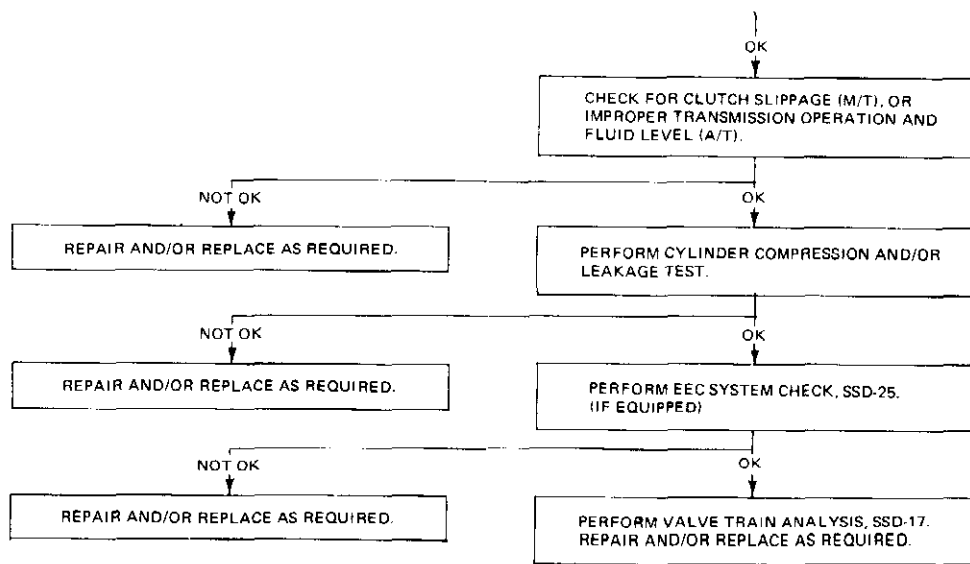


ROUTINE NO. 119
EXCESSIVE FUEL CONSUMPTION – CONTINUED



ROUTINE NO. 120
EXCESSIVE OIL CONSUMPTION

VERIFY THE COMPLAINT

THE MOST COMMON CAUSE OF OIL LOSS IS LEAKAGE. TO VERIFY AN EXCESSIVE OIL CONSUMPTION COMPLAINT, IT IS NECESSARY THAT A THOROUGH INSPECTION BE MADE TO INSURE THAT LEAKAGE DOES NOT EXIST. THE FOLLOWING STEPS SHOULD BE FOLLOWED TO RESOLVE AN EXCESSIVE OIL CONSUMPTION COMPLAINT:

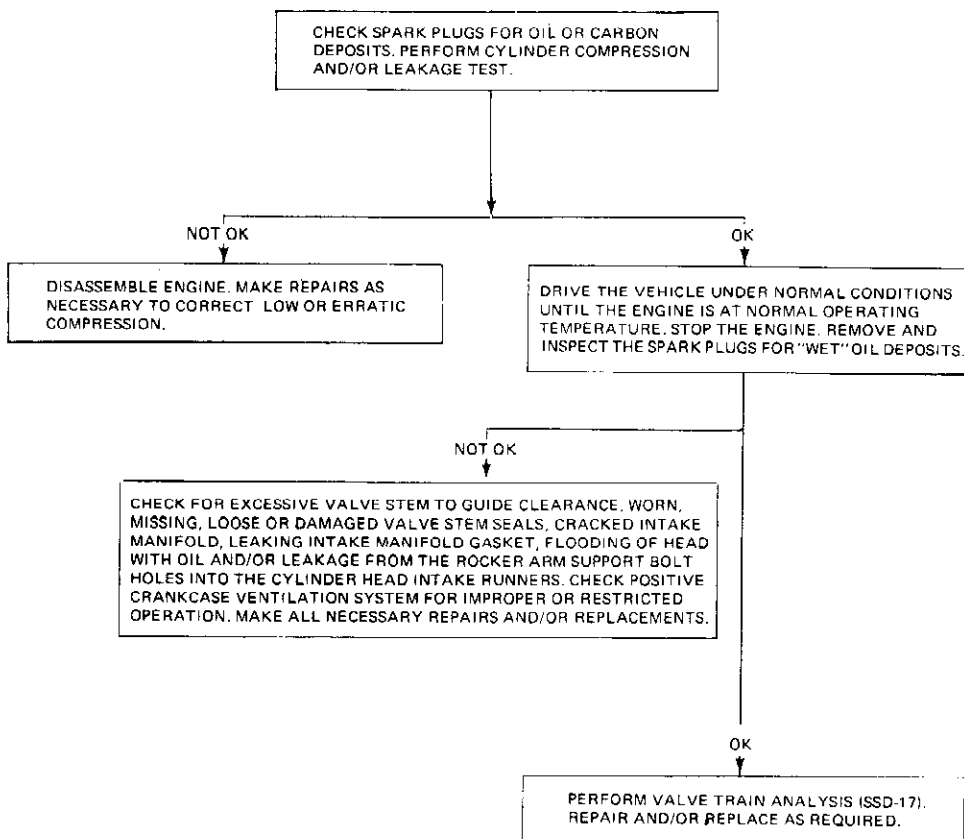
- A. STEAM CLEAN THE ENGINE (IF NECESSARY) TO REMOVE ACCUMULATED DIRT AND/OR OIL.
- B. DRAIN ENGINE OIL AND CHANGE THE OIL FILTER.
- C. FILL THE CRANKCASE WITH THE SPECIFIED AMOUNT OF THE RECOMMENDED GRADE OF OIL. (CHECK TO BE SURE THE CORRECT DIPSTICK HAS BEEN INSTALLED).
- D. PERFORM POSITIVE CRANKCASE VENTILATION SYSTEM SSD-11 PART I A, B, C, D.
- E. WITH THE VEHICLE ON A LEVEL SURFACE, PLACE A CLEAN PAPER UNDER THE ENGINE (TO AID IN DETECTING LEAKAGE) AND OPERATE THE ENGINE FOR APPROXIMATELY 20 MINUTES AT 1200 RPM WITH THE TRANSMISSION IN NEUTRAL.
- F. SHUT OFF THE ENGINE AND CHECK FOR LEAKAGE AT:
 1. VALVE ROCKER ARM COVER GASKETS.
 2. OIL PAN GASKET.
 3. CYLINDER BLOCK FRONT COVER GASKET
 4. CYLINDER BLOCK TO FUEL PUMP GASKET AND FUEL PUMP AIR VENT.
 5. INTAKE MANIFOLD SEALS.
 6. CRANKSHAFT SEALS.
 7. DISTRIBUTOR HOUSING O-RING.
 8. OIL FILTER.
 9. OIL PRESSURE SENDING UNIT.
- G. WHEN ALL CAUSES OF LEAKAGE (IF ANY) HAVE BEEN REPAIRED, CHECK THE OIL LEVEL AND USE A FILE OR CENTER PUNCH TO MARK THE DIPSTICK AT THE INDICATED LEVEL.
- H. RECORD THE ODOMETER READING. HAVE THE CUSTOMER OPERATE THE ENGINE FOR THE APPROXIMATE NUMBER OF MILES INDICATED BY THE COMPLAINT AND THEN RETURN IT FOR EXAMINATION.
- I. WHEN CUSTOMER RETURNS THE VEHICLE, VERIFY THE ODOMETER READING, CHECK THE OIL LEVEL, AND RE-INSPECT THE ENGINE FOR SIGNS OF OIL LEAKAGE.
- J. ADD A MEASURED AMOUNT OF OIL AS NECESSARY TO BRING THE OIL LEVEL TO THE PREVIOUSLY INSCRIBED MARK ON THE DIPSTICK.
- K. IF OIL CONSUMPTION IS NOT WITHIN SPECIFIED LIMITS, PROCEED WITH OIL CONSUMPTION DIAGNOSIS AS OUTLINED ON THE NEXT PAGE.

CONTINUED ON NEXT PAGE

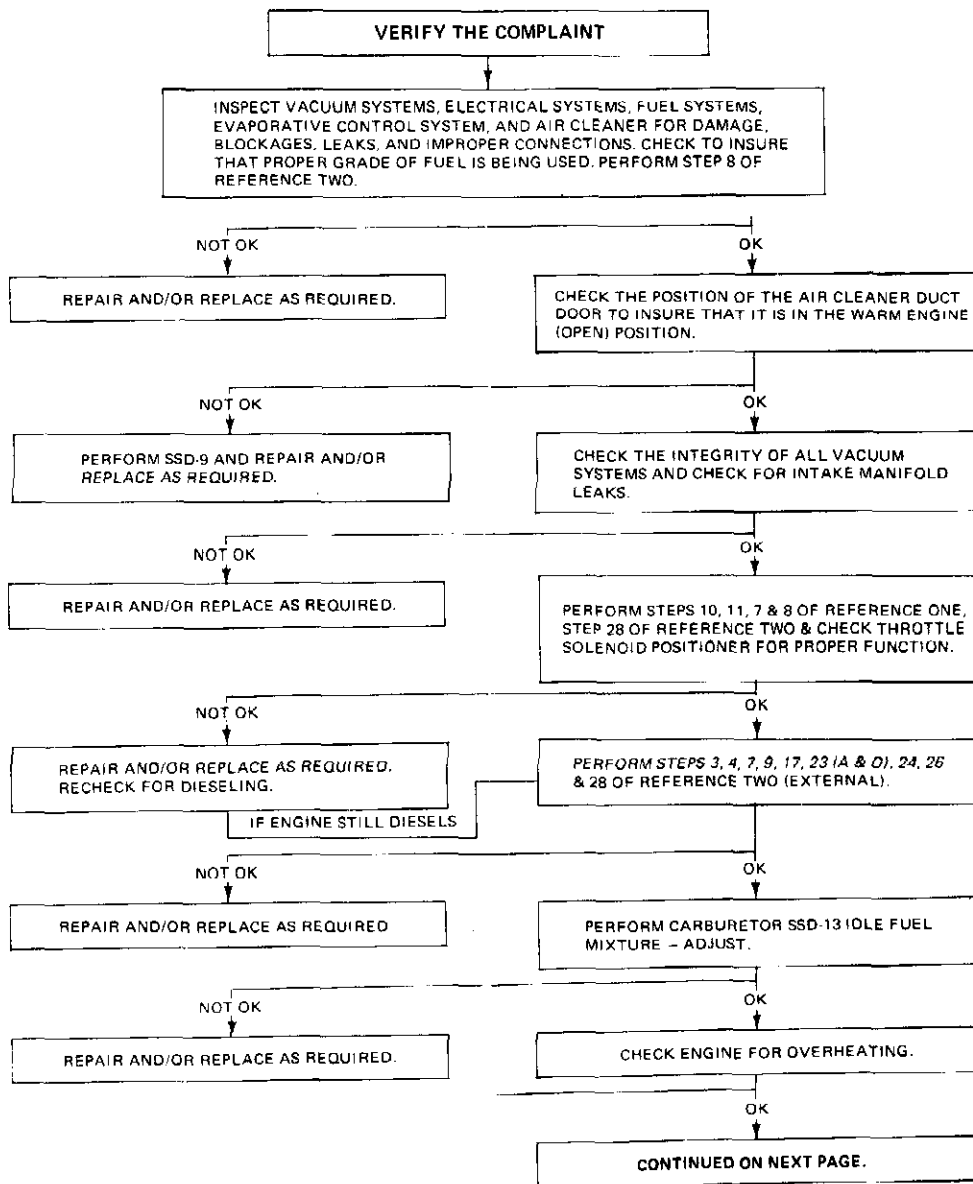
CA1376-2B¹

ROUTINE NO. 120
EXCESSIVE OIL CONSUMPTION – CONTINUED

NOTE: A NEW ENGINE MAY REQUIRE UP TO 6,000 MILES OF OPERATION IN ORDER TO PROPERLY SEAT (BREAK IN) THE PISTON RINGS. FOR THIS REASON, THE ENGINE SHOULD NOT BE CONDEMNED AS LONG AS OIL ECONOMY IS IMPROVING WITH MILEAGE ACCUMULATION. IF OIL ECONOMY CEASES TO IMPROVE WITH MILEAGE ACCUMULATION, CORRECTIVE ACTION SHOULD BE TAKEN.

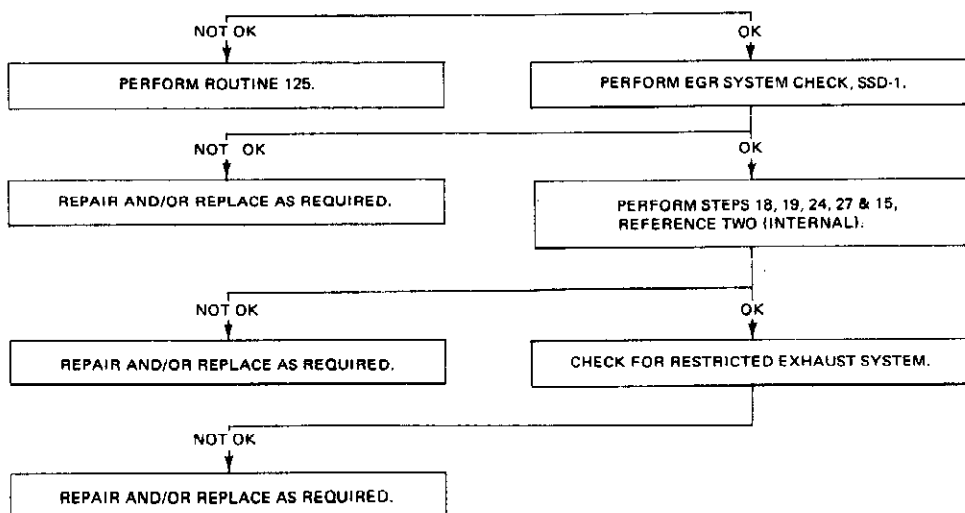


ROUTINE NO. 121
ENGINE DIESELS – CONTINUES TO RUN AFTER SHUT OFF

CA1377-2C¹

ROUTINE NO. 121

ENGINE DIESELS – CONTINUES TO RUN AFTER SHUT OFF – CONTINUED



ROUTINE NO. 122

ENGINE NOISE

NOISY ENGINE OPERATION COVERS A WIDE RANGE OF COMPLAINTS; THEREFORE, TO MAKE THE MOST EFFICIENT USE OF DIAGNOSTIC AIDS TO RESOLVE THE COMPLAINT, AN ACCURATE VERIFICATION OF THE SYMPTOMS MUST BE MADE WHEN THE SYMPTOM IS IDENTIFIED AS TO THE TYPE AND GENERAL LOCATION OF THE NOISE, PROCEED TO THE APPLICABLE STEP OUTLINED BELOW. IT WILL BE SEEN THAT MANY OF THE STEPS ARE BASED ON SIMILAR SYMPTOMS AND, INDEED MAY BE A MATTER OF INDIVIDUAL INTERPRETATION. THEREFORE, IF THE MOST LIKELY STEP FAILS TO RESOLVE THE COMPLAINT, PROCEED TO THE NEXT LIKELY STEP, AND SO ON UNTIL THE COMPLAINT IS RESOLVED.

A. THERMACTOR SYSTEM NOISE: (VEHICLES SO EQUIPPED)

THE THERMACTOR SYSTEM IS NOT COMPLETELY NOISELESS. UNDER NORMAL CONDITIONS, NOISE RISES IN PITCH AS ENGINE SPEED INCREASES. TO DETERMINE IF EXCESSIVE NOISE IS THE FAULT OF THE AIR INJECTION SYSTEM, DISCONNECT THE DRIVE BELT AND OPERATE THE ENGINE. IF THE NOISE DISAPPEARS, REFER TO SSD-4 OR SSD-5.

B. PULSE AIR SYSTEM NOISE: (VEHICLES SO EQUIPPED)

1. IF NOISE IS ISOLATED TO THE AIR CLEANER, CHECK THE FILTER PACK(S) FOR CORRECT INSTALLATION. REINSTALL PROPERLY. IF STILL NOISY, REFER TO PULSE AIR SYSTEM TEST, SSD-23.
2. IF THE FILTER PACK(S) WAS DAMAGED, OR DIRTY, REPLACE AND CHECK THE PULSE AIR SYSTEM ACCORDING TO SSD-23.

C. LIGHT CLICKING VARIES WITH ENGINE SPEED

CHECK ACCESSORY COMPONENTS AS SOURCE OF NOISE BY LOOSENING AND/OR REMOVING DRIVE BELTS ONE AT A TIME UNTIL NOISE STOPS. ALSO INVESTIGATE FUEL PUMP AND/OR FUEL PUMP DRIVE AS THE POSSIBLE CAUSE. IF NOISE CONTINUES, IT COULD BE CAUSED BY IMPROPERLY ADJUSTED, FAILED, DAMAGED OR WORN VALVE TRAIN COMPONENTS. INSERT FEELER GAUGE BETWEEN ROCKER ARM AND VALVE STEM TIP AND/OR EXERT PRESSURE ON ROCKER ARM. IF NOISE IS ELIMINATED ADJUST VALVE TIP CLEARANCE TO SPECIFICATION (WHERE APPLICABLE). IF CONDITION PERSISTS, INSPECT FOR WORN, STUCK OR DAMAGED VALVE TRAIN COMPONENTS BY PERFORMING SSD-17. IF NO FAILURE IS DETECTED, CHECK FOR THE EFFECT OF EXCESSIVE VALVE STEM TO VALVE GUIDE CLEARANCE BY EXERTING SIDE PRESSURE ON VALVE STEM. IF DIAGNOSIS INDICATES THAT THE CLEARANCE RESULTS IN OBJECTIONABLE NOISE, AND THE SPECIFIED SERVICE CLEARANCE (MEASURED WITH A SERVICE TOOL) HAS BEEN EXCEEDED, THE GUIDE BORES SHOULD BE REAMED TO ACCEPT OVERSIZE VALVES AND/OR GUIDE BUSHINGS.

D. SHARP RAPPING – VARIES WITH ENGINE SPEED

USUALLY CAUSED BY MALFUNCTIONING HYDRAULIC TAPPET AND MAY BE LOCATED WITH THE AID OF A STETHOSCOPE. IF THE COMPLAINT ISN'T RESOLVED, PERFORM STEP C.

E. HISSING

INSPECT VACUUM SYSTEMS FOR LEAKAGE DUE TO LOOSE OR BROKEN CONNECTIONS AND/OR DAMAGED OR WORN PARTS. INSPECT MANIFOLDS FOR LEAKS. PERFORM CYLINDER COMPRESSION AND/OR LEAKAGE TESTS TO IDENTIFY AND ISOLATE CYLINDER HEAD GASKET LEAKS. INSPECT FOR CARBURETOR GASKET LEAKS.

NOTE: IF NOISE IS ISOLATED TO THE EGR SYSTEM, PERFORM SSD-1. IF NOISE IS ISOLATED TO THE EVAPORATIVE EMISSION SYSTEM, PERFORM SSD-22.

F. SHARP SNAPPING NOISE DURING ACCELERATION

PERFORM STEPS 21, 22 AND 23 OF REFERENCE ONE FOR HIGH TENSION CIRCUIT LEAKAGE.

G. SQUEAKS AND/OR SQUEALS

LOOSEN DRIVE BELTS ONE AT A TIME TO DETERMINE IF ACCESSORY COMPONENT OR WATER PUMP IS CAUSING NOISE.

H. HEAVY SQUEAL DURING ACCELERATION

CHECK FOR ACCESSORY DRIVE BELT SLIPPAGE AND ADJUST TENSION OR REPLACE AS REQUIRED.

ROUTINE NO. 122
ENGINE NOISE — CONTINUED

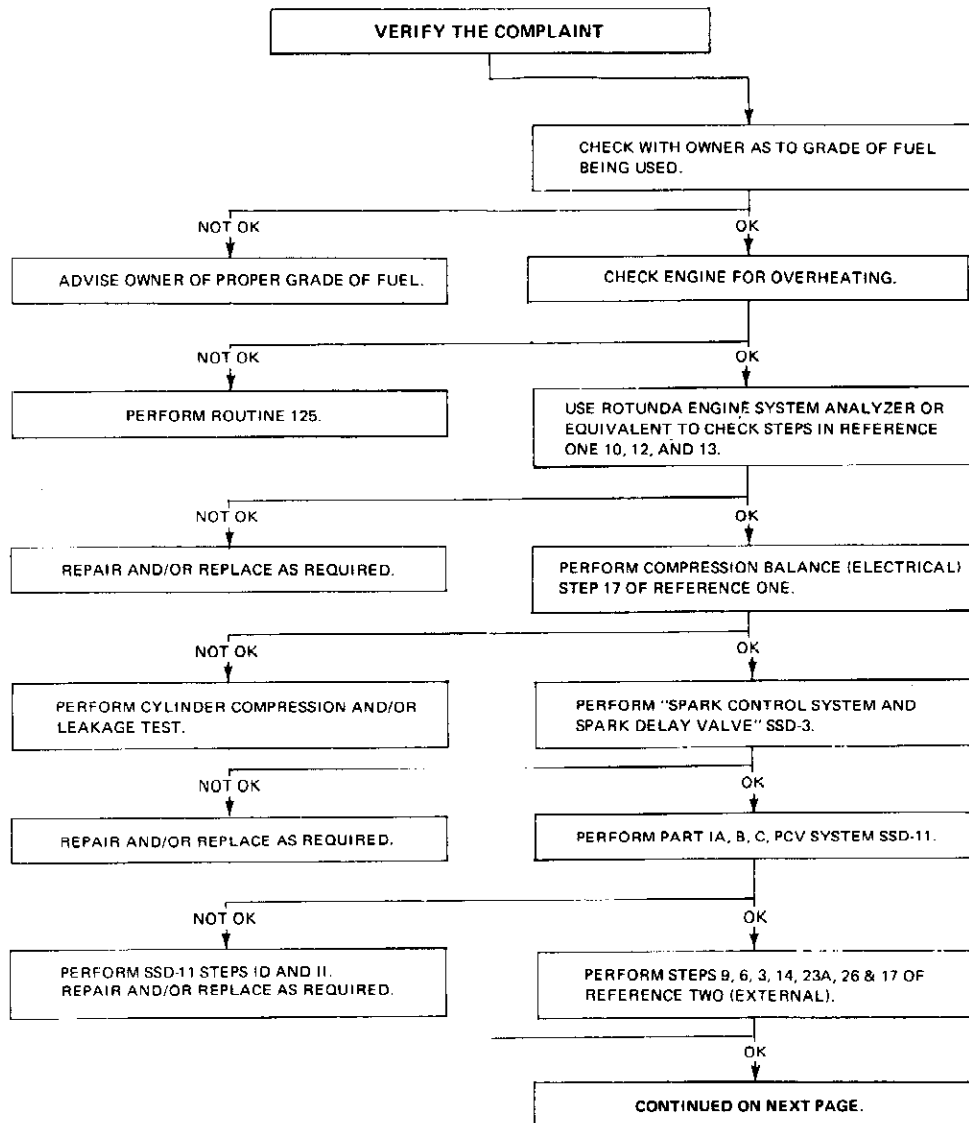
I. RINGING, GRINDING OR COMBINATION OF BOTH

CHECK FOR LOOSE, BENT OR IMPROPER PULLEYS, CHECK FOR FRONT END BRACKET INTERFERENCE BETWEEN ROTATING PARTS AND SURROUNDING COMPONENTS CAUSED BY MISALIGNMENT OF ENGINE, ENGINE COMPONENTS, OR SURROUNDING COMPONENTS. CHECK FOR WORN OR DAMAGED WATER PUMP OR ACCESSORY COMPONENTS BY LOOSENING DRIVE BELTS ONE AT A TIME UNTIL NOISE STOPS.

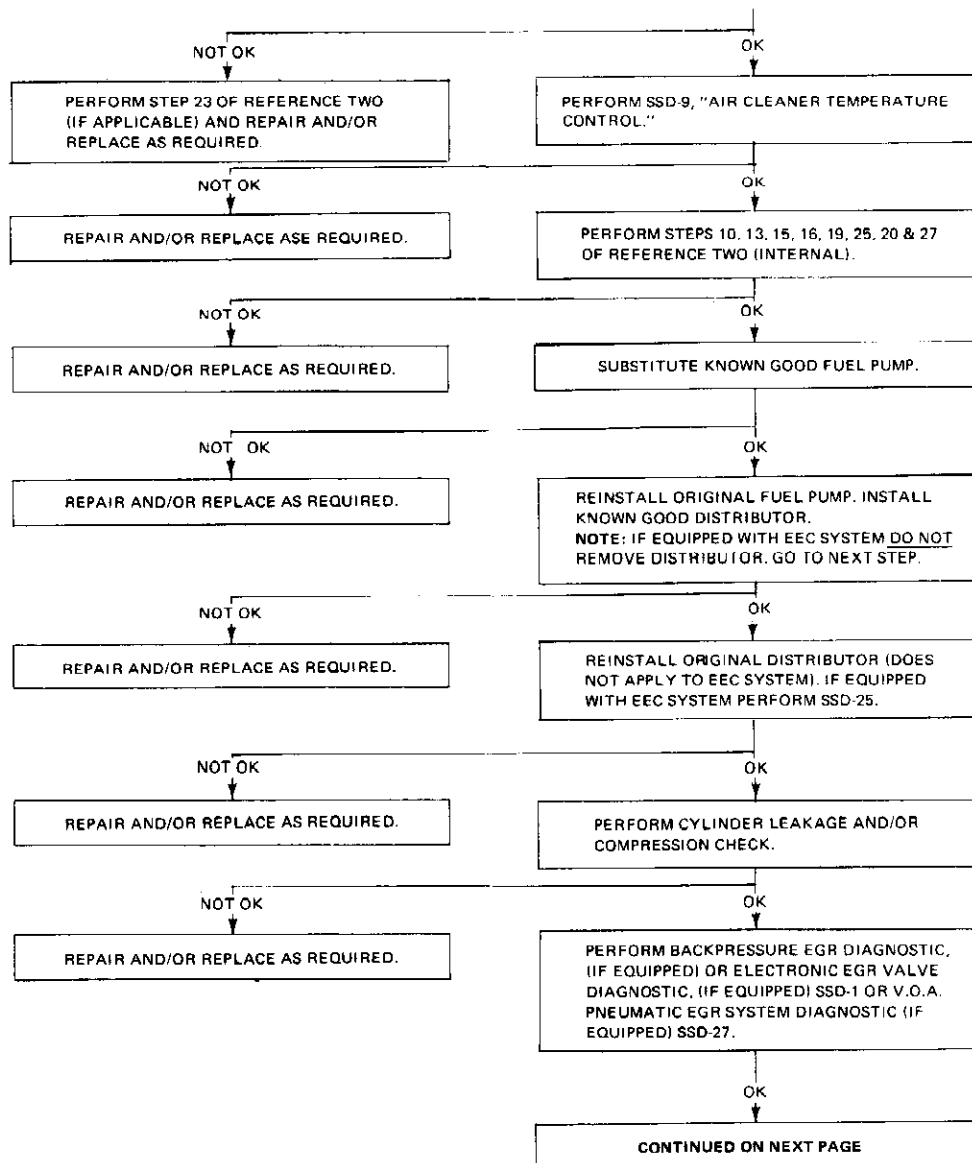
J. BUZZING OR WHISTLING DURING ENGINE OPERATION

PERFORM RADIATOR CAP FUNCTIONAL CHECK AND VERIFY PROPER CAP SEALING. IF ENGINE OVERHEATING IS INDICATED, PERFORM ROUTINE 125. CHECK FOR INTERFERENCE WITH THE FAN OR ENGINE ACCESSORY DRIVE COMPONENTS BY FOREIGN MATERIAL OR LOOSE, OR BROKEN SURROUNDING PARTS. CHECK FOR LOOSE CARBURETOR MOUNTING. CHECK FOR VACUUM LEAKS, CHECK POWER STEERING. CHECK SSD-1 EGR SYSTEM, PART V (BACK-PRESSURE EGR).

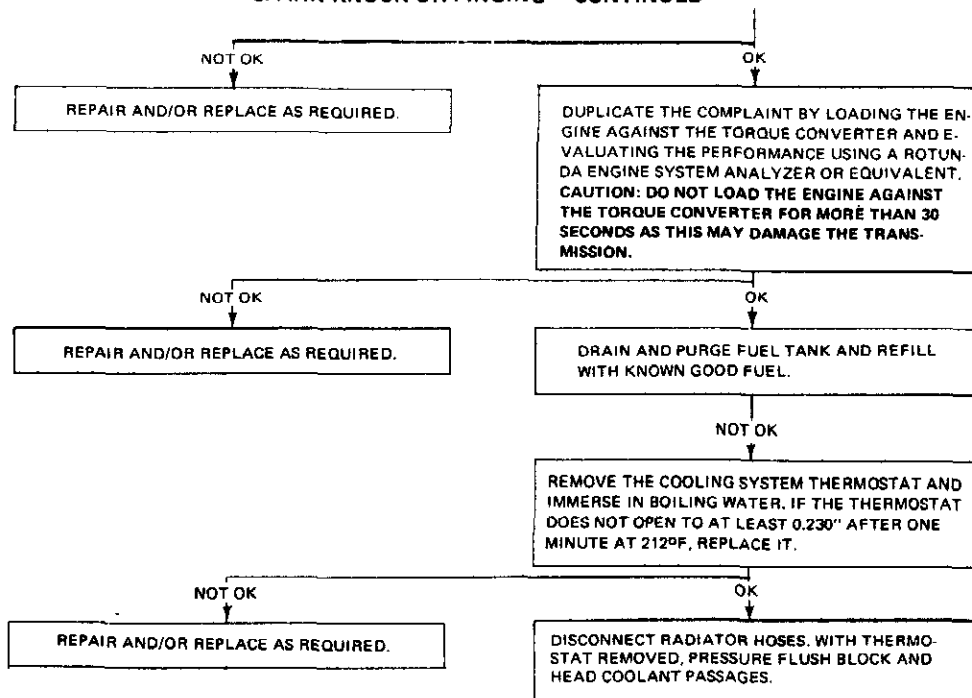
ROUTINE NO. 122A
SPARK KNOCK OR PINGING



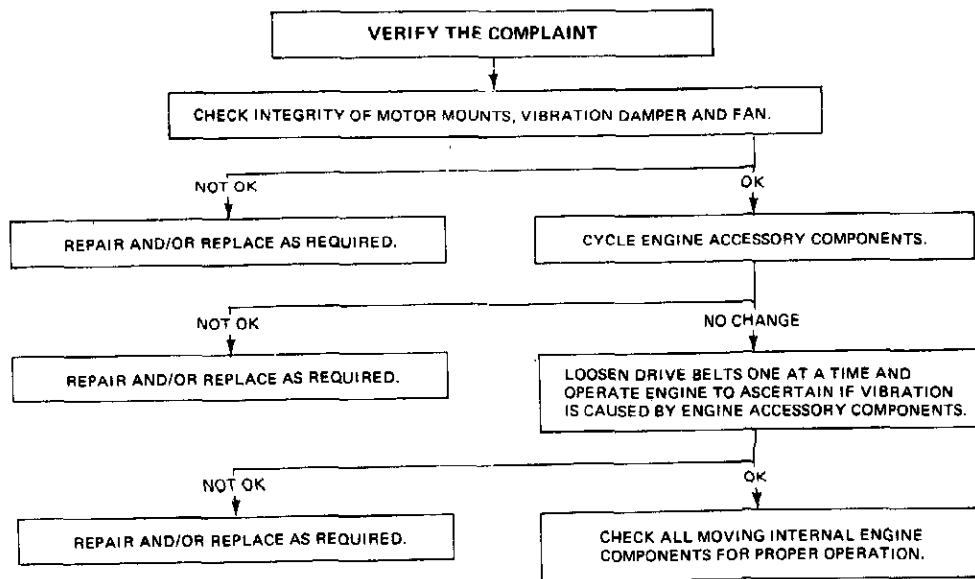
ROUTINE NO. 122A
SPARK KNOCK OR PINGING – CONTINUED



ROUTINE NO. 122A
SPARK KNOCK OR PINGING — CONTINUED

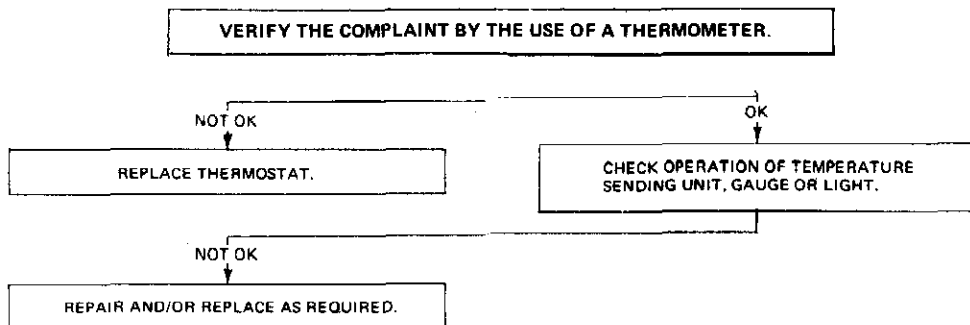


ROUTINE NO. 123
ENGINE VIBRATION

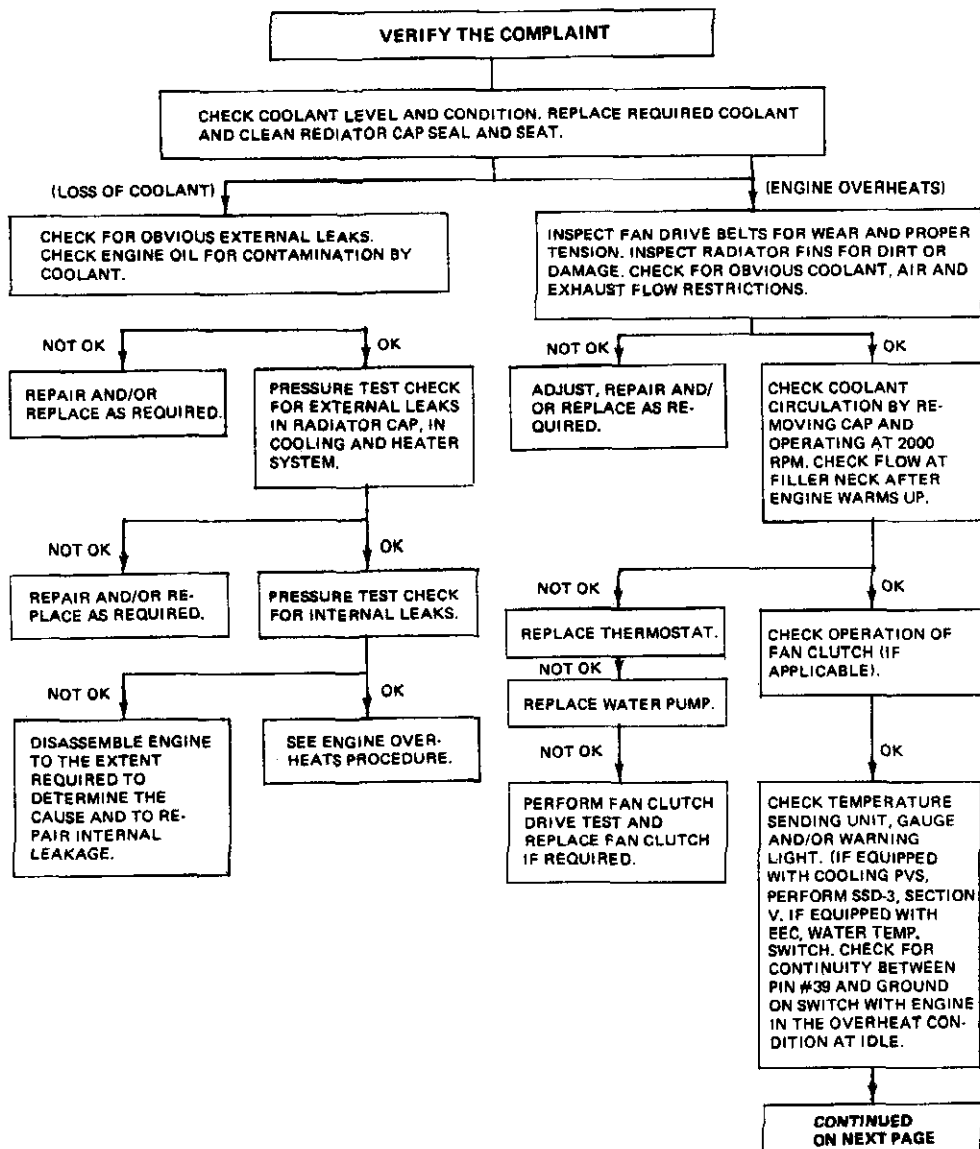


ROUTINE NO. 124

ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE

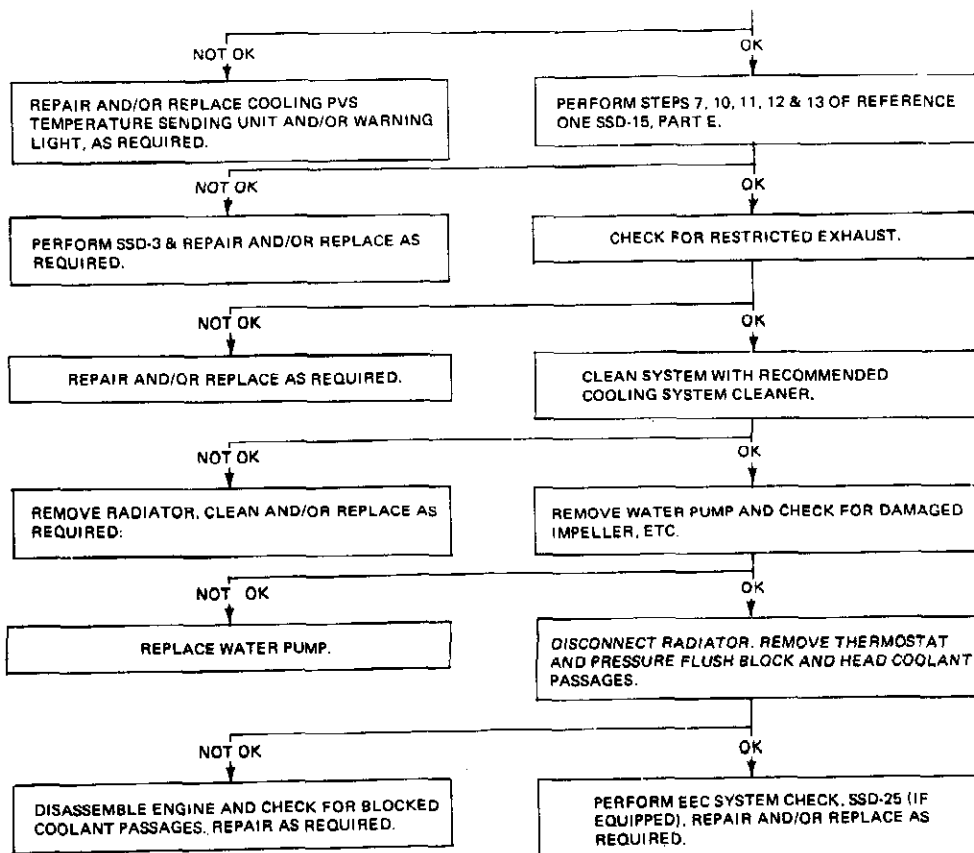


ROUTINE NO. 125
LOSS OF COOLANT OR ENGINE OVERHEATING

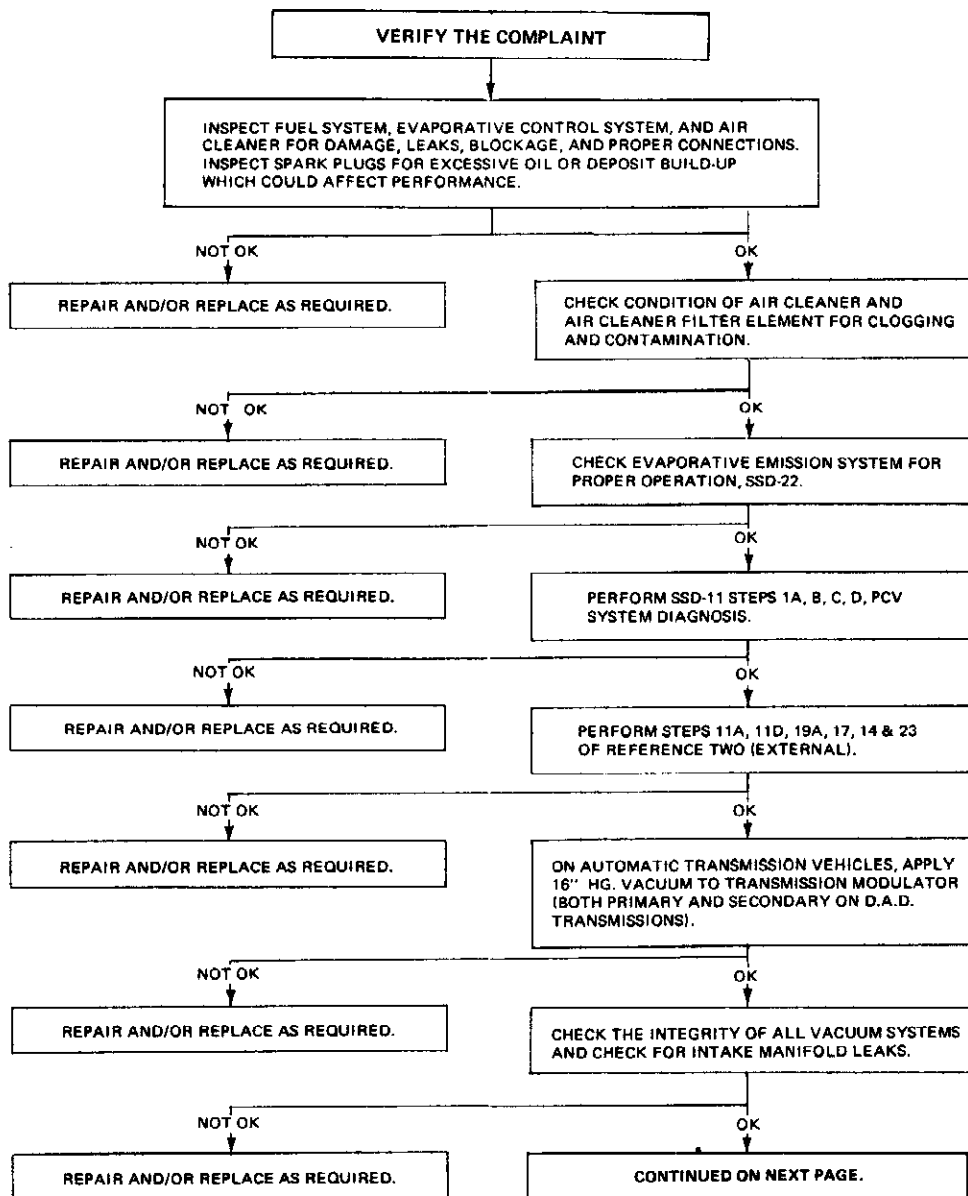


ROUTINE NO. 125

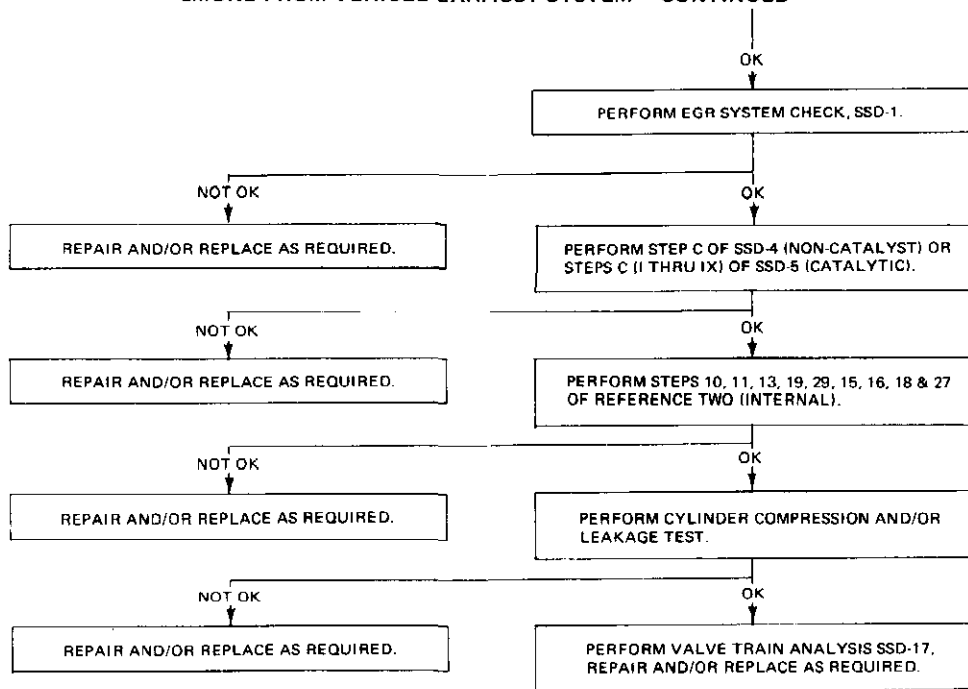
LOSS OF COOLANT OR ENGINE OVERHEATING – CONTINUED



ROUTINE NO. 126
SMOKE FROM VEHICLE EXHAUST SYSTEM

CA1382-2D¹

ROUTINE NO. 126
SMOKE FROM VEHICLE EXHAUST SYSTEM – CONTINUED



ELECTRICAL SYSTEMS DIAGNOSIS

REFERENCE ONE

1. Check battery using Rotunda tester or equivalent.
 2. Check starter draw.
 3. Check battery voltage during cranking.
 4. Check cranking speed.
 5. Check basic timing while cranking.
 6. Check spark plug firing voltage while cranking.
 7. Check low idle speed with and without TSP (SSD-26). NOTE: When idle speed is adjusted, also perform Fuel Bowl Vent Procedure SSD-16 (Except Model 4350).
 8. Check fast idle speed.
 9. Check engine idle manifold vacuum.
 10. Check basic timing — per SSD-15. (Except for EEC equipped vehicles)
 11. Check retard timing — per SSD-15. (Except for EEC equipped vehicles)
 12. Check mechanical advance — per SSD-15. (Except for EEC equipped vehicles)
 13. Check total advance at 2500 RPM — per SSD-15. (Except for EEC equipped vehicles)
 14. Check ignition coil primary voltage at 1000 RPM (measured at "Bat" terminal).
 15. Check battery voltage — 1000 RPM.
 16. Check spark plug firing voltage per SSD-14 (loaded or on quick acceleration).
 - * 17. Check compression balance 1-8 cylinders (electrical — no EGR).
 - * 18. Check ignition system coil reserve voltage — 1000 RPM, per SSD-14.
 - * 19. Check distributor rotor high voltage gap drop, per SSD-14.
 20. Check coil and spark plug wire resistance, per SSD-14.
 21. Inspect coil and spark plug wires and connections.
 22. Inspect condition of cap and rotor.
 23. Check ignition coil condition and operation, per SSD-14.
 24. Check primary wiring in ignition system, per SSD-14.
 25. Check charging rate to battery with engine operating at approximately 1000 RPM.
 26. Check spark delay valve for correct operation (SSD-2).
 27. Use auxiliary vacuum source to check integrity of vacuum advance and retard diaphragm. (Except for EEC equipped vehicles)
 28. Check distributor dwell at normal engine idle and at 2500 RPM.
 29. Check function of vacuum switch.
- * On catalyst equipped vehicles, do not perform Steps 17, 18 and 19 until vehicle passes Step 16.

REFERENCE TWO**CARBURETOR AND FUEL SYSTEM DIAGNOSIS**

TO DETERMINE THE CAUSE OF A FUEL SYSTEM COMPLAINT, USE THE APPROPRIATE COMBINATION OF THE FOLLOWING DIAGNOSIS STEPS AS OUTLINED IN THE PROBLEM DIAGNOSTIC PROCEDURES. ALL DISCREPANCIES SHOULD BE REPAIRED, ADJUSTED, CLEANED AND/OR REPLACED AS REQUIRED. IDLE MIXTURE SHOULD BE VERIFIED AND/OR ADJUSTED AFTER CARBURETOR INTERNAL REPAIRS.

1. **CHECK FUEL SUPPLY IN FUEL TANK**
 - A. CHECK FOR FUEL AVAILABILITY
 - B. CHECK FOR FUEL CONTAMINATION
 - C. CHECK FOR FUEL LEAKS IN TANK AND FUEL LINES
 - D. CHECK FOR DAMAGED PARTS IN TANK AND FUEL LINES
2. **CHECK FUEL DELIVERY TO CARBURETOR**
 - A. CHECK FOR FUEL DELIVERY TO FILTER PRIOR TO REMOVING FILTER FROM CARBURETOR.
 - B. CHECK FOR FUEL DELIVERY THROUGH FILTER(S) TO CARBURETOR (ON MODEL 1946 CARBURETORS, CARE MUST BE TAKEN TO KEEP INLET FITTING IN PLACE).
 - C. CHECK FOR FUEL PUMP LEAKS.
 - D. CHECK FOR DAMAGE, LEAKS, BLOCKAGES AND/OR PROPER CONNECTIONS.
 - E. CHECK FOR CONTAMINATION.
 - F. CHECK FOR DAMAGED PARTS.
3. **CHECK CARBURETOR VACUUM HOSES, FUEL LINES, AND PCV LINE (INCLUDING FEEDBACK VACUUM CONNECTIONS FOR THE MODEL 6500 CARBURETOR)**
 - A. CHECK FOR LEAKS
 - B. CHECK FOR DAMAGED PARTS
 - C. CHECK FOR PROPER ASSEMBLY
 - D. CHECK FOR CONTAMINATION
4. **CHECK ELECTRICAL CONNECTIONS**
 - A. CHECK FOR PROPER ASSEMBLY
 - B. CHECK FOR SHORTED CIRCUIT
 - C. CHECK FOR DAMAGED PARTS
5. **CHECK CHOKE HEAT SUPPLY SYSTEM**
 - A. CHECK FOR AIR LEAKS
 - B. CHECK FOR DAMAGED PARTS
 - C. CHECK FOR PROPER ASSEMBLY
 - D. CHECK FOR MISSING PARTS (EXTERNAL ONLY)
6. **CHECK AIR CLEANER**
 - A. CHECK FILTER ELEMENT(S) FOR CONTAMINATION
 - B. CHECK HEAT CONTROL VALVE FOR FUNCTION (SSD-9)
 - C. CHECK FOR DAMAGED PARTS
 - D. CHECK FOR PROPER ASSEMBLY
7. **CHECK THROTTLE LINKAGE AND THROTTLE PLATES**
 - A. CHECK FOR BINDING
 - B. CHECK FOR FULL TRAVEL
 - C. CHECK FOR PROPER ASSEMBLY
 - D. CHECK FOR CONTAMINATION
 - E. CHECK FOR DAMAGED PARTS

8. CHECK ENGINE SPEED ADJUSTMENTS

NOTE: ALL ENGINE SPEED ADJUSTMENTS AND CHECKS SHOULD BE PERFORMED AFTER ENGINE HAS BEEN PROPERLY WARMED AND AFTER VACUUM, IGNITION, FUEL, AND/OR MECHANICAL COMPLAINTS HAVE BEEN PROPERLY RESOLVED -- THEN FINAL ADJUSTMENTS SHOULD BE MADE ACCORDING TO SPECIFICATION.

- A. CHECK CURB IDLE SPEED. ADJUST AS NECESSARY PER SSD-26.
- B. CHECK LOW IDLE SPEED WITHOUT TSP. **NOTE:** WHEN IDLE SPEED IS ADJUSTED, ALSO PERFORM FUEL BOWL VENT PROCEDURE SSD-16 (EXCEPT MODEL 4350).
- C. CHECK FAST IDLE SPEED. ADJUST AS NECESSARY PER SSD-26.

9. CHECK SECONDARY THROTTLE LINKAGE AND CHOKE LOCKOUT LINKAGE

- A. CHECK FOR LINKAGE BINDING
- B. CHECK FOR DAMAGED PARTS
- C. CHECK FOR PROPER ASSEMBLY
- D. CHECK FOR CONTAMINATION

10. CHECK AIR VALVE PLATE, METERING NEEDLES AND/OR JETS (MODEL 4350 ONLY)

- A. CHECK FOR BINDING
- B. CHECK FOR DAMAGED PARTS
- C. CHECK FOR PROPER ASSEMBLY
- D. CHECK FOR CONTAMINATION

11. CHECK ACCELERATOR PUMP SYSTEM

- A. CHECK FOR FUEL DISCHARGE
- B. CHECK FOR BINDING
- C. CHECK FOR PROPER ADJUSTMENT (SSD-26, PAGE 3, STEP 8, FOR THE MODEL 2700)
- D. CHECK FOR FUEL LEAK
- E. CHECK FOR CONTAMINATION
- F. CHECK FOR PROPER ASSEMBLY
- G. CHECK FOR DAMAGED PARTS

12. CHECK FOR FUEL IN FUEL BOWL

- A. USE FUEL GAUGE TO CHECK FOR FUEL IN BOWL (WHEN GAUGE IS AVAILABLE) (EXCEPT MODEL 2700)
- B. CHECK FOR CONTAMINATION AND IF REQUIRED CLEAN CARBURETOR PER SSD-18
- C. DISASSEMBLE AND CHECK ITEM #13, AS REQUIRED

13. CHECK FUEL INLET SYSTEM COMPONENTS

- A. CHECK FOR CONTAMINATION AND, IF REQUIRED CLEAN CARBURETOR PER SSD-18.
- B. CHECK FOR BINDING
- C. CHECK FOR DAMAGE
- D. CHECK FOR PROPER ASSEMBLY
- E. CHECK FOR CORRECT FUEL LEVEL
- F. CHECK FOR FLOAT ALIGNMENT
- G. CHECK FLOAT FOR LEAKS
- H. CHECK NEEDLE DROP LIMITER CLEARANCE (MODEL 4350 ONLY) PER SSD-18

14. CHECK FUEL BOWL VENTS PER SSD-16

- A. CHECK FOR RESTRICTION IN CARBURETOR OR VENT LINE
- B. CHECK FOR PROPER ADJUSTMENT
- C. CHECK FOR PROPER ASSEMBLY
- D. CHECK FOR BINDING
- E. CHECK FOR SEALING (INTERNAL VENT MODEL 2700 @ IDLE) (ALSO MODELS 1946, 2150, YFA AND 4350)

15. CHECK FUEL METERING SYSTEM (IDLE AND MAIN)

- A. CHECK FOR CONTAMINATION
- B. CHECK FOR FUEL LEAKS
- C. CHECK FOR AIR LEAKS
- D. CHECK FOR RESTRICTIONS
- E. CHECK FOR PROPER ASSEMBLY
- F. CHECK FOR DAMAGED PARTS
- G. CHECK FOR PROPER IDLE FUEL MIXTURE (SSD-13)

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- 16. CHECK FUEL ENRICHMENT SYSTEM**
- A. CHECK FOR AIR LEAK
 - B. CHECK FOR FUEL LEAK
 - C. CHECK FOR RESTRICTIONS
 - D. CHECK FOR DAMAGED PARTS
 - E. CHECK FOR PROPER ASSEMBLY
 - F. CHECK FOR CONTAMINATION
 - G. CHECK FOR PROPER ALIGNMENT OF VENTURI VALVE LIMITER (MODEL 2700) – REMOVE UPPER BODY.
 - H. CHECK FOR PROPER ADJUSTMENT OF VENTURI VALVE LIMITER (MODEL 2700) – SEE PART 24 - 27 OF THIS MANUAL.
- 17. CHECK ALTITUDE COMPENSATOR**
- A. CHECK FOR BINDING
 - B. CHECK FOR AIR LEAK
 - C. CHECK FOR FUEL LEAK (MODELS 2150 AND 5200 ONLY)
 - D. CHECK FOR CONTAMINATION
 - E. CHECK FOR DAMAGED PARTS
 - F. CHECK FOR PROPER ASSEMBLY
 - G. CHECK FOR PROPER ADJUSTMENT (MODELS 4350 & 1946 CLOSED AT SEA LEVEL)
- 18. CHECK VENTURI VALVE SYSTEM (MODEL 2700)**
- A. CHECK FOR BINDING
 - B. CHECK FOR CONTAMINATION (SSD-18, APPENDIX "C")
 - C. CHECK FOR IMPROPER ASSEMBLY
 - D. CHECK FOR LEAKS (VACUUM) (SSD-19)
 - E. CHECK FOR DAMAGED PARTS
 - F. CHECK FOR VENTURI VALVE LIMITS AND ADJUST AS NECESSARY (SEE PART 24-27 OF THIS MANUAL).
- 19. CHECK FUEL PUMP FUEL DELIVERY**
- A. CHECK PRESSURE AND VOLUME WITH ORIGINAL FILTER
 - B. CHECK PRESSURE AND VOLUME WITH NEW FILTER
 - C. CHECK FOR CONTAMINATION
 - D. CHECK FOR FUEL LEAK
- 20. CHECK FUEL TANK**
- A. CHECK FOR LEAKS
 - B. CHECK FOR SOURCES WHERE DIRT OR WATER MAY ENTER
 - C. CHECK TANK FILTER AND PICK-UP FOR FUNCTION
 - D. CHECK GAS TANK CAP FOR PROPER FUNCTION
- 21. CHECK FUEL LINES FROM TANK TO PUMP**
- A. CHECK FOR CONTAMINATION
 - B. CHECK FOR KINKS OR DAMAGED PARTS
 - C. CHECK FOR LEAKS
 - D. CHECK FUEL RETURN LINE IF EQUIPPED
- 22. CHECK CHOKE SYSTEM (SSD-12)**
- A. CHECK PER SSD-12 LINKAGE SYSTEM
 - B. CHECK PER SSD-12 HEAT SYSTEM
 - C. CHECK PER SSD-12 ELECTRICAL SYSTEM (STEPS III AND IV FOR MODEL 2700)
 - D. CHECK FOR PULLDOWN (EXCEPT MODEL 2700)
 - E. CHECK FOR DECHOKE (VISUAL)
 - F. CHECK FOR CLEARANCE (EXCEPT MODEL 2700) ONLY IF A PROBLEM IS FOUND IN STEP D ABOVE
 - G. CHECK CHOKE PLATE ALIGNMENT
 - H. CHECK CHOKE CAP INDEX SETTING
 - I. CHECK FOR PROPER ASSEMBLY
 - J. CHECK FOR DAMAGED PARTS
 - K. CHECK FOR CONTAMINATION

- L. CHECK CHOKE METERING ROD INDEX (MODEL 2700 ONLY-PER CHOKE SET PROCEDURE, STEPS 1 - 5)
 - M. CHECK FAST IDLE CAM SETTING (MODEL 2700 ONLY-PER CAM SET PROCEDURE, STEPS 1 - 5)
 - N. CHECK HIGH CAM FINGER SETTING (MODEL 2700 ONLY-PER HIGH CAM FINGER SETTING PROCEDURE)
 - O. CHECK FOR CHOKE METERING ROD SEATING (MODEL 2700 ONLY-FULLY DEPRESS CHOKE METERING ROD AND CHECK FOR STICKING OR BINDING)
23. CHECK HOT IDLE COMPENSATOR
- A. CHECK FOR DAMAGED PARTS
 - B. CHECK FOR AIR LEAK
 - C. CHECK PROPER TEMPERATURE CALIBRATION (EXCEPT MODEL 4350)
 - D. CHECK FOR CONTAMINATION
 - E. CHECK FOR PROPER ASSEMBLY
 - F. CHECK FOR RESTRICTION
 - G. CHECK TO MAKE SURE THE BI-METAL STRIP IS COOL AND THAT THE COMPENSATOR PLUG IS SEATED BEFORE ATTEMPTING TO MAKE CARBURETOR IDLE ADJUSTMENT (MODEL 4350 ONLY)
24. CHECK SPARK PORT, EGR PORT AND/OR ELA VENTURI PORT
- A. CHECK FOR RESTRICTION
 - B. CHECK FOR CONTAMINATION
 - C. CHECK FOR PROPER ASSEMBLY
 - D. CHECK FOR DAMAGED PARTS
 - E. CHECK FOR AIR LEAKAGE
25. CHECK EXTERNAL GASKETS AND GASKET SURFACES
- A. CHECK FOR AIR LEAKS
 - B. CHECK FOR FUEL LEAKS
 - C. CHECK FOR PROPER ASSEMBLY
 - D. CHECK FOR DAMAGED PARTS
 - E. CHECK FOR PROPER TYPE OF GASKET
26. CHECK INTERNAL GASKETS AND GASKET SURFACES
- A. CHECK FOR AIR LEAKS
 - B. CHECK FOR FUEL LEAKS
 - C. CHECK FOR PROPER ASSEMBLY
 - D. CHECK FOR DAMAGED PARTS
 - E. CHECK FOR CONTAMINATION
 - F. CHECK FOR PROPER TYPE OF GASKET
27. CHECK DASHPOT AND BRACKET, SOLENOID OR SOLI-DASH
- A. CHECK FOR PROPER ADJUSTMENT
 - B. CHECK FOR PROPER ASSEMBLY
 - C. CHECK FOR DAMAGED PARTS
 - D. CHECK FOR CONTAMINATION
28. CHECK CRANKING SYSTEM (MODEL 2700)
- A. CHECK FOR FUEL LEAKS (SSD-19)
 - B. CHECK FOR DAMAGED PARTS
 - C. CHECK FOR ELECTRICAL CIRCUIT (SSD-12, PART IV, STEPS 3 AND 4)

DIAGNOSIS PROCEDURES (SSD's)

NOTE: For specifications not contained in the following procedures, refer to Shop Manual Parts for the individual components or systems being diagnosed or serviced, or refer to the appropriate Service or Performance Specifications Book for the

vehicle being serviced. In addition, always consult the latest bulletins and other service information for changes in procedures and/or latest specifications.

EMISSION CONTROL SYSTEM DIAGNOSIS AND SERVICE PROCEDURES	
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SSD-3 Spark Control Systems and Spark Delay Valve	02-69
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SSD-5 Thermactor System, Catalytic	02-74
SSD-6 Carburetor Icing	02-79
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SSD-11 PCV System	02-82
SSD-12 Automatic Choke	02-82
SSD-13 Idle Fuel Mixture	02-92
SSD-14 Ignition System Diagnostic	02-94
SSD-15 Ignition and Timing	02-110
SSD-16 Fuel Bowl Vent Operation	02-111
SSD-17 Valve Train Inspection	02-114
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SSD-1—EGR SYSTEM DIAGNOSIS

NOTE: The EGR delay valve diagnosis is described in SSD-2. For vehicles equipped with V.O.A. Pneumatic EGR-4.1L (250 CID) and 5.0L (302 CID) California engines—perform SSD-27.

I. Check of EGR Valve When on the Engine. (Remote Type EGR Valve)

NOTE: If the engine is equipped with an Integral Type Backpressure EGR Valve perform Step VI. If the engine is equipped with an Electronic-EGR Valve perform Step VII.

- A. Start the engine and warm it up until engine coolant temperature is above the calibrated temperature of the EGR PVS valve as indicated below according to the color code of the PVS valve:

Color Code	Temperature (°F)
Pink Top or Natural Top	Above 90°
Black Top	Above 100°
Plain Silver or Blue Top	Above 133°
Yellow Top or Gray Top	Above 155°

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- B. Check all vacuum hoses in the system to be sure they are open and not broken, split or cracked and fit snugly onto the connectors. Remove the EGR vacuum supply hose from the EGR valve, plug and hook a vacuum hose from the EGR valve to an external, gauged, variable vacuum source with increments of one in. Hg., 0.10 in. Hg. graduations and a minimum capacity of 10 in. Hg.
- C. Gradually apply vacuum to the EGR valve and simultaneously observe the movement of the EGR valve stem.
 1. With the engine at idle, the stem should visually be observed to start to move within ± 1.0 Hg of the diaphragm signal vacuum as noted for the low flow point noted on the EGR valve flow chart per the "start to open" specifications (to observe movement, mark stem).
 2. If valve does not meet "start to open" specification, replace.
 3. With the engine off, apply 8 in. Hg vacuum to the EGR valve and trap. Vacuum should remain within 1 in. Hg for a minimum of 30 seconds. Replace the EGR valve if out of specification.

4. With the engine at idle, apply vacuum to the EGR valve of at least 8 in. Hg. The valve should move to the full extent of its travel and engine should roughen, RPM should decrease and/or stop completely. If idle quality doesn't change there is no EGR flow and if the specifications of Step 3 have been met something is plugging the EGR system. Perform cleaning procedure to determine problem.
5. With the hose routings properly connected, restart the engine and stabilize temperatures. If the engine idle quality is not acceptable, the EGR valve may not be sealing properly. If this condition is encountered, install a new EGR valve and a new gasket. Adjust engine idle to specified curb idle. Recheck the idle condition of the engine. If there is no improvement in the idle quality, the problem is elsewhere. The original EGR valve should be re-installed and further engine diagnosis should be performed to determine the offending component. If there is improvement in idle quality, retain the new EGR valve on the engine.

II. To Check the Carburetor EGR Port, Perform the Following Steps:

- A. Attach a vacuum gauge directly to the EGR port on the carburetor using a suitable hose.
- B. With the engine running, open the carburetor throttle quickly and momentarily to at least the 1/2 wide open position. (Note: avoid overspeeding).
- C. Observe the vacuum gauge for a quick rise and fall as the throttle is opened and closed. (Absolute vacuum value is not a criteria). If a vacuum is evident, the EGR port is open and OK. If no vacuum is evident, the EGR port in the carburetor is plugged or restricted and should be cleaned.

III. EGR TVS-PVS Functional Check

Verify that the EGR valve, external vacuum passages, and/or solenoid valve (if equipped) are functional.

- A. Perform TVS functional check, SSD-9, Steps 13-a, b and c. (If so equipped.)
- B. **PVS with Two Connectors**
 1. Disconnect both vacuum hoses at the PVS valve. Connect vacuum gauge to either connector on the PVS. Connect manifold vacuum or auxiliary vacuum source of at least 10 in. Hg to other connector.
 2. Start engine and warm it up until engine coolant temperature is above the calibration temperature of the EGR PVS as previously indicated.
 - a. If no reading is noted on vacuum gauge—PVS has failed and should be replaced.
 - b. If vacuum is noted—PVS is OK.
- C. **PVS with Three Connectors**
 1. Disconnect EGR vacuum hose at carburetor and connect manifold vacuum or auxiliary vacuum source to hose.

2. Disconnect EGR vacuum hose at EGR valve and connect a vacuum gauge to the hose.
3. Start engine and warm it up until engine coolant temperature is above the calibration temperature of the EGR PVS as previously indicated.
 - a. If no reading is noted on vacuum gauge—PVS has failed and should be replaced.
 - b. If vacuum is noted—PVS is OK.

D. PVS with Four Connectors

1. Disconnect vacuum hoses at the PVS valve. Connect a vacuum gauge to either of the two ports marked "D" and "M". Connect a vacuum supply to the other.
2. Start engine and warm it up until engine coolant temperature is above the calibration temperature of the EGR PVS as previously indicated.
 - a. If there is no vacuum reading—that portion of the PVS is OK.
 - b. If vacuum is noted—the PVS should be replaced.
3. Connect the gauge to either one of the bottom two port marked "E" and "S" and the vacuum supply to the other.
 - a. If vacuum is noted—the PVS is OK.
 - b. If there is no vacuum reading—the PVS should be replaced.
- E. Do not go to Step IV if, at this point, the EGR system is functioning properly.

IV. Poppet and Internal Tapered Stem EGR Valve

NOTE: Sequence of maintenance can be varied to suit individual engine characteristics. Coordinate with Part V, Step F where applicable.

Procedure for cleaning and conditions for replacing EGR valve:

A. EGR Valve Removal

1. Remove the EGR valve for cleaning.

CAUTION: Do not strike or pry on the valve diaphragm housing or supports, as this may damage the valve operating mechanism and/or change the valve calibration.

2. Check orifice hole in the EGR valve body for deposits. A small hand drill may be used to clean the hole if plugged. **Extreme care** must be taken to avoid enlarging the hole, or damaging the surface.

B. If the valve is "Not Approved" to be taken apart for cleaning:

1. Prior to cleaning, if the orifice plate is less than a .450 in dia. hole, it must be removed. Caution must be used in removing the orifice to prevent deforming—use a hook type tool for removal.
2. To clean the valve seat and poppet, first apply 15 in Hg vacuum to retract the diaphragm.
3. **Preferred cleaning method**
 - a. Where facilities for blast cleaning metal parts are available, the following procedure should be followed.
 - b. Apply masking tape to diaphragm for protection.

- c. Direct the blaster stream against the valve poppet until the poppet appears free of deposits. Remove debris with shop air.

CAUTION: Do not direct blaster stream against the valve diaphragm.

- d. Clean orifice plate and counterbore in valve body. Reinstall orifice by using a small amount of contact cement to retain plate in place while assembling the valve to the carburetor spacer.

CAUTION: Apply cement only to outer edges of orifice plate to avoid restriction to orifice.

4. Alternate cleaning method

- a. The passages and cavities of the valve body can be cleaned by scraping or utilizing a short length of speedometer cable driven by a drill motor. Insert cable up into valve cavity and with slight force move cable back and forth while drill motor is in motion.
- b. To clean the valve seat and poppet, insert cable between poppet and seat. Turn on drill motor and allow cable to move around the valve seat area in a circular motion. Care should be used to avoid removal of metal and damaging valve seat or poppet.

- c. Remove all debris with shop air.

- d. Clean orifice plate and counterbore in valve body. Reinstall orifice by using a small amount of contact cement to retain plate in place while assembling the valve to the carburetor spacer.

CAUTION: Apply cement only to outer edges of orifice plate to avoid restriction to orifice.

C. If the valve is approved to be taken apart for cleaning:

1. Separate the diaphragm section from the main mounting body.
2. Clean the valve plate, stem, and the mounting plate using a small power driven rotary type wire brush taking care not to damage the parts.
3. Remove deposits between stem and valve disc by using a steel blade or steel shim (0.28 thick) in a sawing motion around the stem shoulder at both sides of the disc. The poppet must be free to wobble and move axially before re-assembly.
4. Clean the cavity and passages in the main body section with a small power driven rotary type wire brush taking care not to damage the valve seat.
5. Remove all loosened debris using shop air.
6. Re-assemble the diaphragm section on the main body using a new gasket between them. Torque the attaching screws 23-33 in-lbs.
7. Clean orifice plate and the counterbore in valve body. Re-install orifice by using a small amount of contact cement to retain plate in place while assembling the valve to carburetor spacer.

CAUTION: Apply cement only to outer edges of orifice plate to avoid restriction to orifice.

D. EGR Supply tube and spacers

1. Remove the carburetor and carburetor spacer except on engines where the valve is not mounted on the spacer.
2. Clean supply tube with a small power driven rotary type wire brush or blast cleaning equipment.
3. Clean the exhaust gas passages/cavities in the spacer using a suitable wire brush and/or scraper. The machined holes in the spacer can be cleaned by using a suitable round wire brush. Hard encrusted material should be probed loose first, then brushed out.

E. Exhaust Gas Channels

1. Clean the exhaust gas channel, where applicable, in the intake manifold using a suitable carbon scraper. Clean the exhaust gas entry port in the intake manifold by hand passing a suitable drill bit thru the holes to auger out the deposits. Do not use a wire brush.

CAUTION: The manifold riser bore(s) should be suitably plugged during the above action to prevent any of the residue from entering the induction system.

2. The 3.3L (200 CID) and 4.1L (250 CID) valve is mounted on the side of the cylinder head below the carburetor pad. After removal of the EGR valve, inspect the passages with a small light. If deposits are present in the exhaust passage (left hand side) remove with a wire brush or a suitable drill bit. The re-entry passage (right hand side) may be cleaned with a suitable drill bit hand operated. Remove all foreign particles prior to reassembly.

CAUTION: Do not allow pieces to get into right hand side. An electric drill should not be used to remove deposits.

F. EGR floor entry intake manifold maintenance

1. Remove carburetor and EGR valve.
2. Use scraper, dull drill, or other suitable means to clean EGR passages both at the EGR valve and below carburetor in the floor.

CAUTION: The manifold riser bore(s) should be suitably plugged during the above action to prevent any of the residue entering the induction system. Remove all foreign particles prior to reassembly.

3. Do not use wire bursh.

G. Check of EGR valve function when off the engine

1. After cleaning valve hook a vacuum hose from EGR valve to an externally gauged variable vacuum source with minimum 10 in. Hg capacity. Start at low vacuum (less than 2 in. Hg) and vary vacuum steadily up to 10 in. The valve stem must move smoothly without apparent sticking, binding, or chattering action. The valve should not be noisy or exhibit excessive vibration due to the above operation. If erratic motion or vibration as described above is detected—replace valve. Valve stem may cease to move above 7 in. Hg of applied vacuum—this is not cause for replacement.

Remove vacuum and using a felt tip pencil, mark stem position closest to the valve main body. Re-install valve and related components on engine using new gaskets.

V. Backpressure EGR Diagnostic Procedure (Remote EGR Valve and Transducer)

- A. Remove air cleaner assembly from carburetor to observe the EGR valve. Place air cleaner assembly in such a position so that vacuum hoses are **not** disconnected from the air cleaner TVS switch.
- B.1. **EGR Backpressure System Integrity**
Check EGR system vacuum hose routing for proper connection—refer to vacuum hose routings in emission calibrations—correct as required.
- B.2. **Check Integrity of Backpressure Transducer to Sensor Tube Joint**
The brazed joint between the EGR transducer and the steel exhaust pressure sensing tube should be rigid. If this brazed joint has separated (as indicated by relative movement of the pressure sensing tube within the flared opening on the transducer body), replace the EGR backpressure transducer.
- C. **Backpressure Transducer Leak Check** (NOTE: Transducer and sensor tube must not be hot for this step. If transducer assembly is hot to the touch, use shop air or freon to cool.)
 - C.1. Disconnect vacuum source to EGR backpressure transducer diaphragm and plug with golf tee or other suitable plug.
 - C.2. Start the engine—immediately place the throttle on high cam (1500-2000 rpm). Using leak check or leak detector fluid, coat the sensor tube joint at the transducer.
 - C.3. Check for evidence of exhaust gas leakage (bubbles from detector fluid) at the sensor tube joint. If bubbles are evident, replace the EGR backpressure transducer.
 - C.4. If Step 3 was satisfactory, firmly grasp the transducer and attempt to wiggle the transducer in several directions (do not use excessive force, to avoid bending the tube or bracket). Add more leak check or detector fluid if necessary. If bubbles appear at the sensor tube-to-transducer joint or along the sensor tube, replace the EGR backpressure transducer.
- D. **EGR System Function Check**
 - D.1. Reconnect the vacuum source to the EGR backpressure transducer diaphragm.
 - D.2. Warm up engine to normal operating temperature.
 - D.3. **With Transmission in Neutral**
 - a. While slowly opening and closing the throttle, the EGR valve stem must move upward, appear to oscillate, and move downward to the closed position when the engine returns to idle.
CAUTION: Do not exceed 1/2 throttle or 2500 rpm.
If engine performance seems rough, proceed to check EGR system with engine under load.
If the valve stem moves or operates properly

and the engine shows very little roughness and variation in speed during this test sequence—the EGR system is functioning properly. Discontinue diagnostic procedure.

- b. If the EGR valve does not appear to operate properly; i.e., valve appears to move near full stroke (approx. 0.4 in.), does not have noticeable oscillation and the engine does not have exceptional roughness, proceed to check EGR system with engine under load.
 - c. When a vehicle has a severe drive problem which appears at throttle tip in/driveaway (i.e. severe stumble or surge during driveaway or tip in) the EGR system must always be checked under load in sequence with Steps D-3a and D-3b.
- D.4. **With Transmission in Drive**
NOTE: Throttle positions for the following tests must be equal to or greater than those used in D-3a to assure similar EGR valve motion and also exposure of the carburetor EGR vacuum supply port.
- a. Properly brake vehicle. Apply throttle slightly and hold constant.
CAUTION: Do not exceed 1250 rpm.
If the engine begins to roll and surge excessively—replace the EGR backpressure transducer.
 - b. Vehicles equipped with manual transmission must be tested in third gear with rear wheels free of the ground and engine load created by applying the foot brake. Apply throttle slightly and foot brake simultaneously to create engine load—do not stall engine with brake load.
CAUTION: Do not exceed 2000 rpm.
If engine begins to roll and surge excessively—replace the EGR backpressure transducer.
- E.1. If the EGR valve stem does not move and/or oscillate properly (as described in Step D), disconnect the transducer vacuum supply hose at the TVS or PVS nipple and connect a vacuum gauge to the TVS or PVS nipple. Slowly open and close throttle (as in Step D) and observe vacuum signal in gauge:
- a. If vacuum signal is less than 4.0 in. Hg., check EGR PVS (SSD-1, Part III) or air cleaner TVS switch (SSD-5, Part C). Also check EGR port on carburetor per SSD-1, Part II.
 - b. If vacuum signal is 4.0 in. Hg. or greater, the problem is associated with the backpressure transducer or the EGR valve. Check EGR valve system and backpressure transducer as follows:
- F.1. Check EGR valve on engine per SSD-1, Parts B and C, Steps 1 thru 4.
- a. If EGR valve functions as described above, remove EGR valve and transducer and inspect passages in EGR spacer, EGR valve and transducer for deposits or loose particles.
 - b. If EGR valve, spacer and transducer cavities are free of deposits or loose particles, replace transducer with new part and verify backpressure functioning according to Step D. If EGR valve functions properly, leave new part on. Otherwise, replace with original part.

F.2. If the EGR valve, spacer and transducer have deposits, clean EGR valve and spacer per SSD-1, Part IV. Also clean backpressure pick-up in control chambers with small wire brush or scraper.
CAUTION: Do not use liquid solvents or compressed air on transducer.

F.3. If any repairs were made in Step F, verify backpressure functioning according to Step D. If the EGR valve does not move and/or oscillate, replace backpressure transducer.

VI. Backpressure EGR Transducer Procedure (Integral Type Backpressure EGR Valve)

- A. Remove air cleaner assembly from carburetor, if required, to observe EGR valve. Place air cleaner assembly in such a position so that vacuum hoses are not disconnected from the air cleaner TVS switch.
- B. Inspect EGR system vacuum routing for proper connections—refer to emissions calibrations publications. Check vacuum supply to valve per SSD-1, Part II and III.
- C. Inspect integral EGR valve assembly for loose or broken support brackets, loose or broken diaphragm vacuum nipple, and exhaust blowouts at base to upper cover gasket or base to carburetor spacer gasket. (Replace valve or spacer gasket as necessary.)

D. EGR system function check

D.1. Warm up engine to normal operating temperature.

- D.2. a. With the engine in neutral, slowly open and close the throttle. Observe the EGR valve stem or underside of the diaphragm to which the valve stem is attached. The stem and diaphragm must move upward, appear to oscillate, and move downward to closed position when the engine returns to idle.
- b. If unable to detect if valve strokes and oscillates Step D.2.(a), open throttle to 2000 to 2500 rpm and hold at a steady speed. Then remove and pinch off vacuum hose. With vacuum hose disconnected, engine speed should increase significantly (at least 50 rpm increase).

CAUTION: Do not exceed 1/2 throttle or 2500 rpm in Step D.2.

- c. If valve operates properly in Step D.2.(a), i.e. valve moves and oscillates, or in Step D.2.(b) (idle speed increases), the EGR system is functioning properly. Discontinue diagnostic procedure.
- d. If engine does not appear to operate properly in Steps D.2.(a) or D.2.(b) (has exceptional roughness or stalls), make the following check. At normal idle speed, remove the vacuum hose to the EGR valve and cap this hose. Connect another hose between the EGR valve and a manifold vacuum source.
If the idle speed drops significantly or the engine begins to run exceptionally rough or stalls with the hose from the manifold vacuum supply to the valve, replace the EGR valve.
- e. On engines with an external exhaust gas

supply tube, improper EGR valve seating can be determined by evaluation without EGR gas flow:

- (1) Remove the EGR gas supply tube. Apply appropriate plugs at both exhaust and intake fittings. Plugs at the EGR intake fitting must be air tight.
- (2) Remove the vacuum line from the EGR valve nipple and apply an appropriate cap on the EGR vacuum hose.
- (3) Warm the engine to normal operating temperature and evaluate the idle. The engine should idle smoothly and normally.
 - (a) If the engine idle has not improved, check for leakage at the EGR spacer or gaskets. Repair and/or replace as required. Remove the carburetor, EGR spacer and related gaskets and inspect the spacer and gaskets for cracks and/or porosity. Repair and/or replace as required. Reassemble the components removed and check the engine idle quality. If the engine now idles smoothly and normally, discontinue the diagnostic procedure. If not, go to the next step in the Routine.

(b) If the idle has improved, remove the carburetor, EGR spacer and related gaskets and inspect the spacer and gaskets for cracks and/or porosity.

1. If OK, reinstall the components removed (leaving the EGR tube disconnected) and go to Step (c).

2. If not OK, repair and/or replace parts as required. Reassemble the components removed (including the EGR supply tube) and check the engine idle quality. If the engine now idles smoothly and normally, discontinue the diagnostic procedure. If not, go to Step (c).

(c) Install a slave EGR valve (EGR tube connected) and evaluate its operation by removing the vacuum hose to the slave EGR valve and capping this hose and connecting another hose between the EGR valve and a manifold vacuum source. If the idle speed drops significantly or the engine begins to run exceptionally rough or stalls with the hose from the manifold vacuum supply to the valve, replace the slave EGR valve with another and repeat. If the slave valve is OK, disconnect the manifold vacuum hose, reinstall the EGR vacuum signal hose and reevaluate the engine idle quality. If the idle does not improve with the slave EGR valve, reinstall the original valve and go to the next step in the Diagnostic Routine. If the engine now idles smoothly and normally, discontinue the Diagnostic Procedure.

VII. Electronic EGR Valve Diagnostic Procedure

A. EGR Valve Position Check

1. Verify that the ignition key is "OFF" and then disconnect the electrical harness from the EGR valve position sensor.

2. Using an ohmmeter, measure the following resistances on the EGR valve connector (see Fig. 35).

- a. Pin A to pin C should be 3000 to 5000 ohms.
- b. Pin B to pin C should be 400 to 825 ohms.

3. If both resistance readings are OK, proceed to Step VII-B.
4. If either resistance reading is out of tolerance, replace the EGR valve and repeat test VII-A.

B. Cold Engine EGR Valve Check

1. Verify that the intake manifold temperature is less than 90°F (should feel cool to the touch).
2. Disconnect the EGR pressure line at the EGR valve and connect a pressure gage to the line.
3. Connect a tachometer to the engine.
4. Block the vehicle front wheels and apply the parking brake.
5. Remove the vacuum supply hose from the top of thermactor air bypass valve and connect a hose from a hand operated vacuum pump (21-0014 or equivalent); apply 8-10" HG vacuum to the bypass valve. Start the engine, place the transmission selector in neutral or park and bring the engine speed to 1000 RPM and hold for 5 seconds; note the reading on the pressure gage.
6. If the pressure is less than 0.5 psig, proceed to Step VII-C.
7. If the pressure is greater than 0.5 psig, proceed to SSD-25.

C. Warm Engine EGR Valve Check

1. Warm the engine to normal operating temperature with the transmission in neutral or park and the parking brake set.
2. Connect an appropriate diameter hose to the EGR valve pressure fitting and tee-in an 0-15 psi pressure gage to the other end of the hose. Attach, via an appropriate hose, a hand operated pressure pump to the remaining nipple on the tee fitting (use Tool 21-0012 or equivalent with the hose connected to the **pressure** output side, i.e., upper fitting). With the engine idling in neutral, apply 1.5-2.0 psi to the EGR valve (note, **do not exceed 3.0 psi pressure**). If the engine stalls, proceed to Step 5. If the engine does **not** stall, proceed to Step 3.
3. Remove the EGR valve. Using the same pressure hose routing as in Step 2, slowly apply pressure to the EGR valve and observe the movement of the EGR valve pintle (**NOTE—do not exceed 3.0 psi pressure**). The valve pintle should be fully retracted (approx. 0.4 in of travel) at 2.5 psi. Remove pressure line from valve and observe pintle movement; the pintle should return to the fully extended position. If the valve pintle does not retract fully and/or does not return to the fully extended position, replace the EGR valve and repeat this procedure. If the valve operates as described, proceed to Step 4.
4. With the EGR valve removed, start the engine and let idle in neutral or park. Exhaust gasses

should be observed coming from the open end of the EGR cooler outlet tube. If gasses are not observed, inspect EGR passages per SSD-1, Step E 3. If gasses are observed, inspect EGR spacer per SSD-1, Step D. After completion of this procedure, reinstall EGR valve and repeat Step 2.

5. Remove thermactor air pressure line from the EGR pressure solenoid and install 0-15 psi pressure gage in end of line. Remove the thermactor air hose from the **outlet** of the thermactor air bypass valve and install a thermactor pump pressure gage (Tool T75L-9486-A or equivalent) to the outlet using a short length of appropriate diameter hose. Remove the vacuum control supply hose from the top of the air bypass valve and connect a hose from a hand operated vacuum pump (Tool 21-0014 or equivalent) and apply 8-10 in Hg **vacuum** to the bypass valve. Start engine and increase speed to 1000 rpm in neutral or park. Observe pressure at both gages; pressure must be 2.25 psi minimum. If the pressure at both gages is less than 2.25 psi, the thermactor air pump or air bypass valve are malfunctioning; proceed to SSD-5 (upon completion of SSD-5, repeat this procedure). If the thermactor air pump pressure meets specification, but the EGR air pressure does not, reinstall the EGR pressure gage ahead of the pressure line air filter and repeat procedure. If EGR pressure now meets specification, repair or replace air filter, and repeat original procedure. When both pressures meet specifications, proceed to Step 6.
6. Make sure that the air cleaner is properly installed on the engine; check all vacuum hoses and fittings for the thermactor air bypass valve vacuum control system. Repair or replace hoses and/or fittings if required. Reconnect the vacuum control system hose to the top of the air bypass valve. Start the engine and warm to normal operating temperature in neutral or park. With the front wheels blocked and the parking brake on, increase engine speed to 1300 rpm with the transmission in drive. Observe the pressure at both test gages; the pressure at both gages should be 2.25 psi minimum. If both pressures meet specification, proceed to Step 7. If pressures do not meet specification, check the thermactor air bypass valve vacuum control system by proceeding to SSD-5, Steps C(v), C(vi), C(vii), C(xi), C(xii), C(xiii), and C(xiv). Repeat this procedure upon completion of these steps.
7. If the vehicle is still not OK after completion of Steps 1-6, proceed to SSD-25.

VIII. EGR Vacuum Load Control Valve Diagnostic Procedure

- A. Remove air cleaner assembly from carburetor to observe the EGR valve. Place air cleaner assembly in such a position so that vacuum hoses are not disconnected from the air cleaner TVS switch.
- B. Check EGR system vacuum hose routing for

proper connection—refer to emissions calibrations publications.

- C. Warm up engine to normal operating temperature and connect tachometer.
- D. While slowly opening and closing the throttle, the EGR valve stem must move upward and/or oscillate and move downward to the closed position when the throttle is released to the idle position.

CAUTION: Do not exceed 1/2 throttle or 3000 rpm when opening or closing throttle.

If the EGR valve stem moves and/or oscillates properly, the EGR system is functioning satisfactorily. Discontinue diagnostic procedure.

- E. If the EGR valve stem does not move and/or oscillate properly (as described in Step D), disconnect the vacuum supply hose between the EGR vacuum load control valve and the TVS, at the vacuum load control valve, and connect a vacuum gage to the hose. Raise engine speed to 1200-1500 rpm in neutral and observe vacuum signal:
 1. If vacuum signal is less than 4.0 in. Hg, proceed as follows:
 - a. Perform EGR PVS procedure SSD-1, Part III.
 - b. Perform air cleaner TVS switch procedure SSD-9, Part II.
 - c. Perform either EGR port on carburetor procedure SSD-1, Part II, or spark port on carburetor, Reference Two, Part 25, depending on the vacuum source to the load control valve.
 2. If vacuum signal is 4.0 in. Hg or greater, remove the gage, reinstall the vacuum hose on the EGR vacuum load control valve and proceed as follows:
- F. Remove the vacuum hose between the EGR vacuum load control valve and the EGR backpressure transducer at the vacuum load control valve and connect a vacuum gage to the vacuum load control valve port.
 1. Remove the hose from the venturi port on the carburetor to the vacuum load control valve at the valve.
 2. Raise the engine idle speed to 1200-1500 rpm in neutral and observe vacuum signal.
 - a. If vacuum signal is less than 4.0 in. Hg, replace the EGR vacuum load control valve.
 - b. If vacuum signal is 4.0 inches of Hg or greater, apply one of the following vacuum levels, from an external source, to the venturi port of the load control valve, and observe the first gage signal:

Decal Color of EGR Vacuum Load Control Valve	Vacuum Level (inches of Hg) Applied to Venturi Port
Blue	3.0
Red	4.5

If the gage signal does not drop to less than 2.0 in. Hg, replace the load control valve. If the gage signal drops to less than 2.0 in. of Hg and does not return to greater than 4.0 in. of Hg when the external source vacuum is removed from the venturi port, replace the load control valve.

SSD-2—SPARK DELAY VALVE

To determine if a delay valve is operating correctly, use the following procedure:

EQUIPMENT REQUIRED

- A. Vacuum gauge—USG Model 12121-1, 2" dia., 0-30" Hg vacuum gauge or equivalent with 0.2" OD vacuum hose nipple adaptor and 24" of 5/32" ID distributor vacuum hose or equivalent.
- B. Stop watch or wrist watch with a sweep second hand.
- C. External vacuum source capable of maintaining a constant vacuum (10" Hg minimum).

PROCEDURE

I. Mono Delay Valve

- 1.(a) Set external vacuum source to 10" Hg.
 - (b) Connect black side of delay valve to vacuum source.
 - (c) Connect the 24" section of vacuum hose to gauge and to colored side of delay valve.
 - (d) Apply vacuum and observe time in seconds for gauge to read from 0" to 8" Hg with a constant 10" Hg vacuum source.
2. The minimum and maximum time for the valve to reach 8" Hg should be as follows:

Color	I.D. No.	Time in Seconds	
		Minimum	Maximum
Black and Gray	1	0.6	1.6
Black and Brown	2	1.0	3.0
Black and White	5	2.7	9.3
Black and Yellow	10	4.5	13.2
Black and Blue	15	6.8	18.8
Black and Green	20	8.0	26.0
Black and Orange	30	11.6	38.0
Black and Red	40	14.0	47.2

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When checking the delay valve, care must be exercised to prevent oil or dirt from getting into the valve as this will impair the functioning.

3. Replace the delay valve if the above test showed it to be out of specification. Otherwise, re-install delay valve to its original position.

II. Retard Delay Valve

- 1.(a) Set external vacuum source to 10" Hg.
 - (b) Connect colored side of delay valve to vacuum source.
 - (c) Connect the 24" section of vacuum hose to a gauge and to the white side of delay valve.

- (d) Apply vacuum and observe time in seconds for the gauge to read from 0" to 8" while applying a constant 10" Hg vacuum.
2. The minimum and maximum time for the valve to reach 8" Hg should be as follows:

Color Code	I.D. No.	Time in Seconds	
		Minimum	Maximum
White/Pink	5	2.7	9.3
White/Brown	2	1.0	3.0
White/Green	20	8.0	26.0
White/Yellow	10	4.5	13.2

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When checking the delay valve, care must be exercised to prevent oil or dirt from getting into the valve as this will impair the functioning.

3. Replace the delay valve if the above test showed it to be out of specification. Otherwise, re-install delay valve to its original position.

III. Air Cleaner Delay Valve

Procedure:

- 1.a) Set external vacuum source to 10" Hg.
- b) Connect colored side of delay valve to vacuum source. Note: 0.20" OD to 0.27" OD adaptor may be required to connect colored side of valve to vacuum source.
- c) Connect the 24" section of vacuum hose to gauge and to white side of delay valve.
- d) Apply vacuum and observe time in seconds for gauge to read from 0" to 8" Hg with a constant 10" Hg vacuum source.
2. The minimum and maximum time for the valve to reach 8" Hg should be as follows:

Color Code	I.D. No.	Time in Seconds	
		Minimum	Maximum
White/Red	40	14.0	47.2
White/Blue	20	8.0	26.0

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When checking the delay valve, care must be exercised to prevent oil or dirt from getting into the valve as this will impair its function.

3. Replace the delay valve if the above test showed it to be out of specification. Otherwise, re-install delay valve in its original position.

V. Distributor Vacuum Vent Valve

Procedure:

- 1.a) Set an external vacuum source to 10 inches Hg.
- b) Connect the "VAC" side (side with code number) of the vacuum vent valve to vacuum source.

- c) Connect a 24 inch section of vacuum hose to a gage and to the other side of the vacuum vent valve.
- d) Apply vacuum and observe time in seconds for the gage to read from 0 inches Hg to 8 inches Hg while applying a constant 10 inches Hg vacuum.

2. The minimum and maximum time for the valve to reach 8 inches of Hg vacuum should be as follows:

Code No.	Time in Seconds	
	Minimum	Maximum
20	16	36.8
40	28	67.6

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When checking the vacuum vent valve, care must be exercised to prevent oil or dirt from getting into the valve, as this will impair its function.

3. Replace the vacuum vent valve if the above test showed it to be out of specification. Otherwise, re-install valve to its original position.

SSD-3—SPARK CONTROL SYSTEMS AND SPARK DELAY VALVE

NOTE: Does not apply to vehicles equipped with Electronic Engine Control.

I. NON-THERMAL CONTROL SYSTEM

- (1) Remove air cleaner. Remove SDV if so equipped and check per the delay valve procedure (SSD-2). Install a connector in place of the SDV in order to carry out system checks.
- (2) Install "T" fitting and vacuum gauge at distributor.
- (3) With engine at normal operating temperature and with transmission in neutral, momentarily open throttle (1/2 open).
- (4) Observe the vacuum gauge for a quick rise and fall as the throttle is opened and closed. If a vacuum is evident the system is OK. If no vacuum is evident check the vacuum lines, evaporative canister purge valve "T" (if applicable) and port in carburetor for plugging. Correct if necessary.
- (5) For vehicles with a Cooling PVS check vacuum reading at distributor at normal idle and engine operating temperature. If vacuum reading is 2 in. Hg or less the PVS is OK. If vacuum reading is greater than 2 in. Hg remove the top vacuum line (the line that goes to the carburetor) at PVS. If vacuum reading is still greater than 2 in. Hg, PVS is leaking and should be replaced.
- (6) Remove the vacuum gauge, "T" fitting, connector (where used), re-install SDV (where used), and re-connect all vacuum lines.
- (7) Re-install air cleaner and torque wing nut to specifications.

II. COLD LOCK-OUT SPARK SYSTEM

- (1) Remove air cleaner. Remove SDV if so equipped and check per delay valve procedure (SSD-2).

Install a connector in place of SDV for system checks.

- (2) Install "T" fitting and vacuum gauge in primary side of distributor.
- (3) With engine at normal operating temperature and transmission in neutral, momentarily open throttle (1/2 open).
- (4) Observe the vacuum gauge for a quick rise and fall as the throttle is opened and closed. If a vacuum is evident, the system is OK. If no vacuum is evident check the vacuum lines, evaporative canister purge valve, "T" (if applicable), cold lock-out PVS, and the carburetor port for plugging. Correct if necessary.
- (5) Remove vacuum gauge, "T" fitting, connector (if used) and install SDV (if used) and reconnect all vacuum lines.
- (6) Re-install air cleaner and torque wing nut to specification.

III. COLD START SPARK ADVANCE SYSTEM

NOTE: Perform Steps 1 thru 5 only if engine complaint is spark knock or pinging.

CAUTION: Do not leave transmission in drive during Steps 2 and 4 for longer than 15 seconds.

1. Connect a tachometer to the engine and start the engine.
2. With brake pedal depressed and transmission in drive (see Caution), accelerate engine and record rpm at which spark knock or pinging occurs.
3. To allow transmission to cool, put engine in neutral and accelerate to 1500 rpm three times for 15-30 seconds each time.
4. Remove vacuum advance line from distributor and plug. Restart engine and repeat Step 2 (see Caution above) to recorded rpm.
5. If spark knock or pinging reoccurred with vacuum advance line disconnected, stop engine and proceed to next step. If spark knock or pinging did not reoccur, the system has a CSSA PVS and/or retard delay valve or check valve (if so equipped) that is not operating properly. Repair and/or replace as required.
6. Remove air cleaner. Remove SDV if so equipped and check per delay valve procedure (SSD-2). Install connector in place of SDV. Remove vacuum check valve or retard delay valve (if so equipped) and check per vacuum check valve or retard delay valve procedure. Install connector in place of check valve or retard delay valve.
7. Install "T" fitting and vacuum gauge at distributor primary.
8. Remove vacuum line from bottom port of Cold Start PVS and cap.
9. With engine at normal operating temperature and at idle the vacuum reading should be zero. If vacuum is not zero, the Cold Start PVS should be replaced.
10. Remove cap and reconnect the removed line to the bottom port of the Cold-Start PVS.
11. Remove vacuum line from top port of Cold-Start PVS and plug.

12. For vehicles with a Cooling PVS check vacuum reading at distributor at normal idle. If vacuum reading is 2 in. Hg or less the Cooling PVS is OK. If vacuum reading is greater than 2 in. Hg remove the top vacuum line (the line that goes to the carburetor) at Cooling PVS and plug. If vacuum reading is still greater than 2 in. Hg Cooling PVS is leaking and should be replaced.
13. With engine running and transmission in neutral momentarily open the throttle (1/2 open).
14. Observe vacuum gauge for a quick rise and fall as the throttle is opened and closed. If vacuum is evident the spark advance system is OK. If no vacuum is evident, check the vacuum lines, evaporative canister purge valve, "T" (if applicable), ports in the cooling and cold-start PVS's and port in the carburetor for plugging. Correct if necessary.
15. Remove "T" fitting, vacuum gauge, plug and connectors. Install SDV and check valve or retard delay valve (if used) and reconnect all vacuum lines.
16. Re-install air cleaner and torque wing nut to specifications.

IV. DISTRIBUTOR VACUUM ALTITUDE COMPENSATOR VALVE

1. Attach a vacuum source to the large nipple end.
2. Attach a vacuum gauge to the small nipple end. If the drive complaint occurs at high altitudes:
 - a. Supply 10 in. Hg vacuum at 4000 ft altitude or higher.
 - b. The output reading should be 10 in. Hg. If not, replace the valve.
 If the drive complaint occurs at low altitudes:
 - a. Supply 10 in. Hg vacuum at 1500 ft. altitude or lower.
 - b. The output reading should be less than 10 in Hg but greater than 6 in. Hg. If not, replace the valve.

IV. DELAY VALVE BYPASS SYSTEM (PVS OPERATED)

1. Remove air cleaner.
2. Remove SDV and check per Delay Valve Procedure SSD-2. Install a connector in place of SDV. Remove vacuum line at distributor and install a T-fitting and vacuum gauge.
3. With engine idling at normal operating temperature and with transmission in neutral, momentarily open throttle (1/3 open).
4. Observe the vacuum gauge for a quick rise and fall as the throttle is opened and closed. If a vacuum is evident, the system is OK. If no vacuum is evident, check the vacuum lines, evaporative canister purge valve, "T" (if applicable) and port in the carburetor for plugging. Correct if necessary.
5. Shut engine off.
6. Remove vacuum gauge, "T" fitting, and connector. Reinstall SDV and reconnect vacuum hoses.
7. Remove vacuum check valve and check per Vacuum Check Valve Check Procedure.

8. Reinstall check valve in hose to distributor.
9. Install connector and vacuum gauge in vacuum hose from PVS to check valve.
10. With engine running at normal operating temperature and transmission in neutral, momentarily open throttle (1/2 open).
11. Observe the vacuum gauge for evidence of vacuum. If vacuum reading is two inches Hg or less, PVS is OK. If vacuum reading is greater than two inches Hg the PVS should be replaced.
12. Remove vacuum gauge, connector and plugs (where used), reinstall check valve and reconnect all vacuum hoses.
13. Reinstall air cleaner and torque to specifications.

V. "COOLING PVS OPERATION CHECK"

1. Check all vacuum hose routings and connections. If incorrect or loose, reroute hoses correctly. Replace any broken, split or cracked hose and secure loose connections. Recheck complaint.
2. Disconnect vacuum line leading from distributor at port "D" (center port) of the PVS valve. Connect suitable vacuum gauge and vacuum hose to port "D" of PVS valve in line with the port. Leave other vacuum lines connected to the valve.
3. Remove backing from Tempilabel or equivalent, exposing adhesive surface and press firmly onto thermostat housing or intake manifold surface in close proximity to the cooling PVS valve where it can easily be seen. Use Tempilabel new series temperature monitor part or equivalent rated at 235°F. Mounting surface should be cleaned of all dirt, oil and foreign matter using a suitable solvent and wiping dry with a clean dry cloth.
4. Restrict the incoming air to the radiator by placing a piece of cardboard in front of the radiator.
5. Idle vehicle to heat up the cooling system. Monitor the vacuum gauge attached to the PVS cooling valve for an increase in vacuum before the silver colored Tempilabel or equivalent turns black (color change indicates 235°F temperature has been reached). If the vacuum fails to increase before indicator changes color, replace PVS valve if vacuum gauge shows a definite increase in vacuum before the color change, PVS valve is considered good.
6. A Tempilabel or equivalent of 240°F may be used if the 235°F label is not readily available.

VI VACUUM CHECK VALVE OPERATION

1. For checking function:
 - (a) Set vacuum source at 5 in. Hg.
 - (b) Apply vacuum to the check side of the check valve and trap. After 30 seconds the vacuum should not be less than 4 in. Hg. If it is, replace the valve.
2. For flowing function:
 - (a) Set vacuum source at 5 in. Hg.
 - (b) Connect gauge to check side (same side source was connected to in (1)).

- (c) Apply vacuum to opposite side used in (1). Reading on gauge should be same as source. If it is not, replace the valve.

SSD-4—THERMACTOR NON-CATALYTIC CONVERTER EMISSION SYSTEM CHECK

The thermactor non-catalyst system consists of the following major components:

- Belt-driven air pump supply pump
- Air Bypass Valve
- Check Valve(s)
- Internal or external air manifold(s)
- Air supply tubes
- Crossover tube to connect RH and LH air manifolds (internal system only)

PROCEDURE:

A. Air Pump Supply Test

1. Remove air cleaner.
2. Inspect all hoses and hose connections in the system for any abnormal conditions and correct and/or repair and/or replace as necessary.
3. Check the air pump belt tension and adjust to specification. (See Procedure "B" of this Diagnostic Procedure.)
4. With the transmission in neutral or park and the parking brake on, warm the engine to normal operating temperature.
5. Stop the engine and disconnect the air supply hose(s) from the air pump to the air bypass valve at the air bypass valve.
6. Insert the Thermactor pump pressure gauge (Tool T75L-9486-A or equivalent) in the end of the hose disconnected from the bypass valve. Clamp the hose securely to the air supply tester to prevent it from blowing out.

CAUTION: Position the air pump supply tester so that the air blast emitted will be harmlessly dissipated.

7. Connect a tachometer to the engine and start the engine.
- 8a. Slowly increase engine speed to 1000 rpm and observe the pressure produced at the test gage. The air pump pressure must be 2.25 (2 1/4) psi minimum.
- 8b. If special Tool is not available, increase engine speed to 1500 rpm, place hand over the open hose. Air flow should be heard and felt.
9. If air flow does not comply with minimum requirements listed in Step 8, install a new air pump and repeat Step 8.
10. Turn off the engine. Remove all test equipment and reconnect the air supply hose to the air bypass valve and tighten the hose clamp. Torque the air cleaner nut to specification if the cleaner was removed.

B. Thermactor Air Pump Drive Belt Adjustment

1. Install the belt tension gauge (Tool T75L-8620-A or equivalent) on the drive belt and check the tension following the instructions of the tool

manufacturer. Compare the belt tension to the specified belt tension and adjust as necessary.

2. If adjustment is necessary, loosen the air pump mounting and adjusting arm bolts. Move the air pump toward or away from the engine until the correct tension is obtained. Use air pump belt tensioning tool (Tool T75L-9480-A or equivalent) to hold belt tension while tightening the mounting bolts. Remove the gauge. Tighten the air pump adjusting arm and mounting bolts. Install the tension gauge and check the belt tension.

CAUTION: Do not use a pry bar.

3. Check all air pump pulleys and mounting bolts and torque to specification.

CAUTION: Any belt that has operated for a minimum of ten minutes is considered a used belt; and when adjusted, it must be adjusted to the tension shown in the specifications for used belts.

C. Air Bypass Valve Functional Tests (Timed Bypass Valve Fig. 2)

Determine if the air bypass valve is functioning properly by performing the following operation:

1. If necessary, warm the engine to normal operating temperature with the transmission in neutral or park and the parking brake on.
2. Stop the engine and remove the air bypass valve-to-air manifold check valve hose at the bypass valve. For a tee system, remove both hoses connecting the bypass valve to the check valves. Remove any restricting device in the sense vacuum hose. Install a tachometer on the engine.
3. With the transmission in neutral or park and the parking brake on, start the engine. Accelerate the engine to 1500 rpm. Verify that air is flowing from the air bypass valve hose connection(s) by placing hand over valve connection. Air flow should be felt and heard.
4. With transmission in neutral or park and parking brake on, accelerate to 1500 rpm. With hand held over the bypass valve connection momentarily (approximately 5 to 8 seconds) pinch off the vacuum hose to the bypass valve to duplicate the air bypass cycle. Release the pinched vacuum hose. Air flow thru the bypass valve should be felt and heard to diminish or stop for a short period of time, then resume as before (normal air flow). The length of time required to resume normal flow cannot be specified since the time interval is dependent on engine vacuum and length of time the vacuum line is pinched off. Air will be discharged thru the exhaust port in the side of the valve silencer cover. If this complete cycle does not occur, the valve must be replaced.
5. Perform the following test **ONLY** if the air pump supply tester is available:

Install the Thermactor pump pressure gauge (Tool T75L-9486-A or equivalent) to the air bypass valve outlet using a short length of appropriate diameter hose. If the air bypass valve has two outlets, plug the one without the tester. Increase engine speed to 1000 rpm. Observe the pressure produced at the test gauge. The air pressure must

be 2.25 (2 1/4) psi minimum. If the air pressure is not within specification, replace the valve.

6. Turn off the engine, remove all test equipment and connect the air supply hose(s) to the air bypass valve(s), and tighten all clamps.

Determine if the air bypass valve **controls** are functioning properly by performing the following operations:

D.(I). Check Valve Test

1. With the engine stopped, inspect the hose(s) from the check valve to the bypass valve for any leaks due to cracks, splits, holes, etc. Replace if required.
2. Inspect the hose clamp(s) at the check valve for being properly positioned and tightened. Correct, position, tighten or replace as required.
3. Disconnect the Thermactor hose(s) from check valve to the bypass valve at the bypass valve end.
4. Connect the Thermactor check valve tester (Tool T75L-9487-A or equivalent), to the open end of the check valve hose. Position the hose clamp and tighten to specification.
5. Squeeze the rubber bulb, on the tester, to force as much air from the bulb as possible. Quickly release the bulb and start timing. The bulb should remain collapsed (not return to its original free shape) for at least 15 seconds.
6. If the test bulb does not return to its original free shape for 15 seconds, the check valve and hose are good. Remove the check valve tester from the end of the hose and reinstall the hose on the bypass valve. Position and tighten the hose clamp to specification.
7. If the test bulb returns to its original free shape in 15 seconds or less, both hose and check valve are questionable.
8. Remove the test bulb from the end of the hose. Remove the hose from the check valve. Install a 6 to 18 inch length of appropriate diameter hose to the check valve and test bulb. Position and tighten to specification a hose clamp at each end of the hose. Repeat Step 5 above.
9. If the test bulb does not return to its original free shape for 15 seconds it indicates the check valve is good and the original bypass valve to check valve hose must be replaced. Remove the test hose from the check valve and test bulb. Install a new hose of the proper part number, to the check valve and test bulb. Position and tighten to specification a hose clamp at each end of the hose. Repeat Step 5 to be sure the new hose does not leak. After test remove the hose clamp and test bulb. *Install the hose on the bypass valve nipple.* Position and tighten the hose clamp to specification.
10. If the test bulb returns to its original free shape (Step 8) in 15 seconds or less, the check valve must be replaced.
11. Test the new check valve for leaks before installing on the engine. Connect a 6 to 18 inch length of appropriate diameter hose to the new

check valve and test bulb. Position and tighten to specification a hose clamp at each end of the hose. Repeat Step 5 above.

12. Remove the hose from the check valve. Install the new check valve on the engine and torque to specification. Visually inspect the original hose for any surface condition that would cause a problem in the near future. Replace with a new hose if required. Install the hose on the check valve and bypass valve nipples. Route the hose

as required. Position and tighten to specification a hose clamp at each end of the hose.

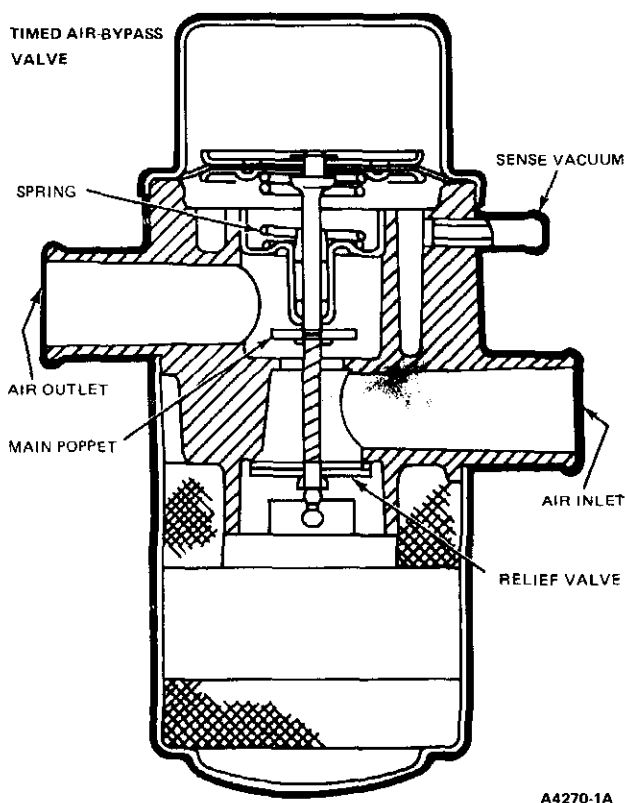
E. Thermactor System Noise Test

NOTE: The thermactor system is not completely noiseless. Under normal conditions, noise rises in pitch as engine speed increases. To determine if excessive noise is the fault of the air injection system, disconnect the drive belt and operate the engine. If the noise disappears, refer to the Thermactor Noise Diagnosis Chart (Fig. 1):

CONDITION	POSSIBLE CAUSE	RESOLUTION
1. Excessive Belt Noise	a. Loose belt b. Seized pump c. Loose pulley d. Loose or broken mounting brackets or bolts	• Tighten to specification using tool T75L-9480-A or equivalent to hold belt tension and Belt Tension Gage T63L-8620-A or equivalent. - CAUTION: Do not use a pry bar to move the air pump. • Replace pump. • Replace pulley and/or pump if damaged. Torque bolts to specification (130-180 in.-lbs.) • Replace parts as required and torque bolts to specification.
2. Excessive Pump Noise (Chirps, Squeaks & Ticks)	a. Insufficient break-in or worn or damaged pump	• Check the thermactor system for wear or damage and make any necessary corrections. If less than 500 miles in service, allow for a 500 mile break-in period. Replace the pump if the noise continues after a 500 mile break-in period.
3. Excessive Mechanical Clicking Noise	a. Over torqued mounting bolt b. Excessive flash on the air pump adjusting arm boss. c. Distorted adjusting arm d. Adjusting arm bolt too long (bottom of the bolt boss is pushed in)	• Torque to 25 ft.-lbs. • Remove flash from the boss. • Replace adjusting arm. • Replace pump using a proper length bolt.
4. Excessive Thermactor System Noise (Putt-Putt, Whirling or Hissing)	a. Leak in hose b. Loose, pinched or kinked hose c. Hose touching other engine parts d. By-pass valve inoperative e. Check valve inoperative f. Pump mounting fasteners loose g. Restricted or bent pump outlet fitting h. Pump worn or damaged	• Locate source of leak using soap solution and replace hoses as necessary. • Reassemble, straighten or replace hose and clamps as required. • Adjust hose to prevent contact with other engine parts. • Test by-pass valve and replace as necessary. • Test check valve and replace as necessary. • Torque fasteners to specification. • Inspect fitting and remove any flash blocking the air passage way. Replace bent fittings. • Replace pump.

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FIG. 1 Thermactor Noise Diagnosis



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FIG. 2 Timed Air Bypass Valve

SSD-5—THERMATOR CATALYTIC CONVERTER EMISSION SYSTEM CHECK

The thermactor catalytic converter system consists of the following major components:

- Belt-drive air pump supply pump
- Air bypass valve
- Air control valve
- Check valve(s)
- External or external air manifold(s)
- Air supply tubes
- Crossover tube to connect RH to LH air manifolds (internal system only)
- Differential vacuum valve (Decel)
- Air Cleaner Temperature sensor
- Electric PVS (ported vacuum switch) high temperature coolant lock out
- Solenoid vacuum valve
- EGR vacuum load control valve (for EGR and thermactor)
- Vacuum delay valve (idle air dump)
- Thermactor idle vacuum valve
- Thermactor vacuum vent valve

PROCEDURE:

A. Air Pump Supply Test

1. Remove air cleaner.
2. Inspect all hoses and hose connections in the system for any abnormal conditions and correct and/or repair and/or replace as necessary.
3. Check the air pump belt tension and adjust to specifications. (See Procedure "B" of this Diagnostic Procedure.)

4. With the transmission in neutral or park and the parking brake on, warm the engine to normal operating temperature.
5. Stop the engine and disconnect the air supply hose(s) from the air pump to the air bypass valve at the air bypass valve.
6. Insert the thermactor pump pressure gauge (Tool T75L-9486-A or equivalent) in the end of the hose disconnected from the bypass valve. Clamp the hose securely to the thermactor pump pressure gauge to prevent it from blowing out.
CAUTION: Position the thermactor pump pressure gauge so that the air blast emitted will be harmlessly dissipated.
7. Connect a tachometer to the engine and start the engine.
- 8a. Slowly increase engine speed to 1000 rpm and observe the pressure produced at the pressure gauge. The air pressure must be 2.25 (2-1/4) psi minimum.
- 8b. If the special test gauge is not available, increase the engine speed to 1500 rpm, place hand over the open hose. Air flow should be heard and felt.
9. If air flow does not comply with minimum requirements listed in Step 8, install a new air pump and repeat Step 8.
10. Turn off the engine. Remove all test equipment and reconnect the air supply hose(s) to the air bypass valve and tighten the hose clamp(s). Torque the air cleaner wing nut to specifications if the air cleaner was removed.

B. Thermactor Air Pump Drive Belt Adjustment

1. Install the belt tension gauge (Tool T75L-8620-A or equivalent) on the drive belt and check the tension following the instructions of the tool manufacturer. Compare the belt tension to the specified belt tension and adjust as necessary.
2. If adjustment is necessary, loosen the air pump mounting and adjusting arm bolts, move the air pump toward or away from the engine until the correct tension is obtained. Use air pump belt tensioning tool (Tool T75L-9480-A or equivalent) to hold belt tension while tightening the mounting bolts. Install the tension gauge and check the belt tension.

CAUTION: Do not use a pry bar.

3. Check all air pump pulleys and mounting bolts and torque to specification.

CAUTION: Any belt that has operated for a minimum of 10 minutes is considered a used belt; and when adjusted, it must be adjusted to the tension shown in the specifications for used belts.

C(I). Air Bypass Valve Functional Tests (Normally Closed Bypass Valve Figs. 3 and 5.)

Determine if the air bypass valve is functioning properly by performing the following operations:

1. If necessary, warm the engine to normal operating temperature with the transmission in neutral or park and the parking brake on.

2. Stop the engine and remove the air bypass valve to air manifold check valve hoses at the bypass valve. For a tee system, remove both hoses connecting the bypass valve to the check valves. Install a tachometer on the engine.
3. With the transmission in neutral or park and the parking brake on, start the engine. Accelerate the engine to 1500 rpm. Verify that air is flowing from the air bypass valve hose connection(s) by placing hand over valve connection. Air flow should be heard and felt.
4. Remove the vacuum hose from the bypass valve and plug off the vacuum hose. With the engine at 1500 rpm and hand held over the bypass valve connection, there should be virtually no air flow felt or heard. Air flow will be discharged thru the exhaust ports in the end of the valve silencer cover. If air flow is felt or heard thru the bypass valve connection, the valve should be replaced.
5. Stop the engine. Remove the plug from the vacuum hose.
6. Reinstall the vacuum hose on the bypass valve sense vacuum nipple.
7. If available, install the thermactor pump pressure gauge (Tool T75L-9486-A or equivalent) to the air bypass valve outlet using a short length of appropriate diameter hose. If the air bypass valve has two outlet(s), plug the one without the tester. If the air bypass valve has a small pressure outlet, as pictured in Fig. 5, install a pressure gauge on this port. Start the engine and increase engine speed to 1000 rpm. Observe the pressure produced at the test gauge(s). The air pressure must be 2.25 (2-1/4) psi minimum. If the air pressure is not within specification, replace the valve.
8. Turn off the engine, remove all test equipment and connect the air supply hoses(s) to the air bypass valve and tighten all hose clamp(s).

Determine if the air bypass valve controls are functioning properly by performing the following operation(s).

C(II). Differential Vacuum Valve (Decel) Functional Check

1. If necessary, warm the engine to normal operating temperature with the transmission in neutral or park and parking brake on.
2. Stop the engine and remove the air bypass valve to air manifold check valve hose at the bypass valve. For a tee system, remove both hoses. Install a tachometer on the engine.
3. Start the engine. With hand held over the bypass valve outlet connections accelerate to approximately 2500 rpm. Release the throttle for a normal return to engine idle rpm. During the deceleration period, the air flow in the valve outlet should be felt and/or heard to momentarily diminish or stop and then resume as before (normal air flow). Air flow will be discharged thru the exhaust ports in the end of the bypass valve

silencer cover. The air flow interruption during deceleration cannot be specified due to variations in the rate of deceleration and manifold vacuum.

4. If the bypass valve meets test requirements, but does not function as described in Step 3, check to be sure the decel valve is receiving a vacuum signal. If the decel valve is receiving a signal then the decel valve is to be replaced.
5. Turn off the engine. Remove all test equipment and reconnect all related components of the thermactor system.

C(III). Electric PVS (Ported Vacuum Switch) High Temperature Coolant Lock Out Vacuum Check

1. Disconnect vacuum line (air bypass valve to PVS valve) at the air bypass valve and connect to a vacuum gauge.
2. With transmission in park or neutral and the parking brake on, start engine and let idle.
3. With engine temperature stabilized, check for a vacuum signal.
If no vacuum signal is noted, PVS should be replaced.
If idle vacuum is indicated, the PVS valve is OK.

C(IV). Thermactor System: Solenoid Vacuum Valve

A. Normally Closed Valve, Type I

NOTE: A normally closed Type I, solenoid vacuum valve is used in conjunction with a Type I air cleaner temperature switch (see Procedure SSD-9: Air Cleaner Temperature Control and Delay Valve, Step No. 8).

- 1a. Determine that engine air cleaner ambient temperature is above 65°F.
- 1b. Engine **must** be at normal operating temperature.
2. While the engine is at idle condition, disconnect vacuum hose to thermactor air bypass valve. Thermactor air should dump to atmosphere thru the exhaust ports in the end of the valve silencer cover. Re-connect vacuum hose.

If thermactor air dumps to atmosphere, the solenoid hose connections are correct.

NOTE: Vacuum supply always goes to the bottom vacuum fitting on the solenoid vacuum valve.

Disconnect vacuum supply hose at the solenoid valve. Place finger over end of open vacuum hose. Your finger should be attracted to the hose opening by the vacuum supplied by the engine manifold. If vacuum supply is not observed, check and/or replace vacuum sources as required. Re-connect vacuum hose.

3. Disconnect wiring to solenoid vacuum valve.
 - a. Determine which wire has battery voltage when the ignition switch is in the RUN position.
 - b. Connect wire which has battery voltage to solenoid vacuum valve.

- 4a. While the engine is at idle condition, ground the other exposed terminal on the solenoid vacuum valve to chassis ground. Thermactor air should not dump to atmosphere.
- 4b. Connect wire removed in Step 3a to solenoid vacuum valve. Thermactor air should not be dumped to atmosphere.
5. Replace solenoid vacuum valve if statement 4a is not a true statement.

Re-install related system components.

B. Normally Opened Valve, Type 2

NOTE: A normally open, Type 2, solenoid vacuum valve is used in conjunction with a Type 2 air cleaner temperature switch (see Diagnostic Procedure SSD-9, Air Cleaner Temperature Control and Delay valve, Step No. 9).

- 1a. Determine that engine air cleaner ambient temperature is above 65°F.
- 1b. Engine must be at normal operating temperature.
- 2a. While the engine is at idle condition, disconnect vacuum hose to thermactor air bypass valve. Thermactor air should dump to atmosphere thru the exhaust ports in the end of the valve silencer cover.
- 2b. If thermactor air dumps to atmosphere, the solenoid hose connections are correct. Re-connect vacuum hose.

NOTE: Vacuum supply always goes to black input nozzle on solenoid valve.

3. Disconnect wiring to solenoid vacuum valve.
 - a. Determine which wire has battery voltage when the ignition switch is in the RUN position.
 - b. Connect wire which has battery voltage to solenoid vacuum valve.
- 4a. While the engine is at idle condition, ground the other exposed terminal on the solenoid vacuum valve to chassis ground. Thermactor air should be dumped to atmosphere.
- 4b. Connect wire removed in Step 3a solenoid vacuum valve. Thermactor air should not be dumped to atmosphere.
5. Replace solenoid vacuum valve if statement 4b is not a true statement.

Re-install related system components.

C(V). Vacuum Reservoir Check (Required on some catalyst converter control systems)

- a) Disconnect vacuum hose on reservoir which connects to electric solenoid valve vacuum nipple.
- b) Connect 10-30" vacuum gauge with suitable length of 3/16 vacuum hose to reservoir.
- c) Remove manifold vacuum hose from reservoir and connect external vacuum source to this nipple. Charge reservoir to 14 in. Hg vacuum from external source and trap. Vacuum or gauge Step (b) should not drop more than 1 in. in one minute. Replace reservoir if out of specification.
- d) Remove all test equipment, reinstall vacuum lines to the reservoir and torque all clamps and air cleaner to specification.

C(VI). Vacuum Delay Valve Check (only required on vehicles equipped with a delay valve in the bypass valve vacuum line)

Delay Valve Functional Test

Equipment Required:

- a) Vacuum gauge—USG Model 12121-1, 2" dia. 0-30" Hg vacuum gauge or equivalent with .20" OD vacuum hose nipple adaptor and 24" of 5/32" ID Distributor Vacuum Hose or equivalent.
- b) Stop watch or wrist watch with a sweep second hand.
- c) External vacuum source capable of maintaining a constant vacuum (10" Hg minimum).

NOTE: The vacuum gauge must have a small internal volume and be free from external leakage.

Procedure:

1.
 - a) Set external vacuum source to 10" Hg.
 - b) Connect colored side of delay valve to vacuum source.
NOTE: .20" OD to .27" OD adaptor may be required to connect colored side of valve to vacuum source.
 - c) Connect the 24" section of vacuum hose to gauge and to white side of delay valve.
 - d) Apply vacuum and observe time in seconds for gauge to read from 0" to 8" Hg with a constant 10" Hg vacuum source.
2. The minimum and maximum time for the valve to reach 8" Hg should be as follows:

Color Code	I.D. No.	Time in Seconds	
		Minimum	Maximum
White/Red	40	14.0	47.2
White/Blue	20	8.0	26.0

CA4271-1B

When checking the delay valve, care must be exercised to prevent oil or dirt from getting into the valve as this will impair its function.

DIAGNOSIS GUIDE:

Replace delay valve if any of the above tests show the valve is out of specification.

C(VII). Temperature Vacuum System (TVS) Valve (Only on applicable models)

See Procedure SSD-9, Step 13: Air Cleaner Temperature Control and Delay Valve.

C(VIII). Thermactor Idle Vacuum Valve Diagnostic Procedure

Preparation

NOTE: Insure that bypass valve is OK per SSD-5, Step C.

- A. Remove the thermactor idle vacuum (TIV) valve from the connector on the air bypass valve.

- B. Install a vacuum hose on the small nipple on the TIV valve and connect it to one leg of a 3-way "tee".
- C. Connect the second leg of the "tee" to a vacuum gage and connect the third leg of the "tee" to the connector on the bypass valve.
- D. Connect a vacuum gage to the intake manifold.
- E. Warm up the engine to normal operating temperature.

Procedure

1. With engine at idle in neutral, disconnect the hose at the large diameter port of the TIV, and from another vacuum source, apply 3-1/2-4 in. Hg to the large port.
Vacuum level on the gage at the bypass valve should increase to within 3 in. Hg or less of intake manifold vacuum.
2. If the vacuum does not increase to within 3 in. Hg or less, the TIV should be replaced.
3. If, when the 3-1/2-4 in. Hg vacuum source is removed from the TIV, the gage reading does not drop to 1.0 in. Hg or less, the TIV should be replaced.
4. At the conclusion of the above procedure, remove all test equipment and reconnect all vacuum hoses, connectors and the TIV valve.

C(IX). Air Bypass Valve Functional Tests (Timed Bypass Valve with Vacuum Vent Fig. 4)

Determine if the air bypass valve is functioning properly by performing the following operations:

1. If necessary, warm the engine to normal operating temperature with the transmission in neutral or park and the parking brake on.
2. Stop the engine and remove the air bypass valve to check valve hose at the bypass valve. For a tee system, remove both hoses connecting the bypass valve to the check valves. Cap the bypass valve vacuum vent nipple. Remove, or short circuit, any restricting or delaying device in the sense vacuum hose. Install a tachometer on the engine.
3. With the transmission in neutral or park and the parking brake on, start the engine. Accelerate the engine to 1500 rpm. Verify that air is flowing from the air bypass valve hose outlet connection(s) by placing hand over the valve connection. Air flow should be felt and heard. If no air flow is detectable, the valve must be replaced.
4. With the transmission in neutral or park, and the parking brake on, accelerate to 1500 rpm. With hand held over the bypass valve outlet, momentarily (approximately 5 to 8 seconds) pinch off the sense vacuum hose to the bypass valve to simulate the air bypass cycle. Release the pinched hose. Air flow through the bypass valve should be felt and heard to diminish or stop for a short period of time, then resume as before (normal air flow). The length of time required to resume normal air flow cannot be specified since the time interval is dependent on engine vacuum, and the length of time the vacuum line is pinched off. Air will be discharged through the exhaust

ports in the valve silencer cover. If this cycle does not occur, the valve must be replaced.

5. Stop the engine and remove the cap from the vacuum vent nipple, and leave nipple open.
6. With the transmission in neutral or park and the parking brake on, start the engine. Accelerate the engine to 1500 rpm. Virtually no air flow should be detectable from the air bypass valve outlet(s). Air will be discharged from exhaust ports in the silencer housing. If air flow can be felt and heard at the bypass valve outlet(s) the valve must be replaced.
7. Stop engine. Correctly connect hoses to the sense vacuum nipple and the vacuum vent nipple.
8. Perform the following test ONLY if the air pump supply tester is available:
Install the thermactor pump pressure gauge (Tool T75L-9486-A or equivalent) to the air bypass valve outlet using a short length of appropriate diameter hose. If the air bypass valve has two outlets, plug the one without the tester. Increase engine speed to 1000 rpm. Observe the pressure produced at the test gauge. The air pressure must be 2.25 (2-1/4) psi minimum. If the air pressure is not within specifications, replace the valve.
9. Turn off the engine, remove all test equipment and connect the air supply hoses(s) to the air bypass valve(s), and tighten all clamps.

C(X). EGR Vacuum Load Control Valve Test

1. With the engine warmed up, tachometer connected, and engine off, remove the air cleaner assembly from the carburetor, placing the air cleaner assembly in such a position so that the vacuum hoses are not disconnected from the cold weather modulator valve(s) on the air cleaner.
2. Disconnect the vacuum supply hose, between the EGR vacuum load control valve and the vacuum reservoir, at the EGR vacuum load control valve and connect a vacuum gage to the EGR vacuum load control valve. Disconnect the vacuum supply hose between the venturi port of the carburetor and the EGR vacuum load control valve at the vacuum load control valve.
3. Start the engine and raise the speed to 1200-1500 rpm in neutral and observe the vacuum signal on the gage:
 - a. If the vacuum signal is less than 4.0 in. Hg, replace the EGR vacuum load control valve.
 - b. If the vacuum signal is 4.0 in. Hg or greater, apply one of the following vacuum levels from an external source to the venturi port of the load control valve and observe the first gage signal:

Decal Color of EGR Vacuum Load Control Valve	Vacuum Level (inches of Hg) Applied to Venturi Port
Blue	3.0
Red	4.5

If the first gage signal does not drop to less than 2.0 in. Hg, replace the load control valve. If the gage signal drops to less than 2.0 in. Hg and does not return to greater than 4.0 in. Hg when the external source vacuum is removed from the venturi port, replace the vacuum load control valve.

C(XI). Thermactor Vacuum Vent Valve Functional Test

1. If necessary, remove the air cleaner assembly.
2. Disconnect the vacuum tubing or connector block from the valve (note the orientation for reinstallation).

NOTE: It may be necessary to remove the valve from the bracket or air cleaner tray to gain access to the vacuum ports on the valve.

3. Connect the black (or cover) vacuum port to a manifold vacuum source.
4. Connect an external vacuum source to the white (or body) vacuum port.
5. Start the engine. With the engine at idle, in neutral, apply 10 in. Hg vacuum to the white port and trap. If 10 in. cannot be obtained, replace the valve.
6. Remove the manifold vacuum source line from the black port. The trapped vacuum should drop to zero. Replace the valve if the trapped vacuum does not drop to zero.
7. Remove all test equipment, reconnect all vacuum hoses and connectors and reinstall the valve and air cleaner assembly (if removed in Step 1).

C(XII) Thermactor PVS with Two Connectors Functional Check

1. Disconnect both vacuum hoses at the PVS valve. Connect vacuum gauge to bottom connector on the PVS. Connect auxiliary vacuum source of at least 10 in Hg to the top connector. With engine cold, no vacuum should be observed on the other side. If vacuum is observed, replace PVS.
2. Start engine and warm it up until engine coolant thermostat is open. (NOTE: hot air through the radiator.) Using same set-up as in Step 1, apply at least 10 in Hg to the top connector.
 - a. If no reading is noted on vacuum gauge, PVS should be replaced.
 - b. If vacuum is noted, PVS is OK.

C(XIII) Vacuum Check Valve Operation

1. For checking function:
 - a. Set vacuum source at 5 in Hg.
 - b. Apply vacuum to the check side of the check valve (white) and trap. After 30 seconds, the vacuum should not be less than 4 in Hg. If vacuum is less than 4 in Hg, replace valve.
2. For flowing function:
 - a. Set vacuum source at 5 in Hg.
 - b. Connect gauge to check side (white)—same side source was connected to in Step 1).
 - c. Apply vacuum to opposite side (black); reading on gauge should be the same as source. If it is not, replace the valve.

C(XIV) Vacuum Reservoir Check

1. Disconnect vacuum hoses from both ends of the vacuum reservoir.
2. Plug one end with vacuum cap.
3. Connect Tool 21-0014 with a small hose to open end of the reservoir and apply vacuum of 10 in Hg. Vacuum should hold for 10 seconds. If vacuum is less than 10 in Hg after 10 seconds, replace vacuum reservoir.

D(I). Check Valve Test

1. With the engine stopped, inspect the hose(s) from the check valve to the bypass valve for any leaks due to cracks, splits, holes, etc. Replace if required.
2. Inspect the hose clamp(s) at the check valve for being properly positioned and tightened. Correct, position, tighten or replace as required.
3. Disconnect the thermactor hose(s) from check valve to the bypass valve at the bypass valve end.
4. Connect the thermactor check valve tester (Tool T75L-9487-A or equivalent) to the open end of the check valve hose. Position the hose clamp and tighten to specification.
5. Squeeze the rubber bulb, on the tester, to force as much air from the bulb as possible. Quickly release the bulb and start timing. The bulb should remain collapsed (not return to its original free shape) for at least 15 seconds.
6. If the test bulb does not return to its original free shape for 15 seconds, the check valve and hose are good. Remove the check valve tester from the end of the hose and reinstall the hose on the bypass valve. Position and tighten the hose clamp to specification.
7. If the test bulb returns to its original free shape in 15 seconds or less, both hose and check valve are questionable.
8. Remove the test bulb from the end of the hose. Remove the hose from the check valve. Install a 6 to 18 inch length of appropriate diameter hose to the check valve and test bulb. Position and tighten to specification a hose clamp at each end of the hose. Repeat Step 5 above.
9. If the test bulb does not return to its original free shape for 15 seconds, it indicates the check valve is good and the original bypass valve to check valve hose should be replaced. Remove the test hose from the check valve and test bulb. Install a new hose of the proper part number, to the check valve and test bulb. Position and tighten to specification a hose clamp at each end of the hose. Repeat Step 5 to be sure the new hose does not leak. After test, remove the hose clamp and test bulb. Install the hose on the bypass valve nipple. Position and tighten the hose clamp to specification.
10. If the test bulb returns to its original free shape (Step 8) in 15 seconds or less, the check valve is to be replaced.
11. Test the new check valve for leaks before installing on the engine. Connect a 6 to 18 inch length of appropriate diameter hose to the new

check valve and test bulb. Position and tighten to specification a hose clamp at each end of the hose. Repeat Step 5.

12. Remove the hose from the check valve. Install the new check valve on the engine and torque to specification. Visually inspect the original hose for any surface condition that would cause a problem in the near future. Replace with a new hose if required. Install the hose on the check valve and bypass valve nipples. Route the hose as required. Position and tighten to specification a hose clamp at each end of the hose.

E. Step Not Required for 1978

F. Thermactor System Noise Test

NOTE: The thermactor system is not completely noiseless. Under normal conditions, noise rises in pitch as engine speed increases. To determine if excessive noise is the fault of the air injection system, disconnect the drive belt and operate the engine. If the noise disappears, proceed with the diagnosis, shown in Fig. 1.

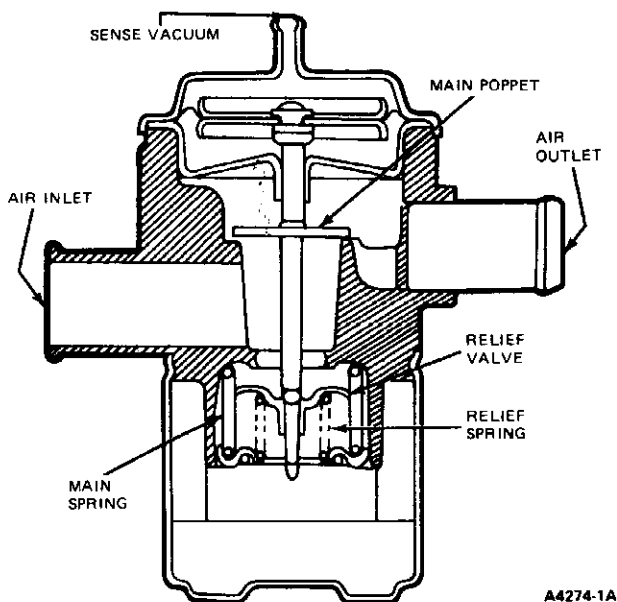


FIG. 3 Normally Closed Air Bypass Valve

SSD-6—CARBURETOR ICING

Generally, carburetor icing can occur if the outside temperature is 30° to 50°F and the relative humidity is 75 percent or greater. The symptoms of carburetor icing are engine roughness or stalling on high cam or closed throttle modes, generally within the first five miles of a cold start and driveaway.

- I. Review driver's complaint to see if the above conditions and symptoms existed at the time of the complaint.
- II. If carburetor icing is suspected, perform SSD-9, air cleaner temperature control and delay valve, and SSD-10, exhaust heat control valve.

SSD-9—AIR CLEANER TEMPERATURE CONTROL

VACUUM OPERATED SYSTEMS CHECK

NOTE: On vehicles equipped with an air cleaner retard delay valve, check the valve according to SSD-2.

On vehicles equipped with a cold weather modulator, by-pass the modulator by connecting the two vacuum lines from the modulator.

CAUTION: This check must be performed in ambients of not less than 60°F.

Do not immerse any part of the vacuum-operated duct and valve assembly in water.

1. Apply parking brake and block wheels.

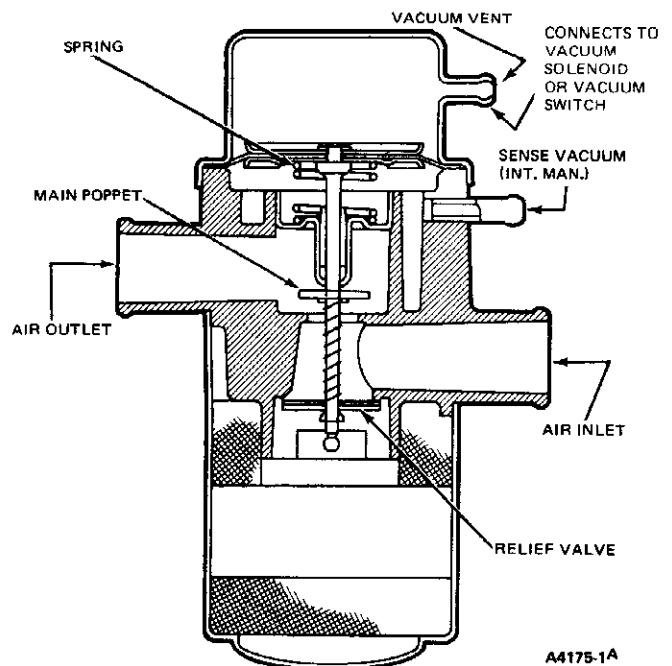


FIG. 4 Timed Air Bypass Valve with Vacuum Vent

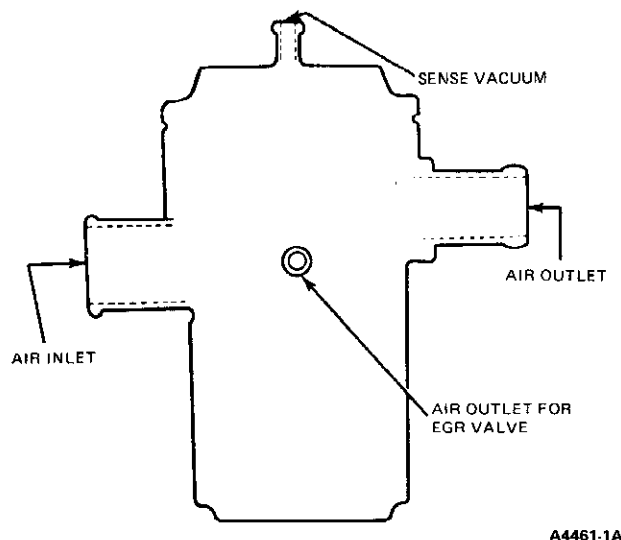


FIG. 5 Normally Closed Air-Bypass Valve with EGR Tap

2. Remove the air cleaner cover and element. Inspect heat riser tube and zip tube for proper installation and/or damage. Repair or replace as required.
3. Remove items necessary to see the duct door.
4. Remove the vacuum line at the duct and valve. Look to confirm that the duct door is in the open (fresh air side) position. If the duct door is in the closed position, check for binding and sticking. Repair and/or replace as required.
5. Place a magnetic base temperature indicator (Kent-Moore J22973 or equivalent) as near as possible to the temperature sensor on the air inlet side.

NOTE: Do not allow the temperature indicator magnet to touch the temperature sensor.

If the air cleaner is aluminum, loop a piece of electrical or masking tape (adhesive side out) and press it against the temperature indicator magnet. Press the tape and the indicator against the air cleaner, as near as possible to the temperature sensor on the inlet side.

6. Start the engine. If the duct door is closed, proceed to Step 7. If the duct door is not closed, turn off the engine. Cool the temperature sensor by spraying with liquid from a small can of R-12 refrigerant and a 23-0009 can adapter or equivalent for 20 seconds after liquid contacts sensor.

CAUTION: Do not cool the temperature sensor while the engine is running. If R-12 refrigerant is drawn into the carburetor while the engine is running, poisonous phosgene gas may be exhausted into the test area. Conduct this procedure only in well-ventilated area.

Restart the engine. If the duct door is closed, proceed to Step 7. If duct door is open during idle, check related vacuum system per Appendix "A".

7. Reinstall the air cleaner cover without installing the wing nut(s).
8. With the engine running, observe the duct door. When the duct door starts to open, remove the air cleaner cover and note the temperature reading of the temperature indicator. It should be within the following specifications:

For sensors color coded with a brown stripe: temperature should not exceed 90°F.

For sensors color coded with a black or pink stripe: temperature should not exceed 100°F.

For sensors color coded with a blue or yellow stripe: temperature should not exceed 115°F.

- (a) If the temperatures are greater than those specified here, replace the sensor.
- (b) If the air temperature is greater than 120°F and the door is less than 5/8 inch open, recheck Step 4. If the door is not binding or sticking, replace the sensor.

If the duct door does not start to open within 5 minutes, remove the air cleaner cover and note the temperature. If temperature is less than those specified, the temperature is insufficient to operate the duct door. Reinstall the air cleaner cover without installing the wing

nut(s) and run engine until the specified temperature is reached. If the duct door has not started to open by then, replace the sensor.

9. Turn off the engine. Remove all test instruments and check to insure that no extraneous dirt or sand is on the air cleaner tray or cover on the inside of the air cleaner element. If dirt is apparent, the assembly should be cleaned per the maintenance procedure. Reinstall the system components and torque the wing nut to specification.

10. Cold Weather Modulator (only on applicable models).

- a. Cool the cold weather modulator to 40°F or less. The modulator can be cooled by spraying with liquid R-12 refrigerant and a 23-0009 can adapter or equivalent. Allow sufficient time for the modulator temperature to stabilize and the modulator valve to close.

CAUTION: Do not cool the cold weather modulator while the engine is running. If R-12 refrigerant is drawn into the carburetor while the engine is running, poisonous phosgene gas may be exhausted into the test area. Conduct this procedure only in a well-ventilated area.

- b. A 24-inch length of 1/4 inch ID vacuum hose should be used between the cold weather modulator and the vacuum gage. Using an external vacuum source, apply a minimum of 16 inches of vacuum to the vacuum motor side of the modulator and trap the vacuum. The modulator must hold at least 5 inches Hg vacuum for 30 seconds, otherwise replace the modulator.

- c. **With blue CWM D5DF-9E862-AA**

Warm the modulator to 70°F or above. The modulator should not hold vacuum at or above this temperature. If the modulator does not function as indicated, it must be replaced.

- d. **With green CWM D7ZE-9E862-AA**

Warm the modulator to 80°F or above. The modulator should not hold vacuum at or above this temperature. If the modulator does not function as indicated, it must be replaced.

11. Cold Temperature Actuated Vacuum System (only on applicable models) Temperature Switch Functional Test (Type 1)

- a. Disconnect the connector from the wiring harness.
- b. Connect the leads from an ohmmeter or self-powered test light to the temperature switch connector terminals.
- c. Cool the switch to a temperature below 40°F. The switch can be cooled by spraying liquid from a small can of R-12 refrigerant with a 23-0009 can adapter or equivalent.

CAUTION: Do not spray the switch with liquid R-12 refrigerant while the engine is running. If R-12 refrigerant is drawn into the carburetor while the engine is running, poisonous phosgene gas may be exhausted into the test area. Conduct this procedure only in a well-ventilated area.

When the switch is cooled below 40°F, the internal switch contacts should be open. The ohmmeter should read maximum resistance and the test light **should not** light.

If the switch does not open below 40°F, the switch should be replaced.

- d. Increase the switch temperature until the temperature is above 70°F. The switch temperature can be increased by placing the palm of the hand on the metal surface of the switch or by starting the engine and allowing the exhaust manifold heat to increase the intake air temperature. When the switch temperature is above 70°F, the switch contacts should be closed. The ohmmeter should read zero resistance or the test light **should** light. If the switch does not close, or if the ohmmeter indicates a resistance of 1 ohm or more, the switch should be replaced.
- e. If it is necessary to replace the switch, check the operation of the new switch before connecting the wiring harness connector.

12. Cold Temperature Actuated Vacuum System (only on applicable models) Temperature Switch Functional Test (Type 2)

- a. Disconnect the connector from the wiring harness.
- b. *Connect the leads from an ohmmeter or self-powered test light to the temperature switch connector terminals.*
- c. Cool the switch to a temperature below 40°F. The switch can be cooled by spraying liquid from a small can of R-12 refrigerant with a 23-0009 can adapter or equivalent.

CAUTION: Do not spray the switch with liquid R-12 refrigerant while the engine is running. If R-12 refrigerant is drawn into the carburetor while the engine is running, poisonous phosgene gas may be exhausted into the test area. Conduct this procedure only in a well-ventilated area.

When the switch is cooled below 40°F, the internal switch contacts should be closed. The ohmmeter should read zero resistance; the test light **should** light.

If the switch is cooled below 40°F, or if the ohmmeter indicates a resistance value of 1 ohm or more, the switch should be replaced.

- d. Increase the switch temperature until the temperature is above 70°F. The switch temperature can be increased by placing the palm of the hand on the metal surface of the switch or by starting the engine and allowing the exhaust manifold heat to increase the intake air temperature. When the switch temperature is above 70°F, the switch contacts should be open. The ohmmeter should indicate maximum resistance and the test light **should not** light.

If the switch contacts do not open, the switch should be replaced.

- e. If it is necessary to replace the switch, check the operation of the new switch before connecting the wiring harness connector.

13. Temperature Vacuum System Valve (only on applicable models)

a. TVS Valve—normally opened type (white)

1. Cool the TVS valve to 40°F or less. The valve can be cooled by spraying with liquid R-12 refrigerant and a 23-0009 can adapter or equivalent. Allow sufficient time for the valve temperature to stabilize and the TVS valve to close.

CAUTION: Do not cool the TVS valve while the engine is running. If R-12 refrigerant is drawn into the carburetor while the engine is running, poisonous phosgene gas may be exhausted into the test area. Conduct this procedure only in a well-ventilated area.

2. A 24-inch length of 1/4 inch ID vacuum hose should be used between the TVS valve and a vacuum gauge. Using an external vacuum source apply a minimum of 16 inches Hg vacuum to the 1/4 inch OD port of the TVS valve and trap. The TVS must hold at least 5 inches Hg vacuum for 30 seconds, otherwise replace the TVS valve.
3. Warm the valve to 80°F or above. The valve should not hold vacuum at or above this temperature. If the valve does not function as indicated, it must be replaced.

b. TVS Valve—normally closed type (red)

1. Heat the valve to 80°F or above. Attach a 24 inch length of vacuum hose (1/4 ID) between the 1/4 inch port of the TVS valve and a vacuum source and gauge. Apply and trap 16 inches Hg vacuum minimum in the valve system. The TVS valve must hold 5 inches Hg vacuum for 30 seconds; otherwise, replace the TVS valve.
2. Cool the TVS valve to 40°F or less. The valve can be cooled by spraying with liquid R-12 refrigerant and a 23-0009 can adapter or equivalent. Allow sufficient time for the valve temperature to stabilize and the TVS valve to open. The valve should not hold vacuum at or below this temperature.

CAUTION: Do not cool the cold weather modulator while the engine is running. If R-12 refrigerant is drawn into the carburetor while the engine is running, poisonous phosgene gas may be exhausted into the test area. Conduct this procedure only in a well-ventilated area.

If the valve does not function as indicated, replace it.

APPENDIX "A"

All Engines

- A. Check air cleaner vacuum system integrity. Repair or replace as required.
- B. Check the duct door for sticking or binding by depressing with fingers and allowing the internal vacuum motor spring to return the door to the normal position. Correct any sticking or binding before proceeding with test.
- C. Disconnect the vacuum hose from the vacuum motor connector tube.

- D. Using an external vacuum source, apply a minimum of 16" Hg vacuum and trap. The vacuum motor should remain closed for 60 seconds. If not, replace the duct and valve assembly.

SSD-11—PCV SYSTEM

ALL VEHICLES—ALL ENGINES

I. Check PCV System Function:

A-1. With the Engine Idling.

1. Remove fresh air inlet of PCV system from rocker arm cover (located on side/end of engine opposite PCV valve).
2. Hold approved Ford PCV valve tester or equivalent over the opening in the valve cover, making sure there is a positive seal between the tester and cover.
3. Start the engine and allow it to operate at the idle speed.
4. If the ball settles in the good (green) area, the system is functioning properly. If the ball settles in the repair (red) area, disconnect the evaporative canister purge hose from the PCV line (if so equipped) TEE and cap. Recheck with tester. If the ball still settles in the repair (red) area, servicing of the system is needed. If the ball settles in the good (green) area, refer to SSD-22 to check the evaporative purge system.

NOTE: If a special PCV Tester is not applicable, use Alternate A-2.

A-2. With Vehicle at Normal Operating Temperature:

1. Remove the PCV valve from its mounting, leaving the valve hose attached. If the valve is functioning properly and not plugged, a hissing air noise will be heard as the air passes through the valve, and a strong vacuum should be felt when a finger is placed over the valve inlet. While finger is over the valve inlet, check for vacuum leaks in the hose line and at all connections.
2. Re-install the PCV valve, then remove the crankcase air inlet hose at the air cleaner connection. Loosely hold a small piece of stiff paper (such as a 3 x 5 memo card or parts tag card) over the opening at the end of the inlet hose. The paper should be sucked against the hose opening with a noticeable force after sufficient time has lapsed for the crankcase pressure to lower (usually about a minute or more).

B. For 2.3L Engines Only

Remove PCV valve from engine. Install a known good slave PCV valve. If idle quality improves, the original valve was not functioning normally.

C. With the Engine Stopped

Remove the PCV valve from its mounting and shake it. A metallic clicking noise should be heard, indicating the valve is free.

- D. If the PCV system meets the requirements of tests A-1 or A-2, B (if applicable) and C, the system is functioning satisfactory and no further service is required. If it fails any of the tests, replace the

PCV valve and clean the PCV system per Step II.

II. Clean PCV System:

1. Remove the PCV System components, filler cap, PCV valve, hoses, tubes, fittings, etc. from the engine.
2. Clean the rubber ventilation hose(s) by passing a suitable cleaning brush through them.
3. Thoroughly wash the rubber hoses in a low volatility petroleum base solvent and dry with compressed air.
4. Thoroughly wash the crankcase breather cap (if so equipped) in a low volatility petroleum base solvent and shake dry.
5. Thoroughly clean tubes, fittings, connections to assure unobstructed flow of emission gases.
6. Install a new PCV valve and re-install previously removed hoses, tubes, fittings, etc. to their proper location.
7. Replace any system component that shows signs of damage, wear or deterioration as required, particularly rubber hoses that no longer fit snugly onto fitting.
8. Replace any hose or tube that cannot be cleaned satisfactorily.

SSD-12—AUTOMATIC CHOKE CHECK

PROCEDURE MODEL 2150 2V CARBURETOR

2.8L, 5.0L, 5.8L and 6.1L (302, 351 and 400 CID) ENGINES

I. Freedom of Linkage and System Integrity Check

With the engine off, perform the following operations:

1. Remove air cleaner, verify that the hold-down wingnut has not been over torqued thus causing the air cleaner housing to interfere with the choke plate operation. Also confirm that vacuum hoses, solenoid, and electric choke wires are properly connected and intact. Correct as required.
2. Check the following for freedom of operation: throttle system, choke plate, all linkages, fast idle cam, altitude compensator air bypass plate, if so equipped. Correct as required.

II. Choke Heat System Leakage and Flow and Flow Meter (Except 5.8L/6.1L [351M/400 CID])

1. Connect choke flow meter (Tool T75L-9850-A or equivalent) to choke cold air supply tube.
2. Warm engine to normal operating temperature and, at curb idle, observe flowmeter reading.
3. If flowmeter reading is within specification, remove and proceed to Section III.
4. If the flowmeter reading is not within specification, clean, repair or replace as required to meet flow specifications.

III. Electric Choke Function and Choke Plate Pulldown Check

1. Disconnect the stator lead at choke cap terminal and connect a test light in series with ground.
2. The light should glow at all times while engine is running.
3. If light does not glow, either the alternator or choke wire is defective and should be repaired as necessary.

4. If necessary, restart the engine and warm to normal operating temperature.
5. Place test light in series with choke terminal and stator lead. If light does not glow, replace choke cap assembly. If light glows, turn-off engine. Remove light.
6. Manually open throttle and set on fast idle cam. Remove (see Caution in Step 10) the hot air supply tube at the choke housing and install a choke tester (14-0206 or equivalent). Cool choke housing per choke tester manufacturer's instruction until bimetal closes choke plate lightly in air horn.

NOTE: Do not use choke tester manufacturer's time specification.

7. With throttle set on the highest step of the fast idle cam:
 - Record the index position of the choke bimetal cap for later use in resetting the cap.
 - Loosen retaining screws and rotate bimetal cap 90 degrees in the closing (rich) direction, and retighten screws.
 - Activate pulldown motor by applying vacuum to external vacuum tube.
 - Manually insure that the pulldown motor is fully retracted.
 - If motor does not fully retract with vacuum, test pulldown motor diaphragm for leakage.
 - If pulldown motor diaphragm is leaking and motor will not retract fully with vacuum, perform vertical hard gage measurement while manually forcing the motor to the fully retracted position.

NOTE: Insure that choke plate linkage is not interfered with or erroneous measurement may result.

- Measure vertical hard gage clearance between choke plate and center of carburetor air horn wall nearest the fuel bowl.
- Pulldown setting should be within specifications.
- If choke plate opening requirement is met, proceed to Step 7.
- If choke pulldown motor is leaking or will not fully retract with vacuum, replace the motor.
- Adjust choke plate vertical hard gage setting to value measured in previous steps by turning adjustment screws.
- Apply Loctite 290 or equivalent to adjusting screw threads at base of the motor after adjustment. Allow 15 minutes set-up time for Loctite or equivalent to solidify.
- Every time that the pulldown adjustment is made, perform the following fast idle cam setting procedure:
 - Open and close the throttle slightly and watch where the fast idle screw contacts the fast idle cam. (The fast idle screw should be set to the approximate high cam speed when making the cam setting.)
 - The fast idle screw should strike the second highest step at the "V" on the fast idle cam. The adjustment is made with the cam adjusting screw.

—After making the cam adjustment, allow the choke plate to close. Check the choke plate to be sure it closes tightly in the air horn.

8. This completes the pulldown check. Next, install new choke cap gasket and reset the choke bimetal cap to previously recorded recommended index position and as specified in the vehicle specifications, and install new choke cap clamp. Reset retaining screws. Check and/or reset (according to specified procedure) fast idle speed to specifications if necessary. Recool choke housing per III-5, if required.
9. Reconnect terminal and alternator stator lead.
10. Disconnect the choke tester (14-0206 or equivalent) from the carburetor.
11. Install plug or cap in choke housing heat inlet port at carburetor.

CAUTION: On 2.8L engine, move fast idle cam to kickdown step to avoid excessive rpm.

Start the engine without touching throttle and observe the following:

- a. If diaphragm retracts.
- b. Record the time from engine start up until the choke plate rotates to a vertical position.

If diaphragm fails to retract refer to Appendix A.

Complete rotation of the choke plate to vertical should occur within specification. If time exceeds specifications, repeat Electric Choke Function. If time still exceeds specifications replace choke cap and repeat Electric Choke Function.

If choke plate to vertical time is still not within specifications, check alternator and lead wire per shop manual. Repair and/or replace as required.

12. Remove the plug from the choke heat inlet. Reinstall the hot air supply tube (see Caution below).

CAUTION: Exercise extreme care in removing, reinstalling and checking for leaks in the choke hot air supply tube, as its retaining nut could be easily cross-threaded.

13. Check choke heat system.
 - a. Connect flow meter to choke cold air supply tube.
 - b. Warm engine to normal operating temperature and, at curb idle, observe flowmeter reading.
 - c. If flowmeter reading is within specification, remove meter.

If flowmeter reading is not within specifications, clean, repair, or replace as required to meet flow specifications.

IV. Altitude Compensator Assembly—Internal

1. Remove the aneroid housing (the outermost housing) and gasket by removing the three machine screws.
2. This exposes the poppet valve assembly. Check the poppet valve for freedom of operation. Confirm that the poppet valve is free and returns to the seated position.
3. If poppet valve is sticky or binds, spray choke cleaner (C9AZ-19A501-B or equivalent) on the poppet valve and guide area to remove any deposits. Make sure that valve is completely free by depressing the valve.

4. If further cleaning is required, remove altitude compensator assembly from the carburetor (removing four machine screws) and clean with lead-free fuel, or equivalent. If unable to free-up the valve, replace the altitude compensator assembly.
5. If required, reinstall the aneroid housing and gasket onto the valve housing (three machine screws).
6. Re-install systems components, torque air cleaner wing nut to specifications.

YFA 1V Carburetor 4.1L (250 CID) Engine

HOLLEY "1946" IV CARBURETORS 3.3L (200 CID) ENGINE

I. Freedom of Linkage and System Integrity Check

With the engine off, perform the following operations:

1. Remove air cleaner. Verify that vacuum hoses, solenoid and electric choke wires are properly connected and intact. Correct as required.
2. Check the following for freedom of operation: throttle system, choke plate and shaft, all linkages, fast idle cam, etc. Correct as required.

II. Choke System Leakage and Flow

1. Disconnect the choke clean air hose (rubber) from the carburetor air horn and attach choke flow meter (Tool T75L-9850-A or equivalent) to the hose. Disconnect and plug EGR vacuum hose at EGR valve and distributor vacuum advance hose.
2. Warm the engine to normal operating temperature. Place transmission in neutral. Bring engine up to 900-1000 rpm and observe choke flow meter reading.
3. If flow meter reading is within specification, remove flow meter. Reconnect the clean air hose to the carburetor, EGR hose to EGR valve, and distributor advance hose to distributor primary. Proceed to Section III.
4. If the flow meter reading is not within specification, refer to Appendix "A".

III. Choke Functional Tests

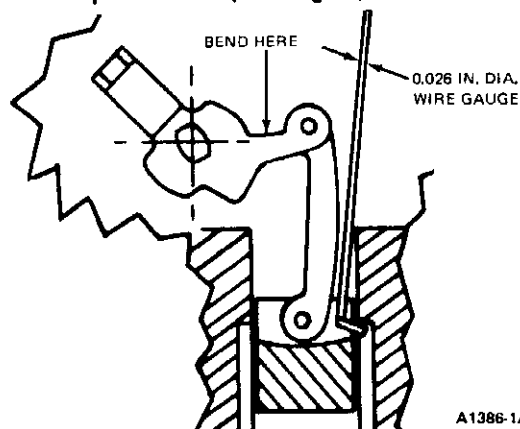
1. Disconnect the stator lead at the connector leading from the choke cap and connect a test light in series with the stator lead and ground.
2. The test light should glow with the engine running.
3. If light does not glow, repair or replace either the alternator or choke wire.
4. Restart engine and warm to normal operating temperature. Place test light in series with choke terminal and alternator stator lead. If light does not glow, replace choke cap assembly. (Engine and choke cap must be warmed to normal operating temperature whenever choke cap is replaced.) If light glows, turn off engine. Reconnect choke terminal and alternator stator lead.
5. Remove (see Caution in Step 10) the hot air supply tube at the carburetor choke housing. Attach choke tester (14-0206 or equivalent). Manually set fast idle cam on high step. Cool choke housing until choke plate just closes.
6. Check for choke resistance by securing an ohmmeter across the choke cap terminal and choke ground strap.

7. This value should be within specification. If range is exceeded, replace choke cap and repeat III beginning with Step 4.
 8. Recoil choke housing until choke plate just closes. (If choke plate is closed, this step should not be performed.)
 9. Remove choke tester (14-0206 or equivalent).
 10. Install plug or cap in the choke housing heat inlet part at the carburetor (Model 1946 only).
 11. With the heat tube removed and the choke plate closed (fast idle screw is positioned on the high step of the cam), disconnect the electric choke harness and connect a jumper wire from the positive terminal of the battery to the terminal on the choke cap. Observe that the choke plate opens to a vertical position with electrical assistance only. Record the choke come-off time. If the choke does not open with electrical assistance only, replace the choke cap and repeat III beginning with Step 4 (Model 1946 only).
 12. With heat tube removed and choke plate closed (fast idle screw is positioned on high step of cam), start engine without touching throttle and see that choke opens to a vertical position with electrical assist only. Record choke come-off time. If choke does not open with electrical assist only, replace choke cap and repeat III beginning with Step 4 (except Model 1946).
- CAUTION:** Exercise extreme care in removing, reinstalling and checking for leaks in the choke hot air supply tube as its retaining nut and/or choke housing can easily be cross-threaded.
13. Stop engine. Remove instruments and reinstall related system components. Torque carburetor wing nut (on air cleaner) to specification.

IV. Choke Plate Pulldown

A. Model YFA IV Carburetor

1. Remove the air cleaner assembly, then remove the choke thermostatic spring housing and gasket from the carburetor.
2. Bend a 0.026 in. diameter wire gauge at a 90 degree angle approximately 1/8-inch from one end. Insert the bent end of the gauge between the choke piston slot and the right hand slot in the choke housing. Rotate the choke piston lever counterclockwise until the gauge is snug in the piston slot. (See Fig. 6).



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FIG. 6 Choke Plate Pulldown Adjustment

3. Exert a light pressure on the choke piston lever to hold the gauge in place, then use a drill with a diameter equal to the specified pulldown clearance between the lower edge of the choke plate and the carburetor bore to check clearance.
4. To adjust the choke plate pulldown clearance, bend the choke piston lever as required to obtain the specified setting. When bending the lever, be careful not to distort the piston link.
5. Install the choke thermostatic spring housing and gasket. Set the housing to specifications.

B. Model 1946 IV Carburetor

1. Remove the air cleaner assembly.
2. Set the throttle on the highest step of the fast idle cam.
3. Cool the choke housing until the bi-metal closes the choke plate lightly in the air horn.
4. Record the index position of the choke bi-metal cap for later use in resetting the cap.
5. Loosen the retaining screws and rotate the bi-metal cap 90 degrees in the closing (rich) direction and retighten the screws.
6. Activate the pulldown motor by applying vacuum to the external vacuum tube.
7. Manually insure that the pulldown motor is fully retracted by pushing on the small metal plate in the bottom of the linkage slot on the pulldown shaft.

NOTE: Do **not** push the linkage or the shaft itself as this will actuate the modulator spring.

- If the motor does not fully retract with vacuum, test the pulldown motor diaphragm for leakage.

- If the pulldown motor diaphragm is leaking and the motor will not retract fully with vacuum, perform the choke plate pulldown clearance test while manually forcing the motor to the fully retracted position.

Warning: Insure that the choke plate linkage is not interfered with or erroneous measurement may result.

8. Use a drill of the proper diameter to check the clearance between the choke plate and the air horn.
9. The pulldown setting should be within specification.
10. If the choke pulldown motor is leaking or will not fully retract with vacuum, replace it.
11. To adjust the choke plate pulldown clearance, bend the choke pulldown linkage as required to obtain the specified setting.

V. Dechoke

1. Remove the air cleaner.
2. Hold the throttle plate fully open and close the choke plate as far as possible without forcing it. Use a drill of the proper diameter to check the clearance between the choke plate and air horn.
3. If the clearance is not within specification, adjust by bending the arm on the choke trip lever. Bending the arm downward will decrease the clearance, and bending it upward will increase the clearance. Always recheck the clearance after making any adjustment.

4. If the choke plate clearance and fast idle cam linkage adjustment was performed with the carburetor on the engine, adjust the engine idle speed. Adjust the dashpot (if so equipped).

VI. Fast Idle Cam Index Setting

1. Position the fast idle screw on the kickdown step of the fast idle cam against the shoulder of the high step.
2. Adjust by bending the choke plate connecting rod to obtain the specified clearance between lower edge of the choke plate and the carburetor bore.

Model 5200 2S/2V Carburetors and Model 6500 Feedback Carburetors

2.3L Engines (All Electric Choke Applications)

Section I—Freedom of Linkage and System Integrity Check

1. Apply parking brake and block wheels.
2. Connect tachometer.
3. Bring engine to normal operating temperature.
4. Turn off the engine.
5. Remove air cleaner assembly and plug vacuum line(s) to air cleaner assembly.
6. Verify that vacuum hoses, solenoid and electric choke wires are properly connected and intact, check that all carburetor hold down nuts are torqued to specification. Correct as required.
7. Check all carburetor linkages for freedom of operation. Repair or replace and adjust as required.

Section II—Bimetal and Linkage Functional Check

1. Inspect if bimetal index is set to specification. Correct as required.
2. With throttle held at 1/4 open position, rotate and hold choke plates to the closed plate position. Release choke plates; they should rotate smoothly to the fully open position. If choke plates do not rotate smoothly, clean and/or repair, then bring engine to normal operating temperature and recheck.

Caution No. 1: If bimetal assist spring is to be removed during repair, extreme care must be taken so as not to deform the spring during removal and/or reinstallation.

Caution No. 2: If fast idle cam latch assembly is removed during repair, the choke plates must be in the closed plate position prior to reinstalling the fast idle cam latch assembly to the choke housing. This will prevent damage to the delicate latch bimetal.

3. Cool the choke bimetal with a choke tester (14-0206 or equivalent) by blowing the cool air directly onto the choke bimetal housing cover. Cool housing for seven (7) minutes, then open throttle linkage to 1/4 open position and slowly release throttle. If the choke plates do not lightly seat themselves in the air horn bores, continue cooling for an additional minute, then open and close the throttle as mentioned above. If plates still do not close, repeat Section I, Step No. 6 and Section II, Steps No. 2 and 3.
4. Manually open choke plates to vertical position and open and close throttle to allow the cam to drop to the kickdown position. Release choke

plates (choke plates will not close completely) and observe that the fast idle adjusting screw is seated on the kickdown step of the fast idle cam. If this condition is met, proceed quickly to Section III. If this condition is **not** met, repair or replace fast idle cam latch assembly, following Caution No. 2 as outlined in Section II, Step No. 2. Then recool bimetal (if necessary) according to Section II, Steps No. 3 and 4 and proceed quickly to Section III.

Section III—Electric Choke Functional Test

1. Without touching throttle, start the engine, position throttle and hold approximately 2500 RPM. Check the time for the choke plates to rotate to the vertical position and the time for the fast idle cam to drop from the kickdown position to the curb idle position.
 - a) If time to rotate is **within** specification, let engine run until the fast idle cam drops to the curb idle position or a maximum of an additional 2 minutes.
If cam does not drop within specification, check fast idle cam latch assembly installation as outlined in Section II, Step No. 2, Caution No. 2. If installation is satisfactory, replace fast idle cam latch assembly and check if cam drops. If cam drops within specification, no further tests are required. Turn off the engine; remove all test equipment and reinstall system components. Torque wing nuts to specification.
 - b) If time to rotate is **not within** specification, proceed to Step No. 2.
2. Disconnect the stator lead at the choke cap terminal or at the lead connector and connect it to one lead of a test light. Connect the second test light lead to ground.
3. With engine running, observe **one** of the following conditions:
 - a) If the light does not glow, either the alternator is not functioning or the automatic choke wire from the stator has an open circuit and should be repaired as necessary. Then, repeat Section II, Steps No. 3 and 4 and Section III.
 - b) If the light glows, replace the choke bimetal assembly. Proceed to Step No. 4.
4. Turn off the engine, remove all test equipment and reinstall systems components. Torque air cleaner wing nuts to specification.

Model 4350-4V Carburetor—7.5L (460 CID) Engines

I. Freedom of Linkage and System Integrity Check

With the engine off, perform the following operations:

1. Remove air cleaner, verify that the vacuum hoses, solenoid and electric choke wires are properly connected and intact. Correct as required.
2. Check the following for freedom of operation: Throttle system (primary and secondary), air valve, choke plate, all linkages, fast idle cam, etc. Correct as required.

II. Choke Heat System Leakage and Flow Meter

1. Disconnect the choke clean air hose from the carburetor air horn and attach a flow meter to the hose.

2. Warm engine to normal operating temperature and observe flow meter reading.
3. If flow meter reading is within specification, remove the flow meter, reconnect the clean air hose to the carburetor and proceed to Section III.
4. If the flow meter reading is not within specification, refer to Appendix A.

III. Choke Functional Checks

1. Disconnect the stator lead at choke cap terminal and connect a test light in series with ground.
2. The light should glow at all times while engine is running.
3. If light does not glow, either the alternator or choke wire should be replaced as necessary.
4. Place test light in series with choke terminal and stator lead. If light does not glow, replace choke cap assembly. If light glows, turn off engine.
5. Remove (see caution in Step 9) the hot air supply tube at the choke housing and install a choke tester (14-0206 or equivalent). Cool choke housing per choke tester manufacturer's instruction until bimetal closes choke plate lightly in air horn.
6. Check for choke resistance by adequately securing an ohmmeter across the choke cap terminal and choke ground strap.
7. This value should be within specifications. If out of specifications, replace choke cap assembly. Remove Ohmmeter.
8. Apply external vacuum 16" (Hg) + 2" to pulldown control diaphragm. Measure (at lower edge) choke plate opening. Pulldown setting should be within specifications for minimum choke plate opening. If choke plate minimum opening is met, continue with Diagnosis. Reset pulldown if found to be out of specification.
9. Remove choke tester from adaptor.
10. Start the engine without touching throttle and observe the following:
 - If diaphragm retracts.
 - On applicable models, the fast idle cam should rotate and throttle should move to kickdown step of cam in specified time.
 - That the choke plate rotates to the specified position within the specified time.

NOTE: The choke plate time to rotate to the specified position is measured from engine start-up until the choke linkage moves the secondary throttle lockout nut just clear of the secondary throttle shaft lever.

If any of these conditions are **not** met, refer to the appropriate section of Appendix A.

11. Re-install hot air supply tube.
CAUTION: Use extreme care in re-installing the hot air supply tube as its retaining nut could easily be cross-threaded.
12. Stop the engine. Remove instruments and reinstall related system components. Torque the air cleaner wing nuts to specification.

IV. Choke Plate Pulldown Check

1. Remove the choke thermostatic spring housing assembly.

2. Open throttle about half-throttle and position the fast idle adjusting screw on the high step of the fast idle cam.
3. Bend a 0.036" diameter wire gauge at a 90 degree angle approximately 1/8" from its end. Insert the bent end of the gauge between the choke piston slot and the upper edge of the right-hand slot in the choke housing.
4. Inspect vacuum piston linkage for binding between pin and slotted link, by rotating thermostatic lever.
5. Rotate the choke thermostat lever counterclockwise until the gauge is snug in the piston slot. Hold the gauge in position with light force on the lever and move the top of the choke rod away from the carburetor while moving the bottom of rod toward carburetor to remove end play from linkage.
6. Using a drill gauge or equivalent, check initial choke pulldown clearance by placing the gauge against the inner wall of the choke air horn on the downstream side at approximately the longitudinal centerline of the carburetor and check clearance from wall to edge of choke plate.
7. If the measured clearance is not within specifications, adjust clearance by turning the hex-head lock screw on the choke shaft in a clockwise direction three (3) full turns. (NOTE: Lock screw is left hand threaded.) Pry choke lever from choke shaft to break taper lock. Choke lever should rotate freely on the choke shaft.
8. Hold the drill gauge with diameter equal to specified pulldown clearance between the lower edge of the choke plate and air horn wall, maintaining light closing force on choke plate.
9. With choke piston snug against the 0.036 inch wire gauge, the top of the choke rod held away from the carburetor while moving the bottom of the rod toward the carburetor to remove end play from linkage and the choke plate held against the drill gauge, tighten the hex-head screw on the choke shaft.
10. Reinstall the choke thermostatic spring housing assembly.
11. Check altitude compensator assembly (if so equipped) as follows:
 - a. Remove the aneroid housing (outer most housing) and gasket by removing the three machine screws.
 - b. This exposes the poppet valve assembly. Check the poppet valve for freedom of operation. If poppet valve is free, proceed to (10d).
 - c. If poppet valve is sticky or binds, spray choke cleaner (C9AZ-19A501-B or equivalent) on the poppet valve and guide area to remove any deposits. Make sure that valve is completely free by depressing the valve. If unable to free-up the valve, replace the altitude compensator assembly.
 - d. Re-install the aneroid housing and gasket onto the valve housing (three machine screws).
12. Re-install system components. Torque carburetor wing nut (on air cleaner) to specification.

SSD-12 AUTOMATIC CHOKE CHECK PROCEDURE

Model 2700 Carburetor

I. Freedom of Linkage and System Integrity Check With the Engine Off, Perform the Following Operations:

1. Remove the air cleaner. Confirm that vacuum hoses, solenoid and electric wires are intact and properly connected. Correct as required.
2. Check the following for freedom of operation: Throttle system linkage, all choke linkages (fast idle cam, levers, etc.). The throttle should be held open slightly for this check. Correct as required and/or clean according to the choke linkage cleaning procedure.

II. Choke Heat System Leakage and Flow with Flow Meter

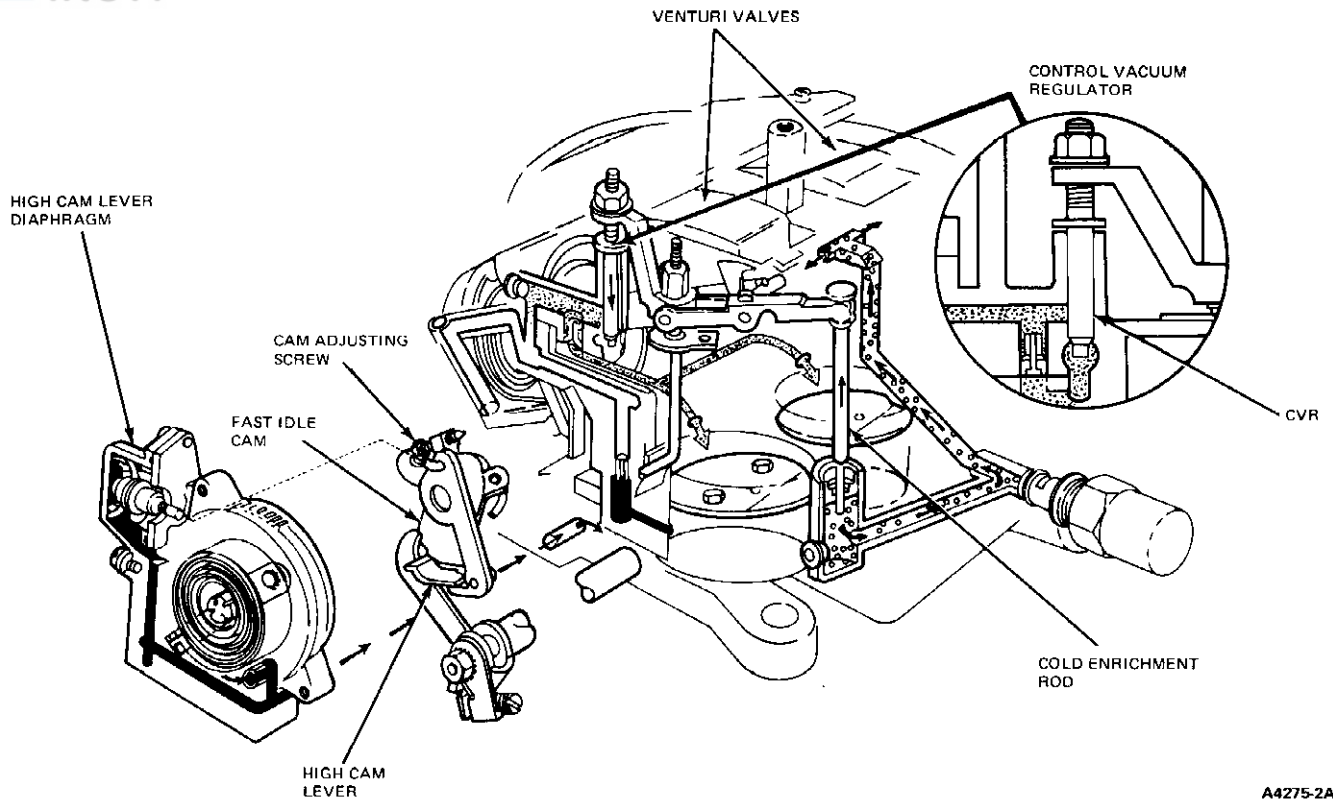
1. Connect flow meter T75L-9850-A or equivalent to choke cold air supply tube. (Use a 9/32" ID (Minimum) adaptor between the choke tester and the cold air supply tube.)
2. Warm engine to normal operating temperature and at curb idle, observe flow meter reading.
3. If flow meter reading is within specification, remove and proceed to Section III.
4. If flow meter reading is not within specification, clean, repair or replace as required to meet flow specifications.

III. Electric Choke Function and Kickdown Check

1. Bring engine to normal operating temperature and turn off. Disconnect the stator lead at the choke cap terminal. Connect a test light in series with the stator lead and ground.
2. The light should glow at all times while engine is running.
3. If light does not glow, check alternator and choke wire and repair as necessary.
4. Place test light in series with choke terminal and stator lead. If light does not glow, replace choke cap assembly. If light glows, turn off engine.

NOTE: If choke cap is replaced, repeat Step 4 to check system and heat bi-metal disc to close contact on electric choke cap.

5. Remove (see caution in Step 13) the hot air supply tube at the choke housing and install a choke tester (14-0206 or equivalent).
6. Open to 1/2 throttle to set the fast idle lever on the specified Step of the fast idle cam (Fig. 7).
7. Cool choke housing per choke tester manufacturer's instructions until the cam lever just touches the cam adjusting screw (Fig. 7). **Do not follow choke tester manufacturer's time specifications.**
8. H.C.S.P. diaphragm check.
 - a. Open the throttle and manually move H.C.S.P. to its retracted position.
 - b. Close throttle with H.C.S.P. retracted.
 - c. Open and close throttle to observe if H.C.S.P. automatically positions itself between fast idle cam and fast idle lever.
 - d. Repeat Steps a, b, and c three times to assure proper operation.



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FIG. 7 Model 2700 VV Carburetor

- e. If H.C.S.P. function is OK, proceed with Step 9. If not OK, refer to Appendix "A" for corrective action.
 9. Remove choke tester. Start engine without touching throttle. Open throttle—the H.C.S.P. should retract. If the H.C.S.P. fails to retract, refer to Appendix "A" for corrective action. Shut engine off.
 10. Install choke tester 14-0206 or equivalent.
 11. Open to 1/2 throttle to set the fast idle lever on the specified Step of the fast idle cam.
 12. Cool choke housing per instructions until the cam lever just touches the cam adjusting screw. **Do not follow choke tester manufacturer's time specification.**
 13. Remove choke tester from adaptor and reconnect alternator stator lead to choke terminal.
CAUTION: Exercise extreme care in removing, re-installing and checking for leaks in the choke hot air supply tube, as its retaining nut could be easily cross-threaded.
 14. Start the engine without touching the throttle. Record the time in seconds required for the choke metering rod to move downward to the seated position. Recorded time should be within specification.
 15. If time exceeds specification, repeat Steps 10-14.
 16. If time still exceeds specification, proceed to Appendix "A".
 17. Choke heat system check:
 - a. Connect a flow meter to the choke cold air supply tube.
 - b. Warm engine to normal operating temperature—and, at curb idle, observe flow meter reading.
 - c. If flow meter reading is within specification, remove meter.
 - d. If flow meter reading is not within specification, clean, repair, and/or replace as required to meet flow meter specification.
 18. Remove instruments and re-install related system components.
- IV. Cold Cranking Enrichment Circuit Check**
1. Check the electrical connections of the carburetor cranking solenoid circuit for proper installation. Repair and/or replace as necessary.
 2. **Check the water temperature switch for proper operation.** Disconnect the wiring harness at the water temperature switch. Measure the resistance between the cold terminal (marked "C" or "R") of the water temperature switch and engine ground. The resistance should be less than one ohm on a cold engine and a warm engine should indicate infinite resistance or an open circuit. If the engine is warm, above 125 degrees, remove the water temperature switch and cool to less than 125 degrees and recheck resistance. If both hot and cold resistance are not met, replace the water temperature switch. (Do not reinstall temperature switch at this time.)
 3. **Check the cranking circuit harness.** Connect the harness to the temperature switch (switch must remain below 125 degrees). Disconnect the wiring harness at the cranking solenoid and place

a test light across the terminals on the harness connector (female receptacle). While cranking the engine the test light should glow. If light does not glow, repair and/or replace cranking electrical circuit. Then repeat Step 3. If light glows, install water temperature switch and proceed.

4. **Check for cranking solenoid activation when battery voltage is applied.** Run two jumper wires to solenoid, one from positive terminal of the battery, the other from engine ground. There should be a distinct click (or audible sound). Repeat three times. If a click is not heard, replace the cranking solenoid according to Appendix B. If click is heard, proceed.
5. Reconnect the harness to the temperature switch making sure the rubber boot is not rolled under, and reconnect the cranking solenoid to the wiring harness.

MODEL 2700 CARBURETOR CAM SET PROCEDURE

Special Tool: 120 degrees Index Stator Choke Cap T77L-9848-A

1. Remove choke cap.
2. Hold throttle lightly closed with a rubber band to maintain cam position.
3. Place the fast idle lever in the corner of the steps (see specification for proper step setting) of the fast idle cam with the H.C.S.P. assembly in its retracted position (Fig. 7).
4. Install 120 degrees stator cap.
5. Turn the cam adjusting screw until the index mark on the stator cap lines up with the proper mark on the choke casting (see specification). Make sure the fast idle lever is still in the corner of the step.
6. Remove the stator cap and reinstall the choke cap, making sure that the tang is engaged in the choke bimetal lever.

MODEL 2700 CARBURETOR CHOKE SET PROCEDURE

Special Tools Needed:

- 1) Dial indicator Tool-4201-C or equivalent.
- 2) Choke weight and 120 degrees index stator choke cap T77L-9848-A or equivalent.

Procedure:

- 1) Remove choke cap.
- 2) Install choke weight on the choke bi-metal lever.
- 3) Remove air cleaner stud and install dial indicator with the tip on the top surface of the choke metering rod. With the choke weight in place, adjust dial indicator to read zero. Make sure the zero repeats. This is critical.
- 4) Remove choke weight.
- 5) Install 120 degrees index stator choke cap at index. Verify that dial indicator reading conforms to vehicle specification. If not proceed to Step 6.
- 6) Turn the choke rod indexing nut (clockwise to increase or counterclockwise to decrease the height) to achieve specification (Fig. 7).
- 7) Repeat Steps 2 thru 6 to establish repeatability. Adjust if necessary.

- 8) Remove the stator cap and dial indicator.
- 9) Re-install the choke cap at index assuring that the bimetal tang is properly inserted in the cam bimetal lever. Re-install air cleaner stud.

APPENDIX A (EXCEPT MODEL 2700 CARBURETOR)

Diaphragm Fails to Retract

1. Check for binding of linkage—repair or replace as required.
2. Check for cracked vacuum hose (on carburetors with external vacuum supply, check vacuum supply to diaphragm).
3. Check for plugged vacuum channel (2V carburetor). Remove vacuum hose at diaphragm. Connect a vacuum source to the hose and trap. If a vacuum reading is maintained, the system is plugged. Clean, repair and/or replace as required.
4. Check for vacuum leak at gasket surfaces or ruptured diaphragm.
5. Check for loose attachment. Correct, repair or replace as required.

Fast Idle Cam Does Not Rotate or Does Not Meet Minimum Time Specification

- Check adjustment and reset as required to insure that fast idle screw rests on fast idle cam kickdown step when diaphragm is fully retracted.
- Check for leaks in diaphragm assembly if time is excessive.
- Replace diaphragm assembly if restriction cannot be cleared.

Choke Plate Does Not Open to Specified Position in Specified Time

- Check for binding linkage.
- Remove thermo assembly and inspect the vacuum piston linkage for binding between the pin and the slotted link.
- If plate does not rotate to specified position in prescribed time, replace choke thermo assembly.

Choke Heat System Flow Not Within Specification

1. Check for leaks; tighten connections in the hot air circuit.
2. Disconnect the hot air tube from the choke housing.
3. Connect choke flow meter to hot air connection on the choke housing.
4. If choke flow meter reading is within specification, check air supply system. Clean, repair or replace as necessary.
5. If choke flow meter reading is not within specification, clean, repair or replace as necessary.

Choke Pulldown Adjustment

1. Make certain that choke plate is lightly closed in carburetor air horn. (If engine is warm use choke

tester, 14-0206 or equivalent, to cool choke until choke plate lightly closes in the air horn.)

2. Note index position of bimetal cap and wrap choke cap 90 degrees in the rich direction (CCW) from that position and secure.
3. Activate pulldown motor manually or with external vacuum if the pulldown motor has an external vacuum tube.
4. Set specified MEAN choke plate opening between choke plate and the center of the carburetor air horn nearest to the fuel bowl by turning the adjusting screw at the back of the pulldown motor.
5. After the adjustment is made, apply Locitite 290 or equivalent to the threads of the adjusting screw where it enters the pulldown motor.
6. Return choke cap to its original position.

APPENDIX "A" FOR VEHICLES EQUIPPED WITH 2700-VV CARBURETOR

I. H.C.S.P. Diaphragm Fails to Retract (Fig. 7)

- A. Check for binding, misaligned linkages, broken parts, contamination and/or loose parts. Repair and/or replace.
- B. If repair or replacement was made, check H.C.S.P. diaphragm to see if it retracts, by repeating Section III, SSD-12 (Steps 5-8). If diaphragm retracts, return to Diagnostic Procedure, Step 9. Otherwise, perform Steps 1-4 of C.
- C. If repair or replacement was not made, proceed as follows:
 1. Remove carburetor.
 2. Remove H.C.S.P. diaphragm cover and check the sealing surface for a cracked, bent, distorted or chipped surface or for contamination. Replace or repair as required.
 3. Using hand vacuum pump 21-0014 or equivalent, apply a vacuum to the vacuum passage in the H.C.S.P. diaphragm flange. If a vacuum reading is maintained, the system is plugged. If plugged, clean as required.
 4. Remove the H.C.S.P. diaphragm from its base, being careful not to tear or distort it. Inspect it for pinholes, cracks, or decomposed diaphragm material:
 - a. If the H.C.S.P. diaphragm is satisfactory, reinstall the diaphragm cover taking care to align all vacuum passages. Check linkage and diaphragm for freedom of movement. Install carburetor on vehicle making all necessary connections, and return to Step 9.
 - b. If the H.C.S.P. diaphragm needs replacement, proceed as follows:
 - 1) Unscrew diaphragm assembly.
 - 2) While holding the throttle lightly in the closed throttle position, rotate the fast idle cam so the fast idle lever and the high cam choke lever rest on a cam step. The fast idle lever should now be resting at the bend in the H.C.S.P. as shown in Fig. 7.
 - 3) Still holding the throttle in the closed position, gently screw diaphragm assembly onto shaft until it bottoms. Then to align the

vacuum passage and hole in the diaphragm, rotate the diaphragm counterclockwise until aligned.

NOTE: The H.C.S.P. diaphragm can only be adjusted in increments of one full turn. The vacuum passage in the diaphragm must be aligned with the vacuum passage on the flange.

- 4) Install diaphragm spring and cover assuring that the vacuum passages are aligned and that the mechanism works freely.
- 5) Using a hand vacuum pump 21-0014 or equivalent, blocking vacuum passage which enters choke housing from the underside of throttle body, apply a vacuum to the choke hot air inlet making sure that the fast idle lever is free to allow cam and choke lever movement. The H.C.S.P. diaphragm should retract.
- 6) If the H.C.S.P. diaphragm fails to retract, remove the choke cap and apply a vacuum using the hand vacuum pump 21-0014 or equivalent to the heat restrictor vacuum passage next to the choke bimetal. Again the vacuum passage in the underside of throttle body near the choke housing must be plugged, clean as required. If the H.C.S.P. diaphragm retracts, reinstall choke cap, inspecting gasket and cap to insure their good condition and install carburetor on vehicle. If the diaphragm still fails to retract check for leaks in choke housing at the lead seals and at H.C.S.P. diaphragm seating surface. Repair or replace as necessary.
- 7) Install carburetor on vehicle making necessary connections and check to make sure the repaired mechanism is functional on running vehicle.

II. If the Choke Metering Rod Mechanism Fails to Move Downward Within the Specified Time.

- A. Disconnect the stator lead at choke cap terminal. Connect a test light in series with stator lead and ground.
- B. The light should glow at all times while engine is running.
- C. If light does not glow, either alternator or choke wire should be repaired as necessary.
- D. Place test light in series with choke terminal and stator lead. If light does not glow, replace choke cap assembly. If light glows, turn off engine.
- E. Check for damaged, missing, and/or misaligned parts. Check for dirt, grease or any foreign material on moving parts. Repair or replace and clean as required. If any linkage is repaired or replaced check choke set and cam set. If necessary, reset per Choke Set and Cam Set Procedure.
- F. If any corrective action is taken in Steps A thru E, re-install Stator lead and then perform electric choke function check, Section III, Steps 10 thru 14. If choke metering rod moves downward within the specified time, return to Diagnostic Procedure Step 17; otherwise, proceed to Step G.

G. Remove carburetor from vehicle.

1. Remove the retaining ("E") ring which holds the choke operating rod to the cam lever and remove the linkage from the cam lever (Fig. 7).
2. Open the throttle slightly and check cam lever for freedom of movement. The choke cap spring should provide the only resistance and the cam lever should spring back to the original position.
3. If movement is OK, proceed with Step 4. If the cam movement is still not free, remove the throttle body from the carburetor. Remove the choke cap and disassemble the choke shaft, the cam lever, and the fast idle cam. Check the surfaces of all parts for grease, foreign material, bends, cracks, or distortion. Clean and replace parts as necessary. If a new fast idle cam is installed, refer to the Model 2700 carburetor cam set procedure. Install throttle body on carburetor and torque to specifications.

4. Check remaining parts of choke system for freedom of movement by manually moving choke operating rod up and down. The movement should be free.

If movement is OK, proceed with Step "e". If the movement is not free, remove the retaining ("E") ring and pin from the choke metering rod lever (Fig. 7).

Carefully lift the choke metering rod, the choke CVR rod, and the choke metering rod lever up and out of the air horn as far as the choke operating rod will allow. Inspect the parts for foreign material, bends, distortion or breakage, clean and replace as necessary. If the choke CVR needs replacing, replace and set per Control Vacuum Regulator (CVR) adjustment procedure.

5. Make sure the choke operating rod is connected to the cam lever with the retaining ("E") ring.
6. Install carburetor on vehicle making sure all parts operate freely. Connect all vacuum hose(s) and electrical wires.

APPENDIX "B FOR VEHICLES EQUIPPED WITH MODEL 2700 CARBURETORS

I. Replacement of Electric Cranking Solenoid

- A. Remove carburetor from vehicle.
- B. Remove electric solenoid from main body of carburetor.
- C. Coat the "O" ring seal of the new solenoid with a mild solution of soap and water. This is important as a damaged "O" ring may result in a fuel leak.
- D. Install the cranking solenoid to the carburetor being careful not to damage the "O" ring. Torque to specification (See Part 24-27).
- E. Install carburetor on the vehicle making all the necessary connections.

MODEL 2700 CARBURETOR HIGH CAM FINGER SETTING PROCEDURE

Open to 3/4 throttle and depress choke operating rod to full travel, then close throttle. The fast idle lever

should be resting at the bend in the H.C.S.P. as shown in Fig. 7. If not, repair and/or replace as required.

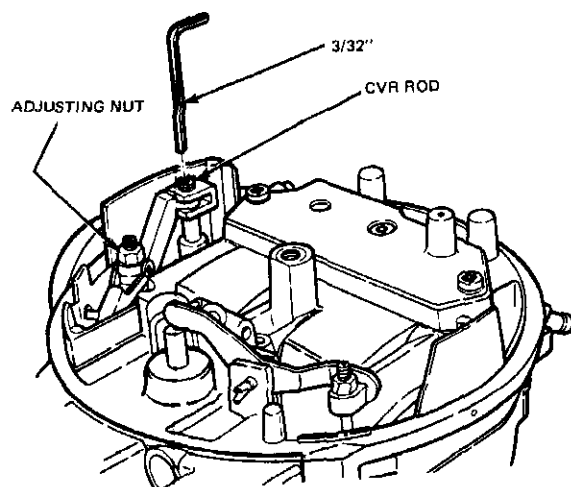
MODEL 2700 CARBURETOR CHOKE LINKAGE CLEANING PROCEDURE

- 1) Remove choke cap.
- 2) Using automatic choke cleaner (C9AZ-19A501-B) or equivalent, spray inside of choke cap on and near the bi-metal until dirty deposits and dirt buildup is washed away.
- 3) **Using the Wand Provided with the Cleaner**, spray all areas of the choke thermostat shaft inside and out of choke housing. Also, spray the entire choke linkage external to the carburetor. Use abundant amount of spray and move the choke thermostat lever, the fast idle lever, and the fast idle cam moderately while spraying.
- 4) Blow the choke parts previously cleaned with compressed air until visibly dry. Again, move the moveable parts moderately while blowing dry.
- 5) Repeat Steps 3 and 4.
- 6) Install choke cap gasket, choke cap (making sure that it is properly indexed) and choke cap retainer ring. Torque screws to specification.

MODEL 2700 CARBURETOR CONTROL VACUUM REGULATOR (CVR) ADJUSTMENT PROCEDURE

NOTE: The cold enrichment metering rod adjustment must be checked and/or set before making this adjustment.

1. Loosen the screws on the choke cap and rotate it 180 degrees clockwise (rich direction) from index and cycle the throttle to set the cam.
2. Press lightly on the CVR rod (Fig. 8), if there is any downward travel, the rod is not seated and must be adjusted. If there is no downward travel, turn the adjusting screw counterclockwise until there is some travel and proceed with the adjustment.
3. Turn the CVR rod clockwise until the adjusting nut just begins to rise (see Fig. 8).



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FIG. 8 Adjusting CVR (Control Vacuum Regulator)

4. Again, press lightly on the CVR rod—if any springback can be seen, the rod is not fully seated. Turn the adjusting screw clockwise by 1/4 turn increments until no springback can be seen.
5. Reset the choke cap to the specified setting.

SSD-13 IDLE FUEL MIXTURE

A. Propane Enrichment Method

NOTE: Leave all vacuum signal hoses attached to the air cleaner assembly when relocating the assembly to perform carburetor adjustments. **The air cleaner assembly must be installed, however, when measuring engine speeds.**

—Some engines may experience normal oscillations in idle speeds which could cause variations in engine speed measurement. If this condition is encountered, use the **average** engine speed.

1. Apply the parking brake and block the wheels. Then, start the engine, bring to normal operating temperature, and turn off.
2. Connect a tachometer.
NOTE: If the engine has a "Dura-Spark I" ignition system (blue coil tower), use tachometer 02-0362 or equivalent.
3. If so equipped, disconnect the fuel evaporative purge valve signal vacuum hose as follows:
Trace the purge valve vacuum hose from the purge valve (located on the canister) to the first point where the vacuum hose can be detached from the underhood hose routing, (vacuum tee connection, PVS, etc.). Disconnect the vacuum hose at **that** point, cap the open port and plug the vacuum hose.
CAUTION: To prevent possible damage to the purge valve, **do not** disconnect the vacuum hose **at the purge valve.**
4. If so equipped, disconnect the evaporative emission purge hose at the air cleaner and plug the nipple.
5. Disconnect the crankcase ventilation closure hose from the air cleaner and plug the nipple.
6. Disconnect the flexible fresh air tube from the air cleaner duct or adaptor. Using a propane enrichment tool (T75L-9600-A or equivalent), insert the tool hose approximately 3/4 of the way into the duct or fresh air tube. If necessary, secure the hose with tape.
7. Verify that the idle mixture limiter(s) is set to maximum rich position (counterclockwise against the stop); correct if required.
8. For vehicles equipped with Thermactor systems, revise the dump valve vacuum lines as follows:
 - a. For dump valves with one or two vacuum lines at the side, disconnect and plug the line(s).
 - b. For dump valve with one vacuum line at the top, check line to see if it is connected to intake manifold vacuum. If not, remove and plug the line at the dump valve and connect a slave line from the dump valve vacuum fitting to an intake manifold vacuum fitting.
9. Check engine curb idle rpm (or A/C - off rpm) according to procedure SSD-26; if necessary, reset to specification.

NOTE: Even if the vehicle has less than 100 miles of operation, set the speed to the "normal" engine specification and not the green engine spec.

10. With the engine idling, place the transmission selector in the position specified for the idle fuel mixture check (see the note below). Gradually open the propane tool valve and watch for engine speed gain, if any, on the tachometer. When the engine speed reaches a maximum and then begins to drop off, note the amount of speed gain.

NOTE: -On vehicles equipped with automatic transmission, the transmission selector position in which curb idle speed is set **may differ** from the position in which the idle fuel mixture check is performed. Be sure the correct transmission selector position is employed in both cases.

- With the transmission in neutral, run the engine at approximately 2500 rpm for 15 seconds before each mixture check.

- If the engine speed will not drop off, check the bottle gas supply. If necessary, repeat Step 10 with a new bottle gas supply.

11. Compare measured speed gain to specified speed gain:

NOTE: If it is determined that idle fuel mixture adjustment will be necessary, adjust the mixture according to the **reset** rpm specification.

• Certain engines have unique "green" engine idle fuel mixture specifications. If the vehicle has less than 100 miles of operation, be sure to use these specifications.

- a. If the measured speed gain is within specification, except as noted below, proceed to Step 12.
NOTE: If the measured speed gain is "0" rpm (no rpm rise) and the minimum speed gain specification is "0" rpm, proceed to Step 11d.
- b. If the measured speed gain is **higher** than the speed gain specification:
 - Turn the mixture screw(s)/limiter(s)* **counterclockwise** (rich) in equal amounts and simultaneously repeat Steps 8-9 until the measured speed rise meets the **reset** rpm specification. After final adjustment, proceed to Step 12.
- c. If the measured speed gain is **lower** than the speed gain specification:
 - Turn the mixture screw(s)/limiter(s)* **clockwise** (lean) in equal amounts and simultaneously repeat Steps 9-10 until the measured speed rise meets the **reset** rpm specification. After final adjustment, proceed to Step 12.
- d. If there is no rpm rise and the **minimum** speed gain specification is "0" rpm, perform the following speed drop test:

NOTE: Speed drop test information is specified with the artificial enrichment requirements on the engine emission decal whenever the minimum speed gain specification is "0" rpm.

* If the mixture limiter(s) must be removed for further adjustment, use Tool T-75L-9500-A to simplify removal and prevent damage.

(1) While watching the tachometer, adjust the mixture screw(s)/limiter(s) clockwise (lean) by the number of turns specified for the speed drop test. Note the drop in engine speed.

- If the measured speed drop is **equal to** or drops off by **more than** (including stall) the speed drop specification, return the mixture limiter(s) to the maximum rich position, or the mixture screw(s) to the position before adjustment. Proceed to Step 12.

- If the measured speed drop is **less than** the specified **minimum** speed drop specification, leave the mixture limiter(s) in the adjusted position and repeat Steps 9-11.

12. Turn engine off. Install new service limiter(s) against the maximum rich stop if the mixture limiter(s) were removed. If the mixture limiter(s) was **not** removed but the mixture limiter(s) is **not** against the maximum rich stop, remove the limiter(s) and install new service limiter(s) against the stop.

NOTE: Re-check engine rpm and idle fuel mixture if the mixture screw is disturbed during limiter installation.

Pre-soaking the limiter cap in hot water will soften the material and reduce the installation effort.

13. If the vehicle has less than 100 miles of operation, reset the curb idle speed to the "green" engine specification.

14. Remove test equipment and secure air cleaner wing nut(s) to specification.

B. Optimum Idle Method (California Only—To be used only when propane enrichment equipment is not available)

NOTE: - Leave all vacuum signal hoses attached to the air cleaner assembly when relocating the assembly to perform carburetor adjustments. **The air cleaner assembly must be installed, however, when measuring engine speeds.**

- Some engines may experience normal rpm oscillations at idle speed which could cause variations in engine speed measurement. If this condition is encountered, use the **average** engine speed.

1. Apply the parking brake and block the wheels. Then, start the engine, bring to normal operating temperature, and turn off.

2. Connect a tachometer.

NOTE: If the engine has a "Dura-Spark I" ignition system (blue coil tower), use tachometer 02-0362 or equivalent.

3. If so equipped, disconnect the fuel evaporative purge valve signal vacuum hose as follows:

a. Trace the purge valve vacuum hose from the purge valve (located on the canister) to the first point where the vacuum hose can be detached from the underhood hose routing, (vacuum tee connection, PVS, etc.). Disconnect the vacuum hose at **that** point, cap the open port and plug the vacuum hose.

CAUTION: To prevent possible damage to the purge valve, **do not** disconnect the vacuum hose at the purge valve.

4. If so equipped, disconnect the evaporative emission purge hose at the air cleaner and plug the nipple.

5. Disconnect the crankcase ventilation closure hose from the air cleaner and plug the nipple.

6. For vehicles equipped with Thermactor systems, revise the dump valve vacuum lines as follows:

a. For dump valves with one or two vacuum lines at the side, disconnect and plug the line(s).

b. For dump valve with one vacuum line at the top, check line to see if it is connected to intake manifold vacuum. If not, remove and plug the line at the dump valve and connect a slave line from the dump valve vacuum fitting to an intake manifold vacuum fitting.

7. Remove the idle mixture limiter(s) with Tool T75L-9500-A or equivalent.

8. Check curb idle rpm (or A/C-OFF rpm) in accordance with procedure D-2; if necessary, reset to specification.

NOTE: Even if the vehicle has less than 100 miles of operation, set the speed to the "normal" engine specification and not the "green" engine specification.

9. With the engine idling, place the transmission selector in the position specified for the propane enrichment check (see engine emission decal). Adjust the engine rpm to the "alternate idle speed change" rpm. (See engine emission decal.) Note the **new** idle speed rpm on the tachometer.

NOTE: - If the "alternate idle speed change" rpm is specified as "0", the above idle speed adjustment is not necessary.

On vehicles equipped with automatic transmission, the transmission position in which curb idle rpm is set **may differ** from the position in which the idle fuel mixture check is performed. Be sure the correct transmission position is employed in both cases.

10. Adjust the idle mixture screw(s) (rich or lean) and idle speed to achieve best idle at the new idle speed rpm.

11. If the "alternate idle speed change" rpm is "0", proceed to Step 13; otherwise, proceed to Step 12.

12. Turn the idle mixture screw(s) clockwise (lean) in equal amounts until the engine speed drops by the specified "alternate idle speed change" rpm.

13. Turn the engine off. Install new service limiter(s) at the maximum rich stop.

NOTE: If the mixture screw setting is disturbed during limiter installation, repeat Steps 8-12.

Pre-soaking the limiter cap in hot water will soften the material and reduce the installation effort.

14. Reconnect hoses removed in Steps 3, 4, 5 and 6.

15. If the vehicle has less than 100 miles of operation, reset the curb idle speed to the "green" engine specification.

16. Remove test equipment and secure the air cleaner wing nut(s) to specification.