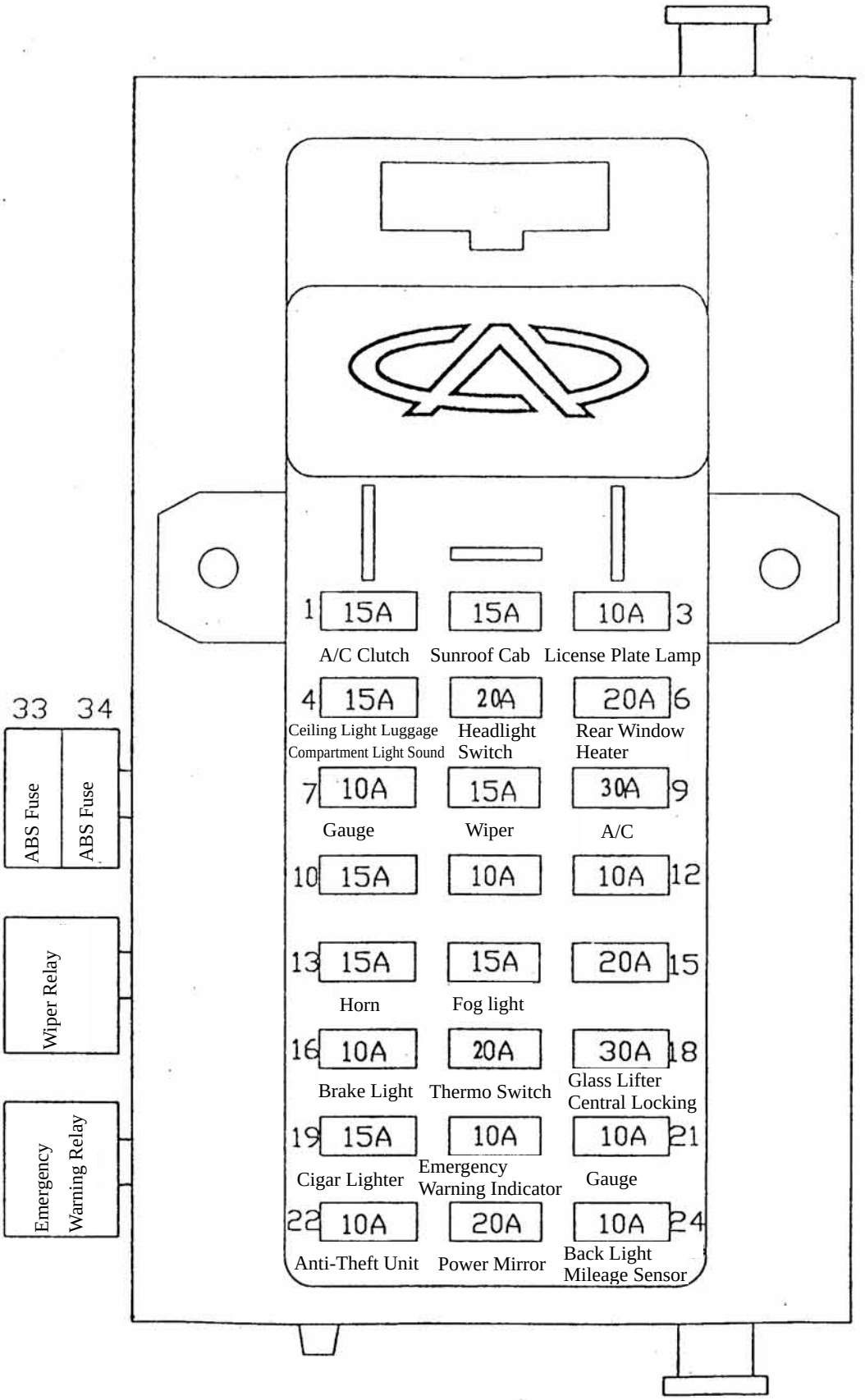
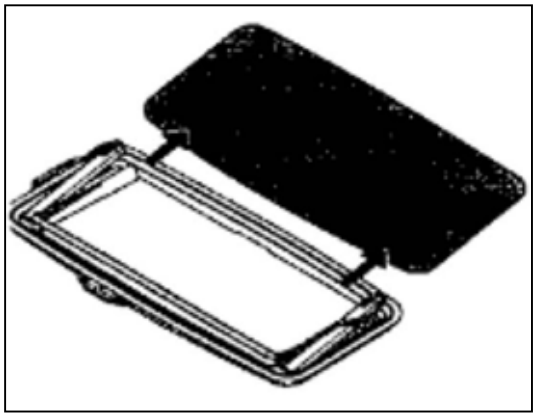
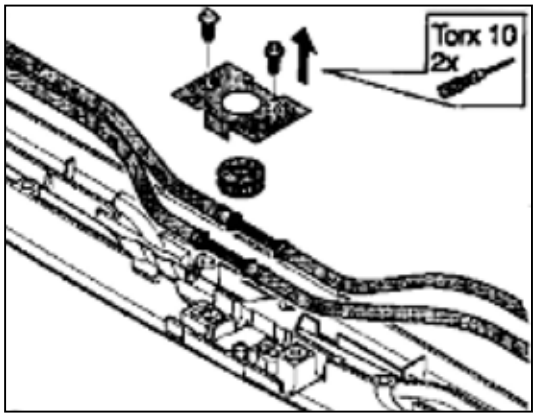
Central Electrical Box Position (In Cabin, Under Steering Wheel)



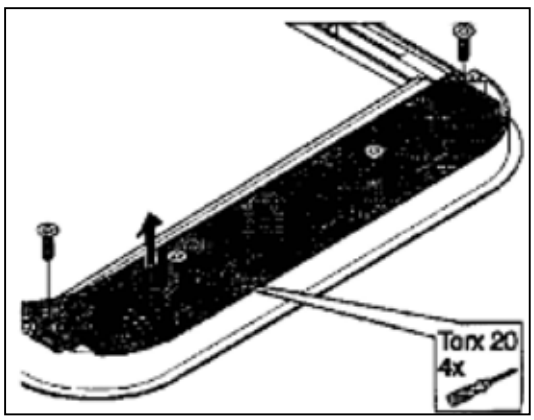
4.6.4 Carefully pull the glass plate out of mechanism group with both sides being parallel.



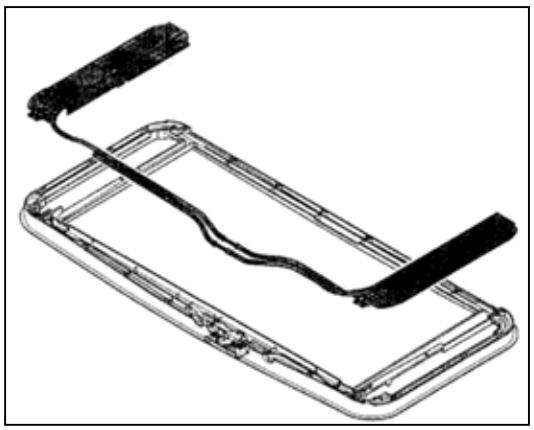
4.6.5 Remove gear cover and gear.



4.6.6 Remove four fixing bolts.



4.6.7 Separate mechanism group from upper frame.



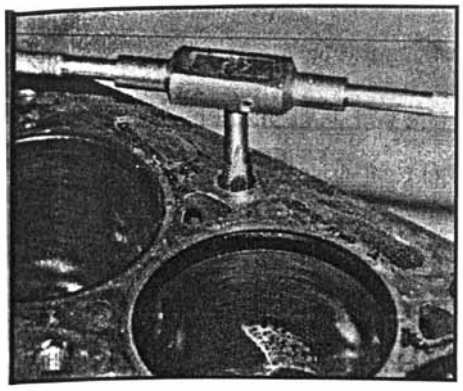


Fig. 69

——Nine main bearing bolts are hex head flange side bolts, and one is stud. For horizontal engine, the stud is mounted in the left threaded hole of the second main bearing cap (see from the front) which is for installing the carrier of oil collector. For the vertical engine, it should be mounted on the left threaded hole of the forth main bearing cap (see from the front).

Before installing the main bearing bolt, engine oil should be applied on the joint surface of head end.

The main bearing bolt and stud should be screwed by hand first and tightened to 90—100Nm.

——The max rotating torque of the crankshaft (with piston rod assembly) is 16Nm.

【**12**】. The removal and installation of oil baffle assembly

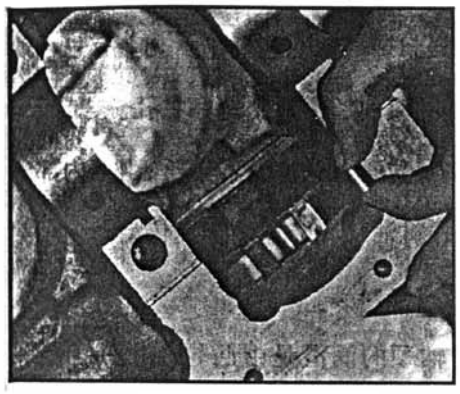


Fig. 70

Removal：

——Take out the oil baffle assembly from the right of the back end of the cylinder body.

Installation：

——Install the oil baffle assembly from the right of the back end of the cylinder body (viewed from the front). The oil baffle assembly should be tensioned. The spring should be lower than the flange surface of cylinder block oil pan.

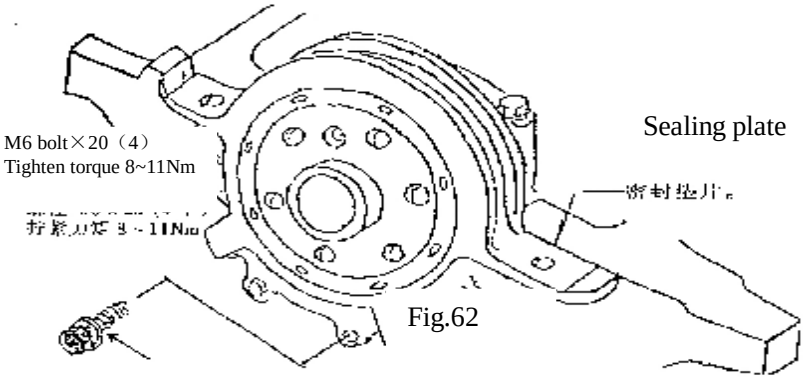


Fig.62

图 62

——Tighten four M6 bolts to 8.0 —11.0Nm。

——Remove the plastic piece.

【11】. Removal and installation crankshaft, crankshaft thrust washer, halves and main bearing cap

g. 62

al:

Before removing, check the end play of crankshaft first.

Use the plunger of dial indicator to contact bearing face of the crankshaft (lightly compressing).

Push the crankshaft away from the contacting tip. Adjust dial indicator to zero and then use post to push the crankshaft towards contacting tip as much as possible. Check dial indicator. The reading is end play. The end play of the crankshaft should be 0.092—0.303mm.

If dial indicator is not available, the end play of the crankshaft may be checked by feeler leaf. Between the third main bearing cap and crankshaft, it should be checked by feeler leaf (push and pull crankshaft)。

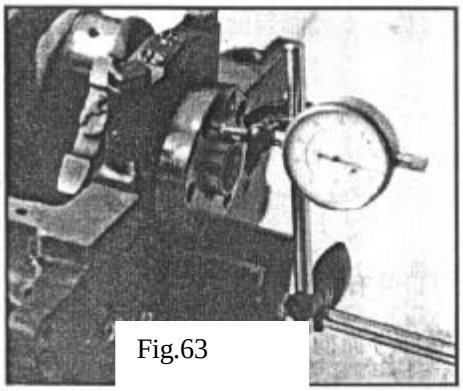


Fig.63

图 63

——Loosen main bearing bolt and stud，(start with the middle bearing cap), take out the bolt and stud, remove main bearing cap and the other shell of main bearing bushings. The other shell of main bearing bushing is still kept in main bearing cap.

——Remove the crankshaft.

——Remove the thrust plates of crankshaft (two pieces) from the cylinder block.

Check：

——Check main journal and main bearing bushing clearance .

Clean the main journal of crankshaft, inner bore of main bearing cap and main bearing bushings with non-woven. Put plastic clearance gauge on the main journal paralleling with the generatrix of main journal. Its length should be a little shorter than the width of main journal.

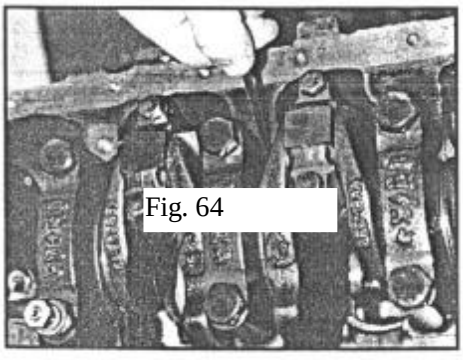


Fig. 64

图 64

Note: Don’t rotate the crankshaft!

Mount the main bearing cap. Screw the bolt of main bearing cap by hand. Tighten to 90—100Nm. Don't rotate the crankshaft.

Remove main bearing bolt. Take out the main bearing cap

6. Electronic Control Unit (ECU)

Purpose: ECU is the core of electronic engine control system. Sensors sent various signals to ECU for electric control, and then ECU controls operations of fuel injector and ignition coil, etc. after internal calculation, thus controlling working of engine.

Normal operation voltage: 9-16V

Composition: it has shielded casing and printed circuit board, which integrates lots of electronic control units for the control of EFI system.

Installation: to be fixed by the support of bracket under pilot trench of front windshield. Pay attention to waterproofing.

ECU

Functions:

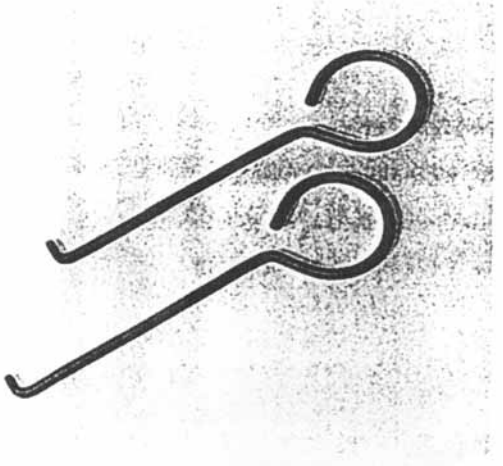
Multipoint sequential injection
Controlling ignition
Idle speed control
Independent knocking control on cylinder-by-cylinder basis (knock sensor);
Providing sensors with power supply: 5V/100mA
λ closed-loop control with self-adaptation
Controlling carbon canister control valve
Air conditioning switch
Engine-fault indicating lamp
Fuel quantitative correction
Engine speed signal output
Speed signal input
Accepting engine load signal

Troubleshooting: due to the fact that ECU (electric control unit) has low failure rate, so generally it is not advisable to replace ECU for troubleshooting on any problem. Failure of components such as periphery circuit and sensors shall be checked and solved firstly. Do not replace ECU until all periphery components are confirmed to be fault-free.

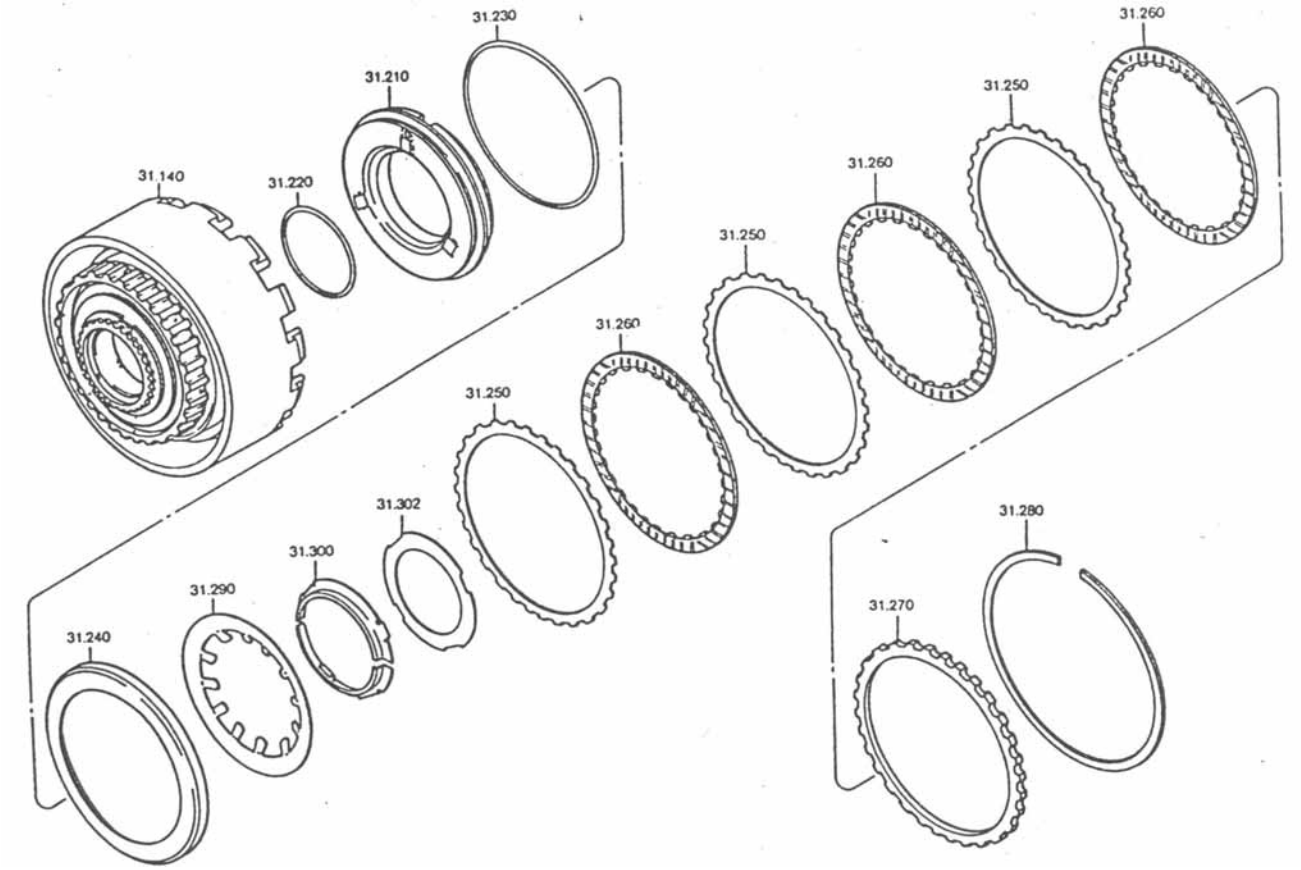
Caution: poor internal contact is common with ECU connector of A-series EFI system. Connector problems are not easy to be detected from the appearance of connector. It is recommended that the detecting probe be inserted from the back of connector without breaking of wires. Broken wires shall be covered by a layer of glass cement and then proof fabric.

2). Engine rotates but fails to start when starting

Step	Operation	Result	Solution
1	Turn ignition switch to "ON", and check with scanner to see if there is any failure information recorded.	Yes	Eliminate failure displayed
		No	Go to next step
2	Unplug cylinder wire and connect spark plug to make spark plug electrode 8-10mm away from engine body. Rotate engine with starting motor and check to see if there is blue or white high voltage spark (notable spark does not prove that he spark plug is in good condition, for the resistance value of the atmosphere differs from that of compressed air in cylinder).	Yes	Go to Step 8
		No	Go to next step
3	Check resistance value of high voltage wire to see if it is normal.	Yes	Go to next step
		No	Repair or replace high voltage wire
4	Check high voltage wire and spark plug of each cylinder to see if they are damaged.	Yes	Replace
		No	Go to next step
5	Check the connection between ignition coil and ECU wire harness to see if it is damaged.	Yes	Replace
		No	Go to next step
6	Check ignition coil to see if it is in normal condition.	Yes	Go to next step
		No	Replace
7	Check socket connector of crankshaft position sensor to see if it is properly connected.	Yes	Go to next step
		No	Connect it
8	Turn ignition switch to "ON" and check fuel pump relay and fuel pump to see if they work normally.	Yes	Go to next step
		No	Check and repair fuel pump circuit
9	Connect fuel pressure gauge valve. Strap Pin 30 and Pin 87 of fuel pump relay, start fuel pump and check fuel pressure to see if it is around **350kPa**.	Yes	Go to next step
		No	Go to Step 13
10	Pull out fuel distributing pipe and injector together, and unplug injector connectors from wire harness one by one. Supply 12V voltage to injector directly from accumulator and check if injector works.	Yes	Go to Step 12
		No	Go to next step
11	Clean injector and recheck to see if it works.	Yes	Go to next step
		No	Replace injector
12	Check fuel to see if it is deteriorated or contains water.	Yes	Replace fuel
		No	Go to Step 18
13	Check fuel pressure to see if it is lower than **350kPa**.	Yes	Go to next step
		No	Go to Step 17
14	Shut fuel gauge valve, turn on ignition switch once	Yes	Go to next step

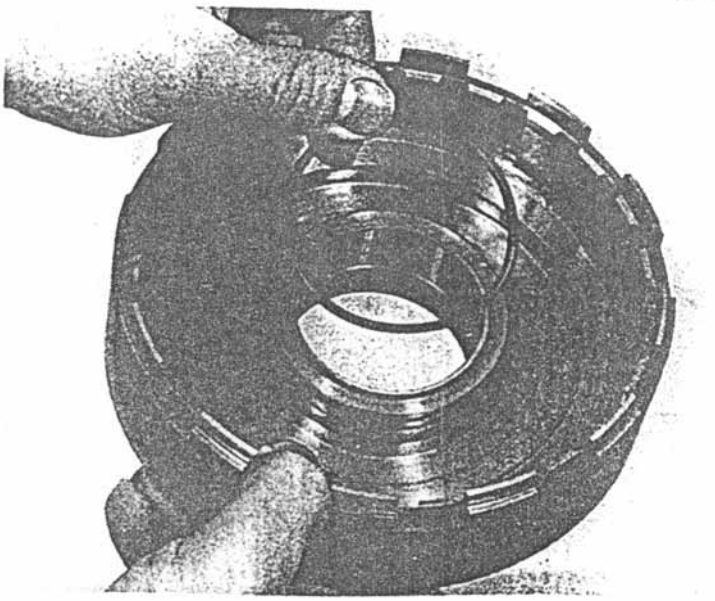
No.	Figure	Code and Application
7	84257 	Piston C assembling tool 5 x 46 000 295
8	84258 	Diaphragm spring compression device 5 x 46 167.
9	76045 	Clutch B drum hook 5 x 46 000 095

3.8、Assembling clutch B and 2nd gear one-way overrun clutch.

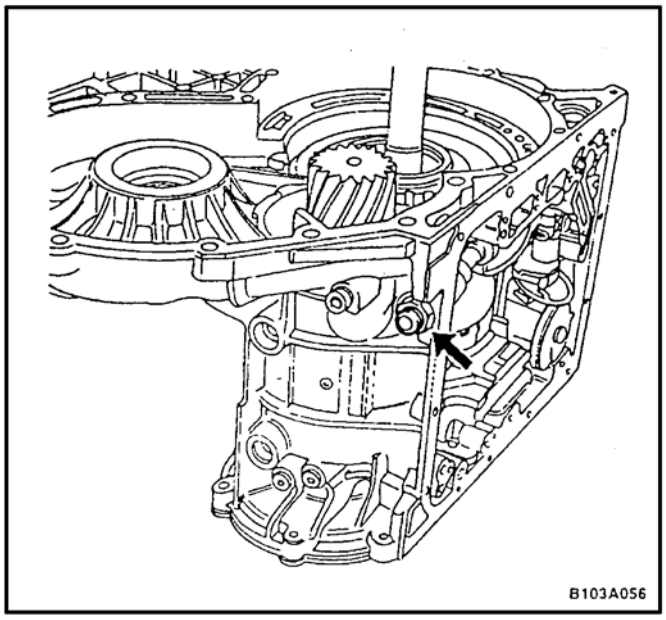


84 212

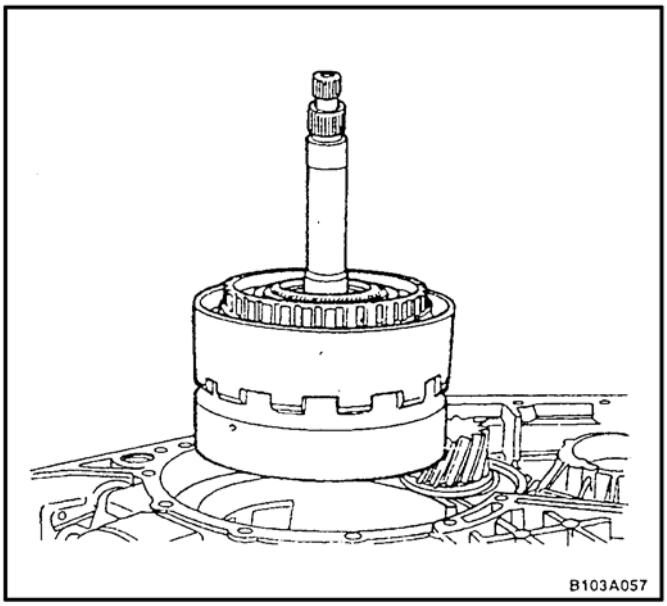
After applying lubricant to O-ring, install O-ring 31 220 into clutch drum B 31 140.



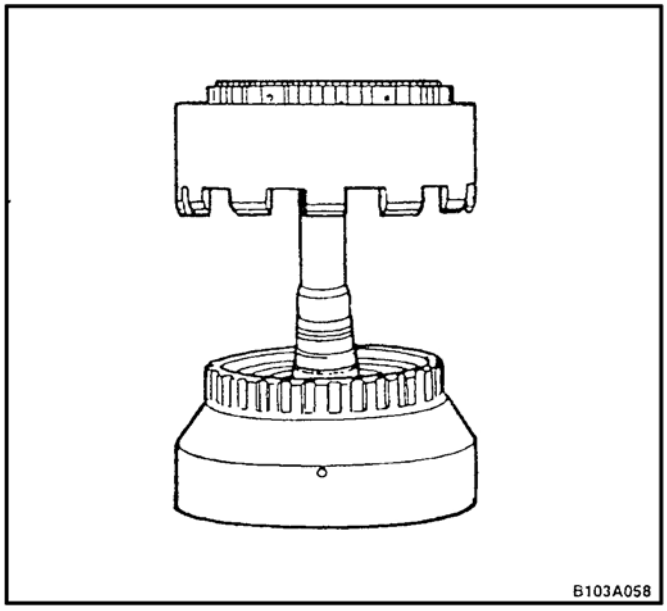
15.Loosen the lock nut. Rotate the adjusting bolt counterclockwise. Loosen the brake band C';



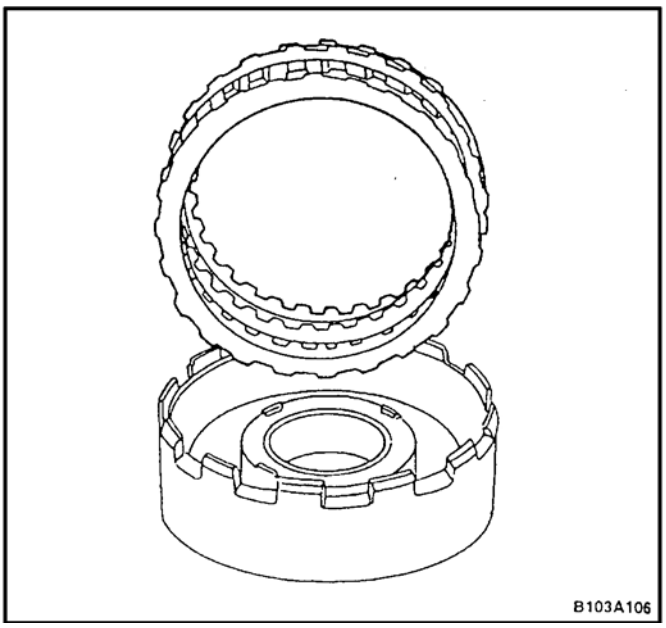
16.Remove the clutch A, clutch B and 2nd gear one-way overrun clutch assembly;



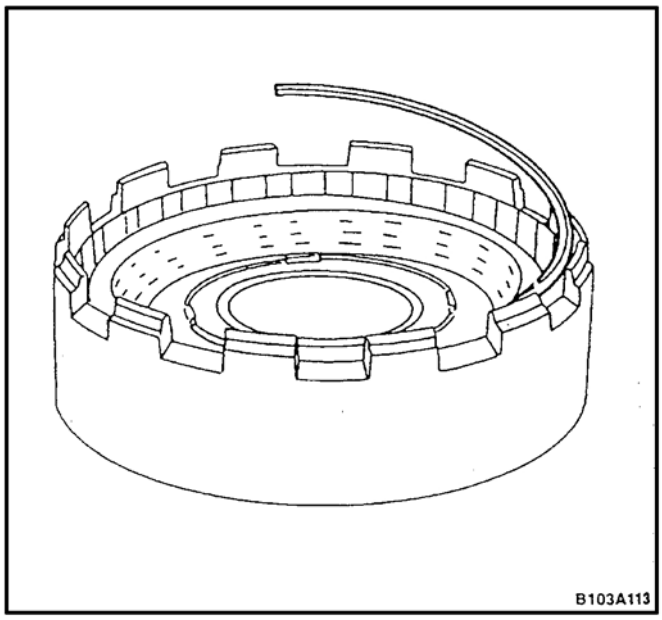
17.You will see that the clutch A is separated from clutch B.



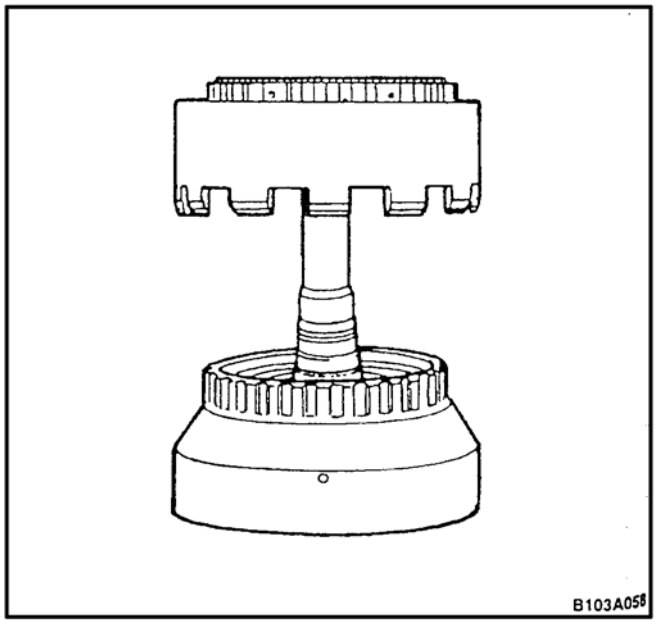
5. Install clutch B assembly;



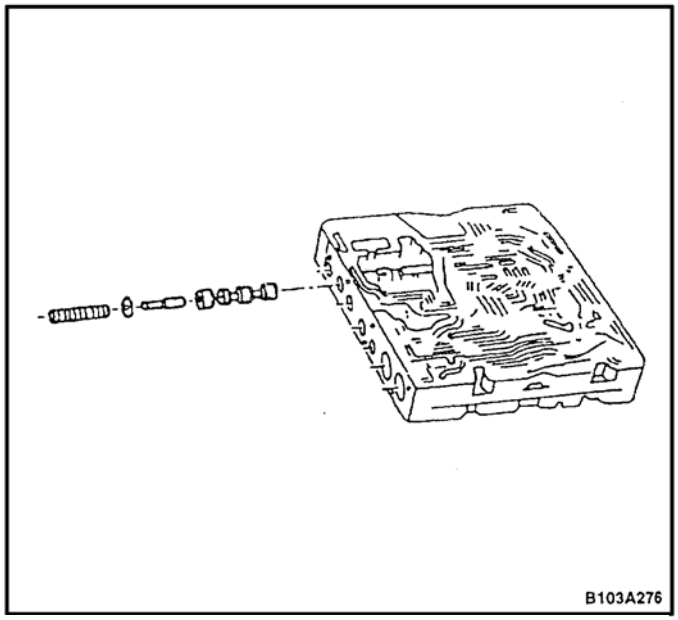
6.Install clutch B assembly's positioning snap ring;



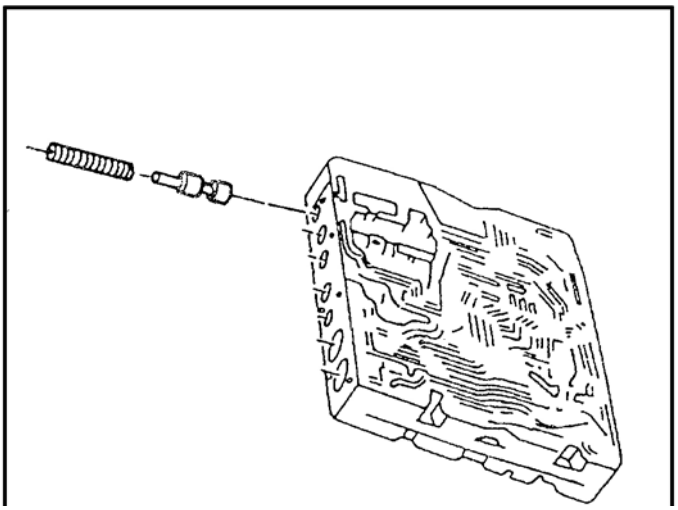
7. Assemble clutch A, clutch B and 2nd gear one-way overrun clutch into an entity;
8. Install clutch A, clutch B and 2nd gear one-way overrun clutch assembly;
9.Install the assembled transmission assembly on the vehicle.



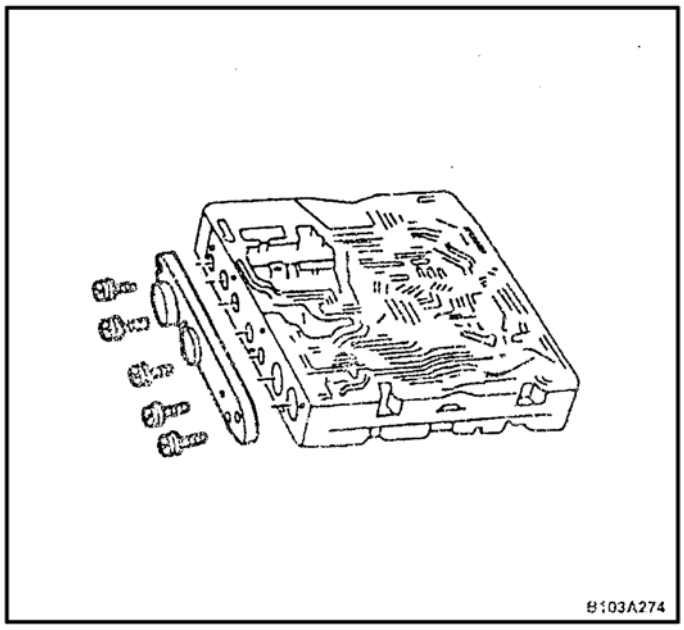
7. Install 3rd-4th shift slide valve and its spring;



8. Install 4th –3rd shift slide valve and its spring;



9. Install the main valve plate's control valve compression plate and fix it with bolts; The bolts' tightening torque: 8Nm



2. Position 1 1st gear's power transfer route

   Brake D is also engaged. The planetary rack is locked by brake D. The engine's brake is realized by its idle rotation resistance.

3. 2nd gear's power transfer route

   Clutch A is engaged. The engine's power is connected with rear sun gear through the torque converter worm gear, worm and sun gear shaft. The front sun gear is locked by brake C and C-shape brake band. 2nd gear one-way overrun clutch is in working status. The short planetary gear brings along the long planetary gear, which rotates around the fixed front sun gear. Thus, the engine's power is transferred to the gear ring and output shaft.

4. 3rd gear's power transfer route

   About 41% of the engine's power is torque transferred.

   Clutch A is engaged. The engine's power is connected with rear sun gear through the torque converter worm gear, worm and sun gear shaft.

   About 59% of the engine's power is mechanically transferred.

   The rear sun gear and planetary rack rotate together. The planetary gear mechanism's drive ratio is 1:1. The output shaft is driven by the gear ring.

5. 4th gear's power transfer route

   Clutch A engages. The engine's power comes directly from the input shaft to the planetary rack. The brake band locks the braking drum so to lock the front long sun gear. The long planetary gear rotates around front sun gear and brings along the output shaft through the gear ring.

6. Back gear's power transfer route

   Clutch A engages. The worm is connected with the front sun gear through the brake drum. Clutch D engages and the planetary rack is locked. Thus, the long planetary gear rotates oppositely between the front sun gear and the gear ring to bring along the counterclockwise rotation of the output shaft.

Parking brake

The parking brake only works when the control handle is in position P. The brake prevents the vehicle's rolling by mechanical method.

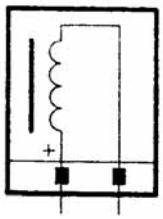
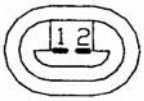
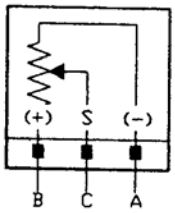
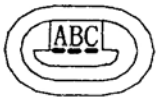
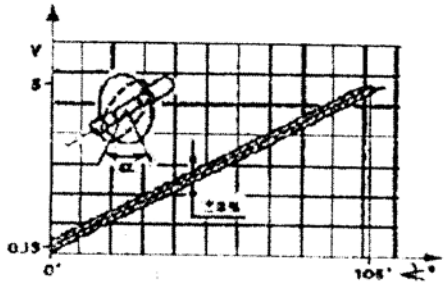
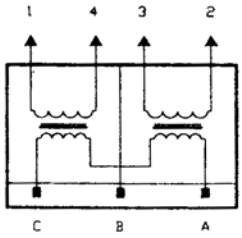
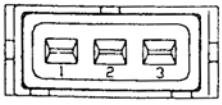
The parking brake pawl engages with the parking interlock gear. The interlock gear is again linked with the driven shaft so to lock the vehicle's drive gear.

When the control handle is in position P, the setup spring could ensure that brake pawl brakes the interlock gear at the very moment that the vehicle rolls.

The lock stabber could prevent the pawl's error action. The vehicle is normally locked even under great traction. The pawl slips on the parking gear at high-speed and only works normally at low-speed.

Pull the handle to position P only when the vehicle has been stopped completely. Otherwise, the braking pawl may be damaged.

Appendix 2：Electrical Components Specification

Part ： Electrical fuel injector Code：IWP116 	Internal expanded view  Connector 	Specification： Fuel injector shape, single hole Operating temperature：-30℃～+110℃ Nominal resistance：13.8～15.2Ω10%(at 20℃) voltage：12V fuel injection pressure：3.5bar
Part ： Throttle valve position sensor (irreplaceable) code：IPF2C 	Internal expanded view  Connect  A=Negative B=Power supply (+5V) C=signal	Specification： Effective electric power angle：90 ° ±2 Mechanical angle：105 ° ±4 ° Full mechanical travel：110 ° ±8 ° Temperature operating range：-30℃～+125℃ Resistance between A and B =1200Ω 20%(at 23℃) 
Part：Electric fuel injector Code：BQE02 	Internal expanded view  Connect 	Specification： Primary coil resistance (A-B or C-B) 0.4Ω±10%(at 23 ° ±5 °) HTtap secondary coil resistance (1—4 cylinder or 2—3 cylinder)； 4900Ω10%(at 23 ° ±5 °)

5. MK20-I/E SYSTEM

5.1 Checking ABS warning light

Check if ABS warning light is as following:

Ⅰ.When ignition turned ON, ABS goes on for about 1.7 senconds，then goes off。

Ⅱ. If ABS warning light is not as specified, a problem is indicated and the fault code must be retrived.

Ⅲ. If ABS warning light does not go on after igniton turned on, repair problem referring to FAULT W/O CODE DIAGNOSTIC CHART.

5.2 Reading condition information

After turning on scan tool, enter 03 at ADDRESS, press Q , following data will be displayed：

1.Example，ECU No. and Version No.

1JO 907 379P ABS MK20I/E

2. Code (Codierung) ：×××××

3. Factory code (WSC) ：×××××

5.3 Retriving Fault Code

Enter 02 at FUNCTION SELECT, press Q, fault number will be displayed. Then press “→”, fault code and related information of each fault will be listed.

5.4 Clearing Fault Code

Enter 05 at FUNCTION SELECT, press Q, fault code will be cleared. If failed to clear the code, the fault is a hard fault. If stored code can be cleared, it indicates an intermittent fault, which can be detected only during a vehicle drive test.

5.5 Fault Code Display Method

System Problem		Displayed Code
No problem so far (ABS warning light is off)	Never happened before	No fault code
	Happened sometime before	Intermittent code
Still exist so far (ABS warning light is on)	Never happened before	Not intermittent code
	Happened sometime before	Intermittent code AND Not intermittent code

4. Knock Sensor KS

Purpose: this sensor is designed to provide ECU with engine knocking information so as to carry out knocking control.

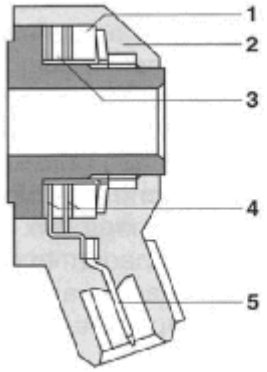
Composition and principle: knock sensor is a sort of vibration acceleration sensor, which is fixed on engine cylinder block. ECU controls engine ignition via signals detected by pressure-sensing element.

Failure diagnosis: ECU monitors on various sensors, actuators, power amplification circuits and sensing circuits. In case any of the following situations occurs, failure mark of the knock sensor is set.

- Knock sensor failure
- Knocking control data processing circuit failure
- Cylinder-detecting signal is unreliable

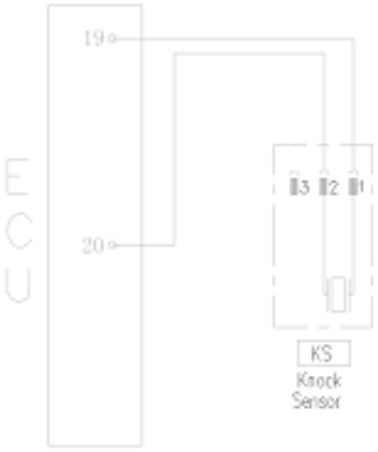
After failure mark of knock sensor being set, knocking closed-loop control is shut down, reduceing a safety angle from the ignition advance angle stored in ECU. When error frequency cuts down to below setting value, failure mark restores.

Installation hint: tightening torque is 20±5Nm.



1. Knocking block
2. Casing
3. Piezoelectric ceramics
4. Contactor
5. Electric connection

Knock sensor with cable



Circuit diagram of knock sensor

Pins:

1 Knock sensor signal 1 (ECU19#)

2 Knock sensor signal 2 (ECU20#)

Troubleshooting: mainly check if there is short circuit or open circuit on the connection between 2 lines on senosr and corresponding ECU pins.

If gasket is added during installation; if tightening torque is proper.

If there is stitching defect between sensor and cylinder, or there is foreign matter between them.