# 1 Diagnostic Procedure for Vehicles Failing a Transient Emissions Test

## Helpful Hints:

**In the event of a multiple failure, there may be a common problem:**

- ***High HC and CO*:** Possible misfire or vehicle not at proper operating temperature. Correct HC failure first.
- ***High HC and NOx:*** Possible lean condition
- ***High HC, CO, and NOx:*** If condition **only** appears in the first phase of the drive trace, a possible cause could be that the converter was not at proper operating temperature.

## Step 1: Visual Inspection

- Check for technical service bulletins related to the emission failure.
- Vapor recovery system
- Air filter
- Vacuum leaks, vacuum lines (disconnected, cracked or missing). The use of a vacuum leak detector is recommended.
- Obvious misfire or rough running engine
- Air management system operation
- Converter (damaged, empty or overheated). Correct cause of overheating before replacing converter.

## Step 2: Check Oil Level and Quality

## Step 3: Check Cooling System Level, Operation and Condition

## Step 4: Check MIL Light

- Does MIL or service engine light illuminate with the key on and engine off?
- Is MIL or service engine light on during emissions test? If yes, diagnose code(s) related to failure.

## Step 5: $O_2$ Sensor Verification

- Is vehicle in fuel-control-at-idle and at time of excessive exhaust emissions? Use lab scope to check $O_2$ sensor time and voltage.
- When diagnosing a **NOx only failure, do not replace an oxygen sensor that can read full rich and full lean (its complete voltage range) or has a lean bias during idle and cruise speeds.** Repairing this condition (i.e. operating at approx. 350ms) can increase NOx readings. **Correct cause of high NOx first.**



 

## Step 6: If $O_2$ Sensor Was Replaced, Verify Operation of New $O_2$ Sensor.

## Step 7: Check Catalytic Converter

- Perform catalytic converter efficiency test.
- If converter tests good, proceed to exhaust gas specific chart.
  If converter tests bad, check for any catalyst damaging condition before replacing catalytic converter.

# NOx FAILURE PROCEDURE

**NOx Only Failure*:* Replacing an oxygen sensor that is allowing the engine to operate rich will not reduce NOx readings.**

## Check Causes of High Combustion Temperature

- Check operation/function of the EGR system (including passages).
- Check operation/function of ignition timing and advance. Correct the condition before continuing.
- Verify correct operation of emission control systems. Note: Emission systems may have interrelated problems.
- Is the vehicle in fuel control? Correct lean condition only. Correcting a rich condition may increase NOx readings.
- Check for carbon deposits. Perform complete decarbonization as needed.

**When a decarbonization process is performed, driving the vehicle at cruise speeds will help remove carbon deposits that have been loosened during that process.**

## Check Cooling System

- Coolant level
- Operation of cooling fan
- Operating temperature (limits 185F to 225F)



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# HC FAILURE PROCEDURE

## Where in the drive trace does HC appear high?

☐ **Near Idle** ☐ **Cruise** ☐ **Acceleration** ☐ **Deceleration**

Perform engine diagnostics on a dynamometer at the same time that the drive trace information shows excessive HC.

- Does engine run rough or miss? Correct condition before continuing.
- Perform engine diagnostics and check for vacuum leaks and proper timing. Over advanced timing can increase HC.
- Run car on dynamometer to detect misfire under load. Perform misfire diagnostics, if possible, at same speed and load that excessive gases show on drive trace.
- Monitor $O_2$ sensor waveform (using lab scope) during drive cycle to help detect misfire.
- Verify correct operation of related emission control systems. Note: Emission systems may have interrelated problems.
- Does engine run smooth? If not, repeat engine diagnostics including accurate testing for vacuum leaks.

**The use of a vacuum leak detector (one that injects smoke into the engine) may be the most effective method to locate vacuum leaks.**



 

# CO FAILURE PROCEDURE

## Where in the drive trace does CO appear high?

□ **Near Idle** □ **Cruise** □ **Acceleration** □ **Deceleration**

Perform engine diagnostics on a dynamometer at the same time that the drive trace information shows excessive CO. Some components may operate properly at idle and malfunction at cruise speed or under load.

### Check Causes of Rich Mixture

- Air filter
- Cooling system: Can engine reach proper operating temperature?
- Check operation/function of the vapor recovery system, which could add unmetered fuel to the engine. Correct the condition before continuing.
- Check operation/function of the fuel delivery system (fuel pressure, float level, etc.).
- Verify correct operation of emission control systems (i.e. proper vacuum to control components such as MAP sensor).
- Is the vehicle in fuel control? Can the oxygen sensor read full rich at idle and at the time of excessive CO emissions? If yes, can O2 sensor be driven lean? **If yes, correct cause of rich mixture.**

**If HC is also excessive, check for misfire.**

**This procedure was developed mainly for vehicles with feedback systems and is designed to assist the technician in locating the cause of excessive exhaust gases in a cost-effective manner. The procedure focuses on the systems and/or components that are related to the failed gas. The success in repairing failed vehicles will depend greatly on the technician's knowledge, access to diagnostic information, vehicle manufacturers' specifications and technical service bulletins, as does any other diagnostic procedure. This procedure does not replace the need for technician training or performing accurate diagnostics but instead helps the technician to determine when to apply that knowledge and eliminates steps not related to the failed gas.**



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