Mazda 929 . 121
WORKSHOP MANUAL
ENGINE

mazda

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1975 Mazda 929 WORKSHOP MANUAL

ENGINE

SUPPLEMENT

WBSTCO 663052 1
39 Epsom Rd Rosebery

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Section 3. COOLING SYSTEM

1. Expansion Tank

The shapes of the radiator, radiator cap, expansion tank, etc. have been changed as shown in Fig. 1 (Refer to Service Bulletin No. 408).

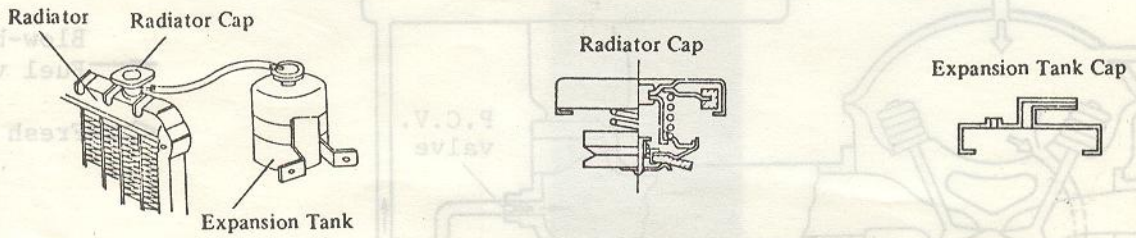

Fig. 1 Expansion tank

Note: Fill the coolant full in the radiator and between "F" and "L" marks in the expansion tank.

Applied Models, Car Nos. & Production Dates:

Models	Car Nos.	Production Dates
Sedan	No. 128875	Feb. 12, 1974
Wagon	No. 109377	Feb. 15, 1974

Section 4. FUEL SYSTEM

1. Fuel Pump

The fitting position of fuel pump has been changed from the inside of trunk room to the lower part of rear floor (Refer to Service Bulletin No. 448).

Applied Models, Car Nos. & Production Dates:

Models	Car Nos.	Production Dates
Sedan	No. 137708	Apr. 16, 1974
Wagon	No. 111479	Apr. 18, 1974

2. Evaporative Emission Control System (Australia only)

The evaporative emission control system is newly equipped on 1975 year model.

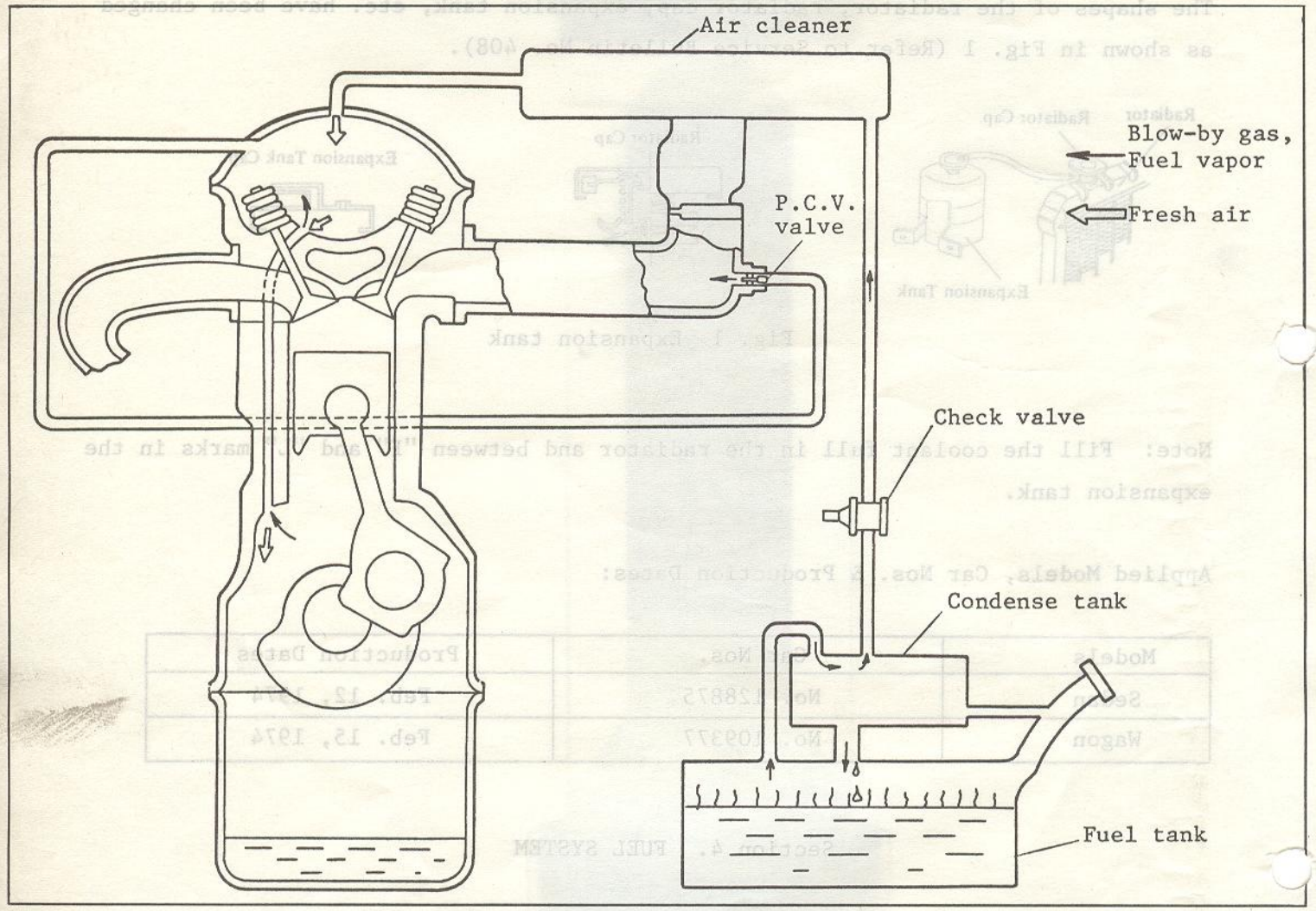

Fig. 2 Evaporative emission control system

2-1. Checking check valve

1. Remove the check valve.
2. Install the pressure gauge at the one end of the check valve and blind the other end by finger.

Breath-out the check valve with the pressure of more than 0.04 kg/cm^2 (0.57 lb/in^2) and breath-in with the negative pressure of more than 0.01 kg/cm^2 (0.14 lb/in^2). If the valve does not operate, replace it with a new one.

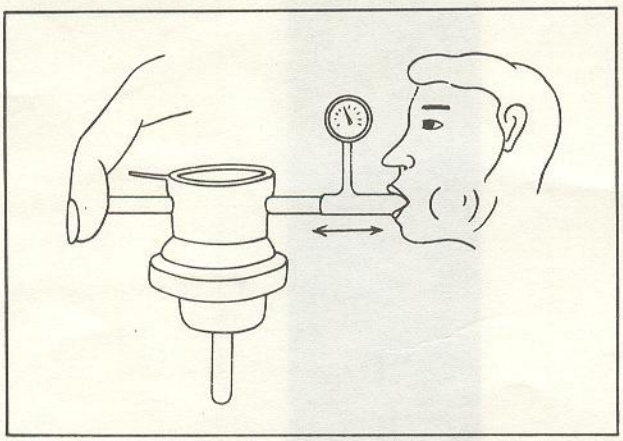

Fig. 3 Checking check valve

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FOREWORD

This workshop manual was prepared as reference material for the service personnel of authorized Mazda dealers to enable them to correctly carry out the task of rendering services and maintenance on Mazda vehicles.

In order to ensure that the customers are satisfied with Mazda products, proper servicing and maintenance must be provided. For this purpose, the service personnel must fully understand the contents of this workshop manual and at the same time, are recommended to keep the manual in a place where reference can readily be made.

The information, photographs, drawings and specifications entered in this manual were the best available at the time of printing this manual. All alterations to this manual occurring as the result of modifications will be notified by the issuance of Service Informations or supplementary volumes. It is, therefore, requested that the manual be kept up to date by carefully maintaining a follow-up of these materials.

Toyo Kogyo reserves the right to alter the specifications and contents of this manual without any obligation and advance notice.

Toyo Kogyo Co.,Ltd.
HIROSHIMA, JAPAN

PRINTED IN JAPAN JAN., '76
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FOREWORD

This manual is a supplement to the 929 (ENGINE) workshop manual. Service information contained in this manual covers only those features that are new for 1975 929 (ENGINE).
Refer to the 929 (ENGINE) workshop manual for service procedures common to previous and 1975 models.

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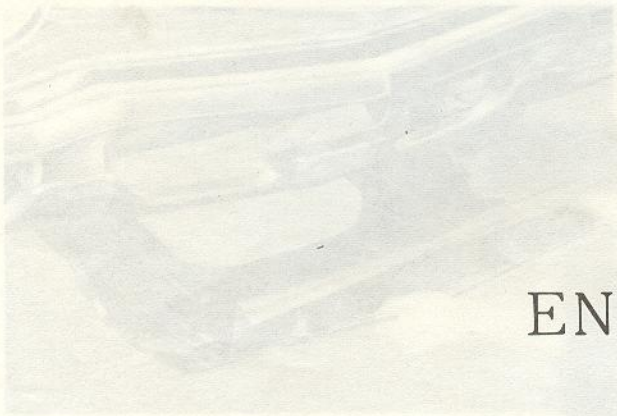


ENGINE

DESCRIPTION

This model is mounted with a 1,769 cc (107.9 cu-in) in-line water cooled, over head camshaft four cylinder engine.
Its bore and stroke is 80 x 88 mm (3.15 x 3.46 in) and the compression ratio is 8.6 : 1.

1–A. CHECKING COMPRESSION PRESSURE

To check the compression pressure, proceed as follows:
1. Be sure the engine oil is at the proper level and the battery is properly charged.
2. Warm up the engine to the normal operating temperature.
3. Remove all spark plugs.
4. Set the throttle valve to the wide open position.
5. Place a compression gauge in the spark plug hole.
6. Crank the engine with the starting motor until the pressure reaches a maximum value.
7. Test the remaining cylinders in the same manner.

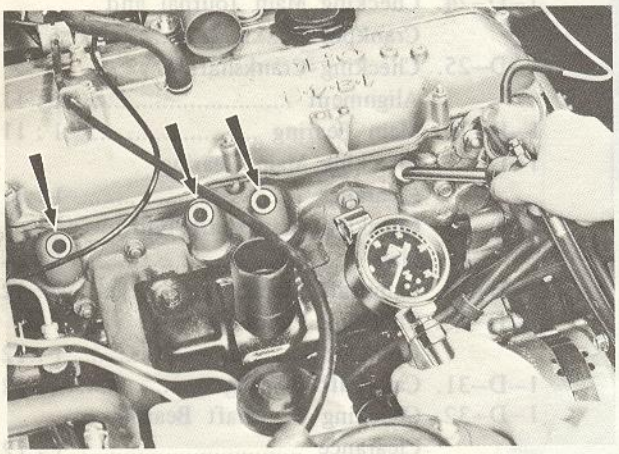


Fig. 1–1 Checking compression pressure

8. The indicated compression pressures are considered normal if the lowest reading cylinder is within 75 percent of the highest.

If one or more cylinders read low, test the compression pressure again after pouring a small quantity of oil into each cylinder.
1) If the compression pressure improves considerably, the piston rings or cylinder bores are worn.
2) If the compression pressure does not improve, valves are sticking or seating poorly.
3) If two adjacent cylinders indicate low compression pressures and pouring oil on the pistons does not increase the compression, the cause may be the cylinder head gasket leak between cylinders. Engine oil and/or coolant in the cylinders could result from this problem.

1–B. ENGINE REMOVAL

The procedures for removing the engine from the vehicle for overhauling are as follows:
1. Remove the bonnet.
2. Remove the engine under cover.

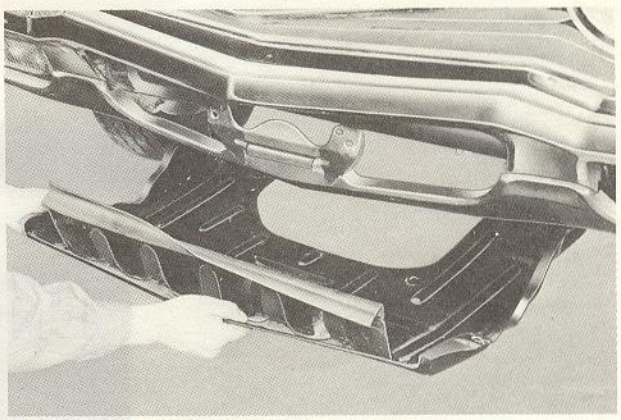


Fig. 1–2 Removing engine under cover

3. Drain the cooling water by opening the drain cocks at the lower part of the radiator and right rear of the cylinder block.
4. Drain the engine oil.
5. Disconnect the negative cable at the battery.
6. Pull off the primary wire and the high tension cable at the distributor.
7. Disconnect the wire at the "B" terminal of the alternator and pull off the wiring coupler from the alternator.
8. Disconnect the wire at the oil pressure switch.
9. Remove the engine earth wire.
10. Disconnect the wiring coupler in front of the cylinder head.
11. Remove the upper and lower radiator hoses.
12. Remove the bolts attaching the radiator cowling to the radiator.
13. Remove the radiator attaching bolts and remove the radiator and cowling.
14. Remove the hot air hose.
15. Pull off the breather pipe from the rocker arm cover.
16. Remove the bolts attaching the air cleaner body and remove the air cleaner assembly.
17. Disconnect the throttle linkage at the carburetor and remove it from the valve rocker cover.
18. Disconnect the choke wire from the carburetor.
19. Disconnect the fuel pipe and fuel return pipe (if equipped) at the carburetor.
20. Disconnect the vacuum pipe for power brake unit from the inlet manifold.
21. Loosen the hose bands and disconnect the heater hoses from the inlet manifold fittings.
22. Pull off the wires from the water temperature gauge unit and the carburetor solenoid.
23. Disconnect the wires from the starting motor and remove the starting motor.
24. Disconnect the exhaust pipe from the exhaust manifold.
25. Remove the clutch cover plate and stays.
26. Remove the nuts and bolts supporting the transmission to the engine.
27. Support the transmission with a suitable jack.
28. Remove the nuts and bolts from the right and left engien mountings.
29. Install a suitable lifting sling on the engine hanger brackets. Attach the sling to a hoist or other lifting

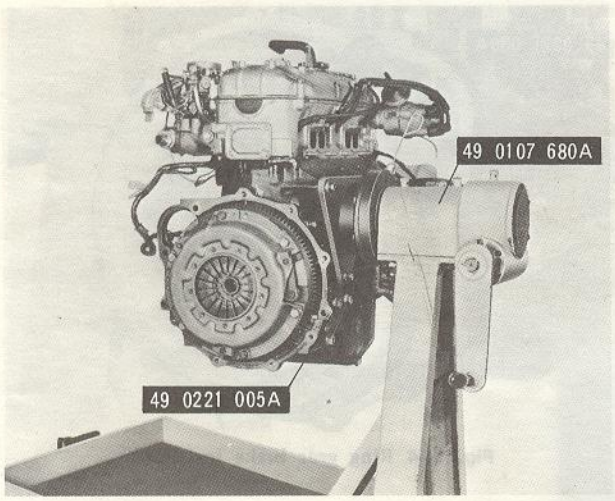


Fig. 1–3 Engine mounted on stand

device and take up all slack.

30. Pull the engine forward until it clears the clutch shaft. Then, lift the engine from the vehicle.

31. Remove the engine mounting brackets from the cylinder block and mount the engine on the **engine stand** (49 0107 680A or 49 0839 000 and 49 0221 005A).

1–C. ENGINE DISASSEMBLY

Engine overhaul should be done in the following order after removing the engine from the vehicle.
If the engine repair stand is not available, take care so as to sufficiently protect the engine and its parts against damage.

1–C–1. Removing Distributor

1. Disconnect the high tension cables from each spark plug.
2. Pull off the vacuum control tube from the distributor.
3. Remove the distributor locking nut and remove the distributor from the cylinder head.

1–C–2. Removing Exhaust Manifold

1. Remove the bolts attaching the heat insulator to the exhaust manifold and remove the heat insulator.
2. Remove the nuts attaching the exhaust manifold to the cylinder head and remove the exhaust manifold and gaskets.

1–C–3. Removing Alternator

1. Remove the alternator strap attaching bolt.
2. Remove the alternator mounting bolts and remove the alternator and the "V" belt.

1–C–4. Removing Oil Filter

1. Remove the oil filter cartridge with the **wrench** (49 0223 195).
2. Remove the bolts attaching the filter cover to the cylinder block and remove the filter cover and gasket.

1–C–5. Removing Cooling Fan and Pulley

1. Remove the bolts that attach the cooling fan and pulley to the water pump boss.
2. Remove the cooling fan, spacer and pulley.

1–C–6. Removing Water Pump

1. Loosen the hose band and disconnect the water bypass hose (water pump ~ inlet manifold) from the inlet manifold.
2. Disconnect the water bypass hose (water pump ~ thermostat case) from the thermostat case.
3. Remove the nuts and bolts that attach the water pump to the timing chain cover.
4. Remove the water pump and alternator strap.

1–C–7. Removing Inlet Manifold and Carburetor Assembly

1. Disconnect the vacuum tube (distributor ~ carburetor) at the carburetor.
2. Disconnect the hose (ventilation valve ~ oil separator) at the ventilation valve, if equipped.
2. Remove the bolts attaching the inlet manifold to the cylinder head and remove the inlet manifold and carburetor assembly.

1–C–8. Removing Cylinder Head

1. Remove the attaching nuts and remove the valve rocker arm cover and gasket.
2. Remove two semicircular oil seals.
3. Install the **ring gear brake** (49 0221 030A) to the flywheel.

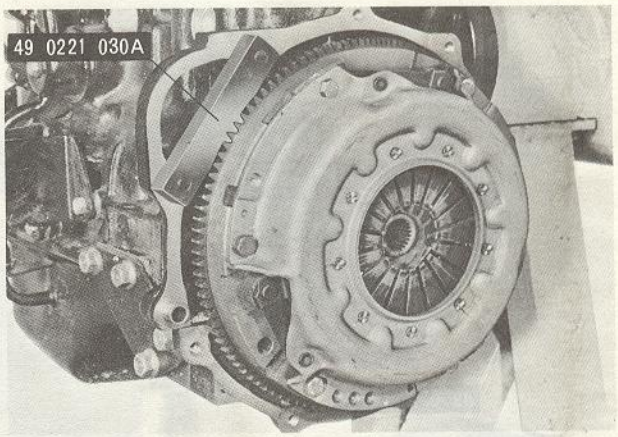


Fig. 1–4 Ring gear brake installed

4. Remove the lock nut and washer and slide the distributor drive gear off the camshaft.
5. With the **spanner** (49 0164 631A) loosen the locknut holding the camshaft sprocket.

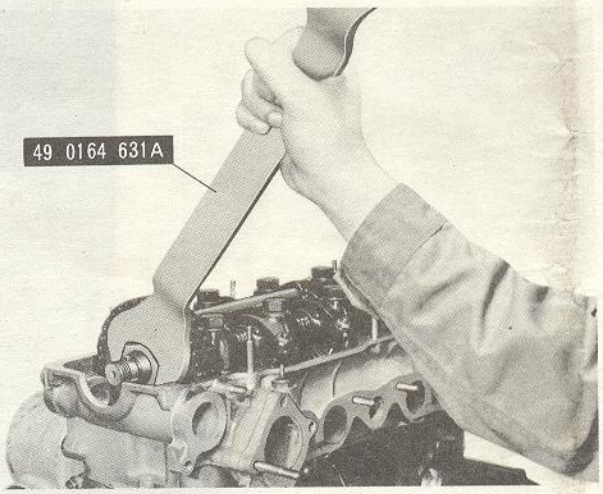


Fig. 1–5 Loosening camshaft sprocket locknut

6. Remove the bolt that attach the cylinder head to the timing chain cover.

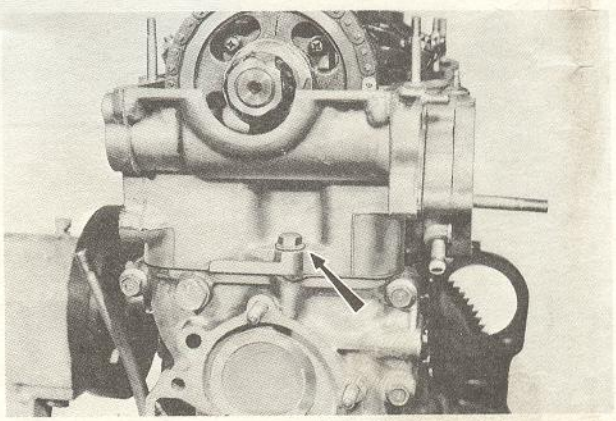


Fig. 1–6 Bolt attaching cylinder head to chain cover

7. Loosen the cylinder head bolts in the reverse order of tightening.

Note:
To avoid cylinder head distortion, loosen the bolts a few turns at a time until they are all loose.

8. Remove the rocker arm assembly.
9. Pull the camshaft rearward and remove the camshaft from the camshaft sprocket. Remove the camshaft sprocket.
10. Remove the camshaft bearing halves from the cylinder head.
11. Remove the cylinder head and gasket.

Note:
When removing only the camshaft or the cylinder head, the timing chain should be lifted upward to prevent the slipper head of the chain tensioner from flying out and causing a difficulty in adjusting the timing chain.

1–C–9. Removing Valve and Valve Spring

1. Remove the carbon inside the combustion chamber.
2. Use the **valve spring lifter** (49 0636 100A and 49 0221 222B) as shown in Fig. 1–7 and compress the valve springs.

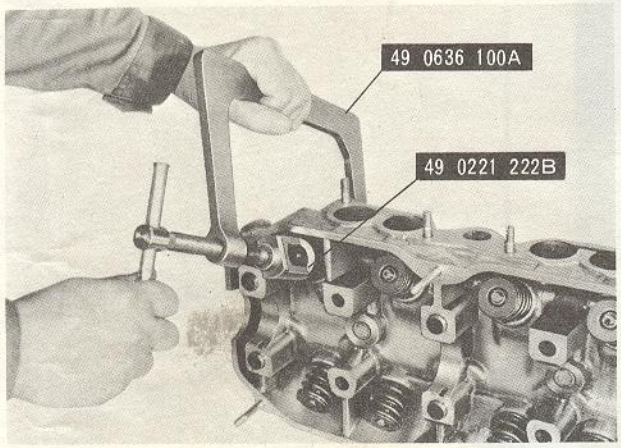


Fig. 1–7 Valve spring lifter

3. Remove the taper sleeves, upper spring seat, valve springs and lower spring seat.
4. Remove the valve.

Note : Place the taper sleeves, upper spring seats, valve springs, lower spring seats and valves in order in a suitable case for reassembling.

1–C–10. Removing Crankshaft Pulley

1. Install the **ring gear brake** (49 0221 030A) to the flywheel.
2. Remove the pulley bolt and pull the pulley off the front end of the crankshaft.

1–C–11. Removing Clutch Assembly

1. Install the **ring gear brake** (49 0221 030A).
2. Remove the bolts holding the clutch cover to the flywheel and remove the clutch cover and pressure plate assembly and clutch disc.
3. Remove the bolts attaching the flywheel to the rear end of the crankshaft.
4. Remove the ring gear brake and flywheel.

1–C–12. Removing Oil Pan

1. Rotate the cylinder block upside down position.
2. Remove the nuts and bolts that attach the oil pan to the cylinder block.
3. Remove the oil pan and gasket.

1–C–13. Removing Timing Chain Cover

1. Remove the bolts and nuts that attach the timing chain cover to the cylinder block.
2. Remove the chain cover and gaskets.
3. Remove the oil thrower from the crankshaft.

1–C–14. Removing Chain Tensioner, Chain Guide Strip and Vibration Damper

Remove the screws, and then remove the chain tensioner, chain guide strip and vibration damper.

1–C–15. Removing Timing Chains and Sprockets

1. Remove the lock nut and washer attaching the oil pump sprocket.
2. Remove the crankshaft sprocket, oil pump drive chain and oil pump sprocket.
3. Remove the timing chain and crankshaft sprocket.
4. Remove the key from the crankshaft.

1–C–16. Removing Oil Pump and Oil Strainer

1. Remove the nuts attaching the oil strainer to the oil pump and remove the oil strainer and "O" ring.
2. Remove the bolts and remove the oil pump, "O" ring and adjusting washers from the cylinder block.

1–C–17. Removing Piston and Connecting Rod

1. Remove the bolts from each connecting rod and remove the bearing caps.
2. Push the piston and connecting rod assembly out of the cylinder block with the handle end of a hammer until the piston rings are free from the cylinder bore. Remove the piston and connecting rod assembly from the top of the block.
3. To separate the piston and connecting rod assembly, remove the clips and remove the piston pin with the **piston pin remover** (49 0223 061).
If tightly, heat the piston with a piston heater.

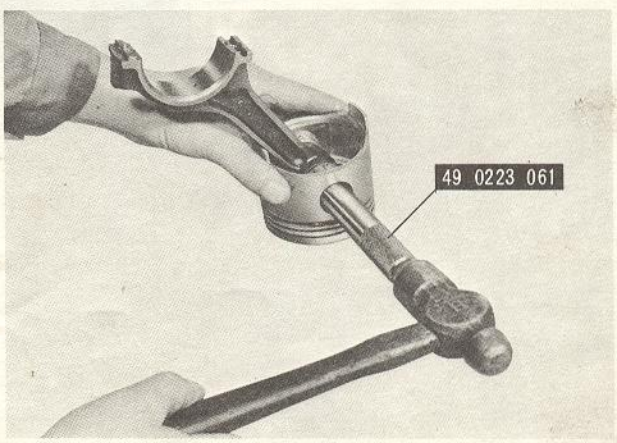


Fig. 1–8 Removing piston pin

1–C–18. Removing Crankshaft

1. Remove the bolts that attach the main bearing caps to the cylinder block.
2. Remove the main bearing caps and thrust washers. When removing the rear main bearing cap, use the **main bearing cap puller** (49 0221 270B).
3. Take out the oil seal from the crankshaft rear end.
4. Remove the crankshaft from the cylinder block.

Fig. 1–9 Removing rear main bearing cap

1–D. ENGINE INSPECTION AND REPAIR

1–D–1. Cylinder Head Inspection

Remove all carbon in the combustion chamber and exhaust port.

Be sure that the water passages are open. Inspect the tapped openings. Repair or replace any damaged threads or broken studs.

Check for cylinder head distortion by placing a straight edge on the cylinder head surface. Measure the clearance between the straight edge and the cylinder head surface with a feeler gauge as shown in Fig. 1–10. If the distortion **exceeds 0.15 mm (0.006 in)**, grind with a surface grinder.

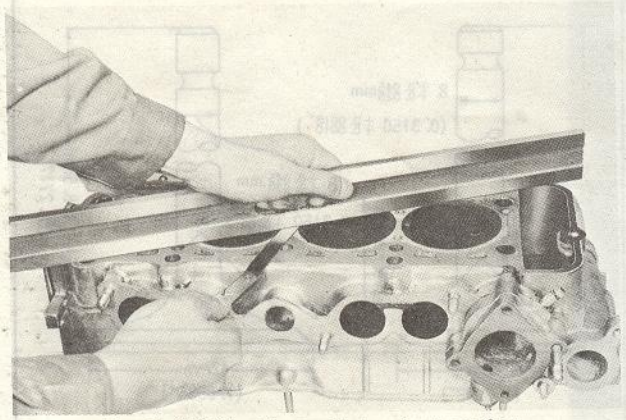


Fig. 1–10 Checking cylinder head surface

1–D–2. Manifold Inspection

Check the intake and exhaust manifold for distortion. To check, place the manifold on a surface plate and check the clearance between the manifold and surface plate with a feeler gauge.

If excessive distortion is found, correct it by grinding.

1–D–3. Valve Spring Inspection

Examine the springs for corrosion or any damage. If it is severe, replace with new ones.

Measure the free length and the fitting pressure. Replace with new springs if the free length is decreased under 36.2 mm (1.425 in) on the outer spring and 35.7 mm (1.406 in) on the inner spring, or if the fitting load is reduced under 10.4 kg (22.9 lb) on the outer spring and 6.3 kg (13.9 lb) on the inner spring.

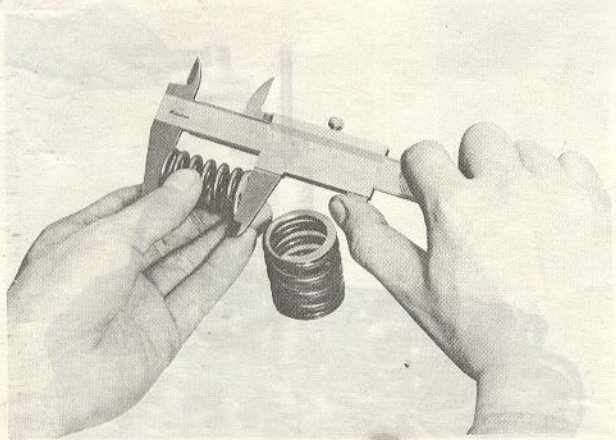


Fig. 1–11 Checking free length of valve spring

Fig. 1–12 Checking spring pressure

The specifications of the springs are as follows:

	Inner spring	Outer spring
Free length	36.8 mm (1.449 in)	37.3 mm (1.469 in)
Fitting length	33.0 mm (1.299 in)	34.5 mm (1.358 in)
Fitting load	7.4 kg (16.3 lb)	12.2 kg (26.9 in)

1–D–4. Valve Inspection

Remove all carbon from the valves. Visually inspect all valves for warpage, cracks or excessive burning and replace if any of these conditions is found.

Replace any worn, pitted or corroded valves that can not be cleaned or refaced.

Measure the diameter of the valve stem at two or three places along the length of the stem with a micrometer. Replace if the stem diameter is less than 7.980 mm (0.3142 in) on the inlet valve and 7.975 mm (0.3140 in) on the exhaust valve.

1–D–5. Checking Valve Stem to Guide Clearance

The standard clearance between the valve stem and guide is, under the condition of the guide being fitted with the cylinder head, **0.018 ~ 0.053 mm (0.0007 ~ 0.0021 in) on the inlet** side and **0.018 ~ 0.058 mm (0.0007 ~ 0.0023 in) on the exhaust** side.

To check this clearance, place the valve in each guide. Check the clearance with a suitably mounted dial indicator, or feel the clearance by moving the stem back and forth. If the clearance is **0.20 mm (0.008 in) or more**, replace the valve guide and valve.

1–D–6. Replacing Valve Guide

1. Press out the old guide with the **valve guide remover** (49 0221 251A), as shown in Fig. 1–13.

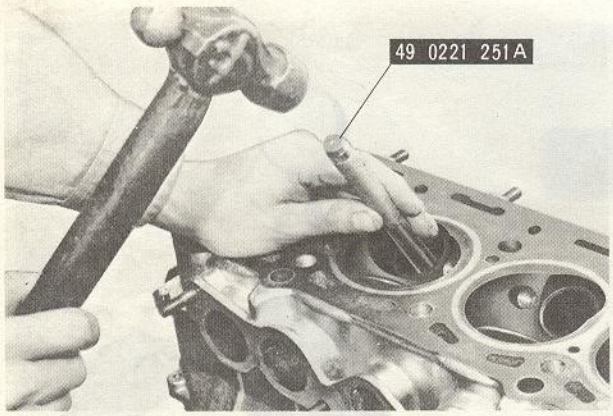


Fig. 1–13 Removing valve guide

2. Press in the new guide squarely with the same tool until the ring on the guide touches the cylinder head.

Note: Intake and exhaust valve guides are different as shown in Fig. 1–14.

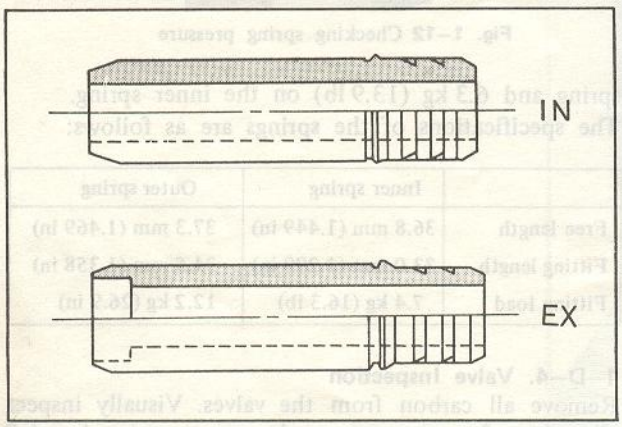


Fig. 1–14 Valve guide

3. Install the new valve seal onto the valve guide with **the valve seal pusher** (49 0223 160A), as shown in Fig. 1–15.

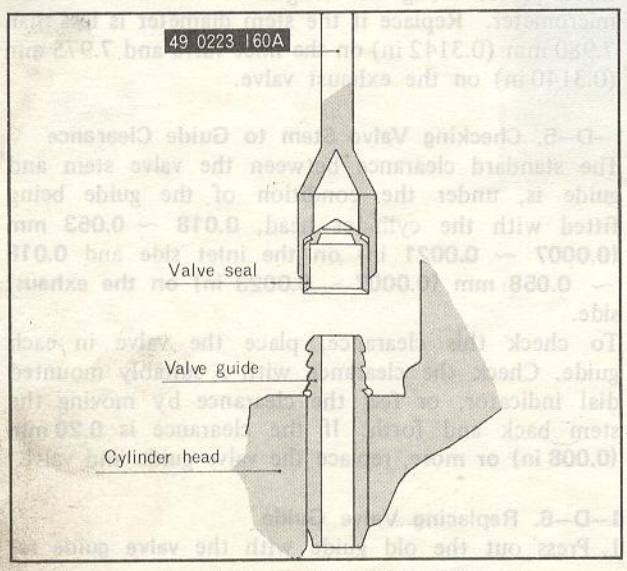


Fig. 1–15 Installing valve seal

1–D–7. Refacing Valve

Reface the valves with a valve refacer, following the instructions of the valve refacer manufacturer.
The **intake** and **exhaust valve face** has a **90 degree** angle.
Take off only the minimum of metal required to clean the valve faces.

Note: If the outer edge of the valve **(valve margin)** becomes **less than 1.0mm (0.039in)** from excessive grinding, the valve must be replaced.

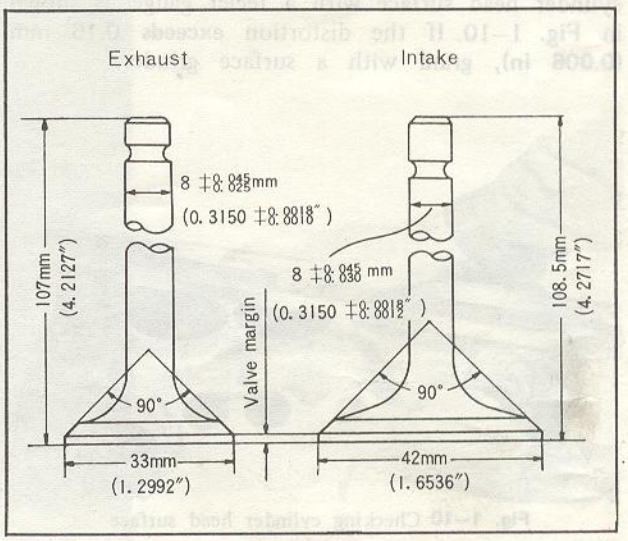


Fig. 1–16 Valve

1–D–8. Inspecting and Refacing Valve Seat

Inspect the valve seats for cracks, burrs, ridges or improper angle and width. If necessary to reface the valve seats, use a valve seat grinder or valve seat cutter and grind to a **90 degree** angle. **Do not** grind any more than is necessary to clean up the valve seat.

Note:
1. If the valve guides are to be replaced, this must be done before refacing the valve seat.
2. The valve seat ring is shrinkage-fitted in the cylinder head. However, the seat ring cannot be replaced in view of maintaining strength.

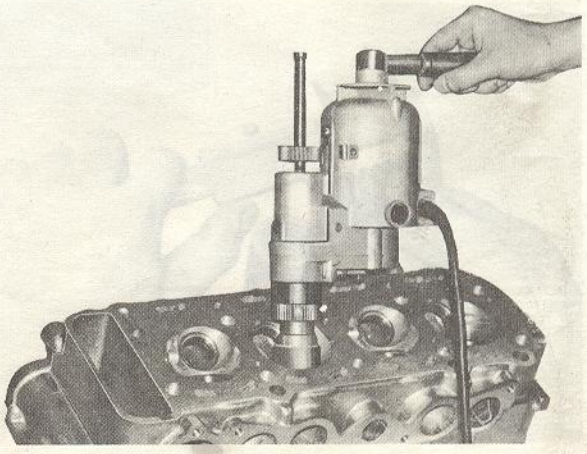


Fig. 1–17 Valve seat grinder

1–D–9. Checking Contact between Valve and Valve Seat

After the valve or valve seat is ground, check the contact between the valve and valve seat as follows:

1. Apply a thin coat of Prussian Blue on the valve face and insert the valve into the valve seat.
2. Move the valve up and down with hand pressure, rotating the valve.
3. Remove the valve and observe the transfer of Prussian Blue to the valve seat.

An even transfer indicates accurate valve and valve seat refacing. If uneven, the valve must be lapped into the valve seat, using a suitable lapping compound.

4. Check the valve seat width with a scale.

The valve seat width is **1.4 mm (0.055 in) on the both intake and exhaust valve seats.**

If the valve seat width is too wide, it can be reduced from inside with a 30° seat cutter and from outside with a 150° seat cutter.

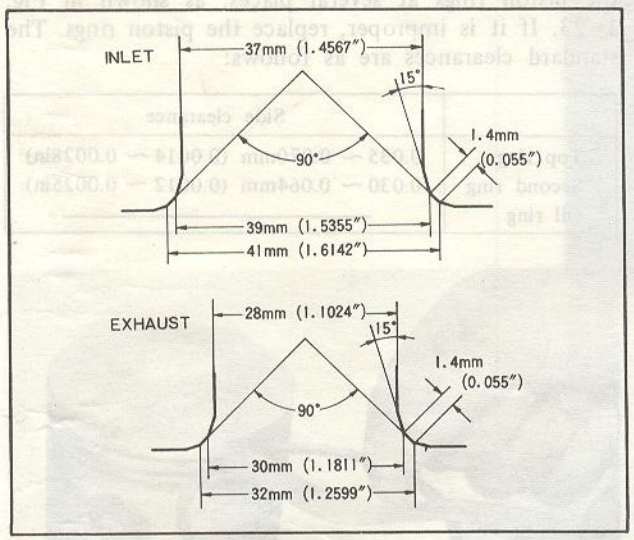


Fig. 1–18 Valve seat

1–D–10. Checking Valve Seat Sinking

When the valve and the valve seat have been refaced several times or they must be cut deeply for adequate reconditioning, the position of the valve sinks below the standard position. Accordingly, the spring pressure under the fitting condition falls.

Check the sinking of the valve seat by using a vernier calipers as shown in Fig. 1–19. If the sinking exceeds 0.5 mm (0.020 in), washers of sufficient thickness to compensate the sinking must be placed under the springs so as to maintain the specified spring pressure. If it is more than 1.5 mm (0.059 in), replace the valve.

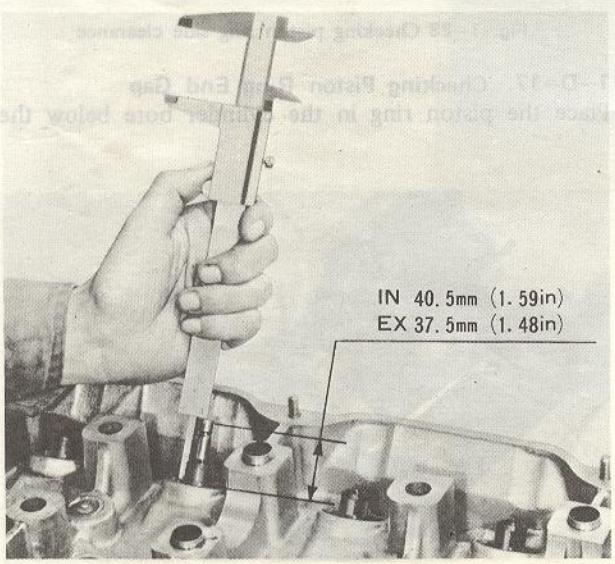


Fig. 1–19 Checking valve seat sinking

1–D–11. Inspection of Rocker Arm and Shaft

The standard clearance between the rocker arm bore and shaft is 0.027 ~ 0.081 mm (0.0011 ~ 0.0032 in). Inspect the clearance and if it is **more than 0.10 mm (0.004 in)**, replace the rocker arm or shaft.

1–D–12. Cylinder Block Inspection

Clean the cylinder block with a suitable solvent. Special care must be taken when cleaning the oil passages, coolant passages and cylinder bore to remove all sludge, dirt and carbon deposit. After cleaning, use compressed air to dry the block thoroughly.

Examine the cylinder block for crack and any damage. Examine all machined surfaces of the block for burrs and scores.

Check the cylinder block for distortion in the same way, as described in Par. 1–D–1.

1–D–13. Inspecting Cylinder Bore

Check the cylinder bores for wear, scratching and waviness.

Measure the diameter of the cylinder bore by using a cylinder gauge as shown in Fig. 1–21.

This measurement should be taken in the X-X direc-

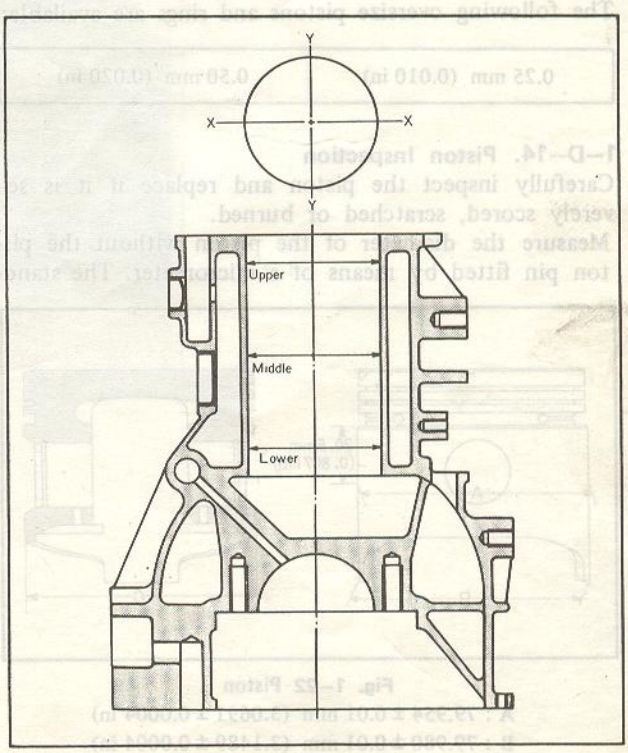


Fig. 1–20 Checking cylinder bore (1)

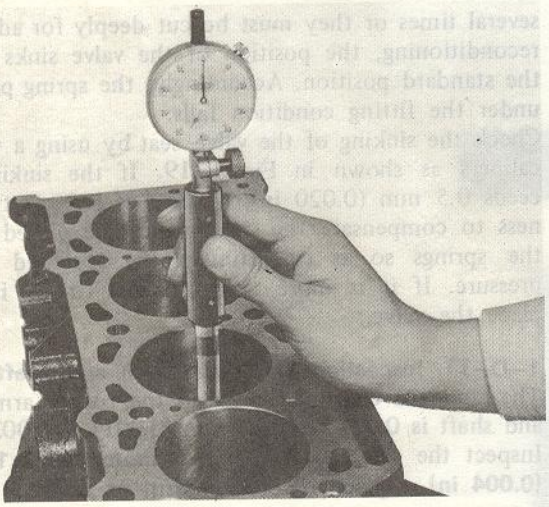


Fig. 1–21 Checking cylinder bore (2)

tion and the Y-Y direction at each of the 3 sections, upper, middle and lower, of one cylinder, as shown in Fig. 1–20.
The difference between the minimum and maximum values out of the 6 measured values is regarded as the amount of wear.
If the wear of cylinder bore is **0.15 mm (0.0059 in) or more,** it should be honed or rebored. Honing and reboring should be made to correspond to piston and rings oversize and to the recommended piston clearance of **0.048 ~ 0.063 mm (0.0019 ~ 0.0025 in).**

Note:
1. If any one of the cylinder bores requires reboring, the remaining ones also require reboring.
2. Reboring must not go beyond 0.50 mm (0.020 in).

The following oversize pistons and rings are available:

0.25 mm (0.010 in)	0.50 mm (0.020 in)

1–D–14. Piston Inspection

Carefully inspect the piston and replace if it is severely scored, scratched or burned.
Measure the diameter of the piston without the piston pin fitted by means of a micrometer. The standard diameter is as shown in Fig. 1–22. If the wear is severe, replace the piston.

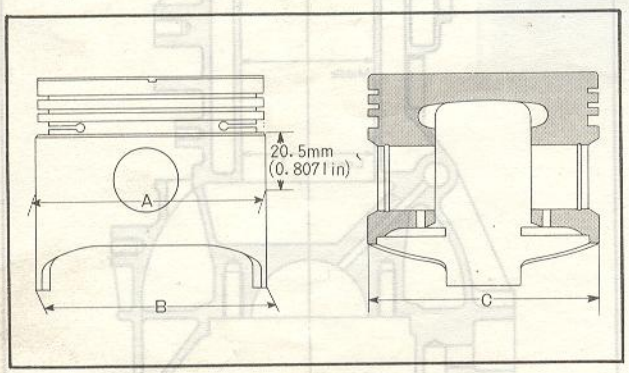


Fig. 1–22 Piston
A : 79.954 ± 0.01 mm (3.0691 ± 0.0004 in)
B : 79.980 ± 0.01 mm (3.1489 ± 0.0004 in)
C : 79.669 ± 0.01 mm (3.1367 ± 0.0004 in)

1–D–15. Piston Clearance

Check the clearance between each piston and cylinder by measuring the diameter of the piston and cylinder. Measure the piston diameter **at right angle to the piston pin and 20.5 mm (0.807 in) below the oil ring groove.**
The standard clearance is 0.048 ~ 0.063 mm (0.0019 ~ 0.0025 in).
If the clearance **exceeds 0.15 mm (0.006 in), rebore** the cylinders and use the oversize pistons and rings, referring to Par. 1–D–13.

1–D–16. Piston Ring Groove Inspection

Remove the carbon from the piston ring grooves by using a ring groove cleaner or a broken piece of piston ring. With a feeler gauge, check the side clearance of the piston rings at several places, as shown in Fig. 1–23. If it is improper, replace the piston rings. The standard clearances are as follows:

	Side clearance
Top ring	0.035 ~ 0.070mm (0.0014 ~ 0.0028in)
Second ring	0.030 ~ 0.064mm (0.0012 ~ 0.0025in)
Oil ring	

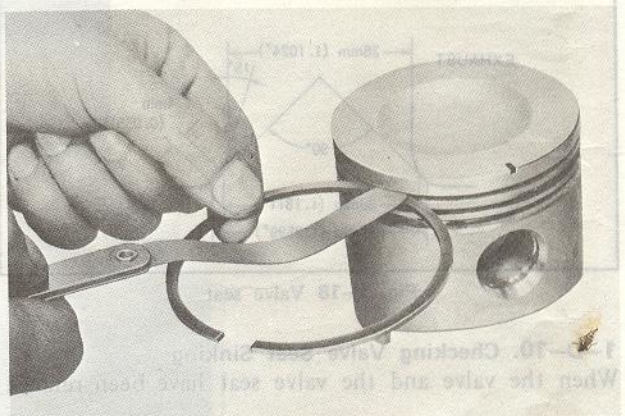


Fig. 1–23 Checking piston ring side clearance

1–D–17. Checking Piston Ring End Gap

Place the piston ring in the cylinder bore below the

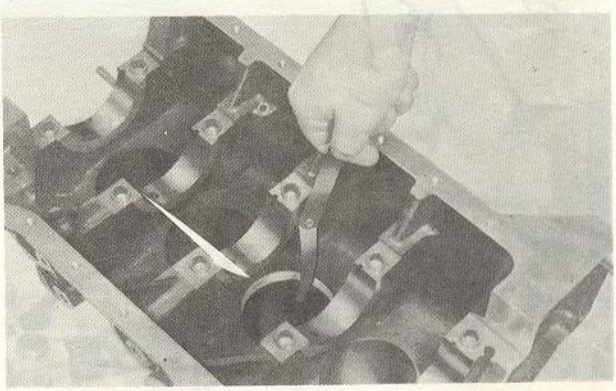


Fig. 1–24 Checking piston ring end gap

ring travel, using a piston head to push the ring in squarely.
Check the piston ring end gap with a feeler gauge as shown in Fig. 1–24. The end gap should be within the specifications. (See Technical Data.)

1–D–18. Checking Piston Pin Fit
Check the fit of the piston pin and the connecting rod small end bush to be 0.01 ~ 0.03 mm (0.0004 ~ 0.0012 in). Replace if they are worn heavily.

1–D–19. Replacing Small End Bush
1. Press out the old bush with a suitable mandrel.
2. Press fit the new bush, being sure to **align the holes** of the bush and connecting rod.
3. Finish the bush with a reamer or a pin hole grinder to the correct fit.

Note: The fit is correct when the piston pin slides through the bush with some pressure but without any noticeable looseness.

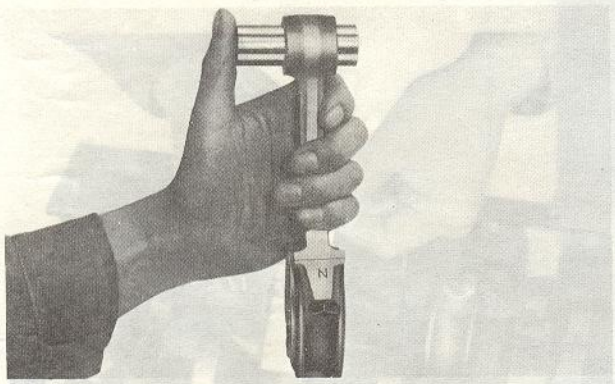


Fig. 1–25 Checking piston pin fit

1–D–20. Connecting Rod Bearing
The connecting rod bearings are of aluminum-lined and of the interchangeable type.
When properly installed, the bearings provide proper clearance without filing, scraping or shimming.
Each bearing consists of two halves and should be replaced as a set.
The connecting rod bearing sets are available in the standard size and undersize of **0.25, 0.50 and 0.75 mm (0.010, 0.020 and 0.030 in).**
Inspect the bearing carefully and replace if it is worn, scored or flaked.

1–D–21. Checking Connecting Rod Bearing Clearance
The connecting rod bearing clearance should be **0.027 ~ 0.077 mm (0.0011 ~ 0.0030 in).**
Check the bearing clearance by using a "Plastigauge" as follows:
1. Clean the surfaces of the bearing and crankpin.
2. Place the "Plastigauge" on the crankpin.
3. Install the bearing cap and tighten the bolts to **5.0 ~ 5.5 m-kg (36 ~ 40 ft-lb).** That will flatten the "Plastigauge" to a width which indicates the bearing clearance.
4. Remove the cap and measure the width of the "Plastigauge", using the scale printed on the envelope.

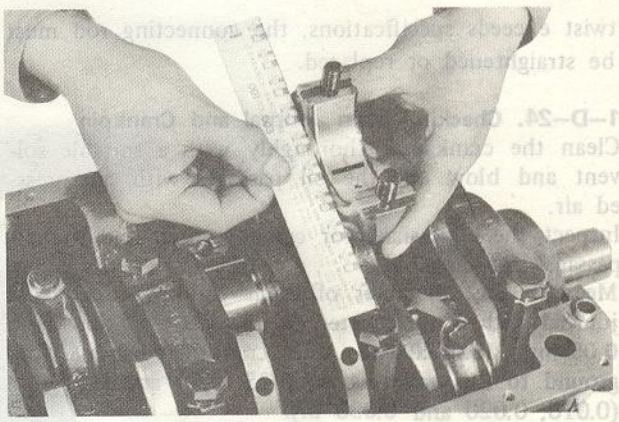


Fig. 1–26 Checking bearing clearance

1–D–22. Checking Connecting Rod Side Play
Check the connecting rod side play with a feeler gauge as shown in Fig. 1–27. The side play should be **between 0.11 ~ 0.21 mm (0.004 ~ 0.008 in).**

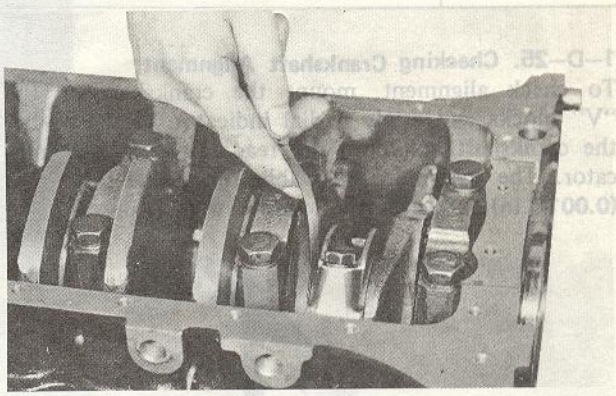


Fig. 1–27 Checking connecting rod side play

1–D–23. Checking Connecting Rod Alignment
Check the connecting rod for bend or twist by using a suitable alignment fixture. Follow the instructions of the fixture manufacturer. If the bend or

Fig. 1–28 Checking connecting rod alignment

twist exceeds specifications, the connecting rod must be straightened or replaced.

1–D–24. Checking Main Journal and Crankpin

Clean the crankshaft thoroughly with a suitable solvent and blow out the oil passages with compressed air.

Inspect the crankshaft for crack, scratch and the oil passages for clog.

Measure the diameter of each crankpin and main journal with a micrometer. If the wear is more than **0.05 mm (0.0020 in)**, the crankshaft should be ground to the undersize of 0.25, 0.50 and 0.75 mm (0.010, 0.020 and 0.030 in).

The standard diameter of the crankpins and main journals is shown in the following table.

Crankpin	$53\ ^{-0.045}_{-0.060}$ mm ($2.0866\ ^{-0.0018}_{-0.0024}$ in)
Main journal	$63\ ^{-0.045}_{-0.060}$ mm ($2.4804\ ^{-0.0018}_{-0.0024}$ in)

1–D–25. Checking Crankshaft Alignment

To check alignment, mount the crankshaft on the "V" blocks and apply a dial indicator. Slowly rotate the crankshaft and note the reading on the dial indicator. The maximum allowable run-out is **0.03 mm (0.0012 in)**. If necessary, correct with a press.

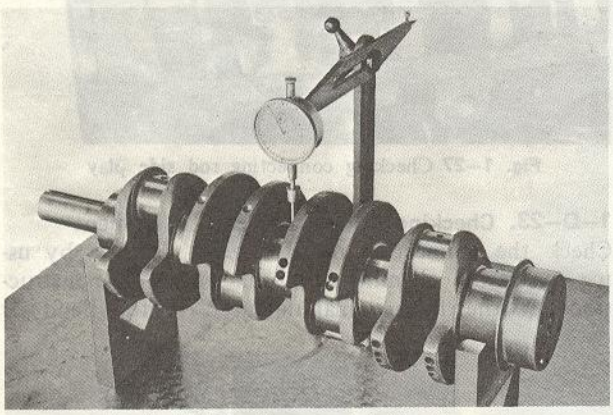


Fig. 1–29 Checking crankshaft alignment

1–D–26. Main Bearing

The main bearings are of aluminum-lined and interchangeable type.

They are classified into 2 types according to the shape as shown in Fig. 1–30.

When correctly installed, it is provided proper clearance without filing, scraping or shimming.

Each bearing consists of two halves and should be replaced as a set. The main bearings are available in the standard size and undersize of **0.25, 0.50 and 0.75 mm (0.010, 0.020 and 0.030 in).**

Inspect the bearings carefully for wear, scoring, flaking or any damage. If any of these conditions exists, replace with new bearings.

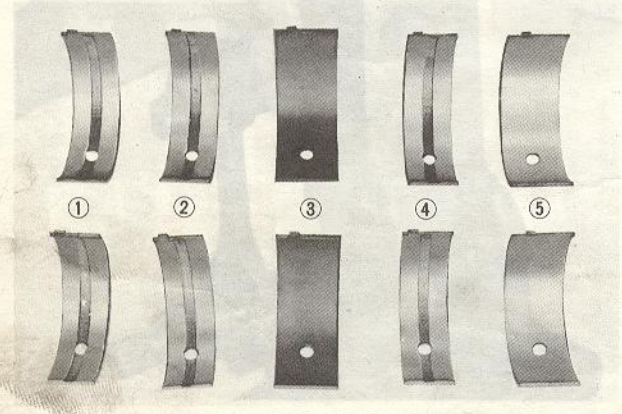


Fig. 1–30 Main bearing

1–D–27. Checking Main Bearing Clearance

Check the main bearing clearance by using a "Plastigauge" in the same manner for the connecting rod bearing clearance.

Note the following differences:

1. The main bearing clearance is **0.031 ~ 0.061 mm (0.0012 ~ 0.0024 in).**
2. The tightening torque of the bearing cap bolts is **8.4 ~ 9.0 m-kg (61 ~ 65 ft-lb).**

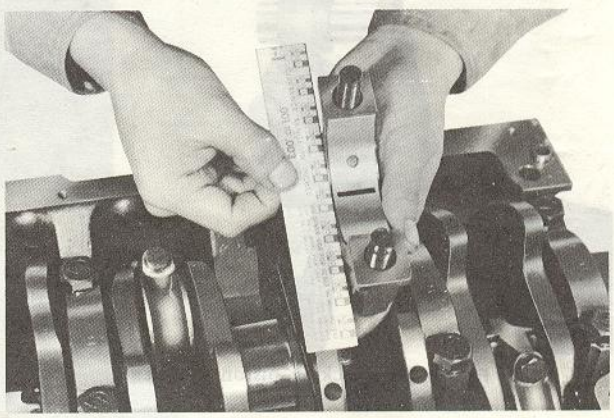


Fig. 1–31 Checking main bearing clearance

1–D–28. Checking Crankshaft End Play

The end thrust of the crankshaft is taken by the thrust washers at the rear of the crankshaft.

The standard end play of the crankshaft is 0.08 ~ 0.24 mm (0.003 ~ 0.009 in).

Check the end play with a dial indicator or a feeler gauge.

Correct if the end play **exceeds 0.3 mm (0.012 in).** The end play can be adjusted by the thrust washer.

Fig. 1–32 Checking crankshaft end play

Thrust washers are available in the oversize of **0.25, 0.50 and 0.75 mm (0.010, 0.020 and 0.030 in).**

1–D–29. Camshaft Inspection

Check to see that the cam faces and journals are smooth and are not scored or worn.

Measure the cam height with a micrometer and replace the camshaft if it is **less than 44.837 mm (1.7653 in) on inlet and 44.804 mm (1.7640 in) on exhaust.** The standard cam height is 45.037 mm (1.7731 in) on inlet and 45.004 mm (1.7718 in) on exhaust.

Measure the diameter of the camshaft journals. When they are worn **more than 0.05 mm (0.0020 in)**, grind the journals to the undersize of **0.25, 0.50 or 0.75 mm (0.010, 0.020 or 0.030 in).**

The standard diameters of the journals are in the following table.

Front	45 $^{-0.040}_{-0.055}$	mm	(1.7717 $^{-0.0016}_{-0.0022}$	in)
Center	45 $^{-0.050}_{-0.065}$	mm	(1.7717 $^{-0.0020}_{-0.0026}$	in)
Rear	45 $^{-0.040}_{-0.055}$	mm	(1.7717 $^{-0.0016}_{-0.0022}$	in)

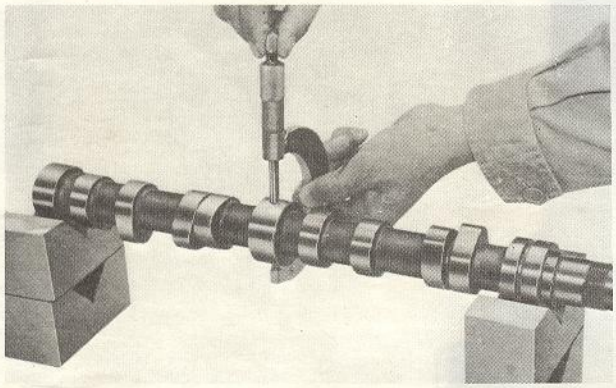


Fig. 1–33 Measuring diameter of camshaft journal

1–D–30. Checking Camshaft Run-Out

Check the camshaft run-out with a dial indicator. The maximum permissible run-out is **0.03 mm (0.0012 in).** If necessary, correct the camshaft with a press.

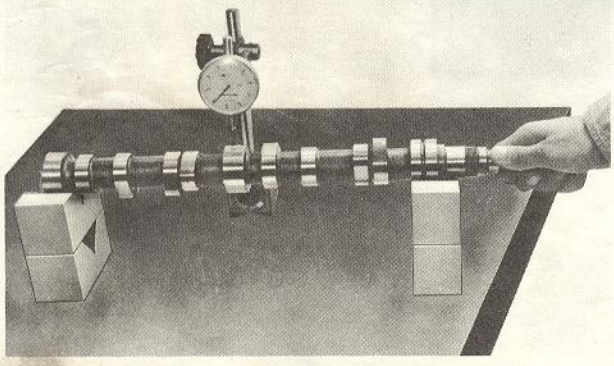


Fig. 1–34 Checking camshaft run-out

1–D–31. Camshaft Bearing

The camshaft bearings are of babbitt-lined and inter-

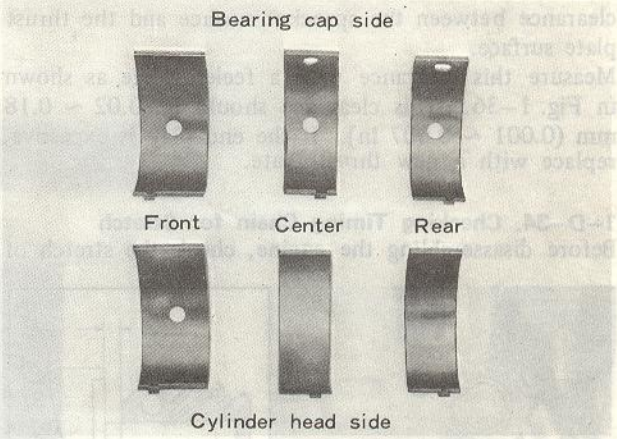


Fig. 1–35 Camshaft bearing

changeable type. They are classified into 3 types. When correctly installed, it is provided proper clearance without filing, scraping or shiming.

Each bearing consists of two halves and should be replaced as a set.

The camshaft bearings are available in the standard size and undersize of **0.25, 0.50 and 0.75 mm (0.010, 0.020 and 0.030 in).**

Inspect the bearings carefully for wear, scoring, flaking or any damage. If any of these conditions exists, replace with new bearings.

1–D–32. Checking Camshaft Bearing Clearance

Check the camshaft bearing clearance by using a "Plastigauge" in the same manner for the connecting rod bearing clearance.

Note the following differences:

1. The standard camshaft bearing clearance is 0.019 ~ 0.069 mm (0.0007 ~ 0.0027 in) for the front and rear, and 0.029 ~ 0.079 mm (0.0011 ~ 0.0031 in) for the center.
2. The tightening torque of the bolts is **8.2 ~ 8.8 m-kg (59 ~ 64 ft-lb).**

1–D–33. Checking Camshaft End Play

The end play of the camshaft is determined by the

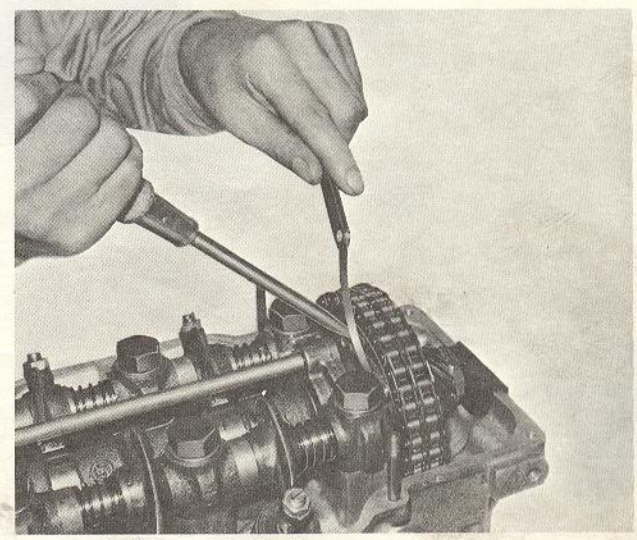


Fig. 1–36 Checking camshaft end play

clearance between the sprocket surface and the thrust plate surface.
Measure this clearance with a feeler gauge as shown in Fig. 1–36. This clearance should be 0.02 ~ 0.18 mm (0.001 ~ 0.007 in). If the end play is excessive, replace with a new thrust plate.

1–D–34. Checking Timing Chain for Stretch

Before disassembling the engine, check the stretch of the chain. To check the stretch of the chain, first readjust the tension of the chain as explained in Par. 1–E–17, and then check the protrusion amount of the slipper head, as shown in Fig. 1–37. If it **exceeds 8.0 mm (0.315 in)**, the chain must be replaced.

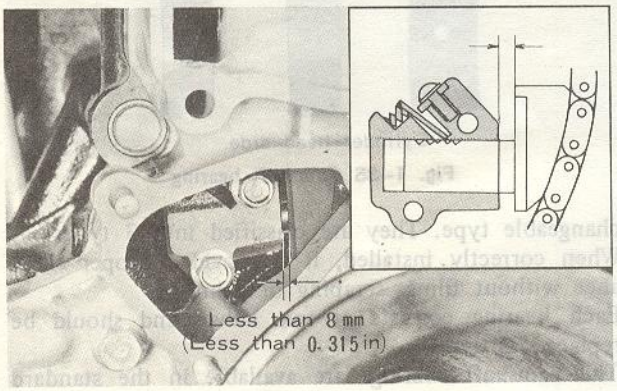


Fig. 1–37 Checking timing chain for stretch

1–D–35. Checking Timing Chain, Oil Pump Drive Chain and Sprockets

Check each chain for broken links. Check the sprockets for cracks and worn or damaged teeth. If any defects are found, replace with new parts.

1–D–36. Checking Chain Tensioner

Check the rubber pad on the chain tensioner for wear or damage and the tensioner spring for loss of tension. If they are defective, replace with a new tensioner assembly.

1–D–37. Checking Chain Guide Strip and Vibration Damper

Check the chain guide strip and chain vibration damper for wear or any damage and replace if they are defective.

1–E. ENGINE ASSEMBLY

The procedures for assembling the engine when the engine is to be completely overhauled are as follows:

1–E–1. Assembling Piston and Connecting Rod

1. Install the piston pin clip in the groove on one side of the piston.
2. Place the connecting rod in the piston and align the hole of the connecting rod with the hole of the piston.

Note: Care must be taken during the installation that relative positions of the oil hole on the connecting rod big end and the notch on the piston are in accordance with Fig. 1–38.

3. Insert the piston pin with the **installer** (49 0223 061) until the piston pin clip can be fitted. Preheat the piston if tightly.

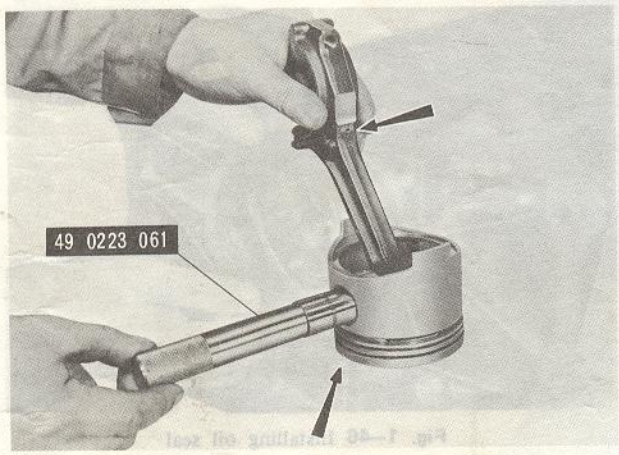


Fig. 1–38 Installing piston pin

4. Fit the piston pin clip in the groove.

1–E–2. Installing Piston Ring

1. Fit the expansive spacer and the guide rails in the bottom ring groove.
2. Install the second ring and then the top ring.

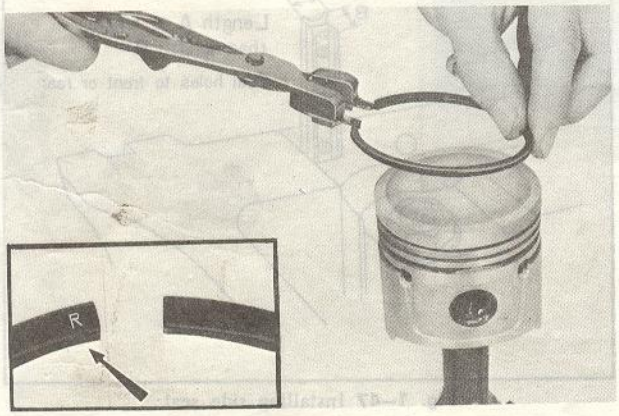


Fig. 1–39 Installing piston ring

Note:
1. Be sure to install the rings with the inscription mark upward as the faces of the top and second rings

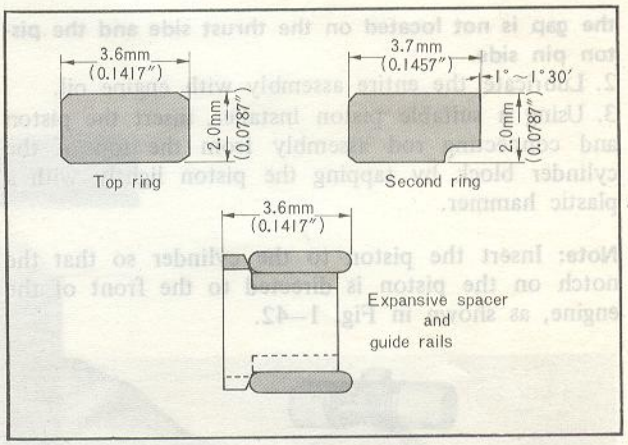


Fig. 1–40 Piston ring

are shaped as shown in Fig. 1–40.
2. Do not expand the rings more than necessary to install, also be careful not to burr the piston with the end of the rings.

1–E–3. Installing Piston and Connecting Rod Assembly

1. Place the piston rings at **about 120° apart so that**

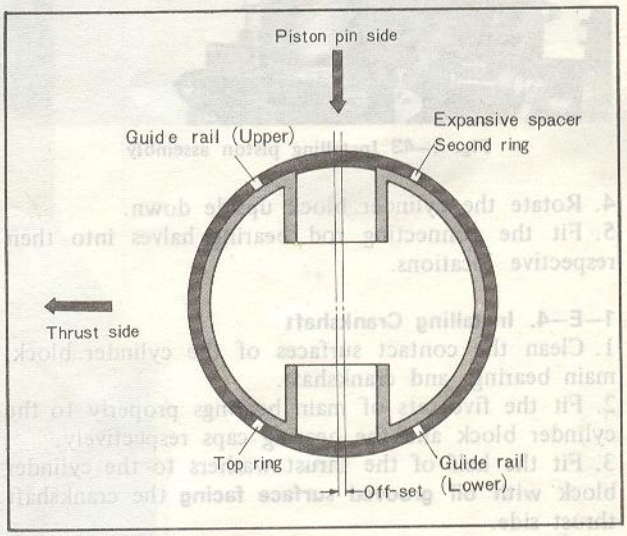


Fig. 1–41 Position of piston ring end gap

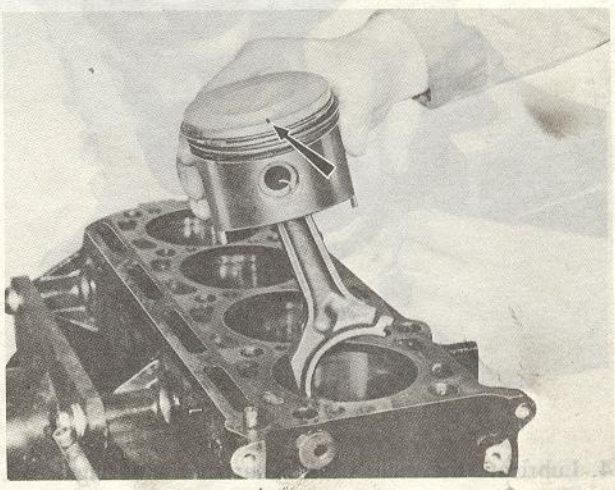


Fig. 1–42 Direction of piston

the gap is not located on the thrust side and the piston pin side.

2. Lubricate the entire assembly with engine oil.
3. Using a suitable piston installer, insert the piston and connecting rod assembly from the top of the cylinder block by tapping the piston lightly with a plastic hammer.

Note: Insert the piston to the cylinder so that the notch on the piston is directed to the front of the engine, as shown in Fig. 1–42.

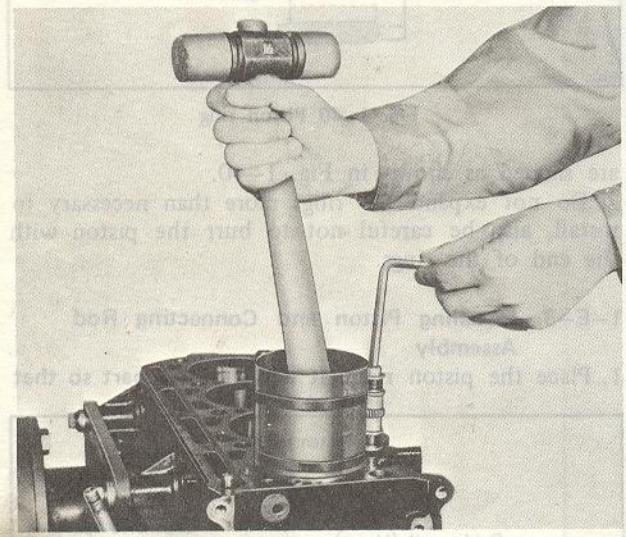


Fig. 1–43 Installing piston assembly

4. Rotate the cylinder block upside down.
5. Fit the connecting rod bearing halves into their respective locations.

1–E–4. Installing Crankshaft

1. Clean the contact surfaces of the cylinder block, main bearings and crankshaft.
2. Fit the five sets of main bearings properly to the cylinder block and the bearing caps respectively.
3. Fit the half of the thrust washers to the cylinder block **with oil grooved surface facing** the crankshaft thrust side.

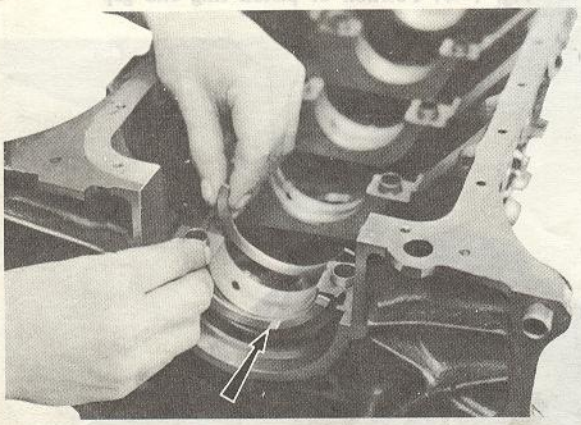


Fig. 1–44 Installing thrust washer

4. Lubricate the main bearing surfaces with engine oil.
5. Place the crankshaft in the cylinder block, being careful not to drop the thrust washers.

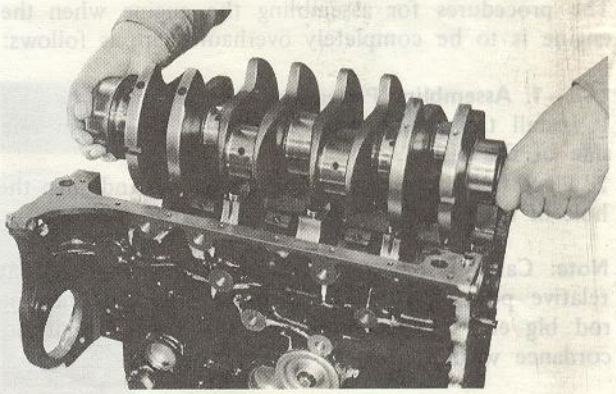


Fig. 1–45 Installing crankshaft

6. Fit the oil seal to the rear end of the crankshaft after applying grease to the seal lip.

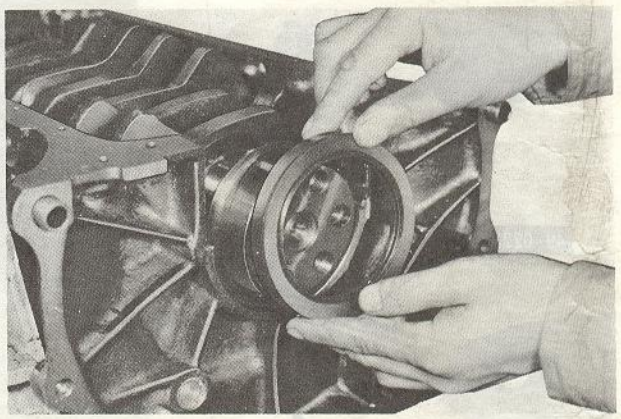


Fig. 1–46 Installing oil seal

7. Insert the rod-shaped oil seals (side seals) into the grooves on both sides of the rear main bearing cap.

Note: The side seals should be installed as shown in Fig. 1–47.

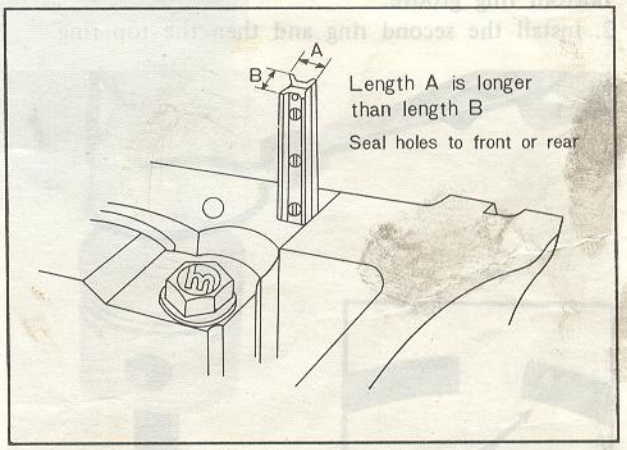


Fig. 1–47 Installing side seal

8. Fit the half of the thrust washers to the rear main bearing cap with the grooves toward the crankshaft thrust side.
9. Install the main bearing caps.

Note: The main bearing caps are marked with a number which shows the order of their arrangement.

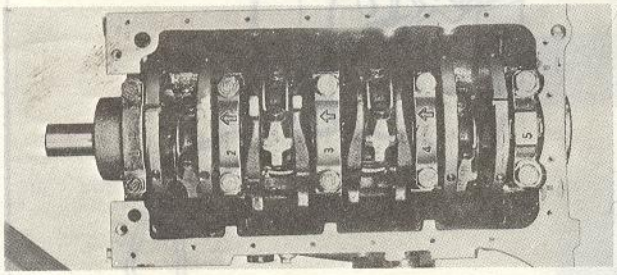


Fig. 1–48 Number and arrow mark on cap

10. Tighten the bolts to **8.4 ~ 9.0 m-kg (61 ~ 65 ft-lb).**

1–E–5. Installing Connecting Rod Bearing Cap

1. Fit the connecting rod bearing halves into their respective caps.
2. Lubricate the connecting rod bearing surfaces with engine oil.
3. Install the caps to the connecting rods, ensuring that the **identification numbers are matched,** as shown in Fig. 1–49.

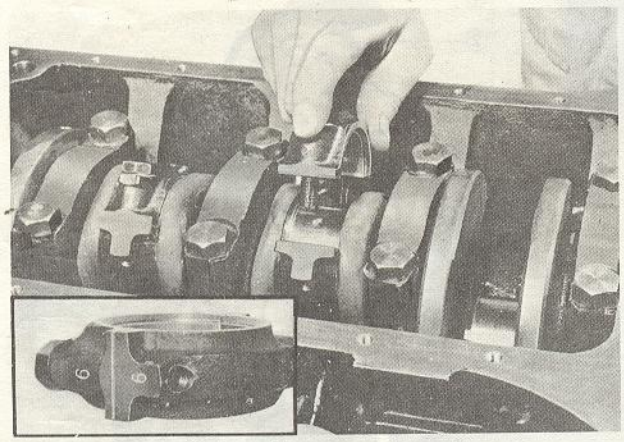


Fig. 1–49 Installing connecting rod cap

4. Torque the bolts **5.0 ~ 5.5 m-kg (36 ~ 40 ft-lb).**
5. Turn the crankshaft and make sure that the rotation is light and smooth.

1–E–6. Installing Oil Pump and Strainer

1. Fit the "O" ring to the outlet hole on the oil pump and install the oil pump to the cylinder block, aligning the dowel pins.
2. Tighten the attaching bolts.
3. Place the "O" ring on the oil pump and install the oil strainer to the oil pump. Tighten the nuts.

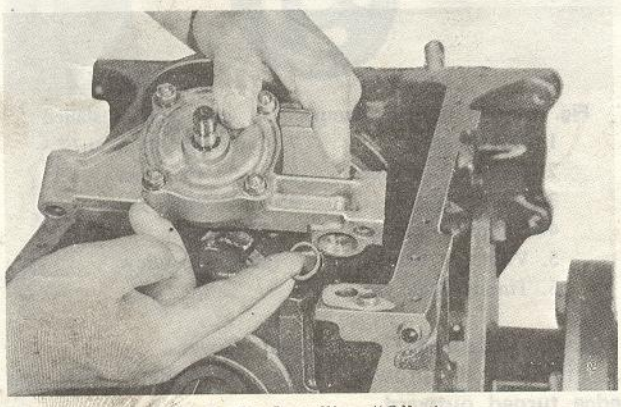


Fig. 1–50 Installing "O" ring

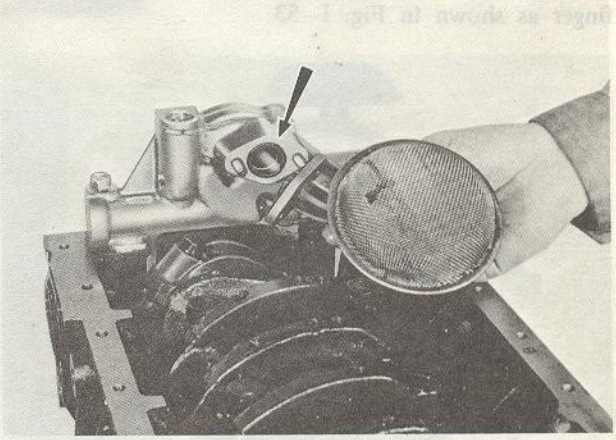


Fig. 1–51 Installing oil strainer

1–E–7. Installing Timing Chain, Oil Pump Drive Chain and Sprockets

1. Place the timing chain on the crankshaft sprocket and camshaft sprocket with the timing mark and nickel-plated link aligned.
2. Being caraful not to change the relations of timing chain, camshaft sprocket and crankshaft sprocket, fit the crankshaft sprocket onto the crankshaft.

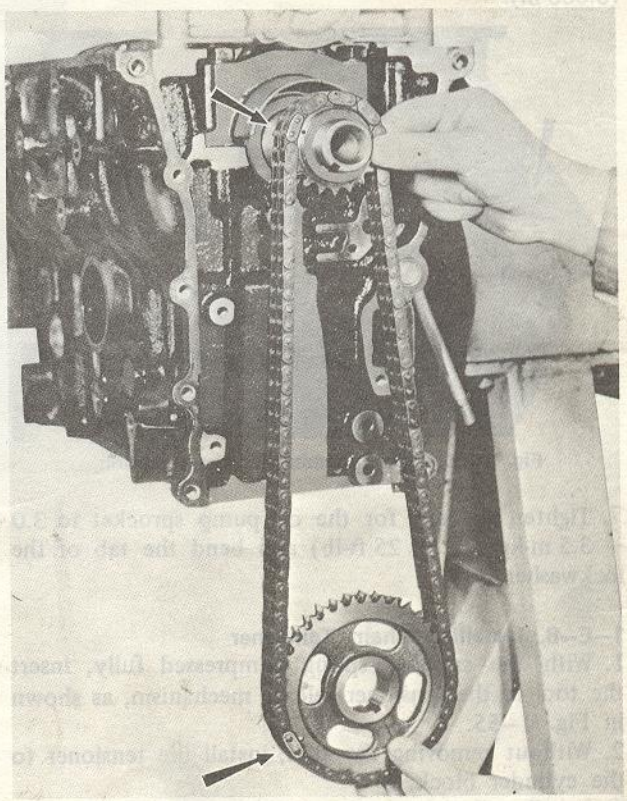


Fig. 1–52 Installing chain and sprockets

3. Align the keyways of the crankshaft and sprocket, and then install the key.

4. Fit the key on the oil pump shaft.
5. Fit the oil pump drive chain onto the oil pump sprocket and crankshaft sprocket, and install them to the crankshaft and oil pump shaft, aligning the key and keyway.
6. Check the slack of the drive chain by pressing a finger as shown in Fig. 1–53.

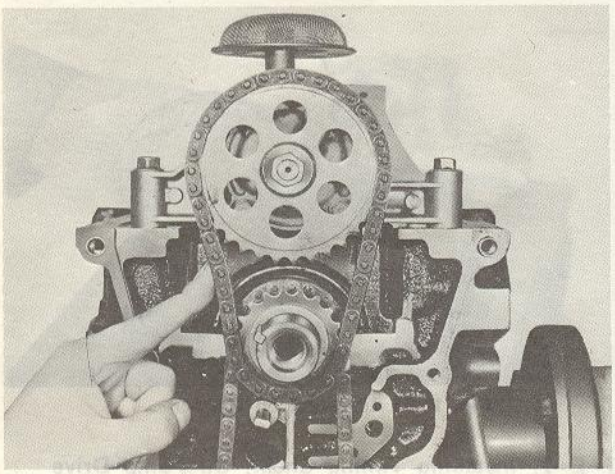


Fig. 1–53 Checking oil pump chain for tension

If the slack **exceeds 4.0 mm (0.157 in)**, install the adjusting shims between the cylinder block and the oil pump body and adjust the slack to be within 4.0 mm (0.157 in).
The thicknesses of the adjusting shims are 0.15 mm (0.006 in).

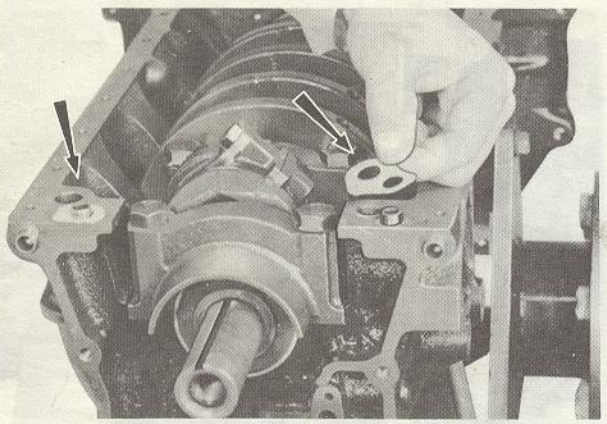


Fig. 1–54 Adjusting shim for chain tension

7. Tighten the nut for the oil pump sprocket to 3.0 ~ 3.5 m-kg (22 ~ 25 ft-lb) and bend the tab of the lockwasher.

1–E–8. Installing Chain Tensioner

1. With the snubber spring compressed fully, insert the tool in the tensioner release mechanism, as shown in Fig. 1–55.
2. Without removing the tool, install the tensioner to the cylinder block.
3. Install and tighten the attaching bolts, holding the tool in place.
Do not remove the tool until the operation in Par. 1–E–17 is finished.

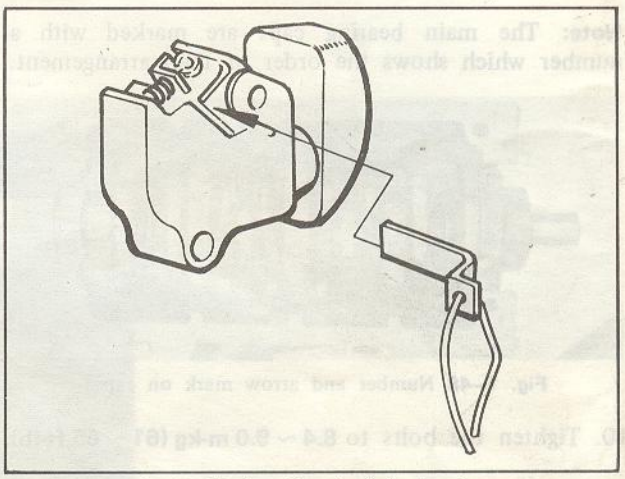


Fig. 1–55 Inserting tool in tensioner

4. Install the chain vibration damper to the cylinder block and tighten the attaching screws.
5. Install the chain guide strip. **Do not tighten** the attaching screws as the tension is adjusted by the chain guide strip, which is explained in Par. 1–E–17.

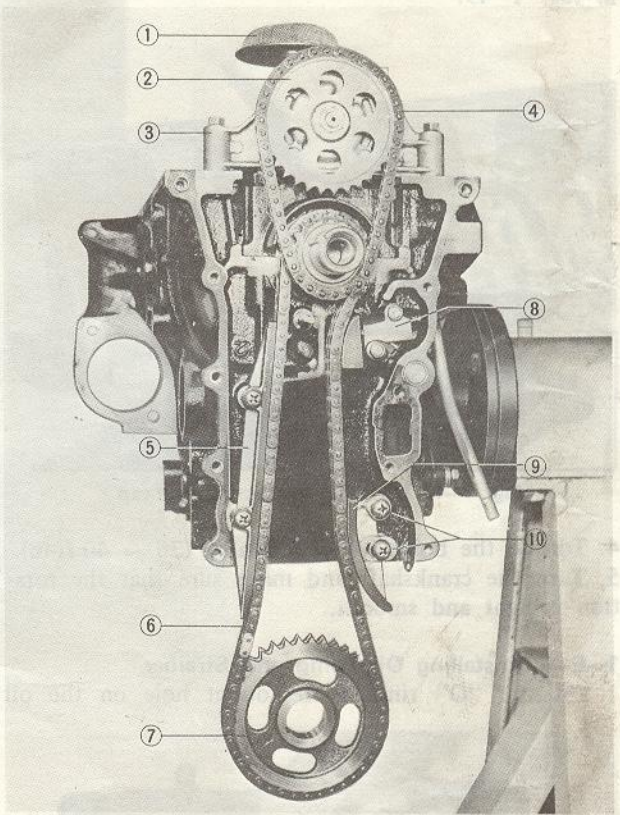


Fig. 1–56 Tensioner, damper and guide strip installed

1. Oil strainer
2. Oil pump sprocket
3. Oil pump
4. Oil pump chain
5. Vibration damper
6. Timing chain
7. Camshaft sprocket
8. Chain tensioner
9. Chain guide strip
10. Guide strip attaching screw

1–E–9. Installing Timing Chain Cover

1. Fit the oil thrower to the crankshaft **with the edge turned outward.**

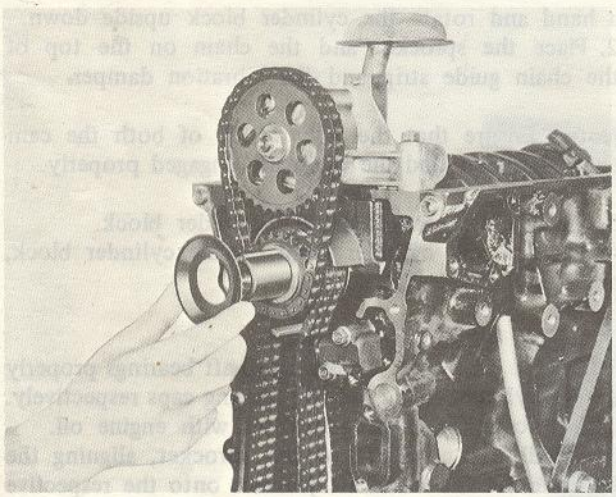


Fig. 1–57 Installing oil thrower

2. Fit the oil deflector and the oil seal into the timing chain cover. Then, fill the oil seal lip with grease.
3. Place the gaskets on the cylinder block and install the chain cover, aligning the dowel pins. Tighten the bolts and nuts.

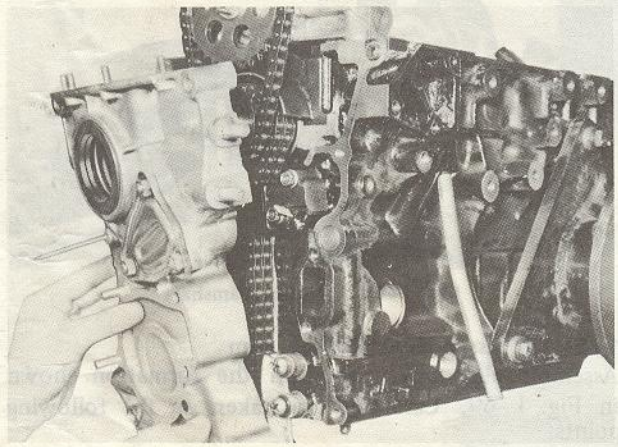


Fig. 1–58 Installing timing chain cover

4. Cut off excess gaskets along the mounting surfaces of the oil pan and cylinder head.

1–E–10. Installing Oil Pan

1. Before installing the oil pan, make a final internal inspection.

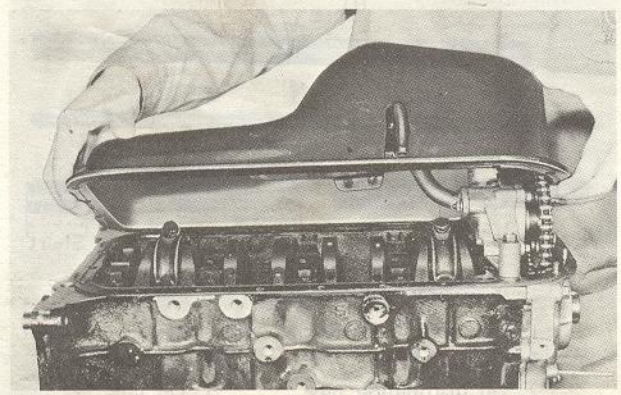


Fig. 1–59 Installing oil pan

2. Apply a thin coat of gasket paste on the oil pan.
3. Place a new gasket on the cylinder block.
4. Install the oil pan and tighten the bolts and nuts little by little in turn.

1–E–11. Installing Flywheel and Clutch

1. Install the flywheel onto the rear end of the crankshaft with a reamer bolt and five standard bolts. When doing so, align the "O" marked hole on the flywheel with the reamed hole on the crankshaft and fit the reamer bolt in the "O" marked hole.

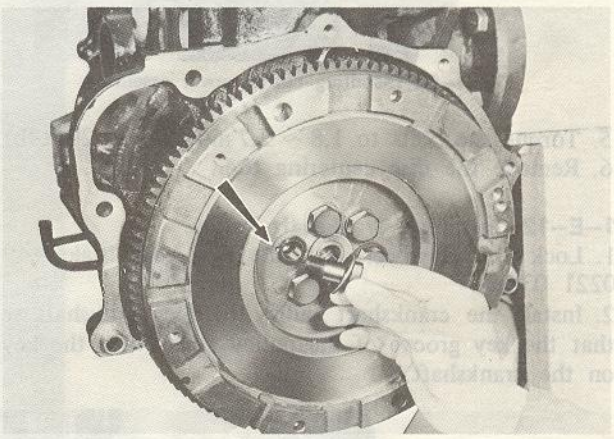


Fig. 1–60 Installing flywheel

2. Install the **ring gear brake** (49 0221 030A) and tighten the bolts to **15.5 ~ 16.3 m-kg (112 ~ 118 ft-lb)**.
3. Hold the clutch disc in its mounting position with the **disc centering tool** (49 0813 310).
If the tool is not available, use a spare main drive shaft.

Note: Avoid touching the clutch disc facing, dropping the parts or contaminating them with oil or grease as a clutch chatter may result.

Fig. 1–61 Installing clutch disc

4. Install the clutch cover and pressure plate assembly onto the flywheel, aligning the "O" mark of the clutch cover with the reamed hole of the flywheel. Install the 4 standard and 2 reamer bolts finger tight.
To avoid pressure plate and cover distortion, tighten the bolts a few turns at a time until they are all tight.

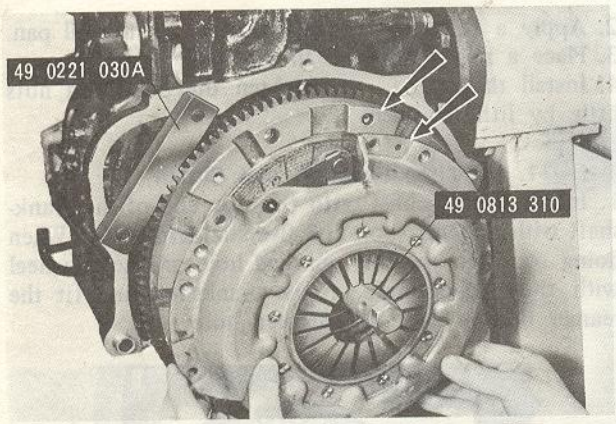


Fig. 1–62 Installing clutch cover assembly

5. Torque the bolts to 1.8 ~ 2.7 m-kg (13 ~ 20 ft-lb).
6. Remove the disc centering tool.

1–E–12. Installing Crankshaft Pulley

1. Lock the flywheel with the **ring gear brake** (49 0221 030A).
2. Install the crankshaft pulley to the crankshaft so that the key groove of the pulley aligns with the key on the crankshaft.

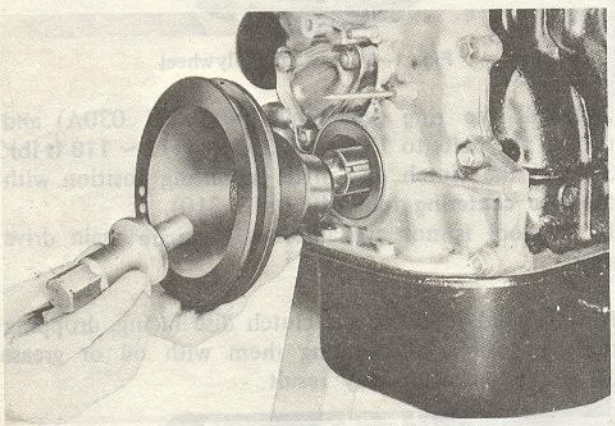


Fig. 1–63 Installing crankshaft pulley

3. Tighten the pulley bolt to **14.0 ~ 15.0 m-kg (101 ~ 108 ft-lb).**

1–E–13. Installing Cylinder Head

1. Hold the camshaft sprocket and chain securely with a hand and rotate the cylinder block upside down.
2. Place the sprocket and the chain on the top of the chain guide strip and the vibration damper.

Note: Ensure that the tally marks of both the camshaft sprocket and the chain are engaged properly.

3. Place a new gasket on the cylinder block.
4. Position the cylinder head on the cylinder block, aligning the dowels.

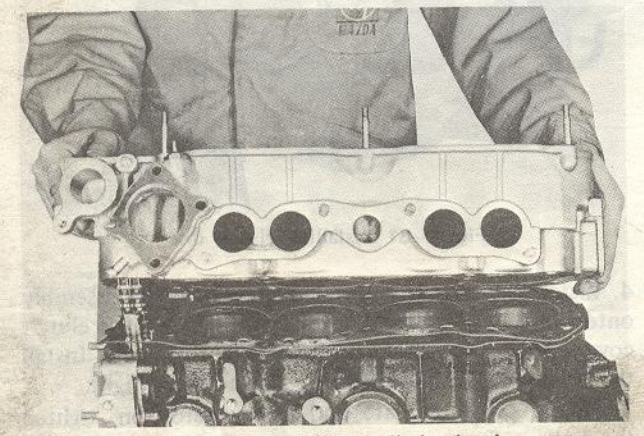


Fig. 1–64 Installing cylinder head

1–E–14. Installing Camshaft

1. Fit the three sets of the camshaft bearings properly to the cylinder head and the bearing caps respectively.
2. Lubricate the bearing surfaces with engine oil.
3. Install hte camshaft to the sprocket, aligning the key and fit the camshaft journals onto the respective bearings.

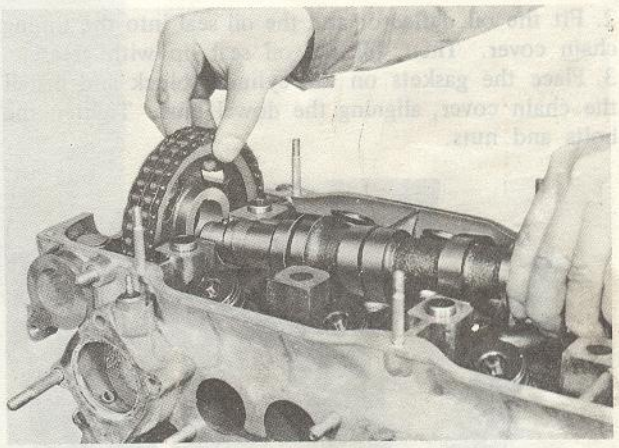


Fig. 1–65 Installing camshaft

1–E–15. Assembling Rocker Arm

Assemble the rocker arms in the formation shown in Fig. 1–69. Care must be taken on the following points:

1. The rocker arm shaft supporters are respectively interchangeable for the intake and the exhaust.
2. The rocker arm shafts for the intake and the exhaust are not interchangeable. Two shafts are installed on the intake side and one on the exhaust side. The

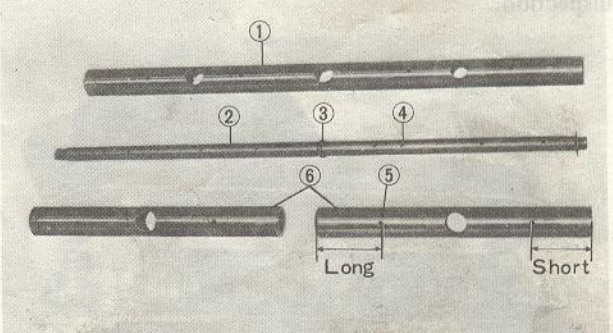


Fig. 1–66 Rocker arm shaft

1. Shaft (EX)
2. Oil distribution pipe
3. "O" ring
4. Oil hole
5. Oil hole
6. Shaft (IN)

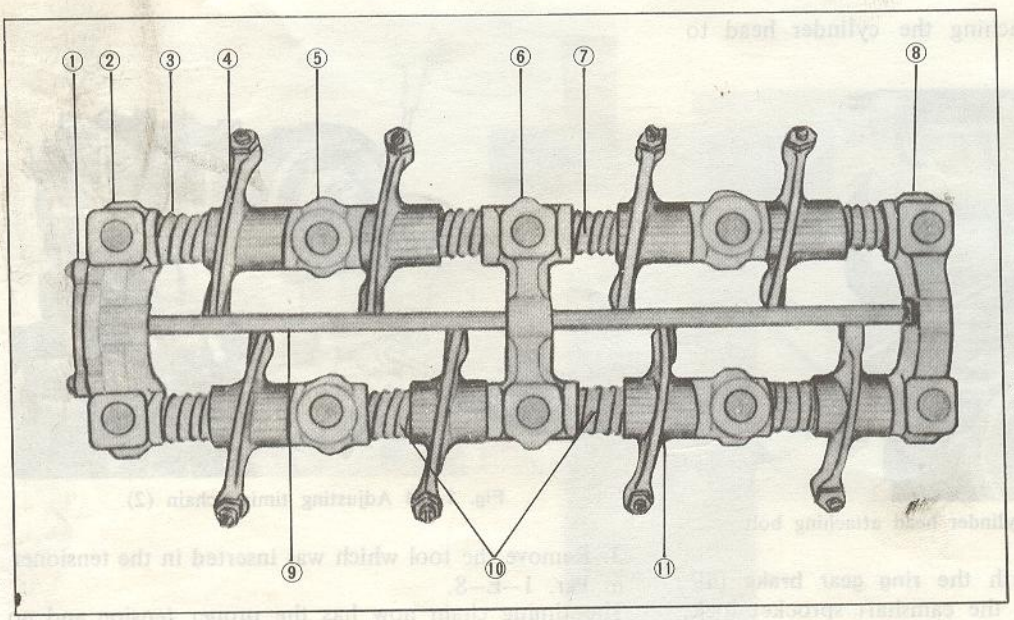


Fig. 1–69
Rocker arm assembly

1. Thrust plate
2. Front bearing cap
3. Spring
4. Exhaust rocker arm
5. Supporter
6. Center bearing cap
7. Exhaust rocker shaft
8. Rear bearing cap
9. Oil distribution pipe
10. Inlet rocker shaft
11. Inlet rocker arm

two shafts for the intake side are interchangeable.
3. When installing the rocker arm shafts on the intake side, the ends with the **longer distance** between the oil hole and the tip are turned toward inside each other, as shown in Fig. 1–66.
4. The center bearing cap is installed with the **oil hole facing toward the intake side.**
5. The oil pipe is installed with the **oil ejection hole facing the camshaft.** In order to avoid vibration of the pipe after it has been installed, the "O" ring fitted on the pipe is pressed into the hole for the pipe on the center bearing cap.

1–E–16. Installing Rocker Arm Assembly

1. Face the flat surface on the ball on each of the rocker arms downward.

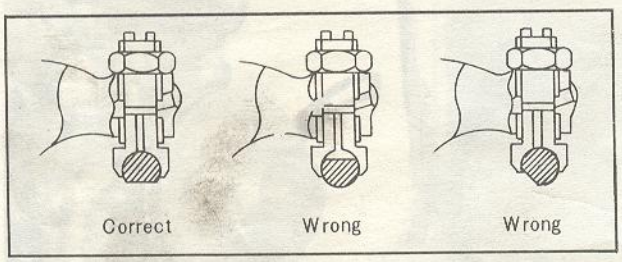


Fig. 1–67 Ball of rocker arm adjusting screw

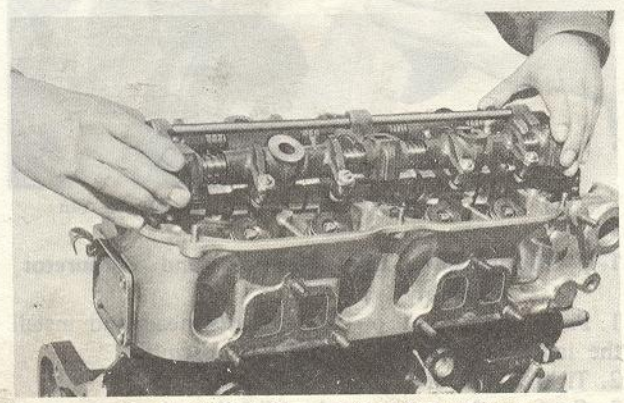


Fig. 1–68 Installing rocker arm assembly

2. Aligning the dowels, position the rocker arm assembly on the cylinder head.
3. Tighten the cylinder head bolts temporarily.
4. Move the rocker arm supporters and **offset each of the exhaust side rocker arms 1 mm (0.04 in)** from the valve stem center as shown in Fig. 1–70.

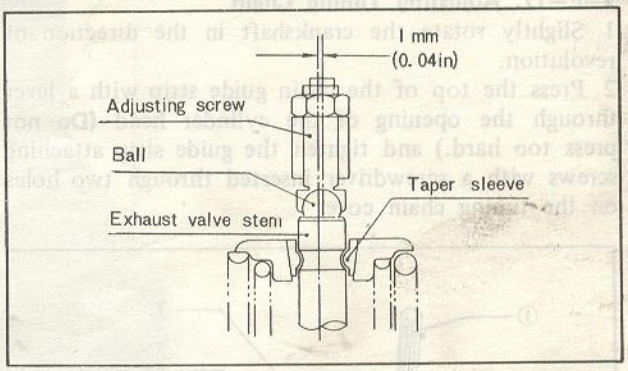


Fig. 1–70 Offset of exhaust rocker arm

5. Tighten the cylinder head bolts **evenly to 8.2 ~ 8.8 m-kg (59 ~ 64 ft-lb) in the sequence shown in Fig. 1–71.**

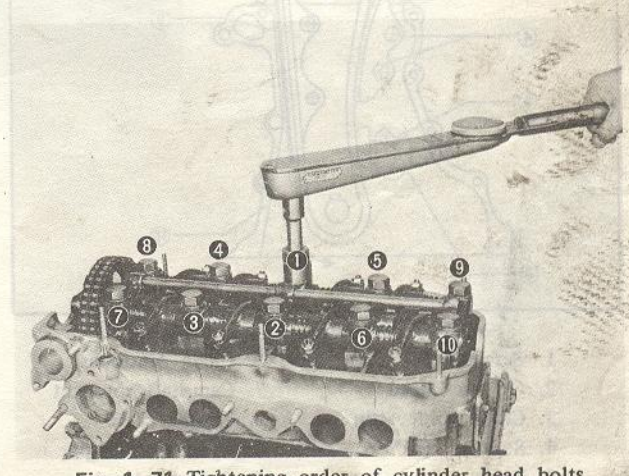


Fig. 1–71 Tightening order of cylinder head bolts

6. Tighten the bolt attaching the cylinder head to the timing chain cover.

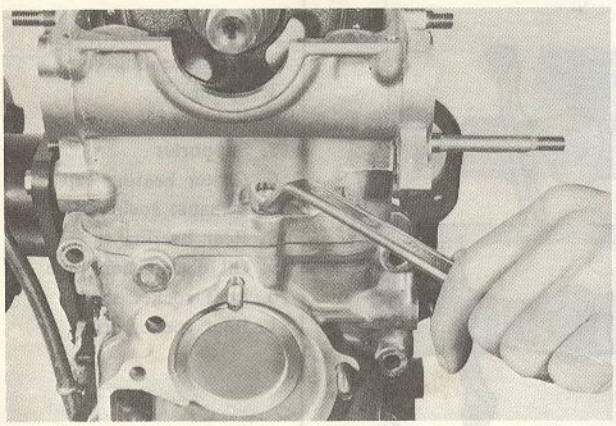


Fig. 1–72 Tightening cylinder head attaching bolt

7. Lock the flywheel with the **ring gear brake** (49 0221 030A) and tighten the camshaft sprocket lock nut to 7.0 ~ 8.0 m-kg (51 ~ 58 ft-lb) with the **spanner** (49 0164 631A). Bend the tab of the lock washer.
8. Aligning the key groove with the pin, install the distributor drive gear to the camshaft. Tighten the lock nut to 7.0 ~ 8.0 m-kg (51 ~ 58 ft-lb) and bend the tab of the lock washer.

1–E–17. Adjusting Timing Chain

1. Slightly rotate the crankshaft in the direction of revolution.
2. Press the top of the chain guide strip with a lever through the opening of the cylinder head **(Do not** press too hard.) and tighten the guide strip attaching screws with a screwdriver inserted through two holes on the timing chain cover.

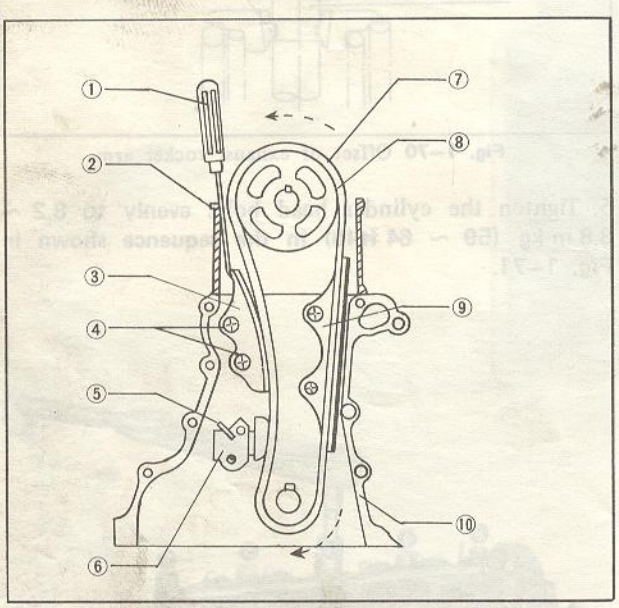


Fig. 1–73 Adjusting timing chain (1)

1. Screwdriver
2. Cylinder head
3. Chain guide strip
4. Screw
5. Tool
6. Chain tensioner
7. Camshaft sprocket
8. Timing chain
9. Vibration damper
10. Cylinder block

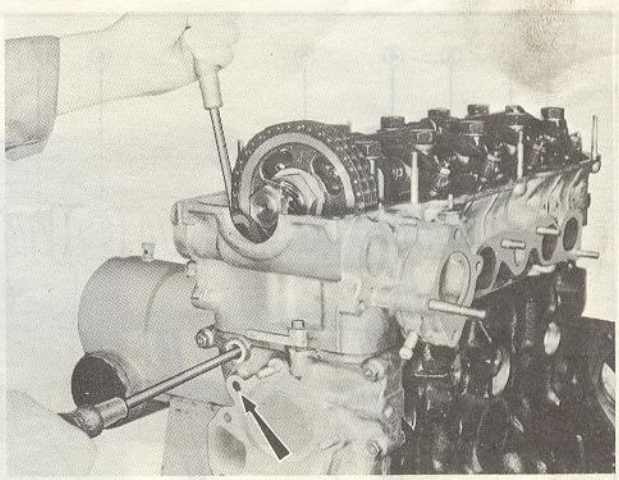


Fig. 1–74 Adjusting timing chain (2)

3. Remove the tool which was inserted in the tensioner in Par. 1–E–8.
The timing chain now has the proper tension and no further manual adjustment is required.
4. Install the blind plugs and aluminum washers to the two holes on the timing chain cover and cylinder head.
5. Install the cover and gasket for the chain tensioner to the chain cover and tighten the nuts.

1–E–18. Installing Water Pump

1. Position the gasket on the timing chain cover and install the water pump.
2. Install the alternator strap.
3. Tighten the attaching bolts and nuts.

1–E–19. Installing Cooling Fan and Pulley

Install the pulley, spacer and cooling fan onto the water pump boss and tighten the bolts.

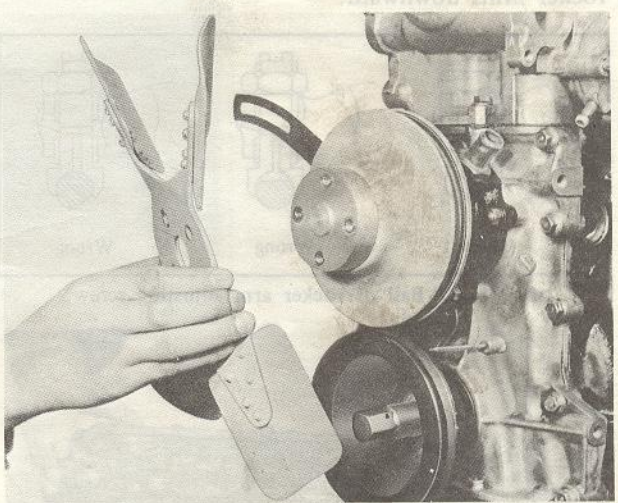


Fig. 1–75 Installing pulley, spacer and cooling fan

1–E–20. Installing Inlet Manifold and Carburetor Assembly

1. Place the gasket on the cylinder head and install the inlet manifold and carburetor assembly.
2. Tighten the attaching bolts.
3. Connect the vacuum tube (distributor ~ carburetor)

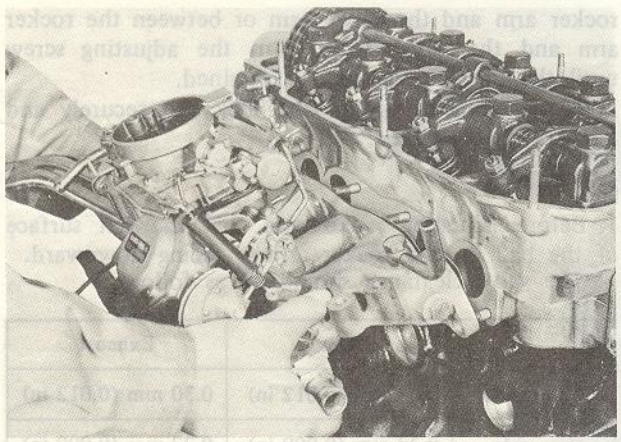


Fig. 1–76 Installing inlet manifold and carburetor

to the carburetor.
4. Connect the water hose (water pump ~ inlet manifold) to the inlet manifold.
5. Connect the water bypass hose (water pump ~ thermostat case) to the thermostat case.
6. Connect the hose (ventilation valve ~ oil separator) to the ventilation valve, if equipped.

1–E–21. Installing Oil Filter

1. Place the gasket on the block and install the oil filter cover. Tighten the bolts.
2. Apply oil onto the oil seal on a new filter cartridge.
3. Install the cartridge onto the cover and tighten the cartridge fully by hand.

1–E–22. Installing Alternator

1. Install the alternator to the bracket with the bolts.

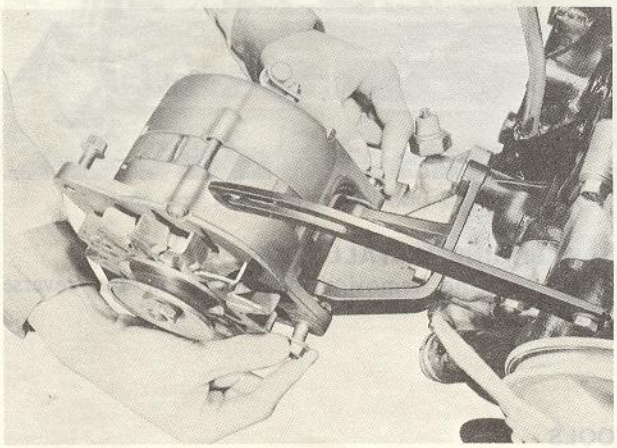


Fig. 1–77 Installing alternator

2. Attach the upper end of the alternator flange to the strap.
3. Fit the "V" belt.
4. Adjust the "V" belt tension. Correct adjustment will permit the belt **to flex 12 ~ 14 mm (0.47 ~ 0.55 in)** by pressing with a finger midway between the pulleys. For a new belt, it should be 9 ~ 11 mm (0.35 ~ 0.43 in).

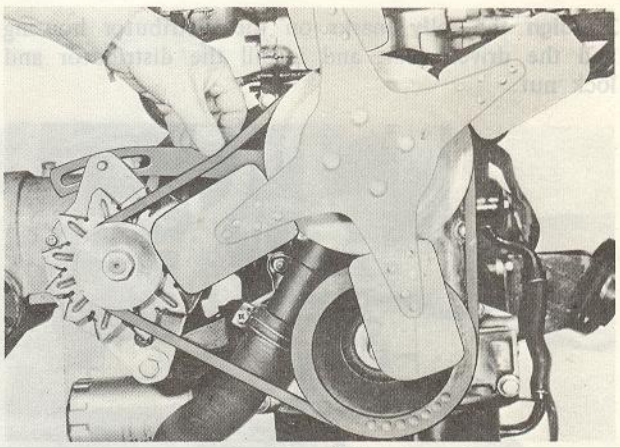


Fig. 1–78 Checking "V" belt tension

5. Tighten the bolts.

1–E–23. Installing Exhaust Manifold

1. Place the gaskets on the cylinder head and install the exhaust manifold. Tighten the nuts.
2. Install the heat insulator to the exhaust manifold.

1–E–24. Installing Distributor

1. Rotate the crankshaft in the direction of revolution until the No. 1 piston is at 8 degrees before top of the compression stroke. The first mark on the edge of the crankshaft pulley should be in line with the top indicator pin on the timing chain cover.

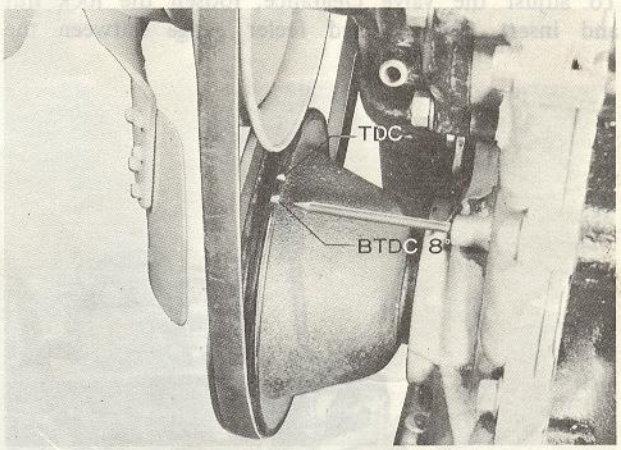


Fig. 1–79 Timing mark aligned

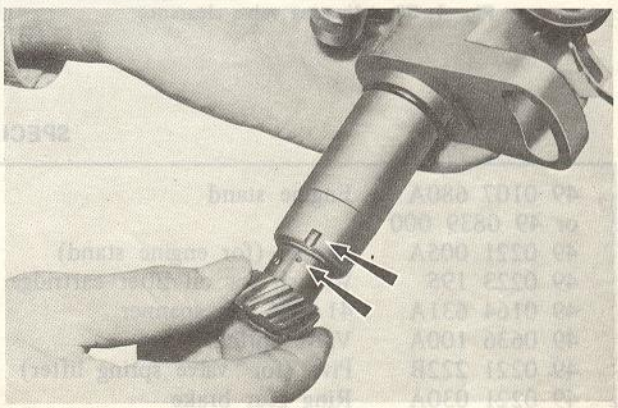


Fig. 1–80 Aligning tally marks

2. **Align the tally marks** on the distributor housing and the driven gear, and install the distributor and lock nut.

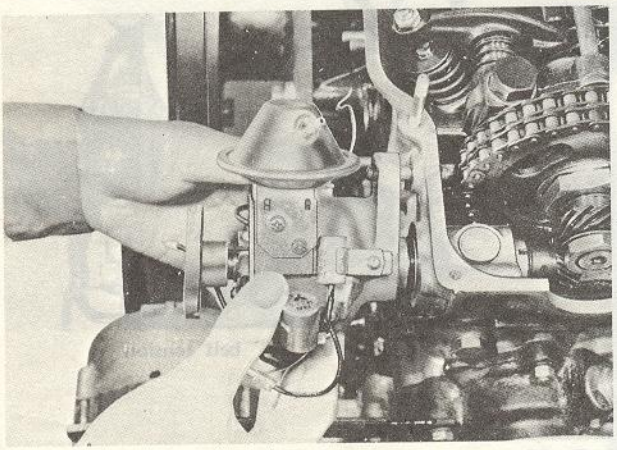


Fig. 1–81 Installing distributor

3. Turn the distributor housing to the right until the contact points close. Then, turn it to the left and stop it when the contact points just start to separate. Tighten the lock nut.

Note: Precise adjustment must be done by using the timing light as instructed in Par. 5–C–2.

1–E–25. Adjusting Valve Clearance

To adjust the valve clearance, loosen the lock nut and insert the specified feeler gauge between the rocker arm and the valve stem or between the rocker arm and the cam. Then, turn the adjusting screw until the proper clearance is obtained.
After adjustment, tighten the lock nut securely and recheck the clearance.

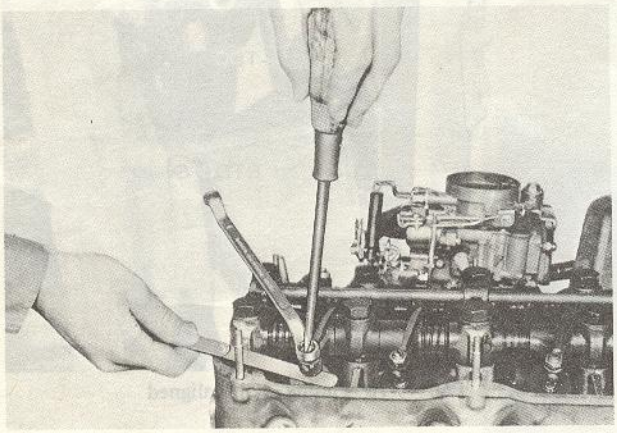


Fig. 1–82 Adjusting valve clearance

Note:
1. Before adjusting make sure that the flat surface of the ball on the rocker arm is facing downward.
2. The valve clearance should be as follows:

	Inlet	Exhaust
Valve side	0.30 mm (0.012 in)	0.30 mm (0.012 in)
Cam side	0.22 mm (0.009 in)	0.22 mm (0.009 in)

3. Whenever the engine is overhauled, warm up the engine and readjust the valve clearance after tightening the cylinder head bolts to the specified torque.

1–E–26. Installing Rocker Arm Cover

1. Fit the semicircular oil seals, with the "OUT" mark facing outward, to the front and rear of the cylinder head.
2. Place the gasket on the cylinder head.
3. Install the rocker arm cover and tighten the attaching nut to 0.15 ~ 0.25 m-kg (1.1 ~ 1.8 ft-lb).

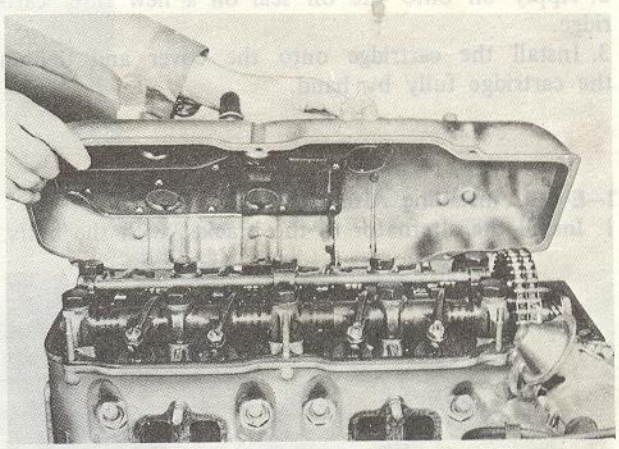


Fig. 1–83 Installing valve rocker arm cover

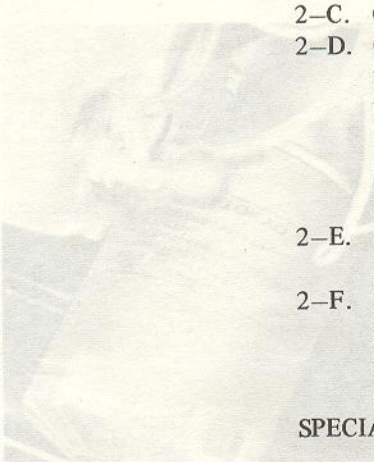
1–F. ENGINE INSTALLATION

Carry out the removing operations in the reverse order.

SPECIAL TOOLS

49 0107 680A or 49 0839 000	Engine stand
49 0221 005A	Hanger (for engine stand)
49 0223 195	Wrench for oil filter cartridge
49 0164 631A	41 x 46 mm spanner
49 0636 100A	Valve spring lifter
49 0221 222B	Pivot (for valve spring lifter)
49 0221 030A	Ring gear brake
49 0223 061	Piston pin remover and installer
49 0221 270B	Main bearing cap puller
49 0221 251A	Valve guide remover and installer
49 0223 160A	Valve seal pusher
49 0813 310	Clutch disc centering tool

LUBRICATING SYSTEM



DESCRIPTION

Oil is circulated under pressure by a rotor type pump. The pump is mounted on the cylinder block inside the oil pan and driven by the chain via the crankshaft. A full flow type oil filter is mounted on the right front of the cylinder block.
The oil capacity is 3.6 liters (3.8 U.S. quarts, 3.2 Imp. quarts).

2–A. LUBRICATING CIRCUIT

1. The oil pump which is driven by the chain, draws up oil from the oil pan through the strainer and sends it to the oil filter.
2. The oil that has been filtered through the oil filter is forced to the main oil gallery and then to the main bearings.
3. The passages in the crankshaft direct the oil from the main bearings to the connecting rod bearings.
4. The cylinder walls, piston pins and bushes are lubricated with oil squirted out of the oil holes on the large end of the connecting rods.
5. The crankshaft and camshaft sprockets are lubricated by oil which is supplied through a passage from the main oil gallery to the oil jet.
6. The oil from the main gallery reaching the oil control plug on the front right side of the cylinder head is forced up to the front camshaft bearing and the exhaust side rocker arm shaft.
7. The oil from the oil passage turning point of the front camshaft bearing is forced to the intake side rocker arm shaft, lubricates each of the rocker arm bushes and then passes on the center camshaft bearing. Also, the oil lubricates the valve stem and other valve train surfaces.
8. The oil from the front camshaft bearing is forced to the oil pipe and ejected from the jets on the oil pipe to lubricate the cam surfaces, and then oil passing through the oil pipe is forced to the rear camshaft bearing.
9. The distributor drive shaft is lubricated with oil splashed on the lubricating-hole for the drive shaft by operation of the timing chain and the rocker arms.
10. After lubricating the various parts, oil drops directly back to the oil pan from the front side of the cylinder head.

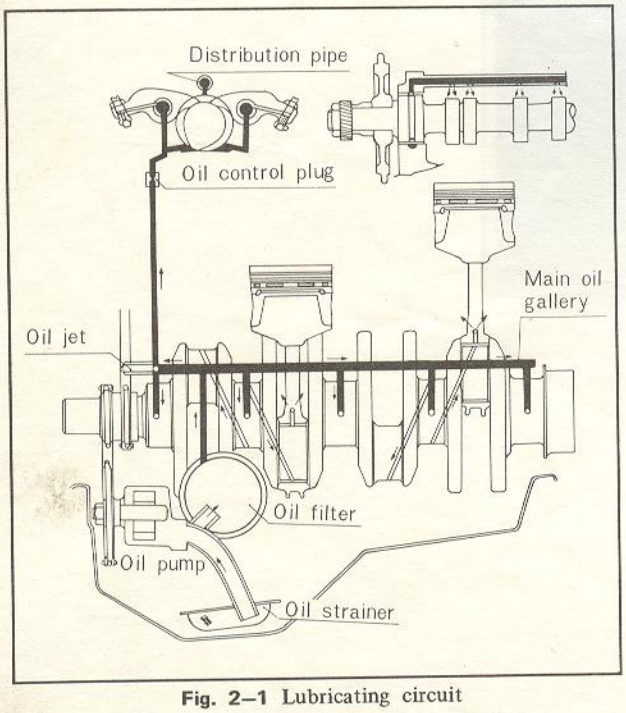


Fig. 2–1 Lubricating circuit

2–B. OIL PRESSURE SWITCH

The oil pressure switch which is fitted to the filter body is connected to the oil pressure warning lamp with the wiring.
Safe minimum pressure is **0.3 kg/cm² (4.3 lb/in²) at idle**. If the oil pressure drops below 0.3 kg/cm² (4.3 lb/in²), the warning lamp lights up to indicate some troubles in the lubricating system.
Therefore, when the warning lamp goes on, immediate check should be made.

Fig. 2–2 Oil pressure switch

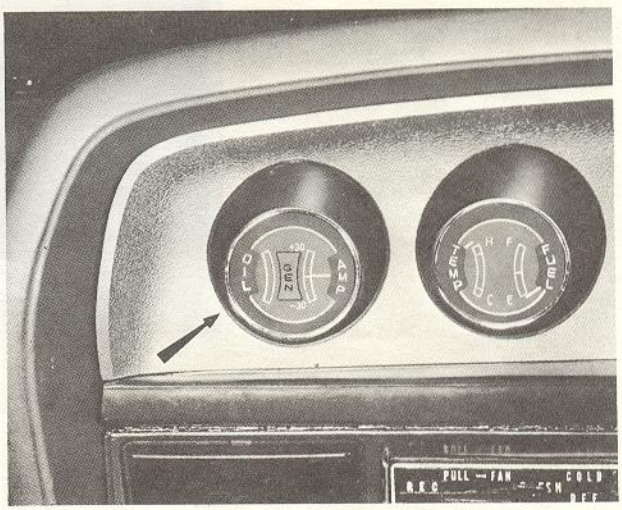


Fig. 2–3 Oil pressure warning lamp

2–B–1. Replacing Oil Pressure Switch

1. Disconnect the lead wire from the oil pressure switch.
2. Loosen and remove the oil pressure switch from the oil filter cover.
3. Install a new switch to the oil filter cover.

4. Connect the lead wire to the switch.

2–C. CHECKING OIL PRESSURE

1. Remove the oil pressure switch and connect the **oil pressure gauge** (49 0187 280) instead.

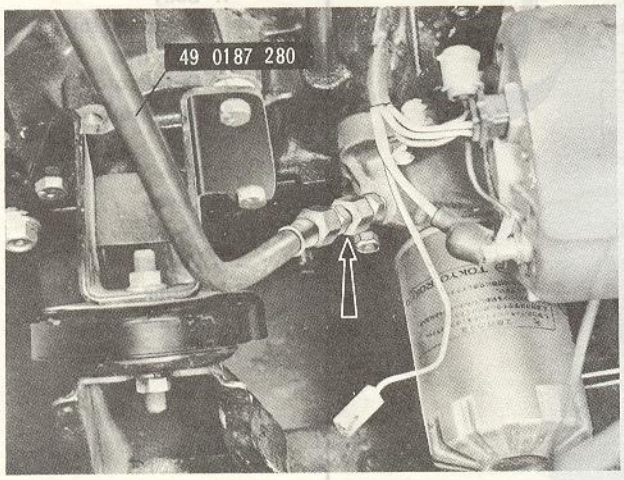


Fig. 2–4 Connecting oil pressure gauge

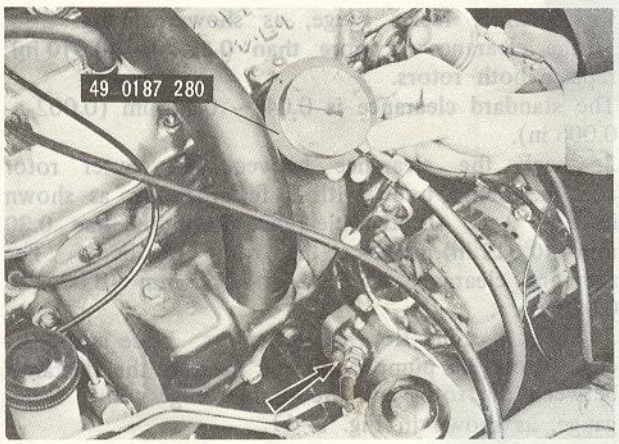


Fig. 2–5 Checking oil pressure

2. Warm up the engine to the normal operating temperature.
3. Run the engine **at 3,000 rpm** and take a reading of the gauge.
If the reading of the gauge is **3.5 to 4.5 kg/cm² (50 to 64 lb/in²)**, the oil pressure is normal.
Should there be a noticeable drop in pressure, check the following points.
1) Ensure that the oil level is between the "F" and "L" of the dipstick gauge.
2) Check the oil filter for clog. If it exists, replace the filter cartridge, referring to Par. 2–E–1.
3) Check the oil pump, as described in Par. 2–D–3.
4) Check the relief valve for worn plunger and fatigued spring. The free length of the spring is 46.4 mm (1.83 in).

2–D. OIL PUMP

The oil pump is of a rotor type based on the trochoid curve and consists of the parts as shown in Fig. 2–10.
The feeding capacity is 13.0 liters/min. (3.4 U.S. gallons/min., 2.9 Imp. gallons/min.) at 2,000 rpm of engine revolution.
The oil pressure relief valve is provided into the oil pump body.
When the engine revolution becomes high and excessive oil pressure develops in the system, the relief valve opens to relieve the pressure and to return the excess oil to the oil pan. Thus, the oil pressure maintains within the maximum pressure of 4.5 kg/cm² (64 lb/in²).

2–D–1. Removing Oil Pump

1. Remove the oil pan, as described in Par. 2–F–1.
2. Remove the nuts attaching the oil strainer to the pump and remove the oil strainer and "O" ring.
3. Straighten the lock tab on the washer and remove the oil pump sprocket attaching nut.

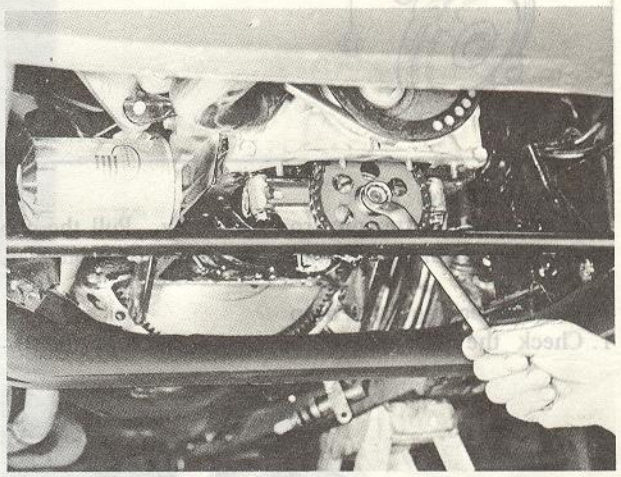


Fig. 2–6 Removing sprocket attaching nut

4. Remove the bolts attaching the oil pump to the block. Remove the sprocket from the pump shaft.
5. Remove the oil pump.

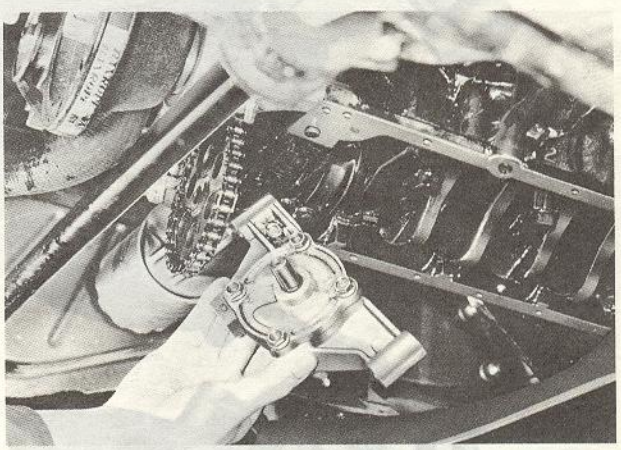


Fig. 2–7 Removing oil pump

2–D–2. Disassembling Oil Pump

1. Remove the "O" ring from the oil pump.
2. Remove the cover attaching bolts and remove the cover.
3. Remove the inner rotor and shaft assembly, then

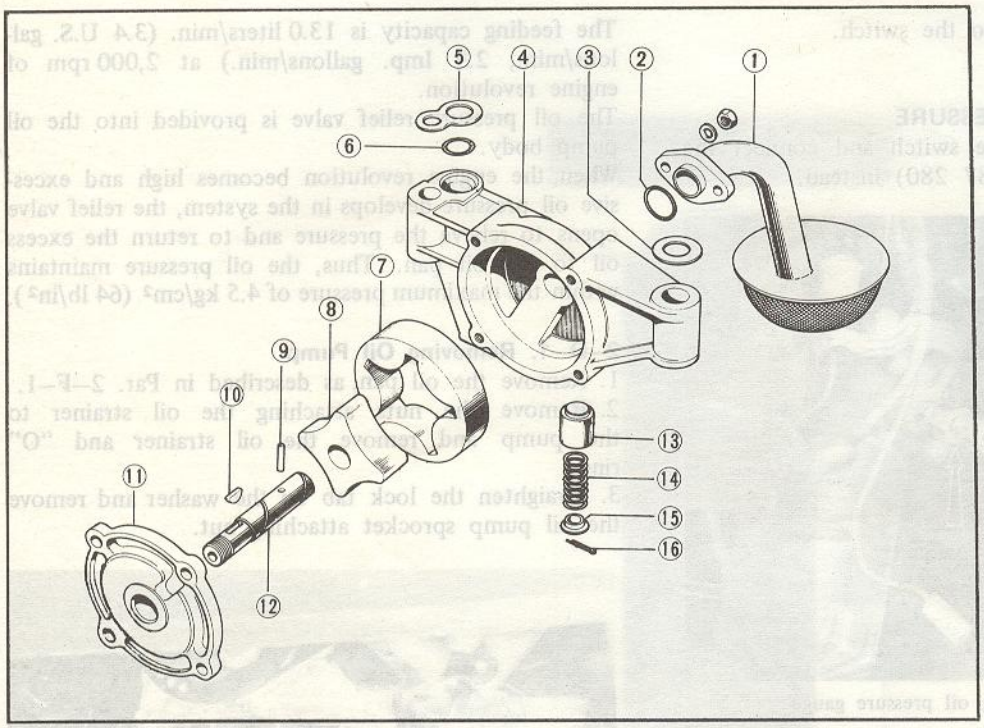


Fig. 2–10
Oil pump components

1. Oil strainer
2. "O" ring
3. Adjusting shim
4. Body
5. Adjusting shim
6. "O" ring
7. Outer rotor
8. Inner rotor
9. Pin
10. Key
11. Cover
12. Shaft
13. Plunger
14. Spring
15. Spring seat
16. Cotter pin

remove the outer rotor.
4. Remove the cotter pin from the body. Pull the cap out of the chamber. Remove the spring and plunger.

2–D–3. Checking Oil Pump

1. Check the clearance between the lobes of the rotors with a feeler gauge, as shown in Fig. 2–8. If the clearance is **more than 0.25 mm (0.010 in)**, replace both rotors.
The standard clearance is 0.04 ~ 0.15 mm (0.002 ~ 0.006 in).
2. Check the clearance between the outer rotor and the pump body with a feeler gauge, as shown in Fig. 2–9. If the clearance is **more than 0.30 mm (0.012 in)**, replace the rotor or body. The standard clearance is 0.14 to 0.25 mm (0.006 to 0.010 in).
3. Check the end float of the rotors. Place a straight edge across the pump body and measure the clearance between the rotor and the straight edge with a feeler gauge, as shown in Fig. 2–11.

Fig. 2–8 Checking clearance between rotors

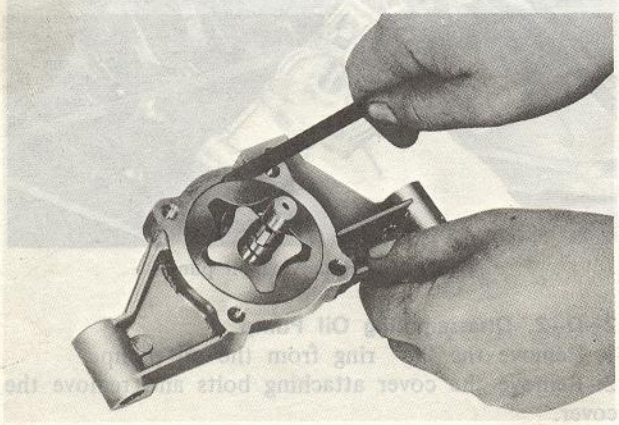


Fig. 2–9 Checking outer rotor and body clearance

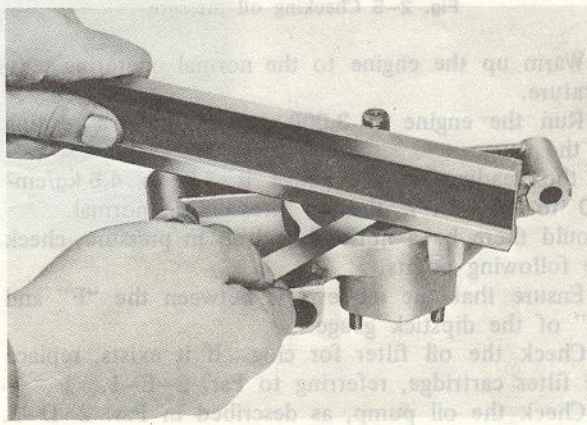


Fig. 2–11 Checking end float (1)

Then, place a straight edge across the pump cover and measure the clearance between the straight edge and the cover, as shown in Fig. 2–12.
If the end float is **0.15 mm (0.006 in)** or more, correct the pump cover by grinding.
The standard end float is 0.04 to 0.10 mm (0.002 to

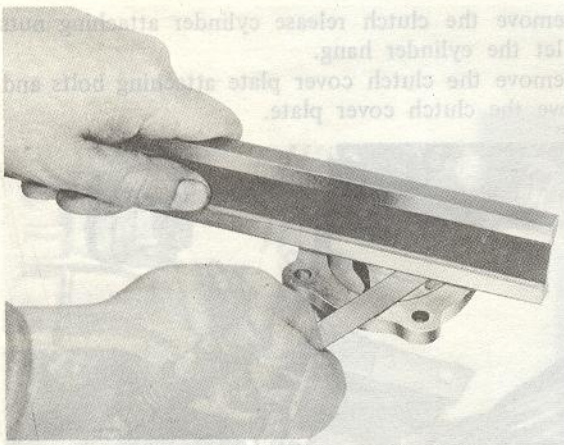


Fig. 2–12 Checking end float (2)

0.004 in).

2–D–4. Assembling Oil Pump

1. Clean all parts thoroughly.
2. Install the oil pressure relief valve plunger, spring and cap. Install a new cotter pin.
3. Install the outer rotor and the inner rotor and shaft assembly into the body so that the **tally marks on the rotors go toward the cover.**

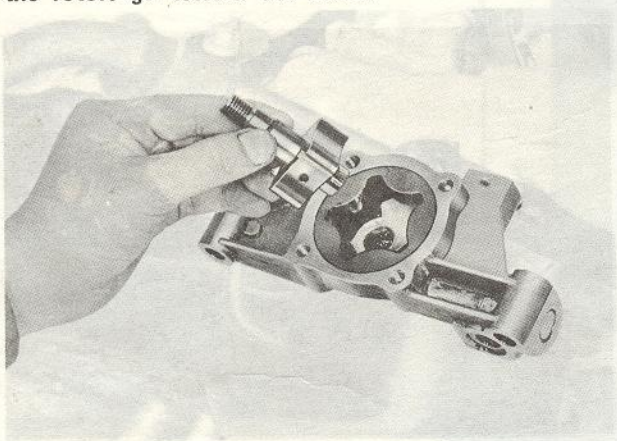


Fig. 2–13 Installing inner rotor and shaft assembly

4. Install the pump cover to the body and tighten the attaching bolts.

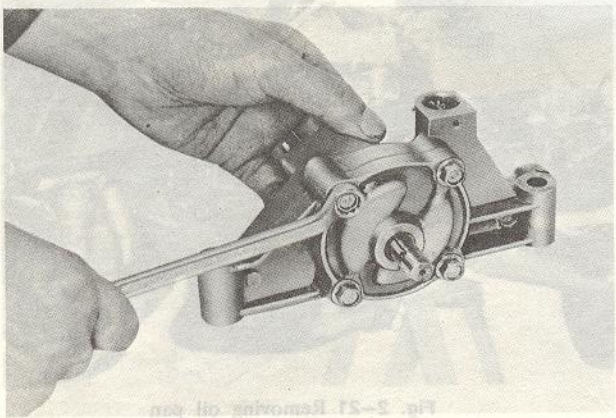


Fig. 2–14 Installing pump cover

5. Prime the oil pump with engine oil before installing it on the engine.

2–D–5. Installing Oil Pump

1. Position the oil pump sprocket to the chain.
2. Place the "O" ring and shims, and position the pump to the sprocket and block, aligning the key.

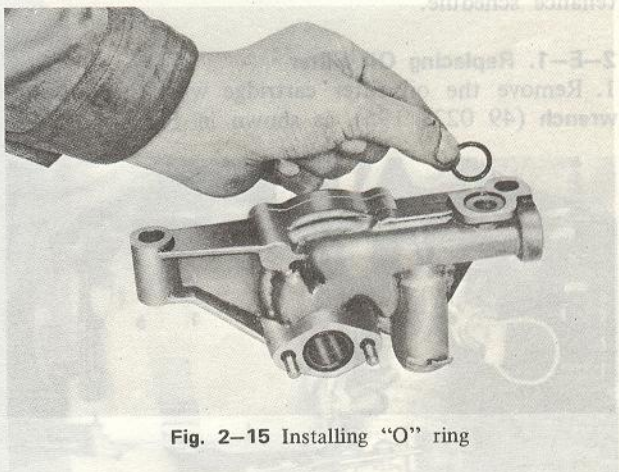


Fig. 2–15 Installing "O" ring

3. Install the pump to block attaching bolts. Torque the bolts to 1.8 ~ 2.7 m-kg (13 ~ 20 ft-lb).
4. Install the washer and nut attaching the sprocket, and tighten the nut to 3.0 ~ 3.5 m-kg (22 ~ 25 ft-lb). Bend the lock tab on the washer.
5. Check the slack of chain, referring to Par. 1–E–7.
6. Install the oil strainer and oil pan, as described in Par. 2–F–3.

2–E. OIL FILTER

The oil filter is of a cartridge type. The element of the filter is sealed in the container as a unit. The

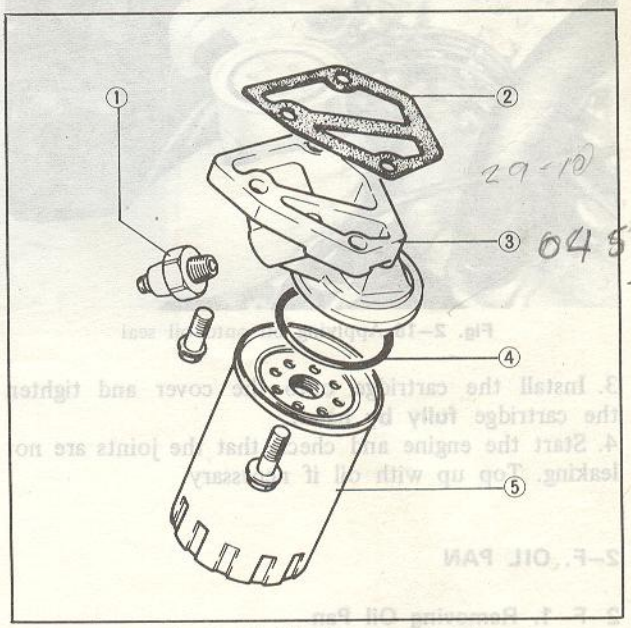


Fig. 2–16 Oil filter components

1. Oil pressure switch
2. Gasket
3. Cover
4. Oil seal
5. Filter

oil filter is provided with a relief valve.
If the oil filter clogs due to impurities in oil and the filtering resistance reaches 0.8 to 1.2 kg/cm² (11 to 17 lb/in²), the oil can not pass through the element. However, the oil pushes the relief valve open and unfiltered oil is supplied to the engine. The element should be replaced at intervals, following the maintenance schedule.

2–E–1. Replacing Oil Filter

1. Remove the oil filter cartridge with the **oil filter wrench** (49 0223 195), as shown in Fig. 2–17.

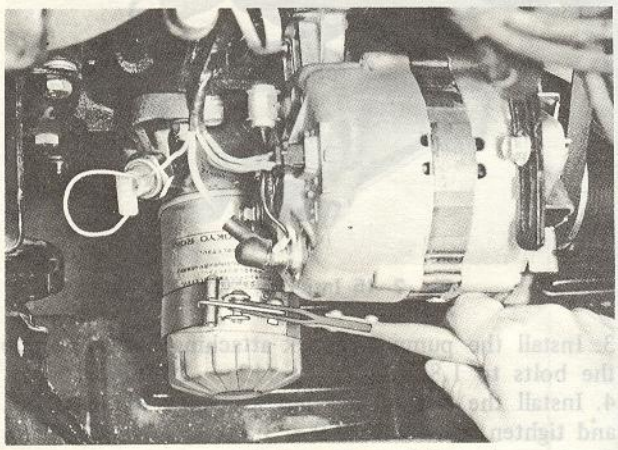


Fig. 2–17 Removing oil filter

2. **Apply oil onto the oil seal** on a new filter cartridge.

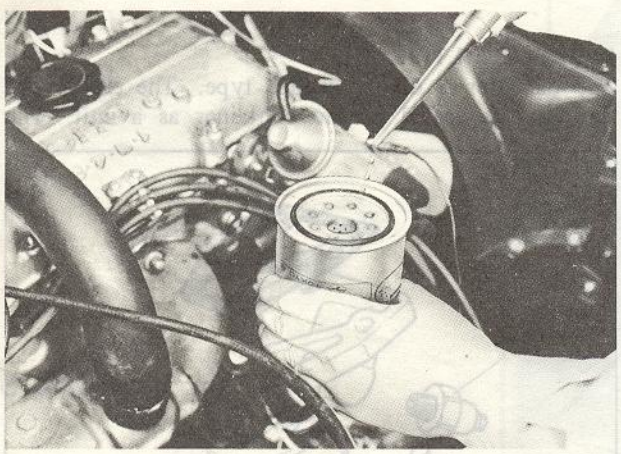


Fig. 2–18 Applying oil onto oil seal

3. Install the cartridge onto the cover and tighten the cartridge **fully by hand.**
4. Start the engine and check that the joints are not leaking. Top up with oil if necessary.

2–F. OIL PAN

2–F–1. Removing Oil Pan

1. Raise the vehicle on the hoist.
2. Remove the engine under cover (engine front lower shield) by removing the attaching bolts.
3. Drain the engine oil.
4. Remove the clutch release cylinder attaching nuts and let the cylinder hang.
5. Remove the clutch cover plate attaching bolts and remove the clutch cover plate.

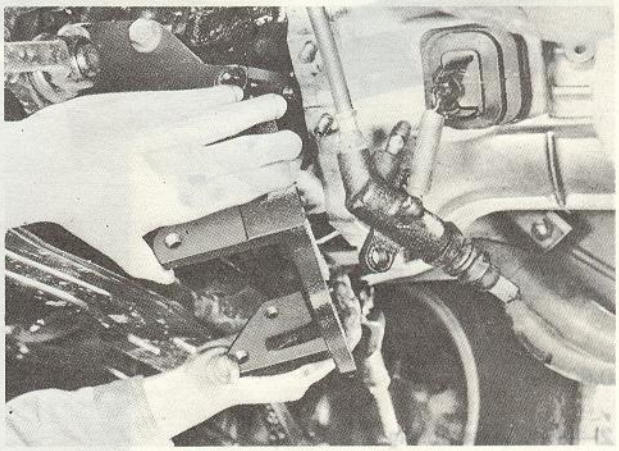


Fig. 2–19 Removing clutch cover plate

6. Remove the oil pan nuts and bolts and lower the pan onto the crossmember.
7. Remove the oil strainer from the oil pump.

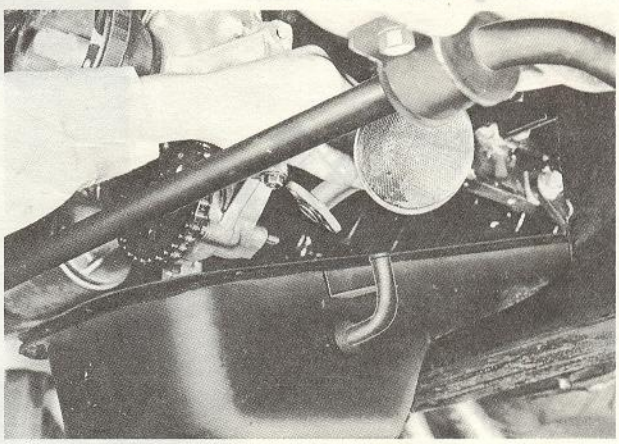


Fig. 2–20 Removing oil strainer

8. Remove the oil pan.

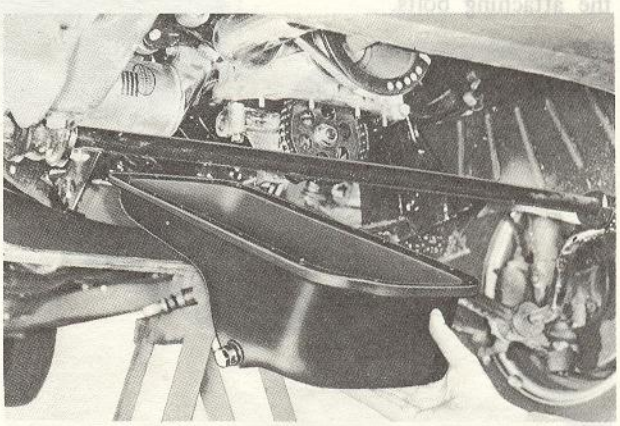


Fig. 2–21 Removing oil pan

2–F–2. Checking Oil Pan

Scrape any dirt or metal particles from the inside of

the oil pan. Wash the oil pan in a solvent and dry it with compressed air.
Check the oil pan for cracks, damaged drain plug threads. Inspect for damage (uneven surface) at the bolt holes caused by over torquing the bolts. Straighten surfaces as required. Repair any damage, or replace the oil pan if repairs can not be made satisfactorily.

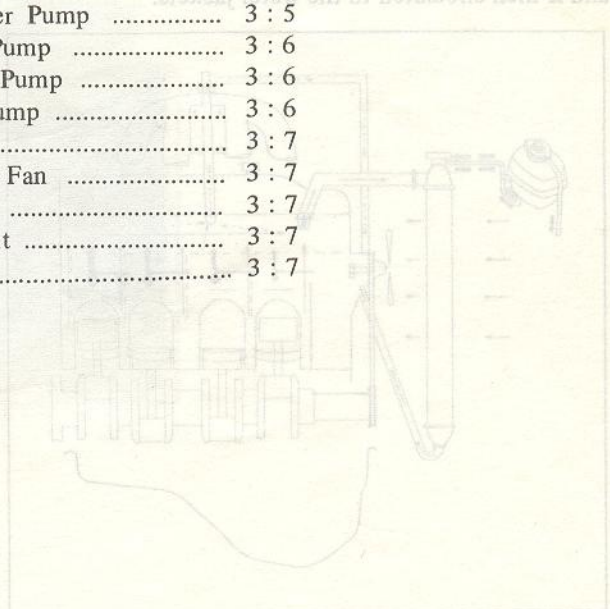
2–F–3. Installing Oil Pan

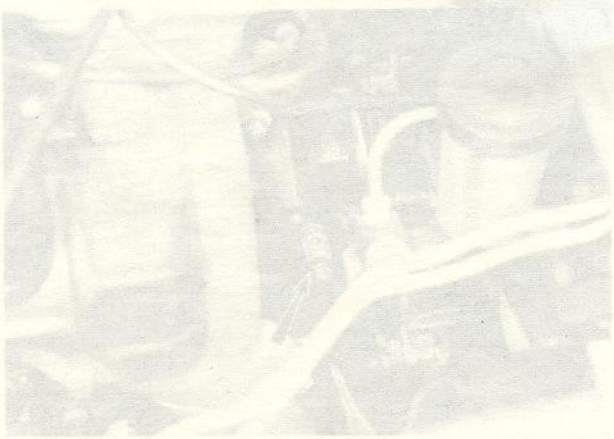
1. Remove the gasket material from block and oil pan surfaces. Clean and inspect the oil pan. Clean the oil strainer tube and screen.
2. Apply a thin coat of gasket paste on the block and the oil pan.
3. Place a new gasket on the block.
4. Position the oil pan on the crossmember.
5. Place the "O" ring on the pump and install the oil strainer. Tighten the nuts.
6. Install the oil pan and tighten the bolts and nuts little by little in turn.
7. Install the clutch cover plate and tighten the bolts.
8. Install the clutch release cylinder and tighten the nuts.
9. Install the engine under cover.
10. Fill the oil pan with the proper grade and quantity of engine oil.

SPECIAL TOOLS

49 0187 280	Oil pressure gauge
49 0223 195	Oil filter wrench

COOLING SYSTEM





3

DESCRIPTION

The cooling system consists of a corrugated fin type radiator, expansion tank, centrifugal water pump, wax pellet type thermostat and a four-blade or seven-blade fan.

The radiator and the expansion tank are connected by hose. When engine is overheated, the coolant in the radiator flows out and led into the expansion tank through the hose. The coolant is then returned to the radiator by negative pressure which builds up in the cooling system when the engine cools down. The coolant should be changed at intervals, following the maintenance schedule.

3–A. COOLANT CIRCUIT

The water pump, which is driven by a belt from the crankshaft, delivers the coolant from the radiator through the inlet pipe to the water jackets on the cylinder block and the cylinder head.

When the engine is cold, the thermostat is closed and the coolant in the water jacket does not circulate back into the radiator but is delivered back to the inlet pipe after passing through the hot spot on the inlet manifold to preheat the air and fuel mixture. As the coolant circulates only between the water jackets and the inlet pipe, this enables the engine to warm up quickly.

Once the engine is warmed up, this opens the thermostat and the coolant is then circulated through the hot spot not only to the inlet pipe but also to the radiator through the thermostat.

The coolant in the radiator is cooled by the fan and the air stream caused by the travel of the vehicle and is then circulated to the water jackets.

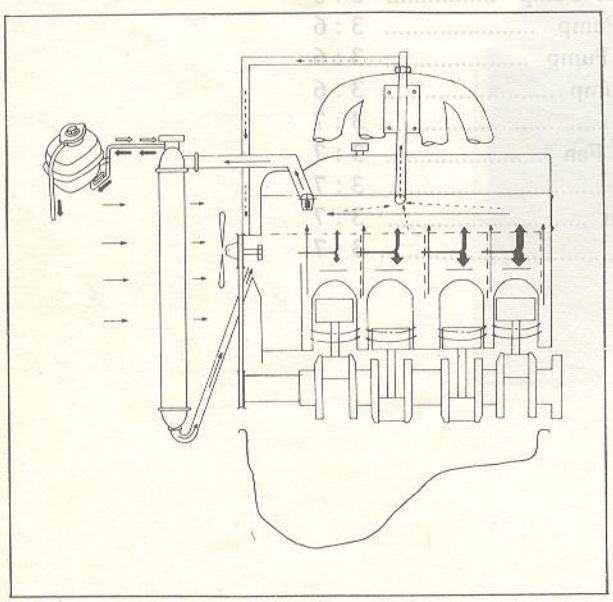


Fig. 3–1 Coolant circuit

3–B. ANTIFREEZE SOLUTION

To prevent freezing, it is recommended to use MAZDA genuine long life solution (0866 77 264, 0880 77 264 or 0884 77 264).

The mixing rate of water and MAZDA genuine long life solution is shown in the following table.

Freezing point	Mixture percentage (Volume)		Specific gravity of mixture at 20°C (68°F)
	Solution	Water	
–20°C (–4°F)	35	65	1.051
–45°C (–49°F)	55	45	1.078

Note:

a) Always use soft water (demineralized water) in the cooling system.

b) If the MAZDA genuine long life solution is not available, use antifreeze solution (for aluminum engine, Ethylene-Glycol based) or anti-corrosive solution on the market in accordance with the season and the maker's instruction.

3–C. CLEANING COOLING SYSTEM

The cooling system should be flushed at intervals, following the maintenance schedule.

The flushing procedures are as follows:

1. Remove the radiator cap.
2. Open the drain cocks and drain the coolant.

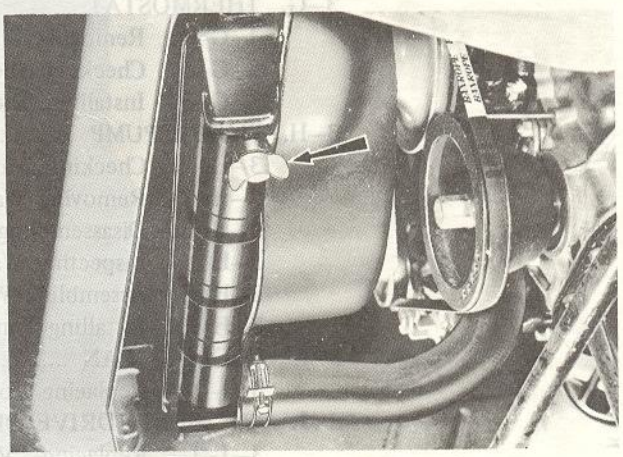


Fig. 3–2 Radiator drain cock

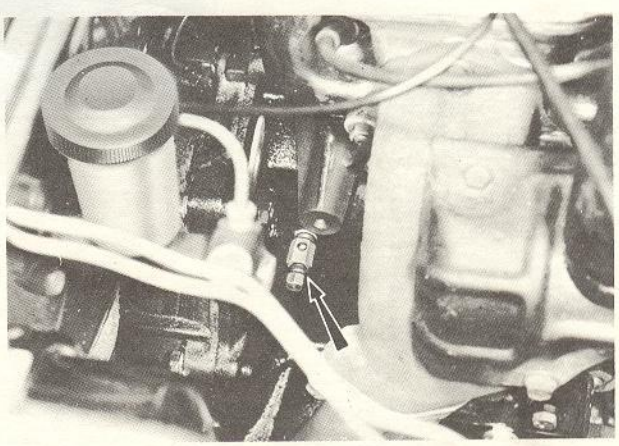


Fig. 3–3 Engine drain cock

3. Close the drain cocks and supply clean soft water (demineralized water).

Note:
If necessary, use cleaning solution to loosen the rust and scale, according to the instructions given by the maker of the cleaning solution.

4. Run the engine for about one hour, keeping the normal operating temperature.
5. Drain the coolant completely and flush clean water through the cooling system in the direction opposite to the normal coolant flow. This action causes the water to get behind the corrosive deposits and force them out.
6. Fill the cooling system with a mixture of clean soft water (demineralized water) and anti-freeze solution or anti-corrosive solution according to the season and maker's instruction.

Note:
During a complete refill of the cooling system, always operate the engine until it reaches normal operating temperature to bleed air from the system. Then, let the system cool, check the coolant level, and add coolant as necessary to the specified level.

3–D. COOLING SYSTEM PRESSURE TEST

Carefully check the radiator and cooling system for leaks by using a radiator cap tester.
Refill the coolant full in the radiator and 1/3 full in the expansion tank.
Run the engine until it reaches normal operating temperature. With the engine running and tester installed, pump up the system to approximately 0.9 kg/cm² (13 lb/in²) and observe the gauge.

Note:
Never allow the pressure to build up to more than 1.0 kg/cm² (14 lb/in²).

If pressure drops rapidly, visually inspect all external parts for leaks. If no external leaks appear and pressure continues to drop, inspect the engine oil to determine whether or not coolant is leaking into the crankcase due to a cracked cylinder block or leaking head gasket.

3–E. RADIATOR

The radiator is of the corrugated fin type with the sealed filler cap. The water capacity of the radiator is 2.6 liters (0.7 U.S. gallon, 0.6 Imp. gallon).

3–E–1. Checking Radiator

Examine the radiator carefully for leaks. If any leakage should be discovered, however small it may be, repair completely by soldering, etc.
Clean the exterior of the radiator core by blowing out with compressed air.
Check the cap rubber gasket to insure an air-tight seal.

3–E–2. Removing Radiator

1. Drain the cooling system.
2. Loosen the hose clamps and disconnect the radiator upper hose (thermostat cover to radiator) and radiator lower hose (water pump to radiator) from the radiator. Disconnect the water hose (radiator to expansion tank) at the radiator.
3. Remove the cooling fan shroud retaining screws and position the fan shroud against the engine.
4. Remove the radiator mounting bolts. Carefully lift the radiator out of the supports.

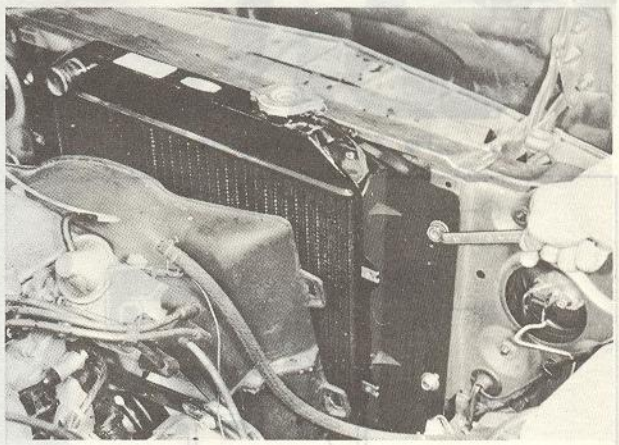


Fig. 3–4 Removing radiator

3–E–3. Installing Radiator

1. Position the radiator against the supports and install the mounting bolts. Tighten the bolts.
2. Connect the hoses to the radiator. Tighten the hose clamps.
3. Position the cooling fan shroud on the radiator. Install and tighten the retaining screws.

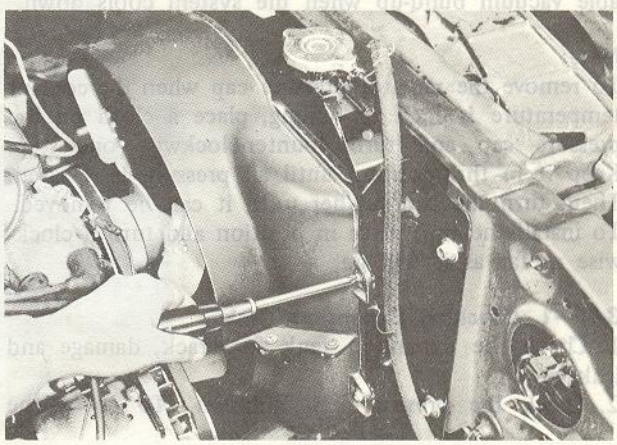


Fig. 3–5 Installing fan shroud

4. Fill the cooling system with a mixture of clean soft water (demineralized water) and anti-freeze solution or anti-corrosive solution according to the season and maker's instruction.

3–F. EXPANSION TANK

The expansion tank and the radiator are connected by the hose.
The pressure cap is provided on the expansion tank. The pressure in the cooling system increases the boiling point of the coolant and prevents overheating and reduces overflow losses.

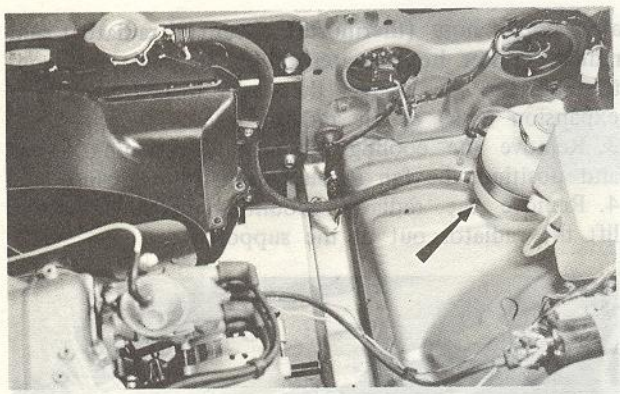


Fig. 3–6 Expansion tank

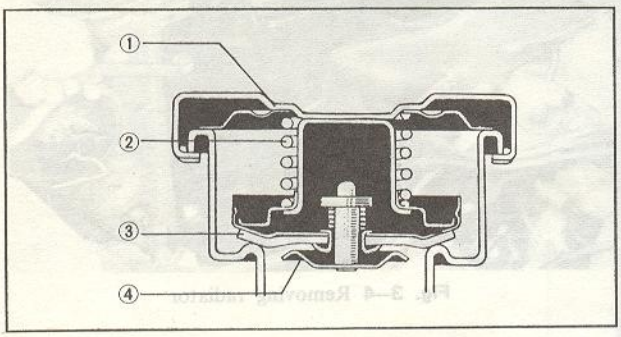


Fig. 3–7 Pressure cap cross section

1. Pressure cap
2. Spring
3. Pressure valve
4. Vacuum release valve

When the pressure in the cooling system exceeds 0.9 kg/cm² (13 lb/in²), the pressure valve opens.
A vacuum release valve is employed to prevent undesirable vacuum build-up when the system cools down.

Note:
To remove the radiator pressure cap when the coolant temperature is high or boiling, place a cloth on the pressure cap and turn counter-clockwise one step. Keep it in this position until all pressure is released. Then, turn the cap further until it can be removed. To install the cap, place in position and turn it clockwise as far as it will go.

3–F–1. Checking Expansion Tank

1. Check the expansion tank for crack, damage and leakage.
2. Check the pressure cap function. To check the cap, first wet the cap rubber gasket to insure an air tight seal then, attach a tester to the cap. The specified pressure is 0.9 kg/cm² (13 lb/in²).

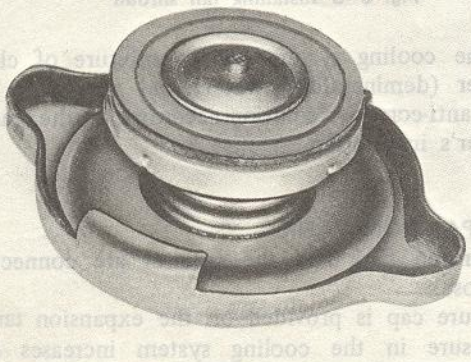


Fig. 3–8 Pressure cap

3–F–2. Replacing Expansion Tank

1. Disconnect the water hose (radiator to expansion tank) at the radiator.
2. Remove the tank attaching bolts and remove the tank.

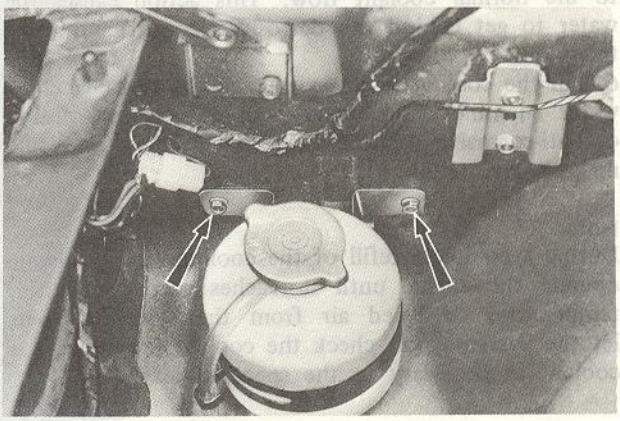


Fig. 3–9 Tank attaching bolts

3. Install the expansion tank in the reverse order of removing.

3–G. THERMOSTAT

The thermostat is of a wax pellet type with the jiggle pin. The cooling system is designed to provide adequate cooling. However, the thermostat is necessary to provide quick warming up and to prevent over cooling.

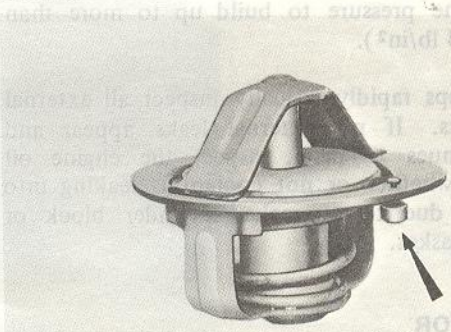


Fig. 3–10 Thermostat

3–G–1. Removing Thermostat

1. Drain the coolant from the radiator until the coolant level is below the thermostat housing.
2. Disconnect the water temperature gauge lead wire.
3. Loosen the hose clamp and disconnect the upper radiator hose (radiator to thermostat cover) from the thermostat cover (coolant outlet elbow).
4. Disconnect the coolant by-pass hose (water pump to thermostat housing) from the thermostat housing.
5. Remove the thermostat cover retaining nuts and bolts. Position the engine hanger out of the way. Remove the thermostat cover and gasket from the

thermostat housing stud.

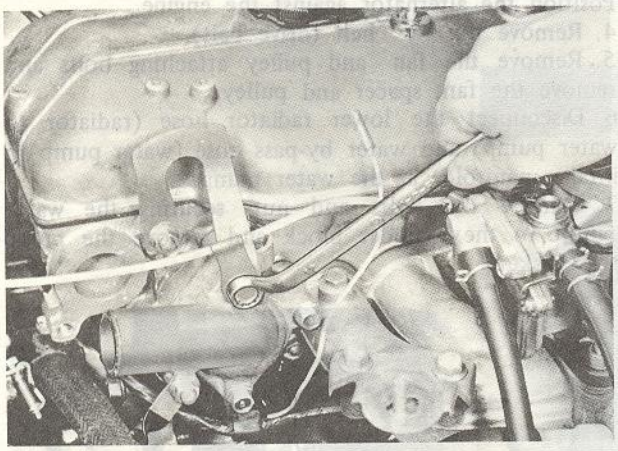


Fig. 3–11 Removing thermostat cover

6. Remove the thermostat and housing from the cylinder head.
7. Remove the thermostat from the housing. Carefully remove all gasket material from the parts.

3–G–2. Checking Thermostat

To test the thermostat, place it in water with a thermometer and heat up the water gradually and check the temperature when the thermostat starts to open and when it opens fully. And also, measure the lift height when the thermostat is fully opened. If the reading shows a large difference from the standard specifications, replace with a new thermostat.
The specifications of the thermostat are shown in the following table.

Starts to open	82° ± 1.5°C (180° ± 2.7°F)
Fully opens at	95°C (203°F)
Lift	8 mm (0.315 in) or more

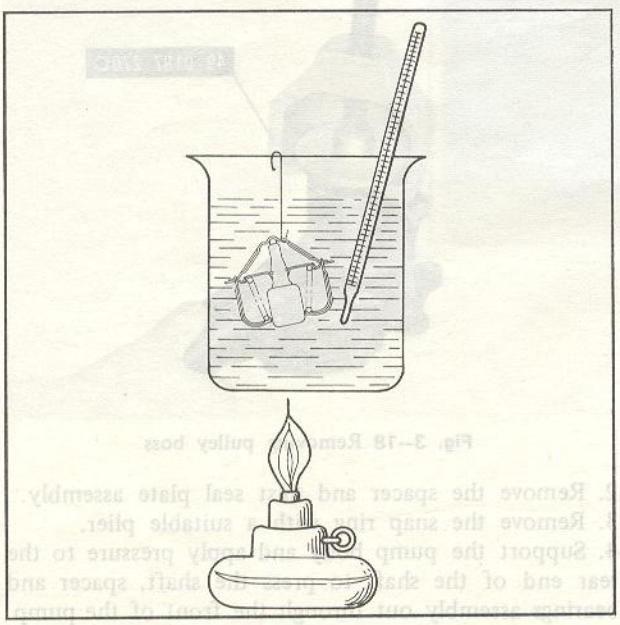


Fig. 3–12 Checking thermostat

3–G–3. Installing Thermostat

1. Install the thermostat housing, using a new gasket with water-resistant sealer.
2. Position the thermostat in the housing **with the jiggle pin up.**

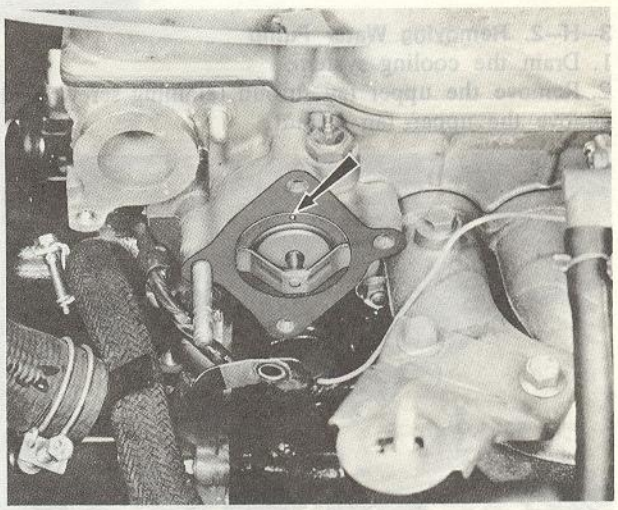


Fig. 3–13 Installing thermostat

3. Coat a new gasket with sealer and position it on the thermostat and housing.
4. Install the thermostat cover and engine hanger. Tighten the bolts and nuts.
5. Connect the by-pass and upper radiator hoses.
6. Connect the water temperature gauge unit wire.
7. Fill the cooling system. Operate the engine and add coolant as necessary to the specified level.

3–H. WATER PUMP

The water pump employs a centrifugal impeller. In the pump body, the shaft is supported with two bearings. The impeller is fitted to the rear end of the shaft. The seal assembly prevents water leakage.

3–H–1. Checking Water Pump on Car

Check the water pump for leaks and excessive end play or looseness of the shaft and bearings. If there is evidence of excessive play when the fan blades are

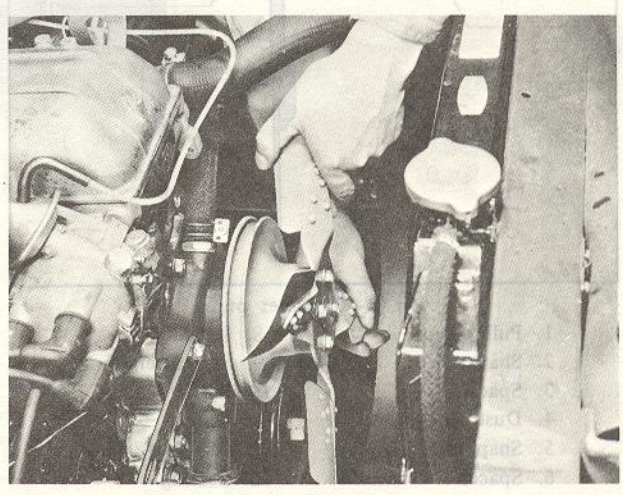


Fig. 3–14 Checking water pump

manually moved up and down, it shows that the bearings are rough.
If water leaks from the hole located on the pump body, it indicates defective seal necessitating overhaul of the pump.

3–H–2. Removing Water Pump

1. Drain the cooling system.
2. Remove the upper fan shroud retaining screws and remove the upper fan shroud.

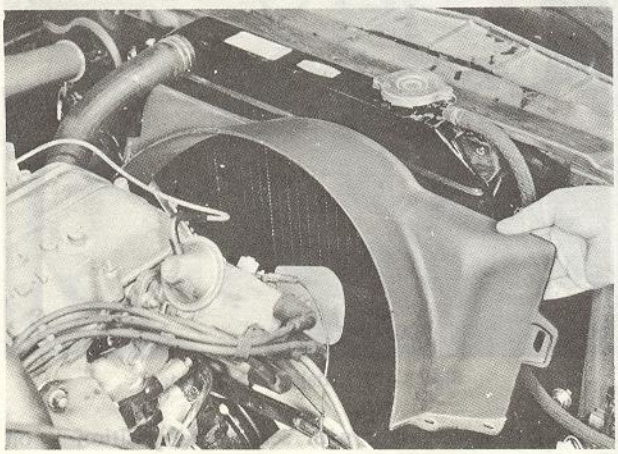


Fig. 3–15 Removing upper fan shroud

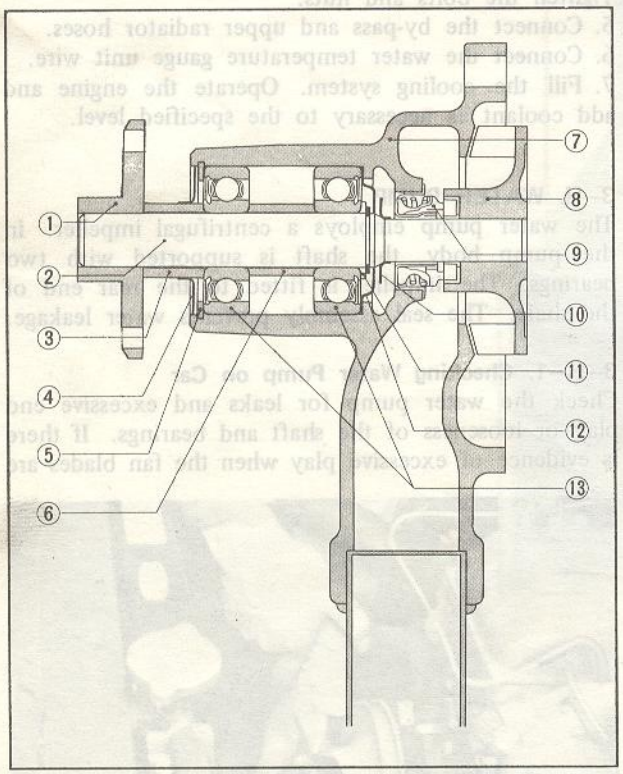


Fig. 3–16 Water pump

1. Pulley boss
2. Shaft
3. Spacer
4. Dust seal plate
5. Snap ring
6. Spacer
7. Body
8. Impeller
9. Seal assembly
10. Baffle plate
11. Washer
12. Dust seal plate
13. Bearing

3. Loosen the alternator adjusting and mounting bolts. Position the alternator against the engine.
4. Remove the "V" belt (drive belt).
5. Remove the fan and pulley attaching bolts and remove the fan, spacer and pulley.
6. Disconnect the lower radiator hose (radiator to water pump) and water by-pass hose (water pump to intake manifold) at the water pump.
7. Remove the bolts and nuts securing the water pump to the cylinder block and remove the pump and gasket.

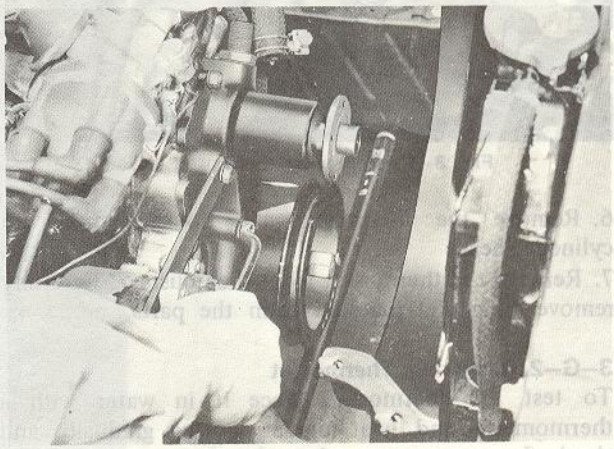


Fig. 3–17 Removing water pump

3–H–3. Disassembling Water Pump

1. Using the **puller** (49 0187 270C), remove the pulley boss from the shaft.

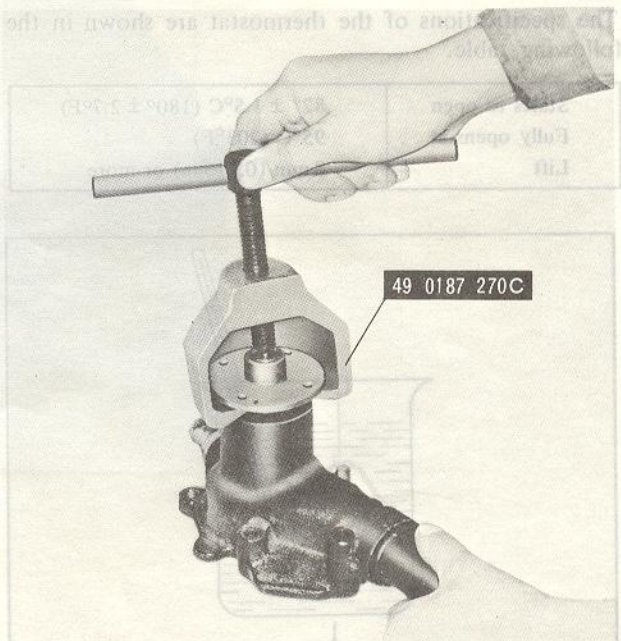


Fig. 3–18 Removing pulley boss

2. Remove the spacer and dust seal plate assembly.
3. Remove the snap ring with a suitable plier.
4. Support the pump body and apply pressure to the rear end of the shaft to press the shaft, spacer and bearings assembly out through the front of the pump.
5. Remove the impeller.

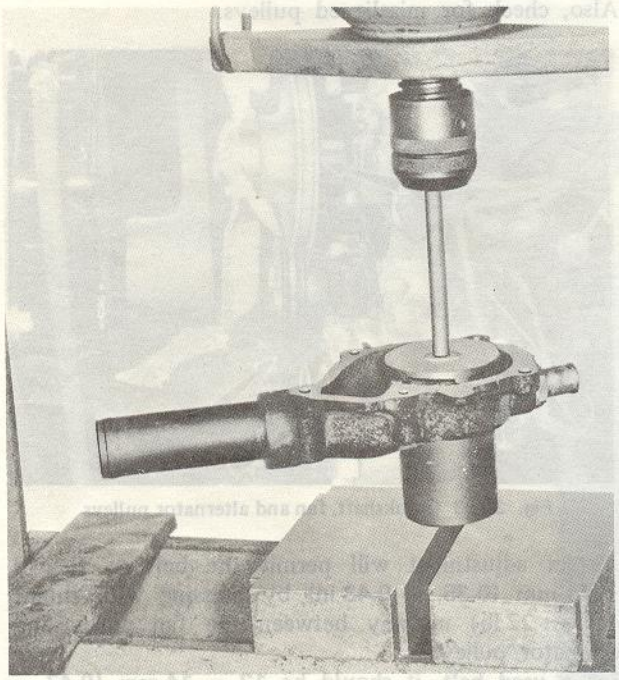


Fig. 3–19 Removing shaft assembly and impeller

6. Remove the seal assembly from the body.
7. Remove the bearings and spacer from the shaft with a suitable puller.

3–H–4. Inspecting Water Pump

1. Inspect the bearing for roughness or excessive end play. Remove any rust or scale from the bearing shaft with an emery cloth.
The bearing should be wrapped in cloth while removing the rust or scale to prevent emery dust from entering the bearing.

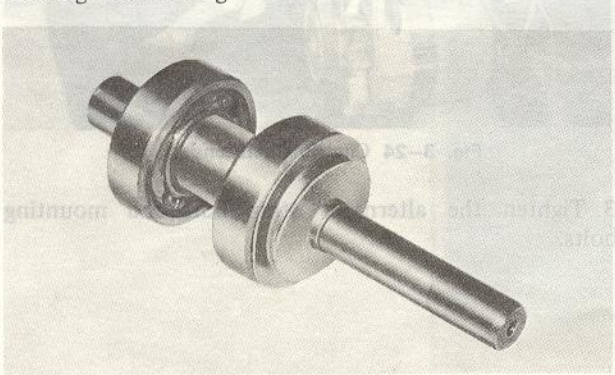


Fig. 3–20 Bearing and shaft assembly

2. Inspect the seat for seal on the impeller for pit marks or scoring. If the seat for the seal is scored or pitted, the impeller should be replaced.
3. Inspect the water pump body and the impeller for cracks and wear. Replace if defective.

3–H–5. Assembling Water Pump

1. Install the stop ring into the groove on the shaft.
2. Place the dust seal plate on the shaft.
3. Drive the baffle plate onto the taper of the shaft.
4. Install the shaft into the body.
5. Install the washer and press in the bearing with the sealed side rearward.
6. Place the spacer on the bearing and fill grease.
7. Install the bearing with the sealed side forward until the snap ring can be installed.
8. Install the snap ring.

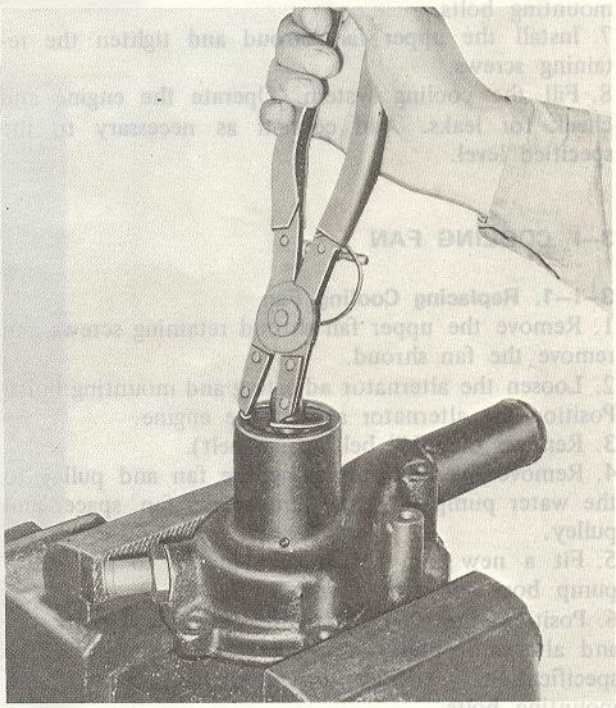


Fig. 3–21 Installing snap ring

9. Position the spacer and dust seal plate on the bearing and press the pulley boss onto the shaft until it is flush with the front end of the shaft.
10. Install the seal assembly into the body.

Fig. 3–22 Installing seal assembly

11. Press the impeller onto the shaft until it is flush with the end of the shaft.

3–H–6. Installing Water Pump

1. Ensure mating surfaces of cylinder block and water pump are clean.
2. Position the pump and gasket on the cylinder block and secure with the attaching bolts and nuts.
3. Position the lower radiator hose on the water pump and tighten the clamp.

4. Connect the by-pass hose to the water pump.
5. Fit the pulley, spacer and fan to the water pump boss and secure with bolts.
6. Position the "V" belt over the crankshaft, fan and alternator pulley and adjust the belt tension to specifications. Tighten the alternator adjusting and mounting bolts.
7. Install the upper fan shroud and tighten the retaining screws.
8. Fill the cooling system. Operate the engine and check for leaks. Add coolant as necessary to the specified level.

3–I COOLING FAN

3–I–1. Replacing Cooling Fan

1. Remove the upper fan shroud retaining screws and remove the fan shroud.
2. Loosen the alternator adjusting and mounting bolts. Position the alternator against the engine.
3. Remove the "V" belt (drive belt).
4. Remove the bolts attaching the fan and pulley to the water pump boss and remove the fan, spacer and pulley.
5. Fit a new fan, spacer and pulley to the water pump boss and secure with bolts.
6. Position the "V" belt over the crankshaft, fan and alternator pulley and adjust the belt tension to specifications. Tighten the alternator adjusting and mounting bolts.
7. Install the upper fan shroud and tighten the retaining screws.

3–J "V" BELT TENSION

If adjustment is necessary, proceed as follows:
1. Loosen the alternator strap bolt and mounting bolts.
2. Move the alternator toward or away from the engine until the correct tension is obtained. If the belt is broken, glazed, or worn, replace it with a new one. If the belt is streched so that it cannot be tightened sufficiently, install a new belt. If the belt is noisy, check the tension of the belt.

Also, check for misaligned pulleys.

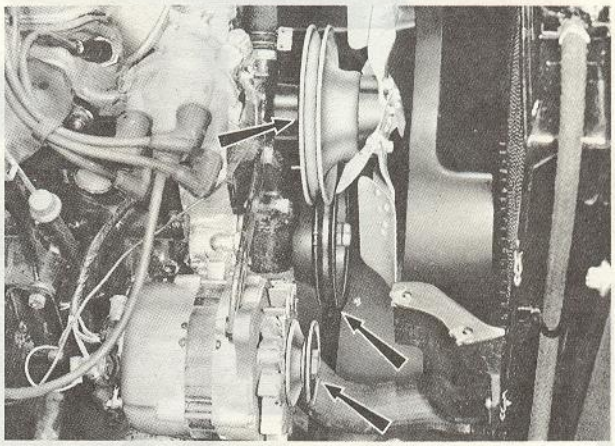


Fig. 3–23 Crankshaft, fan and alternator pulleys

Correct adjustment will permit the belt **to flex 9 ~ 11 mm (0.35 ~ 0.43 in)** by pressing with thumb (10 kg : 22 lb) midway between the fan pulley and alternator pulley.
For a used belt, it should be **12 ~ 14 mm (0.47 ~ 0.55 in).**

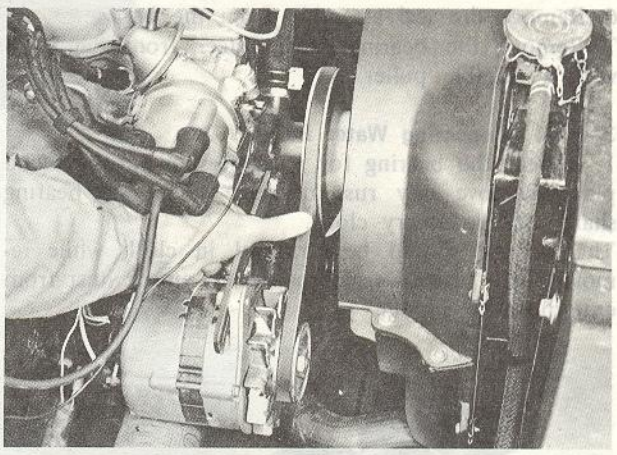


Fig. 3–24 Checking belt tension

3. Tighten the alternator strap bolt and mounting bolts.

SPECIAL TOOL

49 0187 270C	Water pump pulley boss puller

8. Disassemble the air horn.
(1) Remove the gasket from the air horn.
(2) Remove the choke valve and choke shaft from the air horn if necessary.

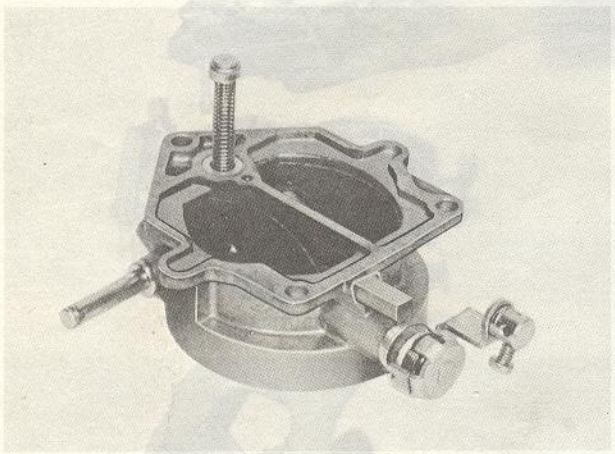


Fig. 4–23 Air horn

9. Disassemble the throttle body.
(1) Remove the diaphragm cover attaching screws and remove the cover and spring.
(2) Remove the idle adjusting screw and spring if necessary.
(3) Remove the throttle valves and shafts if necessary.

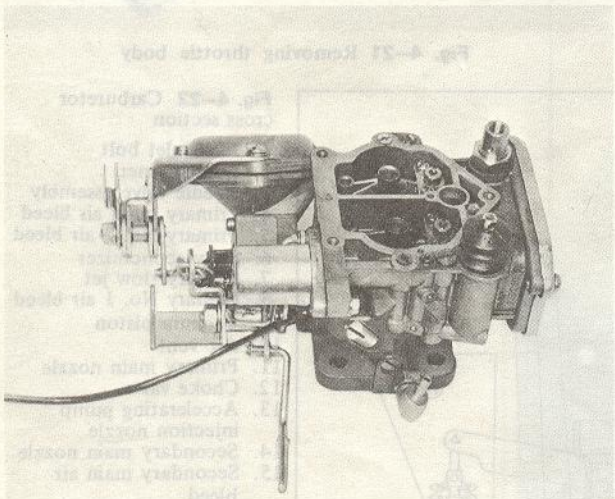


Fig. 4–24 Throttle body

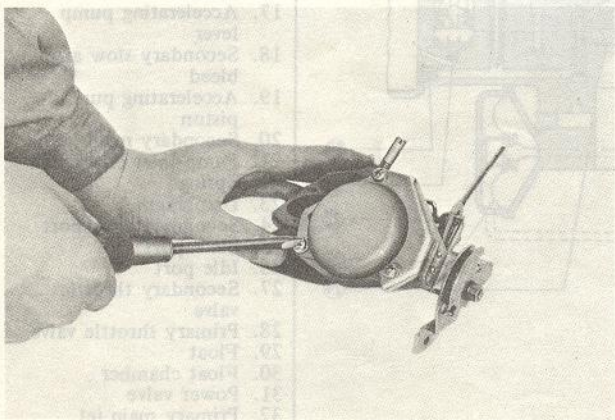


Fig. 4–25 Removing diaphragm cover

10. Disassemble the main body.
(1) Remove the needle valve, spring and push pin from the main body.
(2) Remove the screws attaching the fuel bowl sight glass cover to the main body. Remove the cover, gasket, glass and rubber gasket from the body.
(3) Remove the float retaining pin collar. Then, remove the float.

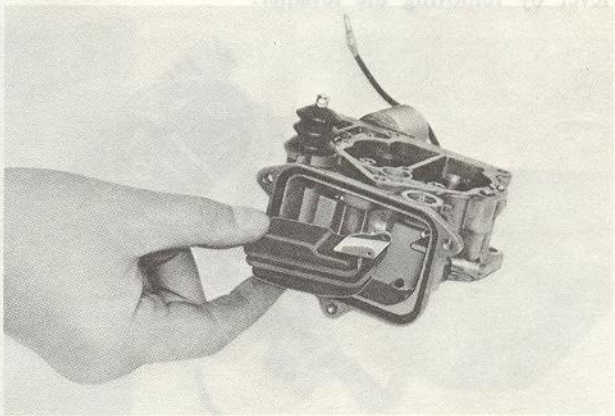


Fig. 4–26 Removing float

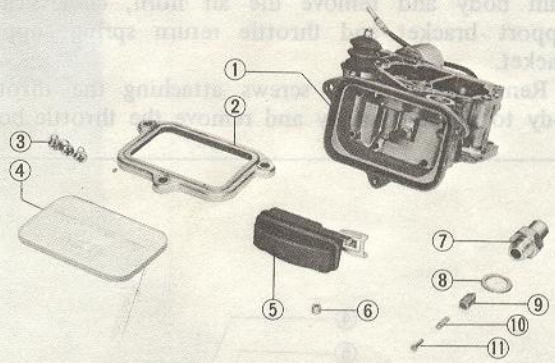


Fig. 4–27 Float and needle valve components

1. Main body
2. Sight glass cover
3. Cover attaching screws
4. Sight glass
5. Float
6. Float retaining pin collar
7. Fuel inlet bolt
8. Shim
9. Needle valve
10. Spring
11. Push pin

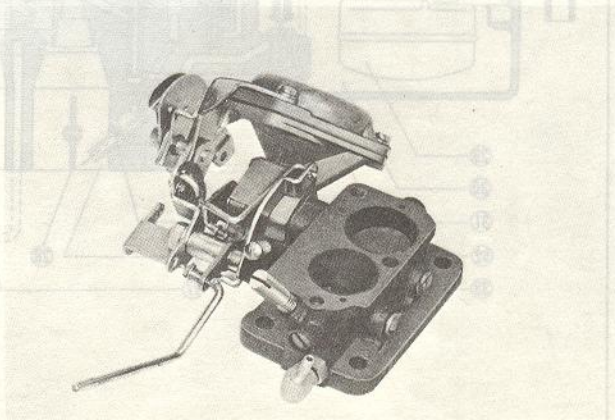


Fig. 4–28 Throttle body

(4) Remove the pump plunger assembly. Remove the pump strainer retaining clip and strainer. Invert the carburetor and remove the pump inlet check ball.

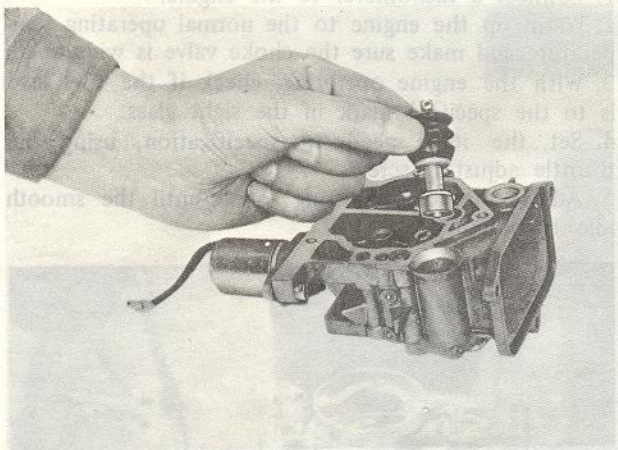


Fig. 4–29 Removing pump plunger assembly

(5) Remove the screw and washer retaining the pump discharge weight and check ball. Invert the carburetor and remove the discharge weight and check ball.

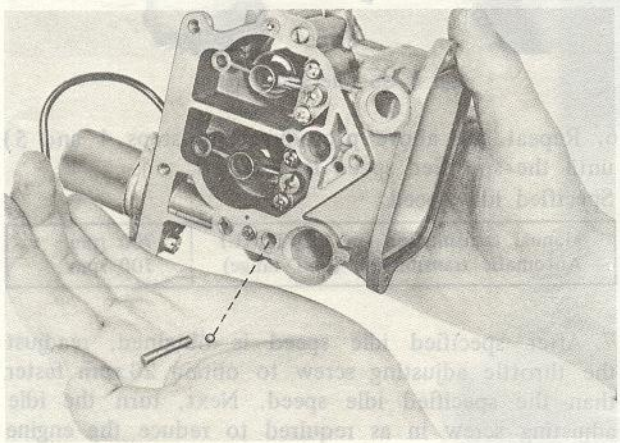


Fig. 4–30 Removing discharge weight and check ball

(6) Remove the power valve with the **screwdriver** (49 0118 870A).

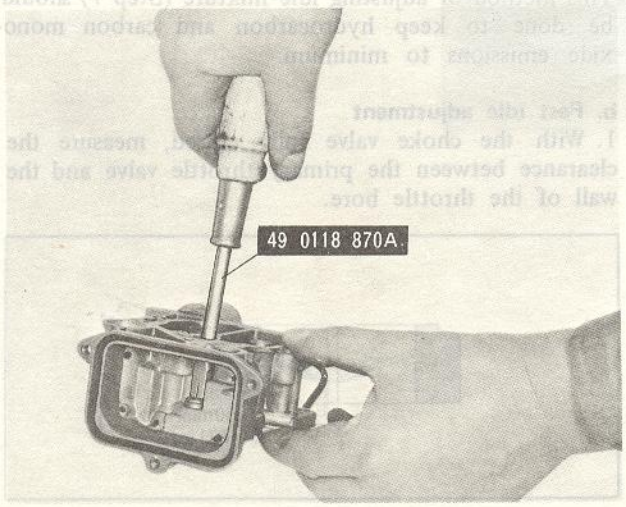


Fig. 4–31 Removing power valve

(7) Remove the slow jets, main jets and all air bleeds.

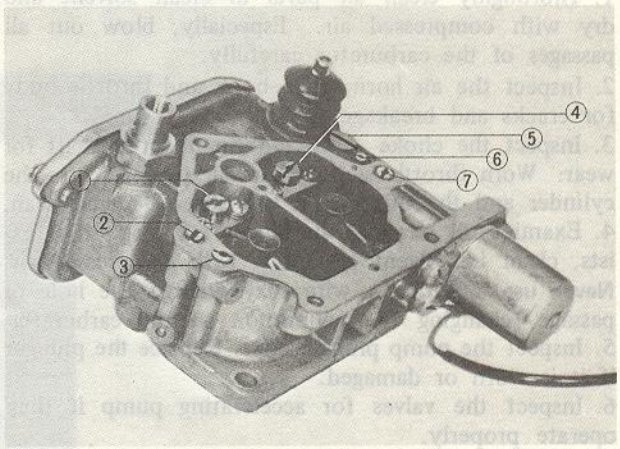


Fig. 4–32 Jets and air bleeds

1. Secondary main air bleed
2. Secondary slow jet
3. Secondary slow air bleed
4. Primary main air bleed
5. Screw (for pump discharge weight)
6. Primary slow jet
7. Primary slow air bleed

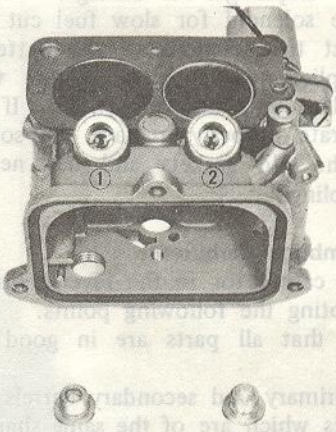


Fig. 4–33 Removing main jets

1. Secondary main jet
2. Primary main jet

(8) Remove the screws attaching the slow fuel cut valve solenoid and remove the solenoid.

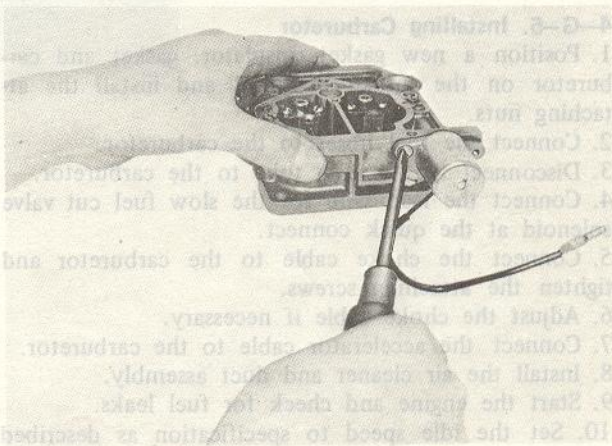


Fig. 4–34 Removing fuel cut valve solenoid

4–G–3. Inspecting Carburetor

1. Thoroughly clean all parts in clean solvent and dry with compressed air. Especially, blow out all passages of the carburetor carefully.
2. Inspect the air horn, main body and throttle body for cracks and breakage.
3. Inspect the choke shaft and the throttle shaft for wear. Worn throttle shaft allows air to enter into the cylinder and the mixture at low speed becomes lean.
4. Examine all jets and air bleeds for clog. If it exists, clean in solvent and blow with compressed air. **Never use a wire.** A wire may enlarge the hole or passage, changing the calibration of the carburetor.
5. Inspect the pump plunger cup. Replace the plunger if it is worn or damaged.
6. Inspect the valves for accelerating pump if they operate properly.
7. Check the power piston for proper operation. To check, breath in and out from the hole at the center of the air horn and check air leak, and smooth piston movement.
8. Check the float needle and seat for wear.
9. Check the float for damage.
10. Inspect the idle adjusting needle for burrs or ridges.
11. Check the diaphragm for damage.
12. Check the solenoid for slow fuel cut valve. To check, connect the solenoid to the battery. When current is applied to the solenoid, the valve stem should be pulled into the valve body. If the valve does not operate properly, replace the solenoid.
13. Discard the old gaskets and use new gaskets when reassembling.

4–G–4. Assembling Carburetor

Assemble the carburetor in the reverse order of disassembling, noting the following points.

1. Make sure that all parts are in good condition and clean.
2. Both the primary and secondary barrels have their respective parts which are of the same shape. Therefore, when assembling, particular care should be taken so as not to mistake one for the other.
3. When installing the throttle valve or choke valve, make sure the valve is properly seated and does not bind.

4–G–5. Installing Carburetor

1. Position a new gasket, insulator, gasket and carburetor on the intake manifold and install the attaching nuts.
2. Connect the fuel hoses to the carburetor.
3. Disconnect the vacuum tube to the carburetor.
4. Connect the lead wire for the slow fuel cut valve solenoid at the quick connect.
5. Connect the choke cable to the carburetor and tighten the attaching screws.
6. Adjust the choke cable if necessary.
7. Connect the accelerator cable to the carburetor.
8. Install the air cleaner and duct assembly.
9. Start the engine and check for fuel leaks.
10. Set the idle speed to specification as described in Par. 4–G–6.

4–G–6. Adjusting Carburetor

a. Idle adjustment

1. Connect a tachometer to the engine.
2. Warm up the engine to the normal operating temperature and make sure the choke valve is wide open.
3. With the engine operating, check if the fuel level is to the specified mark in the sight glass.
4. Set the idle speed to specification, using the throttle adjusting screw.
5. Adjust the idle adjusting screw until the smooth idle is obtained.

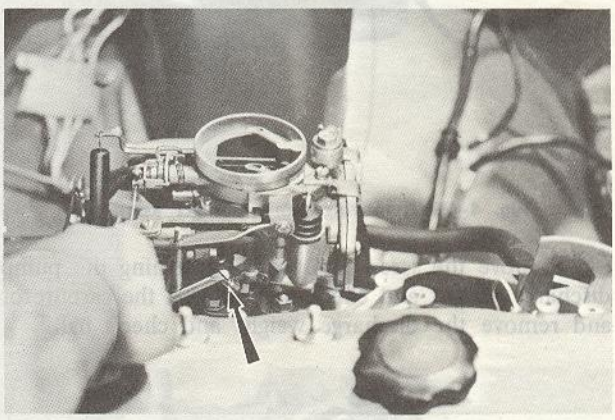


Fig. 4–35 Idle adjustment

6. Repeat the above procedures (in steps 4 and 5) until the specified speed is obtained.

Specified idle speed:

Manual transmission (in NEUTRAL)	700 rpm
Automatic transmission (in D-range)	700 rpm

7. After specified idle speed is obtained, readjust the throttle adjusting screw to obtain **20 rpm** faster than the specified idle speed. Next, turn the idle adjusting screw in as required to reduce the engine speed **20 rpm** (The mixture of the fuel and air becomes lean).

Note:
This method of adjusting idle mixture (Step 7) should be done to keep hydrocarbon and carbon monoxide emissions to minimum.

b. Fast idle adjustment

1. With the choke valve fully closed, measure the clearance between the primary throttle valve and the wall of the throttle bore.

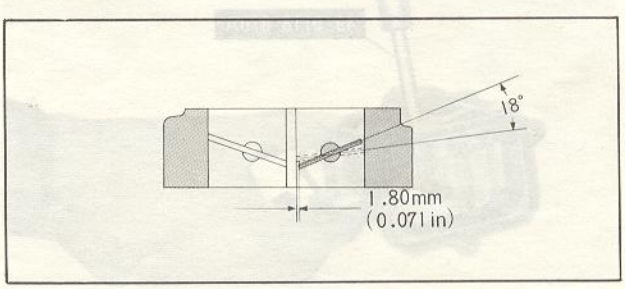


Fig. 4–36 Fast idle adjustment (1)

2. If the clearance is not within specifications, bend the fast idle rod until the proper clearance is obtained.

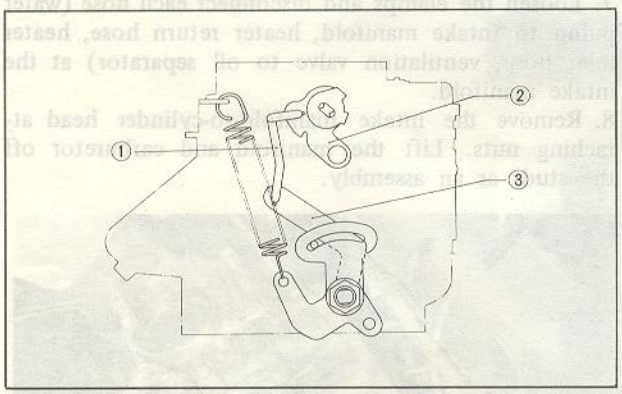


Fig. 4–37 Fast idle adjustment
1. Fast idle rod
2. Fast idle lever
3. Fast idle connecting lever

c. Float level adjustment

1. With the engine operating, check the fuel level in the fuel bowl sight glass.
2. If the fuel level is not to the specified mark in the sight glass, remove the carburetor from the vehicle.

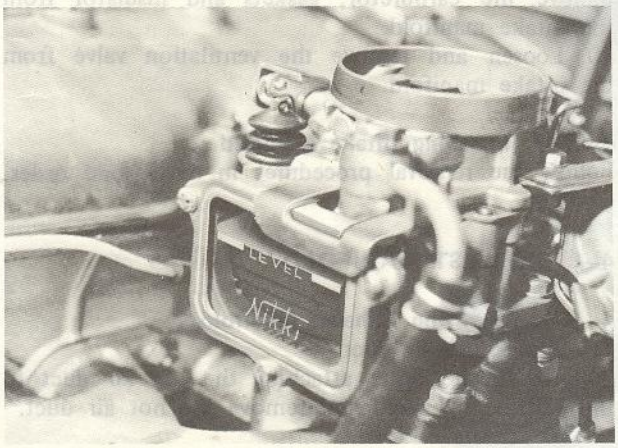


Fig. 4–38 Fuel level mark

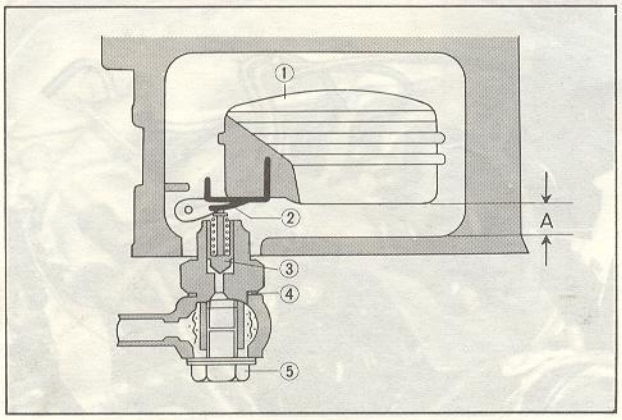


Fig. 4–39 Adjusting float level (1)
1. Float
2. Float seat lip
3. Needle valve
4. Shim
5. Fuel inlet bolt

3. Remove the fuel bowl cover.
4. Invert the carburetor on a stand and allow the float to lower by its own weight.
5. Measure the clearance **(A)** between the float and the bowl. This clearance should be **6 mm (0.236 in).** If not, bend the float seat lip until the proper clearance is obtained.
6. Turn the carburetor to the normal position.
7. Measure the clearance (B) between the lowest tip of the float and the bowl. This clearance should be **1.2 mm (0.047 in).** If the clearance is not within specifications, bend the float stopper until the proper clearance is obtained.

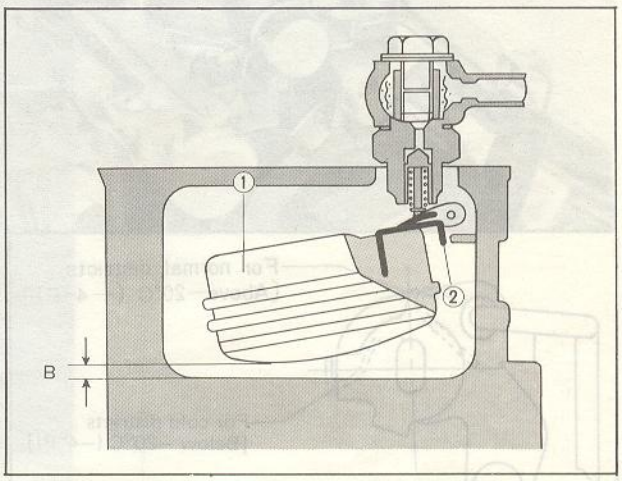


Fig. 4–40 Adjusting float level (2)
1. Float
2. Float stopper

8. Install the fuel bowl cover.
9. Install the carburetor to the engine.
10. Operate the engine and make sure that the fuel level is to the specified mark in the sight glass.

d. Adjustment of accelerator pump

At the end of the accelerator pump connecting rod, there are two holes, which provide two changes in the pump injection amount.
Select and use these holes in accordance with the atomospheric temperature and the engine condition.

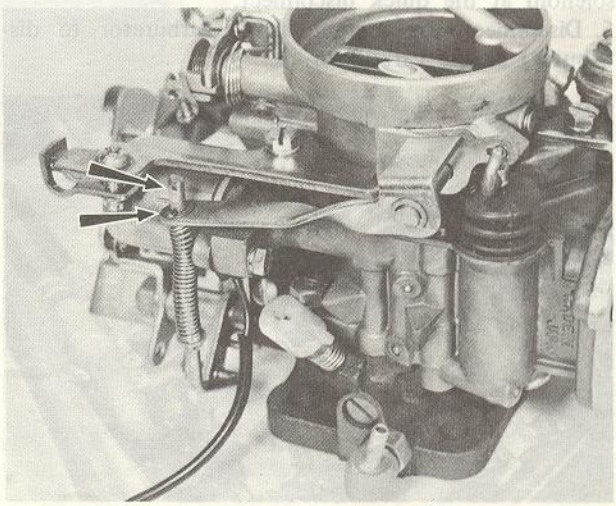


Fig. 4–41 Adjusting of accelerator pump

e. Adjusting choke valve spring
The choke lever is provided with two holes for hanging the choke valve return spring. The return spring is normally hung in the upper hole, but in the cold districts it is hung in the lower hole to improve the engine startability.

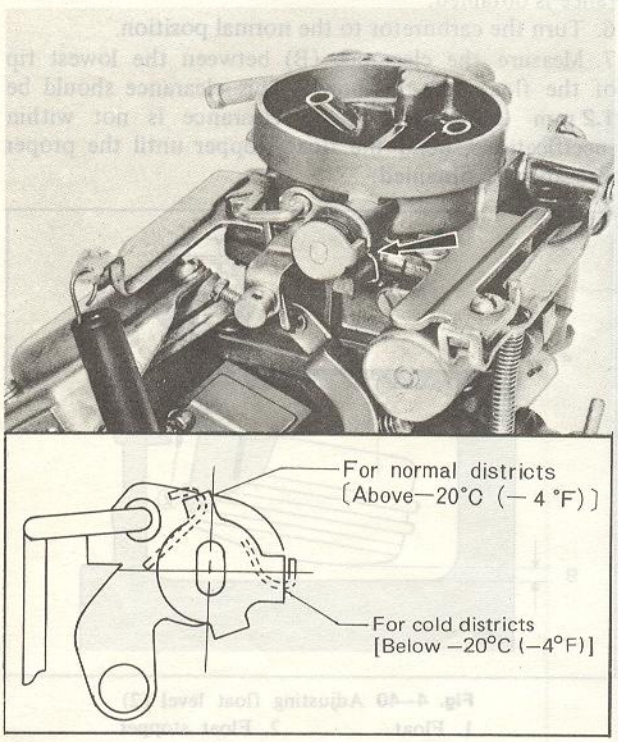


Fig. 4–42 Adjusting choke spring

4–H. INTAKE MANIFOLD

4–H–1. Removing Intake Manifold

1. Remove the air cleaner assembly and air cleaner support.
2. Disconnect the accelerator cable from the carburetor.
3. Remove the choke cable attaching screws and disconnect the cable at the carburetor.
4. Disconnect the lead wire for slow fuel cut valve solenoid at the quick disconnect.
5. Disconnect the vacuum tube (carburetor to distributor) at the carburetor.

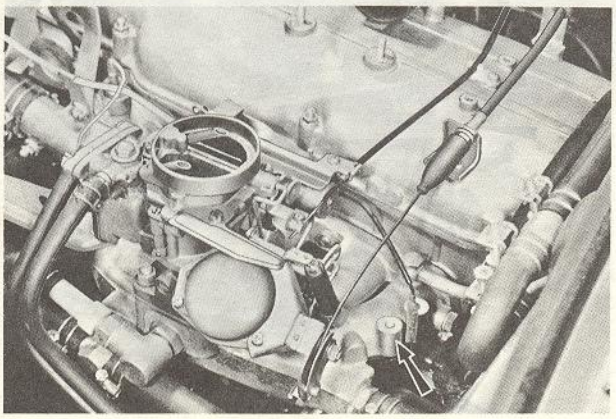


Fig. 4–43 Intake manifold

6. Disconnect the fuel inlet hose (carburetor to fuel pump) and fuel return hose (carburetor to fuel tank) at the carburetor.
7. Loosen the clamps and disconnect each hose (water pump to intake manifold, heater return hose, heater inlet hose, ventilation valve to oil separator) at the intake manifold.
8. Remove the intake manifold-to-cylinder head attaching nuts. Lift the manifold and carburetor off the studs as an assembly.

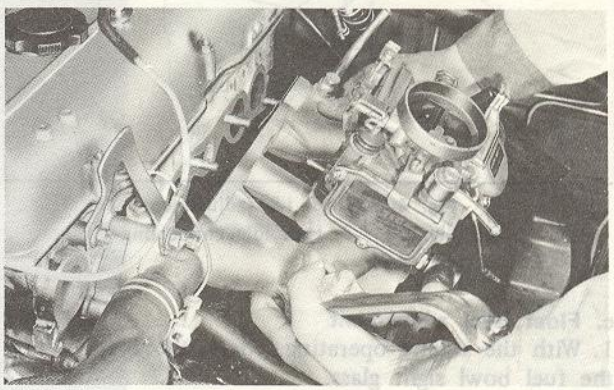


Fig. 4–44 Removing intake manifold

9. Remove the nuts attaching the carburetor and remove the carburetor, gaskets and insulator from the intake manifold.
10. Loosen and remove the ventilation valve from the intake manifold.

4–H–2. Installing Intake Manifold

Follow the removal procedures in the reverse order.

4–I. EXHAUST MANIFOLD

4–I–1. Removing Exhaust Manifold

1. Remove the air duct.
2. Remove the bolts attaching the hot air duct to the exhaust manifold and remove the hot air duct.

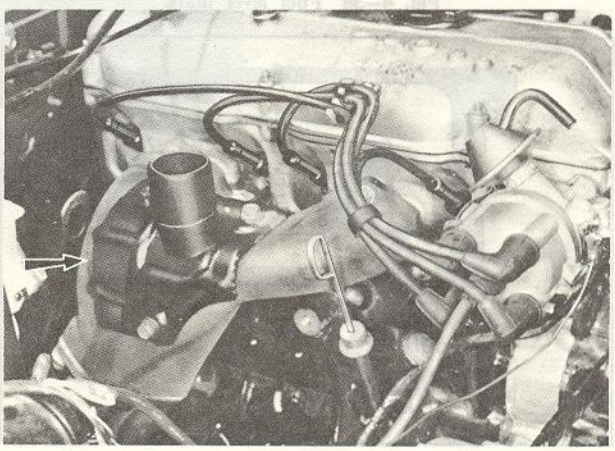


Fig. 4–45 Exhaust manifold

3. Remove the bolt attaching the exhaust pipe clamp to the bracket on the clutch housing.

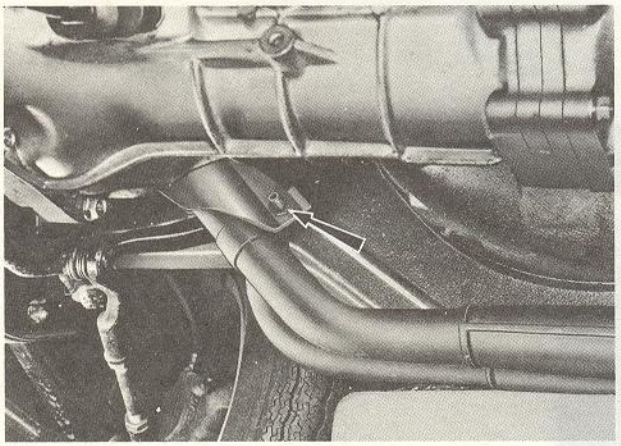


Fig. 4–46 Removing clamp

4. Remove the three bolts that attach the exhaust pipe to the exhaust manifold.

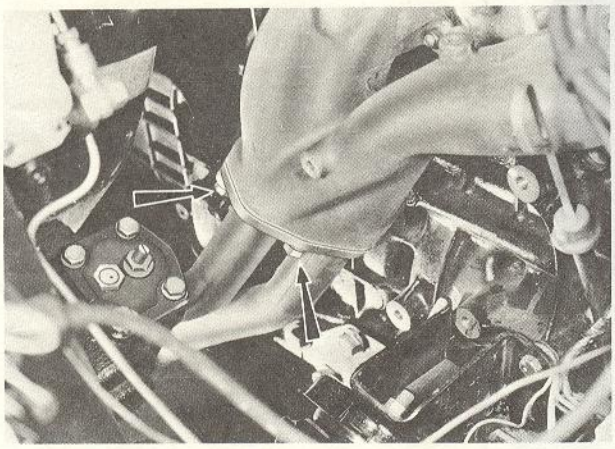


Fig. 4–47 Removing three bolts

5. Remove the exhaust manifold-to-cylinder head attaching nuts. Remove the exhaust manifold and gasket from the studs.

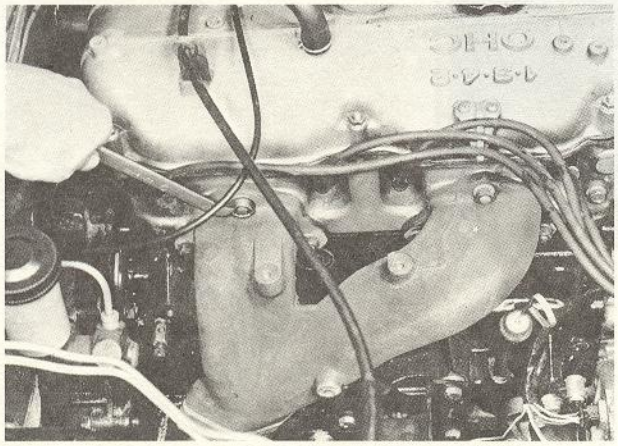


Fig. 4–48 Removing exhaust manifold

4–I–2. Installing Exhaust Manifold

Follow the removal procedures in the reverse order.

4–J. PRE-SILENCER

4–J–1. Removing Pre-silencer

1. Raise the vehicle with a jack and support with stands.
2. Remove the three bolts that attach the exhaust pipe to the exhaust manifold.
3. Remove the bolt that attaches exhaust pipe clamp to the bracket on the clutch housing.
4. Remove the two bolts and nuts that attach the intermediate pipe to the main-silencer.

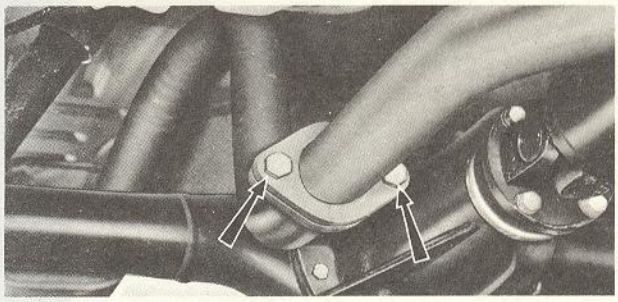


Fig. 4–49 Disconnecting intermediate pipe

5. Remove the nut attaching the pre-silencer to the retaining hanger and remove the pre-silencer.

4–J–2. Checking Pre-silencer

Check the exhaust pipes and silencer for burned condition, crack, and corrosion.

4–J–3. Installing Pre-silencer

To install, follow the removal procedures in the reverse order.

4–K. MAIN-SILENCER

4–K–1. Removing Main-silencer

1. Raise the vehicle and support with stands.
2. Remove the two bolts and nuts that attach the intermediate pipe (pre-silencer) to the main-silencer.
3. Remove the nut attaching the main-silencer to the retaining hanger.
4. Remove the rubber supports from the rear end of the outlet pipe and remove the main-silencer.
5. Lower the vehicle.

4–K–2. Checking Main-silencer

Refer to Par. 4–J–2 and inspect the main-silencer.

4–K–3. Installing Main-silencer

Follow the removal procedures in the reverse order.

SPECIAL TOOL

49 0118 870A	Screwdriver (for power valve)

FUEL SYSTEM

DESCRIPTION

The fuel system consists of the carburetor, fuel pump, fuel filter, fuel tank, fuel line, accelerator linkage and air cleaner.

The fuel tank is installed in the luggage compartment. By the suction of the fuel pump, the fuel flows through the fuel line into the fuel filter. The fuel passes through the filter element from the outside to the inside of the element. During this fuel flow, the filter element cleans out all the dirt. The fuel pump is producing a constant controlled pressure, and the fuel volume required for engine operations. The fuel supplied by the fuel pump flows passing through the fuel hose into the carburetor.

The carburetor mixes the air and fuel in varying proportions for different operating conditions. As the air passes through the carburetor before entering the engine, fuel is supplied into the engine through the various circuits of the carburetor.

The air cleaner operates primarily to remove dust and dirt from the air which is drawn into the carburetor and then into the engine.

4–A. FUEL TANK

The capacity of the tank is 65.0 liters (16.9 U.S. gallons, 14.3 Imp. gallons). The fuel gauge unit is mounted into the top of the fuel tank. The air vent pipe is provided on the fuel tank. A restriction in the air vent pipe will cause difficulty in filling the fuel tank.

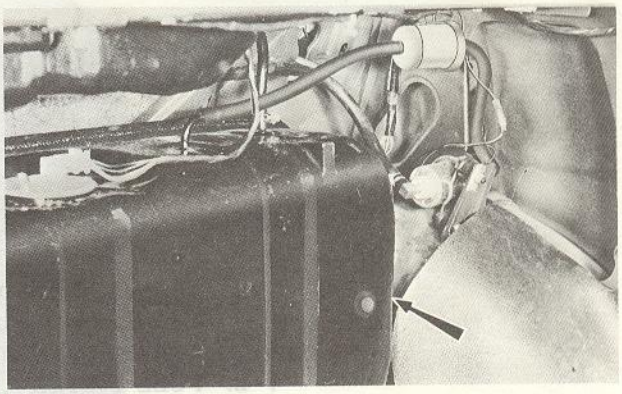


Fig. 4–1 Fuel tank

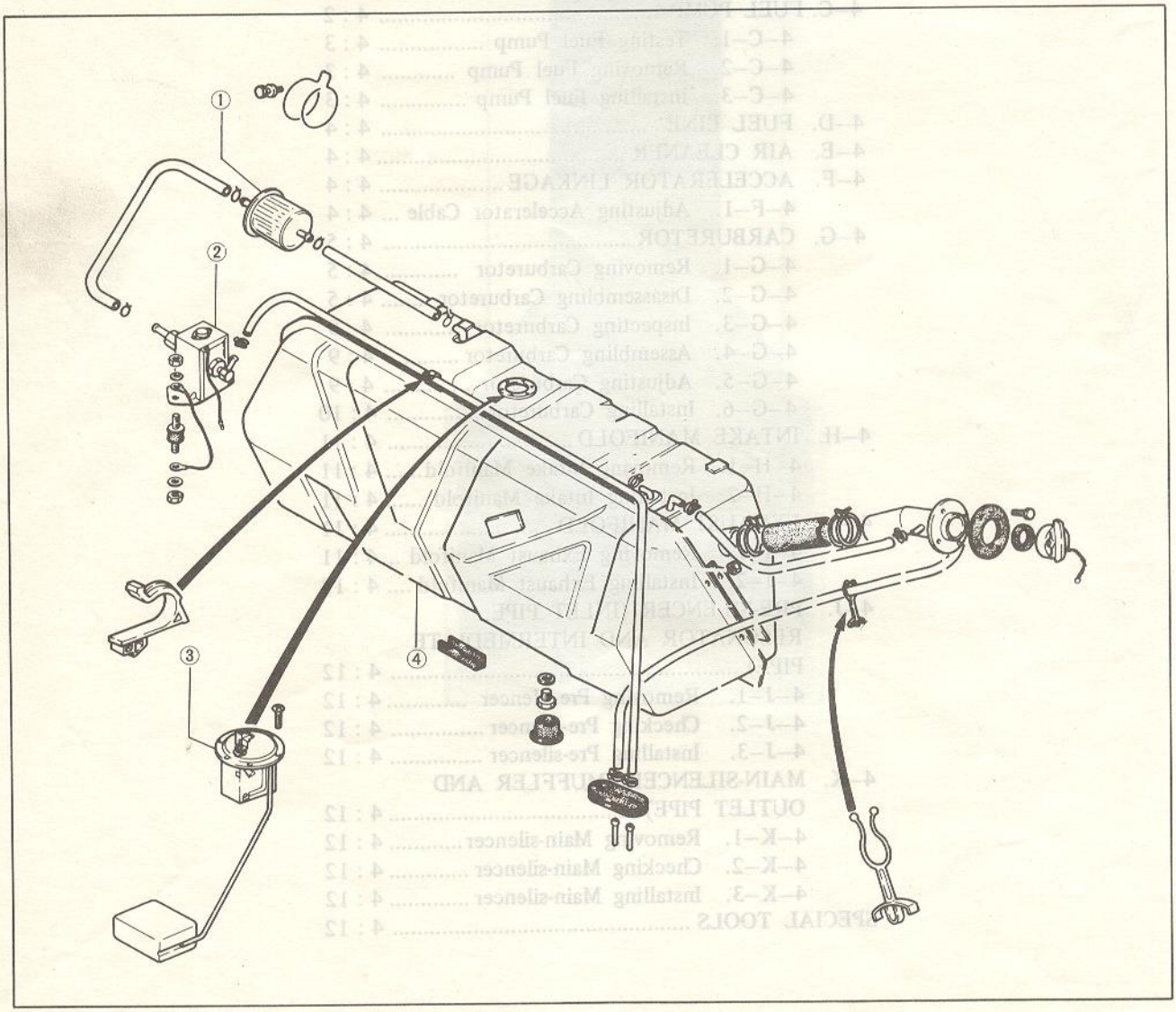


Fig. 4–2 Fuel tank, fuel pump and fuel line

1. Fuel filter
2. Fuel pump
3. Fuel gauge tank unit
4. Fuel tank

4–A–1. Replacing Fuel Tank

Inspect the fuel tank for cracks and corrosion. If any defect is present repair or replace as necessary.
To replace the fuel tank, proceed as follows:

Note:
When repairing the fuel tank, clean the fuel tank thoroughly with steam to remove all explosive gas.

1. Remove the drain plug from the bottom of the tank, and allow the fuel to drain from the fuel tank. After draining, reinstall the drain plug.

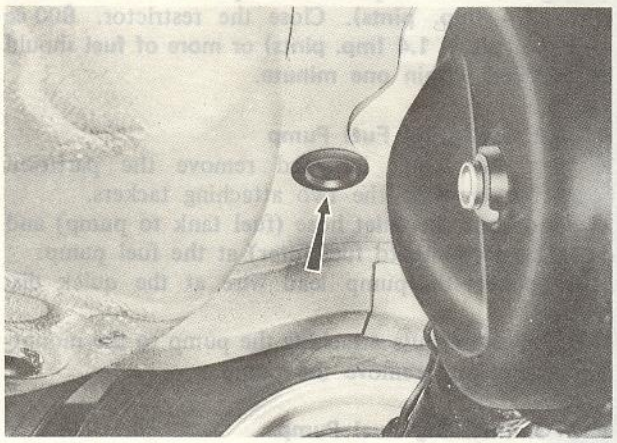


Fig. 4–3 Drain plug

2. Open the trunk lid, and remove the partition board by removing the two tackers.
3. Disconnect the lead wire for fuel gauge tank unit at the unit.
4. Loosen the clamps and disconnect each hose from the fuel tank.
5. Remove the bolts attaching the fuel tank and remove the fuel tank.

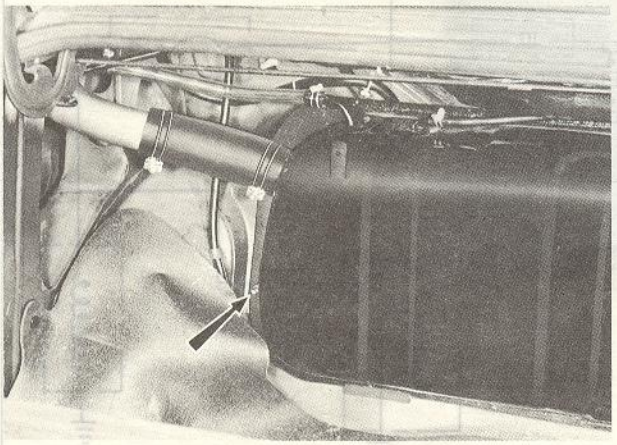


Fig. 4–4 Removing tank attaching bolts

6. Remove the screws attaching the fuel gauge unit to the tank and remove the fuel gauge unit.
7. Position the tank against the mounting bracket and install the attaching bolts.
8. Connect each hose to the tank and tighten the clamps.
9. Connect the lead wire for fuel gauge tank unit.
10. Install the partition board and tighten the two attaching tackers.

4–B. FUEL FILTER

The fuel filter is of a cartridge type and is located in the fuel line between the fuel tank and the fuel pump. The fuel filter should be replaced at intervals, following the maintenance schedule.
To replace the fuel filter, proceed as follows:
1. Open the trunk lid, and remove the partition board by removing the two attaching tackers.
2. Loosen the clamps at both ends of the filter and disconnect the fuel pipes.
3. Pop the filter out of its retainer.
4. Install a new filter and connect the fuel pipes.

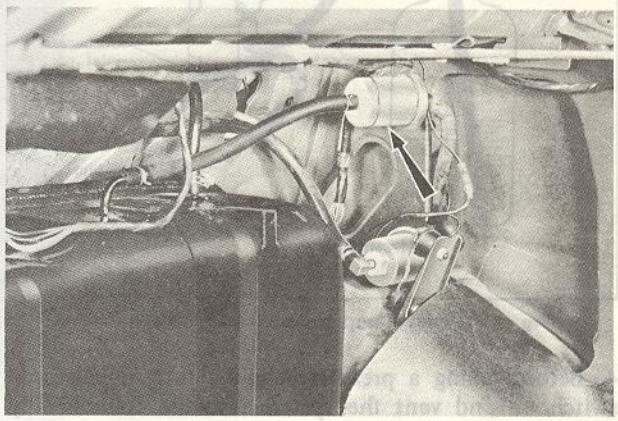


Fig. 4–5 Fuel filter

4–C. FUEL PUMP

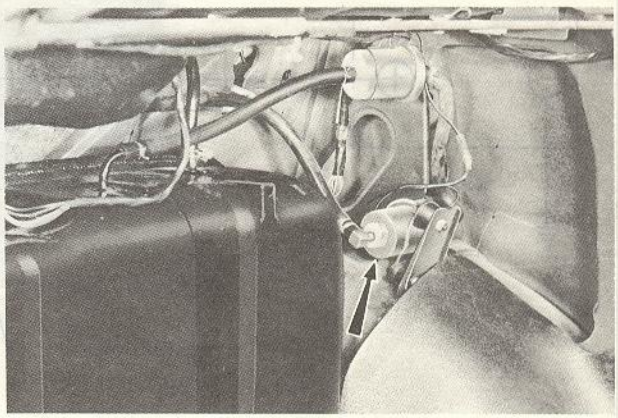


Fig. 4–6 Fuel pump

4–C–1. Testing Fuel Pump

To determine that the fuel pump is in satisfactory operating condition, the following tests should be made. The tests are performed with the pump installed on the car.
Before the tests, make sure the fuel filter has been changed within the recommended maintenance mileage interval. When in doubt, install a new filter.

a. Pressure test

1. Remove the air cleaner assembly. Disconnect the fuel inlet line at the carburetor. Use care to prevent combustion due to fuel spillage.
2. Connect a pressure gauge, a "tee" connection a restrictor and flexible hoses between the fuel line and the carburetor.
3. Position the flexible hose and restrictor so that the fuel can be discharged into a suitable, graduated container.

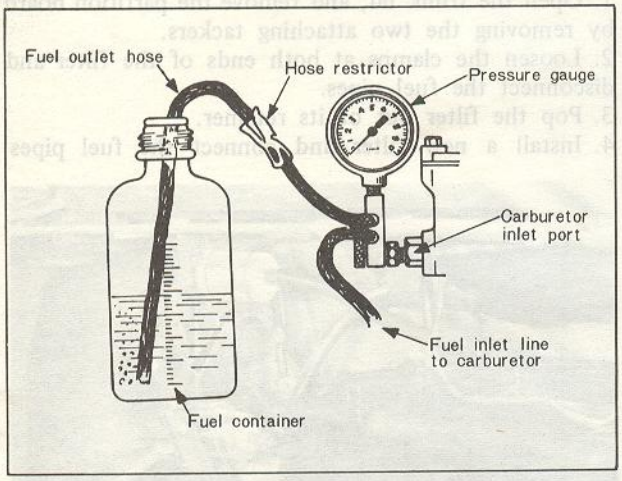


Fig. 4–7 Fuel pump pressure and volume test

4. Before taking a pressure reading, turn the ignition switch on and vent the system into the container by opening the hose restrictor momentarily.
5. Close the hose restrictor, allow the pressure to stabilize, and note the reading.

If the reading is not within **0.20 ~ 0.25 kg/cm² (2.8 ~ 3.6 lb/in²)**, and the fuel lines and filter are in satisfactory condition, the pump is damaged and should be replaced.

If the pump pressure is within the specifications, perform the test for volume.

b. Volume test

Turn the ignition switch on, open the hose restrictor and expel the fuel into the container, while observing the time required to expel **800 cc (1.7 U.S. pints, 1.4 Imp. pints)**. Close the restrictor. **800 cc (1.7 U.S. pints, 1.4 Imp. pints) or more of fuel** should be expelled **within one minute**.

4–C–2. Removing Fuel Pump

1. Open the trunk lid, and remove the partition board by removing the two attaching tackers.
2. Disconnect the inlet hose (fuel tank to pump) and outlet hose (pump to fuel filter) at the fuel pump.
3. Disconnect the pump lead wire at the quick disconnect.
4. Remove the nuts attaching the pump to the mounting bracket and remove the pump.

4–C–3. Installing Fuel Pump

1. Position the fuel pump to the mounting bracket and install the attaching nuts.
2. Connect the pump lead wire at the quick connect.

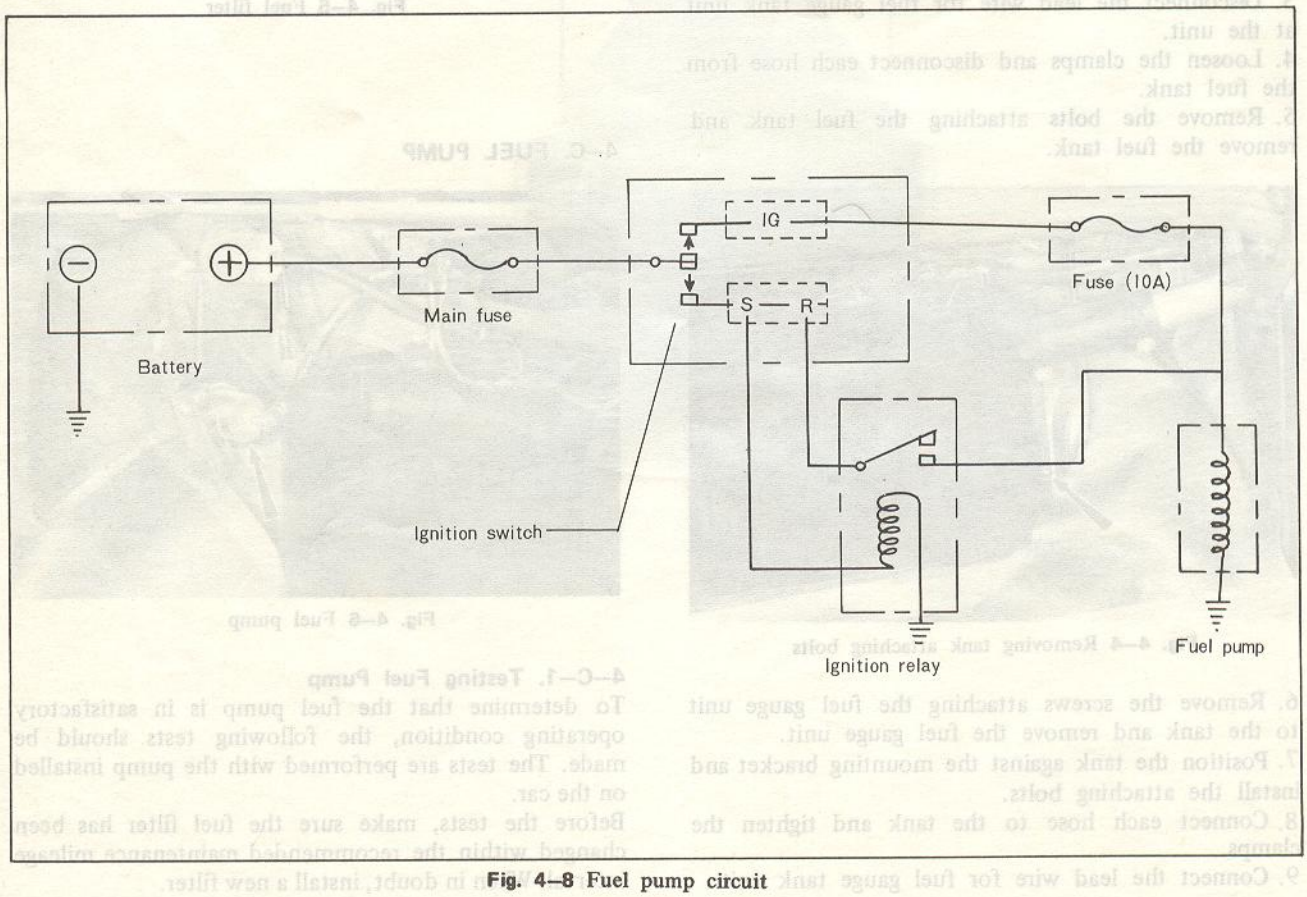


Fig. 4–8 Fuel pump circuit

3. Connect the fuel inlet and outlet hoses at the fuel pump.
4. Install the partition board and tighten the two attaching tackers.

4–D. FUEL LINE

Inspect the fuel lines for leaks and tighten the fuel line connections to prevent leakage.
It is important to keep the fuel system clean and free from water. If an excessive amount of dirt or water is found, drain the fuel tank and blow out the fuel lines with compressed air.

4–E. AIR CLEANER

The air cleaner is of a paper filter type. The element should be serviced at intervals, following the maintenance schedule.
To replace the element, proceed as follows:
1. Remove the wing nut and remove the air cleaner cover.
2. Take out the element and install a new element.
3. Install the air cleaner cover and tighten the wing nut.
To clean the element, remove the element as instructed above and blow out the dust with a low compressed air.

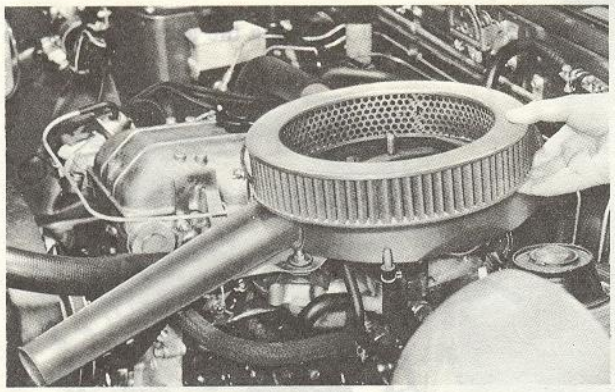


Fig. 4–9 Removing element

4–F. ACCELERATOR LINKAGE

Inspect the accelerator linkage for proper installation.

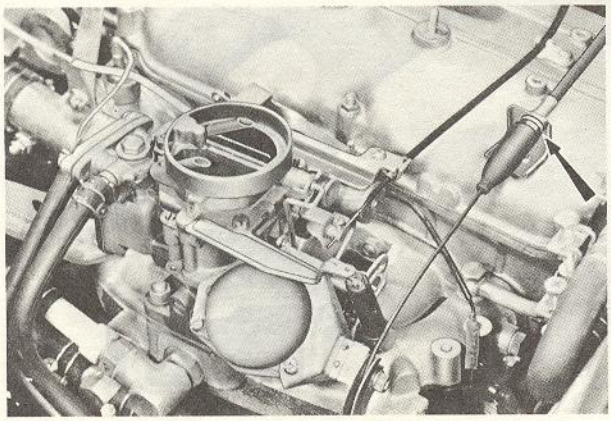


Fig. 4–10 Free play adjusting nut

Remove the air cleaner and, with the accelerator fully depressed, observe the position of the carburetor throttle valves. They should be vertical (wide open position). Check the accelerator to ensure there is sticking or binding and for full return.

4–F–1. Adjusting Accelerator Cable

Adjust the accelerator pedal angle so that the pedal comes **25° 30′** by turning the adjusting screw Ⓐ. The free play of the cable at carburetor side should be **1 ~ 3 mm (0.04 ~ 0.12 in)**, adjust this free play by turning the adjusting nut Ⓑ.

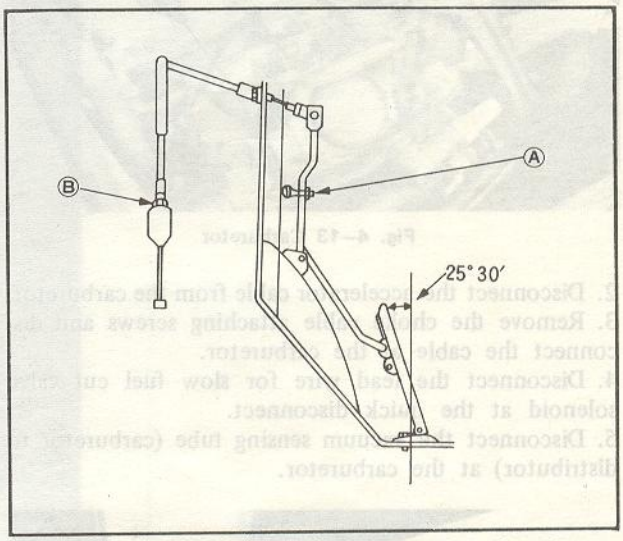


Fig. 4–11 Adjusting pedal angle and cable free play

Fig. 4–12 Pedal angle adjusting screw

4–G. CARBURETOR

4–G–1. Removing Carburetor

1. Remove the air cleaner and duct assembly.

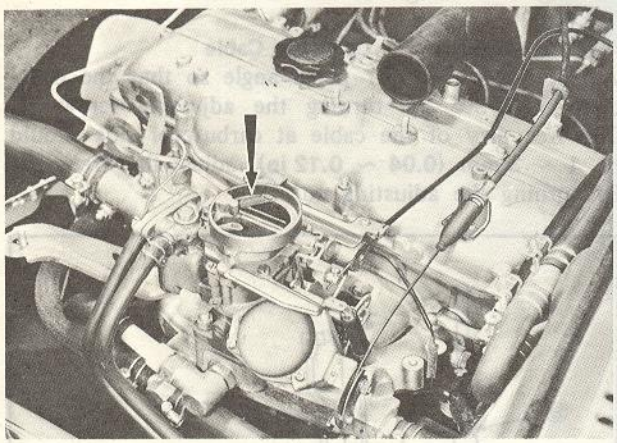


Fig. 4–13 Carburetor

2. Disconnect the accelerator cable from the carburetor.
3. Remove the choke cable attaching screws and disconnect the cable at the carburetor.
4. Disconnect the lead wire for slow fuel cut valve solenoid at the quick disconnect.
5. Disconnect the vacuum sensing tube (carburetor to distributor) at the carburetor.

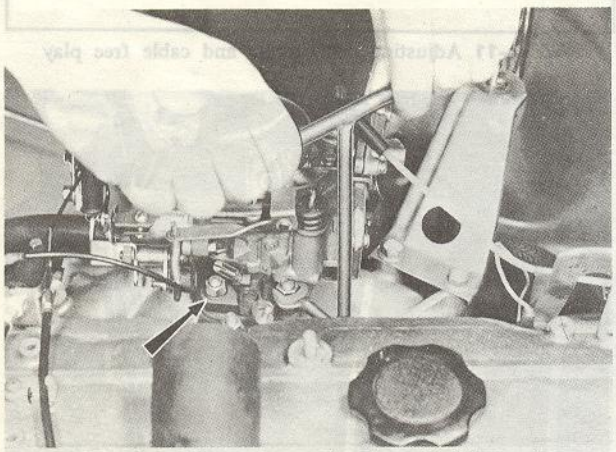


Fig. 4–14 Removing carburetor attaching nuts

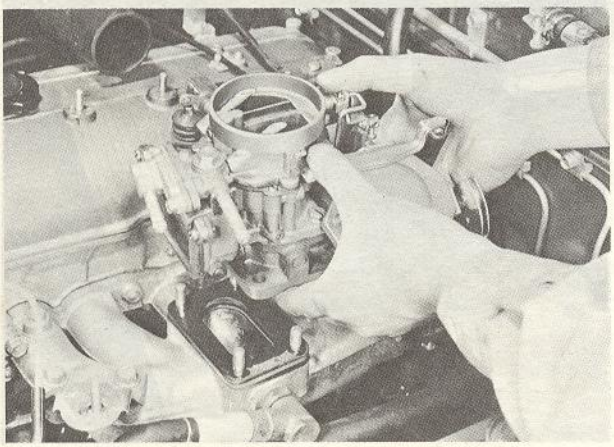


Fig. 4–15 Removing carburetor

6. Disconnect the fuel inlet hose (carburetor to fuel pump) and fuel return hose (carburetor to fuel tank) at the carburetor.
7. Using a tool as shown in Fig. 4–14, remove the carburetor attaching nuts from the intake manifold studs. Remove the carburetor, gaskets and insulator. After removing the carburetor, cover the intake port of the manifold with a clean shop towel to prevent dust or dirt from entering.

4–G–2. Disassembling Carburetor

1. Unhook the throttle return spring from the bracket.

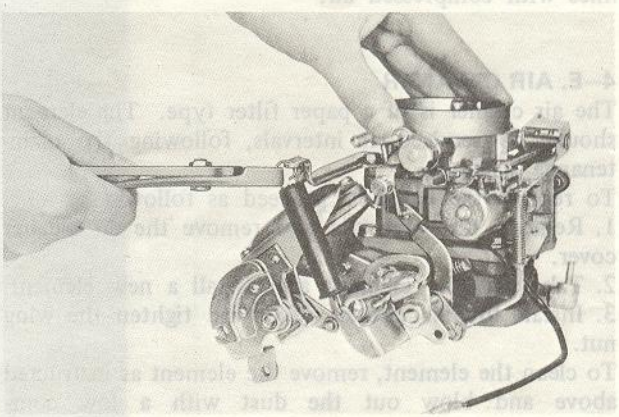


Fig. 4–16 Removing throttle return spring

2. Remove the retainer attaching the accelerating pump lever to the main body.

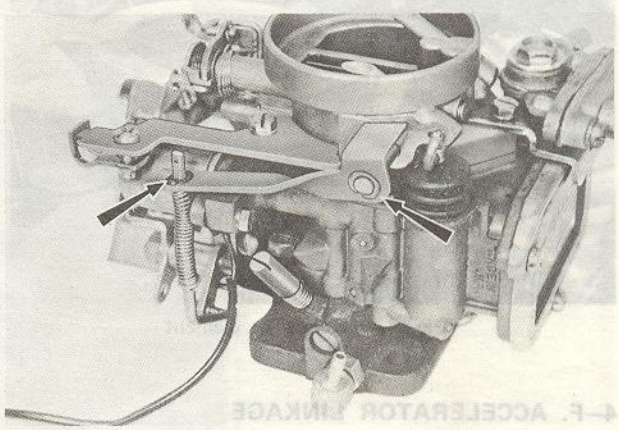


Fig. 4–17 Removing retaining clip and cotter pin

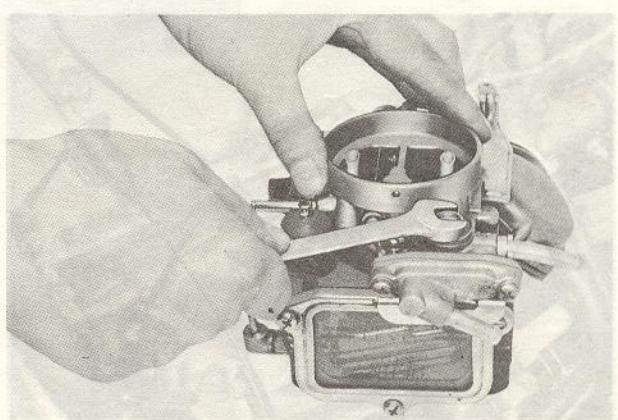


Fig. 4–18 Removing fuel inlet bolt and return valve

3. Remove the cotter pin and washer attaching the pump connecting rod to the pump lever. **Do not** lose the spring and washer from the end of the rod. Disconnect the rod from the pump lever and remove the lever.
4. Remove the fuel inlet bolt, fuel strainer and fuel return valve assembly from the main body.
5. Disconnect the fast idle rod from the fast idle lever by removing the retainer.

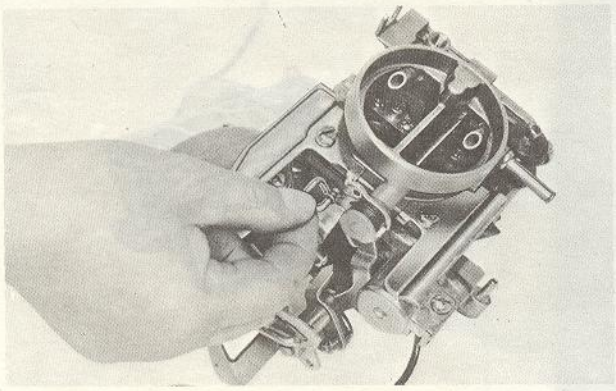


Fig. 4–19 Disconnecting fast idle rod

6. Remove the screws attaching the air horn to the main body and remove the air horn, choke cable support bracket and throttle return spring support bracket.
7. Remove the three screws attaching the throttle body to the main body and remove the throttle body from the main body.

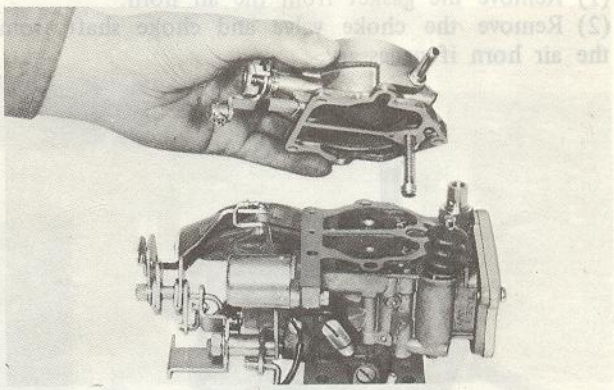


Fig. 4–20 Removing air horn

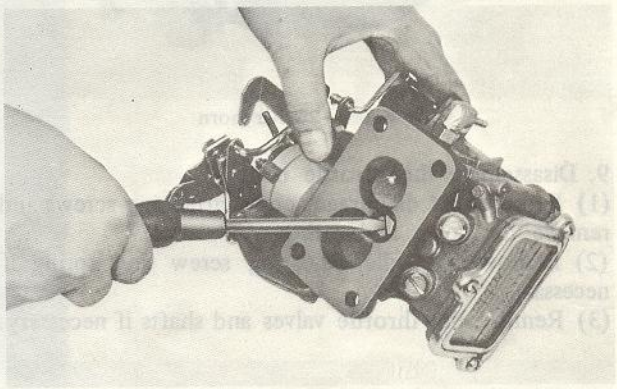


Fig. 4–21 Removing throttle body

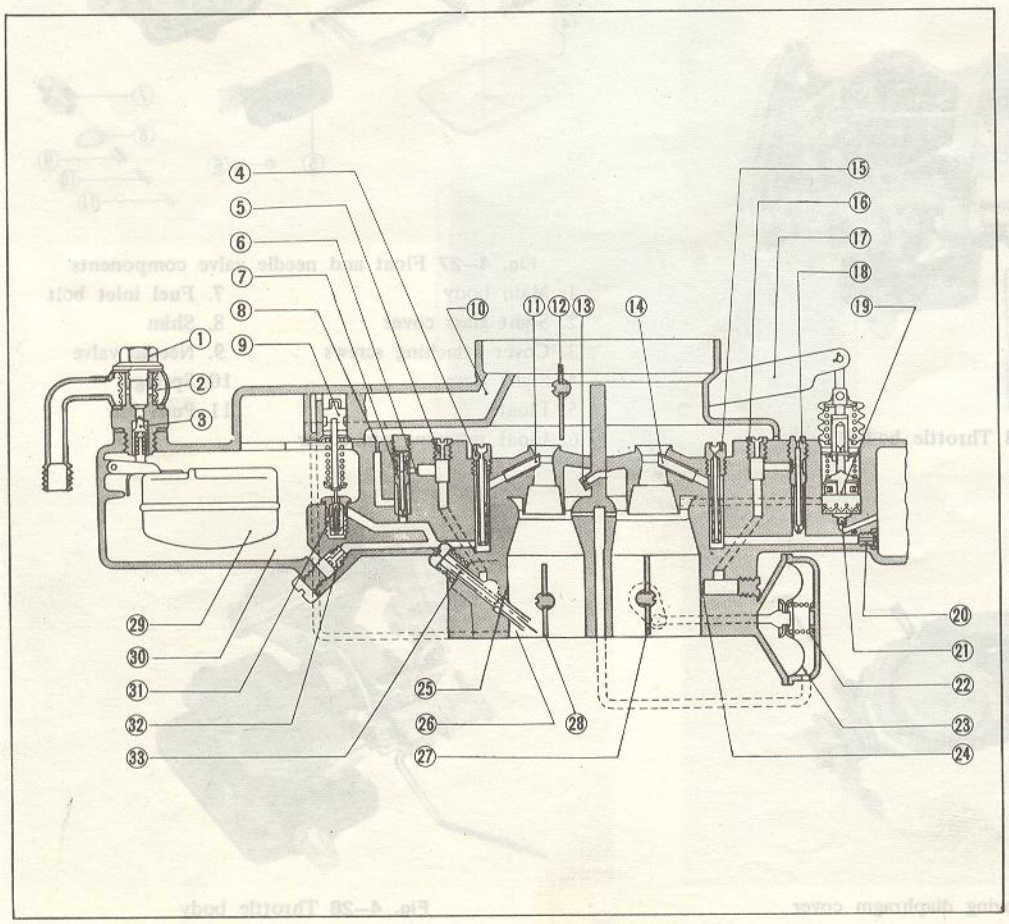


Fig. 4–22 Carburetor cross section

1. Fuel inlet bolt
2. Fuel strainer
3. Needle valve assembly
4. Primary main air bleed
5. Primary No. 2 air bleed
6. Slow economizer
7. Primary slow jet
8. Primary No. 1 air bleed
9. Vacuum piston
10. Air vent
11. Primary main nozzle
12. Choke valve
13. Accelerating pump injection nozzle
14. Secondary main nozzle
15. Secondary main air bleed
16. Secondary slow air bleed
17. Accelerating pump lever
18. Secondary slow air bleed
19. Accelerating pump piston
20. Secondary main jet
21. Pump inlet check ball
22. Spring
23. Diaphragm
24. Secondary slow port
25. Slow port
26. Idle port
27. Secondary throttle valve
28. Primary throttle valve
29. Float
30. Float chamber
31. Power valve
32. Primary main jet
33. Idle adjusting screw

ELECTRICAL SYSTEM

DESCRIPTION

The engine electrical systems are the charging system, starting system and ignition system. Service information for these systems are included in this section.

5–A. BATTERY

This model is equipped with a 12 volt battery consisting of six cells. Its capacity is 50 ampere hours of 20 hour rating.

5–A–1. Checking Battery

As the battery has many important functions to engine start, ignition and lighting, check the following points periodically and always keep the battery in perfect condition.

1. Check the electrolyte level in each cell of the battery, and add distilled water to the **upper level line** marked on the battery. **Do not** overfill.
2. Check the specific gravity of the electrolyte with a hydrometer.

If the reading is below the specification, the battery requires recharging.

3. Check the tightness of the terminals to ensure good electrical connections. Clean the terminals and coat the terminals with grease.
4. Inspect for corroded or frayed battery cables.

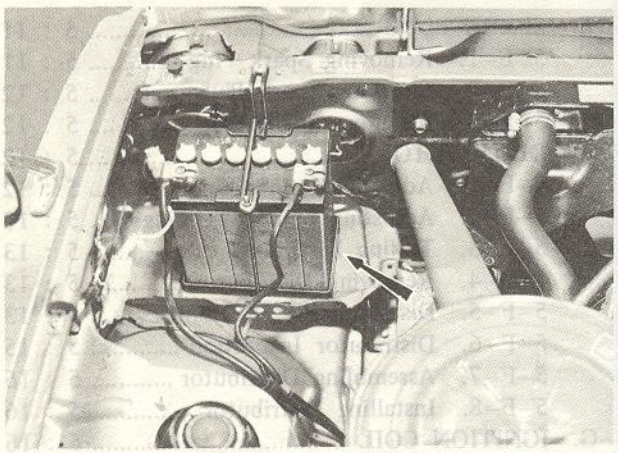


Fig. 5–1 Battery installed

5–A–2. Charging Battery

a. Constant current charge

1. If the exterior of the battery is dirty with sulphuric acid or dust and dirt, wash these off with clean water and dry thoroughly before charging the battery.
2. Check the electrolyte level and add distilled water if necessary.

Note :

If addition of distilled water is neglected, the plates and separators will become exposed to air, causing a sulphation to occur on the plates.
Do not add dilute sulphuric acid unless the electrolyte has overflowed or leaked out.

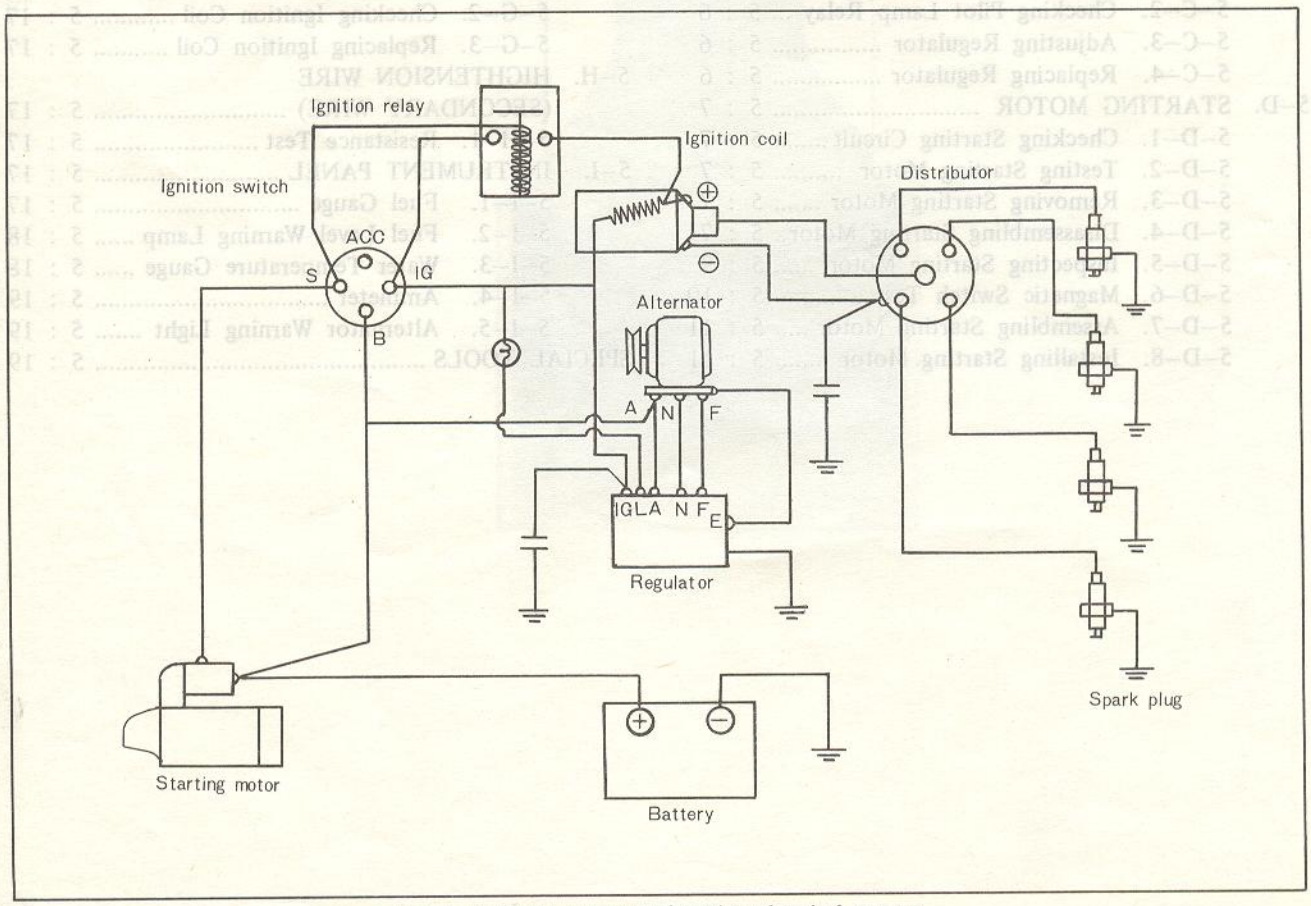


Fig. 5–2 Wiring diagram of engine electrical system

3. Connect the battery to the charger, ensuring that the polarities are correct.
4. To charge, apply an electric current of approximately 5A until the specific gravity of the electrolyte reaches 1.26 ~ 1.28.

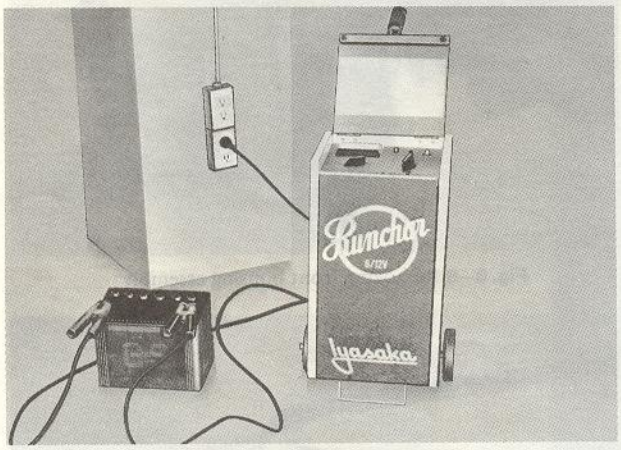


Fig. 5–3 Charging battery

b. Fast charge

As a fast charge causes both the temperature and the level of the electrolyte to rise suddenly, it does not have a favorable effect on the battery. Therefore, this should not be performed unless in the case of an emergency.

To charge with a fast charger, follow the instructions of the manufacturer.

Note :

1. Ensure that the cables are removed from the battery terminals before the charge is applied. If this is neglected, it could cause a damage to the diodes on the alternator.
2. The battery should be kept by the use of cooling water to prevent the temperature of the electrolyte from exceeding 55°C (131°F), otherwise the charging should be discontinued temporarily when the temperature rises above this point.

5–B. ALTERNATOR

5–B–1. Precautions on Service

When servicing the charging system, observe the following precaution. If not followed, the result will be in serious damage of the system.

1. **Do not** short across or ground any of the terminals on the alternator.
2. **Never** operate the alternator on an open circuit (with the field terminal connected and the armature terminal disconnected).
3. When installing the battery, always make sure that the negative post of the battery is attached securely to the nagative cable.
4. **Never** reverse battery cables, even for an instant, as the reverse .polarity current flow will damage the diodes in the alternator.
5. When charging the battery with a fast charger, disconnect the positive cable at the battery.
6. Check the "V" belt tension and adjust it to specification if necessary.

5–B–2. Checking Charging System on Car

If the electrical system is not charging properly, it is advisable to determine whether the trouble is in the alternator or regulator prior to removing the alternator.

1. Disconnect the wire from "B" terminal of the alternator and connect the ammeter with the negative lead of the ammeter to the wire and the positive lead to the "B" terminal, as shown in Fig. 5–4.
2. Disconnect the coupler from the regulator. Connect the disconnected couplers with the suitable wires.
3. Start the engine and take a reading of the ammeter, holding the engine speed to 2,000 rpm.
4. Disconnect the wire from the "F" terminal and short-circuit the wire to the "A" terminal for a moment.
5. If the meter reading increases remarkably, the trouble is in the regulator and if there is no change in current, it is in the alternator.

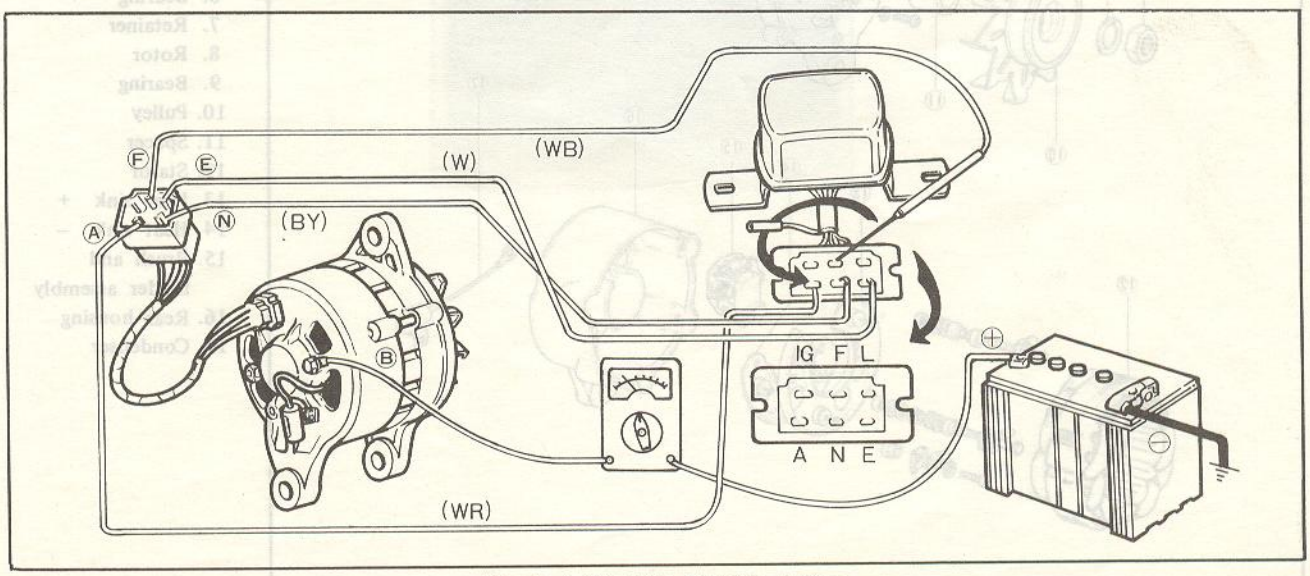


Fig. 5–4 Checking charging system

5–B–3. Removing Alternator

1. Open the hood and disconnect the negative cable at the battery.
2. Disconnect the wires at the alternator "B" terminal by removing the nut. Pull the multiple connector from the rear of the alternator.
3. Remove the alternator strap bolt.
4. Remove the alternator mounting bolts, and remove the alternator from the vehicle.

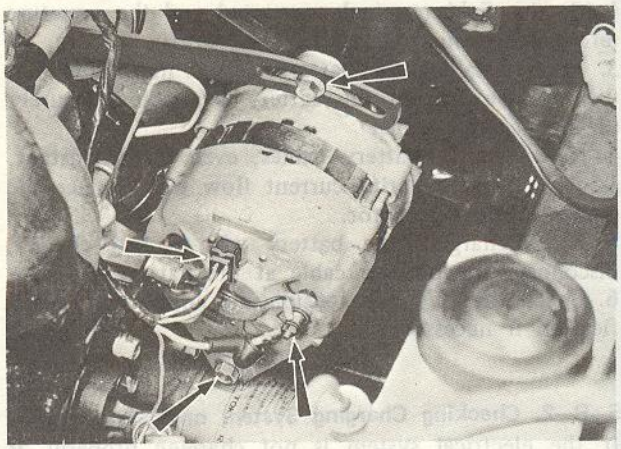


Fig. 5–5 Removing alternator

5–B–4. Disassembling Alternator

1. Remove the through bolts.
2. Separate the front housing assembly by prying apart with a screwdriver at the slots of the front housing.
3. Place the front housing and rotor assembly in a vise. Clamp the assembly on the rotor.

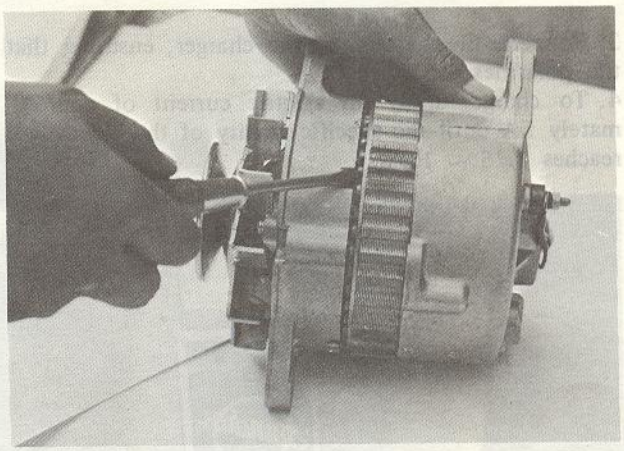


Fig. 5–6 Removing front housing assembly

Fig. 5–7 Loosensing pulley nut

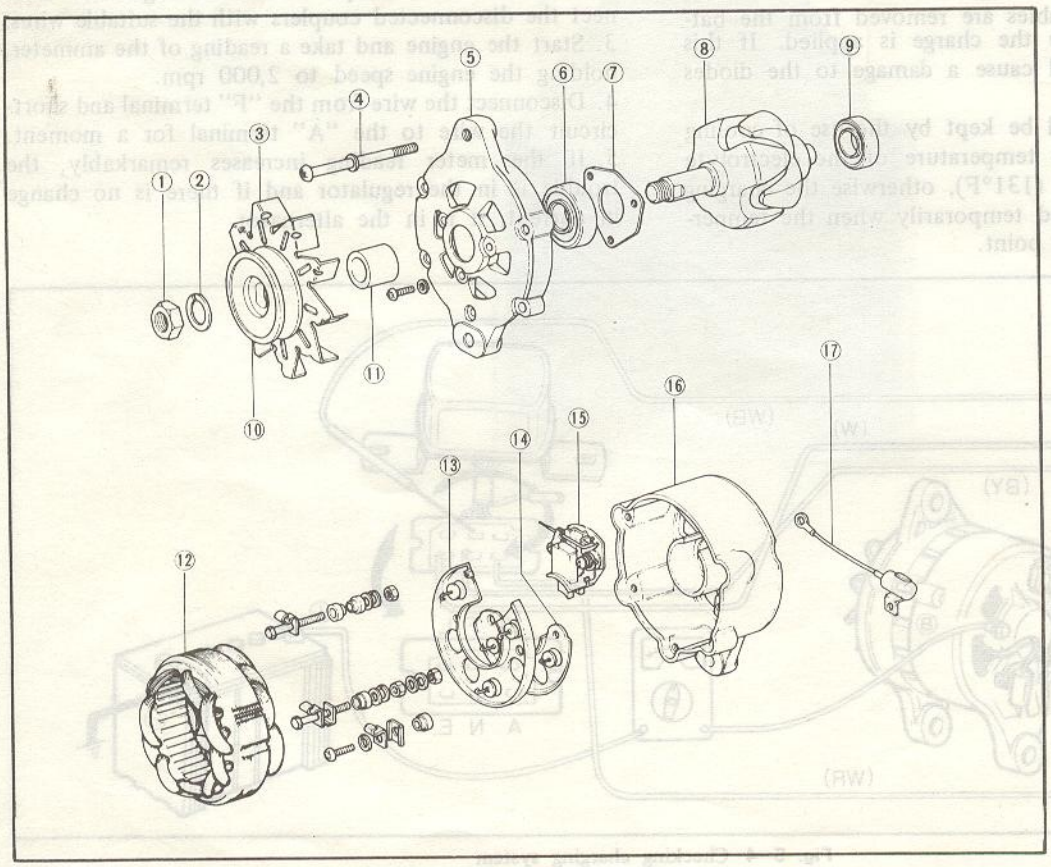


Fig. 5–8
Alternator components

1. Nut
2. Washer
3. Fan
4. Through bolt
5. Front housing
6. Bearing
7. Retainer
8. Rotor
9. Bearing
10. Pulley
11. Spacer
12. Stator
13. Heat sink +
14. Heat sink –
15. Brush and holder assembly
16. Rear housing
17. Condenser

4. Remove the nut and washer attaching the pulley to the shaft. Remove the pulley, fan and spacer.
5. Remove the front housing from the rotor.

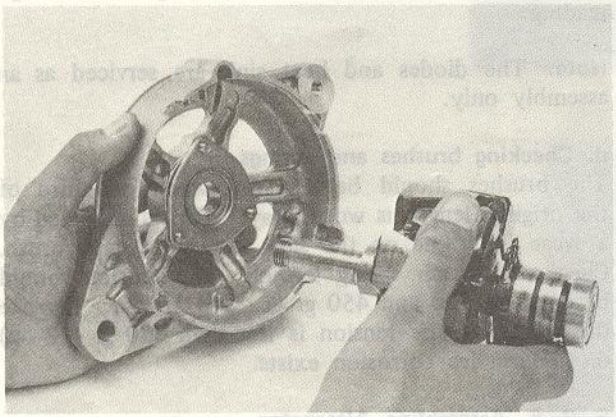


Fig. 5–9 Removing front housing from rotor

6. Remove the radio noise suppression condenser from the rear of the alternator.
7. Remove the nut, washers and insulator from the "B" terminal at the rear of the alternator.
8. Remove the three screws attaching the heat sinks to the rear housing.

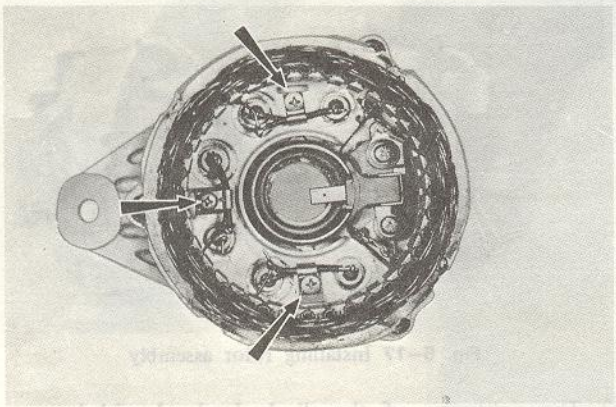


Fig. 5–10 Removing heat sink attaching screws

9. Unscrew but do not remove the two brush holder attaching screws. The screws will help to retain the terminals in the brush holder during removal of the

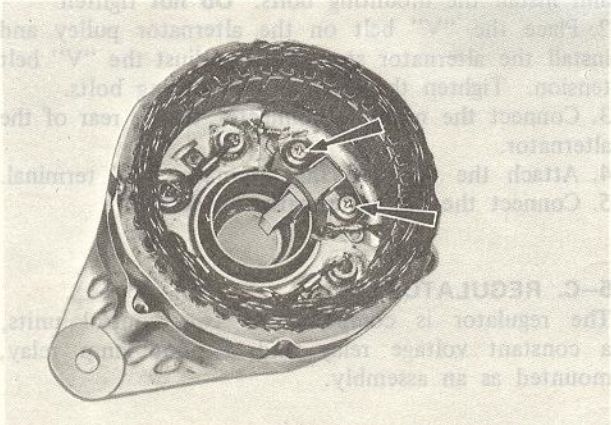


Fig. 5–11 Loosening brush holder attaching screws

stator and attached parts.
10. Carefully remove the stator, heat sinks and brush holder assembly from the rear housing. Use care to keep the brush holder assembly intact during removal from the rear housing.
11. Unsolder the stator leads from the diodes and brush holder assembly. Remove the heat sinks and brush holder assembly from the stator.
12. If bearing replacement is necessary, remove the rear bearing from the rotor shaft with a puller.
To replace the front bearing, remove the bearing retainer attaching screws, and press the bearing from the front housing.

5–B–5. Inspecting Alternator

a. Checking stator coil
Check the stator coil for both open and grounded circuits with an ohmmeter.
To check for open, connect the prods to each of the two leads, as shown in Fig. 5–12. If there is no flow of current, the coil is open circuit and must be repaired or replaced.

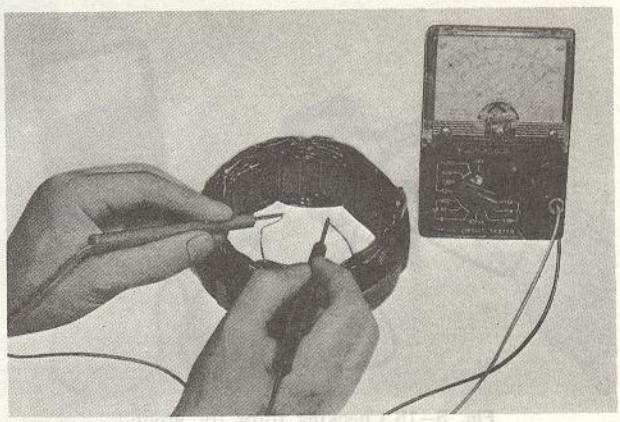


Fig. 5–12 Checking stator coil for open

To check for ground, connect one prod to the core and the other to each lead wire, as shown in Fig. 5–13. If a ground is present, the current will flow and the stator coil must be repaired or replaced.

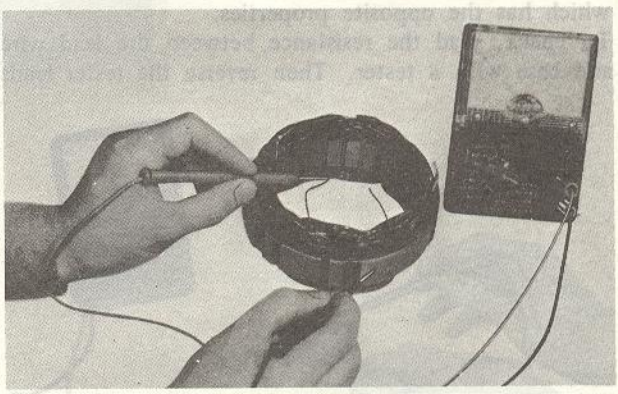


Fig. 5–13 Checking stator coil for ground

b. Checking rotor
To check for open circuit, place both prods of an

ohmmeter on the slip rings, as shown in Fig. 5–14. If the reading is 4 to 6 ohms, there is no trouble in the rotor.

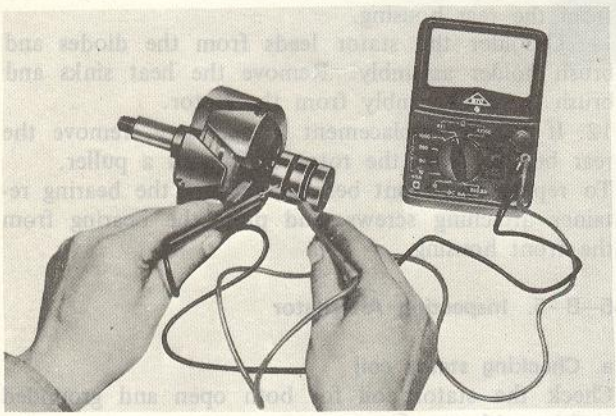


Fig. 5–14 Checking rotor for open

To check for ground, connect one prod to the slip ring and other prod to the core. If the current flows, the rotor must be repaired or replaced.

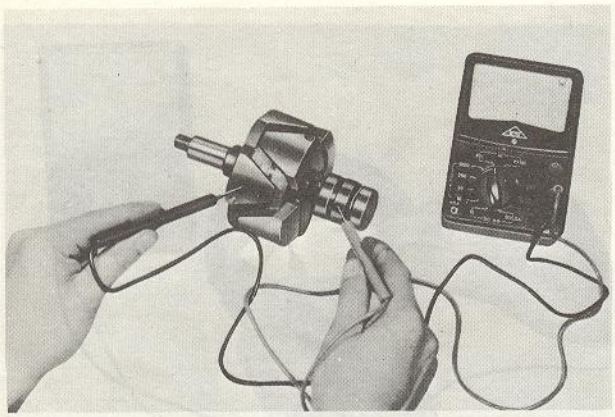


Fig. 5–15 Checking rotor for ground

c. Checking diodes

Diodes for use in the alternator are available in two different types, the positive diode which allows current to flow from the lead wire to the case but not from the case to the lead wire and the negative diode which has the opposite properties.

To check, read the resistance between the lead wire and case with a tester. Then reverse the tester leads and note the reading. If both readings are very low or high, the diode is defective.

A good diode will give one low reading and one high reading.

Fig. 5–16 Checking diode

Note: The diodes and heat sink are serviced as an assembly only.

d. Checking brushes and springs

The brushes should be replaced when one-third of the original length is worn away. This is indicated by a wear limit line on the side surface of each brush. Check the brush spring tension. The tension should be between 330 and 450 gr (12 and 16 oz). Replace the springs if the tension is less than 330 gr (12 oz) or if excessive corrosion exists.

5–B–6. Assembling Alternator

Assemble the alternator in the reverse order of disassembling, noting the following points.

1. When installing the rotor assembly to the rear housing and stator assembly, hold the brushes in position by inserting a piece of stiff wire into the hole of the brush through the rear housing as shown in Fig. 5–17.

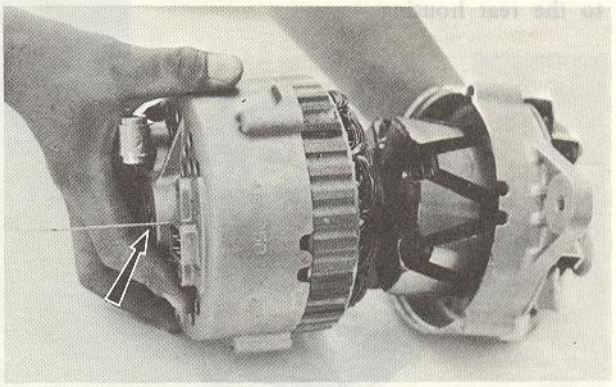


Fig. 5–17 Installing rotor assembly

2. The soldering of the diode leads should be performed in **less than twenty seconds** as the excessive heat may damage the diode.

5–B–7. Installing Alternator

1. Position the alternator to the mounting bracket and install the mounting bolts. **Do not** tighten.
2. Place the "V" belt on the alternator pulley and install the alternator strap bolt. Adjust the "V" belt tension. Tighten the alternator mounting bolts.
3. Connect the multiple connector to the rear of the alternator.
4. Attach the wires to the alternator "B" terminal.
5. Connect the battery negative cable.

5–C. REGULATOR

The regulator is composed of two control units, a constant voltage relay and a pilot lamp relay, mounted as an assembly.

5–C–1. Checking Constant Voltage Relay

To check, use an almost fully charged battery and

connect a voltmeter between the "A" and "E" terminals of the regulator, as shown in Fig. 5–18.
Then, hold the alternator revolution to 4,000 rpm (engine revolution 2,000 rpm) and take a reading of the voltmeter. If the reading is from **14.0 to 15.0 volts,** it is in proper order. If it is not within the specifications, the voltage relay must be adjusted, as instructed in Par. 5–C–3.

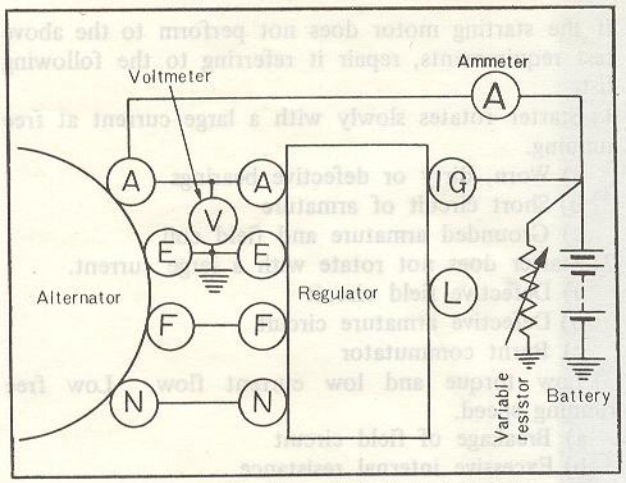


Fig. 5–18 Checking constant voltage relay

5–C–2. Checking Pilot Lamp Relay

Make a circuit, as shown in Fig. 5–19, using a voltmeter and variable resistor, and light up the pilot lamp. Then, slide the knob of the variable resistor so that the voltage gradually increases.
Read the voltage between the "N" and "E" terminal when the lamp goes out. If this voltage is **3.7 to 5.7 volts**, it is normal.
Next, slide the knob to gradually reduce the voltage and the lamp will light again. If the reading is **less than 3.5 volts** at this time, it is proper.

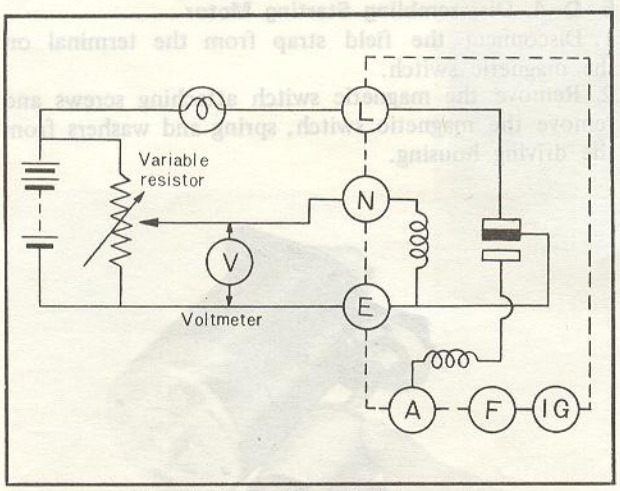


Fig. 5–19 Checking pilot lamp relay

5–C–3. Adjusting Regulator

First, check the air gap, back gap and point gap with a wire gauge. If they are not within the specifications, adjust by bending the stationary contact bracket.
After correct gaps are obtained, adjust the voltage

Constant voltage relay

Air gap	0.7 ~ 1.3 mm (0.028 ~ 0.051 in)
Point gap	0.3 ~ 0.45 mm (0.012 ~ 0.018 in)
Back gap	0.7 ~ 1.5 mm (0.028 ~ 0.059 in)

Pilot lamp relay

Air gap	0.9 ~ 1.4 mm (0.035 ~ 0.055 in)
Point gap	0.7 ~ 1.1 mm (0.028 ~ 0.043 in)
Back gap	0.7 ~ 1.5 mm (0.028 ~ 0.059 in)

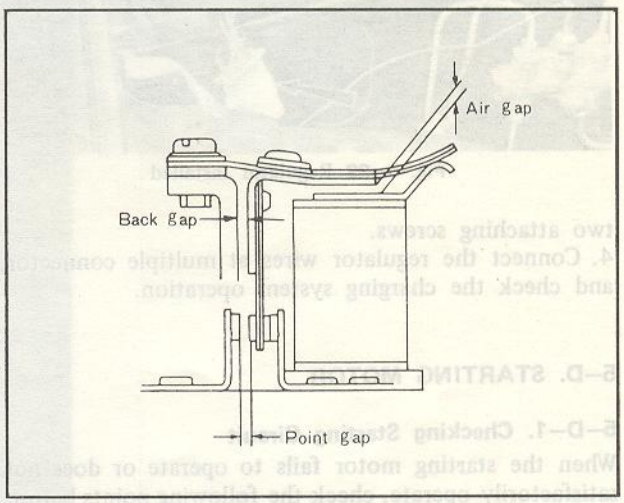


Fig. 5–20 Gaps of regulator

setting. Bend the upper plate down to decrease the voltage setting, up to increase the voltage setting.
In case of the pilot lamp relay, if the voltage when the lamp lights up is adjusted to the specification, the voltage when the lamp goes out may be within the specification.

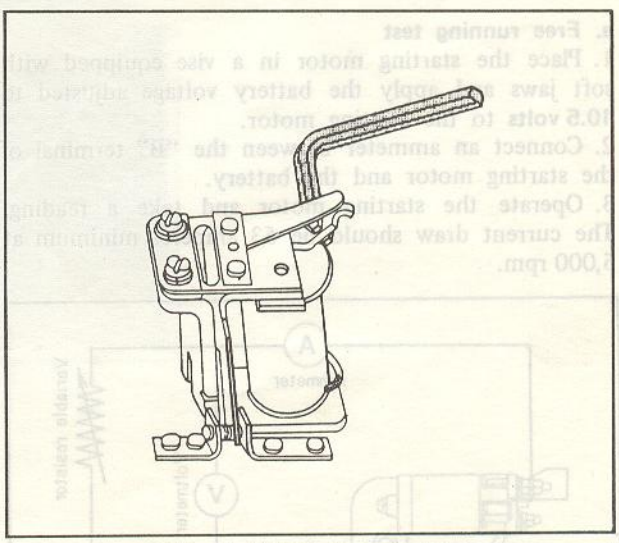


Fig. 5–21 Adjusting regulator

5–C–4. Replacing Regulator

1. Disconnect the regulator wires at the multiple connector.
2. Remove the two regulator attaching screws and remove the regulator.
3. Position the regulator to the body and install the

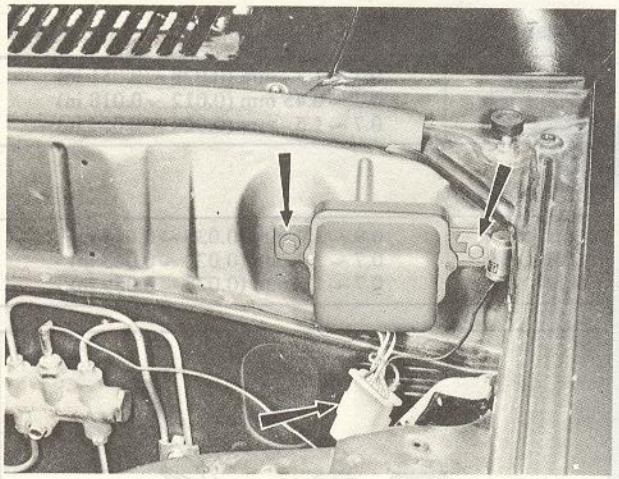


Fig. 5–22 Regulator installed

two attaching screws.
4. Connect the regulator wires at multiple connector, and check the charging system operation.

5–D. STARTING MOTOR

5–D–1. Checking Starting Circuit

When the starting motor fails to operate or does not satisfactorily operate, check the following points before removing the starting motor:
1. Weak battery
2. Corroded or loose battery terminal
3. Loose starting motor terminal
4. Broken or loose wires of the starting circuit
5. Faulty ignition switch

5–D–2. Testing Starting Motor

a. Free running test

1. Place the starting motor in a vise equipped with soft jaws and apply the battery voltage adjusted to **10.5 volts** to the starting motor.
2. Connect an ammeter between the "B" terminal of the starting motor and the battery.
3. Operate the starting motor and take a reading. The current draw should be 53 amperes minimum at 5,000 rpm.

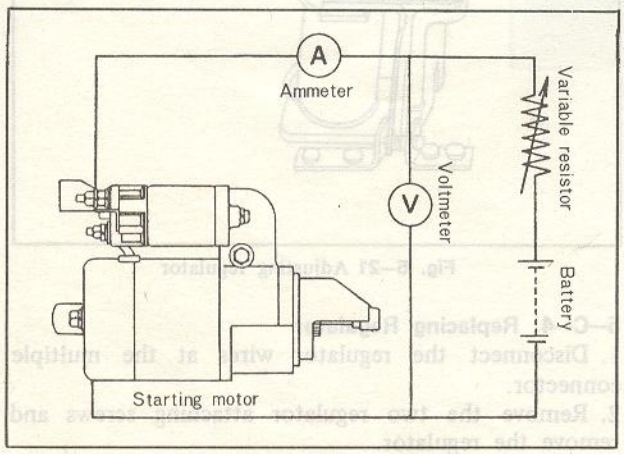


Fig. 5–23 Free running test

b. Lock resistance test

1. Install the starting motor on a test bench.
2. Test the lock resistance of the starting motor, following the instructions of the test equipment manufacturer.
3. With applied battery voltage adjusted to 6.0 volts, the current flow should be 400 amperes and the torque should be 0.93 m-kg (6.7 ft-lb).

If the starting motor does not perform to the above test requirements, repair it referring to the following list.

1) Starter rotates slowly with a large current at free running.
   a) Worn, dirty or defective bearings
   b) Short circuit of armature
   c) Grounded armature and field coil
2) Starter does not rotate with a large current.
   a) Defective field circuit
   b) Defective armature circuit
   c) Burnt commutator
3) Low torque and low current flow. Low free running speed.
   a) Breakage of field circuit
   b) Excessive internal resistance
4) Low torque. High free running speed.
   a) Short circuit of field coil

5–D–3. Removing Starting Motor

1. Disconnect the negative cable from the battery.
2. Disconnect the battery cable from the magnetic switch "B" terminal, and pull the ignition switch wire from the magnetic switch "S" terminal.
3. Working under the vehicle, remove the two bolts attaching the starting motor.
4. Tilt the drive end of the starting motor down and remove the starting motor.

5–D–4. Disassembling Starting Motor

1. Disconnect the field strap from the terminal on the magnetic switch.
2. Remove the magnetic switch attaching screws and remove the magnetic switch, spring and washers from the driving housing.

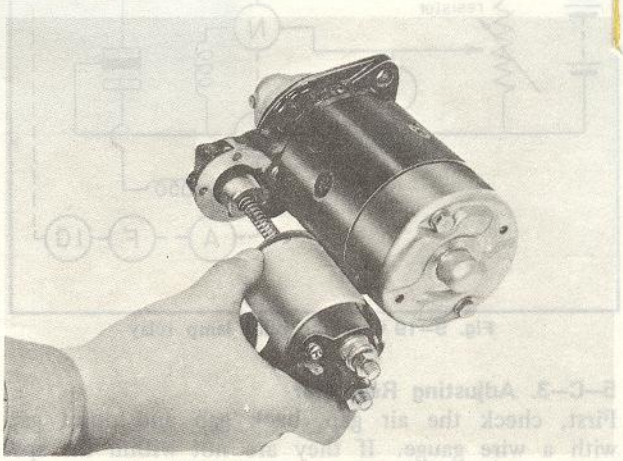


Fig. 5–24 Removing magnetic switch

3. Remove the plunger from the driving lever.

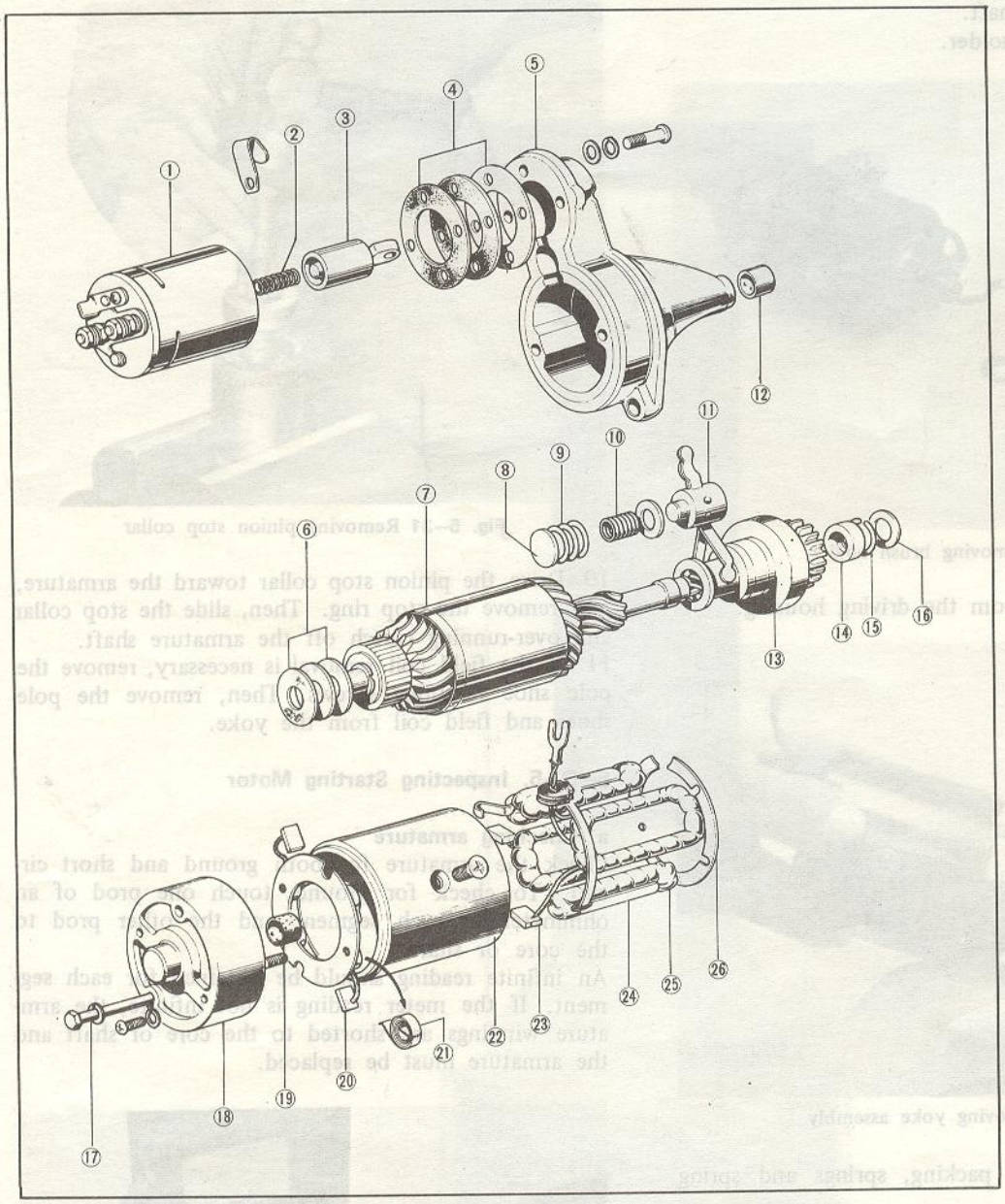


Fig. 5–26 Starting motor components
1. Magnetic switch
2. Spring
3. Plunger
4. Washer
5. Driving housing
6. Washer
7. Armature
8. Rubber packing
9. Spring
10. Spring
11. Driving lever
12. Front bush
13. Over-running clutch
14. Stop collar
15. Stop ring
16. Washer
17. Through bolt
18. Rear cover
19. Rear bush
20. Brush
21. Brush spring
22. Yoke
23. Brush
24. Pole core
25. Field coil
26. Gasket

4. Remove the through bolts and brush holder attaching screws. Then, remove the rear cover.

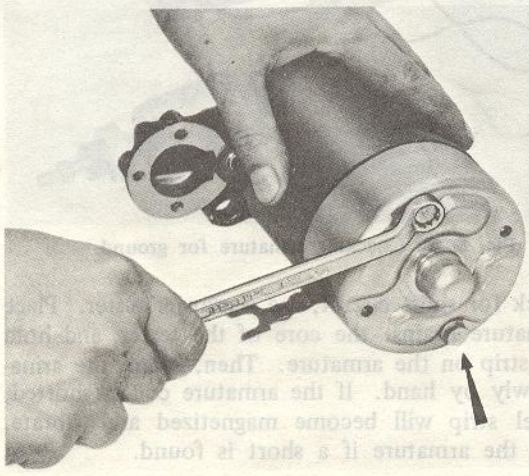


Fig. 5–25 Removing through bolts

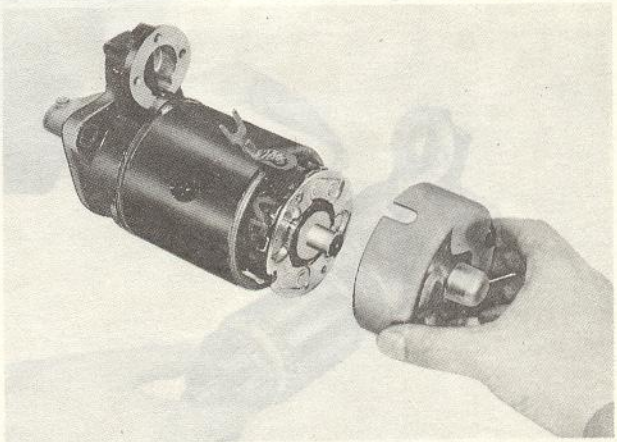


Fig. 5–27 Removing rear cover

5. Remove the insulator and washer from the rear

end of the armature shaft.
6. Remove the brush holder.

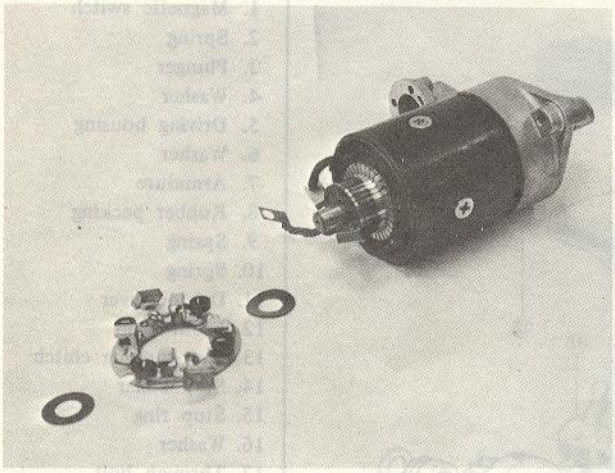


Fig. 5–28 Removing brush holder

7. Separate the yoke from the driving housing.

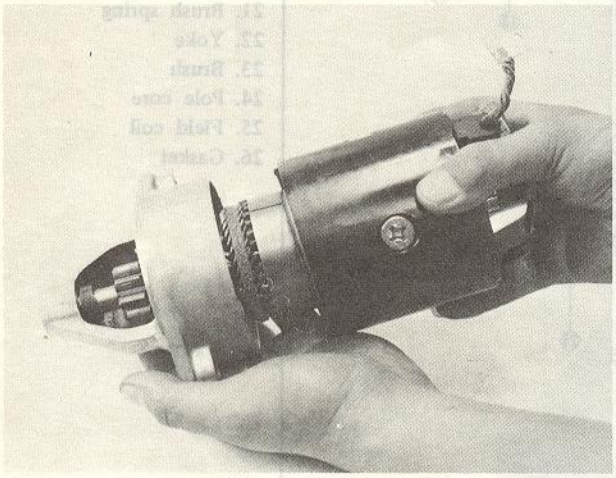


Fig. 5–29 Removing yoke assembly

8. Remove the rubber packing, springs and spring seat.
9. Remove the armature and over-running clutch assembly and driving lever from the driving housing.

Fig. 5–30 Removing armature and driving lever

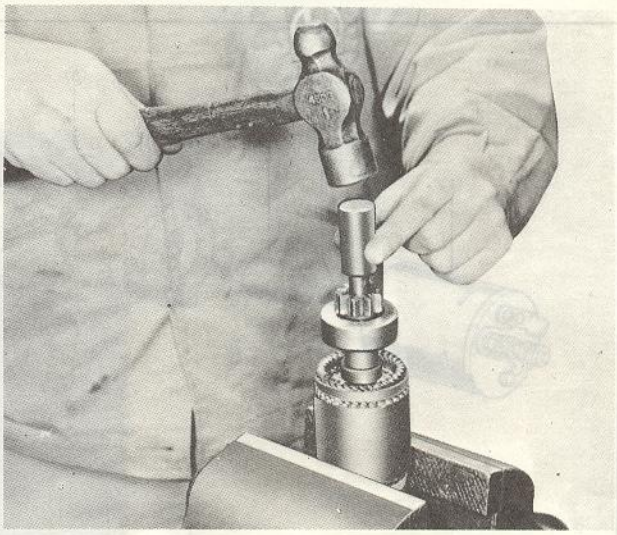


Fig. 5–31 Removing pinion stop collar

10. Drive the pinion stop collar toward the armature, and remove the stop ring. Then, slide the stop collar and over-running clutch off the armature shaft.
11. If the field coil removal is necessary, remove the pole shoe retaining screws. Then, remove the pole shoes and field coil from the yoke.

5–D–5. Inspecting Starting Motor

a. Checking armature

Check the armature for both ground and short circuit. To check for ground, touch one prod of an ohmmeter to each segment and the other prod to the core or shaft.
An infinite reading should be obtained for each segment. If the meter reading is not infinite, the armature windings are shorted to the core or shaft and the armature must be replaced.

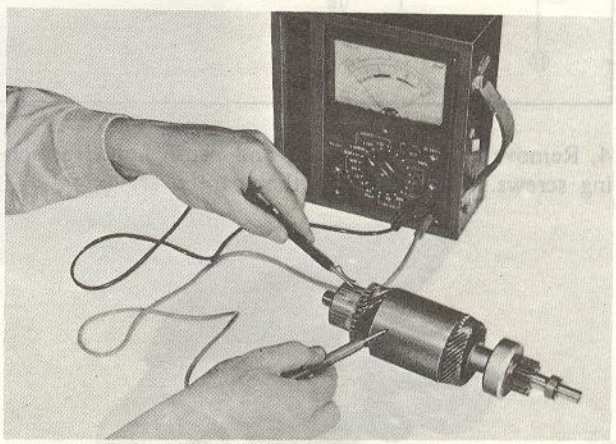


Fig. 5–32 Checking armature for ground

To check for short circuit, use a growler tester. Place the armature against the core of the tester, and hold a steel strip on the armature. Then, rotate the armature slowly by hand. If the armature coil is shorted, the steel strip will become magnetized and vibrate. Replace the armature if a short is found.

b. Checking commutator

If the commutator is dirty, discolored or worn, clean it with emery paper and wash with clean solvent. After cleaning, undercut the mica between the segments to the depth of **0.5 ~ 0.8 mm (0.020 ~ 0.031 in)**, as shown in Fig. 5–34.

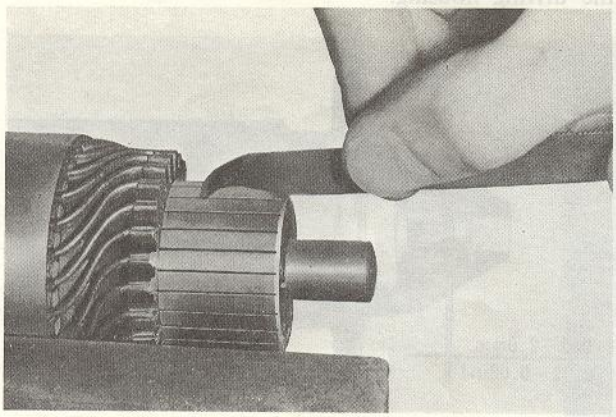


Fig. 5–33 Undercutting mica

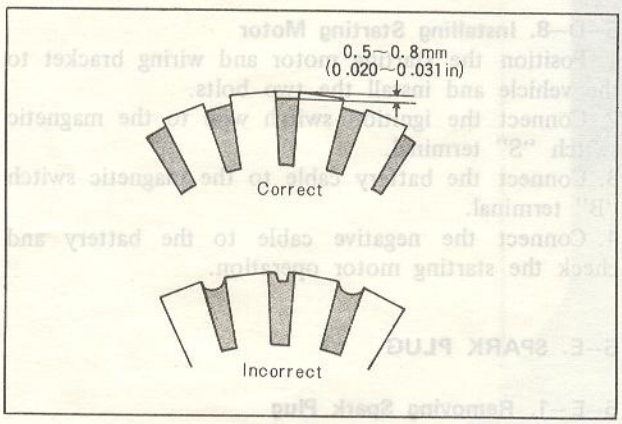


Fig. 5–34 Commutator mica depth

c. Checking field coil

To test the field coil for ground with an ohmmeter, place one prod on the yoke or pole core and the other prod to the field terminal. An infinite meter reading should be obtained. If a reading other than infinite is found, replace the field windings.

To check for open, connect the prods to each of the two leads. If there is no flow of current, the coil is open circuit and must be repaired or replaced.

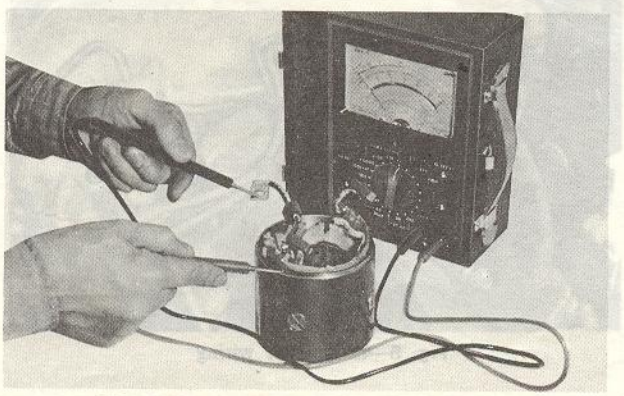


Fig. 5–35 Checking field coil for ground

d. Checking brush holder

Check the brush holder for ground. Touch one prod of an ohmmeter to the insulated brush holder and the other prod to the brush holder frame.

If the meter reading is other than infinite, the brush holder assembly is shorted and must be replaced. Repeat this test for the other insulated brush holder. **Do not** use this test on the two grounded brush holders.

e. Checking brushes and brush springs

Check the brushes and replace if they are worn down more than one third of their original length. Otherwise, the brush spring tension will be reduced, leading to an increase in the brush-commutator contact resistance. This will lower the torque and cause the burnt commutator surface.

The spring tension is 1.4 ~ 1.8 kg (49 ~ 63 oz). If the tension is too low, replace the springs.

f. Checking bushes

Check the clearance between the armature shaft and the bush. If it exceeds 0.2 mm (0.008 in), replace the bush.

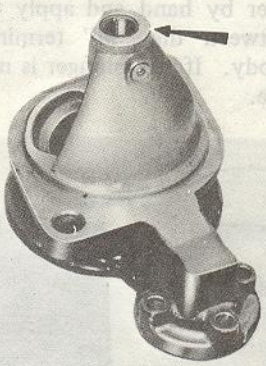


Fig. 5–36 Front bush

5–D–6. Magnetic Switch Test

a. Pull-in coil test

Apply the specified voltage (12V) between the "S" terminal and "M" terminal. If the magnetic switch is forcefully attracted, the pull-in coil is in good condition.

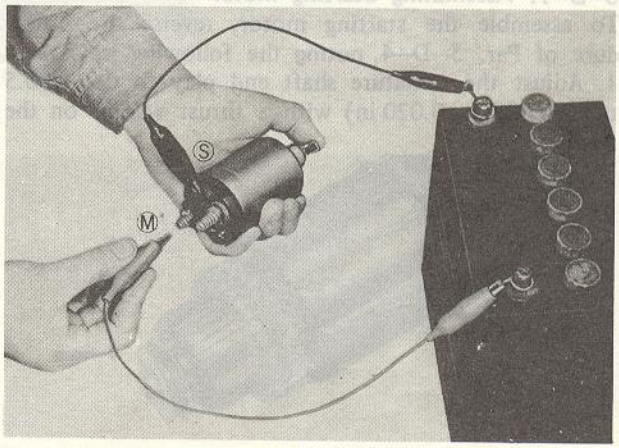


Fig. 5–37 Pull-in coil test

b. Holding coil test

Ground the "M" terminal to the magnetic switch body with a lead and impose the specified voltage (12V) upon the "S" terminal to pull in the plunger. If the plunger remains attracted after disconnecting the lead from the "M" terminal, there is no trouble with the holding coil.

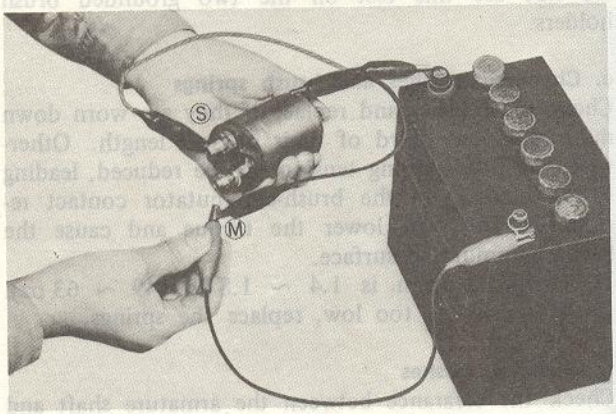


Fig. 5–38 Holding coil test

c. Return test

Push in the plunger by hand and apply the specified voltage (12V) between the "M" terminal and the magnetic switch body. If the plunger is not attracted, there is no trouble.

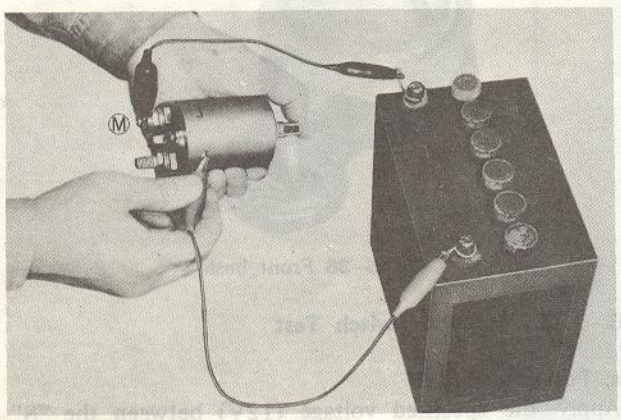


Fig. 5–39 Return test

5–D–7. Assembling Starting Motor

To assemble the starting motor, reverse the procedure of Par. 5–D–4, **noting** the following points.

1. Adjust the armature shaft end play to 0.2 ~ 0.5 mm (0.008 ~ 0.020 in) with a thrust washer on the rear end of the shaft.

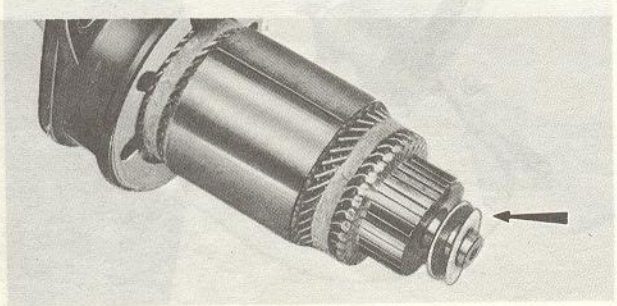


Fig. 5–40 Thrust washer

2. When the magnetic switch is engaged, the clearance between the pinion and stop collar should be 0.5 ~ 2.0 mm (0.02 ~ 0.08 in).
This clearance can be adjusted by inserting the adjusting washer between the magnetic switch body and the driving housing.

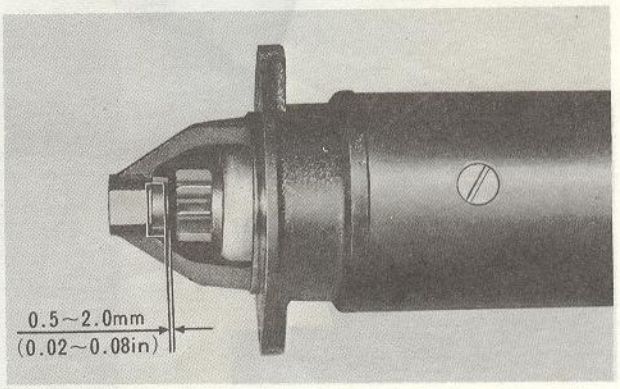


Fig. 5–41 Checking pinion position

5–D–8. Installing Starting Motor

1. Position the starting motor and wiring bracket to the vehicle and install the two bolts.
2. Connect the ignition switch wire to the magnetic switch "S" terminal.
3. Connect the battery cable to the magnetic switch "B" terminal.
4. Connect the negative cable to the battery and check the starting motor operation.

5–E. SPARK PLUG

5–E–1. Removing Spark Plug

Note:

When removing the hightension wires from the spark plugs, grasp, twist and pull the moulded cap only. **Do not pull on the wire** bacause the wire connection inside the cap may become separated.
The ignition wiring installation is shown in Fig. 5–42.

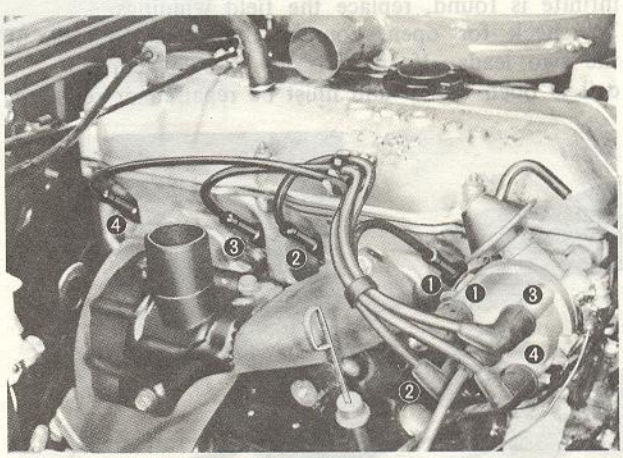


Fig. 5–42 Ignition wiring

1. Disconnect the wire from each spark plug.

2. After loosening each spark plug one or two turns, clean the area around each spark plug port with compressed air, then remove the spark plugs.

5–E–2. Checking Spark Plug

Check the spark plugs for burned and eroded electrode, black deposits, fouling, and cracked porcelain. Clean the spark plugs with a spark plug cleaner or a wire brush if they are fouled.
Replace the badly burned or eroded spark plugs. Measure the electrode gap of each spark plug with a wire gauge, as shown in Fig. 5–43. If it is improper, adjust the gap to the specified **0.8 mm (0.031 in)** by bending the outer electrode.

Fig. 5–43 Checking spark plug gap

5–E–3. Installing Spark Plug

1. Apply **moly paste** (0259 77 767 or 0259 77 768) to the threads of new spark plugs to prevent the threads from damaging.
2. Thread the spark plugs into the head finger tight until the gaskets contact the head. If the plugs cannot be installed with finger pressure, clean the threads with a suitable greased thread chaser.
3. Torque each spark plug to **1.5 ~ 2.1 m-kg (11 ~ 15 ft-lb)**.
4. Connect the spark plug wires.

5–F. DISTRIBUTOR

5–F–1. Adjusting Point Gap

Adjust the point gap as follows :
1. Check the contact points alignment. If necessary, bend the stationary contact bracket so as to obtain contact in the center of the contact points.

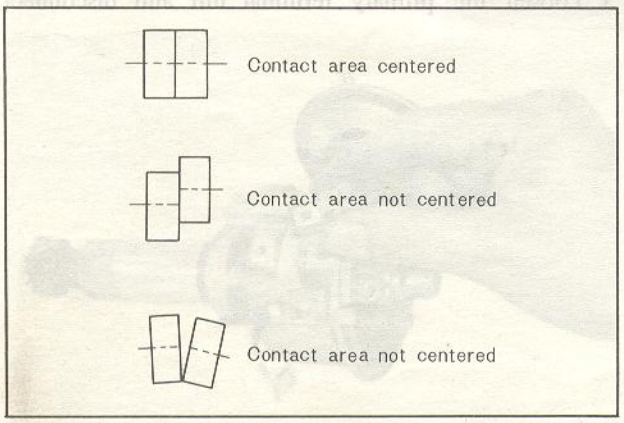


Fig. 5–44 Checking contact points alignment

2. Crank the engine and stop when the rubbing block on the contact arm just rests on the highest point of the cam.
3. Insert a feeler gauge of **0.50 mm (0.020 in)** between the contact points, loosen the two set screws and turn the adjusting screw clockwise or counterclockwise until the correct gap is obtained.

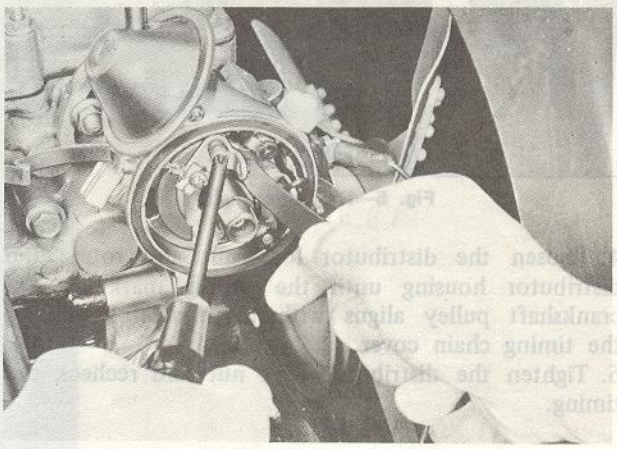


Fig. 5–45 Adjusting point gap

4. Tighten the set screws and recheck the point gap.

5–F–2. Adjusting Ignition Timing

The timing mark and its location is illustrated in Fig. 5–46.

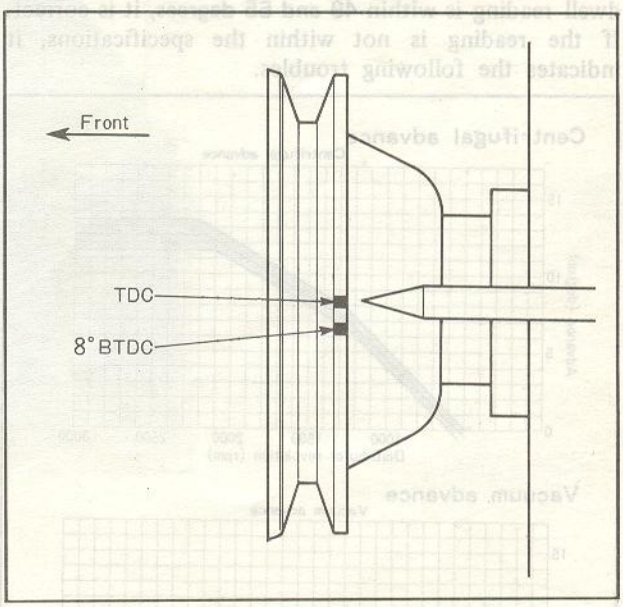


Fig. 5–46 Ignition timing mark

To check and adjust the timing with a timing light, proceed as follows :
1. Connect a timing light to the No. 1 cylinder spark plug. Connect a tachometer to the engine.
2. Start the engine and set the engine idle to 700 rpm.
3. Using the timing light, observe the position of the timing mark.

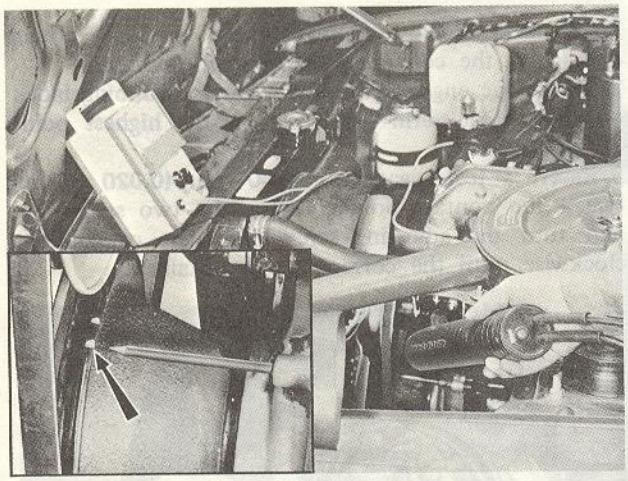


Fig. 5–47 Timing light

4. Loosen the distributor lock nut and rotate the distributor housing until the timing mark on the crankshaft pulley aligns with the indicator pin on the timing chain cover.
5. Tighten the distributor lock nut and recheck the timing.

5–F–3. Testing Distributor

a. Dwell angle test

The dwell angle is degrees of rotation through which the contact points remain closed.
To test the dwell angle, use a distributor tester following the instructions of the manufacturer. If the dwell reading is **within 49 and 55 degrees,** it is correct. If the reading is not within the specifications, it indicates the following troubles.

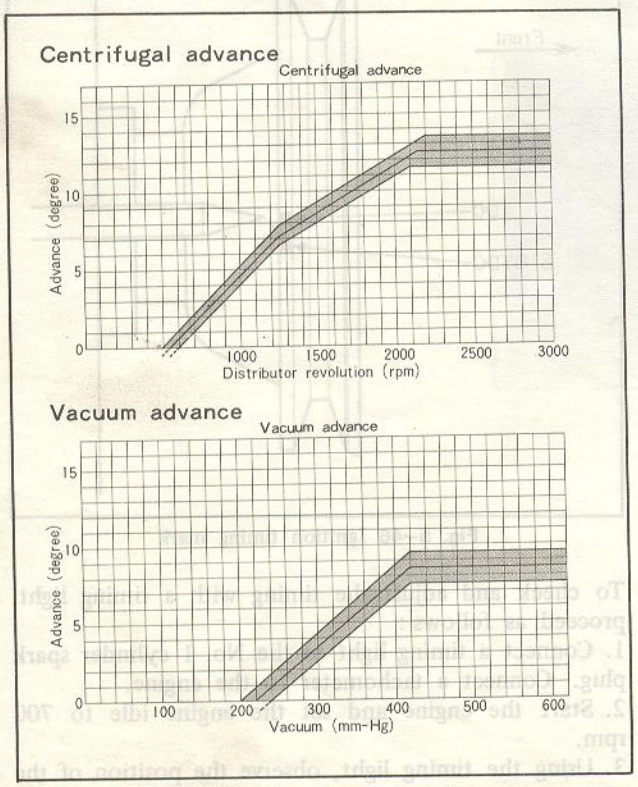


Fig. 5–48 Advancing characteristic

1. Incorrect point gap
2. Worn cam
3. Worn rubbing block
4. Distroted contact arm

b. Advance test

To test the ignition advancing characteristic of the distributor, use a distributor tester.
The advancing characteristic of distributor should be **within the range** shown in Fig. 5–48.

5–F–4. Removing Distributor

1. Remove the distributor cap and disconnect the vacuum sensing tube from the distributor.
2. Scribe a mark on the distributor housing and on the cylinder head indicating the position of the distributor in the head. Scribe another mark on the distributor housing indicating the position of the rotor. These marks should be used as a guide to correctly install the distributor providing it has not been cranked over after the distributor has been removed.

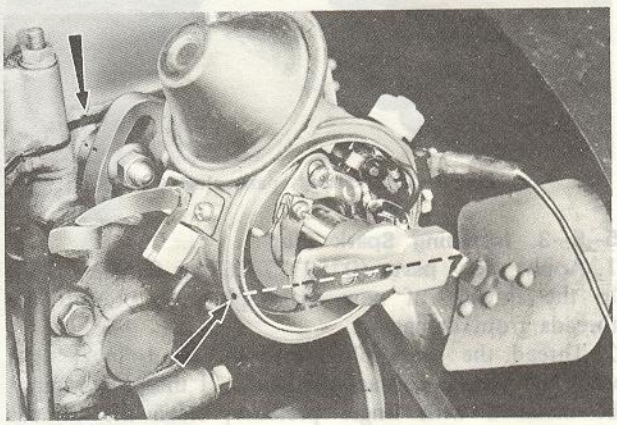


Fig. 5–49 Scribing marks

3. Disconnect the primary wire from the distributor.
4. Remove the distributor attaching nut.
5. Slide the distributor out of the cylinder head. **Do not crank** the engine after the distributor has been removed.

5–F–5. Disassembling Distributor

1. Remove the distributor from the vehicle.
2. Remove the rotor.
3. Loosen the primary terminal nut and disconnect

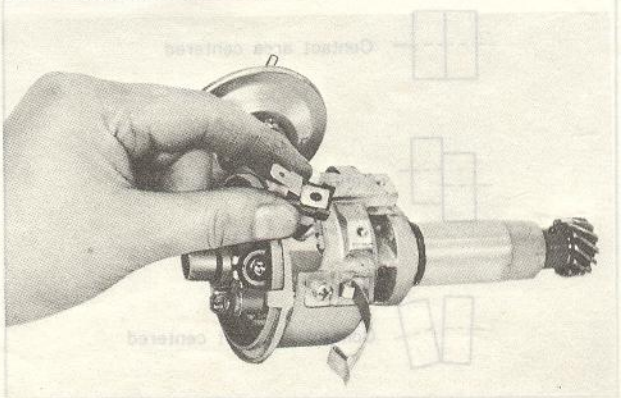


Fig. 5–50 Removing terminal block

the condenser lead and contact point lead.
4. Remove the condenser attaching screw and remove the condenser.
5. Lift the primary terminal block from the distributor housing.
6. Remove the contact point attaching screws and lift the point and cam lubricating felt retainer from the breaker plate.

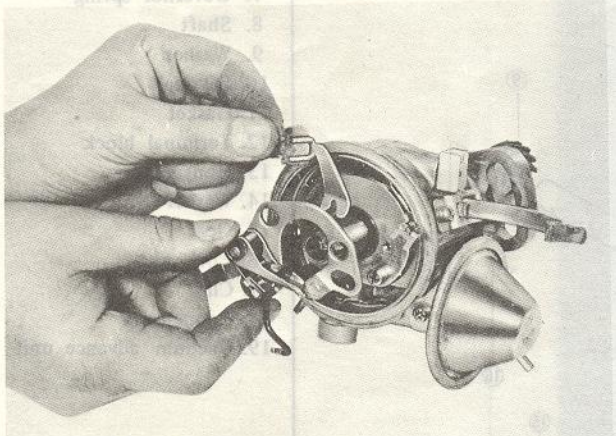


Fig. 5–51 Removing point and felt retainer

7. Remove the clip that secures the vacuum advance diaphragm link to the breaker plate.

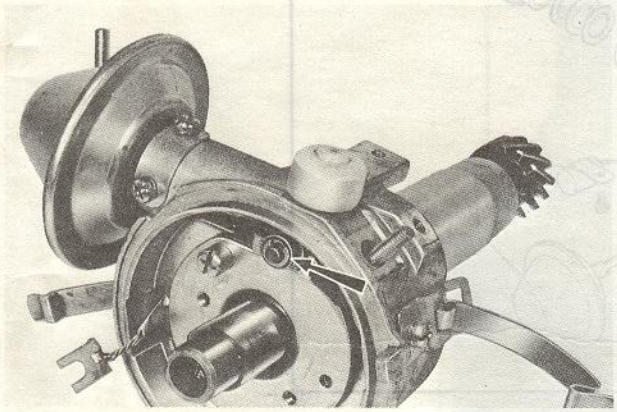


Fig. 5–52 Removing clip

8. Remove the screws that attach the vacuum advance unit to the distributor housing and remove the vacuum advance unit.

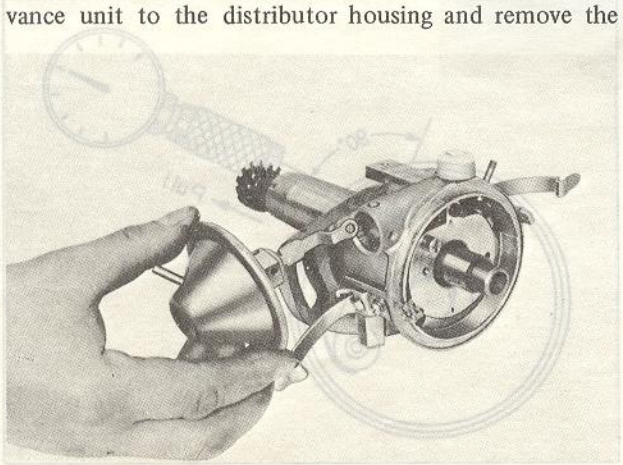


Fig. 5–53 Removing vacuum advance unit

9. Remove the screws attaching the retaining clips, earth wire and breaker plate to the housing. Remove the breaker plate.

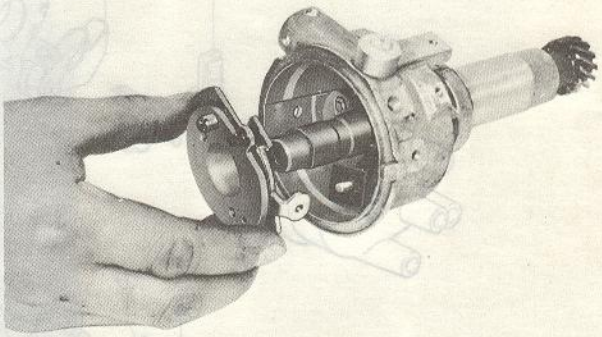


Fig. 5–54 Removing breaker plate

10. Remove the cam attaching screw and lift the cam off the centrifugal weights and from the housing.

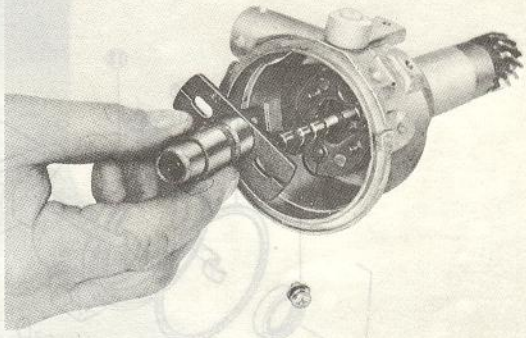


Fig. 5–55 Removing cam

11. Drive the lock pin out of the driven gear with a small drift and remove the gear and washers.

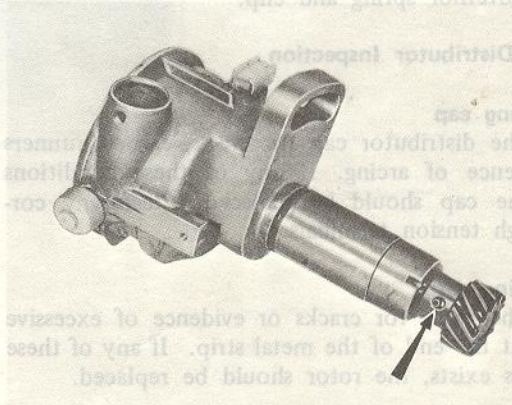


Fig. 5–56 Lock pin

12. Push the shaft up and remove through the top of the housing.
13. The governor weights can be removed by remov-

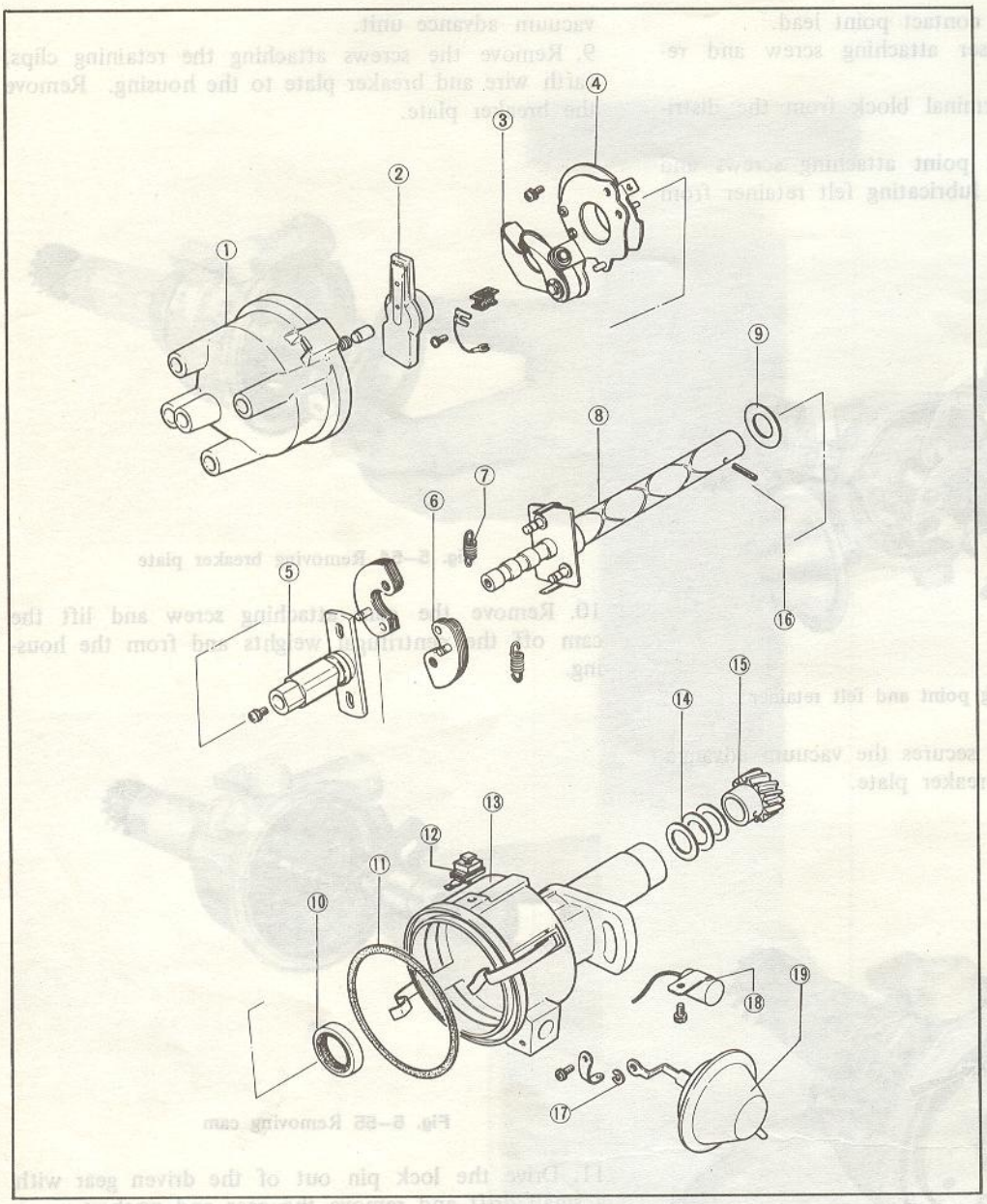


Fig. 5–57
Distributor components
1. Cap
2. Rotor
3. Contact point
4. Breaker plate
5. Cam
6. Governor weight
7. Governor spring
8. Shaft
9. Washer
10. Oil seal
11. Gasket
12. Terminal block
13. Housing
14. Washer
15. Gear
16. Lock pin
17. Clip
18. Condenser
19. Vacuum advance unit

ing the governor spring and clip.

5–F–6. Distributor Inspection

a. Checking cap
Inspect the distributor cap for crack, carbon runners and evidence of arcing. If any of these conditions exists, the cap should be replaced. Clean any corroded high tension terminals.

b. Checking rotor
Inspect the rotor for cracks or evidence of excessive burning at the end of the metal strip. If any of these conditions exists, the rotor should be replaced.

c. Checking contact points
Inspect the points for wear, burning, transferred metal and pitting. If they are slight, the points can be cleaned with a stiff bristled brush or oil stone. If they are severe, replace with new ones.

d. Checking tension of contact arm spring
For inspection, hook a spring scale on the contact

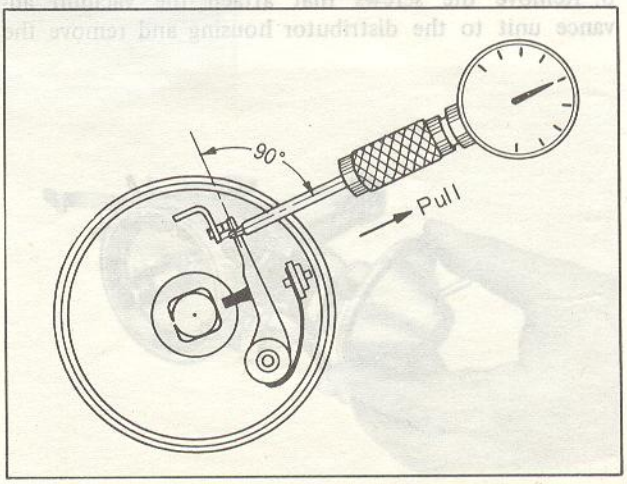


Fig. 5–58 Checking tension of contact arm spring

arm as close as possible to the movable breaker point and pull the spring scale at a right angle to the contact arm. Take a reading when the contact points start to separate. The reading should be between 0.5 ~ 0.65 kg (1.1 ~ 1.4 lb).

e. Checking condenser

If the condenser is leaky, it will cause a weak spark or burned contact points. Check the capacity of the condenser with a condenser tester. The capacity is 0.20 to 0.24 microfarads. In the absence of a tester check by substituting a new condenser.

5–F–7. Assembling Distributor

Assemble the distributor in the reverse order of disassembling.

Note:

When installing the cam, first align the tally marks on the distributor housing and driven gear as shown in Fig. 5–60. Install the rotor onto the cam temporarily and install the cam and rotor onto the governor pin through the drive shaft so that the relation between the metal strip end of the rotor and the vacuum control unit is as shown in Fig. 5–59.

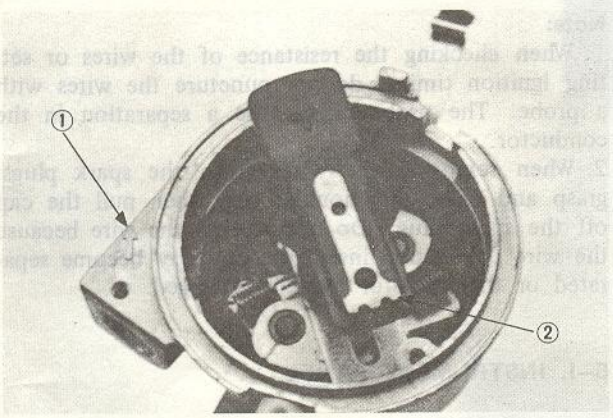


Fig. 5–59 Installing cam
1. Vacuum control unit fitting 2. Metal

5–F–8. Installing Distributor

1. If the engine has been cranked after the distributor has been removed, it will have to be timed before installing the distributor.
2. Turn the crankshaft until the No. 1 cylinder is coming up on compression stroke and the ignition timing mark on the crankshaft pulley is in line with the indicator pin on the timing chain cover.
Slide the distributor into the cylinder head with the tally marks on the distributor housing and the driven gear aligned.
Or if the engine has not been cranked since the distributor has been removed, slide the distributor into the cylinder head making sure that all index marks previously made are in alignment. Install but, do not tighten the nut.
3. Install the distributor cap and connect the primary wire to the terminal.
4. Set the timing with a timing light, then tighten the distributor attaching nut.
5. Connect the vacuum tube to the vacuum advance unit.

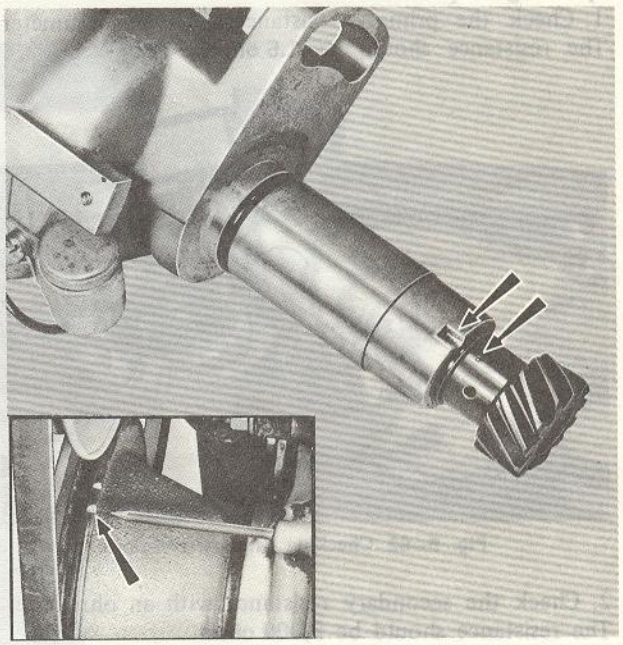


Fig. 5–60 Aligning tally marks

5–G. IGNITION COIL

5–G–1. Spark Intensity Test

1. Connect the **remote starter switch** (49 0242 685A) in the starting circuit.
2. Remove the coil hightension wire from the distributor cap.
3. Turn on the ignition switch.
4. While holding the hightension cord approximately 6 mm (0.24 in) from the cylinder head or any other good ground, crank the engine by using the remote starter switch.
If the spark is good, the trouble lies in the secondary circuit.
If there is no spark or a weak spark, the trouble is in the primary circuit, coil to distributor hightension wire, or the coil.

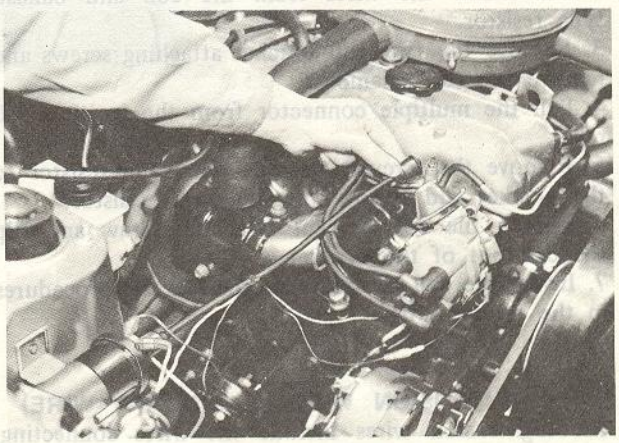


Fig. 5–61 Spark test

5–G–2. Checking Ignition Coil

Before testing the coil, always heat the coil to normal operaring temperature.

1. Check the primary resistance with an ohmmeter. The resistance should be **1.5 ohms.**

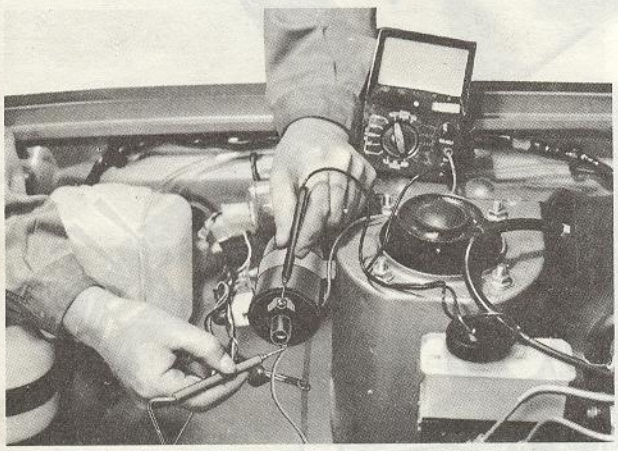


Fig. 5–62 Checking primary resistance

2. Check the secondary resistance with an ohmmeter. The resistance should be **9,000 ohms.**
3. Check the resistance of ballast-type resistor with an ohmmeter. The resistance should be **1.6 ohms.**

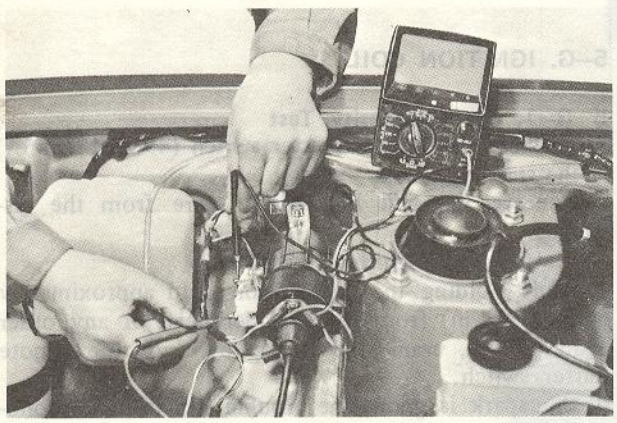


Fig. 5–63 Checking resistance of resistor

5–G–3. Replacing Ignition Coil

1. Disconnect the seocndary wire from the coil tower.
2. Disconnect the wires from the coil and ballast-type resistor.
3. Remove the two coil bracket attaching screws and remove the coil assembly.
4. Pull the multiple connector from the ignition coil relay.
5. Remove the screws attaching relay and resistor to the bracket and remove the relay and resistor.
6. Loosen the coil bracket attaching screw and slip the coil out of the bracket.
7. Install the coil by following the removal procedures in the reverse order.

5–H. HIGHTENSION WIRE (SECONDARY WIRE)

The hightension wires include the wires connecting the distributor cap to the spark plugs and the wire connecting the center terminal of the distributor cap to the center terminal of the ignition coil. These wires are the radio resistance-type which filter out the high frequency electrical impulses that are the source of ignition noise interference.

5–H–1. Resistance Test

Check the resistance of each hightension wire. The resistance should not exceed **16,000 ohms per 1 m (39.37 in).**

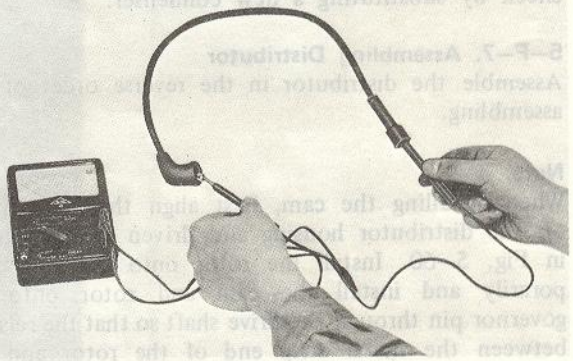


Fig. 5–64 Checking resistance

Note:

1. When checking the resistance of the wires or setting ignition timing, **do not** puncture the wires with a probe. The probe may cause a separation in the conductor.
2. When removing the wires from the spark plugs, grasp and twist the moulded cap, then pull the cap off the spark plug. **Do not** pull on the wire because the wire connection inside the cap may become separated or the insulator may be damaged.

5–I. INSTRUMENT PANEL

5–I–1. Fuel Gauge

The fuel gauge indicates the quantity of gasoline in the fuel tank only when the ignition switch is turned on. The fuel gauge circuit is composed of the fuel gauge, mounted on the instrument panel, and the fuel tank unit, connected by a single wire through the ignition switch.

Should the gauge fail to register, check and repair the fuel gauge circuit, referring to the following list.

1) Fuel gauge shows "E" under all conditions
   a) Open circuit in tank unit or panel unit
   b) Poor contact in tank unit
   c) Open circuit in printed circuit of instrument cluster
   d) Poor or loose contact of tank unit terminal
   e) Break in wire between tank unit and panel unit
2) Fuel gauge shows "F" under all conditions
   a) Short circuit in tank unit
   b) Open circuit in panel unit
   c) Panel unit improperly grounded
   d) Wire to tank unit grounded
3) Fuel gauge shows misreading

a) Poor calibration in panel unit or tank unit
b) Poor contact in tank unit
c) Sticky needle in panel unit
d) Float of tank unit operating improperly

If the **checker** (49 0839 285) is available, use it according to the following procedure to confirm whether the trouble lies in the panel unit or in the tank unit.

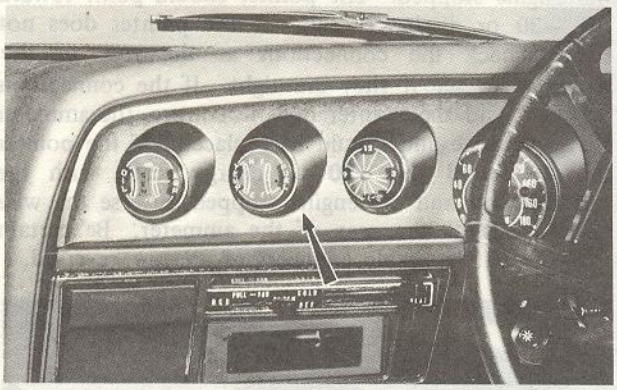


Fig. 5–65 Instrument panel

1. Disconnect the wire (yellow) from the tank unit and connect it to the positive lead of the checker. Ground the negative lead of the checker.

Fig. 5–66 Checking fuel gauge

2. Set the checker button in the sepcifications as shown in Fig. 5–67.

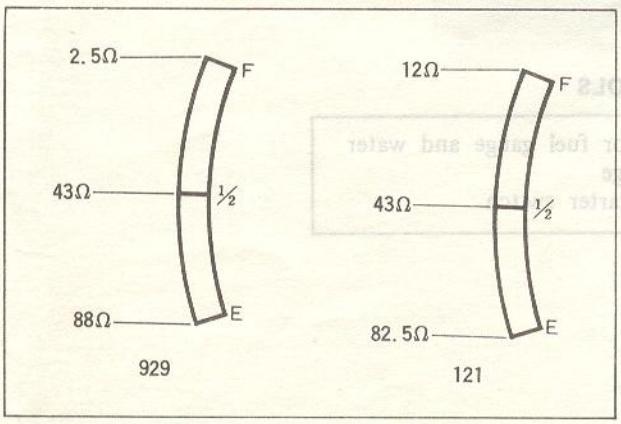


Fig. 5–67 Resistance of fuel gauge

3. Turn on the ignition switch and check whether the fuel gauge at the instrument panel points properly. If the fuel gauge points properly, the trouble lies in the tank unit while if the fuel gauge indication is inaccurate, the trouble lies in the panel unit.

5–I–2. Fuel Level Warning Lamp

The fuel level warning lamp which is install on the overhead console box goes on when the quantity of gasoline in the tank comes less than 12 liters (3.2 U.S. gallons, 2.6 Imp. gallons). On this time fuel gauge indicates near "E" mark.

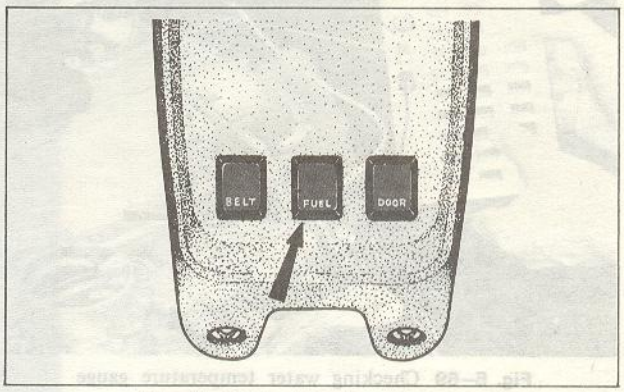


Fig. 5–68 Fuel level warning lamp

Should the lamp fail to register, check and repair the circuit, referring to the following steps.

1. Remove the partition board.
2. Disconnect the wiring and connect the yellow/blue colored wire to the earth with the ignition switched on. If the warning lamp comes on, the trouble lies in the sensor while if the lamp does not comes on, the trouble lies in the wiring or the bulb.

5–I–3. Water Temperature Gauge

The water temperature gague electrically operated like the fuel gauge, consists of the water temperature gauge in the instrument panel and sending unit installed on the intake manifold.

If the water temperature gauge registors improperly, check the following points and repair.

1) Temperature gauge shows "C" under all conditions
   a) Open circuit in sending unit
   b) Poor contact in sending unit
   c) Open circuit in printed circuit of instrument cluster
   d) Poor or loose contact of sending unit terminal
   e) Break in wire between panel unit and sending unit
2) Temperature gauge shows "H" under all conditions
   a) Short circuit on sending unit
   b) Open circuit in printed circuit of instrument cluster
   c) Panel unit improperly grounded
   d) Wire to sending unit grounded
   e) Open circuit in panel unit
3) Temperature gauge shows misreading
   a) Poor calibration in panel unit or sending unit
   b) Poor or loose contact of sending unit terminal

c) Sticky needle in panel unit
d) Poor contact in sending unit

If the **checker** (49 0839 285) is available, use it according to the following procedure to confirm whether the trouble lies in the panel unit or in the sending unit.

1. Disconnect the wire (yellow) from the sending unit and connect it to the positive lead of the checker. Ground the negative lead of the checker.

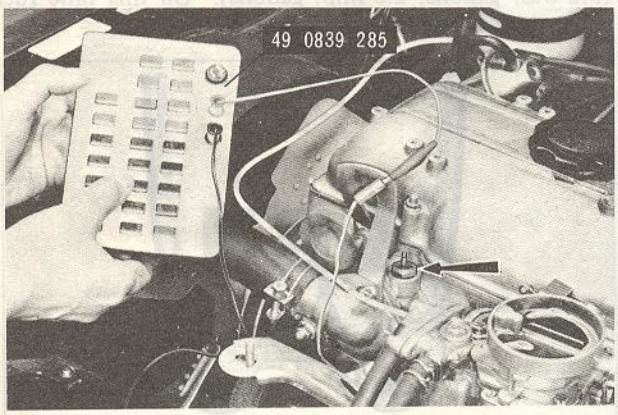


Fig. 5–69 Checking water temperature gauge

2. Set the checker button in the specifications as shown in Fig. 5–70.

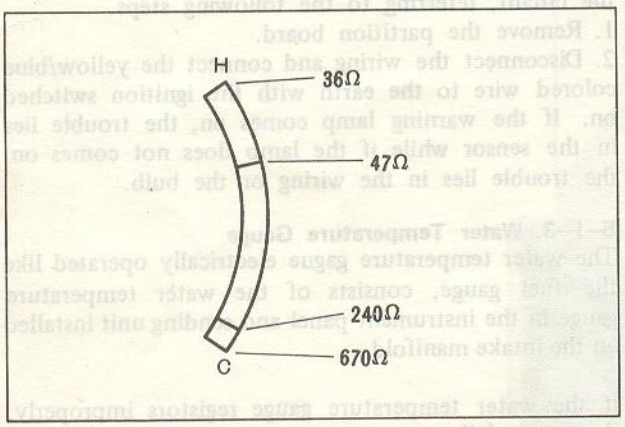


Fig. 5–70 Resistance of water temperature gauge

3. Turn on the ignition switch and check whether the water temperature gauge at the instrument panel points properly.

If the water temperature gauge points properly, the trouble lies in the sending unit while if the water temperature gauge indication is inaccurate, the trouble lies in the panel unit.

5–I–4. Ammeter

To test the ammeter, turn the headlights on with the engine stopped. The pointer should point toward the **–30** or discharge scale. If the pointer does not move, check the connections at the rear of the ammeter to see if they are tight. If the connections are tight and the pointer does not move, the ammeter is in operative and should be replaced. If the pointer moves toward the **+30** or charge scale, with the headlight on and the engine stopped, reverse the wire connections at the rear of the ammeter. Be certain that the battery cable connections are not reversed.

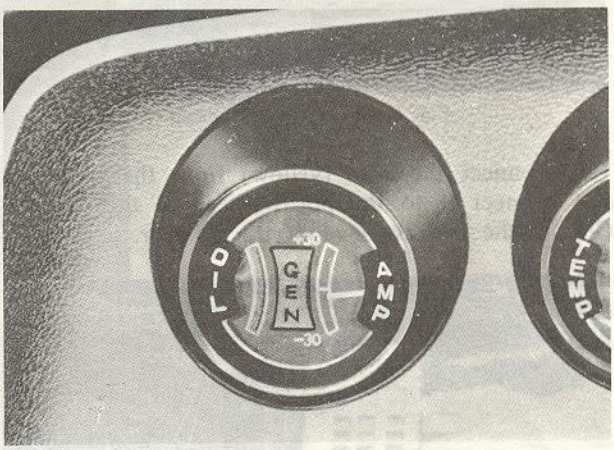


Fig. 5–71 Ammeter

5–I–5. Alternator Warning Light

The "GEN" red warning light should light when the ignition is turned on and before the engine is started; if not lighted either the bulb is burned out or the warning light wiring has an open circuit. After the engine is started, the "GEN" red light should be out at all times; if the light comes on, alternator "V" belt may be loose or missing, the alternator or regulator may be defective, or the charging circuit may be defective.

SPECIAL TOOLS

49 0839 285	Checker for fuel gauge and water temp. gauge
49 0242 685A	Remote starter switch

TECHNICAL DATA

ENGINE	
Type	Four cylinder four stroke engine in line, water cooled, overhead camshaft
Bore	80 mm (3.15 in)
Stroke	88 mm (3.46 in)
Piston displacement	1,769 cc (107.9 cu-in)
Compression ratio	8.6 : 1
Compression pressure:	
New	12.0 kg/cm² (171 lb/in²) at 220 rpm
Limit	See Par. 1–A
Valve clearance (warm engine)	
Valve side	Inlet : 0.30 mm (0.012 in) Exhaust : 0.30 mm (0.012 in)
Cam side	Inlet : 0.22 mm (0.009 in) Exhaust 0.22 mm (0.009 in)
Cylinder head:	
Permissible distortion of cylinder head surface	0.15 mm (0.006 in)
Valve seat:	
Valve seat angle	Inlet : 90° Exhaust : 90°
Valve seat width	Inlet : 1.4 mm (0.055 in) Exhaust : 1.4 mm (0.055 in)
Valve guide :	
Length	50.5 mm (1.988 in)
Outer diameter	$14\ ^{+\ 0.044}_{+\ 0.033}$ mm $(0.5512\ ^{+\ 0.0017}_{+\ 0.0013}$ in)
Inner diameter	$8\ ^{+\ 0.083}_{+\ 0.063}$mm $(0.3150\ ^{+\ 0.0033}_{+\ 0.0025}$ in)
Valve stem to guide clearance	
New	Inlet : 0.018 ~ 0.053 mm (0.0007 ~ 0.0021 in) Exhaust : 0.018 ~ 0.058 mm (0.0007 ~ 0.0023 in)
Wear limit	0.20 mm (0.008 in)
Valve–Inlet:	
Overall length	108.5 mm (4.2717 in)
Head diameter	42 ± 0.1 mm (1.6536 ± 0.0039 in)
Face angle	90°
Stem diameter	
New	$8\ ^{+\ 0.045}_{+\ 0.030}$ mm $(0.3150\ ^{+\ 0.0018}_{+\ 0.0012}$ in)
Wear limit	7.980 mm (0.3142 in)
Valve margin	
Wear limit	1.0 mm (0.039 in)
Valve–Exhaust:	
Overall length	107.0 mm (4.2127 in)
Head diameter	33 ± 0.1 mm (1.2992 ± 0.0039 in)
Face angle	90°
Stem diameter	
New	$8\ ^{+\ 0.045}_{+\ 0.025}$ mm $(0.3150\ ^{+\ 0.0018}_{+\ 0.0010}$ in)
Wear limit	7.975 mm (0.3140 in)
Valve margin	
Wear limit	1.0 mm (0.039 in)
Valve spring–Outer:	
Wire diameter	4.3 mm (0.169 in)
Outer coil diameter	32.9 mm (1.295 in)
Free length	
New	37.3 mm (1.469 in)
Limit	36.2 mm (1.425 in)
Fitting length	34.5 mm (1.358 in)
Fitting load	
New	12.2 kg (26.9 lb)
Limit	10.4 kg (22.9 lb)
Valve spring–Inner:	
Wire diameter	3.0 mm (0.118 in)
Outer coil diameter	23.1 mm (0.909 in)
Free length	
New	36.8 mm (1.449 in)
Limit	35.7 mm (1.406 in)
Fitting length	33.0 mm (1.299 in)
Fitting load	
New	7.4 kg (16.3 lb)
Limit	6.3 kg (13.9 lb)
Rocker arm:	
Bore in rocker arm	$19\ ^{+\ 0.053}_{+\ 0.020}$ mm $(0.7480\ ^{+\ 0.0021}_{+\ 0.0008}$ in)
Rocker arm shaft:	
Outer diameter	$19\ ^{-\ 0.007}_{-\ 0.028}$ mm $(0.7480\ ^{-\ 0.0003}_{-\ 0.0011}$ in)
Length	Inlet : 159 mm (6.260 in) Exhaust : 336 mm (13.229 in)
Clearance in rocker arm	
New	0.027 ~ 0.081 mm (0.0011 ~ 0.0032 in)
Wear limit	0.10 mm (0.004 in)
Camshaft:	
Journal diameter	Front : $45\ ^{-\ 0.040}_{-\ 0.055}$ mm $(1.7717\ ^{-\ 0.0016}_{-\ 0.0022}$ in) Center : $45\ ^{-\ 0.050}_{-\ 0.065}$ mm $(1.7717\ ^{-\ 0.0020}_{-\ 0.0026}$ in) Rear : $45\ ^{-\ 0.040}_{-\ 0.055}$ mm $(1.7717\ ^{-\ 0.0016}_{-\ 0.0022}$ in)
Wear limit of journal	0.05 mm (0.0020 in)
Basic circle of cam	38 ± 0.05 mm (1.4961 ± 0.0020 in)
Cam elevation	Inlet : 45.037 mm (1.7731 in) Exhaust : 45.004 mm (1.7718 in)
Wear limit of cam elevation	Inlet : 44.837 mm (1.7653 in) Exhaust : 44.804 mm (1.7640 in)
Camshaft end play	
New	0.02 ~ 0.18 mm (0.001 ~ 0.007 in)
Wear limit	0.20 mm (0.008 in)
Camshaft run-out	
Limit	0.03 mm (0.0012 in)

Camshaft bearing	
Bearing clearance	
Front	0.019 ~ 0.069 mm (0.0007 ~ 0.0027 in)
Center	0.029 ~ 0.079 mm (0.0011 ~ 0.0031 in)
Rear	0.019 ~ 0.069 mm (0.0007 ~ 0.0027 in)
Limit of bearing clearance	0.15 mm (0.0059 in)
Available undersize bearing	0.25 mm (0.010 in)
	0.50 mm (0.020 in)
	0.75 mm (0.030 in)
Camshaft drive:	
Type	Chain and sprockets
Number of chain links	100
Number of sprocket teeth	Camshaft sprocket : 38
	Crankshaft sprocket : 19
Valve timing:	
Inlet valve opens	10° before top dead center
Inlet valve closes	57° after bottom dead center
Exhaust valve opens	54° before bottom dead center
Exhaust valve closes	13° after top dead center
Connecting rod:	
Length (Center to center)	144 ± 0.05 mm (5.6694 ± 0.0020 in)
Permissible bend or twist	0.02 mm per 50 mm (0.002 in per 5 in)
Side clearance	0.11 ~ 0.21 mm (0.004 ~ 0.008 in)
Small end bush:	
Inner diameter	$22^{+0.014}_{+0.003}$ mm ($0.8662^{+0.0006}_{+0.0001}$ in)
Outer diameter	$25^{+0.056}_{+0.035}$ mm ($0.9843^{+0.0022}_{+0.0014}$ in)
Bore in connecting rod	$25^{+0.021}_{-0.012}$ mm ($0.9843^{+0.0008}_{-0.0005}$ in)
Piston pin and bush clearance	0.01 ~ 0.03 mm (0.0004 ~ 0.0012 in)
Connecting rod bearing:	
Bearing clearance	
New	0.027 ~ 0.077 mm (0.0011 ~ 0.0030 in)
Wear limit	0.10 mm (0.0039 in)
Available undersize bearing	0.25 mm (0.010 in)
	0.50 mm (0.020 in)
	0.75 mm (0.030 in)
Piston:	
Diameter (Measure at 90° to the pin bore axis and 20.5 mm (0.807 in) below the oil ring groove)	79.954 ± 0.010 mm (3.0691 ± 0.0004 in)
Piston pin hole bore	$22^{-0.002}_{-0.012}$ mm ($0.8662^{-0.0001}_{-0.0005}$ in)
Ring groove width	Top : $2.0^{+0.040}_{+0.025}$ mm ($0.0787^{+0.0016}_{+0.0010}$ in)
	Second : $2.0^{+0.034}_{+0.020}$ mm ($0.0787^{+0.0013}_{+0.0008}$ in)
	Oil : $4.0^{+0.032}_{+0.020}$ mm ($0.1575^{+0.0013}_{+0.0008}$ in)
Ring groove depth	3.95 mm (0.1555 in)
Piston and cylinder clearance	
New	0.048 ~ 0.063 mm (0.0019 ~ 0.0025 in)
Wear limit	0.15 mm (0.006 in)
Available oversize piston	0.25 mm (0.010 in)
	0.50 mm (0.020 in)
Piston ring:	
Width	Top : $2.0^{-0.01}_{-0.03}$ mm ($0.0787^{-0.0004}_{-0.0012}$ in)
	Second : $2.0^{-0.01}_{-0.03}$ mm ($0.0787^{-0.0004}_{-0.0012}$ in)
	Oil : ————
Thickness	Top : 3.6 ± 0.1 mm (0.1417 ± 0.0039 in)
	Second : 3.7 ± 0.1 mm (0.1457 ± 0.0039 in)
	Oil : 3.0 ± 0.1 mm (0.1181 ± 0.0039 in)
Side clearance	Top : 0.035 ~ 0.070 mm (0.0014 ~ 0.0028 in)
	Second : 0.030 ~ 0.064 mm (0.0012 ~ 0.0025 in)
	Oil : ————
End gap	Top : 0.2 ~ 0.4 mm (0.008 ~ 0.016 in)
	Second : 0.2 ~ 0.4 mm (0.008 ~ 0.016 in)
	Oil : 0.3 ~ 0.9 mm (0.012 ~ 0.035 in)
Available oversize piston ring	0.25 mm (0.010 in)
	0.50 mm (0.020 in)
Piston pin	
Diameter	$22^{-0.007}_{-0.016}$ mm ($0.8662^{-0.0003}_{-0.0006}$ in)
Length	64.5 ± 0.05 mm (2.5394 ± 0.0020 in)
Clearance between piston and pin	− 0.014 ~ 0.005 mm (−0.0006 ~ 0.0002 in)
Crankshaft:	
Main journal diameter	
New	$63^{-0.045}_{-0.060}$ mm ($2.4804^{-0.0018}_{-0.0024}$ in)
Wear limit	0.05 mm (0.0020 in)
Crankpin diameter	
New	$53^{-0.045}_{-0.060}$ mm ($2.0866^{-0.0018}_{-0.0024}$ in)
Wear limit	0.05 mm (0.0020 in)

Crankshaft end play	
New	0.08 ~ 0.24 mm (0.003 ~ 0.009 in)
Limit	0.30 mm (0.012 in)
Crankshaft run-out	
Limit	0.03 mm (0.0012 in)
Thrust bearing	
Available oversize bearing	0.25 mm (0.010 in) 0.50 mm (0.020 in) 0.75 mm (0.030 in)
Main bearing	
Bearing clearance	
New	0.031 ~ 0.061 mm (0.0012 ~ 0.0024 in)
Wear limit	0.08 mm (0.0031 in)
Available undersize bearing	0.25 mm (0.010 in) 0.50 mm (0.020 in) 0.75 mm (0.030 in)
Cylinder block	
Bore	$80\ ^{+0.019}_{-0}$ mm ($3.1497\ ^{+0.0007}_{-0}$ in)
Wear limit of bore	0.15 mm (0.0059 in)
Boring size	0.25 mm (0.010 in) 0.50 mm (0.020 in)

Lubricant	
30°C or over (85°F or over)	SAE 40
15°C ~ 30°C (60°F ~ 85°F)	SAE 30
0°C ~ 15°C (32°F ~ 60°F)	SAE 20
−10°C ~ 15°C (15°F ~ 60°F)	SAE 20W-20
−10°C ~ 40°C (15°F ~ 100°F)	SAE 10W-40
−10°C ~ 50°C (15°F ~ 120°F)	SAE 20W-50
−18°C ~ 0°C (0°F ~ 32°F)	SAE 10W
−18°C ~ 30°C (0°F ~ 85°F)	SAE 10W-30
−18°C ~ 40°C (0°F ~ 100°F)	SAE 10W-40
−18°C ~ 50°C (0°F ~ 120°F)	SAE 10W-50
−18°C or below (0°F or below)	SAE 5W-20 or 5W-30
Oil capacity	3.6 liters (3.8 U.S. quarts / 3.2 Imp. quarts)

LUBRICATING SYSTEM

Oil pump	
Type	Rotor
Feeding capacity at 2000 rpm (Engine)	13 liter/min (3.4 U.S. gal/min / 2.9 Imp. gal/min)
Oil pump driven by	Chain and sprockets
Number of chain links	46
Number of sprocket teeth	33
Outer rotor and body clearance	
New	0.14 ~ 0.25 mm (0.006 ~ 0.010 in)
Wear limit	0.30 mm (0.012 in)
Clearance between rotor lobes	
New	0.04 ~ 0.15 mm (0.002 ~ 0.006 in)
Wear limit	0.25 mm (0.010 in)
Rotor end float	
New	0.04 ~ 0.10 mm (0.002 ~ 0.004 in)
Wear limit	0.15 mm (0.006 in)
Clearance between pump shaft and body	
New	0.006 ~ 0.051 mm (0.0002 ~ 0.0020 in)
Wear limit	0.10 mm (0.004 in)
Oil pressure at 3000 rpm of engine	3.5 ~ 4.5 kg/cm² (50 ~ 64 lb/in²)
Safe minimum pressure at idle	0.3 kg/cm² (4.3 lb/in²)
Oil filter	
Type	Full flow, cartridge
Relief valve opens at	0.8 ~ 1.2 kg/cm² (11 ~ 17 lb/in²)

COOLING SYSTEM

Water pump	
Type	Centrifugal impeller
Pump driven by	"V" belt
Fan	
Fan diameter	330 mm (13.0 in) or 340 mm (13.4 in)
Number of blades	4 or 7
Ratio of crankshaft and fan	1 : 0.9, 1 : 1.1 or 1 : 1.3
Fan belt tension (Slack)	
New belt	9 ~ 11 mm (0.35 ~ 0.43 in)
Used belt	12 ~ 14 mm (0.47 ~ 0.55 in)
Thermostat	
Type	Wax pellet
Starts to open	82 ± 1.5°C (180° ± 2.7°F)
Fully opens	95°C (203°F)
Lift	8 mm (0.315 in) or more
Radiator	
Type	Corrugated fin, with expansion tank
Pressure cap opens	0.9 kg/cm² (13 lb/in²)
Cooling capacity	
With heater	7.0 liters (7.4 U.S. quarts / 6.2 Imp. quarts)
Without heater	6.5 liters (6.9 U.S. quarts / 5.7 Imp. quarts)

FUEL SYSTEM

Fuel tank capacity	
Sedan & Hardtop	65 liters (16.9 U.S. gallons / 14.3 Imp. gallons)
Wagon	67 liters (17.4 U.S. gallons / 14.7 Imp. gallons)

Fuel pump	
Type	Electrical, plunger
Fuel pressure	0.20 ~ 0.25 kg/cm² (2.8 ~ 3.6 lb/in²)
Fuel feeding capacity	800 cc/min (0.8 U.S. quart/min, 0.7 Imp. quart/min)
Fuel filter	
Type	Cartridge, paper element
Carburetor	
Type	Down draft, two barrel
Throat diameter	
Primary	28 mm (1.10 in)
Secondary	32 mm (1.26 in)
Venturi diameter	
Primary	23 x 15 x 8 mm (0.91 x 0.59 x 0.31 in)
Secondary	28 x 14 x 7 mm (1.10 x 0.55 x 0.28 in)
Main nozzle	
Primary	2.1 mm (0.0827 in)
Secondary	2.5 mm (0.0984 in)
Main jet	
Primary	#106
Secondary	#145
Main air bleed	
Primary	#50
Secondary	#50
Slow jet	
Primary	#46
Secondary	#80
Slow air bleed	
Primary	No. 1 : #1.4 No. 2 : #180
Secondary	#140
Power jet	#55
Fast idle adjustment (Clearance between primary throttle valve and bore when choke valve is fully closed)	1.80 mm (0.071 in)
Secondary throttle valve adjustment (Clearance between primary throttle valve and bore when secondary throttle valve starts to open)	6.6 mm (0.260 in)
Idle speed	
Manual transmission	700 ± 50 rpm
Automatic transmission ("D" range)	700 ± 50 rpm

ELECTRICAL SYSTEM

Battery	
Type	N50Z
Voltage	12 volt
Capacity (20 hour rate)	50 amp. hr
Terminal ground	Negative
Specific gravity at 20°C (68°F)	
Fully charged	1.260 (Arctic area : 1.280)
Recharge at	1.200 (Arctic area : 1.220)

Alternator	
Ground polarity	Negative
No load test	
Voltage	14 volt
Current	0 amp.
Revolution	1050 rpm or less
Load test	
Voltage	14 volt
Current	40 amp.
Revolution	2500 rpm or less
Number of brushes	2
Brush length	
New	15 mm (0.59 in)
Wear limit	8 mm (0.31 in)
Brush spring pressure	330 ~ 450 gr (12 ~ 16 oz)
Slip ring diameter	
New	33 ± 0.2 mm (1.299 ± 0.008 in)
Limit	32.5 mm (1.280 in)
Pulley ratio	1 : 2.2
Regulator	
Constant voltage relay	
Air gap	0.7 ~ 1.3 mm (0.028 ~ 0.051 in)
Point gap	0.3 ~ 0.45 mm (0.012 ~ 0.018 in)
Back gap	0.7 ~ 1.5 mm (0.028 ~ 0.059 in)
Regulated voltage (No load) at 4000 rpm of alternator	14.5 ± 0.5 volt
Pilot lamp relay	
Air gap	0.9 ~ 1.4 mm (0.035 ~ 0.055 in)
Point gap	0.7 ~ 1.1 mm (0.028 ~ 0.043 in)
Back gap	0.7 ~ 1.5 mm (0.028 ~ 0.059 in)
Pilot lamp lights on	3.5 volt or less
Pilot lamp lights out	3.7 ~ 5.7 volt
Starting motor	
Capacity	0.8 kw
Lock test	
Voltage	6.0 volt
Current	400 amp or less
Torque	0.93 m-kg or more (6.7 ft-lb or more)
Free running test	
Voltage	10.5 volt
Current	53 amp or less
Speed	5,000 rpm or more
Number of brushes	4
Brush length	
New	18.5 mm (0.73 in)
Wear limit	11.5 mm (0.45 in)
Brush spring pressure	1.4 ~ 1.8 kg (49 ~ 63 oz)
Control switch	Solenoid
Voltage required to close solenoid contacts	8 volt or less
Distributor	
Driven by	Camshaft
Number of contact points	1
Contact point gap	0.5 ± 0.05 mm (0.020 ± 0.002 in)
Contact point pressure	500 ~ 650 gr (1.1 ~ 1.4 lb)
Dwell angle	49 ~ 55°
Centrifugal advance	
Starts	0° at 550 rpm
Maximum	12.5° at 2,150 rpm

Vacuum advance		Ignition timing	8° BTDC
Starts	0° at 220 mm-Hg (8.66 in-Hg)	Timing mark location	Crankshaft pulley
		Spark plug:	
Maximum	8.5° at 420 mm-Hg (16.54 in-Hg)	Type	NGK BP-6ES or BPR-6ES Denso W-20EP
Condenser capacity	0.20 ~ 0.24 μF	Thread	14 mm
Firing order	1–3–4–2	Spark plug gap	0.8 mm (0.031 in)

TIGHTENING TORQUE

	m-kg	ft-lb		m-kg	ft-lb
Engine:			**Clutch**		
Main bearing caps	8.4 ~ 9.0	61 ~ 65	Flywheel	15.5 ~ 16.3	112 ~ 118
Connecting rod caps	5.0 ~ 5.5	36 ~ 40	Clutch cover	1.8 ~ 2.7	13 ~ 20
Oil pump sprocket	3.0 ~ 3.5	22 ~ 25			
Oil pan	0.65 ~ 0.95	5 ~ 7	**Unless otherwise specified:**		
Cylinder head			**6T**		
Cold engine	8.2 ~ 8.8	59 ~ 64	6 mm bolt/nut	0.7 ~ 1.0	5 ~ 7
Warm engine	9.5 ~ 10.0	69 ~ 72	8 mm bolt/nut	1.6 ~ 2.3	12 ~ 17
Camshaft sprocket	7.0 ~ 8.0	51 ~ 58	10 mm bolt/nut	3.2 ~ 4.7	23 ~ 34
Distributor drive gear	7.0 ~ 8.0	51 ~ 58	12 mm bolt/nut	5.6 ~ 8.2	41 ~ 59
Valve rocker arm cover	0.15 ~ 0.25	1.1 ~ 1.8	14 mm bolt/nut	7.7 ~ 10.5	56 ~ 76
Crankshaft pulley	14.0 ~ 15.0	101 ~ 108			
Inlet manifold	1.9 ~ 2.6	14 ~ 19	**8T**		
Exhaust manifold	1.6 ~ 2.3	12 ~ 17	6 mm bolt/nut	0.8 ~ 1.2	6 ~ 9
Spark plugs	1.5 ~ 2.1	11 ~ 15	8 mm bolt/nut	1.8 ~ 2.7	13 ~ 20
Oil filter cartridge	1.0 ~ 1.5	7 ~ 11	10 mm bolt/nut	3.7 ~ 5.5	27 ~ 40
Oil pressure switch	1.2 ~ 1.8	9 ~ 13	12 mm bolt/nut	6.4 ~ 9.5	46 ~ 69
Temperature gauge unit	0.5 ~ 1.0	4 ~ 7	14 mm bolt/nut	10.4 ~ 14.0	75 ~ 101