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DIAGNOSTIC PROCEDURES

GENERAL

Here is the basic order suggested to diagnose a suspected engine management or fuel injection related problem:

- Check the chart in the TROUBLESHOOTING section to have an overview of problems and suggested solutions.
- Check if the engine management system (EMS) pilot lamp lights up. If so, use the VCK (Vehicle Communication Kit) and look for fault codes to diagnose the trouble.
- Check all fuses.
- Check fuel pressure.
- Check spark plugs condition.
- Check all connections of the wiring harness.
- Refer to COMPONENT INSPECTION AND ADJUSTMENT section for procedures.

TROUBLESHOOTING

The following chart is provided to help in diagnosing the probable source of simple troubles.

MONITORING BEEPER CODED SIGNALS

CODED SIGNALS	POSSIBLE CAUSE	REMEDY
2 short beeps (when engine is started). DESS/RER pilot lamp also blinks.	• Confirms that proper tether cord cap is installed. Engine can rev above pulley engagement.	• Normal condition.
1 short beep every 1.5 seconds (when engine is started). DESS/RER pilot lamp also blinks. Engine cannot reach pulley engagement speed. Vehicle cannot be driven.	• Bad DESS system connection. • Defective tether cord cap. • Dirt or snow in tether cord cap. • Defective DESS post.	• Reinstall tether cord cap correctly over post. • Use another programmed tether cord cap. • Clean tether cord cap. • Replace DESS post.
1 long beep per second.	• Reverse is selected.	• Vehicle can be driven in reverse.
3 short beeps per second. DESS/RER pilot lamp also blinks. Engine cannot reach pulley engagement speed. Vehicle cannot be driven.	• Wrong tether cord cap is installed.	• Install proper tether cord cap. • Program key into ECM.
3 short beeps per second. Engine overheating pilot lamp also blinks.	• Engine is overheating.	• Stop engine immediately and allow to cool. Check cooling system.
3 short beeps per second. Oil pilot lamp also lights up.	• Low oil pressure on 4-TEC models.	• Stop engine immediately and check oil level and top it. Check lubrication system.
3 short beeps per second.	• Low battery voltage.	• Check battery and charging system.
Battery pilot lamp lights up.	• No charging.	• Check battery and charging system.
4 short beeps every 2 minutes.	• Too high battery voltage. • DESS system has detected a shorted key installed on DESS post.	• Check battery and charging system. • Use another programmed tether cord cap.

ENGINE PILOT LAMP	BUZZER	DESCRIPTION	P CODE
OFF	OFF	Air pressure sensor voltage too high.	P0108
OFF	OFF	Air pressure sensor voltage too low.	P0107
OFF	OFF	Battery lamp open circuit or shorted to ground.	P1649
OFF	OFF	Battery lamp shorted to battery.	P1648
OFF	OFF	DESS line shorted to ground.	P1656
OFF	OFF	Engine temperature gauge signal open circuit or shorted to ground.	P1653
OFF	OFF	Engine temperature gauge signal shorted to battery.	P1652
OFF	OFF	Engine temperature lamp open circuit or shorted to ground.	P1647
OFF	OFF	Engine temperature lamp shorted to battery.	P1646
OFF	OFF	Exhaust temperature sensor functional problem.	P0426
OFF	OFF	Exhaust temperature sensor voltage too high.	P0428
OFF	OFF	Exhaust temperature sensor voltage too low.	P0427
OFF	OFF	Idle control valve output stage cutoff memory difference.	P0505
OFF	OFF	Incorrect DESS key.	P0513
OFF	OFF	Inner MAG injector open circuit or shorted to ground.	P0267
OFF	OFF	Inner MAG injector shorted to battery.	P0268
OFF	OFF	Inner PTO injector open circuit or shorted to ground.	P0270
OFF	OFF	Inner PTO injector shorted to battery.	P0271
OFF	OFF	Knock sensor below minimum noise.	P0326
OFF	OFF	Module call monitoring.	P0601
OFF	OFF	No crankshaft signal detected.	P0337
OFF	OFF	Oil lamp open circuit or shorted to ground.	P1658
OFF	OFF	Oil lamp shorted to battery.	P1654
OFF	OFF	Oil pressure switch leakage.	P1203
OFF	OFF	Oil pressure switch still closed.	P1202
OFF	OFF	P+ Test of ISC output signal failed.	P1611
OFF	OFF	R.A.V.E. solenoid open circuit or shorted to ground.	P0079
OFF	OFF	R.A.V.E. solenoid shorted to battery.	P0080
OFF	OFF	Relay 3 open circuit or shorted to ground.	P1678
OFF	OFF	Relay 3 shorted to battery.	P1677
OFF	OFF	Safety fuel cut off detected.	P1148
OFF	OFF	Starter relay open circuit or shorted to ground.	P0616
OFF	OFF	Starter relay shorted to battery.	P0617
OFF	OFF	T.O.P.S. functional problem.	P1502
OFF	OFF	Tachometer RPM signal open circuit or shorted to ground.	P0654
OFF	OFF	Tachometer RPM signal shorted to battery.	P0654
OFF	2 s/15 mn ③	Warning lamp open circuit or shorted to ground.	P0650
OFF	2 s/15 mn ③	Warning lamp shorted to battery.	P0650

ENGINE PILOT LAMP	BUZZER	DESCRIPTION	P CODE
ON	2 s/mn ②	Throttle position sensor adaptation canceled.	P1104
BLINKS ①	OFF	Air pressure sensor voltage out of range.	P0106
BLINKS ①	OFF	Air temperature sensor functional problem.	P0111
BLINKS ①	OFF	Buzzer open circuit or shorted to ground.	P1671
BLINKS ①	OFF	Buzzer shorted to battery.	P1670
BLINKS ①	2 s/mn ②	Battery voltage too low.	P0562
BLINKS ①	2 s/mn ②	Engine temperature sensor voltage too high.	P0118
BLINKS ①	2 s/mn ②	Air pressure sensor voltage too high.	P0108
BLINKS ①	2 s/mn ②	Air pressure sensor voltage too low.	P0107
BLINKS ①	2 s/mn ②	Battery voltage too high.	P0563
BLINKS ①	2 s/mn ②	DESS® shorted to battery.	P1655
BLINKS ①	2 s/mn ②	Engine temperature sensor functional problem.	P0116
BLINKS ①	2 s/mn ②	Engine temperature sensor voltage too low.	P0117
BLINKS ①	2 s/mn ②	Fuel pump open circuit or shorted to ground.	P0231
BLINKS ①	2 s/mn ②	Fuel pump shorted to battery.	P0232
BLINKS ①	2 s/mn ②	High engine RPM detected.	P0336
BLINKS ①	2 s/mn ②	MAG injector open circuit or shorted to ground.	P0261
BLINKS ①	2 s/mn ②	MAG injector shorted to battery.	P0262
BLINKS ①	2 s/mn ②	No MAG ignition output stage.	P0351
BLINKS ①	2 s/mn ②	No PTO ignition output stage.	P0352
BLINKS ①	2 s/mn ②	Oil pressure switch functional problem.	P0520
BLINKS ①	2 s/mn ②	Outer MAG injector open circuit or shorted to ground.	P0261
BLINKS ①	2 s/mn ②	Outer MAG injector shorted to battery.	P0262
BLINKS ①	2 s/mn ②	Outer PTO injector open circuit or shorted to ground.	P0264
BLINKS ①	2 s/mn ②	Outer PTO injector shorted to battery.	P0265
BLINKS ①	2 s/mn ②	PTO injector open circuit or shorted to ground.	P0264
BLINKS ①	2 s/mn ②	PTO injector shorted to battery.	P0265
BLINKS ①	2 s/mn ②	Throttle position sensor voltage too high.	P0123
BLINKS ①	2 s/mn ②	Throttle position sensor voltage too low.	P0122
BLINKS ①	2 s/15 mn ③	Air temperature sensor voltage too high.	P0113
BLINKS ①	2 s/15 mn ③	Air temperature sensor voltage too low.	P0112
BLINKS ①	2 s/15 mn ③	Cam sensor signal missing.	P0344
BLINKS ①	2 s/15 mn ③	Coding checksum fault.	P0605
BLINKS ①	2 s/15 mn ③	Coding ID checksum fault.	P0605
BLINKS ①	2 s/15 mn ③	Crankshaft signal fault.	P0339
BLINKS ①	2 s/15 mn ③	DESS lamp open circuit or shorted to ground.	P0648
BLINKS ①	2 s/15 mn ③	DESS lamp shorted to battery.	P0648
BLINKS ①	2 s/15 mn ③	EEPROM checksum fault.	P0605
BLINKS ①	2 s/15 mn ③	EEPROM fault.	P0605

ENGINE PILOT LAMP	BUZZER	DESCRIPTION	P CODE
BLINKS ①	2 s/15 mn ③	Engine temperature lamp open circuit or shorted to ground.	P0655
BLINKS ①	2 s/15 mn ③	Engine temperature lamp shorted to battery.	P0655
BLINKS ①	2 s/15 mn ③	Idle control valve output stage fault.	P0505
BLINKS ①	2 s/15 mn ③	MPEM not coded.	P0602
BLINKS①	2 s/15 mn ③	Programming checksum fault.	P0605
BLINKS ①	2 s/15 mn ③	RAM fault.	P0604
BLINKS ①	2 s/15 mn ③	Relay 2 open circuit or shorted to ground.	P1676
BLINKS ①	2 s/15 mn ③	Relay 2 shorted to battery.	P1675
BLINKS ①	2 s/15 mn ③	Sensor's power supply voltage too high.	P0608
BLINKS ①	2 s/15 mn ③	Sensor's power supply voltage too low.	P0608
BLINKS ①	2 s/15 mn ③	Throttle position sensor adaptation failure.	P1102
BLINKS ①	2 s/15 mn ③	TPS learns unlikely or checksum fault.	P0601

① Engine pilot lamp is on for half a second and off for half a second.

② Buzzer sounds for 2 seconds every minute.

③ Buzzer sounds for 2 seconds every 15 minutes.

VCK (Vehicle Communication Kit)

The VCK (Vehicle Communication Kit) (P/N 529 035 844) is the primary tool to diagnose engine management and fuel injection related problems.

NOTE: The MPEM programmer does not work on **4-TEC models**.

The 4-TEC requires B.U.D.S. version G2.0 or P2.0 or above.

B.U.D.S. (Bombardier Utility and Diagnostic Software) is designed to allow actuators, sensors and electronic equipments inspection, diagnostic options and reset such as the closed throttle and idle actuator.

For more information pertaining to the use of the software B.U.D.S., use its help which contains detailed information on its functions.

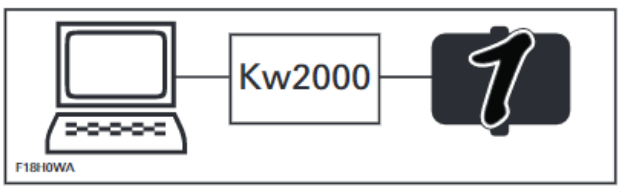
⚠ WARNING

If the computer you are using is connected to the power outlet, there is a potential risk of electrocution when working in contact with water. Be careful not to touch water while working with the VCK.

IMPORTANT: When using the software B.U.D.S., with the **4-TEC engine**, ensure that the protocol "KW2000" is properly selected in " **MPI**" (multi protocol interface) under "**Choose protocol**".

When B.U.D.S. is connected to the vehicle, the status bar shows the protocol (KW2000) and the number 1 to the right. To communicate with the ECM, number 1 must be displayed.

Number 1 means that one ECM is connected.



ONE ECM IS CONNECTED

If an "X" is shown, this means that no communication between the MPI and the ECM is possible. Possible causes are:

– ECM is not powered-up

– wrong protocol is used

– bad connection between MPI and module.

ECM Supply

To power-up the ECM, push the START button shortly while the engine cut-out switch is OFF and the tether cord cap installed on DESS post.

The supply cable (P/N 529 035 869) may also be used. Connecting it between MPI and vehicle will power-up the ECM.

VCK Supply

The VCK (MPI box) can use the vehicle power for its supply. Four AA batteries or an AC/DC power supply can also be used. Make sure to respect MPI specification if a power supply is used.

Writing in ECM

When writing in ECM through B.U.D.S., there will be an "EMS Tracking" message that will say "Remove key from vehicle". When this occurs, remove the tether cord cap from its post and wait until the message disappears (approximately 15 seconds after tether cord cap removal).

4-TEC SYSTEM FAULT CODES

General

The faults saved in the ECM (Engine Control Module) are kept even if the battery is disconnected.

IMPORTANT: After a problem has been solved, ensure to clear the fault(s) in the ECM using the VCK. This will properly reset the appropriate counter(s) and will also record that the problem has been fixed in the ECM memory.

Many fault codes at the same time is likely to be burnt fuse(s).

For more information pertaining to the code faults (state, count, first, etc.) and report, refer to B.U.D.S. online help.

Supplemental Information for Some Specific Faults

- Electrical noise is picked up by the ECM. Ensure that all connections are in good condition, also grounds (battery, ECM, engine and ignition system), they are clean and well tightened and that all electronic components are genuine — particularly in the ignition system. Installing non-resistive spark plugs may lead to generate this fault code.
- Electrical noise might also lead engine to occasional cutout without generating a fault code when engine is restarted. When looking at the fault code, pay attention to the "count" value in the software B.U.D.S. A value between 1 and 9 confirms an electrical noise problem. A value of 10 and above will generate a fault code.
- If everything is in good condition, try a new ECM.

When using the service action suggested in the Fault section of B.U.D.S., the system circuits are referred to as A-41, which means connector "A" on the ECM and the circuit 41.

TPS (Throttle Position Sensor) Faults

Faults which are reported in B.U.D.S. fall into two groups TPS faults and adaption faults. These are displayed on the B.U.D.S. system as TPS OUT OF RANGE and TPS ADAPTION FAILURE.

TPS "OUT OF RANGE" Fault

It is caused by the sensor reading going out of its allowable range. This fault can occur during the whole range of movement of the throttle.

To diagnose this fully, it is recommended to operate the throttle through its full range. It is also recommended to release the throttle quickly as this may also reveal a fault that is intermittent.

POSSIBLE CAUSES	RESULT	ACTION
Check if connector is disconnected from TPS	Yes	• Fix.
Check if sensor is loose	Yes	• Fix and reset **Closed Throttle and Idle Actuator**.
Inspect sensor for damage or corrosion	Yes	• Replace and reset **Closed Throttle and Idle Actuator**.
Inspect wiring (voltage test)	Failed	• Repair.
Inspect wiring and sensor (resistance test)	Failed	• If bad wiring, repair. • If bad TPS, replace and reset **Closed Throttle and Idle Actuator**.
Test sensor operation (wear test)		• Replace and reset **Closed Throttle and Idle Actuator**.

TPS "ADAPTATION FAILURE" Fault

It is caused by the idle position moving out of an acceptable range.

Following failures can be effected by a TPS "Adaption Failure":

– Idle speed is out of range.
– Engine stops, when throttle is released quickly.
– Engine runs inconsistent in low partload or low RPM.

POSSIBLE CAUSES	RESULT	ACTION
Sensor has been replaced and TPS closed position not reset	Yes	• Reset **Closed Throttle and Idle Actuator**.
Throttle body has been replaced and TPS closed position not reset	Yes	• Reset **Closed Throttle and Idle Actuator**.
EMS ECM has been replaced and TPS closed position not reset	Yes	• Reset **Closed Throttle and Idle Actuator**.
Throttle cable too tight	Yes	• Fix and reset **Closed Throttle and Idle Actuator**.
Sensor is loose	Yes	• Fix and reset **Closed Throttle and Idle Actuator**.
Throttle bracket is loose	Yes	• Fix and reset **Closed Throttle and Idle Actuator**.
Adjustment screw worn or loose	Yes	• Change throttle body.
Idle bypass valve replaced but not reset	Yes	• Reset **Closed Throttle and Idle Actuator** using B.U.D.S.