GROUP 10 — ENGINE OILING

SECTION 0 — INDEX

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SECTION 1 — SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
OIL PRESSURE DROP	(a) Low oil level.	(a) Check the engine oil level.
	(b) Faulty oil pressure sending unit.	(b) Install a new sending unit.
	(c) Thin or diluted oil.	(c) Change the oil to correct viscosity.
	(d) Oil pump relief valve stuck.	(d) Remove the valve and inspect.
	(e) Oil pump suction tube loose, bent or cracked.	(e) Remove the oil pan and install a new tube if necessary.
	(f) Clogged oil filter.	(f) Install a new oil filter.
	(g) Excessive bearing clearance.	(g) Check the bearings.***

***Refer to the "Engine" Group 9 and "Engine Oiling System" Group 10 for service procedures.

SECTION 1D — ENGINE OILING SATURN 4 CYLINDER

SPECIFICATIONS

	Chain Driven Camshaft	Belt Driven Camshaft
Pump Type	Trochoid	<———
Drive	Distributor shaft	Belt from crankshaft
Oil Pressure — Max.	390 to 490 kPa (57 to 71 p.s.i.)	<———
— Min.	76 kPa (11 p.s.i.)	<———
Oil Pressure Relief Valve		
Location	Oil pump	<———
Spring Free Length	59,73 mm (2.35")	47,00 mm (1.85")
Load	7,8 kg @ 43,1 mm (17.2 lb. @ 1.70")	7,1 kg @ 35,5 mm (15.6 lb. @ 1.4")
Low Pressure Warning Switch Operating Pressure	20 to 40 kPa (3.0 to 6.0 p.s.i)	<———
Oil Filter	Full flow sealed can	<———
Crankcase Oil Capacity — With Filter	4,5 litres (7.9 pts.)	<———
— Without Filter	4,0 litres (7.0 pts.)	<———
Clearances		
Chain Case to Shaft	0,12 mm (0.005") max.	———
Inner Rotor to Outer Rotor	0,25 mm (0.010") max.	———
Rotor to Cover	0,20 mm (0.008") max.	———
Outer Rotor to Chain Case	0,30 mm (0.012") max.	———
Rotor Tip Clearance (A)	———	0,12 mm (0.005") max.
Outer Rotor to Cover Clearance (B)	———	0,16 mm (0.006") max.
Rotor to Front Case Clearance (C)	———	0,12 mm (0.005") max.
Shaft to Cover Clearance (D)	———	0,05 mm (0.002") max.

TORQUE SPECIFICATIONS

	Nm	lbs./ft	lbs./in.
Crankshaft pulley bolts (belt drive engine)	10-12	8-9	84-108
Oil filter	11-12	8-9	96-108
Oil pan	5-8	4-6	48-72
Oil pan drain plug	60-77	44-57	
Oil pressure switch	30-38	22-28	
Oil pump cover — chain drive engine	15-20	11-15	
— belt drive engine (large bolts)	15-18	11-13	
Oil pump sprocket nut (belt drive engine)	34-39	25-29	

GENERAL INFORMATION

The oil pump of the chain driven camshaft engine is a trochoid gear type, built inside the bottom of the timing chain case. It is driven by the pawl on the end of the distributor shaft which is gear driven by the crankshaft.

The oil pump of the belt driven camshaft engine is a trochoid gear type, built into the lower left hand side of the front case. It is driven by the camshaft drive belt.

Engine oil is picked up from the oil pan through the oil screen and fed from the oil pump to the full flow oil filter. If the oil pump delivery pressure exceeds the specified maximum, the relief valve will open, allowing excessive oil to escape from the pump.

OIL PUMP

Chain Drive Camshaft Engine

Removal

(1) Remove the oil filter.

(2) Remove the oil pump cover bolts and then remove the cover and rotor assembly.

Inspection

Clean all disassembled parts with a suitable cleaning solvent, perform the following checks and replace any defective parts.

Oil Pump Shaft and Rotors

Check the top end of the pump shaft and the inner and outer rotors for excessive wear or damage, any faulty parts should be replaced.

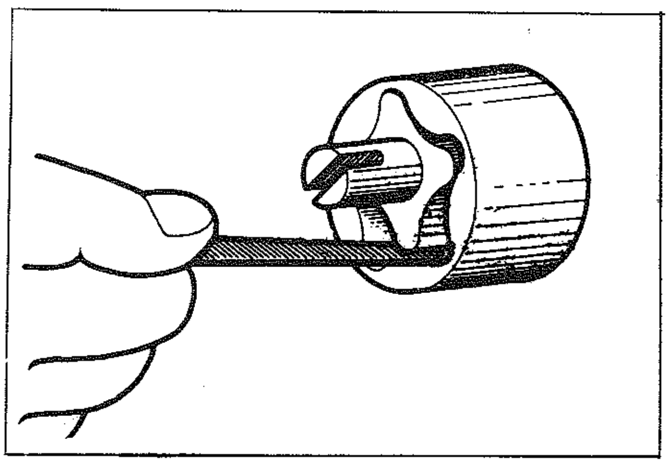


Fig. 1—Checking rotor clearance

Clearances

Check the clearance between the inner rotor and outer rotor, rotor to cover and outer rotor to chain case clearance.

If any of the above clearances exceed the specified dimension or the components are worn or damaged, the faulty components should be replaced.

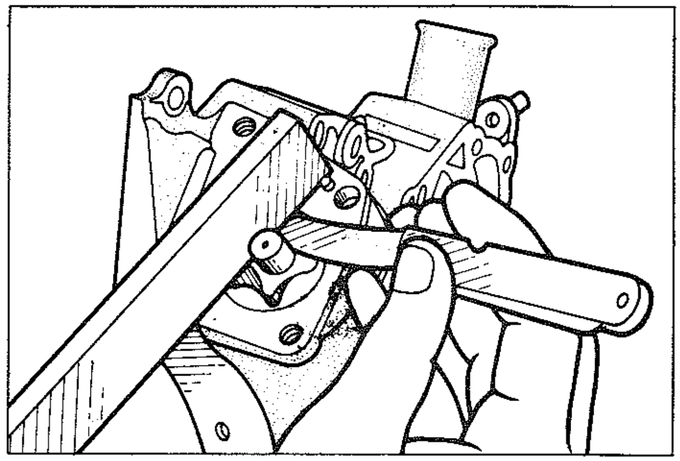


Fig. 2—Checking rotor end play

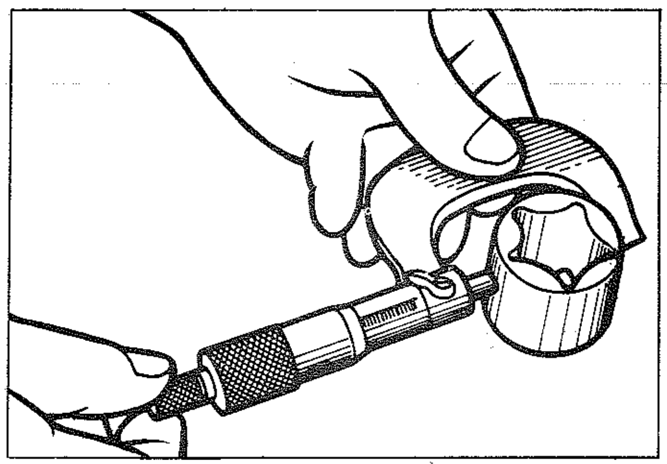


Fig. 3—Checking outer rotor to chain case clearance

Relief Plunger and Spring

Insert the plunger into its bore and check it for smooth operation. Check the plunger for scoring or damage and the spring for breakage or damage.

Installation

(1) Install the pump rotor assembly into the chain case and lubricate with engine oil.

(2) Wipe any excessive oil or grease from the gasket sealing surface.

(3) Install the pump cover with a new gasket and tighten the bolts to the specified torque.

(4) Install the oil filter as described under "Oil Filter".

Belt Drive Camshaft Engine

Removal

(1) Remove the timing belt as described in Group 9 Engine (Section 3D).

(2) Remove the oil pump sprocket nut by holding the sprocket with an old timing belt.

NOTE: Do not use a screw driver to hold the sprocket or attempt to loosen the nut with the timing belt installed.

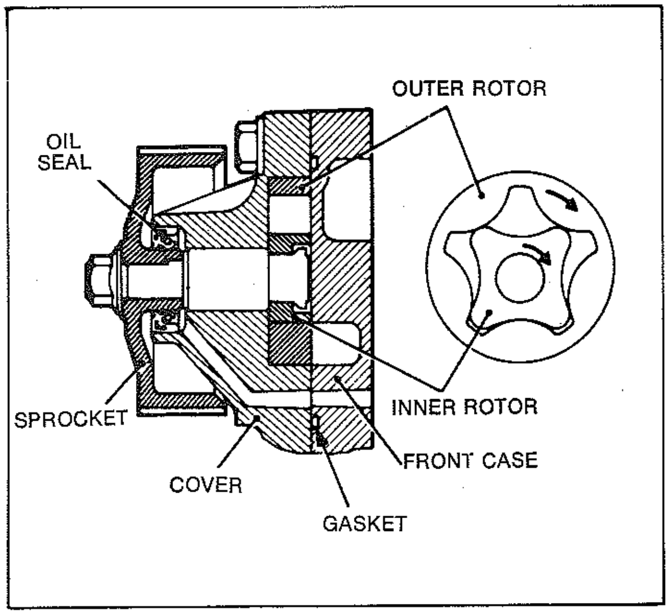


Fig. 4—Oil pump sectioned view

(3) Remove the oil pump cover attaching bolts.

(4) If the lower rear belt cover has not been removed, the oil pump can be removed by sliding it out towards the left of the engine as shown in Fig. 5.

(5) Remove the rotor from the oil pump cover.

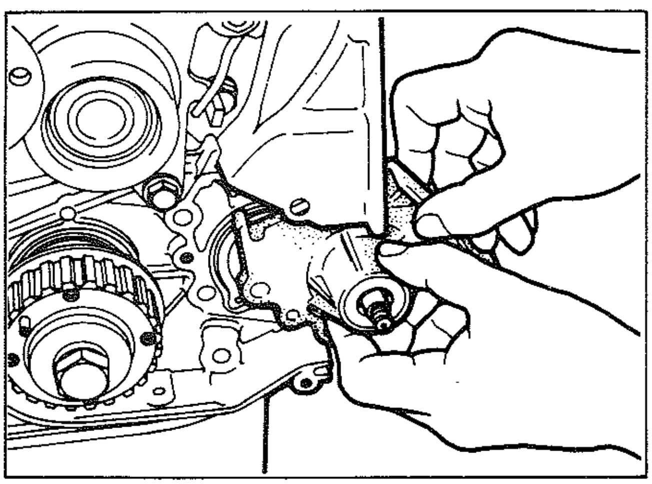


Fig. 5—Removing oil pump assembly

Cleaning and Inspection

Clean all disassembled parts with a suitable cleaning solvent, perform the following checks and replace any defective parts.

Oil Pump Cover

Check the entire cover for cracks and abnormal wear, check the rotor contacting portions for ridge wear.

Check the oil holes and orifices for clogging, blow out deposits with compressed air.

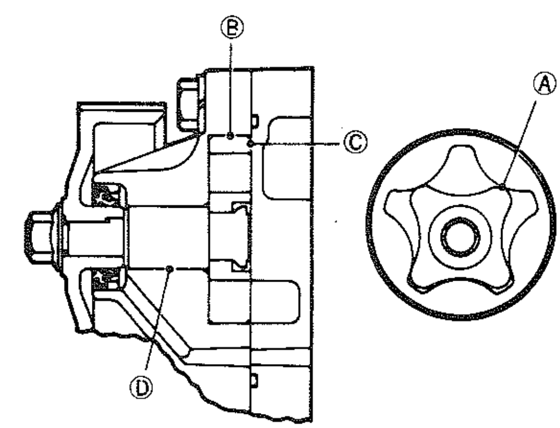
Check the pump cover rotor contacting portions for ridge wear. A badly worn cover should be replaced.

Clearances

Ensure that all clearances shown in Fig. 6 conform to the specified dimensions. Badly worn parts should be replaced.

Relief Plunger and Spring

Insert the plunger into its bore and check it for smooth operation. Check the plunger for scoring or damage and the spring for breakage or damage.



A — ROTOR TIP CLEARANCE
B — OUTER ROTOR TO COVER CLEARANCE
C — ROTOR TO FRONT CASE CLEARANCE
D — SHAFT TO COVER CLEARANCE

Fig. 6—Oil pump clearances

Installation

(1) Install a new oil pump gasket in the groove of the front case, Refer Fig. 7.

NOTE: The gasket has a sectional form and must be installed with the round side facing the oil pump cover (front of engine).

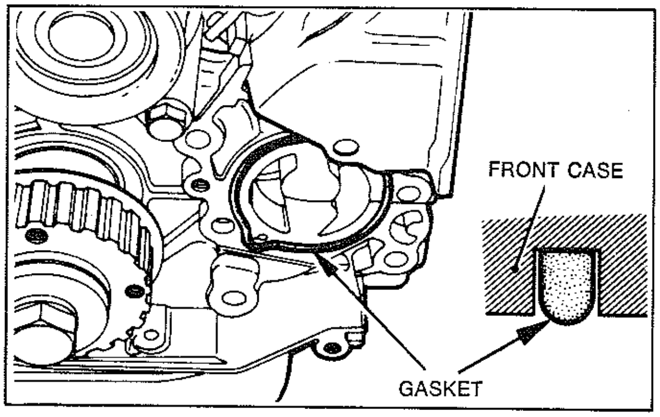


Fig. 7—Installing oil pump gasket

(2) Using a suitable tool install the oil pump cover seal. Ensure the seal is fitted flush with the cover and with the seal lip facing the right way, Refer Fig. 8.

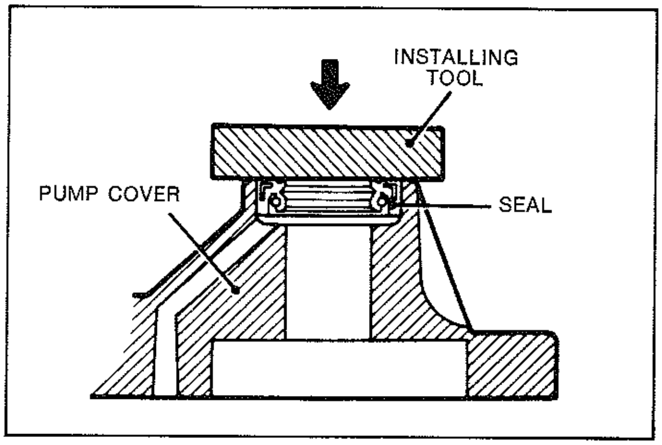


Fig. 8—Installing oil pump seal

(3) Lubricate the pump rotors with engine oil and install the rotor into the cover.

NOTE: The pump rotors have an identification mark on one side which must face to the front (Refer Fig. 9).

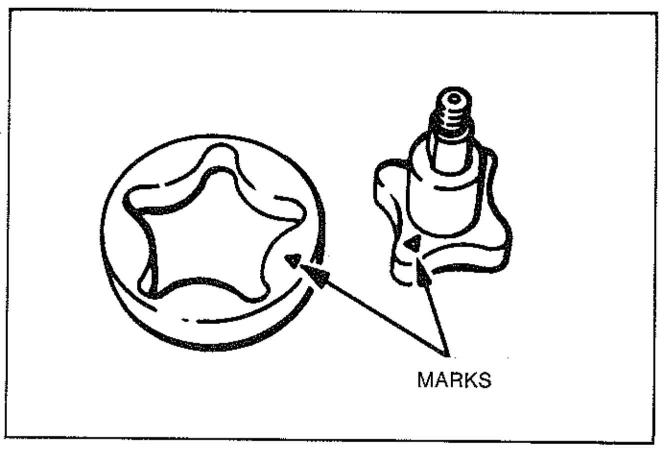


Fig. 9—Rotor identification marks

(4) Install the pump assembly onto the front case and tighten the cover bolts to the specified torque.

(5) Sparingly lubricate the pump seal and sprocket (seal contacting area) with engine oil.

(6) Install the sprocket and tighten the nut to the specified torque. Hold the sprocket with an old timing belt, **do not** use a screw driver.

(7) Install the timing belt as previously described in Group 9 Engine (Section 3D).

OIL FILTER

The oil filter is a full flow sealed unit. If the filter becomes dirty or clogged and creates a pressure difference of 76 to 117 kPa (11 to 17 p.s.i.) between entering and leaving the filter, a valve will open and by pass the filter completely.

Replacement

The oil filter can be removed by hand or if too tight by using a contracting band type oil filter remover.

Prior to installing the filter lightly lubricate the "O" ring with engine oil and partially fill the filter with oil. Tighten the filter securely by hand to the specifications shown on the filter and run the engine to check for the presence of oil leakage.

NOTE: Whenever the oil filter is replaced the engine oil should be changed.

OIL PRESSURE SWITCH

Warning Lamp Type.

The oil pressure switch is located at the centre of the right hand side of the engine. If the oil pressure drops below the specified limit the switch will operate and light the instrument cluster warning lamp.

Replacement

The switch can be removed by using a 25,4 mm (1.00") twelve sided deep socket. When installing the switch apply sealant to the threaded portion and ensure that the electrical connection is tight and secure.

Testing

With the switch connected as shown in Fig. 11, increase the pressure applied to the switch until the lamp is extinguished. If the lamp does not extinguish at the specified pressure the switch is faulty and must be replaced.

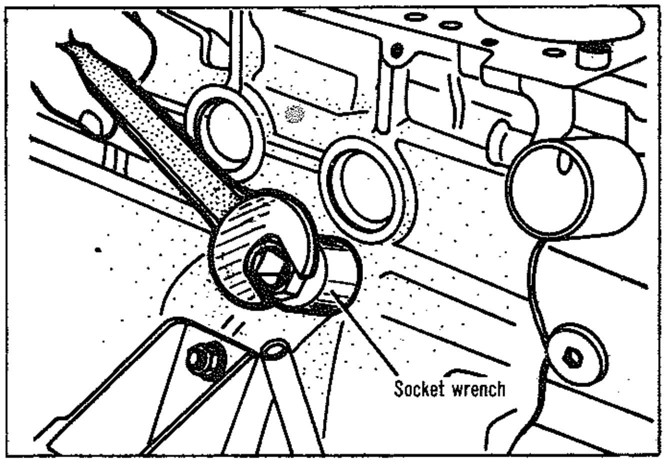


Fig. 10—Replacing oil pressure switch

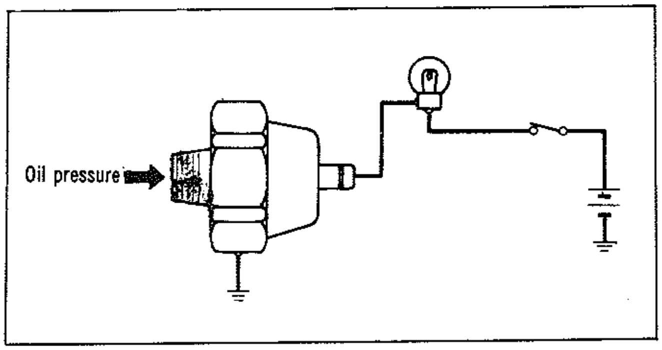


Fig. 11—Testing oil pressure switch (lamp type)

Oil Gauge Type

Vehicles equipped with an oil pressure gauge have the sender unit fitted to the right hand side of the cylinder block. Variations in oil pressure to the sender unit varies the current applied to the gauge.

Replacement

The switch can be replaced as previously described.

Test

With the switch connected as shown in Fig. 12, the following results should be obtained.

0 mA @ 0 kPa (0 p.s.i.)
83,5 mA @ 390 kPa (57 p.s.i.)
110,0 mA @ 785 kPa (114 p.s.i.)

If the unit does not test as specified it is faulty and must be replaced.

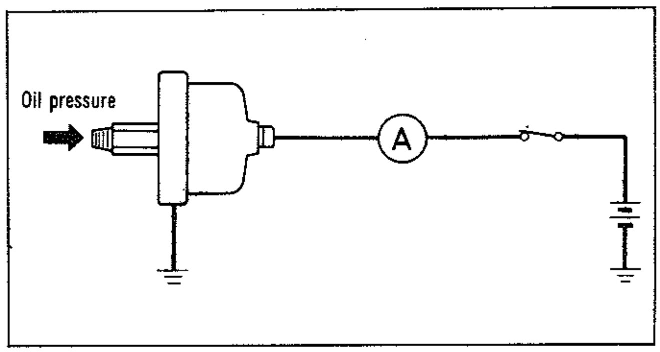


Fig. 12—Testing oil pressure switch (gauge type)

SECTION 1E — ENGINE OILING ASTRON 4 CYLINDER

SPECIFICATIONS

Pump Type	Gear
Drive	Chain drive from crankshaft
Oil Pressure — Max.	345 - 448 kPa (50 - 65 psi)
— Min.	76 kPa (11 psi)
Oil Pressure Relief Valve	
Location	Oil pump
Spring Free Length	47,0 mm (1.85")
Load	4,3 kg/40,0 mm (9.5 lbs/1.575")
Low Pressure Warning Switch Operating Pressure	29 kPa (4.3 psi) or less
Oil Filter	Full flow sealed "can"
Crankcase Oil Capacity — With Filter	4,3 Litres (7.4 pts.)
— Without Filter	3,8 Litres (6.5 pts.)
Pump Body to Gear Clearance	0,105 to 0,150 mm (0.0041" to 0.0059")
Gear End Play	0,06 to 0,12 mm (0.0024" to 0.0047")
Gear to Bearing Clearance	0,020 to 0,046 mm (O.0008" to 0.0018")
Driven Gear Rear End Bearing Clearance	0,044 to 0,066 mm (0.0017" to 0.0026")

TORQUE SPECIFICATIONS

	Nm	lbs/ft	lbs/in
Counter balance shaft bolt	30 - 38	22 - 28	
Crankshaft pulley	108 - 127	80 - 94	
Oil filter	11 - 12	8 - 9	96 - 108
Oil pan	6 - 8	5 - 6	60 - 72
Oil pan drain plug	58 - 77	43 - 57	
Oil pressure switch	30 - 38	22 - 28	
Oil pump cover	15 - 19	11 - 14	

GENERAL INFORMATION

The oil pump is a Trochoid gear type and is chain driven by the crankshaft via a sprocket on the oil pump drive gear. The oil pump driven gear is attached to the right hand counterbalance shaft thus rotating it in the opposite direction to the crankshaft.

Engine oil is picked up from the oil pan through the oil screen and fed from the oil pump to the full flow oil filter. If the oil pump delivery pressure exceeds the specified maximum, the relief valve will open, allowing excessive oil to escape out of the pump.

OIL PUMP

Removal and Installation

Refer to Group 9 Engine Section 3E for oil pump removal and installation.

Oil Pump Body and Cover

Check the entire body for cracks and abnormal wear, check the gear contacting portions for ridge wear.

Check the oil holes and orifices in the body for clogging, blow out deposits with compressed air.

Check the pump cover gear contacting portions for ridge wear. A badly worn cover should be replaced.

Clearances

Ensure that all clearances shown in Fig. 2 conform to the specified dimensions. Badly worn parts should be replaced. If bearing replacement is necessary due to wear or damage, the oil pump body assembly must be replaced.

Relief Plunger and Spring

Insert the plunger into the pump body and check it for smooth operation. Check the plunger for scoring or damage and the spring for breakage or damage.

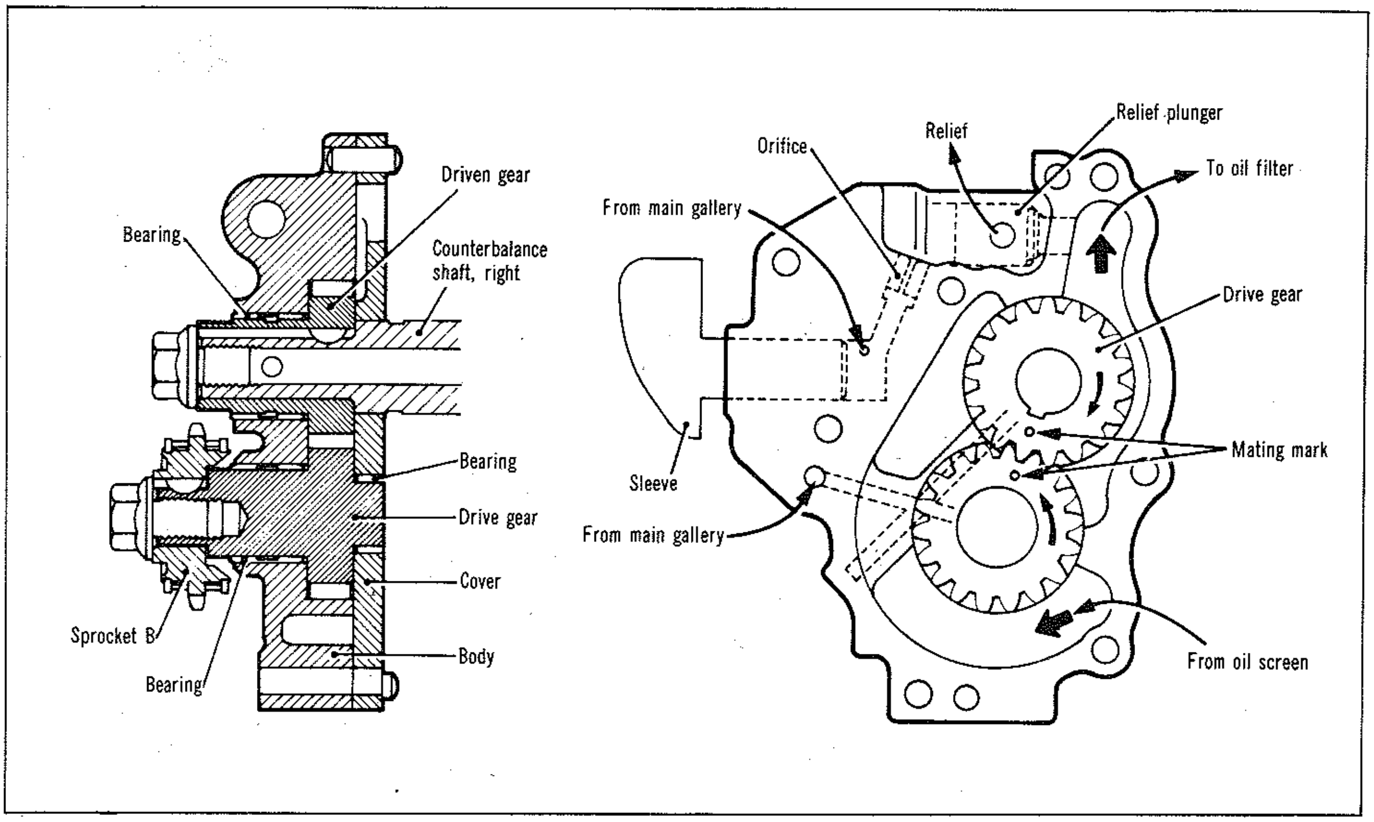


Fig. 1—Oil pump

Disassembly

(1) Remove the gear cover plate and remove the drive gear and driven gear.

(2) Remove the relief valve plug and remove the relief spring and plunger.

Inspection

Clean all disassembled parts with a suitable cleaning solvent, perform the following checks and replace any defective parts.

Assembly

(1) Lubricate the relief plunger and install the plunger, open end towards spring, and spring into its bore, fit the plunger plug.

(2) Lubricate the gears and bearings and install the gears into the pump housing. Ensure that the gear mating marks stamped on the gear surfaces are aligned and that the gears rotate smoothly when installed.

NOTE: Failure to align gear mating marks will position the counterbalance shafts out of phase thus creating engine vibrations.

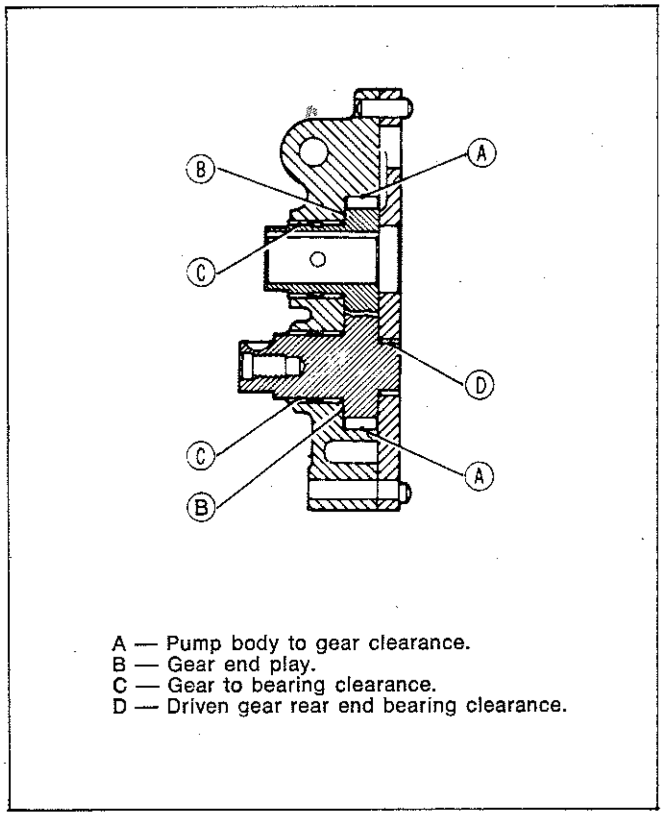


Fig. 2—Oil pump clearances

(3) Install the gear cover and tighten the bolts to the specified torque.

(4) With the pump cover installed position the pump assembly as it is mounted on the engine and place approximately 10,0 millilitres (0.3 fluid ozs.) of engine oil into the delivery port.

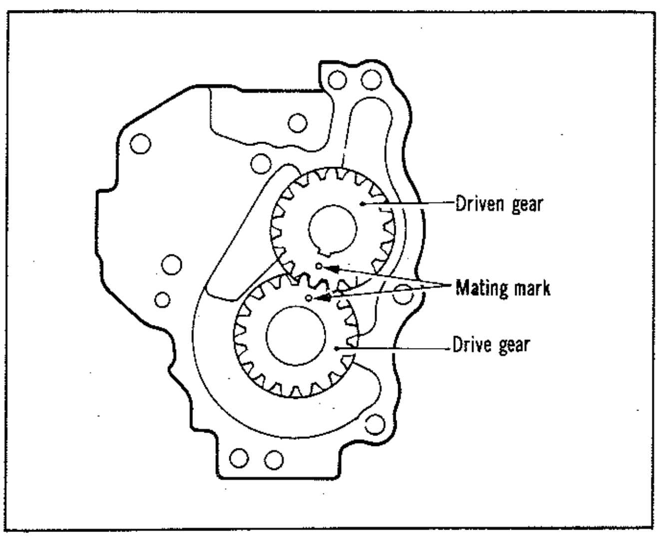


Fig. 3—Gear mating marks

OIL FILTER

The oil filter is a full flow sealed unit. If the filter becomes dirty or clogged and creates a pressure difference of 97 kPa (14 psi) between entering and leaving the filter, a valve will open and by pass the filter completely.

Replacement

The oil filter can be removed by hand or if too tight by using a contracting band type oil filter remover.

Prior to installing the filter lightly lubricate the "O" ring with engine oil and partially fill the filter with oil. Tighten the filter securely by hand, to the specifications shown on the filter and run the engine to check for the presence of oil leakage.

NOTE: Whenever the oil filter is replaced the engine oil should be changed.

OIL PRESSURE SWITCH

Warning Lamp Type

The oil pressure switch is located at the centre of the right hand side of the engine. If the oil pressure drops below the specified limit the switch will operate and light the instrument cluster warning lamp.

Replacement

The switch can be removed by using a 25,4 mm (1.0") twelve sided deep socket. When installing the switch apply sealant to the threaded portion and ensure that the electrical connection is tight and secure.

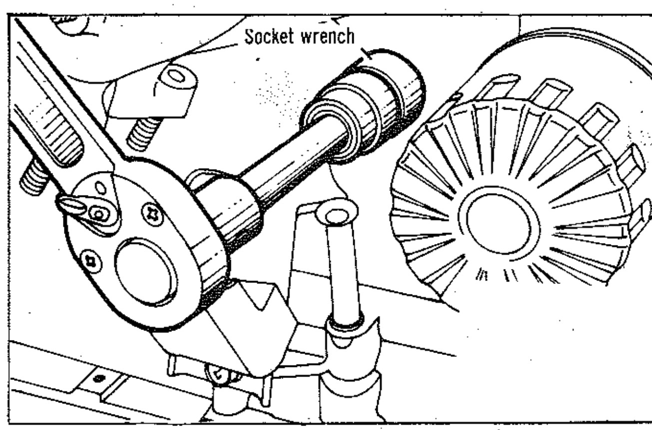


Fig. 4—Replacing oil pressure switch

Testing

With the switch connected as shown in Fig. 5, increase the pressure applied to the switch until the lamp is extinguished. If the lamp does not extinguish at the specified pressure the switch is faulty and must be replaced.

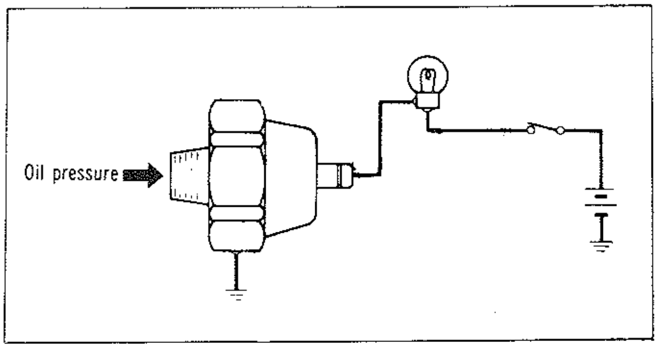


Fig. 5—Testing oil pressure switch (lamp type)

Oil Gauge Type

Vehicles equipped with an oil pressure gauge have the sender unit fitted to the right hand side of the cylinder block. Variations in oil pressure to the sender unit varies the current applied to the gauge.

Replacement

The switch can be replaced as previously described.

Testing

With the switch connected as shown in Fig. 6, the following results should be obtained.

0 mA @ 0 kPa (0 p.s.i.)
83,5 mA @ 390 kPa (57 p.s.i.)
110,0 mA @ 785 kPa (114 p.s.i.)

If the unit does not test as specified, it is faulty and must be replaced.

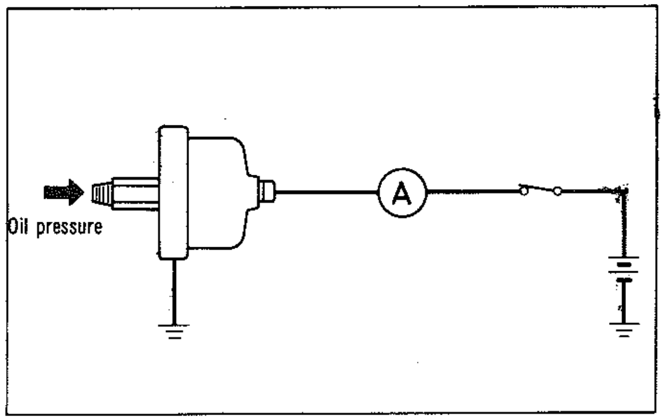


Fig. 6—Testing oil pressure switch (gauge type)

GROUP 11 — EXHAUST SYSTEM

SECTION 0 — INDEX

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SECTION 1 — SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
EXCESSIVE EXHAUST NOISE OR VIBRATION	(a) Exhaust system misaligned.	(a) Align exhaust system.
	(b) Exhaust hangers loose, damaged or misaligned.	(b) Replace damaged hangers, align and tighten securely.
	(c) Loose engine mounts or faulty mount rubbers.	(c) Tighten or replace engine mounts.
	(d) Internal muffler baffles loose.	(d) Replace muffler.
LEAKING EXHAUST GASES	(a) Manifold face to cylinder head warped.	(a) Machine manifold or replace.
	(b) Muffler or connections leaking.	(b) Tighten connections.
	(c) Tail pipe restricted.	(c) Clear or replace tail pipe.
	(d) Leaking pipe joints or manifold connections.	(d) Tighten clamps.
	(e) Manifold cracked.	(e) Replace manifold.
	(f) Manifold gasket leaking.	(f) Replace manifold gasket.
	(g) Bent or pinched exhaust or tail pipe.	(g) Fit new parts as required.
ENGINE HARD TO WARM UP	(a) Heat exchanger supply hose restricted.	(a) Clear or reposition hose.
	(b) Choke faulty.	(b) Adjust or replace choke mechanism.

SECTION 3A — EXHAUST SYSTEM AND INTAKE MANIFOLD

SPECIFICATIONS

Flatness of mating surface to manifold .... 0,15 mm (0.006")

TORQUE SPECIFICATIONS

	Nm	lb/ft	lb/in
EGR valve bolts	8 - 9		72 - 84
Exhaust manifold stove attaching bolts	8 - 9		72 - 84
Exhaust manifold to cylinder head nuts	15 - 19	11 - 14	
Front pipe to centre pipe bolts (two door)	20 - 29	15 - 21	
Exhaust pipe clamp nuts	17	13	150
Exhaust pipe flange nuts	20 - 23	15 - 22	
Hanger clamp screws	17	13	150
Intake manifold to cylinder head nuts	15 - 19	11 - 14	
Thermostat housing bolts	9 - 12		84 - 108
Bracket to bell housing bolts	20 - 30	15 - 22	
Front pipe to bell housing bracket bolt	20 - 30	15 - 22	

GENERAL INFORMATION

The intake manifold is cast aluminium alloy taking advantage of the heat conductivity of aluminium to operate the engine coolant operated heat exchanger in the base of the manifold. This assists in maintaining the fuel in an atomised state thus achieving a high combustion efficiency.

The EGR valve is mounted to the intake manifold with drillings cast in the manifold to direct the recirculated exhaust gases to and from the EGR valve.

The exhaust manifold is manufactured from cast iron. The four port outlets blend, with minimum restriction to the outlet flange, which blends into the exhaust pipe.

A heat stove for the Heated Inlet Air System is also mounted to the exhaust manifold (Astron engine).

INTAKE MANIFOLD

Removal

(1) Drain the cooling system.

(2) Remove the air cleaner assembly.

(3) Disconnect the top radiator hose, the heat exchanger water hose and the heater hose from the intake manifold.

(4) Disconnect the carburettor accelerator linkage and automatic transmission throttle linkage (if applicable).

(5) Disconnect the fuel pump to carburettor fuel lines.

(6) Disconnect all vacuum lines from the manifold and electrical connections to the carburettor.

(7) Remove the intake manifold retaining nuts and remove the manifold.

(8) If the manifold is to be replaced, remove all associated parts, i.e. carburettor, thermostat housing and thermostat, temperature sending unit, EGR and thermo valve and all vacuum hoses.

Inspection

Check the manifold for cracks, damage, machined surface warpage and manifold distortion.

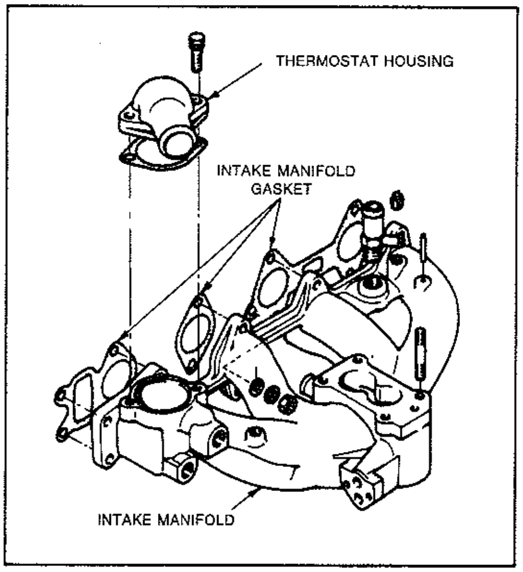


Fig. 1—Intake manifold

Installation

Install the manifold by reversing the removal procedure, noting the following points:

(1) Fit new gaskets where necessary and appy sealer fo the front and rear intake manifold gaskets as shown in Fig. 2.

NOTE: Later models are fitted with a one piece gasket and should be sealed in the same areas shown for the three piece set.

(2) Tighten manifold nuts, EGR valve bolts and thermostat housing bolts to specified torque.

(3) Fill the cooling system using rain or demineralized water, adding corrosion inhibitor or anti-freeze (where required).

EXHAUST MANIFOLD

Removal

(1) Disconnect heated inlet air supply tube (if fitted).

(2) Disconnect the exhaust pipe from the exhaust manifold flange.

(3) Remove the heated inlet air exhaust manifold stove (if necessary).

(4) Remove the exhaust manifold retaining nuts and remove the manifold.

Inspection

Check the manifold for cracks, damage and distortion, repair or replace as necessary.

Installation

Install manifold by reversing removal procedure, fitting new gaskets and tightening all nuts to specified torque.

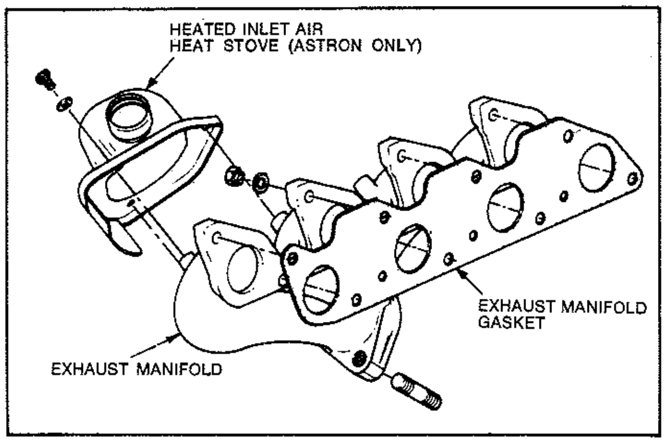


Fig. 3—Exhaust manifold

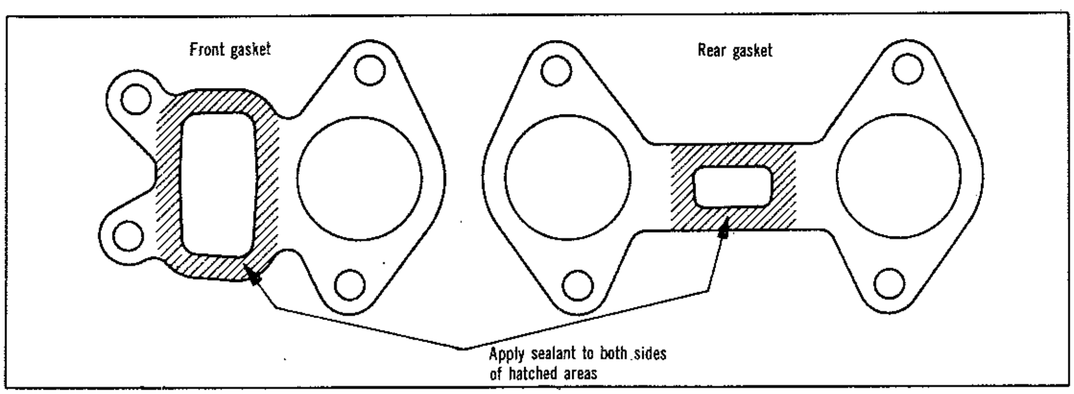


Fig. 2—Intake manifold gasket sealing points—early type gasket shown.

EXHAUST PIPE, MUFFLER AND TAIL PIPE

Removal

(1) Disconnect the tail pipe supports from O rings.
(2) Loosen the tail pipe to front pipe clamp and remove the tail pipe.
(3) Loosen the imtermediate pipe to engine pipe clamp and remove the intermediate pipe and muffler. (Two door).
(4) Remove the front pipe to transmission support, disconnect the pipe from the exhaust manifold and remove the front pipe and resonator assembly.

NOTE: Heating exhaust pipe joints will assist in removal but care must be taken to protect the fuel tank, fuel lines and floor pan from the heat source.

Inspection

Check all parts for damage, wear and burning. Any faulty parts should be replaced.

Installation

Install the exhaust system by reversing the removal procedure, ensuring that the components are correctly aligned and do not foul any body or mechanical components, tighten all bolts to the specified torque. Ensure exhaust supports are central and square at hanger points. Pull tailpipe and muffler forward to dimple on front pipe before tightening clamp.

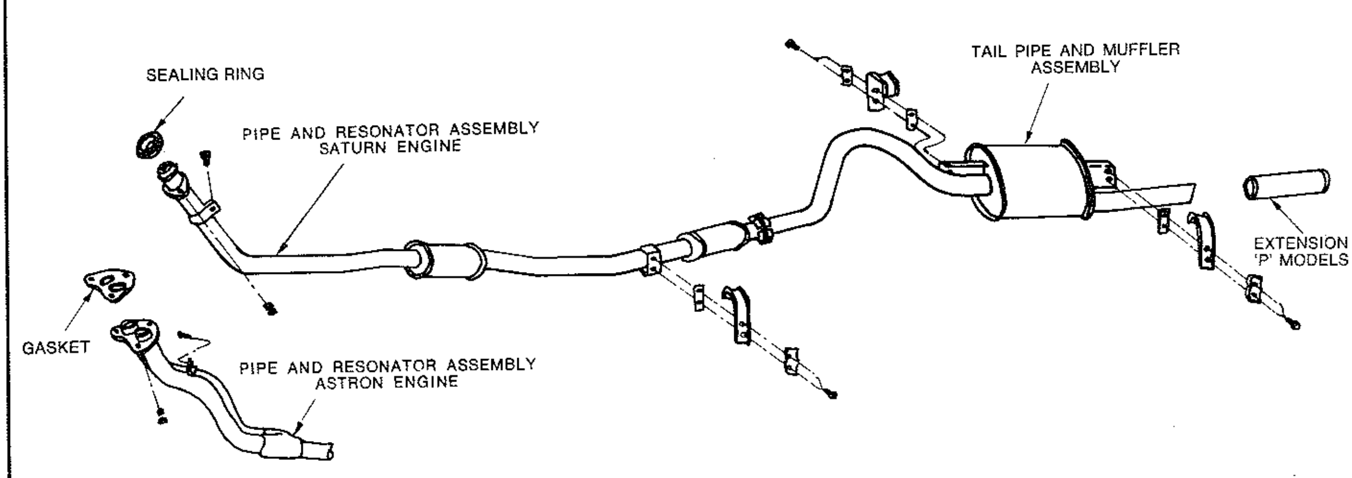


Fig. 4—Exhaust system (early sedans)

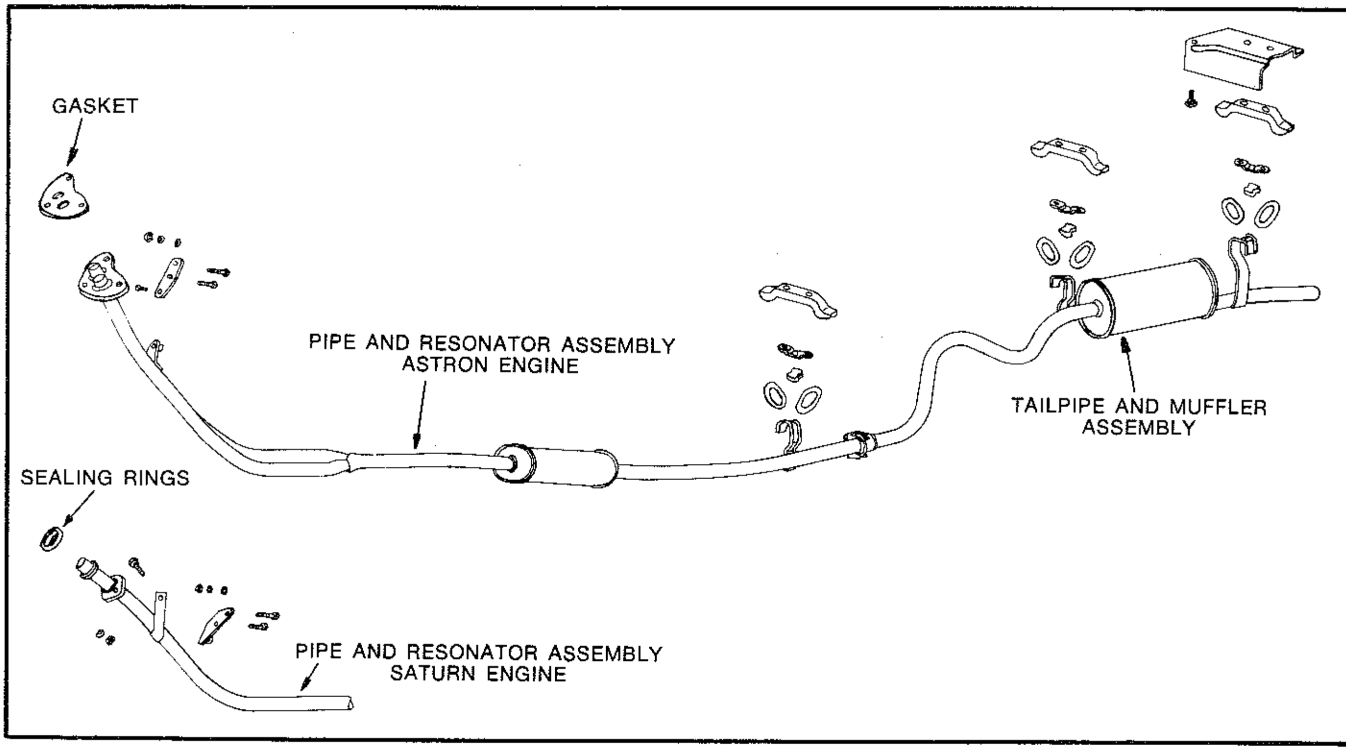


Fig. 5—Exhaust system (late sedans and wagons)

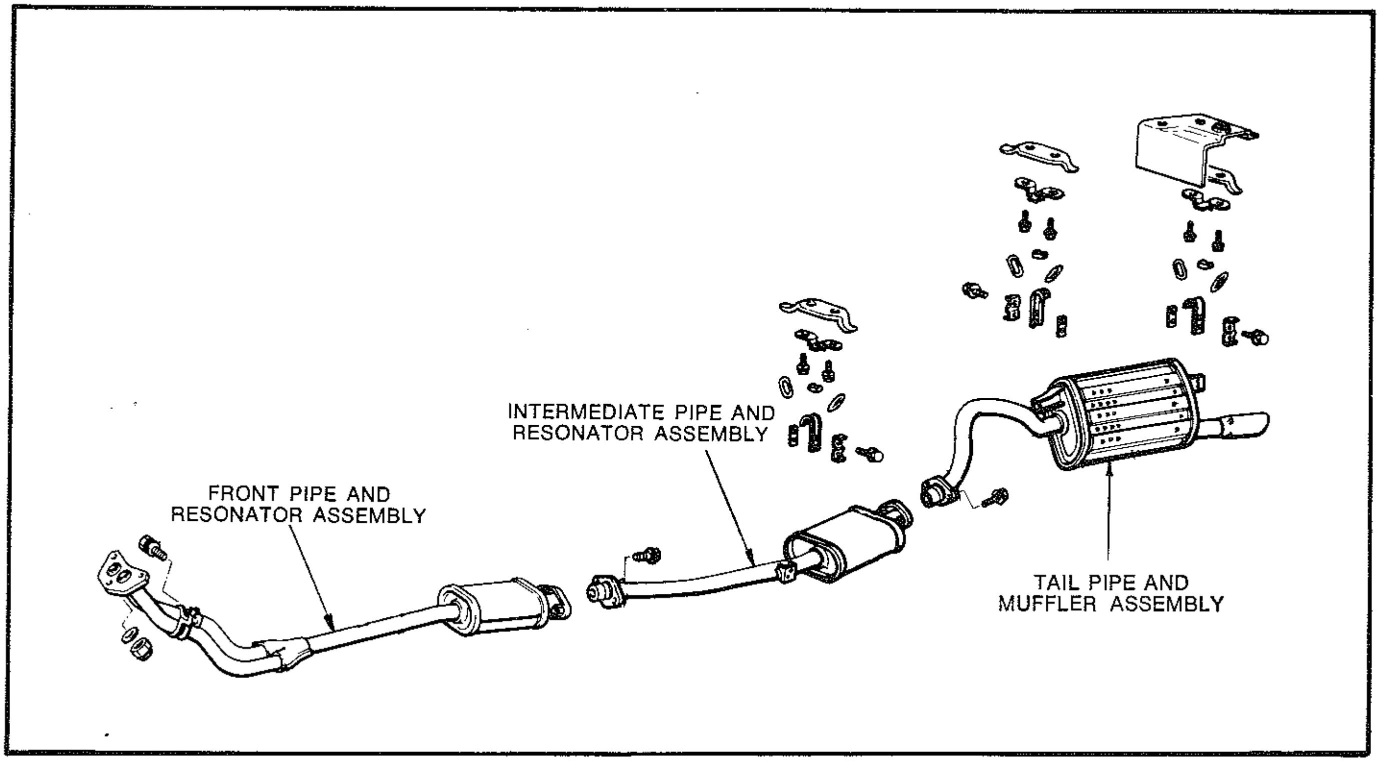


Fig. 6—Exhaust system (two door)

GROUP 14 — FUEL SYSTEM

SECTION 0 — INDEX

SERVICE BULLETIN REFERENCE

DATE	NUMBER	SUBJECT	CHANGES

SECTION 1 — GENERAL INFORMATION

The fuel system consists of the fuel tank, fuel pump, fuel filter, carburettor, fuel lines and vacuum lines.

The fuel tank assembly consists of the tank, filler neck cap, vents and a fuel gauge sending unit.

In operation, the fuel pump draws fuel from the tank and forces it to the filter and carburettor. The carburettor meters the fuel into the air stream drawn into the engine, in quantities suitable for all engine speed and load conditions.

The fuel filter is a paper element type fitted in the fuel line between the fuel tank and fuel pump. These filters are sealed disposable types which cannot be serviced.

The filter unit should be replaced at intervals as specified in Group 1 — Lubrication and Maintenance.

When checking parts removed from the carburettor, it is at times difficult to be sure they are satisfactory for further service. It is therefore recommended that in such case, new parts be installed.

SERVICING CARBURETTOR

Often, the carburettor is blamed for a great variety of trouble which is classed as **"Poor Vehicle Performance."**

Be sure the trouble is not some other component before disassembling the carburettor.

When overhauling the carburettor, several items of importance should be observed.

(1) The carburettor must be completely disassembled.

(2) All parts (except diaphragm assembly) should be cleaned in a suitable solvent then inspected for damage or wear.

(3) Use air pressure only, to clean the various orifices or channels.

(4) Replace questionable parts with **New Ones.**

CLEANING CARBURETTOR PARTS

The recommended solvent for gum deposits is methylated spirits. However, there are other commercial solvents which may be used with satisfactory results.

Diaphragms can be damaged by solvents. Avoid placing the diaphragm assembly in ANY liquid. Clean the external surfaces with a clean cloth or a soft wire brush. Shake dirt or other foreign material from the stem (plunger) side of the diaphragm. Depressing the stem to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt **but should not be connected to the vacuum diaphragm fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a rinse, it should be "HOT." After rinsing, all trace of water must be blown from the passages with air pressure. It is further advisable to rinse all parts in clean kerosene or petrol to be certain no trace of moisture remains. Never clean jets with a wire, drill, or other mechanical means, because the orifices may become enlarged, making the mixture too rich for proper performance.

SECTION 2 — SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
POOR IDLING	(a) Idle air bleed carbonized or of incorrect size.	(a) Disassemble carburettor. Then, use compressed air to clear idle bleed after soaking it in a suitable solvent.
	(b) Idle discharge holes plugged or gummed.	(b) Disassemble carburettor. Then, use compressed air to clear idle discharge holes after soaking main and throttle bodies in a suitable solvent.
	(c) Throttle body carbonized or worn throttle shaft.	(c) Disassemble carburettor. Check throttle valve shaft for wear. If excessive wear is apparent, replace throttle body assembly.
	(d) Incorrect float level.	(d) Test fuel level in carburettor. Adjust as necessary to obtain correct float level.
	(e) Loose main body to throttle body screws.	(e) Tighten main body to throttle body screws securely to prevent air leaks.
	(f) Worn or corroded needle valve and seat.	(f) Clean and inspect needle valve and seat. If found to be in questionable condition, replace assembly, resetting float. Then, test fuel pump pressure. Refer to Specifications for correct fuel pump pressure.
	(g) Fuel cut-off solenoid remains closed.	(g) Check solenoid and electrical circuit (including fuse) for failure.
	(h) Idle mixture incorrect.	(h) Adjust to specification.
	(i) Poor return to idle — due to defective auto choke.	(i) Check fast idle speed. Adjust to specification. Check for deformed unloader lever or rod. Correct or replace.
POOR ACCELERATION	(a) Accelerator pump piston plunger or diaphragm too hard, worn, or damaged.	(a) Disassemble carburettor. Replace accelerator pump assembly if the seal is hard, cracked or worn. Test follow-up spring for compression.
	(b) Incorrect fuel or float level.	(b) Test fuel or float level in carburettor. Adjust as necessary to obtain correct float level.
	(c) Worn accelerator pump and throttle linkage.	(c) Disassemble carburettor. Replace worn accelerator pump and throttle linkage and measure for correct position.
CARBURETTOR FLOODS OR LEAKS	(a) Cracked body.	(a) Disassemble carburettor. Replace cracked body. Make sure main to throttle body screws are tight, use new gaskets (if applicable).
	(b) Faulty body gaskets.	(b) Disassemble carburettor. Replace defective gaskets and test for leakage. Be sure screws are tightened securely.
	(c) High float level.	(c) Test fuel level in carburettor. Make necessary adjustment to obtain correct float level.
	(d) Worn needle valve and seat.	(d) Clean and inspect needle valve and seat, resetting float. If found to be in a questionable condition, replace complete assembly and test fuel pump pressure. Refer to specifications for correct fuel pump pressure.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
	(e) Excessive fuel pump pressure.	(e) Test fuel pump pressure. If pressure is in excess of recommended pressure (refer to Specification), replace fuel pump spring, or replace fuel pump.
	(f) Ruptured accelerator pump diaphragm.	(f) Replace diaphragm.
POOR PERFORMANCE MIXTURE TOO RICH	(a) Restricted air cleaner.	(a) Remove and clean air cleaner or replace element.
	(b) Leaking float.	(b) Disassemble carburettor. Replace leaking float. Test float level and correct as necessary, to proper level.
	(c) High float level.	(c) Adjust float level as necessary to secure proper level.
	(d) Excessive fuel pump pressure.	(d) Test fuel pump pressure. Refer to specifications for recommended pressure. If pressure is in excess of recommended pressure, replace fuel pump spring.
	(e) Worn metering jet.	(e) Disassemble carburettor. Replace worn metering jet, using a new jet of the correct size and type.
	(f) Choke not operating.	(f) Repair, clean or replace.
	(g) Main jet loose.	(g) Tighten jet.
POOR PERFORMANCE MIXTURE TOO LEAN	(a) Air leak bypassing the carburettor.	(a) Repair.
	(b) Main jet blocked.	(b) Clean.
	(c) Secondary diaphragm chamber faulty.	(c) Replace.
	(d) Fuel filter blocked.	(d) Replace.
	(e) Accelerator pump delivery incorrect.	(e) Check for broken diaphragm. Check operation of inlet and outlet, check valves and seats. Replace if necessary.
	(f) Low float level.	(f) Adjust float level as necessary.

ENGINE RUNS EXTREMELY RICH AFTER COLD START

CARBURETTOR RICH	(a) Incorrect gasket or gasket installation between carburettor and intake manifold.	(a) Replace or correct.
CHOKE SYSTEM RICH	(a) Damaged or worn choke housing.	(a) Repair or replace housing.
	(b) Blocked choke housing water passage.	(b) Repair or replace faulty passage.

EXCESSIVE STALLS AFTER COLD START

ENGINE STALLS	(a) Incorrect starting procedure.	(a) Use correct procedure.
	(b) Choke system faulty.	(b) Check items under "Poor Starting—Choke Valve Fails to Close".
	(c) Choke adjustment lean.	(c) Adjust to specifications.
	(d) Vacuum hoses leaking or disconnected.	(d) Check distributor vacuum advance, Cannister/Carburettor purge ports, and PCV valve hoses.
	(e) Faulty distributor vacuum advance.	(e) Check advance curves, replace faulty components.
	(f) Faulty ERG system.	(f) Check as per Group 25 of this manual.
	(g) Carburettor too lean.	(g) Check and adjust carburettor settings.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
ENGINE OUTPUT LOW	(a) Fast idle speed low.	(a) Adjust to specifications.
	(b) Engine lubrication oil of incorrect viscosity.	(b) Replace.
CARBURETTOR LEAN	(a) Curb idle set very lean.	(a) Adjust.
	(b) Air leak bypassing the carburettor.	(b) Repair.

POOR COLD ENGINE STARTING

INCORRECT PROCEDURE	(a) Throttle must be opened as described in operation and Maintenance Manual.	(a) Instruct owner.
CHOKE VALVE FAILS TO CLOSE	(a) Choke adjustment leaner than specified.	(a) Adjust.
	(b) Choke thermostat corroded such that it has cracked and distorted lean.	(b) Replace assembly.
	(c) Choke thermo wax element plunger sticking or faulty.	(c) Replace assembly.
	(d) Choke linkage, shaft or related parts corroded, bent or dirty such that the system is not entirely free to move from the open to the closed position.	(d) Repair, clean or replace.
	(e) Choke valve improperly seated.	(e) Reseat valve.
	(f) Air cleaner gasket interferes with choke valve or linkage.	(f) Reinstall gasket properly.
	(g) Sticky fast idle cam.	(g) Rectify.
LOW ENGINE OUTPUT (10°F or lower)	(a) Engine lubricating oil of incorrect viscosity.	(a) See specifications.
	(b) Choke adjustment incorrect, rich.	(b) Adjust to correct setting.

POOR DRIVABILITY DURING AND AFTER WARM-UP

POOR DRIVABILITY	(a) Incorrect fast idle setting.	(a) Adjust to specification.
	(b) Incorrect or faulty ignition system.	(b) Repair or replace.
	(c) Dirty carburettor passages.	(c) Clean and readjust.
	(d) Heated inlet air system malfunction.	(d) Check as per Group 25 of this manual.
LEAN, SPITS, SAGS OR STALLS	(a) Choke settings incorrect.	(a) Adjust to specification.
	(b) Incorrect idle mixture.	(b) Adjust to specification.
	(c) EGR System faulty.	(c) Check as per Group 25 of this manual.
EXCESSIVE FAST IDLE	(a) Incorrect fast idle setting.	(a) Adjust to specification.

SECTION 2G — DUAL THROAT CARBURETTOR — BI-METAL CHOKE

SPECIFICATIONS

Model Number	28-32 DID TA — 56	30-32 DID TA — 1 (Man) 30-32 DID TA — 7 (Auto)
Application	1,6 litre	1,85 and 2,00 litre
Transmission	Manual	Manual and Automatic
Throttle Bore — Primary	28 mm	30 mm
— Secondary	32 mm	<———
Venturi Bore — Primary	21 mm	22 mm
— Secondary	27 mm	28 mm
Main Jet — Primary	# 101.3	# 107.5
— Secondary	# 185	# 190
Main Air Jet — Primary (Vertical)	0,9 mm (0.035")	0,7 mm (0.028")
(Horizontal)	0,6 mm (0.024")	<———
— Secondary	1,2 mm (0.047")	0,9 mm (0.035")
Pilot Jet — Primary	# 60	# 55
— Secondary	# 60	<———
Pilot Air Jet — Primary (Vertical)	1,6 mm (0.063")	1,4 mm (0.055')
(Horizontal)	2,0 mm (0.079")	<———
— Secondary	1,0 mm (0.039")	<———
Enrichment Jet	# 40 x 2	<———
Primary Throttle Valve Angle When Secondary Begins to Open	45°	<———

ADJUSTMENTS

Float Level — On Vehicle	Centre Dot on Float Chamber Glass	<———
Float Level — Off Vehicle	14 to 15 mm (0.550 to 0.590")	<———
Idle Speed R.P.M. (Kerb Idle)	850 ± 50	<———
Fast Idle Throttle Valve to Bore Gap (Primary Bore)	1,2 mm	1,3 mm
Fast Idle Speed R.P.M. (Cold)	2000	<———
Maximum CO Emission	0.5 to 2.0 %	<———
Automatic Choke	Centre Projection on Choke Housing	<———

NOTE: Specifications printed are correct at the time of publication. If these specifications differ from those on the Vehicle Emission Control Information Label, use the specifications on the label.

GENERAL INFORMATION

The dual-throat down-draft type carburettor utilizes four basic fuel metering systems. The Idling System provides a mixture for idle and low speed performance; the Main System provides an economical mixture for normal cruising conditions; the Accelerator Pump System provides additional fuel during acceleration; and Enrichment System provides a richer mixture when high power output is desired.

In addition to these four basic systems, there is a fuel inlet system that constantly supplies the fuel to the basic metering systems, and an automatic choke system which temporarily enriches the mixture to aid starting and running a cold engine. The carburettor for engines with manual transmission (Astron only) is equipped with a dashpot which retards the return of the throttle to the idle position.

Idling System

The idling system delivers the correct ratio of air-fuel mixture for smooth engine idling, off-idling and low-load operations.

The fuel coming from the float chamber past the primary main jet is led to the pilot jet where the fuel is metered. The air from the venturi air leak and the pilot air jet No. 2 is metered by the pilot air jet No. 1 and mixed with the fuel into an air-fuel mixture. This mixture is adjusted by the bypass screw and final adjustment is controlled by the bypass hole and the mixture screw. The adjusted mixture, flowing from the pilot outlet, mixes with air that passes through the throttle valve gap and passes into the engine. The mixture screw adjusts the ratio of the air-fuel mixture at idle, while the bypass screw adjusts the fuel coming from the bypass hole for off-idling and medium-load operations.

The fuel cut off solenoid shuts off the supply of fuel to the engine when the ignition is switched off thus eliminating the possibility of engine run-on.

Main System

As the throttle valve is opened wider, the air velocity inside the venturi increases, forming a vacuum in the inner venturi. Utilizing this vacuum, the fuel is jetted out from the main nozzle into the bore.

The carburettor primary main circuit is used for medium-load operation. When the driver demands more power, the secondary main circuit is brought into operation.

The fuel metered by the main jet is leaned out with the air from the main air jet and passing into the engine through the main nozzle.

In the event of fuel percolation in the main well, the fuel vapor passes outside the bleed pipe and escapes at the main air jet. Due to this design, the liquid fuel will never be jetted out of the main nozzle.

The float chamber is designed to cool down easily to prevent percolation caused by the combustion heat of the engine.

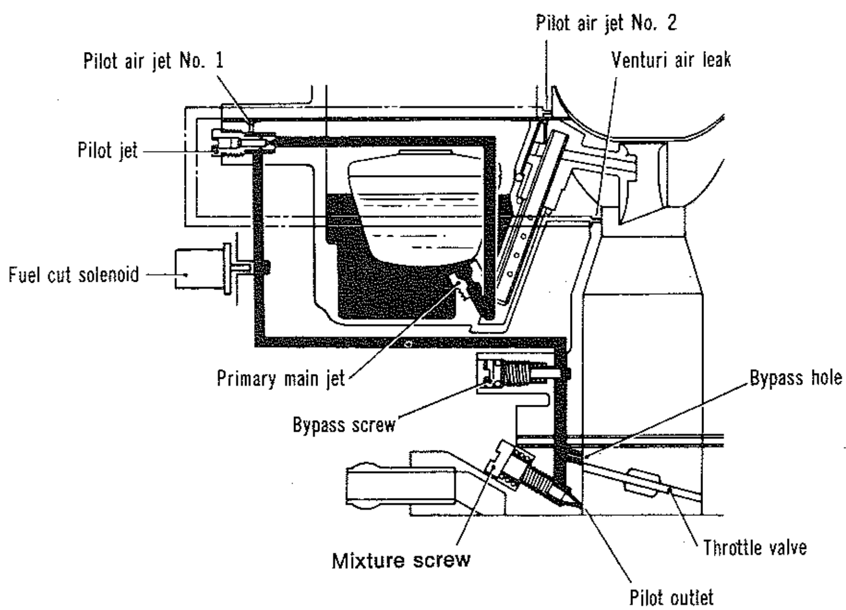


Fig. 1—Idling system

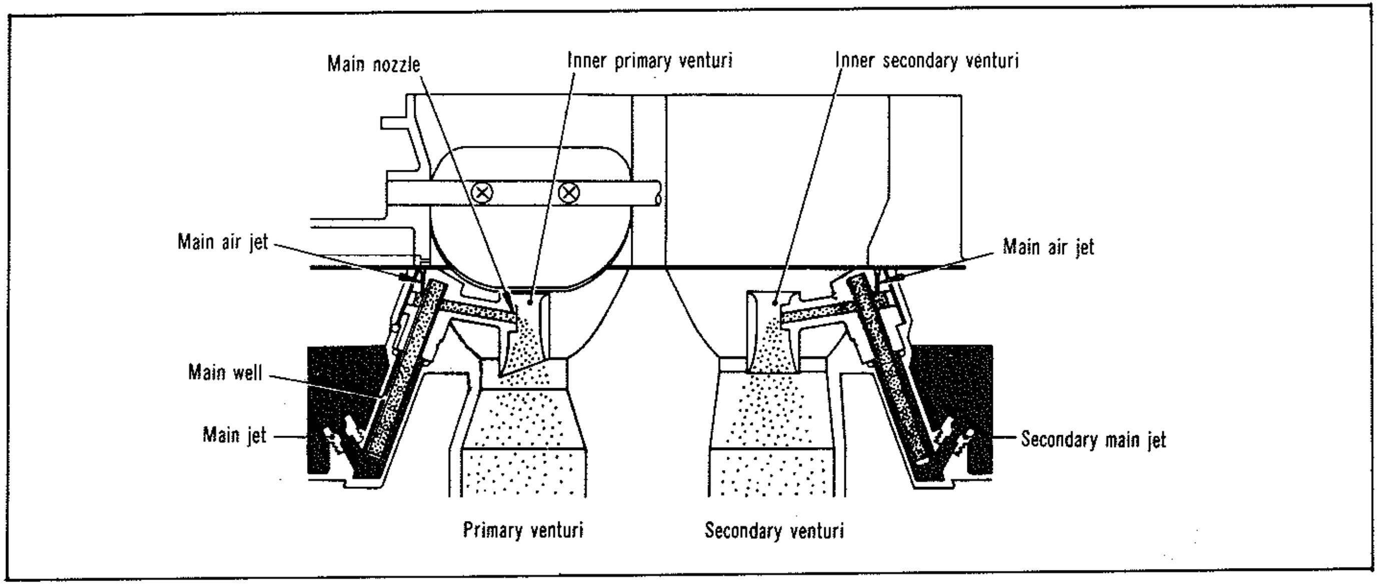


Fig. 2—Main metering system

Enrichment System

This circuit supplies additional quantities of fuel to the primary main circuit when the driver demands more power and torque. The intake manifold vacuum is applied to the membrane through the membrane spring, opening and closing the fuel passage. Under normal driving condition, the intake manifold vacuum is high. The vacuum is applied to the vacuum chamber forcing the membrane outward to close the valve against the force of membrane spring. As engine load increases, the intake manifold vacuum decreases and the valve is moved back to open with spring force; thus the fuel from the float chamber is metered through the enrichment jet, passes through the valve, enters the passage in the primary main circuit, and is mixed with some air to form an air-fuel mixture.

Accelerator Pump System

When the engine speed is increased suddenly, the air-fuel mixture becomes excessively lean. To overcome this condition, the carburettor is provided with an accelerator pump circuit and when the driver demands more power for smooth acceleration, an additional quantity of fuel is temporarily delivered from the pump jet.

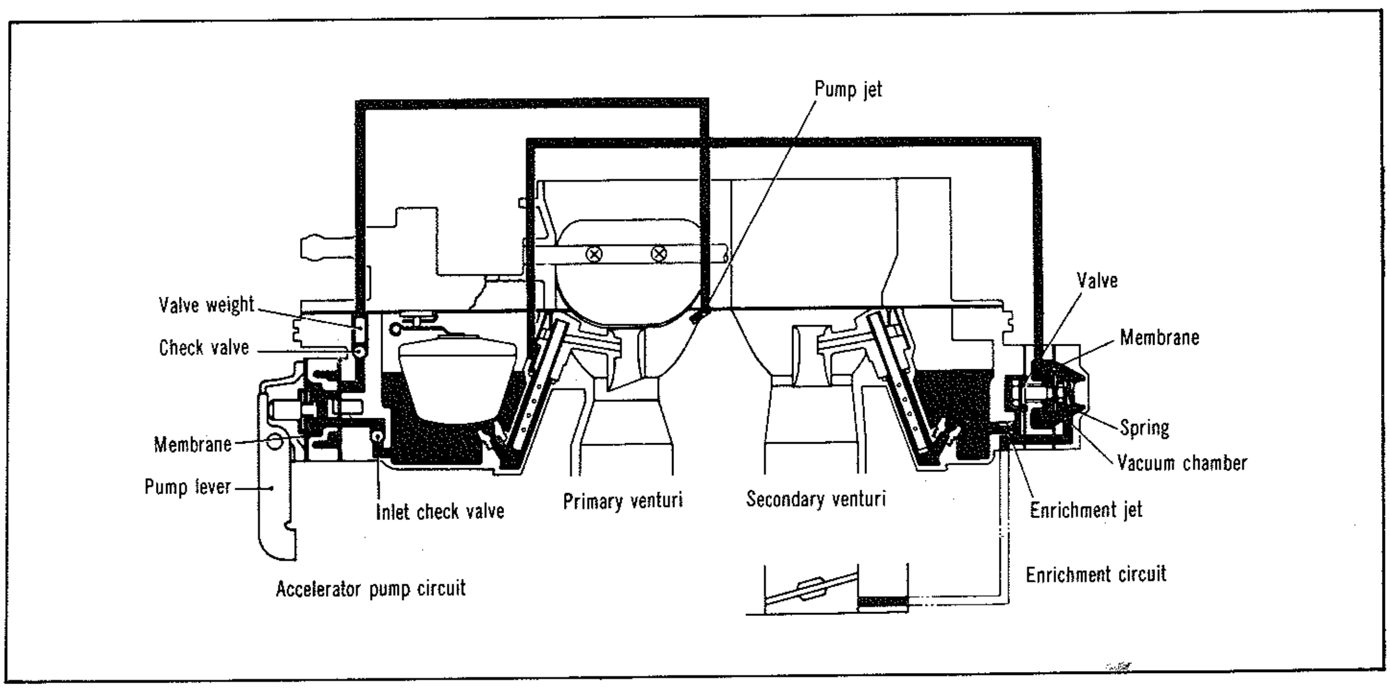


Fig. 3—Enrichment system

The fuel drawn in through the inlet check valve by the reciprocal motion of the membrane reaches the pump nozzle past the outlet check valve and is emitted into the main bore. On acceleration, the membrane is pushed with the pump lever that is interlocked with the throttle valve, and compresses the fuel. On deceleration, the membrane is forced back with spring force, refilling the pump chamber with the fuel.

The fuel delivery decreases as the engine picks up speed. At throttle openings of about 65 degrees or more, no fuel is delivered.

Fuel Inlet System

The fuel inlet system maintains the fuel at a prescribed level within the carburettor during operation. The fuel from the fuel tank flows into the filter past the fuel pump. After the filter, the fuel goes into the float chamber through the needle valve.

As the fuel enters the float chamber, the float moves upward to the prescribed level, where the needle valve is closed. With the consumption of fuel, the float moves down to open the needle valve to permit the fuel to flow into the float chamber, raising the float to the prescribed level. This operation is repeated to store an unvarying level of fuel within the carburettor during operation.

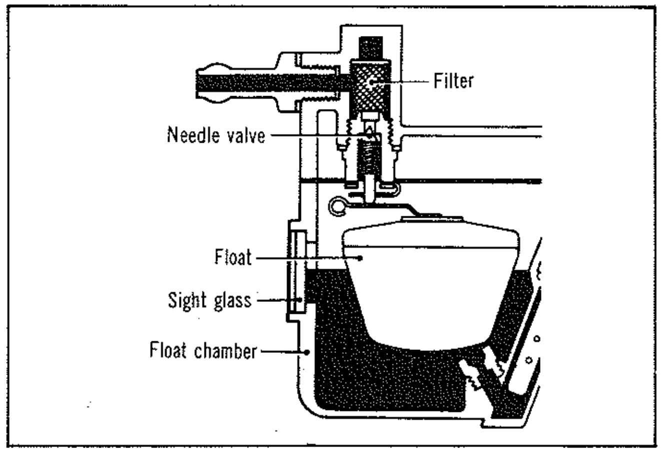


Fig. 4—Fuel inlet system

Automatic Choke System

A greater supply of fuel is required to start a cold engine particularly in cold weather. These conditions vary largely with the atmospheric temperature and the rate of engine warm up. To meet these conditions, a bi-metal spring is actuated by engine coolant to operate the choke valve. The choke valve is installed off-centre to supply the fuel through the main nozzle, at the time of engine starting and is kept closed by the bi-metal spring. The lower the temperature drops, the more the valve is closed by the spring. With a rise of coolant temperature, the choke valve is opened.

Immediately after the engine is started, the vacuum from the intake manifold increases until it overcomes the spring force, forcing the membrane and the shaft down. The pin interlocked with the shaft begins opening the choke valve, preventing the over-richening of the mixture.

A small bi-metal spring operates with the fast idle cam to assist in starting the engine in cold weather preventing unnecessary increases in engine speed at normal engine temperature.

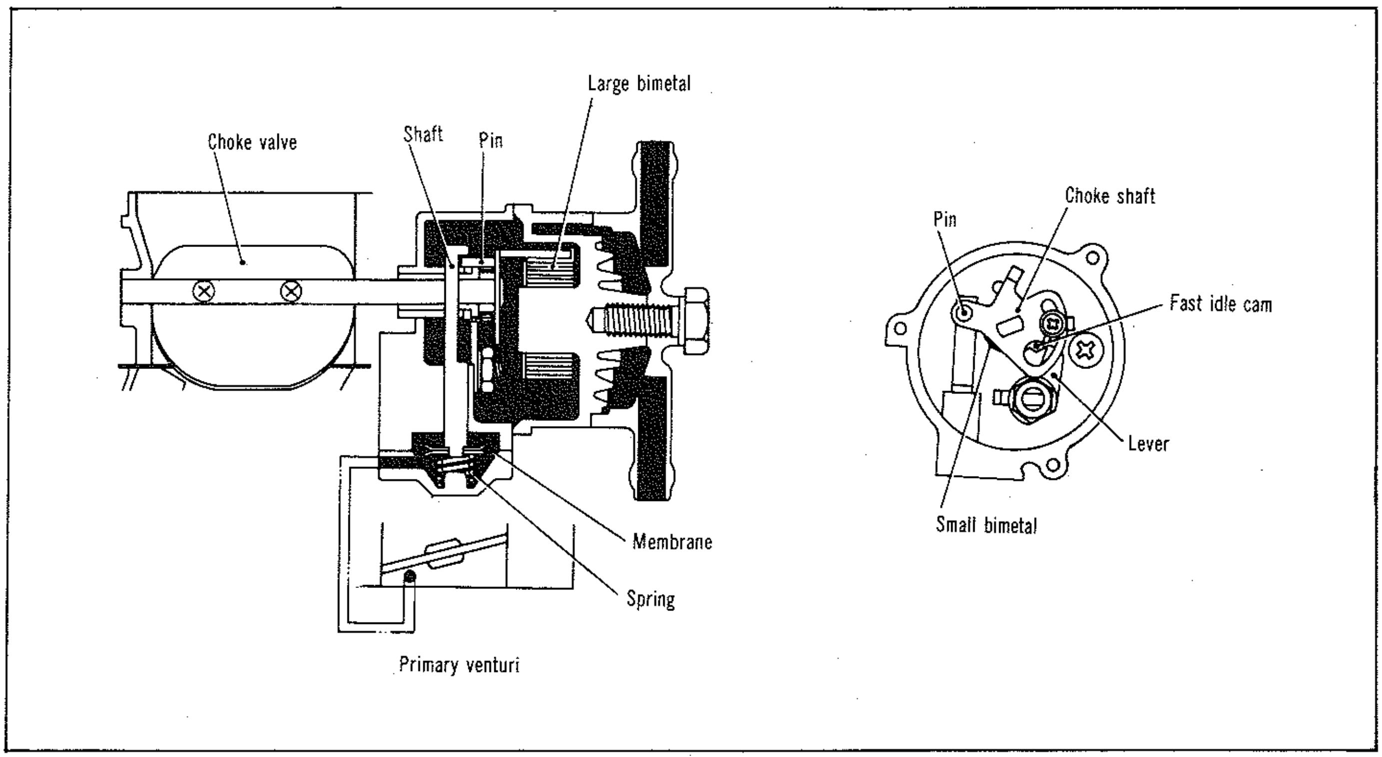


Fig. 5—Automatic choke system

With a drop in temperature the small bi-metal spring lever engages with the high section of the cam. As the temperature rises the lever engages with the low steps of the cam until finally it becomes free of the cam and the engine idles at normal speed.

The small bi-metal spring has no throttle valve operating torque; and therefore after the engine starts, it is necessary to depress the accelerator pedal so that the lever may be engaged with an appropriate cam lobe.

The choke unloader is designed to prevent the over-richening of fuel when the throttle valve is fully opened immediately after starting the engine. The lever is released from the fast idle cam to the idling state at the same time as the choke valve is fully opened.

A spring is installed between the fast idle cam and the small bi-metal spring to compensate for the delay of cam operation.

Dash Pot (where fitted)

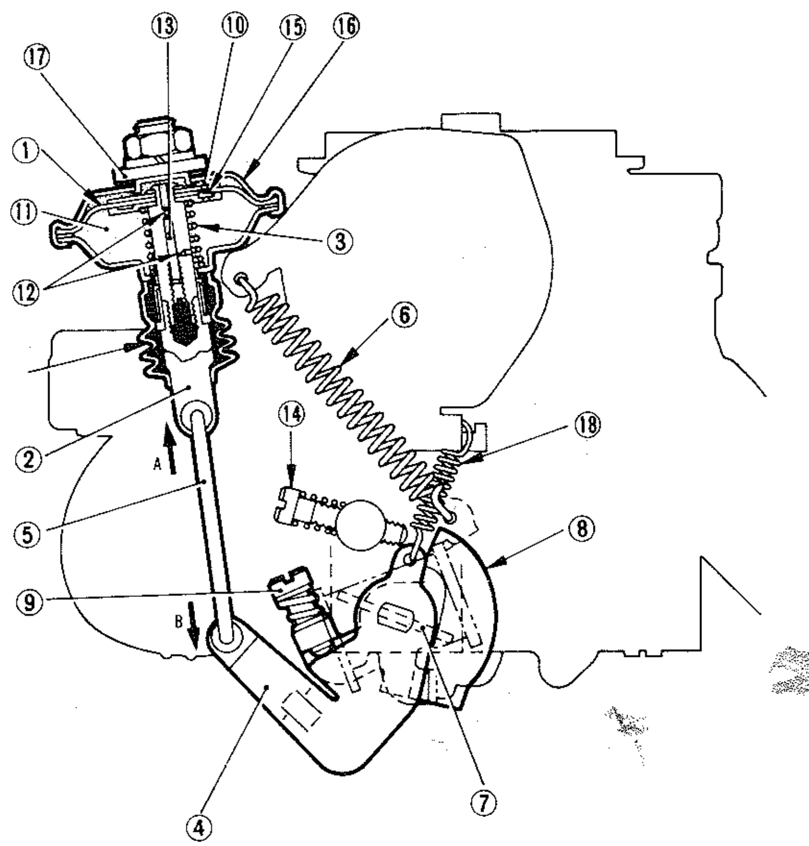
The dash pot diaphragm (1) and the rod (2) connected to this diaphragm are always pushed by the diaphragm spring (3) in direction "A". The lever (4) installed on the throttle valve shaft of the carburettor, rotates freely and is connected by the link (5) to the rod (2).

When the accelerator pedal is released, the carburettor throttle valve (7) is quickly moved by the throttle return spring (6) toward closing. Since the force of this throttle return spring is greater than that of the diaphragm spring the lever is pushed in direction "B" and accordingly the rod (2) and diaphragm (1) are also pulled in the same direction, thus decreasing a pressure inside the diaphragm chamber (10). Air inside the diaphragm chamber (11) flows into the diaphragm chamber (10) through the jet (12) and the orifice around the needle screw (13). The throttle valve is slowly closed with this resistance within a period since the adjusting screw (9) fitted to the abatement plate (8) touches the lever (4) till the other end of the abatement plate touches the speed adjusting screw (14). Thus intake manifold vacuum will not increase excessively at the time of deceleration, thus reducing the quantity of HC (hydrocarbons).

When the accelerator pedal is depressed, the diaphragm (1) and rod (2) are pushed by the diaphragm spring (3) in direction "A". At this time the check valve (15) is opened to allow air to flow from the diaphragm chamber (10) into the diaphragm chamber (11) and the rod (2) quickly returns to its original position.

Dash Pot Adjustment

Refer Carburettor Adjustment.



1 Diaphragm
2 Rod
3 Diaphragm spring
4 Lever
5 Link
6 Throttle return spring
7 Throttle valve
8 Abatement plate
9 Adjusting screw
10 Diaphragm chamber
11 Diaphragm chamber
12 Jet
13 Needle screw
14 Speed adjusting screw
15 Check valve
16 Dash pot body
17 Bracket
18 Lever spring
19 Cover

Fig. 6—Dash pot construction

Fuel Vapour Separator (Where Fitted)

Vehicles fitted with a vapour separator have the fuel supplied from the pump to the carburettor, through the vapour separator. Fuel enters the vapour separator through the middle connector and then flows out of the separator through the lower connector to the carburettor fuel bowl. Vapours separated from the fuel in the separator are held in the upper section. These vapours are then passed through the upper connector of the separator to the carburettor accelerator pump where they are cooled (liquified) and returned to the fuel tank via a return line.

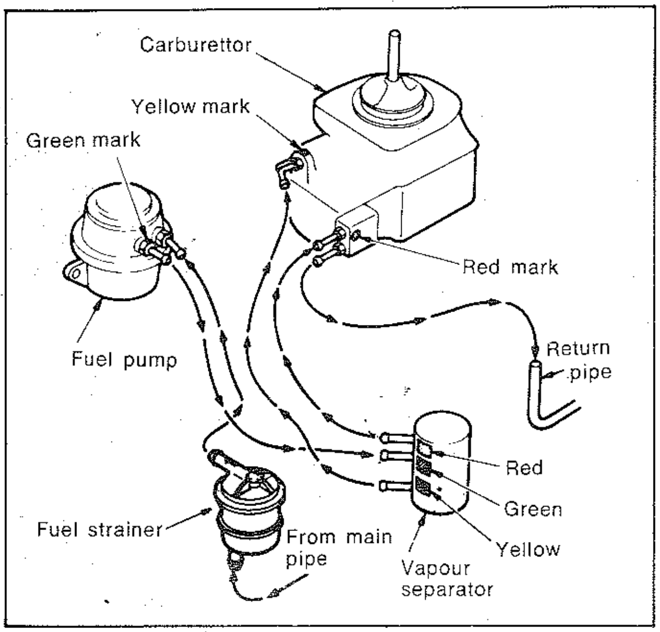


Fig. 7—Vapour separator system

Installation

When reinstalling fuel hoses ensure they are correctly positioned shown in Fig. 7. The vapour separator must be installed with the red identification mark to the top.

Connect each fuel hose positively and tighten the fuel hoses securely.

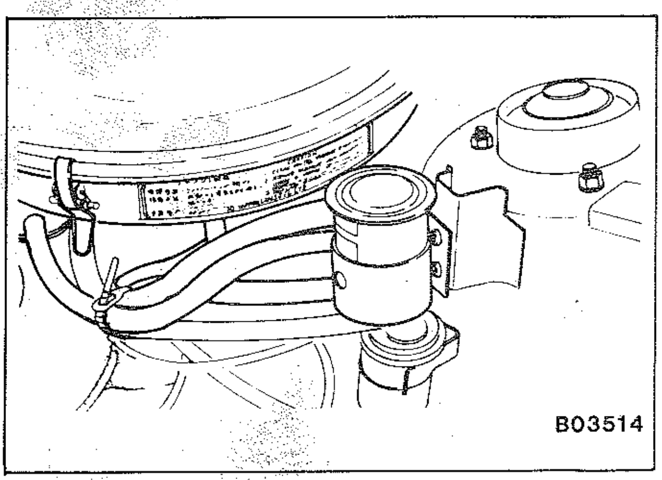


Fig. 8—Vapour separator

CARBURETTOR DISASSEMBLY

Disassemble the carburettor in a systematic order paying attention to the following:

- Use spanners and screw drivers that fit the nuts, screws and jets securely, otherwise the components may be burred or damaged.
- When parts are disassembled place them on a clean bench in the order of removal to aid in reassembly.
- Do not remove the inner venturi (17) and (18) Fig. 8.
- Do not remove the by pass screw (25), Fig. 8, this screw is sealed by paint.
- Do not disassemble the throttle shaft and throttle valve.

CLEANING AND INSPECTION

(1) Clean the disassembled parts with clean methylated spirits or a suitable solvent.

NOTE: Do not clean O-rings, diaphragms or plastic parts with any cleaning solvent as damage may result.

(2) Clean out all fuel passages and jets with compressed air, **DO NOT** use wire or drills to clean jets as the orifices may be enlarged and thus effect the performance of the carburettor.

(3) If "O" rings, gaskets and diaphragms are to be re-used, they should be cleaned with a clean cloth or a soft brush.

(4) Check the carburettor body and water passages for cracks, scale and clogging.

(5) Check the needle valve and seat contact for damage or wear, replace if defective.

(6) Check the filter for damage and clogging.

(7) Check the jets and air bleeds for damage and clogging.

(8) Check each diaphragm for damage.

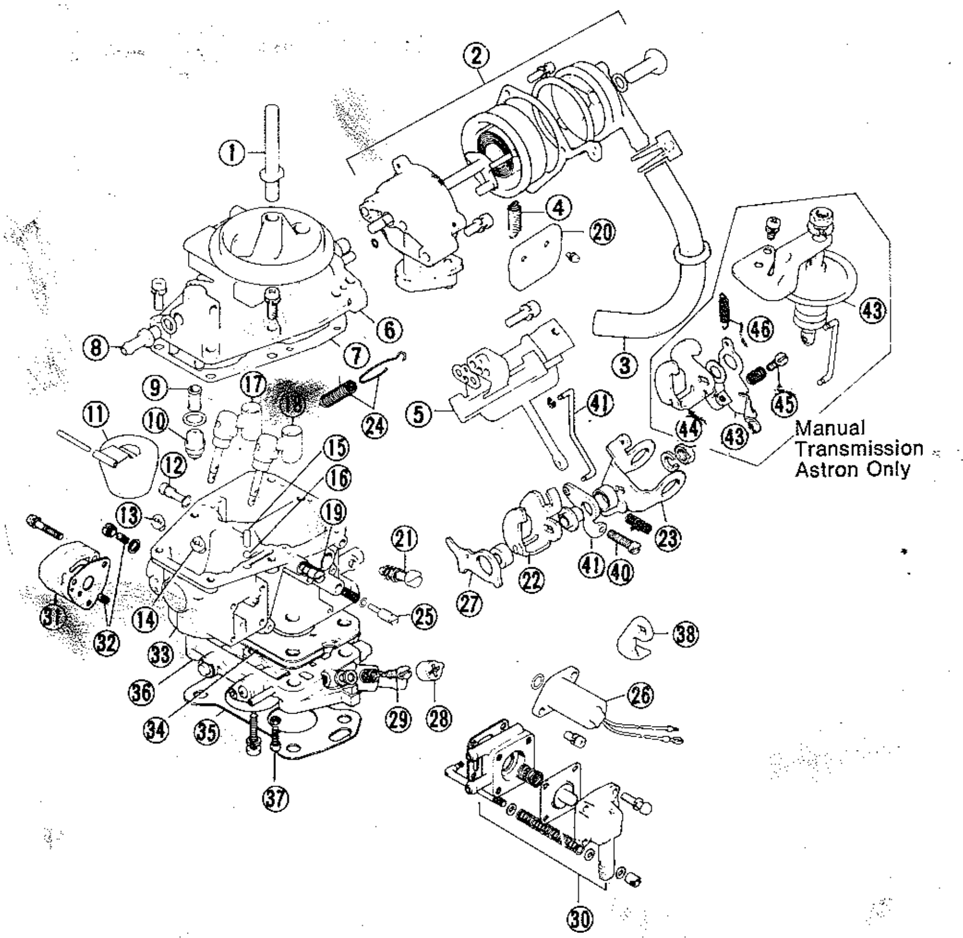
(9) Check the mixture screw contact seat for damaged surface.

(10) Check the throttle valve shaft and choke shaft operation, if unsatisfactory clean the shaft and linkage with solvent and lubricate with engine oil.

(11) Check the accelerator pump operation by quickly opening the throttle valve more than 70° and checking the delivery from the pump nozzle. If the delivery is weak or there is no delivery at all, check for a clogged fuel passage or broken pump diaphragm.

(12) Check the depression chamber by pushing the rod in, sealing off the nipple and releasing the rod. If the rod does not return the chamber is good, if the rod returns when released the diaphragm is defective and the assembly must be replaced.

(13) Check the fuel cut solenoid by connecting the inline connector to the positive (+) terminal of a 12 V battery and the other lead (ring terminal) to the negative (—) side of the battery. The needle should move in towards the solenoid when the battery is connected and it should move out as soon as the battery is disconnected. If the solenoid is not satisfactory it must be replaced.



1 Stud
2 Auto-choke
3 Water hose
4 Return spring
5 Depression chamber
6 Float chamber cover
7 Float chamber gasket
8 Fuel inlet nipple
9 Filter
10 Needle valve
11 Float
12 Secondary pilot jet
13 Secondary main jet
14 Primary main jet
15 Valve weight
16 Check valve
17 Inner secondary venturi
18 Inner primary venturi
19 Primary pilot jet
20 Choke valve
21 Idle speed screw
22 Abatement plate
23 Throttle lever
24 Throttle return spring
25 Bypass screw
26 Fuel cut solenoid
27 Intermediate lever
28 Limit cap
29 Mixture screw
30 Accelerator pump
31 Enrichment body assy
32 Enrichment jet
33 Main body
34 Insulator
35 Carburettor gasket
36 Throttle body
37 Throttle stop screw
38 Lever (A/T)
39 Screw
40 Lever
41 Choke rod
42 Dash pot
43 Lever
44 Abatement plate
45 Adjusting screw
46 Lever spring

Fig. 9—Exploded view of carburettor

(14) Check the dash pot by pulling out the dash pot rod. If it offers strong resistance when pulled, the unit is good, if it can be pulled out without resistance the diaphragm is defective and the dash pot must be replaced. The rod should return to its original position as soon as it is released.

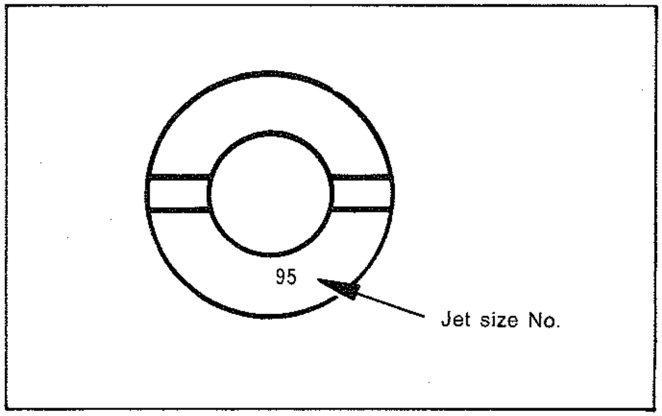


Fig. 10— Jet identification mark

CARBURETTOR ASSEMBLY

Assemble the carburettor by reversing the disassembly procedure, noting the following:

- Ensure all parts are clean and dry.
- Replace any faulty or damaged parts .
- Ensure all linkages and shafts move freely, lubricate if necessary.
- Replace old gaskets and "O" rings.
- Take care not to distort diaphragm upon installation.
- The main jet, pilot jet and enrichment jet have jet size numbers stamped on them as shown in Fig. 10. The jets must be installed as specified.
- When installing the automatic choke ensure that the mating marks of the choke case and bi-metal spring case are aligned. The large centre projection must be aligned with the punch mark of the bi-metal spring case.

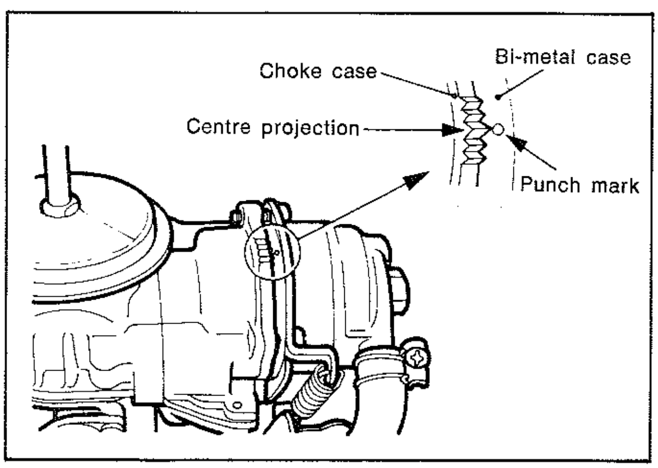


Fig. 11—Automatic choke mating marks

CARBURETTOR ADJUSTMENTS

Float Level Adjustment

The carburettor fuel bowl is fitted with a sight glass which has a centre mark. The normal fuel level is within that centre mark, or no more than 2 mm (0.078") above the level mark.

Fuel level adjustment is accomplished by increasing or decreasing the number of needle valve spacers. Spacers 1,0 mm (0.039"), 0,5 mm (0.020") and 0,3 mm (0.012") thick will alter the float level by 3 mm (0.118"), 1,5 mm (0.059") and 0,9 mm (0.035") respectively.

NOTE: Never adjust the float level by bending the float arm as this can lead to the float arm jamming with resultant flooding or fuel stavation.

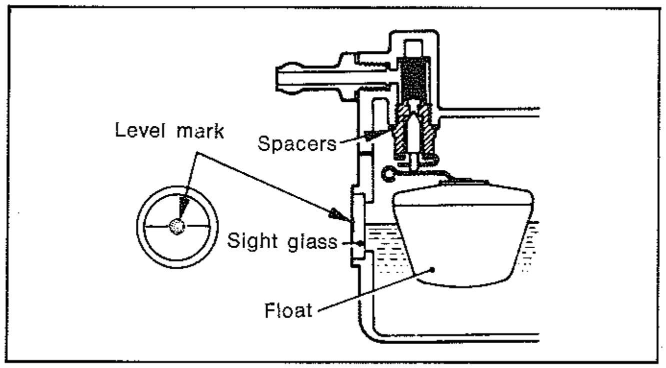


Fig. 12—Float level adjustment

To check the float level before refitting the carburettor to the engine, turn the float chamber cover upside down, tilted at an angle of 20°, (refer Fig. 13).

NOTE: If the float chamber cover is placed in a horizontal position, with the full weight of the float resting on the needle valve spring, a false reading of the float level will be obtained.

Measure the clearance between the top ridge of the float and the float chamber cover (without the gasket) ensuring that the float clearance is 14 to 15 mm (0.550" to 0.590") (refer Fig. 13).

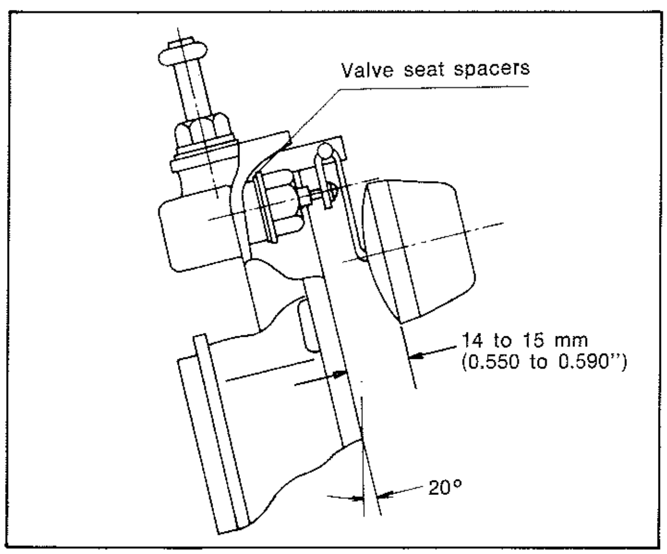


Fig. 13—Checking float level before carburettor assembly

Fast Idle Adjustment

(Carburettor removed)

Position the fast idle cam onto the fourth step and measure the throttle bore-to-valve clearance with a round pin gauge. If the gap is not within specifications adjust it by means of the fast idle adjusting screw.

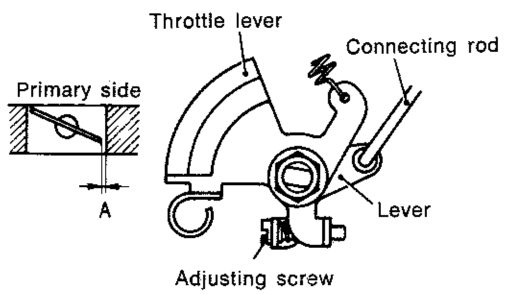


Fig. 14—Fast idle adjustment

Carburettor Installed

The fast idle speed adjustment must be made with the engine cold and the choke valve in the closed position. The engine should be operating at the specified fast idle r.p.m. If the speed is not within specification, adjust it by means of the fast idle adjusting screw.

Dash Pot Adjustment (Where Fitted)

NOTE: Normal idling adjustments must be carried out before the following adjustments are made.

(1) With the engine running, push up on the lower end of the dash pot rod until it bottoms. The engine speed should be 2000 ± 100 r.p.m. If not, reset the speed using the adjusting screw (Fig. 15).

(2) Release the rod and the engine speed should drop to 1000 r.p.m. within 2 to 5 seconds. Replace a dashpot that fails to meet this specification.

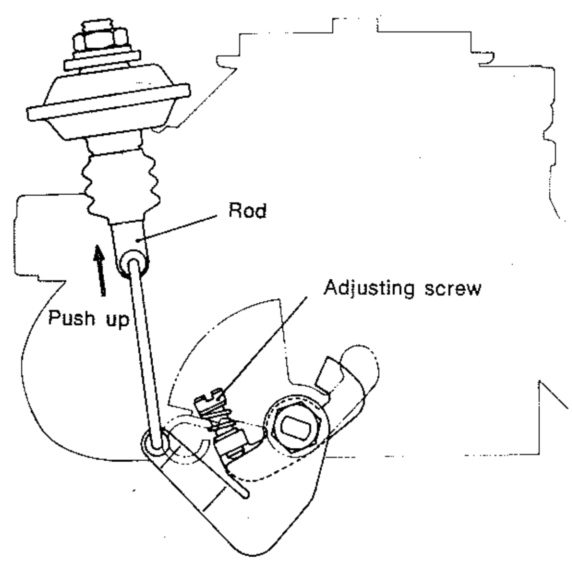


Fig. 15—Dash pot adjustment

SECTION 2H — DUAL THROAT CARBURETTOR — THERMO WAX ELEMENT CHOKE

SPECIFICATIONS

Model Number	28-32 DID TA-230	30-32 DID TA-230 (Man.) 30-32 DID TA-231 (Auto.)	30-32 DID TA-236 (Auto)
Application	1,6 litre	2,0 litre	2,6 litre
Transmission	Manual	Manual and Auto.	Automatic
Throttle Bore—Primary	28 mm (1.102")	30 mm (1.181")	<———
—Secondary	32 mm (1.260")	<———	<———
Venturi Bore—Primary	21 mm (0.826")	22 mm (0.866")	<———
—Secondary	27 mm (1.062")	28 mm (1.102")	<———
Main Jet —Primary	# 101.3	# 106.3	# 107.5
—Secondary	# 190	<———	# 185
Pilot Jet —Primary	# 60	<———	# 55
—Secondary	# 60	<———	<———
Enrichment Jet	# 40	# 40	# 55
Dashpot	—	Constant Vacuum (Man. only)	—
Primary Throttle Valve Angle when Secondary begins to open	45°	<———	<———
ADJUSTMENTS			
Float level—On Vehicle	Centre Dot on Float Chamber Glass	<———	<———
—Off Vehicle	14 to 15 mm (0.550 to 0.590")	<———	<———
Idle Speed R.P.M. (Kerb Idle) —Manual	850 ± 50	<———	—
—Automatic	—	750 ± 30	850 ± 50
Fast Idle Throttle Valve to Bore Gap (Primary Bore)—Manual	1,2 mm (0.047")	0,8 mm (0.031")	—
—Automatic	—	1,0 mm (0.039")	<———
Fast Idle Speed R.P.M. (Cold)	2000 ± 100	<———	1700 ± 100
Maximum CO Emission—Man.	0.5 to 2.0%	<———	—
—Auto. ..	—	0.2 to 0.8%	1.0 to 2.5%
Automatic Choke	Centre Scribe Mark on Pinion Plate at 23°C or less.	<———	<———
Choke Blade to Bore Gap	0-0,5 mm (0.019")	<———	<———
Choke Breaker—Blade to Bore Gap	1,4 mm (0.055")	<———	<———

NOTE: Specifications printed are correct at the time of publication. If these specifications differ from those on the Vehicle Emission Control Information Label, use the specifications on the label.

GENERAL INFORMATION

The dual-throat down-draft type carburettor utilizes four basic fuel metering systems. The Idling System provides a mixture for idle and low speed performance; the Main System provides an economical mixture for normal cruising conditions; the Accelerator Pump System provides additional fuel during acceleration; and Enrichment System provides a richer mixture when high power output is desired.

In addition to these four basic systems, there is a fuel inlet system that constantly supplies the fuel to the basic metering systems, and an automatic choke system which temporarily enriches the mixture to aid starting and cold running. The carburettor for engines with manual transmission (Astron only) is equipped with a dashpot to retard the return of the throttle to idle.

The fuel cut off solenoid shuts off the supply of fuel to the engine when the ignition is switched off thus eliminating the possibility of engine run-on.

Idling System (Fig. 1)

This system controls the mixture during idle, off idle and part load operation, ensuring smooth operation from idling to part load.

Fuel passes through the main jet (1) from the float chamber to passage (2) and is metered by the pilot jet (3).

Air drawn through the venturi air passage (4) and pilot air No. 2 jet (5) is metered by the pilot air No. 1 jet (6) and mixed with fuel in the well to produce an air-fuel mixture. The air-fuel mixture is adjusted by the bypass screw (7) and sprayed from the bypass (8) and pilot outlet (9) to mix with air passing through the throttle valve gap prior to being drawn into the engine.

The mixture screw adjusts the air-fuel ratio mixture at idle.

The bypass screw (7) is used to adjust fuel from the bypass passage (8) for off idle to intermediate load operation.

NOTE: The bypass screw (7) is factory adjusted and white paint applied to the head of the screw. Do not tamper with this screw.

Main Metering System (Fig. 2)

As the throttle valve is opened, air velocity inside the venturi increases, forming a vacuum in the inner venturi (1). Utilizing this vacuum, the fuel is jetted from the main nozzle (2) into the bore.

The carburettor primary main circuit is used for medium-load operation. When the driver demands more power, the secondary main circuit is brought into operation.

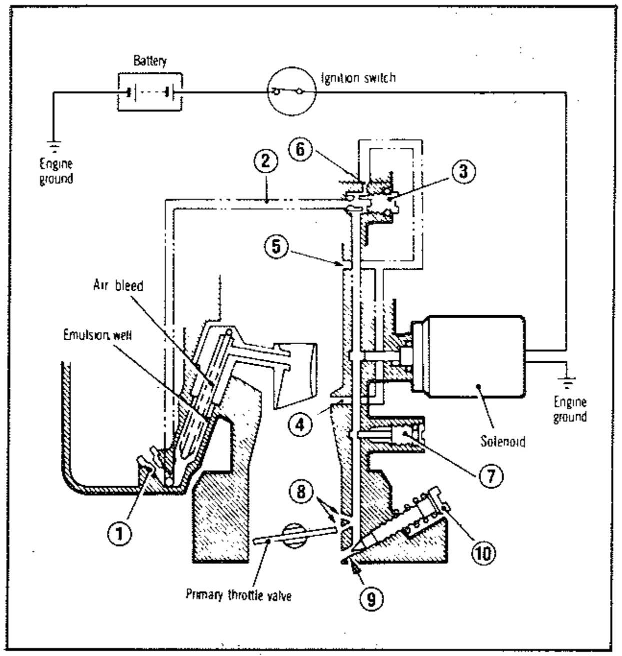


Fig. 1—Idling system

Double Bleed Design

The double bleed design of the primary circuit inner venturi contributes to better atomization. Bleed pipes (3) and (4) are press-fitted into the inner venturi (1) and main air jets (5) and (6) provided. The fuel metered by the main jet (7) is bled with air metered by the main air jets (5) and (6) through the bleed holes provided at the bleed pipes (3) and (4) and supplied from the main nozzle (2) to the engine.

The inner venturi of the secondary is a single bleed design in which the flow of fuel and air is the same as in the double bleed system, the only difference being the single construction of the bleed pipe (3) and main air jet (6).

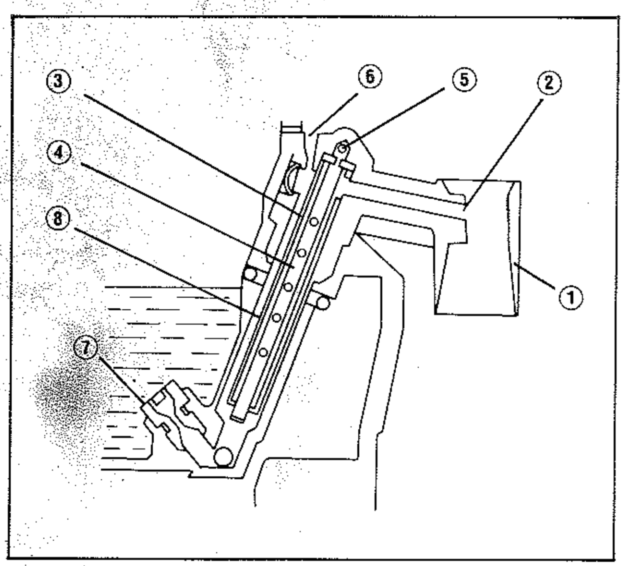


Fig. 2—Main metering system

Countermeasure against Percolation

If percolation occurs in the main well (8), the vapourized fuel will pass outside the bleed pipe and escape from the main air jet (6). Therefore, there is no possibility of liquid fuel being discharged from the main nozzle (2). This assures stability during operation and ease of restarting.

Air Flow System (Fig. 3)

Air drawn through the air cleaner flows from the choke bore (1) into the venturi (2). The amount of air is controlled by the primary throttle valve (3) and secondary throttle valve (7). When the engine is idling, air is drawn through the slight clearance between the primary throttle valve (3) and throttle bore.

During off-idle to intermediate load operation, the air is metered by the primary venturi (2) and controlled by the primary throttle valve (3) before being drawn into the engine.

As the load increases, vacuum produced by air flow past the primary and secondary negative pressure extraction orifices (4) is routed into the depression chamber (5) to operate the diaphragm (6) and open the secondary throttle valve (7).

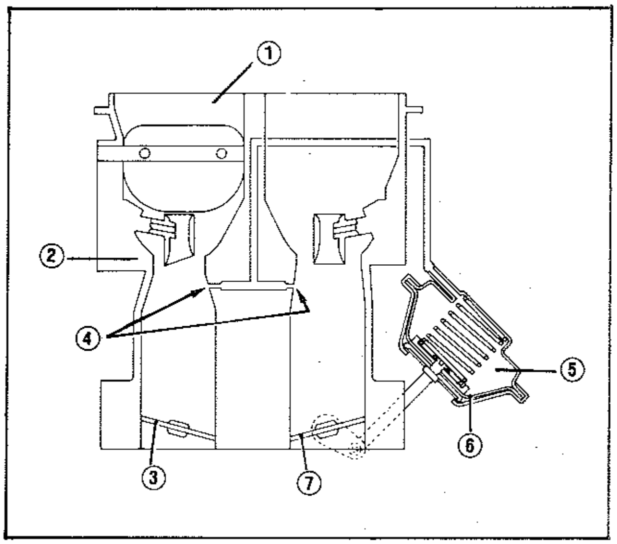


Fig. 3—Air flow system

Enrichment System (Fig. 4)

This circuit supplies additional fuel to the primary main circuit when the driver demands more power. Intake manifold vacuum is applied to the diaphragm (5) through the diaphragm spring (4) opening and closing the fuel passage (1). Under normal driving conditions, the intake manifold vacuum is high. Vacuum is applied through passage (2) to the vacuum chamber (3) forcing the diaphragm (5) outward to close the valve against the force of the diaphragm spring (4). As engine load increases, intake manifold vacuum decreases, the valve (6) opens with spring force, fuel from the float chamber is metered through

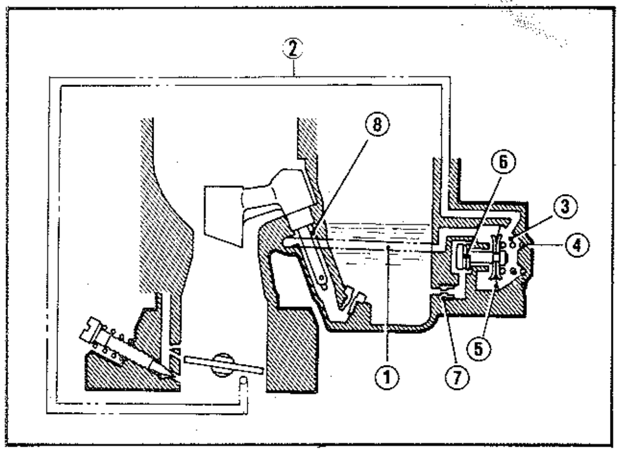


Fig. 4—Enrichment system

the enrichment jet (7), passes through the valve (6), enters passage (1) in the primary main circuit (8) and is mixed with air to form an air fuel mixture.

Accelerator Pump System (Fig. 5)

When the engine speed is increased suddenly, the air-fuel mixture becomes excessively lean. To overcome this condition, the carburettor is provided with an accelerator pump circuit to provide an additional quantity of fuel to the pump jet.

As the throttle is opened rapidly, the diaphragm (1) is pushed by the pump lever (3) interlocked with the throttle valve (2) to force the fuel through the outlet check valve (4) and spray it toward the top of the primary venturi. When the throttle is closed, the diaphragm (1) is pushed backed by the spring (5) to allow fuel flow through the inlet check valve (6) into the pump chamber. Fuel delivery decreases as the engine speed increases.

Lock nut (7) is provided for adjusting the amount of fuel to be injected. This quantity is set at the factory and an adhesive applied to the lock nut.

NOTE: Do not tamper with this adjustment.

Spring (9) is provided to maintain fuel injection for a period after the throttle valve has been opened.

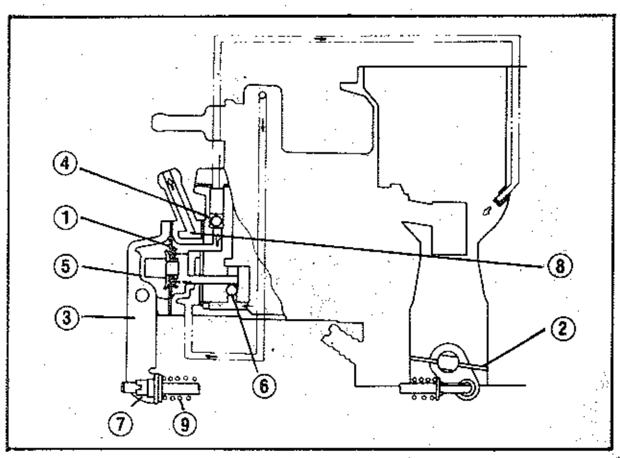


Fig. 5—Accelerator pump system

Fuel Return

Fuel is circulated through the reverse side (8) of the pump chamber to prevent a fuel temperature rise in the pump chamber so that stable delivery characteristics can be obtained without the generation of vapour.

Fuel Inlet System (Fig. 6)

The fuel inlet system maintains a constant level of fuel during engine operation. The fuel flows from the fuel tank, through the fuel filter, fuel pump, vapour seperator and the strainer (1) where it is routed through the needle valve (2) into the float chamber (3).

As fuel enters the float chamber, the float (4) moves upward to the prescribed level, where the needle valve (2) is closed. With the consumption of fuel, the float moves down to open the needle valve to permit fuel to flow into the float chamber, raising the float to the prescribed level. This operation is repeated to maintain a suitable level of fuel within the carburettor during operation.

The spring (5), provided between the needle valve and push pin, prevents the fuel level rising due to rough road operation or vibration. Air vent (6) is open to atmosphere in the choke bore.

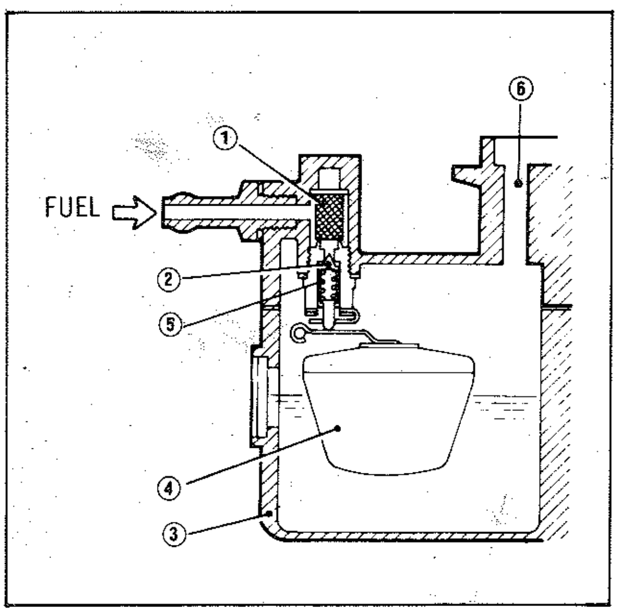


Fig. 6—Fuel inlet system

AUTOMATIC CHOKE

Thermo Wax Element Type (Fig. 7)

The thermo wax element choke system is a fully automatic choke system by which the choke valve, throttle valve openings and fast idle are automatically set according to engine coolant temperature.

Control of the fast idle opening is the major function of the choke system. To assure better (smoother) starting and running, the system has the following auxiliary devices:

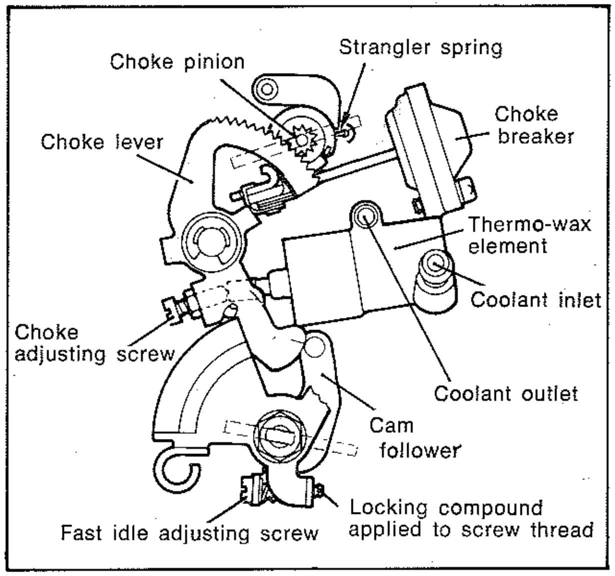


Fig. 7—Automatic choke system

- Fast idle opening control mechanism.
- Strangler mechanism.
- Choke breaker mechanism.
- Unloader mechanism.

Construction and operation of these devices is described as follows.

Fast Idle Opening Control Mechanism (Fig. 8)

When the engine starts and the engine coolant temperature rises, the thermo wax element rod (1) is forced out to move the choke set lever (2) in the direction of the arrow. Accordingly, the choke valve, throttle valve, etc. move in the direction of the arrow to provide a choke valve opening and throttle valve opening (fast idle opening) suitable for engine warm up conditions.

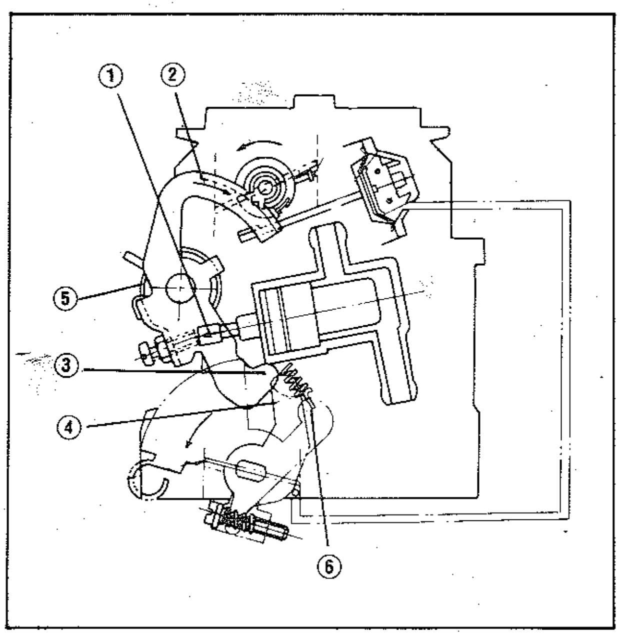


Fig. 8—Fast idle opening control mechanism

Fast Idle Cam (Fig. 8)

The fast idle cam (3) is integral with the choke lever and has a profile set to provide an optimum fast idle opening through the cam follower (4) depending on the varying coolant temperature.

Return Spring

The return spring (5) assists the thermo wax element rod (1) to retract as the engine coolant temperature falls and also ensures that a throttle opening necessary for starting can be automatically obtained against the friction of the throttle return spring (6) and the throttle link system.

Strangler Mechanism (Fig. 9)

The choke valve (1) is mounted on the choke shaft and is held shut by the strangler spring (2). One end of the strangler spring (2) is secured to the choke shaft lever (3), and the other end is secured to the pinion (4). The pinion is in mesh with the rack. The choke set lever (5) is held in contact with the thermo wax element rod (7) by the return spring (6). When the engine coolant temperature falls, the thermo wax element rod (7) retracts. As the temperature rises, the rod extends. Extension or retraction of the rod rotates the choke set lever (5) which rotates the pinion (4). Rotation of the pinion twists the strangler spring (2) which provides the strongest choke valve closing pressure at the lowest coolant temperature and the weakest pressure at the highest coolant temperature.

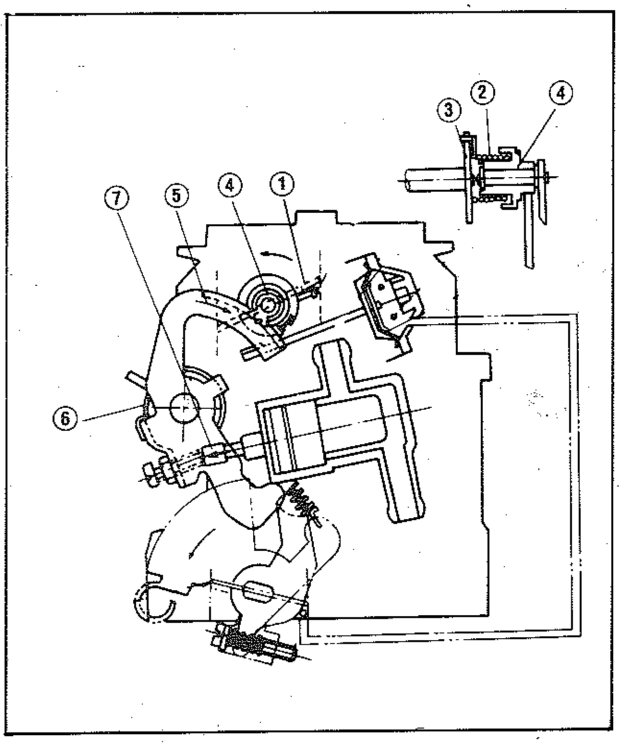


Fig. 9—Strangler mechanism

Choke Breaker Mechanism (Fig. 10)

The choke breaker mechanism prevents the mixture from becoming too rich after the engine has started. When the engine starts, manifold vacuum is applied to the choke breaker diaphragm (3) through passage (1), and overcomes spring pressure to pull the shaft (2) in the direction of the arrow, causing the choke to open a given amount.

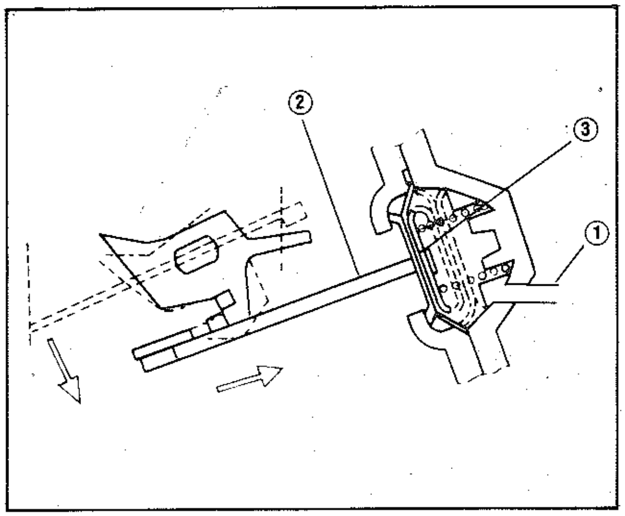


Fig. 10—Choke breaker

Unloader Mechanism (Fig. 11)

The unloader mechanism prevents the mixture from becoming over rich during normal operation with the choke valve closed. When the throttle valve is opened wide, the unloader lever (7) is moved by the rod (6) connected to the abutement plate (5) operating with the throttle valve (4). The choke lever (8) is rotated to open the choke valve until a given opening is reached, thus allowing more air to be drawn in to supply a suitable air-fuel mixture.

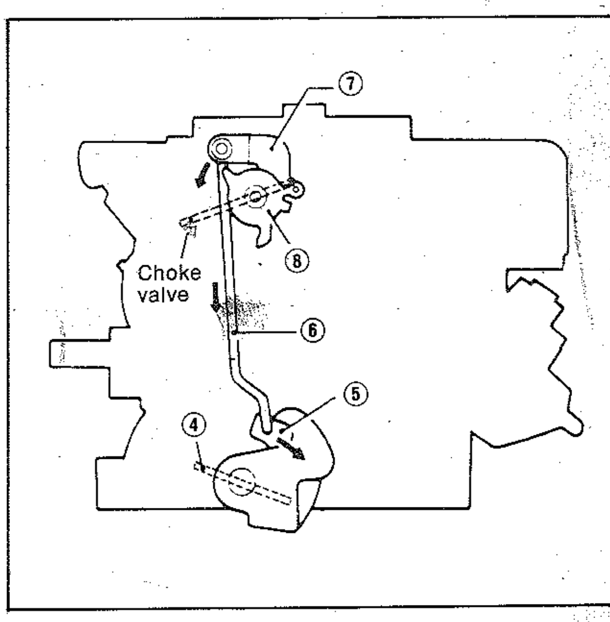


Fig. 11—Unloader mechanism

Constant Vacuum Throttle Dashpot (Fig. 12) (Where Fitted)

The carburettor is equipped with a dashpot to delay the throttle valve closure to its normal idling position, thus reducing the amount of Hydro Carbon emissions. The dashpot is controlled by a servo valve. The servo valve detects intake manifold vacuum and closes when the vacuum exceeds a pre-set value. When the servo valve is closed, air in the diaphragm chamber of the dashpot cannot exhaust, the dashpot diaphragm is locked and the throttle valve opening is maintained through the carburettor linkage. The combination of dashpot and servo valve functions as a throttle valve positioner. If the manifold vacuum is below the pre-set value, the servo valve opens and the dashpot works normally.

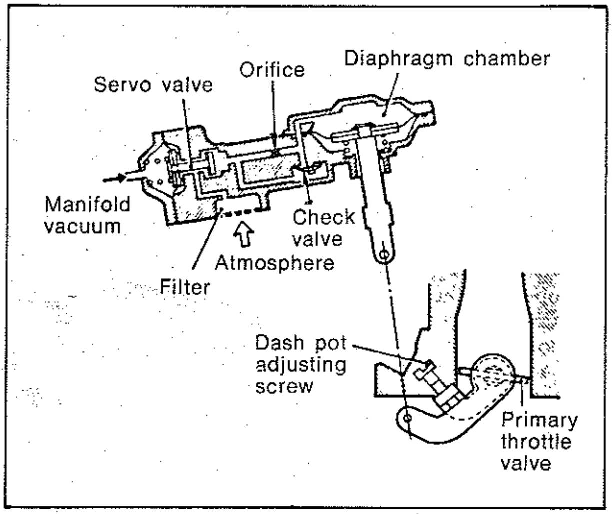


Fig. 12—Constant vacuum throttle dashpot

Fuel Cut Solenoid (Fig. 13)

The fuel cut solenoid is provided to cut off the air-fuel mixture in the pilot passage of the carburettor to eliminate the possibility of engine run-on when the ignition is switched off.

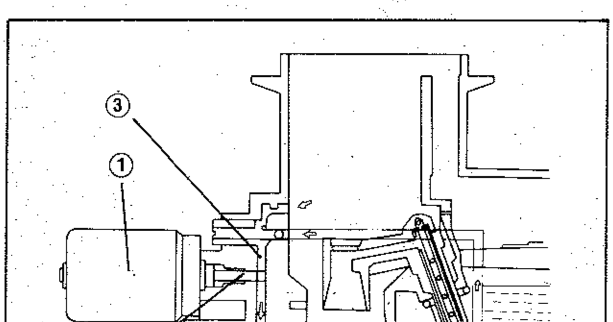


Fig. 13—Fuel cut solenoid

The plunger (2) of the solenoid valve (1) is positioned in the pilot passage (3). When the ignition is in the ON position, the solenoid (1) retracts the plunger (2). When the ignition is in the OFF position, the spring in the solenoid pushes the plunger out to close off the pilot passage (3), cutting the air-fuel mixture and thus prevents engine run-on.

Fuel Vapour Separator (Fig. 14)

Vehicles fitted with a fuel vapour separator have the fuel supplied from the pump to the carburettor, through the vapour separator. Fuel enters the vapour separator through the middle connector and then flows out of the separator through the lower connector to the carburettor fuel bowl. Vapours separated from the fuel in the separator are held in the upper section. These vapours are then passed through the upper connector of the separator to the carburettor accelerator pump where they are cooled (liquified) and returned to the fuel tank via the return line.

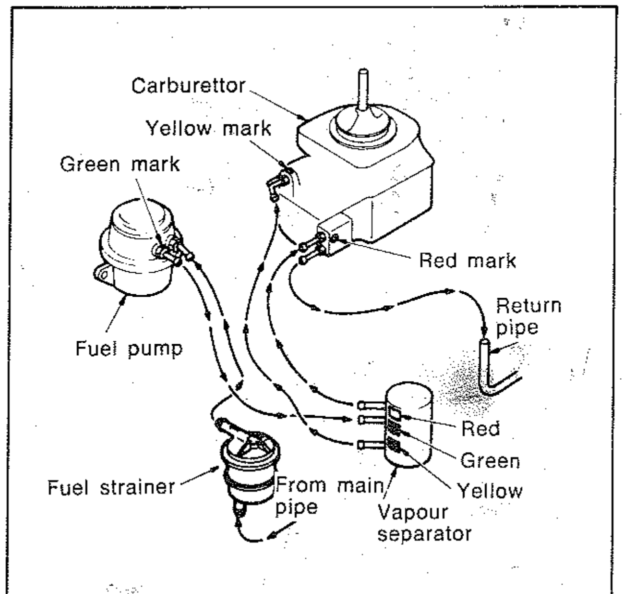


Fig. 14—Vapour separator system

Installation

When reinstalling the fuel hoses, ensure they are correctly positioned as shown in Fig. 14. The separator must be installed with the red identification mark to the top. Connect each fuel hose positively and tighten the fuel hoses securely.

Carburettor Removal

(1) Remove the air cleaner.

(2) Remove the throttle cable.

(3) Disconnect the vacuum hoses and fuel hoses.

(4) Disconnect the coolant hoses.

(5) Using special tool (MD998289) or similar remove the carburettor mounting nuts.

(6) Remove the carburettor assembly.

(7) Remove the carburettor gasket and insulator.

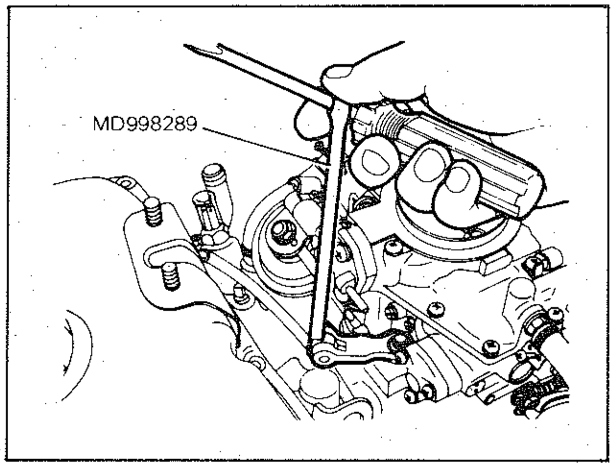


Fig. 15—Removing carburettor mounting nuts

Carburettor Disassembly

Disassemble the carburettor in a systematic order, paying attention to the following:

- Use spanners and screwdrivers that fit the nuts, screws and jets securely otherwise the components may be burred or damaged.
- Where parts are disassembled place them on a clean bench in the order of removal to aid in reassembly.
- Do not remove the inner venturi assemblies.
- Do not remove the by-pass screw (Fig. 22), this screw is sealed by paint.
- Do not disassemble the throttle shaft and throttle valve.

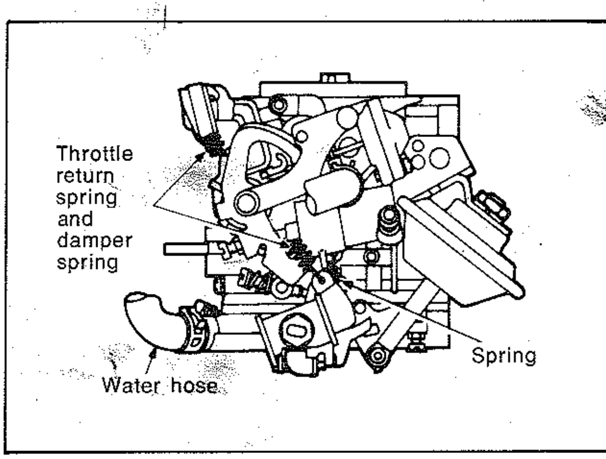


Fig. 16—Removing springs (if applicable)

(1) Remove the throttle return spring and damper spring.

(2) Disconnect the throttle dashpot lower link from the throttle linkage, remove two dashpot to float chamber attaching screws and remove the dashpot and servo valve assembly complete.

(3) Remove the choke unloader link retaining clip and disconnect the choke unloader link.

(4) Disconnect the vacuum hose.

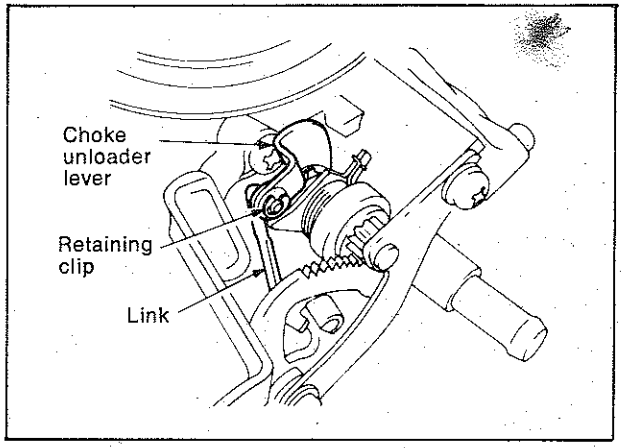


Fig. 17—Removing choke unloader link

(5) Disconnect the lower end of the diaphragm chamber link and remove the diaphragm chamber. Do not immerse the diaphragm chamber in solvent.

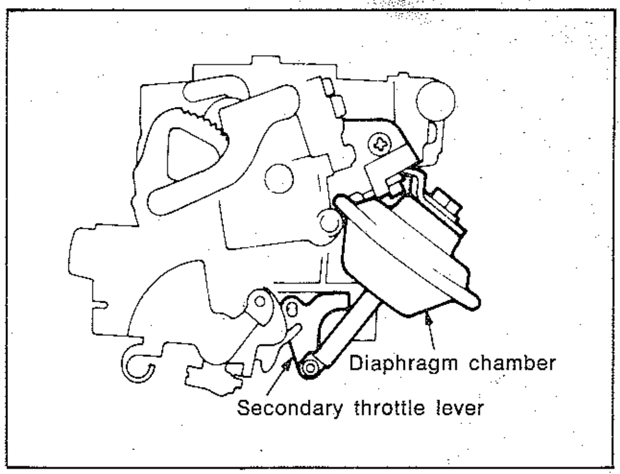


Fig. 18—Removing diaphragm chamber

(6) Remove seven float chamber cover screws. Separate the float chamber cover from the carburettor main body by tapping with a plastic hammer or handle of a screwdriver.

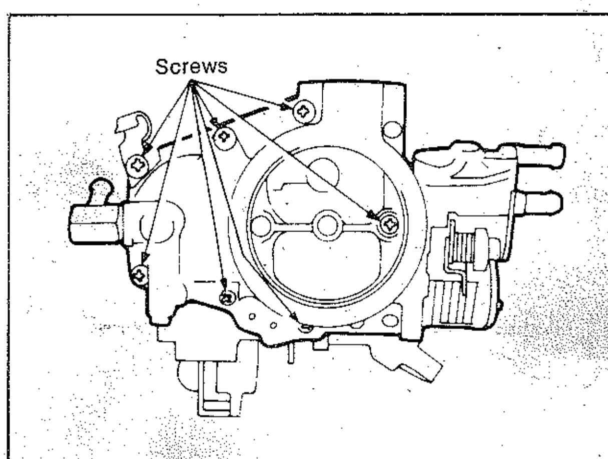


Fig. 19—Removing float chamber cover

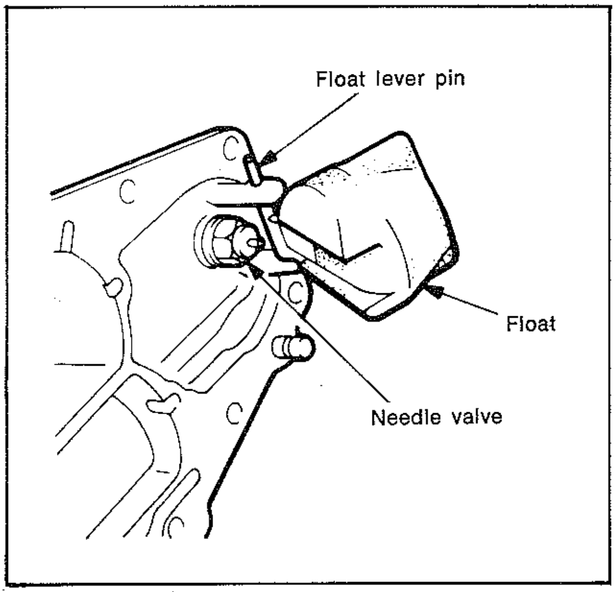


Fig. 20—Removing float

NOTE: Do not pry the cover off with a screwdriver blade.

Don't place the carburettor upside down when the float chamber cover is removed. If the the cover is removed with the carburettor upside down, the discharge check ball and accelerator pump weight might be lost.

Remove the float chamber cover gasket.

(7) Remove the float lever pin and the float. (Fig. 20).

(8) Remove the needle valve assembly, gasket and filter.

(9) Do not remove the automatic choke system because the factory setting will be affected.

(10) Turn the main body upside down and remove the pump discharge check ball and weight.

(11) Remove the fuel cut-off solenoid.

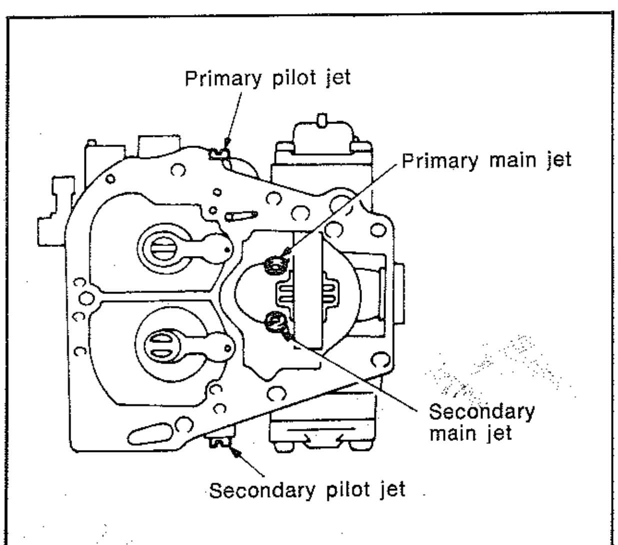


Fig. 21—Jet locations

(12) Remove the main jets and pilot jets, using a screwdriver with a blade suitable for the jet groove.

NOTE: Do not tamper with the factory set bypass and E.G.R. screws, shown in Fig. 22.

The heads of these screws are coated with white paint.

(13) Remove the enrichment assembly.

(14) Disconnect the pump rod from the throttle shaft lever and remove the accelerator pump assembly.

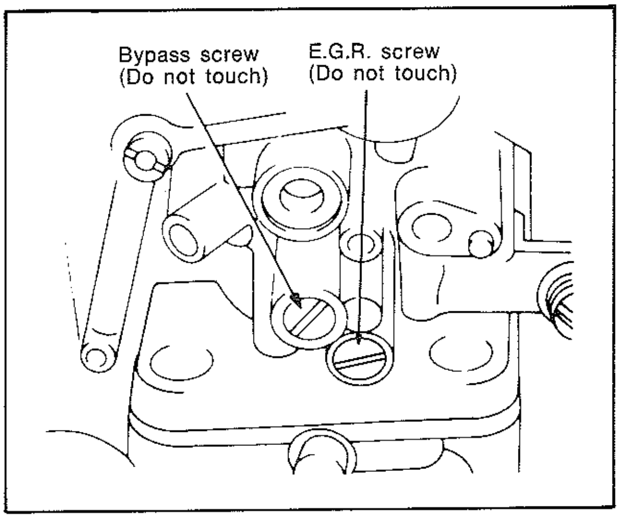


Fig. 22—Bypass and E.G.R. screws

(15) Remove the two main body-to-throttle body screws. Separate the throttle body from the main body and remove the gasket.

(16) Remove the idle mixture adjusting screw, spring, washer and packing from the throttle body.

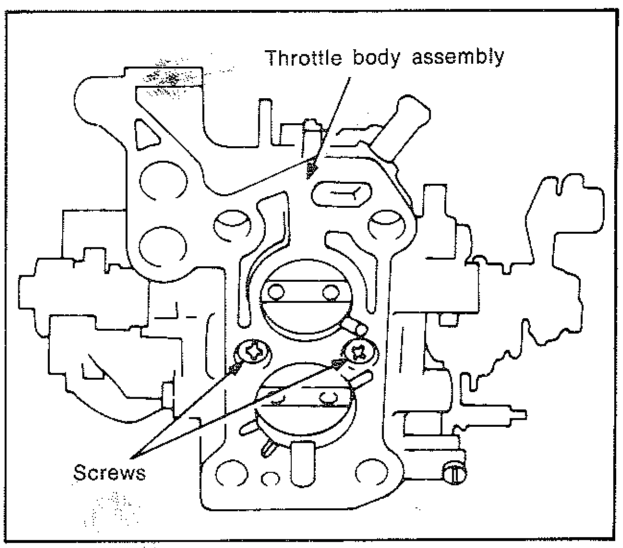


Fig. 23—Separation of throttle body from main body

Cleaning and Inspection

(1) Clean the disassembled parts with clean methylated spirits or a suitable solvent.

NOTE: Do not clean O-rings, diaphragms or plastic parts with any cleaning solvent as damage may result.

(2) Clean out fuel passages and jets with compressed air, DO NOT use wire or drills to clean jets as the orifices may be enlarged and thus effect the performance of the carburettor.

(3) If O-rings, gaskets and diaphragms are to be re-used, they should be cleaned with a clean cloth or a soft brush.

(4) Check the carburettor body and water passages for cracks, scale and clogging.

(5) Check the needle valve and seat contact for damage or wear, replace if defective.

(6) Check the filter for damage and clogging.

(7) Check the jets and air bleeds for damage and clogging.

(8) Check each diaphragm for damage.

(9) Check the mixture screw contact seat for damaged surface.

(10) Check the throttle valve shaft and choke shaft operation, if unsatisfactory clean the shaft and linkage with solvent and lubricate with engine oil.

(11) Check the accelerator pump operation by quickly opening the throttle valve more than 70° and checking the delivery from the pump nozzle. If the delivery is weak or there is no delivery at all, check for a clogged fuel passage or broken pump diaphragm.

(12) Check the diaphragm chamber by pushing the rod in, sealing off the nipple and releasing the rod. If the rod does not return, the chamber is good. If the rod returns when released, the diaphragm is defective and the assembly must be replaced.

(13) Check the fuel cut solenoid by connecting the inline connector to the positive (+) terminal of a 12V battery and the other lead (ring terminal) to the negative (—) side of the battery. The plunger should move in towards the solenoid when the battery is connected and it should move out as soon as the battery is disconnected. If the solenoid is not satisfactory it must be replaced.

Reassembly

(1) Install the idle mixture adjusting screw, spring, washer and packing, in the throttle body. Turn the screw lightly against its seat with fingers. **Do not use a screwdriver.** Turn the idle mixture adjusting screw 1½ turns counter-clockwise as a starting point.

(2) Using a new gasket, install the throttle body to the main body, and tighten the screws.

(3) Connect the accelerator pump rod to the throttle shaft lever.

(4) Install the main jets and pilot jets (Fig. 21).

(5) Install the fuel cut-off solenoid.

(6) Using a new gasket, install the enrichment assembly to the main body.

(7) Install the accelerator pump assembly.

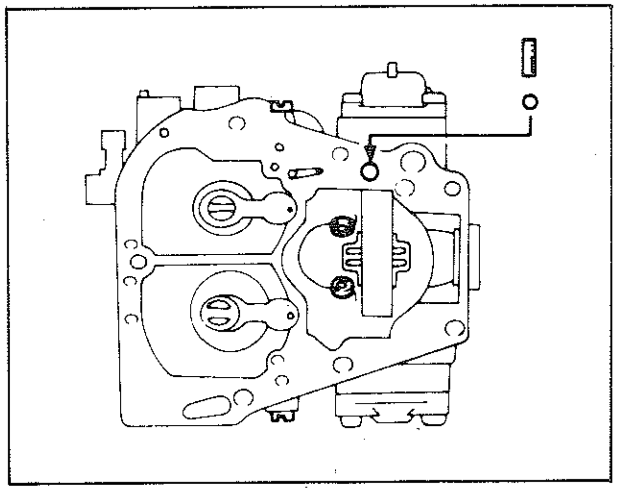


Fig. 24—Accelerator pump discharge check ball and weight location

(8) Install the accelerator pump discharge check ball and weight (Fig. 24).

(9) Install the steel ball to the bottom of float chamber.

Check to ensure that the brass blade is faced downward.

(10) Install the filter and gasket, then install the needle valve assembly.

(11) Install the float assembly to the float chamber cover.

(12) Place a new gasket on the main body, install the float chamber cover assembly, and tighten the screws.

(13) Place a new gasket on the float chamber cover and install the mixture control valve.

(14) Install the diaphragm chamber.

(15) Connect the vacuum hose.

(16) Connect the choke unloader link and fit the retaining clip.

(17) Using a new gasket, install the dashpot to the float chamber, (if fitted).

(18) Connect the dashpot lower link to the throttle linkage.

(19) Install the return springs.

(20) Connect the coolant hose.

Installation

(1) Inspect the mating surfaces of carburettor and intake manifold. Be sure both surfaces are clean and free of nicks, burrs or other damage.

Install a new carburettor gasket on the intake manifold surface.

The carburettor gasket can be installed upside down or backwards. To prevent this, match the holes in the carburettor gasket to holes on the bottom of carburettor, then place the gasket on the intake manifold in the correct position.

(2) Carefully place the carburettor on the intake manifold.

(3) Install the carburettor mounting nuts and tighten alternately, a little at a time, to compress the carburettor gasket evenly. The nuts must be drawn down tightly to prevent vacuum leakage between the carburettor and intake manifold. Tighten the carburettor mounting nuts with Special Tool (MD998289).

(4) Connect the throttle cable and fuel inlet hose.

(5) Check carefully for worn or loose vacuum hose connections.

(6) Check to ensure the choke plate opens and closes fully when operated.

(7) Check to see that full throttle travel is obtained.

(8) Install the air cleaner. The air cleaner should be cleaned or replaced at this time to ensure optimum carburettor performance.

(9) Connect battery cables.

(10) Set carburettor idle mixture adjustment.

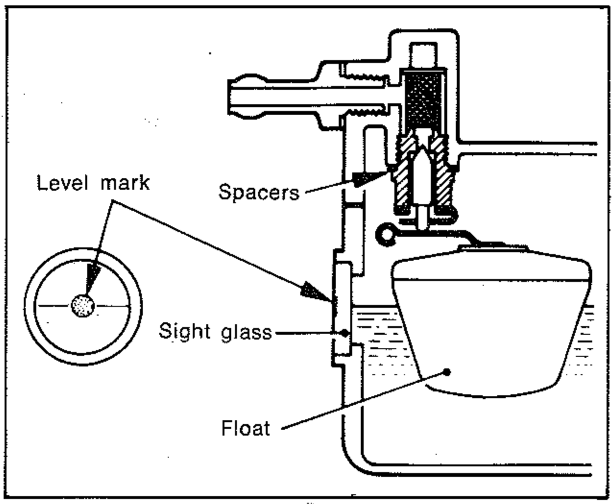


Fig. 25—Float level

CARBURETTOR ADJUSTMENTS

Float Level

The carburettor fuel bowl is fitted with a sight glass which has a centre mark. The normal fuel level is within that centre mark or no more than 2 mm (0.078") above the level mark.

Fuel level adjustment is accomplished by increasing or decreasing the number of needle valve spacers. Spacers 1,0 mm (0.039"), 0,5 mm (0.020") and 0,3 mm (0.012") thick will lower the float level by 3 mm (0.118"), 1,5 mm (0.059") and 0,9 mm (0.035") respectively.

NOTE: Never adjust the float level by bending the float arm as this can lead to the float arm jamming with resultant flooding or fuel starvation.

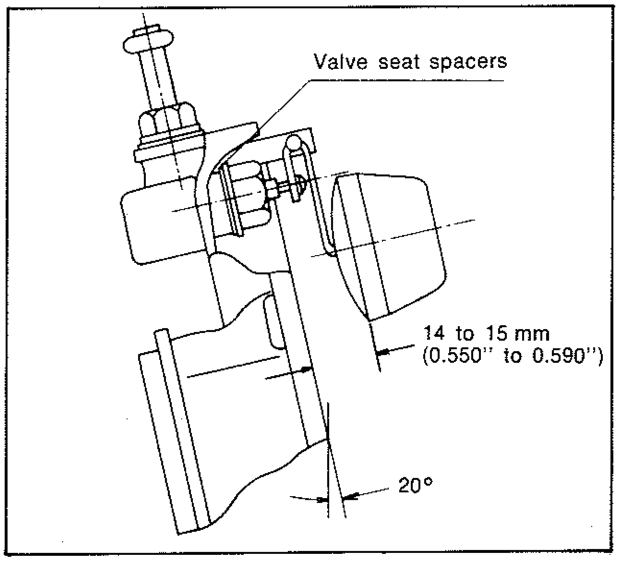


Fig. 26—Float level adjustment

Float Level Adjustment

(1) Remove float chamber cover.

(2) Hold the float chamber cover at the angle shown in Fig. 26, so that the weight of the float closes the needle and seat assembly.

NOTE: If the float chamber cover is placed in a horizontal position, with the full weight of the float resting on the needle valve spring, a false reading of the float level will be obtained.

(3) Measure the gap between the float and float chamber cover. Refer Fig. 26.

(4) If the gap is not within the specified dimensions, 14-15 mm (0.55"-0.59") it must be adjusted by increasing or decreasing the adjusting shims between the needle and seat assembly and float chamber cover .

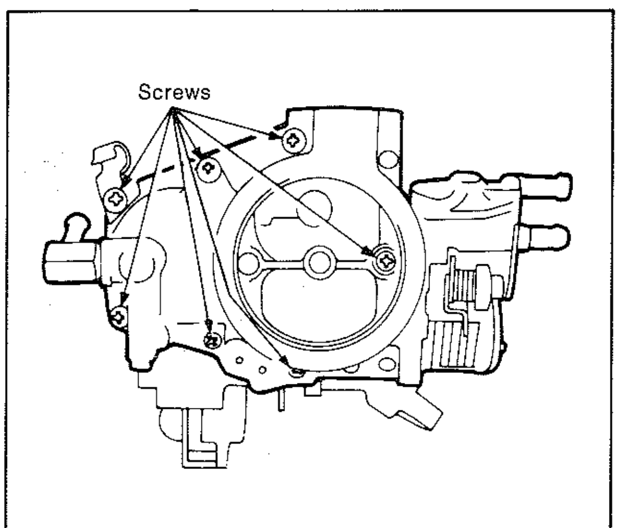


Fig. 27—Removing float chamber cover

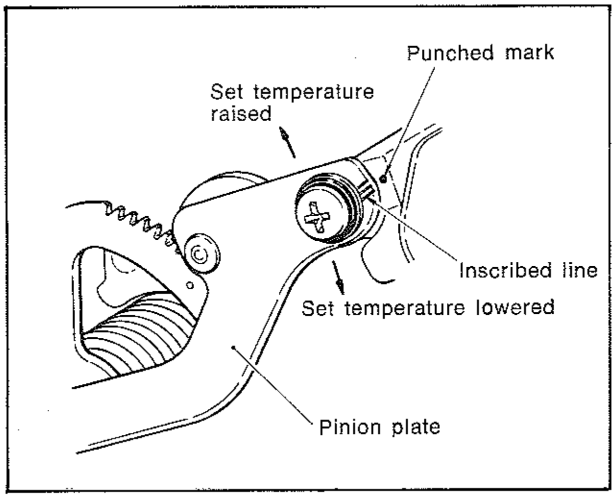


Fig. 28—Choke valve adjustment

Choke Valve Adjustment

NOTE: Prior to making this adjustment the carburettor should be normalised at 23°C (73°F) for one hour.

(1) The choke pinion plate mating marks should be aligned as shown in Fig. 28.

(2) Check the gap between the choke valve and bore, it should be 0-0,5 mm (0-0.020").

(3) If the gap requires adjustment loosen the screw securing the choke pinion plate and raise or lower the plate to achieve the specified gap, re-tighten the screw.

Fast Idle Adjustment

(Carburettor Removed)

NOTE: The fast idle screw thread has a locking compound applied to it during manufacture. This locking compound must be removed by applying heat from a soldering iron (do not use a naked flame) to the screw. Failure to heat the compound may result in BREAKAGE of the screw.

(1) Adjust the choke adjusting screw so that the inscribed line of the cam lever is in alignment with the punch mark of the cam follower.

NOTE: Prior to making this adjustment the carburettor should be normalised at 23°C (73°F) for one hour.

(2) Adjust the fast idle screw (2) until the fast idle opening ØA (drill diameter) reaches the specified opening.

Drill diameter 0,8 mm (0.031") manual transmission — 1,0 mm (0.040") automatic transmission.

Fast Idle Adjustment (Fig. 29)

(On Vehicle)

(1) Remove the locking compound on the fast idle screw.

(2) Ensure the engine is in a cold condition (below 23°C (73°F)), i.e. the choke must be fully closed.

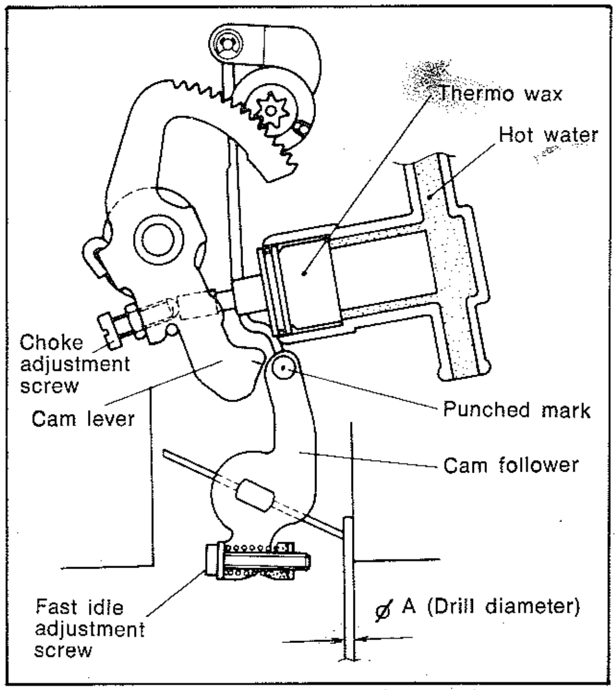


Fig. 29—Fast idle adjustment

(3) Connect a tachometer to the engine.

(4) Start the engine and check the speed immediately — refer specifications page 1 of this section for engine R.P.M.

(5) If necessary, adjust the fast idle screw to achieve the specification.

Dashpot Adjustment (Where Fitted)

NOTE: Normal idling adjustments must be carried out before the following adjustments are made.

(1) With the engine running, push up on the lower end of the dashpot rod until it bottoms. The engine speed should be 2200 ± 100 r.p.m. If not, reset the speed using the dashpot adjusting screw (Fig. 30).

(2) Release the rod and the engine speed should drop to 900 r.p.m. within 3 to 6 seconds. Replace a dashpot that fails to meet this specification.

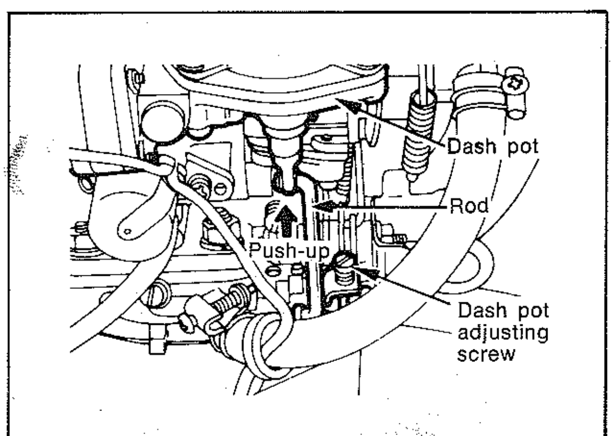


Fig. 30—Dashpot adjustment

Choke Breaker Adjustment

Push the choke valve in the direction that it closes and push the vacuum operated choke breaker shaft to check the clearance between the choke valve and choke bore wall. (The normal clearance is 1,4 mm (0.055"). If necessary, adjust the clearance by inserting a screwdriver in the adjusting groove at the end of the shaft.

Secondary Stopper Adjustment

Avoid tampering with the secondary stopper as far as possible. If it is loose or has to be adjusted, ensure that the secondary stopper is turned approximately 1/8 to 1/4 of a turn in after the secondary throttle valve has fully closed and is firmly locked with the lock nut. The stopper prevents the secondary throttle valve from fouling the throttle bore.

Unloader Adjustment

Push the choke valve in the direction that it closes and fully open the throttle valve. Check the clearance between the choke valve and choke bore wall. The normal clearance is 3 mm (0.118"). If adjustment is necessary, bend the rod.

E.G.R. Screw and Idle Bypass Screw

These two screws are located just below the fuel cut-off solenoid and are sealed with white paint. These screws **must not be adjusted. If** adjustment has been attempted then re-adjust as follows:—

E.G.R. Screw

(1) Turn the screw right in.
(2) Rotate back 1½ turns (minimum).

Idle Bypass Screw

(1) Turn the screw right in .
(2) Rotate back 1¼ to 1½ turns.

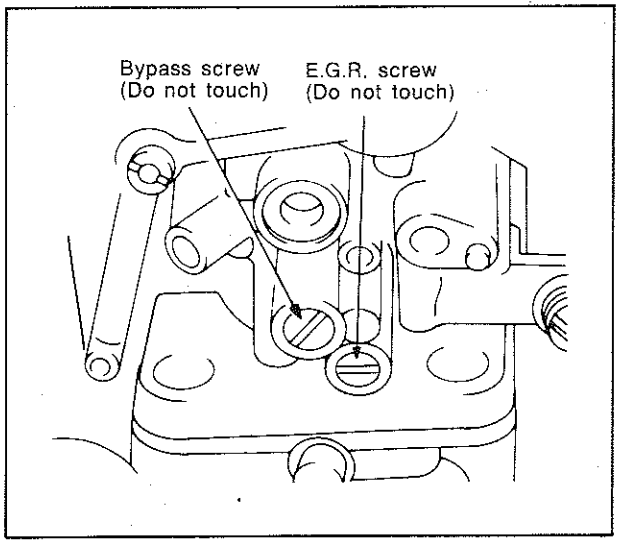
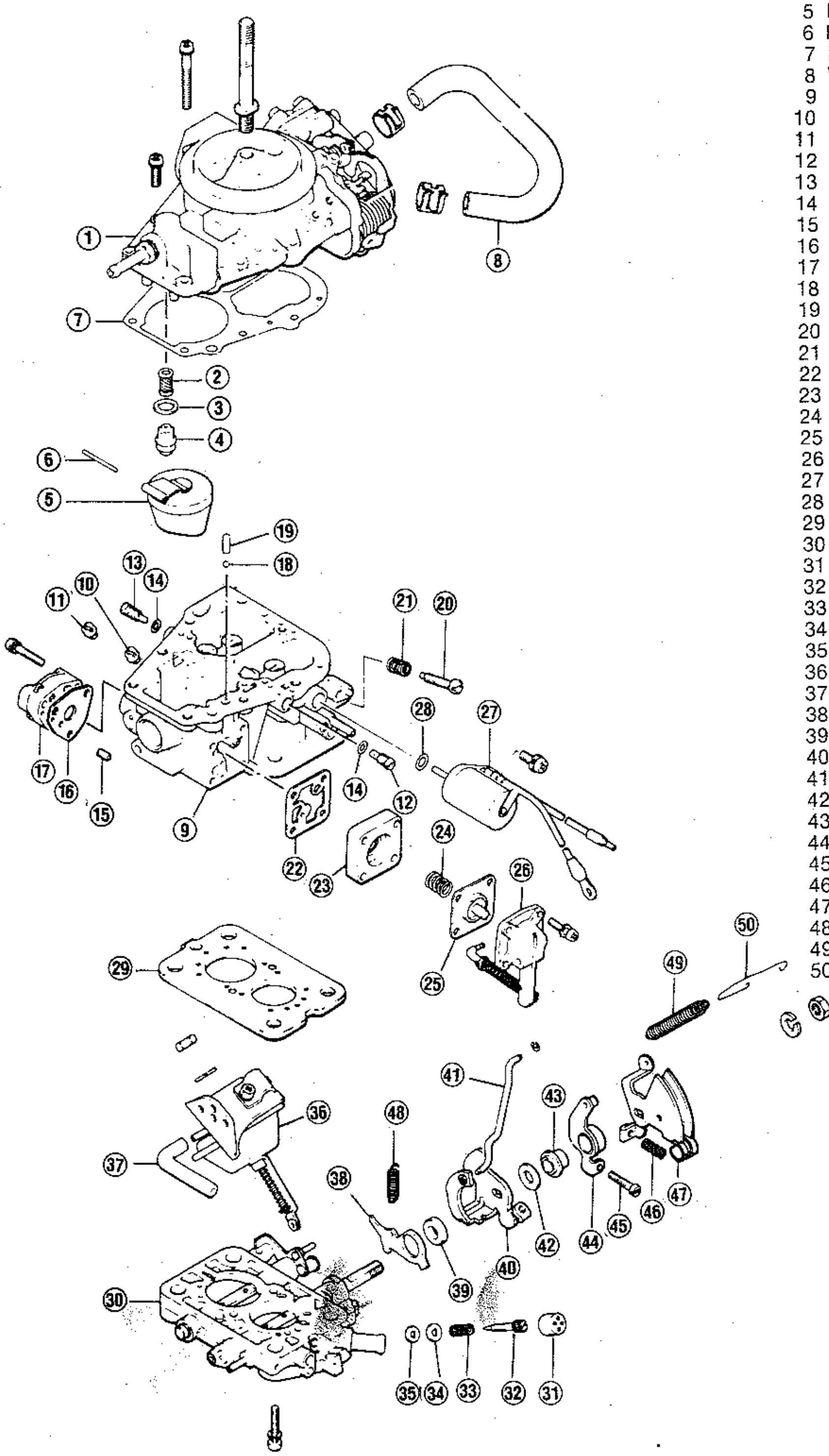


Fig. 31—Bypass and E.G.R. screws



1 Float chamber cover
2 Screen
3 Packing
4 Needle valve
5 Float
6 Pin
7 Float chamber packing
8 Water hose
9 Main body
10 Main jet (Primary)
11 Main jet (Secondary)
12 Pilot jet (Primary)
13 Pilot jet (Secondary)
14 O-ring
15 Enrichment jet
16 Packing
17 Enrichment assembly
18 Check valve
19 Weight
20 Speed adjusting screw
21 Spring
22 Packing
23 Pump body
24 Spring
25 Diaphragm
26 Pump cover
27 Fuel cut solenoid
28 O-ring
29 Insulator
30 Throttle body
31 Idle limiter
32 Mixture adjusting screw
33 Spring
34 Washer
35 Packing
36 Diaphragm chamber
37 Hose
38 Immediate leveller
39 Ring
40 Abutment lever
41 Rod
42 Ring
43 Collar
44 Fast idle lever
45 Adjusting screw
46 Spring
47 Throttle lever
48 Throttle return spring
49 Return spring
50 Damper spring

Fig. 32—Exploded view of carburettor

SECTION 3 — IDLE SPEED AND MIXTURE SETTING PROCEDURE

GENERAL INFORMATION

An increasing awareness of problems created by motor vehicle exhaust emissions has lead to extensive testing programmes with various carburettor modifications having been made. These modifications have significantly lowered the percentages of undesirable hydrocarbon and carbon monoxide pollutants entering the atmosphere.

To achieve acceptable levels of exhaust emission, extreme care must be taken to ensure that the correct idle mixture setting is used to avoid over richness. An indication of the precision required in setting up an engine, as little as ¼ turn of the mixture adjusting screw can result in a 2 % change in carbon monoxide level. During the run-in period as the engine friction level drops, the idle speed would normally increase. However, it is desirable to maintain the lower idle speeds and so the throttle opening is decreased on a run-in engine to maintain the specified idle speeds. This results in carbon monoxide emissions being greater for a run-in engine than for the new or fully reconditioned engine.

Curb Idle Mixture and Speed Adjustments

(1) The only approved method for making these adjustments is using a reliable carbon monoxide (CO) meter and an accurate ignition tachometer.

Procedure Using Tachometer and CO Meter

(1) Idle the engine with the hood up for 15-20 minutes. Ensure that choke is fully open.

NOTE: Vehicles fitted with HIAS must have an engine compartment temperature of at least 42°C (108°F) before any adjustments are made (i.e. snorkel flap valve fully open).

(2) Set the ignition timing to specification.
(3) Check that the air cleaner is fitted correctly.
(4) Place transmission in neutral.
(5) Turn off all vehicle lights and air conditioner.
(6) Connect tachometer.
(7) Switch on the meter, allow it to warm up then calibrate according to the manufacturers' instructions.
(8) Insert the probe of the CO meter in the tail pipe as far as possible.

NOTE: It is essential that the probe and connecting tubing of the meter are in good condition, as any leaks would lead to erroneous readings. If a garage exhaust system is used to conduct the exhaust gases away during the operation, it will be necessary to fit a plenum chamber (or other means) to reduce the vacuum of the system to a reading of 12 mm (½ inch) or less on a water gauge.

(9) Set the idle speed to specification.
(10) Adjust the mixture screw to obtain the specified CO reading using the following procedure:

IMPORTANT: When setting the idle mixture do not turn the adjusting screw more than 1/16 turn at a time. The CO meter is so sensitive that the ratio must be changed by very small amounts if accurate readings are to be obtained.

(a) Adjust the mixture screw 1/16 turn richer (anti-clockwise) and wait 30 seconds before reading the meter.
(b) If necessary repeat step (a) until meter indicates a definite increase in richness. This step is very important since some meters (thermal conductivity type) reverse readings and indicate a richer mixture as the carburettor is set too lean.
(c) When it has been established that the meter is indicating a richer reading when the idle mixture screws are turned in the rich direction, proceed to adjust the carburettor to achieve the specified CO reading.
(d) If the idle speed changes as the mixture screw is turned, adjust the speed back to the specified r.p.m. then re-adjust the idle mixture to obtain specified ratio.
(e) Race engine at 2000 r.p.m. for 5 seconds, then recheck idle speed and meter reading. Replace if necessary.
(f) Increase idle speed to specified value if this differs from the mixture setting speed.

NOTE: As mixture screw is turned clockwise (leaner) air/fuel ratio increases and %CO decreases. As mixture screw is turned anti-clockwise (richer) air/fuel ratio decreases and %CO increases.

NOTE: Specifications and adjustments printed are correct at the time of publication. If these specifications differ from those of the Vehicle Emission Control Information Label, use the specifications on the label.

Idle Mixture Limit Cap Installation

An idle mixture limit cap is fitted correctly in production and must not be disturbed unless that carburettor has been dismantled and the idle mixture screw removed. In this case a new cap should be fitted.

(1) Set idle mixture as specified.
(2) Fit limit cap with tang positioned to allow only 90° extra enrichment as shown.

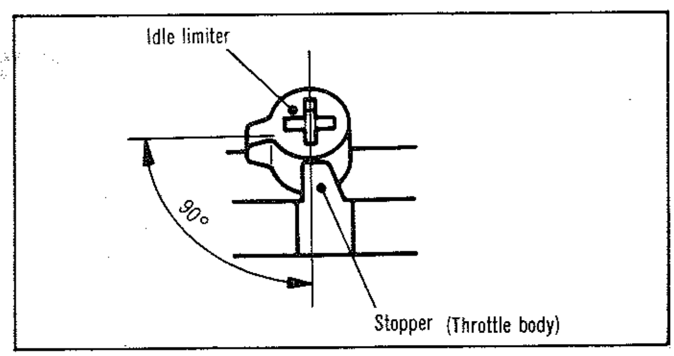


Fig. 1—Idle mixture limit cap installation

SECTION 4 — FUEL PUMPS

SPECIFICATIONS

Make	Kyosan Denki
Description	Mechanically Operated (Semi Serviceable)*
No. of Valves	2
Type of Drive	Camshaft
Pump Pressure	26-36 kPa (3.7 to 5.0 p.s.i.)

* Saturn engine with belt drive camshaft equipped with sealed pump.

TORQUE SPECIFICATIONS

	Nm	lb./ft.	lb./in.
Fuel Pump Mounting Screw	19	14	
Fuel Pump Cover Attaching Screw	0,7 to 2,2		6,0 to 19,0
Valve Body Attaching Screw	2,0 to 5,0		17,0 to 43,0

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
FUEL PUMP LEAKS—FUEL	(a) Worn, ruptured or torn diaphragm.	(a) Install new fuel pump or replace diaphragm.
	(b) Loose diaphragm mounting plates.	(b) Install new fuel pump or tighten the valve body.
	(c) Loose inlet or outlet line fittings.	(c) Tighten line fittings.
FUEL PUMP LEAKS—OIL	(a) Cracked or deteriorated pull rod oil seal.	(a) Install new fuel pump or replace diaphragm assembly.
	(b) Loose rocker arm pivot pin.	(b) Install new fuel pump or replace pivot pin.
	(c) Loose pump mounting bolts.	(c) Tighten mounting bolts securely.
	(d) Defective pump to block gasket.	(d) Install new gasket.
INSUFFICIENT FUEL DELIVERY	(a) Tank vents restricted	(a) Remove restriction from vent and inspect tank for leaks.
	(b) Leaks in fuel line or fittings.	(b) Tighten line fittings.
	(c) Dirt or restriction in fuel tank.	(c) Install new fuel filter and clean out tank.
	(d) Worn, ruptured, or torn diaphragm.	(d) Install new fuel pump or replace diaphragm.
	(e) Frozen fuel lines.	(e) Thaw lines and drain tank.
	(f) Improperly seating valves.	(f) Install new fuel pump or replace valves.
	(g) Vapor lock.	(g) Install heat shield where lines or pump are near exhaust.
	(h) Weak main spring.	(h) Install new fuel pump or replace diaphragm and spring assembly.
	(i) Incorrect fuel pump.	(i) Install correct fuel pump.
	(j) Restricted fuel filter.	(j) Install new filter.
FUEL PUMP NOISE	(a) Loose mounting bolts.	(a) Tighten mounting bolts.
	(b) Scored or worn rocker arm.	(b) Install new fuel pump or replace rocker arm.
	(c) Weak or broken rocker arm spring.	(c) Install new fuel pump or replace spring.

GENERAL INFORMATION

The fuel pump is driven by an eccentric cam on the camshaft. As the camshaft rotates, the eccentric presses against the rocker arm of the fuel pump. This action pulls the diaphragm against the fuel pump main spring, thus creating a vacuum in the valve housing, opening the inlet valve allowing fuel to enter the valve housing chamber. On the return stroke the main spring forces the diaphragm up which, in turn closes the inlet valve and forces the fuel through the outlet valve to the carburettor.

NOTE: Astron engine models have the fuel supplied to the carburettor via a vapour separator.

The fuel pump on Astron engines and early Saturn chain drive camshaft engines can be disassembled for service operations. Later Saturn engines (with belt drive camshafts) are equipped with a non serviceable "sealed" pump.

TESTING THE FUEL PUMP (On Vehicle)

If the fuel pump fails to supply fuel properly to the carburettor, the following tests should be made before removing the fuel pump from the vehicle.

Pressure Test

If leakage is not apparent, test pump for pressure as follows:

(1) Disconnect the supply pipe to the carburettor and "T" a suitably calibrated pressure gauge between the pump and carburettor.

(2) Vent the pump for a few seconds to relieve any air trapped in the fuel chamber. If this is not done the pump will not operate at full capacity.

(3) Run the engine and check the delivery pressure to the specified pressure.

Volume Test

The fuel pump should supply 1,8 litres (3.25 pts.)/min. or more at an engine speed of 5000 r.p.m.

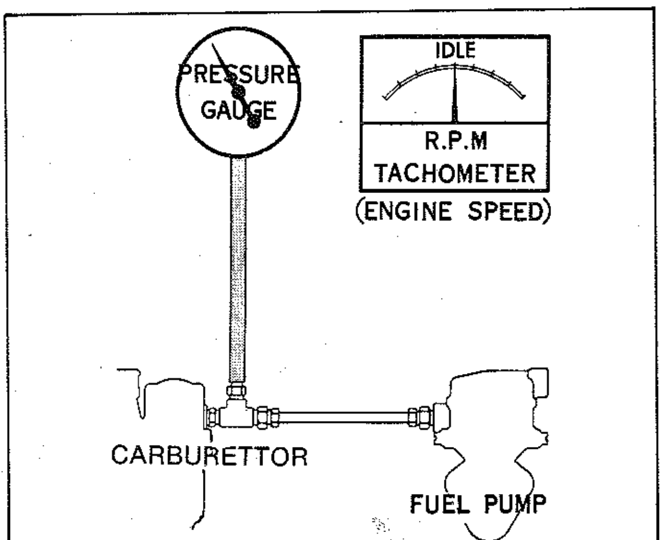


Fig. 1—Pressure testing the fuel pump

SERVICING THE FUEL PUMP (Except Saturn Engine with Belt Drive Camshaft)

Disassembly

With the fuel pump removed from the engine, proceed as follows:

(1) Remove the cover attaching screws and remove the cover and gasket from the valve body.

(2) Remove the screws attaching the valve body to the rocker arm housing and separate the body from the housing.

(3) Remove the pin securing the rocker arm to the housing and remove the rocker arm, rocker arm return spring, the diaphragm, diaphragm return spring and seal assembly.

Inspection

Clean all parts in a suitable solvent and check the diaphragm for cracks, breakage and deterioration, the valves for operation and contact, the rocker arm contacting face for wear, the return spring for deterioration, the rocker arm pin for wear and the pump body and cover for cracks and damage.

Assembly

Replace any faulty parts and reassemble the pump by reversing the disassembly procedure noting the following:

(1) Do not use any adhesive or gasket glue on the diaphragm.

(2) Torque the body and cover attaching screws to the specified torque.

(3) After assembly test the fuel pump as previously described.

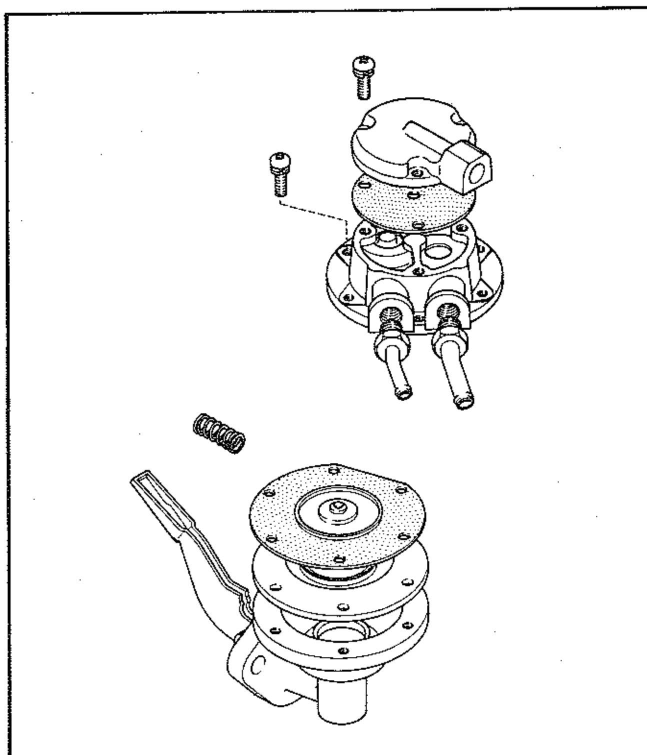


Fig. 2—Fuel pump disassembled view

FUEL PUMP (Saturn Engine with Belt Drive Camshaft)

This pump cannot be dis-assembled, and if it fails to pump fuel it must be replaced as an assembly. When re-fitting this type of pump, take note of the following:

(1) Remove the air cleaner and rocker arm cover.

(2) Turn the engine until no. 2 piston is at top dead centre on the firing stroke, this places the fuel pump drive cam at the minimum lift point. Failure to do this can result in the lever sitting too high on the cam as shown by the dotted profile of the pump lever in Fig. 3.

If the lever is set in the wrong position and the camshaft turned in the normal rotational direction, the lever will return to the correct position, but will already have cracked.

(3) Install new gaskets and insulator.

(4) Install the fuel pump and evenly tighten the fuel pump bolts to the specified torque in the following sequence: lower left, upper and then lower right.

(5) After tightening the retaining bolts, ensure that the fuel pump lever is correctly positioned.

(6) Install the fuel pump hoses, rocker arm cover and air cleaner.

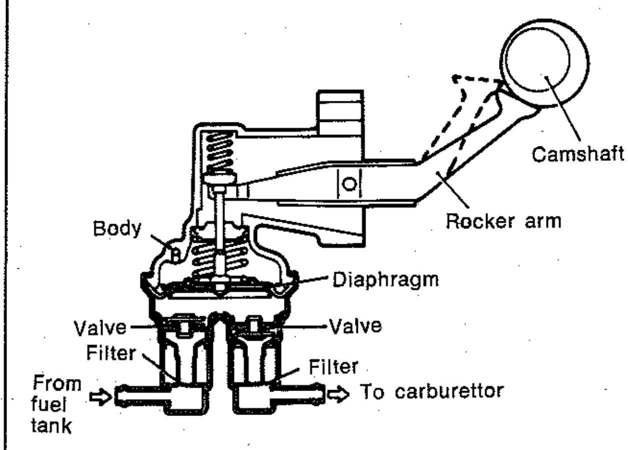


Fig. 3—Cross section view of fuel pump—dotted line shows incorrect position of lever

SECTION 5 — FUEL TANK

SPECIFICATIONS

Location:	All models	Under Vehicle at Rear
Capacity:	Sedan/Two Door	60 litres (13.2 gall.)
	Station Wagon	53 litres (11.7 gall.)

GENERAL INFORMATION

The fuel tank is located at the rear of the body under the trunk compartment floor. The filler neck is situated in the left hand rear quarter panel.

The fuel tank is an "Evaporative Control System" type, i.e. it is not directly vented to atmosphere. Venting is achieved by a hose from the fuel tank to the fuel vapour storage canister.

NOTE: If a car is to be stored for any appreciable length of time, the fuel should be drained from the entire system in order to prevent gum formation.

CAUTION: The fuel tank should not be welded under any circumstances, due to the possibility of an explosion.

Evaporative Control System

The function of the Evaporative Conrtol System is to reduce the emissions of fuel vapours into the atmosphere by evaporation and reduce the unburned hydrocarbons emitted by the vehicle. When fuel evaporates from the fuel tank, vapours pass through the vent line to a charcoal filled fuel vapour storage canister where they are temporarily held until they can be drawn into the engine when running.

When the fuel tank is filled to the base of the vent tube, vapours can no longer escape, and become trapped above the fuel. Vapour flow through the vent line is blocked at the cannister by a control valve. More fuel cannot be filled into the tank under this condition.

A separator tank is connected to the fuel tank. When fuel expansion due to temperature rise occurs the excess fuel rises into the separator tank. The tank also prevents fuel from entering the vapour line under extremely hard cornering.

It is important that all lines are correctly and securely attached, free from leaks, kinks, etc. for the evaporative control system to operate effectively.

The fuel cap is a non vented type thus preventing fuel vapour escape into the atmosphere.

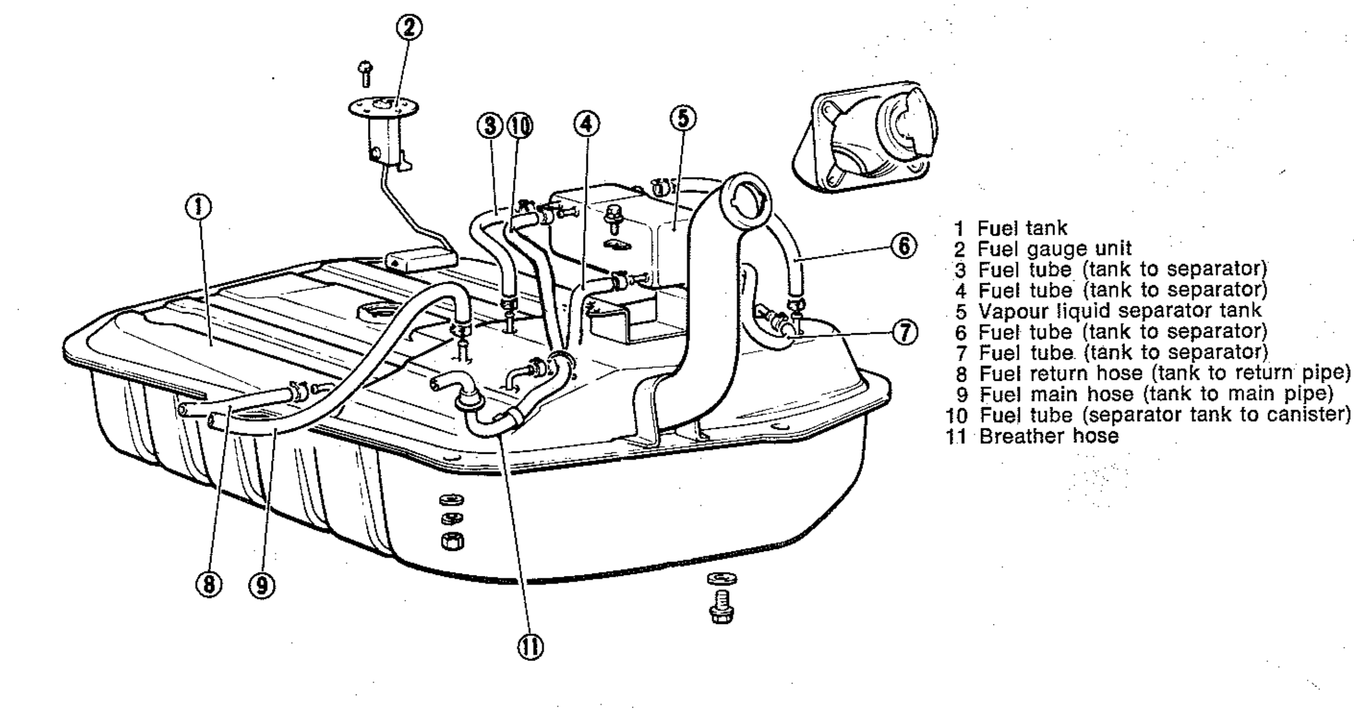


Fig. 1—Fuel tank connections—Sedan/Two Door

The Evaporative Control System should not require any maintenance other than for canister replacement, Refer "Lubrication and Maintenance" Group 1.

NOTE: If the charcoal granules in the fuel vapour storage canister become "flooded" with liquid fuel, the fault must be rectified and the canister assembly replaced.

FUEL TANK

Removal

WARNING: When working on fuel tanks, be sure the ignition is switched off.

NOTE: Prior to working on the fuel tank or lines, remove the fuel cap to release any pressure in the tank.

(1) Remove the drain plug and drain the fuel tank.

(2) Loosen the fuel hose clamps and remove hoses from the tank.

(3) Remove the fuel tank retaining bolts and lower the tank slightly to disconnect the fuel gauge sending unit leads.

(4) Lower and remove the fuel tank from the vehicle.

Inspection

(1) Check the fuel pipe for clogging, cracks, damage and rust, replace the pipe if necessary.

(2) Check the fuel and vapour hoses for cracks and damage, replace any defective hoses.

(3) Check the fuel tank for damage and leaks, a defective tank should be replaced.

CAUTION: The fuel tank should not be welded under any circumstances, due to the possibility of an explosion.

Installation

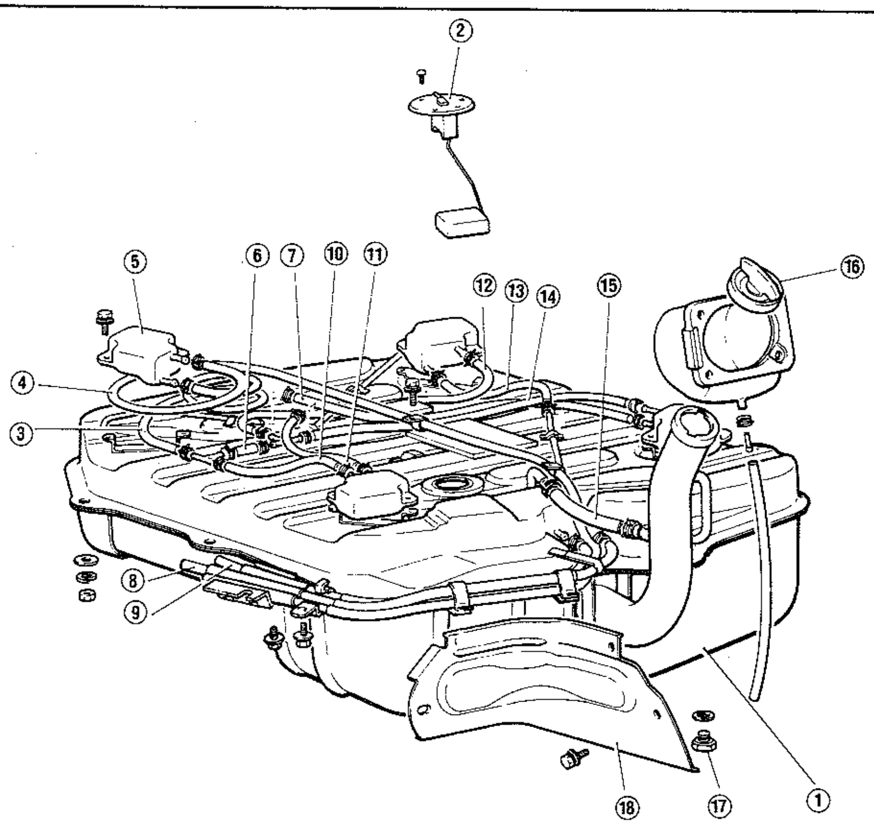
Install the fuel tank by reversing the removal procedure and noting the following:

(1) When installing the fuel gauge sending unit, apply an oil resistant sealer to both sides of the gasket.

(2) When installing the fuel and vapour hoses ensure they are fitted securely and in the correct position. The hose and connector diameters vary to aid in correct location.

(3) Install hoses in such a manner that they do not bend, fold or sag when the tank is correctly positioned.

(4) After installation check the tank and all hose connections for leaks.



1 Fuel tank
2 Fuel gauge unit
3 Vapour hose (6 x 900)
4 Vapour hose (6 x 870)
5 Vapour liquid separator tanks
6 Vapour hose (6 x 65)
7 Vapour hose (6 x 640)
8 Fuel return hose
9 Fuel main hose
10 Vapour hose (6 x 230)
11 Breather hose
12 Vapour hose (6 x 300)
13 Vapour hose (6 x 540)
14 Vapour hose (6 x 260)
15 Vapour hose (6 x 600)
16 Sealed cap
17 Fuel drain plug
18 Fuel tank protector

NOTE: The figures in brackets denote hose diameter x length (in mm)

Fig. 2—Fuel tank connections—Station Wagon

SECTION 6 — CARBURETTOR CONTROLS

AUTOMATIC CHOKE (Bi-Metal)

Choke Valve Setting

The automatic choke is a water heated type, fitted to the carburettor body. To function correctly, it is important that all parts are clean and move freely and that the unit is correctly adjusted.

Adjusting the automatic choke is achieved by loosening the bi-metal spring case retaining screws and rotating the case to align the punch mark on the case, with the centre projection on the choke case, refer Fig. 1.

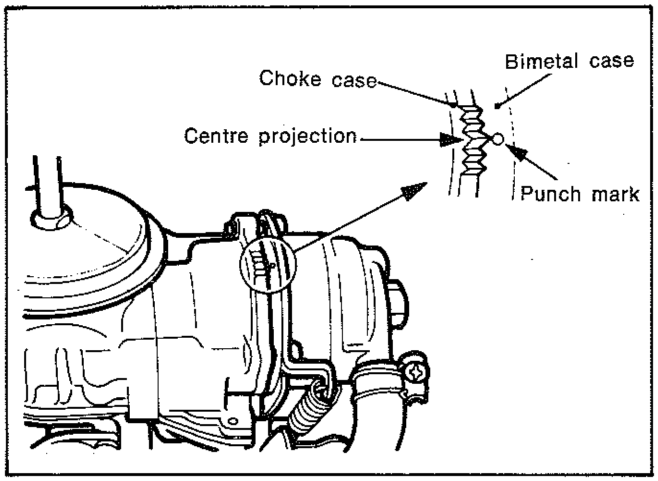


Fig. 1—Automatic choke mating marks

AUTOMATIC CHOKE (Thermo Wax Element)

Choke Valve Setting

NOTE: Prior to making this adjustment the carburettor should be normalised at 23°C (73°F) for one hour.

(1) The choke pinion plate mating marks should be aligned as shown in Fig. 2.

(2) Check the gap between the choke blade and bore, it should be 0-0,5 mm (0-0.020").

(3) If the gap requires adjustment loosen the screw securing the choke pinion plate and raise or lower the plate to achieve the specified gap, re-tighten the screw.

THROTTLE CABLE ADJUSTMENT

(1) Apply a thin film of multi-purpose grease on the accelerator pedal shaft, cable connecting pin at pedal and cable swivel at carburettor.

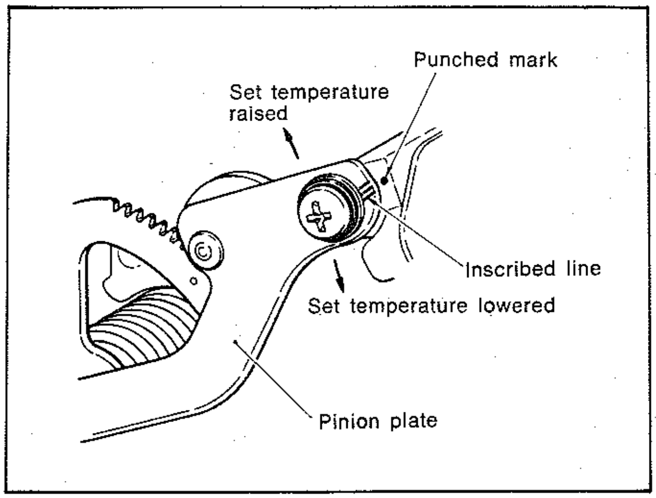


Fig. 2—Choke valve adjustment

(2) If fitted with an automatic transmission, lubricate the transmission cable swivel points.

(3) Ensure that the engine is at operating temperature and choke fast idle is not in operation.

(4) Loosen the cable adjusting lock nut located on the right hand side of the dash panel (engine compartment side).

(5) Adjust the cable tension by means of the adjusting sleeve, the cable must not have any slack and must move freely.

(6) Tighten the lock nut to 10 Nm (95 lbs. in.).

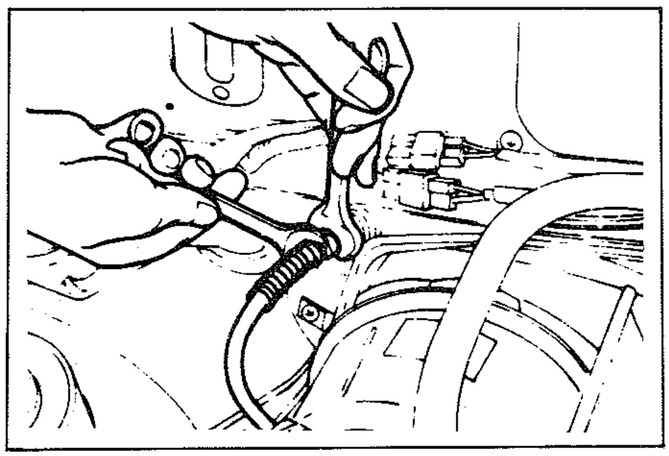


Fig. 3—Throttle cable adjustment