SECTION 6

Catalyst and Exhaust Systems

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Description and Operation

CATALYTIC CONVERTER SYSTEM

Engine Applications

All Engines

The engine exhaust consists mainly of Nitrogen (N_2), however, it also contains Carbon Monoxide (CO), Carbon Dioxide (CO_2), Water Vapor (H_2O), Oxygen (O_2), Nitrogen Oxides (NO_x), and Hydrogen (H_2) as well as various, unburned Hydrocarbons (HC). Three of these exhaust components - CO, NO_x, and HC - are major air pollutants, so their emission to the atmosphere must be controlled.

The three-way catalytic (TWC) converter, mounted in the engine exhaust system, works as a gas reactor to convert and reduce the pollutant levels to within legally prescribed limits.

The catalyst metals are thinly coated onto and supported by a honeycomb shaped high temperature ceramic, mounted inside the converter shell. The result is a highly effective converter design having minimum restriction to exhaust gas flow and good durability.

For further information regarding the makeup of the system and its relationship to other engine/emission systems, refer to the appropriate Schematic Diagram, Section 4 of this manual.

Diagnosis and Testing

SYSTEM INSPECTION

1. Visually inspect the components of the Catalyst and Exhaust System and related controls that may affect exhaust gas quality or cause backfire or loss of power.

   Look for:

Electrical	Mechanical
• Misrouted, Damaged Wiring • Damaged Coil, Distributors or Spark Plugs • Corroded Loose Connectors	• Leaking Fuel Injectors • Damaged Air Inlet Passages • Exhaust Pipe Pinched, Crushed • Damaged, Loose Vacuum Hoses • Incorrect Idle Speed • Air Filter Condition

2. Exercise the wiring and connectors for the solenoids and other components for obvious problems due to looseness, corrosion, or other damage. This must be done until the engine is fully warmed to activate the system controls.

3. Check the vacuum lines and connections for looseness, pinching, leakage, splitting, blockage, or other damage that may cause malfunction.

4. If a vacuum line is suspected as the obvious cause of malfunction, correct the cause before proceeding to the next step.

5. If all checks are OK, proceed to Pinpoint Tests.

6. If diagnostic symptom is "**Fails Emission Test**", proceed to Pinpoint Test **EG1** . If the symptoms are "**Backfires**" or "**Lacks Power**", proceed to Pinpoint Test **EX1** .

NOTE: Failure to conform to the Federal Clean Air Act legal requirements for a particular vehicle and calibration is usually the result of one or more emission related system or component malfunctions.

Diagnosis and Testing | All Engines | EG

TEST STEP	RESULT ▶	ACTION TO TAKE
EG1 EXHAUST GAS EMISSION TEST		
• Perform the Exhaust Emission Test on the vehicle using certified testing equipment. • **Does the vehicle pass the test?**	Yes ▶ No ▶	End of testing. GO to Test **EG2**.
EG2 EMISSION SYSTEM MALFUNCTION DETECTION BY QUICK TEST		
• Use the Quick Test (Section 15) to detect Emission System(s) malfunctioning. **NOTE: Faults in the Catalyst and Exhaust Systems due to exhaust leaks or melted catalyst are not detectable by Quick Test.** • **Are service codes present?**	Yes ▶ No ▶	Perform Electronic Pinpoint Test(s). Refer to Quick Test Step **QT8** for direction. If Pinpoint Tests check OK, perform Test Steps **EG3** through **EG7** prior to EEC component replacement. GO to Test **EX1**. (Catalytic Converter possibly melted or contaminated, or Exhaust System is restricted.)
EG3 CATALYST AND EXHAUST SYSTEM FUNCTION		
• Refer to Section 8 for the correct procedure for checking the EVAP System function. • Rerun Quick Test. • **Does the vehicle pass Quick Test?**	Yes ▶ No ▶	GO to **EG8**. SERVICE/REPLACE as required to eliminate service codes. GO to **EG8**.
EG4 BY-PASS AIR CONTROL AND INLET AIR CONTROL SYSTEMS FUNCTION		
• Refer to Sections 9 and 10 for the correct procedure for checking the By-Pass Air and Inlet Air Control Systems. • Rerun Quick Test. • **Does the vehicle pass Exhaust Emission Quick Test?**	Yes ▶ No ▶	GO to **EG8**. REPAIR/REPLACE as required to eliminate service codes. GO to **EG8**.

Diagnosis and Testing	All Engines	EG

TEST STEP	RESULT ▶	ACTION TO TAKE
EG5 TURBOCHARGER SYSTEM FUNCTION		
• Refer to Section 12 for the correct procedure for checking the Turbocharger System. • Rerun Quick Test. • **Does the vehicle pass Quick Test?**	Yes ▶ No ▶	GO to EG8 . SERVICE/REPLACE as required to eliminate service codes. GO to EG8 .
EG6 FUEL DELIVERY SYSTEM FUNCTION		
• Refer to Section 13 for the correct procedure for checking the Fuel Delivery System. • Rerun Quick Test. • **Does the vehicle pass Quick Test?**	Yes ▶ No ▶	GO to EG8 . SERVICE/REPLACE as required to eliminate service codes. GO to EG8 .
EG7 IGNITION SYSTEM FUNCTION		
• Refer to Section 14 for the correct procedure for checking the Ignition integrity and function. • Rerun Quick Test. • **Does the vehicle pass Quick Test?**	Yes ▶ No ▶	GO to EG8 . SERVICE/REPLACE as required to eliminate service codes. GO to EG8 .
EG8 EXHAUST GAS EMISSION TEST RERUN		
• After all Service codes have been eliminated (Tests EG3 through EG7), or other Exhaust System corrections made (Tests EX1 through EX4), rerun the Exhaust Gas Emission Test. • **Does the vehicle pass the test?**	Yes ▶ No ▶	End of testing. GO to EG9 .

Diagnosis and Testing	All Engines	EG

TEST STEP	RESULT ▶	ACTION TO TAKE
EG9 TEST EQUIPMENT CALIBRATION CHECK		
• Verify the correctness of procedures used in the Exhaust Emission Test. • Determine, if possible, whether the test equipment has been damaged, tampered with, or misused by unqualified personnel. • Check the maintenance records on the test equipment. Note any instances of prior malfunction, age of equipment, and the expiration date of the current certification period. • Check the subject vehicle exhaust gas quality using other available equipment. • **Does the vehicle pass Exhaust Emission Test on the alternate equipment?**	Yes ▶	End of testing; SUBMIT the original equipment for service and recertification.
	No ▶	PERFORM Test Steps EG3 through EG7. If all check OK, return to Diagnostic Routines, Section 2.

Diagnosis and Testing | All Engines | EX

TEST STEP	RESULT ▶	ACTION TO TAKE
EX1 VACUUM TEST • Attach vacuum gauge to intake manifold vacuum source. • Hook up tachometer. • Start engine and gradually increase speed to 2000 rpm with transmission in NEUTRAL. • **Is the manifold vacuum above 16 inches of mercury?**	Yes ▶	No restriction in exhaust system. Condition #1 - If sent here from Test **EG2**, GO to **EG9**. Condition #2 - If sent here from Diagnostic Routines, RETURN to Diagnostic Routines, Section 2.
	No ▶	GO to **EX2**.
EX2 VACUUM TEST — EXHAUST DISCONNECTED • Turn engine off. • Disconnect exhaust system at exhaust manifold. • Repeat vacuum test. • **Is the manifold vacuum above 16 inches of mercury?**	Yes ▶	GO to **EX3**.
	No ▶	GO to **EX4**.
EX3 VACUUM TEST — CATALYTIC CONVERTER ON/MUFFLER OFF • Turn engine Off. • Reconnect exhaust system at exhaust manifold. • Disconnect muffler. • Repeat vacuum test. • **Is the manifold vacuum above 16 inches of mercury?**	Yes ▶	REPLACE muffler.
	No ▶	REPLACE catalytic converter and INSPECT muffler to be sure converter debris has not entered muffler. GO to Test **EG8**.
EX4 EXHAUST MANIFOLD RESTRICTION CHECK • Remove the exhaust manifold. Inspect the ports for casting flash by dropping a length of chain into each port. **NOTE: Do not use a wire or light to check ports. The restriction may be large enough for them to pass through but small enough to cause excessive back pressure at high engine rpm.** • **Is the manifold free of casting flash?**	Yes ▶	RETURN to Diagnostic Routines, Section 2.
	No ▶	REPLACE the exhaust manifold. GO to **EG8**.

Special Service Tools

SPECIAL SERVICE TOOLS

Rotunda Number	Description
059-00008	Vacuum Gauge
055-00101	Engine Tachometer

CA13945-A

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