SERVICE MANUAL

MODEL
A10 AND A12
ENGINE

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

Rev. 2-71 P/N 99999-20020

SERVICE MANUAL

MODEL A10 & A12 ENGINE

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QUICK REFERENCE INDEX

FOREWORD

This service manual has been prepared for the purpose of assisting service personnel of our distributors and dealers for effective service and maintenance of model A10 and A12 series engines.

Since proper maintenance and service are most essential to satisfy our customers by keeping their cars in the best condition, this manual should be read carefully. The followings should be noted for effective utilization of this manual.

1. *Please for complete detail of the car refer to this and DATSUN 1200 SERVICE MANUAL because this manual describes information concerning the engine.*

2. *All part name in this manual conform to DATSUN 1200 PARTS CATALOG and DATSUN 1000 PARTS CATALOG, and only the genuine service parts listed in these parts catalogs should be used for replacement.*

3. *All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication approval.*

4. *It is emphasized that those who use this manual revise the contents according to the SERVICE JOURNAL and SERVICE DATA AND SPECIFICATIONS issued by the factory, which carry the latest factory approved servicing method.*

5. *Rights for alteration in specifications and others at any time are reserved.*

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SECTION EG

ENGINE GENERAL

EG

EXTERNAL VIEW OF ENGINE

External view of model A10 engine

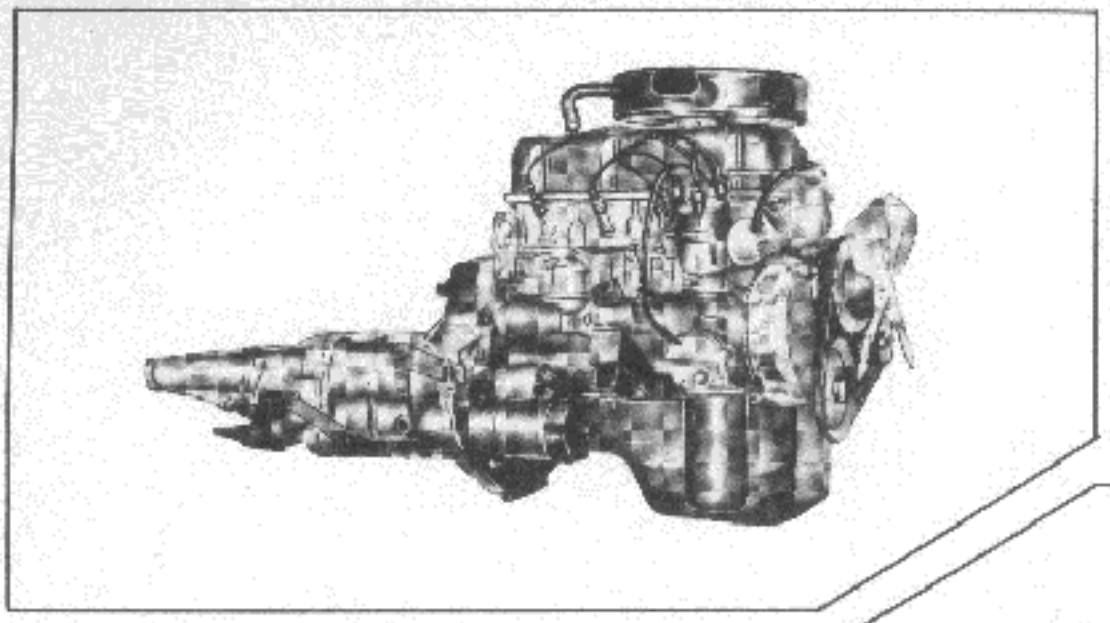


Fig. EG-1 Right hand side

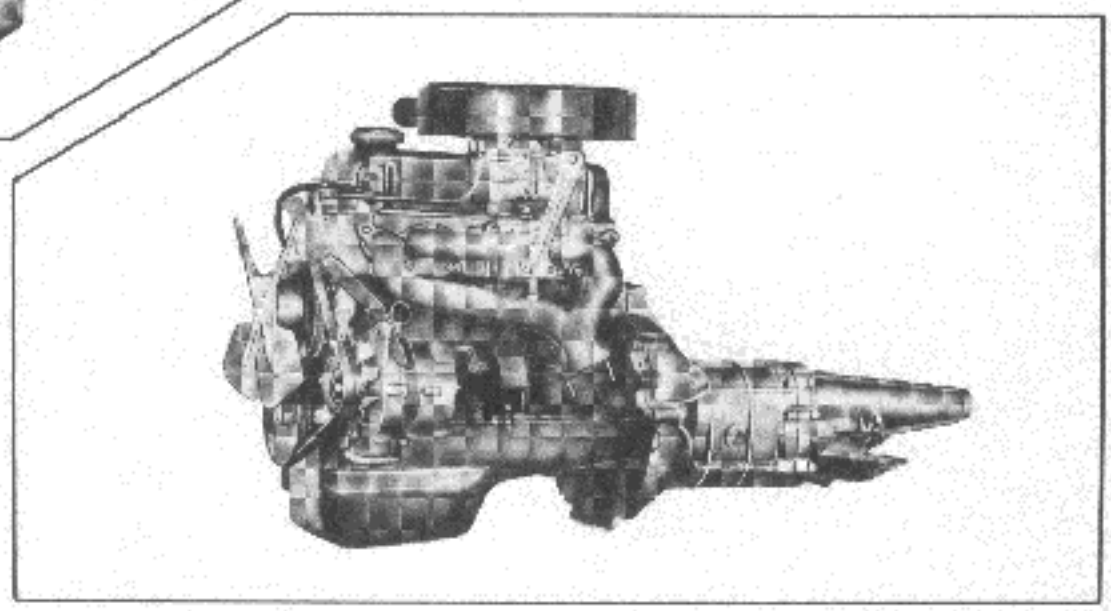


Fig. EG-2 Left hand side

External view of model A12 engine

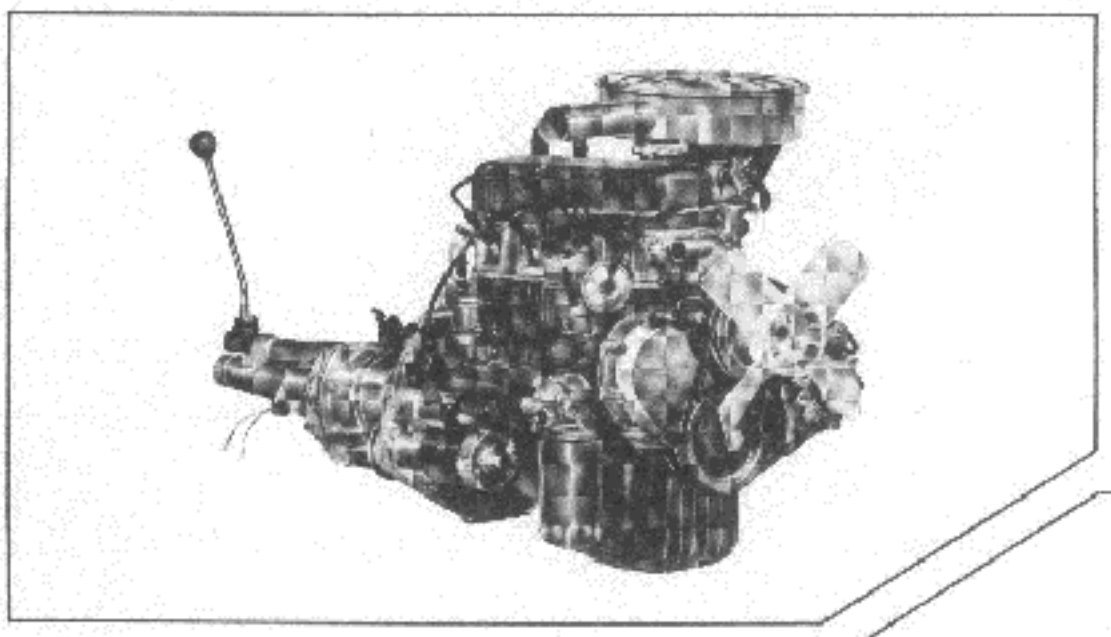


Fig. EG-3 Right hand side

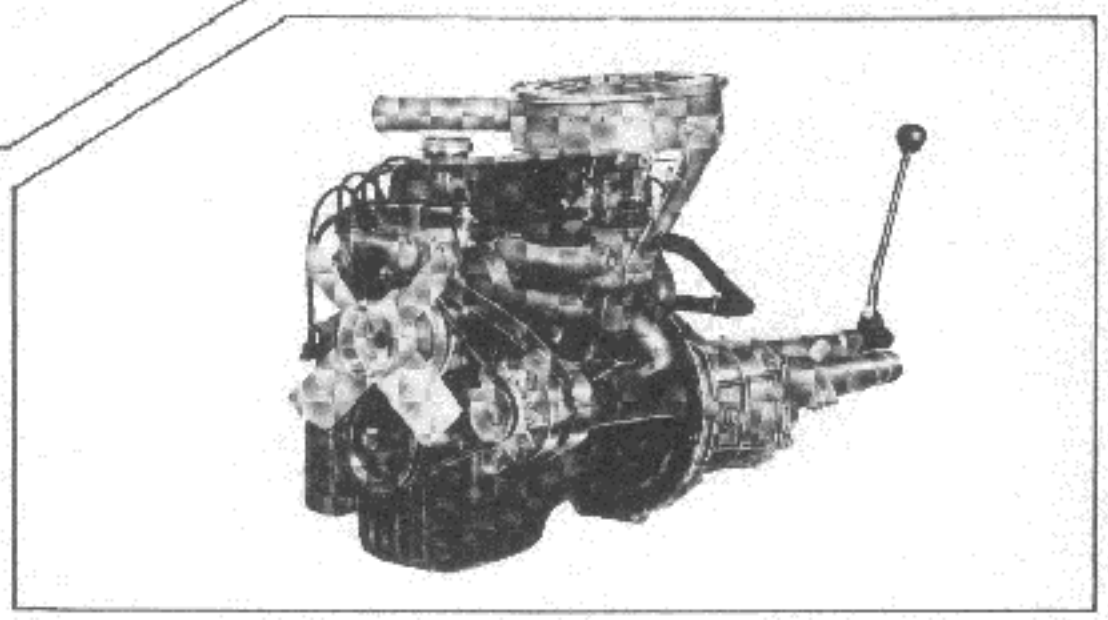


Fig. EG-4 Left hand side

MAIN SPECIFICATIONS

Engine model	A10	A12
Number of cylinders, in line	4	4
Valve arrangement	Over head valve	Over head valve
Bore mm (in)	73 (2.874)	73 (2.874)
Stroke mm (in)	59 (2.323)	70 (2.756)
Displacement cc (cu in)	988 (60.3)	1,171 (71.5)
Compression ratio	8.5 : 1	9.0 : 1
Maximum power, SAE HP at rpm	62/6,000	69/6,000
Maximum torque, SAE kg-m (ft-lb) at rpm	8.5 (62)/4,000	9.7 (70)/4,000
Capacity Oil pan (*) ℓ (USqts/Imp qts)	2.7 (2 7/8 / 2 3/8)	2.7 (2 7/8 / 2 3/8)

(*) The above table indicates volume of oil required for replacement when oil filter element is not replaced. When both oil and oil filter element are replaced, total volume of oil will be approximately 3.2 liters (3-3/8 US qts, 2-3/4 Imp qts).

VEHICLE REFERENCE

Information described herein is about engines only.

Please, refer to both this manual and the manual for chassis and body for complete details of the car.

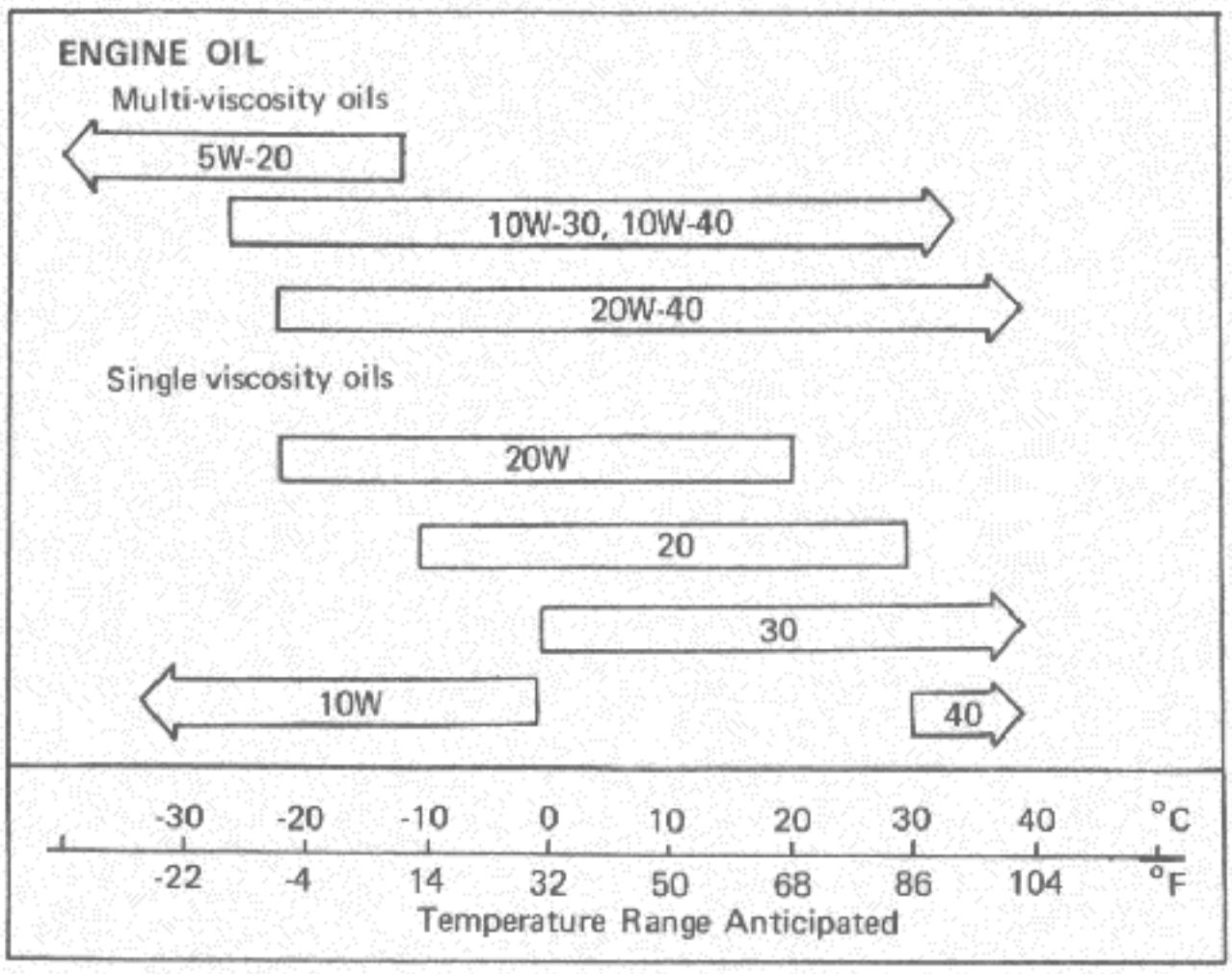
The vehicles on which A10 and A12 engines are mounted are as follows.

Engine		Vehicle		
Model	Displacement	Current model	Vehicle name	Remarks
A10	988 cc (60.3 cu in)	B10(S)(T)FU	DATSUN 1000	RH drive, 4 door sedan with manual T/M
		B10(S)AFU		RH drive, 4 door sedan with automatic T/M
		LB10(S)TF		LH drive, 4 door sedan with manual T/M
		B10(S)(T)U		RH drive, 2 door sedan with manual T/M
		B10(S)AU		RH drive, 2 door sedan with automatic T/M
		LB10(S)T		LH drive, 2 door sedan with manual T/M
		VB10(S)(T)U	DATSUN 1000 VAN	RH drive, Van with manual T/M
		VLB10(S)T		LH drive, Van with manual T/M
		KB10U	DATSUN 1000 COUPE	RH drive, Coupe with manual T/M
		(L)B20(S)TU	DATSUN 1000 PICK-UP	RH & LH drive, Pick-up with manual T/M

A12	1,171 cc (71.5 cu in)	B110(S)(T)U	DATSUN 1200	RH drive, 4 door sedan with manual T/M
		B110(S)AU		RH drive, 4 door sedan with automatic T/M
		LB110(S)T		LH drive, 4 door sedan with manual T/M
		LB110A		LH drive, 4 door sedan with automatic T/M
		B110(S)(T)RU		RH drive, 2 door sedan with manual T/M
		B110ARU		RH drive, 2 door sedan with automatic T/M
		LB110(S)TR		LH drive, 2 door sedan with manual T/M
		LB110TRU		LH drive, 2 door sedan for Canada
		LB110TRN		LH drive, 2 door sedan for Canada
		LB110AR		LH drive, 2 door sedan with automatic T/M
		VB110(S)(T)U	DATSUN 1200 WAGON or VAN	RH drive, Wagon or Van with manual T/M
		VLB110(S)T		LH drive, Wagon or Van with manual T/M
		KB110U	DATSUN 1200 COUPE	RH drive, Coupe with manual T/M
		KLB110		LH drive, Coupe with manual T/M
		KLB110U		LH drive, Coupe for U.S.A. & Canada
		KLB110N		LH drive, Coupe for Canada

RECOMMENDED LUBRICANTS, GASOLINE AND COOLANT

Use the following grades of oil, gasoline and coolant.



Recommended lubricants

			TEXACO	CHEVRON	CALTEX	CASTROL	BP	ESSO (ENCO)	MOBIL	SHELL
ENGINE OIL	Gasoline	Multi grade MIL-L-2104B API MS	Havoline Motor Oil 10W-30, 20W-40	RPM Supreme Motor Oil 10W-30, 20W-40	Custom Five Star Motor Oil 10W-30, 20W-40	Castrolite 10W-30 Castrol XL20W-40 Castrol GTX20W-50*	BP Super V Viscostatic 5W-20, 10W-30, 20W-50*	Esso (Enco) Uniflo 5W-30, 10W-40* Esso (Enco) Extra Motor Oil 10W-30, 20W-40	Mobiloil Special 10W-30 Mobiloil Super 10W-40*	Shell X100 10W-30, 20W-40
		Regular MIL-L-2104B API MS	Havoline Motor Oil 10W, 20W-20, 30, 40	RPM Special Motor Oil 10W, 20W-20, 30, 40	Five Star Motor Oil 10W, 20W-20, 30, 40	Castrol HD 5W, 10W, 20W-20, 30, 40, 50	BP Energol HD 10W, 20W, 30, 40, 50	ESSO (Enco) Motor Oil 10W, 20W-20, 30, 40, 50	Mobiloil 10W, 20W-20, 30, 40, 50	Shell X100 10W, 20W, 30, 40, 50
Multi-purpose Grease MIL-G-2108, MIL-G-10924			Marfak Multi-purpose* Marfak All Purpose*	RPM Multi-motive Grease*	Marfak Multi-purpose* Marfak All Purpose*	Castrol LM*	BP Ener-grease L2*	Esso (Enco) Multi-purpose grease H*	Mobil grease MP*	Shell Retinax A
ANTI-FREEZE COOLANT			Anti-Freeze Coolant*	Atlas Perma Guard* Anti-freeze and Coolant	Anti-freeze Coolant	Castrol Anti-freeze	BP Anti-frost	Atlas Perma Guard*	Mobil Freezone*	Shellzone

* Should the above brand of oils not be available, it is permissible to use oils marked *

Engine model	Compression ratio	Octane number of gasoline
A10	8.5 : 1	more than 85
A12	9.0 : 1	more than 90

Nissan long life coolant (L. L. C.)

L.L.C. is an ethylene glycol base product containing chemical inhibitors to protect the cooling system from rusting and corrosion. The L.L.C. does not contain any glycerine, ethyl or methyl alcohol. It will not evaporate or boil away and can be used with either high or low temperature thermostats. It flows freely, transfers heat efficiently, and will not clog the passages in the cooling system. The L.L.C. must not be mixed with other product. This coolant can be used throughout the seasons of the year and exchange period is two years or total running mileage of 40,000 km (24,000 miles).

Percent concentration	Boiling point		Freeze protection
	Sea level	0.9 kg/cm² cooling system pressure	
30%	106°C (221°F)	124°C (255°F)	-15°C (5°F)
50%	109°C (228°F)	127°C (261°F)	-35°C (-31°F)

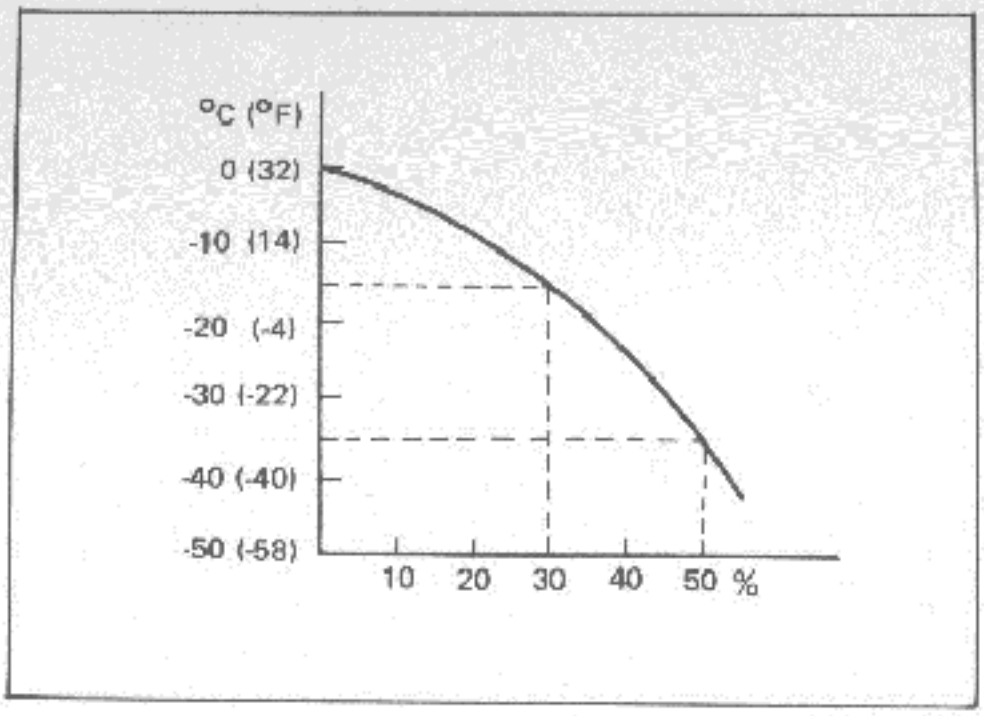


Fig. EG-5 Protection concentration

UNIT SERIAL NUMBER LOCATION

There are two serial numbers for unit identification; the engine number and the chassis number. These numbers are repeated in the car identification plate, which is located in an easy-to-read position.

Engine Serial Number

The engine serial number is stamped in the rear right side of cylinder block, at cylinder head contact surface. The number is preceded by engine model, A10 or A12.

A10 XXXXXX

A12 XXXXXX

Serial number

Engine model

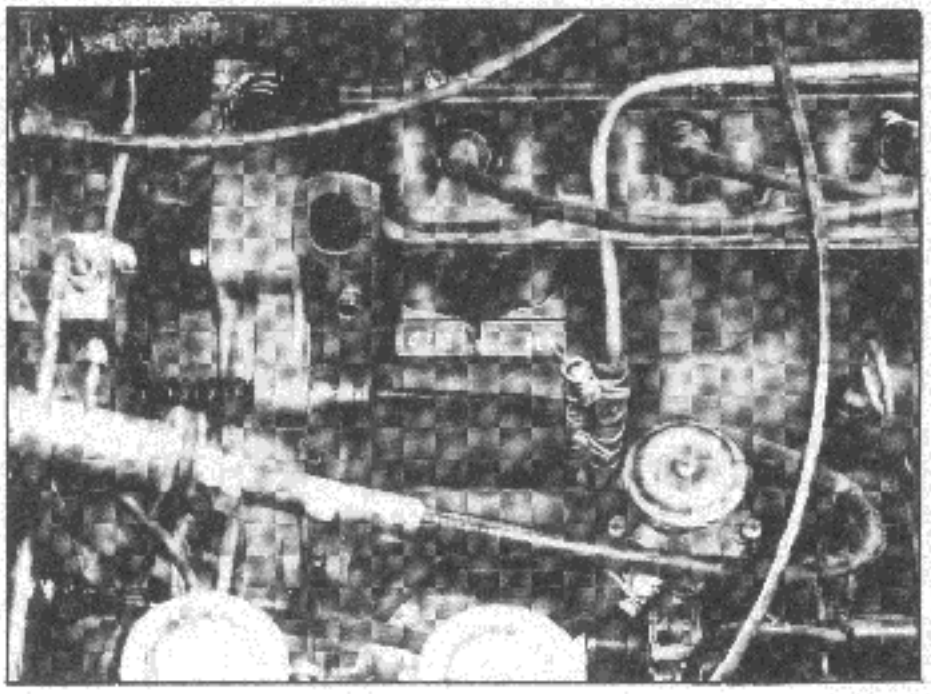


Fig. EG-6 Engine serial number

PERIODICAL INSPECTION AND MAINTENANCE (A10 AND A12 ENGINE)

ENGINE SERVICE POINTS

(Except U.S.A. & CANADA)

Number of thousands of kilometers (miles)

	MAINTENANCE INTERVAL													
	1 (0.6)	5 (3)	10 (6)	15 55 (9 33)	20 60 (12 36)	25 65 (15 39)	30 70 (18 42)	35 75 (21 45)	40 80 (24 48)	45 85 (27 51)	50 (30)	90 (54)	95 (57)	100 (60)
Change engine oil	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Change cooling water			X		X		X		X		X	X		X
Change cooling water (L.L.C.)									X					
Grease distributor shaft & cam heel			X		X		X		X		X	X		X
Lubricate accelerator linkage			X		X		X		X		X	X		X
Replace carburetor air cleaner element									X					
Check or replace spark plugs			X		R		X		R		X	X		R
Check or replace distributor breaker points		X	X	X	X	X	X	X	X	X	X	X	X	X
Replace oil filter		X	X		X		X		X		X	X		X
Replace cartridge type fuel strainer					X				X					X
Retighten cylinder head bolts and manifold nuts	X													
Adjust valve clearance	X		X		X		X		X		X	X		X
Check and adjust ignition timing	X		X		X		X		X		X	X		X
Check fan belt tension	X		X		X		X		X		X	X		X
Adjust engine idling		X	X		X		X		X		X	X		X
Check fuel line (hoses, pipings, connections, etc.) for leaks	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Check engine for oil and water leaks	X		X		X		X		X		X	X		X
Check battery specific gravity	X				X				X					X

R : Replacement

ENGINE SERVICE POINTS

(For U.S.A. & CANADA)

ENGINE EQUIPPED WITH EMISSION CONTROL SYSTEM	MAINTENANCE INTERVAL Number of thousands of kilometers (miles)													
	1 (0.6)	5 (3)	10 (6)	15 (9) 55 (33)	20 (12) 60 (36)	25 (15) 65 (39)	30 (18) 70 (42)	35 (21) 75 (45)	40 (24) 80 (48)	45 (27) 85 (51)	50 (30)	90 (54)	95 (57)	100 (60)
Change engine oil	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Change cooling water			X		X		X		X		X	X		X
Change cooling water (L.L.C.)									X					
Grease distributor shaft & cam heel			X		X		X		X		X	X		X
Lubricate accelerator linkage			X		X		X		X		X	X		X
Replace carburetor air cleaner element									X					
Check or replace spark plugs		X	X	X	R	X	X	X	R	X		X	X	R
Check or replace distributor breaker points		X	X	X	R	X	X	X	R	X		X	X	R
Replace oil filter		X	X		X		X		X		X	X		X
Replace cartridge type fuel strainer									X					
Retighten cylinder head bolts and manifold nuts	X													
Adjust valve clearance	X		X		X		X		X		X	X		X
Check and adjust ignition timing	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Check high tension cables					X				X					X
Check fan belt tension	X		X		X		X		X		X	X		X
Adjust engine idling	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Engine tune-up					X				X					X
Check fuel line (hoses, pipings, connections, etc.) for leaks	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Check engine for oil and water leaks	X		X		X		X		X		X	X		X
Check battery specific gravity	X				X				X					X
Check hose & piping connections for loose (P.C.V.)					X				X					X
Check emission control valves for operation					X				X					X

R : Replacement

AFTER FIRST 1,000KM (600MILES)

Changing engine oil

Second replacement
..... at 5,000 km (3,000 miles)

Third and thereafter
..... every 5,000 km (3,000 miles)

Draining is best done after a good run, when the oil, being thoroughly warm, will flow readily and freely.

Place a large bowl or other proper container under the engine and remove the oil pan drain plug.

Carry out this operation carefully, since the oil is hot and it will spurt out with some force. After completely draining the dirty oil off, securely replace the oil drain plug and finally refill the engine with oil in the usual way up to the "H" mark on the dipstick (oil level gauge).

Be sure to level the car while draining and filling the engine.

Oil capacity

A10 ..... 3.2 ℓ (3 3/8 US qts, 2 3/4 Imp qts)

A12 ..... 3.2 ℓ (3 3/8 US qts, 2 3/4 Imp qts)

Fan belt tension

Second check
..... at 10,000 km (6,000 miles)

Third and thereafter
..... every 10,000 km (6,000 miles)

Incidentally, we call it the fan belt, but it also drives the water pump and alternator. It is advised that the tension be checked carefully, so that when the need for adjustment does arise, it is not overlooked. With the engine switched off and the bonnet up, push the belt gently downward. You should be able to depress it about 10 mm (½ in). When the fan belt is slack through wear, loosen the fixing and adjusting bolts, and move the alternator away from the engine to stretch the belt.

Tighten the bolts again, and make sure that the belt is provided with a proper tension. It should be noted that if the belt is tightened excessively it will wear rapidly and also overload the water pump and alternator bearings.

AFTER FIRST 5,000KM (3,000MILES)

Replacing oil filter

Second replacement
..... at 10,000 km (6,000 miles)

Third and thereafter
..... every 10,000 km (6,000 miles)

The oil filter is of a full-flow cartridge type. The oil filter element is sealed in the container as a unit. It can be easily removed by hand. Be careful not to loose the rubber sealing ring. When assembling oil the seal lightly, and when the seal is contacted, tighten by hand further, rotating it about 1/3 of one full turn.

EVERY 10,000KM (6,000MILES)

Changing cooling water

Scale or sediment accumulated in water jacket or radiator affects heat radiation efficiency. Thoroughly flush the system after opening two drain plugs, (one at the bottom of the radiator and the other at the left side of the cylinder block,) until clean water comes out.

Always use clean mild water for filling the radiator. When cold season arrives, the high quality anti-freeze solution such as a NISSAN LONG LIFE COOLANT should be added. Do not overfill the system. This coolant (L.L.C.) may be changed every 40,000 km (24,000 miles).

EVERY 40,000KM (24,000MILES)

Replacing air cleaner element (wet paper type)

The air cleaner uses a wet paper type cleaner element (viscous type). As this element has been manufactured under special treatment, there is no need of cleaning until it is replaced with a new one. Although the cleaner element looks dirty, do not intend to clean. The cleaning performance in constantly maintained although it looks contaminated. Be careful not to injure cleaner element.

SERVICE MANUAL

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SECTION ET

ENGINE TUNE-UP

ET

ENGINE TUNE-UP

CONTENTS

GENERAL DESCRIPTION

A minor tune-up and test may consist of battery test, cleaning, regapping or replacement of spark plug and distributor points; distributor dwell angle, ignition timing, carburetor idle mixture, and hot idle speed adjustment.

The complete or major tune-up and test procedure consist of those basic them described above, inspections of ignition, compression, electrical system and carburetor and final road test to ensure trouble-free operation.

BASIC PROCEDURE

Connect tune-up equipment

Regard the recommendations provided by the manufacture for the use of testing equipment. Figure ET-1 shows a basic schematic for instrumentation which may be applied to many types of test equipment and may be used as a guide if equipment recommended by the manufacturer are not available.

Connect equipment as shown in Figure ET-1 in accordance with the following instructions:

1. Voltmeter

   (1) Positive lead to resistor side of coil.

   (2) Negative lead to ground.

2. Timing light

   (1) Positive lead to positive battery terminal.

   (2) Negative lead to ground.

3. Tachometer

   (1) Positive lead to distributor side of coil.

   (2) Negative lead to ground.

Note: For transistor ignition, it is necessary to use a tachometer which uses a high voltage pick-up. Attach the pick-up to No. 1 or No. 4 spark plug. This tachometer may also be used for conventional type ignition.

4. Dwell meter

   (1) Positive lead to distributor side of coil.

   (2) Negative lead to ground.

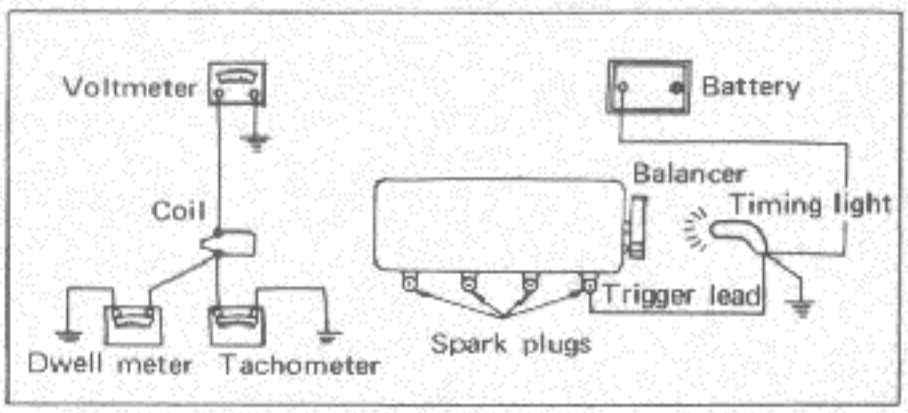


Fig. ET-1 Simple schematic of tune-up instrumentation

Battery inspection

1. Check the battery for electrolyte level.

Make sure that electrolyte is in the level line indicated on the battery case.

If necessary, add distilled water.

2. Measure specific gravity of electrolyte.

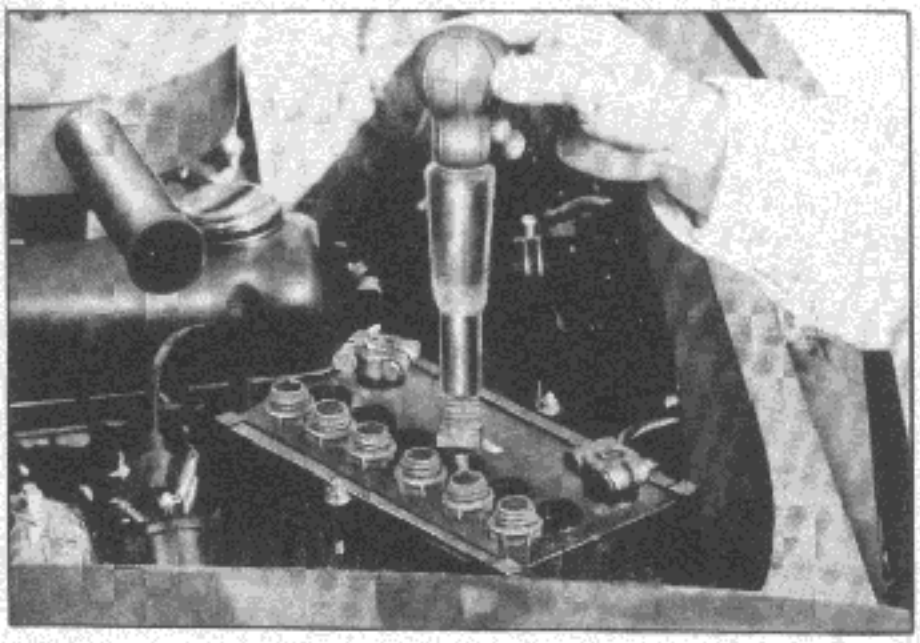


Fig. ET-2 Battery inspection

	Permissible value	Full charge value (at 20° C, 68° F)
Frigid climates	Over 1.22	1.28
Tropical climates	Over 1.18	1.23
Other climates	Over 1.20	1.26

Clean top of battery and terminals with a solution of baking soda and water. Rinse off and dry with compressed air. Top of battery must be clean to prevent current leakage between terminals and from positive terminal to hold-down clamp.

In addition to current leakage, prolonged accumulation of acid and dirt on top of battery may cause blistering of the material covering connector straps and corrosion of straps. After tightening terminals, coat them with petrolatum (vaseline) to protect them from corrosion.

Spark plugs-remove and recondition

Check spark plugs for condition. Spark plug insulators should be thoroughly cleaned to prevent possible flash -over.

Thoroughly clean lower insulator and cavity by sand blasting. File both electrodes flat (rounded surfaces increase voltage required to fire plugs) and set gap to 0,7 to 0.8 mm (0.0276 to 0.0315 in). When plugs are reinstalled, use new gaskets and tighten plugs to 1.5 to 2.0 kg-m (11.0 to 15.0 ft-lb) torque.

Clean and adjust distributor points

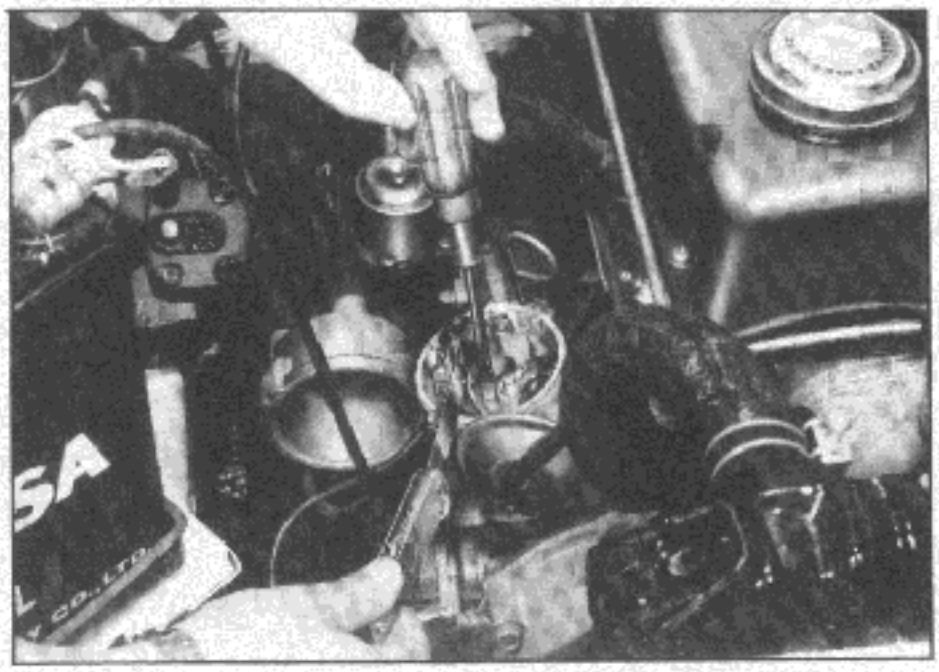


Fig. ET-3 Distributor point gap check

Remove distributor cap and inspect points for excessive burning or pitting. Replace points if necessary. Use a point file to clean contact area and remove scale from points. Filing is for cleaning purposes only. Do not attempt to remove all roughness. Apply a trace of bearing lubricant to the breaker cam. Adjust distributor dwell angle to 49 to 55 degrees on A10 and A12 engines.

Set ignition timing

With distributor vacuum line disconnected and engine operated at normal idle speed or below, set ignition timing.

The timing can be observed by the stationary pointer at the front cover and the markings on the crankshaft pulley with a device called a stroboscopic light (also referred to as a timing light) as shown in Figure ET-4.

Note that the pulley groove is graduated 5° per scale division in terms of the crank angle. The top dead center is located to the extreme left as viewed from the inspector's side.

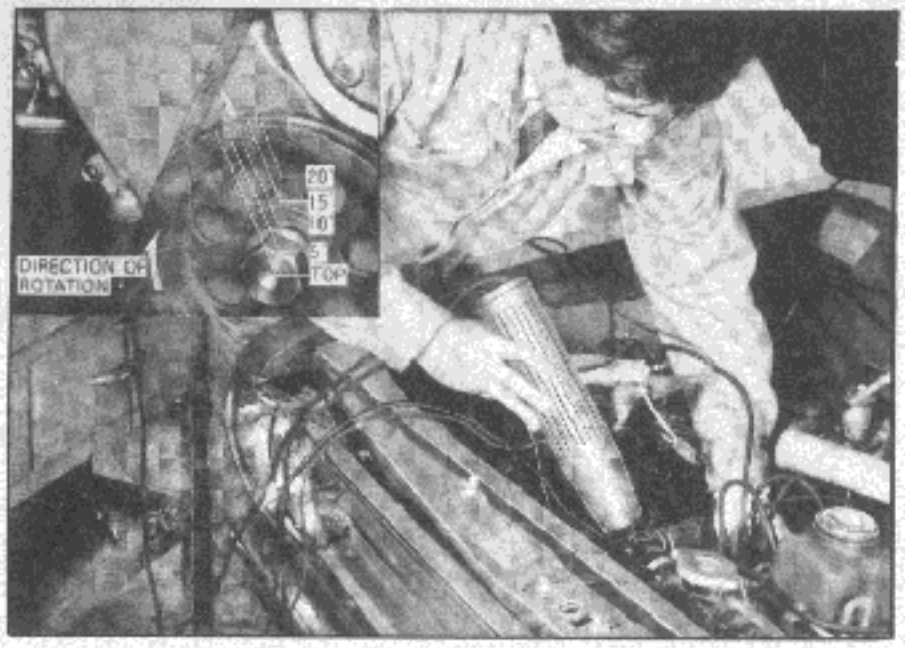


Fig. ET-4 Ignition timing check

Ignition Timing

A10 ..... 8°/600 rpm
A12 ..... 7°/600 rpm

Inspection of fan belt

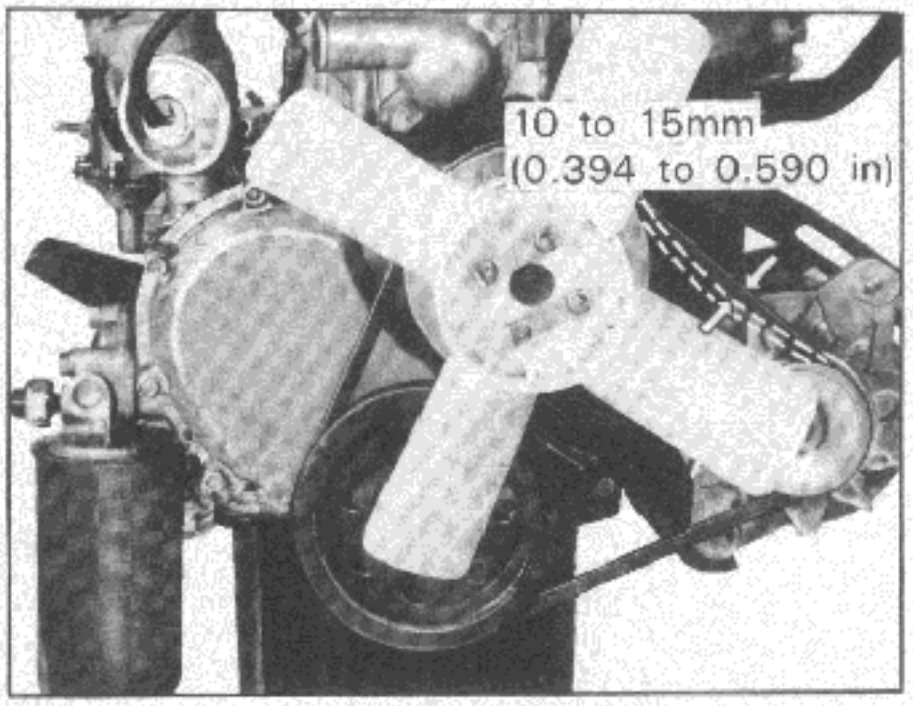


Fig. ET-5 Fan belt tension

1. Check for a cracked or damaged V-belt. Replace if defective.

2. Adjust the belt tension, if necessary.

Permissible slackness of
fan belt: 10 to 15 mm (0.394 to 0.590 in)
Belt tension measuring
point: Between fan pulley and alternator pulley.

Inspection of engine oil

Oil capacity of engine

Capacity \ Engine	A10	A12
Maximum	2.7 ℓ (0.71 US gal) (0.59 Imp gal)	2.7 ℓ (0.71 US gal) (0.59 Imp gal)
Minimum	1.7 ℓ (0.45 US gal) (0.37 Imp gal)	1.7 ℓ (0.45 US gal) (0.37 Imp gal)

1. Make sure that engine oil is not deteriorated with cooling water or gasoline. Drain and refill the oil, if necessary.

Note: a. A milky oil indicates the presence of cooling water.
Find the cause for necessary correction action.

b. Oil with extremely low viscosity indicates dilution with gasoline.

2. Check oil level. If it is lower than the rated level oil of the same grade up to the "H" level.

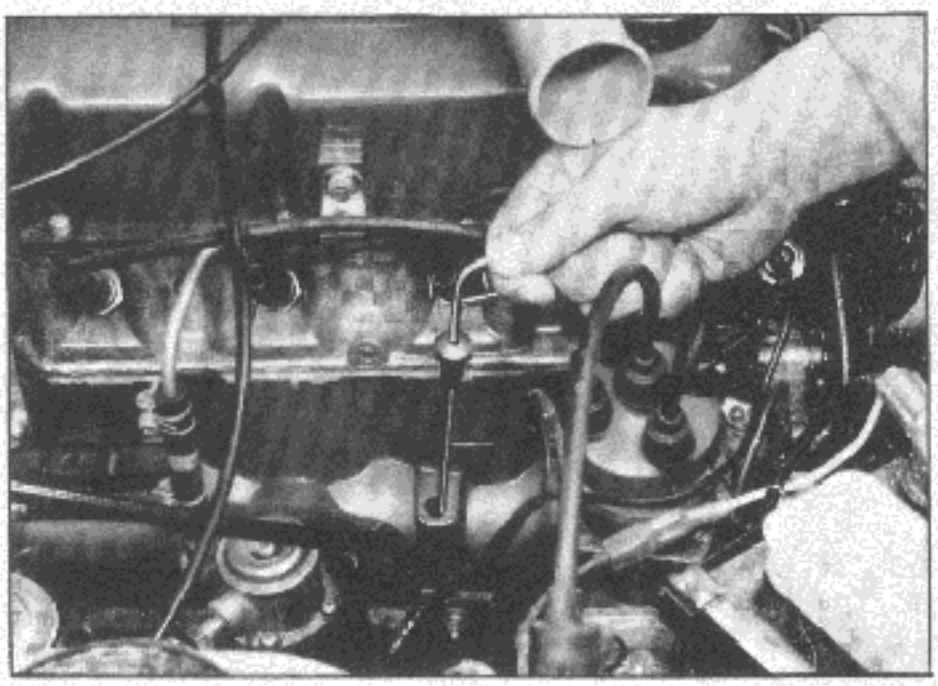


Fig. ET-6 Engine oil level check

Carburetor overhaul and adjustment

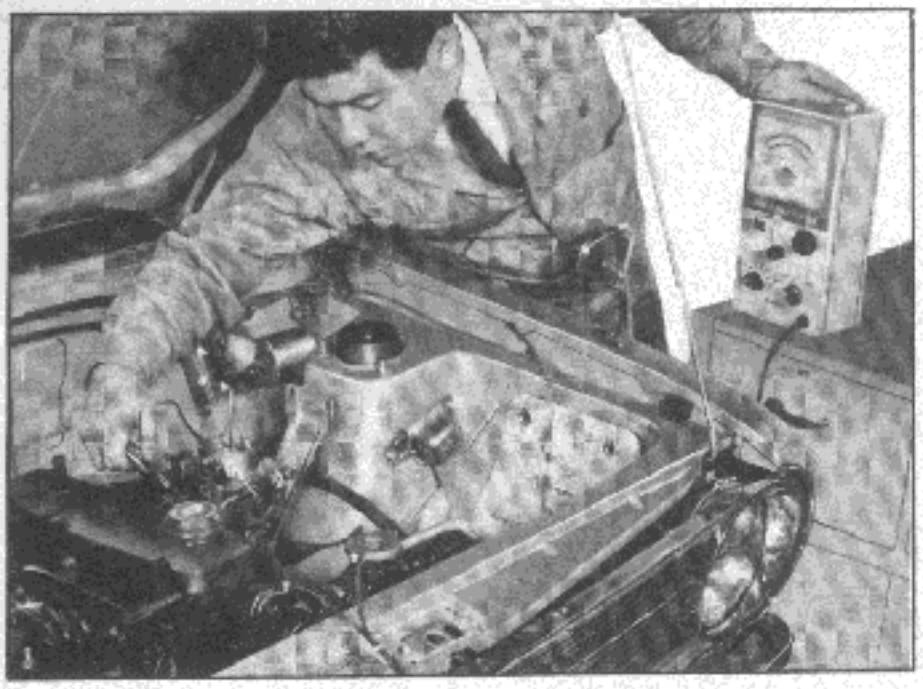


Fig. ET-7 Idle adjustment

OVERHAUL

The detailed information for carburetor overhauling is outlined in section EF (ENGINE FUEL SYSTEM).

Overhaul the carburetor assembly, referring to section EF.

ADJUSTMENT

Adjust carburetor idle speed and mixture to the following specifications.

Engine idling

A10 ..... 600 rpm
A12 ..... 600 rpm

This adjustment is impossible when the engine is in operation. Follow the procedure described below:

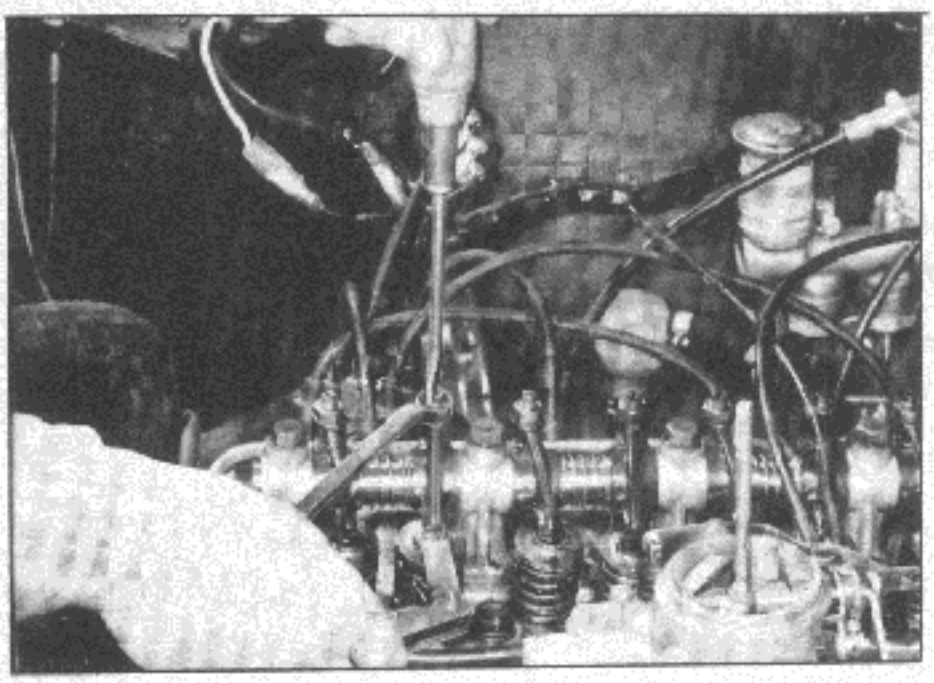


Fig. ET-8 Valve clearance adjustment

1. Warm up the engine, and stop it. Then, measure the hot engine valve clearance. If it deviates from the given hot-engine valve setting value, adjust.

Valve Clearance mm (in)	Cold	Intake	0.25 (0.0098)
		Exhaust	0.25 (0.0098)
	Hot	Intake	0.35 (0.0138)
		Exhaust	0.35 (0.0138)

ADDITIONAL PROCEDURE

For diagnosis purposes, it is sometimes necessary to proceed further than the basic tune-up procedure. The following steps and a road test are included in a complete in a complete or major tune-up and test procedure.

Compression pressure-test (each cylinder)

Note: This test should be done when plugs are removed for service during basic tune-up procedure.

Unless checking for worn rings or for the cause of low speed miss, compression check is not required.

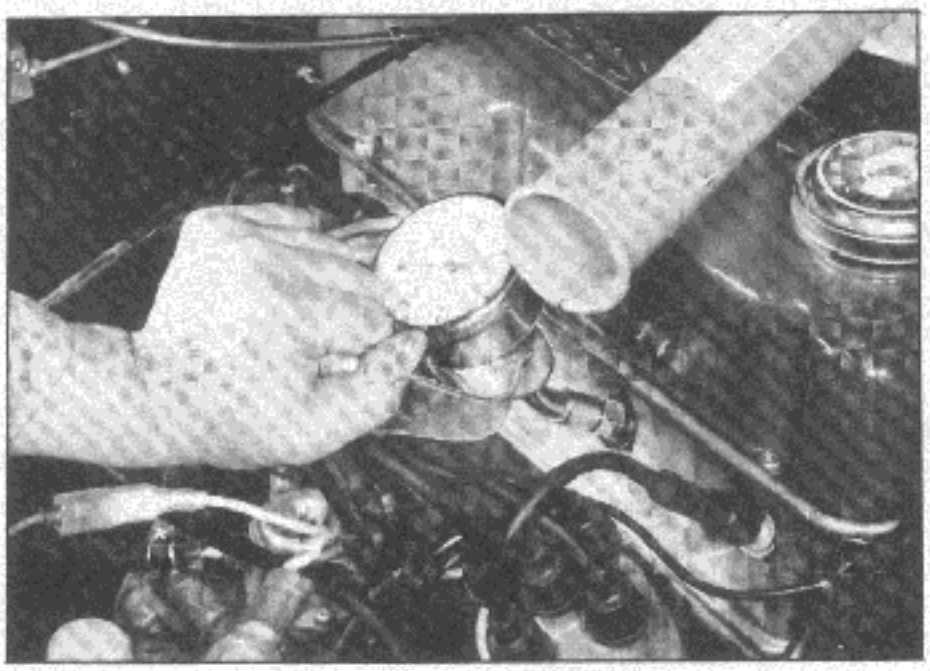


Fig. ET-9 Compression pressure test

Test compression with engine warm, all spark plugs removed and throttle and choke open. No cylinder should be less than 80% of the highest cylinder. Excessive variation between cylinders, accompanied by low speed missing of the cylinder or cylinders which are low, usually indicates a valve not properly seating or a broken piston

ring. Low pressures, even though uniform, may indicate worn rings. This may be accompanied by excessive oil consumption.

Compression pressure kg/cm^2 (lb/sq in) at rpm

		Standard	Minimum
A10	Single carb.	11.0/350 (157/350)	10.0/350 (142/350)
A12	Single carb.	12.7/350 (181/350)	10.0/350 (142/350)

Clean and inspect high tension wires, distributor cap and rotor

Note: This operation is to be performed while checking distributor points during the basic tune-up procedure. Inspect distributor cap for cracks and flash over.

External surfaces of all parts of secondary system must be cleaned to reduce possibility of voltage loss. All wires should be removed from distributor cap and coil so that terminals can be inspected and cleaned. Burned or corroded terminals indicate that wires were not fully seated, which causes arcing between end of wire and terminal. When replacing wires in terminal, be sure they are fully seated before pushing rubber nipple down over tower. Check distributor rotor for damage, and distributor cap for cracks.

Distributor -lubricate

Wipe a very small amount of special cam and ball bearing lubricant on cam lobes when servicing.

Tighten intake manifold and carburetor attaching nuts

Intake manifold attaching bolts and nuts on engines should be tightened to proper torque. Carburetor attaching nuts should be tightened securely. Leaks at these areas can cause rough idle, surging, deceleration popping or deceleration whistle.

Inspection of oil filter

1. Check for oil leaks at the packing flange. If any leakage is found, tighten it slightly, or replace the oil filter assembly. Do not tighten excessively.

2. Replace the filter every 10,000 km (6,000 miles) running.

Inspection of air cleaner

Viscous type element does not require cleaning until the engine used for two years, or for 40,000 km (24,000 miles) running. (under normal conditions)

Inspection of fuel strainer

A10 AND A12 ENGINE

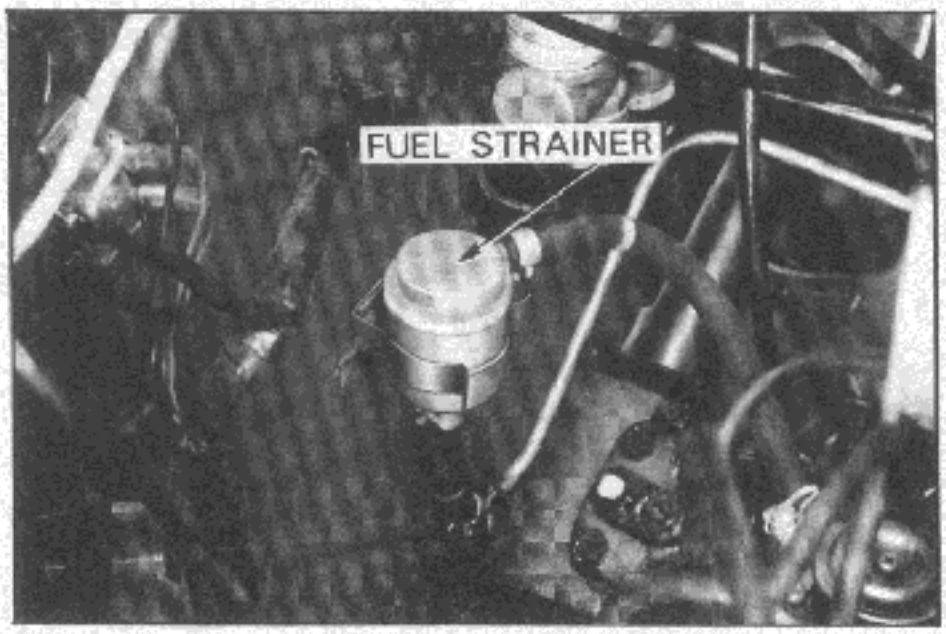


Fig. ET-10 Feul strainer for A10 and A12 engine

These two engines use a cartridge type strainer. If the malfunction is detected, replace as an assembly.

Inspection of cooling system

Inspection of Radiator Cap

Apply reference pressure [0.9 kg/cm^2 (13 lb/sq in)] to the radiator cap (in case of A10 and A12) and make sure that the condition is satisfactory.

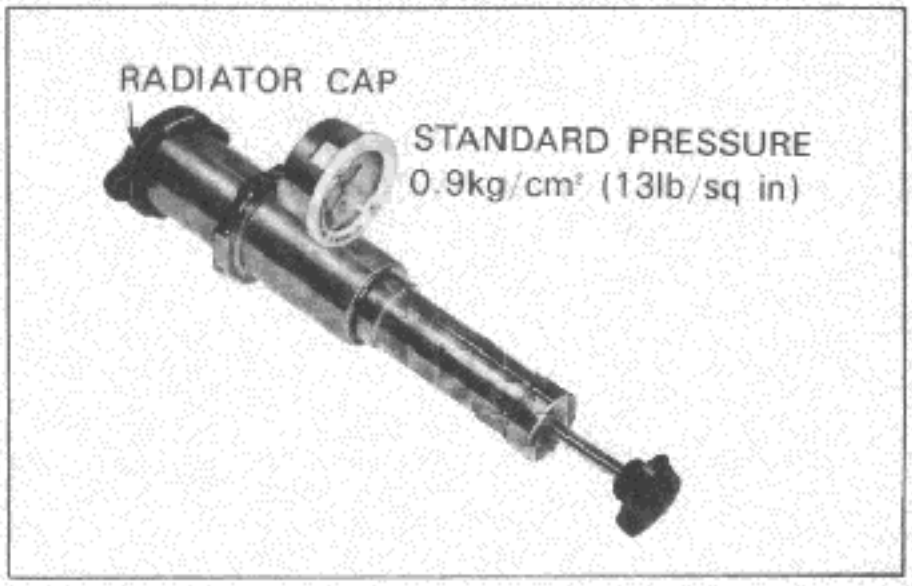


Fig. ET-11 Radiator cap test

Cooling System Pressure Test

With radiator cap removed, apply reference pressure [1.6 kg/cm^2. (23 lb/sq in)] to the cooling system by means of a tester to check for leaks at the system components.

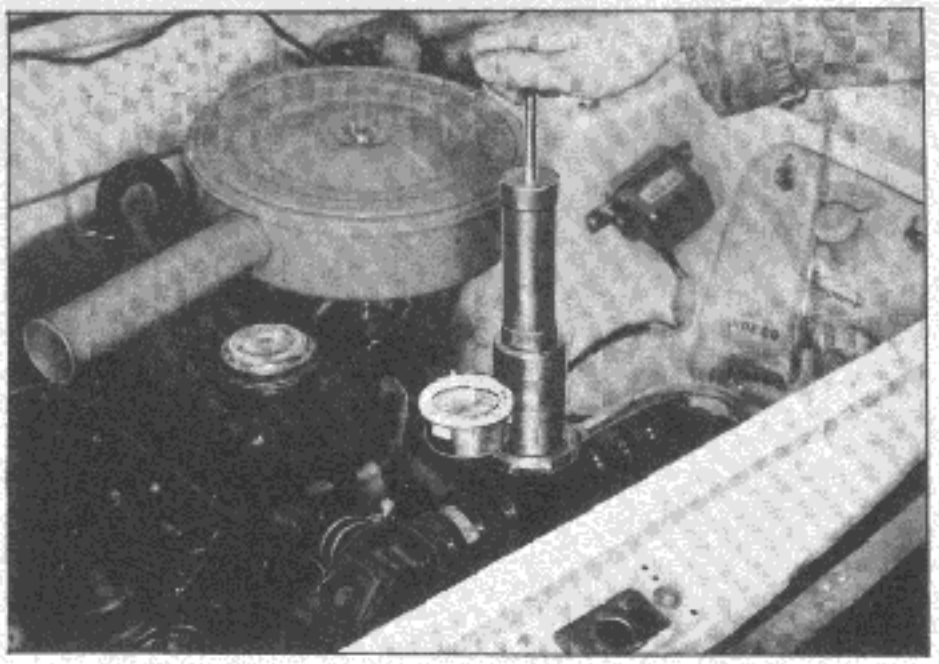


Fig. ET-12 Cooling system pressure test

TROUBLE DIAGNOSES AND CORRECTIONS

Troubles	Possible causes	Remedies
CANNOT CRANK ENGINE OR SLOW CRANKING	Improper grade oil.	Replace with proper grade oil.
	Discharged battery.	Charge battery.
	Defective battery.	Replace
	Loosen fan belt.	Adjust.
	Trouble in charge system.	Inspect charge system.
	Wiring connection trouble in starting circuit.	Correct.
	Defective starter switch.	Repair or replace.
	Defective starter motor.	Repair or replace.

(Trouble shooting procedure on starting circuit)

Switch on the starting motor with light put on.

When light goes off or dims considerably

a. Check battery
b. Check cable for connection.
c. Check starter motor.

When light stays bright

a. Check wiring connection between battery and starter motor.
b. Check starter switch
c. Check starter motor.

ENGINE WILL CRANK NORMALLY BUT WILL NOT START

In this case, following trouble cause may exist. In the most causes, ignition system or fuel system is in trouble.

Ignition system in trouble
Fuel system in trouble
Valve mechanism does not work properly
Low compression

Check spark plug first in accordance with the following procedure.

Disconnect high tension cable from one spark plug and hold it about 10 mm (0.4 in) from the engine metal part and crank the engine.

Good spark occurs

a. Check spark plug.
b. Check ignition timing.
c. Check fuel system.
d. Check cylinder compression.

No spark occurs — Check the current flow inprimary circuit.

Very high current. — Inspect primary circuit for short.
Check breaker point for operation.

Low or no current — Check for loose terminal or disconnection in primary circuit.
Check for burned points.

Ignition system in trouble	
Burned distributor point.	Repair or replace.
Improper point gap.	Adjust.
Defective capacitor.	Replace.
Rotor cap and rotor leak.	Replace.
Defective spark plug.	Clean, adjust plug gap or replace.
Improper ignition timing.	Adjust.
Defective ignition coil.	Replace.
Disconnection of high tension cable.	Replace.

	Loose connection or disconnection in primary circuit.	Repair or replace.
	Lack of fuel.	Supply.
	Dirty fuel strainer.	Replace (A10 and A12).
	Dirty or clogged fuel pipe.	Clean.
	Fuel pump will not work properly.	Repair or replace.
	Carburetor auto-choke will not work properly.	Check and adjust.
	Improper float level adjustment.	Correct.
	Improper idling.	Adjust.
	Dirty or clogged carburetor.	Disassemble and clean.
	Clogged breather pipe.	Clean.
	Incorrect spark plug. Tightening, defective gasket.	Tighten to normal torque, replace gasket.
	Improper grade engine oil or viscosity dropping.	Replace with proper grade oil.
	Incorrect valve clearance.	Adjust.
	Compression leak from valve seat.	Remove cylinder head and lap the valves.
	Sticky valve stem.	Correct or replace valve.
	Weak or defective valve springs.	Replace valve springs.
	Compression leak at cylinder head gasket.	Replace gasket.
	Sticked or defective pistion ring.	Replace piston rings.
	Worn piston ring or cylinder.	Overhaul engine.

(Trouble shooting procedure)

Pour engine oil from plug hole, and then measure cylinder compression.

Compression increases.	Trouble in cylinder or piston ring.
Compression unchanged.	Compression leak from valve, cylinder head or head gasket.

IMPROPER ENGINE IDLING

Fuel system in trouble	Clogged or damaged carburetor jets.	Clean or replace.

	Incorrect idle adjustment.	Adjust.
	Clogged air cleaner.	Replace element.
	Defective gaskets of manifolds or carburetor insulator.	Replace gasket.
	Improper float level adjustment.	Adjust.
Low compression		Previously mentioned.
Others	Incorrect valve clearance.	Adjust.
	Extremely low revolution.	Adjust.
ENGINE POWER NOT UP TO NORMAL		
Low compression		Previously mentioned.
Ignition system in trouble	Incorrect ignition timing.	Adjust.
	Defective spark plugs.	Clean, adjust or replace plugs.
	Defective distributor points.	Dress or replace points. Check condenser.
	Incorrect octane selector setting.	Adjust octane selector.
Fuel system in trouble	Malfunction of choke system.	Adjust.
	Clogged fuel pipe.	Clean.
	Dirty or clogged fuel strainer.	Replace (A10 and A12).
	Fuel pump will not work properly.	Repair or replace.
	Clogged carburetor jets.	Disassemble and clean.
Air intake system in trouble	Clogged air cleaner.	Replace element.
	Air inhaling from manifold gasket or carburetor gasket.	Replace gasket.
Overheating	Insufficient coolant.	Replenish.
	Loosen fan belt.	Adjust.
	Worn or defective fan belt.	Replace.
	Defective thermostat.	Replace.
	Defective water pump.	Replace.
	Clogged or leaky radiator.	Flush, repair or replace.

	Defective radiator filler cap.	Replace.
	Air mixing into cooling system.	Retighten each part of cooling system.
	Improper grade engine oil.	Replace with proper grade oil.
	Incorrect ignition timing.	Adjust.
	Defective carburetor (lean mixture).	Overhaul carburetor.
Overcooling	Defective thermostat.	Replace.
Others	Low octane fuel.	Replace with specified octane fuel.
	Improper tire pressure.	Adjust to the specified pressure.
	Dragging brake.	Adjust.
	Slipping clutch.	Adjust.
NOISY ENGINE		
Carknocking	Overloading to engine.	Use right gear in driving.
	Carbon knocking.	Disassemble cylinder head and remove carbon.
	Timing knocking.	Adjust ignition timing.
	Fuel kocking	Use ,specified octane fuel.
	Preignition (misusing of spark plug).	Use specified spark plug.
Mechanical knocking		
Crankshaft bearing knocking.	This strong dull noise increases when the engine is accelerated. To locate the place, cause a misfire on each cylinder. If the noise stops by the misfire, this cylinder generates the noise.	This is caused by the worn or damaged bearings, or unevenly worn crankshaft. Renew the bearings and adjust or change the crankshaft. Check the lubrication system.
Connecting rod bearing knocking.	This is a little higher-pitched noise than the crankshaft knocking, and also increases when the engine is accelerated. Cause a misfire on each cylinder and if the noise diminishes almost completely this crankshaft bearing generates the noise.	Same as the case of crankshaft bearings.

	Piston and cylinder noise	When you hear an overlapping metalic noise which increases its magnitude with the revolution of the engine and which decreases as the engine is warmed up, this noise is caused by the piston and cylinder. To locate the place, cause a misfire on each cylinder.
		This may cause an abnormal wearing of the cylinder and lower compression which in turn will cause a lower out-put power and excessive consumption of oil.
		Overhaul the engine.
	Piston pin noise.	This noise is heard at each highest and lowest dead end of the poston. To locate the place, cause a misfire on each cylinder.
		This may cause a wear on the piston pin, or piston pin hole.
		Renew the piston and piston pin assembly.
	Water pump noise.	This noise may be caused by the worn or damaged bearings, or by the uneven surface of sliding parts.
		Replace the water pump with a new one.
	Others.	An improper adjustment of the valve clearance.
		Adjust.
		Noise of the timing chain.
		Adjust the tension of the chain.
		An excessive end-play on the crankshaft.
		Disassemble the engine and renew the main bearing bushing.
		Remarks: Disengage the clutch slightly and this noise will stop.
		Wear on the clutch pilot bushing.
		Renew the bushing and adjust the drive shaft.
		Remarks: This noise will be heard when the clutch is disengaged.
ABNORMAL COMBUSTION		
	(back fire, after fire, run-on, etc.)	
	Improper ignition timing	Improper ignition timing.
		Adjust the ignition timing.
		Improper heat range of the spark plugs.
		Use specified spark plugs.
	Fuel system in trouble	Damaged carburetor or mainfold gasket. (back fire, after fire)
		Replace them with new parts.
		Defective carburetor jet.
		Disassemble the carburetor and check it.

	Improper function of the float.	Adjust the level, and check the needle valve.
	Uneven idling.	Adjust.
Defective cylinder head, etc.	Improperly adjusted valve clearance.	Readjust.
	Excess carbon in the combustion chamber.	Remove the cylinder head and remove carbon.
	Damaged valve spring (back fire, after fire).	Replace it with a new one.
EXCESSIVE OIL CONSUMPTION		
Oil leakage	Loose oil drain plug.	Tighten it.
	Loose or damaged oil pan gasket.	Renew the gasket or tighten it.
	Loose or damaged chain cover gasket.	Renew the gasket or tighten it.
	Defective oil seals in front and rear of the crankshaft.	Renew the oil seals.
	Loose or damaged locker cover gasket.	Renew the gasket or tighten it (Do not tighten excessively).
	Improper tightening of oil filter.	Renew the gasket and tighten it correctly.
	Loose or damaged oil pressure switch.	Retighten or renew the oil pressure switch.
Excessive oil consumption	Worn cylinder and piston.	Overhaul the cylinder and renew the piston.
	Improper location of the ring split or reversed assembly.	Reassemble the piston rings correctly.
	Damaged or seized piston rings.	Renew the rings.
		Repair or renew the piston and cylinder.
	Worn piston ring groove and rings.	Renew the piston and piston ring.
	Fatigue of valve oil seal lip.	Replace the seal lip with a new one.
	Worn valve stem.	Renew the valve or the guide.
Others	Inadequate quality of engine oil.	Use the designated oil.
	Engine overheat.	Previously mentioned.

POOR FUEL CONSUMPTION		
See the explanation of the power decrease		
Others	Exceeding idling revolution.	Adjust it to the designated rpm.
	Defective acceleration recovery.	Adjust it.
	Fuel leakage.	Repair or tighten the connection of fuel pipes.
TROUBLE IN OTHER FUNCTIONS		
Decreased oil pressure	Inadequate oil quality.	Use the designated oil.
	Overheat.	Previously mentioned.
	Defective function of oil pump regulator valve.	Disassemble the oil pump and repair or renew it.
	Functional deterioration of oil pump.	Repair or replace it with new one.
	Blocked oil filter.	Renew it.
	Increased clearance in various sliding parts.	Disassemble and replace the worn parts with new one.
	Blocked oil strainer.	Clean it.
	Troubles in the oil gauge pressure switch.	Replace it with a new one.
Excessive wear on the sliding parts	Oil pressure decrease.	Previously mentioned.
	Defective quality or contamination of oil.	Replace the oil with proper one and change the filter element.
	Defective air cleaner.	Replace the air cleaner element.
	Overheat or overcool.	Previously mentioned.
	Improper fuel mixture. (Principally to cylinder walls)	Check the fuel system.
Seizure of sliding parts	Decrease of oil pressure.	Previously mentioned.
	Insufficient clearances.	Reassemble with the designated clearances.
	Overheat.	Previously mentioned.
	Improper fuel mixture.	Check the fuel system.

SERVICE MANUAL

MODEL
A10 & A12
ENGINE

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EM

ENGINE MECHANICAL

EM

GENERAL DESCRIPTION

CONTENTS

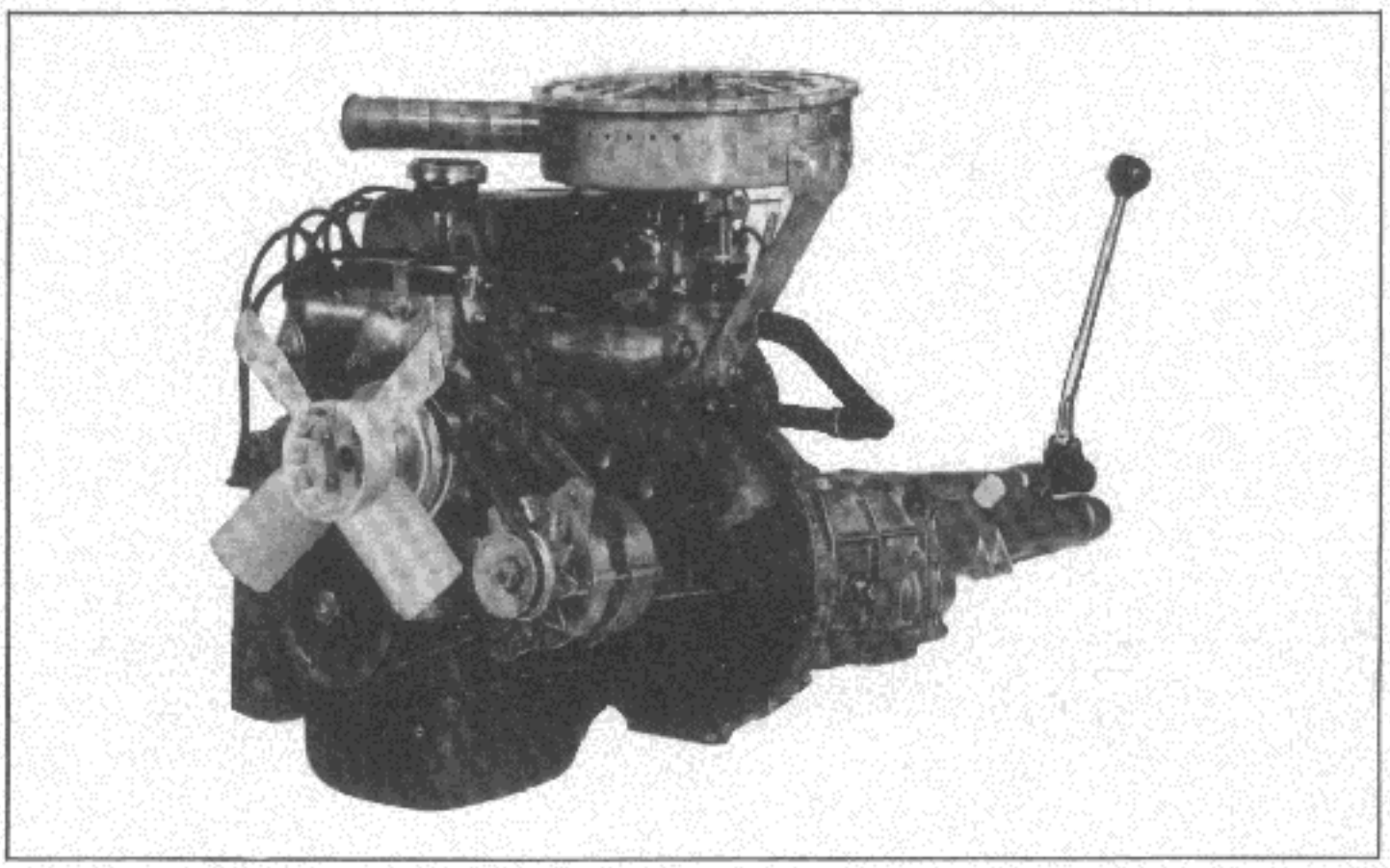


Fig. EM-1 General view of A12 Engine

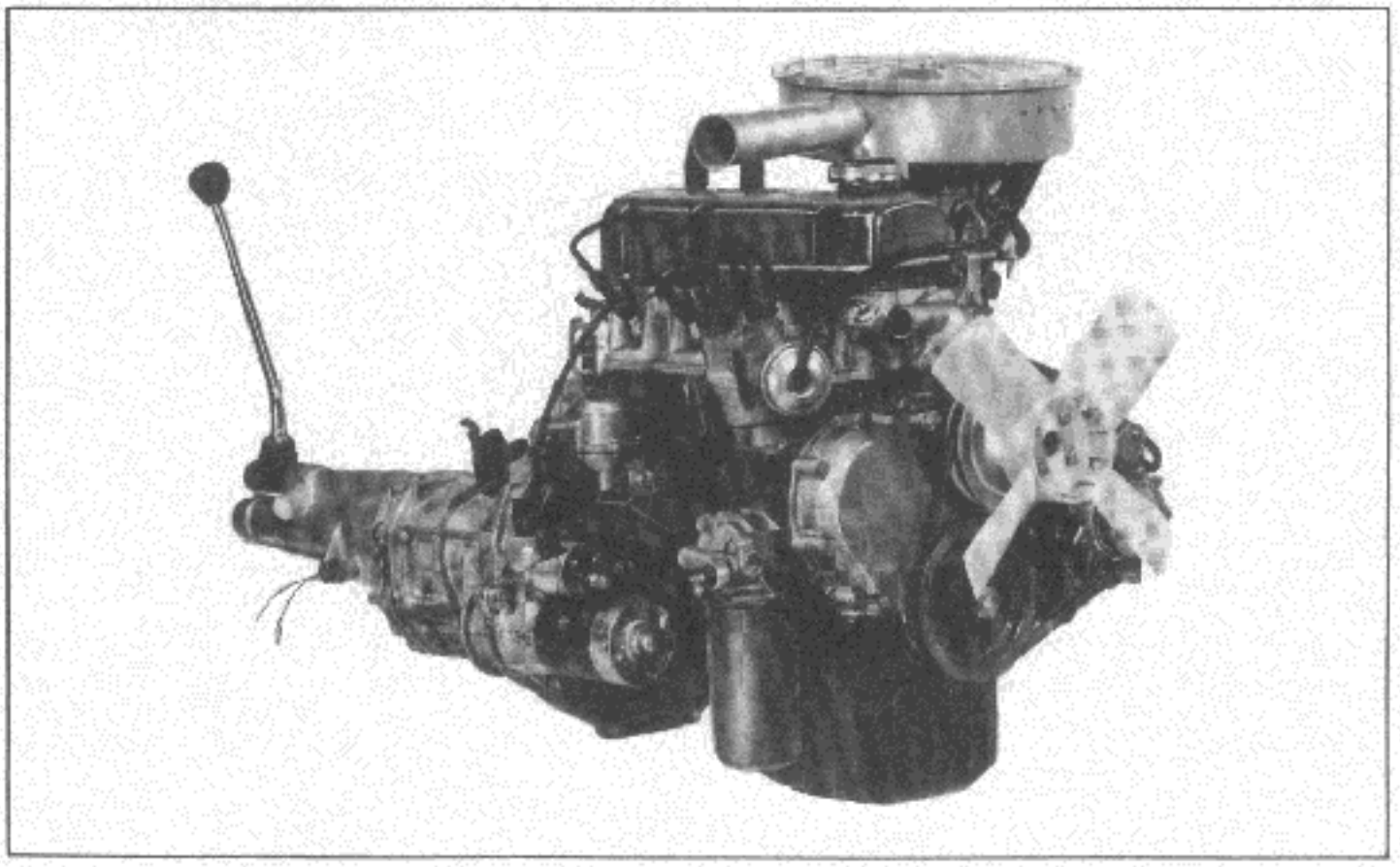


Fig. EM-2 General view of A12 Engine

A10 ENGINE

The A10 Engine is a 988 cc (60.3 cu in) in line OHV four cylinder engine with 73 mm (2.874 in) bore and 59.0 mm (2.323 in) stroke with a compression ratio of 8.5 : 1.

This engine uses three main bearings, valve lifters and hollow push rods to operate the valve rocker arms.

The A10 Engine is of a light weight design using many aluminum diecast parts. The maximum output is 62 HP/6,000 rpm (SAE).

A12 ENGINE

The A12 Engine adopts the same general design and external appearance as the A10 Engine, except for stroke, power and part dimensions for higher output.

In this engine, however, the crankshaft adopts a five bearing support system to bear the higher performance.

The A12 Engine is a 1,171 cc (71.5 cu in) in line over head valve four cylinder engine with 73 mm (2.874 in) bore and 70 mm (2.756 in) stroke.

The maximum output is 69 HP/6,000 rpm (SAE) at a compression ratio of 9.0 : 1.

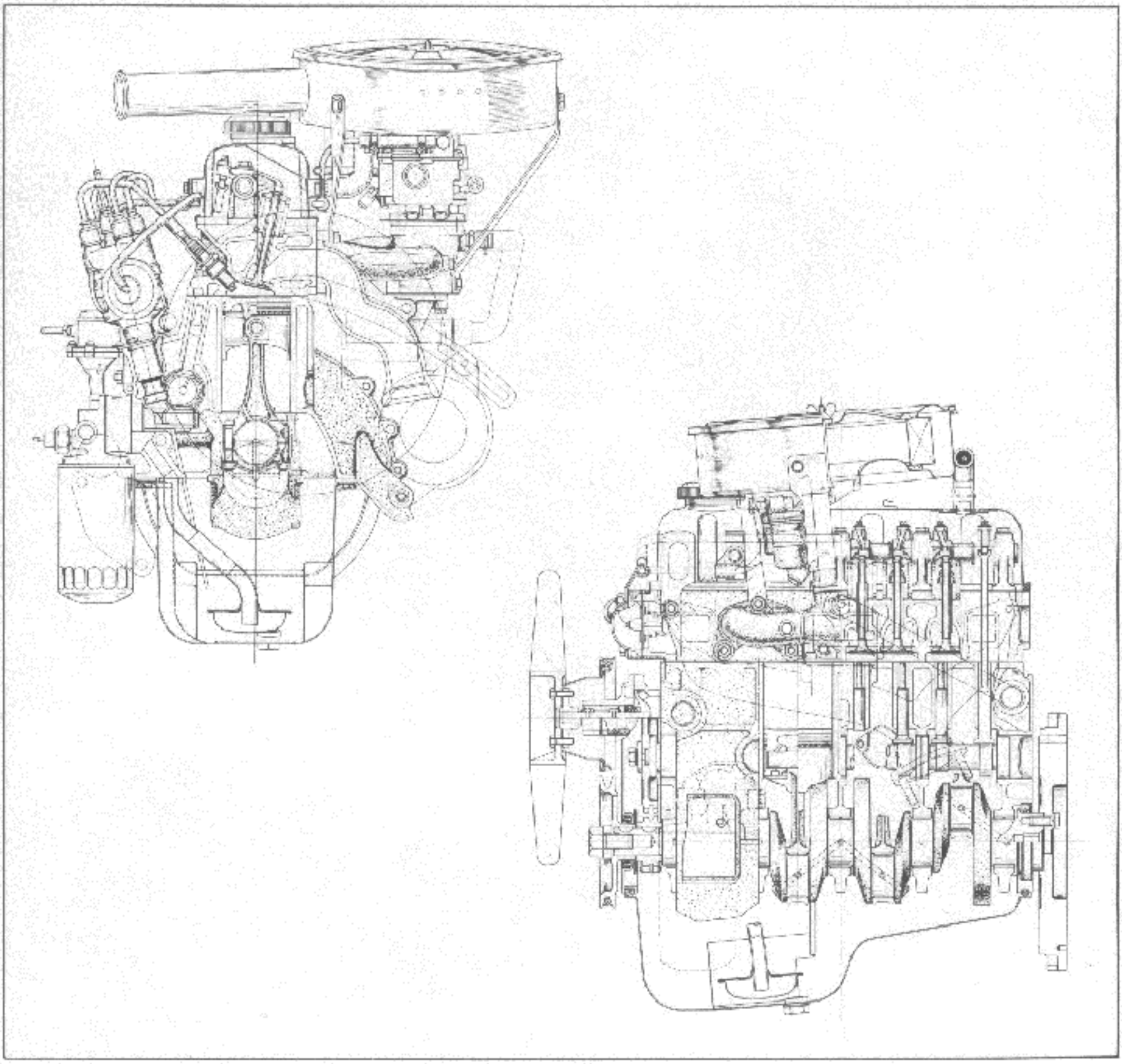


Fig. EM-3 Sectional view of A12 Engine

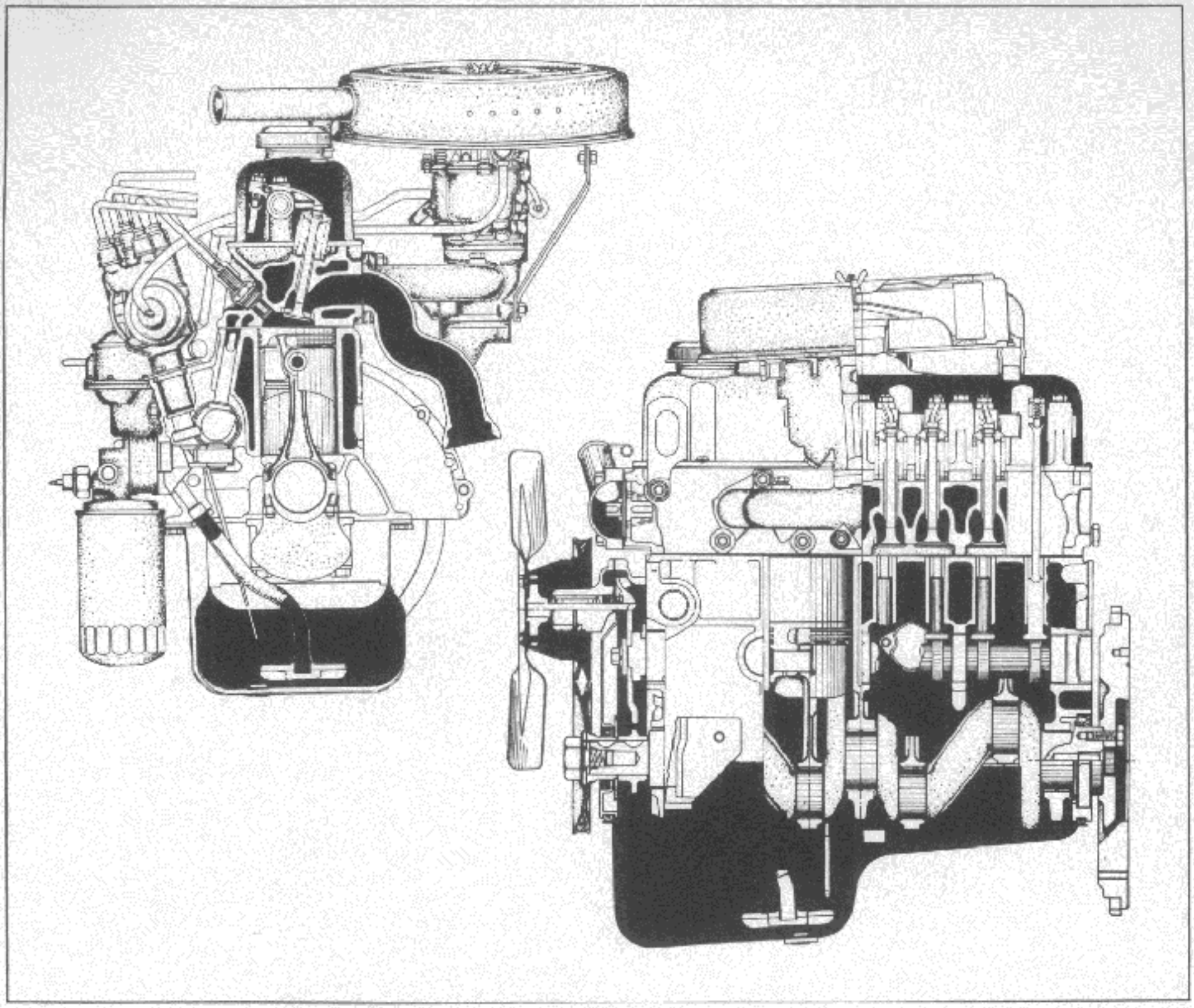


Fig. EM-4 Sectional view of A10 Engine

CYLINDER BLOCK

The cylinder block in a mono block special casting structure adopts five bearing support system (A12 Engine) and three bearing support system (A10 Engine).

The A12 Engine is provided with baffle plate and steel net to reduce oil consumption (the steel net scoops oil).

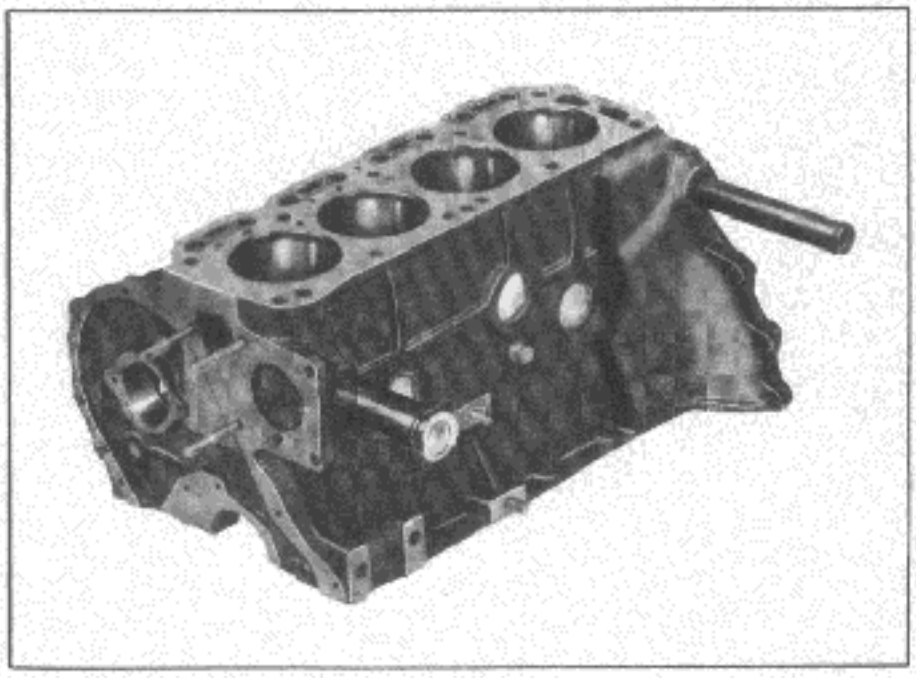


Fig. EM-5 A12 Engine

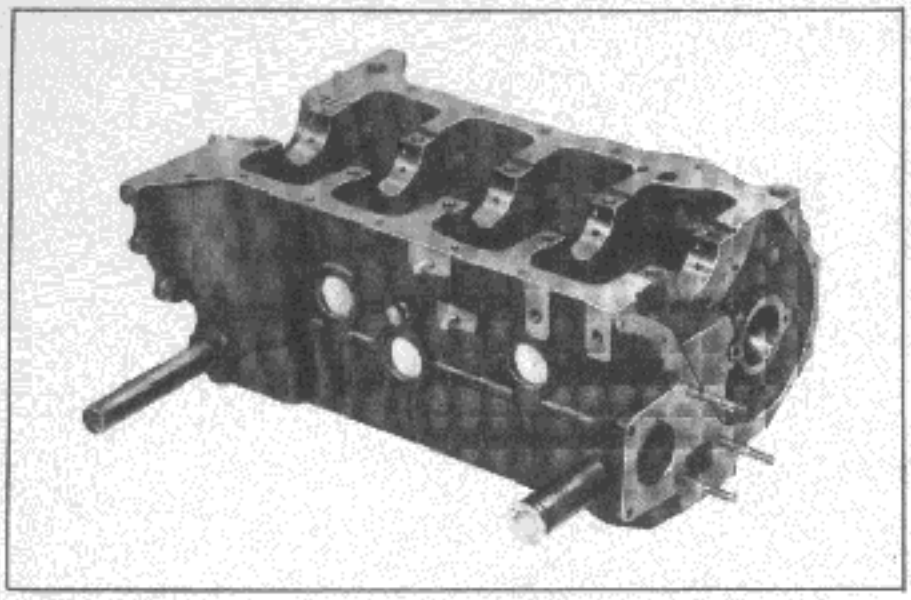


Fig. EM-6 A12 Engine

CRANKSHAFT

The crankshaft is made of special forged steel. Provided with a high capacity balance weight. The crankshaft improves engine quietness and durability at high speed operation.

The main bearings are lubricated from oil holes which intersect the main oil gallery in parallel to the cylinder bores.

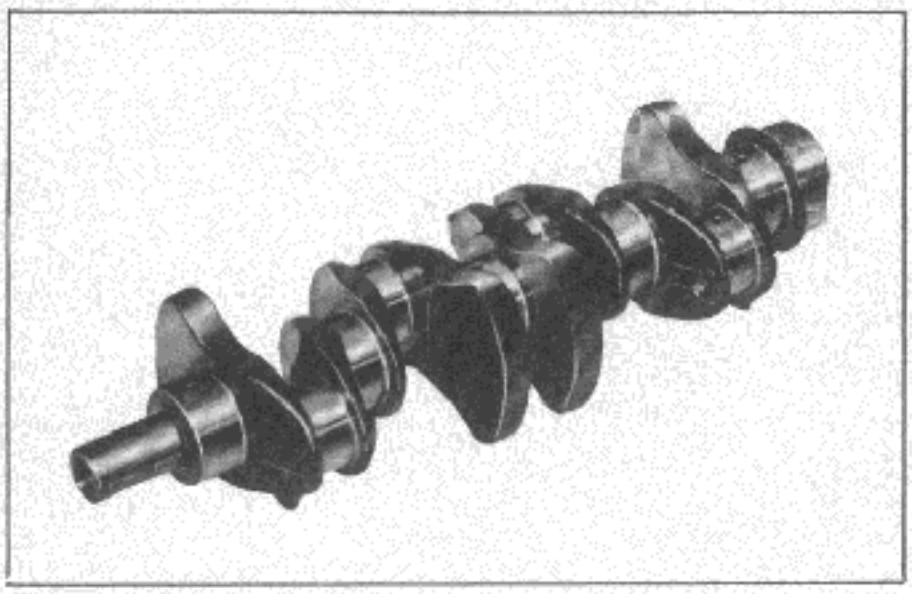


Fig. EM-7 A12 Engine

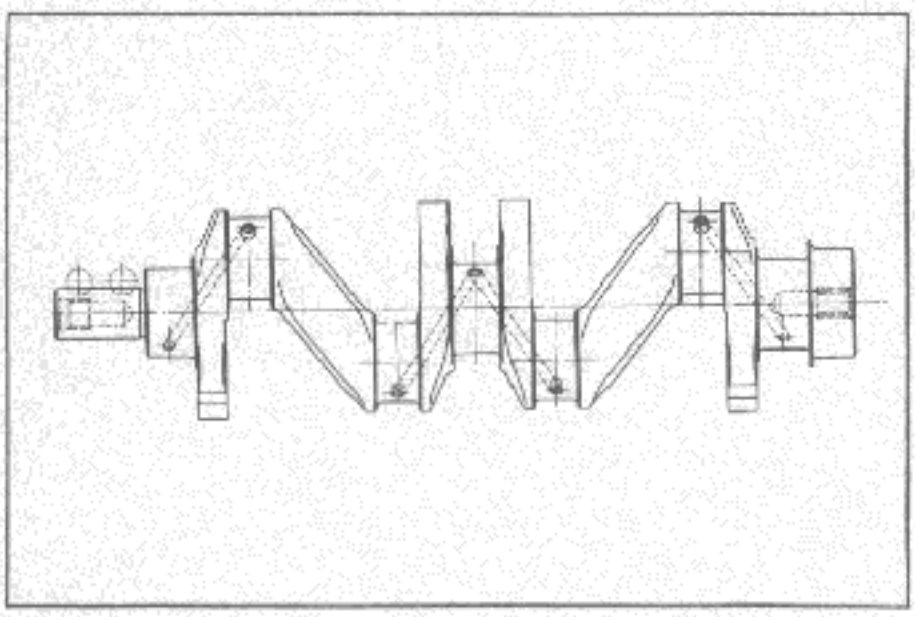


Fig. EM-8 A10 Engine

PISTON AND CONNECTING ROD

The newly designed lightweight piston is of cast aluminum slipper-skirt type.

The A12 Engine uses concave head pistons, and the A10 Engine uses flat head pistons. The piston pin is of a special steel hollow type and is connected to the piston in a full floating fit and to the connecting rod in press fit.

The connecting rod is made of forged steel. Full pressure lubrication is directed to the connecting rods through drilled oil passages from the adjacent main bearing journal.

Oil holes on the connecting rod journals are designed so that oil is supplied to give maximum lubrication just before full bearing load is applied.

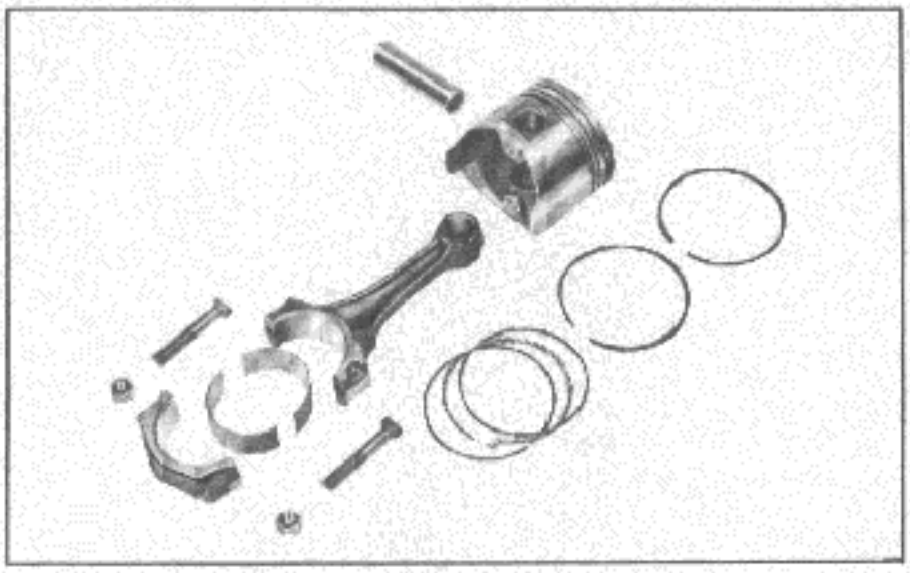


Fig. EM-9 Piston and connecting rod

CYLINDER HEAD

The cylinder head is made of light and strong aluminum alloy with good cooling efficiency. A special aluminum bronze valve seat is used on the intake valve, while a special cast valve seat is installed on the exhaust valve. These parts are hot press fitted.

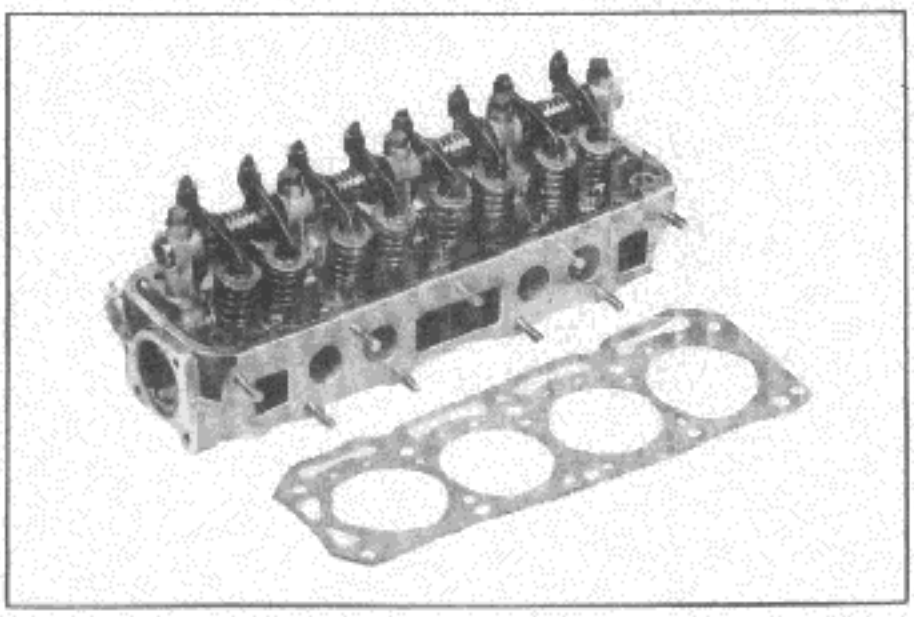


Fig. EM-10 Cylinder head

CAMSHAFT

Camshaft is made of special cast iron and supported by five camshaft bearings.

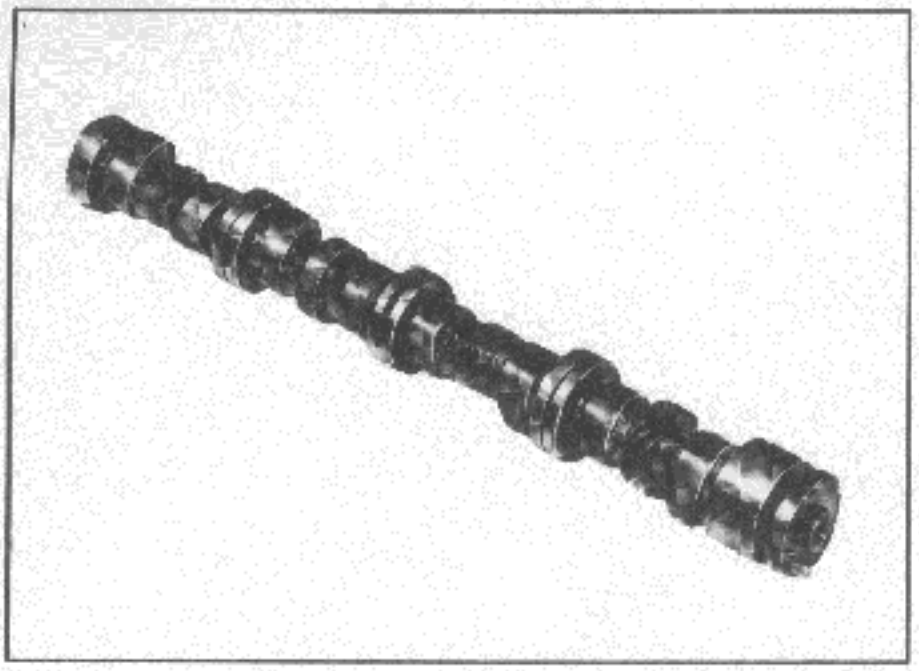


Fig. EM-11 Camshaft

Camshaft bearings are lubricated from oil holes which intersect the main oil gallery of the cylinder block.

Concentric passages are drilled in the front and rear parts of the camshaft for supplying oil to each cam lobe through an oil hole drilled in the base circle of each lobe.

Lubricant is supplied to the front oil gallery from 2nd camshaft bearing and to the rear oil gallery from 4th camshaft bearing.

From the center camshaft bearing, lubricant is supplied to the valve rocker shaft through the center locker shaft bracket.

VALVE MECHANISM

The valve system has push rod type rocker arm which uses the single type valve springs.

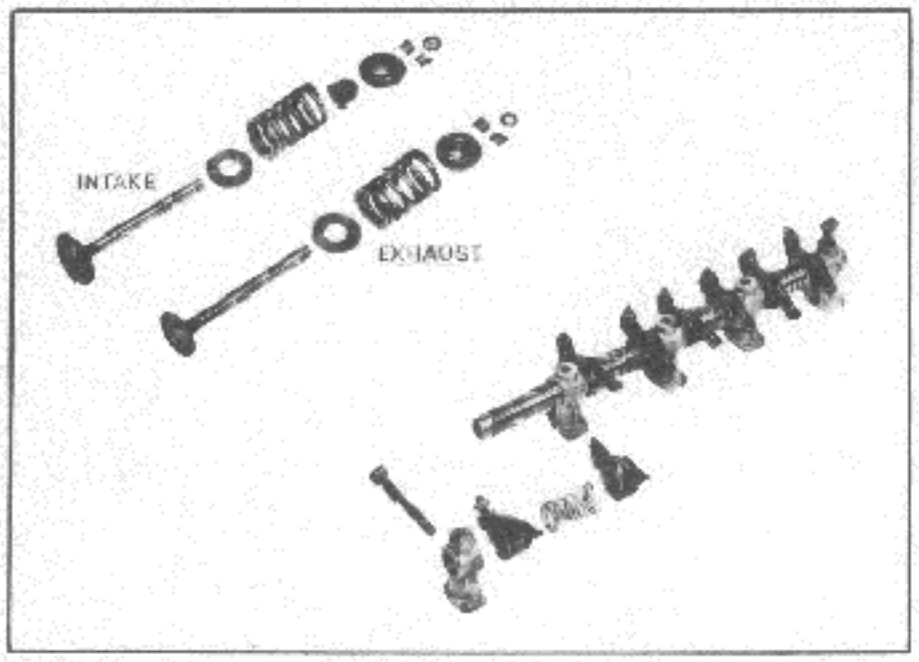


Fig. EM-12 Valve mechanism

CAMSHAFT DRIVE

The camshaft is driven with a double row roller chain which is driven by the crankshaft.

Tension of the chain is controlled by the chain tensioner which is operated with spring and oil pressure.

The rubber shoe type tensioner insulates vibration of the chain and controls tension of the chain.

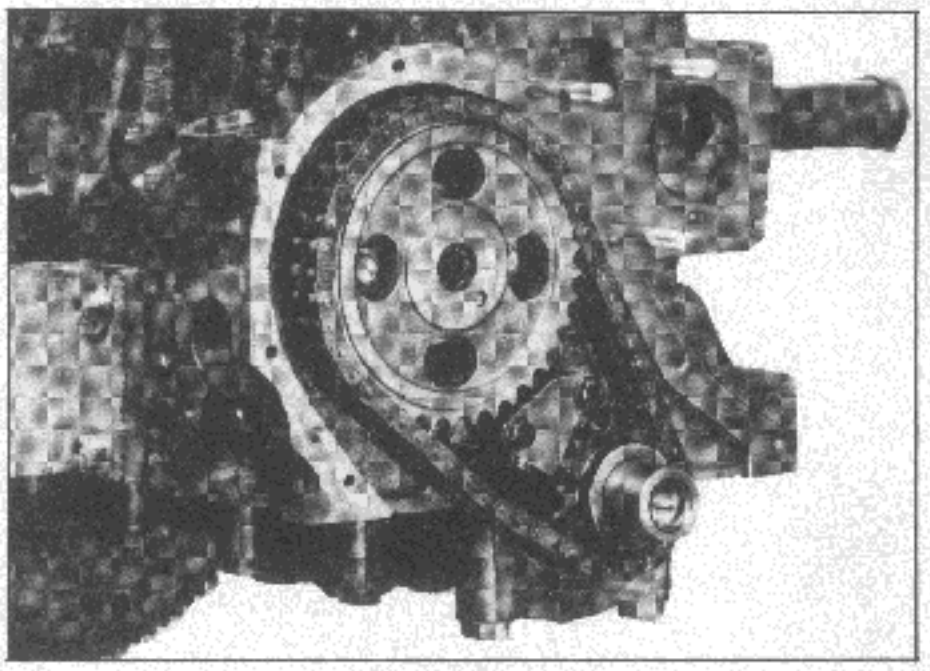


Fig. EM-13

MANIFOLD

The intake manifold is a mono-block aluminum cast.

The exhaust manifold is made of a cast iron. The semi-dual exhaust system which combines exhaust gas flow at the point of exhaust pipe connection, improves exhausting efficiency.

The exhaust manifold has a heat control valve which assures stable and smooth engine running after starting during cold season. The manifold is connected to the exhaust pipe by flanges, which completely eliminate exhaust leaking.

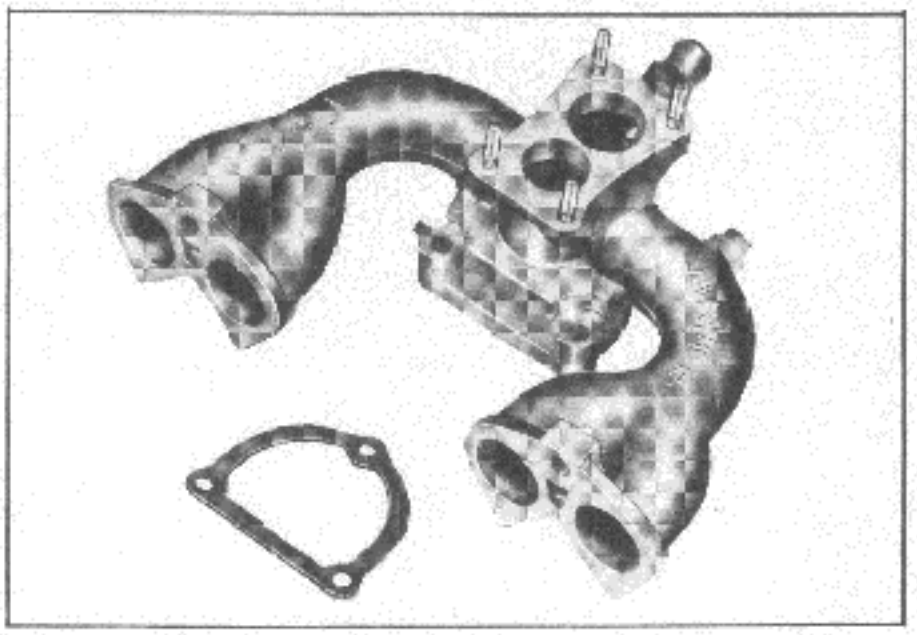


Fig. EM-14 Intake manifold for A12 Engine

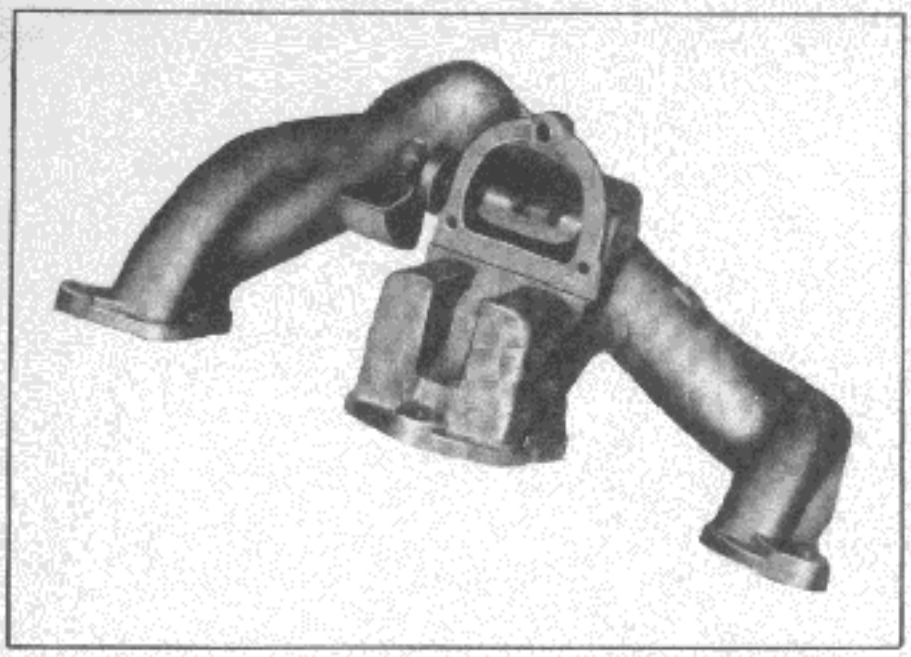


Fig. EM-15 Exhaust manifold for A12 Engine

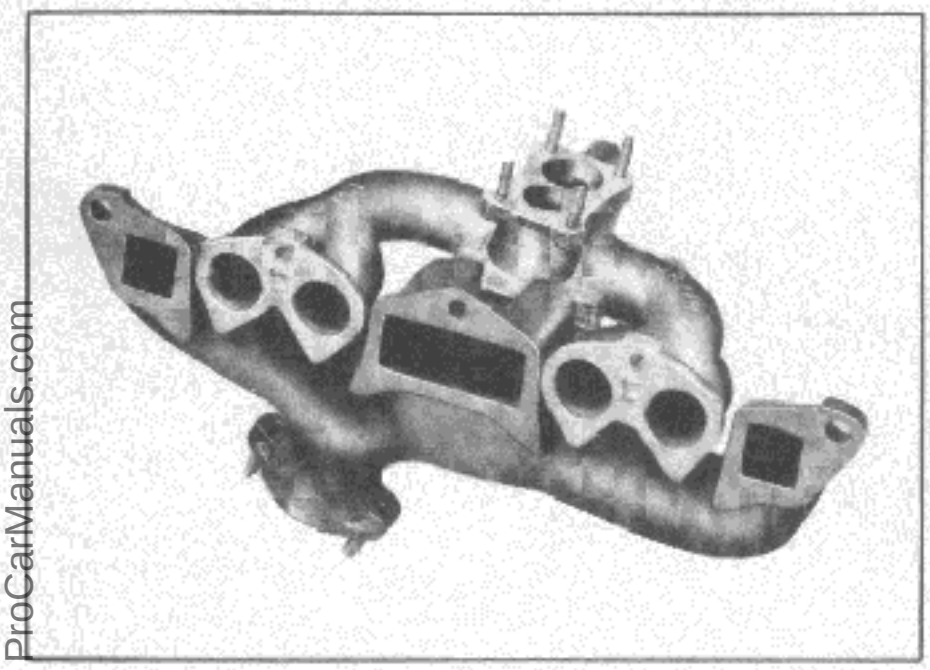


Fig. EM-16 Manifolds for A12 Engine

Carburetor installing angle, main branch angle, and shape of opening on the carburetor installing side of the intake manifold for the A12 Engine differ from that for the A10 Engine. The manifold for the A10 Engine has an opening similar to an ellipse and the manifold for the A12 Engine has two openings; one is for primary side and the other for secondary side. With this intake manifold, distribution of gas mixture is further improved.

In addition, shape of the exhaust manifold joint (connected to the exhaust pipe) for the A10 Engine differs from that for the A12 Engine.

ENGINE DISASSEMBLY

CONTENTS

CLEANING AND INSPECTION

Clean the engine thoroughly before disassembly. Before cleaning the engine, remove the electrical parts, and plug up the carburetor air horn to avoid intrusion of foreign matter.

1. The engine exterior: Check the covers and bolts for breakage, rust, damage and loss.

2. Cylinder block: Check thoroughly the water jacket for cracks and breakage.

3. Clutch housing: Check for cracks.

4. Oil pan: Check for excessive rust.

DISASSEMBLY

1. Mounting engine assembly on engine stand.

(1) Remove the engine mounting R.H.

(2) Install the engine attachment.

(3) Mount the engine on the stand.

Engine stand: ST05010000
Engine attachment: ST05270000

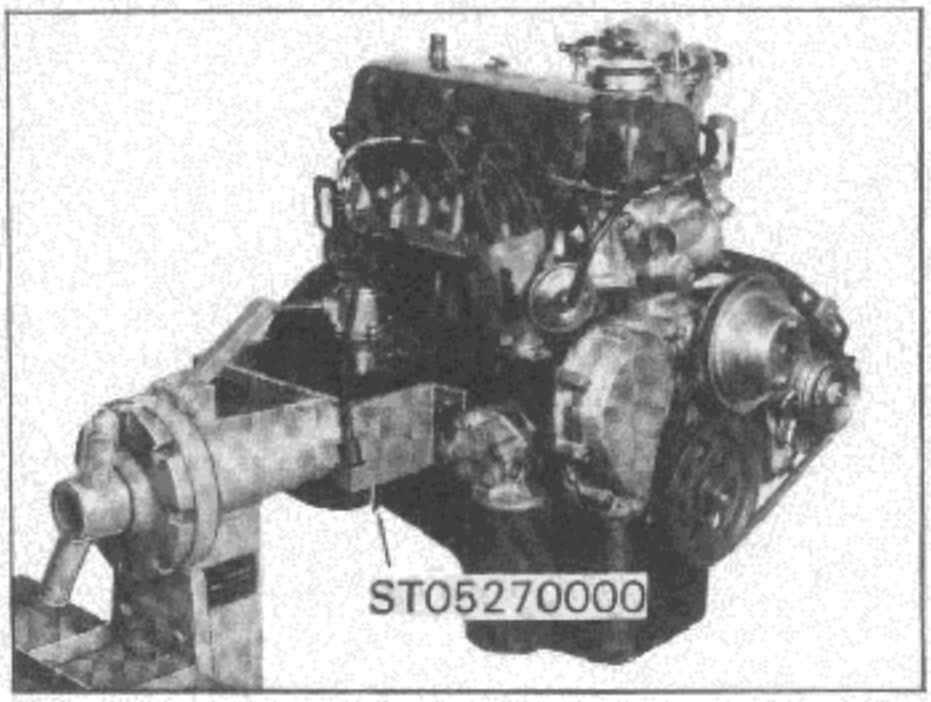


Fig. EM-17 A12 Engine

2. Remove the alternator and engine mounting bracket L.H. side.

3. Remove the crankshaft pulley.

4. Remove the oil pump together with the oil filter.

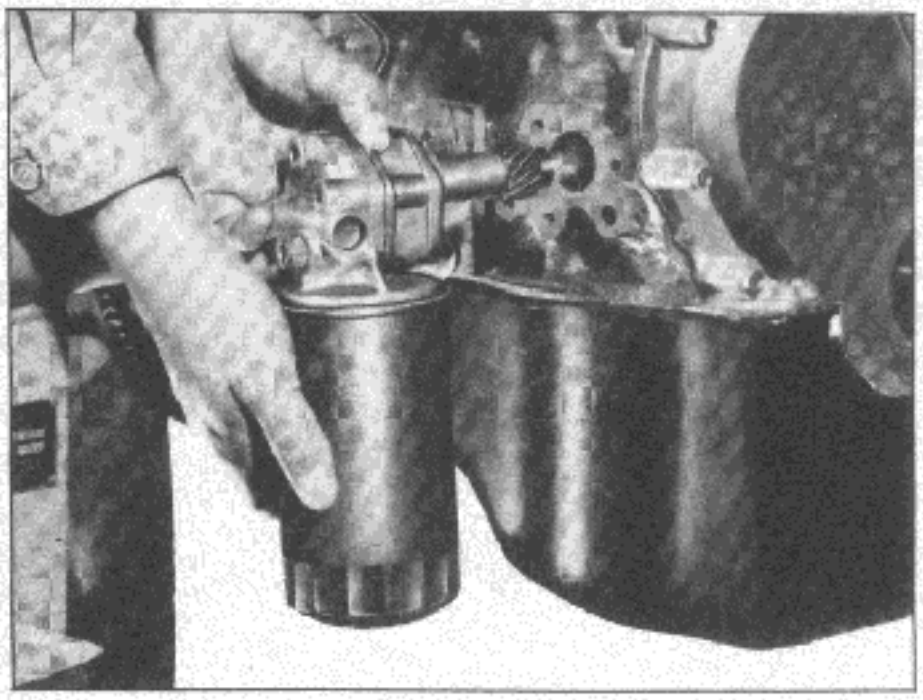


Fig. EM-18 Oil pump removal

5. Remove the high tension cable (with the distributor cap on).

6. Remove the spark plugs.

7. Remove the distributor assembly.

8. Remove the carburetor.

9. Remove the rocker cover.

10. Remove the thermostat housing.

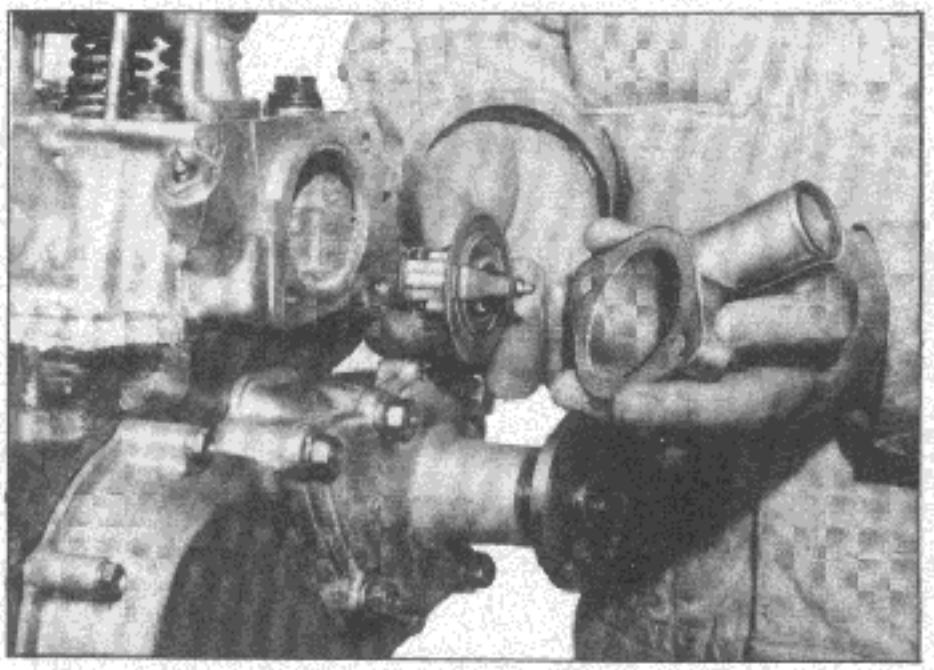


Fig. EM-19 Thermostat housing removal

11. Remove the manifolds.

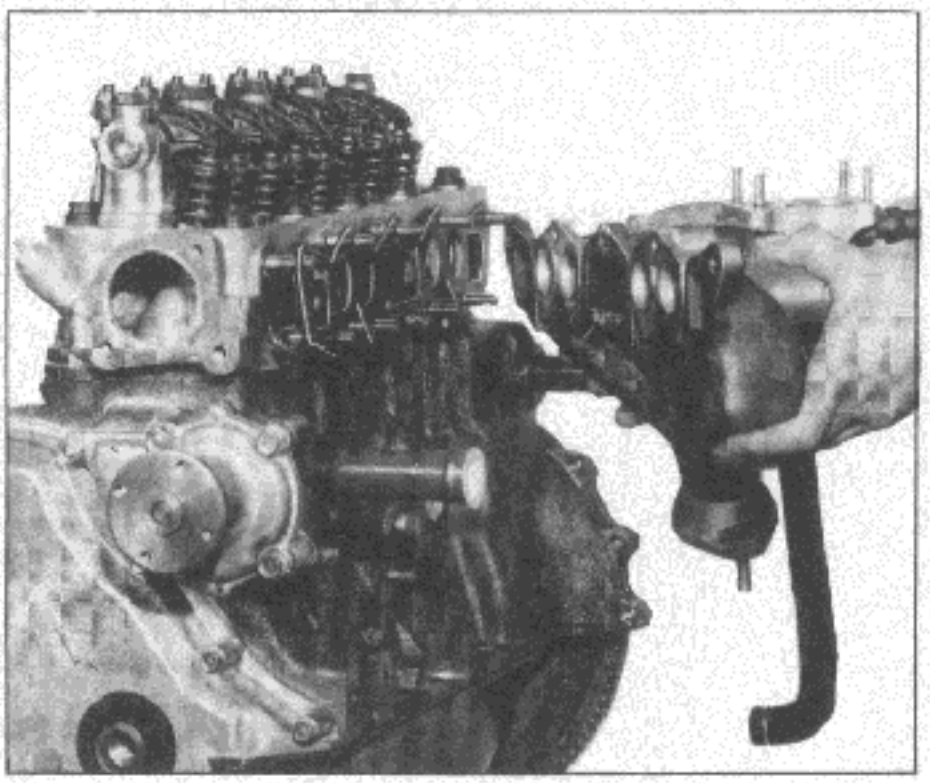


Fig. EM-20 Manifolds removal

12. Remove the water pump.

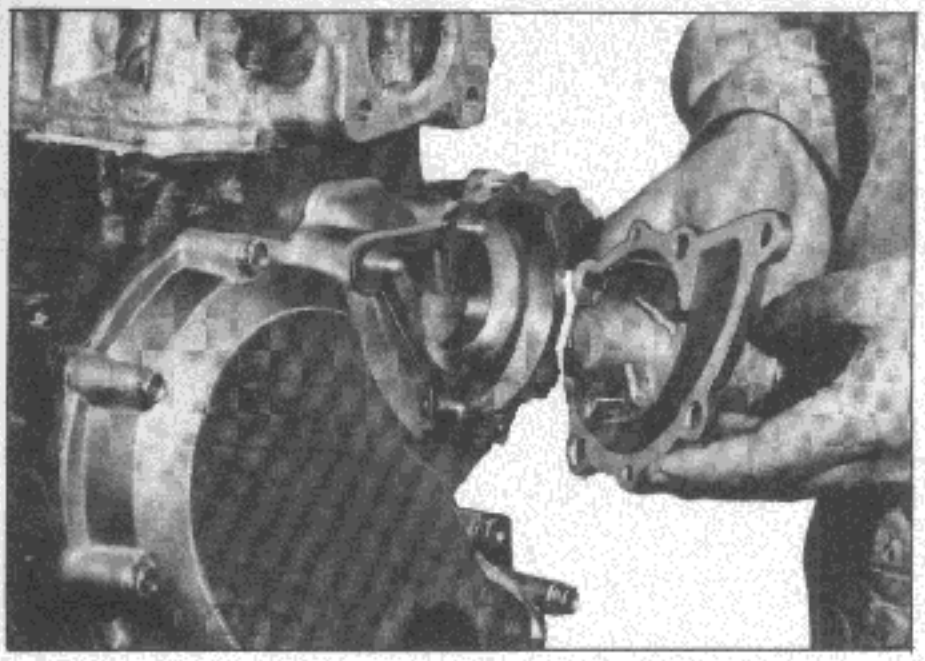


Fig. EM-21 Water pump removal

13. Remove the fuel pump.

14. Remove the rocker shaft assembly and push rods.

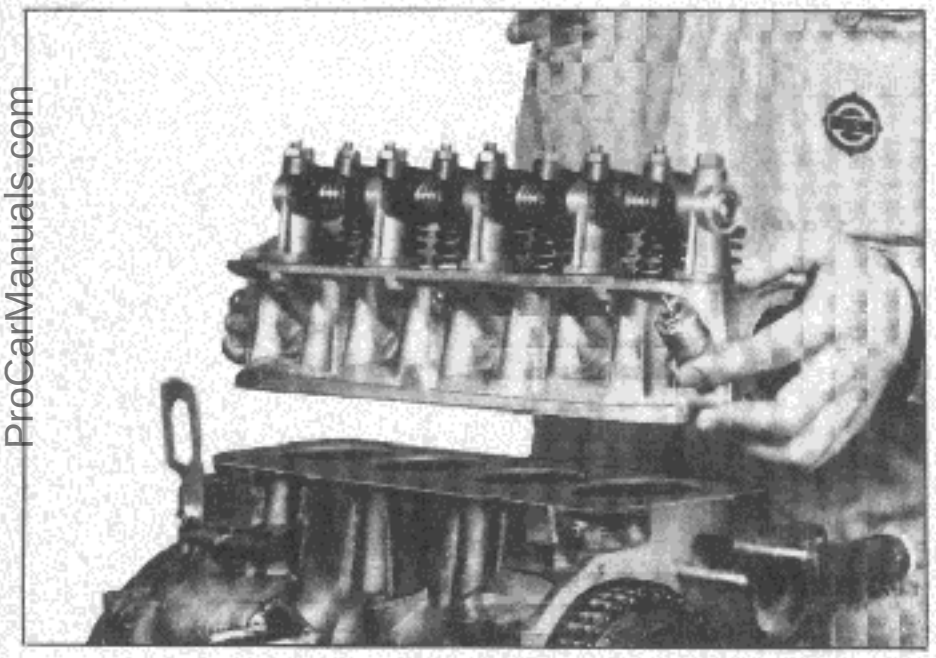


Fig. EM-22 Rocker shaft assembly removal

15. Remove the cylinder head assembly.

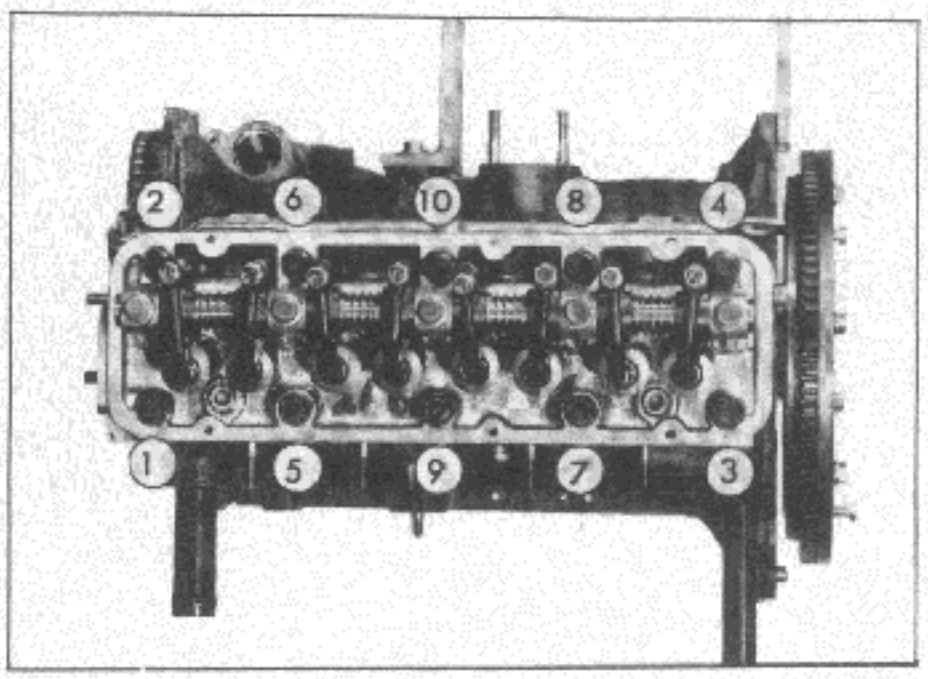


Fig. EM-23 Cylinder head bolts removal sequence

16. Invert the engine.

17. Remove the oil pan and oil strainer.

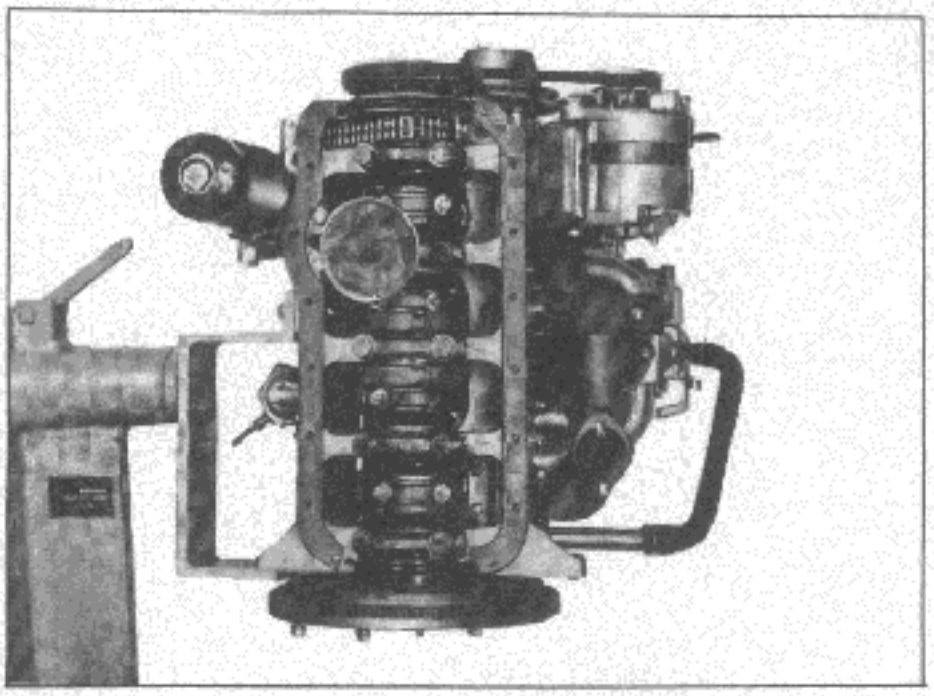


Fig. EM-24 Oil strainer removal

18. Remove the timing chain cover and the chain tensioner.

19. Remove the crankshaft and camshaft sprockets together with the timing chain.

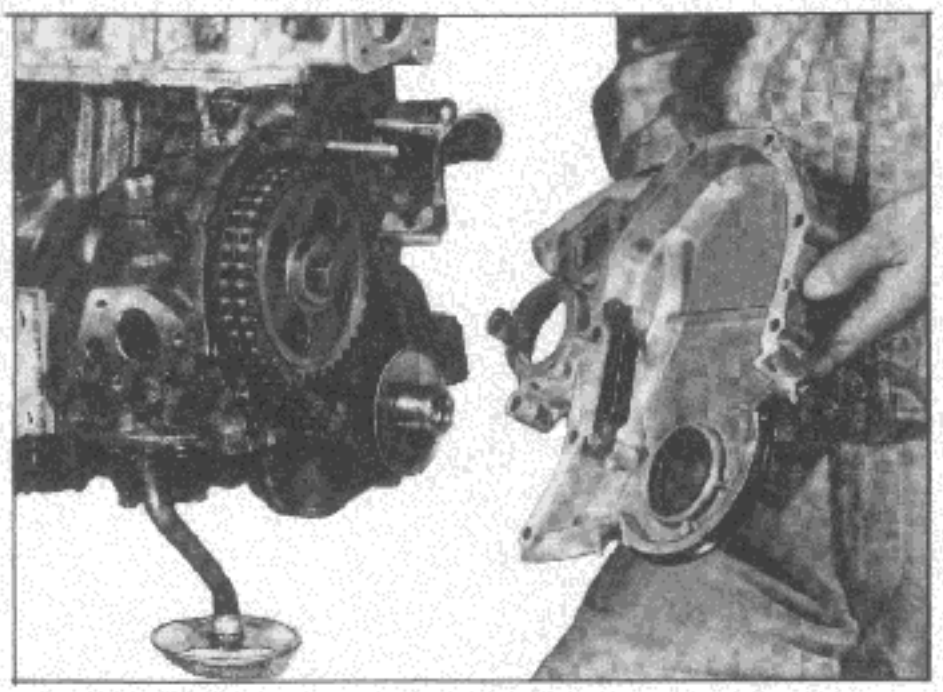


Fig. EM-25 Timing chain cover removal

20. Rotate the engine a quarter turn and remove the piston and connecting rod assembly. Take off the connecting rod bearings at the same time and keep them in order.

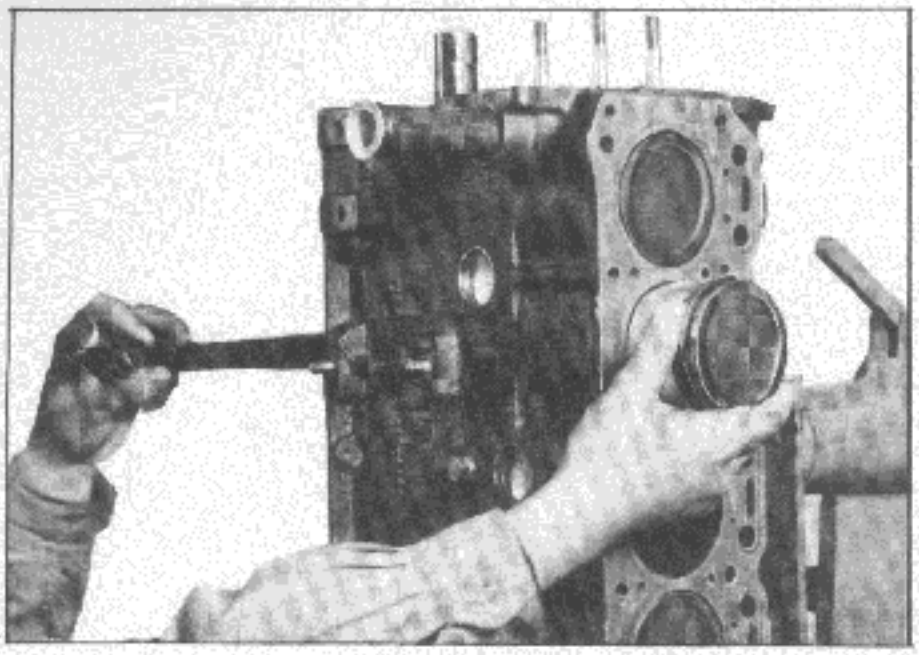


Fig. EM-26 Piston and connecting rod assembly removal

21. Rotate the engine a quarter turn, and remove the flywheel.

22. Remove the main bearing cap and the rear oil seal.

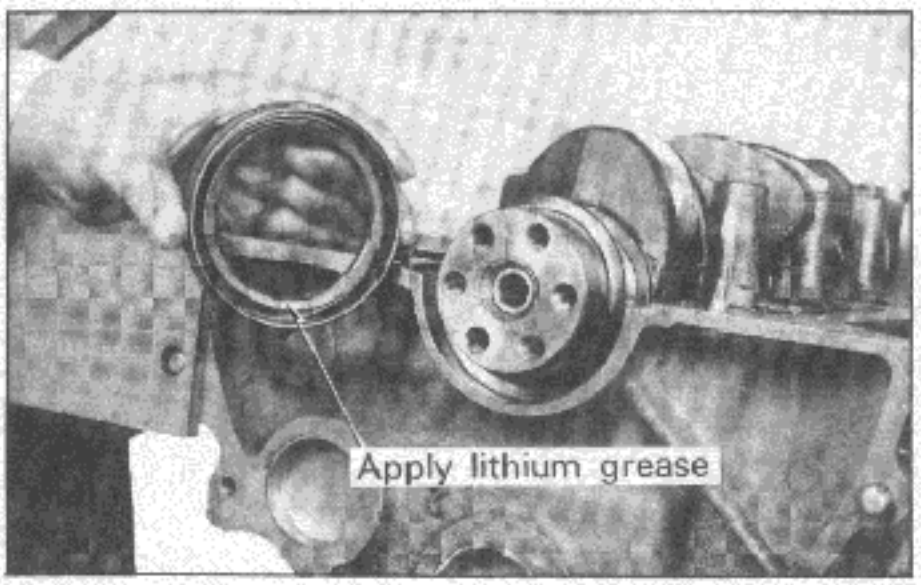


Fig. EM-27 Rear oil seal removal

23. Remove the crankshaft.

24. Remove the baffle plate and the crank case net.

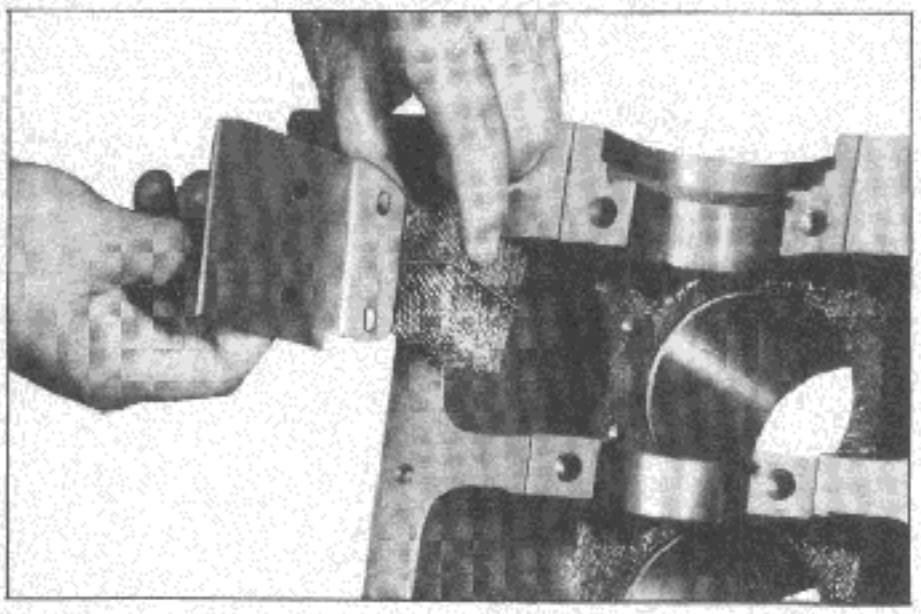


Fig. EM-28 Baffle plate and net removal

25. Remove the camshaft after taking off the camshaft plate.

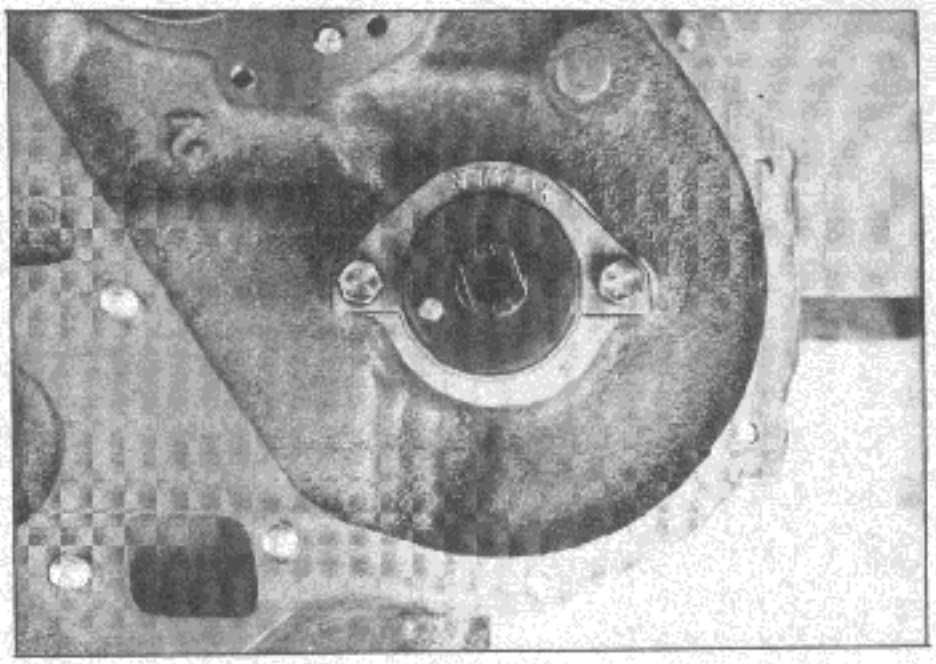


Fig. EM-29 Camshaft plate removal

26. Remove the valve lifter.

PISTON AND CONNECTING ROD

1. Remove the piston rings with a ring remover.

2. Press out the piston pin with a piston pin remover and an arbor press.

Piston pin press stand: ST13040000

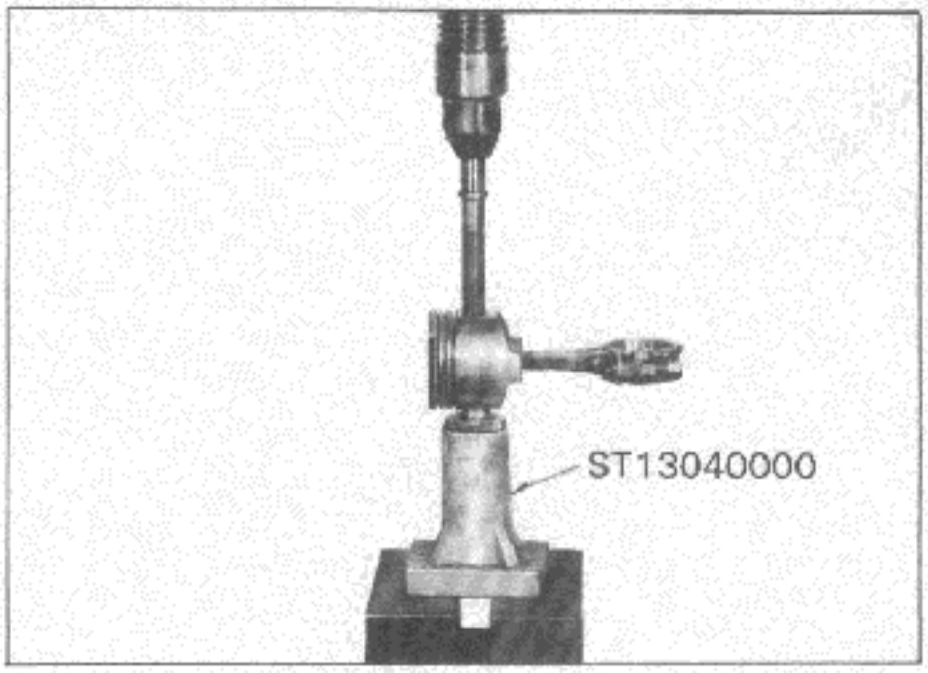


Fig. EM-30 Piston pin removal

CYLINDER HEAD

1. Remove the valves using a valve lifter.

Valve lifter: ST12070000

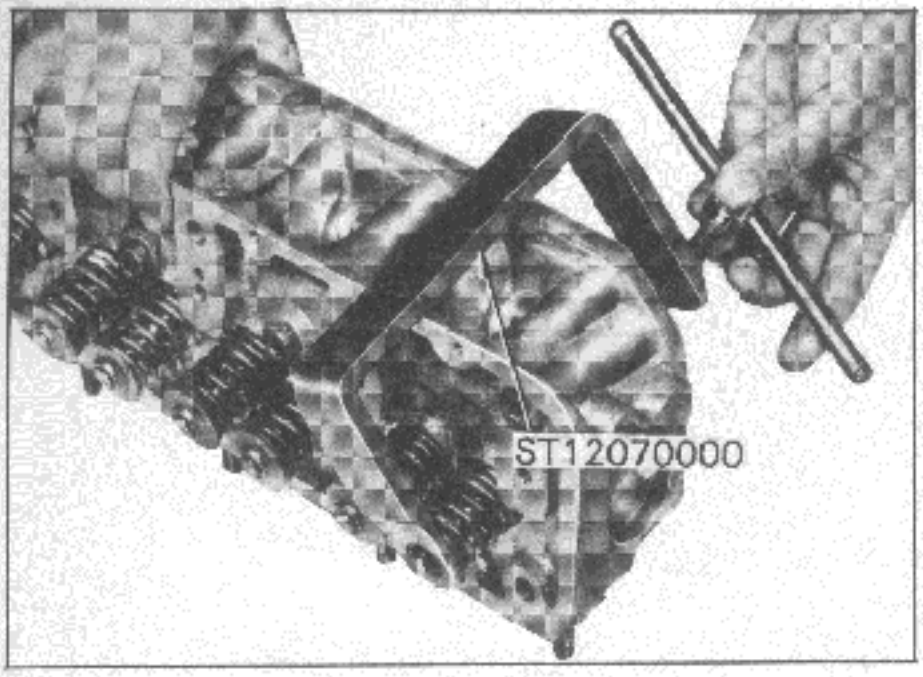


Fig. EM-31 Valve removal

2. Be careful not to lose valve spring seat, oil seal, valve collet, and valve rocker spring.

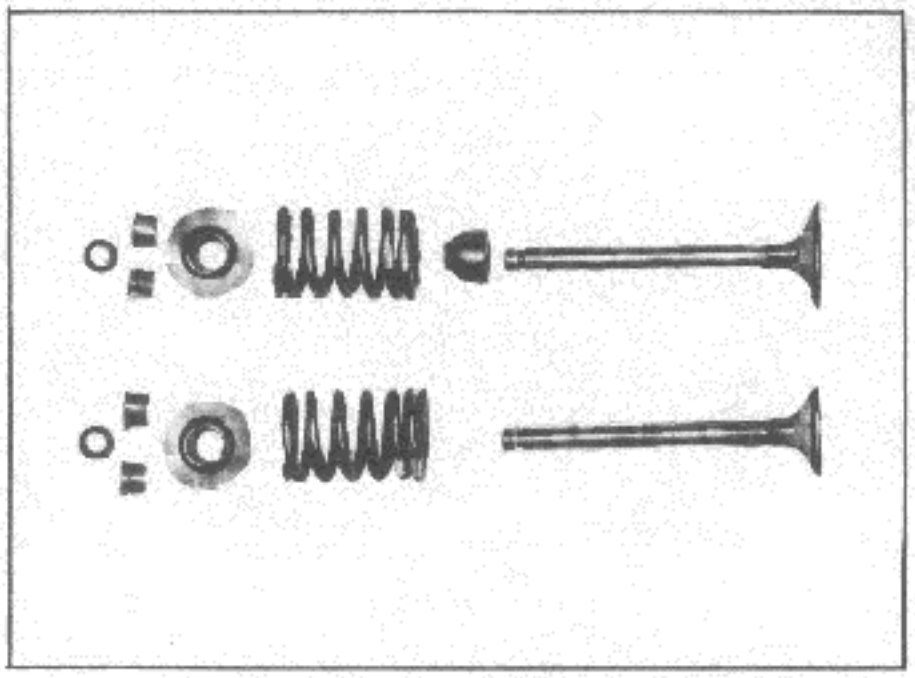


Fig. EM-32 Valve component (A12 engine)

INSPECTION AND REPAIR

CONTENTS

PREPARATION FOR INSPECTION

1. Check the cylinder head and cylinder block for traces of water leaks before cleaning.

2. Clean all parts to remove oil stains, carbon deposits, fur and other foreign matters completely.

3. Make sure that all oil holes are clear. Blow air into them, if required.

4. Secure proper assembly carefully.

CYLINDER HEAD AND VALVES

Checking cylinder head mating face

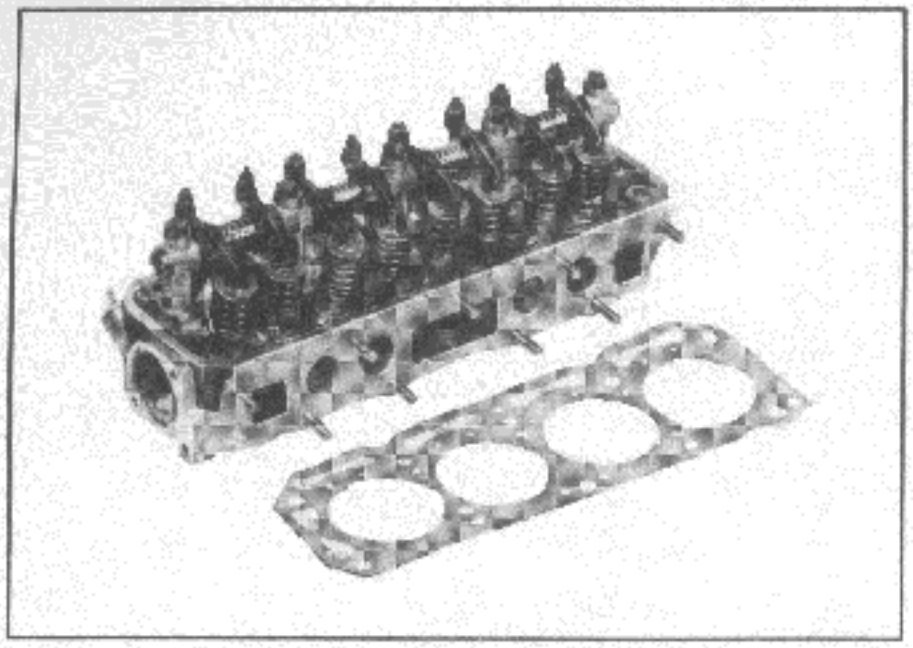


Fig. EM-33 Cylinder head

1. Visually check for cracks and flaws.

2. Measure the surface of the cylinder head (on the cylinder block side) for warping. If it exceeds the limit indicated below, regrind affected surface with a surface grinder.

Cylinder head surface flatness

	Standard mm (in)	Maximum mm (in)
A10 and A12 Engine	less than 0.05 (0.0020)	0.1 (0.0039)

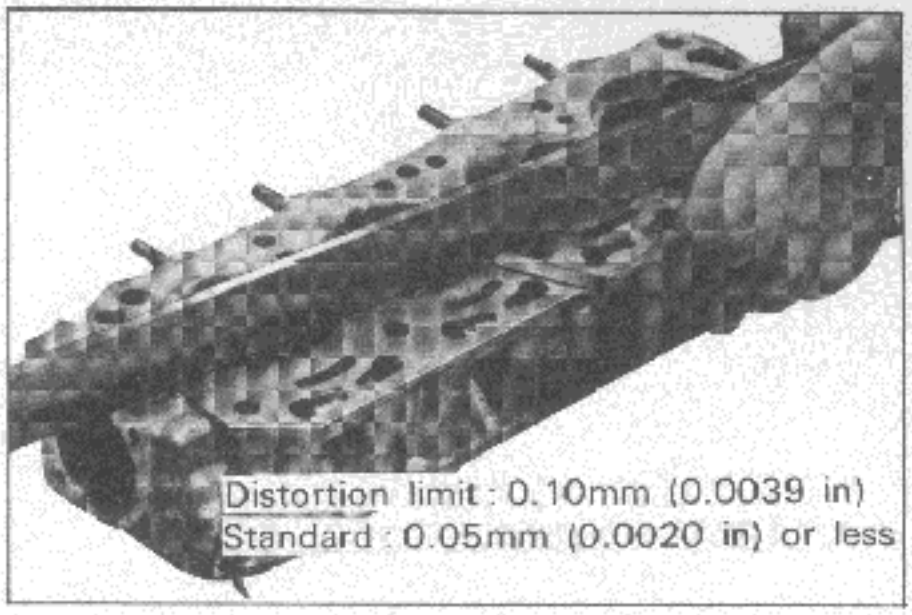


Fig. EM-34 Checking the cylinder head surface

Valve assembly

1. Check each of the intake and exhaust valve assemblies for worn, damaged or deformed valve caps and stems. Correct or replace the valve, if required.

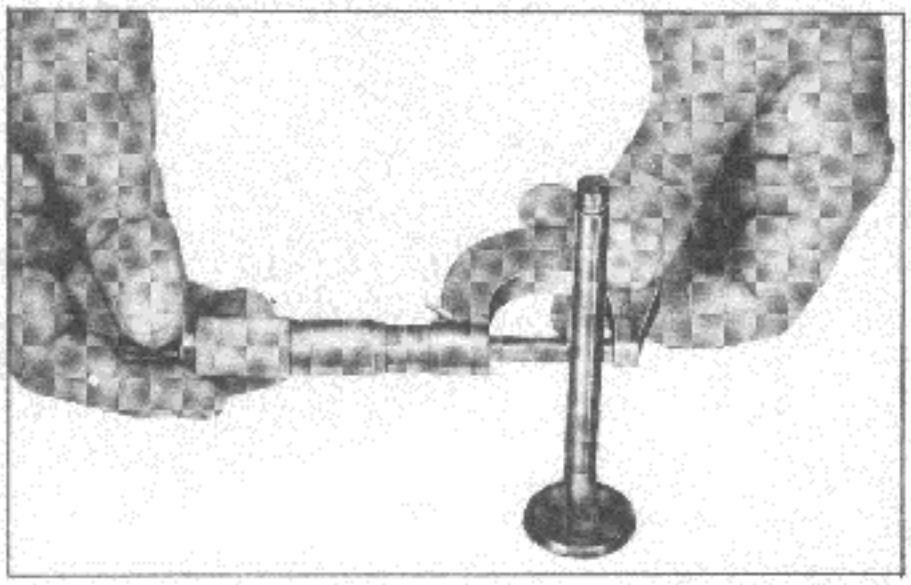


Fig. EM-35 Valve stem diameter check

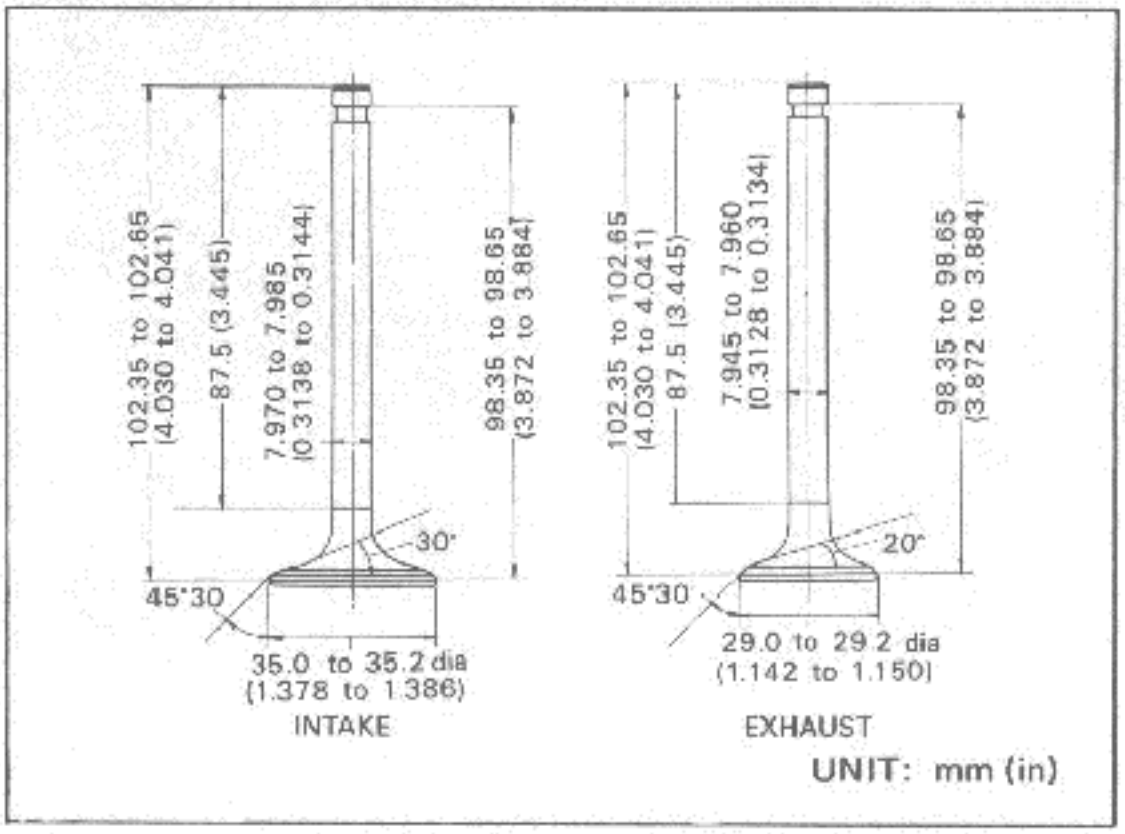


Fig. EM-36 The valves for engine

2. The valve face or valve stem end surface should be refaced by using a valve grinder.

Note: a. Deflection of seat surface against axis should be 0.03 mm (0.0012 in) or less.

b. Correctness of right angle and out-of-round should be 0.01 mm (0.0004 in) or less.

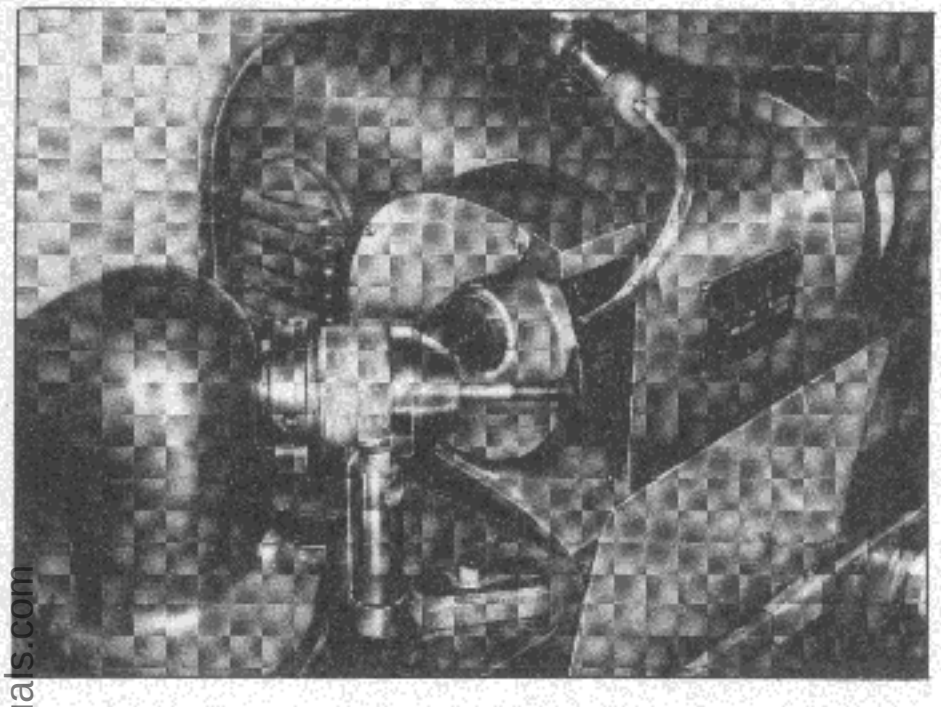


Fig. EM-37 Valve grinder

Note: When the valve head has been reduced to 0.5 mm (0.0197 in) or less in thickness, replace the valve. Grinding allowance for the valve stem end surface is 0.5 mm (0.0197 in) or less.

Valve spring

1. Measure the free length and the tension of each spring. If the measured value exceeds the specified limit, replace the spring.

Spring specifications

	A10	A12
Free length	45.7 mm (1.799 in)	46.5 mm (1.831 in)
Valve closed	38.5 mm at 30 kg (1.516 in at 66.1 lb)	38.7 mm at 23.9 kg (1.524 in at 52.7 lb)
Valve open	31.0 mm at 61.2 kg (1.220 in at 134.9 lb)	30.2 mm at 58.5 kg (1.19 in at 129 lb)

2. Check each spring for deformation with a square. Any springs with deflection of 1.6 mm (0.0630 in) or more must be replaced.

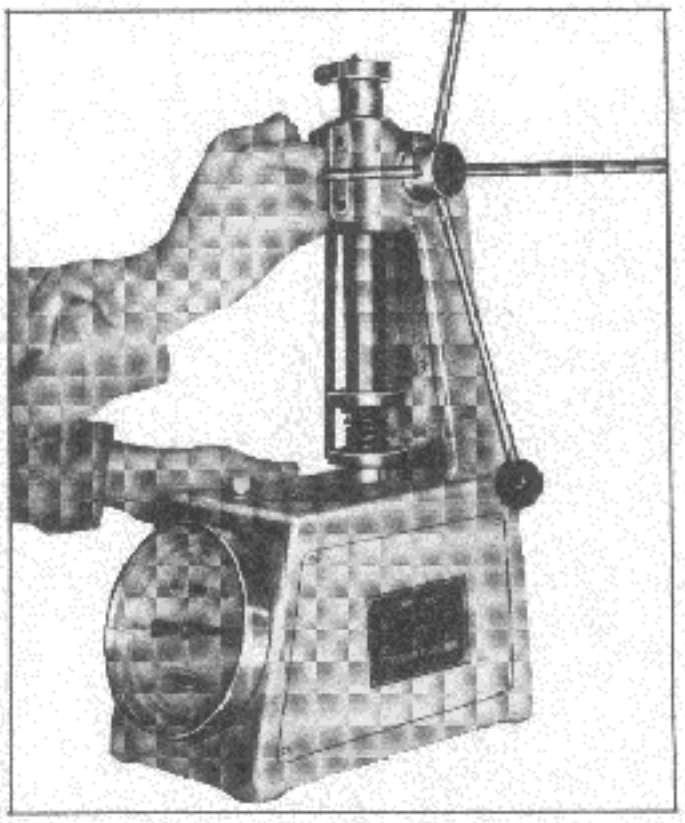


Fig. EM-38 Valve spring test

Valve rocker shaft and rocker arm

1. Check the valve rocker shaft and rocker arm for seizure and wear, and repair or replace as required.

Valve rocker arm to shaft oil clearance:
0.02 to 0.05 mm (0.0008 to 0.0020 in)

2. When valve contact surface of the valve rocker arm is worn excessively in step, repair by means of a valve grinder or replace.

Grinding allowance for valve contact surface of the valve rocker arm is 0.5 mm (0.0197 in) or less.

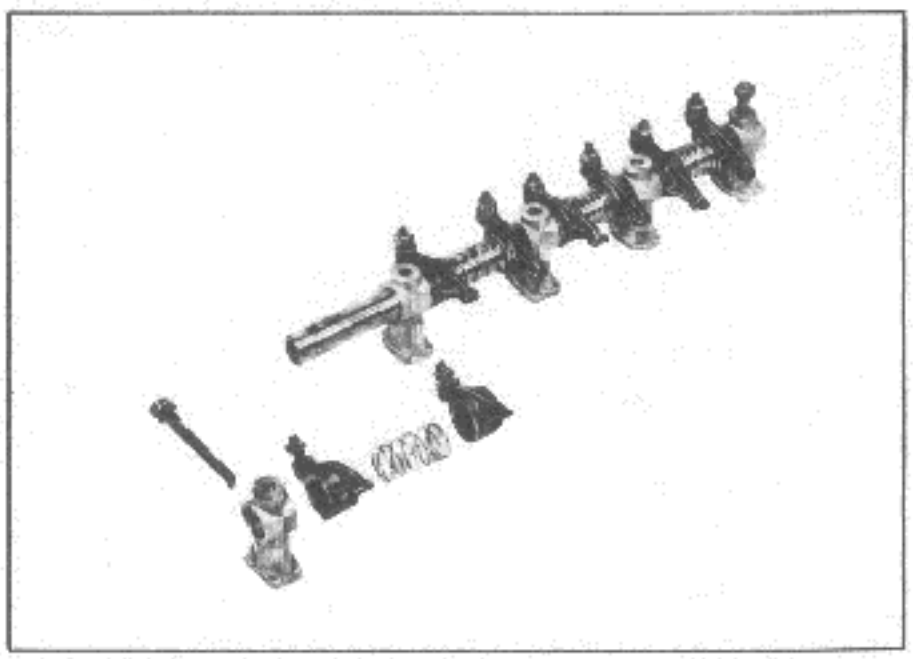


Fig. EM-39 Valve rocker shaft

Valve lifter and push rod

1. Check the valve lifter for wear, seizure and bevel edge contact, and repair or replace as required.

2. Measure clearance between the lifter hole on the cylinder block and valve lifter, and replace the valve lifter when clearance exceeds the limit.

	Standard mm (in)	Maximum mm (in)
Valve lifter/ lifter hole clearance	0.02 to 0.05 (0.0008 to 0.0020)	0.15 (0.0059)

3. Check the push rod for bending and damage, and repair or replace as required.

Valve guide

Measure clearance between the valve guide and valve stem. If clearance exceeds the designated limit, replace the worn parts or both valve and valve guide. In this case, it is essential to determine if such a clearance has been caused by a worn, or bent valve stem or by a worn valve guide.

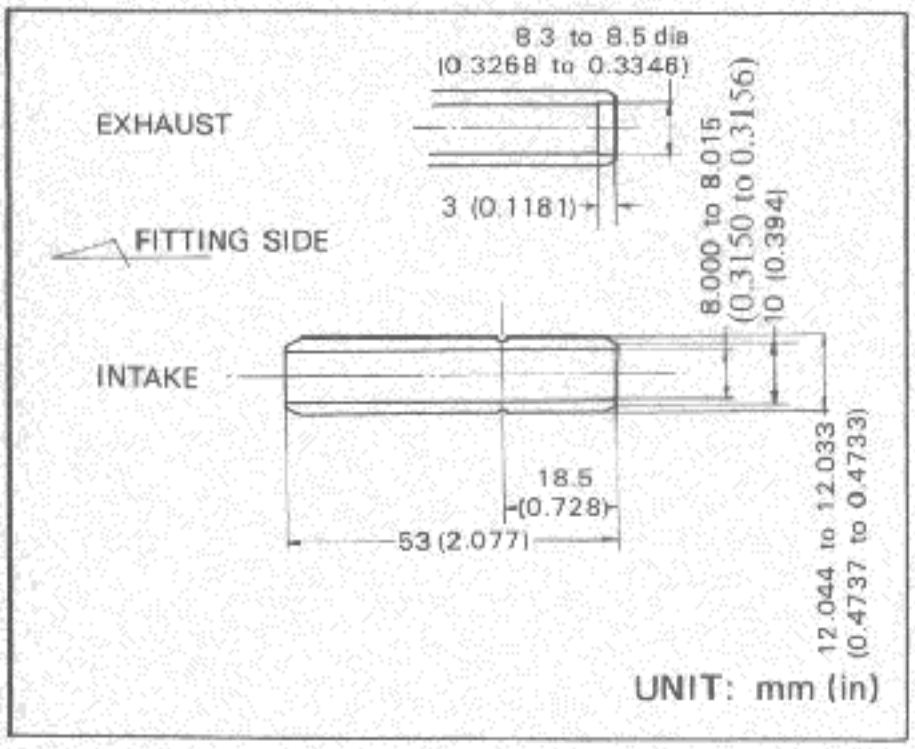


Fig. EM-40 Standard valve guide (A10 and A12)

A10 and A12	In. valve	Ex. valve
Stem to guide clearance mm (in)	0.015 to 0.045 (0.0006 to 0.0018)	0.040 to 0.070 (0.0016 to 0.0028)
Maximum tolerance of above clearance mm (in)	0.1 (0.0039)	0.1 (0.0039)

Determining clearance

When measuring clearance between the valve stem and the valve guide accurately, aids of a micrometer and telescopic hole gauge are required. By using these gauges, measure diameter of the valve stem in three places; top, center and bottom. Insert the telescopic hole gauge in to the valve guide bore, and measure at the center. Subtract highest reading of valve stem diameter from valve guide bore to obtain valve to valve guide clearance. As a simple method, push the valve into the valve guide and move to the left and right. At which points, if the tip deflects about 0.2 mm (0.0079 in) or more, it will be known that clearance between the stem and guide exceeds the maximum limit of 0.1 mm (0.0039 in).

Note: The valve should move in parallel with the rocker arm (Generally, a large amount of wear occurs in this direction.).

Replacement of valve guide

When a defective valve guide is found, replace it in accordance with the following instructions.

1. Remove the defective guide by means of a press and drift pin (under a 2-ton pressure). This work may be carried out at normal room temperature, however, the work can be carried out more effectively at higher temperature.

2. Ream cylinder head side guide hole at normal room temperature.

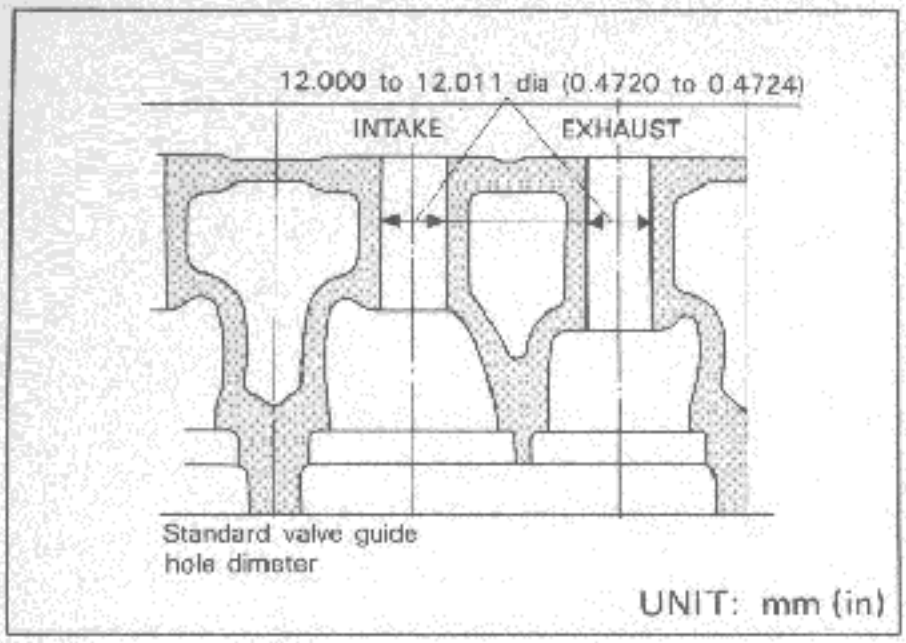


Fig. EM-41 Valve guide hole

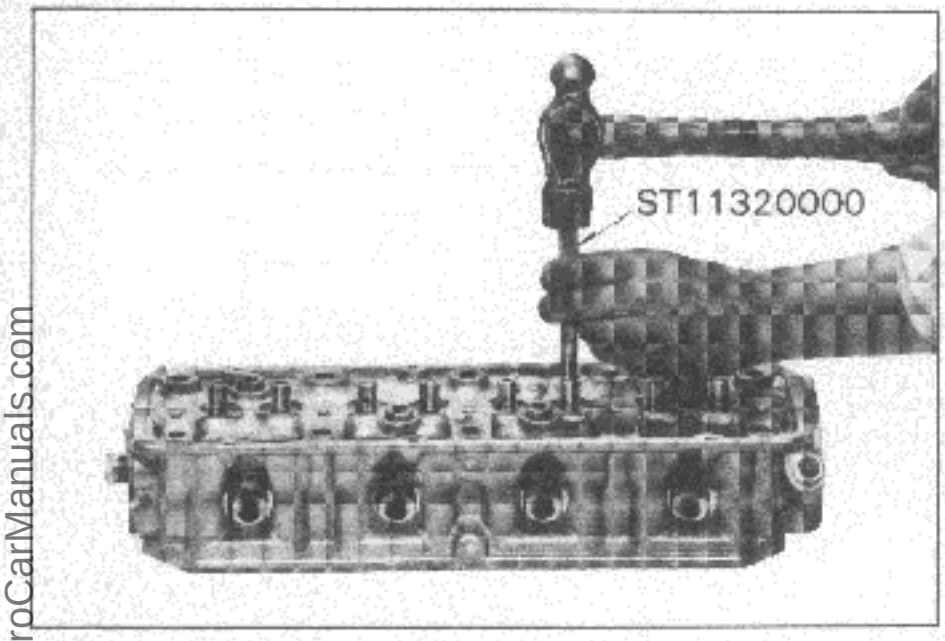


Fig. EM-41-1 Removing and refitting valve guide

		A10 and A12
Guide hole inner diameter mm (in)	For standard valve guide	12.011 to 12.000 dia. (0.4724 to 0.4720 dia.)
	For service valve guide	12.211 to 12.200 dia. (0.4804 to 0.4800 dia.)

3. Press new valve guide into the valve carefully so that it will fit smoothly after heating the cylinder head to 150° to 200°C (302° to 392°F).
The valve guide of 0.2 mm (0.0079 in) oversize diameter is available for service.

	A10 and A12
Interference fit of valve guide to guide hole mm (in)	0.022 to 0.044 (0.0009 to 0.0017)

4. Ream the bore with the valve guide pressed in, using a valve guide reamer.

Special tool: ST11080000

Reaming bore: 8.000 to 8.015 mm (0.3150 to 0.3160 in)

5. Correct the valve seat surface, with the new valve guide as the axis.

Valve seat insert

Check the valve seat inserts for any evidence of pitting at valve contact surface, and reseat or replace valve seat insert if the valve seat insert is worn excessively.

The valve seat insert of 0.5 mm (0.0197 in) oversize is available for service.

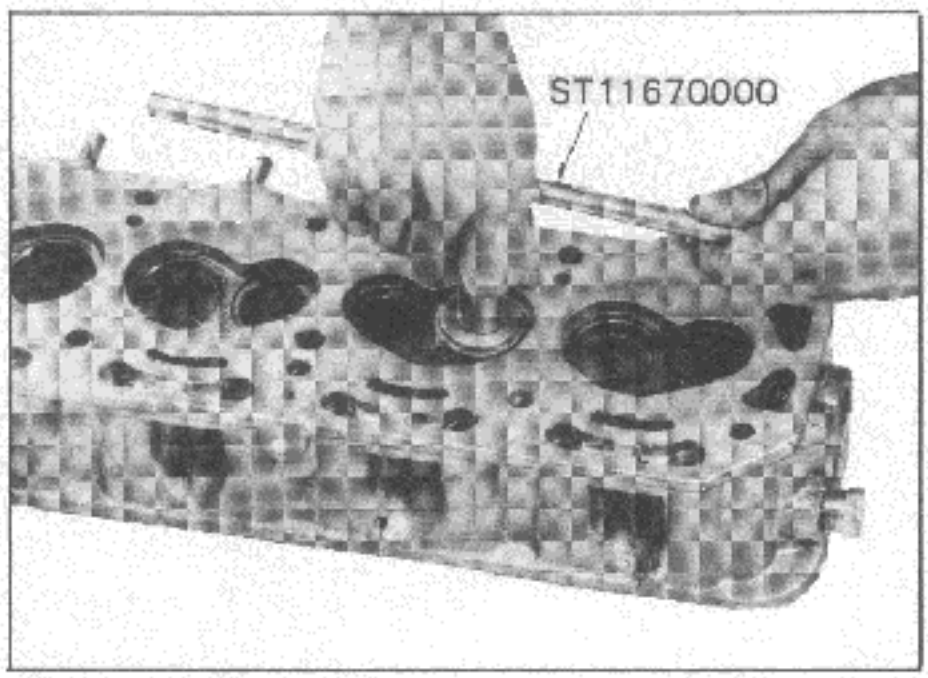


Fig. EM-42 Valve seat correction

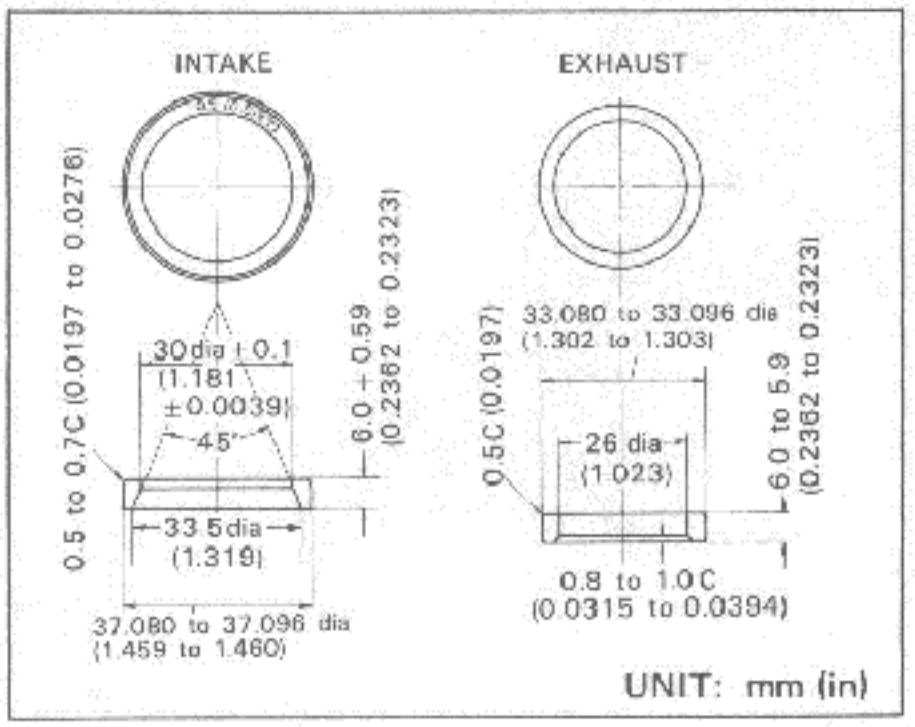


Fig. EM-43 Standard valve seat insert (A10 and A12 Engine)

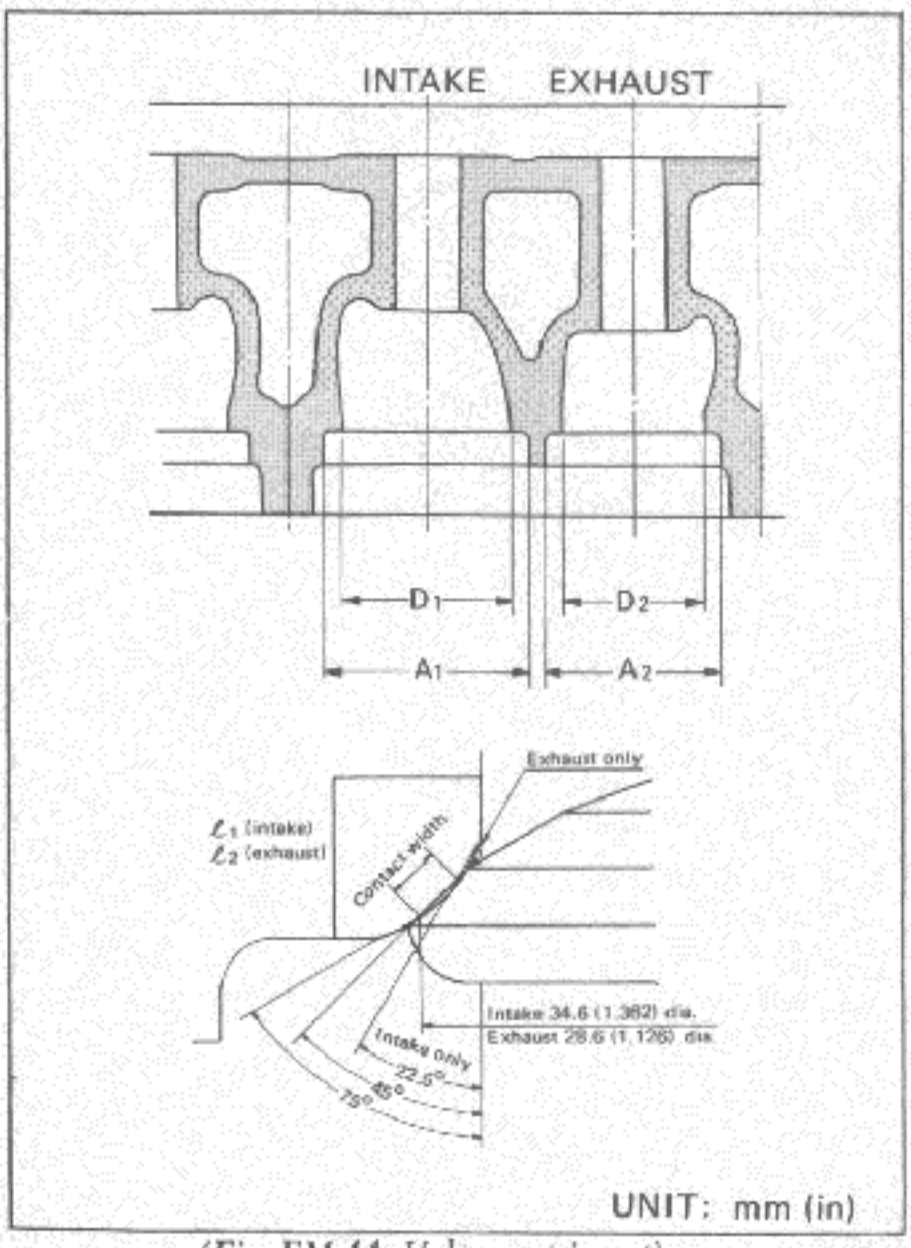
Cylinder head recess diameter

	A10 and A12		
Cylinder head recess diameter mm (in)	Intake	For standard insert	37.016 to 37.000 dia. (1.4576 to 1.4564 dia.)
		For service insert	37.516 to 37.500 dia. (1.4766 to 1.4754 dia.)
	Exhaust	For standard insert	33.016 to 33.000 dia. (1.2996 to 1.2990 dia.)
		For service insert	33.516 to 33.500 dia. (1.3196 to 1.3190 dia.)

Interference fit mm (in)	Intake	0.064 to 0.096 (0.0025 to 0.0038)
	Exhaust	0.064 to 0.096 (0.0025 to 0.0038)

Replacing the valve seat insert

1. Old valve seat insert may be removed by boring up to such an extent that the valve insert is collapsed.
The machine depth stop should be set so that boring cannot be made beyond the bottom face of the insert recess in the cylinder head.



(Fig. EM-44 Valve seat insert)

	A10 and A12
A_1	37.016 to 37.000 dia. (1.4576 to 1.4570 dia.)
A_2	33.016 to 33.000 dia. (1.2996 to 1.2990 dia.)
D_1	34.7 to 34.5 dia. (1.3659 to 1.3581 dia.)
D_2	28.7 to 28.5 dia. (1.1299 to 1.1221 dia.)
ℓ_1	1.3 (0.0512)
ℓ_2	1.8 (0.0709)

Unit: mm (in)

Fig. EM-44 Valve seat insert

2. Select a suitable valve seat insert and verify the outside diameter.

3. Machine the recess for the valve seat insert on the cylinder head correctly along the concentric circle to the valve guide center so that the valve seat insert is fitted correctly.

4. Heat the cylinder head to a temperature of 150° to 200°C (302° to 392°F).

5. Fit the valve seat insert ensuring that it beds on the bottom face of the recess completely.

6. The valve seats newly fitted should be cut or ground to the specified dimensions as shown in Figure EM-44.

CAMSHAFT AND CAMSHAFT BEARING

Measuring camshaft bearing clearance

1. Measure inner diameter of the camshaft bearing and outer diameter of the camshaft journal.

If camshaft bearing clearance is excessive, replace the cylinder block assembly.

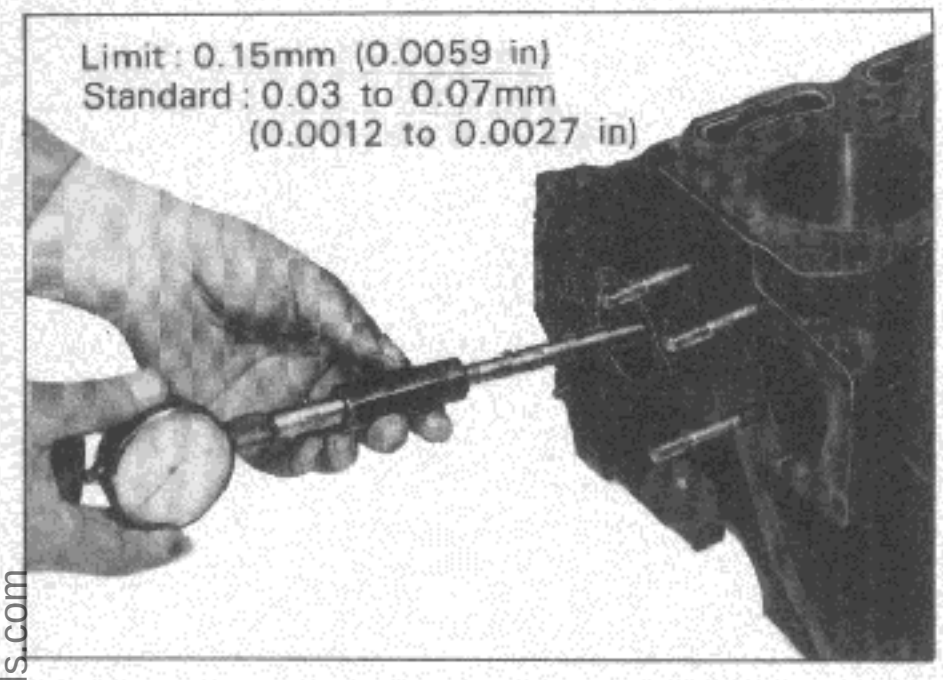


Fig. EM-45 Camshaft bearing check

		Standard		Wear limit
		A10	A12	
Oil clearance	1st	0.037 to 0.060 (0.0015 to 0.0024)	0.037 to 0.060 (0.0015 to 0.0024)	0.15 (0.0059)
	2nd	0.037 to 0.060 (0.0015 to 0.0024)	0.027 to 0.050 (0.0011 to 0.0020)	
	3rd	0.040 to 0.063 (0.0016 to 0.0025)	0.040 to 0.063 (0.0016 to 0.0025)	
	4th	0.037 to 0.060 (0.0015 to 0.0024)	0.027 to 0.050 (0.0011 to 0.0020)	
	5th	0.037 to 0.060 (0.0015 to 0.0024)	0.037 to 0.060 (0.0015 to 0.0024)	
Inner diameter of camshaft bearing mm (in)	1st	43.833 to 43.843 (1.7257 to 1.7261)		
	2nd	43.323 to 43.333 (1.7050 to 1.7060)		
	3rd	42.836 to 42.846 (1.6865 to 1.6868)		
	4th	42.323 to 42.333 (1.6663 to 1.6667)		
	5th	41.258 to 41.268 (1.6243 to 1.6247)		

Valve timing

If the camshaft has no apparent damage although some valve troubles have been detected, compare valve timing data with the valve timing diagram to ensure that beginning and ending of stroke for all cylinders are complying with specified advance and retard figures.

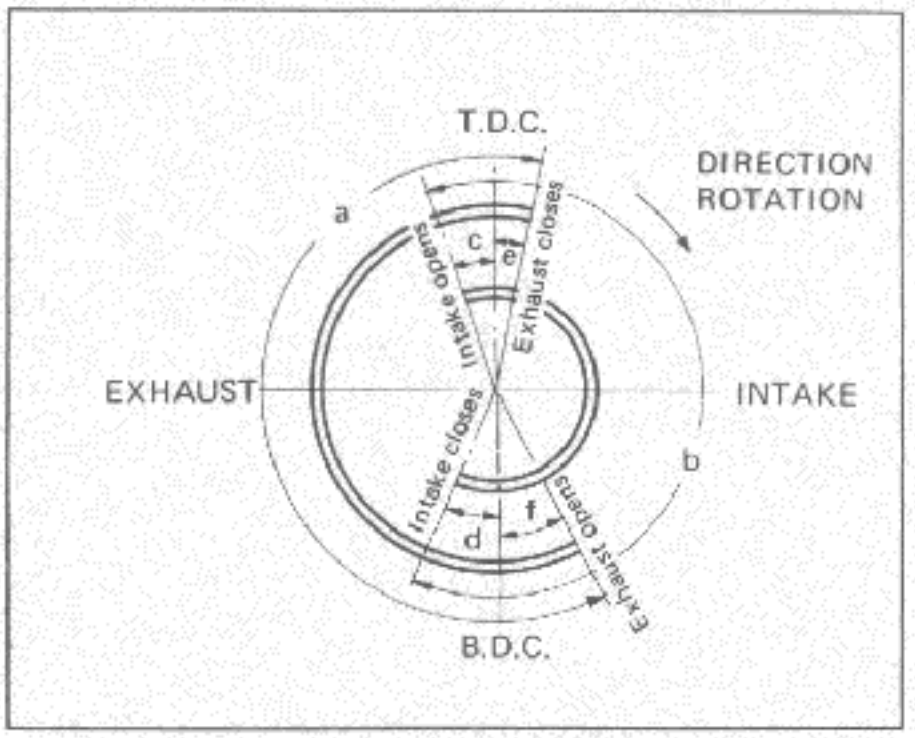


Fig. EM-46 Valve timing diagram

Unit: degree

	a	b	c	d	e	f
A10	240	240	12	48	10	50
A12	248	248	14	54	12	56

Checking camshaft for bending

1. Check the camshaft, camshaft journal and cam surface for bend wear or damage.

If defective condition exceeds the limit, replace the defective part(s).

2. Apply a dial gauge to the center journal, turn the camshaft, and read the dial gauge. Actual bend is a half of the value indicated on the dial gauge.

A10 and A12	Standard	Bend limit
Camshaft bend mm (in)	0.015 (0.0006)	0.05 (0.0020)

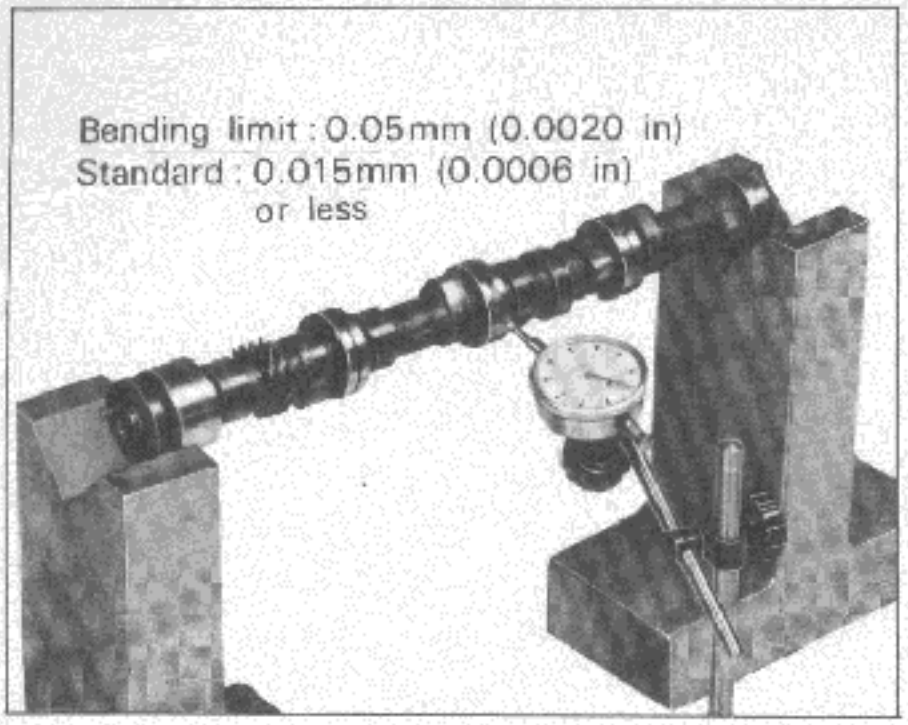


Fig. EM-47 Camshaft bend check

	A10 and A12
Standard height of cam mm (in)	36.45 to 36.55 (1.435 to 1.439)
Wear limit of cam height mm (in)	0.5 (0.0197)
Allowable difference in diameter maximum worn and minimum worn parts of camshaft journal mm (in)	0.03 to 0.07 (0.0012 to 0.0028)
Maximum tolerance in journal diameter mm (in)	0.1 (0.0039)
Camshaft end play mm (in)	0.02 to 0.08 (0.0008 to 0.0031)

	Standard	Maximum tolerance
Surface flatness mm (in)	less than 0.05 (0.0020)	0.1 (0.0039)

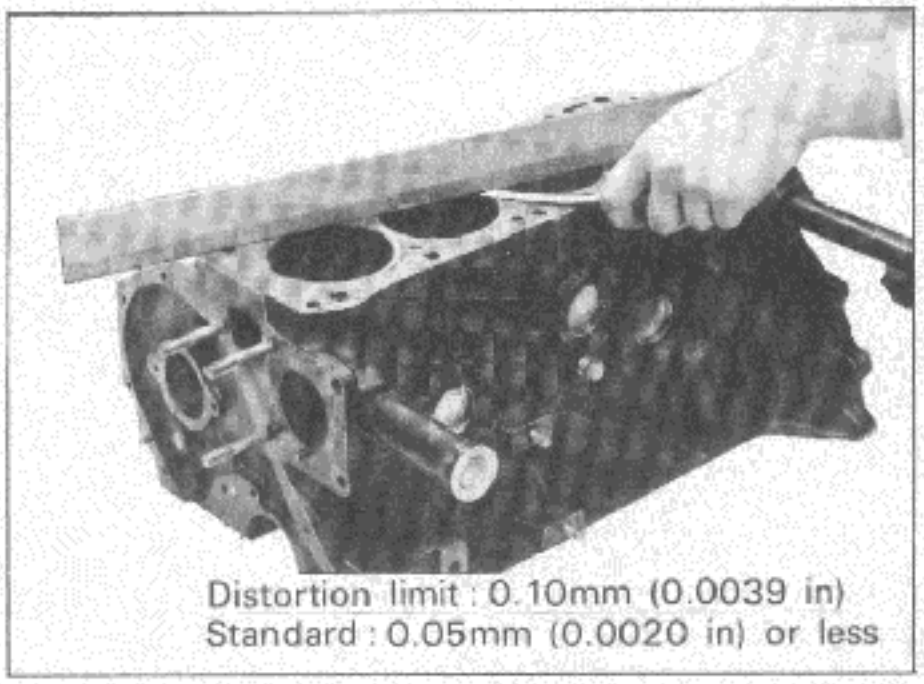


Fig. EM-48 Cylinder block surface check

CYLINDER BLOCK

1. Check the cylinder head visually for defects such as cracks and flaws.

2. Measure the top of the cylinder block (cylinder head mating face) for warping. If the warp exceeds the limit, correct it.

3. Measure the cylinder bore for out-of-round and wear with a bore gauge. If wear or out-of-round is excessive, rebore the cylinder walls by means of a boring machine.

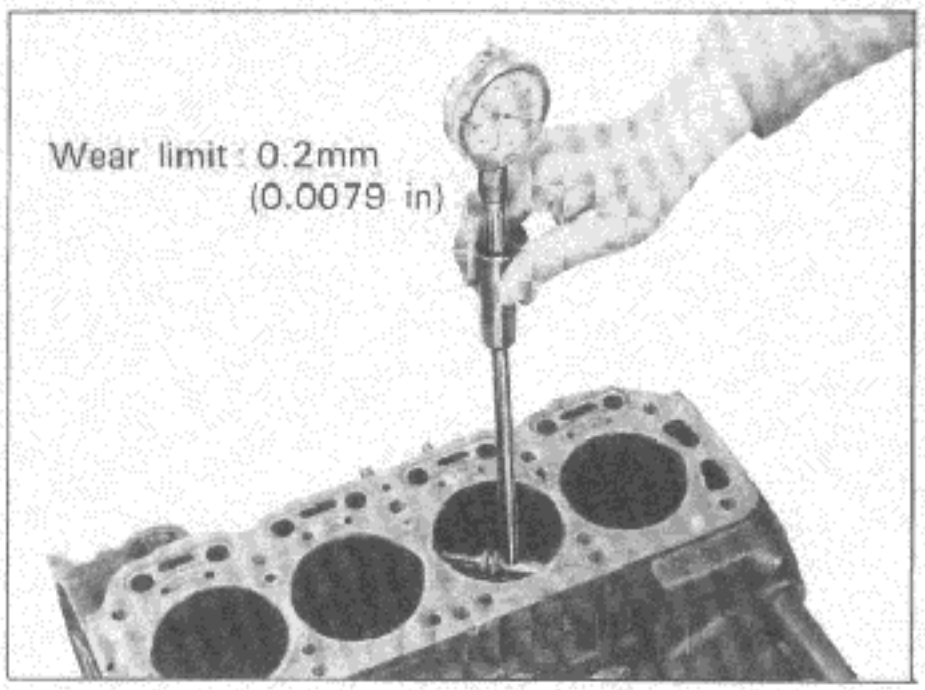


Fig. EM-49 Measuring the cylinder bore

4. When wear or out-of-round is minor and within the limit, remove the step from the topmost portion of the cylinder by the use of a ridge reamer or other similar tool.

How to measure cylinder bore

A bore gauge is used. Measure the cylinder bore at top, middle and bottom positions toward A and B directions as illustrated in Figure EM-50 and record the measured values.

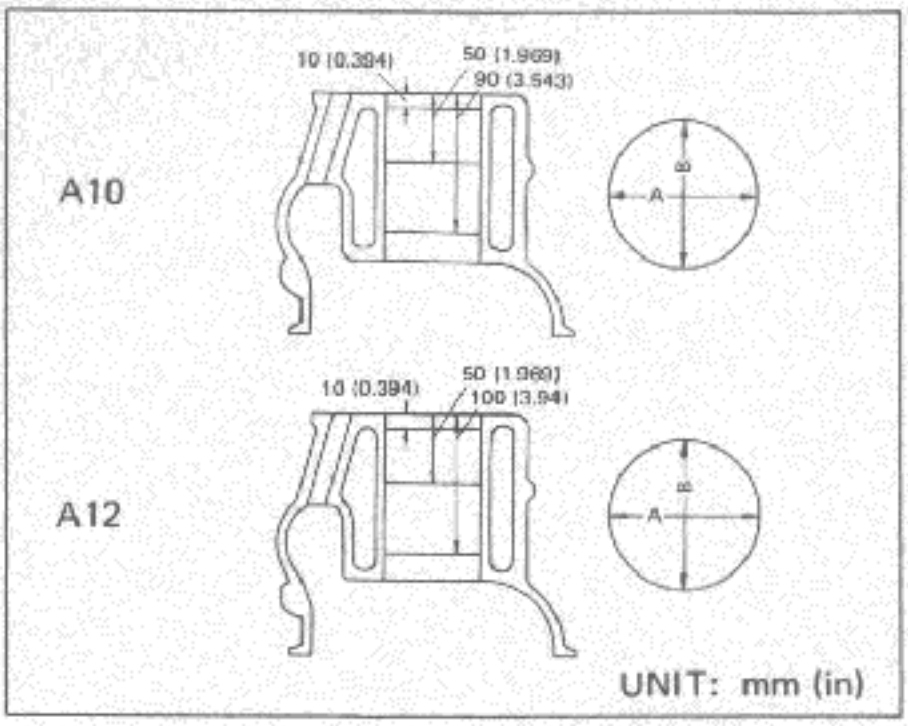


Fig. EM-50 Cylinder bore measuring positions

	Standard	Wear limit
Cylinder bore mm (in)	73.050 to 73.000 (2.8760 to 2.8740)	0.2 (0.0078)
Error in cylinder bore elliptic taper mm (in)		less than 0.015 (0.0006)
Difference cylinder bore mm (in)	0.05 (0.0020)	0.2 (0.0079)

Boring cylinder

1. When any of the cylinder needs boring, all other cylinders must also be bored at the same time.

2. Select an oversize piston according to amount of wear of the cylinder.

Piston for service (A10 & A12)

Piston size	Outside diameter (H) mm (in)
STD	72.967 to 73.017 (2.8727 to 2.8747)
25 oversize	73.217 to 73.267 (2.8826 to 2.8845)
50 oversize	73.467 to 73.517 (2.8924 to 2.8994)
75 oversize	73.717 to 73.767 (2.9022 to 2.9042)
100 oversize	73.967 to 74.017 (2.9121 to 2.9140)
125 oversize	74.217 to 74.267 (2.9219 to 2.9239)
150 oversize	74.467 to 74.517 (2.9318 to 2.9337)

3. By measuring piston to be installed at piston skirt (side thrust face) and adding the mean of clearance specification, the finish hone cylinder measurement can be determined.

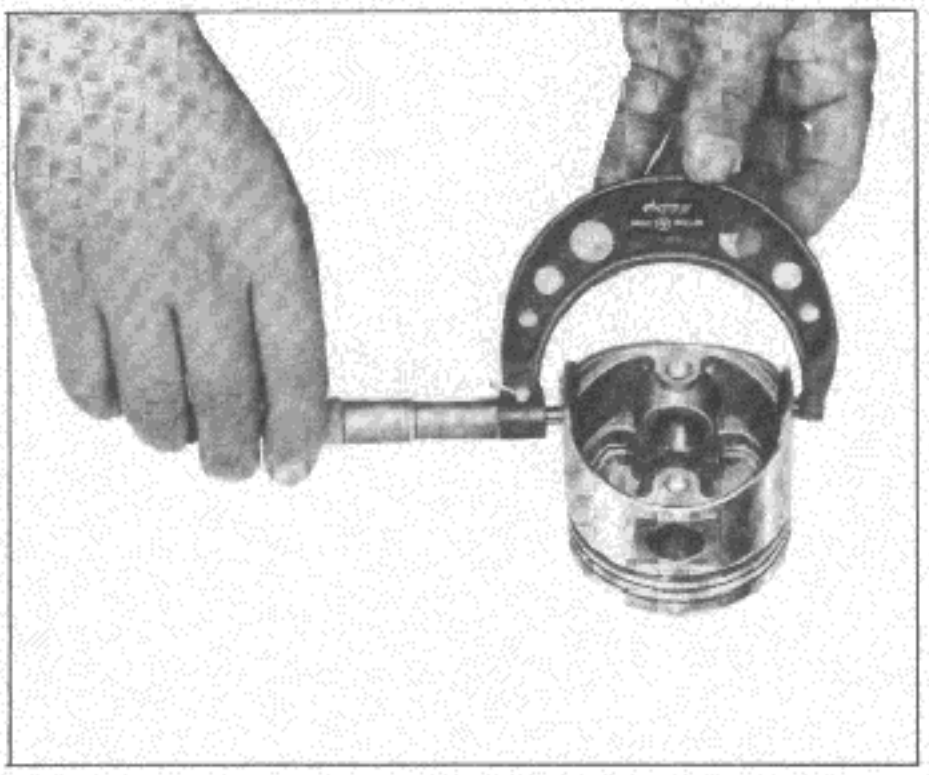


Fig. EM-51 Measuring the piston diameter

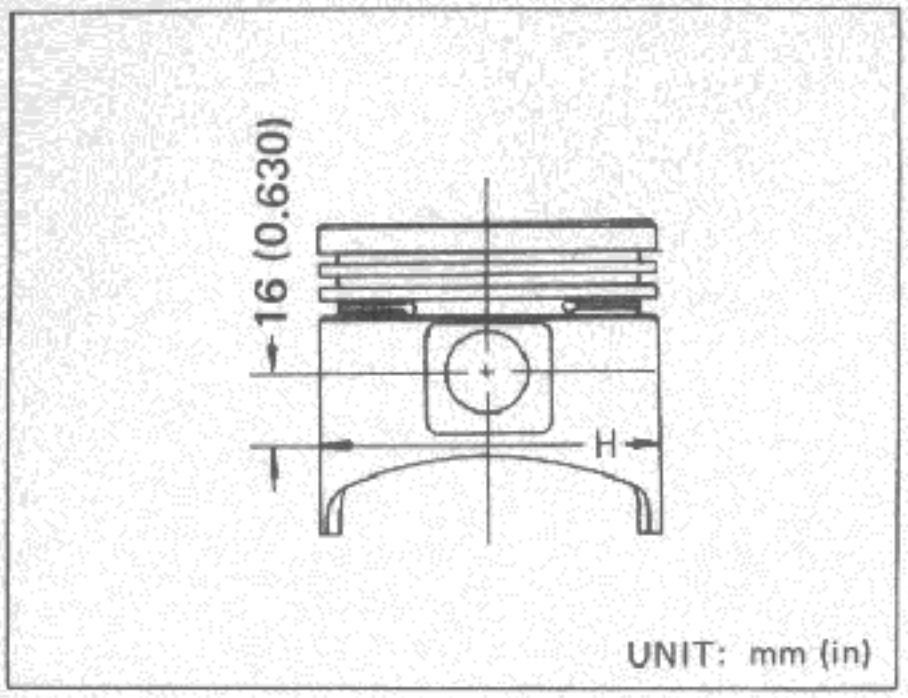


Fig. EM-52 Measuring points

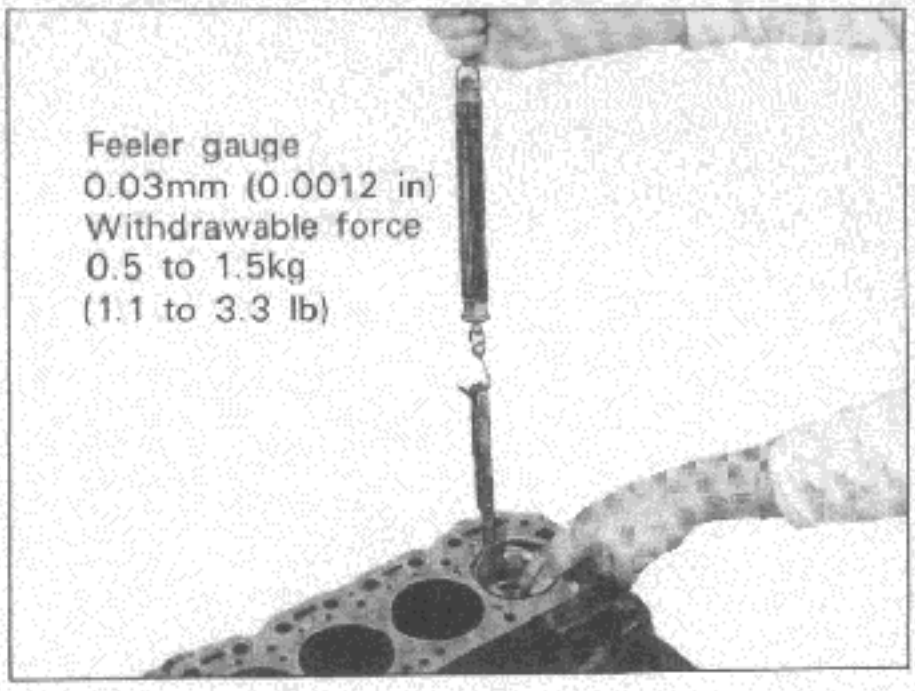


Fig. EM-53 Piston to cylinder clearance check

Outer diameter of piston skirt (measured value): A,

Piston-cylinder clearance:

B = 0.023 to 0.043 mm (0.0009 to 0.0017 in)

Boring allowance C = 0.02 mm (0.0008 in)

Cylinder bore to be machined:

A + B - C = A + 0.01 to 0.02 mm

(0.0004 to 0.0008 in)

	A10 and A12
Standard clearance mm (in)	0.023 to 0.043 (0.0009 to 0.0017)
Feeler gauge mm (in)	0.03 (0.0012)
Extracting force kg (lb)	0.5 to 1.5 (1.1 to 3.3)

4. Machine the cylinder bore to the determined inner diameter.

Note: To prevent strain due to cutting heat, bore in order of 2-4-1-3 or cylinders 3-1-4-2.

5. Do not intend to bore in one time but cut 0.05 mm (0.0020 in) or so at a time.

6. When measuring cylinder bore immediately after boring, note that the cylinder block is expanded due to cutting heat.

7. Finish the treated cylinder bore to the final size by means of honing.

8. Measure the finished cylinder bore for a elliptic or tapered part.

9. Measure clearance between the piston and cylinder. This clearance can be checked easily by using a feeler gauge and a spring scale.

Note: If the cylinder bore is worn beyond the wear limit, use the cylinder liner.
Undersize cylinder liners are available for service.

Interference fit of cylinder liner

Cylinder block 0.8 to 0.9 mm (0.0315 to 0.0354 in).

Cylinder liner for service (A10 and A12)

	Outside diameter mm (in)	Inner diameter mm (in)
400 undersize	77.05 to 77.00 (3.0330 to 3.0310)	72.5 to 72.6 (2.854 to 2.858)
450 undersize	77.55 to 77.50 (3.0530 to 3.0510)	72.5 to 72.6 (2.854 to 2.858)
500 undersize	78.05 to 78.00 (3.0730 to 3.0710)	72.5 to 72.6 (2.854 to 2.858)

PISTON, PISTON PIN AND PISTON RING

1. Check for seizure, scratch and wear. Replace as required.

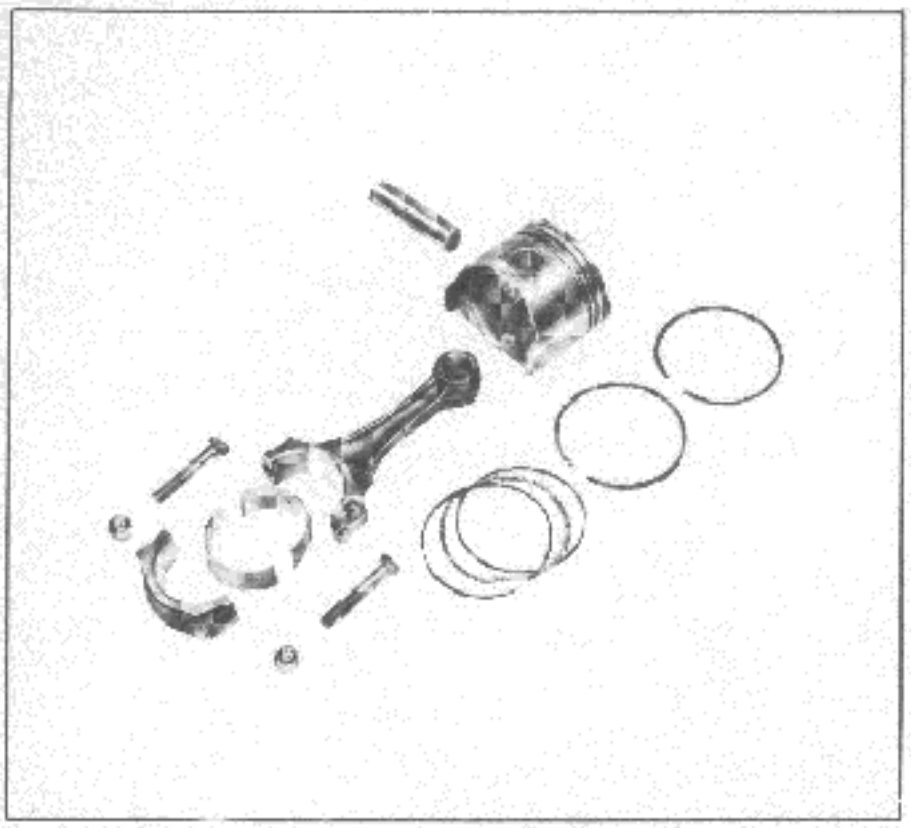


Fig. EM-54 Piston and connecting rod assembly

2. Measure side clearance of each piston ring and ring groove with the piston ring installed on the piston. Clearance of a new piston and piston ring should be as follows:

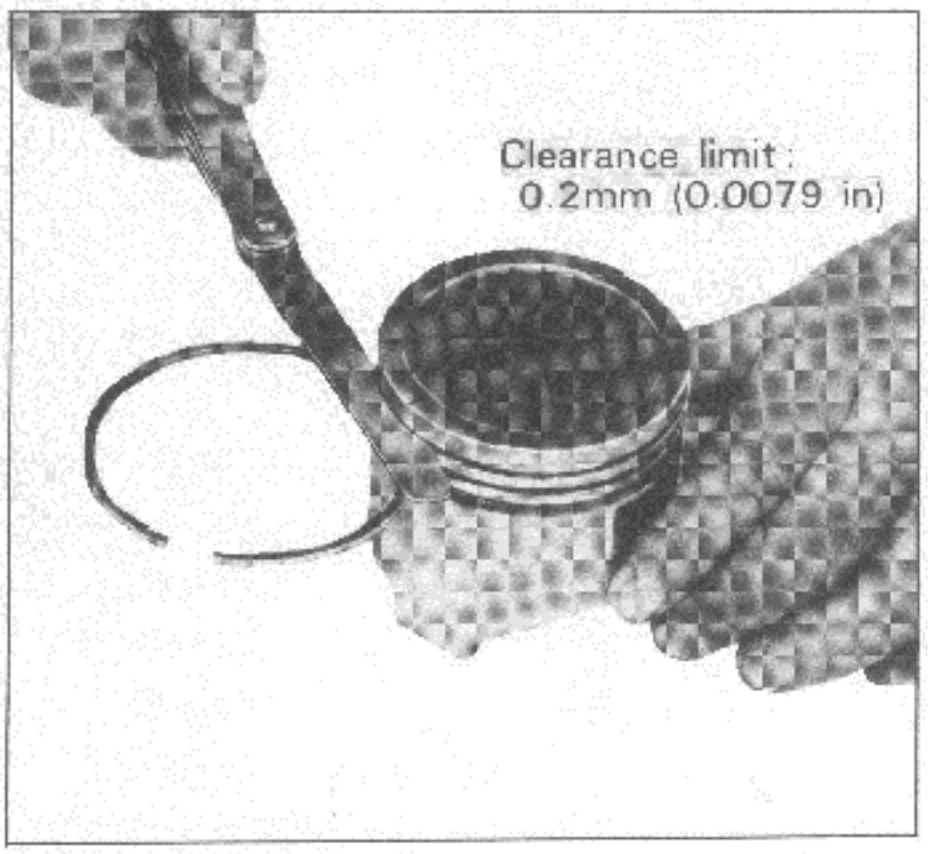


Fig. EM-55 Side clearance measurement

Side clearance

	Standard mm (in)	Wear limit mm (in)
Top ring	0.04 to 0.07 (0.0015 to 0.0027)	0.2 (0.0079)
2nd ring	0.04 to 0.07 (0.0015 to 0.0027)	0.1 (0.0039)
Oil ring	0.04 to 0.08 (0.0015 to 0.0031)	0.1 (0.0039)

Ring gap

	Standard mm (in)	Wear limit mm (in)
Top ring	0.2 to 0.35 (0.0079 to 0.0138)	1.0 (0.0394)
2nd ring	0.2 to 0.35 (0.0079 to 0.0138)	1.0 (0.0394)
Oil ring	0.3 to 0.9 (0.0118 to 0.0354)	1.0 (0.0394)

3. Place the ring at the bottom of the ring traveled part of cylinder bore in which it will be used.

Square ring in bore by pushing it into position with the head piston. Measure gap between ends of ring with feeler gauge.

Gap should be as listed above.

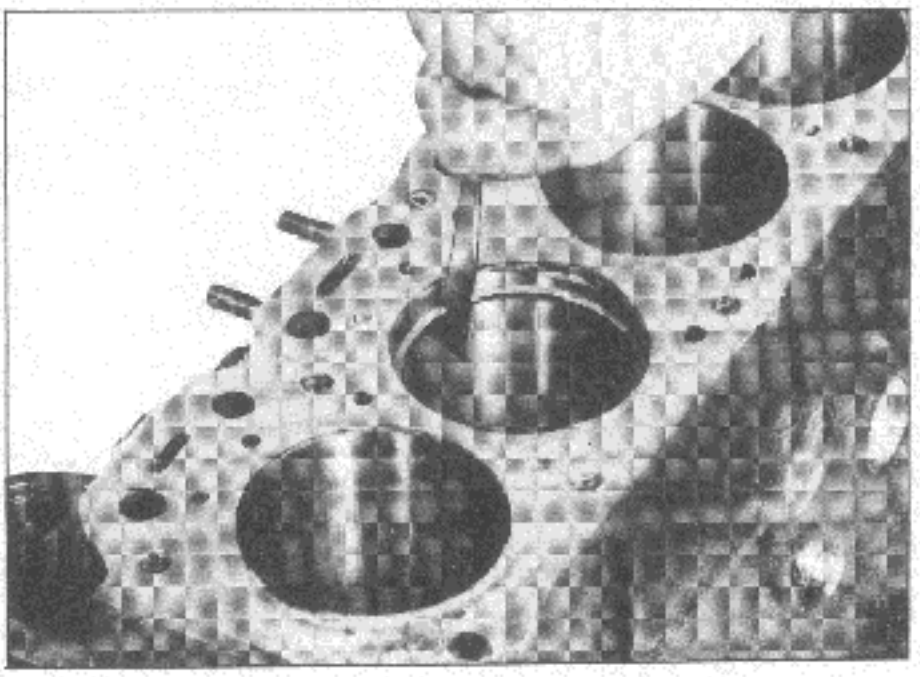


Fig. EM-56 Ring gap measurement

Note: a. When the piston ring only is to be replaced without the cylinder bore being corrected, measure gap at the bottom of the cylinder where the wear is minor.

b. Oversize piston rings are available for service (25, 50, 75, 100, 125, 150 oversize).

4. Measure the piston pin hole in relation to the outer diameter of the pin. If wear exceeds the limit, replace such piston pin together with the piston on which it is installed.

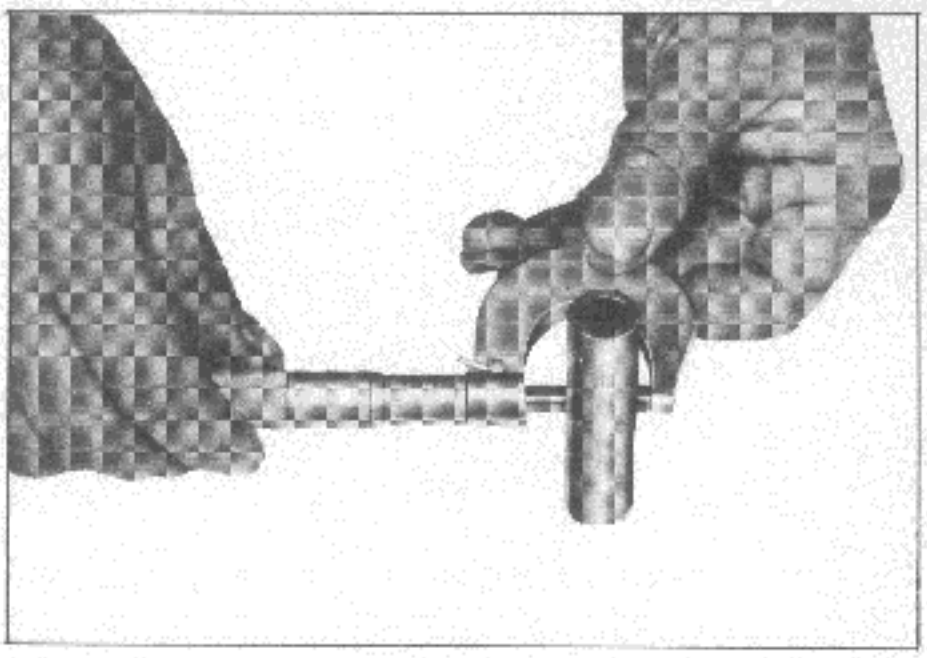


Fig. EM-58 Measuring piston pin diameter

	A10 and A12
Piston pin diameter mm (in)	17.447 to 17.452 (0.6869 to 0.6871)
Piston pin length mm (in)	65.23 to 65.48 (2.5681 to 5.779)
Piston pin hole diameter mm (in)	17.460 to 17.453 (0.6874 to 0.6871)

	A10 and A12
Piston pin to piston clearance mm (in)	0.006 to 0.008 (0.0002 to 0.0003)
Interference fit of piston pin to connecting rod mm (in)	0.020 (0.0008)

5. Fitting of piston pin

Determine the fitting of the piston pin into the piston pin hole to such an extent that it can be finger pressed at room temperature. This piston pin must be tight press fitted into the connecting rod.

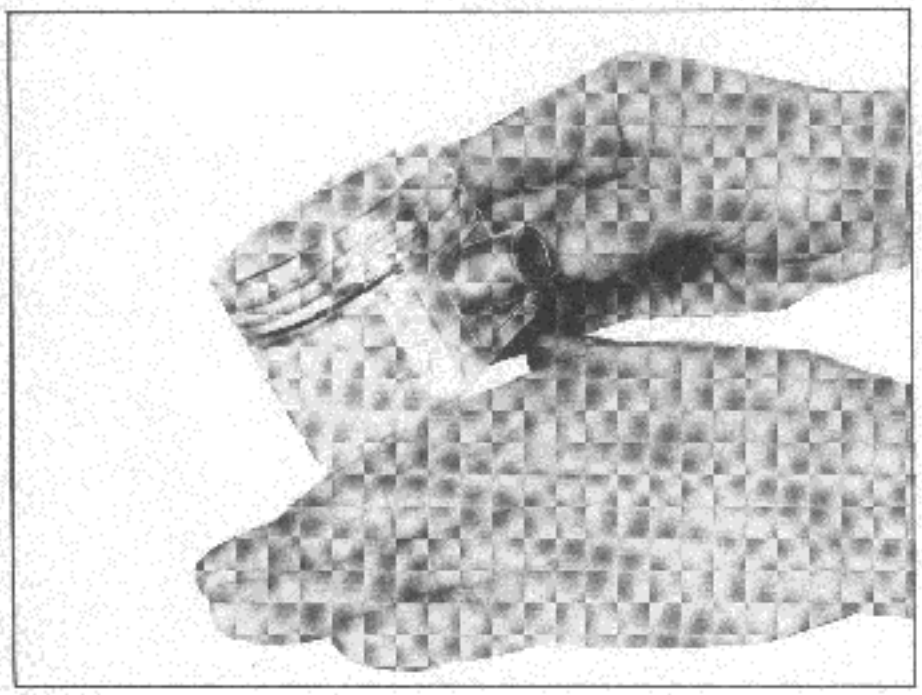


Fig. EM-57 Piston pin fitting (A12 engine)

CONNECTING ROD

1. If a connecting rod has any flaw within both sides of the thrust face and the large end, correct or replace it.

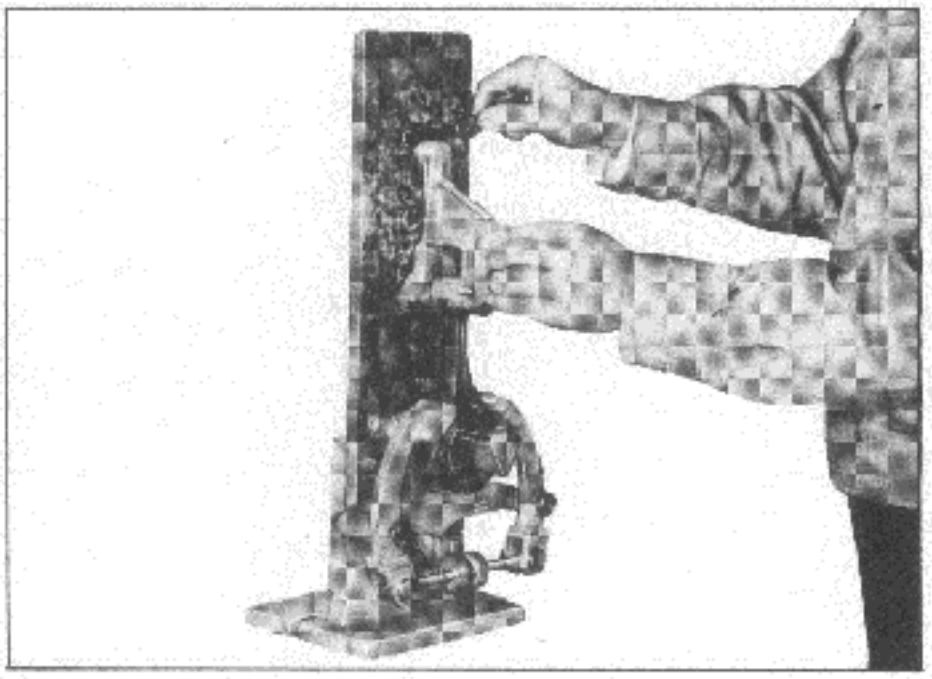


Fig. EM-59 Connecting rod aligner

2. Check for bend or torsion using a connecting rod aligner. If bend or torsion exceeds the limit, correct or replace the connecting rod.

A10 and A12	Standard		Maximum
Connecting rod bend or torsion (per 100 mm or 3.94 in length) mm (in)	bend	0.05 (0.0020)	0.1 (0.0039)
	torsion	0.07 (0.0028)	

3. When replacing the connecting rod, select the rod so that weight difference between new and old rods is within 5 gr (0.18 oz) in unit weight.

4. Install connecting rods with bearings on to the corresponding crank pins and measure the thrust clearance. If the measured value exceeds the limit, replace such connecting rod.

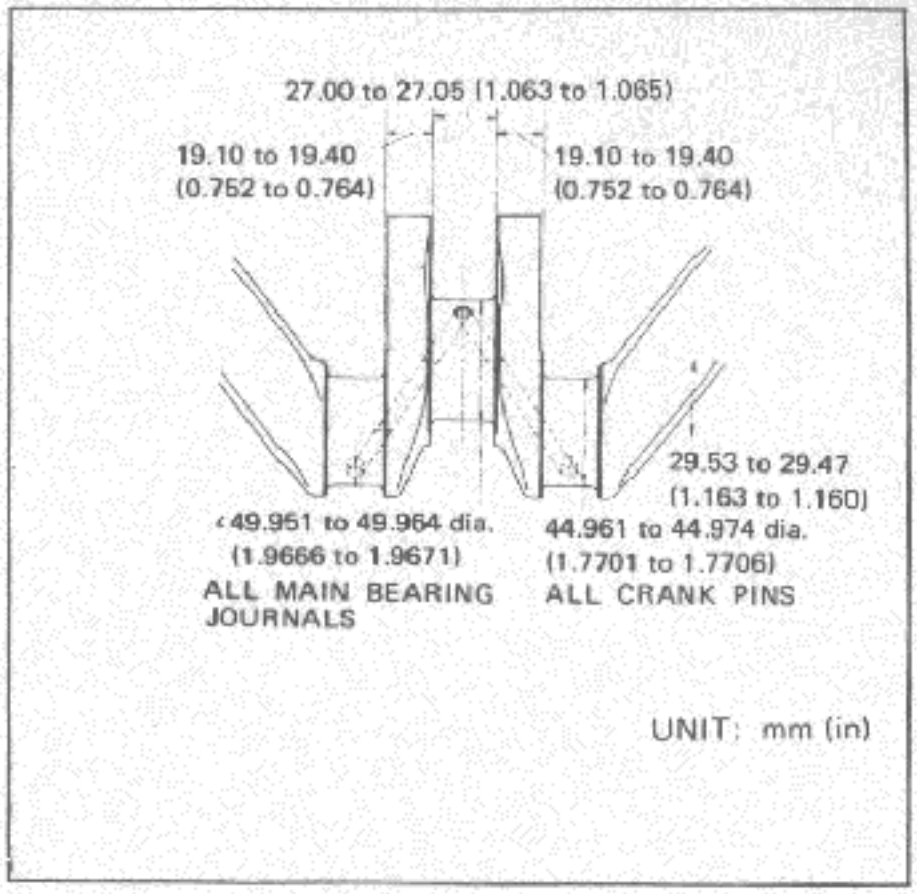


Fig. EM-61 A10 Engine

A10 and A12	Standard	Maximum
Big end play mm (in)	0.2 to 0.3 (0.0079 to 0.0118)	0.4 (0.0157)

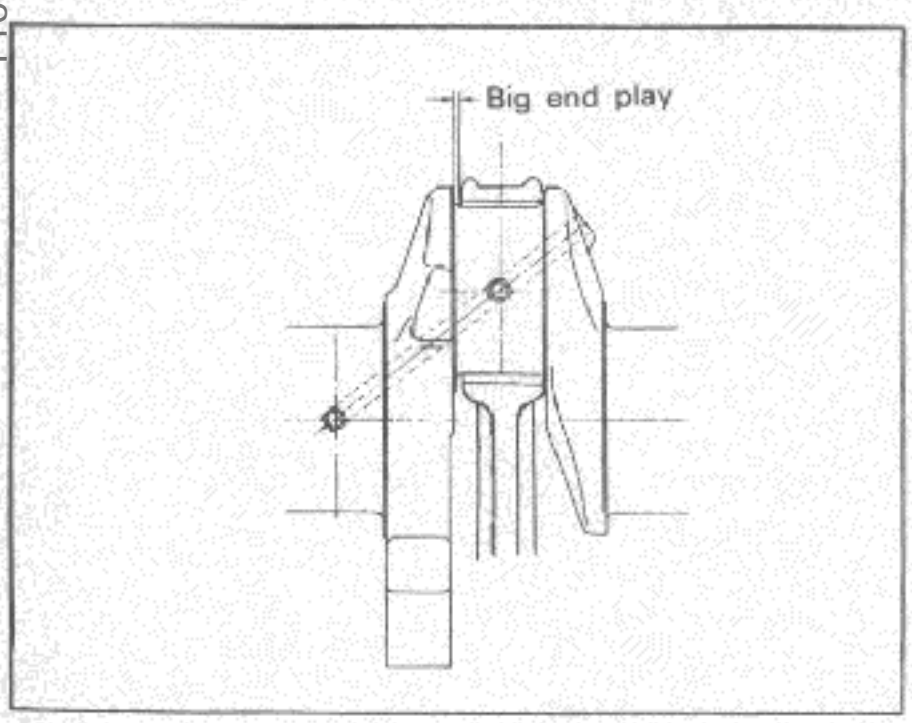


Fig. EM-60 Big end end play check

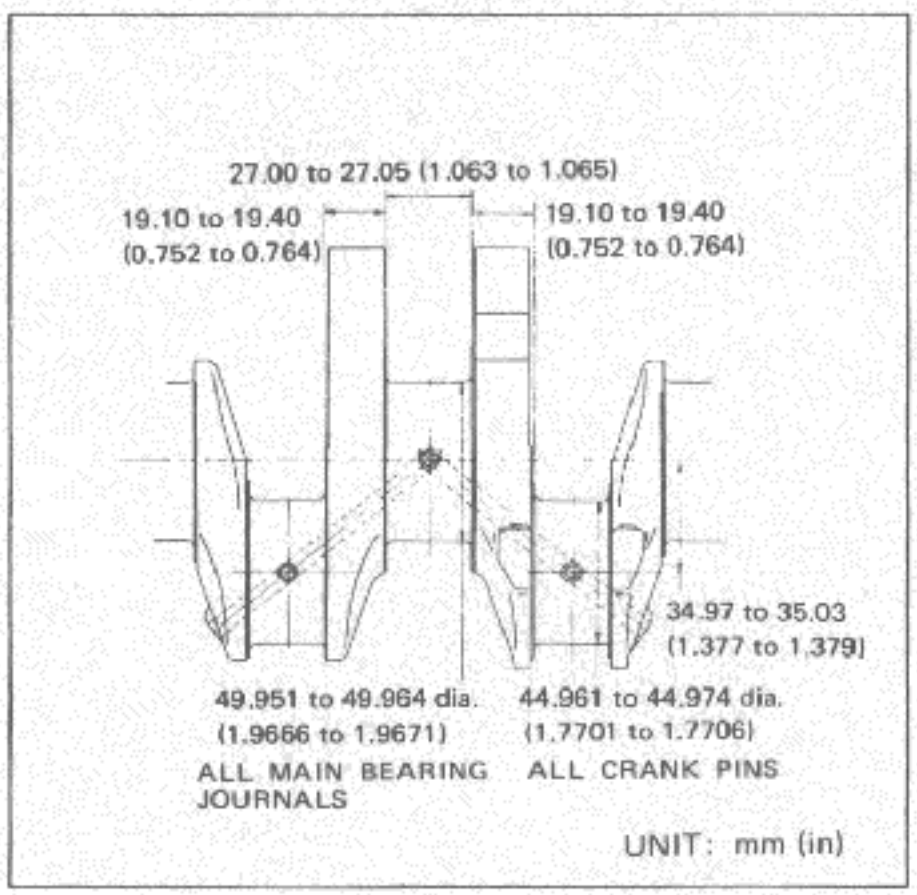


Fig. EM-62 A12 Engine

CRANK SHAFT

A10 and A12	Standard	Maximum
Taper & out-of-round of crank journal and crank pin mm (in)	0.01 (0.0004)	0.03 (0.0012)

1. Check the crankshaft journal and crank pin for scars, biased wear and cracks. Repair or replace as required.

2. Check the crankshaft for bend. If the bend exceeds the limit, replace the crankshaft.

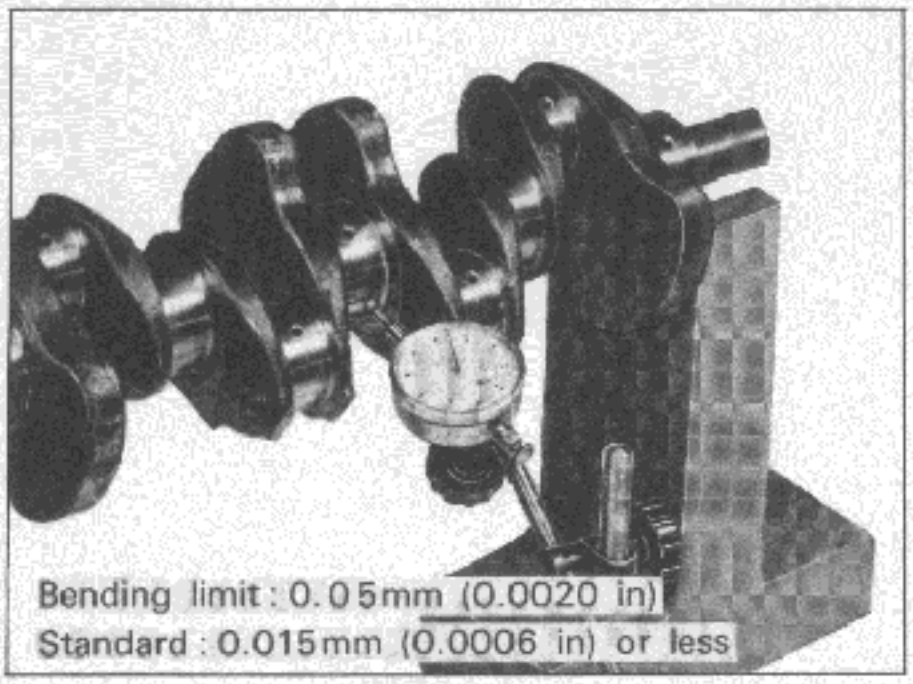


Fig. EM-63 Crankshaft bend check

A10 and A12	Standard	Maximum
Crankshaft bend mm (in)	0.015 (0.0006)	0.05 (0.0020)

Note: When measuring bend, use a dial gauge.
Bend value is a half of the reading obtained when the crankshaft is turned once with the dial gauge applied to its center journal.

3. After regrinding the crankshaft, finish it to the necessary size indicated in the lists on pages EM-25 by using an adequate undersize bearing according to the extent of required repair.

4. Install the crankshaft in the cylinder block and measure the thrust clearance.

Fig. EM-64 Crankshaft end play check

A10 and A12	Standard	Limit
Crankshaft free end play mm (in)	0.05 to 0.15 (0.0020 to 0.0059)	0.30 (0.0118)

5. Check the main drive shaft pilot bearing at the rear end of the crankshaft for wear and damage.

Replace it, if any defects are detected.

BUSHING AND BEARING

Measuring main bearing clearance

1. Check all bearings and bushings for seizure, melt, scar and burr.

Replace bushings, if any defects are detected.

2. Wipe off oil and dust (especially the rear of the bushing).

3. Set the main bearing on the cap block.

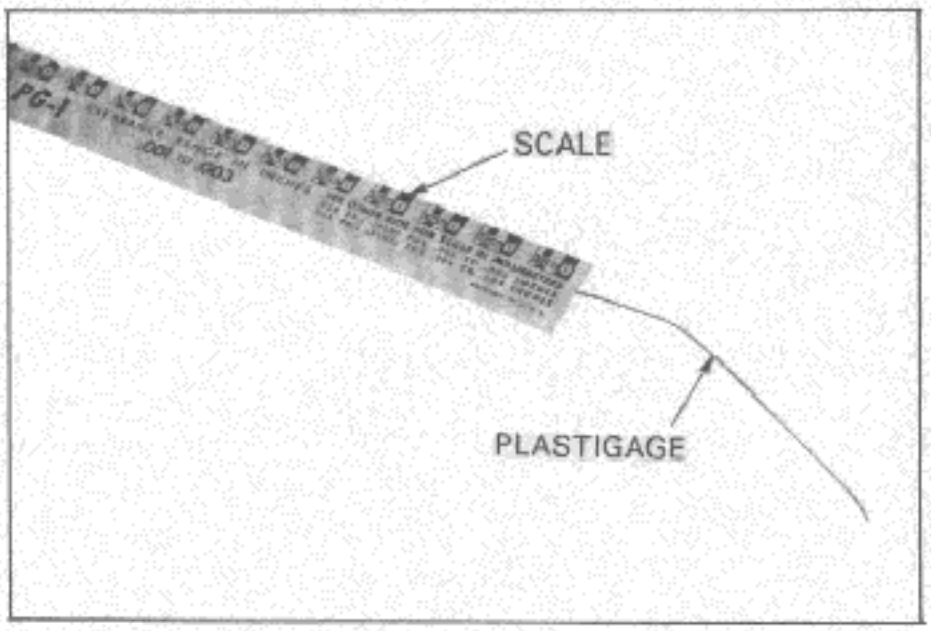


Fig. EM-65 Plastigage

4. Cut a plastigage to the width of the bearing and place it in parallel with the crank pin, getting clear of the oil hole.

Install the cap on the assembly and tighten them together with the specified torque.

Tightening torque
5.0 to 6.0 kg-m (36.2 to 43.4 ft-lb)

Note: Be sure not to turn the crankshaft when the plastigage is inserted.

5. Remove the cap, and measure width of the plastigage at its widest part with the scale printed in the plastigage envelope.

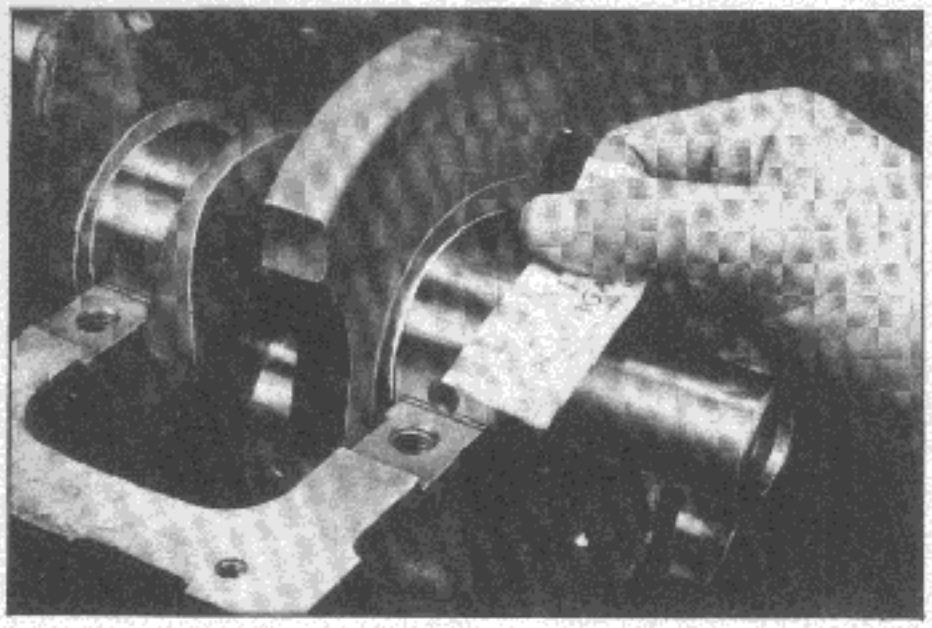


Fig. EM-66 Bearing clearance check

Measuring connecting rod bearing clearance

1. Measure connecting rod bearing clearance in the same manner.

Tightening torque:

A10 ..... 3.0 to 3.6 kg-m (21.7 to 26.0 ft-lb)
A12 ..... 3.2 to 3.8 kg-m (23.1 to 27.5 ft-lb)

Bearing oil clearance (A10 and A12):

	Standard	Wear limit
Main bearing clearance mm (in)	0.020 to 0.062 (0.0008 to 0.0024)	0.1 (0.0039)
Connecting rod bearing clearance mm (in)	0.020 to 0.050 (0.0008 to 0.0020)	0.1 (0.0039)

2. If clearance exceeds the specified value, replace bearing with an undersize bearing and grind out the crankshaft journal adequately.

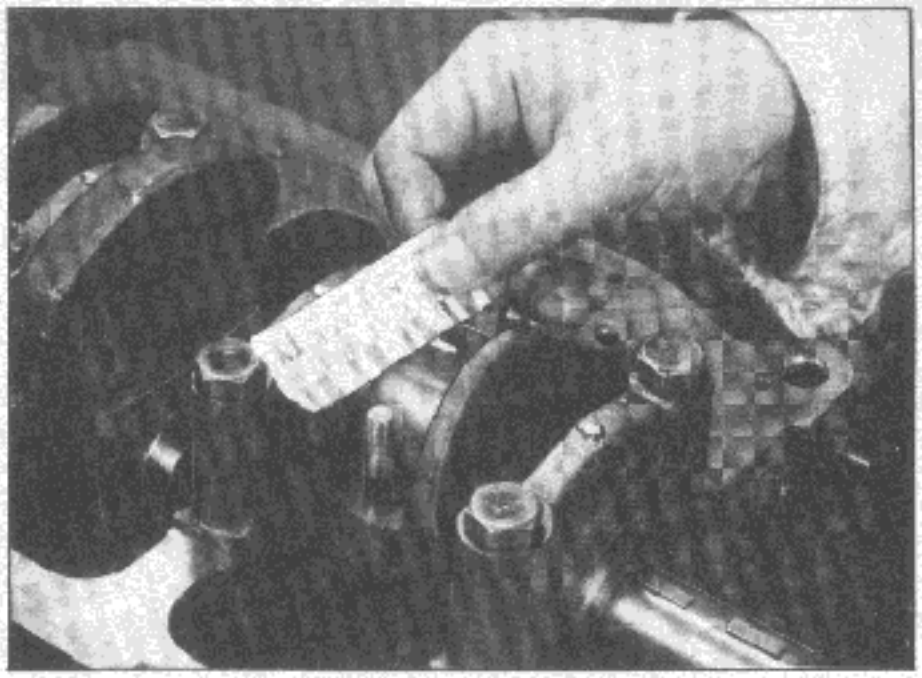


Fig. EM-67 Bearing clearance check

Fitting crankshaft bearings

1. Set the bushings on the main bearing cap and the cylinder block bearing recess and tighten the cap bolts to the specified torque.

Tightening torque:

5.0 to 5.3 kg-m (36.2 to 38.3 ft-lb)

2. Loosen the cap bolt on one side and measure clearance between the cap and cylinder block side.

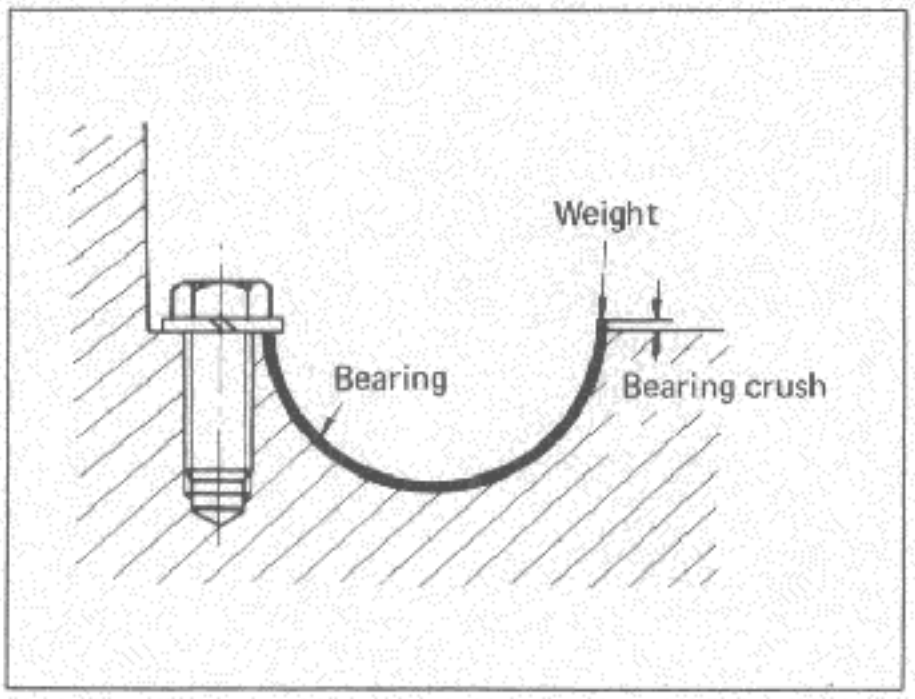


Fig. EM-68 Bearing crush check

3. Ascertain that the clearance is within double as great as the figure listed below.
If it is not, replace the bearing.

4. Handle the connecting rod bearing in the same manner.

Connecting rod cap tightening torque:
A10 ..... 3.0 to 3.6 kg-m (21.7 to 26.0 ft-lb)
A12 ..... 3.2 to 3.8 kg-m (23.1 to 27.5 ft-lb)

Bearing crush

	A10	A12
All main bearing mm (in)	0 to 0.03 (0.to 0.0012)	0 to 0.03 (0 to 0.0012)
All connecting rod bearing mm (in)	0.015 to 0.040 (0.0006 to 0.0016)	0.015 to 0.040 (0.0006 to 0.0016)

Main bearing undersize (A10 and A12)

Bearing size 1/1000	Bearing top thickness mm (in)	Crank journal diameter mm (in)
STD	1.835 to 1.822 (0.0722 to 0.0717)	49.951 to 49.964 (1.9666 to 1.9671)
25 undersize	1.960 to 1.947 (0.0772 to 0.0767)	49.701 to 49.714 (1.9567 to 1.9572)
50 undersize	2.085 to 2.072 (0.0821 to 0.0816)	49.451 to 49.464 (1.9469 to 1.9474)
75 undersize	2.210 to 2.197 (0.0870 to 0.0865)	49.201 to 49.214 (1.9370 to 1.9376)
100 undersize	2.335 to 2.322 (0.0919 to 0.0914)	48.951 to 48.964 (1.9272 to 1.9277)

Connecting rod bearing undersize (A10 and A12)

Bearing size	Bearing top thickness mm (in)	Crank pin diameter mm (in)
STD	1.500 to 1.508 (0.0591 to 0.0594)	44.961 to 44.974 (1.8489 to 1.7706)
8 undersize	1.540 to 1.548 (0.0606 to 0.0609)	44.881 to 44.894 (1.7670 to 1.7675)
12 undersize	1.560 to 1.568 (0.0614 to 0.0617)	44.841 to 44.854 (1.7654 to 1.7659)
25 undersize	1.625 to 1.633 (0.0640 to 0.0643)	44.711 to 44.724 (1.7603 to 1.7608)
50 undersize	1.750 to 1.758 (0.0689 to 0.0692)	44.461 to 44.474 (1.7504 to 1.7509)
75 undersize	1.875 to 1.883 (0.0738 to 0.0741)	44.211 to 44.224 (1.7406 to 1.7411)
100 undersize	2.000 to 2.008 (0.0787 to 0.0791)	43.961 to 43.974 (1.7307 to 1.7313)

Fitting camshaft bushings

1. When clearance exceeds the specified value, remove all camshaft bushings by using the special tool and replace with service parts.

Note: a. Coincide the bearing oil hole with the oil hole of the cylinder block side.

b. After replacing all bushings, correct the bearings by line boring.

c. Install the taper plug into the cylinder block, applying the sealing agent.

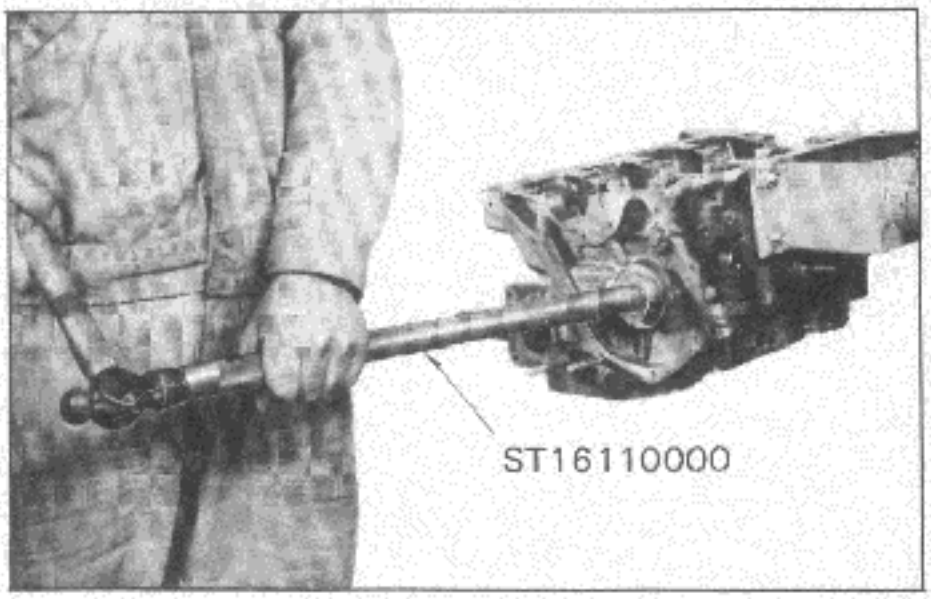


Fig. EM-69 Replacing camshaft bushings

		Bearing thickness mm (in)	Camshaft journal diameter mm (in)
STD	No.1	1.585 to 1.565 (0.0624 to 0.0616)	43.783 to 43.796 (1.7237 to 1.7242)
	No.2		43.283 to 43.296 (1.7041 to 1.7046)
	No.3		42.783 to 42.796 (1.6844 to 1.6849)
	No.4		42.283 to 42.296 (1.6647 to 1.6652)
	No.5		41.208 to 41.221 (1.6224 to 1.6229)
0.25 undersize	No.1	1.710 to 1.690 (0.0673 to 0.0665)	43.533 to 43.546 (1.7139 to 1.7144)
	No.2		43.023 to 43.036 (1.6983 to 1.6943)
	No.3		42.523 to 42.536 (1.6741 to 1.6746)
	No.4		42.023 to 42.036 (1.6544 to 1.6550)
	No.5		40.958 to 40.971 (1.6125 to 1.6130)
0.50 undersize	No.1	1.835 to 1.815 (0.0722 to 0.0715)	43.283 to 43.296 (1.7041 to 1.7046)
	No.2		42.773 to 42.786 (1.6840 to 1.6845)
	No.3		42.273 to 42.286 (1.6643 to 1.6648)
	No.4		41.773 to 41.786 (1.6446 to 1.6451)
	No.5		40.708 to 40.721 (1.6027 to 1.6023)
0.75 undersize	No.1	1.960 to 1.940 (0.0772 to 0.0764)	43.033 to 43.046 (1.6942 to 1.6947)
	No.2		42.523 to 42.536 (1.6741 to 1.6746)
	No.3		42.023 to 42.036 (1.6554 to 1.6550)
	No.4		41.523 to 41.536 (1.6348 to 1.6353)
	No.5		40.458 to 40.471 (1.5928 to 1.5933)

MISCELLANEOUS COMPONENTS

Crankshaft sprocket and camshaft sprocket

1. Check tooth surfaces for flaws and wears.
   Replace defective sprocket.

2. Install the camshaft sprocket in position and check for run-out. If it exceeds 0.1 mm (0.0039 in), replace the camshaft sprocket.

Check the camshaft thrust deviation. If it is deviated, replace the camshaft locating plate

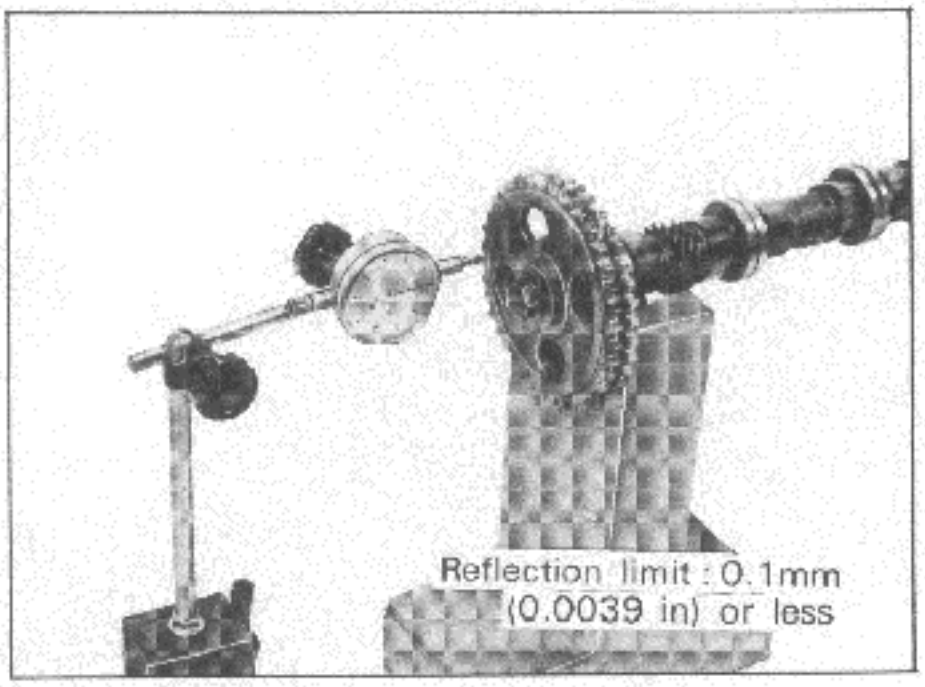


Fig. EM-70 Camshaft sprocket run-out check

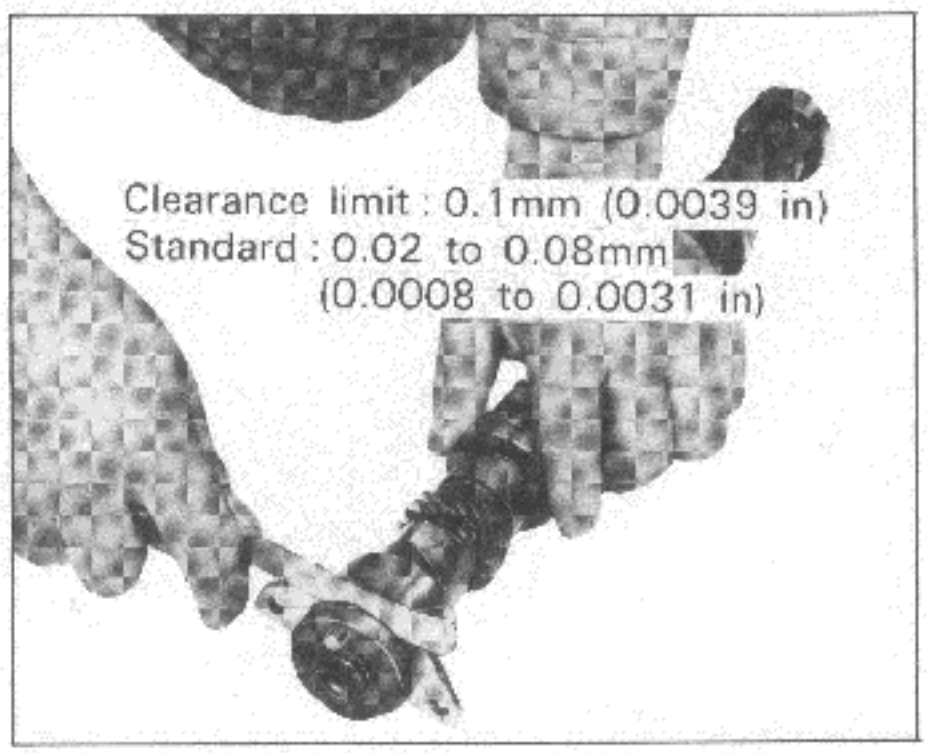


Fig. EM-70-1 Check locating plate thrust clearance

A10 and A12	Standard mm (in)	Wear limit mm (in)
Camshaft sprocket run out		less than 0.1 (0.0039)
Thrust deviation	0.015 (0.0006)	0.05 (0.0020)
Locating plate thrust clearance	0.02 to 0.08 (0.0008 to 0.0031)	0.1 (0.0039)

3. Check the chain for damage, excessive wear and stretch at its roller links. Replace chain, if defective.

Flywheel

1. Check the clutch disc contact surface of the flywheel for damage and wear. Repair or replace if necessary.

2. Measure deviation of the clutch disc contact surface with a dial gauge.

If it exceeds 0.2 mm (0.0079 in), replace it.

3. Check tooth surfaces of the ring gear for flaw and wear.

Replace if necessary.

Note: Replace the ring gear at about 180 to 200° C (356 to 392° F).

ENGINE ASSEMBLY

CONTENTS

PRECAUTION

1. Use thoroughly cleaned parts. Particularly, make sure that oil holes are clear of foreign matter.

2. When installing sliding parts such as bearings, be sure to apply engine oil to them.

3. Use new packings and oil seals.

4. Keep tools and work benches clean.

5. Keep the necessary parts and tools near at hand.

6. Be sure to follow specified tightening torque and orders.

CYLINDER HEAD

Assembly of valve and valve spring

Set the valve spring seat in position, and fit the valve guide with the oil lip seal.

Assemble the parts in order; valve spring, spring retainer, valve collet and valve rocker guide.

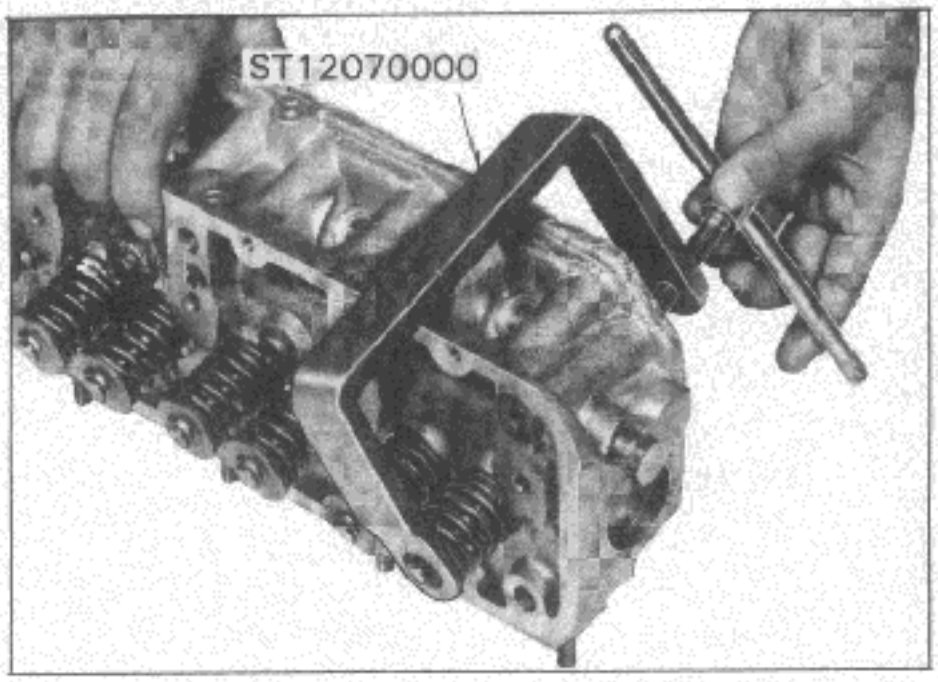


Fig. EM-71 Valve installation

Note: Make sure that the valve face is clear from foreign matters.

PISTON AND CONNECTING ROD

1. Assemble piston, piston pin and connecting rod assorted according to cylinder number for every cylinder.

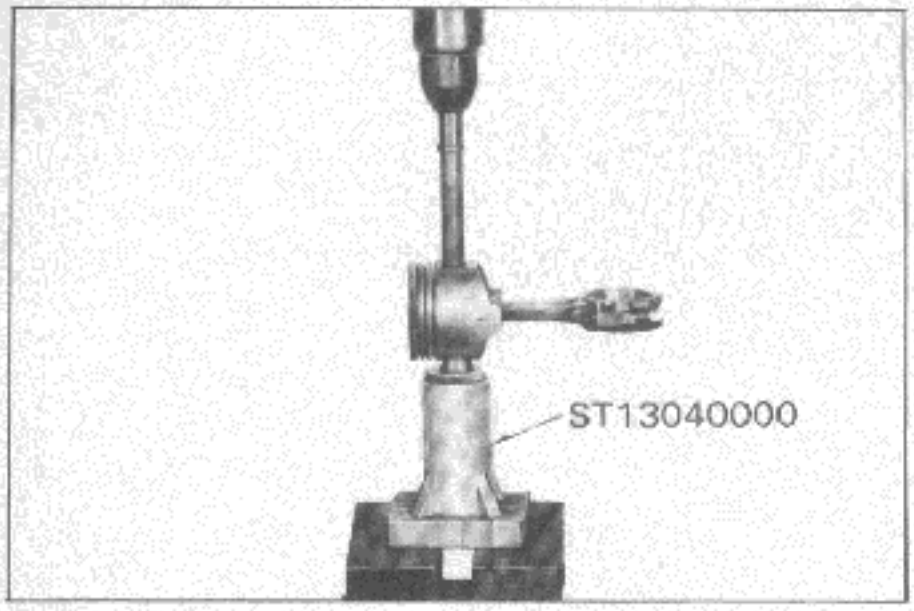


Fig. EM-72 Piston pin installation

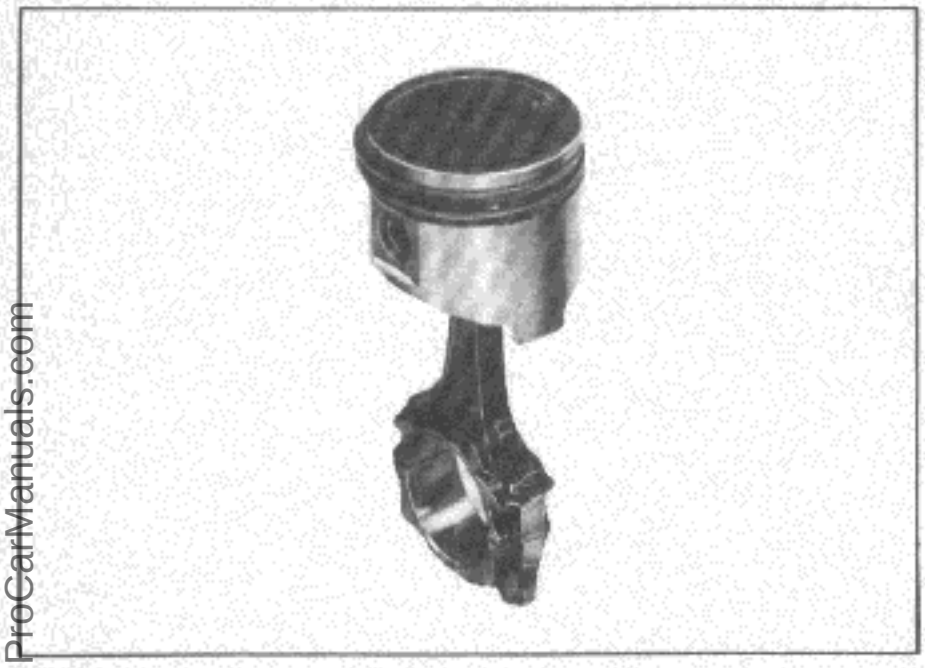


Fig. EM-73 Piston and connecting rod assembly

Note: a. Piston pin is press fitted to the connecting rod tightly, and fitting force is from 1 to 3 tons. When fitting piston pin, special tool must be used.
When pressing the piston pin into the connecting rod, apply engine oil to the pin and the small end of the connecting rod.

b. Arrange the connecting rod so that the oil jet of the connecting rod large end is directed forward the right side of the cylinder block.

2. Installing piston rings

Install the top and second rings in right positions so that the marks are faced upward.

3. Fix bearings on the connecting rod and the connecting rod cap.

Note: Clean the back side of the bearing carefully.

ASSEMBLING ENGINE

1. Set the cylinder block on the working stand with the engine bottom faced upside.

2. Installing the valve lifters, install the camshaft and retain by the camshaft locate plate. Locate plate tightening torque is 0.4 to 0.5 kg-m (2.9 to 3.6 ft-lb).

Note: Set the locate plate so as the "LOWER" mark comes to the engine bottom side.

Set the main bearings on their positions on the cylinder block.

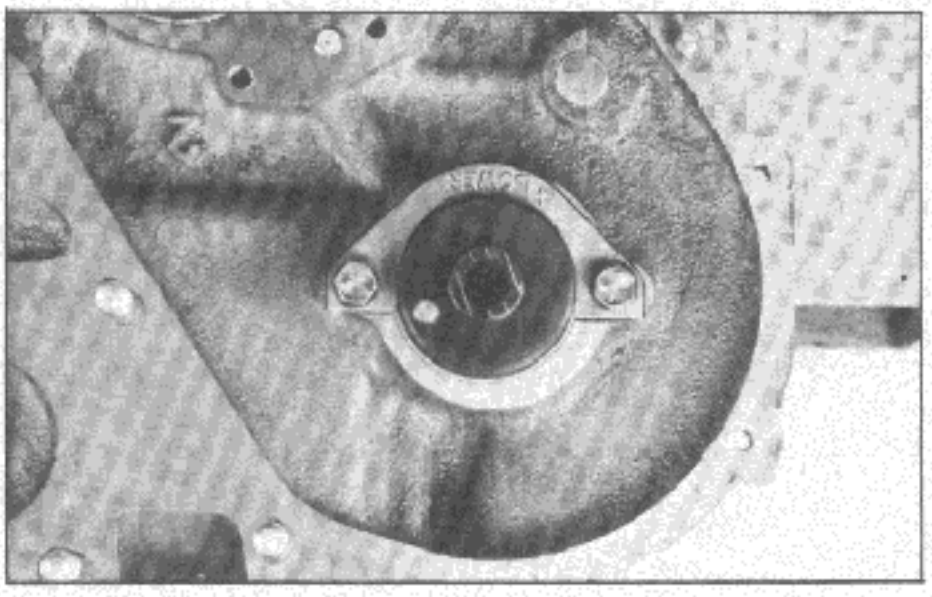


Fig. EM-74 Installing camshaft locate plate

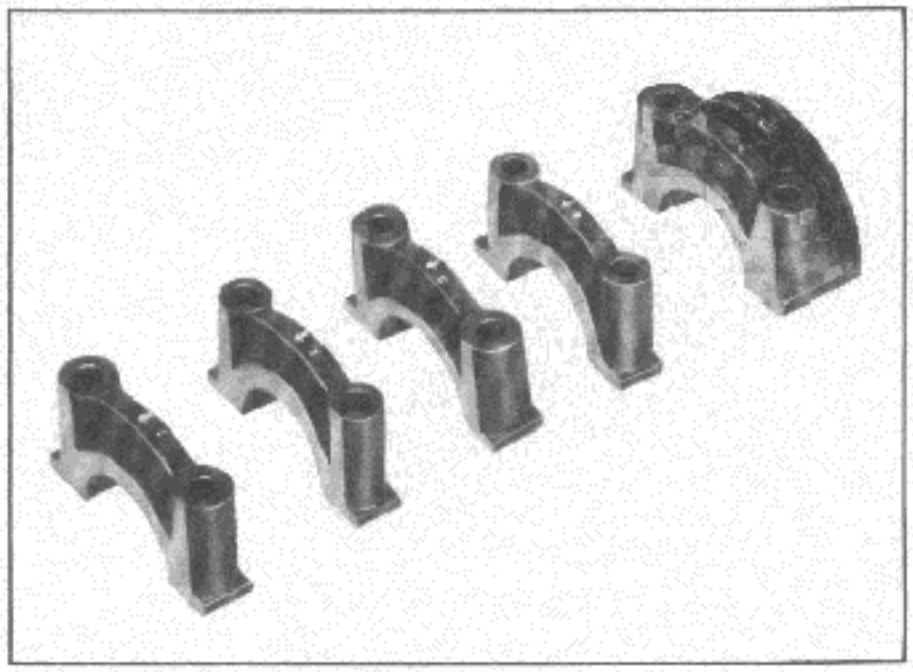


Fig. EM-75 Main bearing caps

Note: a. Only the center bearing (No.3 bearing for A12 Engine and No.2 bearing for A10 Engine) is a flanged type for thrust force.

b. Two inner bearings (No.2 and No.4 for A12 Engine) are of the same type.

c. The front bearing (No.1) is the same type as the rear bearing (No.5 for A12 Engine and No.3 for A10 Engine).

d. All bearings except for No.1 bearing, are interchangeable between upper and lower bearings. (Bearings for A10 Engines and A12 Engines are not interchangeable.)

3. Apply engine oil to the main bearing surfaces on both sides of the cylinder block and cap.
   Install the crankshaft.

4. Install the main bearing cap and tighten the bolts with specified torque.

   Tightening torque:

   5.0 to 6.0 kg-m (36.2 to 43.4 ft-lb)

Note: a. Arrange the parts so that the arrow mark on the bearing cap is faced toward the front of the engine.

b. Prior to tightening the bearing cap bolts, place the bearing cap at a proper position by shifting the crankshaft in the axial direction.

c. Tighten the bearing cap bolts gradually in separating two to three stages and outwardly from the center bearing.

d. After securing the bearing cap bolts, ascertain that the crankshaft can be easily rotated.

5. Make sure that the crankshaft end play is correct.

   Crankshaft end play:

   0.05 to 0.15 mm (0.0020 to 0.0059 in)

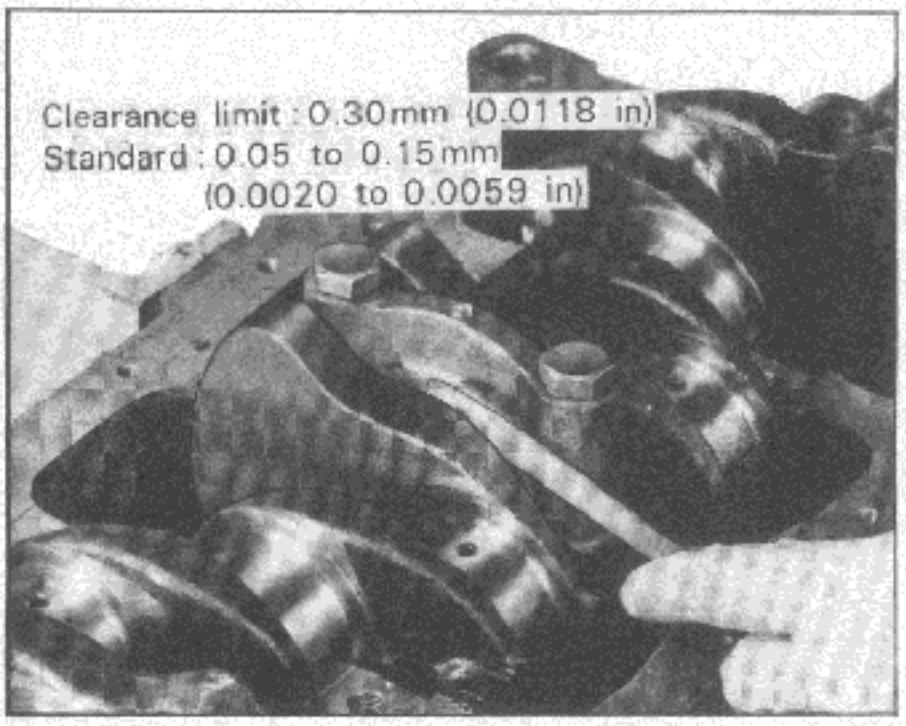


Fig. EM-76 Crankshaft end play check

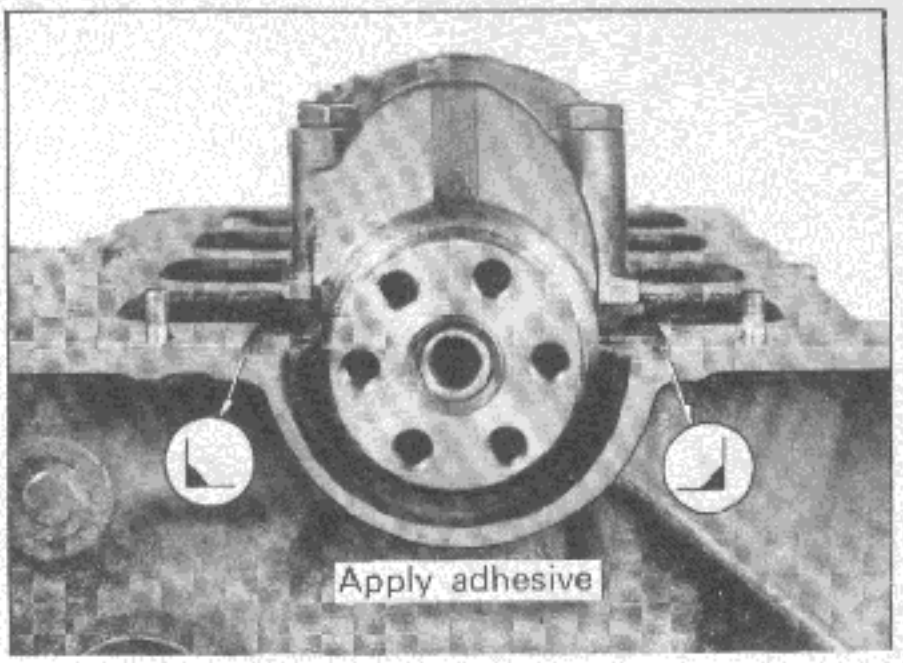


Fig. EM-76-1 Apply adhesive

6. Install the rear oil seal.

7. Install the flywheel securely using the lock washers, and tighten the bolts with specified torque.

   Tightening torque:

   A10 Engine ..... 4.5 to 5.5 kg-m (32.5 to 39.8 ft-lb)
   A12 Engine ..... 6.5 to 7.5 kg-m (47.0 to 54.2 ft-lb)

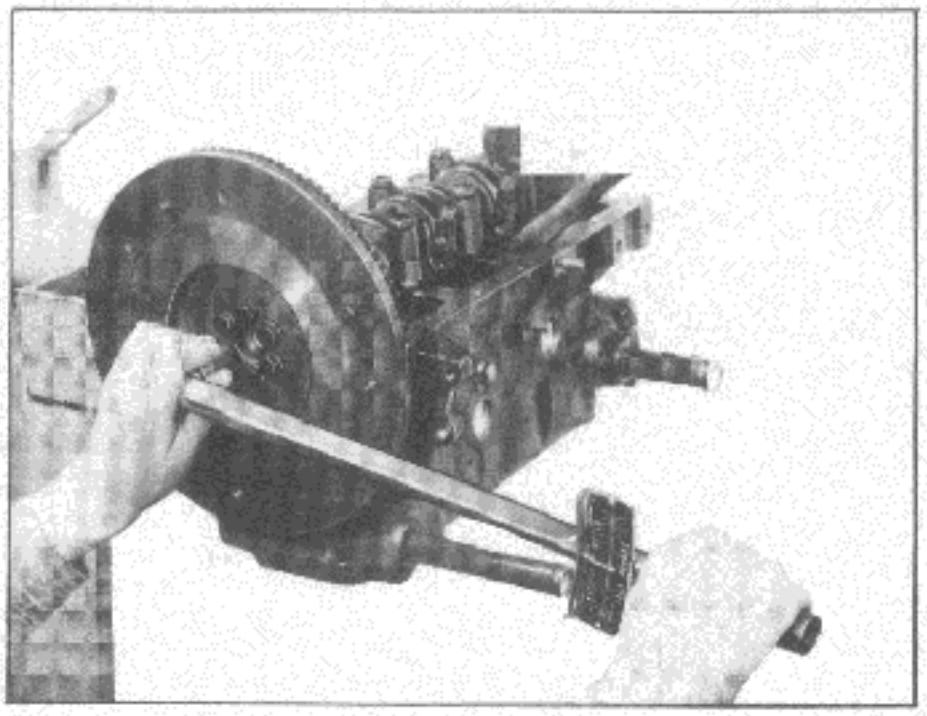
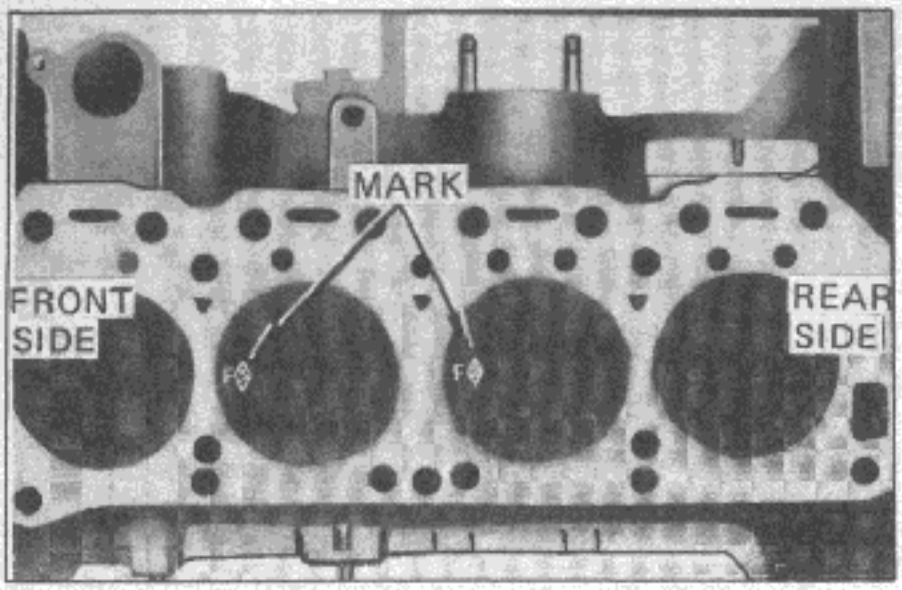


Fig. EM-77 Flywheel installation

8. Rotate the engine a quarter turn and install the piston-rod assembly.



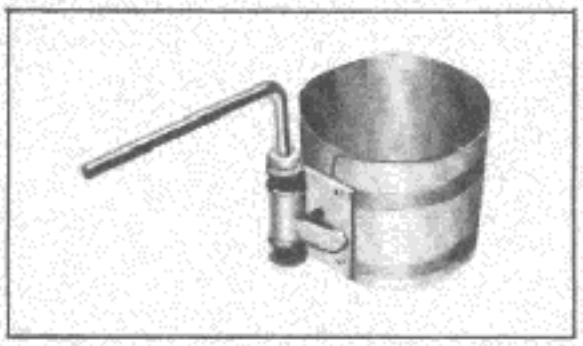


Fig. EM-78 Piston and connecting rod assembly installation

Note: a. Insert the pistons in the corresponding cylinders.

b. Apply engine oil to parts as required.

c. Arrange pistons so that the "F" mark on the piston is faced to the front of the engine.

d. Install piston rings at 180° to each other, avoiding to fit them in the thrust and piston pin axial directions.

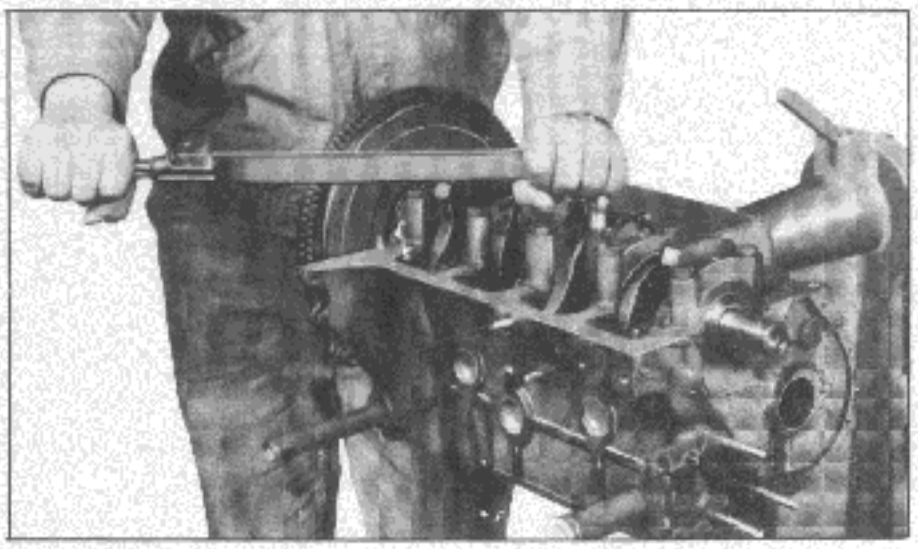


Fig. EM-79 Connecting rod cap installation

Note: Arrange connecting rods and connecting rod caps so that the cylinder numbers are faced toward the same direction.

9. Install the connecting rod cap.

Tightening torque:
A10 Engine ..... 3.0 to 3.6 kg-m (21.7 to 26.0 ft-lb)
A12 Engine ..... 3.2 to 3.8 kg-m (23.1 to 27.5 ft-lb)

10. Make sure that end play of the connecting rod large end is correct.

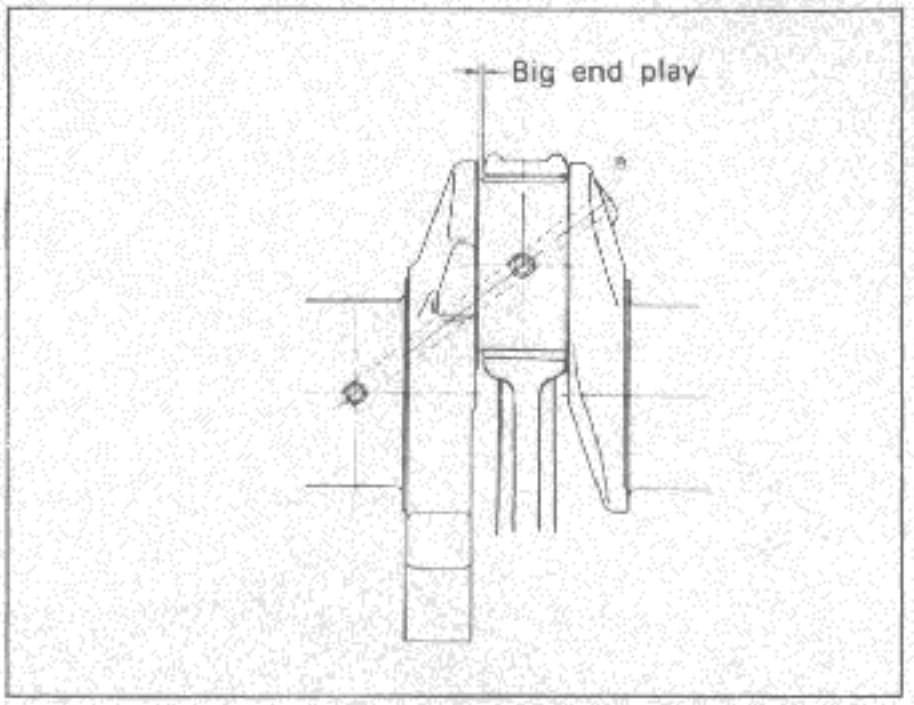


Fig. EM-80 Big end play check

Big end end play: 0.15 to 0.2 mm (0.0059 to 0.0078 in)

11. Install the camshaft and crankshaft sprockets temporarily for adjustment of the tooth height by using adjusting washers.

Height difference mm (in)	less than 0.5 (0.0197)
Adjusting washer thickness mm (in)	0.15 (0.006)

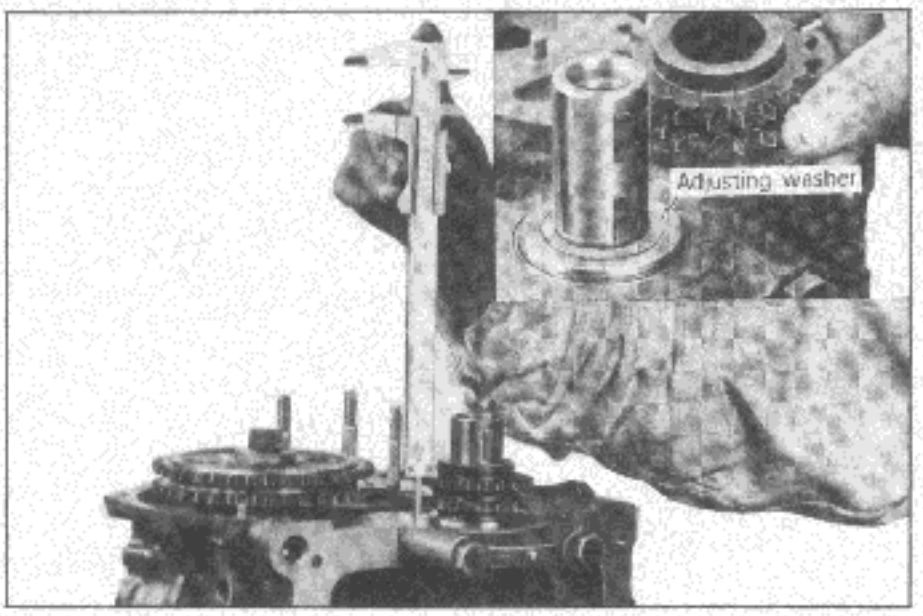


Fig. EM-81 Adjusting sprocket tooth height

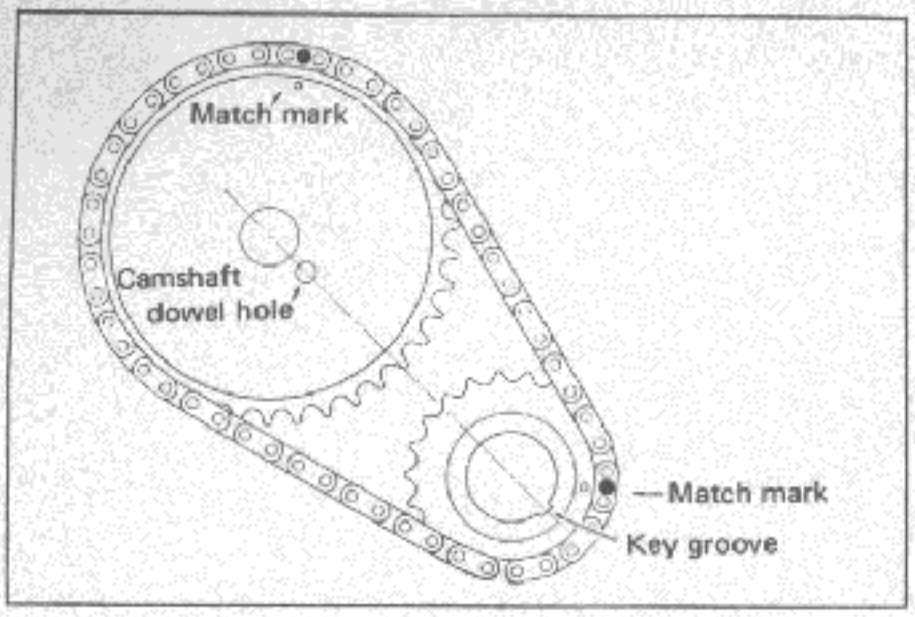


Fig. EM-81-1 Setting chain

12. Install the timing chain and camshaft sprocket.
Camshaft sprocket tightening torque:
4.0 to 4.8 kg-m (28.9 to 34.7 ft-lb)

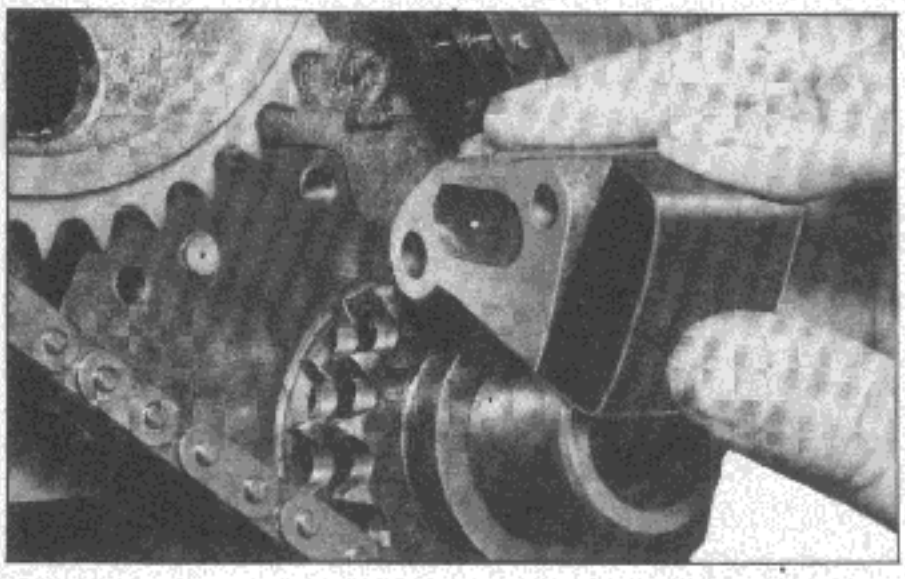


Fig. EM-81-2 Chain tensioner installation

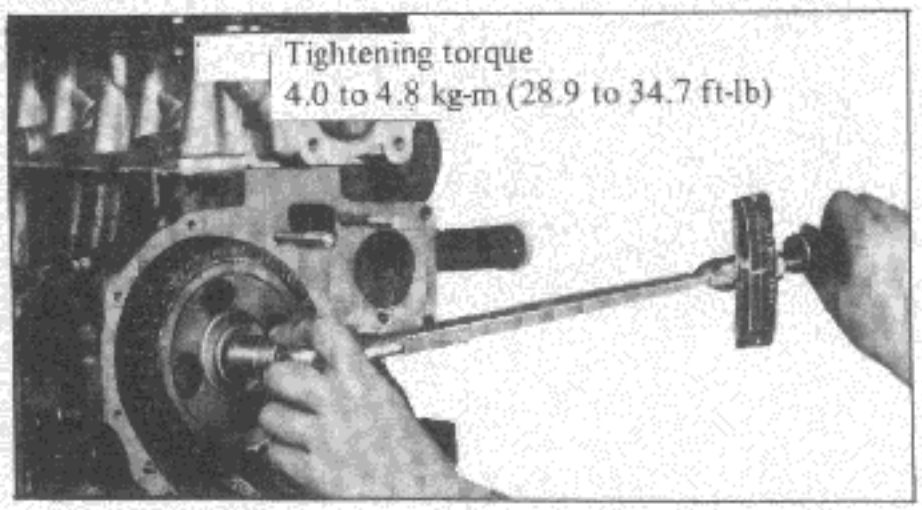


Fig. EM-81-3 Cam sprocket gear installation

Note: a. Make sure that the camshaft sprocket dowel hole and crankshaft sprocket key are in line and both the dowel hole and key are located downward.

b. Set the timing chain making its mating marks meet with those of crankshaft sprocket and camshaft sprocket at the right hand side.

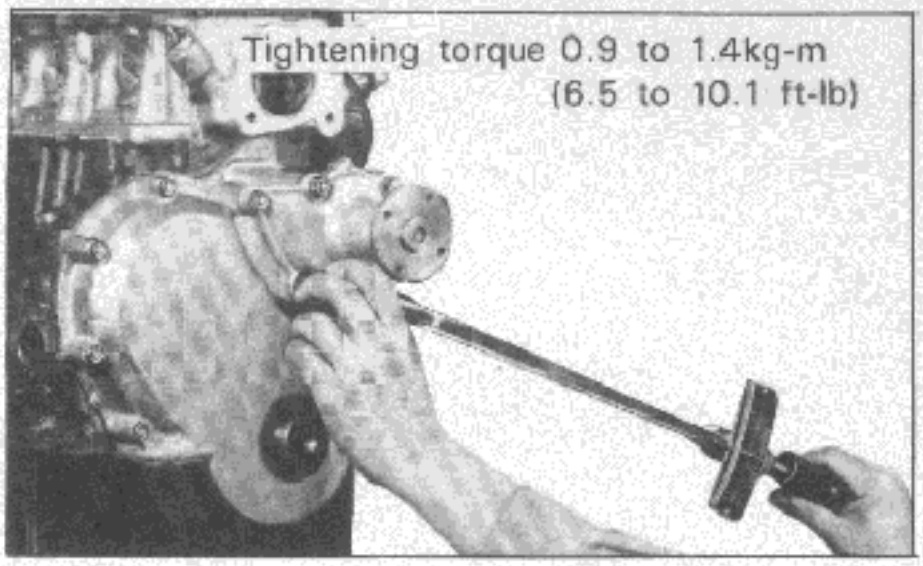


Fig. EM-82 Timing chain cover installation

13. Install the timing chain tensioner and tighten the tensioner bolts to a torque of 0.6 to 0.8 kg-m (4.3 to 5.8 ft-lb).

Check the tensioner spindle projection

	Wear limit
Spindle projection mm (in)	15 (0.591)

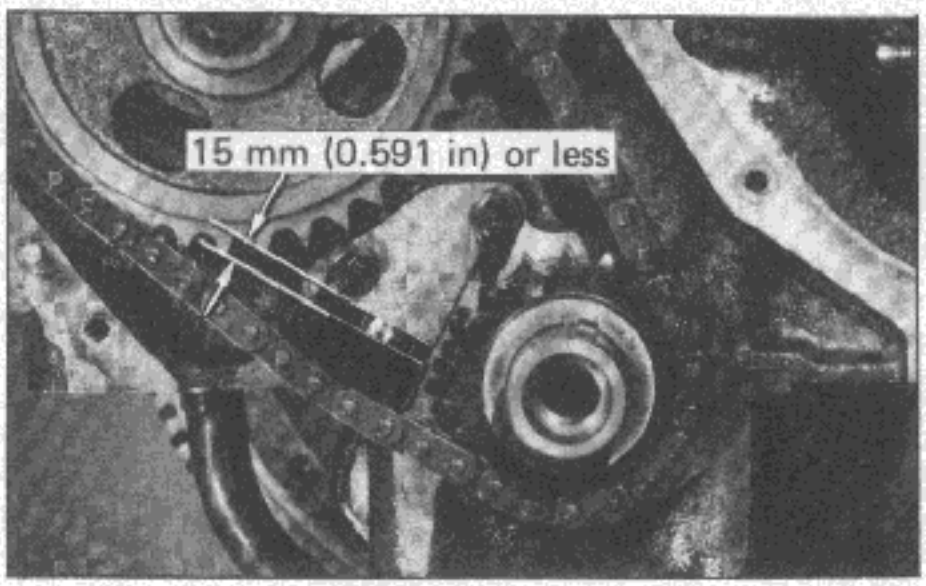


Fig. EM-83 Check the tension spindle projection

14. Install the crankshaft oil thrower.

15. Install the new oil seal to the front cover. (the front cover oil seal should be replaced when the front cover is disassembled.)

16. Install the front cover, applying the sealing agent to both surfaces of the gasket.

Tightening torque:
0.5 to 0.7 kg-m (3.6 to 5.1 ft-lb)

17. Install the oil strainer and the oil pan using the gasket.

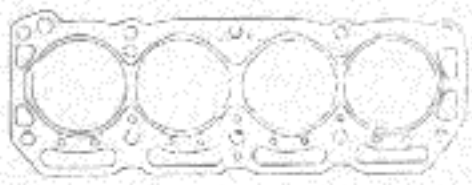
Apply sealing agent on both surfaces of the gasket especially on the front and rear portions of the oil pan.

Oil pan tightening torque:

0.4 to 0.6 kg-m (2.9 to 4.3 ft-lb)

18. Invert the engine and install the cylinder head assembly and gasket.

Cylinder head gasket

Cylinder block side (Steel sheet)	 Sealing agent; not required
Cylinder head side (Joint sheet)	 Sealing agent; not required
Remarks	Install without applying sealing agent. Be careful not to damage the push rod side because this side has previously been provided with sealing agent.

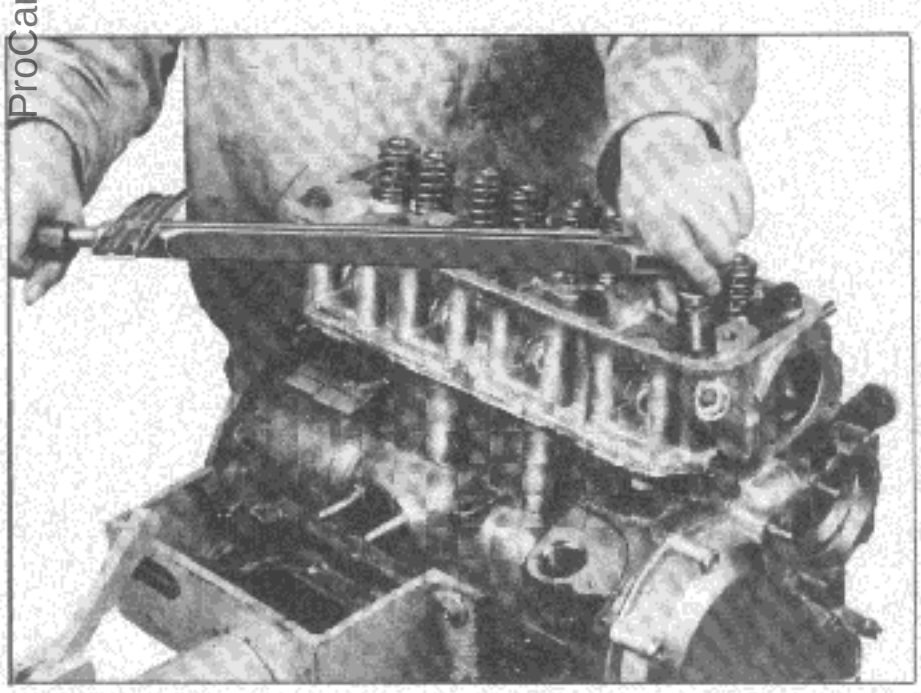


Fig. EM-84 Cylinder head installation

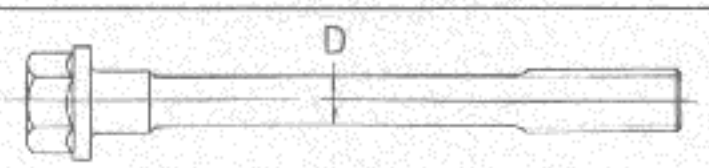
Note: Apply sealing agent overall the cylinder block surface. Place the gasket on it, and apply sealing agent to the gasket top.

19. Tighten the cylinder head bolts to the specified torque.

The cylinder head uses two types of installation bolt; one is for the center right side, and the other is for all other positions. The bolt for the center right side has a "T" mark on its head.

Tightening torque:

4.5 to 5.5 kg-m (32.5 to 39.8 ft-lb)



Bolt number	Diameter	Identification mark
①	7.9 to 8.1 (0.3111 to 0.3189)	T mark
Except for # 1	8.87 to 9.03 (0.3492 to 0.3555)	not marked

Fig. EM-85 Head bolt segment

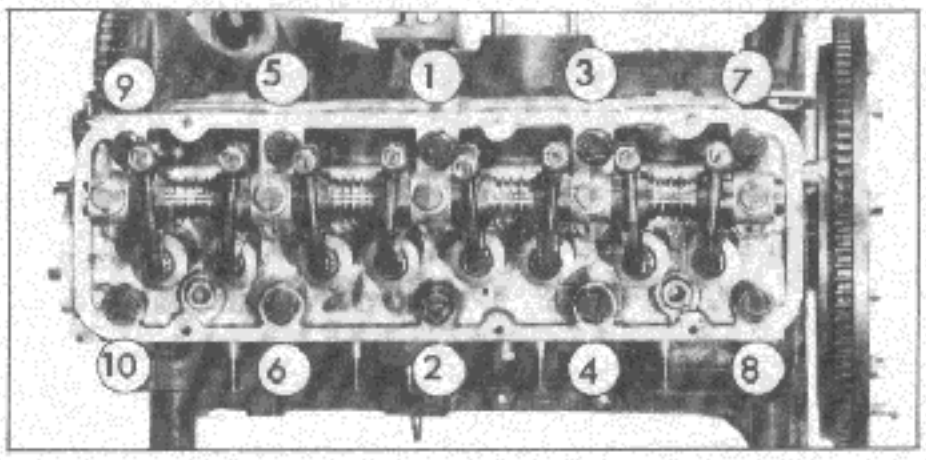


Fig. EM-85-1 Torque tightening sequence

20. Install the push rods.

21. Install the rocker shaft assembly and tighten the rocker shaft bracket bolts to the specified torque.

Tightening torque:
2.0 to 2.5 kg-m (14.5 to 18.1 ft-lb)

Note: Tightening operation should be made gradually in separating two or three stages and outwardly from the center bracket.

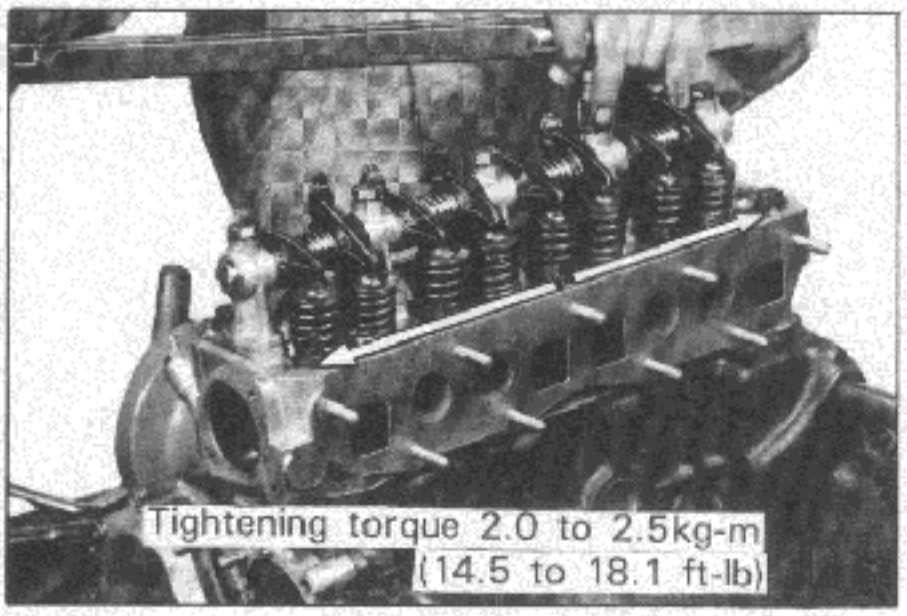


Fig. EM-86 Rocker shaft installation

22. Install the intake and exhaust manifolds.

Tightening torque:
0.9 to 1.4 kg-m (6.5 to 10.1 ft-lb)

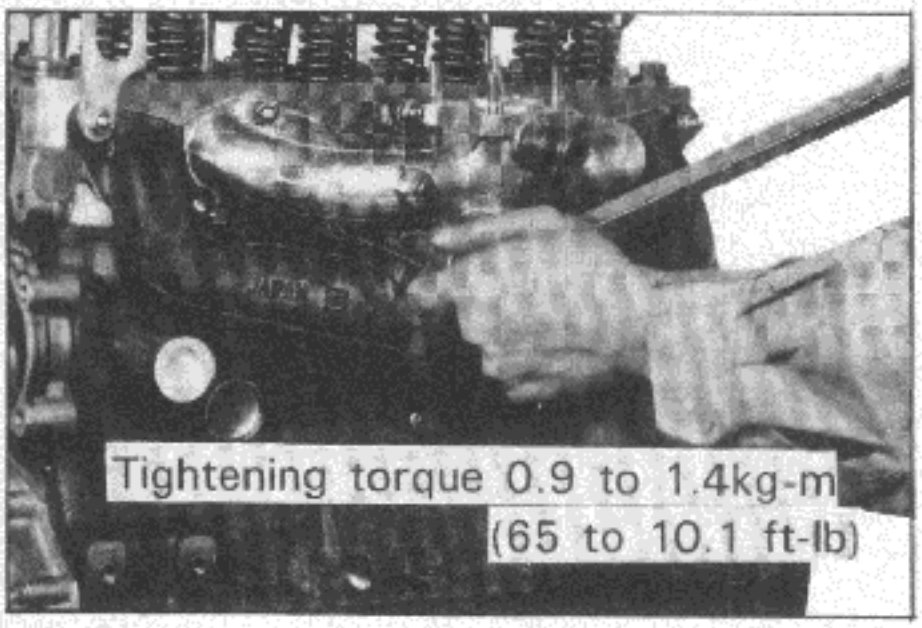


Fig. EM-87 Installation of intake and exhaust manifolds

23. Adjust valve clearance with the specified dimensions.

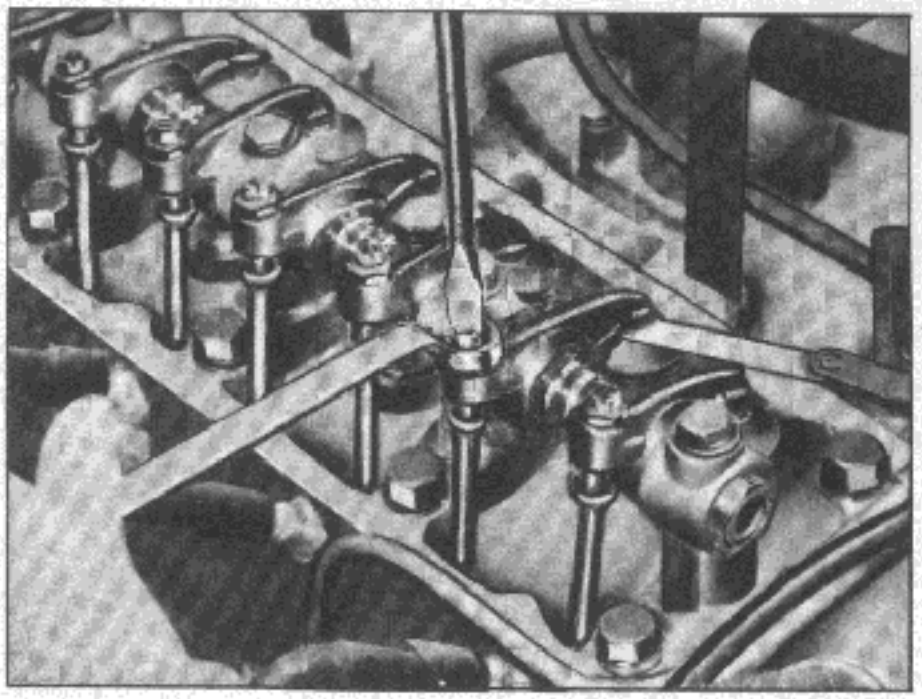


Fig. EM-88 Valve clearance adjustment

	A10 and A12
Intake (at cold) mm (in)	0.35 (0.0138)
Exhaust (at cold) mm (in)	0.35 (0.0138)

24. Install the rocker cover and carburetor assembly.

25. Install the water pump and thermostat.
Tightening torque: 0.9 to 1.4 kg-m (6.5 to 10.1 ft-lb)

26. Install the crankshaft pulley.
Tighten the crank pulley bolt to the specified torque.

Tightening torque:
15 to 16 kg-m (108.5 to 115.7 ft-lb)

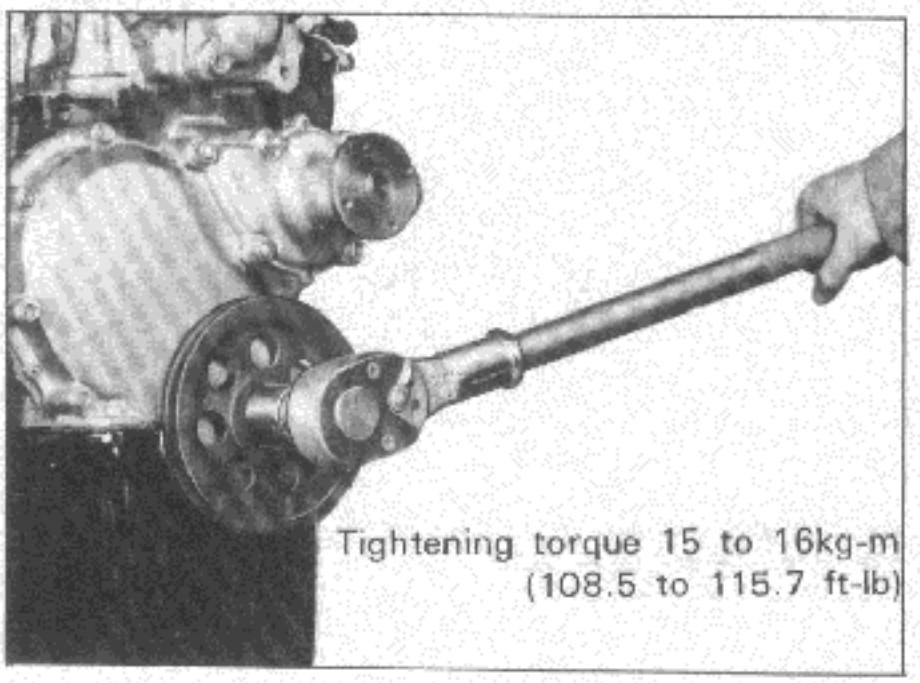


Fig. EM-89 Crankshaft pulley installation

27. Install the oil pump with oil filter.

28. Install the alternator, fan and fan belt.

29. Install the fuel pump.

30. Install the distributor assembly.

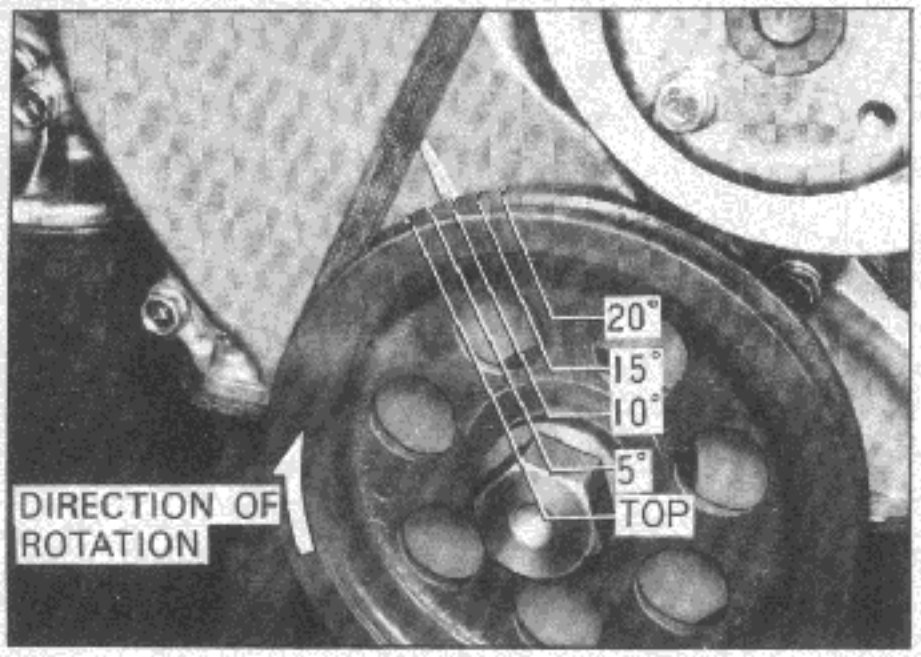


Fig. EM-90 Timing mark

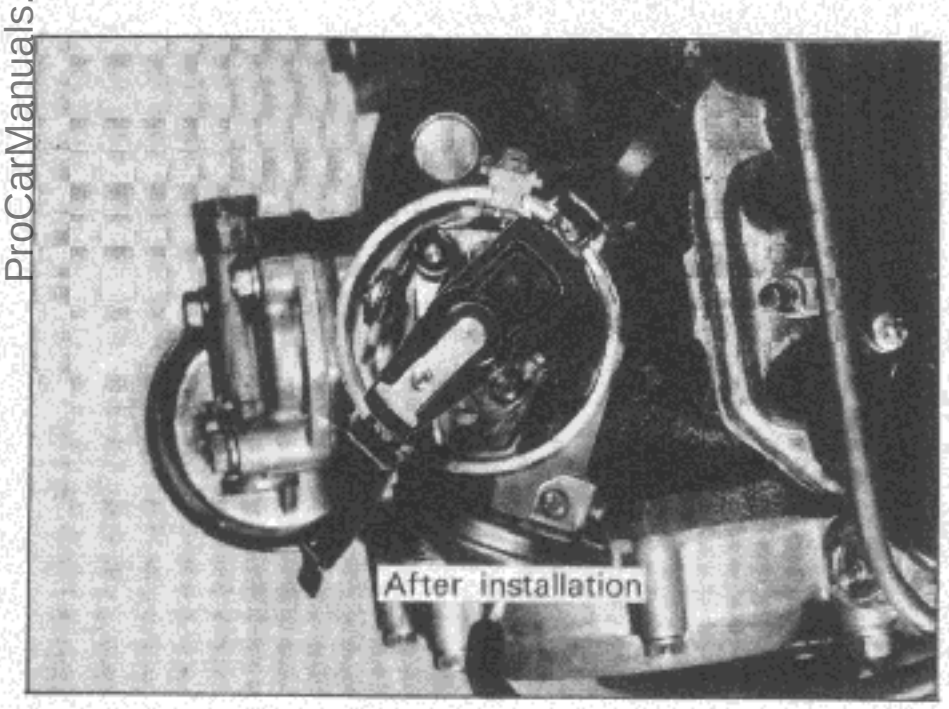


Fig. EM-91 Distributor installation

Note: a. Set the No.1 piston to its top dead center of the compression stroke.

b. Before installation, return the distributor rotor approximately 60 degrees from its regular position. Insert the assembly, meshing the distributor drive gear and driven gear.
After installation, the distributor rotor should come into contact with the mark on the rotor cap fitting as shown in the Figure.

31. Install the spark plugs and connect the distributor to plug high tension lead wire.

32. Install the fuel hoses and tubes.

33. Install the clutch cover assembly.

34. Install the engine slingers and crankcase ventilation hose.

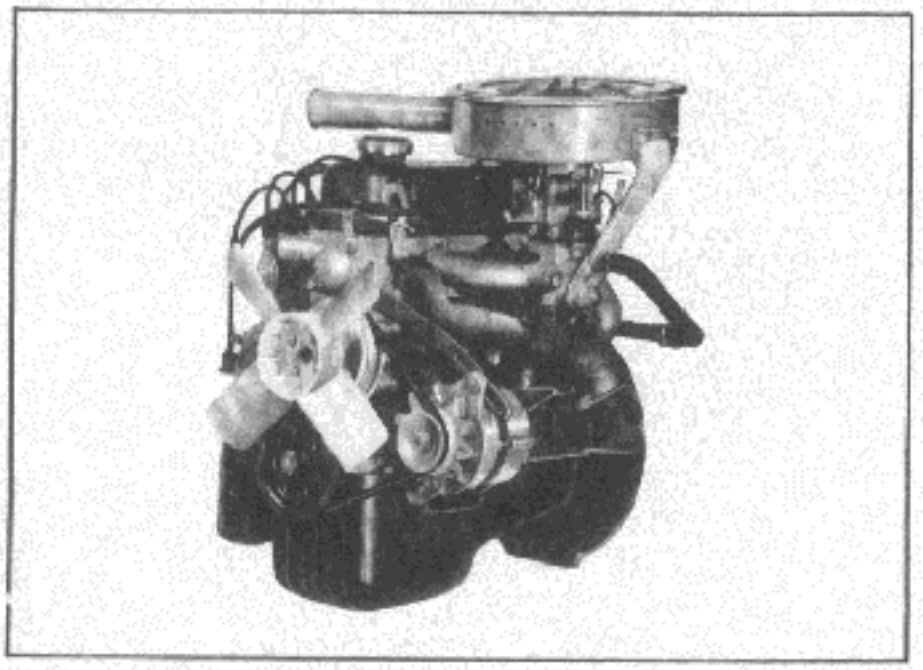


Fig. EM-92 Engine assembly

35. Dismount the engine from the working stand. Install the engine mountings.

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATION

Model	A10	A12
Cylinder arrangement	4 in line	
Displacement cc (cu in)	988 (60.3)	1,171 (71.5)

Bore and stroke	mm (in)	73 x 59 (2.874 x 2.323)	73 x 70 (2.874 x 2.756)
Valve arrangement		Over head valve	
Maximum brake horse power	HP/rpm	56/6,000	68/6,000
Maximum gross torque	kg-m (ft-lb)/rpm	8.5 (61.5)/4,000	9.7 (70.1)/3,600
Firing order		1–3–4–2	
Engine idle	rpm	A10 600	A12 700
Compression ratio		8.5	9.0
Engine idle manifold	mmHg (inHg) at idle rpm	480 (18.9) or higher	
Oil pressure (Hot at 2,000 rpm)	... kg/cm² (lb/sq in)	3.5 to 4.0 (49.8 to 56.9)	3.0 to 3.5 (42.8 to 49.8)

TIGHTENING TORQUE

TIGHTENING TORQUE [unit: kg-m (ft-lb)]		
Model	A10	A12
Cylinder head bolts	4.5 to 5.5 (32.5 to 39.8)	
Connecting rod nuts	3.0 to 3.6 (21.7 to 26.0)	3.2 to 3.8 (23.1 to 27.5)
Flywheel bolts	4.5 to 5.5 (32.5 to 39.8)	6.5 to 7.5 (47.0 to 54.2)
Main bearing cap bolts	5.0 to 6.0 (36.2 to 43.4)	
Camshaft gear bolts	4.0 to 4.8 (28.9 to 34.7)	
Oil pan bolts	0.4 to 0.6 (2.9 to 4.3)	
Oil pump bolts	1.1 to 1.7 (8.0 to 12.3)	
Oil strainer bolts	0.9 to 1.4 (6.5 to 10.1)	
Crank pulley bolts	15 to 16 (108 to 116)	

SPECIFICATION

Model	A10	A12
a) Valve mechanism		
Valve clearance (Hot) mm (in)		
Intake	0.35 (0.0138)	
Exhaust	0.35 (0.0138)	

Valve clearance (Cold)	mm (in)	
Intake		0.25 (0.0098)
Exhaust		0.25 (0.0098)
Valve head diameter	mm (in)	
Intake		35 (1.378)
Exhaust		29 (1.142)
Valve stem diameter	mm (in)	
Intake		7.970 to 7.985 (0.3138 to 0.3144)
Exhaust		7.945 to 7.960 (0.3128 to 0.3134)
Valve length	mm (in)	
Intake		102.35 to 102.65 (4.030 to 4.041)
Exhaust		102.35 to 102.65 (4.030 to 4.041)
Valve lift	mm (in)	7.5 (0.2953) / 8.5 (0.3346)
Valve spring free length	mm (in)	A10: 45.7 (1.799) / A12: 46.5 (1.831)
Valve spring loaded length	mm/kg (in/lb)	A10: 31.0/61.2(1.220/135) / A12: 30.2/58.5(1.199/129)
Valve spring assembled height	mm/kg (in/lb)	A10: 38.5/30.0(1.52/66.1) / A12: 38.7/23.9(1.52/52.7)
Valve spring effective turns		A10: 4.5 / A12: 5.0
Valve spring wire diameter	mm (in)	A10: 4.267 (0.1680) / A12: 4.100 (0.1614)
Valve spring coil diameter	mm (in)	A10: 26.3 (1.035) / A12: 26.4 (1.039)
Valve guide length	mm (in)	53 (2.087)
Valve guide height from head surface	mm (in)	18 (0.709)
Valve guide inner diameter	mm (in)	
Intake		8.015 to 8.000 (0.3156 to 0.3150)
Exhaust		8.015 to 8.000 (0.3156 to 0.3150)
Valve guide outer diameter	mm (in)	
Intake		12.044 to 12.033 (0.4737 to 0.4733) dia.
Exhaust		12.044 to 12.033 (0.4737 to 0.4733) dia.
Valve guide to stem clearance	mm (in)	
Intake		0.015 to 0.045 (0.0006 to 0.0018)
Exhaust		0.040 to 0.070 (0.0016 to 0.0028)
Valve seat width	mm (in)	
Intake		1.3 (0.0512)
Exhaust		1.8 (0.0709)

Valve seat angle	Intake		45°
	Exhaust		45°
Valve seat interference fit	mm (in)		
	Intake		0.064 to 0.096 (0.0025 to 0.0038)
	Exhaust		0.064 to 0.096 (0.0025 to 0.0038)
Valve guide interference fit	mm (in)		
	Intake		0.022 to 0.044 (0.0009 to 0.0017)
	Exhaust		0.022 to 0.044 (0.0009 to 0.0017)

b) Camshaft and timing chain

Camshaft end play	mm (in)		0.02 to 0.08 (0.0008 to 0.0031)
Camshaft robe lift	mm (in)		A10: 5.35 (0.211) / A12: 5.65 (0.222)
Camshaft journal diameter mm (in)	1st		43.783 to 43.796 (1.7237 to 1.7242)
	2nd		43.273 to 43.286 (1.6949 to 1.7056) / 43.283 to 43.296 (1.7041 to 1.7046)
	3rd		42.783 to 42.796 (1.6844 to 1.6849)
	4th		42.273 to 42.286 (1.6643 to 1.6648) / 42.283 to 42.296 (1.6647 to 1.6652)
	5th		41.208 to 41.221 (1.6224 to 1.6229)
Camshaft bend	mm (in)		0.015 (0.0006)
Camshaft journal bearing clearance	mm (in)		
Camshaft bearing inner diameter	mm (in)		
	1st		43.843 to 43.833 (1.7261 to 1.7257)
	2nd		43.333 to 43.323 (1.7060 to 1.7050)
	3rd		42.846 to 42.836 (1.6868 to 1.6865)
	4th		42.333 to 42.323 (1.6667 to 1.6663)
	5th		41.268 to 41.258 (1.6247 to 1.6243)

c) Rocker arm lever ratio 1.42

d) Connecting rod

Center distance	mm (in)		116.97 to 117.03 (4.6112 to 4.6075)
Bearing thickness	mm (in)		1.500 to 1.508 (0.0591 to 0.0594)
Big end end play	mm (in)		0.2 to 0.3 (0.0079 to 0.0012) [less than 0.4 (0.016)]
Connecting rod bearing clearance	mm (in)		0.020 to 0.050 (0.0008 to 0.0020)
Connecting rod bend	mm (in)		0.05 to 0.10 (0.0020 to 0.0039)

e) Crankshaft and main bearing

Journal diameter	mm (in)	49.951 to 49.964 (1.9666 to 1.9671)
Journal taper and out of round	mm (in)	less than 0.03 (0.0012)
Crankshaft free end play	mm (in)	0.05 to 0.15 (0.0020 to 0.0059)
Wear limit of dittoed play	mm (in)	0.3 (0.0118)
Crankpin diameter	mm (in)	44.974 to 44.961 (1.7706 to 1.7701)
Crankpin taper and out of round	mm (in)	less than 0.03 (0.0012)
Main bearing thickness	mm (in)	1.835 to 1.827 (0.0722 to 0.0719)
Main bearing clearance	mm (in)	0.020 to 0.062 (0.0008 to 0.0024)
Wear limit of dittoed clearance	mm (in)	0.15 (0.0059)
Crankshaft bend	mm (in)	0.015 to 0.05 (0.0006 to 0.0020)

f) Piston

Piston diameter – standard		mm (in)	72.967 to 73.017 (2.8727 to 2.8747)
Oversize	1	mm (in)	73.217 to 73.267 (2.8826 to 2.8845)
Oversize	2		73.467 to 73.517 (2.8924 to 2.8944)
Oversize	3		73.717 to 73.767 (2.9022 to 2.9042)
Oversize	4		73.967 to 74.017 (2.9121 to 2.9140)
Oversize	5		74.217 to 74.267 (2.9219 to 2.9239)
Oversize	6		74.467 to 74.517 (2.9318 to 2.9337)
Ellipse difference		mm (in)	0.01 to 0.03 (0.0004 to 0.0012)
Ring groove width		mm (in)	
Top			2.0 (0.0787)
2nd			2.0 (0.0787)
Oil			4.0 (0.1575)
Piston to bore clearance		mm (in)	0.023 to 0.043 (0.0009 to 0.0017)

g) Piston pin

Pin diameter	mm (in)	17.447 to 17.452 (0.6869 to 0.6871)
Pin length	mm (in)	65.23 to 65.48 (2.5681 to 2.5779)
Piston pin to piston clearance	mm (in)	0.006 to 0.008 (0.0002 to 0.0003) [at 20°C (68°F)]

Interference fit of piston pin to connecting rod bushing mm (in) ..... 0.017 to 0.034 (0.0007 to 0.0013)

h) Piston ring

Ring height mm (in)

Top 2.0 (0.0787)

2nd 2.0 (0.0787)

Oil 4.0 (0.1575)

Side clearance mm (in)

Top ..... 0.04 to 0.07 (0.0016 to 0.0027)

2nd ..... 0.04 to 0.07 (0.0016 to 0.0027)

Oil ..... 0.04 to 0.08 (0.0016 to 0.0031)

Ring gap mm (in)

Top ..... 0.2 to 0.35 (0.0079 to 0.0138)

2nd ..... 0.2 to 0.35 (0.0079 to 0.0138)

Oil ..... 0.3 to 0.90 (0.0118 to 0.0354)

TROUBLE DIAGNOSES AND CORRECTIONS

Troubles	Possible causes	Remedies
I Noisy engine Knocking of crank-shaft and bearing	Loose main bearing	Replace
	Seized bearing	Replace
	Bent crankshaft	Regrinding
	Excessive crankshaft end play	Replace center bearing
Piston and connecting rod knocking	Loose bearing	Replace
	Seized bearing	Replace
	Loose piston pin	Replace pin or bushing
	Loose piston in cylinder	Recondition cylinder
	Broken piston ring	Replace
	Improper connecting rod alignment	Realign
Camshaft knocking	Loose bearing	Replace
	Excessive axial play	Replace bearing thrust plate

	Rough gear teeth	Repair
	Broken cam gear	Replace
Timing chain noise	Improper chain tension	Adjust
	Worn and/or damaged chain	Replace
	Worn sprocket	Replace
	Worn and/or broken tension adjusting mechanism	Replace
	Excessive camshaft and bearing clearance	Replace
Camshaft and valve mechanism knocking	Improper valve clearance	Adjust
	Worn adjusting screw	Replace
	Worn rocker face	Replace
	Loose valve stem in guide	Replace guide
	Weakened valve spring	Replace
	Seized valve	Repair or replace
Water pump knocking	Improper shaft end play	Replace
	Broken impeller	Replace
II. Other mechanical trouble Sticked valve	Improper valve clearance	Adjust
	Insufficient clearance between valve stem and guide	Clean stem or ream the guide
	Weakened or broken valve spring	Replace
	Biting or damage of valve stem	Replace or clean
	Poor fuel quality	Use good fuel
Seized valve seat	Improper valve clearance	Adjust
	Weakened valve spring	Replace
	Thin valve head edge	Replace valve
	Narrow valve seat	Refacing
	Overheat	Repair or replace
	Over speeding	Drive under proper speed
	Sticked valve guide	Repair

Excessively worn cylinder and piston	Shortage of engine oil	Add or replace oil Check oil level on daily basis
	Dirty engine oil	Clean crankcase, replace oil and replace oil filter element
	Poor oil quality	Use right oil
	Overheat	Repair or replace
	Wrong assembly of piston with connecting rod	Repair or replace
	Improper piston ring clearance	Adjust
	Dirty air cleaner	Clean periodically
	Too rich mixture	Adjust
	Engine over run	Drive correctly
	Sticked choke valve	Clean and adjust
	Over choking	Start correct way
Defective connecting rod	Shortage of engine oil	Add or replace oil Check oil level on daily basis
	Low oil pressure	Correct
	Poor engine oil quality	Use right oil
	Rough surface of crankshaft	Grind and replace bearing
	Clogged oil passage	Clean
	Wear or eccentricity of bearing	Replace
	Wrong assembly of bearing	Repair
	Loose bearing	Replace
	Incorrect connecting rod alignment	Repair or replace
Defective crankshaft bearing	Shortage of engine oil	Add or replace Check oil level on daily basis
	Low oil pressure	Adjust
	Poor engine oil quality	Use right oil
	Wear or out-of-round of crankshaft journal	Repair
	Clogged oil passage in crankshaft	Clean
	Wear or eccentricity of bearing	Replace

	Wrong assembly of bearing	Repair
	Not concentric crankshaft or bearing	Replace

SERVICE JOURNAL OR BULLETIN REFERENCE

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SERVICE MANUAL

MODEL
A10 & A12
ENGINE

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EL

ENGINE LUBRICATION SYSTEM

EL

LUBRICATION SYSTEM

CONTENTS

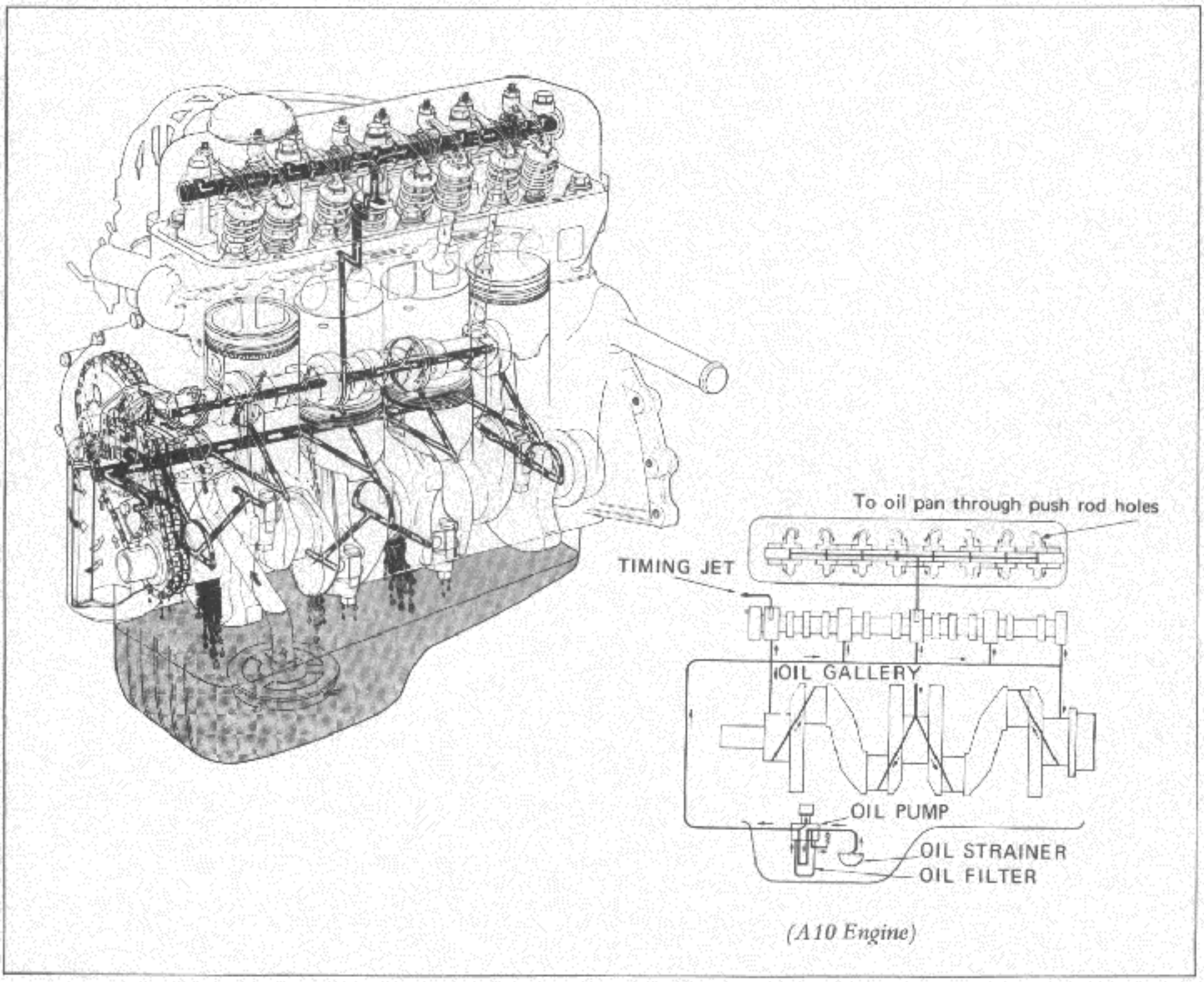


Fig. EL-1 Lubrication circuit (A12 Engine)

DESCRIPTION

The lubricating system is of a pressure-feed type and consists of highly efficient components suited for high performance. (i.e., high out-put and high speed running)

A10 and A12 engines adopt the same lubrication system. (Lubrication for crank shaft and camshaft is excluded.)

LUBRICATION CIRCUIT

Oil drawn from the oil pan through the inlet screen and tube to the inlet side of the oil pump is delivered by the oil pump through the outlet portion of the oil pump and the oil gallery to the inlet side of the full flow oil filter and to the main oil gallery.

The main oil gallery supplies oil to the crankshaft main bearings and drilled passages in the crankshaft, and thus, oil is fed directly from the main bearings to the connecting rod bearings.

Oil injected from jet holes on connecting rods lubricates the cylinder walls and pistion pins.

In A10 and A12 engine, the oil distributed from the main gallery enters the chain tensioner, and the pad is held against the chain by oil pressure and spring. The oil also lubricates the timing chain through the jet located near the chain.

Furthermore, lubricant is supplied to each camshaft bearing through each crankshaft main bearing and finally to the oil gallery in the rocker shaft through the center camshaft bearing.

In A10 and A12 engines, the rocker arm and valve are lubricated by the oil through the oil gallery in the rockershaft.

To this oil gallery, lubricant is supplied through the center camshaft bearing as shown in Figure EL-1.

OIL PUMP

Description

The oil pump assembly is installed on the bottom of the cylinder block (with three bolts for A12 and two bolts for A10) and driven by the distributor drive shaft assembly. The oil pump is of a rotor type. The oil pressure is regulated by the regulator valve camshaft.

Removal (Engine in vehicle)

1. Drain engine oil
2. Remove the front stabilizer.
3. Remove the splash shield board.
4. Detach the oil pump body together with drive gear spindle.

Installation

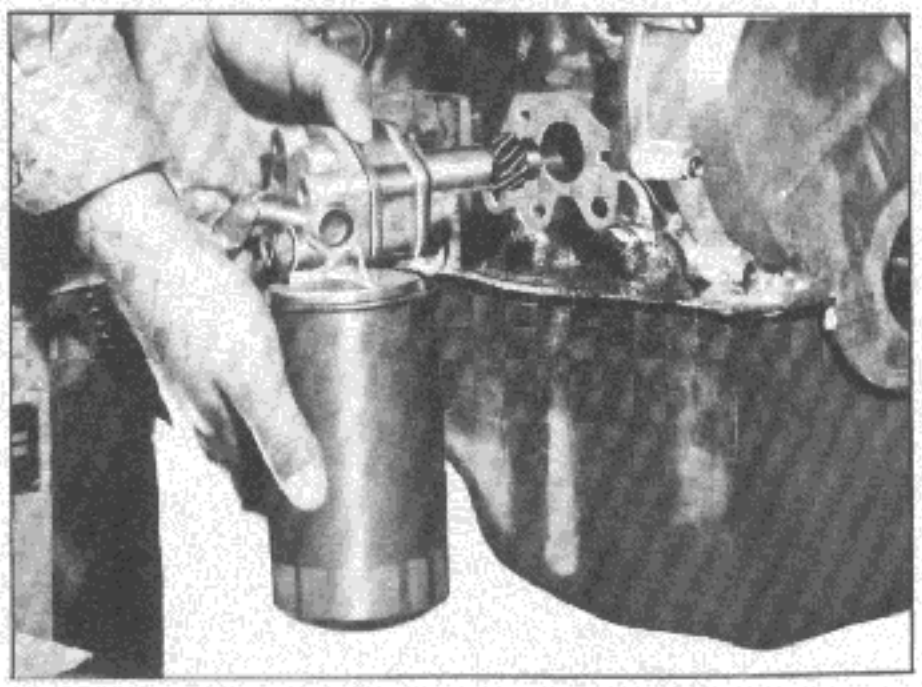


Fig. EL-2 Oil pump installation

Diassembly and reassembly

Separate the body cover from the oil pump body by unscrewing one secure bolt, and take out pump drive and driver gears from the pump body.

Assemble the oil pump carefully and do not turn up the oil pump cover gasket.

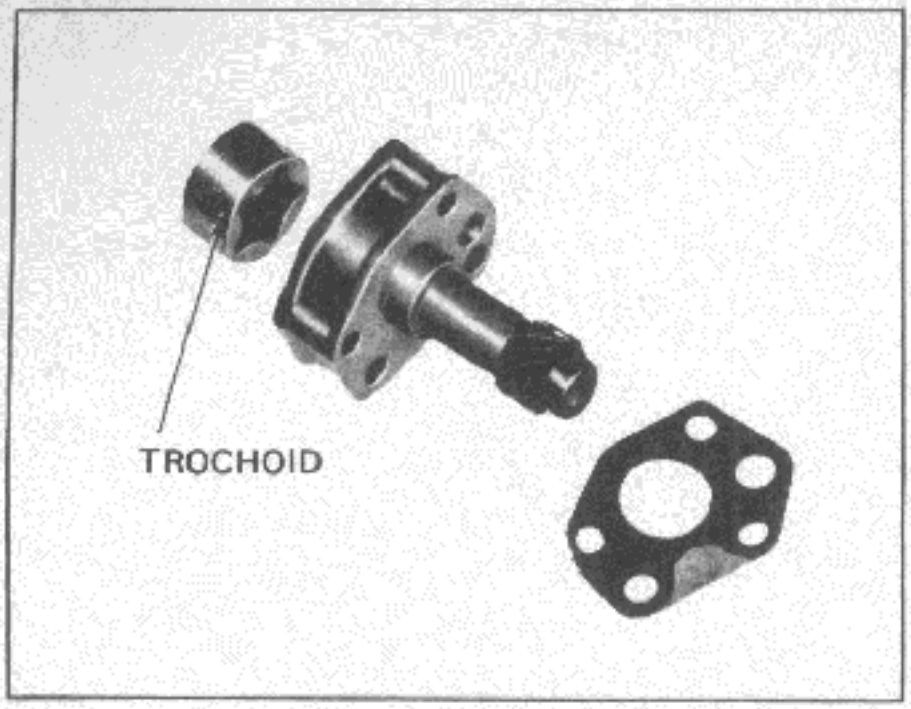


Fig. EL-3 Oil pump for A10 and A12 Engine

Inspection and repair

Clean the disassembled parts with cleaning solvent, and inspect for defects.

Inspect the drive rotor shaft for excessive wear and scores and check the following clearances.

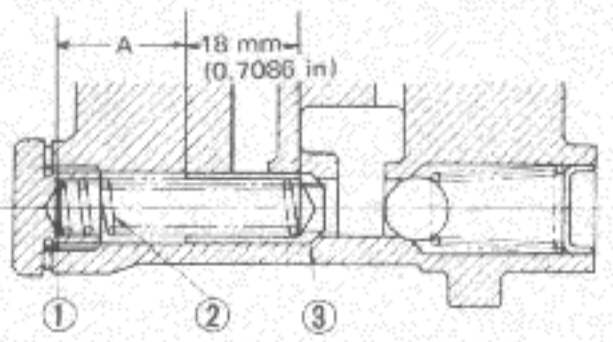
Side clearance between
outer and inner rotor: ..... 0.05 to 0.12 mm
(0.0020 to 0.0047)
Tip clearance: ..... 0.12 mm (0.0492 in)
Clearance between
outer rotor and body: ..... 0.15 to 0.21 mm
(0.0059 to 0.0083 in)

OIL PRESSURE RELIEF VALVE

The oil pressure relief valve is not adjustable. At the released position, the valve permits oil passing through a passage on the pump cover to the inlet side of the pump.

Measure the relief valve spring dimension to ensure that the spring is provided with the correct tension.

Adjusting regulator
1. Insert valve in the body and measure the distance (A) from the valve end to the spring contacting face inside the plug. See Fig. EL-4.
2. The distance from the spring contacting face inside the valve to the valve end amounts to 18 mm (0.7086 in).
3. On inspecting the above dimensions, determine the thickness of adjusting shim.
Shim thickness: [A + 18 mm (0.07086 in)] - [spring length at compression load 3.67 kg (8.09 lbs)]



1	Adjusting shim	3	Regulator valve
2	Valve spring		

Fig. EL-4 Regulator valve

Tightening torque	A10 and A12
Oil pump mounting bolts kg-m (ft-lb)	1.3 to 1.5 (9.4 to 10.8)
Cap nut-release valve kg-m (ft-lb)	4.0 to 5.0 (28.9 to 36.2)

Specifications	A10 and A12
Oil pressure at idling kg/cm² (lb/sq in)	0.9 to 1.2 (12.8 to 17.1)
Regulator valve spirng	
Free length mm (in)	43.49 (1.71)
Pressured length mm (in)	30.3 (1.19)
Regulator valve opening pressure kg/cm² (lb/sq in)	3.8 to 4.2 (54.0 to 59.7)

OIL FILTER

The oil filter is of a cartridge type. The oil filter is installed and removed by the use of special tool.

The filter element and the filter body are caulked together. Interior cleaning is not necessary but the filter body with element must be replaced at every 10,000 km (6,000 miles) running.

When installing the oil filter, fasten it to the oil pump.

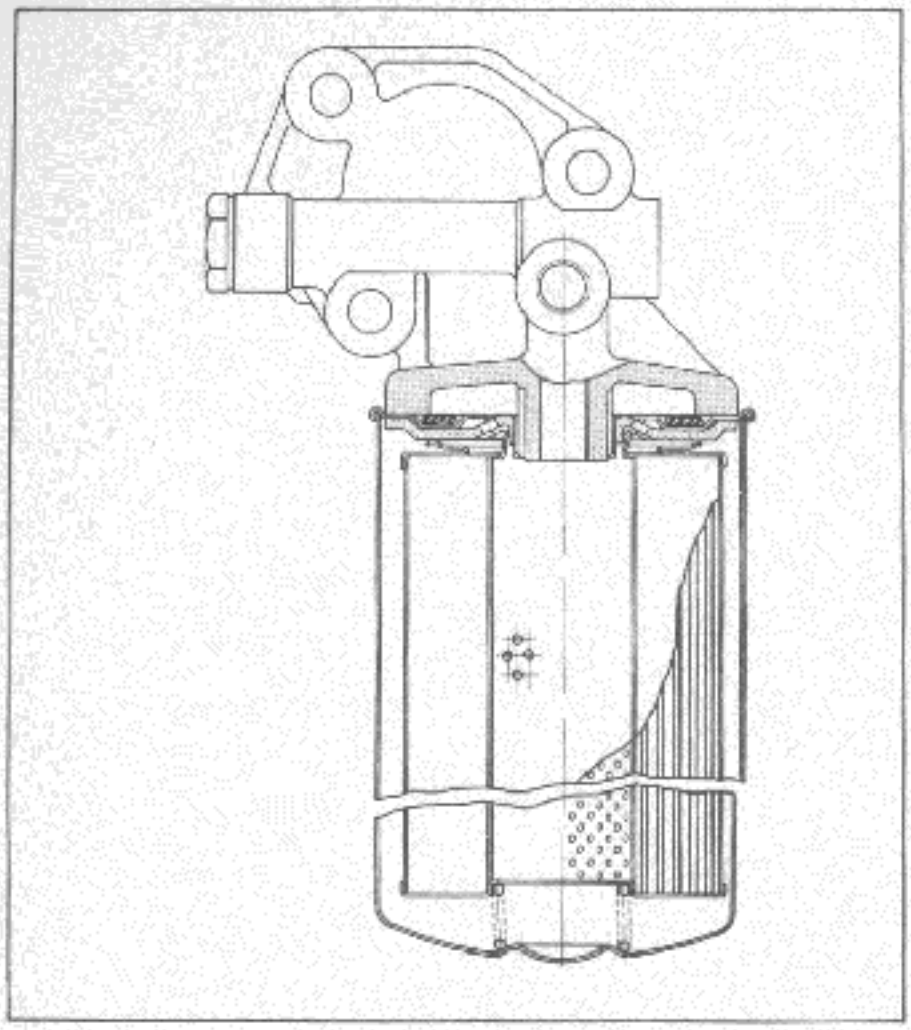


Fig. EL-5 Oil filter

Note: Do not overfasten the filter, or oil leakage may occur.

The oil filter can be removed easily by the use of special tool (ST19320000). (It may also be removed easily by the use of wire type filter remover.)

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SERVICE MANUAL

MODEL
A10 & A12
ENGINE

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION CO

COOLING SYSTEM

CO

COOLING SYSTEM

CONTENTS

DESCRIPTION

The cooling system is a closed pressure type with high cooling capability. Cooling water flowing through resistance-free water passages in the cylinder head and cylinder block is maintained at adequate temperature range at all times by means of an ample capacity water pump, of a corrugated fin type radiator with high cooling efficiency and a pellet type thermostat.

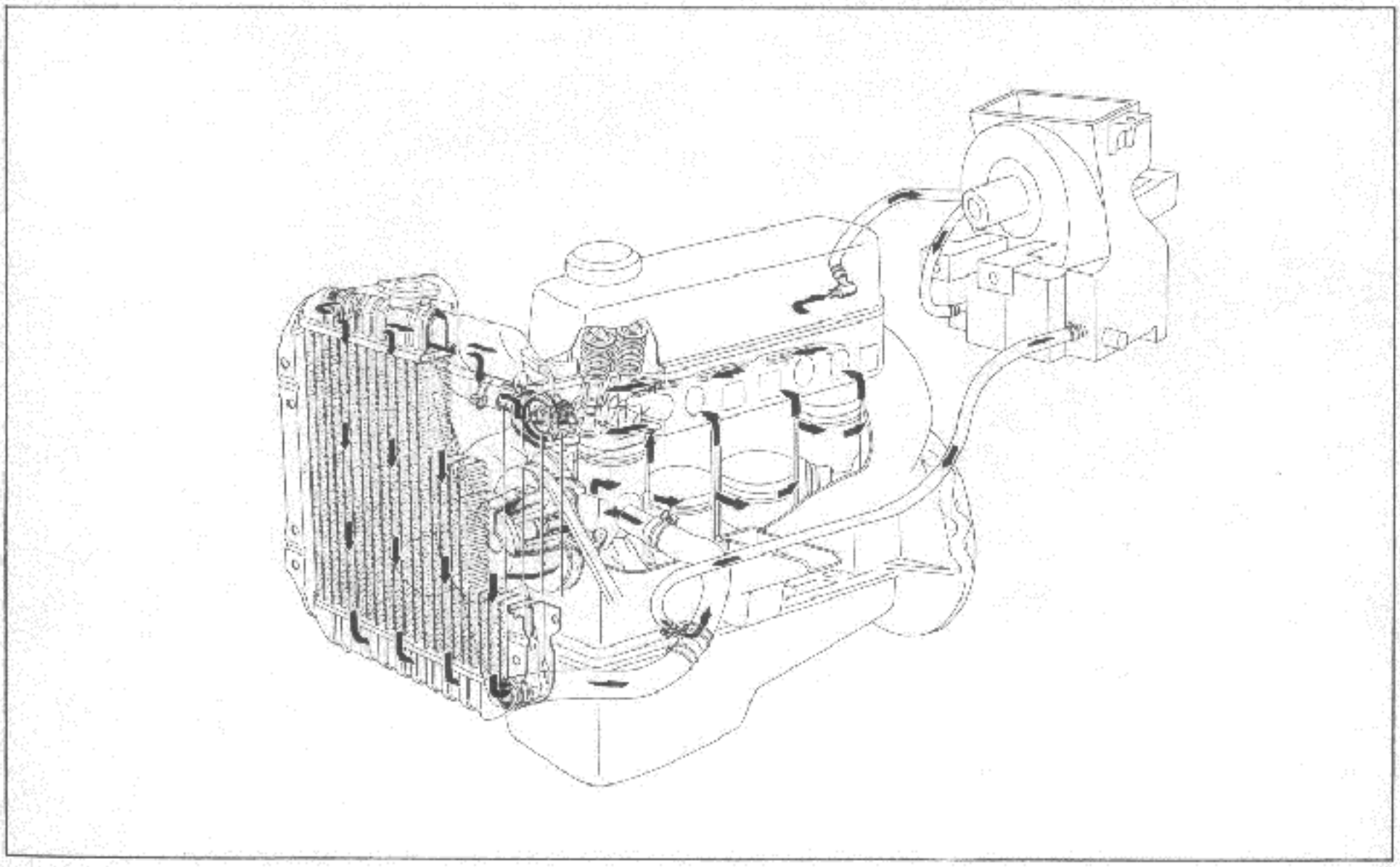


Fig. CO-1 Cooling system A10 and A12 Engine

WATER PUMP

The water pump is a centrifugal type water pump with an aluminium diecast pump body. The volute chamber is built into the front cover assembly and a high pressure sealing mechanism is adopted to prevent the water leakage and noise completely.

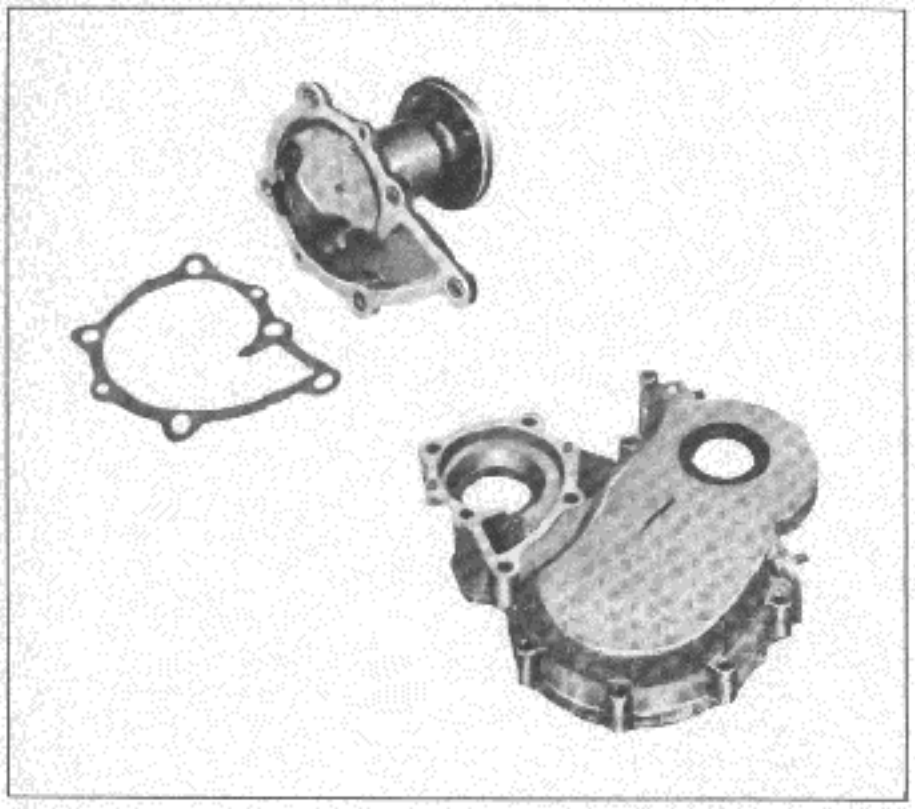


Fig. CO-2 Water pump and front cover

Removal

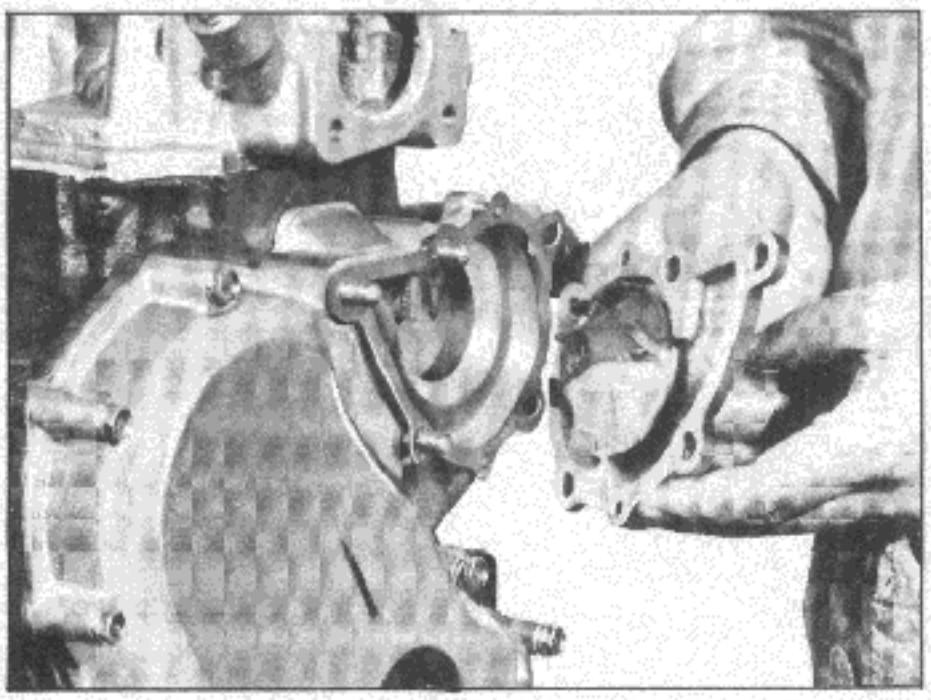


Fig. CO-3 Water pump removal

1. Drain cooling water completely.
2. Take the fan belt off the pulley.
3. Remove fan and pulley.
4. Remove the water pump.

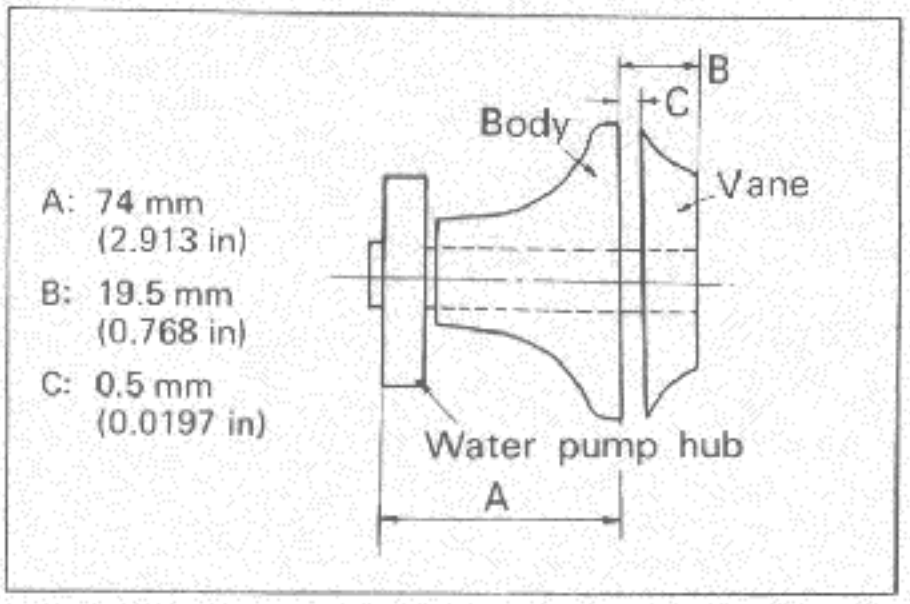
Disassembly and reassembly

Disassembly

1. Remove lock wire used to lock the bearing shaft unit with a screwdriver.
2. Secure the water pump on a press jig.
3. Withdraw the shaft from the vane with a hand press. (Note that the shaft cannot be withdrawn from the hub side.)
4. Carry out work carefully so as not to damage the seal, and completely separate the shaft from the body.
5. The seat is fitted to the vane, and can be removed simply by hand.
6. Turn over the jig used to withdraw the shaft, and remove the seal with the hand press.

Reassembly

1. Thoroughly clean seal and seat surfaces with a piece of dry cloth.
2. Fit the seat to the vane carefully so that it is fitted in parallel.
3. When fitting the seal to the body, apply adhesive slightly to the fitting part for prevention of water leaking.
4. Fit the shaft. (Fitting stroke: 5 to 31 μ)
5. Apply the vane, and adjust the position as shown below:



6. Lightly tap with a hammer and fit lock wire.

Note: When replacing the shaft, replace the hub also.

THERMOSTAT

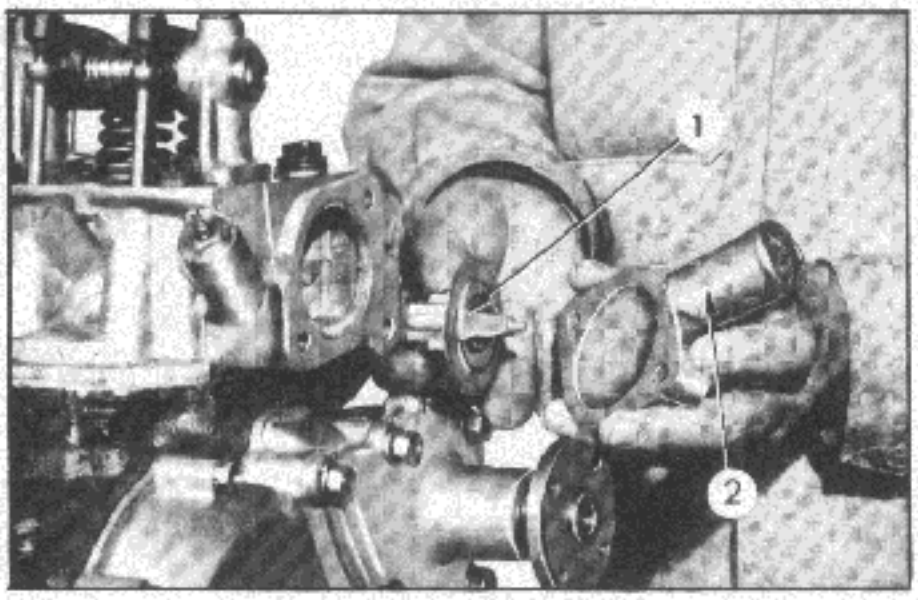
A pellet type thermostat is used in the water outlet passage to control the flow of coolant, providing fast engine warm-up and regulating coolant temperature. A wax pellet in the thermostat expands when heated and contracts when cold. The pellet is connected through a piston to a valve and when the pellet is heated, pressure is exerted against a rubber diaphragm with forces the valve to open. As the pellet is cooled, the contraction allows the spring to close the valve.

Removal

1. Drain cooling water.

2. Remove radiator hose.

3. Remove water out-let elbow. Then, take out the thermostat.



1	Thermostat	2	Water outlet

Fig. CO-4 Thermostat removal

Inspection

To test the thermostat for proper operating temperature, submerge the unit in a container of water. Heat the water and observe the temperature.

1. Measure temperature when the thermostat valve just starts rising.

2. Measure the maximum lift of the thermostat valve.

Valve open temperature:	82°C ± 1.5°C (179.6°F ± 2.7°F)
Max. valve lift:	above 8 mm at 95°C (0.315 in at 203°F)

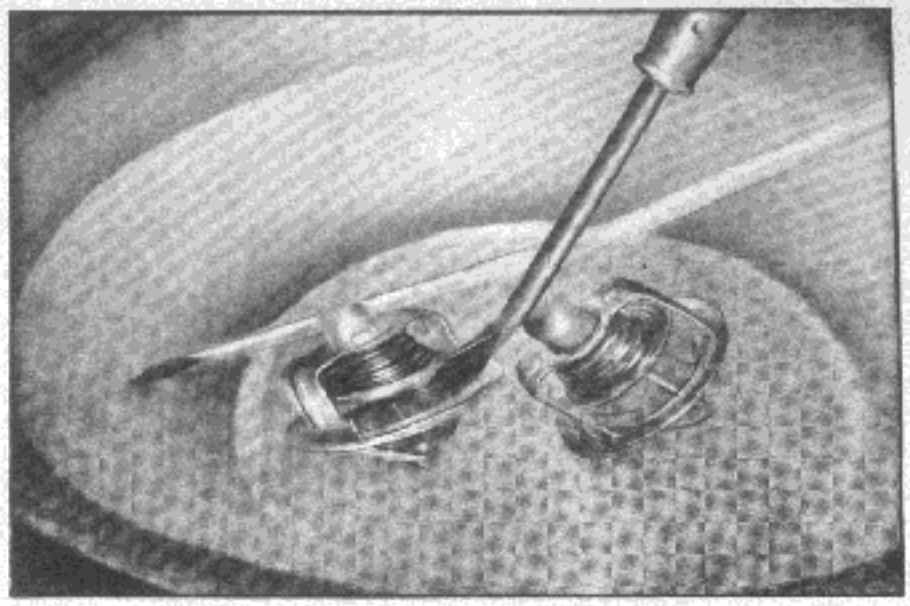


Fig. CO-5 Thermostat inspection

Provide a screwdriver with a marking at a point about 8 mm (0.3150 in) from the tip.

Inspect by inserting the marked screwdriver at 95°C (203°F).

It should be effective to use the following service parts, depending on where and how such parts will be used.

Installation

1. When installing the thermostat, apply adhesive (Three Bond) to both sides of the packing for prevention of water leakage.

2. Install the thermostat in reverse sequence of removal.

RADIATOR

The radiator is of a down flow type with an expantion tank located on the top of tube section.

Pressure is applied to the system, and the relief valve, incorporated in the radiator filler cap, controls the pressure at approximately 0.9 kg/cm² (12.8 lb/sq in).

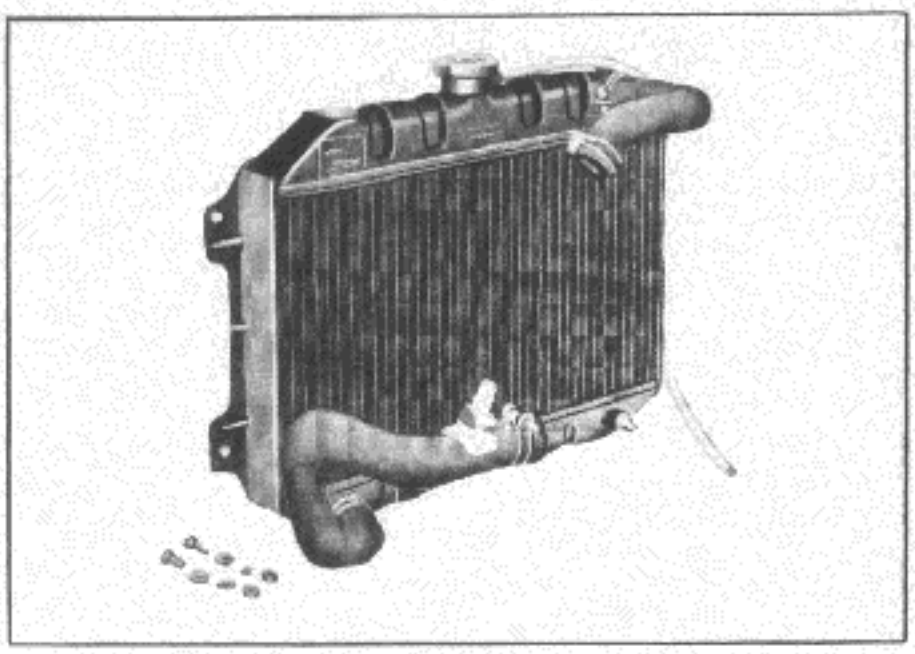


Fig. CO-6 For A10 Engine

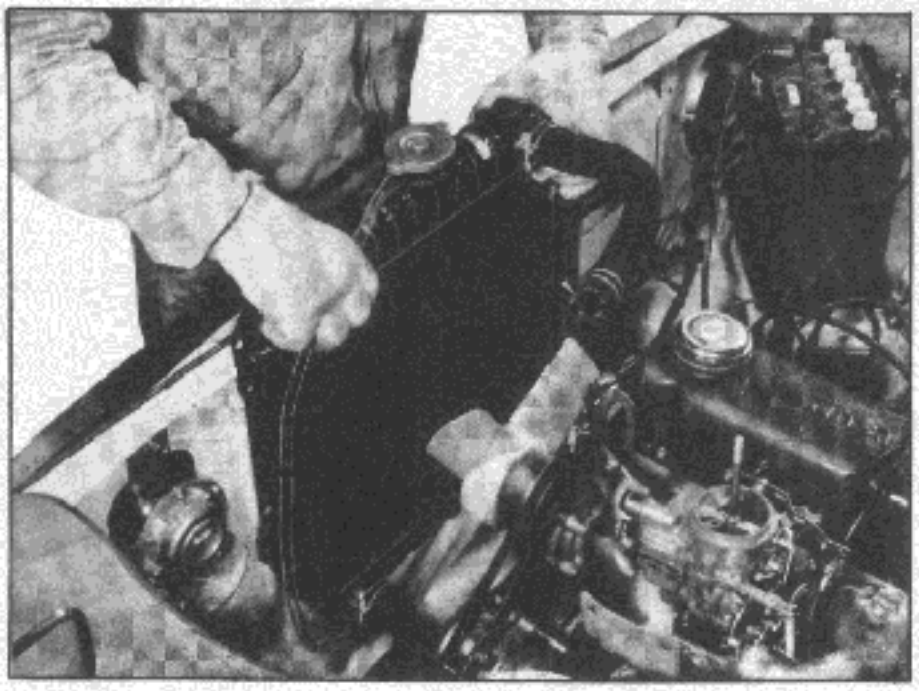


Fig. CO-7 Radiator removal (A12 Engine)

Removal

1. Drain cooling water.

2. Disconnect radiator upper hose, lower hose and hose to the reservoir tank.

3. Detach the radiator assembly by removing six fixing bolts.

Inspection

Check for water leakage and cracks using a cap tester. If such defects are detected, repair or replace the radiator assembly.

SPECIFICATIONS

		A10	A12
Dimensions of radiator core (height x width x thickness)	mm (in)	257 x 442 x 32 (10.12 x 17.40 x 1.25)	330 x 334 x 32 (12.99 x 13.15 x 1.25)
Type	.....	Corrugated fin type	Corrugated fin type
Radiator fin spacing	mm (in)	2.3 (0.091)	2.5 (0.098)
Radiator capacity	K cal/h °C	250	320
Cap working pressure	kg/cm^2 (lb/sq in) ..	0.9 (12.8)	0.9 (12.8)
Water capacity	ℓ (US gal)	1.8 (0.476)	1.8 (0.317)
	(Imp gal)	(0.396)	(0.264)

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SERVICE MANUAL

MODEL
A10 & A12
ENGINE

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EF

FUEL SYSTEM

EF

AIR CLEANER

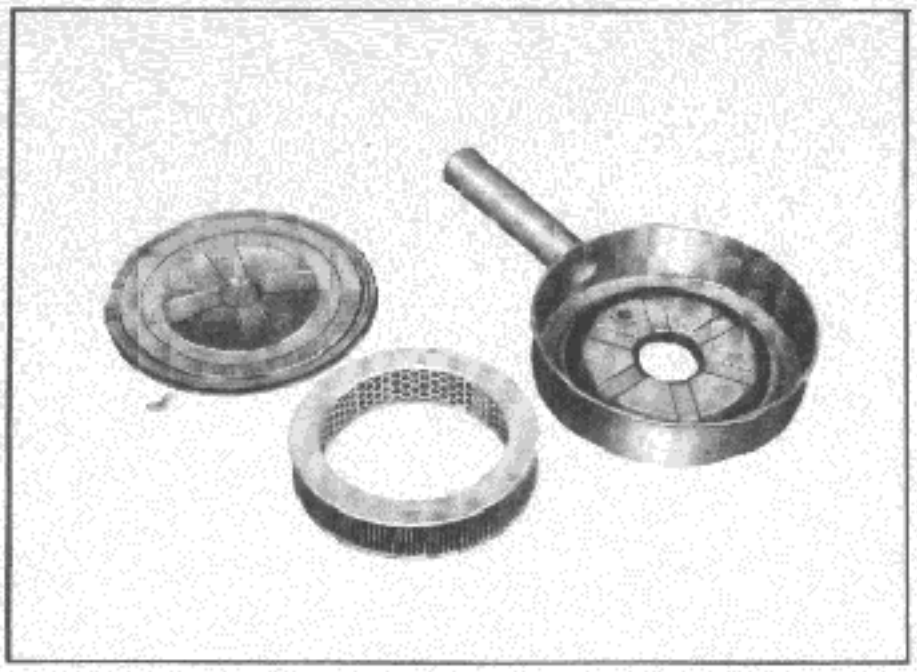


Fig. EF-1 Air cleaner for A12 Engine

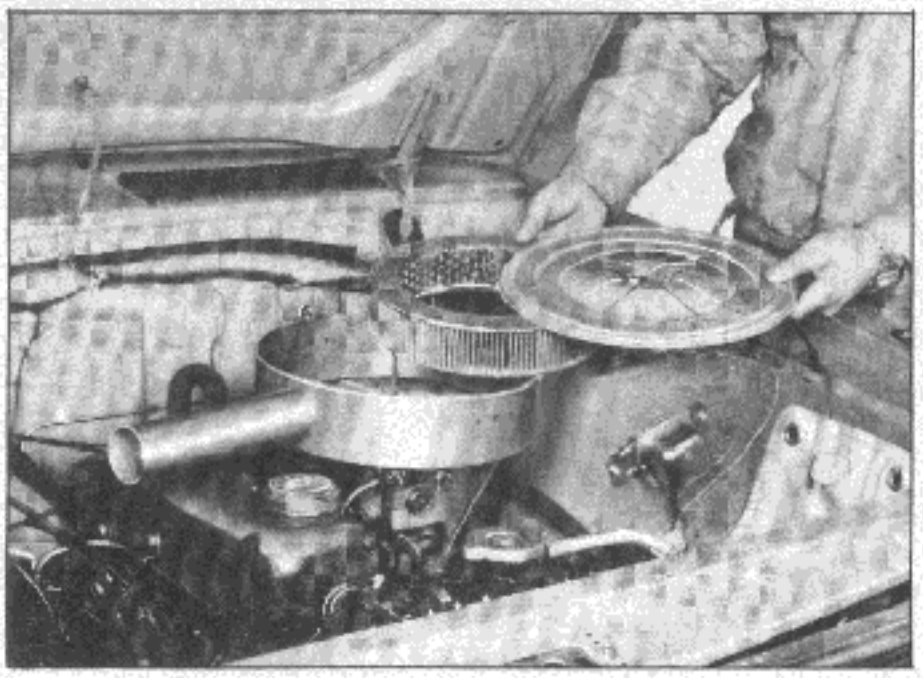


Fig. EF-2 Air cleaner for A12 Engine

DESCRIPTION

The air cleaner element is of a viscous paper type and does not require any cleaning regardless of contamination until it is replaced at every 40,000 km (24,000 miles).

The air cleaner for A10 engine does not adopt center bolt system and accordingly not interchangeable.

Note: Never treat the element by brushing or air blasting before the time for replacement.

FUEL STRAINER

DESCRIPTION

This strainer is of a cartridge type, and a fiber mat is used for the strainer element.

This strainer should be replaced at intervals of every 20,000 km (12,000 miles) or less.

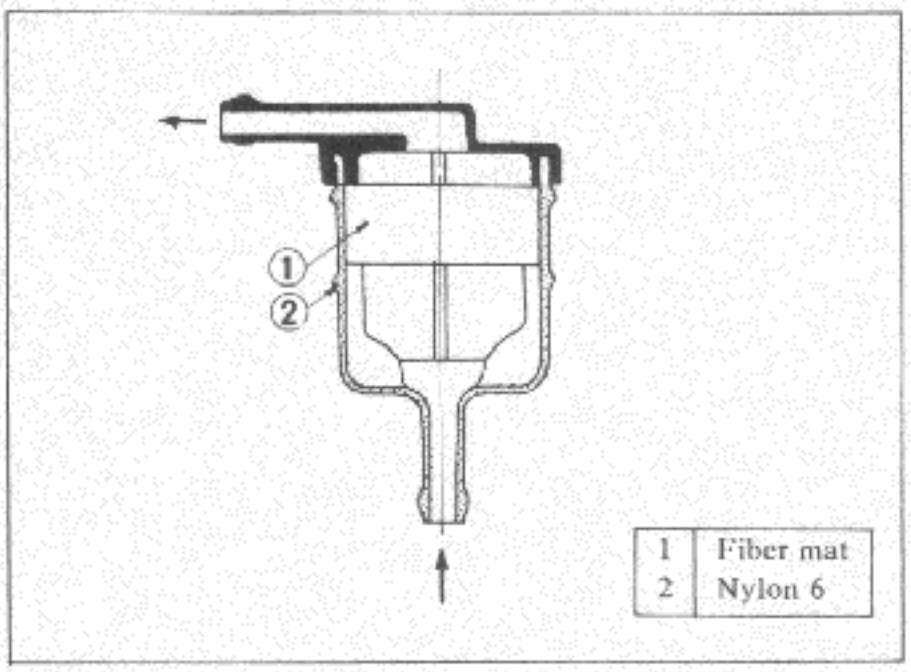


Fig. EF-3 Sectional view of cartridge type fuel strainer

The strainer element can be seen from the outside for convenience of checking the condition.

REMOVAL

Disconnect the inlet and outlet fuel pipes.

The fuel strainer assembly is easily removed.

SERVICE REFERENCE

This fuel strainer has no pet cocks, therefore the strainer, carburetor lines, and fuel pump should not be removed or cleaned when the tank is full, unless absolutely necessary.

When the tube is disconnected, be sure to place the tube end above the top of the fuel tank.

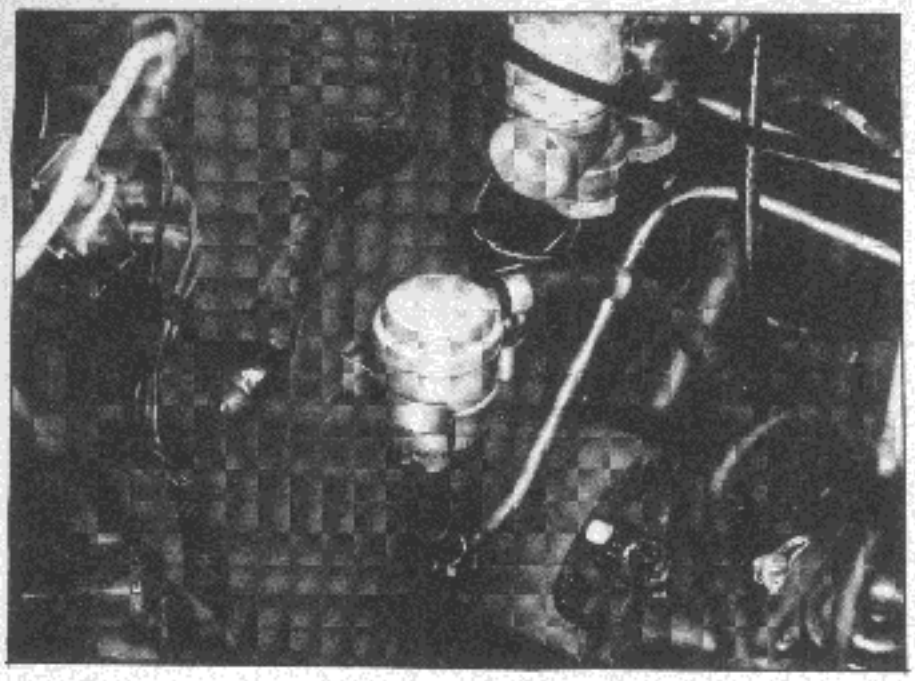


Fig. EF-4 Cartridge type fuel strainer

FUEL PUMP

CONTENTS

DESCRIPTION

The fuel pump transfers gasoline from the tank to the carburetor in sufficient quantity to meet engine requirements at any speed or load.

The fuel pumps used on the models A10 and A12 are of the diaphragm type.

The fuel pump consists of a body, rocker arm and link assembly, fuel diaphragm, fuel diaphragm spring, seal, inlet and outlet valves.

The fuel diaphragm consists of specially treated rubber, which is not affected by gasoline, held together with two metal discs and a pull rod.

FUEL PUMP TESTING

A fuel pump is operating properly when its pressure is within specifications and its capacity is equal to the engine's requirements at all speeds.

Pressure and capacity must be determined by two tests, with the pump mounted on the engine. Be sure that there is gasoline in the tank when conducting these tests.

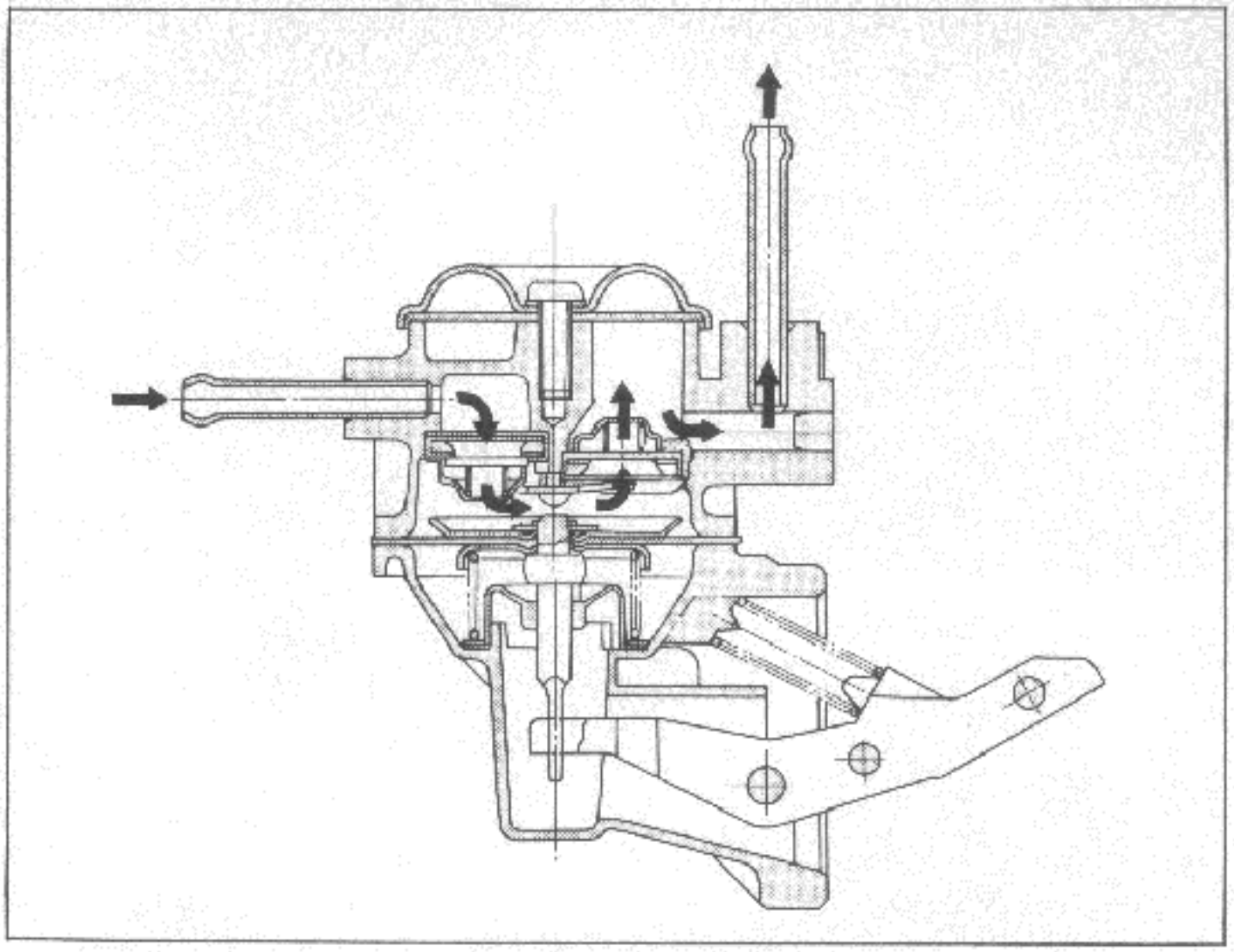


Fig. EF-5 Schematic view of fuel pump

Static pressure test

The static pressure test is conducted as follows.

1. Disconnect the carburetor fuel line at the carburetor.

2. Install the necessary adapter and "tee" fitting to the fuel line and attach a suitable pressure gauge.

3. Start and run engine at varying speeds.

4. The reading on the gauge is the static fuel pressure and this should remain within the following limits.

A10 Engine
0.16 kg/cm² (2.28 lb/sq in)

A12 Engine
0.18 kg/cm² (2.56 lb/sq in)

Pressure below the lower limit indicates extreme wear on one part or a small amount of wear on each working part.

They also indicate a ruptured diaphragm; worn, warped, dirty or gumming valves and seats or weak diaphragm return spring. Pressure above the upper limit indicates an excessively strong diaphragm that is too tight. This condition requires removal of the fuel pump assembly for replacement or repair.

Capacity test

The capacity test is used only when the static pressure is within specifications. The capacity test is conducted as follows:

1. Disconnect the fuel pipe at the carburetor.

2. Place a suitable container at the end of the pipe.

3. Start the engine and run at 1,000 rpm.

4. On model A10 engine the pump should deliver 450 cc (27.5 US pts) of fuel in one minute or less.

On model A12 engine
450 cc (27.5 US pts)

If no gasoline, or only a little flows from open end of pipe, the fuel pipe is clogged or the pump is malfunctioning. Before removing the pump, remove the gas tank

cap, disconnect both inlet and outlet pipes and blow through them with an air hose to make sure that they are clear.

This will eliminate possible clogged gas strainer in the fuel tank. Reconnect the pipes to the pump and retest flow.

REMOVAL AND DISASSEMBLY

Remove the fuel pump assembly by unscrewing two mounting nuts and disassemble in the following order.

1. Separate the upper body and the lower body by unscrewing the body set screws.

2. Take off the cap and the cap gasket by removing the cap screw.

3. Unscrew the elbow and the connector.

4. Take off the valve retainer by unscrewing two valve retainer screws. Two valves are easily removed.

5. To remove the diaphragm, diaphragm spring, lower body seal washer and lower body seal from the lower body, press down the diaphragm counter to the force of the diaphragm spring and while doing this, cant the diaphragm so that the rectangular part in the lower end of the pull rod is unhooked from the rocker arm link.

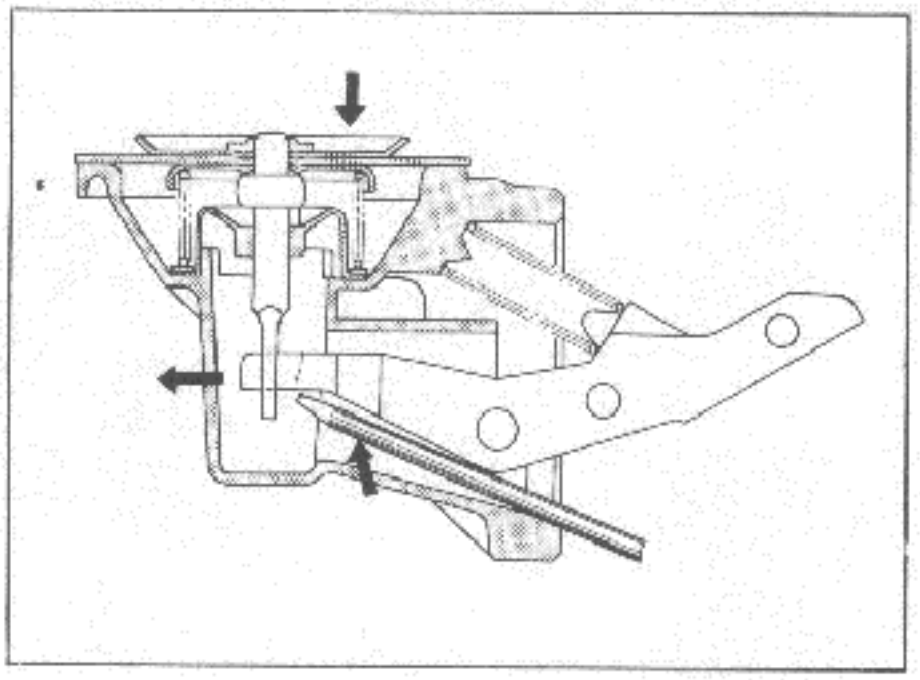
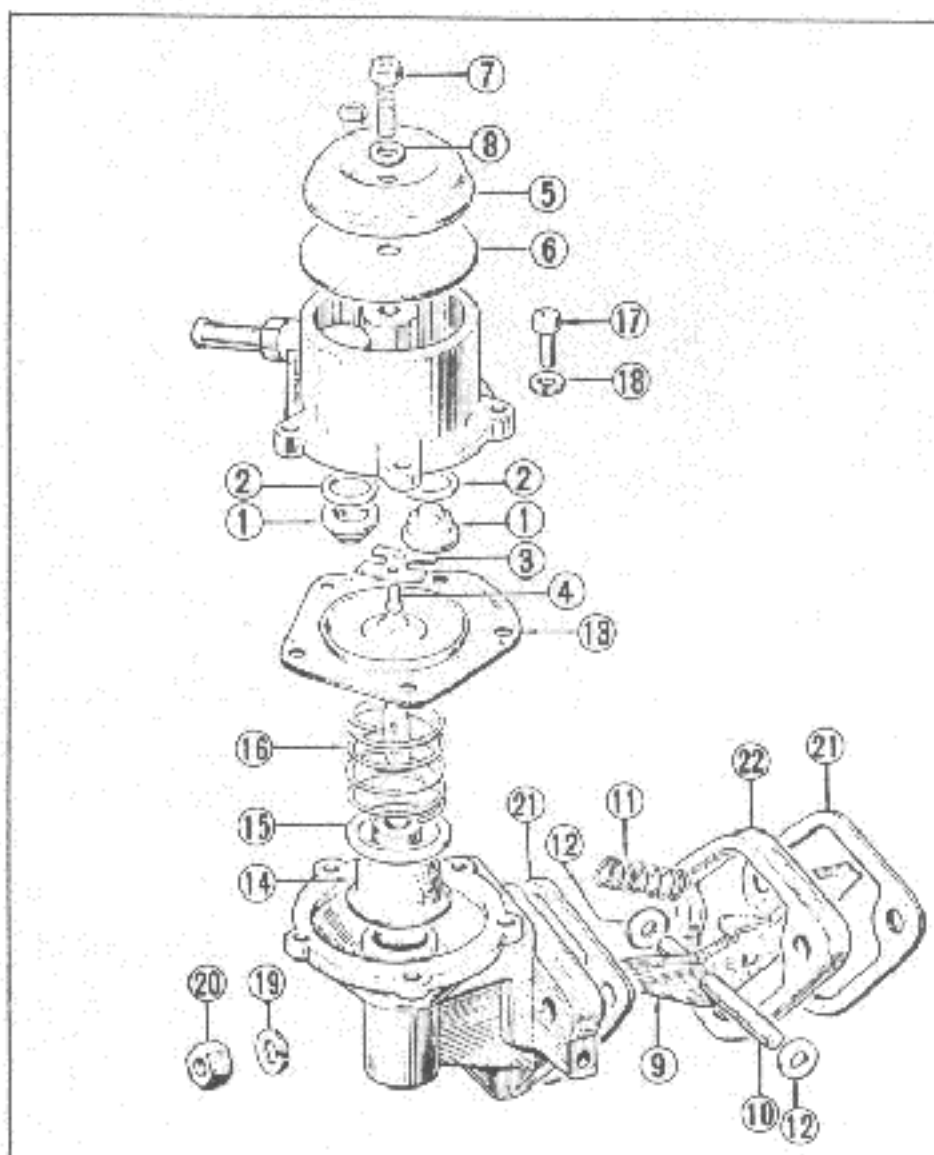


Fig. EF-6 Pull rod removal

6. Drive out the rocker arm pin by using a press or hammer.



1	Valve assembly
2	Packing
3	Retainer
4	Screw
5	Cap
6	Gasket
7	Screw
8	Washer
9	Rocker arm
10	Rocker pin
11	Rocker arm spring
12	Spacer
13	Diaphragm assembly
14	Oil seal
15	Retainer
16	Diaphragm spring
17	Screw
18	Washer
19	Washer
20	Nut
21	Packing
22	Spacer

Fig. EF-7 Structure of fuel pump

INSPECTION

1. Check the upper body and lower body for cracks.

2. Check the valve assembly for wear of the valve and valve spring. Blow the valve assembly by breath to examine its function.

3. Check the diaphragm for small holes, cracks and wear.

4. Check the rocker arm for wear at the portion in contact with the camshaft.

5. Check the rocker arm pin for wear since a worn pin may cause oil leakage.

6. Check all other components for any abnormalities and replace with new parts as required.

ASSEMBLY

Assembly is done in reverse order of disassembly. For reassembly and reinstallation, the following matters should be noted:

1. Use new gasket.

2. Lubricate the rocker arm link, rocker arm pin and lever pin before installation.

3. To test the function, position the fuel pump assembly about 1 meter (3.3 ft) above fuel level with a pipe connecting the fuel pump and the fuel strainer and operate the rocker arm by hand. If fuel is drawn up soon after the rocker arm is released, the function of the pump is satisfactory.

CARBURETOR

CONTENTS

DESCRIPTION

Model DCG286 ..... A10 Engine

Model DCG306 ..... A12 Engine

As almost all mechanisms of two carburetors are quite similar, the general explanation is made commonly except for the different points.

These are downdraft carburetors which are made aiming at the elevation of power and starting mechanism.

These carburetors present several distinctive features of importance to the car owner.

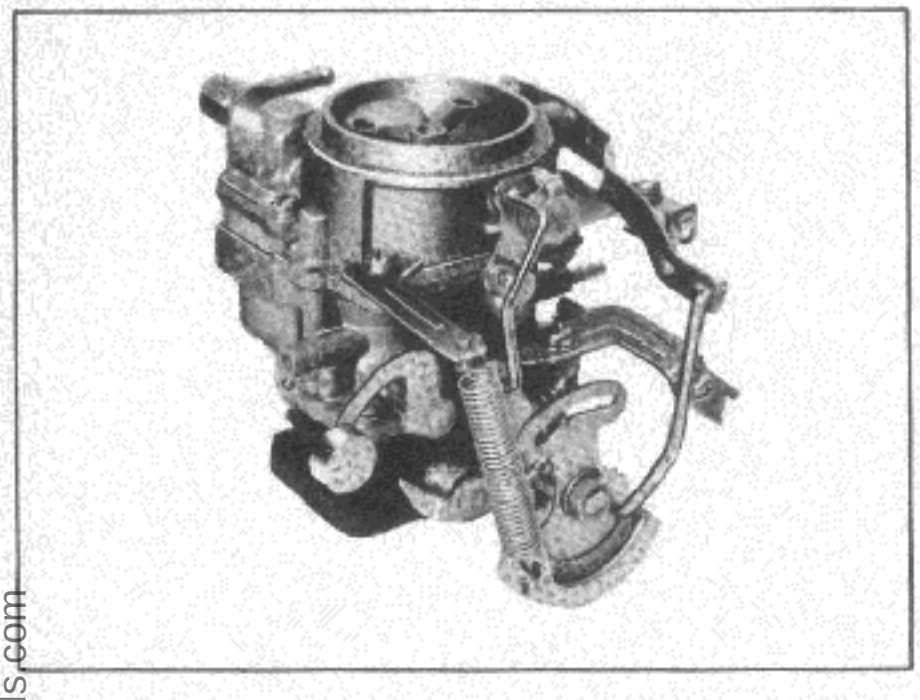


Fig. EF-8 DCG306 carburetor

Foremost among these features are:

1. Secondary throttle valve is operated by throttle lever.
   The high power and good acceleration are gained with combination of the auxiliary valve.

2. Accelerating pump gives excellent acceleration.

3. Power valve mechanism, so-called vacuum actuated boost type, improves high speed driving (A12 engine only).

These carburetors are almost similar as already mentioned, but some parts adopt different structures.

The reference table shown below will help you in making better use of this manual.

	A10 Engine DCG286	A12 Engine DCG306
STRUCTURE AND OPERATION		
1. Primary System		
1-1 Primary main system	O	O
1-2 Idling and slow system	O	O
1-3 Accelerating mechanism	O	O
1-4 Starting mechanism	O	O
1-5 Power valve mechanism		O
2. Secondary System		
2-1 Secondary main system	O	O
2-2 Step system	O	O
2-3 Secondary switch over mechanism	O	O
3. Float System	O	O
ADJUSTMENT		
1. Idling Adjustment	O	O
2. Fuel Level Adjustment	O	O
3. Adjustment of starting interlock valve opening	O	O

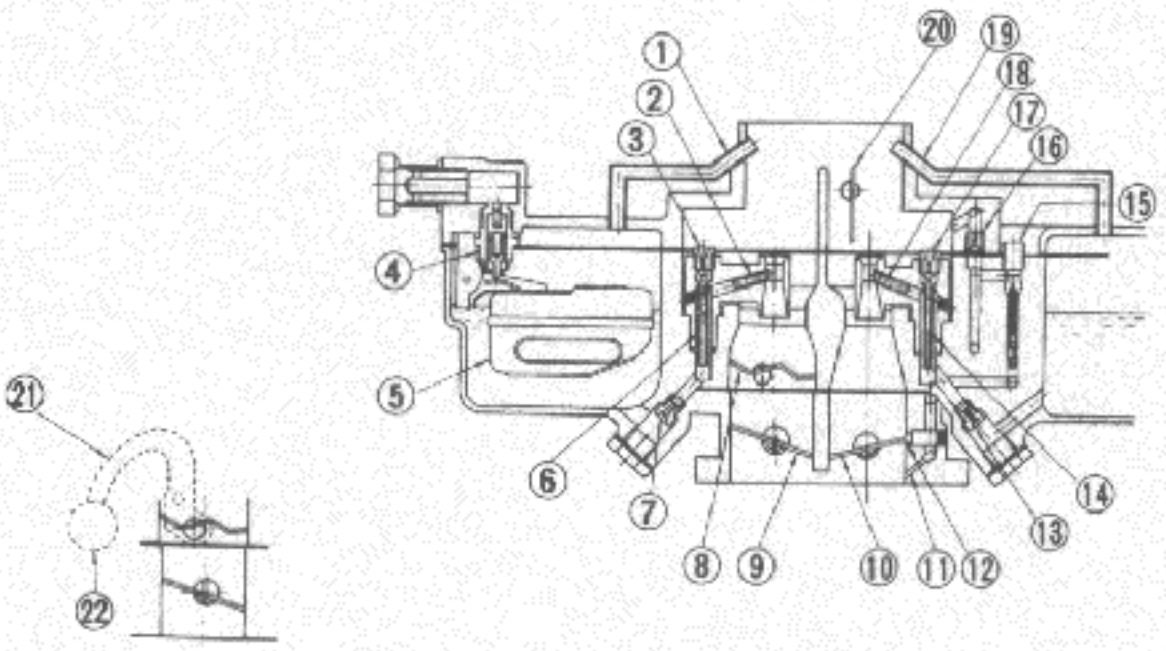
4. Adjustment of interlock opening of primary and secondary throttle valve	O	O
MAJOR SERVICE OPERATIONS		
1. Removal	O	O
2. Disassembly	O	O
3. Cleaning and Inspection	O	O
4. Assembly and Installation	O	O
JETS	O	O
SERVICE DATA AND SPECIFICATIONS	O	O
TROUBLE DIAGNOSES AND CORRECTIONS	O	O

STRUCTURE AND OPERATION

These carburetors consist of the primary system for normal running and secondary system for full load running. The float system which is commonly used by the primary and secondary systems, the secondary switch over mechanism, etc. are also attached.

For model DCG306 carburetor, the power valve mechanism is used.

Both carburetors are of down draft two barrel type.

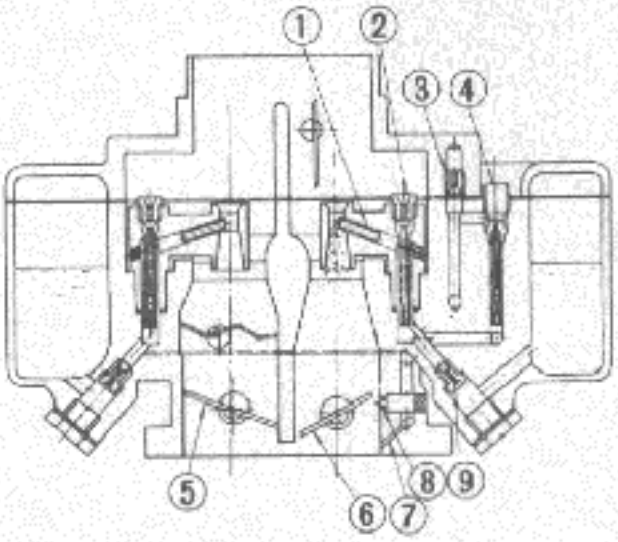


1	Secondary air vent pipe	9	Secondary throttle valve	16	Primary slow air bleed
2	Secondary main nozzle	10	Primary throttle valve	17	Primary main air bleed
3	Secondary main air bleed	11	Idle hole	18	Primary main nozzle
4	Needle valve	12	By-pass hole	19	Primary air vent pipe
5	Float	13	Primary main jet	20	Choke valve
6	Secondary emulsion tube	14	Primary emulsion tube	21	Counter lever
7	Secondary main jet	15	Primary slow jet	22	Counter weight
8	Auxiliary valve				

Fig. EF-9 Sectional view of model DCG286 carburetor

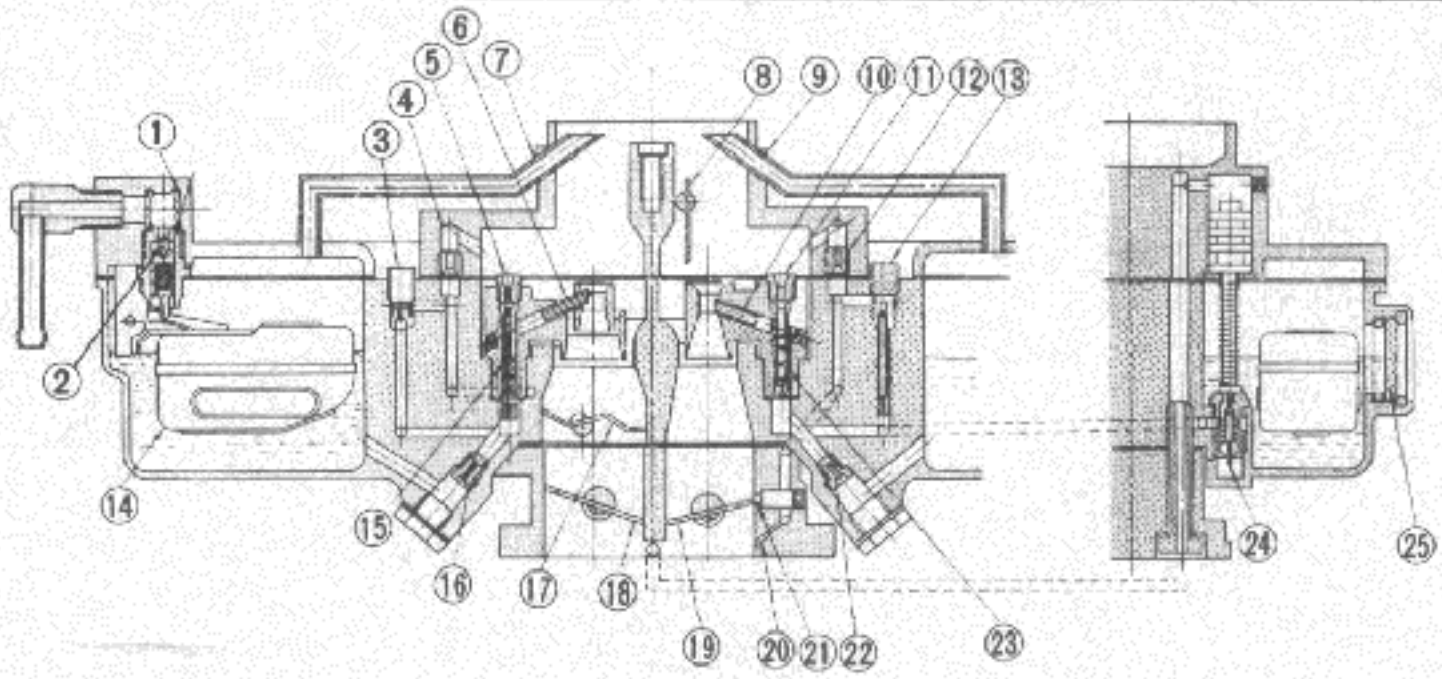
1. Primary system

1-1 Primary main system



1	Primary main nozzle	6	Primary throttle valve
2	Primary main air bleed	7	Idle hole
3	Primary slow air bleed	8	By-pass hole
4	Primary slow jet	9	Primary main jet
5	Secondary throttle valve		

Fig. EF-10 Partially loading



1	Filter	10	Primary main nozzle	18	Secondary throttle valve
2	Needle valve	11	Primary main air bleed	19	Primary throttle valve
3	Secondary slow jet	12	Primary slow air bleed	20	Idle hole
4	Secondary slow air bleed	13	Primary slow jet	21	By-pass hole
5	Secondary main air bleed	14	Float	22	Primary main jet
6	Secondary main nozzle	15	Secondary emulsion tube	23	Primary emulsion tube
7	Secondary air vent pipe	16	Secondary main jet	24	Power valve
8	Choke valve	17	Auxiliary valve	25	Level gauge
9	Primary air vent pipe				

Fig. EF-11 Sectional view of model DCG306 carburetor

The fuel flowing out of the passages at the bottom of the float chamber passes through the primary main jet, and is mixed with the air coming from the main air bleed. The gas mixture is injected into the venturi through the main nozzle.

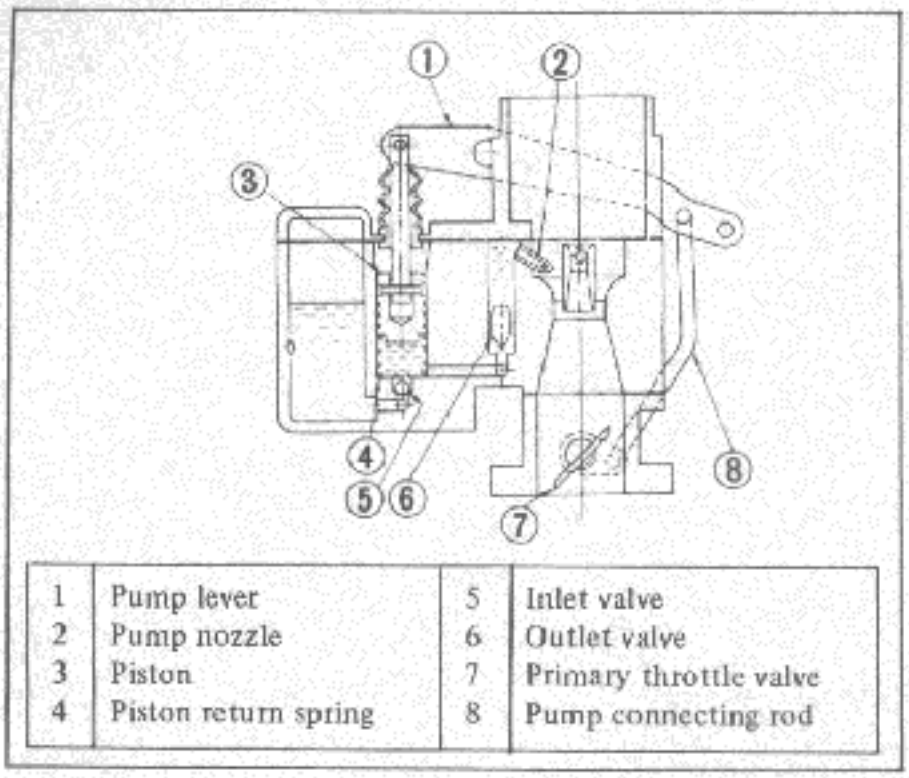
When the throttle valve is wide open and the engine requires dense mixture gas the accelerating pump opens its power valve, from where the fuel also flows into the main system.

1-2 Idling and slow system

Passing through the main jet, the fuel passage is

separated from main line, fuel flows through the slow jet; primary slow air bleed and secondary (only A12 Engine) slow air bleed and is ejected from the by-pass holes and idle holes.

1-3 Accelerating mechanism



1	Pump lever	5	Inlet valve
2	Pump nozzle	6	Outlet valve
3	Piston	7	Primary throttle valve
4	Piston return spring	8	Pump connecting rod

Fig. EF-12

A mechanical accelerating pump synchronized with the throttle valve is used.

When the throttle valve is closed, the piston rod is pushed up with the linkage, which pushes up the piston through the damper spring.

When the piston comes down, the inlet check valve closes, the outlet check valve opens, and the fuel within the pump is blown out from the pump jet by the compressed damper spring. The fuel hits against the side wall of the small venturi, becoming minute drops and compensating trancient sparseness of the fuel. The jetting amount of the fuel can be varied by selecting two holes on the pump arm to which the connecting rod is connected.

1-4 Starting mechanism

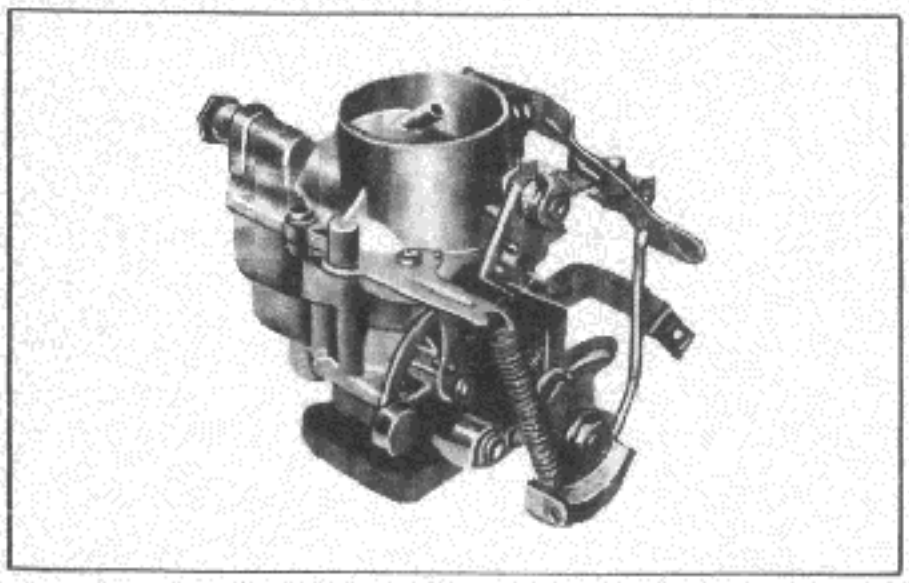


Fig. EF-13

The choke valve is provided with a spring, installed eccentrically on the normal carburetting device, and synchronized with the throttle valve.

When the choke is fully closed, the throttle valve opens 14 degrees from fully closed position. This is the best condition to start the engine. The synchronization of the choke valve and the throttle valve can be correctly maintained after the engine is started.

1-5 Power valve mechanism

The power valve mechanism, so-called vacuum actuated boost type, makes use of the downward pulling force of the air stream below the throttle valve.

When the throttle valve is slightly opened during light load running, a high vacuum is created in the intake manifold.

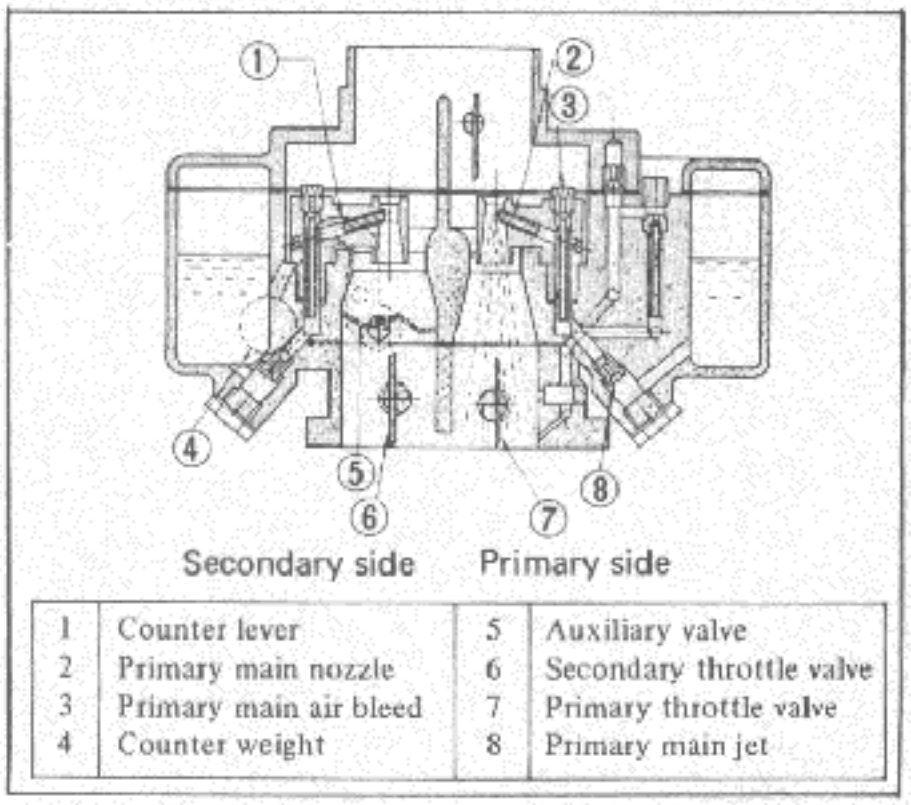
This vacuum pulls the vacuum piston upward against the spring, leaving the power valve closed.

When the vacuum below the throttle valve is lowered during full load or accelerating running, the spring pushes the vacuum piston downward, opening the power valve to furnish fuel.

2. Secondary system

2-1 Secondary main system

As well as the normal carburetting function, the fuel flowing out of the passage at the bottom of the float chamber passes through the secondary main jet and becomes minute drops. The fuel is mixed with the air coming from the main air bleed and the mixture is blown into the venturi through the main nozzle.



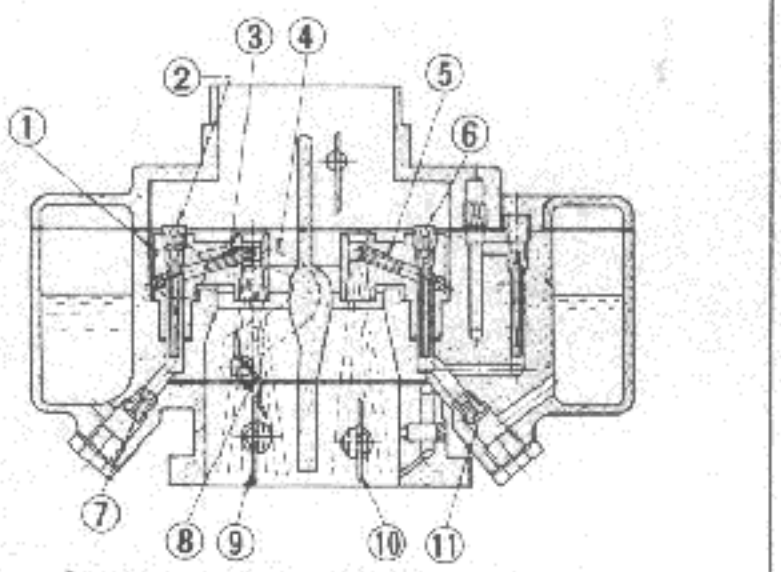
1	Counter lever	5	Auxiliary valve
2	Primary main nozzle	6	Secondary throttle valve
3	Primary main air bleed	7	Primary throttle valve
4	Counter weight	8	Primary main jet

Fig. EF-14 At full open, slow speed

When the throttle valve of the normal carburetor is wide open and the engine produces high power, the throttle valve of the power carburetor begins to open by the synchronized linkage.

However, at the top of the power, carburetor throttle valve operates as an auxiliary valve which does not open at a slow speed with a heavy load due to the load of the counterweight connected to the valve shaft although the throttle valve is open.

When the engine further increases the revolutions, the auxiliary valve opens against the load of the counter-weight and the power carburetor starts operation for high power. When the normal carburetor throttle valve is in the fully opened position, the power carburetor throttle valve is also fully opened.



1	Counter weight	7	Secondary main jet
2	Secondary main air bleed	8	Auxiliary valve
3	Secondary main nozzle	9	Secondary throttle valve
4	Counter lever	10	Primary throttle valve
5	Primary main nozzle	11	Primary main jet
6	Primary main air bleed		

Fig. EF-15 At full open, high speed

2-2 Step system

The construction of this system may correspond to the idling and slow system of the primary system.

This system aims in the power filling up of the gap when fuel supply is transferyed from the primary system to the secondary system. The step port is located near the auxiliary valve in its fully closed state.

3. Float system

Fuel fed from the fuel pump flows through the filter and needle valve into the float chamber. A constant fuel level is maintained by the float and needle valve.

As ventilation within the float chamber is of an air vent method and pressure within the venturi and the float chamber is always constant no matter how suctional resistance of the air cleaner varies, fuel consumption can be always economically maintained.

ADJUSTMENT

1. Idling adjustment

Idling adjustment is made by the throttle adjust screw and idle adjust screw as shown in Figure EF-16.

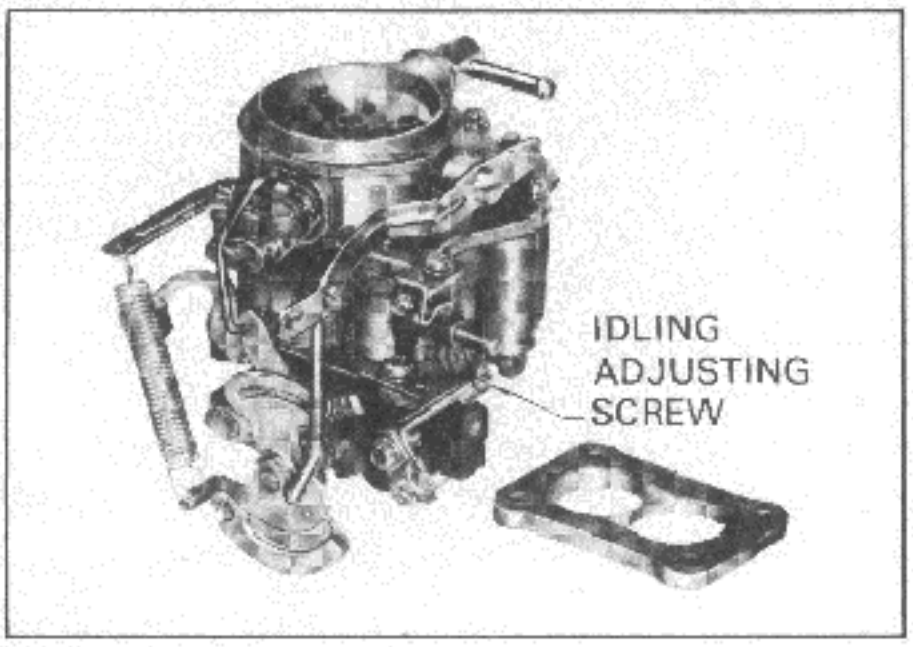


Fig. EF-16 Idling adjustment

a. Give the idle adjust screw approximately three turns, starting from the fully closed position.
Screw in the throttle adjust screw two or three turns and start the engine.

b. Screw out the throttle adjust screw gently until the engine is about to rotate unevenly after the engine speed gradually drops.

c. Screw in the idle adjust screw until the engine runs smoothly at the highest speed.

d. Readjust the throttle screw to drop the engine speed. Repeat these operations until a smooth engine speed of approximately 600 rpm is obtained.

Note: Do not attempt to screw down the idle adjust screw completely to avoid damage to the tip, which will tend to cause malfunctions.

2. Fuel level adjustment

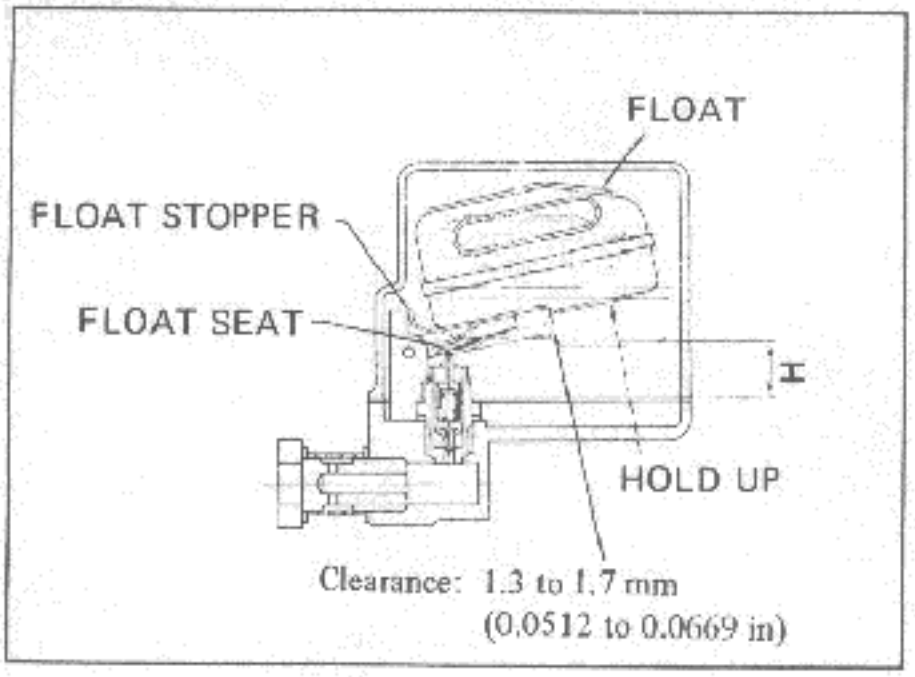


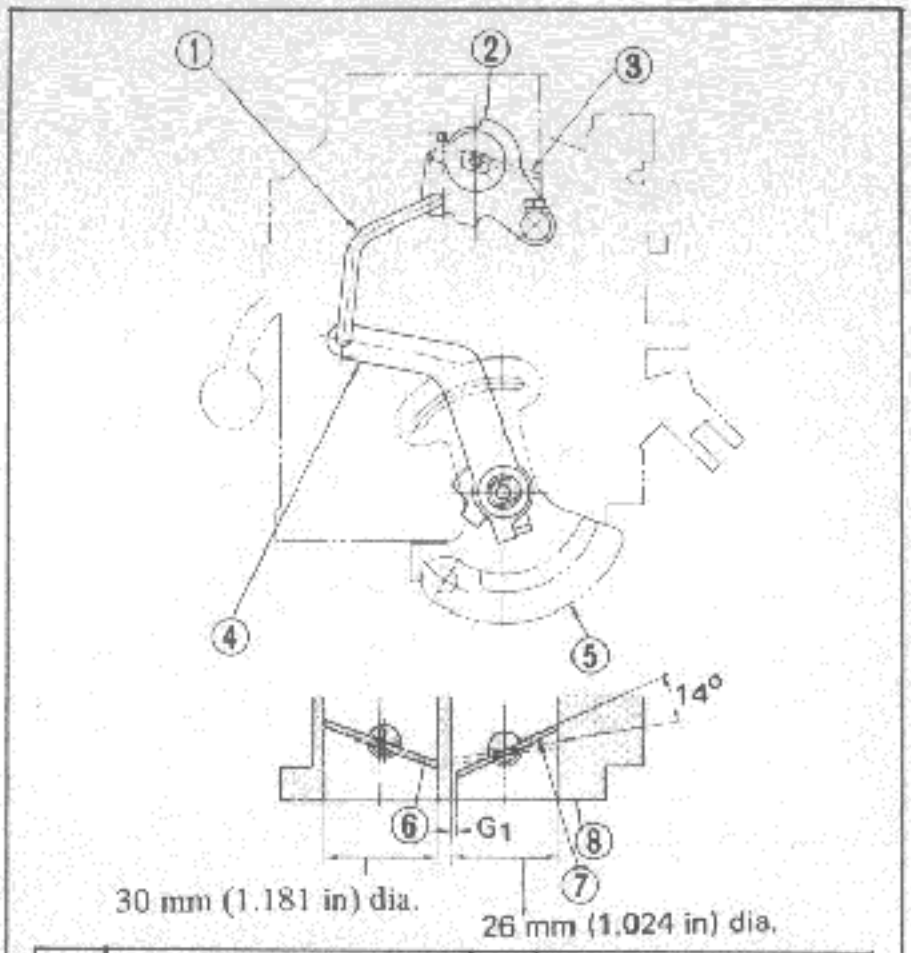
Fig. EF-17 Adjusting float level

a. Turn down the float chamber to allow the float coming into contact with the needle valve, and measure "H" shown in Figure EF-17. When the "H" is approximately 12.0 mm (0.472 in), top float position is correct. The top float position can be adjusted by bending float seat. Upon completion of the adjustment, check oil level with the attached level gauge.

b. Adjust bottom float position so that clearance between the float seat and the needle valve stem is 1.3 to 1.7 mm (0.0512 to 0.0669 in) when the float is fully raised. Bend the float stopper properly as required.

3. Adjustment of starting interlock valve opening

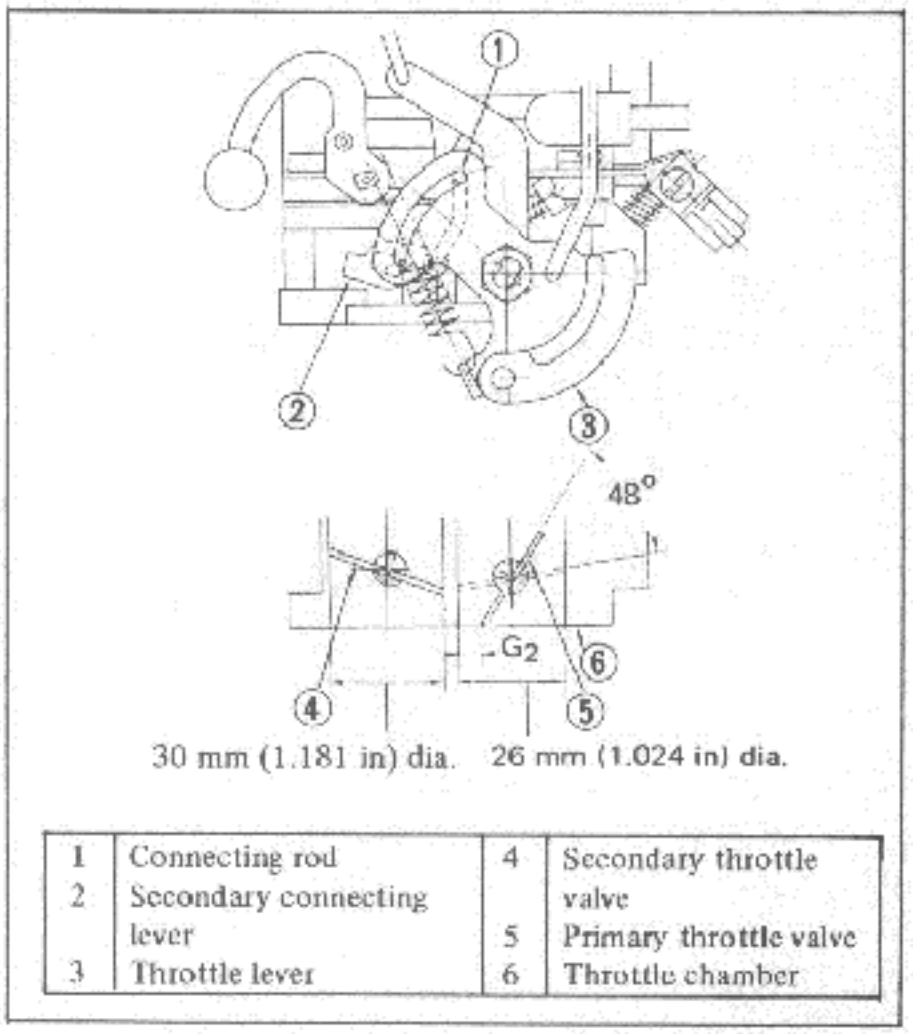
Fully close the choke valve, and measure clearance between the primary side throttle valve and throttle chamber interior. Under this condition, primary throttle valve opening should be 14°. When adjustment is required, bend the choke connecting rod properly so that clearance "G1" shown in Figure EF-18 is 1.22 mm (0.0480 in).



1	Secondary connecting lever	5	Throttle lever
2	Choke lever	6	Secondary throttle valve
3	Choke valve	7	Primary throttle valve
4	Choke connecting lever	8	Throttle chamber

Fig. EF-18 Measuring starting interlock valve opening

4. Adjustment of interlock opening of primary and secondary throttle valves



1	Connecting rod	4	Secondary throttle valve
2	Secondary connecting lever	5	Primary throttle valve
3	Throttle lever	6	Throttle chamber

Fig. EF-19 Adjusting interlock opening (primary and secondary throttle valves)

a. Open the primary side throttle valve 48° from the fully closed position, and measure clearance between the throttle valve and throttle chamber inside wall as shown in Figure EF-19.

b. Make sure that the throttle valve shaft ring is in relative position with the primary side throttle lever as shown in the Figure EF-19, and measure "G2" size. The condition is normal if the "G2" size is 5.83 mm (0.2295 in). When adjustment is required, bend the connecting rod properly so that the secondary side throttle valve stops immediately before it completes the opening. Upon completion of the adjustment, make sure that the link system operates smoothly.

MAJOR SERVICE OPERATIONS

A completely adjusted and serviced carburetor will provide the engine with proper gasoline and air ratio at all speeds.

Periodical overhauling which cleans all components and passages will recover the originally designed performance, producing the engine with proper gasoline and air ratio at all speeds. Passages and holes of the carburetor must be cleaned carefully. Use only carburetor solvent and compressed air to clean all passages and discharge holes. Never use wire or other pointed tool, or otherwise accurately calibrated carburetor will be affected.

1. Removal

a. Remove the air cleaner.

b. Disconnect the fuel line, vacuum line and choke wire from the carburetor.

c. Remove the throttle lever.

d. Remove four nuts and washers retaining the carburetor to the manifold.

e. Lift the carburetor and remove from the manifold.

f. Remove and discard the gasket used between the carburetor and manifold.

2. Disassembly

a. The main jets and needle valves on both primary and secondary sides are accessible from outside the carburetor for disassembly.

b. The choke chamber can be detached by removing the choke connecting rod, pump lever, return spring, and five set screws.

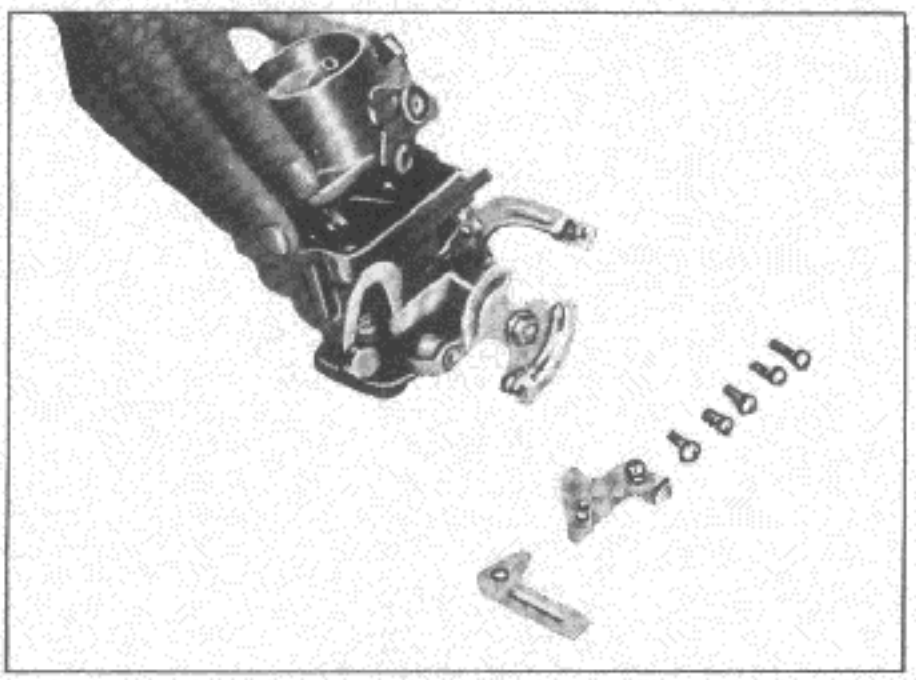


Fig. EF-20 Choke chamber removal

c. The primary and secondary emulsion tubes can be disassembled by removing the main air bleeds on the individual sides.

d. To check the accelerator pump, the pump cover is removed. Be careful not to lose the return spring and inlet valve (ball) provided at the lower part of the piston during disassembly.

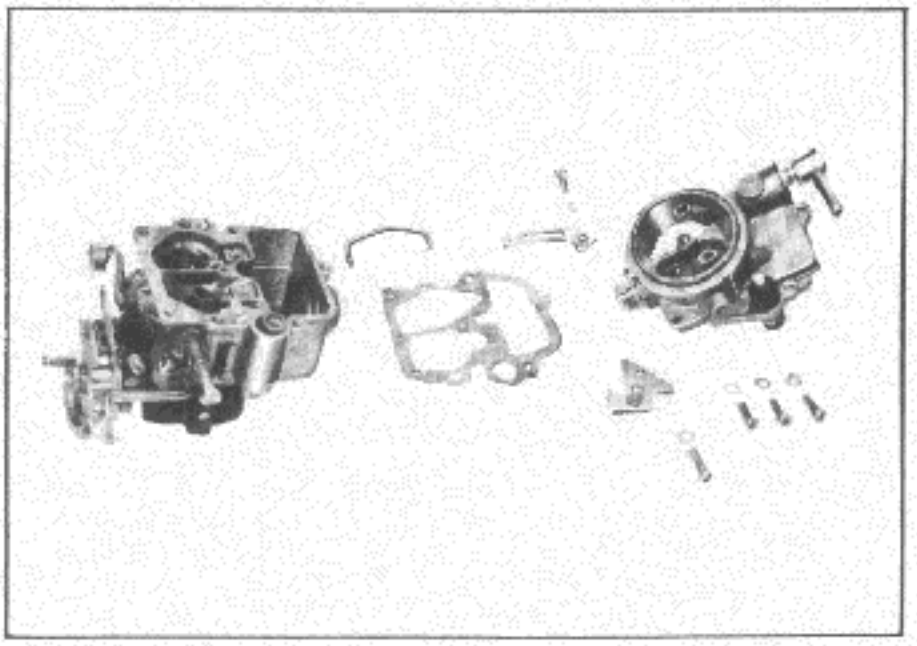


Fig. EF-21 Accelerator pump

e. The throttle chamber can be detached from the float chamber by removing three set screws.
Leave the throttle valve intact unless otherwise required.

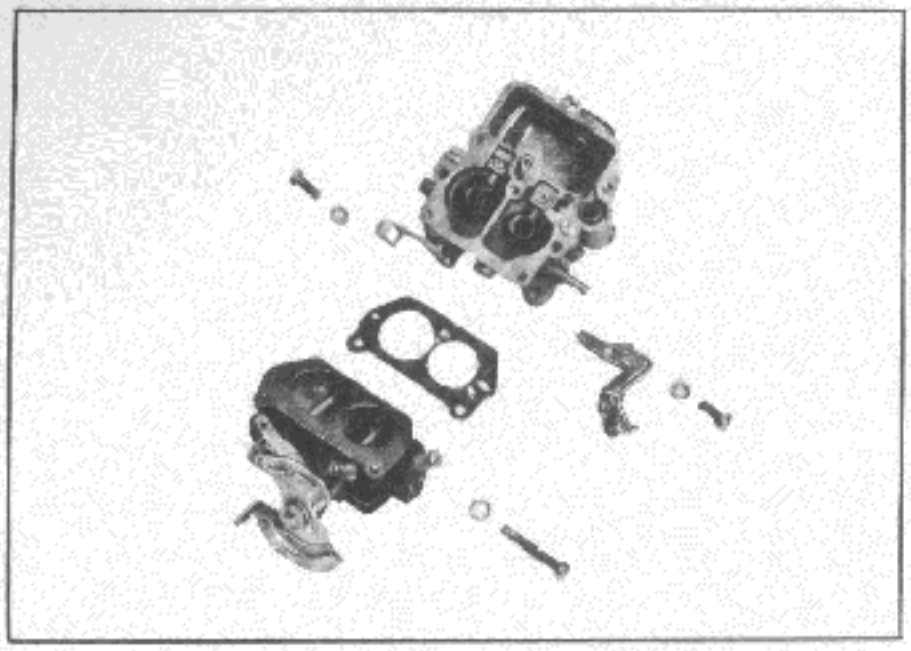
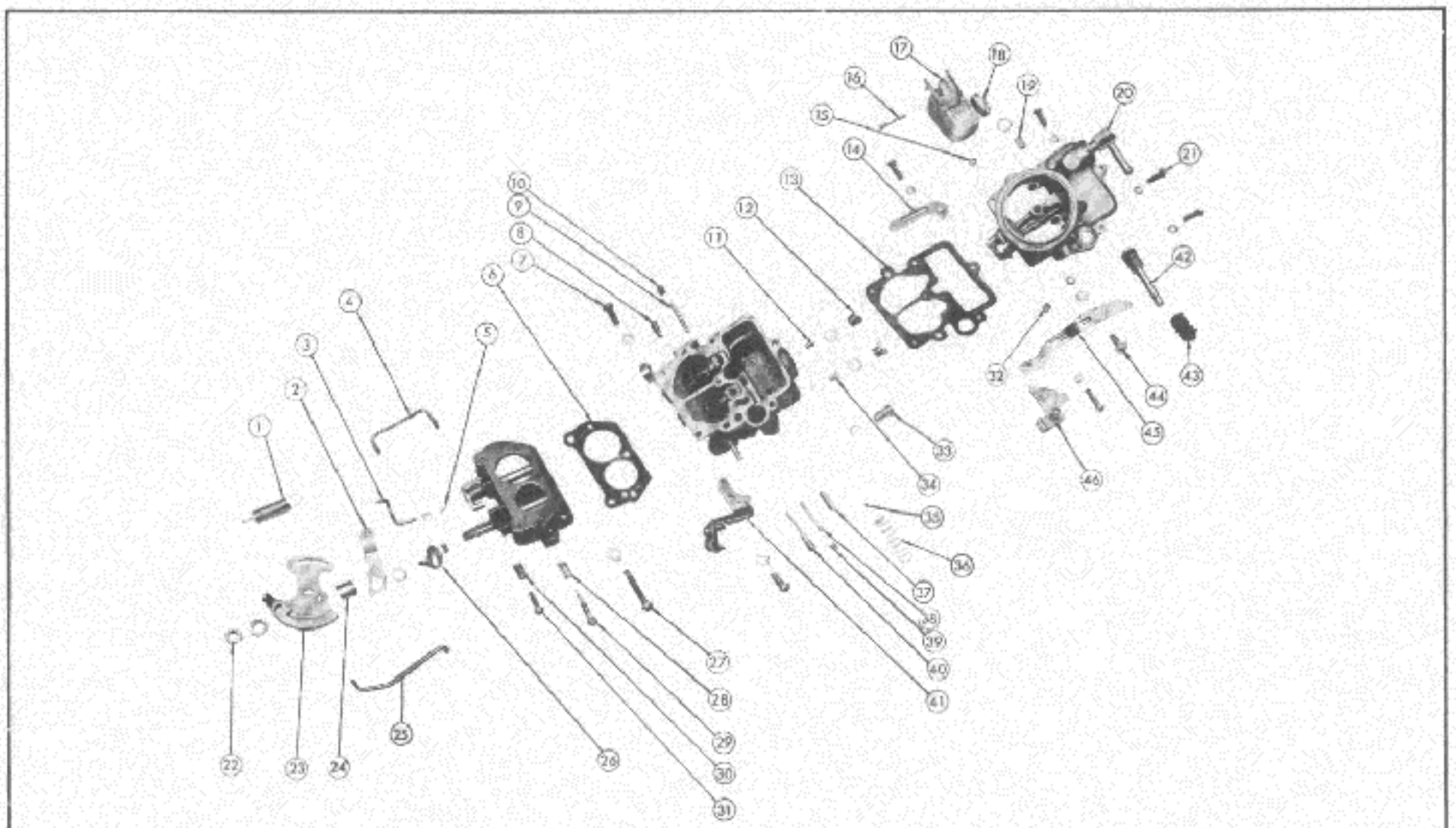


Fig. EF-22 Throttle chamber removal

f. When disassembling and reassembling the interlocking links carry out the operation carefully so that each linkage has a smooth action, and that they are not fitted in any forced position.



1	Throttle return spring	17	Float	32	Primary slow air bleed
2	Starting lever	18	Needle valve	33	Power valve
3	Connecting rod	19	Filter	34	Primary main jet
4	Choke connecting rod	20	Choke chamber assembly	35	Ball
5	Cotter pin - 1 mm dia.	21	Screw - 5 mm dia.	36	Piston return spring
6	Throttle chamber	22	Nut - 8 mm dia.	37	Injector weight
7	Screw - 6 mm dia.	23	Throttle lver	38	Primary emulsion tube
8	Secondary slow jet	24	Sleeve	39	Primary main air bleed
9	Secondary emulsion tube	25	Pump rod	40	Primary slow jet
10	Secondary main air bleed	26	Adjust plate	41	Throttle wire arm
11	Secondary main jet	27	Screw - 6 mm dia.	42	Piston
12	Drain plug	28	Idle adjust screw spring	43	Pump cover
13	Float chamber gasket	29	Idle adjust screw	44	Pump lever shaft
14	Spring hanger	30	Throttle adjust screw spring	45	Pump lever
15	Secondary slow air bleed	31	Throttle adjust screw	46	Choke wire arm
16	Float shaft				

Fig. EF-23 Disassembly carburetor

3. Cleaning and inspection

Dirt, gum, water or carbon contamination in or on the exterior moving parts of carburetor are often responsible for unsatisfactory performance.

For this reason, efficient carburetion depends upon careful cleaning and inspection while servicing.

a. Blow all passages and castings with compressed air and blow off all parts until dry.

Note: Do not pass drills or wires through calibrated jets or passages as this may enlarge orifice and seriously affect carburetor calibration.

b. Check all parts for wear. Replace worn part. Especially the following matters should be noted:

1) Check float needle and seat for wear. Replace the assembly, if worn.

2) Check the throttle and choke bores in throttle body and cover casting for wear or out of round.

3) Inspect idle adjusting needles for burrs or ridges. Replace as required.

c. Inspect gaskets to ensure that they do not appear hard or brittle and that the edges are not turned or distorted. If any such condition is detected, they must be replaced.

d. Check filter screen for clogging. Clean and if it is distorted or remains plugged, replace.

e. Check venturi clusters for loose or worn parts. If damage or looseness exists, replace cluster assembly.

f. Check the linkage for operating condition.

g. Inspect the operation of accelerating pump.
Pour gasoline into the float chamber and operate the throttle lever. Check condition of gasoline injection from the accelerating nozzle.

4. Assembly and installation

Assemble and install the carburetor in reverse sequence of disassembly and removal.

Replace the gaskets, if necessary.

When disassembling and reassembling the interlock link and related components, be careful not to bend or deform the components.

Reassemble carefully and correctly so that all interlock links operate smoothly.

JETS

The carburetor performance depends on jets and air bleeds. That is why these components are manufactured with utmost care.

To clean them, use gasoline and blow air on them. Larger numbers stamped on the jets indicate larger diameters. Accordingly, main and slow jets with larger numbers provide richer mixture, and the smaller numbers the leaner mixture. Inversely, the main and slow air bleed, which are for air to pass through, make the fuel leaner if they bear larger numbers, and the smaller numbers the richer fuel. Replacement of designated jets to meet the service condition of the car must be carried out with the above directions in mind. To cite a practical example, when it becomes necessary to economize fuel at the limited sacrifice of output to meet frequent light-load operation, use smaller main jets or slow jets, or larger main air bleeds or slow air bleeds than regularly specified.

This should meet the purpose.

Inversely, when increasing output at the limited sacrifice of fuel consumption, use larger main jets or slow jets, or smaller main air bleeds or slow air bleeds. This will bring a satisfactory result.

SERVICE DATA AND SPECIFICATION

Carburetor model		DCG286		DCG306	
Applied engine		A10		A12	
			Secondary	Primary	Secondary
Outlet diameter	mm (in)	26 (1.024)	28 (1.142)	26 (1.024)	30 (1.181)
Venturi diameter	mm (in)	20 (0.787)	24 (0.945)	20 (0.787)	26 (1.024)
Main jet		# 95	# 140	# 98	# 135

Main air bleed		# 80	# 120	# 80	# 80
Slow jet		# 40		# 43	# 50
Slow air bleed		# 210		# 220	# 100
Power jet			# 60		# 60
Float level			18 + 1		19 ± 1
Fuel pressure	kg/cm² (lb/sq in)		0.16 (0.28)		0.18 (2.56)
Weight	kg (lb)		1.65 (3.6)		1.9 (4.2)

(example) * # 210 represents 210/100 = 2.1 mm (0.0827 in) diameter.

≪ MAIN JET VARIATION ≫

Altitude	DCG286		DCG306	
Standard	Primary	Secondary	Primary	Secondary
1,000 m (3,300 ft)	# 98	# 140	# 98	# 135
	# 96	# 135	# 96	# 130
2,000 m (6,600 ft)	# 92	# 135	# 92	# 130
3,000 m (10,000 ft)	# 90	# 130	# 90	# 125
4,000 m (13,300 ft)	# 86	# 125	# 86	# 120

TROUBLE DIAGNOSES AND CORRECTIONS

In the following table, the symptoms and causes of carburetor troubles and remedies for them are listed to facilitate quick repairs.

There are various causes of engine troubles. It sometimes happens that the completely effective carburetor seems apparently to have some troubles when electric system is defective. Therefore, whenever the engine has troubles, electric system must be checked first before adjusting the carburetor.

Troubles	Possible causes	Remedies
Overflow	Dirt accumulated on needle valve	Clean needle valve.
	Fuel pump pressure too high	Repair pump.
	Needle valve seat improper	Lap or replace.
Excessive fuel consumption	Fuel overflow	See above.
	Each main jet, slow jet too large	Replace.
	Each main air bleed clogged	Clean.

	Choke valve does not open	Adjust.
	Outlet valve seat of accelerator pump improper	Lap.
	Linked opening of secondary throttle valve too early	Adjust.
Power shortage	Each main jet clogged	Clean.
	Each throttle valve does not fully open	Adjust.
	Fuel pump operated improperly	Repair.
	Fuel strainer clogged	Clean.
	Vacuum jet clogged	Clean.
	Air cleaner clogged	Clean.
	Diaphragm damaged	Replace.
	Power valve operated improperly	Adjust.
Improper idling	Slow jet clogged	Clean.
	Each throttle valve does not close.	Adjust.
	Secondary throttle valve operated improperly	Overhaul and clean.
	Each throttle valve shaft wear	Replace.
	Packing between manifold/carburetor defective	Replace packing.
	Manifold/carburetor tightening improper	Correct tightening.
	Fuel overflow	See the first item.
Engine hesitation	Each main jet, slow jet clogged	Clean.
	By-pass hole, idle passage clogged	Clean tube.
	Emulsion tube clogged	Clean.
	Idling adjustment incorrect	Correct adjustment.
	Secondary throttle valve operated improperly	Overhaul and clean.
Engine does not start	Fuel overflows	See the first item.
	No fuel	Check pump, fuel pipe and needle valve.
	Gauge plate adjustment incorrect	Correct adjustment.

	Idling adjustment incorrect	Correct adjustment.
	Fast idle adjustment incorrect	Correct adjustment.
	Bimetal rod in contact with bimetal case	Adjust.

SERVICE JOURNAL OR BULLETIN REFERENCE

DATE	JOURNAL or BULLETIN No.	PAGE No.	SUBJECT

SERVICE MANUAL

MODEL
A10 & A12
ENGINE

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EC

EMISSION CONTROL SYSTEM

EC

GENERAL DESCRIPTION

There are three types of emission control system to be controlled. These are;

1. Crankcase emission control system
2. Exhaust emission control system

   Engine modifications
3. Evaporative emission control system

Emission control system described in 1) is adopted by all models, however, control systems described in 2) and 3) are adopted on LB110TRU exported to CANADA and KB110TU exported to U.S.A.

Periodic inspection and required servicing of these systems should be carried out at the recommended intervals to assure better performance extended engine service life and elimination of air pollution improved to the maximum extent.

CRANKCASE EMISSION CONTROL SYSTEM

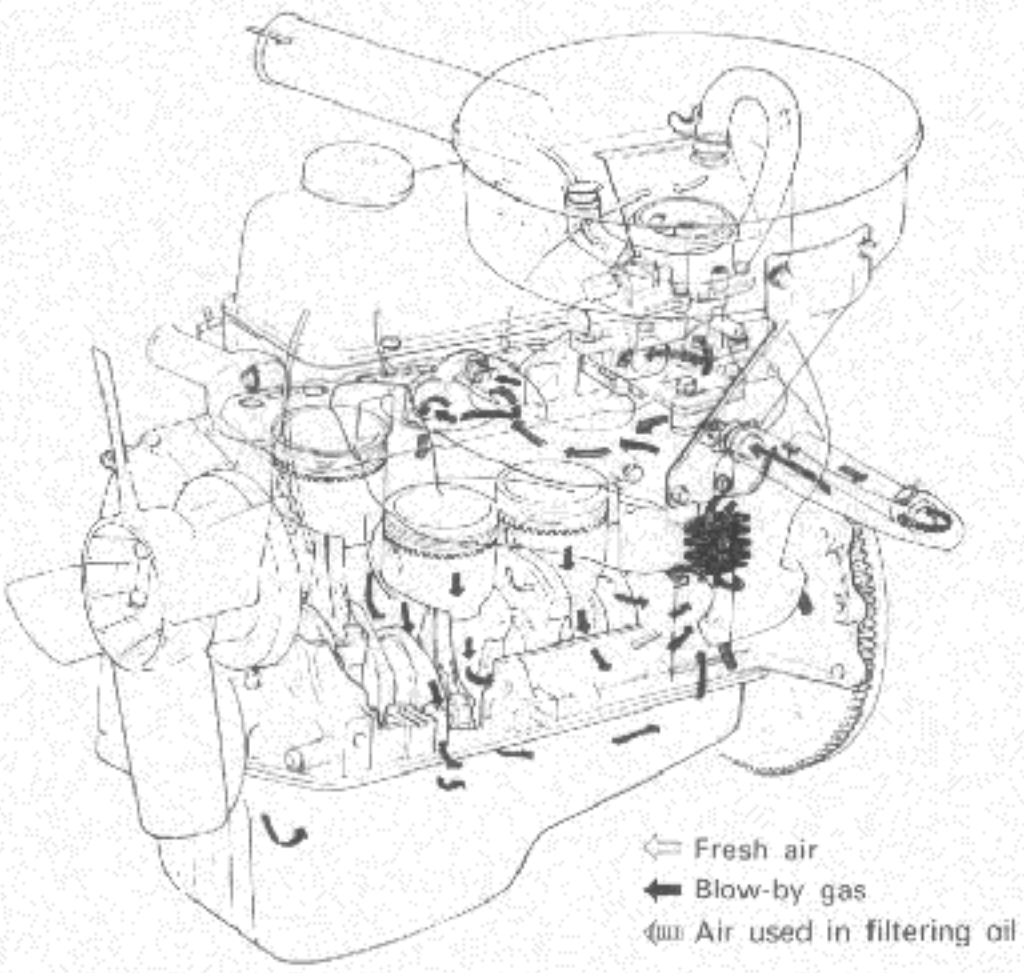
DESCRIPTION

This system returns blow-by gas to both the intake manifold and carburetor air cleaner.

The ventilation control valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the clean side of the carburetor air cleaner, through the tube connecting carburetor air cleaner to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the tube connection in the reverse direction. In vehicles with an excessively high blow-by some of the flow will go through the tube connection to the carburetor air cleaner under all conditions.

At partially throttle open



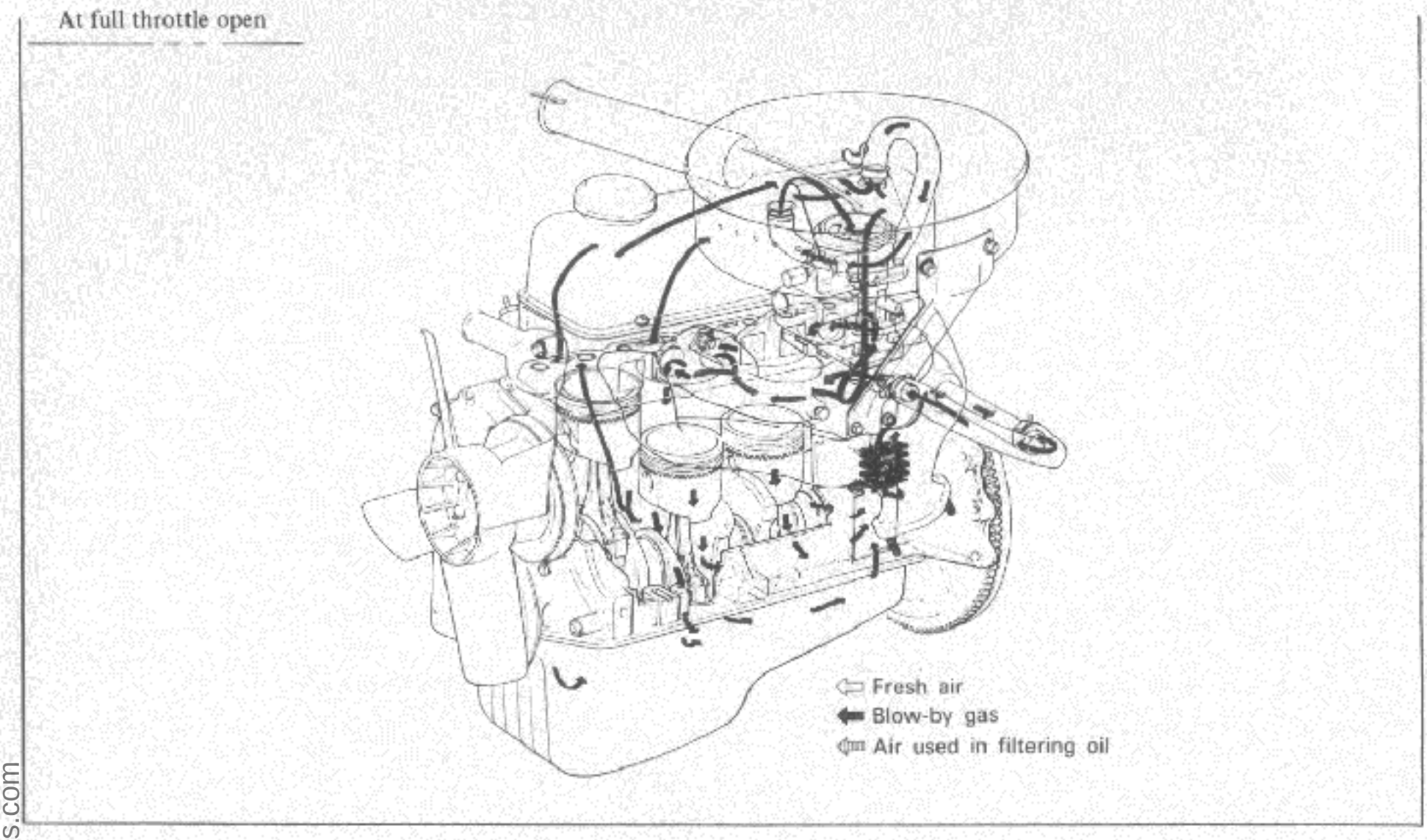


Fig. EC-1 Crankcase emission control system

EXHAUST EMISSION CONTROL SYSTEM

DESCRIPTION

The engine modification system is employed by the A12 engine. It consists of a modified carburetor, distributor and throttle opener.

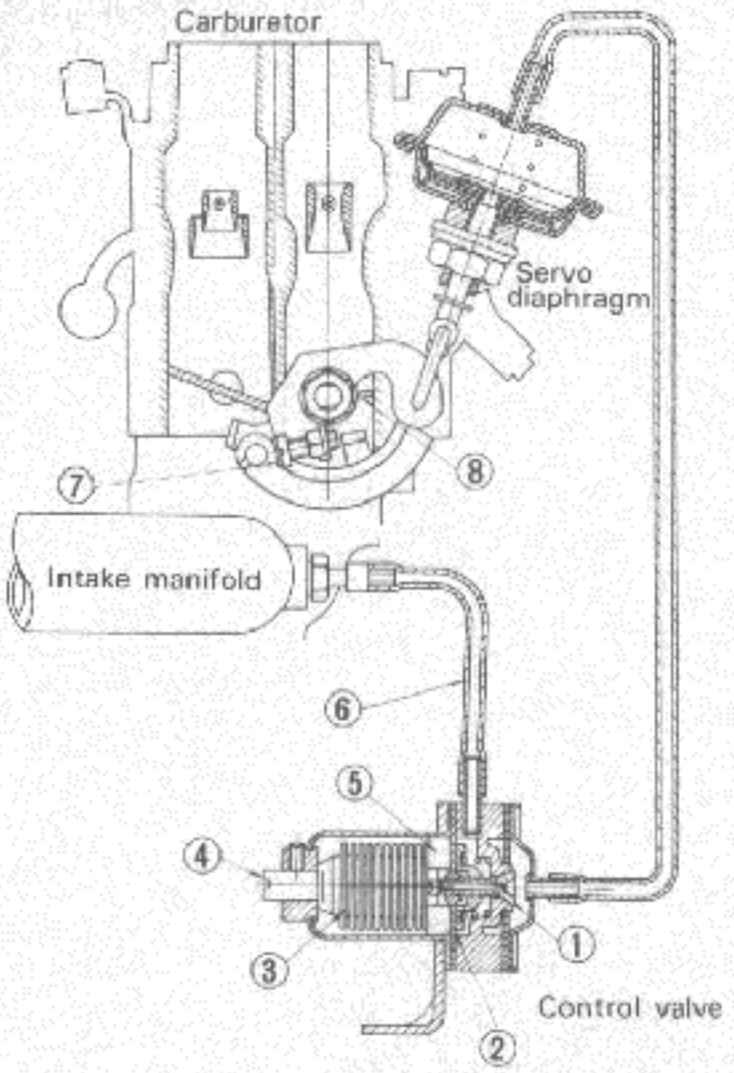
Throttle opener

The function of the throttle opener is to open the throttle valve of carburetor slightly in vehicle coasting condition. During deceleration, manifold vacuum rises and a quantity of mixture in the engine is not sufficient so that a normal combustion can not continue, and a great amount of unburned HC is emitted. The carburetor equipped with the throttle opener supplies the engine with an adequate charge of combustible mixture to keep proper combustion during deceleration, resulting in remarkable reduction of HC emission.

The operation of the throttle opener is as follows. A schematic drawing of the system is shown in Figure EC-2. At the moment when the manifold vacuum increases as occurs upon deceleration, the control valve opens to transfer the manifold vacuum to the servo diaphragm chamber and the throttle valve of the carburetor opens slightly. As the vehicle speed decreases, the manifold vacuum lowers to the predetermined value. The control valve begins to close gradually, keeping the manifold vacuum at the predetermined constant value.

As a result, both low HC emission and normal engine brake during deceleration are obtained.

The altitude corrector is provided with a slight preload to compensate the variation of the atmospheric pressure.



1	Valve
2	Diaphragm
3	Altitude corrector
4	Vacuum adjusting screw
5	Filter
6	Manifold vacuum tube
7	Adjusting screw
8	Primary throttle valve

Fig. EC-2 Throttle opener control system

EVAPORATIVE EMISSION CONTROL SYSTEM

CONTENTS

DESCRIPTION

This system consists of four basic elements indicated below:

1. Fuel tank with positive sealing filler cap
2. Vapor-liquid separator
3. Vapor vent line
4. Flow guide valve

The flow guide valve prevents blow-by gas flowing into the fuel tank and guides fresh air into it, preventing gasoline vapor escaping into the carburetor air cleaner.

Flow guide valve operates and blow-by gas and gasoline vapor flow as follows.

When the engine is at rest, the vapor vent line, vapor liquid separator and fuel tank are filled with evaporation gas produced in the sealed type fuel tank. A flow guide valve opens when the gas pressure is above 10 mm (0.4 in) Hg. The gas passed through the flow guide valve (2) is accumulated the crankcase. Once the engine starts, evaporation gas in the carnkcase, manifold and carburetor air cleaner is sucked into the manifold for combustion. When the pressure of the sealed type fuel tank, vapor liquid separator and vapor vent line becomes negative by decreasing the fuel, the flow guide valve (1) opens to send fresh air from the carburetor air cleaner to the fuel tank.

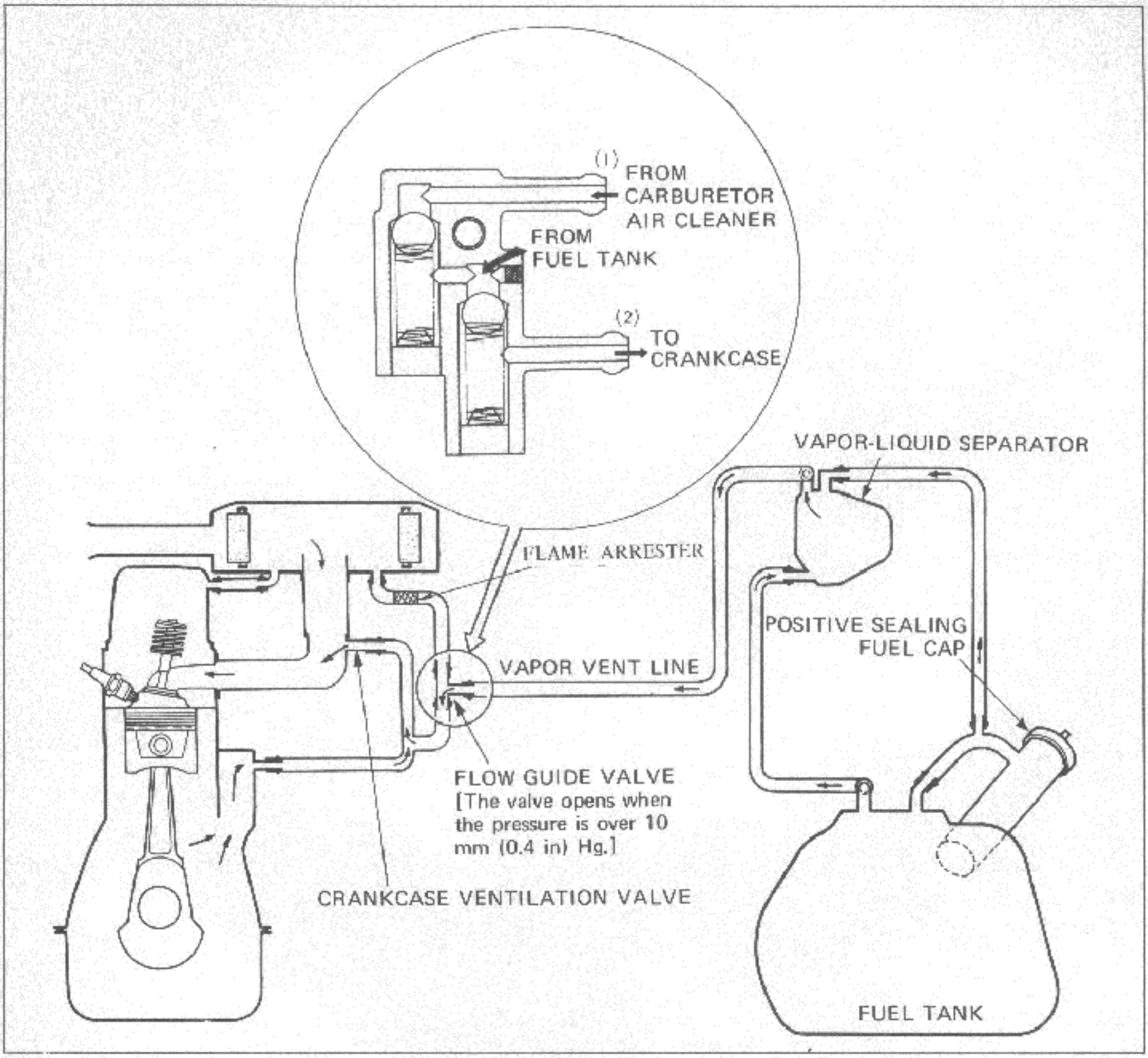


Fig. EC-3 Evaporative emission control system

FLOW GUIDE VALVE

This valve is mounted in the engine compartment. Marks A, F and C are engraved in the body of the valve to indicate the connection of the vapor vent line.

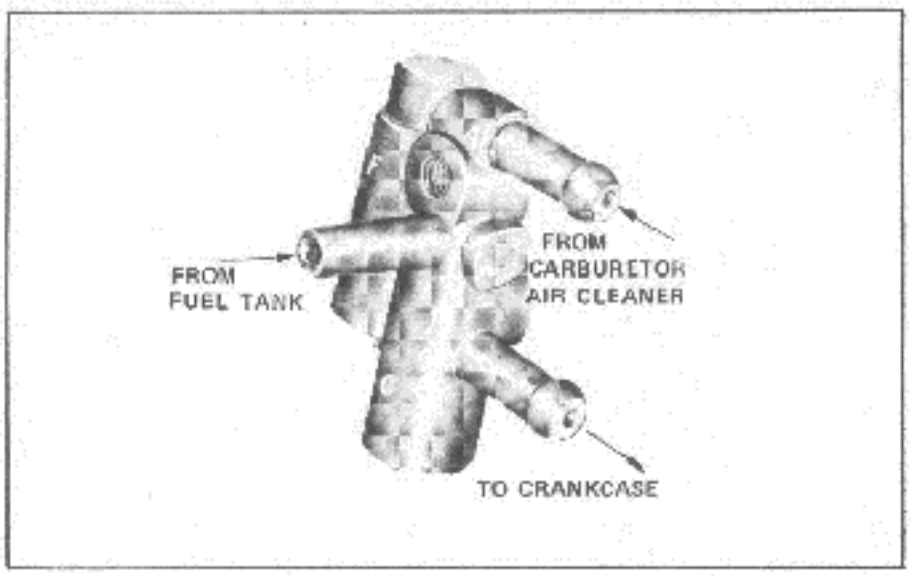


Fig. EC-4 Flow guide valve

MAINTENANCE AND TESTING

CONTENTS

GENERAL MAINTENANCE

To make sure that exhaust emissions are maintained at a low level, it is recommended that inspection be conducted every 12 months or every 20,000 km (12,000 miles), whichever occurs first. Best engine operation and minimum exhaust emissions will be obtained through periodical inspections and from recommended servicing at these intervals.

Carburetor

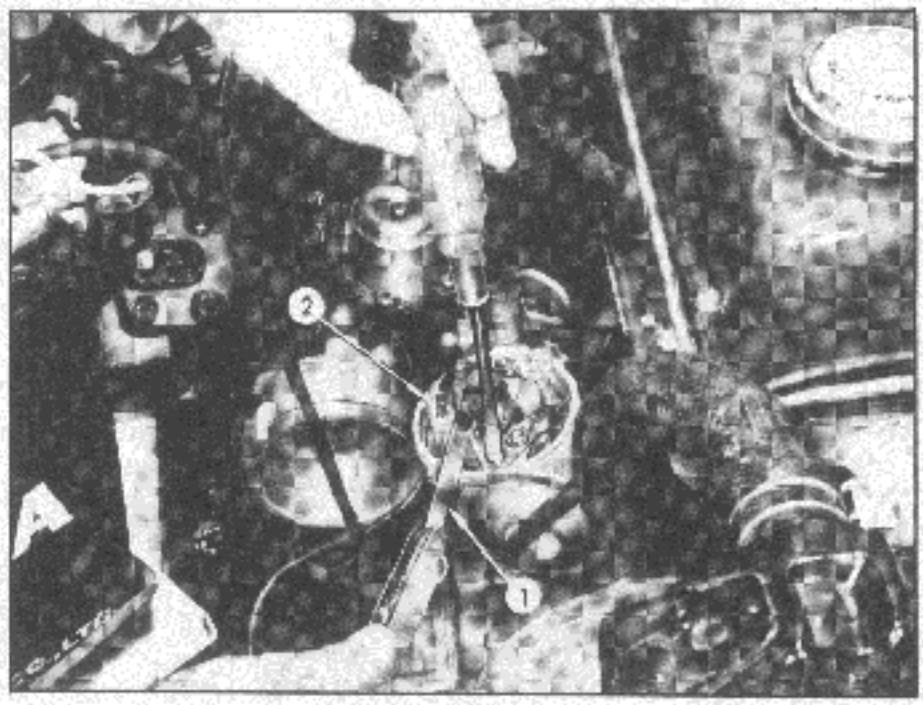
Check the choke setting and adjust to specifications as required.

Proper carburetor idle mixture adjustment is imperative for best exhaust emission control.

Refer to the article given in "Adjusting ignition timing, engine idling speed and gas mixture".

Distributor

Check the distributor breaker points for abnormal pitting and wear. Replace if necessary. Make sure they are in correct alignment for full contact and that point dwell and gap are correct. Clean and apply distributor grease to the cam and wick. Breaker points should be replaced at intervals not to exceed 20,000 km (12,000 miles).



1	Thickness gauge	2	Distributor

Fig. EC-5 Checking distributor breaker point gap

Spark plug

Remove and clean plugs in a sand blast cleaner. Inspect each spark plug. Make sure that they are of the specified heat range. Inspect insulator for cracks and chips. Check both center and ground electrodes. If they excessively worn, replace with new spark plugs. File center electrode flat. Set the gap to 0.80 to 0.90 mm (0.0315 to 0.0355 in) using the proper adjusting tool. Spark plug should be replaced every 20,000 km (12,000 miles).

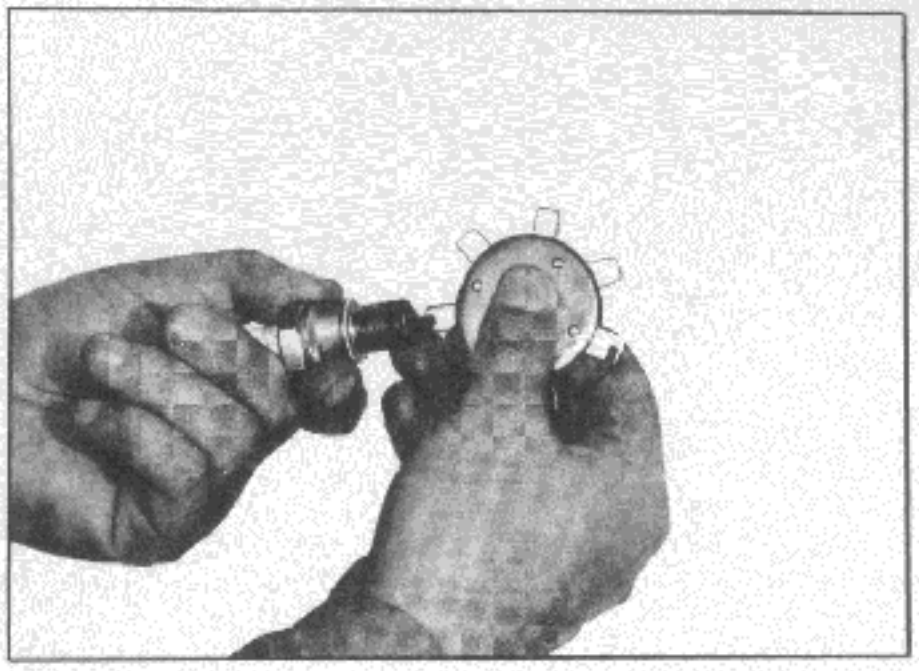


Fig. EC-6 Checking spark plug point gap

High tension cable

Use an ohmmeter to check resistance on secondary cables. Disconnect cable from spark plug and install the proper adaptor between cable and spark plug. Remove the distributor cap from the distributor with secondary cables attached. Do not remove the cables from the cap.

Connect the ohmmeter between the spark plug adaptor and the corresponding electrode inside the cap. If the resistance is more than 30,000 ohms, remove the cable from cap and check cable resistance only. If the resistance is still more than 30,000 ohms, replace cable assembly.

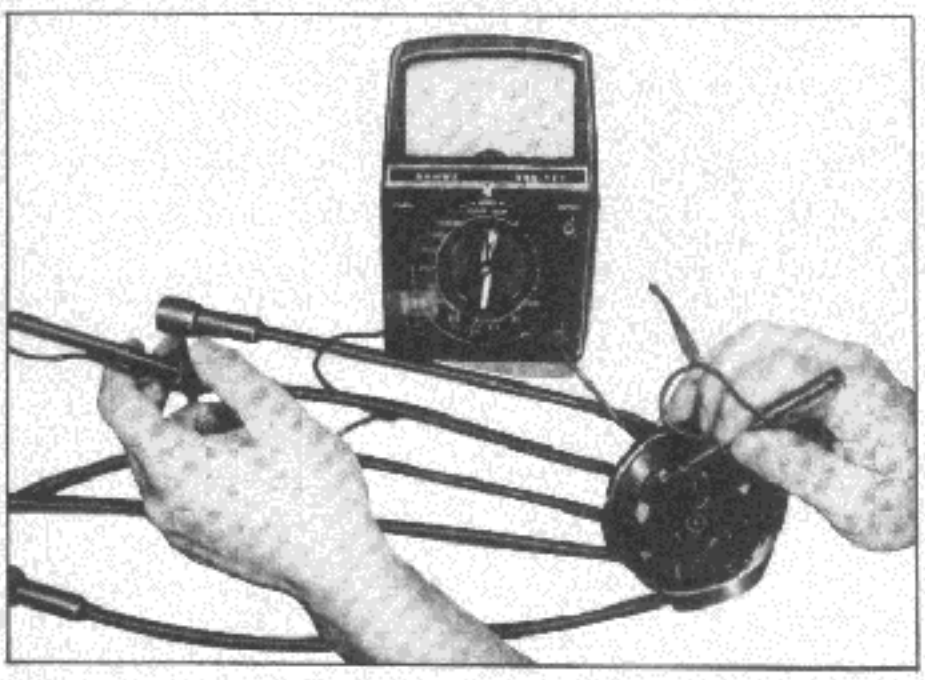


Fig. EC-7 Checking high tension cables

Battery

Measure specific gravity of electrolyte with an accurate hydrometer. specific gravity should be at least 1.220 or more at the standard. Add mineral free water (distilled water) as required to bring fluid upto proper level.

Clean battery posts and cable terminals. After tightening clamps, coat the battery posts and clamps with light grease to retard corrosion.

Carburetor air cleaner element

The paper element has been specially treated (Viscous type), and therefore, no cleaning is required. But it should be replaced every 40,000 km (24,000 miles).

CRANKCASE EMISSION CONTROL SYSTEM

1. Check hoses and hose connections for leaks.

2. Disconnect all hoses and blow them out with compressed air.

If any hose can not be freed of abstractions, replace with a new one.

3. Test the crankcase ventilation control valve in accordance with the following method.

With engine running at idle, remove the ventilator hose from the crankcase ventilation control valve, if the valve is working, a hissing noise will be heard as air passes through the valve and a strong vacuum should be felt immediately when a finger is placed over the valve inlet. If valve is plugged, do not attempt to clean it. Replace with a new valve. Check for deposit plugging in the hose. Clean if necessary.

Normal control valve replacement period is every 50,000 km (30,000 miles).

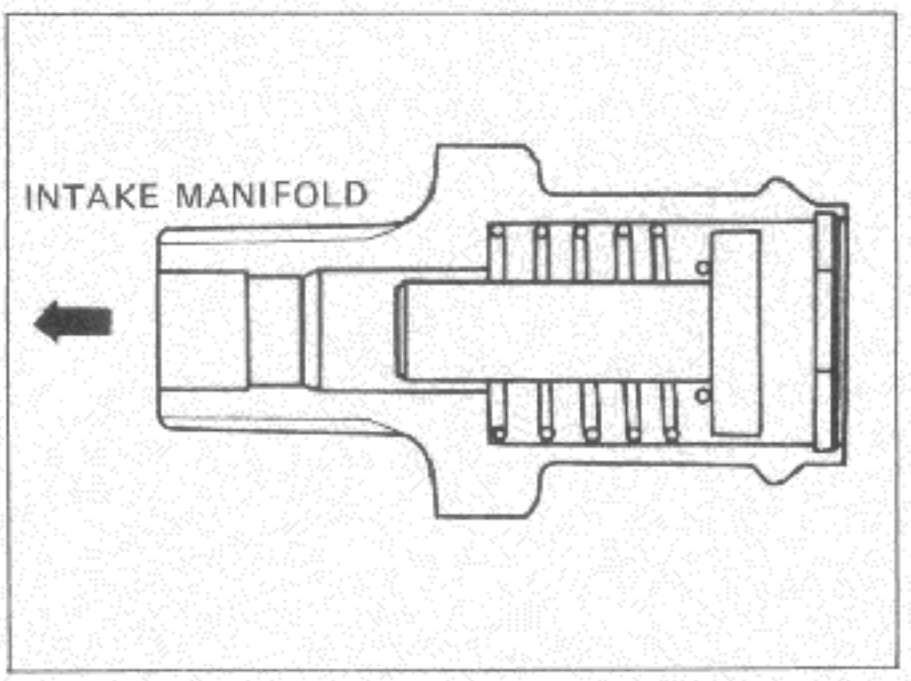


Fig. EC-8 Cross-sectional view of crankcase ventilation control valve

4. Crankcase steel net

If clogged with oil slush clean with gasoline and dry with compressed air.

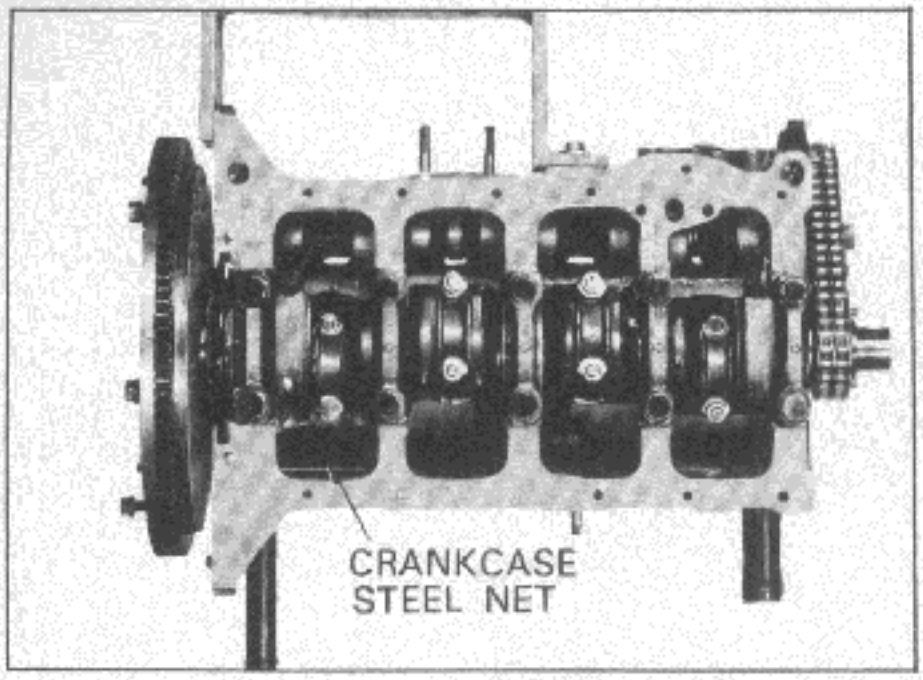


Fig. EC-9 Crankcase steel net in cylinder block

EXHAUST EMISSION CONTROL SYSTEM

Adjust the throttle opener after sufficiently warming up the engine. Make sure that the choke valve is fully open.

In the following subparagraphs, two methods:

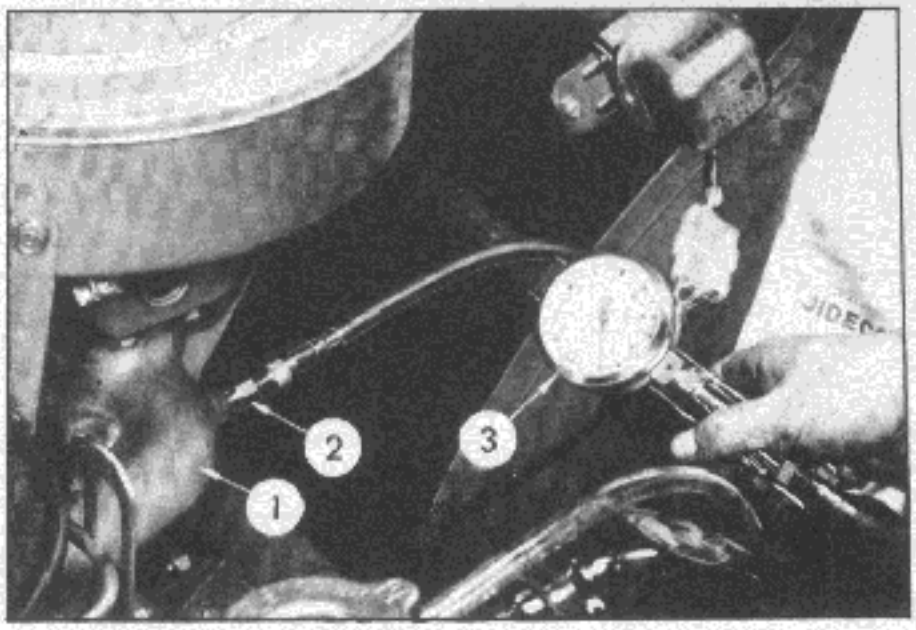
1) Adjustment with vacuum gauge and tachometer

2) Adjustment only with a tachometer; are described. When a highly accurate vacuum gauge is available, use it.

Adjustment with vacuum gauge and tachometer

1. Installing tachometer of the engine tester and vacuum gauge

Install a connector on the blind hole of the intake manifold (A 1/8 inch tapered screw is installed,), and connect the vacuum tube.



1	Intake manifold	3	Vacuum gauge
2	Connector		

Fig. EC-10 Vacuum gauge installation

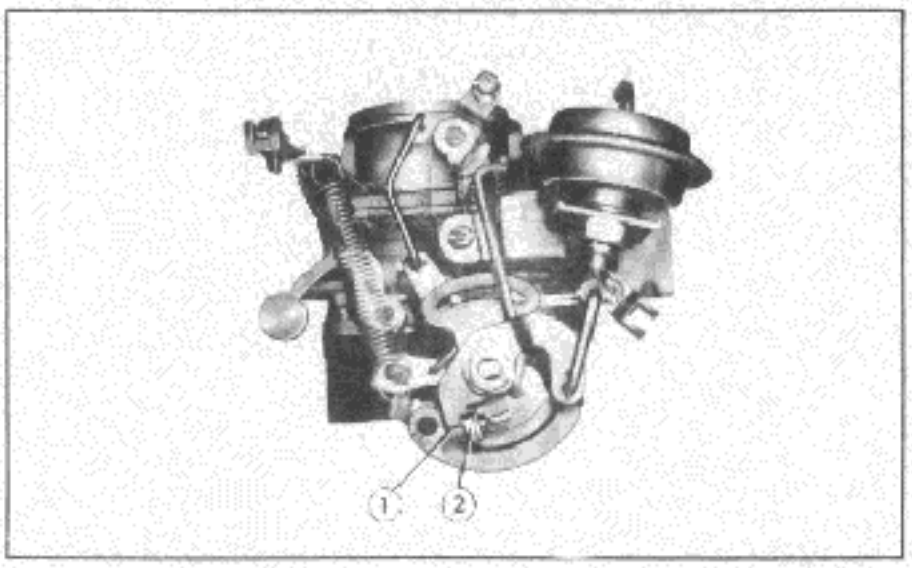
2. Connect the servo diaphragm vacuum tube directly to the intake manifold connector without laying through the control valve.

3. With negative pressure (vacuum) in the intake manifold, the servo diaphragm operates, and thus, the primary throttle valve is opened. When the servo diaphragm normally operates, engine speed rises reaching 1,700 to 1,800 rpm. When engine speed does not reach this range, turn adjusting screw properly. (See Figure EC-11.)

(1) When engine speed is lower than the prescribed range, turn the adjusting screw clockwise.

(2) When engine speed is higher than the prescribed range, turn the adjusting screw counterclockwise.

Upon completion of the adjustment, set the adjusting screw lock nut stationarily, and make sure that engine speed is in the prescribed range correctly.



1	Lock nut	2	Adjusting screw

Fig. EC-11 Servo diaphragm adjusting screw

4. Disconnect the servo diaphragm vacuum tube from the intake manifold, and connect it to the control valve. Connect the vacuum tube of the control valve to the intake manifold (normal piping).

5. As the servo diaphragm operates, the link connected to the primary throttle valve shaft controls primary throttle valve opening. When engine speed is increased to approximately 3,000 rpm and lowered naturally from this speed, changes in servo diaphragm link stroke, intake manifold vacuum, and engine speed are as shown in Figure EC-12.

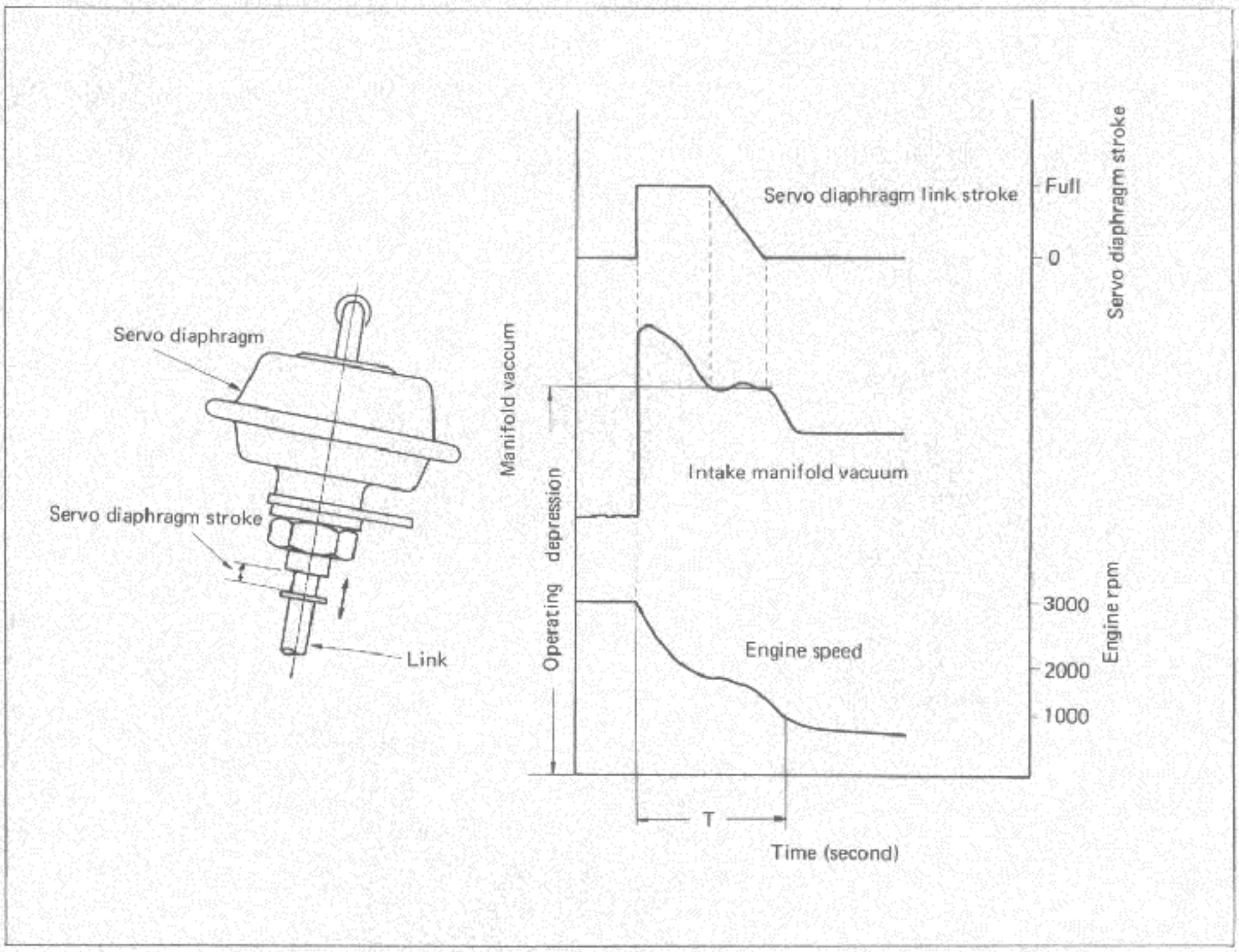


Fig. EC-12 Changes in servo diaphragm link stroke, intake manifold vacuum and engine speed

As engine speed lowers, negative pressure generated in the intake manifold also lowers. However, dropping of negative pressure in the intake manifold is suspended for a few seconds by operating the servo diaphragm and control valve. (In the graph shown in the Figure EC-12, curve is comparatively flat.) Thus, condition under which HC emission gas is easily generated is controlled.

The comparatively flat portion of the curve shown in the Figure EC-12 is called "Operating depression".

6. Operating depression changes depending on altitude, and thus, servo diaphragm and control valve operations are adjusted in coincidence with altitude at which the vehicle is driven automatically. The graph shown in the Figure EC-13 indicates change in operating depression for changes in atmospheric pressure and altitude.

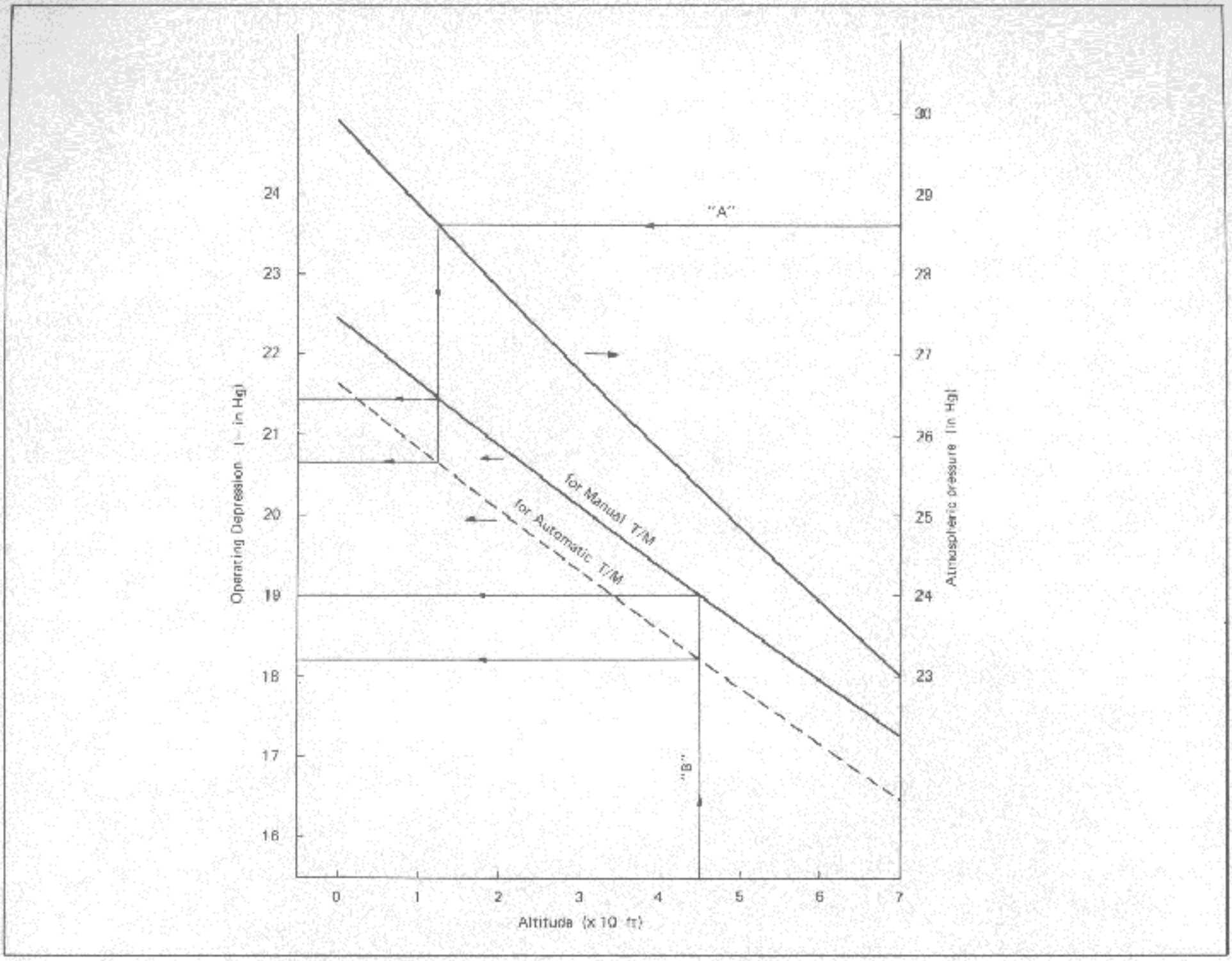
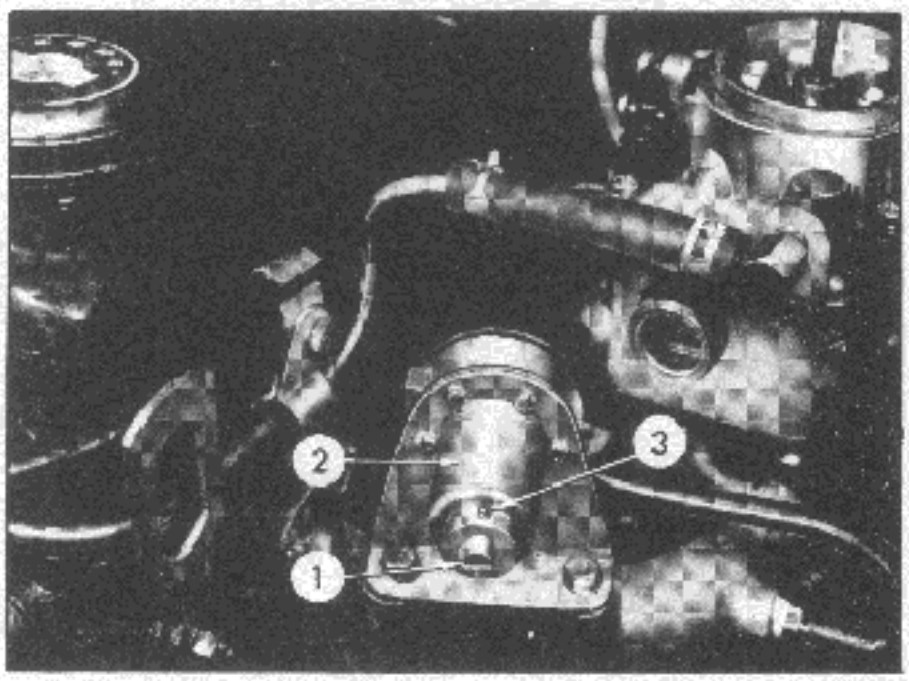


Fig. EC-13 Changes in operating depression for changes in atmospheric pressure and altitude

How to read the Figure EC-13 (Determining operating depression) and adjustment of control valve:

(1) When atmospheric pressure is known, operating depression is found by following arrow line "A". When altitude is known, operating depression is found by following arrow line "B".

(2) Turn the adjusting screw of the control valve (See the Figure EC-14.) and adjust the control valve so that negative pressure in the intake manifold is suspended as is for a few seconds at the value of operating depression found as described in (1) above while engine speed lowers from 3,000 rpm to 1,000 rpm.



1	Vacuum adjusting screw	3	Lock screw
2	Control valve		

Fig. EC-14 Control valve

Adjustment only with a tachometer

1. Install a tachometer of the engine tester and follow the instructions described in "2" thorugh "4" for "Adjustment with vacuum gauge and tachometer" above.

2. With the engine unloaded, increase engine speed to 3,000 rpm, and release the throttle valve lever. Normally, engine speed lowers as shown in Figure EC-12.

3. Time required in lowering engine speed from 3,000 rpm to 1,000 rpm is normally 4.0 ±0.5 seconds in case of manual transmission or 3.0±0.5 seconds in case of automatic transmission.

(1) When engine speed lowers in time shorter than this range, turn the adjusting screw of the control valve clockwise.

(2) When engine speed lowers in time longer than this range, turn the adjusting screw of the control valve counterclockwise.

Upon completion of the adjustment, tighten the lock screw, and make sure again that throttle valve closing timing is correct.

Note: a. When turning the vacuum adjusting screw, do not depress the screw with a screwdriver.

b. When measuring operating depression and engine speed lowering timing, be sure to tighten the lock screw of the control valve first.

c. When the servo diaphragm does not draw the link or operating depression is high vacuum, turn the vacuum adjusting screw clockwise.
When the servo diaphragm draws the link at idling speed or operating depression is low vacuum, turn the vacuum adjusting screw counterclockwise.
Set the lock screw stationarily, repeat the above described adjustment, and make sure that operating depression is correct and that engine speed settles down at the rated idling speed.

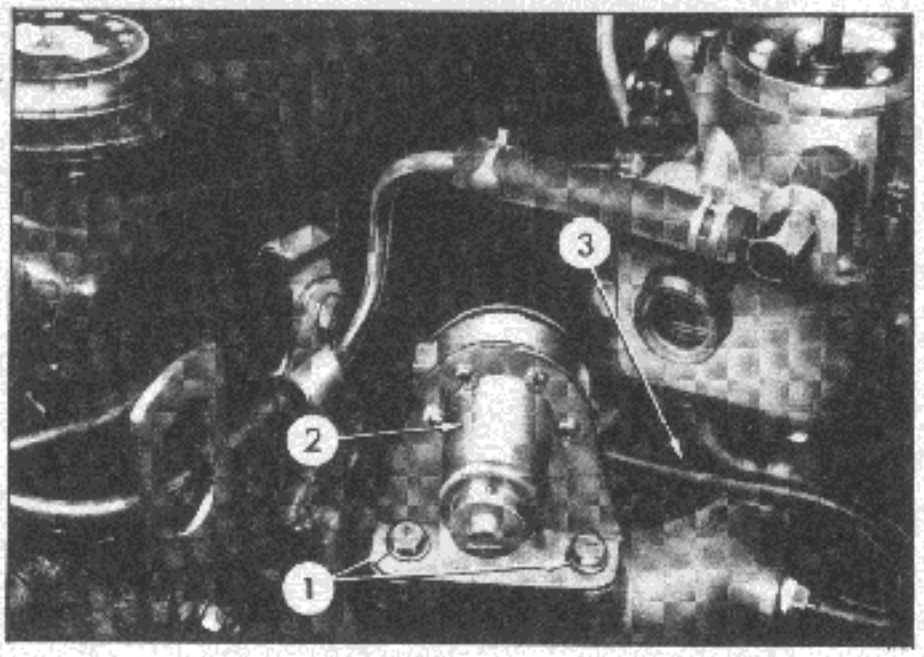
Removal

When replacing the control valve and servo diaphragm, the following instructions apply:

Control valve

1. Disconnect the vacuum tube from the control valve.

2. Remove two set screws.



1	Installation bolt	3	Vacuum tube
2	Control valve		

Fig. EC-15 Removing control valve

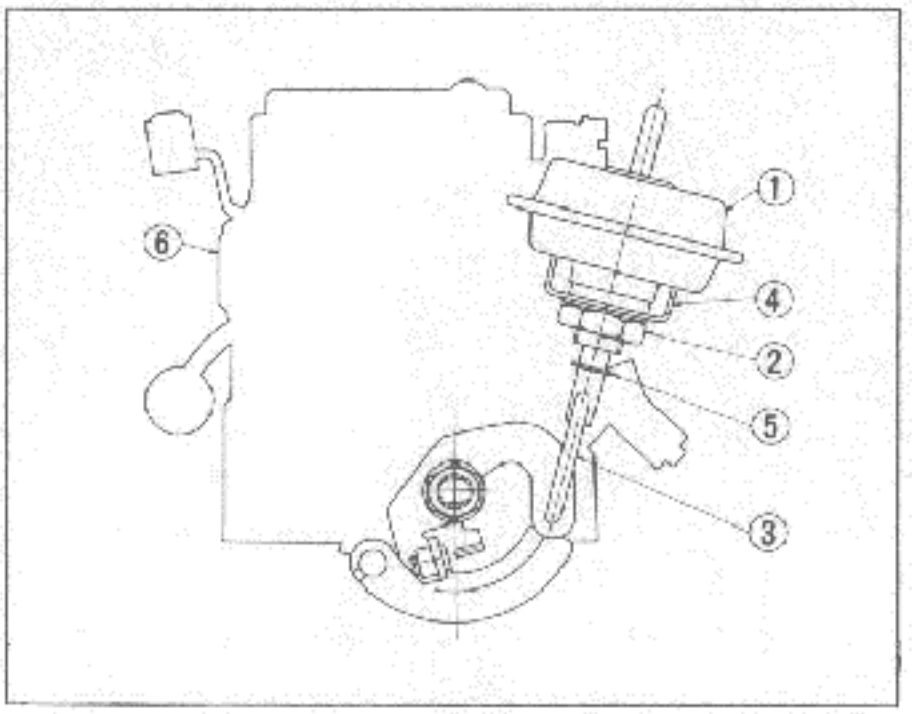
Servo diaphragm

1. Disconnect the vacuum tube from the servo diaphragm.

2. Remove the servo diaphragm together with the carburetor.

3. Withdraw the cotter pin, and remove the link.

4. Loosen the lock nut, and remove the servo diaphragm from the carburetor.



1	Servo diaphragm	4	Bracket
2	Lock nut	5	Stopper
3	Link	6	Carburetor

Fig. EC-16 Servo diaphragm

EVAPORATIVE EMISSION CONTROL SYSTEM

Checking fuel tank, vapor-liquid separator and vapor vent line

1. Check all hoses and fuel tank filler cap.

2. Disconnect the vapor vent line connecting flow guide valve to vapor-liquid separator.

3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way change cock) to the end of the vent line.

4. Supply fresh air into the vapor vent line through the cock little by little until the pressure becomes 368 mm (14.5 in) Aq.

5. Shut the cock completely and leave it that way.

6. After 2.5 minutes, measure the height of the liquid in the manometer.

7. Variation of height should remain within 25.4 mm (1.0 in) Aq.

8. When the filler cap does not close completely the height should drop to zero in a short time.

9. If the height does not drop to zero in a short time when the filler cap is removed, it is the cause of the stuffy hose.

Note: In case the vent line is stuffy, the breathing in fuel tank is not thoroughly made, thus causing insufficient delivery of fuel to engine or vapor lock. It must therefore be repaired or replaced.

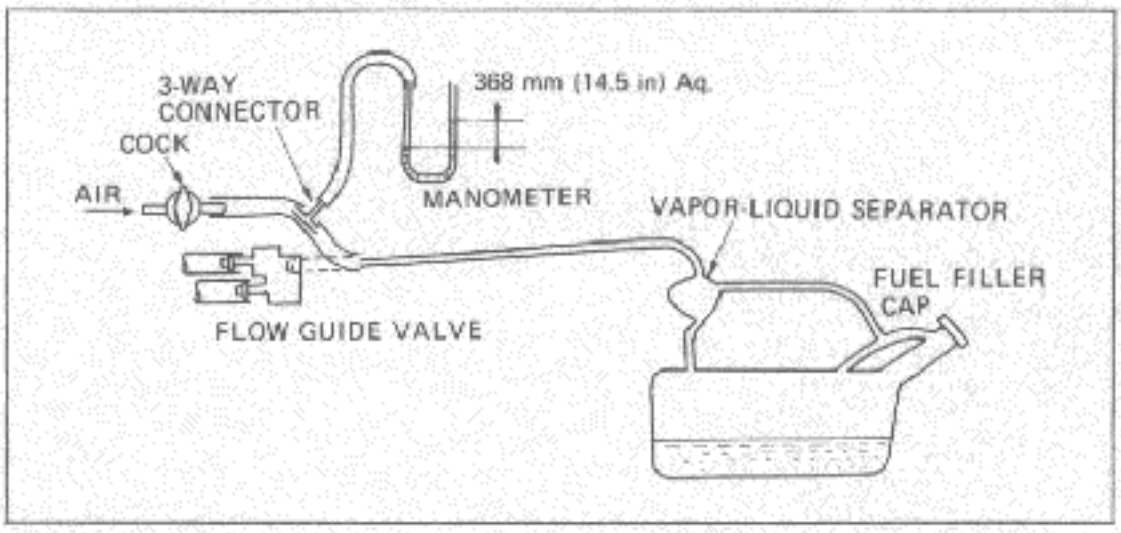


Fig. EC-17 Checking evaporative emission control system

Checking flow guide valve

1. Disconnect all hoses connected to the flow guide valve.

2. While lower pressure air is pressed into the flow guide valve from the ends of vent line of fuel tank side, the air should go through the valve and flow to crankcase side. If the air does not flow the valve should be replaced. But when the air is blown from crankcase side, it should never flow to the other two vent lines.

3. While the air is pressed into the flow guide valve from carburetor air cleaner side, it flows to the fuel tank side and/or crankcase side.

4. This valve opens when the inner pressure 10 mm (0.4 in) Hg. In case of improper operations or breakage, replace it.

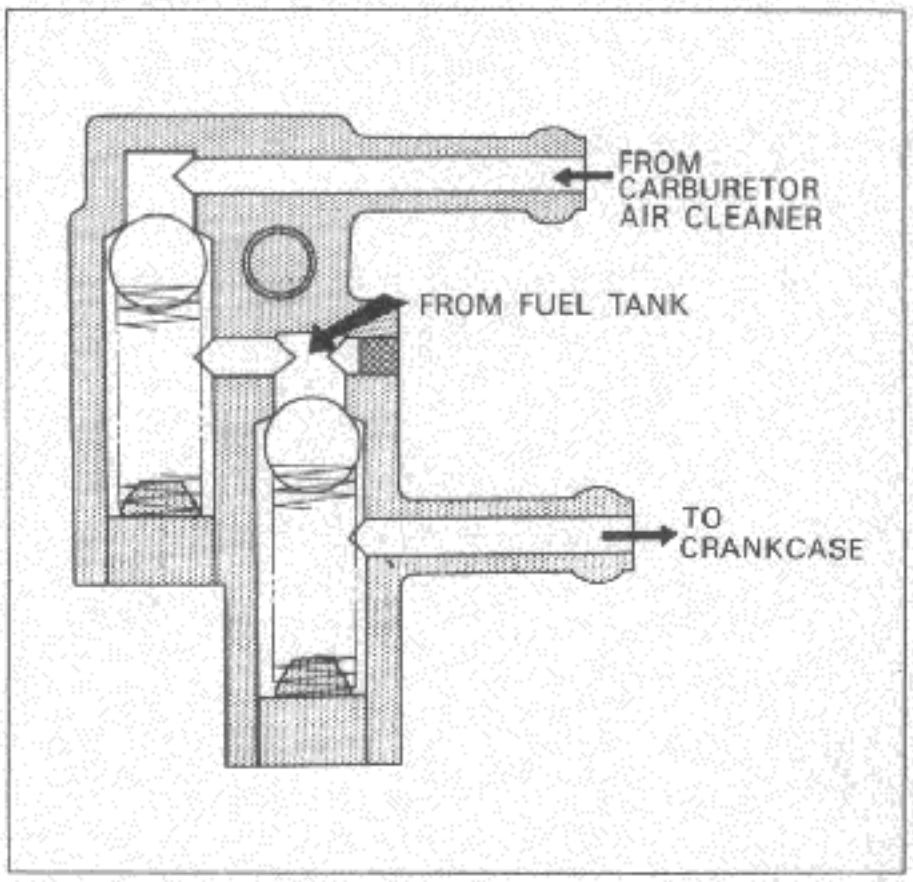


Fig. EC-18 Flow guide valve

ADJUSTING IGNITION TIMING, ENGINE IDLING SPEED AND GAS MIXTURE

CONTENTS

ADJUSTING IGNITION TIMING

1. Check the spark plugs and distributor breaker points for condition.

2. Thoroughly wipe off dirt and dust from the timing mark on the crank pulley (Figure EC-19).

3. Warm up the engine sufficiently.

4. Install a timing light on the No. 1 cylinder spark plug wire, and install a tachometer.

5. Loosen the set screw to such an extent that the distributor can be moved by hand.

6. Set idling speed to approximately 700 rpm.

7. Adjust the ignition timing to 5°BTDC (Before Top Dead Center) by the use of timing light.

8. Lock the distributor set screw, and make sure that the timing is correct.

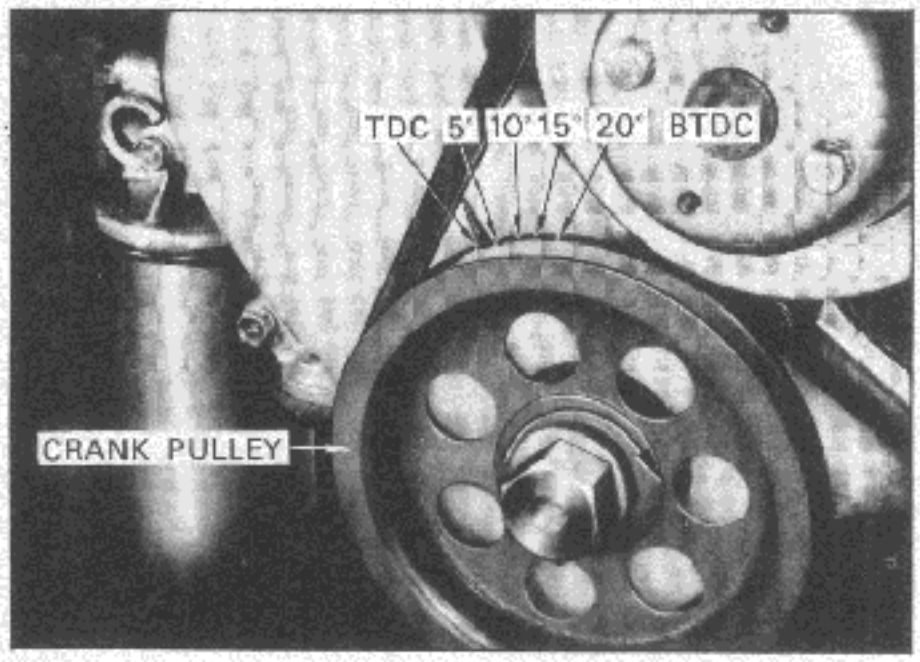


Fig. EC-19 Timing marks on crank pulley

ADJUSTING IDLING SPEED AND GAS MIXTURE

Adjusting only with a tachometer

1. Warm up the engine sufficiently.

2. Continue engine operation for one minute under idling speed.

3. Adjust the throttle adjusting screw and idle adjusting screw correctly so that best engine idling speed is obtained. (750 rpm for vehicle with manual transmission and 780 rpm for vehicle with automatic transmission.)

4. Turn the idle adjusting screw clockwise (for a leaner mixture) and reduce engine speed to 700 rpm (750 rpm for vehicle with automatic transmission).

5. In the case of an automatic transmission model, make sure that idling speed is approximately 600 rpm when the shift lever is set to "D" range.

Adjusting with CO meter and tachometer

1. Warm up the engine sufficiently.

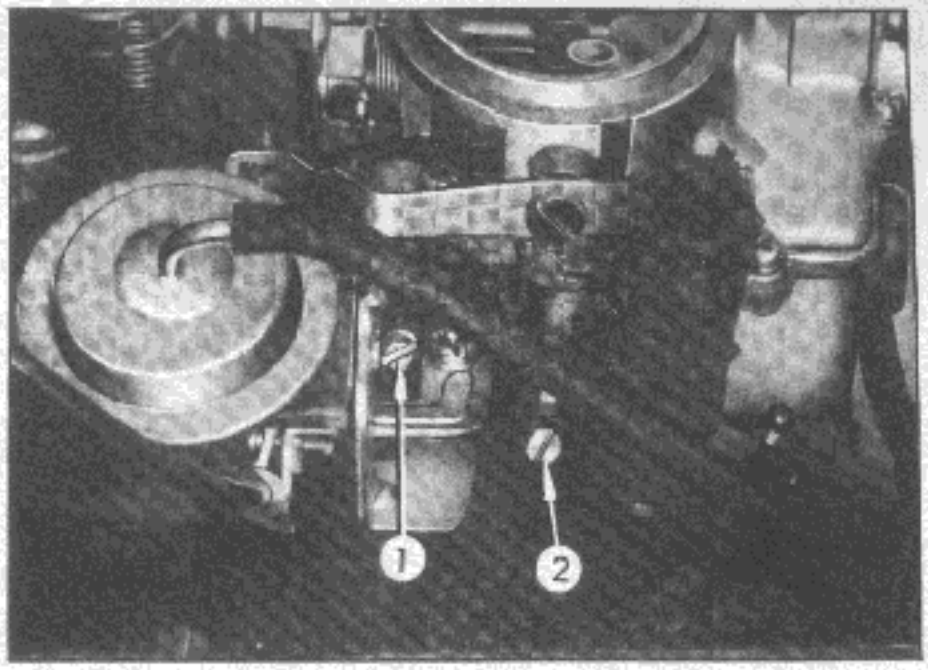
2. Continue engine operation for one minute under idling speed.

3. Adjust the throttle adjusting screw so that engine speed is 700 rpm for vehicle with manual transmission (750 rpm for vehicle with automatic transmission).

4. Adjust the idle adjusting screw so that CO percentage is 2.0 to 3.0%.

5. Repeat adjustments as described in 3. and 4. above so that CO percentage is 2.0 to 3.0 at 700 rpm (CO percentage 2.0 to 3.0 750 rpm in the case of an automatic transmission model).

6. In the case of an automatic transmission model, make sure that idling speed is approximately 600 rpm when the shift lever is set to "D" range.



1	Throttle adjusting screw	2	Idle adjusting screw

Fig. EC-20 Throttle adjusting screw and idle adjusting screw

TROUBLE DIAGNOSES AND CORRECTIONS

Troubles	Possible causes	Remedies
Rough engine idle or engine stop	Incorrect carburetor adjustment idle speed, idle mixture, choke setting Incorrect basic ignition timing	Adjust idle speed mixture and timing.
Engine idle too fast	Trouble in throttle link and cable Incorrect throttle opener adjustment Trouble in control valve	Check throttle link and cable. Adjust throttle opener. Replace control valve.
Car knock when coasting	Incorrect throttle opener adjustment Trouble in control valve	Adjust throttle opener. Replace control valve.

RECOMMENDED PERIODICAL MAINTENANCE

Item	Interval km (miles)
1. Engine	
Check and adjust ignition timing.	every 5,000 (3,000)
Adjust engine idling.	5,000 (3,000)
Engine tune-up.	20,000 (12,000)
Check spark plugs.	5,000 (3,000)
Replace spark plugs.	20,000 (12,000)
Check high tension cables.	20,000 (12,000)
Check distributor breaker points.	5,000 (3,000)
Replace distributor breaker points.	20,000 (12,000)
Grease distributor cam and cam heel.	10,000 (6,000)
Replace carburetor air cleaner element.	40,000 (24,000)
2. Crankcase Emission Control	
Check hoses and piping connections for loose.	20,000 (12,000)
Check ventilation control valve for operation.	20,000 (12,000)
3. Exhaust Emission Control	
Check throttle opener setting (throttle valve opening position and vacuum)	20,000 (12,000)
4. Evaporative Emission Control	
Check hoses, hose connectors and pipings for leaks.	20,000 (12,000)
Check flow guide valve for proper function.	20,000 (12,000)

SERVICE DATA AND SPECIFICATIONS

Type of crankcase emission control ..... Closed type

Type of exhaust emission control ..... Engine modification

Carburetor

Make ..... HITACHI

Model DCG306

Type ..... Down draft dual throat

Barrel				Primary	Secondary
Bore		mm (in) dia.	.....	26 (1.024)	30 (1.181)
Large venturi		mm (in) dia.	.....	20 (0.787)	26 (1.024)
Small venturi	1st	mm (in) dia.	.....	8 (0.315)	7 (0.276)
	2nd	mm (in) dia.	.....	–	13 (0.512)
Main jet			.....	#98	#135
Main air bleed			.....	#80	#80
Main nozzle		mm (in) dia.	.....	2.1 (0.083)	2.8 (0.110)
Slow jet			.....	#43	#50
Slow air bleed			.....	#220	#100
Power jet			.....	#60	
Accelerator pump injector		mm (in) dia.	.....	0.5 (0.020)	
Injection volume		cc (cu in)	.....	0.7 (0.04)	
Dumper spring		g (lb)	.....	1,000 (2.205)	
Choke spring		g (lb)	.....	110 (0.243)	
Fast idle			.....	17.5° (Throttle opening at full choke)	
Alternator					
Make			.....	HITACHI	
Model			.....	LT133-05	
Capacity			.....	12V-33A	
Distributor					
Make			.....	HITACHI	
Model			.....	D412-63	
Condenser		μF	.....	0.22	
Spark plug					
Make			.....	N.G.K.	
Model			.....	BP-6E	
Flow guide valve					
Make			.....	HITACHI	
Model			.....	FGA-1	
Opening pressure		mmHg (in Hg)	.....	10 (0.4)	
Control valve					
Make			.....	HITACHI	
Model			.....	TPA28-1	

Operating depression (at Sea level)			
	mmHg (in Hg)	.....	566 to 579 (22.3 to 22.8) for manual transmission
Servo diaphragm			
Full stroke	mm (in)	.....	5 (0.1969)
Operating stroke		.....	1,700 to 1,800 rpm of engine speed on no loading
Tune up data			
Basic timing		.....	5° BTDC/700 rpm
Idling speed		.....	700 rpm for manual transmission 600 rpm in the range of "Drive" for automatic transmission
CO percent setting	%	.....	2.0 to 3.0
Distributor dwell angle		.....	49° to 55° at 0.5 mm (0.02 in) of point gap
Spark plug gap	mm (in)	.....	0.8 to 0.9 (0.0315 to 0.0355)
Choke setting		.....	Manual

SERVICE JOURNAL OR BULLETIN REFERENCE

DATE	JOURNAL or BULLETIN No.	PAGE No.	SUBJECT

SERVICE MANUAL

MODEL
A10 & A12
ENGINE

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EE

ENGINE ELECTRICAL SYSTEM

EE

BATTERY

CONTENTS

REMOVAL

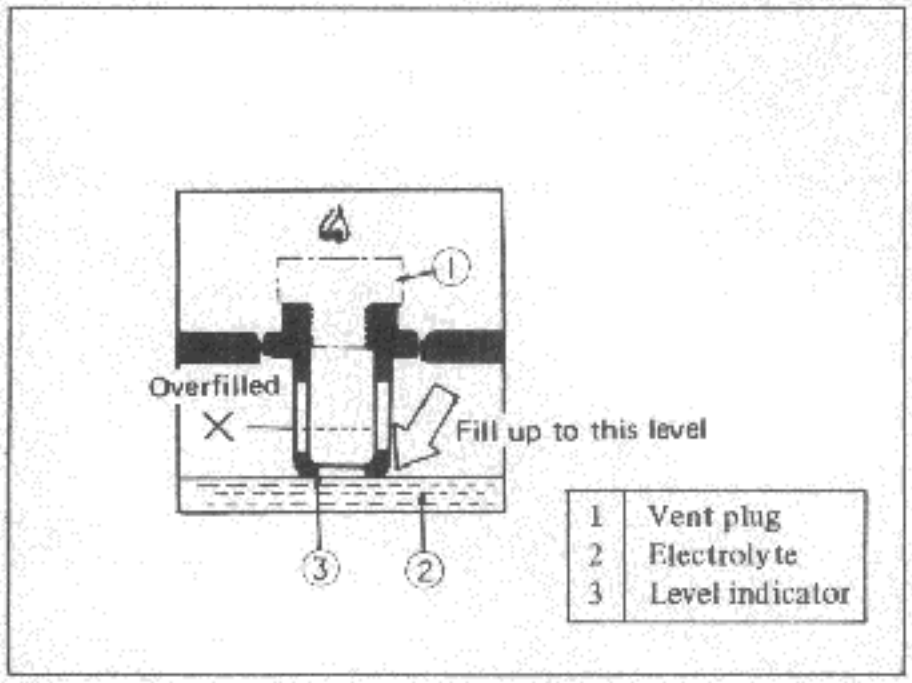
1. Disconnect the negative (-) terminal first and then the positive (+) terminal.

2. Remove the retainer nuts and take off retainer.

3. Release retainer bolts and remove battery.

CHECKING ELECTROLYTE LEVEL

Adjust the electrolyte level in the battery when the battery is in a fully charged condition. The electrolyte should maintain its indicated correct level in the battery. No water other than distilled water should be added.

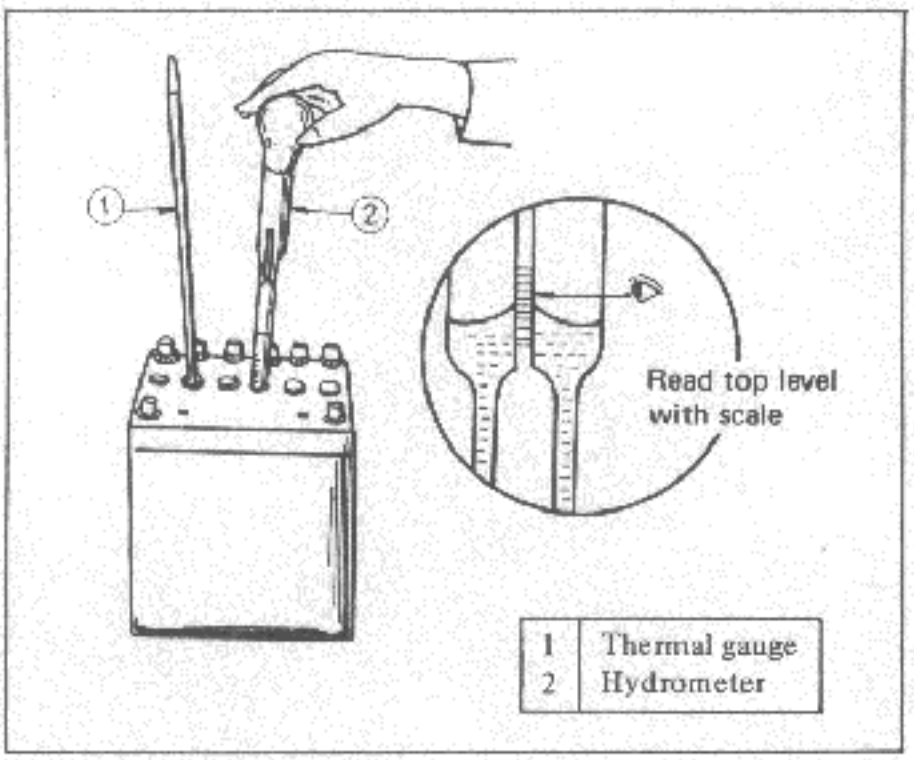


1	Vent plug
2	Electrolyte
3	Level indicator

Fig. EE-1 Electrolyte level

CHECKING SPECIFIC GRAVITY

The specific gravity of the battery liquid is measured by means of a hydrometer. When, according to the table described later, the charging of the battery is below 60 percent [the specific gravity is below 1.20 converted into the condition at 20°C (68°F)] and also when the difference in the specific gravity of the individual cells is above 0.025, the battery must be changed or adjusted.



1	Thermal gauge
2	Hydrometer

Fig. EE-2 Checking specific gravity

– Temperature conversion in measuring specific gravity –

The standard specific gravity of the electrolyte is obtained when the battery is fully charged at an electrolyte temperature of 20°C (68°F).

When temperature rises 1°C (1.8°F) the specific gravity decreases 0.0007, and reversely, when temperature drops 1°C (1.8°F) the specific gravity increases 0.0007. Therefore, assuming the specific gravity at t°C is St, S_{20}, the specific gravity at 20°C (68°F), is calculated according to the following expressions.

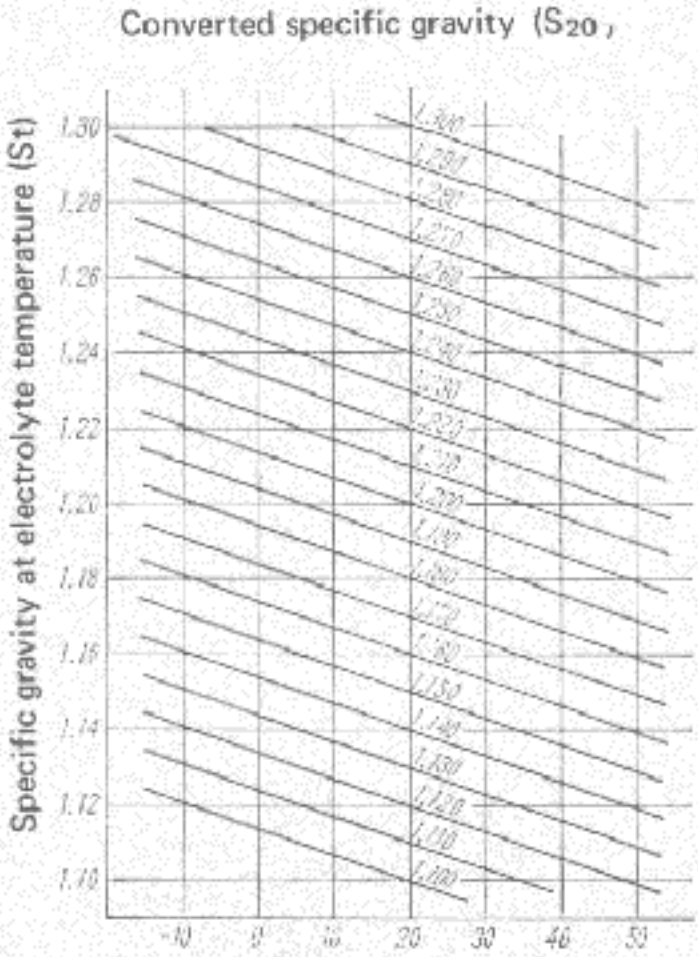
$$S_{20} = St + 0.0007\ (t - 20)$$

If, $0.0007\ (t - 20)$ is X

$$S_{20} = St + X$$

Accordingly, if X is known beforehand, S_{20} can be obtained easily. The values of X are shown in the following table.

Temperature °C (°F)	X	Temperature °C (°F)	X	Temperature °C (°F)	X
0 (32.0)	-0.014	14 (57.2)	-0.004	28 (82.4)	0.006
1 (33.8)	-0.013	15 (59.0)		29 (84.2)	
2 (35.6)		16 (60.8)	-0.003	30 (86.0)	0.007
3 (37.4)	-0.012	17 (62.6)	-0.002	31 (87.8)	0.008
4 (39.2)	-0.011	18 (64.4)	-0.001	32 (89.6)	
5 (41.0)		19 (66.2)		33 (91.4)	0.009
6 (42.8)	-0.010	20 (68.0)	0	34 (93.2)	0.010
7 (44.6)	-0.009	21 (69.8)	0.001	35 (95.0)	0.011
8 (46.4)	-0.008	22 (71.6)		36 (96.8)	
9 (48.2)		23 (73.4)	0.002	37 (98.6)	0.012
10 (50.0)	-0.007	24 (75.2)	0.003	38 (100.4)	0.013
11 (51.8)	-0.006	25 (77.0)	0.004	39 (102.2)	
12 (53.6)		26 (78.8)		40 (104.0)	0.014
13 (55.4)	-0.005	27 (80.6)	0.005		



The state of discharge of the battery can be determined by checking the specific gravity according to the following table. (The electrolyte level should be satisfactory).

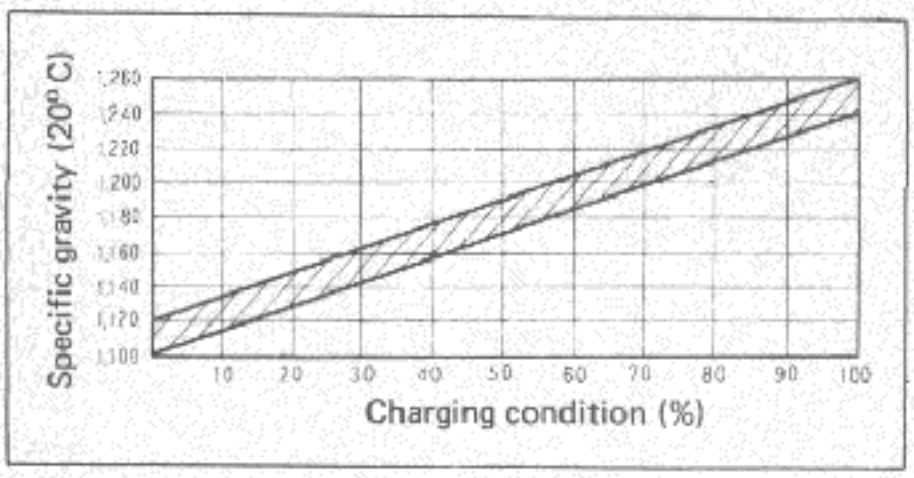


Fig. EE-3

CHARGING

When the specific gravity of the electrolyte is below 1.20 with the electrolyte level being satisfactory, it is necessary to recharge the battery. Whenever, a quick charge is carried out, the negative (-) terminal of the battery must be disconnected. The corroded terminal posts of the battery should be cleaned with warm water of bicarbonate of soda solution prior to charging. The following points should be observed in charging.

1. If the electrolyte level is below the plates, add distilled water.

2. Remove all the vent plugs and keep them at a particular place.

3. Keep the electrolyte temperature below 45°C (113°F) during charging.

4. During charging the voltage increases gradually until it reaches the particular maximum value (2.5 V/cell). The charging is completed when this value stays almost constant for more than one hour and all cells gas freely.

5. If the specific gravity is above 1.260 (20°C or 68°F) after charging, adjust it by adding distilled water.

6. Keep any open flame away from the place where the battery is being charged.

7. Replace vent plugs and clean the upper face of the battery after charging.

INSTALLATION

1. Mount the battery firmly so that the bouncing or shaking of the vehicle may not move it.

2. Clean cable terminals, coat them thinly with grease and tighten nuts securely.

STARTING CIRCUIT

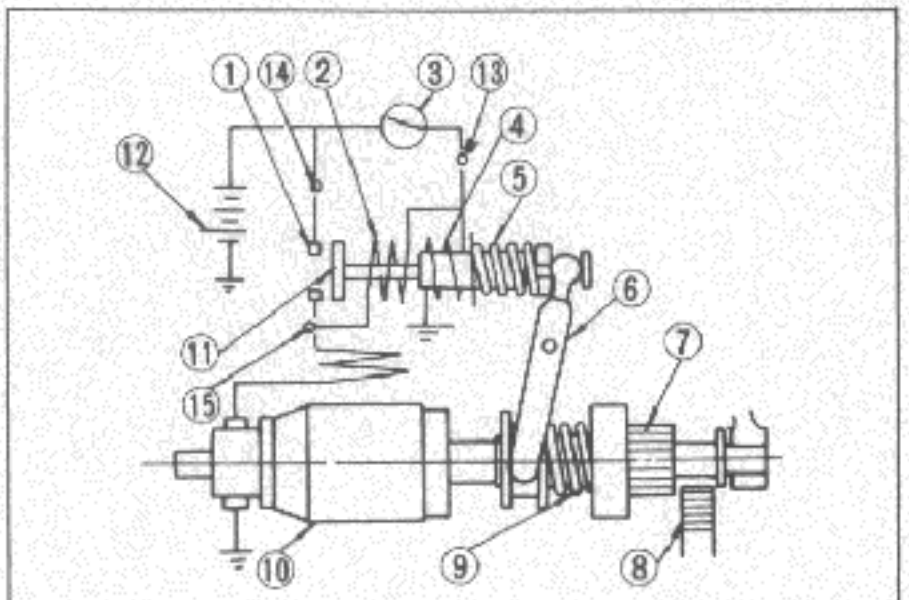
The purpose of this starting system is to crank the engine.

When the ignition switch is set to "start", current flows through the "series" and "shunt" coils of the solenoid and thus, the solenoid is excited. The plunger is pulled into the solenoid so that it operates the shift lever to engage the drive pinion with flywheel ring gear, and the magnetic switch is closed.

When the contacts (stationary and movable) are closed, the motor operates to crank the engine, and the "series" coil of the solenoid is cut out. The magnetic force of the "shunt" coil is sufficient to hold the pinion in mesh after shifting the system.

When the engine is operated, and the ignition switch is set to "ON", the "series" coil demagnetizes the "shunt" coil, and the return spring actuates the plunger to return to the original position. Consequently, the motor stops.

More positive meshing and demeshing of the pinion and the ring gear teeth are secured by means of the over-running clutch. The over-running clutch employs a shift lever to slide the pinion along the armature shaft so as to engage or disengage with the ring gear teeth. The over-running clutch is designed to transmit driving torque from the motor armature to the ring gear, and to permit the pinion over-running the armature when the engine is started.



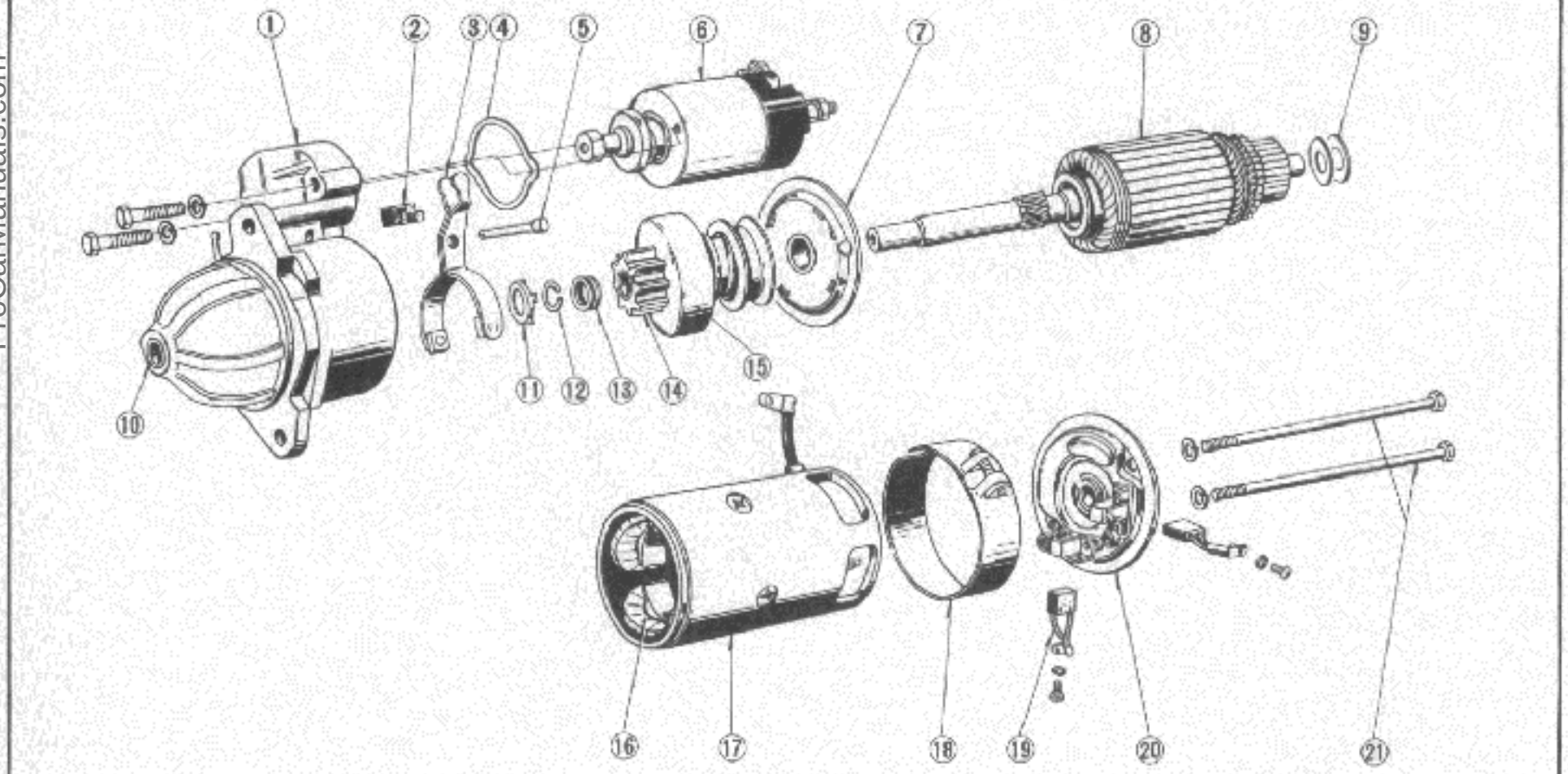
1	Stationary contact	6	Shift lever	11	Moving contact
2	Series coil	7	Pinion	12	Battery
3	Starting switch	8	Ring gear	13	"S" terminal
4	Shunt coil	9	Pinion sleeve spring	14	"B" terminal
5	Return spring	10	Armature	15	"M" terminal

Fig. EE-4 Starting motor circuit

STARTING MOTOR

CONTENTS

CONSTRUCTION



1	Gear case	8	Armature	15	Over running clutch
2	Dust cover	9	Thrust washer	16	Field coil
3	Shift lever	10	Metal	17	Yoke
4	Dust cover	11	Stopper washer	18	Brush cover
5	Shift lever pin	12	Stopper clip	19	Brush
6	Magnetic switch	13	Pinion stopper	20	Rear cover
7	Center bracket	14	Pinion	21	Through bolt

Fig. EE-5 Exploded view of starting motor (S114-87L)

REMOVAL

1. Disconnect the battery ground cable.

Disconnect the black and yellow wire from the magnetic switch terminal, and black battery cable from the battery terminal.

2. Remove two bolts used to secure the starting motor on the clutch housing. Pull the starter assembly forward and remove the starting motor.

DISASSEMBLY

1. Remove the brush cover, and take out the brush.

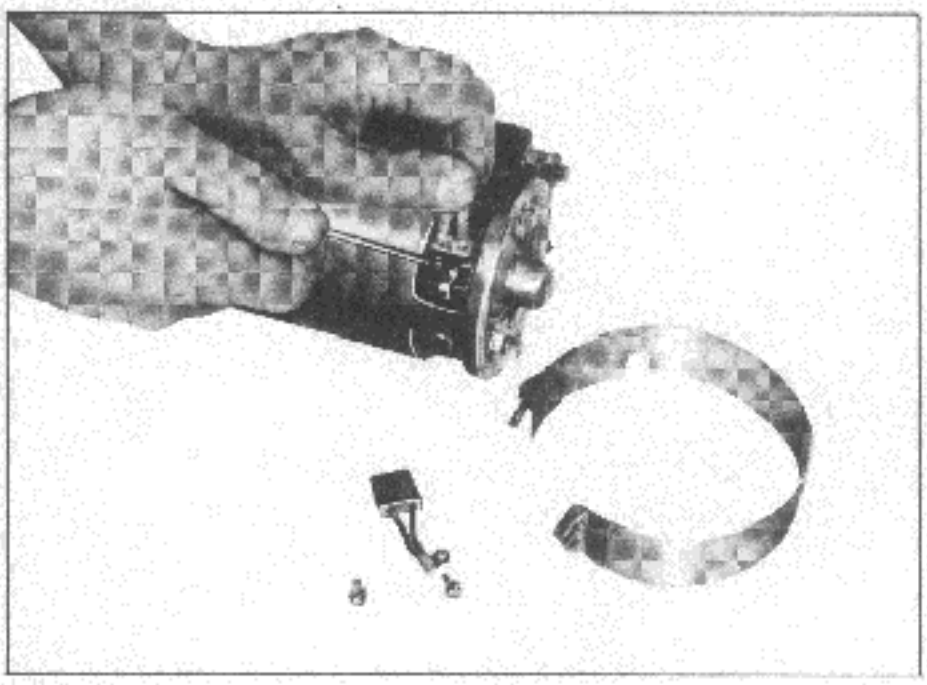


Fig. EE-6 Removing the brush cover

2. Loosen the nut used to secure the connecting plate to the magnetic switch "M" terminal. Remove two screws used to secure the magnetic switch. Remove the cotter pin, and withdraw the shift lever pin. Now, remove the magnetic switch.

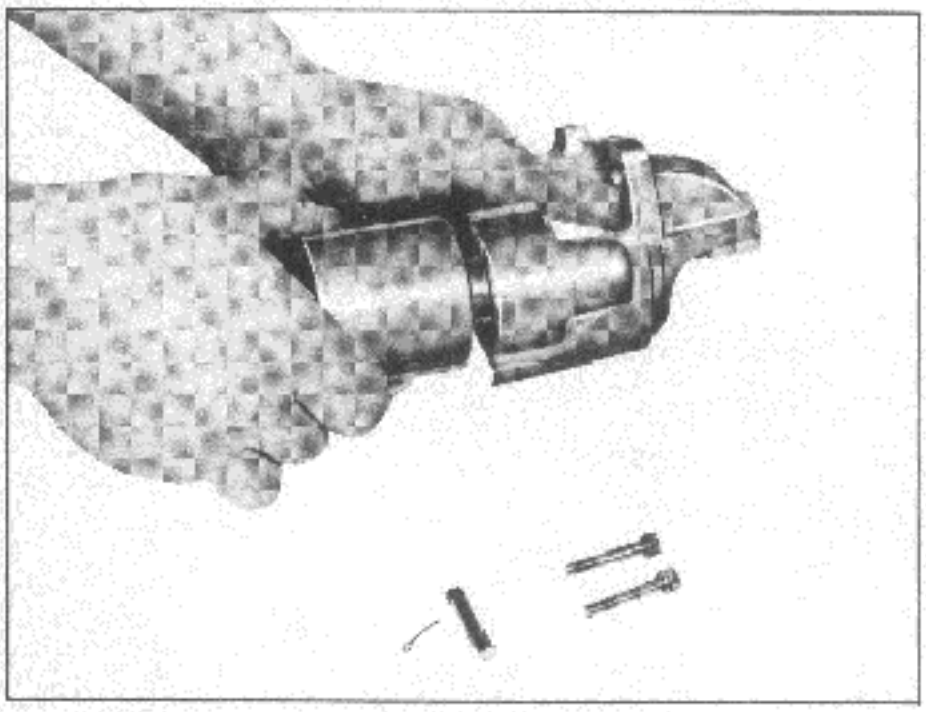


Fig. EE-7 Removing the magnetic switch assembly

3. Remove two through bolts and rear cover assembly. Remove the yoke assembly by lightly tapping with a wooden mallet.

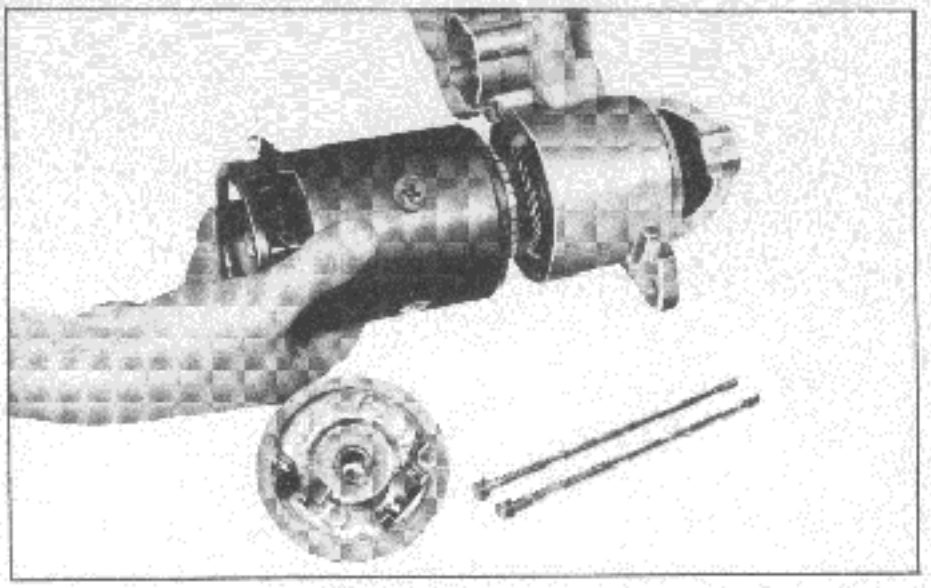


Fig. EE-8 Removing the brush cover and yoke assembly

4. Withdraw the armature assembly and shift lever.

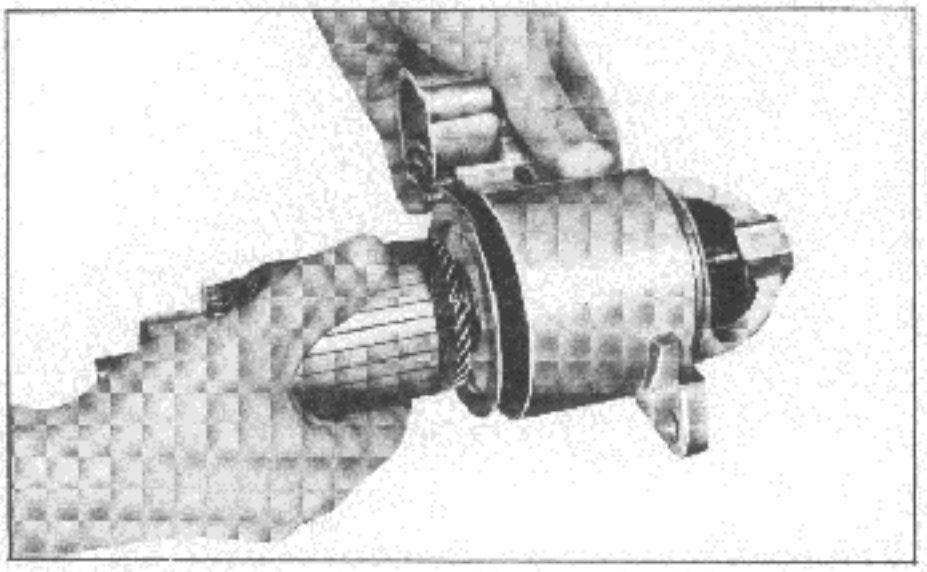


Fig. EE-9 Removing the armature assembly and shift lever

5. Remove the pinion stopper from the armature shaft end. To remove the stopper first, remove the stopper washer, and push the stopper to the over-running clutch side, and after removing the stopper clip, remove the stopper together with the over-running clutch. Withdraw the over-running clutch assembly from the armature shaft.

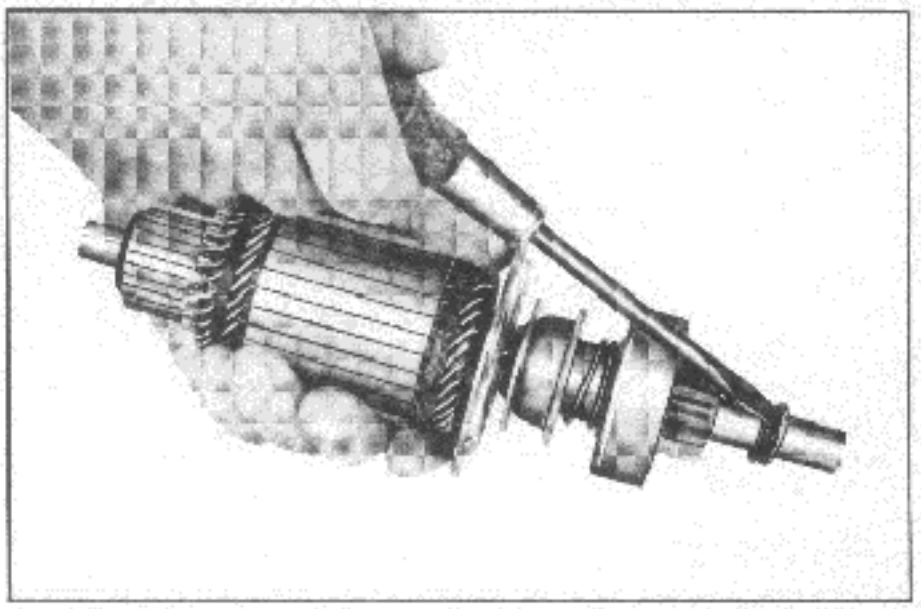


Fig. EE-10 Removing the over-running clutch assembly

CLEANING AND INSPECTION

Clean all disassembled parts. Be careful not to use grease dissolving solvent for cleaning of the over-running clutch, armature assembly, magnetic switch assembly and field coils since solvent dissolves grease packed in the clutch mechanism and damages the coils or insulators.

Check them for damage or excessive wear. Replace them as required.

Terminal

Check the terminal for damage and wear, and replace if necessary.

Field coil

Check the field coil for insulation. If the coil insulator is damaged or worn, replace.

Testing field coil for continuity

Connect test probe of a circuit tester or a resistance counter to the field coil positive (+) terminal and positive (+) brush holder. If the tester indicates no continuity, the field circuit or coil is open.

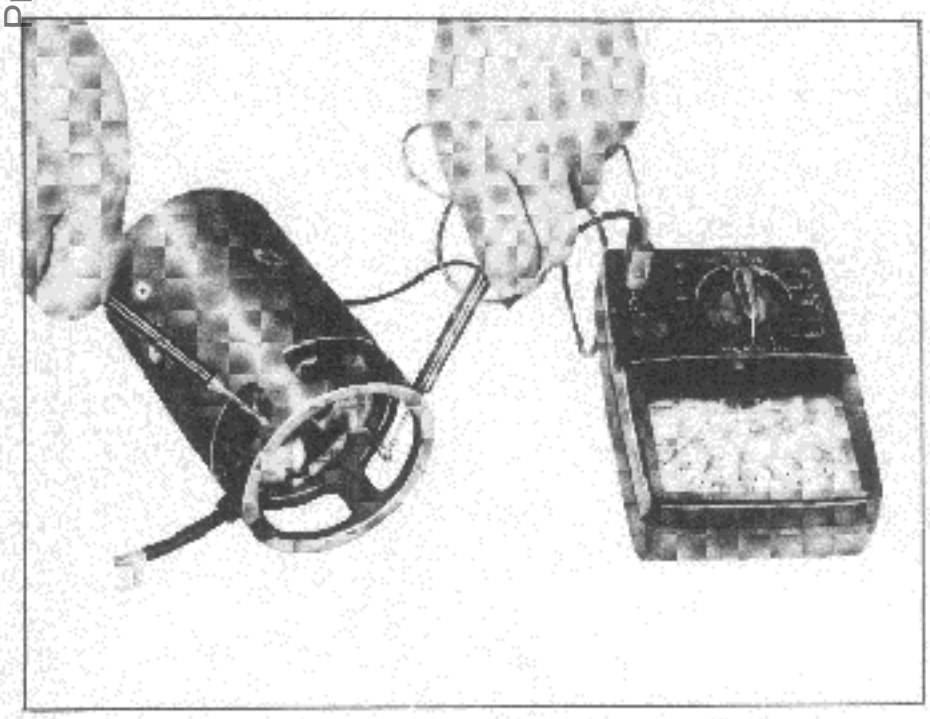


Fig. EE-11 Continuity test of field coil

Testing field coil for ground

Place one probe of a circuit tester onto the yoke and the other on to the field coil positive (+) terminal. If resistance is read, the field coils are grounded.

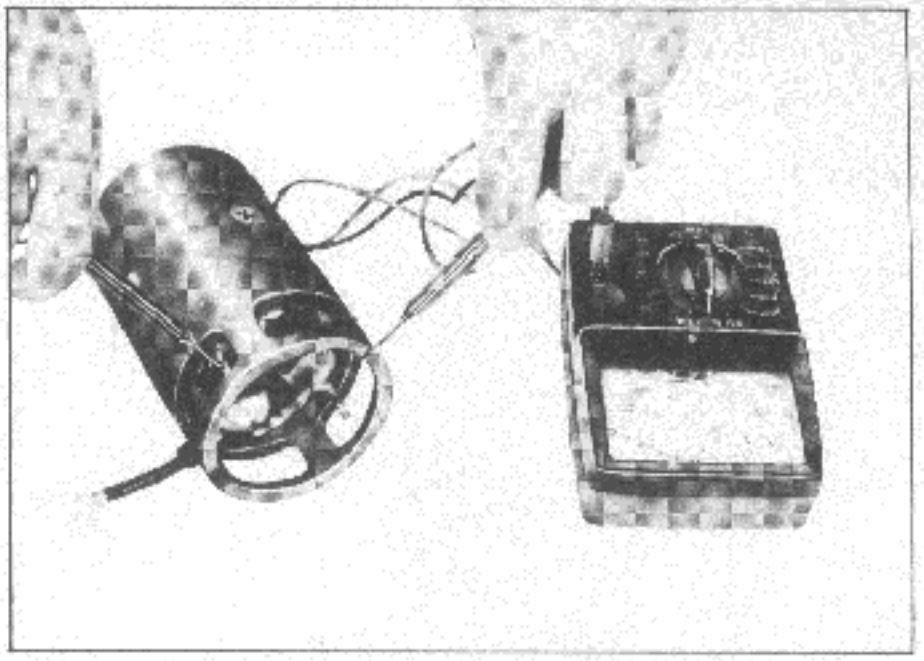


Fig. EE-12 Ground test of field coil

Field coil test for short-circuit

Unsolder the connected section of each coil and check the circuit with a tester in the same manner as described above.

When the coil is defective, replace the coil.

Brush and brush lead wire

Check the brush contact for surface condition and wear. When the brush contact is loose, replace the brush.

If the brush is worn and height is less than 6.5 mm (0.2569 in), replace it.

Check the connection of the lead clip and lead wire for conditions.

Check brush holders and spring clip to ensure that they are not deformed or bent and properly hold brushes against the commutator.

If the brushes or brush holders are dirty, clean.

Brush spring tension

Measure the brush spring tension by the use of a spring scale as shown in Figure EE-13. The reading should be approximately 0.8 kg (1.76 lb).

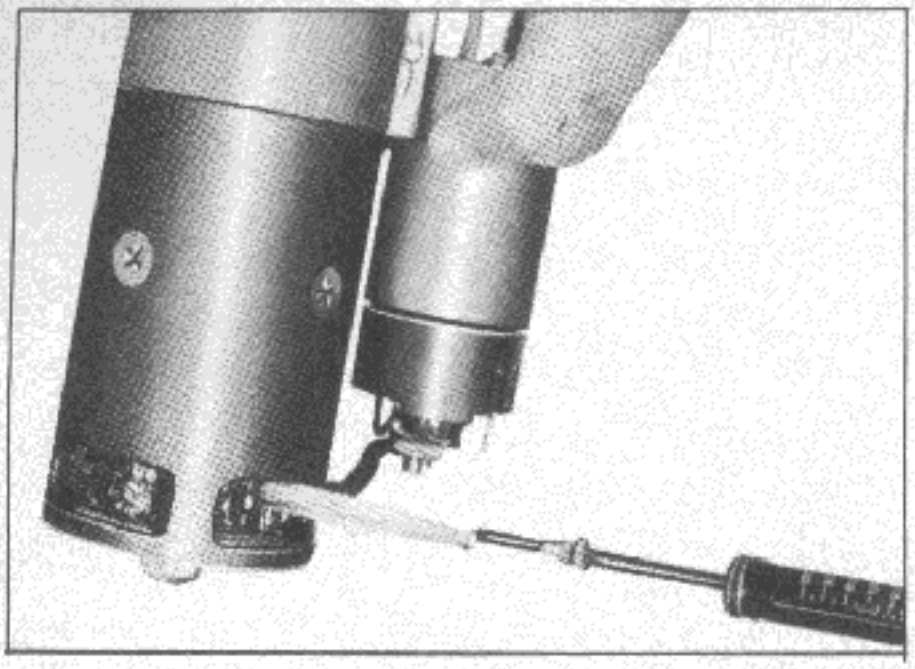


Fig. EE-13 Inspection of brush spring pressure

Armature assembly

Check external appearance of the armature and the commutator.

1. Measure the armature shaft for bend by the use a dial gauge. Replace the armature shaft if the bend exceeds 0.08 mm (0.0031 in).

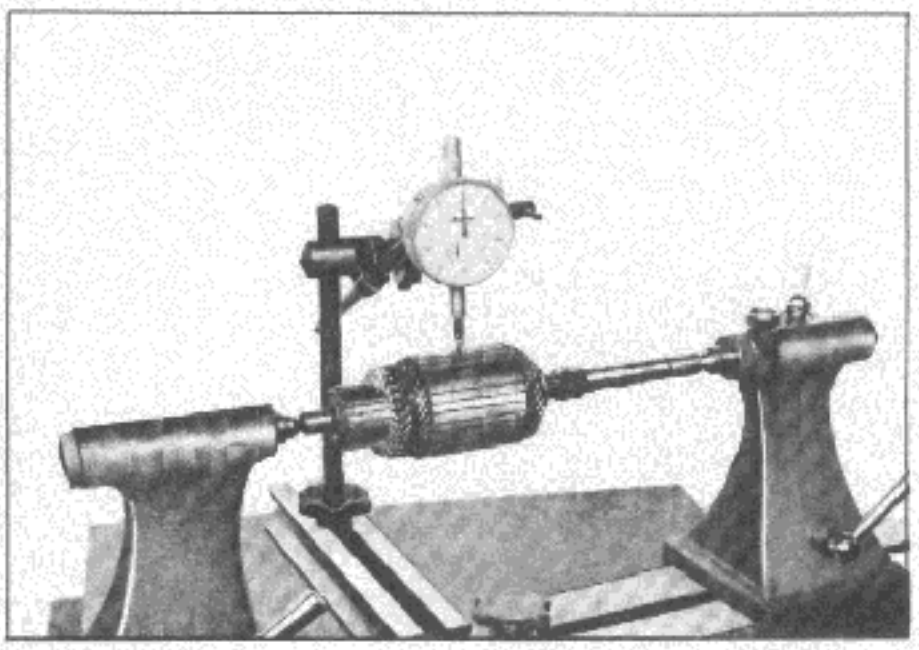


Fig. EE-14 Inspection of armature shaft for bend

2. Inspect the commutator. If the surface of the commutator is rough, smooth it lightly with a No. 500 emery paper. Check the commutator also for out-of-round. If the out-of-round is more than 0.4 mm (0.0157 in), turn the commutator (armature) in a lathe, so that the out-of-round is less than 0.05 mm (0.0020 in). When depth of mica from the surface of commutator segment is reduced to less than 0.2 mm (0.0079 in), under-cut the mica so that depth is in range from 0.5 to 0.8 mm (0.0197 to 0.0315 in).

The wear limit of the commutator diameter is 2 mm (0.0787 in). If the commutator is worn excessively, repair or replace it.

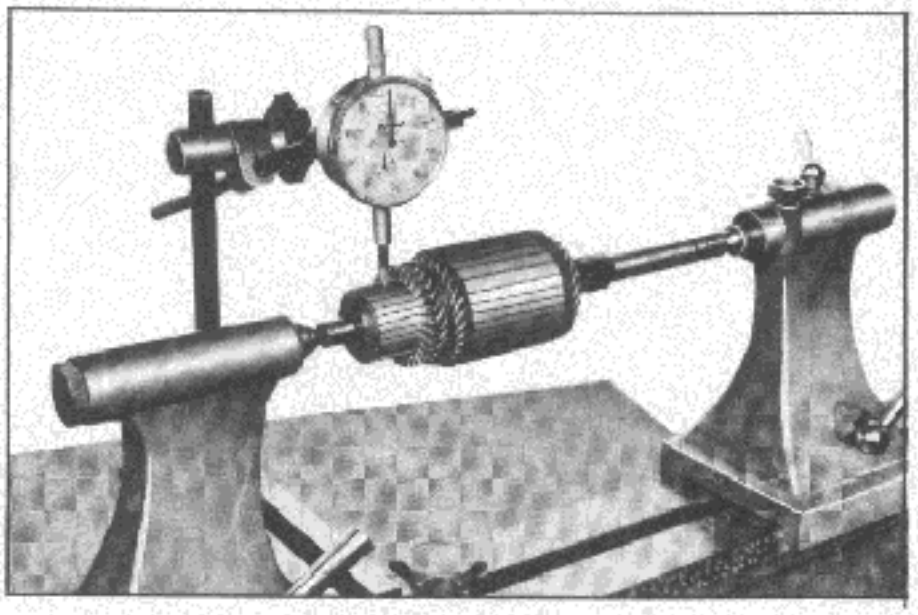


Fig. EE-15 Inspection of commutator

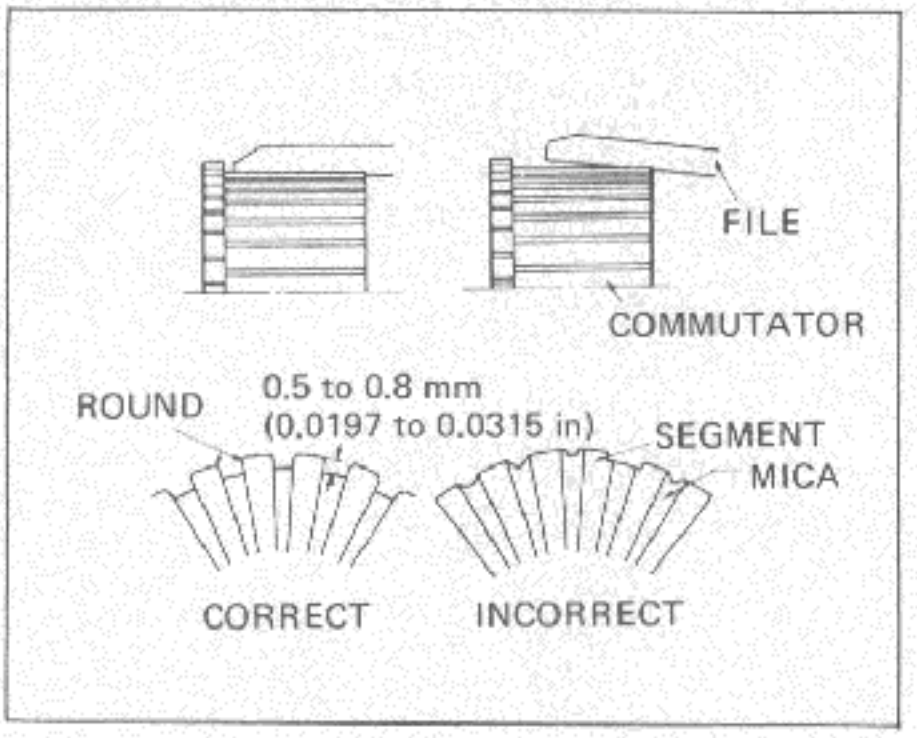


Fig. EE-16 Undercutting insulating mica

3. Inspect the soldered connection of armature lead and commutator. If loose connection is found, resolder (using rosin flux).

4. Testing armature for ground

Place one test probe of a circuit tester, on to armature shaft and the other on to each commutator bar.

If the tester shows continuity, armature is grounded. Replace the armature with new one.

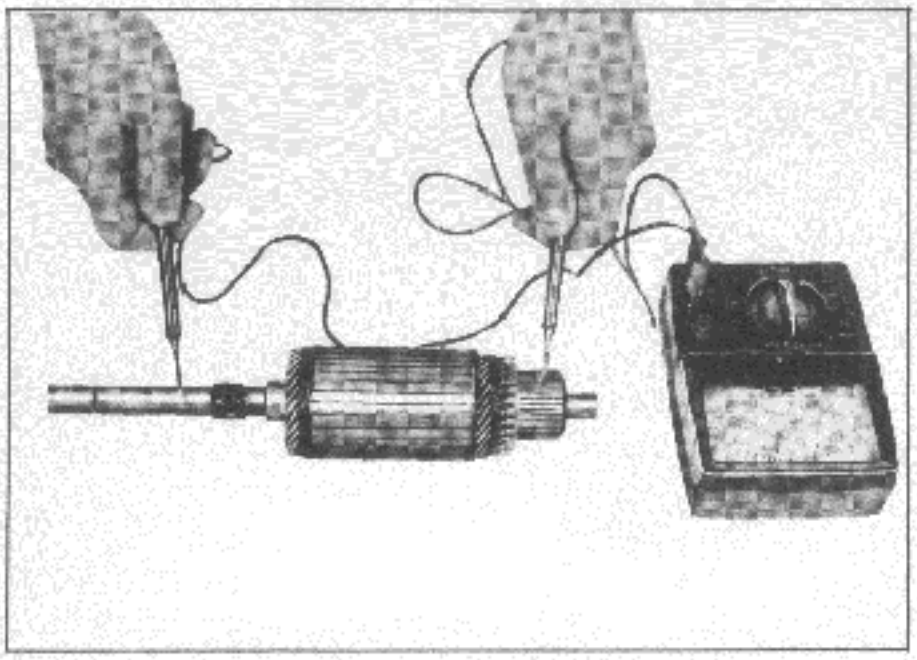


Fig. EE-17 Ground test of armature

5. Check the armature for short circuit by placing it on an armature tester placing a hack-saw blade over the armature core, and by rotating the armature. If the saw blade vibrates, armature is short-circuited.

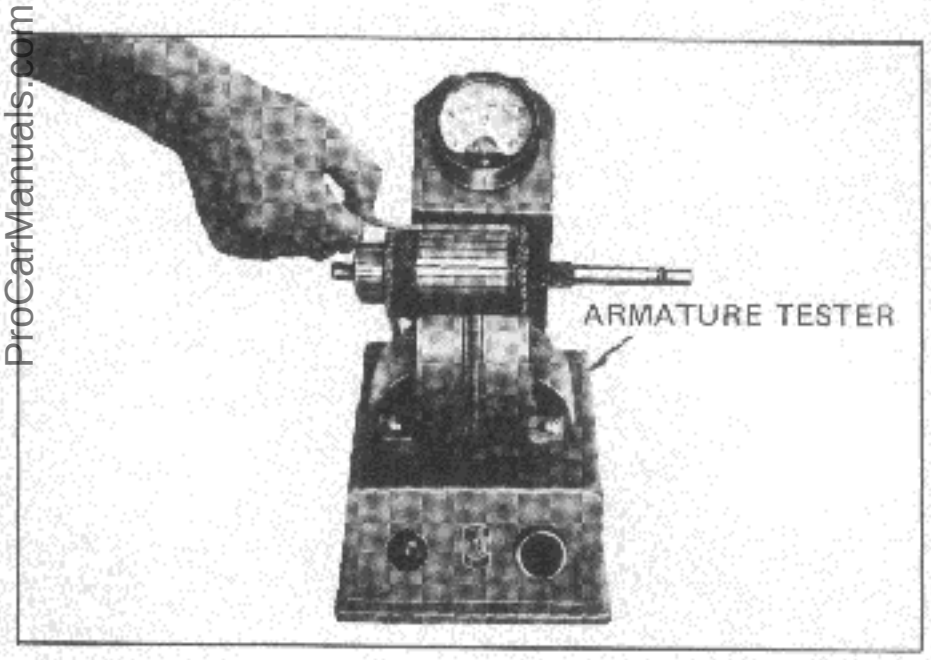


Fig. EE-18 Armature test for short-circuit

6. Check the armature for continuity by placing probes of a tester on two segments side by side. If the tester shows no conduction, the circuit is open.

Over-running clutch assembly

Check the over-running clutch for operation, and replace if the clutch is defective due to slippage or dragging.

Inspect the pinion assembly and sleeve. Sleeve must slide freely along the armature shaft spline. If damages are found or there is a resistance while sliding, replace. Inspect the pinion teeth for excessive rubbing, and replace as required. Check the flywheel ring gear also for damage and wear.

Testing brush holder for ground

Place one test probe of a circuit tester on to the rear cover and the other on to the positive side brush holder. If the tester shows conduction, the brush holder is shorted to ground. Replace the insulator or brush holder.

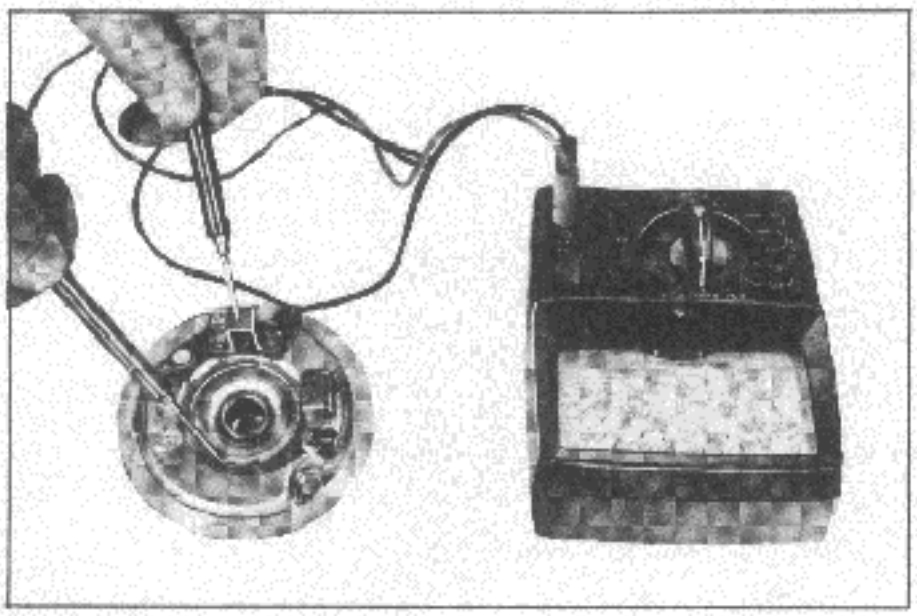


Fig. EE-19 Ground test of brush holder

Pinion case bearing metal

Inspect the bearing metal for wear and side play. If the clearance between the bearing metal and the armature shaft is more than 0.2 mm (0.0079 in), replace the metal. Install a new bearing and adjust the clearance to 0.03 to 0.10 mm (0.0012 to 0.0039 in). Install the bearing metal so that the end of the bearing metal is flush with gear case end plane.

Magnetic switch assembly

Inspect the magnetic switch contact surface. If the contact surface is rough, replace. Replace the pinion sleeve spring, if weakened.

When inspecting the series coil, apply voltage (8 to 12V) between S and M terminals. The series coil is normal if the plunger is attracted.

When inspecting the shunt coil, connect the S terminal, M terminal and switch body as shown in Figure EE-20. With the plunger attracted, open the M terminal. The

shunt coil is satisfactory if the plunger is attracted continuously.

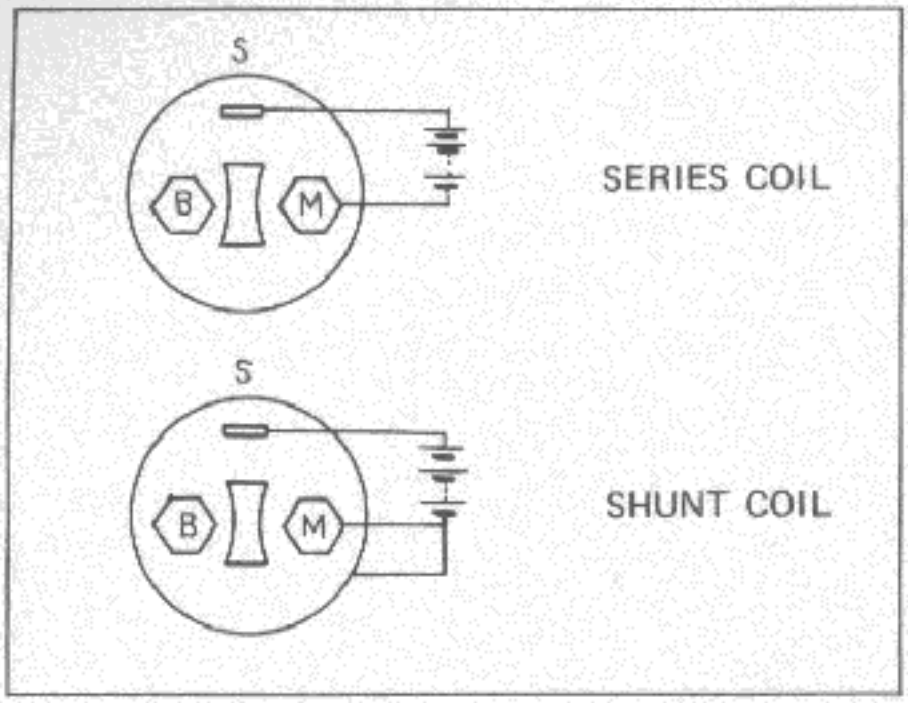
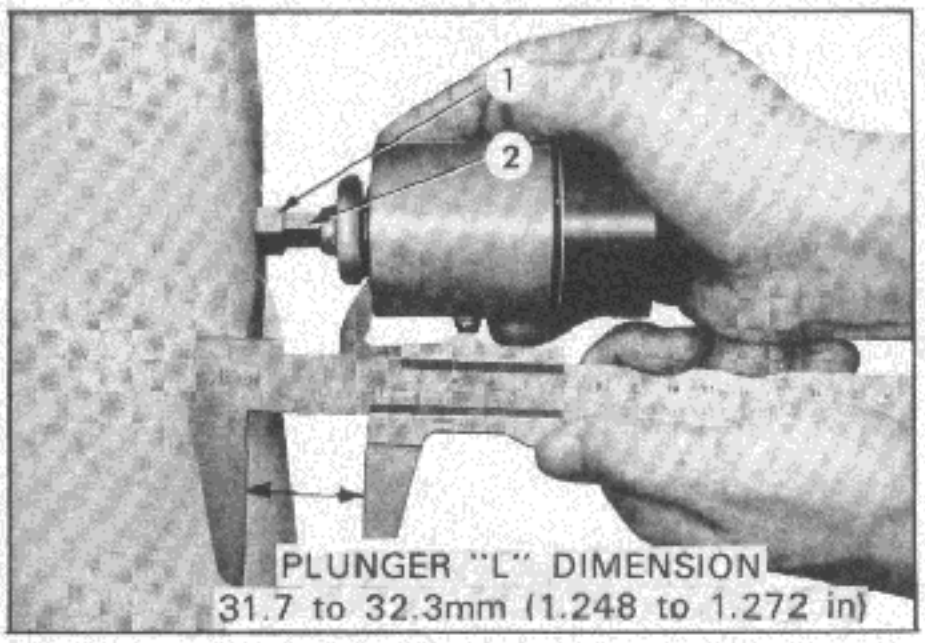


Fig. EE-20 Inspecting series and shunt coils

When measuring the "L" dimension, depress the plunger against a wall and measure the length "L" between the adjusting nut and magnetic switch cover as shown in Figure EE-21, and adjust if necessary.



1	Adjusting nut	2	Plunger adjuster

Fig. EE-21 Adjusting "L" dimension

REASSEMBLY

Reassemble the starting motor in reverse sequence of disassembly.

When assembling, be sure to apply grease to the armature shaft spline and apply oil to the rear cover and gear case bearing metals and pinion slightly.

TEST

Performance test

The starting motor should be subjected to "no-load" and "lock-torque" tests whenever it has been overhauled to ensure that it operates correctly when installed on the engine. The starting motor should also be subjected to these tests when finding cause of abnormal operation. These tests are summarized as follows:

No-load test

Connect the starting motor in series with the specified battery (12 volts) and an ammeter capable of indicating 1,000 amperes.

Specified current draw and revolution in these tests are shown in "specification".

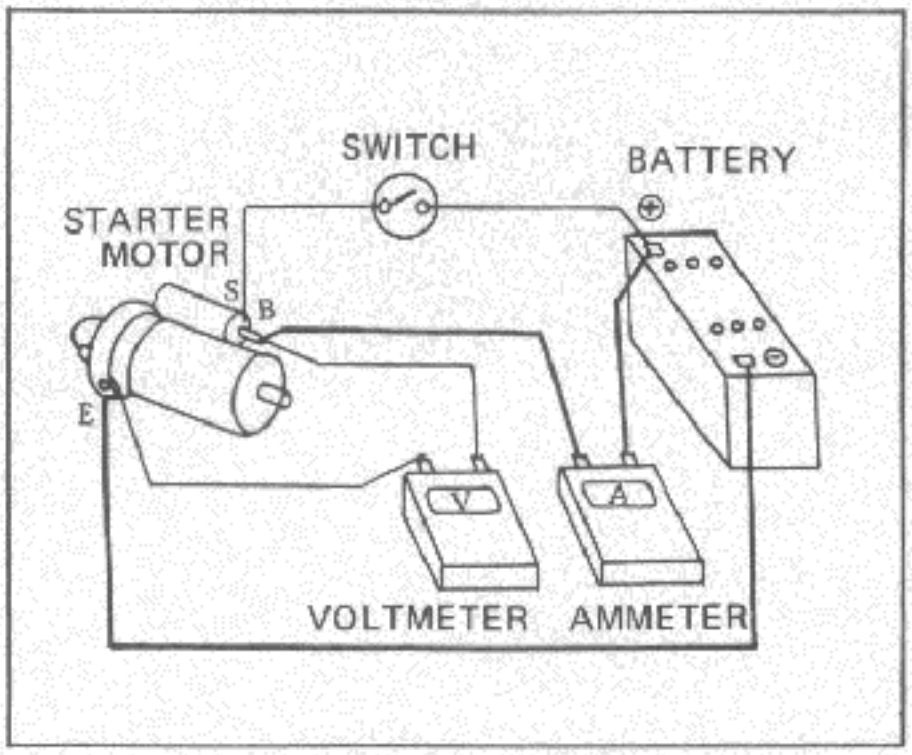


Fig. EE-22 No-load test

Torque test

Torque testing equipment should be used to measure the torque the motor will develop. A high current carrying variable resistance should be connected to the circuit so that the specified voltage at the starting motor may be obtained, since a small variation in the voltage will produce a marked difference in the torque development.

Specified power, voltage and torque are shown in Figure EE-23.

≪ Characteristic curve ≫

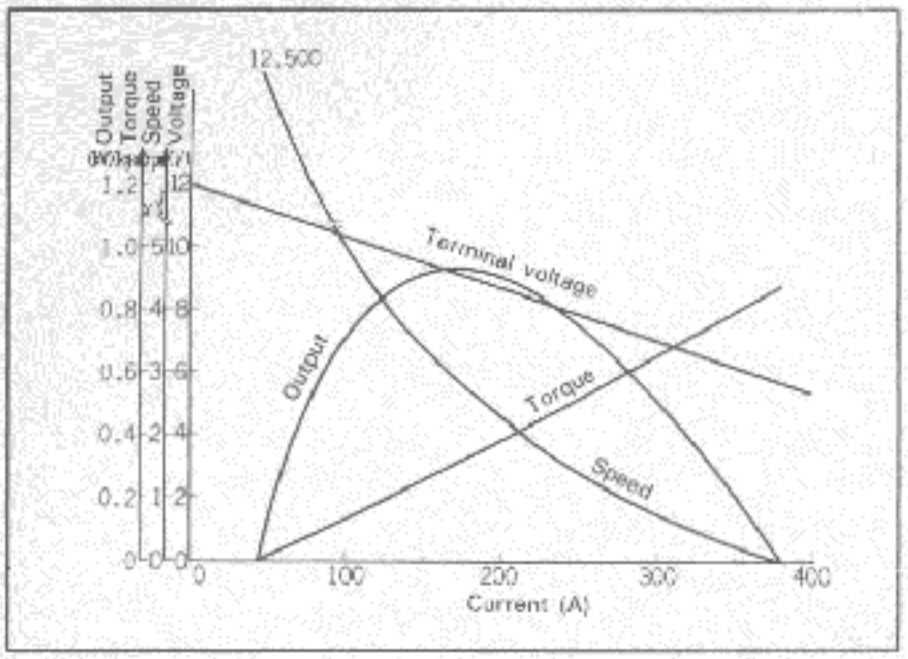


Fig. EE-23 S114-87L

Diagnoses of test

1. Low speed with no-load and high current draw may result from following:

(1) Tight, dirty or worn bearings.

(2) Bent armature shaft.

(3) Shorted armature;

Check armature further.

(4) Grounded armature or field;

Remove copper connector. Remove negative side brush and insulate it from the commutator before inspection. Using a circuit tester, place one probe on the insulated terminal and the other on the rear cover. If the tester indicates conduction, remove the other brush and check field and armature separately to determine whether the field is grounded or armature is grounded.

2. Failure to operate with high current draw may result from following:

(1) Grounded or open field coil:

Inspect the connection and check the circuit by the use of a circuit tester.

(2) The armature coil does not operate:

Inspect the commutator for excessive damage due to buring. In this case, arc may occur on defective commutator during operating the motor with no-load.

(3) Burned out commutator bar:

Weak brush spring tension, broken brush spring, rubber brush, thrust out of mica in the commutator or a loose contact brush and commutator would cause burning of the commutator bar.

3. Low torque, low current draw or low no-load speed causes high internal resistance due to loose connections, defective leads, dirty commutator and causes listed on item 2-(3).

4. High no-load speed with low developed torque causes grounded field coil. Replace the field coil and check for improvement in performance.

Magnetic switch assembly test

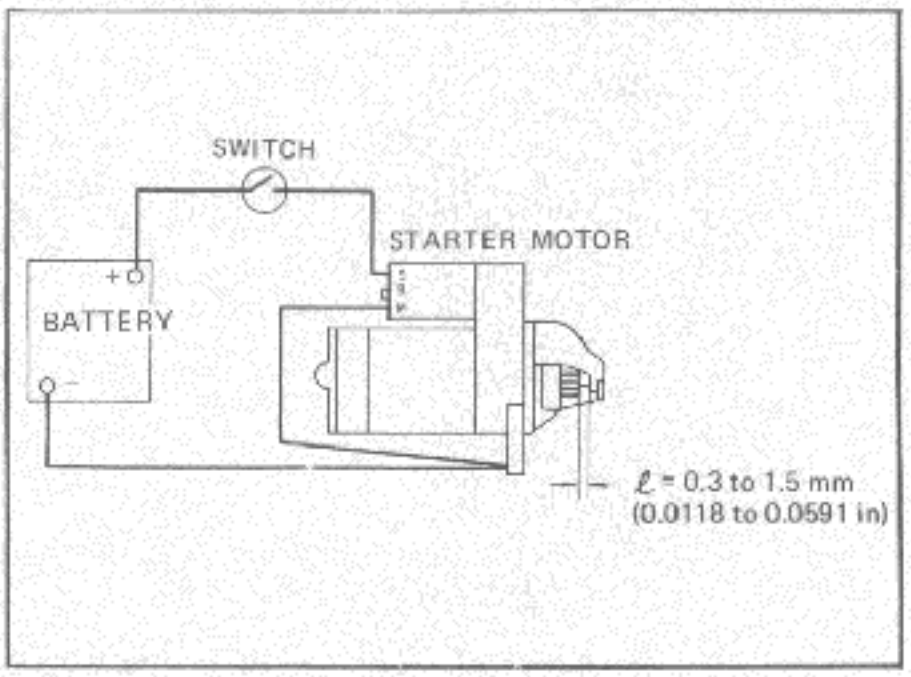


Fig. EE-24 Circuit of magnetic switch assembly test

When the starting motor is checked completely, check the magnetic switch assembly. Connect jumper cables between the "negative" battery terminal and the starting motor "M" terminal, the "positive" battery terminal and the starting motor "S" terminal connecting switch in series as shown in Figure EE-24.

With the ignition switch on, measure the gap "ℓ" between the pinion front edge and the pinion stopper, and adjust by changing the plunger "L" dimension if necessary.

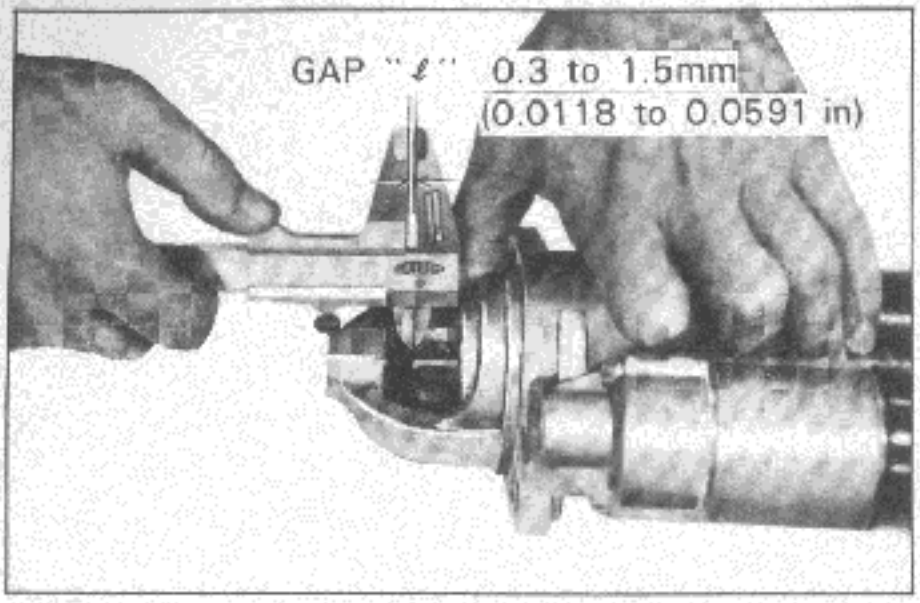


Fig. EE-25 Measurement of gap "ℓ"

SPECIFICATIONS AND SERVICE DATA

Specifications

Make and type		HITACHI S114-87L
Nominal output	KW	1.0
Rating	seconds	30
System voltage	V	12
Weight	kg (lb)	4.6 (10.1)
No load		
Terminal voltage	V	12
Current	A	less than 60
Revolution	rpm	more than 7,000
Load		
Terminal voltage	V	6.3
Current	A	less than 420
Torque	kg-m (ft-lb)	more than 0.9 (6.5)
Pinion drive out voltage	V	less than 8

Service data

Brush length		
Standard height	mm (in)	16 (0.630)
Wear limit	mm (in)	6.5 (0.256)
Brush spring tension		
Standard pressure	kg (lb)	0.8 (1.8)

Commutator

Outer diameter

Standard OD	mm (in)	33 (1.299)
Wear limit	mm (in)	2 (0.0787)

Difference between maximum and minimum diameters

Repair limit	mm (in)	0.4 (0.0157)
Repair accuracy	mm (in)	0.05 (0.0020)

Depth of mica

Repair limit	mm (in)	0.2 (0.0079)
Repair accuracy	mm (in)	0.5 to 0.8 (0.0197 to 0.0315)

Clearance between armature shaft and bushing

Repair limit	mm (in)	0.2 (0.0079)
Repair accuracy	mm (in)	0.03 to 0.1 (0.0012 to 0.0039)

Armature shaft

Outer diameter

Pinion side	mm (in)	13 (0.512)
Rear end	mm (in)	11.5 (0.453)
Wear limit	mm (in)	0.1 (0.0039)
Bend limit	mm (in)	0.08 (0.0031)

Gap "ℓ" between the pinion front edge and the pinion stopper	mm (in)	0.3 to 1.5 (0.0118 to 0.0591)

Magnetic switch

Coil resistance

Series coil	Ω	0.3	(at 20°C)
Shunt coil	Ω	0.9	(at 20°C)

Plunger "L" dimension	mm (in)	31.7 to 32.3 (1.248 to 1.272)

TROUBLE DIAGNOSES AND CORRECTIONS

Troubles	Trouble location	Causes	Remedies
Starting motor does not operate			
No magnetic switch operating sound	Battery	Defective battery	Replace battery
		Over-discharging	Measure specific gravity of electrolyte and charge or replace the battery

	Ignition switch	Defective contact	Correct or replace ignition switch
	Wiring	Faulty starting motor grounding	Correct
		Faulty battery grounding	Correct
		Broken or disconnected cable	Correct or replace
	Starter	Broken armature or field coil cable	Replace
		Broken brush pig tail	Replace
		Defective mica	Correct or replace
	Magnetic switch	Broken or shorted series coil	Replace
		Faulty plunger sliding	Repair or replace
Magnetic switch operating sound is heard	Battery	Over-discharging	Measure specific gravity of electrolyte and charge if necessary
		Faulty terminal contact or loose connection	Clean and retighten
	Wiring	Faulty B or M terminal connections	Retighten
	Starting motor	Shorted armature or field coil	Repair or replace
		Worn brush or improper spring pressure	Repair or replace
		Contaminated commutator or defective mica	Clean and repair
		Faulty brush connection	Repair
		Seized metal	Replace
		Armature contacted with pole core	Repair or replace
		Insufficient plunger "L" dimension	Adjust
	Magnetic switch	Faulty contact	Replace
		Broken or shorted shunt coil wire	Replace
The starting motor rotates			
Pinion gear does not intermesh with ring gear	Ring gear	Worn teeth	Replace
	Starting motor	Weakened pinion sleeve spring	Replace
		Worn pinion teeth	Replace

Pinion intermeshes with ring gear		Faulty pinion sliding	Repair
		Dropped off lever pin	Repair
		Excessive plunger "L" dimension	Adjust
	Starting motor	Defective over-running clutch	Replace
Starting motor rotates and pinion intermeshes with ring gear but rotation is too slow	Battery	Over-discharging	Charge battery
		Improper or loose terminal contact	Repair and retighten
	Wiring	Improperly tightened connection	Retighten
	Ignition switch	Rough contact surface	Repair or replace
	Starting motor	Shorted armature coil or field coil	Repair or replace
		Worn brush or insufficient spring pressure	Repair or replace
		Contaminated commutator or improper brush contact	Repair.
		Defective mica	Repair
		Lack of metal lubrication	Repair or replace
		Armature contacted with pole core	Repair or replace
When starting switch is set to "OFF", the starting motor does not stop	Ignition switch	Faulty returning	Replace
	Magnetic switch	Seized contact	Replace
		Shorted coil	Replace
		Faulty plunger sliding	Replace
	Starting motor	Pinion does not disengage the ring gear smoothly	Repair or replace
		Pinion spline does not disengage smoothly	Repair or replace
		Seized pinion metal	Replace

CHARGING CIRCUIT

The charging circuit consists of the battery, alternator, regulator and necessary wiring to connect these parts. The purpose of this system is to convert mechanical energy from the engine into electrical energy which is used to operate all electrically operated units and to keep the battery fully charged.

When the ignition switch is set to "on", current flows from the battery to ground through the ignition switch, voltage regulator IG terminal, primary side contact point "P1", movable contact point "P2", voltage regulator "F" terminal, alternator "F" terminal, field coil and alternator "E" terminal, as shown in Figure EE-26 by full line arrow marks. Then the rotor in the alternator is exited. On the other hand, current flows from the battery to ground through the ignition switch, warning lamp, voltage regulator "L" terminal, lamp side contact point "P4", movable contact point "P5", and voltage regulator "E" terminal, as shown by dotted line arrow marks. Then, the warning lamp lights.

When the alternator begins to operate, three-phase alternating current is induced in the armature. This alternating current is rectified by the positive and negative silicon diodes. The rectified direct current output reaches the alternator "A" and "E" terminals.

On the other hand, the neutral point voltage reaches "N" and "E" terminals (nearly a half of the output voltage), and current flows from voltage regulator "N" terminal to "E" terminal or ground through the coil "VC1" as shown in Figure EE-27 by the dotted line arrow marks. Then, the coil "VC1" is excited, and the movable contact point "P5" comes into contact with voltage winding side contact point "P6". This action causes to turn off the warning lamp and complete the voltage winding circuit, as shown by the full line arrow marks.

When the alternator speed is incrased or the voltage starts to rise excessively, the movable contact point "P2" is separated from the primary side contact "P1" by the magnetic force of coil "V2". Therefore, register "R1" is applied into the field circuit and output voltage is decreased. As the output voltage is decreased, the movable contact point "P2" and primary side contact "P1" comes into contact once again, and the alternator voltage increases. Thus, the rapid vibration of the movable contact point "P2", maintains an alternator output voltage to constant.

When the alternator speed is further increased or the voltage starts to rise excessively the movable contact point "P2" comes into contact with secondary side contact point finally. Then, the field current is shut off and alternator output voltage is decreased immediately. This action causes to separate movable contact "P2" from secondary contact "P3". Thus, the rapid vibration of the movable contact point "P2" or breaking and completing the field circuit maintains an alternator output voltage to constant.

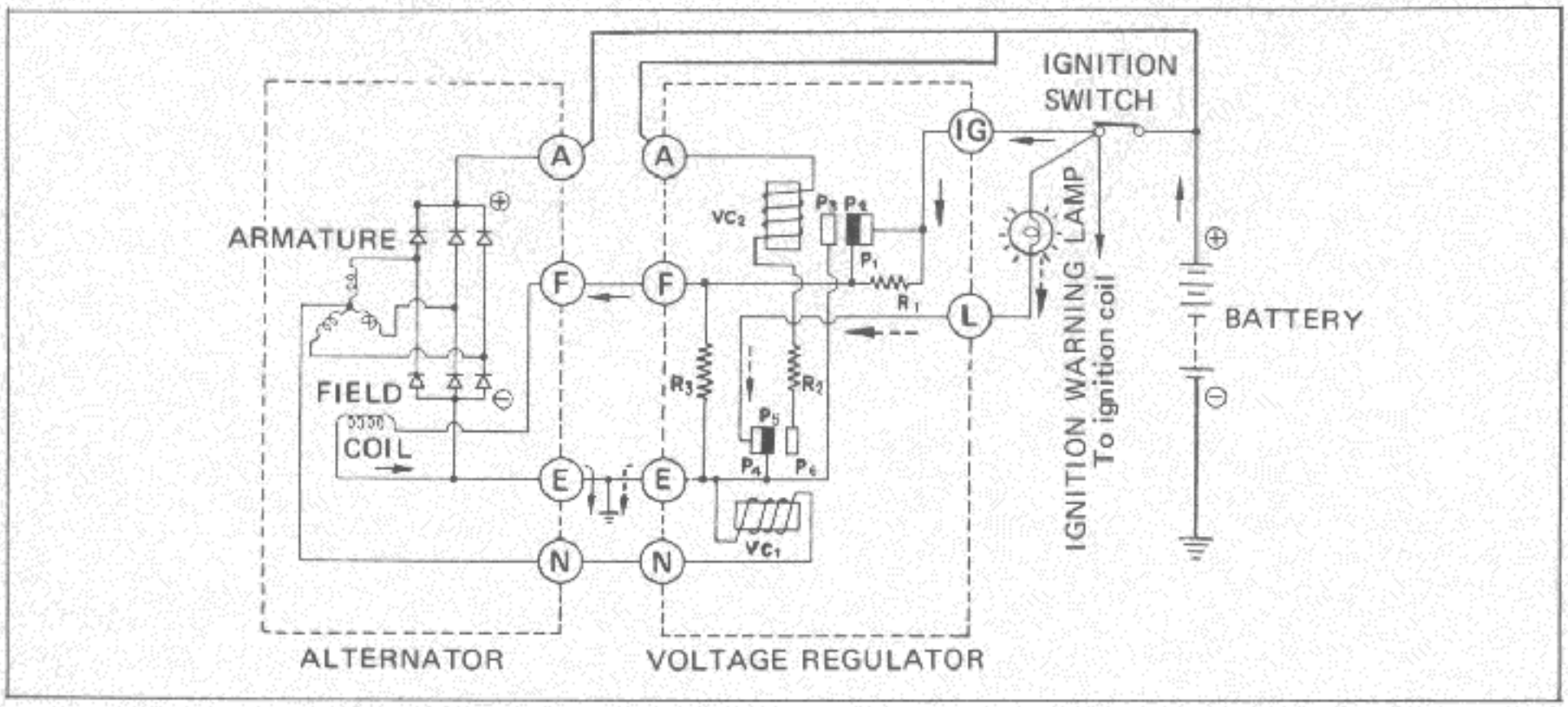


Fig. EE-26 Charging circuit (I)

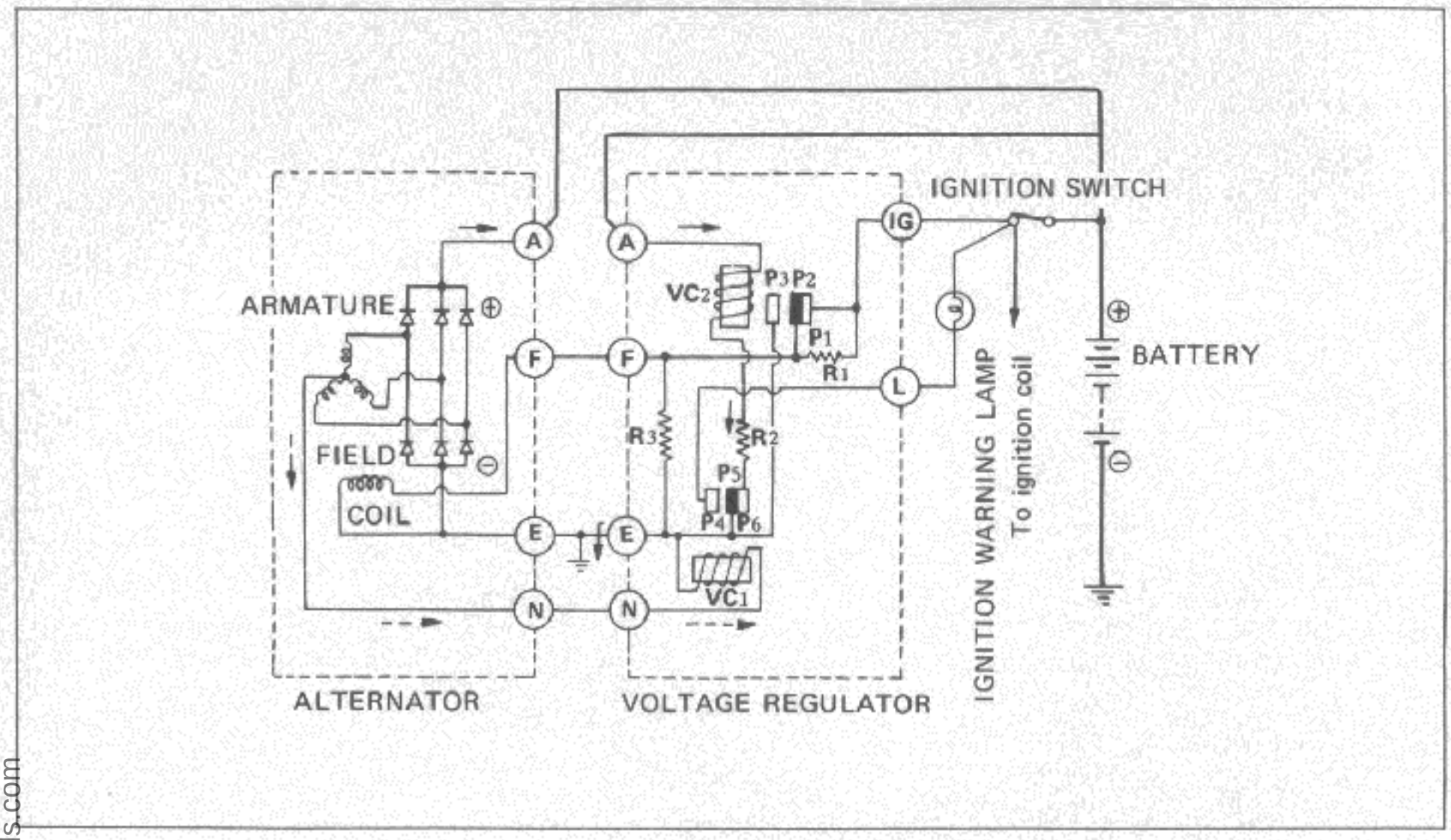


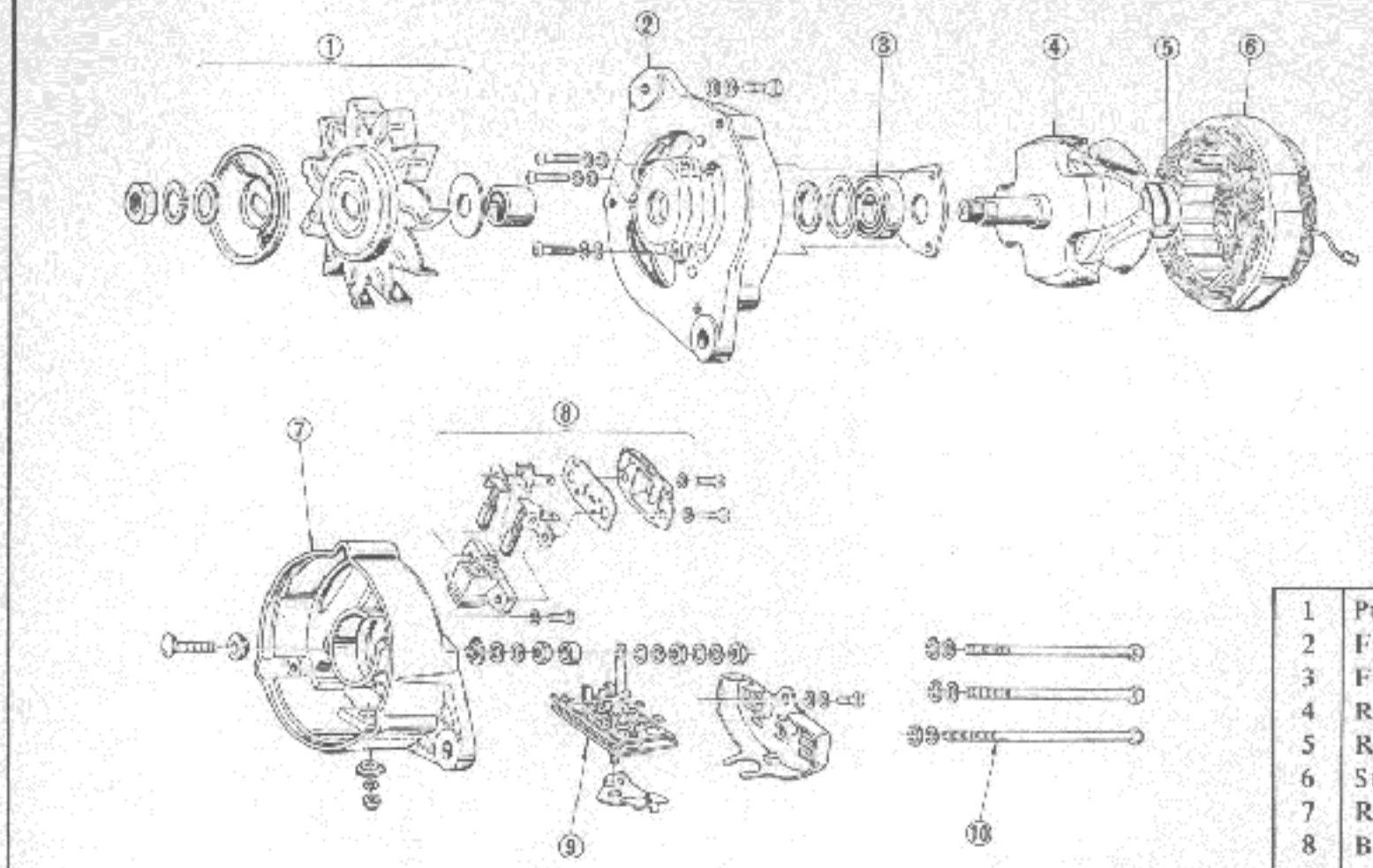
Fig. EE-27 Charging circuit (II)

ALTERNATOR

CONTENTS

DESCRIPTION

In the alternator, a magnetic field is produced by the rotor which consists of alternator shaft, field coil, pole pieces, and slip rings. The slip rings pressed in the shaft conduct only a small field current. Output current is generated in the armature coils located in the stator. The stator has three windings and generates Three-phase alternating current. Silicon diodes act like a one-way valve for electricity so that charging current passes easily but reverse current is shut out. In this alternator, six diodes are used (three negatives and three positives), positive plate has 3 positive diodes and negative plate has 3 negative diodes, and are installed in positive and negative plates as an assembly.



1	Pulley assembly
2	Front cover
3	Front bearing
4	Rotor
5	Rear bearing
6	Stator
7	Rear cover
8	Brush assembly
9	Diode set plate assembly
10	Through bolt

Fig. EE-28 Exploded view of alternator (LT125-06)

REMOVAL

1. Disconnect the negative battery terminal.

2. Disconnect two lead wires and connector from the alternator .

3. Loosen the adjusting bolt.

4. Remove the alternator drive belt.

5. Remove the alternator installation.

6. Dismount the alternator from the vehicle.

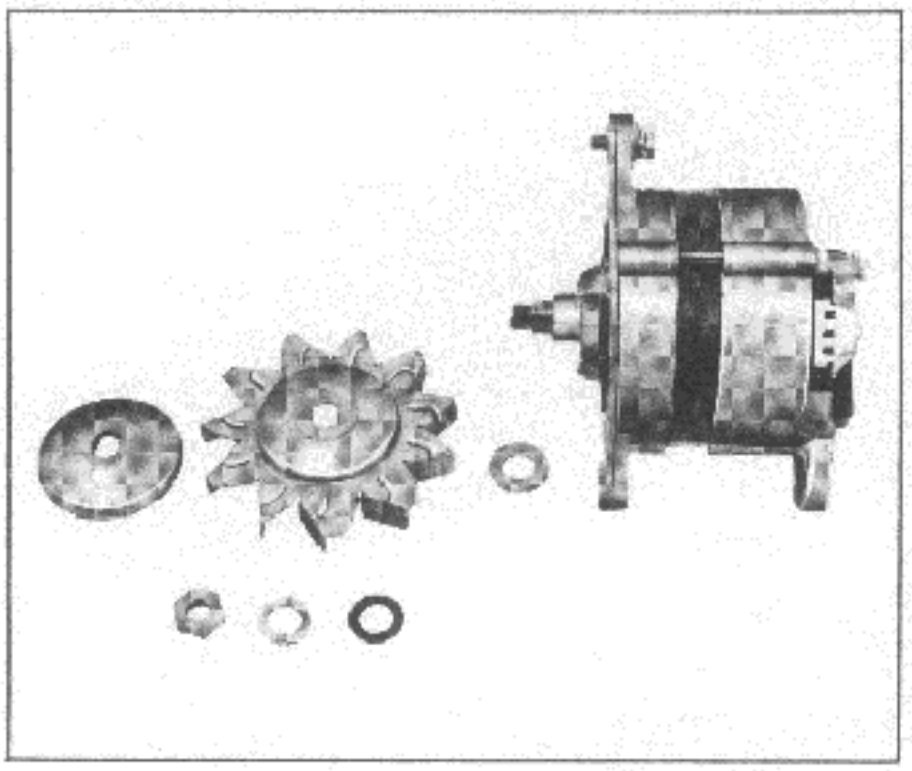


Fig. EE-29 Removal of pulley

DISASSEMBLY

1. Remove the pulley nut, pulley rim, fan and the spacer.

2. Remove the brush holder fixing screws, and remove the brush holder cover. Remove the brush holder forward, and remove the brushes together with the brush holder.

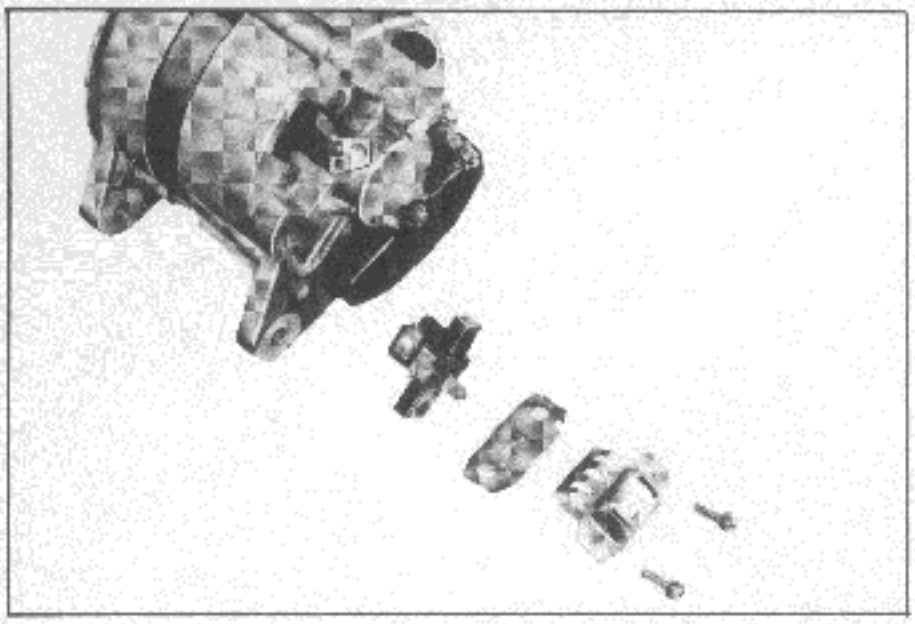


Fig. EE-30 Removal of brush

3. Loosen and remove three through bolts. Separate the diode end housing from the drive end housing assembly by tapping the front bracket lightly with a wooden mallet.

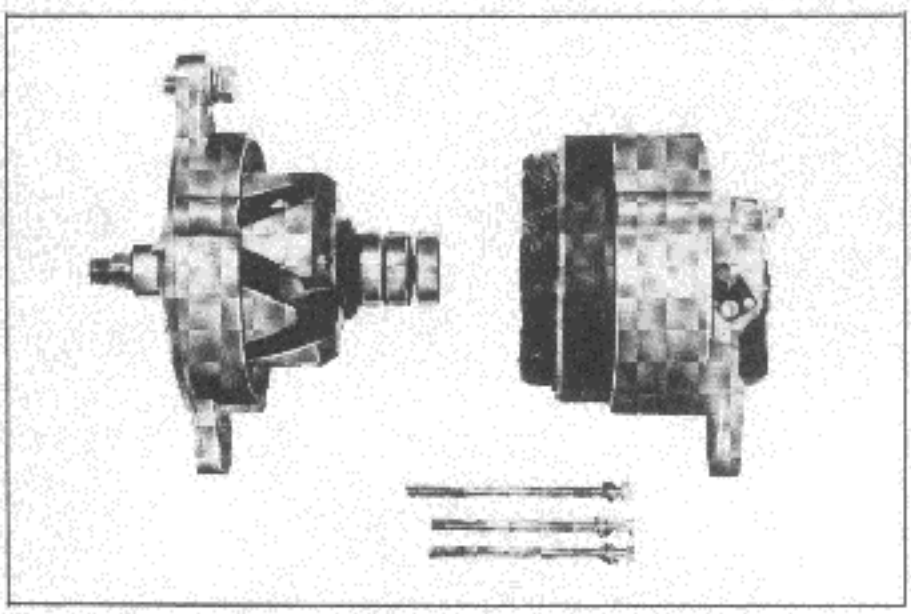


Fig. EE-31 Drive end housing and diode end housing separated

4. Remove three screws from the bearing retainer, and separate the rotor from the front cover.

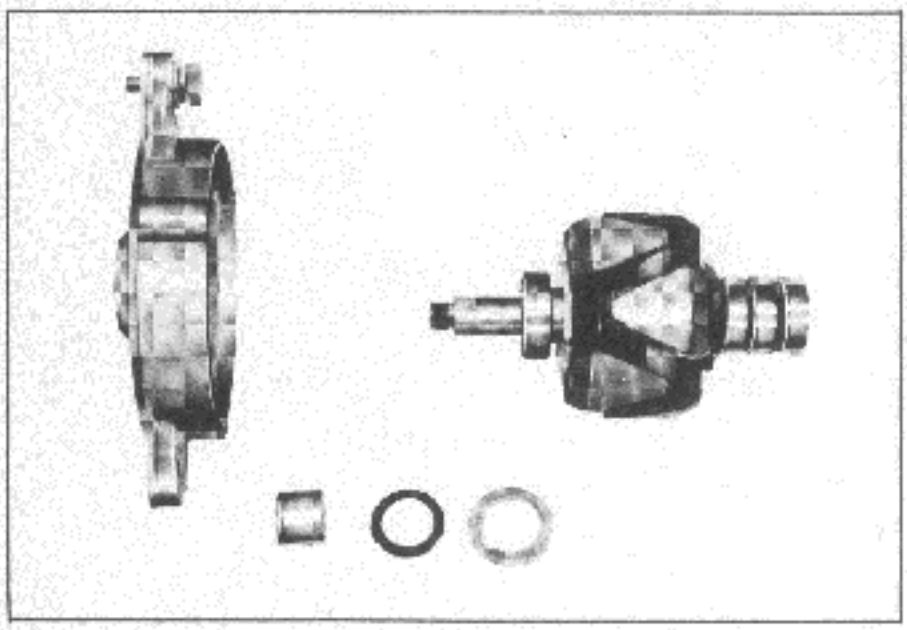


Fig. EE-32 Removal of rotor

5. Pull out the rear bearing from the rotor assembly with a press or bearing puller.

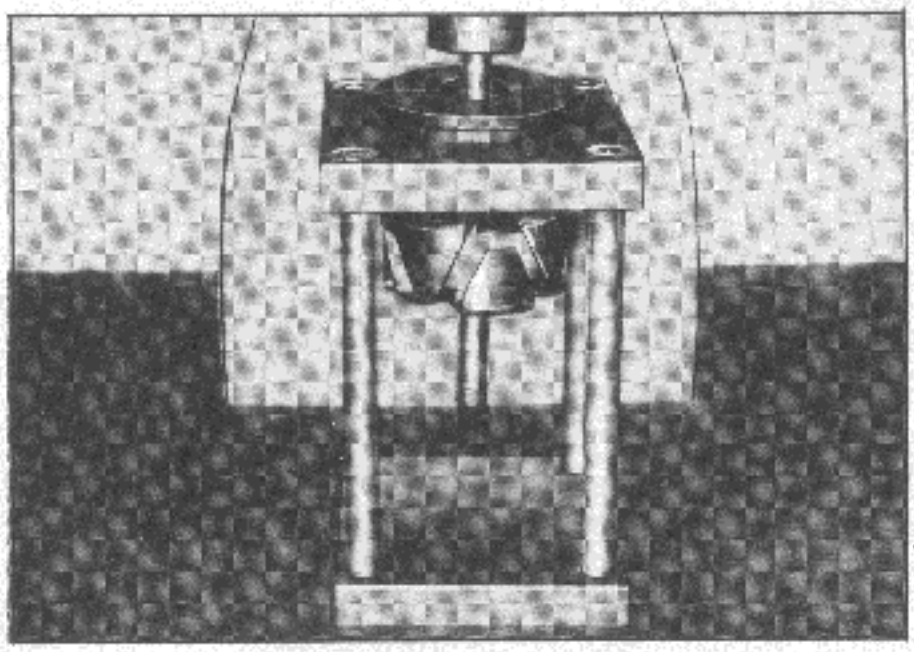


Fig. EE-33 Pulling out of rear bearing (I)

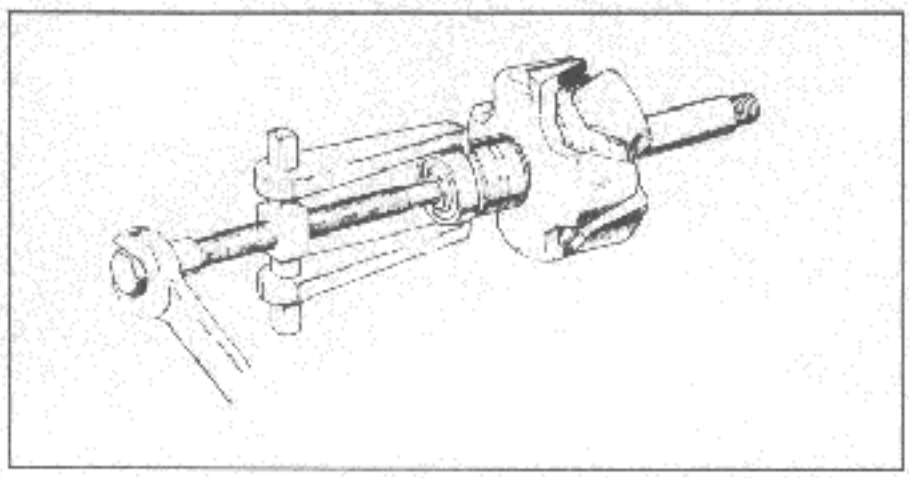


Fig. EE-34 Pulling out of rear bearing (II)

6. Remove the diode cover fixing screw, and remove the diode cover. Disconnect three stator coil lead wires from the diode terminal with a soldering iron.

7. Remove the A terminal nut and diode installation nut, and remove the diode assembly.

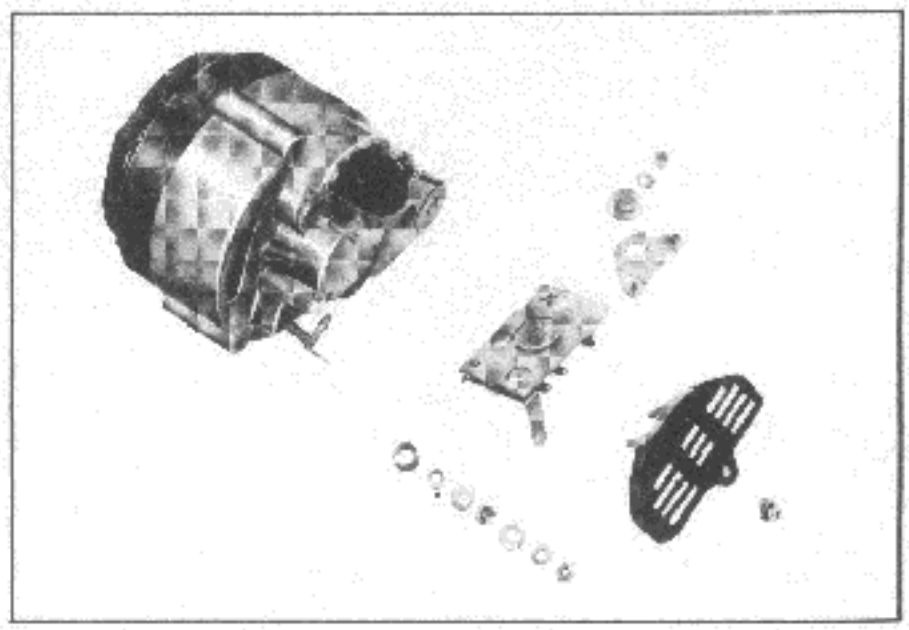


Fig. EE-35 Removing diode assembly

Note: When disassembling or when removed, be careful not to deform the diode assembly by applying unreasonable force.

8. Remove the stator from the rear cover.

INSPECTION AND REPAIR

Remove the alternator from the vehicle and apply the tester between the lead wire F (black and white color) and the lead wire E (black color). When the resistance is approximately 5 Ω, the condition of brush and field coil is satisfactory. When no conduction exists in the brush, field coil, or when resistance differs remarkably between those parts, disassemble and inspect.

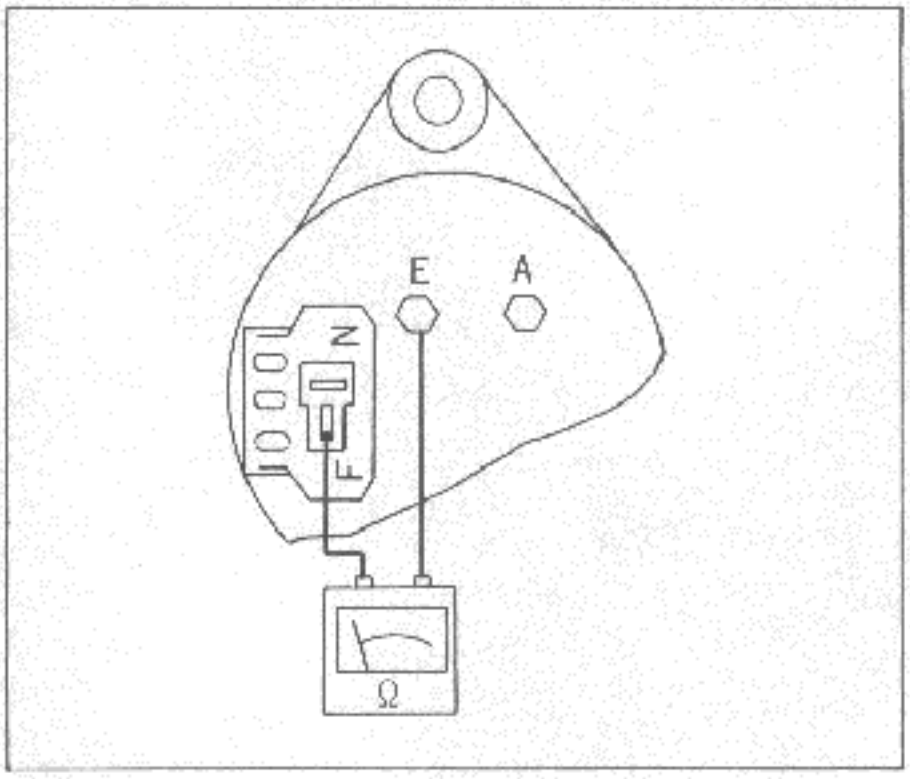


Fig. EE-36 Inspection of alternator

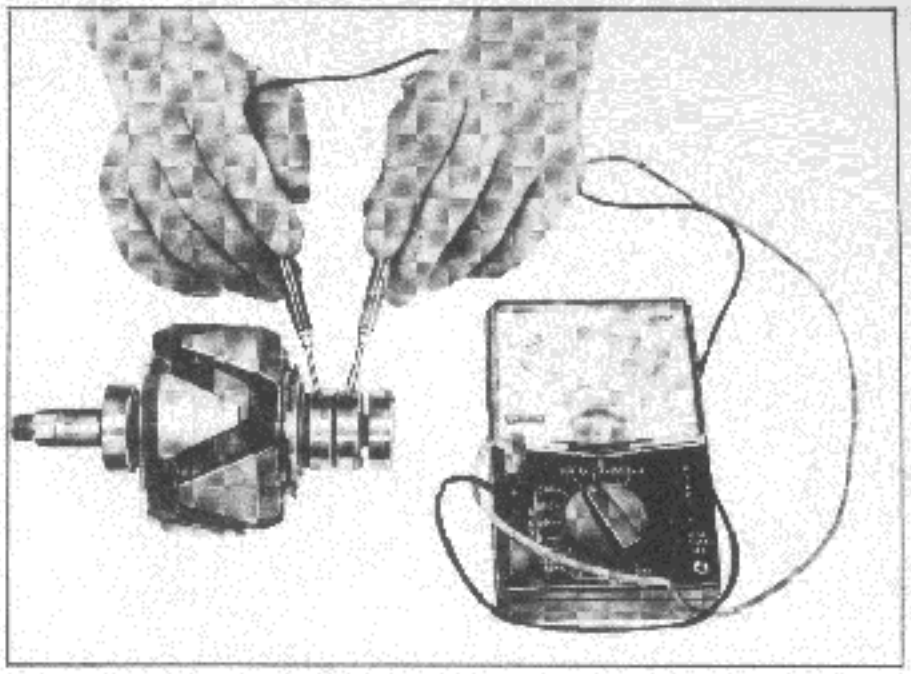


Fig. EE-37 Conduction test of field coil

2. Ground test of field coil

Check the conduction between slip ring and rotor core. If the conduction exists, replace rotor assembly, because field coil or slip ring must be grounded.

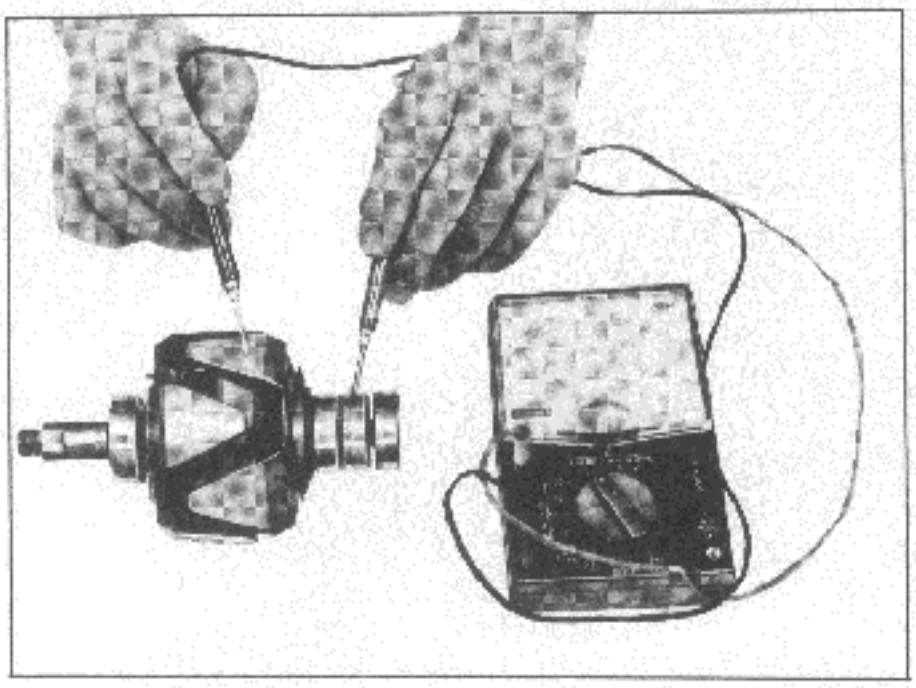


Fig. EE-38 Ground test of field coil

Rotor inspection

1. Conduction test of field coil

Apply the tester between the slip rings of rotor as shown in Figure EE-37 If there is no conduction, the disconnection of field coil may exist. When the resistance is approximately 4.4 Ω at normal ambient temperature, the condition is satisfactory.

Inspection of stator

1. Conduction test

The stator is normal when there is conduction between the individual stator coil terminals. When there is no conduction between the individual terminals, the cable is broken. Replace.

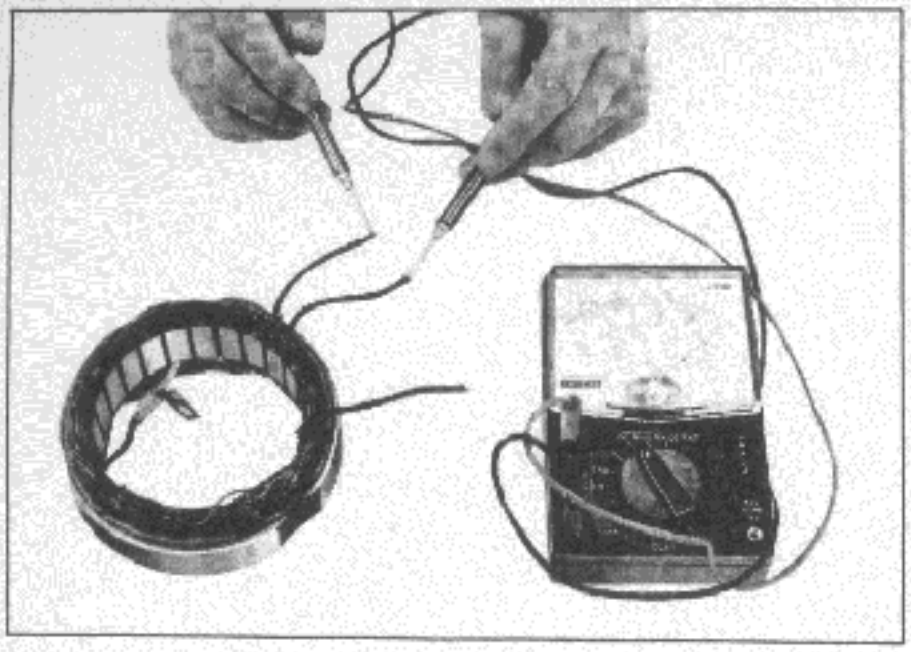


Fig. EE-39 Conduction test

2. Ground test

If each lead wire of stator coil (including neutarl wire) is not conductive with stator core, the condition is satisfactory. If there is conduction, the stator coil is grounded. Replace.

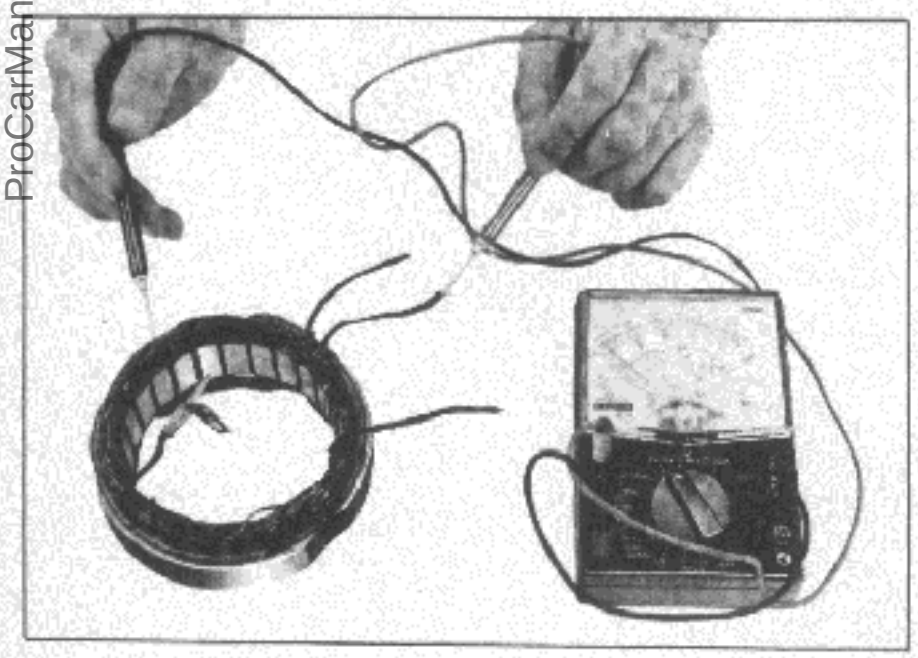


Fig. EE-40 Ground test

Inspection of diode

Each one of ⊕ and ⊖ plates is provided with three each diodes. Inspect each diode for both positive and negative conductions by the use of a tester.

The diode installed on the ⊕ plate is a positve diode which allows current flowing from the terminal to ⊕ plate only. In other words, current does not flow from the (+) plate to the terminal.

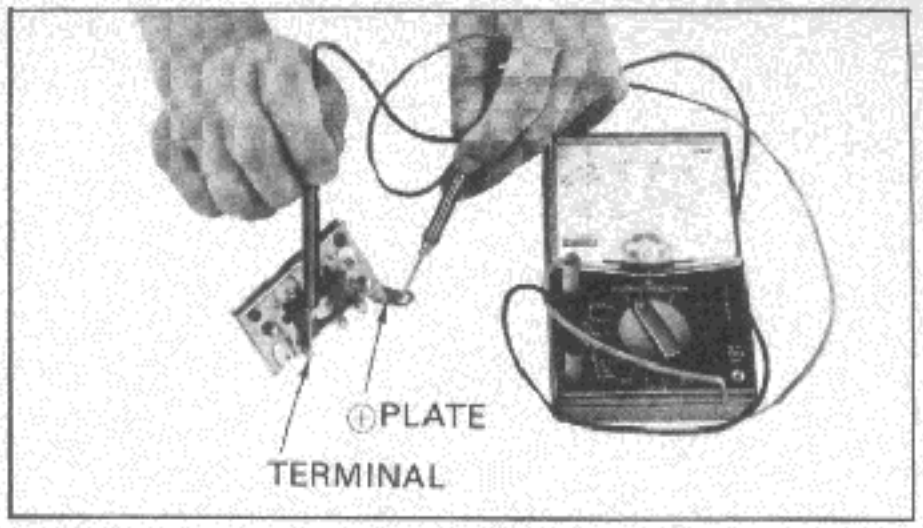


Fig. EE-41 Inspecting positive diode

The diode installed on the ⊖ plate is a negative diode which allows current flowing from the ⊖ plate to the terminal only. In other words, current does not flow from the terminal to ⊖ plate.

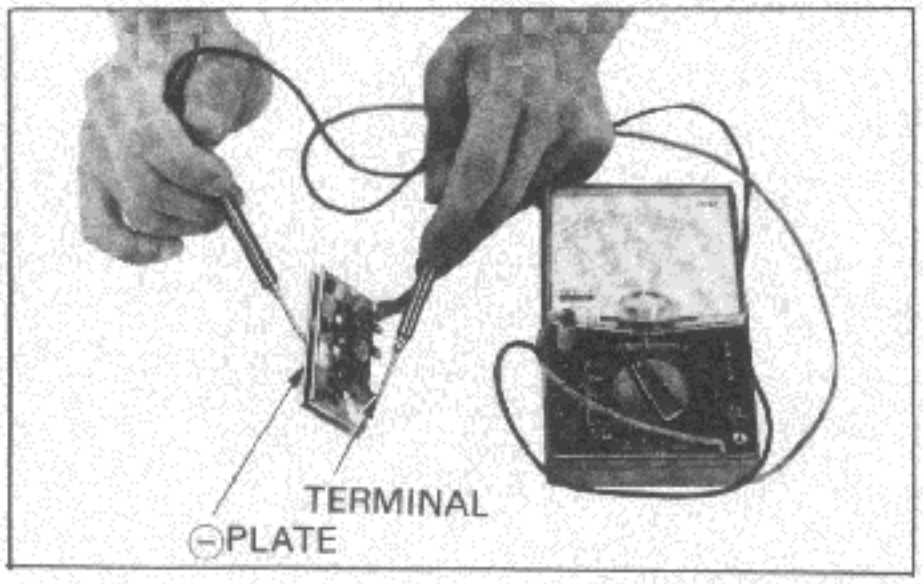


Fig. EE-42 Inspecting negative diode

If current flows toward both positive and negative directions, the diode is short-circuited. If current does not flow both directions, the diode is open. These diodes are unserviceable. If there is a defective diode, replace all diodes (six diodes) as an assembly. (See the Figure EE-43.)

Test probe of a circuit tester		Conduction
⊖	⊕	
terminal	⊕ plate	X
⊕ plate	terminal	–
terminal	⊖ plate	–
⊖ plate	terminal	X
⊖ plate	⊕ plate	X
⊕ plate	⊖ plate	–

Fig. EE-43 Inspection of diodes

Inspection of brush

Check the movement of brush and if the movement is unsmooth, check brush holder and clean it. If the brush is worn and the length is 7 mm (0.2756 in) or less, replace the brush with a new one. Check the brush pig tail and if it is about to break, replace.

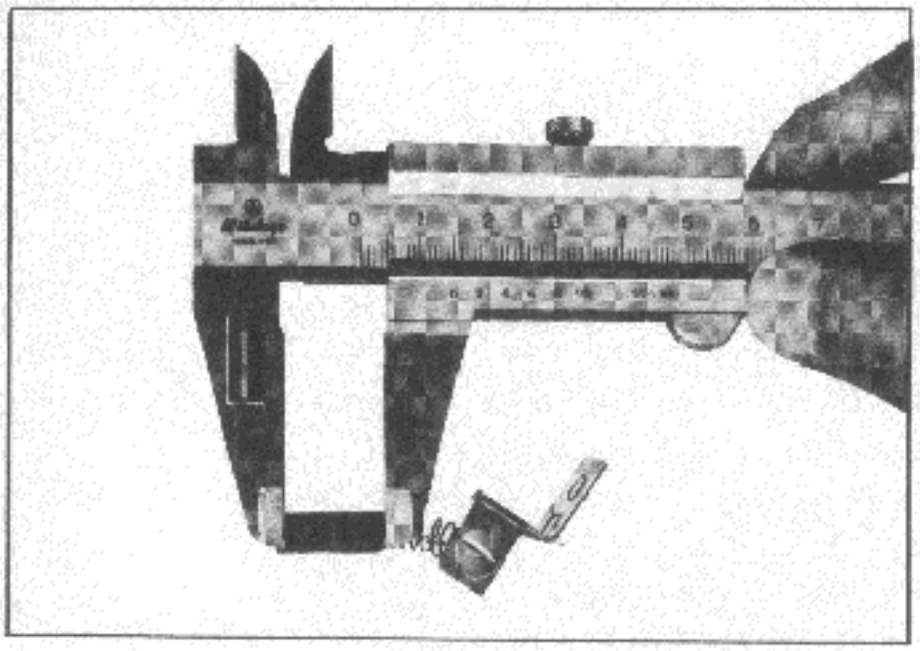


Fig. EE-44 Brush wear limit

Spring pressure test

With the brush projected approximately 2 mm (0.0787 in.) from the brush holder, measure brush spring pressure by the use of a spring balance. Normally, the rated pressure of a new brush spring is 255 to 345 grams (9.0 to 12.2 oz).

Moreover, when the brush is worn, pressure decreases approximately 20 grams per 1 mm (0.0394 in) wear.

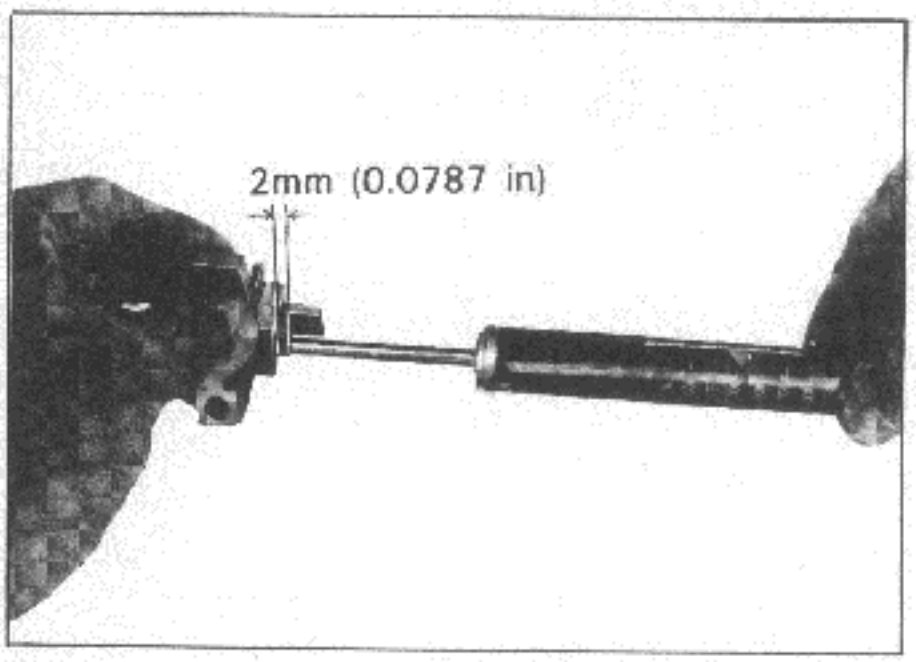


Fig. EE-45 Measuring spring pressure

REASSEMBLY

Reassemble the alternator in reverse sequence of disassembly noting the following matters:

1. When soldering each stator coil lead wire to the diode assembly terminal, carry out the operation as fast as possible.

2. When install the diode A terminal, install the insulating bushing and insulating tube correctly.

3. Tighten the pulley nut with tightening torque of 350 to 400 kg-cm (301 to 344 in-lb). When the pulley is tightened, make sure that deflection of V-groove is less than 0.3 mm (0.0118 in).

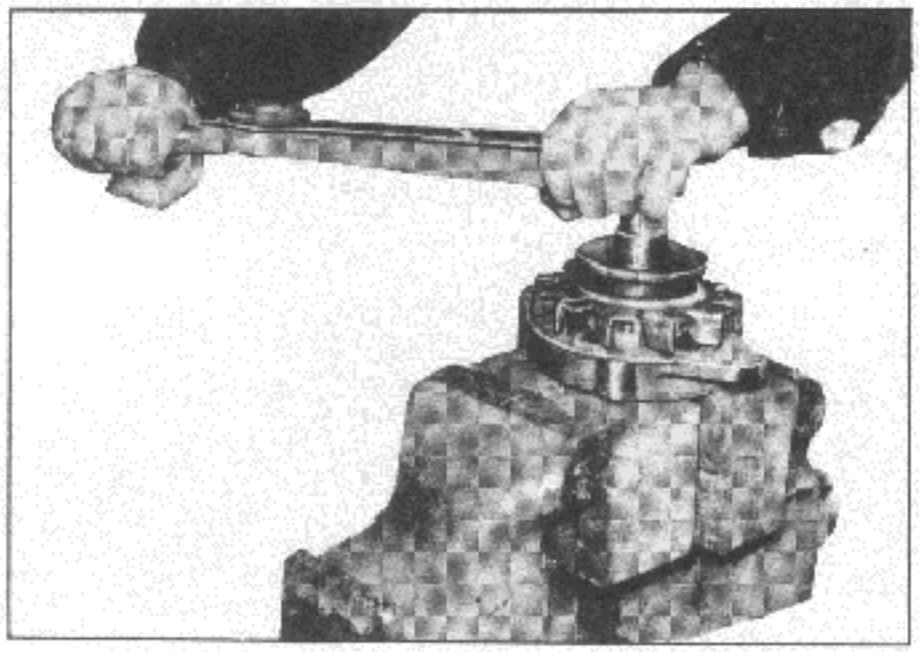


Fig. EE-46 Tightening pulley nut

TEST

When measuring alternator output by means of a test bench, a measuring instrument with which rotor shaft speed can be changed freely is required.

No-load minimum revolution

1. Connect a battery and voltmeter as shown in Figure EE-47, and rotate the alternator.

2. When speed reaches approximately 800 rpm, open the switch.

3. Increase alternator speed gradually, and when voltage reaches 14V, measure the alternator speed.

The condition is satisfactory when the alternator speed at 14V is within the rated speed.

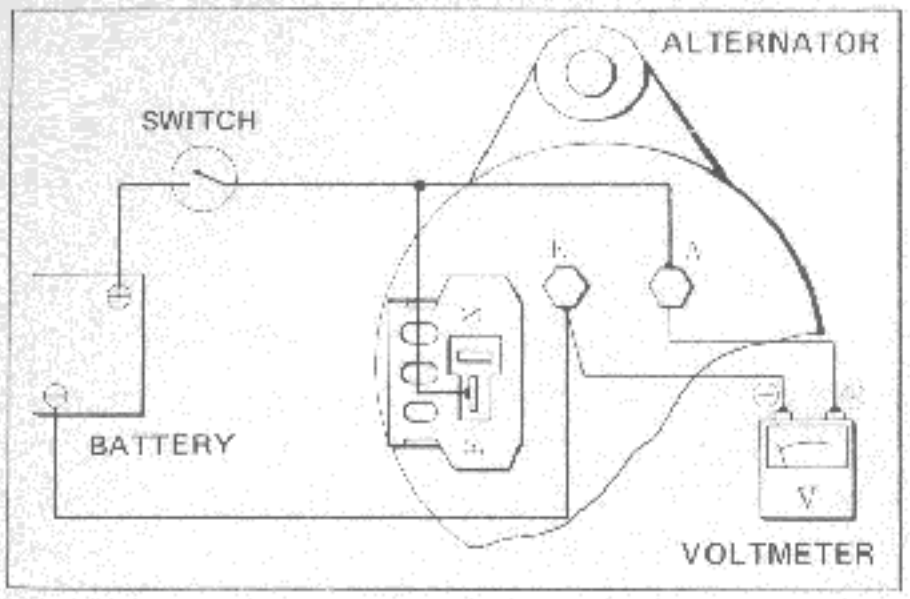


Fig. EE-47 Circuit diagram for measurement of output (I)

Output current

1. Connect a variable resistor, battery, ammeter, and voltmeter as shown in Figure EE-48.

2. Close the switch SW1, and rotate the alternator.

3. When alternator speed increases to approximately 800 rpm, set the variable resistor to "Max.", and close the switch SW2.

4. Adjust the variable resistor properly so that voltage is maintained at 14V, and increase speed further.

5. Measure amperages at 2,500 rpm and 5,000 rpm.

The condition is satisfactory when the rated amperage or higher current is generated at 2,500 rpm and 5,000 rpm alternator speeds.

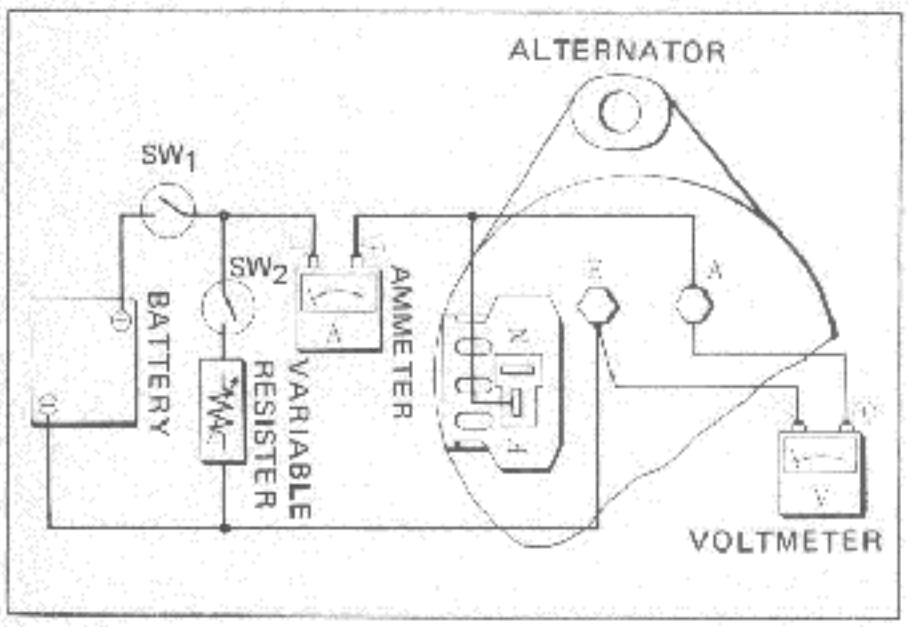


Fig. EE-48 Circuit diagram for measurement of output (II)

When measuring alternator output with the alternator mounted on the vehicle, first, disconnect the connector from the alternator F and N terminals, and connect the F and A terminals with a jumper wire. Apply a voltmeter between the A and E terminals. Make sure that the voltmeter indicates battery voltage. (See the Figure EE-49.)

1. Pull the lighting switch to second step, and light the main head lamp (high beam).

2. Start the engine.

3. Increase engine speed gradually, and read voltage indicated on the voltmeter at approximately 1,000 rpm.

When the voltmeter indicates 12.5V or higher, the alternator is normal. If less than 12.5V, the alternator may be judged defective.

Note: a. Be sure that the battery has been completely charged.

b. In no event should the lighting switch be opened before stopping the engine, when the measurement has been completed.

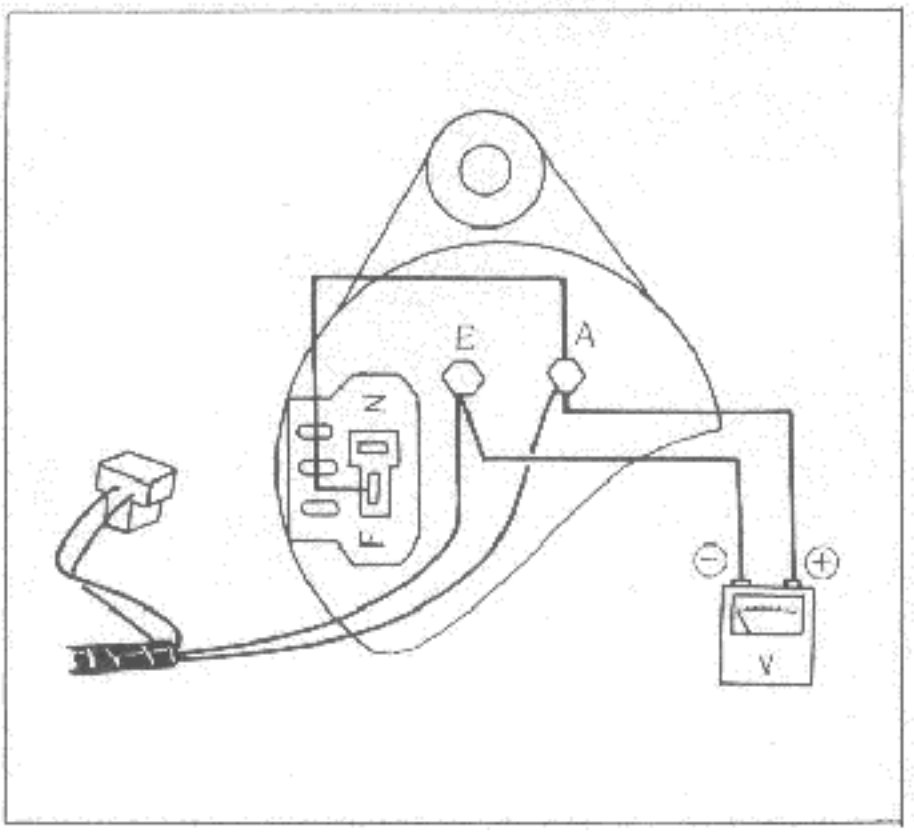


Fig. EE-49 Circuit diagram for measurement of output

SPECIFICATIONS AND SERVICE DATA

Specifications

Item \ Make and Type		HITACHI LT125-06	HITACHI LT133-05 (for U.S.A., CANADA)
Nominal output	V-A	12-25	12-33
Pole		Negative ground	←
Revolution	rpm	1,050 to 13,500	1,000 to 13,500
No-load minimum revolution	rpm	Less than 1,050	Less than 1,000
Output current	A (V, rpm)	More than 18 (14, 2,500) More than 25 (14, 5,000)	More than 24 (14, 2,500) More than 33 (14, 5,000)
Weight	kg (lb)	3.4 (7.5)	←
Applied regulator		TL1Z-37	←

Service data

Item \ Make and Type		HITACHI LT125-06	HITACHI LT133-05 (for U.S.A., CANADA)
Stator coil			
Resistance per phase	Ω	0.17 [at 20°C (68°F)]	0.15 [at 20°C (68°F)]
Rotor coil			
Resistance	Ω	4.4 [at 20°C (68°F)]	4.5 [at 20°C (68°F)]
Brush			
Brush length	mm (in)	14.5 (0.571)	←
Wear limit	mm (in)	7 (0.2756)	←
Spring pressure	kg (lb)	0.25 to 0.35 (0.55 to 0.77)	←
Slip ring			
Outer diameter	mm (in)	31 (1.220)	←
Reduction limit	mm (in)	1 (0.0394)	←
Repair limit	mm (in)	0.3 (0.0118)	←
Repair accuracy	mm (in)	0.05 (0.0197)	←

REGULATOR

CONTENTS

DESCRIPTION

The TLIZ-37 voltage regulator is equipped with an over temperature compensator, and regulating value changes in response to change in ambient temperature. With this system, over-discharging during cold season and over-charging during hot season are prevented, and the battery is protected from reduction of service life.

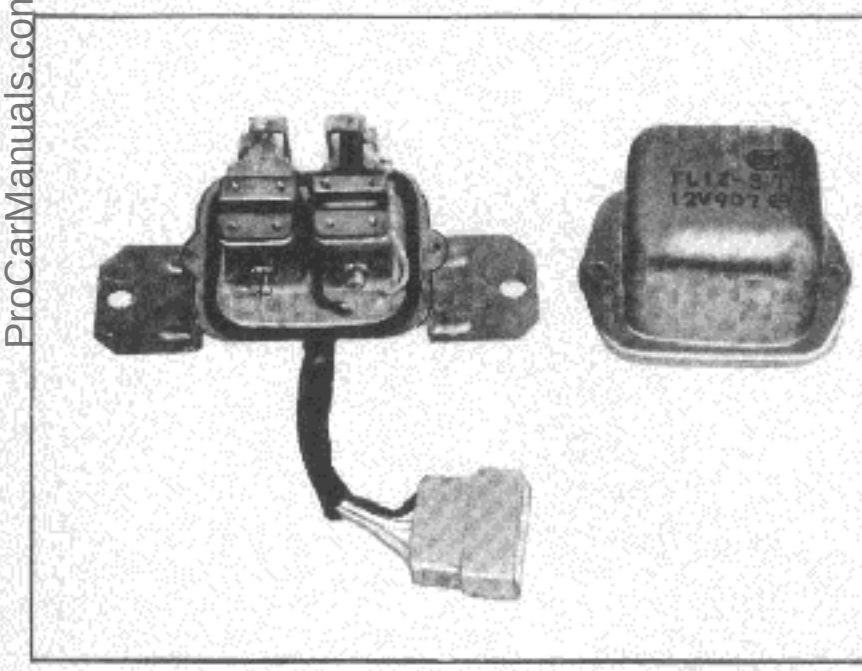
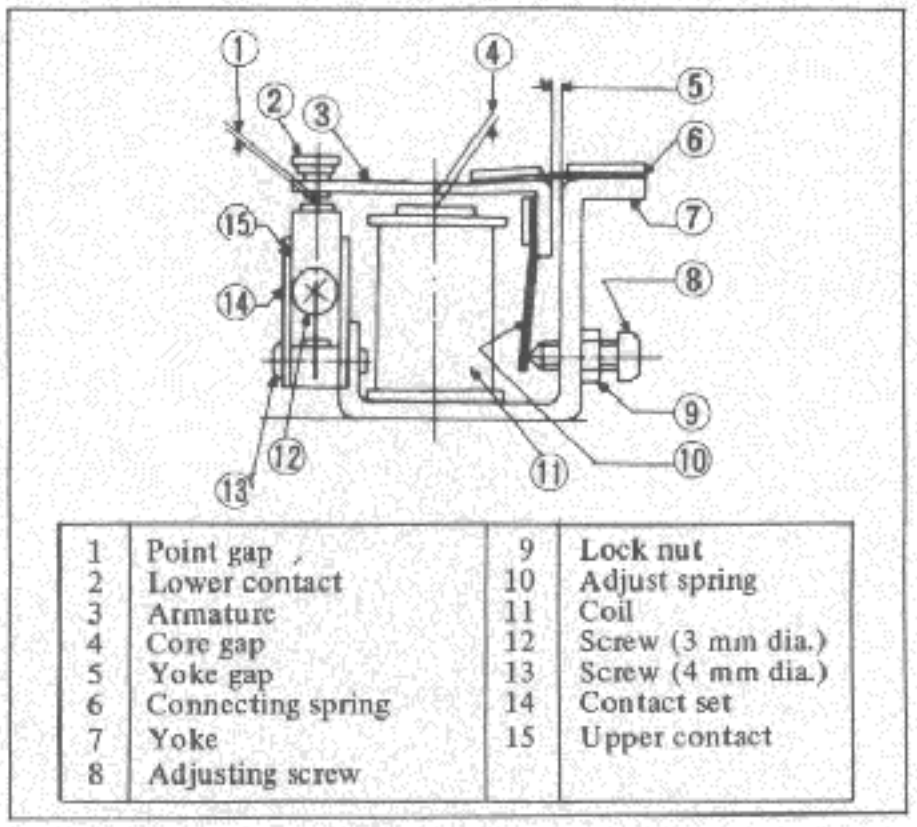


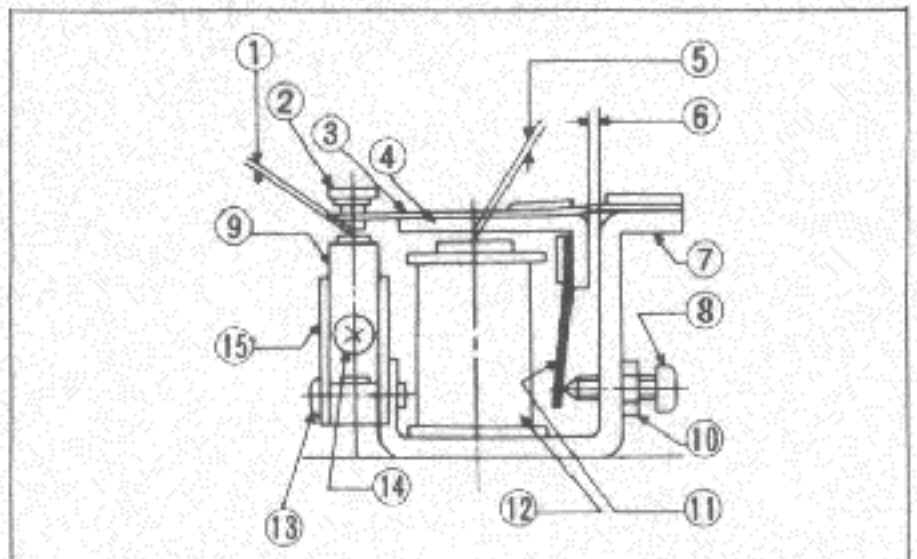
Fig. EE-50 TLIZ-37 voltage regulator

The voltage regulator and pilot lamp relay are built-in the regulator box. In the Figure EE-50, the parts shown in the right and left sides are respectively charge relay and voltage regulator.



1	Point gap	9	Lock nut
2	Lower contact	10	Adjust spring
3	Armature	11	Coil
4	Core gap	12	Screw (3 mm dia.)
5	Yoke gap	13	Screw (4 mm dia.)
6	Connecting spring	14	Contact set
7	Yoke	15	Upper contact
8	Adjusting screw		

(a) Construction of voltage regulator



1	Point gap	9	Voltage regulator contact
2	Charge relay contact	10	Lock nut
3	Connecting spring	11	Adjust spring
4	Armature	12	Coil
5	Core gap	13	Screw (3 mm dia.)
6	Yoke gap	14	Screw (4 mm dia.)
7	Yoke	15	Contact set
8	Adjusting screw		

(b) Construction of charge relay

Fig. EE-51 Structural view

MEASUREMENT OF REGULATING VOLTAGE

1. Connect a voltmeter, ammeter, fully charged battery and resistor as shown in Figure EE-52. Install the regulator perpendicularly by facing the connector downward.

Note: Make sure that all electrical loads (such as head lamps, air conditioner, radio, etc.) on the vehicle have been interrupted.

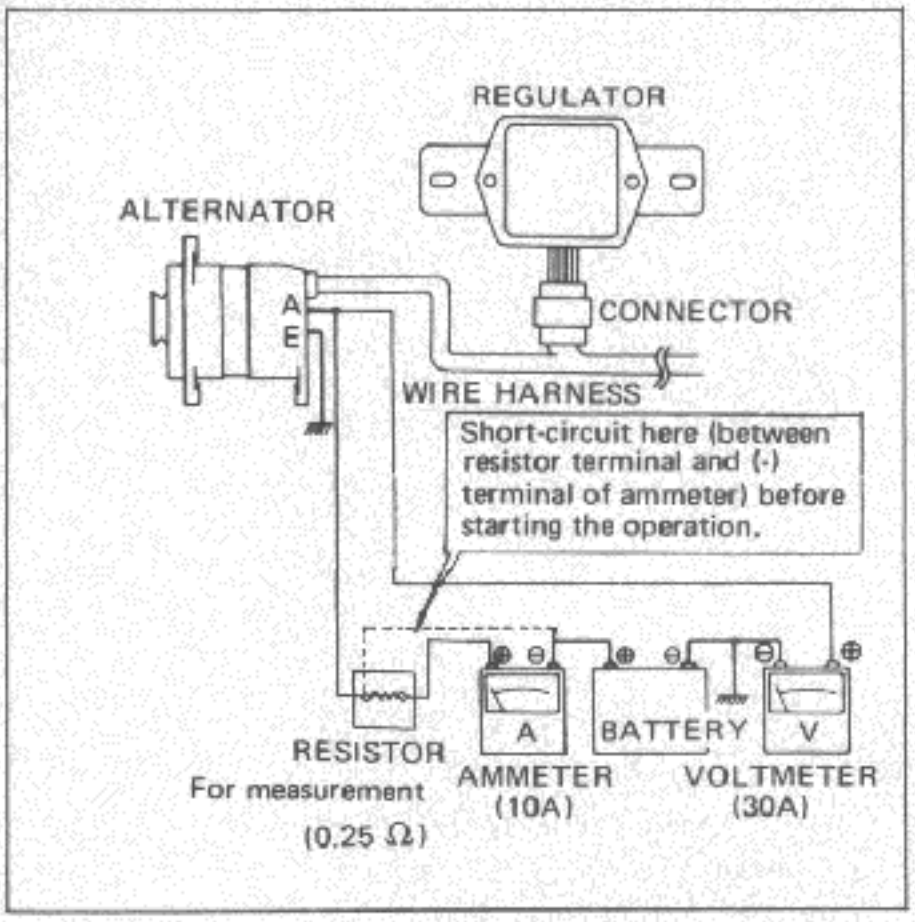
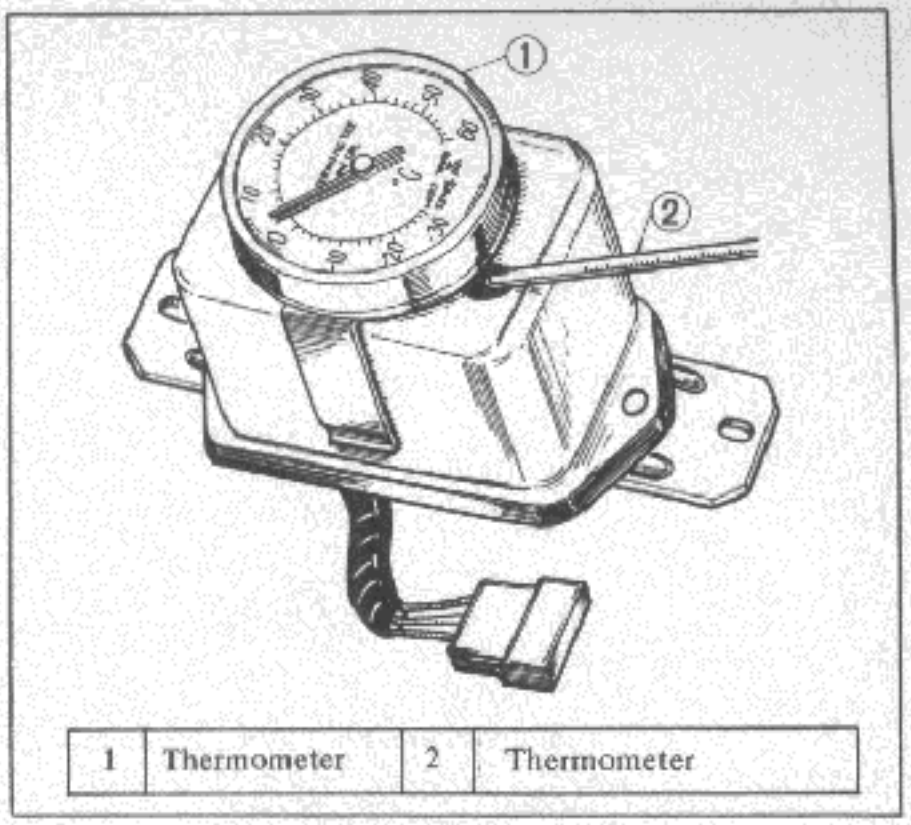


Fig. EE-52 Regulating voltage measuring circuit with regulator and alternator mounted on the vehicle

2. In the over temperature compensated regulator, it is necessary to check the temperature of the regulator cover as the regulating voltage is varied according to the surrounding temperature. In this case, use the thermometer or cylindrical thermometer with putty as shown in Figure EE-53.

3. Before starting the operation, be sure to short-circuit the line between terminal of the resistor for voltage measurement and ⊖ terminal of the ammeter. Pointer of the ammeter may deflect rapidly and reversely due to discharge current flowing from the battery resulting damaged ammeter. (See Figure EE-52.)



1	Thermometer	2	Thermometer

Fig. EE-53 Measuring of regulator cover temperature

4. Remove the short circuit wire.

Increase engine speed to 2,500 rpm gradually, and continue the operation for several minutes. Make sure that amperage is less than 5A when several minutes are elapsed. Lower engine speed to idling speed.

Note: When several minutes are elapsed and amperage does not lower below 5A, the battery is not fully charged. Replace the battery with a fully charged one.

5. Increase engine speed to 2,500 rpm gradually, and read voltage indicated on the voltmeter. Compare the regulating voltage against the rated regulating voltage at ambient temperature of the regulator at the time of measurement.

Note: When two to three minutes are elapsed after starting the regulator operation, voltage rises approximately 0.3V from the normal voltage due to the self-heating. Thus, be sure to measure voltage within one minute after starting the operation. When measurement cannot be made within one minute, cease the operation once and measure again after cooling the regulator.
Do not measure output voltage immediately after driving. When measureing, be sure that the regulator is cold.

Ambient temperature [°C (°F)]	Rated regulating voltage (V)
-10 (14)	14.6 to 15.6
0 (32)	14.45 to 15.45
10 (50)	14.3 to 15.3
20 (68)	14.15 to 15.15
30 (86)	14.0 to 15.0
40 (104)	13.85 to 14.85

ADJUSTMENT

Voltage regulator

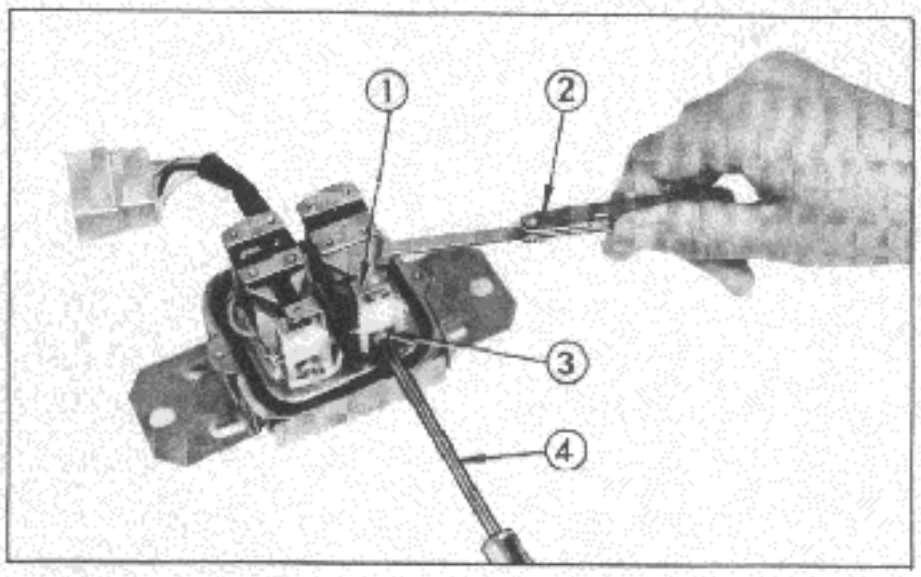
As the result of above measurement, when the regulating voltage is deviated from the rated value, adjust the regulator in accordance with the following instructions.

1. Inspect contact surface, and if rough, lightly polish the surface with fine emery paper (#500 or 600).

2. Measure each gap, and adjust if necessary. Adjust the core gap and point gap in that order. No adjustment is required for the yoke gap.

3. Adjusting core gap

Loosen the screw [4 mm (0.1575 in) diameter] which is used to secure the contact set on the yoke, and move the contact upward or downward properly. (See Figure EE-54.)

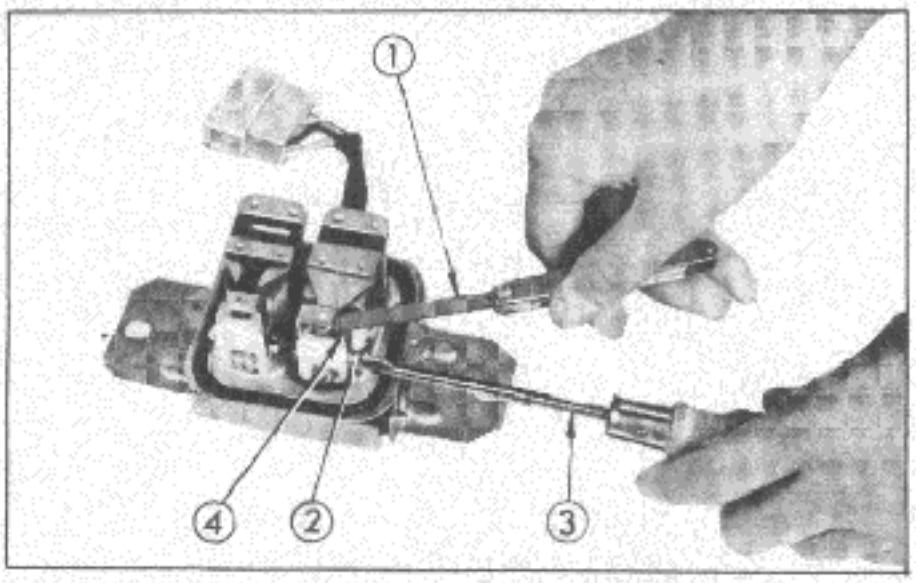


1	Contact set	3	4 mm dia. (0.1575 in dia.) screw
2	Thickness gauge	4	Cross-head screwdriver

Fig. EE-54 Adjusting core gap

4. Adjusting point gap

Loosen the screw [3 mm (0.1181 in) diameter] used to secure the upper contact, and move the upper contact upward or downward adequately. (See Figure EE-55.)

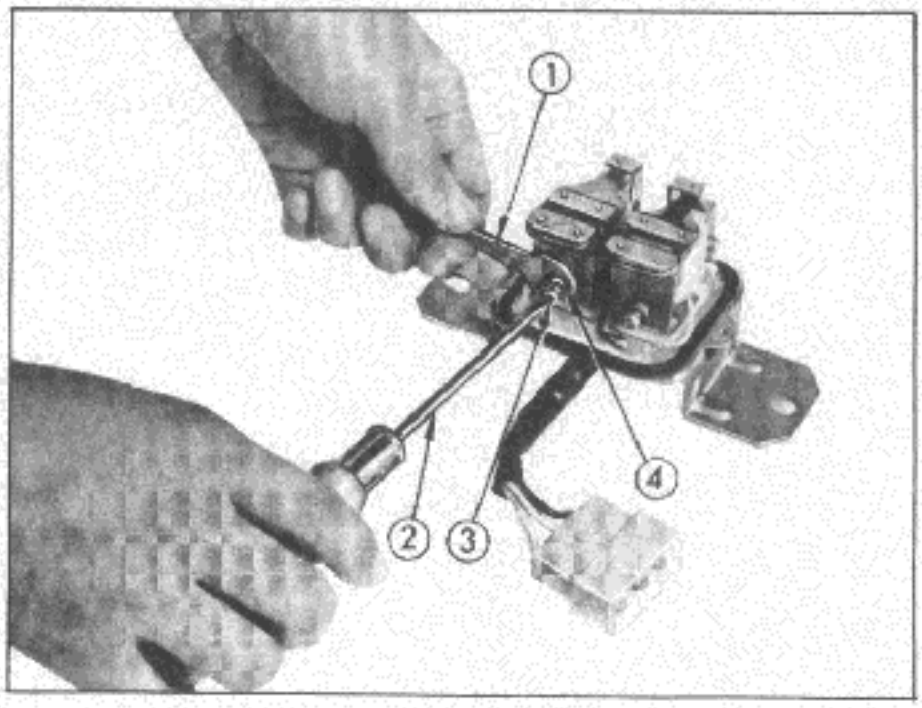


1	Thickness gauge	3	Cross-head screwdriver
2	3 mm dia. (0.1181 in dia.) screw	4	Upper contact

Fig. EE-55 Adjusting point gap

5. Adjusting voltage

Adjust regulating voltage with the adjusting screw. When increasing voltage, loosen the lock nut (used to secure the adjusting screw) and screw the adjusting screw. When decreasing, unscrew the adjusting screw. (See Figure EE-56.)



1	Spanner	3	Adjusting screw
2	Cross-head screwdriver	4	Lock nut

Fig. EE-56 Adjusting regulating voltage

Note: Upon completion of the regulating voltage adjustment, retighten the lock nut and securely set the adjusting screw stationarily.

Under the normal (satisfactory) condition, difference between the lower contact operating voltage and upper contact operating voltage rises 0 to approximately 0.5V as shown in Figure EE-57.

Reduce the core gap when the difference exceeds 0.5V, and increase when the difference is 0V.

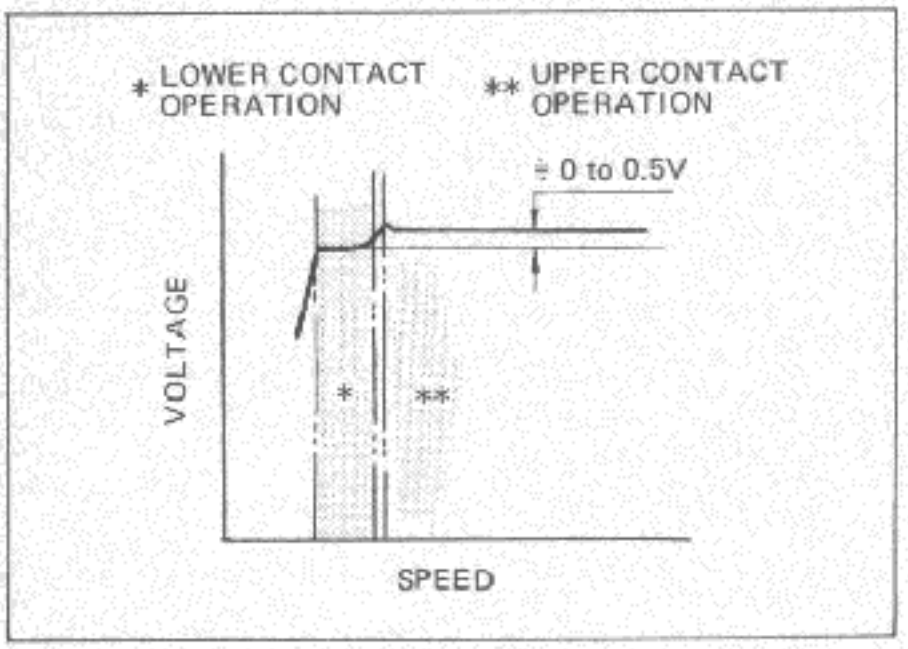


Fig. EE-57 Jump voltage

check operating voltage after dismounting the regulator. Figure EE-58 shows the measuring circuit.

Set the variable resistor to "MAX" position, apply current (turn on the switch), and reduce resistance gradually. When resistance is reduced to a certain level, the charge lamp goes out. This level indicates the charge relay operating voltage. The rated value is 4.2 to 5.2 volts. When deviated, readjust. The adjustment is carried out in the same manner as the voltage regulator.

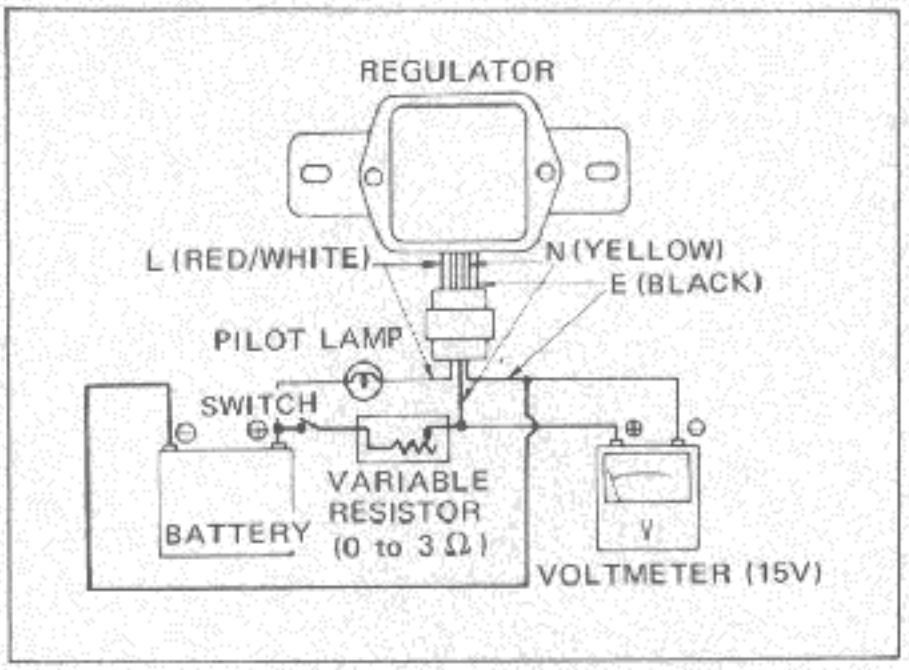


Fig. EE-58 Charge relay operating voltage measuring circuit

Charge relay

The normal charge relay operating voltage is 8 to 10V at the generator "A" terminal. However, it operates at 4 to 5V because one half of the "A" terminal voltage ("N" terminal voltage) is applied to the charge relay voltage coil.

It is difficult to measure this operating voltage with the regulator mounted on the vehicle.

Prepare a battery, voltmeter and variable resistor, and

Precautions for adjustment

1. Upon completion of the adjustment, reinstall the cover and make sure that the regulator operates correctly.

2. When the cover is removed or adjusting screw is adjusted while adjusting voltage, be sure to disconnect the regulator once, and reconnect when measuring actually. The battery circuit may be short-circuited.

SPECIFICATIONS AND SERVICE DATA

Voltage regulator		
Model		HITACHI TL1Z-37
Regulating voltage (with fully charged battery and connected faced downward)	V	*14.3 to 15.3 [at 20°C (68°F)]

Voltage coil resistance	Ω	.....	10.5 [at 20°C (68°F)]
Rotor coil inserting resistance	Ω	.....	10
Voltage coil series resistance	Ω	.....	25
Smoothing resistance	Ω	.....	40
Core gap	mm (in)	.....	0.6 to 1.0 (0.0236 to 0.0394)
Point gap	mm (in)	.....	0.3 to 0.4 (0.0118 to 0.0157)
Charge relay			
Release voltage	V	.....	4.2 to 5.2 at "N" terminal
Voltage coil resistance	Ω	.....	37.8 [at 20°C (68°F)]
Core gap	mm (in)	.....	0.8 to 1.0 (0.0315 to 0.0394)
Point gap	mm (in)	.....	0.4 to 0.6 (0.0157 to 0.0236)

*Standard temperature gradient: -0.015 V/°C

TROUBLE DIAGNOSES AND CORRECTIONS

Troubles	Trouble location	Causes	Remedies
Not output	Alternator	Sticking brushes	Correct or replace brush and brush spring
		Dirty brushes and slip rings	Clean
		Loose connections or broken leads	Retighten or solder connection Replace leads if necessary
		Open stator coil	Repair or replace the stator coil
		Open rotor coil	Replace the rotor
		Defective diodes	Replace the diodes assembly
		Shorted rotor	Replace the rotor
		Shorted stator	Repair or replace the stator
		Grounded "A" terminal	Replace the insulator
		Broken fan belt	Replace the belt

	Regulator	Faulty voltage regulator point contact	Repair or replace the regulator
	Wiring	Broken cable or disconnection of charging circuit	Repair or replace
Low output	Alternator	Sticking brushes	Correct or replace brushes if necessary
		Low brush spring tension	Correct or replace brush
		Dirty slip rings	Clean
		Partially shorted, ground or open stator coil	Replace the stator
		Partially shorted or grounded rotor coil	Replace the rotor
		Defective diode	Replace the diode assembly
		Loose or worn fan belt	Retighten or replace the belt
	Regulator	Improper voltage regulator adjustment	Check the voltage regulator operation and repair or replace as required
		Faulty voltage regulator point contact Defective operation	Repair or replace the regulator
	Wiring	Faulty charging circuit lead wire connection	Repair or replace
		Loose battery terminal	Retighten
Excessive output	Alternator	Short-circuited or broken neutral wire	Replace the wire
	Regulator	Improper voltage regulator adjustment. Defective operation	Check the voltage regulator operation and repair or replace as required
		Improper charge relay adjustment, detective operation, and/or faulty point contact	Check the charge relay operation and repair or replace as required

IGNITION CIRCUIT

The ignition circuit consists of the distributor, ignition coil, ignition switch, spark plugs, high tension cable and the battery. Figure EE-59 shows ignition circuit.

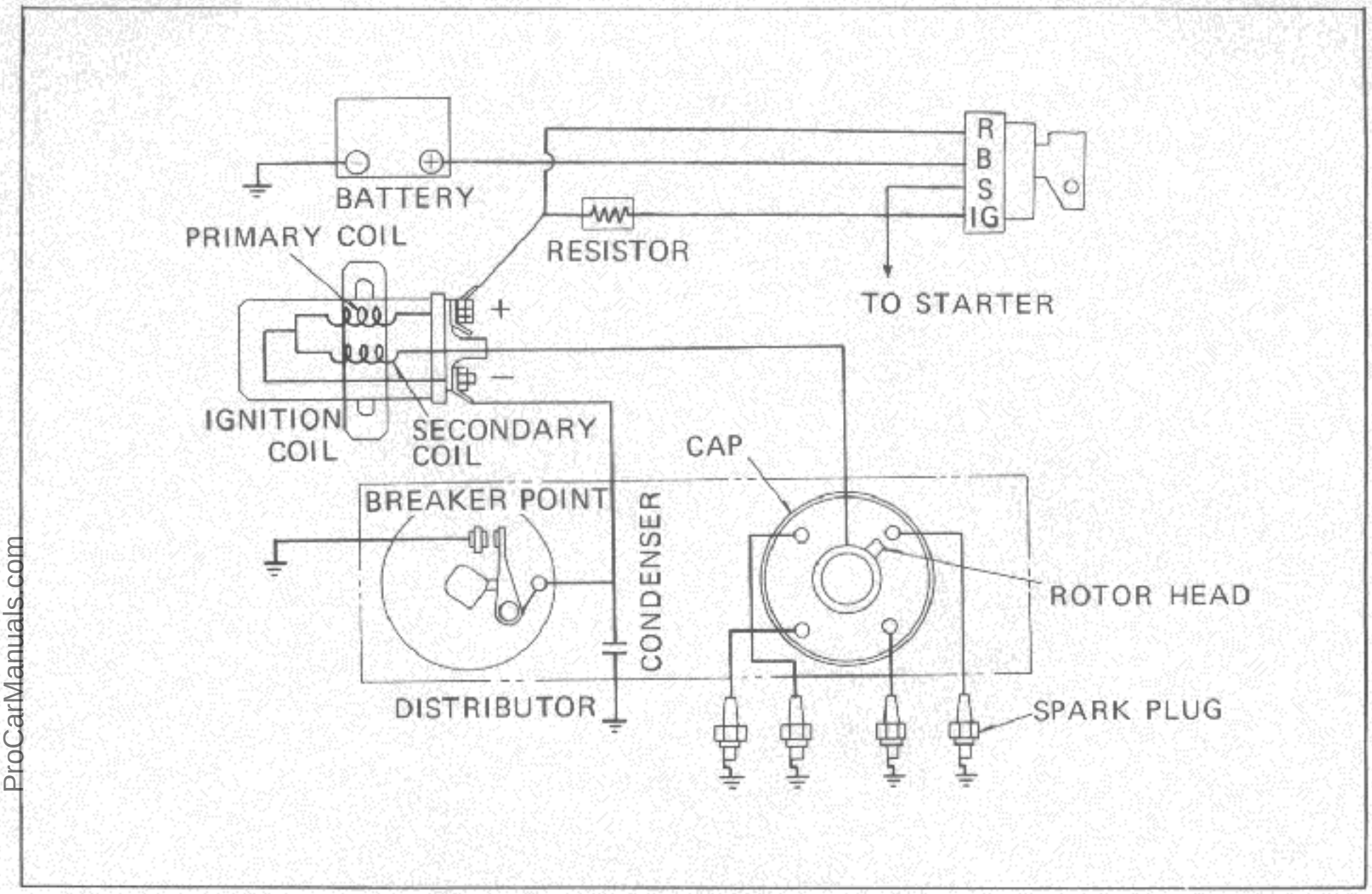


Fig. EE-59 Ignition system circuit diagram

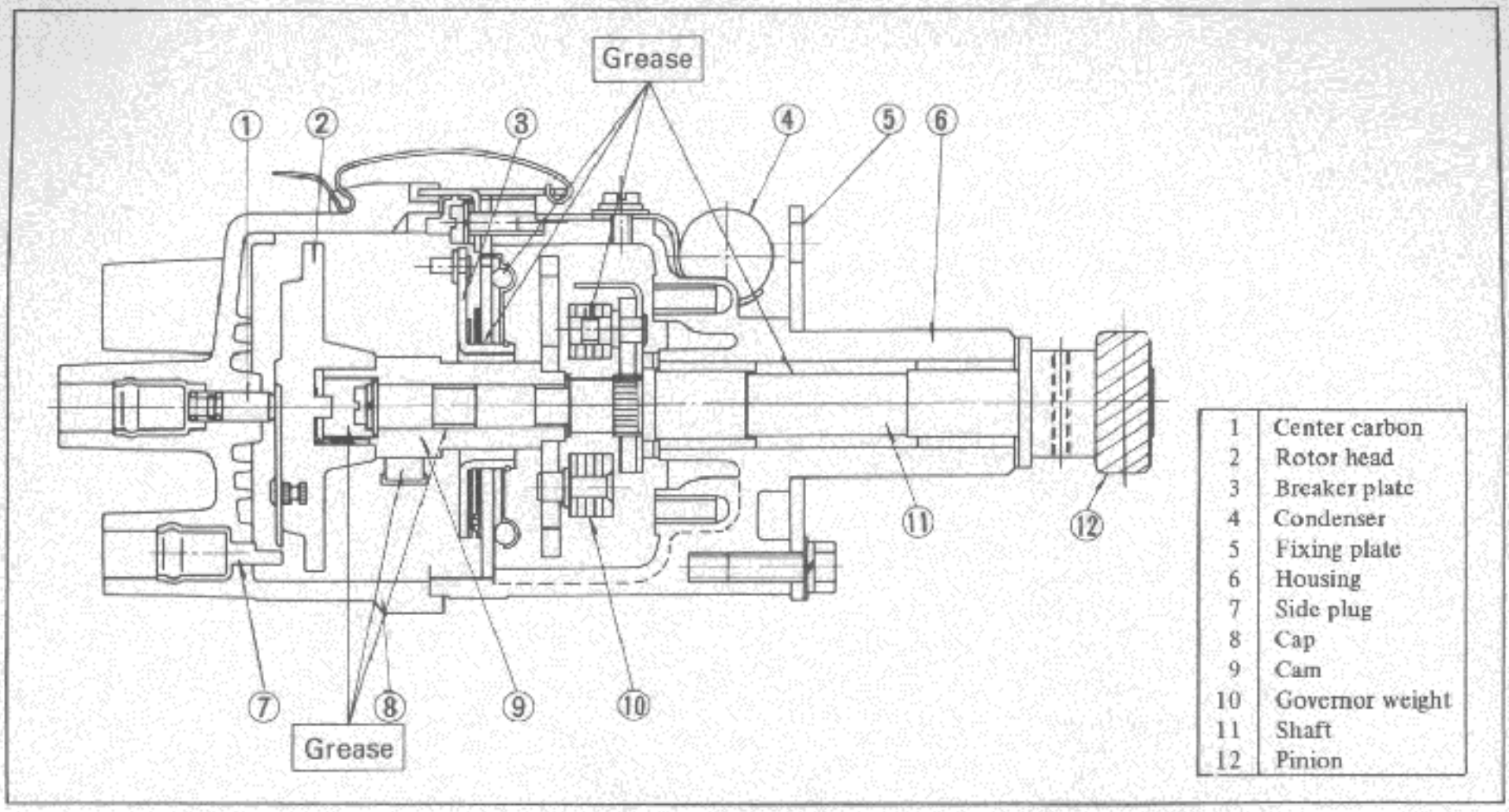
DISTRIBUTOR

CONTENTS

CONSTRUCTION

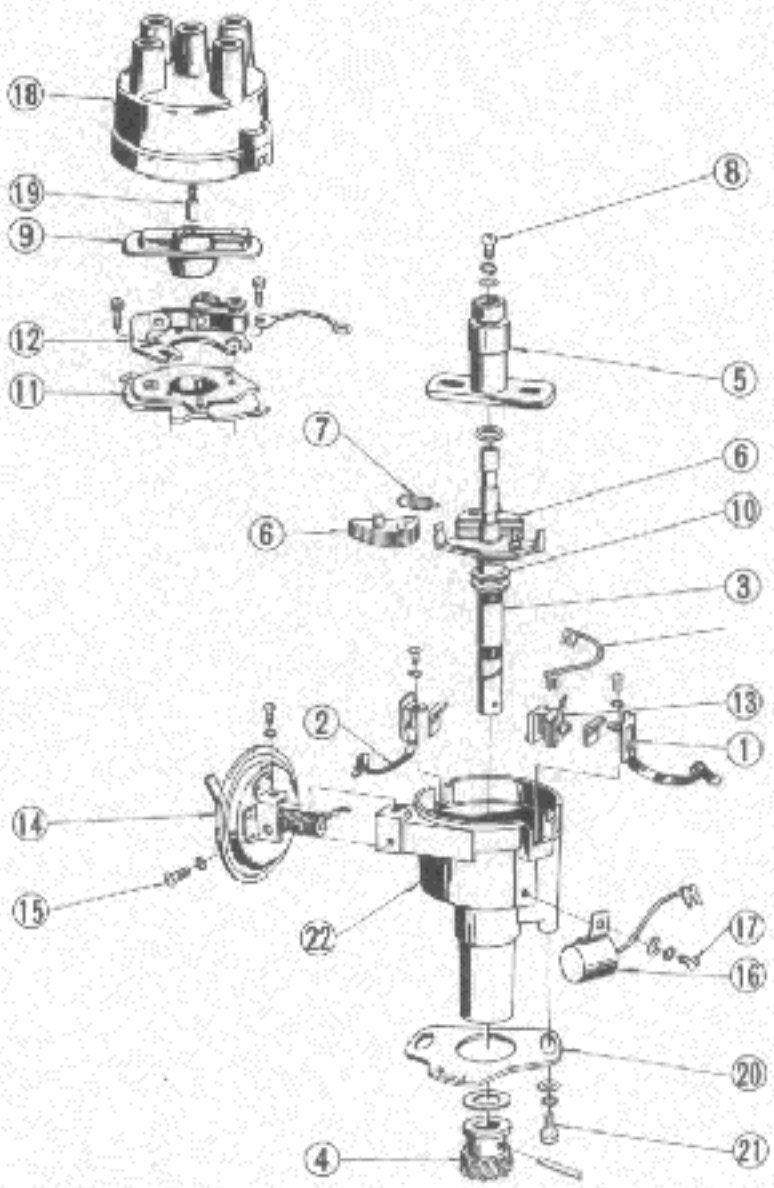
The distributor consists of high tension voltage part, switch off part, centrifugal advancing angle part, vacuum advance mechanical part and driving part.

Figures EE-60 and 61 show the construction and exploded view.



1	Center carbon
2	Rotor head
3	Breaker plate
4	Condenser
5	Fixing plate
6	Housing
7	Side plug
8	Cap
9	Cam
10	Governor weight
11	Shaft
12	Pinion

Fig. EE-60 Structure D411-61



1	Assembly clamp cap
2	Assembly clamp cap
3	Assembly shaft
4	Pinion
5	Assembly cam
6	Assembly weight governor
7	Spring governor
8	Screw
9	Assembly rotor head
10	Washer thrust
11	Assembly breaker plate
12	Set contact
13	Assembly terminal
14	Assembly control vacuum
15	Screw
16	Assembly condenser
17	Screw
18	Assembly cap distributor
19	Assembly point carbon
20	Plate fixing
21	Bolt
22	Housing

Fig. EE-61 Exploded view of distributor D411-61

CHECKING AND ADJUSTMENT

Cap and rotor head

Cap and rotor head must always be kept clean to maintain good insulation durability since high tension voltage from ignition coil is imposed on them. Sometimes, inside of the cap and rotor head is covered with fine carbon particles and dust. Whenever crack or trace of leakage is found on the cap, replace with a new one.

Recommend the rotor head also be replaced with a new one if excessively damaged.

Point

When point surface is roughened due to burning, polish with a fine emery paper (No. 500 or 600) or oil stone. When the point is worn excessively, replace. When the point is replaced with a new one, apply grease to the arm pivot receiver and cam surface. For causes of damaged (burnt) point, improper point contact, insufficient point gap, and defective condenser are considered.

The standard point gap is 0.45 to 0.55 mm (0.0177 to 0.0217 in). When gap is deviated from the standard gap, adjust. Turn the shaft to a position where the breaker arm heel rides the cam lug (a position where point gap is maximum), loosen the gap adjusting screw, apply a thickness gauge between contacts, and adjust to the standard point gap.

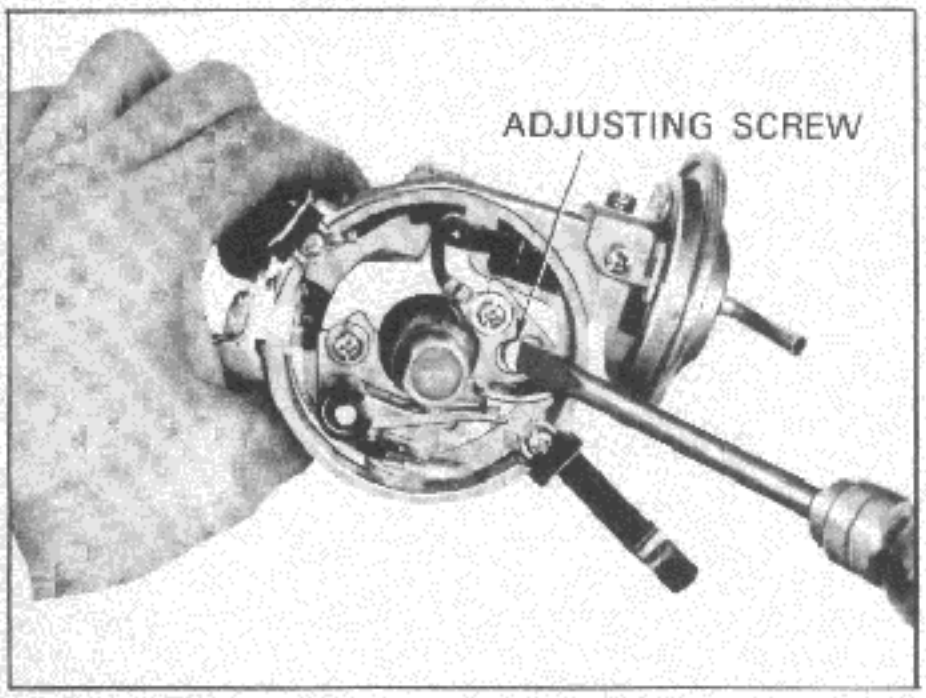


Fig. EE-62 Adjusting point gap

When measuring breaker point spring tension, apply spring tension gauge to the breaker point, and position the spring tension gauge in right angle against the breaker arm. The standard breaker point spring tension is 0.5 to 0.65 kg (1.1 to 1.4 lb).

Replace, if deviated.

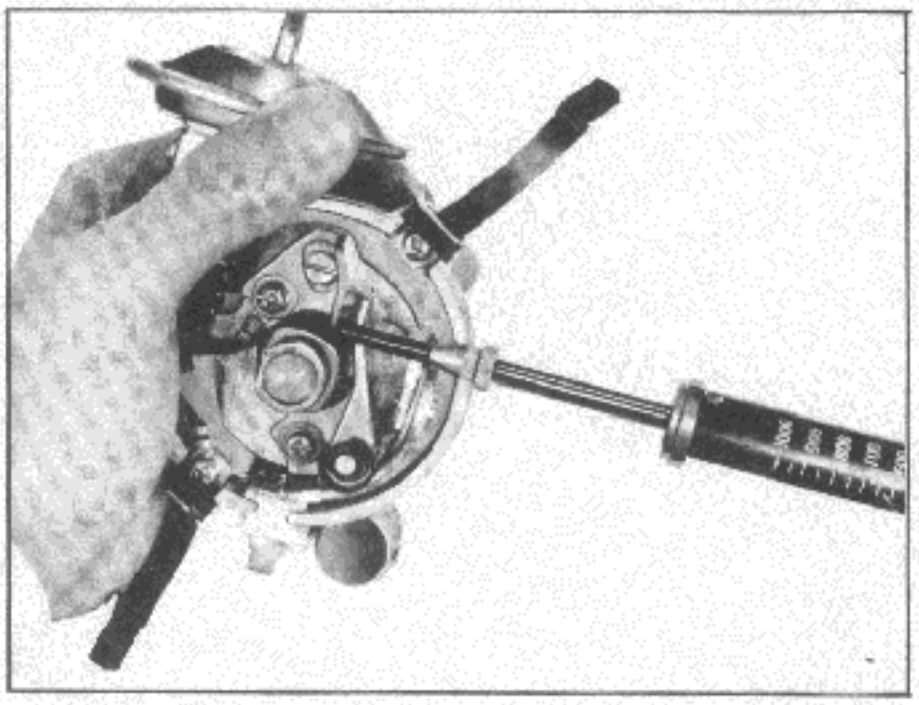


Fig. EE-63 Measuring breaker point spring tension

Condenser

Performance of condenser is affected by improper setting, contamination and reduction of insulation resistance. Thus, periodical checking is required to maintain the outlet of lead wire clean and to prevent set screw from loosening. Checking the condenser capacity is checked by the use of a capacity meter. It may be also checked condenser isolate resistance by the use of a tester by adjusting its range to measure large resistance value.

When the condenser is normal, the tester pointer swings largely and rapidly, and moves gradually back to the infinite side. When the pointer does not stay still or it points Zero in resistance, replacement is necessary.

Centrifugal advance mechanical part

When cause of engine trouble is traced to centrifugal advance mechanical part, use distributor tester to check its characteristics.

When nothing is wrong with its characteristics, conceivable causes are defectiveness or abnormal wearing of driving part or others. Do not disassemble it.

When characteristics are improper, check cam assembly, governor weight, shaft and governor spring, and other relative parts carefully.

When reassembling the centrifugal advance mechanical part, be sure to check advance characteristics by the use of a distributor tester.

≪ Centrifugal advance characteristics ≫

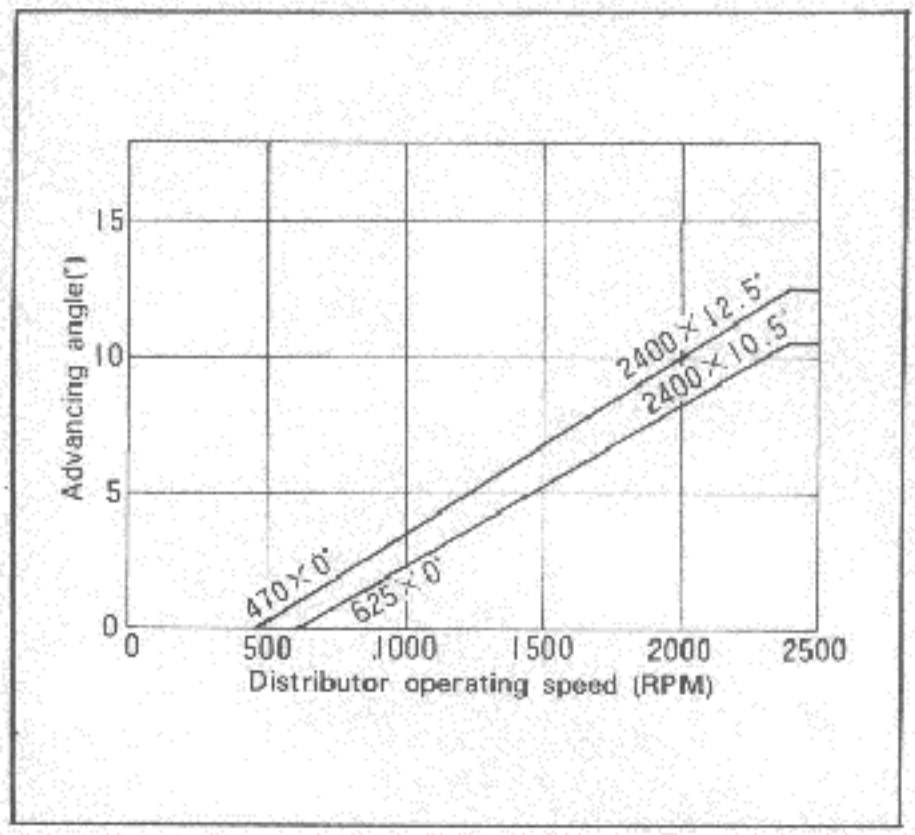


Fig. EE-64 D411-61

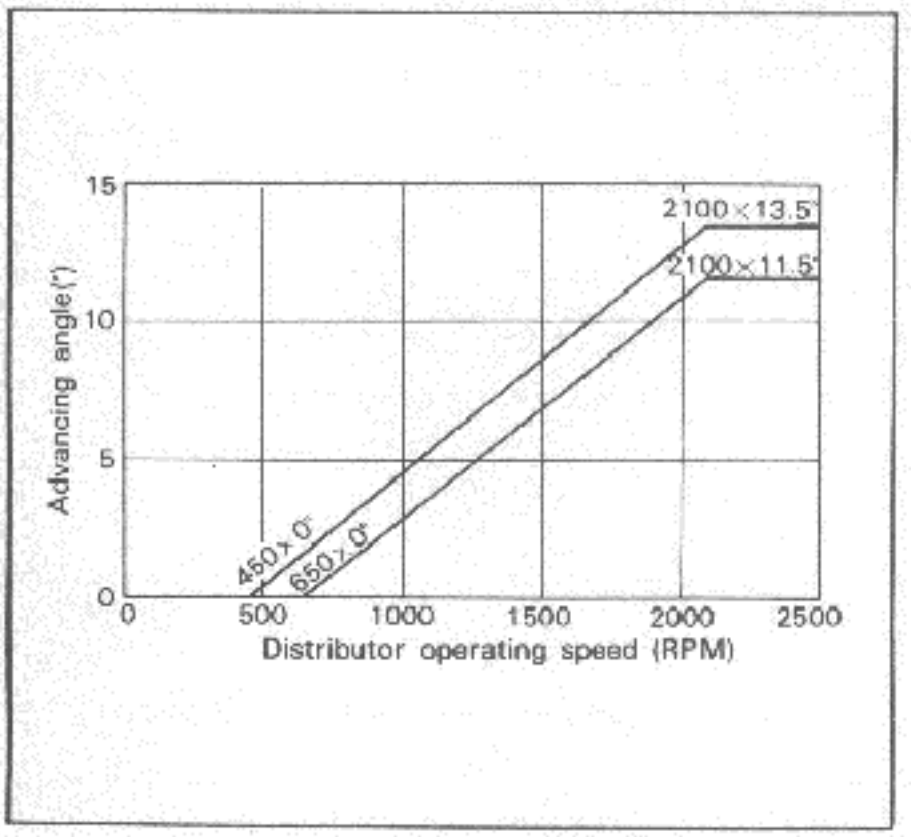


Fig. EE-65 D412-63

Vacuum advance mechanical part

≪ Vacuum advance characteristic ≫

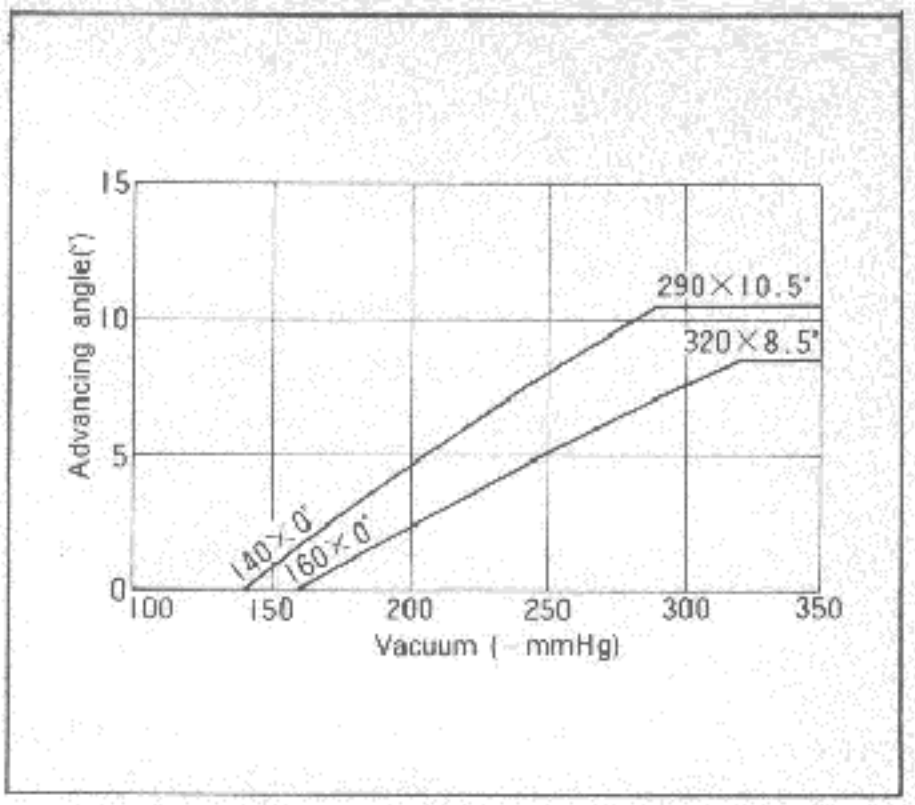


Fig. EE-66 D411-61

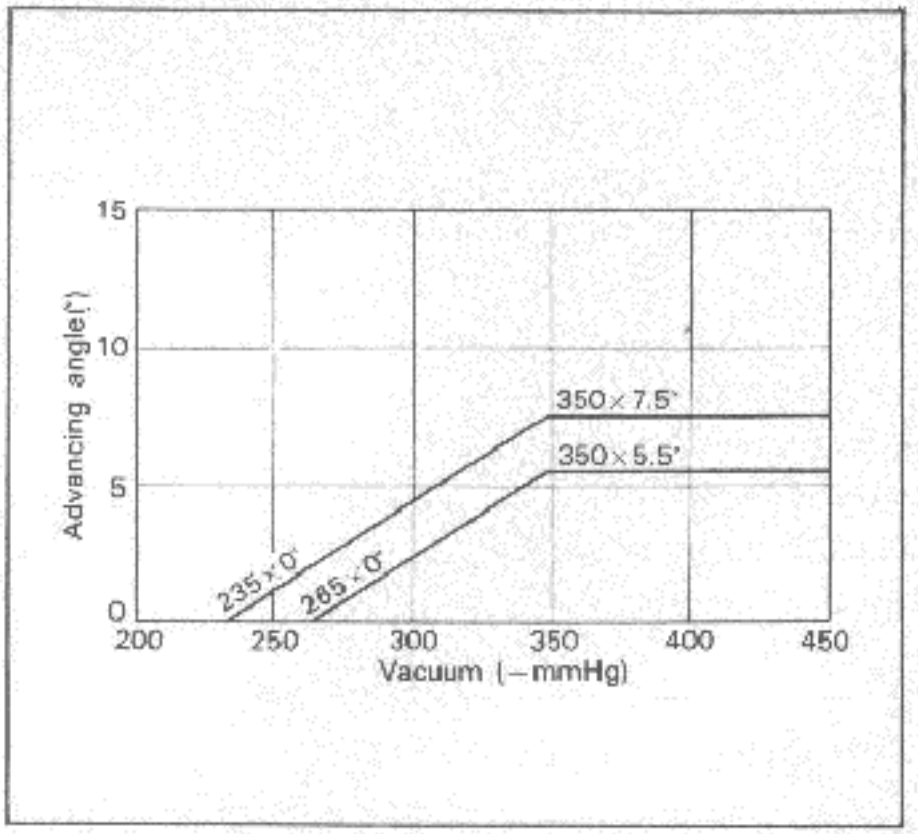


Fig. EE-67 D412-63

The following causes are considered for improper operation.

1. Leakage of air due to incomplete fastening of vacuum inlet.

2. Leakage due to defective diaphragm.

3. Stationary side and moving side of the breaker plate are sticked.

Solution for 1. is to make complete fastening and 2. is to replace it with a new one. Solution for 3. is as follows:

(1) The moving side of the breaker plate is supported by three steel balls at upper and lower sides.

Make sure that these balls work smoothly.

(2) The moving side of the breaker plate is rotated with the stationary side pivot receiver.

Make sure that this pivot receiver operates correctly. When assembling, be sure to apply three steel balls to the upper and lower sides and to grease them.

DISASSEMBLY AND REASSEMBLY

Disassembly

When the distributor is disconnected from engine, position of distributor and rotor head for housing must be well remembered or marked.

If distributor is installed incorrectly, it does not operate correctly. Disassembly is to be carried out in the following sequence.

1. Remove cap and disconnect rotor head.

2. When removing the contact set, first, unscrew two set screws one to one and a half of full turn.

Remove the primary lead terminals and remove the contact set from the distributor.

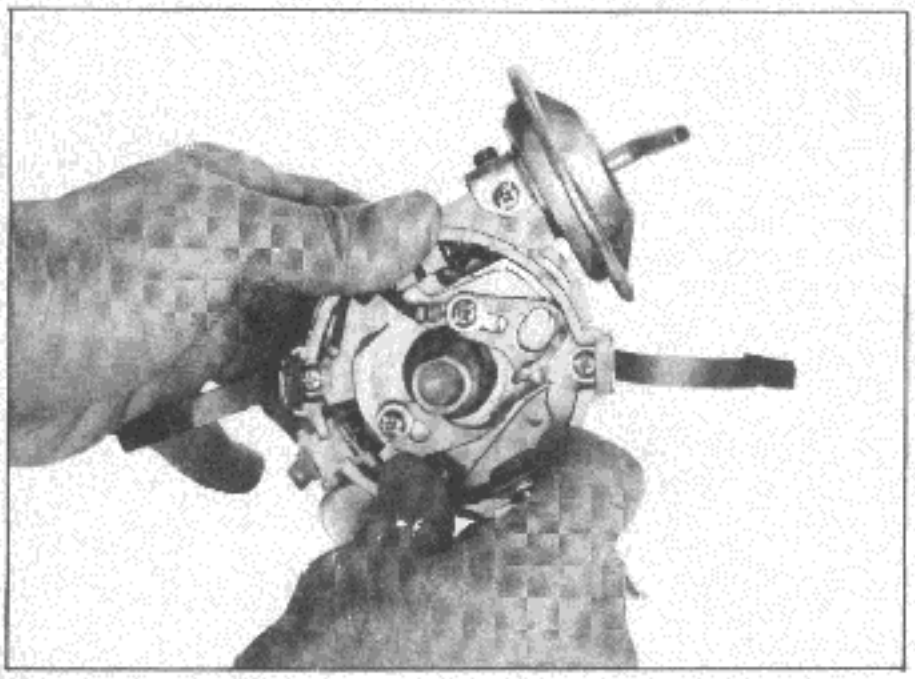


Fig. EE-68 Removal of contact set

3. Remove the vacuum controller.

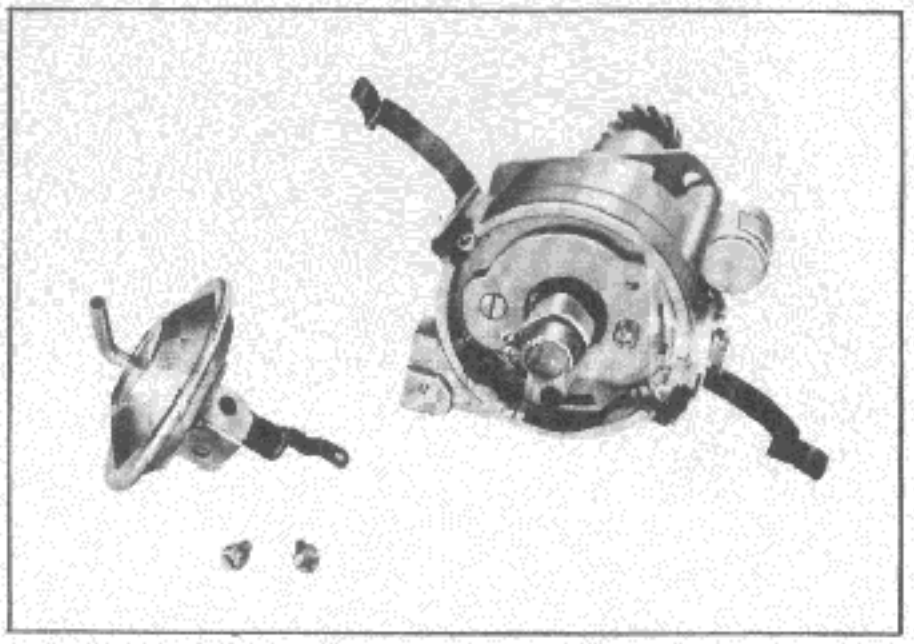


Fig. EE-69 Disassembly of vacuum controller

4. Loosen two screws used to secure the breaker plate on the housing, and remove the breaker plate. The clamp, terminal, and lead wire can also be removed.

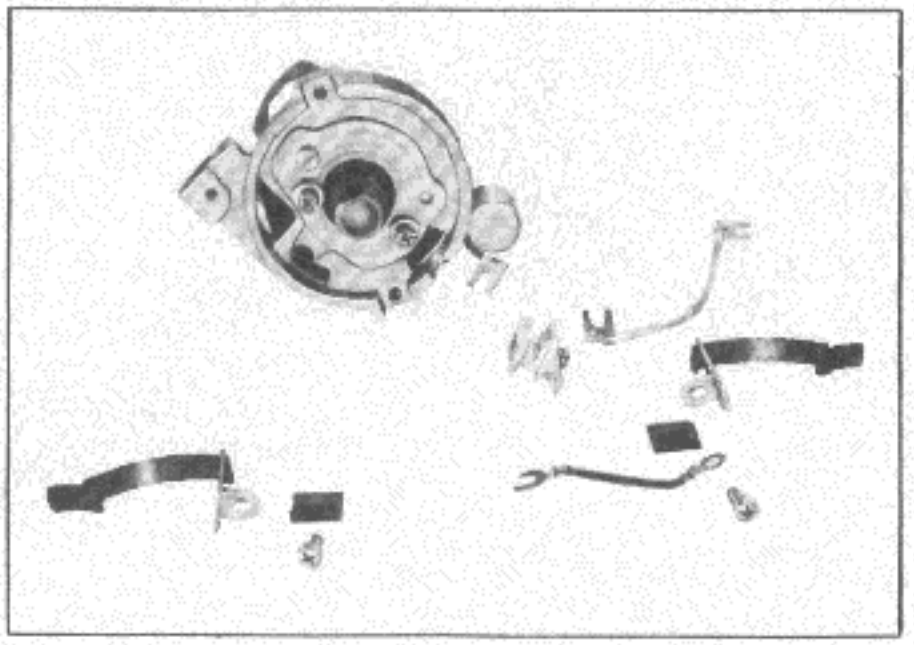


Fig. EE-70 Removal of breaker plate

5. To remove the cam, remove the set screw first, since the shaft head is fastened by the screw to hold the cam down.

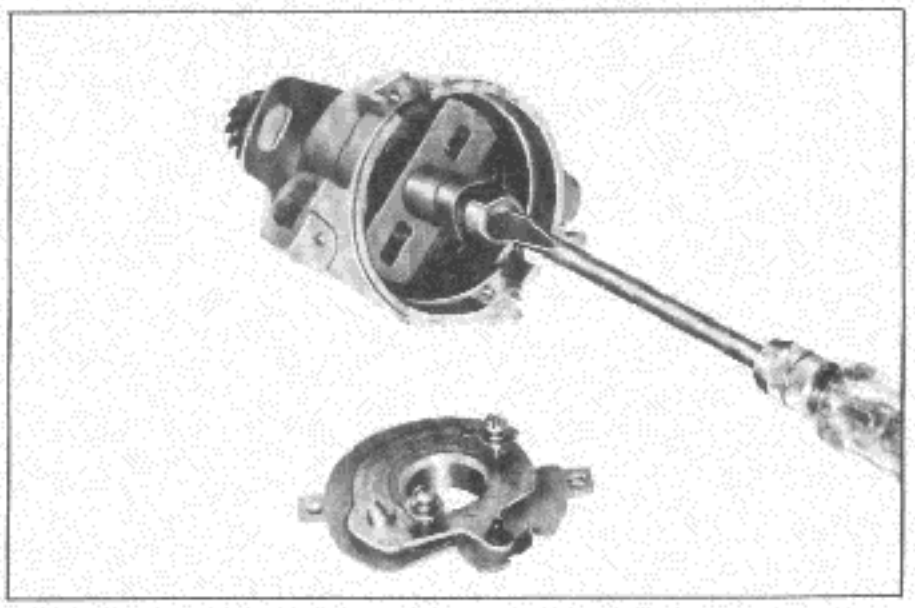


Fig. EE-71 Removal of cam

6. Drive out the knock pin and disconnect the pinion to remove the whole rotary unit.

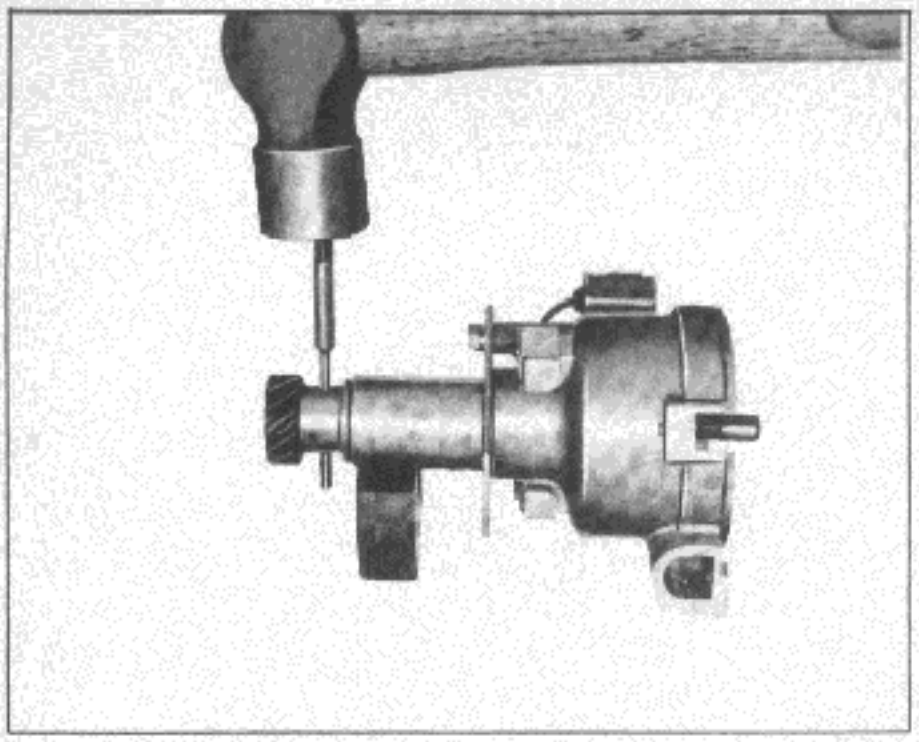


Fig. EE-72 Removal of knock pin

7. Remove the whole rotary unit.

When disconnecting the governor spring from the governor weight, be careful not to stretch or deform the governor spring.

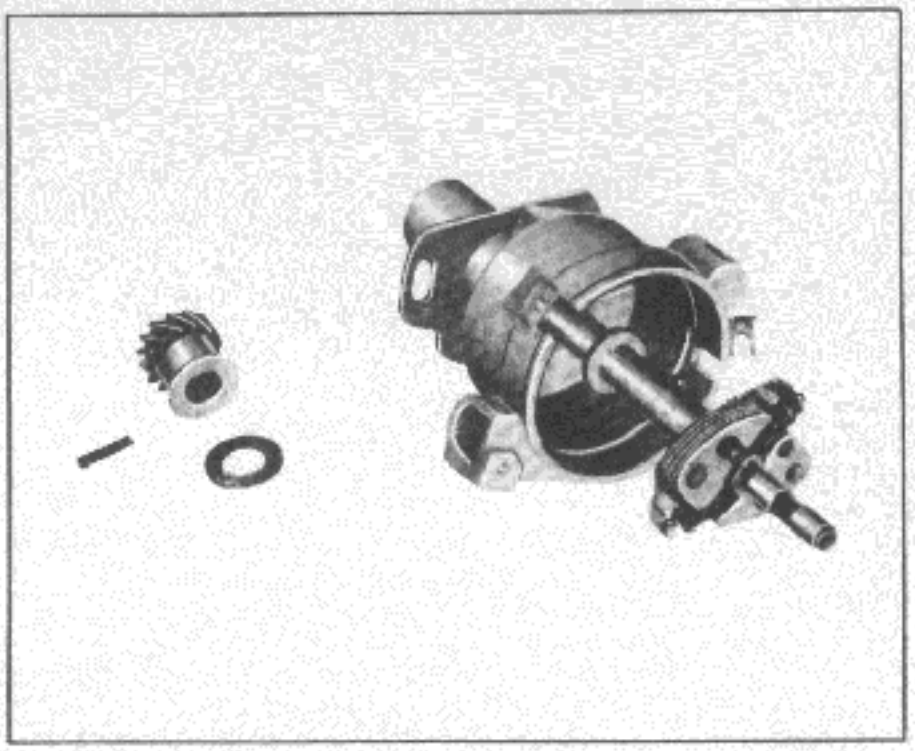
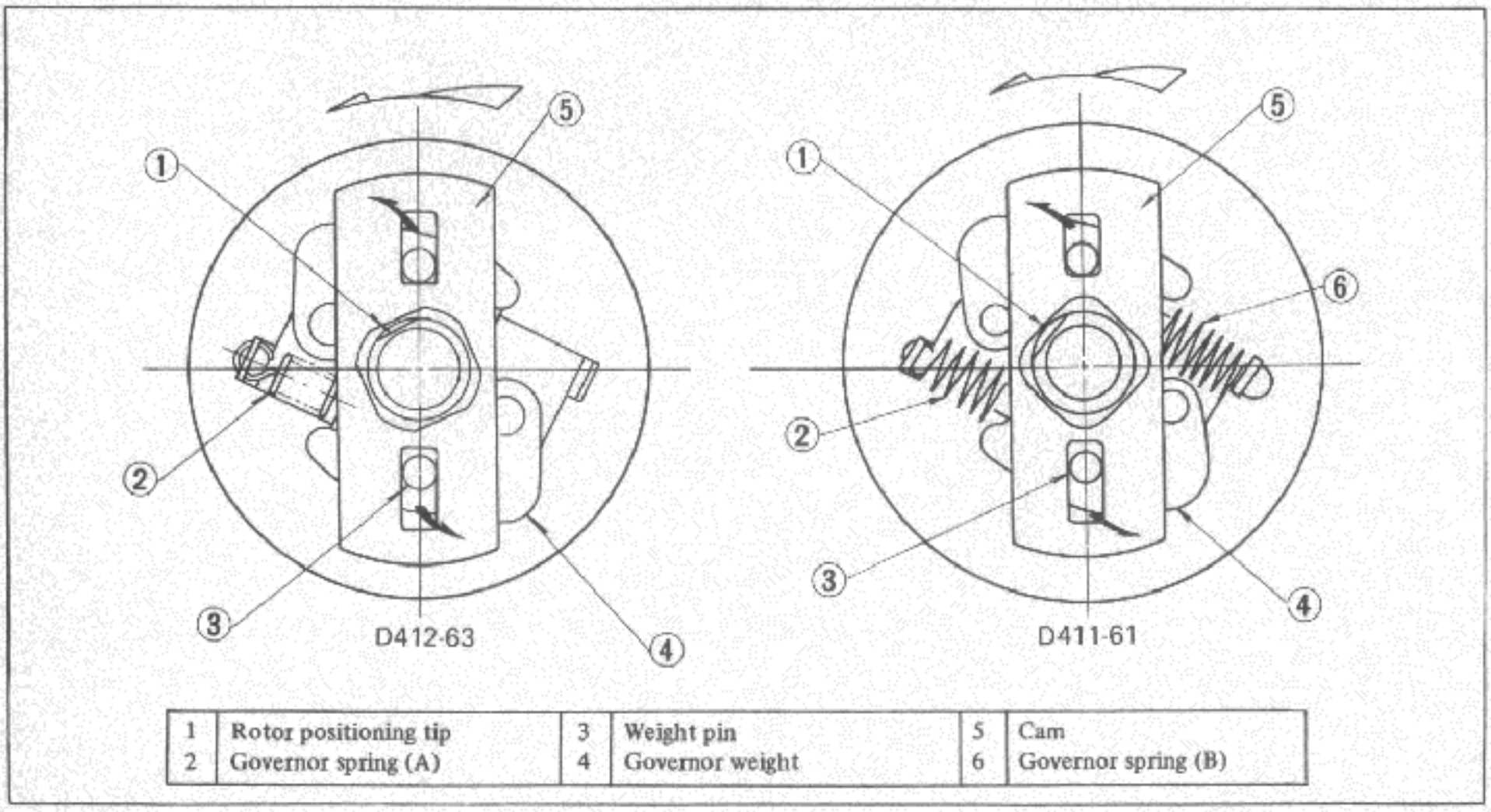


Fig. EE-73 Removal of rotation part

Reassembly

Reassemble the distributor in reverse sequence of disassembly. When assembling, be sure to apply grease to portion as shown EE-60.

For the governor spring and cam installing positions, refer to Figure EE-74.



1	Rotor positioning tip	3	Weight pin	5	Cam
2	Governor spring (A)	4	Governor weight	6	Governor spring (B)

Fig. EE-74 Installation of governor spring and cam

Set the governor spring (A) to the rotor head positioning tip side. In this case, the weight pin for the governor spring (A) is applied into the long groove, and a clearance is remained at beginning and ending of advancing. On the other hand, the weight pin in the opposite side enters the short groove, and no clearance is remained at both beginning and ending of advancing.

In the case of a D411-61 distributor, it has two governor springs. The governor spring (A) can be identified easily because the free length is shorter than that of the governor spring (B).

Upon completion of the assembly, measure advancing characteristics to ensure the performance before installing the distributor on the engine.

SPECIFICATIONS AND SERVICE DATA

Specifications

Make and type				HITACHI D411-61	HITACHI D412-63 (for U.S.A., CANADA)
Firing order				1-3-4-2	←
Rotating direction				Counterclockwise	←
Ignition timing (B.T.D.C.)	Manual transmission °/rpm			7/600	5/700
	Automatic transmission °/rpm			7/600	
Dwell angle				49-55°	←
Condenser capacity			μF	0.20 to 0.24	←
Advance characteristic	Centrifugal	Start	rpm	547.5	550
		Maximum	°/rpm	11.5/2,400	12.5/2,100
	Vacuum	Start	mm Hg (in Hg)	150 (5.91)	250 (9.84)
		Maximum	°/mm Hg (in Hg)	9.5/305 (12)	6.5/350 (13.8)
Weight			kg (lb)	1.0 (2.2)	←

Service data

Point gap	mm (in)	0.45 to 0.55 (0.0177 to 0.0217)
Point pressure	kg (lb)	0.50 to 0.65 (1.1 to 1.4)
Condenser capacity	μF	0.20 to 0.24
Condenser isolate resistance	MΩ	5
Cap carbon point	mm (in)	12 (0.472)

Shaft diameter (lower part)	mm (in)	12.45 $\frac{-0.010}{-0.020}$ (0.4902 $\frac{-0.0004}{-0.0008}$)
Housing inner diameter	mm (in)	12.45 $\frac{+0.018}{0}$ (0.4902 $\frac{+0.0007}{0}$)
Clearance between shaft and housing	mm (in)	0.010 to 0.038 (0.0004 to 0.0015)
Amendment limit of clearance	mm (in)	0.08 (0.0031)
Shaft diameter (upper part)	mm (in)	8 $\frac{-0.005}{-0.014}$ (0.3150 $\frac{-0.0002}{-0.0006}$)
Cam inner diameter	mm (in)	8 $\frac{+0.015}{0}$ (0.3150 $\frac{+0.0006}{0}$)
Clearance between shaft and cam	mm (in)	0.005 to 0.029 (0.0002 to 0.0011)
Weight pivot diameter	mm (in)	5 $\frac{-0.028}{-0.005}$ (0.1969 $\frac{-0.0011}{-0.0002}$)
Weight hole diameter	mm (in)	5 $\frac{-0.018}{0}$ (0.1969 $\frac{+0.0007}{0}$)
Clearance between pivot and hole	mm (in)	0.005 to 0.046 (0.0002 to 0.0018)

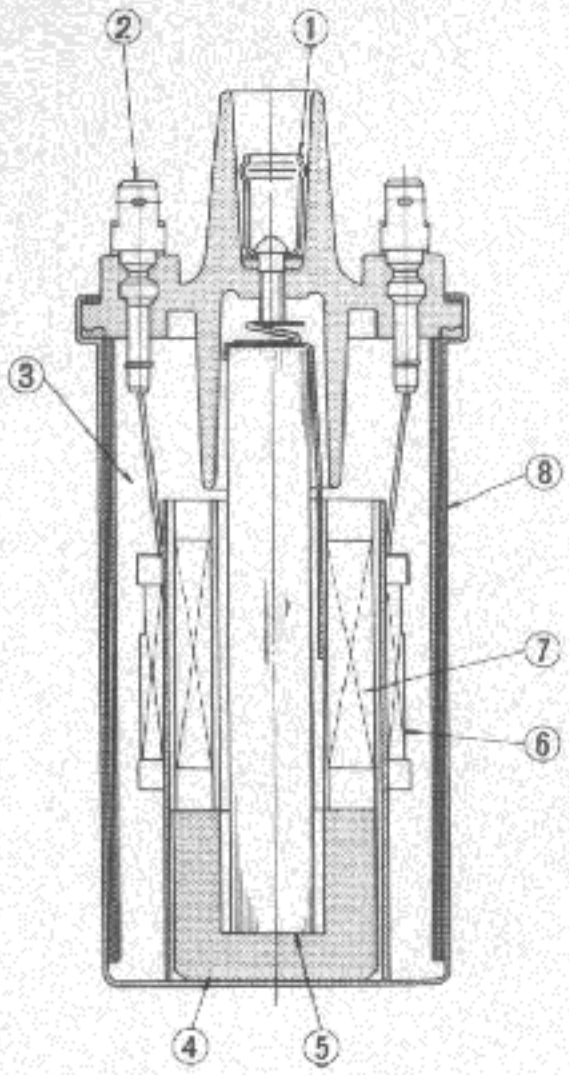
IGNITION COIL

CONTENTS

DESCRIPTION

The ignition coil is an oil type coil. The ignition coil is equipped with resistor for improved spark performance at high revolution. The number of turns in primary winding results in a higher inductance in this winding, which makes it possible for this coil to provide a higher secondary voltage output throughout the speed range.

For optimum starting performance, the resistor is by-passed during cranking, thereby connecting the ignition coil directly to the battery. This provides full battery voltage available at coil and thus keeps ignition voltage as high as possible during cranking. The resistor is by-passed automatically through the ignition and starting switch when switch is in the "start" position.



1	High voltage terminal	5	Core
2	Primary terminal	6	Primary coil
3	Insulation oil	7	Secondary coil
4	Core insulating material	8	Case

Fig. EE-75 Construction

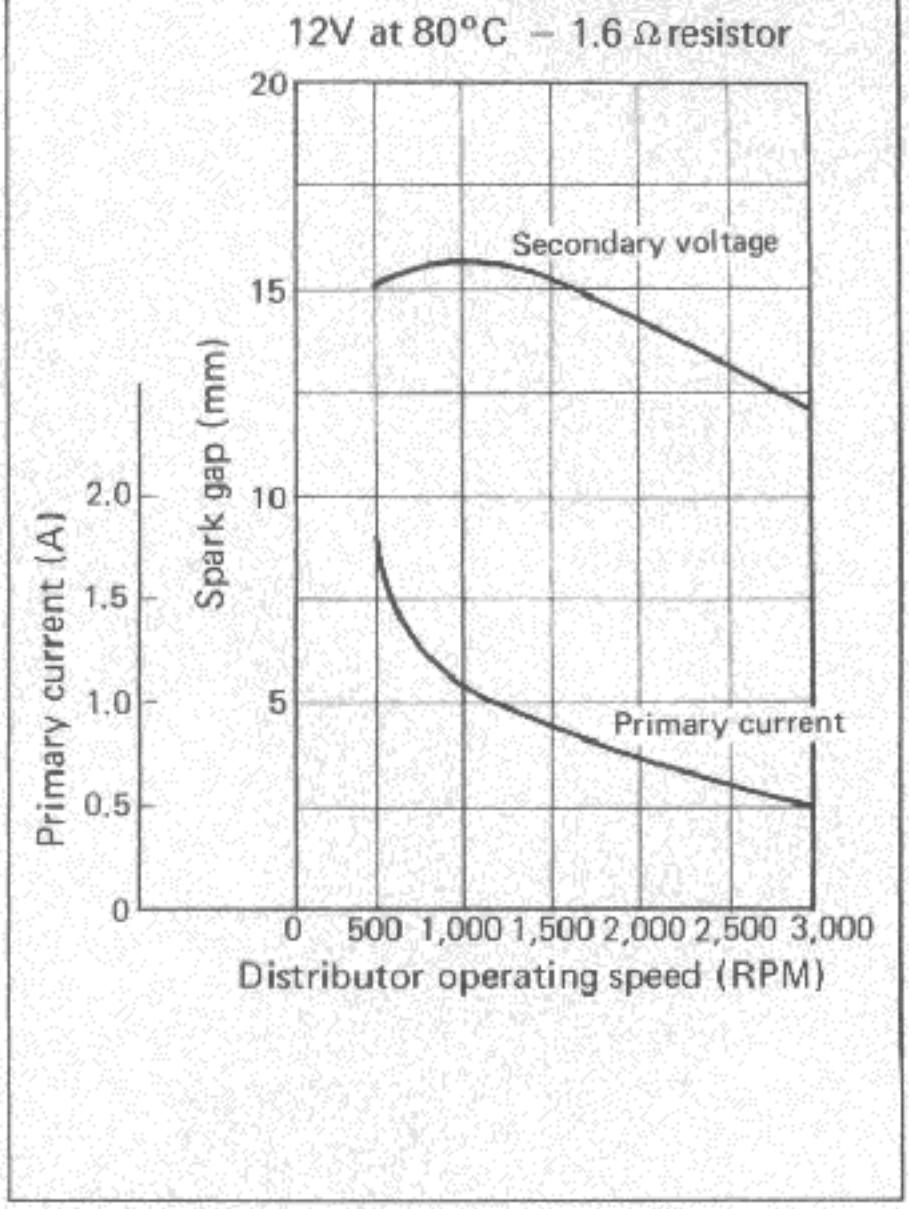


Fig. EE-76 C6R-200, characteristic curve

SPECIFICATIONS

Make and type	HITACHI C6R-200
Primary voltage V	12
Spark gap mm (in)	more than 7 (0.2756)
Primary resistance at 20°C (68°F) Ω	1.3 to 1.6
Secondary resistance at 20°C (68°F) KΩ	9 to 14
Resistor at 20°C (68°F) Ω	1.4 to 1.8

SPARK PLUGS

CONTENTS

PERIODICAL SERVICES

Plugs should be removed for cleaning, inspection and regapping periodically (actual time depending on operating conditions).

INSPECTION

Spark plug life is affected to a large extent by operating conditions and plug life varies consequently. In order to secure spark performance, spark plugs should be checked, cleaned and regapped periodically.

Worn or dirty plugs will give satisfactory operation at idling speed, but under high speed operation, they frequently fail. Faulty plugs are evident in a number of ways such as increased fuel consumption, power loss, loss of speed, hard starting and general poor engine performance.

Spark plug failure, in addition to normal wear, may be due to dirty or leaded plugs, excessive gap or broken insulator.

Dirty or leaded plugs may be evident by black carbon deposits, or red, brown, yellow or blistered oxide deposits, on the plugs. The black deposits are usually the result of slow-speed driving and short runs where sufficient engine operating temperature is seldom reached.

Worn piston rings, faulty ignition, over-rich carburetion and spark plugs which are too "cold" will also result in carbon deposits. Red or brown oxide deposits and a consequence of the use of leaded fuel, usually result in spark plug failure under severe operating conditions. The oxide has no adverse effect on plug operation as long as it remains in a powdery state. But, under high speed or hard pull, the power oxide deposits melt and form a heavy glaze coating on the insulator which, when hot, acts as a good electrical conductor, allowing current to follow the deposits and short out the plug.

Excessive gap wear on plugs of low mileage, usually indicates the engine is operating at high speeds or loads that are consistently greater than normal or that a plug which is too "hot" is being used. In addition, electrode wear may be the result of plug overheating, caused by combustion gases leaking through the treads and gasket, due to insufficient compression of the spark plug gasket, dirt under the gasket seat. Too "lean" carburetion will also result in excessive electrode wear.

Broken insulators are usually the result of improper installation or carelessness when regapping the plug. Broken upper insulators usually result from a poor fitting wrench or an outside blow. The cracked insulator may not make itself evident immediately, but soon oil or moisture will penetrate the fracture. The fracture is usually just below the crimped part of shell and may not be visible.

Broken lower insulators usually result from carelessness when regapping and generally are visible. In fairly rare instances, this type of break may result from the plug operating too "hot" such as encountered in sustained periods of high-speed operation or under extremely heavy loads. When regapping a spark plug, to avoid lower insulator breakage, always make the gap adjustment by bending the ground side electrode. Spark plugs with broken insulators should always be replaced.

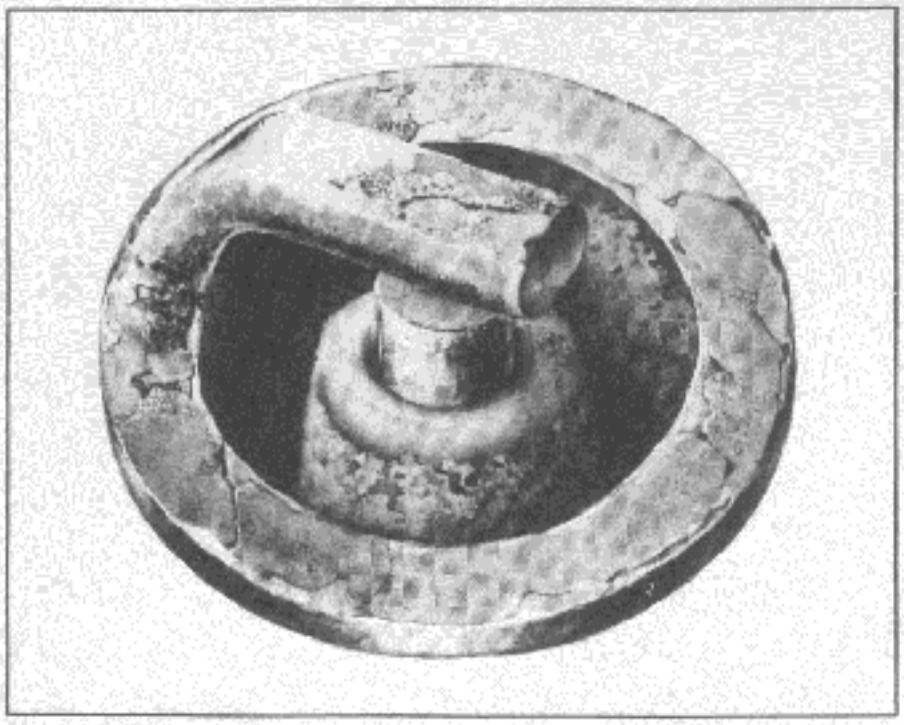


Fig. EE-77 Normal condition

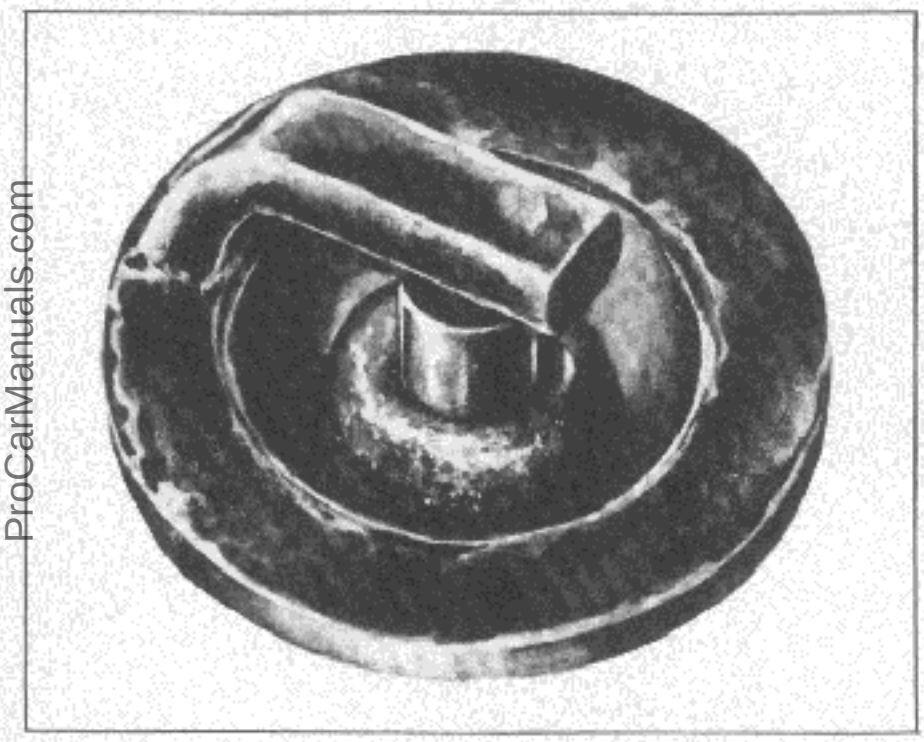


Fig. EE-78 Fouling plug

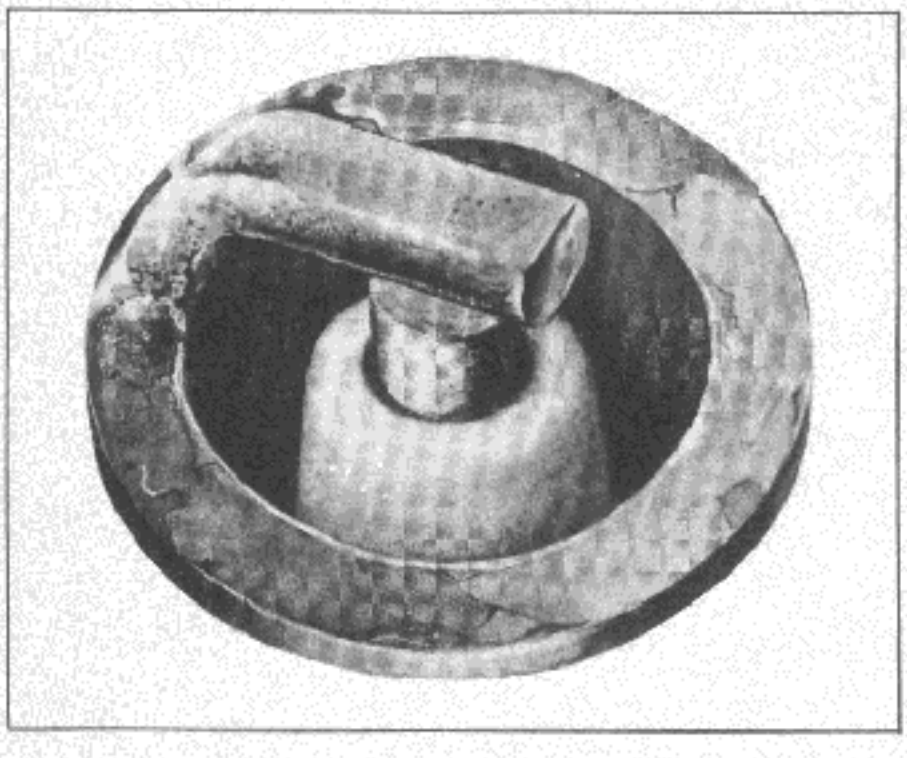


Fig. EE-79 Overheating plug (I)

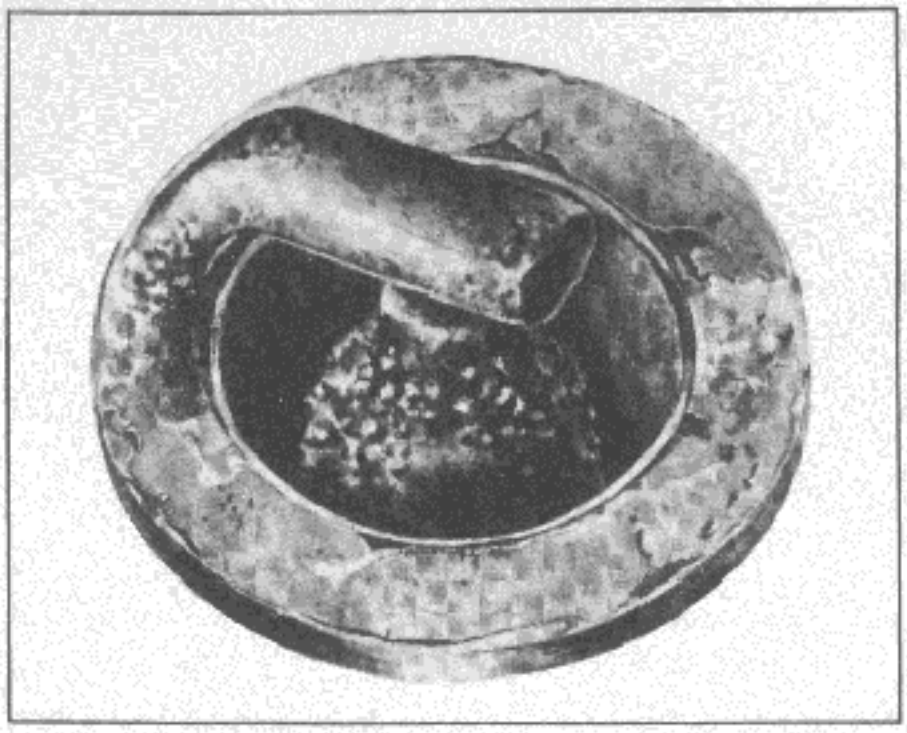


Fig. EE-80 Overheating plug (II)

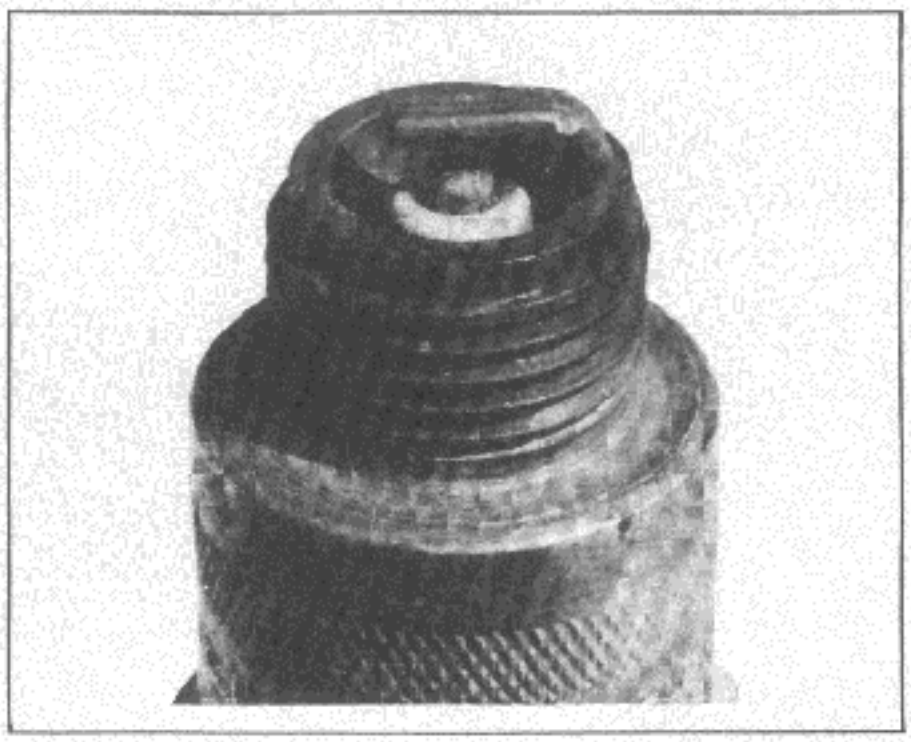


Fig. EE-81 Overheating plug (III)

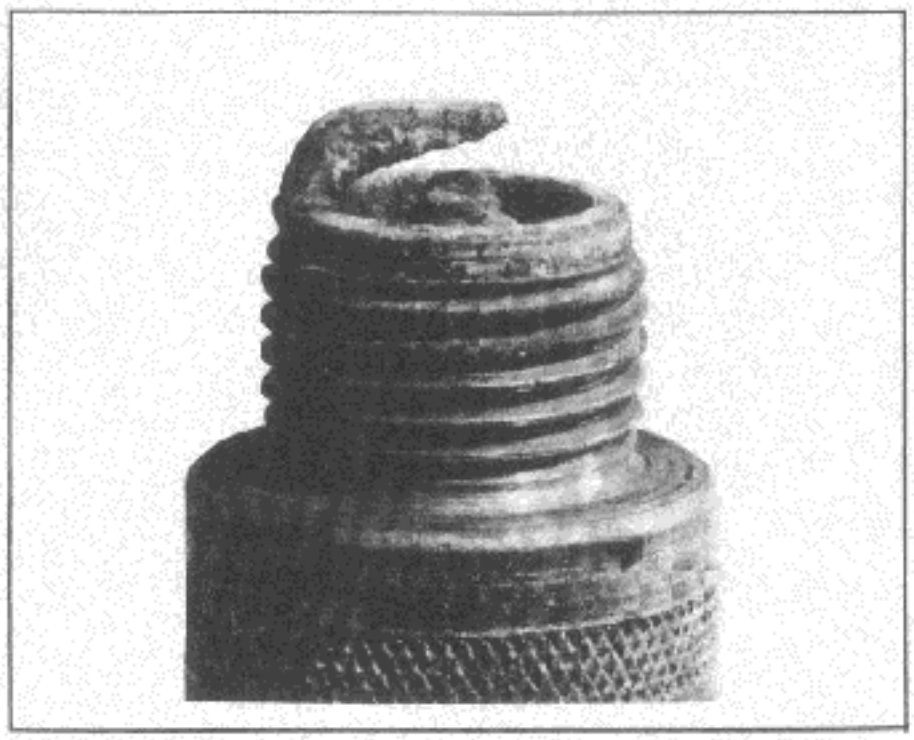


Fig. EE-82 Normal electrode wear

CLEANING AND REGAP

Clean spark plugs thoroughly using an abrasive-type cleaner. All spark plugs must be of the same make and number or heat range. Use a round wire feeler gauge to adjust the spark plug gaps.

Note: Before adjusting gap, file center electrode flat. In adjusting spark plug gap, never bend center electrode which extends through porcelain center. Always make adjustments by bending ground side electrode.

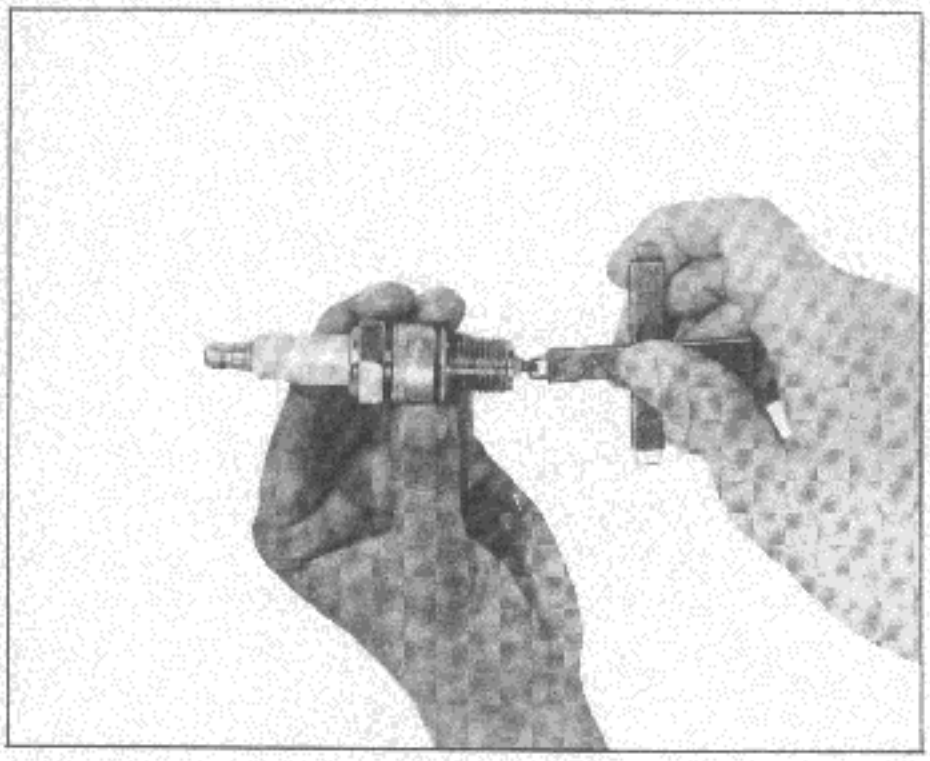
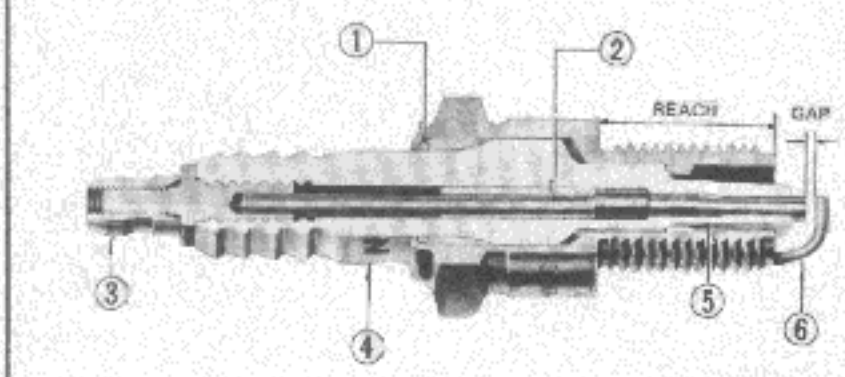


Fig. EE-83 Measuring spark plug gap

SPECIFICATION AND SERVICE DATA

Item \ Make and Model	NGK BP-6E HITACHI L46-P
Size (screw diameter x reach) mm (in)	14 x 19 (0.55 x 0.75)
Plug gap mm (in)	0.8 to 0.9 (0.031 to 0.035)
Torque kg-m (ft-lb)	2.0 to 3.0 (15.0 to 21.7)



1	Ring	4	Insulator
2	Center electrode	5	Insulator
3	Terminal nut	6	Ground electrode

Fig. EE-84 Cross section of spark plug

TROUBLE DIAGNOSES AND CORRECTIONS

1. The engine does not start.

If there is no trouble in the fuel system, the ignition system should be checked. This can be easily done by detaching the high tension cord from spark plugs, cranking the engine by the starting motor and observing the condition of the sparks that occur between the high tension cord and cylinder block. After checking this, use the proper countermeasures.

Spark gap	Trouble location	Causes	Remedies
No sparks at all	Distributor	Defective insulation of condenser	Replace
		Breakage of lead-wire on low tension side	Repair
		Defective insulation of cap and rotor head	Replace
		Point does not open or close	Repair
	Ignition coil	Wire breakage or short circuit of coil	Replace with new one.

	Hightension code	Wire coming off Defective insulation	Repair Replace
1 to 2 mm (0.0294 to 0.0787 in) or irregular	Distributor	Point gap too wide Oil sticking on point Excessively burnt point Layer short-circuit	Correct Clean Replace Replace with good one
Less than 6 mm (0.2362 in)	Spark plugs	Electrode gap too wide Excessively accumulate carbon Broken insulator neck Expiry of plug's life	Correct or replace Clean or replace Replace Replace

2. The engine rotates but does not run smoothly.

There are many causes for this trouble, and it is difficult to point out the right cause. However, when considering the ignition system only, pay special attention to the following points.

Spark gap	Trouble location	Causes	Remedies
Engine misses	Distributor	Dirty point	Correct
		Improper point gap	Correct
		Leak of electricity of cap and rotor head	Clean or replace
		Defective insulation of condenser	Replace
		Defective insulation of lead wire of condenser	Correct
		Defective arm	Oil the shaft
		Defective arm spring	Correct or replace
		Near-breakage of lead	Correct
		Worn or shaky breaker plate	Correct
		Worn or shaky distributor shaft	Correct
	Ignition coil	Layer short-circuit or use of inferior quality	Replace with good one
	High tension code	Deterioration of insulation and leak of electricity	Replace

	Spark plugs	Dirty	Clean or replace
		Electricity leaks at the upper porcelain insulator	Clean
Engine causes knocking very often	Distributor	Improper advance timing	Adjust
		Come off or breakage of governor spring	Correct or replace
		Worn out pin or hole of governor portion	Replace
	Spark plugs	Excessively burnt spark plug	Replace
Engine does not provide enough power	Distributor	Improper or retarded timing	Adjust
		Defective function of governor	Correct
		Dirty point	Correct
		Point gap too narrow	Correct
	Spark plugs	Dirty	Clean

SERVICE JOURNAL OR BULLETIN REFERENCE

DATE	JOURNAL or BULLETIN No.	PAGE No.	SUBJECT

SERVICE MANUAL

MODEL
A10 & A12
ENGINE

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION SE

SERVICE EQUIPMENT

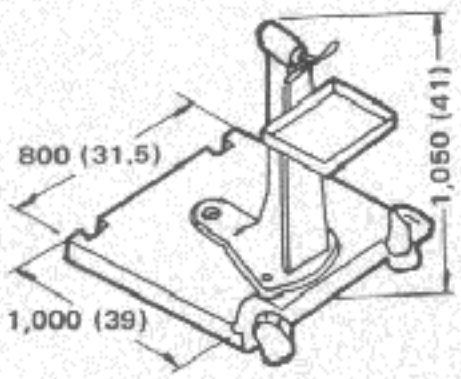
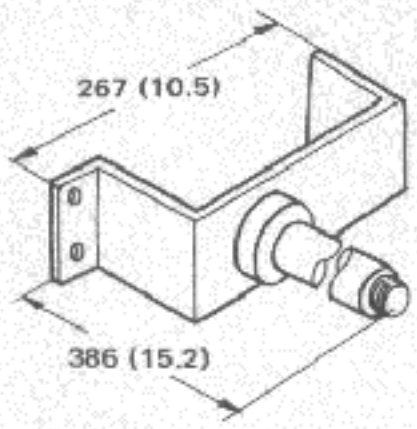
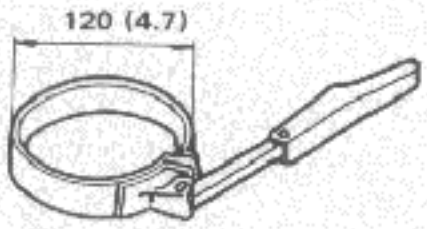
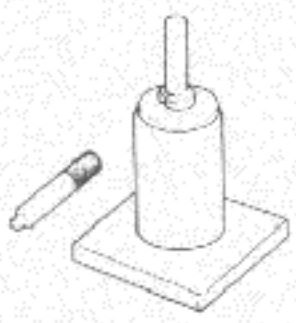
SE

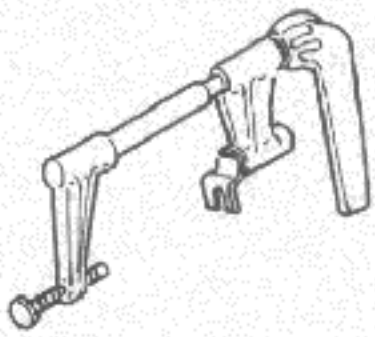
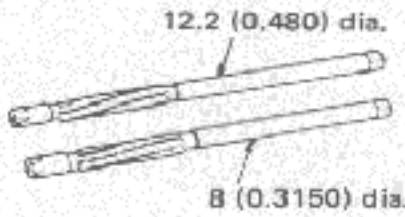
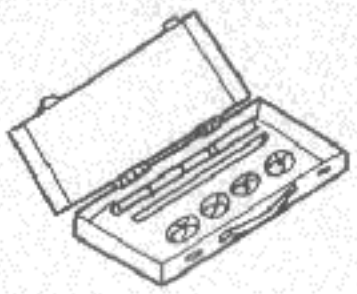
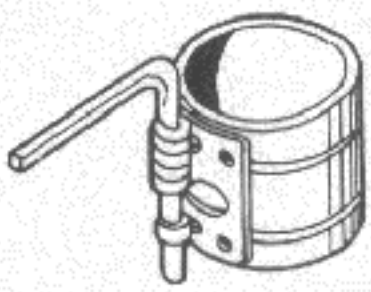
A10, A12 ENGINE SPECIAL SERVICE TOOL

B110 Special service tool set number: { Set A ST09330000 / Set B ST09340000

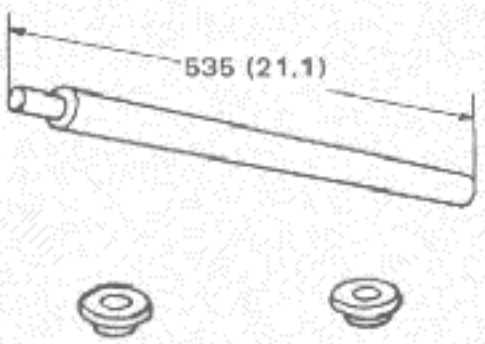
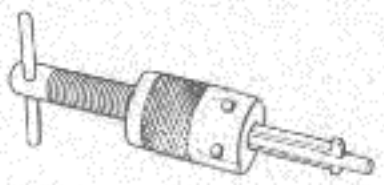
510 Special service tool set number: ST09110000

"*" means tool included in Tool Set ST09330000.
"**" means tool included both in Tool Sets ST09330000 and ST09340000.
"#" means tool included in Tool Set ST09110000.

Tool number / Tool name	Figure (mm (inch))	Description	B110 special service tool set	510 special service tool set	Applied model	S.M. reference page (See Fig. No.)
ST05010000 Engine stand		Rotary type stand for efficient, safe disassembly or reassembly of the engine Use the engine stand with the attachment (ST05270000) as a set			All	Fig. EM-17
ST05270000 Engine attachment		Attachment for setting the engine on the engine stand			A10 A12	Fig. EM-17
ST19320000 Oil filter wrench		For removing the oil filter		#	All	Page EL-4
ST13040000 Piston pin press stand		For removing and installing the piston pin	**		A10 A12	Fig. EM-30 Fig. EM-72

Tool number Tool name	Figure mm (inch)	Description	B110 special service tool set	510 special service tool set	Applied model	S.M. reference page (See Fig. No.)
ST12070000 Valve lifter set		For removing and installing the valve springs	*	#	All	Fig. EM-31 Fig. EM-71
ST11080000 Valve guide reamer set		For correcting the valve guide	**		A10 A12	Page EM-14
ST11320000 Valve guide drift		For replacing the valve guide	**		A10 A12	Fig. EM-41
ST11670000 Valve seat cutter set		For correcting the valve seat insert	**		A10 A12	Fig. EM-42
EM03470000 Piston ring compressor		For installing the piston			All	Fig. EM-78

SERVICE EQUIPMENT

Tool number Tool name	Figure mm (inch)	Description	B110 special service tool set	510 special service tool set	Applied model	S.M. reference page (See Fig. No.)
ST16110000 Camshaft bearing drift		For replacing the camshaft bearings	**		A10 A12	Fig. EM-69
ST16680000 Pilot bush puller		For removing the transmission main drive shaft pilot bushing	**		A10 A12	Fig. EM-23

SERVICE JOURNAL OR BULLETIN REFERENCE

DATE	JOURNAL or BULLETIN No.	PAGE No.	SUBJECT

NISSAN

Issued Date: 1st March, 1970 (010450)
Publication No. SM0E-0A12G0