**Emission Control Devices Operation and Diagnosis**

**Chapter 19**

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**ACROSS**

3. Most GM and many other vehicles use a _______ that contains a pulse-width modulated solenoid to precisely regulate exhaust gas flow and a feedback potentiometer that signals the computer regarding the actual position of the valve.

7. A ____________ is an aftertreatment device used to reduce exhaust emissions outside of the engine.

10. __________ systems were developed to ventilate the crankcase and recirculate the vapors to the engine's induction system so they can be burned in the cylinders.

14. Measure the inlet and the outlet temperatures using an ____________.

15. The catalytic converter uses a ________, which is a chemical that helps start a chemical reaction but does not enter into the chemical reaction.

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**DOWN**

1. The catalytic converter does not work when cold, and it must be heated to its ________ of close to 500°F (260°C) before it starts working at 50% effectiveness.

2. A ________ sensors monitors the rate with which vacuum increases in the system.

4. Many vehicles use a ________ as part of the evaporative control system diagnosis equipment.

5. ____ is an emission control system that lowers the amount of NOx formed during combustion.

6. A ________ contains a spring-type metallic disc or reed that closes under exhaust backpressure.

8. By a process called __________, the fuel vapor molecules adhere to the carbon surface.

9. Excessive ____ emissions are controlled by the exhaust gas recirculation system and the catalytic converter.

11. Since the early 1990s, many converters contain ________, an element that can store oxygen.

12. The substrate is coated with a porous aluminum material called a ________, which makes the surface rough.

13. The recirculated exhaust gas is _____ and does not enter into the combustion process.