

MOTION EFI SYSTEM DIAGNOSIS GUIDELINE

EFI SYSTEM

1. Introduction

Because of the EFI, there are many possibilities for the engine issues. In other word, one issue may be caused by the mechanical problem or the EFI components. And the diagnostic tools cannot 100% indicate the root cause. So this manual shows the way to dig out the root cause with the help of the diagnostic tools.

2. Precautions

- 1) Do not disassemble the components arbitrarily. It may damage the components if the water or the oil seep into the parts.
- 2) Turn the ignition off, before connect or disconnect the connectors.
- 3) Make sure the temperature of the ECU is below 80°C.
- 4) The fuel pressure is much high (about 350kPa or 250kPa), so please do not disassemble the fuel pipe arbitrarily. If have to, please release the pressure at first, and make sure the operation is delivered in the ventilated environment by the the professional maintenance persons.
- 5) When disassemble the fuel pump from the pump, make sure the power is off. Or it may cause the fire.
- 6) The fuel pump cannot work in air or water, it will shorten the service life. And the positive and negative connectors cannot be exchanged.
- 7) The ignition system check only could be delivered when it is necessary. When check the spark plug out of the engine, if start the engine, please make sure the throttle is closed. Or too much unburned gasoline coming to the catalyst may damage the catalyst.
- 8) The idle speed is adjusted by the ECU. The idle pintle is not allowed to adjust.
- 9) The Positive and Negative of the battery cannot be reversed. It may damage the EFI components.

10) It is forbidden to remove the battery when the engine is running.

11) Cannot measure the signal by pierce the harness.

3. Tools

1) Multimeter: Measure the voltage, the resistance and the harness connection.

2) Diagnostic tool: reading the malcode, and engine parameters.

3) Oil pressure gauge: Measure the fuel pressure.

4) Cylinder pressure gauge: Measure the pressure gauge.

4. Maintenance depending on the malcode

Description

1) If the issue cannot repeat, the issue analysis may be wrong.

2) The multimeter below means the digital type. Pointer-type is forbidden.

3) If the malcode shows the voltage is low, it means maybe the wire is short to ground. If the malcode shows the voltage is high, it means maybe the wire is short to battery. If the malcode shows the components signal abnormal, it means the wire is open or short to other wires.

Diagnostic help:

1) If the malcode shows again after clearance, check whether the connector is connected well.

2) Do not ignore the affect of the engine maintenance situation, the cylinder pressure, and the mechanical ignition timing.

3) Change another ECU to do the test. If the malcode disappears, the root cause is the ECU. If the malcode is still there, then use the old ECU to

do the test.

4) Malcode: P0263

5) Information: MAP Circuit Low Voltage or Open

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	Check the data of 'BARO'. Make sure whether it is about 100kPa (depending on where you are)	Yes	Step 5
		No	next
3	Remove the connector, and use the multimeter to check whether the voltage between pin B and D is about 5V.	Yes	Step 5
		No	Next
4	Check whether the following pins is short to ground: pin 31, pin 28, pin 23 of the ECU and pin A, D, B of the connector.	Yes	Check the harness
		No	Next
5	Crank the engine to stay at idle. Check whether the MAP is about 30-50kPa. Then go to WOT, check whether the MAP goes to about 90kPa.	Yes	Diagnostic help
		No	Change the sensor

Malcode: P0264

Information: MAP Circuit High Voltage

ITEM	OPERATION	RESULT	NEXT STEP
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1	Connect the diagnostic tool, and ignition on.		next
2	Check the data of 'BARO'. Make sure whether it is about 100kPa (depending on where you are)	Yes	Step 5
		No	next
3	Remove the connector, and use the multimeter to check whether the voltage between pin B and D is about 5V.	Yes	Step 5
		No	Next
4	Check whether the following pins is short to battery: pin 31, pin 28, pin 23 of the ECU and pin A, D, B of the connector.	Yes	Check the harness
		No	Next
5	Crank the engine to stay at idle. Check whether the MAP is about 30-50kPa. Then go to WOT, check whether the MAP goes to about 90kPa.	Yes	Diagnostic help
		No	Change the sensor

Malcode: P0274

Information: IAT Circuit Low Voltage

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		NEXT STEP

2	check whether the data of 'intake air temperature' equals to the real intake air temperature.	Yes	Step 5
		No	Next
3	Remove the connector, and use the multimeter to check whether the resistance between pin B and D is reasonable according to the temperature.	Yes	Step 5
		No	Next
4	Remove the connector and check whether the voltage between pin B and D is about 5V.	Yes	Next
		No	Check harness
5	Check whether the following pins are short battery: pin 33, pin 28 of the ECU and pin C, D of the connector.	Yes	Change the harness
		No	Next
6	Crank the engine and stay idle. Check whether the 'intake air temperature' goes up when the engine temperature goes up.	Yes	Help
		No	Change the sensor.

Malcode: P0275

Information: IAT Circuit High Voltage

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	check whether the data of 'intake air temperature' equals to the real intake air temperature.	Yes	Step 5

		No	Next
3	Remove the connector, and use the multimeter to check whether the resistance between pin B and D is reasonable according to the temperature.	Yes	Step 5
		No	Next
4	Remove the connector and check whether the voltage between pin B and D is about 5V.	Yes	Next
		No	Check harness
5	Check whether the following pins are short to ground or open: pin 33, pin 28 of the ECU and pin C, D of the connector.	Yes	Change the harness
		No	Next
6	Crank the engine and stay idle. Check whether the 'intake air temperature' goes up when the engine temperature goes up.	Yes	Help
		No	Change the sensor.

Malcode: P0279

Information: Coolant/Oil Temperature Sensor Circuit Low Voltage

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	check whether the data of 'engine temperature' equals to the real	Yes	Step 5

	temperature.	No	Next
3	Remove the connector and use the multimeter to check whether the resistance between pin A and C of the sensor is reasonable according to the temperature.	Yes	Step 5
		No	Next
4	Use the multimeter to measure whether the voltage between A and C is about 5V.	Yes	Next
		No	Check the harness
5	check whether the following pins are short to ground or open: pin 28, pin 15 of the ECU and pin C and D of the sensor.	Yes	Harness issue
		No	Next
6	Use multimeter to check whether the voltage between pin A and B is about 5V.	Yes	Help
		No	Step 5

Malcode: P0305/P0306

Information: O2S 1 Circuit Low/High Voltage

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	Use multimeter to check whether the connection between pin B of the oxygen sensor and pin 16 of the ECU is open, and whether the pin B of sensor is short to pin A.	Yes	Harness issue
		No	Next

3	Crank the engine and stay idle. When the engine gets warm, use multimeter to check whether the voltage between pin A and B keeps jumping between 100-900mV.	Yes	Help
		No	Next
4	A、 emission pipe: block/leakage or not. B、 injector: leakage or not C、 fuel pressure too big or not D、 valve clearance is too small or not	Yes	Engine maintenance
		No	Change sensor

Malcode: P0609

Information: Injector 1 Circuit Malfunction

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	Remove the connector of injector 1, use multimeter to check whether the voltage of Pin A is about 12V.	Yes	Step 4
		No	Next
3	Check whether the connection between pin A and the main power relay is short to ground or open.	Yes	Harness issue
		No	Next
4	Use multimeter to measure whether the resistance between pin A and B of the injector is about 10-14 Ω @ 20°C	No	Change the injector
		Yes	next

5	Use the multimeter to check whether the voltage of Pin B is about 12V.	Yes	Help
		No	Next
6	Check whether the connection between pin B of the injector and 25 of the ECU is open or short to battery/ground.	Yes	Harness issue
		No	Help

Malcode: P0560/P0562

Information: FPR Coil Circuit Low/High Voltage or Open

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition off		next
2	Wait about 30s. Remove the fuel pump relay, ignition on. Check whether voltage of the relay feeder ear is about 12V	Yes	Change the pump
		No	Next
3	Check whether the feeder ear is short to ground or open.	Yes	Harness issue
		No	Help

Malcode: P8960

Information: Cylinder 1 Ignition Coil Malfunction

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next

2	Remove the connector and check whether the voltage of pin + is about 12V.	Yes	Step 4
		No	Next
3	Check whether the connection of the pin + and main power relay is open or short to ground	Yes	Harness issue
		No	Next
4	Use multimeter to check whether the resistance of the two coil pins is $0.5-0.65\Omega$ @20℃	Yes	Change coil
		No	Next
5	Use multimeter to check whether the voltage of pin B is about 12V.	Yes	Help
		No	Next
6	Check whether the connection of pin 2 of the coil and pin 1 of ECU is open or short to battery/ground	Yes	Harness issue
		No	Help

Malcode: P1285

Information: Idle Speed Control Error

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition off		next
2	Remove the connector. Use multimeter to check whether the resistance between pin A and pin D, pin B and pin C is about $53\pm 5.3\Omega$	Yes	Next
		No	Change stepper motor

3	Check whether the 4 wires are short to battery/ground or open.	Yes	Harness issue
		No	Help

5. Maintenance depending on the performance.

Before issue analysis, please check:

- 1) The MIL works well.
- 2) Clear the history malcode.
- 3) When the malcode comes again, note the conditions.

Check the appearance

- 1) Whether there is leakage of the fuel pipe or not.
- 2) Whether there is block/leakage or damage of the intake pipe.
- 3) Aging level of the high-voltage cable.
- 4) Whether the ground connection is strong enough.
- 5) All the connectors connected well.

Note: if any item above exists, please do the fix it at first before issue analysis.

Diagnostic Help:

- 1) Make sure there is no any issue record of the engine.
- 2) Make sure the issue could repeat.

- 3) Have checked follow the instructions above and no cause found.
- 4) Do not ignore the maintenance situation, cylinder pressure, mechanical timing and fuel quality.
- 5) Change the ECU and repeat the test, if the issue is gone, then the root cause is the ECU. Or change the old one back to check the root cause.
- 6) Engine cannot start

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the voltage of the battery is around 8-12V.	Yes	Next
		No	Change the battery.
2	Crank the engine, and check whether the voltage is above 8V.	Yes	Next
		No	Change the battery.
3	Check whether the start motor working well or not.	Yes	Next
		No	Change the start motor.
4	If the issue only occurs in winter, check the oil and gear box oil	Yes	Change the oil
		No	Next
5	Check whether the engine rotation resistance is too big or not.	Yes	Check the engine
		No	Help

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the fuel pump pressure is about 250kPa at idle.	Yes	Next
		No	Check the pump.
2	Check whether the 'RMP' data on the diagnostic tool shows the real engine RPM.	Yes	Next
		No	Check the crank sensor.
3	Pull out the spark plug, check whether the spark over is normal	Yes	Next
		No	Check the ignition system
4	Check whether the cylinder pressure is normal	Yes	Engine is good.
		No	Check the engine

7) Start Difficult.

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the fuel pump pressure is about 250kPa at idle.	Yes	Next
		No	Check the pump.
2	Pull out the spark plug, check whether the spark over is normal	Yes	Next
		No	Check the ignition system

3	Remove the connector of the engine temperature sensor, and check whether the engine start well	Yes	Check the engine temperature sensor
		No	Next
4	With a little bigger throttle, check whether the engine starts well	Yes	Clean the throttle body and bypass channel.
		No	Next
5	Pull out the injector, and crank the engine. Check whether the injection is normal	Yes	Next
		No	Clean or change the injector.
6	Pull out the spark plug, check whether it is wet or not	Yes	dry the plug and combustion chamber.
		No	Next
7	Check whether the cylinder pressure is normal or not	Yes	Engine is good
		No	Check the engine

● Unstable idle

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the air filter is blocked and whether the intake pipe leaks.	Yes	Intake system maintenance
		No	Next

2	Whether there is carbon deposit at the throttle body and bypass channel	Yes	Clean the TB
		No	Next
3	Check whether the IACV works well	Yes	Next
		No	Check the IACV
4	Check whether the fuel pressure is about 250kPa.	Yes	Next
		No	Check the pump
5	Check whether the injector is blocked	Yes	Clean or change the injector
		No	Next
6	Make sure using the right type spark plug	Yes	Next
		No	Change the spark plug
7	Check whether the cylinder pressure is normal	Yes	Next
		No	Check the engine
8	Remove the engine temperature sensor, and check whether the engine works well	Yes	Change the sensor
		No	Next
9	Remove the TPS, check whether the engine works well	Yes	Change the sensor
		No	Help

● High idle

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the throttle cable is stuck	Yes	Adjust the cable
		No	Next
2	Check whether the idle pintle has been adjusted	Yes	Change the TB
		No	Next
3	Check whether there is any leakage of the intake pipe.	Yes	Maintenance
		No	Next
4	Check whether the IACV works well	Yes	Next
		No	Change IACV
5	Remove the engine temperature sensor and check whether the engine works well	Yes	Help
		No	Change the sensor

● Acceleration gets worse

ITEM	OPERATION	RESULT	NEXT STEP
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1	Check whether the air filter is blocked and whether the intake pipe leaks.	Yes	Intake system maintenance
		No	Next
2	Check whether the fuel pressure is about 250kPa.	Yes	Next
		No	Check the pump
3	Pull out the spark plug, check whether it is wet or not	Yes	dry the plug and combustion chamber.
		No	Next
4	Check whether the TMAP, TPS and the connections works well	Yes	Next
		No	Change the sensor or harness maintenance
5	Check whether the injector is blocked	Yes	Clean or change the injector
		No	Next
6	Check the type and the clearance of the spark plug.	Yes	Next
		No	Change the spark plug
7	Check whether the cylinder pressure is normal	Yes	Next
		No	Check the engine
8	Check whether the exhaust pipe is blocked or not	No	help
		Yes	maintenance

● Backfire

ITEM	OPERATION	RESULT	NEXT STEP
1	Pull out the spark plug, check whether the spark over is normal	Yes	Next
		No	Check the ignition system
2	Check whether the timing is right	Yes	Next
		No	Adjust the timing
3	Check whether there is leakage of the valve	Yes	Adjust the valve
		No	Next
4	Check whether the injector is blocked	Yes	Clean or change the injector
		No	Next
5	Check whether the oxygen sensor works well	Yes	Help
		No	Change the sensor

System or Component	DTC Number	DTC Description	Related Calibration	DTC
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Intake Air Pressure	P0263	IAP Circuit Low Voltage or Open	COBDM_IAP_LO	263
	P0264	IAP Circuit High Voltage	COBDM_IAP_HI	264
Intake Air Temperature Sensor (IAT)	P0274	IAT Circuit Low Voltage	COBDM_IAT_LO	274
	P0275	IAT Circuit High Voltage or Open	COBDM_IAT_HI	275
Engine/Oil Temperature Sensor	P0279	Engine/Oil Temperature Sensor Circuit Low Voltage	COBDM_ETS_LO	279
	P0280	Engine/Oil Temperature Sensor Circuit High Voltage or Open	COBDM_ETS_HI	280
Throttle Position Sensor (TPS)	P0290	TPS Circuit Low Voltage or Open	COBDM_TPS_LO	290
	P0291	TPS Circuit High Voltage	COBDM_TPS_HI	291
Oxygen Sensor(O21S)	P0305	O21S Circuit Low Voltage	COBDM_O21_LO	305
	P0306	O21S Circuit High Voltage	COBDM_O21_HI	306

Oxygen Sensor Heater Circuit (OXYAHD)	P0050	O21S Heater Circuit High Voltage	COBDM_O21Heater_HI	50
	P0049	O21S Heater Circuit Low Voltage or Open	COBDM_O21Heater_LO	49
Fuel Injector	P0610	Fuel Injector Circuit High Voltage	COBDM_INJA_HI	610
	P0609	IFuel Injector Circuit Low Voltage or Open	COBDM_INJA_LO	609
Fuel Pump Relay (FPR)	P0560	FPR Coil Circuit Low Voltage or Open	COBDM_FPR_LO	560
	P0562	FPR Coil Circuit High Voltage	COBDM_FPR_HI	562
Crank Angle Sensing(CAS)	P0822	CAS Sensor Noisy Signal	COBDM_CAS_Noise	822
	P0823	CAS Sensor No Signal	COBDM_CAS_Lost	823
Ignition Coil	P8961	Ignition Coil Ignition Coil High Voltage	COBDM_IGNA_HI	8961
	P8960	Ignition Coil Ignition Coil Low Voltage or Open	COBDM_IGNA_LO	8960
Idle Control System	P1285	Idle Control Speed Control Error	COBDM_ICS	1285
System Voltage	P1378	System Voltage Low	COBDM_VLT_LO	1378
	P1379	System Voltage High	COBDM_VLT_HI	1379
MIL	P1616	MIL Control Circuits	COBDM_MIL	1616

Tachometer Circuit (TACH)	P5779	Tachometer Circuit Low Voltage	COBDM_TACH_LO	5779
	P5780	Tachometer Circuit High Voltage	COBDM_TACH_HI	5780
Vehicle Speed Sensor	P1280	VSS No Signal	KsDGDM_VSS_NoSignal	1280
Park Neutral Switch (PNSWD)	P2128	Park Neutral Switch Error	COBDM_PNSW	2128
Evaporative Emission (EVP)	P1093	EVP short to high	COBDM_EVAP_HI	1093
	P1092	EVP short to low/open	COBDM_EVAP_LO	1092
ECU Check Error	P1537	ECU diagnostic by self	COBDM_ROMChecksum	1537
VoltageRegulator	P0791	VoltageRegulator Circuit High Voltage	COBDM_FAN_1_HI	792
	P0792	VoltageRegulator Circuit Low Voltage	COBDM_FAN_1_LO	791