

SECTION 15B

Catalysts and Exhaust Systems

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Description and Operation

Three Way Catalytic Converter System

The engine exhaust consists mainly of Nitrogen (N₂); however, it also contains Carbon Monoxide (CO), Carbon Dioxide (CO₂), Water Vapor (H₂O), Oxygen (O₂), Nitrogen Oxides (NO_x), and Hydrogen (H₂), 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.

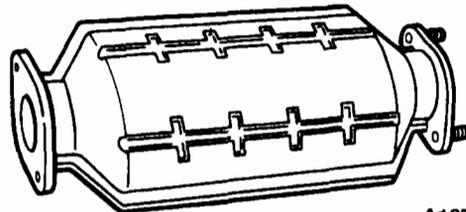
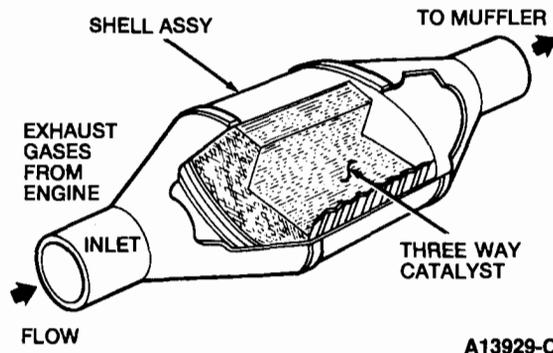
For further information regarding the makeup of the system and its relationship to other engine / emission systems, refer to the schematic diagrams in Engine Supplement — Car, Section 3B of this manual.

Three Way Catalytic Converter

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 converter removes these pollutants from the exhaust gases by means of a chemical reaction, with remaining gases being transferred to the muffler.

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 good durability and minimum restriction to exhaust gas flow.

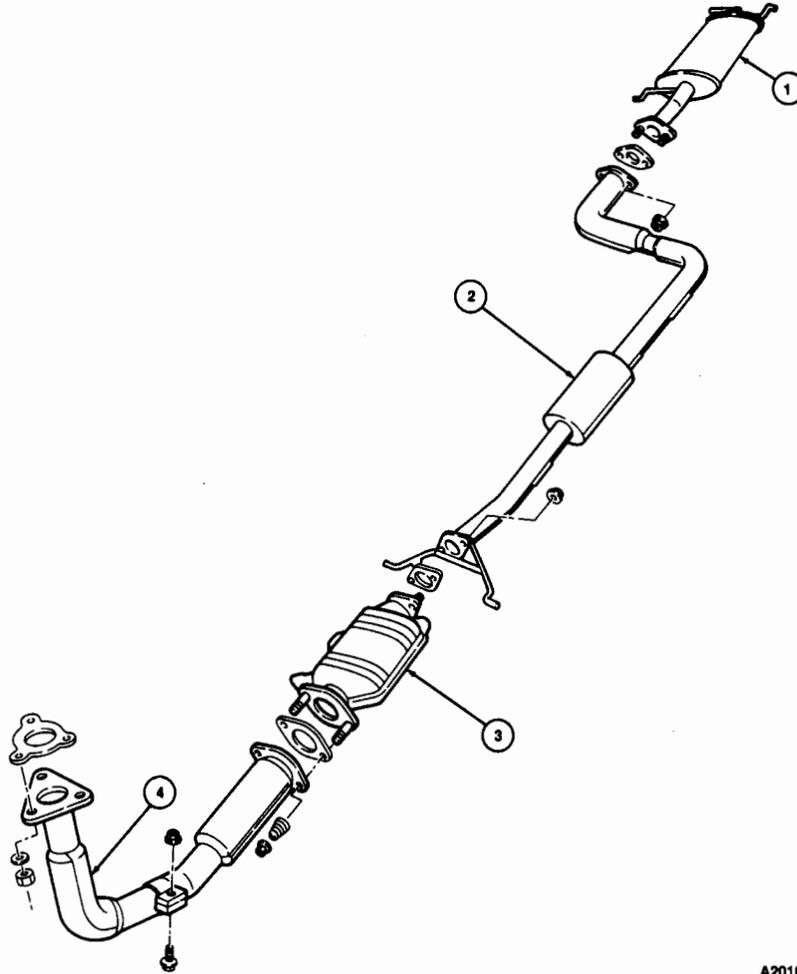
Three Way Catalytic Converter



Engine	Location
1.3L, 1.6L, 1.8L, 2.0L, 2.5L	Mounted between the exhaust manifold and the muffler.

Description and Operation

1.3L Component Location

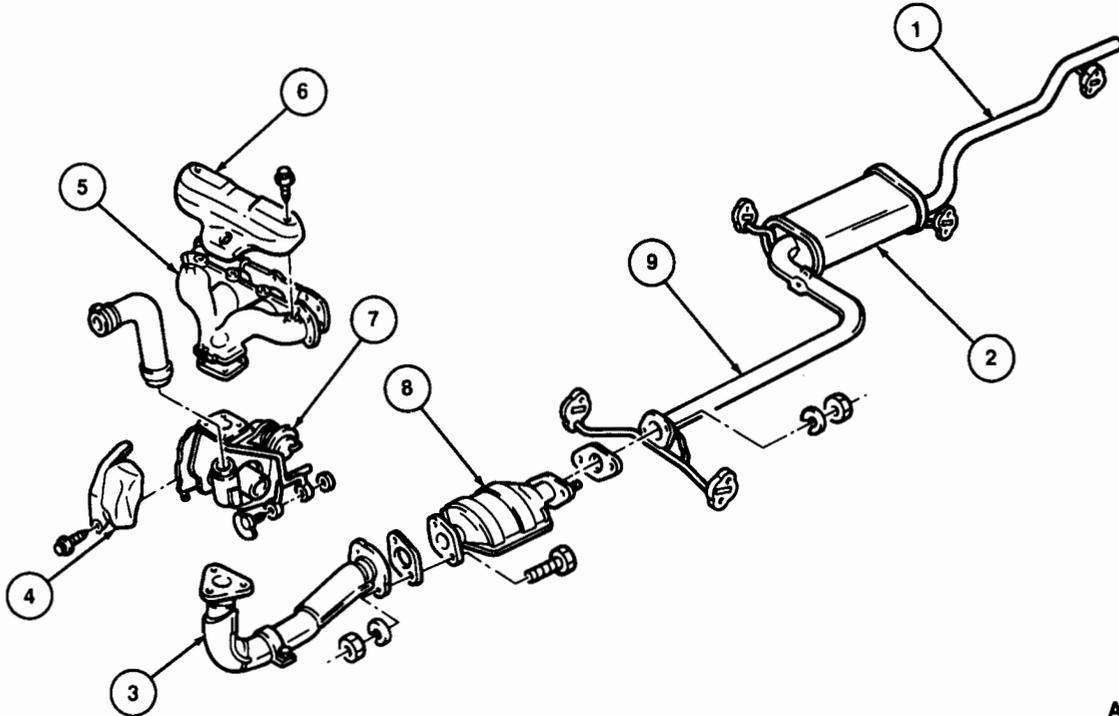


A20167-A

Item	Description
1	Muffler
2	Muffler Inlet Pipe
3	Three Way Catalytic Converter
4	Three Way Catalytic Converter Inlet Pipe

Description and Operation

1.6L Component Location

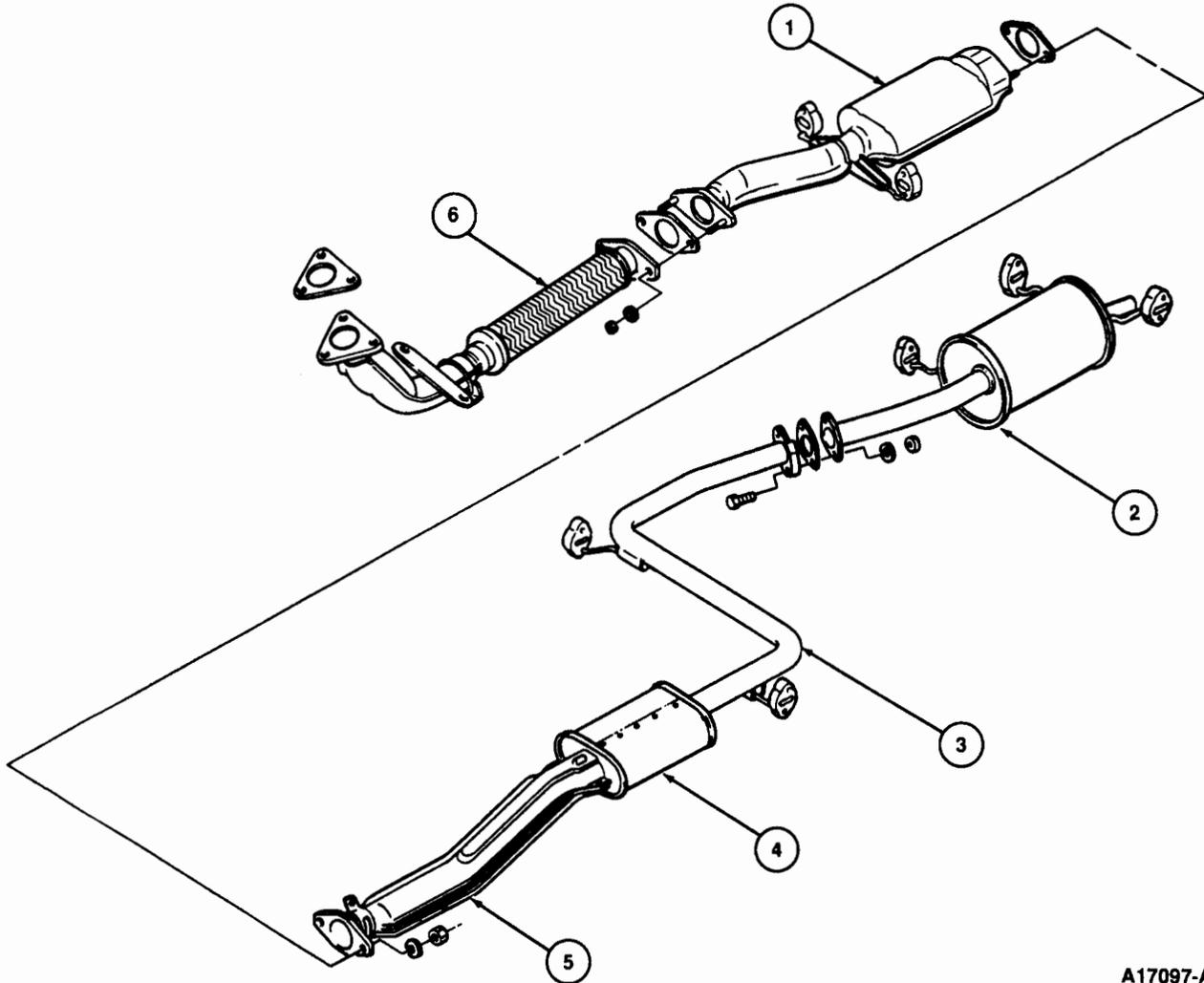


A17096-A

Item	Description
1	Tail Pipe
2	Muffler
3	Three Way Catalytic Converter Inlet Pipe
4	Heat Shield
5	Exhaust Manifold
6	Heat Shield
7	Turbocharger (If Equipped)
8	Three Way Catalytic Converter
9	Muffler Inlet Pipe

Description and Operation

1.8L Component Location

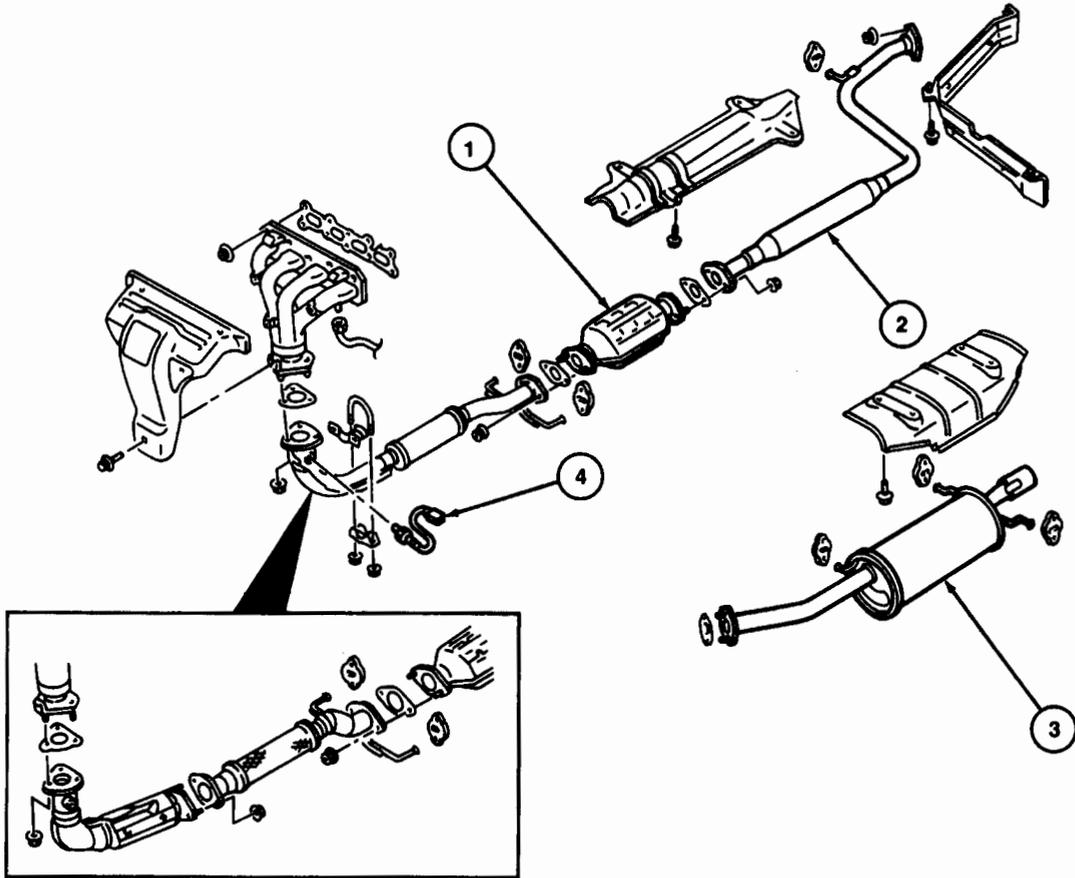


A17097-A

Item	Description
1	Three Way Catalytic Converter
2	Muffler
3	Middle Pipe
4	Resonator
5	Converter Outlet Pipe
6	Three Way Catalytic Converter Inlet Pipe

Description and Operation

2.0L Component Location

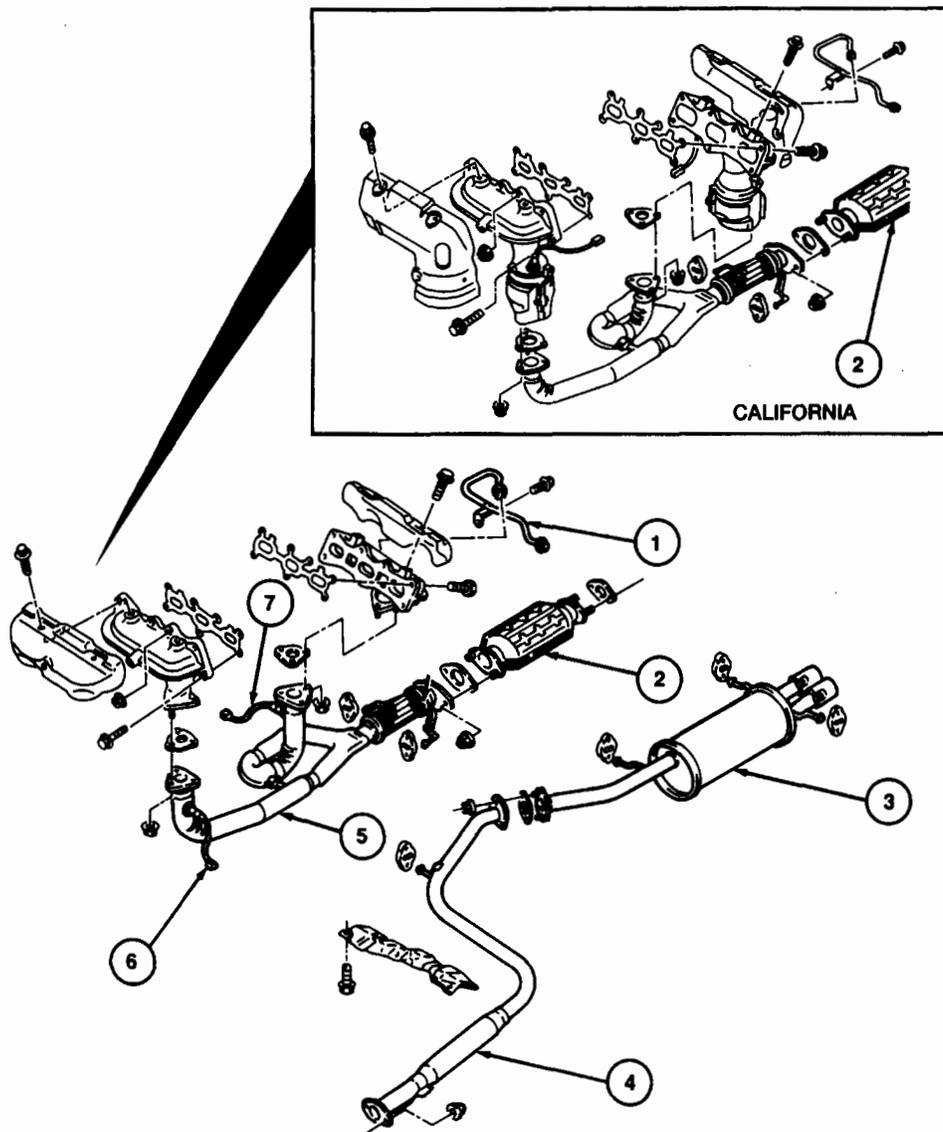


A20623-A

Item	Description
1	Three Way Catalytic Converter
2	Middle Pipe
3	Muffler
4	Heated Oxygen Sensor (HO2S)

Description and Operation

2.5L Component Location



A20624-A

Item	Description
1	EGR Pipe (California Only)
2	Three Way Catalytic Converter
3	Muffler
4	Middle Pipe
5	Converter Inlet Pipe
6	Right Heated Oxygen Sensor (RHO2S)
7	Left Heated Oxygen Sensor (LHO2S)

Diagnosis and Testing (Exhaust Gas Emissions Test)

System Inspection

1. Visually inspect the components of the three way catalytic converter and exhaust system and related controls that may affect exhaust gas quality, cause backfire, or loss of power.

VISUAL INSPECTION CHART

Mechanical	Electrical
<ul style="list-style-type: none"> ● Leaking fuel injectors ● Damaged air inlet passages ● Inoperative Exhaust Gas Recirculation (EGR) valve ● Exhaust pipe pinched, crushed ● Damaged, loose vacuum hoses ● Incorrect idle speed ● Dirty air filter ● Damaged three way catalytic converter 	<ul style="list-style-type: none"> ● Misrouted, damaged wiring ● Damaged coil, distributor, or spark plugs ● Corroded, loose connectors

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 after the engine is fully warmed so as 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 or orifice (restrictor) blockage is suspected as the obvious cause of malfunction, correct the cause before proceeding to the next step.
5. Check engine oil for fuel dilution.
6. If all checks are OK, proceed to the Pinpoint Tests.
7. If the diagnostic symptom is "Fails Emission Test", proceed to Pinpoint Test **EG1**. If the symptom is "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
EG6	CHECK TURBOCHARGER SYSTEM FUNCTION (1.6L TURBO ONLY)		
	<ul style="list-style-type: none"> Refer to Section 9B for the correct procedure for checking the turbocharger system. Rerun the EEC Quick Test. Does the vehicle pass the EEC Quick Test? 	Yes No	<ul style="list-style-type: none"> GO to EG9. SERVICE as required to eliminate the diagnostic trouble codes. GO to EG7.
EG7	CHECK FUEL DELIVERY SYSTEM FUNCTION		
	<ul style="list-style-type: none"> Refer to Section 9B for the correct procedure for checking the fuel delivery system. Rerun the EEC Quick Test. Does the vehicle pass the EEC Quick Test? 	Yes No	<ul style="list-style-type: none"> GO to EG9. SERVICE as required to eliminate the diagnostic trouble codes. GO to EG8.
EG8	CHECK IGNITION SYSTEM FUNCTION		
	<ul style="list-style-type: none"> Refer to Section 8B for the correct procedure for checking the ignition system. Rerun the EEC Quick Test. Does the vehicle pass the EEC Quick Test? 	Yes No	<ul style="list-style-type: none"> GO to EG9. SERVICE as required to eliminate the diagnostic trouble codes. GO to EG9.
EG9	RERUN EXHAUST GAS EMISSION TEST		
	<ul style="list-style-type: none"> After all diagnostic trouble codes have been eliminated (Tests EG3 through EG8), or other exhaust system corrections have been made (Tests EX1 through EX4), rerun the Exhaust Emission Test. Does the vehicle pass the test? 	Yes No	<ul style="list-style-type: none"> End of testing. GO to EG10.
EG10	CHECK TEST EQUIPMENT CALIBRATION		
	<ul style="list-style-type: none"> Verify the correctness of procedures used in the Exhaust Emission Test. Determine if 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 the Exhaust Emission Test on the alternate equipment? 	Yes No	<ul style="list-style-type: none"> End of testing; SUBMIT the original equipment for REPAIR and RECERTIFICATION. GO to EX1.

Diagnosis and Testing	All Engines	EX
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Pinpoint Tests — EX

TEST STEP		RESULT	ACTION TO TAKE
EX1	PERFORM VACUUM TEST		
	<ul style="list-style-type: none"> ● Attach Rotunda Vacuum / Pressure Tester 059-00008 or equivalent, to the intake manifold vacuum source. ● Hook up Rotunda 88 Digital Multimeter 105-00053 or equivalent as a tachometer. ● Start the engine and gradually increase the engine speed to 2000 rpm with the transaxle in NEUTRAL (PARK on ATX) and the parking brake set. ● Is the manifold vacuum above 406.4 mm-Hg (16 in-Hg)? 	<p>Yes</p> <p>No</p>	<p>▶ No restriction in the exhaust system. If sent here from EG2, GO to EG10. Otherwise, RETURN to the Diagnostic Routines, Section 2B.</p> <p>▶ GO to EX2.</p>
EX2	PERFORM VACUUM TEST — EXHAUST DISCONNECTED		
	<ul style="list-style-type: none"> ● Turn the engine off. ● Disconnect the exhaust system at the exhaust manifold. ● Repeat Test EX1. ● Is the manifold vacuum above 406.4 mm-Hg (16 in-Hg)? 	<p>Yes</p> <p>No</p>	<p>▶ GO to EX3.</p> <p>▶ GO to EX4.</p>
EX3	PERFORM VACUUM TEST — THREE WAY CATALYTIC CONVERTER ON / MUFFLER OFF		
	<ul style="list-style-type: none"> ● Turn the engine off. ● Reconnect the exhaust system at the exhaust manifold. ● Disconnect the muffler. ● Repeat Test EX1. ● Is the manifold vacuum above 406.4 mm-Hg (16 in-Hg)? 	<p>Yes</p> <p>No</p>	<p>▶ REPLACE the muffler.</p> <p>▶ REPLACE the three way catalytic converter and INSPECT the muffler to be sure converter debris has not entered the muffler. GO to EG9.</p>
EX4	CHECK EXHAUST MANIFOLD RESTRICTION		
	<ul style="list-style-type: none"> ● Remove the exhaust manifold(s). Inspect the ports for casting flash by dropping a length of chain into each port. <p>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.</p> <ul style="list-style-type: none"> ● Is the manifold free of casting flash? 	<p>Yes</p> <p>No</p>	<p>▶ RETURN to the Diagnostic Routines, Section 2B.</p> <p>▶ REPLACE the exhaust manifold. GO to EG9.</p>

Specifications/Special Service Tools

Special Service Tools/Equipment

ROTUNDA EQUIPMENT

Model	Description
059-00008	Vacuum / Pressure Tester
105-00053	88 Digital Multimeter