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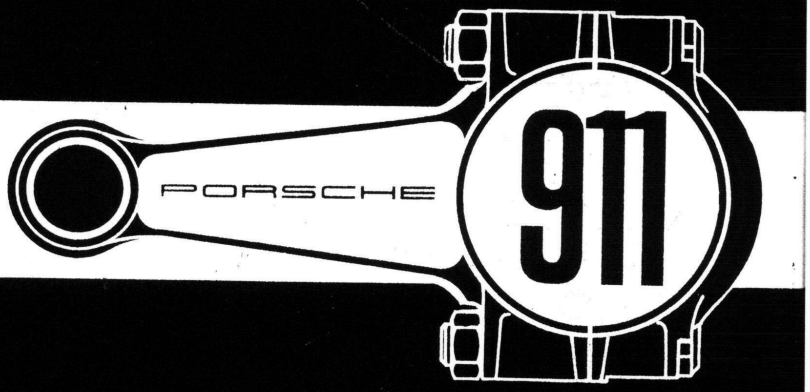
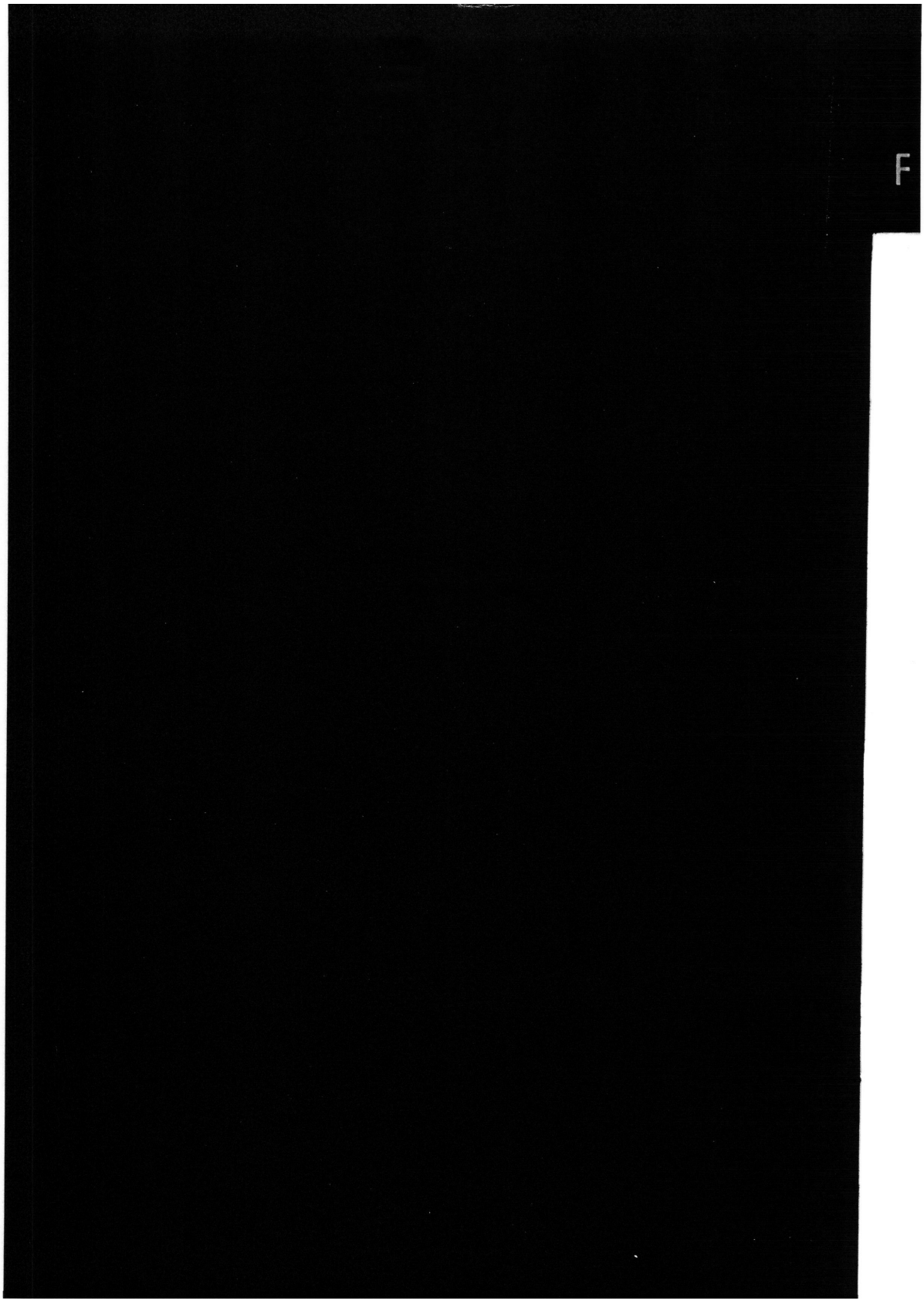
WORKSHOP MANUAL
MANUEL DE RÉPARATION



SECTIONS INDEX

VOLUME

I


F

INDEX

GROUP F: FUEL SYSTEM

General Description

The fuel system incorporates the following components:

1. Fuel tank
2. Fuel supply line
3. Electric fuel pump
4. Mechanical fuel pump (tandem)
5. Downdraft carburetors
6. Air filtering system

The fuel tank is located in the front luggage compartment and has a capacity of 62 liters (16.4 US gal) including reserve of 6 liters (1.6 Us gal).

The fuel supply line is attached to the tank with a threaded fitting which also contains a filtering screen. The fuel line leading to the fuel pump is partly accomodated within the frame tunnel.

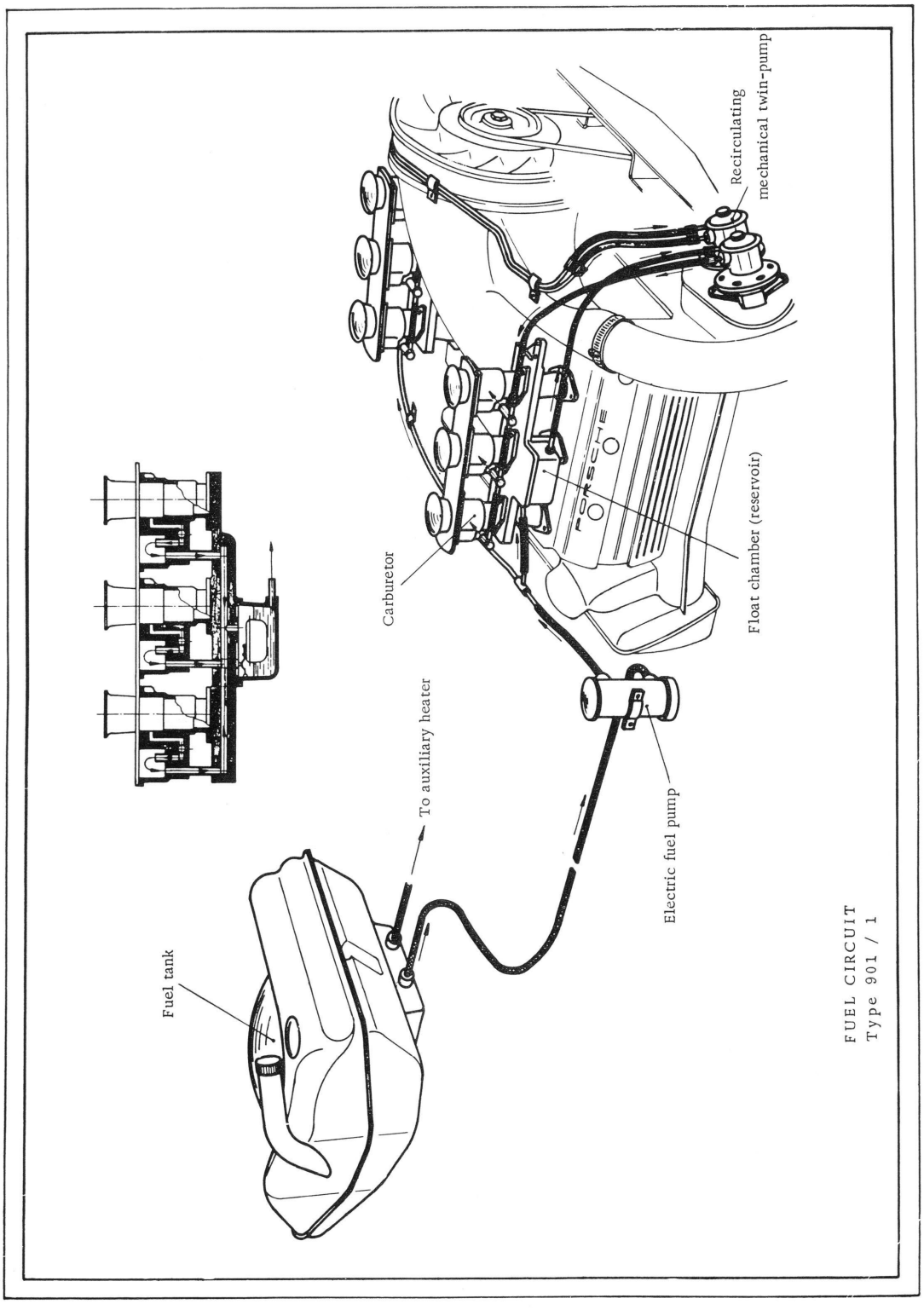
FUEL PUMPS:

An electro-magnetic drive mechanism actuates the electric fuel pump. The mechanical tandem pump is actuated by a skewed camshaft nut and a single actuating plunger.

THE CARBURETOR:

The carburetors rest on the intake duct. Each cylinder is provided with its own carburetor and accelerating pump. Each three-carburetor assembly has a common but detached float chamber which is attached to the intake duct.

The air cleaners, which also act as induction air silencers, remove impurities from the induction air.



FUEL CIRCUIT
Type 901 / 1

CARBURETOR DESCRIPTION

SOLEX 40 PI

Contrary to the thus far popular carburetor types in which the metering jet fuel level was controlled by a float, the Solex 40 PI spill-tube carburetor maintains the desired metering jet fuel level by means of a spill tube placed in the immediate vicinity of the jet discharge points.
The actual float chamber has been separated from the carburetor and usually is positioned close to the carburetors and below their fuel level line, serving as a supply and overflow reservoir for several carburetors at a time.
A primary supply pump delivers the fuel from the fuel tank to the above mentioned reservoir.
A second, recirculating pump delivers the fuel to the carburetors; there are 2 triple-throat carburetor assemblies in the opposed-cylinder, Type 901 engine. Excess of the fuel delivered to the carburetors returns to the overflow reservoir by way of the spill tube.
This carburetor design makes it possible to maintain a constant fuel level in the metering system and is not affected by conditions encountered during acceleration, deceleration, changing vehicle attitude, and especially by the considerable centrifugal and inertia forces acting upon the fuel mass in fast negotiations of curves.

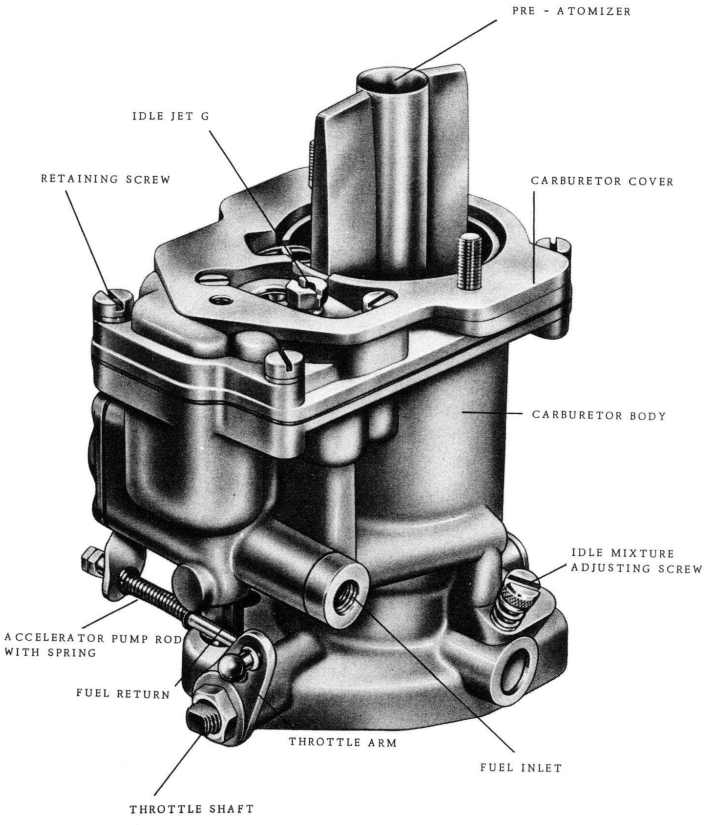


Fig. I

This carburetor design differs from the usual arrangements in that all jets are clustered into one assembly located in a separate compartment within the carburetor body and extending through the carburetor cover; the jet cluster is easily accessible and can be removed for servicing
The accelerator pump is of the diaphragm type and is actuated through the throttle arm, a pump rod with spring, and the pump lever. The pump circuit has a system of check valves permitting an added flow of fuel into the inducti on throat at increased induction air velocities encountered at higher power sttings. The purpose of this enrichment system is to further enrich the fuel/air mixture at high engine loads and revolutions when maximum power is required.

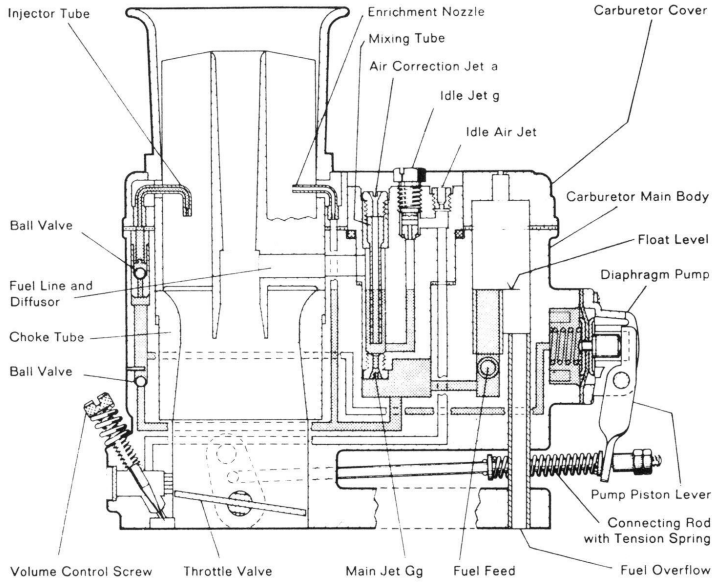


Diagram of Solex - Carburetor 40 PI

Fig. II

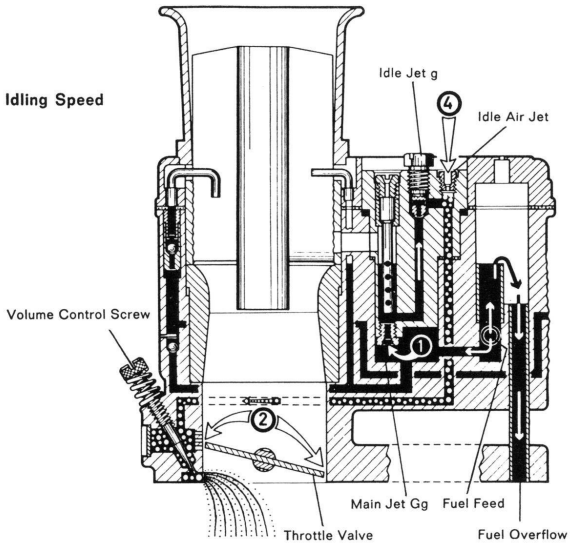


Fig. III

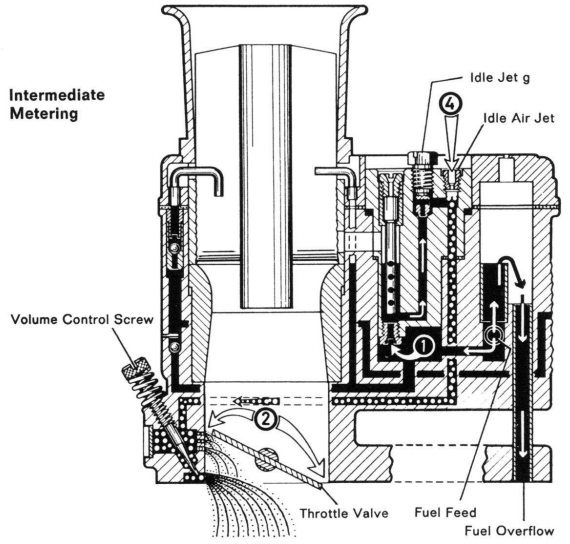


Fig. IV

Idle Metering

The fuel passes through the idle metering jet (g) where it mixes with air entering through the idle air bleed (4) and changes into a fuel/air emulsion. This emulsion is channeled to four small discharge ports located next to the throttle valve. The emulsion flow through the lowest port is controlled by the idle mixture adjusting screw. Idle mixture required for idling is drawn from this port when the throttle valve is set for idling. The upper three orifices are by-pass ports and have differing functions. The port located exactly at the throttle valve disc (see Fig. 3) boosts the idle mixture. The two topmost ports, located just above the throttle valve disc, become active as the throttle valve opens, and supply additional fuel emulsion to ensure a smooth response from idling to power (see Fig. 4). The emulsified fuel mixture leaving these ports mixes with induction air which flows past the throttle valve (2), and is then atomized into the actual idle mixture.

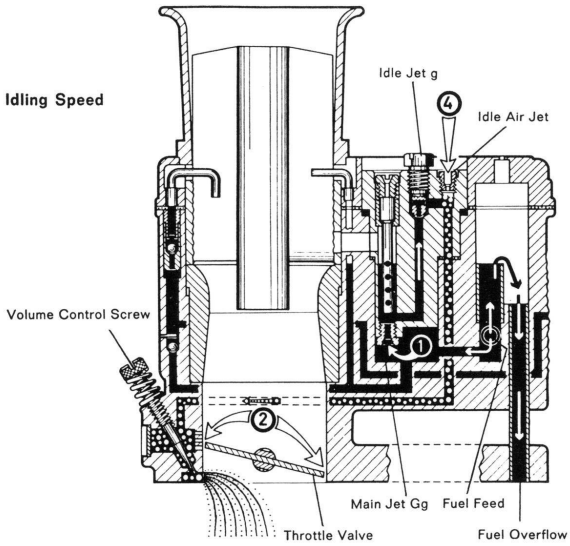


Fig. III

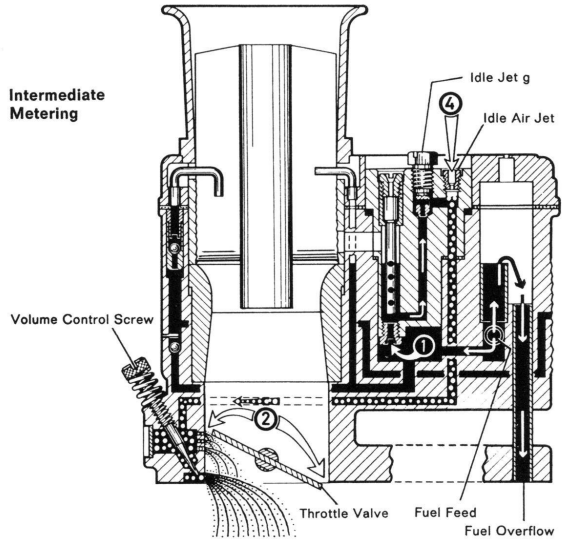


Fig. IV

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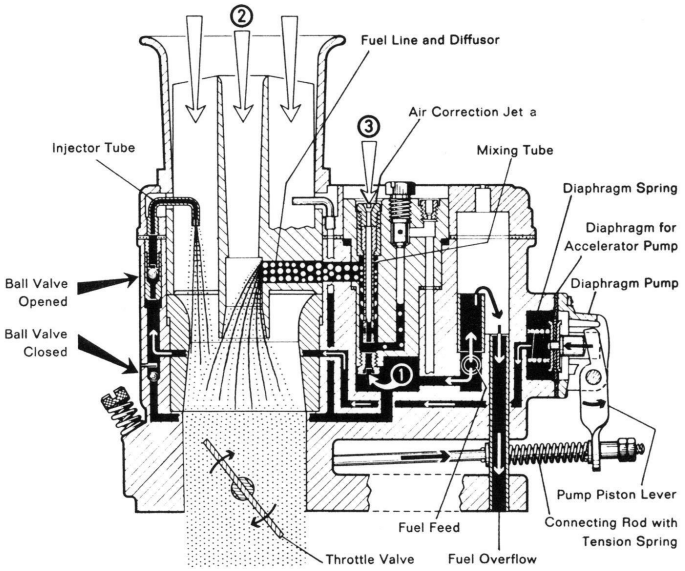
Acceleration

The accelerating pump system is filled with fuel arriving from the inlet port. When the pump is at rest, a spring presses the pump diaphragm outward (see Fig. 6). As the throttle valve is in the process of opening, the motion also is transmitted to the pump lever via the throttle arm and the spring on the pump rod, thus causing the pump diaphragm to be pushed inward against the fuel contained in the pump. This results in delivery of fuel into the carburetor throat via the pump nozzle, thus enriching the fuel / air mixture and ensuring smooth and rapid acceleration (see Fig. 7). The amount of injected fuel is controlled by pump stroke. Duretion of injection is determined by eppropiately calibrating the size of the injection nozzle.



Accelerator Pump 40 PI: Pressure Stroke

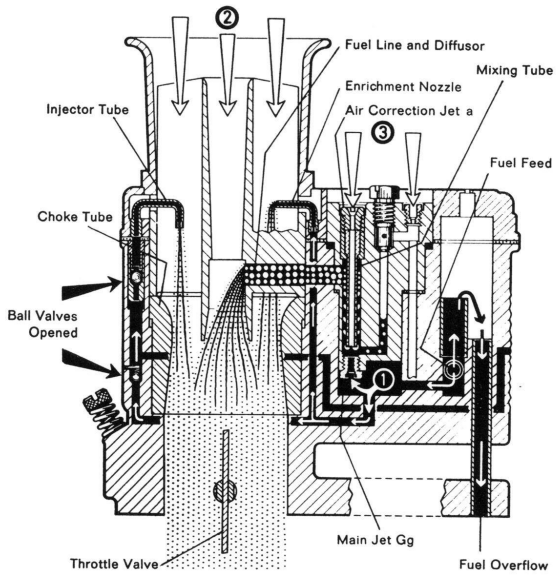
Fig. VII

Power Enrichment

The carburetor is equipped with an enrichment nozzle which is connected to the fuel inlet port. The enrichment nozzle point of discharge is situated in a low-vacuum area where the vacuum is not strong enough to draw fuel from the enrichment nozzle at low engine rpm or light throttle settings. However, al full power settings, when the vacuum has considerably increased, the enrichment nozzle is brought into action by discharging additional fuel.

In addition, a separate port connects the accelerating pump nozzle with the fuel supply to provide for further enrichment of the fuel/air mixture.

The fuel enrichment takes place progressively, that is, the enrichment continues to increase until the engine has been brought to its full operating load. This system has been devised to provide economical cruising power and low specific fuel consumption in the lower power range without affecting the engine's maximum power performance.



Full Power with Enrichment

Fig. VIII

Downdraft Spill - tube Carburetor 40 P I

Venturi	30
Main jet	125
Air correction jet	180
Idle metering jet	55
Idle air bleed	1,0
Accelerating pump nozzle	0,8 mm
Pump jet	0,5 mm
Emulsion tube	8
Float needle valve	2,0
Float weight	7 grams

Caution:

A possibility of a carburetor fire exists when the air cleaners are removed; modifications of this sort can be made only at owner's risk.

Main jet metering is of great importance when operating at considerably varying altitudes for which the following rule - of thump may be applied:
Change main jet calibration by 6 % for each 1,000 m (3,280') altitude variation. For example, normal main jet calibration at an altitude of 400 m (1,312') is 125; proper jet size for an altitude of 1,400 m (4,592') is 117.5.

Carburetor Removal and Installation

1 Fu

Removal

1. Remove hot air duct from air cleaner.
2. Loosen clamps and remove air cleaner.
3. Detach connecting linkage.

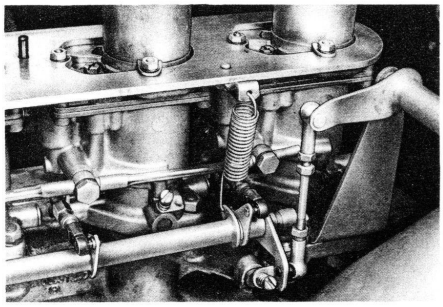


Fig. 1

4. Withdraw float bowl vent hose.
5. Remove retaining nuts and withdraw air horns and base plate.

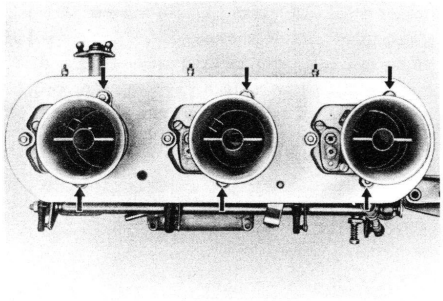


Fig. 2

6. Remove carburetor retaining nuts at carburetor flange.
7. Withdraw carburetor.

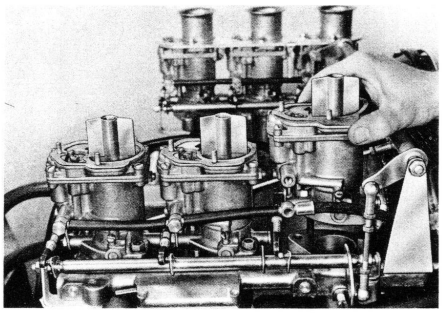


Fig. 3

8. Cover intake duct.

Installation

Installation is accomplished in reversed order of the above by noting the following points:

1. Install new carburetor flange gasket at the intake duct; carefully clean flange surfaces. Make sure during installation that the gasket profile matches that of the intake duct.
2. Tighten carburetor flange retaining nuts.
3. Adjust connecting linkage if necessary; the throttle valve must close fully.
4. Adjust idling speed.

2 Fu CARBURETOR CLEANING PROCEDURE

Cleaning

1. Remove carburetor

2. Remove retaining screws from carburetor cover.

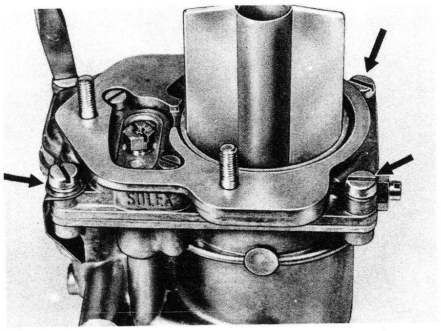


Fig. 4

3. Withdraw carburetor cover.

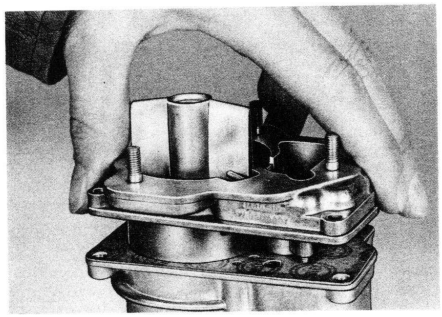


Fig. 5

4. Loosen retaining nuts and withdraw entire jet carrier.

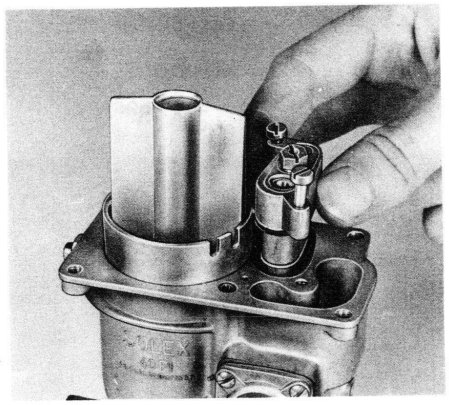


Fig. 6

5. Unscrew and clean the main jet, air correction jet, emulsion tube, idle metring jet, and idle air bleed.

6. Clear all passages with compressed air.

It is appropriate to clean the carburetors in a container filled with clean cleaning solvent. The jets and passages are to be cleaned with compressed air. In no case is it permissible to use needles or wire for cleaning purposes since this may result in damaged or enlarged calibration bores.

3 Fu CARBURETOR DISASSEMBLY AND REASSEMBLY

1. Remove carburetor.

2. Remove slotted retaining screws and withdraw carburetor cover.

3. Remove slotted retaining screws from jet carrier and withdraw carrier.

4. Unscrew idle air bleed.

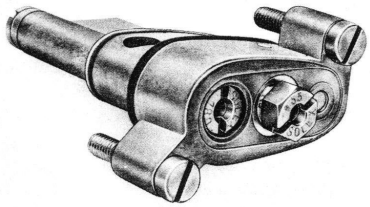


Fig. 7

5. Unscrew idle metering jet.

6. Unscrew air correction jet and shake out emulsion tube.

7. Unscrew main jet.

8. Unscrew idle mixture adjusting screw and spring.

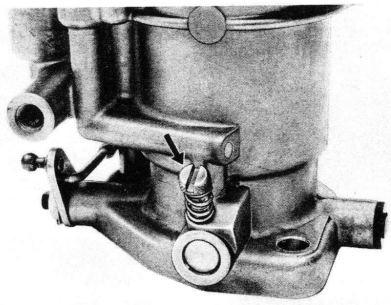


Fig. 8

9. Loosen pre-atomizer retaining pin and withdraw pre-atomizer.

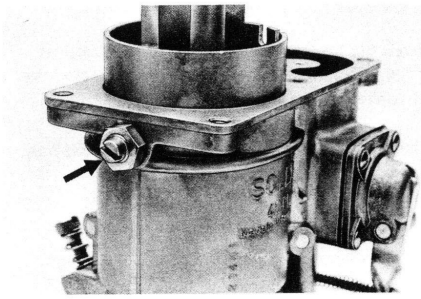


Fig. 9

10. Withdraw venturi by pulling it up.

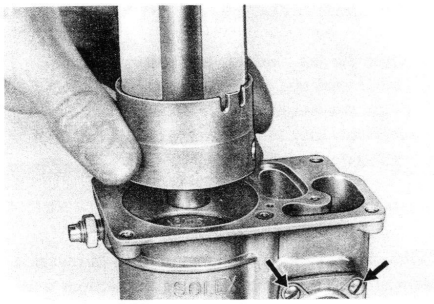


Fig. 10

11. Remove pump rod adjusting screws.

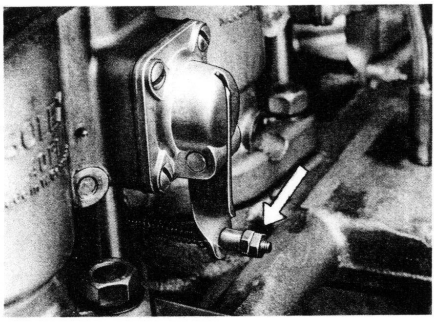


Fig. 11

12. Unscrew slotted pump cover retaining screws and remove pump cover.

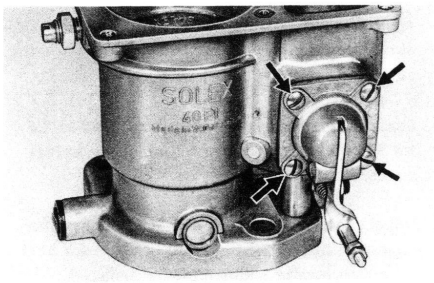


Fig. 12

13. Remove pump diaphragm and spring.

Cleaning

1. Clean parts in gasoline.

2. Clear the jets, valves, and passages with compressed air. In no case is it permissible to use needles or wire for cleaning purposes since this may result in damaged or enlarged calibration bores.

Inspection and Reassembly

Carburetor reassembly is accomplished in reversed order of the above; the following instructions must be adhered to:

1. Inspect throttle shaft for clearance. Excessive radial clearance permits entry of false air and negatively affects engine starting and idling.

2. Inspect throttle valve for light - tight closing; when closed, the throttle valve should not permit light to pass through.

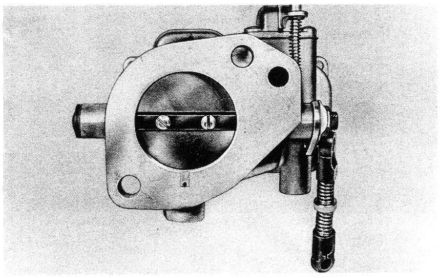


Fig. 13

3. Inspect pump piston and diaphragm for proper condition and replace when necessary. The complete diaphragm must be replaced when the diaphragm rivet joint is loose.

4. Shale carburetor housing vigorously and listen for audible signs that both pump check valves are free.

5. Inspect idle mixture adjusting screw for proper condition of the needle point; screws with bent or broken needle points must be replaced.

6. Check jets for size by comparing with the carburetor specification chart (also refer to Shop Instruction M 2/65).

a) Main Jet

The shape of the main jet bore is machined so as to be compatible with the direction of fuel flow.
To facilitate identification, the calibration number stamped on the face of the jet has a prefix "X", such as X 130, X 125, etc.
In cases of complaints pertaining to poor power transition in engines equipped with carburetor covers of older design, the X 130 main jet can be replaced with the X 125 main jet. However, the driving response resulting from the installation of the X 125 main jet must be tested.
Whenever replacing or installing the main jet, make certain that only those jets bearing the prefix "X" are used.

Fig. 14

b. Idle Air Bleed u

The idle air bleed bore is machined directly into the jet carrier; the formerly used space for the idle air bleed has been blocked with a plug.

c. Idle Metering Jet g

Check the tapered seat of the idle metering jet in the jet carrier and the jet itself, replacing the jet carrier or the jet when necessary.

When replacing jets care must be taken that only "Solex" marked jets are used.

a. The rubber O-ring must be tightly seated at the jet carrier. Streched or deformed O-rings must be replaced.

b. Check lower surface gasket for centric seating; the idle mixture bore must be unobstructed.

c. Installing jet carrier

Tighten the slotted screws by hand, then tighten with a screwdriver by alternating from side to side at each one-quarter turn; uneven tightening of the screws can result in damage to the gasket surface.

An insufficient gasket sealing between the jet carrier and carburetor housing causes an ab - normally high fuel consumption.

ADJUSTING IDLE SPEED

4 Fu

1. Bring engine to operating temperature(oil temperature approx. 60° C) and remove the air cleaner assembly.

2. Adjust breaker point gap (0,4 mm) and ignition timing.

3. Inspect carburetor linkage for proper seating in the ball joints.

4. Detach actuating shaft connecting links from bell - crank shaft.

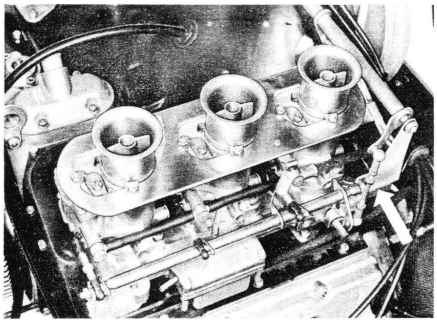


Fig. 15

5. Check injection quantity.

6. Using the synchro-test gauge, with engine idling at 1200 - 1400 rpm, synchronize the trottle valves of all carburetors.
Care should be taken that the adjustment disc of the synchro-test gauge is fully open (indicating plunger remains in lower sector of the glass tube) to ensure that the carburetor air flow conditions are changed as little as possible.

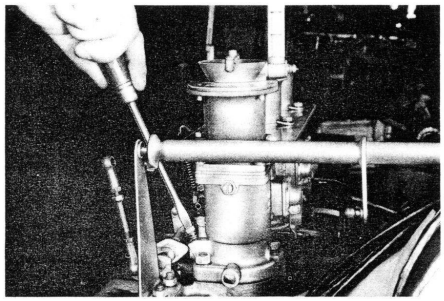


Fig. 16

7. Adjust idle mixture screws so that the engine runs smoothly.

8. Adjust actuating shaft stop screws to bring the idle speed to approx. 900 rpm (± 100 rpm).

9. Using the synchro-test gauge, recheck throttle valve adjustment.

10. Readjust idle mixture adjusting screws.

11. Reconnect connecting links with bell-crank shaft.
CAUTION!
Adjust connecting links so that no preload is exerted upon reconnection.

12. Reinstall air cleaner assembly.

13. Perform a final idle adjustment with the mixture adjusting screws.

14. Check adjustment of the throttle return damper and correct if necessary; damper plunger travel should be approx. 4 - 5 mm.

5 Fu ADJUSTING INJECTION QUANTITY

1. Remove air cleaner assembly.

2. Detach actuating shaft connecting links from bell-crank shaft.

3. Connect an auxiliary alectric fuel pump in place of the mechanical pump to provide adequate fuel supply.

a. Mount electric fuel pump on blower housing, ensuring proper grounding.

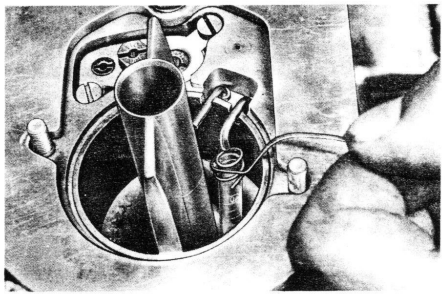
b. Withdraw fuel hose (connecting the float bowl and mechanical fuel pump) from the mechanical fuel pump and attach to the outlet fitting of the electric fuel pump.

c. Withdraw fuel hose (connecting the mechanical fuel pump and carburetor) from the mechanical fuel pump and attach to the outlet fitting of the electric fuel pump.

d. Connect Terminal 1 of the electric fuel pump to Terminal 15 of the ignition coil.

4. Switch the ignition on and check functioning of both electric fuel pumps.

5. Hold the liquid graduate at the injection nozzle and move throttle linkage twice from stop to stop.



6. Check injection quantity.

7. The correct injection quantity per 2 pump strokes per nozzle is:
during the summer season 0,40 to 0,50 cc
during the winter season 0,55 to 0,65 cc

8. If necessary, adjust injection quantity by appropriately adjusting the pump actuating rod.

9. Reconnect actuating shaft connecting links ensuring freedom from possible preloads.

NOTE:

The pump jet size does not affect the injection quantity. The injection quantity must be same in all carburetors.

CHECKING FLOAT AND FLOAT LEVEL

6 Fu

1. Withdraw fuel hose (connecting the float bowl and mechanical fuel pump) from the float fitting.

NOTE:

Collect the outflowing fuel!

2. Attach measuring device to float bowl fitting.

3. Switch the ignition on and absorve the increasing fuel level in the transparent hose section.

4. When the fuel level has steadied, measure the distance between the fuel level and the milled underside at the intake duct.

5. The fuel level must be 15 - 20 mm below the milled underside of the intake duct (see Fig. 18). If the fuel level rises above the 15 mm line, it will be necessary to replace the float.

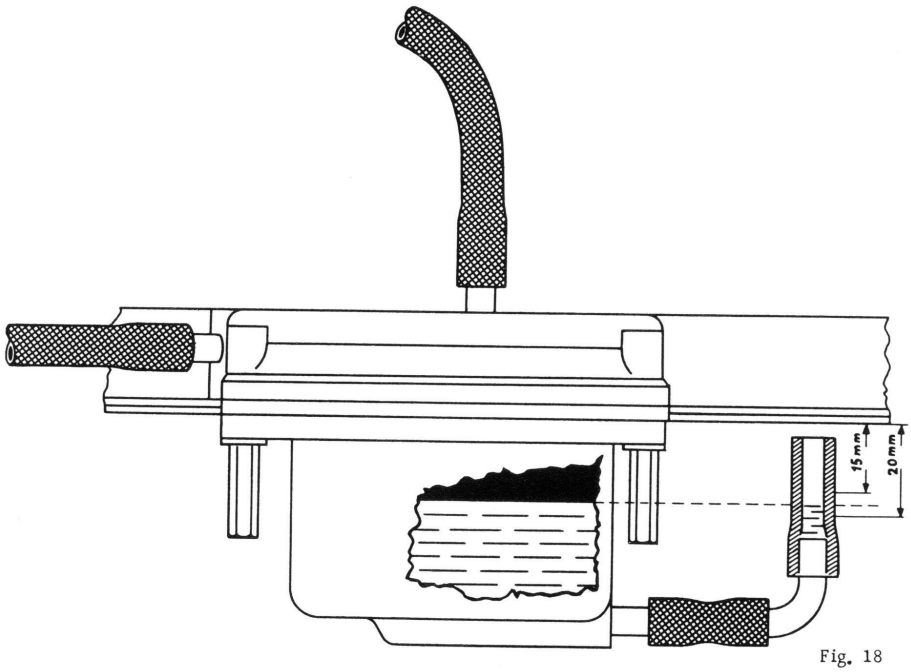


Fig. 18

CHECKING THROTTLE VALVE

7 Fu

General

Unsatisfactory idling and power transition are not always caused by a plugged idling jet and sometimes can be traced to inadequacies within the throttle valve area.

Inspection and adjustment:

1. Unscrew idle mixture adjusting screws and inspect for proper condition of the tapered ends, i.e., absence of grooves, depressions, or bends. Whenever in doubt, install new idle mixture adjusting screws.

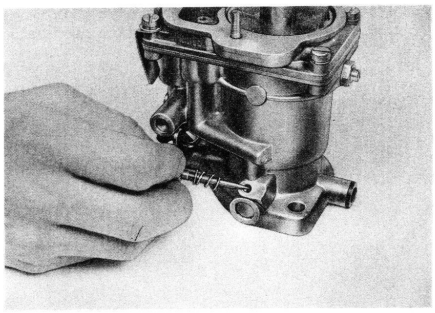


Fig. 19

2. Inspect throttle valves for light-tight closure. Throttle valves of the 3 carburetors must always close in unison. Should this not be the case, equal closing of all throttle valves must be brought about by carefully turning the knurled nut on the throttle valve rods.

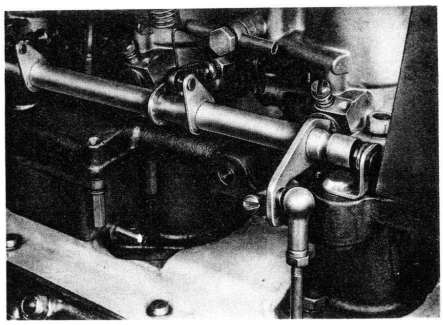


Fig. 20

8 Fu

CLEANING AIR FILTER

Purpose of the air filter is to clean the induction air drawn by the engine and reduce induction air noise. These functions are performed in the Type 2000 engine by a large paper cartridge. The filtering cartridge should be cleaned at intervals governed by local dust conditions.

1. Loosen snap fasteners at filter cover and remove cover.

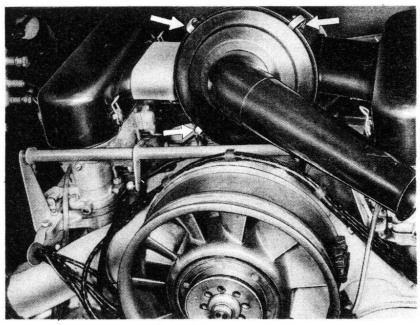


Fig. 21

2. Remove paper cartridge from the housing and inspect cor contamination.
   The cartridge must not be washed or treated with oil.
   If necessary, clean through light tapping or by blowing inward with dry compressed air. Heavily contaminated paper cartridges are to be replaced.

3. Thoroughly wipe the housing interior with an oil-coated rag; do not use shredded rags or similar materials.

4. Inspect rubber gasket in housing for possible damage.

5. Insert cartridge ensuring proper seating.

6. Install cover and secure with snap fasteners; the position marker in the cover must point to the upper left snap fastener.

Removal

1. Remove air filter assembly.

2. Disconnect at ball joints and remove the throttle control rod and connecting links.

3. Remove bell-crank shaft.
The bell-crank shaft, which connects the right and left carburetors, is suspended in ball joints; the right suspension joint is fixed and attached to the intake duct, whereas the left joint floats in a spring suspension and can be removed from its seat with two fingers.

4. Detach fuel hoses connecting the float housing with the fuel pump, and fuel supply hoses at the carburetors.

5. Remove intake duct retaining nuts (12mm) with tool P 120 a.

6. Remove intake duct with attached carburetors.

7. Cover intake ports in cylinder head.

8. Detach carburetors by removing retaining nuts.

INSTALLATION

The intake duct can be reinstalled in the reversed order of the above by noting the following points:

1. Install new intake duct gasket ensuring that the gasket contour matches that of the intake duct passage.

2. Adjust carburetors (4 Fu).

10 Fu REMOVING AND INSTALLING THROTTLE LINKAGE

Removal

1. Remove floormat to facilitate access to opening in the floor panel.
2. Detach throttle linkage from ball joint in front bell-crank.
3. Remove retaining bolts from shift lever fixture.
4. Withdraw shift lever together with fixture.
5. Remove retaining bolts from handbrake fixture and withdraw fixture.
6. Remove throttle linkage retaining clamps through the now unobstructed openings.
7. Detach throttle linkage from ball joint in the rear-crank (under the transmission).
8. Withdraw throttle linkage rearward.

Installation

Installation is accomplished in the reversed order of the above. All ball joints and bell-crank pivots should be thoroughly lubricated. Ball joint lock nuts must be properly tightened.

11 Fu ADJUSTING TRHOTTLE LINKAGE

The throttle linkage must be so adjusted that all throttle valves work in unison. In addition, care must be taken to ensure a full and unobstructed travel of the throttle valves from idling to full power settings. Fine adjustments are made with the aid of the carburetor adjustment gauge P 227, as outlined on Page F 15.

Note:

Proper and simultaneous closing of the throttle valves can be achieved only when all ball joints in the throttle linkage work freely. If necessary, fill ball joint cups with grease.

12 Fu LUBRICATING CARBURETOR JOINTS

1. Lubricate all moving joints on right and left side with 1 - 2 drops of engine oil while actuating the carburetor linkage.
2. Lubricate accelerator pump linkage.
3. Disconnect all connecting links and place a small amount of high temperature grease into the ball joint cups.
4. Check carburetor linkage for proper functioning by repeatedly actuating the carburetor controls.

CARBURETOR SERVICE DIAGNOSIS

This service diagnosis applies only to carburetors meeting the prescribed carburetor specification.

Malfunction	Possible Cause	Remedy
1. Engine does not start despite properly functioning ignition and an adequate fuel supply in the fuel tank.	a. Fuel tank vent plugged.	a. Check fuel tank venting and clean if necessary.
	b. Fuel outlet in tank contaminated.	b. Remove and clean the fuel filter.
	c. Electric fuel pump inoperative.	c. Check electrical lines, install new fuel pump if necessary.
	d. Mechanical fuel pump not working.	d. Check mechanical fuel pump, repair or replace when necessary.
	e. Engine flooded due to repeated actuating of the throttle with engine not running.	e. Fully depress throttle pedal and actuate engine starter; if necessary, remove and clean spark plugs.
2. Uneven idling.	a. Ignition breaker points incorrectly set or ignition timing incorrectly adjusted.	a. Readjust breaker points and ignition timing.
	b. Incorrect idle speed adjustment.	b. Readjust idling.
	c. Carburetor jets plugged.	c. Remove and clean the jets.
	d. Idle mixture adjusting screw damaged.	d. Install new idle mixture adjusting screw.
	e. Spark plugs fouling or defective.	e. Clean or replace the spark plugs.
	f. Intake duct drawing false air.	f. Check intake ducts, flange connections, and gaskets.

Malfunction	Possible Cause	Remedy
3. Poor power transition	a. Incorrect idle speed adjustment.	a. Readjust idling.
	b. Incorrect injection quantity.	b. Check and adjust injection quantity.
	c. Spark plugs fouling or defective.	c. Clean or replace the spark plugs.
	d. Intake duct drawing false air.	d. Check intake ducts, flange connections, and gaskets.
4. Engine stalls when throttle is quickly closed.	a. Incorrect idle speed adjustment.	a. Readjust idling.
	b. Throttle return damper not pressing upon the bell-crank shaft or defective.	b. Check positioning of the throttle return damper, replace damper if necessary.

Malfunction	Possible Cause	Remedy
5. Engine runs unevenly, misses, backfires.	a. Mixture too rich.	a. Check float chamber vent hose for free passage; if deformed, install new fuel-proof hose. Check lower gasket at jet carrier for proper sealing, replace if necessary. Check jet calibrations. Check injection quantity.
	b. Mixture too lean.	b. Clean the jets. Check output of electric fuel pump. Inspect calibrated bore (1.2mm dia.) in the gland screws and clean if necessary.
	c. Incorrect idle speed adjustment.	c. Adjust idling.
	d. Uneven throttle valve positioning in the carburetors.	d. Correctly adjust the throttle valves of all carburetors to ensure synchronisation.
	e. Intake duct drawing false air.	e. Check intake ducts, flange connections, and gaskets.
6. High fuel consumption.	a. Idle mixture too rich.	a. Readjust idling.
	b. Lower gasket at jet carrier not sealing properly.	b. Replace gasket; check sealing surface at jet carrier carburetor body.
	c. Injection quantity too high.	c. Adjust injection quantity.
	d. Obstructed float chamber venting.	d. Deformed hoses to be replaced with fuel-proof hoses.
	e. Jets of improper size.	e. Install proper jets.
	f. Unfavorable driving conditions.	f. Fuel consumption tests have shown that in city traffic, for instance, the fuel consumption can be up to 90 % above that experienced in normal highway driving.

Mechanical Fuel Pump

General:

The fuel is delivered to the carburetors by a mechanical twin pump mounted on the left chain housing cover. Pump actuation is off a skewed nut on the camshaft via a plunger in the pump housing.

The pump assembly consists of one main lower housing and two upper parts. The lower housing accomodates the two actuating arms; each of the two upper parts contains the inlet and outletvalves and a fuel screen. Located between the lower housing and the upper part is the pump diaphragm -which also serves as a gasket- and the diaphragm spring. The diaphragm is made of several layers of a fuel-proof material; the layers are sandwiched between two metal discs and riveted to the diaphragm actuating rod.

Operating Principle:

The purpose of hte mechanical twin pump is to draw fuel from the common float chamber and deliver it to the individual carburetors, as follows:

The skewed camshaft nut exerts pressure upon the plunger in the lower pump housing. The plunger transmitts this force to the two actuating arms which move the diaphragm arms down, against the pressure of the diaphragm springs. This motion creates a negative pressure in the chamber above the diaphragm, thus drawing fuel through the inlet valve. As the actuating plunger retreats, the diaphragm spring forces the dia - phragm upward which, in turn, forces the fuel to exit through the outlet valve to the carburetors. This process repeats at every turn of the camshaft nut (once every two revolutions of the crankshaft).

FUEL PUMP CROSS - SECTION

APG MECHANICAL FUEL PUMP

(Tandem)

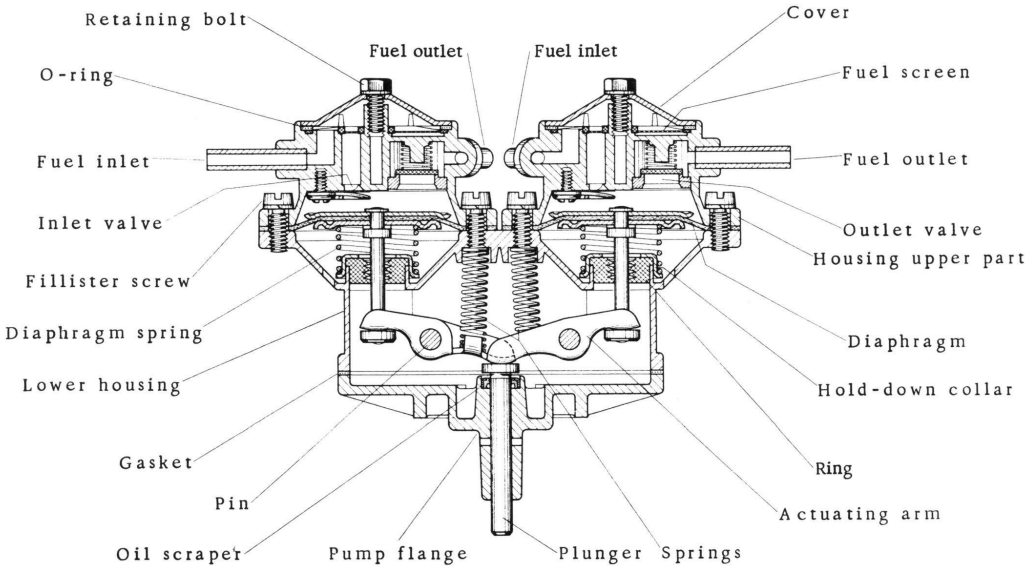


Fig. 22

DESCRIPTION OF THE ELECTRIC FUEL PUMP

1. Design Features:

The fuel pump consists of the pump housing with the mechanical and electrical parts.

The cylindrical housing has a permanently fixed, dome-shaped top. Situated below the top is a corrugated diaphragm. Located at the pump bottom is a detachable cover with a seal, the cover having a bayonet-type lock. The lower cover is equipped with a small magnet for the purpose of removing ferrous particles which may be carried in the fuel stream. Soldered into the pump housing are three fittings, that is, at the bottom the fuel inlet, at the top the fuel outlet, and in the center the electrical terminal. Located in the central interior of the pump housing is a brass tube which is soldered to the housing, i.e., at the bottom by way of a socket, at the top through a supporting ring; the pump piston travels up and down within this brass tube.

The mechanical part of the pump consists of the valve carrier, the pump piston, and the pump spring.

The valve carrier is attached to the brass tube socket ba way of three retaining screws and can be removed if the necessity should arise. Attached to its bottom end is the actuating stud with its valve which is also made of a synthetic material. Place into the upper part of the pump piston is a cushioning spring.

The pump spring rests against the valve carrier. In the relaxed condition, the spring forces the piston upward where the cushioning spring comes to rest at the supporting ring of the brass tube.

The electrical part consists of the coil, resistor, and the magnetic circuit breaker. The coil is made of synthetics and enameled copper wire; the coil windings and wire cross-section must match the operating voltage of the vehicle (6, 12, or 24 volts). The initial terminal of the coil is at the housing electrical terminal; the coil end is soldered to the contact spring of the circuit breaker.

The resistor consists of a thin, cotton-spun wire and is loosely wound around the coil with a cotton strip. It is wired across the coil windings and provides a connection between the housing electrical terminal and the ground.

The magnetic circuit breaker is mounted on the circuit breaker base which is located above the coil; it consists of a permanent magnet and the circuit breaker. The permanent magnet is arranged as a trigger-magnet inasmuch that it is soldered into the pivoting circuit breaker; the mating, fixed contact of the circuit breaker is also attached to a contact spring but it is, however, insulated; attached to it is the end terminal of the coil windings. To improve the ground connection of the circuit breaker, a copper wire has been soldered between the movable contact spring and the circuit breaker fixture.

The pump housing interior which contains the electrical components is freed of air and then filled with helium gas to keep contact erosion at an absolute minimum.

2. OPERATING PRINCIPLE:

The pump operates by virtue of the constantly alternating movement of the pump piston which rides in the brass tube. The movement is magnetically and electrically controlled and takes place at a rapid rate.

When the piston spring moves the pump piston up, the upper end of its steel cylinder enters the field of force of the trigger magnet. The force of attraction existing between the magnet and the steel cylinder causes the trigger magnet, with its angle-mounted pole, to tilt against the brass tube which contains the pump piston. Since the trigger magnet pivots within the fixture of the circuit breaker, it causes the ground contact point to press against the mating but fixed contact point and thus close the electric circuit.

As this happens, battery or generator current begins to flow through the coil windings and creates a strong electromagnetic field in the coil. This electromagnetic force overcomes the tension of the piston spring and pulls the pump piston down.

As the pump piston moves away from the field of force of the trigger magnet, forces of attraction of the trigger magnet anti-pole move the trigger magnet back into its original position causing the circuit breaker points to reopen. As a result, the flow of current the coil windings stop and the electromagnetic forces collapse.

As this happens, the piston spring tension takes over and the piston moves up. The process then repeats itself.

The above magnetic and electromagnetic action results in fuel delivery in the following manner:

When the pump piston moves up due to force of the piston spring, it performs the task of fuel delivery as well as fuel intake; on this stroke, the fuel transfer valve in the piston is closed, and the inlet valve in the valve carrier is open.
As a result, fuel contained in the area above the transfer valve is raised and delivered to the carburetors through the pump pressure chamber and fuel outlet. Simultaneously, fuel is drawn into the valve carrier from the pump fuel inlet and through the open inlet valve.

When the pump piston moves down, only an internal fuel transfer is performed within the pump, that is, the fuel is transfered from the valve carrier, through the opening transfer valve, into the chamber within the pump cylinder; the inlet valve is closed on this stroke.

Based on the above, it may be concluded that

the upward stroke of the pump piston encompasses the inlet stroke and delivery stroke of the pump;
the downward stroke of the pump piston represents only a fuel transfer stroke within the pump.

The fuel flowing through the pump undergoes a two-fold cleaning. In the first instance, the fuel has to pass through a fine synthetic fiber screen located within the pump inlet chamber between the valve carrier and the magnetic filtering element. In the second instance, the fuel is forced to flow through a very narrow passage between the magnetic filtering alement is effective enough to entrap any ferrous metal particles which may be suspended in the fuel.

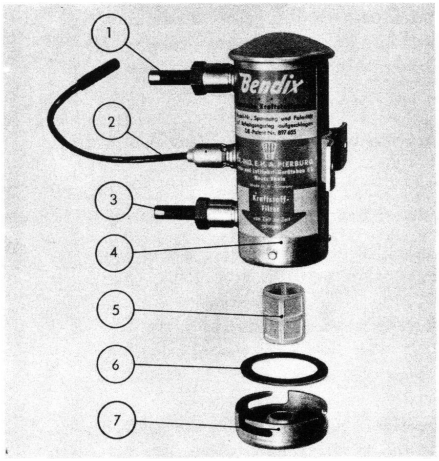
The corrugated diaphragm installed in the pressure end of the pump, together with a built-in air pocket between the diaphragm and the pump cover, provides a soft cushioning effect to further improve the flow steadiness and continuity during the pumping procedure.

To protect the pump coil against unforeseen and excessive generator current surges, a resistor has been wired across the coil. As already indicated, the resistor is situated between the pump electrical terminal and the ground .

Test Specifications:

Minimum rate of delivery	= 900 cc / min.
Pump pressure with closed float needle valve and zero level	= 0,28 - 0.33 atm
Current requirement, maximum	= 0. 65 Amperes

13 Fu CLEANING ELECTRICAL FUEL PUMP



1 fuel outlet
2 Electrical terminal
3 Fuel inlet
4 Pump housing
5 Fuel screen
6 Gasket
7 Cover with filtering magnet

Fig. 23

1. Remove pump bottom cover (bayonet lock-turn hex bolt counter-clockwiese).
2. Remove filter, clean it and blow out with air.
3. Clean bottom cover and inspect gasket for serviceability.
4. Insert filter screen and tighten bottom cover by turning clockwise to stop.
5. Check for leaks (enginge running).

REMOVING AND INSTALLING FUEL PUMP

14 Fu

Removal:

1. Withdraw fuel lines from pump.
2. Remove retaining bolts from pump flange.
3. Withdraw pump.

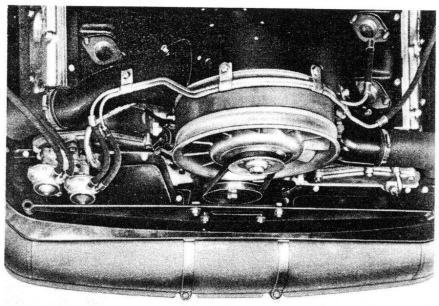


Fig. 24

Installation:

Please pay attention to the following points:

1. Use new flange seal.
2. Fasten fuel pumps.
3. Connect fuel lines; pay attention to the tightness of the connections.

CLEANING FUEL FILTERS

15 Fu

To prevent contamination of the pumps as well as a carburetor jets, the pumps have been provided with an additional fuel screen. Cleaning should be accomplished in the course of scheduled inspections.

Cleaning Mechanical Twin Pumps

16 Fu

1. Unscrew retaining bolt and withdraw cover.
2. Remove and clean filtering screens; replace screen when necessary.

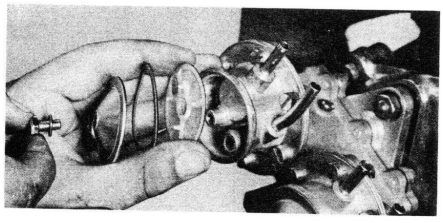


Fig. 25

3. Clean cover and pump housing.

4. Properly insert filtering screens and mount pump covers ensuring good condition and seating of the gaskets.

5. Start engine and check pumps for possible leaks.

17 Fu

OVERHAULING FUEL PUMP

Disassembly:

1. Remove cover retaining bolt.

2. Remove cover, withdraw filtering screen.

3. Remove 6 slotted retaining screws and withdraw upper part of pump.

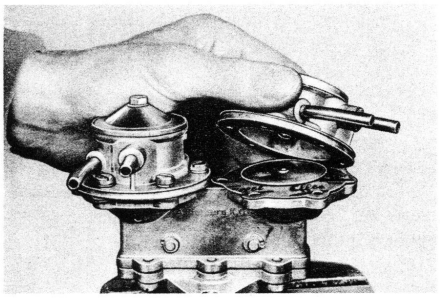


Fig. 26

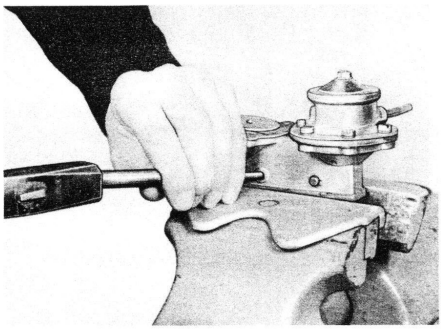


Fig. 27

7. Withdraw diaphragm with diaphragm rod and spring.

8. Remove fillister screw at inlet valve, withdraw valve limiter and leaf spring (outlet valve is not removable).

4. Remove slotted screws from pump flange.

5. Detach pump flange.

6. Remove 1 lock ring from actuating arm shaft and drive the shaft out. Withdraw actuating arm together with spring.

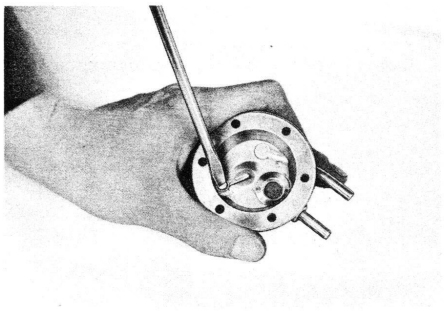


Fig. 28

9. Clean pump parts in gasoline.

Reassembly:

Reassembly is accomplished in the reversed order of the above by noting the following points:

1. Check outlet valve in upper part of pump for proper functioning.

2. Check seat of inlet valve.

3. Install leaf springs for inlet valve and the valve limiter. Check for proper functioning.

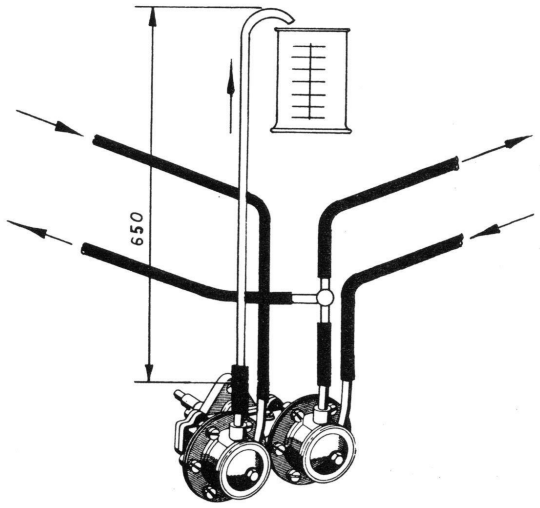
4. When installing pump upper part, ensure that the diaphragm is not creased. Tighten screws across, uniformly and securely.

5. Check pump cover gasket, replace if necessary.

6. Install new gasket between the housing and pump flange.

CHECKING FUEL PUMP PRESSURE

During this test the rate of flow is measured under true pressure conditions. For this purpose a vertical tube 650 mm long (25.6") must be connected to the pump outlet of one pump. The other pump should be connected to both triple carburetors through a T-connector.
The pump must transfer a minimum of 800 cc (27 fl.oz.) of fuel in 1 minute at 3,000 engine rpm. Both pumps should be checked.



FUEL PUMP SERVICE DIAGNOSIS

Mechanical Twin Pump

Malfunction	Possible Cause	Remedy
1. Pump leaking between upper part and lower housing: loss of fuel	a) Slotted screws loose b) Ruptured diaphragm	a) Tighten screws b) Replace diaphragm
2. Diaphragm leaking at riveted points: loss of fuel	Diaphragm damaged due to improper installation	Install new diaphragm according to instruction
3. Diaphragm plies leaking: loss of fuel	Diaphragm damaged due to solvents in fuel	Replace diaphragm
4. Pump stroke too long: diaphragm strained	Pump improperly installed. Gasket too thin	Install pump according to instructions; if necessary, check diaphragm
5. Pump pressure too low	a) Pump improperly installed; gasket too thick b) Spring tension too low	a) Install pump according to instructions b) Replace spring or stretch somewhat if not at hand
6. Pump pressure too high; float needle valve being forced down	a) Pump improperly installed; gasket too thin b) Spring tension too high	a) Install pump according to instructions b) Replace spring or, if not available, open the coils slightly in mid-length
7. Fuel pump inoperative or fuel delivery insufficient	Valves not seating well or stuck	Check valves, replace valve discs and seat if necessary

CHECKING FUEL SYSTEM

18 Fu

Work Procedure

1. Check fuel level in tank. The air vent in the filler cap must be free of dirt.

2. Detach fuel hose from carburetor. Crank engine briefly with the starter motor and see if fuel is being pumped.

   a) Fuel is pumped: Check pump pressure. Inspect for cleanliness all jets, spill system passages, bypass system, and calibrated bore of the gland screw (1.2 mm dia).

   b) Fuel is not pumped:

3. Detach fuel hose from mechanical fuel pump

   a) Fuel spilling from the float chamber: Check mechanical fuel pump for leaks; if evident, tighten pump housing screws and connections, otherwise remove and inspect fuel pump.

   b) No fuel in evidence:

4. Detach fuel hose from float chamber housing; switch the ignition on:

   a) Fuel is pumped: Remove float chamber housing; check float needle valve and float weight.

   b) No fuel in evidence:

5. Remove and inspect electric fuel pump, replace if necessary.

6. Clear fuel lines with compressed air.

CHECKING FUEL CONSUMPTION

19 Fu

Average fuel consumption in road test:

The fuel consumption of a vehicle in operation under normal driving conditions is best tested when the car is driven over a greater distance. To determine approximate consumption values, it is convenient to use a small container which is connected to the fuel pump and where the amount of fuel required to cover a certain distance is determined by means of refilling or weighing. In such tests, the carburetors should not be run dry if they were not dry at the initiation of the test. When performing the fuel consumption tests, the following points should be noted:

1. The fuel pump, carburetor, and ignition settings must be in compliance with the existing instructions.

2. The engine must be at its normal operating temperature at the initiation of the test.

3. The vehicle must carry the normal load.

4. The test conditions should possibly be such as encountered under average road conditions and in a normal driving manner. Typical city driving conditions, continuous use of lower gears in flat or hilly terrain, vigorous acceleration and high speeds necessarily lead to an increased fuel consumption.

5. Commercial fuel must be used. The fuel Consumption should be calculated according to the following formula:

$$\frac{\text{Fuel Consumed (liters)}}{\text{Distance Driven (km)}} \times 100$$

In addition to the above outlined procedure, the fuel consumption can be established on a test stand when the engine is removed from the vehicle.

20 Fu

Removing and Installing Fuel Tank

General:

The fuel tank (62 liter capacity) is accessible through the front luggage compartment.

Removal:

1. Remove fuel drain plug and drain fuel into a container.

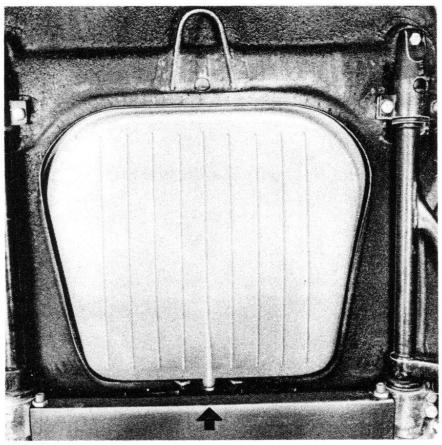


Fig. 29

2. Detach both fuel lines.

3. Open front luggage compartment. Remove compartment padding, spare wheel, and spare wheel pad.

4. Detach vent hose.

5. Detach fuel gauge cable from tank sending unit.

6. Remove 3 Allen screws.

7. Loosen hose clamp at hose connecting fuel filler with tank.

8. Remove connecting hose.

9. Remove fuel tank through the top.

Installation:

Installation is accomplished in the reversed order of the above by noting the following points:

1. Replace tank support gasket if damaged.

2. Tank vent hose must be in serviceable condition; clear pipe extension with compressed air.

3. Detach fuel hose from the electric fuel pump, blow through with compressed air, and refasten fuel lines.

Beginning with Engine Nr. 907 001, the Type 2000 engines are being equipped with Weber carburetors.

Fuel Pump

The mechanical twin-pump is no longer utilized. The fuel transfer function is performed by the electrical fuel pump.

Carburetors

Each cylinder has its own carburetor. Each carburetor of a triple-carburetor assembly is attached to an intake duct of a cylinder. Each triple-carburetor assembly has two float chambers and one accelerating pump.

General:

Fuel pumped by the electrical fuel pump flows through the float needle valve (7) into the float chamber (6). The float (5), anchored in the pivot (9), presses against the float needle valve (8) and maintains constant fuel level. Each triple-carburetor assembly has two float chambers.

Normal Operation:

The fuel flows from the float chamber (6) through the main metering jet (10) and the port (11) to the emulsion tube well (12). Here it mixes with air entering through the air correction jet (3) and exiting through orifices in the emulsion tube (4). The fuel/air mixture flows through the mixture delivery port (2) into the mixing chamber which consists of the pre-atomizer (1) and the venturi (13).

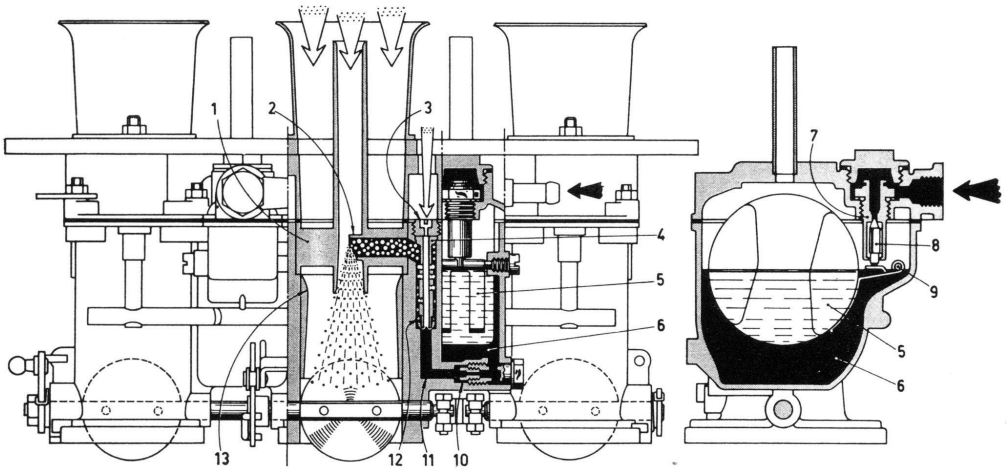


Fig. 30

1 Pre-atomizer
2 Mixture delivery port
3 Air correction jet
4 Emulsion tube
5 Float
6 Float chamber
7 Float needle valve
8 Float valve needle
9 Float pivot
10 Main metering jet
11 Fuel port
12 Emulsion tube well
13 Venturi

Acceleration:

As the throttle valve is closed, the lever (34) allows the diaphragm (30) to retreat under the pressure of the spring (29) and thus draw fuel from the float chamber (6) through the inlet check valve (36) and the port (35).

When the throttle valve is opened, the lever (34) actuates the cam (32) via the connecting link (33). The cam in turn actuates the lever (31) and the diaphragm assembly (30) causing the fuel to press against the diaphragm (28) and disc (27) which act as a valve. As the diaphragm (28) retreats, it opens the delivery ports (37) allowing the fuel to flow through the check valves (26) and the pump discharge nozzles (25) into each of the three carburetor throats.

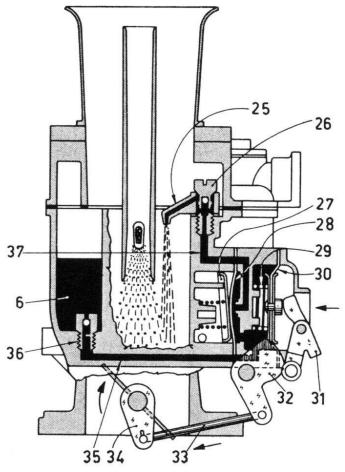


Fig. 31

6 Float chamber
25 Pump discharge nozzle
26 Check valve
27 Disc
28 Diaphragm
29 Spring
30 Diaphragm
31 Lever
32 Cam
33 Connecting link
34 Lever
35 Port
36 Inlet check valve
37 Delivery port

Idling and Power Transition:

The fuel is drawn from the emulsion tube well (12) through the delivery port (22) to the idle metering jet (23); it mixes here with air which enters through the idle air bleed (24). The fuel/air mixture passes through the delivery port (21) to the idle mixture discharge port (19) which is located below the throttle valve (18). The tapered idle mixture control screw (20) meters the flow. Immediately above the throttle valve (18) are located two transition ports (15) which begin to discharge additional fuel/air mixture as soon as the throttle valve opens far enough to clear these ports. This provides a smooth power transition from idling to higher engine speeds.

To ensure an equal flow of air through all three carburetor throats when the throttle valve is set for idling, an air adjustment screw (16) has been provided in each of the three carburetor throats. These screws control the flow of air through the passage (14) and, thus, the amount of air which is permitted to enter below the throttle valves through the air port (17).

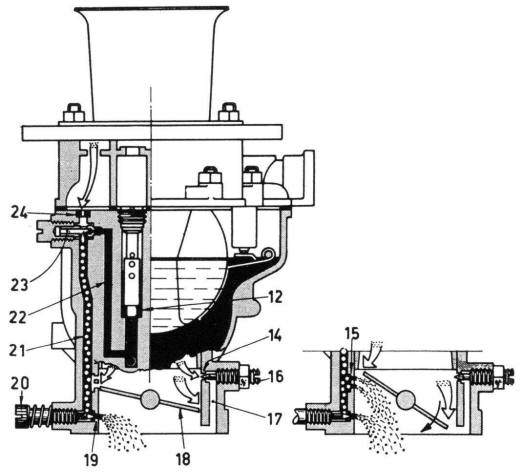


Fig. 32

12 Emulsion tube well
14 Passage
15 Transition ports
16 Air adjustment screw
17 Air port
18 Throttle valve
19 Idle mixture discharge port
20 Idle mixture control screw
21 Delivery port
22 Fuel delivery port
23 Idle metering jet
24 Idle air bleed

CHECKING AND ADJUSTING FLOAT LEVEL

21 Fu

Special Tools: P 226 Float level gauge

Each float chamber is provided with a stopper screw. Upon removal of this screw, the P 226 gauge may be installed. The car must be standing on level ground when the float level test is performed. With engine running at idling speed, the fuel level must be between the two inspection marks on the glass.

If the float level is incorrect, adjustment can be made by inserting gaskets of varying thickness under the float needle valve. For this purpose it will be necessary to remove the air cleaner assembly and the connecting duct at the carburetors. The float needle valve can be removed upon removal of the plug screw. The fuel level can be raised by installing a thicker gasket, and lowered through a thinner gasket.

Should it be not possible to adjust the fuel level through the use of gaskets, a further adjustment can be effected by bending the float anchoring toggle.

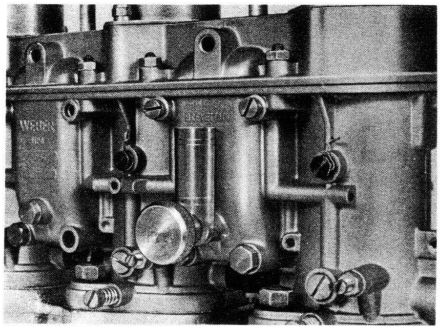


Fig. 33

ADJUSTING IDLE SPEED

22 Fu

Special Tools: P 227 Synchro tester

Idle speed is adjusted with the aid of the P 227 synchro tester.

The idle speed adjustment should be performed with the engine at operating temperature (approx. 60°C oil temperature) (140°F) and after having checked the breaker gap (0.4 mm) or the cam dwell angle (38° ± 3°), and the ignition timing.

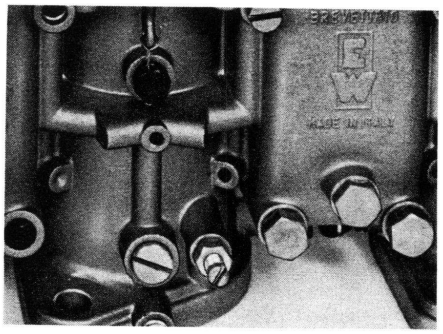


Fig. 34

The adjustment should be carried out in the sequence applicable to the Solex carburetors. If the induction air flow differs from throat to throat, it can be adjusted by turning the air adjustment screws.

Weber downdraft carburetors 40 IDA 3 C and 3 C 1 for Type 2000 Engine (Type 911)

Venturi	30
Pre-atomizer	4.5
Main jet	125
Air correction jet	180
Emulsion tube	F 26
Idle metering jet	55
Pump jet	50
Idle air bleed	110
Float needle valve	1.75
Float chamber vent	6

Float level: 12.5 - 13.0 mm (.492" - .512") from top of float to top edge of carburetor housing (without gasket).

Fuel level: 20.5 - 21.0 mm (.807" - .827") from top edge of carburetor housing at a pump pressure of 2.5 m water column (3.6 psi)

Injection quantity: 0.8 cc per cylinder per stroke. Variations of ± 0.2 cc are insignificant. The injection quantity is determined by the cam lift and cannot be adjusted.

Removal:

1. Detach carburetor preheating hose from air cleaner assembly.

2. Unsnap fasteners and withdraw air cleaner cartridge.

3. Detach oil breather hose from oil filler stack.

4. Withdraw condensation water hose from bottom of air cleaner housing.

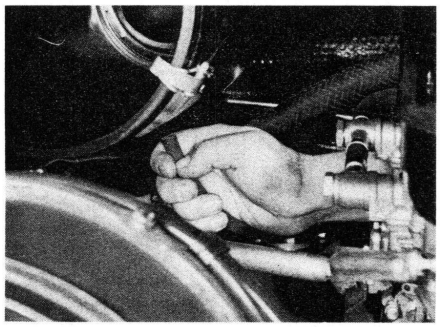


Fig. 35

5. Unsnap fasteners of air cleaner ducts at carburetors and remove air cleaner assembly.

6. Detach fuel hoses.

7. Detach carburetor control links from throttle levers.

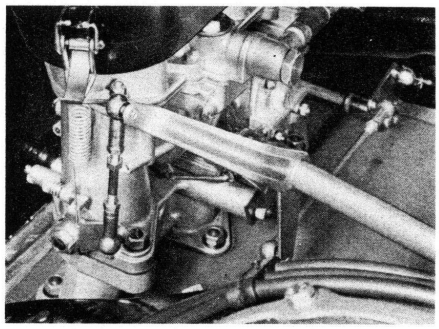


Fig. 36

8. Unscrew carburetor retaining nuts from intake ducts.

9. Withdraw carburetor assembly. Caution: Ensure that spring washers do not fall into the intake ducts.

10. Cover intake ducts.

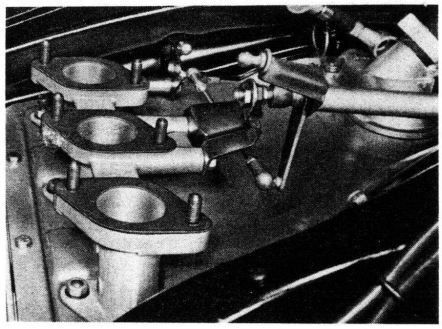


Fig. 37

Installation:

Note the following during installation:

1. Use new gaskets at intake ducts. Thoroughly clean the sealing surfaces. Make sure that the gasket contour matches that of the intake ducts.

2. If necessary, adjust control linkage; the throttle valves must close fully.

3. Adjust idle speed.

CLEANING CARBURETORS

24 Fu

1. Remove carburetors.
2. Remove air cleaner lower assembly and carburetor top.
3. Remove and clean the main jet, air correction jet, emulsion tube, idle metering jet, and idle air bleed.
4. Clear all ports with compressed air.

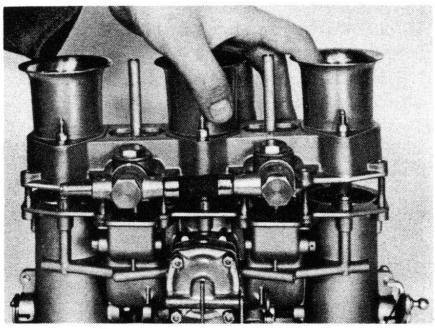


Fig. 38

For obvious reasons the ports must be cleaned with clean gasoline. The jets and ports should be cleared with compressed air. Note: Do not use wires or needles since the calibrated orifices could possibly be damaged.

DISASSEMBLING AND REASSEMBLING CARBURETORS

25 Fu

1. Remove carburetors.
2. Remove air cleaner lower assembly and carburetor top.
3. Remove filter body retaining screws and filter body.
4. Remove plug screw and float needle valve.

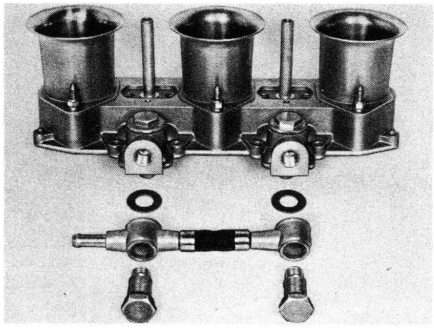


Fig. 39

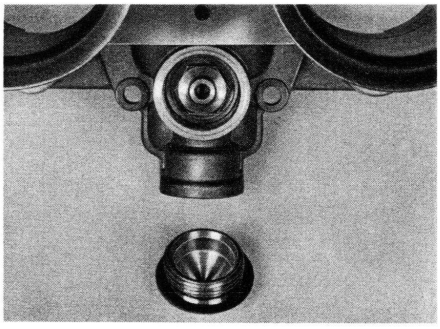


Fig. 40

5. Remove main jet carrier and main jet, air adjustment screw, stopper screw, idle metering jet, venturi set screws, and throttle valve adjusting screw.

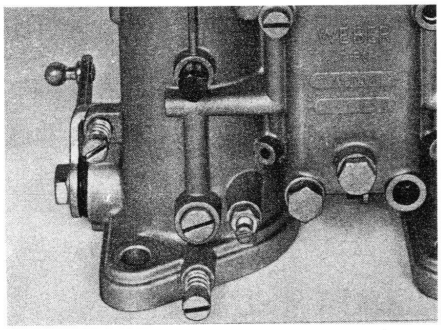


Fig. 41

6. Unscrew air correction jet and shake out the emulsion tube. If the emulsion tube is stuck (fuel sediments), it can be easily pulled out with a slightly tapered punch gently pushed into the tube to gain hold.

7. Remove check valve and pump nozzle.

8. Withdraw pre-atomizer; if it is stuck, loosen through light tapping.

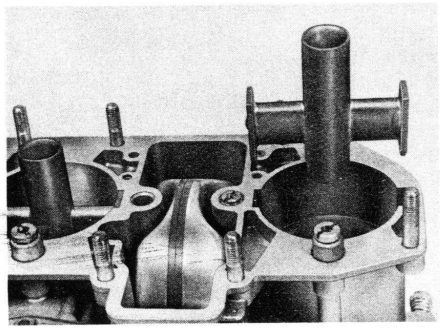


Fig. 42

9. Withdraw venturis.

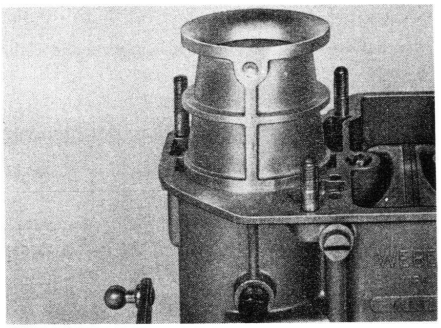


Fig. 43

10. Remove float pivot pin and withdraw float.

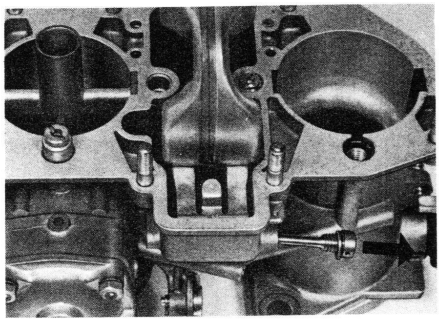


Fig. 44

11. Unscrew pump cover retaining nuts and remove cover.

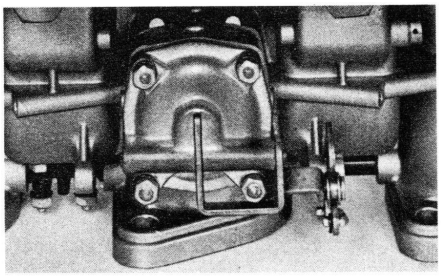


Fig. 45

12. Remove diaphragms, pump lower assembly, springs, and valve.

Cleaning:

The parts are best cleaned with gasoline and compressed air.

Note the following during reassembly:

1. Check radial play of throttle shafts. Excessive play permits false air to enter the intake throats.
2. The throttle valve must close fully (light tight).
3. Check pump diaphragms for good condition, replace if necessary.
4. Check tips of idle adjustment screws and air adjustment screws for possible damage or defects.
5. Upon installation of the venturis, safety-wire the set screws.
6. Check jets for proper size prior to installation.

Main jets:

The contour of the main jet bore is machined with consideration given to the direction of flow. The identifying number is stamped into the side of the jet, such as "125" (Type 40 IDA and 40 IDS carburetors).

Idle air bleed:

The idle air bleed is drilled into the body and cannot be changed.

SUPPLEMENTS

GROUP **F**

FUEL SYSTEM

CONTENTS

Supplements to Section F: Fuel System

3rd Revision, June 1972

Weber downdraft carburetors 40 IDA 3 C and 3 C 1, stamped with identifying letter S for 2000 S engine (Type 911 S) and, beginning with Engine Nr. 960 502, carburetors 40 IDS 3 C and 3 C 1.

Carburetor Type	40 IDA (S)	40 IDS
Venturi	32	32
Pre-atomizer	4.5	4.5
Main jet	135	125
Air correction jet	170	185
Emulsion tube	F 26	F 3
Idle metering jet	55	55
Pump jet	50	50
Idle air bleed	110	110
Float needle valve	1.75	1.75
Float chamber vent	4.5	4.5

Float level: 12.5 - 13.0 mm (.492" - .512") from top of float to top edge of carburetor housing (without gasket).

Fuel level: 20.5 - 21.0 mm (.807" - 827") from top edge of carburetor housing at a pump pressure of 2.5 m water column (3.6 psi).

Injection quantity: 0.8 cc per cylinder per stroke. Variations of $\pm$ 0.2 cc are insignificant. The injection quantity is determined by the cam lift and cannot be adjusted.

Beginning with engines numbered 408 0773 (Type 2000S) and 418 0144 (Type 2000S with Sportomatic), standard carburetors with changed jet specifications are being installed.

Carburetor Type	40 IDS 3 C
Venturi	32
Preatomizer	4.5
Main jet	130
Air correction jet	180
Emulsion tube	F 3
Idle jet	55
Pump jet	50
Idle air bleed	110
Float needle valve	1.75
Pump inlet valve	closed
Injection quantity	0.8 ± 0.1 cc per stroke
Pump valve	closed
Enrichment jet	50
Mixture outlet	5 mm
Idle mixture outlet	1.0 mm
Bypass orifices	0.80 mm, 1.1 mm, 1.35 mm

Float adjustment: Top edge of float from top edge of carburetor housing, without gasket, should be 12.5 - 13.0 mm (.492" - .512").

Fuel level: 20.75 ± 1 mm from top edge of carburetor housing at a pump pressure of 2.5 mWS (3.6 psi).

Carburetor specifications for the Weber carburetor 40 IDT 3 C and 40 IDT 3 C1 used in Type 2000T (901/03) engines.

Carburetor Type	40 IDT 3 C
Venturi	27
Preatomizer	4.5
Main jet	110
Air correction jet	185
Emulsion tube	F 2
Idle jet	50
Pump jet	50
Idle air bleed	110
Pump inlet valve	closed
Injection quantity	0.5 ± 1 cc per stroke
Float needle valve	1.75
Pump valve	closed
Mixture outlet	5 mm
Idle mixture outlet	1.0 mm
Bypass orifices	1.0 mm, 1.1 mm, 1.35 mm

Float adjustment: Top edge of float from top edge of carburetor housing, without gasket, should be 12.5 - 13.0 mm (.492" - .512").

Fuel level: 20.75 ± 1 mm from top edge of carburetor housing at a pump pressure of 2.5 mWS (3.6 psi).

CARBURETOR SPECIFICATIONS

Carburetor Type	WEBER 40 IDTP 3 C/3 C 1	WEBER 40 IDTP 1 3 C/3 C 1
Vehicle Type	911 T (69-model)	911 T (71-model except USA)
Engine Type	901/03, 901/13 901/16, 901/19	911/03, 911/06
Venturi	27	27
Preatomizer	4.5	4.5
Main jet	110	105
Air correction jet	185	170
Emulsion tube	F 1	F 1
Idle jet	45	5 5
Pump jet	50	50
Idle air bleed	145	145
Pump inlet valve	closed	closed
Injection quantity	0.5 cc/stroke	0.5 cc/stroke
Float needle valve	1.75	1 .75
Pump valve	closed	closed
Mixture outlet	5 mm	5 mm
Idle mixture outlet	1.0 mm	1.0 mm
Bypass orifices	1 0.70 mm 2 1.30 mm 3 1.20 mm	1 0.70 mm 2 1.30 mm 3 1.20 mm

Float adjustment: From top edge of float to top edge of carburetor housing, without gasket, should be 12.5 - 13.0 mm.

Fuel level: Adjust at idle speed with special tool P 226 a to 20.75 ± 1.0 mm (0.82 ± 0.04 in.) from the top edge of carburetor housing at a pump pressure of 2.5 mWS (3.6 psi).

Idle speed: 900 ± 50 rpm

CO content in exhaust gas: 3.5 ± 0.5 % by volume

CARBURATOR SPECIFICATIONS FOR TYPE 2000 ENGINE EQUIPPED WITH THE EECS
(INTERNAL DESIGNATION 901/14 AND 901/17)

Carburetor Type	Weber 40 IDAP 3C/40 IDAP 3 C1	Remarks
Venturi	30	
Preatomizer	4.5	
Main jet	125	
Air correction jet	180	
Idle jet	52	
Idle air bleed	110	
Pump jet	50	
Emulsion tube	F 26	
Float weight	25.5 g	
Float needle valve setting	From top edge of float to top edge of housing, without gasket, 12.5 - 13.0 mm	
Fuel level	20.75 $\pm$ 1 mm from the top edge of the housing at fuel pump pressure of 2.5 m water column.	
Float needle valve	1.75	
Enrichment jet	70	
Pump jet	closed	
Pump cam	adjustable	
Pump inlet valve	closed	
Injection quantity	0.5 cc $\pm$ 0.1 per stroke	
Float chamber vent	6.0 mm dia.	
Mixture outlet	5 mm	
Idle mixture outlet	1.0 mm	
Bypass orifices	1 = 0.8 mm 2 = 1.1 mm 3 = 1.35 mm	

HARDI ELECTRIC FUEL PUMP

General

The Hardi electric fuel pump is of the pulsating-diaphragm type. The breaker points are mounted on the magnet housing beneath a transparent plastic cap. The pump diaphragm and its spring are located between the magnet housing and valve housing which contains the inlet and outlet fuel valves as well as a filtering screen. When the ignition is switched on, the magnet becomes energized and pulls the armature, to which the diaphragm is attached, against the pressure of the diaphragm spring. At the end of this stroke, a pressure rod connected to the diaphragm trips the breaker point mechanism, opening the breaker points. As a result, electric current ceases to flow through the magnet and diaphragm spring tension takes over, pushing the diaphragm back and forcing the fuel out of the pump. Since the spring tension determines the fuel delivery pressure, it must not be changed or altered. At the end of the delivery stroke, the contacts close, energizing the magnet and repeating the pumping cycle again.

Pump Specifications

Fuel delivery rate, with suction and discharge points on same level	= 900 cc/min (30 fl. oz./min)
Fuel pressure with float needle valve closed	= 0.25-0.30 atm (3.6-4.3 psi)
Max. current draw	= 1.6 amps

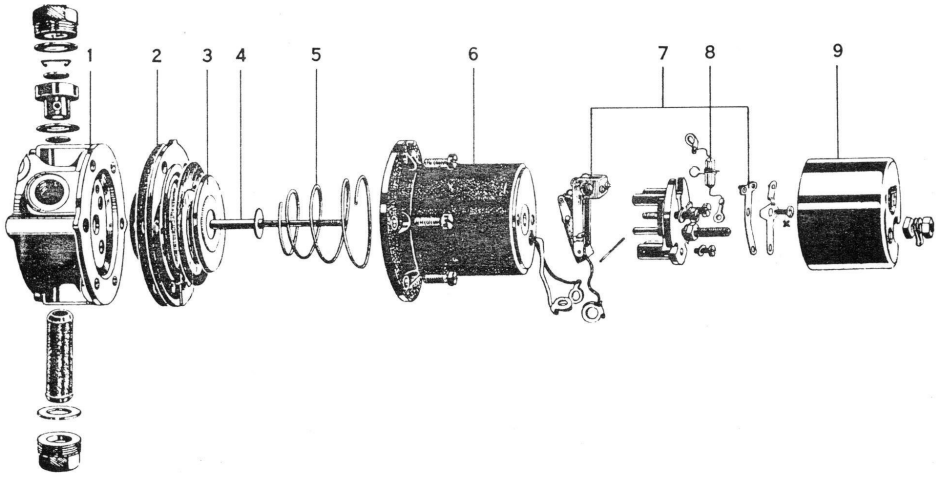


Fig. 1

1 Valve housing
2 Diaphragm
3 Armature
4 Pressure rod
5 Diaphragm spring
6 Magnet housing
7 Breaker points
8 Condenser
9 Plastic cap

REMOVING AND INSTALLING FUEL PUMP

Removal

1. Disconnect fuel line banjos from pump.
2. Remove pump retaining bolts and detach ground wire at the support.
3. Detach positive (+) lead from terminal in pump.

Installation

Note the following points during installation:

1. Check support grommets, replace if necessary.
2. Use only good gasket rings when reattaching fuel line banjo connections.

REMOVING AND INSTALLING DIAPHRAGM

Removal

1. Remove the 6 valve housing retaining screws and withdraw housing.
2. Unscrew diaphragm by turning counter-clockwise. Withdraw diaphragm with armature and spring from the magnet housing.

Installation

1. Place spring onto pressure rod with small coil against the armature.

   Caution: Do not alter spring tension since it determines fuel delivery pressure.

2. Insert diaphragm with spring into magnet housing. Screw the pressure rod so far into the lower part of the rocker assembly until the contacts will no longer open when the diaphragm is pushed up.
3. Now the diaphragm and pressure rod should be turned counter-clockwise until the points will just begin to open (throw-over point) when the diaphragm is pushed up.
4. To ensure proper functioning of the breakers, turn the diaphragm and pressure rod 300^{o} (5 screw holes) counter-clockwise from the point determined in Point 3, above.
5. Install valve housing and tighten slotted screws uniformly across.

REMOVING AND INSTALLING BREAKER POINTS

Removal

1. Remove valve housing retaining screws and withdraw housing.
2. Unscrew diaphragm.
3. Unfasten and remove plastic cap.
4. Remove adjusting screw from upper part of breaker assembly as well as condenser and breaker assembly retaining screws. Remove condenser and upper part of breaker assembly.
5. Remove hinge pin from lower part of breaker assembly and withdraw the lower part.

Installation

Note the following points when installing the lower and upper parts of the breaker assembly:

1. Lubricate breaker pivots making sure that contacts do not oil up.
2. Adjust breaker gap. Push diaphragm up so that the points are open, then adjust gap to 1.2 mm (.05") by turning the adjusting screw. The adjusting screw must engage the contact spring.
3. Secure plastic cap. Do not forget the gaskets.

ADJUSTING EXHAUST EMISSION CONTROL SYSTEM IN TYPE 911, MODEL 69

1. Adjust ignition timing and idle speed

   a. Adjust breaker point gap to 0.4 ± 0.03 mm (0.016 ± 0.001 in.), or dwell angle of $40^{\circ} \pm 3^{\circ}$.

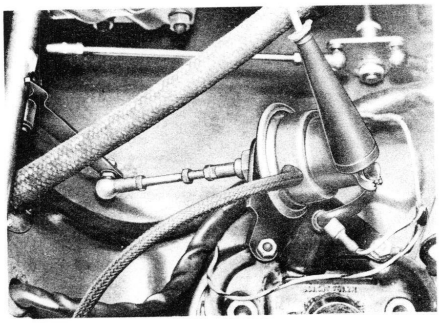
   b. Adjust ignition timing at idle speed (900-950 rpm) to 4° ATDC. Warm up engine to at least 60°C (140°F). Check ignition timing. It should be 35° BTDC at 6000 rpm. If this is not the case, ignition timing can be retarded to 2° ATDC at idle speed.

   c. Synchronize carburetors.

   d. Adjust mixture control screws evenly, at idle speed, until the exhaust emission tester shows $3.5 \pm 0.5\%$ CO emission.

2. Adjust throttle valve compensator

   a. Disconnect wire from insulated terminal in the throttle valve compensator.



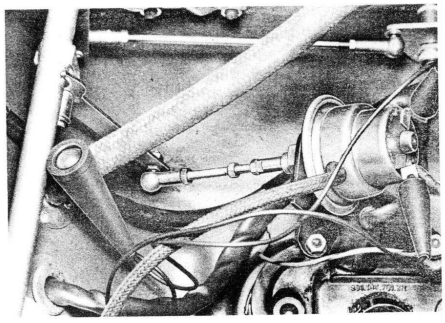
   b. Connect a source of power (hot wire) to this terminal so that the solenoid valve is activated.

   c. Start engine and adjust the compensator actuating rod by turning it so that an engine speed of 1250 - 1300 rpm is reached after the throttle was opened once (to approx. 3000 - 4000 rpm) and then slowly closed. When making this adjustment, use a separate tachometer instead of the vehicle tachometer.

   d. Reconnect wire leading from the rpm transducer to the insulated terminal on the throttle valve compensator. Start engine, raise engine speed briefly to about 3000 - 4000 rpm. Release the accelerator and check if idle speed is 900 ± 50 rpm.

3. Check RPM Transducer (Speed Switch)

   a. Connect test light to both electrical terminals on the throttle valve compensator. The light should come on when engine reaches a speed of 2000 - 3000 rpm.



   b. Slowly reduce engine speed. The test light should go off when the engine speed is between 1450 - 1500 rpm. This is called "cut-off" rpm. If the test light does not go out in this rpm range, replace rpm transducer.

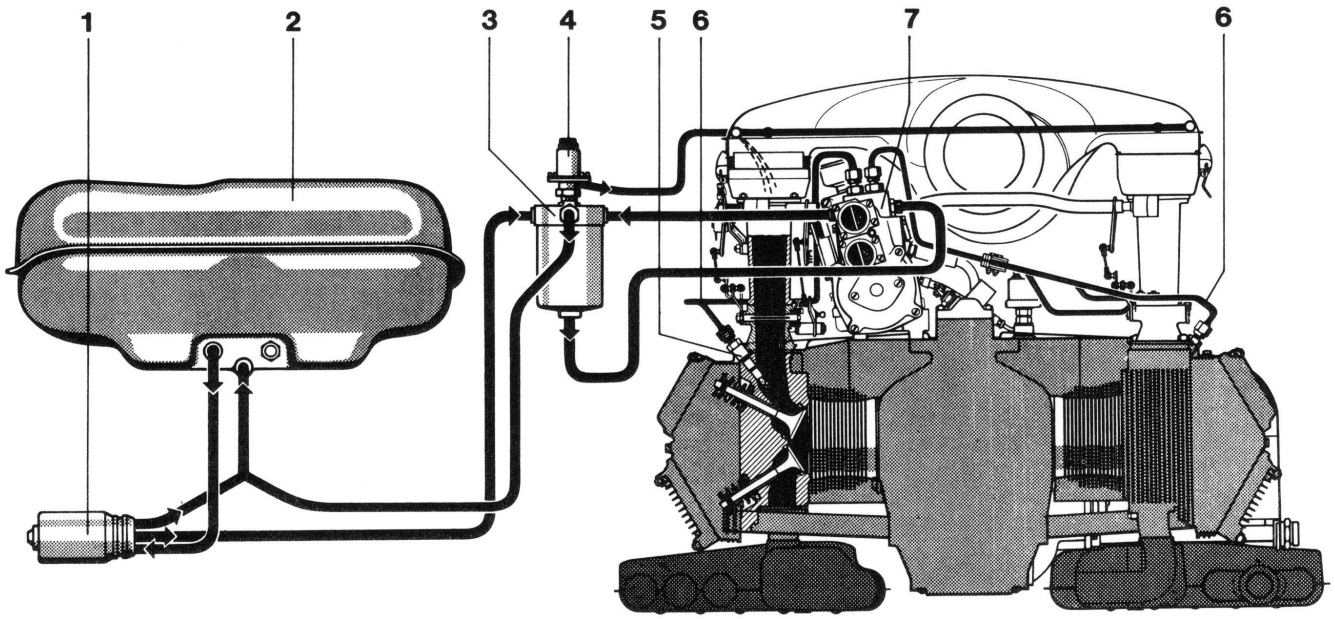
General

As of 1969, the 911 E and 911 S vehicles are provided with fuel injection.

The advantages of fuel injection are essentially an output increase of the engine, better transition during acceleration, good cold starting characteristics and low fuel consumption. In addition, the accurately balanced injected fuel quantity in relation to the inducted air permits a better combustion of the air fuel mixture.

The double row six-plunger injection pump is driven by the left engine camshaft by a toothed belt. The fuel is delivered from the tank to the injection pump by an electric fuel delivery pump via a fuel filter. Six injection plungers, actuated by the injection pump camshaft, force the fuel through six pressure lines of equal length to the injection valves in the cylinder heads. The injection valves open at a pressure of 15 - 18 atü (213-256 psi) and inject the fuel into the intake ports and onto the opening intake valves. This is known as a timed indirect injection system or manifold injection.

SCHEMATIC OF PORSCHE FUEL INJECTION SYSTEM



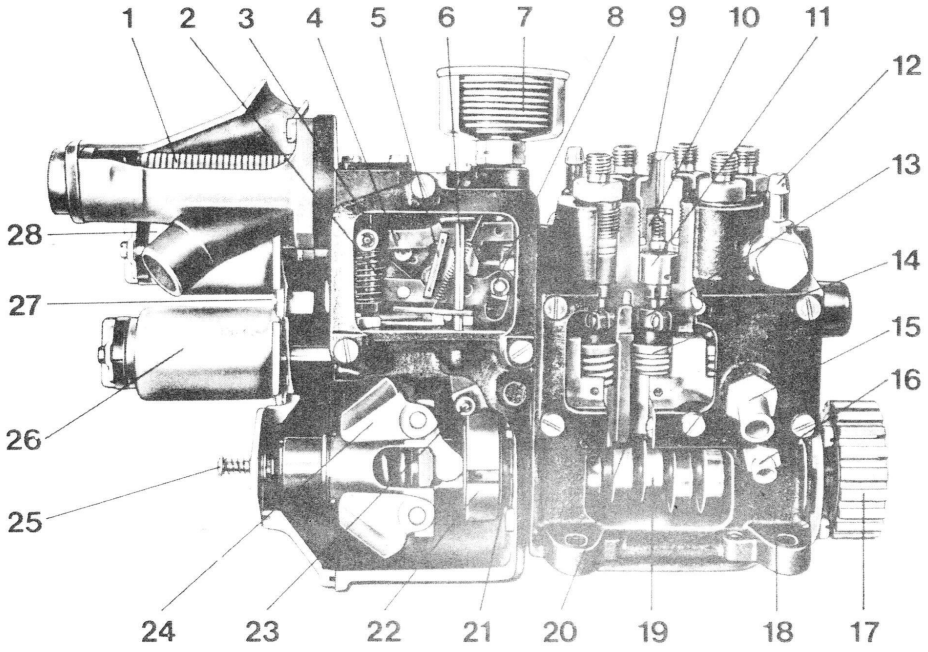
1 Fuel delivery pump
2 Fuel tank
3 Fuel filter
4 Solenoid for cold starting unit
5 Injection valve
6 Injection line
7 Injection pump

The air is drawn into the cylinders by the engine via a noise-dampening filter and two triple intake pipes which are fastened to the venturi control units. The throttle valves in the venturi control unit should always be synchronized with each other and in proper adjustment or correlated with the control lever on the injection pump. The throttle valves are connected to each other by linkages, and to the injection pump by means of the control lever.
Providing the air fuel mixture required for perfect combustion requires a ration of 14.8 kp air to 1 kp fuel. This is why the coordination of the throttle valves in relation to each other and in relation to the control lever of the injection pump is extremely important.

To obtain ideal combustion, the air fuel ratio should be constantly uniform. The climatic changes of the air, as well as the varying air quantities at different speeds and load conditions are corrected by the injected fuel in order to arrive at and maintain a ratio of 14.8 : 1. For this purpose, the injection pump is provided with a centrifugal governor and a correction device.

Description of Injection Pump

The fuel injection system consists of two main parts, the pump assembly and the control and compensating unit. The pump assembly contains the pump camshaft, roller tappets, injection plungers, and the plunger control rack. The control unit incorporates the fuel delivery controlling and compensating units. The injection pump is lubricated by the engine lubrication system. Lubricating oil supplied by the engine flows through a connecting line and filtering screen before reaching the camshaft compartment. Oil pressure build-up occuring in the camshaft compartment, is relieved through the roller tappets and delivery plunger springs. A drain passage allows the oil to return to the crankcase.

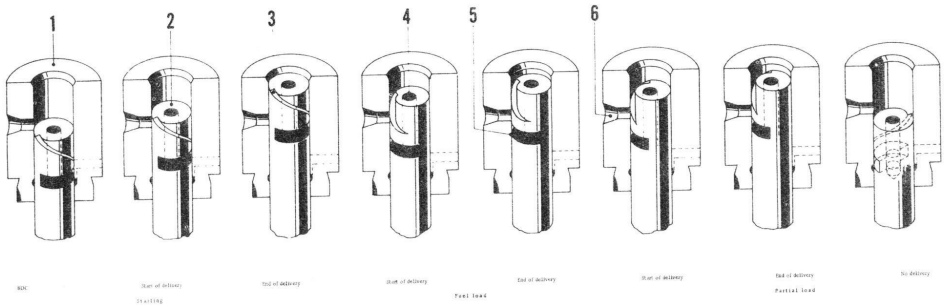


1 Thermostat
2 Compensating lever
3 Thermostat connecting sleeve
4 Cross-arm
5 Support
6 Guide stud
7 Barometric cell
8 Guide
9 Injector line fitting
10 Check valve
11 Plunger unit
12 Fuel inlet
13 Toothed segment
14 Plunger spring
15 Engine oil return
16 Engine oil inlet
17 Pump drive wheel
18 Support flange
19 Camshaft
20 Roller tappet
21 Contoured cam spring
22 Contoured cam
23 Sensor
24 Centrifugal governor weight
25 Idle speed adjustment
26 Shut-off solenoid
27 Access to control rack head
28 Enrichment solenoid

Operation of Injection Pump

1. Pump Assembly

The pump housing contains 6 pump units. Each unit consists of a cylinder and a plunger. Each plunger is connected to a roller tappet which rides on the cam lobe. The pump cylinders are fastened to the pump housing. Each cylinder is immersed in fuel which can enter the cylinder compression chamber through an inlet port. The camshaft exerts a force upon the roller tappet and causes it to move the delivery plunger up. As a result, fuel contained in the compression chambers is forced out through a check valve into pressure lines connected to injectors which spray the fuel into intake ports. Maximum lift of the delivery plungers is determined by camshaft design and remains constant. The injection quantity is regulated by turning the delivery plungers, thus resetting a metering land in each. The toothed control rack, engaging its toothed counterpart in each delivery plunger, can slide back or forth and to turn the delivery plungers as required. As a result, the slanted metering land closes the fuel inlet port at an earlier or later time, causing greater of smaller amounts of fuel to be delivered on each stroke, depending on the relative position of the injection plunger.

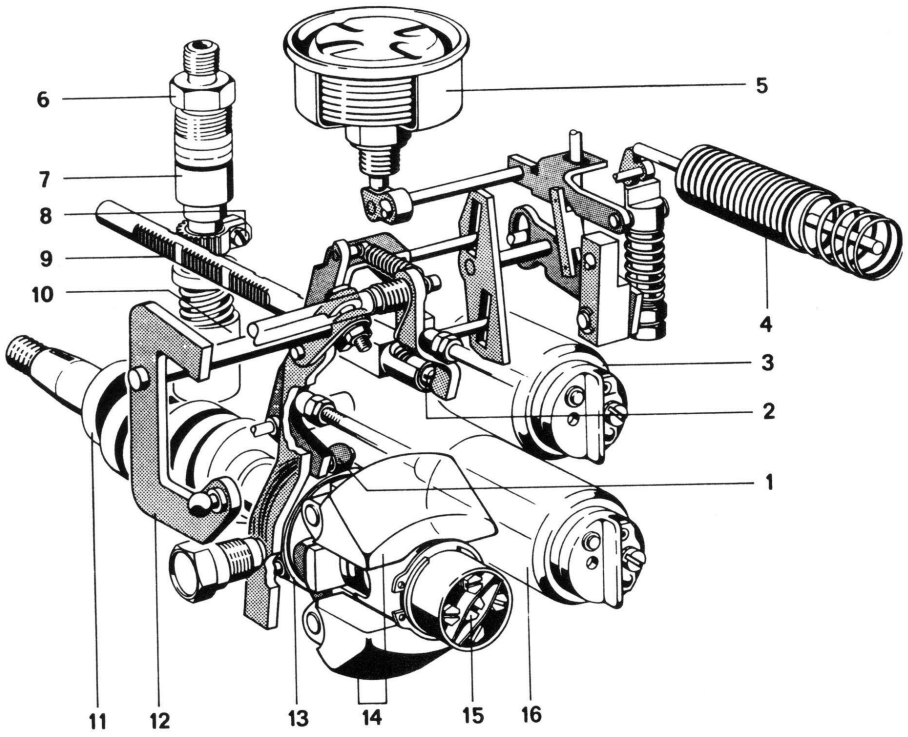


1 Pump cylinder
2 Pump plunger
3 Metering land
4 Oval orifice
5 Cross-slot
6 Inlet port

2. Control and Compensating Units

a. Control Unit:

To obtain the required air fuel mixture ratio, the engine must be supplied with different quantities of fuel under varying engine speed and loads. The engine performance graph illustrates the fuel quantities required under various operation conditions. This performance graph is represented by a contoured cam which is mounted on the cam shaft together with a centrifugal governor. The contoured cam can be moved axially by the centrifugal governor and rotated on its axis by the accelerator pedal in relation to given engine loads. Riding on the contoured cam is a sensor (roller) which transfers the appropriate fuel valume requirements to the control rack via a guide lever.



1 Sensor on contoured cam
2 Control rack head
3 Enrichment solenoid
4 Thermostat
5 Barometric cell
6 Check valve
7 Plunger unit
8 Toothed segment
9 Control rack
10 Roller tappet
11 Camshaft
12 Governor control lever
13 Contoured cam
14 Centrifugal governor
15 Idle adjusting screw
16 Shut-off solenoid

b. Compensating Unit:

Changes in air pressure and temperature require continued corrections in fuel metering. In addition, a supplemental mixture enrichment for cold and hot starting must be taken into consideration. This requires the following compensating units:

1. Barometric Cell: To compensate for changes in air pressure.
2. Thermostat: To compensate for varying engine operating temperatures (quantities required during engine warm-up).
3. Enrichment Solenoid: To enrich the combustion mixture in cold and hot starting (controlled by the thermo-limit switch and time-limit relay).
4. Shut-off Solenoid: For stopping fuel delivery from the injection pump when coasting in gear (controlled by the throttle valve microswitch and rpm transducer).

All corrective action indicated by the compensating devices is transfered to the control rack by means of connecting levers which cause the rack to slide forward or backward. The resulting rotation of the plungers in the pump cylinders changes the quantity of injected fuel.

1. Barometric Cell

The barometric cell works in the same way as a barometer. When the aneroid mechanism expands, a pin transfers the action to the compensating mechanism by means of a lever. This movement corrects the given position of the control rack so that the quantity of injected fuel is increased at high air pressures, and reduced when the pressure drops, such as in changing weather or when driving in the mountains. The barometric cell is a sensitive precision instrument and should be handled with care to prevent any damage. It cannot be replaced without adjusting the injection pump on a Bosch-Service test stand.

2. Thermostat

The thermostat is mounted on the control unit housing and responds to engine cooling air which comes from a heat exchanger and is ducted to the thermostat through hoses. The thermostat consists of several heat expansion elements which cause a certain amount of mechanical movement. A connecting lever transfers this movement to a compensating mechanism which, in turn, corrects the position of the plunger control rack. When the engine is cold, the control rack is moved into the "full load" position to appropriately enrich the combustion mixture. Increasing engine temperature progressibely reduced fuel enrichment. The thermostat does not influence the control rack position after a temperature of $+45^{\circ}C/+113^{\circ}F$ has been reached ($+53^{\circ}C/+127^{\circ}F$ for 1970 Models).

3. Enrichment Solenoid

Full mixture enrichment is required for starting the engine. For this reason, the enrichment solenoid has been incorporated in the fuel pump and acts directly on the plunger control rack, moving it beyond the full-power position with plunger aligning for starting-rate fuel delivery. The solenoid energizing circuit includes a time-limit relay and a thermo-limit switch. The time-limit relay closes the solenoid circuit for 2 seconds during each starting procedure, without regard to the air temperature in the crankcase. A thermo-limit switch keeps the energizing circuit closed over an appropriately longer period of time when the temperature ranges between $+10^{o}C$ ($+50^{o}F$) and $-25^{o}C$ ($-14^{o}F$). When the air temperature in the crankcase drops to between $-10^{o}C$ ($+14^{o}F$) and $-30^{o}C$ ($-22^{o}F$), an additional thermo-switch activates a supplemental cold-starting device.

The above described enrichment solenoid, the 2 second time limit relay, as well as the two thermo-time switches are no longer used on the 2.2 liter fuel injected engine.

The supplementary starting equipment is controlled by a new thermo-time switch, which is housed in the breather cover. During the starting operation, the cold starting device is turned on up to a temperature of $+45^{o}C$ ($+113^{o}F$).

4. Shut-off Solenoid

Function of the shut-off solenoid is to move the plunger control rack to the "off" position and close the fuel delivery to the engine when the car is coasting in gear. The shut-off solenoid is controlled by a mircoswitch and an rpm-transducer. The microswitch is mounted on the intake stack and is actuated by the throttle valve linkage. The rpm-transducer closes the circuit when engine speed exceeds 1500 rpm. When the throttle is closed, the microswitch closes the circuit and current can flow from the rpm-transducer through the microswitch and on to the shut-off solenoid. This energized the solenoid and causes it to pull the control rack to the "off" position, stopping the flow of fuel to the engine. When the engine speed drops below 1300 rpm, the rpm-transducer interrupts the flow of current, causing the shut-off solenoid to return into its inactive position and release the plunger control rack. As a result, fuel flow to the engine is resumed, permitting the engine to idle when the vehicle is stopped. If the engine speed is again increased, the rpm-transducer becomes reactivated at 1500 rpm. However, the solenoid circuit will be interrupted by the mircroswitch. The rpm-transducer receives its control impulses from the ignition coil.

General

The fuel injection pump can only be adjusted with an exhaust emission analyzer. During the emission test, the CO components in the exhaust gases are measured.

The CO rating is also influenced by the general engine condition (timing, valve clearance, compression, spark plugs, etc.), by proper correlation of the throttle valves and injection pump, the operating temperature and the intake air temperature. Incorrect measurements will result if these conditions are not within tolerances.

Adjusting

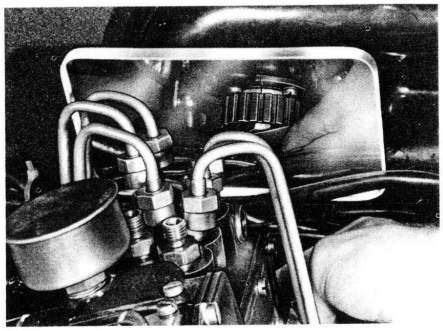
1. Incorrect valve clearance will change the valve timing and thereby the fuel supply to the cylinders. The valve clearances should, therefore, be checked and adjusted if necessary (0.10 mm/0.004 in.) before making the exhaust emission test.

2. Make compression check between +60 and +80°C (+140 and 176°F). The compression should be the same for all cylinders from 9 - 11 kp/cm^2 (128 - 156 psi). The cylinder leakage should not exceed 10 % per cylinder. Larger deviations will influence the quantity of intake air considerably even though the quantity of injected fuel will remain the same for all cylinders.

3. Adjust dwell angle and timing before making exhaust emission test. Adjust the dwell angle to $38^{\circ} \pm 3^{\circ}$ at idle speed and the timing to 30° BTDC at 6000 rpm.

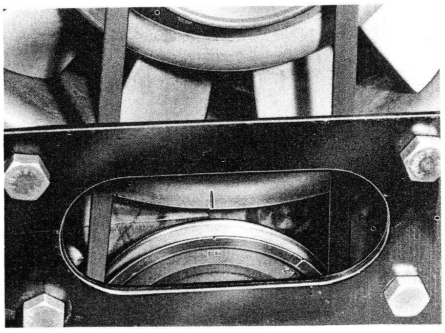
Adjusting End of Delivery Stroke

1. Bring number 1 piston to Top Dead Center of compression stroke, then turn one complete revolution (360°) in the direction of engine rotation.
   Continue turning slightly beyond the Top Dead Center mark, approximately 40°, and align the "F - E" mark on the camshaft pulley with the notch in the blower housing.



2. The pump is then properly timed if the marking on the hub of the belt pulley lines up with the mark on the pump bearing cover. Check mark alignment with a mirror.

   If the marks do not line up the pump must be loosened, the spur belt removed and the camshaft pullex repositioned. By loosening the 3 socket head bolts, fine adjustments can be made.



3. Check correlation of throttle valves in relation to each other and in relation to the control lever of the injection pump.

4. Check function of fuel delivery pump (fuel pressure, fuel flow rate), the enrichment solenoid and shut-off solenoid (relay, thermo-time switch).

5. Check warm air supply hose to thermostat to ensure unrestricted air flow.

CHECKING AND ADJUSTING CORRELATION IN FUEL INJECTION ENGINES

Special Tools

P 228b or P 228c, respectively

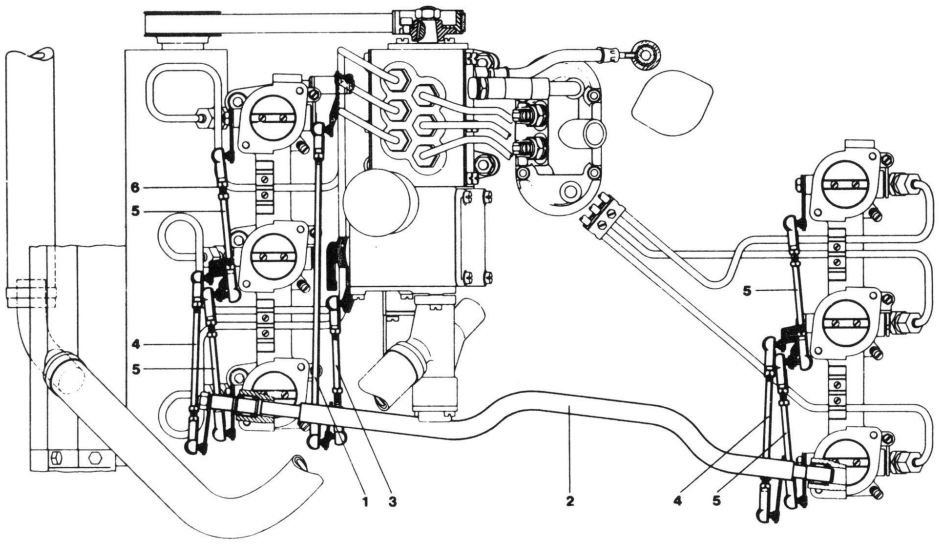
General

To maintain proper fuel/air ratio under all engine operating conditions, accelerator pedal movement is transmitted to the pump control lever and throttle valves by actuating rods working in unison. The pump control lever determines the amount of fuel, and the throttle valves the amount of air, taken by the engine.

For this reason, the pump control lever and the throttle valves must always move in unison and in a definite ratio in relation with each other (correlation). Any change of the fuel/air ratio will impair engine performance during acceleration, power transition, etc. Correct correlation is a prerequisite for proper operation of the injection system.

It should be noted that correlation is greatly affected by engine temperatures. When making the basic adjustment or checkout of correlation, the engine should be at operating temperature [oil temperature of 75^{o} - 85^{o} C (167^{o} - 185^{o} F)].

When at this temperature, all levers (throttle valve and pump levers) should be resting exactly at their stops. The connecting rods (cross-shaft to throttle valve housing) must fit free (without preload). When the engine cools down, a slight advance in pump lever position will be noted; that is, the pump lever will be open by about 0.5^{o} to 1.0^{o} when the throttle levers are at their travel stops. The connecting rods will no longer fit freely.



1 Pull rod
2 Cross shaft
3 Injection pump control lever
4 Throttle valve push rod
5 Throttle valve connecting rods
6 Paint seal

Basic Adjustment

1. Make sure that hand throttle lever is at its bottom stop.

2. Adjust control lever to a length of 114 ± 0.2 mm (4.49 ± 0.01 in) between ball centers, and connect.

3. Synchronize left and right throttle valves when oil temperature is 75° - 85° C (167° - 185° F).
Connect push rods to throttle valve levers.

Adjust the push rods so that the ball sockets will connect to cross shaft without preload.

Throttle valves and control lever must be exactly at their stops.
Adjust each push rod separately.

Note
Rod length is determined by the position of the cross shaft lever which is set by the 114 ± 0.2 mm (4.49 ± 0.01 in) rod. Length of left and right rod can be different by up to 5 mm (0.2 in). Differing rod length will not affect correlation.

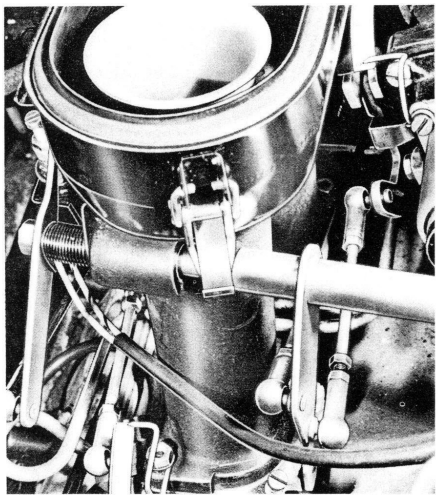
4. For 2.0 liter engines, fasten the appropriate pointer under the upper left retaining nut of the start enrichment solenoid. For 2.2 and 2.4 liter engines, make a new pointer. Fasten it to the upper left retaining screw of the cover plate, ahead of the thermostat. This new location is because the enrichment solenoid has been discontinued on these engines.

5. Attach protractors to left and right throttle levers. Attach the corresponding pointers under intake manifold retaining nuts.

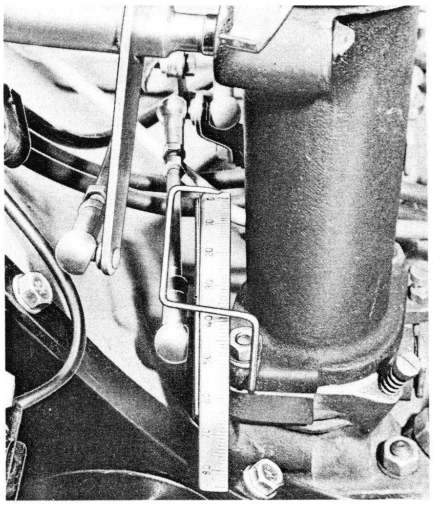
Note
In vehicles equipped with air conditioning it is necessary to first detach the compressor from its support so that the protractor can be attached to the right throttle valve lever.
Do not detach hoses from compressor.

6. Adjust the 3 protractor pointers to 0^{o} reading.

7. Actuate the linkage manually and check if values shown in the table coincide with those shown on the protractors.



Protractor on pump	Protractor on throttle valve	Maximum Deviation
0^{o}	0^{o}	
5^{o}	3^{o}	
10^{o}	6^{o}	0.5^{o}
15^{o}	9.5^{o}	
20^{o}	13^{o}	
30^{o}	21^{o}	
40^{o}	30^{o}	
50^{o}	40.5^{o}	
60^{o}	52^{o}	$\pm 1^{o}$
70^{o}	65^{o}	
$79 - 82^{o}$	$80 - 85^{o}$	Full throttle position



Note
If the measured values deviate from the indicate permissible tolerances, check for bent cross shaft, push rods, or throttle valve levers.

8. Check hand throttle actuation upon completion of the correlation adjustment. When the engine is warm and hand throttle pulled up fully, the engine should reach 4000 rpm.

9. Push throttle pedal fully down. In this position, the pump control lever should be about 1 mm from its end stop; if necessary, readjust throttle pedal travel limiting bolt.

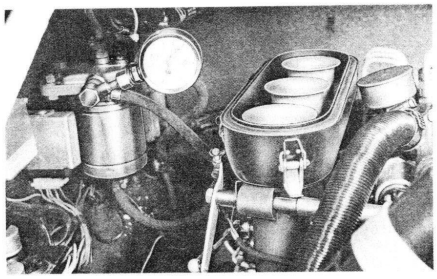
Description and Test Values of Fuel Delivery Pump

The roller-cell type fuel pump has a delivery capacity of approximately 110 liters/hr (29 gal. per hr.) up to 125 liters/hr (33 gal. per hr.). This delivery capacity is several times the amount of actual fuel consumption and is necessary to keep the fuel temperature in the injection pump as low as possible. The fuel delivery pump delivers the fuel via a fuel filter to the injection pump. The delivery pump is mounted by a bracket to the support member under the fuel tank.

The excessive fuel flows back to the tank via a return line. An overflow valve in the fuel filter will establish a pressure of 0.8 $\pm$ 0.2 atm (11.8 $\pm$ 3.0 psi) in the fuel system. When the pressure increases above approximately 1 atm (14 psi) some of the fuel is returned to the fuel tank via the bypass valve installed in the fuel pump. The bypass valve operates independent of the overflow valve.

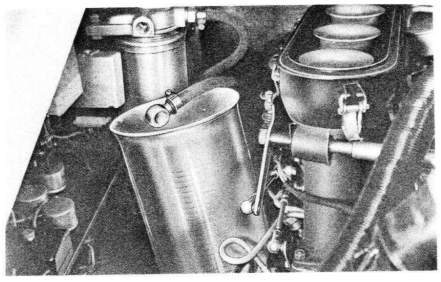
1. Checking Fuel Deliver Pump Pressure.
   Loosen hollow bolt on filter of injection pump return line.

   a. Attach pressure gauge special tool P 233b together with return line to fuel filter (long hollow bolt).



   b. Turn on ignition and read fuel pressure on pressure gauge. If the pressure is below 0.8 $\pm$ 0.2 atm (11.8 $\pm$ 3.0 psi), the filter must be replaced. If the specified pressure is still not attained, check the overflow valve, as well as the fuel pump electrical connection.

2. Checking the Fuel Quantity Delivery by the Fuel Pump.
   Loosen hollow bolt on filter of injection pump return line. Hold line into a 1000 cc measuring beaker.



a. Turn ignition on for 30 seconds; the delivered quantity should be 900 - 1000 cc. If this value is not attained, perform steps 1a and 1 b.

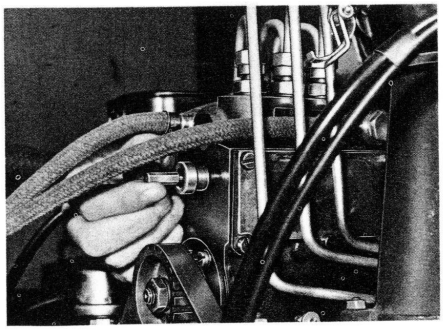
3. Checking Fuel Pump Current Draw.

a. Connect volt meter to pump and correct voltage. The voltage should be 11 volts $\pm$ 1 volt.

b. Connect ammeter to pump, turn on ignition. The current draw should be between 2.15 - 2.40 amps.

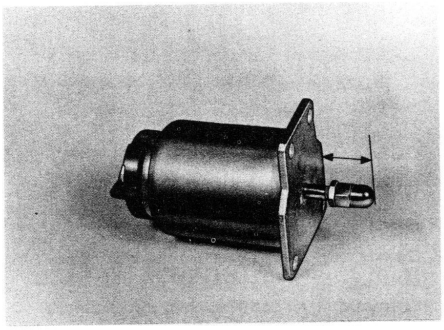
4. Checking Enrichment Solenoid.

a. Remove rubber cap on driving end of injection pump and insert a M 5x30 bolt into the plunger control rack. Pull control rack in driving direction. When released, the control rack should snap back to its original position. If the control rack sticks or does not return to its original position, replace the injection pump.



b. Remove wires from enrichment solenoid. Connect a jump wire to fuse box terminal 15. While observing bolt M 5x30 touch solenoid with jump wire. The control rack should move in driving direction.

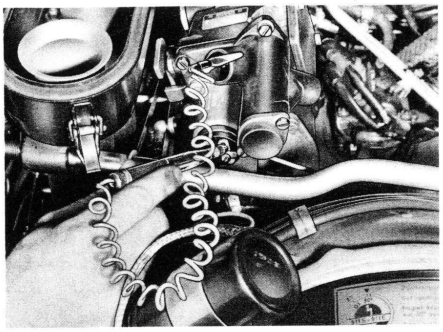
c. If the rack does not move, even though the rack is mechanically free, the enrichment solenoid must be replaced.
When replacing the enrichment solenoid adjust the plunger to the same length as the old solenoid.



d. As of model year 1970, fuel injected 2.2 liter engines do not have an enrichment solenoid. There are no threads in the control rack, therefore, a clean blunt tool must be used to push the control rack rearward (opposite to driving direction). When released, the control rack should automatically snap back to its starting position. If the control rack sticks or does not release to its original position, replace the injection pump. Reinstall rubber cap after check.

5. Checking the Time Limit Relay.

a. Connect test light to terminal on enrichment solenoid (other end to ground).



b. Start engine. The test light should stay on for two seconds. If not, replace time limit relay.

6. Checking the Thermo-Limit Switch.
Between -25°C (-14°F) to +2°C (+35°F) the thermo-limit switch will close the circuit to the enrichment solenoid for more than 2 seconds.

a. Connect test light to terminal enrichment solenoid.

b. Start engine. The test light should go on for more than two seconds.
Note!
The test can only be made at temperatures between -25°C (-14°F) to +2°C (+35°F).

7. Testing the Shut-off solenoid.
The test the shut-off solenoid remove the rubber cap on injection pump and insert a M 5x30 bolt into control rod.

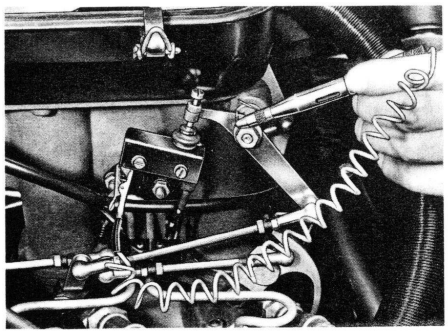
a. Start engine, run engine at 3000 to 4000 rpm, then decelerate. The control rod should move to the rear, i.e., opposite driving direction (zero delivery).

If the control rod does not move in the named direction, check rpm transducer and micro switch. If the switches are in order, replace shut-off solenoid.
This work can be done only by a qualified service shop.

8. Checking the rpm transducer (speed switch).

a. Connect test light to terminal 30b and ground.

b. Start engine and accelerate. The test light should go on at approximately 1500 rpm.



c. Decelerate. Test light should go out at approximately 1300 rpm. Replace rpm transducer if necessary.

9. Checking the Micro Switch.

a. Connect a hot wire to the terminal of the connection of micro switch.

b. Connect a test light from ground to terminal via a test lamp.

c. Turn on ignition and actuate switch. When pushing the actuating button, the test light should go on. The test lamp should go out when the actuating button is released. Replace micro switch if necessary.

10. Adjusting the Micro Switch.
The micro switch for interrupting the fuel supply under overrrunning conditions is adjusted as follows:

a. Release lock nut and loosen adjusting screw to the extent that the micro switch is not bridged in idling position.

b. From this position, turn adjusting screw down until the micro switch is barely bridged (audible clicking sound).

c. Turn adjusting screw in 1/2 to 3/4 of a turn and tighten lock nut.

FUEL INJECTION TROUBLE SHOOTING CHART

Symptom	Cause	Remedy
Hard starting when engine is cold	Improper starting procedure	Pull hand throttle valve up to stop at all outside temperatures. Do not use accelerator pedal when starting vehicle. When the engine starts, run for a short period in the preset hand throttle position. Then step on accelerator pedal until engine is running at approximately 4500 rpm. Release accelerator pedal and push hand throttle lever back until engine runs at approx. 1200 - 1400 rpm. If the engine speed increases as the temperature increases, set the hand throttle lever back accordingly until it rests against the bottom stop. If the engine does not start after 10 - 15 seconds, wait for 10 seconds and start again.
	Enrichment solenoid does not activate. Starting relay defective, Time limit relay for enrichment solenoid defective or response period too short.	Check electrical connections and voltage. Replace enrichment solenoid starting relay, as well as time limit relay, if necessary.
	Thermo-limit switch for cold starting device at outside temperatures below -10°C (+14°F).	Replace thermo-limit switch.
Hard starting when engine is hot	Improper starting procedure	Before starting a hot engine, the ignition should be turned on for approximately 5 seconds so that any vapor that may have formed in the system will be flushed out. Depress accelerator fully while starting.
	Enrichment solenoid does not activate.	Check connections and voltage on enrichment solenoid.
	Starting relay defective	Replace starting relay.
	Control rod remains in starting position.	Check to see that control rack is released after approximately 2 seconds. Check relay, enrichment solenoid and time limit relay, replace if necessary.
	Time control switch defective	Replace time control switch.

Symptom	Cause	Remedy
Rough engine idle	Idle air control on throttle valve housing incorrectly adjusted.	Adjusting air control screws with synchrometer P 235 (at 3000 rpm).
	Timing off.	Adjusting firing point (idling speed 0^{o} to -2^{o}, at 6000 rpm 30^{o} - 32^{o}).
	Restricted warm air flow to thermostat (engine excessively oily).	Eliminate restriction in lines, replace lines.
	Thermostat on injection pump defective (engine excessively oily).	Replace thermostat.
	Injection valves defective	Check injection jet, replace valve if necessary.
	Compression of individual cylinders varies	Check compression or pressure loss and make required adjustment.
	Cold weather starting device does not shut off.	Check cold weather starting device.
Engine won't start	Fuel delivery pump inoperative	Check power supply, replace pump if necessary.
	Fuel delivery pump running but with insufficient or no delivery	Check hose connections (suction-pressure-bypass), check voltage and current draw on electrical connections. Check fuel filter, replace if necessary.
	Starting relay defective	Replace starting relay
	Thermo-time switch defective	Replace thermo-time switch
	Control rack stuck	Replace injection pump
	Time limit relay switch defective	Replace time-limit relay
Engine won't start at temperatures below -10^{o} C	Cold starting device not operating	Check electrical connections, check voltage on electrical connections.
Engine misfires	Ignition system not in order	Check ignition system
	Fuel filter contaminated	Replace filter element

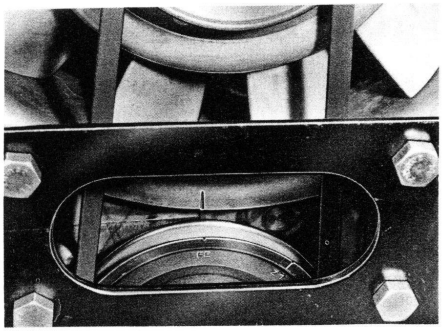
Symptom	Cause	Remedy
	Injection valves not in order	Check injection valves, replace if necessary
	Insufficient delivery of fuel delivery pump	Check delivered quantity, check hose connections as well as electrical connections on pump, install new pump if necessary
Poor transition during acceleration with warm engine (jerking and backfiring)	Injection pump adjustment not in order	Check adjustment with exhaust gas tester, adjust if necessary
	Improper linkage correlation	Check coordination and linkage correlation, adjust if necessary
Backfiring under overrunning conditions	Throttle valve housing not synchronized	Synchronize throttle valve housing with synchrometer P 235
	Micro switch out of adjustment	Adjust micro switch, replace if necessary
	Rpm transducer defective	Replace rpm transducer (speed switch)

Removing Injection Pump

1. Disconnect battery.

2. Remove air filter.

3. Set engine to end of delivery stroke (F-E) by bringing number 1 piston to TDC of compression stroke and then turning one complete revolution (360^{o}) in the direction of engine rotation. Continue slightly (about 40^{o}) beyond the TDC mark and align the "F-E" mark on the crankshaft pulley with the notch on the blower housing.

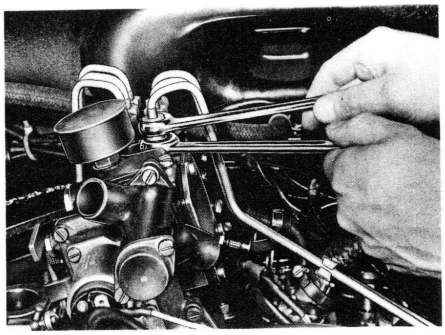


4. Disconnect wires from micro switch.

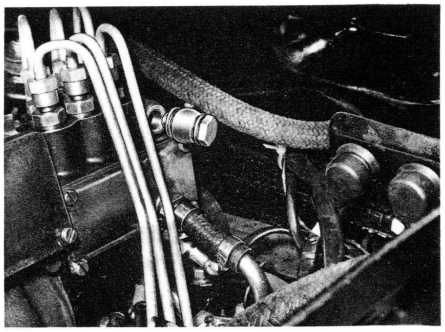
5. Remove wires from enrichment and shut-off solenoids (grey wire = enrichment solenoid; grey-red wire = shut-off solenoid).

6. Loosen warm air supply hose to thermostat.

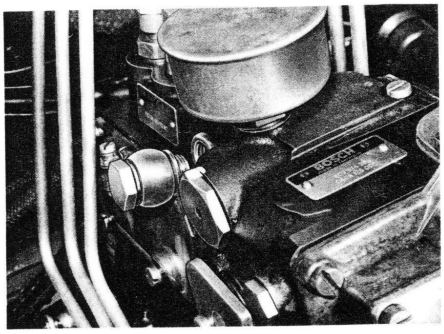
7. Disconnect injector lines at injection pump, prevent lines from turning by using a 19 mm flare nut wrench on line pressure fittings.



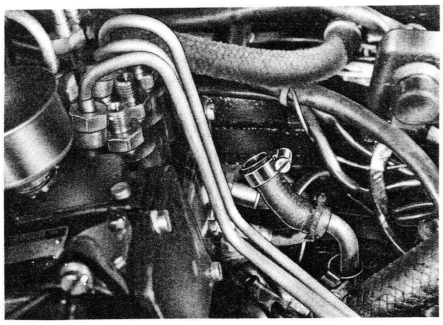
8. Disconnect fuel inlet line on right side of injection pump.



a. Disconnect return line on left side of injection pump.



9. Detach oil inlet and return lines.
When disconnecting the inlet (lower) line hold fitting with wrench. Loosen clamp on return line and pull line from connection.



10. Remove linkage between guide shaft and governor.

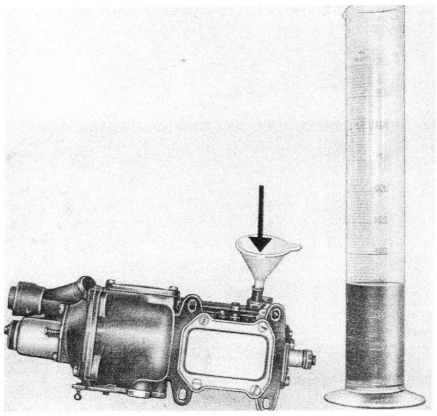
11. Remove injection pump retaining nuts on pump base with special tool P 120b.

12. Push spur belt off pump drive wheel. Secure spur belt (use rubber band) so that it does not fall off the driving wheel at the engine camshaft.

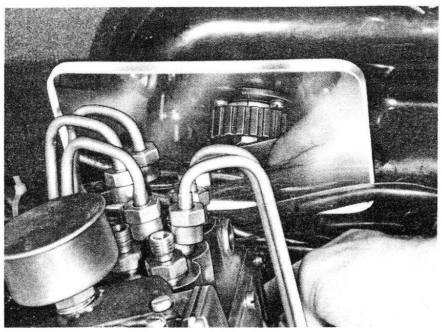
13. Remove injection pump from mounting bracket and lift out.
Note !
Do not lift pump by the barometric cell to prevent damage to unit.

Installing Injection Pump

1. Before installing injection pump place pump on side and fill through oil return flow connection (top hole) with approximately 300 cc (10 fl.oz.) oil (same as used in engine).



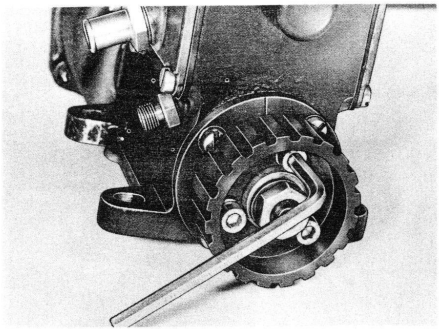
2. Set injection pump to end of delivery stroke (F-E mark). Align mark on crankshaft pulley with the notch on the blower housing.



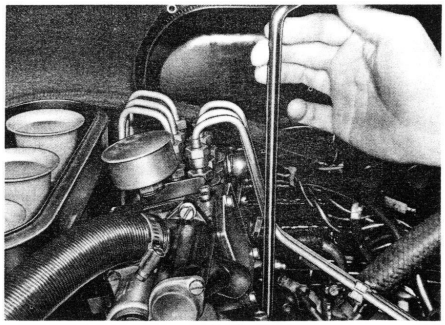
3. Check F-E position of engine again.

4. After installing pump and tightening nuts slightly, push toothed belt on drive pinion. Be sure, that the delivery end is not misaligned.

5. If the teeth on the drive wheel do not mesh with those of the belt, remove the pump and reset the drive wheel by loosening the 3 Allen head bolts.



6. Slightly tighten pump retaining nuts. Push pump sideways, using special tool P 234b, until the spur belt is properly tensioned. With thumb pressure at the center, the belt should give 6 - 8 mm (1/4 - 1/3 in.).

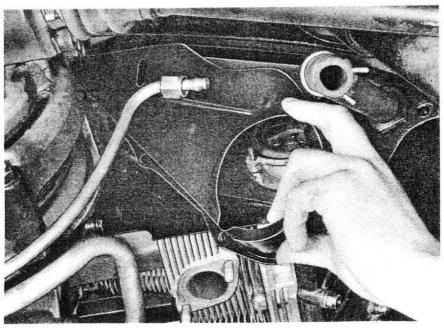


REPLACING SPUR BELT

1. Set engine and injection pump to end of delivery stroke (F-E mark).

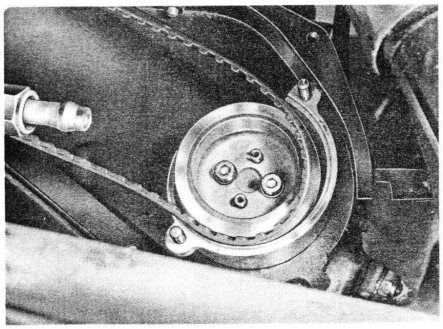
2. Remove left heat exchanger.

3. Remove left front engine cover.



4. Loosen pump retaining nuts. Move pump to the left within range of oblong holes using special tool P 120b.

5. Remove belt from drive sprocket.



6. Install new spur belt. Slightly tighten pump retaining nuts. Push pump sideways, using special tool P 234b, until the spur belt is properly tensioned. With thumb pressure at the center, the belt should give 6 - 8 mm (1/4 - 1/3 in.).

7. Install cover plate and heat exchanger. Use new gasket.

Additional Steps for Replacing Spur Belt on Sportomatic Model

Removing

1. Remove pressure and suction lines on oil pump.

2. Remove oil pump mounting bolts and remove oil pump.

Installing

1. Use new gasket.

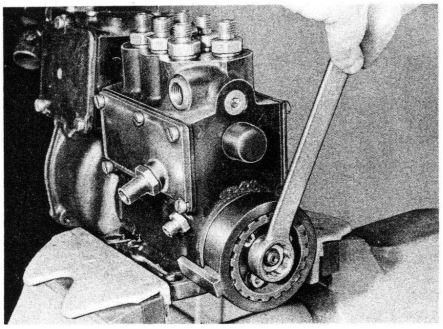
2. Mount cylindrical pin of oil pump shaft between clamping sleeves of camshaft.

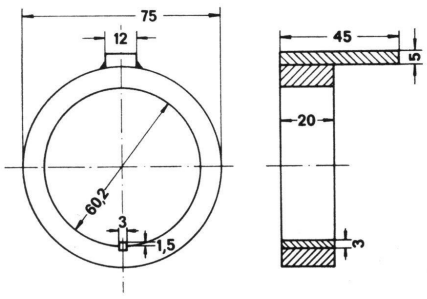
3. Use new gaskets for heat exchanger and tighten fastening nuts alternately and uniformly.

REPLACING SPUR WHEEL HUB

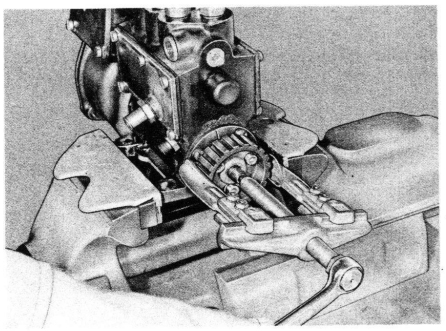
CAUTION:
Do not damage spur wheel when removing nut.

1. Mount injection pump in a vise and remove nut. Use an appropriate tool (or local manufacturers tool / see sketch).





2. Remove spur wheel and hub using a gear puller.



3. The conical contact surfaces of the pump camshaft and wheel hub must be free of grease at time of assembly. Torque hex nut of hub to 2.5 mkp (18 lb.ft.).

TIGHTENING TORQUES FOR FUEL INJECTION SYSTEM

Pump drive wheel retaining nut (M 12)	2.5 mkp (18.0 ft.lbs.)
Injection valve (nozzle)	3.0 mkp (22 ft.lbs.)
Injection lines at injection valves	1.0 mkp (7.2 ft.lbs. or 87.0 in.lbs.)
Injection pump fuel inlet connector	4.0 mkp (29.0 ft.lbs.)

ADJUSTING FUEL INJECTION PUMP WITH EMISSION TESTER

1. Bring engine to operating temperature approx. + 80°C (+ 175°F).

2. Connect emission tester according to manufacturer's instructions.

3. Connect thermometer for monitoring intake air temperature.

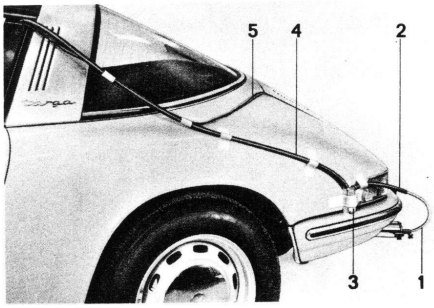
4. Check emission values through road test or dynamometer test.

5. Determine exhaust emission values under partial load with throttles open 7° and engine speed at constant 2, 500 rpm in second gear. Emission values are shown in charts on pages SF 38 and 39.

SAMPLE ROAD TEST PROCEDURE USING SUN-CCT-262 EMISSION TESTER

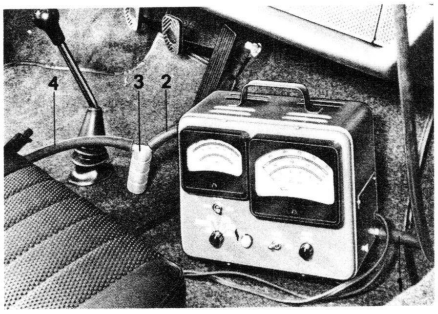
1. Insert flex probe approx. 400 mm (16 in.) into muffler exhaust pipe.

2. Attach connecting hoses and 2 water separators as shown in illustration.



1 Flexible exhaust gas probe
2 Connecting hose, short
3 Water separator
4 Connecting hose, long
5 Connecting wire for emission tester and thermometer

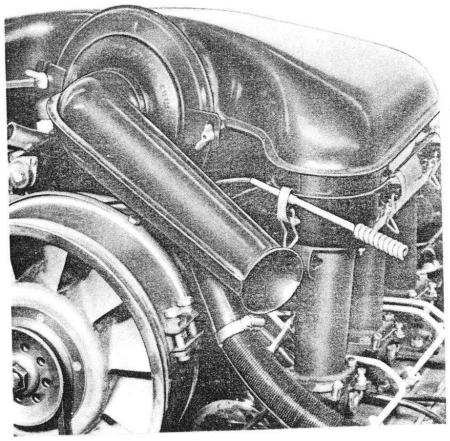
3. SUN tester electrical connections: red terminal to hot wire at fuse box; black wire to ground; blue wire to Terminal 1 in distributor.



1 Hose to outside (instrument exhaust)
2 Connecting hose, short
3 Water separator
4 Connecting hose, long

4. Connect intake air monitoring thermometer (special tool P 237).

Intake air preheating hose at the air cleaner assembly must be disconnected during the test.



5. Attach protracter with pointer to left throttle valve lever. Set pointer to 0^{o}.

   Note!
   Hand throttle lever should be pushed fully down to stop.

6. Adjust hand throttle to 7^{o}, while actuating accelerator pedal several times to relieve tensions on the linkage.

7. Calibrate unit (with hose of probe removed).

8. Following the calibration, connect hose of probe to unit input, place hose from unit output to lead outside.

   Caution!
   Be sure that exhaust gases do not enter the passenger compartment (danger of poisoning).

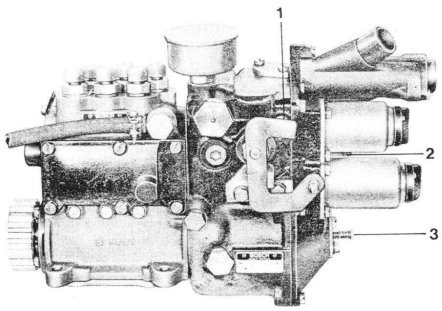
9. Run engine to operating temperature.

10. Shift to second gear, accelerate vehicle on road, brake engine with pedal brake until a speed of 2500 rpm is attained. Read exhaust gas data.

11. If the exhaust gas readings are too high or too low, shift performance field on control rack head of injection pump.

Adjusting

a. Remove Allen head screw on inlet to control rack head.



1 Bolt 8 mm
2 Allen head screw at inlet of control rack head
3 Idle speed adjusting screw

b. Remove 8 mm bolt (transmission lever support) on the left rear housing of the injection pump to gain access to the adjustment screw inside the pump.
   Adjustment of the performance field is made with special screw driver P 229 b.

c. Turn adjusting screw on control rack head with screw driver. Clockwise for "leaner", counter-clockwise for "richer" adjustment.

d. Depending on deviation from specified CO value, the adjusting screw should be shifted from 1 to 2 notches, then check exhaust gas values again during a driving test.
Note!
Tighten access bolt before starting engine (on 2 liter engines only).

Note!
Turning the adjusting screw on the control rack head will change the adjusted quantity of fuel and thereby the CO value in all ranges of the performance field. The idle speed adjustment should therefore be checked after each correction.

Adjusting Idle Speed

1. Run engine to operating temperature.

2. Check idle speed. If the idle speed is incorrect, adjust idle speed air screws on throttle valve housings accordingly. Turning in lowers idle, turning out increases idle. Then check air flow for individual cylinders at 3000 rpm, using synchrometer special tool P 235.

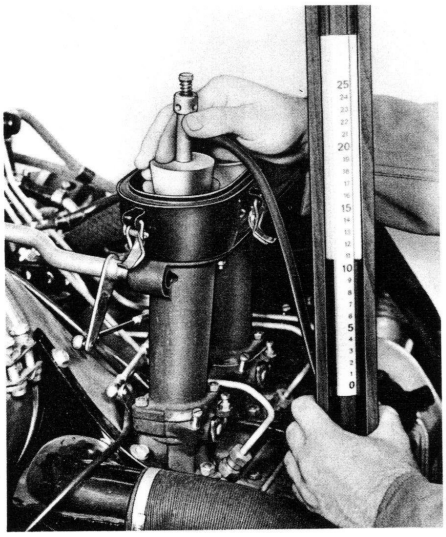
3. Connect exhaust gas analyzer and check CO content. If the CO quantity is not within specifications readjust idle speed injection quantity on pump.

4. For this purpose, stop engine, push elastic idle speed adjusting knob down with special tool P 230b until it locks.

5. For a leaner mixture turn adjusting screw counterclockwise; for a richer mixture turn clockwise.
Do not adjust by more than one notch at a time. Maximum of 3 notches may be adjusted toward either the right or left starting from the basic position.

6. Adjust idle speed again to specified value by idle speed air screws. Measure again with synchrometer for uniform vacuum in intake pipes.

Note!
The adjustments in the partial load and idle range should be done as quickly as possible, so that the intake passages do not heat up. Prior to continuing exhaust gas measurements (road or roller test stand) drive vehicle for a short period or run at higher speed (approximately 3000 rpm), so that the intake passages will cool down.

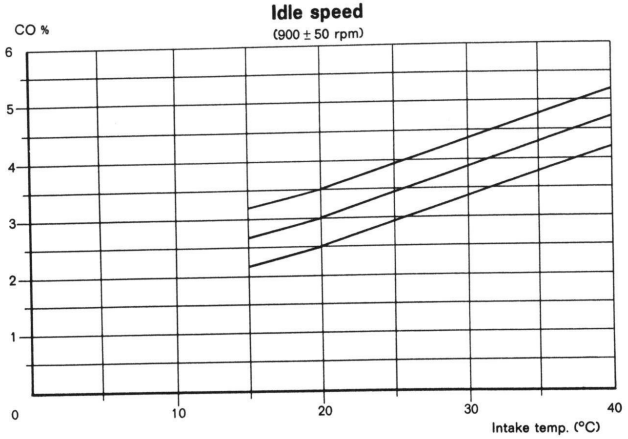


Influence of intake air temperature on CO values

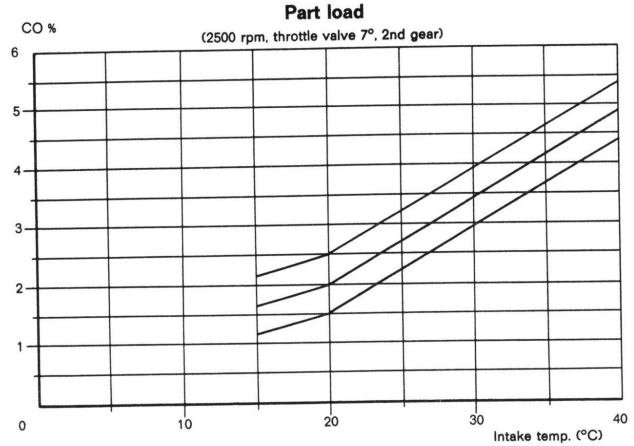
Oil temperature 80° C (176°F)

911 E

Idle speed
(900 ± 50 rpm)



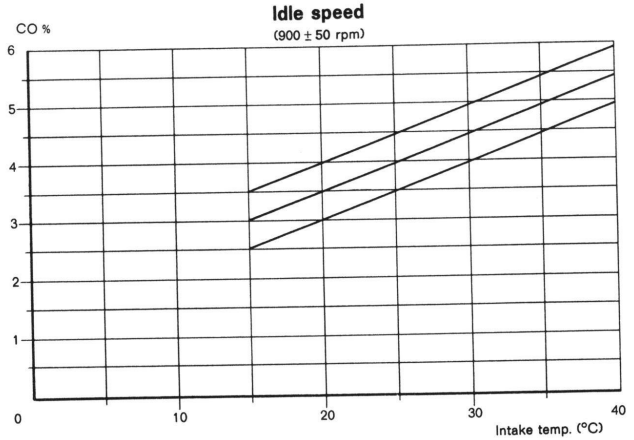
Part load
(2500 rpm, throttle valve 7°, 2nd gear)



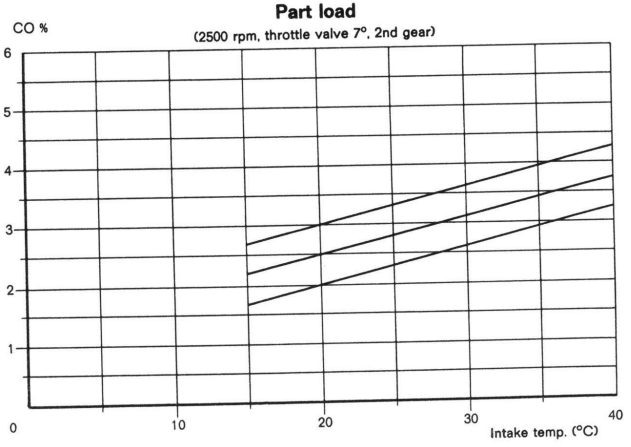
Full load, 3000 rpm, 4.5 - 6 % CO

911 S

Idle speed
(900 ± 50 rpm)



Part load
(2500 rpm, throttle valve 7°, 2nd gear)



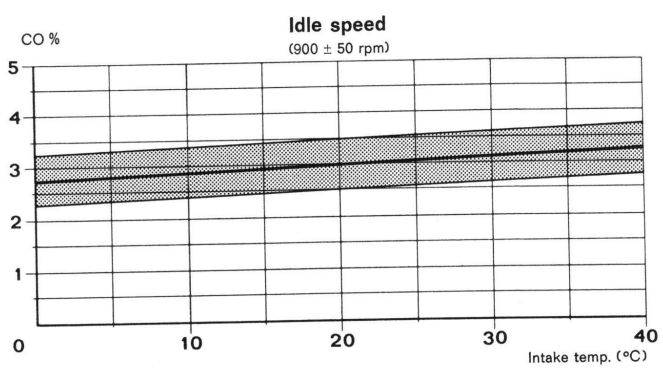
Full load, 3000 rpm, 5 - 6.5 % CO

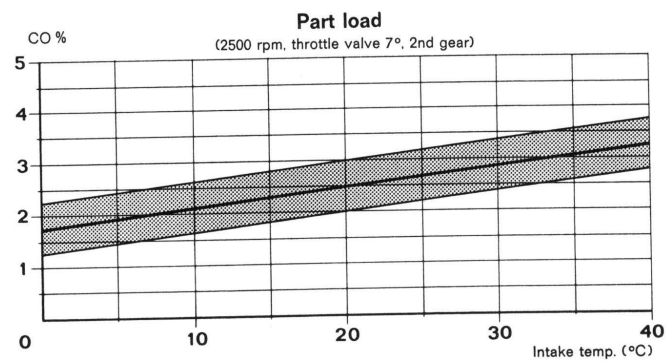
Influence of intake air temperature on CO values of the 2,2 l engines

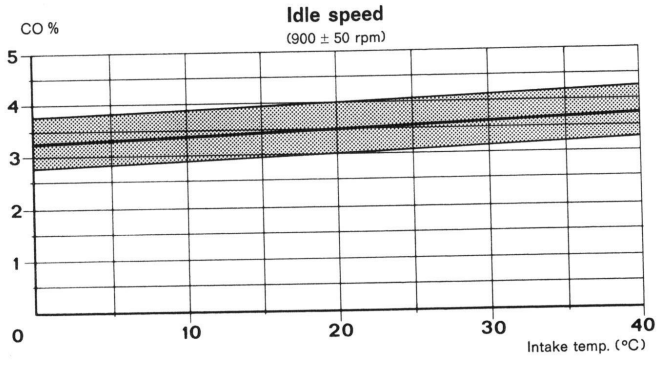
911 E-C

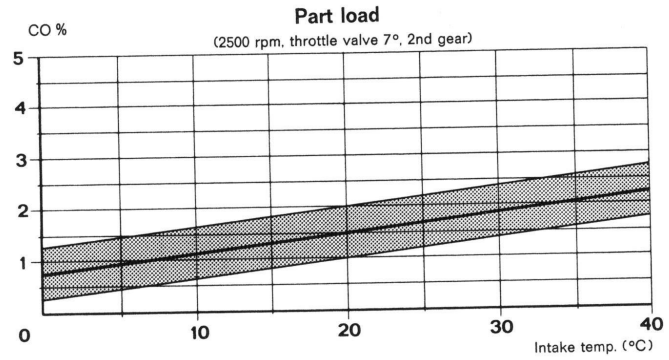
Oil temperature 65 - 80° C (150 - 175° F)

911 S-C









AIR FLOW RATE OF THROTTLE VALVES IN PARTIAL LOAD RANGE
SPECIFICATIONS AND ADJUSTMENTS

General

When the throttle valves are actuated, each intake pipe should have the same vacuum, so that each cylinder draws the same quantity of air.
If a cylinder draws in more air, this cylinder will have a leaner mixture. Since the same amount of fuel is injected into the cylinder, but the intake air volume is higher, the cylinder shows a backfiring and knocking tendency.

The air flow rate should therefore be measured with the throttle valves at partial load position. This requires the synchrometer special tool P 235. If the vacuum measuring instrument does not react when the air correction screws are turned, check and clean the air ducts in the throttle valve housing if necessary.

Adjusting

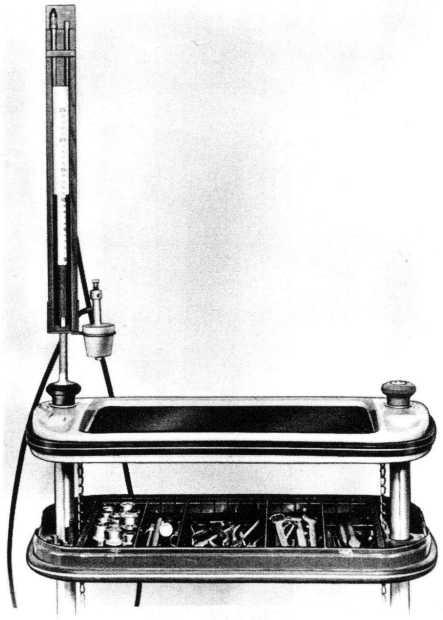
Measure as follows:

1. Run engine to operating temperature (60-80°C/ 140-176°F). Adjust engine speed with hand throttle to 3000 rpm.

2. Position rubber plug of measuring instrument in sequence on the individual intake funnels, read pertinent position of fluid column and record reading.

3. Add these values and divide by the number of cylinders (6). Then set each cylinder to this mean value by turning the air correction screws.

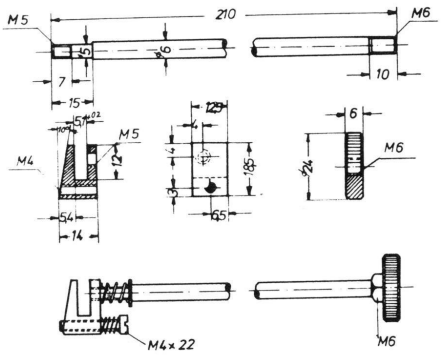
Synchrometer, Special Tool P 235



Tool for 7° Throttle Setting

The throttle valves must be held open in the 7° position when checking exhaust emissions under partial load. A tool can be made so that the 7° setting can be maintained. This tool is attached to the control lever of the fuel injection pump and does not prevent lever movement in the full throttle direction. The adjusting screw allows the control lever to be adjusted to the described throttle valve opening.

Specifications for the self-made tool are shown in the sketch below.



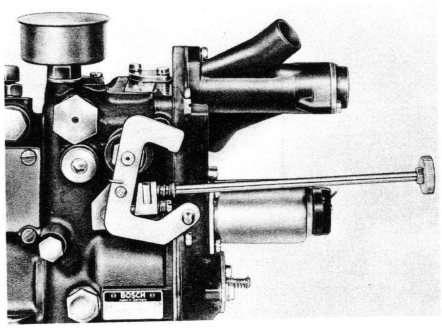
Checking 7° Throttle Setting

1. Attach protractor P 228 b to the left throttle valve housing.
2. Attach pointer and set to zero (0°).

Note

Hand throttle must be in release position (fully down).

3. Place self-made tool on the control lever of the fuel injection pump and screw with retaining bolt (See illustration).
4. Turn adjusting screw until the pointer indicates 7° on the protractor.



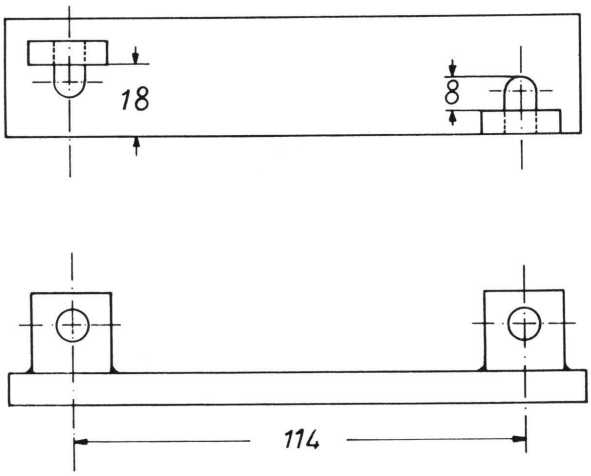
Fixture for Checking Basic Adjustment of Pump Control Lever Actuating Arm

When checking adjustment of the fuel injection pump by means of the exhaust emission tester, it is necessary to check correlation prior to each emission test.

The fixture shown below can be locally manufactured to provide easy means for checking the pump actuating rod.

Adjusted length of pump actuating rod: 114 ± 0.2 mm (4.49 ± 0.01 in)

Materials:		
	1 section flat steel stock	145 x 30 x 8 mm (5.7 x 1.2 x .31 in)
	2 sections flat steel stock	20 x 20 x 6 mm (.8 x 8 x .24 in)
	2 sections round steel stock	8 mm dia, 16 mm long (.31 in dia, .62 in long)



ELECTRIC FUEL PUMP FOR 911 T-C (1970 MODEL)

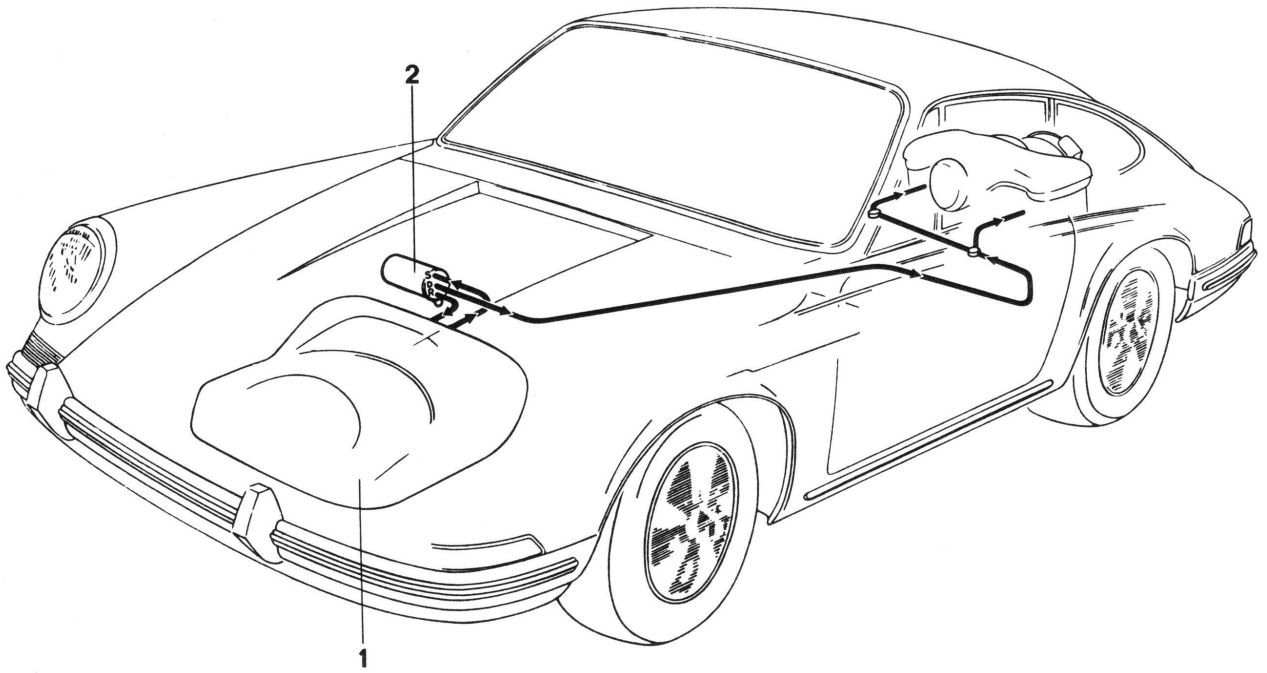
The 1970 model 911 T vehicles have an electric fuel pump. This pump is similar to the type pump used on the 911 E and S models.

Refer to the following table to note pump differences.

Vehicle Type	911 T	911 E and S
Part number	911.608.107.00	901.608.105.00
BOSCH number	058096 0009	058097 0001
Operating pressure	0.3 atm (4.3 psi)	1 atm (14.2 psi)
Pressure relief valve opens from	0.2 - 0.3 atm (2.8 - 4.3 psi)	approx. 2 atm (28 psi)
Fuel delivery capacity	80 liters per hour	125 liters per hour
Markings	Blue dot on pump housing (across from the fuel line connecting points) Stamped on BOSCH number	No color markings (Stamped on BOSCH number)
Current draw	2.5 A @ 12 V	3.5 A @ 12 V
RPM	approx. 2000	approx. 2800

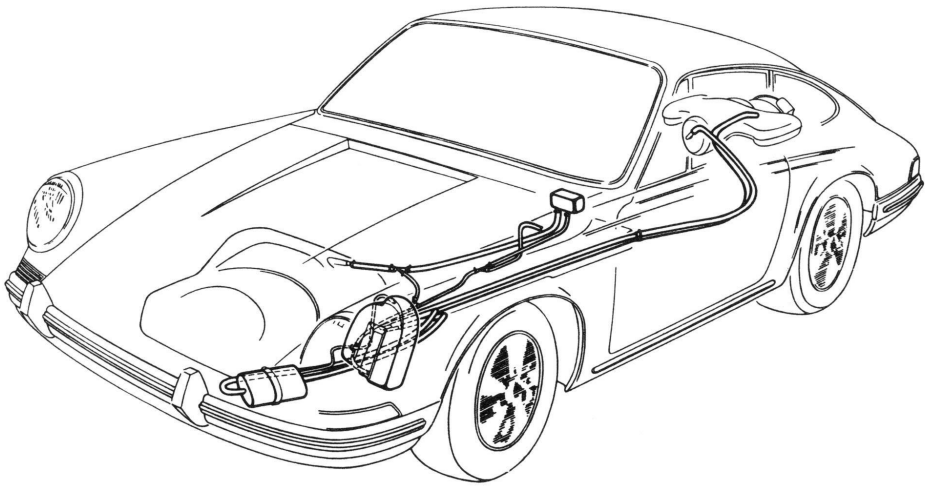
FUEL DELIVERY SCHEMATIC

1970 TYPE 911 T-C

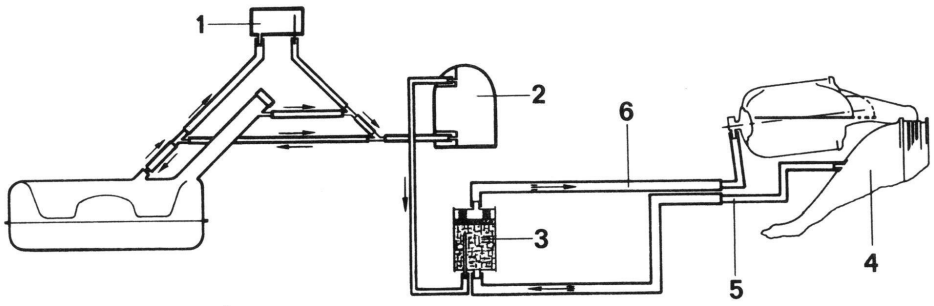


1 Fuel tank

2 Fuel delivery pump



The vapors escaping from the fuel tank pass thru a line to an expansion chamber to a vent chamber, then directly to a container filled with activated charcoal. The hydrocarbon fumes are then trapped on the surface of the charcoal. When the engine is running, air from the cooling fan purges the charcoal container. The fumes are then immediately drawn off by the air container where the fumes are mixed with the induction air. This is a regenerative process that can be repeated indefinitely.

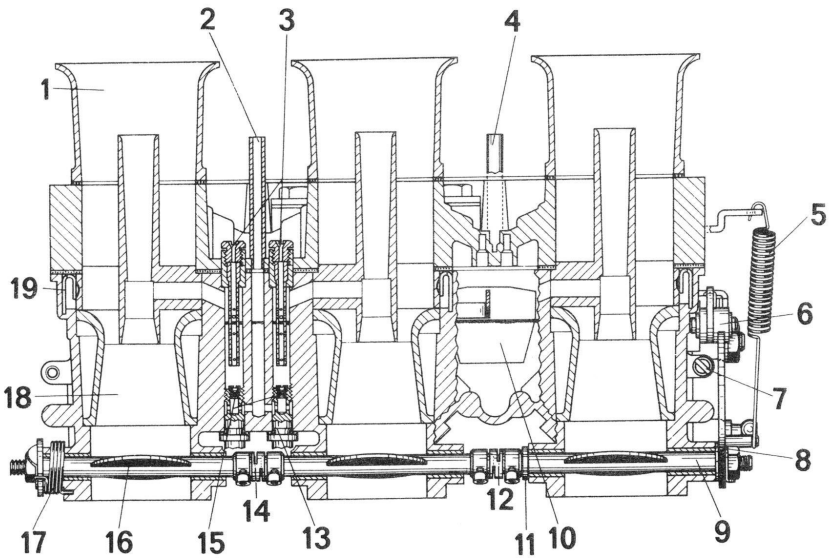


1. Expansion chamber
2. Vent chamber
3. Activated charcoal container
4. Engine fan upper shrouding
5. Pressure line from fan to activated charcoal container
6. Purging line from charcoal container to engine air cleaner

General

The type 911 T-C engines are equipped with two Zenith 40 TIN downdraft carburetors.
Each carburetor has two float chambers and three throats. Each throat having an accelerator pump that can be separately adjusted. An auxiliary enrichment system keeps emissions to a minimum.
The throttle valve shafts are connected by couplings and have the throttle valve lever attached to one end of the connected shafts. A pivot attached to the throttle valve lever actuates a rod which engages the accelerator pumps.

Side view

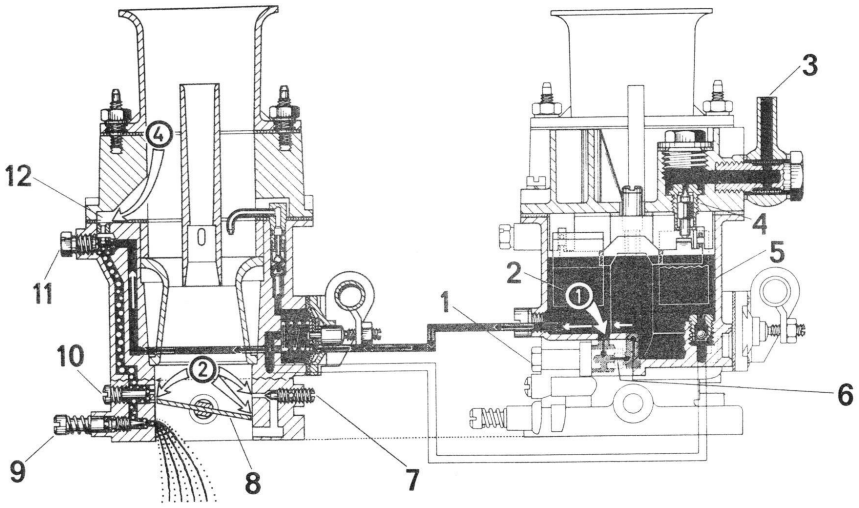


1. Velocity stack
2. Float chamber vent
3. Air correction jet and emulsion tube
4. Float chamber vent
5. Return spring
6. Pump lever with roller
7. Idle speed adjusting screw
8. Spring washer
9. Throttle valve shaft
10. Double float
11. Thrust washer
12. Coupling
13. Main jet housing
14. Coupling
15. Main jet
16. Throttle valve
17. Throttle valve shaft return spring
18. Venturi
19. Pre-atomizer retaining clip

IDLE CIRCUIT

Each mixing throat has its own idle system. Fuel required for idle is drawn from the float chamber via the main jet circuit. The fuel is then metered by the idle jet and mixed with air drawn in through the pressed-in idle air jet. This emulsion is then channeled to an opening below the closed throttle valve. Flow rate through the opening is regulated by the idle mixture control screw. Air passing the partially open throttle valve mixes with the idle emulsion, creating the proper idle air/fuel mixture.
Just above the throttle valves are the transition ports. When the throttle valves are opened, vacuum draws air/fuel from these ports. This permits smooth transition from idle speed to higher speeds.

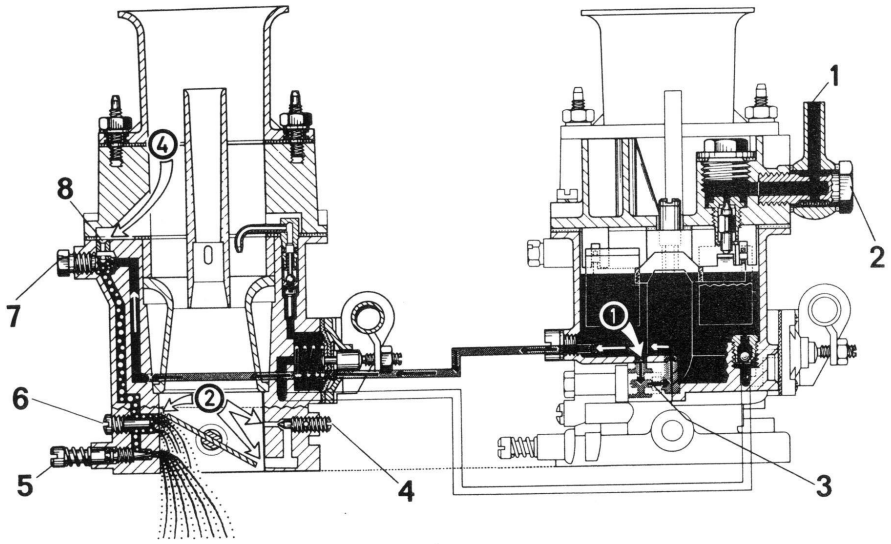
Idle Speed



1. Main jet housing
2. Double float
3. Fuel inlet line
4. Float needle valve
5. Float chamber
6. Main jet
7. Air bypass control screw
8. Throttle valve
9. Idle mixture control
10. Threaded plug
11. Idle jet
12. Idle air bleed

(1) Fuel inlet
(2) Induction air flow
(4) Idle air inlet

TRANSITION CIRCUIT



1. Fuel supply line
2. Hollow bolt
3. Main jet
4. Air bypass control screw
5. Idle mixture control screw
6. Threaded plug
7. Idle fuel jet
8. Idle air bleed

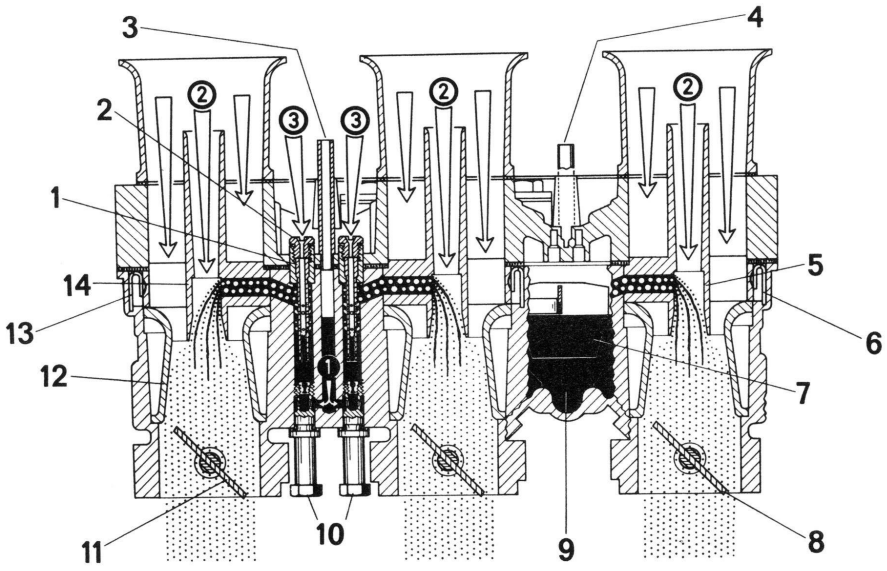
① Fuel inlet

② Induction air flow

④ Idle air inlet

MAIN JET CIRCUIT

The fuel flows through the main jet into the emulsion tube. The air correction jet meters the air which flows to the emulsion tube. Vacuum in the mixing throat draws fuel out of the emulsion tube through a passage. Air enters through the air correction jet. Passes through the openings in the emulsion tube, where it mixes with the fuel forming an air/fuel mixture.



1. Emulsion tube
2. Air correction jet
3. Float chamber vent
4. Float chamber vent
5. Pre-atomizer
6. Retaining clip
7. Double float
8. Throttle valve
9. Float chamber
10. Main jet housing with jets
11. Throttle valve
12. Venturi
13. Retaining clip
14. Pre-atomizer

(1) Fuel inlet
(2) Induction air flow
(3) Compensating air inlet

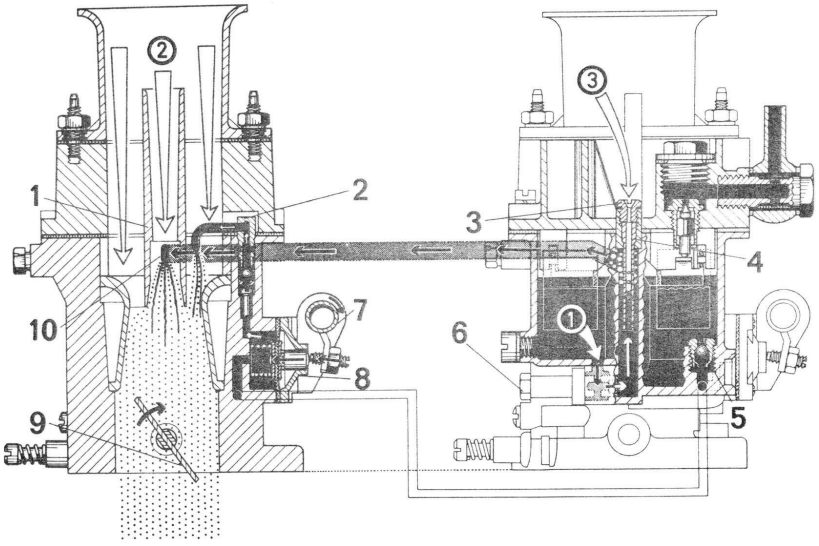
ACCELERATOR PUMP CIRCUIT

The accelerator pump provides the necessary fuel from the moment when the throttle is quickly opened to the time when the main jets take over.

The fuel is forced out of the pump chamber and flows through ports to the calibrated injection tube which delivers the fuel into the mixing throat.

As the throttle closes, the suction stroke of the pump begins and the fuel flows from the float chamber through the pump check valve into the pump chamber. The pump inlet valve prevents the fuel from flowing back into the float chamber on pressure stroke. A second ball check valve is located in the injection tube. This valve prevents air from entering the pump chamber on the suction stroke.

Pump stroke length determines the quantity of fuel to be discharged. The duration of the fuel discharge is determined by the size of the injection tube.



1. Pre-atomizer
2. Injection tube
3. Air correction jet
4. Emulsion tube
5. Accelerator pump inlet valve (closed)
6. Main jet housing with main jet
7. Accelerator pump shaft
8. Diaphragm accelerator pump
9. Throttle valve
10. Discharge port

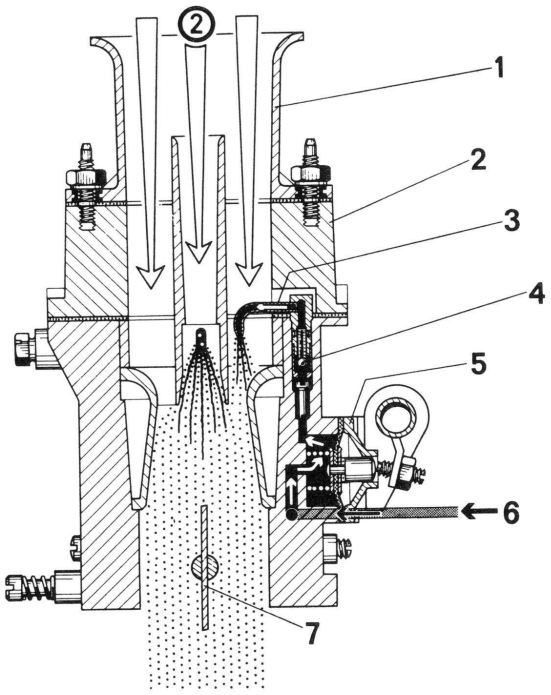
(1) Fuel inlet

(2) Induction air flow

(3) Compensating air inlet

POWER ENRICHMENT

When running the engine under full load, high vacuum draws fuel from the accelerator pump injection tube and ensures proper enrichment of the fuel/air mixture.



1. Velocity stack
2. Carburetor cover
3. Pump discharge nozzle
4. Ball check valve (open)
5. Diaphragm pump
6. Fuel inlet
7. Throttle valve

(2) Induction air flow

AUXILIARY ENRICHMENT FOR OVERRUN CONDITIONS

General

When the engine operates under closed-throttle, overrun conditions, partial or no combustion takes place. This results in very high hydrocarbon emission in the exhaust gases.

The auxiliary enrichment system is activated on the overrun and provides all cylinders with the correct amount of clean fuel/air mixture to ensure combustion.

This enrichment system consists of an auxiliary mixture valve, solenoid valve, and rpm transducer.

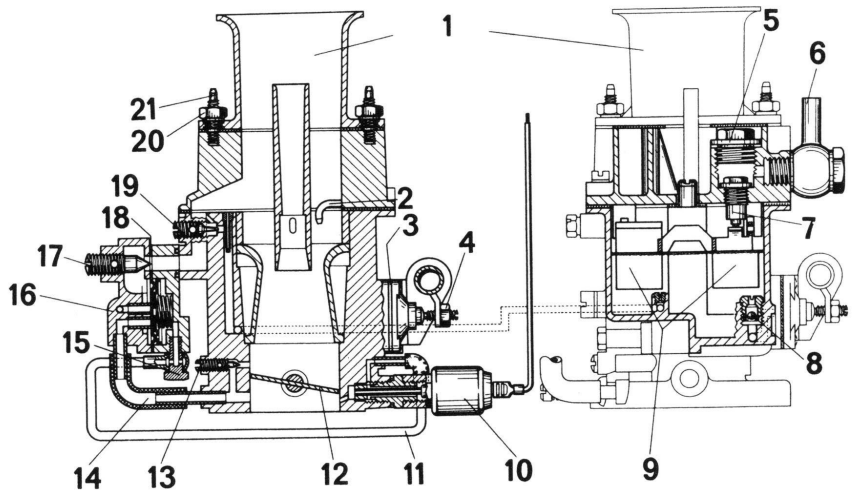
During overrun conditions, at engine speeds above 1350 rpm, the rpm transducer activates a solenoid valve. This allows the high vacuum to reach the diaphragm of the mixing valve, causing the valve to open. Additional fuel/air then flows to the individual intake manifolds.

When the engine speed drops below 1300 rpm, the mixing valve closes and the idle circuit takes over.

As the throttle valves are re-opened (acceleration), a micro switch on the accelerator linkage shuts off the auxiliary enrichment device.

AUXILIARY ENRICHMENT FOR OVERRUN CONDITIONS

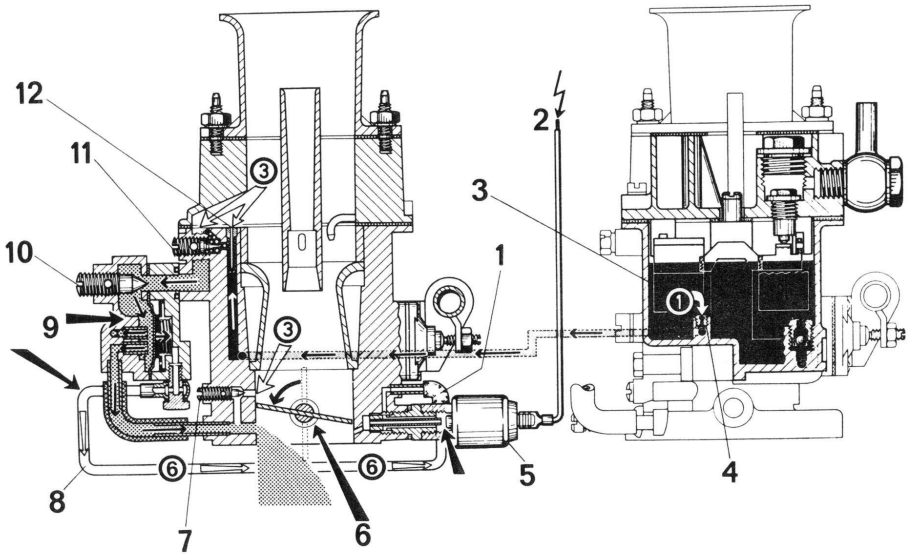
SCHEMATIC VIEW



1. Velocity stack
2. Injection tube
3. Accelerator pump
4. Adjusting screw
5. Threaded plug
6. Fuel inlet
7. Float needle valve
8. Accelerator pump inlet valve
9. Double float
10. Enrichment solenoid
11. Vacuum line
12. Throttle valve
13. Air control screw
14. Connecting hose
15. Hollow bolt for vacuum line
16. Mixing valve
17. Flow rate adjusting screw
18. Diaphragm
19. Auxiliary mixture control screw
20. Nut
21. Stud

AUXILIARY ENRICHMENT FOR OVERRUN CONDITIONS

FUNCTION SCHEMATIC



1. Vacuum line
2. Current from RPM transducer
3. Float chamber
4. Metering jet for mixing valve
5. Enrichment solenoid open, vacuum to mixing valve diaphragm
6. Throttle valve closed, engine on overrun
7. Air bypass control screw
8. Vacuum line
9. Vacuum opens mixture valve
10. Flow rate adjusting screw
11. Mixture control screw
12. Plunger jet

(1) Fuel inlet

(3) Compensating air inlet

(6) Vacuum

CARBURETOR SPECIFICATIONS

Carburetor Types	SOLEX-ZENITH 40 TIN Standard Version		SOLEX-ZENITH 40 TIN - with mixture enrichment for overrun		
Vehicle Type Engine Type	911 T (70 and 71 models) 911/03, 911/06		911 T (70 and 71 models - USA) 911/07, 911/08		
From engine number	911/03 610 0001 911/06 610 3001	610 2400 610 3169	911/07 610 5001 911/08 610 8001	610 8564 610 8001	911/08 611 9553
To engine number	911/03 610 2545 911/06 610 3177		911/07 610 8563 911/08 610 8267		
Effective date	September 1969	March 70 change	September 1969	March 70 change	September 1970 change
Venturi	K 27.5		27.5		110
Main jet	Gg 115		115		170
Air correction jet	a 185	195	185	195	
Emulsion tube	4 mm dia.	4.3 mm dia.	4 mm dia.	4.3 mm dia.	
Idle fuel jet	g 47.5		47.5		47.5 p
Idle air bleed	u 140	155	140	165	
Float needle valve	P 1.5		P 1.5		
Float weight	15.7 g		15.7 g		
Injection quantity	0.5 ± 0.1 cc/ stroke		0.5 ± 0.1 cc/ stroke		
Injection nozzle	0.3 cal.		0.3 cal.		
Bypass bore	0.7/0.7/1.1/1.1	0.65/0.75/1.1/1.1	0.7/0.7/1.1/1.1	0.65/0.75/1.1/1.45	
Fuel jet			Mixture enrichment for overrun 50		
Air correction (submersion jet)			100		
Idle speed	900 ± 50 rpm		900 ± 50 rpm		
CO exhaust emissions (% by volume) At idle speed At 1200 rpm	3.5 ± 0.5 %		3.5 ± 0.5 % approx. 3 %		

ADJUSTING ZENITH 40 TIN CARBURETOR

Adjusting Idle Speed

Before adjusting idle speed, bring engine to operating temperature (oil temperature of about 80° C) and make sure that ignition timing and dwell angle are correctly set.

Note

Make sure that the hand throttle lever is fully down.

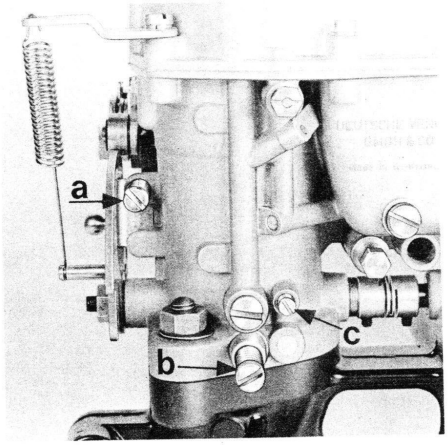
Adjusting

1. Remove air cleaner.

2. Detach actuating linkage from cross-shaft.

3. Turn idle mixture control screws fully in, then open up by two and one half (2 1/2) turns.

4. Close air bypass control screws.



a. Idle speed adjusting screw
b. Idle mixture control screw
c. Air bypass control screw

SOLEX-ZENITH CARBURETOR SPECIFICATIONS

Carburetor Type	40 TIN, Standard		40 TIN with auxiliary enrichment for overrun		
Vehicle Type	911 T-C		911 T-C USA (Sweden from 1971 on)		
Engine Type (internal)	911/03 911/06		911/07 911/08		
From engine number	911/03 = 610 0001 911/06 = 610 3001	610 2400 610 3169	911/07= 610 5001 911/08= 610 8001	610 8564 610 8001	911/08= 611 9553
To engine number	911/03 = 610 2545 911/06 = 610 3177		911/07= 610 8563 911/08= 610 8267		
Effective date	Sep 69	Mar 70 modification	Sep 69	Mar 70 modification	Sep 70 modification
Venturi	K 27.5		27.5		
Main jet	Gg 115		115		
Air correction jet	a 185	195	185	195	110
Emulsion tube	4 mm dia.	4.3 mm dia.	4 mm dia.	4.3 mm dia.	170
Idle fuel jet	g 47.5		47.5		
Idle air bleed	u 140	155	140	165	47.5p
Float needle valve	P 1.5		P 1.5		
Float weight	15.7		15.7 g		
Injection quantity	0.5 ± 0.1 cc/stroke		0.5 ± 0.1 cc/stroke		
Injection tube	0.3 cal		0.3 cal		
Bypass bore	0.7/0.7/1.1/1.1	0.65/0.75/1.1/1.45	0.7/0.7/1.1/1.1	0.65/0.75/1.1/1.45	
			Auxiliary enrichment for overrun		
Fuel jet			50		
Air correction (plunger)			100		
Idle speed	900 ± 50 rpm		900 ± 50 rpm		
Emission values CO emissions %					
CO emission at idle speed	3.5 ± 0.5 %		3.5 ± 0.5 %		
CO emission at rpm rise of 1200 rpm	-		approx. 3 %		

5. Start engine.

6. Using the P 227 synchrotester, make the initial carburetor adjustment by checking cylinders ≠ 1 and ≠ 4 and turning the idle speed adjusting screws (throttle stops) as necessary; adjust at approx. 1000 rpm.

7. Synchronize the cylinders 1-3 and 4-6 by adjusting the air bypass control screws.
   Note
   The air bypass control screw in the mixing throat with the highest rate of air flow (measured with air bypass screws closed) must definitely remain closed (reference throat) while the other throats of that cylinder bank are adjusted.
   The air bypass screws should be opened as little as possible.

8. Adjust all idle mixture control screws to smoothest engine performance.
   First turn the idle mixture control screws in to "lean", then gradually out to "rich" until the engine runs smoothest.

9. If the idle speed has changed, readjust the idle speed adjusting screws. Check for equal air flow in right and left bank, so that the specified idle speed of 900 ± 50 rpm is attained.

10. Check exhaust emissions. CO value should not exceed 3.5 ± 0.5 %. Readjust idle mixture control screws if necessary.

11. Reconnect control linkage. Make sure that the ball joints engage without preload at idle speed. Check cross-shaft; should not stick or bind.

ADJUSTING AUXILIARY ENRICHMENT SYSTEM

General

Before adjusting the auxiliary enrichment system check that the:

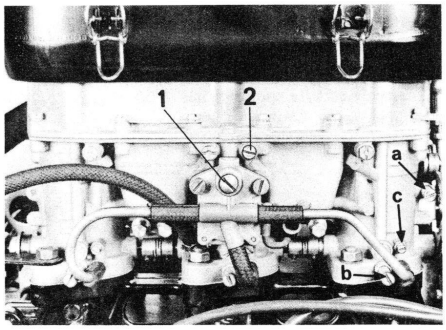
- engine is at operating temperature (oil temperature of 80° C)
- ignition timing is adjusted correctly
- exhaust emissions are below 3.5 ± 0.5 % CO
- idle speed is correct 900 ± 50 rpm

The two auxiliary enrichment valve assemblies are situated at the mixing throats of cylinders ≠ 2 and ≠ 5.

Adjustment

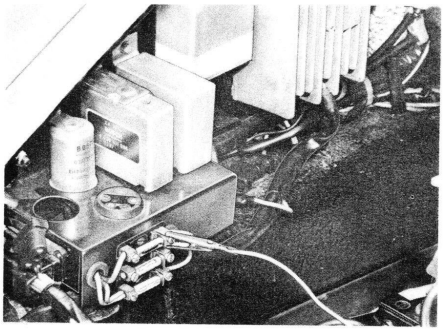
1. Basic setting of the auxiliary enrichment control screws is two (2) full turns out (open).

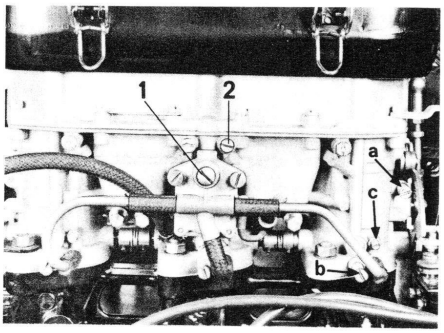
2. Turn in the adjusting screw of the microswitch until the contact points close (listen for click sound). Then turn the screw in an additional one-half (1/2) turn.



1 Flow rate adjusting screw
2 Auxiliary mixture control screw

3. Disconnect the grey/red wire from solenoid for auxiliary enrichment device. Connect the jump wire from source of power (such as the positive battery terminal or top fuse in fuse box) to the free terminal at the solenoid.





1 Flow rate adjusting screw
2 Auxiliary mixture control screw

Note
When starting the engine the idle speed will increase slightly because the solenoid for auxiliary enrichment device has been activated.

4. Start engine.

5. Turn the flow adjusting screw on both the right and left carburetors in or out until the engine idles between 1150 - 1250 rpm.

6. Using a synchrotester, check the air flow rate in cylinders ≠ 2 and ≠ 5. Balance out as necessary by re-adjusting the flow rate adjusting screws. Should the engine speed change, turn the flow rate adjusting screws either in to lower rpm, or out to increase rpm.

7. Turn in the auxiliary mixture control screw in left and right carburetor so that the rpm rise will just begin to drop. Turn out the screws until the highest engine speed is reached. Do this separately on both carburetors.

8. Connect exhaust gas analyzer and measure CO content. The CO content should be 3 % at the increased idle speed of 1150 - 1250 rpm.

If this emission value is not reached, proceed as follows:

a. Adjust the CO content to the specified value by evenly turning the flow rate adjusting screws (turning out - richer, turning in - leaner).

b. Recheck and balance out the auxiliary enrichment system as described in paragraph 6, above.

c. Check if rpm rise of 1150 - 1250 rpm is attained after a quick actuation of the throttle. If the speed hangs up at about 1800 rpm, reduce the engine speed by evenly turning in both flow rate adjusting screws.

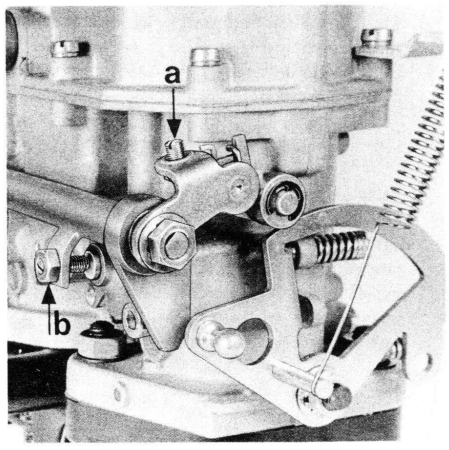
d. Recheck balance of the auxiliary system at cylinders ≠ 2 and ≠ 5 and check CO content.

10. Remove jump wire and reconnect grey/red wire to enrichment solenoid.

ADJUSTING ACCELERATOR PUMPS

1. Turn the self-locking adjusting screws "a" at the pump shaft lever until the 3 actuating fingers on the pump shaft are positioned vertically (straight up and down).

2. Loosen adjusting screws "b" on the actuating fingers.

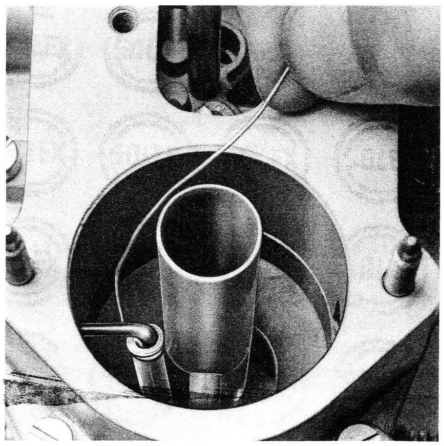


Caution

To prevent inacurate reading do not adjust the injection quantity while the engine is hot.

3. Turn in adjusting screws of accelerator pumps for cylinders ≠ 1 and ≠ 4 until they lightly touch the pump plungers. Tighten lock nuts.

4. Check discharge quantity in cylinders ≠ 1 and ≠ 4 with measuring tube P 25a. Nominal quantity is 0.5 ± 0.1 cc per stroke. Activate lever once or twice before taking measurement. If the discharge quantity is too high, turn the adjusting screws on the actuating fingers farther in. Adjust as necessary.



5. Adjust the other accelerator pump screws as described above in paragraph No. 3. Recheck discharge quantity and correct if necessary.

Note

Fuel should flow from the injection tube as soon as the accelerator pump is actuated. If fuel does not flow immediately, the pump inlet valve may be defective.

CHECKING AND ADJUSTING CARBURETOR FLOAT LEVEL

Special Tools:

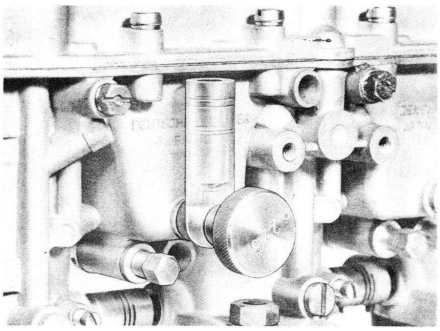
P 226b Float level gauge

Note

The two lower lines on the float level gauge apply to the 40 TIN ZENITH carburetors. These lines are 17 and 18 mm respectively when measured from the top edge of the carburetor (without gasket).
The upper two lines on the gauge are for adjusting the float level of Weber carburetors.

Float Level Check

1. Remove threaded plug from the float chamber and install the float level gauge in its place. When the engine is running at idle speed, the fuel level should be between the two lower lines.



2. If the level is incorrect, adjustment can be made by inserting gasket rings of appropriate thicknesses under the float needle valve assembly.
   To accomplish the above, remove the air cleaner assembly, velocity stacks, and clamp pan.

3. Remove threaded plug with a 14 mm wrench. Remove float needle valve and gasket with a 10 mm wrench.

Note

To raise the fuel level, use a thicker gasket. To lower the fuel level, use a thinner gasket.
The fuel level changes approximately 2 mm for each 0.5 mm difference in gasket thickness.

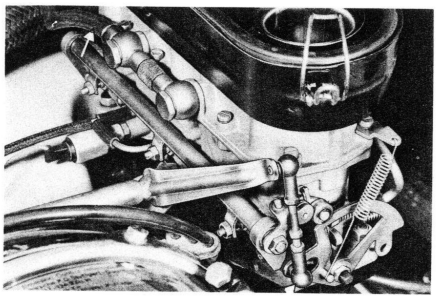
REMOVING AND INSTALLING ZENITH CARBURETORS

Removing

1. Remove top part of air cleaner assembly together with hoses.

2. Detach fuel line from carburetor.

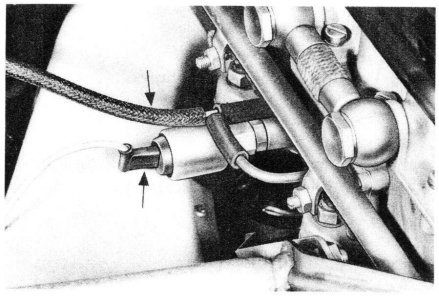
3. Disconnect actuating rod from throttle valve lever.



4. Remove retaining nuts and spring washers.

5. Disconnect wire from solenoid valve (in right carburetor).

6. Detach vacuum line.



7. Remove carburetor.

8. Cover up intake stack openings.

Installing

Note the following when installing:

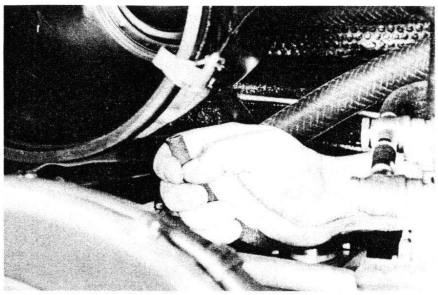
1. Carefully clean gasket surfaces. Install new gaskets between carburetor and intake stack assembly. Make sure that the gasket openings match the intake stack openings.

2. Position carburetor and tighten nuts evenly.

3. Connect solenoid valve wire.

4. Push vacuum line on fitting.

5. Reconnect linkage.

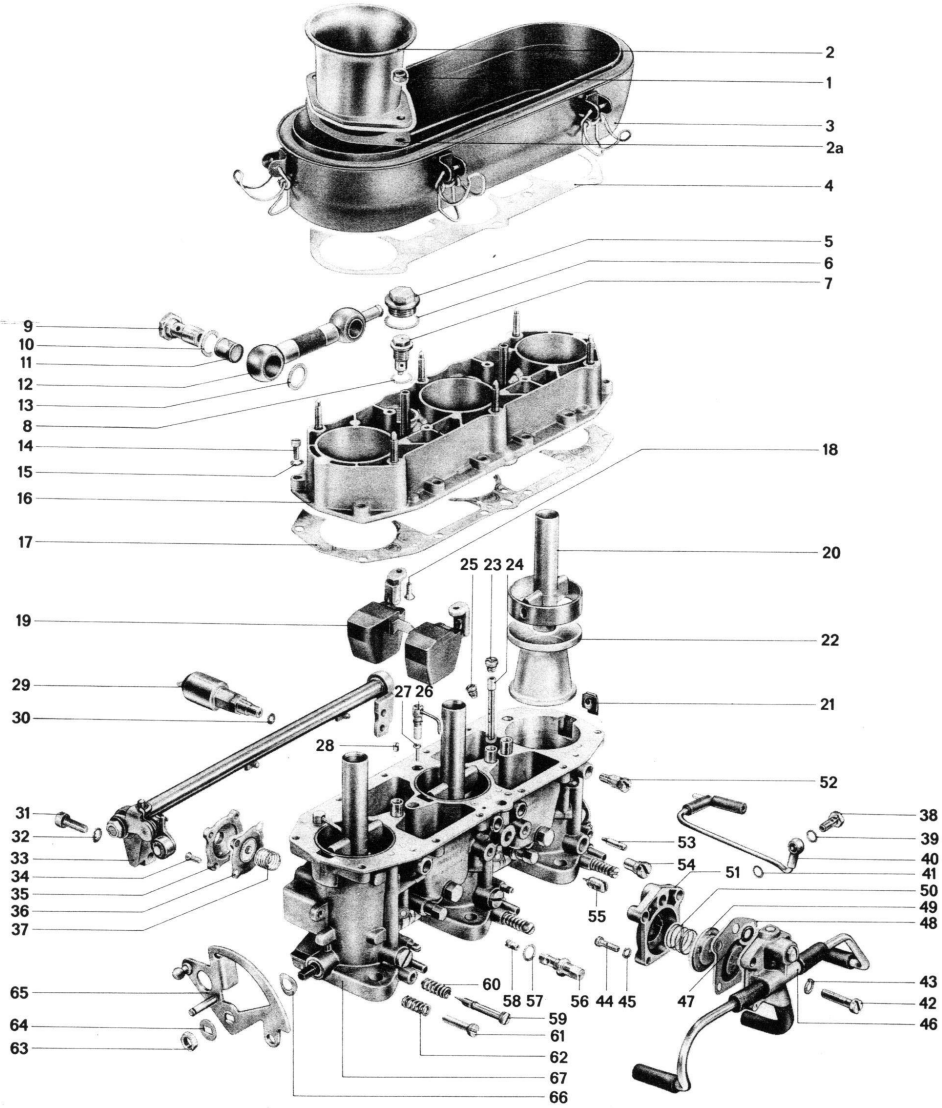


6. Adjust idle (see SF 58).

7. Install air cleaner and secure hoses.

Note

Push condensation water drain hose on fitting in bottom part of the air cleaner assembly.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Nr.	Description	Qty.	Note when Removing	Note when Installing	Remarks
1	Self-locking nut	6			
2	Velocity stack	3			
2a	Gasket	3		Replace	
3	Clamp pan	1			
4	Gasket	1		Replace	
5	Threaded plug	2			
6	Ring gasket	2		Replace	
7	Float needle valve	2		Check & replace if necessary; max. torque 1.5 mkp (11.0 ft. lbs)	
8	Gasket	2		Replace	
9	Hollow bolt	2			
10	Gasket	2		Replace	
11	Filtering screen	2			
12	Connector	1			
13	Gasket	2		Replace	
14	Fillister head screw	12			
15	Lock washer	12			
16	Carburetor cover	1			
17	Gasket	1		Replace	
18	Round head screw	4			
19	Float, complete	2		Check & replace if necessary	
20	Pre-atomizer	3		Position properly; port must face mixing throat	
21	Retaining clip	3			
22	Venturi	3			
23	Air correction jet	3			

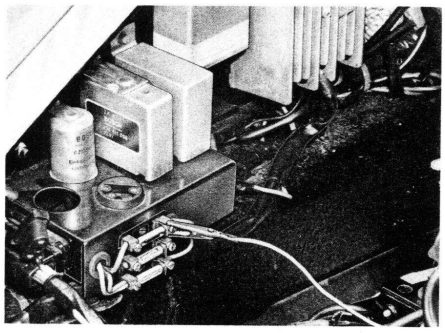
Nr.	Description	Qty.	Note when Removing / Installing	Remarks
24	Emulsion tube	3		
25	Pump inlet valve	6		
26	Injection tube	3		
27	Plug	3		
28	Fuel jet for enrichment valve	1		
29	Enrichment solenoid	1		
30	Gasket	1	Replace	
31	Fillister head screw	4		
32	Lock washer	4		
33	Pump shaft			
34	Round head screw	12		
35	Pump cover	3		
36	Diaphragm	3		
37	Pump spring	3		
38	Hollow bolt	1		
39	Gasket	1	Replace	
40	Fuel line, complete	1		
41	Gasket	1	Replace	
42	Fillister head screw	4		
43	Lock washer	4		
44	Fillister head screw	2		
45	Lock washer	2		
46	Enrichment valve top	1		
47	O-ring	1	Check & replace if necessary	
48	Diaphragm	1	Check & replace if necessary	

Nr.	Description	Qty.	Note when Removing	Note when Installing	Remarks
49	Diaphragm plunger	1			
50	Spring	1			
51	Enrichment valve bottom	1			
52	Idle jet	3			
53	Air bypass control screw	3			
54	Threaded plug	3			
55	Auxiliary mixture control screw	1			
56	Jet housing	3			
57	Gasket	3		Replace	
58	Main jet	3			
59	Idle mixture control screw	3		Check taper point for damage, replace if necessary	
60	Spring	3			
61	Idle speed adjusting screw	1			
62	Spring	1			
63	Nut	1			
64	Lock plate	1			
65	Cam track	1			
66	Spring washer	1			
67	Carburetor housing	1			

Checking Micro switch

a. Disconnect both wires from micro switch.

b. Connect a jump wire from a source of power (such as positive battery cable or upper fuse in fuse box) to one of the micro switch terminals.



c. Connect the second micro switch terminal to a test light and ground.

d. Depress micro switch. The test light should light up when the switch is depressed, and go out when it is released.

Replace the micro switch if necessary.

Checking RPM Transducer

a. Disconnect left wire from micro switch and connect it to ground through a test light.

b. Start engine and depress throttle. The light should come on at about 1350 rpm.

c. Release throttle. The light should go out at about 1300 rpm. Replace the micro switch if necessary.

Checking Solenoid for Enrichment Device

Disconnect right wire from micro switch. Connect a jump wire to a source of power (such as positive battery terminal or upper fuse in fuse box). When touching the jump wire to the terminal the solenoid should make a "clicking" sound. Replace solenoid for enrichment device if necessary.

REMOVING AND INSTALLING FUEL PUMP

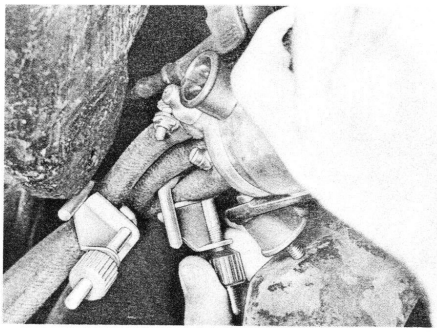
General

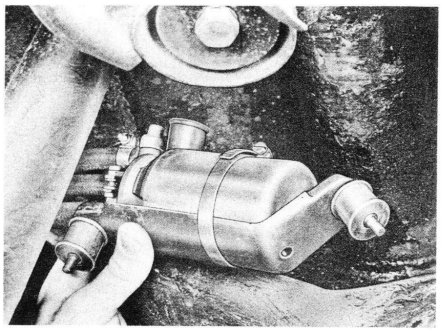
Beginning with the 1971 models, the electric fuel pump has been relocated. It is now in the left rear of the vehicle, between the transverse tube and rear axle trailing arm.

Removing

1. Remove cap nuts.

2. Withdraw pump with mounting bracket.





3. Loosen hose clamp and take pump out of the bracket.

4. Loosen fuel hose retaining clamps and pull hoses off the pump.
   Caution
   Block off the fuel hoses with hose clamps to keep fuel from spilling. Inlet is marked "S" and return is marked "R".

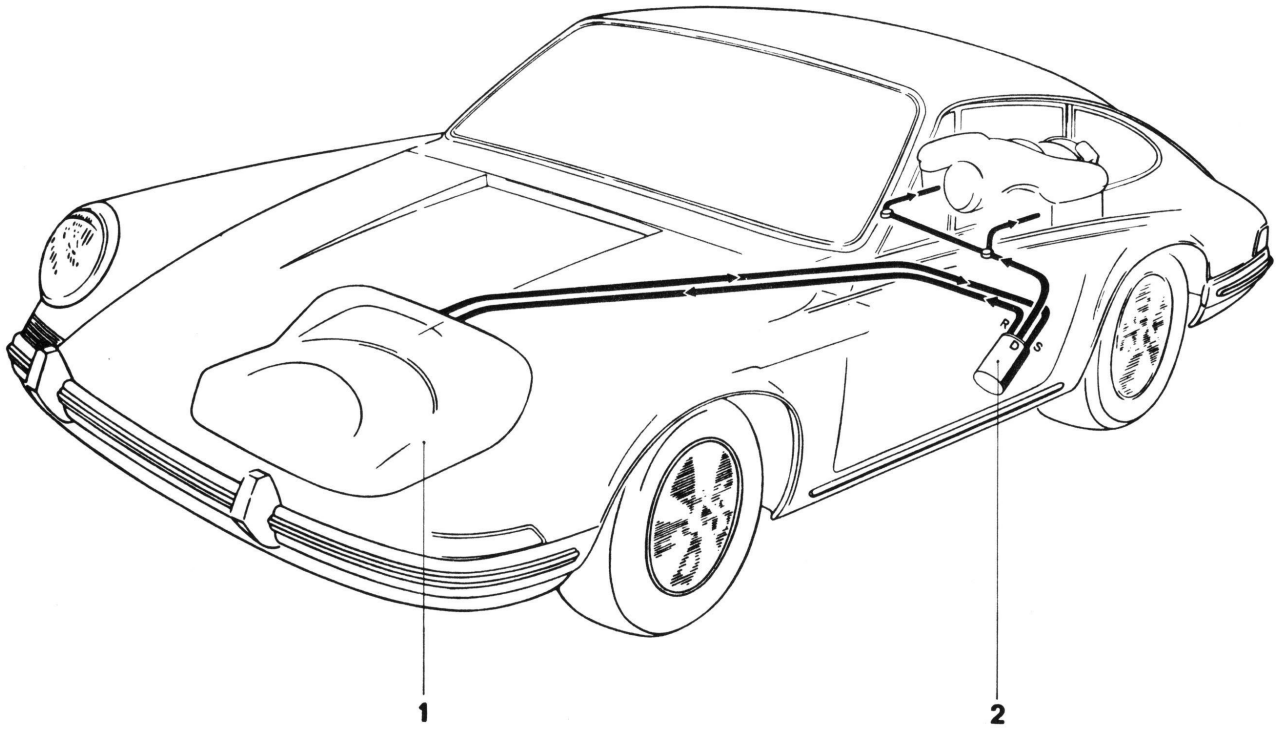
Installing

Note the following points during installation:

1. Coat both electrical terminals with multi-purpose Lithium grease to prevent corrosion.

2. Make sure that rubber boot is properly seated.

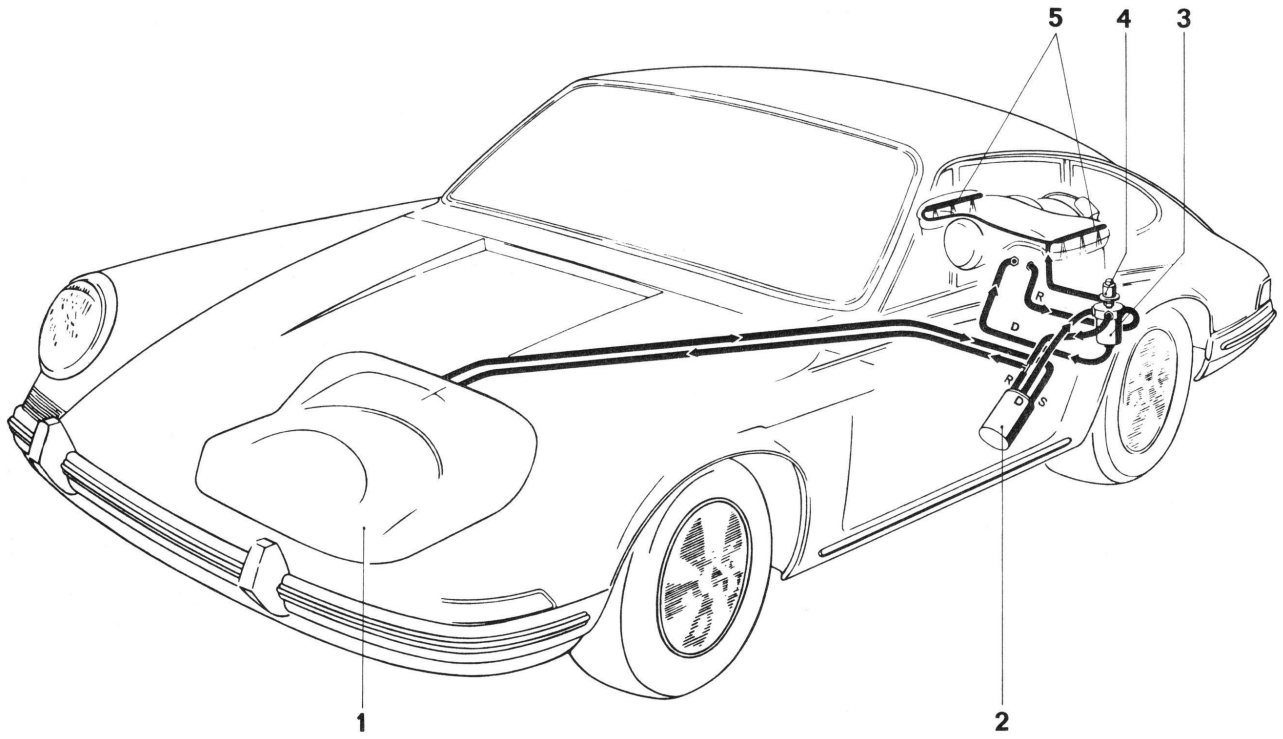
FUEL DELIVERY SCHEMATIC, TYPE 911 T-C
1971 - MODEL



1 Fuel tank
2 Fuel pump

D = Pressure line
S = Suction (inlet) line
R = Return line

FUEL DELIVERY SCHEMATIC, TYPE 911 E-C AND 911 S-C
1971 - MODEL



1 Fuel tank
2 Fuel pump
3 Fuel filter
4 Cold start solenoid
5 Nozzles for cold start enrichment