**), fill oil (**GL-4 75W/90 Gear Oil**) about 2.2 liters.

### Check transmission oil

If the color of transmission oil changes, you need to replace oil. Replace transmission oil as above.

### D. Engine Coolant

You must check the coolant for level and leaks. If it is low, you need to refill coolant into the radiator (**approximately 6000 ml**). The lack of coolant will cause the engine to overheat. This can cause engine damage.

The coolant should always be topped up, since the coolant can evaporate.



**Figure 15**



**Figure 16**

Put the vehicle on level ground.

1. Turn the coolant cap counterclockwise and open the cap (**see Fig. 15**).
2. Pour fresh coolant to filler neck.
3. Start the engine at idle.
4. Increase the engine rev's a few times
5. Repeat 2, 3, 4 till the coolant is at neck and no bubbles come up.
6. Refit the coolant cap, turn it clockwise and tighten it
7. Turn the reserve coolant case cap counterclockwise and open the cap (**see Fig. 16**).
8. Pour fresh coolant of the specified type into the reserve coolant tank till the coolant reaches  $\frac{2}{5}$  to  $\frac{3}{5}$  of the reserve coolant tank volume.
9. Close the reserve coolant case cap, turn it clockwise and tighten it

### Top up the reserve coolant

If the coolant in the reserve coolant tank is less than 2/5, it needs to be topped up.

1. Turn the reserve coolant case cap counterclockwise and open the cap.
2. Pour fresh coolant of the specified type into the reserve coolant tank till the coolant reaches 2/5 to 3/5 of the reserve coolant tank volume.
3. Close the reserve coolant case cap, turn it clockwise and tighten it

#### **WARNING**

**Opening the radiator cap while the engine is hot can be hazardous.**

**Opening the radiator cap can spray the high temperature coolant in your eyes, face and any parts of your body. This can result in severe injury.**

**Never open the radiator cap while the engine is hot.**

#### **WARNING**

**New and used coolant can be hazardous.**

**Children and pets may be harmed by new or used coolant.**

**Continuous or brief contact with coolant may be dangerous for your health.**

**Keep new and used coolant away from the children and pets. To minimize your exposure to new and used coolant, wear a long sleeve shirt and moisture-proof gloves (such as dishwashing gloves) when you change coolant. If coolant contacts your skin, wash thoroughly with soap and water. Wash any clothing or rags if wet with coolant. Recycle or properly dispose of used coolant.**

#### **WARNING**

**Harm or damage may occur if use coolant that don't meet to the specification 50% standard green coolant and 50% distill water.**

### G. Cleaning Instructions

Keep your vehicle clean. With a clean rag, wipe off any dirt and oil from around controls. Wipe off any spilled fuel and oil. Keep the engine clean of foreign object and be sure to check that air intake fan is free of debris for proper cooling.

### H. Vehicle Lubrication

Lubricate vehicle every 90 days of use, Apply several drops of oil in specific points.

### I. Storage Instruction

In the event your vehicle is not to be operated for periods in excess of 30 days or at the end of each driving season prepare for storage as follows:

- a. Drain fuel tank by allowing engine to run out of fuel, or use a fuel stabilizer.
- b. Lubricate engine cylinder by removing the spark plug and pour one ounce of clean

lubricating oil through the spark plug hole into the cylinder. Crank the engine slowly to spread oil and replace spark plug.

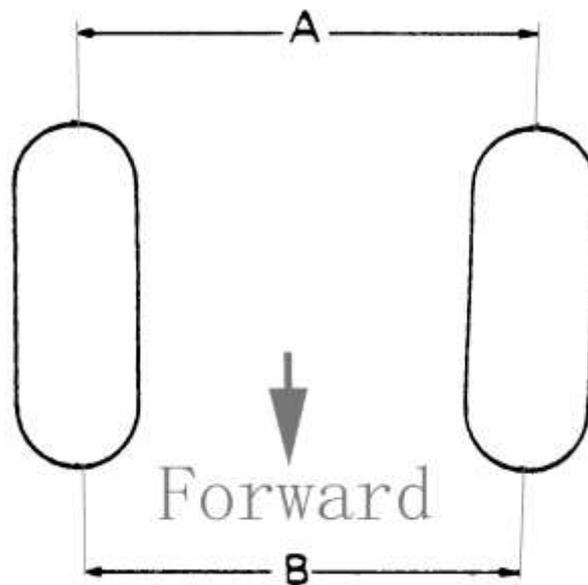
- c. Do not save or store gasoline over winter. Using old gasoline, which has deteriorated from storage, will cause hard starting and affect engine performance.

 **WARNING**

**Do not drain fuel while engine is hot. Be sure to move OFF HIGH WAY RECREATIONAL VEHICLE outside before draining fuel.**

## Front Wheel Alignment

1. Put the vehicle on level ground.
2. The “toe-in” of the front wheels should be 0.2 inches. Check for alignment, measure distance A and B between the centerline (CL) of the wheels. The proper toe-in dimension A should be 0.2 inches greater than dimension B.
3. To adjust the alignments, loose the lock nuts on both sides of Front Tie Rods. To make Dimension B smaller, turn the rod to the left. Turn the rod to the right to make Dimension B larger. After adjusted to desired length, tighten the lock nut against the rod end. Recheck the dimensions for proper alignment.



# Repairmen manual

## Engine repairmen

### Precaution

- a. Strictly observe all requirements and specifications in this manual.
- b. Check the earth polarity of accumulator. This gasoline engine adopts negative earth.
- c. Grinding in must be conducted when using a new gasoline engine.
- d. When gasoline engine is running, your head, hand, cloth, tool and other things should be strictly forbidden to approach the running fan and pump belt.
- e. When running or just stopping, doesn't touch exhaust sub-tube etc heat exhaust parts. Don't open radiator cover when it is hot.
- f. When starting gasoline engine, you must not throttle fiercely in order to avoid running at a high speed and too low fuel pressure.
- g. When running at a high speed and overload, don't stop engine. You should stop it after it runs at a low speed for 3-5 minutes.

### Grinding in of new gasoline engine and its precautions.

New gasoline engine must be grinded in before using it normally. It should be mounted on a car and driven for 1000km according to the running criteria in table 1 or grinded in on the gasoline engine test platform for 50 hours according to the grinding in criteria

Grinding in of new gasoline engine and its precautions

Engine oil, fuel, coolant, and electrolyte of accumulator should be sufficient. Don't operate it at high speed at once after starting the engine. You should preheat it step by step.

You'd better drive it on cement pavement or asphaltum pavement, and avoid running on soil sand road as little as possible.

Don't exceed the high speed that asked in table 1.

After driving for 1000km, the new car can be used normally.

Check the valve clearance, firing advance angle, idle, tightness of water pump belt, then adjust them to meet the manual requirement.

Change filter, lubricant of gasoline engine, gearbox and differential.

Screw tightly connecting bolt of cylinder cover, every bracket bolt, admission and exhaust sub-tube bolt or nut.

### Storage of gasoline engine

There is a small quantity of lubricant in SQR484F gasoline engine when it left factory. It should be stored in clean, dry and ventilated warehouse without any corrosive gas. Storage period should be half a year.

If period of storage were longer than half a year, you should fill 4.5L antirust lubricant into gasoline engine and remove spark plug of all cylinder, and make all piston be between upper dead and lower dead point, and fill 0.006L antirust lubricant into every cylinder and start gasoline engine for 3-4 times using start motor. Each time is about 15 seconds long. And then remove bleeding screw plug and spark plug, and screw them tightly according to the specified torque.

## ENGINE PARAMETER AND SPECIAL MAINTENANCE TOOLS

Engine Model	SQR484F	
Engine Type	4-Cylinder, Water Cooled, In-line Double Overhead Camshaft, 16 Valve, Controllable Burning Rate, Variable Valve Timing	
Cylinder Diameter (mm)	83.5	
Piston Stroke (mm)	90	
Displacement (L)	1.971	
Compression Ratio	10	
Rated Power (KW)	95	
Rev at Rated Power (r/min)	5750	
Max. Torque (N•M)	180	
Rev at Max. Torque (r/min)	4300-4500	
Minimum Fuel Consumption Rate (g/Kw.h)	275	
Cylinder Pressure (Bar)	10-15±0.2	
Fuel Pressure (Bar)	4	
Engine Oil Pressure (Bar)	Low Idle Speed (800±50r/min)	1.2-1.5
	High Idle Speed (2000r/min)	3.2-3.5
	High Speed (4000r/min)	3.7±0.5
A/C Circuit Pressure (Bar)	High Pressure Circuit	13--18
	Low Pressure Circuit	2.6--3.3
Expansion Tank Cap (kpa)	Pressure Relief Valve (Release Pressure to Outside)	88±14.5
	Vacuum Valve (Lead Air into Tank)	-10 ~ -2
Thermostat Working	Start Working Temperature	87

Temperature (°C)	Full Working Temperature	104
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## TECHNOLOGY DATA INSTRUCTION

Item			Standard Value	
Camshaft	Cam Height	Intake cam	37.15	
		Exhaust cam	37.05	
	Camshaft Diameter	Intake cam	<b>24</b> <sup>-0.040/-</sup> <sub>0.053</sub>	
		Exhaust cam	<b>24</b> <sup>-0.040/</sup> <sub>-0.053</sub>	
	Axial clearance of Camshaft	Intake cam	0.15--0.20	
		Exhaust cam	0.15--0.20	
Cylinder Head	Plane Degree of Lower Surface		0.04	
	Whole Height		140±0.41	
	Surface Grind Limit* Total Grinding Quantity of Cylinder Block and Head			
Valve	Fringe Thickness on Top of Valve	Intake Valve	0.3±0.15	
		Exhaust Valve	0.3±0.15	
	Valve Stem Diameter	Intake Valve	5.98±0.008	
		Exhaust Valve	5.96±0.008	
	Seal Bandwidth	Intake Valve	1.158	
		Exhaust Valve	1.306	
	Gap Between Valve Stem And Guide	Intake Valve	0.02	
		Exhaust Valve	0.04	
	Tilt Angle	Intake Valve	65°	
		Exhaust Valve	68°	
	Height	Intake Valve	107.998	
		Exhaust Valve	106.318	
	Valve Spring	Free Height		47.7
		Working Tension in Advance/		620N/32mm

	Working Height Kg /mm		
Valve Guide	Valve Guide Length		38±0.25
	Inside Diameter		5.4±0.1
	Outer Diameter		11 <sub>-0.051</sub> /0.040
	Pressure Height		16±0.3
	Protruding Part of Valve Stem		47.5
Piston	Piston Skirt Diameter		83.46±0.009
Piston Ring	Side Clearance	1st Ring	0.04--0.08
		2nd Ring	0.01--0.025
	End Play	1st Ring	0.2--0.4
		2nd Ring	0.4--0.6
	Height	1st Ring	1.2 <sub>-0.05/</sub> 0.03
		2nd Ring	1.5 <sub>-0.04/0.02</sub>
Oil Ring		2.5 <sub>-0.03/0.01</sub>	
Ring Groove	Height/ Depth	1st Ring	1.2 <sub>-0.01/</sub> 0.03
		2nd Ring	1.5 <sub>-0.005/0.030</sub>
		Oil Ring	2.5
Piston Pin	Diameter		21 <sub>0/0.005</sub>
	Length		60
	Diameter of Piston Pin Hole		21 <sub>-0.01</sub>
Crankshaft	Axial Clearance		-0.07/-0.265
	Radical Clearance		0.0035~0.034
	Crankshaft Main shaft Diameter	Coaxial Degree	0.05
		Cylindricity	0.008
		Roundness	0.005
	Connecting Rod Journal Diameter	Cylindricity	
Roundness			
Cylinder	Whole Height		218±0.05
	Cylinder Hole Roundness / Straightness Accuracy		0.008 / 0.01
	Upper Surface Plainness		0.04
Connecting	Radial Clearance of Connecting Rod Bearing		0.016--0.051

g Rod	Axial Clearance of Big End	0.15--0.4
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## SPECIAL TOOLS

	<p>Camshaft Timing Tool</p>
	<p>Crankshaft Timing Tool</p>
	<p>Flywheel Tool</p>
	<p>Guide Sleeve of Crankshaft Oil Seal</p>
	<p>Guide Sleeve of Camshaft Oil Seal</p>
	<p>Hydraulic Hoist</p>
	
	<p>Fuel Pressure Gauge</p>
	<p>Cylinder Pressure Gauge: when measure the cylinder pressure, firstly remove the spark plug, screw the pipe end of instrument instead of it, and operate the engine by starter, then take</p>

the maximum value in cylinder pressure gauge as cylinder pressure.

## ENGINE NUMBER POSITIONS

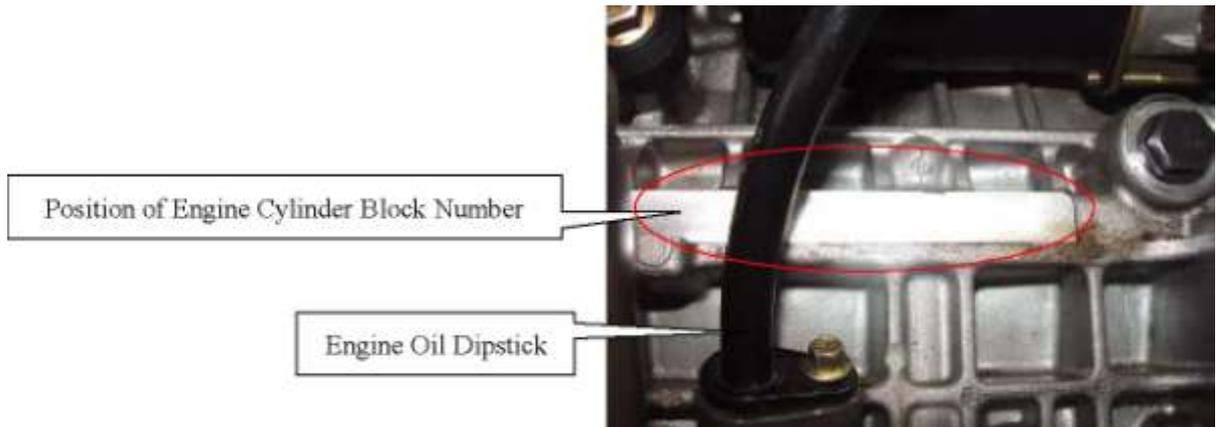


Fig. 17

## COLLATING METHOD OF ENGINE TIMING

1. Remove the upper cover of engine timing belt (see Fig. 18).
2. Remove the lower cover of engine timing belt (see Fig. 19).
3. Loosen the central bolt of timing belt tension pulley and remove the timing belt (see Fig. 20).
4. Draw out the high voltage ignition cable (see Fig. 21).

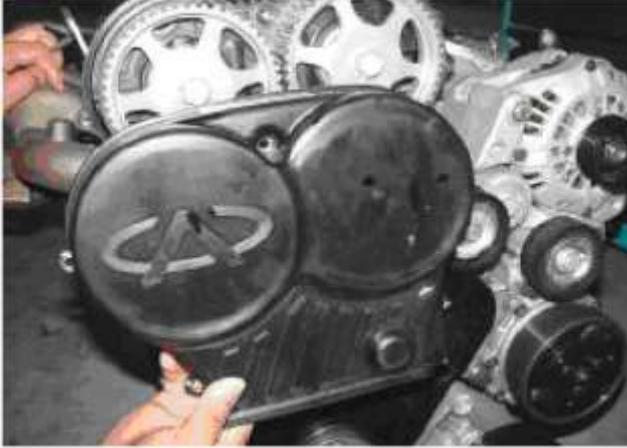


Fig. 18



Fig. 19

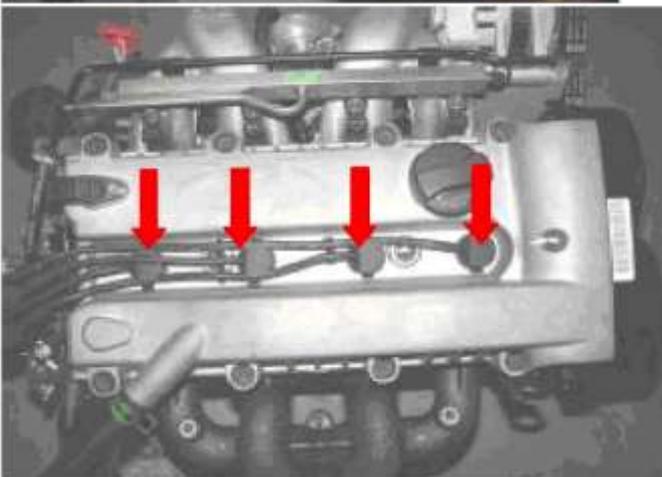
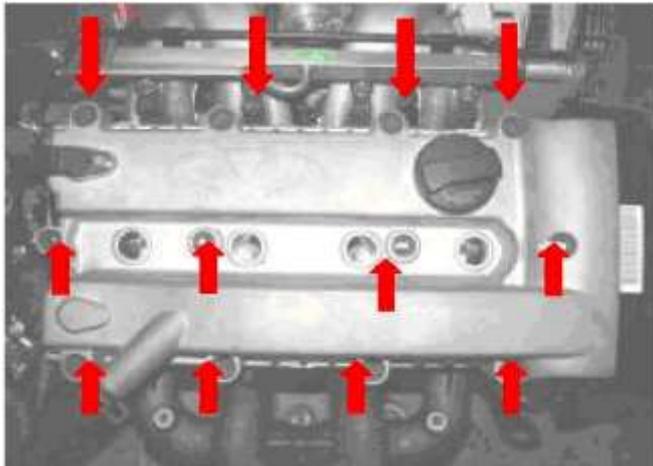


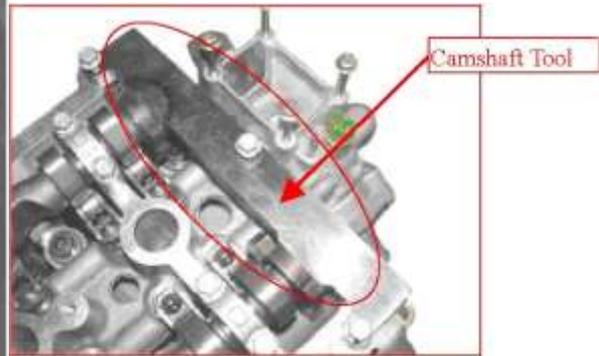
Fig. 20

Fig. 21

5. Loosen the bolt of valve cover and remove the valve cover (see Fig. 22).
6. Rotate the camshaft in order to clip the **camshaft tool** into the slot at the end of camshaft (see Fig. 23)



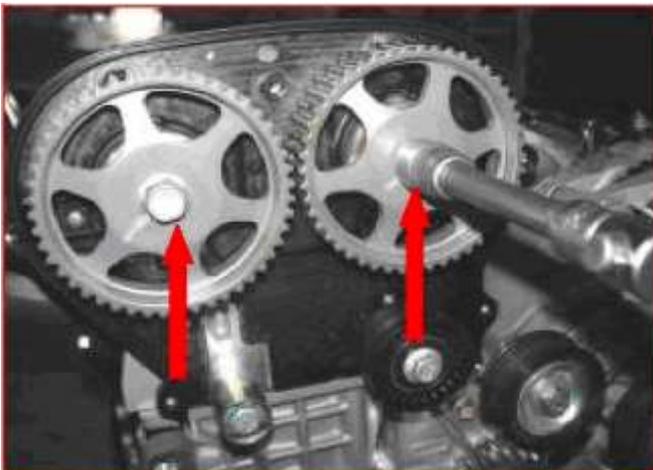
**Fig. 22**



**Fig. 23**

7. Loosen the bolts of air intake and exhaust camshaft tension pulleys with torque wrench.  
Note: It is not to remove but loosen.
8. Revolving the crankshaft, you may rotate in the **crankshaft tool** so as to it cannot move in both direction.  
Note: Do it with patience and carefulness lest the crankshaft should be broken.

**Crankshaft Tool**



**Fig. 24**



**Fig. 25**

9. Mount the timing belt and rotate tension pulley with Allen wrench in order to tension the belt and make the finger of tensioned point to the middle of U slot opening. Fasten the bolt

of tension pulley, the fastening bolts of air intake and exhaust camshaft tension pulleys and camshaft (**see Fig. 26**).

Torque:  $120 \pm 5 \text{Nm}$ .

10. Remove the special timing tool, and mount the valve cover, the high voltage ignition cable and the timing belt cover. (**See Fig. 26**).

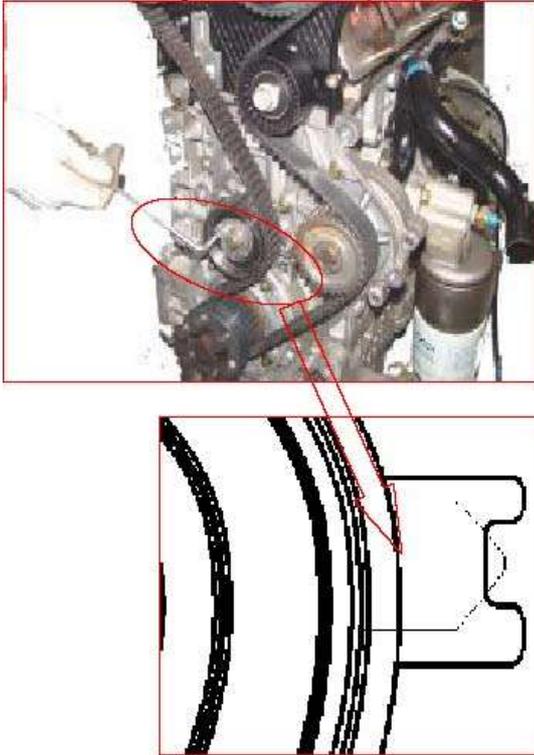
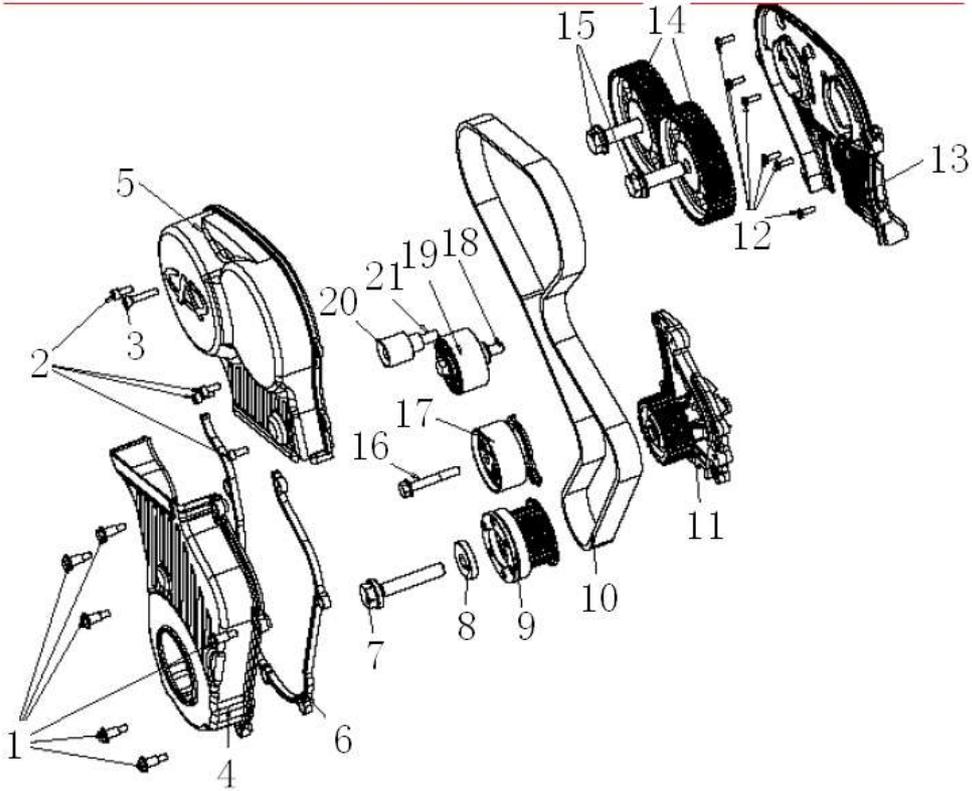


Fig. 26

## ENGINE BODY

### SECTION 1 WHEEL TRAIN I. STRUCTURAL DIAGRAM



**Fig. 27**

	Part Name	Torque value Nm	Re-sc rew angle
1	Bolt-Lower Part Of Timing Front Cover	8+3	
2	Bolt-Upper Part Of Timing Front Cover	8+3	
3	Bolt-Upper Part Of Timing Front Cover	8+3	
4	Lower Part Of Timing Front Cover		
5	Upper Part Of Timing Front Cover		
6	Washer-Lower Part Of Timing Front Cover		
7	Bolt-Crankshaft Timing Gear	130+10	65+5
8	Washer-Crankshaft Timing Gear		
9	Crankshaft Timing Gear		
10	Timing Belt		
11	Water Pump		
12	Bolt-Timing Gear 了	5+1.5	

1			
3	Timing Gear Rear Cover		
1			
4	Camshaft Timing Gear		
1			
5	Bolt-Camshaft Timing Gear	120+5	
1			
6	Bolt-Timing Tensioner	27+2.7	
1			
7	Timing Tensioner		
1			
8	Bolt-Timing Idler wheel	40+5	
1			
9	Timing Idler wheel		
2			
0	Contact Idler wheel		
2			
1	Bolt-Contact Idler wheel	40+5	

## II. MAINTENANCE

### 1. Replace upper and lower covers of timing belt

#### 1.1 Needed tools and auxiliary materials

Allen wrench, 10#, 13# sleeve, ratchet wheel and ratchet rod.

#### 1.2 Removal

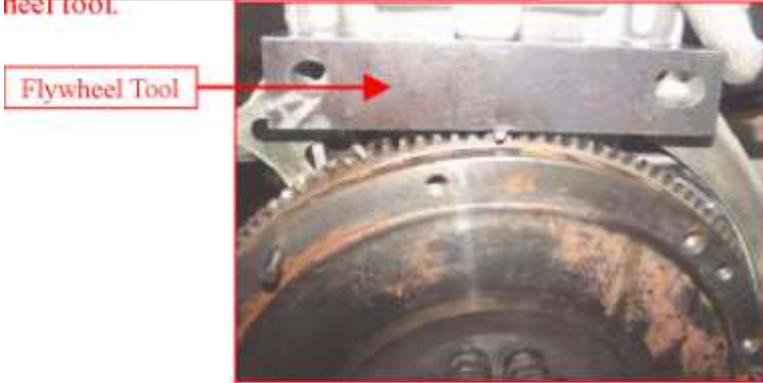
1) Loosen the five bolts on the upper cover with Allen wrench.

2) Remove the upper cover of timing belt. **(See Fig. 28).**

3) Clip the flywheel with flywheel tool. **(See Fig. 29).**



heel tool.



Flywheel Tool

**Fig. 28**

**Fig. 29**

- 4) Remove the crankshaft pulley with 13# sleeve. **(See Fig.30)**



**Fig. 30**

- 5) Remove the 5 bolts on the lower cover of timing belt with 10# sleeve, ratchet wheel and ratchet rod. **(See Fig.31)**  
6) Remove the lower cover. **(See Fig.32)**



Fig. 31

Fig. 32

### 1.3 Inspection

Observe the timing cover and the timing belt. Replace the timing belt cover or adjust the position of timing belt if any trail from crack or friction is found.

### 1.4 Installation

The installing steps are reverse to those for removal.

**Note: Install the lower cover first and then install the upper one.**

## 2. Replace timing belt

### 2.1 Needed tools and auxiliary materials

Allen wrench, 10#, 13# sleeve, ratchet wheel and ratchet rod.

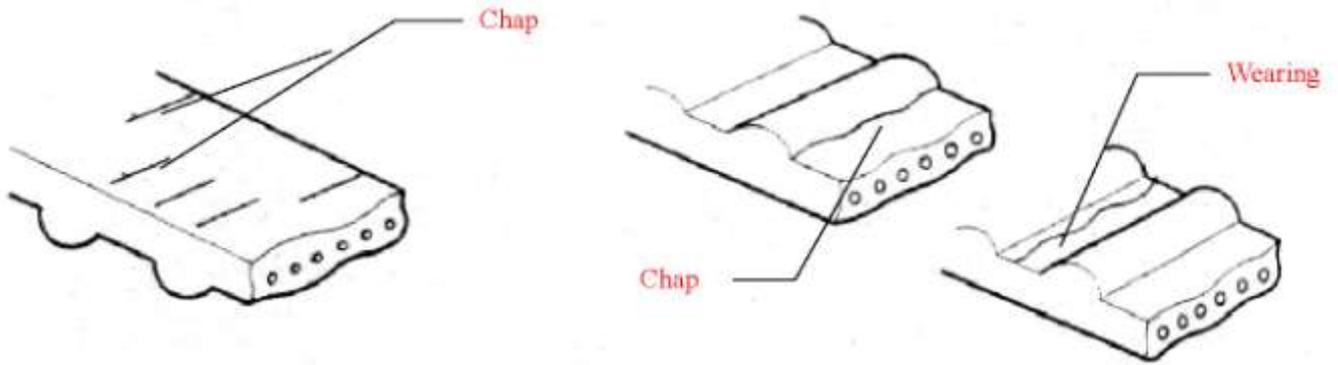
### 2.2 Removal

- 1) Remove the upper and lower covers of timing belt (see “replace covers of timing belt” for details).
- 2) Loosen the central bolt of tension pulley and remove the timing belt.

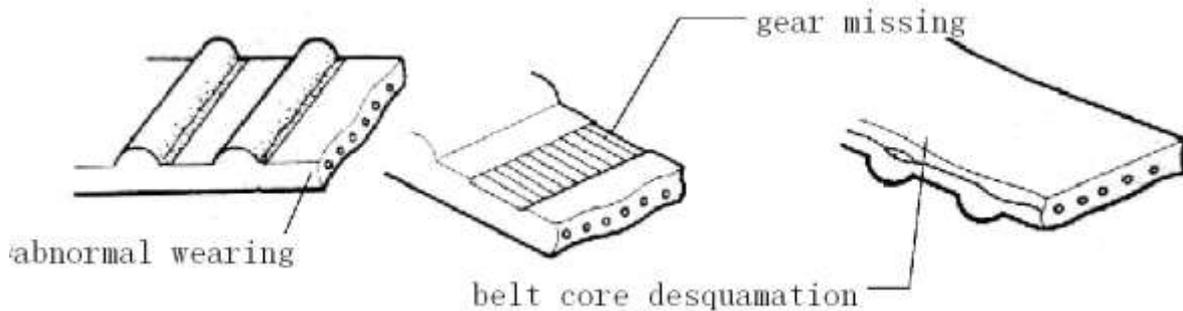
### 2.3 Inspection

Check the timing belt carefully; replace the parts if any following situation occurs.

- (1) Chap of back-side rubber
- (2) Chap of dedendum, chap of separated cord fabric.
- (3) Wearing, gear missing and incomplete gear of cord fabric. **(see Fig.33)**
- (4) Abnormal wearing of belt flank. **(see Fig.34)**



**Fig.33**



**Fig.34**

Replace the belt as any following situation occurs, even though abrasion cannot be found directly.

- 1) The water pump leaks water out, and requires continuing infusion.
- 2) If the belt is spotted with much oil stains, and the rubber may be damaged due to expansion, you should replace the belt.

#### 2.4 Installation

The installing steps are reverse to those for removal. Note: Do engine timing.

#### 3. Replace idler wheel, tensioner and contact belt pulley

3.1 Needed tools and auxiliary materials Allen wrench, 10#, 13# and 15# sleeve, ratchet wheel and ratchet rod.

#### 3.2 Removal

- 1) Remove the timing belt (see “replace timing belt” for details). **(See Fig.35)**
- 2) Remove idler wheel, tension pulley and contact belt pulley. **(See Fig.35)**



**Fig.35**

### 3.3 Inspection

#### 1) Check from appearance

Check idler wheel, tension pulley and contact belt pulley carefully for any damages, such as sunken trace and sliding damage etc.

#### 2) Check performance

Revolve tension pulley, idler wheel and contact belt pulley respectively to insure that they can run freely without stagnancy.

Replace it with the spare part if any above problem is found.

### 3.4 Installation

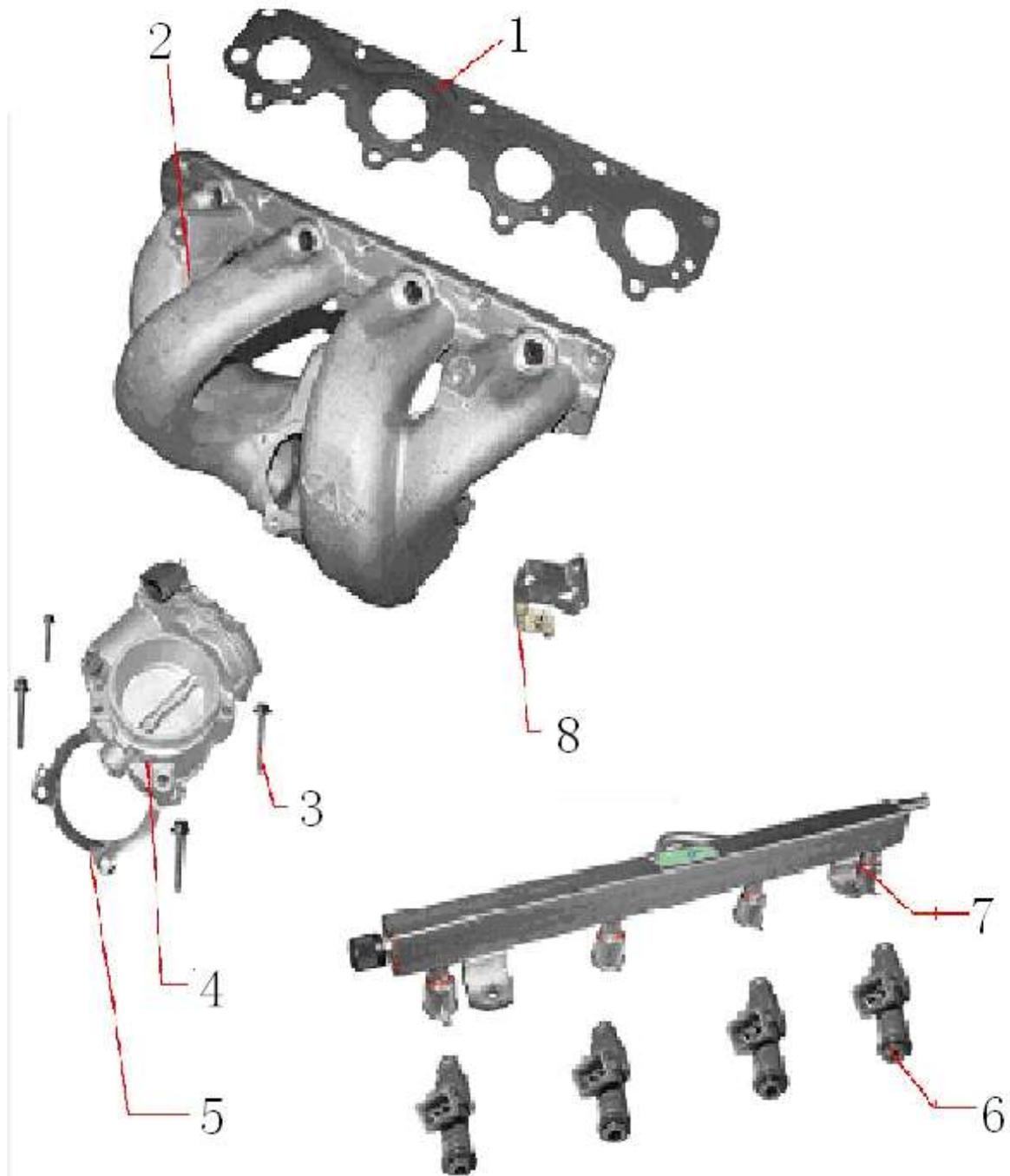
1) The installing steps of tension pulley, idler wheel and contact belt pulley are reverse to those for removal.

2) Mount the timing belt and collate engine timing.

3) Mount other parts.

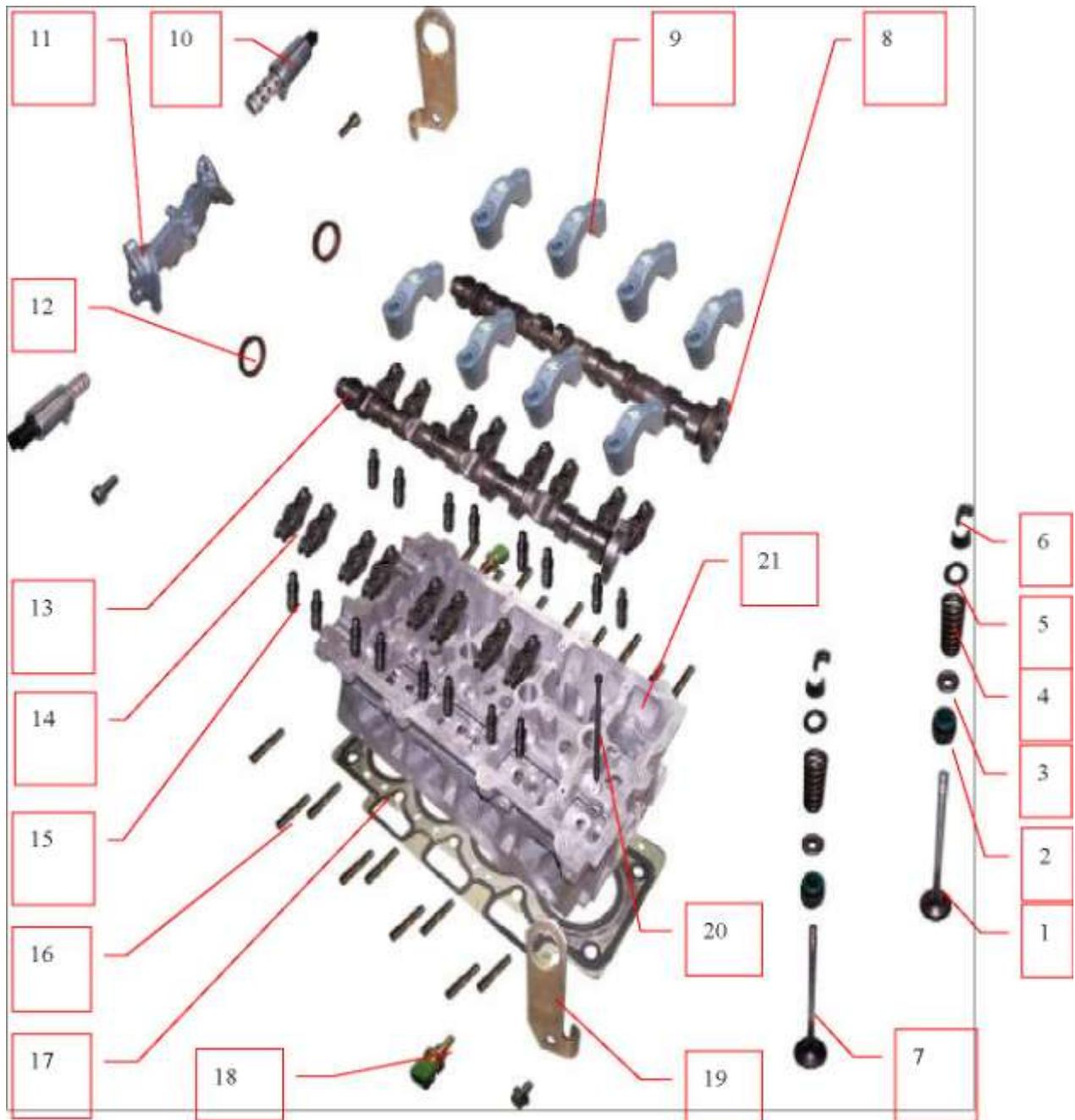
## **SECTION 2 CYLINDER HEAD**

### **I. STRUCTURAL DIAGRAM**



**Fig.36**

1. Gasket—Intake Manifold
2. Intake Manifold Assembly
3. Hexagonal Flange Bolt
4. Throttle Valve Body Assembly
5. Gasket—Throttle Valve Body Assembly
6. Oil injector Assembly
7. Fuel Distribution Pipe Assembly
8. Bracket



**Fig.37**

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

## II. MAINTENANCE

2.1 Replace intake manifold, delivery pipe and oil injector

2.1.1 Needed tools and auxiliary materials

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

2.1.2 Process of removal

1 Put the ignition key at the OFF position.

)

2 Loosen the plug of oil injector. (see Fig.38)

)

3

) Remove the connecting bolt between.

Engine oil dipstick and intake manifold. (see Fig.39)

4) Remove the clamp between intake hose and throttle valve body. (See Fig.39)

5) Remove the connecting bolt of throttle valve body, and take out throttle valve body. (See Fig.40)

Note: Because this throttle valve body is electronic, do not force the middle vanes turning manually or with other objects.

6) Loosen the joint of oil intake pipe. (See Fig.41)

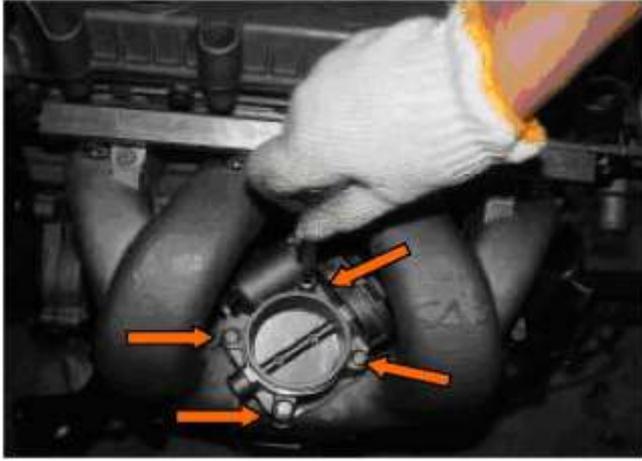
7) Remove the fastening nut of intake manifold and take out the intake manifold. (see Fig.41)



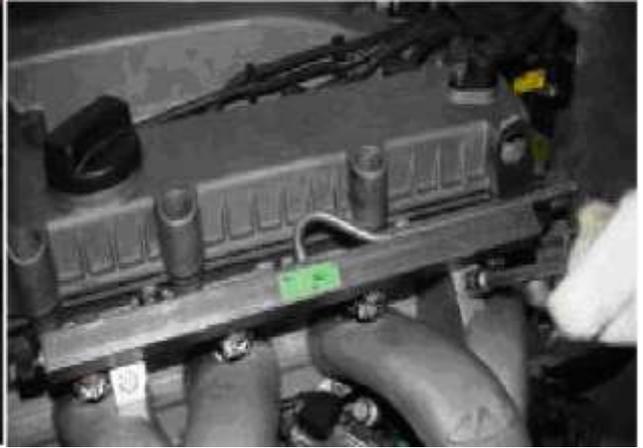
Fig. 38



Fig. 39



**Fig. 40**



**Fig. 41**

### 2.1.3 Installation steps

The installing steps are reverse to those for removal.

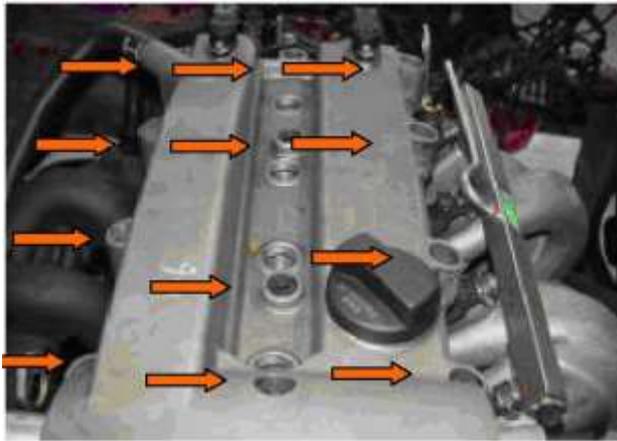
## 2.2 Replace camshaft, bearing bushings, valve and valve oil seal.

### 2.2.1 Needed tools and auxiliary materials

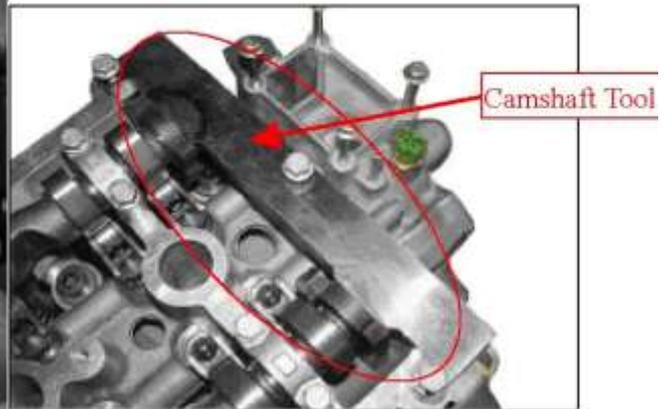
Special tools for valve oil seal, engine transmission oil, a set of sleeve tools, an adjustable spanner, special tools for timing and a set of Allen wrenches

### 2.2.2 Removal

- 1) Remove the dynamo belt (See“reof dynamo belt” for details).
- 2) Remove the timing belt (see it and “replacement of engine timing be timing calibration” for details).
- 3) Remove the cover of engine valve chamber. (See Fig.42)
- 4) Clamp the timing special tool into camshaft slot and fasten the bolt. (See Fig.43)
- 5) Dismantle the belt pulley of air intake and exhaust camshafts with torque wrench. (See Fig.44)
- 6) Remove the back cover of timing belt. (See Fig.45)



**Fig. 42**



**Fig. 43**



**Fig. 44**



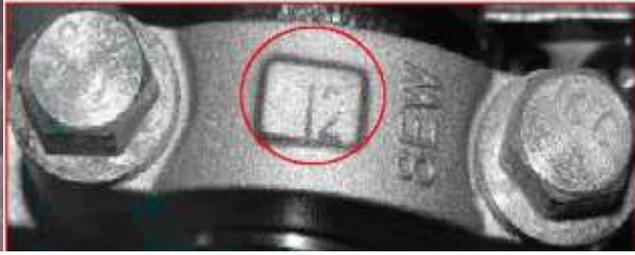
**Fig. 45**

- 7) Dismantle the bearing caps of air intake and exhaust camshaft respectively and put them down in the sequence. (see Fig.46、 47)

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

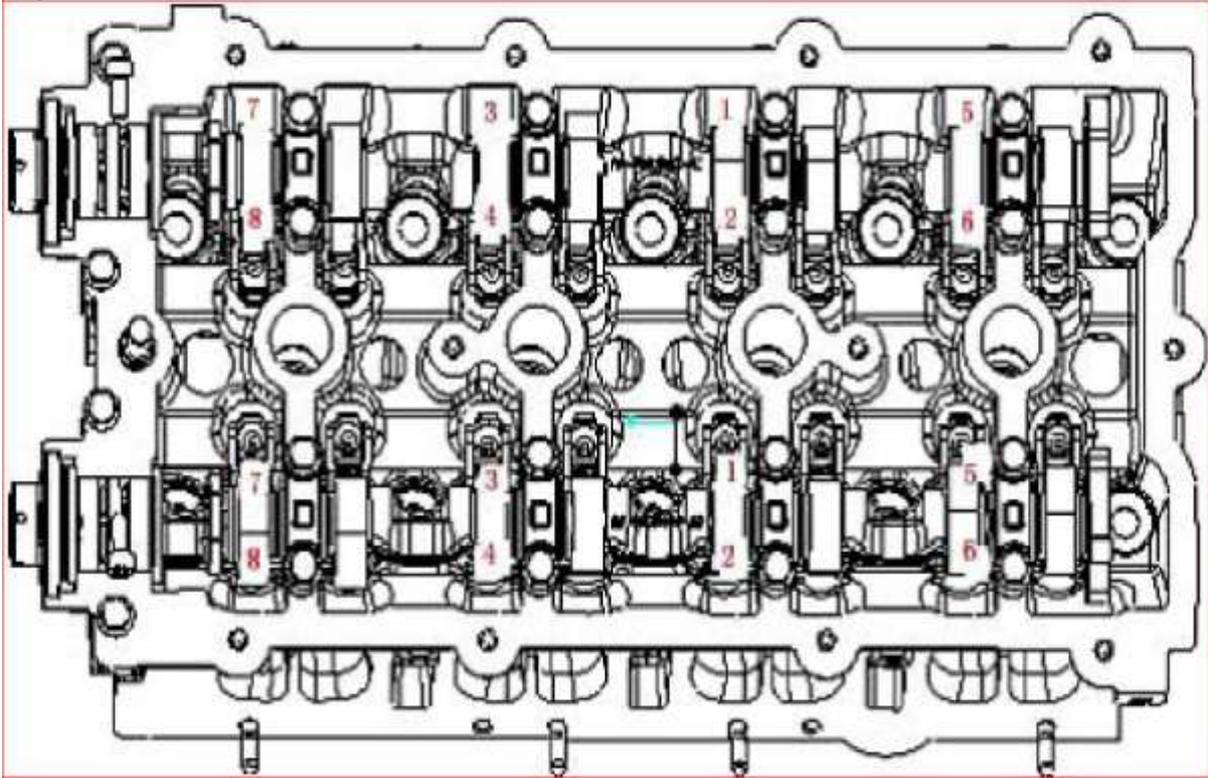


**Fig. 46**



**Fig. 47**

See the following picture for removal sequence of intake and exhaust camshaft-bearing caps:



**Fig. 48**

8) Take out the camshaft and the hydraulic tappet.

9) Remove the valve spring with special tools. (Picture is unavailable)

10) Remove the used valve oil seal with special tools. (Picture is unavailable)

### 2.2.3 Inspection

1) Check the valve spring. Measure the free length, the verticality and the length under special pressure with caliper. Replace with the new valve spring if the measured value exceeds the limit value.

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

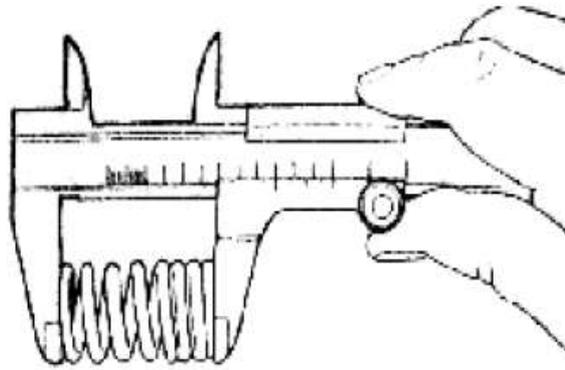


Fig. 49

2) Check camshaft

Measure the camshaft diameter with micrometer caliper. (See Fig.50)

	Standard Value (mm)	Limit Value (mm)
Diameter	$\phi 24^{+0.040}$	

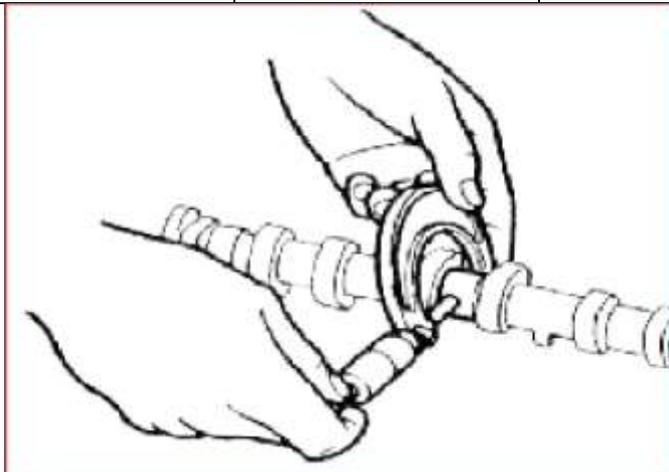
Replace with the new camshaft if the measured value exceeds the limit value.

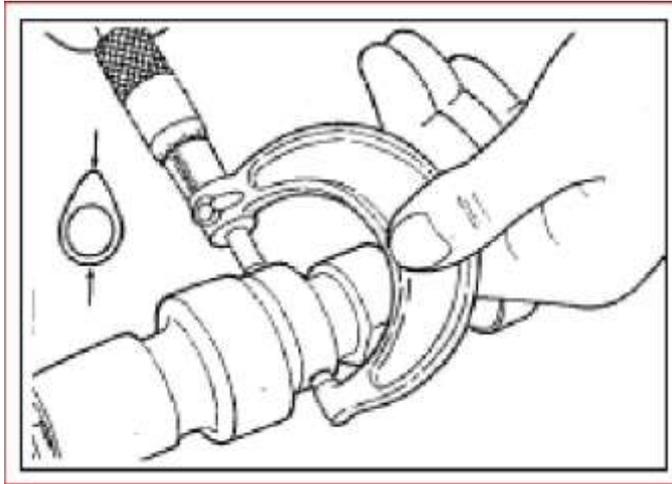
3) Examine camshaft

Measure the high of cam with micrometer caliper. (See Fig.51)

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

	Standard Value (mm)	limit value (mm)
Intake Cam	37.15	
Exhaust Cam	37.05	



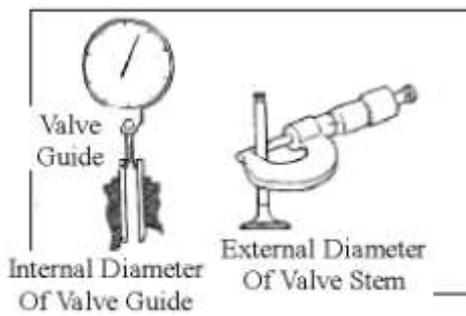


**Fig. 50**

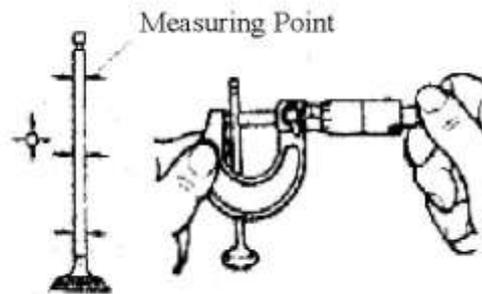
**Fig.51**

- 4) Examine diameter of valve stem  
 Measure the diameter of valve stem with  
 a: micrometer caliper.

See the picture for measuring points: they are 26, 52, and 78 mm from measure positions to bottom of valve. (see Fig.52, 53)



**Fig. 52**



**Fig.53**

- b: Use internal micrometer gauge to measure the internal diameter of valve guide and the measuring point is a quartering point of guide. (See Fig.55)
- c: Calculate the difference of measured value and the clearance. (See Fig.55)

Replace the valve or the guide if the value exceeds the limit value.

- d: Examine the contact bandwidth of valve. (See Fig.56)

- e: Check the valve seat insert. (See Fig.57)

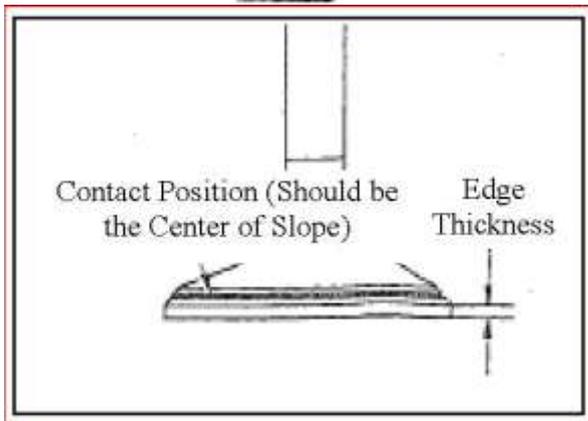
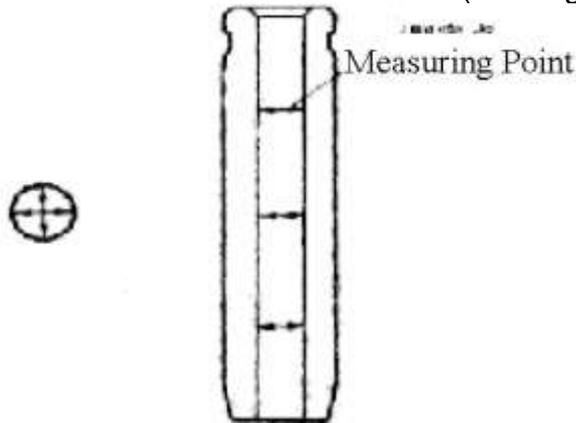


Fig. 55

Fig.56

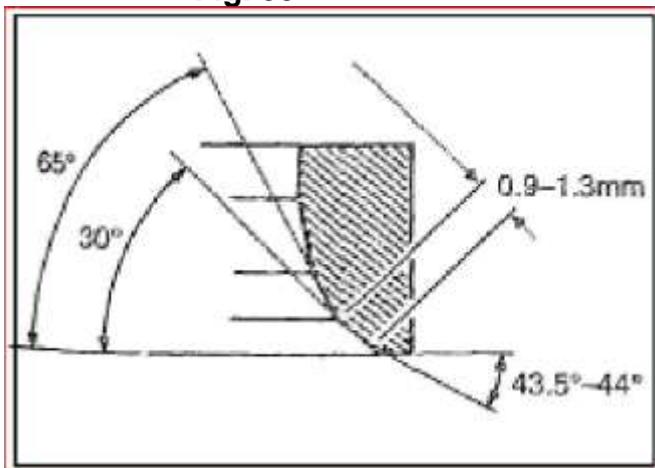


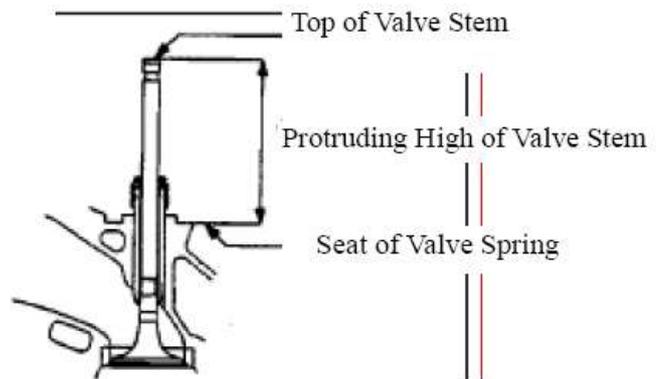
Fig. 57

		Standard Value
Outer	IN	$\varnothing$

Diameter of Valve stem (mm)		5.98±0.008
	EX	ϕ 5.96±0.008
Inner Diameter of Valve guide (mm)	IN	ϕ 5.4±0.1
	EX	ϕ 5.4±0.1
Clearance (mm)	IN	0.02
	EX	0.04
Thickness of Valve Top (mm)	IN	0.3±0.15
	EX	0.3±0.15
Seal Bandwidth (mm)	IN	1.158
	EX	1.306

f) Examine the protruding capacity of valve stem.  
 And examine the protruding high of valve stem with vernier caliper. ( See fig.58 )

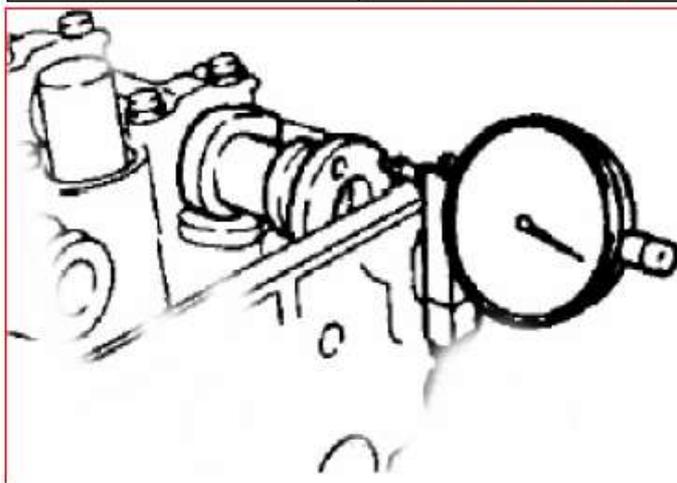
	Standard Value (mm)
Protruding Capacity Of Intake Valve stem	47.5
Protruding Capacity Of Exhaust Valve stem	47.5



**Fig. 58**

5) Examine the axial clearance of camshaft.  
 Replace the camshaft if the value of axial clearance exceeds the normal value. ( See fig.59 )

	Standard Value
Intake camshaft	0.015—0.02
Exhaust camshaft	0.015—0.02

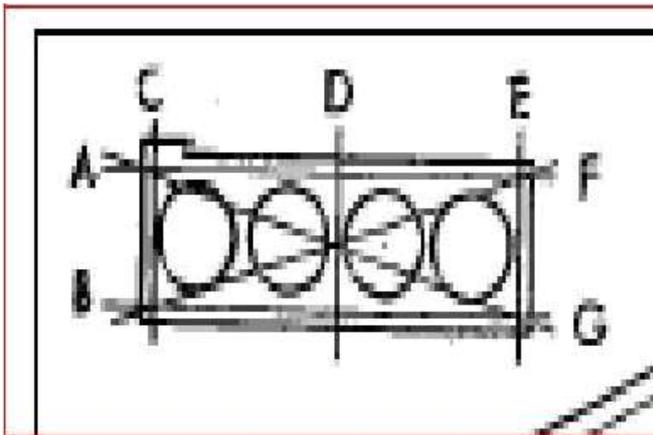


**Fig. 59**

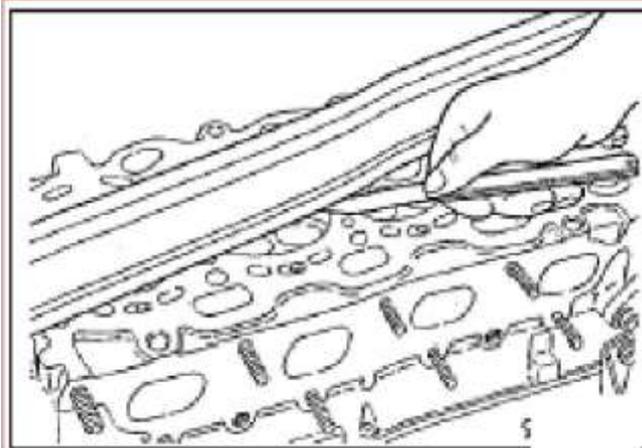
6) Examine the plainness of cylinder

- a: Clear the lower surface of cylinder head. ( See fig.60,61 )
- b: With the help of ruler and feeler gauge, check whether the lower surface of cylinder head is warped.(Measure it in the sequence of A, C, D, E, F, G in the picture) ( See fig.60,61 )

	Standard Value
Cylinder head planeness	0.04



**Fig. 60**



**Fig.61**

C: Revise it if the planeness exceeds, and replace when it exceeds the limit value.

The permitted maximum abrading thickness between cylinder block and cylinder head is:

2.2.3 Installation (See fig.62)

The installing steps are reverse to those for removal. Note:

1) Dismantle valve springs into groups. The 1st and 4th cylinders are in one group and the 2nd and 3rd ones are in the other group. Then put the piston to the upper point of 1st and 4th cylinders in order to dismantle the valve spring of 1st and 4th cylinders, replace their valve oil seal and mount the spring immediately. And put the piston to the upper point of 2nd and 3rd cylinders in order to replace the other valve oil seal. Those steps prevent from that the valve falls into cylinder and the unanticipated trouble occurs.

2) Wipe the engine transmission oil on the opening of oil seal when mounting the valve oil seal.

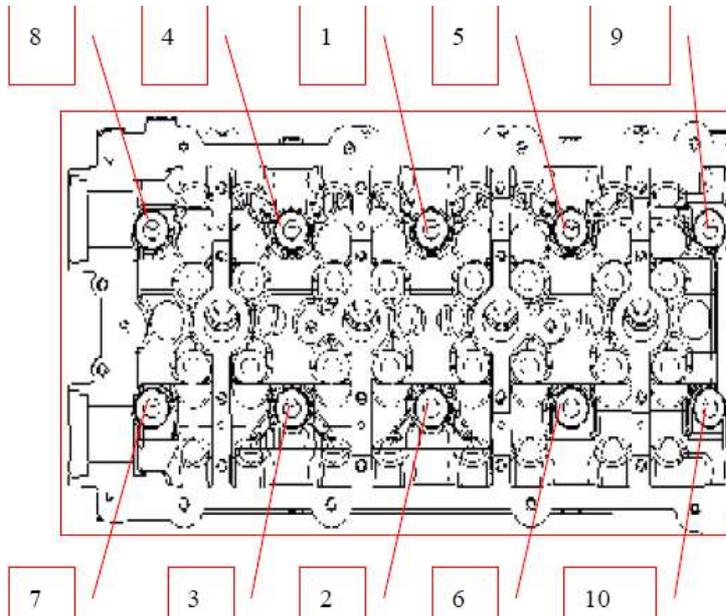
3) Fasten the cylinder bolt as the following process.

A: Smear some oil on the top and root of bolt.

B: Fasten to  $40 \pm 5$  NM in sequence

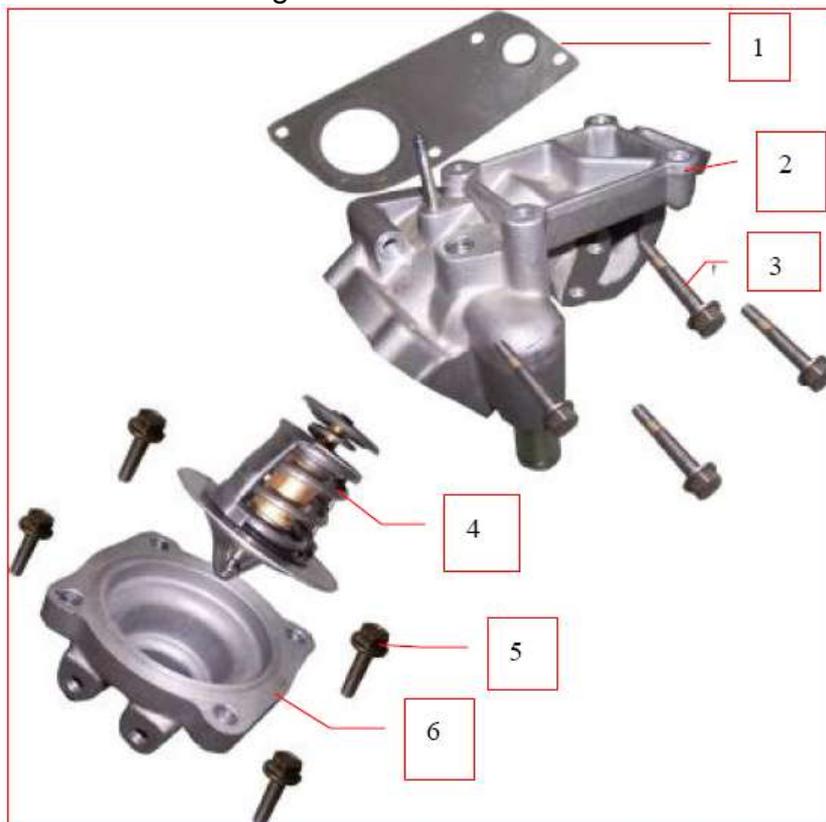
C: Fasten  $90 \pm 5$  degree clockwise.

Fasten  $90 \pm 5$  degree clockwise.



**Fig. 62**

2.3 Replace thermostat  
2.3.1 Structural diagram



- 1. Pad—Thermostat Seat
- 2. Thermostat Seat
- 3. Hexagonal Flange Bolt
- 4. Thermostat Assembly
- 5. Hexagonal Flange Bolt
- 6. Cover—Thermostat Seat

**Fig. 63**

2.3.2 Needed tools and auxiliary materials Hatch clamp, 10# sleeve, ratchet wheel and wrench

2.3.3 Removal

1) Loosen the clamp of thermostat water exhaust pipe with hatch clamp to release the coolant.

Note: Do it after the temperature decreased to prevent scald.

2) Remove the 4 bolts of thermostat cover with 10# sleeve wrench.

3) Take out the thermostat.

#### 2.3.4 Inspection

Put the thermostat in the boiling water and use it with thermometer. Then observe the temperatures when the thermostat is turning on and fully opened.

	Temperature value
Regular unlocking temperature	87°C
fully opened temperature	104°C

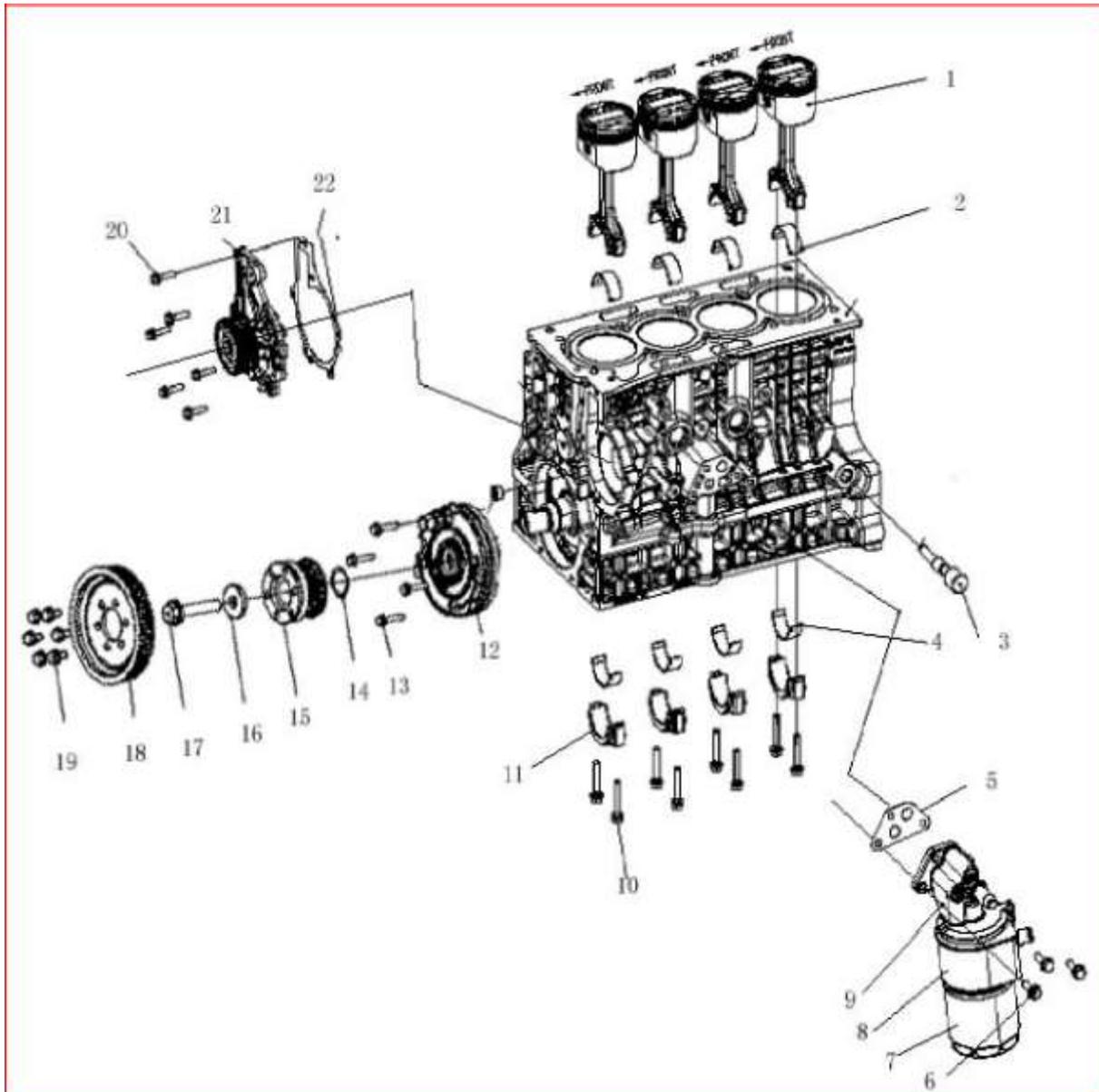
Replace the new thermostat if the measured value is abnormal.

2.3.5 Installation the installing steps are reverse to those for removal.

Note: Fill in the engine coolant with fixed quantity after installation.

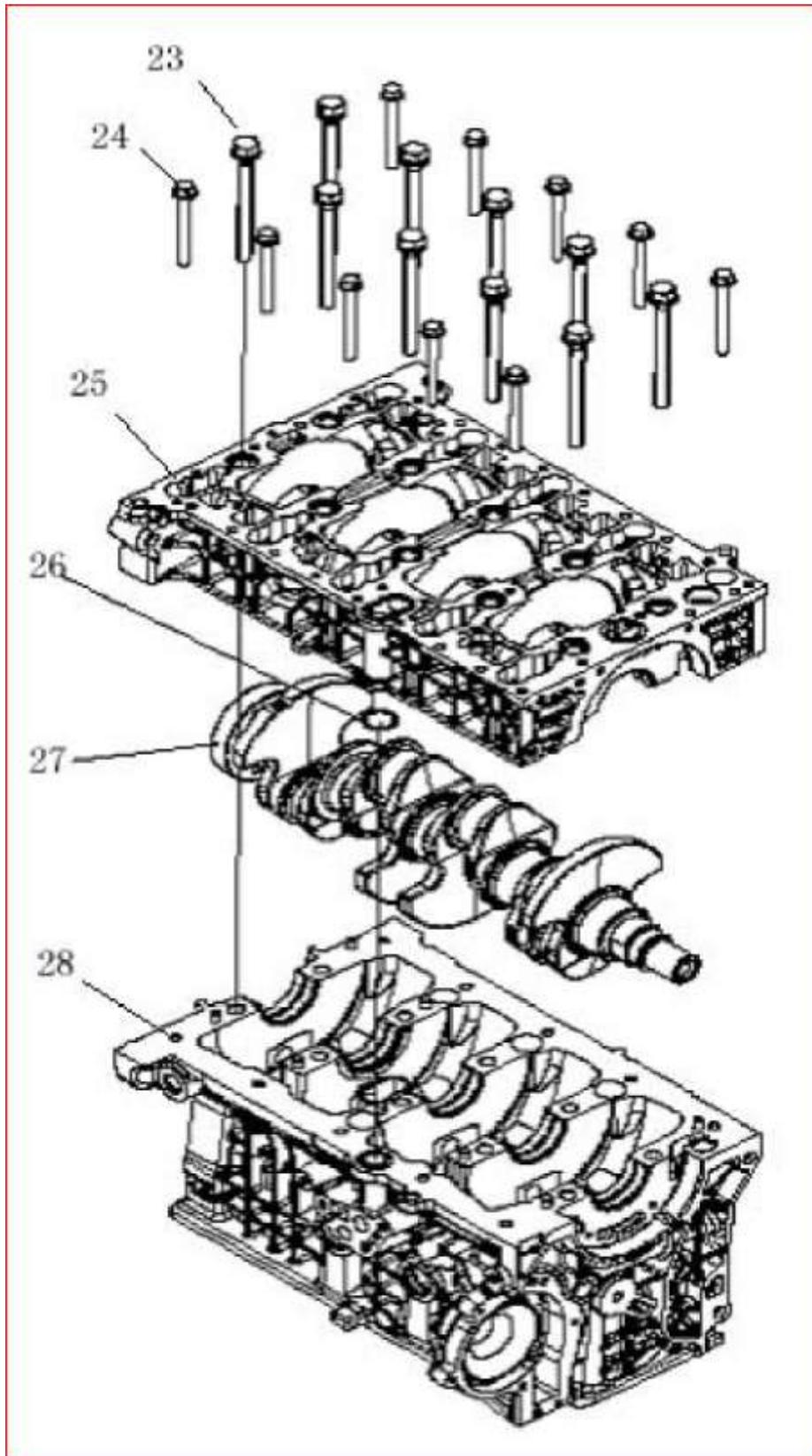
## SECTION 3, SHORT ENGINE I.STRUCTURE

## DIAGRAM



**Fig. 64**

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



**Fig. 65**

23. Crankshaft Main Bearing Bolt

24. Frame Bolt

26. O-Type  
Ring

27.

25. Frame

Crankshaft  
28. Cylinder  
Block

## II. MAINTENANCE

### 1. Replace oil pan

#### 1.1 Needed tools and auxiliary materials

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

#### 1.2 Process of Replacement

##### 1.2.1 Process of removal

1) Loosen the oil discharge bolt of oil pan to discharge the engine oil. (See fig.66)

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

2) Remove the fastening bolt of oil pan with 10# open end wrench and 10# sleeve.(18 bars of M7x25, 3 bars of M7x40, 4 bars of M7x95) (See fig.67)

3) Remove the connecting bolt (2 bars, black) between oil pan and transmission housing with 17# sleeve wrench. (See fig.68)

4) Remove the connecting bolt between the oil return pipe of PVC valve and the oil pan with 15# sleeve wrench. (See fig.69)

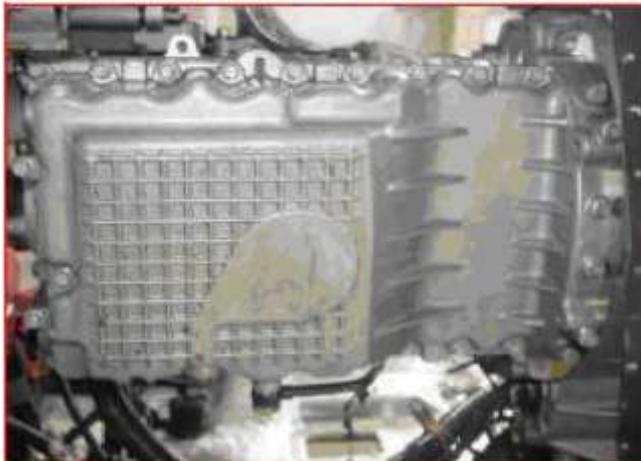
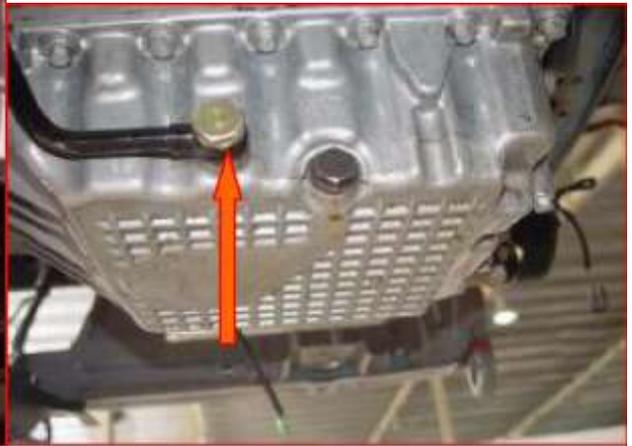


Fig. 66

Fig.67



**Fig. 68**



**Fig. 69**

5) Tap the edge of oil pan with rubber pestle, and then remove the oil pan.

**Note: Pay attention to safety because the oil pan might fall down when being tapped.**

6) clean the engine frame with right-angled tool to get rid of old Le Tai glue. (See fig.70)

**Note: Do not lacerate the frame surface.**

### 1.2.2 Installation

1) Spread Le Tai 5910 glue on the connection surfaces of frame and oil pan, close the oil pan and fasten the fastening bolt of oil pan.

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

2) Screw the bolt. Screw to combine enough at first then to get specified Torque.

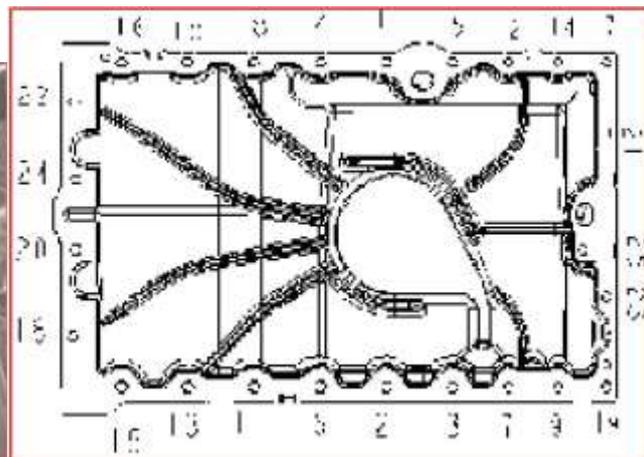
**See the diagram for screwing sequence.** (See fig.71)

Torque:  $15 \pm 3 \text{NM}$

3) Infuse engine oil to specified capacity.



**Fig. 70**



**Fig. 71**

## 2 Replace the engine oil strainer

### 2.1 Needed tools and auxiliary materials

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

### 2.2 Process of replacement

### 2.2.1 Process of removal

- 1) Remove the oil pan. (See “replace oil pan” for details)
- 2) Remove the connecting bolt between engine oil strainer and frame with 10# sleeve wrench. (total 8 bars) (See fig.72)



**Fig. 72**

- 3) Draw out the engine oil strainer carefully.

### 2.2.2 Installation

- 1) Spin the nozzle of engine oil strainer into the frame carefully.
- 2) Mount the 8 bolts for the strainer and fasten them.

**Note: the bolts should be mounted with Le Tai 243 glue.**

Torque:  $8\pm 3\text{Nm}$

- 3) Install oil pan (See “installation of oil pan” for details).

## **3 Replace the piston, piston ring, piston pin and connecting rod bearing**

### 3.1 Needed tools and auxiliary materials

10# open end wrench, 10#, 15#, 17# sleeve, ratchet wheel and ratchet rod, Le Tai 5901 Glue, engine oil, torque wrench Special tools for installing piston, feeler gauge, clearance gauge, micrometer caliper

### 3.2 Process of replacement

#### 3.2.1 Process of removal

- 1) Dismantle the timing belt (see “dismantle the timing belt” in the section of “replacement of engine timing belt” for details).
- 2) Remove the oil pan (see REPLACE OIL PAN for details).
- 3) Remove the cylinder head. (See “removal of cylinder head” for details).
- 4) dismantle the engine oil strainer (see the “replacement of engine oil strainer” for details).

5) Loosen the big bolt on connecting rod.



6) Remove the connecting rod bearing lower cover.

Connecting Rod  
Bearing Lower Cap



**Fig. 73**

- 7) Uplift the connecting rod and the piston with a wooden stem and then remove the connecting rod and piston assembly.



- 8) Remove the piston ring.
- 9) Remove the retainer ring of piston pin and draw out the piston pin.

Note: With large tension, the retainer ring may hurt people in the process of removal.



Retainer Ring

Fig. 74

### 3.2.2 Inspection

#### I. Check piston

- 1) Examine the diameter of piston.

Measure the diameter along the vertical direction to piston pin and at the place 11mm under piston skirt with micrometer caliper.

Cylinder No.	Standard Size
1	83.46±0.009
2	83.46±0.009
3	83.46±0.009
4	83.46±0.009

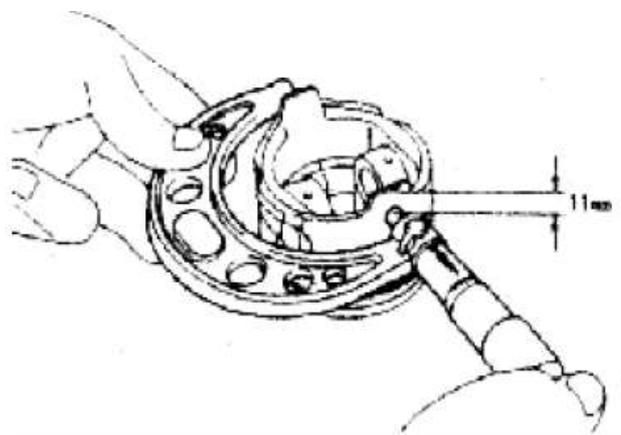
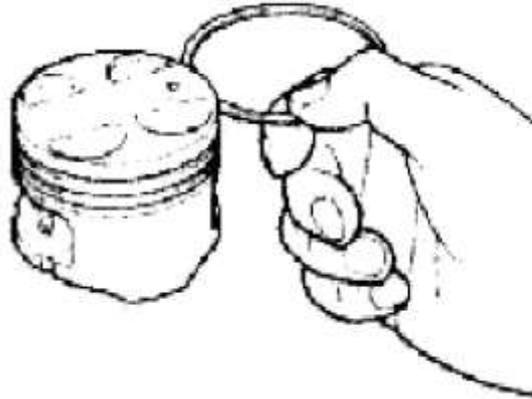


Fig. 75

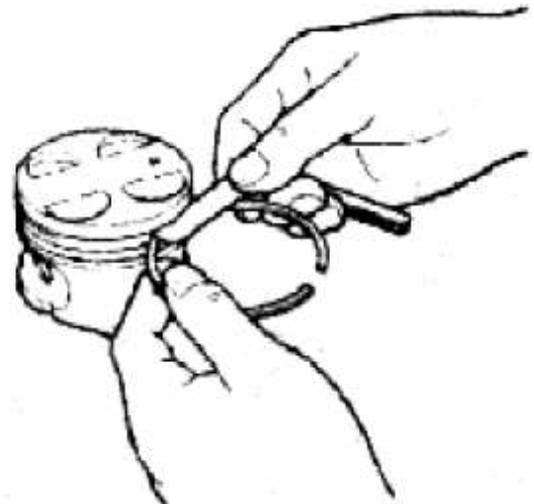
Replace with the new one if the part cannot be worn and torn any longer.

- 2) Examine the clearance between piston ring and ring groove.
  - a. Clean up the accumulated carbon in the ring groove with piston ring. (See fig.76)



**Fig. 76**

- b. Examine the clearance between piston ring and ring groove with feeler gauge. (See fig.77)



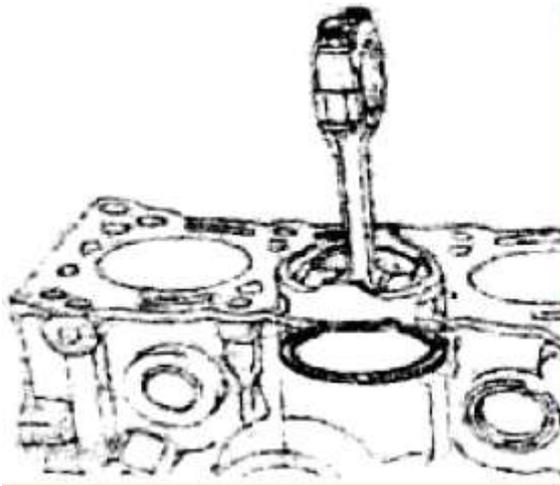
**Fig. 77**

	Reference Value (mm)
1 <sup>st</sup> Ring	0.04--0.08
2 <sup>nd</sup> Ring	0.01--0.025

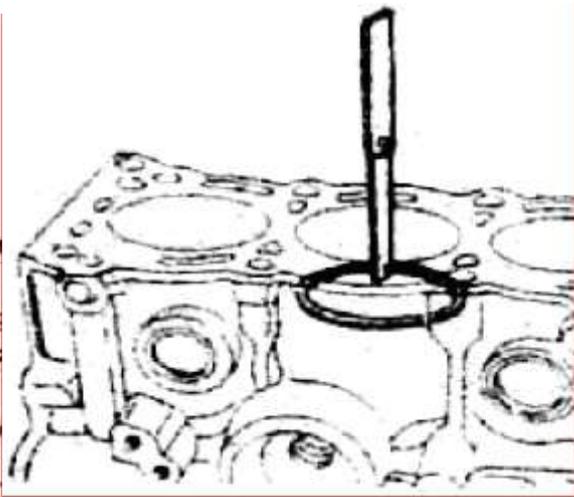
Replace with the new one if the examined clearance cannot be worn and torn any longer.

- 3) Inspect the end clearance of piston ring.
  - a. Put the piston ring at the position 45mm below the top surface of cylinder aperture and push the piston ring into cylinder with piston. (See fig.78)
  - b. Measure the opening with feeler gauge. (See fig.79)

Replace with the new piston if the examined clearance exceeds the limit.

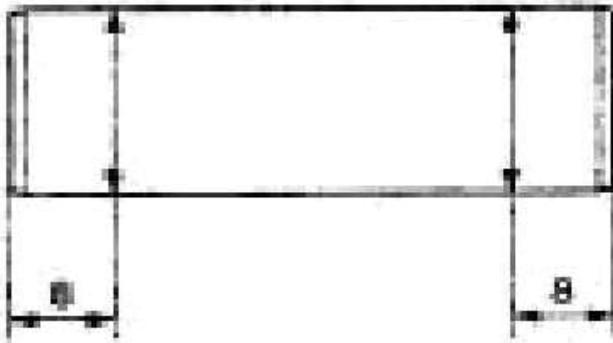


**Fig. 78**

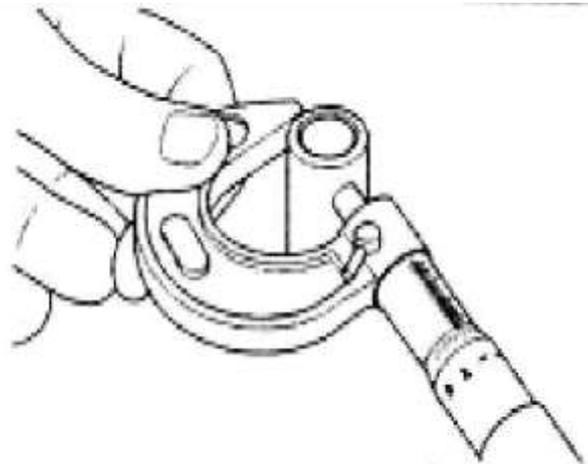


**Fig. 79**

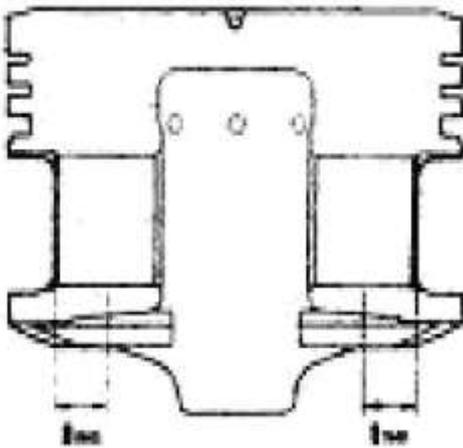
- 4) Inspect the diameter of piston pin and piston pin hole.
- a. As the following picture, measure the piston pin position around with micrometer caliper. And take the maximum value as the diameter of piston pin. ( See fig.80 )
  - b. Measure the diameter of piston pin hole around with micrometer gauge for inside diameter, as the following picture, and take the minimum value as the diameter of pin hole. ( See fig.81,82,83 )



**Fig. 80**



**Fig. 81**



**Fig. 82**



**Fig. 83**

	Standard Size
Diameter of piston pin	$21_{-0.005}^0$
Diameter of piston pin hole	$21_{0.002}^{0.008}$

Replace with the new piston and pin if the examined clearance exceeds the limit.

5) Inspect the connecting rod journal and connecting rod bearing

a. Examine the diameter of connecting rod journal. (See fig.84)

Measure the axle diameter of connecting rod with micrometer caliper.

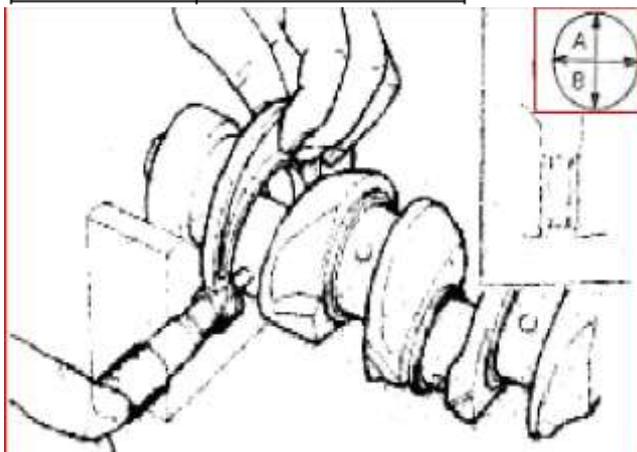
Rotate the crankshaft 90° and measure it again. (See fig.85)

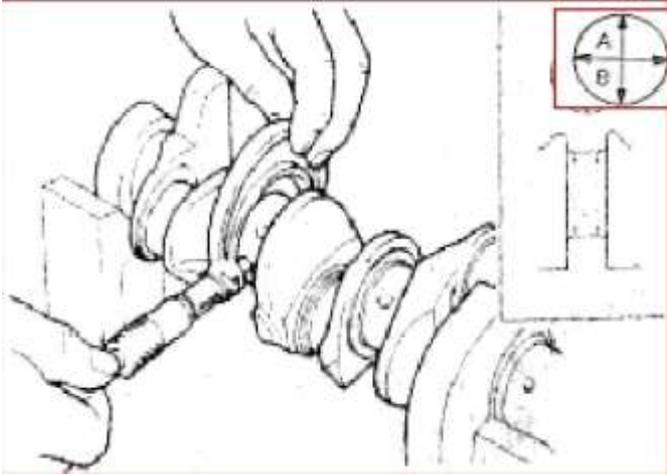
Work out the Roundness and cylindricity through twice measuring.

① Roundness = Max. diameter — Min. diameter / 2 as the picture, take the vertical diameters on the same plane, subtract the half of Minimum from the Maximum to get roundness.

② cylindricity = Maximum bore — Minimum bore / 2 As the picture, measure the bores of 3 planes along both A direction and B direction respectively. Get the maximum and the minimum from 6 values, and then subtract the half of Minimum from the Maximum to get cylindricity;

	Standard Value
Diameter	$47.9_{-0.016}^0$
Roundness	—
Cylindricity	—



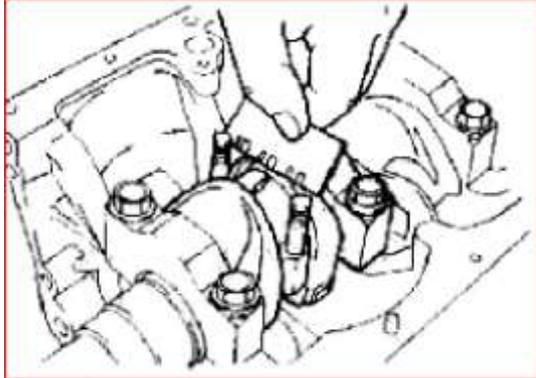


**Fig. 84**

**Fig. 85**

b. Inspect the radial clearance of connecting rod bearing ( See fig.86 )  
 Inspect the radial clearance of connecting rod bearing with clearance gauge. Clean up the connecting rod journal and connecting rod bearing. And put clearance gauge on the journal, fasten bearing bushing and fasten the bolt according to set torque.

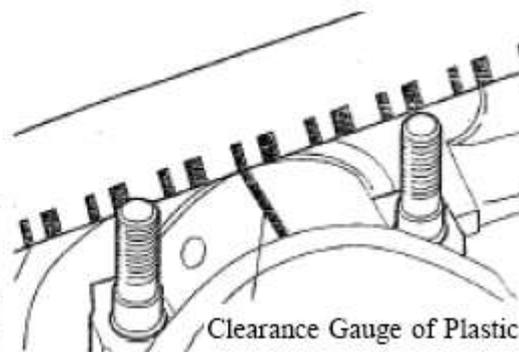
**Note: Do not rotate the crankshaft during the process.**



**Fig. 86**

Loosen the connecting rod bolt, remove the cap, and measure the maximum width of pressed clearance gauge with the ruler on its package to get the clearance value.

	Standard Value	Abrasion Limit
Clearance	0.016—0.051	



**Fig. 87**

**Replace with the new connecting rod bearing if the examined clearance exceeds the limit.**  
**Note: Use the same brand consistent with assorting sign when you replace the bearing bushing.**

Selection of connecting rod bearing:

You may select the connecting rod bearing by observing the sign on the first balance weight at the front end of crankshaft. ( see picture, unavailable )

6) Inspect the planeness of cylinder block surface.

a. Clean the upper surface of cylinder block.

b. Check with ruler and feeler gauge whether the surface of cylinder block is warped.

(Measure it in the sequence of A, C, D, E, F, G in the picture)

	Standard Value	limit value
warping amount	0.04	

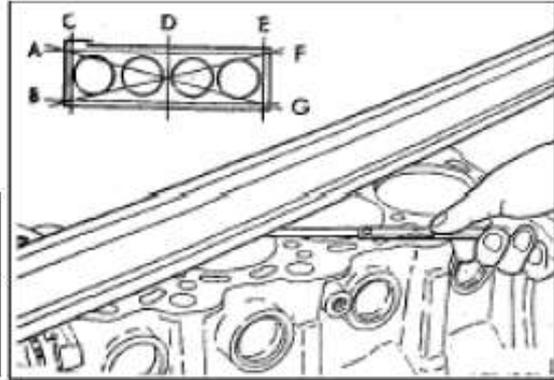


Fig. 88

C: Revise it if the warping amount is excessive.

Replace with the new cylinder if it exceeds the limit. The maximum for the sum of permitted abrading thickness of cylinder block and cylinder head is:

7) Inspect cylinder

a: Inspect if the cylinder wall is scratched or scored. **If there are cylinder scoring and scratching you need to hone cylinder wall, replace cylinder liner or replace cylinder block.**

b: **Examine the inner diameter and cylindricity of cylinder with cylinder gauge**

	Standard value
Inner diameter	83.5
cylindricity	0.008

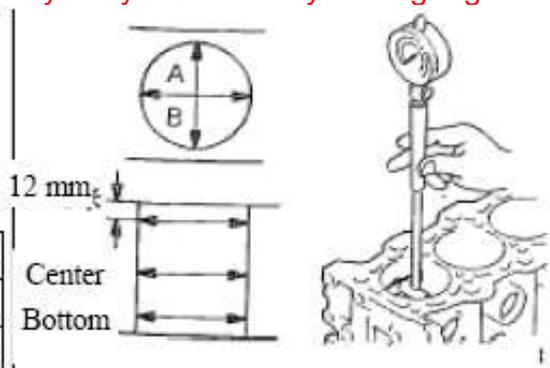


Fig. 89

cylindricity= Maximum bore – Minimum bore/2

**As the picture, measure the bores of 3 planes along both a direction and B direction respectively. Get the maximum and the minimum from 6 values, and then subtract the half of Minimum from the Maximum to get cylindricity;**

3.2.3 Installation

1) Spread oil on the piston pin and in the piston pin hole, connect the piston and connecting rod with piston pin, and mount the piston pin circlip.

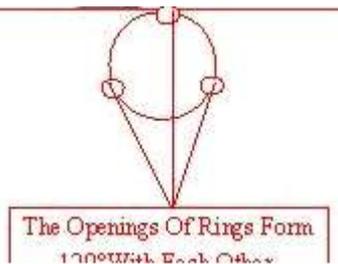


Fig. 90

2) Mount the piston ring. Mount the rings on the piston in the sequence of oil ring expander, upper and lower segments, 2nd air ring and 1st air ring; Pay attention to the direction of piston ring, the side with "TOP" should be upward. The two segments and expander are staggered. The angle of expander connector points to the top of piston, and the 1st ring and 2nd ring form  $120^\circ$  with the upper expander.



**Fig. 91**



**Fig. 92**

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

**Note:** the gap on bushing should be orderly with that of connecting rod.



**Fig. 93**

4) Spread the engine transmission oil in the engine cylinder, clasp the piston ring with special tool, tap the piston head with wooden handle and encase the piston connecting rod assembly.

**Note:** the end of connecting rod with a point should face the cylinder and consists with the arrowhead on the top side of piston.



**Fig. 94**

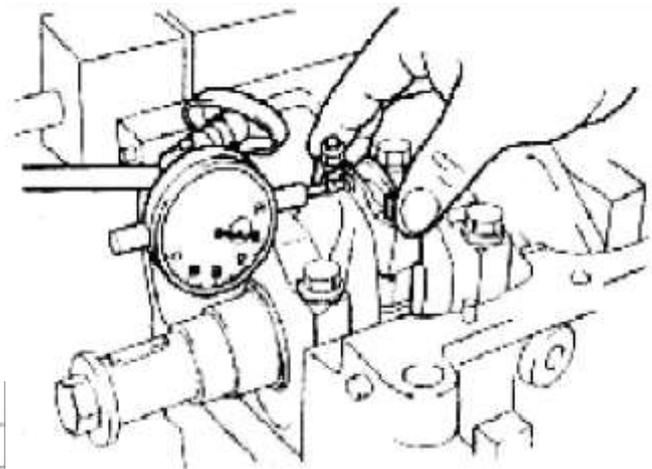
- 5) Mount the lower bearing of connecting rod and the connecting rod cap together. Then spread engine transmission oil.

Note: the gap on bushing should be orderly with that of connecting rod.



**Fig. 96**

- 6) Close the connecting rod cap and screw down the bolt. Torque:  $25 \pm 3 \text{ N}\cdot\text{m}$ , then screw  $90^\circ \pm 5^\circ$
- 7) Examine the axial clearance of connecting rod. Examine the axial clearance with micrometer gauge or feeler gauge.



	Standard Value (mm)
Clearance	0.15—0.50

**Fig. 97**

- 8) Mount the engine oil strainer. 9) Mount the oil pan. 10) Mount the cylinder head. 11) Mount the timing belt during timing adjusting.

**4. Replace front oil seal of crankshaft**

4.1 Needed tools and auxiliary materials

Ratchet wheel and ratchet rod, 13#, 15#, 17#, 22# sleeve, 13# open end wrench, Allen wrench, engine transmission oil and guide sleeve of crankshaft oil seal

4.2 Process of Replacement

4.2.1 Process of Removal

- 1) Dismantle the timing belt (See “replacing the timing belt” for details).



**Fig. 98**

- 2) Engage the gear to 5th, and then press the brake with toes, Dismantle the connecting bolt of timing belt pulley and crankshaft with torque wrench. Remove the timing belt.

**Torque:  $130\pm 10$ , then screw  $65^\circ\pm 5^\circ$**



**Fig. 99**

- 3) Pry out the old oil seal with right-angled screwdriver carefully.

**Note: Be careful in dismantling the oil seal not to damage the oil seal seat ring.**

#### 4.2.2 Installation

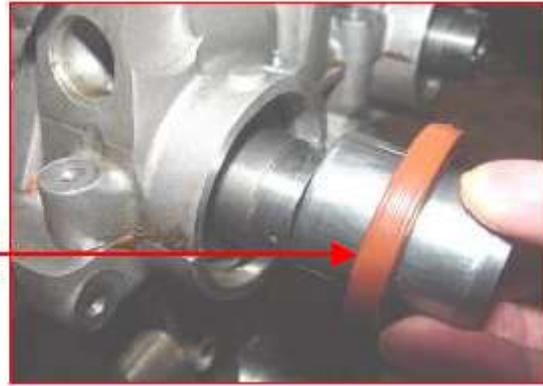
- 1) Clean the oil seal seat ring and spread transmission oil on the seat ring
- 2) **Spread transmission oil at the seal lip.**



**Fig. 100**

- 3) Enclose the guide sleeve of crankshaft oil seal, special tool, with that oil seal.

Guide Sleeve of Crankshaft Oil Seal



**Fig. 101**

- 4) Press the oil seal into oil seal seat ring and knock it to right position with hammer.



**Fig. 102**

## 5. Replacement of oil pump

### 5.1 Needed tools and auxiliary materials

A set of big sleeves, a set of small sleeves and a set of open end wrench

### 5.2 Process of Replacement

#### 5.2.1 Process of Removal

- 1) Dismantle the timing belt (See "removal of timing belt" for details).
- 2) Engage the gear to 5th, then press the brake with toes, and remove the timing belt pulley.
- 3) Dismantle the fastening bolt of oil pump with 10# sleeve and take out the oil pump.  
Torque: 8+3NM
- 4) Pry out the oil seal.
- 5) Clean the seat ring of oil pump.

5.2.2 Installation 1) Spread oil on the gasket of oil pump. 2) Mount the oil pump in its seat ring.

**Note:** The bulge of oil pump should be put downwards because the wrong position cannot make the bolt be screwed in.

- 3) Mount the oil seal. 4) Mount the other parts.

## 6. Replacement of crankshaft rear oil seal

### 6.1 Needed tools and auxiliary materials

A set of big sleeves, a right-angled screwdriver, a small hoist and engine oil

## 6.2 Process of Removal

- 1) Suspend the engine assembly from vehicle (See “suspending of engine assembly” for details) .
- 2) Remove the clutch pressure plate.
- 3) For removing the flywheel, lock the flywheel with special tool and then screw off the fastening bolt with sleeve wrench.
- 4) Pry the old oil seal with the right-angled screwdriver.

Note: Do not damage the oil seal seat ring.

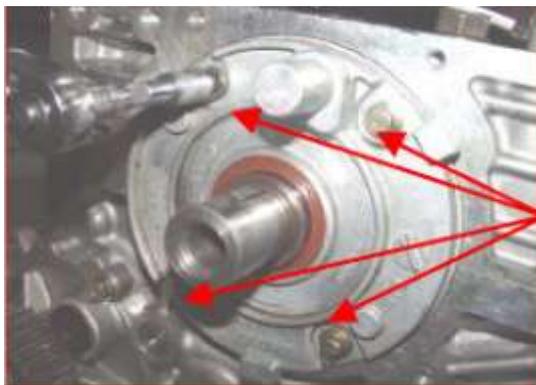


Fig. 103

Fastening

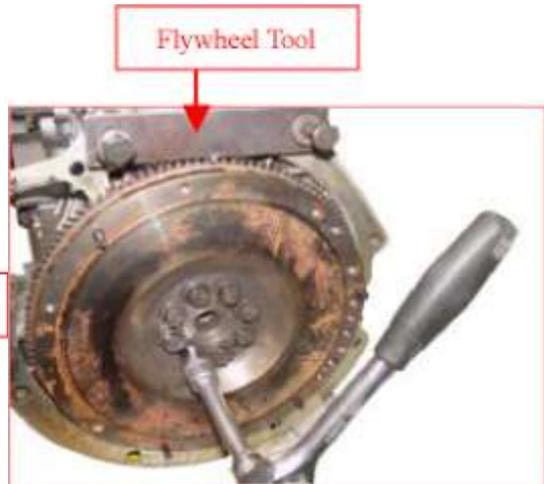


Fig. 104

## 6.2 Installation

- 1) Clean the oil seal seat ring. Clean the oil seal seat ring with clean oiled gauze.



Fig. 105

- 2) Spread the oil at the lip of crankshaft front oil seal.

Enclose the **guide sleeve of crankshaft oil seal**, special tool, with that oil seal. Then press it into oil seal seat ring.

Guide Sleeve of Crankshaft Oil Seal



Fig. 106

- 3) Mount the flywheel and the clutch pressure plate, and then mount the engine on the vehicle.

**Torque:  $25 \pm 5 \text{ N.M}$ , then screw  $30^\circ \pm 5^\circ$ .**

## **7. Replace crankshaft and thrust washer**

### 7.1 Needed tools and auxiliary materials

A set of open end wrenches, a set of sleeve tools, a small hoist, Le Tai glue, Engine oil, feeler gauge, feeler gauge, micrometer gauge.

### 7.2 Process of Removal

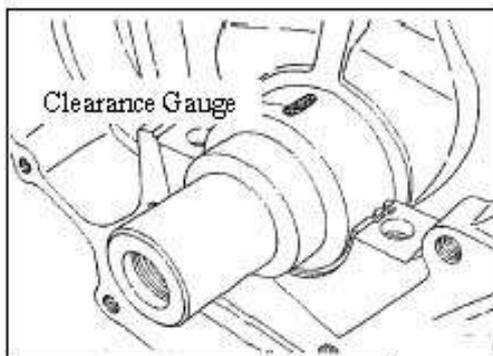
- 1) Suspend the engine assembly from vehicle (See “suspending of engine assembly” for details) .
- 2) Drain out the engine oil.
- 3) Remove the timing belt (see “replace timing belt” for details).
- 4) Dismantle the accessories, such as dynamo, A/C compressor, power steering pump and bracket. ( See the “replacement of engine accessory” for details)
- 5) Dismantle the engine cylinder head assembly. ( See the “replacement of cylinder head” for details)
- 6) Dismantle the engine clutch pressure plate, the flywheel and the timing belt pulley.
- 7) Remove the oil pan and engine oil strainer. ( See the “replacement of oil pan and strainer” for details.)
- 8) Remove the piston connecting rod assemblies for 4 cylinders and Put them in order.

**Note: You'd better stick the number on each piston connecting rod assembly to prevent from wrong mounting.**

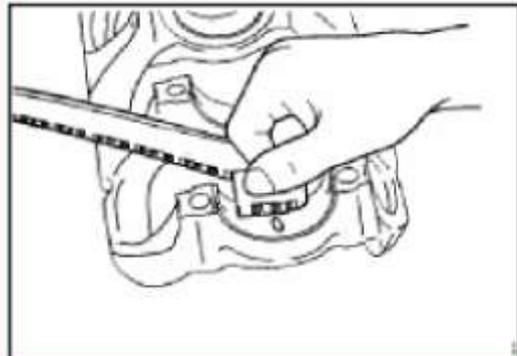
- 9) Dismantle engine oil pump assembly.
- 10) Dismantle the frame assembly under cylinder block and remove the crankshaft and thrust washer.

### 7.3 Inspection

- 1) Radial clearance of crankshaft
  - a): Clean the journal and bearing bushing.
  - b): Install crankshaft
  - c): Make the length of plastic clearance gauge equal to the width of bearing. Then put it on the journal paralleling the axis.



**Fig. 107**



**Fig. 108**

d): Mount the main bearing cap carefully and screw down the bolt with specified torque. (see Fig.108)

e): Dismantle the main bearing cap carefully.

f): Measure the width at the most bread part of pressed plastic line with ruler on plastic clearance gauge package, then get clearance value.

	Standard Value
Clearance	-0.0035-0.034

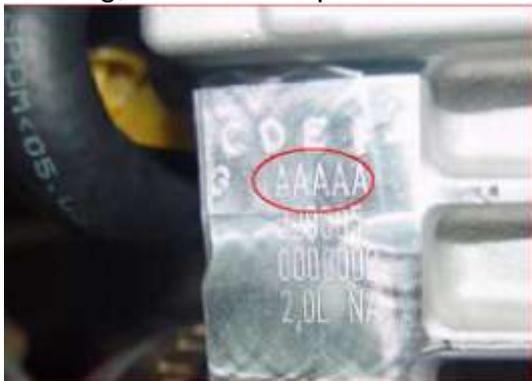
Replace the new bearing bushing if the measured clearance value exceeds the limit value.

**Note: Replace the whole group when replacing bearing bushing.**

Selecting method of main bearing bushing:

By observing the sign on cylinder (see the picture), we could see 5 as which correspond to bearing bushings respectively.

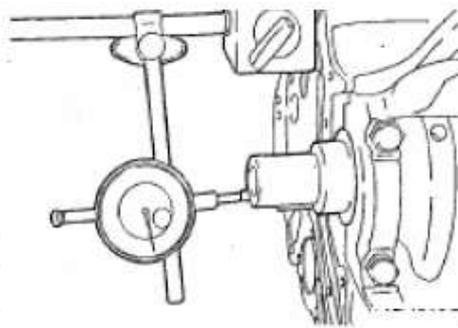
There two kinds of signs on this vehicle, A and B, corresponding to two kinds bushing, red one and blue one (the color can be recognized on the new bushing but it is possible unrecognized the color on the old one.) A corresponds to red bushing, and B corresponds to blue bushing.



**Fig. 109**

2) Inspect the crankshaft axial clearance

Mount the crankshaft and measure its radical clearance with micrometer gauge.



	Standard Value
Clearance	0.076—0.265

**Fig. 110**

Replace the new thrust washer if the measured value exceeds the limit value.

**Standard thickness of thrust washer:**

7.4 Installation

1) Clean the engine and spread the engine transmission oil on the crankshaft journal.

2) Mount the crankshaft correctly and then mount the thrust washer.



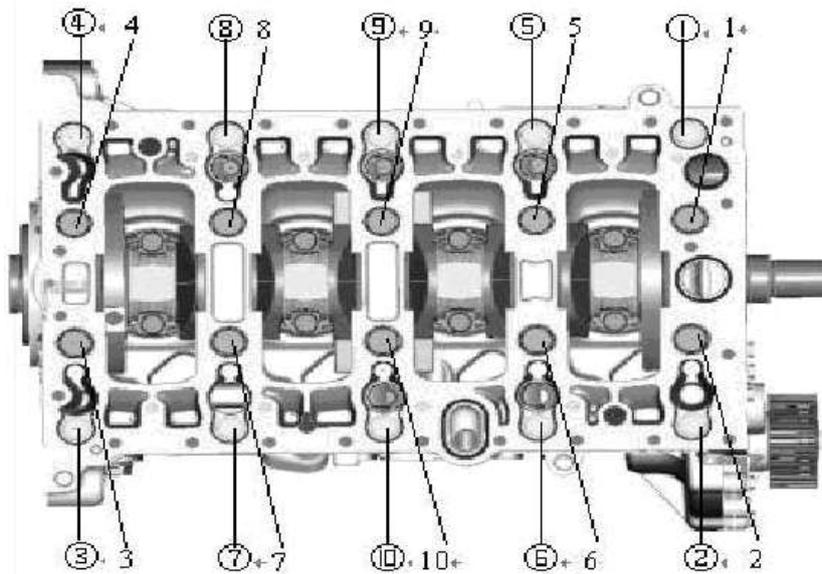
**Fig. 111**

3) Mount the cylinder frame and screw down the crankshaft fastening bolt. See the picture for the screwing sequence Screwing way and Torque:

A: Pre-fasten the bolt according to the sequence in the picture.

B: Screw the bolt as the sequence on the picture to  $45\pm 5$  N.m.

C: Screw  $180\pm 5^\circ$



**Fig. 112**

4) Mount and screw down the bolt of frame periphery. **Torque: 23N.m**

5) Mount the engine oil strainer, oil pan, crankshaft front and rear oil seal and oil pump.

6) Mount the engine accessories, suspend the engine assembly from vehicle and mount the water pipe and insert electric connector.

## **8 Replace coolant pump**

### **8.1 Needed tools and auxiliary materials**

A box sleeve wrench, a set of open end wrench, Allen wrench, coolant

### **8.2 Removal**

1) Remove the engine timing belt. (see "engine timing calibration" for details.)

2) Loosen the engine water exhaust pipe, and exhaust coolant.

3) Removal the coolant pump.

### **8.3 Installation**

The installing steps are reverse to those for removal. Infuse enough coolant after installation.

Note: Do not splash the coolant on the timing belt and skin.

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## **EFI SERVICE MANUAL**

A21 car is equipped with ME7.9.7 EFI system which developed by UAES. This manual will introduce the general service and the operational principle and character of sensor elements of EFI system in detail. At last there will be some diagnostic method and flow for the typical problems.

### **1. NOTICE TO THE EFI SYSTEM SERVICE**

#### **1.1. GENERAL SERVICE**

- Digital multimeter is the only permitted instrument to inspect the EFI system.
- please use the quality spare parts for service, otherwise cannot make sure the EFI work properly.
- please use lead free gasoline during service.
- Please be obedient to the service and diagnose flow.
- It is forbidden to disassembly the EFI part during service.
- it should be careful to take the electronic component (ECU, sensor, etc.) for preventing from dropping to the ground.
- please protect the environment; deal with the rejectamenta carefully and effectively.

#### **1.2. NOTICE DURING THE SERVICE**

- do not disassemble any part or inserts of the EFI system from its original position at random to prevent from damaging parts or that moisture and dirt oil come into the inserts. And that will keep the system from working properly.
- Please leave the ignition switch at shut off position when you disconnect and connect the inserts otherwise it will damage the electric element.
- It is must keep the ECU under 80°C, when you do the work of hot status simulation and other works which may cause the temperature increase.
- the supplying oil pressure is high (around 300kPa); the entire fuel pipe is made up of anti high pressure pipe. There is high pressure in fuel pipe even the engine does not run. So do not disassemble the fuel pump at random when carrying out service for fuel system. Before disassemble the fuel pipe please carry out discharge pressure procedure. The method is as below: Disassemble the fuel pump relay (or disconnect the connector plug), start engine at its idle running and it dies out by itself. After the service supply fuel to engine fuel pipe at first, the method is: turn ignition key to ON position and wait a while, repeat this four or five times. Disassembly of fuel pipe and fuel filter should be carried out at a place with good ventilation and done by professional maintainer.
- do not give electricity to fuel pump when the electrical pump is taken out of fuel tank in order to prevent from electrical spark and cause fire.
  - Fuel pump is not allowed to carry out running test at dry or water situation, which will decrease its life. And do not exchange anode

and cathode of the pump.

- Carry out jump spark inspection at necessary time when inspect the ignition system, and the time to inspect must be short. Do not open the throttle valve to prevent a lot of unburned gasoline entering exhaust pipe and damage the 3-way catalytic converter ( It is better to take off the corresponding injector insert during the jump spark testing)
- The adjustment of idle speed is done completely by EFI without manual work. The accelerator stop screw of throttle valve has been fixed well in advance by manufacturer so that it is not allowed to change it original position by the customer.
- Do not exchange the anode and cathode of the accumulator to prevent damaging the electronic component. This system uses cathode ground.
- Do not disassemble accumulator cable when the engine is running.
- Disassemble the cable of accumulator anode and cathode, and ECU when there is welding work on the car.
- do not inspect the input and output signal of component by impaling the lead surface.

### 1.3. SERVICE TOOLS

**Tool name: (see Fig.113)**

EFI system diagnostic tester

**Function:**

Read/clear the breakdown code in EFI and inspect data, test part motion.

**Tool name: (see Fig.113)**

**Ignition timing lamp**

**Function:**

Inspect engine ignition timing.



Fig. 113



Fig. 114

**Tool name: (see Fig.115)**

Digital multimeter

**Function:**

Inspect the character parameter of voltage, current, resistance.

**Tool name: (see Fig.116)**

Fuel pressure gauge

**Function:**

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



**Fig. 115**



**Fig. 116**

**Tool name: (see Fig.117)**

Pressure gauge for cylinder

**Function:**

Inspect the pressure in every cylinder.



**Fig. 117**

**Tool name: (see Fig.118)**

Fuel injector cleaner and analyzer

**Function:**

Analyze and clean the injector.

**Tool name: (see Fig.119)**

Vacuum meter

**Function:**

Inspect the pressure of intake manifold



**Fig. 118**

**Fig. 119**

#### **1.4. EXPLANATIONS OF THE ABBREVIATION IN THE MANUAL**

DG Speed Sensor DVE Electronic Throttle Valve DR Fuel Pressure Regulator  
 FPM Accelerator Pedal ECU Electronic Control Unit (Computer) EKP Fuel Pump  
 EMS Engine Management System EV Fuel Injector LSH Heating Oxygen  
 Sensor KS Knock Sensor KSZ Fuel Distributing Pipe Assembly KVS Fuel  
 Distributing Pipe ROV Ignition System with Distributor PG Phase Sensor RUV  
 Ignition System without Distributor TEE Oil Pump Bracket Assembly TF-W

Coolant Temperature Sensor TEV Purge Canister Control Valve HFM Air Flow  
Sensor ZSK Ignition Coil

**2. ME7.9.7 SYSTEM INTRODUCTION**

**2.1. SYSTEM BASIC PRINCIPLE**

**2.1.1 SYSTEM GENERAL INTRODUCTION: ME7.9.7-MOTRONIC EMS**

Engine management system (EMS) is composed mainly by three components: sensor, ECU, and actuator. And these three parts control the intake air quantity, fuel injection quantity and ignition advance angle. The basic frame is shown in chart 2.1.

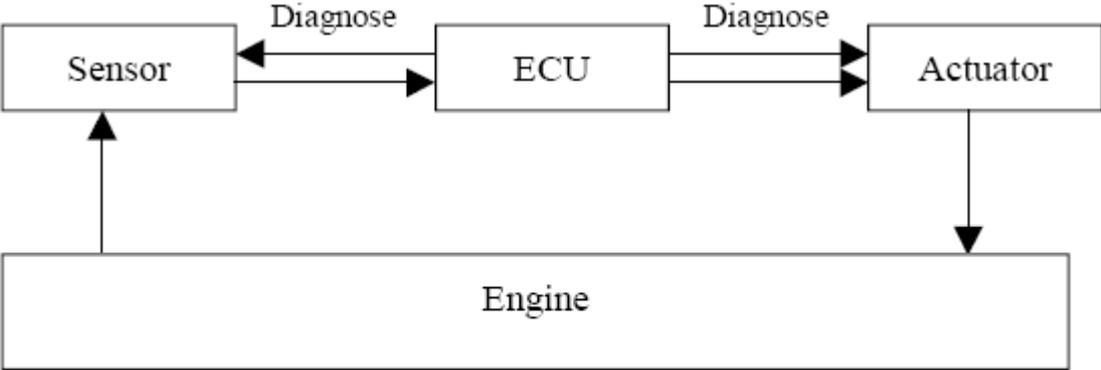


Chart 2.1 compose of engine electronic control system

In engine electronic control system, the sensor is the input part used for measuring all kinds of physics signal (temperature and pressure etc.) and change them to corresponding electronic signal; the function of ECU is accepting the signal and calculate it according to the programmed program and generate corresponding output signal to power drive circuit; and the power drive circuit makes the engine running according to established strategy by driving every actuator to do different action; at the same time the malfunction diagnosis system of ECU monitors all parts or control function, and if a malfunction is detected and confirmed it will memorize malfunction code, transferring “limping home” function, and when the malfunction is deleted, the normal value will be desterilized.

Engine electronic control system schematic of ME7.9.7 chart 2.2

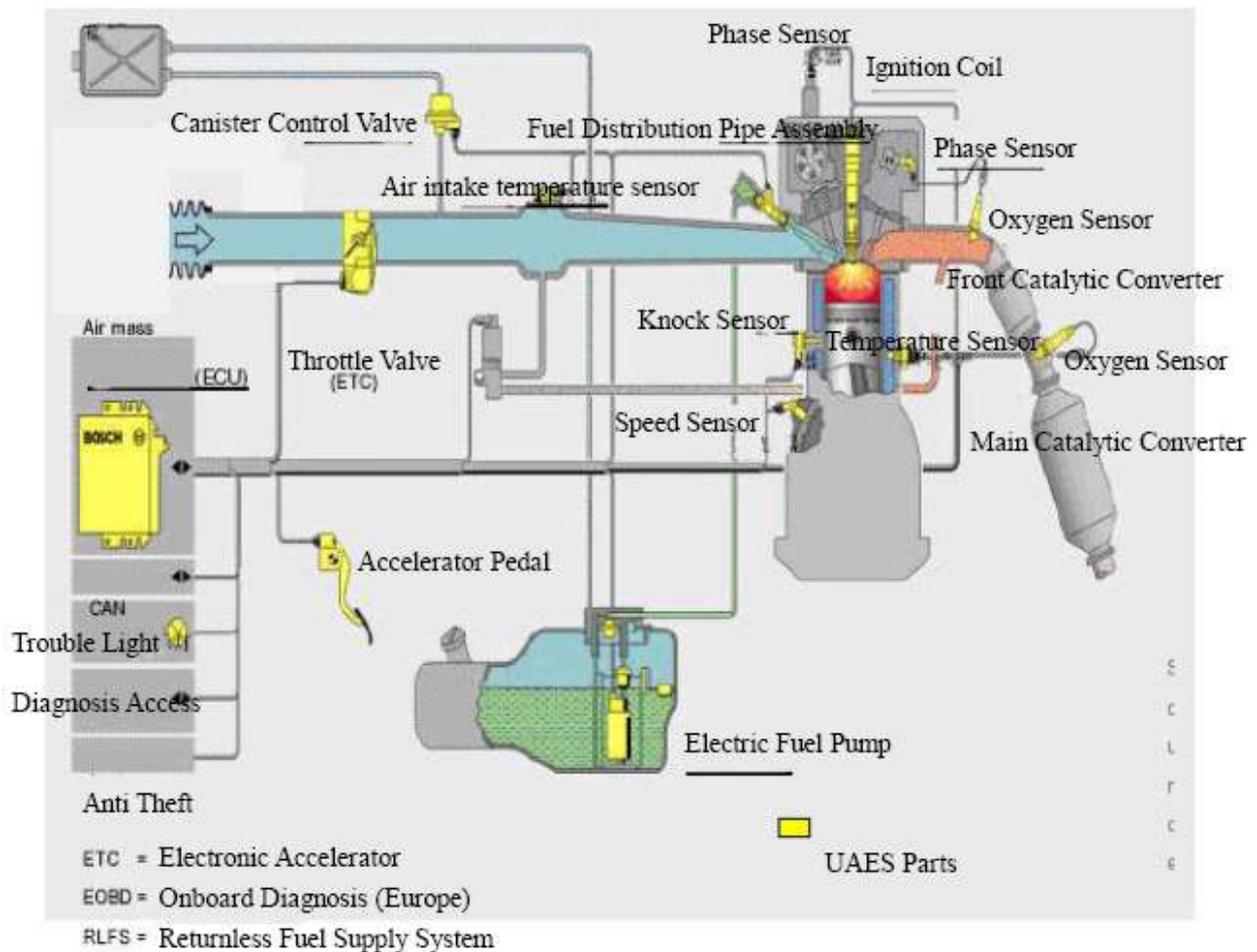


Chart 2.2

**The basic component of ME7.9.7 engine electronic control system:**

Electronic Control Unit (ECU)	Accelerator	Electronic Throttle Valve
Air Quality Flow Meter	Injector	Electronic Fuel Pump
Coolant temperature sensor	Fuel Pressure Regulator	Throttle position sensor
Fuel Pump Bracket	Camshaft Position Sensor	Fuel Distributing Pipe
Speed Sensor	Oxygen Sensor	Canister Control Valve
Knock Sensor	Ignition Coil	

ME7.9.7 engine management system is an electronic gasoline control system, and it can provide lots of control characters about operator and vehicle or equipment. The system adopts a combination method of open loop and closed loop (feedback) control to provide all kinds of control signal to engine. The main function of the system:

1) The basic functions of applying physics mode engine

□ For the system structure based on torque, the airflow sensor will confirm the loading of cylinder and improve the mixture air control function closed loop control.

Fuel injects ignition timing on the order of cylinder order, including knock control and emission control functions.

3ways catalytic convert heating

Canister control

Idle speed control

Limping home

## **2.2. CONTROL SIGNAL: ME7.9.7 SYSTEM INPUT/OUTPUT SIGNAL**

The main sensor input signal of ECU of ME7 system:

Air flow signal

Throttle valve corner signal

Coolant temperature signal

Engine speed signal

Phase signal

Knock sensor signal

Oxygen sensor signal

Speed signal

Air conditioner pressure signal

The above information after the transaction of ECU, there will generate required actuator control signal, and this signal will be magnified in output driving circuit and was transferred to its corresponding actuator. The signals include below information:

Injection timing and injection continuous time

Fuel pump relay

Opening degree of canister control valve

Ignition coil closing angle and ignition angle of advance

Air conditioner compressor relay

Cooling fan relay

## **2.3. INTRODUCTION OF SYSTEM MALFUNCTION DIAGNOSIS FUNCTION**

### **2.3.1. MALFUNCTION INFORMATION RECORD**

The ECU monitors sensor, actuator, related circuit, malfunction indicator and accumulator voltage etc., and ECU itself continuously. At the same time the ECU inspect the reliability test on sensor signal output, actuator driving signal and internal signal (e.g.: closed loop control, coolant temperature, knock control, idle engine speed and accumulator voltage etc.). ECU will set the malfunction record on RAM malfunction memory immediately once the malfunction or the

unlikely signal is detected. The malfunction information is recorded by malfunction code and displayed according to its appeared order, dividing malfunction into “steady malfunction” and “contingency malfunction”(for example the malfunction is caused by short time cable braking or bad contact of the inserts) according to its appeared frequency.

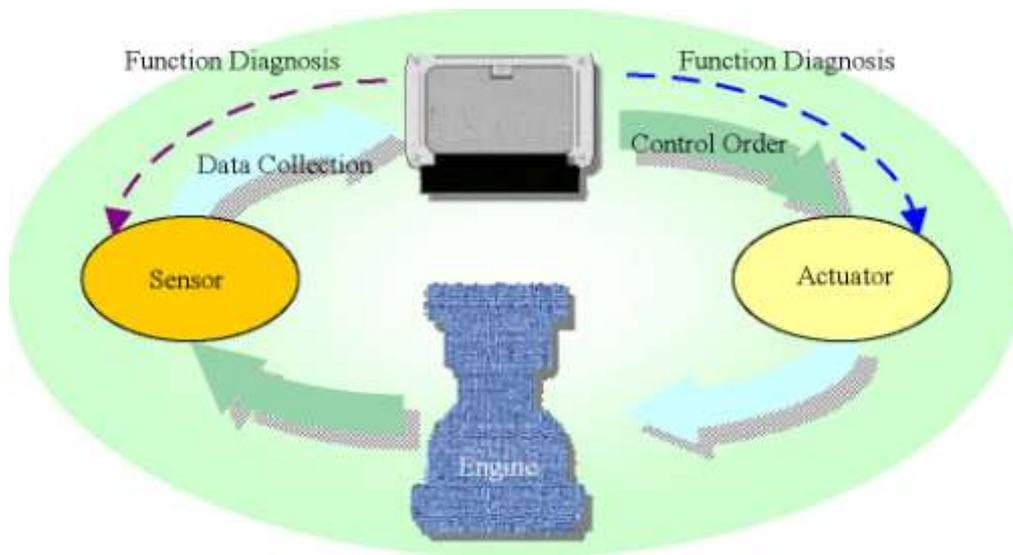


Chart 2.4 EFI System Malfunction Diagnosis Principle Chart

### 2.3.2, CONTROL STRATEGY OF FAILURE LAMP

When there is no trouble:

- ★The failure lamp is lighting and die out within 4 seconds after the ignition switch is ON
- ★Starting within 4 seconds, the failure lamp dies when the engine speed signal is found;
- ★The failure lamp winking at 2HZ frequency when the K cable contact to ground more than 2.5 seconds. When there is a trouble:
- ★ The failure lamp always on light when the ignition switch is ON;
- ★ Start and die out when the engine speed signal is detected; If the failure lamp was defined as lighting mode, it will always on light after reach its confirmed conditions;
- ★Output winking code that is P-CODE value after the K cable contact with the ground more than 2.5 seconds. For example: the winking mode of P0203 is: wink 10 times continuously –intermission –wink 2 times continuously –intermission -wink 10 times continuously –intermission –wink 3 times continuously.

### 2.3.3, DIAGNOSIS METER CONNECTION

**This system adopts “K” cable communication protocol and use ISO 9141-2 standard diagnosis joint, please see chart 2.5. This standard diagnosis joint is connected to engine harness fixed. The pins of No.4, 7 and 16 on the standard diagnosis joint are used for EMS. The pin of No. 4 on standard diagnosis joint is ground wire; Pin of No.7 is connecting to No.71 pin of ECU, which is engine data “K” cable; No.16 pin is connecting to accumulator anode.**

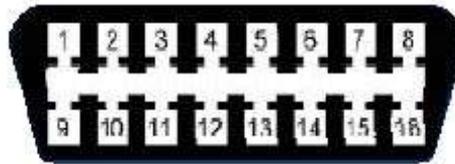


Chart 2.5 ISO9141-2 Standard Diagnosis Joint

### **2.3.4, READ MALFUNCTION INFORMATION BY WINK CODE**

Switch on ignition switch and use engine data K cable(that is standard diagnosis joint 7#)to ground(use one lead connect pin of diagnosis joint 4# and pin of 7#) more than 2.5 seconds, if there are malfunction code in ECU malfunction memorizer, the malfunction light wink code of engine now is P-CODE value. Such as: P0203 winking type is: wink 10 times continuously –intermission –wink 2 times continuously –intermission -wink 10 times continuously –intermission –wink 3 times continuously.

## **3. WORKING PRINCIPLE AND CHARACTER OF EFI SYSTEM ELEMENT**

### **3.1 ELECTRONIC CONTROL UNIT -ECU**

#### **1) Exterior drawing**

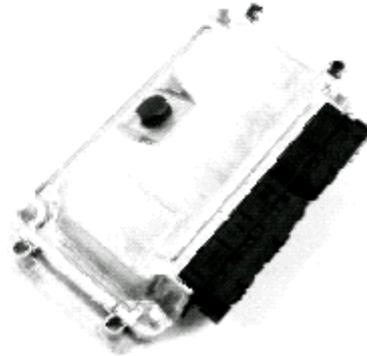
**2) Purpose:** ECU accepts and deals with engine status signals inputted from sensors and drives the actuators to work. Making engine working as the established program, insure power good, fuel consuming effectively and low emission.

**3) Mounting position: Passenger compartment**

#### **4) Functions**

- Multipoint injection in order**
- Control ignition**

- Idle speed control
- Knock control
- Provide sensor power: 5V/100mA
- Closed loop control
- Control carbon canister solenoid valve
- Air conditioner switch
- engine malfunction indicator
- Fuel fix quantity modification
- Engine speed signal output(TN signal)
- Input of speed signal
- Malfunction self diagnosis
- Accept engine loading signal etc.



### 5) Definition of pin

Pin	point	Pin	Connection point
1	Oxygen sensor heating	42	Air intake temperature
2	Ignition coil 2	43	
3	Ignition	44	Non persistent power
4	Oxygen sensor heating	45	Non persistent power
5	Ignition coil 1	46	Canister valve
6	Injection nozzle 4(cylinder No. 2)	47	Injection nozzle 3(cylinder No.4)
7	Injection nozzle 2(cylinder No.3)	48	
8	Engine speed	49	

9	Coolant temperature	50	Fan control 1
10	Fuel consuming	51	electronically 2
11	Trouble light	52	
12	Persistent power	53	electronically 1
13	Ignition coil	54	Electronic throttle valve position
14	Main relay	55	Downstream oxygen sensor
15	Engine speed sensor A	56	
16	Accelerator position sensor	57	
17	Sensor 1	58	Brake switch
18	Upstream oxygen sensor	59	Speed signal
19	Knock sensor A	60	Medium switch
20	Knock sensor B	61	Power 1
21	Brake light	62	CAN communication
22		63	Non persistent power
23	Accelerating sensor	64	Electronic throttle valve control
24		65	Electronic throttle valve control
25		66	Electronic throttle valve control
26		67	Electronic throttle valve control
27	Injection nozzle 1(cylinder No.1)	68	Cooling fan
28		69	Air conditioner relay
29		70	Fuel pump relay

30		71	Diagnosis K cable
31	EOBD inspection light	72	
32	5V power supply 2	73	Anti theft device
33	5V power supply 1	74	Clutch switch
34	Engine speed sensor B	75	Air conditioner switch
35	Sensor 3	76	Power steering switch
36	Sensor 2	77	Headlamp switch
37	Air flow sensor	78	Sensor
38	Electronic throttle valve control	79	Phase sensor
39	Engine coolant temperature sensor	80	Power 2
40	Accelerator position sensor	81	CAN communication
41	Air conditioner pressure		

**6)Normal working voltage:** 9--16V Normal working temperature: -40--70℃

### 7) Malfunction phenomena and diagnosis method

- **Malfunction phenomena:** idle speed not stable, accelerating not good, cannot start, idle speed is too high, exhaust gas exceed standard, difficult to start, air conditioner failure, injector control failure, engine dies out etc.
- **Reasons for general malfunction:** 1, ECU component was burnt down caused by overloading of the exterior connected electrical device; 2, circuit board was rust and erode caused by water in ECU.
- **Service notice:** 1, do not disassemble ECU at random during the service; 2, disassemble accumulator 5 minutes prior to disassemble ECU; 3, keep the disassembled ECU carefully; 4, prohibit to connect any circuit to ECU connecting line.
- Simple measurement method:
  - 1、(connect ECU joint)Read engine malfunction record by K line.
  - 2、(disassemble ECU joint)Check the connecting line of ECU, and pay more attention to check the power supply and ground line of ECU;

- 3、 Check the working conditions of exterior sensor and its output signal and its circuit;
- 4、 Check actuator and its circuit;
- 5、 At last change ECU and have a test.

### **3.2 COOLANT TEMPERATURE SENSOR**

#### **1) Exterior drawing and pin**

This sensor has two exchangeable pins.

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

#### **3) Installation position**

Coolant temperature sensor was installed on the water outlet of cylinder block and the copper heat conducted socket was inserted into water. There are thread on the socket, and screw in coolant temperature sensor onto the threaded hole on cylinder block by the hexagon head of the socket. The maximum moment is 20Nm.

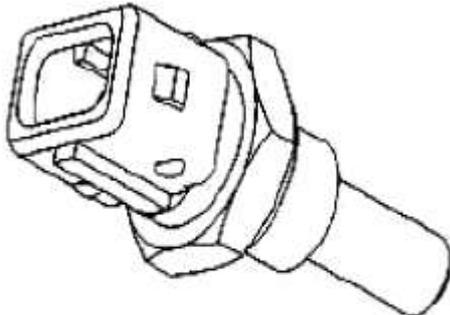


Chart 3-2 Outlook drawing of the coolant temperature sensor

#### **4) Working principle**

This sensor is a thermostat of negative temperature coefficient (NTC), and its value will decrease with the coolant temperature increasing but the changes are not linearity. There are several different resistance values at different temperature:

T(°C)	Resistance value(kΩ)
-10	8.62----10.28
20	2.37----2.63
80	0.299----0.345

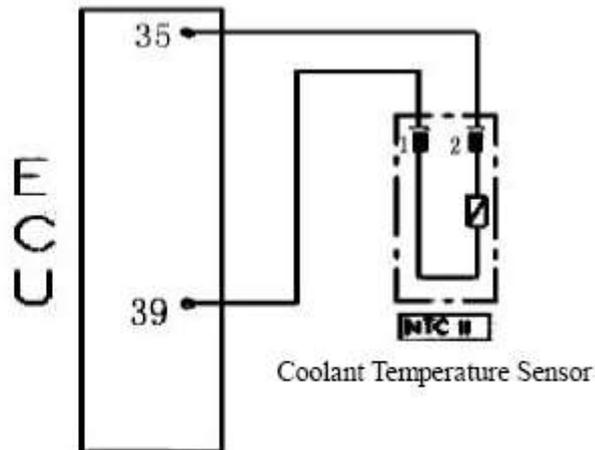


Chart 3-3 Circuit diagram of coolant temperature sensor

**5) Normal working temperature:** -30----130 °C

**Normal working voltage:** 5V DC

**6) Malfunction phenomenon and diagnosis method.**

□ **Malfunction phenomenon:** Difficult to start

□ **Reasons of malfunction:** man made

□ **Simple measurement method:**

(Disassemble the joint)leave the digital multimeter at ohm shift and contact the No.1 and No. 2 pin of the sensor by its two meter pens. When it is 20°C Rated the resistance is 2.5kΩ±5%. The other temperature can get reference from above chart.

### 3.3 KNOCK SENSOR

#### 1) Exterior drawing and pin

This sensor has three pins; No.1 and No.2 pin connect with ECU, and No. 3 pin connects with shield.

**2) Purpose: This sensor provides engine knock information to ECU, and carries out knock control.**

#### 3) Installation position

There is a hole in the middle of knock sensor, and the sensor is assembled on the block between No.2 and No.3 cylinder head. For the aluminum alloy block, using long bolt with 30mm long; for the casting iron, using 25mm long bolt. And the moment is 20±5Nm.

#### 4) Working principle

Knock sensor is a kind of vibrating acceleration sensor and is assembled on cylinder block. The sense organ of the sensor is a piezoelectric element. The vibration of cylinder block is transferred to piezoelectric crystal by mass block inside of sensor. The piezoelectricity crystalloid gets pressure from mass block vibration, producing voltage on two polar and transferring vibration signals to voltage signal and output it. Because the frequency of knock vibration signal is much higher than the normal engine vibration signal, the ECU can separate the signal into knock signal and non knock signal.

5) Normal working temperature: -40--130°C

#### 6) Malfunction phenomenon and diagnosis method



Chart 3-4 Exterior drawing of knock sensor

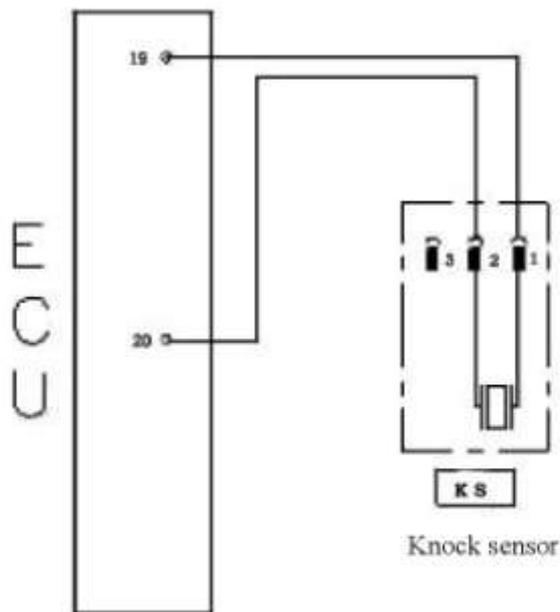


Chart 3-5 circuit diagram of knock sensor

- Malfunction phenomenon: badness accelerating.
- Normal malfunction reason: all kinds of liquid such as oil, coolant, braking liquid and water contact with sensor for a long time and erode the sensor.
- Simple measuring method: (disassemble the joint) put digital multimeter at

ohm shift, and contact the No.1, No. 2 and No.3 pin with its two meter pens. The resistance value should be more than 1MΩat normal conditions. Leave the digital multimeter at millivolt shift, and tap around the sensor using little hammer, there should be voltage signal output.

### 3.4 OXYGEN SENSOR

#### 1) Exterior drawing and pin

There are 4 pins on this oxygen sensor

No. 1 connect to heating power anode (white)

No. 2 connects to heating power cathode (white)

No. 3 connects to signal cathode (gray)

No. 4 connects to signal anode (black)

#### 2) Installation position: Assemble it on the top of exhaust pipe.

**3) Purpose:** The oxygen sensor checks the oxygen percent in exhaust gases and transfer the signal to ECU, and ECU will control the fuel closed loop according to this information. This will make engine working at its optimum conditions. And transfer and purify CO, HC, NO<sub>x</sub> compound in 3-way catalytic converter of the tail gas maximally.

#### 4) Working principle

Sensing element of oxygen sensor is a kind of ceramic tube with holes, and outside of tube walls are surrounded by engine exhaust gas and inside is air. Ceramic sensor element is a kind of solid state electrolyte with electrical heating

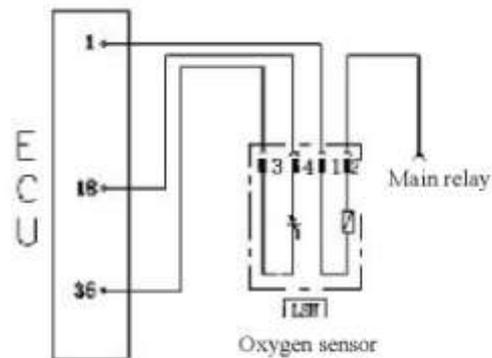
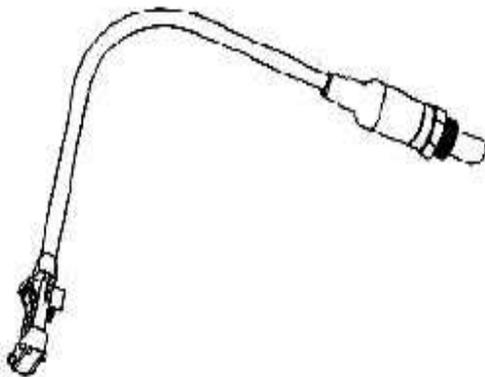


Chart 3-7 circuit diagram of oxygen sensor

tube inside. The working of oxygen sensor is carried out by transferring the concentration difference of the oxygen ion outside of ceramic tube to voltage (100mv—900mv) signal and output.

#### 5) Working voltage: 12—14V

#### 6) Malfunction and diagnosis method

❑ **Malfunction:** badness idle speed, badness acceleration, badness tail gas, over fuel consume etc.

❑ **Reason:** 1, moisture entering inside of sensor, and when the temperature is changed pin is broken; 2, sensor poisoning (Pb, S, Br, Si)

- **Notice:** it is forbidden to use cleaning liquid, oiliness liquid or volatility solid during service.
- **Measuring method:** a) disassemble joint, put digital multimeter to ohm shift, connect meter pen to No.1(white) and No.2(white) pins of the sensor. Normally the resistance value is 1~6Ω. b) Connect the joint and keep it at idle speed status. When the oxygen sensor reaches to its working temperature 350°C, keep digital multimeter to DC volt shift and connect meter pen to No.3 (gray) and No.4 (black) pins of sensor. Now the voltage should be fluctuate between 0.1-0.9V quickly (the data also can be gotten from data flow inspected by diagnosis meter).

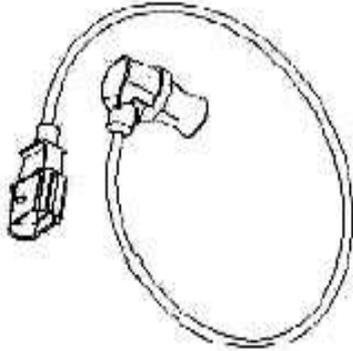
### 3.5 SPEEDSENSOR (CRANKCASE POSITIONING SENSOR)

#### 1) Exterior drawing and pin

No.1pin connects to shield

No.2 and No.3 pin provide signal to ECU.

#### 2) Installation position: on the flywheel plane at rear of engine.



#### Service notice:

- For the inductive engine speed sensor, it is permitted to take out from its pack before it is assembled to the auto or testing device right away.
- Inductive engine speed sensor is assembled by press in method but not hammer tapping.
- Tightening torque is 8.2Nm. Gas clearance between inductive engine speed sensor and pulse disc is 0.8 -1.2mm.

**3) Purpose:** Speed sensor provides engine speed, crankshaft angle and top dead center signal to ECU. That will control engine ignition and injection timing.

**4) Working principle:** The inductive engine speed sensor work together with pulse disc, it is used in ignition system without distributor providing engine speed and crank shaft top dead center information. Speed sensor is made up of a permanent magnet and coil outside of magnet. Pulse disc is a tooth disc with 60 teeth originally but there are two teeth opening. Pulse disc is assembled on crank shaft and rotate with crankshaft. When the tip of the tooth passed the end

of inductive engine speed sensor, the magnet pulse disc incises the magnetic line of force, generating rotating speed signal and output.

**5)Working temperature:-40--120℃**

**Resistance of coil in room T: 731--989Ω**

**6) Malfunction and diagnosis method:**

- Malfunction: cannot start etc.
- Reason: man failure
- Service notice: use pressing method but not a hammer to install it.
- Simple measure method: disconnect the joint, put digital multimeter to ohm shift, connecting two meter pen to No. 2 and No.

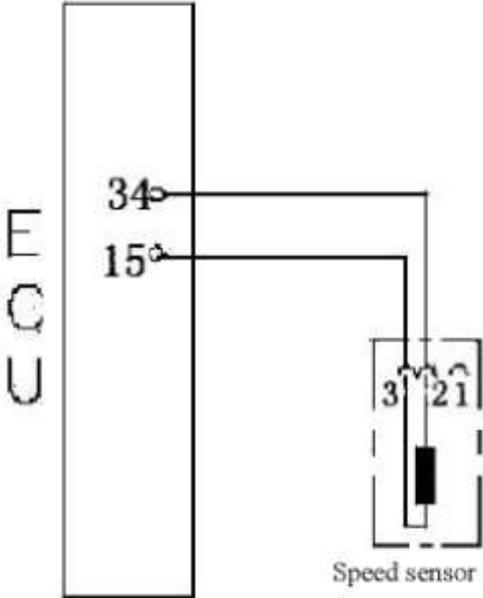


Chart 3-9 Circuit diagram of speed sensor

3 sensor connectors. The rated resistance is 860Ω±10% When it is 20℃

### 3.6 PHASE SENSOR (CAM SHAFT POSITIONING SENSOR)

#### 1) Exterior drawing and pin

This sensor has three pins: No. 1 grounding, No. 2 for signal output and No. 3 connecting to power anode.

**2) Installation position:** on the valve cover. There is only one hole on this sensor casing for tightening M6, and the torque is:  $8 \pm 0.5 \text{ Nm}$ .

**3) Purpose:** This sensor provides crankshaft phase information to ECU, that is to say, to separate crankshaft compression top dead center and exhaust top dead center.

#### 4) Working principle

It is a Hall sensor.

**5) Working temperature:**  $-30 \sim 130^\circ \text{C}$

**Working voltage:** 4.5—16V

**Trigger gap:** 0.1—1.8mm

#### 6) Malfunction and diagnosis method

- Malfunction: cannot start, emission exceed standard, fuel consume increased.
- Reason: Man made.
- Simple measuring method: (connect the joint) switch on ignition switch but do not start the engine; put digital multimeter on DC volt, connect two meter pen to No. 3 and No. 1 sensor connectors and make sure there is 12V reference voltage. Start the engine, checking if it is in good conditions of No. 2 pin by oscillograph on vehicle.

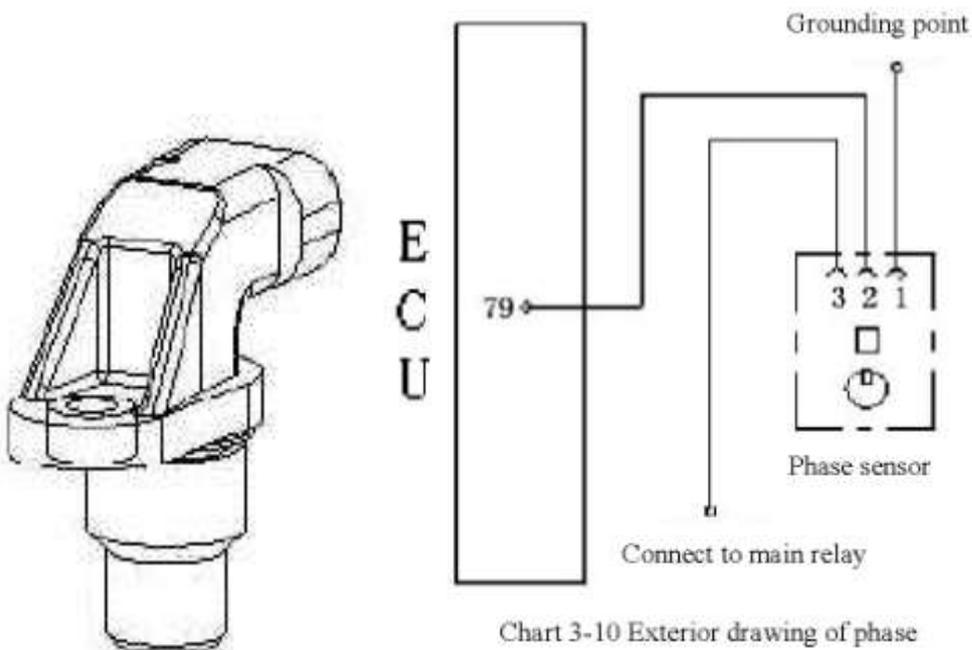


Chart 3-10 Exterior drawing of phase sensor

### 3.7 ELECTRIC FUEL PUMP

#### 1) Exterior drawing and pin

The electric fuel pump has two pins connecting to pump relay. There are “+” and “-” showing anode and cathode on the pump housing near to pins.

#### 2) Installation position: inside fuel tank

**3)Purpose:** Deliver the fuel to engine fuel supplying pipe at certain flow and fuel pressure and keep the stable fuel pressure (realized by fuel pressure regulator)

**4) Working principle**

The electric fuel pump is made up of DC electromotor, vane pump and end cover (it's an integration of check valve, relief valve and an anti electromagnetic interference element). Pump and electromotor are coaxial assembly and within the same casing. The pump and electromotor are full of gasoline for coolant and greasing inside of the casing. The accumulator provide power to electric fuel pump via fuel pump relay, and the relay switches on electric fuel pump only when engine starting and running. When the engine stops for some reason, the pump will stop to run by itself.

**5)Working voltage:**8—14V **Working temperature:**-30--70°C **System pressure:** 300KPa

**6) Malfunction and diagnosis method**

- Malfunction: big running noise, badness acceleration, cannot start (difficult to start) etc.
- Reason: use of low quality fuel and cause 1, colloid became insulation layer; 2, fuel pump bushing and armature come to together; 3, components of fuel level sensor eroded.
- Service notice: 1, the electric fuel pump can

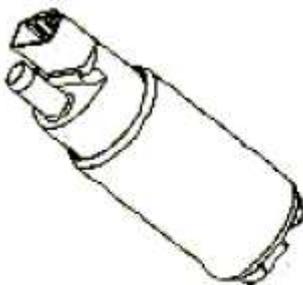


Chart 3-12 Exterior Drawing of Electric Fuel Pump

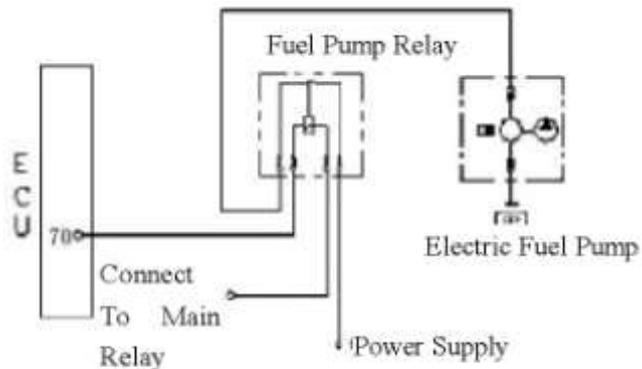


Chart 3-10 Exterior Drawing Of Phase Sensor

has different flow according to the requirement of engine, but with the same exterior looking.

The pump which can be assembled to perhaps is not the fittest. For service the replaced electric fuel pump must has the same part number as the original pump; 2, do not change the pump at dry status to prevent the pump from accident; 3, when it needs changing fuel pump, please clean fuel tank and fuel filter.

- Simple measuring method: (disconnect joint) leave digital multimeter at ohm shift, connect two meter pen to two pins of pump, measure the resistance, it is not zero or infinite(that is non short circuit, open circuit).(connect the

joint)connect the fuel pressure meter to fuel intake pipe and start the engine, observing if the fuel pump works; If it is not running, check if there is power or not on the pin of”+”; if it is running, at the condition of idle speed, check the fuel pressure if it is around 260kPa; plug off the fuel pressure regulator vacuum pipe if it is around 300kPa.

### 3.8 ELECTROMAGNETIC INJECTOR

#### 1) Exterior drawing and pin

There are two pins on each injector. One of them is No. 87 pin aside of casing marked with plus and connected to main relay output; and another on connect with ECU No. 27,6,7,47 pins.

**2) Installation position:** On the air intake manifold near the end of air intake port. When you .disassemble and reassemble the fuel injector the O ring must be changed. And pay attention no to damage the sealing surface of the injector.

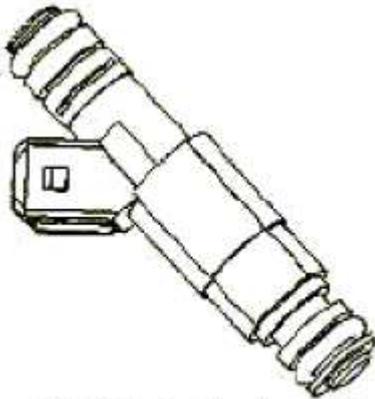


Chart 3-14 Exterior Drawing of Injector

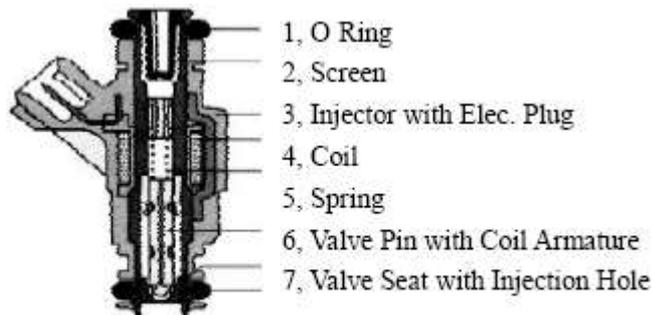


Chart 3-15 Cutaway View Of Injector

**3) Purpose:** Inject some fuel to its correspondent cylinder at proper time to meet the engine requirement of different power and different torque.

**4) Working principle:** ECU sends electrical impulse to injector coil and form magnetic field force. When magnetic field force increase to conquer Return spring pressure, needle valve gravity and friction force, the needle valve begin to rise up and start the injection process. The pressure of return spring makes needle valve close again when the injection impulse is stopped.

**5) Working voltage:** 6—16V

**Working injection pressure:** 350KPa

#### 6) Malfunction and diagnosis method

- Malfunction: badness idle speed, badness acceleration, cannot start (difficult to start) etc.
- Reason: lack of maintenance causes invalid by the colloid inside of injector became insulation layer.
- Simple measure method: (disconnect the joint) leave digital multimeter at ohm shift, connect the meter pen to the two pins of injector. The rated resistance should be 11 -13Ωwhenitis20°C.

### 3.9 AIR FLOW SENSOR

#### 1) Exterior drawing and pin definition

This sensor is 5 pins: No. 1 is intake temperature pressure signal; No. 2 is accumulator pressure; No. 3 is grounding; No. 4 is reference voltage 5V; No. 5 is intake airflow signal output.

#### 2) Installation position

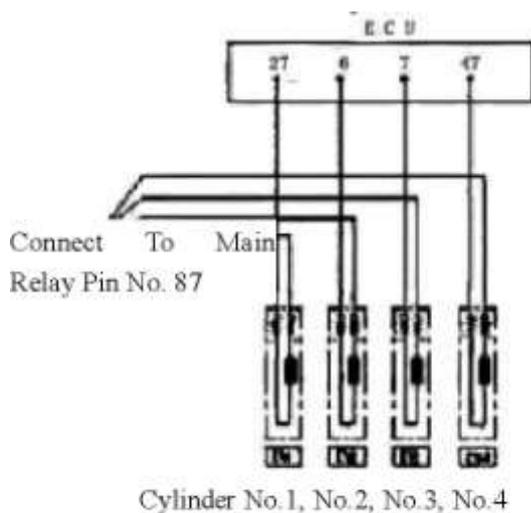
It is behind the air cleaner of the air intake tube.

#### 3) Purpose:

This sensor is hot cable airflow sensor, which check the temperature and air intake flow entering to cylinder and provide evidence to ECU to calculate fuel injection quantity.

#### 4) Working principle

If there are no airflow passing when the air quality and flow meter works, temperature grads of both sides of the heating area spread symmetry and temperature of these two points are same. When the air passes here just one way, the air will be heated when it passes the central heating area and this will



Cylinder No. 1, No. 2, No. 3, No. 4

Chart 3-16 Circuit Diagram of Injector

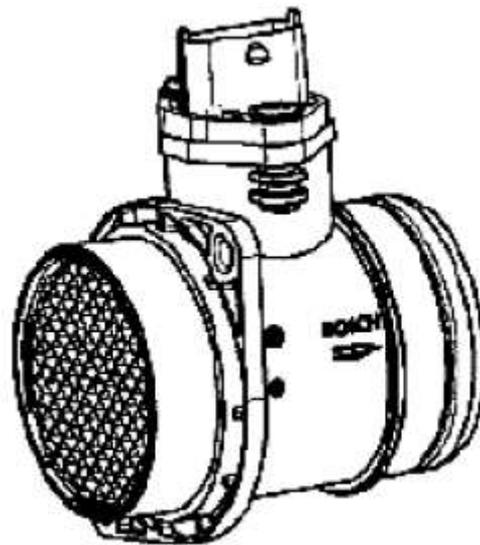


Chart 3-17 Exterior Drawing of Airflow Sensor

make the heat exchange different of the heat diaphragm of both sides.

This will make the temperature of two sensing element measuring point inside of the flow meter Changes differently and appears difference in temperature. And the difference of the temperature will increase with the increase of the airflow. Big/small and positive/negative of the temperature difference improved the quality and direction of the airflow. And the inside evaluate circuit will transfer the temperature difference to voltage signal and output.

**5) Working temperature:** -40--125°C

#### 6) Malfunction and diagnosis method

- Reason: sensing element is polluted by the dust particle, oil and water and causes the part invalid.

- Service notice: 1, it is prohibited to use erosion liquid to clean sensing element during service; 2, not to use high pressure air to impact sensing element; 3, make sure there are no dust into air pipe when you change air cleaner and no unqualified air into air cleaner.
- Simple measuring method: **static measurement:** (zero flow measurement) No. 3 grounding; No. 4 input 5V reference voltage; No.2 input 14V rated voltage; check No. 5 output voltage, if the output is bigger than 1.025V, can confirm the Function of this sensor is not qualified. **Dynamic measurement:** if it is confirmed the sensor is broken, connect a tail gas analysis meter to exhaust pipe and check it by using “two working conditions method”: 1, idle speed working conditions; 2, 2000rpm stable working conditions. Check the reading of HC、CO、CO<sub>2</sub>, normally HC<100ppm CO<0.5%,CO<sub>2</sub>>13.5%

### 3.10 DOUBLE SPARK IGNITION COIL

#### 1) Exterior and pin definition

No. 1 coil primary winding connect with No.5 pin of ECU; No. 2 coil primary winding connect with No. 2 pin of ECU; No. 3 and No.4 pins connect with power anode.

**2) Installation position:** on the engine

**3) Purpose:** Ignition coil transfers the low voltage of primary winding to high voltage of secondary winding, and produce spark by spark plug discharging then burning the combustible gas inside of the cylinder.

#### 4) Working principle

Ignition coil ZS -K22 is made up of two primary windings, two secondary windings, mandrel, and casing. When one of the primary windings grounding channel is connected, the primary winding is in charging. Once the circuit is cut off by ECU, the charging is stopped. At the same time the high voltage is sensed in the secondary winding and making the spark plug discharging. There is a different with the distributor ignition coil: for the ignition coil ZS -K22, there is one spark plug on both side of the secondary winding, and the both spark plugs can ignite at the same time. These two primaries connect and

disconnect to power correspondently these two discharge alternatively.  
 alternatively.  
 And  
 secondary windings  
 wi

#### 5) Working

**voltage:**14V

**Working temperature:**-40—120℃

#### 6) Malfunction and diagnosis method

- Malfunction: cannot start.
- Reason: current is too big and got burnt, damage by outside force etc
- Service notice: forbid to use "short circuit test igniting method" to test ignition function, prevents the electronic controller from damaging.
- Simple measuring method: (disassemble the joint) leave digital multimeter at

ohm shift, connect two meter pen to two pins of primary winding, the resistance value is 0.42-0.58Ω when it is 20°C; secondary winding resistance value is 11.2- 14.8kΩ.

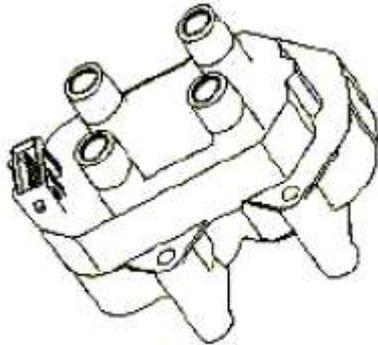


Chart 3-18 Exterior Drawing of Ignition Coil

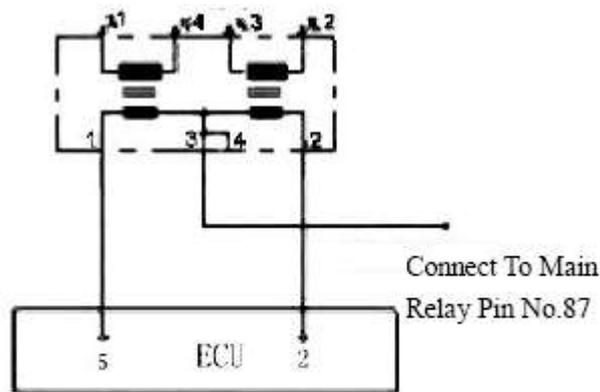


Chart 3-19 circuit Diagram of Ignition Coil

### 3.11 CARBON CANISTER SOLENOID VALVE

#### 1) Exterior drawing and pin definition

Canister control valve only has two pins; one is connect to No.87 pin of main relay output end; and another pin connected to No. 5 pin of ECU.

**2) Installation position:** Canister vacuum pipe of intake manifold

**3) Purpose:** Control the quantity of the cleaning flow from canister to air intake chief pipe. The absorption of the canister is limited so if the gasoline vapor adhesive to canister cannot be consumed the gasoline vapor will volatility to outside and pollute the air.

#### 4) Working principle

Canister is made up of electromagnetic coil, armature and valve etc. There is strainer on the intake. The flow quantity passes canister valve is correlate not only to electrical impulse duty ratio of canister control valve output by ECU, but also to the pressure difference between canister valve intake and outlet. When there is no electronic impulse, the canister control valve will shut down.

**5) Working voltage:** 9—16V

**Working temperature:** -30--120°C

#### 6) Malfunction and diagnosis method

- Malfunction: Function invalidation.
- Reason: some particle coming to inside of valve causes erosion or poor sealing.
- Service notice: 1, let the airflow direction be accord with the regulation; 2, when there are black particle inside of valve and causes the control valve invalidation, the valve need to be changed, please check the canister working conditions; 3, avoid the water, fuel and other liquid into valve during the service; 4, hang the valve on the tube to avoid the transferring of solid sound.
- Simple measurement method: (disassemble the joint) leave digital multimeter to ohm shift, two meter pen connect to the pins of canister valve, it is  $26 \pm 4 \Omega$  when it is  $20^{\circ}\text{C}$ .

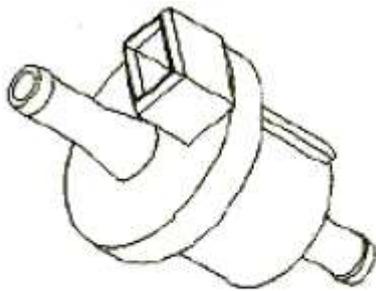


Chart 3-20 Exterior Drawing of Canister Solenoid

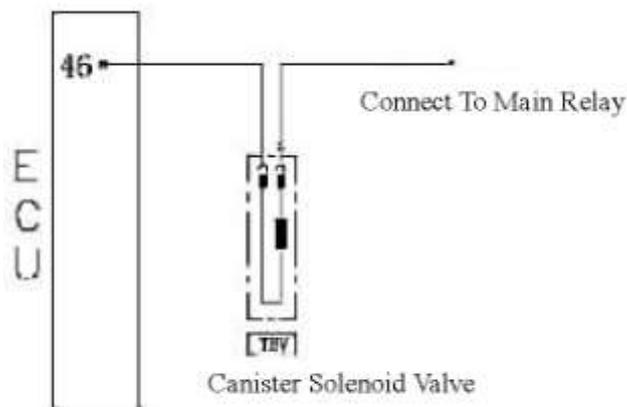


Chart 3-21 Circuit Diagram of Canister Solenoid

### 3.12 FUEL PRESSURE REGULATOR

#### 1) Exterior drawing

#### 2) Installation position: Fuel bracket assembly

**3) Purpose:** Adjust the pressure inside of fuel pipe; keep the System pressure around 350Kpa.

**4) Working principle:** See chart 3-23, one piece of flexible film made up of rubber and fiber separate the fuel pressure regulator into two compartments. The upper compartment communicates to the air, and there is spring inside. The lower compartment is full of fuel entering from the fuel intake under the fuel pressure regulator. The lower part of the film gets the pressure from fuel and the upper part gets the pressure from air and spring. The film can distort and drive valve seat making the valve open and close, but the distortion is smaller the acting force of the spring may be seemed as not changed. So the opening and closing of the valve is decided by the pressure difference of the fuel pressure

from lower compartment and the air pressure from the upper compartment. If the valve is closed at first, then the fuel pressure increased causing the pressure difference between upper and lower compartments increased. At last the film was raised up by the fuel pressure and valve is opened. The fuel return to fuel tank from oil return port of pressure regulator, the fuel pressure decreased until the valve is closed. If the engine changes its working conditions now, the pressure difference of fuel system and the air pressure is about the same.

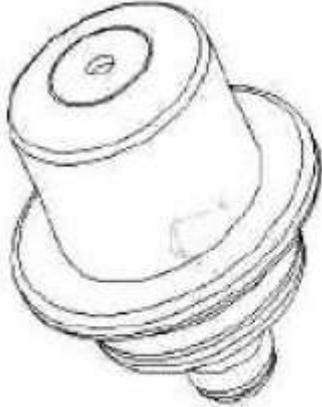


Chart 3-22 Fuel Pressure Regulator

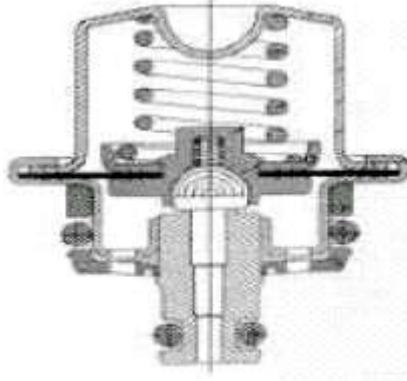


Chart 3-23 cutaway View of Fuel Pressure Regulator

### 5) Malfunction and diagnosis method

- Malfunction: fuel pressure is too high or too low, difficult to start.
- Reason: long time using without maintenance causing: 1, strainer jammed; 2, particle causes big leaking; 3, manmade mechanical damages.
- Service notice: 1, prohibit using high pressure air blowing film element; 2, Forbid using strong causticity liquid to wash it; 3, avoid it from distorting by outside force. Simple measurement method: connect fuel pressure gauge at fuel intake pipe, start the engine and make the engine running at idle speed; check the fuel pressure around 350kPa or not; step on the gas until the engine speed to 2500rpm, and observe if the fuel pressure at around 350kPa.

### 3.13 ELECTRONIC THROTTLE VALVE AND ACCELERATOR

#### 1) Exterior drawing and pin

- Accelerator pin definition

Pin No.1 and No.2 is the anode of the 5V reference voltage Pin No.3 and No.5 is the cathode of 5V reference

Voltage Pin No. 4 and No. 6 is output voltage signal

- Electronic throttle valve pin definition Pin No. 1 is motor anode. Pin No. 2 is potentiometer anode. Pin No. 3 is potentiometer cathode. Pin No. 4 is motor cathode. Pin No. 5 is signal output 1.

Pin No. 5 is signal output 2. **2) Installation position:** Electronic throttle valve:

front end of intake manifold; accelerator: driver cockpit. **3) Working principle:**

The engine on time torque

requirement was transferred from accelerator to ECU, and ECU sends impulse electronic signal to electronic throttle valve according to torque requirement information; the motor is running and drive throttle valve to its opening required degrees; this throttle valve can stay at one fixed position or change to another position upon required to meet the

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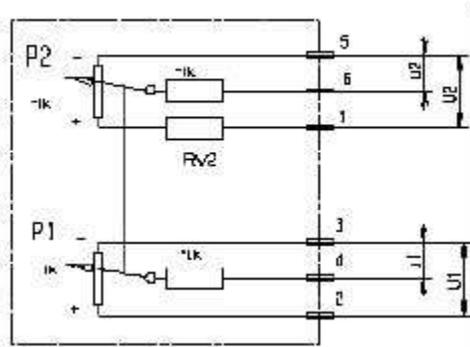


Chart 3-25 Circuit Diagram of Accelerator

Requirement of the engine working conditions according to the impulse signal frequency and width of impulse.

### 3.14 FAN CONTROL

ECU control the fan according to water temperature of the engine and the requirement signal and control the fan system delay at the fit conditions.

- 1) Conditions for fan running at low speed:
  - a) Engine coolant temperature between 96°C to 102.°C
  - b) There is air conditioner requirement and the air conditioning compressor begins to work.
- 2) Conditions for fan running at high speed:
  - a) Engine coolant temperature sensor broken
  - b) Engine coolant temperature higher than 102.°C
- 3) Conditions of fan continue to work after the engine stops working
  - A) Engine air intake temperature sensor is broken and delay 60 seconds.
  - B) Engine coolant temperature sensor is broken and delay 60 seconds.
  - C) Engine coolant temperature higher than 100.5°C, high speed delay 60

seconds.

D) Temperature of intake air more than  $70.5^{\circ}\text{C}$ , delay 60 seconds.

4) Malfunction diagnose

Short circuits from high relay line to power supply

Short circuits from high-speed relay line to ground

Open circuits of high-speed relay line

Short circuits from low-speed relay to power supply

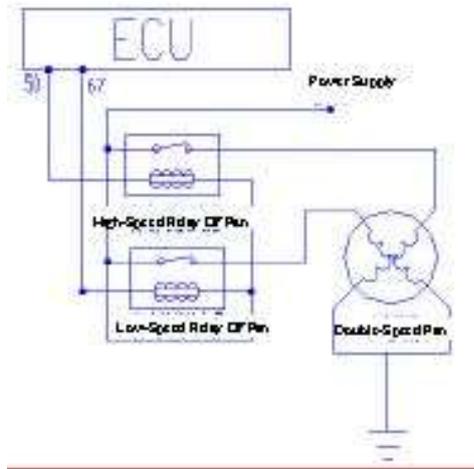


Chart 3-26 Fan control schematic

Short circuits from low-speed relay line to ground

Open circuits of low-speed relay line

Engine coolant temperature sensor failure

Engine intake air temperature sensor failure

### 3.15 AIR CONDITIONER CONTROL

1) Working principle

Switch on the air conditioner and blower; air conditioner pressure is regular; evaporator temperature sensor inspect the right data; requirement signal of air conditioner is sending by these switches to ECU, and ECU controls air conditioning relay attracting and provide rotating speed signal to step motor and open the electronic fan and air conditioning chart to work.

2) Air conditioner control strategy

a) The air condition can be switched on after 5 seconds of the engine starts.

b) Cut off the air conditioner when temperature of intake air higher than  $140.3^{\circ}\text{C}$ .

c) Cut off air conditioner when the coolant temperature higher than  $114.8^{\circ}\text{C}$ ; resume the air conditioning control after its lower than  $11.8^{\circ}\text{C}$ .

$^{\circ}\text{C}$

d) Cut off air conditioner when the engine speed is higher than 6520rpm or lower than 520rpm.

e) Cut off air conditioner when the pressure inside of air conditioner high pressure pipe is higher than 20bar and resume the control when the pressure

is lower than 9.5bar.

f) Cut off air conditioner when the evaporator temperature is lower than 1.5°C; and resume the control when it is higher than 4.5°C.

g) Cut off air conditioner when the system pressure is lower than 8.04V; consume the control when it is higher than 10.01V.

### 3) Malfunction diagnosis

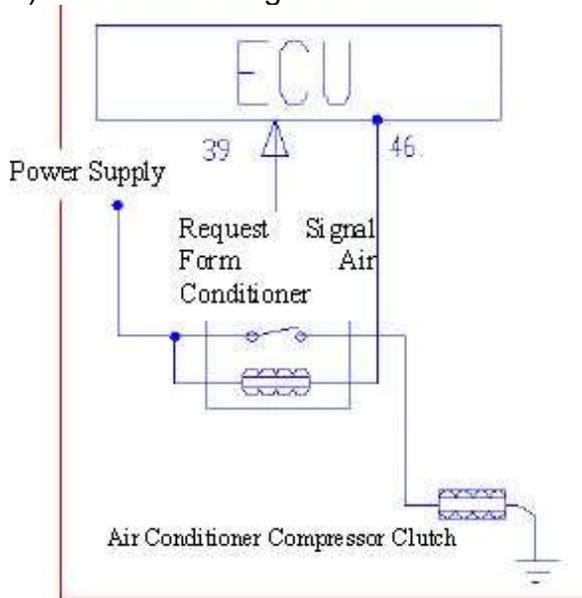


Chart 3-27 Air conditioner control schematic

Blower circuit malfunction (fuse is burnt, relay circuit is open circuit or short circuit) Irregular pressure of air conditioner (much higher of the high voltage or the much lower of the low voltage) Malfunction of evaporator temperature sensor Air conditioner relay circuit is failure (short circuit to ground, short circuit to power supply, open circuit).

## 4 ME7 SYSTEM TEST AND REPAIR ACCORDING TO TDC

Explanation:

1. When it is confirmed that malfunction is steady we can carry out the test and repair as below, otherwise this will cause wrong diagnosis.
2. There is multimeter mentioned below, it is referred to digital multimeter; prohibit to use finger multimeter check the EFI system.
3. Check and repair the vehicle with anti theft system please re-program the replaced ECU when there is the occasion of changing the ECU at "flow up steps".
4. In this items when the TDC of P0171 、 P0172 、 P0335 、 P0336 、 P1651 existing, the engine trouble light will not light on.
5. If it shows much lower of the voltage in some circuit in DTC explanation, it refers to perhaps there is ground short circuit inside of this circuit; If it shows much higher of the voltage in some circuit in DTC explanation, it refers to perhaps there is power supply short circuit inside of this circuit; If it shows circuit failure in DTC explanation, it refers to perhaps there is open circuit or multi circuit malfunction inside of this circuit.

Diagnosis help:

1. DTC cannot be deleted; it is steady failure; if it is occasional failure, check if it is because of the loosening of cable joint.
2. Check according to the above steps and find nothing wrong;
3. During check and repair pay attention that the influence of vehicle maintenance, cylinder pressure and mechanical ignition timing to the system;
4. Change ECU and test it. If the DTC can be deleted, the malfunction is inside of ECU; if the DTC cannot be deleted, change back to the original ECU and check it again according to above items.

#### 4.1 ENGINE DTC (DIAGNOSTIC TROUBLE CODE) LIST

DTC	Definition	DTC	Definition
P0107	Much lower voltage of the air intake pressure sensor	P0340	Phase sensor signal failure
P0108	Much higher voltage of the air intake pressure sensor	P0342	Much lower voltage of the phase sensor
P0112	Indicated temperature is much lower of the air intake temperature sensor	P0343	Much higher voltage of the phase sensor
P0113	Temperature is much higher indicated by the air intake temperature sensor	P0443	Canister control valve drive grade control circuit failure
P0117	Temperature is much lower indicated by engine coolant temperature sensor	P0444	Much lower voltage of canister control valve drive grade control circuit
P0118	Temperature is much higher indicated by engine coolant temperature sensor	P0445	Much higher voltage of canister control valve drive grade control circuit
P0122	The circuit voltage of throttle position sensor is much lower	P0480	Air conditioner condenser cooling fan relay control circuit failure

P0123	The circuit voltage of throttle position sensor is much higher	P0500	Unreasonable failure of speed signal
P0130	Unreasonable failure of the upstream oxygen sensor signal	P0506	Rotating speed of idle speed is lower than target idle speed
P0132	Much higher voltage of upstream oxygen sensor	P0507	Rotating speed of idle speed is higher than target idle speed
P0134	Signal failure of upstream oxygen sensor	P0508	Idle speed regulator control circuit voltage is too low
P0135	Heating circuit failure of upstream oxygen sensor	P0509	Idle speed regulator control circuit voltage is too high
P0171	Closed loop air fuel ratio control self adapting exceeds its maximum limit	P0511	Idle speed regulator control circuit failure
P0172	Closed loop air fuel ratio control self adapting exceeds its minimum limit	P0560	System voltage signal unreasonable
P0201	The 1st cylinder injector circuit failure	P0562	System voltage is too low
P0202	The 2nd cylinder injector circuit failure	P0563	System voltage is too high
P0203	The 3rd cylinder injector circuit failure	P0601	ECU testing code failure
P0204	The 4th cylinder injector circuit failure	P0602	ECU diagnosis data ID code failure
P0230	Fuel pump control circuit failure	P0645	Air conditioner compressor relay control circuit failure
P0325	Knock sensor circuit failure	P0646	Much lower voltage of air conditioner

			compressor relay control circuit
P0335	Crank shaft position sensor signal failure	P0647	Much higher voltage of air conditioner compressor relay control circuit
P0336	Crank shaft position sensor signal	P1651	Trouble light control circuit failure

**DIAGNOSIS FLOW WHEN THERE IS DIFFERENT DTC P0107** Much lower

voltage of the air intake pressure sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Observe "air intake pressure" item in data flow, if it is about 101kpa (specific data is correlated to that time air pressure).	Yes	To step No. 5
		No	Next steps
3	Take off the joint of cable air intake pressure sensor, check the voltage between pin No. 3 and pin No. 1 by multimeter and look if it is around 5V.	Yes	To step No. 5
		No	Next step
4	Check if it is short circuit to ground between ECU pin No. 17, No. 33, No. 37 and sensor connector No.1, No.3 and No. 4.	Yes	Repair or replace cable
		No	Next step
5	Start the engine at idle speed. Step on the accelerator slowly approach to open	Yes	Diagnosis help

	completely and observe the value changes of diagnostic tester “air intake pressure”, the changes should be not big; step on the accelerator quickly to complete open, the displayed value should be reach up to 90kpa instantaneous.	No	Replace the sensor
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**DTC: P0108** Much higher voltage of the air intake pressure sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”		Next step
2	Observe “air intake pressure” item in data flow, if it is about 101kpa(specific data is correlated to that time air pressure)	Yes	To step No. 5
		No	Next steps
3	Take off the joint of cable air intake pressure sensor, Check the voltage between pin No. 3 and pin No. 1 by multimeter and look if it is around 5V.	Yes	To step No. 5
		No	Next step
4	Check if it is open circuit or short circuit to power supply between ECU pin No. 17, No. 33, No. 37 and sensor connector No.1, No.3 and No. 4.	Yes	Repair or replace cable
		No	Next step
	Start the engine at idle speed. Step on the accelerator	Yes	Diagnosis help

5	slowly approach to open completely and observe the value changes of diagnostic tester “air intake pressure”, the changes should be not big; step on the accelerator quickly to complete open, the displayed value should be reach up to 90kpa instantaneous.	No	Replace the sensor
---	--	----	--------------------

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”		Next step
2	Observe “air intake temperature” item in data flow, if it is same temperature with air intake pipe(specific data is correlated to the engine temperature at that time) Notice: if the value is -40°C there is perhaps open circuit failure in the circuit.	Yes	To step No. 5
		No	Next step
3	Take off the joint of cable air intake temperature sensor, check the resistance values using multimeter between sensor connector No. 1 and No. 2 and check if it is corresponding to its temperature (please reference the related section of this service manual)	Yes	Next step
		No	Replace sensor
4	Take off the joint of cable air intake temperature sensor, check the voltage	Yes	To step 5
		No	Next step

	between pin No.1 and pin No.2 by multimeter and look if it is around 5V.		
5	Check if it is open circuit or short circuit to power supply between ECU pin No. 17, No. 40 and sensor connector No.1, No.2	Yes	Repair or replace cable
		No	Next step
6	Start the engine at idle speed. Observe the value changes Of diagnostic tester "air intake temperature", the value should increase with the increase of the engine intake air.	Yes	Diagnosis help
		No	Replace the sensor

**DTC: P0113** Temperature is much higher indicated by the air intake temperature sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Observe "air intake temperature" item in data flow, if it is same temperature with air intake pipe(specific data is correlated to the engine temperature at that time) Notice: if the value always is -40°C there is perhaps open circuit failure in the circuit.	Yes	To step No. 5
		No	Next step
	Take off the joint of	Yes	Next step

3	cable air intake temperature sensor, Check the resistance values using multimeter between sensor connector No. 1 and No. 2 and check if it is corresponding to its temperature (please reference the related section of this service manual).		
		No	Replace sensor
4	Take off the joint of cable air intake temperature sensor, Check the voltage between pin No.1 and pin No.2 by multimeter and look if it is around 5V.	Yes	To step 5
		No	Next step
5	Check if it is short circuit to ground between ECU pin No. 17, No. 40 and sensor connector No.1, No.2	Yes	Repair or replace cable
		No	Next step
6	Start the engine at idle speed. Observe the value changes of diagnostic tester “air intake temperature”, the value should increase with the increase of the engine intake air.	Yes	Diagnosis help
		No	Replace the sensor

**DTC: P0117** Temperature is much lower indicated by engine coolant temperature sensor.

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Observe "coolant temperature" item in data flow, if It is same temperature with engine temperature (specific data is correlated to the engine temperature at that time). Notice: if the value always is -40°C there is perhaps open circuit failure in the circuit.	Yes	To step 6
		No	Next
3	Take off the joint of coolant temperature sensor on The cable, check the resistance values using multimeter between sensor connector No. 1 and No. 2 and check if it is corresponding to its temperature (please reference the related section of this service manual).	Yes	Next step
		No	Replace sensor
4	Take off the joint of coolant temperature sensor on The cable, check the voltage between pin No.1 and pin No.2 by multimeter and observe if it is around 5V.	Yes	To step 6
		No	Next step
5	Check if it is open circuit or short circuit to power supply between ECU pin No.39, No. 35 and sensor	Yes	Repair or replace cable

	Connector No.1, No.2.	No	Next step
6	Start the engine at idle speed. Observe the value changes of diagnostic tester “coolant temperature”, the value should increase with the increase of the engine coolant temperature.	Yes	Diagnosis help
		No	Replace sensor

**DTC: P0118** Temperature is much higher indicated by engine coolant temperature sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”.		Next step
2	Observe “coolant temperature” item in data flow, if	Yes	To step 6
	It is same temperature with engine temperature (specific data is correlated to the engine temperature at that time). Notice: if the value always is -40°C there is perhaps open circuit failure in the circuit.	No	Next
3	Take off the joint of coolant temperature sensor on the cable, check the resistance values using multimeter between the sensor connector No. 1 and the No. 2 and check if it is corresponding to its temperature (please reference the related section of this service manual).	Yes	Next step
		No	Replace sensor
	Take off the joint of coolant temperature sensor on	Yes	To step 6

4	The cable, check the voltage between pin No.1 and pin No.2 by multimeter and observe if it is around 5V.	No	Next step
5	Check if it is short circuit to ground between ECU Pin No.39, No. 35 and sensor connector No.1, No.2.	Yes	Repair or replace cable
		No	Next step
6	Start the engine at idle speed. Observe the value Changes of diagnostic tester "coolant temperature", the value should increase with the increase of the engine coolant temperature.	Yes	Diagnosis help
		No	Replace sensor

**DTC: P0122** Indicated temperature is much lower of the air intake temperature sensor.

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Observe "throttle valve absolute opening" item in data flow, check the value if it is between 4% and 10% (specific data is correlated to the vehicle type).	Yes	Next step
		No	To step No. 5
3	Step on the accelerator slowly to complete opening and observe "throttle valve absolute opening" item in data flow, check if the value is increased to around 85-90% with the opening of the throttle valve (specific data is correlated to the vehicle type).	Yes	Next step
		No	To step No. 5

4	Repeat step 3 and observe “throttle valve absolute opening” item in data flow, and check if there is jump during the changes.	Yes	Replace the sensor
		No	Next step
5	Take off the joint of throttle valve positioning sensor on the cable, check if there is short circuit to ground between pin No.17, No.32, No.16 of ECU and pin No.1, No.2, No.3.	Yes	Repair or replace cable
		No	Next step
6	Check the voltage between pin No.1 and pin No.2 by	Yes	Replace sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”		Next step
2	Observe “throttle valve absolute opening” item in data flow, check the value if it is between 4% and 10% (specific data is correlated to the vehicle type).	Yes	Next step
		No	To step No. 5
3	Step on the accelerator slowly to complete opening and observe “throttle valve absolute opening” item in data flow, check if the value is increased to around 85-90% with the opening of the throttle valve (specific data is correlated to the vehicle type).	Yes	Next step
		No	To step No. 5

4	Repeat step 3 and observe “throttle valve absolute opening” item in data flow, and check if there is jump during the changes.	Yes	Replace the sensor
		No	Next step
5	Take off the joint of throttle valve positioning sensor on the cable, check if there is open circuit or short circuit to power supply between pin No.17, No.32, No.16 of ECU and pin No.1, No.2, No.3 of sensor	Yes	Repair or replace cable
		No	Next step
6	Check the voltage between pin No.1 and pin No.2 by multimeter and observe if it is around 5V.	Yes	Replace sensor
		No	Diagnosis help

**DTC: P0130** Unreasonable failure of the upstream oxygen sensor signal  
(Notice: below diagnosis process is fit for those without P0135 at the same time; if there is P0135 failure, please deal with P0135 failure at first and then check as below.)

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “ON”		Next step
2	Start the engine and leave it at idle speed until its coolant reaches to the normal value. Observe the value changes of “oxygen sensor voltage” item on diagnostic meter, the displayed value should change rapidly from 100mV-900mV.	Yes	Diagnosis help
		No	Next step
3	Check if there is short circuit to ground between pin No.36, No.18, of ECU	Yes	Repair or change cable

	and pin A (opposite to oxygen sensor gray connecting line), B (opposite to oxygen sensor black connecting line).	No	Next step
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**DTC: P0132** Much higher voltage of upstream oxygen sensor  
(Notice: below diagnosis process is fit for those without P0135 at the same time; if there is P0135 failure, please deal with P0135 failure at first and then check as below.)

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No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Start the engine and leave it at idle speed until its coolant reaches to the normal value. Observe the value changes of "oxygen sensor voltage" item on diagnostic meter, the displayed value should change rapidly from 100mV-900mV.	Yes	Diagnosis help
		No	Next step
3	Check if there is short circuit to power supply between pin No.36, No.18, of ECU and pin A (opposite to oxygen sensor gray connecting line), B (opposite to oxygen sensor black connecting line).	Yes	Repair or change cable
		No	Diagnosis help
4	A, check if the exhaust system is jammed B, check if the injector is leaking C, check if the fuel pressure is over higher D, check if the	Yes	Check and repair according to diagnosis

	valve clearance is over smaller etc.	No	Diagnosis help
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**DTC: P0134** Signal failure of upstream oxygen sensor

(Notice: below diagnosis process is fit for those without P0135 at the same time; if there is P0135 failure, please deal with P0135 failure at first and then check as below.)

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value. Observe the value changes of "oxygen sensor voltage" item on diagnostic meter, the displayed value should change rapidly from 100mV-900mV.	Yes	Diagnosis help
		No	Next step
3	Check if there is open circuit between pin No.36, No.18, of ECU and pin A (opposite to oxygen sensor gray connecting line), B (opposite to oxygen sensor black connecting line) of sensor joint.	Yes	Repair or change cable
		No	Diagnosis help

**DTC: P0135** Heating circuit failure of upstream oxygen sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step

2	Take off the oxygen sensor joint on the cable and Check the voltage between the pins of C (opposite to oxygen sensor white connecting line) and D (opposite to oxygen sensor white connecting line) by multimeter, and observe if it is about 12V.	Yes	Next step
		No	To step No.4
3	Check the resistance value between oxygen sensor connectors C (white) and D (white) using multimeter, and observe if it is 2-5Ω when it is 20°C.	Yes	Next step
		No	Change sensor
4	Check the fuse inside of oxygen sensor heating circuit and observe if it is blow.	Yes	Change fuse
			Next step
5	Check if there is open circuit or short circuit to power supply between ECU pin No.1, main relay sensor No.87 and pin C (opposite to oxygen sensor white connecting line), D (opposite to oxygen sensor white connecting line) of sensor joint.	Yes	Repair or change cable
		No	Diagnosis help

**DTC: P0171** Closed loop air fuel ratio control self adapting exceeds its maximum limit

(Notice: below diagnosis flow is fit for when air intake pressure sensor failure, canister control valve failure and oxygen sensor failure are not appeared at the same time; if there are failures existing at the same time please deal with other failures at first and then do as below.)

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step

2	Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value. Observe the value changes of “oxygen sensor voltage” item on diagnostic meter, and the displayed value keeps around the value of 100mV at some working conditions.	Yes	Next step
		No	Diagnosis help
3	Connect the fuel pressure meter (connection position is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check the fuel pressure at idle speed conditions if it is around 260kpa; take off the vacuum pipe on fuel pressure regulator, check the pressure and observe if it is around 300kpa.	Yes	Repair or replace the cable
		No	Next step
4	Check if there is short circuit to ground between ECU pin No.36, No.18 and pin A (opposite to oxygen sensor gray connecting line), pin B (opposite to oxygen sensor black connecting line) of sensor joint.	Yes	Repair or replace cable
		No	Next step
5	A, check if there is a heavy leaking in air intake system B, check if the injector is jammed	Yes	Repair according to diagnosis data
	C, check if the clearance of spark plug is too big D, check if the sub live wire resistance is too big E, check if the valve clearance is too big etc.	No	Diagnosis help

**DTC: P0172** Closed loop air fuel ratio control self adapting exceeds its minimum

limit

(Notice: below diagnosis flow is fit for when air intake pressure sensor failure, canister control valve failure and oxygen sensor failure are not appeared at the same time; if there are failures existing at the same time please deal with other failures at first and then do as below.)

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Start the engine and leave it at idle speed until its coolant temperature reaches to the normal value. Observe the value changes of "oxygen sensor voltage" item on diagnostic meter, and the displayed value keeps around the value of 900mV at some working conditions.	Yes	Next step
		No	Diagnosis help
3	Connect the fuel pressure meter (connection position is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check the fuel pressure at idle speed conditions if it is around 260kpa; take off the vacuum pipe on fuel pressure regulator, check the pressure and observe if it is around 300kpa.	Yes	Repair or replace the cable
		No	Check and repair fuel system
4	Check if there is short circuit to power supply between ECU pin No.36, No.18 and pin A (opposite to oxygen sensor gray connecting line), pin B (opposite to oxygen sensor black connecting line) of sensor joint.	Yes	Repair or replace cable
		No	Next step

5	A, check if the injector is leaking B, check if the exhaust pipe is jammed C, check if the valve clearance is too small etc.	Yes	Repair according to diagnosis data
		No	Diagnosis help

**DTC: P0201** the 1<sup>st</sup> cylinder injector circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the 1 <sup>st</sup> cylinder injector joint from the cable, Check the voltage value between this joint pin No.1 and the power cathode by multimeter and observe if it is 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between the 1 <sup>st</sup> injector joint pin No.1 and main relay.	Yes	Repair or replace the cable
		No	Next step
4	Check the resistance value by multimeter between 1 <sup>st</sup> cylinder injector pin No.1 and No.2, and observe if it is 11-13Ω when it is 20°C.	Yes	Next step
		No	Change injector
5	Check the voltage value by multimeter between 1 <sup>st</sup> cylinder injector pin No 2	Yes	Repair according to

	and power supply cathode		diagnosis data
	cylinder injector pin No.2 and power supply cathode, and observe if it is around 3.7V.	No	Diagnosis help
6	Check if there is open circuit or short circuit to ground between 1 <sup>st</sup> cylinder injector joint pin No.2 and the ECU pin No.27.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC: P0202** The 2<sup>nd</sup> cylinder injector circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the 2 <sup>nd</sup> cylinder injector joint from the cable, Check the voltage value between this joint pin No.1 and the power cathode by multimeter and observe if it is 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between the 2 <sup>nd</sup> injector joint pin No.1 and main relay.	Yes	Repair or replace the cable
		No	Next step
4	Check the resistance value by multimeter between 2 <sup>nd</sup> cylinder injector pin No.1 and No.2, and observe if it is 11-13Ω when it is 20°C.	Yes	Next
		No	Change injector
5	Check the voltage value by multimeter between 2 <sup>nd</sup> cylinder injector pin No.2 and power supply cathode, and observe if it is around 3.7V.	Yes	Diagnosis help
		No	Next step

6	Check if there is open circuit or short circuit to ground between 2 <sup>nd</sup> cylinder injector joint pin No.2 and the ECU pin No.6.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC: P0203** the 3<sup>rd</sup> cylinder injector circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the 3 <sup>rd</sup> cylinder injector joint from the cable, Check the voltage value between this joint pin No.1 and the power cathode by multimeter and observe if it is 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between the 3 <sup>rd</sup> injector joint pin No.1 and main relay.	Yes	Repair or replace the cable
		No	Next step
4	Check the resistance value by multimeter between 3 <sup>rd</sup> cylinder injector pin No.1 and No.2, and observe if it is 11-13Ω when it is 20°C.	Yes	Next step
		No	Change injector
5	Check the voltage value by multimeter between 3 <sup>rd</sup> cylinder injector pin No.2 and power supply cathode, and observe if it is around 3.7V.	Yes	Diagnosis help
		No	Next step
6	Check if there is open circuit or short circuit to ground between 3 <sup>rd</sup> cylinder injector joint pin No.2 and the ECU pin No.7.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC: P0204** The 4<sup>th</sup> cylinder injector circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the 4 <sup>th</sup> cylinder injector joint from the cable, Check the voltage value between this joint pin No.1 and the power cathode by multimeter and observe if it is 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between the 4 <sup>th</sup> injector joint pin No.1 and main relay.	Yes	Repair or replace the cable
		No	Next step
4	Check the resistance value by multimeter between 4 <sup>th</sup> cylinder injector pin No.1 and No.2, and observe if it is 11-13Ω when it is 20°C.	Yes	Next step
		No	Replace injector
5	Check the voltage value by multimeter between 4 <sup>th</sup> cylinder injector pin No.2 and power supply cathode, and observe if it is around 3.7V.	Yes	Diagnosis help
		No	Next step
6	Check if there is open circuit or short circuit to ground between 4 <sup>th</sup> cylinder injector joint pin No.2 and the ECU pin No.47.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC: P0230 Fuel pump control circuit failure**

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF"		Next step
	Take off the fuel pump relay and put ignition	Yes	To step No.4

2	switch to “ON”; check the voltage separately between fuel pump relay power supply ends -that is relay pin No. 30 and No.86 and power supply cathode, and observe if it is around 12V.	No	Next step
		Yes	Repair or replace the cable
3	Check if there is open circuit or short circuit to ground of the relay power supply ends circuit.	No	To step No.2
		Yes	Replace fuel pump relay
4	Check the voltage by multimeter between fuel pump relay control ends that is relay pin No. 85 and power supply cathode and observe if it is around 3.7V.	No	Next step
		Yes	Repair or replace cable
5	Check if there is open circuit or short circuit to ground or to power supply between relay control ends that is relay pin No.85 and ECU pin No.69.	No	Diagnosis help

**DTC: P0325** Knock sensor circuit failure

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No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to “OFF”		Next step
2	Take off the knock sensor joint from the cable; check The resistance value by multimeter between knock sensor connector No.1and No.2 and observe if it is 1MΩ.	Yes	Next step
		No	Change sensor
3	Check if there is open circuit or short circuit to ground or to power	Yes	Repair or replace the cable

	supply between circuit of knock sensor joint No.1, No.2 and ECU pin No.19, No. 20	No	To step No.2
4	Replace the knock sensor according to the regulation; Try running the vehicle and make the engine speed exceed 2200rpm. Check if the DTC P0325 will appear again.	Yes	Diagnosis help
		No	Check if it is a occasional fault

**DTC: P0335** Crank shaft position sensor signal failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF"		Next step
2	Take off the speed sensor joint from the cable; check the resistance value by multimeter between speed sensor connector No.2and No.3 and observe if it is around 770-950MΩwhen it is 20℃	Yes	Next step
		No	Replace sensor
3	Check if there is open circuit or short circuit to ground or to power supply between circuit of speed sensor joint No.2, No.3 and ECU pin No.34, No. 15	Yes	Repair or replace the cable
		No	Next step
		Yes	Diagnosis help

4	Check the flywheel signal disc if it is in good conditions.	No	Replace signal disc
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**DTC: P0336** Crank shaft position sensor signal unreasonable failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF"		Next step
2	Take off the speed sensor joint from the cable; check the resistance value by multimeter between speed sensor connector No.2 and No.3 and observe if it is around 770-950MΩ when it is 20°C	Yes	Next step
		No	Replace sensor
3	Check if there is open circuit or short circuit to ground or to power supply between circuit of speed sensor joint pin No.2, No.3 and ECU pin No.34, No. 15	Yes	Repair or replace the cable
		No	Next step
4	Check the flywheel signal disc if it is in good conditions.	Yes	Diagnosis help
		No	Replace signal disc

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the phase sensor joint from the cable; check the voltage value by multimeter between phase sensor joint pin No.3 and No.1; and observe if it is around 12V.	Yes	To step No.4
		No	Next step

3	Check if there is open circuit or short circuit to ground between circuit of phase sensor joint pin No.3 and main relay pin No.87; check if there is bad contact of phase sensor connector No.1.	Yes	Repair or replace the cable
		No	Next step
4	Check the voltage if it is around 9.9V between phase sensor joint pin No.2 and power supply cathode.	Yes	To step 6
		No	Next step
5	Check if there is open circuit or short circuit to power supply or to ground between phase sensor joint pin No.2 and ECU pin No.79.	Yes	Repair or replace cable
		No	Next step
6	Check the camshaft signal disc if it is in good conditions.	Yes	Diagnosis help
		No	Replace signal disc

**DTC: P0342** Much lower voltage of the phase sensor

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the phase sensor joint from the cable; check the voltage value by multimeter between phase sensor joint pin No.3 and No.1; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between circuit of phase sensor joint pin No.3 and main relay pin No.87; check if there is bad contact of phase sensor connector No.1.	Yes	Repair or replace the cable
		No	Next step
4	Check the voltage if it is	Yes	To step 6

	around 9.9V between phase sensor joint pin No.2 and power supply cathode.	No	Next step
5	Check if there is open circuit or short circuit to power supply or to ground between the circuit of phase sensor joint pin No.2 and ECU pin No.79.	Yes	Repair or replace cable
		No	Next step
6	Check the camshaft signal disc if it is in good conditions.	Yes	Diagnosis help
		No	Replace signal disc

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the phase sensor joint from the cable; check the voltage value by multimeter between phase sensor joint pin No.3 and No.1; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground between circuit of phase sensor joint pin No.3 and main relay pin No.87; check if there is bad contact of phase sensor connector No.1.	Yes	Repair or replace the cable
		No	Next step
4	Check the voltage if it is around 9.9V between phase sensor joint pin No.2 and power supply cathode.	Yes	To step 6
		No	Next step
5	Check if there is open circuit or short circuit to power supply or to ground between the circuit of phase sensor	Yes	Repair or replace cable

	joint pin No.2 and ECU pin No.79.	No	Next step
6	Check the camshaft signal disc if it is in good conditions.	Yes	Diagnosis help
		No	Replace signal disc

**DTC: P0443** Canister control valve drive grade control circuit failure

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the canister control valve joint from the cable; check the voltage value by multimeter between this joint pin No.1 and power supply cathode; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the canister control valve power supply ends circuit.	Yes	Repair or replace the cable
		No	To step No.2
4	Check the resistance value if it is around 22-30Ω when it is 20°C between canister control valve pin No.1 and pin No.2.	Yes	Next step
		No	Replace the valve
5	Check the voltage if it is around 3.7V between canister control valve joint pin No.1 and power supply cathode.	Yes	Diagnosis help
		No	Next step
6	Check if there is open circuit between the circuit of canister joint pin No.2 and ECU pin No. 46.	Yes	Repair or replace cable
		No	Diagnosis help

No.	Operating steps	Result	Follow up steps
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1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
2	Take off the canister control valve joint from the cable; check the voltage value by multimeter between this joint pin No.1 and power supply cathode; and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the canister control valve power supply ends circuit.	Yes	Repair or replace the cable
		No	To step No.2
4	Check the resistance value if it is around 22-30Ω when it is 20°C between canister control valve pin No.1 and pin No.2.	Yes	Next step
		No	Replace the valve
5	Check the voltage by the multimeter if it is around 3.7V between canister control valve joint pin No.1 and power supply cathode.	Yes	Diagnosis help
		No	Next step
6	Check if there is short circuit to ground between the circuit of canister joint pin No.2 and ECU pin No. 46.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC: P0445** Much higher voltage of canister control valve drives grade control circuit

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON"		Next step
	Take off the canister control valve joint from	Yes	To step No.4

2	the cable; check the voltage value by multimeter between this joint pin No.1 and power supply cathode; and observe if it is around 12V.		
		No	Next step
3	Check if there is open circuit or short circuit to ground of the canister control valve power supply ends circuit.	Yes	Repair or replace the cable
		No	To step No.2
4	Check the resistance value if it is around 22-30Ω when it is 20°C between canister control valve pin No.1 and pin No.2.	Yes	Next step
		No	Replace the valve
5	Check the voltage by the multimeter if it is around 3.7V between canister control valve joint pin No.1 and power supply cathode.	Yes	Diagnosis help
		No	Next step
6	Check if there is short circuit to power supply between the circuit of canister joint pin No.2 and ECU pin No. 46.	Yes	Repair or replace cable
		No	Diagnosis help

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF"		Next step
2	Take off the air conditioner condenser cooling fan relay; put the ignition switch to "ON" position, and check the voltage value by multimeter between this relay power supply end that is relay pin No.30, No.85 and power supply cathode if it is around	Yes	To step No.4
		No	Next step

	12V.		
3	Check if there is open circuit or short circuit to ground of the air conditioner cooling fan relay power supply end circuit.	Yes	Repair or replace the cable
		No	To step No.2
4	Check the voltage by the multimeter if it is around 3.7V between air conditioner condenser cooling fan relay control ends that is relay pin No.86 and power supply cathode.	Yes	Replace relay
		No	Next step
5	Check if there is open circuit or short circuit to power supply or to ground between the circuit of relay control end pin No.86 and ECU pin No. 50.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC: P0500 Unreasonable failure of speed signal**

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF".		Next step
2	If it is a vehicle with ABS, please check if there is ABS DTC.	Yes	Check and repair ABS system
		No	Next step
3	Check if the speedometer finger works normally.	Yes	Next step
		No	Check the speedometer line
4	Check if the speed sensor works normally.	Yes	Next step
		No	Replace speed sensor

5	Check if there is open circuit or short circuit to power supply or to ground between the circuit of speed sensor and ECU pin No. 59.	Yes	Repair or replace cable
		No	Diagnosis help

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF".		Next step
2	Check if the throttle valve adjusting screw, accelerator cable and throttle valve working in good conditions.	Yes	Next step
		No	Carry out the necessary repair and maintenance
3	Check if the idle speed regulator works in good conditions.	Yes	Next step
		No	Carry out the necessary repair and maintenance
4	E, check if the pressure of the fuel supplying system is too low F, check if the injector is jammed G, check if the exhaust system is not straightway	Yes	Next step
		No	Replace speed sensor

**DTC: P0507** Rotating speed of idle speed is higher than target idle speed

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF"		Next step
2	Check if the throttle valve adjusting screw, accelerator cable and throttle valve working in	Yes	Next step
		No	Carry out the necessary repair and maintenance

	good conditions.		
3	Check if the idle speed regulator works in good conditions.	Yes	Next step
		No	Carry out the necessary repair and maintenance
4	A, check if the system is leaking; B, check if the injector is leaking; C, check if the pressure of fuel supplying system is too high	Yes	Carry out the necessary repair and maintenance
		No	Diagnosis help

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Take off the idle regulator joint and Check the resistance value between idle speed regulator pin A and pin D, pin B and pin C if it is around $53 \pm 5.3 \Omega$ when it is 20°C.	Yes	Next step
		No	Replace step motor
3	Check if there is short circuit to ground between the circuits of idle speed regulator joint pin A, B, C, D and ECU pin No. 65, No.66, No.67. No.64.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC:** P0509 Idle speed regulator control circuit voltage is too high

No.	Operating steps	Result	Follow up steps
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1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Take off the idle regulator joint and check the resistance value by multimeter separately between idle speed regulator pin A and pin D, pin B and pin C if it is around $53 \pm 5.3 \Omega$ when it is $20^{\circ}\text{C}$ .	Yes	Next step
		No	Replace step motor
3	Check using multimeter separately if there is short circuit to power supply between the circuits of idle speed regulator joint pin A, B, C, D and ECU pin No. 65, No.66, No.67. No.64.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC: P0511 Idle speed regulator control circuit failure**

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Take off the idle regulator joint and check the resistance value by multimeter separately between idle speed regulator pin A and pin D, pin B and pin C if it is around $53 \pm 5.3 \Omega$ when it is $20^{\circ}\text{C}$ .	Yes	Next step
		No	Replace step motor
3	Check using multimeter separately if there is open circuit between the circuits of idle speed regulator joint pin A, B, C, D and ECU pin No. 65, No.66, No.67. No.64.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC: P0560 System voltage signal unreasonable**

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to		Next step

	"OFF".		
2	Check the accumulator voltage by multimeter if it is around 12V.	Yes	Next step
		No	Replace accumulator
3	Check if there is open circuit or short circuit to ground between the circuits of ECU pin No.44, No.45, No.63 and main relay pin No.87.	Yes	Repair or replace cable
		No	Next step
4	Start the engine and check if the entire generator recharging voltage is around 9-16V at the different engine speed.	Yes	Next step
		No	Replace generator
5	Check the engine cable harness contact position if it is in good conditions.	Yes	Diagnosis help
		No	Repair or replace cable

**DTC: P0562 System voltage is too low**

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF".		Next step
2	Check the accumulator voltage by the multimeter and observe if it is around 12V.	Yes	Next step
		No	Replace accumulator
3	Check if the resistance is over big between the circuits of ECU pin No.44, No.45, No.63 and main relay pin No.87.	Yes	Repair or replace cable
		No	Next step
		Yes	Next step

4	Start the engine and check if the entire generator recharging voltage is around 9-16V at the different engine speed.	No	Replace generator
5	Check the engine cable harness contact position if it is in good conditions.	Yes	Diagnosis help
		No	Repair or replace cable

**DTC: P0563 System voltage is too high**

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF".		Next step
2	Check the accumulator voltage by the multimeter and observe if it is around 12V.	Yes	Next step
		No	Replace accumulator
3	Start the engine and check if the entire generator recharging voltage is around 9-16V at the different engine speed.	Yes	Next step
		No	Replace generator
4	Check the engine cable harness contact position if it is in good conditions.	Yes	Diagnosis help
		No	Repair or replace cable

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Clean up the DTC and check the failure once again if it is a steady	Yes	Next step
		No	System if correct

	failure.		
3	Replace ECU	Finish	

**DTC: P0602 ECU diagnosis data ID code failure**

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Clean up the DTC and check the failure once again if it is a steady failure.	Yes	Next step
		No	System if correct
3	Replace ECU	Finish	

**DTC: P0645 Air conditioner compressor relay control circuit failure**

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF".		Next step
2	Take off air conditioner compressor relay; put ignition switch to "ON"; check the voltage value between relay power supply ends that relay pin No.30, No.85 and power cathode and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the relay power supplying ends circuit.	Yes	Repair or replace cable
		No	To step No.2
4	Check the voltage value by the multimeter between air conditioner	Yes	Replace relay

	compressor relay control ends that is relay pin No.86 and power cathode and observe if it is around 3.7V.		
		No	Next step
5	Check if there is open circuit between the circuit of air conditioner compressor relay control ends that is relay pin No.86 and ECU pin No.70.	Yes	Repair or replace cable
		No	Diagnosis help

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF".		Next step
2	Take off air conditioner compressor relay; put ignition switch to "ON"; check the voltage value between relay power supply ends that relay pin No.30, No.85 and power cathode and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the relay power supplying ends circuit.	Yes	Repair or replace cable
		No	To step No.2
	Check the voltage value by the multimeter between air	Yes	Replace relay

4	conditioner compressor relay control ends that is relay pin No.86 and power cathode and observe if it is around 3.7V.	No	Next step
5	Check if there is short circuit to ground between the circuit of air conditioner compressor relay control ends that is relay pin No.86 and ECU pin No.70.	Yes	Repair or replace cable
		No	Diagnosis help

**DTC: P0647 Much higher voltage of air conditioner compressor relay control circuit**

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "OFF".		Next step
2	Take off air conditioner compressor relay; put ignition switch to "ON"; check the voltage value between relay power supply ends that relay pin No.30, No.85 and power cathode and observe if it is around 12V.	Yes	To step No.4
		No	Next step
3	Check if there is open circuit or short circuit to ground of the relay power supplying ends circuit.	Yes	Repair or replace cable
		No	To step No.2
4	Check the voltage value by the multimeter between air conditioner compressor relay control ends that is relay pin No.86 and power cathode and observe if it is around 3.7V.	Yes	Replace relay
		No	Next step

5	Check if there is short circuit to power supply between the circuit of air conditioner compressor relay control ends that is relay pin No.86 and ECU pin No.70.	Yes	Repair or replace cable
		No	Diagnosis help

No.	Operating steps	Result	Follow up steps
1	Connect the diagnostic tester and commutator, put the ignition switch to "ON".		Next step
2	Carry out action test to engine trouble light by using diagnostic meter "actuator action test" item; and observe the indicator if it is always at the status of extinguishing or lighting on.	Yes	Next step
		No	System is correct
3	Check if there is open circuit or short circuit to ground of the engine trouble light power supplying circuit.	Yes	Repair or replace cable
		No	Next step
4	Check if there is open circuit or short circuit to power supply or short circuit to ground between the circuit of engine trouble light control ends and ECU pin No. 28.	Yes	Repair or replace cable
		No	Diagnosis help

## 5. TYPICAL FAILURE AND ITS DIAGNOSIS FLOW

### 5.1 EXPLANATION

Carry out the primary inspection before start the diagnosing according to the engine failure phenomenon.

- 1) Make sure the engine trouble light is working properly;
- 2) Make sure that there is no failure information record checked by diagnostic meter;
- 3) Make sure that the failure phenomenon exists according to the

customers' complaints, and confirm the conditions causing the failure.

Then carry out the exterior inspection:

- (1) Check if there is any fuel pipe is leaking;
- (2) Check if the vacuum pipe is broken, kinked up or linked correctly;
- (3) Check if the air intake pipe is jammed, leaking, staved or damaged;
- (4) Check the high voltage line of ignition system if it is broken or aging and if the ignition order is correct;
- (5) Check the cable grounding place if it is clean and fastness;
- (6) Check the sensor and actuator joint if it is loosening or bad contact.

Important notice: if the above phenomenon is appeared, you should repair the above the failure at first otherwise it will influence the later service. Diagnosis help:

- 1 Confirm there is no engine failure record;
- 2 Confirm that the failure exists before the customer complaints;
- 3 Inspect the engine according to the above steps and find nothing wrong;
- 4 During the service please do not ignore the influence from vehicle maintenance, cylinder pressure, mechanical ignition timing and fuel conditions;
- 5 Replace ECU and carry out test. If the failure is deleted, the failure is in ECU; if the failure can not be deleted, replace back to the original ECU and repeat the flow and check and repair it again.

## 5.2 TYPICAL FAILURE DIAGNOSIS FLOW

### 1. The engine does not rotate or rotate slowly when it is started

The normal failure component: 1) accumulator; 2) starting motor; 3) cable or ignition switch; 4) mechanical part of the engine. The general diagnosis flow:

No.	Operating steps	Result	Follow up steps
1	Check the voltage value between the two wiring terminals of the accumulator by multimeter; check if it is around 8-12V when the engine is starting.	Yes	Next step
		No	Replace accumulator
2	Put the ignition switch at start position, checking the anode terminal of starting motor by multimeter and observe the voltage if it is above 8V.	Yes	Next step
		No	Repair or replace cable

3	Disassemble the starting motor and check its working conditions. Check if there is open circuit or jammed by poor lubricating.	Yes	Repair or replace starting motor
		No	Next step
4	If the failure is happened in winter time, check if it is because of the wrong engine lubricant and gearbox oil causes the big resistance of the starting motor.	Yes	Change to correct lubricant
		No	Next step
5	Check the mechanical resistance inside of the engine if it is too big causes the starting motor can not rotate or rotate slowly.	Yes	Repair the engine inside resistance
		No	Repeat the above steps

**2. The engine can draw rotating but can not start successfully when it is started.**

**General failure component:**

- 1) no fuel in fuel tank;**
- 2) fuel pump;**

3) speed sensor;

4) ignition coil;

5) engine mechanical part. **Diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Connect the fuel pressure meter ( connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); starting the engine by starter and check fuel pressure if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
2	Connect EFI diagnostic meter; observe “engine speed” data item and start the engine and check if there is rotation speed signal is output.	Yes	Next step
		No	Repair the sensor cable
3	Pull off one of the cylinder separating line and take off this cylinder injector joint and connect spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine by starter and check if there is blue and	Yes	Next step
		No	Repair the ignition system

	white high pressure fire.		
4	Check the pressure of each engine cylinder; check if there is engine cylinder insufficient pressure.	Yes	Eliminate engine mechanical failure
		No	Next step
5	Check if the power supply to ECU pin No.12, 13, 44, 45, 63 is correct; check if the pin armature of No. 3, 51, 53, 61, 80 are working correctly.	Yes	Diagnosis help
		No	Check the corresponding line

### 3. It is hard to start the heating car.

#### General failure component:

1) water inside of fuel;

2) fuel pump;

3) coolant temperature sensor;

4) fuel pressure regulator vacuum pipe;

5) ignition coil. General diagnostic flow

No.	Operating steps	Result	Follow up steps
	Connect the fuel pressure meter ( connecting point is the	Yes	Next step

1	front end of fuel distributing pipe assembly fuel intake pipe); starting the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	No	Repair the fuel supplying system
2	Pull off one of the cylinder separating line and connect spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine and check if there is blue and white high pressure fire.	Yes	Next step
		No	Repair the ignition system
3	Take off the coolant temperature sensor joint and start the engine; observe if the engine can be started successfully. (or serial connecting a 300Ωresistance at the joint of coolant temperature sensor; observe if we can start the engine)	Yes	Repair circuit or replace sensor
		No	Next step
4	Check if there if loosen or leaking of the fuel pressure regulator vacuum pipe..	Yes	Repair or replace
		No	Next step
5	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Diagnosis help
	Connect EFI system adaptor, turn on the ignition switch;	Yes	Diagnosis help

6	check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.		Check correspond circuit
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#### 4. It's hard to start the cold car.

**General failure component: 1), water in the fuel; 2), fuel pump; 3), coolant temperature sensor; 4), injector; 5), ignition coil; 6), throttle valve and idle speed by pass port; 7), engine mechanical part.**

**General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Connect the fuel pressure meter ( connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
2	Pull off one of the cylinder separating line and connect spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine and check if there is blue and white high pressure fire.	Yes	Next step
		No	Check and repair ignition system
3	Take off the coolant temperature sensor joint and start the engine; observe if the engine can be started successfully. (or serial connecting a 2500Ωresistance at the joint of coolant temperature sensor; observe if we can start the	Yes	Repair circuit or replace sensor
		No	Next step

	engine)		
4	Step on the accelerator slightly and observe if it is easy to be started	Yes	Clean throttle valve and idle speed air port
		No	Next step
5	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Yes	Replace the part
		No	Next step
6	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Next step
7	Check pressure conditions of every cylinder and observe if there is insufficient pressure	Yes	Trouble shoot
		No	Next step
8	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Check correspond circuit

**5. Normal engine speed but hard to start at any time.**

**General failure component:**

- 1), water in fuel;**
- 2), fuel pump;**
- 3), coolant temperature sensor;**
- 4), injector;**

- 5), ignition coil;
  - 6), throttle valve and idle speed by pass port;
  - 7), air intake port;
  - 8), ignition timing;
  - 9) Spark plug;
  - 10), engine mechanical part.
- General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed; check the air intake port if it is leaking.	Yes	Repair the air intake system
		No	Next step
2	Connect the fuel pressure meter ( connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
3	Pull off one of the cylinder separating line and connect spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine and check if there is blue and white high pressure fire.	Yes	Next step
		No	Check and repair ignition system
4	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
5	Take off the coolant temperature sensor joint and start the engine; observe if the engine can be started successfully.	Yes	Repair circuit or replace sensor
		No	Next step
6	Step on the accelerator slightly and observe if it is easy to be started easily.	Yes	Clean throttle valve and idle speed air port
		No	Next step
7	Disassemble the injector, check the injector using the	Yes	Replace the part

	injector special cleaning analysis meter and observe if it is leaking or jammed.	No	Next step
8	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Next step
9	Check pressure conditions of every cylinder and observe if there is insufficient pressure	Yes	Trouble shoot
		No	Next step
10	Check the engine ignition order and ignition timing if it is accord with the regulation.	Yes	Next step
		No	Repair the ignition timing

**6. Regular starts but the idle speed is not steady at any time.**

**General failure component:**

- 1), water in fuel;
- 2), injector;
- 3) spark plug;
- 4) throttle valve and idle speed by pass port;
- 5), air intake port;
- 6), idle speed regulator;
- 7), ignition timing;
- 8) spark plug;
- 9), engine mechanical.

**General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed; check the air intake port if it is leaking.	Yes	Repair the air intake system
		No	Next step
2	Check idle speed regulator if it is partial blocked	Yes	Clean or replace
		No	Next step
3	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
4	Check the throttle valve and idle speed by pass if there is carbon deposition.	Yes	Cleaning
		No	Next step

5	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Yes	Replace part
		No	Next step
6	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Next step
7	Check pressure conditions of every cylinder and observe if there is big pressure difference between the cylinders.	Yes	Trouble shoot
		No	Next step
8	Check the engine ignition order and ignition timing if it is accord with the regulation.	Yes	Next step
		No	Repair the ignition timing
9	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

**7. Regular starts but the idle speed is not steady during engine heating.**

**General failure component:**

- 1), water in fuel;
- 2), coolant temperature sensor;
- 3), spark plug;
- 4), throttle valve and idle speed by pass port;
- 5), air intake port;
- 6), idle speed regulator;
- 7), engine mechanical.

**General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed; check the air intake port if it is leaking.	Yes	Repair the air intake system
		No	Next step
2	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
3	Disassemble the idle speed regulator and check the throttle valve and idle speed by pass port if there is carbon deposition	Yes	Cleaning the related parts
		No	Next step
4	Pull off coolant temperature sensor joint and start the engine; observe the engine if it is idle speed unsteady during warming up the engine.	Yes	Repair the line or replace sensor
		No	Next step
5	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed or overflowing.	Yes	Replace part
		No	Next step
6	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Change fuel
		No	Next step
7	Check pressure conditions of every cylinder and observe if there is big pressure difference between the cylinders.	Yes	Trouble shoot
		No	Next step

8	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

**8. Regular starts but idle speed is not steady after the engine heating.**

**General failure component:**

- 1), water in fuel;
- 2), coolant temperature sensor;
- 3), spark plug;
- 4), throttle valve and idle by pass port;
- 5), air intake port;
- 6), idle speed regulator;
- 7), engine mechanical part.

**General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed; check the air intake port if it is leaking.	Yes	Repair the air intake system
		No	Next step
2	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
3	Disassemble the idle speed regulator and check the throttle valve and idle speed by pass port if there is carbon	Yes	Cleaning the related parts

	deposition	No	Next step
4	Pull off coolant temperature sensor joint and start the engine; observe the engine if it is idle speed unsteady during warming up the engine.	Yes	Repair the line or replace sensor
		No	Next step
5	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed or overflowing.	Yes	Replace part
		No	Next step
6	Check fuel conditions and check if the failure is appeared just after the fuel refilling	Yes	Change fuel
		No	Next step
7	Check pressure conditions of every cylinder and observe if there is big pressure difference between the cylinders.	Yes	Trouble shoot
		No	Next step
8	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

**9. Regular starts but idle speed is not steady or dying out when there is partial loading.**

**General failure component:**

**1) air conditioner system;**

**2) idle speed regulator;**

**3) injector. General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Disassemble the idle speed regulator and check the throttle valve and idle speed by pass port if there is carbon deposition.	Yes	Cleaning the related parts
		No	Next step
2	Observe if the engine output power increased when the air conditioner is switched on, that is using EFI system diagnosis meter observing ignition angle of advance, fuel injection pulse width and changes of air intake flow.	Yes	To step No.4
		No	Next step
3	Connect EFI system adaptor; break connecting line of ECU pin No.75; check the cable end if it is up level signal when the air conditioner is switched on.	Yes	Next step
		No	Repair air conditioning system
4	Check air conditioning system pressure; check the compressor solenoid clutch and air conditioner compressor pump fuel conditions and check if it is working correctly.	Yes	Next step
		No	Repair the air conditioning sys.
5	Disassemble the	Yes	Replace fault

	injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed or overflowing.		part
		No	Next step
6	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

**10. Regular starts with high idle speed.**

**General failure component:**

**1) throttle valve and idle speed by pass port;**

**2) vacuum pipe;**

**3) idle speed regulator;**

**4) coolant temperature sensor;**

**5) ignition timing. General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Check accelerator cable if it is blocked or over tightening	Yes	Adjust
		No	Next step

2	Check the air intake system and its connecting vacuum pipe if it is leaking.	Yes	Repair the air in taking system
		No	Next step
3	Disassemble the idle speed regulator and check the throttle valve and idle speed by pass port if there is carbon deposition	Yes	Clean related part
		No	Next step
4	Take off the coolant temperature sensor joint; start the engine and observe if it has high idle speed.	Yes	Repair line or replace sensor
		No	Next step
5	Check the engine ignition timing if it is accord with the regulations.	Yes	Next step
		No	Repair the ignition timing
6	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair the corresponding line

**11. Low engine speed or dying out exists when it is accelerated.**

**General failure component: 1) water in fuel; 2) air intake pressure sensor and throttle position sensor; 3) spark plug; 4) throttle valve and idle speed by pass port; 5) air intake port; 6) idle speed regulator; 7) injector; 8)**

**ignition timing; 9) exhaust pipe.**

**General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed.	Yes	Repair the air intake system
		No	Next step
2	Connect the fuel pressure meter (connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
3	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
4	Disassemble idle speed regulator and check throttle valve, idle speed regulator and idle speed by pass port if there is carbon deposition.	Yes	Clean related part
		No	Next step
5	Inspect air intake pressure sensor, throttle position sensor and its line if it is working correctly.	Yes	Next step
		No	Repair line or replace sensor
6	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is	Yes	Replace fault part

	leaking or jammed.	No	Next step
7	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Replace fuel
		No	Next step
8	Check the engine ignition order and ignition timing if it is accord with the regulation.	Yes	Next step
		No	Repair ignition timing
9	Check the exhaust pipe if the air exhausting is smooth	Yes	Next step
		No	Repair or replace exhaust pipe
10	Connect EFI system adaptor, turn on the ignition switch; check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Yes	Diagnosis help
		No	Repair corresponding line

**12. React slowly when it is accelerated.**

**General failure component: 1) water in fuel; 2) air intake pressure sensor and throttle position sensor; 3) spark plug; 4) throttle valve and idle speed by pass port; 5) air intake port; 6) idle speed regulator; 7) injector; 8) ignition timing; 9) exhaust pipe.**

**General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Check the air cleaner if it is jammed.	Yes	Repair the air intake system
		No	Next step
2	Connect the fuel pressure meter ( connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa;	Yes	Next step
		No	Repair the fuel supplying system

	take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.		
3	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Yes	Next step
		No	Adjust or replace
4	Disassemble idle speed regulator and check throttle valve, idle speed regulator and idle speed by pass port if there is carbon deposition.	Yes	Clean related part
		No	Next step
5	Inspect air intake pressure sensor, throttle position sensor and its line if it is working correctly.	Yes	Next step
		No	Repair line or replace sensor
6	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Yes	Replace fault part
		No	Next step
7	Check fuel conditions and check if the failure is appeared after the fuel refilling	Yes	Replace fuel
		No	Next step
8	Check the engine ignition order and ignition timing if it is accord with the regulation.	Yes	Next step
		No	Repair ignition timing
9	Check the exhaust pipe if the air exhausting is smooth	Yes	Next step
		No	Repair or replace exhaust pipe
	Connect EFI system adaptor, turn on the	Yes	Diagnosis help

10	ignition switch;		
	check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	No	Repair corresponding line

**13. The performance is poor when it is accelerated.**

**General failure component:1) water in fuel; 2) air intake pressure sensor and throttle position sensor; 3) spark plug; 4) ignition coil; 5) throttle valve and idle speed by pass port; 6) air intake port;7) idle speed regulator; 8) injector; 9) ignition timing; 10) exhaust pipe.**

**General diagnosis flow:**

No.	Operating steps	Result	Follow up steps
1	Check if there are failures like clutch skidding, low tyre pressure, brake dragging, wrong tyre size, and wrong four wheel positioning etc..	Yes	Repair
			Next step
2	Check the air cleaner if it is jammed.	Yes	Repair the air intake system
		No	Next step
3	Connect the fuel pressure meter ( connecting point is the front end of fuel distributing pipe assembly fuel intake pipe); start the engine and check fuel pressure at idle speed if it is around 260kpa; take off the vacuum pipe from fuel pressure regulator check the fuel pressure if it is around 300kpa.	Yes	Next step
		No	Repair the fuel supplying system
	Pull off one of the cylinder separating line and	Y	Next step

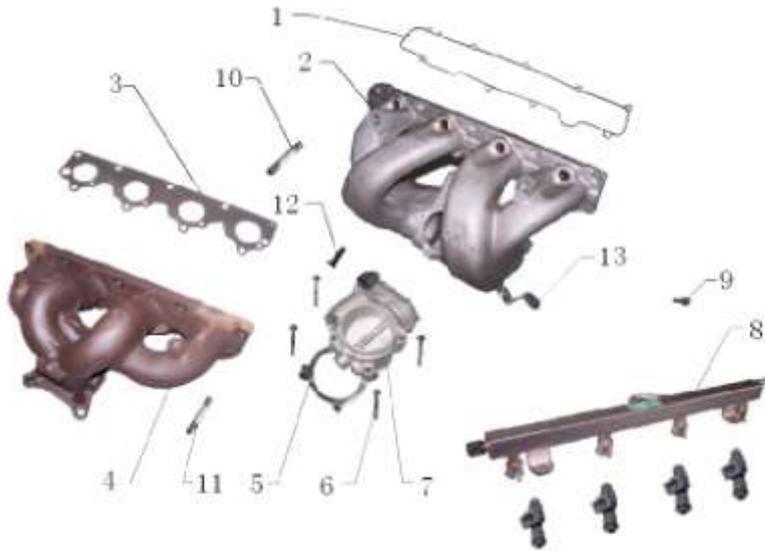
4	connect	e s	
	spark plug to it; keep the spark electrode around 5mm away from engine body; start the engine and check the high pressure fire strength if it is regular.	N o	Repair ignition system
5	Check spark plugs in every cylinder and observe its type and clearance if it is accord with the regulation.	Y e s	Next step
		N o	Adjust or replace
6	Disassemble idle speed regulator and check throttle valve, idle speed regulator and idle speed by pass port if there is carbon deposition.	Y e s	Clean related part
		N o	Next step
7	Inspect air intake pressure sensor, throttle position sensor and its line if it is working correctly.	Y e s	Next step
		N o	Repair line or replace sensor
8	Disassemble the injector, check the injector using the injector special cleaning analysis meter and observe if it is leaking or jammed.	Y e s	Replace fault part
		N o	Next step
9	Check fuel conditions and check if the failure is appeared after the fuel refilling	Y e s	Replace fuel
		N o	Next step
1 0	Check the engine ignition order and ignition timing if it is accord with the regulation.	Y e s	Next step
		N o	Repair ignition

			timing
1 1	Check the exhaust pipe if the air exhausting is smooth	Y e s	Next step
		N o	Repair or replace exhaust pipe
1 2	Connect EFI system adaptor, turn on the ignition switch;  check the power supply of pin No.12, 13, 44, 45 and No.63 if it is in right conditions; check pin armature of No.3, 51, 53, 61 and No.80 if it is in right conditions.	Y e s	Diagnosis help
		N o	Repair corresponding line



# PARTS MANUAL ENGINE

## INTAKE AND EXHAUST SYSTEM



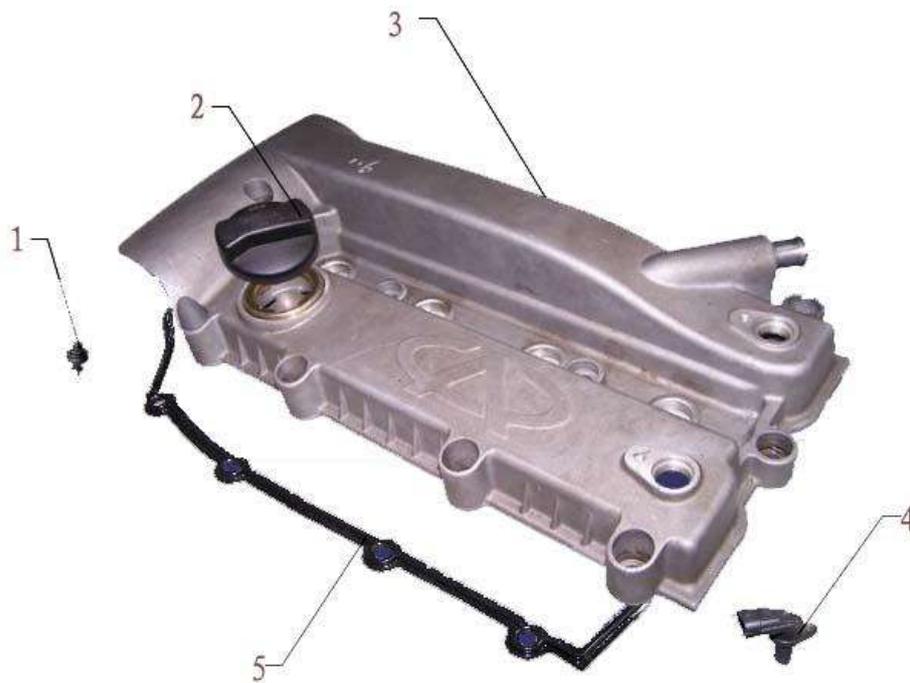
No	Code name	Description	O'ty
	484FDJ-JPQXT	INTAKE AND EXHAUST SYSTEM	
1	481F-1008028	WASHER - INTAKE MANIFOLD	1
2	481F-1008010	MANIFOLD ASSY - INLET	1
3	481H-1008026	WASHER - EXHAUST MANIFOLD	1
4	481H-1008111	MANIFOLD - EXHAUST	1
5	A11-1129011	WASHER - THROTTLE BODY	1
6	Q1840650	BOLT - HEXAGON FLANGE	4
7	A11-1129010	THROTTLEN BODY ASSY	1
8	A11-1121010	PIPE ASSY - FUEL DISTRIBUTOR	1
9	Q1840835	BOLT - HEXAGON FLANGE	1
10	481H-1008112	STUD	9
11	481H-1008032	STUD - M6x20	9
1	473H-1008022	BOLT A-3X10	1
13-1	481H-1008022	BRAKET-INTAKE MANIFOLD	1
13-2	481FC-1008022	BRAKET-INTAKE MANIFOLD	1

## CYLINDER BLOCK



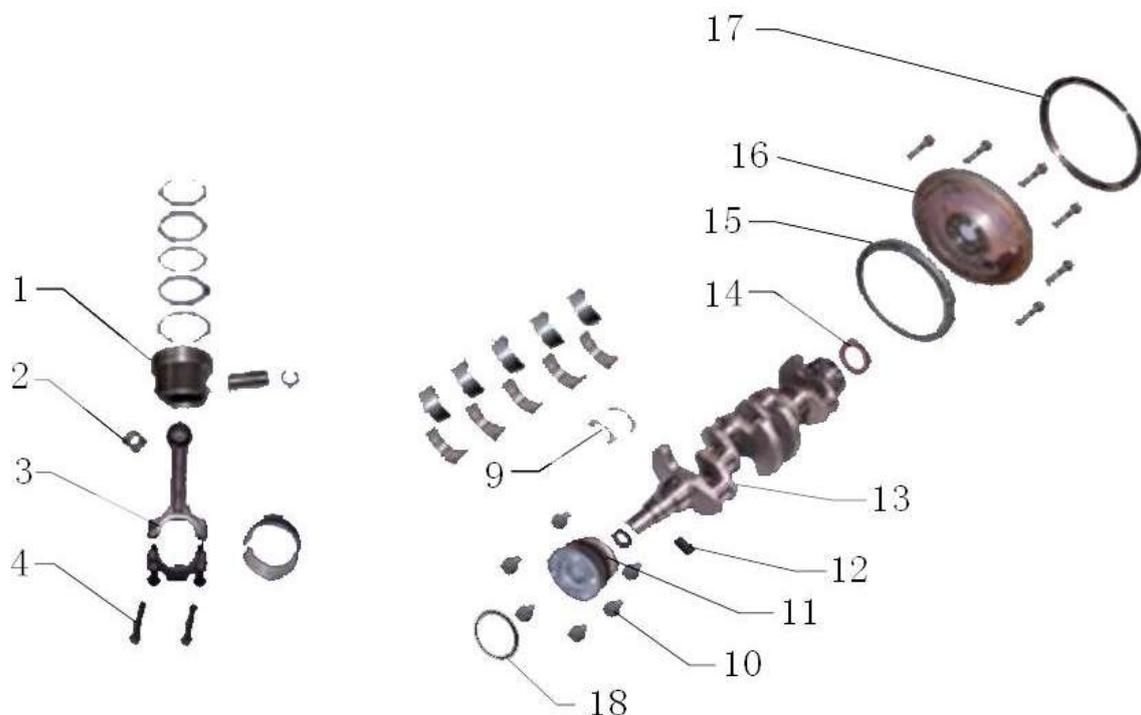
No.	Code name	Description	O'ty
	484FDJ-GT	CYLINDER BLOCK	
1	Q1840880	BOLT	10
2	481H-1002024	BOLT - MAIN BEARING CAP	10
3	Q5210616	POSITION PIN-6M6X16	2
4	481H-1011030BA	OIL PUMP ASSY	1
5	Q1840635	BOLT - HEXAGON FLANGE	4
6	481H-1002031	PLUG	2
7	481H-1012023	SEAT - OIL FILTER	1
8	481H-1002037	O RING-22x22.5	2
9	GT-YYKG	SWITCH - OIL PRESSURE	0
10	481H-1012026	WASHER - OIL FILTER SEAT	1
11	Q1840825	BOLT	3
12	484J-1013010	OIL COOLER ASSY	1
13	484J-1012021	CONNECTOR - OIL FILTER	1
14	481H-1012010	OIL FILTER ASSY	1
15	484F-1002010	BODY - CYLINDER WITH FRAME	1
16	481H-1002034	PLUG - BOWL SHAPE	1
17	481H-1002036	PLUG - BOWL SHAPE	1
18	481H-1002038	SLEEVE - CLUTCH POSITION	1
19	481H-1002039	PLUG	1
20	481H-1002041	WASHER - PLUG	1
21	481H-1002042	PLUG	1
22	481H-1011035	GASKET - OIL PUMP	1
23	B11-3611031	SENSOR - SHOCK	1

## COVERY-VALVE CHAMBER



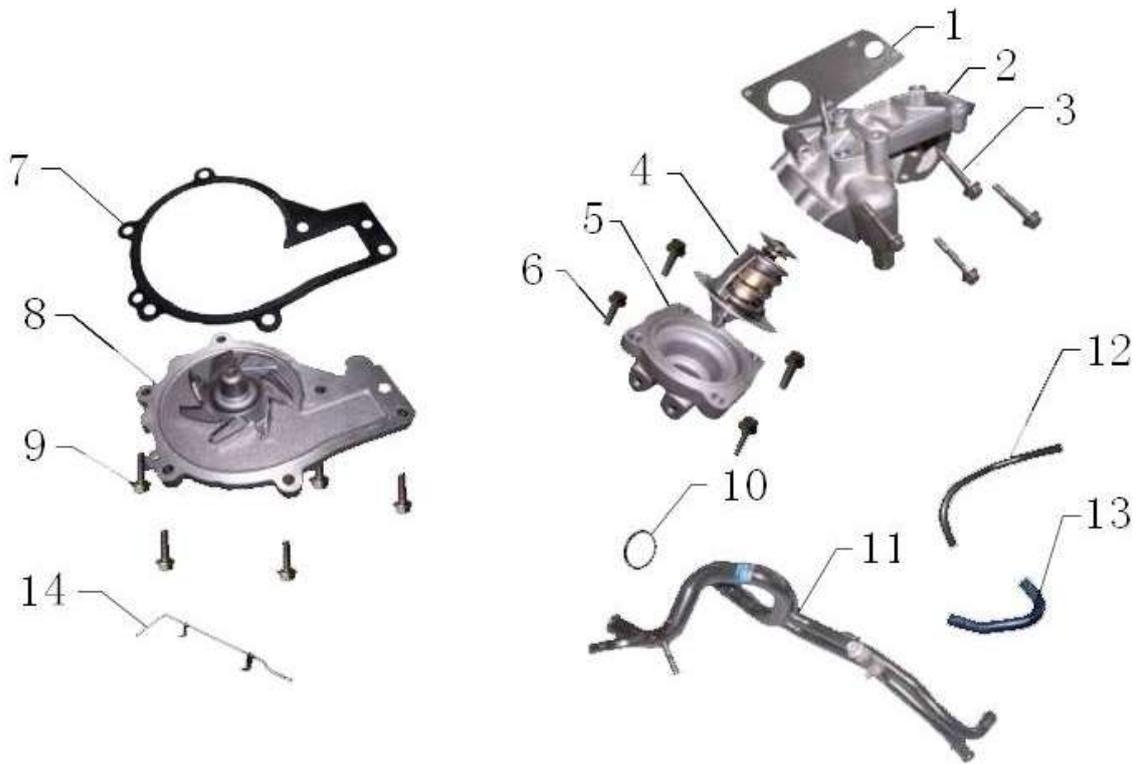
No.	Code name	Description	O'ty
	484FDJ-QMSZG	COVERY-VALVE CHAMBER	0
1	481H-1003043	DAMPING UNIT - VALVE CHAMBER COVER	1
2	480-1003040BA	COVER ASSY - OIL TANK CAP	1
3	481F-1003030BC	COVER ASSY - ROCKER	1
4	A11-3611011	SENSOR-CAMSHAFT POSITION	2
5	481H-1003042	GASKET - VALVE CHAMBER COVER	12

## CRANK MECHANISM



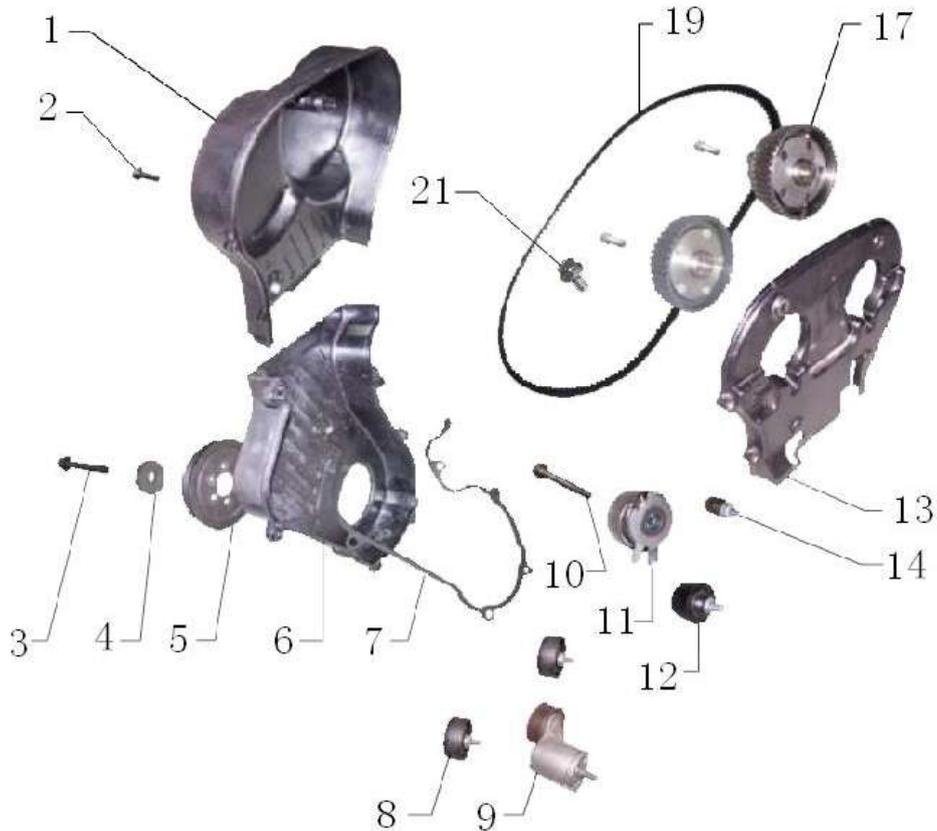
No.	Code name	Description	O'ty
	484FDJ-QZLGJG	CRANK MECHANISM	0
1	484F-1004020	PISTON ASSY(WITH PIN &RING)	4
2	481H-1004117	SLEEVE - CONNECTING ROD	4
3	481H-1004110	CONNECTING ROD ASSY	4
4	481H-1004115	BOLT - CONNECTING ROD	8
9	481H-1005015	PLATE - THRUST(CRANKSHAFT)	2
10	481H-1005083	BOLT - HEXAGON FLANGE (M8x1x16)	6
11	481H-1005051	TIMING GEAR-CRANKSHAFT	1
12	Q5500516	KEY - WOODRUFF	1
13	484J-1005011	CRANKSHAFT	1
14	481H-1005030	OIL SEAL-CRANKSHAFT RR	1
15	481H-1005114	WHEEL - SIGNAL	1
16	484F-1005110	FLY WHEEL ASSY	1
17	481H-1005115	RING - FLY WHEEL	1
18	481H-1005071	FRICION DISC - FRICTION	1

## COOLING SYSTEM



No.	Code name	Description	O'ty
	484FDJ-LQXT	COOLING SYSTEM	0
1	481H-1306056	WASHER - THERMOSTAT SEAT	1
2	481H-1306011AB	SEAT - THERMOSTAT	1
3	480-1005041	BOLT - HEXAGON FLANGE	4
4	481H-1306020	THERMOSTAT ASSY	1
5	481H-1306021AB	COVER - THERMOSTAT SEAT	1
6	Q1840650	BOLT - HEXAGON FLANGE	4
7	481H-1307041	WASHER - WATER PUMP ASSY	1
8	484J-1307010	WATER PUMP	1
9	480-1007161	BOLT - HEXAGON FLANGE	6
10	473H-1307021	O RING - $\phi 27 \times 3$	1
11	A11-1303310DA	COOLANT PIPE ASSY I	1
12	A21-1303821	HOSE - OUTLET (THROTTLE	1
13	A11-1303711	HOSE - WATER OUTLET	2
14	B11-1303330NA	COOLANT PIPE ASSY	1

## WHEEL SYSTEM



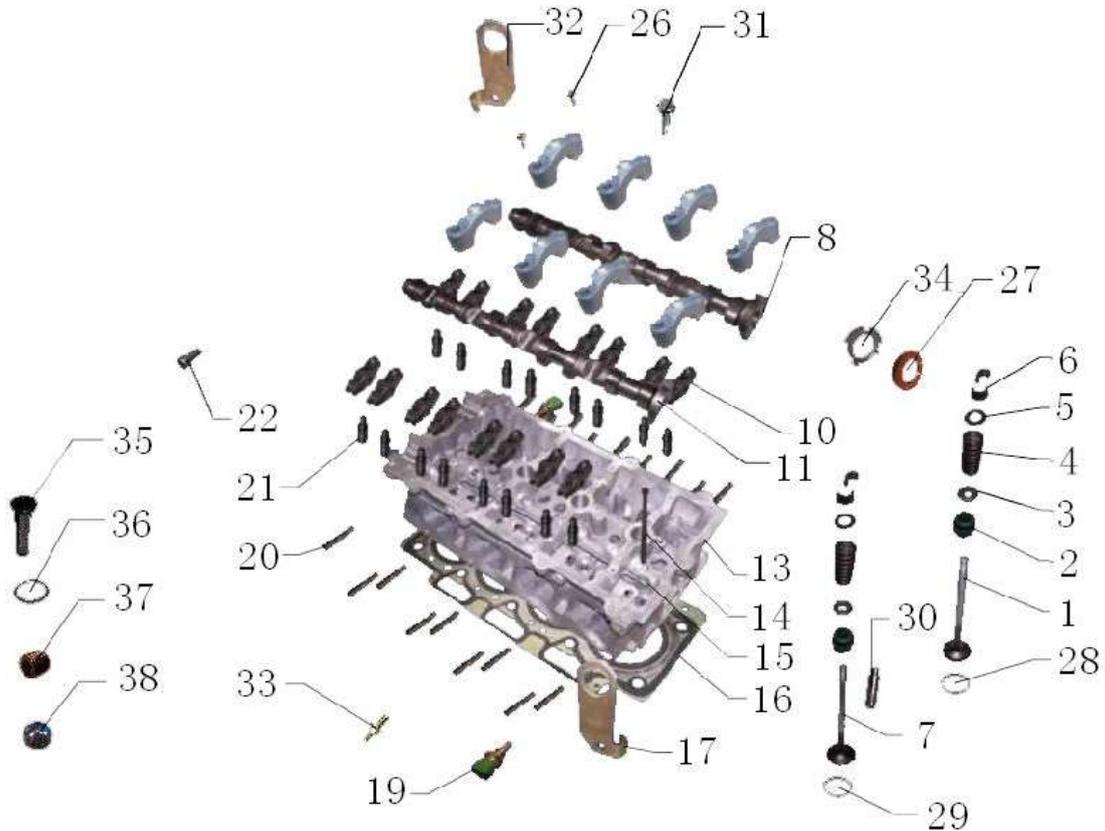
No.	Code name	Description	O'ty
	484FDJ-LX	WHEEL SYSTEM	0
1	481H-1007081	COVER - TIMING GEAR UPR	1
2	481H-1007082	BOLT - HEXAGON HEAD (M6x24)	6
3	481H-1005081	BOLT	1
4	481H-1005082	WASHER - CRANKSHAFT PULLEY SCREW	1
6	481H-1007083	COVER - TIMING GEAR LWR	1
7	481H-1007052BA	GASKET- TIMING GEAR FR COVER	1
8	A11-8111210CA	IDLER PULLEY ASSY	2
9	A11-8111200CA	TENSIONER	1
10	Q1840855	BOLT (M8X55)	1
11	473H-1007060	TENSIONER ASSY	1
12	481H-1007070	IDLER PULLEY-TIMING BELT	1
13	481H-1007071	IDLE PULLEY - TIMING BELT	1
14	481H-1007050	COVER - TIMING GEAR RR	1
16	481H-1006060	REGULATOR - PHASIC (EXHAUST CAM)	1
17	481F-1006041BA	GEAR - CAMSHAFT TIMING	1
19	481H-1007073BA	BELT - TIMING	1
21	481F-1006075	BOLT	1

## STARTER AND GENERATOR



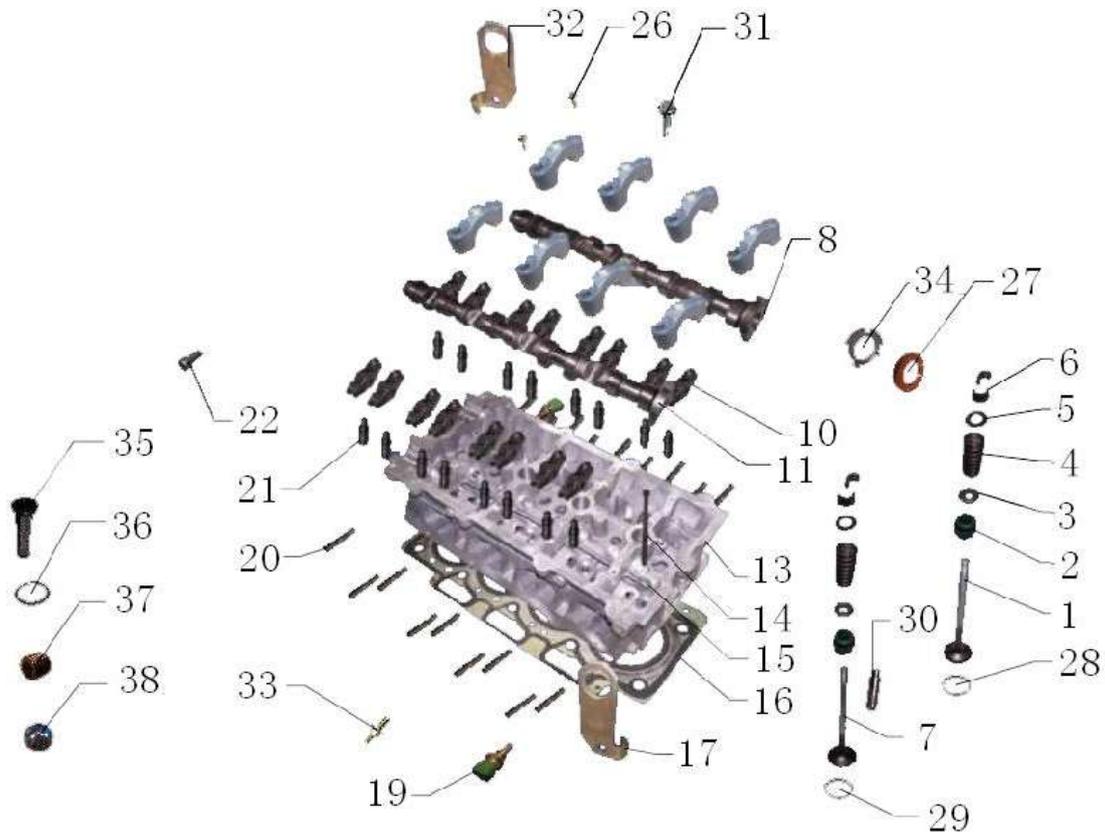
No.	Code name	Description	O'ty
	484FDJ-FDJQDJ	STARTER AND GENERATOR	
1	A11-3412041EA	BRACKET - A/C COMPRESSOR	1
2	B11-3701110BB	GENERATOR ASSY	1
3	Q1840840TF2	BOLT-M8x40(10.9)	3
4	Q1840835	BOLT - HEXAGON FLANGE	1
5	B11-3701315BA	V BELT	1

## CYLINDER HEAD



No.	Code name	Description	O'ty
	484FDJ-GG	CYLINDER HEAD	
1	481H-1007011BA	VALVE - INLET	8
2	481H-1007020	SEAL - OIL	16
3	473H-1007013	SEAT-VALVE SPRING LWR	16
4	481H-1007014BA	SPRING - VALVE	16
5	473H-1007015	SEAT-VALVE SPRING UPR	16
6	481H-1007018	BLOCK - LOCK (VALVE)	32
7	481H-1007012BA	VALVE - EXHAUST	8
8	481F-1006010	CAMSHAFT ASSY - INTAKE	1
10	481H-1007030	ROCKER ARM ASSY	16
11	481F-1006035	CAMSHAFT - EXHAUST	1
13	481F-1003010BA	MPI CYLINDER HEAD ASSY	1
14	481H-1003082	BOLT - CYLINDER HEAD	10
15	481H-1003033	WASHER - CYLINDER HEAD BOLT	10
16	484J-1003080BA	GASKET - CYLINDER	1
17	481H-1003086	HANGER	2
19	A11-3617011	SENSOR - WATER TEMPERATURE	2

## CYLINDER HEAD



No.	Code name	Description	O'ty
20	481H-1008032	STUD - M6x20	9
21	481H-1007040	TAPPET ASSY - HYDRAULIC	16
22	481H-1003031	BOLT - THROTTLE	2
26	481H-1003062	BOLT - HEXAGON FLANGE (M6x30)	20
27	481F-1006020	SEAL - OIL (CAMSHAFT)	1
28	481H-1003021	SEAT - INTAKE VALVE	16
29	481H-1003022	RING - EXHAUST VALVE SEAT	16
30	481H-1003023	GUIDE - VALVE	16
31	481H-1003063	BOLT-CAMSHAFT BEARING COVER	1
32	481H-1003085	HANGER	10
33	481H-1003087	STUD	1
34	481H-1006019	WHEEL - SIGNAL	1
35	481H-1003029	STRAINER - CAMSHAFT PHASIC EQUIPMENT	1
36	481H-1003032	WASHER	1
37	481H-1003034	PLUG	1

## OIL PAN



No.	Code name	Description	O'ty
	484FDJ-YDK	OIL PAN	
1	A21-1009110	OIL DIPSTICK	1
2	A21-1009112	PIPE - OIL DIPSTICK	1
3	Q1840612	BOLT	10
4	481H-1010010BA	OIL STRAINER	1
5	481H-1009010BA	OIL TANK	1
6	481H-1009023	BOLT - HEXAGON FLANGE (M7X25)	18
7	481H-1009026	BOLT - HEXAGON FLANGE (M7X95)	7
8	481H-1011032	O RING-30x25	1
9	481H-1009114	O RING	1
10	481H-1009022	O RING	1
11	481H-1009013BA	CLAPBOARD	1

# IGNITION SYSTEM



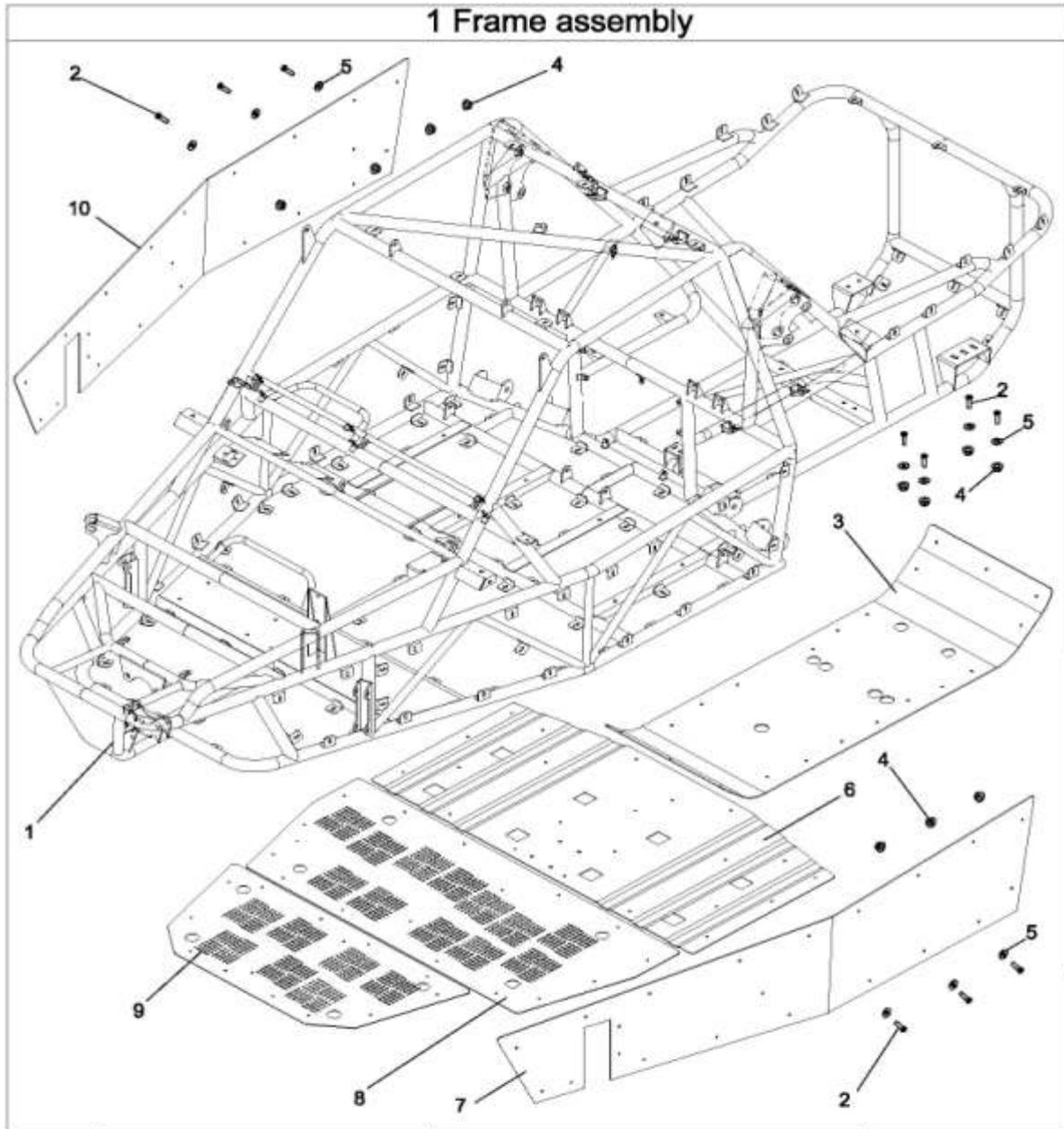
No.	Code name	Description	O'ty
	484FDJ-DHXT	IGNITION SYSTEM	
1	A11-3707110CA	SPARK PLUG ASSY	4
2	A11-3705110EA	IGNITION COIL	1
3	Q1840650	BOLT - HEXAGON FLANGE	4
4	A11-3701118EA	BRACKET - GENERATOR	1

## VENTILATION SYSTEM-CRANKCASE



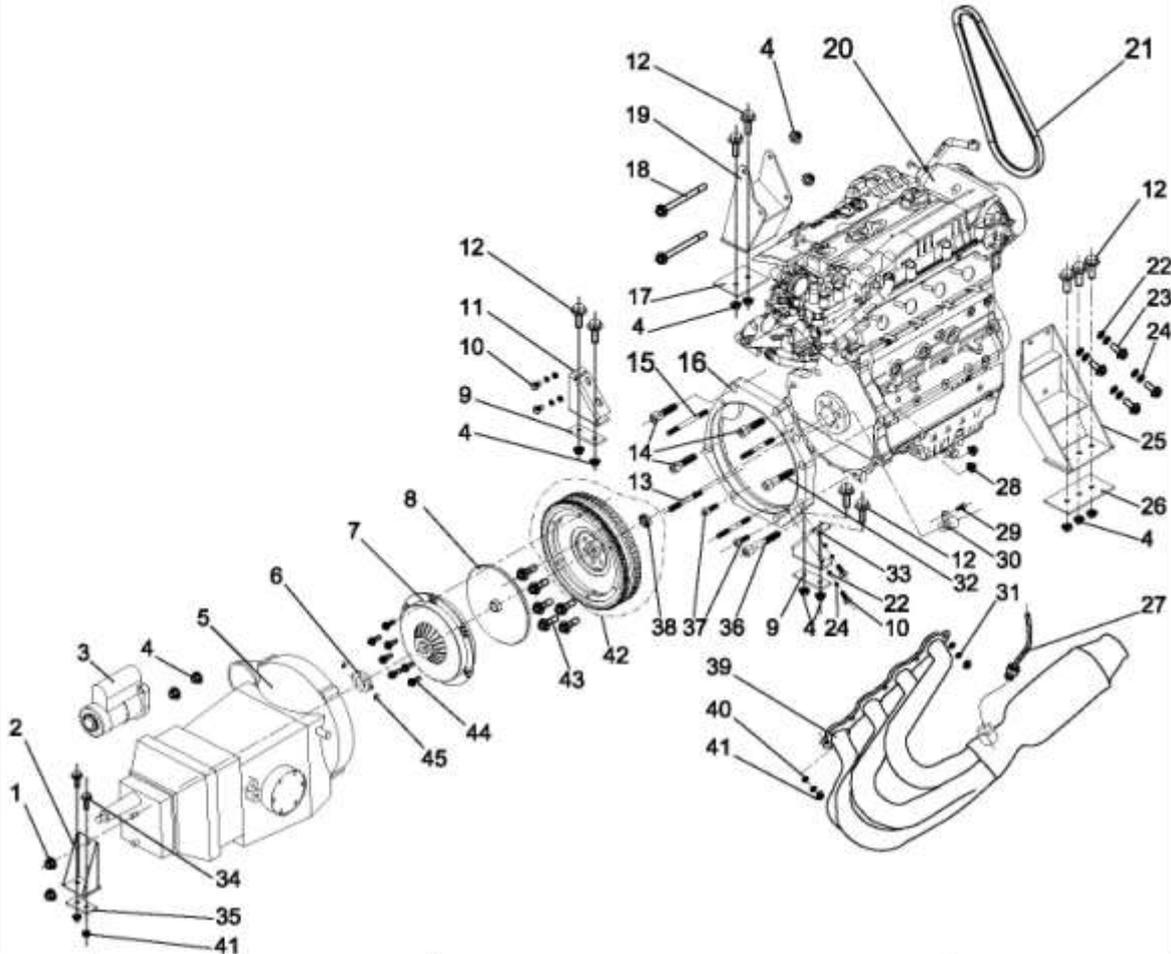
No.	Code name	Description	O'ty
	484FDJ-TFXT	VENTILATION SYSTEM-CRANKCASE	
1	481H-1014013BB	PIPE -VALVE COVER	1
2	481H-1014040	PVC VALVE	1
3	481H-1014011BA	PIPE - MANIFOLD	1
4	481H-1014015	TUBE	1

# Frame



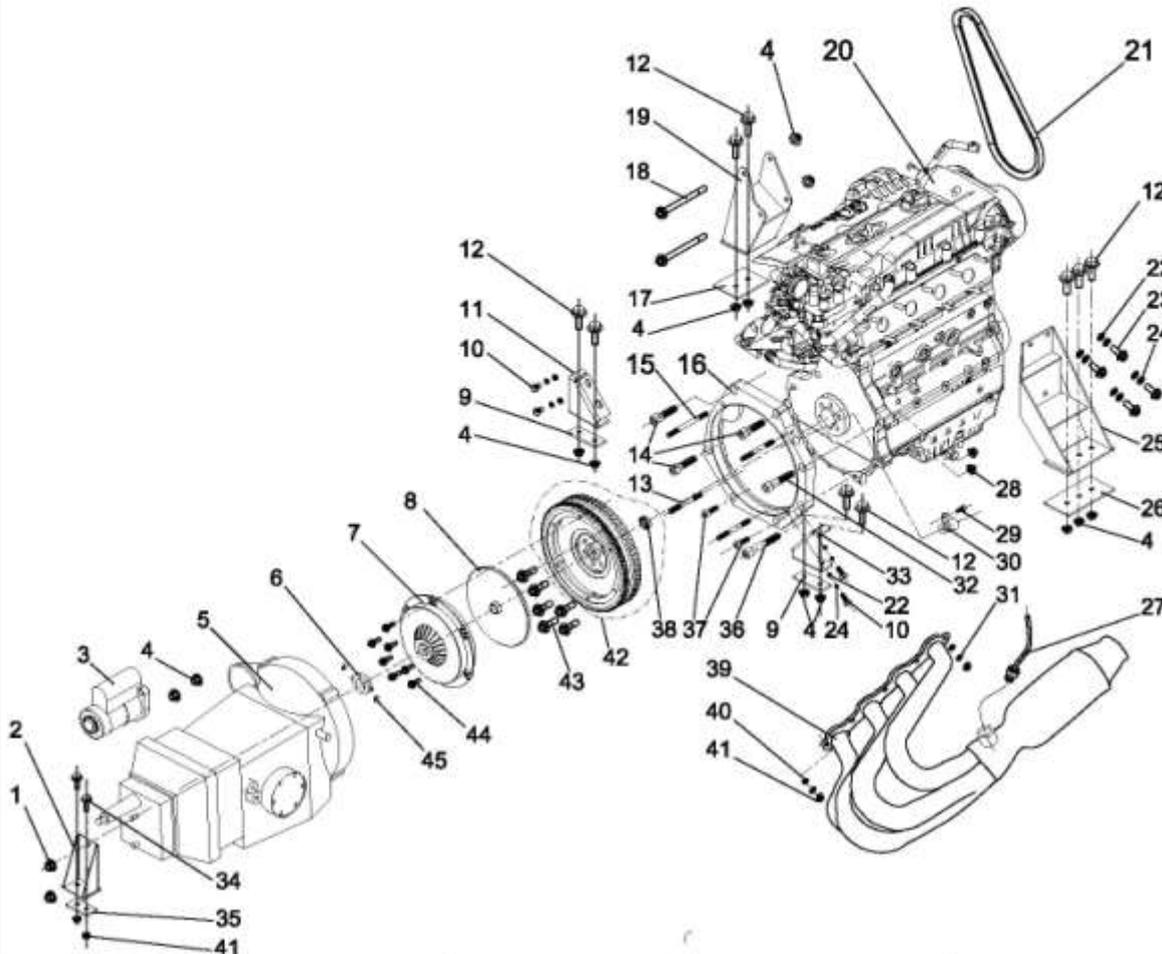
No.	Code name	Description	Q' ty
1	SR2000.01.01.00.00	Frame component	1
2	D848-M6*16	Cross panhead screw M6*16	113
3	SR2000.01.01.03.08	engine bottom plate	1
4	6187.1-M6	caulking nut M6	113
5	JD0900008	rubber-washer $\Phi 6$	113
6	SR2000.01.02.00.05	seat bottom plate	1
7	SR2000.01.01.03.03	side plate,left	1
8	SR2000.01.02.00.04	middle plate	1
9	SR2000.01.02.00.03	front plate	1
10	SR2000.01.01.03.10	side plate,right	1

## 2 Engine bracket and muffler assembly



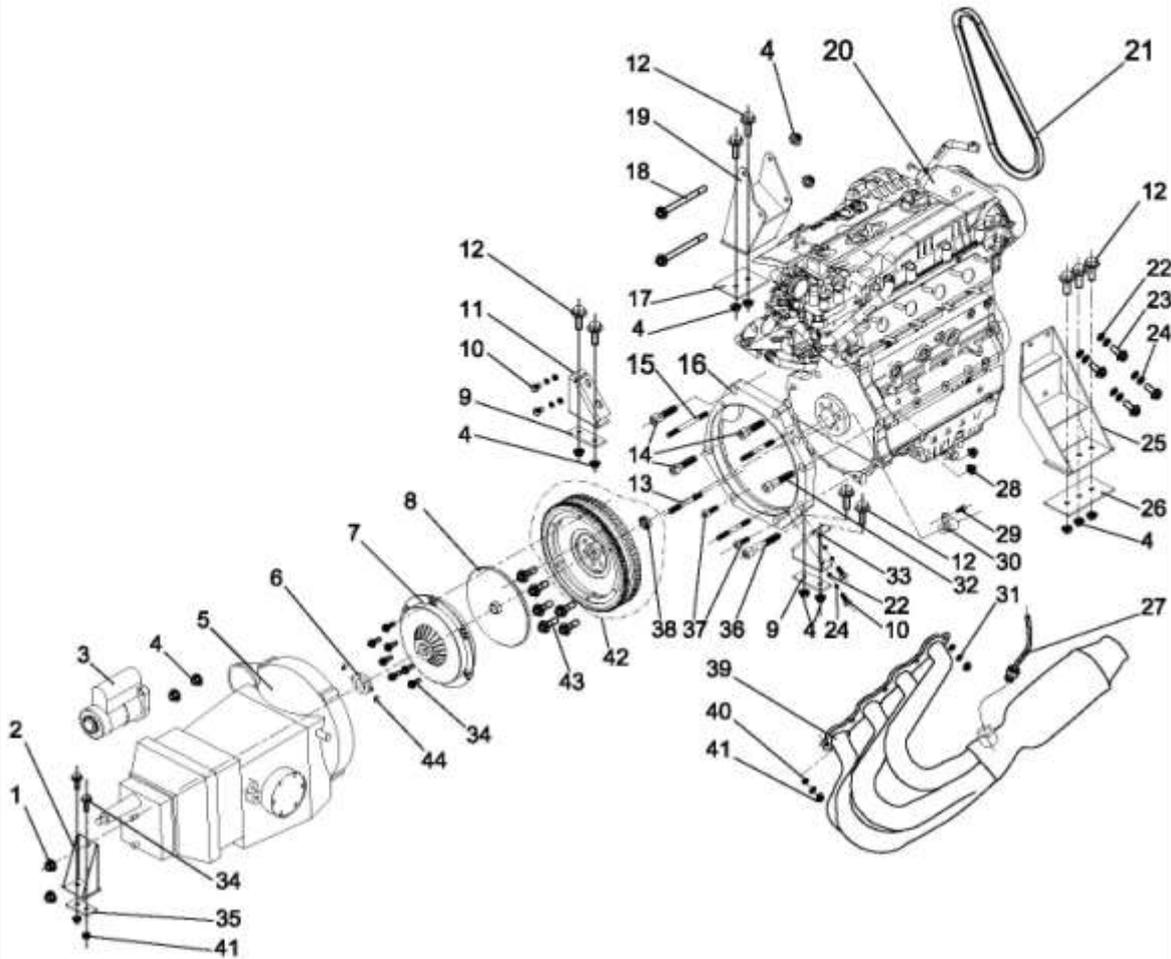
No.	Code name	Description	Q' ty
1	6177.1-M10*1.5	nut-washer M10*1.5	2
2	SR2000.04.01.03.00	transmission front bracket	1
3	SR2000.04.01.06.06	starting dynamo	1
4	6177.1-M10*1.25	nut-washer M10*1.25	13
5	SR2000.04.01.06.00	transmission assembly	1
6	SR2000.04.01.06.03	thrust bearing	1
7	SR2000.04.01.06.04	clutch cover	1
8	SR2000.04.01.06.05	driven disk assembly	1
9	SR2000.04.01.00.06	rubber cushion	2
10	5787-M10*1.25*20	bolt-washer M10*1.25*20	4
11	SR2000.04.01.00.08	transmission rear bracket, right	1
12	5787-M10*1.5*30	bolt-washer M10*1.5*30	9
13	897-M10*1.25*90	double-screw bolt M10*1.25*90	3
14	70.1-M12*1.75*40	socket cap screw M12*1.75*40	3
15	897-M10*1.25*125	double-screw bolt M10*1.25*125	1
16	SR2000.04.01.00.01	connection board	1

## 2 Engine bracket and muffler assembly



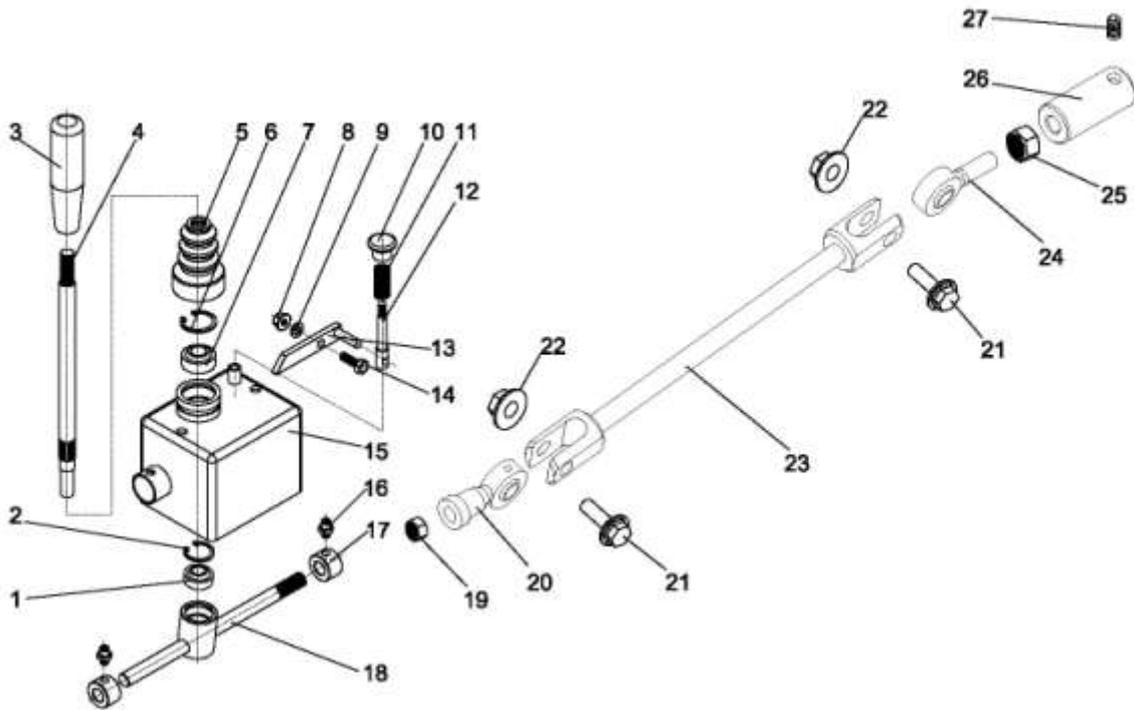
No.	Code name	Description	Q' ty
17	SR2000.04.01.00.04	rubber cushion	1
18	5787-M10*1.25*105	bolt-washer M10*1.25*105	2
19	SR2000.04.01.02.00	engine bracket,right	1
20	484F-1000010-2	SQR484 engine	1
21	SR2000.04.01.00.02	belt	1
22	95-W10	washer Ø10	8
23	5787-M10*1.5*30	bolt-washer M10*1.5*30	4
24	93-SP10	spring washer Ø10	8
25	SR2000.04.01.01.00	engine bracket left	1
26	SR2000.04.01.00.03	rubber cushion	1
27	A11-1205110DA	oxygen sensor	1
28	6177.1-M12*1.75	nut-washer M12*1.75	2
29	5787-M6*12	bolt-washer M6*12	1
30	A11-3611021	crankshaft position sensor	1
31	93-SP8	spring washer Ø8	9
32	70.1-M12*1.75*60	socket cap screw M12*1.75*60	1

## 2 Engine bracket and muffler assembly



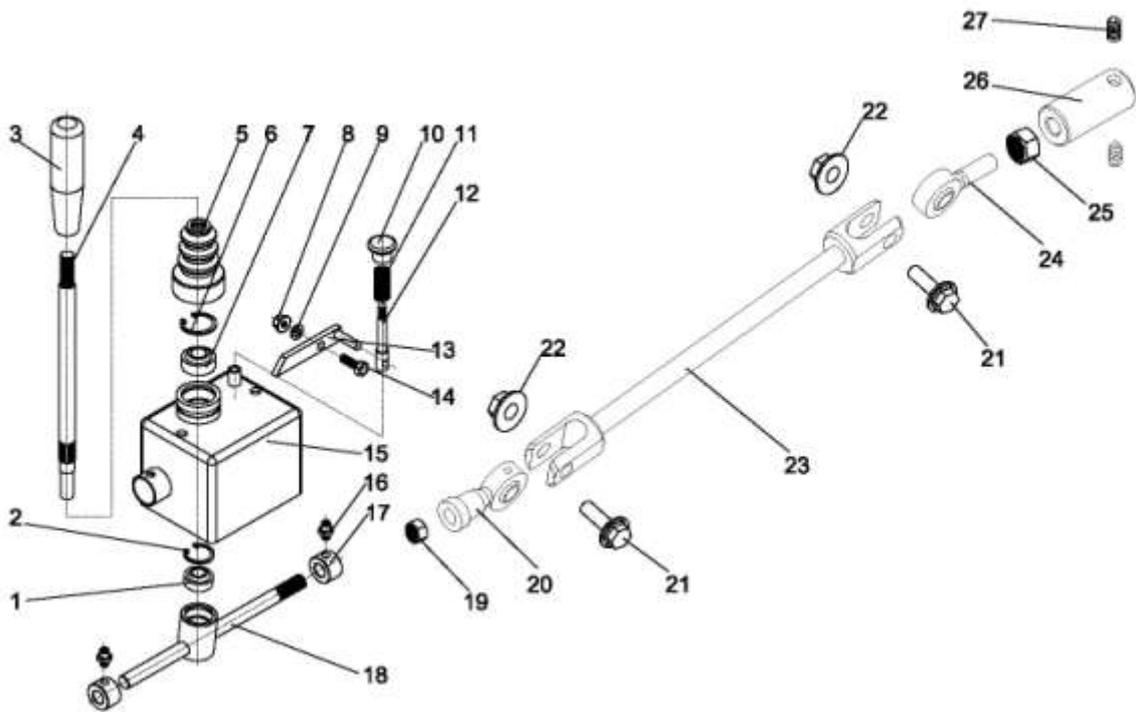
No.	Code name	Description	Q' ty
33	SR2000.04.01.00.07	transmission rear bracket, left	1
34	5787-M12*1.75*60	bolt-washer M8*25	8
35	SR2000.04.01.00.05	rubber cushion	1
36	70.1- M12*1.75*65	socket cap screw M12*1.75*65	1
37	70.1-M10*1.5*30	socket cap screw M10*1.5*30	2
38	276-B6202-2Z	ball bearing 6202-2Z	1
39	SR2000.04.04.01.00	manifold and muffler assembly	1
40	95-W8	washer Ø8	9
41	6177.1-M8	nut-washer M8	9
42	SR2000.04.01.04.00	fly wheel assembly	1
43	5787-M10*1.25*30	bolt-washer M10*1.25*30(10.9class)	6
44	SR2000.04.01.06.02	thrust bearing pin	2

### 3 Gear-shift mechanism



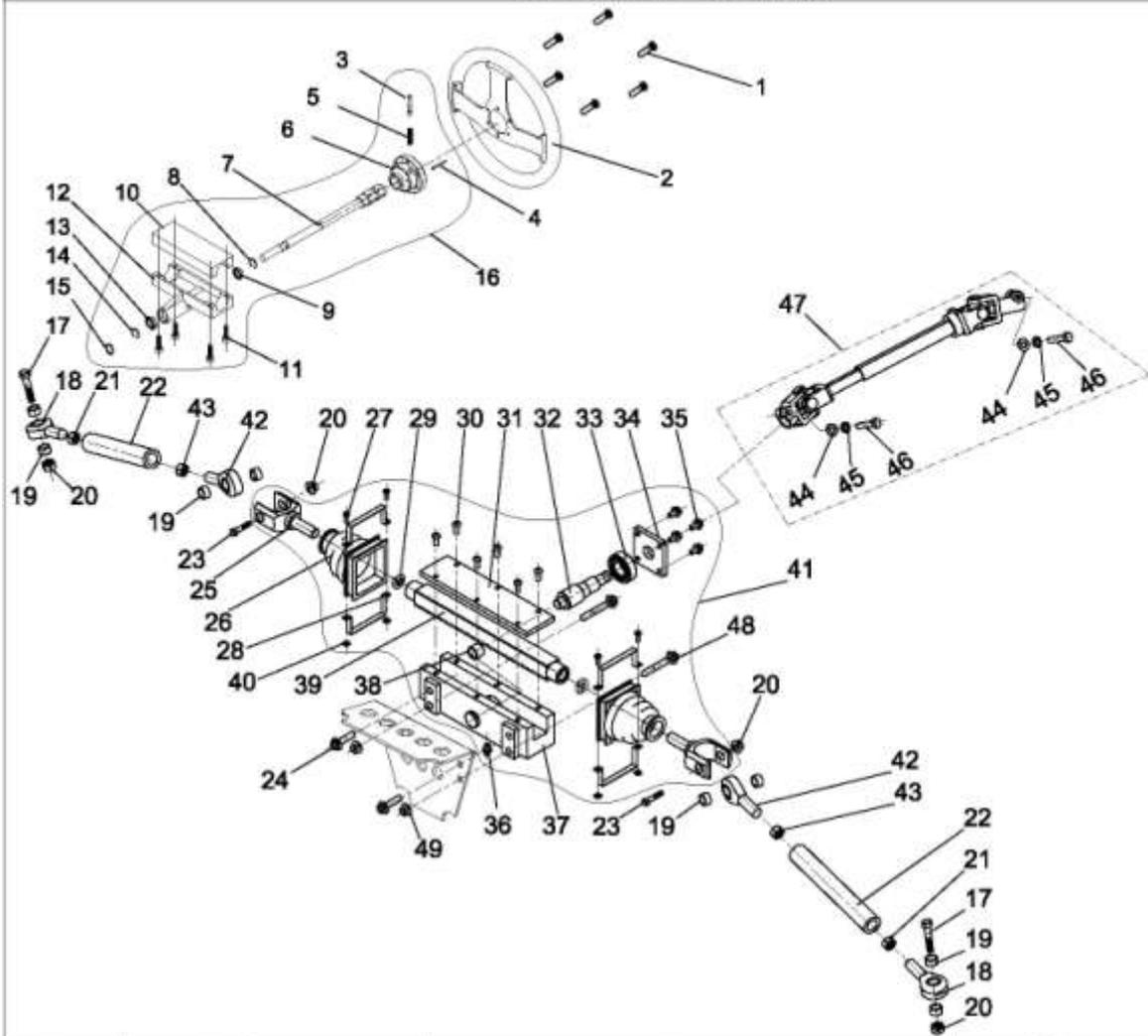
No.	Code name	Description	Q' ty
1	304.1-10	transverse bearing GE10C (G series)	1
2	SR2000.05.02.01.10	circlip for hole Ø22	1
3	SR2000.05.02.01.03	operating grip,gear shift	1
4	SR2000.05.02.01.02	control lever,gear shift	1
5	SR2000.07.01.01.15	dirt-proof boot	1
6	SR2000.05.02.01.11	circlip for hole Ø26	1
7	304.1-12	transverse bearing GE12C (G series)	1
8	6187.1-M6	caulking nut M6	1
9	95-W6	washer Ø6	1
10	SR2000.05.02.01.04	button	1
11	SR2000.05.02.01.05	spring	1
12	SR2000.05.02.01.07	gag lever post	1
13	SR2000.05.02.01.08	rotary plank	1
14	5782-M6*20	nut M6*20	1
15	SR2000.05.02.01.01	box,gear shift	1
16	7940.1-M6*1	nozzle tip M6X1	2
17	SR2000.05.02.01.06	copper sleeve	2
18	SR2000.05.02.01.09	driving rod	1

### 3 Gear-shift mechanism



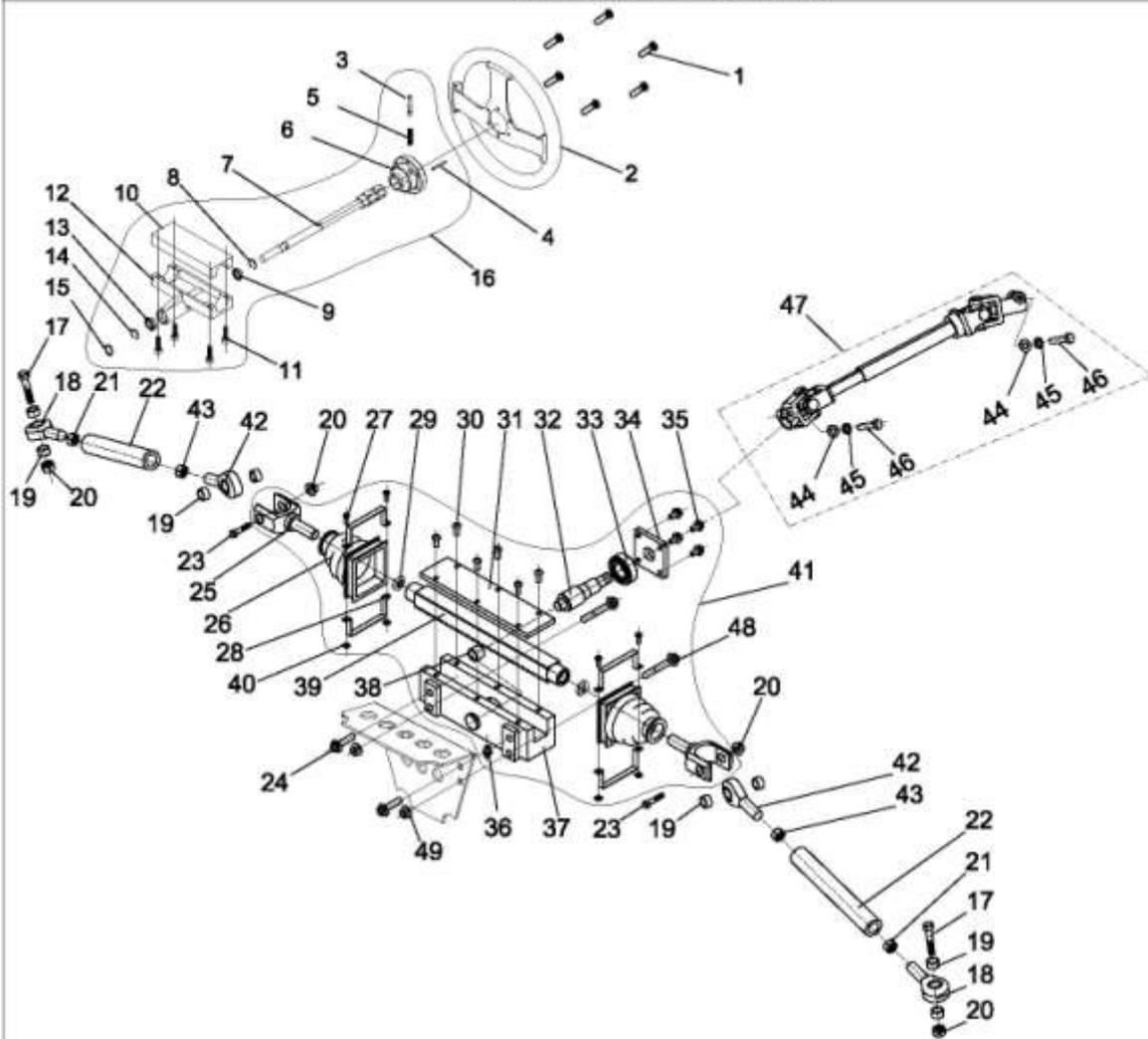
No.	Code name	Description	Q' ty
19	41-7/16-20	thin nut 7/16-20	1
20	SR2000.05.02.00.02	rod end bearing 7/16-20	1
21	5787-M10*1.25*35	bolt-washer M10*1.25*35	2
22	6187.1-M10*1.25	caulking nut M10*1.25	2
23	SR2000.05.02.02.00	gear shift bar	1
24	SR2000.05.02.00.01	rod end bearing M10*1.25,left	1
25	41-M10*1.25	nut M10*1.25 left	1
26	SR2000.05.02.02.03	steel sleeve	1
27	78-M8*8	socket screw M8*8	2

### 4 Steering assembly



No.	Code name	Name	Q' ty
1	818-M6*16	Cross panhead screw M6*16, rustless steel	6
2	SR2000.05.01.05.00	steering wheel	1
3	SR2000.05.01.01.05	adjustment shaft	1
4	879.1-P4*35	spring pin $\phi 4*35$	1
5	SR2000.05.01.01.06	release spring	1
6	SR2000.05.01.01.04	permanent seat, steering wheel	1
7	SR2000.05.01.01.01	steering shaft	1
8	893.2-C $\phi 26$	circlip for hole $\phi 26$	1
9	276-B61803	ball bearing 61803	1
10	SR2000.05.01.01.03	mounting lid	1
11	70.1-M8*30	socket head screw M8*30	4
12	SR2000.05.01.01.02	cannula, steering shaft	1
13	276-B61902	ball bearing 61902	1
14	893.2-C $\phi 28$	circlip for hole $\phi 28$	1
15	894.1-C $\phi 15$	circlip for shaft $\phi 15$	1
16	SR2000.05.01.01.00	Steering column assy	1
17	5787-M12*1.5*60	M12*1.5*60 bolt	2
18	D800.05.01.00.01	rod end bearing POSA12LH	2
19	D800.05.01.00.03	spacer sleeve	8

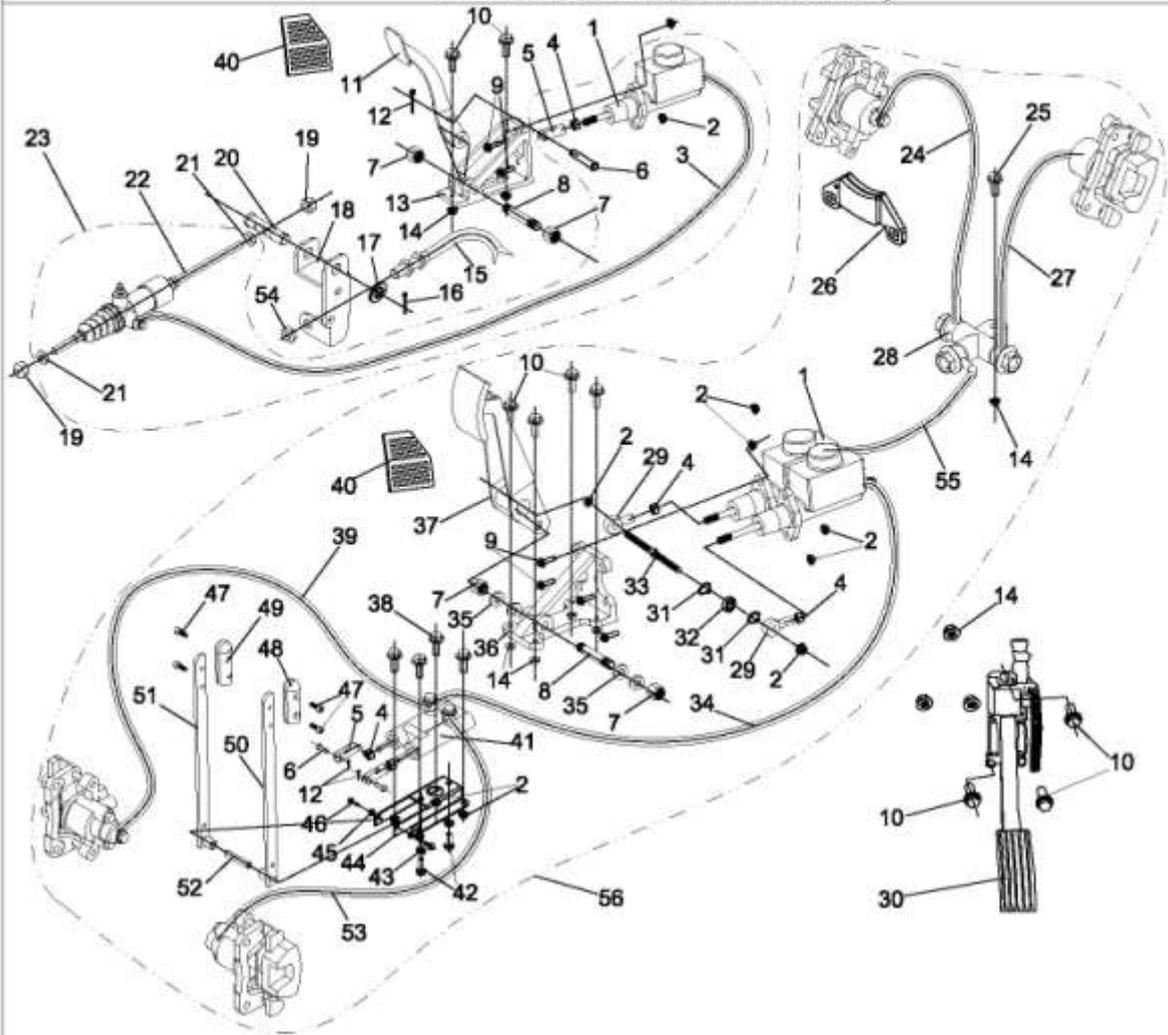
## 4 Steering assembly



No.	Code name	Name	Q'ty
20	6177.1-M12*1.5	nut-washer M12*1.5	4
21	6172.1-M12*1.75LH	jam nut M12*1.75LH	2
22	SR2000.05.01.04.00	tie rod	2
23	B5782-M12*1.5*65	Hex bolt M12*1.5*65	2
24	5787-M10*1.5*10	Bolt-washer M10*1.5*10	2
25	SR2000.05.01.03.04	hook	2
26	SR2000.05.01.03.05	dirt-proof boot, socket	2
27	823-M4X12	cross small panhead screw M4X12	4
28	SR2000.05.01.03.06	anchor ear, dirt-proof boot	4
29	SR2000.05.01.03.07	spacing nut M16X1.5	2
30	2672-M6X12	socket panhead screw M6X12	6
31	SR2000.05.01.03.02	Capping plate	1
32	D800.05.01.03.02	steering gear shaft	1
33	D800.05.01.03.09	ball bearing 20*42*12	1
34	D800.05.01.03.05	bearing cover	1
35	5787-M6X12	bolt-washer M6X12	4
36	D800.05.01.03.08	M8X1 nozzle tip	1
37	SR2000.05.01.03.01	socket	1
38	D800.05.01.03.10	Oiliness bearing 14c7x18x12	1

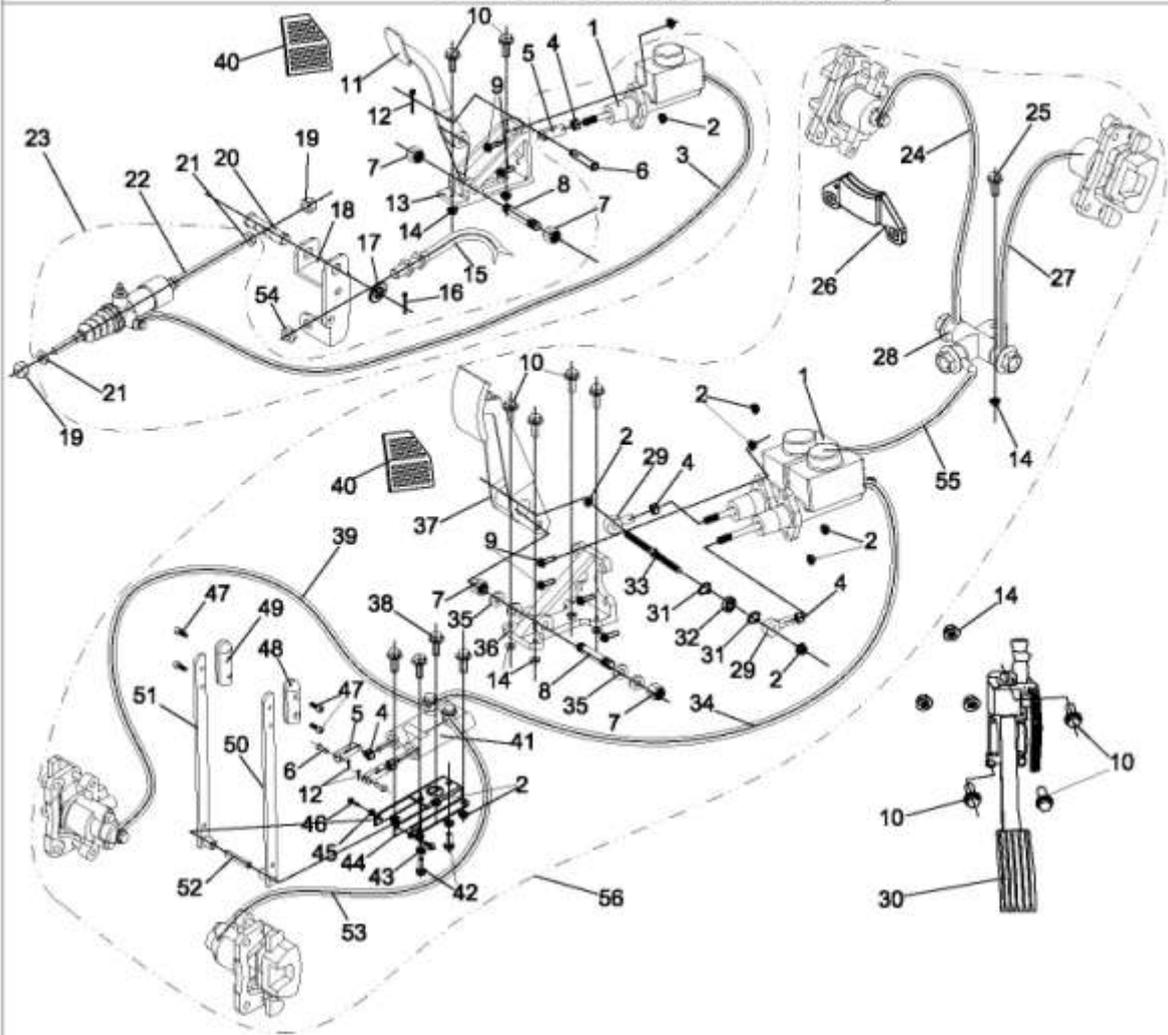


### 5 Throttle and park assembly

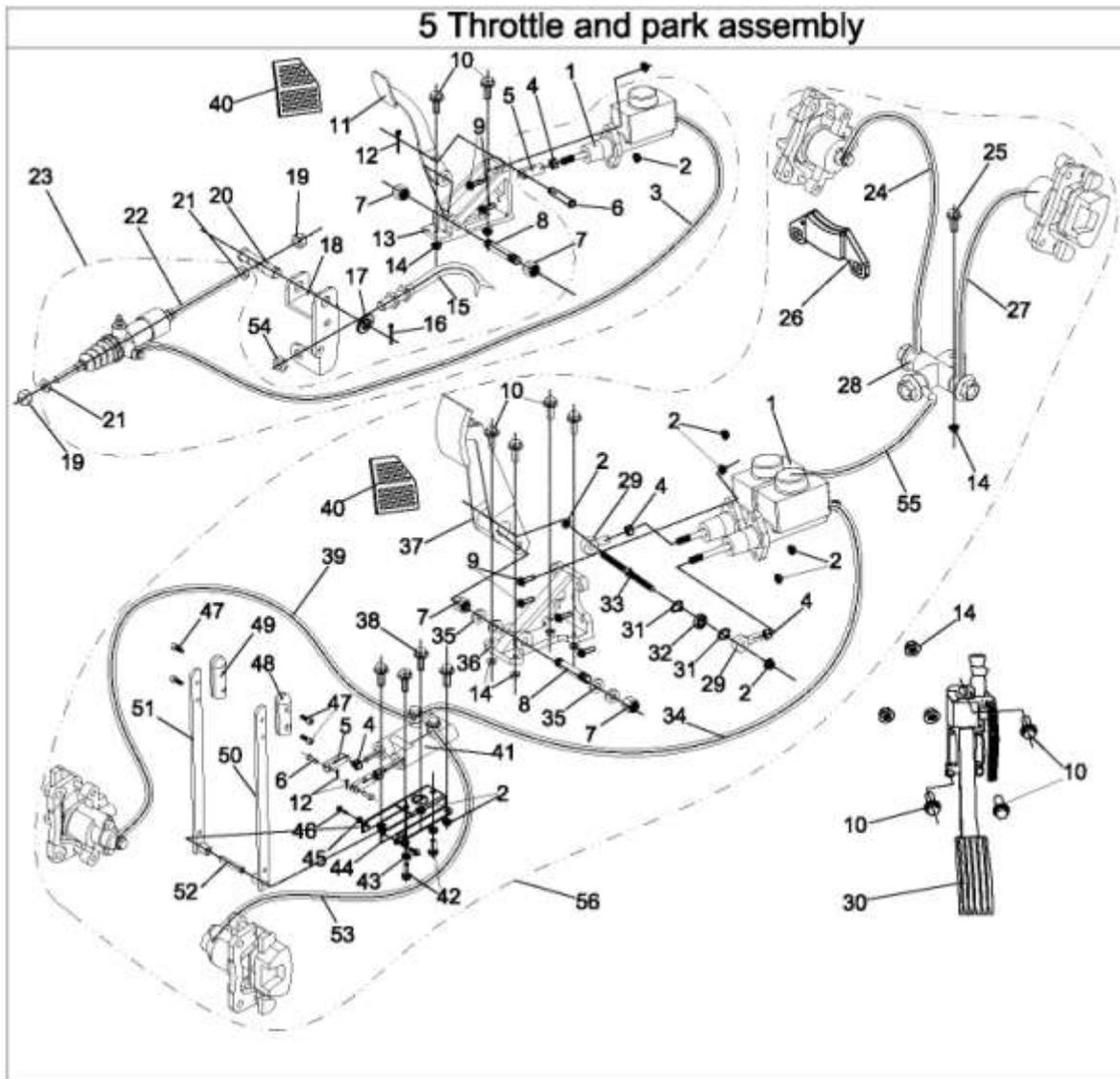


No.	Code name	Description	Q' ty
1	SR2000.07.01.01.01	master cylinder	3
2	6187.1-M8	caulking nut M8	12
3	SR2000.07.03.02.03	oil tube,clutch	1
4	941-M8	M8 nut	5
5	SR2000.07.03.02.04	'U' carrier rod	3
6	882-PP6*20	pin roll Ø6*20	3
7	6172.2-M12	thin nut M12	4
8	SR2000.07.01.02.05	screw thread pole	2
9	5787-M8*35	bolt-washer M8*35	6
10	5787-M6*25	bolt-washer M6*25	9
11	SR2000.07.03.02.01	clutch pedal	1
12	91-CP2*25	cotter pin 2*25	3
13	SR2000.07.03.02.02	bracket,clutch pedal	1
14	6187.1-M6	caulking nut M6	10
15	SR2000.06.01.11.00	speedometer sensor	1

### 5 Throttle and park assembly

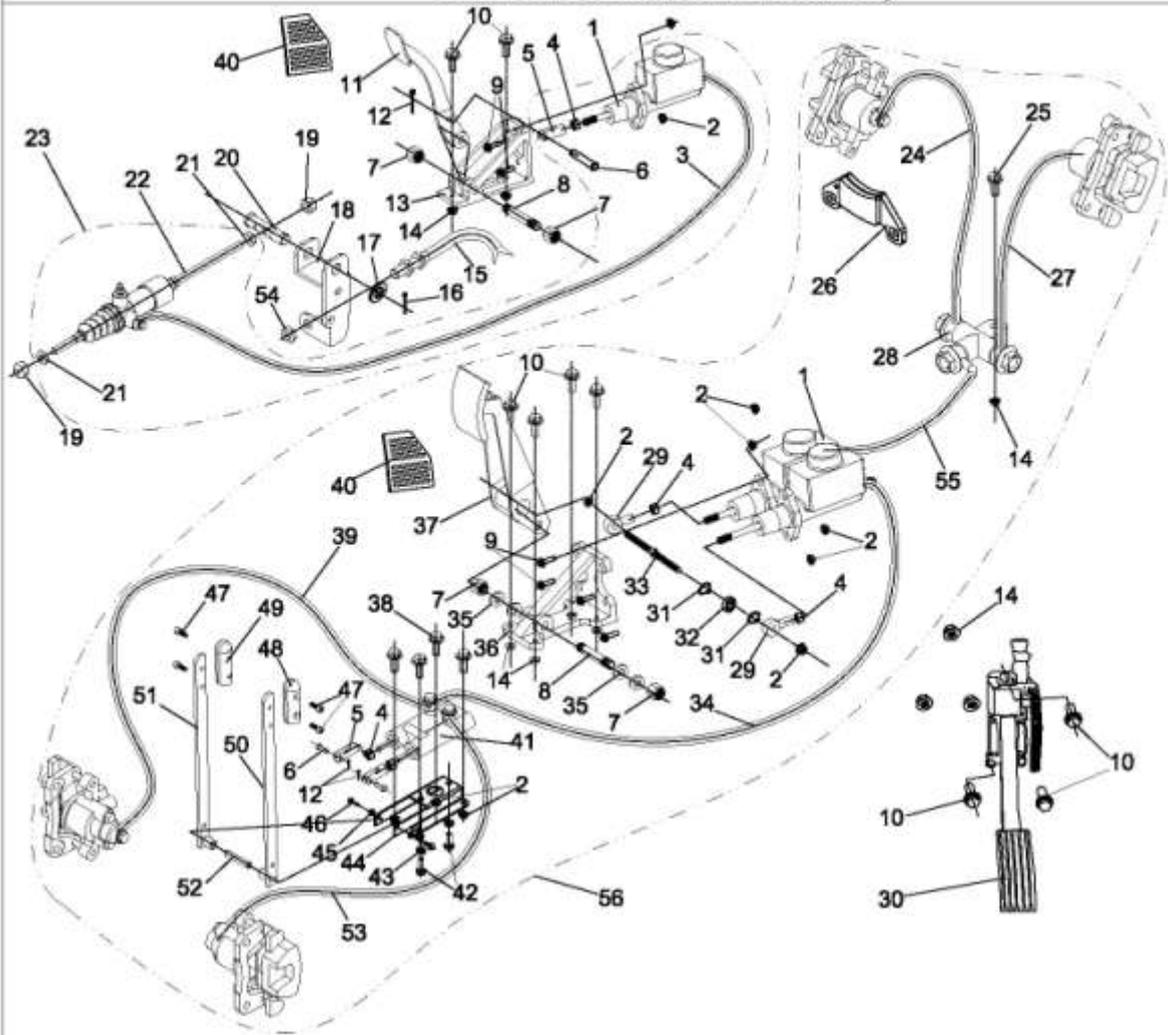


No.	Code name	Description	Q' ty
16	91-CP2*30	cotter pin 2*30	1
17	95-W14	Ø14 washer	1
18	SR2000.07.03.04.00	bracket,clutch working cylinder	1
19	SR2000.07.03.03.01	stop nut	2
20	SR2000.07.03.00.01	pin,clutch working cylinder	1
21	41-M8	M8 nut	2
22	SR2000.07.03.03.00	clutch working cylinder	1
23	SR2000.07.03.02.00	clutch system assembly	1
24	SR2000.07.01.01.08	front brake hose,left	1
25	5787-M6*35	bolt-washer M6*35	1
26	SR2000.07.01.01.03	brake pad,hydraulic brakingassy	8
27	SR2000.07.01.01.09	front brake hose,right	1
28	SR2000.07.01.01.11	tee joint	1
29	SR2000.07.01.02.03	rod end bearing M8	2
30	B11-1108010	electronic throttle pedal assembly	1



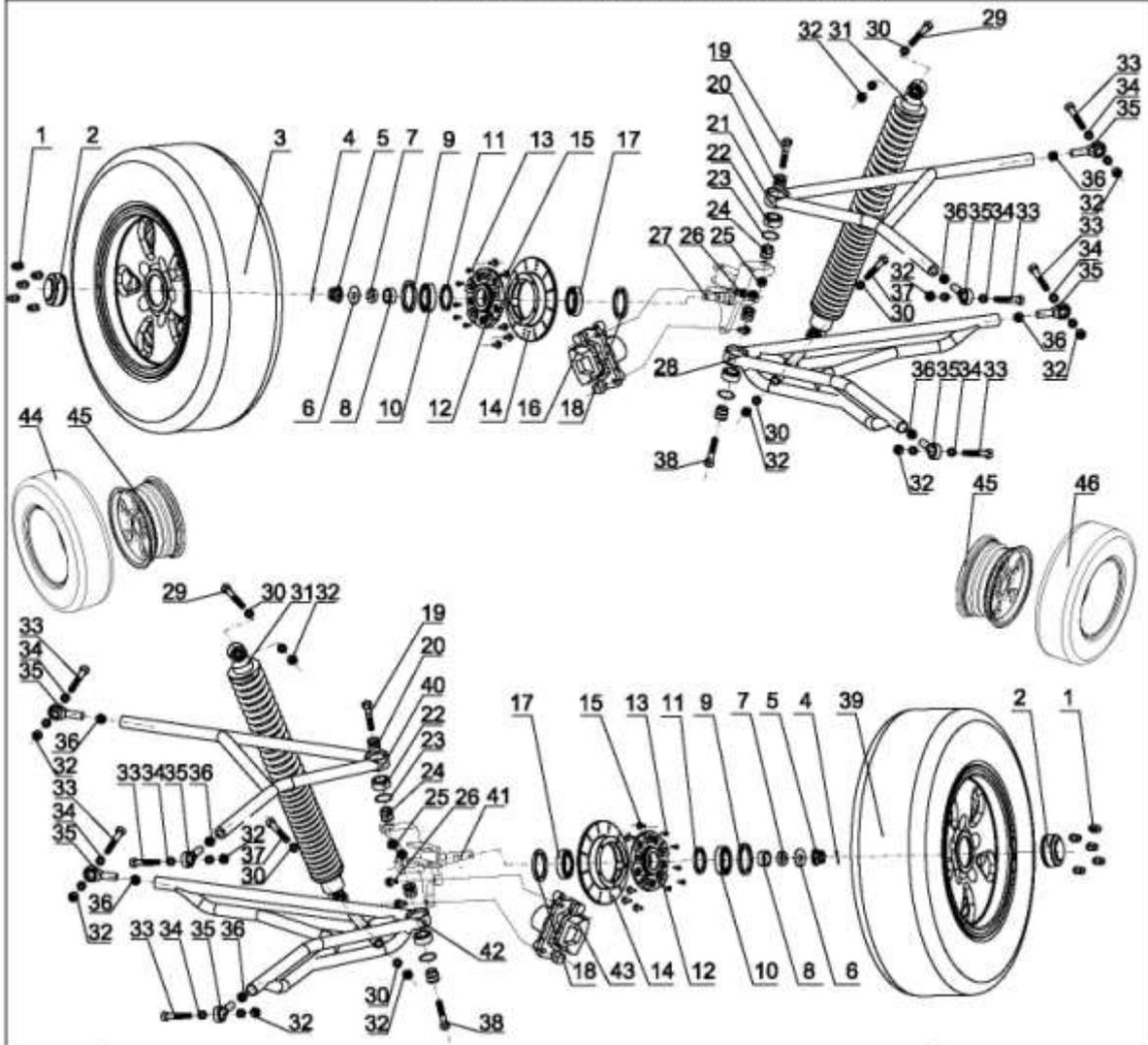
No.	Code name	Description	Q' ty
31	894.1-CØ12	circlip for shaft Ø12	2
32	304.1-12	transverse bearing GE12C (E series)	1
33	SR2000.07.01.02.04	screw thread pole	1
34	SR2000.07.01.01.14	fore and after brake hose	1
35	95-W12	Ø12 washer	4
36	SR2000.07.01.02.02	bracket,brake cylinder	1
37	SR2000.07.01.02.01	brake pedal	1
38	5787-M8*20	bolt-washer M8*20	4
39	SR2000.07.01.01.12	rear brake hose,left	1
40	D650.07.01.00.05	pedal rubber cover	2
41	SR2000.07.01.03.01	cylinder,turning brake	1
42	5782-M10*1.5*20	bolt M10*1.5*20 (full thread)	2
43	93-SP10	spring washer Ø10	2
44	SR2000.07.01.03.02	bracket,turning brake	1
45	93-SP6	spring washer Ø6	2

### 5 Throttle and park assembly



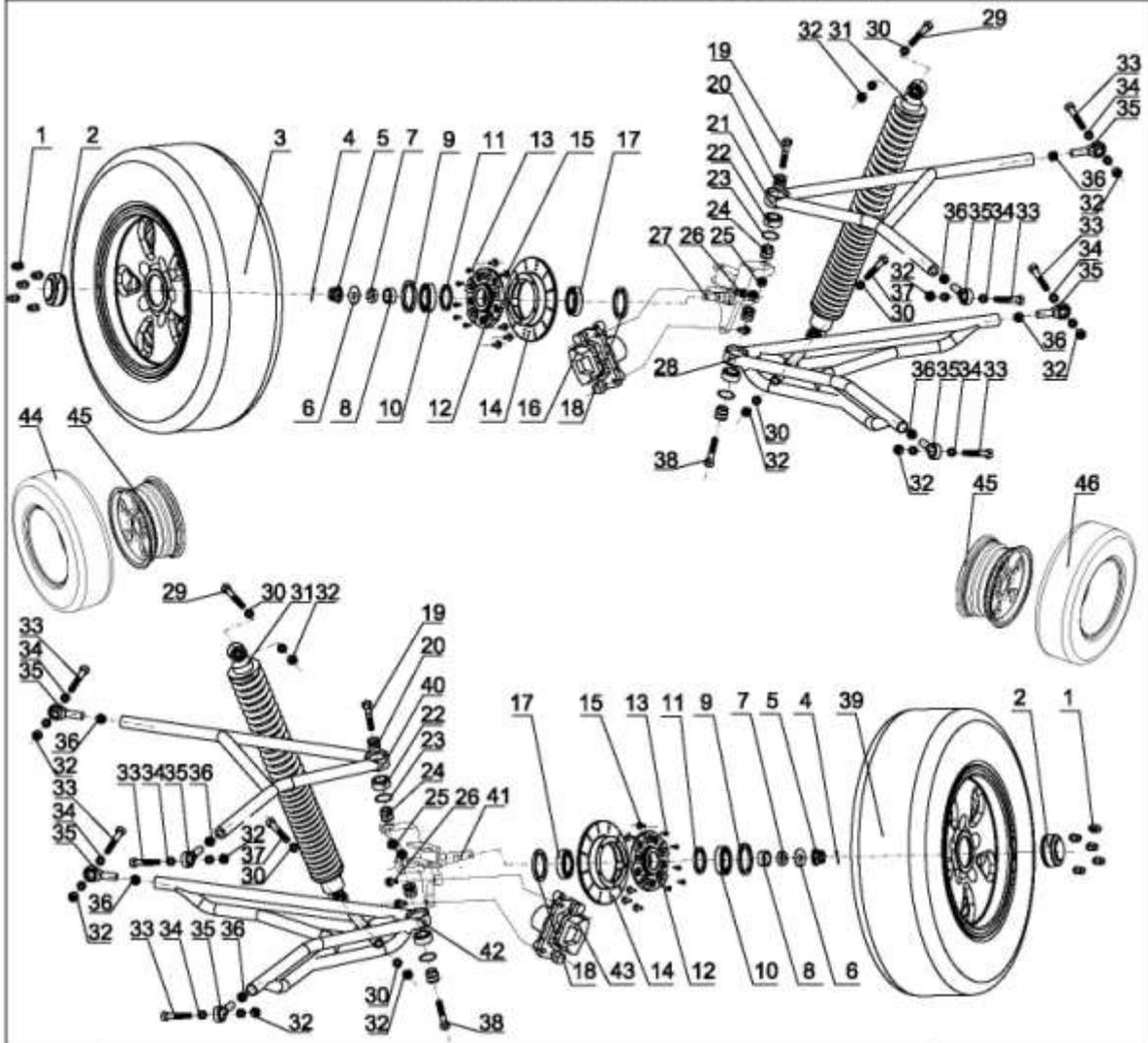
No.	Code name	Description	Q' ty
46	5782-M6*20	bolt M6*20 ( full thread )	2
47	823- M6*16	cross small panhead screw M6*16	4
48	SR2000.07.01.03.07	operating grip,right	1
49	SR2000.07.01.03.04	operating grip,left	1
50	SR2000.07.01.03.06	right operating arm,turning brake	1
51	SR2000.07.01.03.03	left operating arm,turning brake	1
52	SR2000.07.01.03.05	copper sleeve	1
53	SR2000.07.01.01.13	rear brake hose,right	1
54	6173-M12*1.25	thin nut M12*1.25	2
55	SR2000.07.01.01.10	master brake hose,front	1
56	SR2000.07.01.00.00	brake system assembly	1

## 6 Front suspension assembly



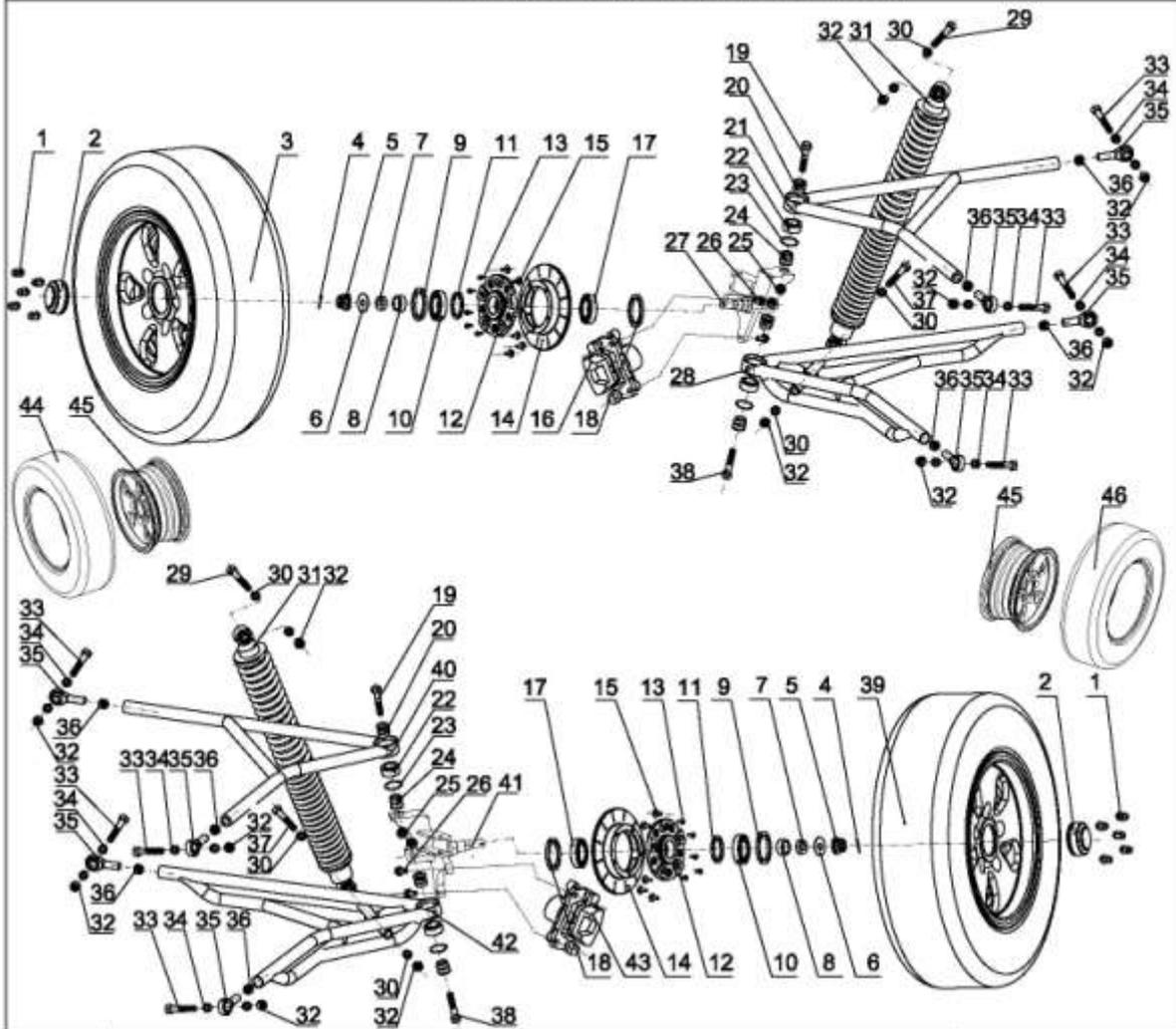
No.	Code name	Description	Q' ty
1	D1600.03.01.00.04	M15*1.5 wheel nut	10
2	D1600.03.01.01.04	dirt-proof boot	2
3	SR2000.03.01.01.00	front wheel(27*7.5-15),left	1
4	91-CP4*40	cotter pin 4*40	2
5	9457-M18*1.5	slotted nut M18*1.5	2
6	D800.03.01.00.10	washer	2
7	D650.03.01.00.08	spacer sleeve	2
8	D800.03.01.00.07	axile bush	2
9	D800.03.01.00.08	30*52*8 grease seal	2
10	D800.03.01.00.04	ball bearing 25X52X15	2
11	D800.03.01.00.06	spacer sleeve	2
12	D1600.03.01.00.01	front hub	2
13	5787-M10*1.25*30	bolt-washer M10*1.25*30	10
14	D1600.03.01.00.02	brake disk	2
15	D1600.03.01.00.03	knurled screw M15*1.5	10

## 6 Front suspension assembly



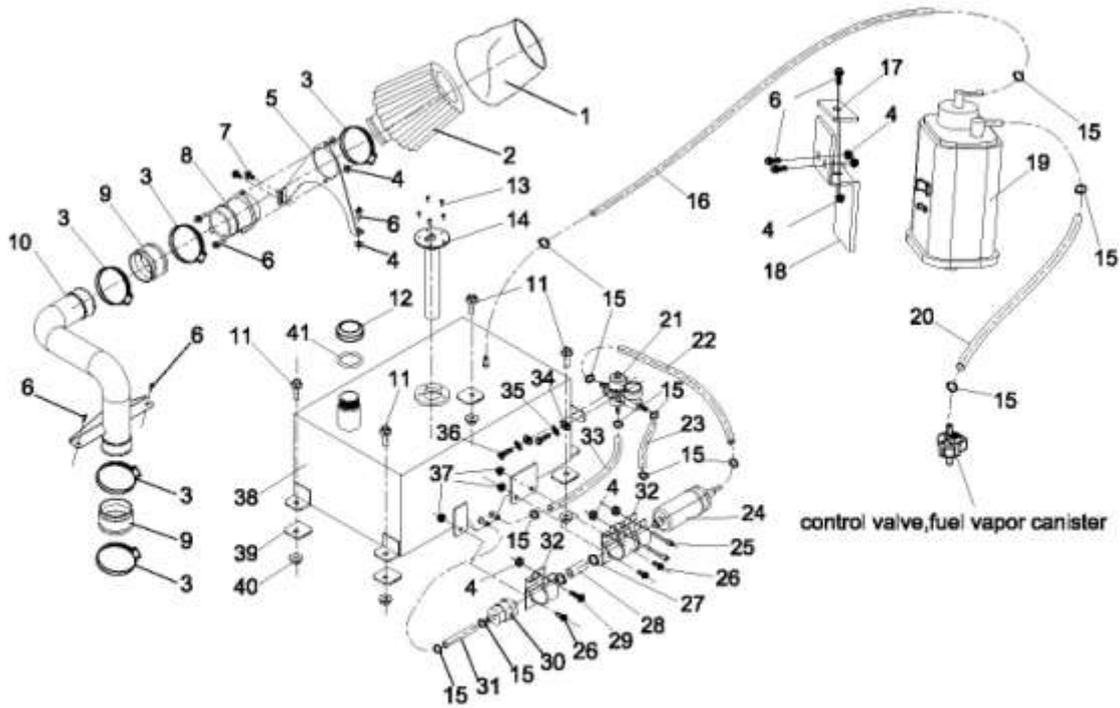
No.	Code name	Description	Q' ty
16	SR2000.07.01.01.04	front brake caliper,left	1
17	D800.03.01.00.05	30*62*16 ball bearing	2
18	D800.03.01.00.09	40x62x7 grease seal	2
19	5782-M16*2*85	M16*2*85 bolt	2
20	D800.02.01.00.02	bushing	8
21	SR2000.02.01.02.00	upper control arm,left	1
22	D800.02.01.00.01	radial bearing	4
23	D800.02.01.00.05	circlip	4
24	D800.02.01.00.02	bushing	8
25	6185.1-M16*2	M16*2 nut	4
26	5787-M12*1.25*18	bolt-washer M12*1.25*18	4
27	SR2000.03.01.03.00	left wheel axle,front	1
28	SR2000.02.01.01.00	lower control arm,left	1
29	5782-M15*1.5*190	M15*1.5*190 bolt	2
30	D800.02.03.00.03	spacer sleeve,shocker	8

## 6 Front suspension assembly



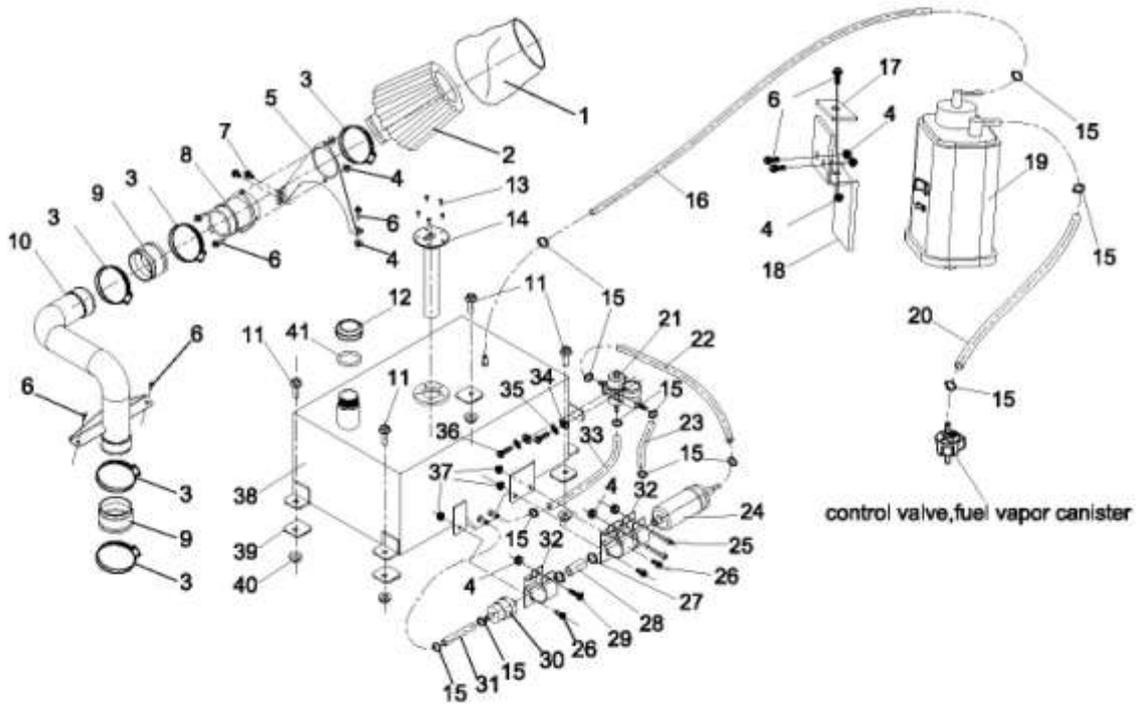
No.	Code name	Description	Q' ty
31	SR2000.02.03.01.00	front shocker	2
32	6185.1-M15*1.5	M15*1.5 nut	2
33	5782-M16*2*65	M16*2*65 bolt	8
34	D800.02.01.00.04	spacer sleeve,control arm	16
35	D800.02.01.00.03	rod end bearing, control arm	4
36	6172.2-M16*2	jam nut M16*2	8
37	5782-M15*1.5*210	M15*1.5*210 bolt	2
38	5782-M16*2*95	bolt M16*2*95	2
39	SR2000.03.01.02.00	front wheel(27*7.5-15),right	1
40	SR2000.02.01.03.00	upper control arm,right	1
41	SR2000.03.01.04.00	right wheel axle, front	1
42	SR2000.02.01.04.00	lower control arm,right	1
43	SR2000.07.01.01.05	front brake caliper,right	1
44	SR2000.03.01.01.02	front tire( 27X7.5-15),left	1
45	SR2000.03.01.01.01	front rim(15X8)	2
46	SR2000.03.01.02.01	front tire( 27X7.5-15),right	1

## 7 Fuel tank and gasoline pump



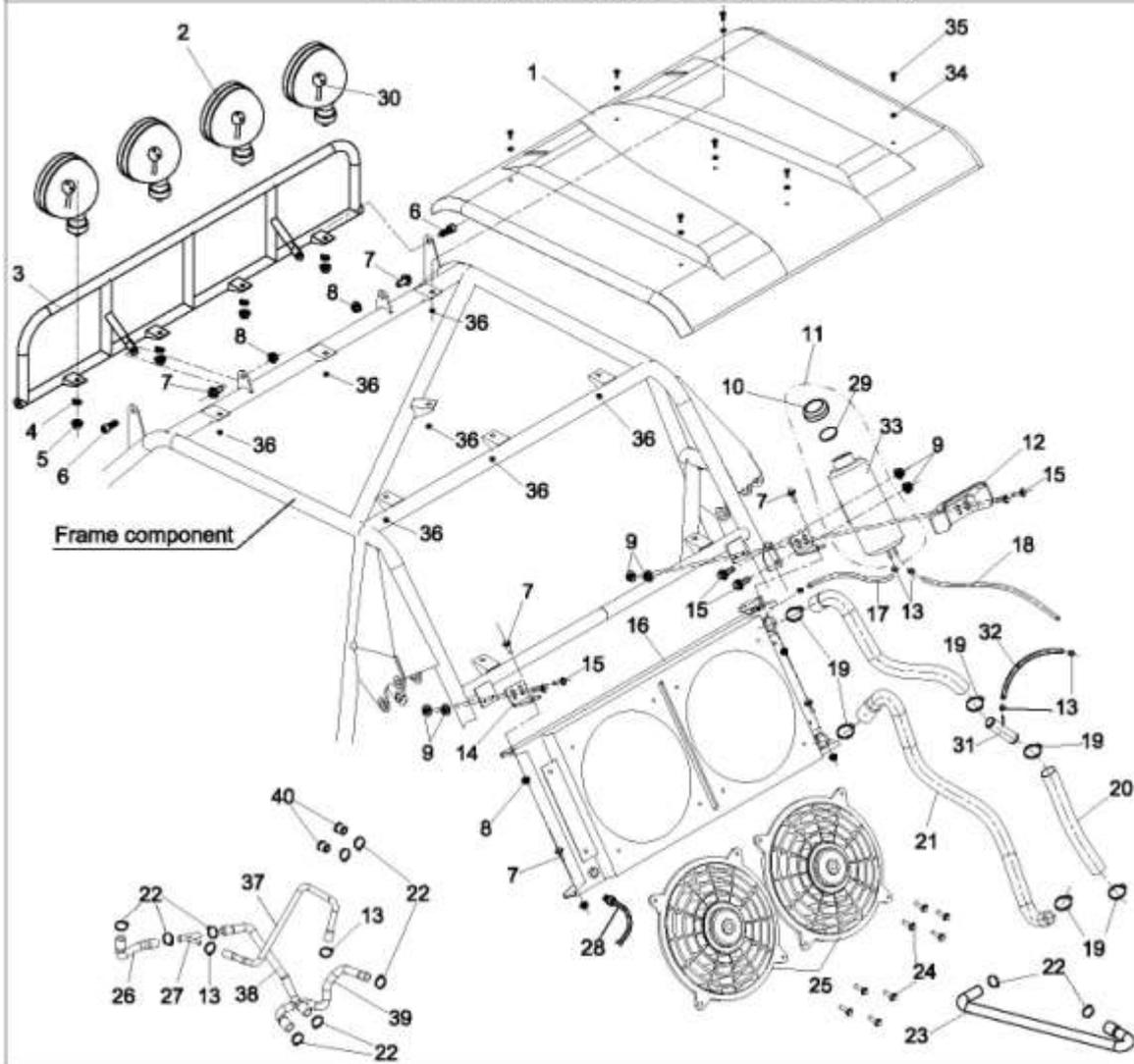
No.	Code name	Description	Q' ty
1	D800.08.01.00.04	dirt-proof boot	1
2	SR2000.04.05.00.01	air filter	1
3	CQ67676	anchor ear	5
4	6177.1-M6	nut-washer M6	9
5	SR2000.04.05.00.02	air filter bracket	1
6	5787-M6*16	bolt-washer M6*16	8
7	5787-M6*12	bolt-washer M6*12	2
8	A11-3614011	airometer	1
9	A21-1109817	rubber jointer	2
10	SR2000.04.05.02.00	air intake	1
11	5787-M10*1.25*30	bolt-washer M10*1.25*30	4
12	SR2000.04.03.00.03A	aluminum fuel tank cap	1
13	5787-M4*10	bolt-washer M4*10	5
14	SR2000.04.03.03.00	oil level sensor assembly	1
15	D650.04.03.00.04	hoop (10-16)	12
16	SR2000.04.06.00.01	outlet tube, fuel vapor canister	1
17	D650.04.06.01.02	sheet metal	1
18	D650.04.06.01.01	mount	1
19	TR1100.04.06.01.00	fuel vapor canister	1
20	SR2000.04.06.00.02	outlet tube, fuel vapor canister	1
21	D1600.04.03.03.00	fuel pressure adjuster	1
22	D1600.04.03.00.07	Φ8*Φ15 outlet tube, fuel pump	1

## 7 Fuel tank and gasoline pump



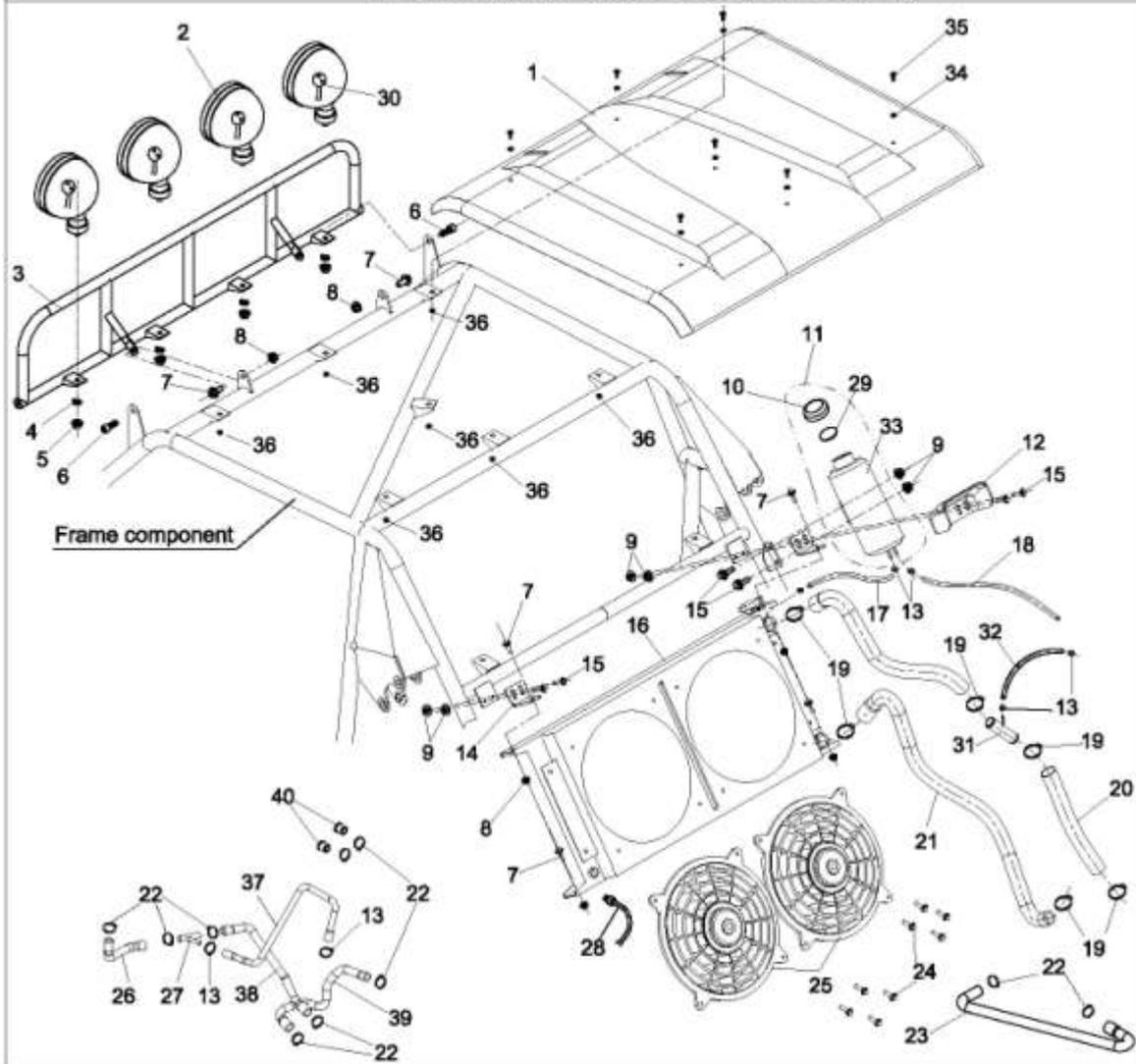
No.	Code name	Description	Q' ty
23	SR2000.04.03.00.05	Φ8*Φ15 inlet tube,engine	1
24	D1600.04.03.02.00	fuel pump	1
25	70.1-M6*60	socket head screw M6*60	2
26	5787-M8*20	bolt-washer M8*20	3
27	D1600.04.02.00.06	hoop (16-25)	2
28	D1600.04.03.00.08	inlet tube Φ16*Φ21,fuel pump	1
29	818-M5*35	cross panhead screw M5*35	2
30	D650.04.03.00.05	fuel filter	1
31	SR2000.04.03.00.01	Φ8*Φ15 outlet tube,fuel tank	2
32	D650.04.03.00.10	Clip , fuel filter	3
33	SR2000.04.03.00.04	Φ8*Φ15 return tube	4
34	95-W4	washer Φ4	2
35	93-SP4	Spring washer Φ4	2
36	5782-M4*10	bolt M4*10	2
37	6187.1-M8	caulking nut M8	3
38	SR2000.04.03.01.00A	fuel tank	1
39	SR2000.04.03.00.02	rubber cushion,fuel tank	4
40	6177.1-M10*1.25	nut-washer M10*1.25	4
41	SR2000.04.03.00.04	'O' seal ring 44.7*57	1

### 8 spot lights and radiator assembly



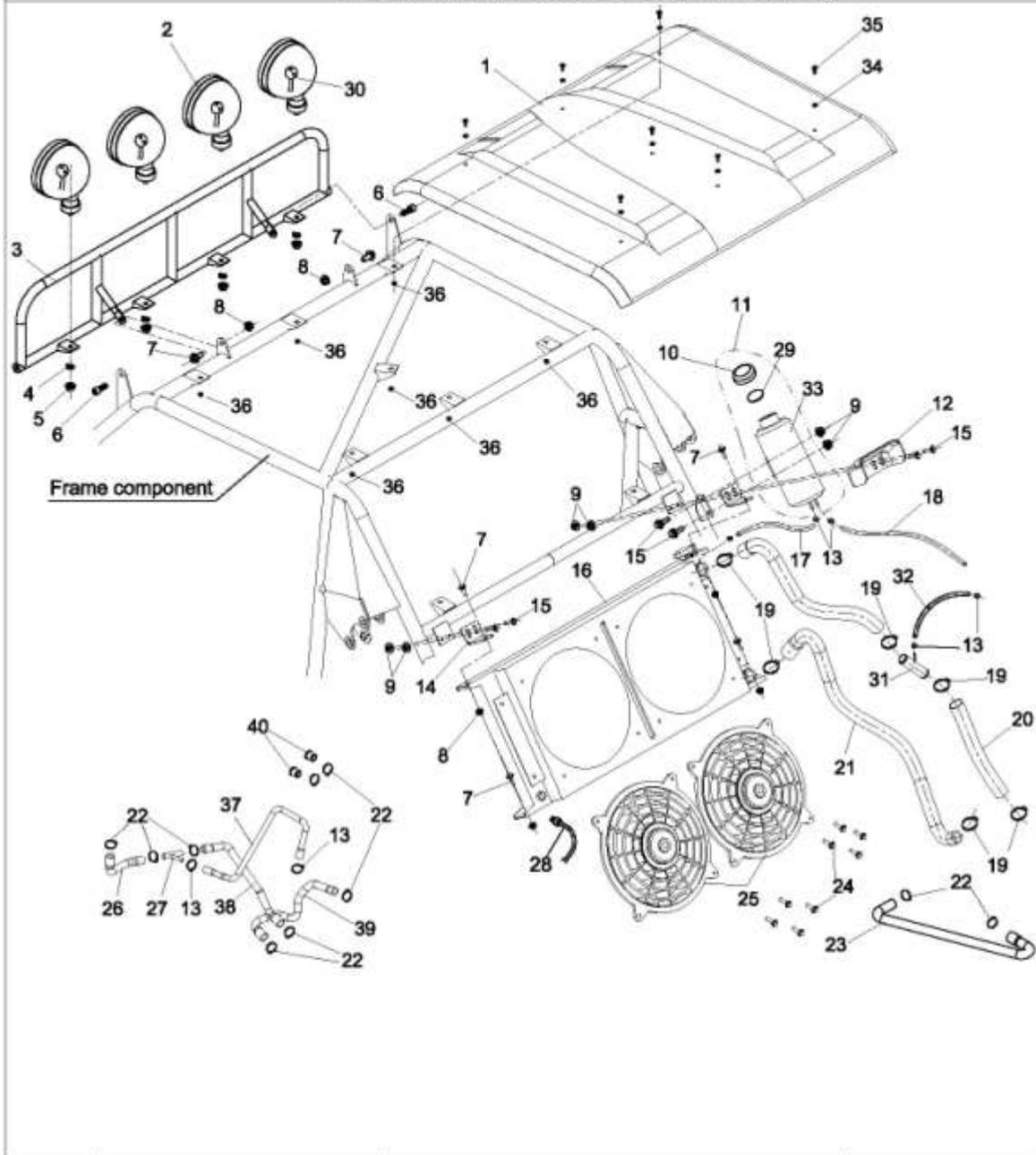
No.	Code name	Description	Q' ty
1	SR2000.08.01.00.02	plastic roof cover	1
2	D1600.06.10.00.00	spot light	4
3	SR2000.01.02.02.00	mount of spot lights	1
4	93-SP10	spring washer Ø10	4
5	GB41-M10	nut M10	4
6	70.1-M12*1.25*30	M12*1.25*30 socket head screw	2
7	5787-M10*20	bolt-washer M10*20	6
8	6177.1-M10	nut-washer M10	6
9	6177.1-M8	nut-washer M8	6
10	D800.04.02.00.01	cap of reserve tank	1
11	D800.04.02.02.00	reserve tank assembly	1
12	SR2000.04.02.00.04	plastic protective covering	1
13	D650.04.03.00.04	hoop(10-16)	7
14	D800.01.02.00.05	bracket,aluminium radiator	2
15	5787-M8*20	bolt-washer M8*20	6

### 8 spot lights and radiator assembly



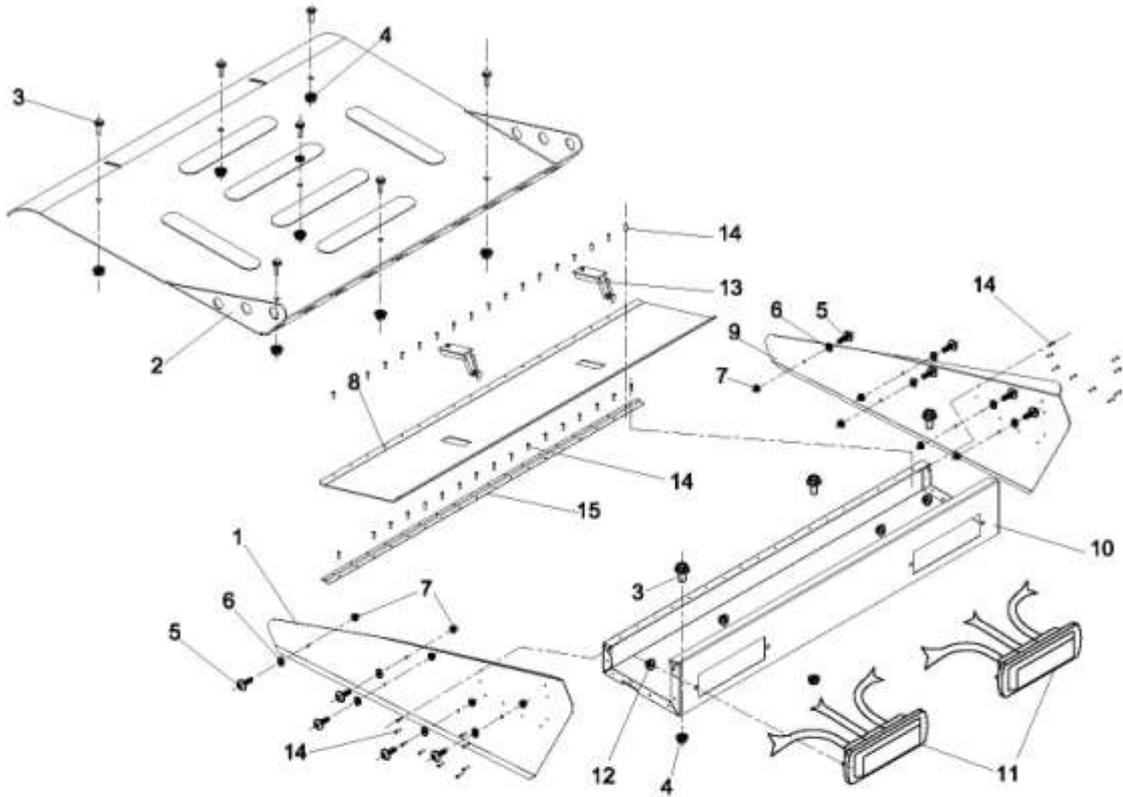
No.	Code name	Description	Q' ty
16	SR2000.04.02.01.00	aluminium radiator assembly	1
17	SR2000.04.02.00.01	water pipe, reserve tank	1
18	D1600.04.02.00.09	aeration pipe, reserve tank	1
19	D1600.04.02.00.10	hoop(27-51)	6
20	D1600.04.02.00.02	delivery hose , engine	1
21	D1600.04.02.00.01	water supply hose , engine	1
22	D1600.04.02.00.06	hoop(16-25),water tube	10
23	SR2000.04.02.00.02	circulation cooling hose	1
24	5787-M6*16	bolt-washer M6*16	8
25	D1600.04.02.02.00	radiator fan	2
26	A11-1303611	coolant hose	1
27	A11-1303611	three-limb tube	1
28	D650.04.02.03.00	temperature detect switch(TDS)	1
29	D800.04.02.00.02	airproof washer, reserve tank	1
30	D1600.06.10.00.01	bulb of spotlight	4

### 8 spot lights and radiator assembly



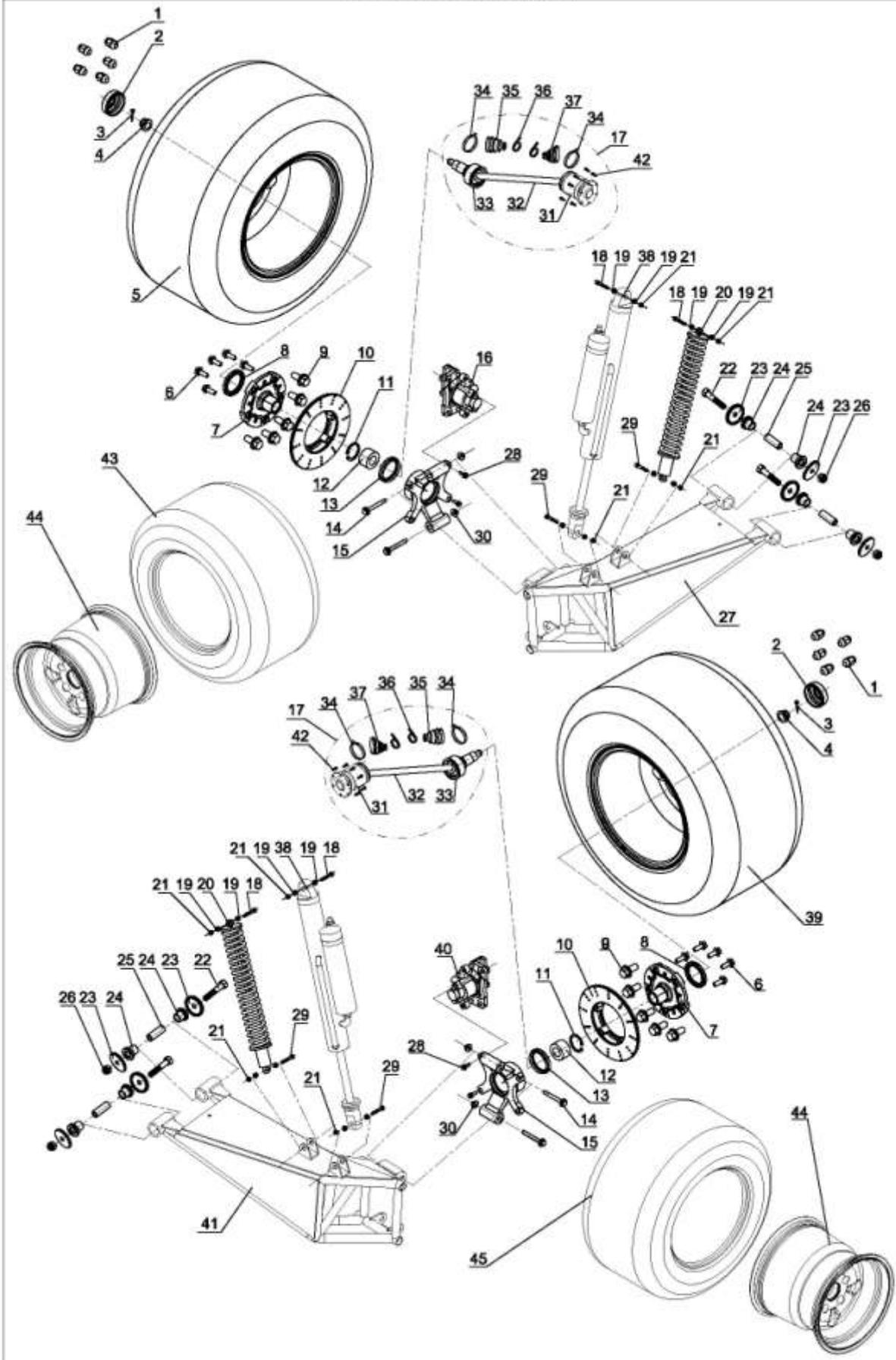
No.	Code name	Description	Q' ty
31	D1600.04.02.03.00	Tee branch	1
32	D1600.04.02.00.12	Pressure relief hose	1
33	D800.04.02.02.03	reserve tank	1
34	JD0900008	rubber-washer $\Phi 6$	7
35	818-M6*16	cross panhead screw M6*16	7
36	6187.1-M6	caulking nut M6	7
37	A11-1303811	coolant hose	1
38	A11-1303621	outlet tube,oil cooler	1
39	A11-1303613	inlet tube,oil cooler	1
40	D1600.04.01.05.16	rubber plug	2

### 9 aluminum roof rack and empennage assembly



No.	Code name	Description	Q' ty
1	SRB2000.01.02.01.01	side plate of empennage, left	1
2	SR2000.08.01.00.03	aluminum roof rack	1
3	5787-M6x16	nut-washer M6x16	10
4	6187.1-M6	caulking nut M6	10
5	818-M6*16	cross panhead screw M6*16	10
6	JD0900008	rubber-washer $\Phi 6$	10
7	6177.1-M6	nut-washer M6	10
8	SRB2000.01.02.01.02	top plate of empennage	1
9	SRB2000.01.02.01.04	side plate of empennage, right	1
10	SRB2000.01.02.01.03	rear plate of empennage	1
11	D800.06.00.00.12	tail light assembly	2
12	6177.1-M10	nut-washer M10	4
13	LS2.01.02.01.06	lock	2
14	152.1-4*16	clinch bolt	54
15	SRB2000.01.02.01.05	iron hinges	1

# 10 Rear suspension

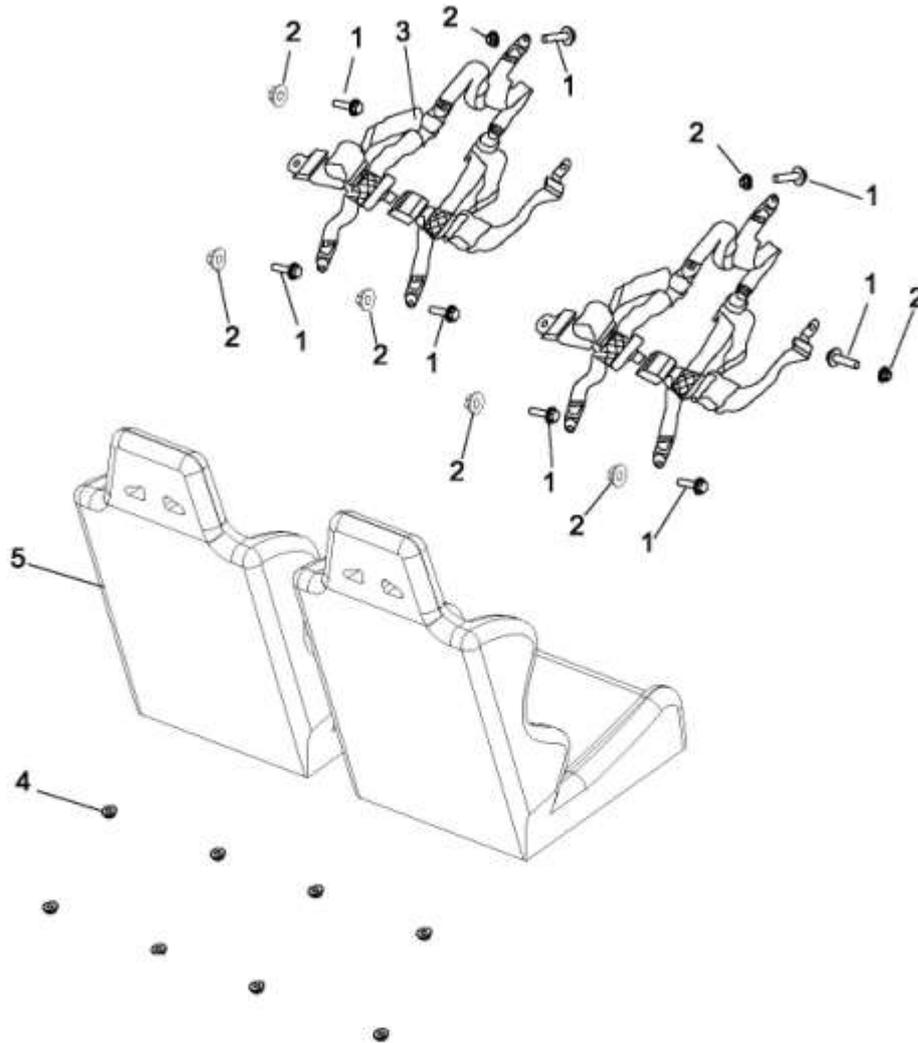


10 Rear suspension			
No.	Code name	Description	Q' ty
1	D1600.03.01.00.04	M15*1.5 wheel nut	10
2	D1600.03.01.01.04	dirt-proof boot	2
3	91-CP4*40	cotter pin 4*40	2
4	D1600.03.01.00.05	slotted nut M24*2, rear shaft	2
5	SR2000.03.02.01.00	rear wheel (28*13-15), left	1
6	5787-M10*1.25*30	bolt-washer M10*1.25*30	10
7	D1600.03.02.00.02	wheel hub	2
8	D1600.03.02.00.04	oil seal (60*84*8)	2
9	D1600.03.01.00.03	knurled screw M15*1.5	10
10	D1600.03.01.00.02	brack disk	2
11	893.2-CΦ84	circlip for hole Φ84(model B)	2
12	D1600.03.02.00.03	bearing 309797(45*84*39)	2
13	D1600.03.02.00.05	oil seal (60*80*8/14)	2
14	5787-M16*2*100*25	bolt-washer M16*2*100*25	4
15	D1600.03.02.00.02	rear bearing chock	2
16	SR2000.07.01.01.06	rear brake caliper, left	1
17	SR2000.03.02.03.00	half shaft	2
18	5782-M15*1.5*80*30	M15*1.5*80*30 bolt	2
19	D800.02.03.00.03	spacer sleeve Φ15	8
20	SR2000.02.03.02.00	rear shock	2
21	6185.1-M15*1.5	M15*1.5 nut	2
22	5787-M16*2*125	M16*2*125 bolt	4
23	D800.02.02.00.03	grease seal, Ø46	8
24	D800.02.02.00.02	powdered spacer sleeve	8
25	D800.02.02.00.04	spacer sleeve	4
26	6177.1-M16*2	M16*2 nut	4
27	SR2000.02.02.02.00	rear rocker arm, left	1
28	5787-M12*1.25*26	bolt-washer M12*1.25*26	4
29	5782-M15*1.5*65*25	bolt-washer M15*1.5*65*25	2
30	6177.1-M16*2	nut-washer M16*2	4
31	SR2000.03.02.03.01	inboard joint , end motion type	2
32	SR2000.03.02.03.02	solid bar	2
33	D1600.03.02.03.03	outboard joint, fixed enter type	2
34	D1600.03.02.03.04	BIG band	4
35	D1600.03.02.03.05	outer boot seal	2
36	D1600.03.02.03.06	SMALL band	4
37	D1600.03.02.03.07	inner boot seal	2
38	SR2000.02.03.03.00	counterbuffer	2
39	SR2000.03.02.02.00	rear wheel (28*13-15), right	1
40	SR2000.07.01.01.07	rear brake caliper, right	1
41	SR2000.02.02.01.00	rear rocker arm, right	1

## 10 Rear suspension

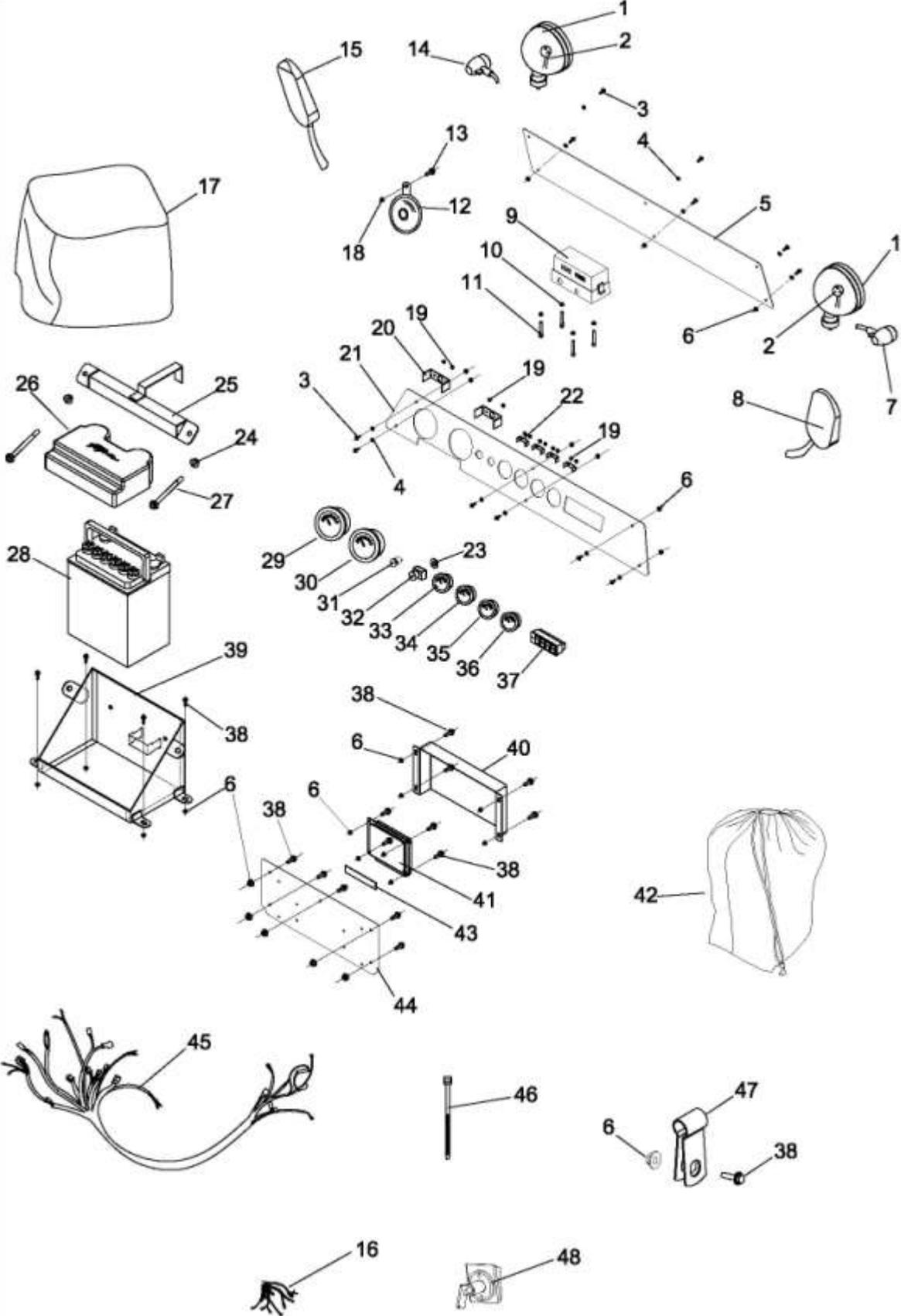
No.	Code name	Description	Q' ty
42	SR2000.04.01.06.07	bolt 3/8-24X3/4	12
43	SR2000.03.02.01.02	rear tire( 28X13-15),left	1
44	SR2000.03.02.01.01	rear rim(15X10)	2
45	SR2000.03.02.02.01	rear tire( 28X13-15),right	1

## 11seats and safety belts



No.	Code name	Description	Q' ty
1	5787-M12*1.5*25	bolt-washer M12*1.5*25	10
2	6177.1-M12*1.5	nut-washer M12*1.5	10
3	SV1100.08.01.18.00	safty belt	2
4	6177.1-M10*1.25	nut-washer M10*1.25	8
5	SV1100.08.01.01.00	seat	2

12 other parts



12 other parts			
No.	Code name	Description	Q' ty
1	D1600.06.11.00.00	head light	2
2	D1600.06.11.00.01	bulb of headlight	2
3	818-M6*20	cross panhead screw M6*20	12
4	JD0900008	rubber-washer Φ6	12
5	SR2000.01.02.00.01	plate	1
6	6177.1-M6	nut-washer M6	23
7	D650.06.00.15.00	right turn light,front	1
8	D650.08.01.00.07	back view mirror ,right	1
9	SR2000.06.01.03.00A	fuse and relay box	1
10	6177.1-M6	nut-washer M6	4
11	70.1-M6*35	M6*35 socket head screw	4
12	D650.06.00.09.00	horn	1
13	5787-M8*20	bolt-washer M8*20	1
14	D650.06.00.05.00	left turn light,front	1
15	D650.08.01.00.06	back view mirror ,left	1
16	B11-3724180BV	Engine cable	1
17	D1600.08.01.00.01	battery fabric covering	1
18	6187.1-M8	caulking nut M8	1
19	6177.1-M5	nut-washer M5	12
20	D1600.01.02.00.06	big meter mount	2
21	SR2000.06.01.03.00A	gauge board	1
22	D1600.06.06.00.01	small meter mount	4
23	JD0460003	washer	1
24	6177.1-M8	nut-washer M8	2
25	D1600.01.02.08.00	battery bracket	1
26	D1600.08.01.00.04	battery rubber covering	1
27	5787-M8*140	bolt-washer M8*140	2
28	D1600.06.02.00.00	battery	1
29	SR2000.06.04.00.00	speedometer	1
30	D1600.06.05.00.00	tachometer	1
31	S650.06.08.00.00	Starting electric door lock	1
32	D650.06.00.13.00	horn button	1
33	N650.06.04.00.00	fuel level gauge	1
34	D1600.06.07.00.00	oil pressure gauge	1
35	SR2000.06.03.00.00	coolant temperature indicator	1
36	D1600.06.09.00.00	voltmeter	1
37	D1600.06.03.00.00A	four swiches assembly	1
38	5787-M6*16	bolt-washer M6*16	27
39	SR2000.01.02.03.00	battery box	1
40	D1600.01.02.06.00	ECU plastic shield	1

**12 other parts**

No.	Code name	Description	Q' ty
41	B11-3605010HA	ECU	1
42	SR2000.08.01.00.01	vehicle fabric covering	1
43	D1600.06.00.00.01	rubber backing	1
44	SR2000.01.01.02.22	ECU mounting plate	1
45	SR2000.06.01.00.00	electric cable	1
46	D650.08.05.00.06	cable tie	25
47	D1600.07.01.01.01	tube clip	10
48	DN250.10.07.00.00	Electrical source switch	1

# DEALER PRE-DELIVERY INSPECTION



## TEAM JOYNER USA

www.teamjoynerusa.com



### DEALER PRE-DELIVERY INSPECTION

1245 N. Mondel Dr. • Gilbert, AZ 85233  
 Ph: 480-813-6363 • Fax: 480-813-6379

This form registers warranty

This form registers warranty

**SOLD TO:**

Customer Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
 Email \_\_\_\_\_ Contact Person \_\_\_\_\_ Phone \_\_\_\_\_  
 Phone \_\_\_\_\_ Name \_\_\_\_\_ Fax \_\_\_\_\_ Cell \_\_\_\_\_  
 Technician \_\_\_\_\_ Supervisor \_\_\_\_\_

We have determined that your vehicle is safe to operate <input type="checkbox"/> YES <input type="checkbox"/> NO
---

SALE DATE:		DELIVERY DATE:		YEAR:		MAKE:		VIN #:		COLOR:	
ITEM	OPERATIONAL	ITEM	OPERATIONAL	ITEM	OPERATIONAL	ITEM	OPERATIONAL	ITEM	OPERATIONAL		
Paint	Yes No	Carburetor	Yes No	Mirror	Yes No	Rear Diff	Yes No				
Lug Nuts	Yes No	Throttle Cable	Yes No	Battery	Yes No	Wheel Bearings	Yes No				
Axle Nuts	Yes No	Choke Cable	Yes No	Ignition	Yes No	Blinkers	Yes No				
Tie Rods	Yes No	Emergency Brake	Yes No	Gauges	Yes No	Fuel Lines	Yes No				
Axles	Yes No	Charging System	Yes No	Switches	Yes No	Steering Wheel	Yes No				
CV Joint	Yes No	Tires/Wheels	Yes No	Fluids	Yes No	Clutch	Yes No				
Seats	Yes No	Cooling System	Yes No	Gas	Yes No	Belts	Yes No				
Seat Belts	Yes No	Winches	Yes No	Engine Oil	Yes No	Brake Pedal	Yes No				
Wiring Harness	Yes No	A Arms	Yes No	Transmission Fluid	Yes No	EPA Sticker	Yes No				
Brakes	Yes No	Swing Arms	Yes No	Gear Oil	Yes No	Carb Sticker	Yes No				
Brake Lines	Yes No	Shocks	Yes No	Shock Oil	Yes No	Oil Vent System	Yes No				
Brake Pads	Yes No	Steering Boy	Yes No	Coolant Fluid	Yes No						
Shifter	Yes No	Lights	Yes No	Brake Fluid	Yes No						
Throttle Pedal	Yes No	Horn	Yes No	Front Diff	Yes No						

**REMARKS:**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Dealer Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
 Email \_\_\_\_\_ Contact Person \_\_\_\_\_ Phone \_\_\_\_\_  
 Phone \_\_\_\_\_ Name \_\_\_\_\_ Fax \_\_\_\_\_ Cell \_\_\_\_\_

Dealers Signature \_\_\_\_\_ Date \_\_\_\_\_

I agree to terms and conditions \_\_\_\_\_  
 Customer Signature \_\_\_\_\_ Date \_\_\_\_\_

This form registers warranty

\_\_\_\_\_ Jumping the vehicle can cause serious damage to the drive train (axle, transmission, suspension).

\_\_\_\_\_ Injury or death can result from jumping vehicle. Do Not Jump.

\_\_\_\_\_ I understand that the roll bars are cosmetic and a roll over could cause death or serious injury. The seller is not liable for death or injury.

\_\_\_\_\_ I have inspected all machines for any cosmetic damage and found it/them to be satisfactory. I further understand that cosmetic damage is NOT covered by any factory warranties and unless noted here are deemed accepted by me.

\_\_\_\_\_ Sand dunning or desert riding is dangerous. Death or injury could occur. The seller is not liable for injury or death.

\_\_\_\_\_ I understand all sales are final and that there is no right of rescission, no option for return or

exchange for any vehicle purchased, and that the titled and registered machines were effectively purchased when I signed the title application.

\_\_\_\_\_ I understand the warranty is 90 day manufacture defect only with the following not covered: axles, electrical batteries, light bulbs, clutches, turbo cartridges, carburetor cleaning, piston rings that are scorched from one revving, rims/tires, bearings.

\_\_\_\_\_ I understand that although some lending institutions do not require insurance, state law DOES require liability insurance and a driver's license. I also understand that none of the products offered by the dealer constitutes insurance and a separate policy would have to be purchases from an outside source to protect my purchase and fulfill state requirements.

\_\_\_\_\_ I have been shown the VIN number for each machine and they match this form and all paperwork received.

\_\_\_\_\_ I understand that I have only 72 hours to notify the seller of any issues to the paperwork or the vehicle.

\_\_\_\_\_ Off Road use only. Driving on paved roads can cause axle or transmission damage. Both tires turn equally, this is not a limited slip differential. Injury or death can occur from operating a non DOT vehicle on public roads.

\_\_\_\_\_ Turbo systems, system lessen life of engine, over revving the engine to increase boost of turbo can cause engine damage. This will not be covered under warranty.

#### ADDITIONAL TERMS AND CONDITIONS OF SALE

1. PROMISE TO PAY. By signing this contract, Buyer agrees to pay Seller the "TOTAL DUE".
2. TIME OF ESSENCE. Time is of the essence of this contract. Sellers acceptance of partial payments shall not in any manner modify the terms of this contract and such acceptance shall not be construed as a waiver of any subsequent defaults on Buyer's part nor shall it waive the "time is of the essence" provision.
3. NOTICE. Any notice required to be given to Buyer shall be deemed reasonable notification if  
( I ) mailed by ordinary mail, postage prepaid, to Buyer's mailing address as shown on this contract or to Buyer's most recent address as shown by a "notice of change of address" on file with Seller, whether or not such notice is actually received by buyer, or ( II ) if given in any other manner which results in Buyer's actual receipt of such notice.
4. BAD CHECK. If Buyer pays Seller with a check that is dishonored or unpaid for any reason, Seller may at Seller's sole option, terminate this contract and retake the vehicle, or make claims against Buyer on the check. In addition, Seller will charge Buyer a \$25 returned check charge plus any actual charges assessed by Seller's financial institution resulting from such returned check.
5. ATTORNEYS FEES. If it is necessary for Seller to take legal action to enforce any of seller's rights under this contract, Buyer agrees to pay to the extent permitted by law, the seller's reasonable attorneys fees and court costs.
6. GENERAL. This contract is governed by applicable federal law and the laws of the State of Arizona. Any provisions found to be invalidate the remainder hereof, Waiver of any default shall not constitute waiver of any subsequent default. All words used herein shall be construed to be of such gender and number as the circumstances require. The contract shall be binding upon Buyer's heirs, personal representatives, successors and assigns and shall inure to the benefit of Seller's successors and assigns. This contract

constitutes the entire agreement between the parties with respect to the subject matter herein, and may not be altered or amended unless made in writing and duly executed by Seller.

7. CASH DEPOSIT. If Buyer fails or refuses to accept delivery of any Vehicle or product or fails to comply with this contract, Seller may keep any cash deposit as liquidated damages, to the extent not prohibited by law. The deposit may also be used to reimburse Seller for any expenses and losses Seller incurs or suffers as a result of Buyer's failure or refusal to accept delivery of the Vehicle or product or to comply with this contract. Such expenses and losses may include Seller's reasonable attorney's fees.
8. NON-DELIVERY. Seller is not liable for failure to deliver or for delay in delivering the Vehicle or other product where such failure or delay is due, in whole or in part, to any cause beyond Seller's control or without Seller's fault or negligence,
9. RISK OF LOSS, INSURANCE. The risk of loss to the Vehicle or any other items covered by this invoice passes to Buyer upon delivery of the Vehicle or other goods to Buyer at the address set forth on this invoice for shipment to Buyer or such other place of receipt designated by Buyer. Buyer is responsible for maintaining its own theft and liability insurance coverage for the Vehicle.
10. AGE. Buyer represents and warrants to Seller that Buyer is over the age of majority and is fully competent to enter into this contract. Buyer acknowledges that Seller is relying on this representation in entering into and performing this contract.

#### ADDITIONAL TERMS AND CONDITIONS OF SALE

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2. TIME OF ESSENCE. Time is of the essence of this contract, Seller's acceptance of partial payments shall not in any manner modify the terms of this contract and such acceptance shall not be construed as a waiver of any subsequent defaults on Buyer's part nor shall it waive the "time is of the essence" provision.
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4. BAD CHECK. If Buyer pays Seller with a check that is dishonored or unpaid for any reason, Seller may at Seller's sole option, terminate this contract and retake the vehicle, or make claims against Buyer on the check. In addition, Seller will charge Buyer a \$25 returned check charge plus any actual charges assessed by Seller's financial institution resulting from such returned check.
5. ATTORNEYS FEES. If it is necessary for Seller to take legal action to enforce any of Seller's rights under this contract. Buyer agrees to pay to the extent permitted by law, the seller's reasonable attorney's fees and court costs.
6. GENERAL. This contract is governed by applicable federal law and the laws of the State of Arizona. Any provisions found to be invalid shall not invalidate the remainder hereof. Waiver of any default shall not constitute waiver of any subsequent default. All words used herein shall be construed to be of such gender and number as the circumstances require. The contract shall be binding upon Buyer's heirs, personal representatives, successors and assigns and shall inure to the benefit of Seller's successors and assigns. This contract constitutes the entire agreement between the parties with respect to the subject matter herein, and may not be altered or amended unless made in writing and duly executed by Seller.
7. CASH DEPOSIT. If Buyer fails or refuses to accept delivery of any Vehicle or product or fails to comply with this contract, Seller may keep any cash deposit as liquidated damages, to the extent not prohibited by law. The deposit may also be used to reimburse Seller for any expenses and losses Seller incurs or suffers as a result of Buyer's failure or refusal to accept delivery of the Vehicle or product or to comply with this contract. Such expenses and losses may include Seller's reasonable and losses Seller incurs or suffers as a result of Buyer's failure or refusal to accept delivery of the

Vehicle or product or to comply with this contract .Such expenses and losses may include Seller's reasonable attorney's fees.

8. NON-DELIVERY. Seller is not liable for failure to deliver or for delay in delivering the vehicle or other product where such failure or delay is due. In whole or in part, to any cause beyond Seller's control or without Seller's fault or negligence.
9. RISK OF LOSS: INSURANCE. The risk of loss to the vehicle or any other items covered by this invoice passes to Buyer upon delivery of the vehicle or other goods to Buyer at the address set forth on this invoice for shipment to Buyer or such other place of receipt designated by Buyer. Buyer is responsible for maintaining its own theft and liability insurance coverage for the vehicle.

AGE. Buyer represents and warrants to Seller that Buyer is over the age of majority and is fully competent to enter into contact. Buyer acknowledges that Seller is relying on this representation in entering into performing this contract.