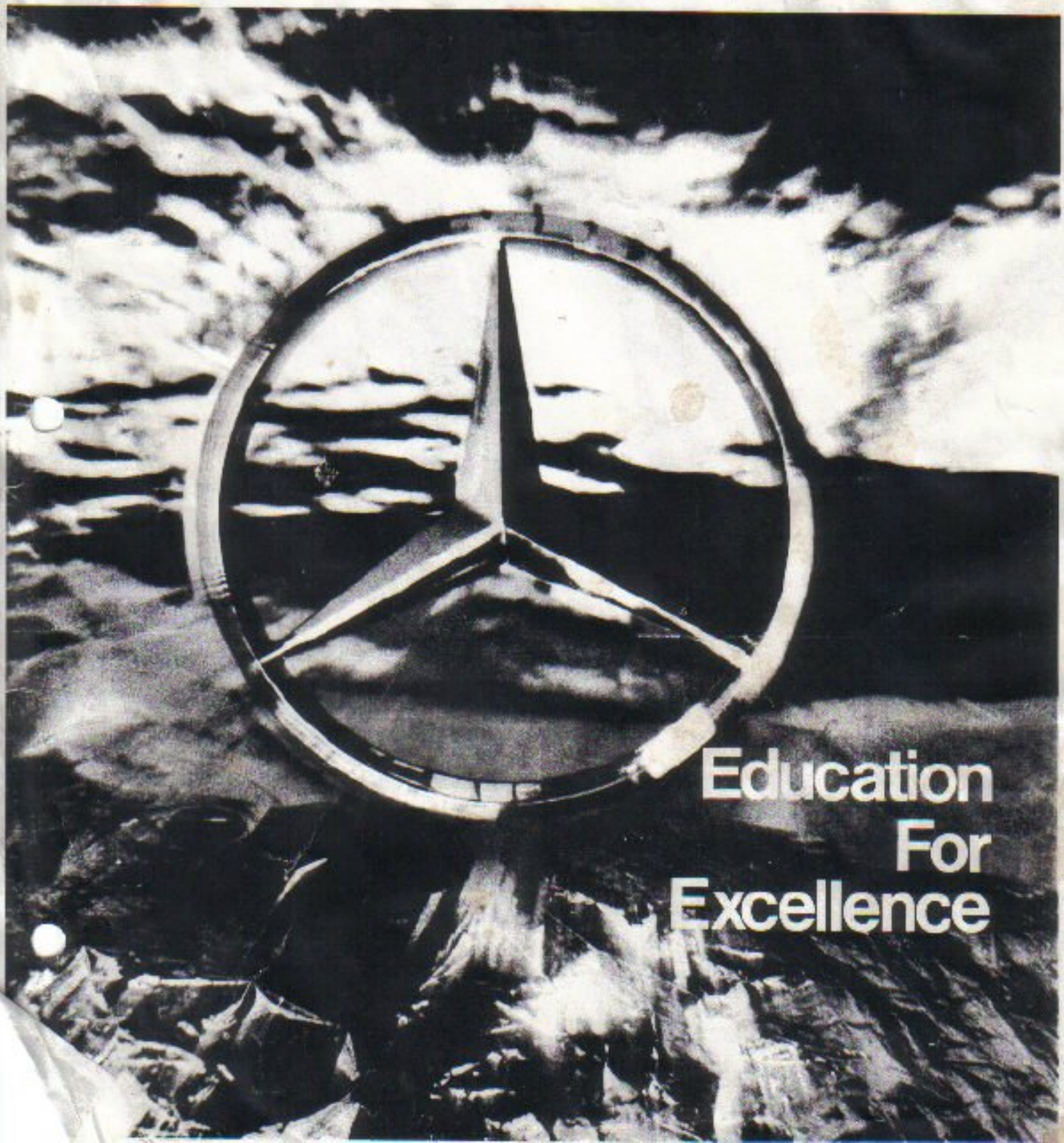
Mercedes-Benz service

Mercedes-Benz CONTINUOUS INJECTION SYSTEM (CIS) Diagnosis & Adjustment — (1976-1979)



Mercedes-Benz
CONTINUOUS INJECTION SYSTEM (CIS)
Diagnosis & Adjustment
(1976-1979)

MERCEDES-BENZ OF NORTH AMERICA
SERVICE TRAINING DEPARTMENT

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C.I.S. PROBLEM DIAGNOSIS CHART

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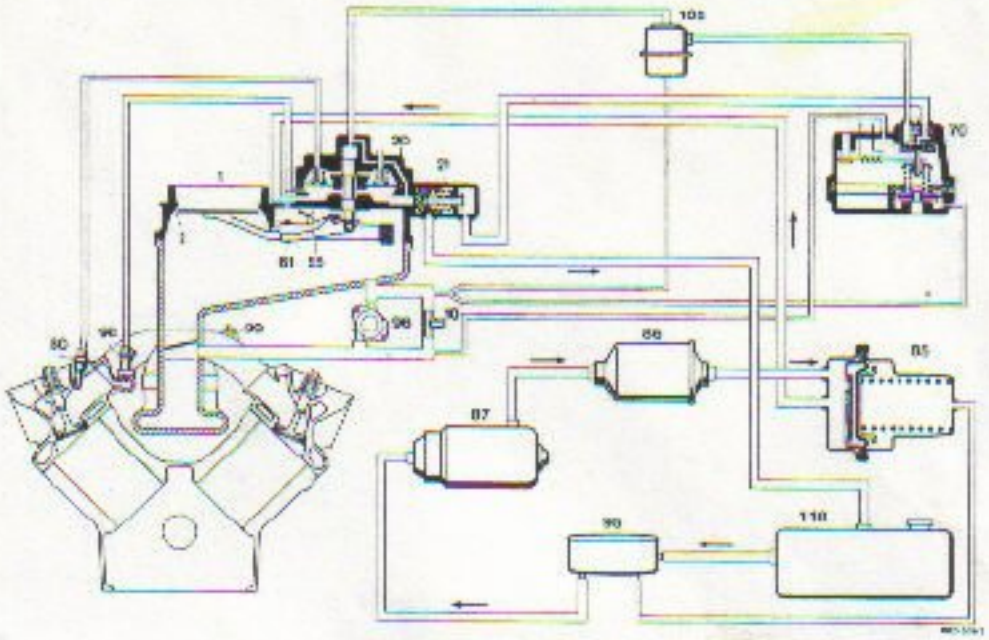
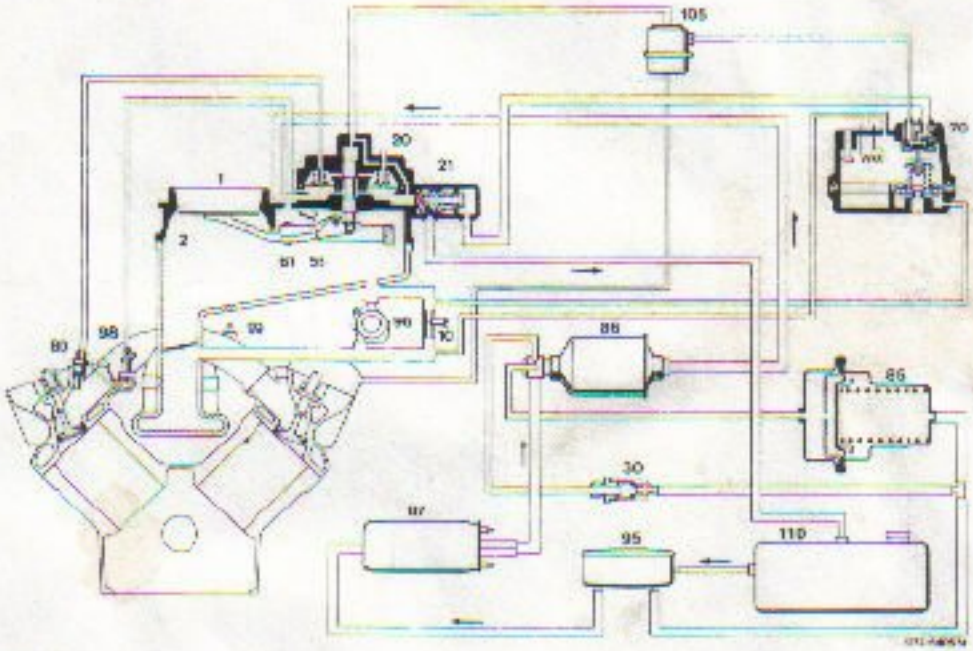
CIS Injection System — 1976, 1977, 1978 Models



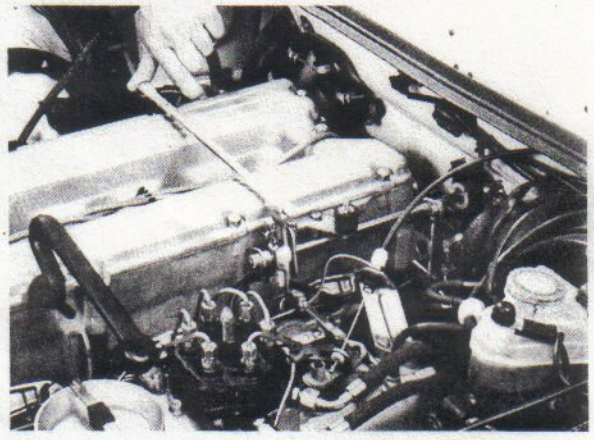
CIS Injection System — 1979 Models



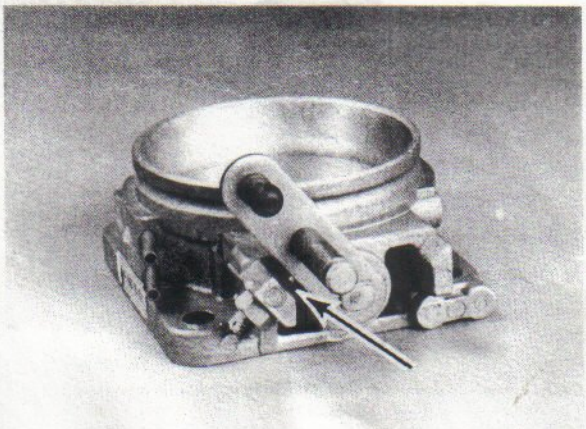
1 Mixture Regulator Assembly
2 Airflow Sensor
10 Idle Air Screw
20 Fuel Distributor
21 Primary System Pressure Regulator
30 Pressure Compensating Valve
55 Safety Switch
61 Idle Mixture Screw
70 Warm Up/Full Load Enrichment Compensator
80 Injection Nozzle
85 Fuel Accumulator
86 Fuel Filter
87 Fuel Pump
95 Suction Damper
96 Auxiliary Air Valve
98 Cold-Start Valve
99 Thermo Time Switch
105 Pressure Damper
110 Fuel Tank

TEST 1 CHECK THROTTLE CONTROL LINKAGE (6 CYL.)

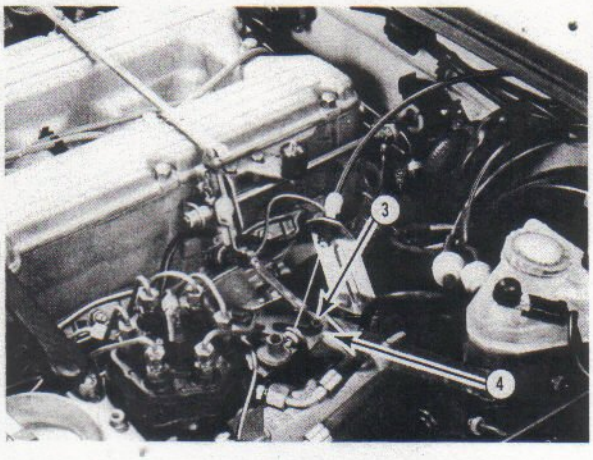
DESCRIPTION — Characterized by problems in controlling throttle opening and transmission shifting.
PURPOSE — To check linkage operation and adjustment.



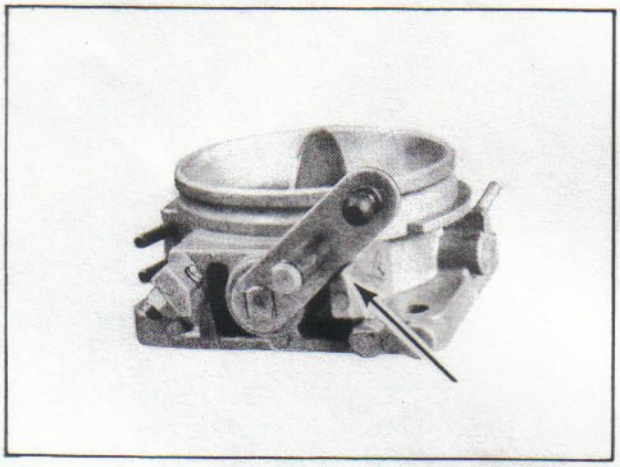
1.1
OPERATE linkage. It should move freely.



1.2
CHECK idle stop. The throttle valve lever should rest against it (arrow).

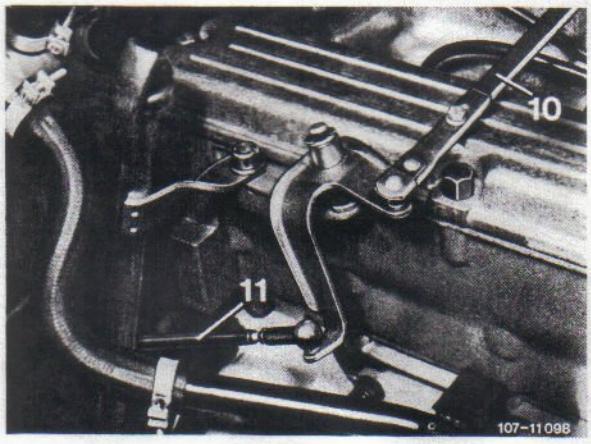


1.3
CHECK roller (3). It should rest tension free at the end of the slot of the gate lever (4).



1.4
DEPRESS accelerator pedal from inside car to touch kick down button.

The throttle valve lever should touch the full throttle stop (arrow).



1.5
DISCONNECT control pressure rod (11) and push toward rear.

It should reconnect to the ball joint tension free.

STOP

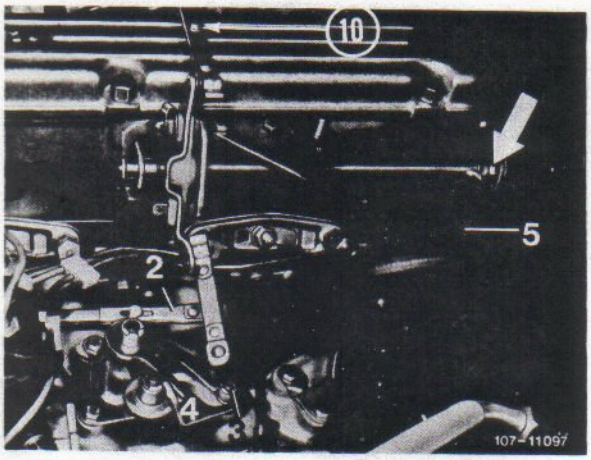
OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT, ADJUST LINKAGE (NEXT PAGE)

CORRECTING THROTTLE CONTROL LINKAGE (6 CYL.)



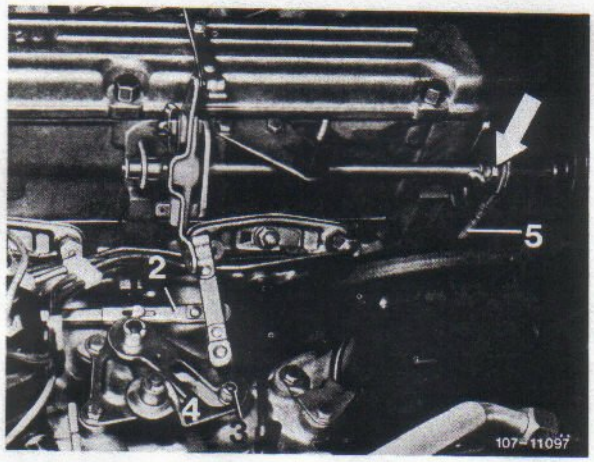
1.6
Throttle valve lever does not rest against idle stop:

MEASURE and correct length of control rods 2-5-10:

ROD 2 — 343 mm (13½") center to center of ball sockets.

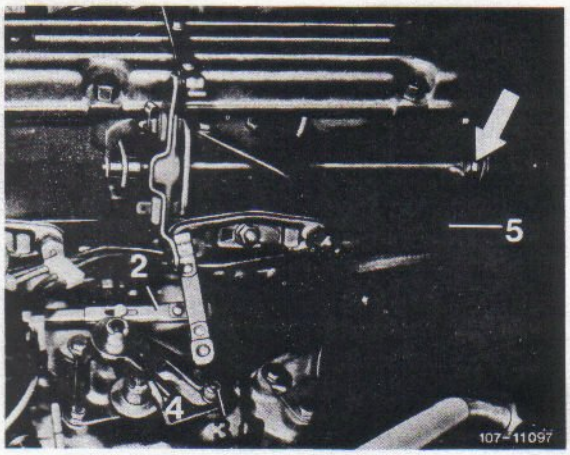
ROD 5 — 186 mm (7-5/16") center of ball socket to center of damping ring.

ROD 10 — 306 mm (12") center to center of ball sockets.



1.7
The roller does not rest at the end of the slot tension free:

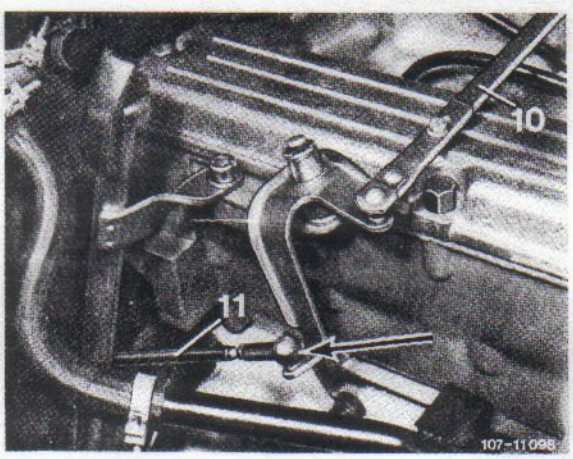
ADJUST control rod (2) as necessary.



1.8
The throttle valve lever does not touch the full throttle stop:

a. **ADJUST** control linkage travel with hex nut (arrow).

b. **MEASURE** and correct length of control rod (5). See step 1.6.



1.9
The control pressure rod (11) does not fit the ball joint tension free:

ADJUST length of rod at ball joint (arrow) to fit.

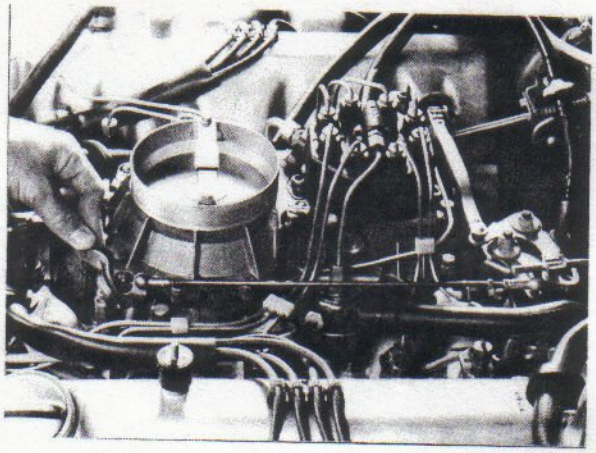
STOP

OK

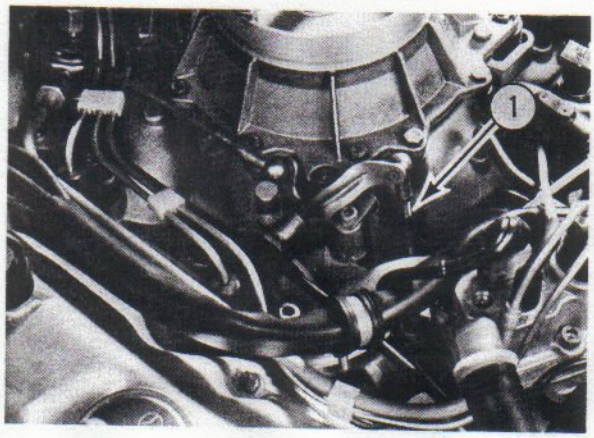
IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

TEST 1 CHECK THROTTLE CONTROL LINKAGE (8 CYL.)

DESCRIPTION — Characterized by problems in controlling throttle opening and transmission shifting.
PURPOSE — To check linkage operation and adjustment.



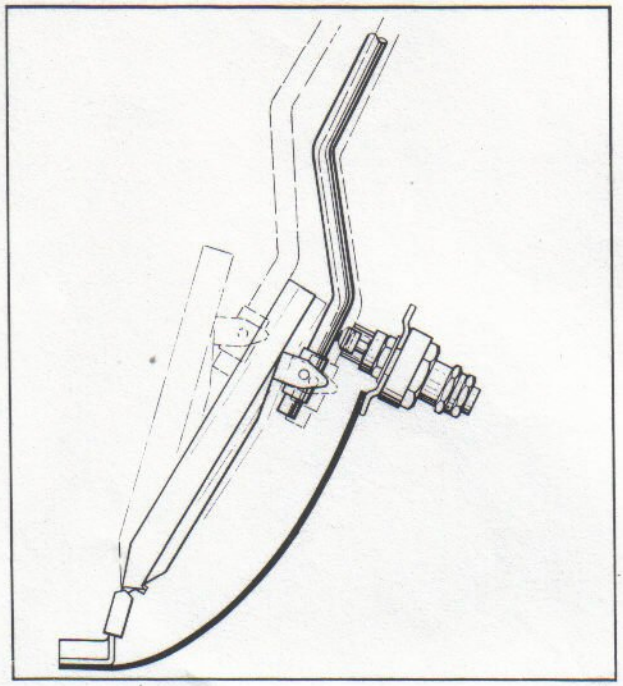
1.1
OPERATE linkage. It should move freely.



1.2
DISCONNECT rod (1) and check basic linkage adjustment.

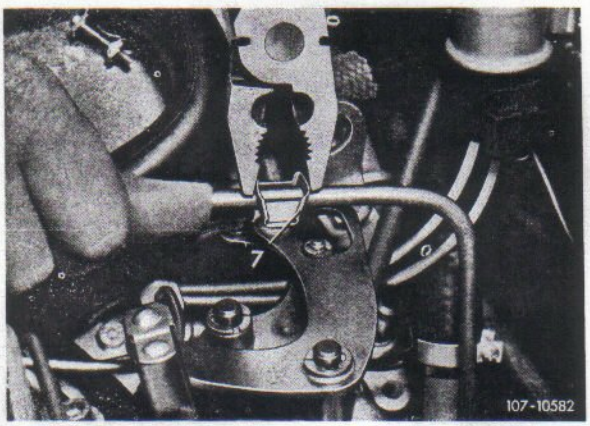
a. The throttle valve lever should rest against the idle stop.

b. Rod (1) should then reconnect tension free.



1.3
DEPRESS accelerator pedal from inside car to TOUCH kick-down button.

The throttle valve lever should touch the full throttle stop on the throttle valve housing.



1.4
COMPRESS — adjusting clip (7) and push control pressure rod fully toward the rear. (Do not force beyond stop).

Control pressure rod is thereby adjusted.

STOP

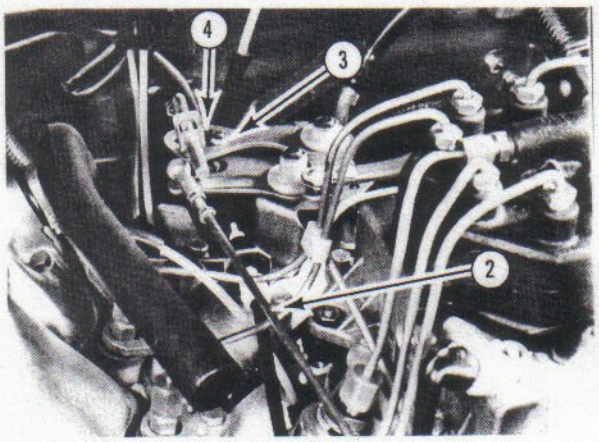
OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

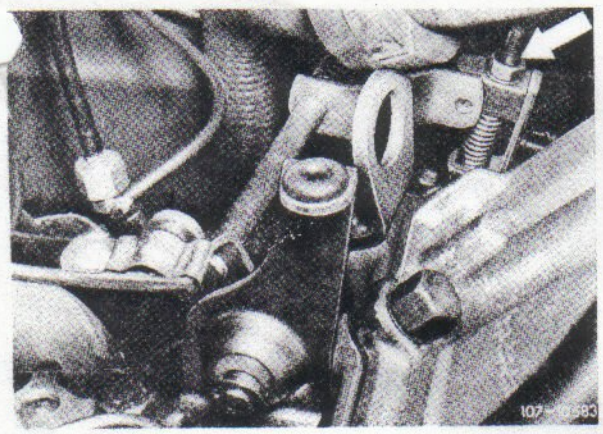
IF NOT CORRECT, ADJUST LINKAGE (NEXT PAGE)

CORRECTING THROTTLE CONTROL LINKAGE (8 CYL.)



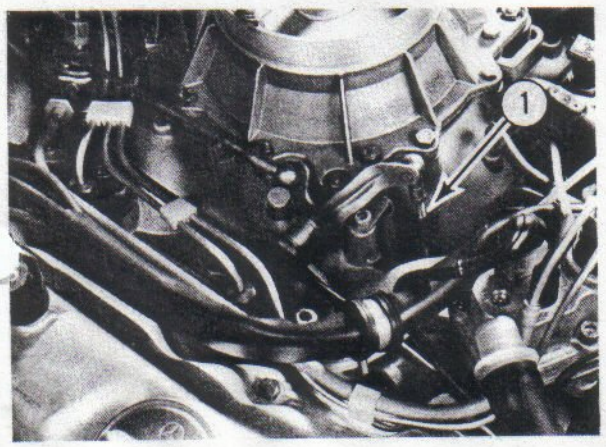
1.5
Rod (1) does not reconnect tension free.

ADJUST rod (2) so that roller (3) rests tension free in slot of gate lever (4).



1.6
The throttle valve lever does not touch the full throttle stop at the same time the kick down button is touched:

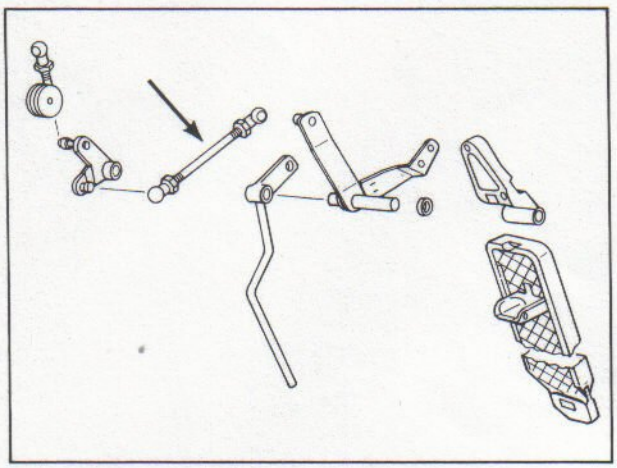
ADJUST linkage at nut (arrow).



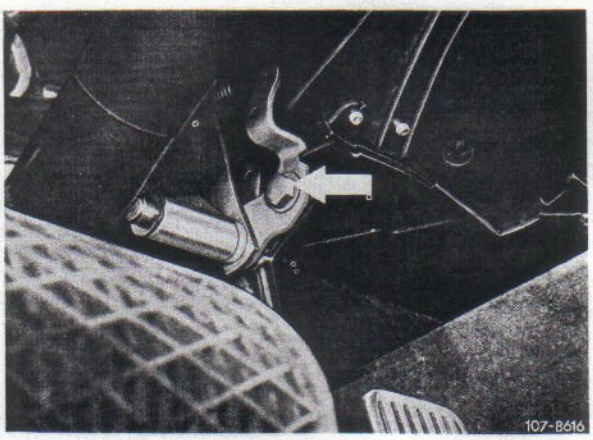
1.7
RECHECK that idle stop and full throttle stop are contacted.

IF NOT CORRECT: CHECK length of control rods:

a. Rod (1) from throttle valve lever to bell crank = 104mm (4⅛") from center socket to center ball socket.



b. Rod (arrow) from accelerator pedal to bell crank lever = 122mm (4-13/16") from center ball socket to center ball socket.



1.8
RECHECK that idle stop and full throttle stop are contacted.

IF NOT CORRECT: ADJUST accelerator pedal from inside vehicle:

LOOSEN screw (arrow) and pull pedal upwards slightly.

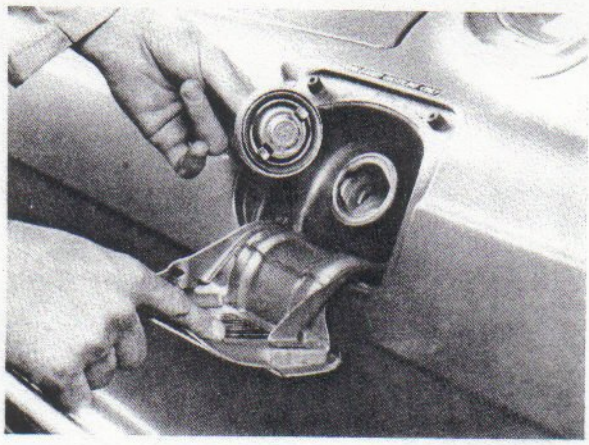
STOP

OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

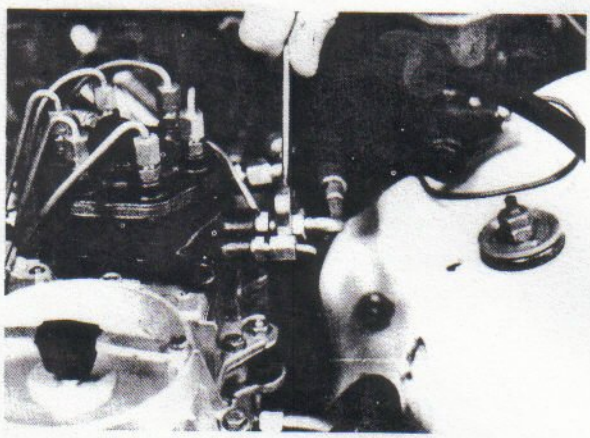
TEST 2 TESTING FUEL PUMP DELIVERY VOLUME

DESCRIPTION — Characterized by high speed fuel starvation. If totally restricted could cause a no-start situation.
PURPOSE — Tests condition of fuel pump, fuel filter, and fuel accumulator.



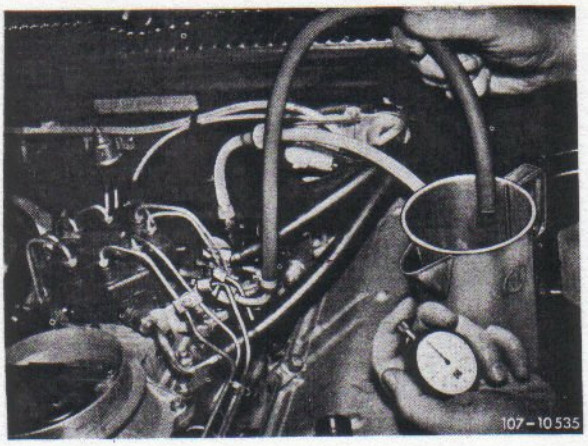
NOTE: The volume test does not test for an inoperative fuel tank venting system which would also cause a fuel starvation problem.

2.1
REMOVE fuel tank cap to release pressure in fuel tank.

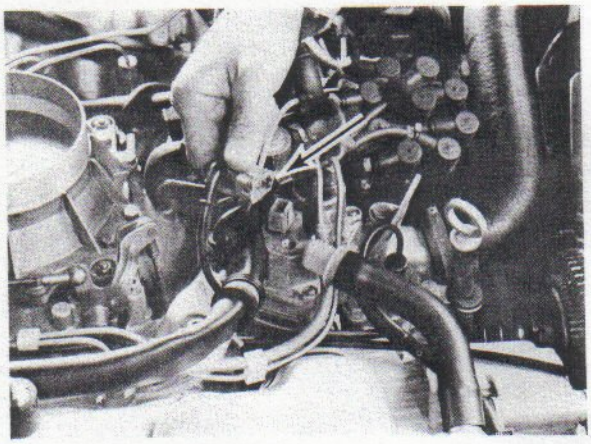


2.2
DISCONNECT fuel return hose on fuel distributor.

2.3
CONNECT fuel line (901 589 00 21 00) to fuel distributor.

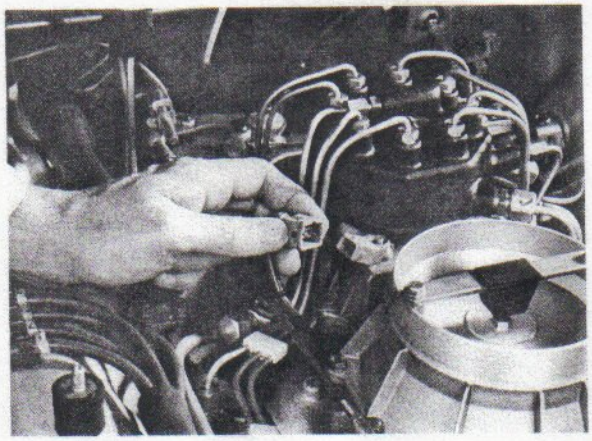


2.4
PLACE fuel line into measuring container.



2.5
DISCONNECT plug (arrow) on enrichment compensator.

NOTE: Avoid heating up compensator until cold control pressure value is checked.



2.6
TURN ON ignition. Then **DISCONNECT** fuel pump safety switch to run fuel pump.

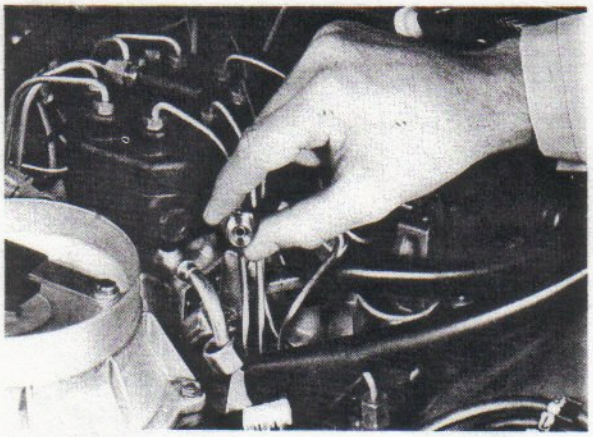
VALUE = 1 liter in 30 seconds (min.) with fuel tank at least half full and 11.5 volts min. at fuel pump.

2.7
READ fuel pump delivery volume.

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

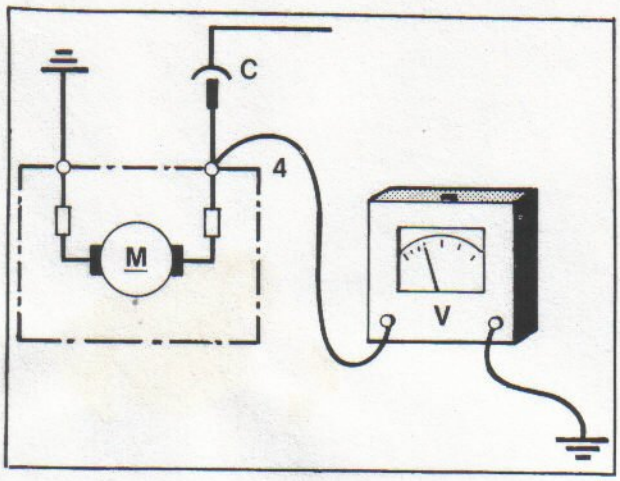
IF NOT CORRECT, CONTINUE FURTHER TESTING

Fuel pump delivery volume is not correct:
ADDITIONAL TESTING — FUEL PUMP DELIVERY VOLUME



2.8
CHECK for restriction in screw fitting strainer at fuel distributor.

2.9
CHECK fuel filter for restriction.



2.10
TEST voltage at fuel pump terminal B+.

VALUE =min. 11.5 volts.

OK

IF CORRECT:
REPLACE fuel pump.

OK

IF NOT CORRECT:
a. CHECK battery.
b. CHECK for resistance in electrical circuit to fuel pump (see E.T.M.).
c. CHECK for restriction in fuel circuit between pump and fuel pressure regulator.
d. REPLACE fuel pump.

VALUE = 1 liter in 30 seconds.

2.11
REPEAT fuel pump volume test.

OK

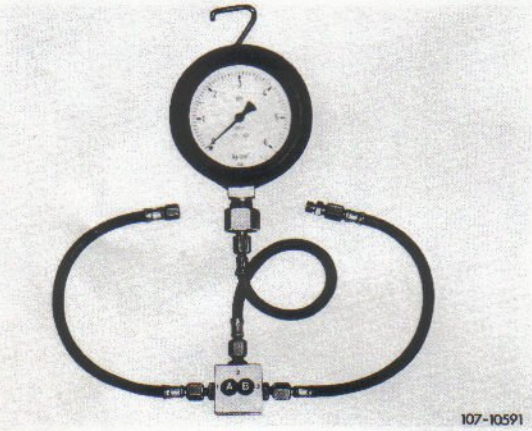
IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart

TEST 3 TESTING PRIMARY SYSTEM PRESSURE

DESCRIPTION — Characterized by a rough idle, hard starting (cold), & stumble on acceleration.

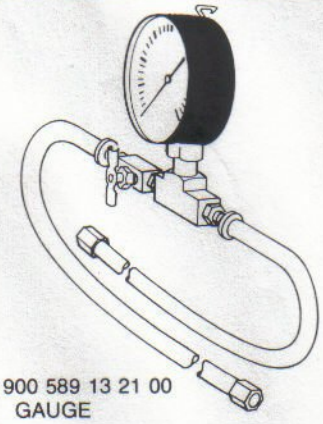
PURPOSE — Tests adjustment or condition of pressure regulator and condition of the fuel return circuit.

NOTE: The pressure gauge hook-up remains the same for all pressure tests. To prevent damage to seals, always keep gauge valves open.



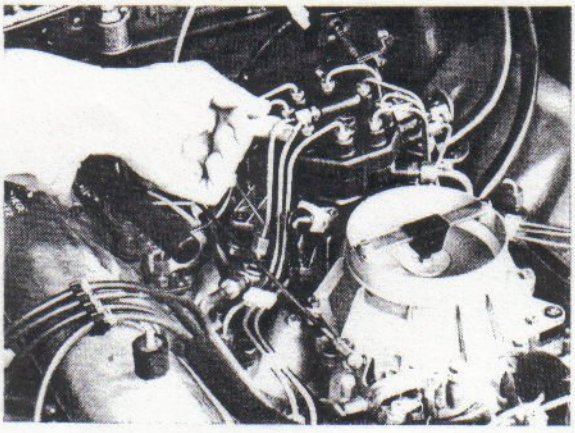
Part # 100 689 13 21 00
GAUGE

C.I.S. PRESSURE GAUGE IN BAR



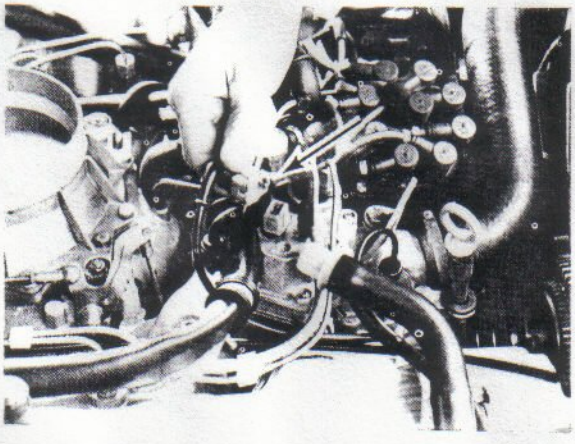
Part # 900 589 13 21 00
GAUGE

C.I.S. PRESSURE GAUGE IN P.S.I.



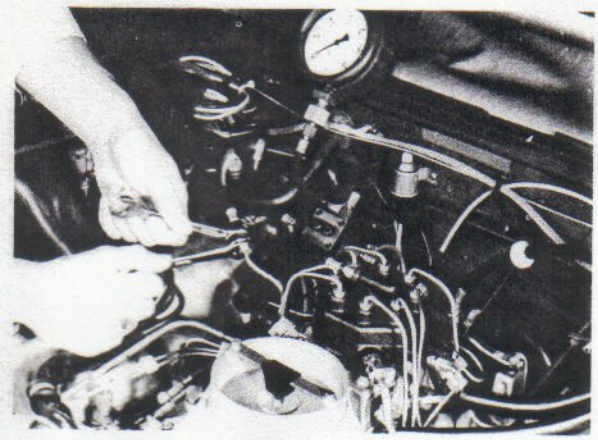
3.1
CHECK all fuel connections for external leaks.

3.2
REMOVE fuel tank cap.



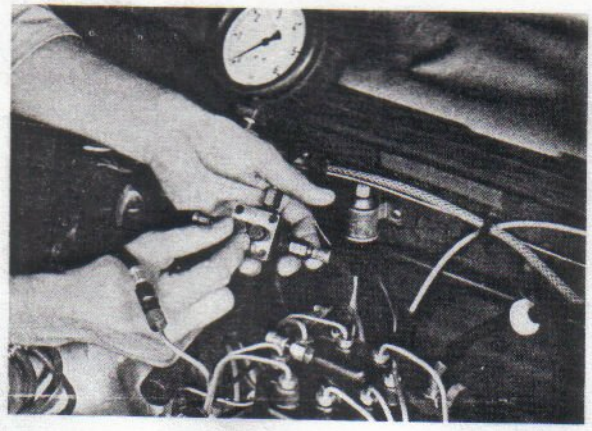
3.3
DISCONNECT plug (arrow) on enrichment compensator.

NOTE: Avoid heating up compensator until cold control pressure value is checked.

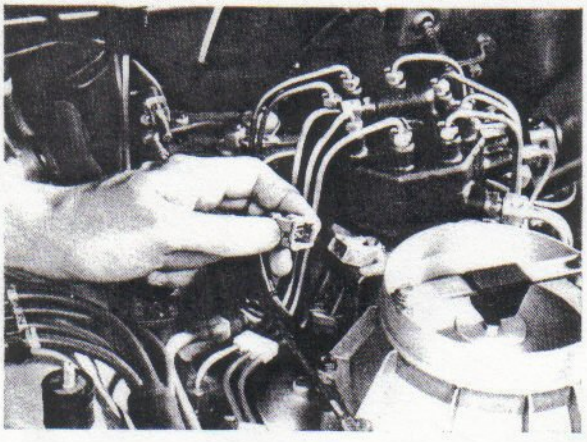


3.4
INSTALL gauge into control pressure circuit as follows:

Remove control pressure line at fuel distributor and connect gauge in between using adaptor fitting if necessary.



3.5
CLOSE VALVE on down-stream side of pressure gauge.



3.6
TURN ON ignition and disconnect fuel pump safety switch to run fuel pump.

✔✔✔✔✔✔✔✔✔✔✔✔✔✔✔✔✔✔

VALUE = 5.2-5.8 bar (76-84 psi).

✔✔✔✔✔✔✔✔✔✔✔✔✔✔✔✔✔✔

3.7
READ primary system pressure.

STOP

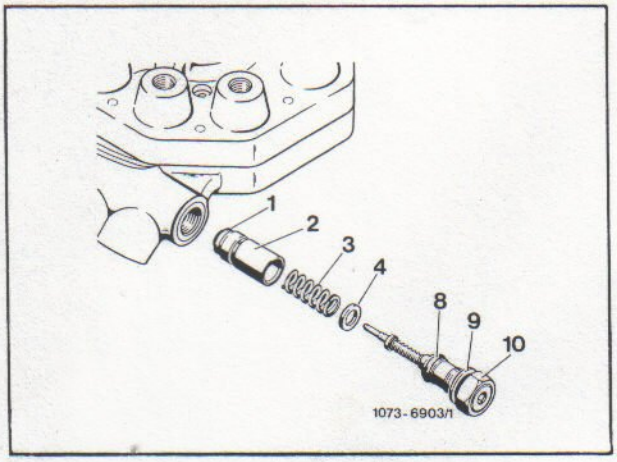
OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT, remove pressure regulator and attempt adjustment by changing adjusting shim

CORRECTING PRIMARY SYSTEM PRESSURE



3.8
REMOVE pressure regulator and attempt adjustment by changing adjusting shim (4).

NOTE: 0.1mm = 0.1 bar change
(.004") = (1.5 psi)

VALUE = 5.2-5.8 bar (76-84 psi).

3.9
REPEAT Test.

OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT,
if primary system pressure can not be corrected by replacing adjustment shims:

RECONDITION PRIMARY SYSTEM PRESSURE REGULATOR

SERVICE MICROFICHE GROUP 07.3. JOB #210

VALUE = 5.2-5.8 bar (75-84 psi)

3.10
CHECK primary system pressure:

OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT,
REMOVE Primary system pressure regulator again.
ADJUST be adding or removing adjusting shims (4).

NOTE: 0.1mm = 0.1 bar change
(.004") = (1.5 psi)

VALUE = 5.2-5.8 bar (76-84 psi).

3.11
REPEAT Test.

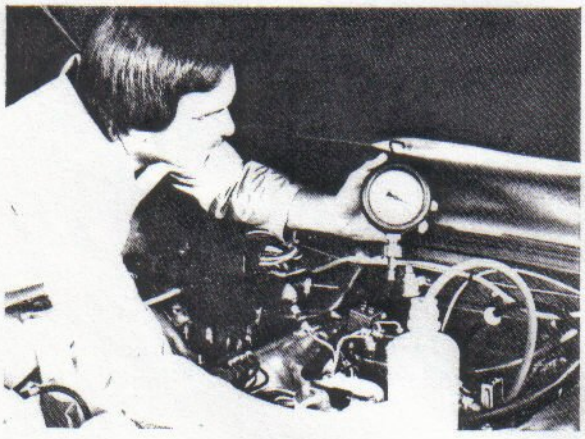
OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT,
IF PRESSURE REMAINS HIGH,
CONTINUE (NEXT PAGE)

3.12
DISCONNECT fuel return line at fuel distributor, attach fuel volume test hose, and place end in suitable container.



3.13
Run fuel pump (page 11) and **OBSERVE** pressure gauge.

RESULT: The pressure should now be lower than previous readings.

NOTE: If pressure is now lower than previous readings there is a restriction in the fuel return circuit. Find and repair cause of restriction.

VALUE = 5.2-5.8 bar (76-84 psi).

3.14
REPEAT primary system pressure test.

OK

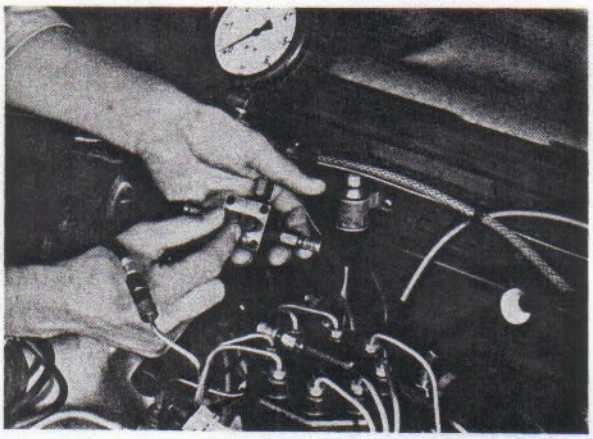
IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT,
REMOVE PRIMARY SYSTEM PRESSURE REGULATOR AGAIN.
ADJUST BY ADDING OR REMOVING ADJUSTING SHIMS.

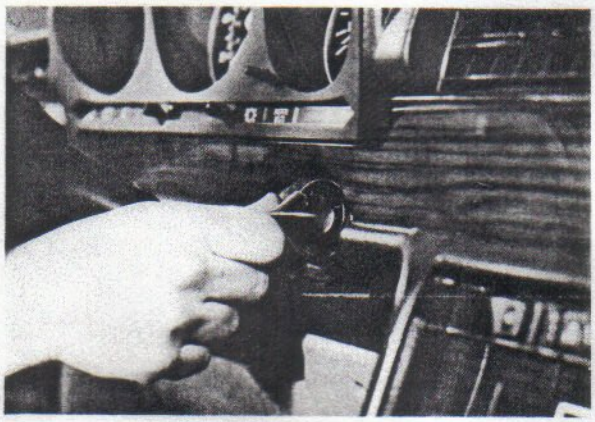
TEST 4 STATIC PRESSURE TEST

DESCRIPTION — Characterized by hard starting.
PURPOSE — Tests for internal system leakage that could be caused by: pressure regulator, cold-start valve, fuel pump non-return valve, leaking diaphragm in accumulator, pressure compensating valve, flow control valve, or leakage around control plunger or O-ring on metering sleeve in fuel distributor.



NOTE: See Test 3 for connecting gauge.

4.1
OPEN valve(s) on gauge.



4.2
TURN ON ignition and run fuel pump for 30 seconds to fill accumulator.

VALUE = approx. 2.8 bar (41 psi) should hold steady.

After 30 minutes, the pressure should still be approximately 2.5 bar (36 psi).

4.3
TURN OFF ignition and read static pressure.

STOP

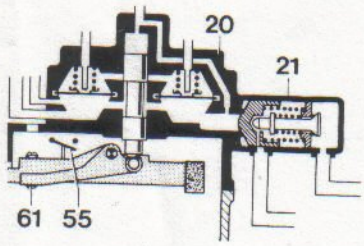
OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

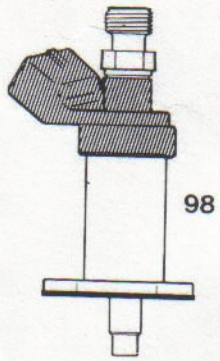
OK

IF NOT CORRECT, check the following to locate the leakage:
(NEXT PAGE)

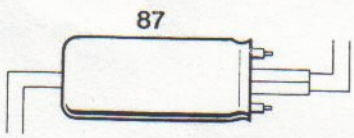
ADDITIONAL CHECKS — STATIC PRESSURE LOSS



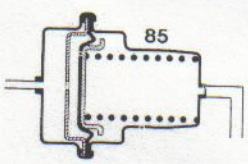
4.4
CHECK primary system pressure regulator and flow control valve.



4.5
CHECK cold-start valve.

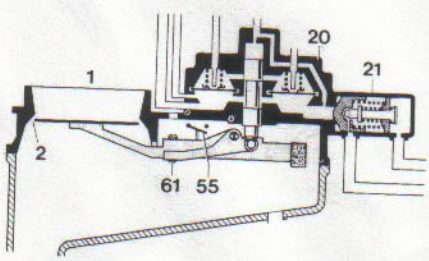


4.6
CHECK fuel pump non-return valve.



4.7
CHECK accumulator for leaking diaphragm.

4.8
CHECK pressure compensating valve.



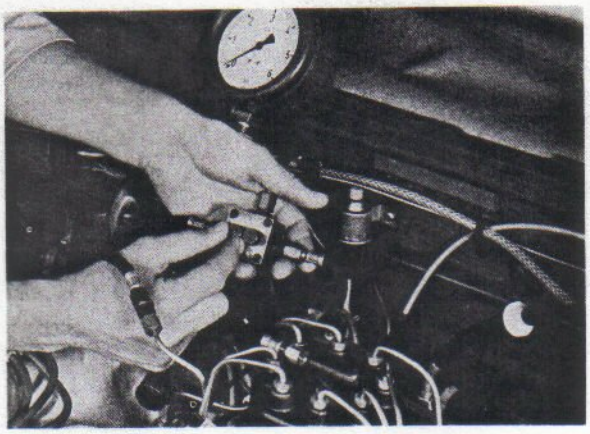
4.9
CHECK fuel distributor for internal leakage around control plunger or O-ring of metering sleeve.

OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

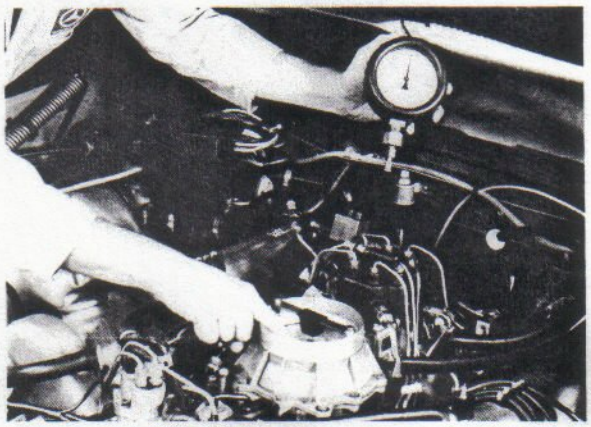
TEST 5 INJECTION NOZZLE LEAK TEST (INSTALLED)

DESCRIPTION — Characterized by an engine miss after starting, stumble on acceleration, and post detonation (dieseling) on shut off.
PURPOSE — To test for leaking injection nozzles.



CAUTION: Ignition must be **OFF!**

5.1
OPEN valve(s) on gauge.



5.2
PRESS sensor plate down slowly.

RESULT: the fuel pressure should move momentarily, then return and hold steady.

5.3
OBSERVE gauge.

STOP

OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT, go to "TEST 12". (PAGE 42)

TEST 6 TESTING COLD-START VALVE SYSTEM

DESCRIPTION — Characterized by an engine that is hard starting — hot or cold.

PURPOSE — Test that cold-start valve opens during cranking, does not leak after closing, and does not open on a hot engine.

A — TEST COLD-START VALVE

6 CYLINDER

8 CYLINDER

6A.1
REMOVE cold-start valve leaving it connected to fuel line and wiring harness and place valve in container.

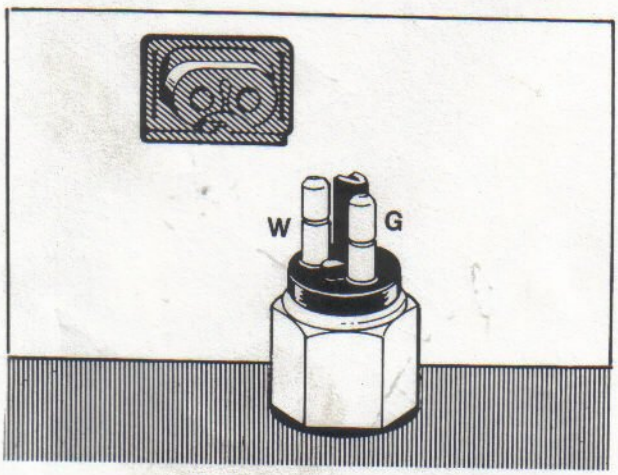
6 CYLINDER

8 CYLINDER

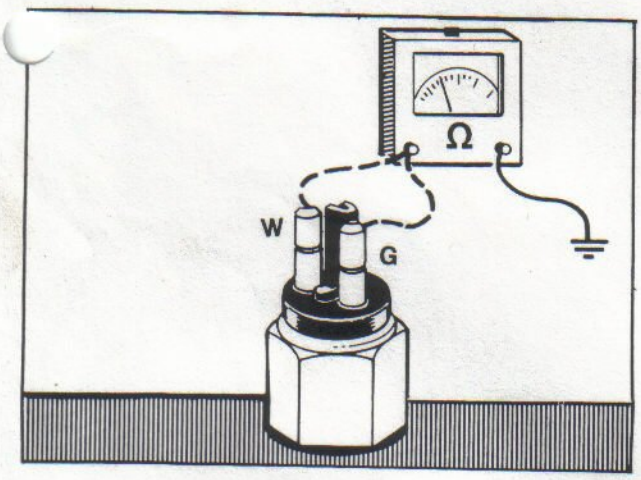
6A.2
DISCONNECT plug on thermo time switch.

B — TEST THERMO TIME SWITCH

NOTE: If the complaint is a hard starting engine, the thermo time switch should be checked in a hot state then removed from the engine and checked in a cold state.



6B.1
DISCONNECT plug on thermo time switch (99).



6B.2
TEST resistance at the "G" and "W" terminal pins of the thermo time switch.

COLD STATE

VALUES BELOW 15°C/59°F coolant temperature:

G to ground = approx. 50 ohms.

W to ground = approx. 0 ohms (contacts in switch closed).

HOT STATE

VALUES ABOVE 15°C/59°F coolant temperature:

G to ground = approx. 60 ohms.

W to ground = approx. 270 ohms (contacts in switch open).

STOP

OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

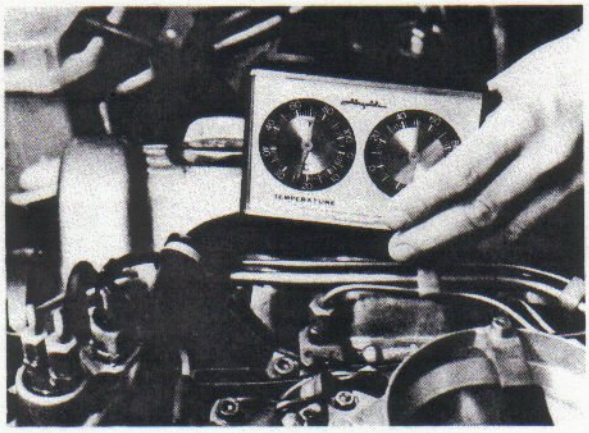
IF NOT CORRECT, replace the thermo-time switch.

TEST 7 TESTING COLD CONTROL PRESSURE

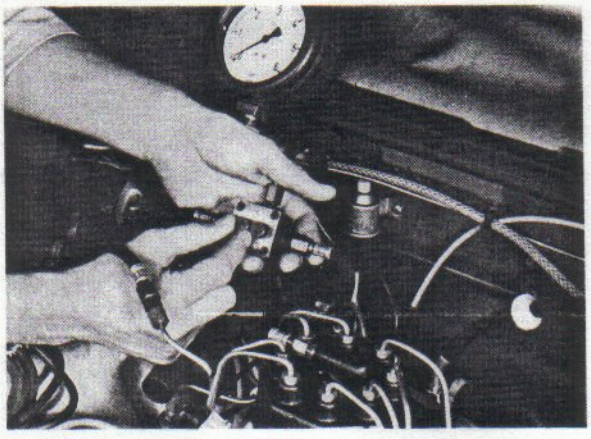
DESCRIPTION — Characterized by poor acceleration, stumble or lack of power when cold.

PURPOSE — To check enrichment compensator for cold operation.

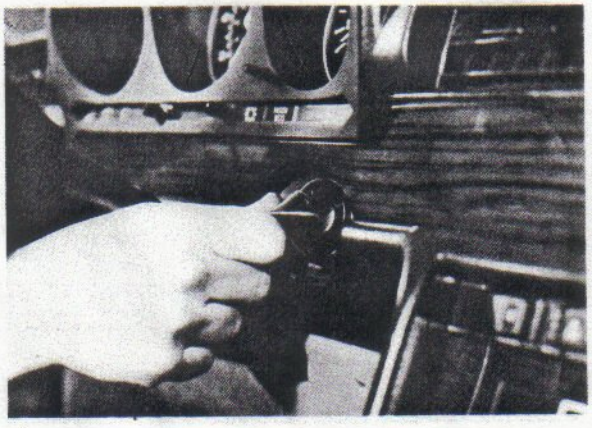
NOTE: The engine *must be cold* before this test can be conducted. This means that the vehicle must stand at ambient temperature *at least six hours* and may not be started before performing this test.



7.1
DETERMINE temperature of enrichment compensator assembly.



7.2
1. **OPEN** Valve(s) on pressure gauge.
2. Unplug Compensator to prevent electric heat coils from operating.



7.3
START the engine and **IMMEDIATELY . . .**

VALUE: Dependant on temperature of compensator assembly, pressure should be as shown on applicable chart.

7.4

READ the pressure gauge.

NOTE: Do not warm engine up during this test as operation of auxiliary air valve is performed during the warm-up phase.

ENGINE M100

ENGINE M100 — 1977/78 ONLY

F° = psi	C° = bar
32 = 7-13	0 = 0.5-0.9
41 = 7-13	5 = 0.5-0.9
50 = 10-16	10 = 0.7-1.1
59 = 13-19	15 = 0.9-1.3
68 = 16-22	20 = 1.1-1.5
77 = 19-25	25 = 1.3-1.7
86 = 22-28	30 = 1.5-1.9
95 = 25-31	35 = 1.7-2.1
104 = 28-33	40 = 1.9-2.3

ENGINE M100 — 1979

F° = psi	C° = bar
32 = 9-15	0 = 0.6-1.0
41 = 12-18	5 = 0.8-1.2
50 = 15-20	10 = 1.0-1.4
59 = 18-23	15 = 1.2-1.6
68 = 20-25	20 = 1.4-1.8
77 = 23-29	25 = 1.6-2.0
86 = 25-32	30 = 1.8-2.2
95 = 29-35	35 = 2.0-2.4
104 = 32-37	40 = 2.2-2.6

ENGINE M110

ENGINE M110 — 1976-1979

except hi-altitude version

F° = psi	C° = bar
32 = 7-13	0 = 0.5-0.9
41 = 9-15	5 = 0.6-1.0
50 = 12-18	10 = 0.8-1.2
59 = 15-20	15 = 1.0-1.4
68 = 18-23	20 = 1.2-1.6
77 = 20-25	25 = 1.4-1.8
86 = 23-29	30 = 1.6-2.0
95 = 25-32	35 = 1.8-2.2
104 = 29-35	40 = 2.0-2.4

ENGINE M110 — 1976-1979

high altitude version only

F° = psi	C° = bar
32 = 9-15	0 = 0.6-1.0
41 = 12-18	5 = 0.8-1.2
50 = 15-20	10 = 1.0-1.4
59 = 18-23	15 = 1.2-1.6
68 = 20-25	20 = 1.4-1.8
77 = 23-29	25 = 1.6-2.0
86 = 25-32	30 = 1.8-2.2
95 = 29-35	35 = 2.0-2.4
104 = 32-37	40 = 2.2-2.6

ENGINE M117

ENGINE M117 — 1976/77/78

F° = psi	C° = bar
32 = 9-15	0 = 0.6-1.0
41 = 12-18	5 = 0.8-1.2
50 = 15-20	10 = 1.0-1.4
59 = 18-23	15 = 1.2-1.6
68 = 20-25	20 = 1.4-1.8
77 = 23-29	25 = 1.6-2.0
86 = 25-32	30 = 1.8-2.2
95 = 29-35	35 = 2.0-2.4
104 = 32-37	40 = 2.2-2.6

ENGINE M117 — 1979

F° = psi	C° = bar
32 = 12-18	0 = 0.8-1.2
41 = 15-20	5 = 1.0-1.4
50 = 18-23	10 = 1.2-1.6
59 = 20-25	15 = 1.4-1.8
68 = 23-29	20 = 1.6-2.0
77 = 25-32	25 = 1.8-2.2
86 = 29-35	30 = 2.0-2.4
95 = 32-37	35 = 2.2-2.6
104 = 35-42	40 = 2.4-2.8

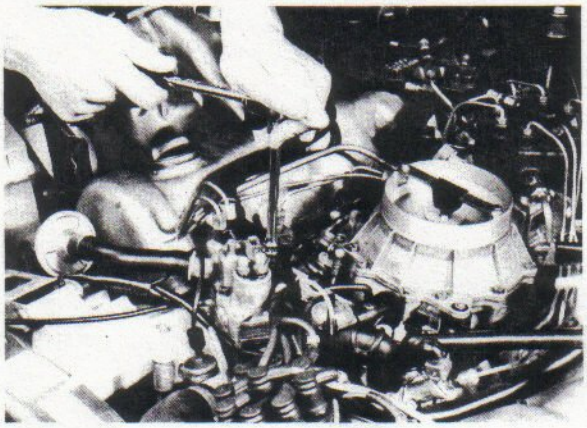
OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT, Continue Further Testing (NEXT PAGE)

CORRECTING COLD CONTROL PRESSURE



VALUE: See applicable chart on preceeding page.

Cold control pressure is **NOT CORRECT:**

7.5
REPLACE enrichment compensator temporarily.

or adjust by driving 9mm stud (recessed) next to plug-in down to reduce p.s.i. (richer) with "key on" or motor running

7.6
REPEAT cold control pressure test.

OK

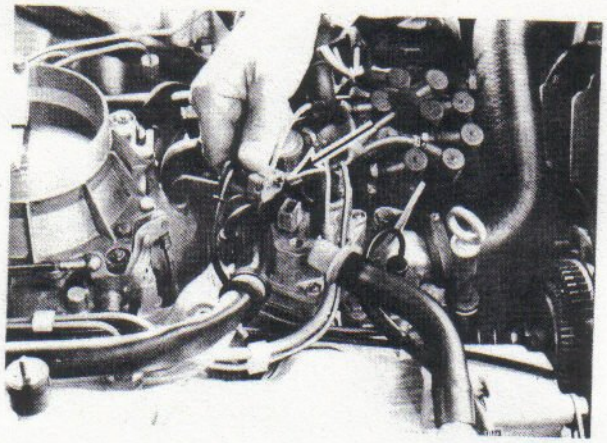
IF CORRECT, complete installation of new enrichment compensator and proceed to next test as specified in Problem Diagnosis Chart.

OK

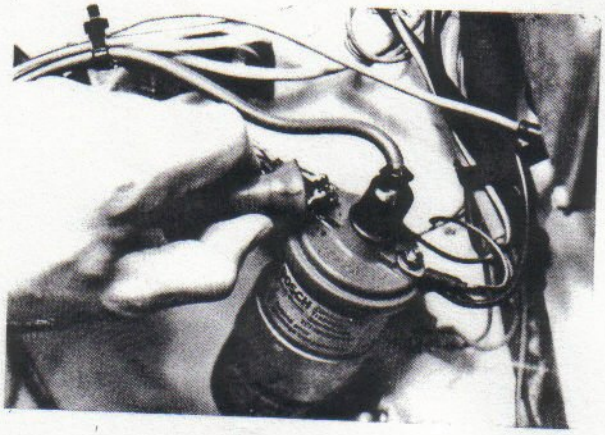
IF NOT CORRECT, Check for a restriction in circuits to and from enrichment compensator.

TEST 8 TESTING OPERATION OF AUXILIARY AIR VALVE

DESCRIPTION — Characterized by engine running rough and dieing at cold idle (if stuck in closed position) or engine idles high when warm (if stuck in open position).
PURPOSE — Check opening and closing of the auxiliary air valve.



8.1
(RECONNECT plug of enrichment compensator, if disconnected.)



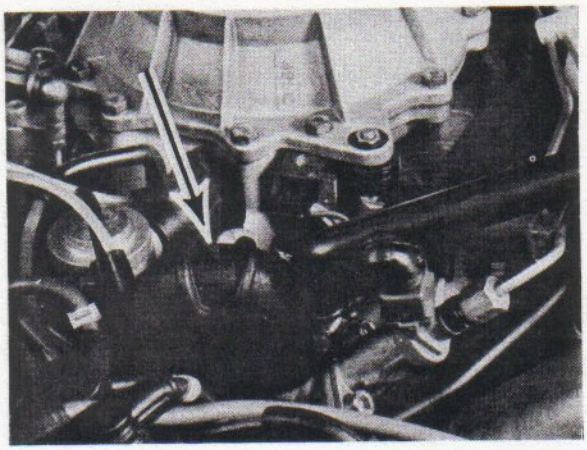
8.2
CONNECT tachometer.

VALUES: Cold engine = 800 - 1000 rpm
Max. increase = 1200 - 1300 rpm
NORMAL IDLE SPEED RETURNS AT 70°C/158°F

8.3
RUN engine and read tachometer.

OK
IF CORRECT, CONTINUE

OK
IF NOT CORRECT, REPLACE AUXILIARY AIR VALVE



8.4
PINCH air hose from air valve shut after engine is fully warm.

RESULT: Idle speed should not change noticeability.

STOP

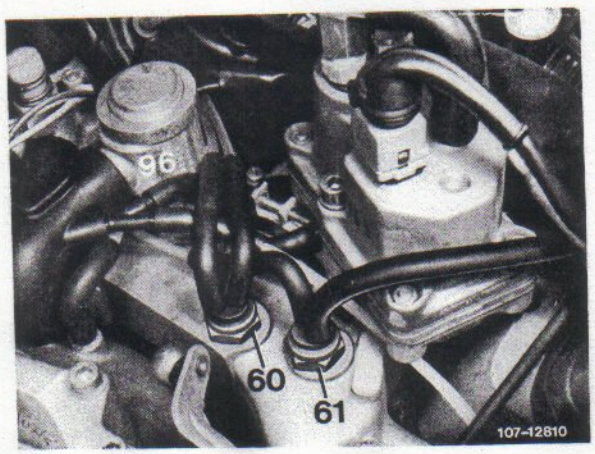
OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

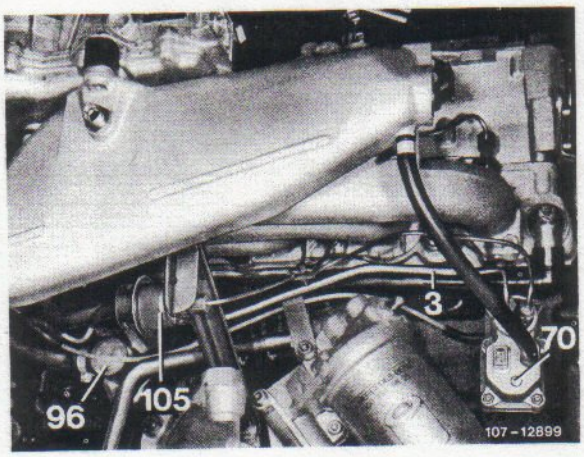
OK

IF NOT CORRECT, REPLACE AUXILIARY AIR VALVE.

LOCATION OF AUXILIARY AIR VALVE (96)



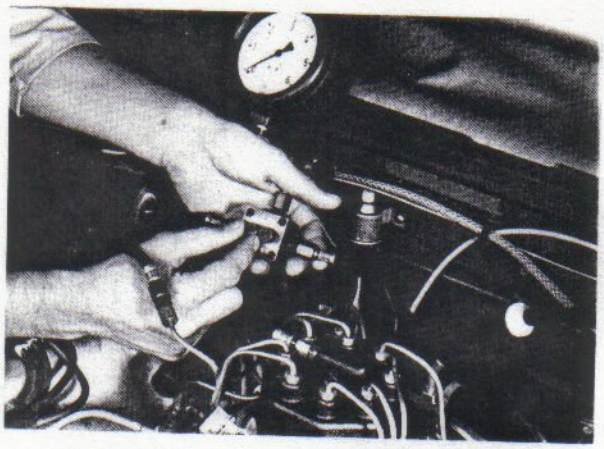
6 CYLINDER



8 CYLINDER

TEST 9 TESTING WARM CONTROL PRESSURE

DESCRIPTION — Characterized by poor acceleration, or lack of power when engine temperature is warm.
PURPOSE — To check enrichment compensator for warm operation.



9.1
OPEN valve(s) on pressure gauge.

AND

9.2
IDLE engine at operating temperature.

VALUES with compensator fully warm:*

ENGINE M100
FEDERAL AND CALIFORNIA
3.4-3.8 bar (49-55 psi)
Federal high altitude
3.6-4.0 bar (52-58 psi)

ENGINE M110
FEDERAL
3.4-3.8 bar (49-55 psi)
CALIFORNIA
3.0-3.4 bar (44-49 psi)
Federal high altitude
3.6-4.0 bar (52-58 psi)

ENGINE M117
FEDERAL AND CALIFORNIA
3.4-3.8 bar (49-55 psi)
Federal high altitude
3.6-4.0 bar (52-58 psi)

NOTE:		
Pressure values given are obtained at an engine vacuum of: 400 mm Hg. (16 in. Hg.)	If engine vacuum is: 300 mm Hg. *subtract* 0.1 bar (12 in. Hg. *subtract* 1.5 psi)	If engine vacuum is: 500 mm Hg. *add* 0.1 bar (19.5 in. Hg. *add* 1.5 psi)

STOP

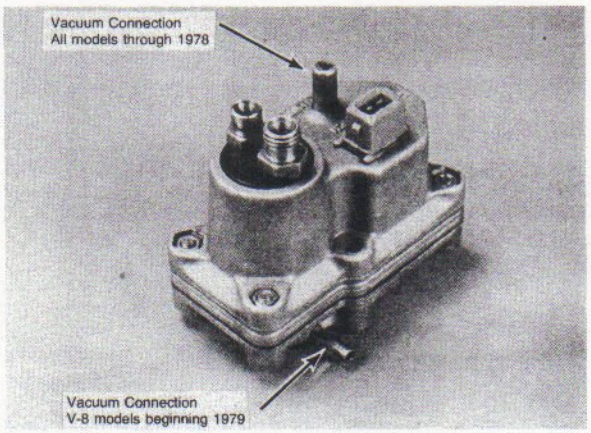
OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT, CONTINUE FURTHER TESTING

CORRECTING WARM CONTROL PRESSURE



If the warm control pressure is **NOT CORRECT:**

A — TEST INTAKE MANIFOLD VACUUM.

9.3
CONNECT vacuum gauge into vacuum hose to enrichment compensator with T-fitting.

VALUES = approx. 350-450 mm Hg. (14-18 in Hg.)

NOTE: Control pressure values given are obtained at a vacuum of 400 mm Hg. (16 in. Hg.)

9.4
RUN engine at idle:

OK

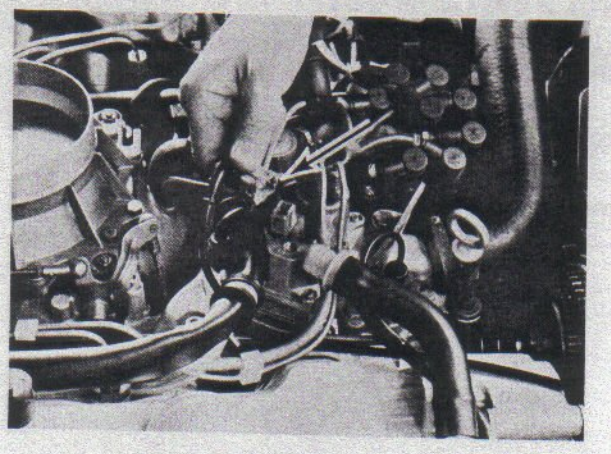
IF CORRECT,
CONTINUE FURTHER TESTING
(NEXT PAGE)

OK

IF NOT CORRECT (low vacuum) determine cause and repair as necessary.

POSSIBLE CAUSES of low vacuum:

a. Engine intake system leaking air.
b. Exhaust system restricted. Check for plugged-catalyic converter.
c. Ignition timing incorrect.
d. Burned or tight valves.
e. Enrichment compensator vacuum diaphragm leaking.



VALUE = Approx. 13.5 volts.

If the warm control pressure temperature is **NOT CORRECT:**

B — TEST VOLTAGE AT THE ENRICHMENT COMPENSATOR

9.5
RUN engine AND . . .

9.6
DISCONNECT plug on enrichment compensator.

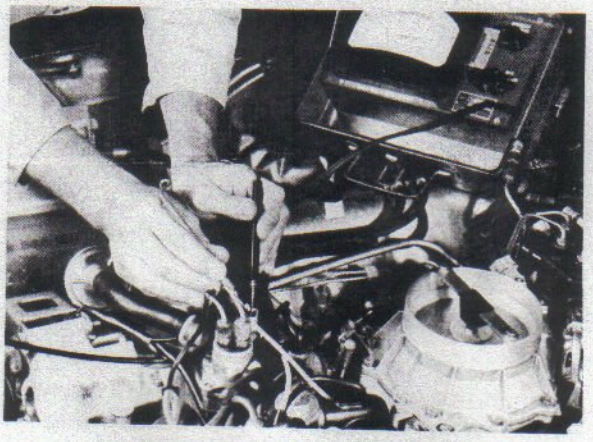
9.7
TEST voltage at plug.

OK

IF CORRECT, CONTINUE FURTHER TESTING. (BELOW)

OK

IF NOT CORRECT, CHECK ELECTRICAL CIRCUIT



VALUE = Approx. 30 ohms.

If the warm control pressure is **NOT CORRECT:**

C — TEST HEATING COIL

9.8
CONNECT ohm meter to the two pins of the enrichment compensator.

NOTE: Do not use a high scale ohm meter to check. Use 100 ohm max. reading scale.

9.9
READ ohm meter.

NOTE: A defective heating coil will be indicated by a zero or infinity reading (0 or ∞).

OK

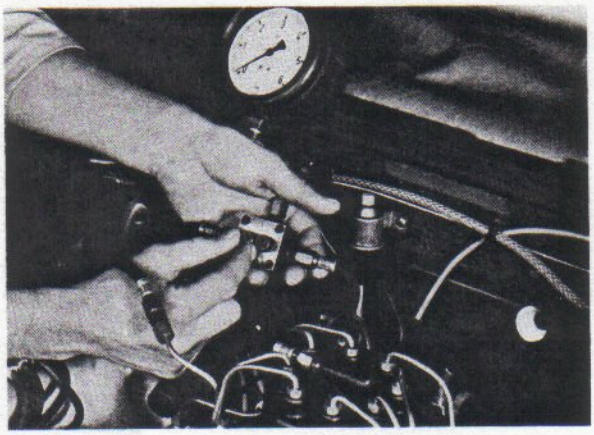
IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

OK

IF NOT CORRECT, REPLACE ENRICHMENT COMPENSATOR

TEST 10 TESTING FULL LOAD VACUUM CONTROLLED ENRICHMENT

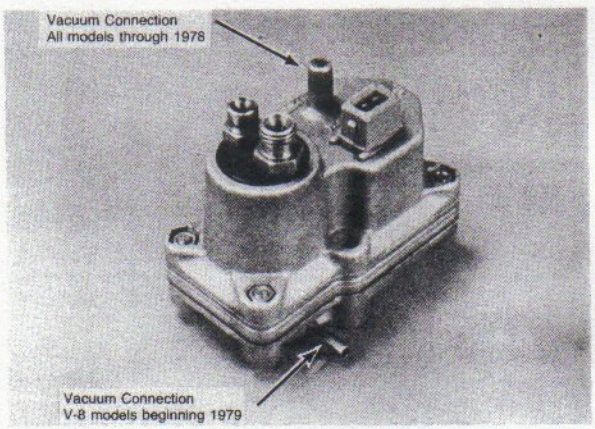
DESCRIPTION — Characterized by a stumble on acceleration with a warm or cold engine.
PURPOSE — To check the enrichment compensator for full load operation.



10.1
OPEN valve(s) on pressure gauge.

AND . . .

10.2
RUN engine until warm-up cycle of enrichment compensator is completed.



10.3
DISCONNECT vacuum line of enrichment compensator and plug resulting vacuum leak.

NOTE: The larger hose is always the vacuum line.

VALUES:

ENGINE M100	ENGINE M110	ENGINE M117
(1976-1978) 3.0-3.4 bar (43-49 psi)	(1976-1979) 2.8-3.2 bar (41-46 psi)	(1976-1979) 3.0-3.4 bar (43-49 psi)
(1979) 2.8-3.2 bar (41-46 psi)		
Federal High Altitude 3.2-3.6 bar (46-52 psi)	Federal High Altitude 3.0-3.4 bar (43-49 psi)	Federal High Altitude 3.2-3.6 bar (46-52 psi)

STOP

OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

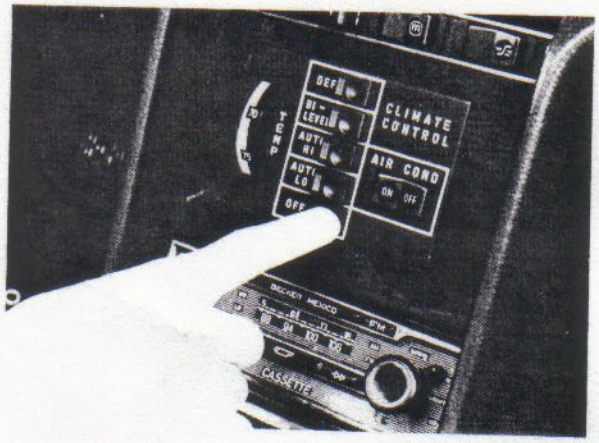
OK

IF NOT CORRECT, replace warm-up/full load enrichment compensator.

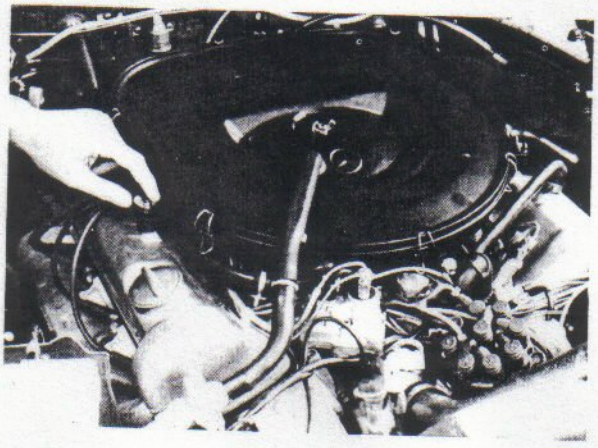
TEST 11 TESTING IDLE SPEED AND C/O ADJUSTMENT

DESCRIPTION — Characterized by engine stumbling, poor fuel economy, and rough idle. Will cause high C/O emission levels and possible burning of the catalyst.

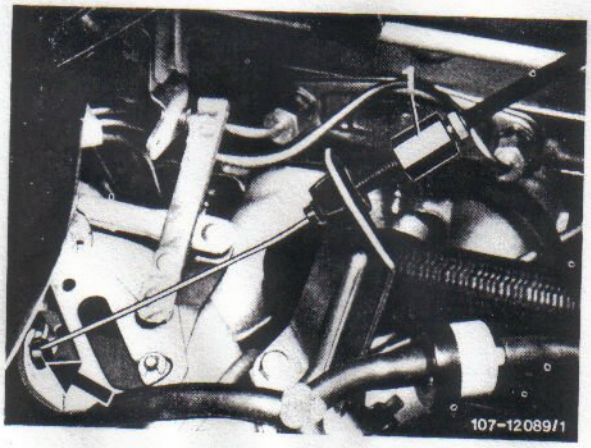
NOTE: If an oil change is to be included, do before checking C/O. Also, check idle speed, ignition timing, and plug gap before adjusting C/O.



11.1
TURN OFF the air conditioning system.



11.2
REMOVE the air cleaner.

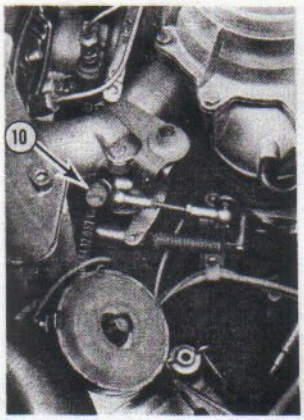


11.3
CHECK to see if the bowden cable for the cruise control rests tension free against the throttle lever (arrow). If necessary, adjust bowden cable at the adjusting nut (1).

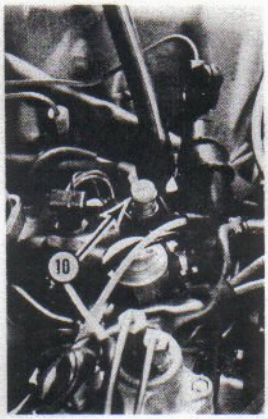
11.4
RUN engine until an oil temperature of 140-176°F (60-80°C) is reached.

NOTE: **DO NOT ADJUST** on an over hot engine.

6 CYLINDER

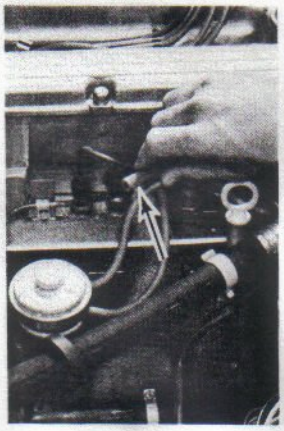


8 CYLINDER

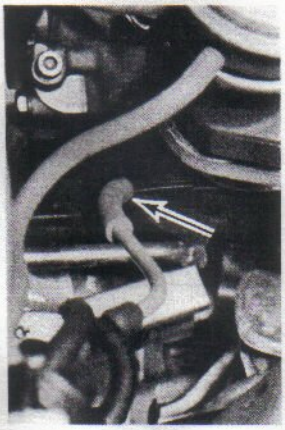


11.5
ADJUST to correct idle rpm by using the idle air adjustment screw (10).

6 CYLINDER



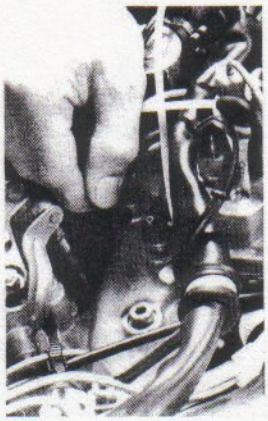
8 CYLINDER



11.6
CONNECT C/O tester after removing the connecting hose (arrow) at the exhaust pick-up tube.

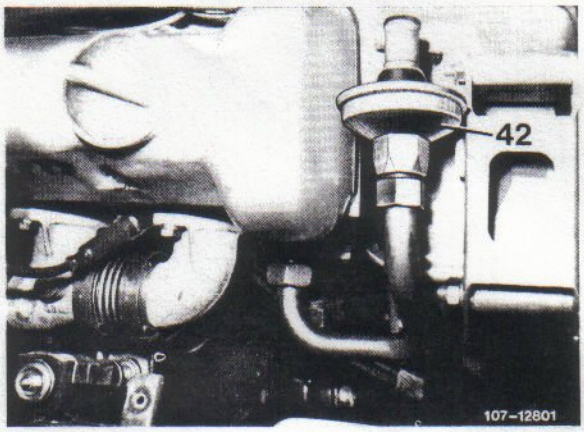
6 CYLINDER

8 CYLINDER

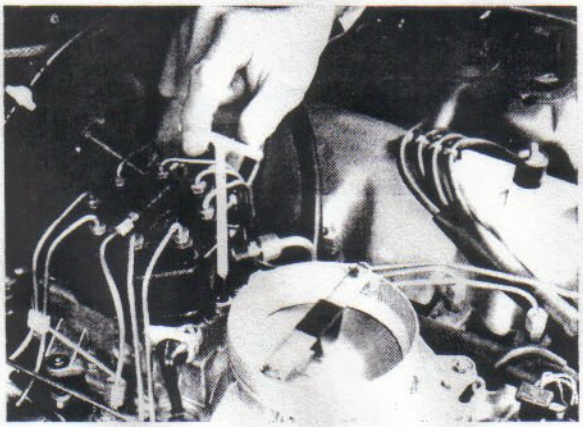


11.7A
VEHICLE WITH AIR PUMP: CANCEL AIR INJECTION.

DISCONNECT vacuum line on vertical connection of blue thermo-vacuum valve and plug vacuum valve.



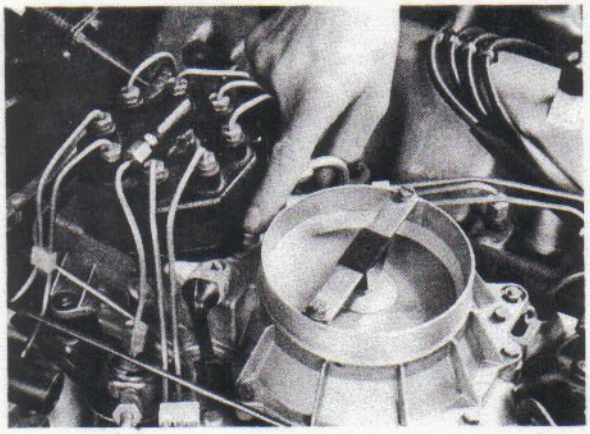
11.7B
WITH ASPIRATOR (42): DO **NOT** PLUG AIR INJECTION.



ADJUST FOR PROPER C/O VALUE

11.8
REMOVE the closing plug and insert the 3mm Allen key through the bore to reach the idle mixture adjusting screw.

TURN TO LEFT = LEANER
TURN TO RIGHT = RICHER



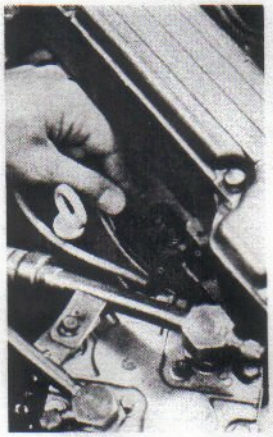
11.9
PLUG the closing plug hole after turning the idle mixture adjusting screw.

ACCELERATE engine and recheck the idle C/O value. Readjust if necessary.

11.10
INSTALL air filter and recheck idle speed and C/O.

NOTE: The C/O will initially go slightly lean when installing a cold air cleaner. C/O should return to the set value after it warms up.

6 CYLINDER



8 CYLINDER

11.11
RECONNECT vacuum line to thermo-vacuum valve, or hose to aspirator.

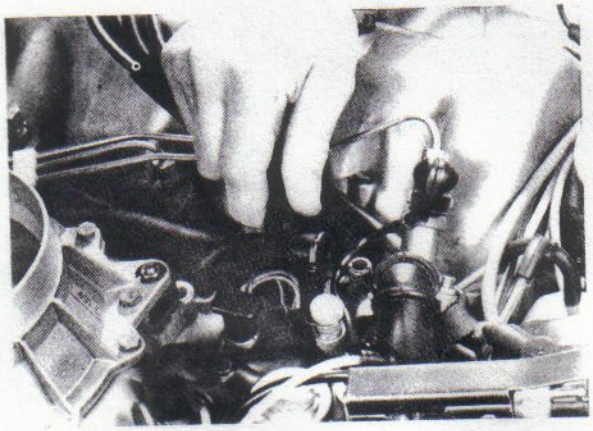
IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

IF PROBLEM ACHIEVING CORRECT IDLE SPEED OR C/O, CONTINUE FURTHER TESTING
(NEXT PAGE)

CORRECTING IDLE PROBLEMS

Additional testing to correct rough idle; erratic idle speed; erratic C/O readings; overheating catalyst.

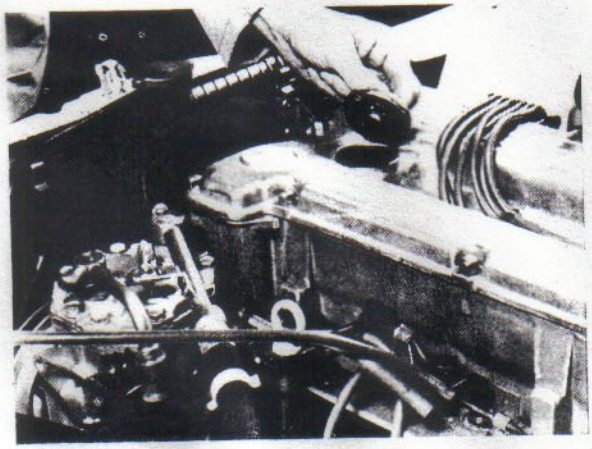
11.12
MEASURE idle C/O per procedure for all checks noted.



A — CHECK CRANKCASE AFFECT:

11.13
V-8 Engines: **REMOVE** crankcase vent hose and note C/O DROP.

IF C/O DROPS more than 1%, the crankcase vapors are affecting the idle C/O excessively.



11.13
6 Cyl Engine: **REMOVE** oil fill cap and note C/O INCREASE.

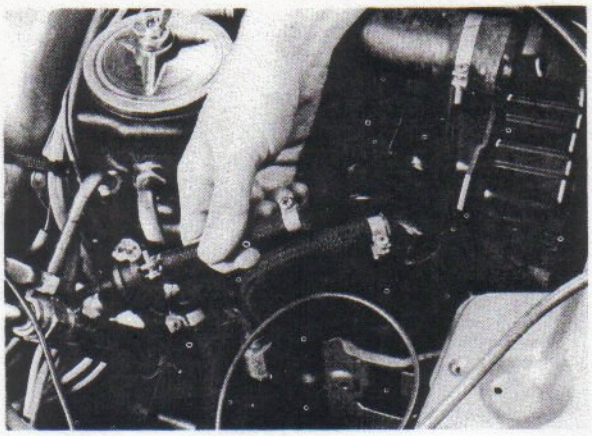
IF C/O INCREASES by more than 1.5%, the crankcase vapors are affecting the idle C/O excessively.

OK

IF CORRECT, CONTINUE FURTHER TESTING.

OK

CORRECTION: EXCESSIVE DROP or INCREASE, oil contamination or dilution, or excessive blow-by are possible causes.



B — CHECK CHARCOAL CANISTER AFFECT:

11.14
REMOVE Small line going from charcoal canister to engine BY LOOSENING CLAMP AT CHARCOAL CANISTER.

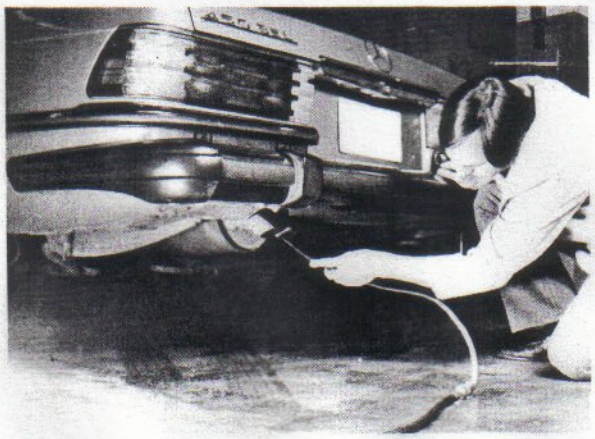
IF C/O DROPS more than 0.5%, the fuel evaporation control system is affecting the idle C/O excessively.

OK

IF CORRECT, CONTINUE FURTHER TESTING.

OK

CORRECTION: Purge valve defective and/or canister saturated with fuel.



C — CHECK AFFECT OF CYLINDERS NOT PROVIDED WITH MANIFOLD C/O PICKUP:

11.15
CHECK C/O reading at tailpipe.

The C/O reading should not be higher than the reading at the manifold.

NOTE: A higher reading at the tailpipe is only of concern if rough idle or an overly hot catalyst is experienced.

OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

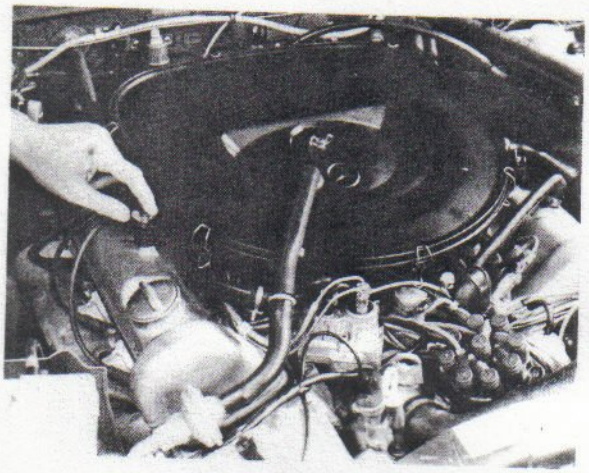
OK

IF NOT CORRECT: CHECK FOR UNEQUAL FUEL DELIVERY "TEST 13" (PAGE 47)

TEST 12 TESTING INJECTION NOZZLES (REMOVED)

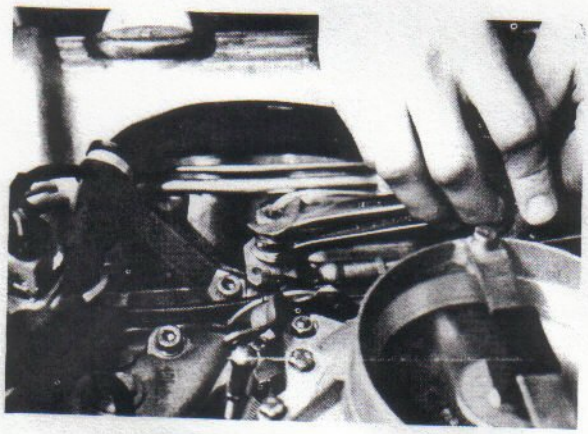
DESCRIPTION — Characterized by rough idling or engine miss on acceleration.

PURPOSE — To test injection nozzles as to opening pressure, possible leaking, and evaluating their spray pattern.

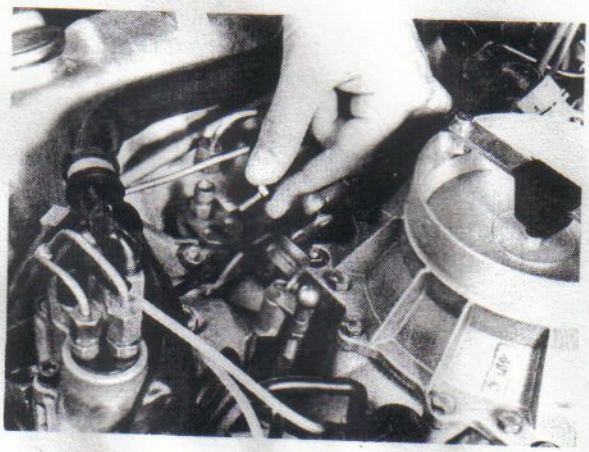


REMOVE NOZZLES

12.1
REMOVE air filter.

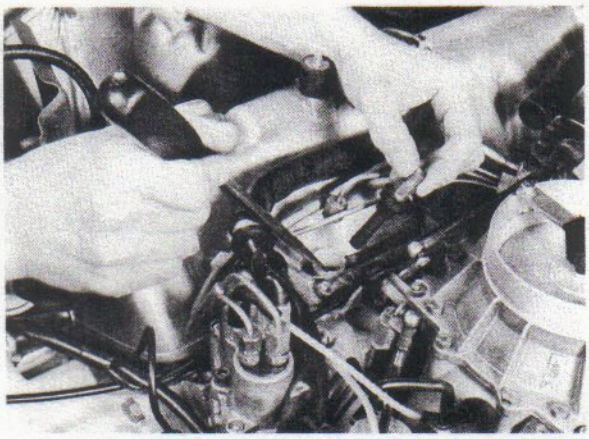


12.2
REMOVE fuel injection lines. When loosening the injection lines at the fuel nozzles, hold nozzles to keep from turning.



12.3
REMOVE hold-down brackets.

CAUTION: When removing the hold-down brackets, the nozzles must be held in place in order to avoid pulling out the nozzles and insulating sleeves!



12.4
PULL OUT Injection nozzles and make sure to hold down the insulating sleeves.

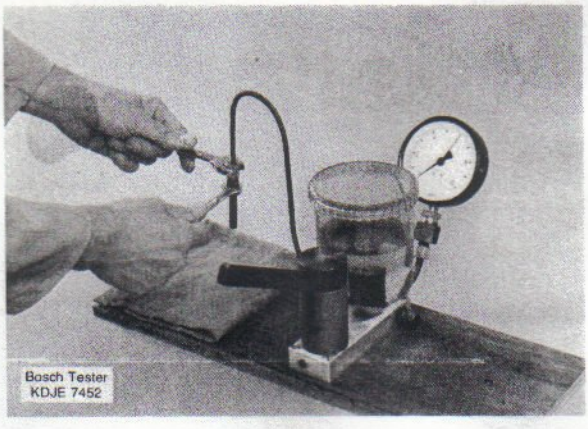
NOTE: If the insulating sleeves are pulled out, they must be reinstalled with new O-rings.

TESTING NOTES:

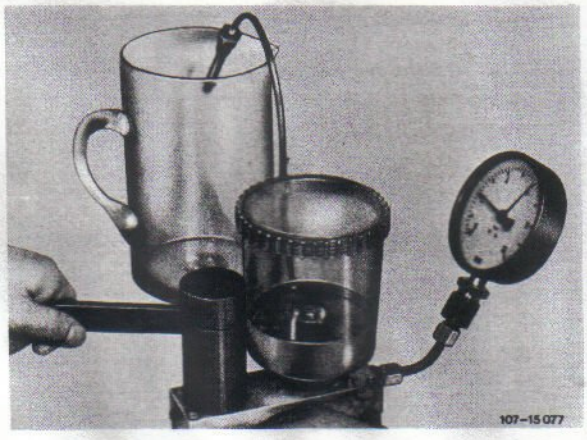
The injection nozzle tester serves to test the opening pressure, the spray pattern, and the nozzles for leaks.

Prior to starting the testing of the injection nozzles, fill the fuel container of the tester with kerosene and bleed the tester.

Any injection nozzle, which is outside the specified tolerances, must be replaced.



12.5
CONNECT nozzle to tester.



12.6
BLEED pressure line with shut-off valve open and nut of pressure line on injection nozzle loose with slow strokes of the lever.

NOTE: DO **NOT** IMMEDIATELY PUMP THE HAND LEVER VIGOROUSLY.

Value:

New Nozzle-	Used Nozzle-
3.5 - 4.1 bar	3.0 bar minimum
(51 - 59 psi)	(44 psi) minimum

A — CHECK OPENING PRESSURE

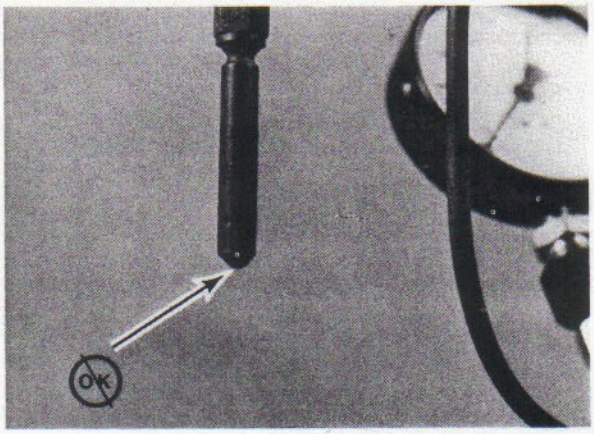
12.A1

OPEN shut-off valve and check opening pressure by depressing lever slowly.

IF CORRECT,
CONTINUE TESTING

IF NOT CORRECT,
REPLACE DEFFECTIVE NOZZLES

USE THE SPACE BELOW TO RECORD OPENING PRESSURES.



B — LEAK TEST

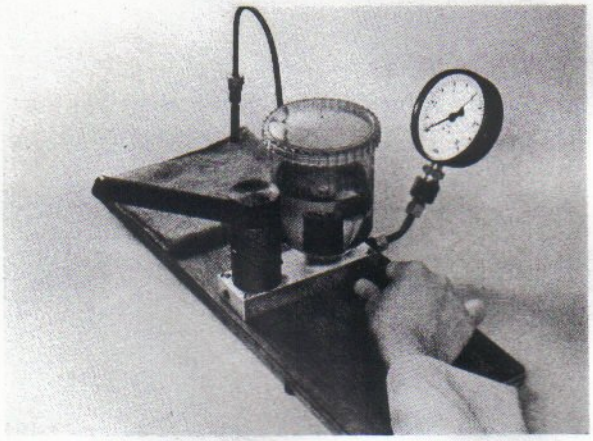
12.B1
INCREASE Pressure slowly to 0.5 bar (7 psi) below the previously determined opening pressure of the nozzle and hold this pressure.

RESULT: Within 15 seconds no drop should form on the tip of the injection nozzle.

STOP

OK
IF CORRECT,
CONTINUE TESTING

OK
IF NOT CORRECT,
REPLACE DEFECTIVE NOZZLES



C — EVALUATION OF NOZZLE SPRAY PATTERN

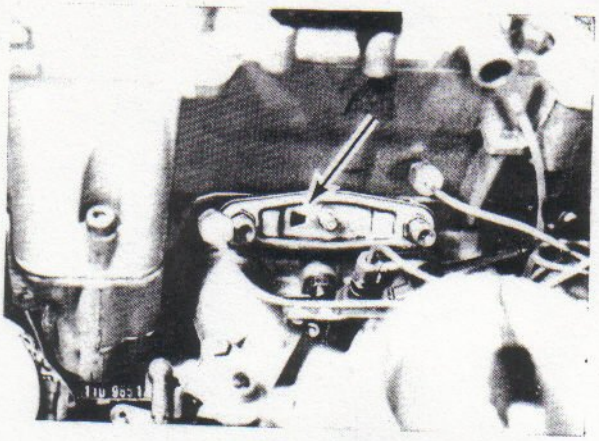
12.C1
CLOSE shut-off valve.

12.C2
OPERATE lever at 2 strokes per second then reduce to one stroke per second.

RESULT: The nozzle must begin to chatter. The spray pattern should be well atomized. A one-sided but well atomized pattern within a total spray angle of not less than 35° is permissible.

OK
IF CORRECT,
INSTALL NOZZLES
(NEXT PAGE)

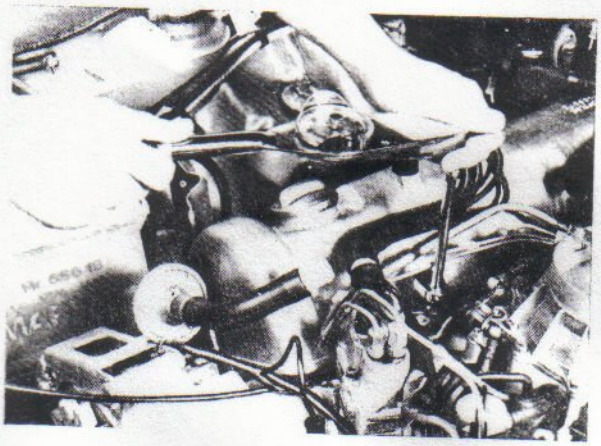
OK
IF NOT CORRECT,
REPLACE DEFECTIVE
NOZZLES



INSTALLATION

12.7
INSTALL injection nozzles. Make sure that the holes on hold-down brackets, (6 cyl) face to the left.

NOTE: If the insulating sleeves have been removed, they must be installed with new O-rings.



12.8
CONNECT injection lines. 1.0-1.2 kpm (7.5-9 ft. lbs.) torque.

CAUTION: When tightening the injection lines, the injection nozzles as well as the connection fittings on the fuel distributor must be held with a wrench to prevent them from turning!

DO NOT OVER TORQUE LINE FITTINGS!

12.9
RUN engine and check all fuel line connections for leaks.

STOP

OK

IF CORRECT, proceed to next test as specified in Problem Diagnosis Chart.

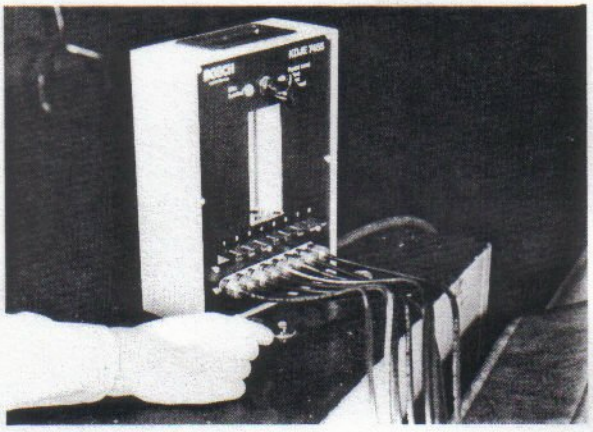
OK

IF LEAKAGE OCCURS, REPAIR OR REPLACE AS NECESSARY

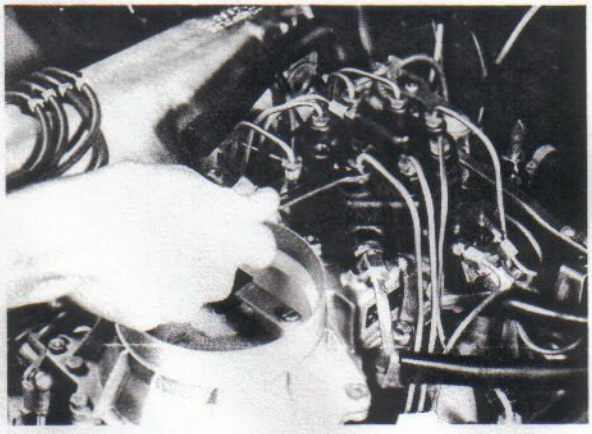
TEST 13 TESTING FUEL DISTRIBUTOR

DESCRIPTION — Characterized by rough engine idle, overheated catalyst or poor fuel economy,

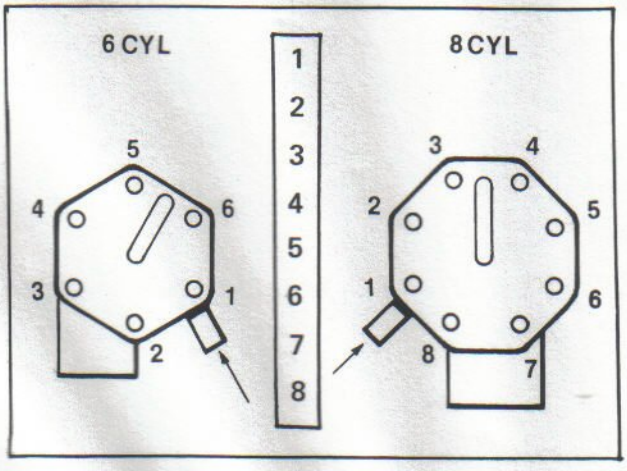
PURPOSE — To check the fuel distributor by measuring the individual fuel quantities which are delivered from the fuel distributor to the injection nozzles.



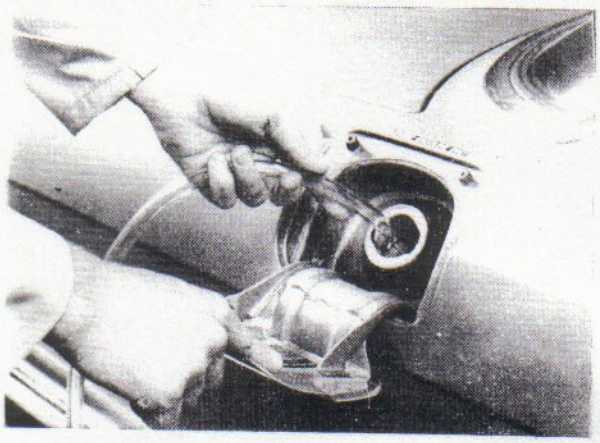
13.1
LEVEL Bosch KDJE-7455 tester using leveling legs and spirit bubble.



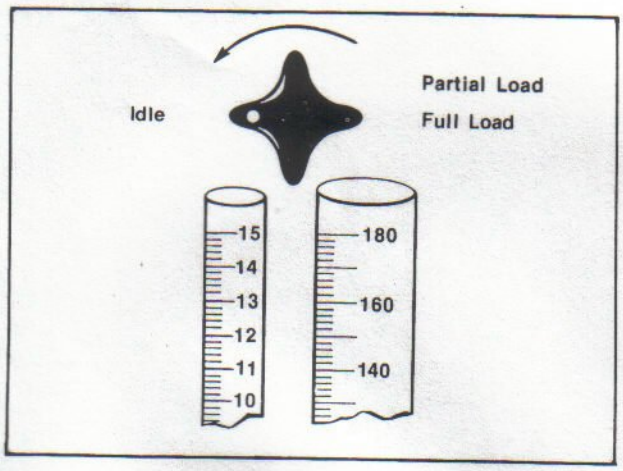
13.2
REMOVE air filter and unscrew injection lines at fuel distributor.



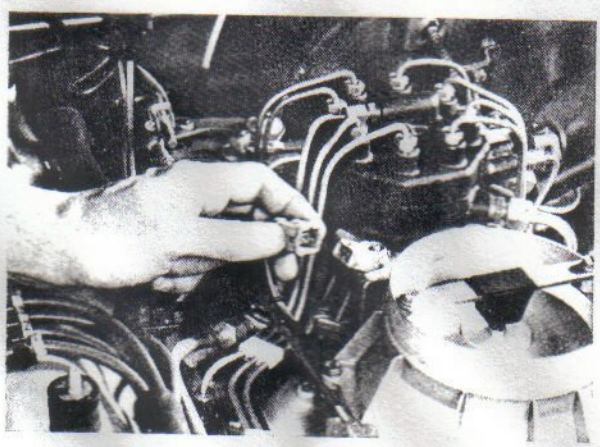
13.3
CONNECT tester fuel lines to fuel distributor in proper sequence.



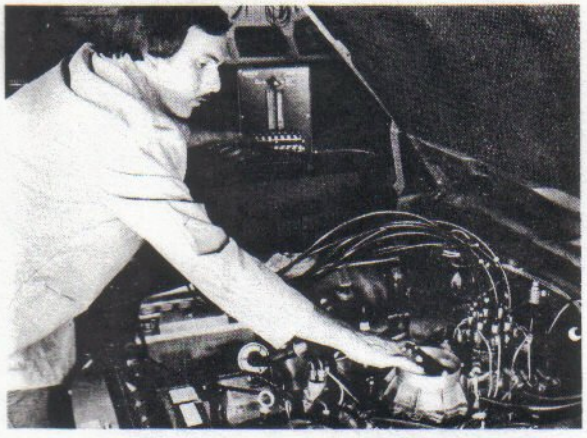
13.4
PLACE fuel return flow line of tester into fuel tank filler neck.



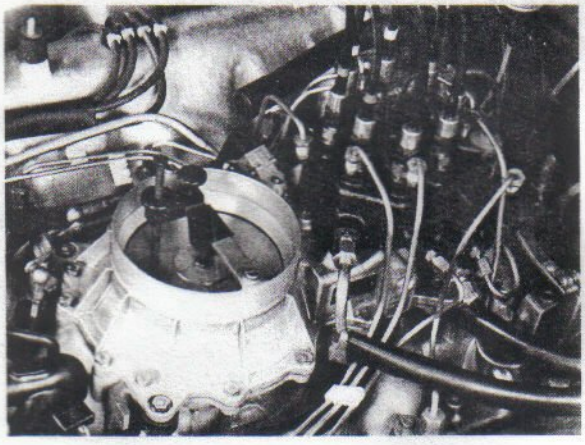
13.5
TURN selector knob on tester to the left (Learlauf/idle).



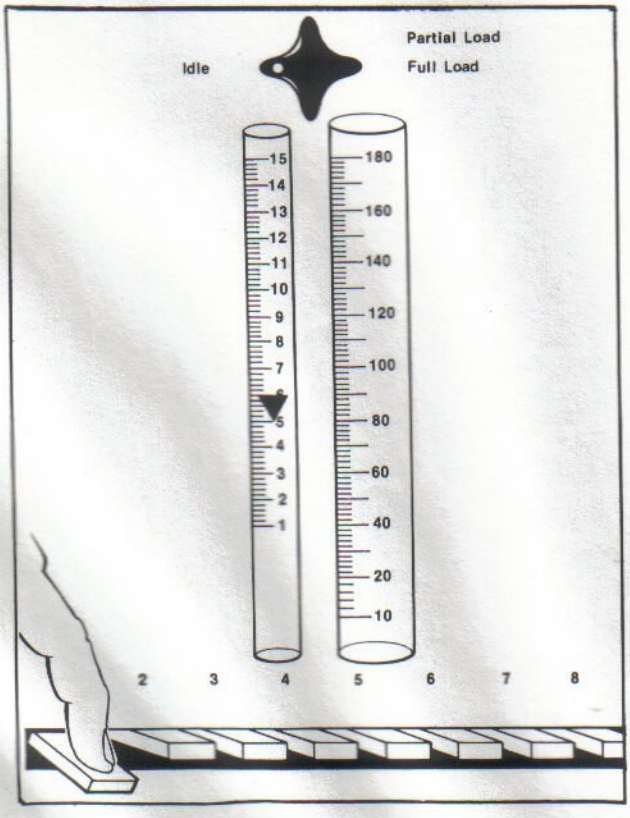
13.6
OPERATE fuel pump. **TURN ON** ignition and disconnect fuel pump safety switch to run fuel pump.



13.7
DEPRESS airflow sensor plate and briefly push each tester key one at a time, to bleed the tester.



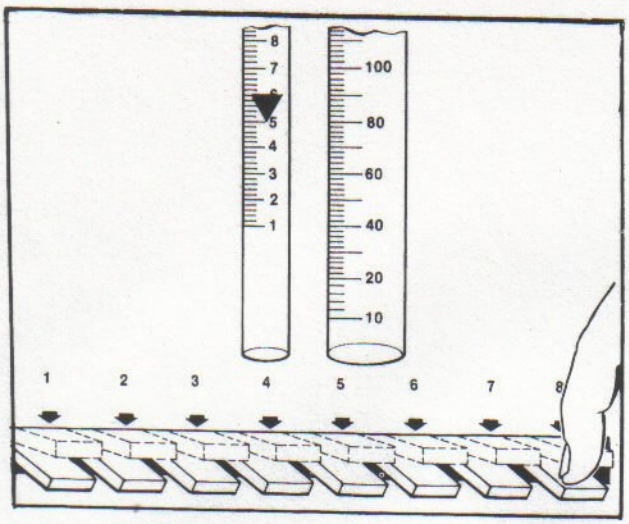
13.8
ATTACH adjustment fixture for airflow sensor plate to holding bar for rubber stop.



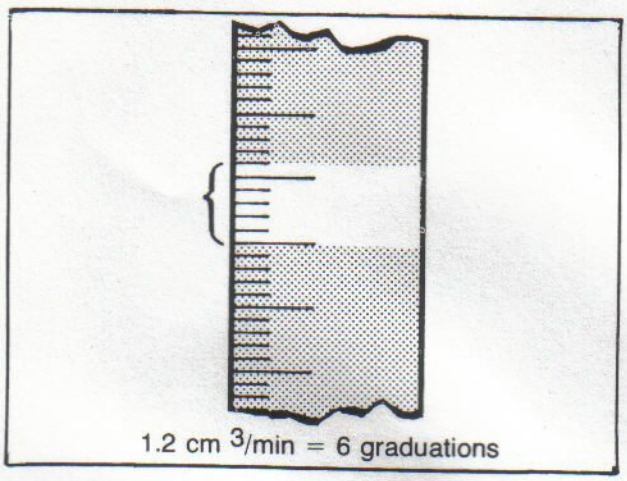
TEST A

13.9
HOLD DOWN one tester key while adjusting position of airflow sensor plate with the adjustment fixture to provide an idle flow rate of:

6 cm^3/minute



13.10
LOCK the adjustment fixture and depress the other keys one at a time.



13.11
READ the individual flow rates and enter them on the test sheet, (MBNA/MBC 437, see pg. 53).

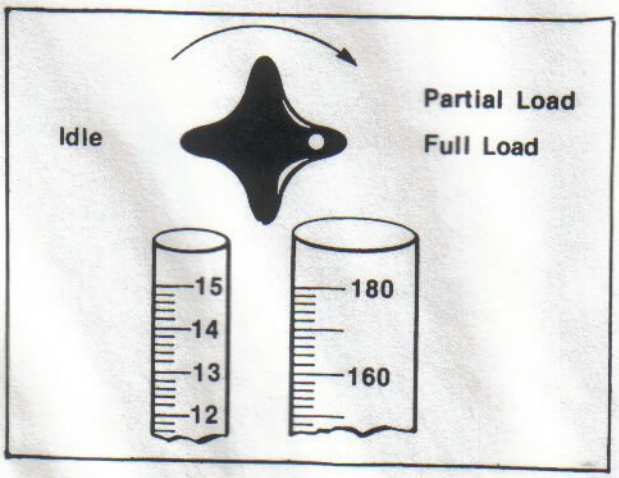
RESULT: The permissible difference between smallest and largest flow rate is 1.2 cm^3/min.

OK

IF CORRECT, CONTINUE TESTING

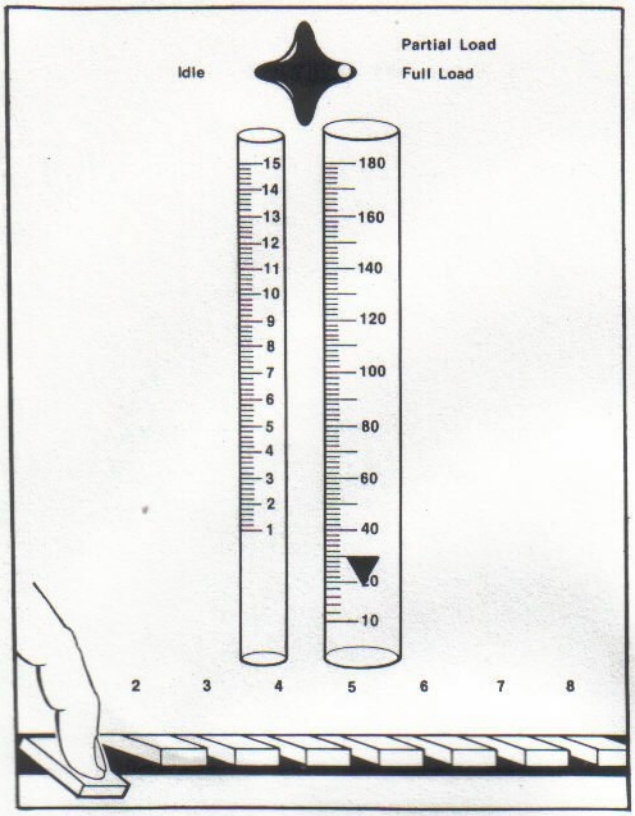
OK

IF NOT CORRECT: Replace fuel distributor.



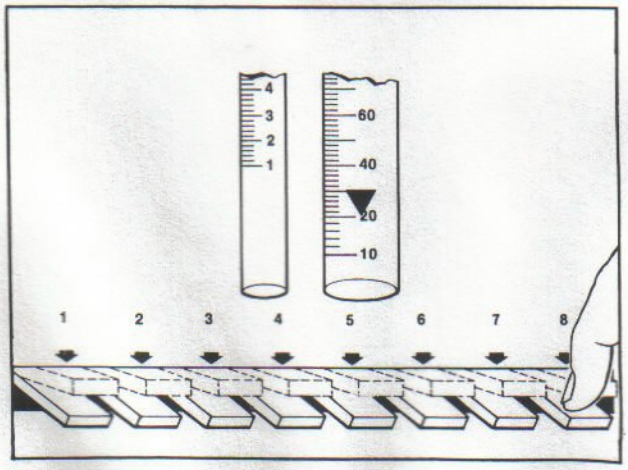
TEST B

13.12
TURN selector knob on tester to right (Teillast, Vollast/part load, full load).

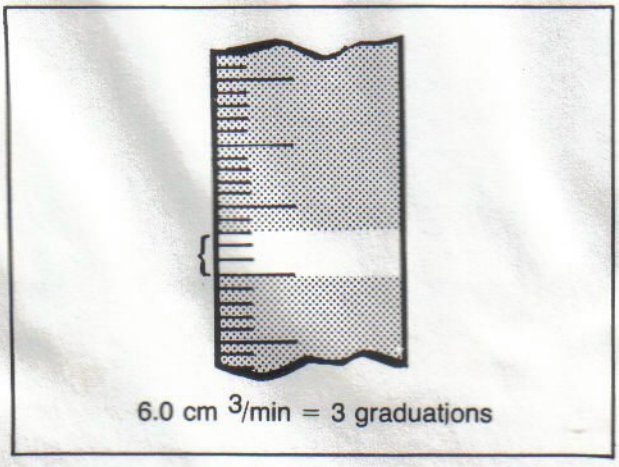


13.13
HOLD DOWN one tester key while adjusting position of airflow sensor plate with the adjusting fixture to provide a partial load flow rate of:

30cm³/minute



13.14
LOCK the adjustment fixture and depress the other keys one at a time.



13.15
READ the individual flow rates and enter them on the test sheet.

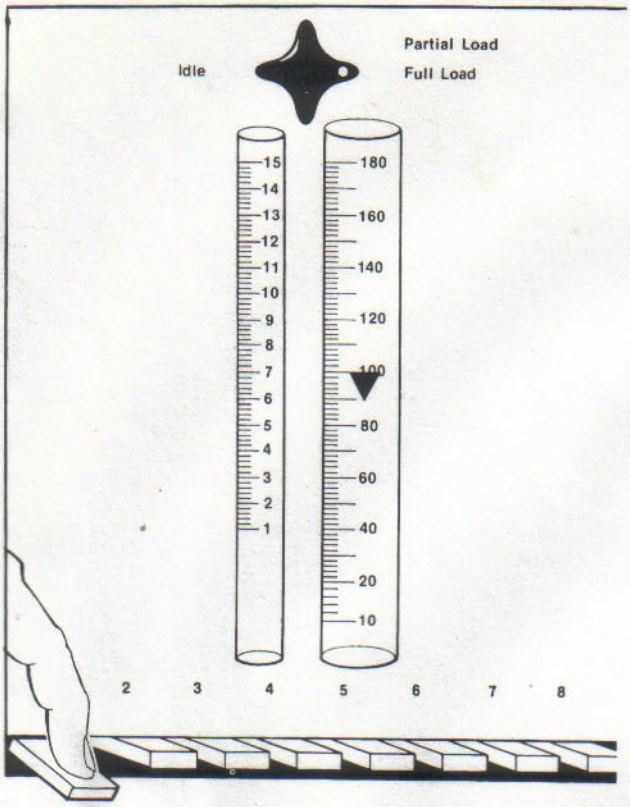
RESULT: The permissible difference between smallest and largest flow rate is 6.0cm³/min.

OK

IF CORRECT, Continue Testing

OK

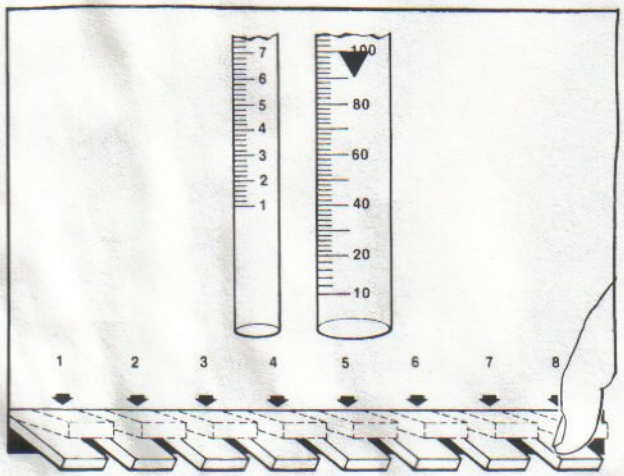
IF NOT CORRECT: Replace fuel distributor.



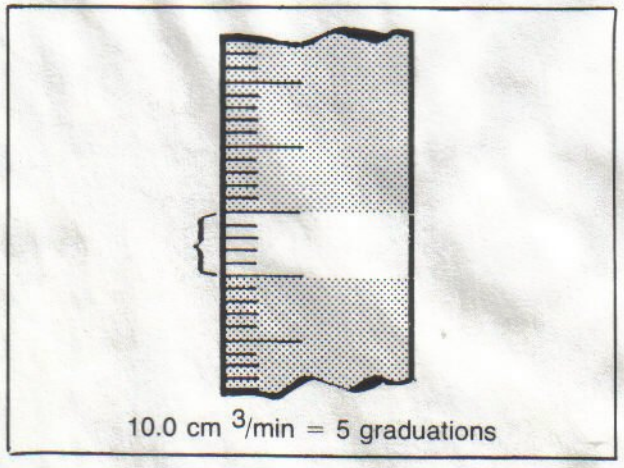
TEST C

13.16
HOLD DOWN one tester key while adjusting position of airflow sensor plate with the adjusting fixture to provide a full load flow rate of:

100cm³/minute



13.17
LOCK the adjustment fixture and depress the other keys one at a time.



13.18
READ the individual flow rates and enter them on the test sheet.

RESULT: The permissable difference between smallest and largest flow rate is 10.0cm³/min.

STOP

OK

IF CORRECT, End of C.I.S. test sequence

OK

IF NOT CORRECT: Replace fuel distributor.