

Engine

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How to follow trouble diagnoses:

Description:

Trouble diagnoses indicate work procedures required to diagnose problems effectively. Read the following instructions before diagnosing.

1. Before performing trouble diagnoses, read the “Preliminary Check”, the “Symptom Chart” or the “Work Flow” first.
2. After repairs, recheck that the problem has been completely eliminated.
3. Refer to Component Parts and Harness Connector Location for the Systems described in each section for identification/location of components and harness connectors.
4. Refer to the Circuit Diagram Volume.

If you need to check circuit continuity between harness connectors in more detail, such as when a sub-harness is used, refer to Wiring Diagram and Harness Layout in each individual section for identification of harness connectors.

5. When checking circuit continuity, ignition switch should be set to **OFF** position.
6. Before checking voltage at electrical components, check battery voltage first.
7. After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as they were.

Model Identification Information

Vehicle type:

Body number	Engine model	Manual transmission number
B-Class MPV	4G93D DL	F5M41-G6

Vehicle identification number (VIN):

- 1) Vehicle identification number (VIN) location: On name plate or at lower left corner of windshield.



General Maintenance

General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform these checks themselves or have their JAC dealers do them.

Outside the vehicle:

The maintenance items listed here should be performed from time to time, unless otherwise specified.

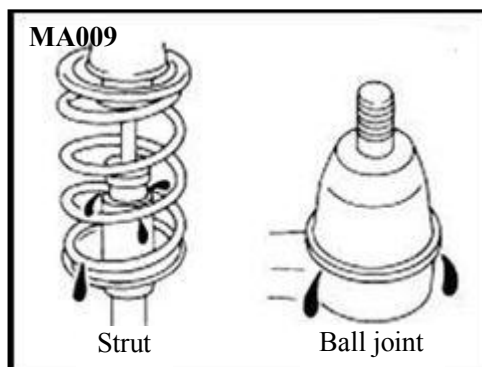
Item	
Tires	Check tire pressure (including spare tire) with a pressure gauge at a service station regularly. Adjust to the specified pressure if necessary. Check tires carefully for damage, cracking or excessive wear.
Windshield	Clean the windshield on a regular basis. Check the windshield at least every six months for cracks or other damage. Please repair or replace as necessary.
Windshield wiper blades	Check for fracture or wear if they do not wipe properly.
Doors and engine hood	Check that all doors as well as the engine hood and tail gate can be opened and closed normally. Also make sure that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch of the engine hood is released. When always driving in areas using road salt or other corrosive materials, check lubrication frequently too.
Tire rotation	Tires should be rotated every 8,000 km.
Lamps	Make sure that the headlights, fog lights, stop lights, taillights, turn signal lights, and other lighting are all operating properly and fixed securely. Also check headlight aim.

Inside the vehicle:

Item	
Warning lights and buzzers	Make sure that all warning lights and buzzers are operating properly.
Windshield, wipers and washer	Check that the wipers and washer operate properly and that the wipers do not streak.
Windshield defroster	Check that the air comes out of the defroster outlets properly and that air is sucked in sufficient quantity when operating the heater or air conditioner.
Steering wheel	Check that it has the specified free play (<35 mm); check it for hard steering or abnormal noise.

leakage.

- Check ball joint dust cover for cracks or other damage.



Tires:

For safe driving of your vehicle, type and size of tires must be suitable for the vehicle model; in addition, tire treads must be in good condition and appropriate tire pressures must be provided.

The way to service tires and the method for tire replacement are described below.

Warning!

- Use of excessively worn or under inflated tires will cause accidents resulting in personal injury or death.
- All instruction regarding tire inflation and maintenance in the *Operation Manual* must be observed.

Overview of inflation:

Keeping tires properly inflated provides the best combination of steerability, tread life and driving comfort.

- Underinflation may cause uneven wear of tires and affect steerability and fuel consumption, and much more likely result in air leaks due to overheating.
- Overinflated tires will make your ride in the vehicle uncomfortable, are more likely to be damaged by rugged roads, and are subjected to uneven wear.

Measure tire pressure with a tire gauge at least monthly. Even pressure of a tire in good condition may decrease by 10~20KPa (0.1~0.2kgf/cm²) per month. Also check spare tire each time all tires are checked.

Measure tire pressure when tires are cold. This means that the measurement should be made after your vehicle has been parked for at least 3 hours or when travel distance does not exceed 1.6km. If necessary, inflate or deflate tires until their tire pressures reach the value recommended for cold tires in the name plate on driver side door frame.

When pressure of a tire is checked when hot (after a travel of several kilometers), the reading will be 30~40KPa (0.3~0.4kgf/cm²) higher than that when cold, which is normal. Do not deflate the tire in order to reach the specified cold tire pressure reading, otherwise tire underpressure will result.

When a tubeless tire is punctured, its self-seal function will be activated. If pressure of a tire starts to drop, locate air leak carefully.

3. Disconnect wire connector from ignition coil assembly.
4. Screw off 2 bolts securing ignition coil, and take out ignition coil.
5. Disconnect secondary cable from ignition coil.



Inspection after removal:

1) Ignition coil

- Check resistance of primary coil between terminals.

Resistance of primary coil: $0.77 \sim 0.95 \Omega$

- Check resistances between high voltage terminals of No. 1 and No. 4 cylinders and those of No. 2 and No. 3 cylinders.

Resistance of secondary coil: $7.75 \sim 10.23 K\Omega$

Caution:

- When measuring coil resistance, be sure to pull off ignition coil harness connector.

2) Spark plug

Checking spark plug:

- Check spark plug insulator for damage or fracture.
- Check for spark plug fouling. See the following table for causes of fouling.

Analysis Sheet of Causes of Spark Plug Fouling

Symptom	Black carbon	White carbon
Cause	Impurities content in fuel filled or mixture too rich	Impurities content in fuel filled, or ignition timing incorrect, or spark plug not tightened

- Check spark plug electrode for damage.
- Check spark plug gap.

Inspection after removal:

Piston rings:

1. Check piston ring side clearance. If the clearance exceeds the specified limit value, replace piston ring or piston or both.

Standard value:

Top ring: 0.03-0.07mm

Second ring: 0.02-0.06mm

Limit value:

Top ring: 0.1mm

Second ring: 0.1mm

2. Put piston rings in cylinder bore, and push them down using piston. Ensure that piston top comes into contact with piston rings and that rings are perpendicular to cylinder wall. Then measure the piston ring end gap with a feeler gauge. If the end gap is too large, replace piston ring.

Standard value:

Top ring: 0.25-0.40mm

Second ring: 0.40-0.55mm

Oil ring: 0.10-0.35mm

Limit value:

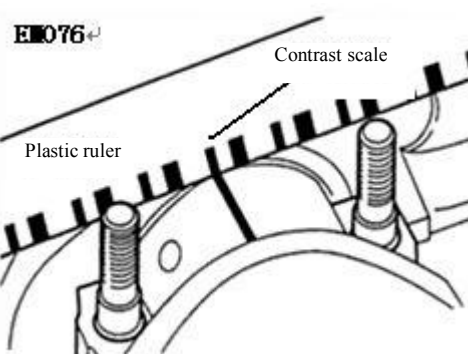
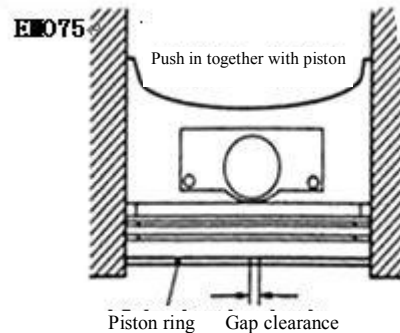
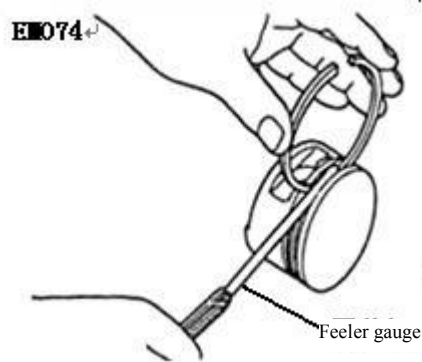
Top ring: 0.8mm

Second ring: 0.8mm

Oil ring: 1.0mm

Connecting rod bearing shell clearance (plastigage method):

1. Wipe off all engine oil from connecting rod journal and connecting rod bearing shell.
2. Put a plastigage cut to a length equal to bearing shell width on connecting rod journal. Plastigage must be placed at center of connecting rod journal and is parallel to axis of the journal.



Essential service material:

Lubricant

Item	Recommended lubricant	Quantity (including lubricant in oil filter)
Engine oil (API grade)	15W-40 SJ grade or above	3.5L

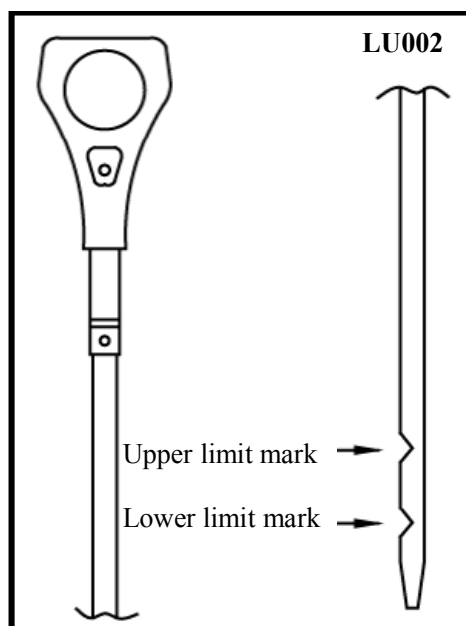
Engine Oil

Engine oil level:

Note:

Before starting engine, park vehicle horizontally and firmly and check the engine oil level. If engine is already started, stop it and wait 10 minutes before checking.

1. Pull out oil level gauge and wipe off engine oil on it with a clean rag.
2. Insert oil level gauge fully back to its tube.
3. Pull out oil level gauge again to check the oil level and make sure the level is within the range shown in the figure at top right.



4. If the oil level is below “MIN” scale, refill with designated engine oil.
5. Start engine and stop it after idling it for 5 minutes, and then wait a moment before checking if the engine oil level is within the specified range.

Engine oil appearance:

- Check engine oil for white turbidity or heavy contamination.
- If engine oil becomes turbid and white, it is highly probable that it is contaminated with engine coolant. Repair or replace damaged parts.

Engine oil leak check:

Check for engine oil leakage around the following areas:

- Oil pan
- Oil pan drain bolt
- Oil pressure switch
- Oil filter
- Mating surface between cylinder block and cylinder head
- Crankshaft oil seals (front and rear)

Graduation line	Reference resistance (Ω)
3/4	58 \pm 3
7/8	49 \pm 3
F	40 \pm 2

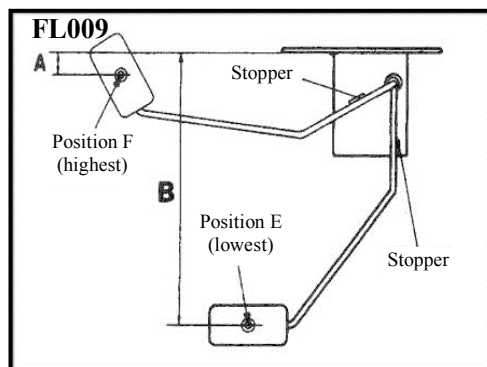
- ② Check that resistance changes smoothly when the float moves slowly between F (Highest) and E (Lowest) positions.

- 2) Heights of float of fuel gauge sensor component: Move the float, and measure F (Highest) and E (Lowest) positions as well as heights A and B when the float rod comes into contact with the stopper.

■ Standard values:

A: 2.75mm

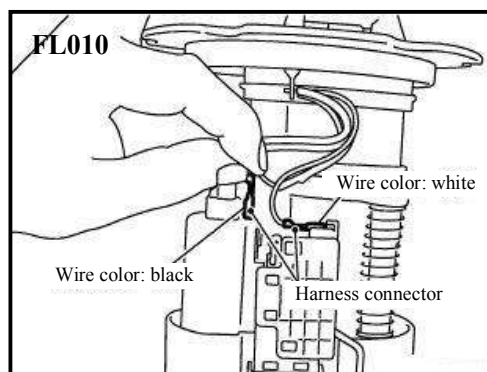
B: 158.8mm



Disassembly:

1. Disconnect harness connector.

■ Hold connector by fingers and pull it out, because there is no stopper release tab.

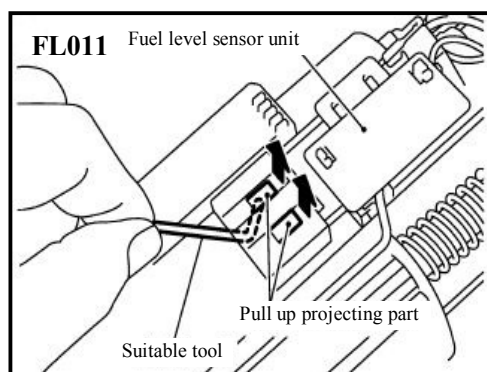


2. Remove fuel level sensor unit as follows:

- ① Using suitable tool, pull up tabs points as shown in the figure to release the lock.

Caution:

- Be careful not to damage it.
- An example of using Allen wrench [2.0mm (0.08 in)] is as shown.



Installation:

Installation is the reverse order of removal.

Caution:

- Tightening torque: 20N·m
- Be careful not to allow the sensor's prolonged contact with fluids such as engine oil, coolant, brake fluid, and water.
- Note that use of washers of any type is not allowed during installation. The sensor must cling to cylinder block through its metal surface.
- When laying signal cables of the sensor, be careful not to resonate the cables in order to prevent fracture.
- Avoid applying high voltage between 1# and 2# pins when inspecting the sensor, otherwise piezoelectric element will be damaged.

Throttle position sensor:

1) Component position description:

It is mounted on throttle body.

2) Component description:

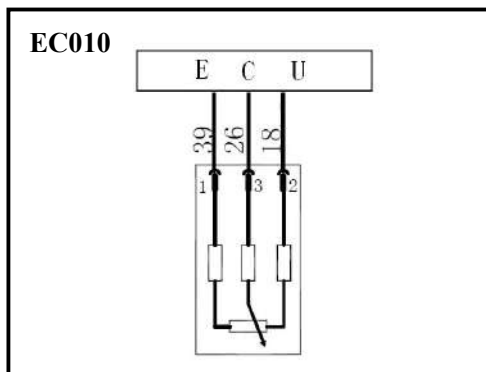
The throttle position sensor (TPS) is a rotary variable resistor. It rotates around throttle spindle to sense throttle angle. When throttle spindle rotates, throttle angle of the TPS will change. The ECM detects throttle opening according to output signals from the TPS.

3) Descriptions of component pins:

Pin 1: 39#-ground, ECU

Pin 2: 18#-5V power supply from ECU

Pin 3: 26#-output signal to ECU



4) Symptoms and inspection methods:

■ Symptoms: Poor acceleration, etc.

■ Inspection methods:

① Check resistance between pins 1 and 2.

■ Resistance: $2k\Omega \pm 20\%$ (at normal temperature)

② Check resistance between pins 1 and 3. When throttle is rotated, the resistance should change linearly in response to throttle opening.

SN	DTC	Description
37	P0264	Control circuit of fuel injector in No. 2 cylinder short to ground
38	P0267	Control circuit of fuel injector in No. 3 cylinder short to ground
39	P0270	Control circuit of fuel injector in No. 4 cylinder short to ground
40	P0262	Control circuit of fuel injector in No. 1 cylinder short to power
41	P0265	Control circuit of fuel injector in No. 2 cylinder short to power
42	P0268	Control circuit of fuel injector in No. 3 cylinder short to power
43	P0271	Control circuit of fuel injector in No. 4 cylinder short to power
44	P0300	Misfire in several cylinders
45	P0301	Misfire in No. 1 cylinder
46	P0302	Misfire in No. 2 cylinder
47	P0303	Misfire in No. 3 cylinder
48	P0304	Misfire in No. 4 cylinder
49	P0317	Rough road test ABS signal fault
50	P0318	Rough road test sensor signal fault
51	P0321	CKP sensor reference point failure
52	P0322	No CKP sensor pulse signal (open or short)
53	P0327	KS signal circuit voltage too low
54	P0328	KS signal circuit voltage too high
55	P0340	Installation position of CMP sensor improper
56	P0341	Poor contact of CMP sensor
57	P0342	CMP sensor short to ground
58	P0343	CMP sensor short to power
59	P0420	TWC oxygen storage capacity deterioration (excess emission)
60	P0444	Control circuit of canister control valve open

9) DTC P0105: IAP sensor signal unchanged (frozen)

Step 1: Read “Mode 3” and “Mode 7” with a diagnostic tester.			
Read result 1		Read result 2	
In Mode 3	In Mode 7	In Mode 3	In Mode 7
Fault information available	Fault information not available	Fault information not available	Fault information available
P0105			P0105
Maintenance tips: The fault has been recognized. Its causes may be the following: 1) IAP sensor vacuum leak or clogging 2) IAP sensor serious aging		Maintenance tip: The fault has not been finally recognized. Check the following: 1) Reinstall after checking or cleaning sensor vacuum tube. Read after-start pressure with a diagnostic tester in “Mode 1”.	

10) DTC P0106: IAP sensor signal improper

Step 1: Read “Mode 3” and “Mode 7” with a diagnostic tester.			
Read result 1		Read result 2	
In Mode 3	In Mode 7	In Mode 3	In Mode 7
Fault information available	Fault information not available	Fault information not available	Fault information available
P0106			P0106
Maintenance tips: The fault has been recognized. Its causes may be the following: 1) Air leak from sensing unit in the sensor 2) Sensor damaged 3) Air leak from installation position of the sensor 4) Migration characteristics of the sensor		Maintenance tip: The fault has not been finally recognized. It may be an intermittent fault. Check the following: 1) The sensor is a free voltage sensor, so it can not be diagnosed by reading pressure parameters in diagnostic tester. Therefore, wait for the system to give a final diagnostic result.	

P0318			P0318
Maintenance tips: The fault has been recognized. Its causes may be the following: 1) Short to ground exists in the circuit connected to ECU pin. 2) The circuit connected to ECU pin short to power or open 3) Installation position or support of acceleration sensor loose 4) Acceleration sensor damaged		Maintenance tips: The fault has not been finally recognized. It may be an intermittent fault. Check the following: 1) Check resistance to ground of the circuit connected to ECU pin. 2) Check voltage of the circuit connected to ECU pin. 3) Check that installation position and support of acceleration sensor are normal.	

51) DTC P0321: CKP sensor reference point failure

Description of source of trouble: The system uses a 60-2 tooth speed measuring system. Mounted on flywheel, the 60-2 induction ring gear will generate magnetic changes in the sensor when it follows flywheel (with same speed as that of crankshaft) to rotate, so that an induced AC voltage of which the frequency depends on speed is generated. The ECU signal circuit converts the input sine waves into square waves. When ECU finds that the distance between falling edges of 2 square waves is greater than 2 X pitch, the reference position is then detected. Physically, this reference pitch corresponds to a specific position of No. 1 cylinder. It is defined in the system that the second falling edge after the reference pitch be the reference point signal of the software (BM) and that the crank angle from the signal to TDC of No. 1 cylinder be a fixed value 108°CA. The system will receive a BM at each crankshaft turn. In addition, the system keeps pace with crankshaft position according to this BM thus ensuring correct control over fuel injection, intake and ignition timing.

If any of the following cases is found, you can judge that a BM fault occurs:

- ① It is frequently found that the measured BM appears at the position ahead of or behind the expected position;
- ② Speed signals can be detected but BM can not be detected;
- ③ BM is missed frequently.

Step 1: Read “Mode 3” and “Mode 7” with a diagnostic tester.			
Read result 1		Read result 2	
In Mode 3	In Mode 7	In Mode 3	In Mode 7
Fault information available	Fault information not available	Fault information not available	Fault information available
P0321			P0321

SN	Work procedure	Inspection result	Follow-up procedure
3	Pull off CTS connector, start the engine, and observe if the engine then starts successfully. (Or connect a 300Ω resistor to CTS connector in series to replace the sensor, and observe if the engine then starts successfully.)	Y	Service line or replace sensor.
		N	Next step
4	Check vacuum tube of fuel pressure regulator for looseness or air leaks.	Y	Service or replace.
		N	Next step
5	Check fuel condition, and observe if the symptom occurs just after a refueling.	Y	Change fuel.
		N	Next step
6	Connect an EFI system adapter, turn ignition switch ON, and check 12#, 13#, 44#, 45#, and 63# pins for normal power supply; check 3#, 51#, 53#, 61#, and 80# pins for normal ground connections.	Y	Seek for diagnosis help.
		N	Repair or replace harness.

4. Hard cold starting

General trouble locations:

① Moisture in fuel; ② fuel pump; ③ CTS; ④ fuel injector; ⑤ ignition coil; ⑥ throttle body and idle air bypass; ⑦ engine mechanical parts.

General diagnostic flow:

SN	Work procedure	Inspection result	Follow-up procedure
1	Connect a fuel pressure gauge with its access point at front end of fuel inlet pipe of fuel rail assembly, start the engine, and check if the fuel pressure is around 300kPa in idling mode.	Y	Next step
		N	Service fuel supply system.
2	Pull out ignition cable from one of the cylinders, connect a spark plug with the distance from its electrode to engine body kept at around 5mm, and then start the engine to check for blue-white high-voltage sparks.	Y	Next step
		N	Service ignition system.
3	Pull off CTS connector, start the engine, and observe if the engine then starts successfully. (Or connect a 2,500Ω resistor to CTS connector in series to replace the sensor, and observe if the engine then starts successfully.)	Y	Service line or replace sensor.
		N	Next step