

2006 ENGINE**Engine Controls - 2.2L (L61) - Troubleshooting - HHR****SYMPTOMS - ENGINE CONTROLS****IMPORTANT PRELIMINARY INSPECTIONS****Before Starting**

Before using this section, perform the **Diagnostic System Check - Vehicle** in Vehicle DTC Information and ensure that the following items are OK:

- The engine control module (ECM), malfunction indicator lamp (MIL), and check engine are operating correctly.
- There are no DTCs stored.
- Scan tool data is within normal operating range. Refer to **Scan Tool Data List** .

Verify the customer complaint and locate the correct symptom in the table of contents. Inspect the items indicated under that symptom.

VISUAL/PHYSICAL INSPECTION

Several of the symptom procedures call for a careful visual/physical check. The importance of this step cannot be stressed strongly enough. This step can lead to correcting a condition without further inspections and can save valuable time. This inspection should include:

- ECM grounds for the following conditions:
 - Clean connection
 - Tight connection
 - Proper location

Refer to **Power and Grounding Component Views** in Wiring Systems.

- Vacuum hoses for the following conditions:
 - Splits
 - Kinks
 - Proper connections as shown on Vehicle Emission Control Information label - Refer to **Evaporative Emissions (EVAP) Hose Routing Diagram** .
 - Leaks
 - Restrictions
- Air leaks at the following components:
 - Throttle body mounting

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

- Intake manifold sealing surfaces
- Wiring for the following conditions:
 - Proper locations
 - Pinches
 - Cuts
- Use the following tables when diagnosing a symptom complaint:
 - **Hard Start**
 - **Surges/Chuggles**
 - **Lack of Power, Sluggishness, or Sponginess**
 - **Detonation/Spark Knock**
 - **Hesitation, Sag, Stumble**
 - **Cuts Out, Misses**
 - **Poor Fuel Economy**
 - **Poor Fuel Fill Quality**
 - **Rough, Unstable, or Incorrect Idle and Stalling**
 - **Dieseling, Run-On**
 - **Backfire**
 - **Malfunction Indicator Lamp (MIL) Inoperative**
 - **Malfunction Indicator Lamp (MIL) Always On**

INTERMITTENT CONDITIONS

Intermittent Conditions

Inspections	Action
DEFINITION: The condition is not currently present but is indicated in DTC history. OR There is a customer concern, but the symptom cannot currently be duplicated, if the condition is not DTC related.	
Preliminary	● Refer to Important Preliminary Inspection Before Starting in <u>Symptoms - Engine Controls</u>. ● The fault must be present to locate a problem using the DTC table. If a fault is intermittent, the use of DTC tables may result in the replacement of good parts.
Visual/Physical	This step is an important aid for locating a condition without extensive testing. Perform a thorough visual and physical inspection of the following components:

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	• Wiring harness for damage or cuts • A misrouted harness that is too close to high voltage or high current devices such as the following: ○ Secondary ignition components ○ Motors ○ Generators • Vacuum hoses for the following conditions: ○ Proper routing ○ Proper connections ○ Splits in the hose or the connections ○ Kinks • The control module and body grounds are clean and tight. • Battery connections are clean and tight • Charging system for proper operation - Refer to Charging System Test in Engine Electrical.
Harness/Connector Test	Many intermittent open or shorted circuits come and go with harness and connector movement caused by vibration, engine torque, bumps and rough pavement, etc. Test for this type of condition by performing the applicable procedure from the following list: • Move the related connectors and wiring while monitoring the appropriate scan tool data. • Move the related connectors and wiring with the component commanded ON and OFF, with the scan tool. Observe the components operation. • With the engine running, move the related connectors and wiring while monitoring engine operation. If harness or connector movement affects the data displayed, the component and system operation, or the engine operation, inspect and repair the harness or connections as necessary. Refer to Electrical Connections or Wiring in this table.
Electrical Connections or Wiring	Poor electrical connections and terminal tension or wiring faults cause most intermittents. Perform a careful inspection of the suspected circuit for the following:

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

- Inspect for incorrect mating of the connector halves, or terminals not fully seated in the connector body, backed-out.
- Inspect for improperly formed or damaged terminals. Test for incorrect terminal tension.
- Inspect for poor terminal to wire connections including terminals crimped over insulation. This requires removing the terminal from the connector body.
- Inspect for corrosion or water intrusion. Pierced or damaged insulation can allow moisture to enter the wiring. The conductor can corrode inside the insulation with little visible evidence. Look for swollen and stiff sections of wire in the suspect circuits.
- Inspect for wires that are broken inside the insulation.
- Inspect the harness for pinched, cut, or rubbed through wiring.
- Make sure the wiring does not come in contact with hot exhaust components.

Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems.

Control Module Power and Grounds

Poor power or ground connections can cause widely varying symptoms.

- Test all control module power circuits. Many vehicles have multiple circuits supplying power to the control module. Inspect connections at the control module connectors, fuses, and any intermediate connections between the power source and the control module or component. A test lamp or a DMM may indicate that voltage is present, but neither tests a circuit's ability to carry sufficient current. Ensure that the circuit can carry the current necessary to operate the component. Refer to **Power Distribution Schematics** in Wiring Systems.
- Test all control module ground and system ground circuits. The control module may have multiple ground circuits. Other components in the system

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	may have separate grounds that may also need to be tested. Make sure the ground connections are clean and tight at the grounding point. Inspect the connections at the component and in splice packs, where applicable. Ensure that the circuit can carry the current necessary to operate the component.
Temperature Sensitivity	• An intermittent condition may occur only when the component is cold, or only when the component is hot. The heat that affects the circuit can be engine generated or due to a poor connection in the circuit or a high electrical load. • Information from the customer may help to determine if the trouble follows a pattern that is temperature related. The Freeze Frame/Failure Records or Snapshot data may help with this type of intermittent condition, where applicable. • If the intermittent is related to heat, review the data for a relationship with the following: ○ High ambient temperatures ○ Underhood/engine generated heat ○ Circuit generated heat due to a poor connection, or high electrical load ○ Higher than normal load conditions (towing, etc.) • If the intermittent is related to cold, review the data for the following: ○ Low ambient temperatures-In extremely low temperatures, ice may form in a connection or component. Inspect for water intrusion. ○ The condition only occurs on a cold start. ○ The condition goes away when the vehicle warms up.
Electromagnetic Interference (EMI) and Electrical Noise.	Some electrical components and circuits are sensitive to electromagnetic interference (EMI) or other types of electrical noise. Inspect for the following conditions: • A misrouted harness that is too close to high voltage and high current devices such as secondary ignition components, motors, generator, etc. These components may induce electrical noise on a circuit that could interfere with normal circuit operation.

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	• Electrical system interference caused by a malfunctioning relay, control module driven solenoid, or switch. They can cause a sharp electrical surge. Normally, the problem will occur when the malfunctioning component is operating. • Incorrect installation of non-factory, aftermarket, add-on accessories such as lights, 2-way radios, amplifiers, electric motors, remote starters, alarm systems, cell phones, etc. • Test for an open diode across the A/C compressor clutch and for other open diodes. Some relays may contain a clamping diode or resistor.
Incorrect Control Module Programming	• There are only a few situations where reprogramming a control module is appropriate: ◦ A new control module is installed. ◦ Revised software/calibration files have been released for this vehicle. IMPORTANT: DO NOT reprogram the control module with the SAME software/calibration files that are already present in the control module. This is not an effective repair for any type of driveability problem. • Verify that the control module contains the correct software/calibration. If incorrect programming is found, reprogram the control module with the most current software/calibration. Refer to Service Programming System (SPS) in Programming.
Duplicating Failure Conditions	If the previous tests were not successful, attempt to duplicate and/or capture the failure conditions. Freeze Frame/Failure Records data, where applicable, contains the conditions that were present when the DTC set. 1. Review and record the Freeze Frame/Failure Records data. 2. Clear any DTCs with a scan tool. 3. Turn OFF the key and wait 15 seconds. 4. Operate the vehicle under the same conditions that were noted in Freeze Frame/Failure Records. The vehicle must also be operating within the Conditions

	For Running the DTC. Refer to Conditions for Running the DTC in the supporting text of the DTC being diagnosed. 5. Monitor DTC status for the DTC being tested. The scan tool will indicate Ran when the enabling conditions have been satisfied long enough for the DTC to run. The scan tool will also indicate whether the DTC passed or failed. An alternate method is to drive the vehicle with a DMM connected to a suspected circuit. An abnormal reading on the DMM when the problem occurs may help you locate the problem.
Scan Tool Snapshot	The scan tool can be set up to take a snapshot of the parameters available via serial data. The Snapshot function records live data over a period of time. The recorded data can be played back and analyzed. The scan tool can also graph parameters singly or in combinations of parameters for comparison. The snapshot can be triggered manually at the time the symptom is noticed or set up in advance to trigger when a DTC sets. An abnormal value captured in the recorded data may point to a system or component that needs to be investigated further. Refer to the scan tool user instructions for more information on the Snapshot function.

HARD START

Hard Start

Inspection/Test	Action
DEFINITION: Engine cranks OK, but does not start for a long time. Does eventually run, or may start but immediately dies.	
Preliminary	- Refer to Important Preliminary Inspections Before Starting in Symptoms - Engine Controls. - Inspect the engine control module (ECM) grounds for being clean, tight, and in the proper locations. Refer to Power and Grounding Component Views in Wiring Systems and Engine Controls Schematics. - Search for bulletins.

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	• Verify that the driver is using the correct starting procedure as described in the owners manual.
Sensor/System	• Inspect for an engine coolant temperature (ECT) sensor that has shifted in value. Refer to <u>Temperature vs Resistance</u>. • Test for proper operation of the manifold absolute pressure (MAP) sensor. Refer to <u>Altitude vs Barometric Pressure</u>. • Test for proper operation of the throttle position (TP) sensor. Refer to <u>DTC P0106</u>.
Fuel System	• Verify there is adequate fuel. • Inspect the fuel pump operation. The fuel pump should turn ON for 2 seconds when you turn ON the ignition. Refer to <u>Fuel Pump Electrical Circuit Diagnosis</u>. • A faulty in-tank fuel pump check valve allows the fuel in the lines to drain back to the tank after the engine stops. Refer to <u>Fuel System Diagnosis</u>. • Test the fuel injectors. Refer to <u>Fuel Injector Coil Test</u>. • Inspect for incorrect fuel pressure. Refer to <u>Fuel System Diagnosis</u>. • Inspect for a restricted fuel filter. Refer to <u>Fuel System Diagnosis</u>. • Inspect for a contaminated fuel condition. Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>.
Ignition System	• In order to properly inspect the spark plugs or to correct a condition, refer to the following procedures: ○ <u>Ignition System Specifications</u> ○ <u>Spark Plug Inspection</u> ○ <u>Spark Plug Replacement</u> • Remove spark plugs and inspect for the following: ○ Correct heat range ○ Wet plugs ○ Cracks ○ Wear

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	○ Improper gap ○ Burned electrodes ○ Heavy deposits ○ Verify that the spark plugs are of the correct type. ● Inspect for proper ignition voltage output with J 26792 (SA9199Z) Spark Tester. See Special Tools. ● An improper spark plug gap will cause a driveability condition. Gap the spark plugs using a wire gage gap tool. ● Determine the cause of the fouling before replacing the spark plugs. ● Inspect for damaged or misaligned spark plug boots. ● Inspect the electronic ignition (EI) module for proper ground connection.
Engine Mechanical	Inspect for the following conditions: ● Excessive oil in combustion chamber or leaking valve seals - Refer to Oil Consumption Diagnosis in Engine Mechanical. ● Low cylinder compression - Refer to Engine Compression Test in Engine Mechanical. ● Improper valve timing. ● Combustion chambers for excessive carbon buildup-Clean the chambers using top engine cleaner. Follow the instructions on the can. ● Incorrect basic engine parts-Inspect the following: ○ The camshaft - Refer to Camshaft Cleaning and Inspection in Engine Mechanical. ○ The cylinder heads - Refer to Cylinder Head Cleaning and Inspection in Engine Mechanical. ○ The pistons, etc. - Refer to Piston, Connecting Rod, and Bearings Cleaning and Inspection in Engine Mechanical. ● Inspect for excessive crankshaft endplay that will cause the CKP sensor reluctor wheel to move out of alignment with the CKP sensor. Refer to Crankshaft and Bearings Cleaning and Inspection in Engine

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Mechanical-2.2L (L61). This could result in any of the following conditions: ○ A no start ○ A start and stall ○ Erratic performance
Additional	● Inspect for a restricted exhaust. Refer to <u>Restricted Exhaust</u> in Engine Exhaust. ● Inspect the air intake ducts for the following: ○ Collapsed ○ Damage ○ Loose ○ Improperly installed ○ Leaking

SURGES/CHUGGLES

Surges/Chuggles

Inspection/Tests	Action
DEFINITION: Engine power variation under steady throttle or cruise. Feels like the vehicle speeds up and slows down with no change in the accelerator pedal position.	
Preliminary	● Refer to Important Preliminary Inspections Before Starting in <u>Symptoms - Engine Controls</u>. ● Search for bulletins. ● Inspect the engine control module (ECM) grounds for being clean, tight, and in the proper locations. Refer to <u>Power and Grounding Component Views</u> in Wiring Systems and <u>Engine Controls Schematics</u>. ● Verify the driver understands the operation of the transmission torque converter clutch (TCC) and A/C compressor operation as explained in the owners manual.
Sensor/System	NOTE: <u>Refer to Silicon Contamination of Heated Oxygen Sensors Notice in Cautions and Notices.</u> ● Inspect the heated oxygen sensors (HO2S). The HO2S should respond quickly to different throttle positions. If they do not, inspect the HO2S for silicon or other contaminants from fuel or the use of improper RTV sealant. The sensors may have a

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	white, powdery coating and result in a high but false signal voltage rich exhaust indication. The ECM will then reduce the amount of fuel delivered to the engine causing a severe driveability problem. • Inspect for an engine coolant temperature (ECT) sensor that has shifted in value. Refer to <u>Temperature vs Resistance</u>. • Inspect for proper operation of the manifold absolute pressure (MAP) sensor. Refer to <u>Altitude vs Barometric Pressure</u>. • Inspect for proper operation of the throttle position (TP) sensor. Refer to <u>DTC P0106</u>. • Inspect for proper operation of the ECT sensor. Refer to <u>Temperature vs Resistance</u>.
Fuel System	• Test for incorrect fuel pressure. Refer to <u>Fuel System Diagnosis</u>. • Test the fuel injectors. Refer to <u>Fuel Injector Coil Test</u>. • Inspect for a restricted fuel filter. Refer to <u>Fuel System Diagnosis</u>. • Inspect for a contaminated fuel condition. Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>. • Verify that each injector harness is connected to the correct injector or cylinder. Relocate the injector harnesses as necessary. • Inspect for the following that may cause the engine to run rich: NOTE: Refer to Heated Oxygen and Oxygen Sensor Notice in Cautions and Notices. ○ Water intrusion in the HO2S connector ○ Engine oil contaminated by fuel - Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>. ○ An evaporative emission (EVAP) canister purge

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	condition ○ Incorrect fuel pressure - Refer to <u>Fuel System Diagnosis</u>. ○ Leaking fuel injectors - Refer to <u>Fuel System Diagnosis</u>. ○ Vacuum hoses that are split, kinked, or improperly connected ○ An air intake duct that is collapsed or restricted ○ An air filter that is dirty or restricted - Refer to <u>Air Cleaner Element Replacement</u>. ● Inspect for the following conditions that may cause the engine to run lean: NOTE: Refer to Heated Oxygen and Oxygen Sensor Notice in Cautions and Notices. ○ Water intrusion in the HO2S connector ○ An exhaust leak between the HO2S and the engine - Refer to <u>Exhaust Leakage</u> in Engine Exhaust. ○ Vacuum leaks ○ Incorrect fuel pressure - Refer to <u>Fuel System Diagnosis</u>. ○ Restricted fuel injectors - Refer to <u>Fuel Injector Balance Test with Special Tool</u>. ○ Fuel contamination - Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>. ○ Vacuum hoses that are split, kinked, or improperly connected
Ignition System	● In order to properly inspect the spark plugs or to correct a condition, refer to the following procedures: ○ <u>Ignition System Specifications</u> ○ <u>Spark Plug Inspection</u> ○ <u>Spark Plug Replacement</u> ● Remove spark plugs and inspect for the following: ○ Correct heat range

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	○ Wet plugs ○ Cracks ○ Wear ○ Improper gap ○ Burned electrodes ○ Heavy deposits ○ Verify that the spark plugs are of the correct type. ● Inspect for proper ignition voltage output with the J 26792 (SA9199Z) Spark Tester. See Special Tools . ● An improper spark plug gap will cause a driveability condition. Gap the spark plugs using a wire gage gap tool. ● Determine the cause of the fouling before replacing the spark plugs. ● Inspect for damaged or misaligned spark plug boots. ● Inspect the electronic ignition (EI) module for proper ground connection. ● Monitor the Misfire Current Counters while driving the vehicle in the conditions that the symptom occurred. If a misfiring cylinder can be located, use the DTC P0300 table for diagnosis. Refer to DTC P0300 .
Engine Mechanical	Inspect for excessive crankshaft endplay that will cause the CKP sensor reluctor wheel to move out of alignment with the CKP sensor. Refer to Crankshaft and Bearings Cleaning and Inspection in Engine Mechanical. This could result in any of the following conditions: ● A no start ● A start and stall ● Erratic Performance
Additional Inspections	● Visually and physically inspect vacuum hoses for splits, kinks, and proper connections and routing as shown on the Vehicle Emission Control Information label. ● Inspect the transmission torque converter clutch (TCC) for proper operation. Refer to Torque Converter Diagnosis Procedure in Automatic

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

Transaxle-4T40-E/4T45-E.

- Test the A/C clutch for proper operation. Refer to **Symptoms - HVAC Systems - Manual** in HVAC Systems-Manual.
- Inspect the exhaust system for possible restrictions. Refer to **Restricted Exhaust** in Engine Exhaust.

LACK OF POWER, SLUGGISHNESS, OR SPONGINESS

Lack of Power, Sluggishness, or Sponginess

Inspection/Tests	Action
DEFINITION: Engine delivers less than expected power. Little or no increase in speed when the accelerator pedal is pushed down part way.	
Preliminary Inspections	• Refer to Important Preliminary Inspections Before Starting in Symptoms - Engine Controls. • Search for bulletins. • Inspect the engine control module (ECM) grounds for being clean, tight, and in the proper locations. Refer to Power and Grounding Component Views in Wiring Systems and Engine Controls Schematics. • Remove the air filter element and inspect for dirt or for restrictions. Refer to Air Cleaner Element Replacement and replace as necessary.
Fuel System	• Test for incorrect fuel pressure. Refer to Fuel System Diagnosis. • Inspect for a restricted fuel filter. Refer to Fuel System Diagnosis. • Inspect for a contaminated fuel condition. Refer to Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool) or Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool). • Test the fuel injectors. Refer to Fuel Injector Coil Test. • Inspect for the following that may cause the engine to run rich: NOTE: Refer to Heated Oxygen and Oxygen Sensor Notice. ○ Water intrusion in the heated oxygen sensor

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	(HO2S) connector ○ Engine oil contaminated by fuel ○ An evaporative emission (EVAP) canister purge condition ○ Incorrect fuel pressure - Refer to <u>Fuel System Diagnosis</u>. ○ Leaking fuel injectors - Refer to <u>Fuel System Diagnosis</u>. ○ Vacuum hoses that are split, kinked, or improperly connected ○ An air intake duct that is collapsed or restricted - Refer <u>Air Cleaner Outlet Duct Replacement</u> . ○ An air filter that is dirty or restricted - Refer to <u>Air Cleaner Element Replacement</u> . ● Inspect for the following conditions that may cause the engine to run lean: NOTE: Refer to <u>Heated Oxygen and Oxygen Sensor Notice</u> . ○ Water intrusion in the HO2S connector ○ An exhaust leak between the HO2S and the engine - Refer to <u>Exhaust Leakage</u> . ○ Vacuum leaks ○ Incorrect fuel pressure - Refer to <u>Fuel System Diagnosis</u>. ○ Restricted fuel injectors - Refer to <u>Fuel Injector Balance Test with Special Tool</u>. ○ Fuel contamination - Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>. ○ Vacuum hoses that are split, kinked, or improperly connected
Sensor/System	Monitor the knock sensor (KS) system for excessive spark retard activity with a scan tool. Refer to <u>Scan Tool Data List</u> .
Ignition System	

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	• In order to properly inspect the spark plugs or to correct a condition, refer to the following procedures: ○ <u>Ignition System Specifications</u> ○ <u>Spark Plug Inspection</u> ○ <u>Spark Plug Replacement</u> • Remove spark plugs and inspect for the following: ○ Correct heat range ○ Wet plugs ○ Cracks ○ Wear ○ Improper gap ○ Burned electrodes ○ Heavy deposits ○ Verify that the spark plugs are of the correct type. • Inspect for proper ignition voltage output with J 26792 (SA9199Z) Spark Tester. See <u>Special Tools</u> . • An improper spark plug gap will cause a driveability condition. Gap the spark plugs using a wire gage gap tool. • Determine the cause of the fouling before replacing the spark plugs. • Inspect for damaged or misaligned spark plug boots. • Inspect the electronic ignition (EI) module for proper ground connection. • Monitor the Misfire Current Counters while driving the vehicle in the conditions that the symptom occurred. If a misfiring cylinder can be located, use the DTC P0300 table for diagnosis. Refer to <u>DTC P0300</u> .
Engine Mechanical	• Inspect for incorrect camshaft timing. • Inspect for excessive oil in the combustion chambers and leaking valve seals. Refer to <u>Oil Consumption Diagnosis</u> . • Test for low cylinder compression. Refer to <u>Engine Compression Test</u> . • Inspect for incorrect basic engine parts, including the following:

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	○ The camshaft - Refer to <u>Camshaft Cleaning and Inspection</u> . ○ The cylinder heads - Refer to <u>Cylinder Head Cleaning and Inspection</u> . ○ The pistons, etc. - Refer to <u>Piston, Connecting Rod, and Bearings Cleaning and Inspection</u> . ● Inspect for excessive crankshaft endplay that will cause the CKP sensor reluctor wheel to move out of alignment with the CKP sensor. Refer to <u>Crankshaft and Bearings Cleaning and Inspection</u> . This could result in any of the following conditions: ○ A no start ○ A start and stall ○ Erratic performance
Additional Inspections	● Inspect the exhaust system for possible restrictions. Refer to <u>Restricted Exhaust</u> . ● Inspect the exhaust system for damaged or collapsed pipes. ● Inspect the mufflers for heat distress or internal failure. ● Inspect the transmission torque converter clutch (TCC) for proper operation. Refer to <u>Torque Converter Diagnosis Procedure</u> .

DETONATION/SPARK KNOCK

Detonation/Spark Knock

Inspection/Tests	Action
DEFINITION: A mild to severe ping, usually worse under acceleration. The engine makes sharp metallic knocks that changes with throttle opening.	
Preliminary Inspections	● Refer to Important Preliminary Inspections Before Starting in <u>Symptoms - Engine Controls</u>. ● Search for bulletins. ● Inspect the engine control module (ECM) grounds for being clean, tight, and in the proper locations. Refer to <u>Power and Grounding Component Views</u> and <u>Engine Controls Schematics</u> . ● If there are no engine mechanical faults, fill the fuel tank with a known high quality fuel that meets the vehicles minimum octane requirements. Road test the

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	vehicle and re-evaluate the vehicles performance.
Fuel System	• Test for incorrect fuel pressure. Refer to <u>Fuel System Diagnosis</u>. • Inspect for a restricted fuel filter. Refer to <u>Fuel System Diagnosis</u>. • Test the fuel injectors. Refer to <u>Fuel Injector Coil Test</u>. • Inspect for a contaminated fuel condition. Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>. • Inspect for the following conditions that may cause the engine to run lean: NOTE: Refer to <u>Heated Oxygen and Oxygen Sensor Notice</u> . ○ Water intrusion in the heated oxygen sensor (HO2S) connector ○ An exhaust leak between the HO2S and the engine - Refer to <u>Exhaust Leakage</u> . ○ Vacuum leaks ○ Incorrect fuel pressure - Refer to <u>Fuel System Diagnosis</u>. ○ Restricted fuel injectors - Refer to <u>Fuel Injector Balance Test with Special Tool</u>. ○ Fuel contamination - Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>. ○ Vacuum hoses that are split, kinked, or improperly connected
Sensor/System	Inspect for an engine coolant temperature (ECT) sensor that has shifted in value. Refer to <u>Temperature vs Resistance</u> .
Ignition System	• In order to properly inspect the spark plugs or to correct a condition, refer to the following procedures: ○ <u>Ignition System Specifications</u>

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	○ <u>Spark Plug Inspection</u> ○ <u>Spark Plug Replacement</u> ● Remove spark plugs and inspect for the following: ○ Correct heat range ○ Wet plugs ○ Cracks ○ Wear ○ Improper gap ○ Burned electrodes ○ Heavy deposits ○ Verify that the spark plugs are of the correct type. ● Inspect for proper ignition voltage output with J 26792 (SA9199Z). See <u>Special Tools</u> . ● An improper spark plug gap will cause a driveability condition. Gap the spark plugs using a wire gage gap tool. ● Determine the cause of the fouling before replacing the spark plugs. ● Inspect for damaged or misaligned spark plug boots. ● Inspect the electronic ignition (EI) module for proper ground connection.
Engine Cooling System	Inspect for obvious overheating problems: ● Low engine coolant - Refer to <u>Loss of Coolant</u> . ● Faulty thermostat - Refer to <u>Thermostat Diagnosis</u> . ● Restricted air flow to the radiator or restricted coolant flow through the radiator ● Inoperative electric cooling fan - Refer to <u>Cooling Fan Inoperative</u> . ● Proper tension on the drive belts - Refer to <u>Drive Belt Tensioner Diagnosis</u> . ● Correct coolant solution should be a 50/50 mix - Refer to <u>Cooling System Description and Operation</u> .
Engine Mechanical	Inspect for the following engine mechanical problems: ● Excessive oil in combustion chamber-Leaking valve

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	seals. Refer to <u>Oil Consumption Diagnosis</u> . • High cylinder compression - Refer to <u>Engine Compression Test</u> . • Combustion chambers for excessive carbon buildup- Clean the combustion chamber by using top engine cleaner. Follow the instructions on the can. • Incorrect camshaft timing • Inspect for incorrect basic engine parts. Inspect the following: ◦ The camshaft - Refer to <u>Camshaft Cleaning and Inspection</u> . ◦ The cylinder heads - Refer to <u>Cylinder Head Cleaning and Inspection</u> . ◦ The pistons, etc. - Refer to <u>Piston, Connecting Rod, and Bearings Cleaning and Inspection</u> . • Refer to <u>Symptoms - Engine Mechanical</u> .
Additional Inspections	• Inspect the park/neutral position (PNP) switch operation. • Inspect the transmission torque converter clutch (TCC) operation. The TCC applying too soon can cause the engine to spark knock. Refer to <u>Torque Converter Diagnosis Procedure</u> .

HESITATION, SAG, STUMBLE

Hesitation, Sag, Stumble

Inspection/Tests	Action
DEFINITION: Momentary lack of response as the accelerator is pushed down. Can occur at any vehicle speed. Usually more pronounced when first trying to make the vehicle move, as from a stop. May cause the engine to stall if severe enough.	
Preliminary	• Refer to Important Preliminary Inspections Before Starting in <u>Symptoms - Engine Controls</u>. • Search for bulletins. • Inspect the engine control module (ECM) grounds for being clean, tight, and in the proper locations. Refer to <u>Power and Grounding Component Views</u> in Wiring Systems and <u>Engine Controls Schematics</u> .
Sensor/System	NOTE: Refer to <u>Silicon Contamination of Heated Oxygen Sensors Notice</u> in Cautions and Notices.

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	• Inspect the heated oxygen sensors (HO2S). The HO2S should respond quickly to different throttle positions. If they do not, inspect the HO2S for silicon or other contaminants from fuel or the use of improper RTV sealant. The sensors may have a white, powdery coating and result in a high but false signal voltage rich exhaust indication. The PCM will then reduce the amount of fuel delivered to the engine causing a severe driveability problem. • Inspect for proper operation of the manifold absolute pressure (MAP) sensor. Refer to <u>Altitude vs Barometric Pressure</u> . • Inspect for proper operation of the throttle position (TP) sensor. Refer to <u>DTC P0106</u> . • Inspect for proper operation of the engine coolant temperature (ECT) sensor. Refer to <u>Temperature vs Resistance</u> .
Fuel System	• Test for incorrect fuel pressure. Refer to <u>Fuel System Diagnosis</u>. • Inspect for a restricted fuel filter. Refer to <u>Fuel System Diagnosis</u>. • Inspect for a contaminated fuel condition. Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>. • Test the fuel injector Refer to <u>Fuel Injector Coil Test</u>. • Inspect for the following that may cause the engine to run rich: NOTE: Refer to Heated Oxygen and Oxygen Sensor Notice in Cautions and Notices. ○ Water intrusion in the HO2S connector ○ Engine oil contaminated by fuel ○ An evaporative emission (EVAP) canister purge condition ○ Incorrect fuel pressure - Refer to <u>Fuel System Diagnosis</u>. ○ Leaking fuel injectors - Refer to <u>Fuel System</u>

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

Diagnosis.

- Vacuum hoses that are split, kinked, or improperly connected
- An air intake duct that is collapsed or restricted
- An air filter that is dirty or restricted - Refer to **Air Cleaner Element Replacement**.
- Inspect for the following conditions that may cause the engine to run lean:

NOTE:

Refer to **Heated Oxygen and Oxygen Sensor Notice** in **Cautions and Notices.**

- Water intrusion in the HO2S connector
- An exhaust leak between the HO2S and the engine - Refer to **Exhaust Leakage** in Engine Exhaust.
- Vacuum leaks
- Incorrect fuel pressure - Refer to **Fuel System Diagnosis.**
- Restricted fuel injectors - Refer to **Fuel Injector Balance Test with Special Tool.**
- Fuel contamination - Refer to **Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)** or **Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool).**
- Vacuum hoses that are split, kinked, or improperly connected

Ignition System

- In order to properly inspect the spark plugs or to correct a condition, refer to the following procedures:
 - **Ignition System Specifications**
 - **Spark Plug Inspection**
 - **Spark Plug Replacement**
- Remove spark plugs and inspect for the following:
 - Correct heat range
 - Wet plugs
 - Cracks
 - Wear

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	○ Improper gap ○ Burned electrodes ○ Heavy deposits ○ Verify that the spark plugs are of the correct type. ● Inspect for proper ignition voltage output with J 26792 (SA9199Z) Spark Tester. See Special Tools . ● An improper spark plug gap will cause a driveability condition. Gap the spark plugs using a wire gage gap tool. ● Determine the cause of the fouling before replacing the spark plugs. ● Inspect for damaged or misaligned spark plug boots. ● Inspect the electronic ignition (EI) module for proper ground connection. ● Monitor the Misfire Current Counters while driving the vehicle in the conditions that the symptom occurred. If a misfiring cylinder can be located, use the DTC P0300 table for diagnosis. Refer to DTC P0300 .
Engine Mechanical	Inspect for excessive crankshaft endplay that will cause the CKP sensor reluctor wheel to move out of alignment with the CKP sensor. Refer to Crankshaft and Bearings Cleaning and Inspection in Engine Mechanical. This could result in any of the following conditions: ● A no start ● A start and stall ● Erratic Performance
Engine Cooling System	Inspect the engine thermostat for proper operation and for correct heat range. Refer to Thermostat Diagnosis in Engine Cooling.

CUTS OUT, MISSES

Cuts Out, Misses

Inspections	Action
DEFINITION: Steady pulsation or jerking that follows engine speed, usually more pronounced as engine load increases. This condition is not normally felt above 1,500 RPM or 48 km/h (30 mph). The exhaust has a steady spitting sound at idle or low	

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

speed.

Preliminary

- Refer to Important Preliminary Inspections Before Starting in **Symptoms - Engine Controls**.
- Search for bulletins.
- Verify that the engine control module (ECM) grounds are clean, tight, and in the proper locations. Refer to **Power and Grounding Component Views** in Wiring Systems and **Engine Controls Schematics**.
- Remove the air filter element and inspect for dirt and for restrictions. Refer to **Air Cleaner Element Replacement**. Replace as necessary.

Fuel Systems

- Test the fuel injectors. Refer to **Fuel Injector Coil Test**.
- Test for incorrect fuel pressure. Refer to **Fuel System Diagnosis**.
- Inspect for a restricted fuel filter. Refer to **Fuel System Diagnosis**.
- Inspect for a contaminated fuel condition. Refer to **Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)** or **Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)**.
- Inspect for the following conditions that may cause the engine to run rich:

NOTE:

Refer to **Heated Oxygen and Oxygen Sensor Notice in Cautions and Notices**.

- Water intrusion in the heated oxygen sensor (HO2S) connector
- Engine oil contaminated by fuel
- An evaporative emission (EVAP) canister purge condition - Refer to **Scan Tool Data List**.
- Incorrect fuel pressure - Refer to **Fuel System Diagnosis**.
- Leaking fuel injectors - Refer to **Fuel System Diagnosis**.
- Vacuum hoses that are split, kinked, or improperly connected
- An air intake duct that is collapsed or restricted

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	○ An air filter that is dirty or restricted - Refer to <u>Air Cleaner Element Replacement</u> . ● Inspect for the following conditions that may cause the engine to run lean: NOTE: Refer to <u>Heated Oxygen and Oxygen Sensor Notice</u> in Cautions and Notices. ○ Water intrusion in the HO2S connector ○ An exhaust leak between the HO2S and the engine - Refer to <u>Exhaust Leakage</u> in Engine Exhaust. ○ Vacuum leaks ○ Incorrect fuel pressure - Refer to <u>Fuel System Diagnosis</u>. ○ Restricted fuel injectors - Refer to <u>Fuel Injector Balance Test with Special Tool</u>. ○ Fuel contamination - Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>. ○ Vacuum hoses that are split, kinked, or improperly connected
Sensor/System	● Use a scan tool in order to monitor the knock sensor (KS) system for excessive spark retard activity. Refer to <u>Scan Tool Data List</u> . ● Inspect for throttle body tampering, excessive deposits, or damage. Refer to <u>Throttle Body Cleaning Procedure</u> . ● Inspect the throttle position (TP) sensor and related circuit. Refer to <u>DTC P0106</u> . ● Inspect the crankcase ventilation system for proper operation. Refer to <u>Crankcase Ventilation System Inspection/Diagnosis</u> in Engine Mechanical.
Ignition System	● In order to properly inspect the spark plugs or to correct a condition, refer to the following procedures: ○ <u>Ignition System Specifications</u> ○ <u>Spark Plug Inspection</u>

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	○ Spark Plug Replacement ● Remove spark plugs and inspect for the following: ○ Correct heat range ○ Wet plugs ○ Cracks ○ Wear ○ Improper gap ○ Burned electrodes ○ Heavy deposits ○ Verify that the spark plugs are of the correct type. ● Inspect for proper ignition voltage output with J 26792 (SA9199Z) Spark Tester. See Special Tools . ● An improper spark plug gap will cause a driveability condition. Gap the spark plugs using a wire gage gap tool. ● Determine the cause of the fouling before replacing the spark plugs. ● Inspect for damaged or misaligned spark plug boots. ● Inspect the electronic ignition (EI) module for proper ground connection. ● Monitor the Misfire Current Counters while driving the vehicle in the conditions that the symptom occurred. If a misfiring cylinder can be located, use the DTC P0300 table for diagnosis. Refer to DTC P0300 .
Engine Mechanical	● Inspect engine mechanical for the following: ○ Compression ○ Sticking or leaking valves ○ Worn camshaft lobes ○ Valve timing ○ Worn rocker arms ○ Broken valve springs ○ Excessive oil in combustion chamber or leaking valve seals. For more information, refer to one or more of

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

the following procedures in Engine Mechanical:

- **Engine Compression Test**
- **Symptoms - Engine Mechanical**
- **Oil Consumption Diagnosis**
- For incorrect basic engine parts. Inspect the following:
 - The camshaft - Refer to **Camshaft Cleaning and Inspection** in Engine Mechanical.
 - The cylinder heads - Refer to **Cylinder Head Cleaning and Inspection** in Engine Mechanical.
 - The pistons, etc. - Refer to **Piston, Connecting Rod, and Bearings Cleaning and Inspection** in Engine Mechanical.
- Refer to **Symptoms - Engine Mechanical** in Engine Mechanical for diagnosis procedures.
- Inspect for excessive crankshaft endplay that will cause the CKP sensor reluctor wheel to move out of alignment with the CKP sensor. Refer to **Crankshaft and Bearings Cleaning and Inspection** in Engine Mechanical-2.2L (L61) This could result in any of the following conditions:
 - A no start
 - A start and stall
 - Erratic Performance

Additional Inspections

- Inspect the exhaust system for possible restrictions. Inspect for the following:
 - Inspect the exhaust system for damaged or collapsed pipes.
 - Inspect the mufflers for heat distress or possible internal failure.
 - Inspect for possible plugged catalytic converters. Refer to **Restricted Exhaust** in Engine Exhaust.
- Electromagnetic interference (EMI) can cause an engine misfire condition. A sudden increase in indicated RPM with little change in actual engine RPM change indicates EMI is present. Inspect for high voltage components near ignition control circuits

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

if a condition exists.

- Inspect the intake manifold and the exhaust manifold passages for casting flash.

POOR FUEL ECONOMY

Poor Fuel Economy

Inspections	Action
DEFINITION: Fuel economy, as measured by an actual road test, is noticeably lower than expected. Also, fuel economy is noticeably lower than the economy was on this vehicle at one time, as previously shown by an actual road test.	
Preliminary	• Refer to Important Preliminary Inspections Before Starting in Symptoms - Engine Controls. • Search for bulletins. • Inspect the engine control module (ECM) grounds for being clean, tight, and in the proper locations. Refer to Power and Grounding Component Views in Wiring Systems and Engine Controls Schematics. • Discuss driving habits with the owner. ○ Is the A/C ON or the Defroster mode ON full time? ○ Are the tires at the correct pressure? ○ Are the wheels and tires the correct size? ○ Are there excessively heavy loads being carried? ○ Is the acceleration rate too much, too often? • Remove the air filter element and inspect for dirt or for restrictions. Refer to Air Cleaner Element Replacement. Replace as necessary.
Fuel System	• Discuss with the owner the type, quality, and alcohol content of the fuel. Oxygenated fuels have lower energy and may deliver reduced fuel economy. Refer to Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool) or Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool). • Inspect the fuel injectors. Refer to Fuel Injector Coil Test. • Test for incorrect fuel pressure. Refer to Fuel System Diagnosis. • Inspect for a restricted fuel filter. Refer to Fuel

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	<u>System Diagnosis.</u> • Inspect for a contaminated fuel condition. Refer to <u>Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)</u> or <u>Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)</u>. • Inspect that each fuel injector harness is connected to the correct injector and cylinder. Relocate the injector harnesses as necessary.
Sensor/System	• Inspect for the following that may cause the engine to run rich: NOTE: Refer to Heated Oxygen and Oxygen Sensor Notice in Cautions and Notices. ○ Water intrusion in the heated oxygen sensor (HO2S) connector ○ Engine oil contaminated by fuel ○ An evaporative emission (EVAP) canister purge condition- Refer to <u>Scan Tool Data List</u> . ○ Incorrect fuel pressure - Refer to <u>Fuel System Diagnosis</u>. ○ Leaking fuel injectors - Refer to <u>Fuel System Diagnosis</u>. ○ Vacuum hoses that are split, kinked, or improperly connected ○ An air intake duct that is collapsed or restricted ○ An air filter that is dirty or restricted - Refer to <u>Air Cleaner Element Replacement</u> . • Inspect the air intake system and crankcase for air leaks. • Inspect for an engine coolant temperature (ECT) sensor that has shifted in value. Refer to <u>Temperature vs Resistance</u> . • Inspect the crankcase ventilation system for proper operation. Refer to <u>Crankcase Ventilation System Inspection/Diagnosis</u> in Engine Mechanical. • Inspect for an inaccurate speedometer. • Monitor the knock sensor (KS) system for excessive spark retard activity with a scan tool. Refer to <u>Scan</u>

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Tool Data List .
Ignition System	• In order to properly inspect the spark plugs or to correct a condition, refer to the following procedures: ◦ <u>Ignition System Specifications</u> ◦ <u>Spark Plug Inspection</u> ◦ <u>Spark Plug Replacement</u> • Remove spark plugs and inspect for the following: ◦ Correct heat range ◦ Wet plugs ◦ Cracks ◦ Wear ◦ Improper gap ◦ Burned electrodes ◦ Heavy deposits ◦ Verify that the spark plugs are of the correct type. • Inspect for proper ignition voltage output with the J 26792 (SA9199Z) Spark Tester. See <u>Special Tools</u> . • An improper spark plug gap will cause a driveability condition. Gap the spark plugs using a wire gage gap tool. • Determine the cause of the fouling before replacing the spark plugs. • Inspect for damaged or misaligned spark plug boots. • Inspect the electronic ignition (EI) module for proper ground connection. • Monitor the Misfire Current Counters while driving the vehicle in the conditions that the symptom occurred. If a misfiring cylinder can be located, use the DTC P0300 table for diagnosis. Refer to <u>DTC P0300</u> .
Engine Cooling System	• Inspect the engine coolant level for being low. Refer to <u>Loss of Coolant</u> in Engine Cooling. • Inspect the engine thermostat for proper operation and for the correct heat range. Refer to <u>Thermostat Diagnosis</u> in Engine Cooling.
Engine Mechanical	• Inspect engine mechanical for the following: ◦ Compression

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

- Sticking or leaking valves
- Worn camshaft lobes
- Valve timing
- Worn rocker arms
- Broken valve springs
- Excessive oil in combustion chamber or leaking valve seals.

For more information, refer to one or more of the following procedures in Engine Mechanical:

- **Engine Compression Test**
- **Symptoms - Engine Mechanical**
- **Oil Consumption Diagnosis**
- For incorrect basic engine parts, inspect the following:
 - The camshaft - Refer to **Camshaft Cleaning and Inspection** in Engine Mechanical.
 - The cylinder heads - Refer to **Cylinder Head Cleaning and Inspection** in Engine Mechanical.
 - The pistons, etc. - Refer to **Piston, Connecting Rod, and Bearings Cleaning and Inspection** in Engine Mechanical.
- Refer to **Symptoms - Engine Mechanical** in Engine Mechanical for diagnosis procedures.

Additional Inspections

- Visually and physically inspect the vacuum hoses for splits, kinks, and proper connections and routing as shown on the Vehicle Emission Control Information label.
- Inspect the transmission torque converter clutch (TCC) operation. The scan tool should indicate an RPM drop when the system commands the TCC ON.
- Inspect the exhaust system for a possible restriction. Inspect for the following:
 - The exhaust system for damaged or collapsed pipes
 - The mufflers for heat distress or possible internal failure

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

- Possible plugged catalytic converter - Refer to **Restricted Exhaust** in Engine Exhaust.
- Inspect the brake system for dragging or improper operation. Refer to **Symptoms - Hydraulic Brakes** in Hydraulic Brakes. Verify that the vehicle operator does not drive with a foot on the brake pedal.

POOR FUEL FILL QUALITY

Poor Fuel Fill Quality

Problem	Causes
Definition: During the fueling process a continual, occasional or no fuel nozzle shut-off condition has occurred.	
Difficult to fill	● Fill limiter vent valve stuck closed ● Evaporative emission (EVAP) canister restricted ● EVAP vent valve stuck closed ● Restricted vapor lines ● High Reid vapor pressure or high fuel temperature ● Fuel filler hose is pinched or kinked ● Ignition switch ON, Vent Valve Closed
Over fill	● Pressure relief valve is stuck open or leaking ● Fill limiter vent valve stuck open or leaking
Premature shut-off of the fuel dispensing nozzle	● Fill limiter vent valve stuck closed ● EVAP canister restricted ● EVAP vent valve stuck closed ● Restricted vapor lines ● High Reid vapor pressure or high fuel temperature ● Ignition switch ON, EVAP vent valve closed
Fuel Spitback	● Restricted EVAP canister ● High Reid vapor pressure or high fuel temperature ● Ignition switch ON, EVAP vent valve closed

ROUGH, UNSTABLE, OR INCORRECT IDLE AND STALLING

Rough, Unstable, or Incorrect Idle and Stalling

Inspections	Action
DEFINITION: Engine runs unevenly at idle. If severe, the engine or vehicle may shake. Engine idle speed may vary in RPM. Either condition may be severe enough to	

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

stall the engine.

Preliminary Inspections

- Refer to Important Preliminary Inspections Before Starting in **Symptoms - Engine Controls**.
- Search for bulletins.
- Inspect the engine control module (ECM) grounds for being clean, tight, and in the proper locations. Refer to **Power and Grounding Component Views** in Wiring Systems.
- Remove and inspect the air filter element for dirt or for restrictions. Refer to **Air Cleaner Element Replacement** . Replace as necessary.

Fuel System

- Inspect the fuel injectors. Refer to **Fuel System Diagnosis**.
- Inspect for incorrect fuel pressure. Refer to **Fuel System Diagnosis**.
- Inspect for a restricted fuel filter. Refer to **Fuel System Diagnosis**.
- Inspect for a contaminated fuel condition. Refer to **Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)** or **Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)**.
- Inspect that each fuel injector harness is connected to the correct injector/cylinder. Relocate fuel injector harnesses as necessary.
- Inspect for the following that may cause the engine to run rich:

NOTE:

Refer to **Heated Oxygen and Oxygen Sensor Notice in Cautions and Notices**.

- Water intrusion in the heated oxygen sensor (HO2S) connector
- Engine oil contaminated by fuel
- An evaporative emission (EVAP) canister purge condition
- Incorrect fuel pressure - Refer to **Fuel System Diagnosis**.
- Leaking fuel injectors - Refer to **Fuel System Diagnosis**.

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

- Vacuum hoses that are split, kinked, or improperly connected
- An air intake duct that is collapsed or restricted
- An air filter that is dirty or restricted - Refer to **Air Cleaner Element Replacement** .
- Inspect for the following conditions that may cause the engine to run lean:

NOTE:

Refer to **Heated Oxygen and Oxygen Sensor Notice in Cautions and Notices.**

- Water intrusion in the HO2S connector
- An exhaust leak between the HO2S and the engine - Refer to **Exhaust Leakage** in Engine Exhaust.
- Vacuum leaks
- Incorrect fuel pressure - Refer to **Fuel System Diagnosis**.
- Restricted fuel injectors - Refer to **Fuel Injector Balance Test with Special Tool**.
- Fuel contamination - Refer to **Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool)** or **Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool)**.
- Vacuum hoses that are split, kinked, or improperly connected

Sensor/System

- Test for conditions which cause an incorrect idle speed.
 - Throttle body tampering, excessive deposits, or damage
 - Restricted air intake system
 - Large vacuum leak
- Inspect the throttle position (TP) sensor and related wiring. Refer to **DTC P0106** .
- Inspect the crankcase ventilation system for proper operation. Refer to **Crankcase Ventilation System Inspection/Diagnosis** in Engine Mechanical.

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	• Monitor the knock sensor (KS) system for excessive spark retard activity with a scan tool.
Ignition System	• In order to properly inspect the spark plugs or to correct a condition, refer to the following procedures: ◦ <u>Ignition System Specifications</u> ◦ <u>Spark Plug Inspection</u> ◦ <u>Spark Plug Replacement</u> • Remove spark plugs and inspect for the following: ◦ Correct heat range ◦ Wet plugs ◦ Cracks ◦ Wear ◦ Improper gap ◦ Burned electrodes ◦ Heavy deposits ◦ Verify that the spark plugs are of the correct type. • Inspect for proper ignition voltage output with the J 26792 (SA9199Z) Spark Tester. See <u>Special Tools</u> . • An improper spark plug gap will cause a driveability condition. Gap the spark plugs using a wire gage gap tool. • Determine the cause of the fouling before replacing the spark plugs. • Inspect for damaged or misaligned spark plug boots. • Inspect the electronic ignition (EI) module for proper ground connection. • Monitor the Misfire Current Counters while driving the vehicle in the conditions that the symptom occurred. If a misfiring cylinder can be located, use the DTC P0300 table for diagnosis. Refer to <u>DTC P0300</u> .
Engine Mechanical	• Inspect engine mechanical for the following: ◦ Compression ◦ Sticking or leaking valves ◦ Worn camshaft lobes ◦ Valve timing

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

- Worn rocker arms
- Broken valve springs
- Excessive oil in combustion chamber or leaking valve seals.

For more information, refer to one or more of the following procedures in Engine Mechanical:

- **Engine Compression Test**
- **Symptoms - Engine Mechanical**
- **Oil Consumption Diagnosis**
- For incorrect basic engine parts, inspect the following:
 - The camshaft - Refer to **Camshaft Cleaning and Inspection** in Engine Mechanical.
 - The cylinder heads - Refer to **Cylinder Head Cleaning and Inspection** in Engine Mechanical.
 - The pistons, etc. - Refer to **Piston, Connecting Rod, and Bearings Cleaning and Inspection** in Engine Mechanical.
- Refer to **Symptoms - Engine Mechanical** in Engine Mechanical for diagnosis procedures.
- Inspect for excessive crankshaft endplay that will cause the CKP sensor reluctor wheel to move out of alignment with the CKP sensor. Refer to **Crankshaft and Bearings Cleaning and Inspection** in Engine Mechanical-2.2L (L61). This could result in any of the following conditions:
 - A no start
 - A start and stall
 - Erratic performance

Additional Inspections

- Inspect the exhaust system for possible restrictions. Inspect for the following:
 - The exhaust system for damaged or collapsed pipes
 - The mufflers for heat distress or possible internal failure
 - Possible plugged catalytic converters - Refer to

Restricted Exhaust in Engine Exhaust.

- Electromagnetic interference (EMI) on the reference circuit can cause an engine miss condition. A scan tool can usually detect EMI by monitoring the engine RPM. A sudden increase in RPM with little change in actual engine RPM change indicates that EMI is present. If a condition exists, inspect routing of secondary ignition wires or high voltage components near the ignition control circuits.
- Inspect for faulty motor mounts. Refer to **Engine Mount Inspection** in Engine Mechanical.
- Inspect the intake manifold and the exhaust manifold passages for casting flash.

DIESELING, RUN-ON**Dieseling, Run-On**

Inspections	Action
DEFINITION: Engine continues to run after key is turned OFF, but runs very rough. If the engine runs smooth, inspect the ignition switch and the ignition switch adjustment.	
Preliminary Inspections	• Refer to Important Preliminary Inspections Before Starting in <u>Symptoms - Engine Controls</u>. • Search for bulletins. • Verify that the engine control module (ECM) grounds are clean, tight, and in the proper locations. Refer to <u>Power and Grounding Component Views</u> in Wiring Systems and <u>Engine Controls Schematics</u>.
Fuel System	Test the fuel injectors. Refer to <u>Fuel Injector Coil Test</u> .

BACKFIRE**Backfire**

Inspections	Actions
DEFINITION: Fuel ignites in the intake manifold or in the exhaust system, making a loud popping noise.	
Preliminary Inspections	• Refer to Important Preliminary Inspections Before Starting in <u>Symptoms - Engine Controls</u>. • Search for bulletins. • Inspect the engine control module (ECM) grounds for

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	being clean, tight, and in the proper locations. Refer to Power and Grounding Component Views in Wiring Systems and Engine Controls Schematics .
Fuel System	• Test for incorrect fuel pressure. Refer to Fuel System Diagnosis. • Inspect for a restricted fuel filter. Refer to Fuel System Diagnosis. • Inspect for a contaminated fuel condition. Refer to Alcohol/Contaminants-in-Fuel Diagnosis (without Special Tool) or Alcohol/Contaminants-in-Fuel Diagnosis (with Special Tool). • Test the fuel injectors. Refer to Fuel Injector Coil Test. • Verify that each injector harness is connected to the correct injector or cylinder. Relocate injector harnesses as necessary.
Sensor/System	• Inspect the air intake system and crankcase for air leaks. • Inspect the crankcase ventilation system for proper operation. Refer to Crankcase Ventilation System Inspection/Diagnosis in Engine Mechanical. • Use a scan tool in order to monitor the knock sensor (KS) system for excessive spark retard activity. Refer to Scan Tool Data List.
Ignition System	• In order to properly inspect the spark plugs or to correct a condition, refer to the following procedures: ○ Ignition System Specifications ○ Spark Plug Inspection ○ Spark Plug Replacement • Remove spark plugs and inspect for the following: ○ Correct heat range ○ Wet plugs ○ Cracks ○ Wear ○ Improper gap ○ Burned electrodes ○ Heavy deposits ○ Verify that the spark plugs are of the correct

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	type. • Inspect for proper ignition voltage output with J 26792 (SA9199Z) Spark Tester. See Special Tools. • An improper spark plug gap will cause a driveability condition. Gap the spark plugs using a wire gage gap tool. • Determine the cause of the fouling before replacing the spark plugs. • Inspect for damaged or misaligned spark plug boots. • Inspect the electronic ignition (EI) module for proper ground connection. • Monitor the Misfire Current Counters while driving the vehicle in the conditions that the symptom occurred. If a misfiring cylinder can be located, use the DTC P0300 table for diagnosis. Refer to DTC P0300.
Engine Cooling System	• Inspect the engine coolant level for being low. Refer to Loss of Coolant in Engine Cooling. • Inspect the engine thermostat for proper operation and for the correct heat range. Refer to Thermostat Diagnosis in Engine Cooling.
Engine Mechanical	• Refer to Symptoms - Engine Mechanical in Engine Mechanical for diagnosis procedures. • Inspect engine mechanical for the following: ○ Compression ○ Sticking or leaking valves ○ Worn camshaft lobes ○ Valve timing ○ Worn rocker arms ○ Broken valve springs ○ Excessive oil in combustion chamber or leaking valve seals. For more information, refer to one or more of the following procedures in Engine Mechanical: • Engine Compression Test • Symptoms - Engine Mechanical • Oil Consumption Diagnosis

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	• For incorrect basic engine parts. Inspect the following: ◦ The camshaft - Refer to <u>Camshaft Cleaning and Inspection</u> in Engine Mechanical. ◦ The cylinder heads - Refer to <u>Cylinder Head Cleaning and Inspection</u> in Engine Mechanical. ◦ The pistons, etc. - Refer to <u>Piston, Connecting Rod, and Bearings Cleaning and Inspection</u> in Engine Mechanical.
Additional Inspections	• Visually and physically inspect the vacuum hoses for splits, kinks, and proper connections and routing as shown on the Vehicle Emission Control Information label. • Inspect the intake manifold and the exhaust manifold passages for casting flash. • Inspect the exhaust system for possible restrictions. Inspect the following: ◦ Inspect the exhaust system for damaged or collapsed pipes. ◦ Inspect the mufflers for heat distress or possible internal failure. ◦ Inspect for possible plugged catalytic converter. Refer to <u>Restricted Exhaust</u> in Engine Exhaust. • Electromagnetic interference (EMI) circuit can cause an engine miss condition. A scan tool can usually detect EMI by monitoring the engine RPM. A sudden increase in RPM with little change in actual engine RPM change may indicate that EMI is present. If a problem exists, inspect for high voltage components near the ignition control circuits.

MALFUNCTION INDICATOR LAMP (MIL) INOPERATIVE

CIRCUIT DESCRIPTION

The malfunction indicator lamp (MIL) is located on the instrument panel cluster (IPC).

Ignition voltage is supplied to the MIL. The engine control module (ECM) turns the MIL ON by grounding the MIL control circuit. There should be a steady MIL with the ignition

ON and the engine OFF.

MIL Function

- The MIL informs the driver that a malfunction has occurred and the vehicle should be taken in for service as soon as possible.
- The MIL illuminates during a bulb test and a system test.
- A DTC will be stored if a MIL is requested by the ECM.

MIL Illumination

- The MIL will illuminate with the ignition switch ON and the engine OFF.
- The MIL will turn OFF when the engine is started.
- The MIL will remain ON if the self-diagnostic system has detected a malfunction.
- The MIL may turn OFF if the malfunction is not present.
- If the MIL is illuminated and then the engine stalls, the MIL will remain illuminated as long as the ignition switch is ON.
- If the MIL is not illuminated and the engine stalls, the MIL will not illuminate until the ignition switch is cycled OFF, then ON.

Test Description

The number below refers to the step number on the diagnostic table.

3: This step tests for a short to voltage on the MIL control circuit. With the fuse removed there should be no voltage on the MIL control circuit.

Malfunction Indicator Lamp (MIL) Inoperative

Step	Action	Values	Yes	No
Schematic Reference: <u>Engine Controls Schematics</u> Connector End View Reference: <u>Engine Control Module (ECM) Connector End Views</u> or <u>Engine Controls Connector End Views</u>				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to Diagnostic System Check - Vehicle
2	Command the malfunction indicator lamp (MIL) ON and OFF with a scan tool. Does the MIL turn ON and OFF when commanded with a scan tool?	-	Go to Testing for Intermittent Conditions and Poor Connections	Go to Step 3

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

3	1. Turn OFF the ignition. 2. Remove the fuse that supplies voltage to the instrument panel cluster (IPC). 3. Disconnect the engine control module (ECM). 4. Turn ON the ignition, with the engine OFF. 5. Measure the voltage from the MIL control circuit in the ECM harness connector to a good ground. Is the voltage less than the specified value?	0.3 V	Go to Step 4	Go to Step 8
4	1. Turn OFF the ignition. 2. Install the fuse that supplies voltage to the IPC. 3. Turn ON the ignition with the engine OFF. 4. Connect a 3-amp fused jumper wire between the MIL control circuit in the ECM harness connector and a good ground. Is the MIL illuminated?	-	Go to Step 7	Go to Step 5
5	Test the MIL control circuit for an open or high resistance. Refer to Circuit Testing and Wiring Repairs. Did you find and correct a condition?	-	Go to Step 11	Go to Step 6
6	Test for an intermittent and for a poor connection at the IPC. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs. Did you find and correct the condition?	-	Go to Step 11	Go to Step 9
	Test for an intermittent and for a poor connection at the ECM. Refer to Testing for Intermittent Conditions			

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

7	and Poor Connections and Connector Repairs . Did you find and correct the condition?	-	Go to Step 11	Go to Step 10
8	Repair the short to voltage in the MIL control circuit. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 11	-
9	Replace the IPC. Refer to Instrument Panel Cluster (IPC) Replacement . Did you complete the replacement?	-	Go to Step 11	-
10	Replace the ECM. Refer to Control Module References for replacement, setup, and programming. Did you complete the replacement?	-	Go to Step 11	-
11	1. Remove all test equipment. 2. Connect any disconnected components or any disconnected fuses. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine and operate the vehicle to verify the performance, and driveability. 5. Observe the MIL, the vehicle performance, and the driveability. Does the vehicle operate correctly, without MIL illumination and without stored DTCs?	-	System OK	Go to Diagnostic Trouble Code (DTC) List - Vehicle

MALFUNCTION INDICATOR LAMP (MIL) ALWAYS ON**CIRCUIT DESCRIPTION**

The malfunction indicator lamp (MIL) is located on the instrument panel cluster (IPC).

Ignition voltage is supplied directly to the MIL. The engine control module (ECM) turns the MIL ON by grounding the MIL control circuit.

MIL Function

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

- The MIL informs the driver that a malfunction has occurred and the vehicle should be taken in for service as soon as possible.
- The MIL illuminates during a bulb test and a system test.
- A DTC will be stored if a MIL is requested by the diagnostic.

MIL Illumination

- The MIL will illuminate with the ignition switch ON and the engine OFF.
- The MIL will turn OFF when the engine is started.
- The MIL will remain ON if the self-diagnostic system has detected a malfunction.
- The MIL may turn OFF if the malfunction is not present.
- If the MIL is illuminated and then the engine stalls, the MIL will remain illuminated as long as the ignition switch is ON.
- If the MIL is not illuminated and the engine stalls, the MIL will not illuminate until the ignition switch is cycled OFF, then ON.

Diagnostic Aids

If the problem is intermittent, refer to **Testing for Intermittent Conditions and Poor Connections** .

TEST DESCRIPTION

The number below refers to the step number on the diagnostic table.

2: This step determines if the condition is with the MIL control circuit or the ECM.

Malfunction Indicator Lamp (MIL) Always On

Step	Action	Yes	No
Schematic Reference: <u>Engine Controls Schematics</u> Connector End View Reference: <u>Engine Control Module (ECM) Connector End Views</u> or <u>Engine Controls Connector End Views</u>			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Turn OFF the ignition. 2. Disconnect the engine control module (ECM). 3. Turn ON the ignition, with the engine OFF. 4. Observe the malfunction indicator lamp		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	(MIL).		
	Is the MIL illuminated?	Go to Step 3	Go to Step 5
3	1. Remove the instrument panel cluster (IPC). Refer to Instrument Panel Cluster (IPC) Replacement . 2. Test the MIL control circuit for a short to ground. Refer to Circuit Testing and Wiring Repairs .		
	Did you find and correct the condition?	Go to Step 6	Go to Step 4
4	Replace the IPC. Refer to Instrument Panel Cluster (IPC) Replacement . Did you complete the replacement?	Go to Step 6	-
5	Replace the ECM. Refer to Control Module References for replacement, setup, and programming. Did you complete the replacement?	Go to Step 6	-
6	1. Turn the ignition OFF for 30 seconds. 2. Start the engine. Does the vehicle operate correctly without MIL illumination, and without stored DTCs?	System OK	Go to Diagnostic Trouble Code (DTC) List - Vehicle

ENGINE CRANKS BUT DOES NOT RUN

DESCRIPTION

The Engine Cranks but Does Not Run diagnostic table is an organized approach to identifying a condition that causes an engine not to start. The Engine Cranks but Does Not Run diagnostic table directs the service technician to the appropriate system diagnosis.

The Engine Cranks but Does Not Run diagnostic table assumes the following:

- The battery is completely charged. Refer to **Battery Inspection/Test** in Engine Electrical.
- The engine cranking speed is acceptable.
- There is adequate fuel in the fuel tank.

Engine Cranks but Does Not Run

Step	Action	Value(s)	Yes	No
	Did you perform the Diagnostic			Go to

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

1	System Check - Vehicle?	-	Go to Step 2	Diagnostic System Check - Vehicle in Vehicle DTC Information
2	1. Turn ON the ignition, with the engine OFF. 2. Observe the DTC Information with a scan tool. Does the scan tool display DTCs P0261, P0264, P0267, P0270, P0336, P0601, P0602, P1621, P1631, P0641, P2533?	-	Go to Diagnostic Trouble Code (DTC) List - Vehicle in Vehicle DTC Information	Go to Step 3
3	Does the scan tool display any body control module (BCM) vehicle theft deterrent (VTD) DTCs?	-	Go to Diagnostic Trouble Code (DTC) List - Vehicle in Vehicle DTC Information	Go to Step 4
4	Monitor the ignition 1 signal parameter with a scan tool. Is the ignition 1 signal parameter at the specified value?	B+	Go to Step 5	Go to Step 11
5	1. Attempt to start the engine. 2. Monitor the CMP resync counter parameter while the engine is cranking with a scan tool. Does the CMP resync counter increment while cranking the engine?	-	Go to Step 6	Go to Electronic Ignition (EI) System Diagnosis (Without Special Tool) or Electronic Ignition (EI) System Diagnosis (With Special Tool)
	Command the fuel pump relay ON			Go to Fuel

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

6	with a scan tool. Does the fuel pump operate?	-	Go to Step 7	Pump Electrical Circuit Diagnosis
7	1. Turn OFF the ignition. 2. Remove the fuel pump relay. 3. Remove the ignition coil housing. Refer to Ignition Coil Housing Replacement. IMPORTANT: Not grounding the ignition coil housing may cause erratic spark. 4. Install a jumper wire with clips on both ends from the top of the ignition coil housing to ground. 5. Install the J 36012-A (J 43883) Ignition Test Wires. See Special Tools. 6. Install a J 26792 (SA9199Z) Spark Tester on the #1 spark plug jumper wire. See Special Tools. 7. Connect the #4 (companion to #1) spark plug jumper wire to ground. 8. Crank the engine with the remaining spark plug jumper wires connected. 9. Repeat the above steps by installing the spark tester on the #4 jumper and grounding the #1 jumper. 10. Do the same for #2 and #3 spark plugs, ensuring the companion wire is grounded. Does the spark tester spark on all cylinders?	-	Go to Step 8	Go to Electronic Ignition (EI) System Diagnosis (Without Special Tool) or Electronic Ignition (EI) System Diagnosis (With Special Tool)
	1. Turn OFF the ignition. 2. Disconnect a fuel injector			

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

8	connector. 3. Install the J 34730-405 Injector Test Lamp (Noid Light) to the fuel injector connector. 4. Attempt to start the engine. Does the test lamp blink while the engine is cranking?	-	Go to Step 9	Go to Fuel Injector Circuit Diagnosis
9	1. Turn OFF the ignition. 2. Install a SA9127E Gage Bar Set. Refer to Fuel Pressure Gage Installation and Removal. 3. Turn ON the ignition, with the engine OFF. 4. Command the fuel pump relay ON with a scan tool. Is the fuel pressure within the specified range while the fuel pump is operating?	345-414 kPa (50-60 psi)	Go to Step 10	Go to Fuel System Diagnosis
10	Inspect for the following conditions: • A collapsed air intake duct • A restricted air filter element - Refer to Air Cleaner Element Replacement. • The spark plugs for being gas or coolant fouled - Refer to Spark Plug Inspection. If the spark plugs are fouled, determine what caused the condition. • Any engine mechanical conditions, worn timing chain and gears, or low compression - Refer to Symptoms - Engine Mechanical and Engine Compression Test in Engine Mechanical. • A restricted exhaust system - Refer to Restricted Exhaust in Engine Exhaust.	-		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	• An inaccurate engine coolant temperature (ECT) sensor - Refer to <u>Temperature vs Resistance</u> . • An inaccurate manifold absolute pressure (MAP) sensor or throttle position (TP) sensor - Refer to <u>Altitude vs Barometric Pressure</u> .			
	Did you complete the action?		Go to Step 14	-
11	1. Test the ignition 1 voltage circuits that are supplied by the ECM fuse for an open or for a short to ground. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> in Wiring Systems. 2. Replace the fuse, if necessary.	-		
	Did you find and correct the condition?		Go to Step 14	Go to Step 12
12	Inspect for poor connections at the harness connector of the engine control module (ECM). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> in Wiring Systems.	-		
	Did you find and correct the condition?		Go to Step 14	Go to Step 13
13	Replace the ECM. Refer to <u>Control Module References</u> in Computer/Integrating Systems for replacement, setup, and programming.	-		
	Did you complete the replacement?		Go to Step 14	-
14	1. Clear the DTCs with a scan tool. 2. Turn OFF the ignition for 30 seconds. 3. Attempt to start the engine.	-		
	Does the engine start then continue to run?		Go to Step 15	Go to Step 2

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

15	1. Allow the engine to reach operating temperature. 2. Observe the DTC information with a scan tool. Are there any DTCs that have not been diagnosed?	-	Go to Diagnostic Trouble Code (DTC) List - Vehicle in Vehicle DTC Information	System OK
----	--	---	---	-----------

FUEL PUMP ELECTRICAL CIRCUIT DIAGNOSIS**CIRCUIT DESCRIPTION**

The control module enables the fuel pump relay when the ignition switch is turned ON. The control module will disable the fuel pump relay within 2 seconds unless the control module detects ignition reference pulses. The control module continues to enable the fuel pump relay as long as ignition reference pulses are detected. The control module disables the fuel pump relay within 2 seconds if ignition reference pulses cease to be detected and the ignition remains ON.

Fuel Pump Electrical Circuit Diagnosis

Step	Action	Yes	No
Schematic Reference: Engine Controls Schematics Connector End View Reference: Engine Controls Connector End Views or Engine Control Module (ECM) Connector End Views			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to Diagnostic System Check - Vehicle
2	1. Turn ON the ignition, with the engine OFF. 2. Command the fuel pump relay ON and OFF with a scan tool. 3. Repeat the commands as necessary. Does the fuel pump turn ON and OFF?	Go to Testing for Intermittent Conditions and Poor Connections	Go to Step 3
3	Command the fuel pump relay ON and OFF with a scan tool. Do you hear the fuel pump relay click when you command the fuel pump relay ON and OFF?	Go to Step 9	Go to Step 4
	1. Turn OFF the ignition.		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

4	2. Remove the fuel pump relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the control circuit of the fuel pump relay with a test lamp that is connected to a good ground. Refer to <u>Probing Electrical Connectors</u>. 5. Command the fuel pump relay ON and OFF with a scan tool. Does the test lamp turn ON and OFF?	Go to Step 5	Go to Step 6
5	1. Connect a test lamp between the control circuit of the fuel pump relay and the ground circuit of the fuel pump relay. 2. Command the fuel pump relay ON and OFF with a scan tool. Does the test lamp turn ON and OFF?	Go to Step 21	Go to Step 24
6	Does the test lamp remain illuminated with each command?	Go to Step 7	Go to Step 8
7	Test the control circuit of the fuel pump relay for a short to voltage. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u>. Did you find and correct the condition?	Go to Step 29	Go to Step 28
8	Test the control circuit of the fuel pump relay for the following conditions: • A short to ground • An open • High resistance Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u>. Did you find and correct the condition?	Go to Step 29	Go to Step 22
9	Turn ON the ignition, with the engine OFF. Does the fuel pump operate continuously?	Go to Step 10	Go to Step 11
10	1. Turn OFF the ignition. 2. Remove the fuel pump relay. 3. Turn ON the ignition, with the engine OFF.		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Does the fuel pump operate continuously?	Go to Step 23	Go to Step 27
11	Inspect the fuel pump fuse. Is the fuel pump fuse open?	Go to Step 12	Go to Step 15
12	1. Disconnect the fuel pump module harness from the body pass-through connector. 2. Test the supply voltage circuit of the fuel pump for a short to ground between the fuel pump relay and the body pass-through connector. Refer to Circuit Testing and Wiring Repairs. 3. Replace the fuel pump fuse, if necessary.		
	Did you find and correct the condition?	Go to Step 29	Go to Step 13
13	1. Lower the fuel tank. Refer to Fuel Tank Replacement. 2. Inspect the fuel pump module harness on top of the fuel tank for the following conditions: • Any damage to the harness • A short to ground in the supply voltage circuit of the fuel pump - Refer to Circuit Testing and Wiring Repairs. 3. Replace the fuel pump fuse, if necessary.		
	Did you find and correct the condition?	Go to Step 29	Go to Step 14
14	1. Connect all disconnected electrical components. 2. Install a new fuel pump fuse. 3. Command the fuel pump relay ON with a scan tool. 4. Inspect the fuel pump fuse.		Go to Testing for Intermittent Conditions and Poor Connections
	Is the fuel pump fuse open?	Go to Step 26	
	1. Turn OFF the ignition. 2. Remove the fuel pump relay.		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

15	3. Turn ON the ignition, with the engine OFF. 4. Probe the battery voltage circuit of the fuel pump relay, switch side, with a test lamp that is connected to a good ground. Refer to <u>Probing Electrical Connectors</u> . Does the test lamp illuminate?	Go to Step 16	Go to Step 25
16	Connect a 15-amp fused jumper wire between the battery voltage circuit of the fuel pump relay and the supply voltage circuit of the fuel pump. Does the fuel pump operate?	Go to Step 21	Go to Step 17
17	1. Disconnect the fuel pump module harness from the body pass-through connector. 2. Test the supply voltage circuit of the fuel pump for an open or high resistance between the fuel pump relay and the body pass-through connector. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> . Did you find and correct the condition?	Go to Step 29	Go to Step 18
18	IMPORTANT: Inspect the ground circuit for proper torque, corrosion on the terminals, or damage to the wiring harness. Test the ground circuit of the fuel pump for an open or high resistance between the body pass-through connector and ground. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .Did you find and correct the condition?	Go to Step 29	Go to Step 19
19	Test for an intermittent and for a poor connection at the fuel pump module harness to the body pass-through connector. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> . Did you find and correct the condition?	Go to Step 29	Go to Step 20
	1. Lower the fuel tank. Refer to <u>Fuel Tank Replacement</u> .		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

20	2. Inspect the fuel pump module harness on top of the fuel tank for the following conditions: • A damaged harness • An open circuit - Refer to Circuit Testing and Wiring Repairs . Did you find and correct the condition?	Go to Step 29	Go to Step 26
21	Test for an intermittent and for a poor connection at the fuel pump relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	Go to Step 29	Go to Step 27
22	Test for an intermittent and for a poor connection at the engine control module (ECM). Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	Go to Step 29	Go to Step 28
23	Repair the short to voltage in the supply voltage circuit of the fuel pump. Refer to Wiring Repairs . Did you complete the repair?	Go to Step 29	-
24	Repair the open or high resistance in the ground circuit of the fuel pump relay. Refer to Wiring Repairs . Did you complete the repair?	Go to Step 29	-
25	Repair the open in the battery voltage circuit of the fuel pump relay. Refer to Wiring Repairs . Did you complete the repair?	Go to Step 29	-
26	IMPORTANT: Inspect for poor connections at the fuel pump, within the fuel tank, before replacing the fuel pump. 1. Replace the fuel pump module. Refer to Fuel Pump Module Replacement . 2. Replace the fuel pump fuse if necessary. Did you complete the replacement?	Go to Step 29	-
	Replace the fuel pump relay.		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

27	Did you complete the replacement?	Go to Step 29	-
28	Replace the ECM. Refer to Control Module References for replacement, setup, and programming.		
	Did you complete the replacement?	Go to Step 29	-
29	Operate the system in order to verify the repair.		
	Did you correct the condition?	System OK	Go to Step 2

FUEL SYSTEM DIAGNOSIS

SYSTEM DESCRIPTION

The control module enables the fuel pump relay when the ignition switch is turned ON. The control module will disable the fuel pump relay within 2 seconds unless the control module detects ignition reference pulses. The control module continues to enable the fuel pump relay as long as ignition reference pulses are detected. The control module disables the fuel pump relay within 2 seconds if ignition reference pulses cease to be detected and the ignition remains ON.

The fuel system is a returnless on-demand design. The fuel pressure regulator is a part of the fuel pump module, eliminating the need for a return pipe from the engine. A returnless fuel system reduces the internal temperature of the fuel tank by not returning hot fuel from the engine to the fuel tank. Reducing the internal temperature of the fuel tank results in lower evaporative emissions.

The fuel tank stores the fuel supply. An electric turbine style fuel pump attaches to the fuel pump module inside the fuel tank. The fuel pump supplies high pressure fuel through the fuel feed pipe to the fuel injection system. The fuel pump provides fuel at a higher rate of flow than is needed by the fuel injection system. The fuel pump also supplies fuel to a venturi pump located on the bottom of the fuel pump module. The function of the venturi pump is to fill the fuel pump module reservoir. The fuel pressure regulator, a part of the fuel pump module maintains the correct fuel pressure to the fuel injection system. The fuel pump module contains a reverse flow check valve. The check valve and the fuel pressure regulator maintain fuel pressure in the fuel feed pipe and the fuel rail in order to prevent long cranking times.

Fuel System Diagnosis

Step	Action	Values	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to Diagnostic System Check - Vehicle

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

2	IMPORTANT: Inspect the fuel system for damage or external leaks before proceeding with this diagnostic. 1. Turn ON the ignition, with the engine OFF. 2. Command the fuel pump relay ON with a scan tool. Does the fuel pump operate?	-	Go to Step 3	Go to Fuel Pump Electrical Circuit Diagnosis
3	IMPORTANT: Verify that adequate fuel is in the fuel tank before proceeding with this diagnostic. 1. Turn OFF the ignition. 2. Turn OFF all accessories. 3. Install a fuel pressure gage. Refer to Fuel Pressure Gage Installation and Removal. 4. Turn ON the ignition, with the engine OFF. IMPORTANT: • The fuel pump relay may need to be commanded ON a few times in order to obtain the highest possible fuel pressure. • DO NOT start the engine. 5. Command the fuel pump relay ON with a scan tool. 6. Observe the fuel pressure gage with the fuel pump commanded ON. Is the fuel pressure within the specified range?	345-414 kPa (50-60 psi)	Go to Step 4	Go to Step 8
4	IMPORTANT: The fuel pressure may vary slightly when the fuel pump stops operating. After the fuel pump stops operating, the fuel pressure should stabilize and remain constant.	34 kPa (5 psi)		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Monitor the fuel pressure gage for 1 minute. Does the fuel pressure decrease by more than the specified value?		Go to Step 7	Go to Step 5
5	1. Relieve the fuel pressure to the first specified value. 2. Monitor the fuel pressure gage for 5 minutes. Does the fuel pressure decrease by more than the second specified value?	69 kPa (10 psi) 14 kPa (2 psi)	Go to Step 12	Go to Step 6
6	1. Operate the vehicle within the conditions to reproduce the original symptoms. 2. Monitor the O2 and the Fuel Trim parameters with a scan tool. Does the scan tool parameters indicate a lean condition?	-	Go to Step 9	Go to Symptoms - Engine Controls
7	1. Turn OFF the ignition. 2. Relieve the fuel pressure. Refer to Fuel Pressure Relief Procedure. 3. Disconnect the chassis fuel hose from the fuel rail. Refer to Quick Connect Fitting(s) Service (Metal Collar). 4. Install the J 37287 Fuel Line Shut-Off Adapter between the chassis fuel hose and the fuel rail. See Special Tools. 5. Open the valve on the fuel pipe shut-off adapter. 6. Turn ON the ignition, with the engine OFF. 7. Command the fuel pump relay ON with a scan tool. 8. Bleed the air from the fuel pressure gage. 9. Command the fuel pump relay ON and then OFF with a scan tool.	-		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	10. Close the fuel feed pipe shut-off valve. 11. Monitor the fuel pressure gage for one minute. Does the fuel pressure remain constant?		Go to Step 12	Go to Step 11
8	Is the fuel pressure more than the specified value?	414 kPa (60 psi)	Go to Step 12	Go to Step 9
9	Inspect the fuel feed pipe for a restriction. Did you find and correct the condition?	-	Go to Step 13	Go to Step 10
10	Inspect the harness connectors and the ground circuits of the fuel pump for poor connections. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	-	Go to Step 13	Go to Step 12
11	1. Turn OFF the ignition. 2. Raise the fuel rail, with the fuel line connected. Refer to Fuel Rail Assembly Replacement . 3. Turn ON the ignition, with the engine OFF. 4. Command the fuel pump relay ON with a scan tool. 5. Locate and replace the leaking fuel injector. Refer to Fuel Injector Replacement . Did you complete the replacement?	-	Go to Step 13	-
12	Replace the fuel pump module. Refer to Fuel Pump Module Replacement . Did you complete the replacement?	-	Go to Step 13	-
13	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 3

FUEL INJECTOR COIL TEST

CIRCUIT DESCRIPTION

The control module enables the appropriate fuel injector pulse for each cylinder. Ignition

voltage is supplied directly to the fuel injectors. The control module controls each fuel injector by grounding the control circuit via a solid state device called a driver. A fuel injector coil winding resistance that is too high or too low will affect engine driveability. A fuel injector control circuit DTC may not set, but a misfire may be apparent. The fuel injector coil windings are affected by temperature. The resistance of the fuel injector coil windings will increase as the temperature of the fuel injector increases.

DIAGNOSTIC AIDS

- Monitoring the misfire current counters, or misfire graph, may help to isolate the fuel injector that is causing the condition.
- Operating the vehicle over a wide temperature range may help isolate the fuel injector that is causing the condition.
- Perform the fuel injector coil test within the conditions of the customer's concern. A fuel injector condition may only be apparent at a certain temperature, or under certain conditions.

Fuel Injector Coil Test

Step	Action	Values	Yes	No
Schematic Reference: Engine Controls Schematics Connector End View Reference: Engine Control Module (ECM) Connector End Views or Engine Controls Connector End Views				
1	Did you perform the Diagnostic System Check-Vehicle?	-	Go to Step 2	Go to Diagnostic System Check - Vehicle
2	Observe the ECT Sensor parameter with a scan tool. Is the ECT Sensor parameter within the specified range?	10-32°C (50-90°F)	Go to Step 3	Go to Step 4
3	1. Remove the air cleaner assembly. Refer to Air Cleaner Assembly Replacement . 2. Measure the resistance of each fuel injector with a DMM. Refer to Testing for Continuity . Is the resistance within the specified range for each injector?	11-14 ohm	Go to Fuel Injector Balance Test with Special Tool or Fuel Injector Balance Test with Tech 2	Go to Step 6
	1. Remove the air cleaner assembly. Refer to Air Cleaner Assembly			

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

4	<u>Replacement</u> . - Measure the resistance of each fuel injector with a DMM. Refer to <u>Air Cleaner Assembly Replacement</u> . - Record each fuel injector resistance value. - Subtract the lowest resistance value from the highest resistance value. Is the difference equal to, or less than, the specified value?	3 ohm	Go to <u>Fuel Injector Balance Test with Special Tool</u> or <u>Fuel Injector Balance Test with Tech 2</u>	Go to Step 5
5	- Add all of the fuel injector resistance values to obtain a total resistance value. - Divide the total resistance value by the number of fuel injectors to obtain an average resistance value. - Subtract the lowest individual fuel injector resistance value from the average resistance value. - Compute the difference between the highest individual fuel injector resistance value and the average resistance value. - Replace the fuel injector that displays the greatest resistance difference above or below the average. Refer to <u>Fuel Injector Replacement</u> . Did you complete the replacement?	-	Go to Step 7	-
6	Replace the fuel injector or fuel injectors with resistance that is out of the specified range. Refer to <u>Fuel Injector Replacement</u> . Did you complete the replacement?	11-14 ohm	Go to Step 7	-
7	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 2

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

FUEL INJECTOR BALANCE TEST WITH SPECIAL TOOL

SYSTEM DESCRIPTION

The scan tool is first used to energize the fuel pump relay. The fuel injector tester is then used to pulse each injector for a precise amount of time, allowing a measured amount of fuel into the manifold. This causes a drop in system fuel pressure that can be recorded and used to compare each injector.

Fuel Injector Balance Test Example (Actual Results May Vary)

Cylinder	1	2	3	4
1st Reading	379 kPa (55 psi)	379 kPa (55 psi)	379 kPa (55 psi)	379 kPa (55 psi)
2nd Reading	280 kPa (41 psi)	310 kPa (45 psi)	340 kPa (49 psi)	317 kPa (46 psi)
Amount of Drop	99 kPa (14 psi)	69 kPa (10 psi)	39 kPa (6 psi)	62 kPa (9 psi)
Average Range: 47-87 kPa (6.8- 12.6 psi)	Replace fuel injector - too much fuel pressure drop	Injector OK	Replace fuel injector - too little fuel pressure drop	Injector OK

Test Description

The number below refers to the step number on the diagnostic table.

3: The engine coolant temperature (ECT) must be below the operating temperature in order to avoid irregular fuel pressure readings due to hot soak fuel boiling.

Fuel Injector Balance Test with Special Tool

Step	Action	Values	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	Did you perform the Fuel Injector Coil Test?	-	Go to Step 3	Go to <u>Fuel Injector Coil Test</u>
3	IMPORTANT: DO NOT perform this test if the engine coolant temperature (ECT) is above 94°C (201°F). Observe the ECT Sensor parameter with a scan tool. Is the ECT Sensor parameter less than the specified	94°C (201°F)		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	value?		Go to Step 4	-
4	IMPORTANT: Verify that adequate fuel is in the fuel tank before proceeding with this diagnostic. - Turn OFF the ignition. - Turn OFF all accessories. - Install the fuel pressure gage. Refer to <u>Fuel Pressure Gage Installation and Removal</u>. - Turn ON the ignition, with the engine OFF. IMPORTANT: - The fuel pump relay may need to be commanded ON a few times, in order to obtain the highest possible fuel pressure. - DO NOT start the engine. - Command the fuel pump relay ON with a scan tool. - Observe the fuel pressure gage with the fuel pump operating. Is the fuel pressure within the specified range?	345-414 kPa (50-60 psi)	Go to Step 5	Go to Fuel System Diagnosis
5	IMPORTANT: The fuel pressure may vary slightly when the fuel pump stops operating. After the fuel pump stops operating, the fuel pressure should stabilize and remain constant. Monitor the fuel pressure gage for one minute. Does the fuel pressure decrease by more than the specified value?	34 kPa (5 psi)	Go to Fuel System Diagnosis	Go to Step 6
	NOTE: Do Not repeat any portion of this test before running the engine in order to prevent the engine from flooding. Remove the air cleaner assembly. Refer to <u>Air Cleaner Assembly Replacement</u>.			

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

2. Connect the **J 39021** Fuel Injector Tester to a fuel injector with a **J 44602** Injector Tester Adapter. See **Special Tools**.
3. Set the amperage supply selector switch on the fuel injector tester to the Balance Test 0.5-2.5 amp position.
4. Command the fuel pump relay ON and then OFF with a scan tool.
5. Record the fuel pressure indicated by the fuel pressure gage after the fuel pressure stabilizes. This is the first pressure reading.

IMPORTANT:

The fuel pressure may rise after the fuel injector stops pulsing. Record the fuel pressure value immediately after the fuel injector stops pulsing. DO NOT record the higher fuel pressure value.

20 kPa (3
psi)

6. Energize the fuel injector by depressing the Push to Start Test button on the fuel injector tester.
7. Record the fuel pressure indicated by the fuel pressure gage after the fuel injector has stopped pulsing. This is the second pressure reading.
8. Repeat steps 2-7 for each fuel injector.
9. Subtract the second pressure reading from the first pressure reading for one fuel injector. The result is the pressure drop value.
10. Obtain a pressure drop value for each fuel injector.
11. Add all of the individual pressure drop values. This is the total

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	pressure drop. 12. Divide the total pressure drop by the number of fuel injectors. This is the average pressure drop. Is the difference between any individual pressure drop and the average pressure drop more than the specified value?			Go to Symptoms - Engine Controls
7	Replace the affected fuel injectors. Refer to Fuel Injector Replacement . Did you complete the replacement?	-	Go to Step 8	-
8	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Symptoms - Engine Controls

FUEL INJECTOR BALANCE TEST WITH TECH 2

SYSTEM DESCRIPTION

The scan tool is first used to energize the fuel pump relay. The scan tool is then used to pulse each injector for a precise amount of time allowing a measured amount of fuel into the manifold. This causes a drop in system fuel pressure that can be recorded and used to compare each injector.

Fuel Injector Balance Test Example (Actual Results May Vary)

Cylinder	1	2	3	4
1st Reading	379 kPa (55 psi)	379 kPa (55 psi)	379 kPa (55 psi)	379 kPa (55 psi)
2nd Reading	280 kPa (41 psi)	310 kPa (45 psi)	340 kPa (49 psi)	317 kPa (46 psi)
Amount of Drop	99 kPa (14 psi)	69 kPa (10 psi)	39 kPa (6 psi)	62 kPa (9 psi)
Average Range: 47-87 kPa (6.8-12.6 psi)	Replace fuel injector - too much fuel pressure drop	Injector OK	Replace fuel injector - too little fuel pressure drop	Injector OK

Test Description

The number below refers to the step number on the diagnostic table.

3: The engine coolant temperature (ECT) must be below the operating temperature in order to avoid irregular fuel pressure readings due to hot soak fuel boiling.

Fuel Injector Balance Test with Tech 2

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

Step	Action	Values	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u> in Vehicle DTC Information
2	Did you perform the Fuel Injector Coil Test?	-	Go to Step 3	Go to <u>Fuel Injector Coil Test</u>
3	IMPORTANT: DO NOT perform this test if the engine coolant temperature (ECT) is above 94°C (201°F). Observe the ECT Sensor parameter with a scan tool. Is the ECT Sensor parameter less than the specified value?	94°C (201°F)	Go to Step 4	-
4	IMPORTANT: Verify that adequate fuel is in the fuel tank before proceeding with this diagnostic. - Turn OFF the ignition. - Turn OFF all accessories. - Install the fuel pressure gage. Refer to <u>Fuel Pressure Gage Installation and Removal</u>. - Turn ON the ignition, with the engine OFF. IMPORTANT: - The fuel pump relay may need to be commanded ON a few times in order to obtain the highest possible fuel pressure. - DO NOT start the engine. - Command the fuel pump relay ON with a scan tool. - Observe the fuel pressure gage, with the fuel pump operating.	345-414 kPa (50-60 psi)		Go to Fuel

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Is the fuel pressure within the specified value?		Go to Step 5	System Diagnosis
5	IMPORTANT: The fuel pressure may vary slightly when the fuel pump stops operating. After the fuel pump stops operating, the fuel pressure should stabilize and remain constant. Monitor the fuel pressure gage for one minute. Does the fuel pressure decrease by more than the specified value?	34 kPa (5 psi)	Go to Fuel System Diagnosis	Go to Step 6
6	NOTE: Do Not repeat any portion of this test before running the engine in order to prevent the engine from flooding. - With a scan tool, select the Fuel Injector Balance Test function, within the Special Functions menu. - Select an injector to be tested. - Press Enter. This will prime the fuel system. - Record the fuel pressure indicated by the fuel pressure gage after the fuel pressure stabilizes. This is the 1st pressure reading. IMPORTANT: Record the fuel pressure value immediately after the fuel injector stops pulsing. The fuel pressure may rise after the fuel injector stops pulsing. DO NOT record the higher fuel pressure value. - Energize the fuel injector by depressing the Pulse Injector button on the scan tool. This will energize the injector and decrease the fuel pressure. - Record the fuel pressure indicated by the fuel pressure gage after the fuel injector has	20 kPa (3 psi)		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	stopped pulsing. This is the 2nd pressure reading. - Press Enter again to bring you back to the Select Injector screen. - Repeat for each fuel injector. - Subtract the 2nd pressure reading from the 1st pressure reading for one fuel injector. The result is the pressure drop value. - Obtain a pressure drop value for each fuel injector. - Add all of the individual pressure drop values. This is the total pressure drop. - Divide the total pressure drop by the number of fuel injectors. This is the average pressure drop. Is the difference between any individual pressure drop and the average pressure drop more than the specified value?			
			Go to Step 7	Go to Symptoms - Engine Controls
7	Replace the affected fuel injectors. Refer to Fuel Injector Replacement . Did you complete the replacement?	-	Go to Step 8	-
8	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Symptoms - Engine Controls

FUEL INJECTOR CIRCUIT DIAGNOSIS

CIRCUIT DESCRIPTION

The control module enables the appropriate fuel injector pulse for each cylinder. Ignition voltage is supplied to the fuel injectors. The control module controls each fuel injector by grounding the control circuit via a solid state device called a driver.

DIAGNOSTIC AIDS

- Performing the Fuel Injector Coil Test may help isolate an intermittent condition. Refer to **Fuel Injector Coil Test**.
- For an intermittent condition, refer to **Testing for Intermittent Conditions and Poor**

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

Connections .

Fuel Injector Circuit Diagnosis

Step	Action	Values	Yes	No
Schematic Reference: Engine Controls Schematics Connector End View Reference: Engine Control Module (ECM) Connector End Views or Engine Controls Connector End Views				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	Is DTC P0201, P0202, P0203, or P0204 set?	-	Go to <u>DTC P0201-P0204</u>	Go to Step 3
3	1. Turn OFF the ignition. 2. Remove the air cleaner assembly. Refer to <u>Air Cleaner Assembly Replacement</u> . 3. Disconnect the harness connector of a fuel injector. 4. Turn ON the ignition, with the engine OFF. 5. Probe the ignition 1 voltage circuit of a fuel injector, fuse side, with a test lamp that is connected to a good ground. Refer to <u>Probing Electrical Connectors</u> . Does the test lamp illuminate?	-	Go to Step 4	Go to Step 10
4	1. Remove the fuse. 2. Measure the resistance from the fuse to the ignition 1 voltage circuit terminal of a fuel injector with a DMM. Refer to <u>Circuit Testing</u> . Is the resistance more than the specified value?	5 ohm	Go to Step 11	Go to Step 5
	1. Connect the J 44603 Injector Test			

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

5	Lamp into each injector connector one at a time. See Special Tools . 2. Crank the engine. Does the test lamp flash for each injector?	-	Go to Fuel Injector Coil Test	Go to Step 6
6	Does the test lamp remain illuminated at all times for any injector circuit?	-	Go to Step 8	Go to Step 7
7	Test the control circuits of the fuel injectors for an open and for a short to voltage. Refer to Circuit Testing and Wiring Repairs . Did you find and correct the condition?	-	Go to Step 13	Go to Step 9
8	Test the control circuits of the fuel injectors for a short to ground. Refer to Circuit Testing and Wiring Repairs . Did you find and correct the condition?	-	Go to Step 13	Go to Step 12
9	Test for an intermittent and for a poor connection at the engine control module (ECM). Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	-	Go to Step 13	Go to Step 12
10	Repair the open in the ignition 1 voltage circuit of the fuel injectors. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 13	-
11	Repair the high resistance in the ignition 1 voltage circuit of the fuel injectors. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 13	-
12	Replace the ECM. Refer to Control Module References for replacement, setup, and programming. Did you complete the replacement?	-	Go to Step 13	-
13	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 2

FUEL TANK LEAK TEST

DESCRIPTION

The fuel tank leak test is used to locate any fuel or fuel vapor escaping the fuel tank area. Fuel vapors escaping above the fuel level will be detected, if more than the calibrated amount, when the evaporative emission (EVAP) diagnostics complete one test cycle. The malfunction indicator lamp (MIL) will illuminate after the EVAP diagnostics have failed 2 test cycles.

DIAGNOSTIC AIDS

- Operate the vehicle under the condition of the customer concern. Under high temperature conditions fuel vapors may increase to the point of EVAP canister vapor saturation. Fuel vapors would then be released into the atmosphere. Once the engine is running and the EVAP purge is enabled, all fuel vapor release would be eliminated.
- Movement of the EVAP pipes or the fuel pipes may help find an intermittent condition.
- If the fuel level is low, a liquid fuel leak may not be evident.

TEST DESCRIPTION

The numbers below refer to the step numbers on the diagnostic table.

4: This step tests for fuel leaks below the fuel tank fuel level.

5: This step tests for fuel vapors escaping above the fuel level in the fuel tank.

Fuel Tank Leak Test

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to Diagnostic System Check - Vehicle
2	CAUTION: Gasoline or gasoline vapors are highly flammable. A fire could occur if an ignition source is present. Never drain or store gasoline or diesel fuel in an open container, due to the possibility of fire or explosion. Have a dry chemical (Class B) fire extinguisher nearby. 1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle. 2. Inspect the fuel tank and the fuel pipes for damage or external leaks. Did you find fuel leaking from the fuel tank?	Go to Step 6	Go to Step 3
	1. Turn ON the ignition, with the engine OFF.		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

3	2. Command the fuel pump relay ON with a scan tool. 3. Inspect for fuel leaking from the fuel pipes. Did fuel leak from the fuel pipes?	Go to Step 7	Go to Step 4
4	1. Turn OFF the ignition. 2. Install the J 41413-200 (J 41413-100) Evaporative Emission System Tester (EEST) and the GE-41415-50 Fuel Tank Cap Adapter. See Special Tools . 3. Test for a fuel tank leak referring to the J 41413-210 Operation Manual. IMPORTANT: If the floating indicator registers any flow after stabilizing, a leak is evident. 4. Raise the vehicle. Refer to Lifting and Jacking the Vehicle . 5. Inspect for a fuel leak while the system is under pressure. Did fuel leak from the fuel tank?	Go to Step 6	Go to Step 5
5	1. Using the J 41413-200 (J 41413-100) and the J 41413-210 Operation Manual, introduce smoke into the evaporative emission (EVAP) system. See Special Tools . IMPORTANT: It may be necessary to partially lower the fuel tank. Refer to Fuel Tank Replacement . 2. Inspect for leaks in any of the following locations: • The fuel tank, the fill limiter vent valve, the pressure relief valve, and the grade vent valves - Refer to Fuel Tank Replacement . • The fuel pump module housing, the fuel pump module seal, the		

	fuel pipe, and the EVAP pipes - Refer to Fuel Pump Module Replacement . • The fuel tank pressure (FTP) sensor seal - Refer to Fuel Tank Pressure Sensor Replacement . • The fuel fill pipe and hose - Refer to Fuel Tank Filler Pipe Replacement .		
	Did you find and correct the condition?	Go to Step 8	Go to Diagnostic Aids
6	Replace the fuel tank. Refer to Fuel Tank Replacement . Did you complete the replacement?	Go to Step 8	-
7	Replace the leaking fuel pipe. Refer to Fuel Hose/Pipes Replacement - Chassis or Fuel Feed Intermediate Pipe Replacement . Did you complete the replacement?	Go to Step 8	-
8	Operate the system under the condition of the customer concern in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

ALCOHOL/CONTAMINANTS-IN-FUEL DIAGNOSIS (WITHOUT SPECIAL TOOL)

TEST DESCRIPTION

Water contamination in the fuel system may cause driveability conditions such as hesitation, stalling, no start, or misfires in one or more cylinders. Water may collect near a single fuel injector at the lowest point in the fuel injection system and cause a misfire in that cylinder. If the fuel system is contaminated with water, inspect the fuel system components for rust or deterioration.

Ethanol concentrations of greater than 10 percent can cause driveability conditions and fuel system deterioration. Fuel with more than 10 percent ethanol could result in driveability conditions such as hesitation, lack of power, stalling, or no start. Excessive concentrations of ethanol used in vehicles not designed for it may cause fuel system corrosion, deterioration of rubber components, and fuel filter restriction.

ALCOHOL IN FUEL TESTING PROCEDURE

The fuel sample should be drawn from the bottom of the tank so that any water present in the tank will be detected. The sample should be bright and clear. If alcohol contamination is

suspected then use the following procedure to test the fuel quality.

1. Using a 100 ml (3.38 oz) specified cylinder with 1 ml (0.034 oz) graduation marks, fill the cylinder with fuel to the 90 ml (3.04 oz) mark.
2. Add 10 ml (0.34 oz) of water in order to bring the total fluid volume to 100 ml (3.38 oz) and install a stopper.
3. Shake the cylinder vigorously for 10-15 seconds.
4. Carefully loosen the stopper in order to release the pressure.
5. Re-install the stopper and shake the cylinder vigorously again for 10-15 seconds.
6. Put the cylinder on a level surface for approximately 5 minutes in order to allow adequate liquid separation.

If alcohol is present in the fuel, the volume of the lower layer, which would now contain both alcohol and water, will be more than 10 ml (0.34 oz). For example, if the volume of the lower layer is increased to 15 ml (0.51 oz), this indicates at least 5 percent alcohol in the fuel. The actual amount of alcohol may be somewhat more because this procedure does not extract all of the alcohol from the fuel.

PARTICULATE CONTAMINANTS IN FUEL TESTING PROCEDURE

The fuel sample should be drawn from the bottom of the tank so that any water present in the tank will be detected. The sample should be bright and clear. If the sample appears cloudy, or contaminated with water, as indicated by a water layer at the bottom of the sample, use the following procedure to diagnose the fuel.

1. Using an approved fuel container, draw approximately 0.5 liter (0.53 qt) of fuel.
2. Place the container on a level surface for approximately 5 minutes in order to allow settling of the particulate contamination. Particulate contamination will show up in various shapes and colors. Sand will typically be identified by a white or light brown crystals. Rubber will appear as black and irregular particles.
3. Observe the fuel sample. If any physical contaminants or water are present, clean the fuel system. Refer to **Fuel System Cleaning**.

ALCOHOL/CONTAMINANTS-IN-FUEL DIAGNOSIS (WITH SPECIAL TOOL)

DESCRIPTION

Water contamination in the fuel system may cause driveability conditions such as hesitation, stalling, no start, or misfires in one or more cylinders. Water may collect near a single fuel injector at the lowest point in the fuel injection system, and cause a misfire in that cylinder. If the fuel system is contaminated with water, inspect the fuel system components for rust or deterioration.

Ethanol concentrations of greater than 10 percent can cause driveability conditions and fuel system deterioration. Fuel with more than 10 percent ethanol could result in driveability conditions such as hesitation, lack of power, stalling, or no start. Excessive concentrations of ethanol used in vehicles not designed for it may cause fuel system corrosion, deterioration of rubber components, and fuel filter restriction.

TEST PROCEDURE

1. Test the fuel composition using **J 44175** Fuel Composition Tester and J 44175-3 Instruction Manual. See **Special Tools** .
2. If water appears in the fuel sample, clean the fuel system. Refer to **Fuel System Cleaning** .
3. Subtract 50 from the reading on the DMM in order to obtain the percentage of alcohol in the fuel sample. Refer to the examples in the Fuel Composition Test Examples table.
4. If the fuel sample contains more than 15 percent ethanol, add fresh, regular gasoline to the vehicle's fuel tank.
5. Test the fuel composition.
6. If testing shows the ethanol percentage is still more than 15 percent, replace the fuel in the vehicle. Refer to **Fuel System Cleaning** .

Fuel Composition Test Examples

-	Frequency (Hz)	Subtract 50	Ethanol Percent
Example A	50 Hz	-50	0
Example B	65 Hz	-50	15
Example C	129 Hz	-50	79

ELECTRONIC IGNITION (EI) SYSTEM DIAGNOSIS (WITHOUT SPECIAL TOOL)

CIRCUIT DESCRIPTION

Each ignition coil supplies secondary voltage to a pair of spark plugs. This is called a waste spark ignition system. The engine control module (ECM) supplies a signal on each of the ignition control (IC) timing circuits to the ignition control module (ICM). The ICM fires the correct ignition coil at the correct time based on the signals. The ICM detects if cylinder 1 or cylinder 3 is on the compression stroke by sensing the secondary voltage and polarity of each side of the ignition coil. The ICM detects this voltage with sensing circuitry integrated into each ignition coil. The higher voltage is on the compressing cylinder. This is called compression sense ignition. The ICM provides a synthesized cam signal to the ECM based on these inputs. The ECM uses the cam signal to synchronize fuel injection.

This system consists of the following circuits:

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

- An ignition voltage circuit
- A ground circuit
- A camshaft position (CMP) sensor signal circuit
- An IC timing control circuit for cylinders #1 and #4
- An IC timing control B circuit for cylinders #2 and #3

Electronic Ignition (EI) System Diagnosis (Without Special Tool)

Step	Action	Values	Yes	No
Schematic Reference: <u>Engine Controls Schematics</u> Connector End View Reference: <u>Engine Control Module (ECM)</u> Connector End Views or <u>Engine Controls Connector End Views</u>				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Turn OFF the ignition. 2. Remove the fuel pump relay with the J 43244 Relay Puller Pliers. 3. Remove the ignition coil housing assembly. Refer to <u>Ignition Coil Housing Replacement</u> . 4. Install the J 36012-A Ignition System Diagnostic Harness. See <u>Special Tools</u> . 5. Install a J 26792 Spark Tester on #1 spark plug jumper wire. See <u>Special Tools</u> . 6. Connect the #4 jumper wire to a good ground. 7. Connect the other jumper wires from the 2-3 ignition coil to the respective cylinders. 8. Observe the spark tester. 9. Crank the engine.	-		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	10. Repeat the procedure for the remaining cylinders. Does the spark tester spark on all cylinders?		Go to Step 5	Go to Step 3	
3	Is the no spark condition only present on one cylinder?		Go to Step 15		Go to Step 4
4	Is the no spark condition only present on companion cylinders 1-4 or 2-3?	-	Go to Step 11	Go to Step 7	
5	Does the spark tester indicate a bright blue spark on all cylinders?	-	Go to Step 6	Go to Step 15	
6	1. Remove the spark plugs. 2. Examine the spark plugs for any abnormal conditions or damage. Refer to Spark Plug Inspection . Are the spark plugs in good condition?	-	System OK	Go to Step 22	
7	1. Turn OFF the ignition. 2. Disconnect the harness connector of the ignition control module (ICM). 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp from the ignition voltage circuit of the ICM to a good ground. Does the test lamp illuminate?	-	Go to Step 8	Go to Step 18	
8	Connect a test lamp from the ignition voltage circuit to the ground circuit of the ICM. Does the test lamp illuminate?	-	Go to Step 9	Go to Step 19	
	1. Turn OFF the ignition. 2. Remove the fuse that supplies ignition voltage to				

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

9	the ICM. 3. Measure the resistance of the ignition voltage circuit of the ICM from the harness connector of the ICM to the fuse. Is the resistance less than the specified value?	3 ohm	Go to Step 10	Go to Step 20
10	Measure the resistance of the ground circuit of the ICM from the harness connector of the ICM to a good ground. Is the resistance less than the specified value?	3 ohm	Go to Step 11	Go to Step 21
11	1. Turn OFF the ignition. 2. Remove the ICM from the ignition coil housing. Refer to Ignition Control Module Replacement . 3. Connect the harness connector of the ICM. 4. Confirm that the interconnect is connected to the ICM. 5. Turn ON the ignition, with the engine OFF. IMPORTANT: If using a different test lamp, the bulb resistance needs to be 4 ohms or less. 6. Connect a J 34730-405 Injector Test Lamp from the ignition voltage circuit at the ICM interconnect to a good ground. For the circuit identification in the ICM interconnect, refer to Electronic Ignition (EI) System Description .	-	Go to Step	Go to Step

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Does the test lamp illuminate?		12	16
12	1. Connect a J 34730-405 between the ignition voltage circuit and the ignition control (IC) timing control circuit for the inoperative ignition coil. For the circuit identification in the ICM interconnect, refer to <u>Electronic Ignition (EI) System Description</u>. 2. Crank the engine. Does the test lamp flash?	-	Go to Step 15	Go to Step 13
13	1. Leave the test lamp connected between the ignition voltage and the IC timing control circuit for the inoperative ignition coil. 2. Turn OFF the ignition. 3. Disconnect the harness connector of the ICM. 4. Connect jumper wires from the harness connector of the ICM to the corresponding terminals of the ICM. 5. Using the jumper wires, exchange the IC timing control circuits of the ICM. 6. Crank the engine. Does the test lamp flash?	-	Go to Step 14	Go to Step 16
14	Test the IC timing control circuit of the ICM for one of the following conditions: • An open • A short to voltage • A short to ground • A high resistance	-		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Refer to Circuit Testing and Wiring Repairs . Did you find and correct the condition?		Go to Step 26	Go to Step 17
15	Test for shorted terminals or a poor connection at the ignition coil housing. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	-	Go to Step 26	Go to Step 23
16	Test for shorted terminals or a poor connection at the ICM. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	-	Go to Step 26	Go to Step 24
17	Test for shorted terminals or poor connections at the engine control module (ECM). Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	-	Go to Step 26	Go to Step 25
18	Repair an open or short to ground in the ignition voltage circuit of the ICM. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 26	-
19	Repair an open in the ground circuit of the ICM. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 26	-
20	Repair the high resistance in the ignition voltage circuit of the ICM. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 26	-
	Repair the high resistance in the			

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

21	ground circuit of the ICM. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 26	-
22	Replace the spark plugs. Refer to Spark Plug Replacement . Did you complete the replacement?	-	Go to Step 26	-
23	Replace the ignition coil housing. Refer to Ignition Coil Housing Replacement . Did you complete the replacement?	-	Go to Step 26	-
24	Replace the ICM. Refer to Ignition Control Module Replacement . Did you complete the replacement?	-	Go to Step 26	-
25	Replace the ECM. Refer to Control Module References for replacement, setup, and programming. Did you complete the replacement?	-	Go to Step 26	-
26	1. Turn the ignition OFF for 90 seconds. 2. Start the engine and operate the vehicle. 3. Observe the vehicle performance and driveability. Does the vehicle operate normally?	-	System OK	Go to Step 2

ELECTRONIC IGNITION (EI) SYSTEM DIAGNOSIS (WITH SPECIAL TOOL)**CIRCUIT DESCRIPTION**

Each ignition coil supplies secondary voltage to a pair of spark plugs. This is called a waste spark ignition system. The engine control module (ECM) supplies a signal on each of the ignition control (IC) timing circuits to the ignition control module (ICM). The ICM fires the correct ignition coil at the correct time based on the signals. The ICM detects if cylinder 1 or cylinder 3 is on the compression stroke by sensing the secondary voltage and polarity of

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

each side of the ignition coil. The ICM detects this voltage with sensing circuitry integrated into each ignition coil. The higher voltage is on the compressing cylinder. This is called compression sense ignition. The ICM provides a synthesized cam signal to the ECM based on these inputs. The ECM uses the cam signals to synchronize fuel injection.

This system consists of the following circuits:

- An ignition voltage circuit
- A ground circuit
- A camshaft position (CMP) sensor signal circuit
- An IC timing control circuit for cylinders #1 and #4
- An IC timing control B circuit for cylinders #2 and #3

Electronic Ignition (EI) System Diagnosis (With Special Tool)

Step	Action	Values	Yes	No
Schematic Reference: Engine Controls Schematics Connector End View Reference: Engine Control Module (ECM) Connector End Views or Engine Controls Connector End Views				
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	1. Turn OFF the ignition. 2. Remove the fuel pump relay with the J 43244 Relay Puller Pliers. 3. Remove the ignition coil housing. Refer to <u>Ignition Coil Housing Replacement</u> . 4. Install the J 36012-A Ignition System Diagnostic Harness. See <u>Special Tools</u> . 5. Install a J 26792 Spark Tester on #1 spark plug jumper wire. See <u>Special Tools</u> . 6. Connect the #4 jumper wire to a good ground.	-		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	7. Connect the other jumper wires from the 2-3 ignition coil to the respective cylinders. 8. Observe the spark tester. 9. Crank the engine. 10. Repeat the procedure for the remaining cylinders. Does the spark tester spark on all cylinders?		Go to Step 5	Go to Step 3	
3	Is the no spark condition only present on one cylinder?	Go to Step 15			Go to Step 4
4	Is the no spark condition only present on companion cylinders 1-4 or 2-3?	-	Go to Step 11	Go to Step 7	
5	Does the spark tester indicate a bright blue spark on all cylinders?	-	Go to Step 6	Go to Step 15	
6	1. Remove the spark plugs. 2. Examine the spark plugs for any abnormal conditions or damage. Refer to Spark Plug Inspection . Are the spark plugs in good condition?	-	System OK	Go to Step 22	
7	1. Turn OFF the ignition. 2. Disconnect the harness connector of the ignition control module (ICM). 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp from the ignition voltage circuit of the ICM to a good ground. Does the test lamp illuminate?	-	Go to Step 8	Go to Step 18	
	Connect a test lamp from the				

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

8	ignition voltage circuit to the ground circuit of the ICM. Does the test lamp illuminate?	-	Go to Step 9	Go to Step 19
9	1. Turn OFF the ignition. 2. Remove the fuse that supplies ignition voltage to the ICM. 3. Measure the resistance of the ignition voltage circuit of the ICM from the harness connector of the ICM to the fuse. Is the resistance less than the specified value?	3 ohm	Go to Step 10	Go to Step 20
10	Measure the resistance of the ground circuit of the ICM from the harness connector of the ICM to a good ground. Is the resistance less than the specified value?	3 ohm	Go to Step 11	Go to Step 21
11	1. Turn OFF the ignition. 2. Remove the ICM from the ignition coil housing. Refer to <u>Ignition Control Module Replacement</u>. 3. Connect the harness connector of the ICM. 4. Remove the interconnect from the ICM. 5. Connect the J 43298 Ignition Module Tester to the ICM. See <u>Special Tools</u>. 6. Crank the engine. 7. Observe the 1-4 and 2-3 LEDs on the tester. Do the 1-4 and 2-3 LEDs flash on the tester?	-	Go to Step 15	Go to Step 12
	Does only one of the LEDs flash		Go to Step	Go to Step

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

12	on the tester?	-	13	16
13	1. Leave the test lamp connected between the ignition voltage and the ignition control (IC) timing control circuit for the inoperative ignition coil. 2. Turn OFF the ignition. 3. Disconnect the harness connector of the ICM. 4. Connect jumper wires from the harness connector of the ICM to the corresponding terminals of the ICM. 5. Using the jumper wires, exchange the IC timing control circuits of the ICM. 6. Crank the engine. Does the inoperative LED on the tester flash now?	-	Go to Step 14	Go to Step 16
14	Test the IC timing control circuit for the affected coil of the ICM for one of the following conditions: • An open • A short to voltage • A short to ground • A high resistance Refer to Circuit Testing and Wiring Repairs . Did you find and correct the condition?	-	Go to Step 26	Go to Step 17
15	Test for shorted terminals or a poor connection at the ignition coil housing. Refer to Testing for Intermittent Conditions and Poor Connections and	-		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Connector Repairs . Did you find and correct the condition?		Go to Step 26	Go to Step 23
16	Test for shorted terminals or a poor connection at the ICM. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	-	Go to Step 26	Go to Step 24
17	Test for shorted terminals or poor connections at the engine control module (ECM). Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	-	Go to Step 26	Go to Step 25
18	Repair an open or short to ground in the ignition voltage circuit of the ICM. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 26	-
19	Repair an open in the ground circuit of the ICM. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 26	-
20	Repair the high resistance in the ignition voltage circuit of the ICM. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 26	-
21	Repair the high resistance in the ground circuit of the ICM. Refer to Wiring Repairs . Did you complete the repair?	-	Go to Step 26	-
22	Replace the spark plugs. Refer to Spark Plug Replacement . Did you complete the replacement?	-	Go to Step 26	-
23	Replace the ignition coil housing. Refer to Ignition Coil Housing Replacement .	-		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Did you complete the replacement?		Go to Step 26	-
24	Replace the ICM. Refer to Ignition Control Module Replacement . Did you complete the replacement?	-	Go to Step 26	-
25	Replace the ECM. Refer to Control Module References for replacement, setup, and programming. Did you complete the replacement?	-	Go to Step 26	-
26	1. Turn the ignition OFF for 90 seconds. 2. Start the engine and operate the vehicle. 3. Observe the vehicle performance and driveability. Does the vehicle operate normally?	-	System OK	Go to Step 2

INSPECTION/MAINTENANCE (I/M) SYSTEM CHECK**DESCRIPTION**

Several states require that a vehicle pass on-board diagnostic (OBD) system tests and the inspection and maintenance (I/M) emission inspection in order to renew license plates. This is accomplished by viewing the I/M System Status display on a scan tool. Using a scan tool, the technician can observe the I/M System Status in order to verify that the vehicle meets the criteria that comply with the local area requirements.

CONDITIONS FOR UPDATING THE I/M SYSTEM STATUS

Each system monitor requires at least one, and sometimes several diagnostic tests. The result of each test is reported by a diagnostic trouble code (DTC). A system monitor is complete when either all of the DTCs comprising the monitor have Run and Passed, or when any one of the DTCs comprising the monitor has illuminated the malfunction indicator lamp (MIL). Once the system monitor is complete, the I/M System Status display will indicate YES in the Completed column.

For example, when the HO2S Heater Status indicates YES, either all of the oxygen sensor heater tests have passed or one of the tests has illuminated the MIL. If the vehicle has 4 heated oxygen sensors, either all 4 heater circuit tests have passed or one of the heater circuit tests has illuminated the MIL. The I/M System Status will indicate NO under the Completed column when any of the required tests for that system have not run. The following is a list of conditions that would set the I/M System Status indicator to NO:

- The vehicle is new from the factory and has not yet been driven through the necessary drive conditions to complete the tests.
- The battery has been disconnected or discharged below operating voltage.
- The control module power or ground has been interrupted.
- The control module has been reprogrammed.
- The control module DTCs have been cleared.

MONITORED EMISSION CONTROL SYSTEMS

The on-board diagnostic (OBD) II system monitors all emission control systems that are on-board. Not all vehicles have a full complement of emission control systems. For example, a vehicle may not be equipped with secondary air injection (AIR) or exhaust gas recirculation (EGR). The OBD II regulations require monitoring of the following:

- The Air Conditioning System
- Catalytic converter efficiency
- Comprehensive component monitoring-Emission related inputs and outputs
- The Evaporative Emissions (EVAP) System
- The EGR System
- The Fuel Delivery System
- Heated catalyst monitoring
- Misfire monitoring
- The Oxygen Sensor System (O2S or HO2S)
- The Oxygen Sensor Heater System (HO2S heater)
- The AIR System

For the specific DTCs required for each system, refer to **Inspection/Maintenance (I/M) System DTC Table**. Systems such as fuel delivery, misfire, and comprehensive components may not be listed in a system status list. These tests run continuously and do not require an I/M System Status indicator.

Inspection/Maintenance (I/M) System Check

Step	Action	Value(s)	Yes	No
	1. Perform Diagnostic			

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

1	<u>System Check - Vehicle</u> in Vehicle DTC Information. IMPORTANT: Many DTC related repairs will instruct the technician to clear the DTC information. This procedure will reset ALL of the I/M System Status indicators to NO, and require performing the inspection and maintenance (I/M) Complete System Set Procedure. 2. Repair any DTCs or driveability concerns that would prevent the I/M System Status tests from completing. Did you find and repair a DTC or driveability concern?	-	Go to Step 3	Go to Step 2
2	1. Review any service bulletins for software updates that may prevent I/M readiness. 2. Perform any reprogramming or repairs indicated by the service bulletins. Was a reprogramming or repair service required?	-	Go to <u>Inspection/Maintenance (I/M) Complete System Set Procedure</u>	Go to Step 3
3	Observe the I/M System Status display with a scan tool. Is more than one test indicating a NO status?	-	Go to <u>Inspection/Maintenance (I/M) Complete System Set Procedure</u>	Go to the I/M System Set Procedure for the indicated system that has not updated.

INSPECTION/MAINTENANCE (I/M) COMPLETE SYSTEM SET

PROCEDURE

DESCRIPTION

The purpose of the inspection and maintenance (I/M) Complete System Set Procedure is to satisfy the enable criteria necessary to execute all of the I/M readiness diagnostics, and complete the drive cycles for those particular diagnostics. When all diagnostic tests are completed, the I/M System Status indicators are set to YES. Perform this procedure when more than one of the I/M System Status indicators are set to NO.

CONDITIONS FOR RUNNING

Cold Start

- The barometric pressure (BARO) is more than 74 kPa.
- The startup engine coolant temperature (ECT) is between 4-30°C (39-86°F).
- The startup intake air temperature (IAT) is between 4-30°C (39-86°F).
- The difference between the startup IAT and the startup ECT is 8°C (14.4°F) or less.
- The battery voltage is between 9-18 volts.
- The fuel level is between 15-85 percent.
- The fuel level does not increase more than 9 percent during this drive cycle.
- The engine run time is at least 10 minutes.
- The vehicle has been driven at least 5 km (3.15 miles) this drive cycle.
- The estimated ambient temperature at the end of this drive cycle is between 2-32°C (36-89°F).
- The shutdown ECT is at least 70°C (158°F).
- The ignition is turned OFF for at least one hour after this drive cycle.

TEST DESCRIPTION

The numbers below refer to the step numbers on the diagnostic table.

2: This step is to run the heated oxygen sensor (HO2S) heater diagnostics and initiate the evaporative emission (EVAP) system diagnostic.

3: This step is to run the EVAP, secondary air injection (AIR) and the oxygen sensor diagnostics. The EVAP test begins once the engine coolant reaches a calibrated temperature. The AIR test, if equipped, begins shortly after Closed Loop and the indicated speed is achieved. The oxygen sensor diagnostics begin once the engine is at operating temperature, in Closed Loop fuel control, and a calibrated amount of time has elapsed.

4: This step is to run the catalyst diagnostics and the engine off natural vacuum (EONV) portion of the EVAP diagnostics. The Catalyst diagnostics run during the idle

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

period immediately following a cruise period that meets a minimum calibrated RPM and time period. The EONV portion of the EVAP diagnostics runs with the engine OFF.

6: The I/M System Status only reports on whether or not a diagnostic has run, not what the outcome of the test was. If any emission related DTC sets after the tests are complete, the DTC will require diagnosis.

Inspection/Maintenance (I/M) Complete System Set Procedure

Step	Action	Value(s)	Yes	No
1	Did you perform the Inspection/Maintenance (I/M) System Check?	-	Go to Step 2	Go to Inspection/Maintenance (I/M) System Check
2	IMPORTANT: Whenever the ignition is turned ON, ignition positive voltage is supplied to the heated oxygen sensor (HO2S) heaters. After verifying the enable criteria, turn OFF the ignition for approximately 5 minutes to allow the sensors to cool before continuing with the test. Once the engine is started, DO NOT turn the engine OFF for the remaining portion of the set procedure. 1. Preprogram the scan tool with the vehicle information before the ignition is turned ON. 2. Ensure the vehicle is within the Conditions for Running specified in the supporting text. 3. Turn OFF all of the accessories, e.g., A/C, blower fan, etc. 4. Set the vehicle parking brake. 5. Verify the transmission is in PARK for automatic transmissions and	2 minutes		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	NEUTRAL for manual transmissions. 6. Start the engine and idle for the specified time.			
	Is the action complete?		Go to Step 3	-
3	CAUTION: Refer to <u>Road Test Caution</u> in Cautions and Notices. 1. Accelerate at part throttle to 90 km/h (56 mph) with this speed maintained until the engine reaches operating temperature. This may be up to 10 minutes depending on the start-up coolant temperature. 2. Continue operation under these conditions for an additional 6 minutes.	-		
	Is the action complete?		Go to Step 4	-
4	CAUTION: Refer to <u>Road Test Caution</u> in Cautions and Notices. 1. Accelerate at part throttle to 73-89 km/h (45-55 mph) with this speed maintained for 2 minutes. 2. Decelerate to 0 km/h (0 mph). 3. Allow the engine to idle for 2 minutes while the following criteria is maintained: • Service brake depressed • Automatic transmission in	-		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	DRIVE or manual transmission in NEUTRAL with the clutch pedal depressed 4. Turn OFF the ignition for one hour. 5. Turn ON the ignition after one hour. Is the action complete?		Go to Step 5	-
5	Observe the I/M System Status display with a scan tool. Did all of the I/M System Status indicators update to YES?	-	Go to Step 6	Go to the I/M System Set Procedure for the systems that have not updated to YES
6	Observe the Emission Related DTC portion of the I/M System Status display with a scan tool. Does the scan tool indicate any Emission Related DTCs set?	-	Go to Diagnostic Trouble Code (DTC) List - Vehicle in Vehicle DTC Information	System OK

INSPECTION/MAINTENANCE (I/M) SYSTEM DTC TABLE

Inspection/Maintenance (I/M) System DTC Table

System	DTCs Required to Set System Status to YES
Catalyst	DTC P0420
EVAP	DTC P0442 DTC P0446 DTC P0455 DTC P0496
Oxygen Sensor	DTC P0133 DTC P0136 DTC P0140 DTC P1133
Oxygen Sensor Heater	DTC P0135 DTC P0141

INSPECTION/MAINTENANCE (I/M) CATALYST SYSTEM SET PROCEDURE

DESCRIPTION

The purpose of this test is to satisfy the enable criteria necessary to execute inspection and maintenance (I/M) readiness diagnostics for the catalyst system. The test may be used to set the I/M System Status indicators to YES. The I/M System Status Display on the scan tool provides an indication of whether the control module has completed the required tests. I/M System Status does not indicate that the tests have passed or failed. When all of the diagnostics for a specific system have run and passed I/M System Status will update to YES. If a test for a specific system has failed, the I/M System Status will update to YES, indicating a determination was made, even if all of the other tests for that system have not run.

CONDITIONS FOR RUNNING

- The engine has been running longer than 10 minutes.
- The engine load must be stable.
- The idle air control (IAC) position parameter does not change more than 20 counts.
- The short term fuel trim (FT) is between -23 and +16 percent.
- The mass air flow (MAF) is more than 10 g/s.
- The catalytic temperature is between 525-675°C (977-1,247°F).
- The vehicle speed sensor (VSS) is more than 5 km/h (3 mph).
- The barometric pressure (BARO) is more than 75 kPa.
- Engine coolant is at operating temperature, 70-125°C (158-257°F).
- The intake air temperature (IAT) is between -20 to +80°C (-4 to +176°F).
- The engine is in Closed Loop fuel control.
- The battery voltage is more than 11 volts.

DIAGNOSTIC AIDS

If the status does not update, the test outlined in this procedure can be repeated until the I/M System Status updates to YES.

If there is an impending failure, the system may require more time to run the diagnostic than was allotted in the set procedure. If the test does not run after numerous attempts and no DTC is set, review the appropriate scan tool data list and the service information for an indication of why the test does not complete. Some tests may abort due to changes in the conditions while the test is running. For example, changes in engine load, such as a cooling fan or an A/C compressor clutch turning ON, may cause the test to abort.

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

Inspection/Maintenance (I/M) Catalyst System Set Procedure

Step	Action	Yes	No
1	Did you perform the Inspection/Maintenance (I/M) System Check?	Go to Step 2	Go to Inspection/Maintenance (I/M) System Check
2	1. Ensure the vehicle is within the Conditions for Running specified in the supporting text. 2. Turn OFF all of the accessories, e.g., A/C, blower fan, etc. 3. Start the engine and allow the engine to idle for 2 minutes. CAUTION: Refer to Road Test Caution in Cautions and Notices. IMPORTANT: In order for this test to run, the vehicle must operate in the following conditions: 4. Acceleration at part throttle to 90 km/h (56 mph) with this speed maintained until the engine reaches operating temperature. This may take up to 10 minutes. 5. Continue operating under these conditions for an additional 5 minutes after the engine reaches operating temperature. 6. Deceleration to 0 km/h (0 mph). 7. Engine idling for 2 minutes while the following criteria is maintained: • Service brake depressed • Automatic transmission in Drive or manual transmission in Neutral with the clutch pedal depressed 8. Observe the I/M System Status display with a scan tool.		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Did the Catalyst System Status update to YES?	Go to Step 5	Go to Step 3
3	Observe the DTC Information with a scan tool. Does the scan tool indicate any failed DTCs?	Go to <u>Diagnostic Trouble Code (DTC) List - Vehicle</u> in Vehicle DTC Information	Go to Step 4
4	1. Refer to <u>Inspection/Maintenance (I/M) System DTC Table</u> to determine which DTCs are required to run in order to complete this test. 2. Observe the Not Ran Since Code Cleared display with a scan tool. 3. Determine which of the DTCs required for a YES status has not run. 4. Enter the DTC number in the Specific DTC menu of the scan tool. 5. Operate the vehicle within the Conditions for Running the DTC, located in the supporting text for the diagnostic table of the DTC. 6. Repeat the procedure until the scan tool indicates the diagnostic test has run. This may take up to 2 hours. 7. Repeat steps 4-6 for any additional required DTCs that have not run. 8. Observe the I/M System Status display with a scan tool. Did the Catalyst System Status update to YES?	Go to Step 5	Go to Diagnostic Aids
	Observe the Emission Related DTC portion of the I/M System Status	Go to Diagnostic	

5	display with a scan tool. Does the scan tool indicate any Emission Related DTCs set?	Trouble Code (DTC) List - Vehicle in Vehicle DTC Information	System OK
---	---	--	-----------

INSPECTION/MAINTENANCE (I/M) EVAPORATIVE EMISSION (EVAP) SYSTEM SET PROCEDURE

DESCRIPTION

The purpose of this procedure is to satisfy the enable criteria necessary to execute inspection/maintenance (I/M) readiness diagnostics for the evaporative emission (EVAP) system. The procedure may be used to set the EVAP I/M System Status display on the scan tool to YES. The EVAP I/M System Status display indicates whether or not the control module has completed the readiness diagnostics. The readiness diagnostics complete when all DTCs comprising the diagnostics run and pass, or any DTC comprising the diagnostics illuminates the malfunction indicator lamp (MIL). If the diagnostics pass during one drive cycle, 17 hours must elapse, regardless of whether the vehicle is driven or not. Then, the diagnostics will run again during the next drive cycle in which the conditions for running are met. Once the diagnostics have passed during the third drive cycle, the EVAP I/M System Status display will be updated to YES. A failed or aborted diagnostic will require the vehicle to cool down in order to meet the enable criteria for another drive cycle. Therefore, performing a visual inspection prior to running the EVAP test may prevent having to repeat the drive cycle.

CONDITIONS FOR RUNNING

- DTCs P0106, P0107, P0108, P0112, P0113, P0117, P0118, P0120, P0121, P0125, P0128, P0130, P0131, P0132, P0133, P0134, P0135, P0136, P0137, P0138, P0140, P0141, P0220, P0443, P0449, P0452, P0453, P0502, P0503, P0562, P0563, P0722, P1106, P1107, P1111, P1112, P1114, P1115, P1133, P1134, P1681, P2135, P2610 are not set.
- At least 17 hours have elapsed since the last drive cycle met the Conditions for Running.
- The difference between the start-up engine coolant temperature (ECT) and the start-up intake air temperature (IAT) is less than 8°C (14.4°F).
- The barometric pressure (BARO) is more than 74 kPa.
- The start-up ECT is between 4-30°C (39-86°F).
- The start-up IAT is between 4-30°C (39-86°F).
- The fuel level is between 15-85 percent.
- The battery voltage is between 10-18 volts.

- The fuel level does not increase more than 9 percent during this drive cycle.
- The engine run time is at least 10 minutes.
- The vehicle has been driven at least 5 km (3.15 mi) this drive cycle.
- The estimated ambient temperature at the end of this drive cycle is between 2-32°C (36-89°F).
- The shutdown ECT is at least 70°C (158°F).
- The ignition is turned OFF for at least one hour after this drive cycle.

DIAGNOSTIC AIDS

Extreme high or low ambient temperatures may prevent the EVAP System Tests from initiating. A loose fuel cap may cause a test to abort or fail and prevent the I/M System Status from updating. A failed or aborted diagnostic will require the vehicle to cool down in order to meet the enable criteria for another drive cycle.

If there is an impending failure, the system may require more time to run the diagnostic than was allotted in the set procedure. If the diagnostic does not run after numerous attempts and no DTC is set, review the appropriate scan tool data list and the service information. This will give an indication of why the test does not complete. Some diagnostics may abort due to changes in the conditions while the test is running. For example, changes in engine load, such as a cooling fan or an A/C compressor clutch turning ON, may cause the diagnostic to abort.

Inspection/Maintenance (I/M) Evaporative Emission (EVAP) System Set Procedure

Step	Action	Yes	No
1	Did you perform the Inspection/Maintenance (I/M) System Check?	Go to Step 2	Go to Inspection/Maintenance (I/M) System Check
	IMPORTANT: At least 3 drive cycles, with a minimum of 17 hours between drive cycles, are required for the EVAP System Status to update to YES. Repeat steps 1-9 until the minimum requirement of drive cycles is met. 1. Ensure the vehicle is within the Conditions for Running specified in the supporting text. 2. Turn OFF all of the accessories, e.g., A/C, blower fan, etc. IMPORTANT: Once the engine is started, DO NOT		

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

2	turn the engine OFF for the remainder of the procedure. 3. Start the engine and idle for 2 minutes. CAUTION: Refer to <u>Road Test Caution</u> in <u>Cautions and Notices</u>. 4. Accelerate at part throttle to 72 km/h (45 mph) with this speed maintained until the engine reaches operating temperature. This may be up to 10 minutes depending on the start up coolant temperature. 5. Continue the operating conditions for an additional 6 minutes after the engine reaches operating temperature. 6. Decelerate to 0 km/h (0 mph). 7. Allow the engine to idle for 2 minutes. IMPORTANT: Ensure that the ignition remains OFF for one hour in order for the control module to perform vacuum testing. 8. Turn OFF the ignition for one hour. 9. Turn ON the ignition after one hour. Did the EVAP System Status update to YES?	Go to Step 5	Go to Step 3
3	Observe the DTC Information with a scan tool. Does the scan tool indicate any failed DTCs?	Go to <u>Diagnostic Trouble Code (DTC) List - Vehicle</u> in Vehicle DTC	

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

		Information	Go to Step 4
4	1. Refer to the <u>Inspection/Maintenance (I/M) System DTC Table</u> to determine which DTCs are required to run in order to complete this diagnostic. 2. Observe the Not Ran Since Code Cleared display with a scan tool. 3. Determine which of the DTCs required for a YES status has not run. 4. Enter the DTC number in the Specific DTC menu of the scan tool. 5. Ensure that the vehicle is within the Conditions for Running the DTC, located in the supporting text for the diagnostic table of the DTC. 6. Repeat the procedure in step 2 of the inspection/maintenance (I/M) evaporative emission (EVAP) system set procedure until the scan tool indicates the DTC has run. 7. Repeat steps 4-6 for any additional required DTCs that have not run. 8. Observe the I/M System Status display with a scan tool. Did the EVAP System Status update to YES?		
		Go to Step 5	Go to Diagnostic Aids
5	Observe the Emission Related DTC portion of the I/M System Status display with a scan tool. Does the scan tool indicate any Emission Related DTCs set?	Go to <u>Diagnostic Trouble Code (DTC) List - Vehicle</u> in Vehicle DTC Information	System OK

INSPECTION/MAINTENANCE (I/M) HEATED OXYGEN SENSOR/OXYGEN SENSOR (HO2S/O2S) SYSTEM SET PROCEDURE

DESCRIPTION

The purpose of this test is to satisfy the enable criteria necessary to execute inspection and maintenance (I/M) readiness diagnostics for the oxygen sensor/heated oxygen sensor (O2S/HO2S) system. The test may be used to set the I/M System Status to YES. The I/M System Status Display on the scan tool provides an indication of whether the control module has completed the required tests. The I/M System Status does not indicate that the tests have passed or failed. When all of the diagnostics for a specific system have run and passed the I/M System Status will update to YES. If a test for a specific system has failed, the I/M System Status will update to YES, indicating a determination was made, even if all of the other tests for that system have not run.

CONDITIONS FOR RUNNING

- The fuel level is more than 10 percent.
- The engine speed is between 1,000-3,500 RPM.
- The short term FT is between -20 and +20 percent.
- The vehicle speed sensor (VSS) is between 32-121 km/h (20-80 mph).
- The engine coolant temperature (ECT) is more than 70°C (158°F).
- The engine is running in Closed Loop fuel control.
- The engine has been running for more than 200 seconds.
- The battery voltage is 11 volts.

DIAGNOSTIC AIDS

If the status does not update, the test outlined in this procedure can be repeated until the I/M System Status updates to YES.

If there is an impending failure, the system may require more time to run the diagnostic than was allotted in the set procedure. If the test does not run after numerous attempts and no DTC is set, review the appropriate scan tool data list and the service information for an indication of why the test does not complete. Some tests may abort due to changes in the conditions while the test is running. For example, changes in engine load, such as a cooling fan or an A/C compressor clutch turning ON, may cause the test to abort.

Inspection/Maintenance (I/M) Heated Oxygen Sensor/Oxygen Sensor (HO2S/O2S) System Set Procedure

Step	Action	Yes	No
1	Did you perform the Inspection/Maintenance (I/M) System		Go to Inspection/Maintenance

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

	Check?	Go to Step 2	(I/M) System Check
2	1. Ensure the vehicle is within the Conditions for Running specified in the supporting text. 2. Turn OFF all of the accessories, e.g., A/C, blower fan, etc. 3. Start the engine and allow the engine to idle for 2 minutes. CAUTION: Refer to Road Test Caution in Cautions and Notices. IMPORTANT: In order for this test to run, the vehicle must operate in the following conditions: 4. Acceleration at part throttle to 72-89 km/h (45-55 mph) with this speed maintained for 6 minutes. 5. Deceleration to 0 km/h (0 mph). 6. Engine idling for 2 minutes while the following criteria is maintained: • Service brake is depressed • Automatic transmission in drive • Manual transmission in neutral with the clutch pedal depressed 7. Review the I/M System Status display with a scan tool. Did the HO2S/O2S System Status update to YES?	Go to Step 5	Go to Step 3
3	Observe the DTC Information with a scan tool. Does the scan tool indicate any failed DTCs?	Go to Diagnostic Trouble Code (DTC) List - Vehicle	

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

		in Vehicle DTC Information	Go to Step 4
4	1. Refer to the Inspection/Maintenance (I/M) System DTC Table to determine which DTCs are required to run in order to complete this test. 2. Observe the Not Ran Since Code Cleared display with a scan tool. 3. Determine which of the DTCs required for a YES status has not run. 4. Enter the DTC number in the Specific DTC menu of the scan tool. 5. Operate the vehicle within the Conditions for Running the DTC, located in the supporting text for the diagnostic table of the DTC. 6. Repeat the procedure until the scan tool indicates the diagnostic test has run. This may take up to 2 hours. 7. Repeat steps 4-6 for any additional required DTCs that have not run. 8. Observe the I/M System Status display with a scan tool. Did the HO2S/O2S System Status update to YES?		
5	Observe the Emission Related DTC portion of the I/M System Status display with a scan tool. Does the scan tool indicate any Emission Related DTCs set?	Go to Diagnostic Trouble Code (DTC) List - Vehicle in Vehicle DTC Information	Go to Diagnostic Aids System OK

INSPECTION/MAINTENANCE (I/M) HEATED OXYGEN SENSOR (HO2S)

HEATER SYSTEM SET PROCEDURE

DESCRIPTION

The purpose of this test is to satisfy the enable criteria necessary to execute inspection and maintenance (I/M) readiness diagnostics for the heated oxygen sensor (HO2S) heater system. The test may be used to set the I/M System Status to YES. The I/M System Status Display on the scan tool provides an indication of whether the control module has completed the required tests. The I/M System Status does not indicate that the tests have passed or failed. When all of the diagnostics for a specific system have run and passed the I/M System Status will update to YES. If a test for a specific system has failed, the I/M System Status will update to YES, indicating a determination was made, even if all of the other tests for that system have not run.

CONDITIONS FOR RUNNING

- The fuel level is more than 10 percent.
- The engine run time is more than 60 seconds.
- The mass air flow (MAF) is less than 16 g/s.
- The catalyst tests are not active.
- The engine coolant temperature (ECT) is more than 70°C (158°F).
- The battery voltage is between 10-18 volts.

DIAGNOSTIC AIDS

The HO2S Heater Tests will normally run within the 2 minutes allotted in the procedure. If there is an indeterminate condition, the test may take up to 2 hours on some vehicles before a decision of pass or fail is made. If the test does not update to YES, it may have aborted due to the loss of enabling conditions.

If there is an impending failure, the system may require more time to run the diagnostic than was allotted in the set procedure. If the test does not run after numerous attempts and no DTC is set, review the appropriate scan tool data list and the service information for an indication of why the test does not complete. Some tests may abort due to changes in the conditions while the test is running. For example, changes in engine load, such as a cooling fan or an A/C compressor clutch turning ON, may cause the test to abort.

Inspection/Maintenance (I/M) Heated Oxygen Sensor (HO2S) Heater System Set Procedure

Step	Action	Value (s)	Yes	No
1	Did you perform the Inspection/Maintenance (I/M) System Check?	-	Go to Step 2	Go to Inspection/Maintenance (I/M) System Check

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

2	IMPORTANT: Whenever the ignition is turned ON, ignition positive voltage is supplied to the heated oxygen sensor (HO2S) heaters. After verifying the enable criteria, turn OFF the ignition for approximately 5 minutes to allow the sensors to cool before continuing with the test. 1. Preprogram the scan tool with the vehicle information before the ignition is turned ON. 2. Ensure the vehicle is within the Conditions for Running specified in the supporting text. 3. Set the vehicle parking brake. 4. Verify the transmission is in Park for automatic transmissions and Neutral for manual transmissions. 5. Turn OFF all of the accessories, e.g., A/C, blower fan, etc. 6. Start the engine and allow the engine to idle for the specified time or until the I/M System Status indicator updates to YES. Did the HO2S Heater System Status update to YES?	2 minutes	Go to Step 5	Go to Step 3
3	Observe the DTC information with a scan tool. Does the scan tool indicate any failed DTCs?	-	Go to <u>Diagnostic Trouble Code (DTC) List - Vehicle</u> in Vehicle DTC	

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

			Information	Go to Step 4
4	1. Refer to <u>Inspection/Maintenance (I/M) System DTC Table</u> to determine which DTCs are required to run in order to complete this test. 2. Observe the Not Ran Since Code Cleared display with a scan tool. 3. Determine which of the DTCs required for a YES status has not run. 4. Enter the DTC number in the Specific DTC menu of the scan tool. 5. Operate the vehicle within the Conditions for Running the DTC, located in the supporting text for the diagnostic table of the DTC. 6. Repeat the procedure until the scan tool indicates the diagnostic test has run. This may take up to 2 hours. 7. Repeat steps 4-6 for any additional required DTCs that have not run. 8. Observe the I/M System Status display with a scan tool. Did the HO2S Heater System Status update to YES?	-		
			Go to Step 5	Go to Diagnostic Aids
5	Observe the Emission Related DTC portion of the I/M System Status display with a scan tool. Does the scan tool indicate any Emission Related DTCs set?	-	Go to <u>Diagnostic Trouble Code (DTC) List</u> - Vehicle in	

2006 Chevrolet HHR LT

2006 ENGINE Engine Controls - 2.2L (L61) - Troubleshooting - HHR

			Vehicle DTC Information	System OK
--	--	--	-------------------------------	-----------