VOLVO

1974

TECHNICAL INFORMATION

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Section 1

CONTINUOUS INJECTION SYSTEM (C.I.)

Contrary to conventional fuel injection systems, this system is not actuated mechanically or electronically. Its working principle depends on measuring the intake air flow rate to determine the amount of fuel to be injected.

The basic components of the Continuous Injection System are shown in the illustration below, and are described in detail on the following pages.

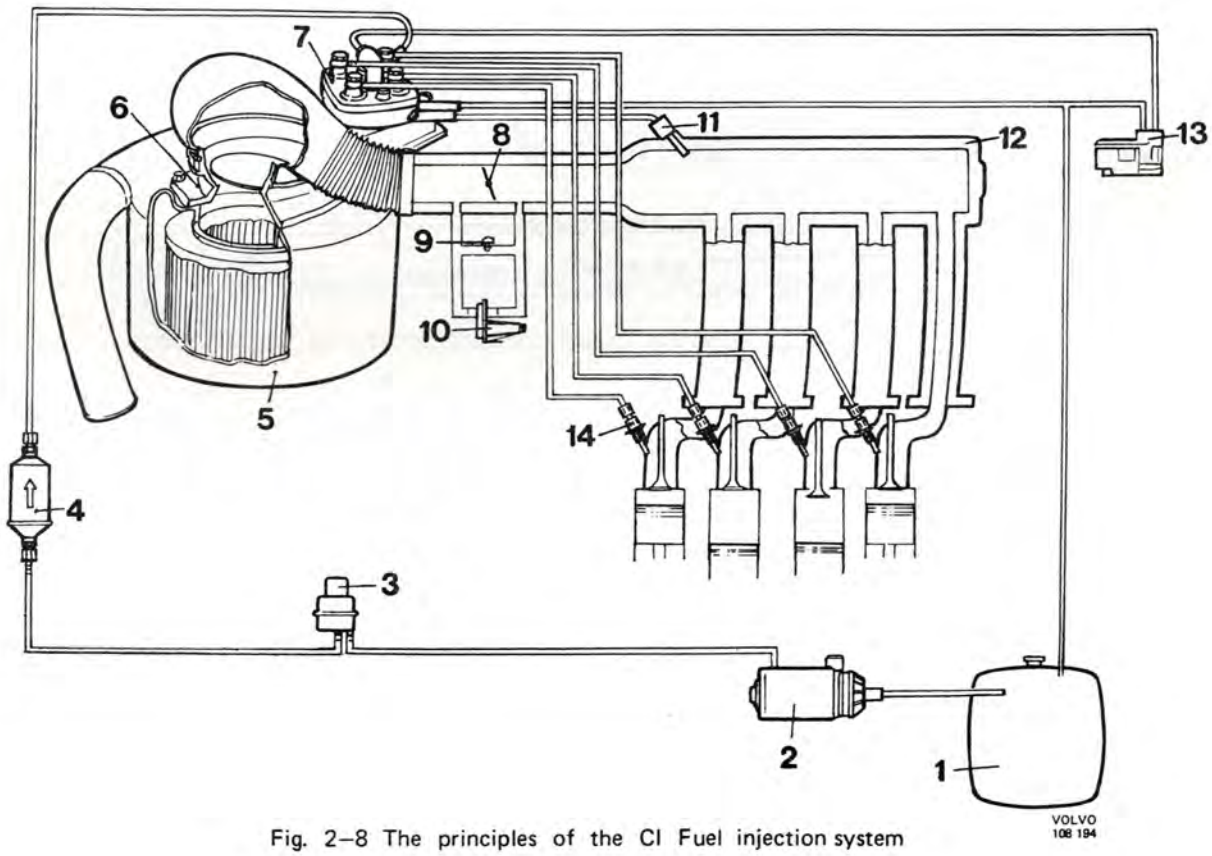
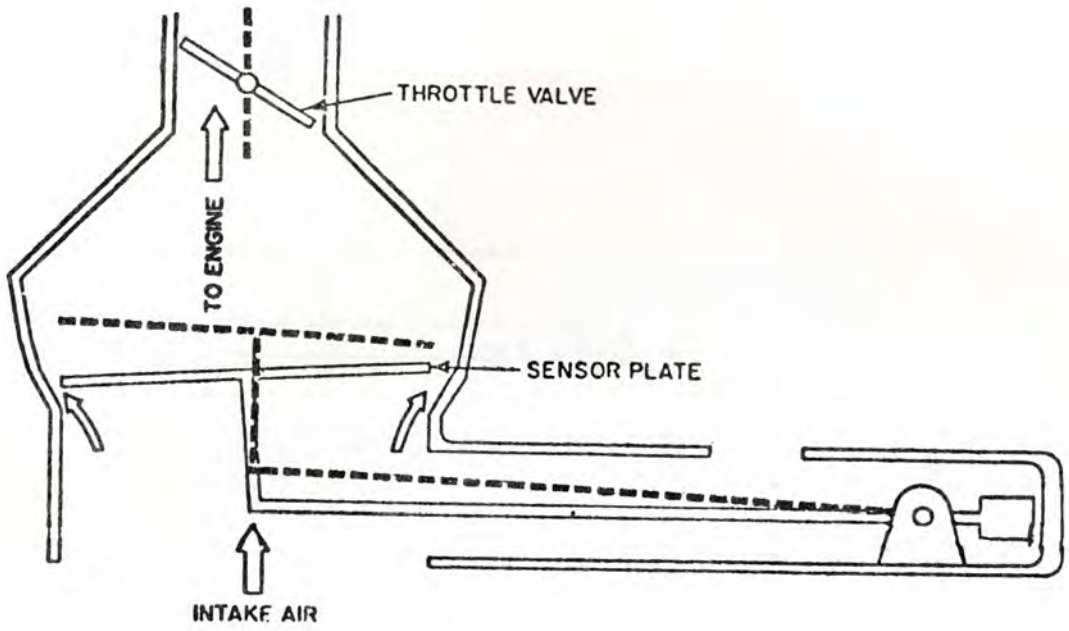


Fig. 2–8 The principles of the CI Fuel injection system

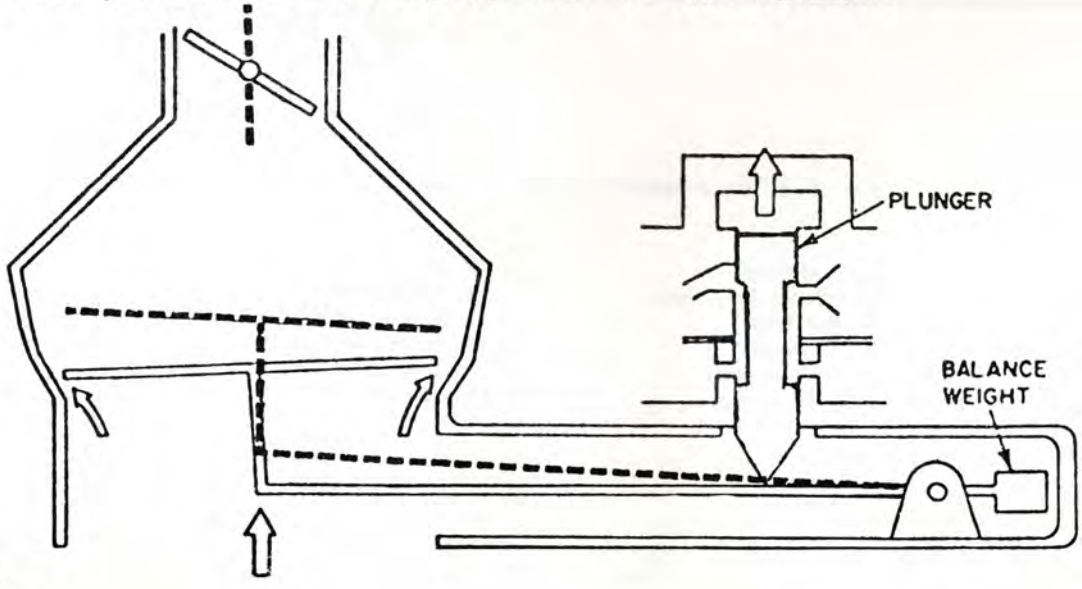
1. Fuel tank
2. Fuel pump
3. Pressure accumulator
4. Fuel filter
5. Air cleaner
6. Air flow sensor
7. Fuel distributor
8. Throttle
9. Idle adjustment screw
10. Auxiliary air valve
11. Cold start injector
12. Intake manifold
13. Control pressure regulator
14. Injector

The main function of any carburetor or fuel injection system is to mix air and fuel for most efficient combustion. The theoretical ratio is 14 parts of air to one part of fuel. In the Continuous Injection System, the air requirement of the engine is measured first and later the necessary fuel is added.

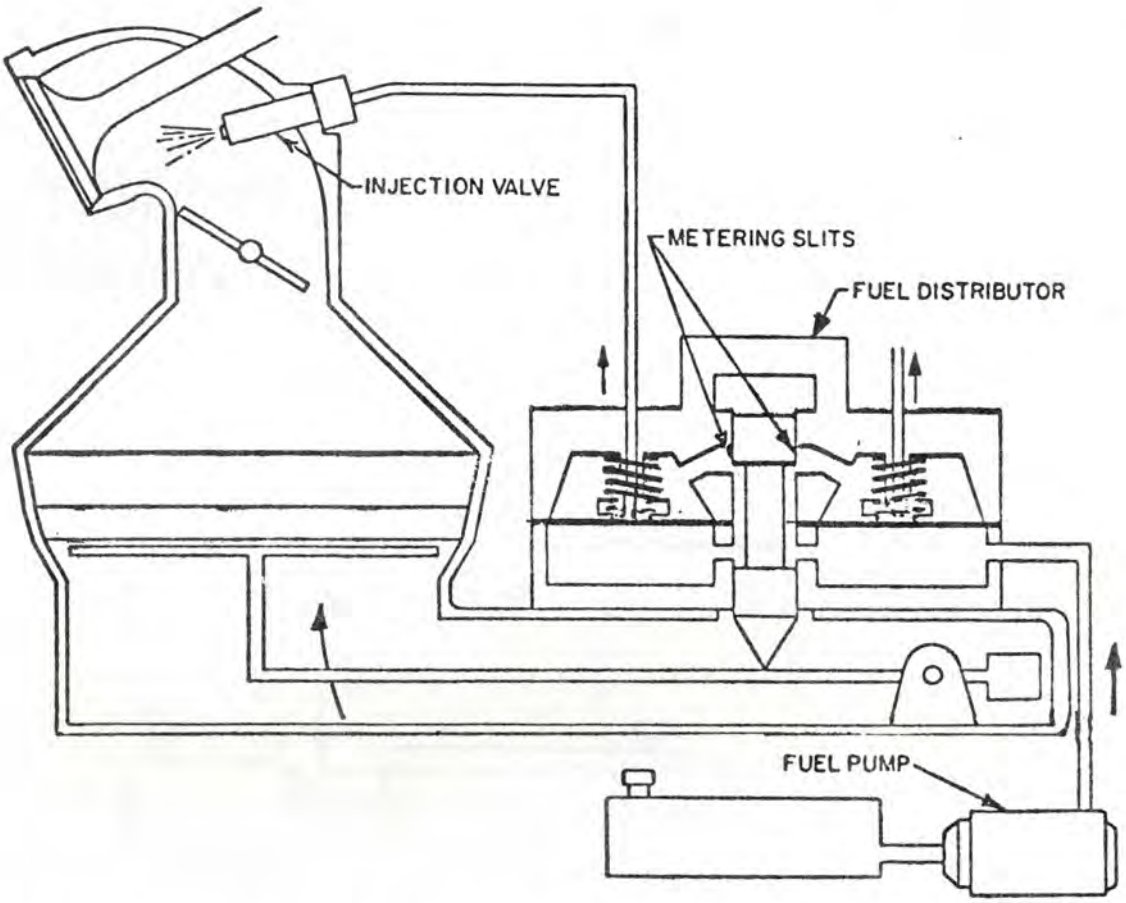
Depending on the position of the throttle valve, the engine draws in more or less air. Ahead of the throttle valve in an air funnel is an air flow sensor plate connected to a lever. The sensor plate rises in the air funnel to permit air to pass through. The position of the sensor plate in the air funnel determines the quantity of fuel required.



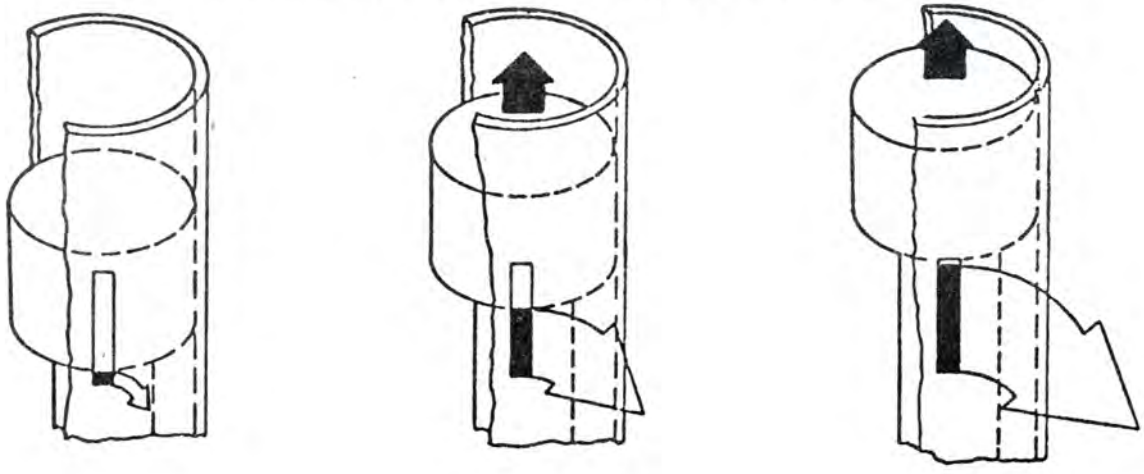
The air sensor plate is mounted on a lever. A balance weight is attached to the short end of the lever. In the air funnel the quantity of intake air lifts the air sensor plate until an equilibrium is reached between the air flow and the hydraulic counter pressure which acts on the lever through a plunger.



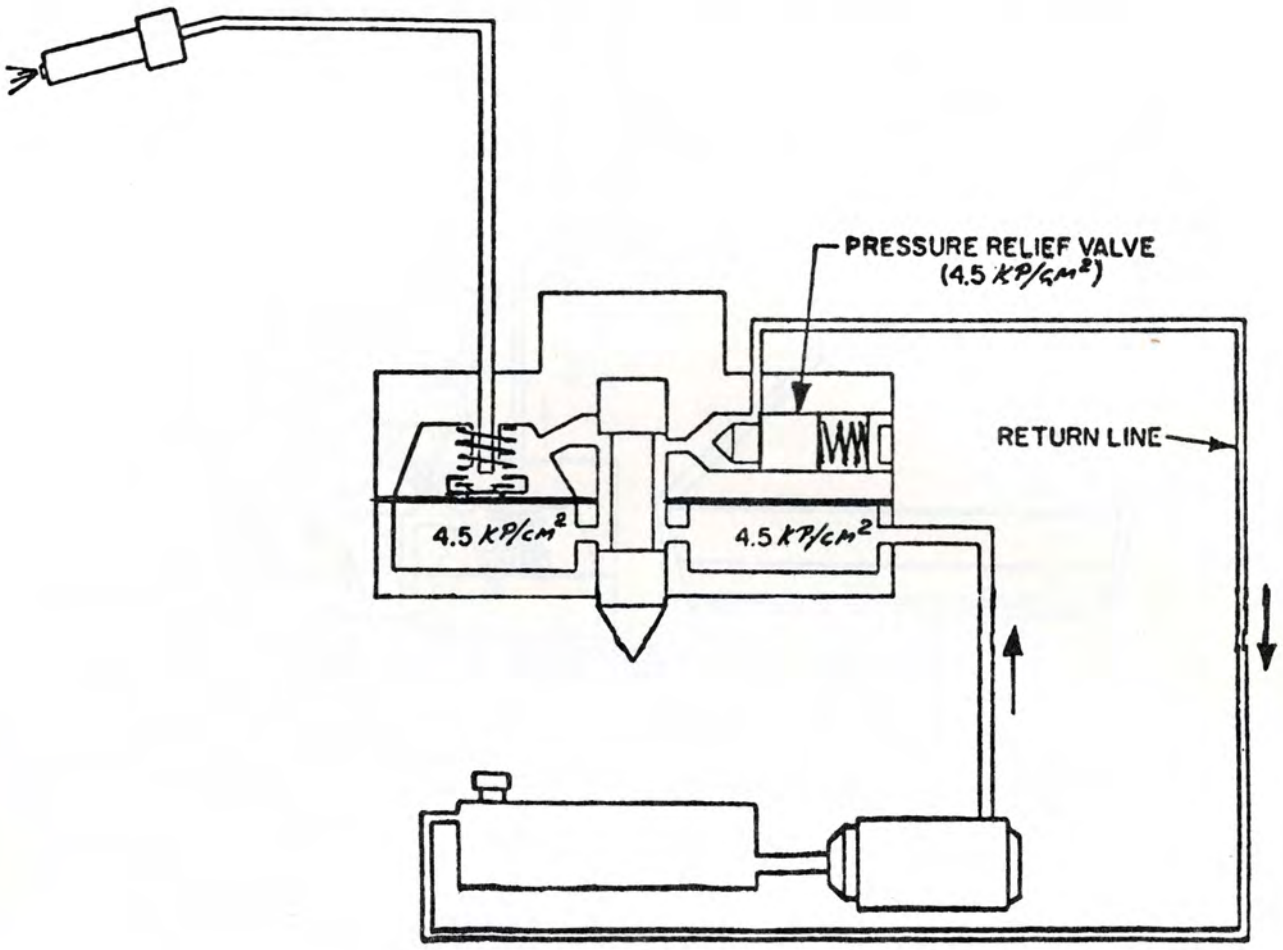
In this balanced position, the plunger maintains a certain position in the fuel distributor thus opening small metering slits, one for each engine cylinder. The fuel under a controlled pressure from the fuel pump passes through the slit opening to the injection valves. The slit openings determine the correct amount of the fuel rather than the injection valves as in electronic fuel injection systems.



In a cutaway view of the plunger and its cylinder, the metering slits are visible. The plunger opens or closes the slits depending on its position, thus increasing or decreasing fuel quantity.

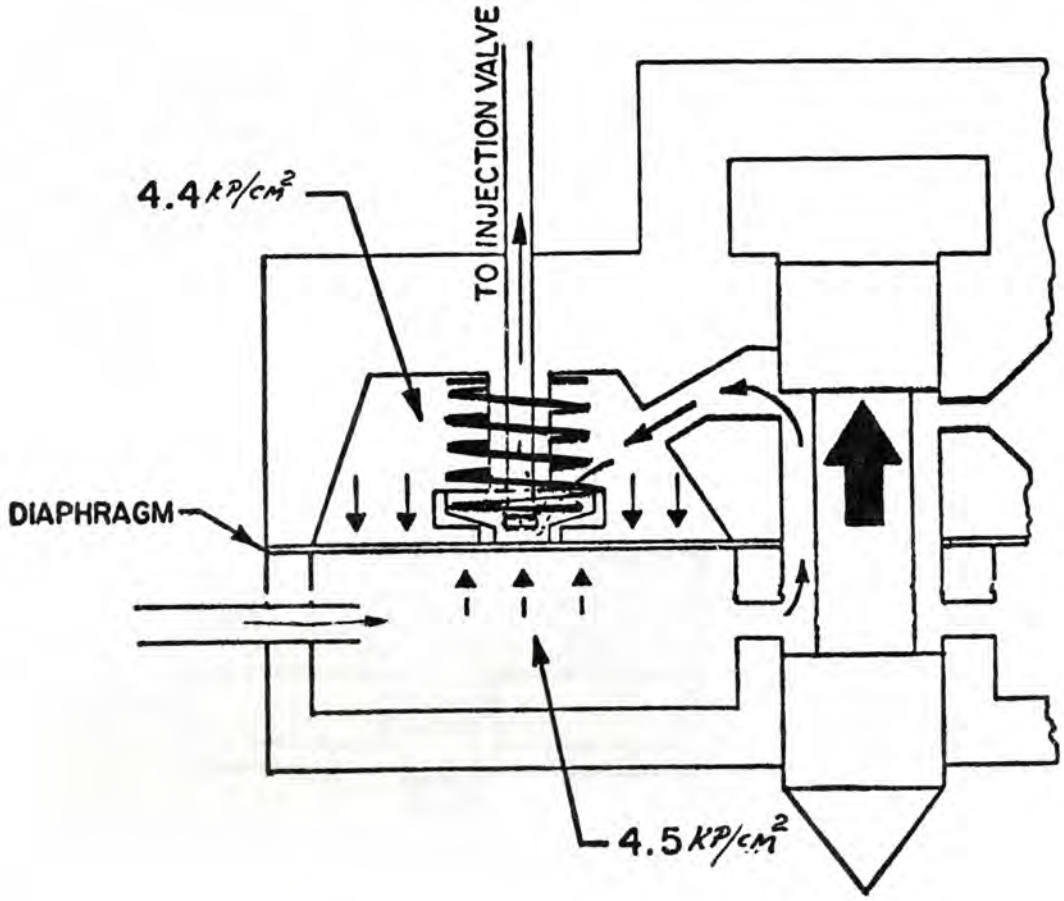


In order to maintain a fuel pressure of 4.5–5.2 KP/cm^2* a pressure relief valve is located in the primary fuel distributor. Excess fuel is diverted back via a return line to the fuel tank.



* 4.5 KP/cm^2 = 64 p.s.i.

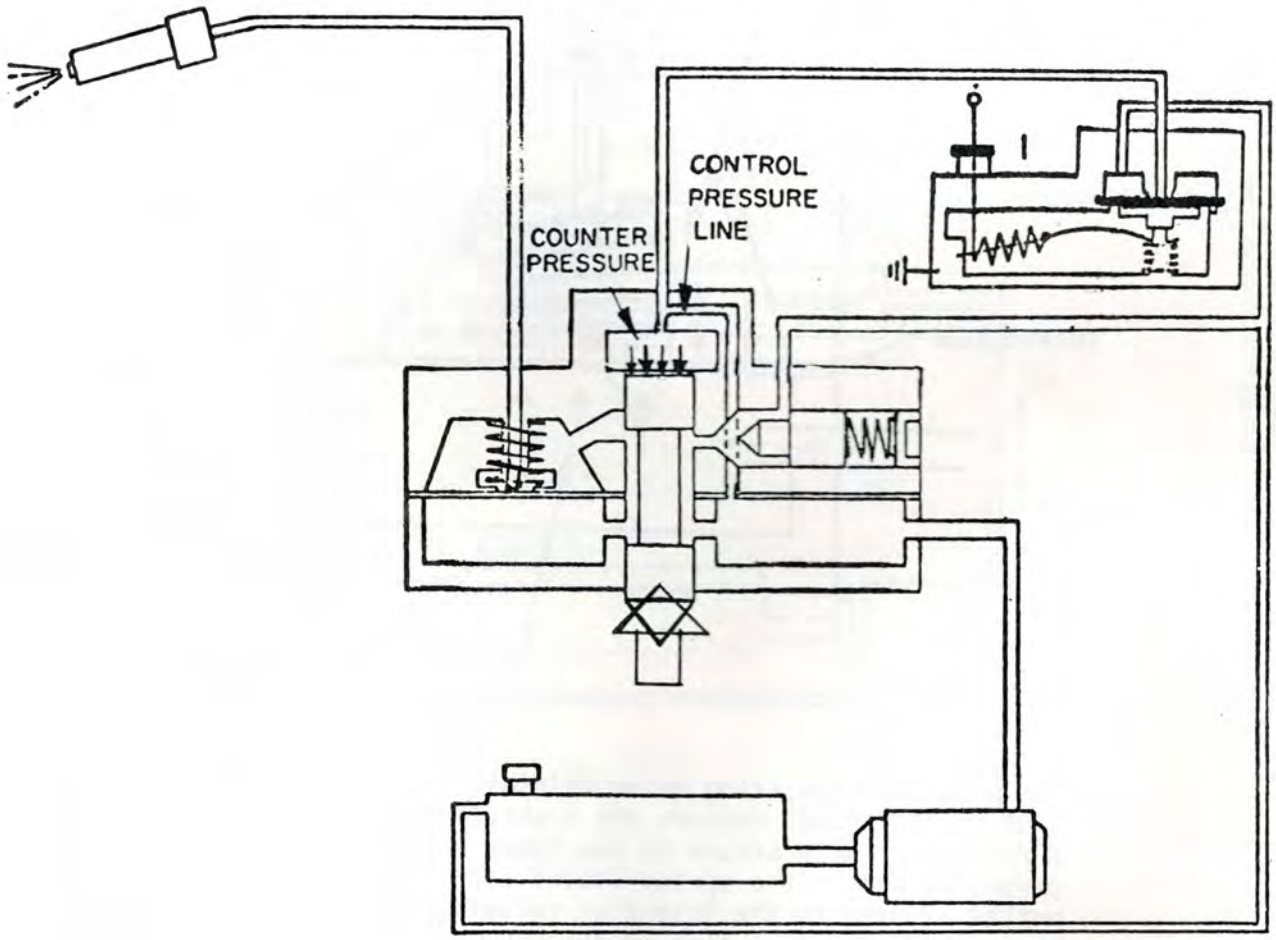
To assure that the quantity of fuel flowing through the slit openings depends only on the open area of the slit, an exact pressure differential must exist at all times at the inlet opening. The pressure is controlled by a pressure regulating valve (one for each injection valve), consisting of a spring loaded steel diaphragm and an outlet to the injection valve. Looking at the illustration you can see that the diaphragm separates the upper from the lower chamber.



The pressure regulating valve maintains an exact pressure differential of 0.1 KP/cm^2 between the pressure in the upper chamber (4.4 KP/cm^2) and the pressure in the lower chamber (4.5 KP/cm^2). Both pressures act on the spring loaded steel diaphragm which opens the outlet leading to the injection valves. The amount of opening at the outlet is always just sufficient to maintain the pressure differential of 0.1 KP/cm^2 at the metering slit. If a larger amount of fuel flows, the diaphragm opens further to allow more fuel to flow, thus maintaining a pressure of 4.4 KP/cm^2 in the upper chamber. If a smaller amount of fuel enters the upper chamber, the diaphragm opens less, permitting less fuel to flow to the injection valves. In both cases the pressure differential between upper and lower chamber is always constant at 0.1 KP/cm^2. In practice, the diaphragm moves only a few hundredths of a milimeter.

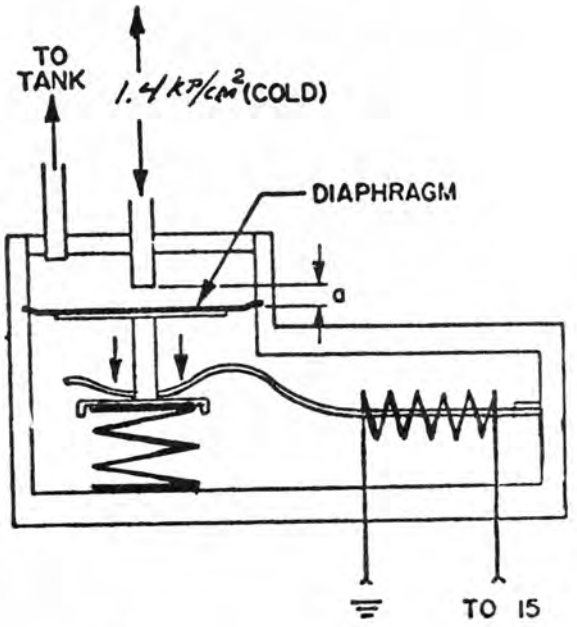
We talked earlier about the counter pressure on the plunger which keeps the lever in balance. This counter pressure or force acting on the top of the plunger is used to influence the fuel quantity. Limiting the travel of the plunger by excerting more force on the top, the slits open less, thereby permitting less fuel to the injection valves. In turn, decreasing the pressure (or force) on the plunger permits the plunger to open the slits further, thus increasing the quantity of fuel to the injection valves. The hydraulic pressure on the top of the plunger is obtained from the primary fuel circuit. The pressure is then varied by the control pressure regulator, regulating the pressure on the top of the plunger according to engine and outside temperatures.

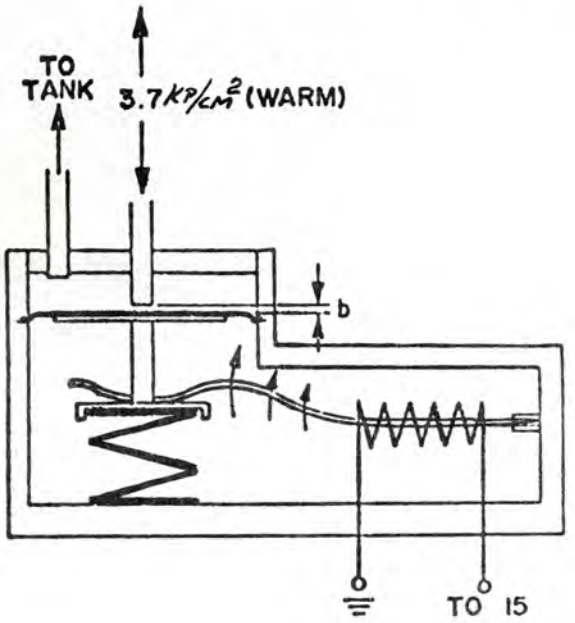
The Control Pressure Regulator for Warm running Compensation (number 1) is mounted on the engine. During engine warm-up it maintains the correct air/fuel ratio by enriching the mixture. As the engine reaches its normal running temperature, it leans out the mixture as necessary after three minutes.



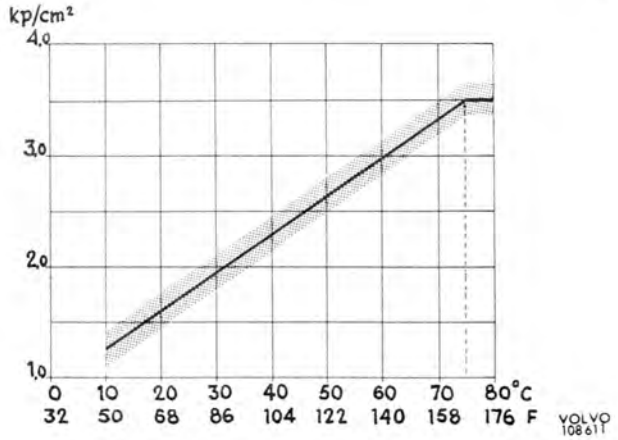
The control pressure regulator for warm running compensation contains a by-metallic spring acting on a spring loaded diaphragm.

When the engine is cold, the diaphragm keeps the inlet from the control pressure sufficiently open (distance a) to maintain a minimum pressure on the plunger of approximately 1.4 KP/cm^2.



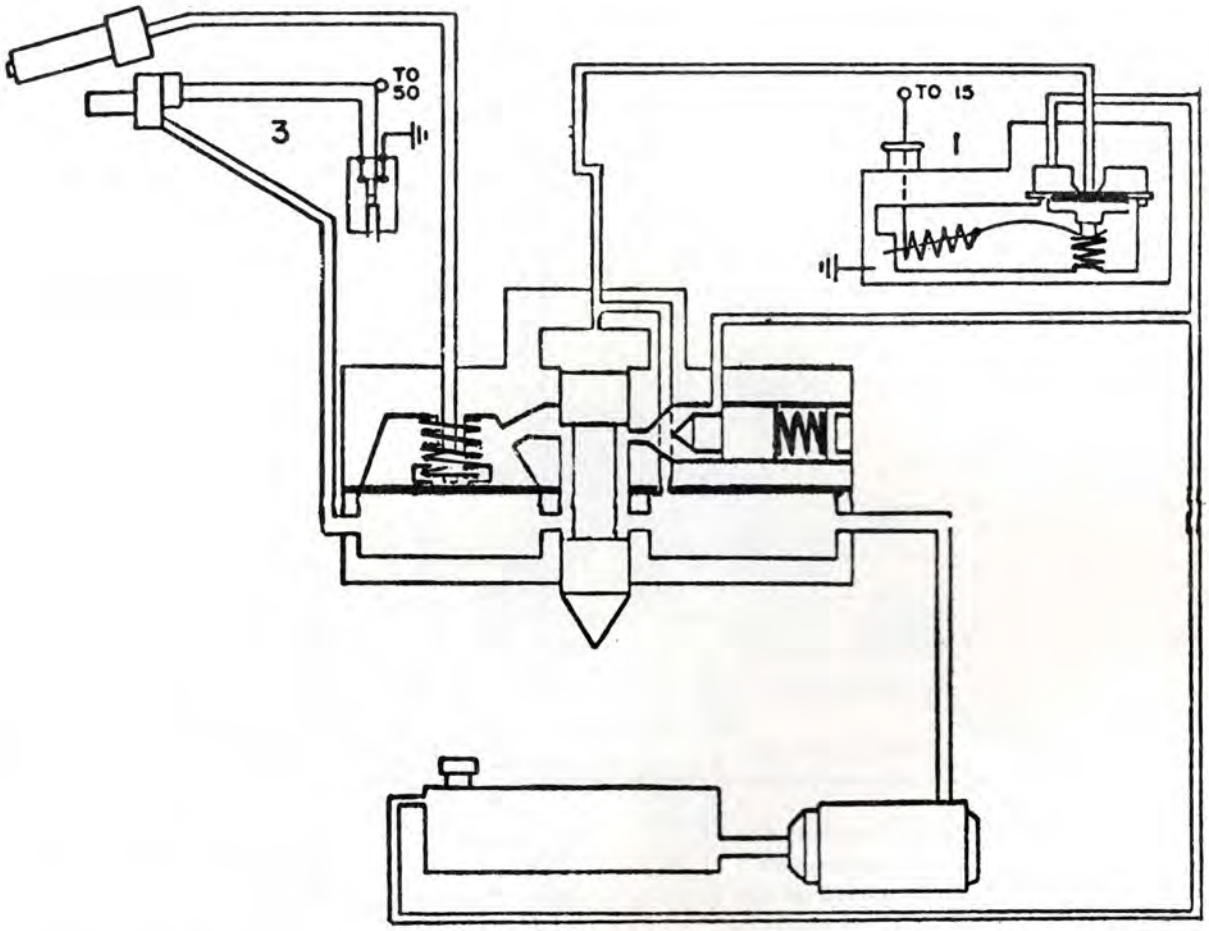


As the heating coil of the by-metalic spring, activated through the ignition system heats up, it permits the diaphragm to close off the inlet opening (distance b), thus increasing the control pressure on the top of the plunger to a maximum of approximately 3.7 KP/cm^2 after 3 min.



Control pressure at various temperatures

In addition to the control pressure regulating valve, an additional cold start valve (number 3) is provided in the intake manifold. The purpose of the start valve is to provide sufficient fuel during the starting cycle since the air flow created by the engine pistons is insufficient to actuate the plunger of the fuel distributor. The start valve receives its fuel under pressure from the primary circuit of the fuel distributor.



The cold start valve is activated during the starting cycle, that is, whenever the engine is cranked by the starter motor, and the thermal time switch is closed which occures at engine temperatures below +95° F.

The solenoid of the cold start valve receives its current from the starter motor solenoid via the thermal time switch.

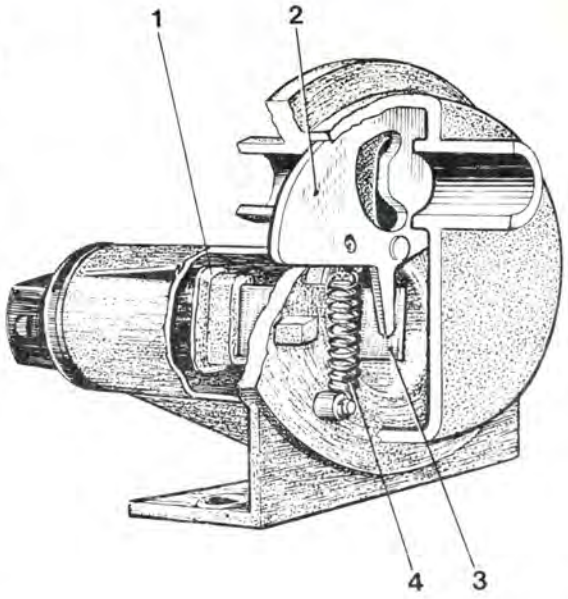
The thermal time switch utilizes a set of contacts controlled by a bi-mettalic spring. The bi-mettalic spring has two heating coils, one activated from the cold start valve; and one from the starter. At temperatures below -5° F, the contacts are closed for 12 seconds, and the cold start valve is injecting extra fuel in the manifold. The time period that the thermal time switch contacts are closed decreases gradually with the increase of temperature, and ceases at +95° F.

At engine temperatures above +95° F, the thermal time switch will not activate the cold start valve.

An auxiliary air valve by-passes the throttle plate to provide extra air at cold start, and fast idling during engine warm up.

The auxiliary air valve is activated by a bi-mettalic spring, which is heated by an electric coil connected to the ignition as the engine is started. The auxiliary air valve gradually closes, and the engine returns to normal idling speed.

The amount of opening of the auxiliary air valve when starting the engine is dependent on the ambient temperature. For example: At -5° F. the valve is fully open, but at +68° F it is half open.



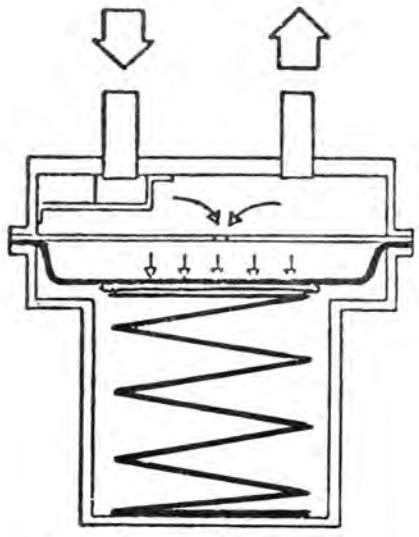
Auxiliary air valve

1. Coil
2. Air valve
3. Bi-metallic spring
4. Return spring

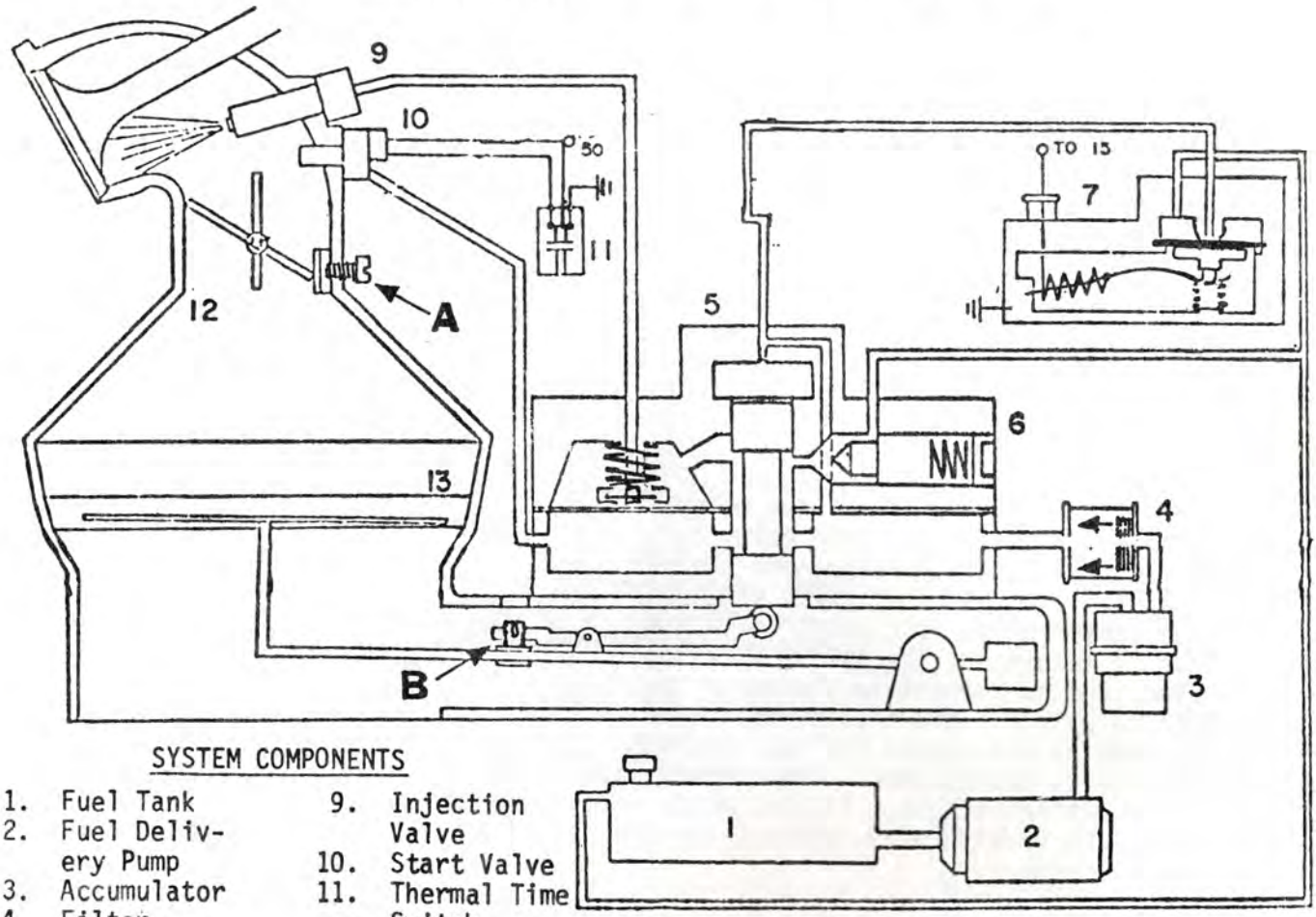
The fuel pump is controlled by two relays. (See wiring diagram.) The pump relay is controlled by the safety relay. On the air sensor plate is a switch which is closed when the sensor plate is closed. When the ignition is turned on, the safety relay is activated, and no current is passed on to the pump relay until the starter is turned on. As soon as the engine starts, the sensor plate switch opens, and the safety relay is deactivated. The current then is supplied to the pump relay from the ignition circuit. If the engine stops, the air sensor switch closes activating the safety relay, and the current is turned off to the pump relay and the pump stops.

To prevent vapor locking of the system, a Fuel Accumulator is provided in the primary circuit as a reservoir to release sufficient fuel under pressure, to the system when the engine is switched off for a short period of time. The Fuel Accumulator also acts as a pressure damper to absorb the initial pressure surge at the moment the ignition is turned on. This dampening action is needed to prevent the plunger from being forced up before sufficient control pressure has been allowed to build up.

The fuel accumulator consists of a container in the fuel delivery line. A spring loaded diaphragm provides the necessary dampening action and the expanded chamber serves as the reservoir to keep the system under sufficient pressure.



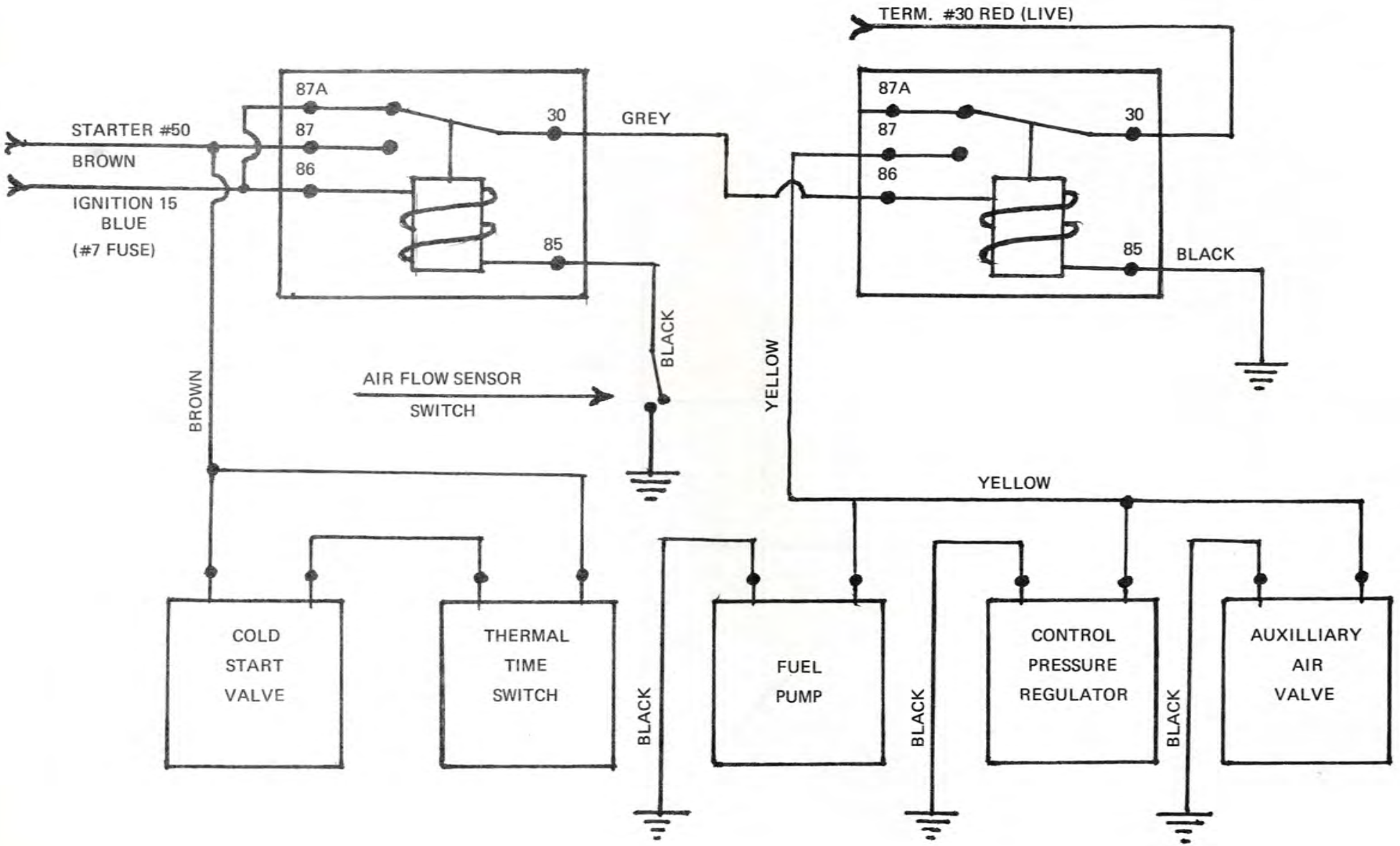
The following diagram illustrates the complete system including all the individual components.



SYSTEM COMPONENTS

1. Fuel Tank
2. Fuel Delivery Pump
3. Accumulator
4. Filter
5. Fuel Distributor
6. Pressure Relief Valve
7. Control Pressure Regulator W/Warm Running Compensation
9. Injection Valve
10. Start Valve
11. Thermal Time Switch
12. Throttle Valve
13. Air Sensor

To make basic adjustments possible, an air bypass screw (A) for idle speed adjustment is provided. To obtain the basic CO setting at idle, an adjustment screw (B) is provided on the air sensor lever. These are the only adjusting provisions in the Continuous Injection System.

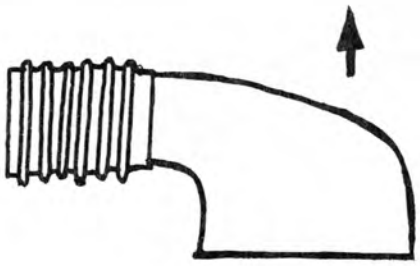
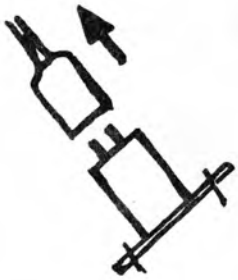
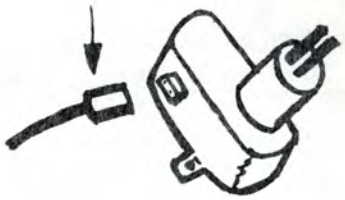
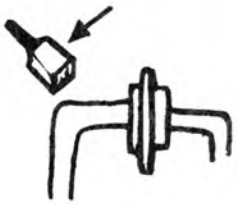


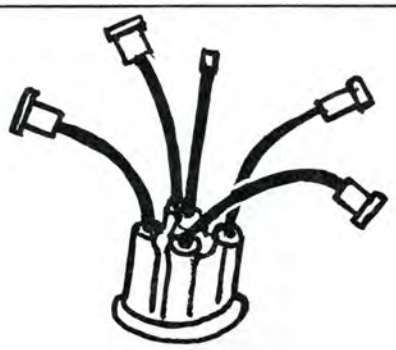
C.I. SYSTEM COMPONENT CIRCUITRY

SERVICE OF B20 WITH CI-SYSTEM

SERVICE DIAGNOSIS INCLUDED

U = part of maintenance service

	1. Rubber bellow Remove.
	2. Cold start injector Disconnect wire at terminal.
	3. Control pressure regulator Disconnect wire at terminal.
	4. Auxiliary air valve Remove wire at terminal.



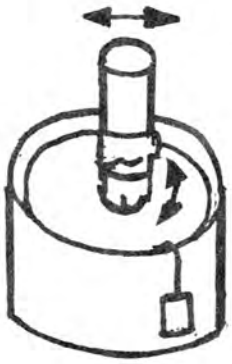
5. Distributor cap with high tension leads
Remove.

Inspect and clean cap and high tension leads.

6. Rotor
Remove.

Check rotor for cracks or damages.

7. Breaker points
Check for condition.



8. Distributor
Check distributor shaft and breaker point plate for play.

9, Distributor
Lubricate.

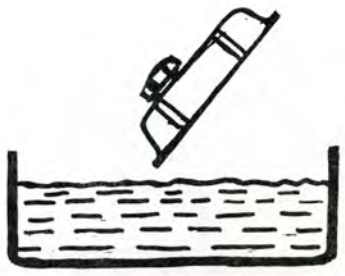
10. Spark plugs
Remove.

11. Valve cover
Remove.

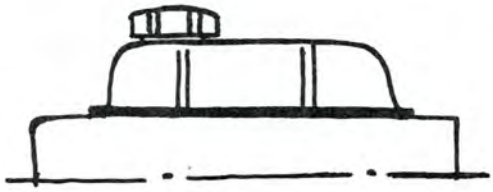
12. Valves
Adjust.

Always adjust the valves with the piston in top dead center.

B20 F MAN, B20 E	.45-.50 mm (.018"-.020")
B20 F AUT	.40-.45 mm (.016"-.018")



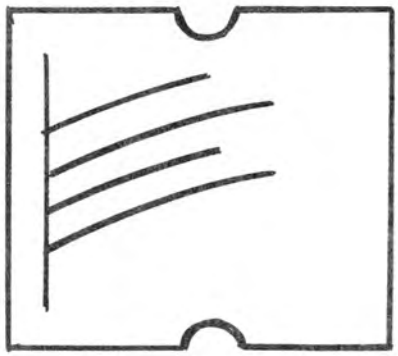
13. Valve cover. Distributor cap and high tension leads.
Wash.



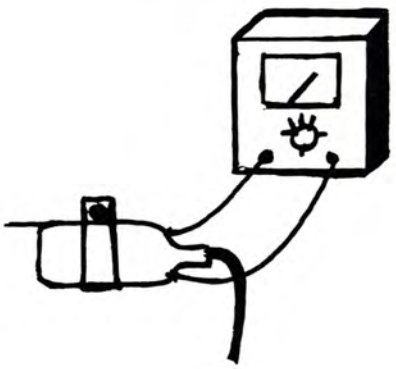
14. Valve cover
Install.

Check gasket.

15. Remote control starter switch
Connect.

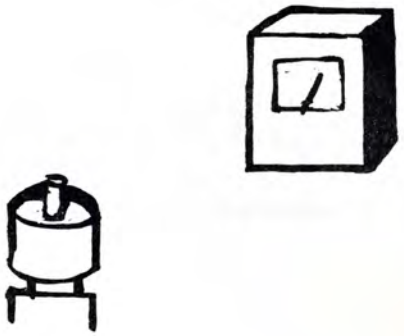


16. Compression
Test.



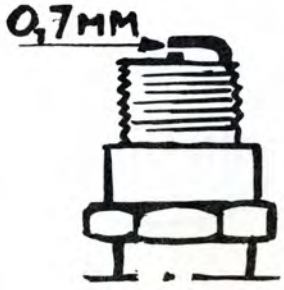
17. Dwell angle meter
Connect.

18. Ignition
Switch on.



19. Dwell angle
Adjust.
B20, $62^{\circ} \pm 3^{\circ}$

20. Ignition
Switch off.

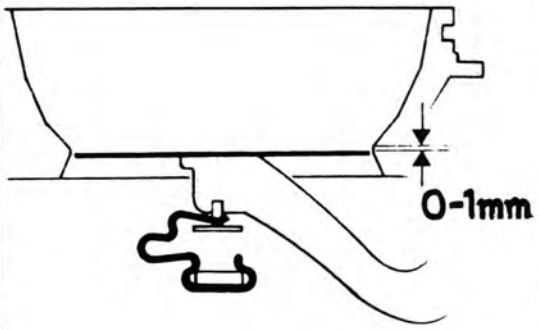


21. Spark plugs
Check or replace. Adjust gap.

22. Spark plugs
Install.

23. Rotor
Install.

24. Distributor cap with high tension leads
Install.



25. Air flow sensor plate
Check rest position.

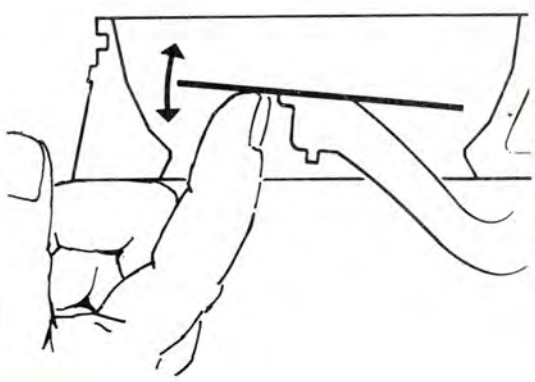
For correction: see page 35, point 25.

26. Air flow sensor plate
Check center position.

Check that the air flow sensor plate is centered and does not touch at the edge at any point.

For correction: see page 35, point 26 A and B.

27. Air filter
Remove upper parts, complete with air-fuel control unit.



28. Air-fuel control unit
Check for seizure.

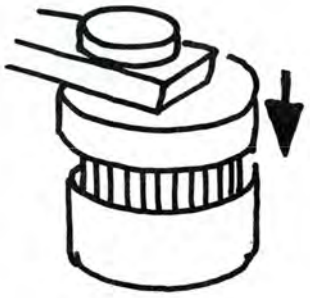
Lift the sensor plate with a finger.

NOTE: The control pressure will cause some resistance, when the sensor plate is lifted. Do not confuse this resistance with a seizure.

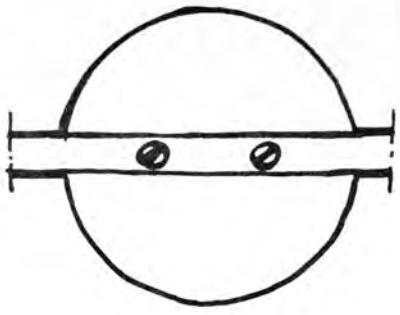
For correction: see page 36, point 28 ABC.

29. Air filter
Inspect.

Replace air filter if necessary.

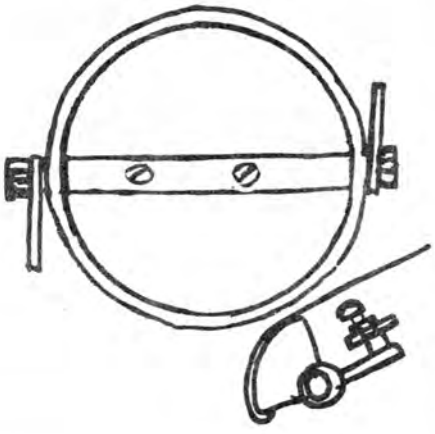


30. Air filter, upper part
Install.



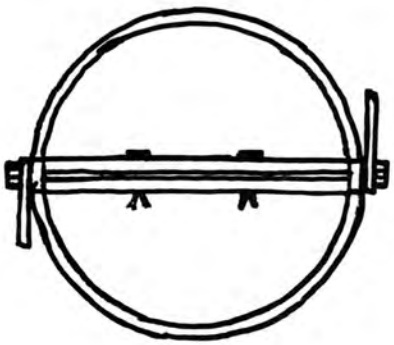
31. Throttle plate
Check installation on the throttle shaft.

Check that the throttle plate does not seize.



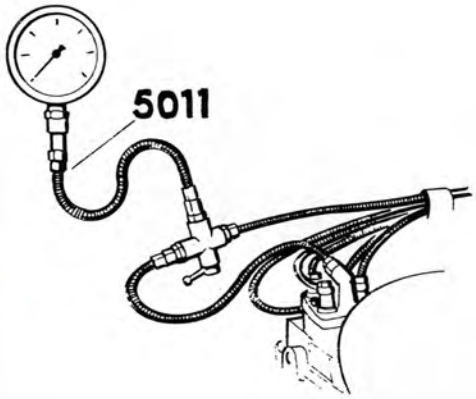
32. Throttle plate
Check that the throttle plate closes.

Adjust if necessary:
Loosen the stop nut. Screw up the screw until it releases from the stop.
Screw it down again until it just touches the stop.
Screw in another half turn. Lock the stop nut.



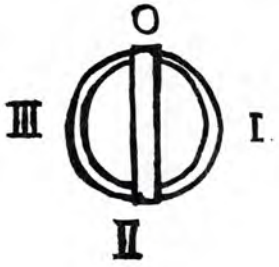
33. Throttle plate
Check that the throttle touches the full speed stop when the accelerator pedal is completely depressed.

Adjust if necessary.

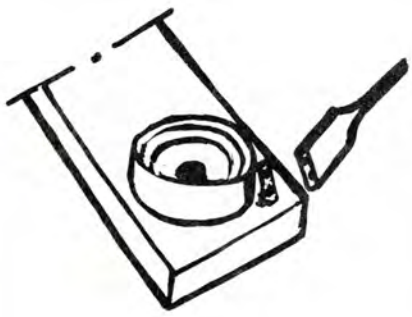


34. Pressure gauge
Connect.

Put the valve lever in position 1 (towards the air-fuel control unit) for check of the line pressure.



35. Ignition
Switch on.



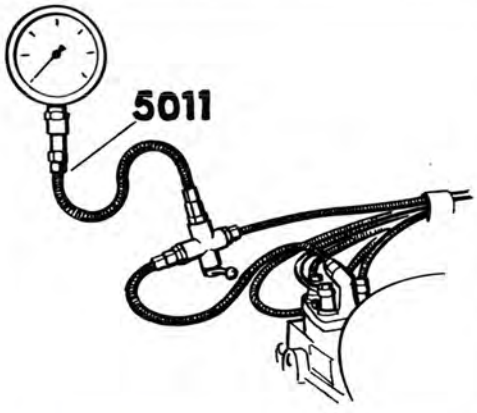
36. Terminal at air flow sensor
Disconnect.
(The fuel pump should start).

If the fuel pump does not start, see Service Diagnosis "Engine does not start".

37. Line pressure
Read the pressure gauge.
Line pressure 4.5-5.2 kp/cm^2 = 64-74 psi.

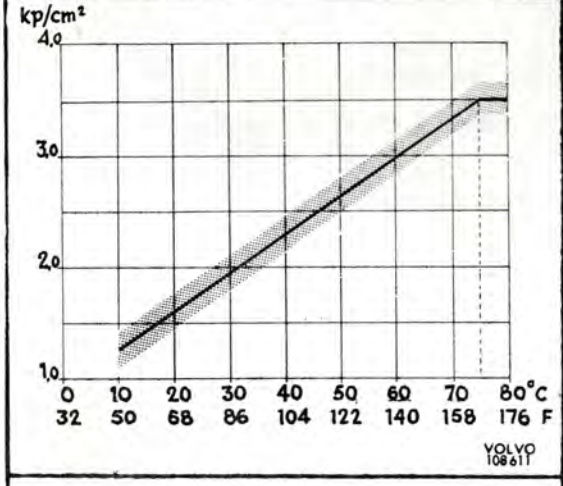
For correction: see page 36 point 37 ABCDE and F.

V



38. Control pressure
Put the valve lever in position 2 (straight out) for test of the control pressure.

V



39. Control pressure
Test.

Cold engine.

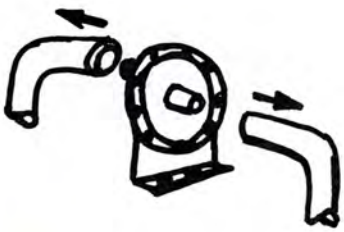
Control pressure, cold engine, see Diagram.

For correction: see page 37 point 39 AB and C.

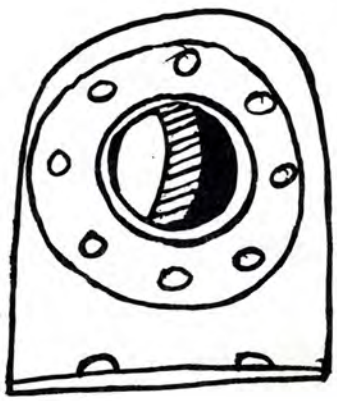
40. Control pressure terminal
Re-connect.

(Within 3 minutes the control pressure should rise to 3.7 ± .2 kp/cm^2 = 50-55 psi).

(In the meantime, make tests 41-48.)



41. Auxiliary air valve
Remove hoses.

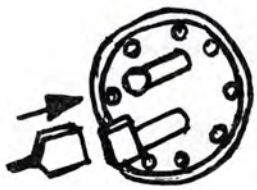


42. Auxiliary air valve
Check that the valve is open.

(The valve is half open at 20°C = 68°F, it is completely closed when the engine is hot.)

Jsean inspection mirror and a light.

For correction: see page 38 point 42.



43. Auxiliary air valve
Re-connect terminal.

The valve should have closed within 5 minutes.

(In the meantime make tests 44-49.)

44. Cold start injector
Re-connect terminal.

45. Cold start injector
Remove.

46. Cold start injector
Check for leaks.

NOTE: Engine vibrations and manifold vacuum may cause leakages, which cause erratic idle.

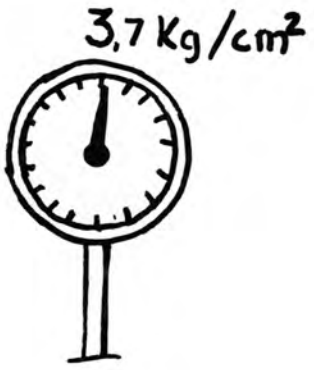
For correction: see page 38, point 46.

47. Cold start injector
Re-install.

48. Fuel distributor
Check tightness.

Injectors may get wet but must not drop.

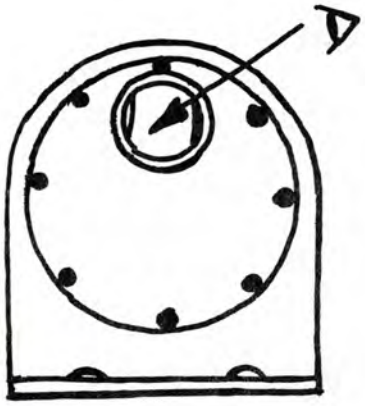
For correction: see page 39 point 48.



49. Control pressure
Check.

Check that the control pressure has risen to 3.7 ± .2 kp/cm² = 50-55 psi.

For correction: see page 39, point 49 ABC.



50. Auxiliary air valve
Check.

Check that the valve has changed position (see point 43).

For correction: see page 40, point 50 ABC.

51. Auxiliary air valve
Re-connect hoses.

52. Air flow sensor terminal
Re-connect wire.
(Fuel pump should stop.)

For correction: see page 40, point 52 A and B.

V

53. Rest pressure
Test.

1.7-2.4 kp/cm^2 = 24-34 psi.

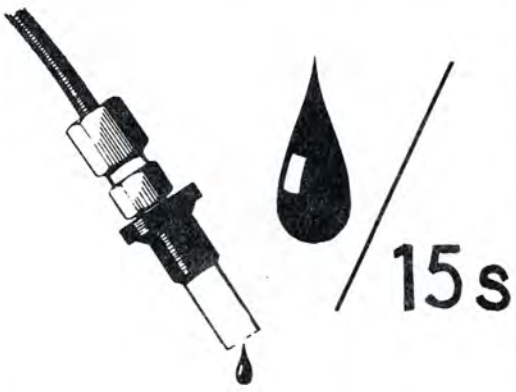
For correction: see page 41 , point 53 A and B.

54. Check tightness

Check the fuel system for leaks by observing that the pressure does not drop within 1 minute.

For correction: see page 41 , point 54 ABC.

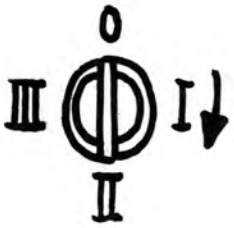
55. Ignition
Switch off.



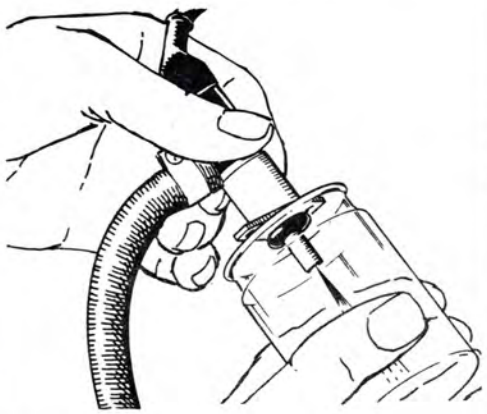
56. Injectors
Check for **leaks** (at rest pressure).

Lift the air flow sensor plate so that the metering slots open.
The injectors must not leak more than 1 drop in 15 seconds.

For correction: see page 42, point 56.



57. Ignition
Switch on.

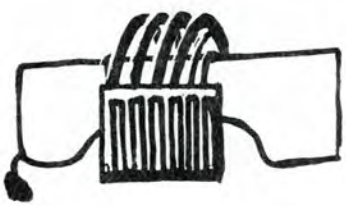


58. Cold start injector
Hold the cold start injector over a pan and check that the valve sprays when the starter is running.

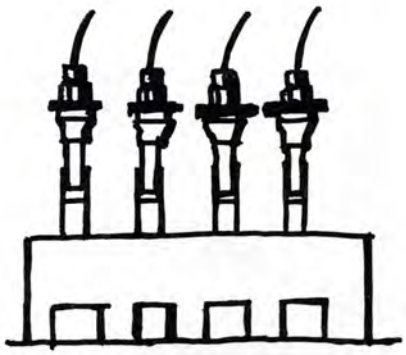
NOTE: The injector sprays for approx. 12 seconds at an engine temperature of -20°C = -4°F. Increasing temperature means decreased spraying time, injection ceases at temperatures above 35°C = 95°F.

For correction: see page 42, point 58 AB.

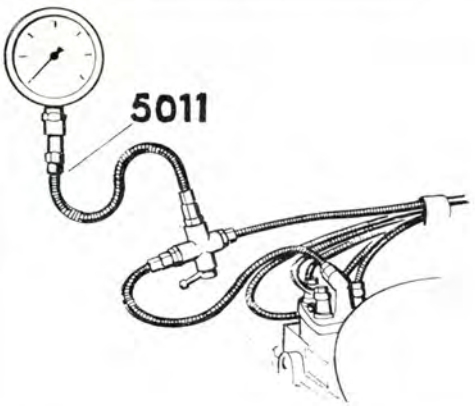
59. Cold start injector
Install.



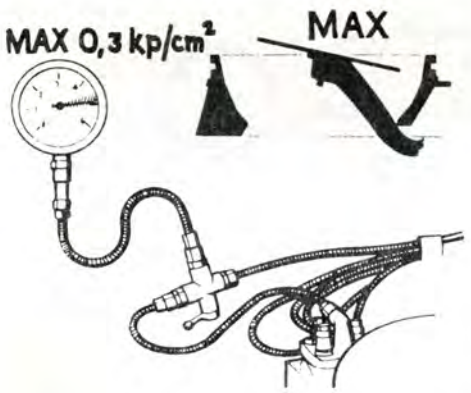
60. Test equipment
Connect.



61. Injectors
Connect to test equipment.



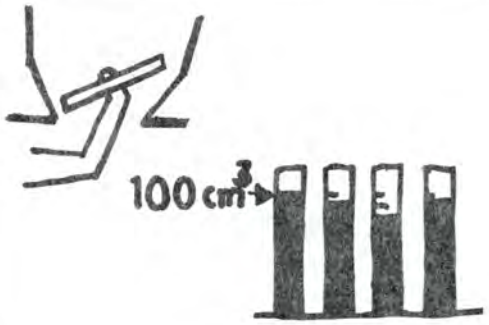
62. Pressure gauge
Put valve lever in position 1 (towards fuel distributor).



63. Fuel supply
Check.

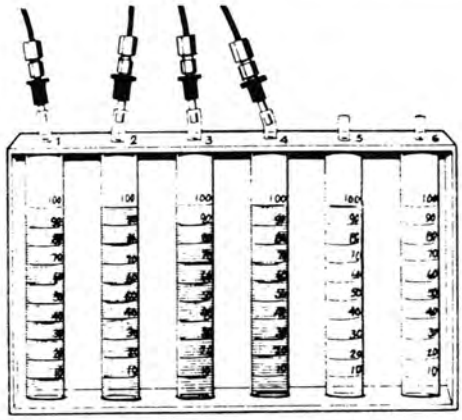
Lift the air flow sensor plate for max. 4 seconds. Observe the pressure gauge. The line pressure must not decrease (at full throttle) more than .3 kp/cm^2 = 4 psi. Release the plate.

For correction: see page 43, point 63 A and B.



64. Fuel supply
Test.

Lift the air flow sensor plate to middle position. Release the plate when the fuel quantity in one of the test glasses has reached 100 cm^3.

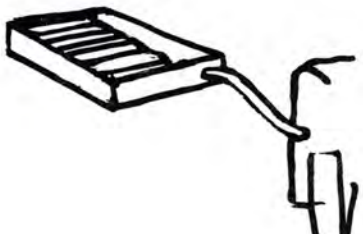


65. Fuel feed
Test deviation.

The fuel feed deviation should not exceed 10 – 15 %.

For correction: see page 43, point 65.

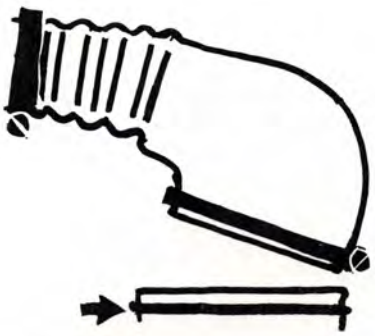
66. Injectors
Disconnect the injectors from the test equipment.



67. Test equipment
Disconnect

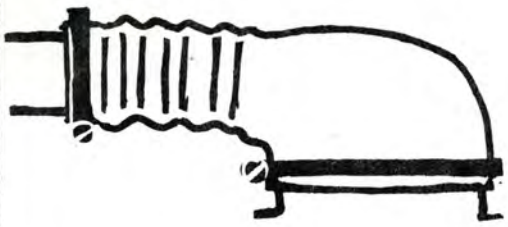
Return fuel to tank.

68. Injectors
Install.

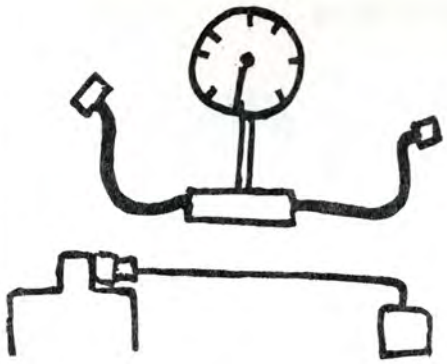


69. Rubber bellow
Check that the rubber bellow is in good condition.

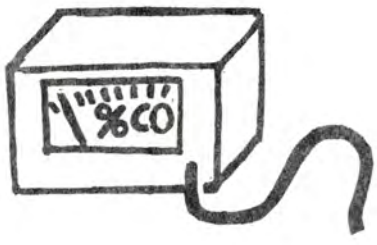
Check the O-ring.



70. Rubber bellow
Install.

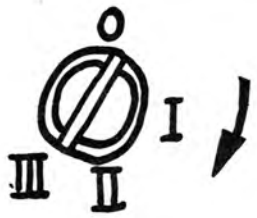


71. Pressure gauge
Remove.

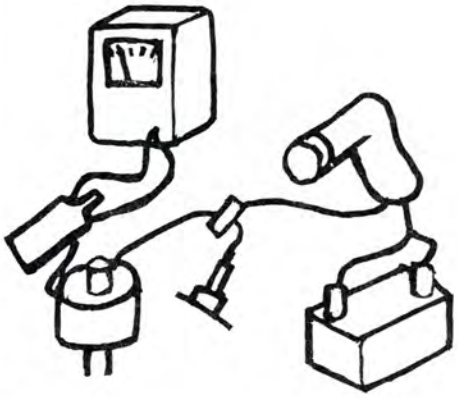


72. CO-meter
Connect.

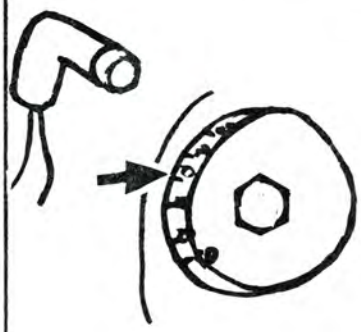
73. Exhaust hose
Connect.



74. Start engine.



75. Tachometer and timing light
Connect.



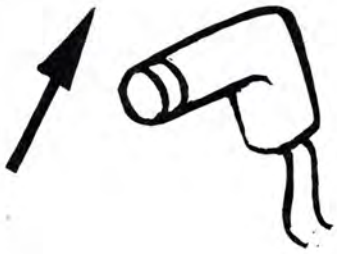
76. Adjust timing.

77. Engine
Run the engine hot and check it.

Check that all hoses and electrical connections to the engine are in order and correctly installed.

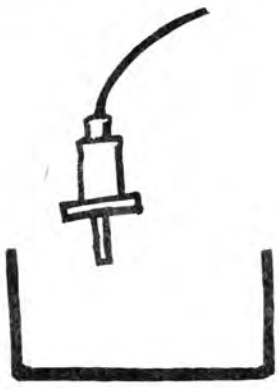
Check that all fuel hoses are tight and correctly installed.

Check that all details are tightly attached.

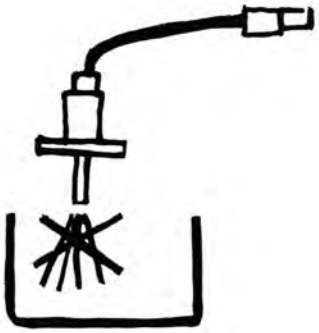


78. Timing light
Remove.

79. Stop engine.



80. Cold start injector
Remove and hold it over a pan.



81. Thermal time switch
Test.

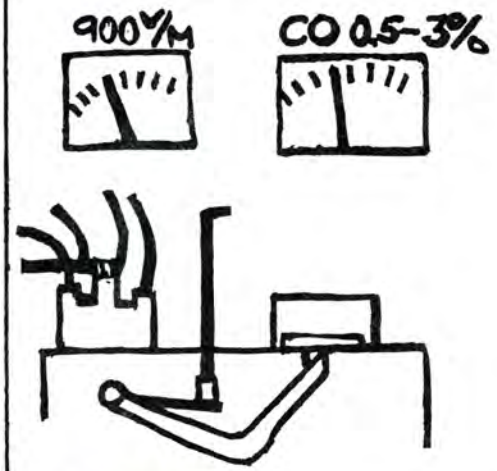
Run the starter.

The cold start injector should not spray (when the engine is hot).

For correction: see page 44, point 81.

82. Cold start injector
Install.

83. Start engine.

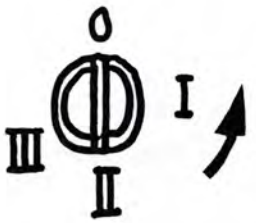


84. CO and idle
Adjust.

Set idle rpm 800, automatic transmission.

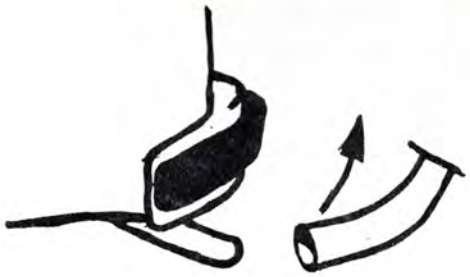
Set idle rpm 900, manual transmission.

Set CO .5-3.0 % (USA 1.5 %).

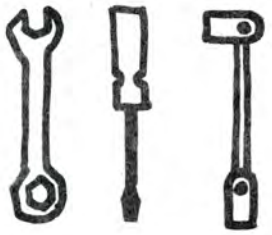


85. Stop engine.

86. Instruments
Disconnect tachometer, remote control starter switch and CO-meter.



87. Remove exhaust hose.



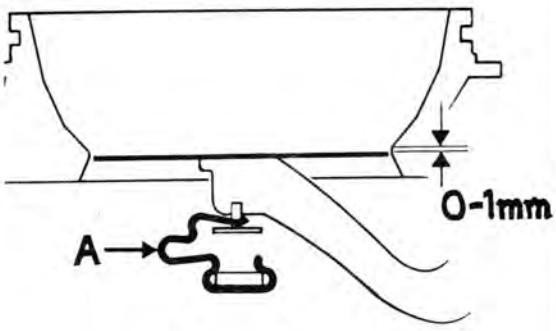
88. Return tools.

SERVICE DIAGNOSIS AND SERVICE PROCEDURES FOR THE CI-SYSTEM

The service diagnosis points have the same number as the maintenance points.

The service diagnosis presumes that previously checked points are in order.

For instance, if a fault is detected at point 39, it is presumed that the points 1-38 are in order.



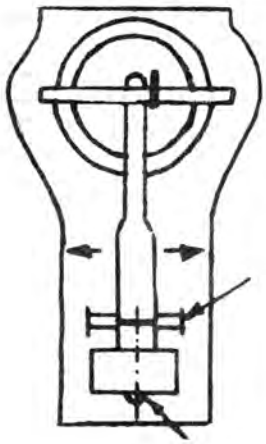
25. Air flow sensor plate
Adjust rest position.

Remove the air-fuel control unit.
Pull apart resp. press together the wire at the stop for the air flow sensor plate.

A. Wire

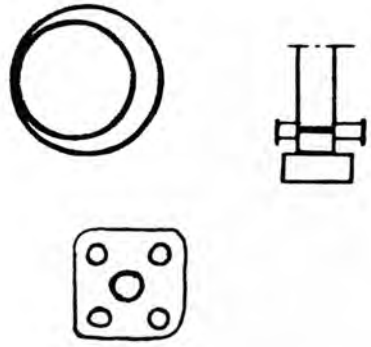
26. Air flow sensor plate
Adjust center position.

A Loosen the center screw and align the air flow sensor plate in the middle of the air venturi.



B. Movement sideways of the air flow sensor plate can be accomplished by moving the lever on its shaft. This adjustment method can be used when the lever is replaced or is out of center.

Remove the air-fuel control unit.
Loosen the lock screw.
Move the lever.
Lock the lock screw.
Install the air-fuel control unit.

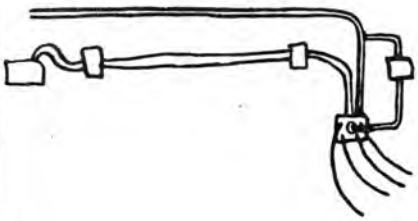


28. Fuel distributor seizure.
Possible faults:

A The air flow sensor plate dislocated in the air venturi (point 25).

B The lever shaft seizes in the housing (point 26 B)

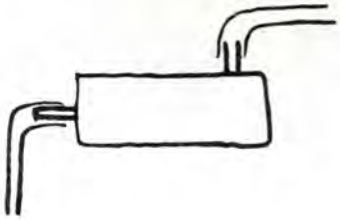
C Dirt in the fuel distributor (plunger seizes).



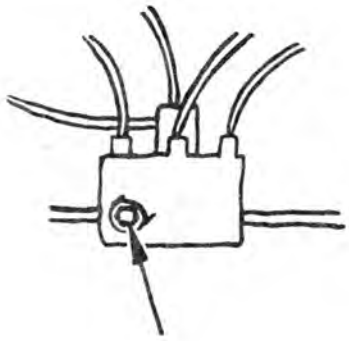
37. Line pressure too low.

A Fuel line leakage.
Check fuel lines under pressure.

Start the fuel pump.
Inspect the lines.



B Fuel pump pressure too low. Fold the fuel return line (rubber hose) carefully by hand, so the pressure rises to approx. 5.0 kp/cm^2 = 71 psi. If the fuel line does not rise to this figure, when the return line is completely blocked, the fuel pump is defective or the tank filter clogged.
NOTE: Avoid blocking the return line completely, as the pump can provide so high pressures that some components may get damaged.

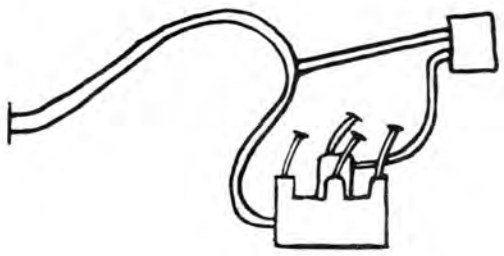


C The line pressure regulator is defective if the components above are in order.

Adding of shims increases the line pressure. Each shim increases the line and rest pressure .3 kp/cm^2 = 4 psi.

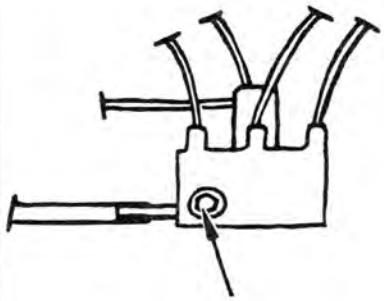
Check according to point 53, page 14.

If adjustment does not cure the problem, replace the fuel distributor.



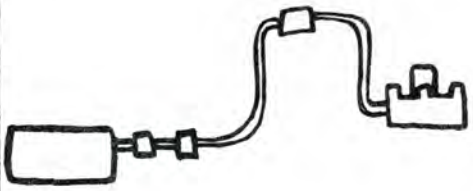
37. Line pressure too high.

D Fuel return line clogged.
If the control pressure (maintenance points 38-39) is as high as the line pressure, the fuel return line is clogged.between the line pressure regulator and the tank. If not, check the fuel return line from the fuel distributor to the control pressure regulator.



E Line pressure regulator defective.
Removal of shims in a line pressure regulator will decrease the line pressure. Each shim decreases the line and rest pressure approx. 3 kp/cm^2 = 4 psi.

Check according to point 53, page 14. Replace fuel distributor if adjustment is not effective.



No line pressure (or rises very slowly). Fuel pump is operating.

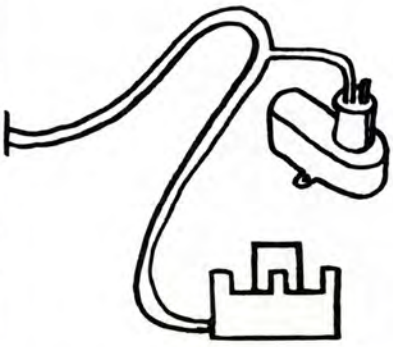
F Fuel lines (filter) clogged, or fuel distributor clogged.

(The fuel pump has usually a high noise if the fuel lines are clogged.)

39. Control pressure too low, cold engine.

A Control pressure regulator defective. Test a new one.

(If there is no control pressure even if the fuel pump feeds, the line or the fuel distributor may be clogged. See point 37.)



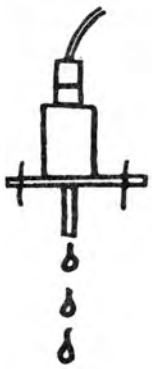
Control pressure too high.

B Fuel return line clogged..
If control pressure = line pressure, see point 37 (line pressure too high).
If not, check the hose from the control pressure regulator to the return line.

C Control pressure regulator defective.
Try a new one.

42. Auxiliary air valve closed, cold engine.

Check several times that the valve is cold before you replace it.



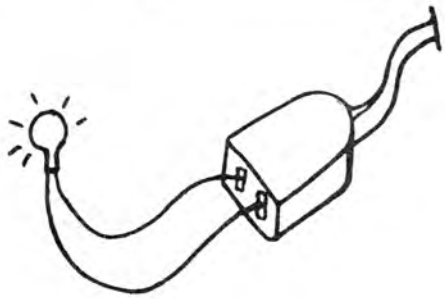
46. Cold start injector leaks.

Replace the cold start injector.

48. Injectors drop

A **All injectors drop.**
Fuel distributor plunger seizes or plunger O-rings defective.
Remove fuel distributor, remove plunger, clean plunger.

B One injector drops, see point 56.



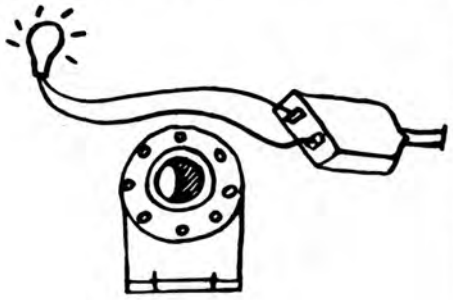
49. Control pressure does not increase.

A Open electrical circuit. Switch on the ignition and check that the terminal is live (use a test light).
The wire is defective if the circuit is open.

B Control pressure regulator defective.
Try a new one.

49. Control pressure incorrect, hot engine.

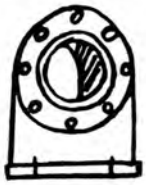
C Control pressure regulator defective.
Try a new one.



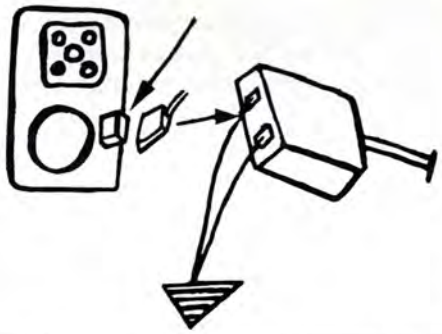
50. Auxiliary air valve has not closed

A Cap on the auxiliary air valve. It is correct if it closes.

B Open circuit.
Switch on the ignition and check that the terminal is live (use a test light connected to connector). The wire is defective if the circuit is open.

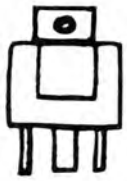


C Auxiliary air valve defective.
Try a new one.

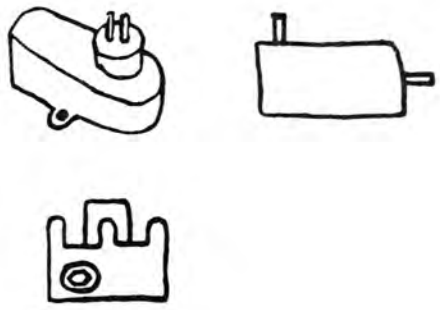


52. Fuel pump does not stop

A Air flow sensor terminal defective.
See if the pump stops when the terminal is grounded.

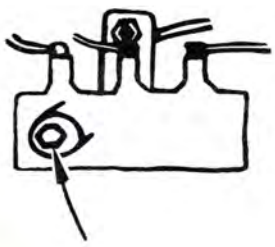


B Safety relay defective.
(Rear relay)



53. Rest pressure incorrect

A Rest pressure drops, that means, it does not stand constant. Possible cause: leakage, see point 54.

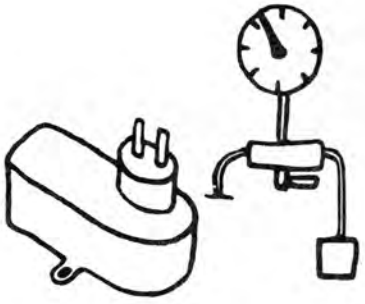


B Line pressure regulator defective if the pressure is constant but incorrect.

Adjust the line pressure regulator. Each added shim increases the pressure .3 kp/cm^2 = 4 psi.

NOTE: A change of the rest pressure also changes the line pressure, therefore also check the line pressure after adjustment.

If adjustment does not help, replace the fuel distributor.

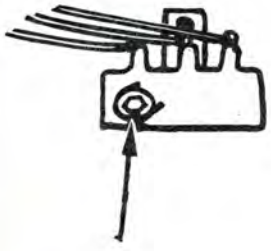


54. System leaking (rest pressure declines too soon).

A Control pressure regulator defective. Move the valve lever to position 3 (towards the control pressure regulator).

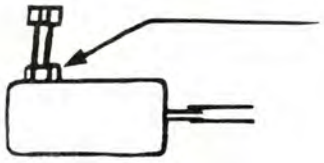
Only the control pressure is on in this position.

If the pressure still declines, the control pressure regulator or its line is defective and should be replaced.



B Line pressure regulator defective.

Block the fuel return line after the fuel distributor. If the pressure stops declining, the line pressure regulator or its O-ring is defective.



54.

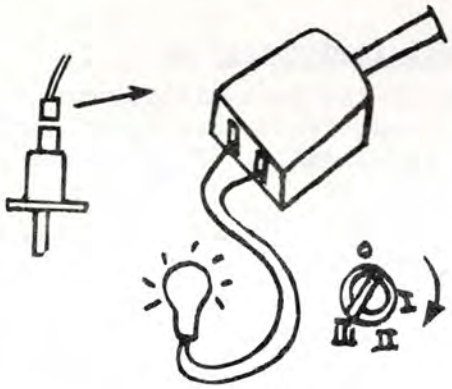
C Fuel pump check valve leaks.

Move the valve lever to position 2. Disconnect the wire at the air flow sensor terminal for a moment in order to get pressure. Press together the fuel feed line from the tank to the pump. The check valve leaks if the pressure stops declining.

D Check the fuel lines for tightness.

56. Injectors leak at rest pressure

Replace leaking injectors.

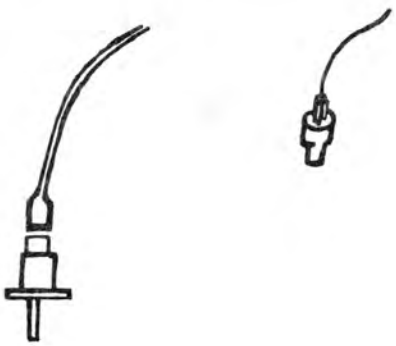


58. Cold start injector does not spray.

A Cold start injector defective.

Check that the cold start injector wires are live when the starter is running (use a test light).

The injector is defective if the terminal is live.



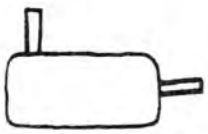
B The electrical circuit is open, if the wire is not live according to A. Check that the wires from the thermal time switch are in order. If they are, replace the thermal time switch.

63. Fuel feed incorrect.

A Fuel lines clogged.

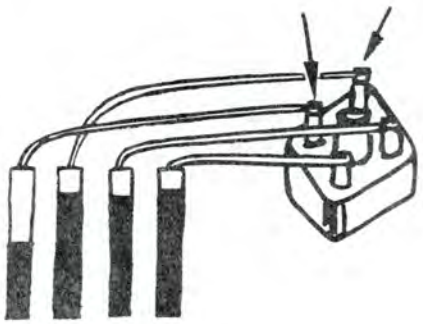
Check fuel tank filter and line fuel filter.

Check lines.



B Fuel pump low capacity.

Try a new pump.



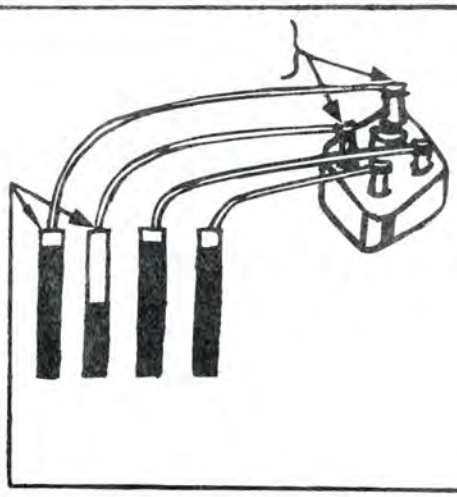
65. Excessive fuel feed deviation.

Switch hoses at the fuel distributor for the injector that feeds too little with one that feeds normally. (First check the hose for defects.)

Re-test according to maintenance points 64-65. If the injector also this time deviates, it is defective and should be replaced. If, on the other hand, the fault moved to the other injector, the fuel distributor is defective (clogged).

Remove the fuel distributor and plunger. Clean.

NOTE: Replace injectors only if the engine runs erraticly.



81. Cold start injector sprays.

Thermal time switch defective. Try a new one.

(Check that the engine really is hot.)

Section 3

E.G.R. Valve with Vacuum Amplifier (California Only)

The purpose of the E.G.R. Vacuum Amplifier is to control the amount of E.G.R., dependent on the driving condition, to meet the NO^X emission standards with minimal sacrifice in vehicle drivability.

The principal of operation is based on utilization of the Venturi vacuum at the air cleaner inlet as a measure of the total air flow.

This weak Venturi signal of vacuum controls the vacuum amplifier to regulate the E.G.R. valve to give the right amount of exhaust gas recirculated in relation to the intake air flow.

The amplifier receives two inputs:

A. The weak Venturi signal to be amplified.
B. The strong manifold vacuum for its power source.

The system has a vacuum reservoir and a check valve to maintain adequate vacuum regardless of variations in engine manifold vacuum. The amplifier thus continues to provide desired amplification at higher speeds, and moderate accelerations when the manifold vacuum generally drops.

Built into the system is a relief valve to "dump" the Venturi signal at wide open throttle closing the E.G.R. valve when full power is required.

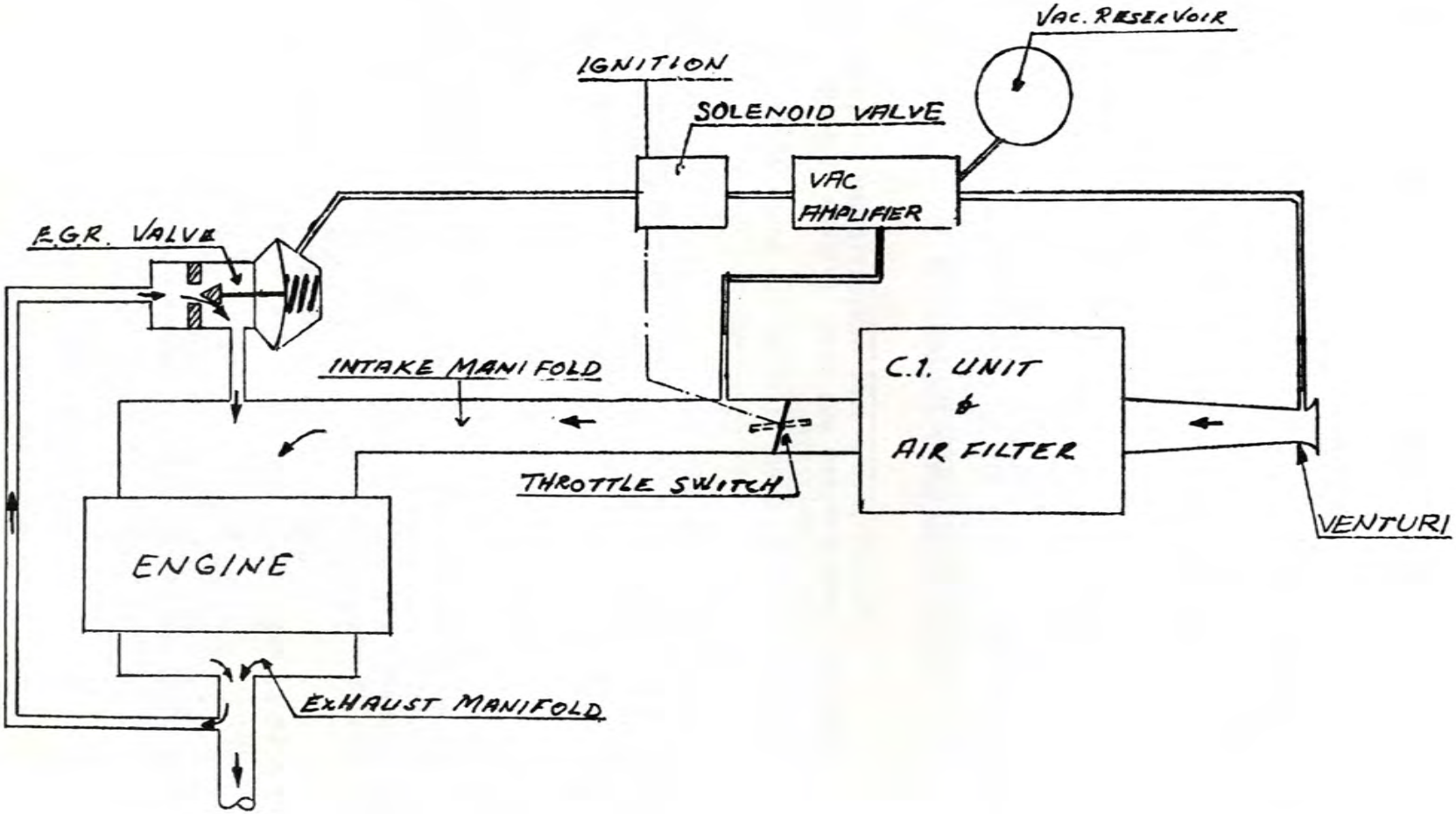
The E.G.R. valve is also closed at engine idling by a solenoid valve in front of the E.G.R. valve. This solenoid valve is controlled by a micro-switch on the throttle valve.

The E.G.R. valve is <u>closed</u> at:

1. Engine idling.
2. Full throttle.

The E.G.R. valve is <u>open</u> in varying degrees depending on driving conditions and engine load, from slight throttle opening until wide open throttle.

Schematic Lay-out of the EGR System with Vacuum Amplifier



FUNCTION CONTROL OF EGR SYSTEM WITH VACUUM AMPLIFIER

1. Turn on the ignition, disconnect the wire on the throttle plate micro switch (this is the wire connected to the solenoid valve), connect a test light between the disconnected wire and the micro switch terminal. Insert a 0.036" feeler guage under the throttle plate stop screw. The test light should stay on.

2. Insert a 0.052" feeler guage under the stop screw. The light should then be off. Re-connect the wire to the micro switch.

3. With the engine idling, remove the Venturi Hose, number 1 (this is the hose which is connected to the air intake, to the air cleaner), from the vacuum amplifier. Connect a vacuum pump or any other suction device to the outlet number 1 on the vacuum amplifier. The EGR Valve should not open ie., the idling should not change.

4. Check that the system will hold a vacuum for approximately 20 seconds.

5. With vacuum still applied on outlet number 1 on the vacuum amplifier, disconnect the wire from the throttle plate micro switch. The EGR Valve should then open indicated by poor idling or the engine would stop. Connect the wire to the micro switch and connect the Venturi Hose on the vacuum amplifier. Caution: (The lower outlet on the vacuum amplifier is not used).

6. Increase the engine speed and visually check that the EGR Valve opens.

7. Release the throttle control, when the engine r.p.m. decreases, the EGR Valve should close immediately.

ADJUSTMENT OF THROTTLE PLATE AND THROTTLE PLATE MICRO SWITCH

1. Release the lock nut on the throttle plate stop screw, and back off on the screw until the throttle plate is completely closed.

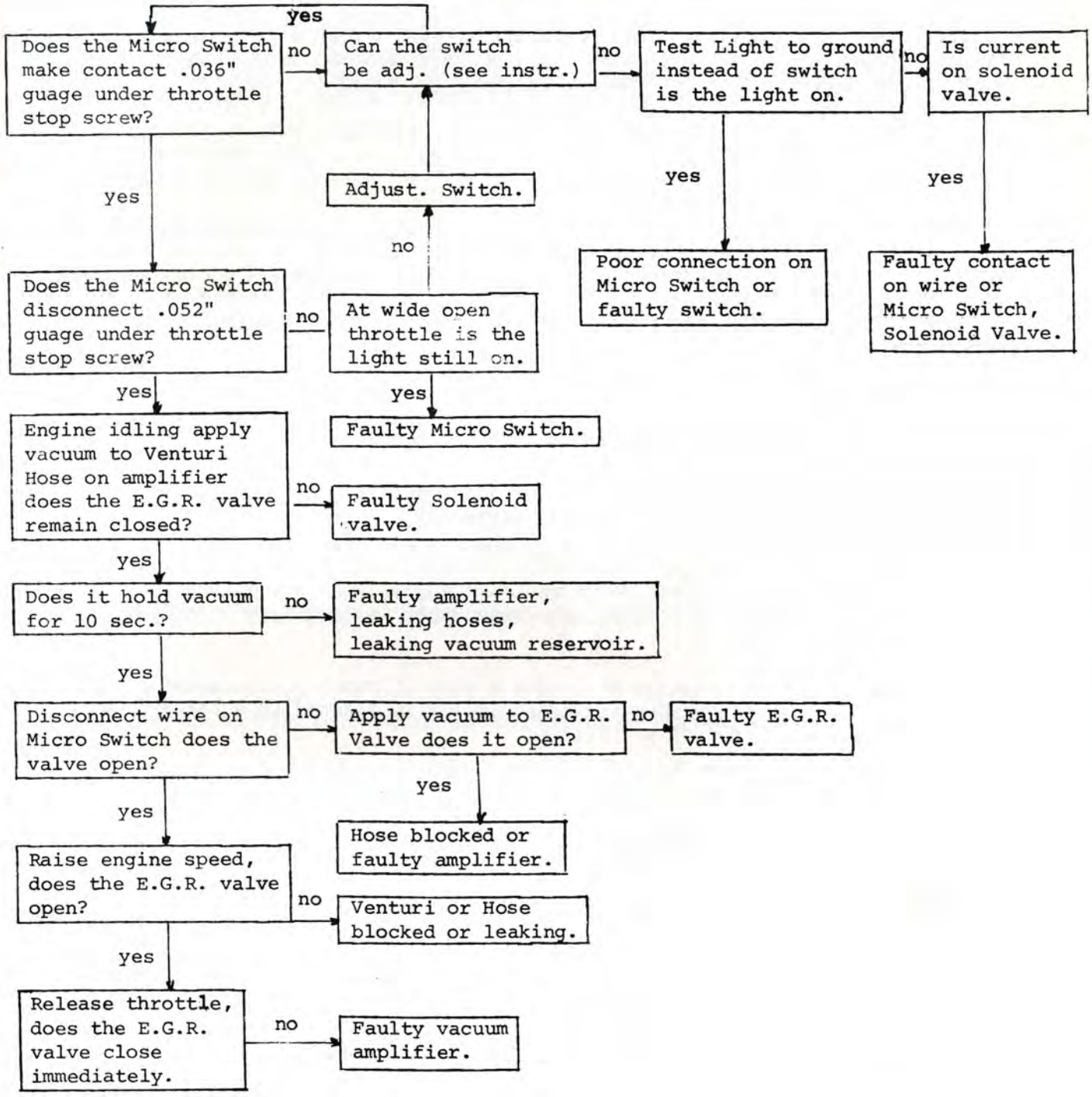
2. Then, turn the throttle plate stop screw until it touches its' stop, and thereafter ½ turn. Secure the lock nut. Check that the throttle plate is free, and not binding, in closed position.

3. Connect a test light between the micro switch and the wire from the solenoid valve. Turn on the ignition. Insert 0.040" feeler guage under stop screw. Loosen the lock nut for the micro switch adjustment screw, turn the screw until the switch is released. Then, turn the screw in until the light just turns on. Secure the lock nut. Remove the feeler guage.

CAUTION: ANYTIME THE THROTTLE PLATE ADJUSTMENT SCREW IS ADJUSTED, THE MICRO SWITCH MUST ALSO BE RE-ADJUSTED.

E.G.R. System With Vacuum Amplifier

Fault-Tracing Scheme Using Test Light



IGNITION INTERLOCK SYSTEM (U.S.A. Only)

Function

Each front seat has a combination of seat and belt contacts which are independent of each other. (See wiring diagram.)

The signal from the driver's side as well as the passenger side is transmitted to a relay in the control unit. With normal use of the safety belts, the relay will remain in closed position and contact is made between terminal C and 1. The engine will then start.

The Ignition Interlock System is activated if the seat or belt contacts are improperly connected. The driver will be warned by a buzzer and a warning light when the ignition key is turned to start position, and the engine will not start until the seat belts are fastened on the front seats which are occupied.

The Interlock System has a device which delays the actuation of the interlock system for 20 seconds if the seat is momentarily unloaded (because of a dip in the road or the occupant changes his position in the seat). If the seat has been unoccupied for more than 20 seconds while the seat belt has been fastened, the interlock system will be activated and the seat belt warning light will light up and the buzzer will sound.

In order to deactivate the interlock unit, the seat belt must be released and refastened for the occupied seats. If the engine is stopped, and the warning light and buzzer is on, the same resequence is necessary in order to start the engine again.

If the seat belt is disconnected while the engine is running, the warning buzzer and light will go on when the transmission is engaged in a forward gear indicating that the belt must be fastened.

The Engine Will Start

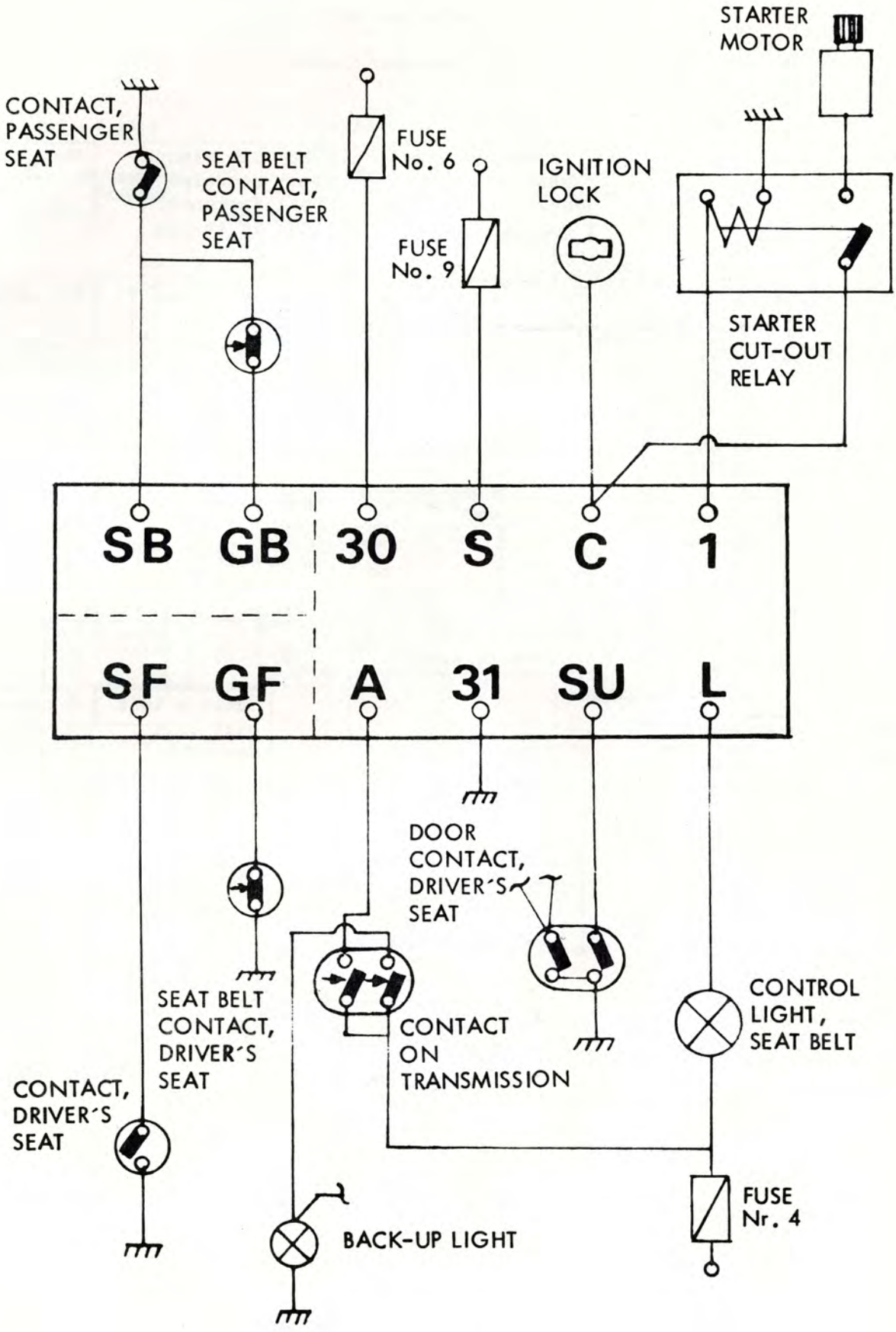
1. When the seats are <u>not</u> occupied.
2. When the seat is occupied and the seat belt thereafter is connected.

If The Engine Does Not Start

The Interlock System can be bypassed by removing Fuse #9.

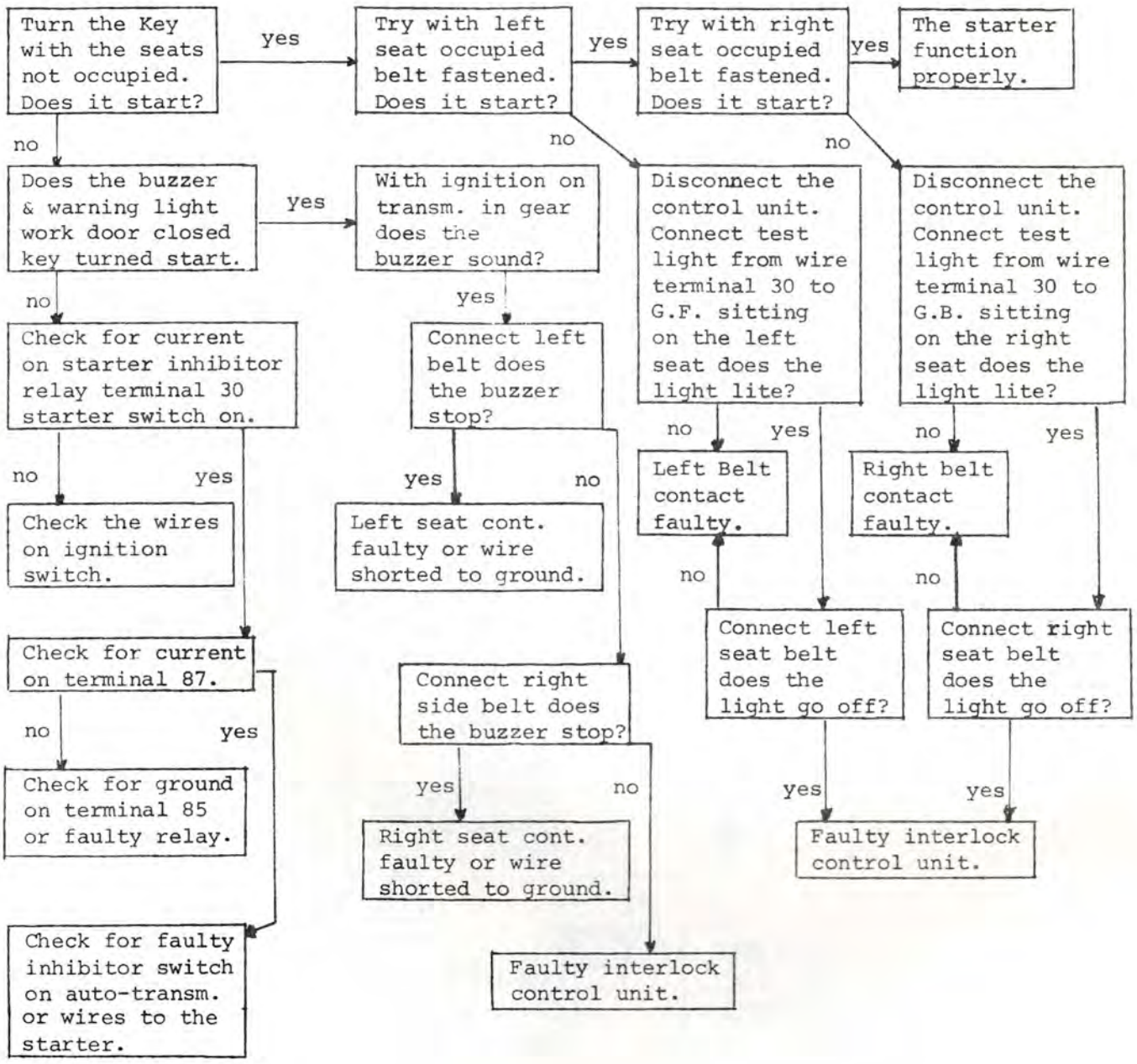
If the engine then starts with Fuse #9 removed, the fault is within the Interlock System.

To find the fault see Fault Tracing Scheme.

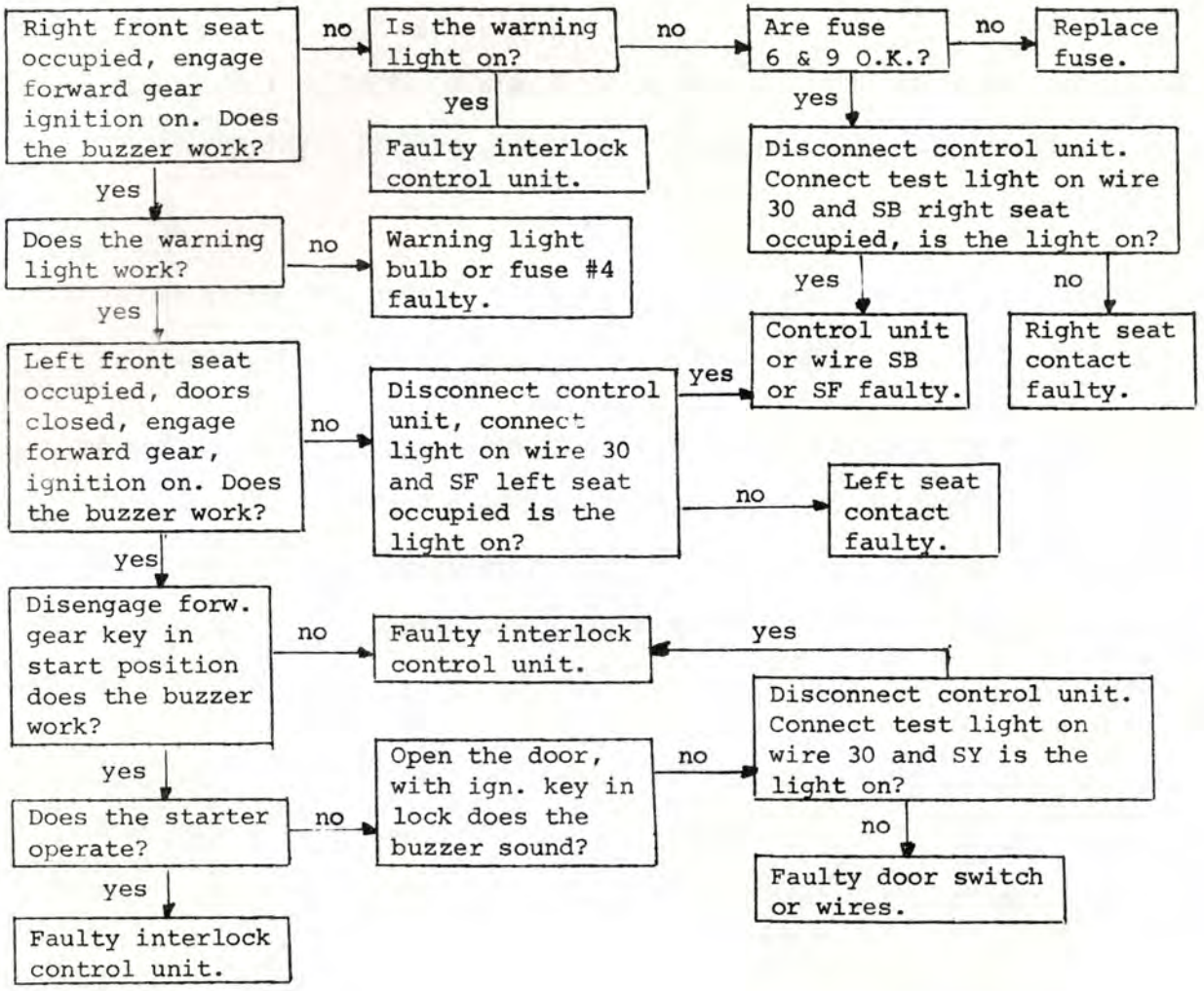

STARTER MOTOR
CONTACT, PASSENGER SEAT
SEAT BELT CONTACT, PASSENGER SEAT
FUSE No. 6
FUSE No. 9
IGNITION LOCK
STARTER CUT-OUT RELAY
SB GB 30 S C 1
SF GF A 31 SU L
DOOR CONTACT, DRIVER'S SEAT
SEAT BELT CONTACT, DRIVER'S SEAT
CONTACT ON TRANSMISSION
CONTROL LIGHT, SEAT BELT
CONTACT, DRIVER'S SEAT
BACK-UP LIGHT
FUSE Nr. 4

Before Replacing the Ignition Interlock Control Unit Use These Fault-Tracing Schemes.

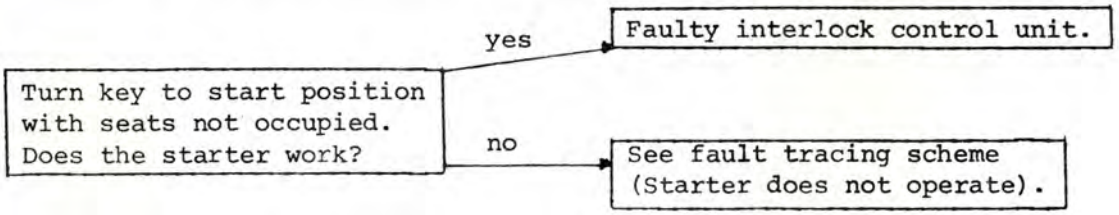
Fault: Starter Does Not Operate



Fault: Warning Light and Buzzer do not Work.



Fault: Warning Light and Buzzer Stays on Continuously



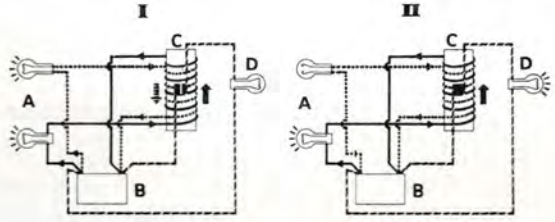
BULB INTEGRITY SENSOR

The Bulb Integrity Sensor indicates by a warning light on the dashboard, if any of the bulbs for Low Beam, Stop Light, or Tail Light are not functioning.

The warning light comes on when the Integrity Sensor Reed Relay is out of balance, and closes the points for the warning light circuit.

The Reed Relay consists of three pairs of coils, which are connected to each pair of bulbs. One coil for the left bulb, and one coil for the right bulb, as long as the current flows through both bulbs the relay remains in balance, and the contact points for the warning light stay open.

However, if one bulb goes out, the current ceases to flow through the coil connected to this faulty bulb causing the relay to go out of balance closing the points for the warning light.

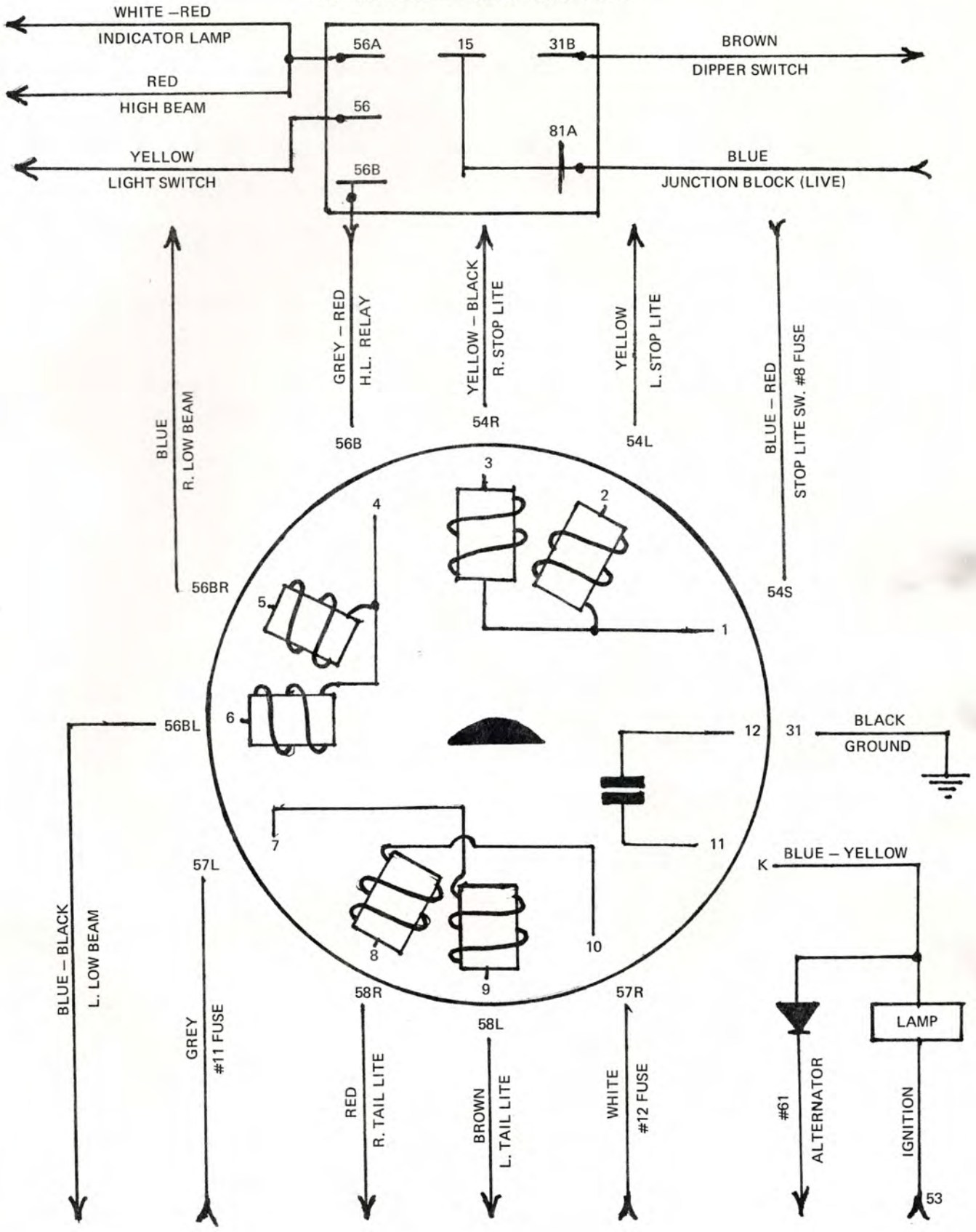


I Both circuits closed II One circuit open

Bulb Integrity Sensor, function

A Lower beams, tail lights or stop light
B Battery
C Reed-relay
D Control light

BULB INTEGRITY SENSOR CIRCUITY



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