TOYOTA

2F ENGINE

REPAIR MANUAL

Aug., 1980

TOYOTA MOTOR CORPORATION

Pub. No. 36104E

FOREWORD

This repair manual has been prepared to provide information covering general service repair for the 2F engine equipped on the TOYOTA LAND CRUISER and HEAVY DUTY TRUCKS.

Applicable models: *FJ 40, 43, 45, 60 series*
FA100, 115 series

For instructions on how to use this manual, please refer to page 1–4.
Specifications contained herein are based on the August, 1980 production model. For specifications on other models, please refer to the respective Service Specification Manual.
Also, for vehicles equipped with an emission control device, please refer to the Emission Control Repair Manual.

TOYOTA MOTOR CORPORATION

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GENERAL REPAIR INSTRUCTIONS

1. **Use fender, seat and floor covers to keep the car clean and prevent damage.**

2. **During disassembly, keep parts in order to facilitate reassembly.**

3. **Before performing electrical work, disconnect the cable from the battery terminal.**

4. **Always replace cotter pins, gaskets and O rings with new ones.**

5. **When necessary, use a sealer on gaskets to prevent leaks.**

6. **Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.**

7. **Use genuine Toyota parts.**

8. **When replacing fuses, be sure the new fuse is the correct amperage. DO NOT exceed the fuse amp rating or use one of a lower rating.**

9. **If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels in order to ensure safety.**

10. **After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on a jack alone, even for a small job that can be finished quickly.**

11. **Use of a special service tool (SST) may be required, depending on the nature of the repair. Be sure to use SST where specified and follow the proper work procedure. A list of SST can be found at the back of this manual.**

ABBREVIATIONS USED IN TOYOTA REPAIR MANUALS

For convenience, the following abbreviations are used in Toyota repair manuals.

Abbreviation	Term	Abbreviation	Term
A/T	Automatic Transmission	O/S	Oversize
BDC	Bottom Dead Center	RH	Right-hand
BTDC	Before Top Dead Center	RHD	Right-hand Drive
EX	Exhaust	SST	Special Service Tool
IN	Intake	STD	Standard
LH	Left-hand	T	Tightening Torque
LHD	Left-hand Drive	TDC	Top Dead Center
MP	Multipurpose	U/S	Undersize
M/T	Manual Transmission	W/	With
OPT	Option	W/O	Without

HOW TO USE THIS MANUAL

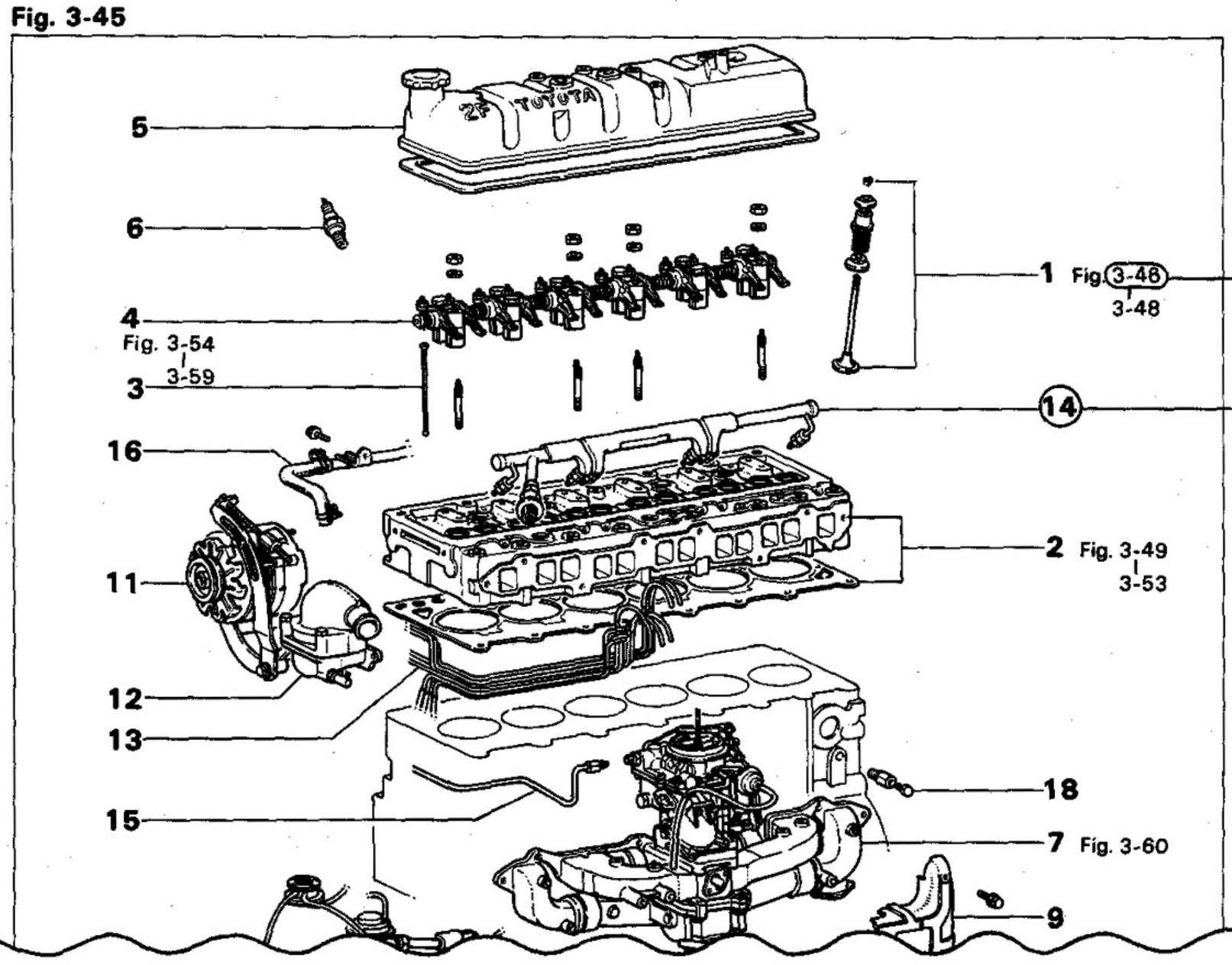
1. OVERVIEW ILLUSTRATION

Many service operations begin with an overview illustration as a general guide.

ASSEMBLY

Assemble the parts in the numerical order shown in the figure.

Fig. 3-45



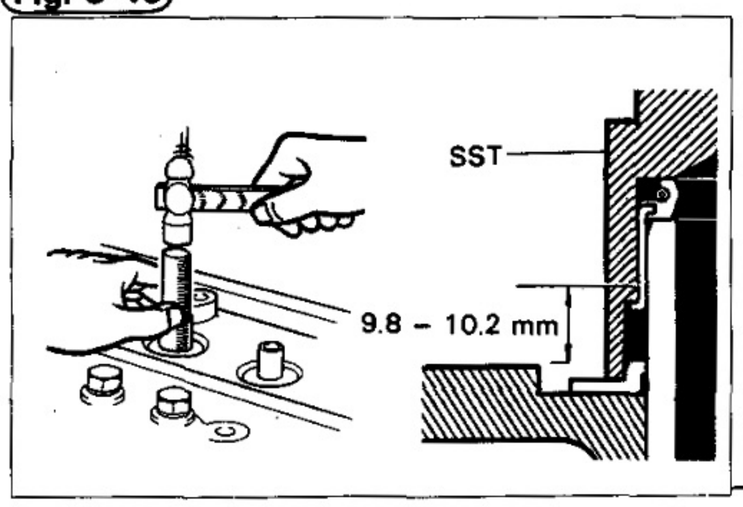
Ⓐ : The bold numbers indicate the order in which the work is to be done.

Ⓑ : The figure numbers refer you to more detailed instructions and specifications.

2. ILLUSTRATED INSTRUCTIONS

All important steps in every service job are illustrated. Obvious steps are omitted to save space. Experienced technicians may only need to glance at the overview illustration and/ or specifications.

Fig. 3-46



Coat the valve stems with engine oil.
Install the spring seat and oil seal with SST.
SST [09201-31010]

Drive in distance:
9.8 – 10.2 mm
(0.386 – 0.402 in.)

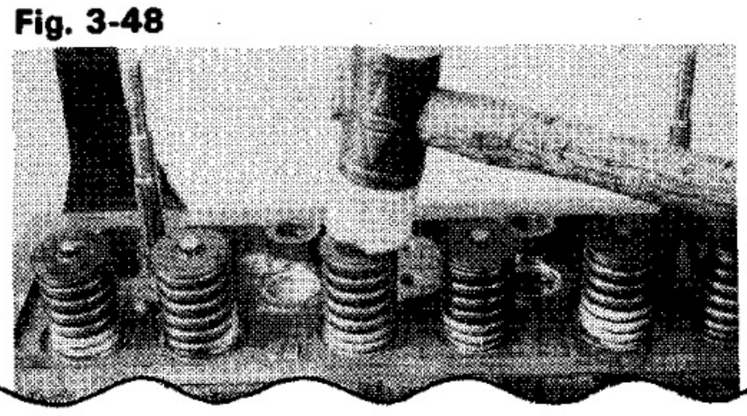
– Note –

1. **A new oil seal should be used whenever the valve is disassembled.**
2. **Coat the oil seal lip with engine oil.**



Compress the valve spring with SST and insert the spring retainer locks.
SST [09202-43012]

Fig. 3-48



After installing the springs, lightly tap the stem ends and allow the springs to settle down snugly.

Ⓒ : The pictures give basic information on what to do in each step.

Ⓓ : A symbol is often used to explain the action required.

Ⓔ : The text explains how to perform the step.

Ⓕ : Specifications, Notes and Cautions are given in bold type so you won't miss them.

SYMBOLS

The following symbols have been adopted for simplicity and quick recognition.



REMOVE or DISASSEMBLE



INSTALL or ASSEMBLE



INSPECT



MEASURE



TIGHTEN



CLEAN



IMPORTANT

ENGINE TUNE-UP

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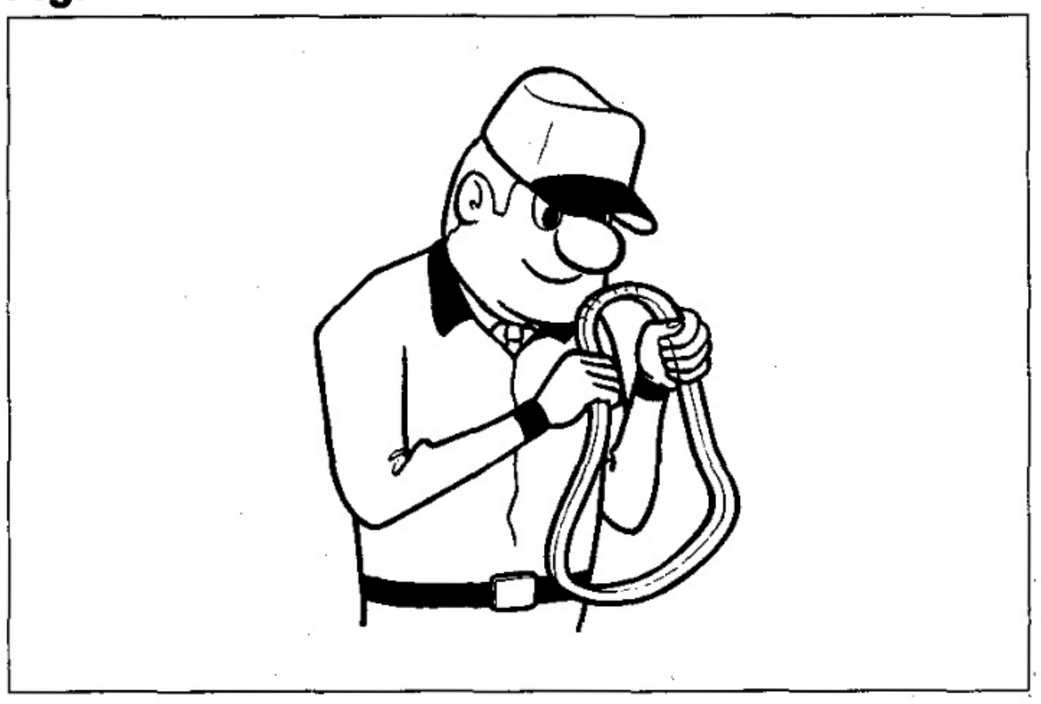
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ENGINE TUNE-UP ITEMS

	ITEM			REMARKS	
1	**DRIVE BELT TENSION**				
	(General destinations)				
	Deflection with 10 kg (22 lb) force				
	Fan – Alternator				
	N.S.W. & Victoria states			13 – 15 mm	0.51 – 0.59 in.
	Other australian states			7 – 10 mm	0.28 – 0.39 in.
	ex. Australia				
			New belt	7 – 9 mm	0.28 – 0.35 in
			Used belt	9 – 12 mm	0.35 – 0 47 in.
	Fan – Air pump				
	N.S.W. & Victoria states			7 – 10 mm	0.28 – 0.39 in.
	(USA & Canada)				
	Borroughs belt tension gauge No. BT-33-73F				
		Air con.	New belt	100 – 150 lbs	
			Used belt	60 – 80 lbs	
		Others	New belt	120 – 170 lbs	
			Used belt	80 – 120 lbs	
2	**BATTERY**				
	Specific gravity			1.25 – 1.27	
				[when fully charged at 20°C (68°F)]	
	Electrolyte level			Correct level	
3	**ENGINE OIL**				
	Oil level check			F line	
	Oil replenishment		USA	API service SE or better	
			ECE	API service SD, SE or better	
			Others	API service SC, SD, SE or better	
	Oil capacity	Dry fill		8.0 liters	8.5 US qt 7.0 Imp. qt
		Drain & refill			
		w/ oil filter change		7.8 liters	8.2 US qt 6.9 Imp. qt
		w/o oil filter change		7.0 liters	7.4 US qt 6.2 Imp. qt
	Oil filter replacement			SST [09228-44010]	
4	**COOLING SYSTEM**				
	Coolant level			Full line	
	Coolant quality, Leakage				
	Radiator cap valve opening pressure				
			STD	0.75 – 1.05 kg/cm^2	
				(10.7 – 14.9 psi)	
			Limit	0.6 kg/cm^2	8.5 psi
	Coolant capacity w/ heater or air conditioner				
		FJ40, 43, 45 series		16.0 liters	16.9 US qt 14.1 Imp. qt
		FJ60 series		16.5 liters	17.4 US qt 14.5 Imp. qt
		FA series		25.0 liters	26.4 US qt 22.0 Imp. qt
5	**AIR CLEANER**				
	Clean element				
	Oil capacity (Oil bath type)			Correct level	

	ITEM			REMARKS	
6	HOT AIR INTAKE				
	Operational check				
7	SPARK PLUGS				
	Visual check, Cleaning				
	Gap			0.8 mm	0.031 in.
8	HIGH TENSION CORD			Less than 25 kΩ per cord	
9	DISTRIBUTOR				
	Distributor cap				
	Air gap (USA)			0.2 – 0.4 mm	0.008 – 0.016 in.
	Rubbing block gap (except USA)			0.3 mm	0.012 in.
	Governor advancer, Vacuum advancer				
10	IGNITION TIMING				
	Dwell angle (except USA)			41°	
	Ignition timing			7° BTDC/Max. 950 rpm	
11	VALVE CLEARANCE	HOT	Intake	0.20 mm	0.008 in.
			Exhaust	0.35 mm	0.014 in.
12	CARBURETOR				
	Choke, Choke breaker, Choke opener				
	Float level, Acceleration pump				
13	IDLE SPEED ADJUSTMENT (USA)				
			Idle speed	650 rpm	
14	IDLE SPEED & IDLE MIXTURE ADJUSTMENT				
	(except USA)		Idle speed	650 rpm	
			Idle mixture speed	690 rpm	
15	FAST IDLE SPEED ADJUSTMENT				
	Fast idle speed	USA		1,800 rpm (w/EGR and EVAP systems OFF and vacuum advancer OFF)	
		N.S.W. & Victoria states		1,800 rpm (w/EGR & EVAP systems OFF)	
		Others		1,800 rpm	
16	THROTTLE POSITIONER				
	Throttle positioner setting speed				
		N.S.W. & Victoria states		1,200 rpm (w/EGR & EVAP systems OFF)	
		Others		1,000 rpm	
17	COMPRESSION PRESSURE		at 250 rpm		
			STD	10.5 kg/cm^2	149 psi
			Limit	8.0 kg/cm^2	114 psi
	Pressure difference between each cylinder			Less than 1.0 kg/cm^2 (14 psi)	

Fig. 2-1



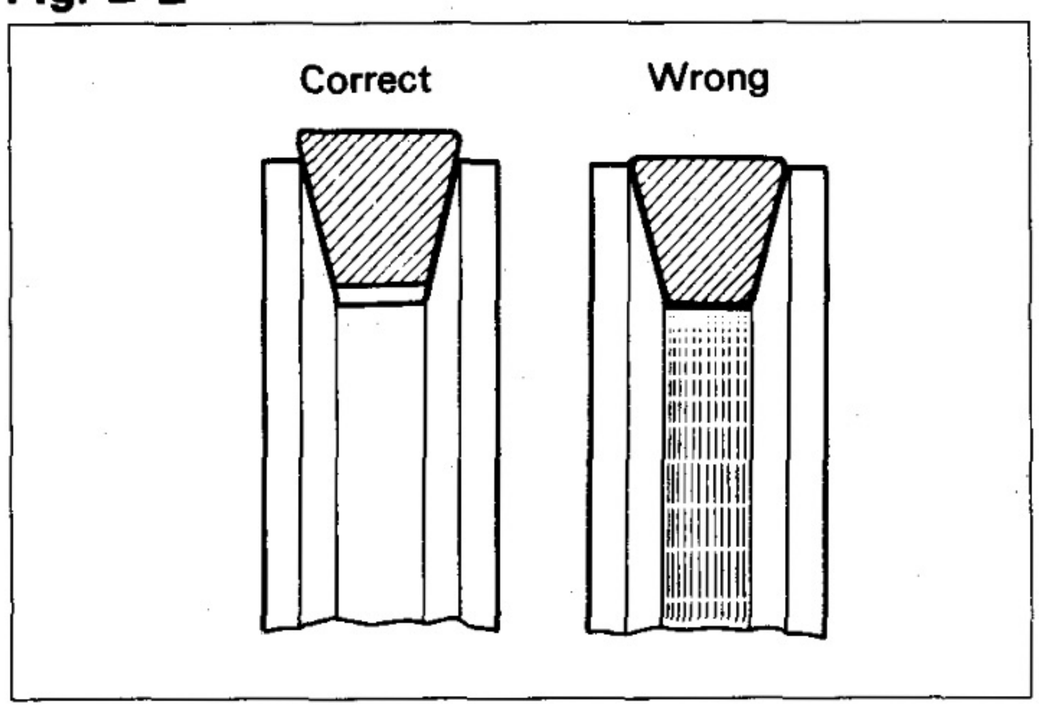
DRIVE BELT

VISUAL CHECK

Check for:

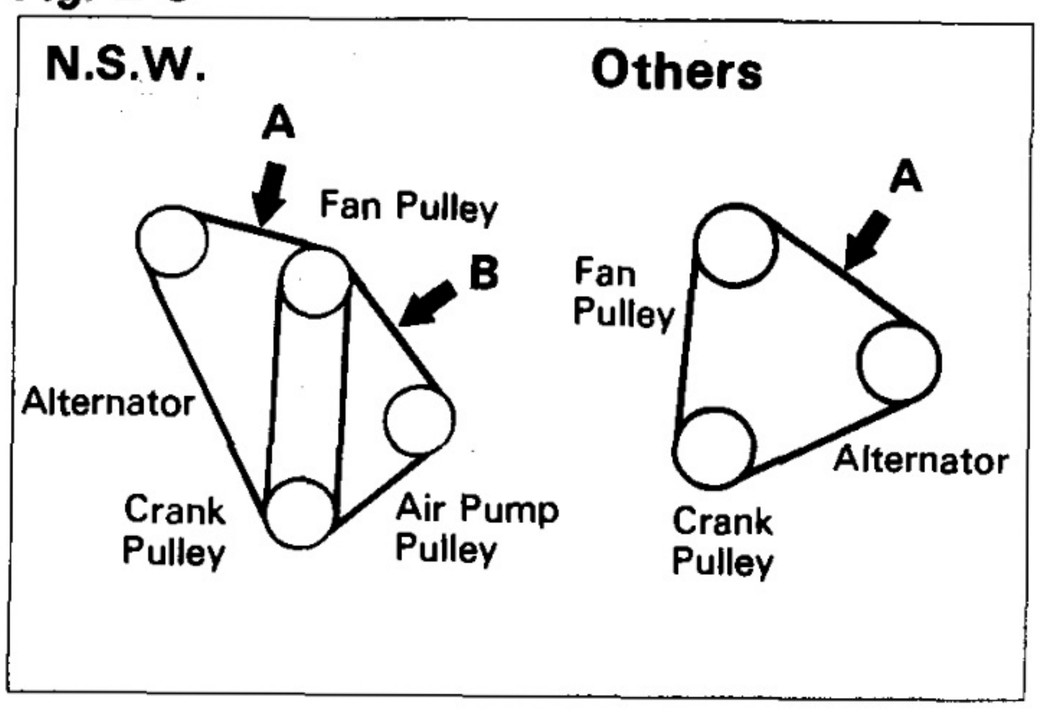
1. Cracks, deterioration, stretching or wear.
2. Adherence of oil or grease.

Fig. 2-2



3. Improper belt-to-pulley contact.

Fig. 2-3



CHECK & ADJUST BELT TENSION

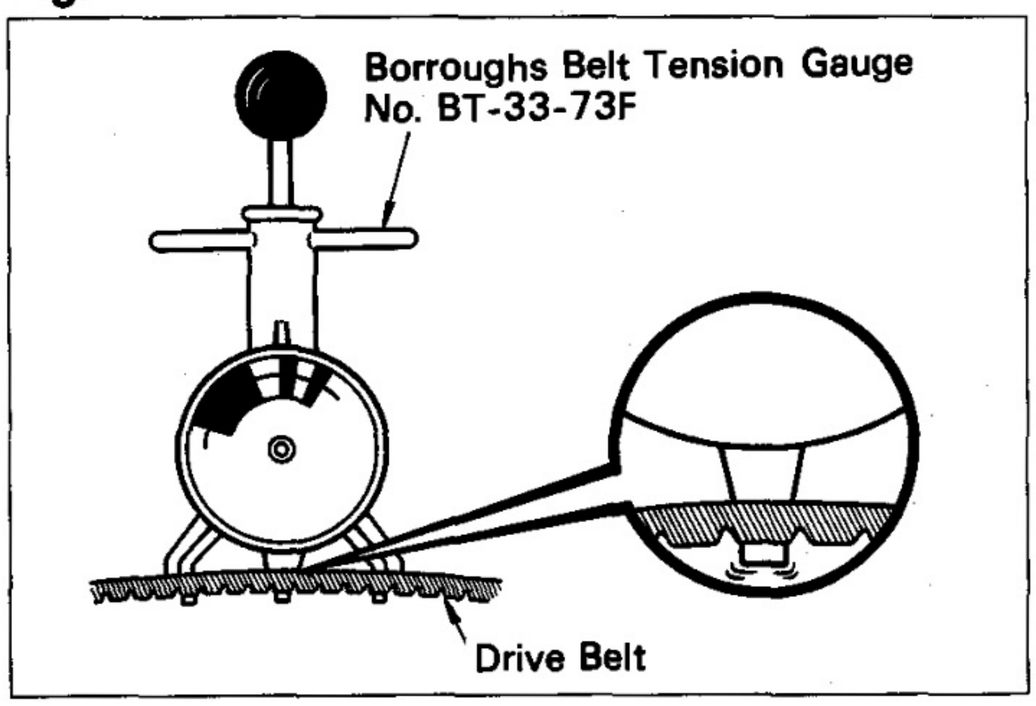
General destinations

With 10 kg (22 lb) of force, press on the belts at the points indicated in the figure. The belts should deflect the amount specified.

Drive belt deflection

	N.S.W. & Victoria	Other australian states	except Australia	
A mm (in.)	13 – 15 (0.51 – 0.59)	7 – 10 (0.28 – 0.39)	New	7 – 9 (0.28 – 0.35)
			Used	9 – 12 (0.35 – 0.47)
B mm (in.)	7 – 10 (0.28 – 0.39)	——	——	

Fig. 2-4



USA

Using a Borroughs belt tension gauge BT-33-73F, adjust as follows:

Drive belt tension:

Air con.

New belt 100 – 150 lbs

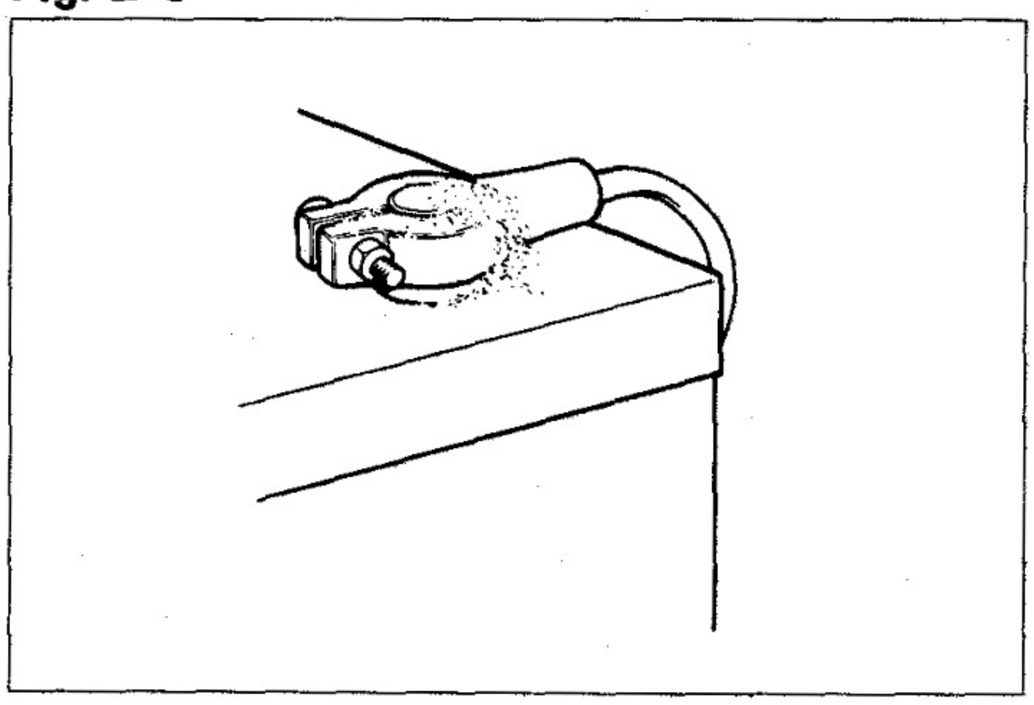
Used belt 60 – 80 lbs

Others

New belt 120 – 170 lbs

Used belt 80 – 120 lbs

Fig. 2-5



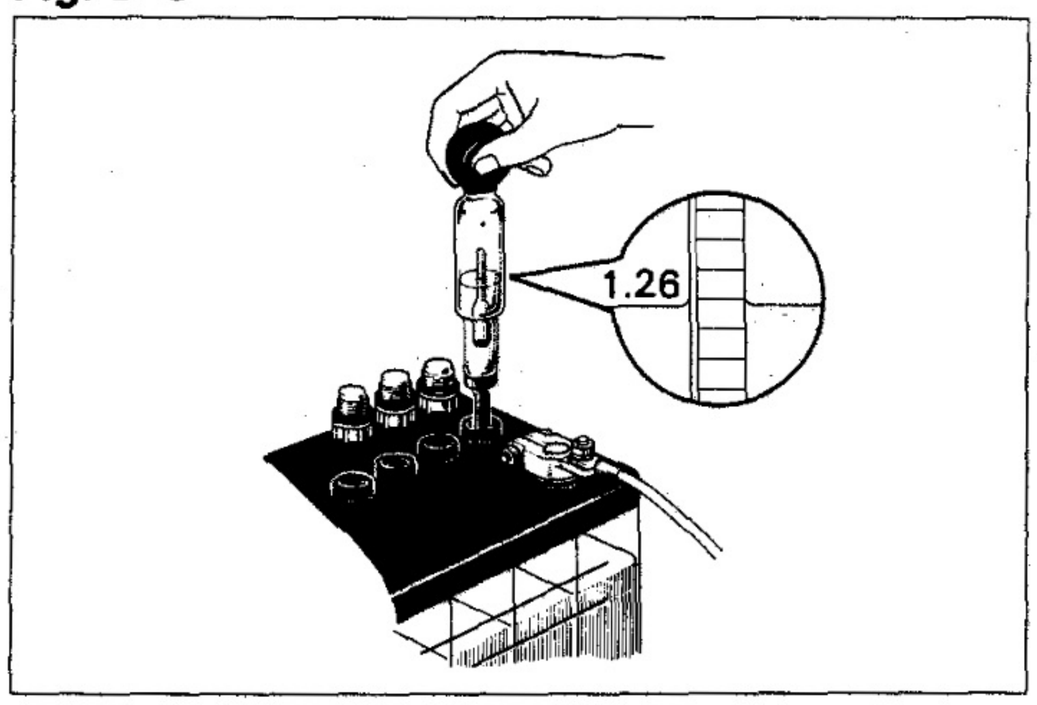
BATTERY

VISUAL CHECK

Check for:

1. Rusted battery support.
2. Loose terminal connections.
3. Rusted or deteriorated terminals.
4. Damaged or leaking battery.

Fig. 2-6

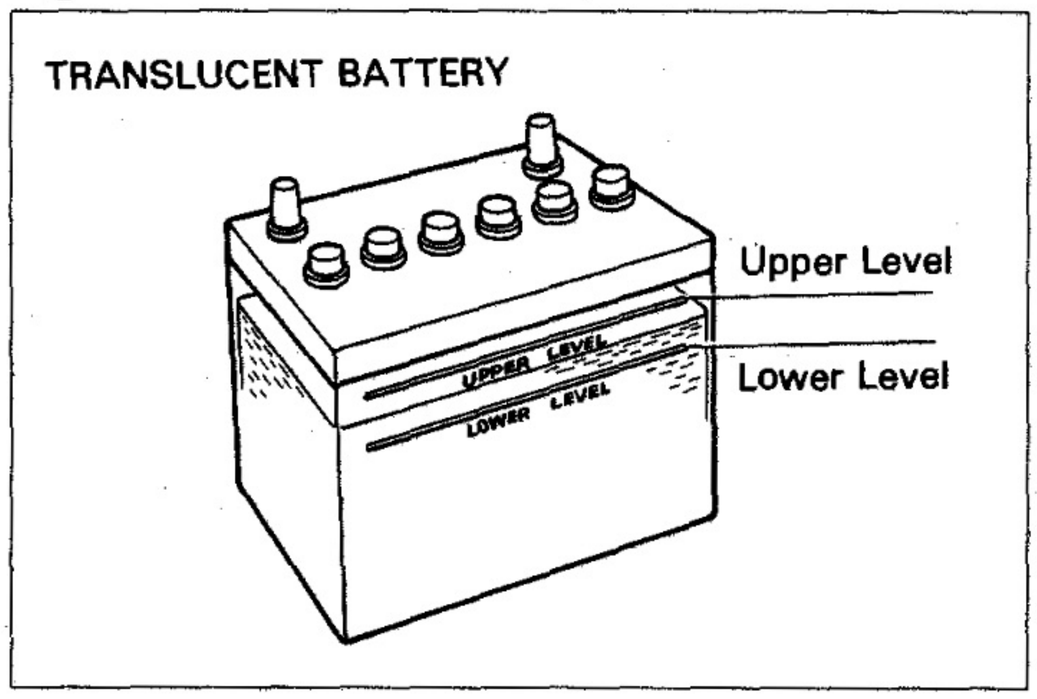


MEASURE SPECIFIC GRAVITY

1. Check the specific gravity of the electrolyte with a hydrometer.

Specific gravity [when fully charged at 20°C (68°F)]:
1.25 – 1.27

Fig. 2-7



2. Check the electrolyte quantity of each cell. If insufficient, refill with distilled water.

Fig. 2-8

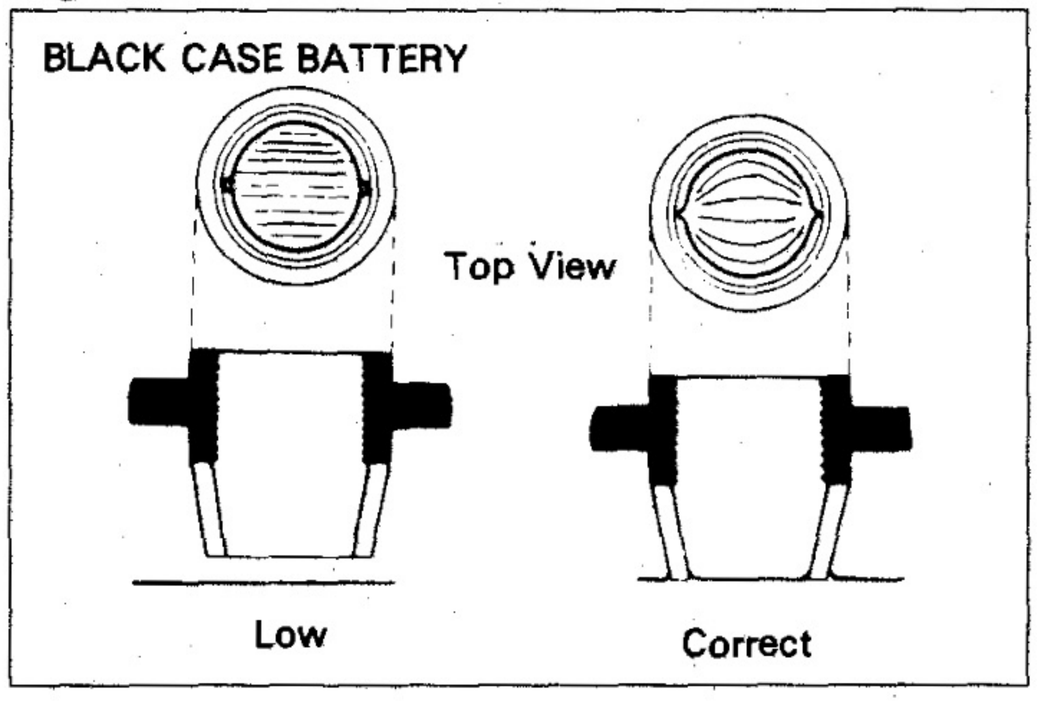
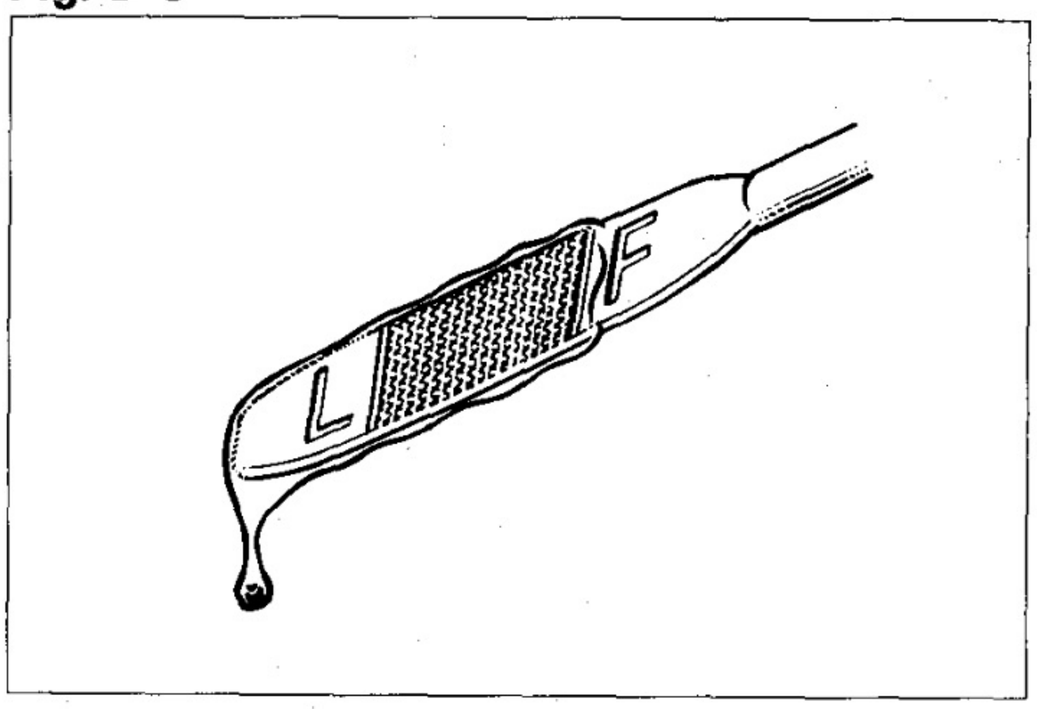


Fig. 2-9



ENGINE OIL

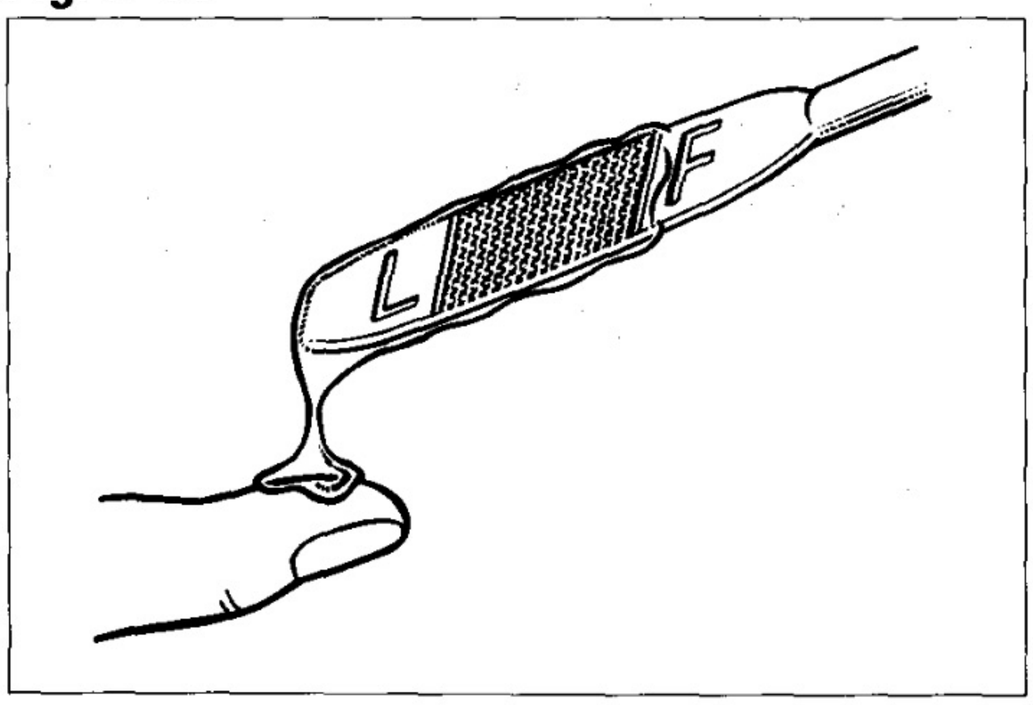
CHECK OIL LEVEL

The oil level should be between the L and F marks. If low, check for leakage and add oil up to the F mark.

Use the engine oil indicated below.

USA —→ API service SE or better
ECE —→ API service SD, SE or better
Others —→ API service SC, SD, SE or better

Fig. 2-10



CHECK OIL QUALITY

Check for:

1. Deterioration.
2. Entry of water.
3. Discoloration or thinning.

Fig. 2-11



REPLACE OIL FILTER

1. Remove the oil filter with SST.
   SST [09228-44010]
2. Install a new filter and tighten it firmly by hand.

— Note —

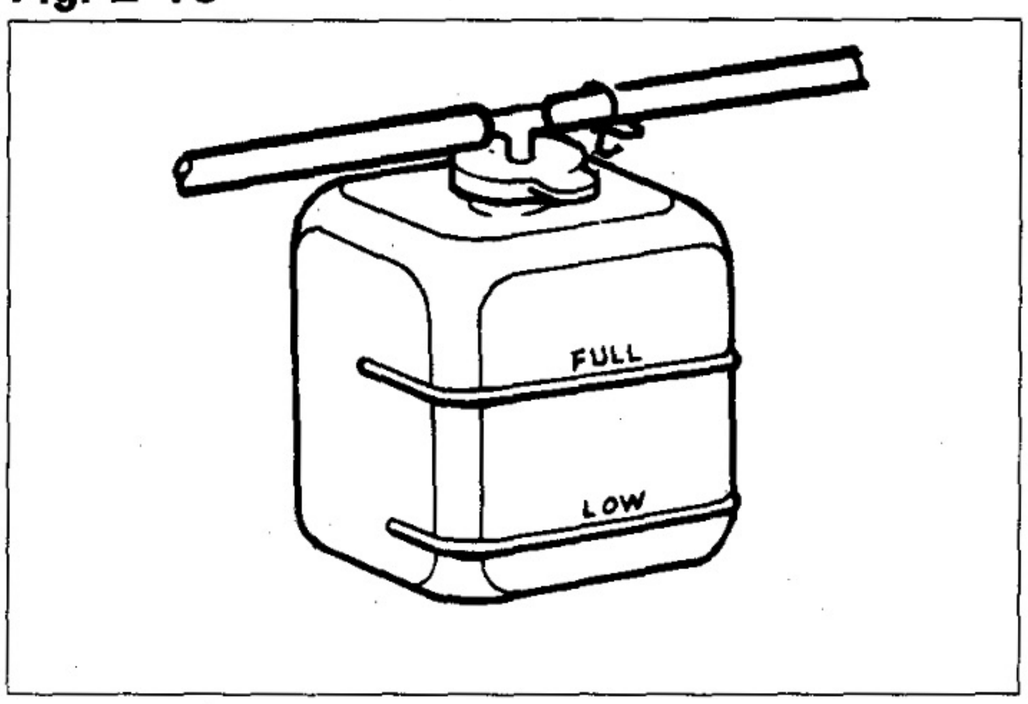
Do not tighten with SST or a wrench.

Fig. 2-12



3. Start the engine and check for oil leakage.
4. Stop the engine and recheck the oil level.

Fig. 2-13



COOLING SYSTEM

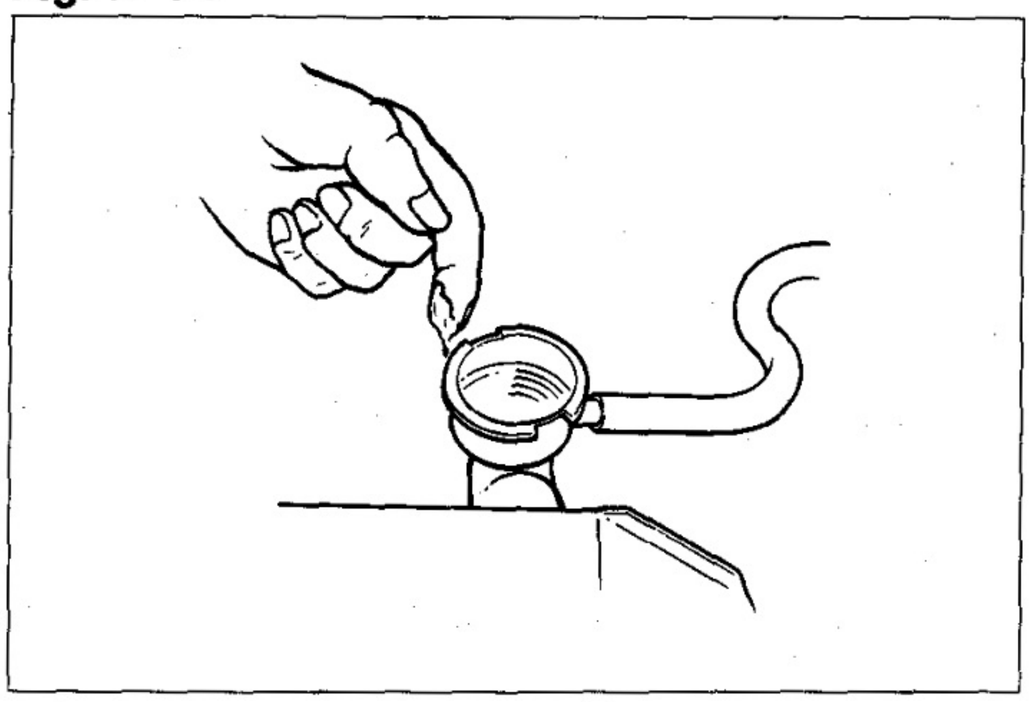
CHECK COOLANT LEVEL

If low, fill reservoir to FULL line.

— Note —

To maintain freeze protection, use a recommended anti-freeze.

Fig. 2-14

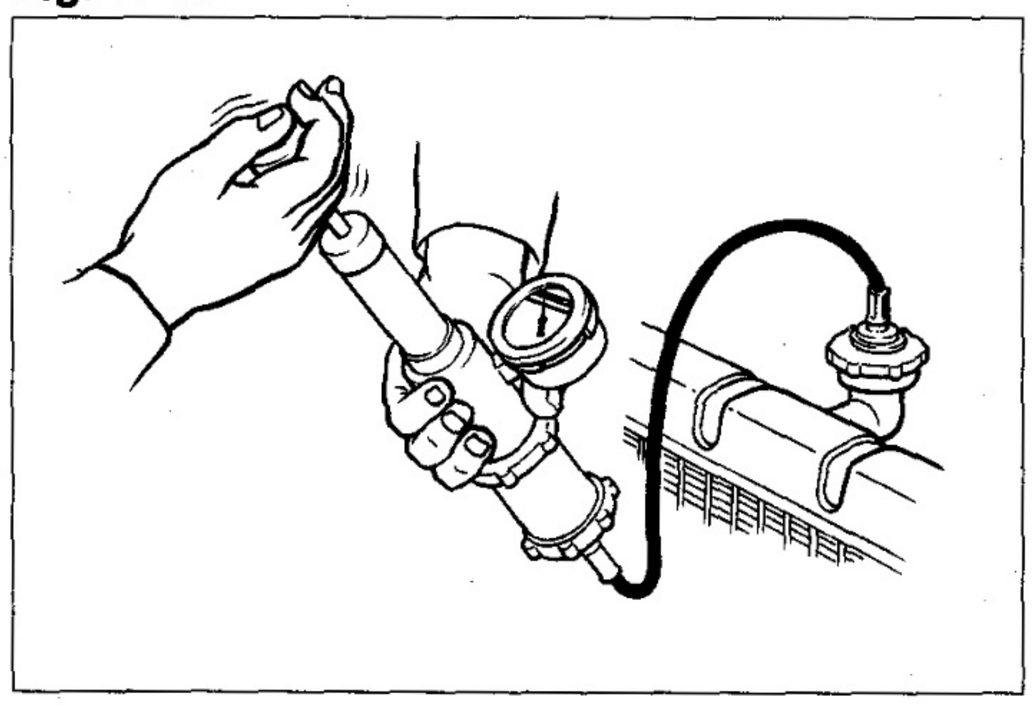


CHECK COOLANT QUALITY

Check for:

1. Coolant cleanliness.
2. Rust or scale deposits around the radiator cap and filler neck.
3. Entry of oil.

Fig. 2-15

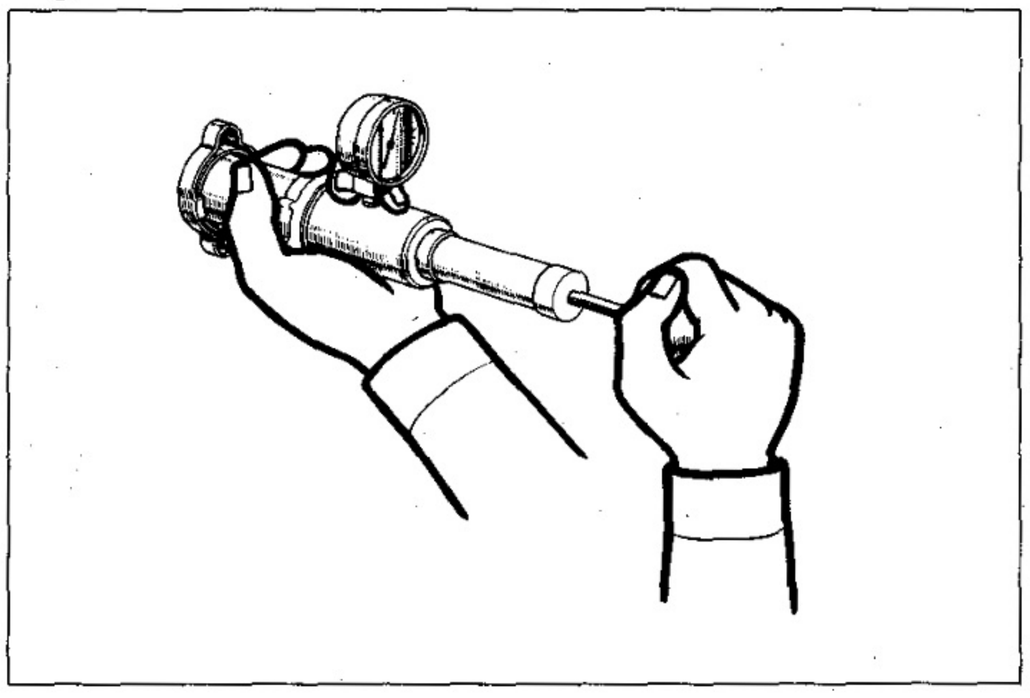


CHECK COOLING SYSTEM PARTS

Check for:

1. Damaged or deteriorated radiator and water hoses.
2. Loose hose clamps.
3. Damaged or corroded radiator core.
4. Leakage from the water pump, radiator core or loose water drain cock.

Fig. 2-16

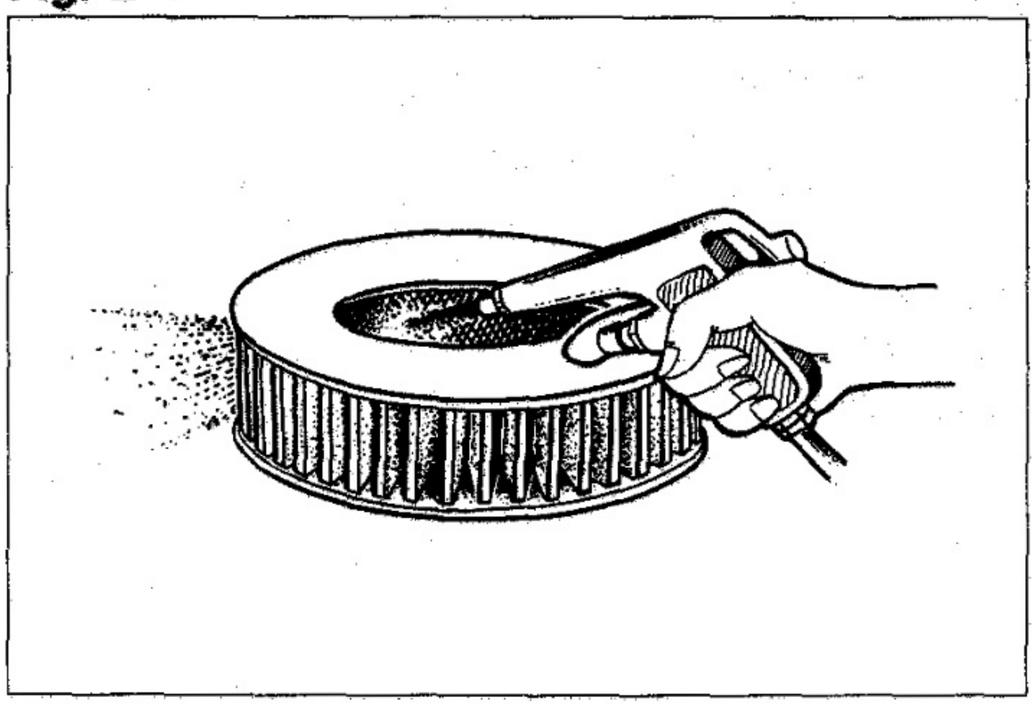


5. Faulty operation of radiator cap.
   Inspect the spring tension and seating condition of the radiator cap vacuum valves. If the valve opens at a pressure below specification or is otherwise defective, replace the radiator cap.

Valve opening pressure:

STD	**0.75 — 1.05 kg/cm² (10.7 — 14.9 psi)**
Limit	**0.6 kg/cm² (8.5 psi)**

Fig. 2-17



AIR CLEANER

[Paper Element Type]

CLEAN ELEMENT

1. Remove the air cleaner.

– Note –
Use care to prevent dirt or other foreign matter from entering into the carburetor.

2. Remove the element and blow compressed air from inside.
3. Replace the element with a new one if torn or excessively dirty.

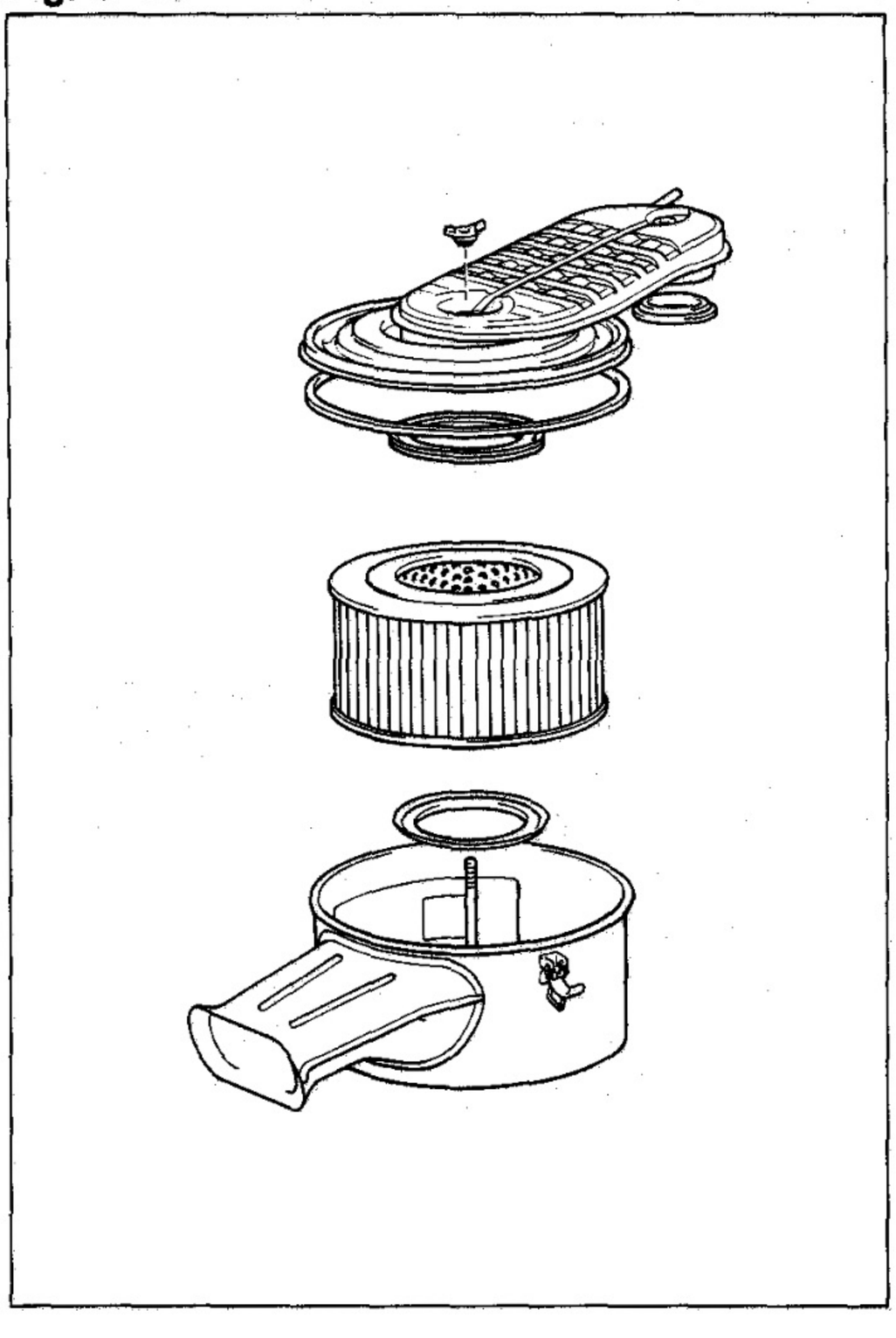
VISUAL CHECK

Check for:
1. Damaged, worn or deteriorated gaskets.
2. Damaged or worn seal washer.

INSTALL AIR CLEANER

1. Install the gaskets.
2. Finger tighten the brackets.
3. After installing the element, tighten the air cleaner cap with the clips.
4. Tighten the wing nut and brackets.

Fig. 2-18



[Oil Bath Type]

CLEAN ELEMENT

1. Remove the air cleaner and element.
2. Clean the element and case with kerosene and dry them thoroughly.

Fig. 2-19

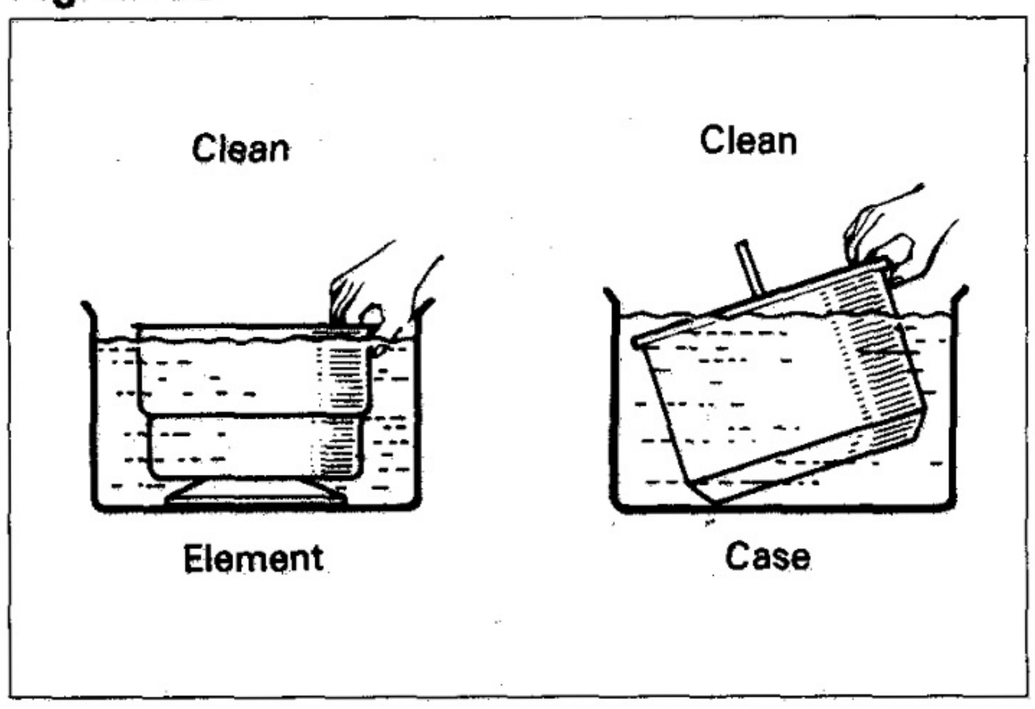
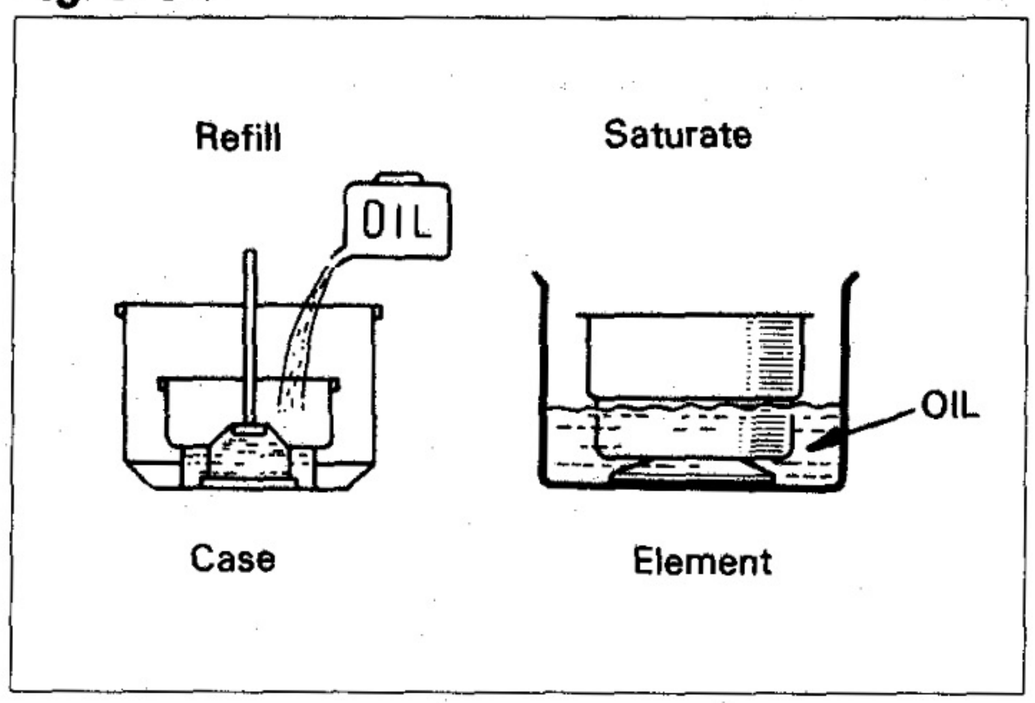


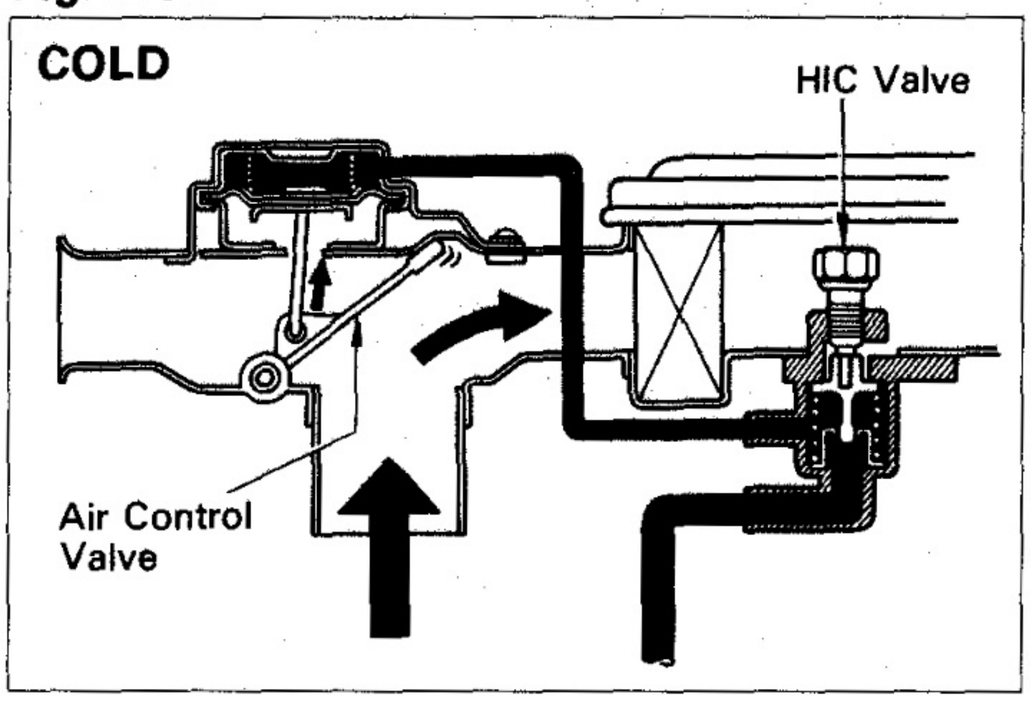
Fig. 2-20



INSTALL AIR CLEANER

1. Refill the case up to the indicated level with clean engine oil.
2. Saturate the element with clean engine oil.
3. Install the cap and element.
4. Tighten the air cleaner on the air cleaner support.

Fig. 2-21

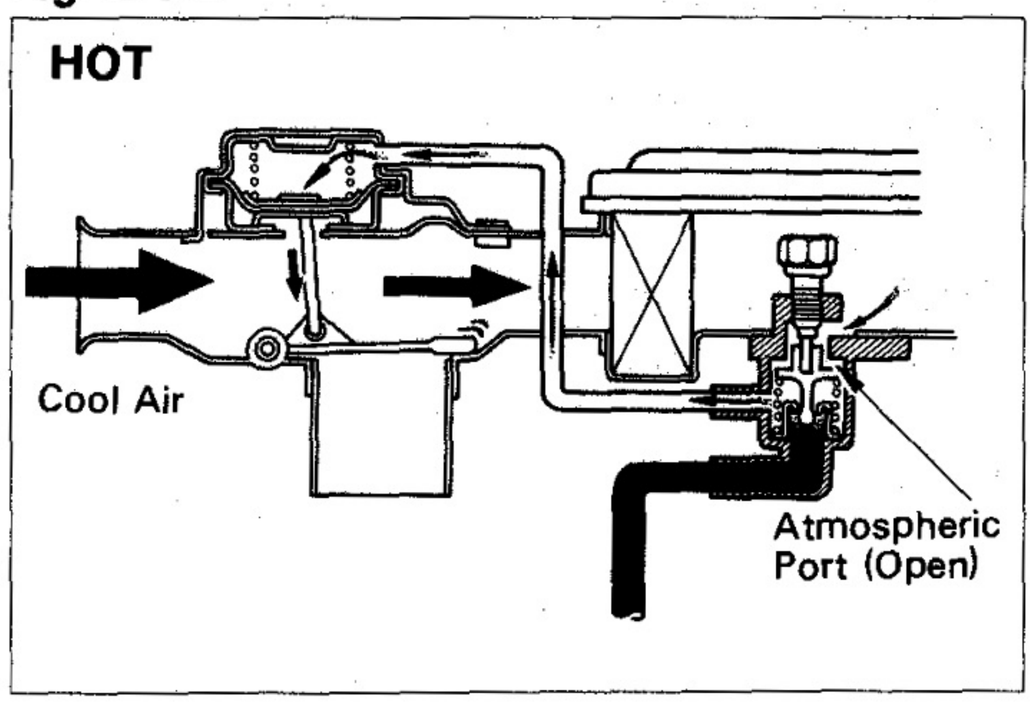


HOT AIR INTAKE (USA, N.S.W. & ECE FJ series)

INSPECTION

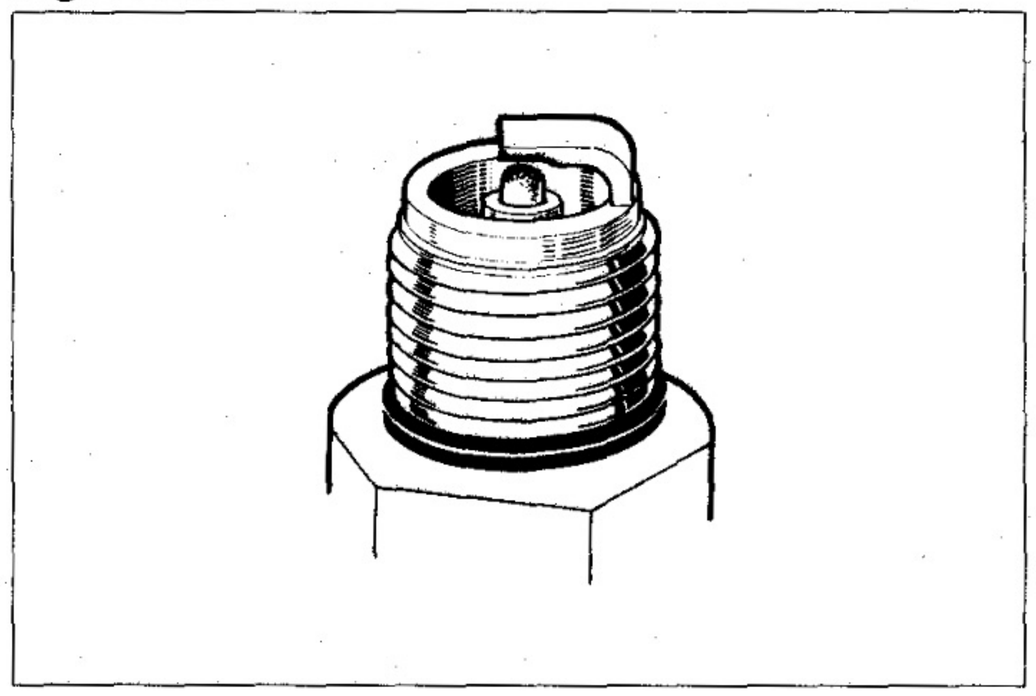
1. Remove the air cleaner cap.
2. Cool the HIC valve by blowing compressed air on it.
3. Check that the air control valve closes the cool air passage at idle.

Fig. 2-22



4. Reinstall the air cleaner cap and warm up the engine.
5. Check that the air control valve opens the cool air passage at idle.

Fig. 2-23



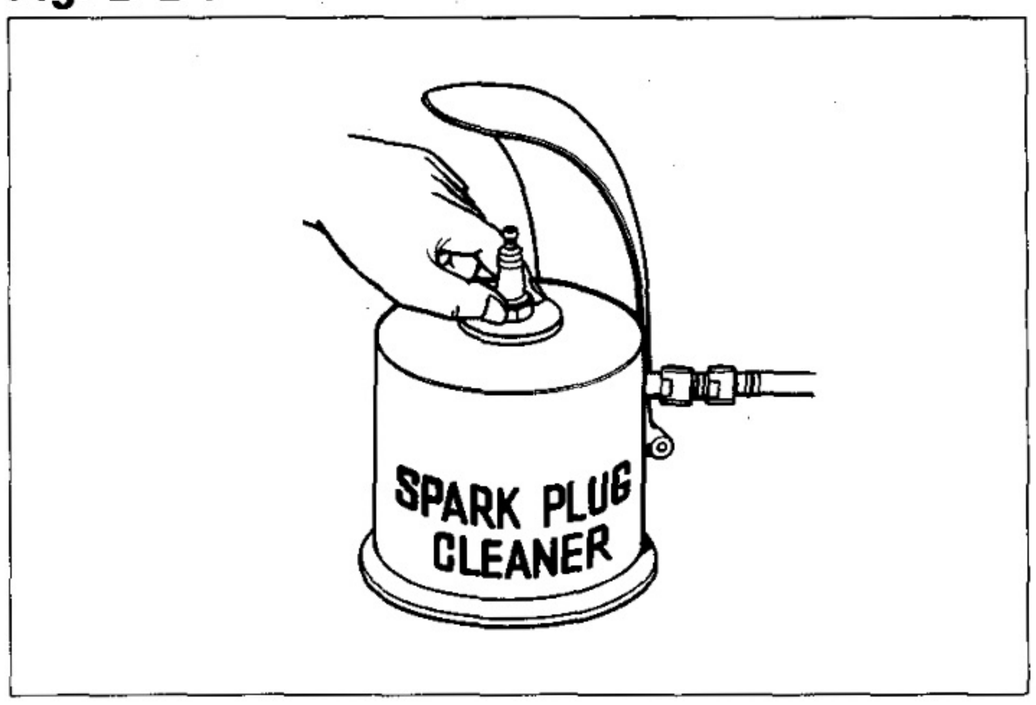
SPARK PLUGS

VISUAL CHECK

Check for:

1. Cracks or other damage on the threads and insulator.
2. Electrode wear.
3. Damaged or deteriorated gaskets.
4. Burnt electrode or excess carbon deposits.

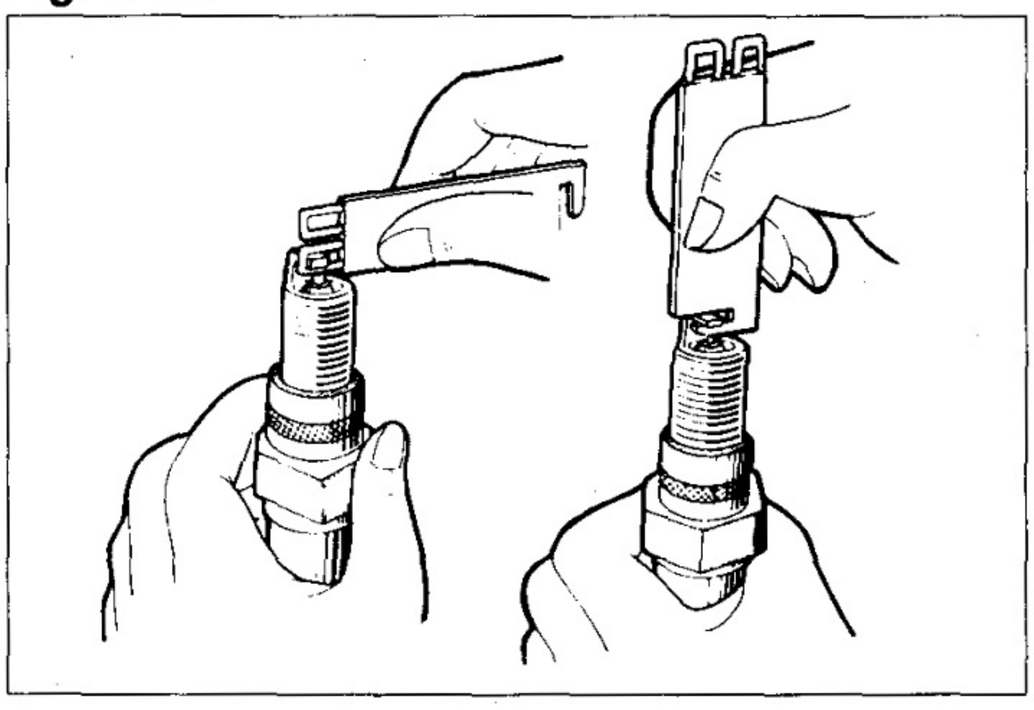
Fig. 2-24



CLEAN SPARK PLUGS

1. Do not use the spark plug cleaner any longer than necessary.
2. Thoroughly blow off the cleaning compound and carbon on the threads with compressed air.
3. Clean off the dirt from the outer surface of insulator and threads.

Fig. 2-25



ADJUST SPARK PLUG GAP

Check each plug gap with a spark plug gap gauge. If necessary, adjust by bending the protruding (outer) electrode.

Spark plug gap: 0.8 mm (0.031 in.)

Fig. 2-26

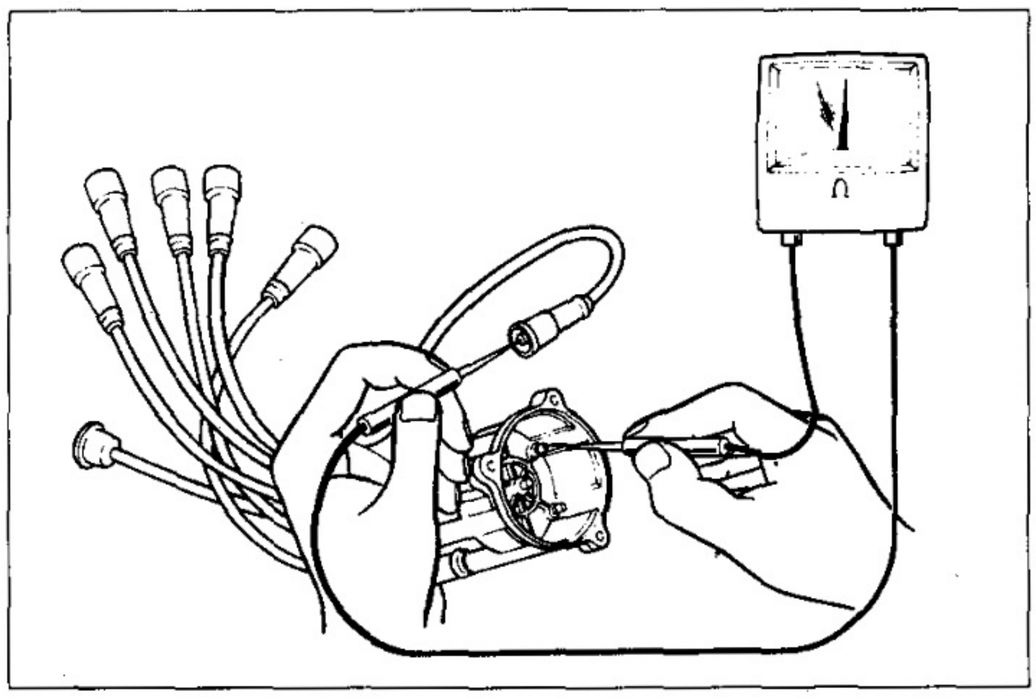


HIGH TENSION CORD

CHECK RESISTANCE

– Note –
When pulling the cord off the spark plug, always grip the end of the cord.

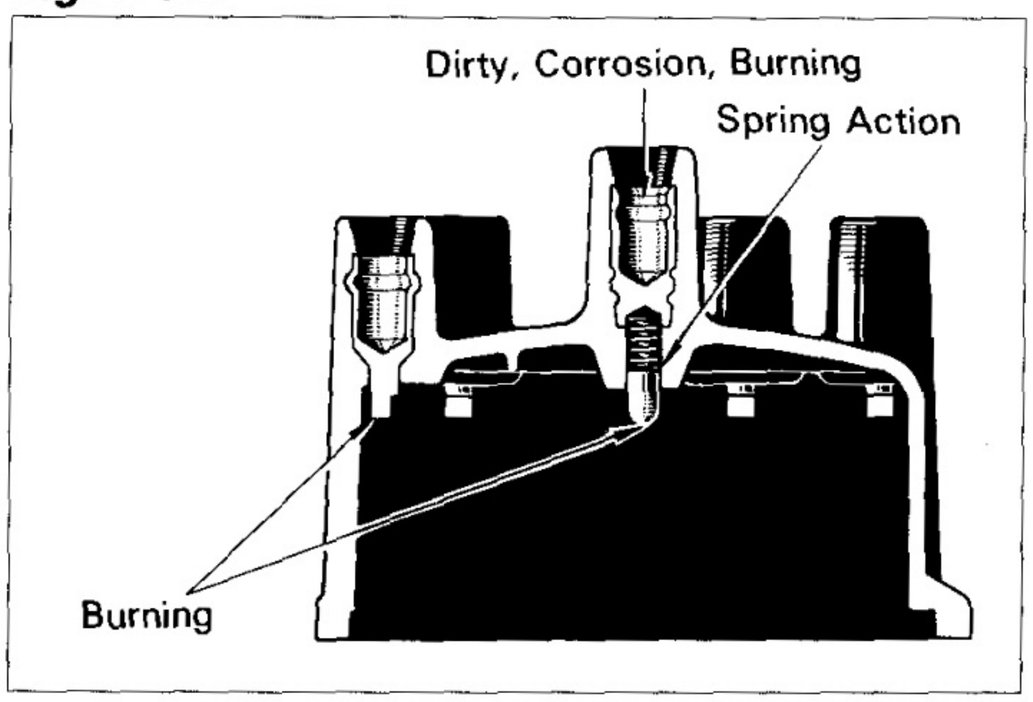
Fig. 2-27



Check the cord resistance.

Resistance:
Less than 25 kΩ per cord

Fig. 2-28



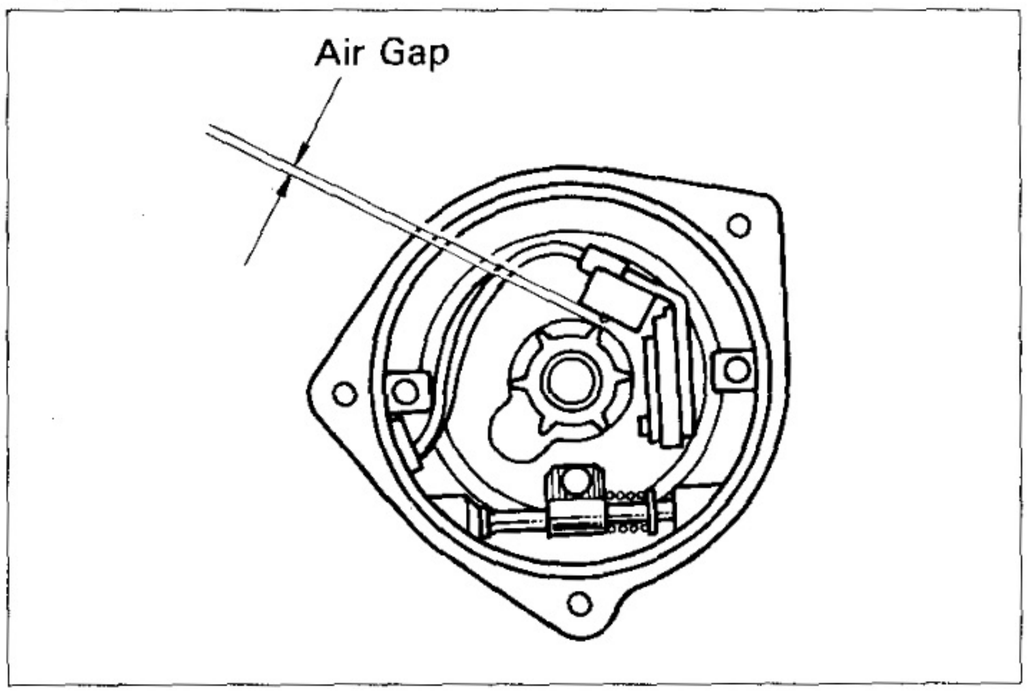
DISTRIBUTOR

CHECK DISTRIBUTOR CAP

Clean the distributor cap and check the cap and rotor for:

1. Cracks, damage, corrosion, burning or dirty cord hole.
2. Burnt electrode terminal.
3. Weak center piece spring action.

Fig. 2-29

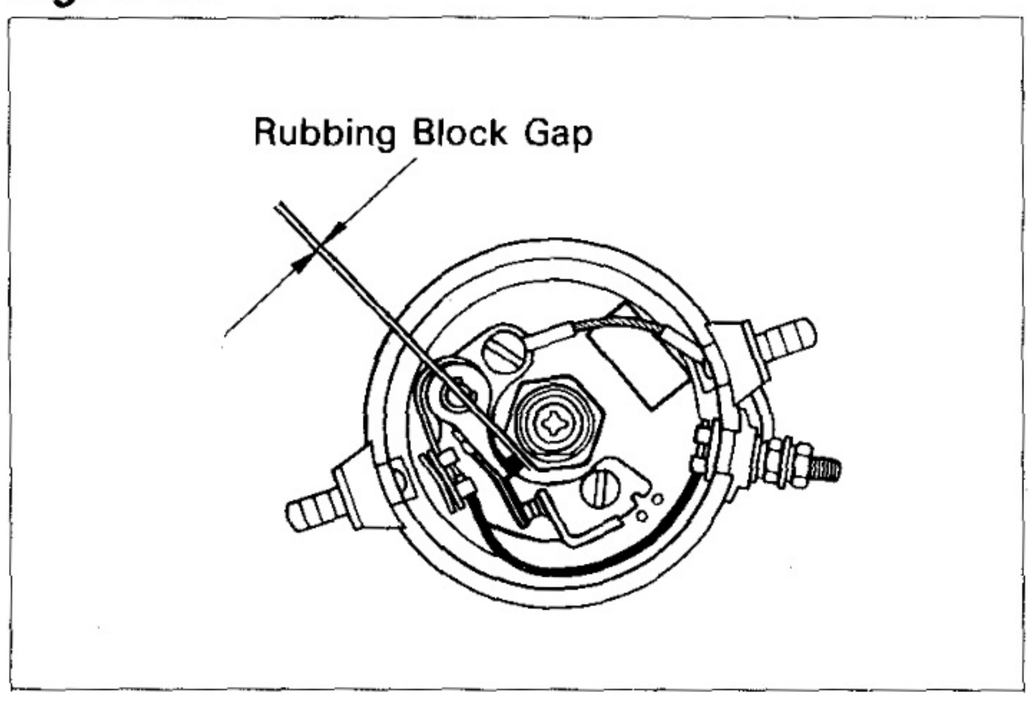


ADJUST GAP

1. Adjust the air gap. (USA)

Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)

Fig. 2-30



2. Adjust the rubbing block gap. (Others)

Rubbing block gap: 0.3 mm (0.012 in.)

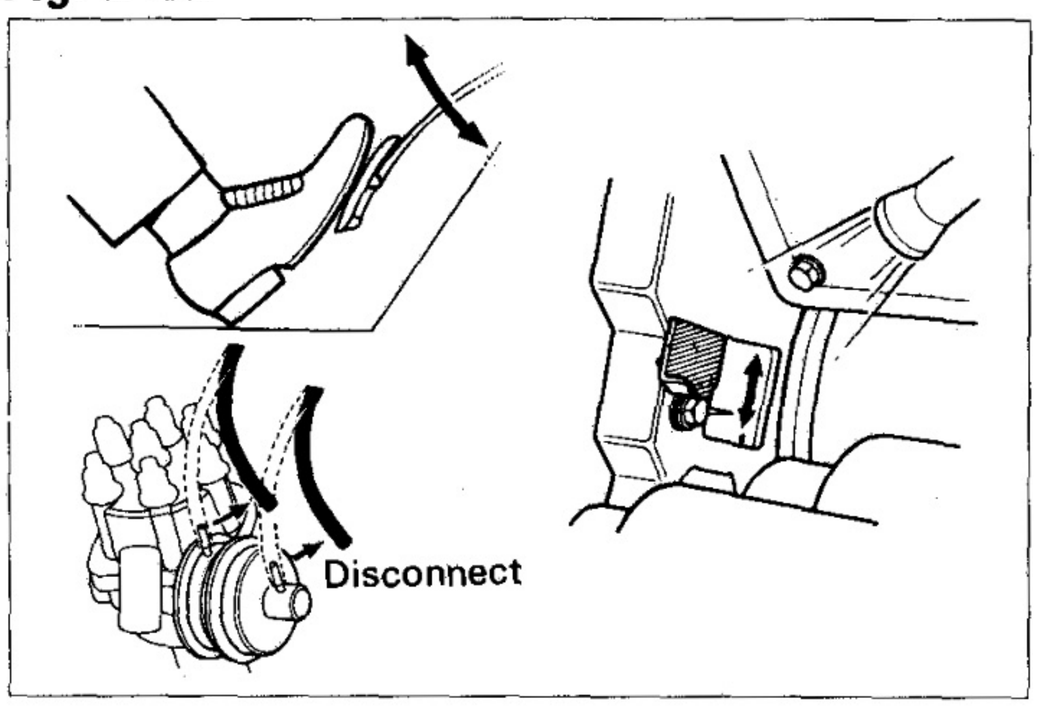
Fig. 2-31



CHECK GOVERNOR OPERATION

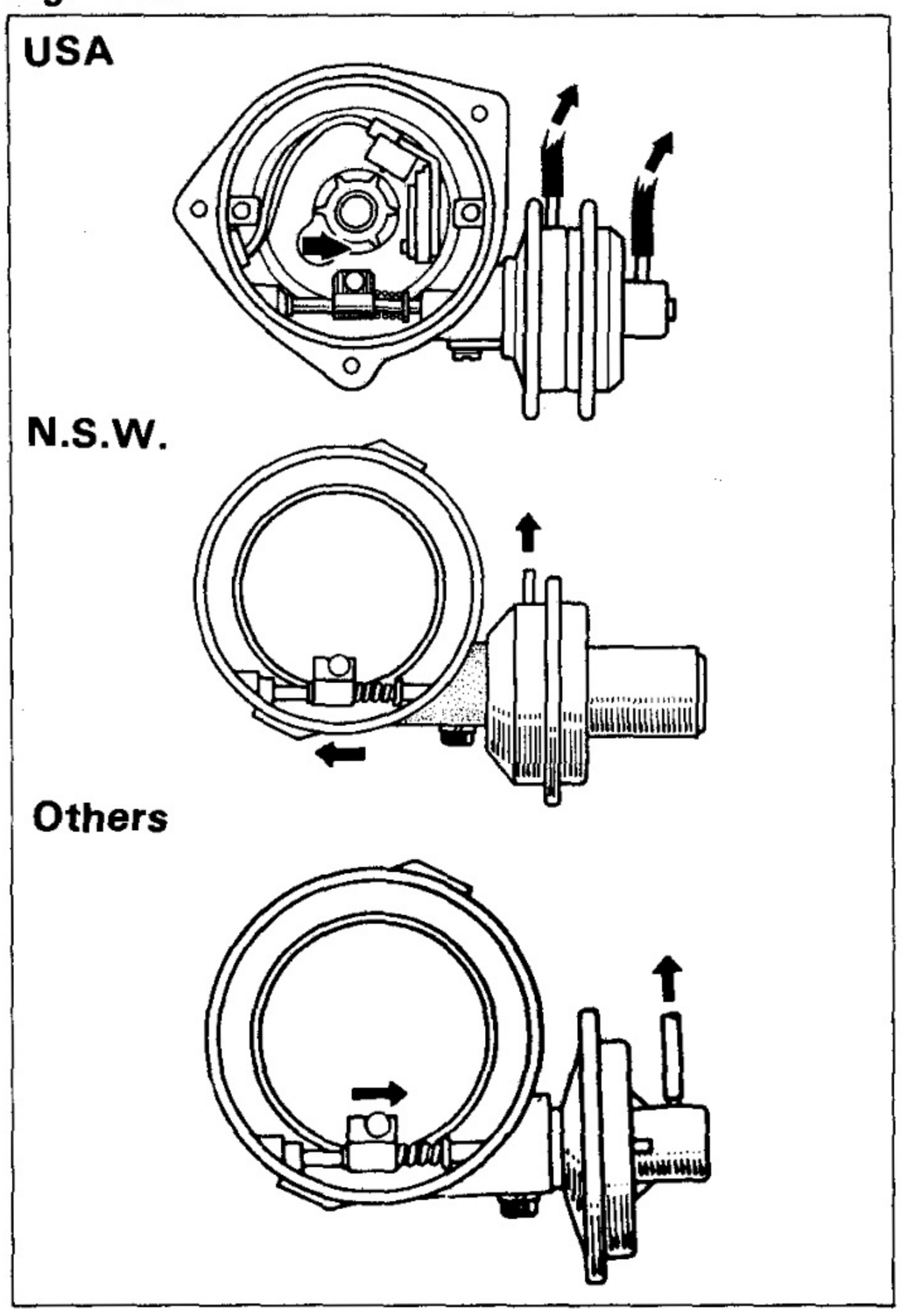
1. Turn the rotor clockwise and release it. The rotor should return quickly.
2. Check the rotor for looseness.

Fig. 2-32



3. Start the engine and disconnect the vacuum hoses from the distributor. The timing mark should vary with the engine rpm.

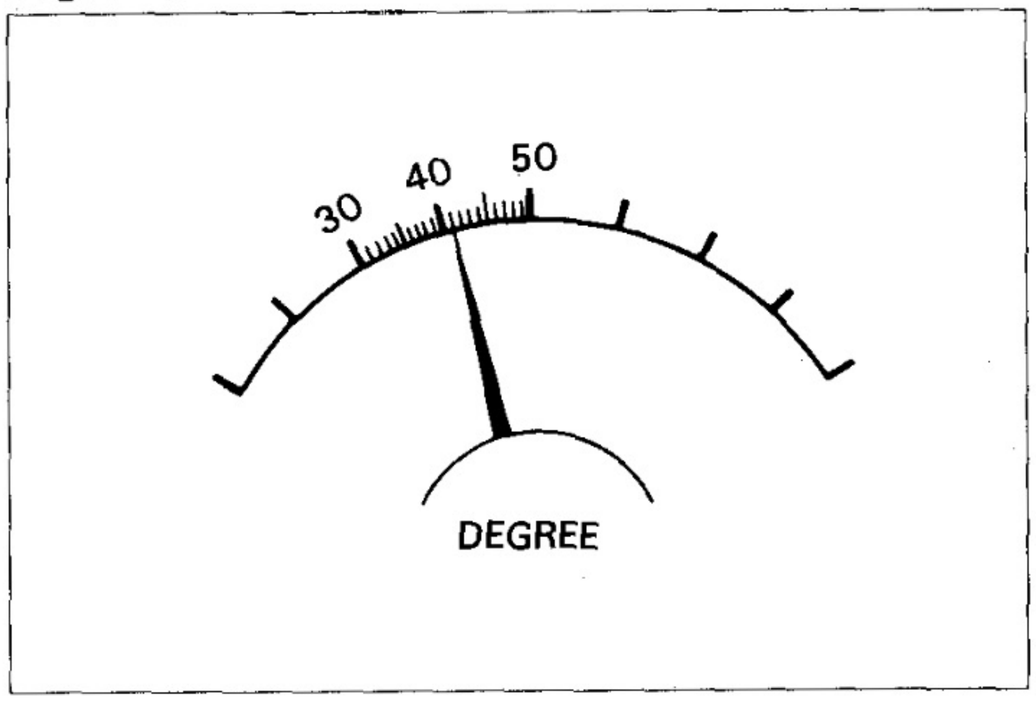
Fig. 2-33



CHECK VACUUM ADVANCER OPERATION

Apply vacuum to the diaphragm and check that the vacuum advancer moves in accordance with the vacuum.

Fig. 2-34



IGNITION TIMING

CHECK DWELL ANGLE (except USA)

Using a dwell angle tester, check the dwell angle at idle speed before adjusting the ignition timing.

Dwell angle: 41°

If the angle does not meet specification, adjust the rubbing block gap as follows:

More than 42° ——→ Decrease the gap.
Less than 40° ——→ Increase the gap.

Fig. 2-35

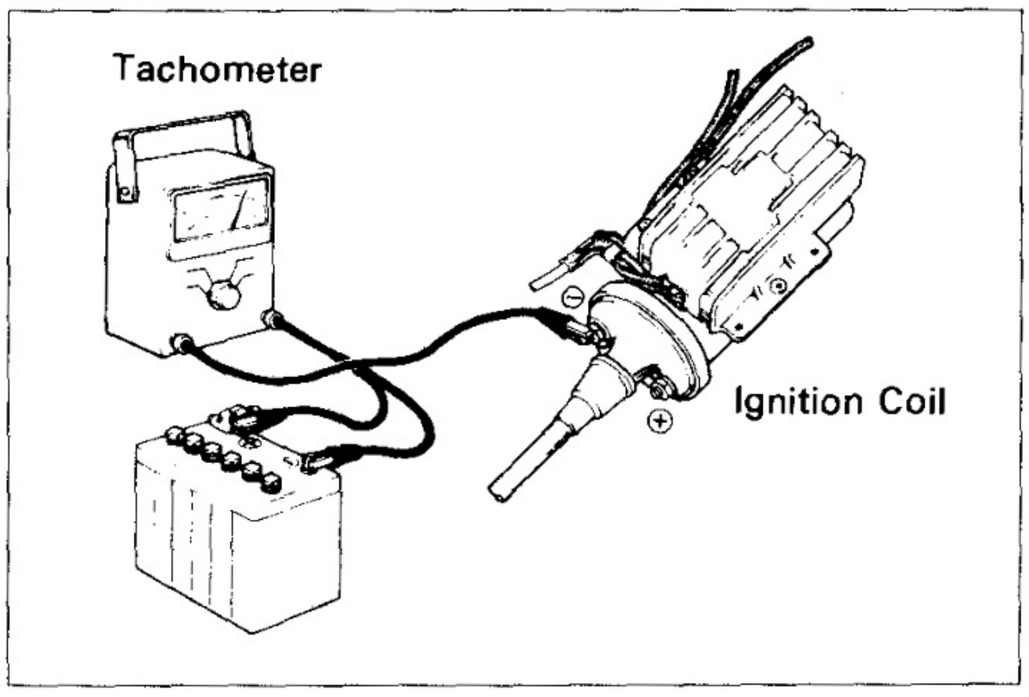


Fig. 2-36

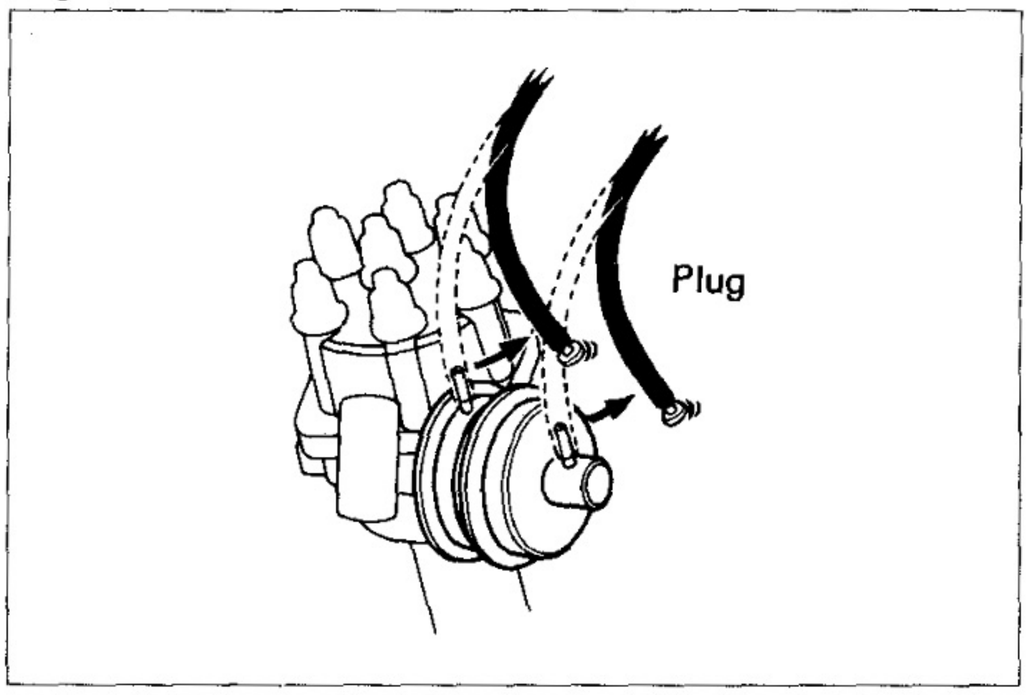


Fig. 2-37

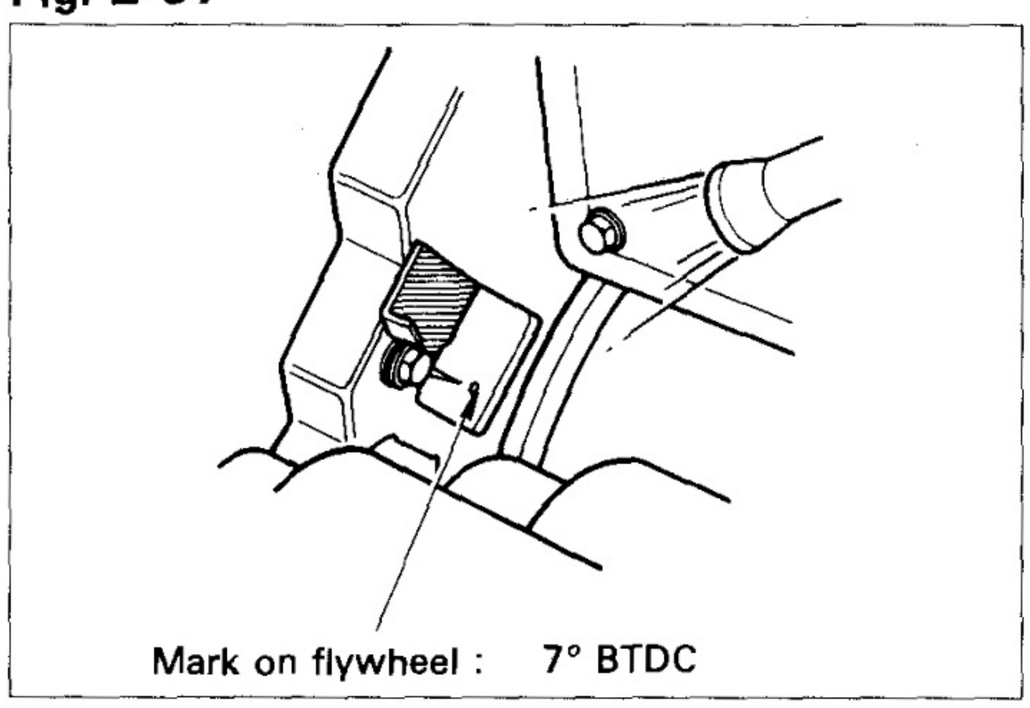
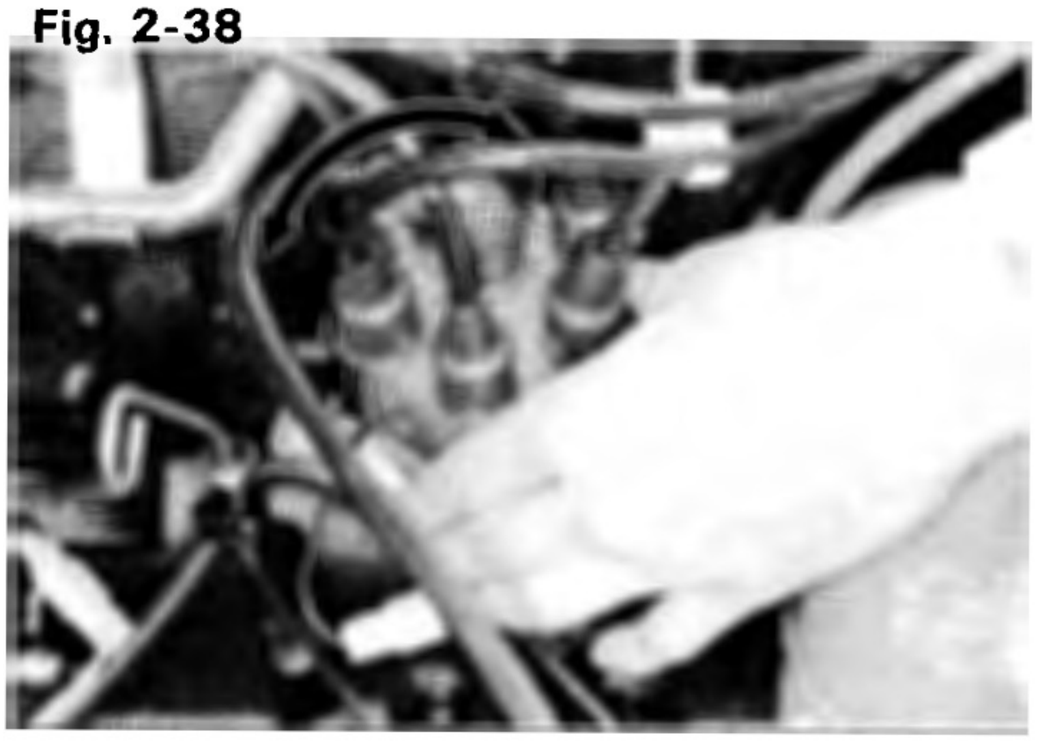


Fig. 2-38



CHECK IGNITION TIMING

1. Connect a tachometer and timing light.

– Note –

1. **Do not keep the ignition switch ON for more than 10 minutes if the engine will not start.**
2. **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**
3. **NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.**
4. **Do not disconnect the battery when the engine is running.**
5. **Make sure that the igniter is properly grounded to the body.**

2. Warm up the engine.
3. Disconnect the vacuum hoses from the distributor and plug the ends of them.
4. Check the ignition timing with the engine idling.

   Ignition timing:
   7° BTDC/Max. 950 rpm
   (w/ Vacuum advance cut)

5. If necessary, loosen the distributor bolt and turn the distributor to align the marks.
6. Recheck the timing after tightening the distributor.

Fig. 2-39



VALVE CLEARANCE

ADJUSTMENT

1. Warm up the engine to normal operating temperature.
2. Stop the engine and retighten the cylinder head bolts, the rocker support blots and nuts.

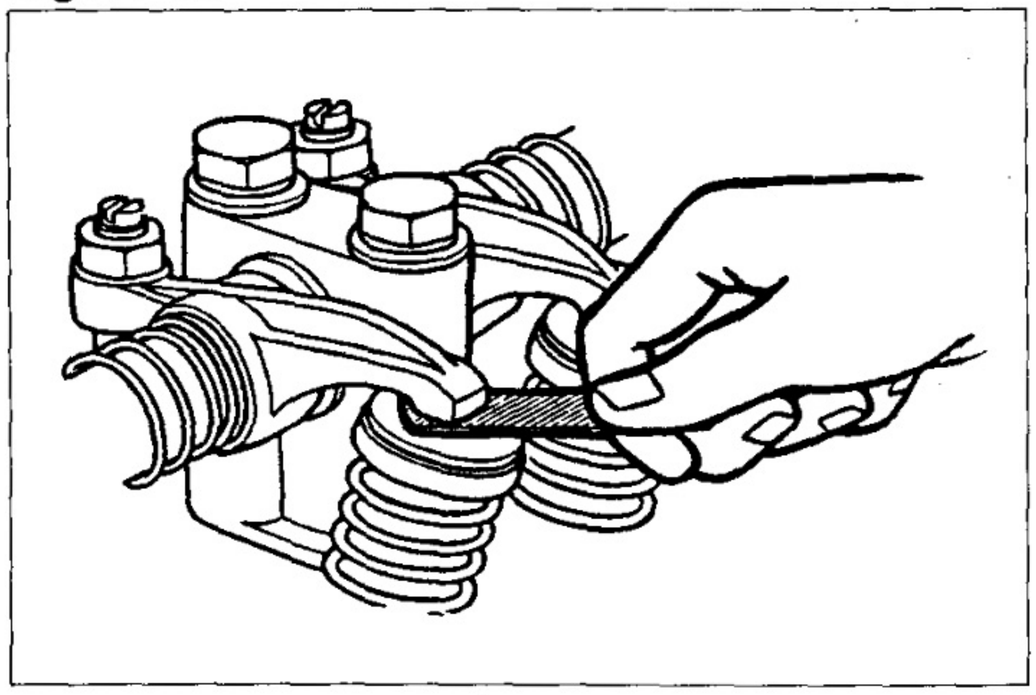
Tightening torque:

Cylinder head bolts
11.5 – 13.5 kg-m
(84 – 97 ft-lb)

Rocker support bolts and nuts

10 mm bolt	**3.0 – 4.5 kg-m**
	(22 – 32 ft-lb)
8 mm bolt	**2.0 – 3.0 kg-m**
	(15 – 21 ft-lb)

Fig. 2-40



3. Adjust the valve clearance.
   (1) Set the engine at idle speed, and check the valve clearance.
   Adjust if necessary.

Valve clearance:

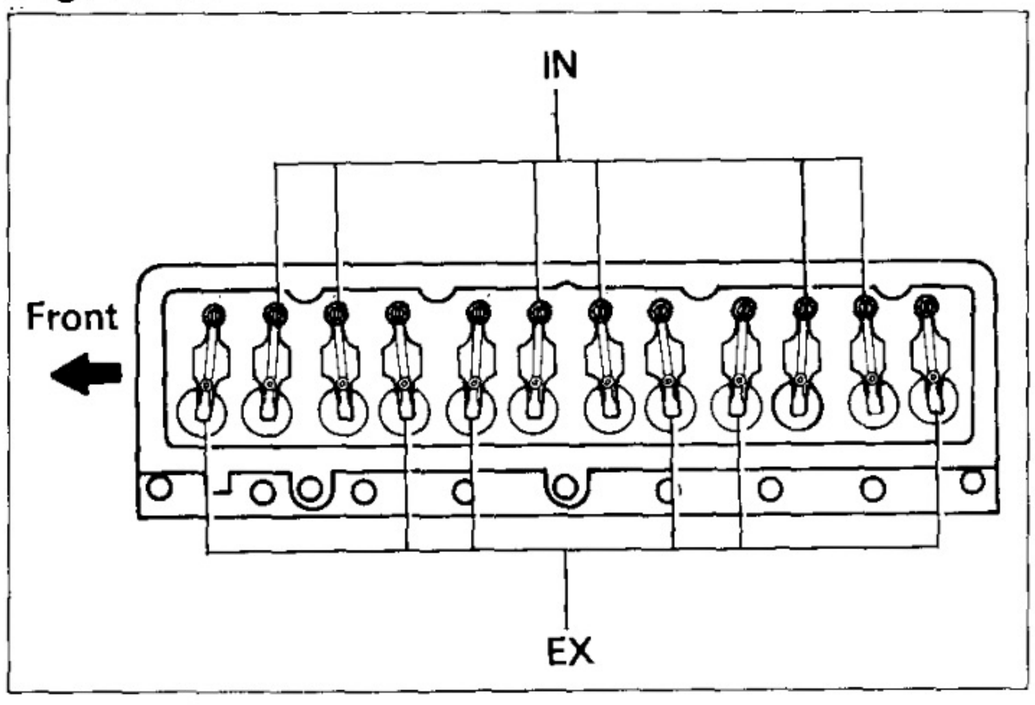
Intake	**0.20 mm**
	(0.008 in.)
Exhaust	**0.35 mm**
	(0.014 in.)

Fig. 2-41



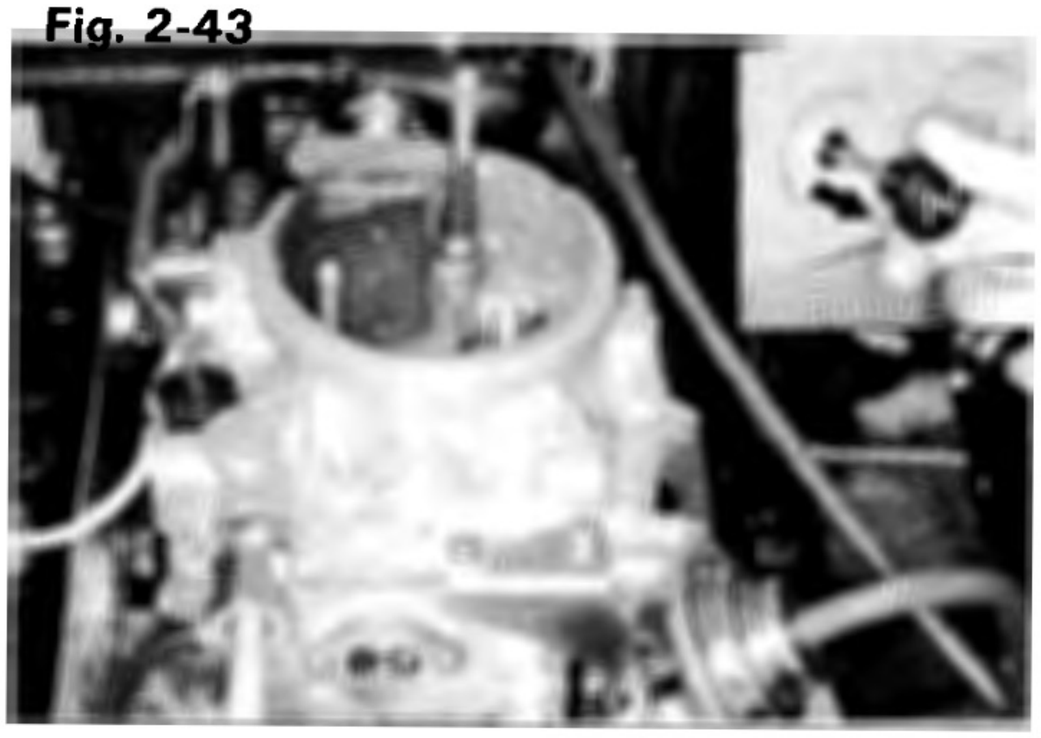
   (2) Retighten the lock nuts securely after adjustment.

Fig. 2-42



   (3) Recheck the valve clearance.

Fig. 2-43

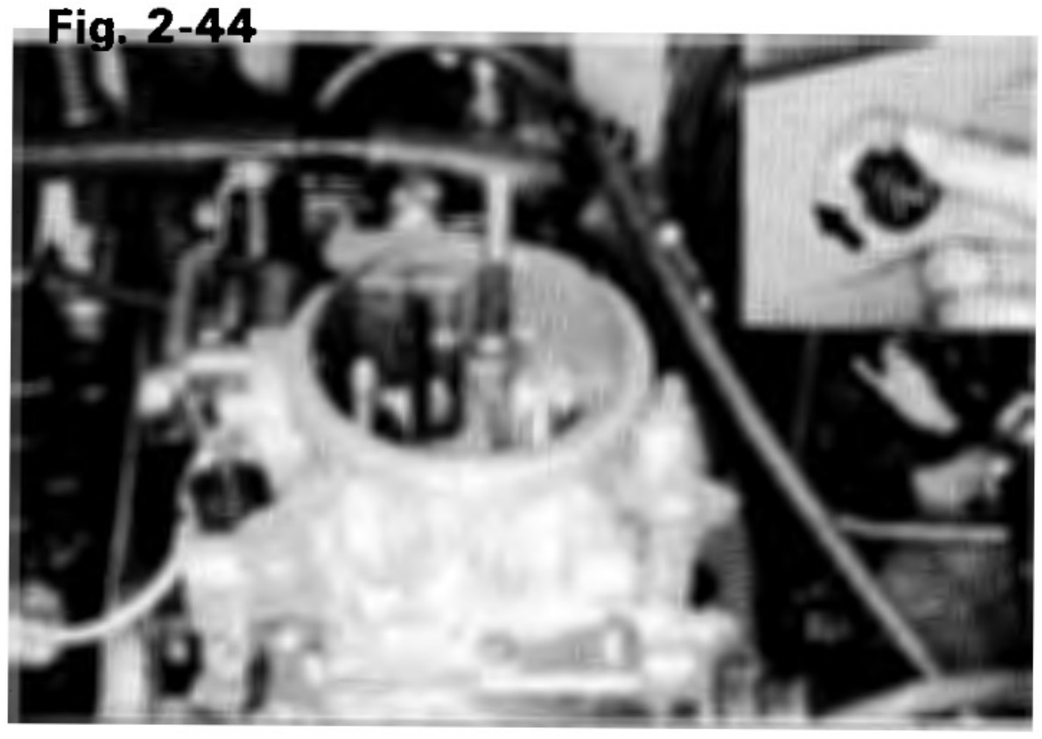


CARBURETOR

CHOKE

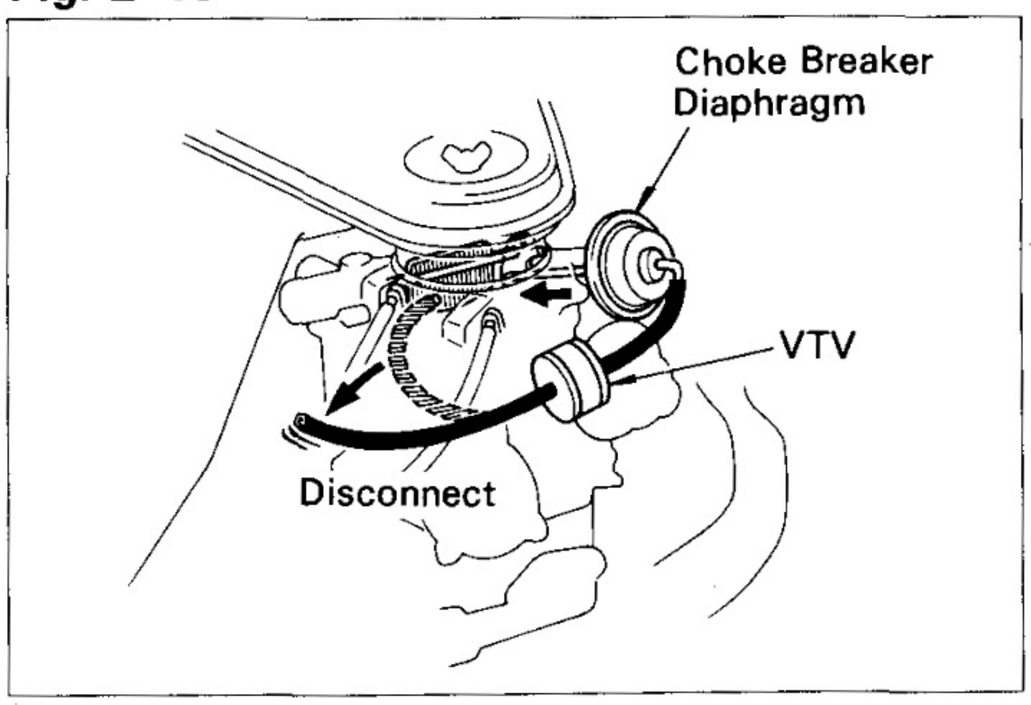
1. Pull out the choke knob all the way and check to see that the choke valve is fully closed.

Fig. 2-44



2. Check to see that the choke valve is fully open when the choke knob has been returned.

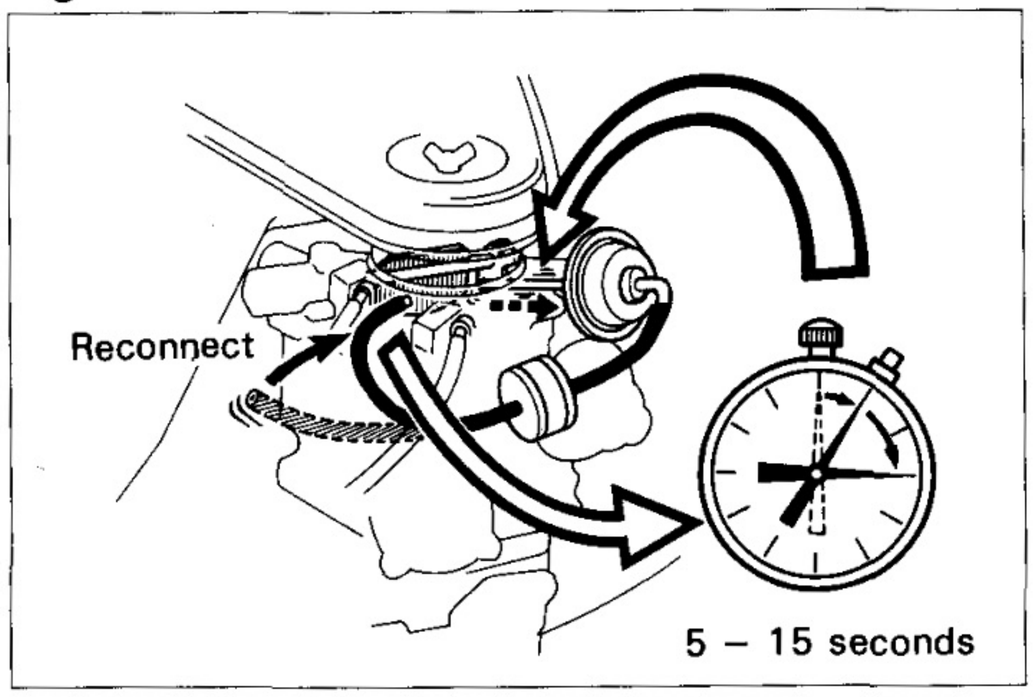
Fig. 2-45



CHOKE BREAKER (USA)

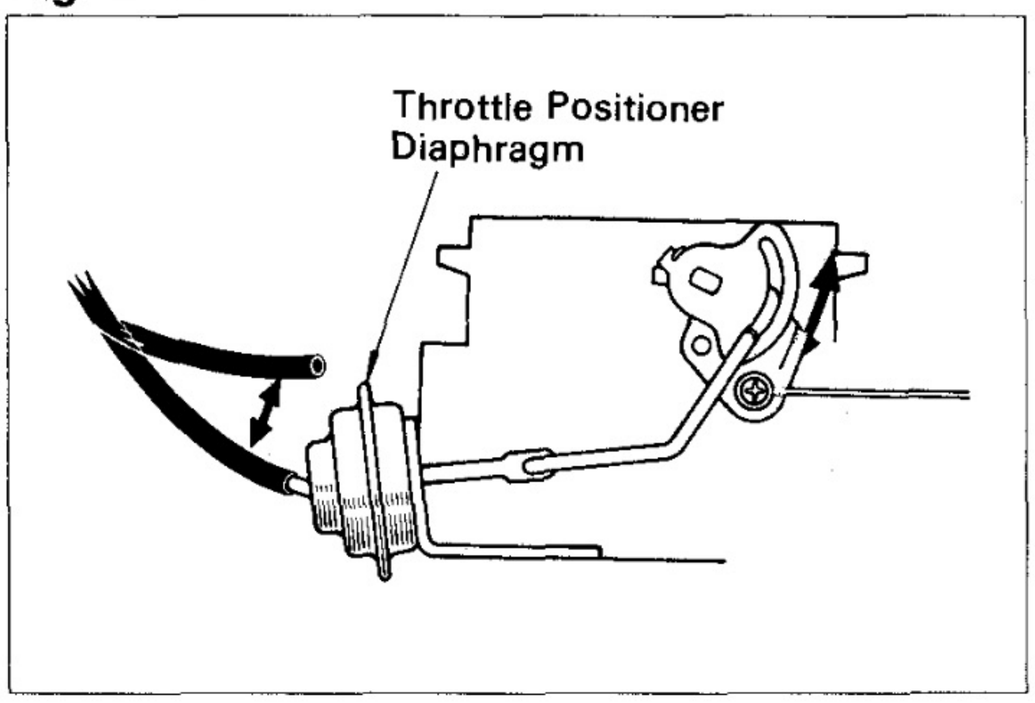
1. Start the engine.
2. Disconnect the vacuum hose between the carburetor and the VTV at the carburetor side.
3. Check that the choke breaker linkage returns quickly by spring tension.

Fig. 2-46



4. Reconnect the hose.
5. Check that the choke breaker linkage is pulled into the diaphragm within 5 – 15 seconds after reconnecting the hose.

Fig. 2-47



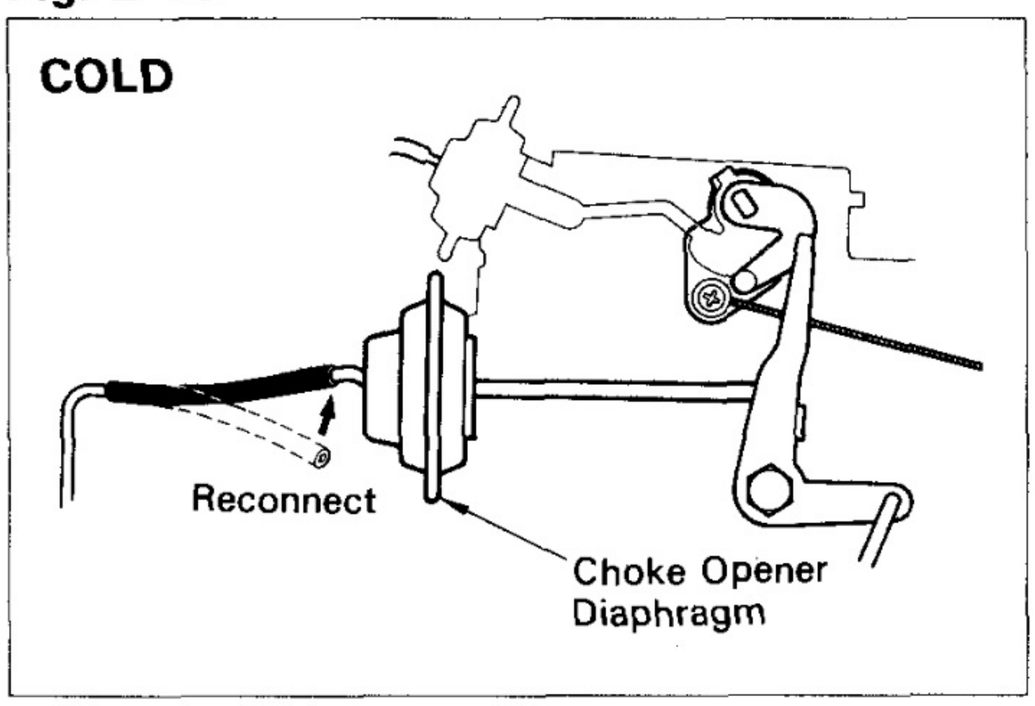
CHOKE BREAKER (FJ except General and USA)

1. Start the engine.
2. Disconnect the hose from the throttle positioner diaphragm and check that the choke linkage returns.
3. Reconnect the hose to the throttle positioner diaphragm and check that the choke linkage is pulled by the diaphragm.

– Note –

The choke breaker system utilizes the throttle positioner diaphragm.

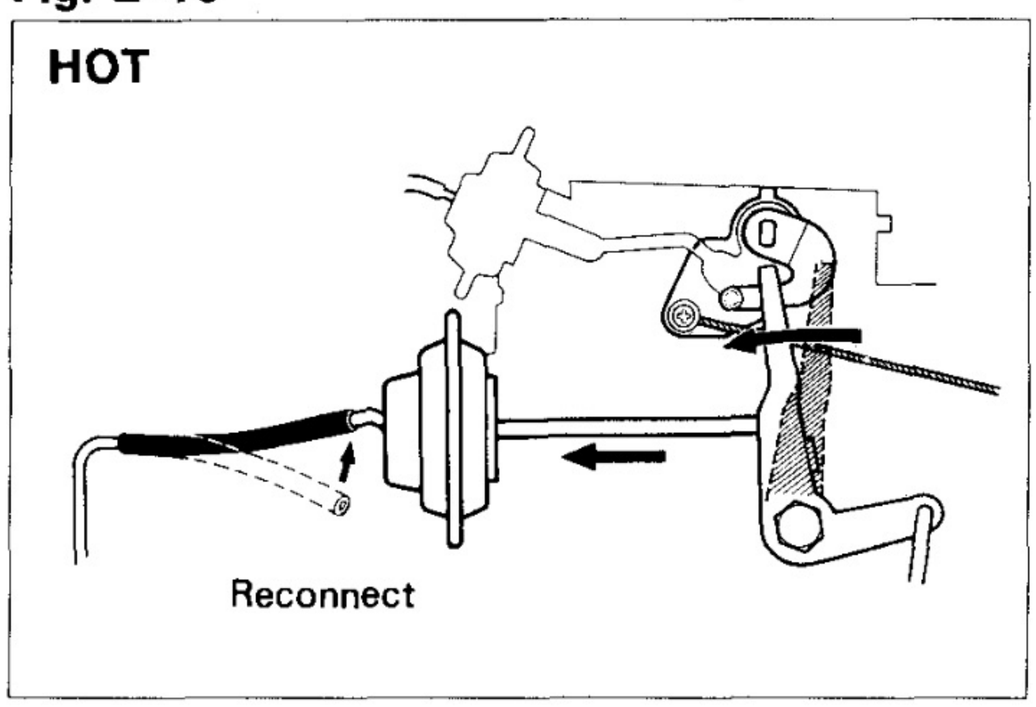
Fig. 2-48



CHOKE OPENER (USA)

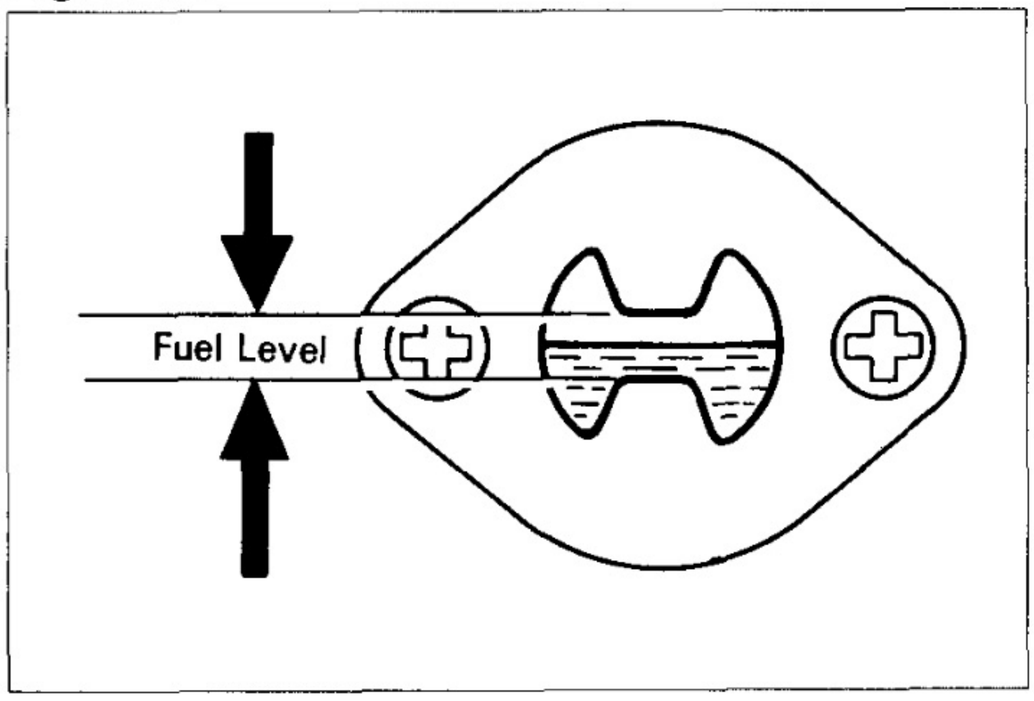
1. The coolant temperature should be below 5°C (41°F).
2. Start the engine and disconnect the hose from the choke opener diaphragm and reconnect it.
3. Check that the choke linkage does not move.

Fig. 2-49



4. With the engine warm and idling, disconnect the hose from the choke opener diaphragm and check that the choke linkage returns.
5. Reconnect the hose and check that the choke linkage is pulled by the choke opener diaphragm.

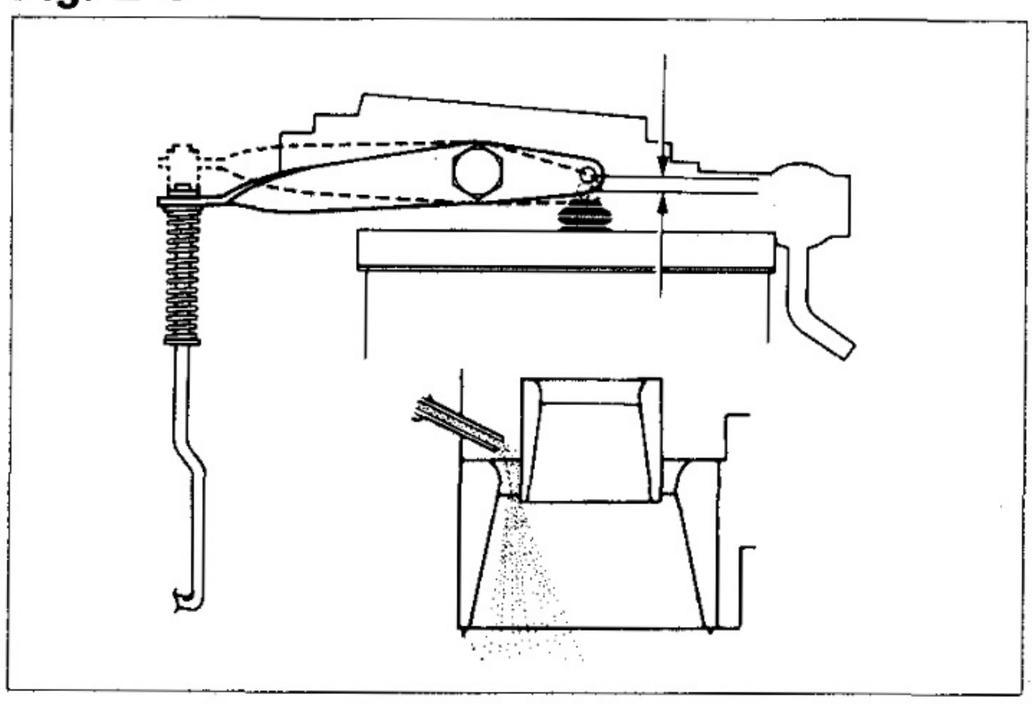
Fig. 2-50



CHECK FUEL LEVEL

Check the fuel level while the engine is idling.

Fig. 2-51

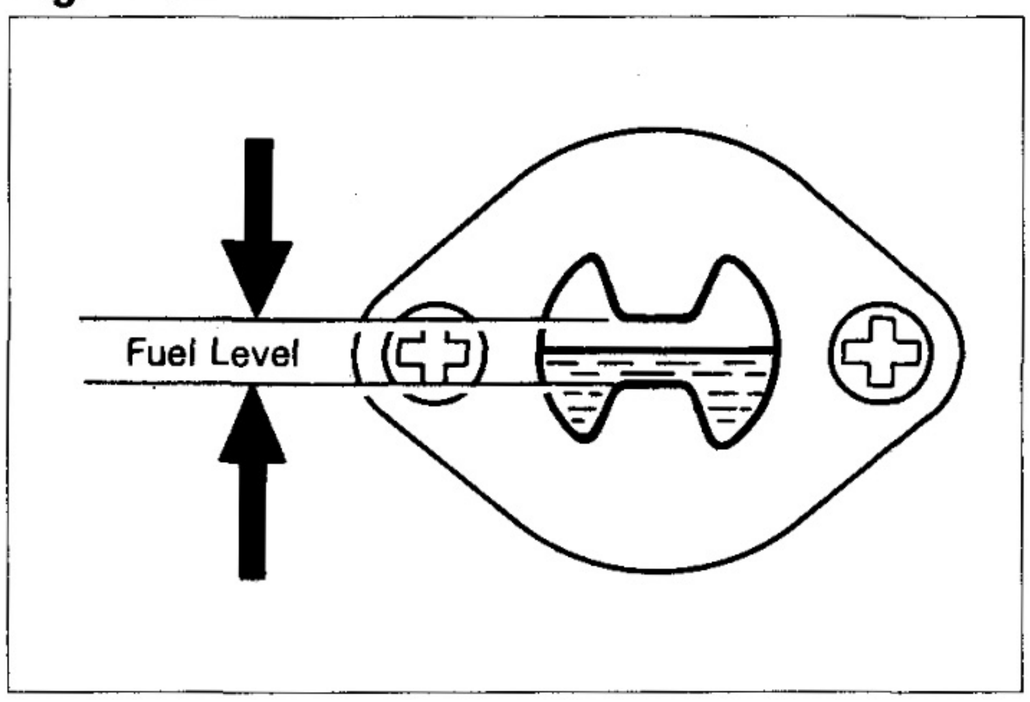


CHECK ACCELERATION PUMP

1. Check the acceleration pump operation. Gasoline should shoot out with force from the jet when the throttle valve is opened.
2. Check the throttle valve opening. The throttle valve should be fully open when the accelerator pedal is fully depressed.

Acceleration pump stroke:
9.5 mm
(0.374 in.)

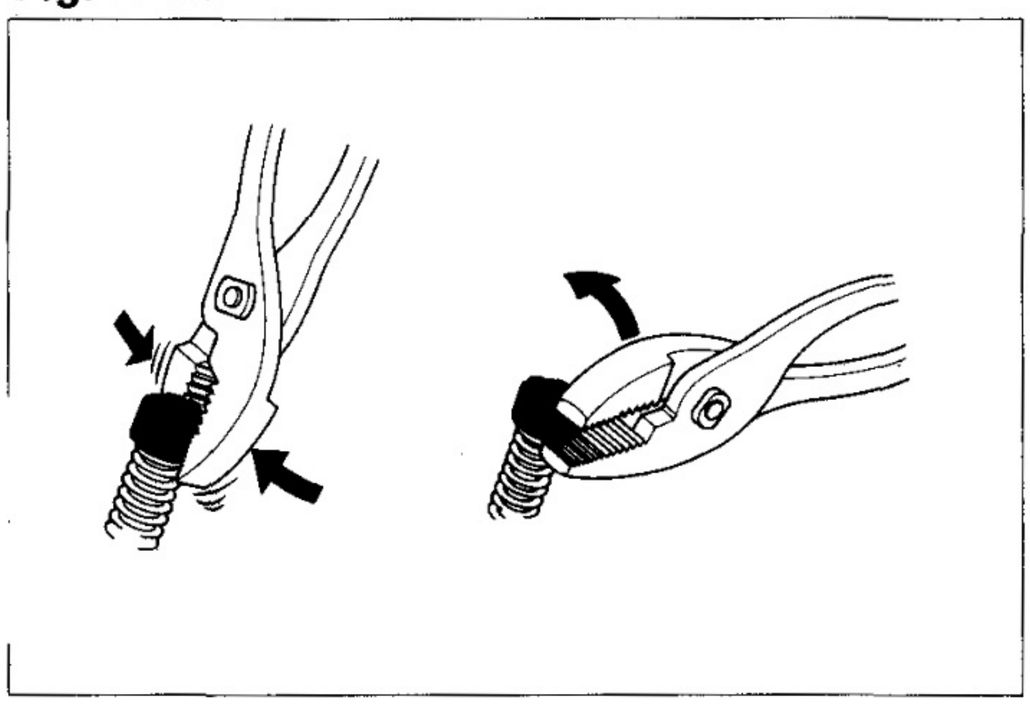
Fig. 2-52



IDLE SPEED ADJUSTMENT (USA)

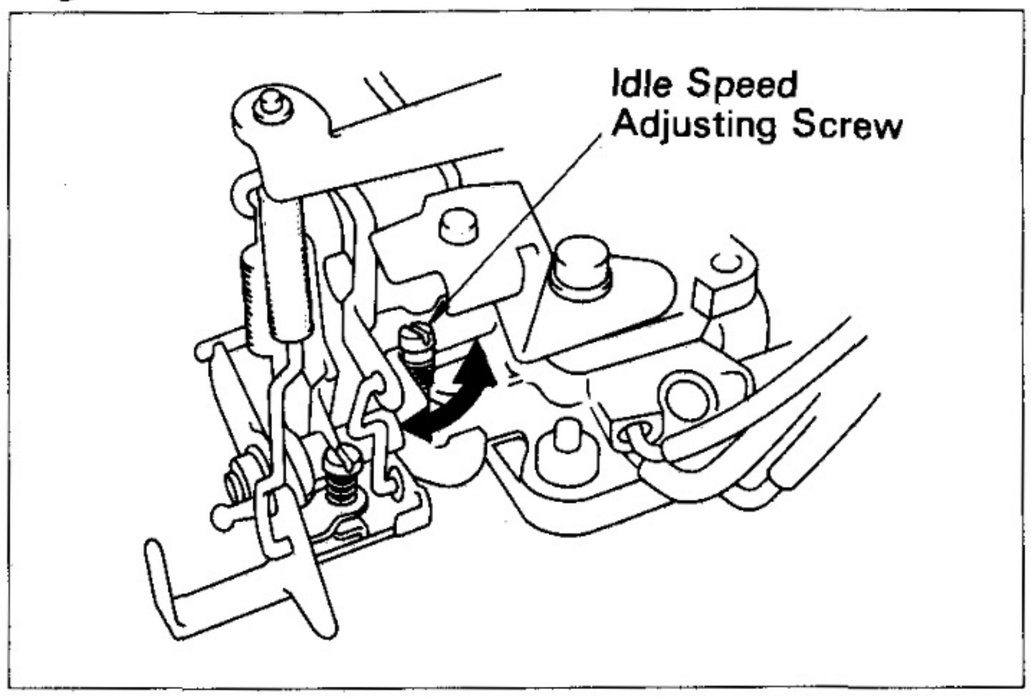
1. Check the following items beforehand.
   (1) Air cleaner installed
   (2) Normal operating coolant temperature
   (3) Choke fully open
   (4) All accessories switched off
   (5) All vacuum lines connected
   (6) Ignition timing set correctly
   (7) Transmission in neutral
   (8) Fuel level should be about even with the correct level in the sight glass.

Fig. 2-53



2. Break the idle limiter cap on the idle speed adjusting screw, if one is installed.

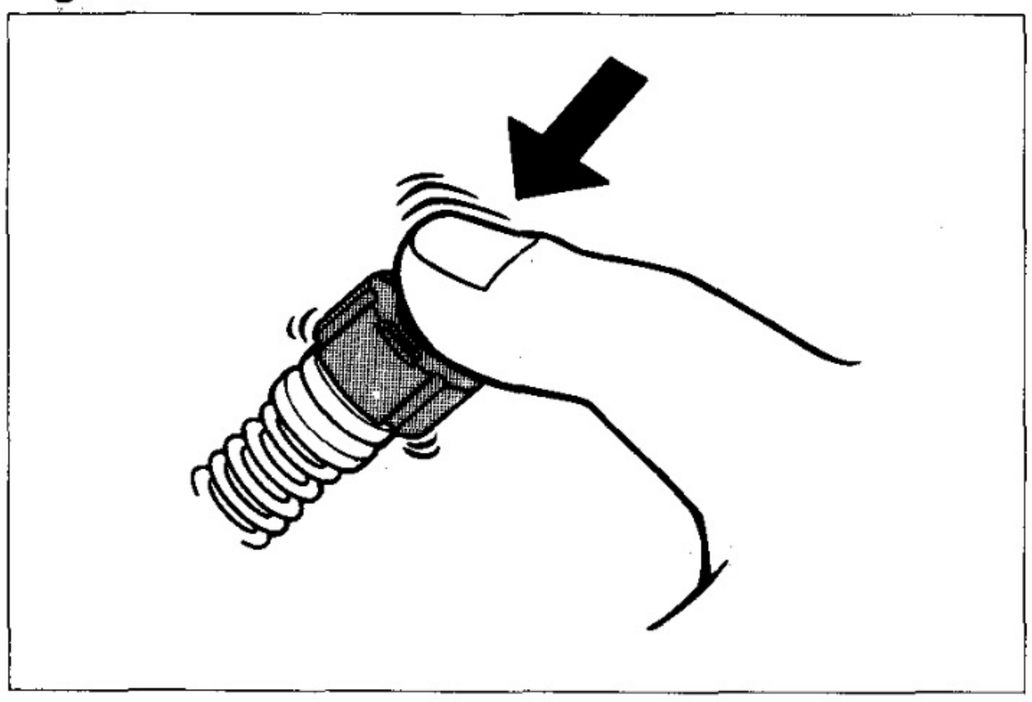
Fig. 2-54



3. Adjust the idle speed by turning the idle speed adjusting screw.

Idle speed: 650 rpm

Fig. 2-55



4. Install a new limiter cap on the idle speed adjusting screw, if one was installed.

Fig. 2-56

SEE

FUEL SYSTEM SECTION

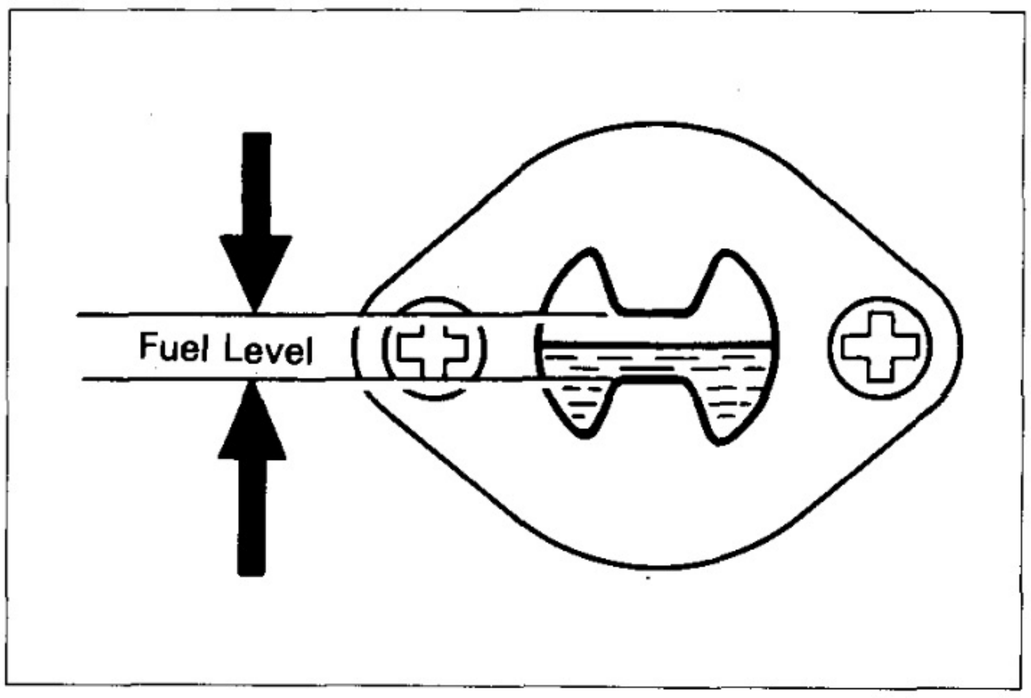
Fig. 6-163 to 6-175

— Note —

For the idle mixture adjustment, the idle mixture adjusting screw is adjusted and plugged with a steel plug by the manufacturer.

If necessary, remove the plug and follow the procedure described in FUEL SYSTEM section.

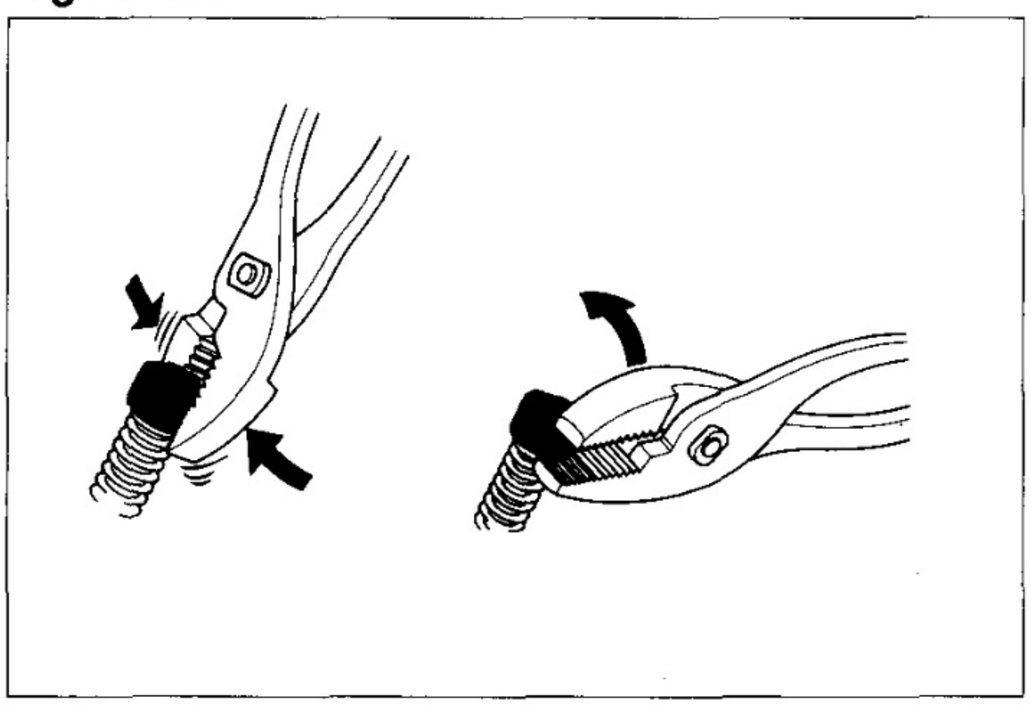
Fig. 2-57



IDLE SPEED & IDLE MIXTURE ADJUSTMENT (except USA)

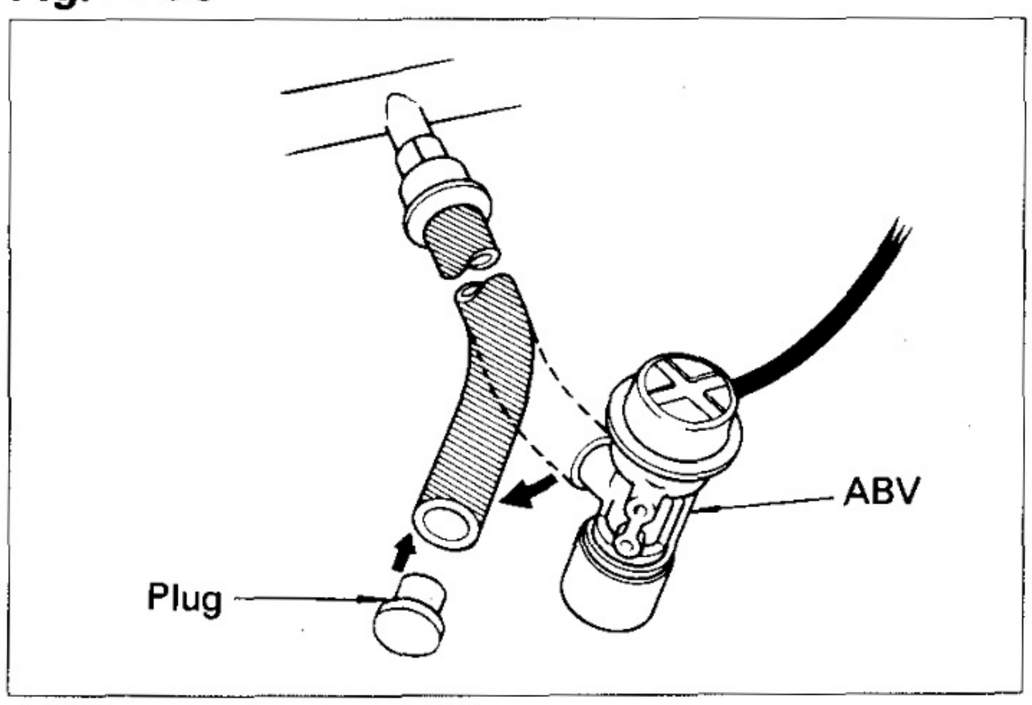
1. Check the following items beforehand.
   (1) Air cleaner installed
   (2) Normal operating coolant temperature
   (3) Choke fully open
   (4) All accessories switched off
   (5) All vacuum lines connected
   (6) Ignition timing set correctly
   (7) Transmission in neutral
   (8) Fuel level should be about even with the correct level in the sight glass.

Fig. 2-58



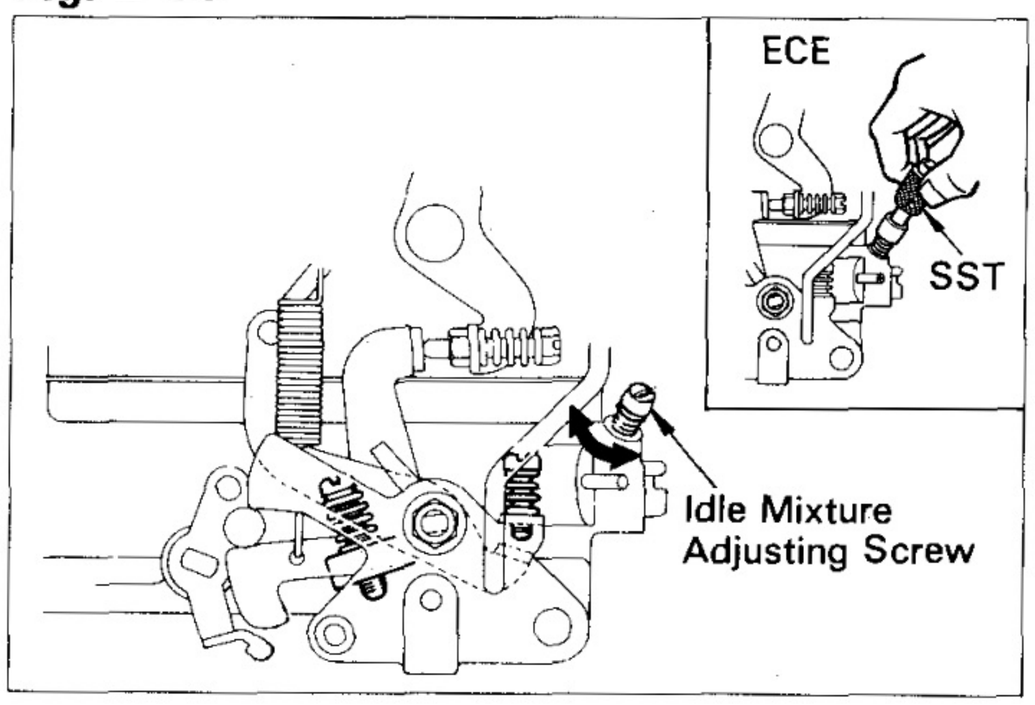
2. Break the idle limiter cap on the idle speed adjusting screw, if one is installed.

Fig. 2-59



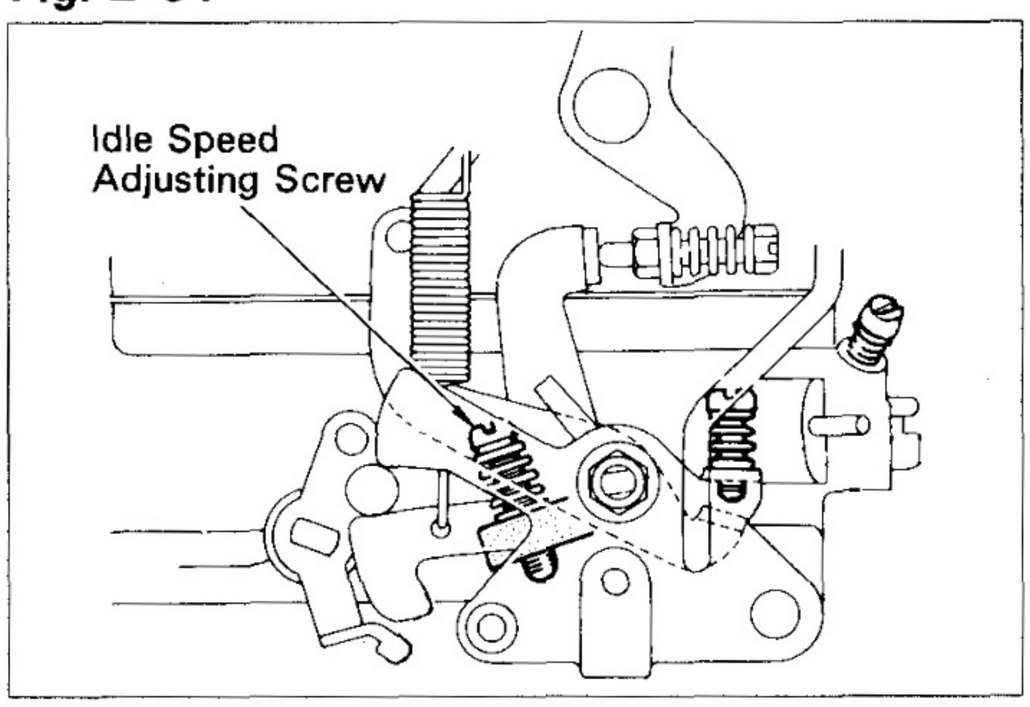
3. (N.S.W. & Victoria states)
Disconnect the air hose from the ABV and plug the hose end. (AI system OFF)

Fig. 2-60



4. Start the engine.
5. Set to the maximum speed by turning the idle mixture adjusting screw with SST (ECE) or a screwdriver (others).
SST [09243-00020]

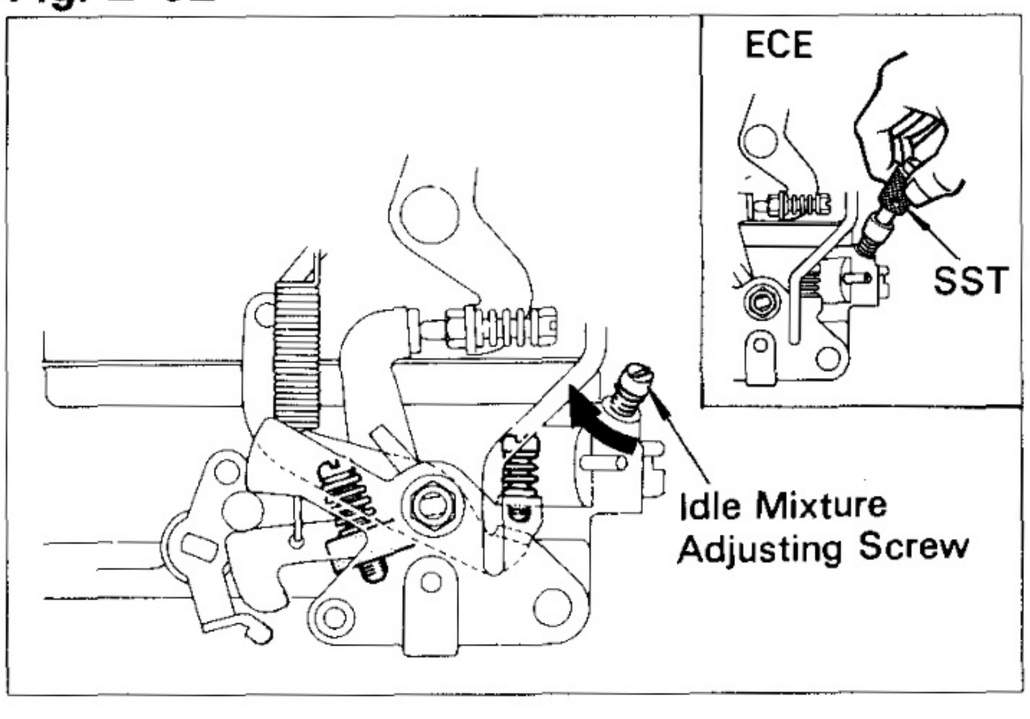
Fig. 2-61



6. Set to the idle mixture speed by turning the idle speed adjusting screw.
Idle mixture speed: 690 rpm

– Note –
Before moving to the next step, continue adjustments 5 and 6 above, until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.

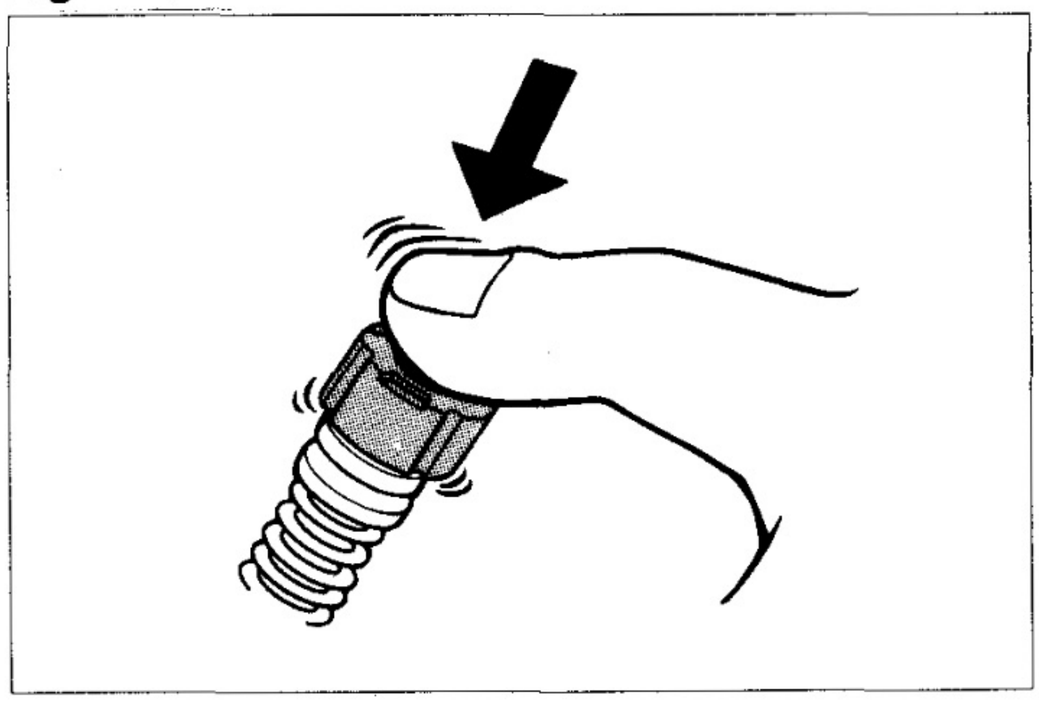
Fig. 2-62



7. Set to the idle speed by screwing in the idle mixture adjusting screw with SST (ECE) or a screw driver (others).
SST [09243-00020]
Idle speed: 650 rpm

– Note –
This is the LEAN DROP METHOD for setting idle speed and mixture.

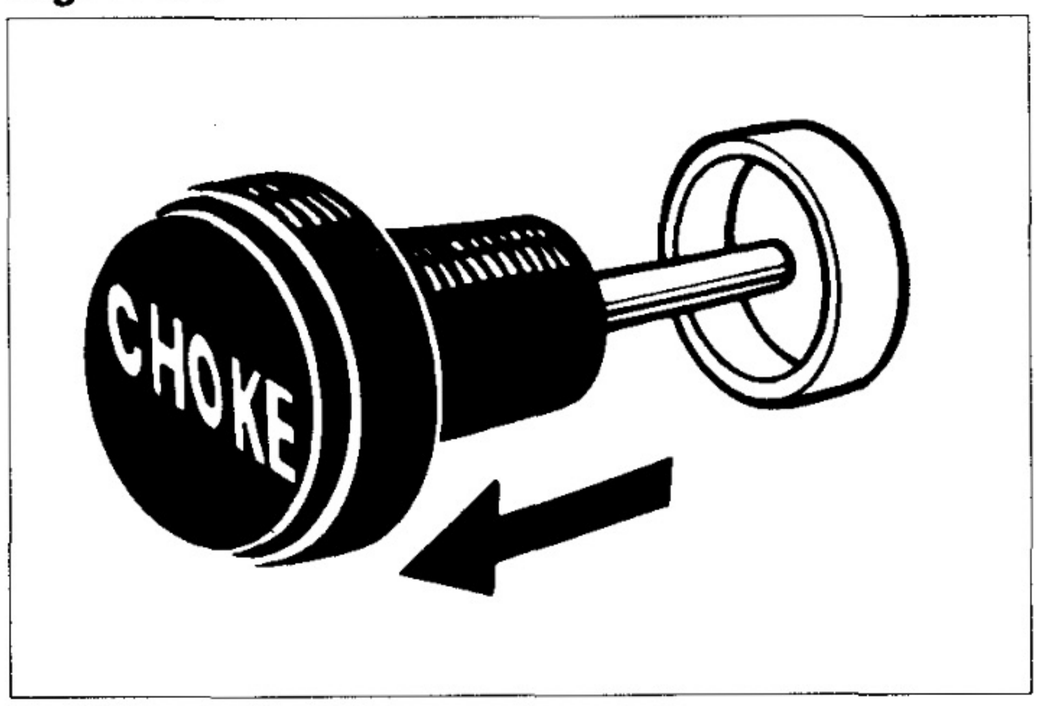
Fig. 2-63



8. (N.S.W. & Victoria states)
   Reconnect the air hose to the ABV.
9. Install a new limiter cap on the idle speed adjusting screw, if one was installed.

– Note –
After completing adjustment, perform a road test to make certain engine performance has not changed.

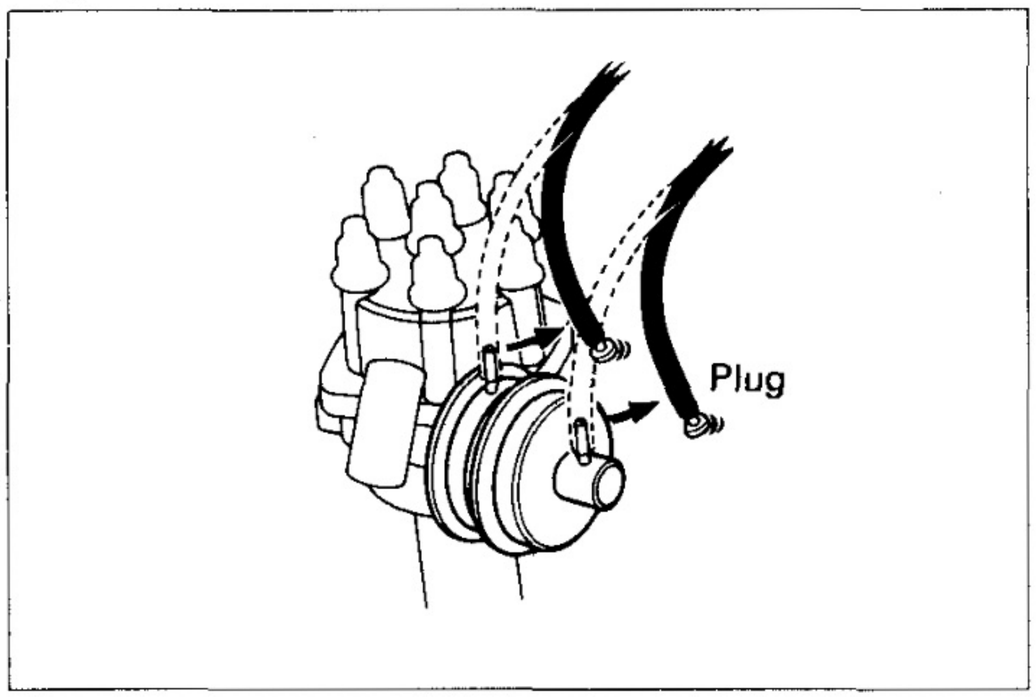
Fig. 2-64



FAST IDLE SPEED ADJUSTMENT (USA)

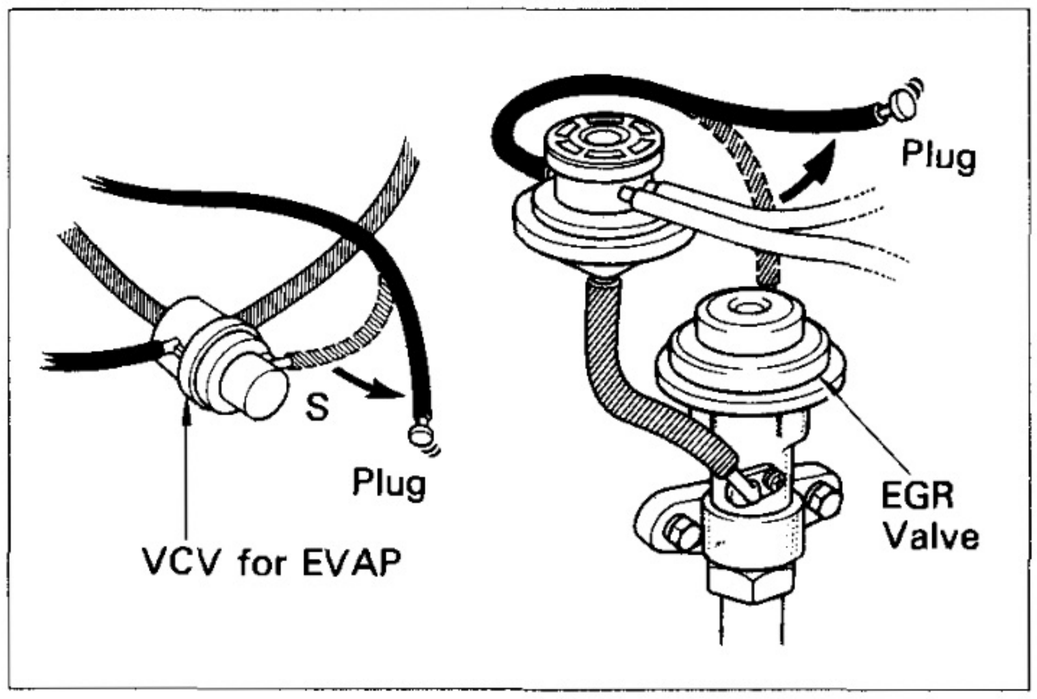
1. Warm up the engine and then stop it.
2. Remove the air cleaner cover.
3. Fully pull out the choke knob.

Fig. 2-65



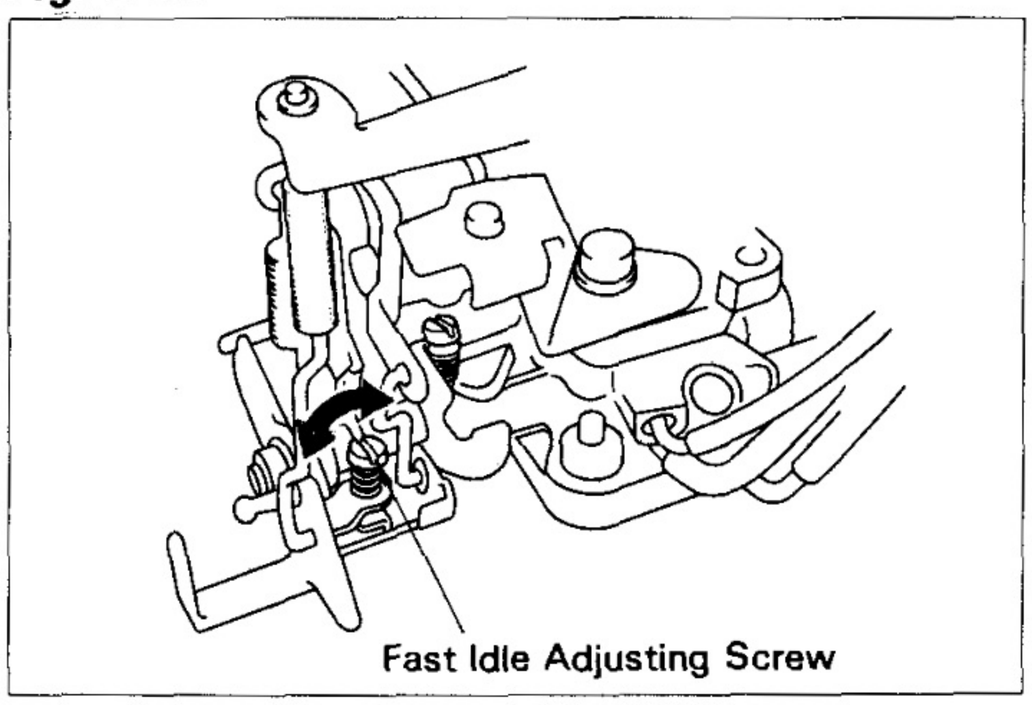
4. Disconnect the vacuum hoses from the distributor and plug the hose ends. (Vacuum advancer OFF)

Fig. 2-66



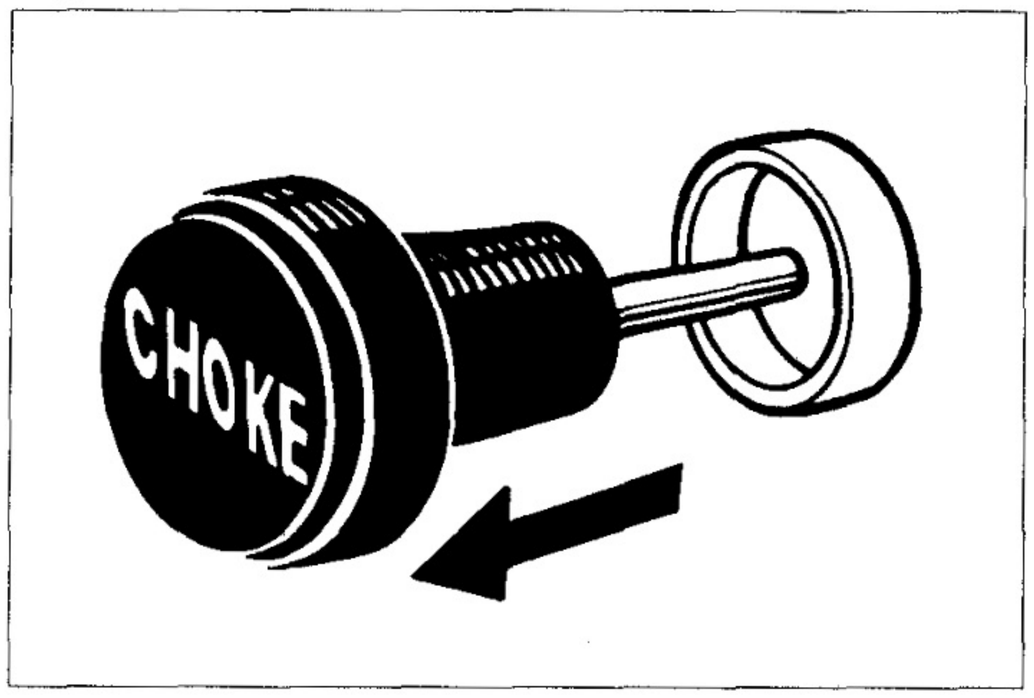
5. Disconnect the vacuum hoses from port S of the VCV for EVAP, and EGR valve, and plug the hose ends.
   (EVAP system and EGR system OFF)

Fig. 2-67



6. Adjust the fast idle speed by turning the fast idle adjusting screw.
   Fast idle speed: 1,800 rpm
7. When the choke knob is pushed in all the way, the engine speed should return to idle speed.
8. Reinstall the air cleaner cover.

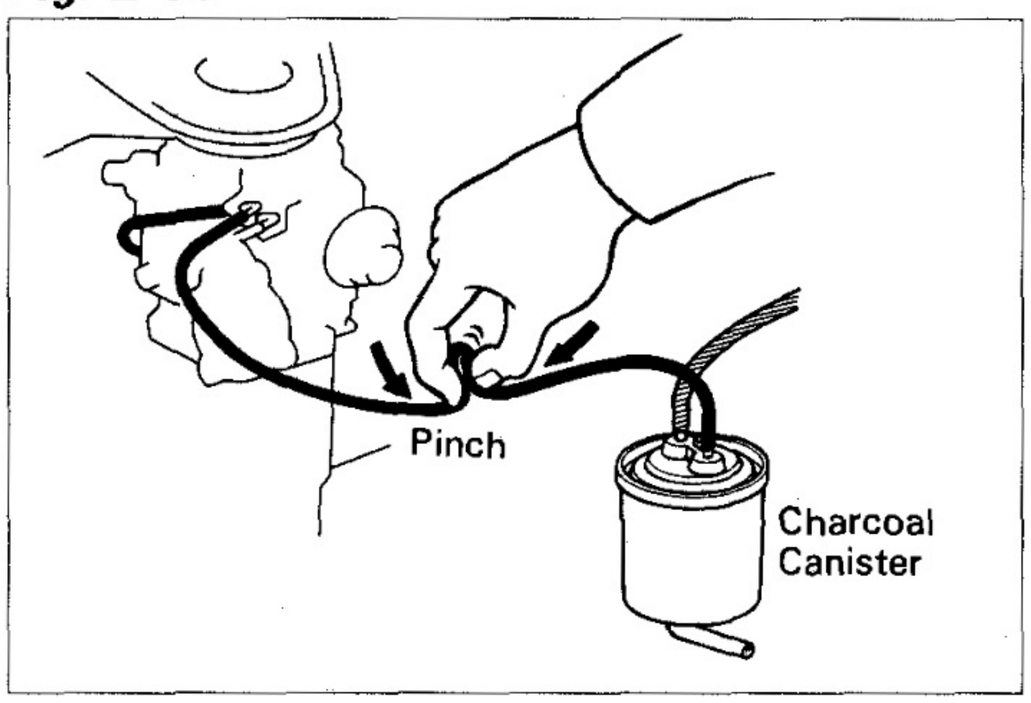
Fig. 2-68



FAST IDLE SPEED ADJUSTMENT (Others)

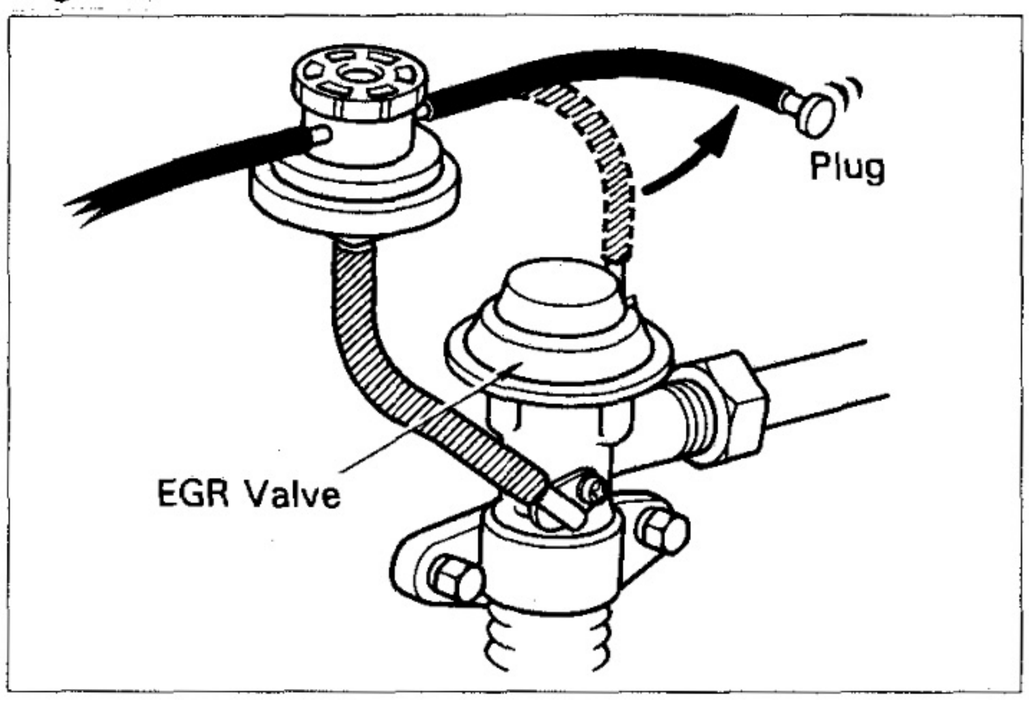
1. Warm up the engine and then stop it.
2. Remove the air cleaner cover.
3. Fully pull out the choke knob.

Fig. 2-69



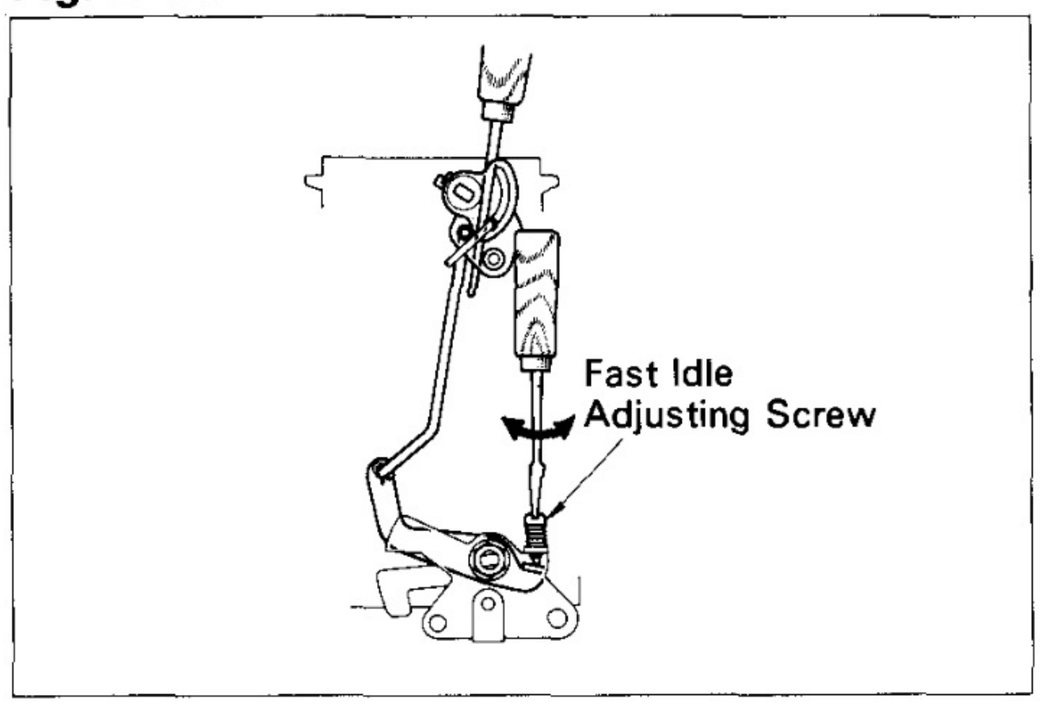
4. (N.S.W. & Victoria states)
   (1) Pinch shut the vacuum hose to the charcoal canister. (EVAP system OFF)

Fig. 2-70



   (2) Disconnect the vacuum hose from the EGR valve and plug the hose end. (EGR system OFF)

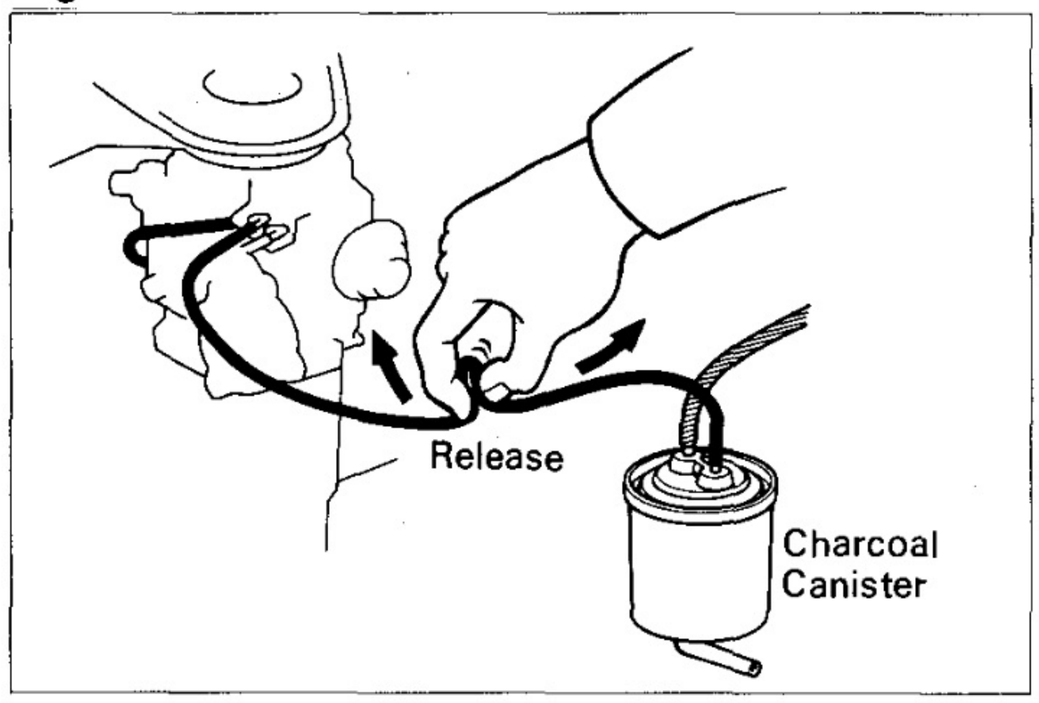
Fig. 2-71



5. Open the choke valve with a screwdriver and start the engine.
6. Adjust the fast idle speed by turning the fast idle adjusting screw.

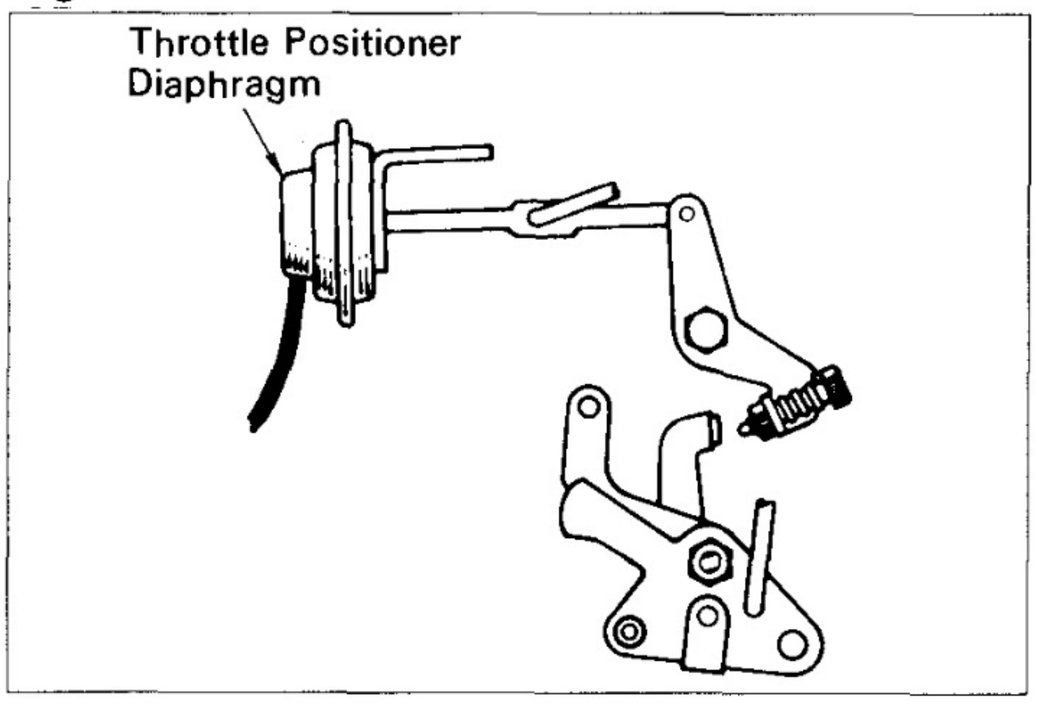
   Fast idle speed: 1,800 rpm
7. When the choke knob is pushed in all the way, the engine speed should return to idle speed.

Fig. 2-72



8. (N.S.W. & Victoria states)
   Release the pinched hose and reconnect the vacuum hose to the EGR valve.
9. Reinstall the air cleaner cover.

Fig. 2-73

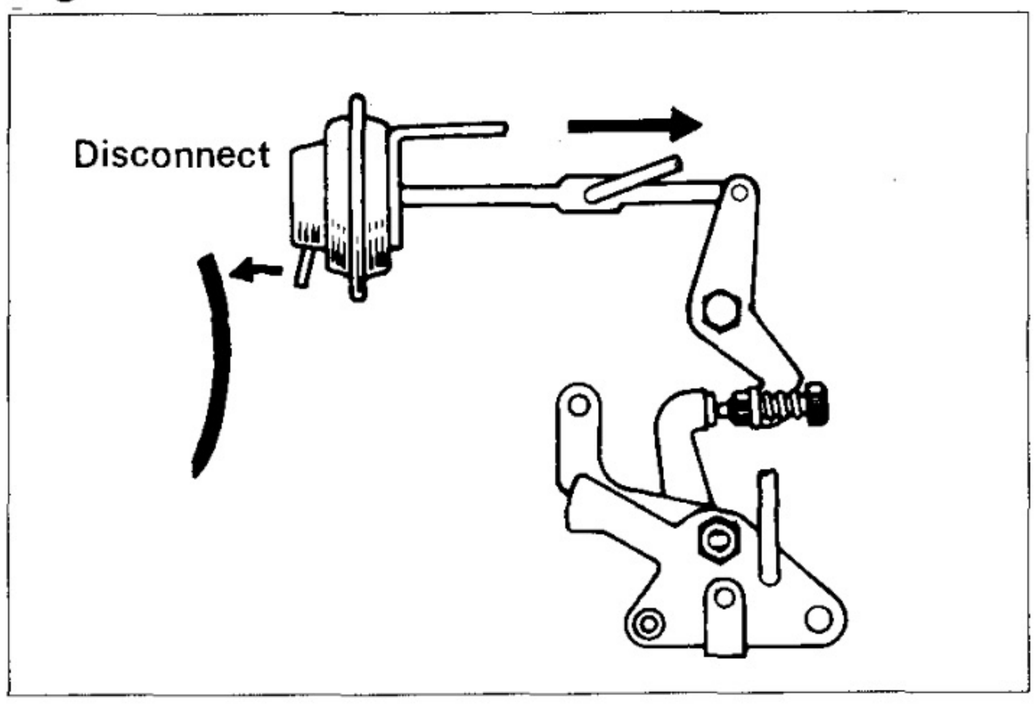


THROTTLE POSITIONER (Australia & ECE FJ series)

CHECK THROTTLE POSITIONER OPERATION

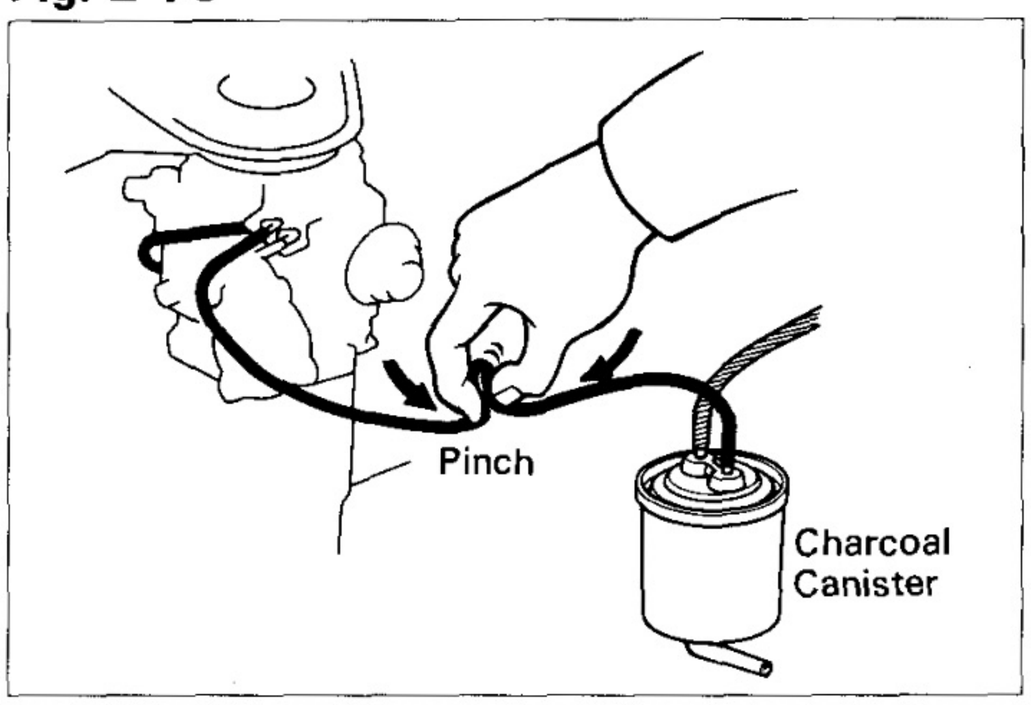
1. Warm up the engine.
2. Check the idle speed and adjust if necessary.
3. Check that the throttle positioner is released at idle.

Fig. 2-74



4. Disconnect the vacuum hose from the throttle positioner diaphragm and plug the hose end.
5. Race the engine and then release the accelerator pedal.
6. At this time, the throttle positioner adjusting screw should strike the throttle lever so that the engine runs faster than idle RPM. (Throttle positioner is set.)

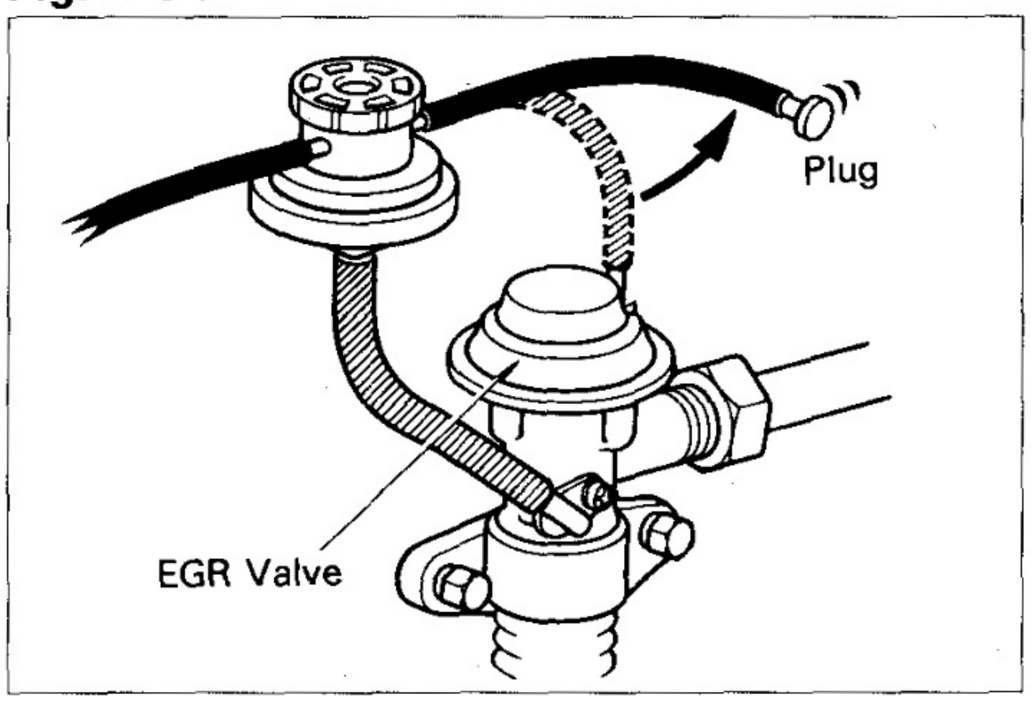
Fig. 2-75



CHECK THROTTLE POSITIONER SETTING SPEED

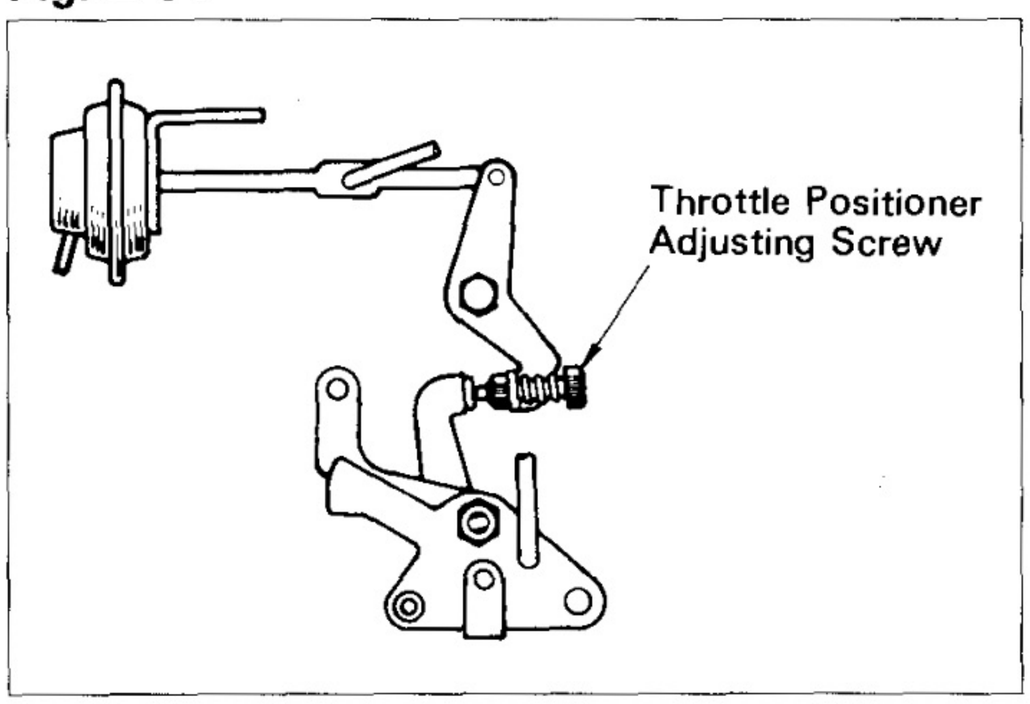
1. (N.S.W. & Victoria states)
   (1) Pinch shut the vacuum hose to the charcoal canister. (EVAP system OFF)

Fig. 2-76



   (2) Disconnect the vacuum hose from the EGR valve and plug the hose end. (EGR system OFF)

Fig. 2-77



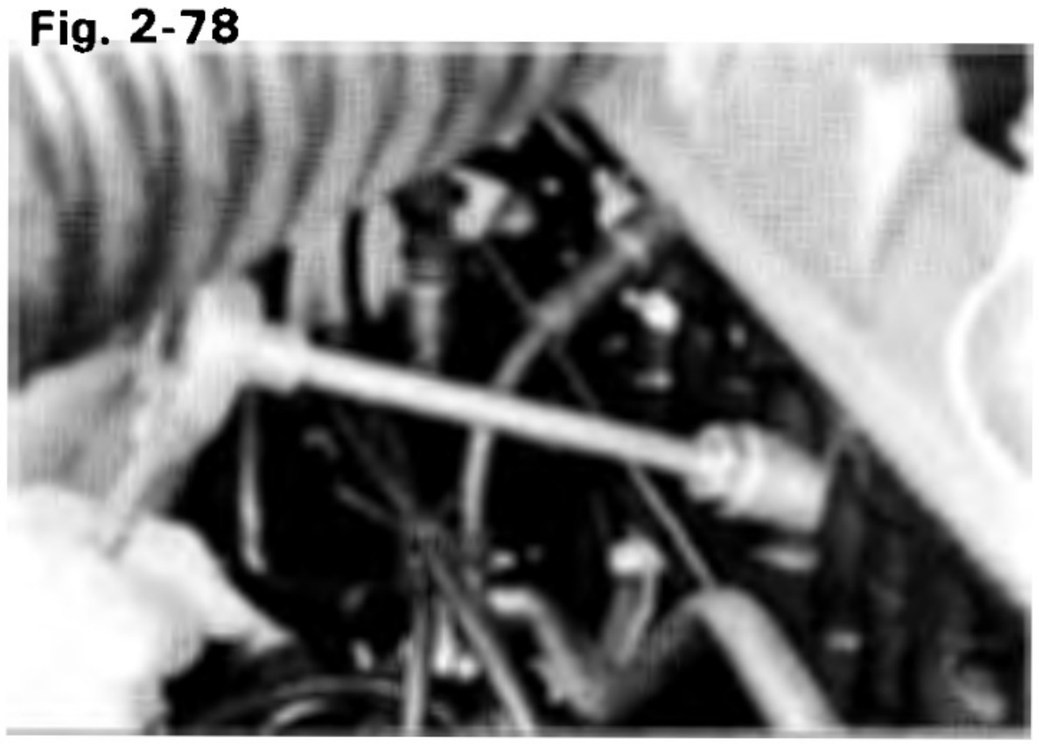
2. With the throttle positioner set, check the engine speed.

Throttle positioner setting speed:

N.S.W. & Victoria states	**1,200 rpm**
Others	**1,000 rpm**

3. If not at specified speed, adjust with the throttle positioner adjusting screw.
4. Release the pinched hose and reconnect the vacuum hoses to the proper locations.

Fig. 2-78



COMPRESSION PRESSURE

1. Warm up the engine.
2. Remove all spark plugs.
3. Disconnect the high tension cord from the ignition coil to cut off the secondary circuit.

Fig. 2-78



4. Insert a compression gauge into the spark plug hole and fully open the throttle valve. While cranking the engine, measure the compression pressure.

Compression pressure (at 250 rpm):
STD More than 10.5 kg/cm² (149 psi)
Limit 8.0 kg/cm² (114 psi)
Pressure difference between each cylinder: Less than 1.0 kg/cm² (14 psi)

– Note –
Always use a fully charged battery.

ENGINE SERVICE

	Page
CUTAWAY VIEW	3-2
CYLINDER HEAD	3-4
TIMING GEAR	3-21
CYLINDER BLOCK	3-32

CUTAWAY VIEW

Fig. 3-1

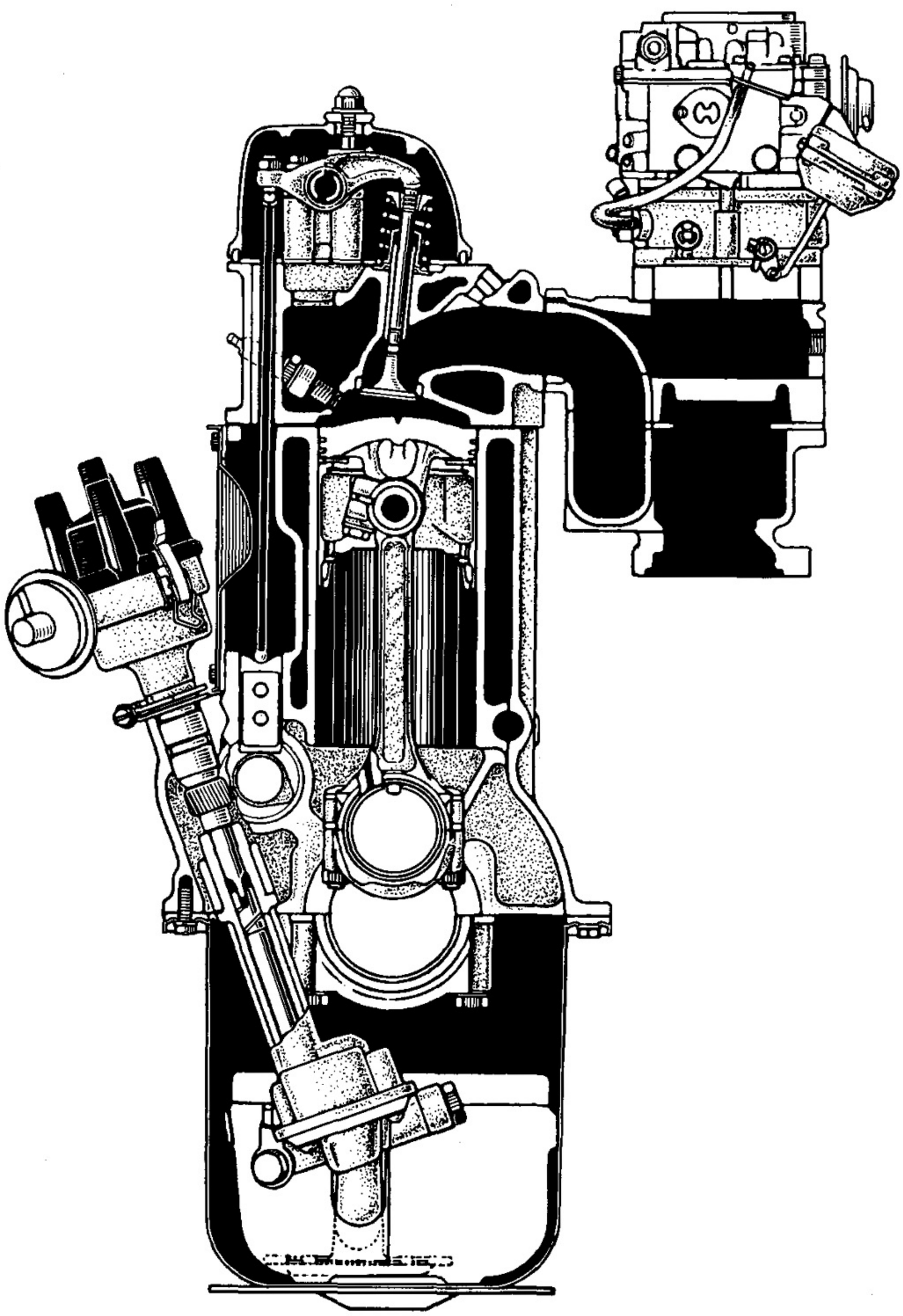
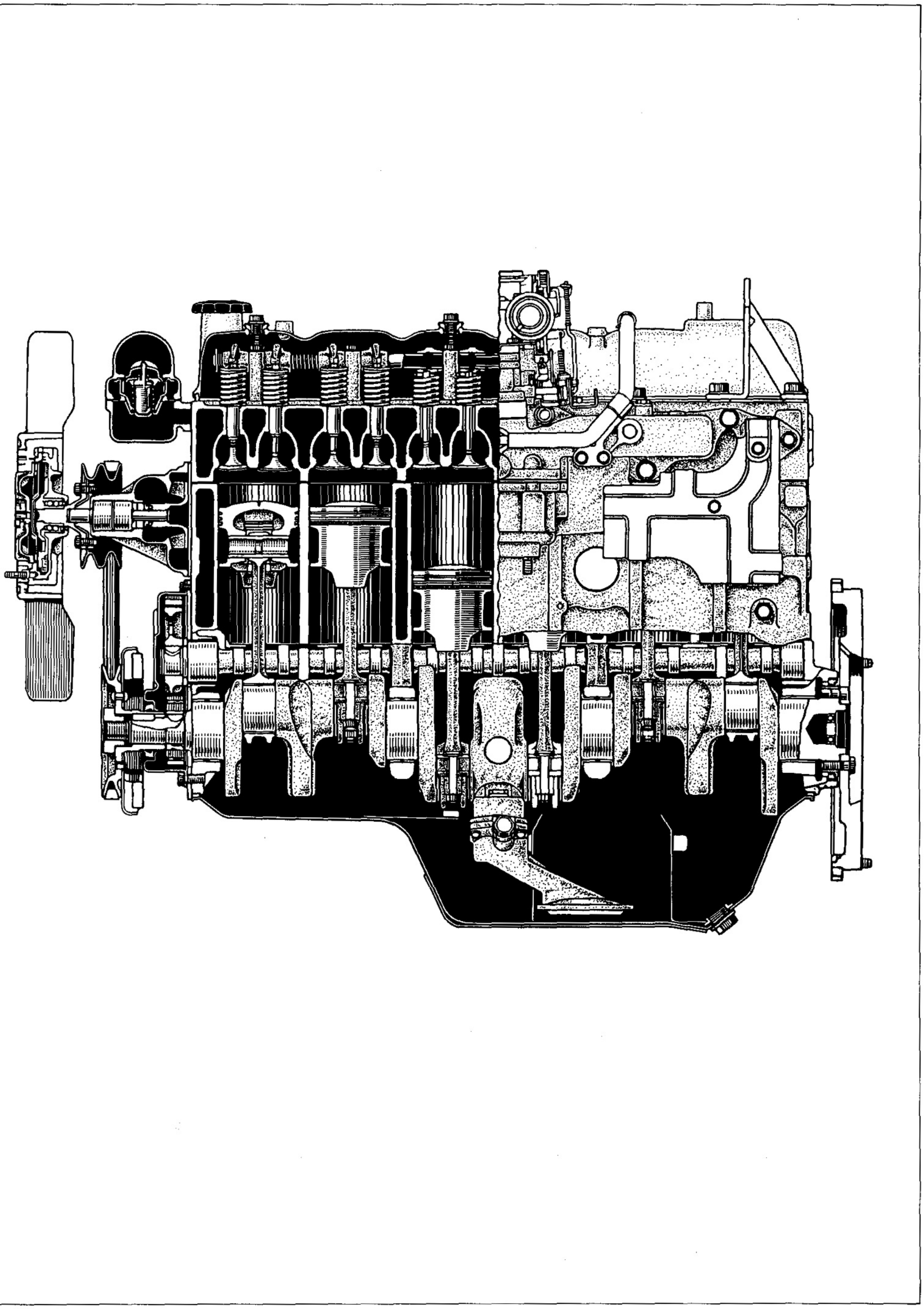


Fig. 3-2

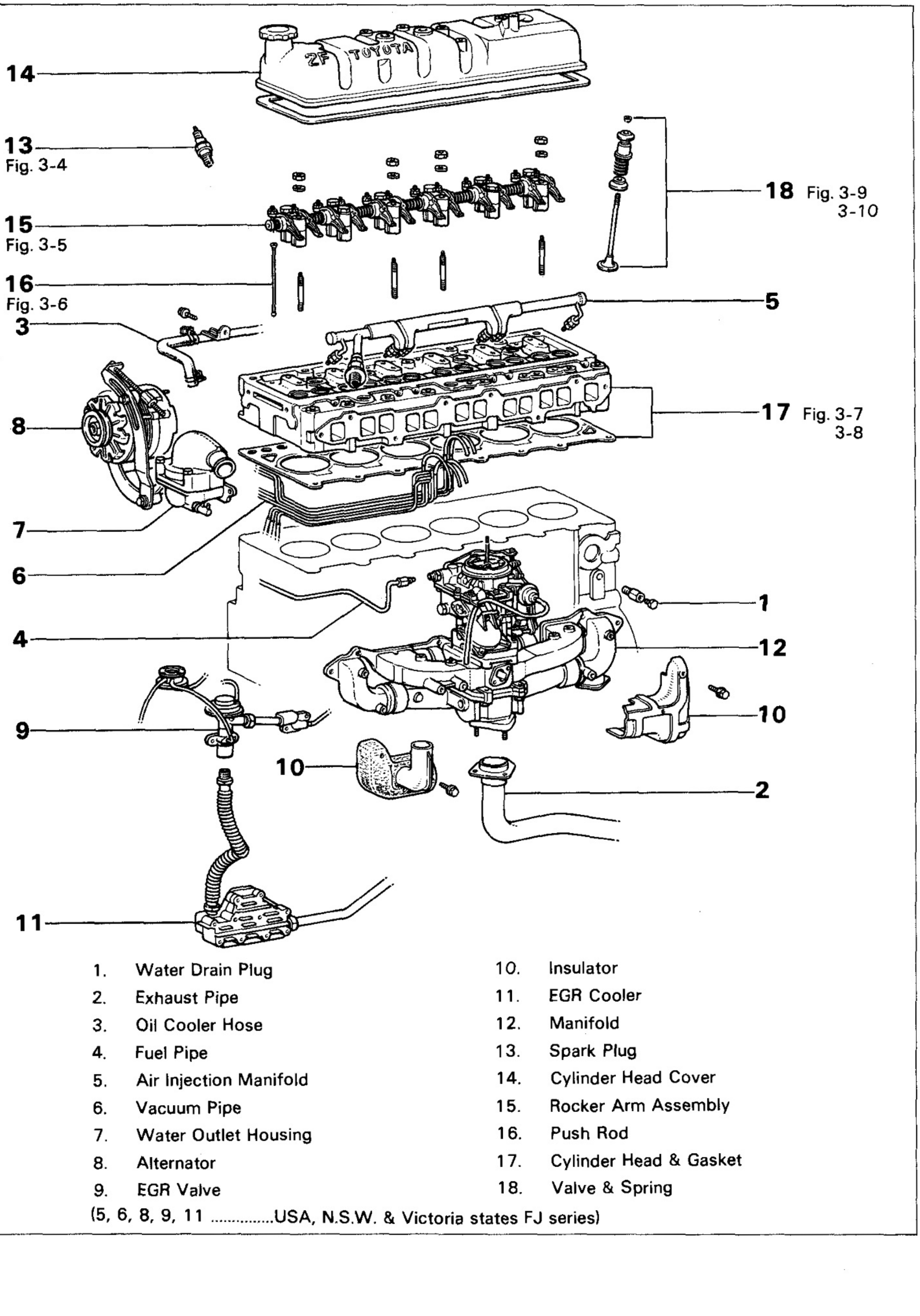


CYLINDER HEAD 2F

DISASSEMBLY

Disassemble the parts in the numerical order shown in the figure.

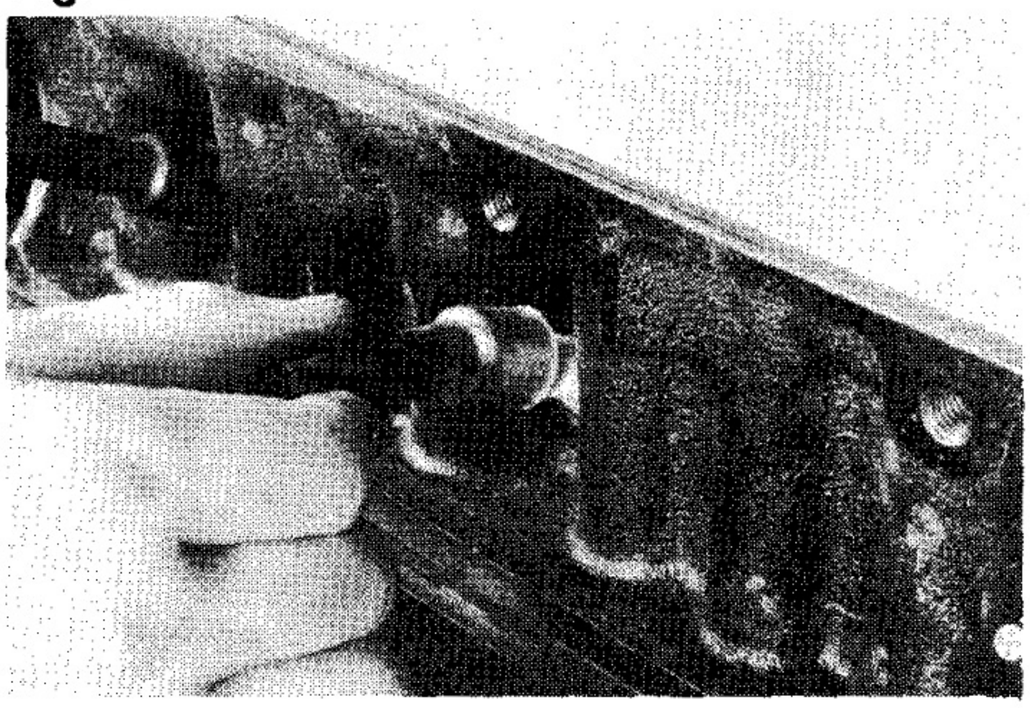
Fig. 3-3



1. Water Drain Plug
2. Exhaust Pipe
3. Oil Cooler Hose
4. Fuel Pipe
5. Air Injection Manifold
6. Vacuum Pipe
7. Water Outlet Housing
8. Alternator
9. EGR Valve
10. Insulator
11. EGR Cooler
12. Manifold
13. Spark Plug
14. Cylinder Head Cover
15. Rocker Arm Assembly
16. Push Rod
17. Cylinder Head & Gasket
18. Valve & Spring

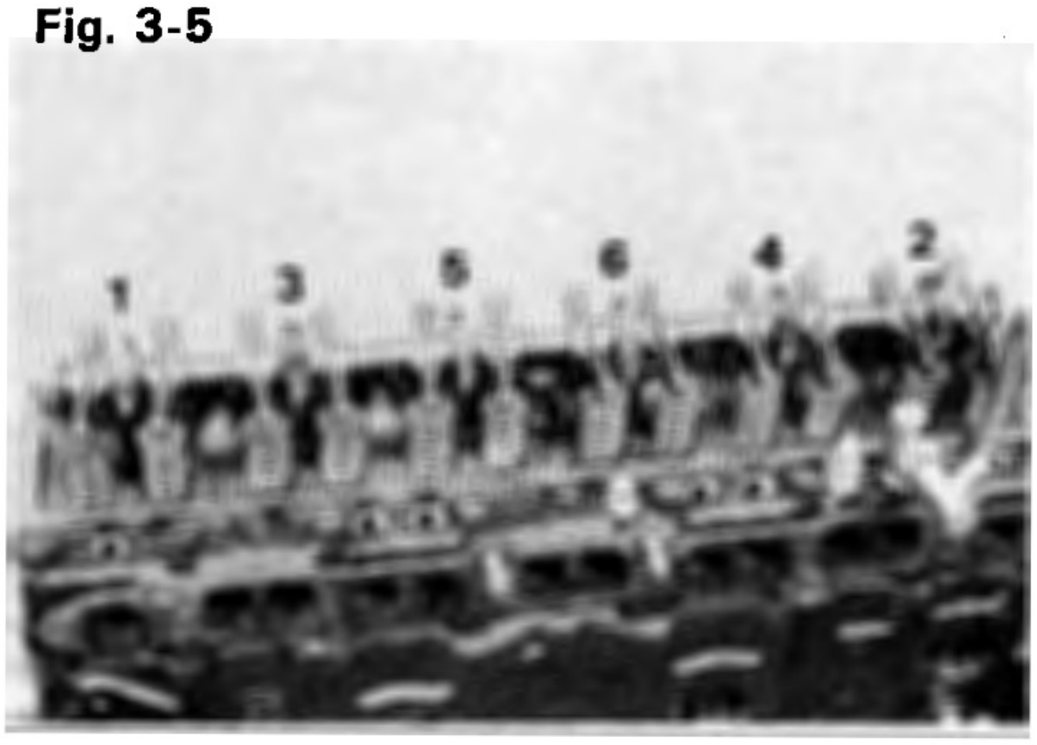
(5, 6, 8, 9, 11 .....USA, N.S.W. & Victoria states FJ series)

Fig. 3-4



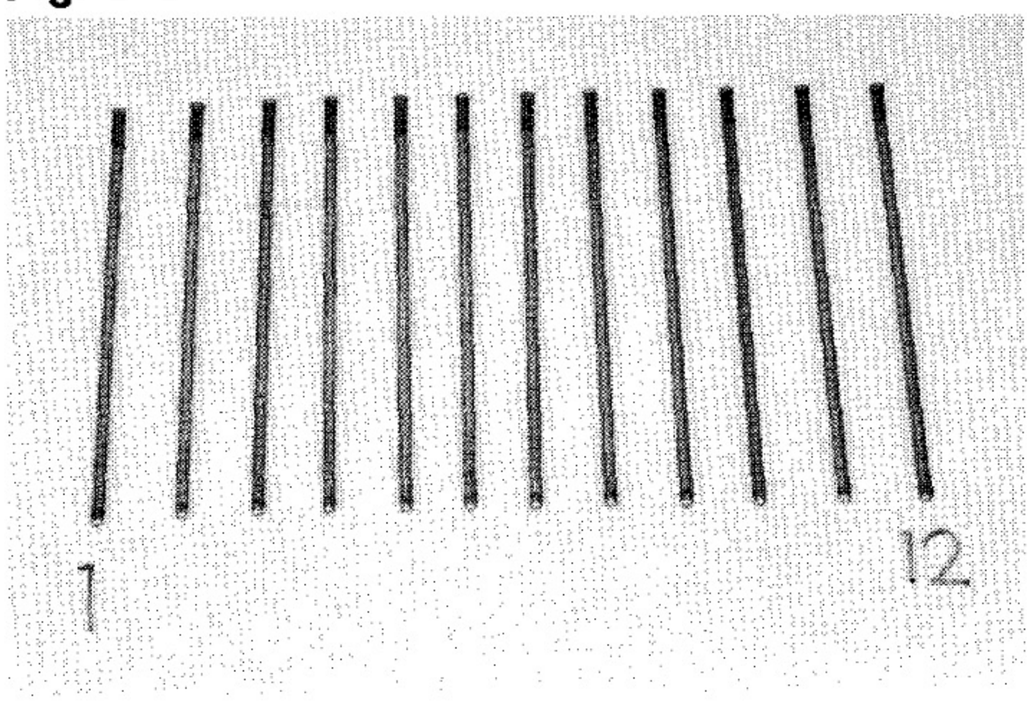
⚠ Remove the plug cords by carefully pulling on the rubber boots.

Fig. 3-5



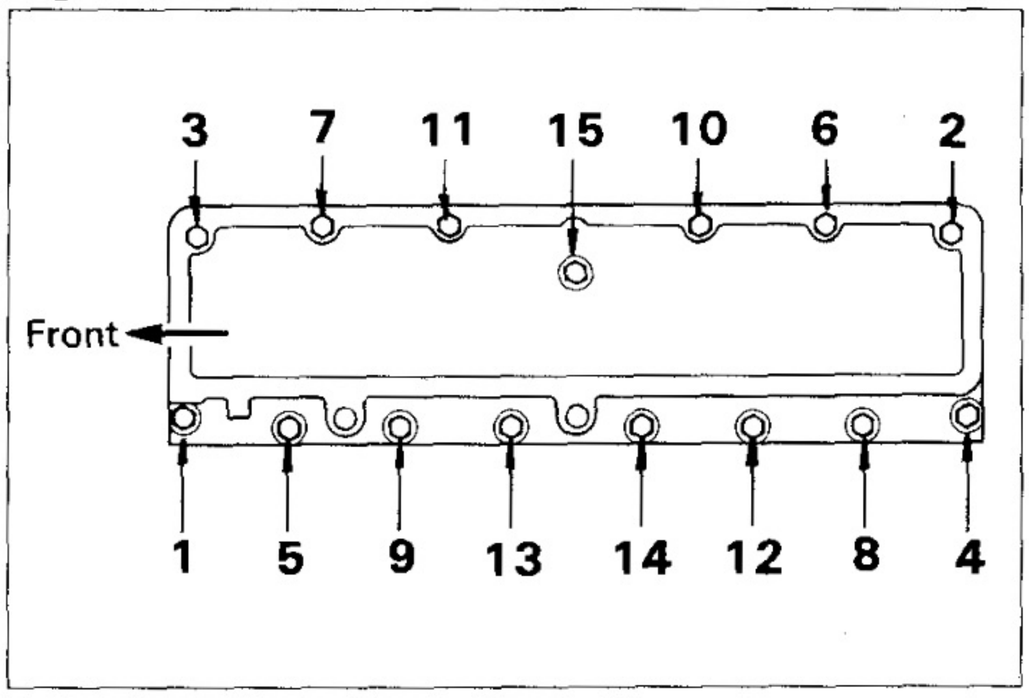
↔ Loosen each rocker support bolt a little at a time in the sequence shown in the figure.

Fig. 3-6



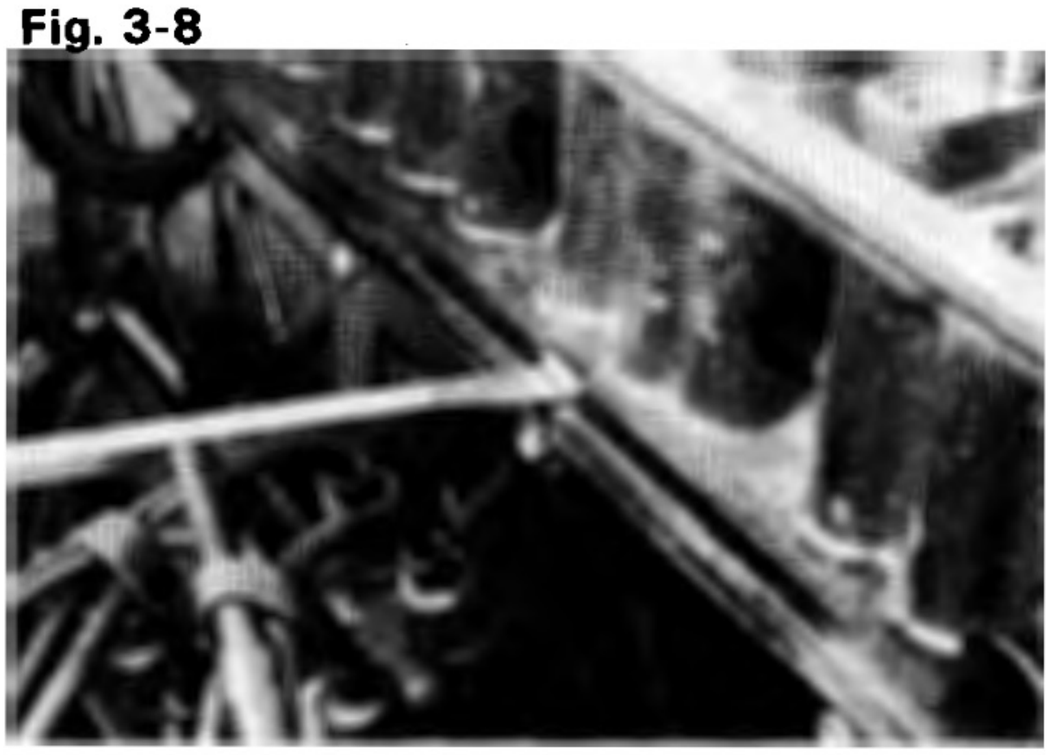
⚠ Keep the push rods in correct order.

Fig. 3-7

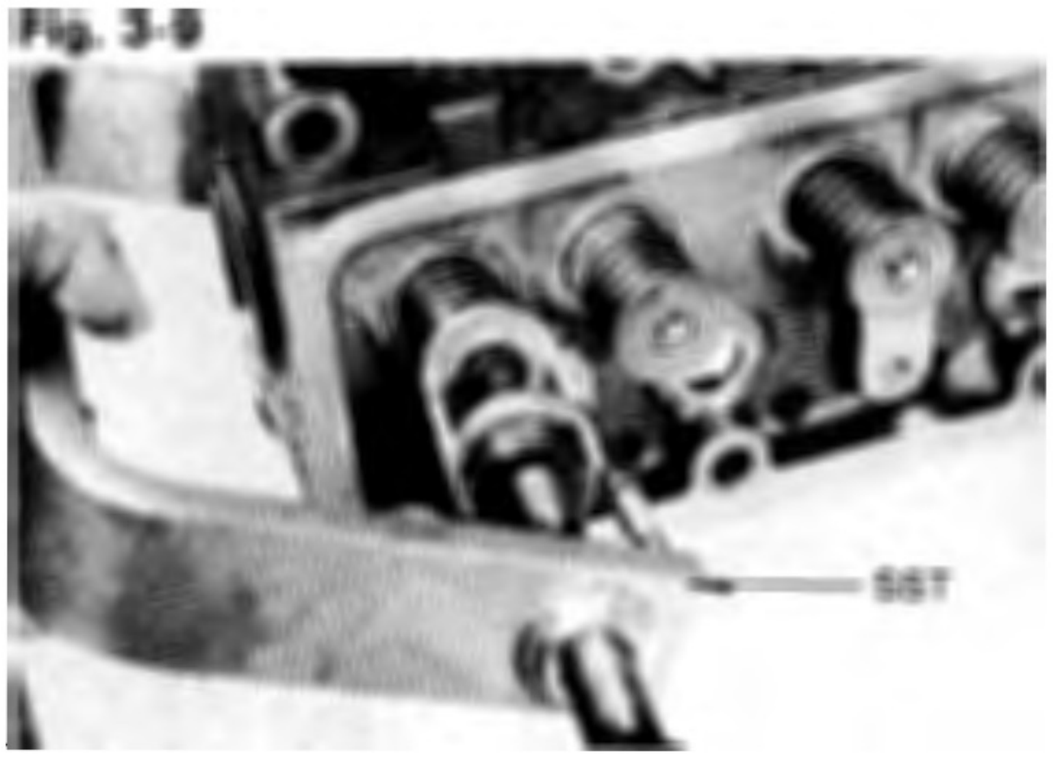


↔ Loosen each cylinder head bolt a little at a time in the sequence shown in the figure.

Fig. 3-8

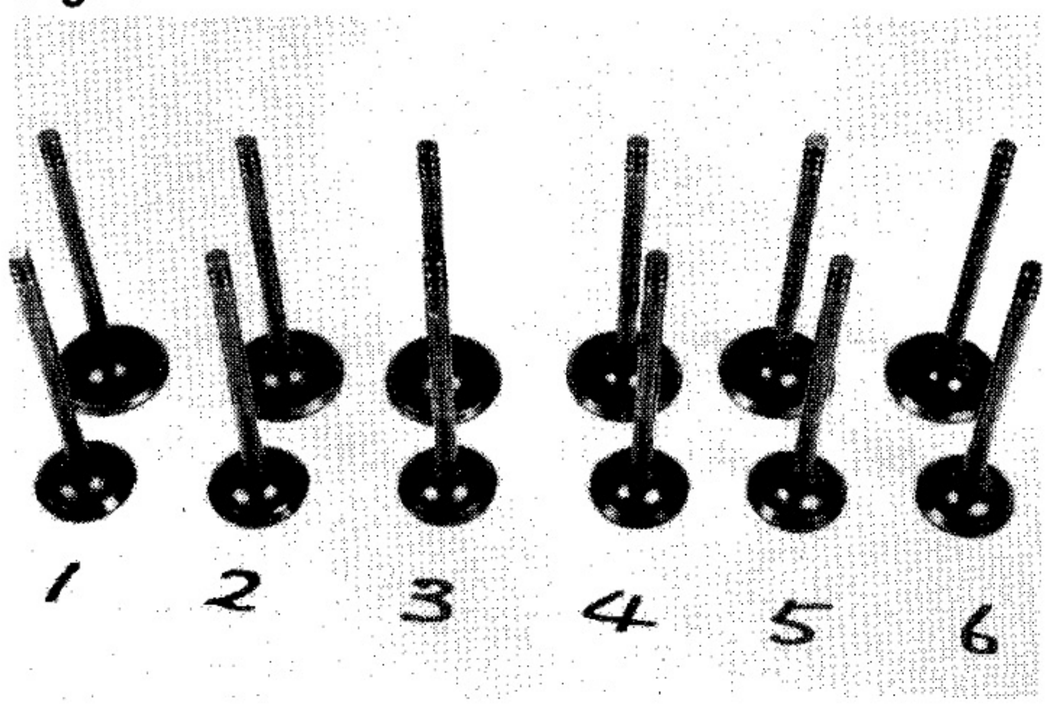


If the cylinder head is difficult to lift off, pry with a screwdriver between the head and block.



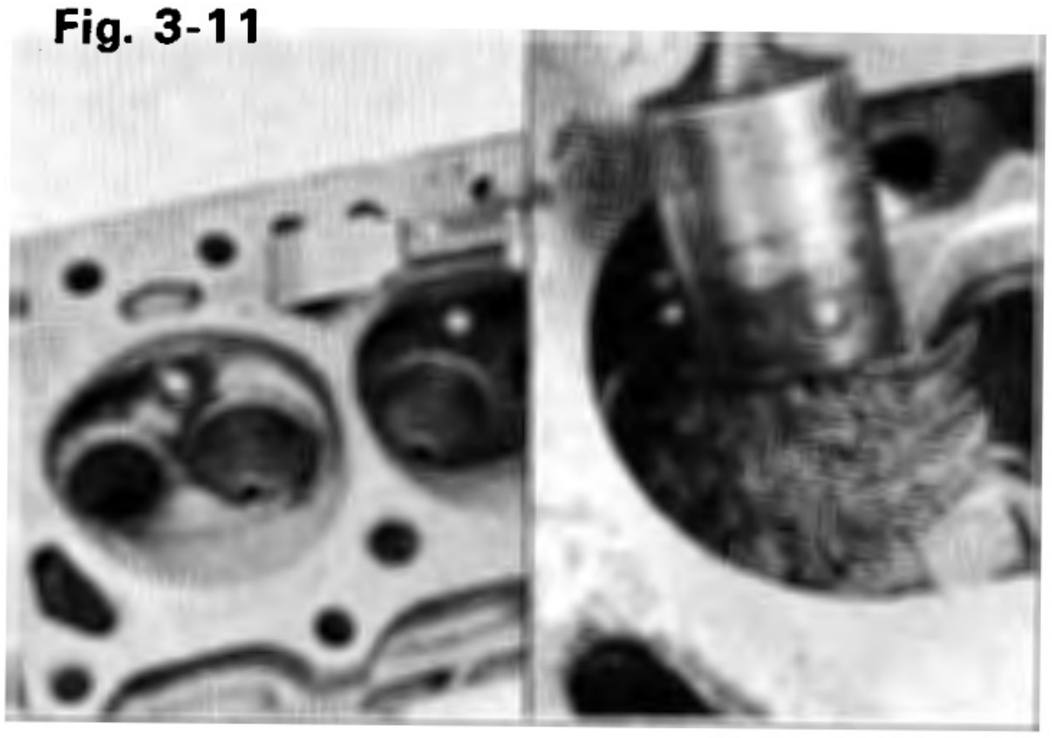
Remove the valves and springs with SST.
SST [09202-43012]

Fig. 3-10



Arrange the valves in correct order.

Fig. 3-11

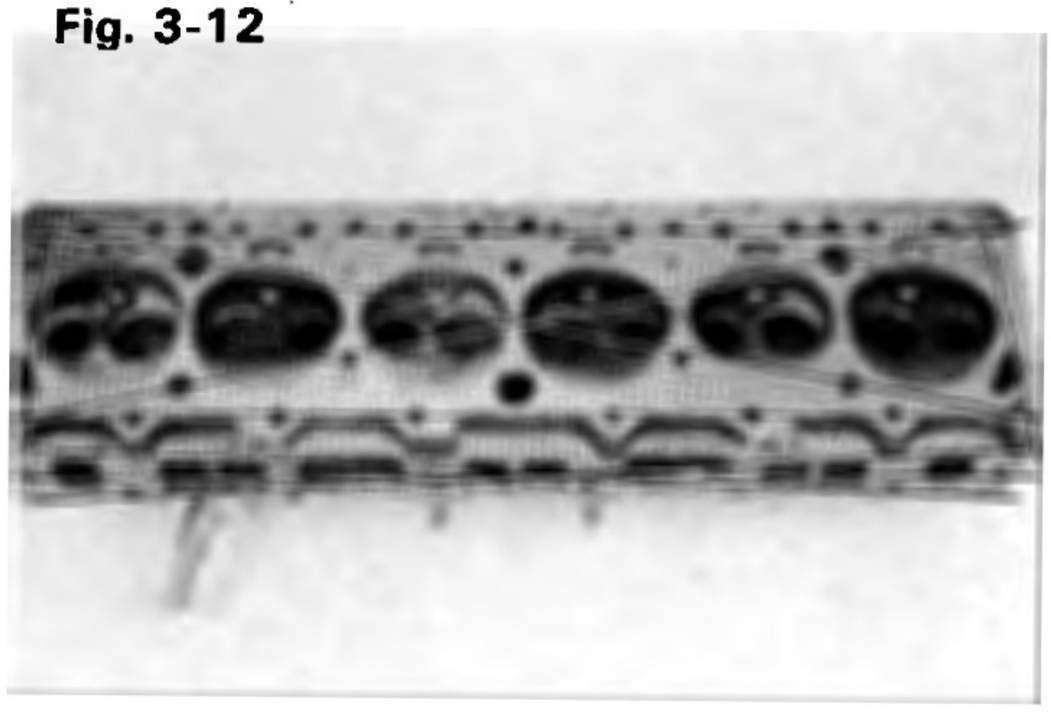


INSPECTION & REPAIR

Cylinder Head

1. Clean the combustion chamber and remove any gasket material from the manifold and head surface.
   Check the cylinder head for cracks or excessively burnt valve surfaces.

Fig. 3-12



2. Using a precision straight edge and thickness gauge, check the cylinder head under surface and manifold mounting surface for warpage.

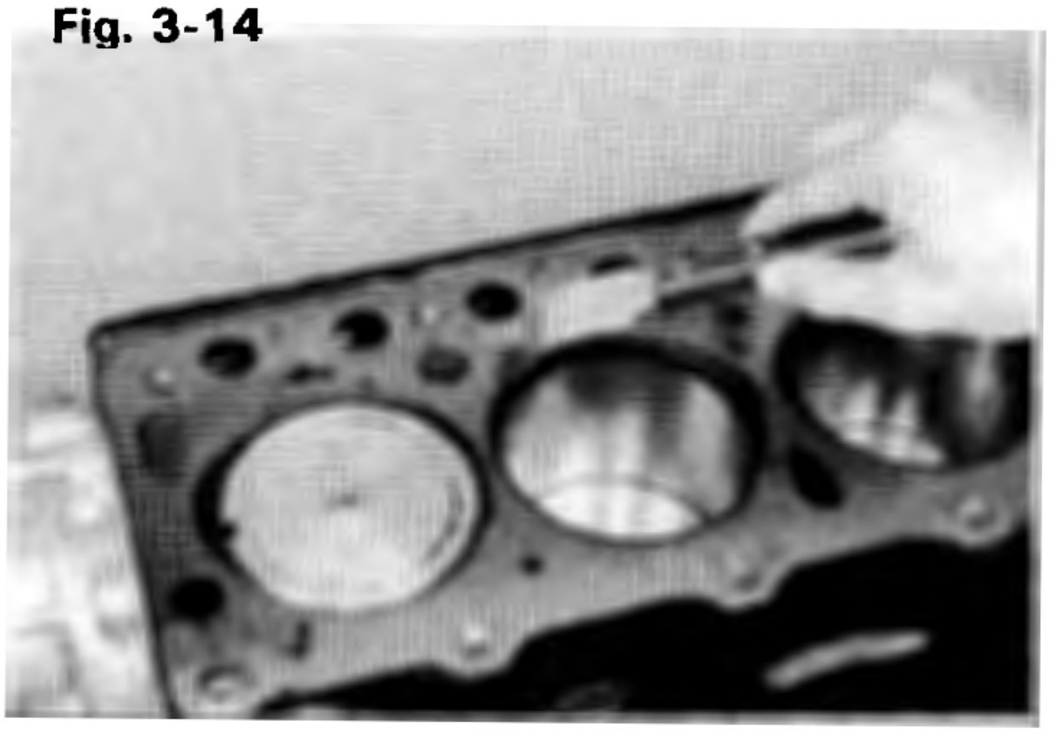
Fig. 3-13



3. If warpage exceeds the limit, correct it by machining, or replace the head.

   Cylinder head surface warpage:
   Limit 0.15 mm (0.0059 in.)
   Manifold mounting surface warpage:
   Limit 0.10 mm (0.0039 in.)
   Maximum reface:
   Limit 0.20 mm (0.0079 in.)

Fig. 3-14



4. Clean the cylinder block upper surface.
   Check the cylinder block. (Refer Fig. 3-107 to 3-111)

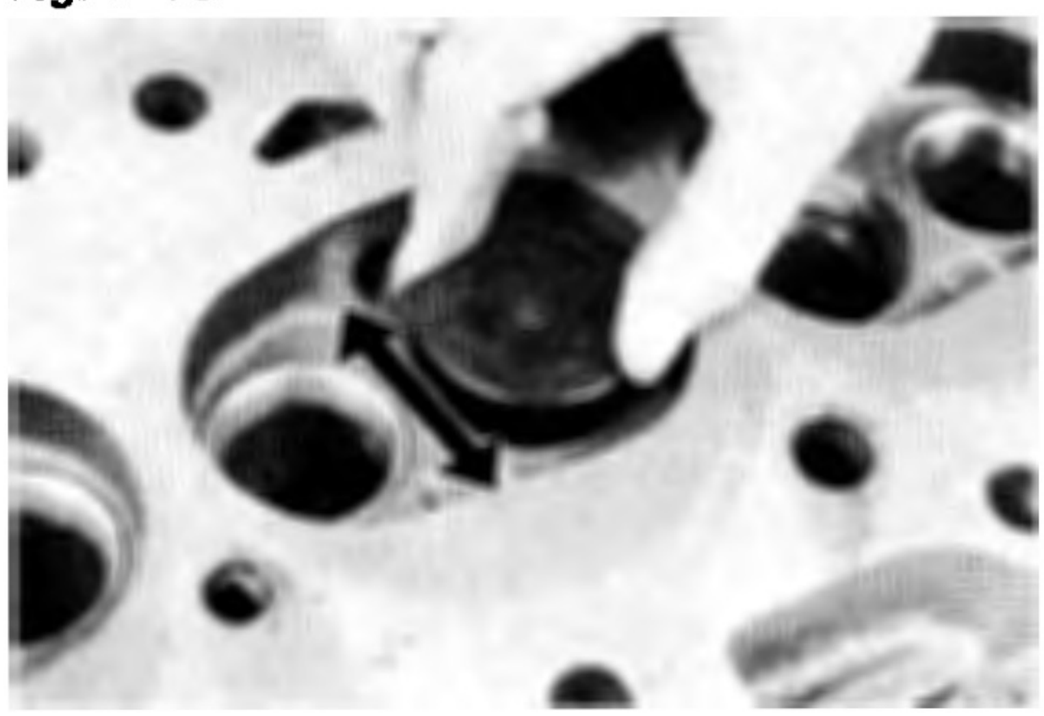
Fig. 3-15



Valve & Guide

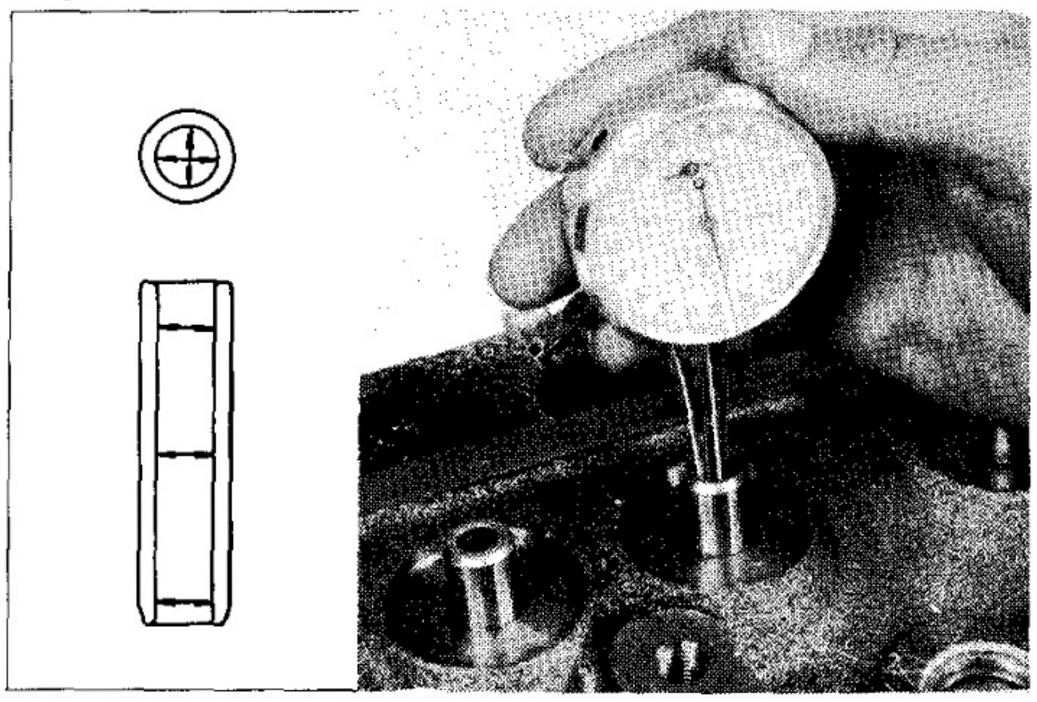
1. Clean and check the valves for wear, scores and bending.

Fig. 3-16



2. Check the valve stem-to-valve guide clearance.
   (1) Insert the valve stem into the guide.
   (2) Move the valve back and forth and check the clearance as shown in the figure.

Fig. 3-17



3. Measure the valve stem oil clearance.
   (1) Measure the inside diameter of the valve guide at several places.

Guide inside diameter:
8.01 – 8.03 mm
(0.3154 – 0.3161 in.)

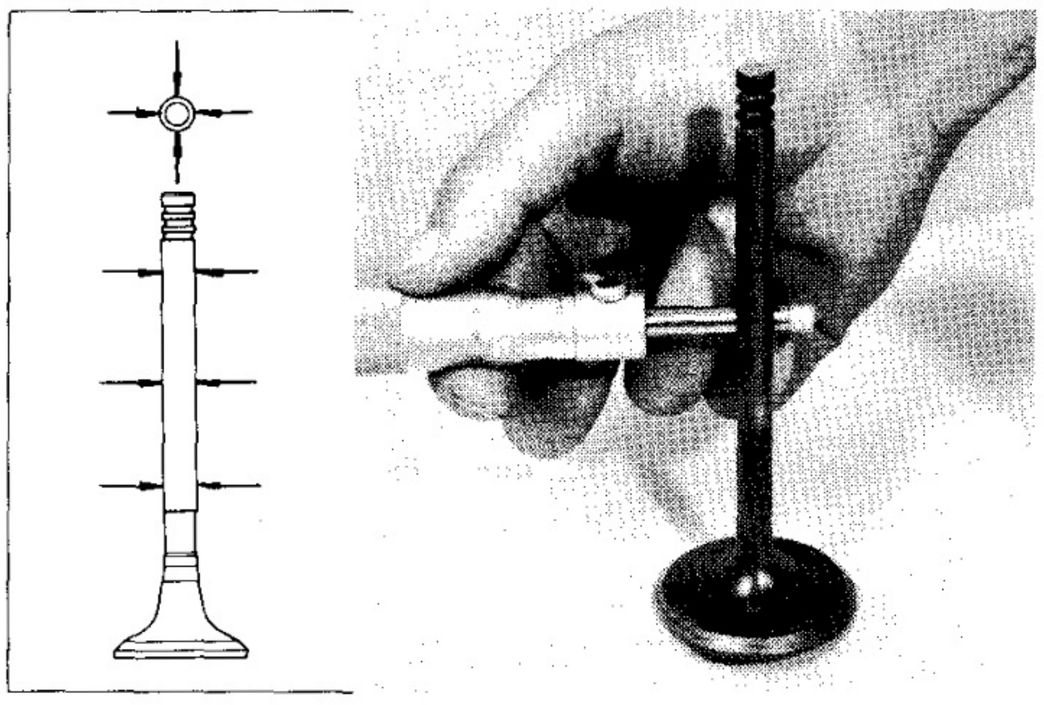
   (2) Measure the valve stem diameter.

Stem diameter:
IN 7.970 – 7.985 mm
(0.3138 – 0.3144 in.)
EX 7.960 – 7.975 mm
(0.3134 – 0.3140 in.)

   (3) Calculate the valve stem oil clearance.

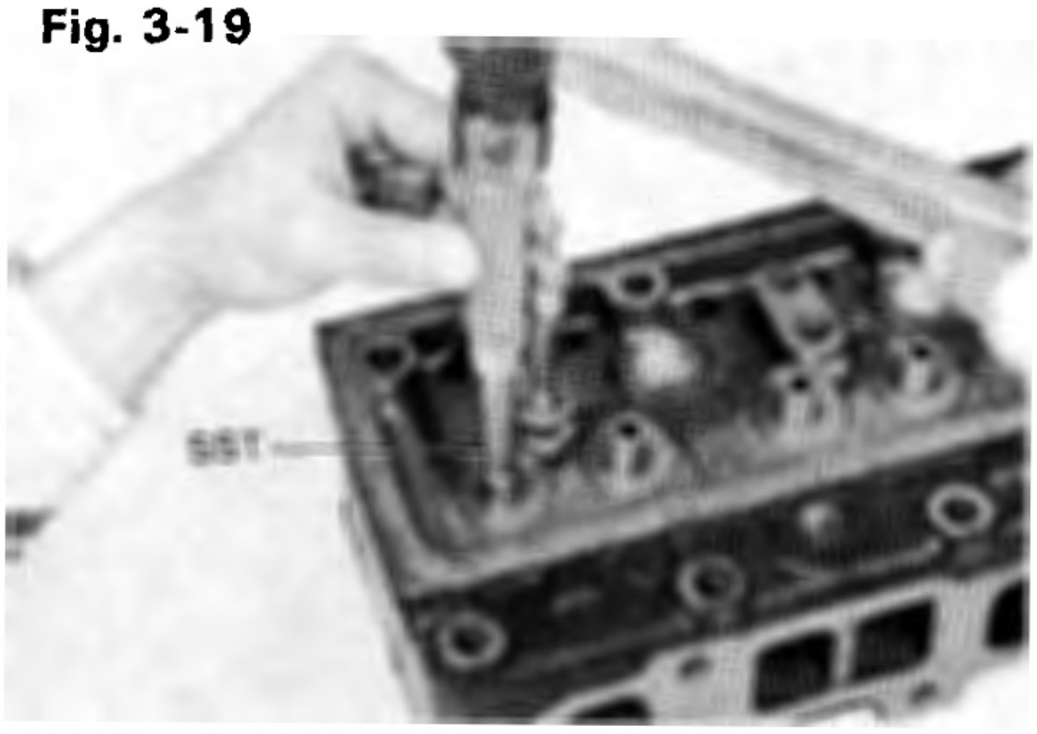
Stem oil clearance:
STD IN 0.03 – 0.06 mm
(0.0012 – 0.0024 in.)
EX 0.04 – 0.07 mm
(0.0016 – 0.0028 in.)
Limit IN 0.10 mm (0.0039 in.)
EX 0.12 mm (0.0047 in.)

Fig. 3-18



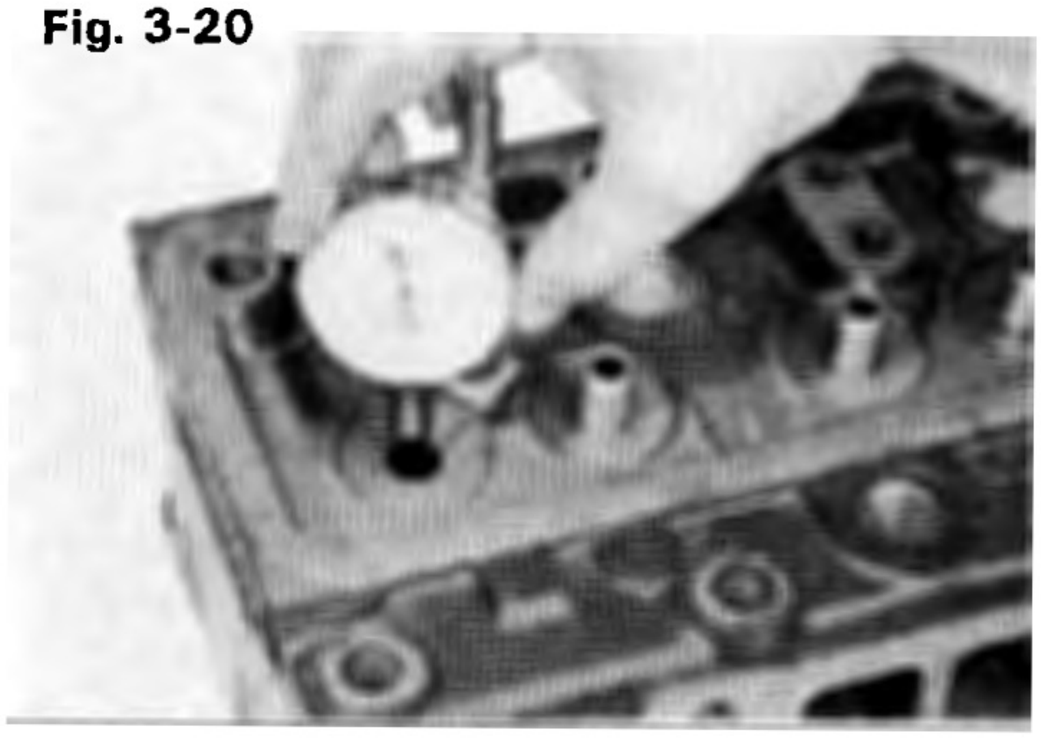
– Note –
Measure at several places and use the maximum wear for calculation.

Fig. 3-19



4. If the oil clearance exceeds the limit, replace both the valve and guide.
   (1) Using SST, drive out the valve guide from the top end toward the combustion chamber.
   SST [09201-60011]

Fig. 3-20



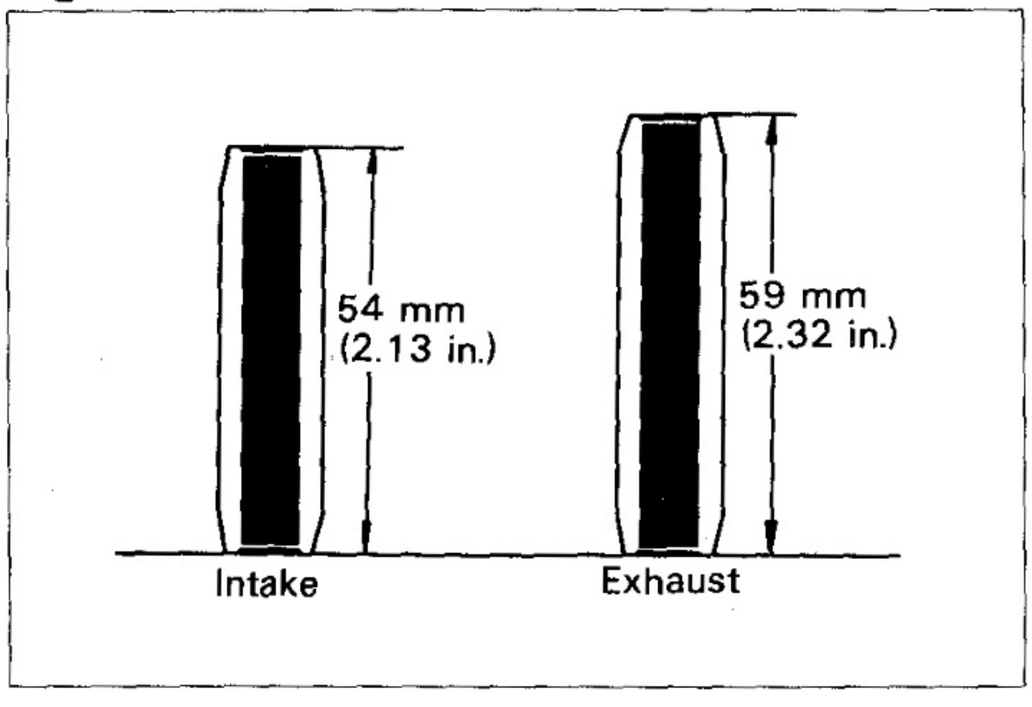
(2) Measure the cylinder head bore for the valve guide bushing.

Both intake and exhaust

Cylinder head bore	Guide bushing
14.000 – 14.018 mm (0.5512 – 0.5519 in.)	Use STD
Over 14.018 mm (0.5519 in.)	Use O/S 0.05

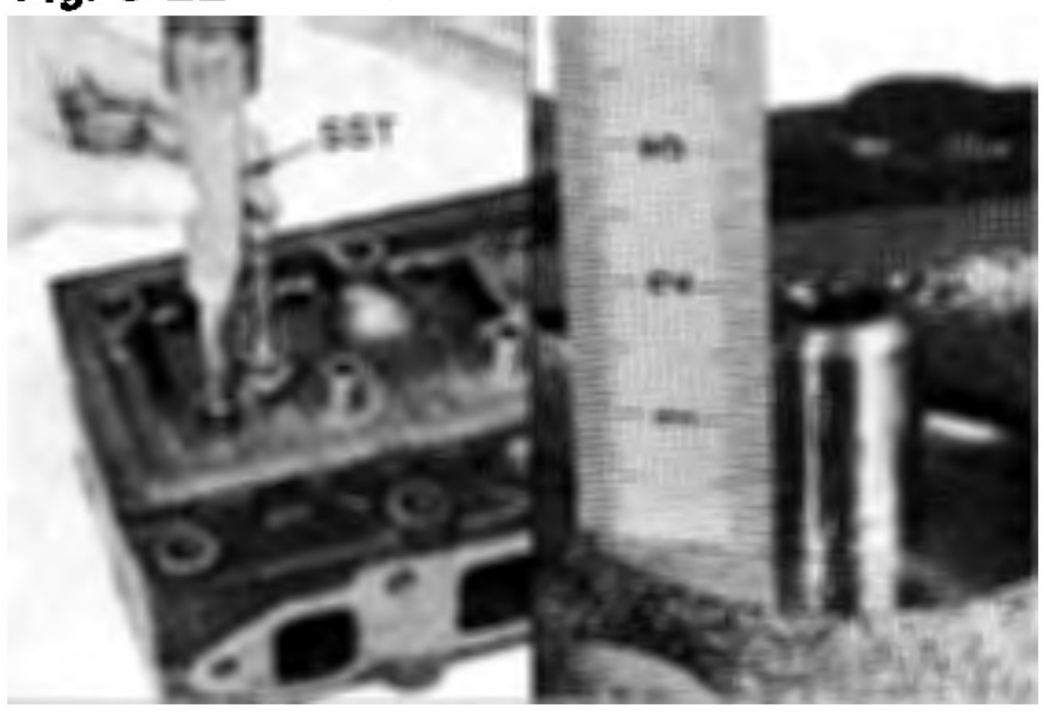
(3) Select a bushing.
(4) If the cylinder head bore is more than 14.018 mm (0.5519in.), machine the bore to the following dimension.
Rebored cylinder head bore dimension:
14.050 – 14.068 mm
(0.5531 – 0.5539 in.)

Fig. 3-21



(5) Different bushings are used for the intake and exhaust.

Fig. 3-22



(6) Drive in a new valve guide until its tip projects from the top of the cylinder head by the specified length.

Protrusion from cylinder head: 17.5 mm (0.689 in.)

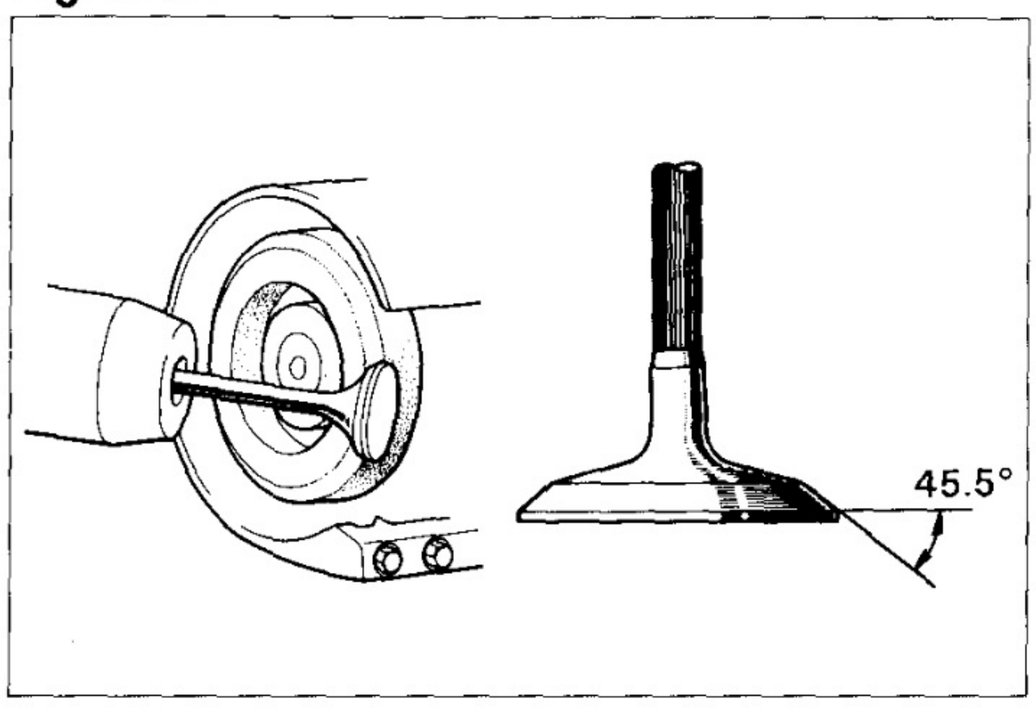
Fig. 3-23



(7) Using a reamer, ream the valve guide to obtain the specified clearance.

Oil clearance:
STD
IN 0.03 – 0.06 mm (0.0012 – 0.0024 in.)
EX 0.04 – 0.07 mm (0.0016 – 0.0028 in.)

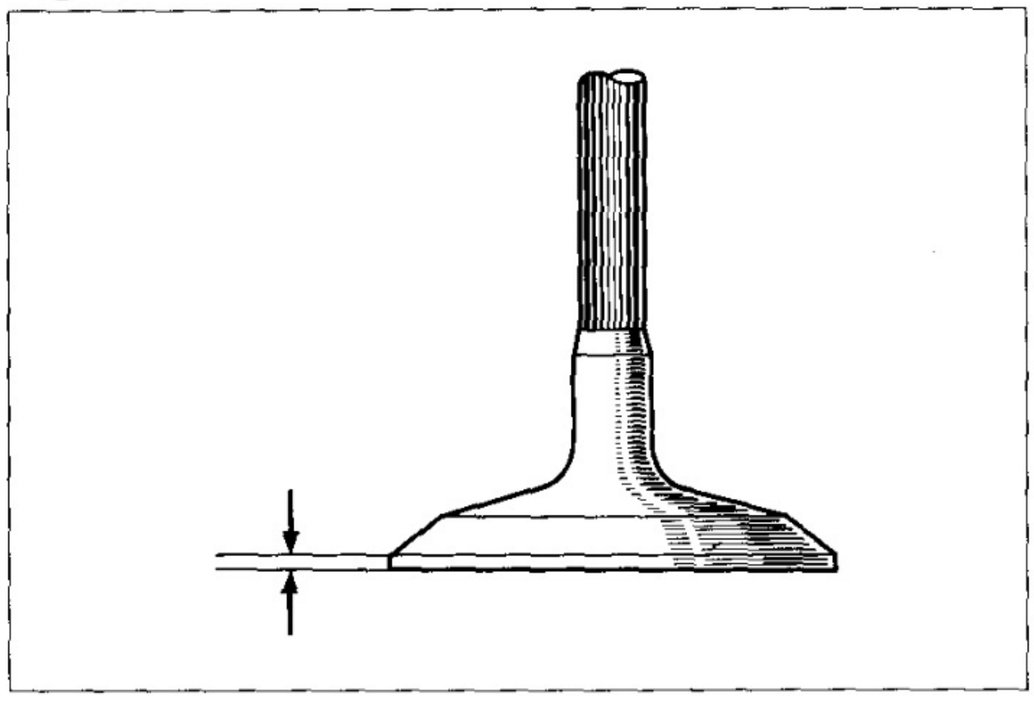
Fig. 3-24



5. Reface the valve seating face with a valve refacer.

Valve face angle: 45.5°

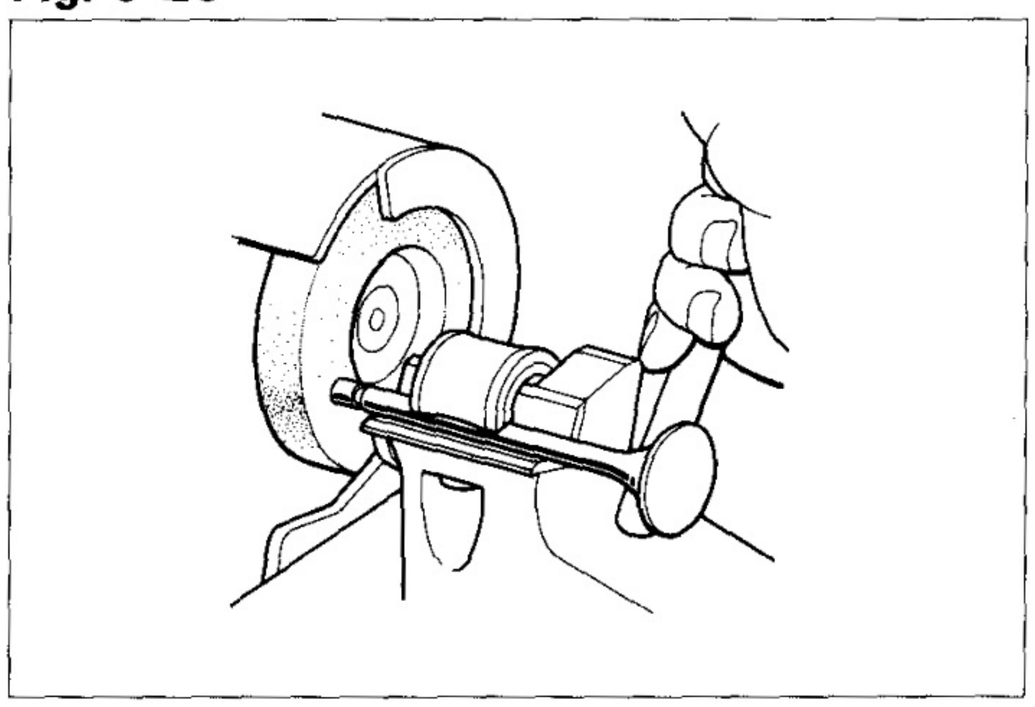
Fig. 3-25



6. Check the valve head margin thickness.

Margin thickness:
Limit IN 0.8 mm (0.031 in.)
EX 1.0 mm (0.039 in.)

Fig. 3-26



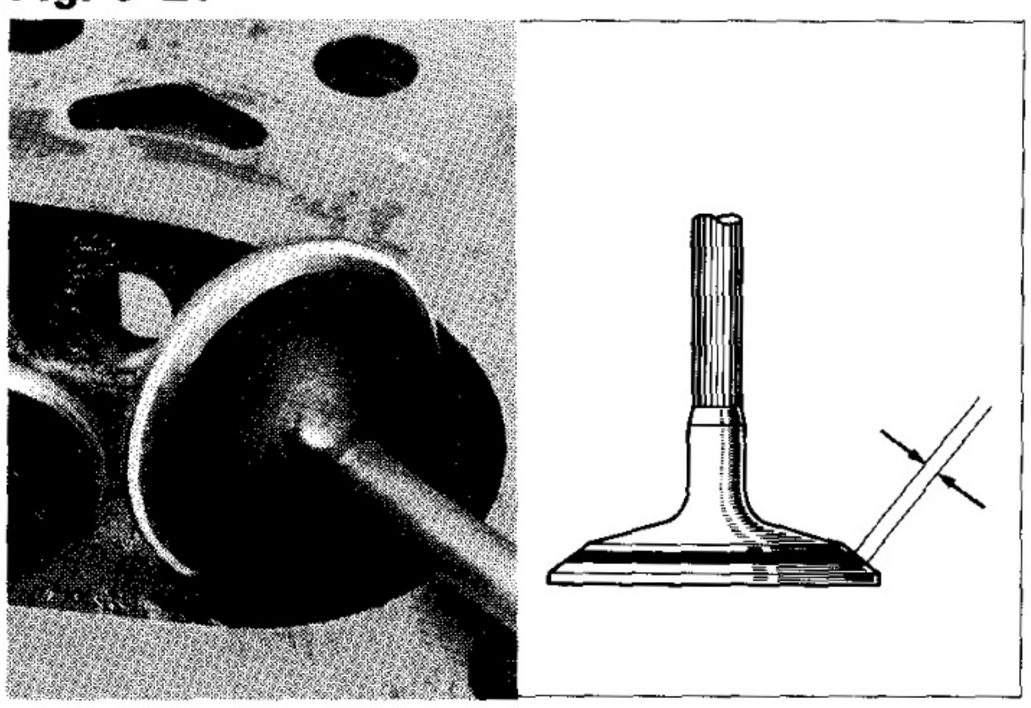
7. Check the valve stem tip.
Resurface the valve stem tip with a valve grinder if necessary.

Stem tip resurfacing:
Limit 0.5 mm (0.020 in.)

Overall length:

Limit	**IN**	**124.3 mm (4.894 in.)**
	EX	**124.5 mm (4.902 in.)**

Fig. 3-27



Valve Seat

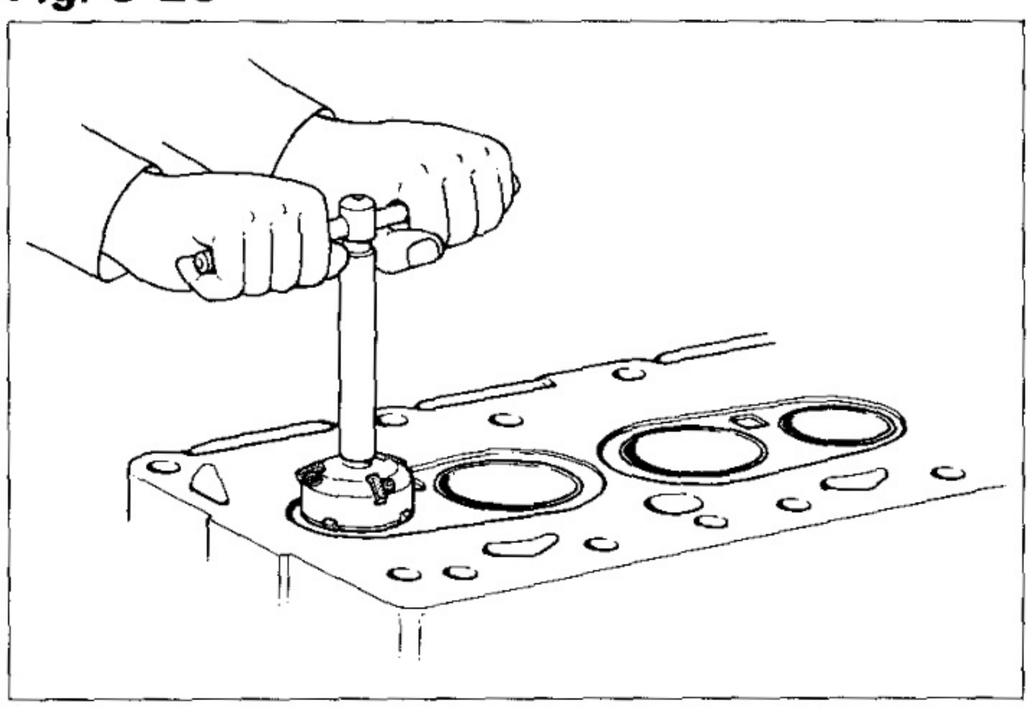
1. Check the position of the valve contact with the seat. Coat the valve face with prussian blue or red lead. Locate the contact point on the valve by rotating the valve against the seat.

Contact width:

IN	**1.4 mm (0.055 in.)**
EX	**1.7 mm (0.067 in.)**

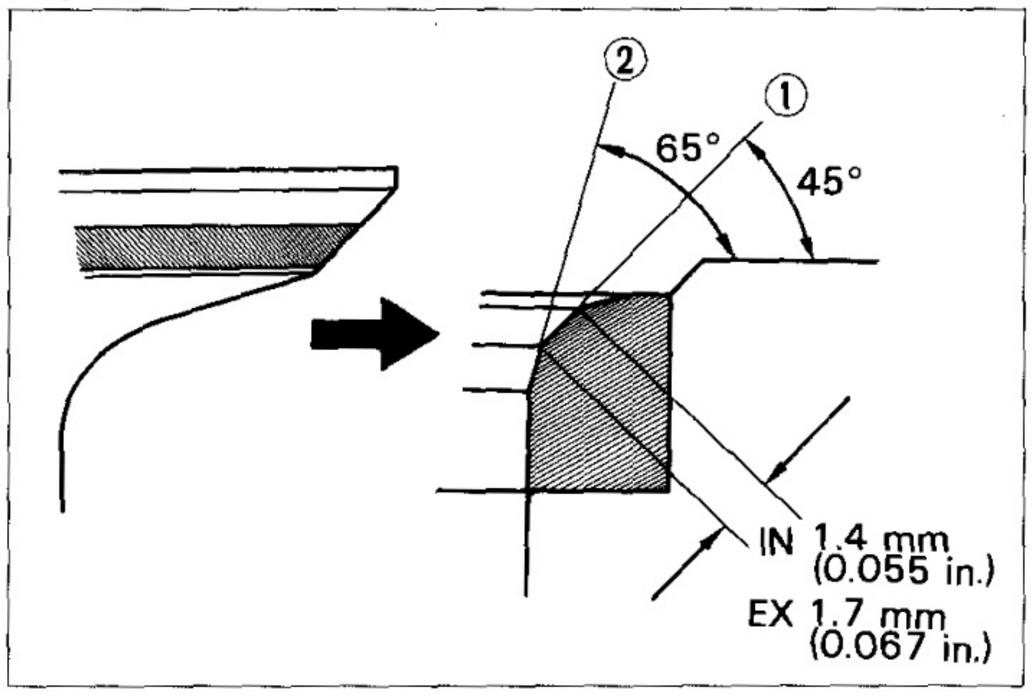
Contact position:
Middle of valve face

Fig. 3-28



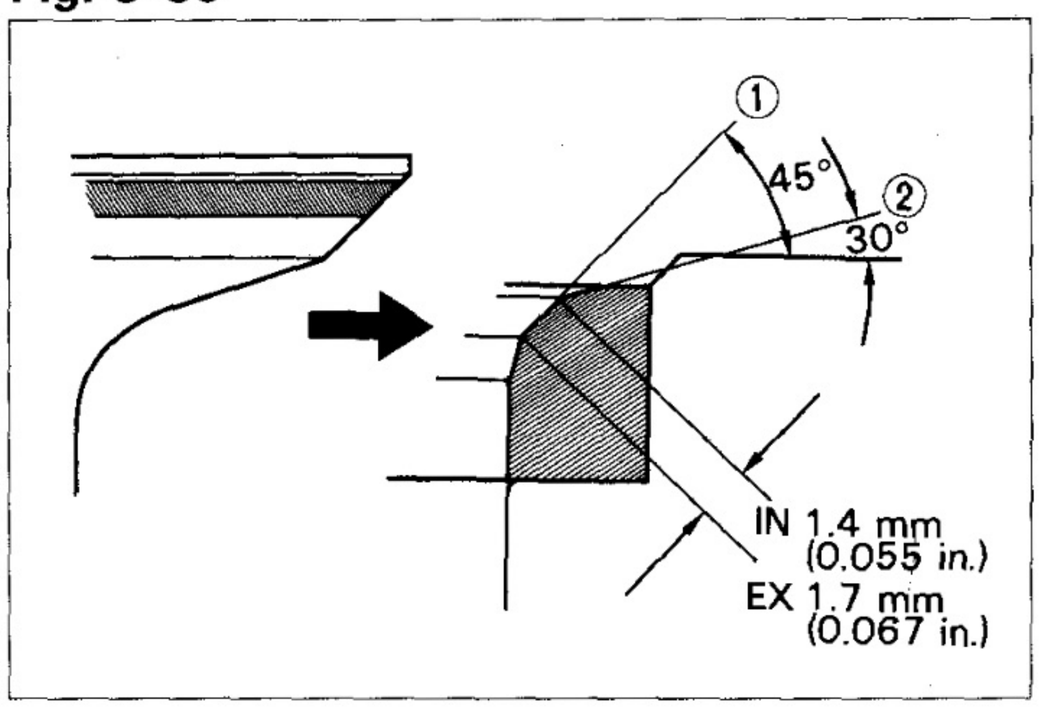
2. Resurface the valve seat with a 45° cutter.

Fig. 3-29



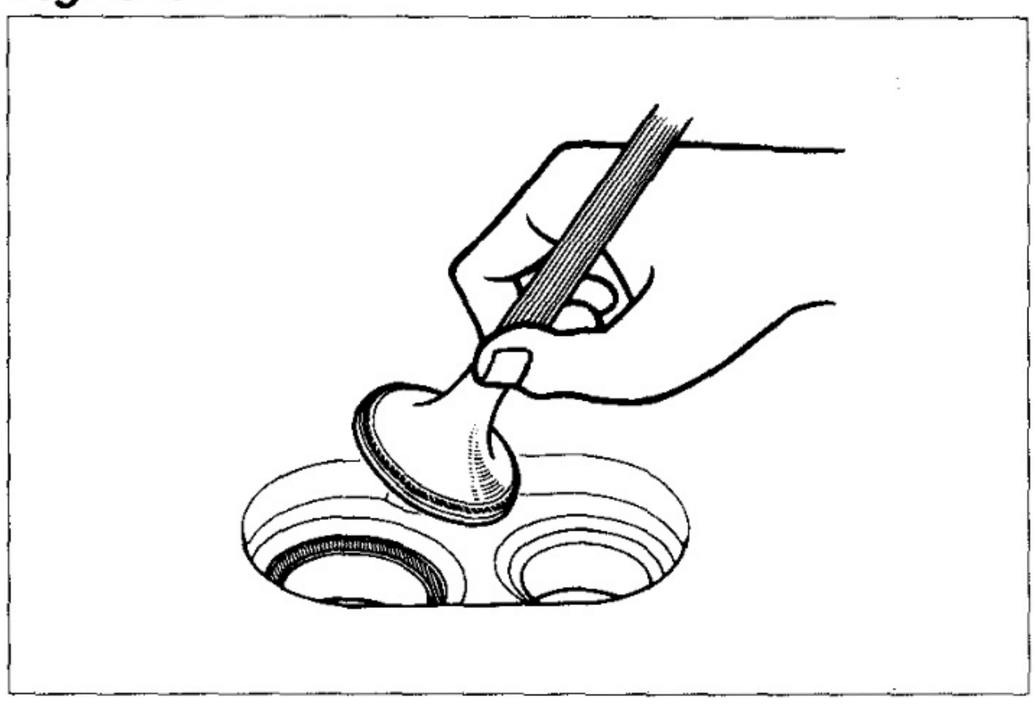
3. Correct the seat position.
   (1) If the seat position is too high, use a 45° and 65° cutters in the order indicated.

Fig. 3-30



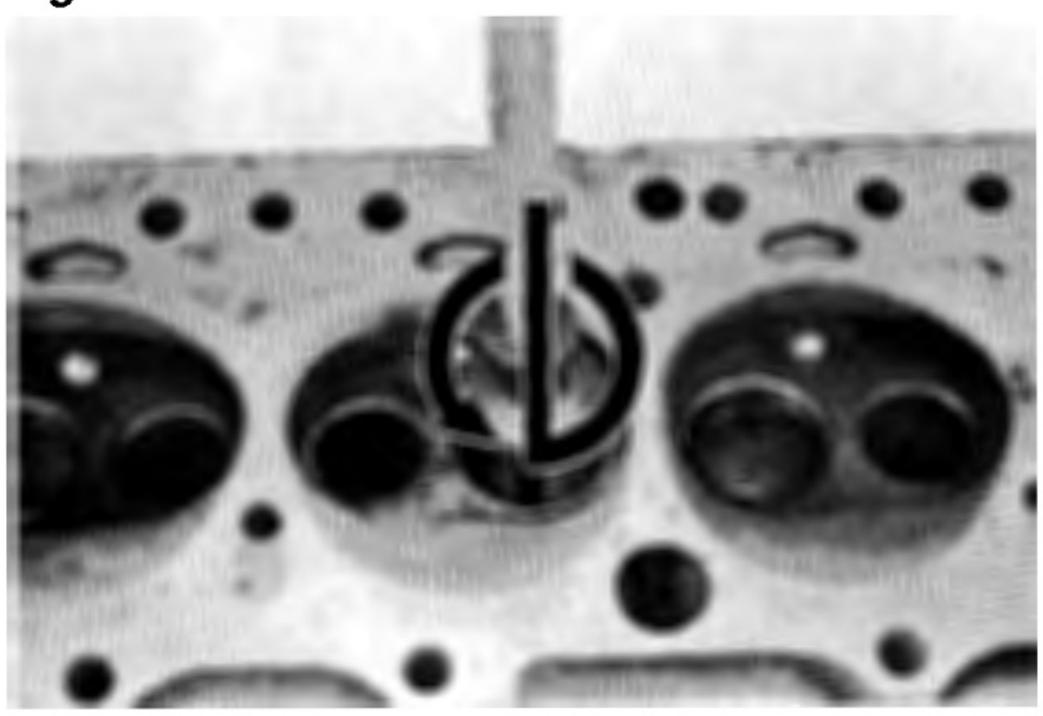
(2) If the seat position is too low, use a 45° and 30° cutters in the order indicated.

Fig. 3-31



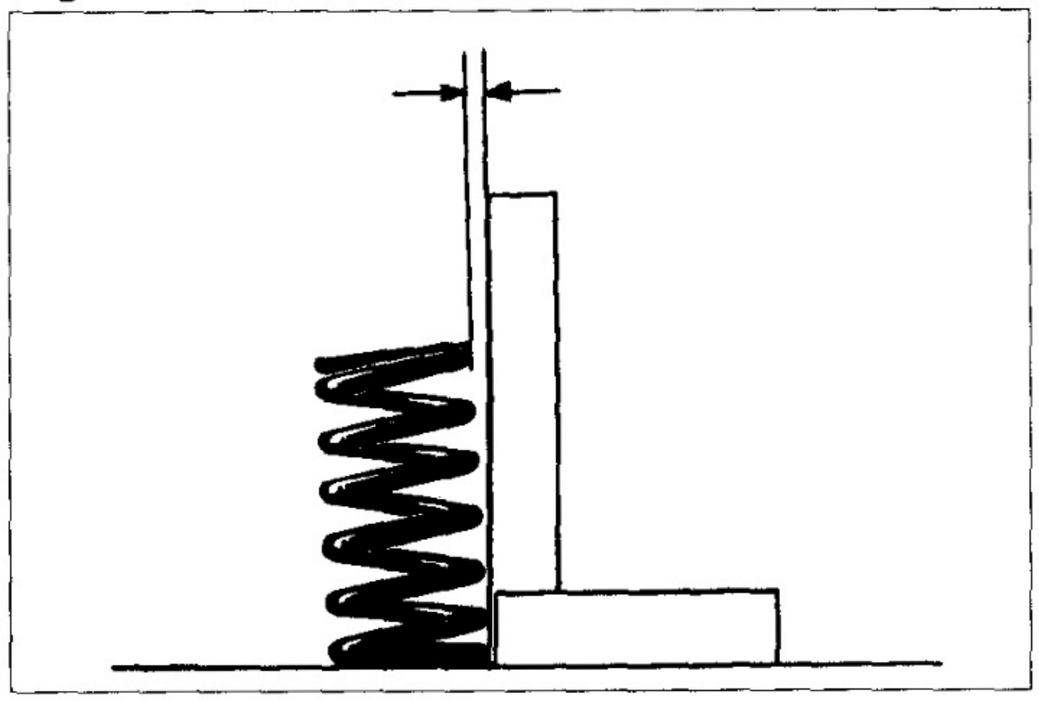
(3) Check the valve concentricity.
Lightly coat the seat with prussian blue.
Install the valve and rotate. If blue appears 360° around the face, the valve stem and face are concentric.
If not, replace the valve.

Fig. 3-32



4. After correction, the valve and valve seat should be lapped lightly with a lapping compound.

Fig. 3-33



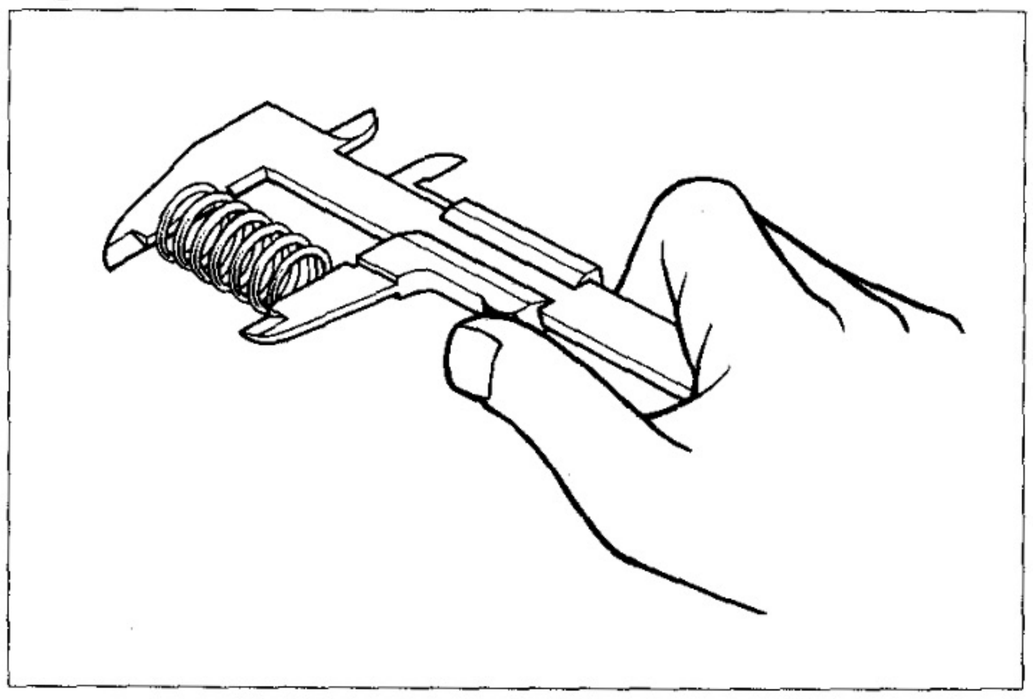
Valve Spring

1. Check the squareness of the valve spring with a square.

Squareness:

Limit 1.8 mm (0.071 in.)

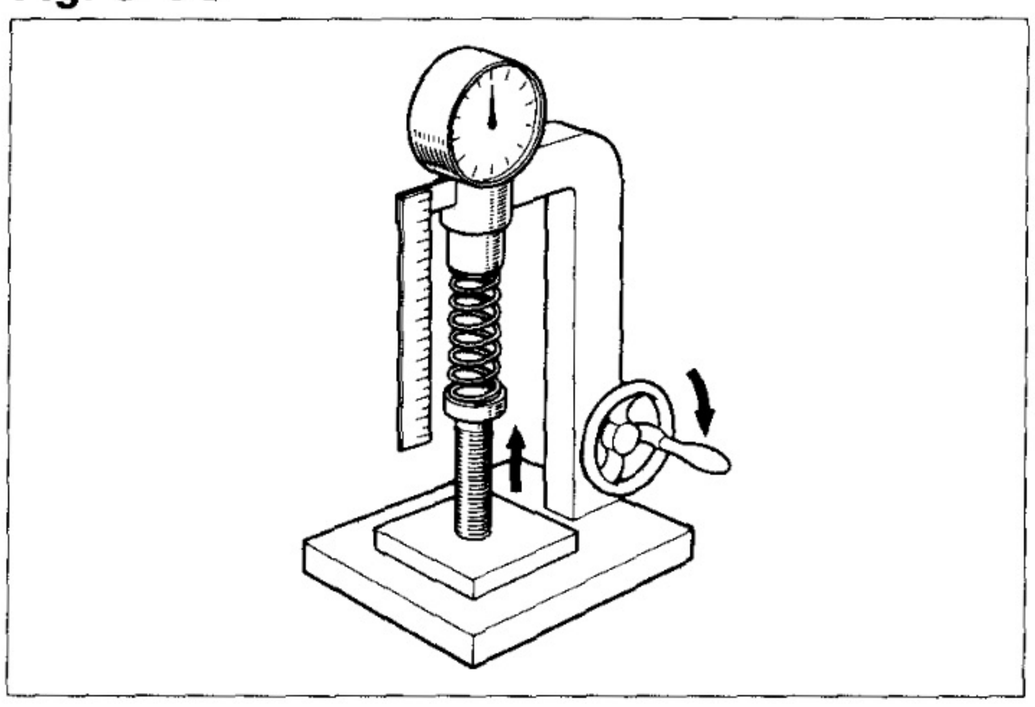
Fig. 3-34



2. Measure the spring free length. Replace any spring that does not meet specification.

Free length: 51.5 mm (2.028 in.)

Fig. 3-35

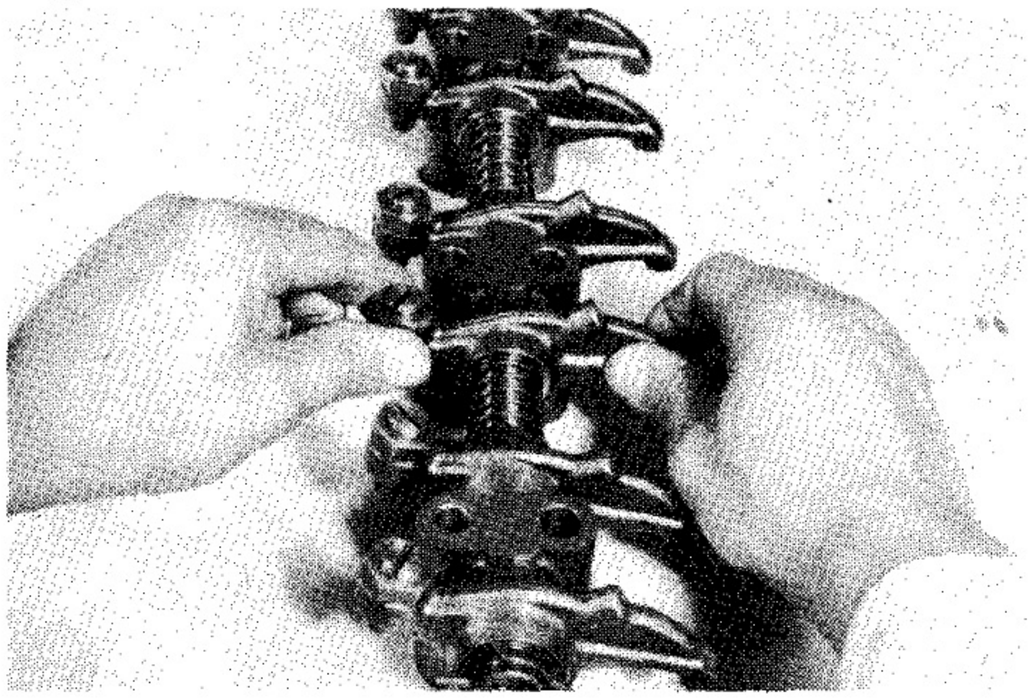


3. Using a spring tester, measure the tension of each spring at the specified installed length.
Replace any spring that does not meet specification.

Installed length: 43.0 mm (1.693 in.)

Installed load:
STD 32.5 kg (71.6 lb)
Limit 27 kg (59.5 lb)

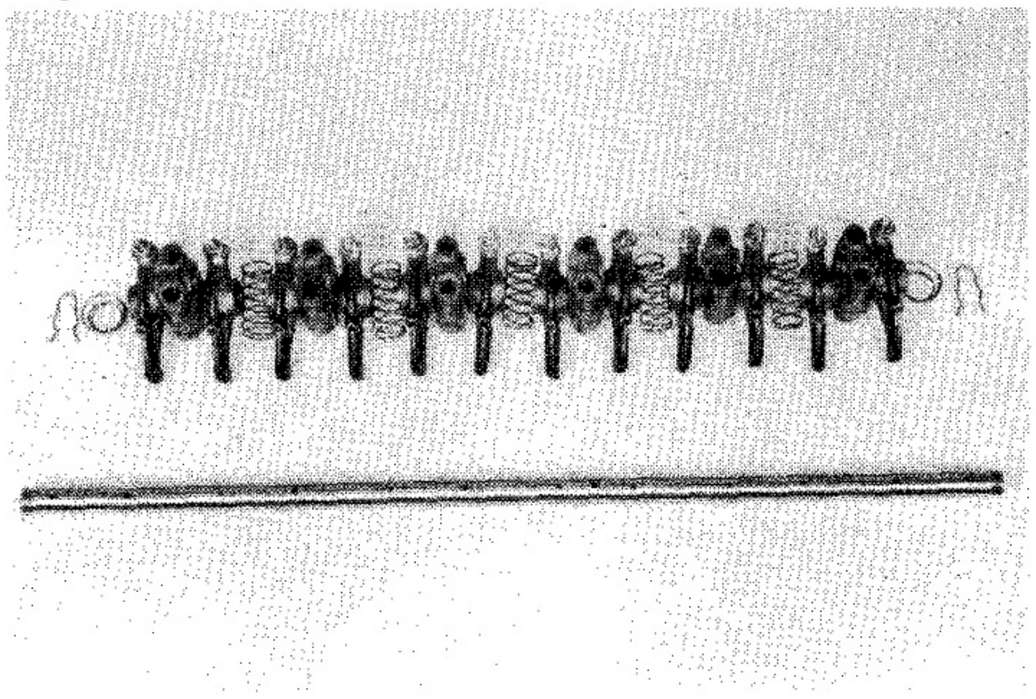
Fig. 3-36



Rocker Arm & Shaft

1. Check the rocker arm to shaft clearance. If worn excessively, disassemble and check.

Fig. 3-37



2. Arrange the rocker shaft and rocker support.

Fig. 3-38



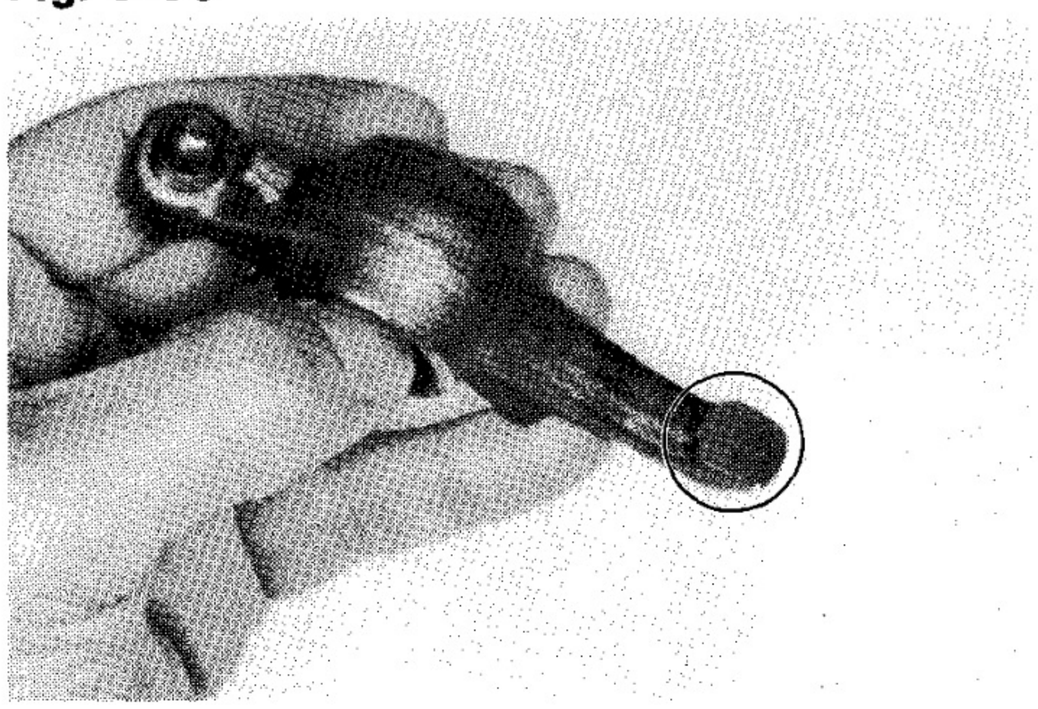
3. Measure the clearance with a dial indicator and outside micrometer. If the clearance exceeds the limit, replace the rocker arm and/or shaft.

Oil clearance:

STD 0.018 – 0.043 mm (0.0007 – 0.0017 in.)

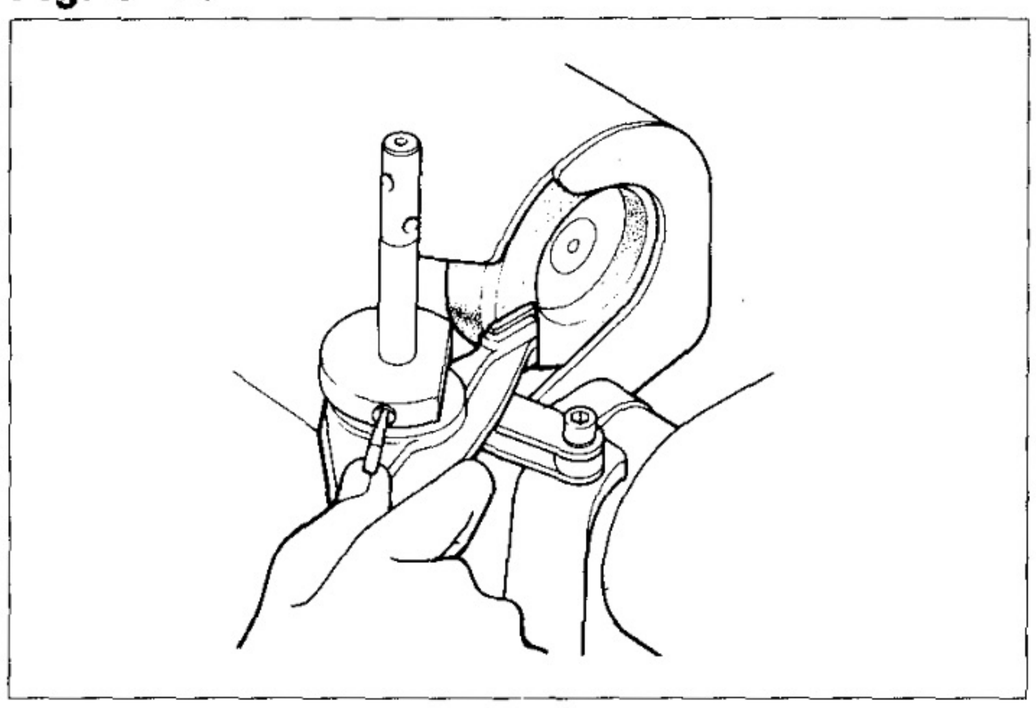
Limit 0.08 mm (0.0031 in.)

Fig. 3-39



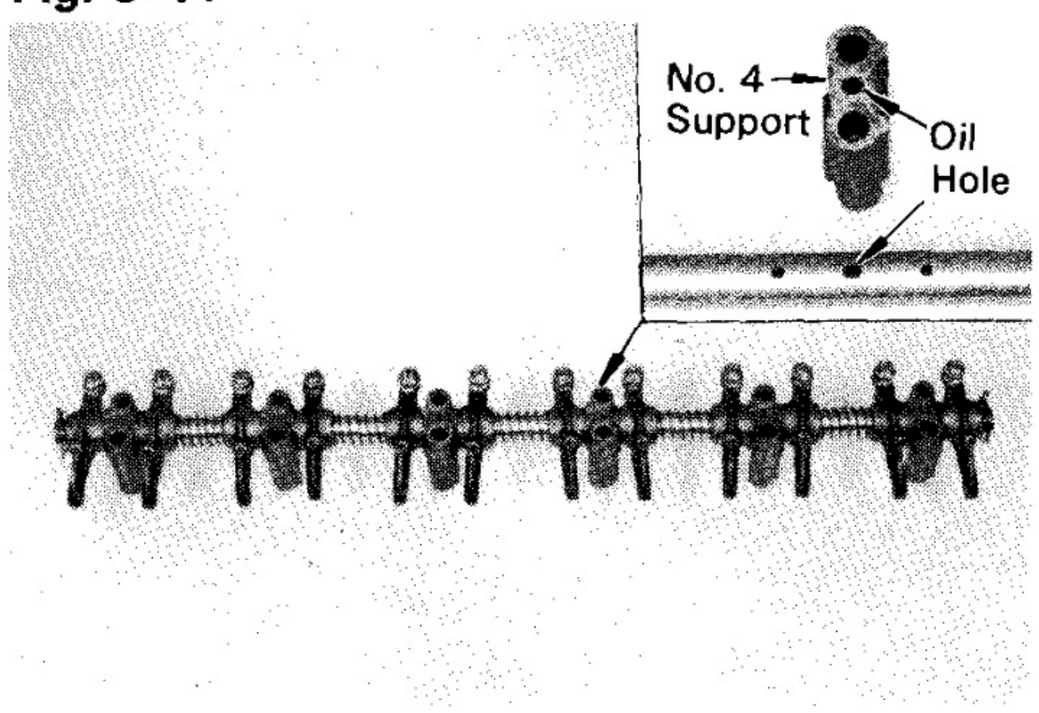
4. Check the contact surface.

Fig. 3-40



5. If only a light ridged wear, correct the valve contacting surface of the rocker arm with a valve refacer and oil stone.

Fig. 3-41

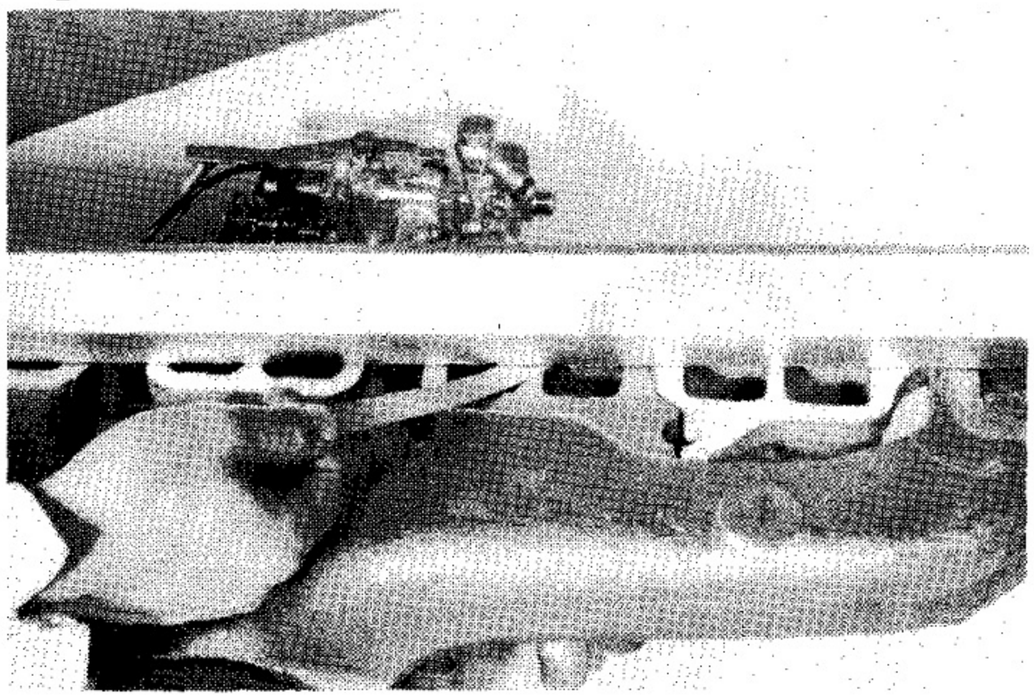


6. Assemble the rocker arms, supports and shaft aligning the oil hole of the shaft with that of No.4 support.

– Note –

There are two types of rocker arms.

Fig. 3-42



Manifold

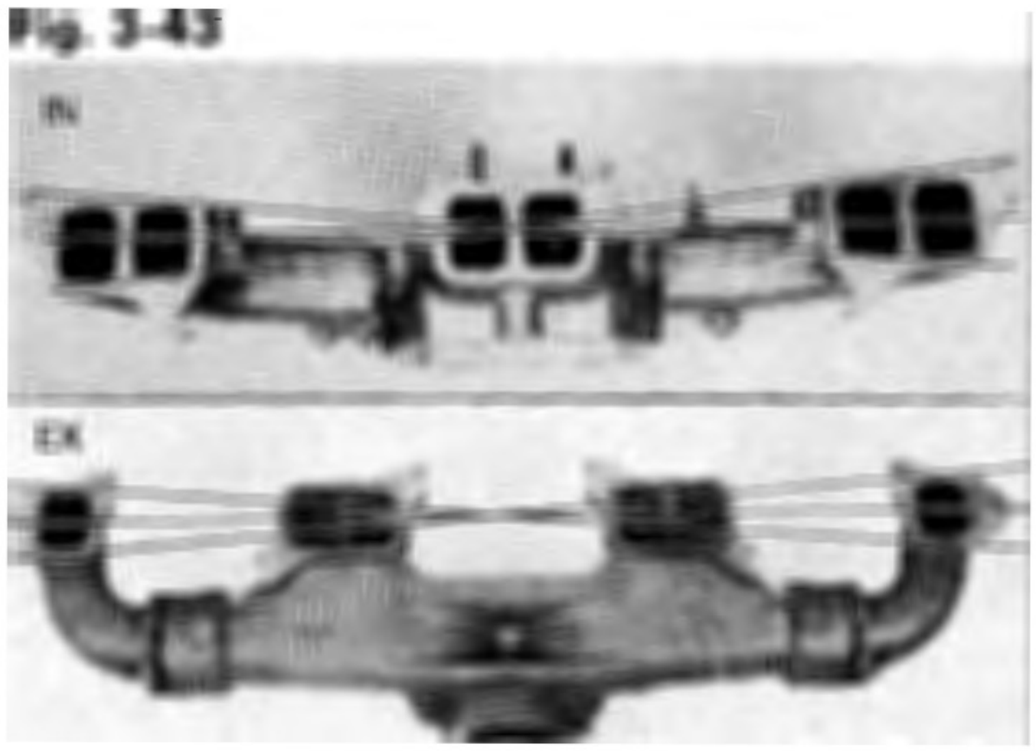
Using a straight edge and thickness gauge, check the cylinder head contacting surfaces for warpage.

Replace the manifold if it exceeds the limit.

Installing surface warpage:

Limit IN & EX 0.5 mm (0.020 in.)

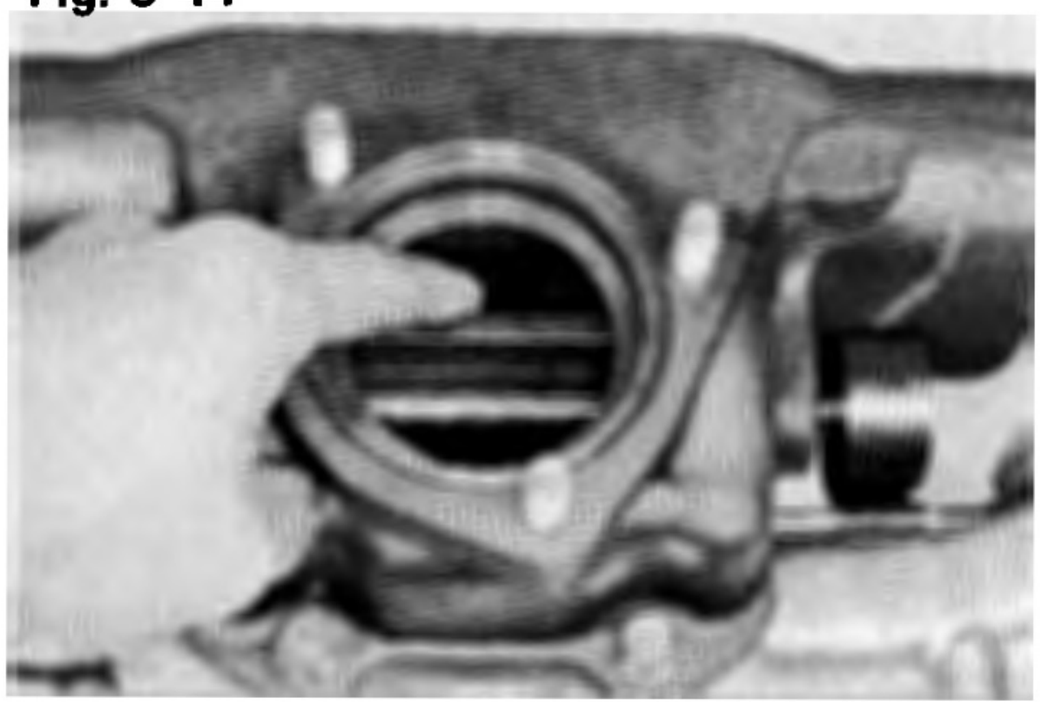
Fig. 3-43



– Note –

Measure at three places as shown in the figure.

Fig. 3-44



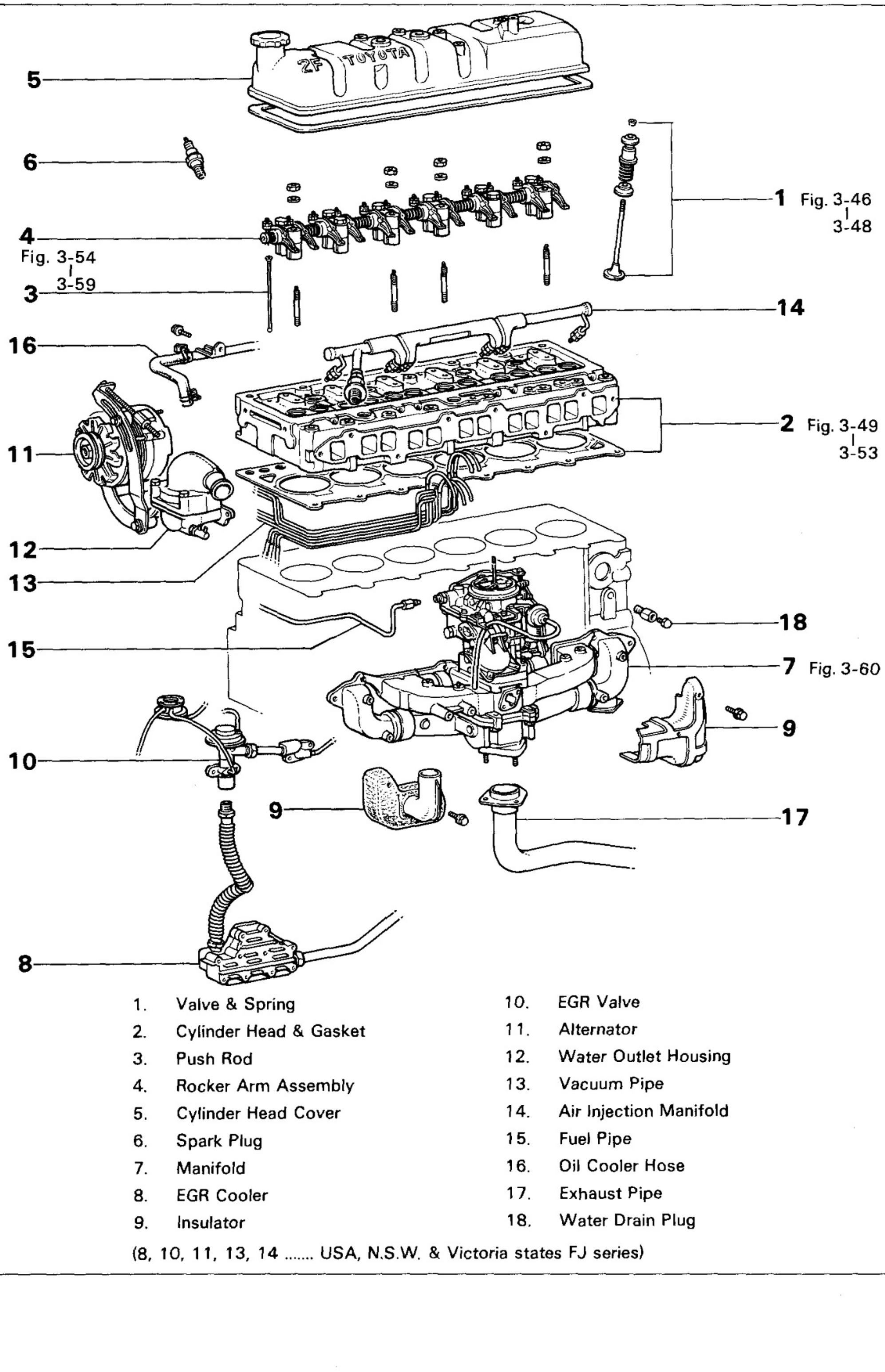
Heat Control Valve

1. Check the bi-metal coil for cracks or damage.
2. Check the control valve for deformation.
3. Make sure that the control shaft rotates smoothly.

ASSEMBLY

Assemble the parts in the numerical order shown in the figure.

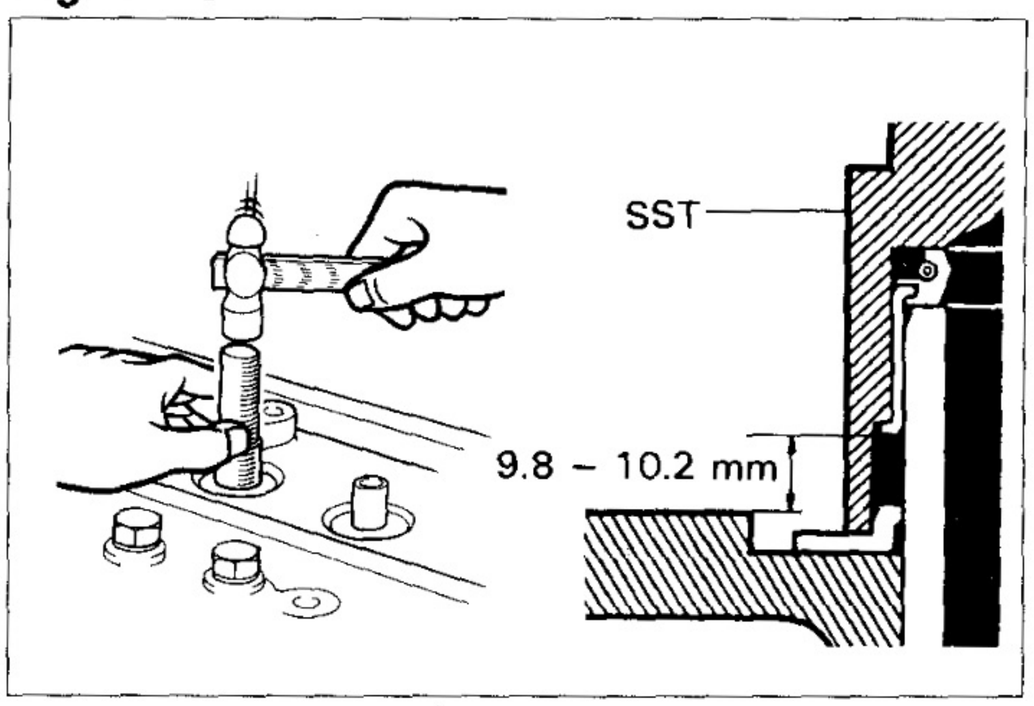
Fig. 3-45



1. Valve & Spring
2. Cylinder Head & Gasket
3. Push Rod
4. Rocker Arm Assembly
5. Cylinder Head Cover
6. Spark Plug
7. Manifold
8. EGR Cooler
9. Insulator
10. EGR Valve
11. Alternator
12. Water Outlet Housing
13. Vacuum Pipe
14. Air Injection Manifold
15. Fuel Pipe
16. Oil Cooler Hose
17. Exhaust Pipe
18. Water Drain Plug

(8, 10, 11, 13, 14 ..... USA, N.S.W. & Victoria states FJ series)

Fig. 3-46



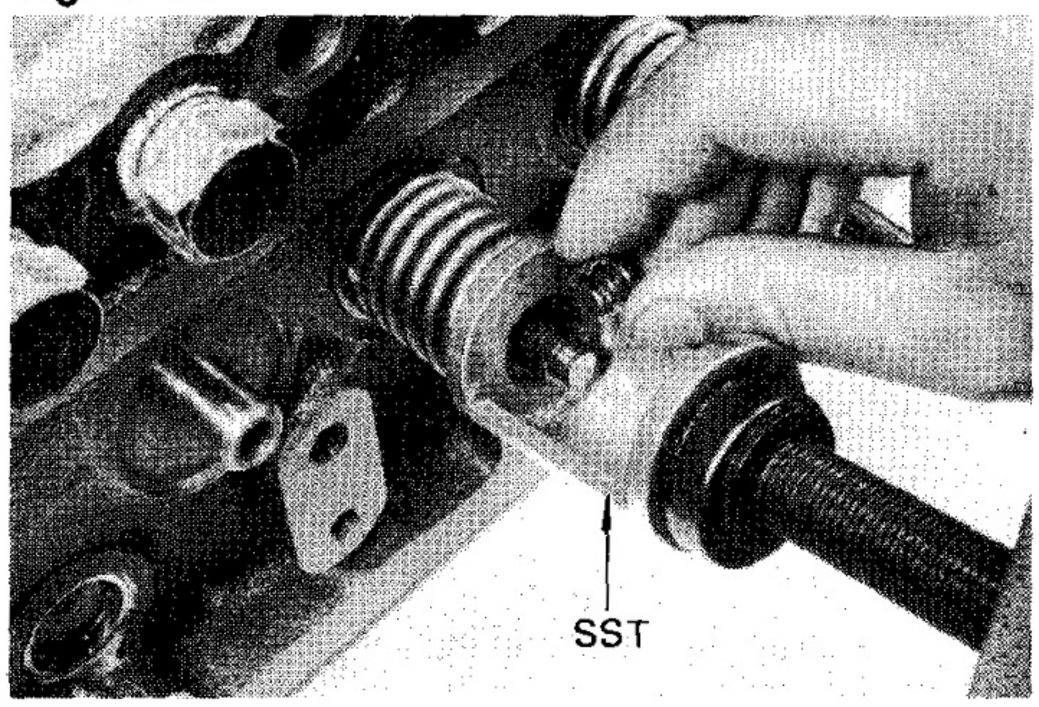
Coat the valve stems with engine oil.
Install the spring seat and oil seal with SST.
SST [09201-31010]

Drive in distance:
9.8 – 10.2 mm
(0.386 – 0.402 in.)

– Note –

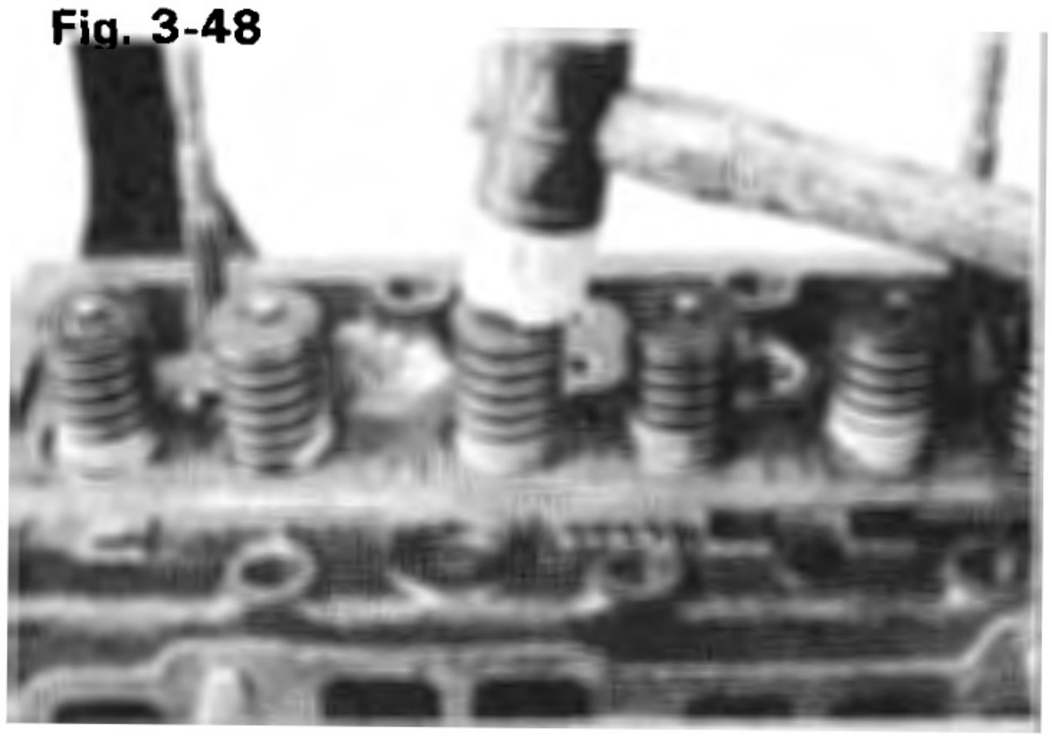
1. **A new oil seal should be used whenever the valve is disassembled.**
2. **Coat the oil seal lip with engine oil.**

Fig. 3-47



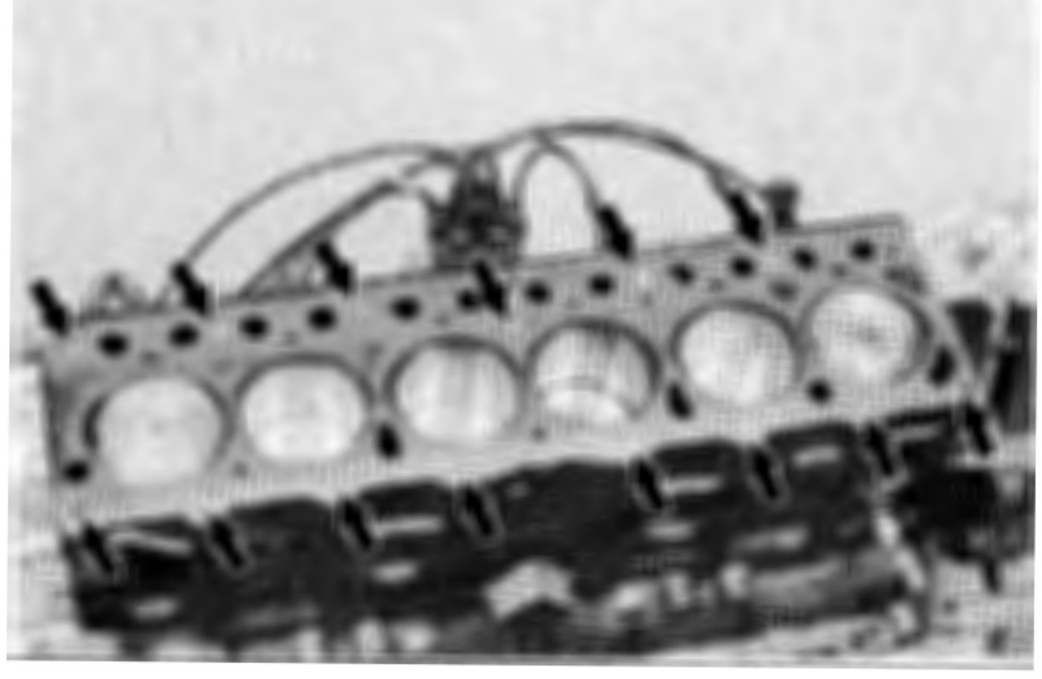
Compress the valve spring with SST and insert the spring retainer locks.
SST [09202-43012]

Fig. 3-48



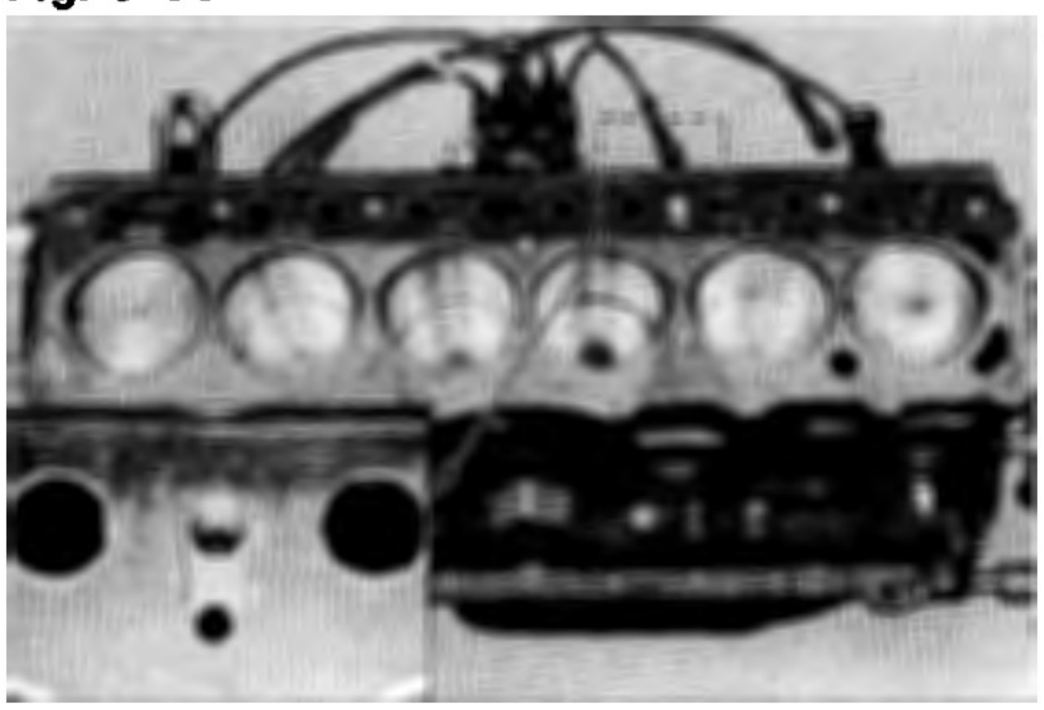
After installing the springs, lightly tap the stem ends and allow the springs to settle down snugly.

Fig. 3-49



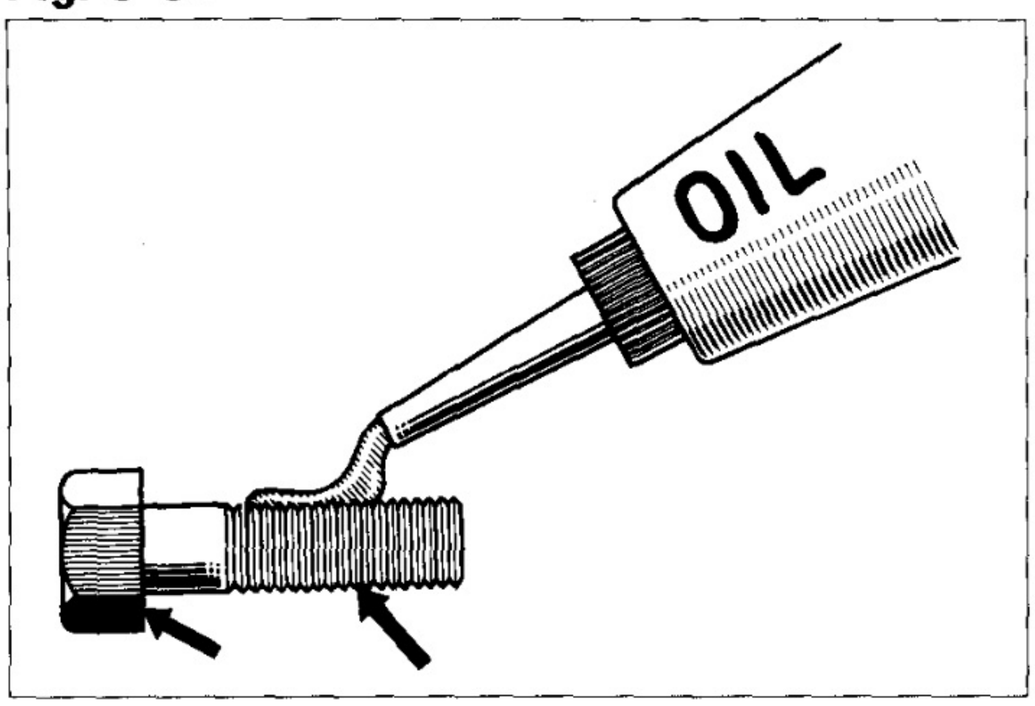
Clean out the bolt holes with compressed air.

Fig. 3-50



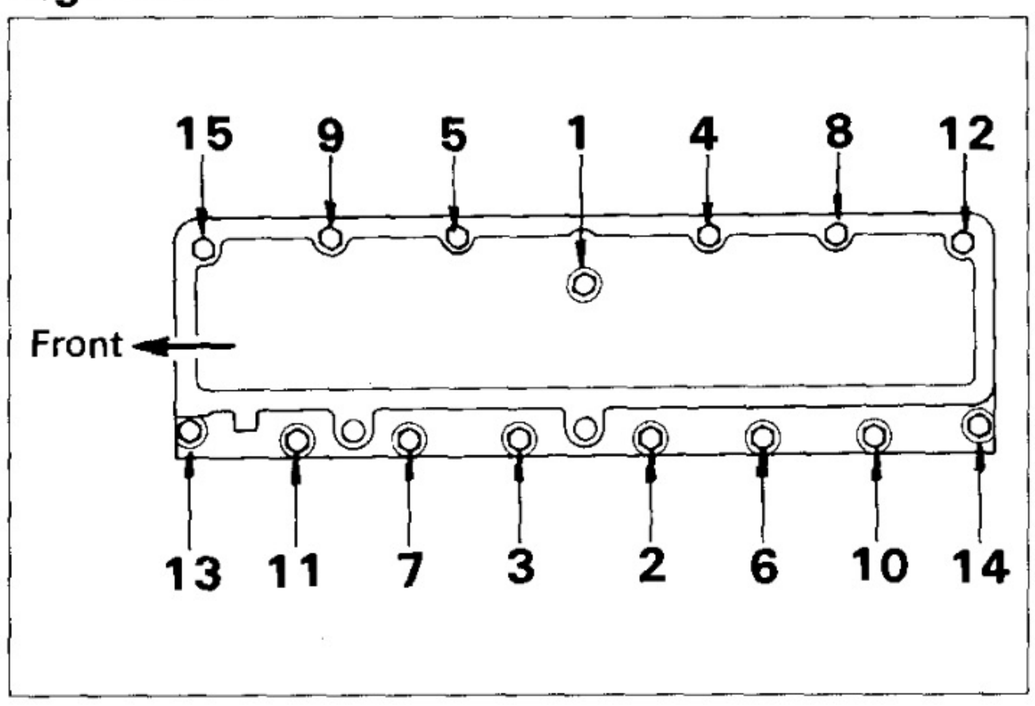
Install a new gasket as shown in the figure.

Fig. 3-51



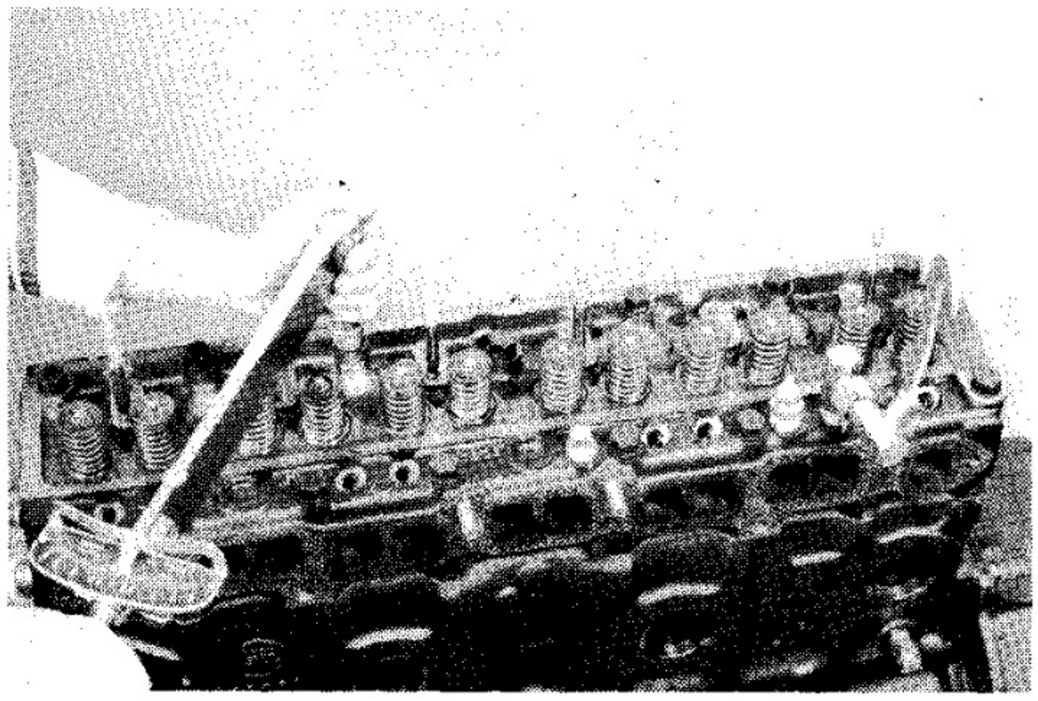
Apply a light coat of engine oil on the bolt threads and under the bolt head before installing the bolts.

Fig. 3-52



Tighten each cylinder head bolt a little at a time in the sequence shown in the figure.

Fig. 3-53



Tighten the cylinder head bolts to specified torque.

Tightening torque:

11.5 – 13.5 kg-m

(84 – 97 ft-lb)

Fig. 3-54

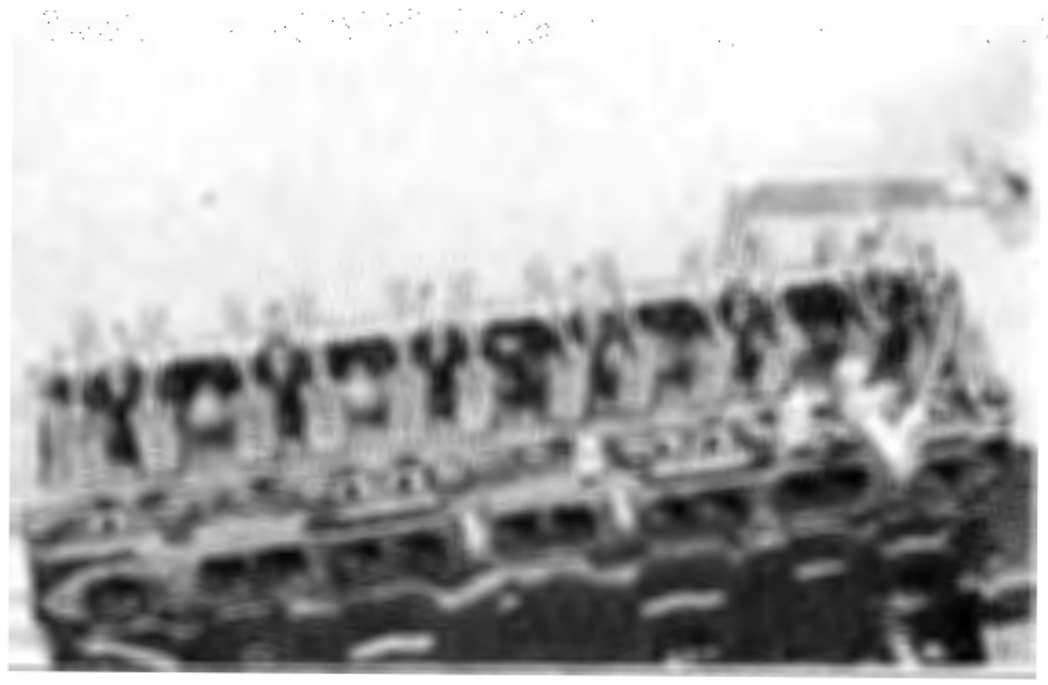


Tighten each rocker support bolt a little at a time in the sequence shown in the figure.

– Note –

Do not keep the valve push rods apart from the adjusting screws while tightening the bolts.

Fig. 3-55

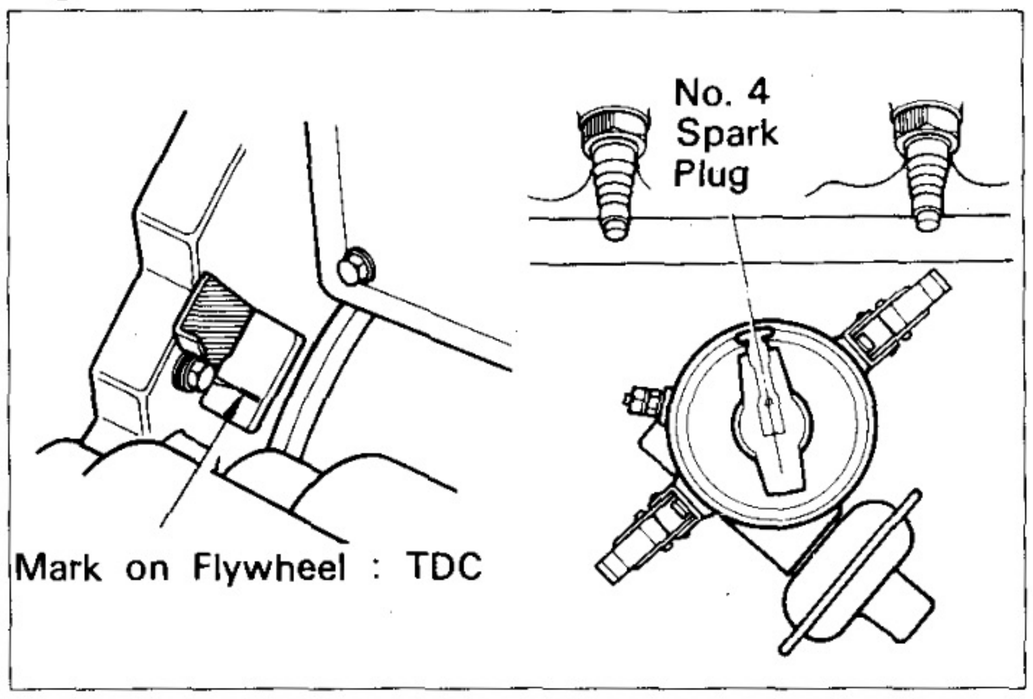


Tighten the valve rocker support bolts to specified torque.

Tightening torque:

10 mm bolt	**3.0 – 4.5 kg-m (22 – 32 ft-lb)**
8 mm bolt	**2.0 – 3.0 kg-m (15 – 21 ft-lb)**

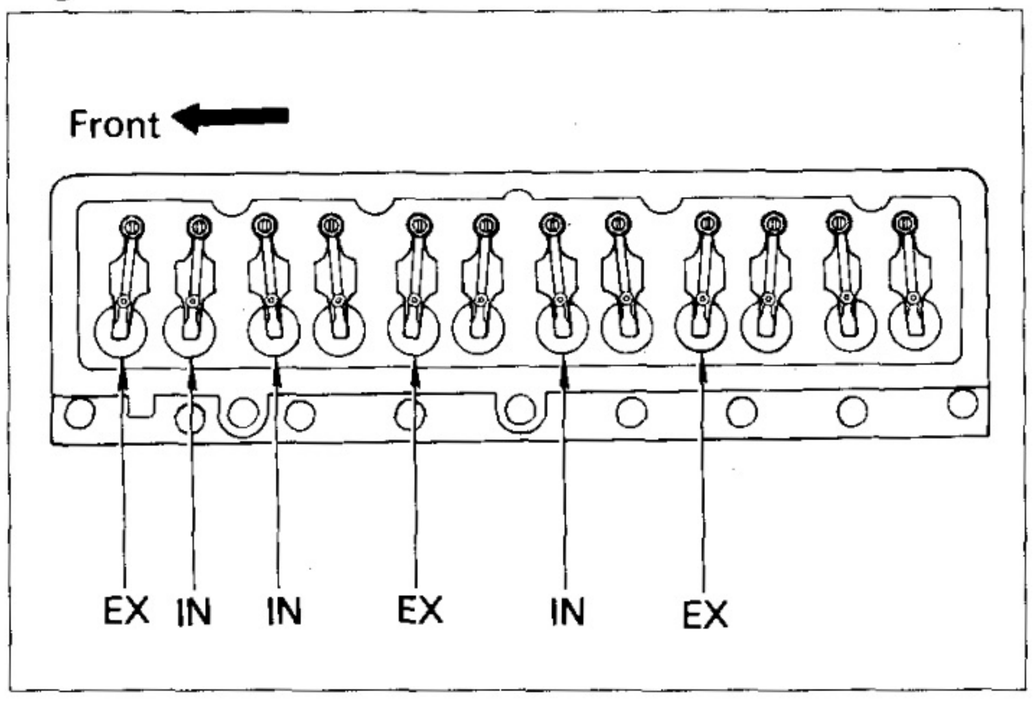
Fig. 3-56



Temporarily adjust the valve clearance.

1. Set No.1 cylinder to TDC/compression.
   Align the mark (groove) with the pointer.
   The distributor rotor should face as shown.

Fig. 3-57

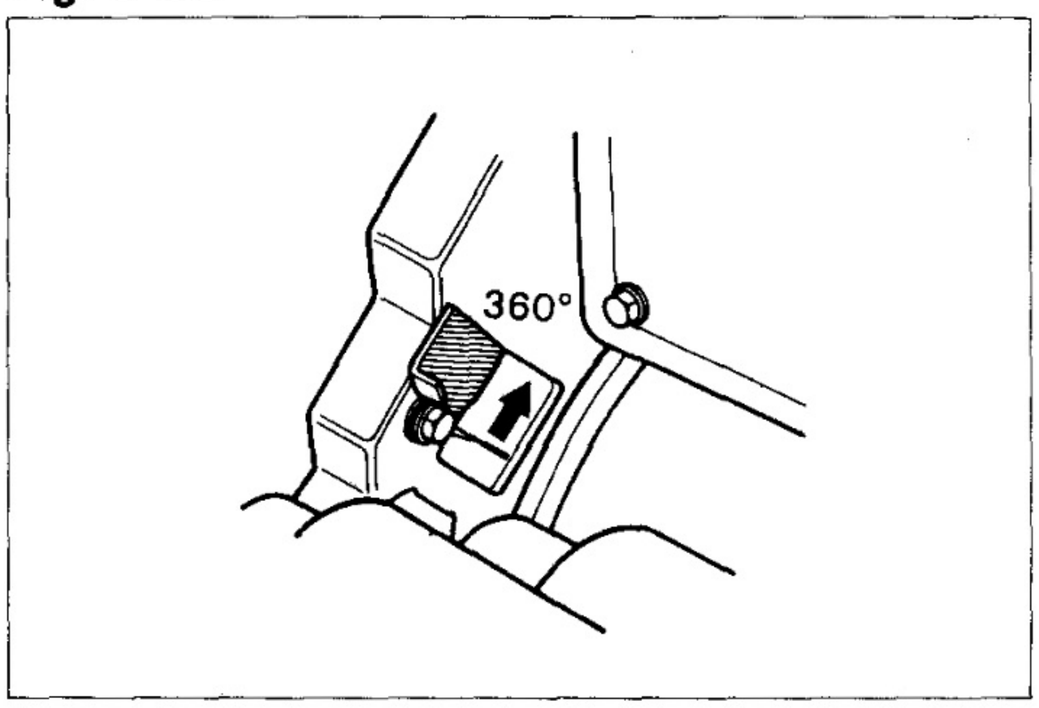


2. Adjust the valve clearance.
   The valve clearance is measured between the valve stem and rocker arm adjusting screw.
   Adjust only the valves indicated by arrows.

Valve clearance (hot):

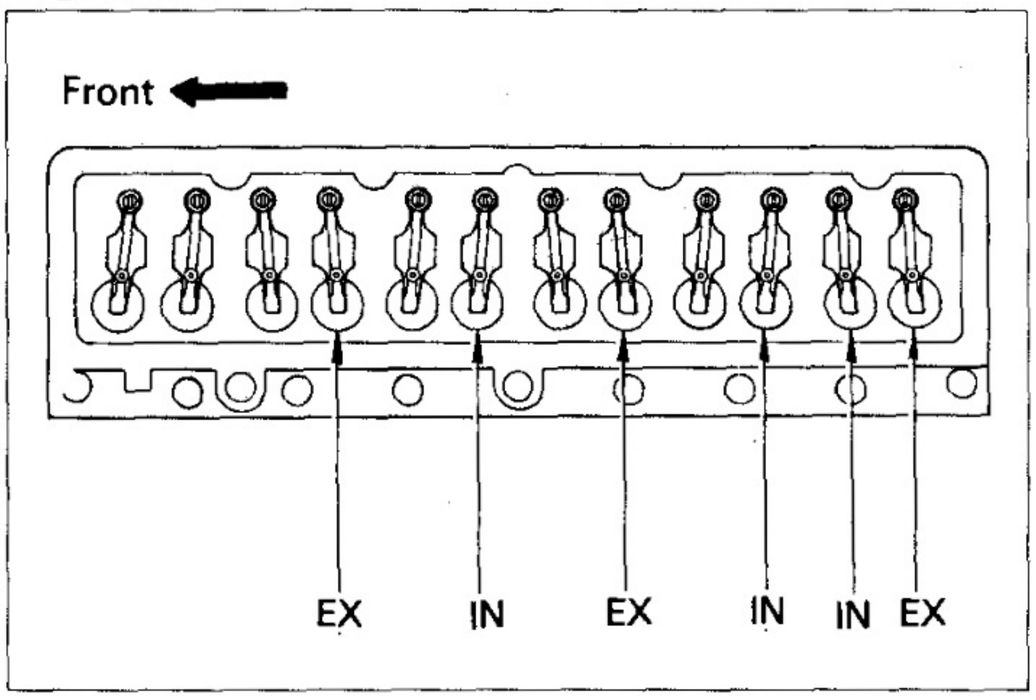
IN	**0.20 mm (0.008 in.)**
EX	**0.35 mm (0.014 in.)**

Fig. 3-58



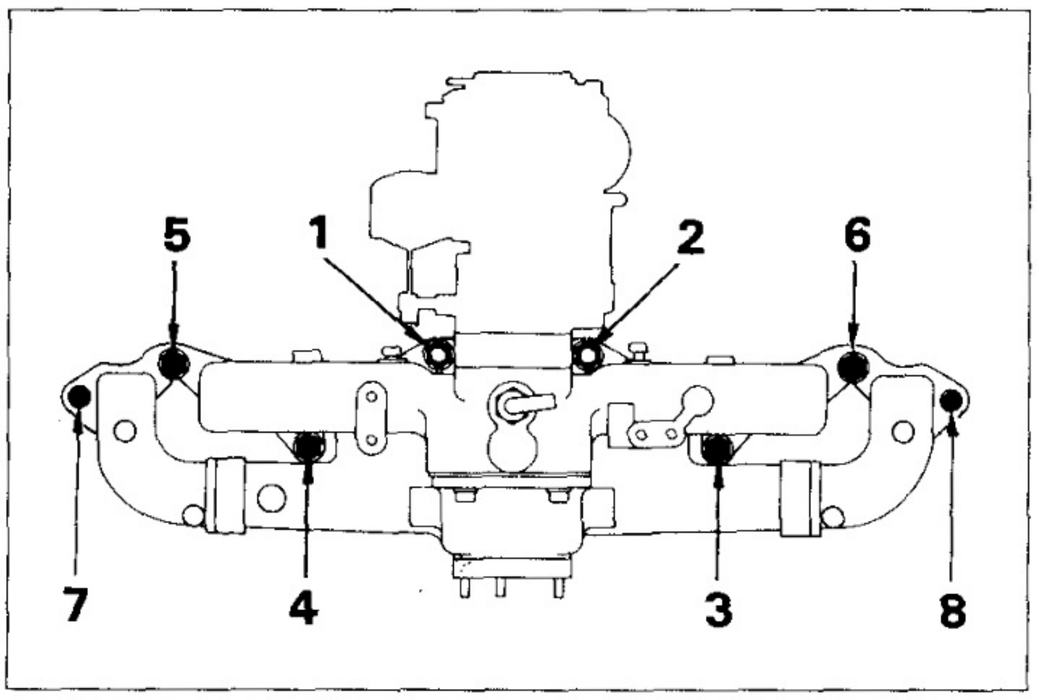
3. Rotate the crankshaft 360°.

Fig. 3-59



4. Adjust the remaining valves indicated by arrows.

Fig. 3-60



Tighten each manifold bolt and nut a little at a time to the specified torque in the sequence shown in the figure.

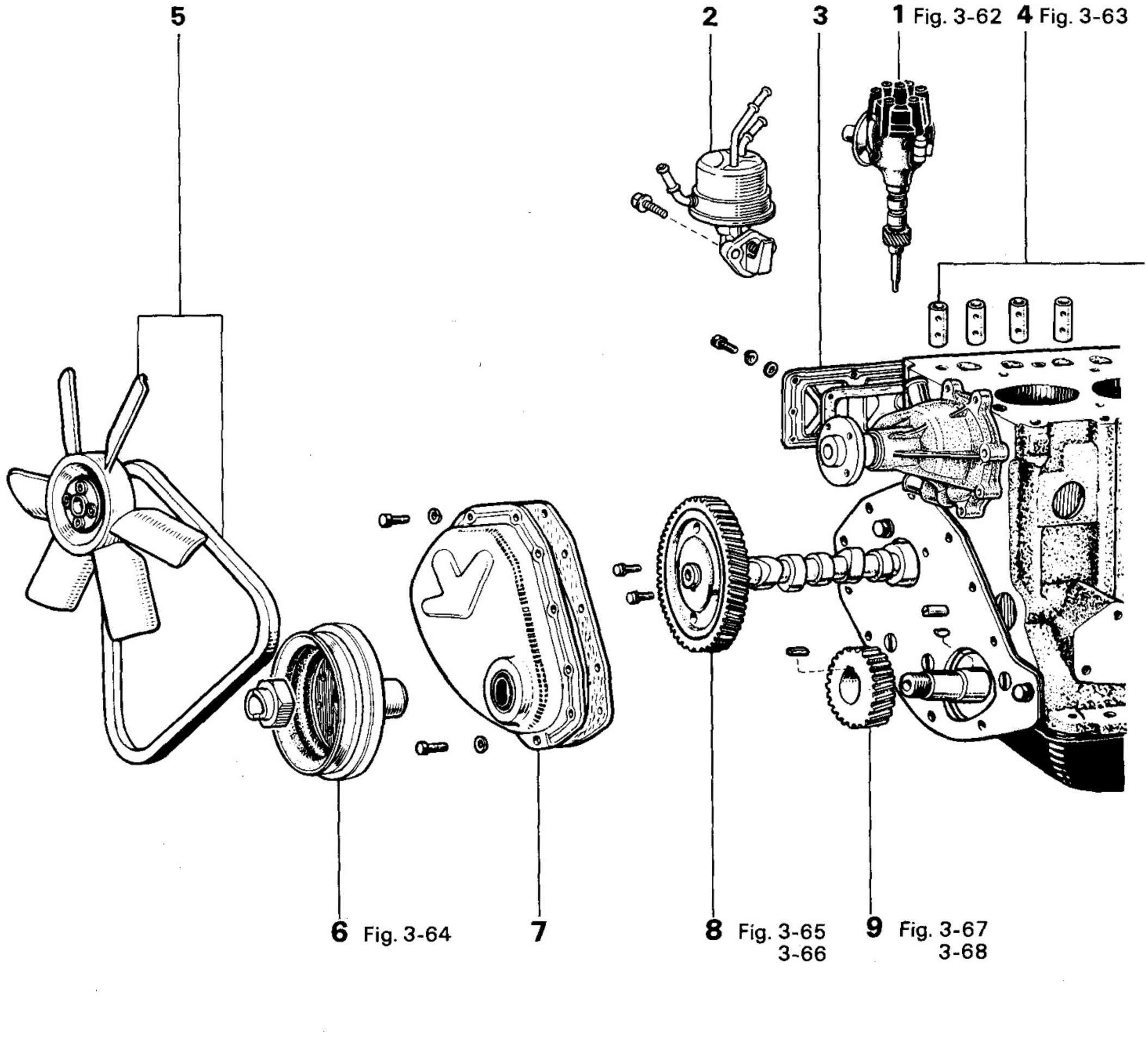
Tightening torque: 3.9 – 5.1 kg-m (29 – 36 ft-lb)

TIMING GEAR

DISASSEMBLY

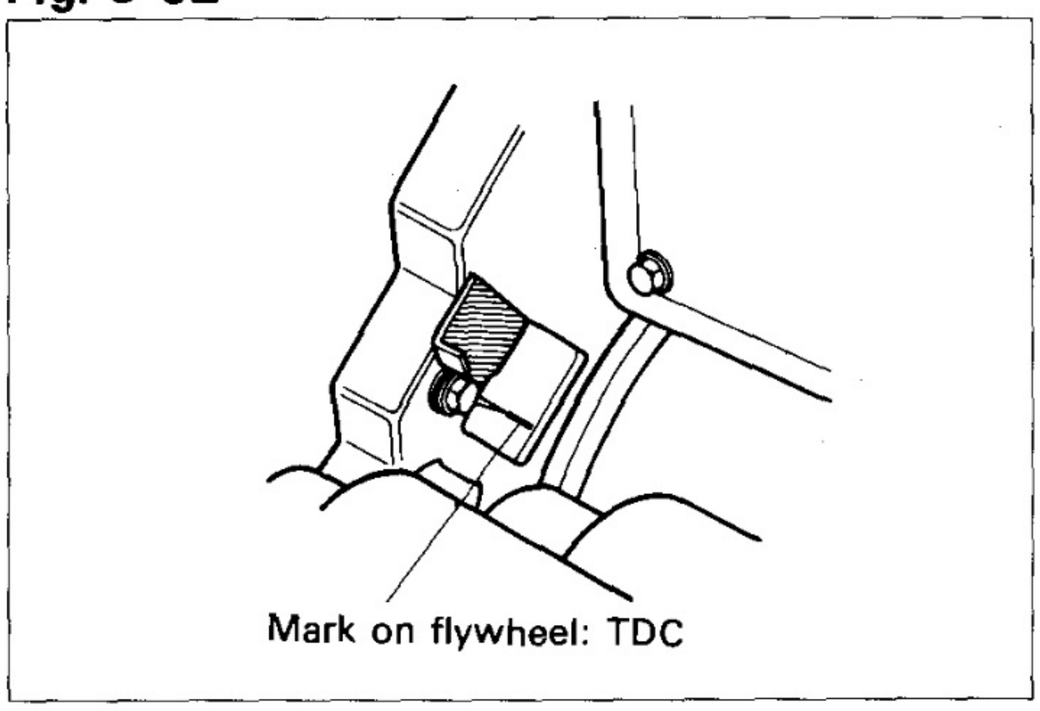
Disassemble the parts in the numerical order shown in the figure.

Fig. 3-61



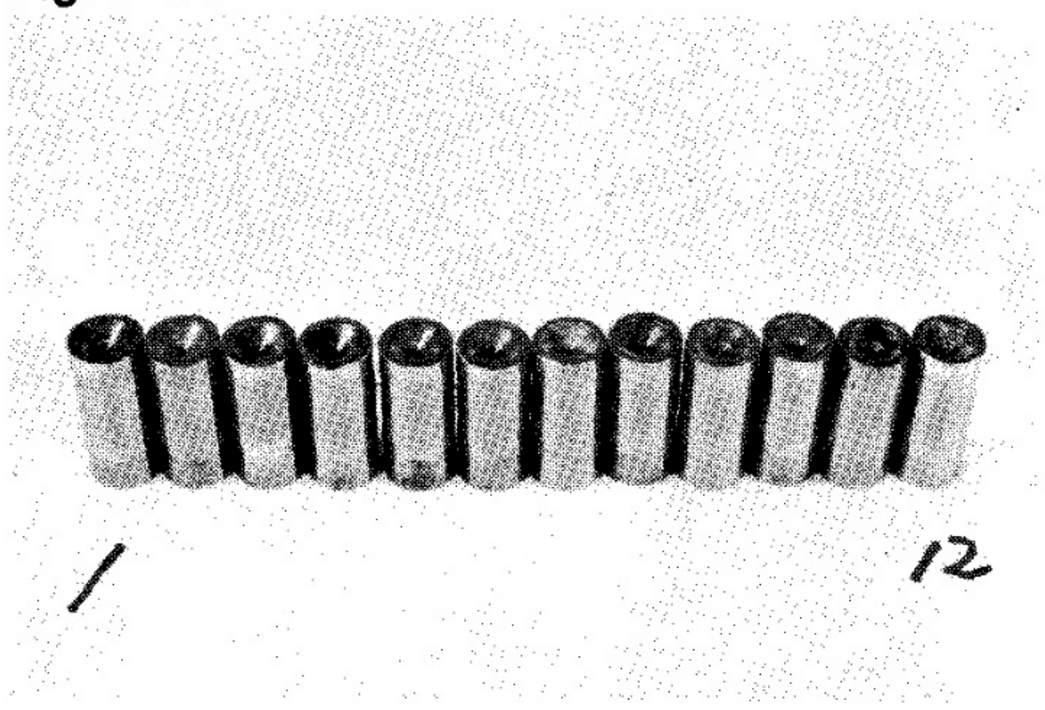
1. Distributor
2. Fuel Pump
3. Valve Lifter Cover
4. Valve Lifter
5. Cooling Fan & Drive Belt
6. Crankshaft Pulley
7. Timing Gear Cover
8. Camshaft & Timing Gear
9. Crankshaft Timing Gear

Fig. 3-62



Before starting work, set No.1 cylinder piston to TDC/compression.

Fig. 3-63



Keep the valve lifters in correct order.

Fig. 3-64



Pull out the crankshaft pulley with SST.
SST [09213-60016]

Fig. 3-65

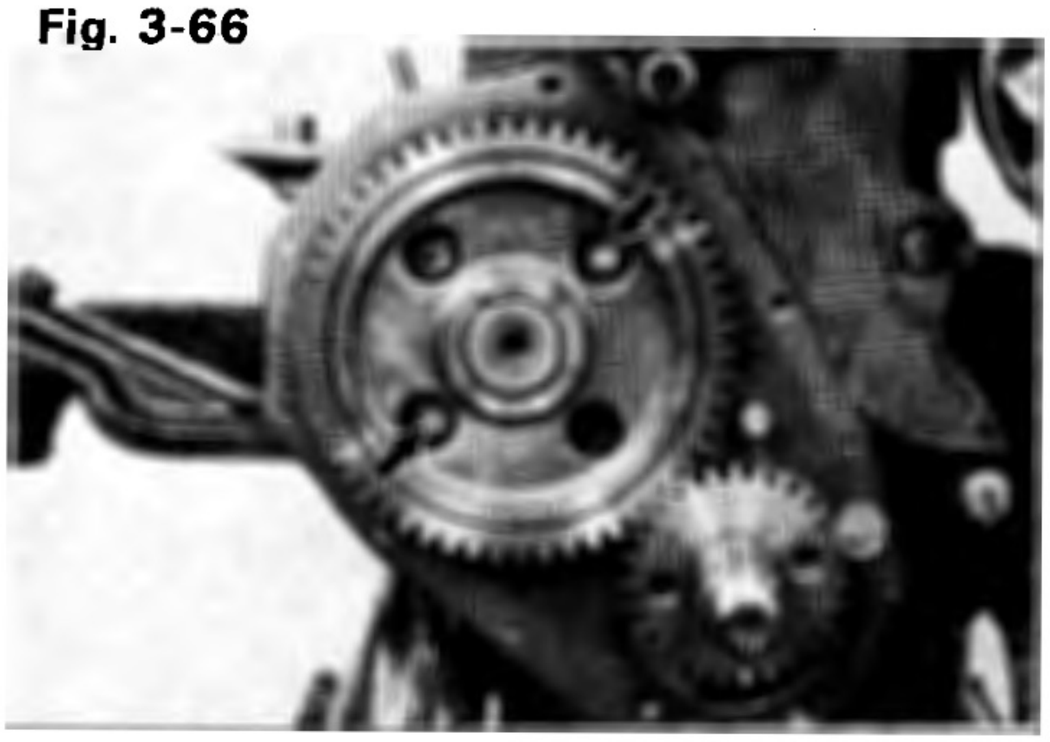


Check the timing gear backlash in several places.

Backlash:

STD	**0.05 – 0.12 mm (0.0020 – 0.0047 in.)**
Limit	**0.2 mm (0.008 in.)**

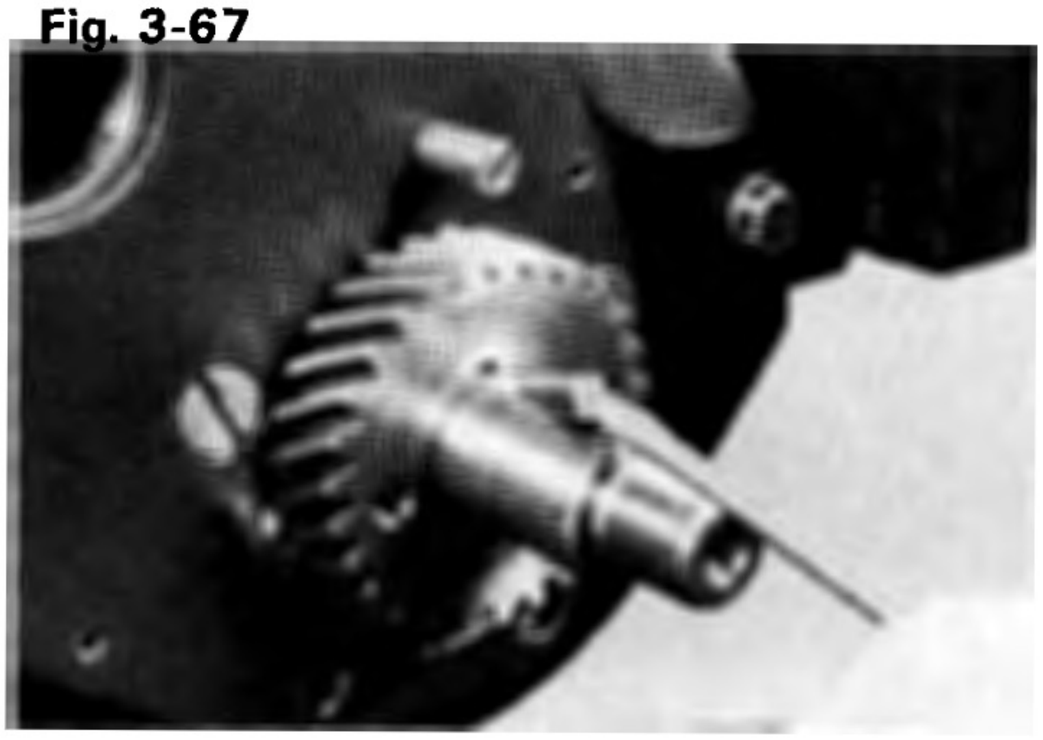
Fig. 3-66



⚠ Align the matchmarks, remove the two retaining bolts of the camshaft thrust plate, and pull out the camshaft.

– Note –
When removing the camshaft, take care not to damage the camshaft bearing.

Fig. 3-67



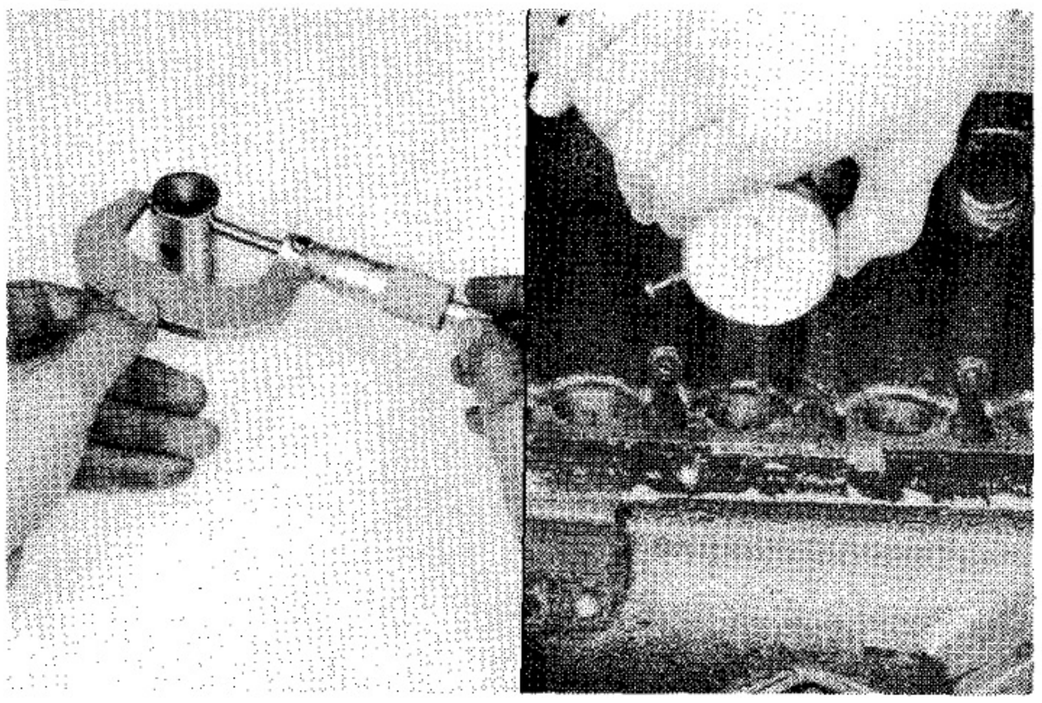
Remove the pulley key from the crankshaft before removing the crankshaft timing gear.

Fig. 3-68



Pull out the crankshaft timing gear with SST.
SST [09213-60016]

Fig. 3-69



INSPECTION & REPAIR

Valve Lifter

Check the lifters and lifter bores for wear or damage.

Measure the oil clearance.

Oil clearance:

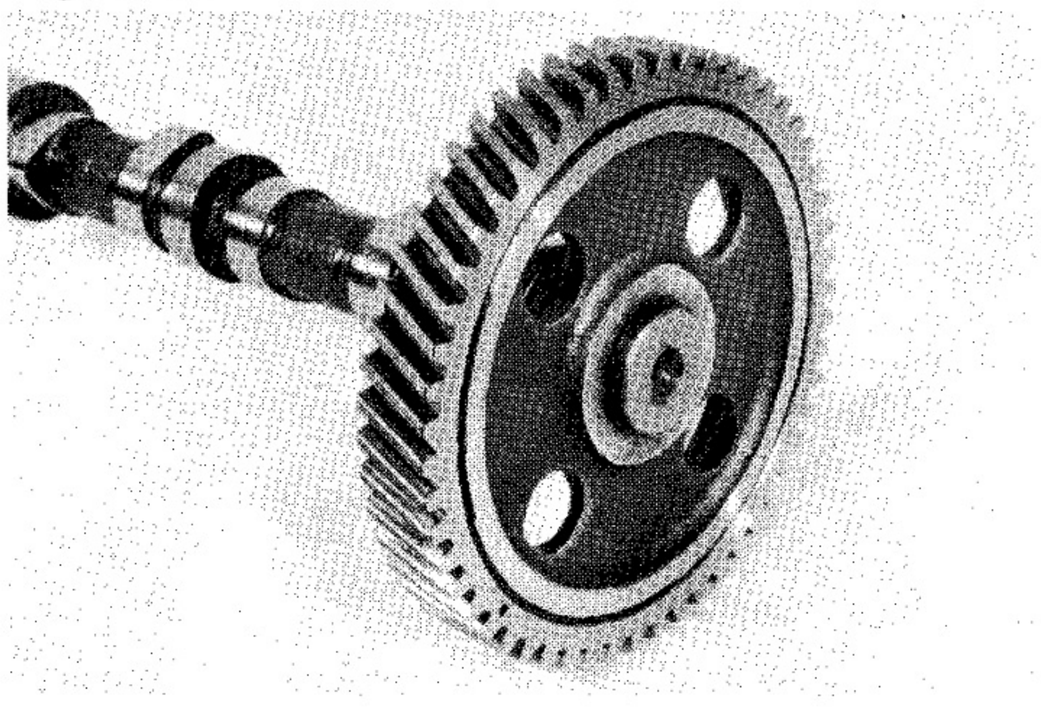
STD 0.019 – 0.075 mm (0.0007 – 0.0030 in.)

Limit 0.1 mm (0.004 in.)

– Note –

If the oil clearance exceeds the limit, it should be replaced with a lifter of O/S 0.05 to obtain proper clearance.

Fig. 3-70

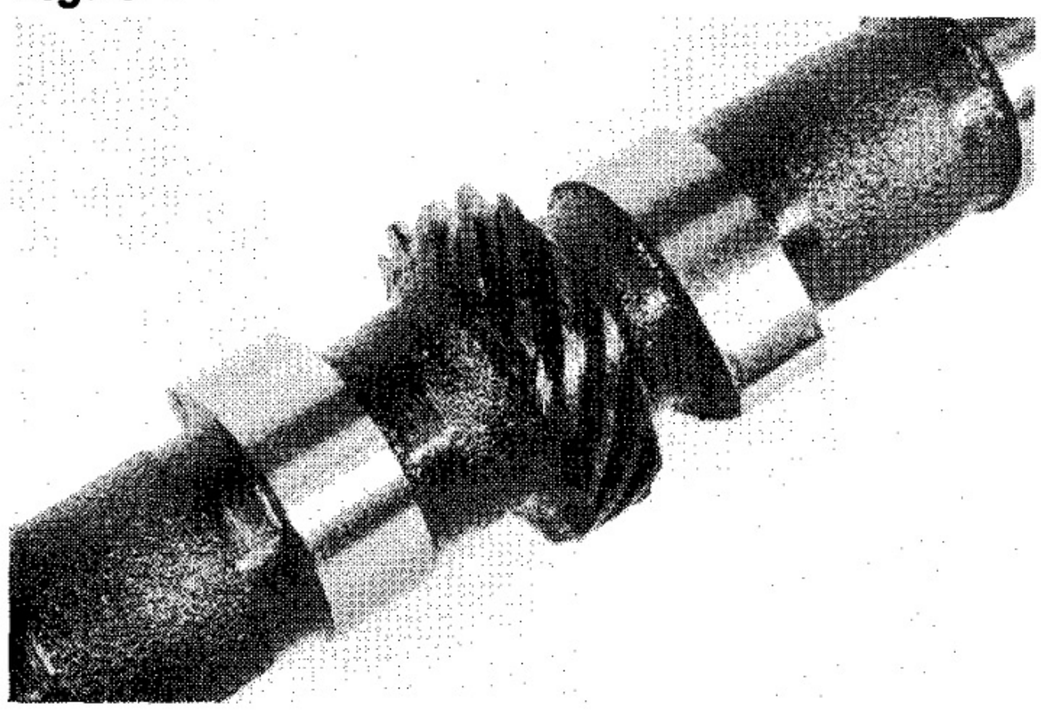


Timing Gears

Check for cracks, wear and chipped teeth.

If damaged, replace the camshaft timing gear.

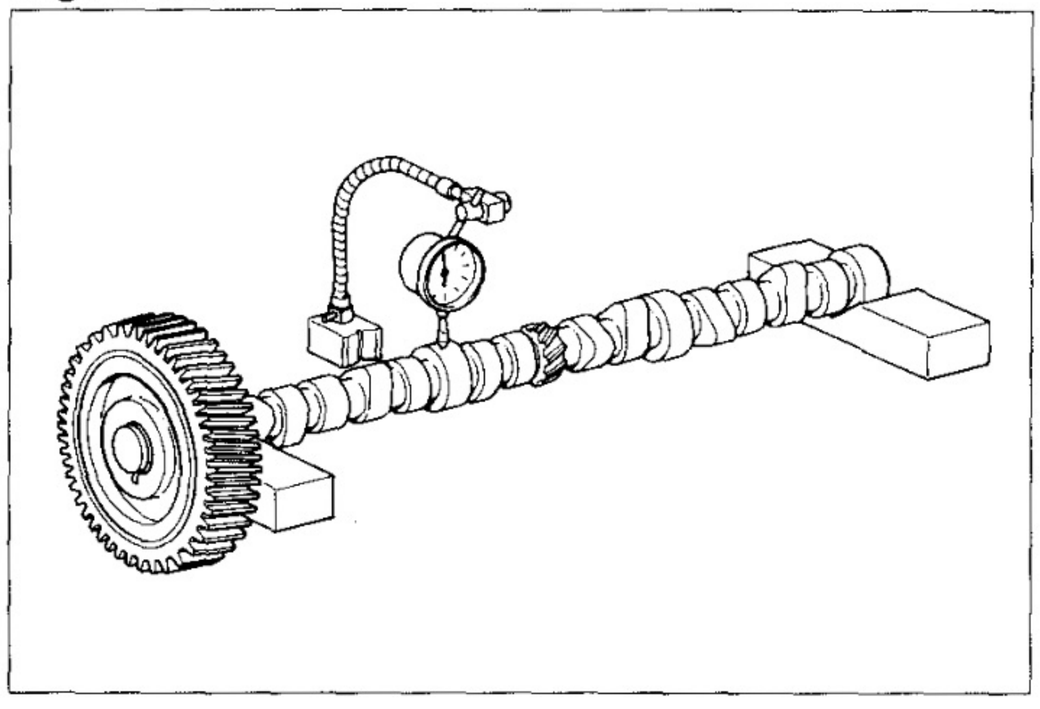
Fig. 3-71



Camshaft

1. Check the cam and journal for cracks or wear.
   If damaged, replace the camshaft.

Fig. 3-72

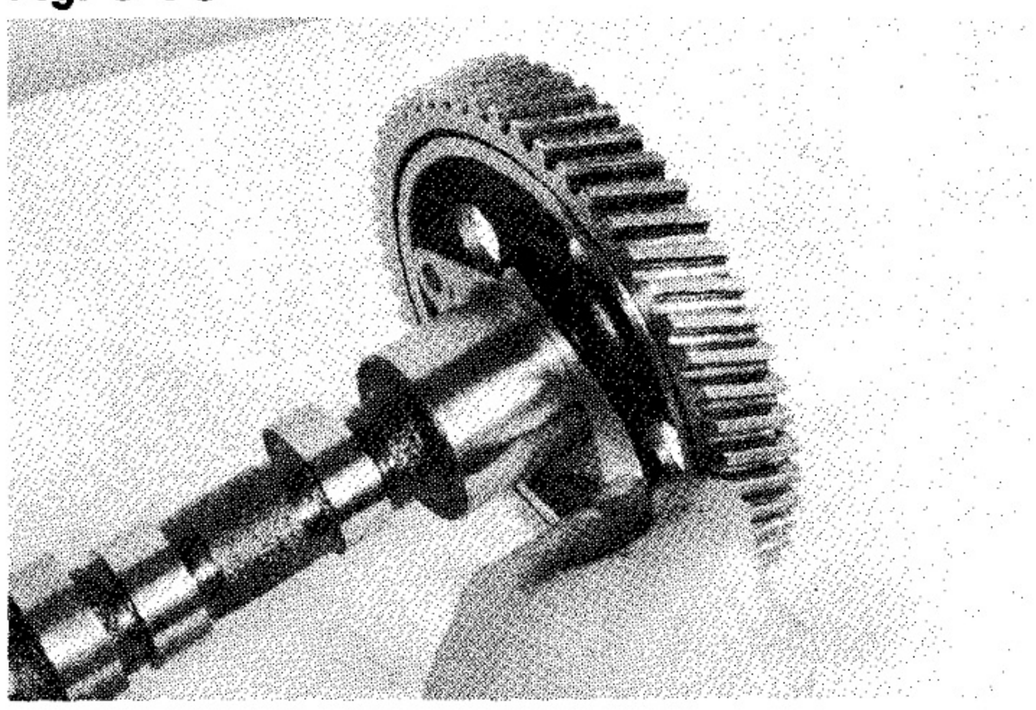


2. Check the camshaft for runout. Replace the camshaft if it exceeds the limit.

Circle runout:

Limit 0.15 mm (0.0059 in.)

Fig. 3-73

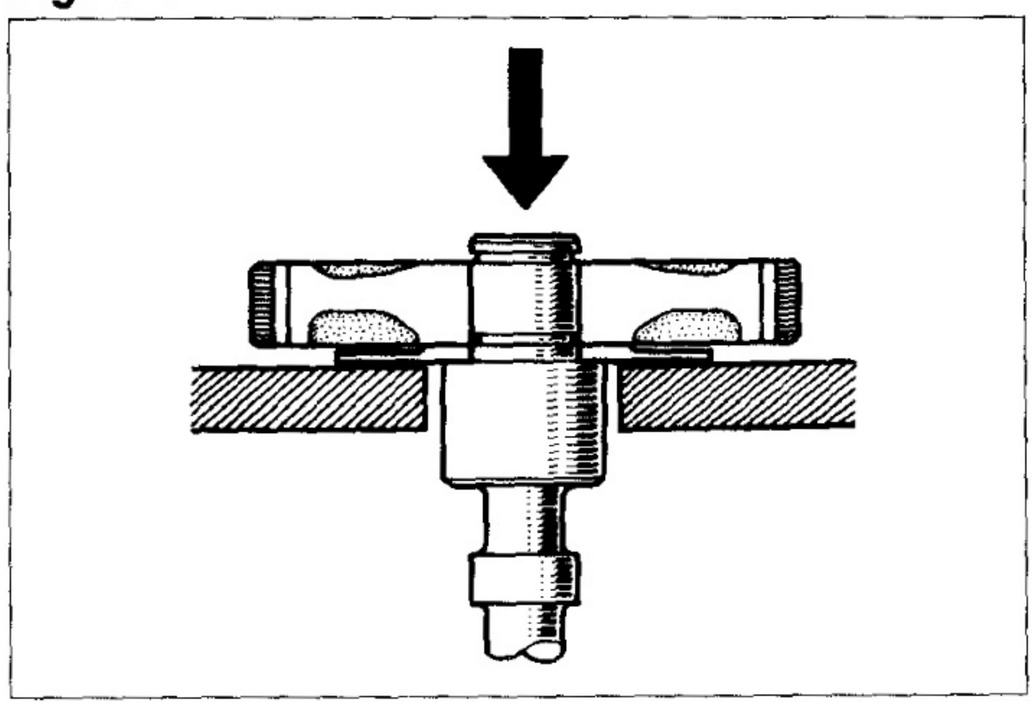


3. Measure the camshaft thrust clearance. If it exceeds the limit, replace the thrust plate.

Thrust clearance:

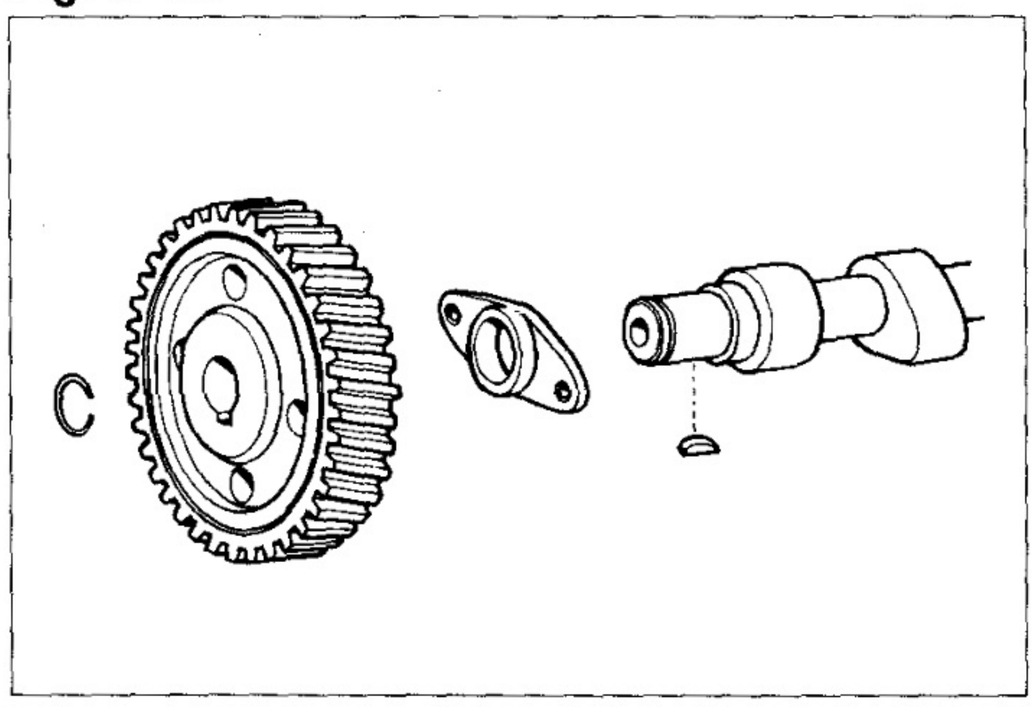
STD	**0.200 – 0.262 mm (0.0079 – 0.0103 in.)**
Limit	**0.3 mm (0.012 in.)**

Fig. 3-74



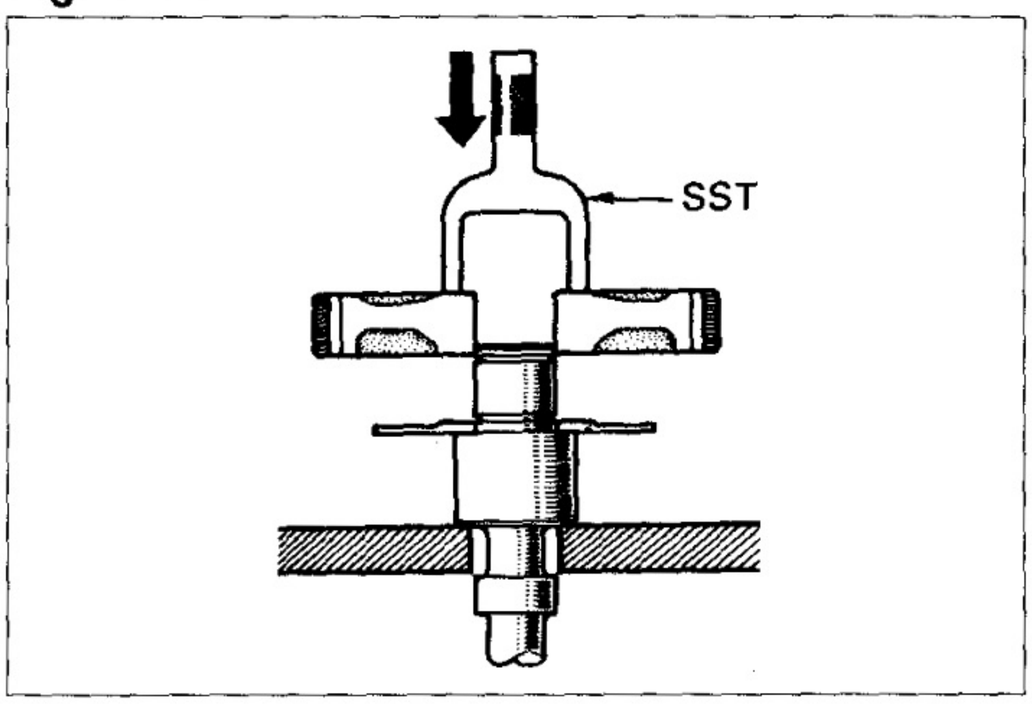
4. Replace the thrust plate.
   (1) Take out snap ring.
   (2) Using a press and a 23 mm socket wrench, press out the timing gear from the camshaft.

Fig. 3-75



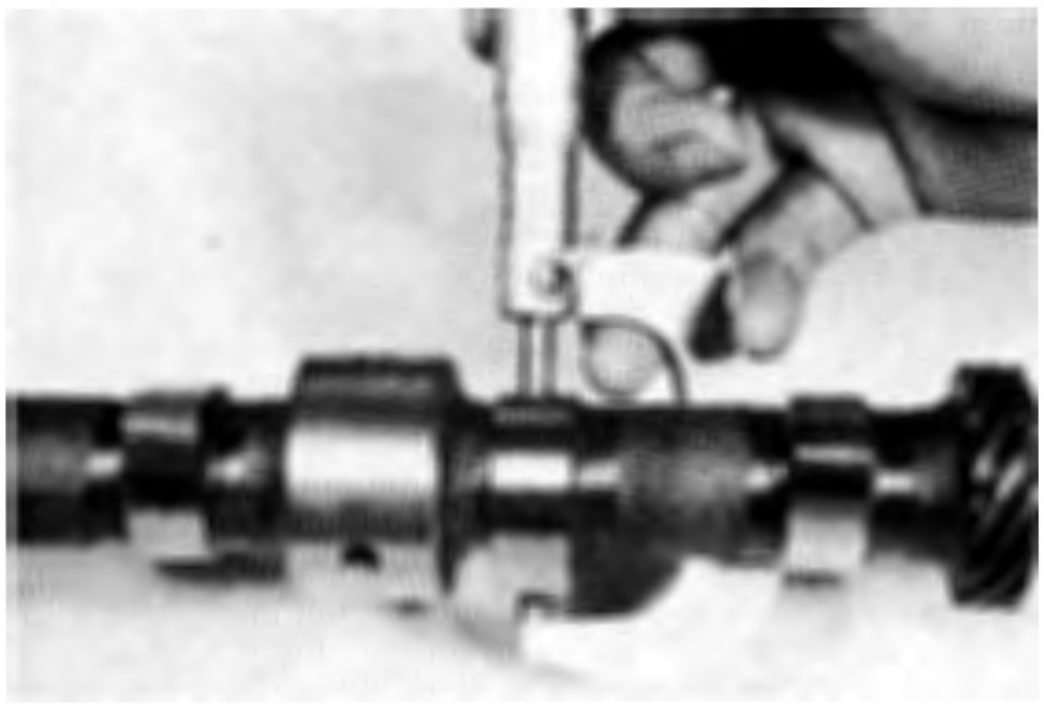
   (3) Assemble the thrust plate and gear in the manner shown.

Fig. 3-76



   (4) Using a press and SST, press in the timing gear and lock it with a new snap ring.
   SST [09214-60010]

Fig. 3-77

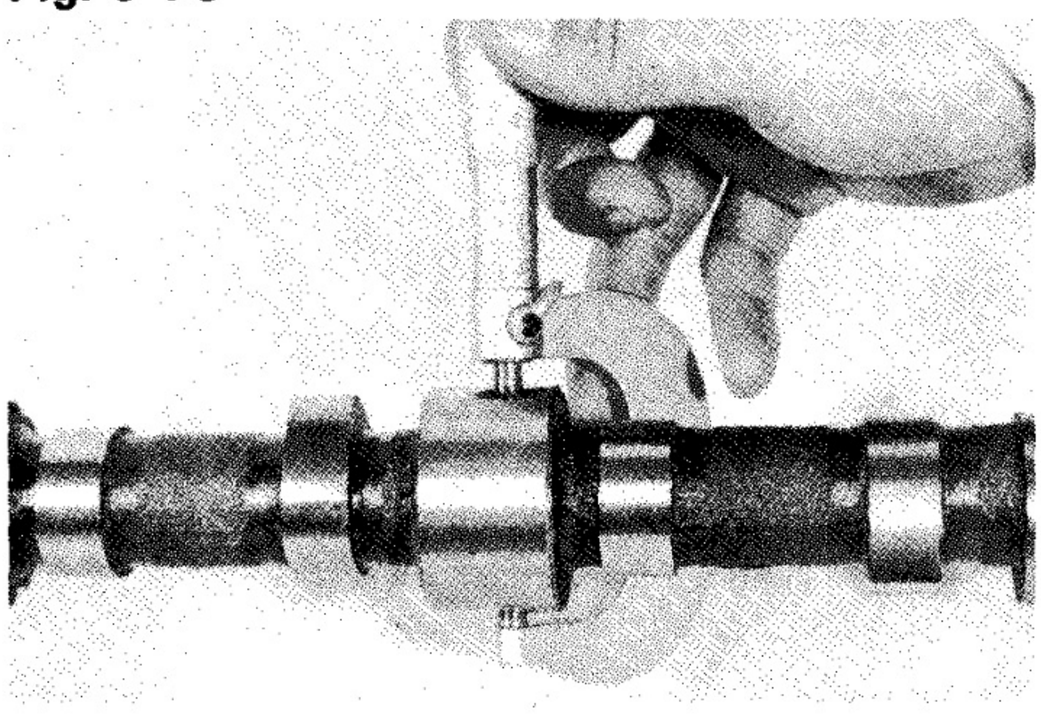


5. Measure the cam lobe height.

Cam height:

Limit	**IN**	**38.0 mm (1.496 in.)**
	EX	**37.9 mm (1.492 in.)**

Fig. 3-78

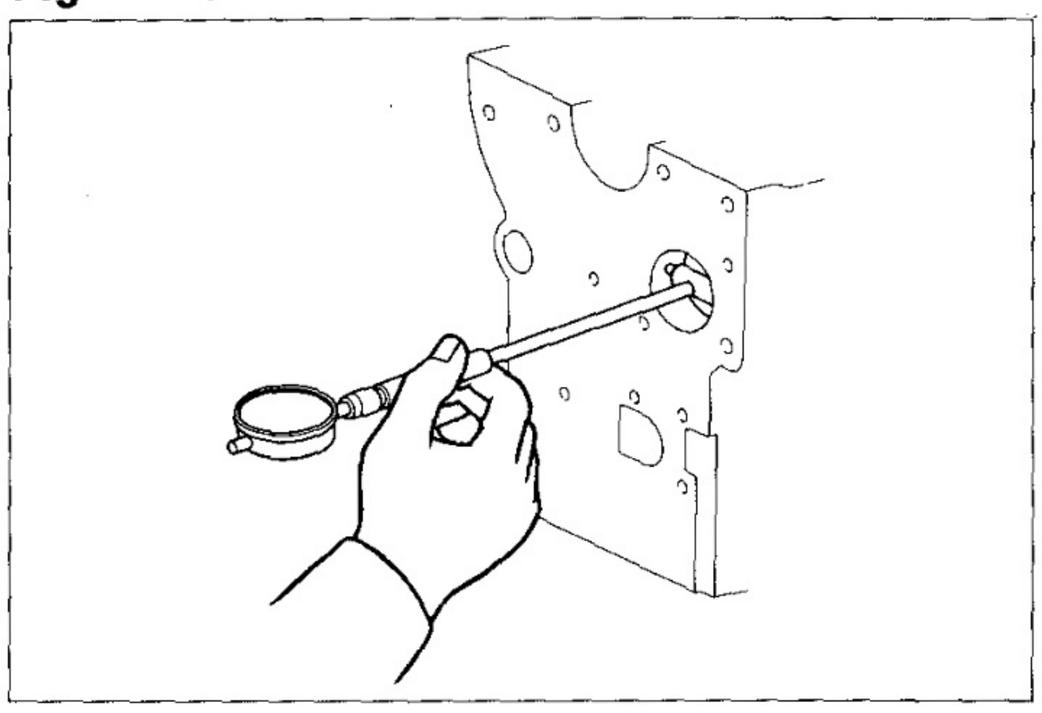


6. Measure the journal oil clearance.
   (1) Measure the camshaft journal diameter.

Journal diameter:

No.1	**47.955 – 47.975 mm (1.8880 – 1.8888 in.)**
No.2	**46.455 – 46.475 mm (1.8289 – 1.8297 in.)**
No.3	**44.955 – 44.975 mm (1.7699 – 1.7707 in.)**
No.4	**43.455 – 43.475 mm (1.7108 – 1.7116 in.)**

Fig. 3-79

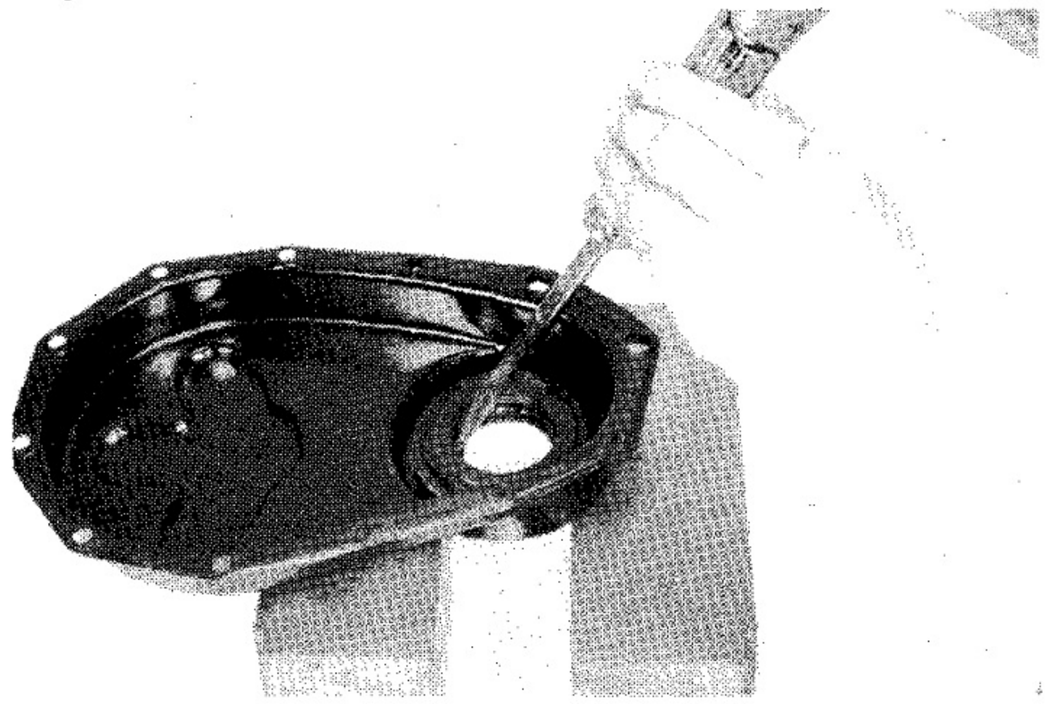


(2) Measure the bearing inner diameter, referring to CYLINDER BLOCK section. (Refer Figs. 3-143 to 3-148.)

Oil clearance:

STD	**0.025 – 0.075 mm (0.0010 – 0.0030 in.)**
Limit	**0.1 mm (0.004 in.)**

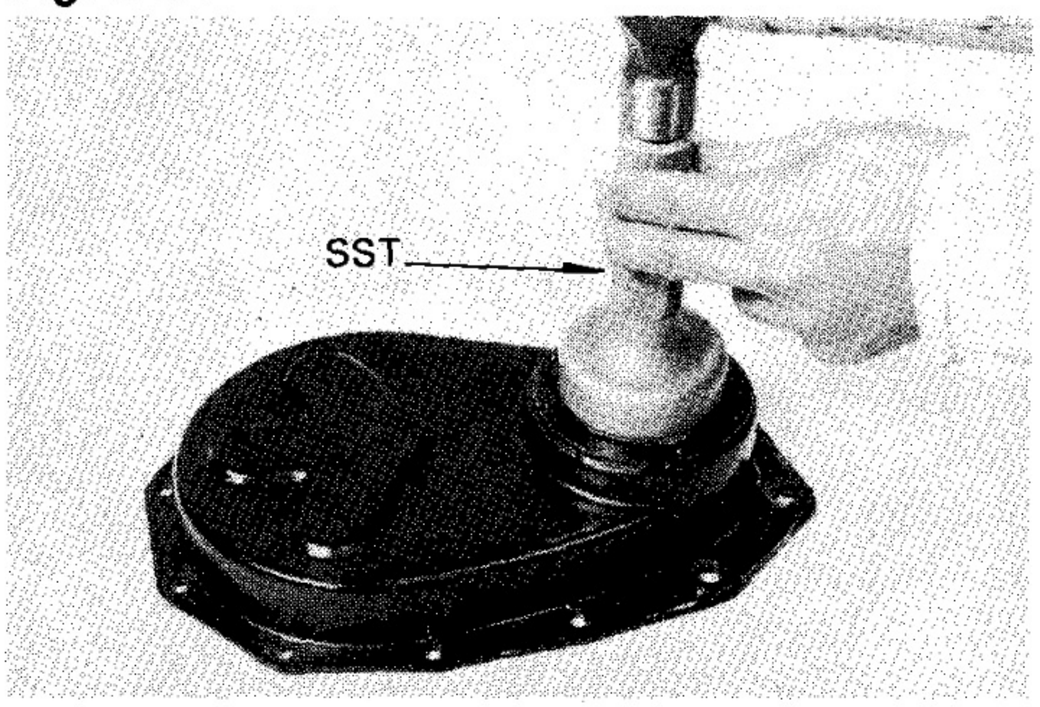
Fig. 3-80



Crankshaft Front Oil Seal

1. Check for wear or damage.
2. Replace the oil seal.
   (1) Remove the oil seal with a screwdriver.

Fig. 3-81

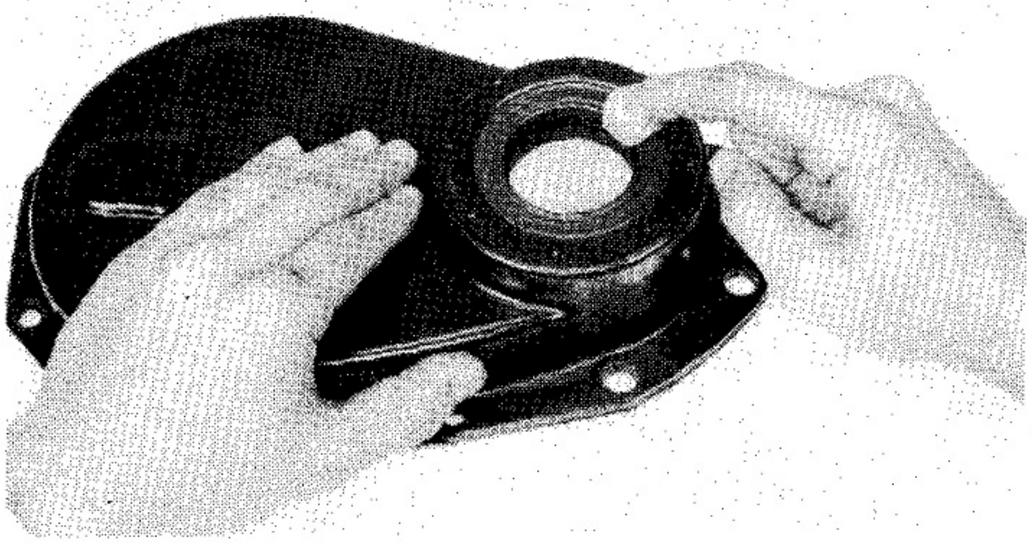


(2) Install a new oil seal with SST.
SST [09515-35010]

– Note –

1. **Drive in the oil seal until it is about even with the timing gear cover.**
2. **Be careful not to drive it in slant wise.**

Fig. 3-82

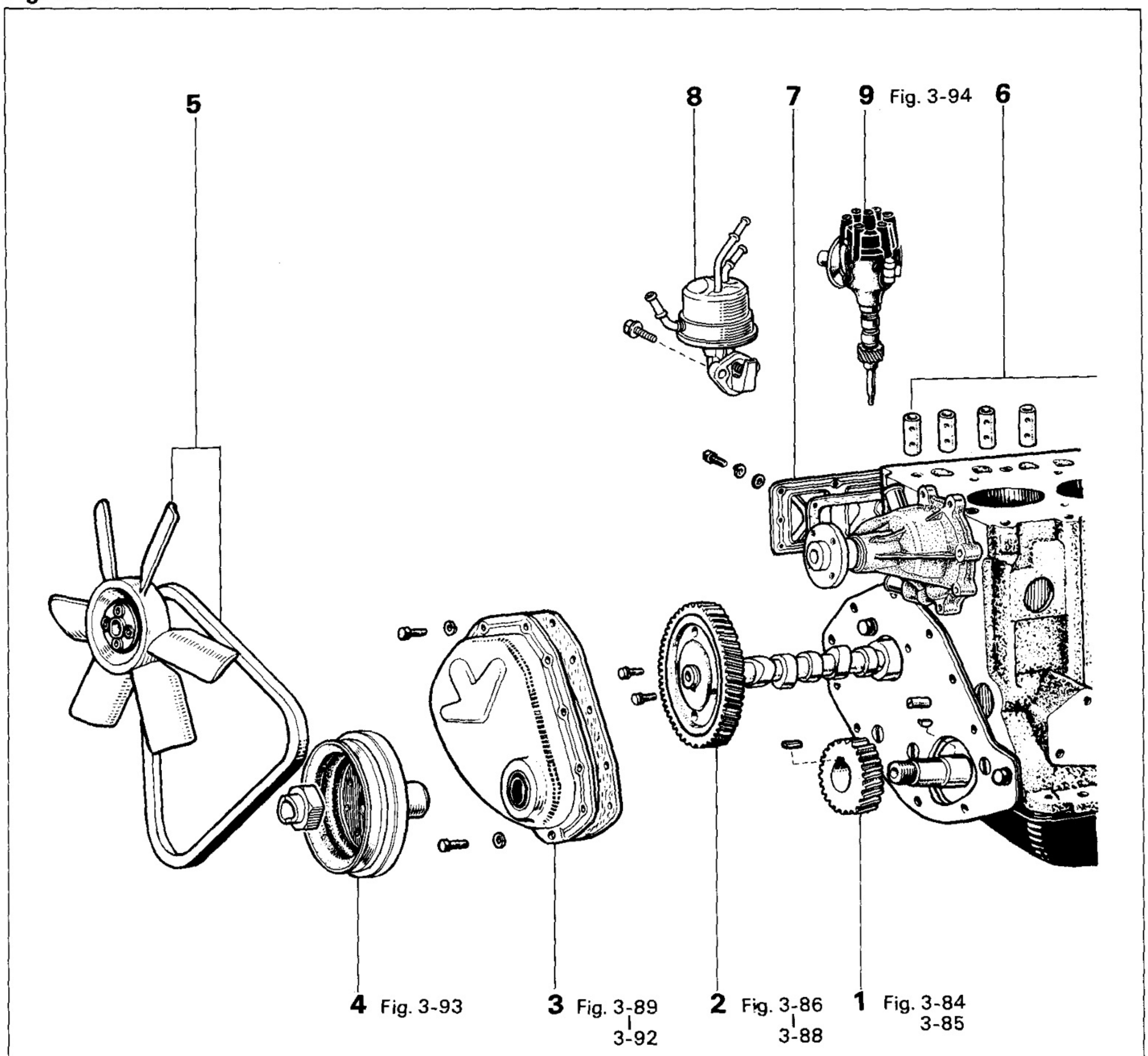


3. After driving in the seal, lightly coat the seal lip with MP grease.

ASSEMBLY

Assemble the parts in the numerical order shown in the figure.

Fig. 3-83



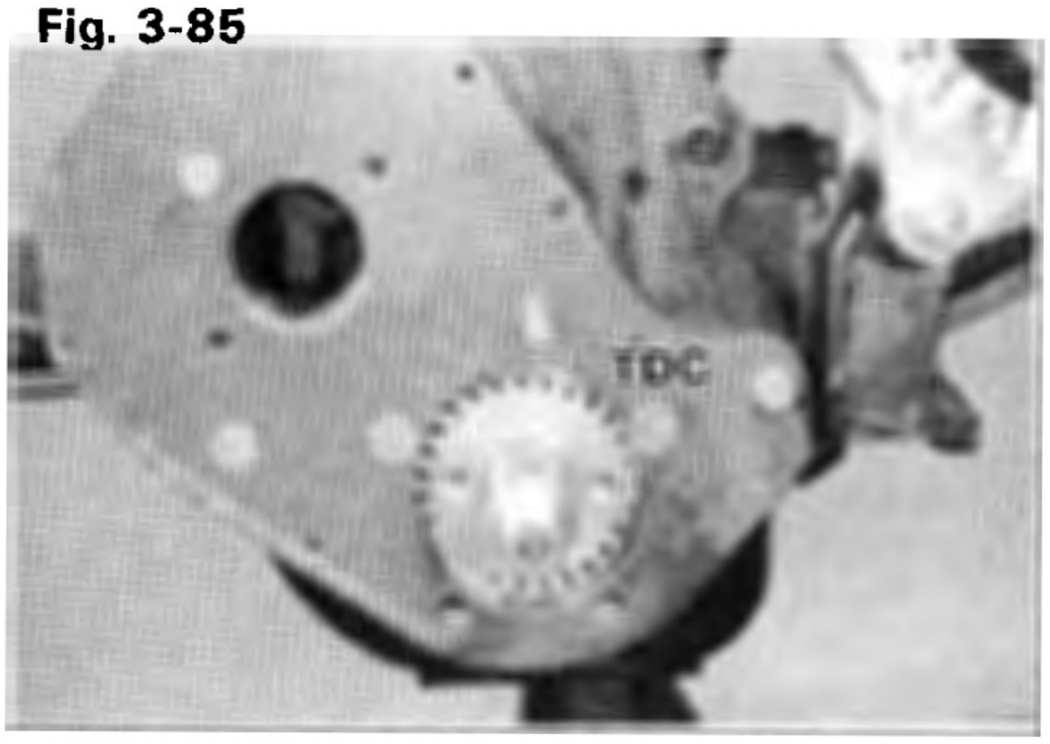
1. Crankshaft Timing Gear
2. Camshaft & Timing Gear
3. Timing Gear Cover
4. Crankshaft Pulley
5. Cooling Fan & Drive Belt
6. Valve Lifter
7. Valve Lifter Cover
8. Fuel Pump
9. Distributor

Fig. 3-84



Drive in the crankshaft timing gear with SST.
SST [09214-60010]

Fig. 3-85



Set No.6 cylinder piston to TDC/compression.

Fig. 3-86

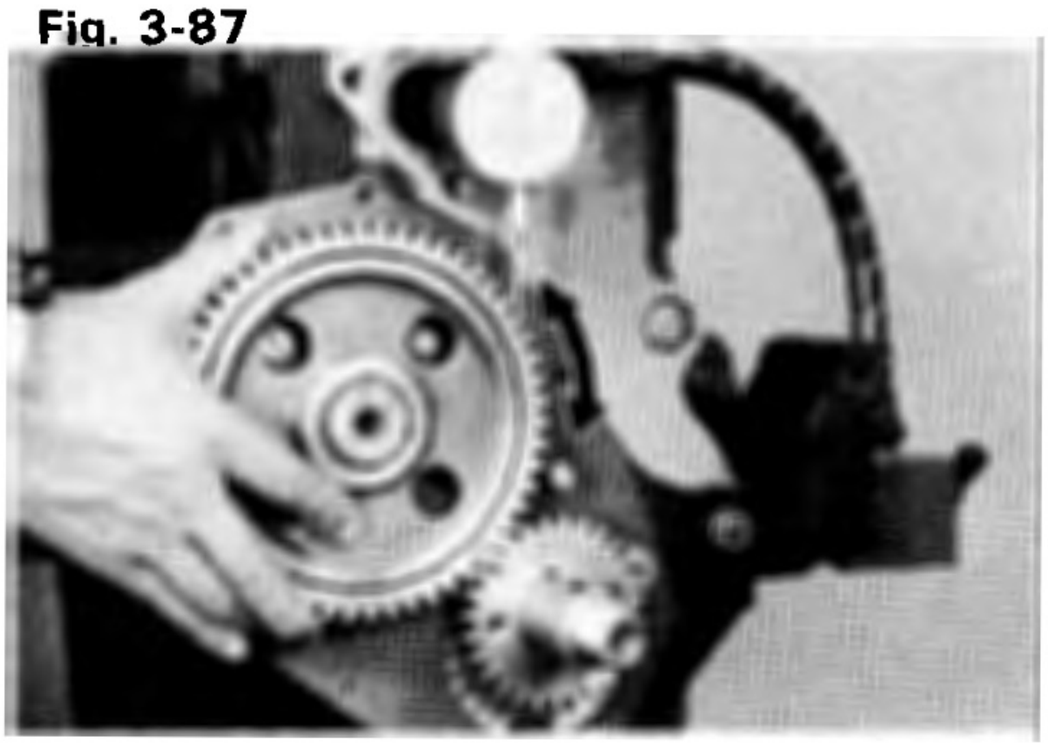


Align the matchmarks and tighten the camshaft thrust plate.

Tightening torque: 1.0 — 1.6 kg-m (8 — 11 ft-lb)

— Note —
At this time, No. 6 cylinder should be at TDC/compression.

Fig. 3-87

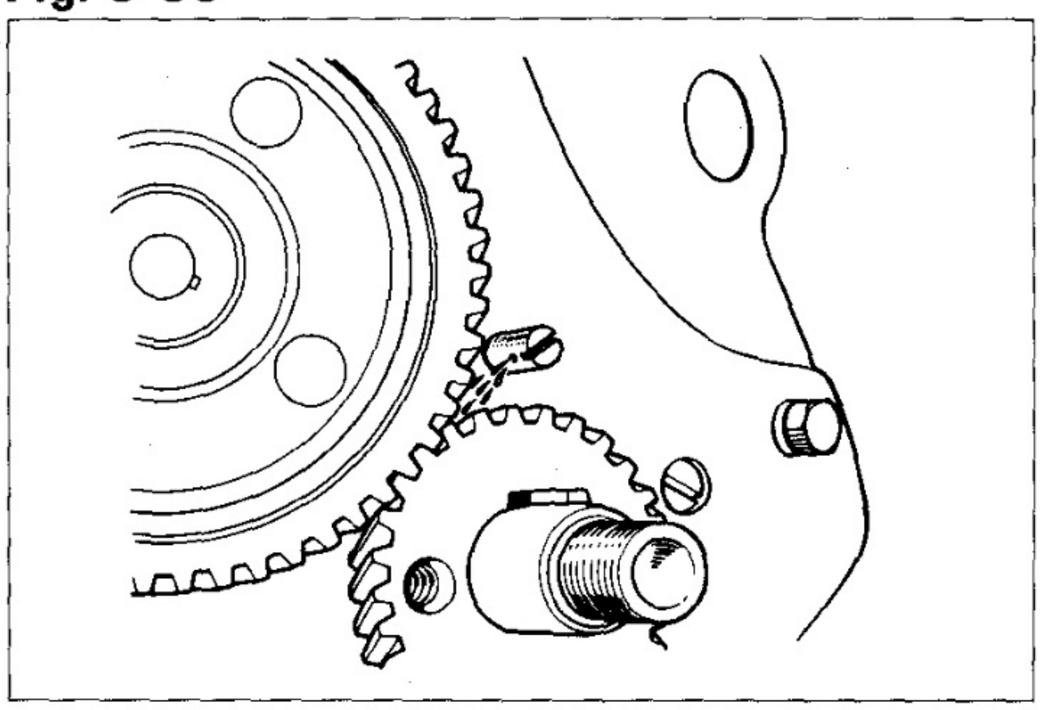


Check the timing gear backlash in several places.

Backlash:

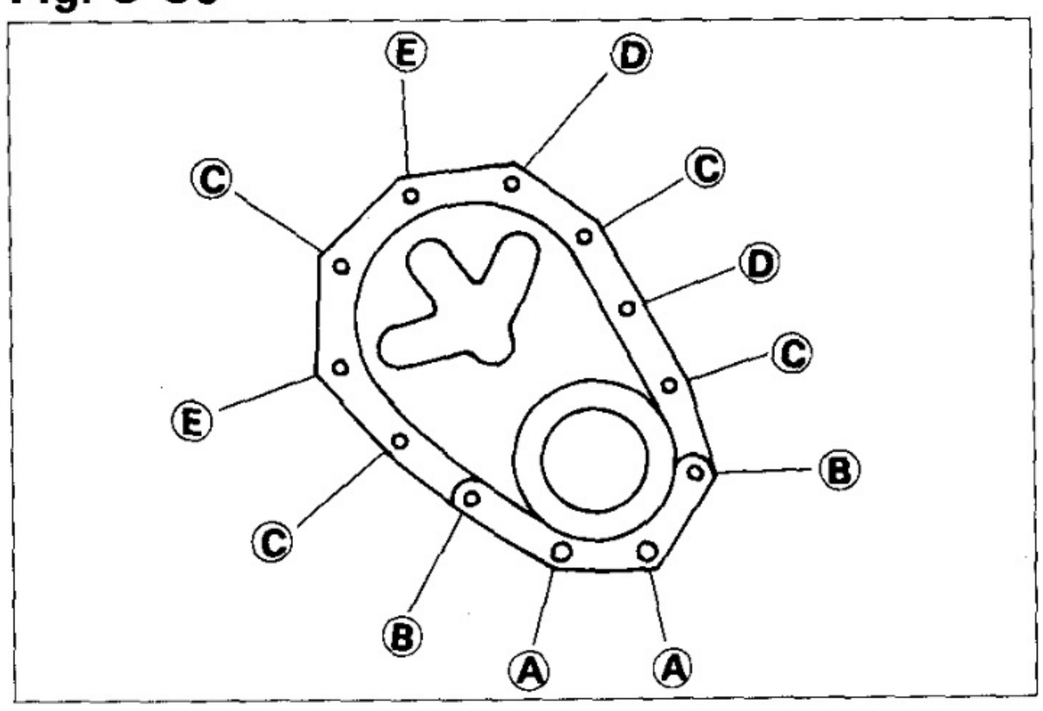
STD	**0.05 — 0.12 mm (0.0020 — 0.0047 in.)**
Limit	**0.2 mm (0.008 in.)**

Fig. 3-88



If the oil nozzle was removed, screw in and stake the plate at two places.
The oil hole should be faced as shown in the figure.

Fig. 3-89



Install the timing gear cover and pulley as follows.

1. Install each bolt referring to the figure and the following chart.

Location	Bolt Length mm (in.)	Location	Bolt Length mm (in.)
A	25 (0.984)	E	w/o Oil Cooler 8 (0.315)
B	12 (0.472)		
C	8 (0.315)		w/ Oil Cooler 16 (0.630)
D	16 (0.630)		

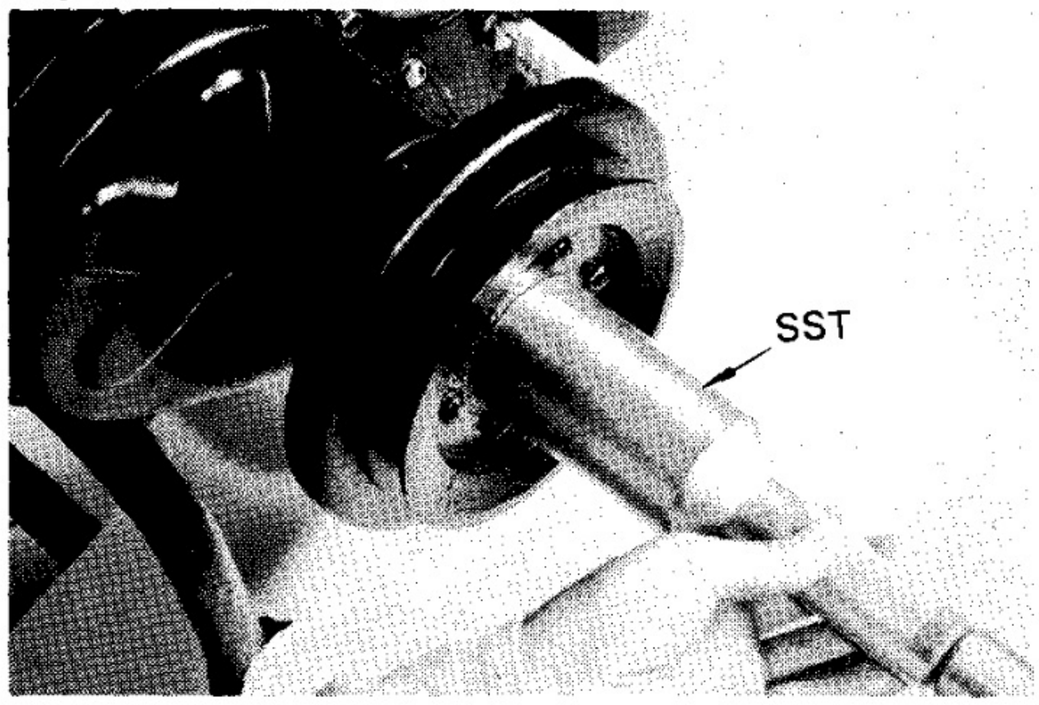
– Note –
Apply liquid sealer onto the bolt threads of Ⓐ.

2. Finger tighten all bolts.

Fig. 3-90

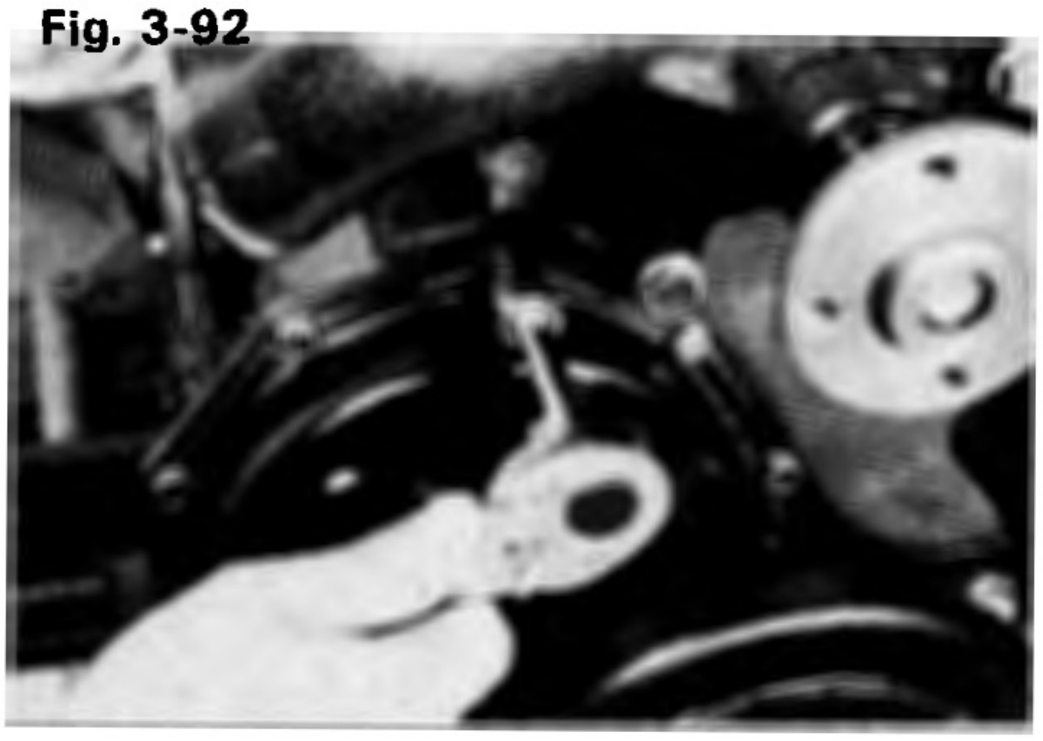


Fig. 3-91



3. Drive in the pulley with SST to position the timing gear cover correctly.
SST [09214-60010]

Fig. 3-92



4. After installing the pulley, tighten the cover bolts.

Tightening torque:
6 mm bolt 0.6 – 0.8 kg-m (53 – 69 in.-lb)
10 mm bolt 1.6 – 2.4 kg-m (12 – 17 ft-lb)

Fig. 3-93



5. Tighten the claw nut.

Tightening torque:
16.0 – 20.0 kg-m (116 – 144 ft-lb)

– Note –
Apply a light coat of engine oil on the nut before installing.

Fig. 3-94

SEE

IGNITION SYSTEM DISTRIBUTOR

INSTALLATION SECTION

Figs. 8-79 to 8-86

OR

Figs. 8-87 to 8-93

Install the distributor.

CYLINDER BLOCK

DISASSEMBLY

Disassemble the parts in the numerical order shown in the figure.

Fig. 3-95

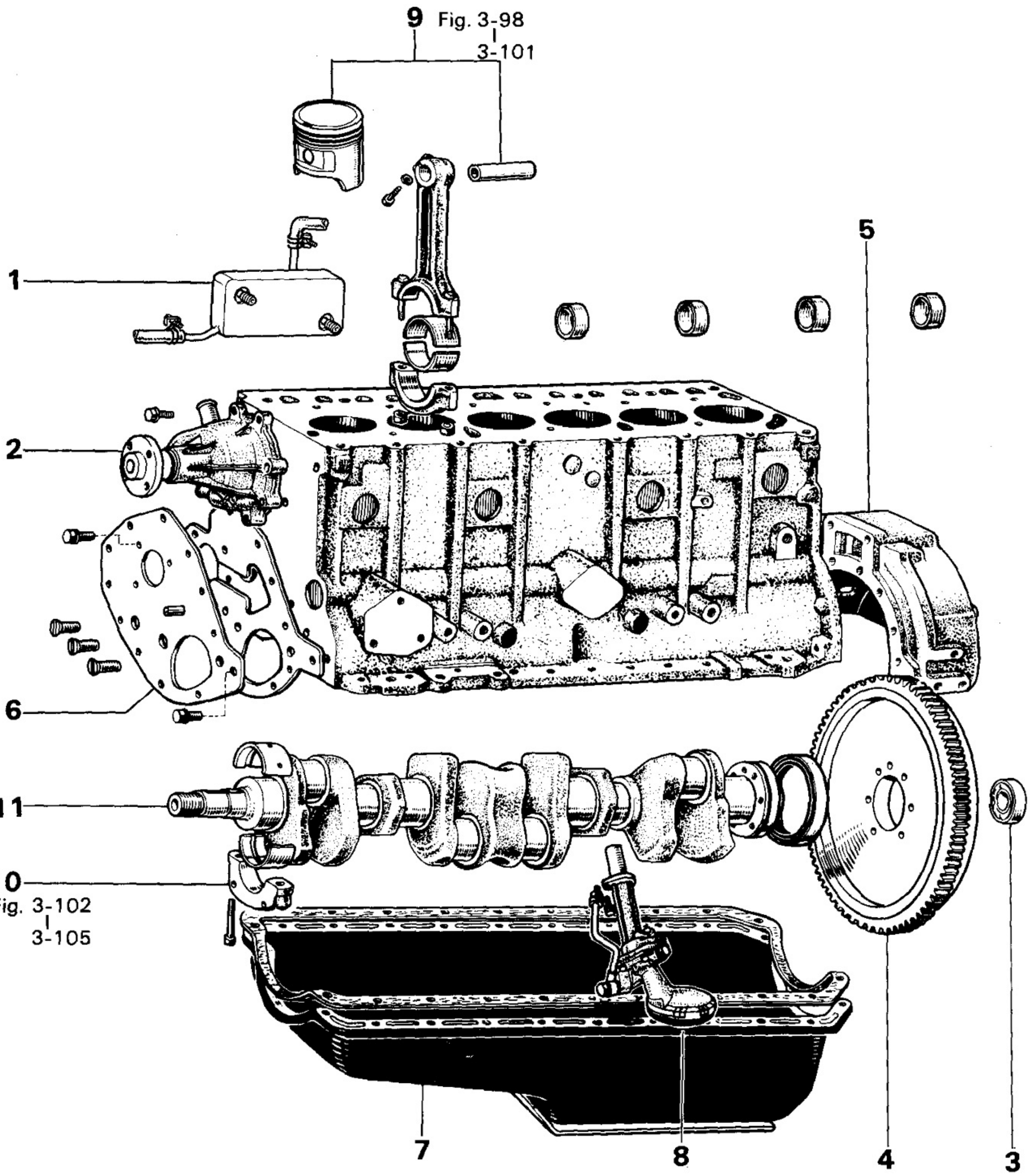
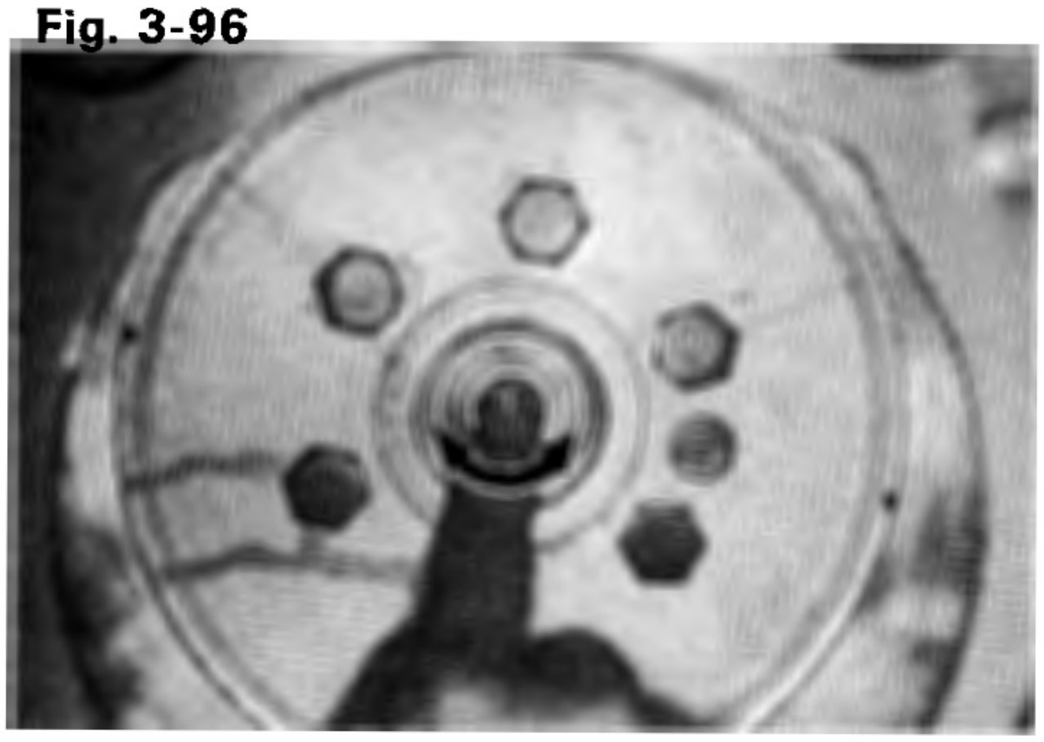


Fig. 3-96
3-97

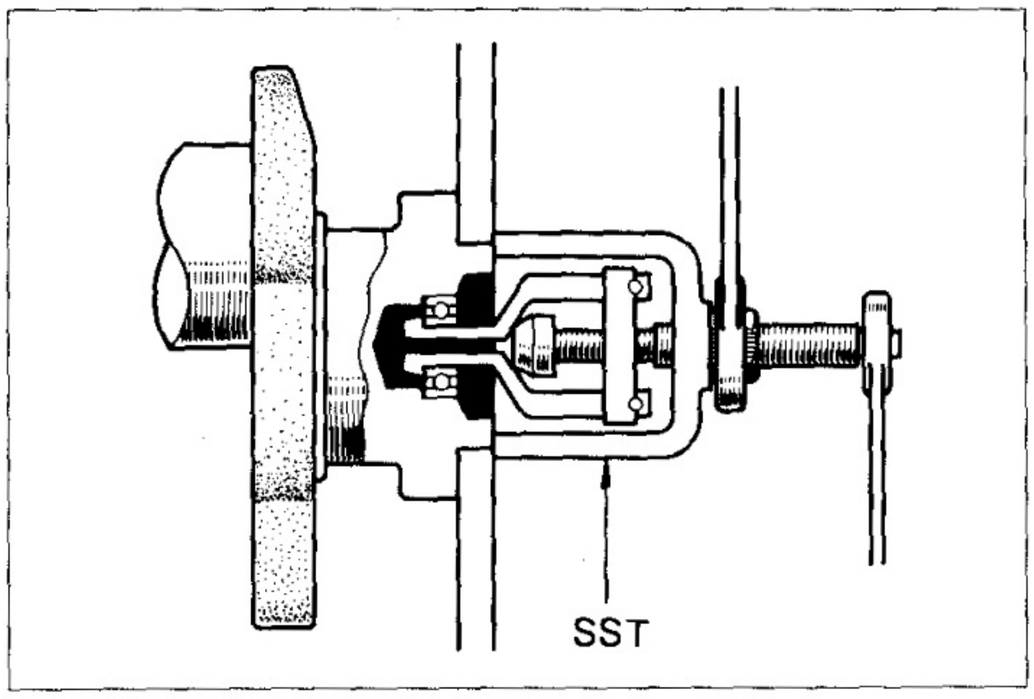
1. Oil Cooler
2. Water Pump
3. Input Shaft Bearing
4. Flywheel
5. Flywheel Housing
6. Front End Plate
7. Oil Pan
8. Oil Pump
9. Piston & Connecting Rod
10. Crankshaft Bearing Cap
11. Crankshaft

Fig. 3-96



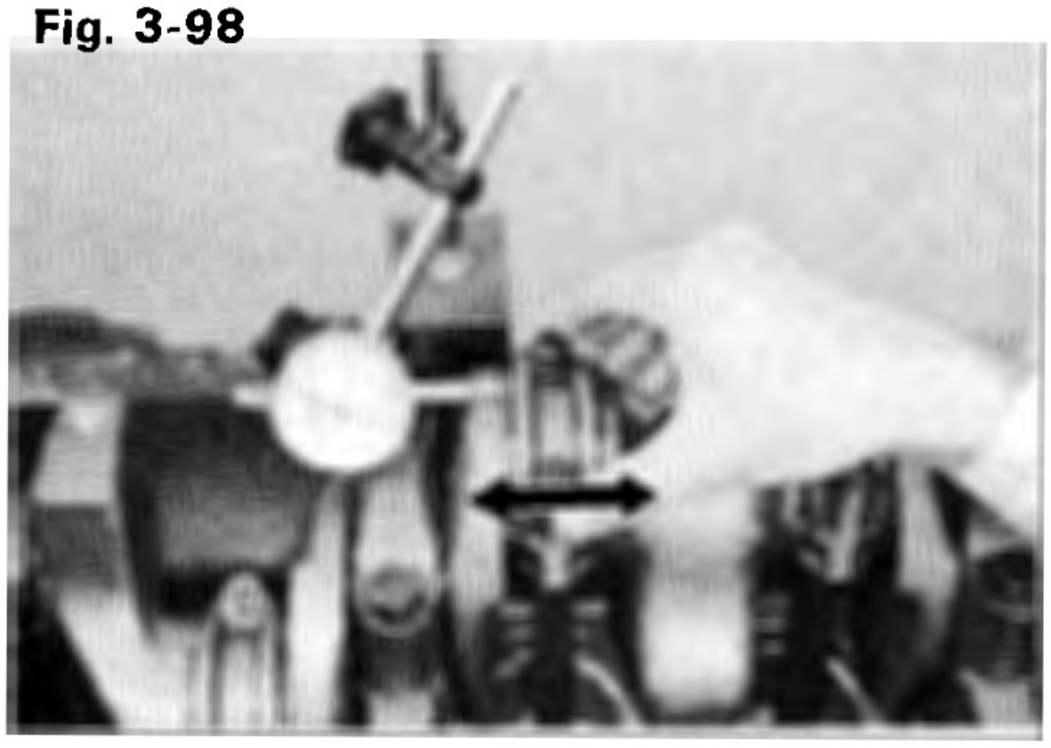
Check the input shaft bearing for wear or damage.
Check to see that there is no drag on the bearing when it is turned.

Fig. 3-97



If necessary, remove the input shaft bearing with SST.
SST [09303-55010]

Fig. 3-98



Measure the connecting rod thrust clearance. If it exceeds the limit, replace the connecting rod.

Thrust clearance:

STD	**0.08 – 0.24 mm (0.0031 – 0.0094 in.)**
Limit	**0.3 mm (0.012 in.)**

Fig. 3-99



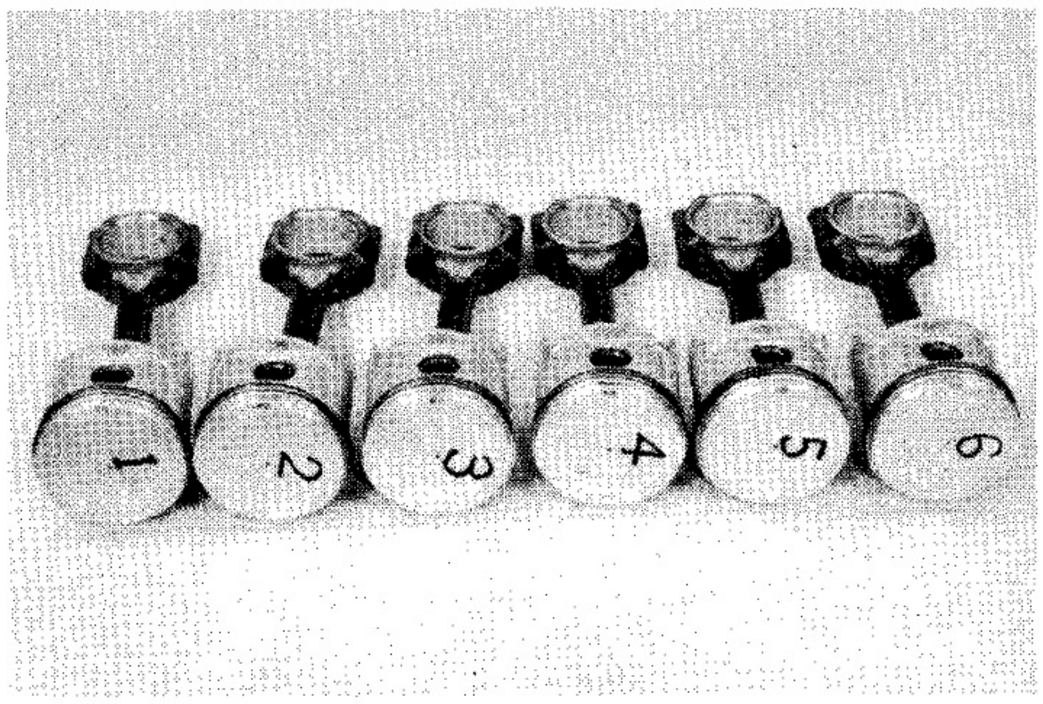
Place matchmarks on the cap and connecting rod.

Fig. 3-100



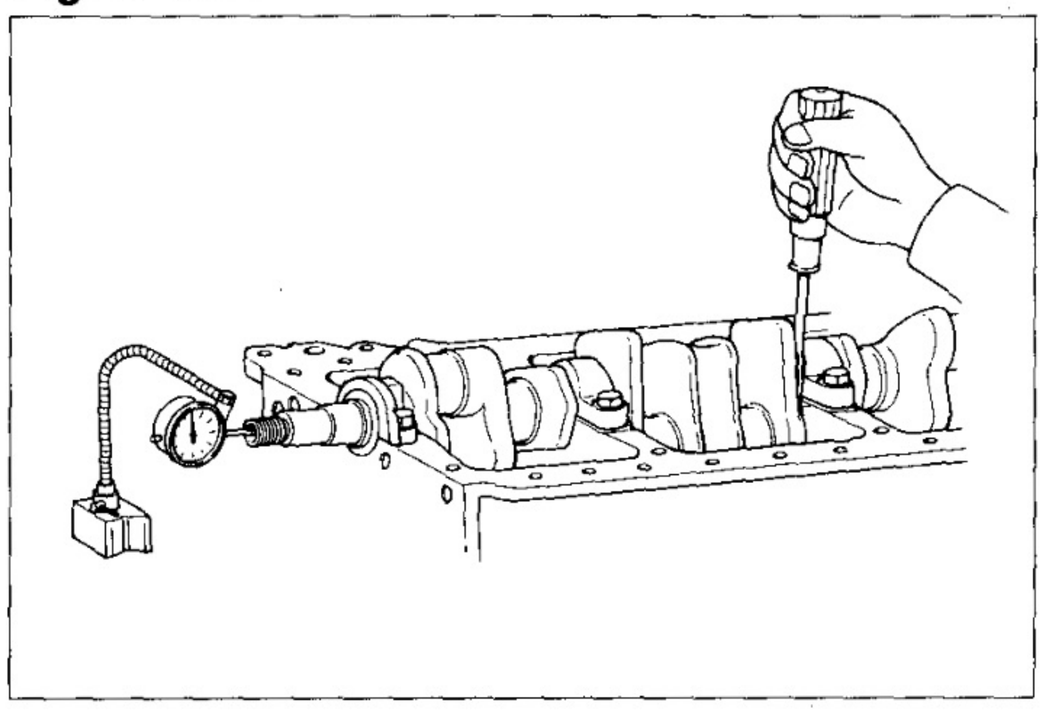
⚠ Cover the rod bolts with short pieces of hose to protect the crankshaft from damage.

Fig. 3-101



⚠ Keep the pistons and connecting rod caps in correct order.

Fig. 3-102

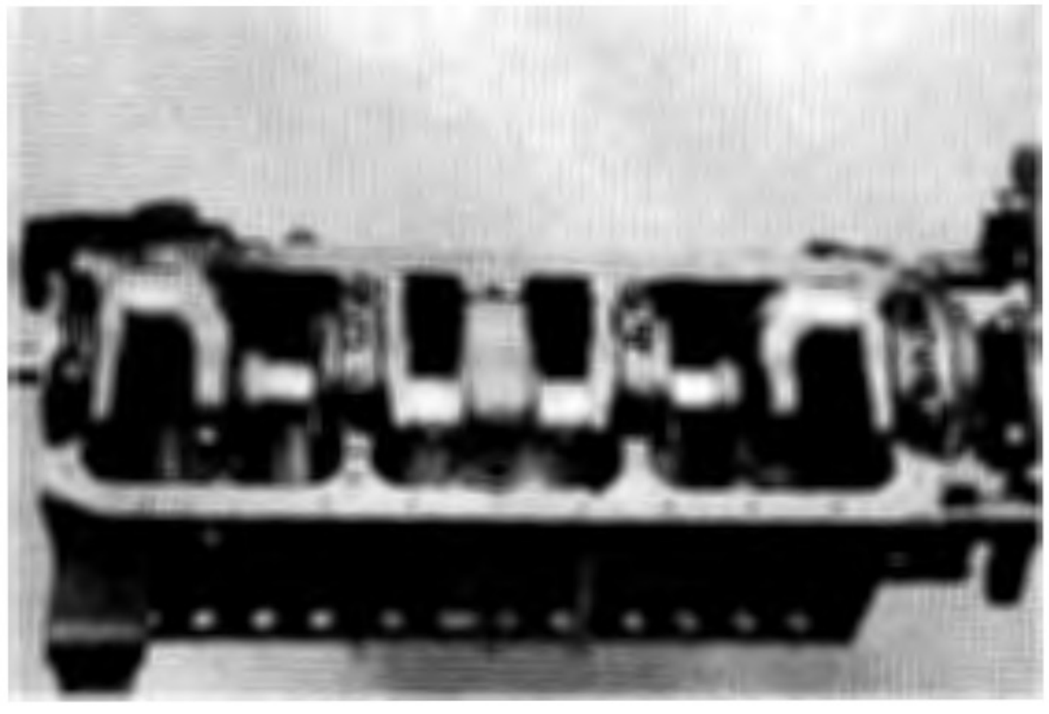


Measure the crankshaft thrust clearance.
If it exceeds the limit, replace the No.3 bearing as a set.

Thrust clearance:

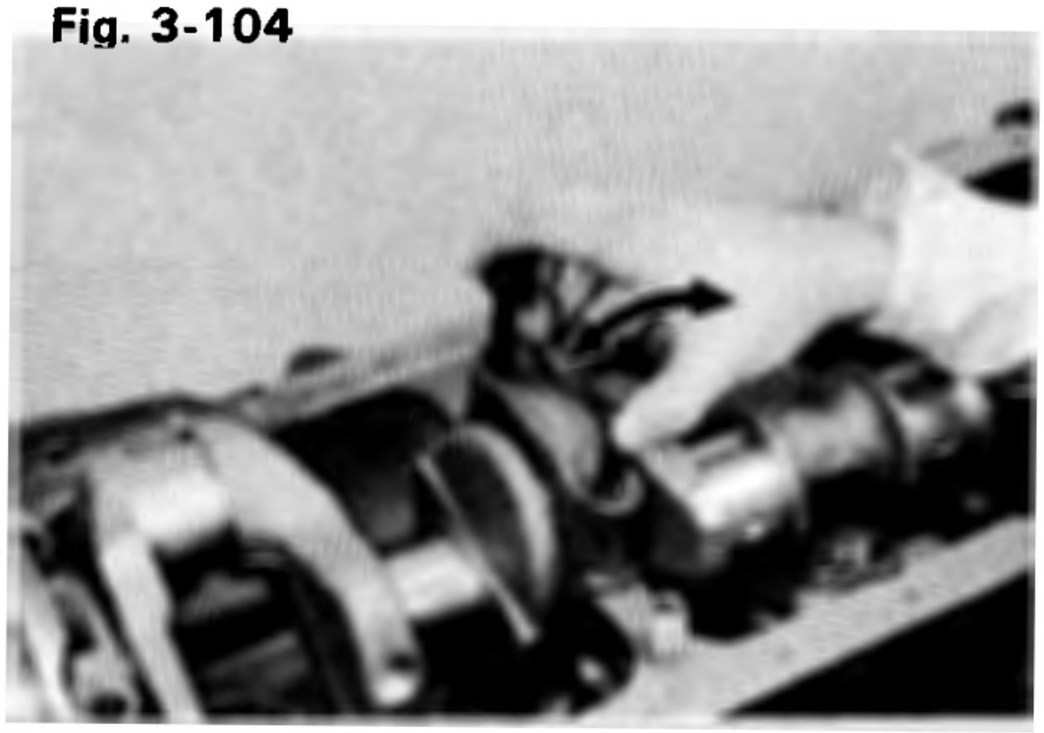
STD	**0.06 – 0.16 mm (0.0024 – 0.0063 in.)**
Limit	**0.3 mm (0.012 in.)**

Fig. 3-103



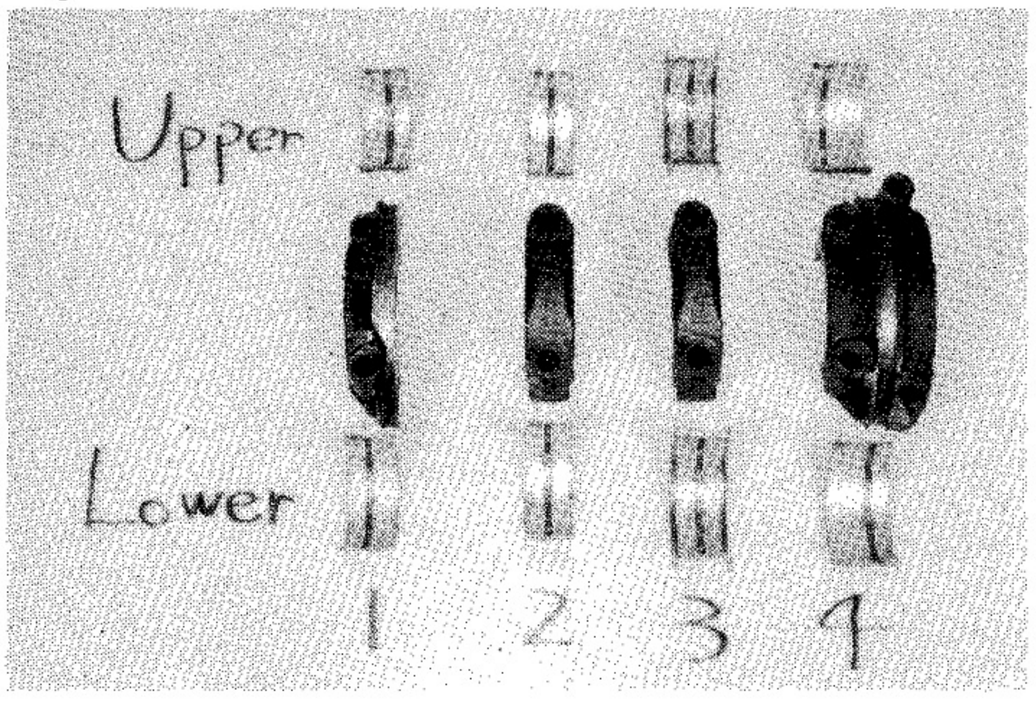
⚠ Loosen each crankshaft bearing bolt a little at a time in the sequence shown in the figure.

Fig. 3-104



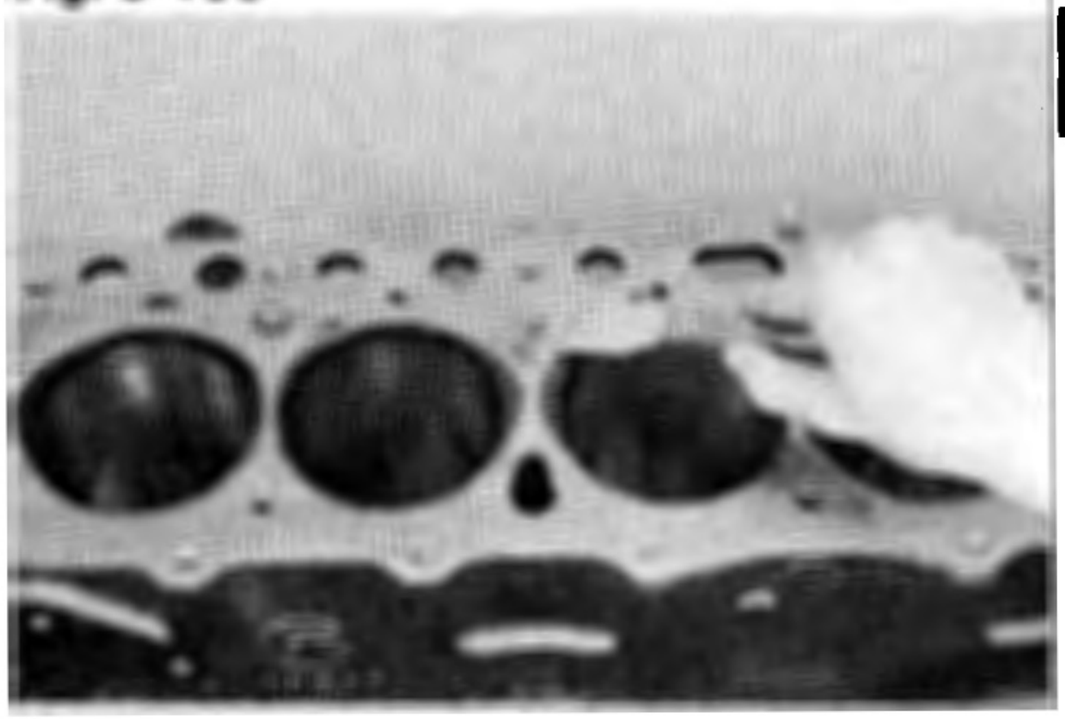
If the crankshaft bearing cap will not come off, remove it by raising the bolts and prying fore and aft.

Fig. 3-105



Keep the crankshaft bearings and caps in correct order.

Fig. 3-106

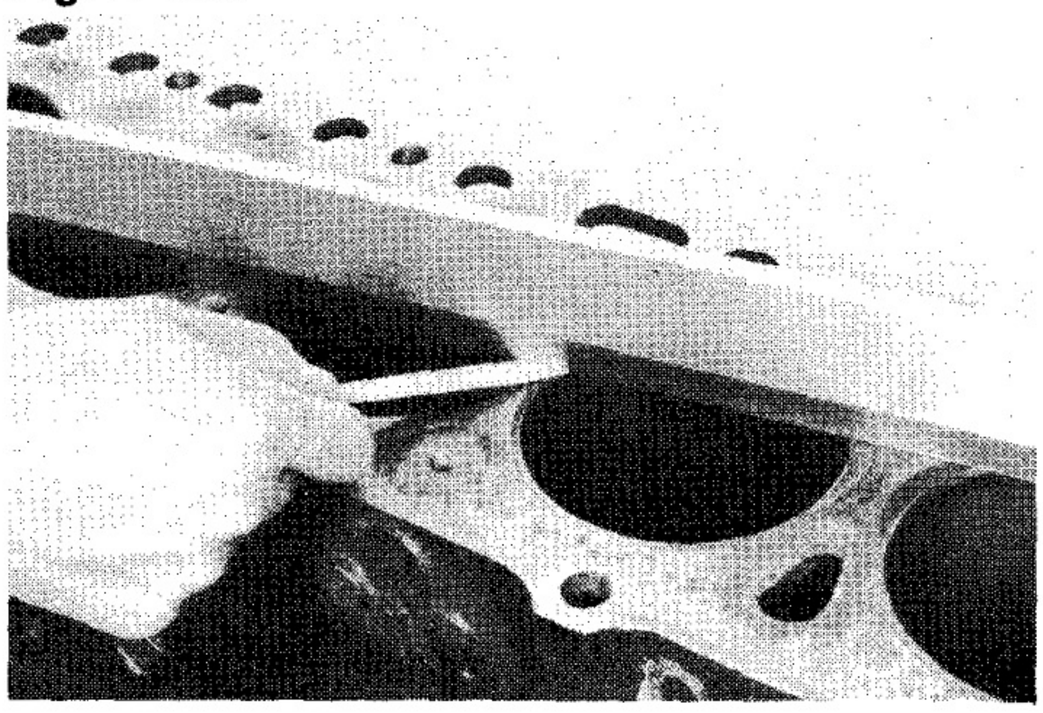


INSPECTION & REPAIR

Cylinder Block

1. Clean the cylinder block and check for cracks or scores.

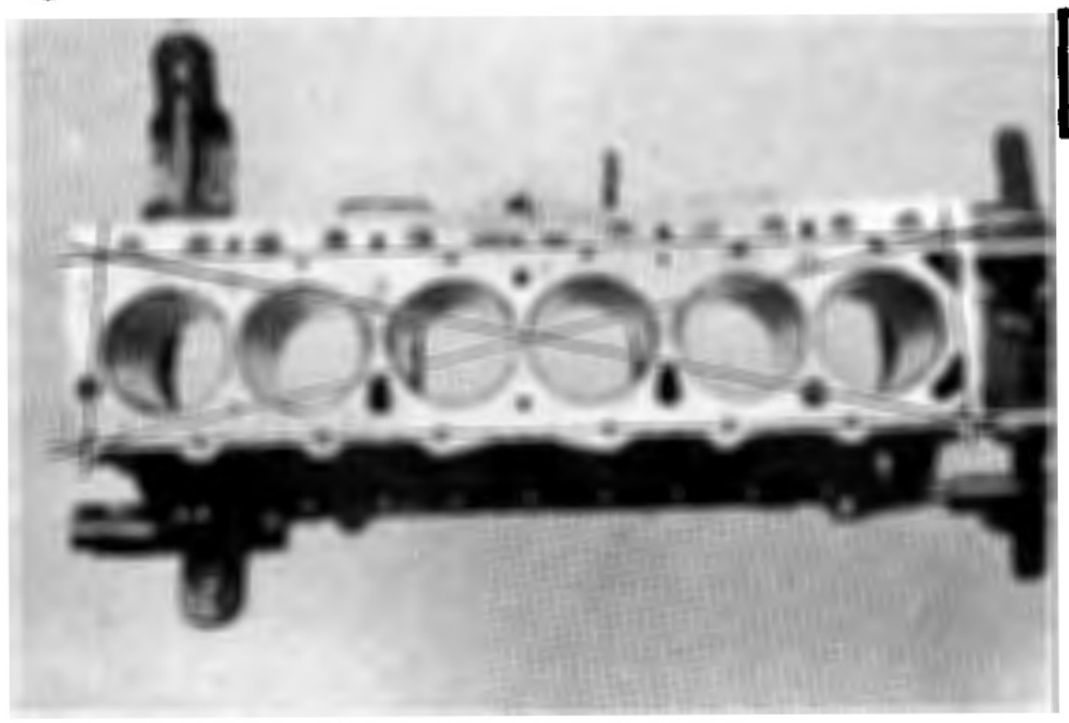
Fig. 3-107



2. Using a precision straight edge and thickness gauge, check the cylinder block topside surface for warpage.

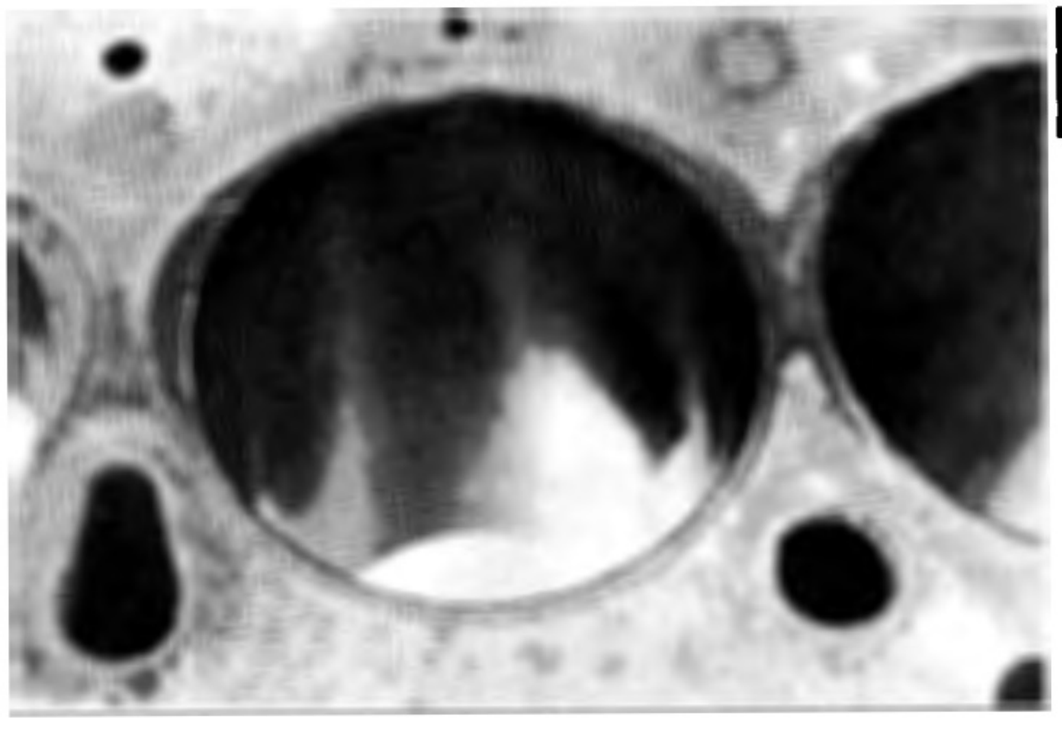
Topside surface warpage:
Limit
0.15 mm
(0.0059 in.)

Fig. 3-108



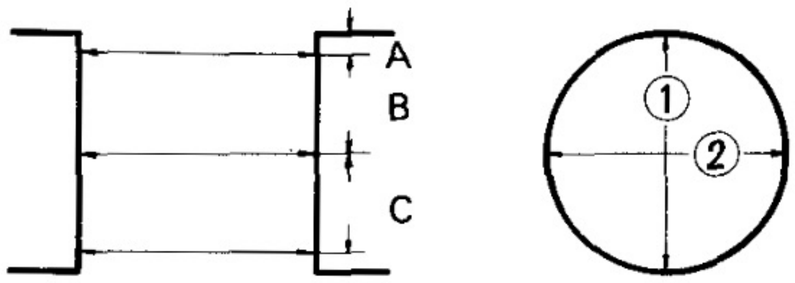
3. Check for warpage along the indicated lines.

Fig. 3-109



4. Visually check the cylinder for vertical scratches. If deep scratches are present, the cylinder must be rebored.

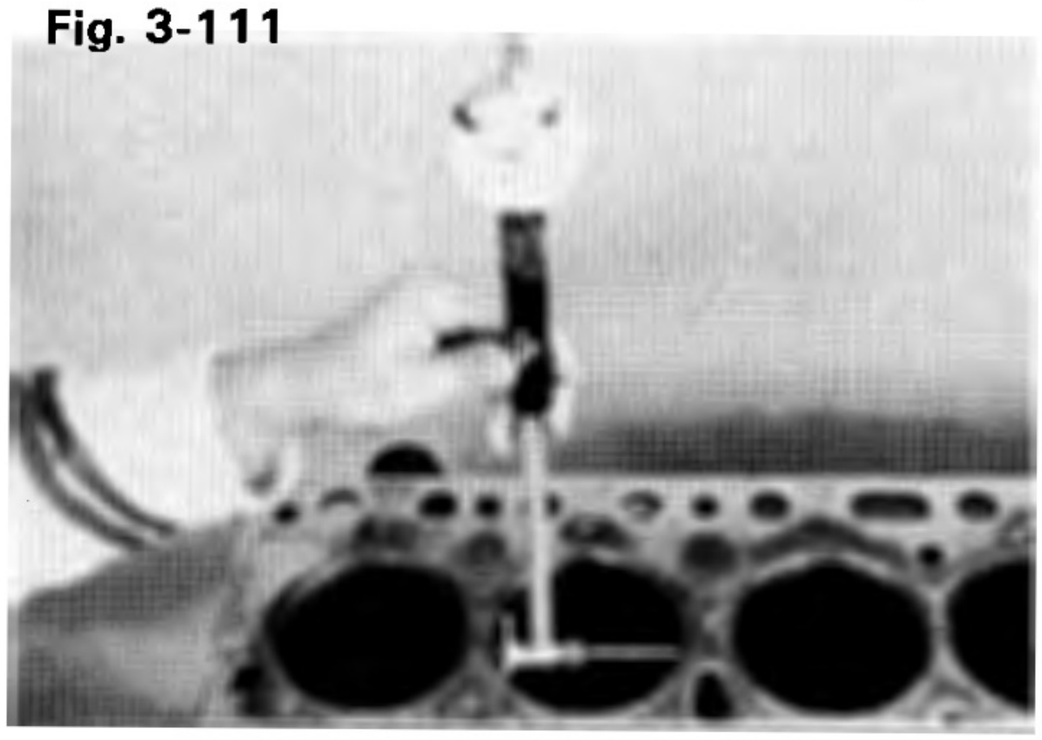
Fig. 3-110



A : 15 mm (0.59in.)
B : 60 mm (2.36in.) ① : Thrust Direction
C : 60 mm (2.36in.) ② : Axial Direction

5. Measure the cylinder bore at the position shown in the figure.

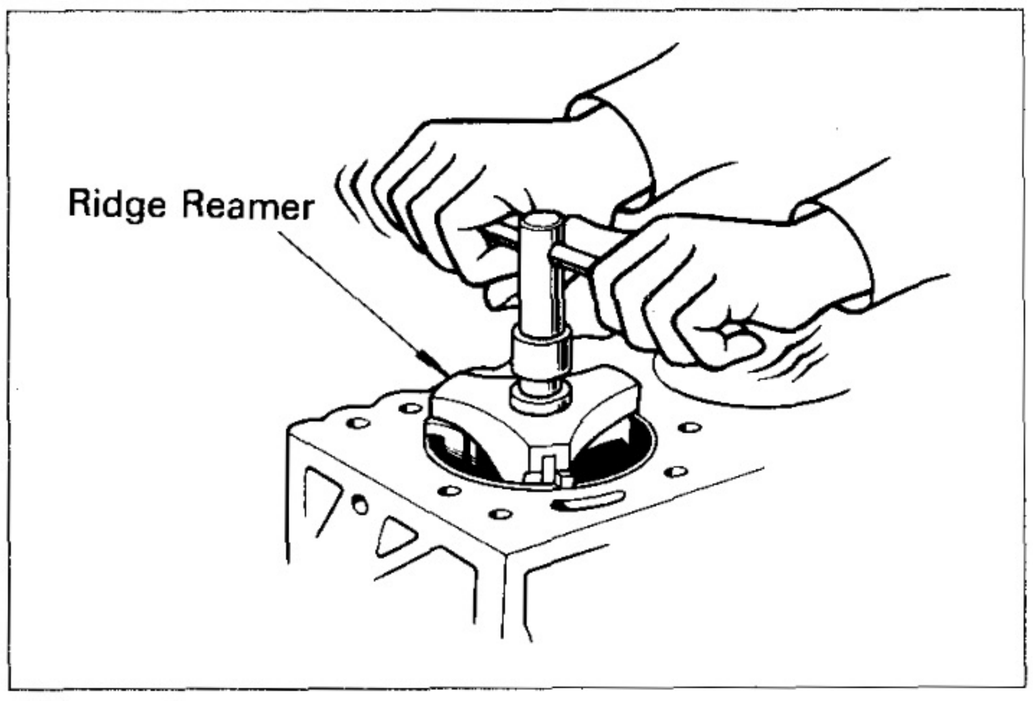
Fig. 3-111



6. If the bore exceeds specification, it must be rebored.

Cylinder bore:
STD 94.00 – 94.05 mm (3.7008 – 3.7027 in.)
Wear:
Limit 0.2 mm (0.008 in.)
Taper and out-of-round:
Limit 0.02 mm (0.0008 in.)
Difference of bore limit between each cylinder:
Less than 0.05 mm (0.0020 in.)

Fig. 3-112



7. If the wear is less than 0.2 mm (0.008 in.), use a ridge reamer to machine the piston ring ridge at the top of the cylinder.

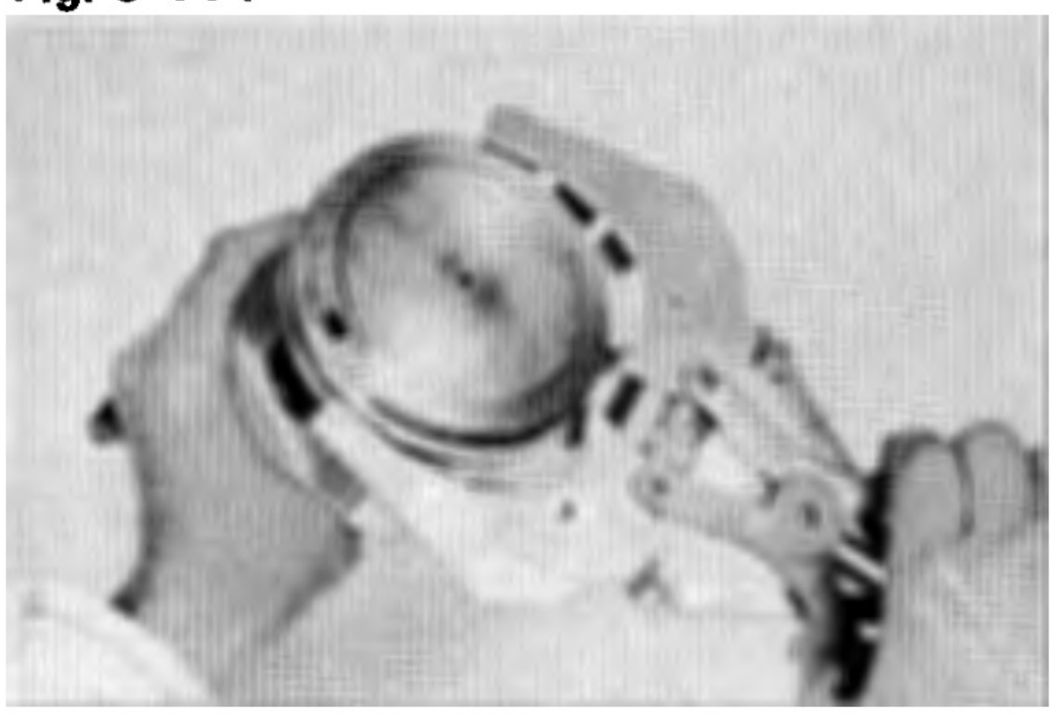
Fig. 3-113



Piston Pin & Connecting Rod

1. Try to move the piston back and forth on the piston pin.
   If any movement is felt, replace the piston and pin.

Fig. 3-114



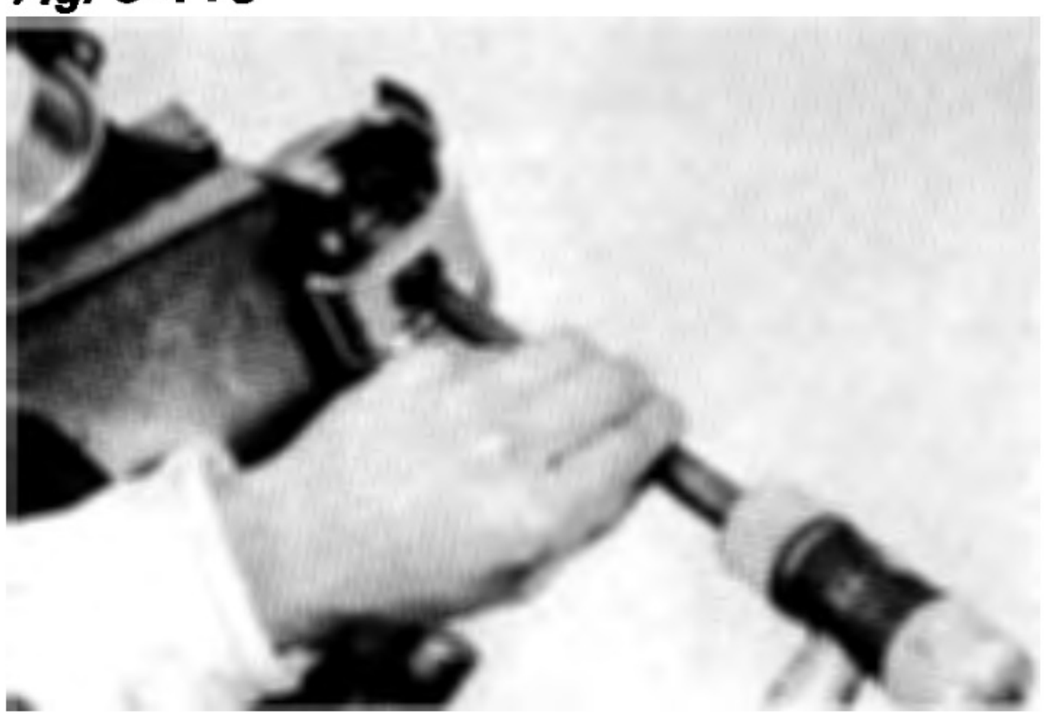
2. Remove the piston ring with a piston ring expander.

Fig. 3-115



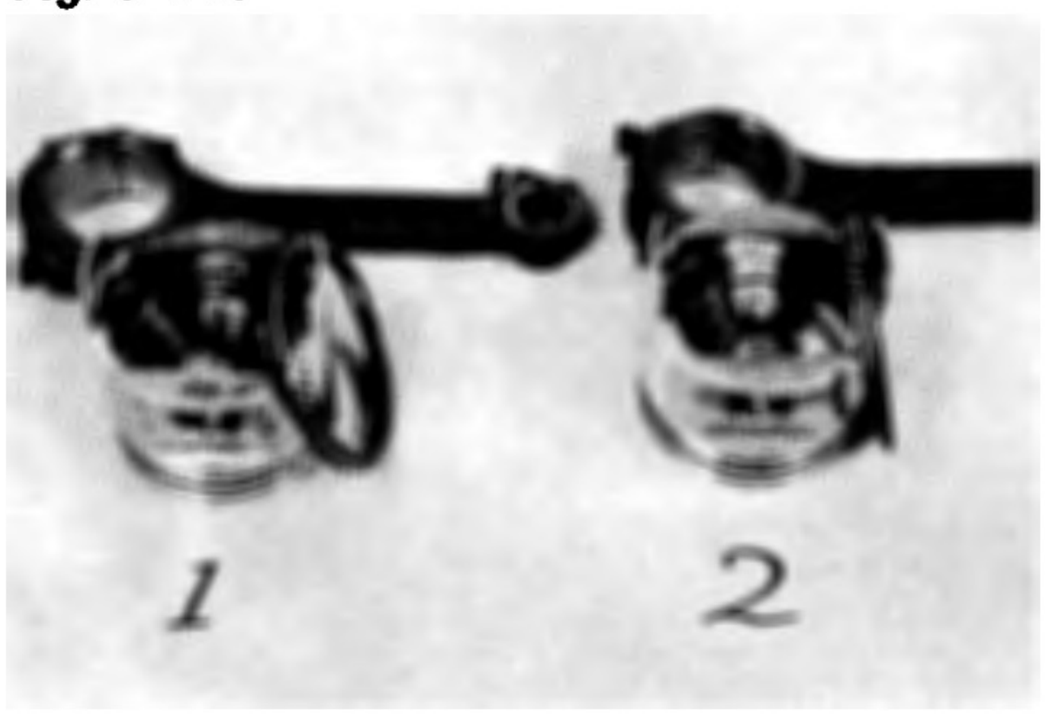
3. Remove the piston pin bolt.

Fig. 3-116



4. Push out the piston pin.

Fig. 3-117



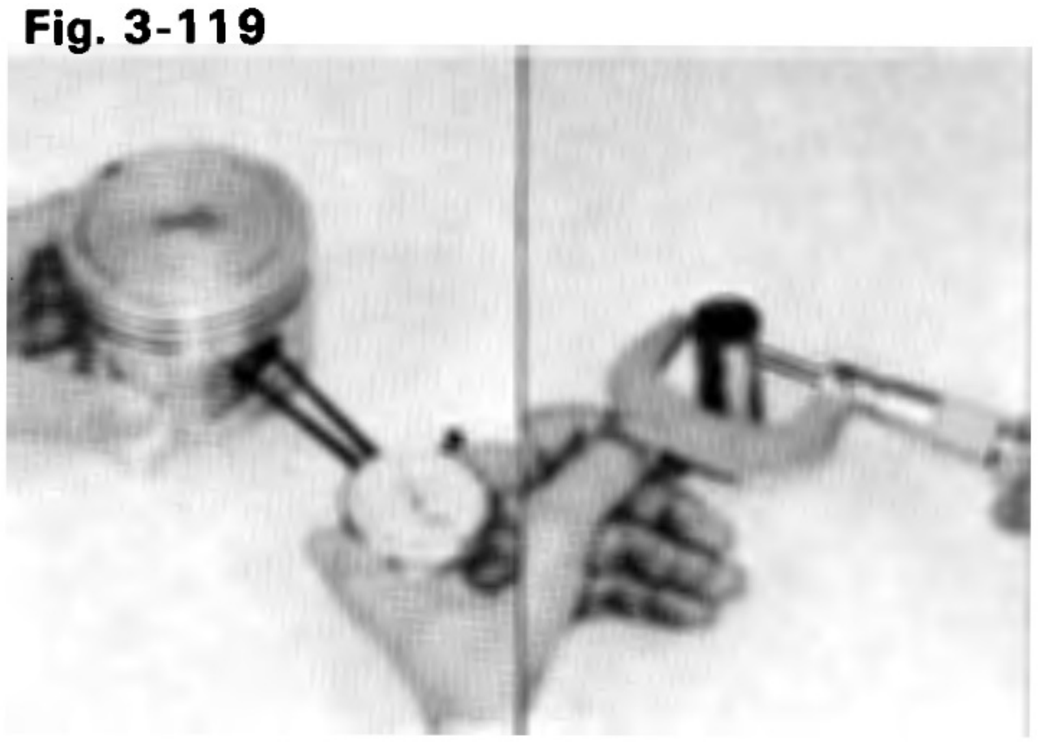
5. After disassembly, arrange the parts in correct order.

Fig. 3-118



6. Check the piston pin fitness.
Coat the pin with engine oil.
It should then be possible to push the pin into the piston hole with thumb pressure.

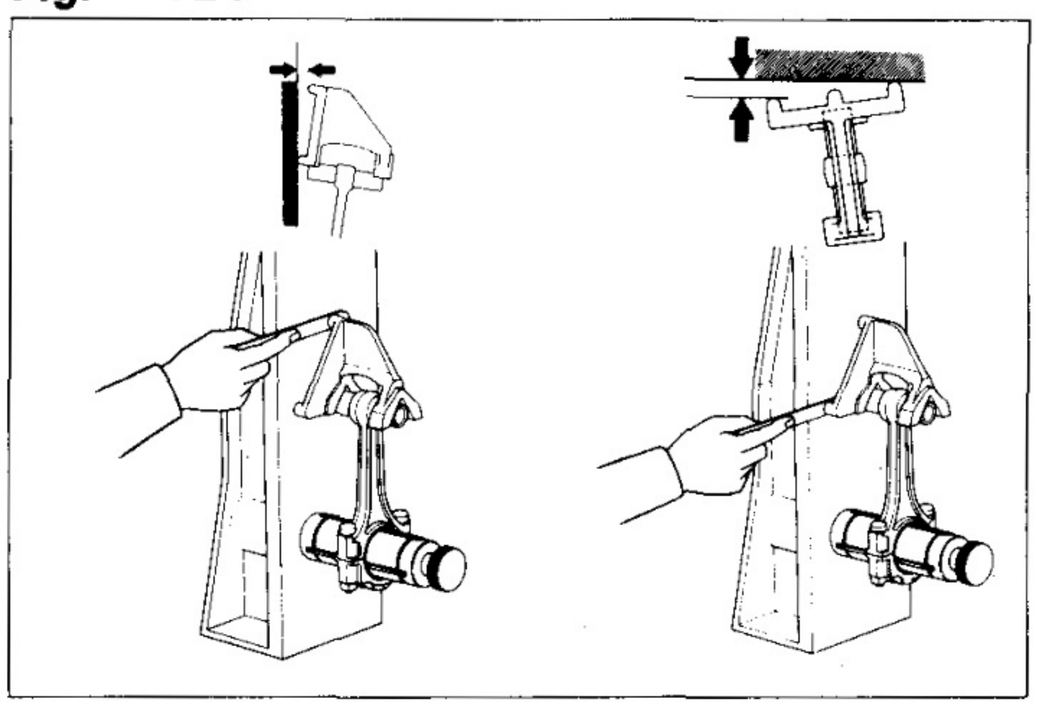
Fig. 3-119



7. Measure the oil clearance between the piston and piston pin. If it exceeds the limit, replace the piston and pin as a set.

Oil clearance:
STD 0.008 – 0.012 mm (0.0003 – 0.0005 in.)
Limit 0.07 mm (0.0028 in.)

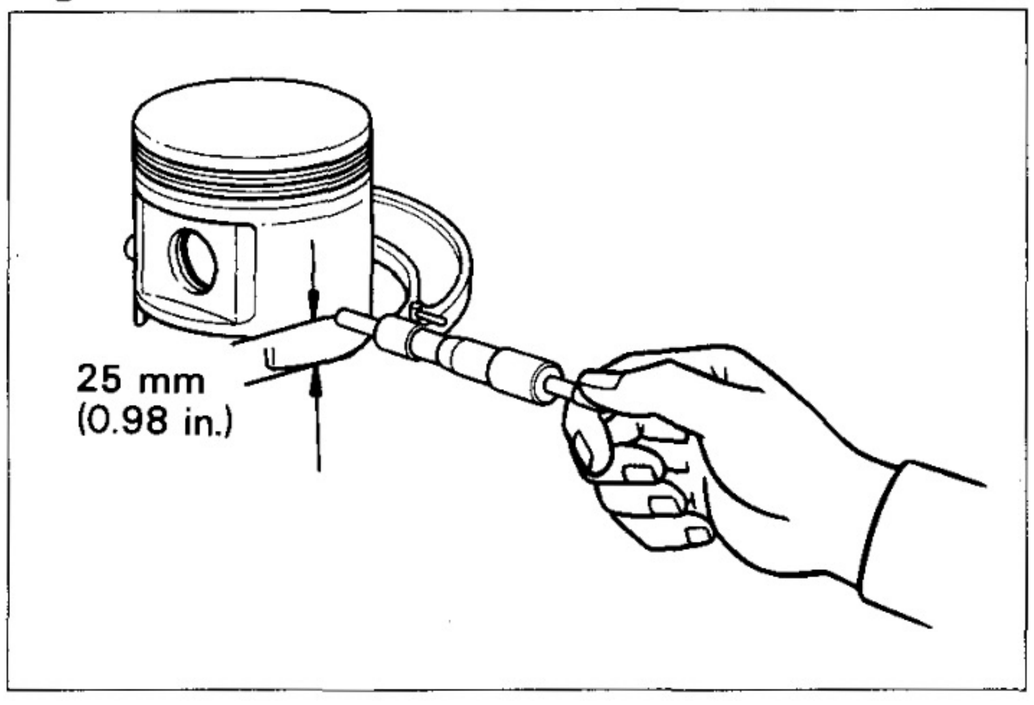
Fig. 3-120



8. Check the connecting rod for bending or twisting.

Bend per 100 mm (3.94 in.):
Limit 0.05 mm (0.0020 in.)
Twist per 100 mm (3.94 in.):
Limit 0.15 mm (0.0059 in.)

Fig. 3-121

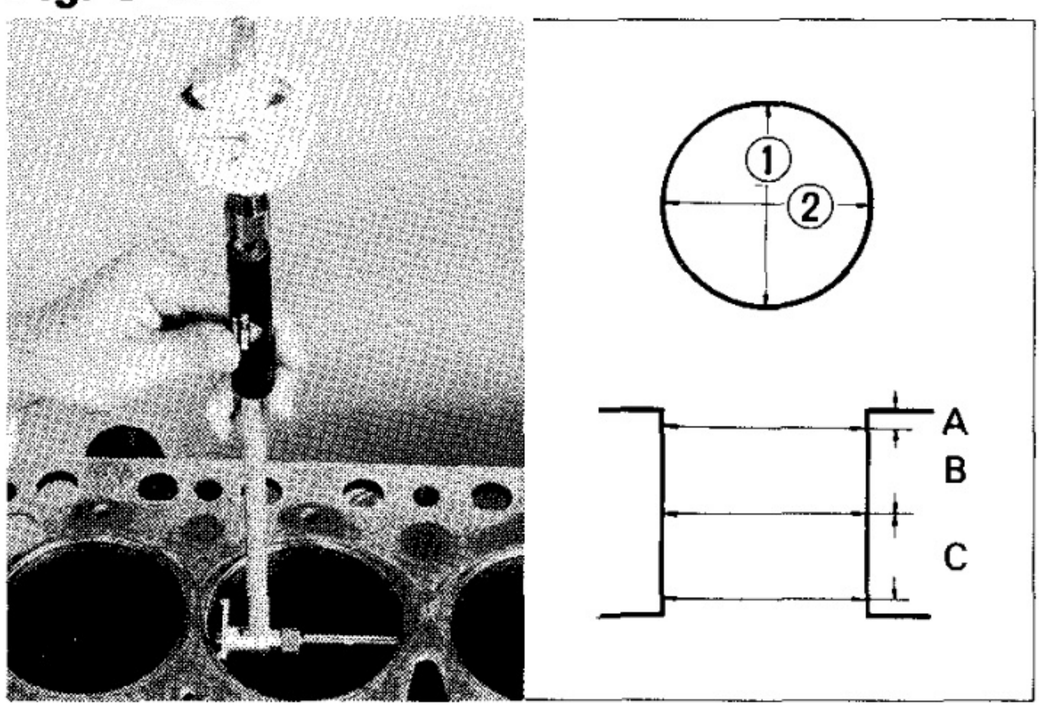


Piston Clearance

1. Measure the piston diameter at right angle to the piston pin center line.
Measurement must be made at room temperature (20°C or 68°F).

Piston diameter:
STD 93.96 – 94.01 mm (3.6992 – 3.7012 in.)

Fig. 3-122

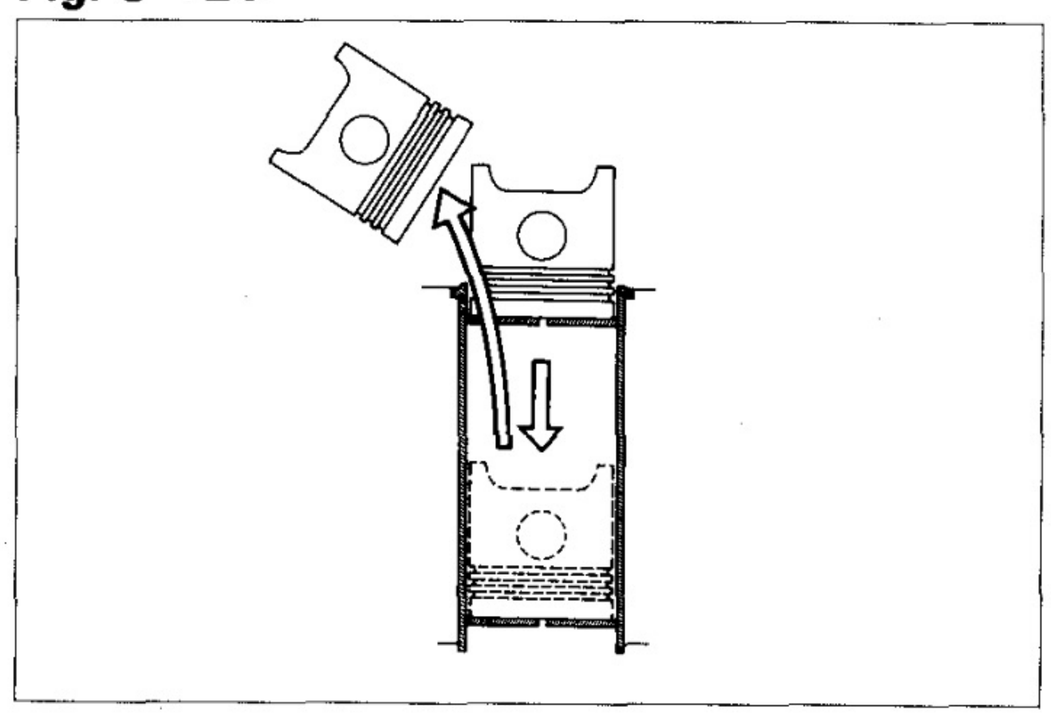


2. Measure the cylinder bore and subtract the piston measurment. If clearance exceeds specification, replace the piston.

Piston oil clearance:
STD 0.03 – 0.05 mm
(0.0012 – 0.0020 in.)

– Note –
Use the measurement where the wear is at maximum.

Fig. 3-123



Piston Ring

1. Measure the ring end gap.
   (1) Using a piston, insert the ring into the cylinder. Position the ring at the lower part of the cylinder bore.

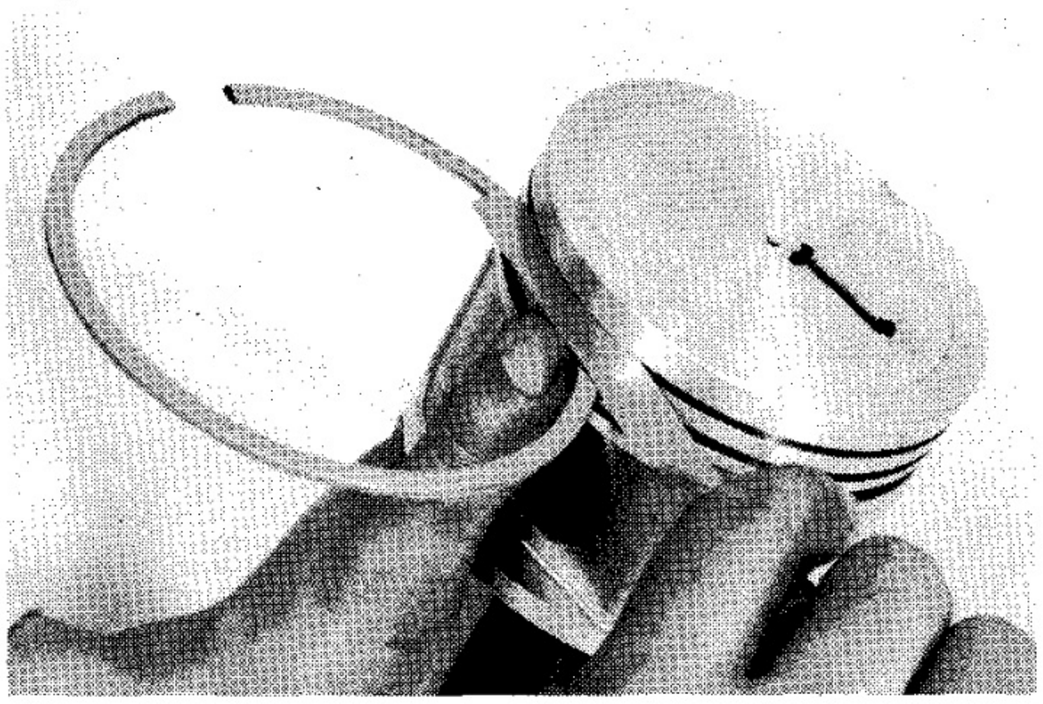
Fig. 3-124



   (2) Measure the end gap. If it exceeds specification, the ring must be replaced.

End gap:
No.1 0.20 – 0.56 mm
(0.0079 – 0.0220 in.)
No.2 0.20 – 0.58 mm
(0.0079 – 0.0228 in.)
Oil
NP 0.20 – 0.88 mm
(0.0079 – 0.0346 in.)
Riken 0.20 – 0.58 mm
(0.0079 – 0.0228 in.)

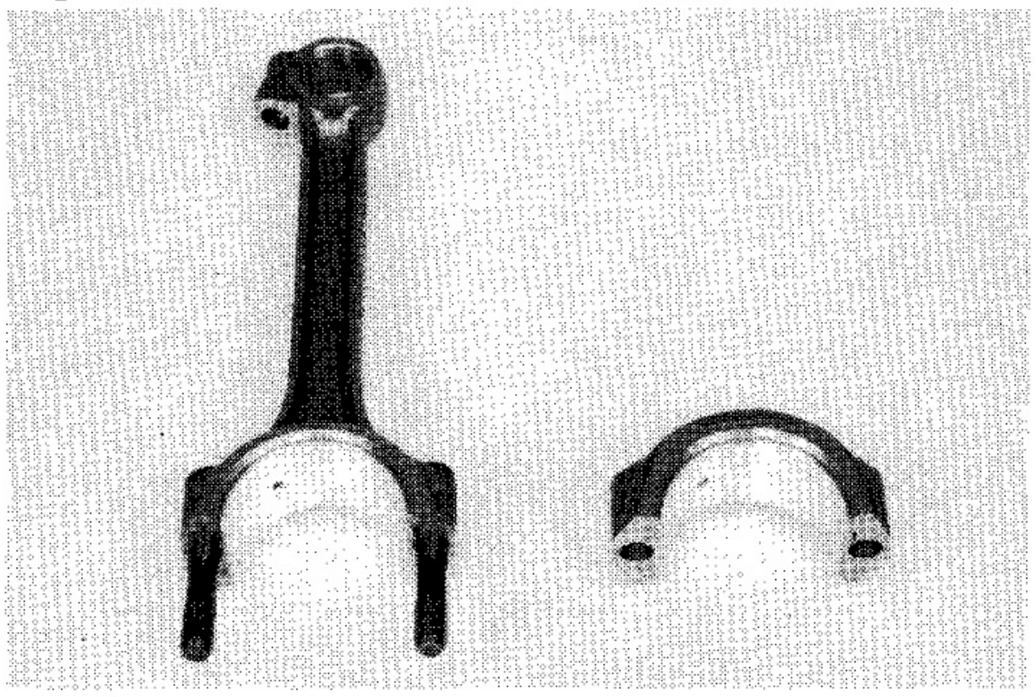
Fig. 3-125



2. Measure the ring groove clearance. If it exceeds specification, replace the ring and/or piston.

Ring groove clearance:
STD No.1 0.03 – 0.07 mm
(0.0012 – 0.0028 in.)
No.2 0.02 – 0.06 mm
(0.0008 – 0.0024 in.)
Oil N.S.W
0.03 – 0.07 mm
(0.0012 – 0.0028 in.)
Others
0.04 – 0.19 mm
(0.0016 – 0.0075 in.)

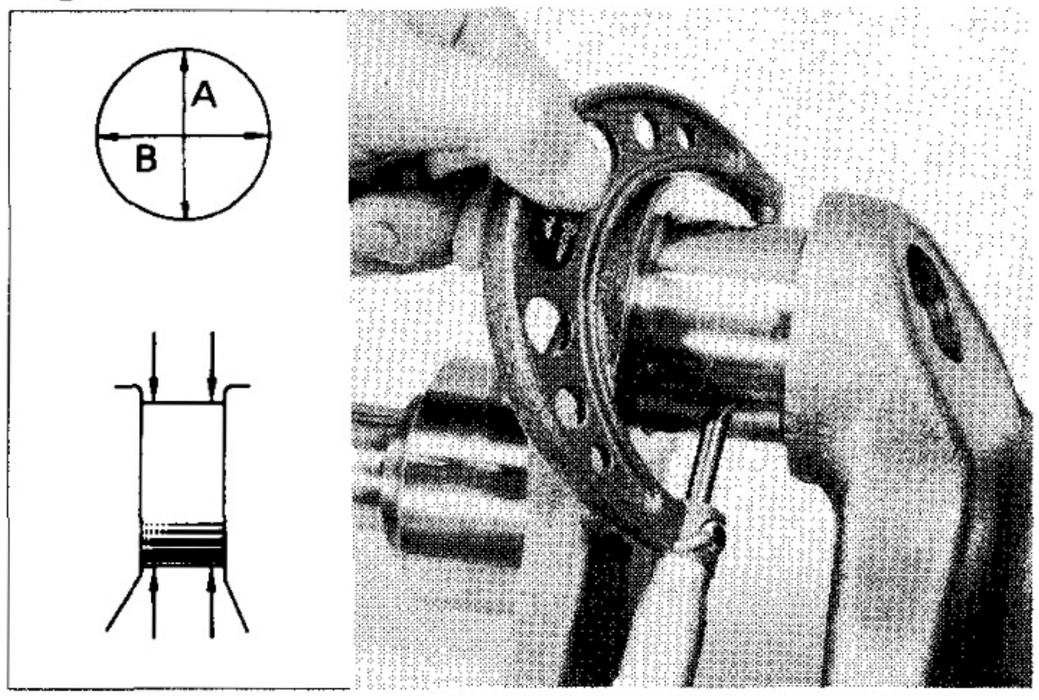
Fig. 3-126



Crankshaft Pin & Bearing

1. Check the bearings for flaking or scoring. If bearings are damaged, replace them.

Fig. 3-127

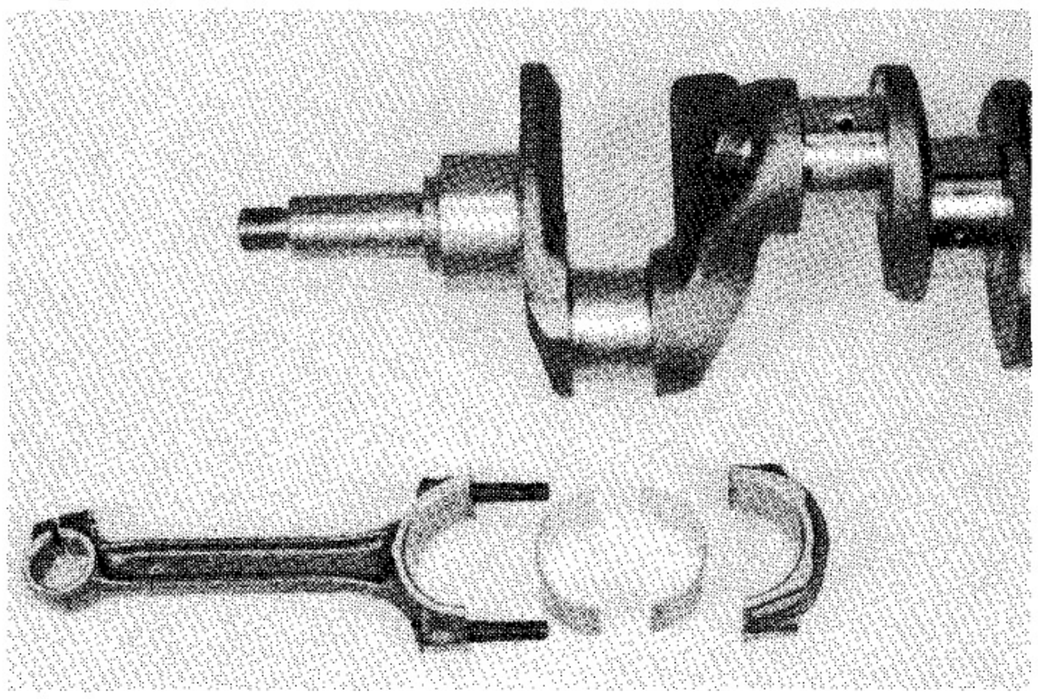


2. Measure the crank pin diameter. If wear is excessive, the crankshaft must be reground or replaced.

Crank pin diameter:
STD 53.98 – 54.00 mm (2.1252 – 2.1260 in.)
Taper and out-of-round:
Limit 0.01 mm (0.0004 in.)

– Note –
Measure A and B diameters in two places.

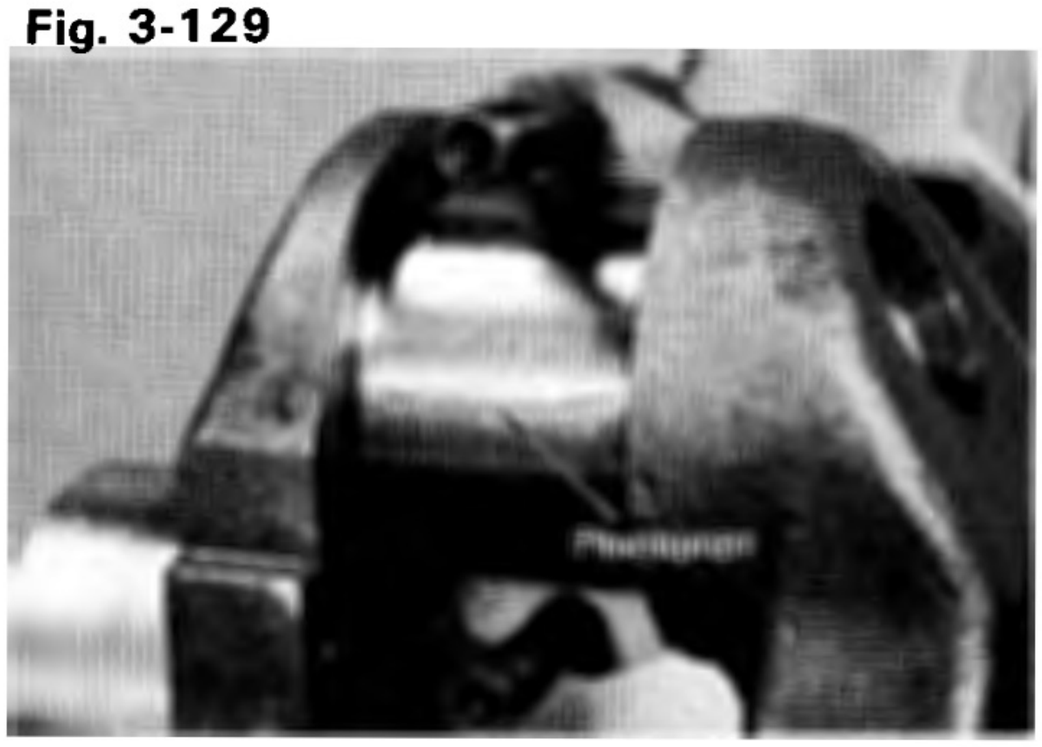
Fig. 3-128



Measure the crank pin oil clearance.

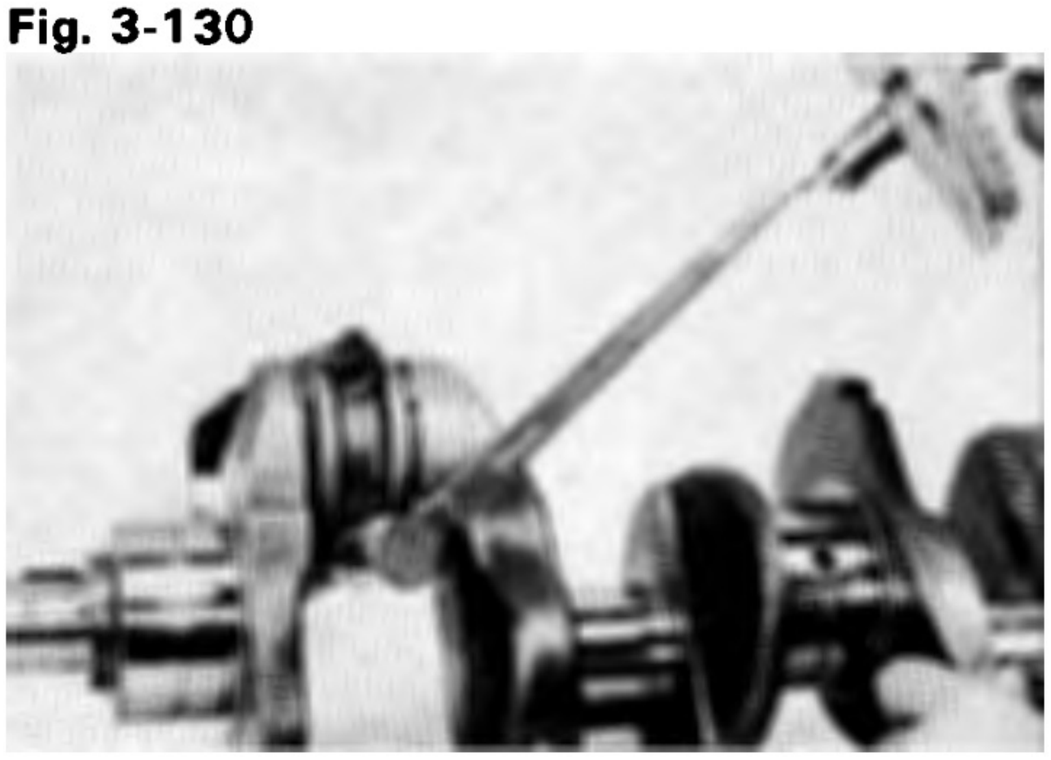
1. Clean the crankshaft pin, rod, cap and bearing.

Fig. 3-129



2. Lay a strip of plastigage across the pin.

Fig. 3-130



3. Tighten the cap nuts to specified torque.
   Tightening torque:
   4.8 – 7.6 kg-m
   (35 – 54 ft-lb)
4. Loosen the cap nuts.

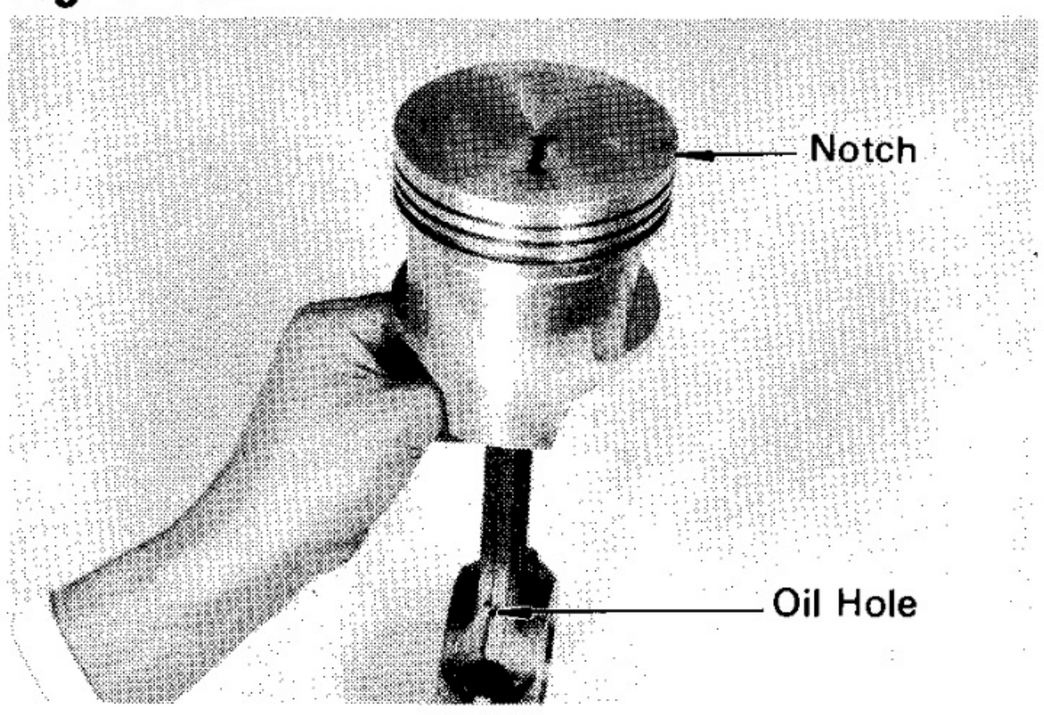
– Note –
Do not turn the connecting rod.

Fig. 3-131



5. Measure the plastigauge at its widest point.
   If clearance is not within specification, replace the bearings.
   Bearing oil clearance:
   STD 0.02 – 0.06 mm
   (0.0008 – 0.0024 in.)
   Limit 0.1 mm
   (0.004 in.)
   U/S bearing size:
   U/S 0.05, 0.25, 0.50

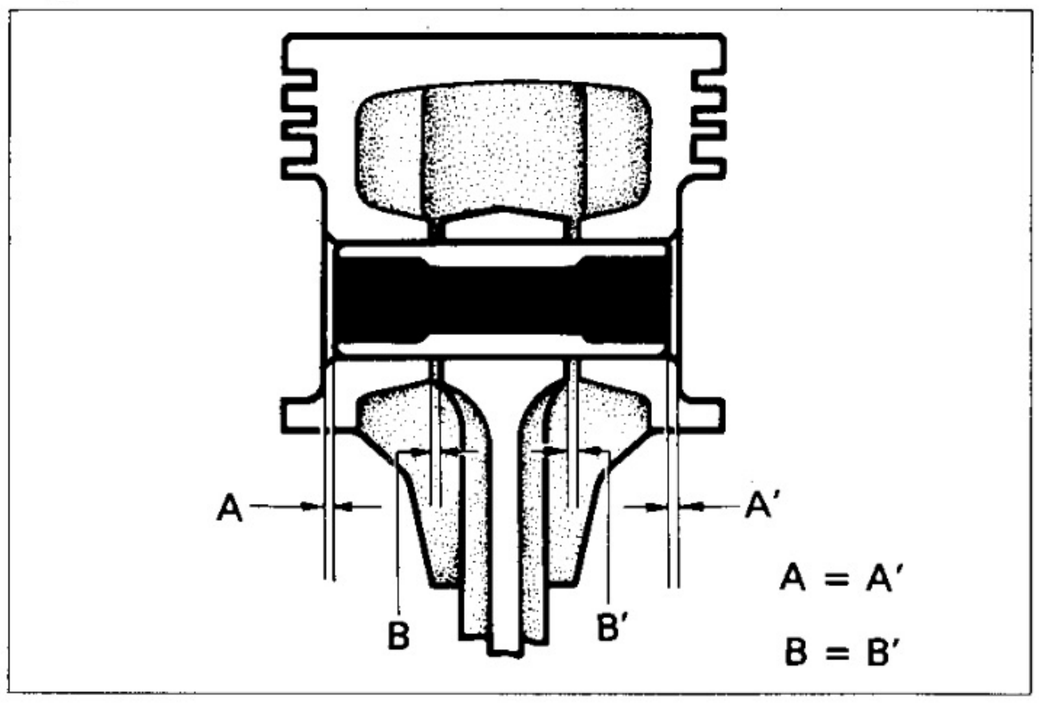
Fig. 3-132



Assemble The Piston & Connecting Rod

1. Align the notch on the piston with the oil hole of the connecting rod.

Fig. 3-133



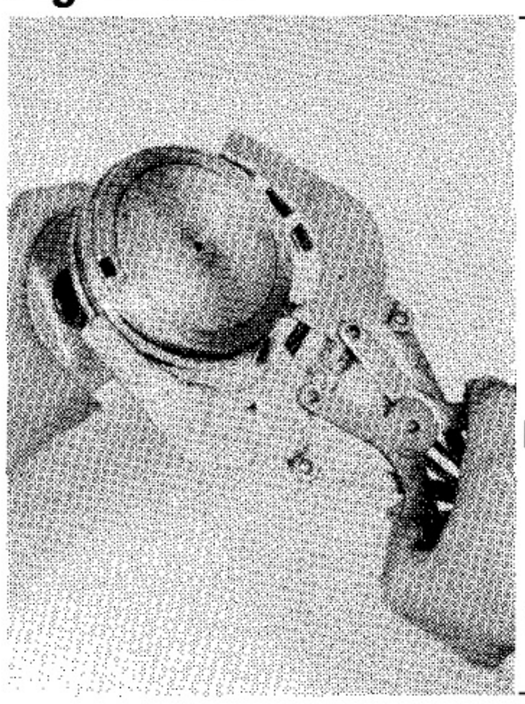
2. Center the piston pin in the piston, and position the connecting rod in the center of the two piston pin bosses.
   Tighten the pin bolt.
   Tightening torque:
   5.4 – 7.0 kg-m
   (40 – 50 ft-lb)

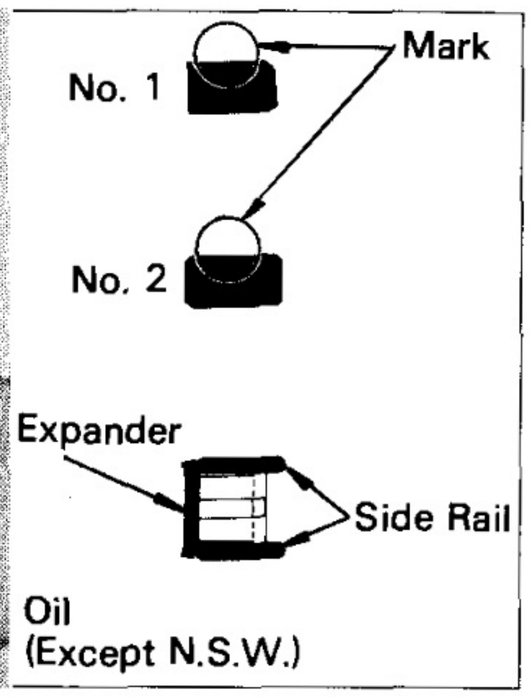
Fig. 3-134



3. Rock the piston at right angle to the pin and verify that movement is smooth.

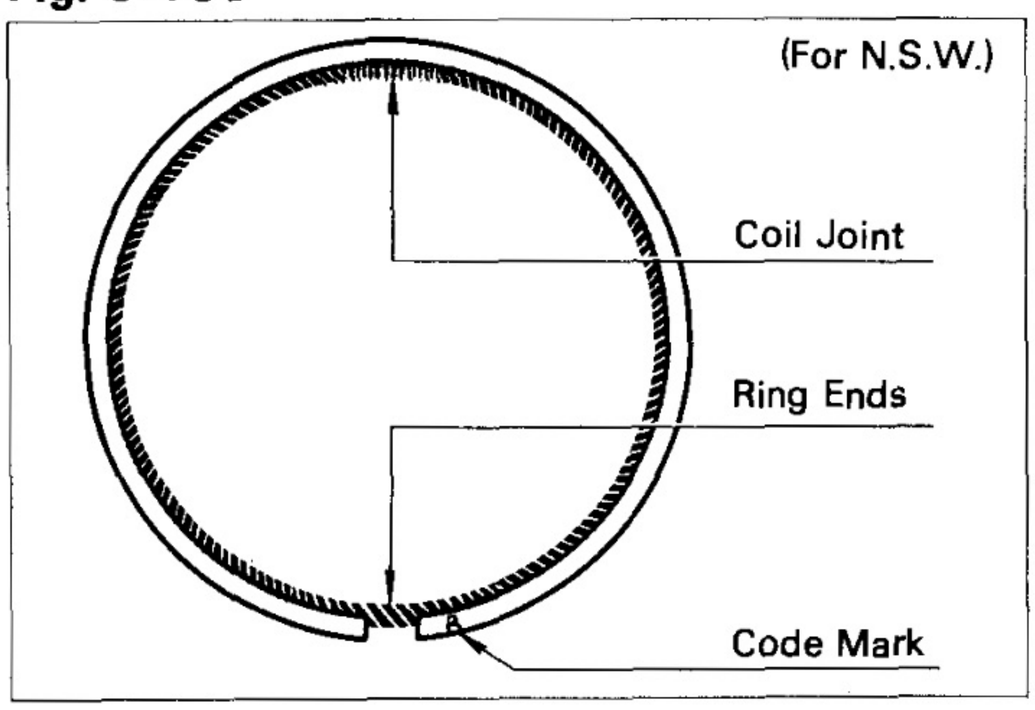
Fig. 3-135





4. Install the piston rings with a piston ring expander.
   Install two compression rings with the code marks facing upward.

Fig. 3-136

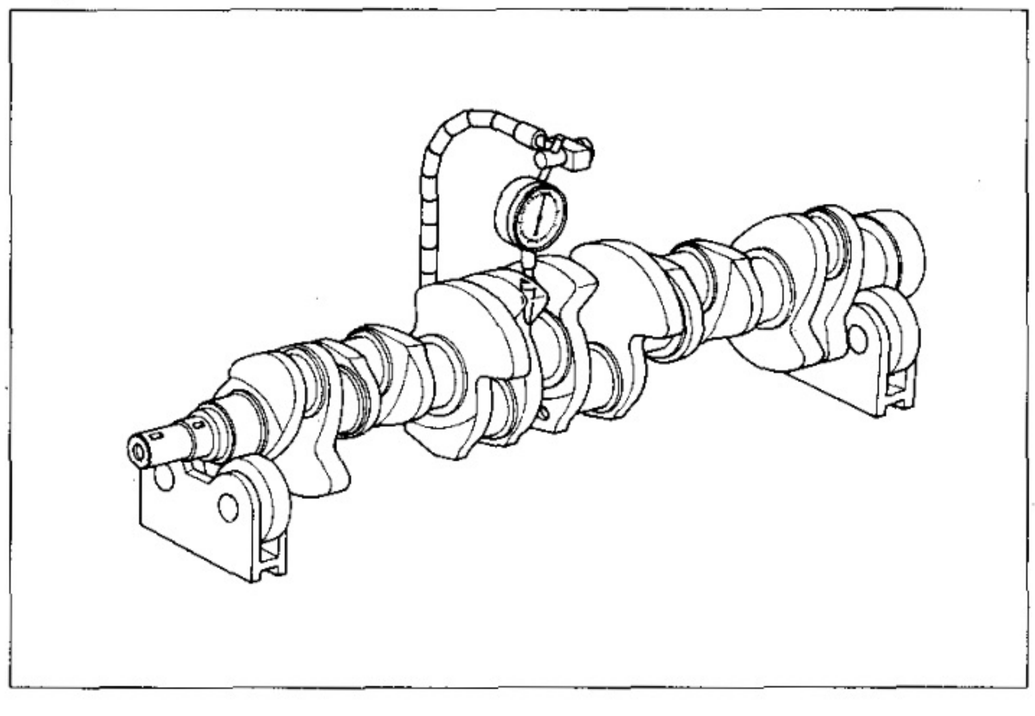


– Note –

1. For N.S.W. vehicles, make sure that the expander coil joint is at the opposite side of the oil ring ends when assembling.

2. Install the oil ring with the code mark facing upward.

Fig. 3-137



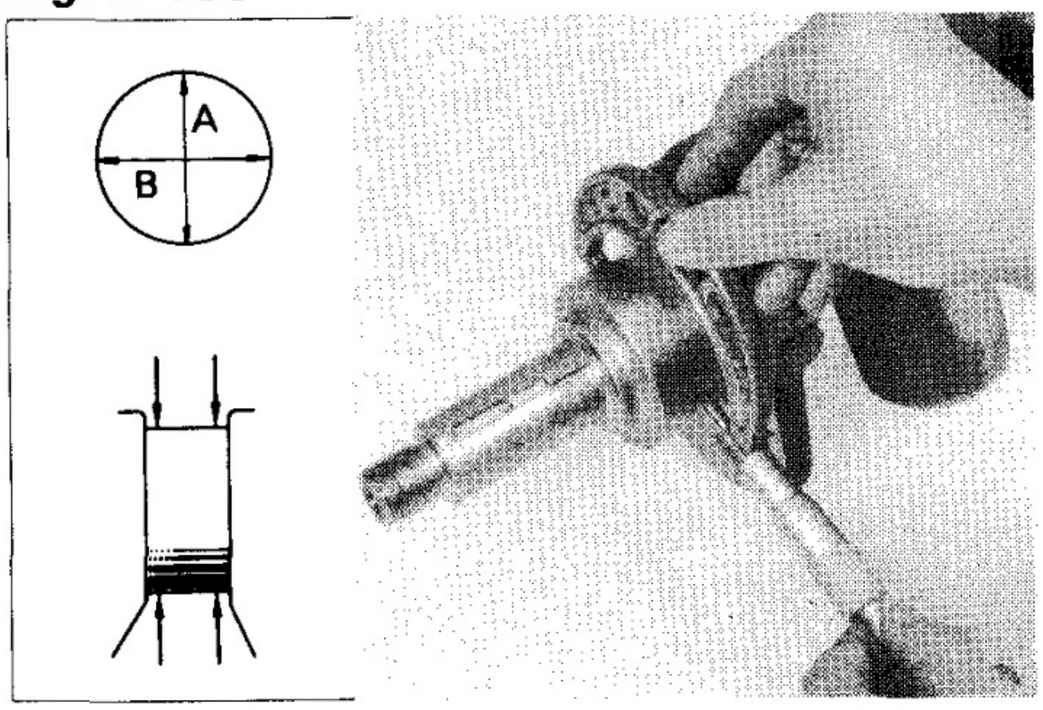
Crankshaft & Bearing

1. Check the crankshaft for runout and if it exceeds the limit, replace.

Circle runout:

Limit 0.1 mm (0.004 in.)

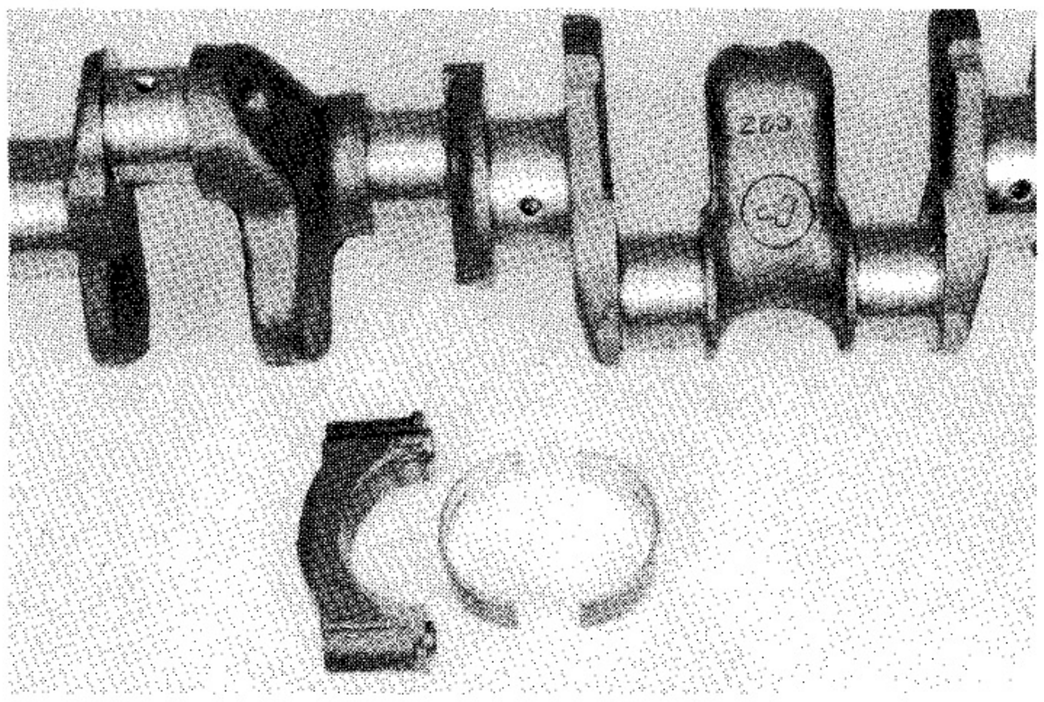
Fig. 3-138



2. Measure the crankshaft main journal.
If wear is excessive, the crankshaft must be reground or replaced.

Main journal diameter:
STD
No.1 66.972 – 66.996 mm
(2.6367 – 2.6376 in.)
No.2 68.472 – 68.496 mm
(2.6957 – 2.6967 in.)
No.3 69.972 – 69.996 mm
(2.7548 – 2.7557 in.)
No.4 71.472 – 71.496 mm
(2.8139 – 2.8148 in.)
Taper and out-of-round:
Limit 0.01 mm (0.0004in.)

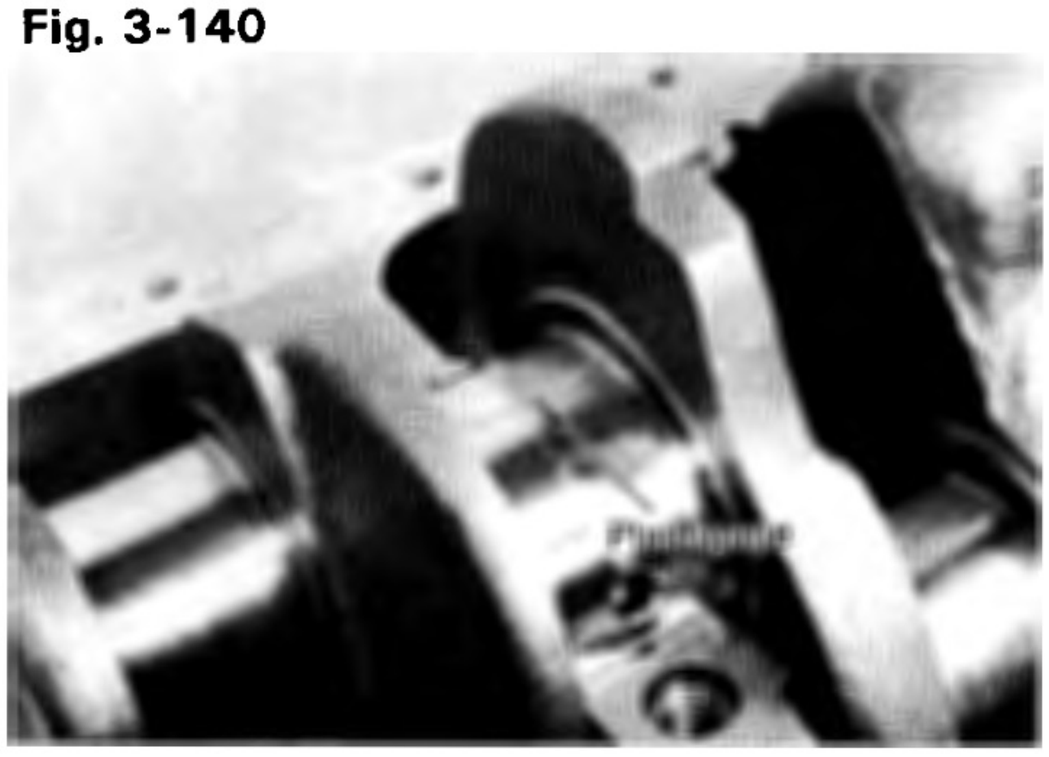
Fig. 3-139



– Note –
Measure A and B diameters in two places.

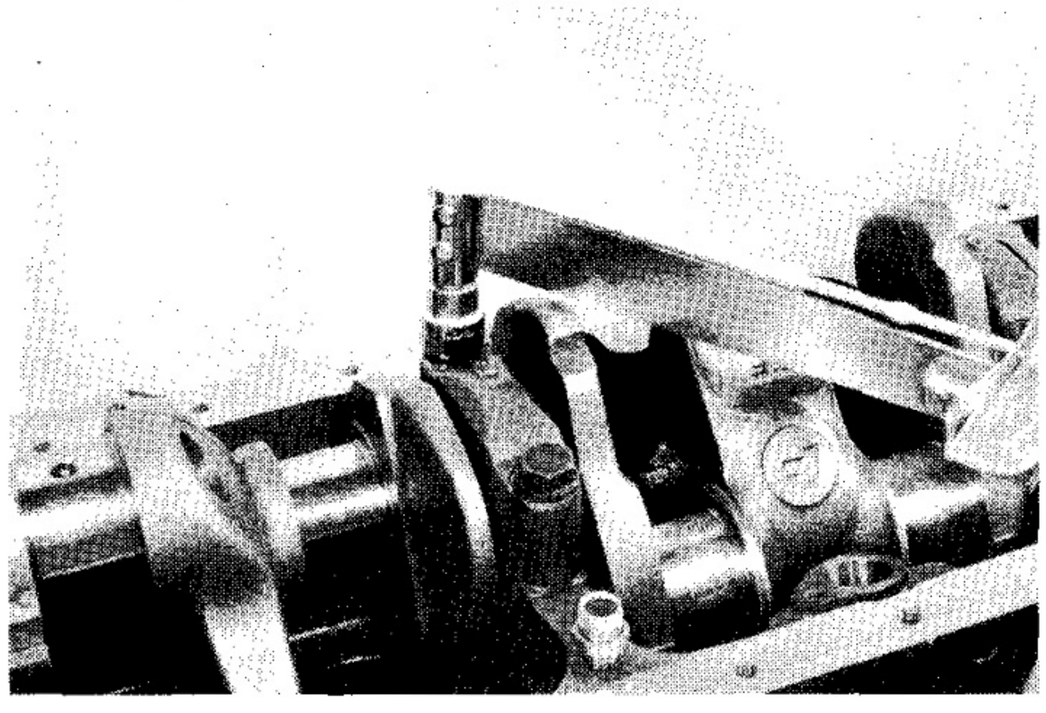
3. Measure the main journal oil clearance.
(1) Clean the journal, cap and bearing.

Fig. 3-140



(2) Lay a strip of plastigage across the journal.

Fig. 3-141



(3) Tighten the cap bolts to specified torque.

Tightening torque:
No.1 – No.3
12.5 – 15.0 kg-m
(91 – 108 ft-lb)
No.4 10.5 – 13.0 kg-m
(76 – 94 ft-lb)

– Note –
Do not turn the crankshaft.

Fig. 3-142



(4) Measure the plastigage at its widest point. If clearance is not within specification, replace the bearings.

Oil clearance:

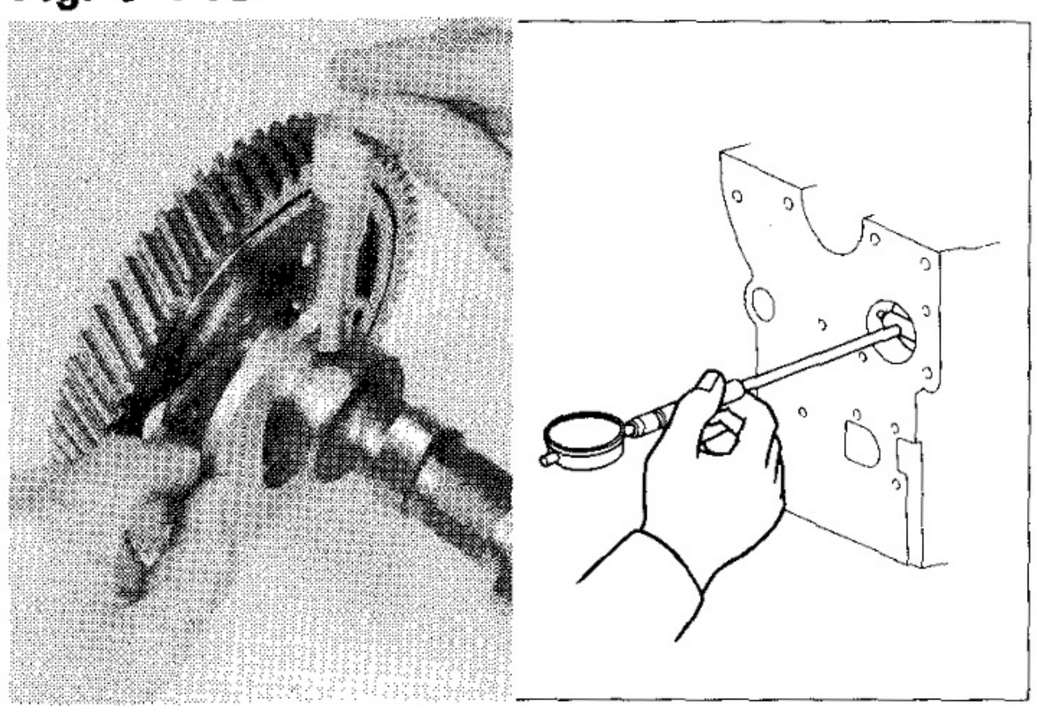
STD 0.020 – 0.044 mm (0.0008 – 0.0017 in.)

Limit 0.10 mm (0.0039 in.)

U/S bearing:

0.05, 0.25, 0.50

Fig. 3-143



Camshaft Bearing

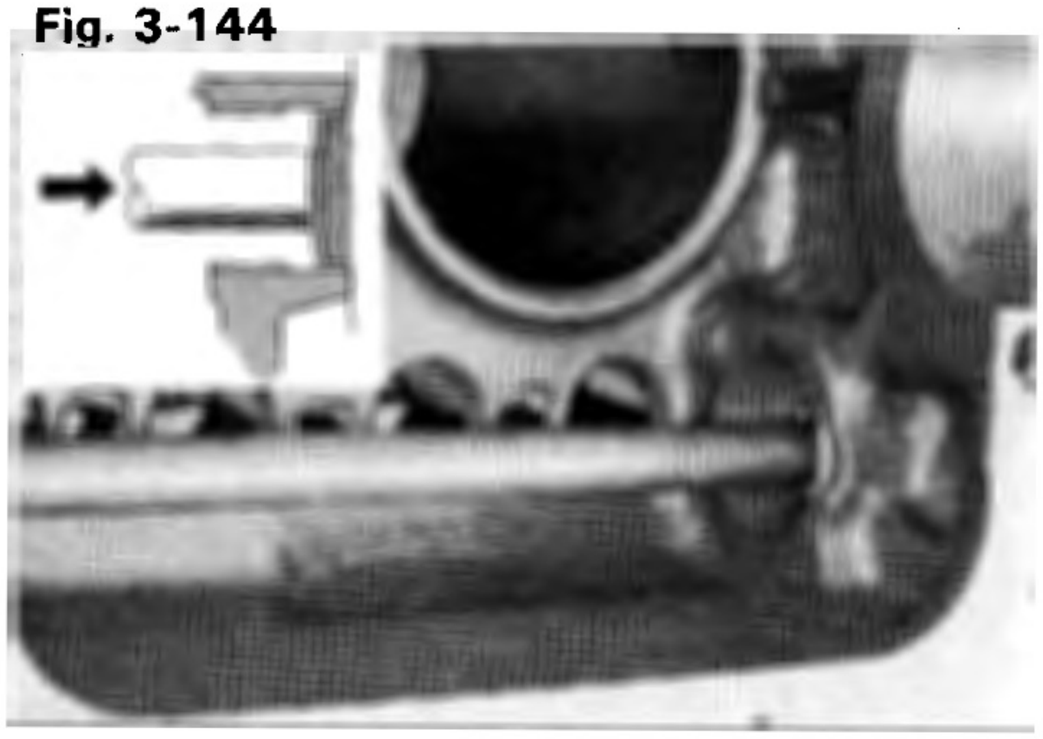
1. Check the bearing oil clearance.

Oil clearance:

STD 0.025 – 0.075 mm (0.0010 – 0.0030 in.)

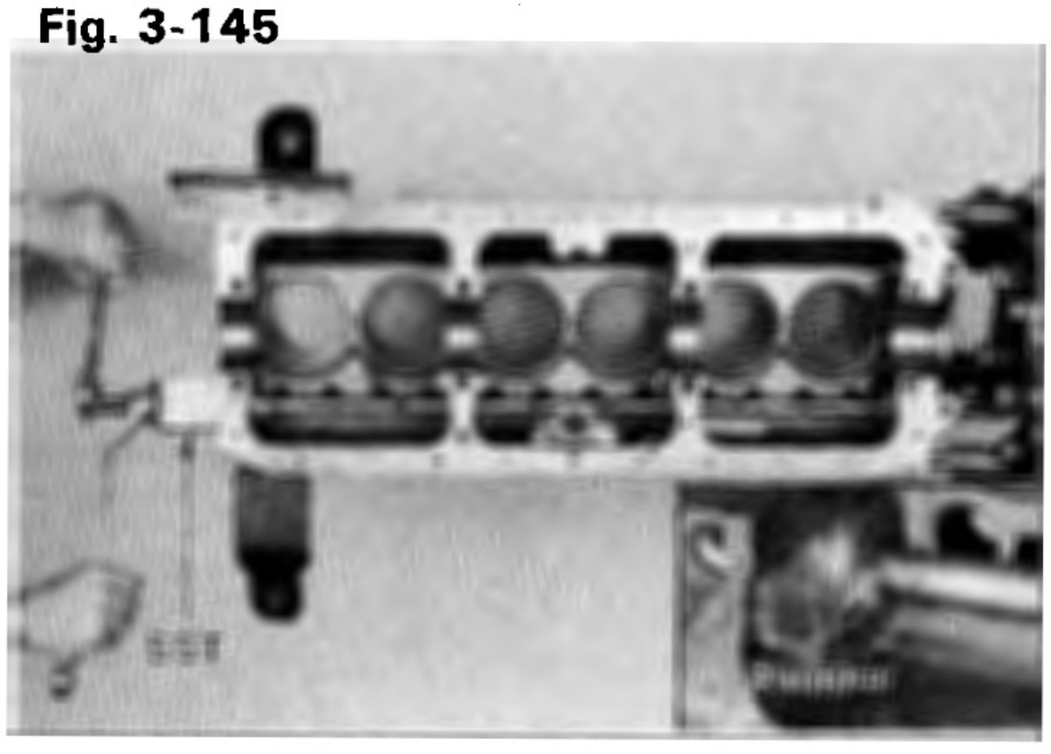
Limit 0.1 mm (0.0039 in.)

Fig. 3-144



2. Replace the camshaft bearing.
   (1) Remove the camshaft rear expansion plug.

Fig. 3-145

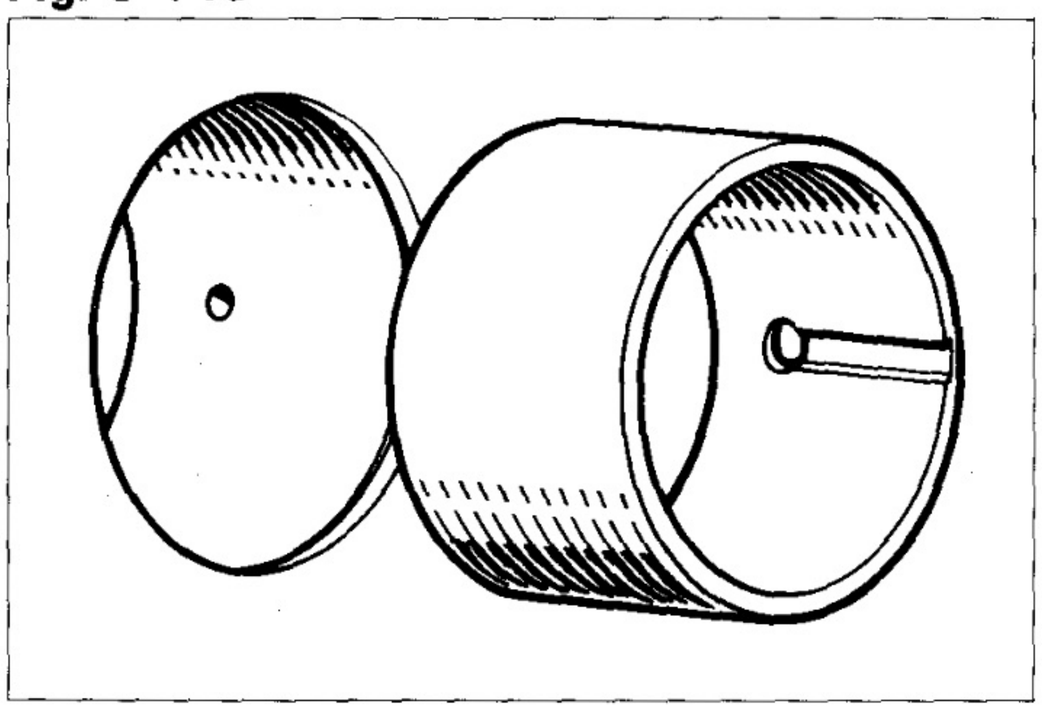


(2) Remove the camshaft bearings with SST.
SST [09215-00010]
[09215-00100]

– Note –

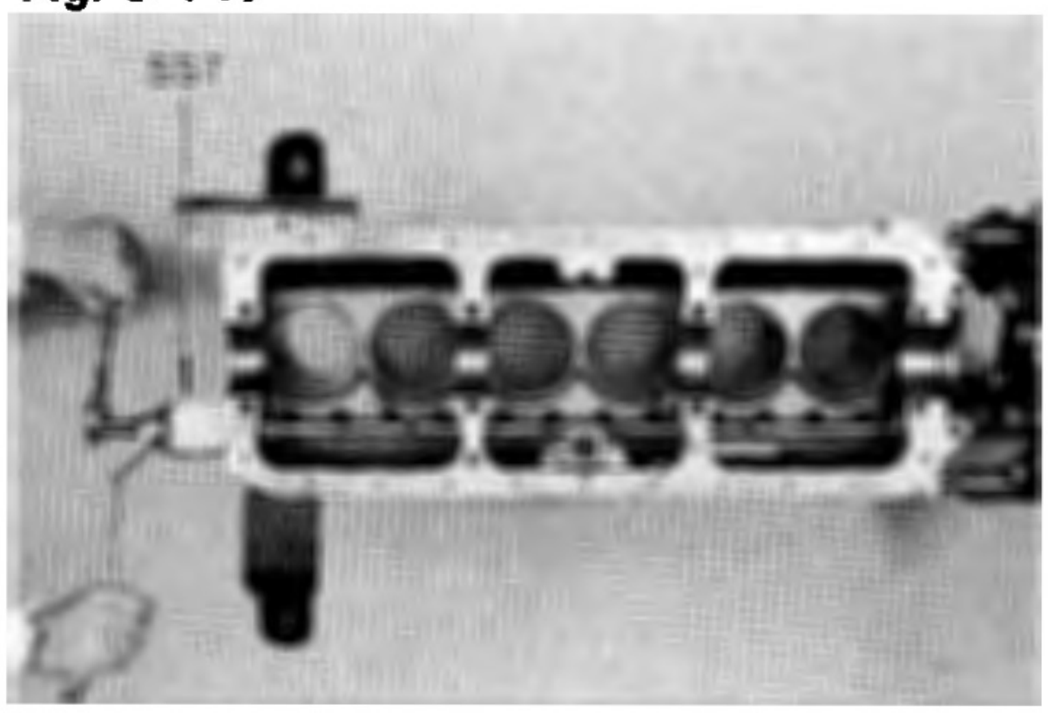
1. Shorten the shaft of SST to proper length by inserting the stopper into the shaft hole as shown in the figure.
2. Remove each bearing one at a time.

Fig. 3-146



(3) When installing the bearings, align the bearing oil holes with those of the cylinder block.

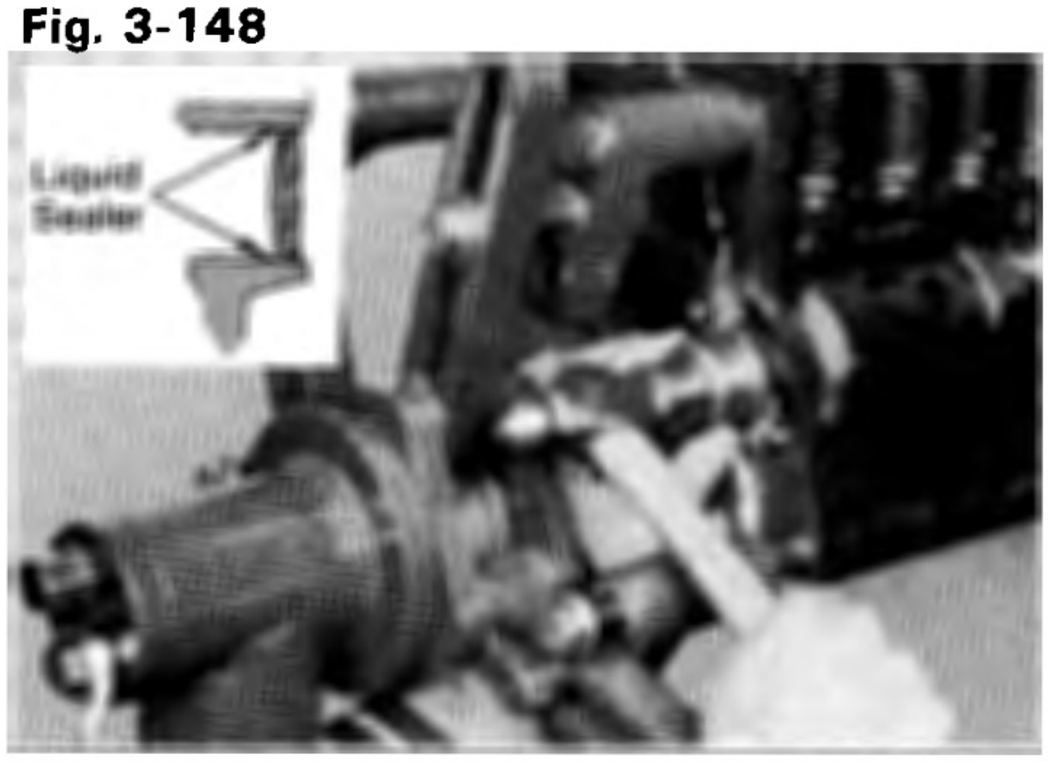
Fig. 3-147



(4) Install new bearings with SST.
SST [09215-00010]
[09215-00100]

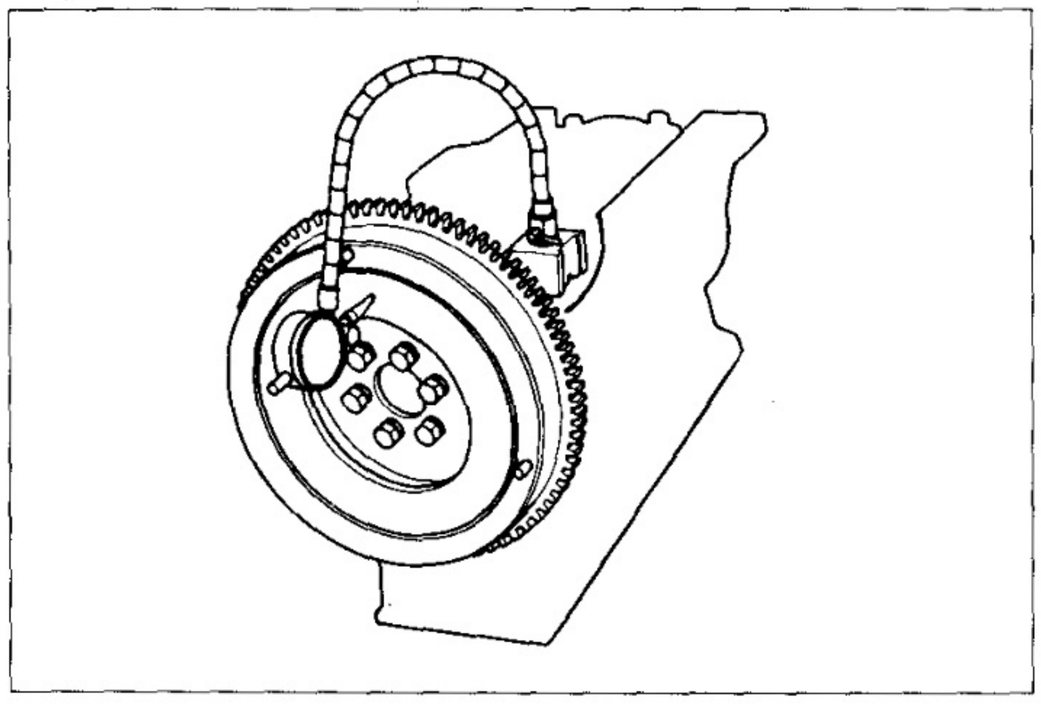
– Note –
Install each bearing one at a time.

Fig. 3-148



(5) Install a new expansion plug with liquid sealer.

Fig. 3-149



Flywheel

1. Check the surface contacting the clutch disc.
2. Measure the runout of the surface contacting the clutch disc.

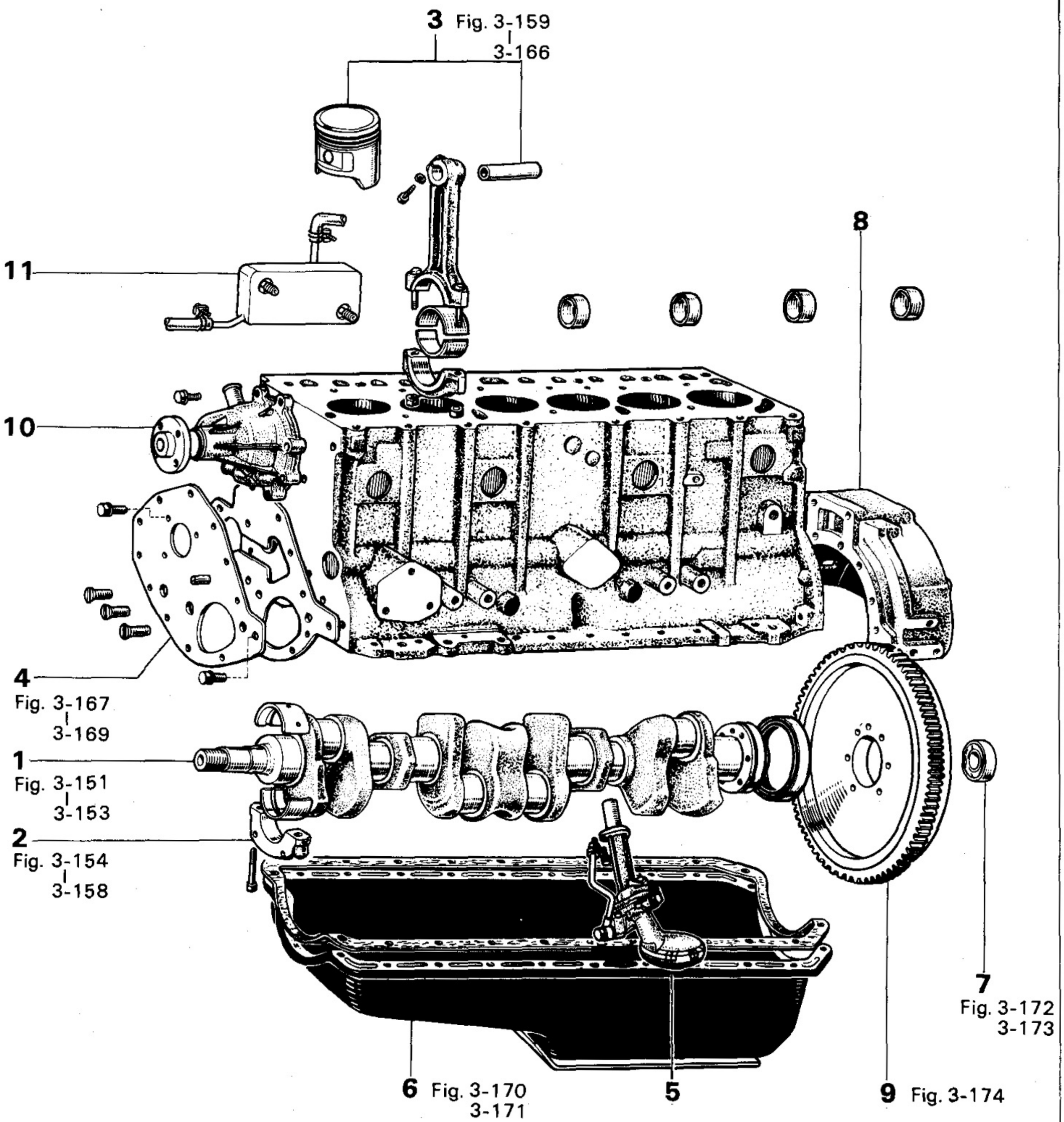
Runout:
Limit 0.1 mm (0.004 in.)

3. Check the ring gear.

ASSEMBLY

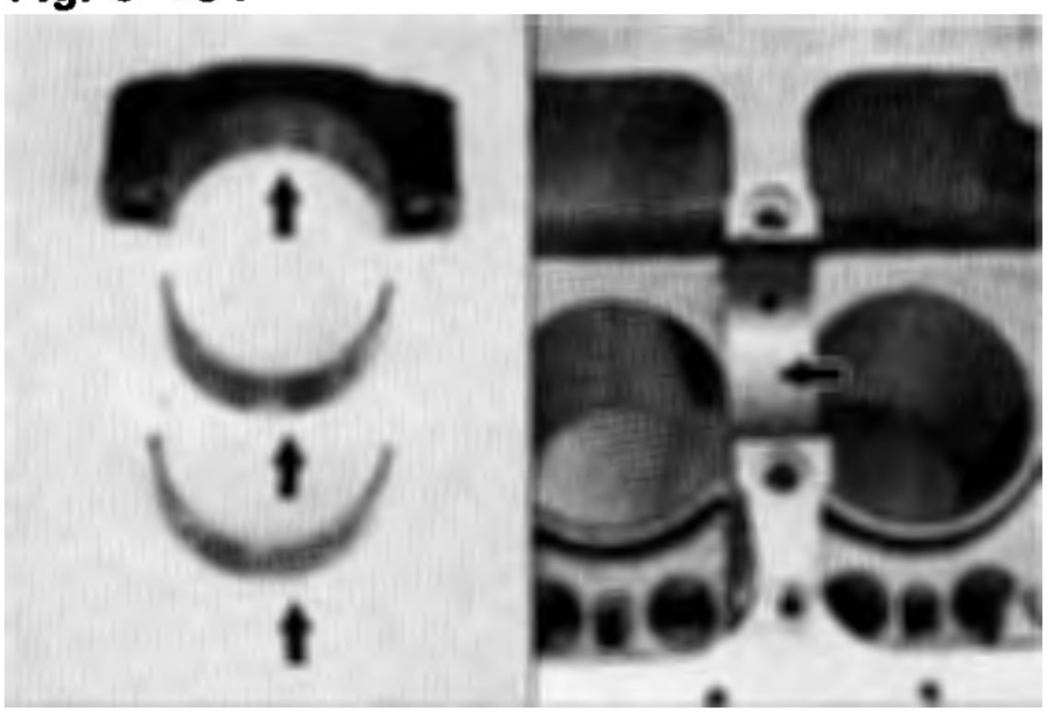
Assemble the parts in the numerical order shown in the figure.

Fig. 3-150



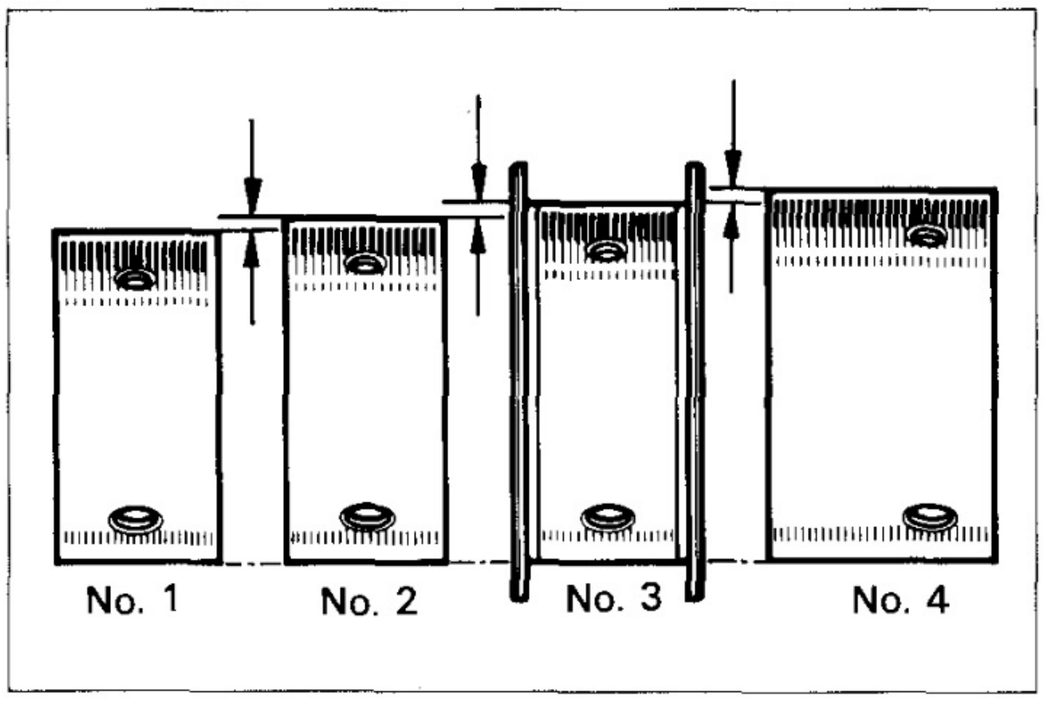
1. Crankshaft
2. Crankshaft Bearing Cap
3. Piston & Connecting Rod
4. Front End Plate
5. Oil Pump
6. Oil Pan
7. Input Shaft Bearing
8. Flywheel Housing
9. Flywheel
10. Water Pump
11. Oil Cooler

Fig. 3-151



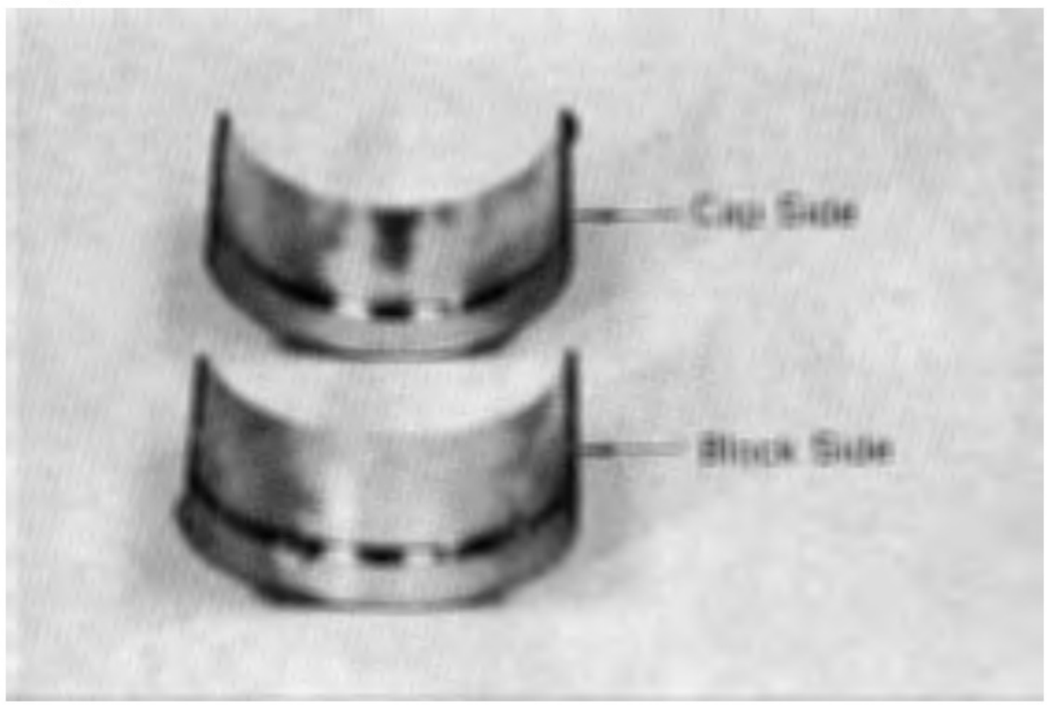
Do not allow oil to get on the back side of the bearing.

Fig. 3-152



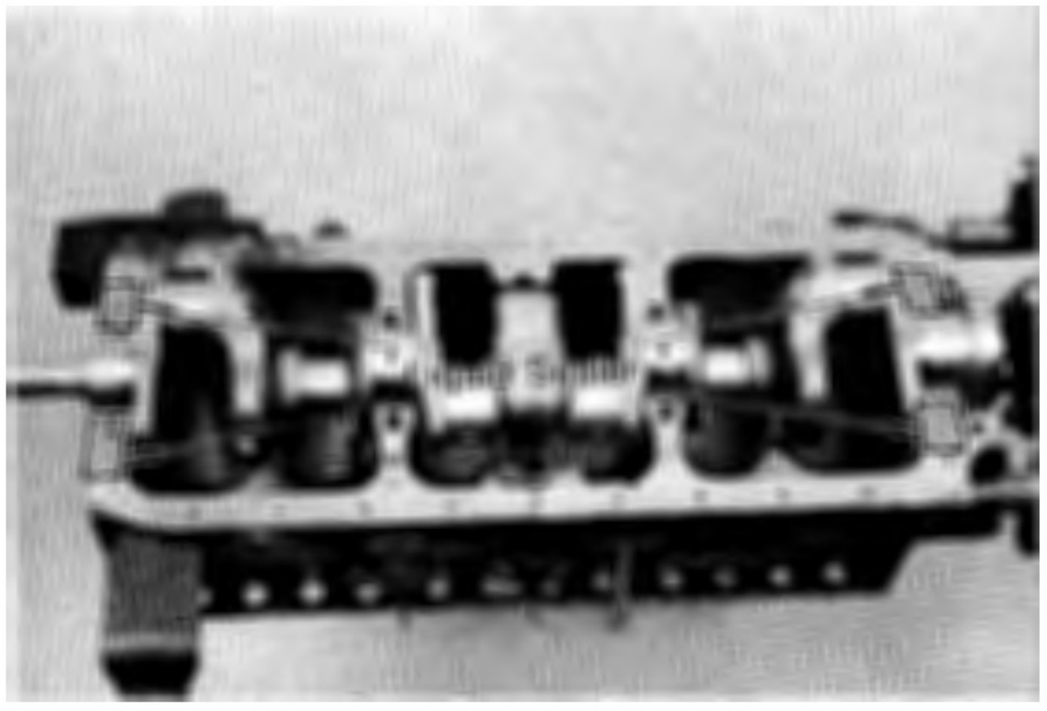
All main bearings are different. Install the bearings in the block and caps, lubricating the face only.

Fig. 3-153



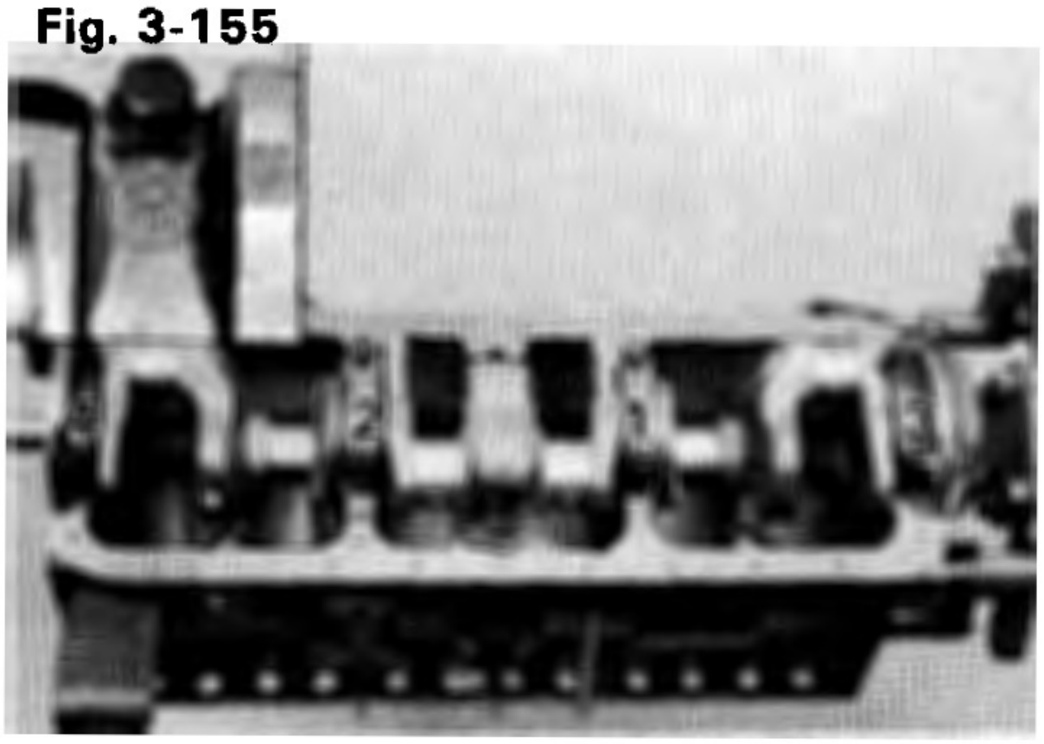
The oil holes of the front (No.1) and rear (No.4) bearings must be positined toward the cylinder block side.

Fig. 3-154



Before installing the front (No.1) and rear (No.4) bearing caps, coat liquid sealer to the areas indicated in the figure.

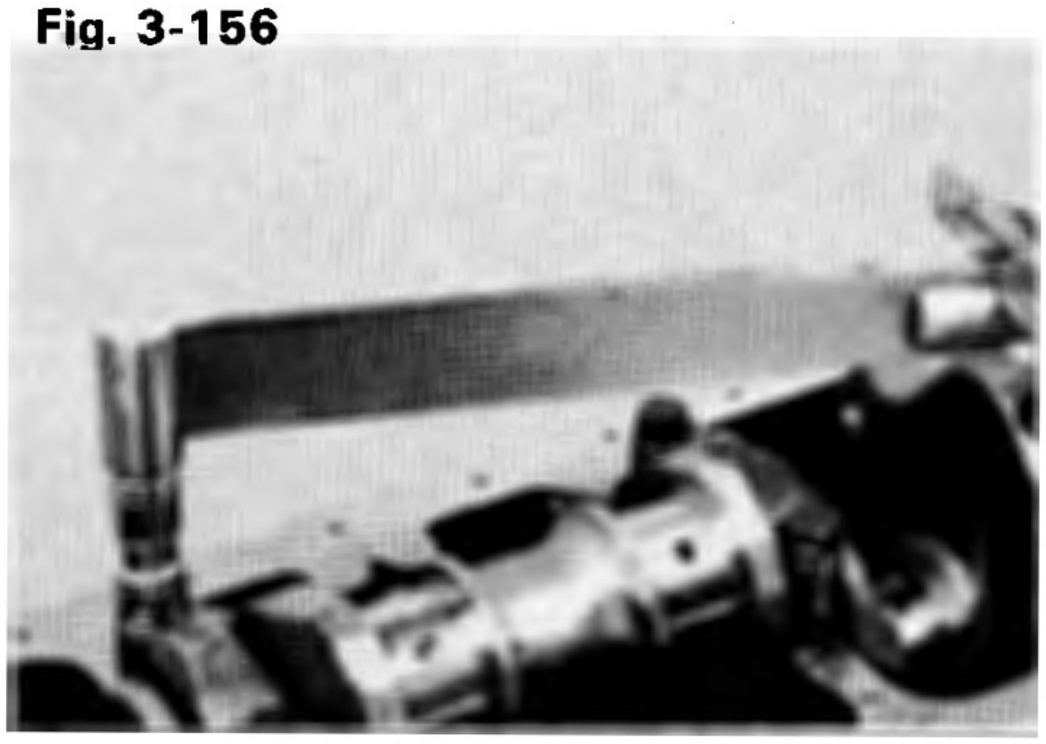
Fig. 3-155



Tighten each bearing cap bolt a little at a time in the sequence shown in the figure.

— Note —
Face the mark toward the front.

Fig. 3-156

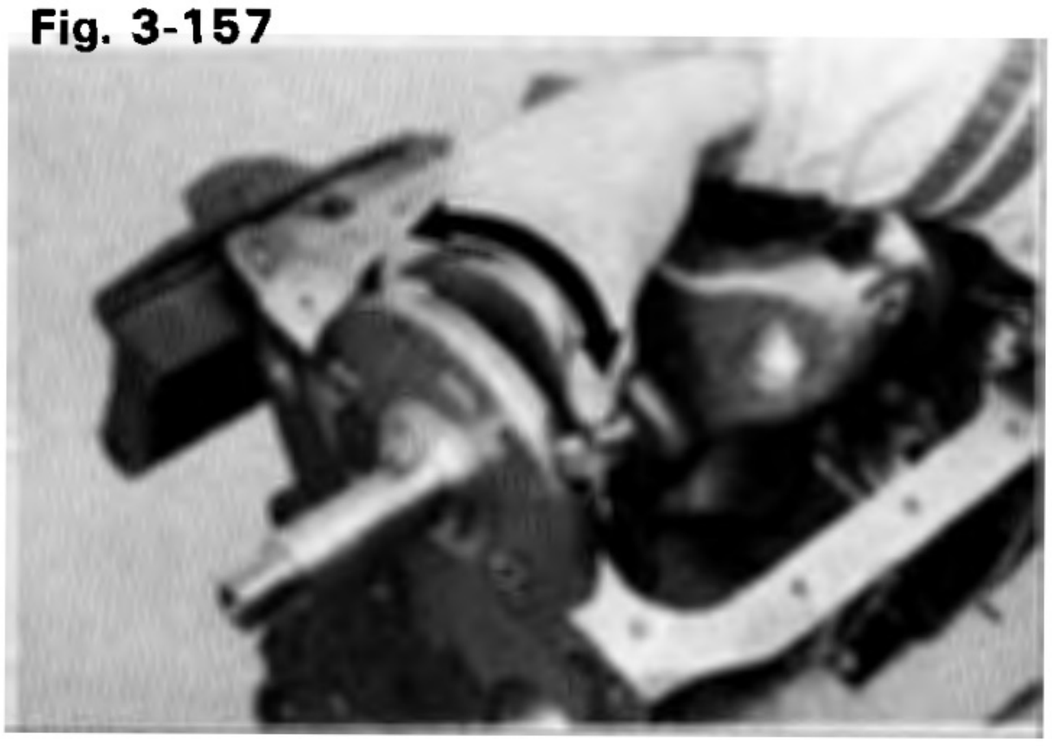


Tighten the bearing caps to specified torque.

Tightening torque:

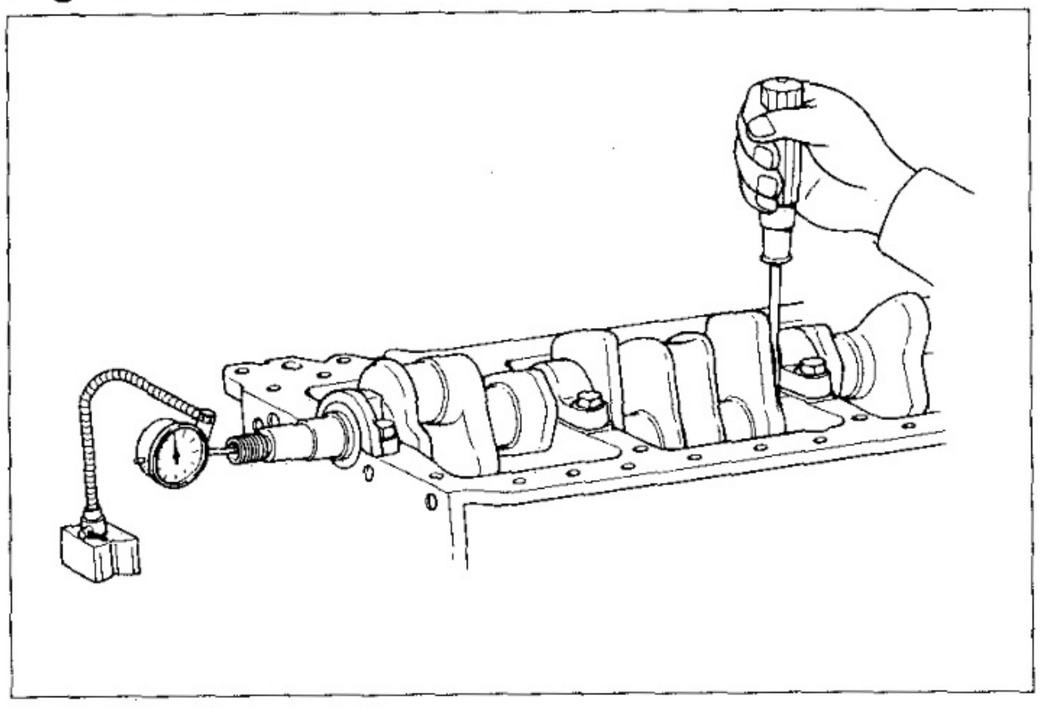
No.1 — No.3	**12.5 — 15.0 kg-m (91 — 108 ft-lb)**
No.4	**10.5 — 13.0 kg-m (76 — 94 ft-lb)**

Fig. 3-157



— Note —
Check for tightness of crankshaft rotation after each time a bearing cap is tightened.

Fig. 3-158

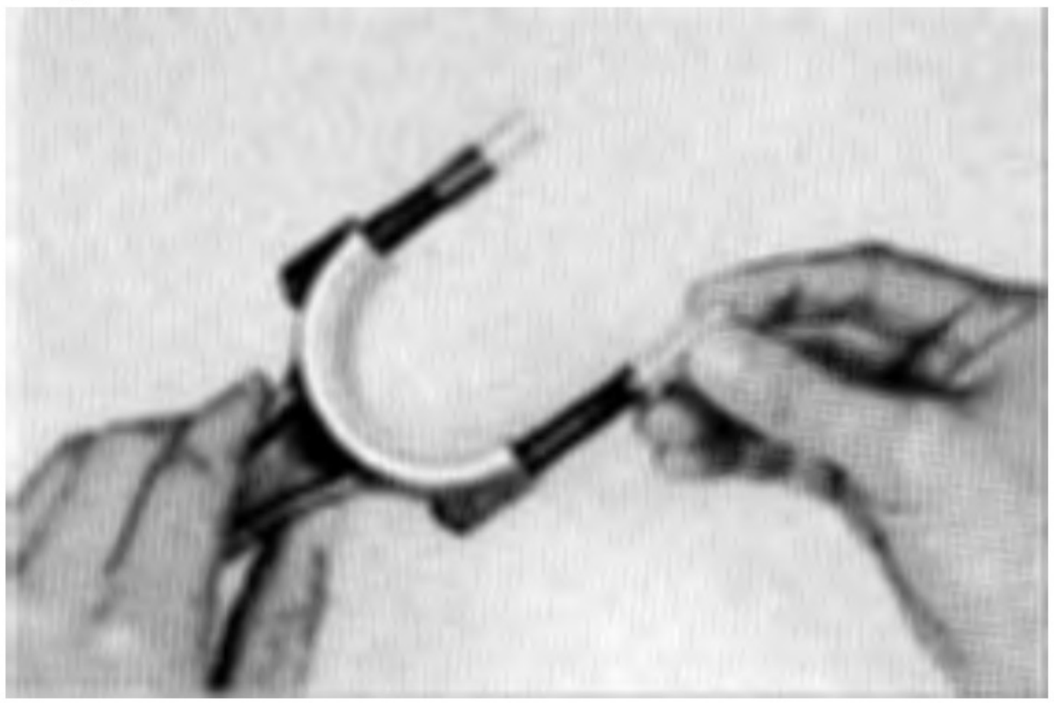


Measure the crankshaft thrust clearance.

Thrust clearance:

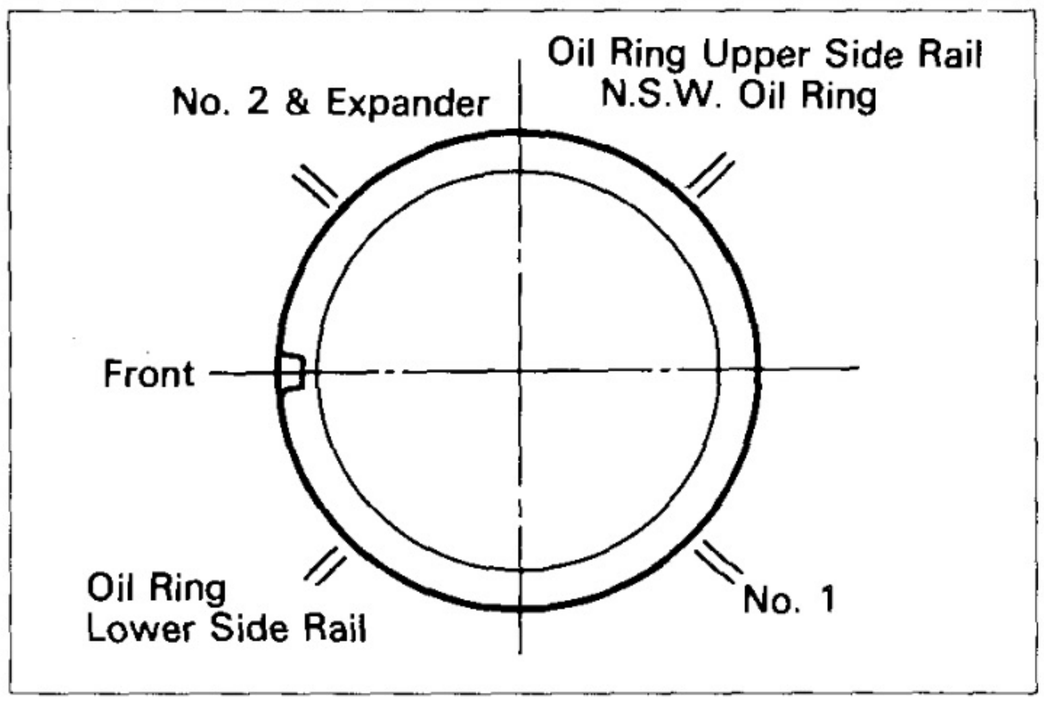
STD	**0.06 — 0.16 mm (0.0024 — 0.0063 in.)**
Limit	**0.3 mm (0.012 in.)**

Fig. 3-159



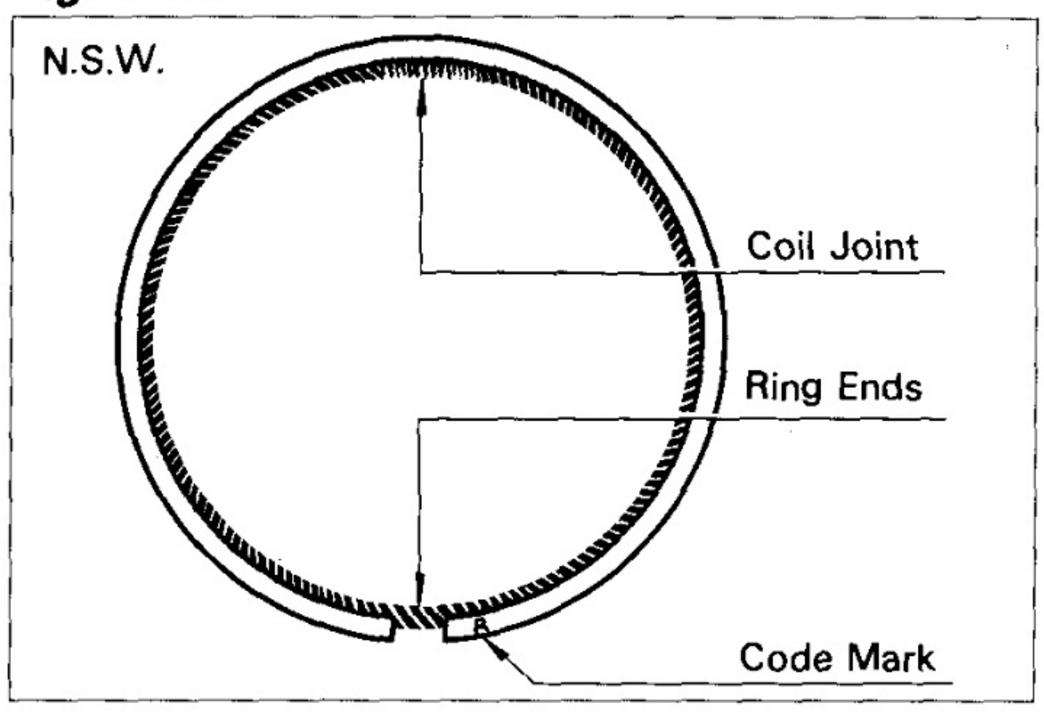
⚠ Cover the rod bolts with a hose to protect the crank pins from damage.

Fig. 3-160



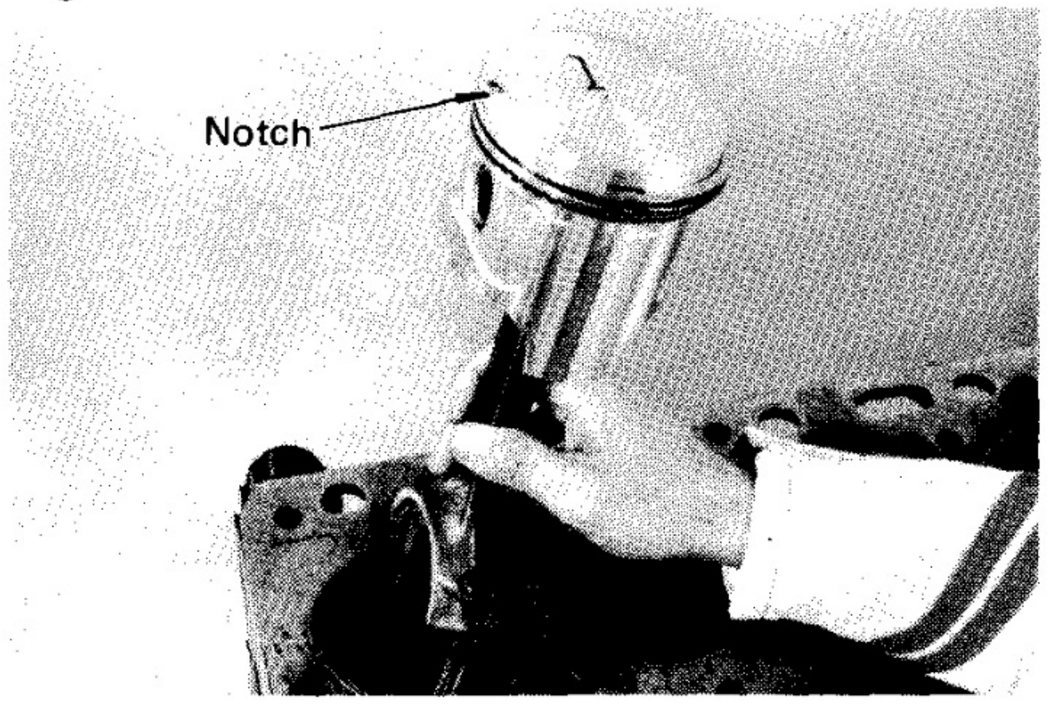
⚠ Position the ring gap in the direction shown in the figure.

Fig. 3-161



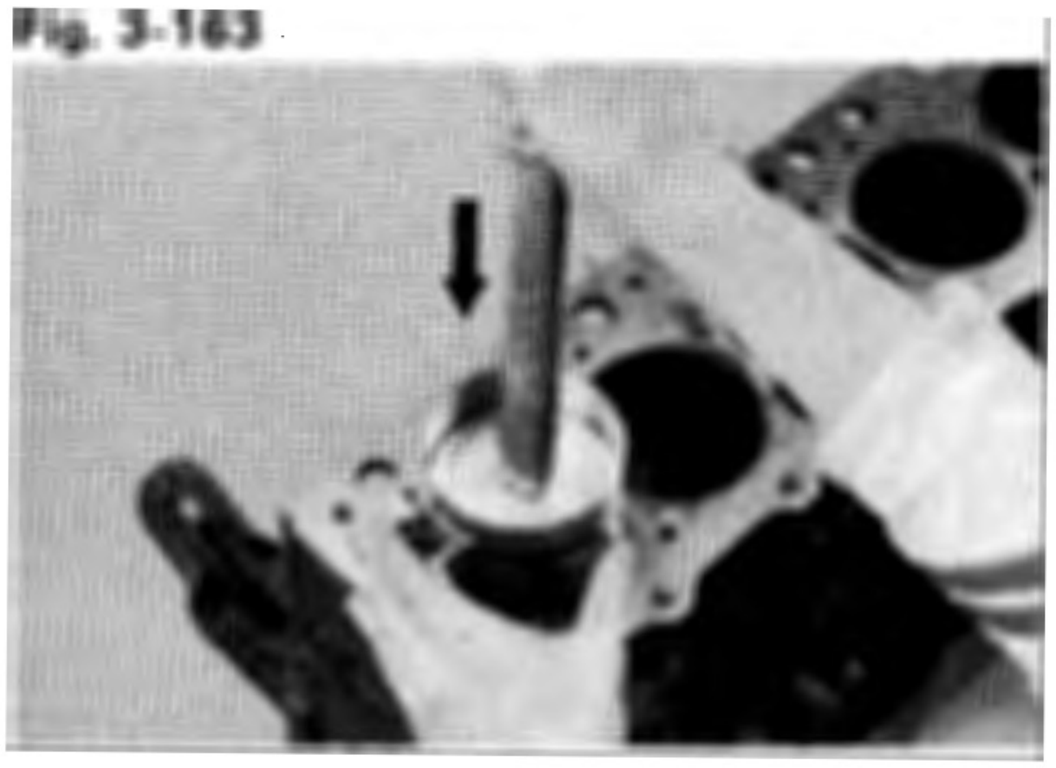
⚠ (N.S.W.)
The oil ring ends should be at the opposite side of the expander coil joint.

Fig. 3-162



⚠ Assemble matching numbered piston/rod assemblies with the notch on the piston and the ⓕ mark on the connecting rod facing the rear.

Fig. 3-163



Insert the piston into the cylinder while compressing rings with a piston ring compressor.

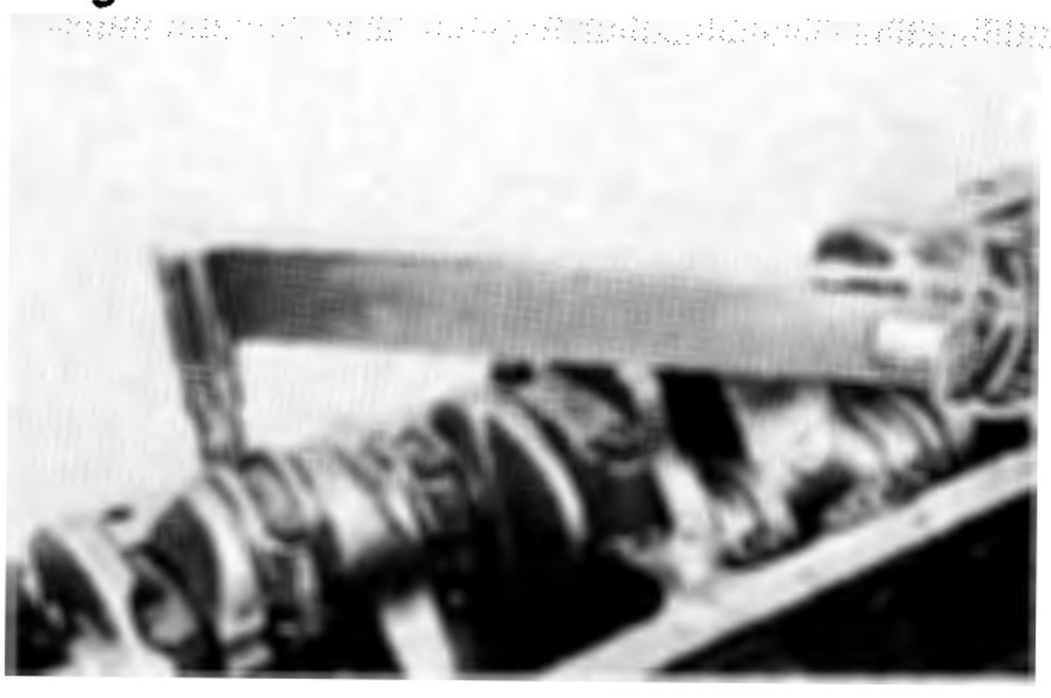
– Note –
Be careful not to break the piston ring.

Fig. 3-164



Align the marks on the rod and cap, and fit on the cap.

Fig. 3-165

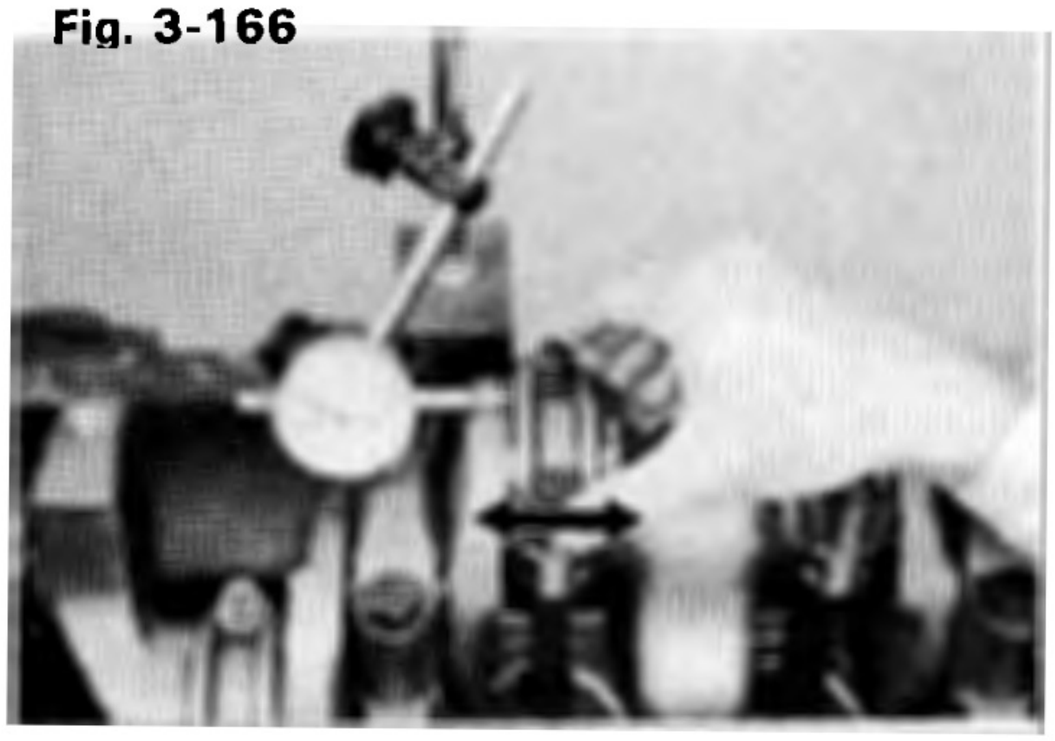


Tighten the connecting rod cap to specified torque.

Tightening torque: 4.8 – 7.6 kg-m (35 – 54 ft-lb)

– Note –
Check for tightness of crankshaft rotation after tightening each bearing.

Fig. 3-166



Check the connecting rod thrust clearance.

Thrust clearance:

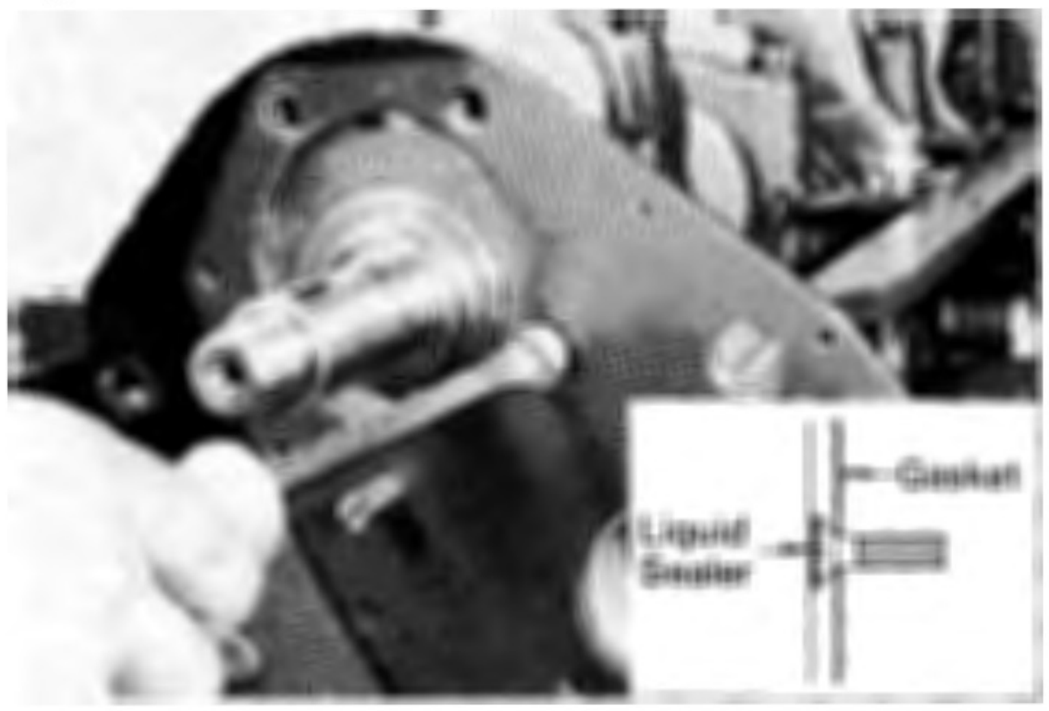
STD	**0.08 – 0.24 mm (0.0031 – 0.0094 in.)**
Limit	**0.3 mm (0.012 in.)**

Fig. 3-167



Apply liquid sealer onto both surfaces of the end plate gasket.

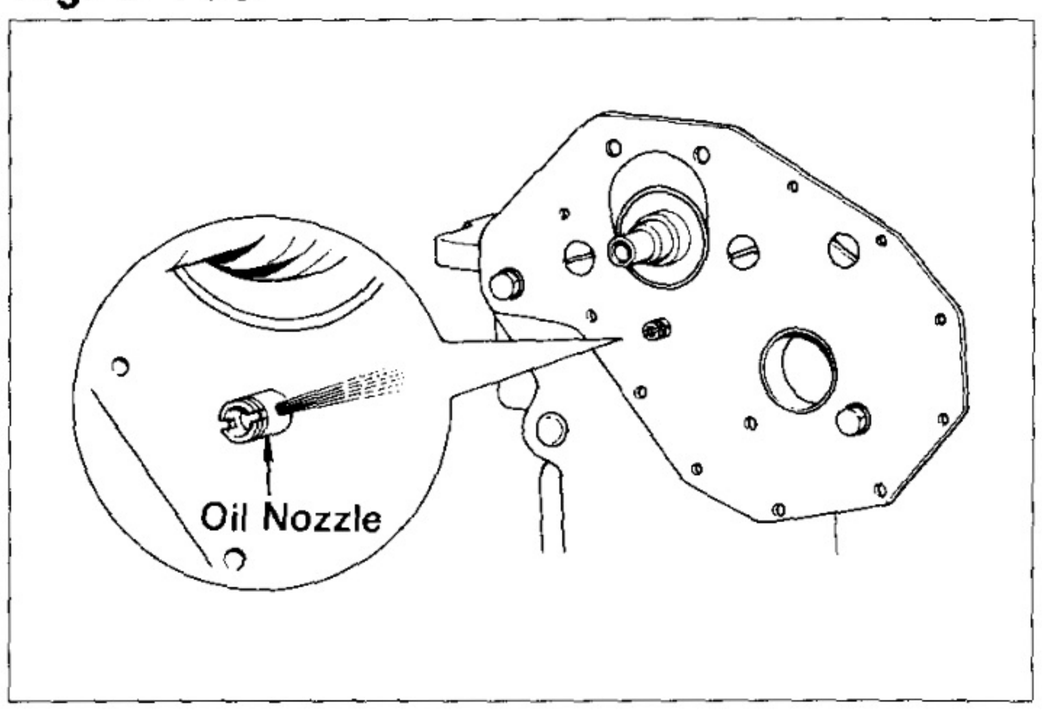
Fig. 3-168



Correctly position the end plate by tightening the undercut flat head screws. Then tighten the bolts.

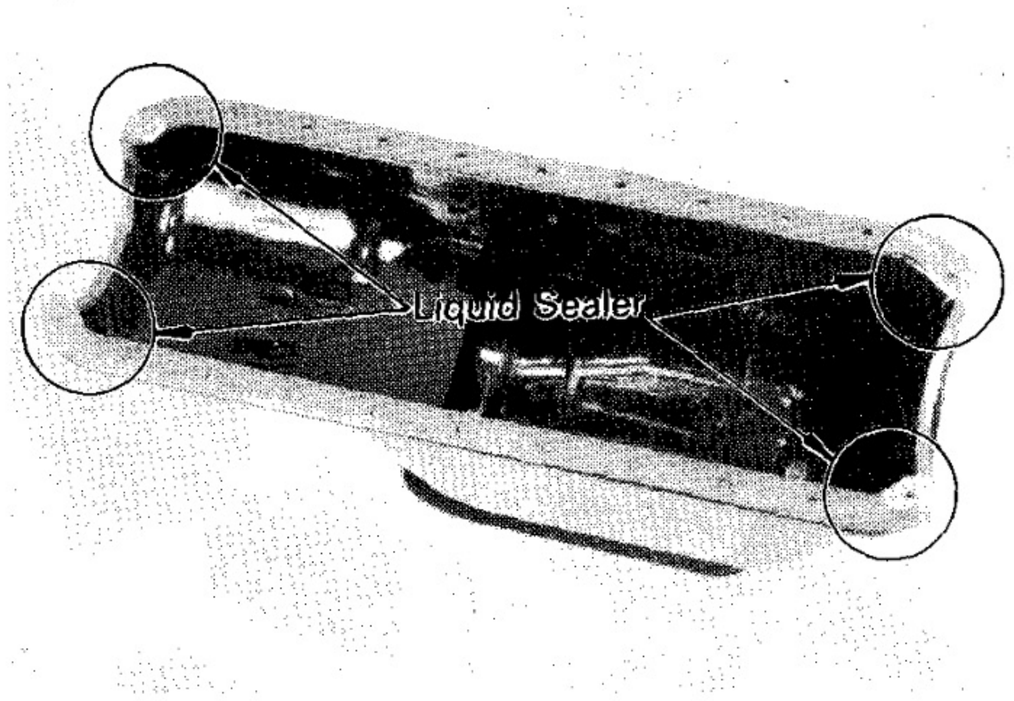
– Note –
Stake the end plate to fix the screws and apply liquid sealer on the head of them.

Fig. 3-169



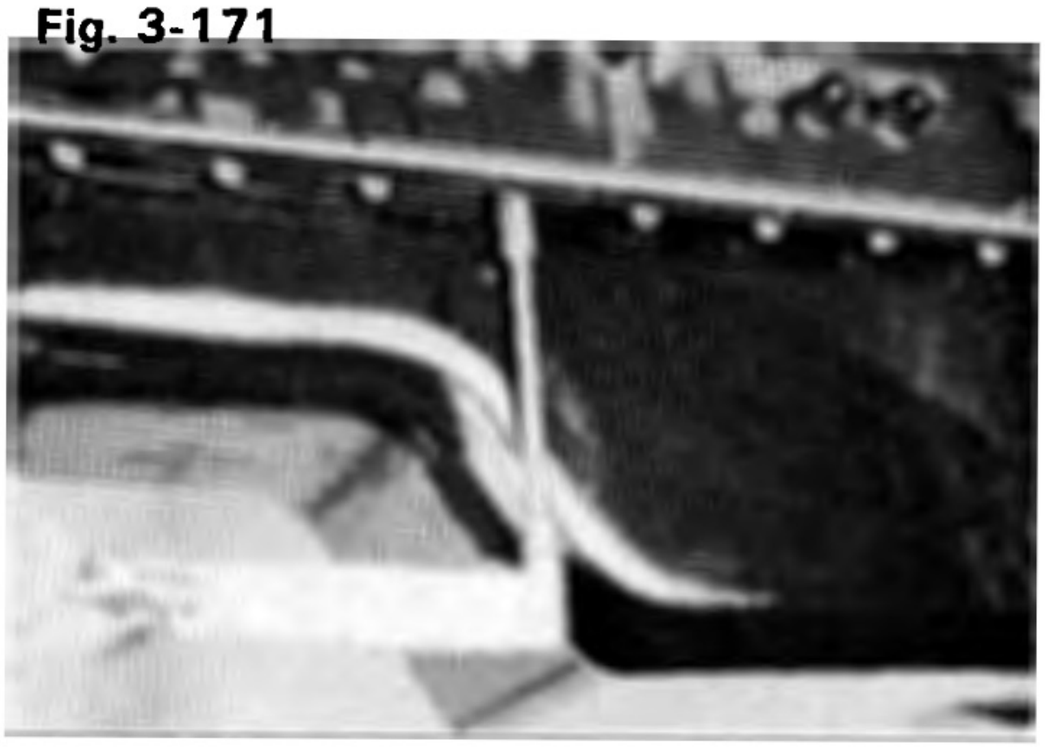
Make sure that the oil nozzle faces in the direction indicated in the figure and then stake the end plate at two places.

Fig. 3-170



Apply liquid sealer to the cylinder block and gear cover as shown in the figure.

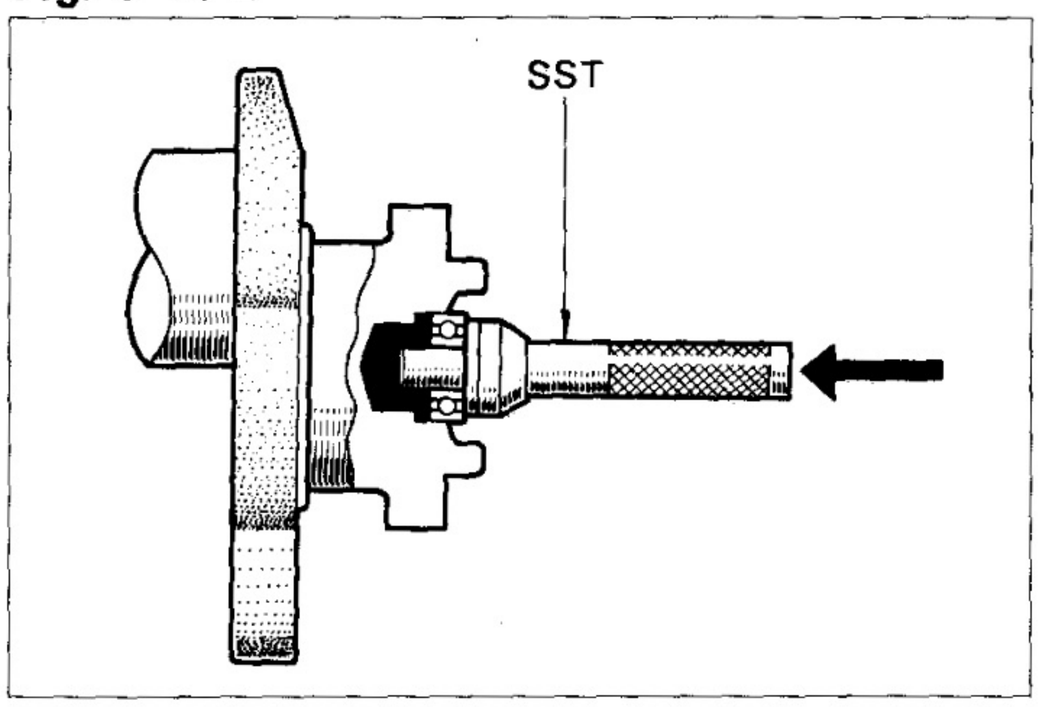
Fig. 3-171



Install the oil pan.

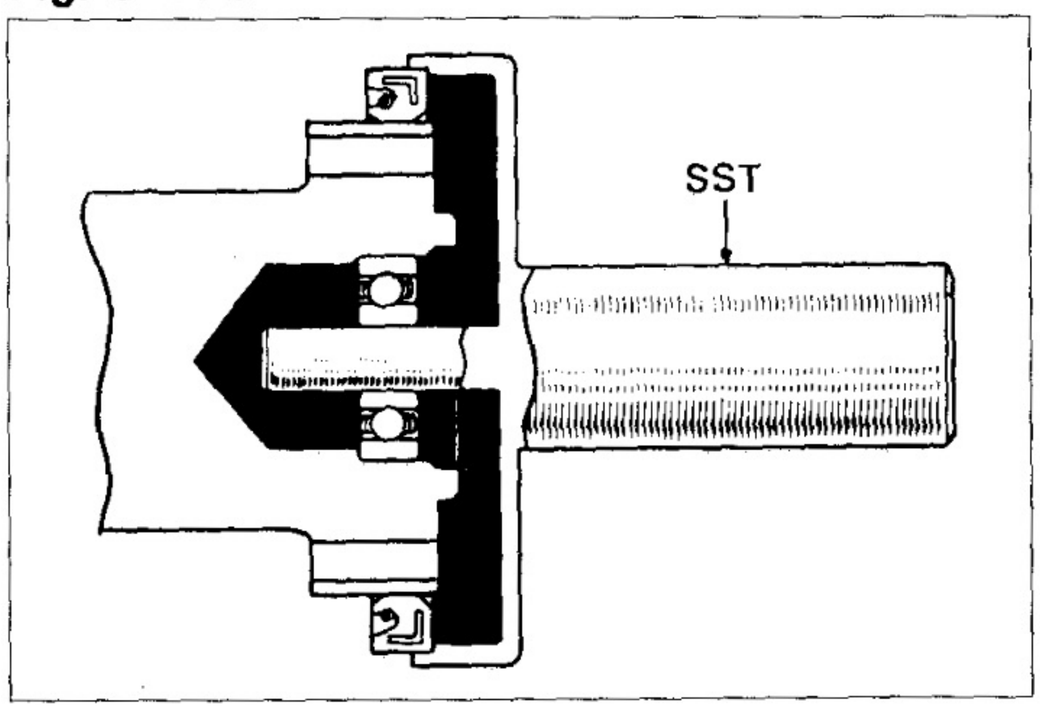
Tightening torque: 0.6 – 1.2 kg-m (53 – 104 in.-lb)

Fig. 3-172



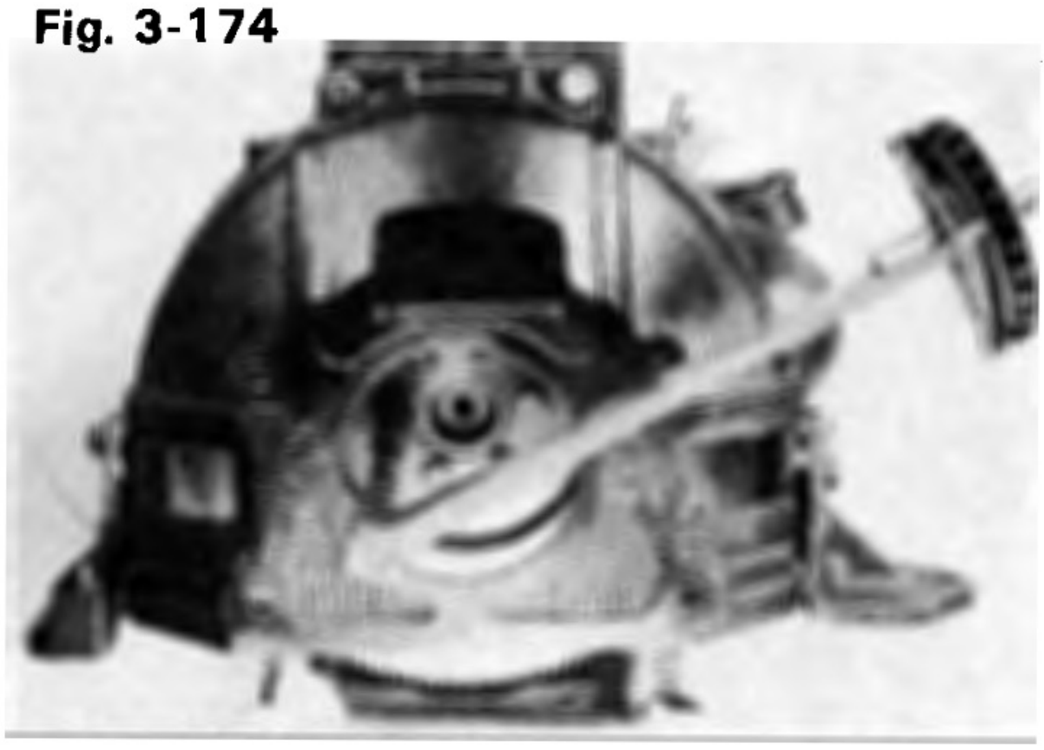
Drive in the input shaft bearing with SST.
SST [09304-47010]

Fig. 3-173



Using SST, apply MP grease onto the oil seal lip and install the oil seal.
SST [09223-60010]

Fig. 3-174



Tighten the bolts to specified torque.

Tightening torque: 8.0 – 11.0 kg-m (58 – 79 ft-lb)

– Note –

Apply a light coat of engine oil on the bolt threads and under the bolt head before installing.

LUBRICATION SYSTEM

Page

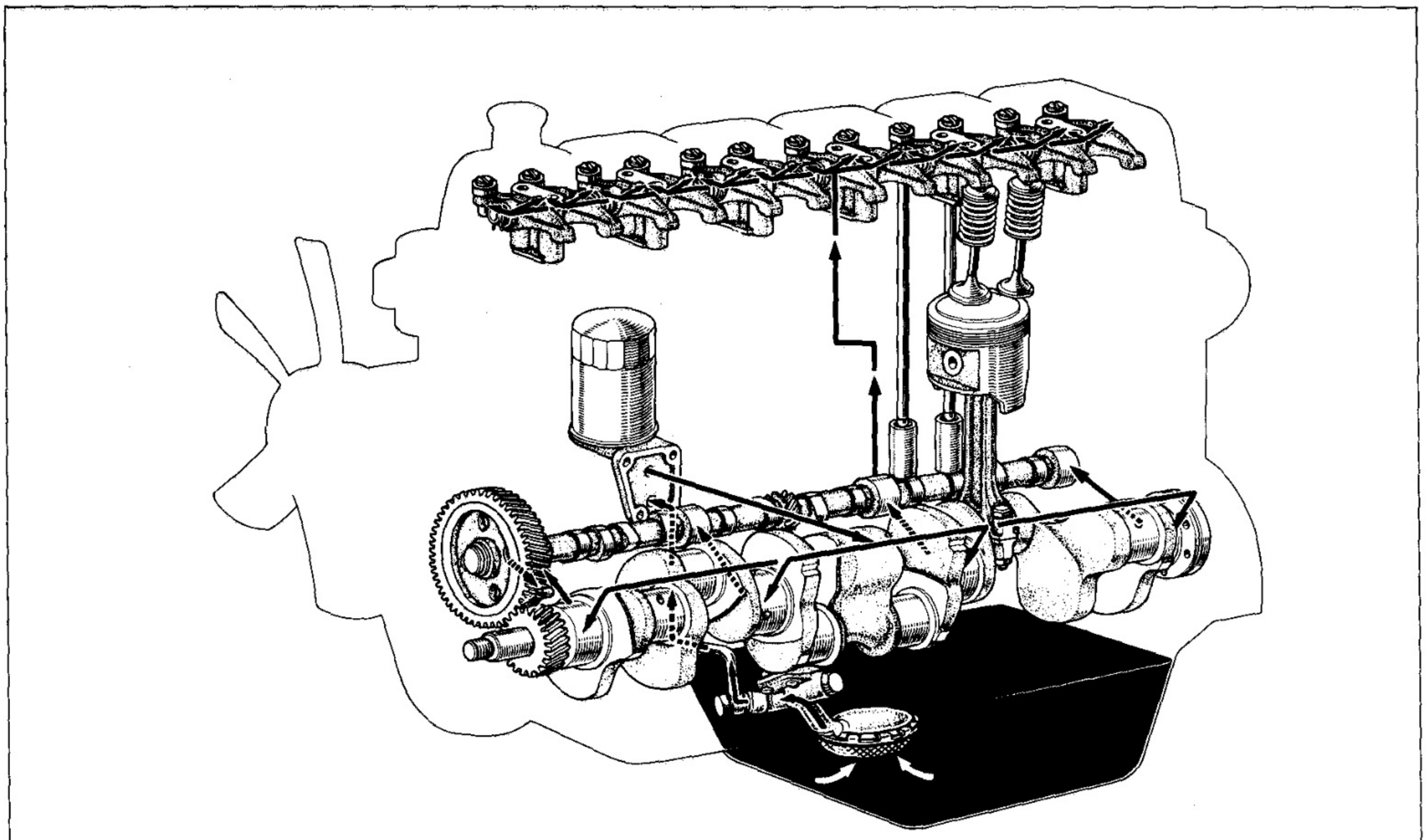
LUBRICATION SYSTEM CIRCUIT 4-2

OIL PUMP 4-3

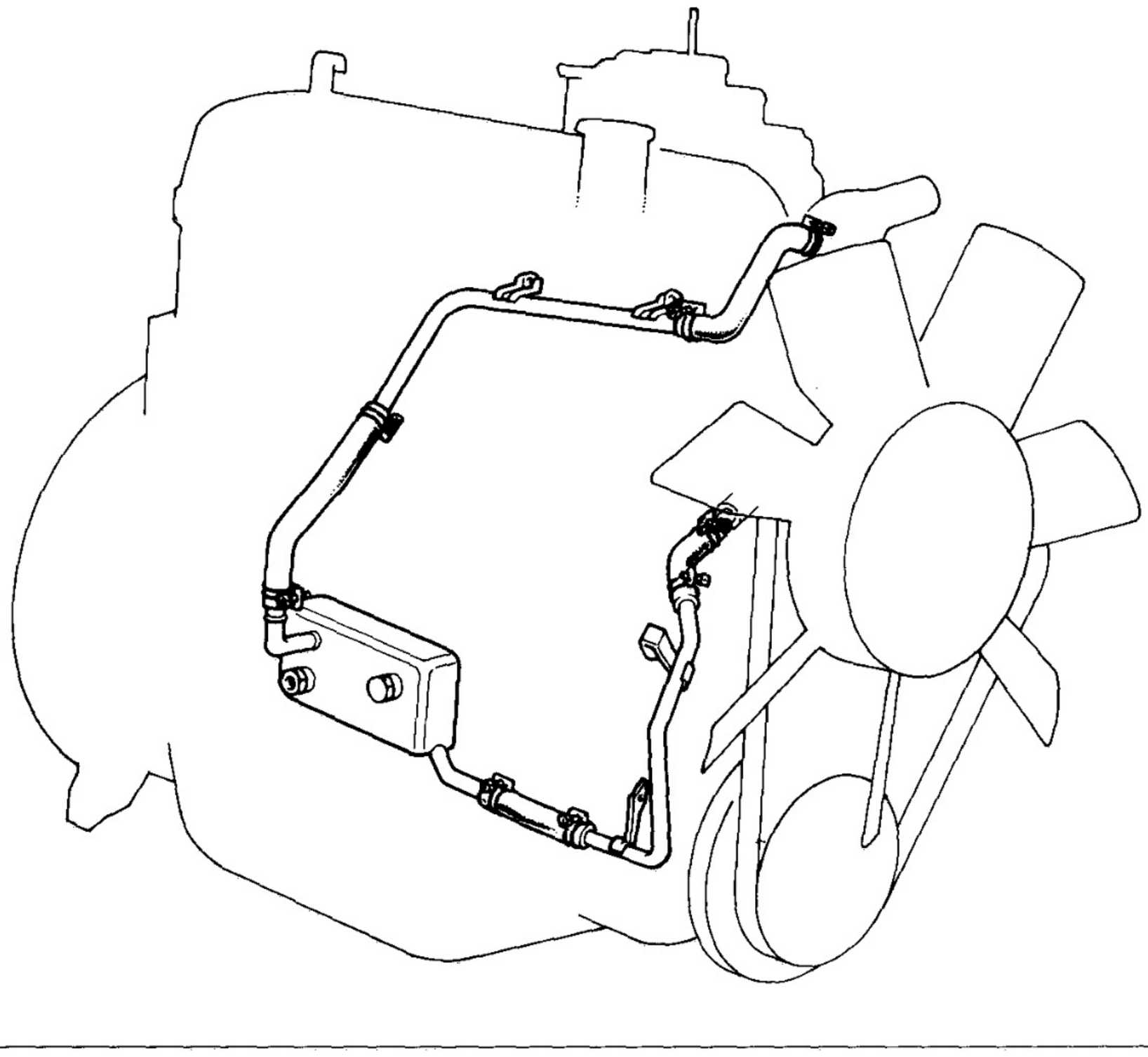
4

LUBRICATION SYSTEM CIRCUIT

Fig. 4-1



Oil Cooler

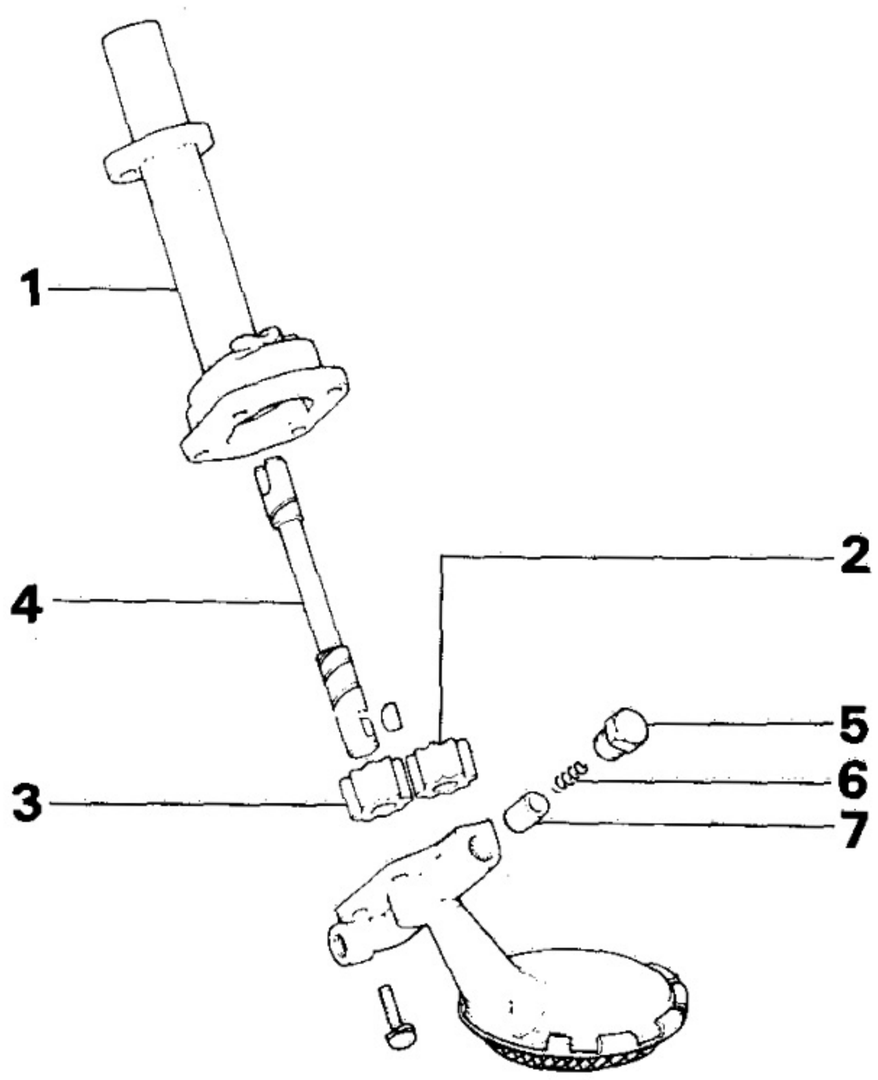


OIL PUMP

DISASSEMBLY

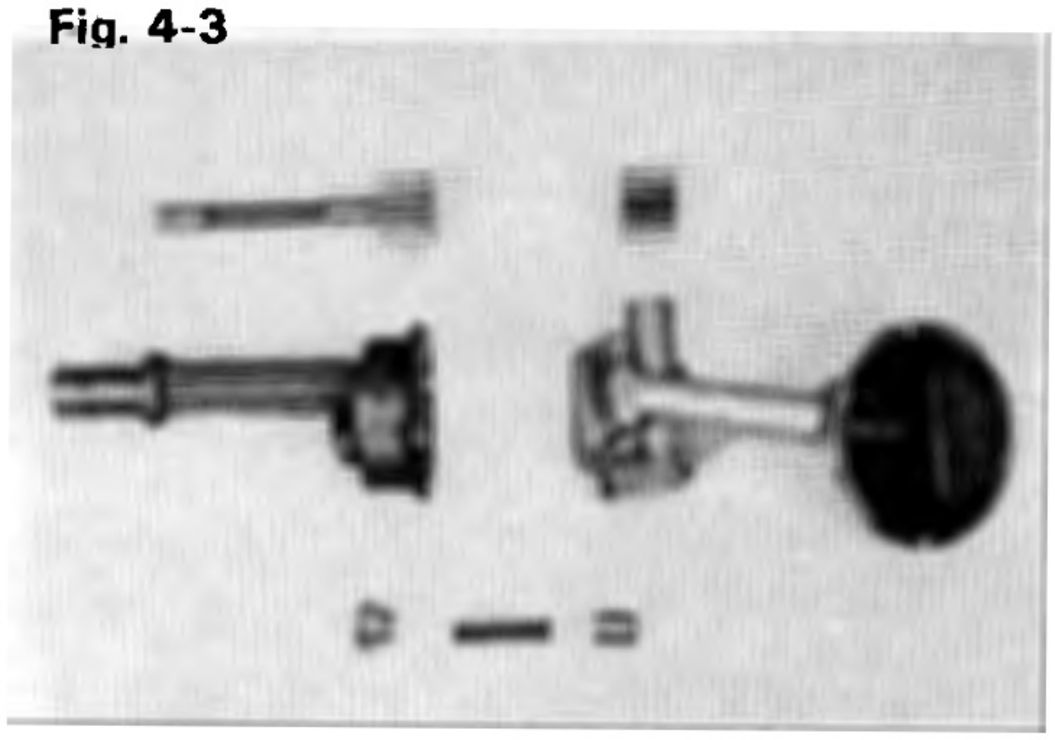
Disassemble the parts in the numerical order shown in the figure.

Fig. 4-2



1. Oil Pump Cover
2. Oil Pump Driven Gear
3. Oil Pump Drive Gear
4. Oil Pump Drive Shaft
5. Plug
6. Oil Pump Relief Valve Spring
7. Oil Pump Relief Valve

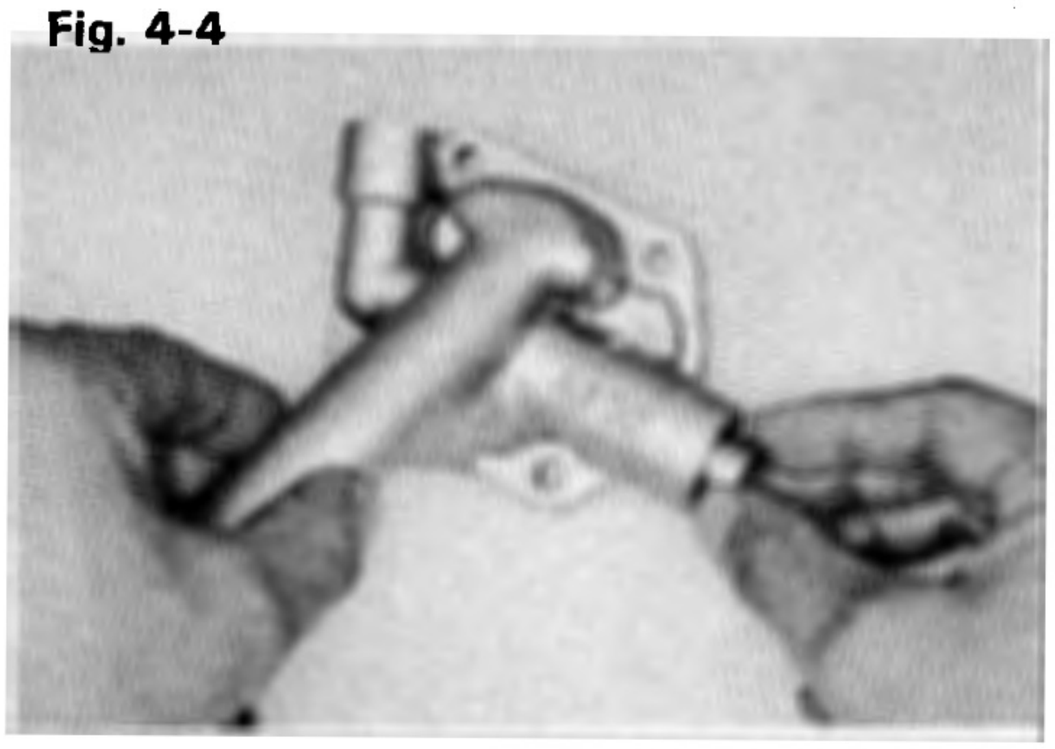
Fig. 4-3



INSPECTION

1. Check the disassembled parts for wear or damage.

Fig. 4-4



2. Check the relief valve for wear or scoring and check that it slides smoothly.

Fig. 4-5



3. Measure the tip clearance. If it exceeds the limit, replace the gear and/or pump body.

Tip clearance:

STD	**0.11 – 0.18 mm (0.0043 – 0.0071 in.)**
Limit	**0.2 mm (0.008 in.)**

Fig. 4-6



4. Measure the backlash. If it exceeds the limit, replace both gears.

Backlash:

STD	**0.5 – 0.6 mm (0.020 – 0.024 in.)**
Limit	**0.95 mm (0.0374 in.)**

Fig. 4-7



5. Measure the side clearance. If it exceeds the limit, replace the gear and/or pump body.

Side clearance:

STD	**0.03 – 0.09 mm (0.0012 – 0.0035 in.)**
Limit	**0.15 mm (0.0059 in.)**

Fig. 4-8



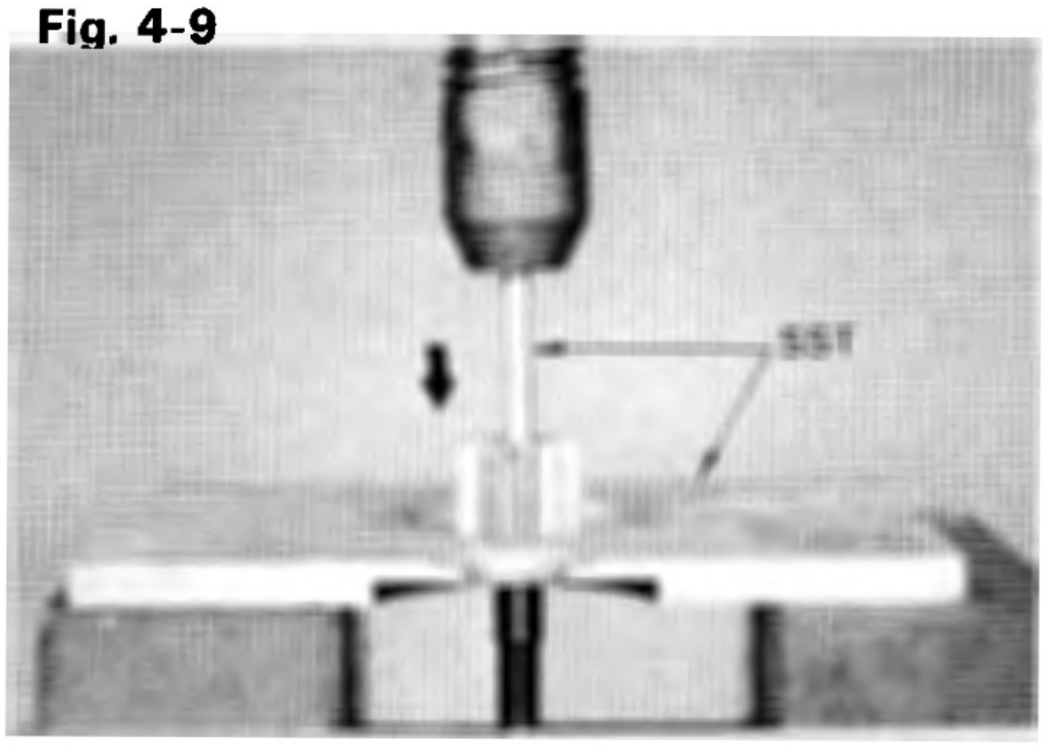
6. Measure the pump cover wear. If it exceeds the limit, replace the pump cover.

Wear limit: 0.15 mm (0.0059 in.)

– Note –

Hold the oil pump cover in a soft jaw vise.

Fig. 4-9

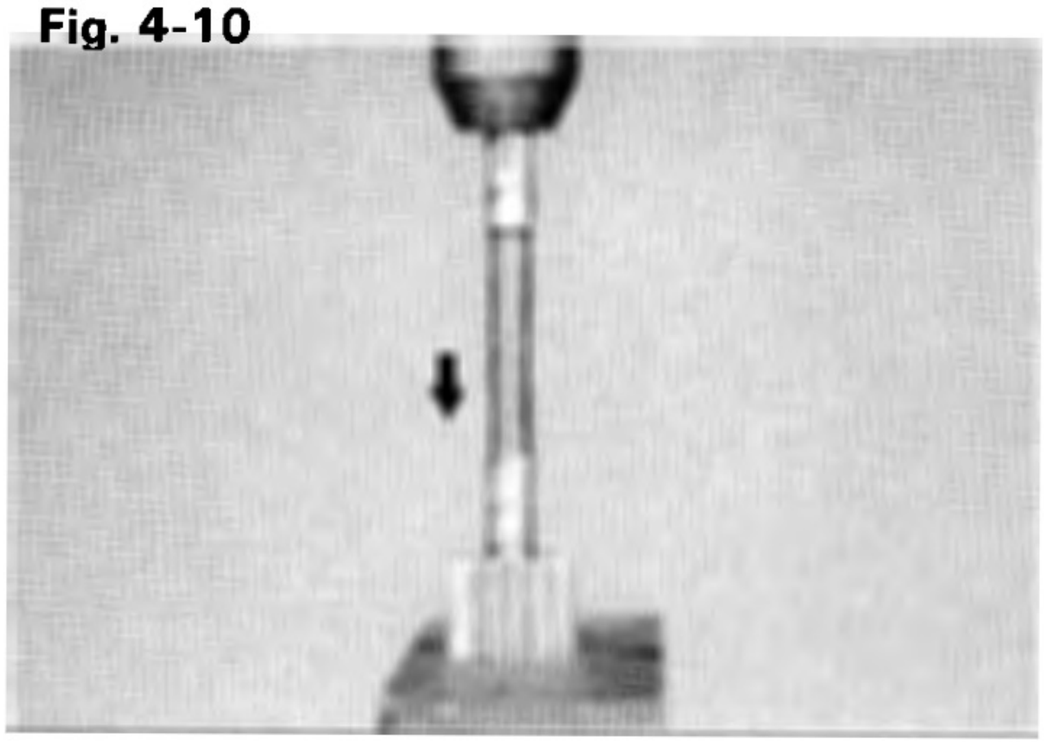


REPLACEMENT

If necessary, replace the oil pump drive gear referring to the following procedures.

1. Using SST and press, press out the drive gear.
   SST [09236-28011]
   [09236-36010]

Fig. 4-10

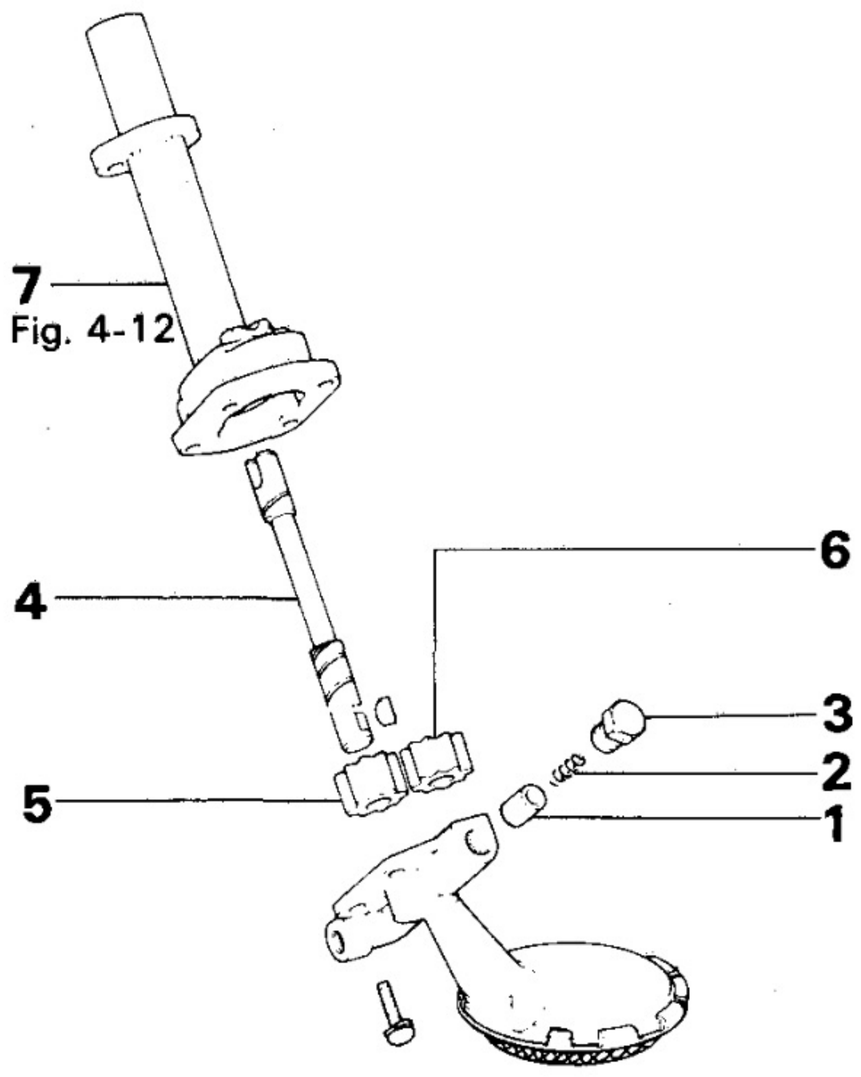


2. Press in a new drive gear.

ASSEMBLY

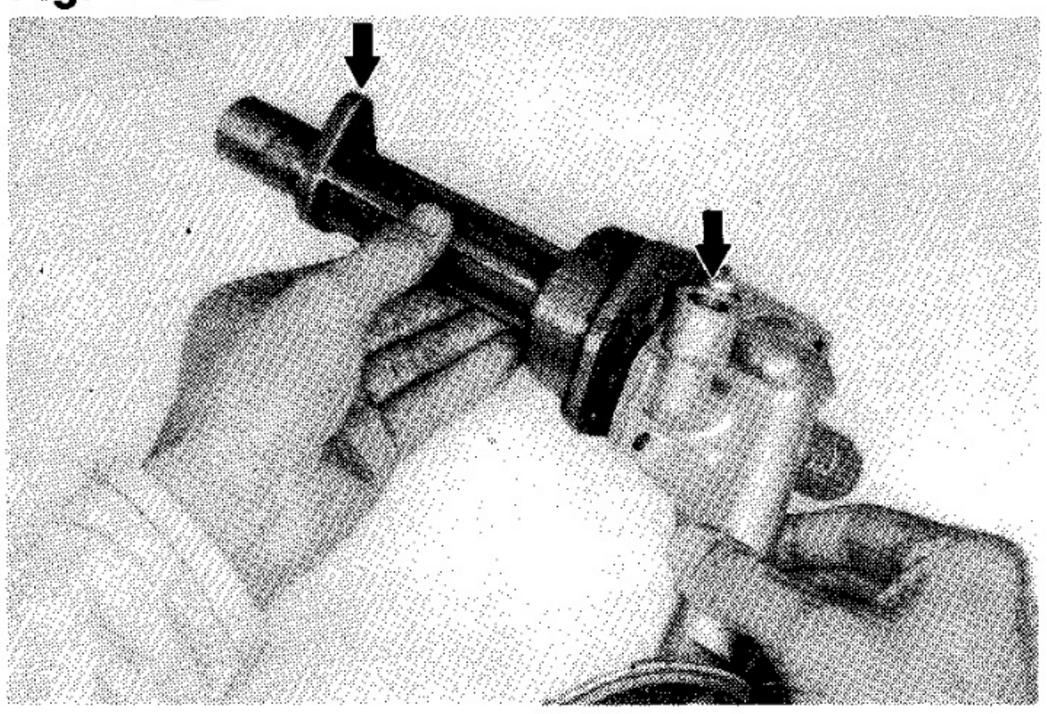
Assemble the parts in the numerical order shown in the figure.

Fig. 4-11



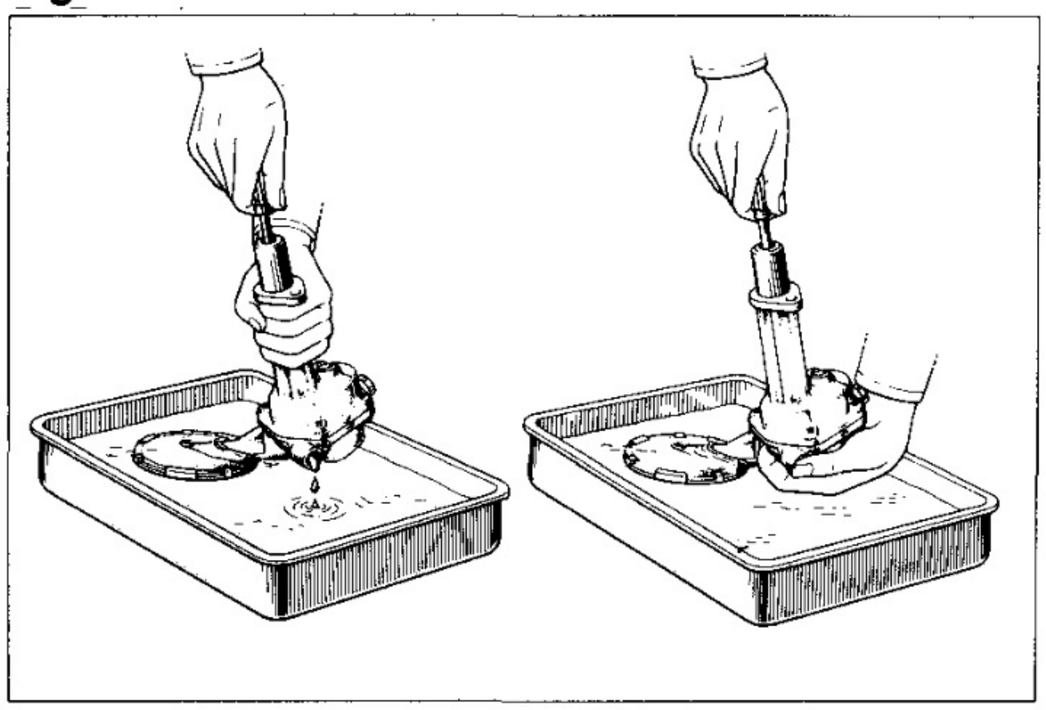
1. Oil Pump Relief Valve
2. Oil Pump Relief Valve Spring
3. Plug
4. Oil Pump Drive Shaft
5. Oil Pump Drive Gear
6. Oil Pump Driven Gear
7. Oil Pump Cover

Fig. 4-12



Install the pump cover, facing the discharge hole toward the pump body bolt hole.

Fig. 4-13



CHECK PUMP OPERATION

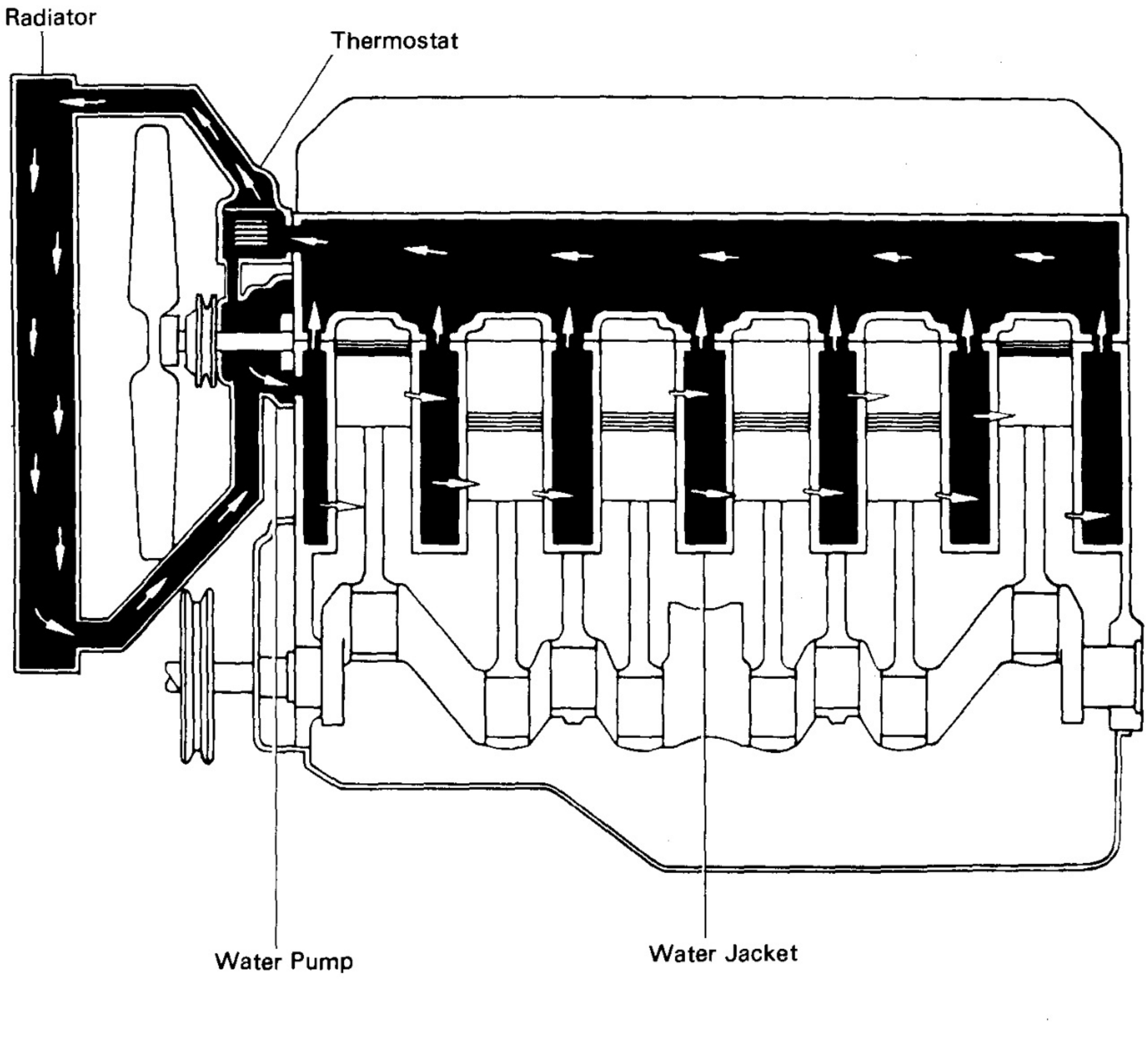
1. After assembly, immerse the pump suction end into clean engine oil, and turn the pump shaft clockwise with a screwdriver until oil comes out of the discharge hole.
2. Close the discharge hole with your thumb, and check to see if the pump shaft rotational resistance increases when turned further.

COOLING SYSTEM

	Page
COOLING SYSTEM CIRCUIT	5-2
WATER PUMP	5-3
RADIATOR	5-9
THERMOSTAT	5-9

COOLING SYSTEM CIRCUIT

Fig. 5-1

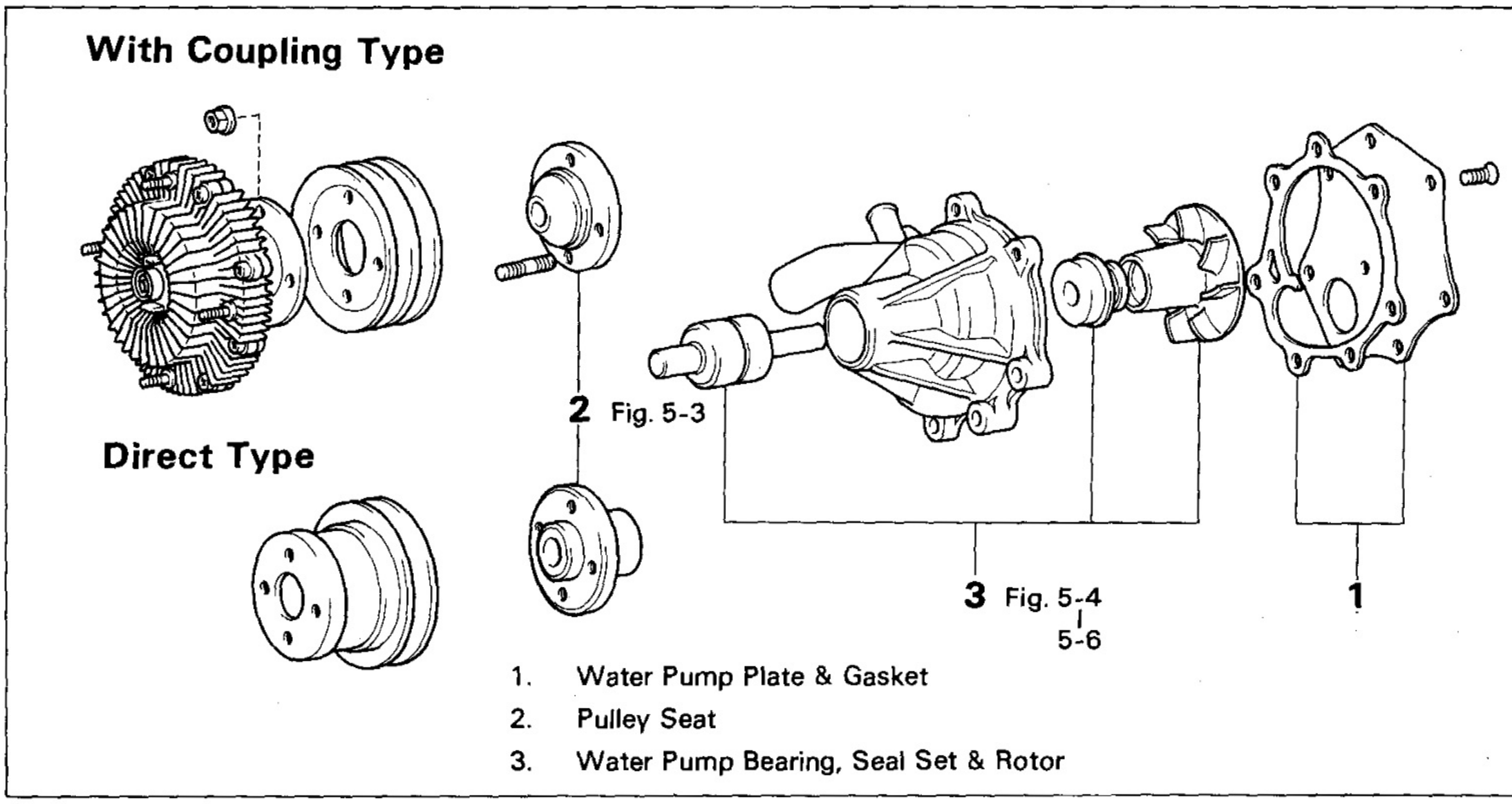


WATER PUMP

DISASSEMBLY

Disassemble the parts in the numerical order shown in the figure.

Fig. 5-2



1. Water Pump Plate & Gasket
2. Pulley Seat
3. Water Pump Bearing, Seal Set & Rotor

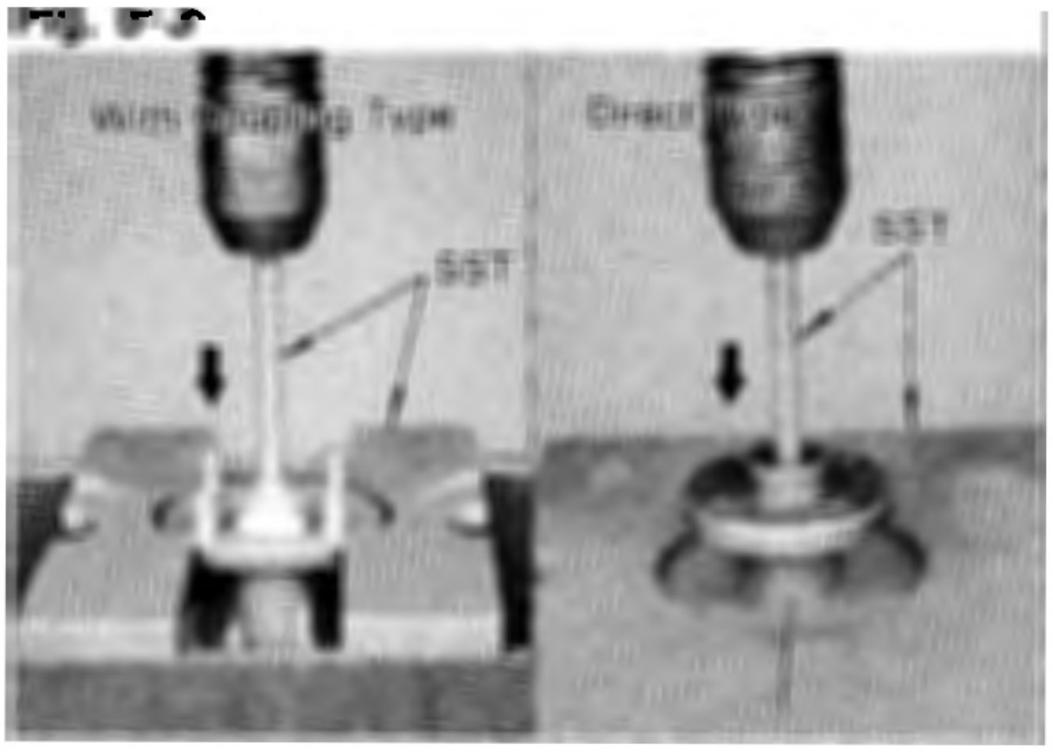
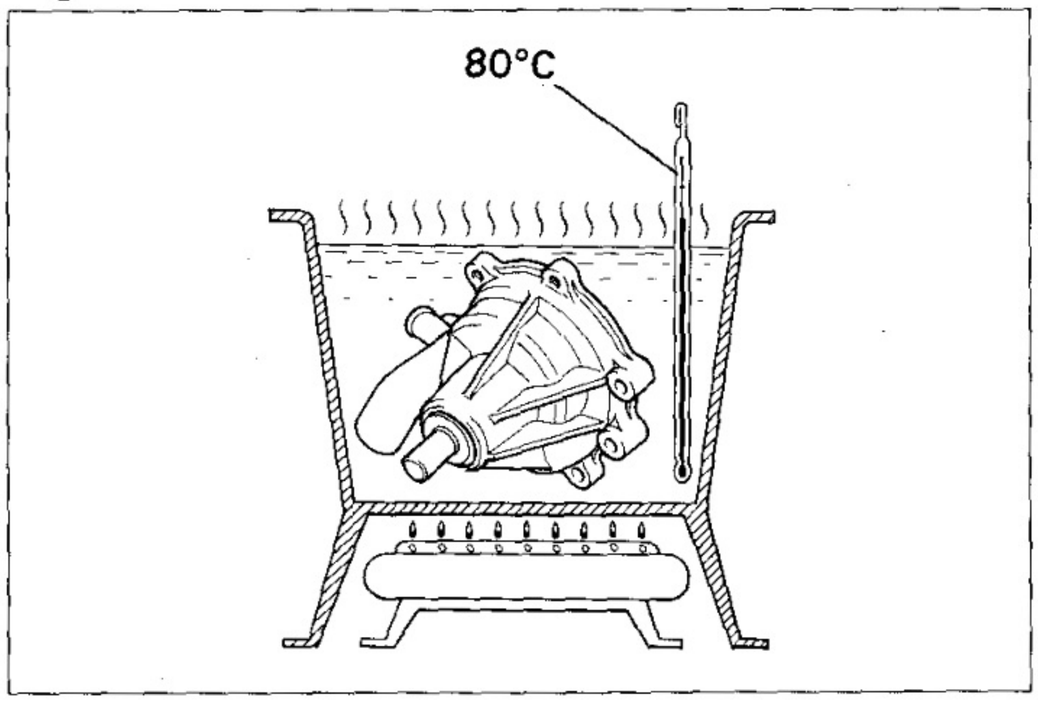


Fig. 5-4

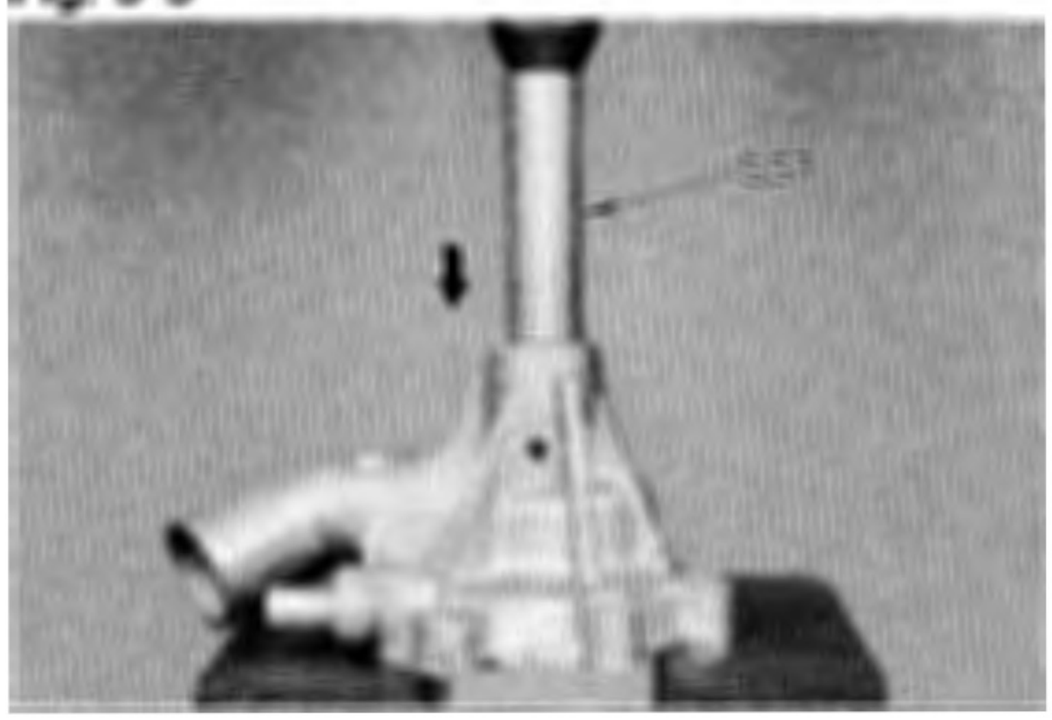
While supporting the pulley seat, press out the shaft with SST.

SST [09236-36010] —— With Coupling type
[09236-28011] ⟩ Direct type
[09236-36010] ⟩



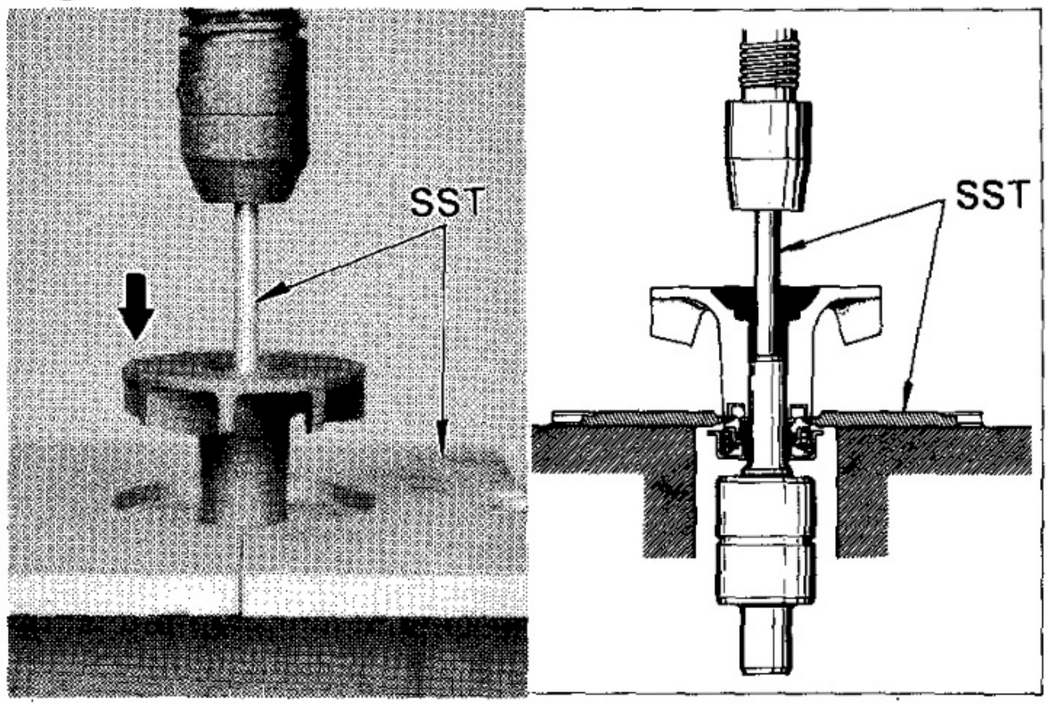
Heat the water pump body to about 80°C (176°F).

Fig. 5-5



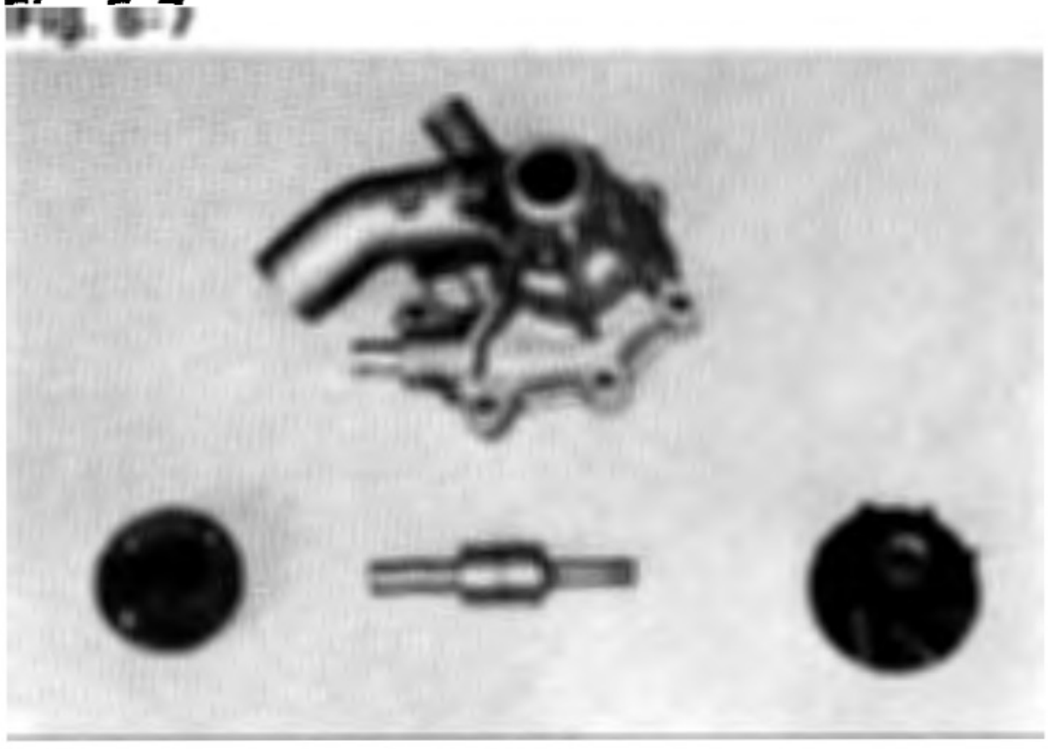
Press out the bearing together with the rotor with SST.
SST [09236-28011]—— Direct type
[09236-36010]—— With Coupling type

Fig. 5-6



Press out the bearing with SST.
SST [09236-28011]
[09236-36010]

Fig. 5-7



INSPECTION

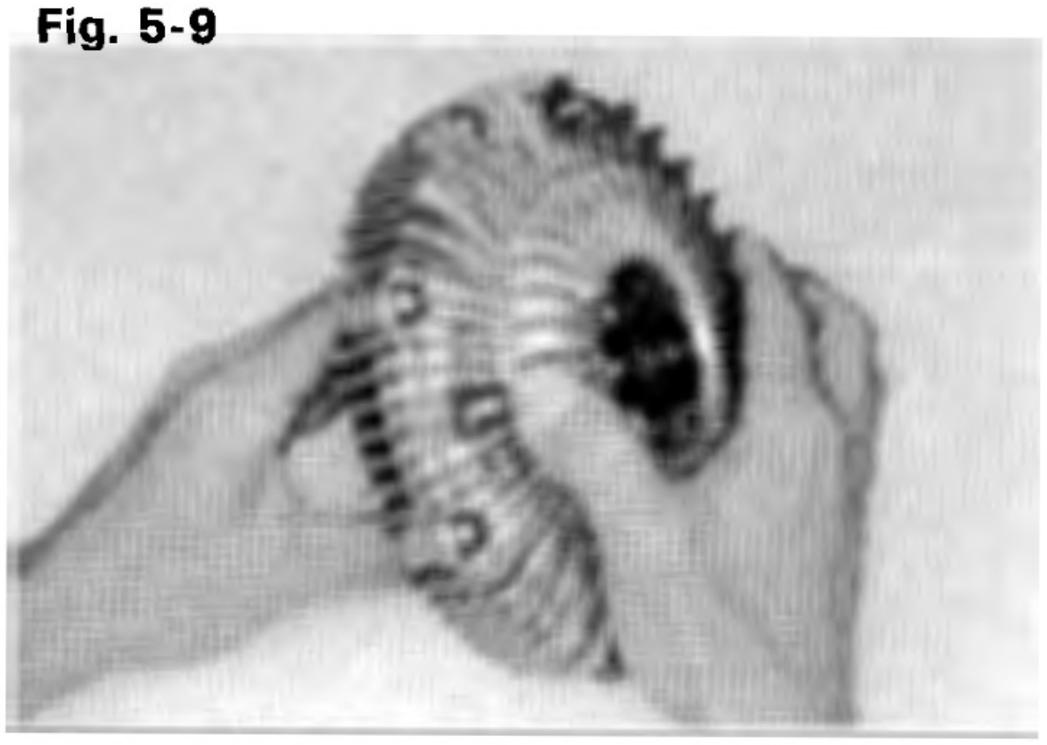
1. Inspect the disassembled parts for cracks, wear, damage and replace if defective.

Fig. 5-8



2. Inspect the bearing rotation. If damaged, produces noise or does not turn properly, replace it.

Fig. 5-9



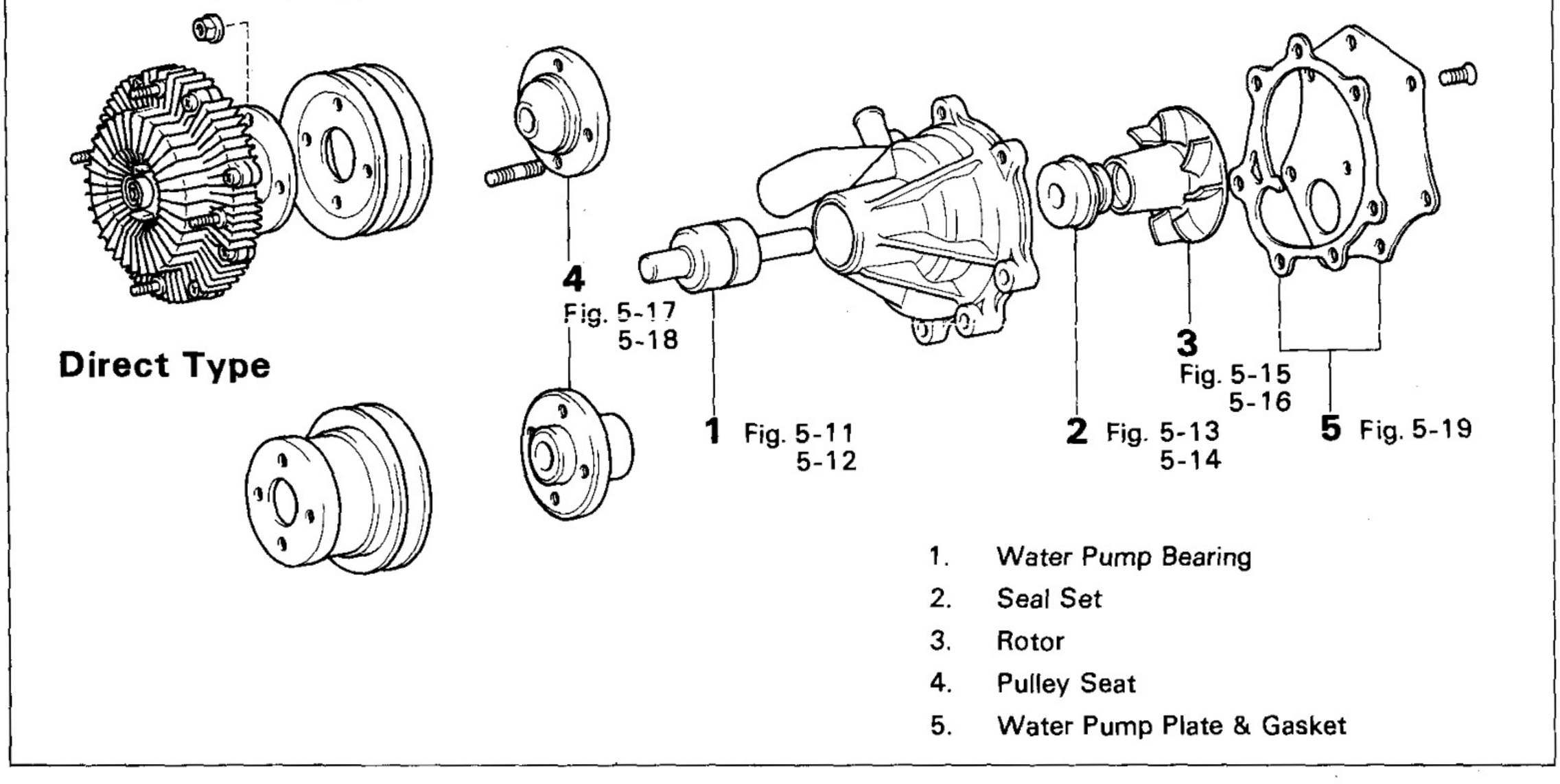
3. Check the fluid coupling for damage and silicone oil leak. If necessary, replace the coupling assembly.

– Note –
Do not press on the bi-metal.

ASSEMBLY

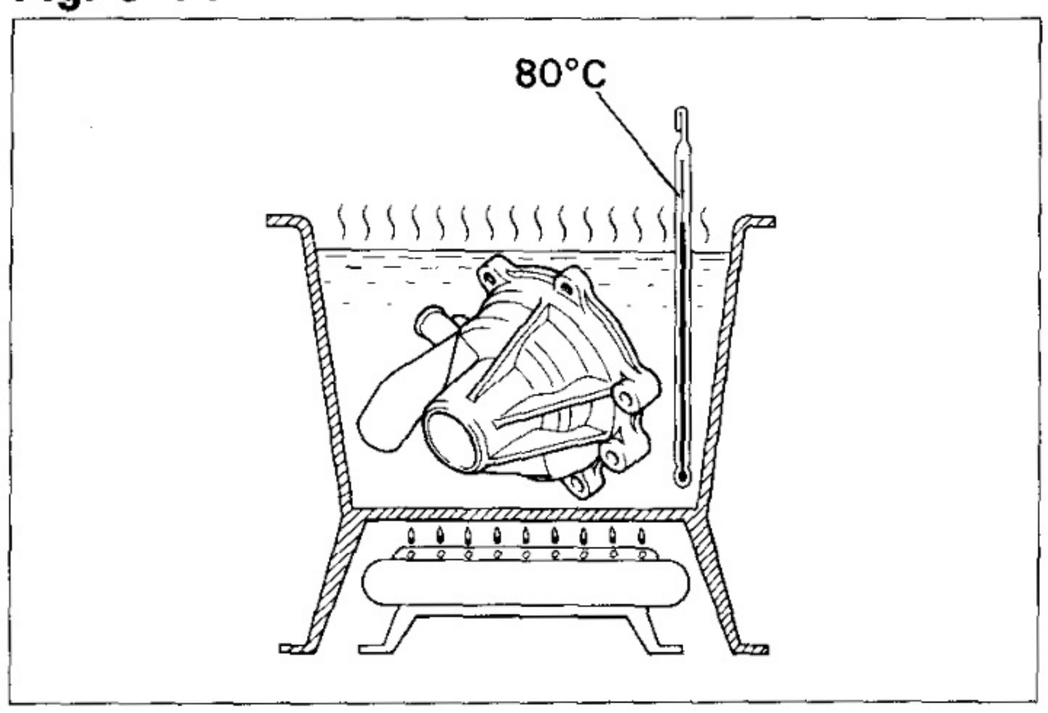
Assemble the parts in the numerical order shown in the figure.

Fig. 5-10



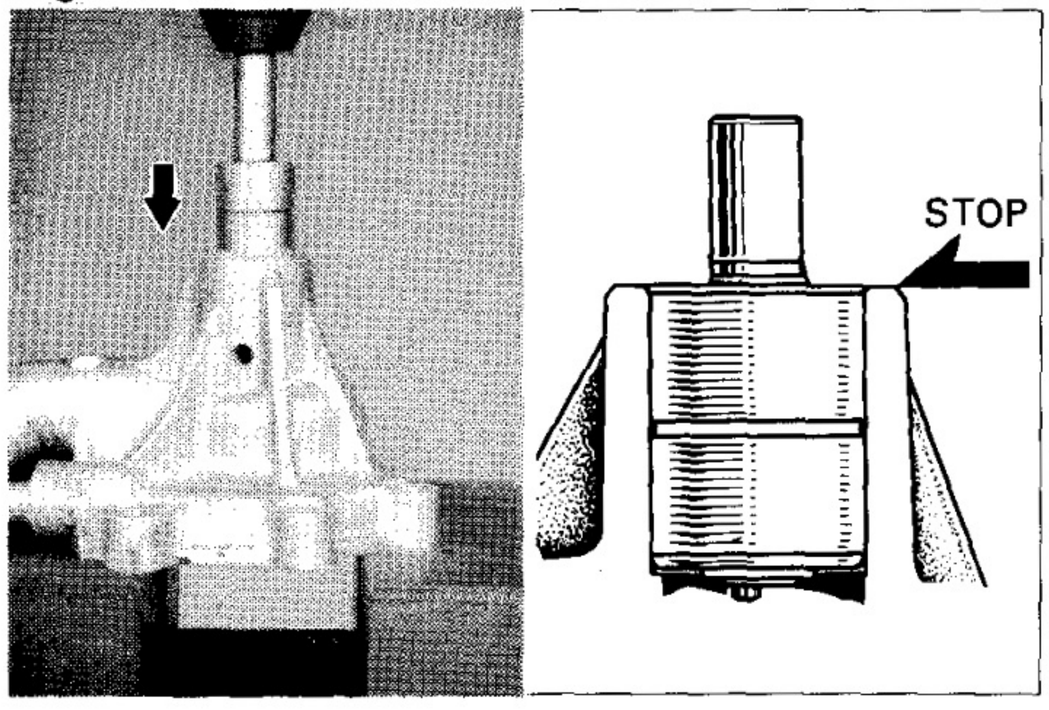
1. Water Pump Bearing
2. Seal Set
3. Rotor
4. Pulley Seat
5. Water Pump Plate & Gasket

Fig. 5-11



⚠ Heat the water pump body to about 80°C (176°F).

Fig. 5-12

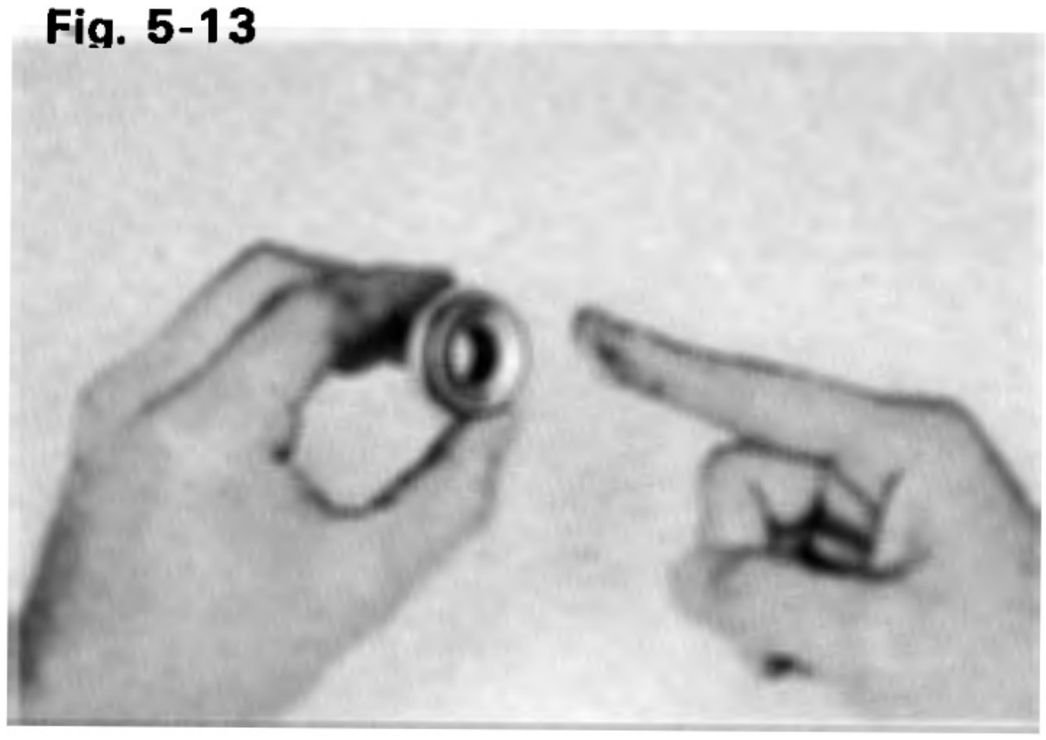


Press in the bearing.

– Note –

The bearing end face should be flush with the body top surface.

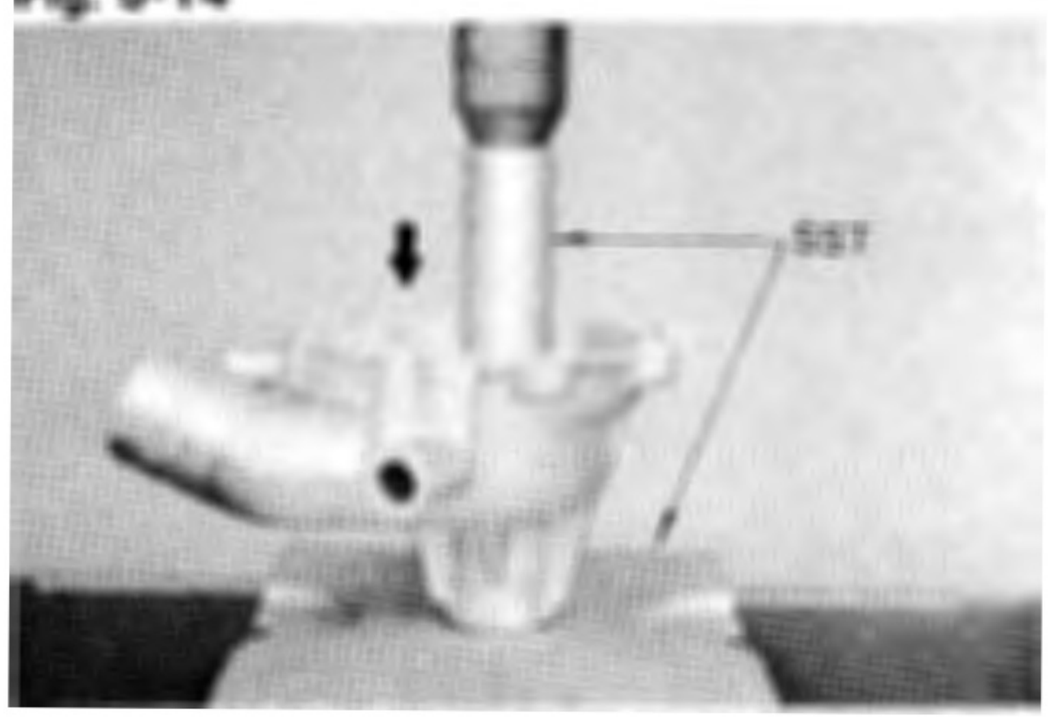
Fig. 5-13



⚠ Apply a little liquid sealer to the seal set.

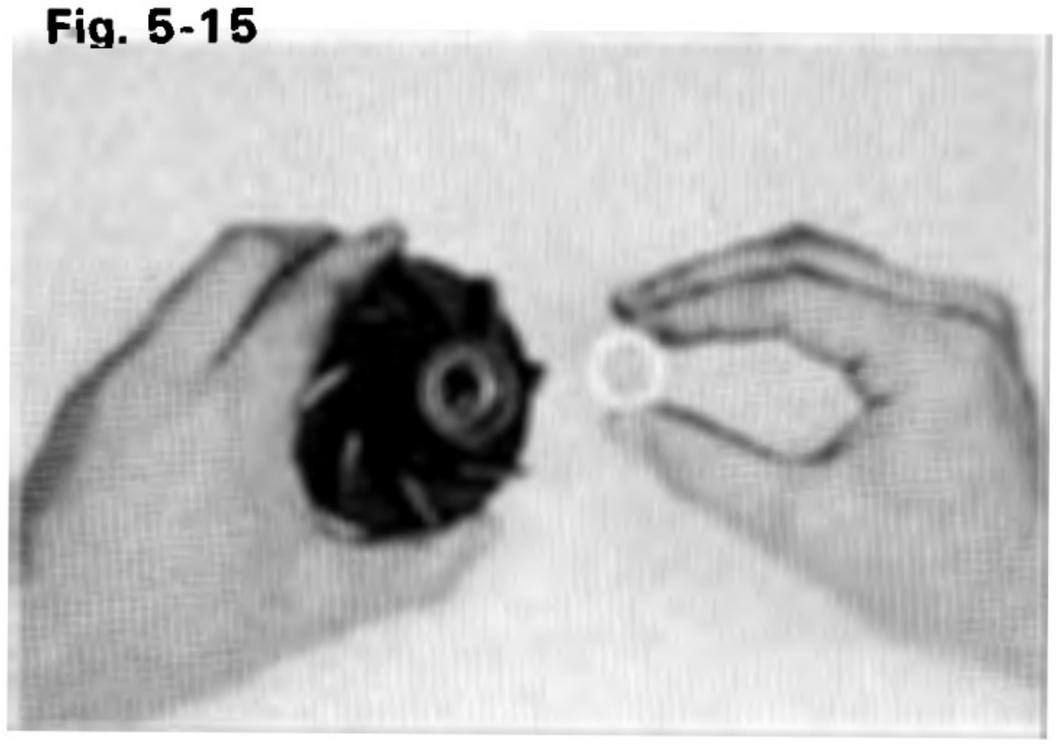
– Note –
Always replace the seal set before re-assembly.

Fig. 5-14



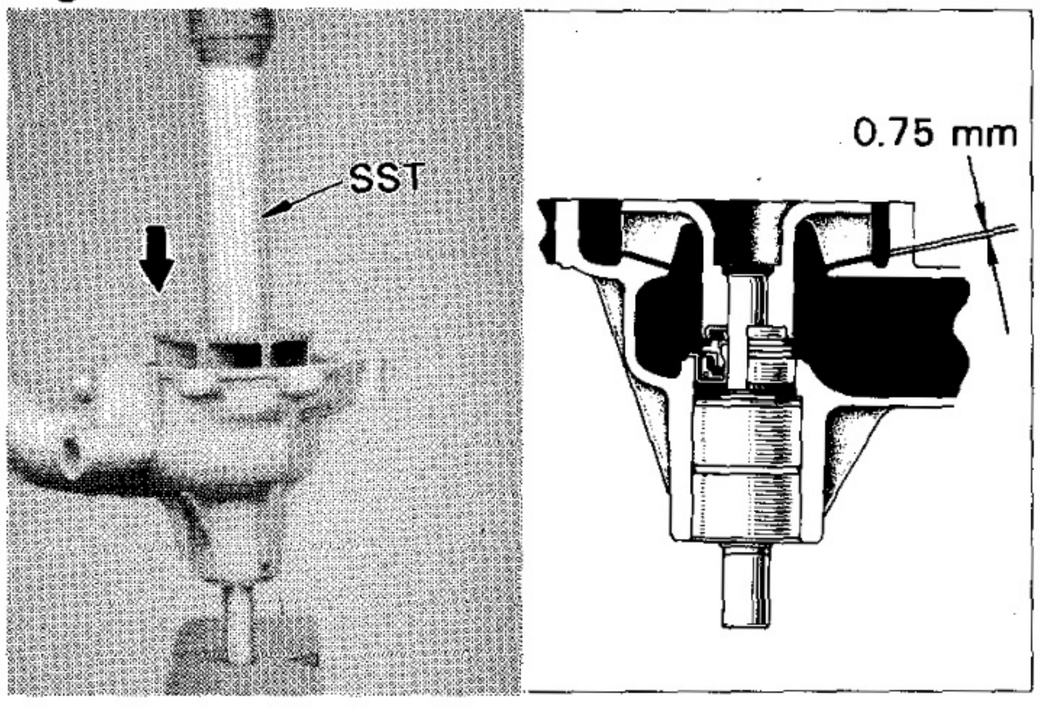
Press the seal set into the pump body with SST.
SST [09236-36010]

Fig. 5-15



Install the packing and seat into the rotor.

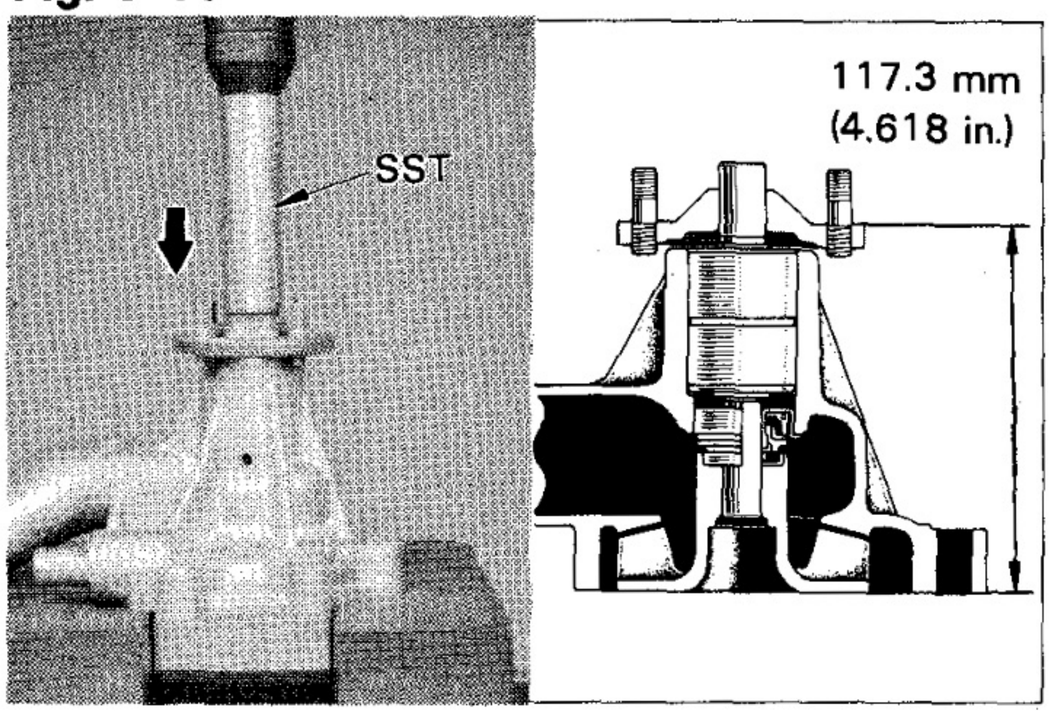
Fig. 5-16



Press in the rotor with SST.
SST [09236-36010]

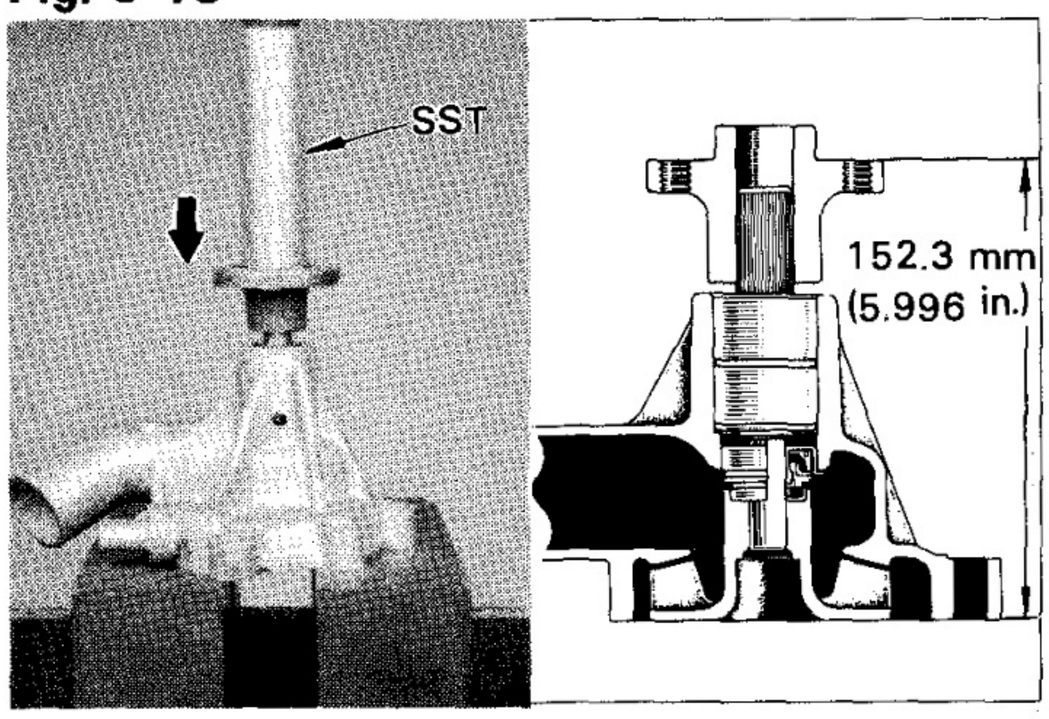
– Note –
The gap between the pump body and rotor should be 0.75 mm (0.0295 in.).

Fig. 5-17



(With Coupling type)
Press in the pulley seat to the specified depth with SST.
SST [09236-28011]

Fig. 5-18



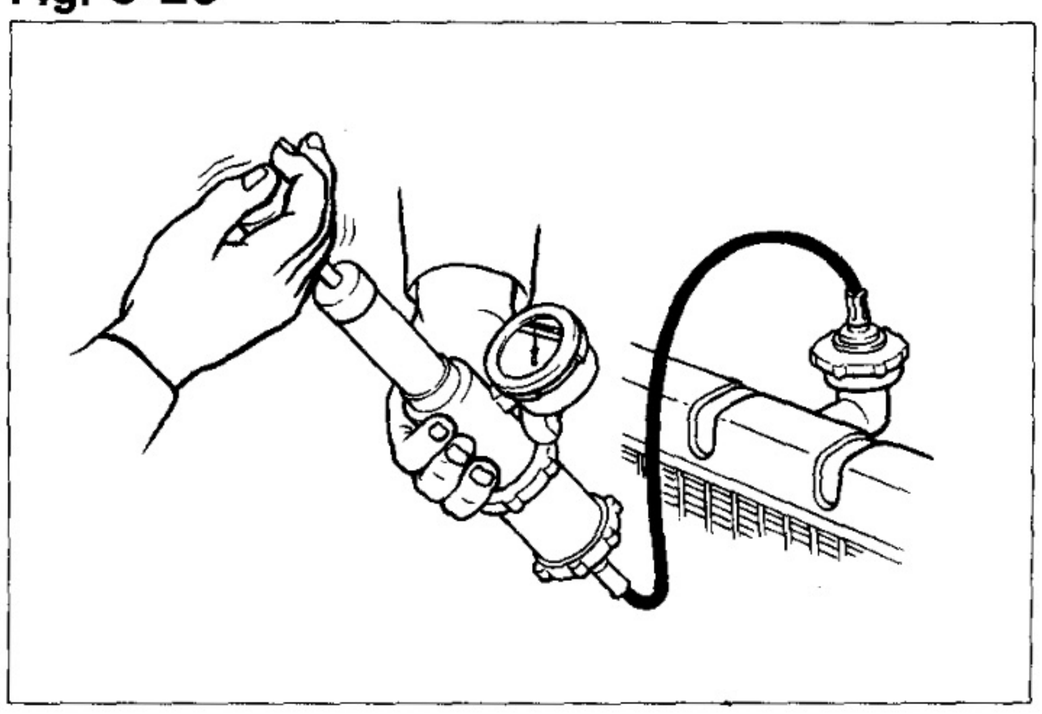
(Direct type)
Press in the pulley seat to the specified depth with SST.
SST [09236-36010]

Fig. 5-19



After assembly, make sure the rotor rotates smoothly.

Fig. 5-20



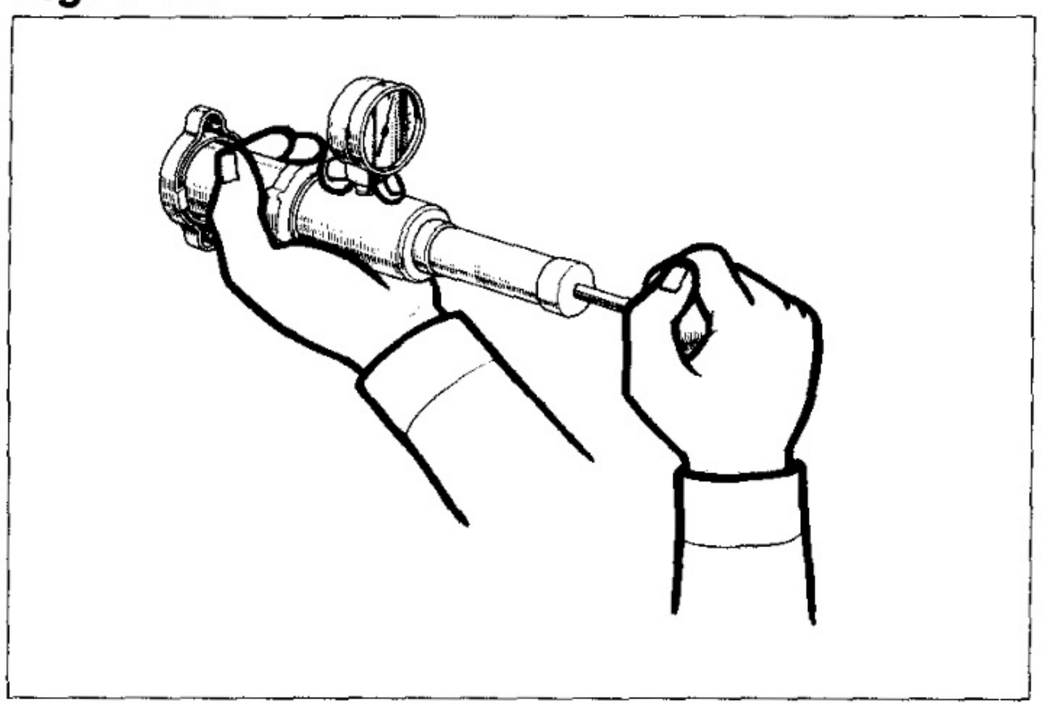
RADIATOR

INSPECTION

1. Install the radiator cap tester to the radiator, apply pressure and check for leakage in the cooling system under normal operating temperature.

Applicable pressure:
1.5 kg/cm² (21 psi)

Fig. 5-21



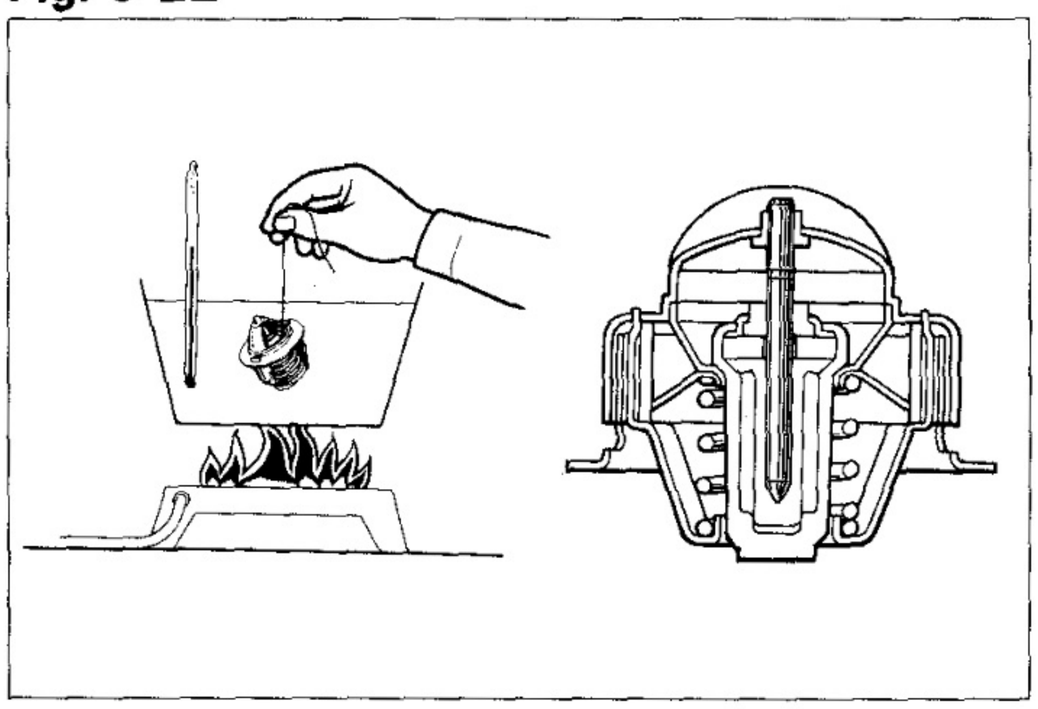
2. Check the pressure sealing and vacuum relief valve operation.

Valve opening pressure:

STD	**0.75 — 1.05 kg/cm² (10.7 — 14.9 psi)**
Limit	**0.6 kg/cm² (8.5 psi)**

3. If the readings are not within acceptable limits, replace the radiator cap.

Fig. 5-22



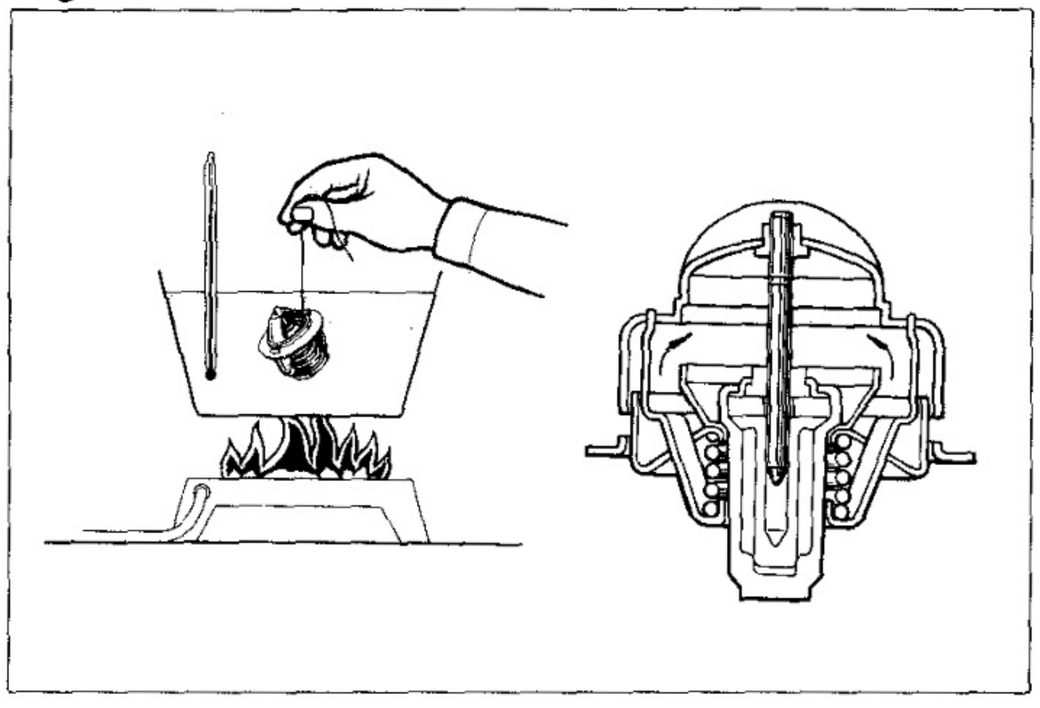
THERMOSTAT

INSPECTION

1. Immerse the thermostat in water, and check the valve opening temperature by gradually heating the water.
2. Replace the thermostat if the valve remains open at normal temperature or is not very tight when fully closed.

Valve starts to open at 86 — 90°C (187 — 194°F).

Fig. 5-23

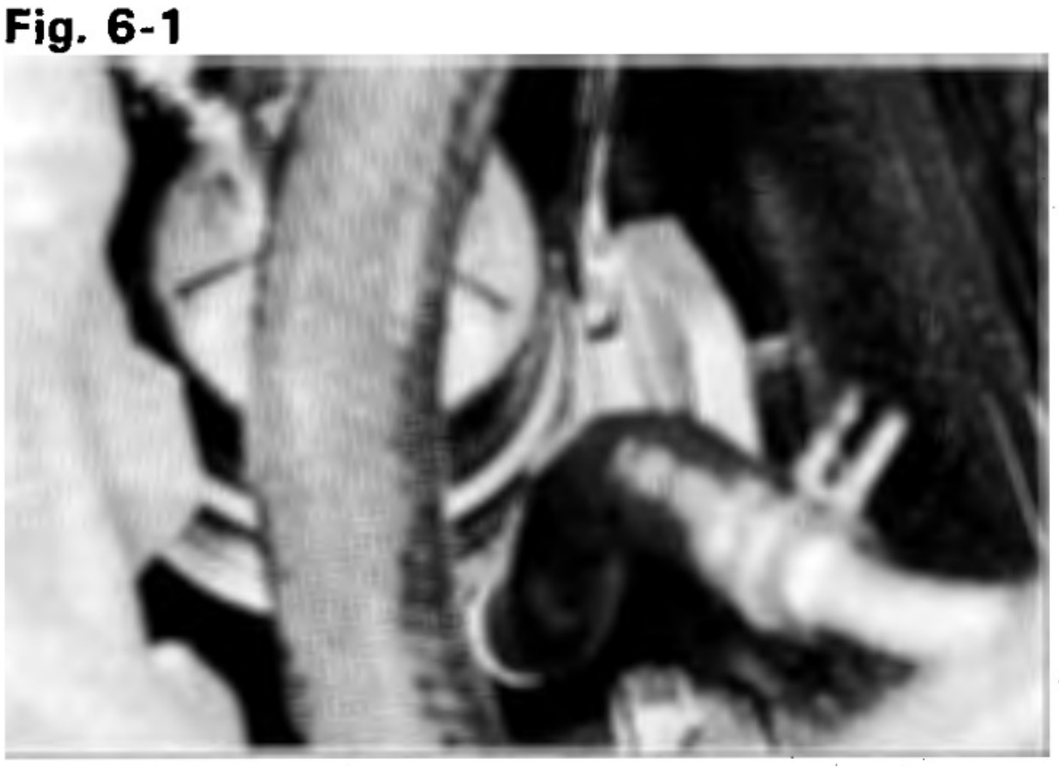


Valve opens by more than 10 mm (0.39 in.) at 100°C (212°F).

FUEL SYSTEM

	Page
FUEL PUMP	6-2
CARBURETOR (USA)	6-4
(General Countries)	6-27
CARBURETOR ADJUSTMENT	6-50

Fig. 6-1



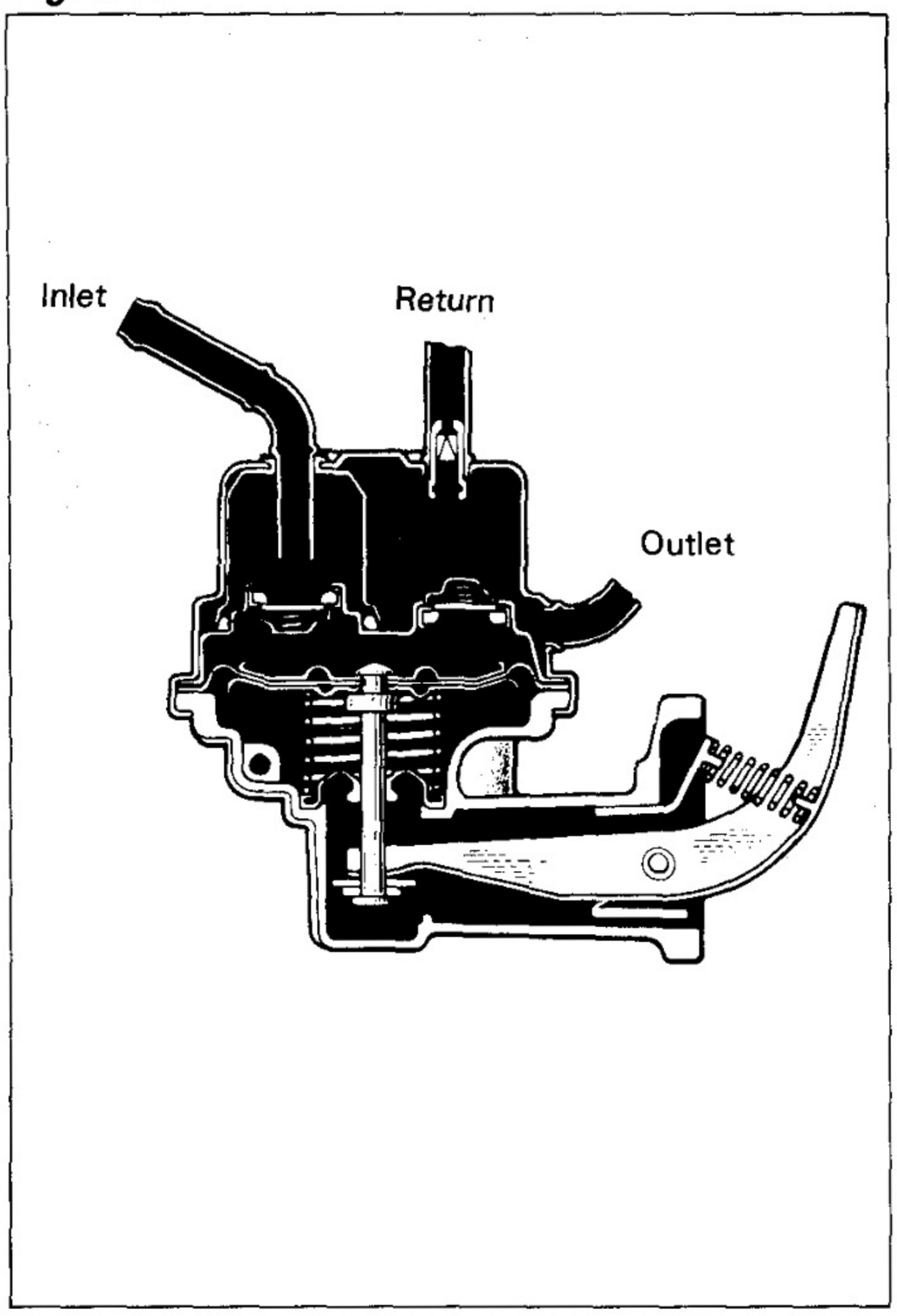
FUEL PUMP

REMOVAL

After disconnecting the fuel hoses, remove the fuel pump.

— Note —
Be sure to plug the ends of the fuel hoses.

Fig. 6-2



PRECHECK

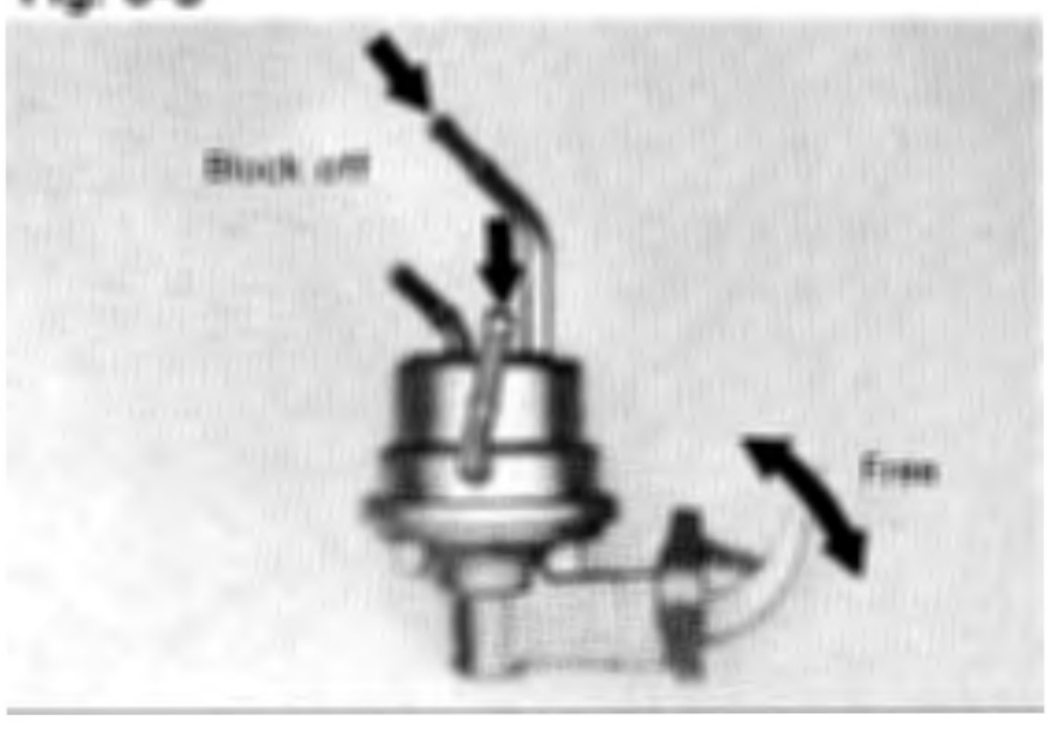
1. Run some fuel through the pump to insure that the check valves seal tightly.

— Note —
A dry check valve may not seal properly.

2. Without blocking off any pipes, operate the pump lever and check the amount of force necessary for operation and the amount of arm play.

— Note —
This same amount of force should be used in the following checks.

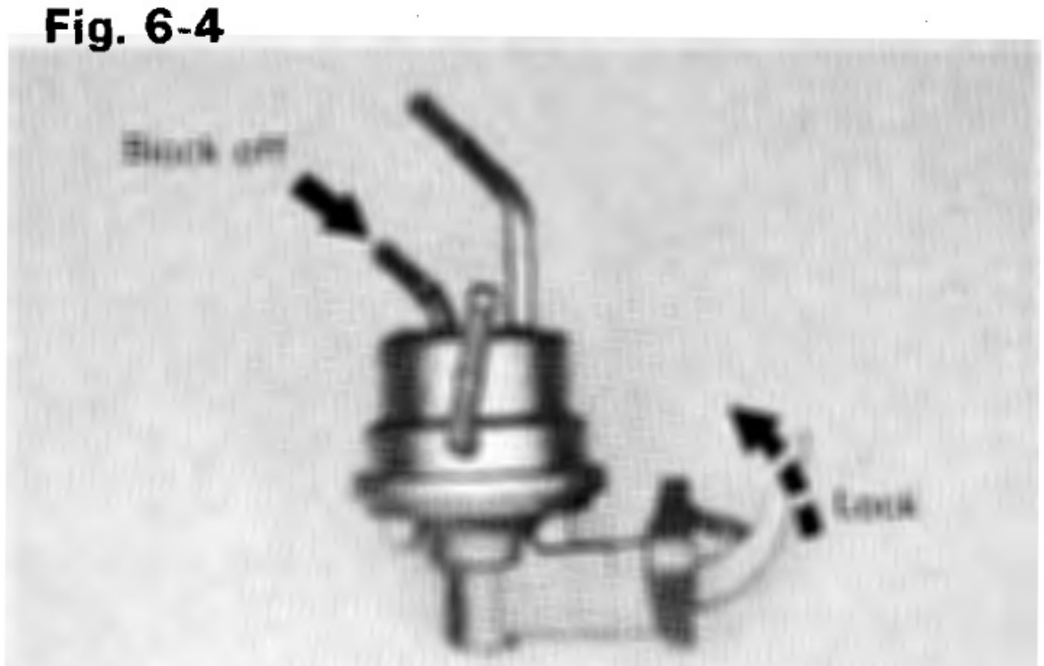
Fig. 6-3



INSPECTION

1. Block off the outlet pipes with your finger and check that there is an increase in lever arm play and that the lever arm moves freely.

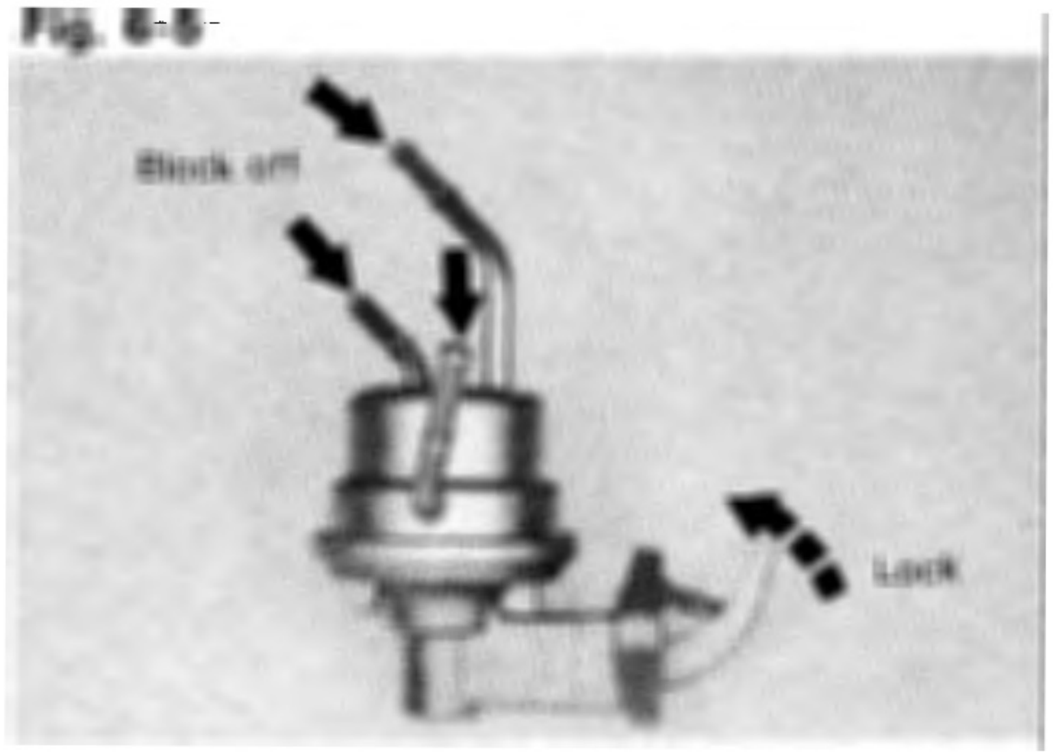
Fig. 6-4



2. Block off the inlet pipe with your finger and check that the pump arm locks.

— Note —
Do not use more force than that used in the PRECHECK.

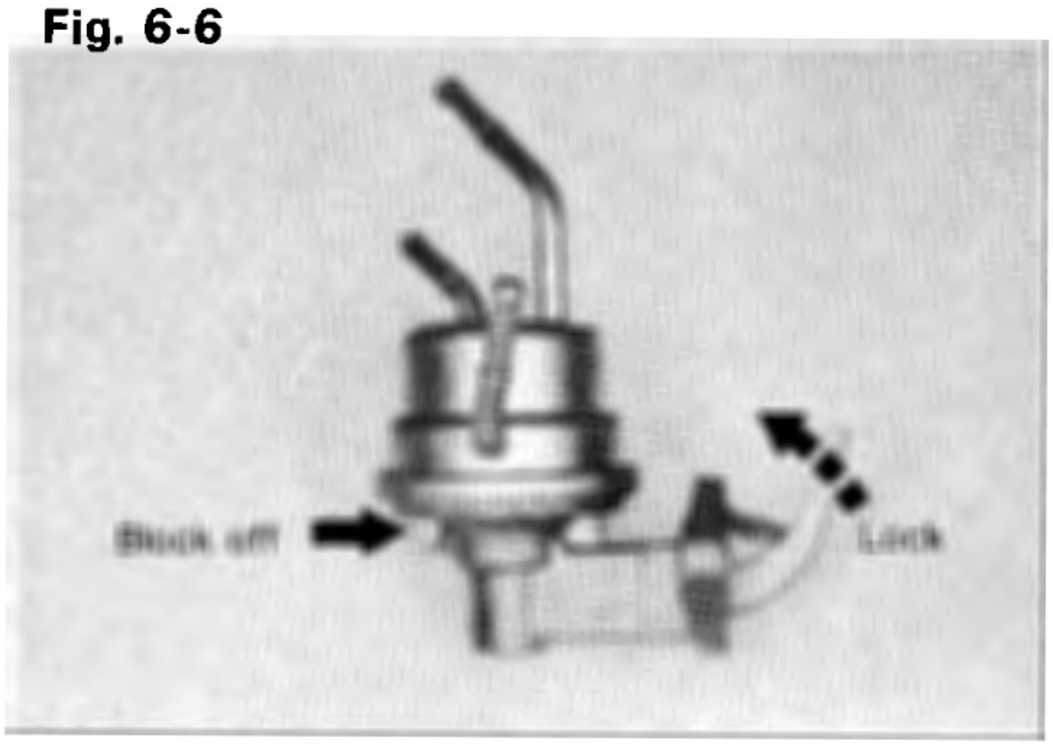
Fig. 6-5



3. Block off the inlet and outlet pipes and check that the pump arm locks.

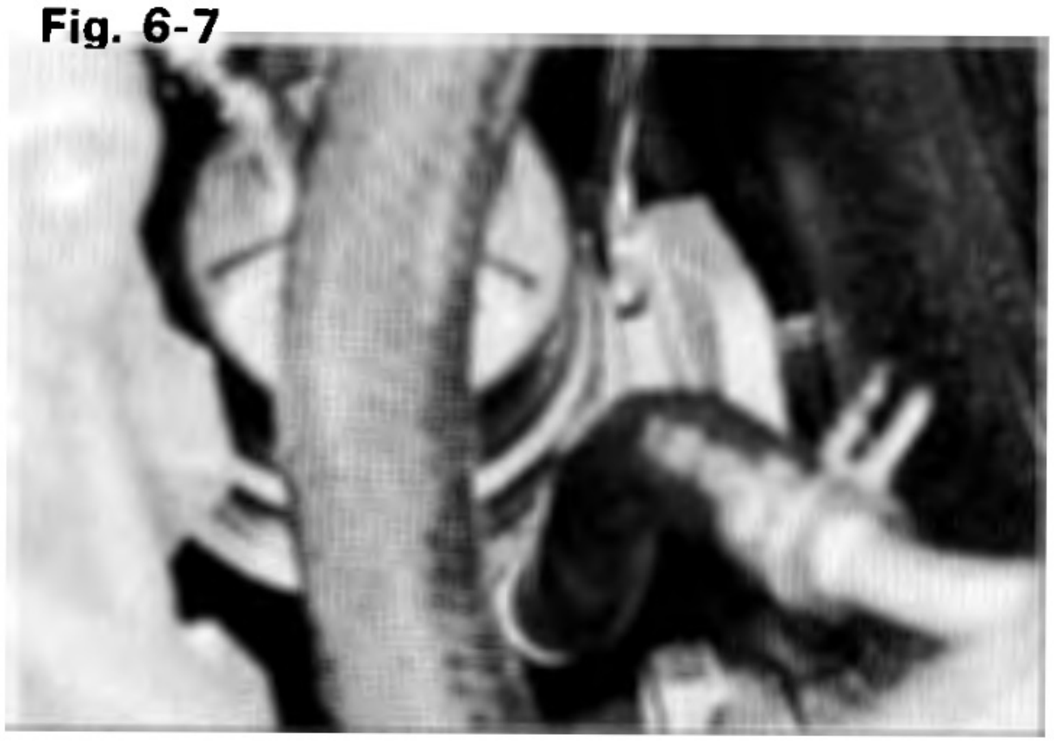
— Note —
If all three checks mentioned above are not as specified, the caulking of the body and upper casing is faulty.

Fig. 6-6



4. Block off the vent hole with your finger and check that the pump arm locks.

Fig. 6-7



INSTALLATION

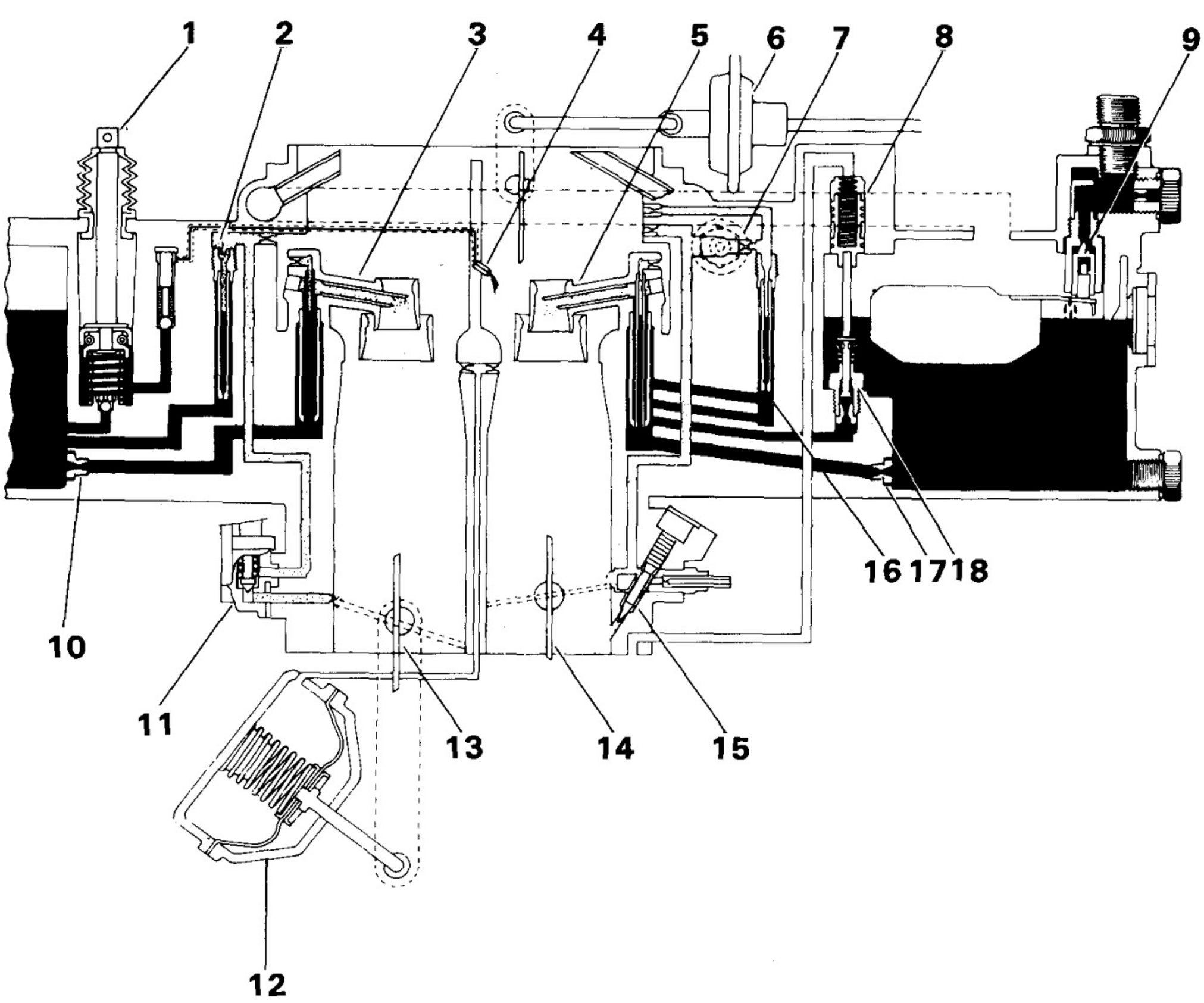
After installing the fuel pump, connect the fuel hoses.

— Note —
After connecting the fuel hoses, start the engine and check for fuel leaks.

CARBURETOR (USA)

CARBURETOR CIRCUIT

Fig. 6-8



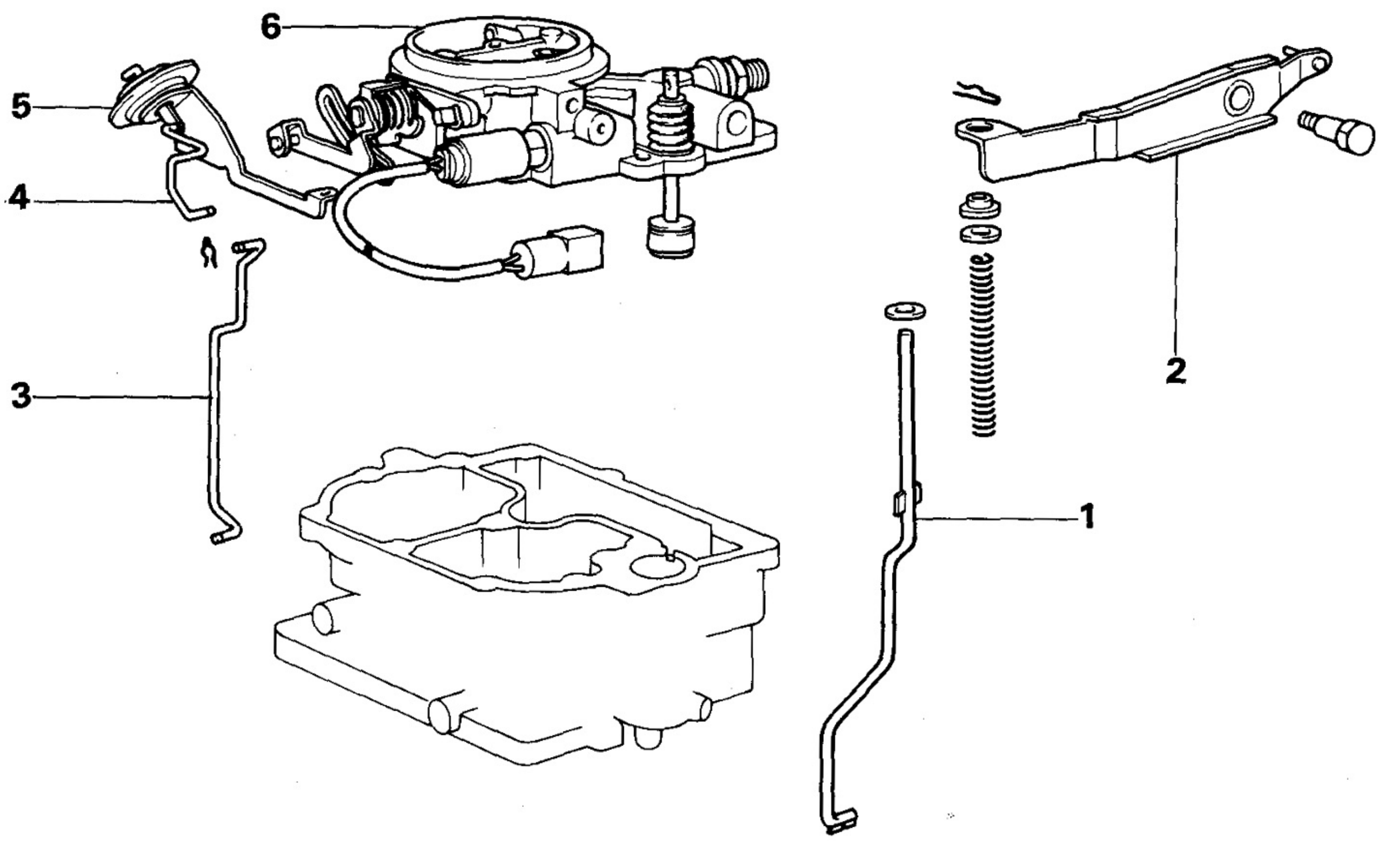
1. Pump Plunger
2. 2nd Slow Jet
3. 2nd Main Nozzle
4. Pump Jet
5. 1st Main Nozzle
6. Choke Breaker
7. Solenoid Valve
8. Power Piston
9. Needle Valve
10. 2nd Main Jet
11. Slow Cut Valve
12. Diaphragm
13. 2nd Throttle Valve
14. 1st Throttle Valve
15. Idle Mixture Adjusting Screw
16. 1st Slow Jet
17. 1st Main Jet
18. Power Valve

DISASSEMBLY

Air Horn

Disassemble the parts in the numerical order shown in the figure.

Fig. 6-9



1. Pump Connecting Link
2. Pump Arm
3. Fast Idle Connecting Link
4. Choke Breaker Connecting Link
5. Choke Breaker
6. Air Horn with Gasket

Float

Disassemble the parts in the numerical order shown in the figure.

Fig. 6-10

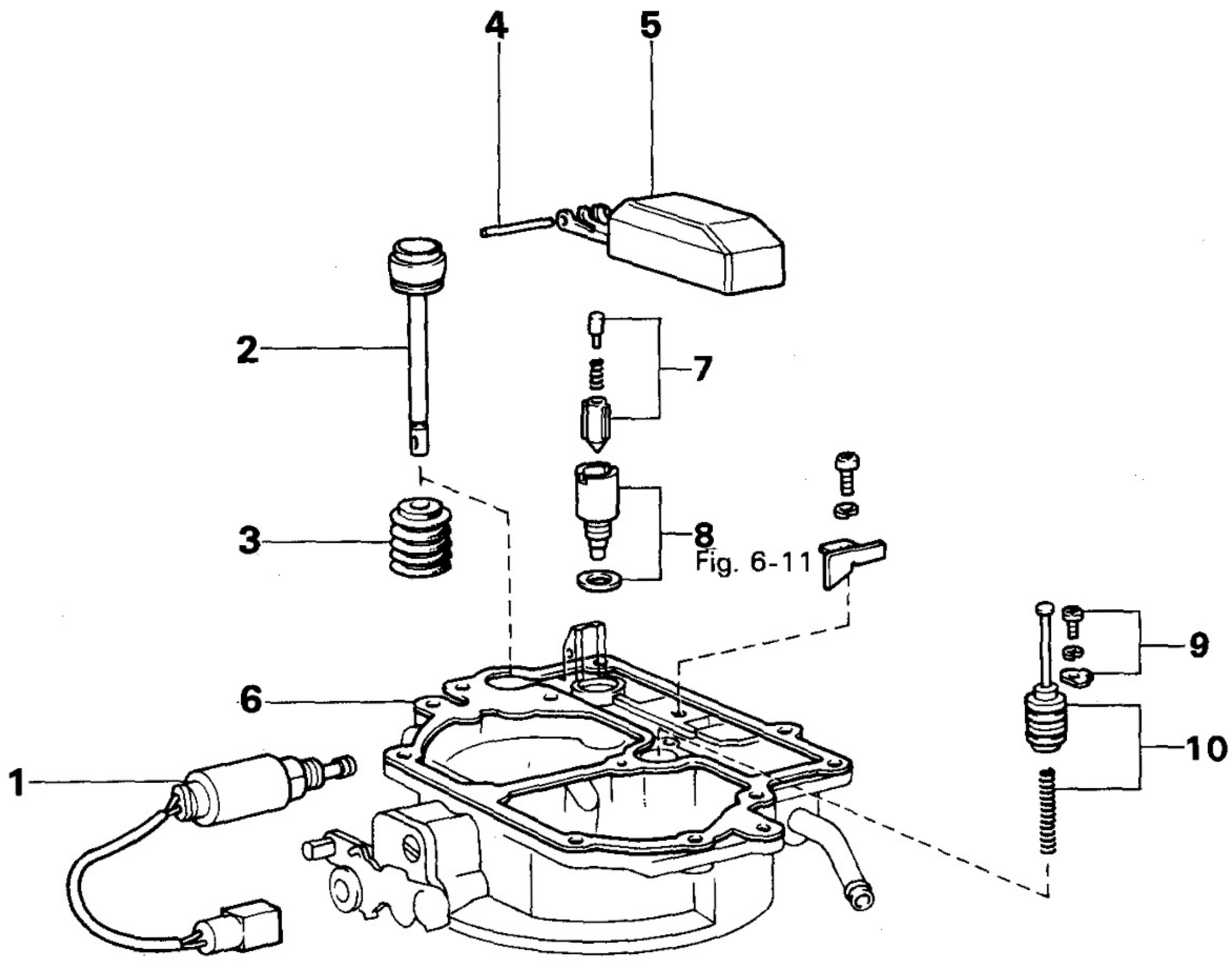
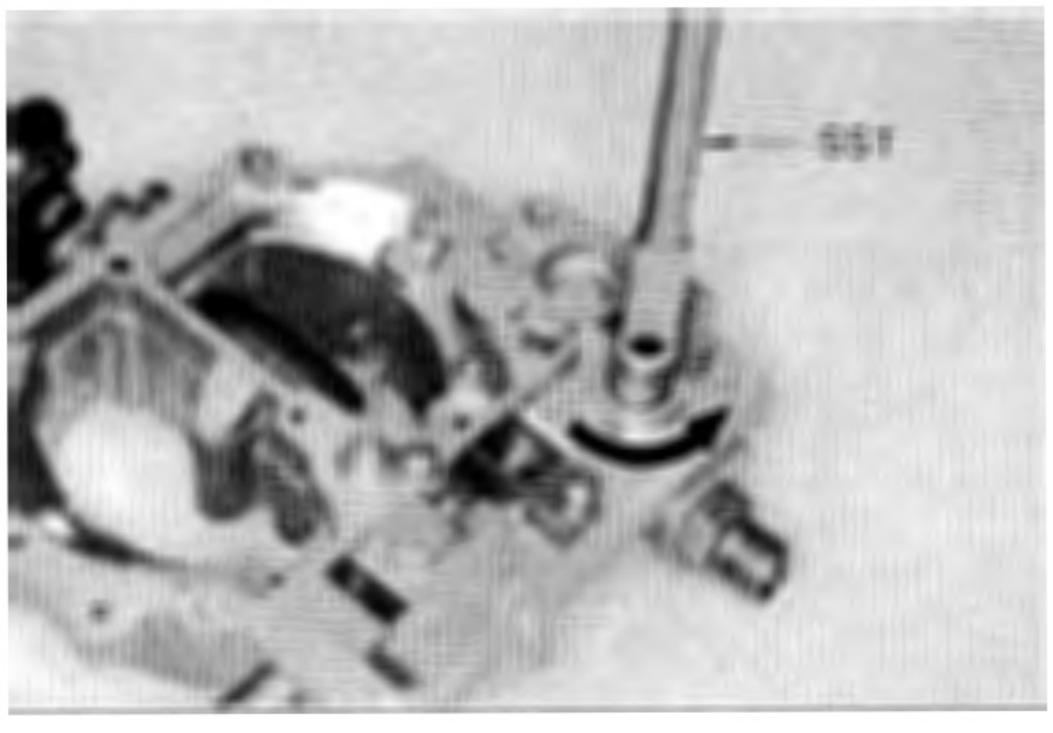


Fig. 6-11

1. Solenoid Valve
2. Pump Plunger
3. Boot
4. Float Lever Pin
5. Float
6. Air Horn Gasket
7. Needle Valve, Spring & Pin
8. Needle Valve Seat
9. Power Piston Retainer
10. Power Piston & Spring

Fig. 6-11

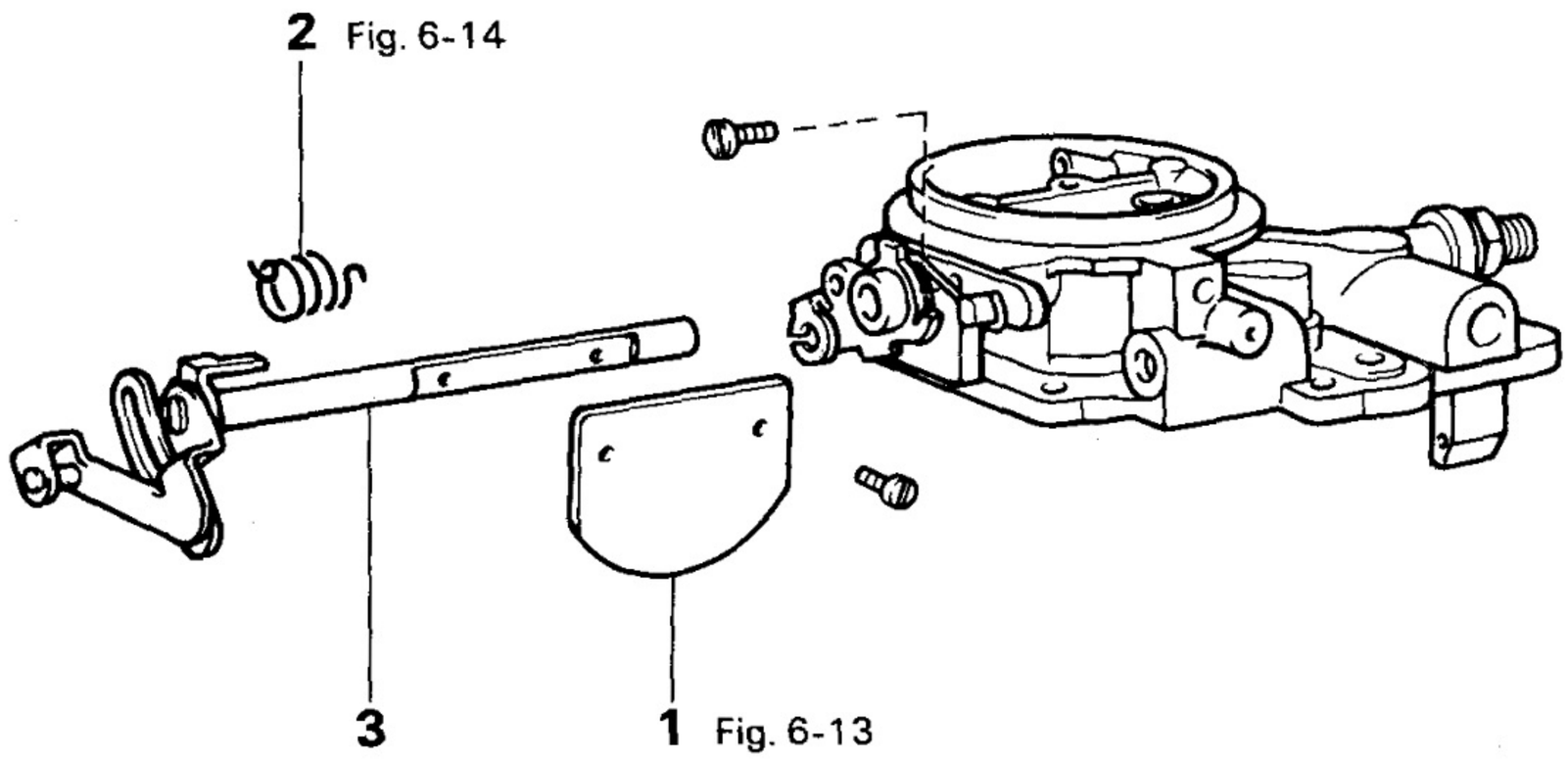


Remove the needle valve seat with SST.
SST [09860-11011]

Choke System

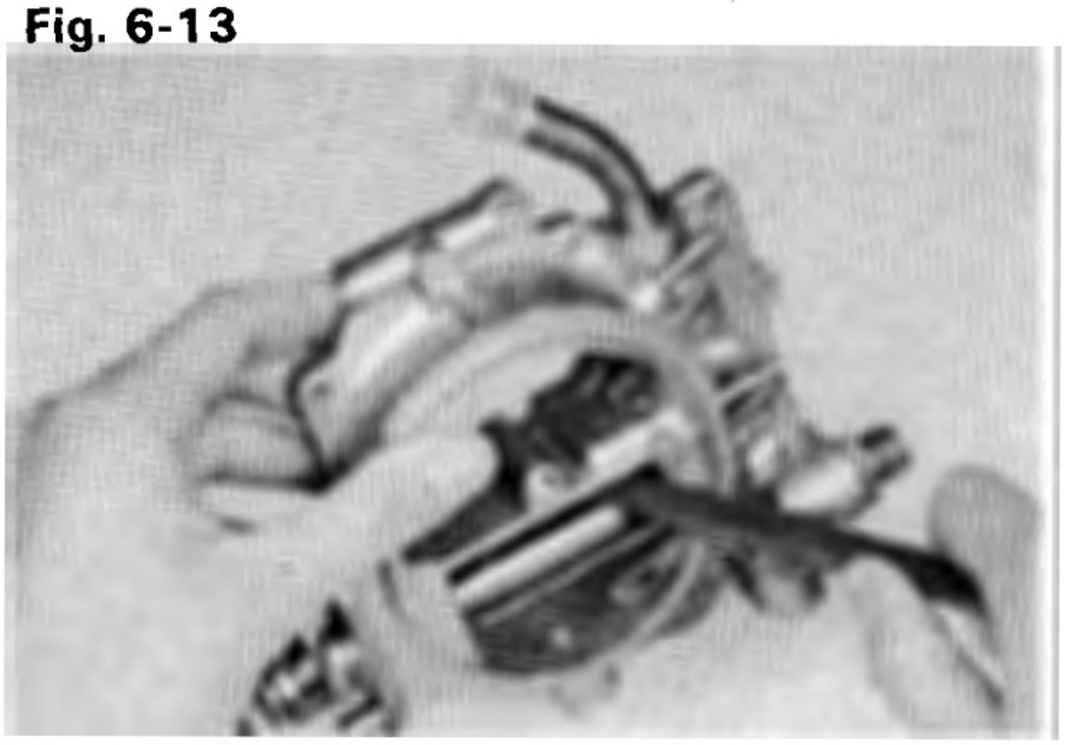
Disassemble the parts in the numerical order shown in the figure.

Fig. 6-12



1. Choke Valve
2. Choke Valve Relief Spring
3. Choke Shaft

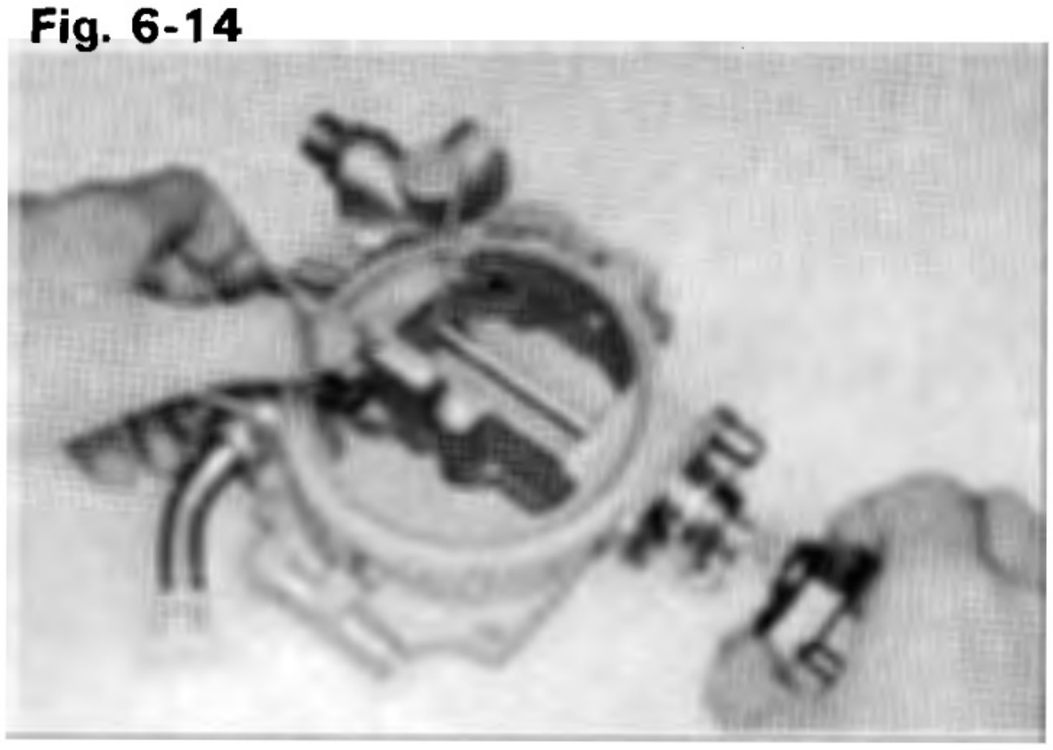
Fig. 6-13



To remove the choke valve, file off the ends of the set screws.

— Note —
Do this only if it is necessary to replace the choke shaft.

Fig. 6-14

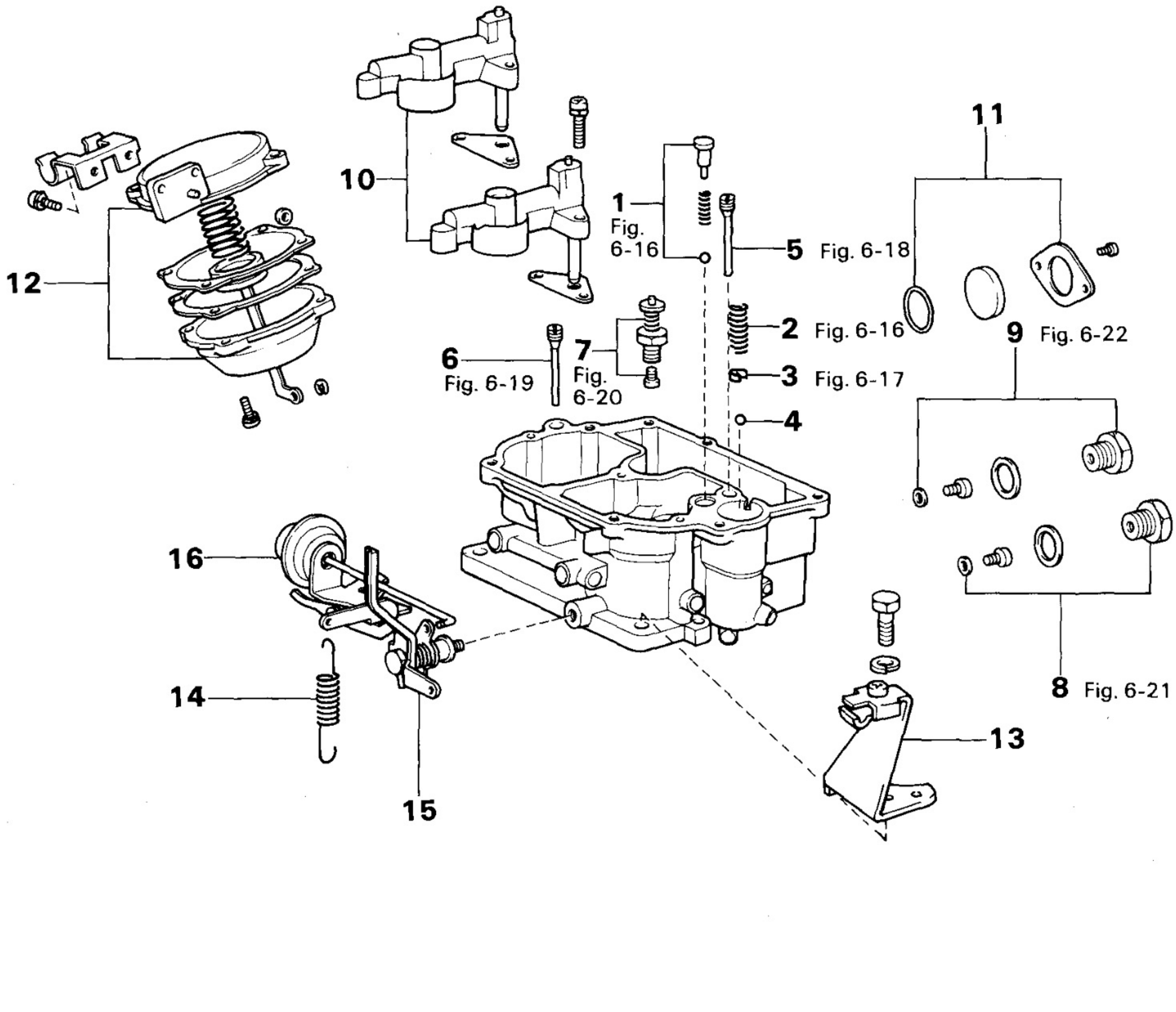


Unhook the choke valve relief spring and pull out the choke shaft.

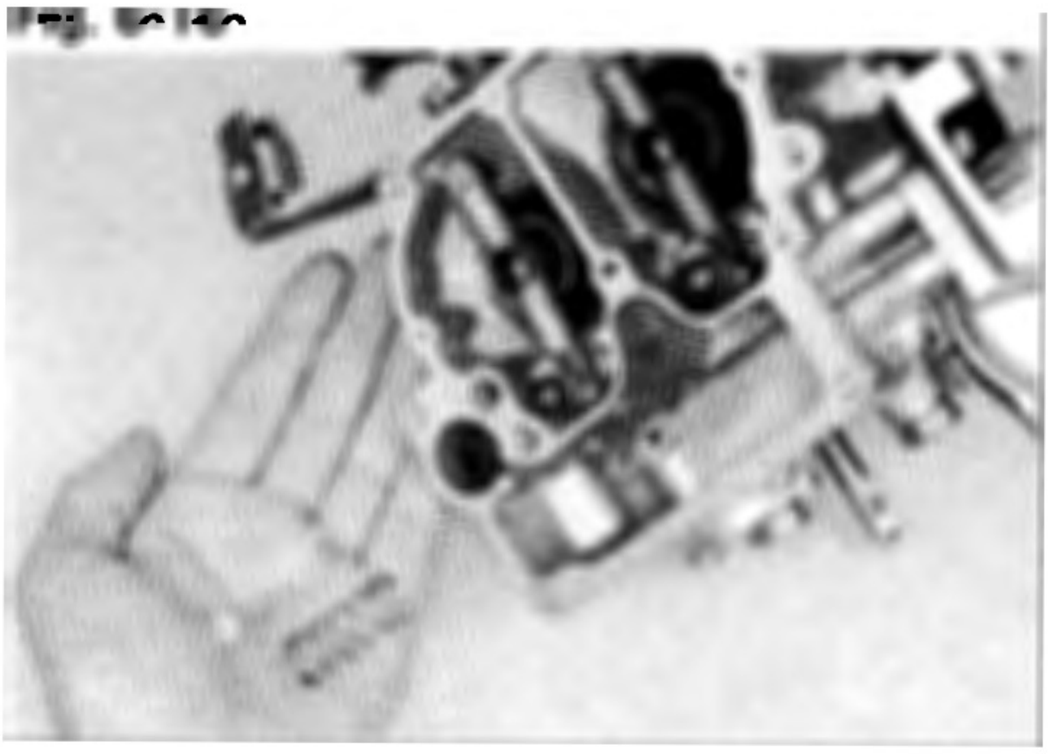
Body

Disassemble the parts in the numerical order shown in the figure.

Fig. 6-15



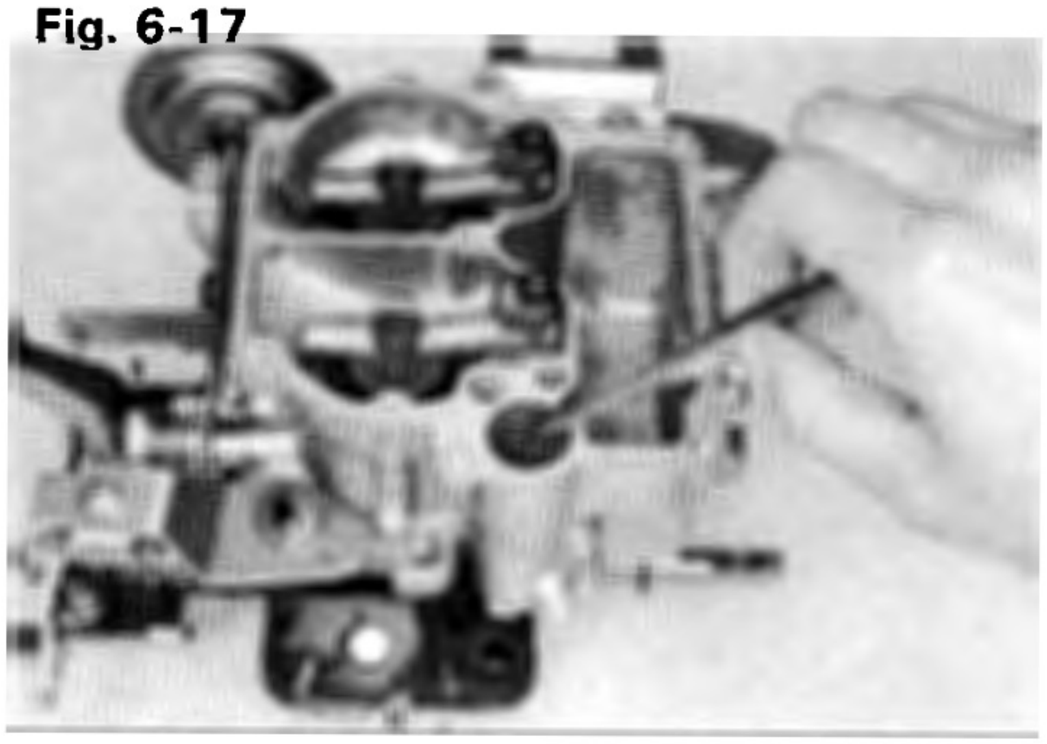
1. Steel Ball for Discharge Weight & Spring
2. Pump Damping Spring
3. Check Ball Retainer
4. Steel Ball for Pump Plunger
5. 1st Slow Jet
6. 2nd Slow Jet
7. Power Valve
8. 1st Main Jet
9. 2nd Main Jet
10. Small Venturi
11. Level Gauge Glass
12. Diaphragm
13. Choke Wire Clamp
14. Back Spring for Throttle Shaft
15. Choke Opener Connecting Arm
16. Choke Opener



Drop out the steel ball for the discharge weight and springs.

– Note –
Be careful not to lose the steel ball.

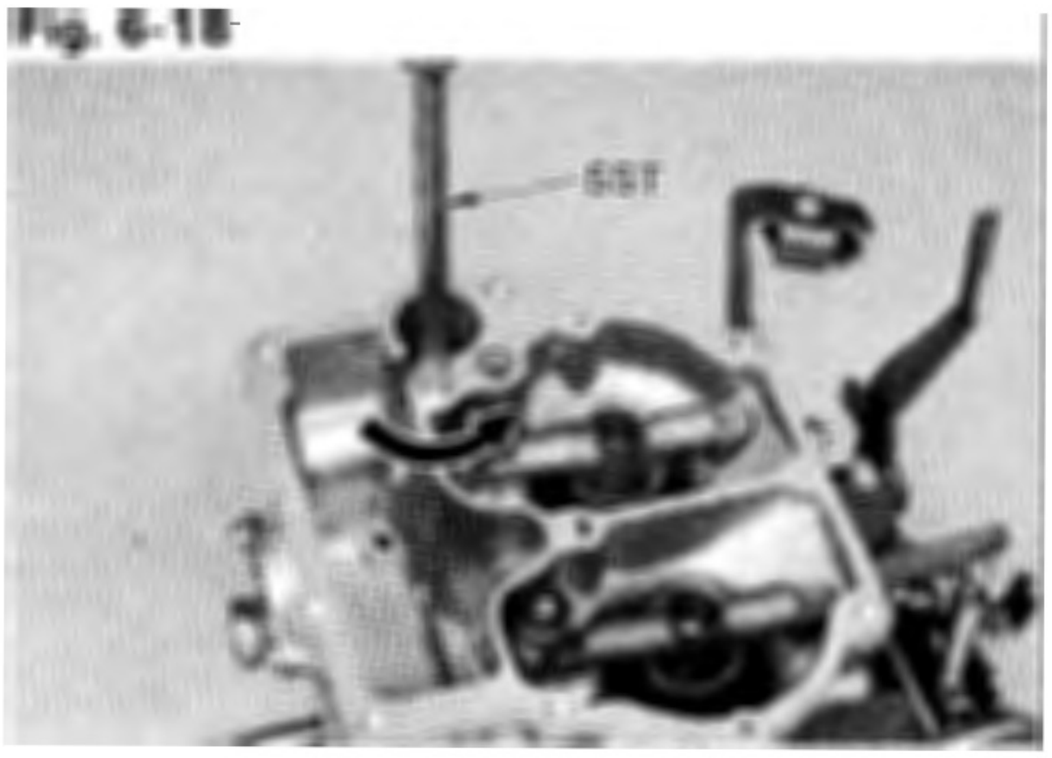
Fig. 6-17



Remove the check ball retainer with a pair of tweezers and then remove the steel ball for pump plunger.

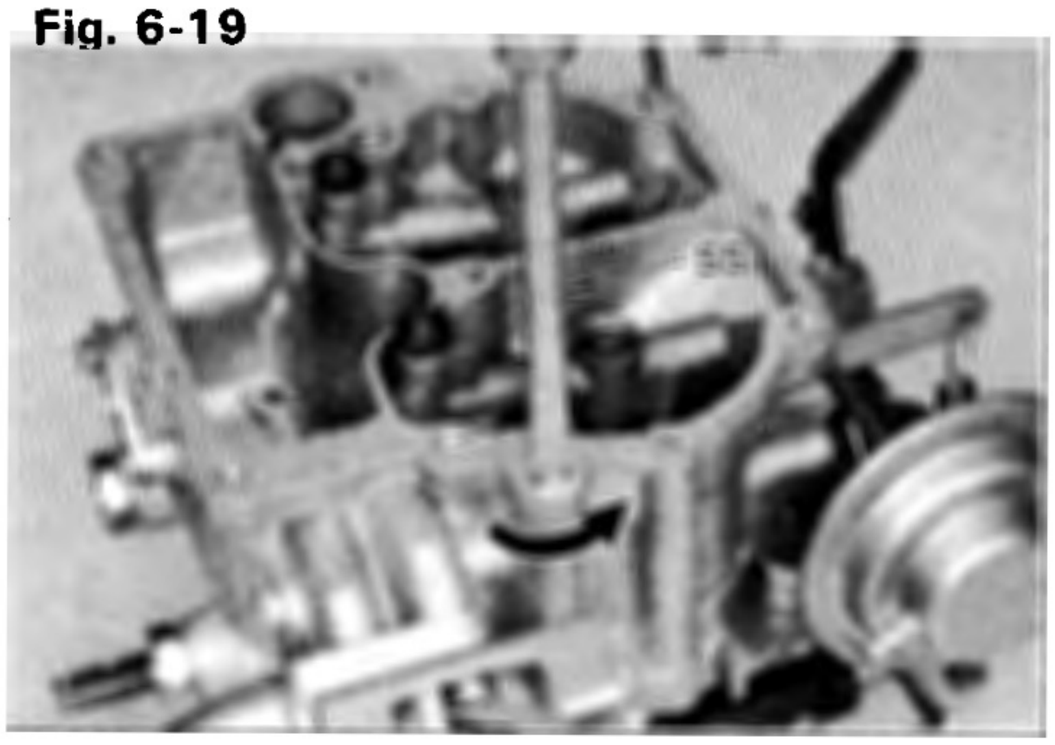
– Note –
Be careful not to lose the steel ball.

Fig. 6-18



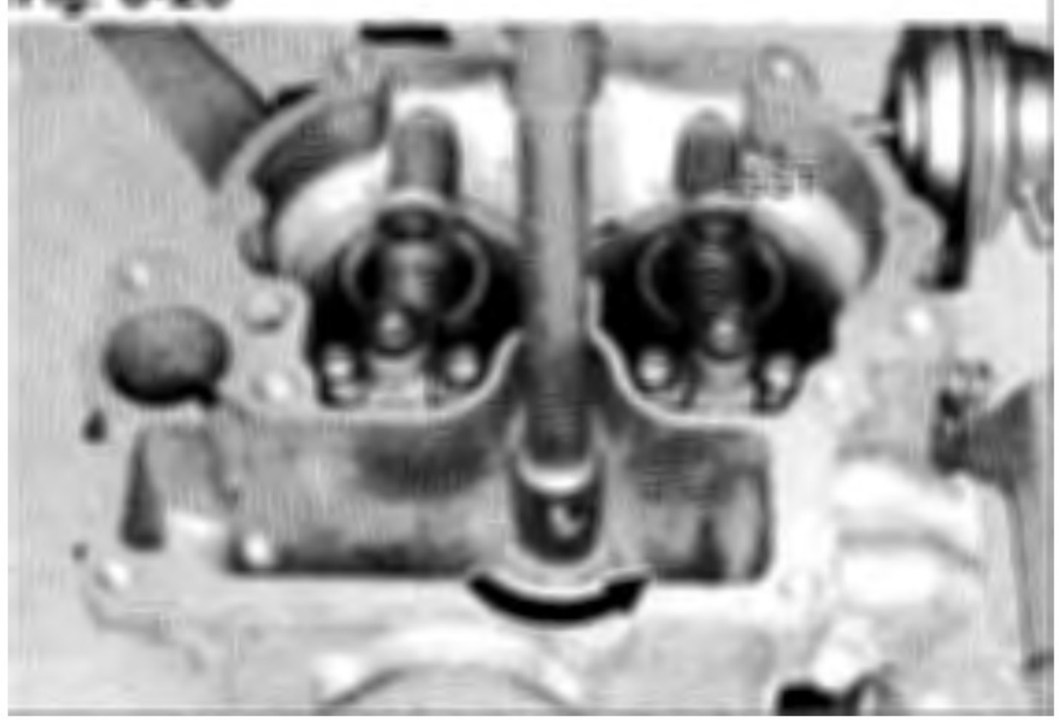
Remove the 1st slow jet with SST.
SST [09860-11011]

Fig. 6-19



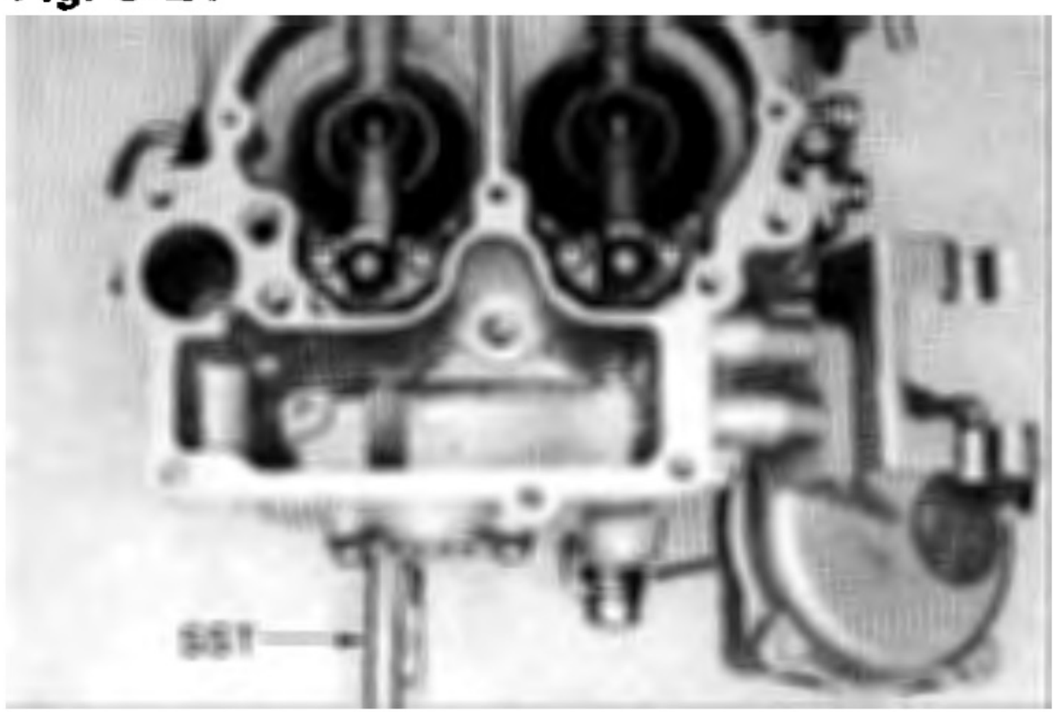
Remove the 2nd slow jet with SST.
SST [09860-11011]

Fig. 6-20



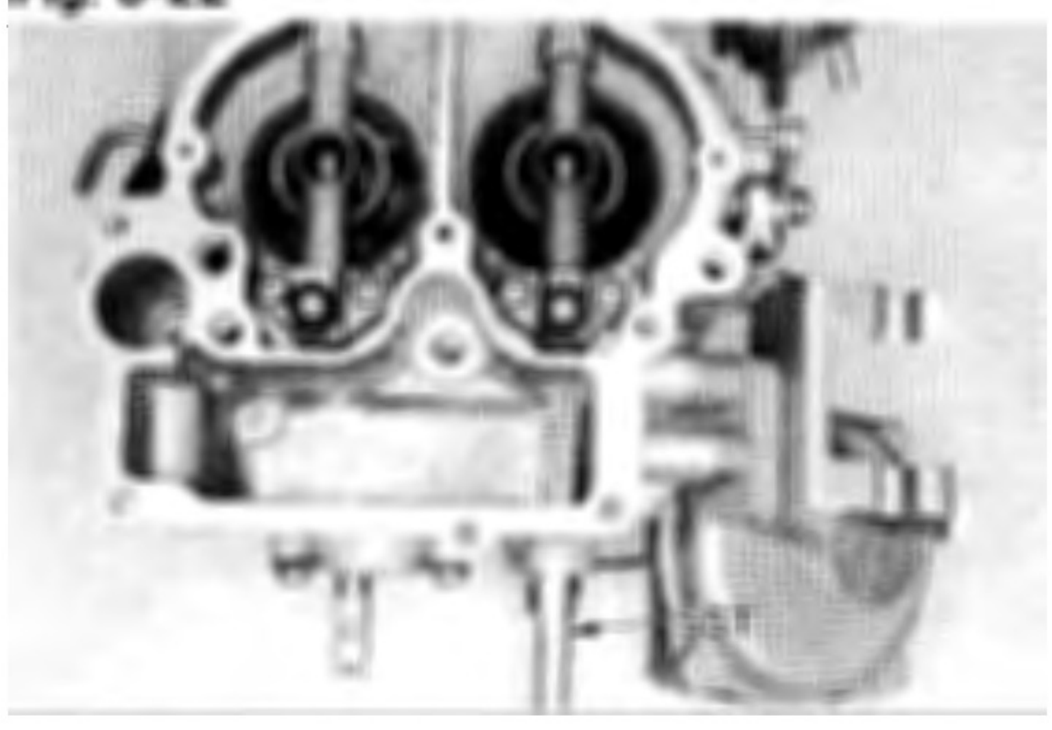
Remove the power valve with SST.
SST [09860-11011]

Fig. 6-21



Remove the 1st main jet with SST.
SST [09860-11011]

Fig. 6-22



Remove the 2nd main jet with SST.
SST [09860-11011]

Flange

Disassemble the parts in the numerical order shown in the figure.

Fig. 6-23

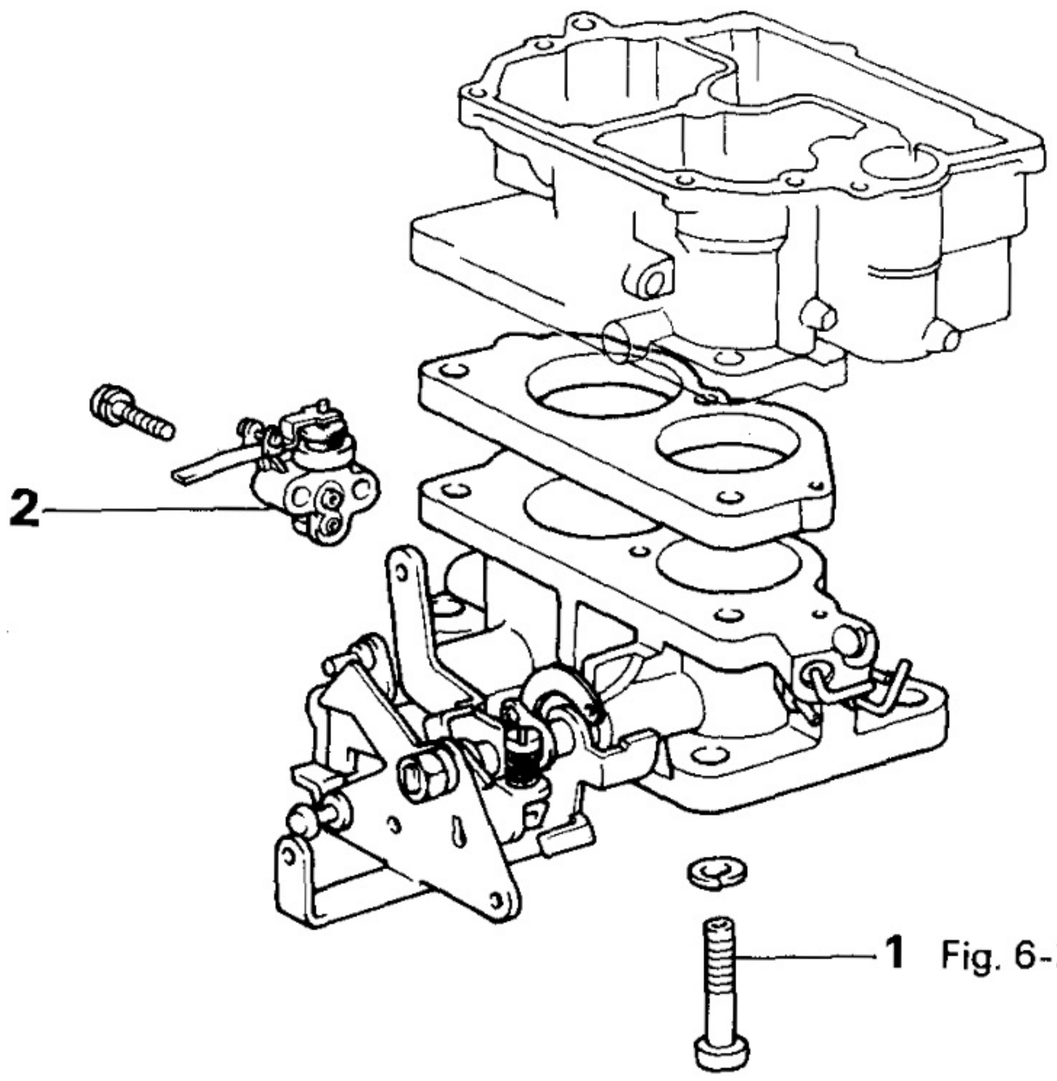
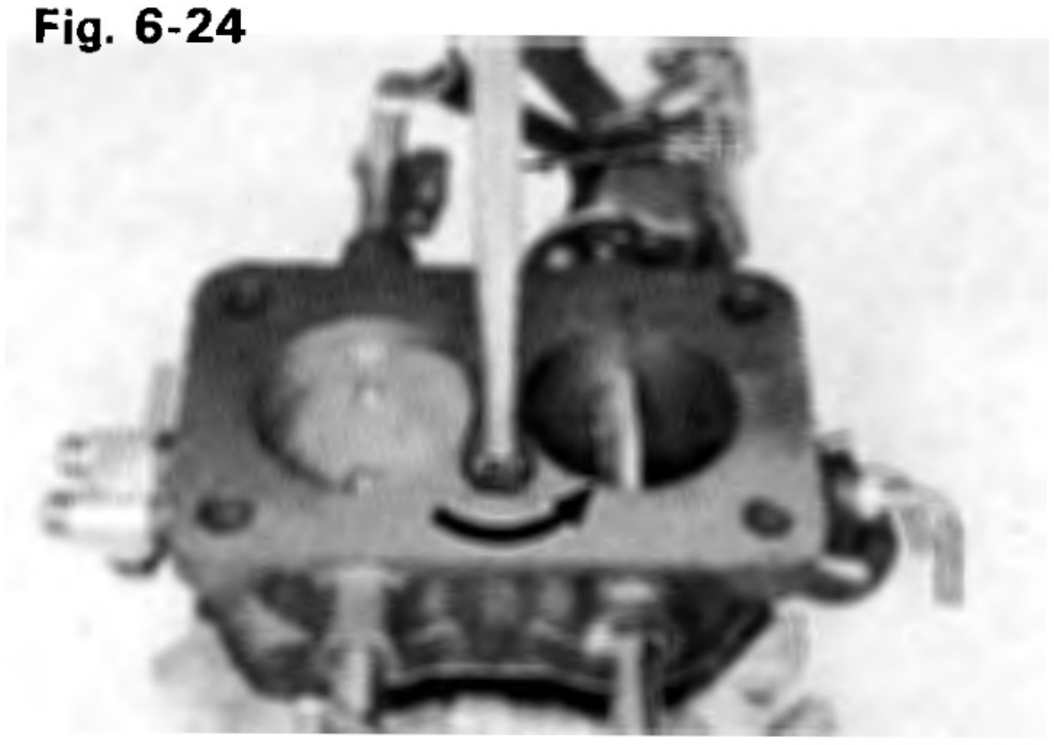


Fig. 6-24

1. Vacuum Passage Bolt
2. Slow Cut Valve

Fig. 6-24



Remove the vacuum passage bolt with SST.
SST [09860-11011]

Fig. 6-25

SEE

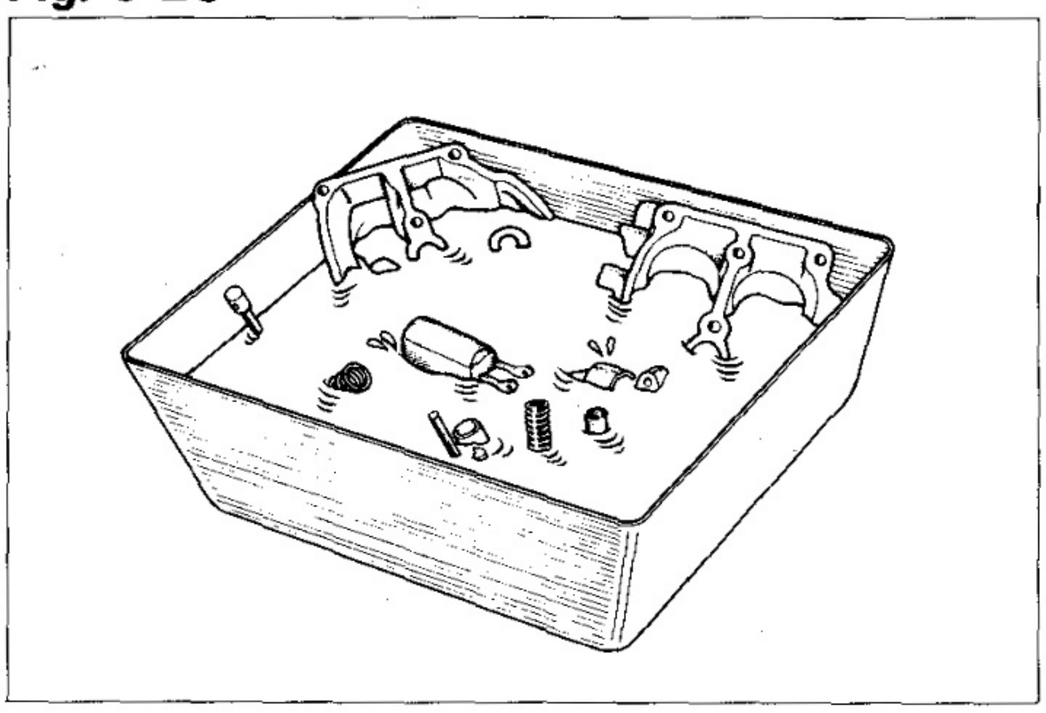
FUEL SYSTEM

ADJUSTMENT SECTION

Figs. 6-163 to 6-175

The idle mixture adjusting screw is adjusted and plugged with a steel plug by the manufacturer.
If necessary, remove the steel plug and adjust the idle mixture speed referring to CARBURETOR ADJUSTMENT section.

Fig. 6-26

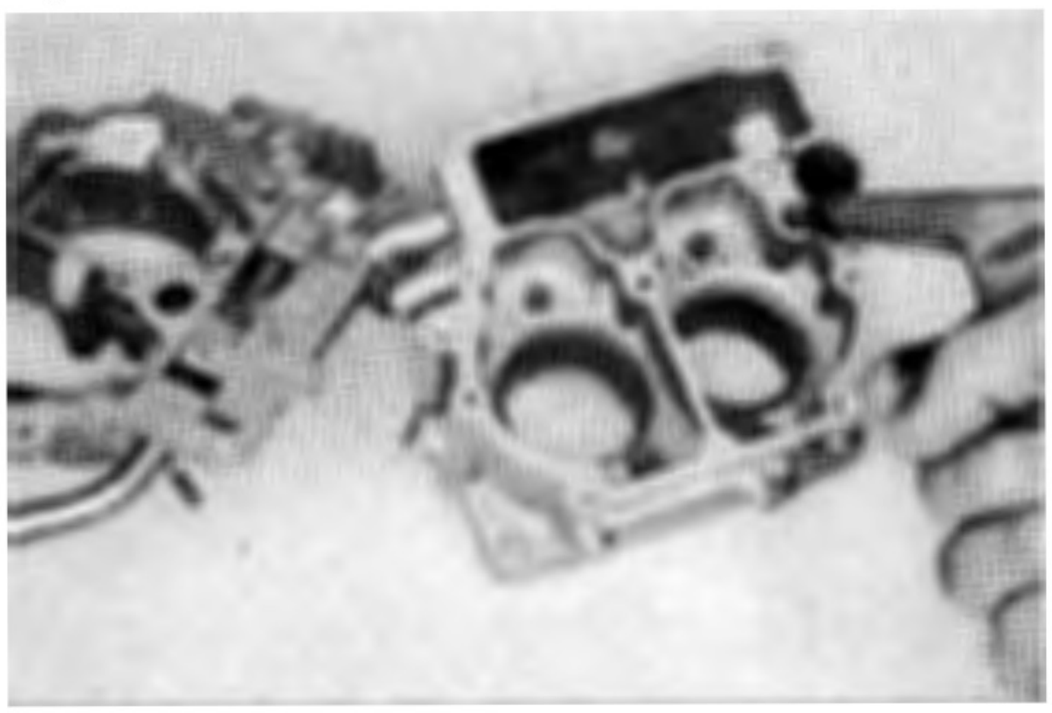


INSPECTION

– Precaution –

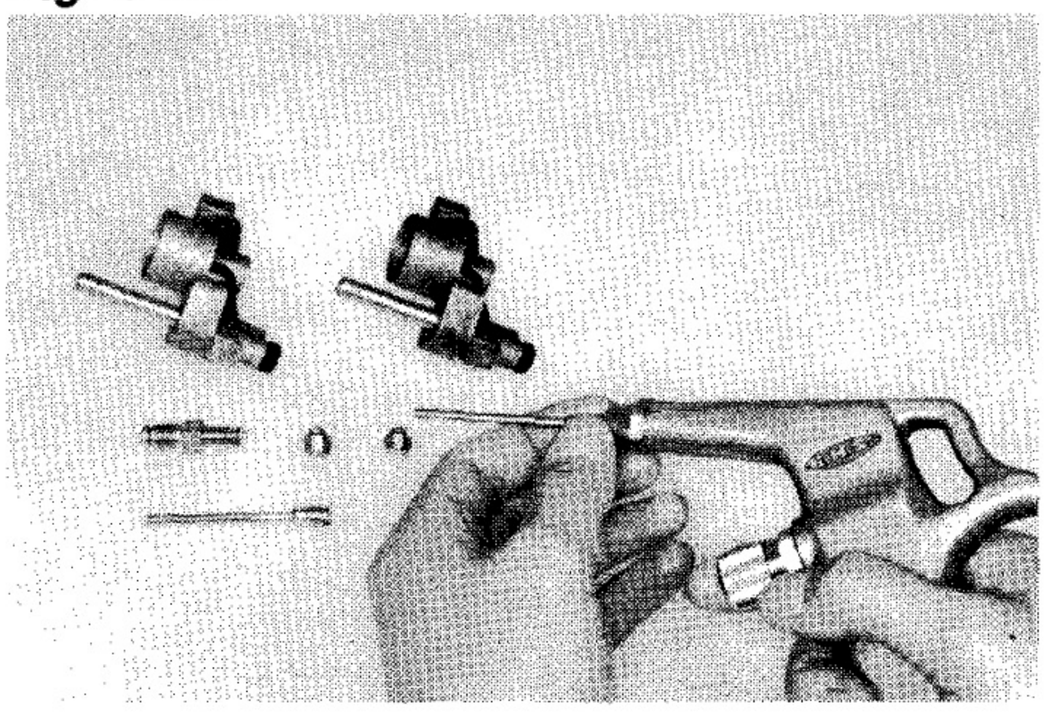
1. Before inspection, wash all parts thoroughly with gasoline.

Fig. 6-27



2. Using compressed air, blow all dirt and other foreign matter from the jets and similar parts, and from the fuel passages and apertures in the body.

Fig. 6-28



3. Never clean the jets or orifices with wire or a drill. This could enlarge the openings and result in excessive fuel consumption.

Fig. 6-29

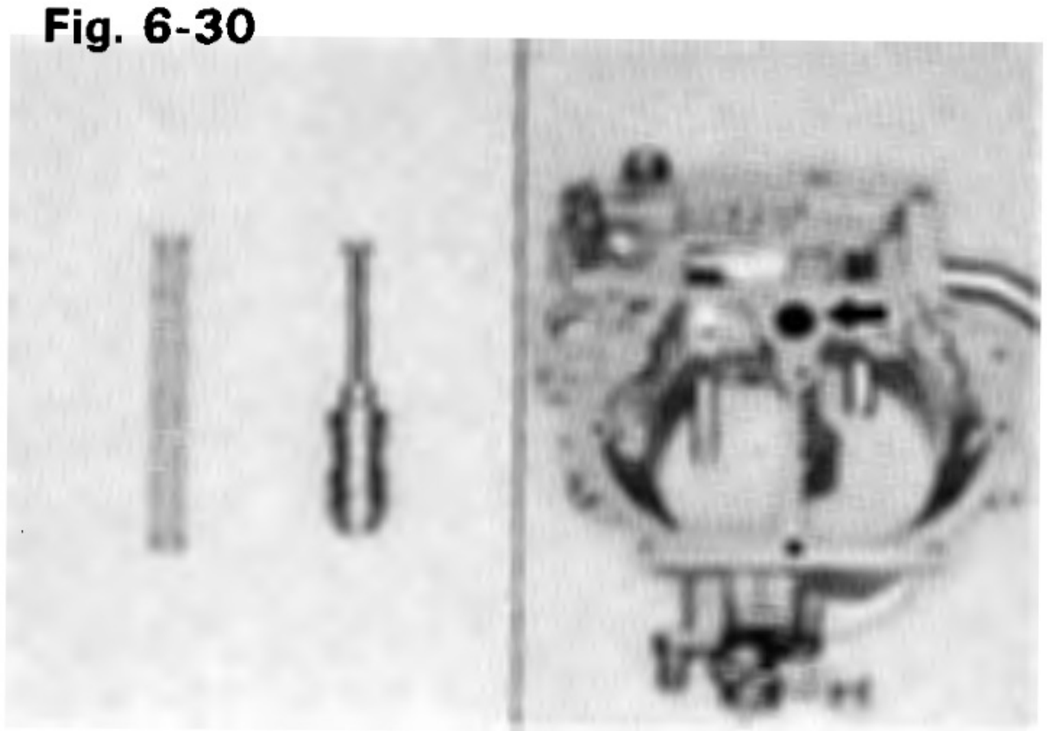


Inspect the following parts and replace any part damaged.

Air Horn Parts

1. Air horn: Check for cracks, damaged threads and wear on choke shaft bores.

Fig. 6-30



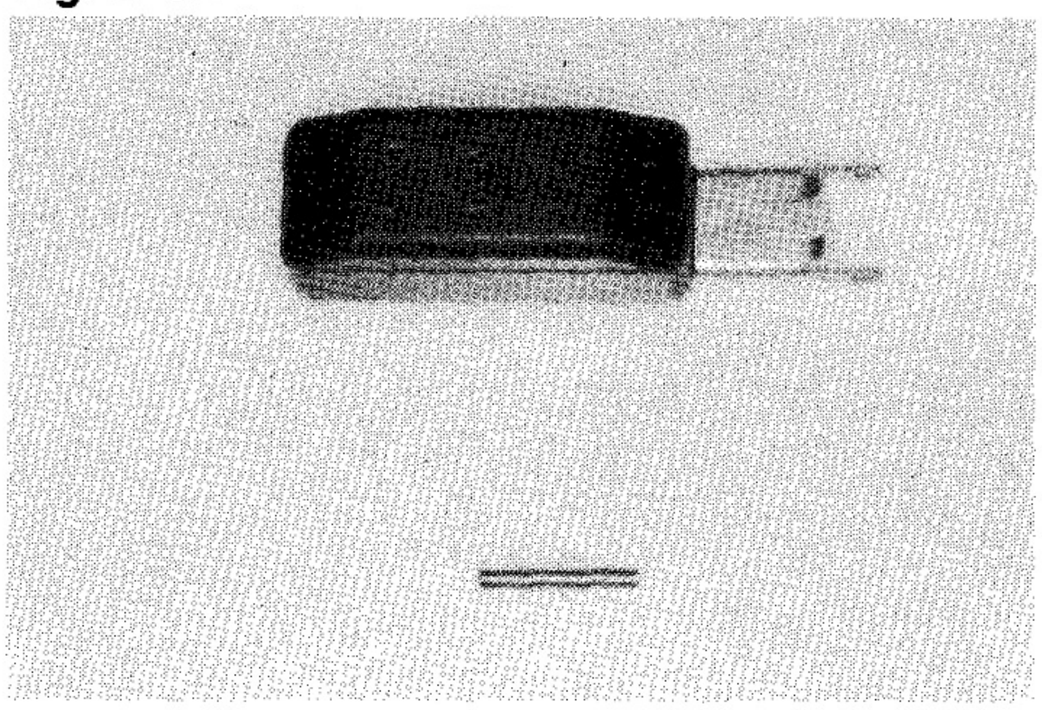
2. Power piston: Check for damage.
Spring: Check for deformation or rust.
Power piston bore: Check for wear or damage.

Fig. 6-31



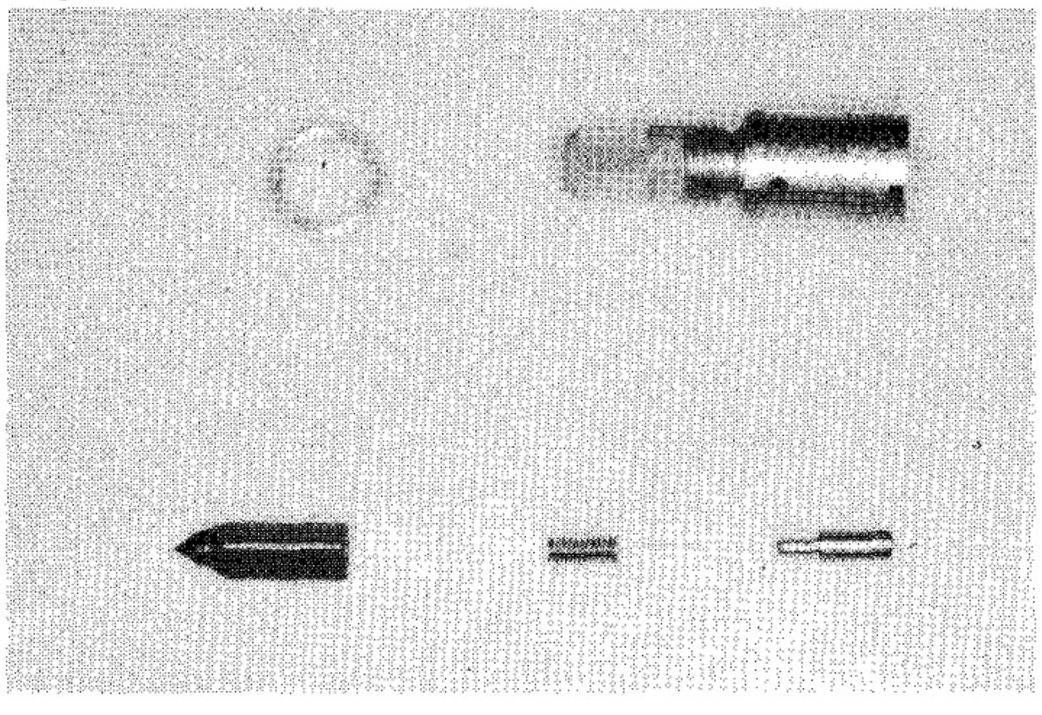
3. Make sure that the power piston moves smoothly in the air horn bore.

Fig. 6-32



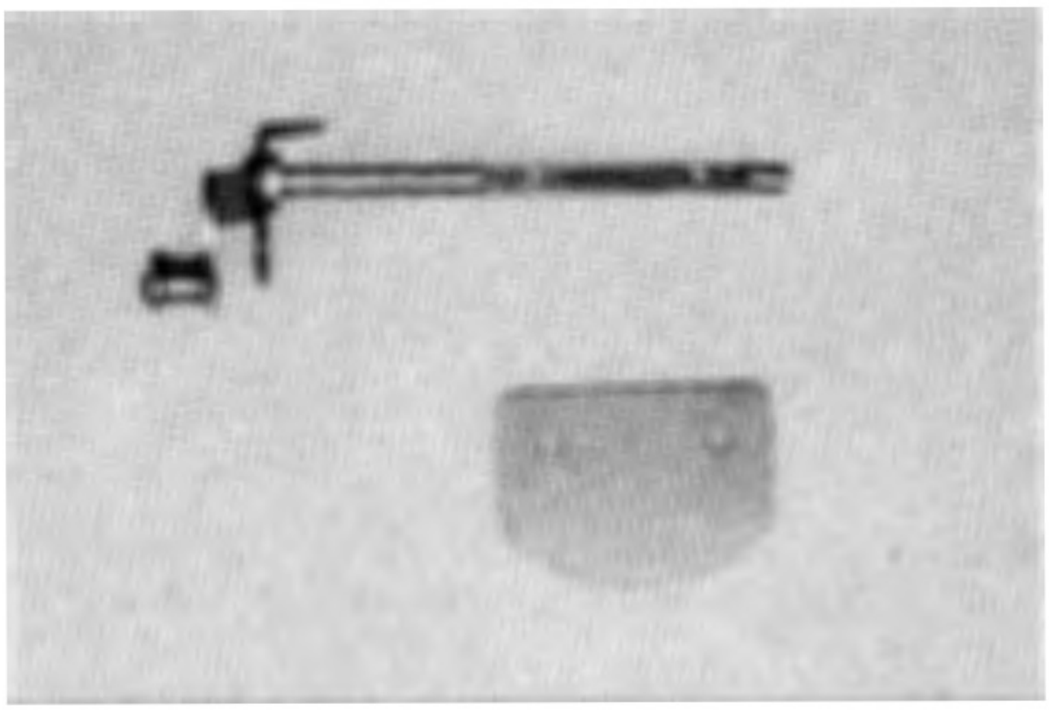
4. Float and float lever pin: Check for wear or breaks.

Fig. 6-33



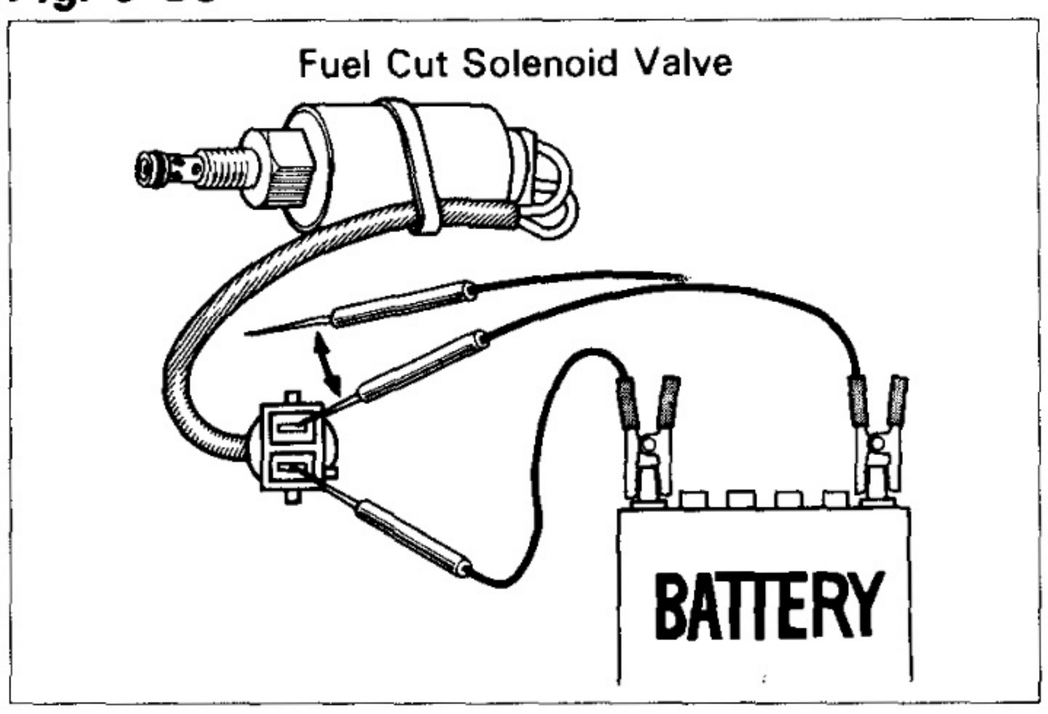
5. Strainer: Check for rust or breaks.
6. Needle valve surface.
7. Needle valve seat.

Fig. 6-34



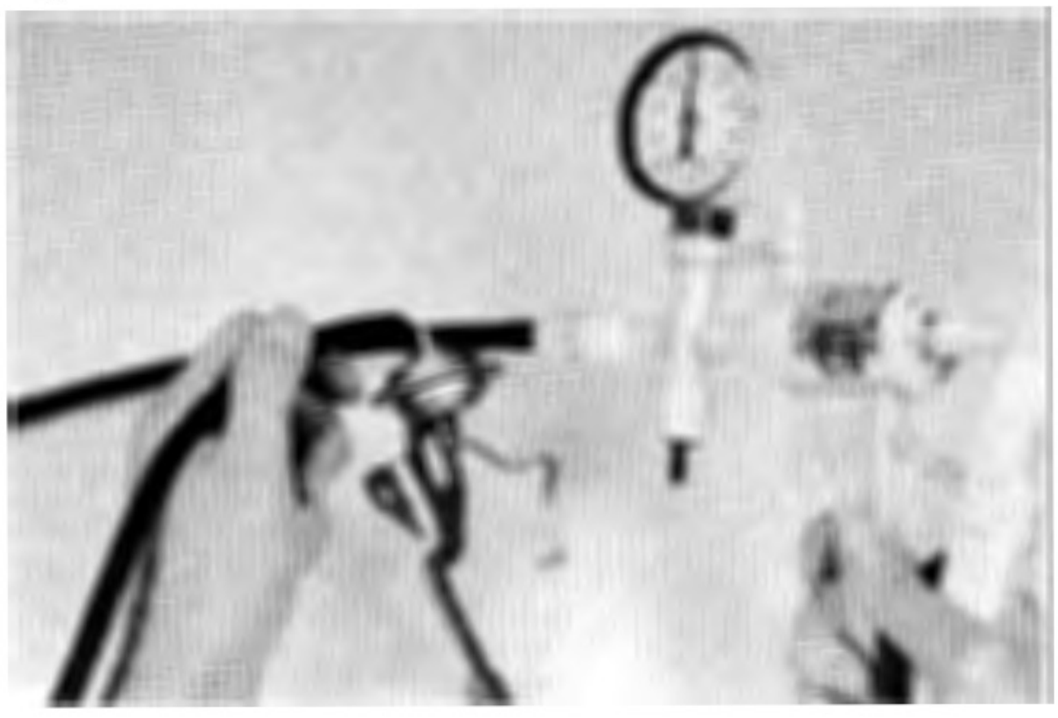
8. Choke valve: Check for deformation.
Choke shaft: Check for wear, bending or improper fit in housing.

Fig. 6-35



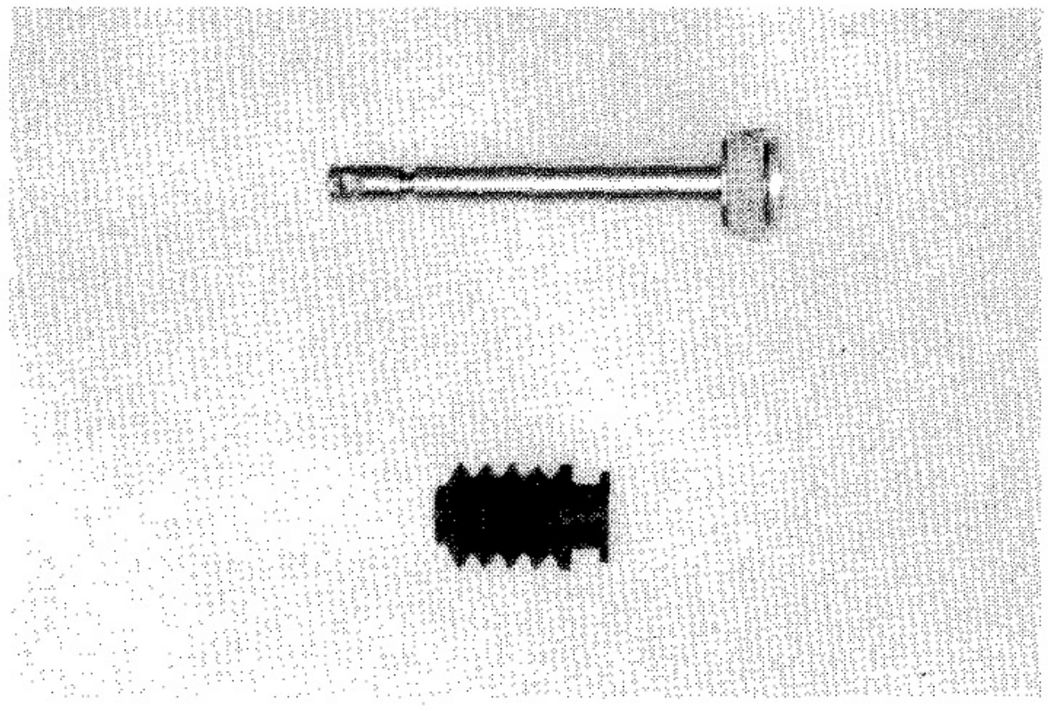
9. Solenoid valve: Connect two terminals and battery as shown in the figure.
Check that you can feel the click from the solenoid valve when the battery is connected and disconnected.

Fig. 6-36



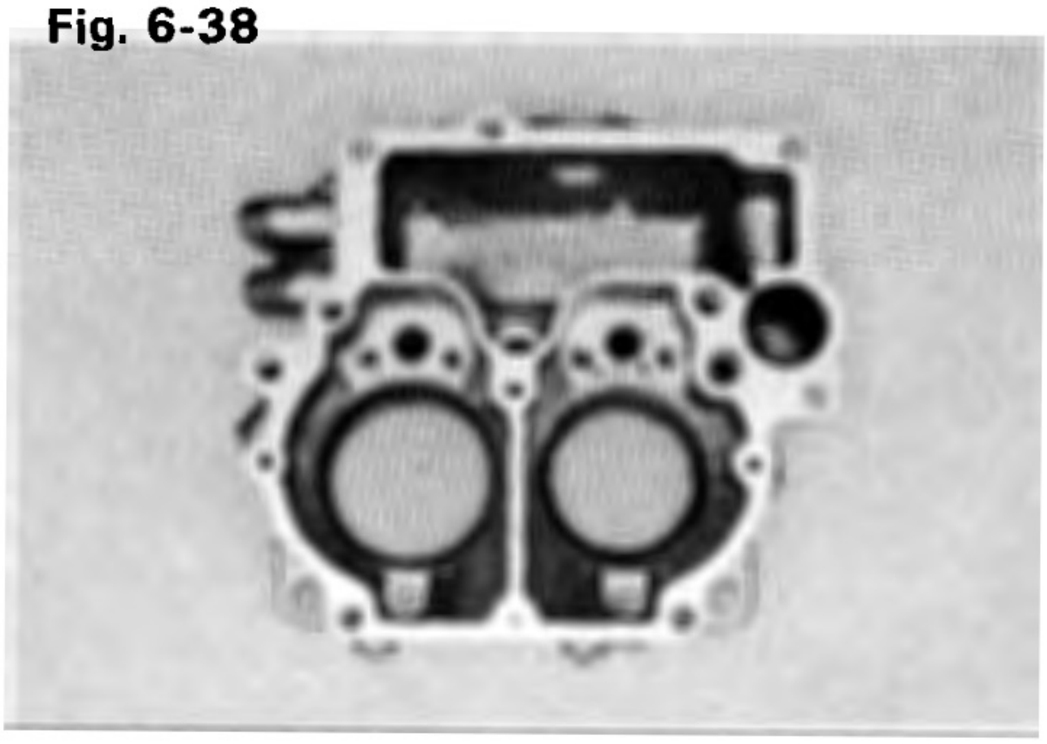
10. Choke breaker: Apply vacuum to the diaphragm.
Check that vacuum does not drop immediately and the link moves when vacuum is applied.

Fig. 6-37



11. Pump plunger: Check for wear on sliding surface and for damaged or deformed leather.
Boot: Check for damage.

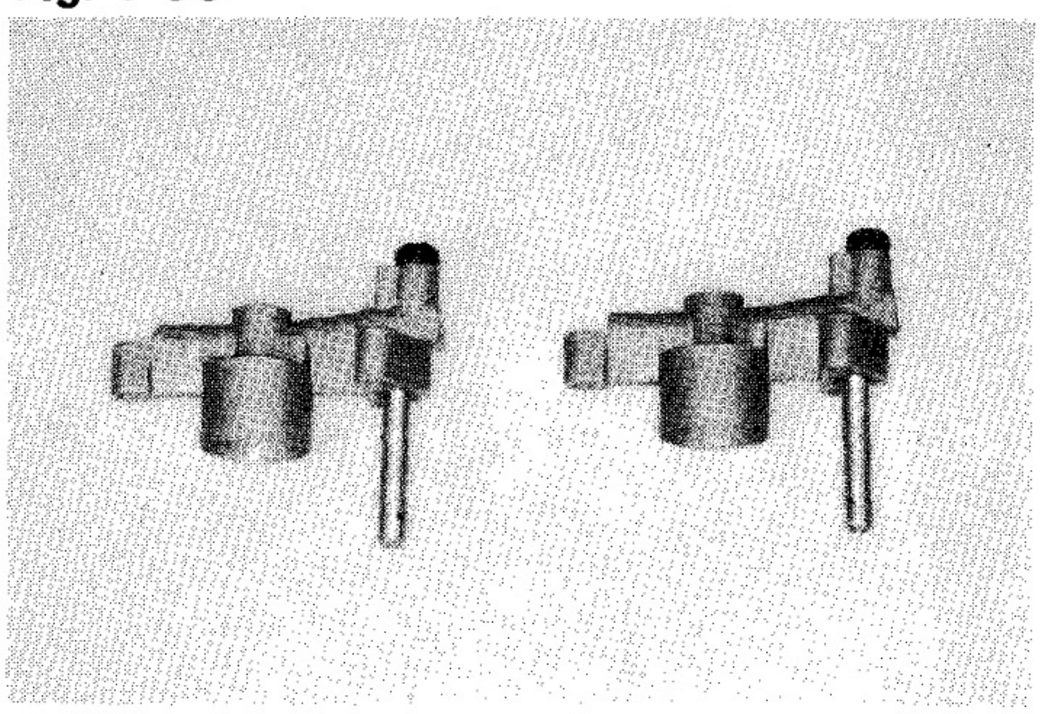
Fig. 6-38



Body Parts

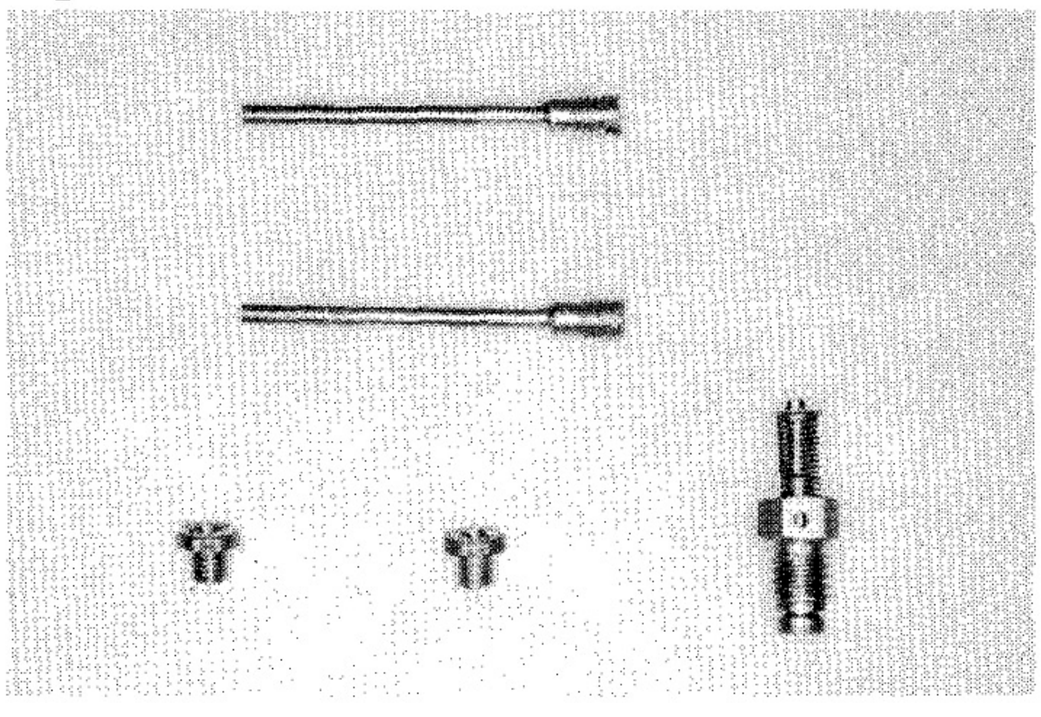
1. Body: Check for cracks, scored mounting surfaces and damaged threads.

Fig. 6-39



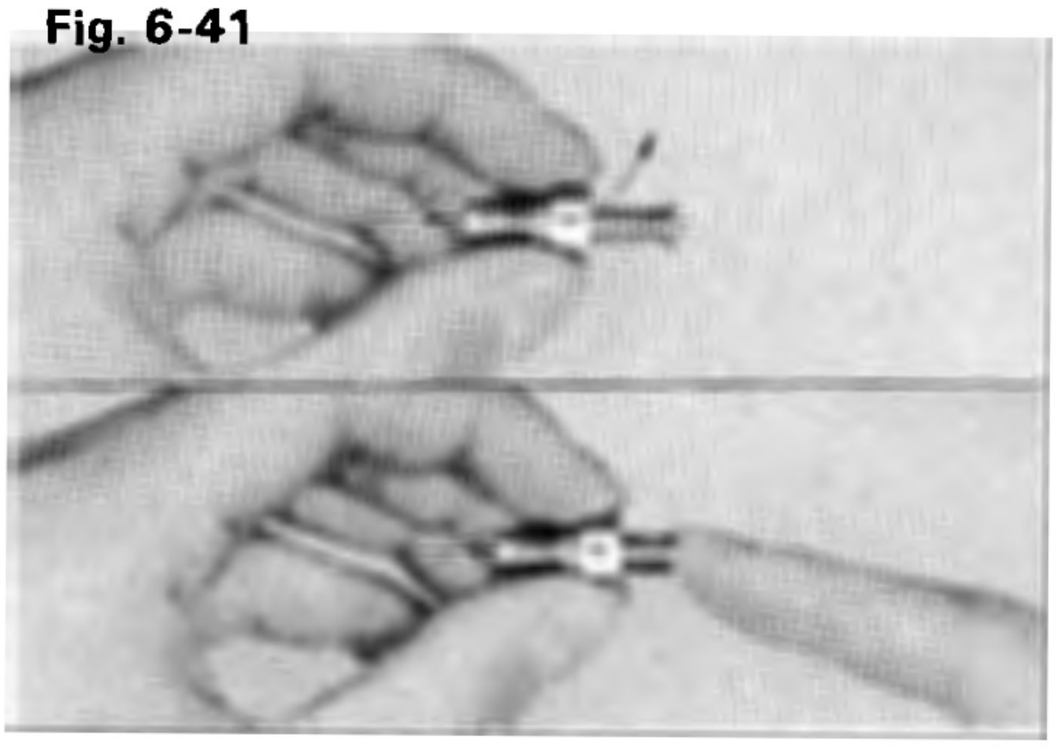
2. Small venturis: Check for damage or clogging.

Fig. 6-40



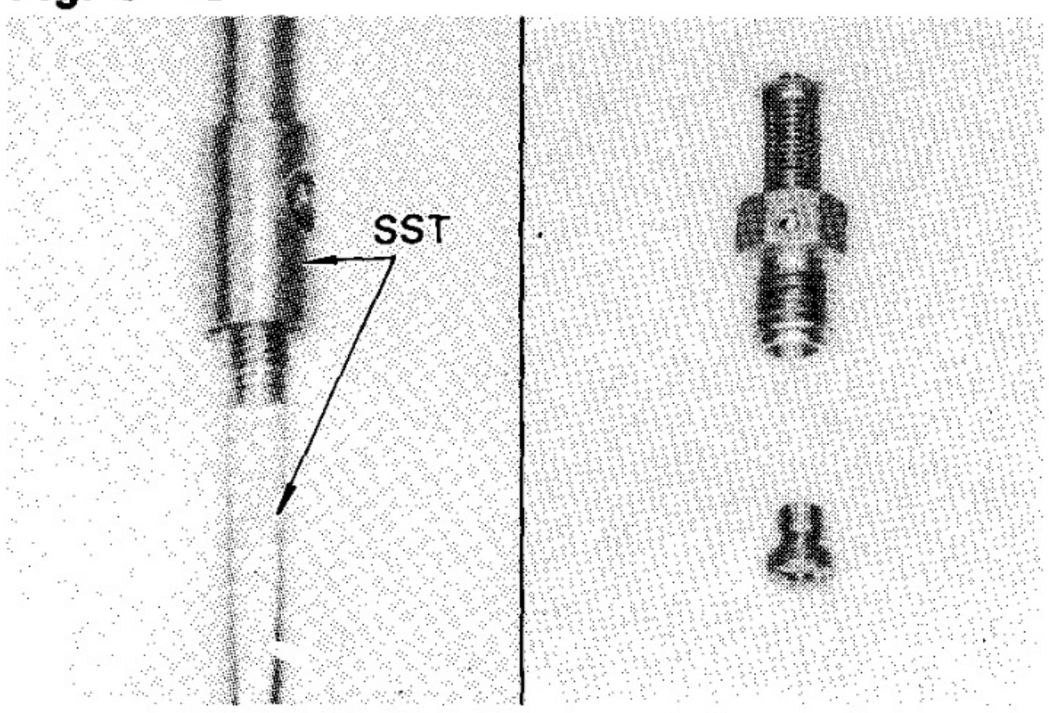
3. Jets: Check for damage or clogging.
Check for damaged contact surface, threads and screwdriver slots.

Fig. 6-41



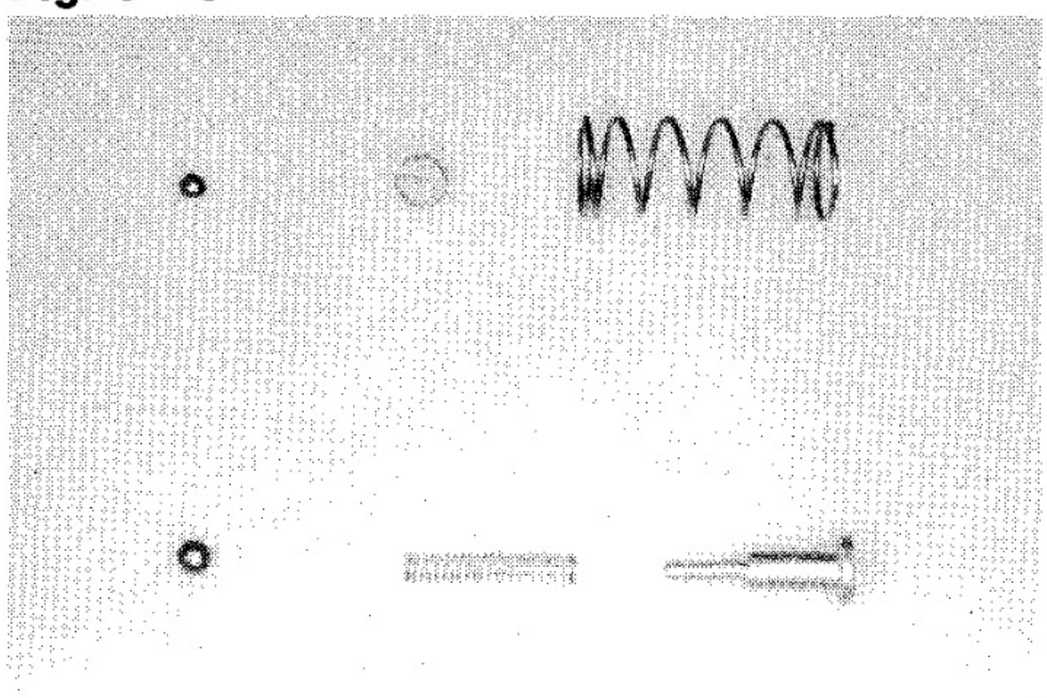
4. Power valve: Check for faulty opening and closing action.
Check for damaged contact surface and threads.

Fig. 6-42



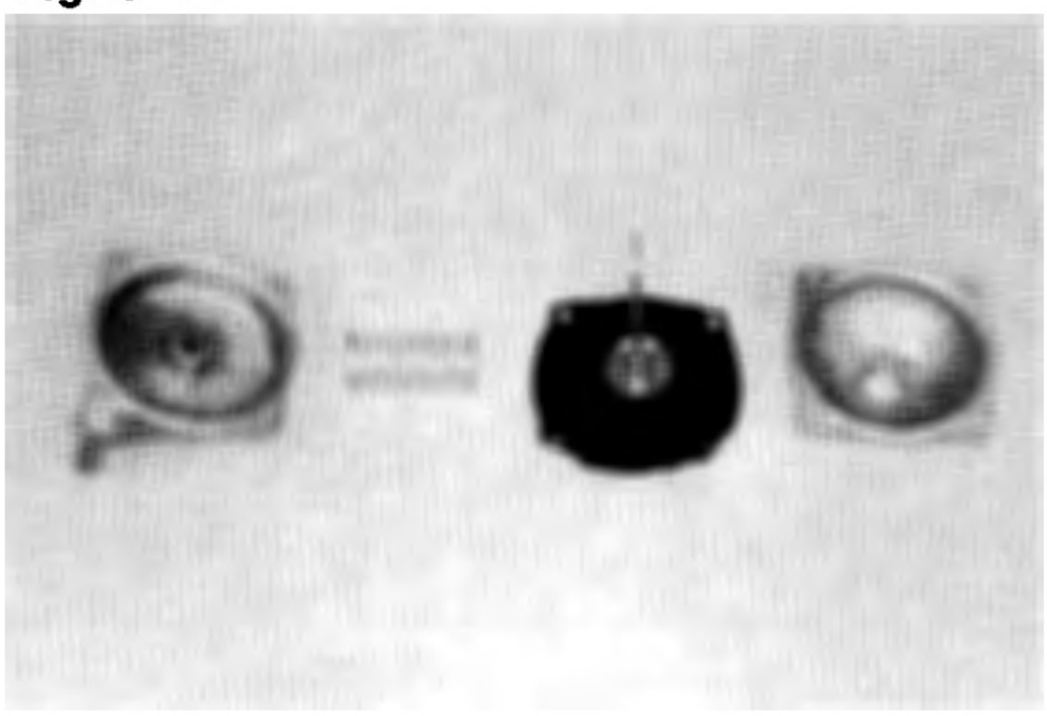
5. Remove the jet with SST.
SST [09860-11011]

Fig. 6-43



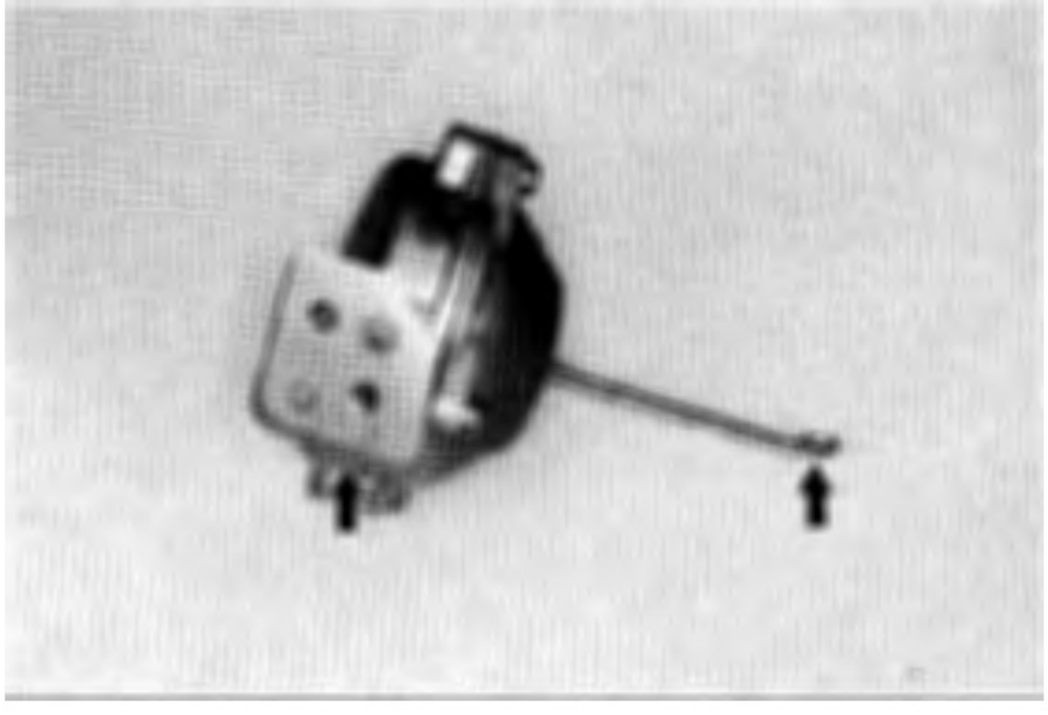
6. Pump damping spring: Check for deformation or rust.
Steel ball: Check for damage or rust.

Fig. 6-44



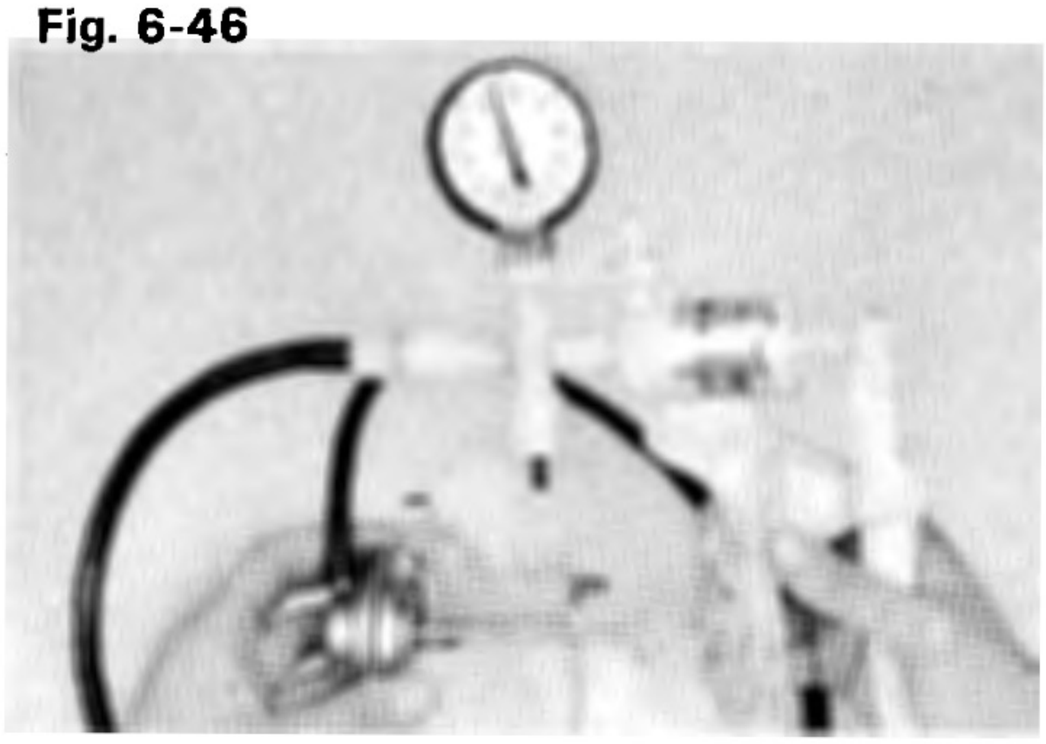
7. Diaphragm: Check the diaphragm, housing and spring for wear or damage.

Fig. 6-45



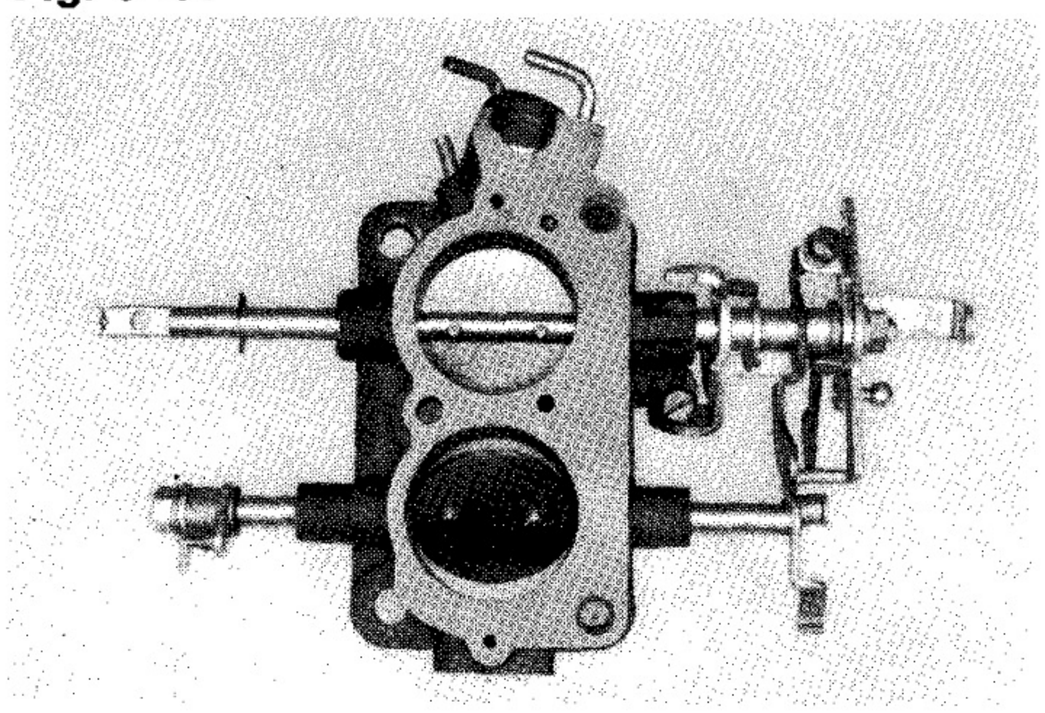
8. Assemble the diaphragm as shown in the figure.

Fig. 6-46



9. Choke opener: Apply vacuum to the diaphragm.
Check that vacuum does not drop immediately and the link moves when vacuum is applied.

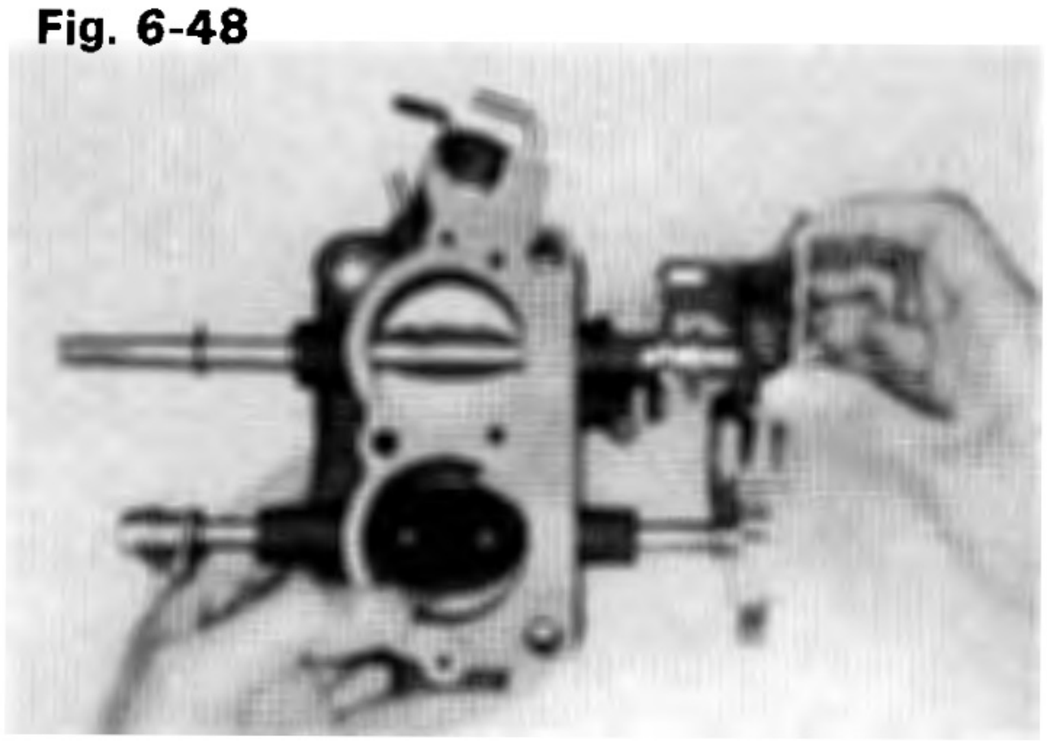
Fig. 6-47



Flange Parts

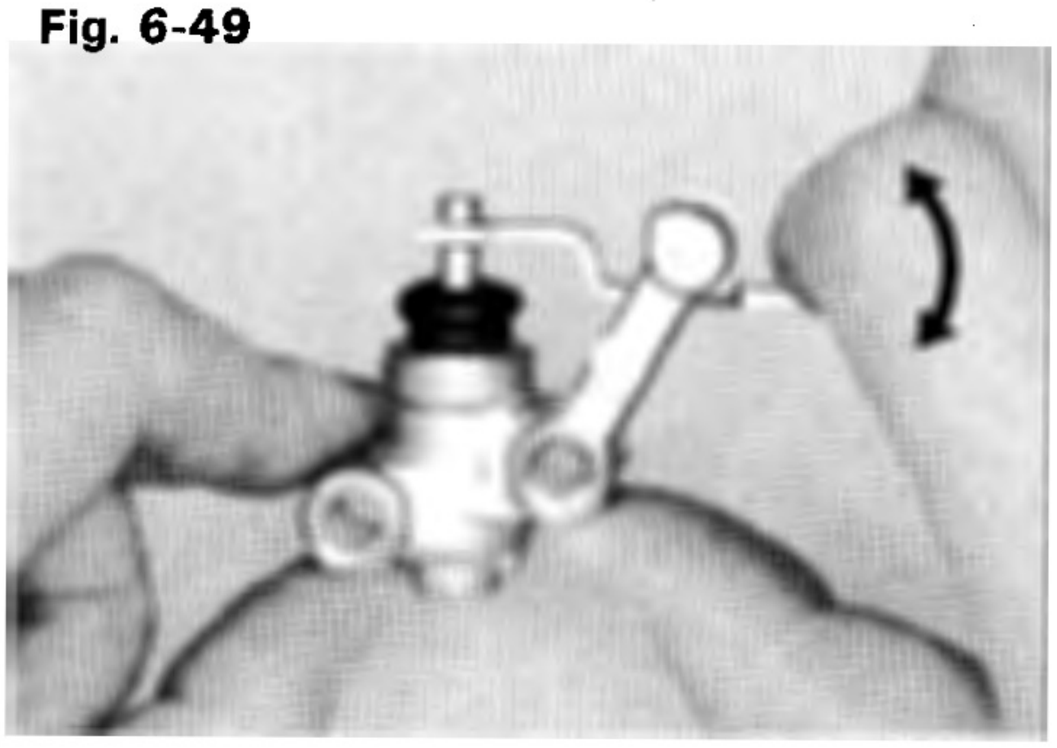
1. Flange: Check for cracks, damaged mounting surfaces, threads and for wear on throttle shaft bearings.

Fig. 6-48



2. Throttle valves: Check for worn or deformed valves and for wear, bending, twisting or faulty movement inside the housing shaft.

Fig. 6-49



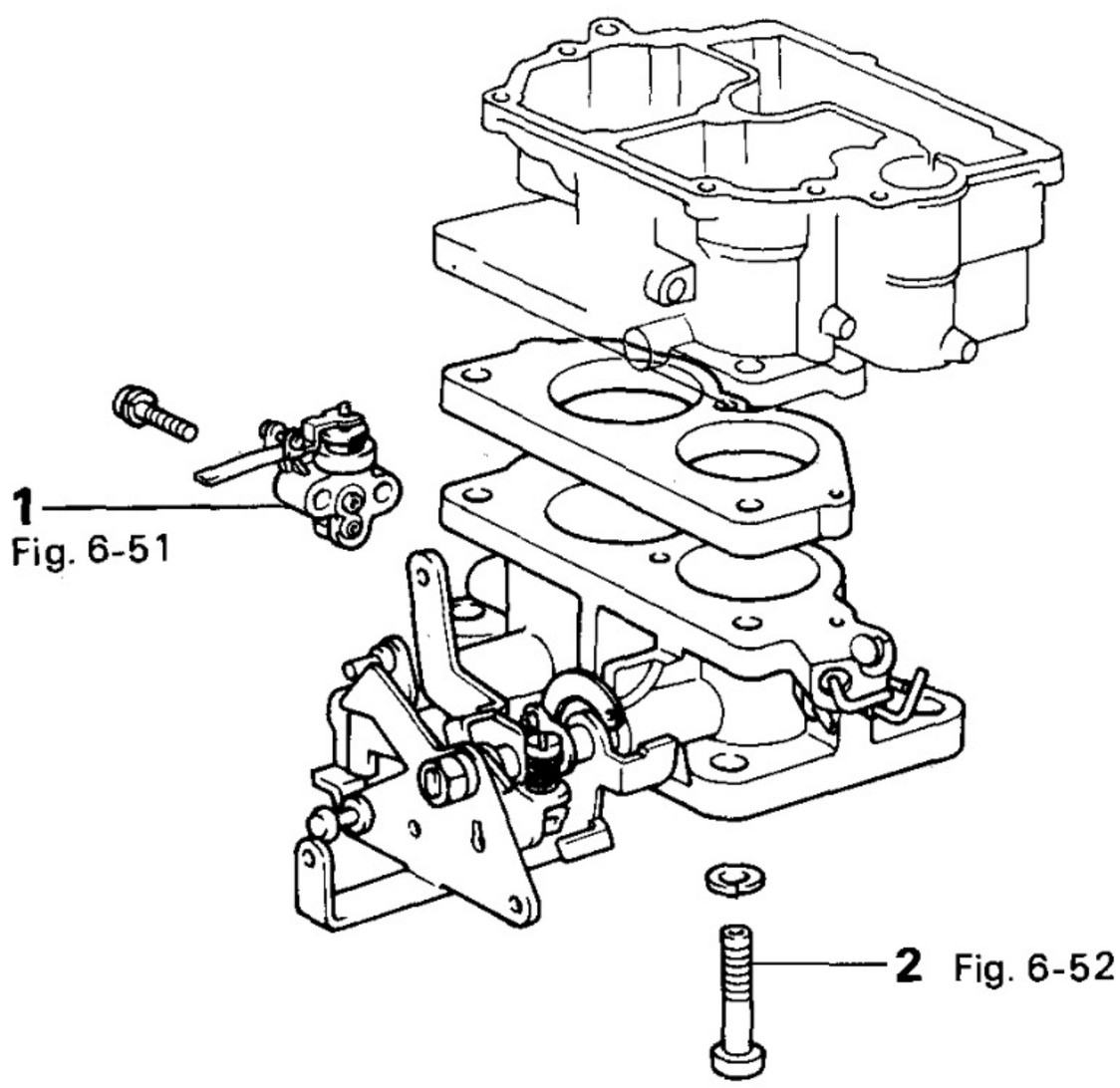
3. Slow cut valve: Check the boot for damage.
Make sure that the valve moves smoothly.

ASSEMBLY

Flange

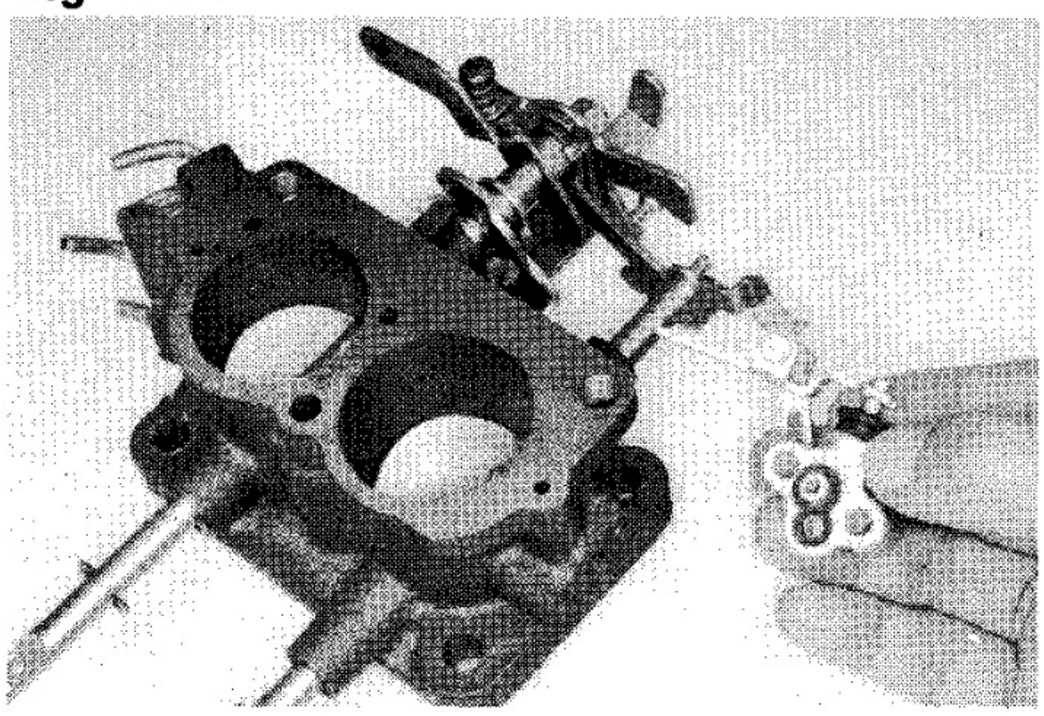
Assemble the parts in the numerical order shown in the figure.

Fig. 6-50



1. Slow Cut Valve
2. Vacuum Passage Bolt

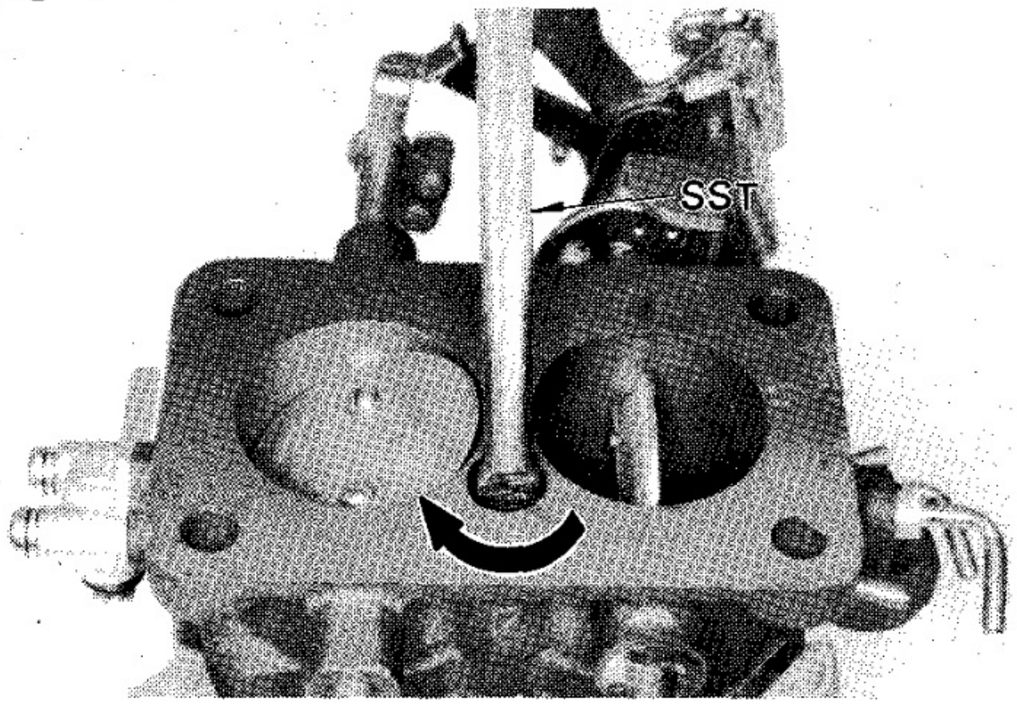
Fig. 6-51



Install the slow cut valve.

– Note –
Before tightening the set bolts, confirm that the gasket is installed correctly.

Fig. 6-52



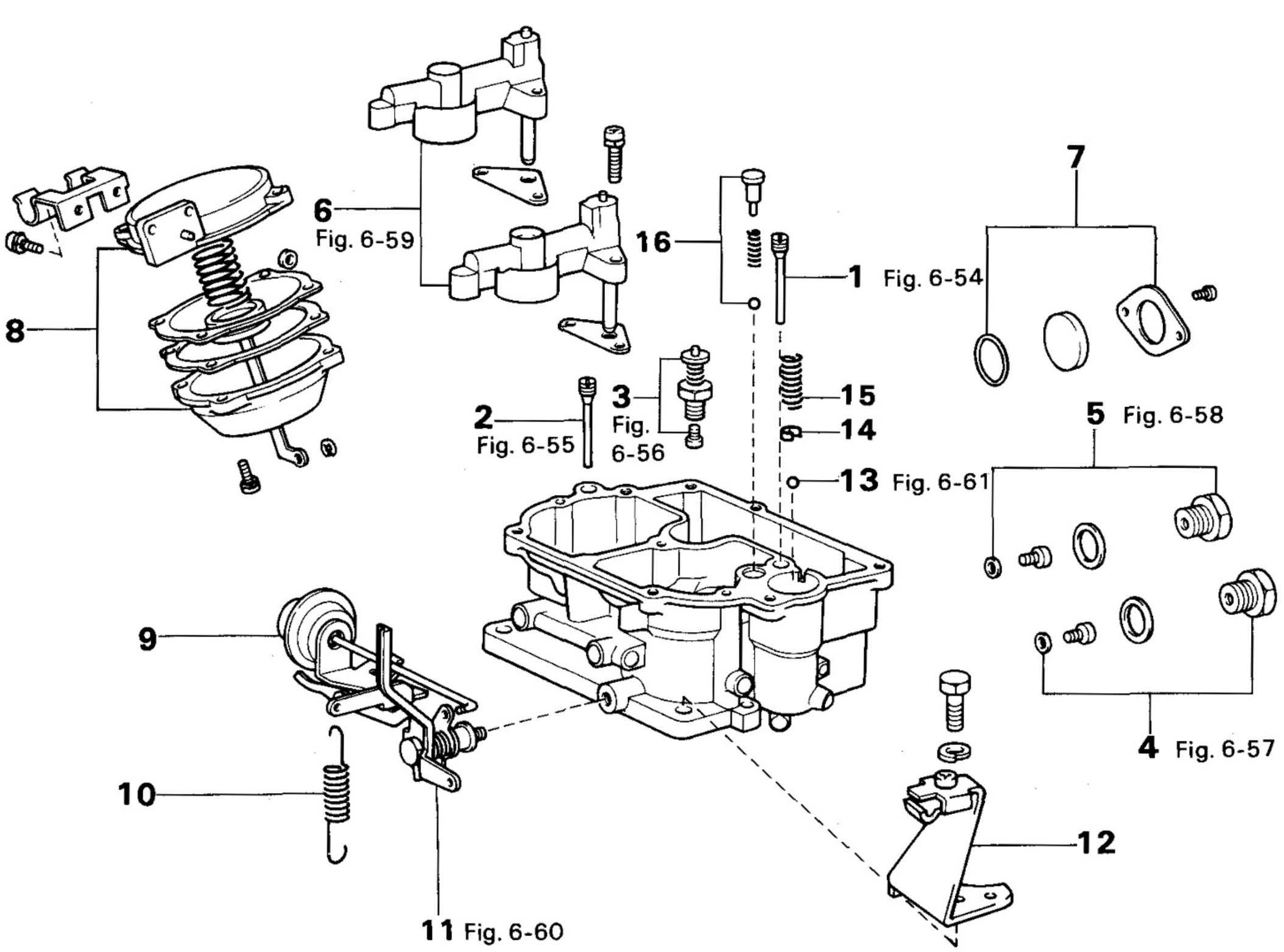
Tighten the vacuum passage bolt with SST.
SST [09860-11011]

– Note –
Use a new gasket.

Body

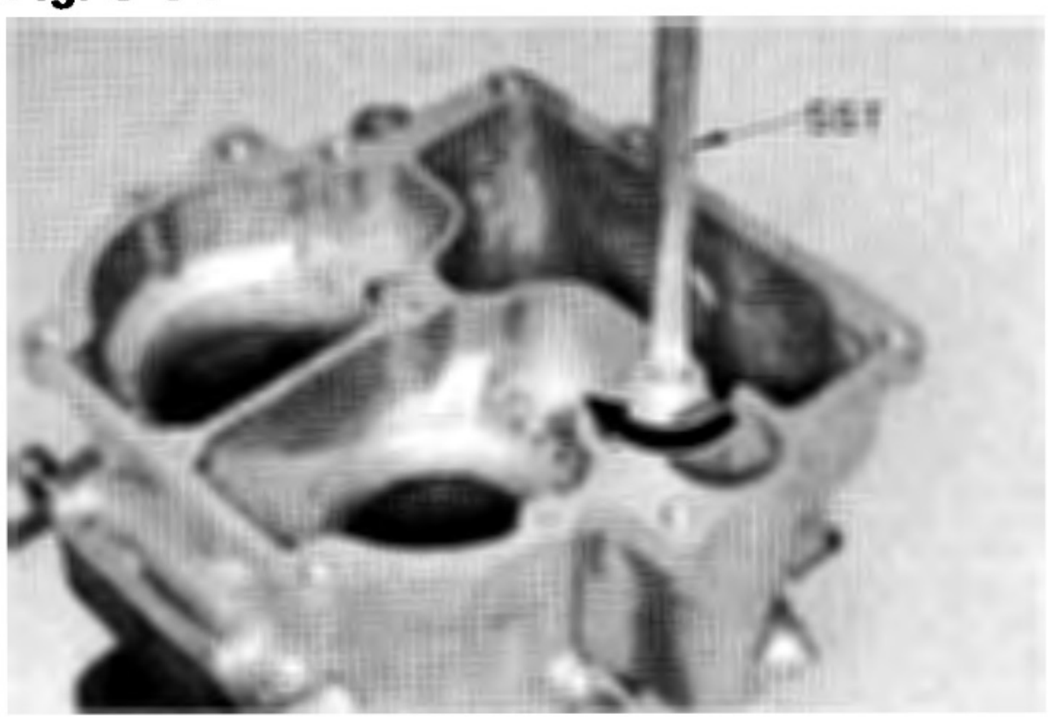
Assemble the parts in the numerical order shown in the figure.

Fig. 6-53



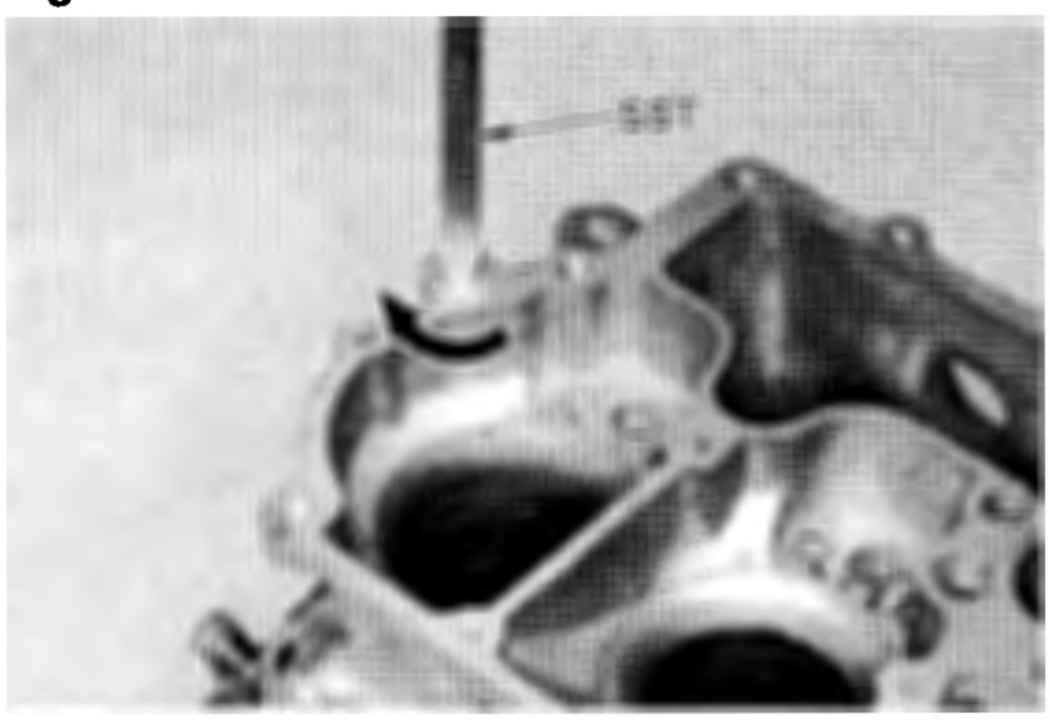
1. 1st Slow Jet
2. 2nd Slow Jet
3. Power Valve
4. 1st Main Jet
5. 2nd Main Jet
6. Small Venturi
7. Level Gage Glass
8. Diaphragm
9. Choke Opener
10. Back Spring for Throttle Shaft
11. Choke Opener Connecting Arm
12. Choke Wire Clamp
13. Steel Ball for Pump Plunger
14. Check Ball Retainer
15. Pump Damping Spring
16. Steel Ball for Discharge Weight & Spring

Fig. 6-54



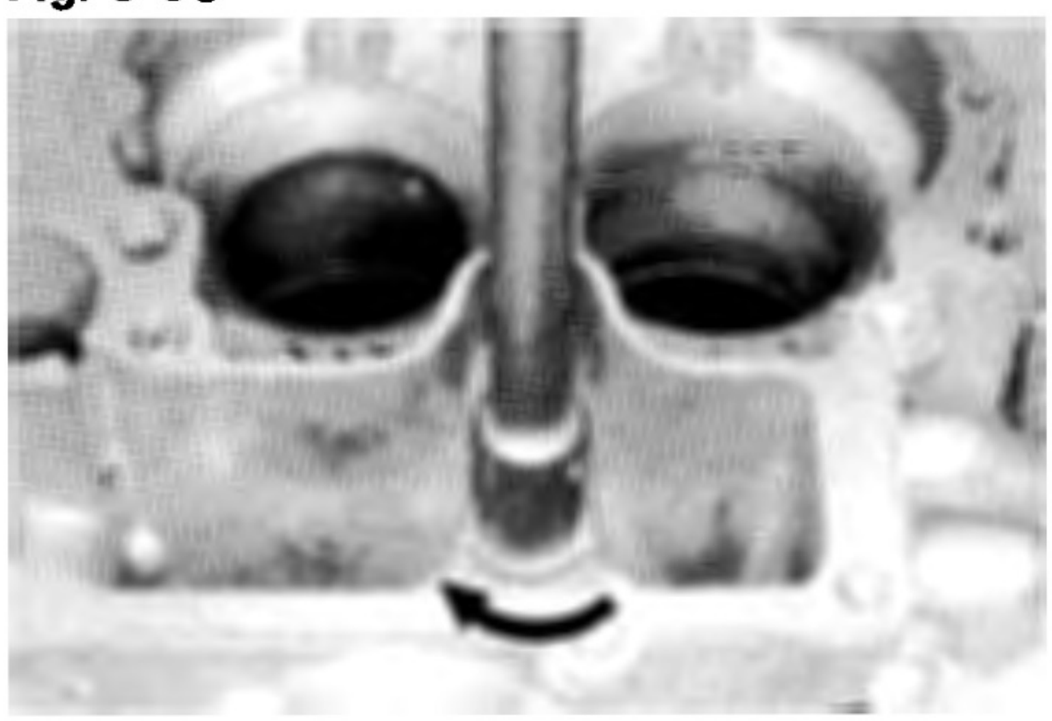
Install the 1st slow jet with SST.
SST [09860-11011]

Fig. 6-55



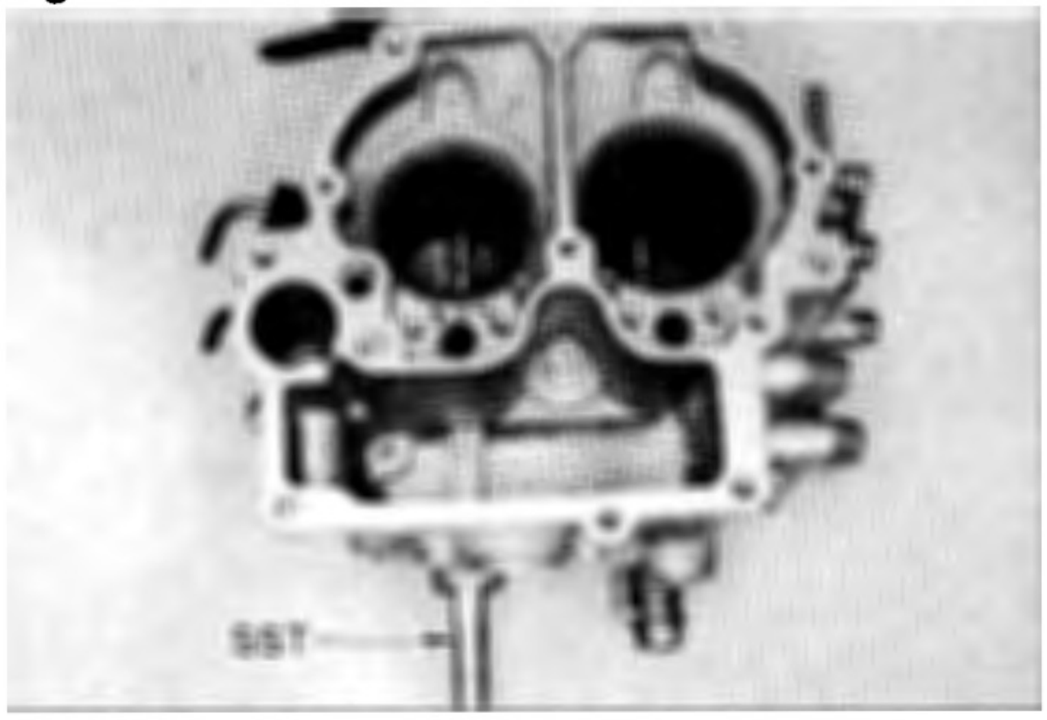
Install the 2nd slow jet with SST.
SST [09860-11011]

Fig. 6-56



Install the power valve with SST.
SST [09860-11011]

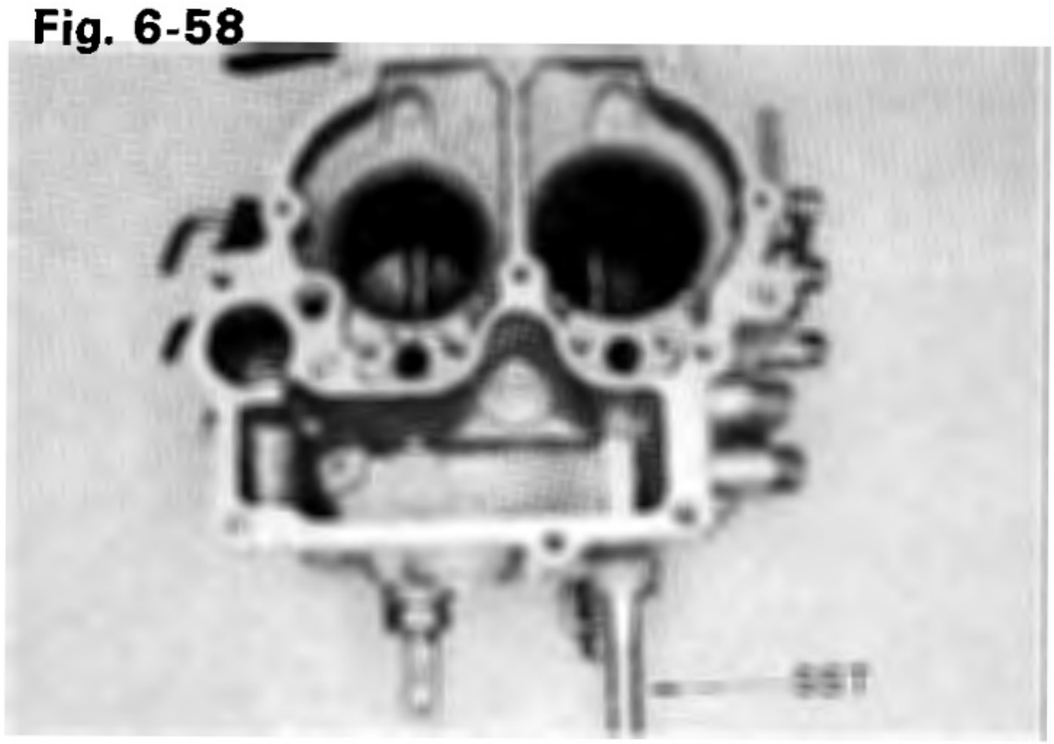
Fig. 6-57



Install the 1st main jet with SST.
SST [09860-11011]

– Note –
The 1st main jet is brass colored.

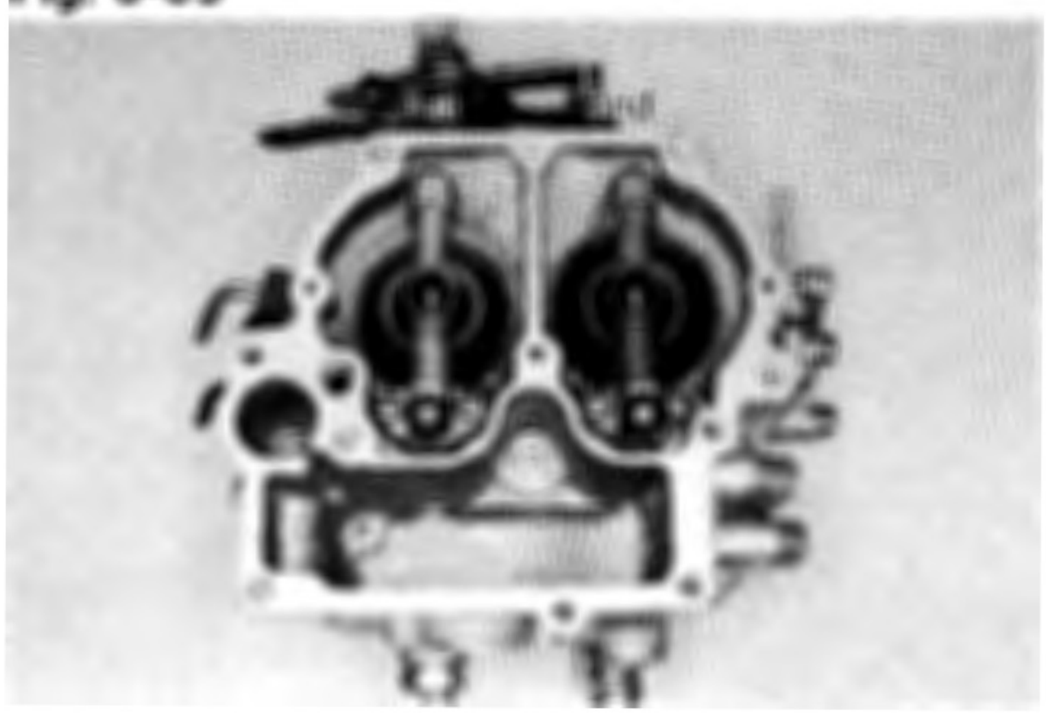
Fig. 6-58



Install the 2nd main jet with SST.
SST [09860-11011]

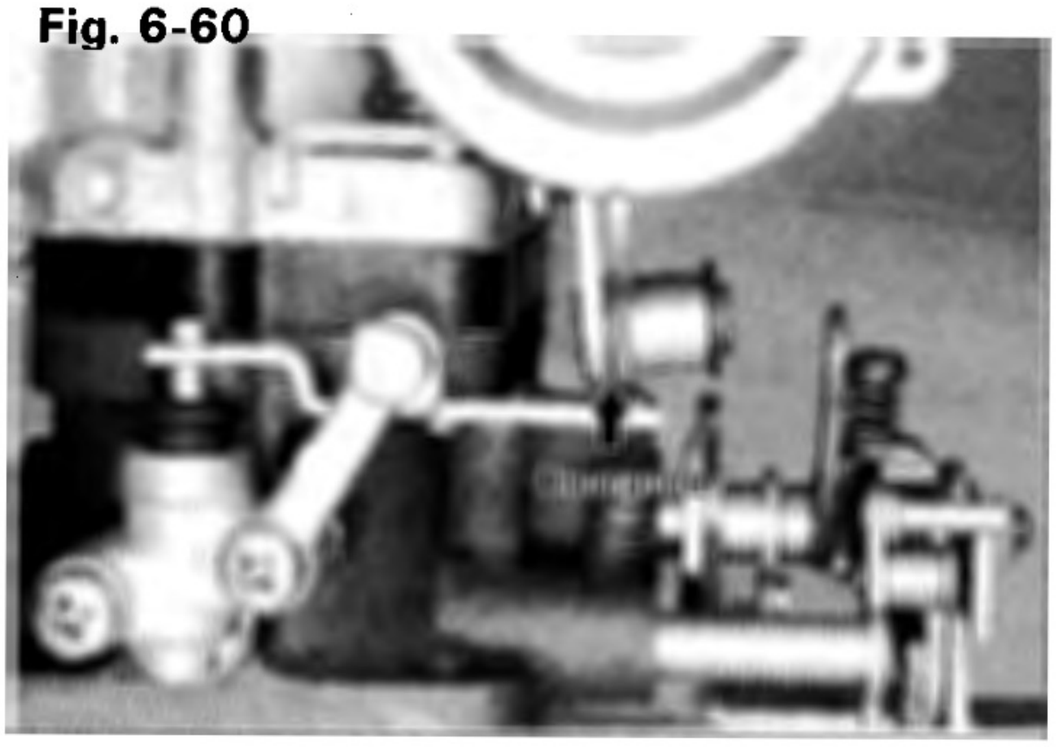
– Note –
The 2nd main jet is chrome colored.

Fig. 6-59



Install the venturis.
1st small venturi ——→ Chrome colored
2nd small venturi ——→ Brass colored

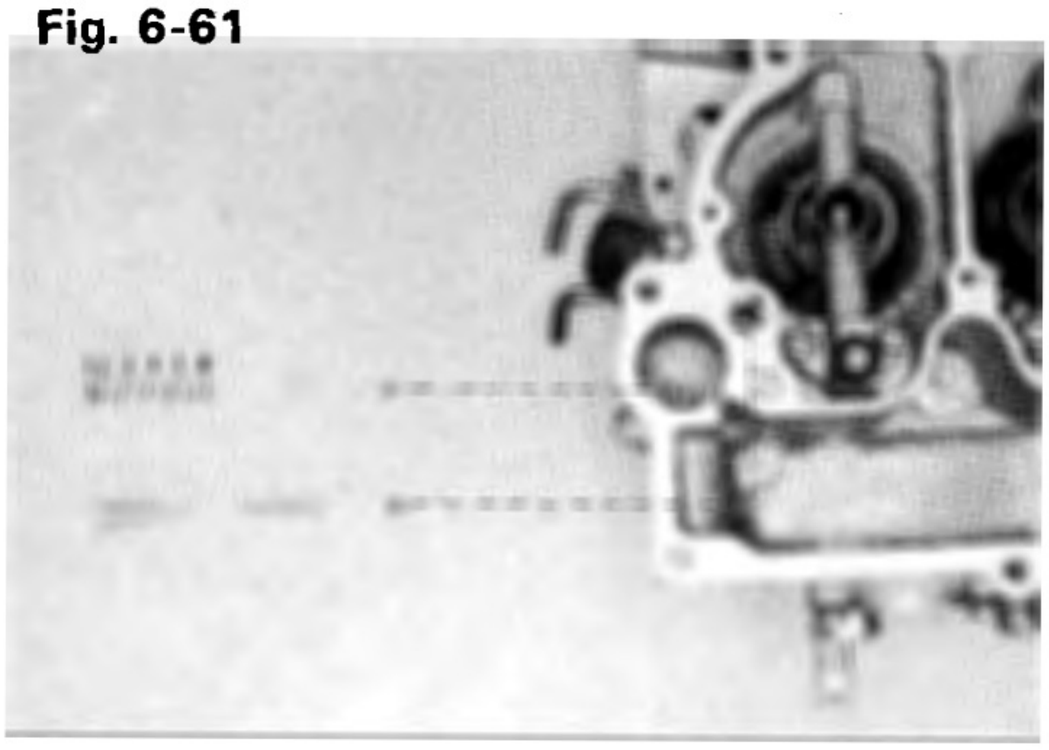
Fig. 6-60



Select the fast throttle shaft shim to obtain the specified clearance at the point indicated in the figure.

Clearance: 0.1 mm (0.004 in.)
Shim thickness:
0.1, 0.2, 0.3, 0.6 mm (0.004, 0.008, 0.012, 0.024 in.)

Fig. 6-61



Install the steel balls, being careful not to mix up the two sizes of balls.
Smaller ball ——→ For pump plunger
Larger ball ——→ For discharge weight

Choke System

Assemble the parts in the numerical order shown in the figure.

Fig. 6-62

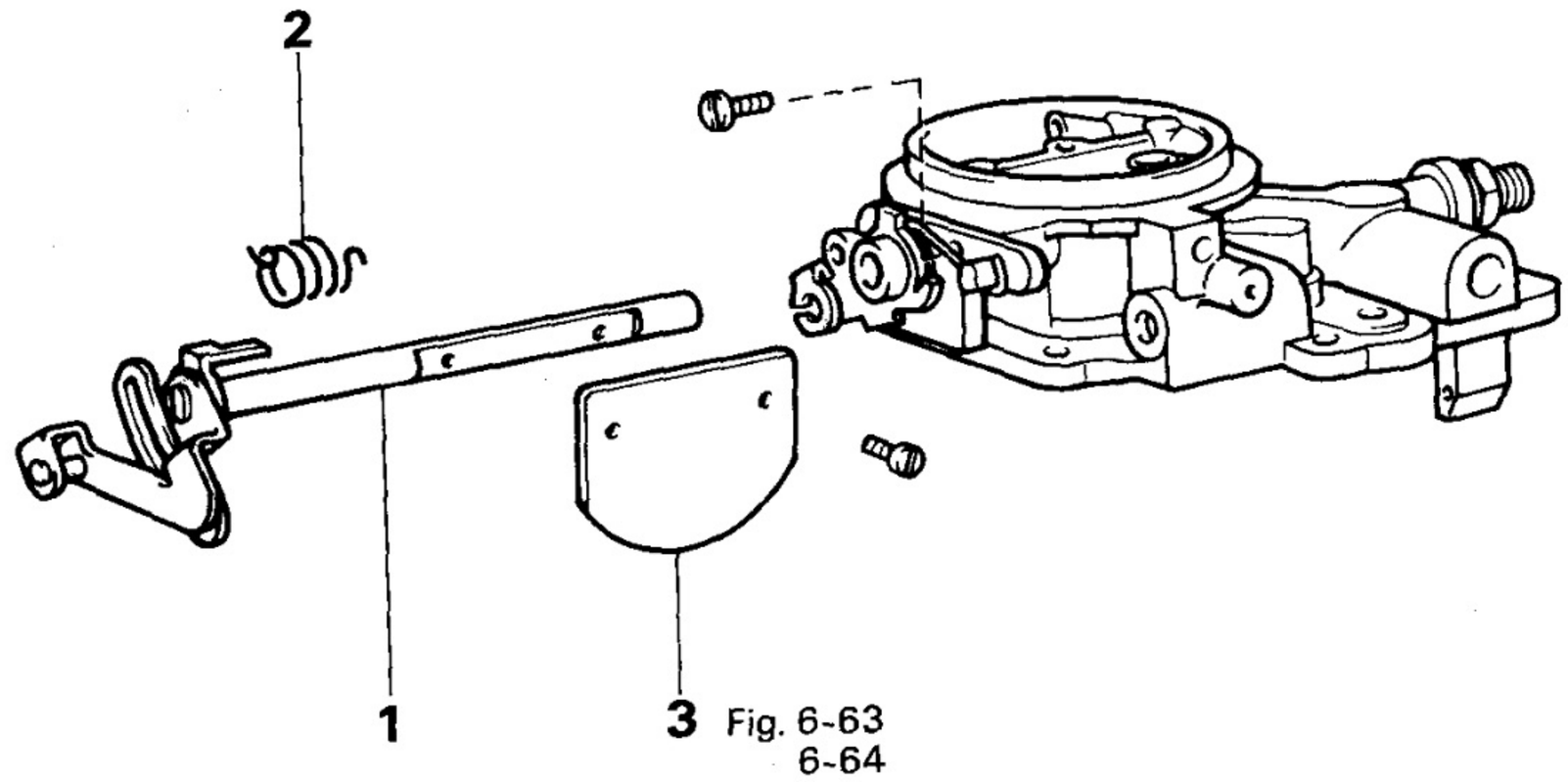
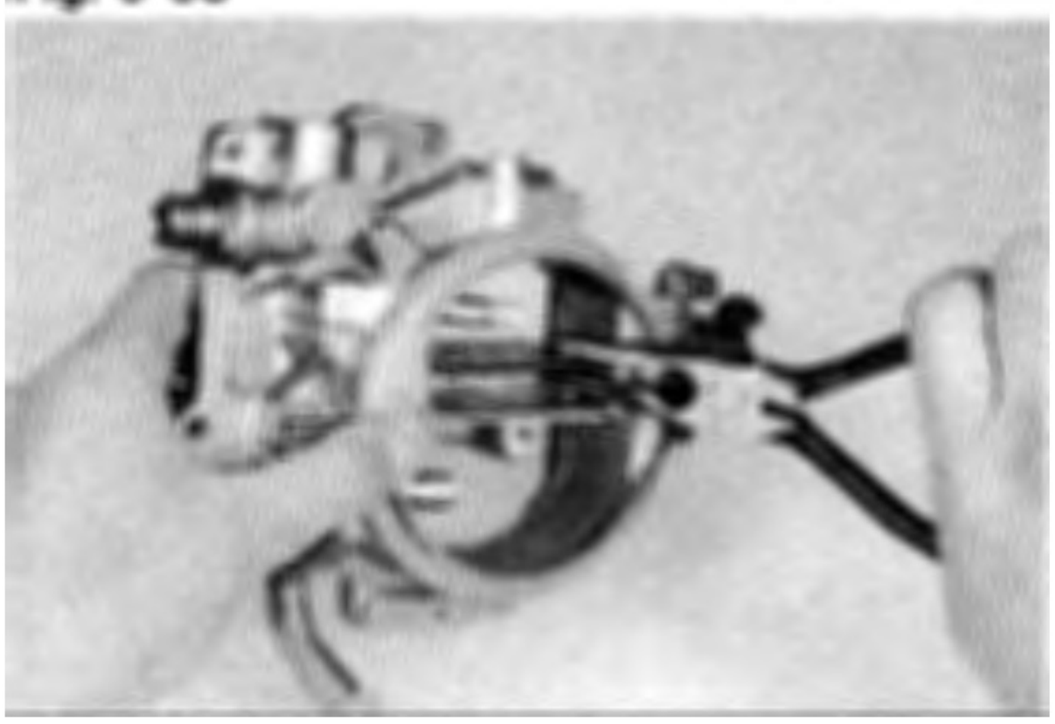


Fig. 6-63
6-64

1. Choke Shaft
2. Choke Valve Relief Spring
3. Choke Valve

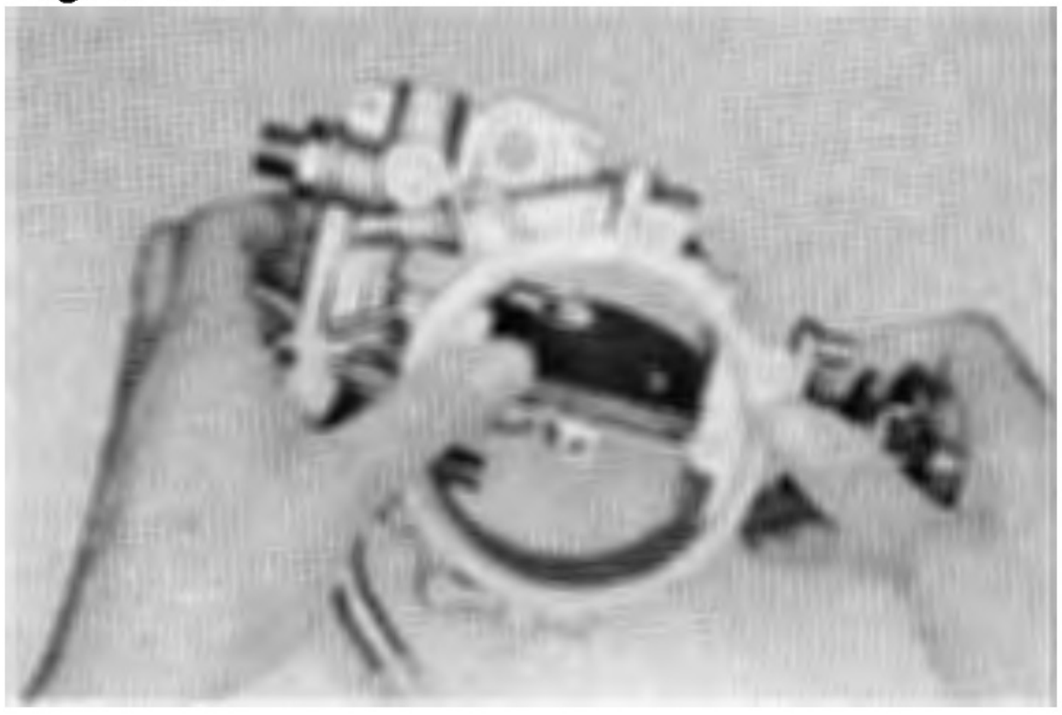
Fig. 6-63



Install the choke valve.

– Note –
Stake the choke shaft screws after assembling them.

Fig. 6-64

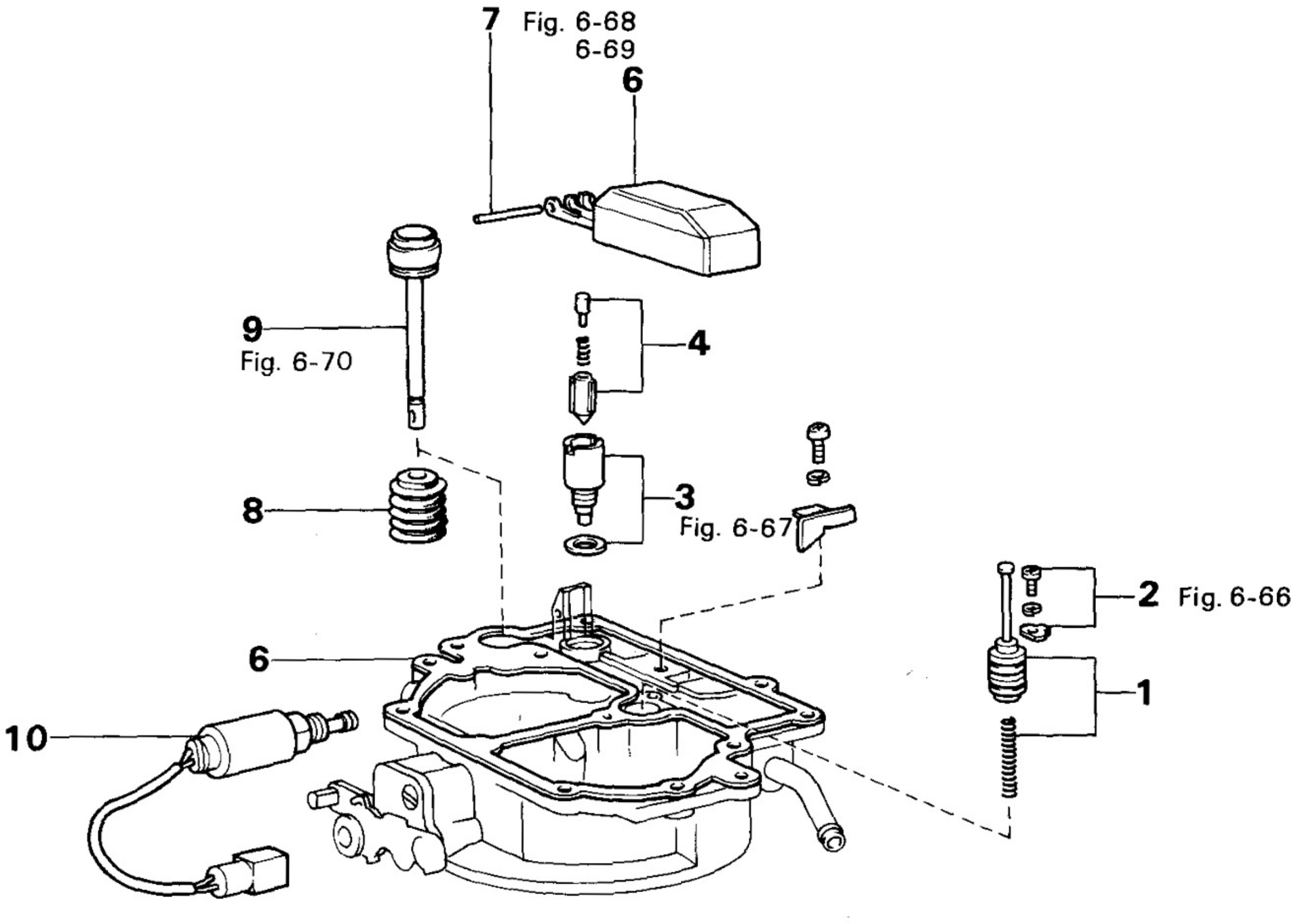


Check the choke valve action.

Float

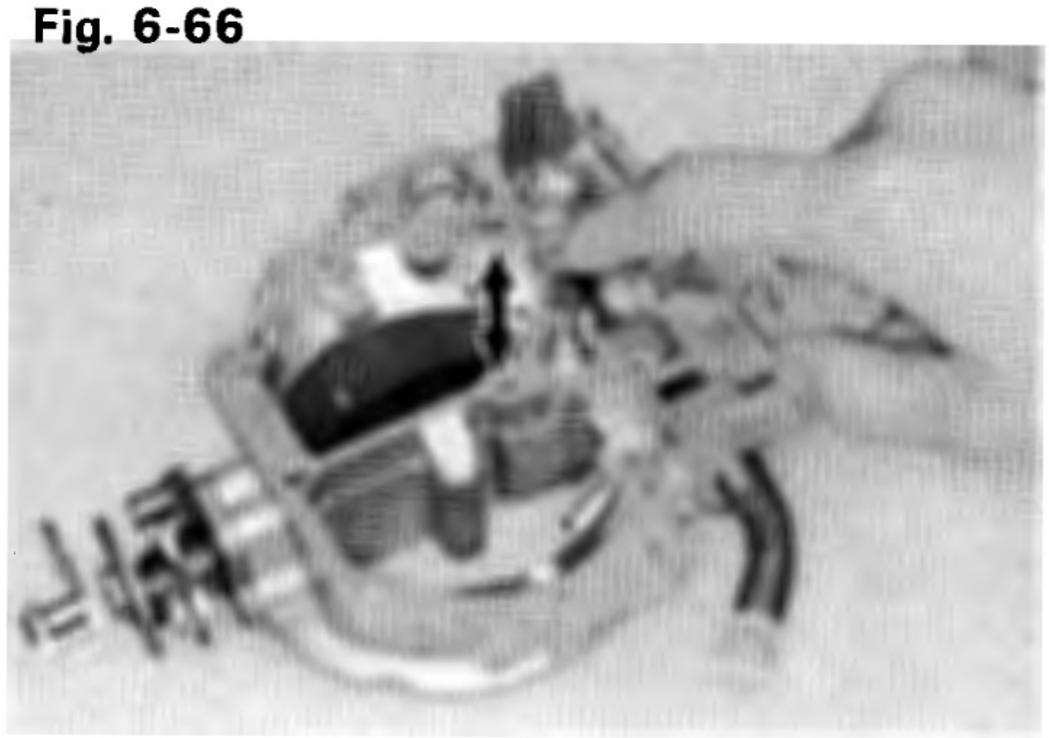
Assemble the parts in the numerical order shown in the figure.

Fig. 6-65



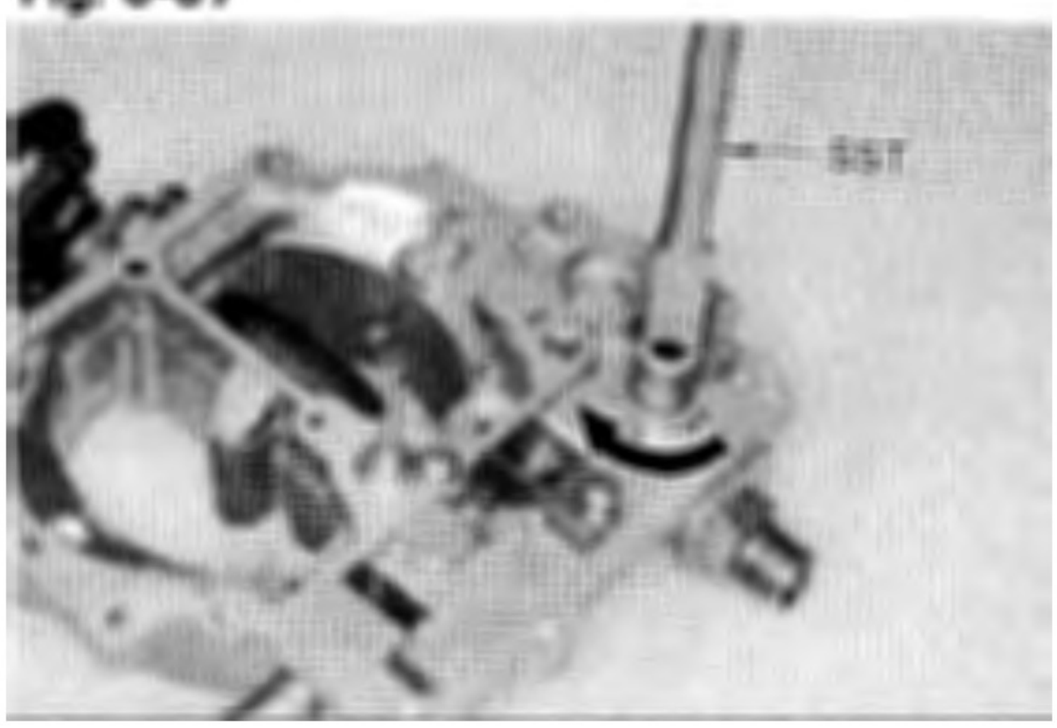
1. Power Piston & Spring
2. Power Piston Retainer
3. Needle Valve Seat
4. Needle Valve, Spring & Pin
5. Air Horn Gasket
6. Float
7. Float Lever Pin
8. Boot
9. Pump Plunger
10. Solenoid Valve

Fig. 6-66



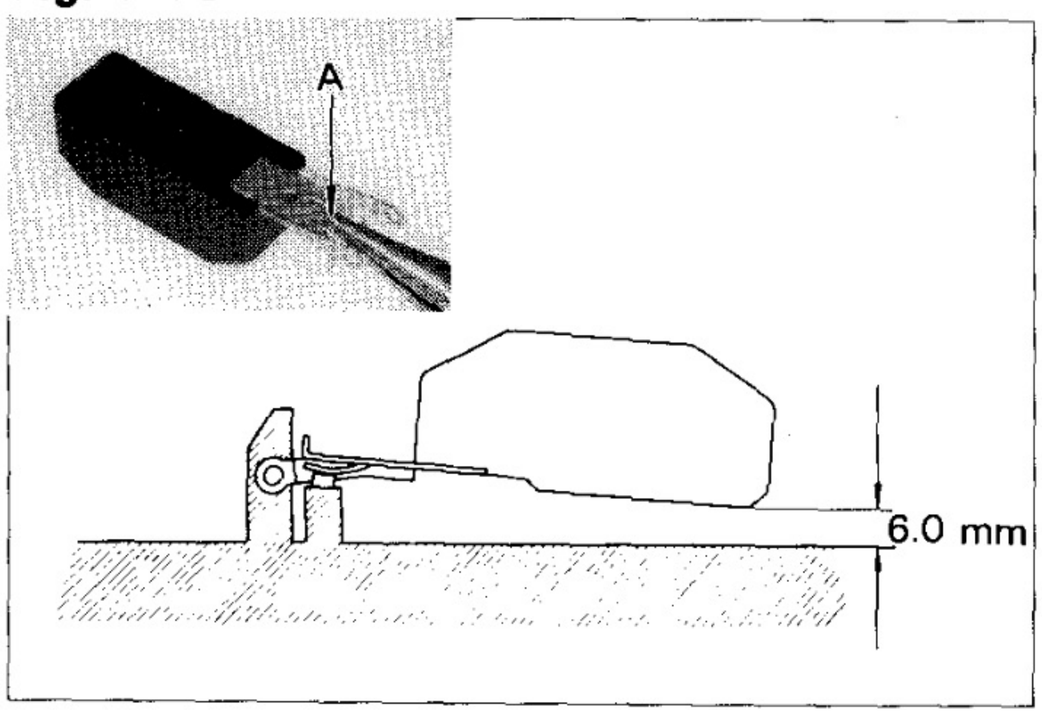
Make sure that the power piston moves smoothly.

Fig. 6-67



Install the needle valve seat with SST.
SST [09860-11011]

Fig. 6-68



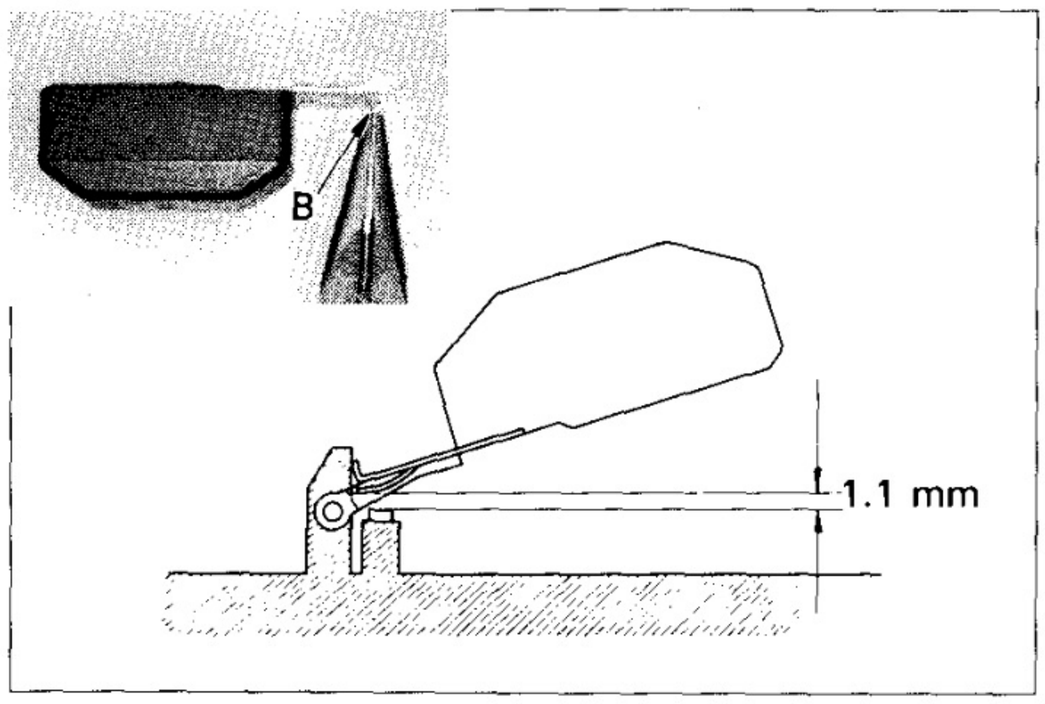
Adjust The Float Level

Allow the float to hang down by its own weight. Then check the clearance between the float tip and air horn with SST.
Adjust by bending part A of the float lip.
SST [09240-00014]

Float upper level: 6.0 mm (0.236 in.)

— Note —
This measurement should be made without a gasket on the air horn.

Fig. 6-69

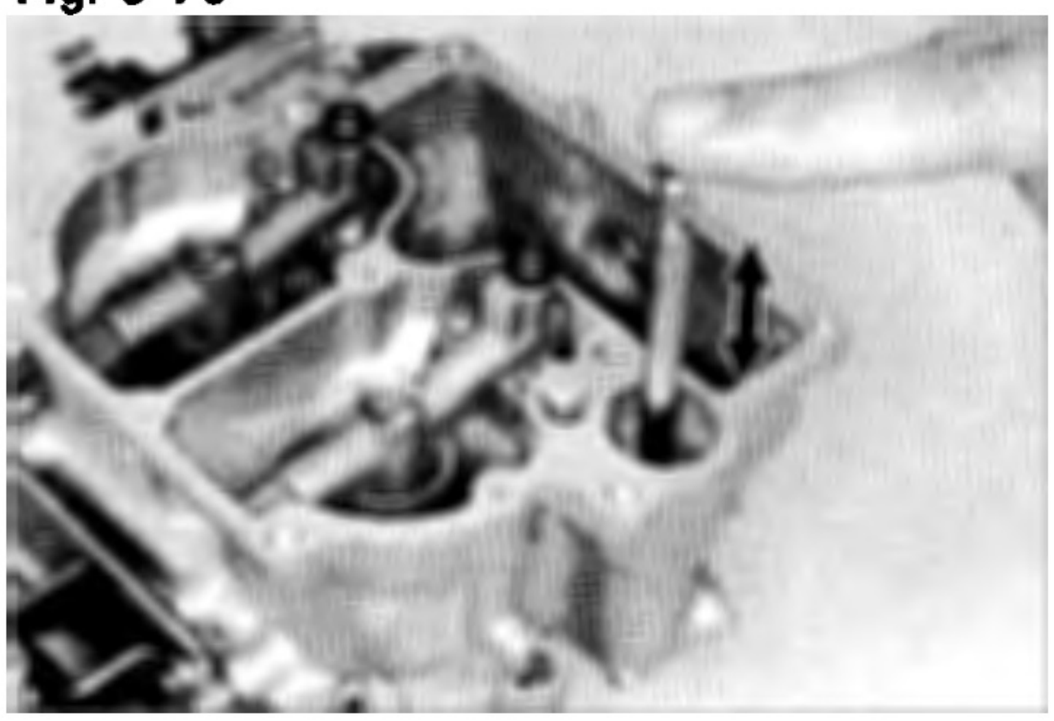


Adjust The Lowered Position

Lift up the float and check the clearance between the needle valve plunger and float lip with SST.
Adjust by bending part B of the float lip.
SST [09240-00020]

Float lower level: 1.1 mm (0.043 in.)

Fig. 6-70

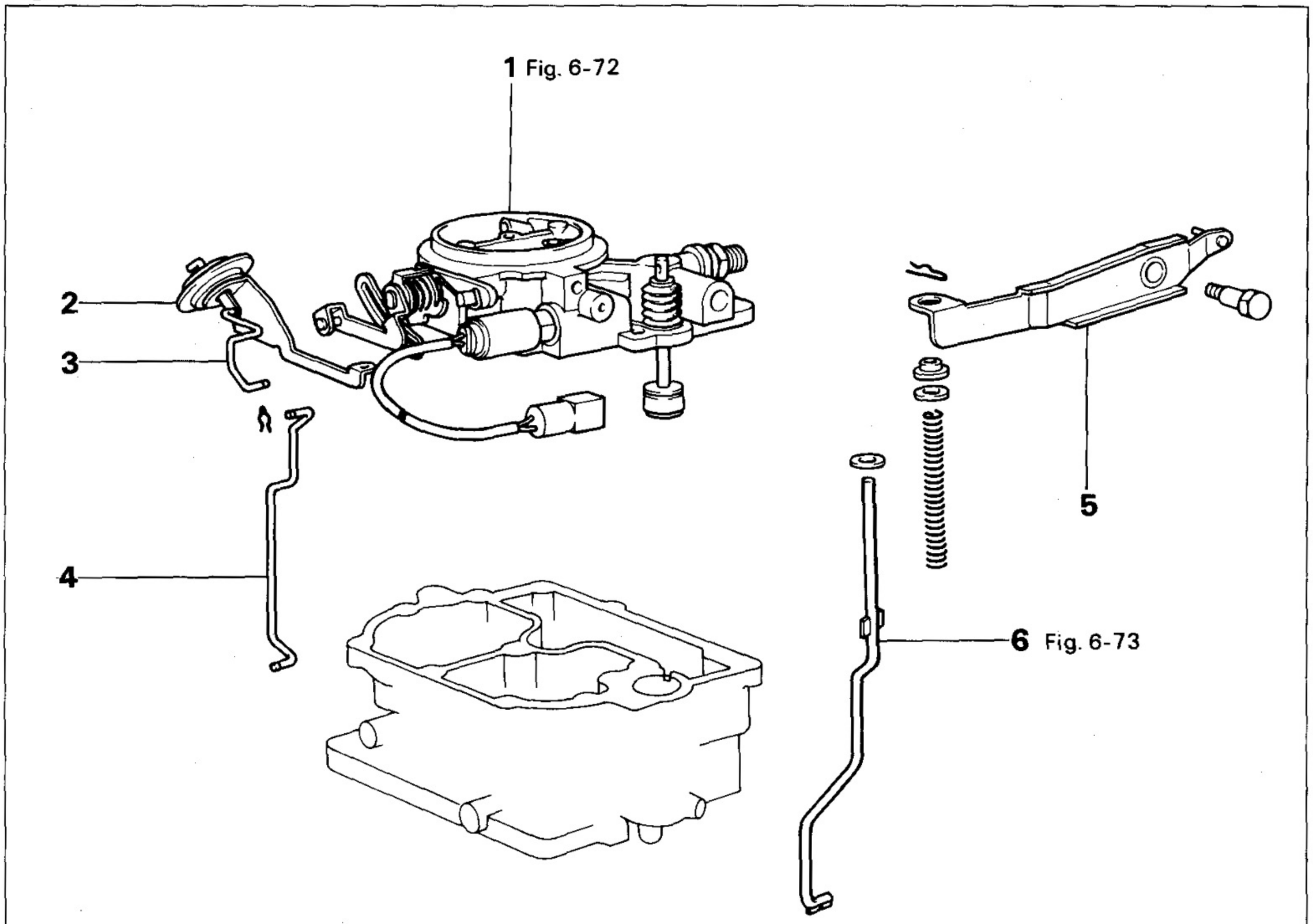


Insure that the pump plunger moves smoothly.

Air Horn

Assemble the parts in the numerical order shown in the figure.

Fig. 6-71



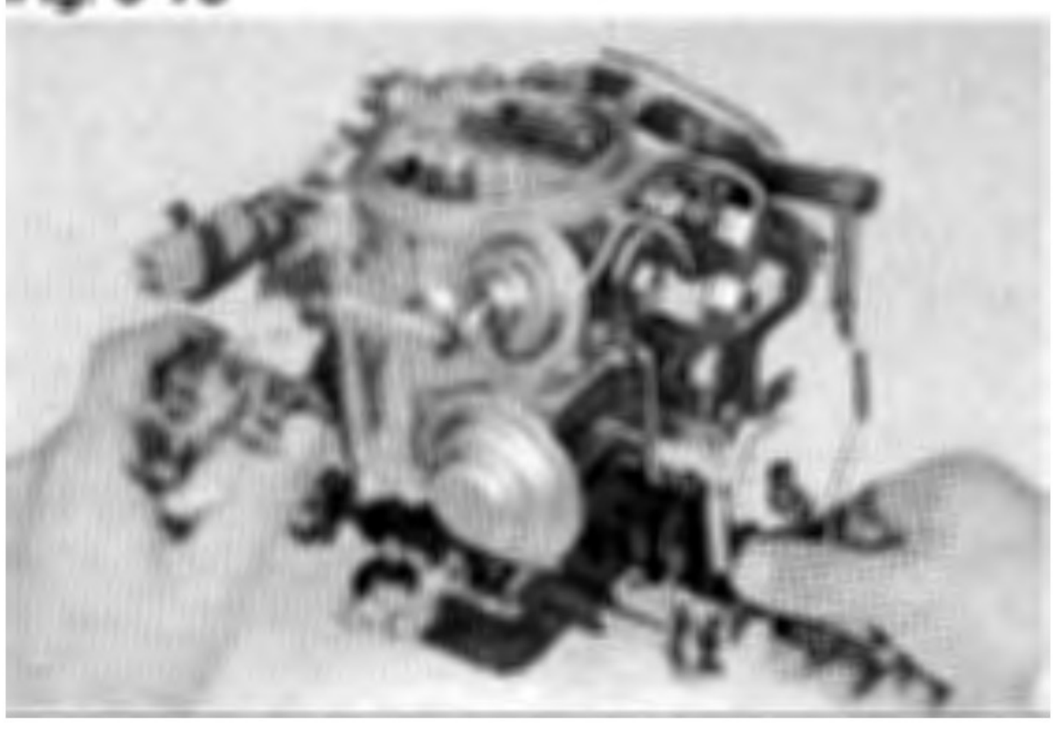
1. Air Horn with Gasket
2. Choke Breaker
3. Choke Breaker Connecting Link
4. Fast Idle Connecting Link
5. Pump Arm
6. Pump Connecting Link

Fig. 6-72



⚠ Before installing the air horn, make sure that the pump discharge weight is properly assembled.

Fig. 6-73

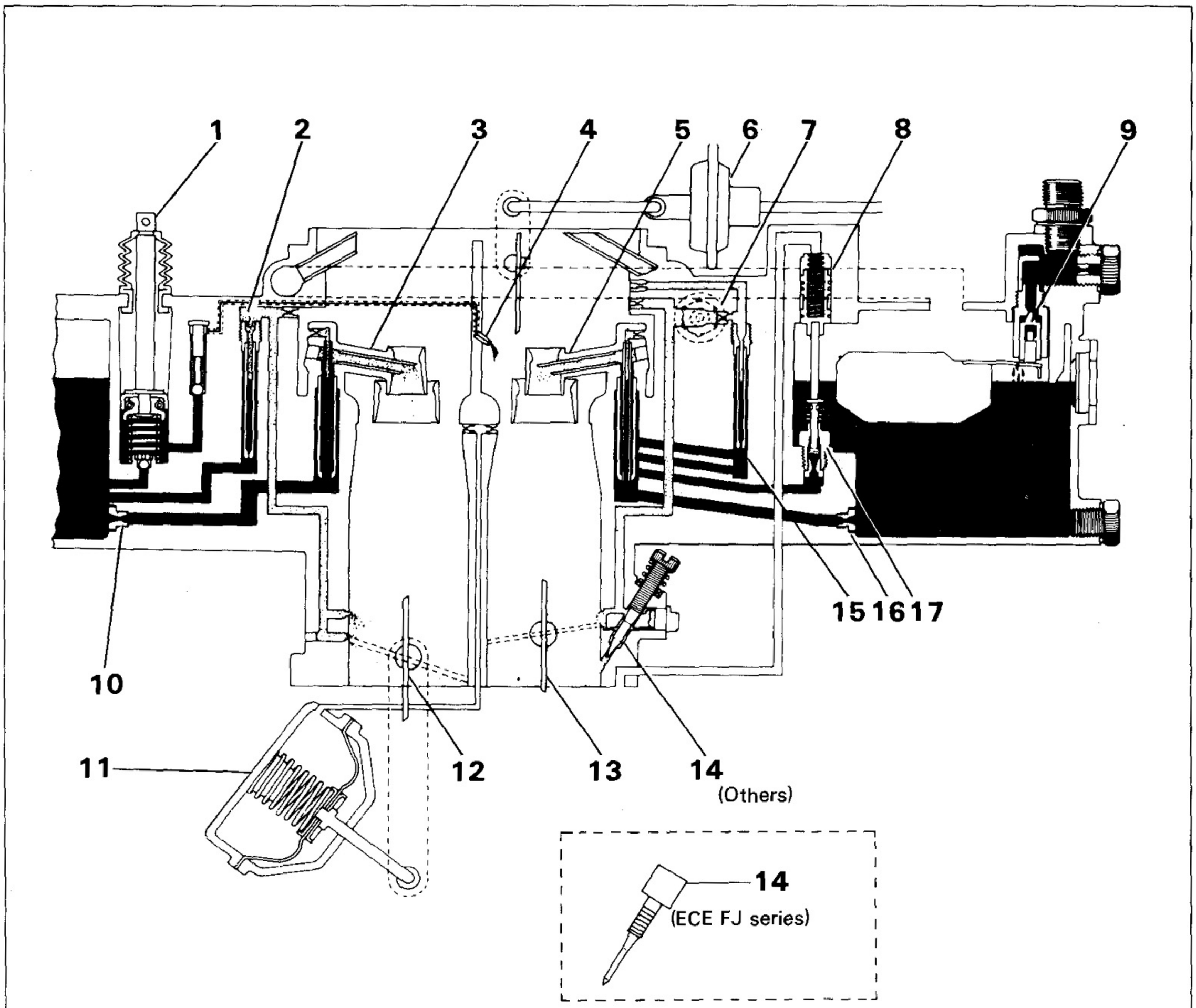


After assembly, make sure that each link moves smoothly.

CARBURETOR (General Countries)

CARBURETOR CIRCUIT

Fig. 6-74



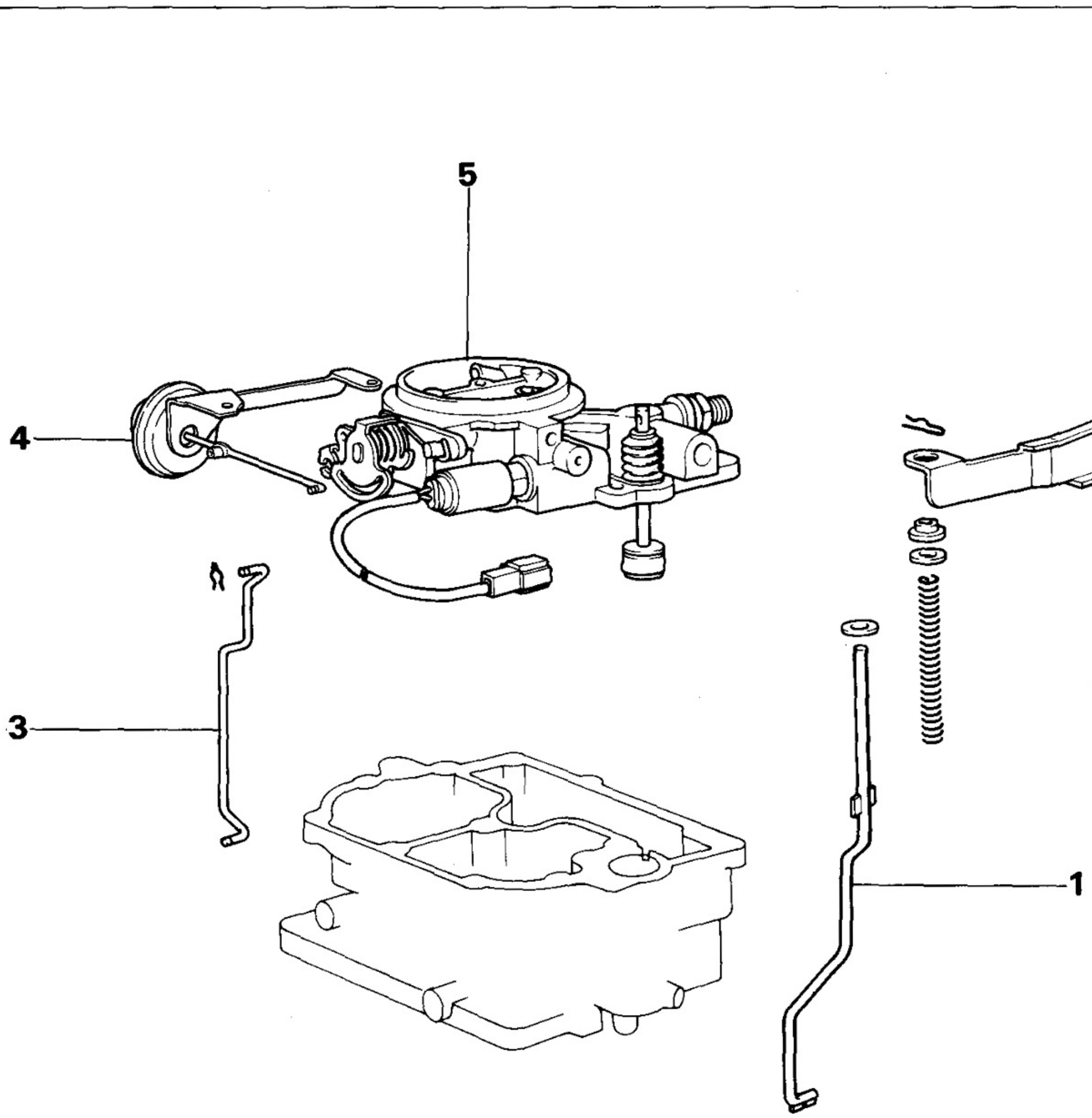
1. Pump Plunger
2. 2nd Slow Jet
3. 2nd Main Nozzle
4. Pump Jet
5. 1st Main Nozzle
6. Choke Breaker (Throttle Positioner Diaphragm) (Australia & ECE FJ series)
7. Solenoid Valve
8. Power Piston
9. Needle Valve
10. 2nd Main Jet
11. Diaphragm
12. 2nd Throttle Valve
13. 1st Throttle Valve
14. Idle Mixture Adjusting Screw
15. 1st Slow Jet
16. 1st Main Jet
17. Power Valve

DISASSEMBLY

Air Horn

Disassemble the parts in the numerical order shown in the figure.

Fig. 6-75



1. Pump Connecting Link
2. Pump Arm
3. Fast Idle Connecting Link
4. Choke Breaker (Throttle Positioner Diaphragm) (Australia & ECE FJ series)
5. Air Horn with Gasket

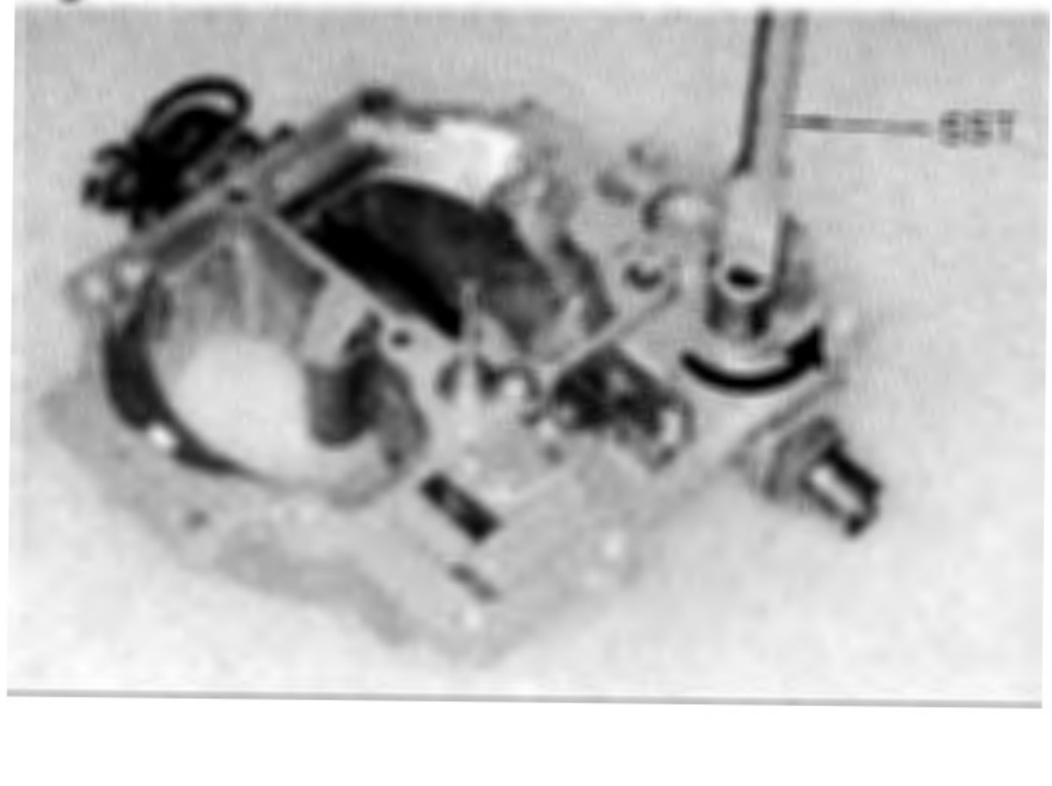
Float

Disassemble the parts in the numerical order shown in the figure.

Fig. 6-76

1. Solenoid Valve
2. Pump Plunger
3. Boot
4. Float Lever Pin
5. Float
6. Air Horn Gasket
7. Needle Valve, Spring & Pin
8. Needle Valve Seat
9. Power Piston Retainer
10. Power Piston & Spring

Fig. 6-77

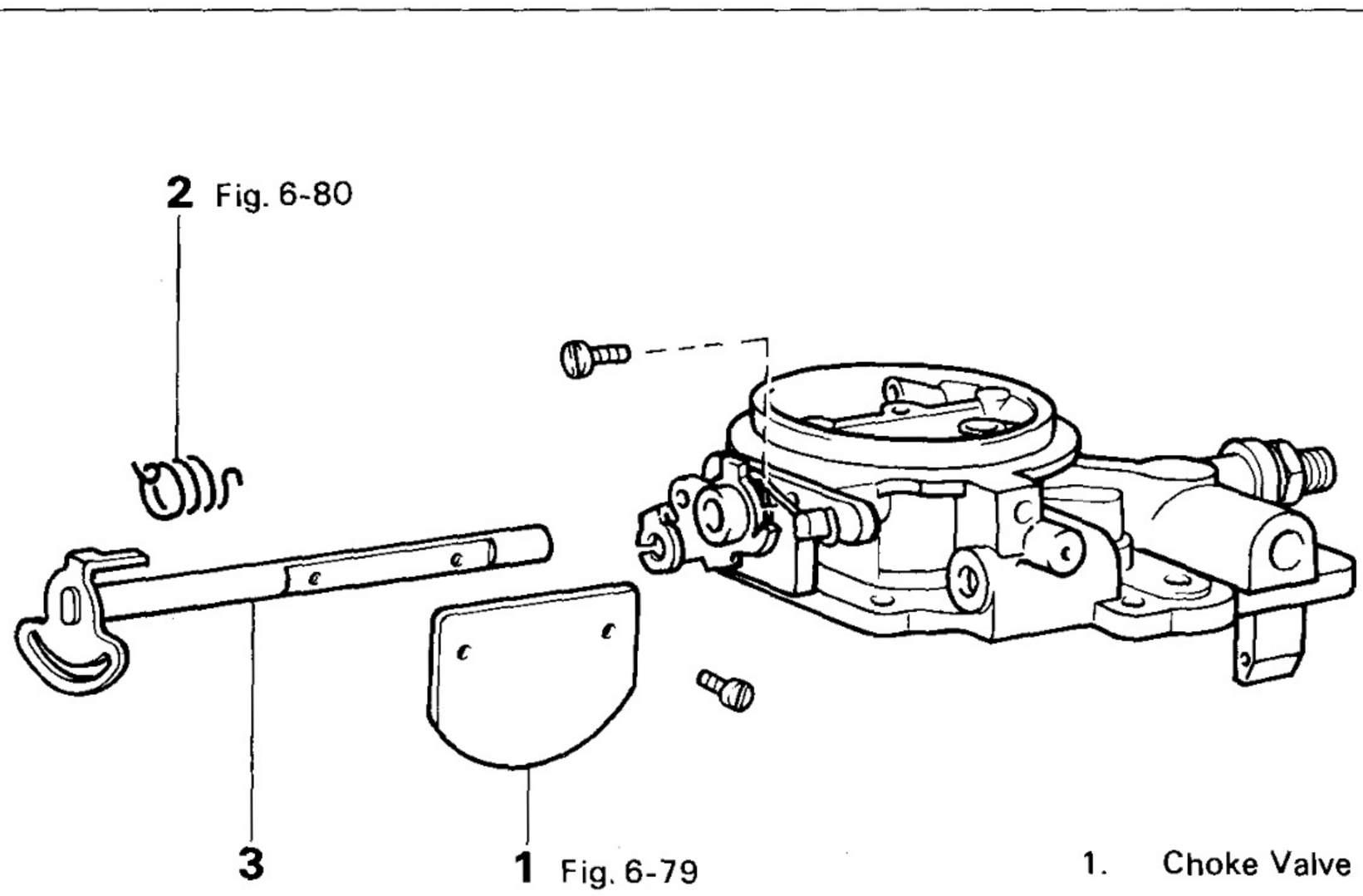


Remove the needle valve seat with SST.
SST [09860-11011]

Choke System

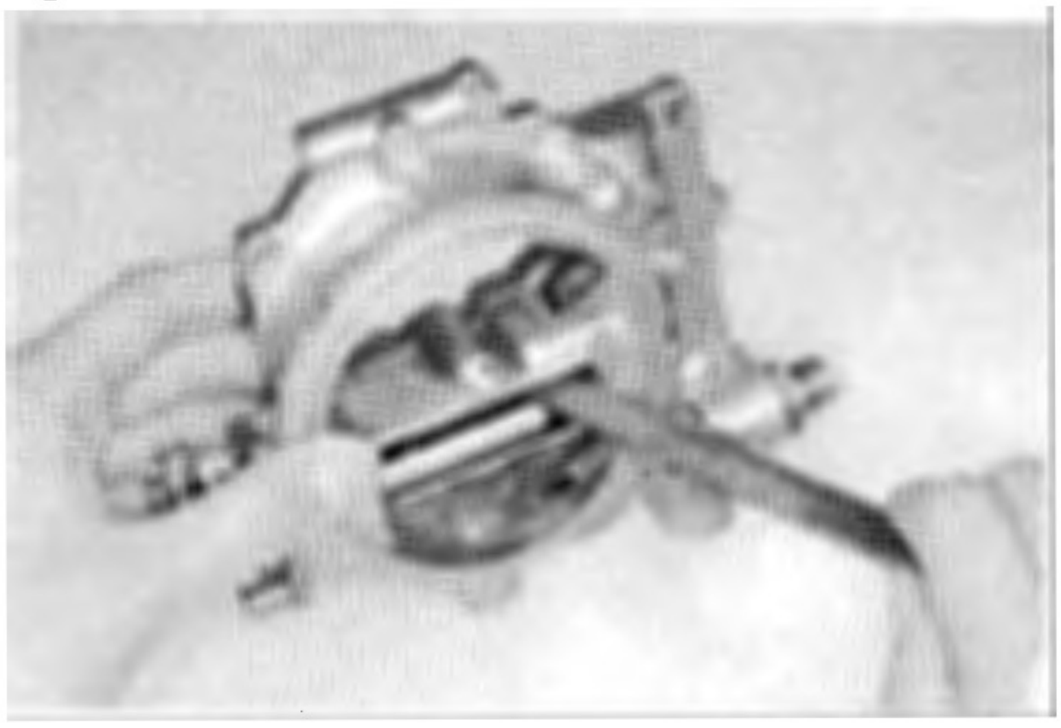
Disassemble the parts in the numerical order shown in the figure.

Fig. 6-78



1. Choke Valve
2. Choke Valve Relief Spring
3. Choke Shaft

Fig. 6-79



To remove the choke valve, file off the ends of the set screws.

— Note —
Do this only if it is necessary to replace the choke shaft.

Fig. 6-80

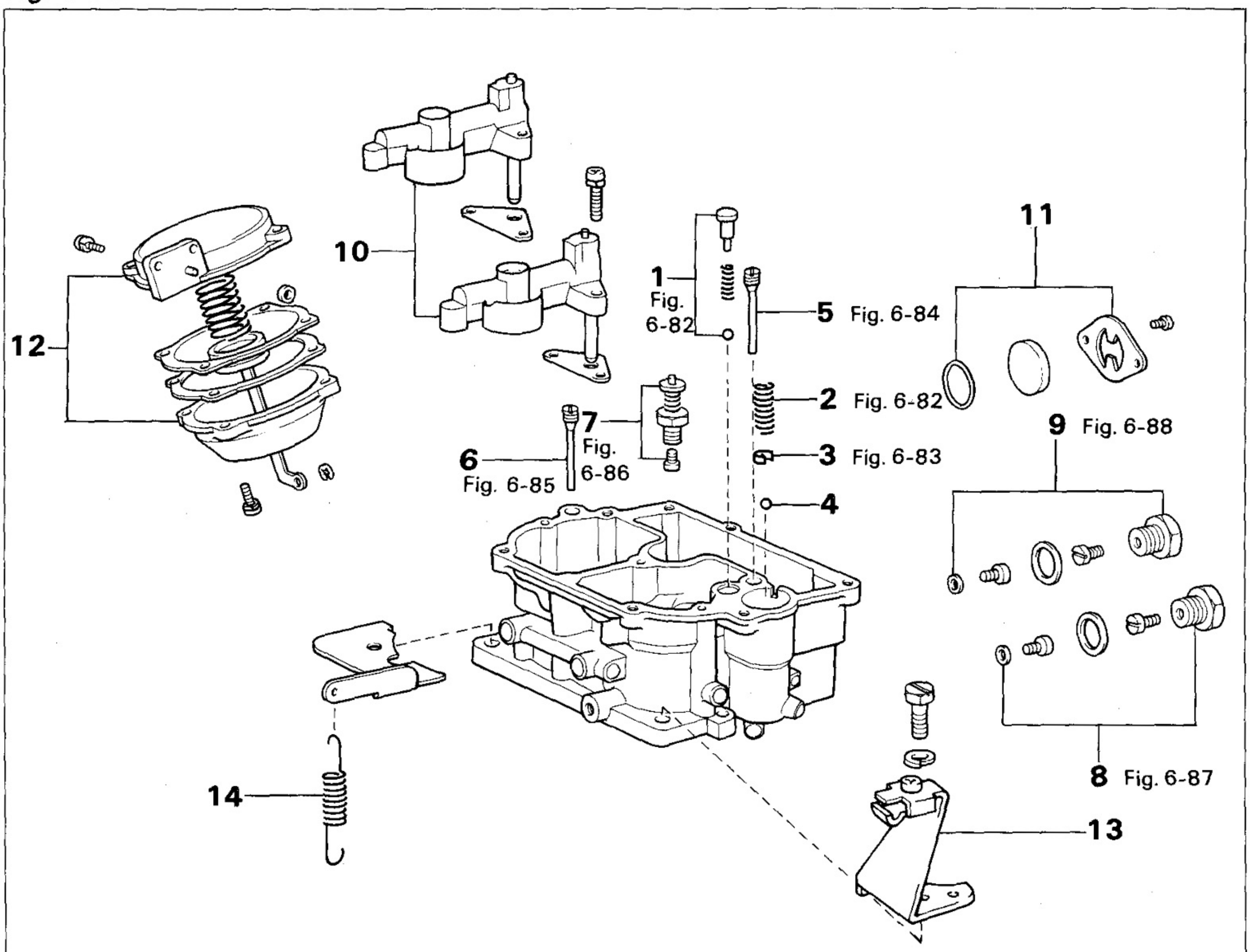


Unhook the choke valve relief spring and pull out the choke shaft.

Body

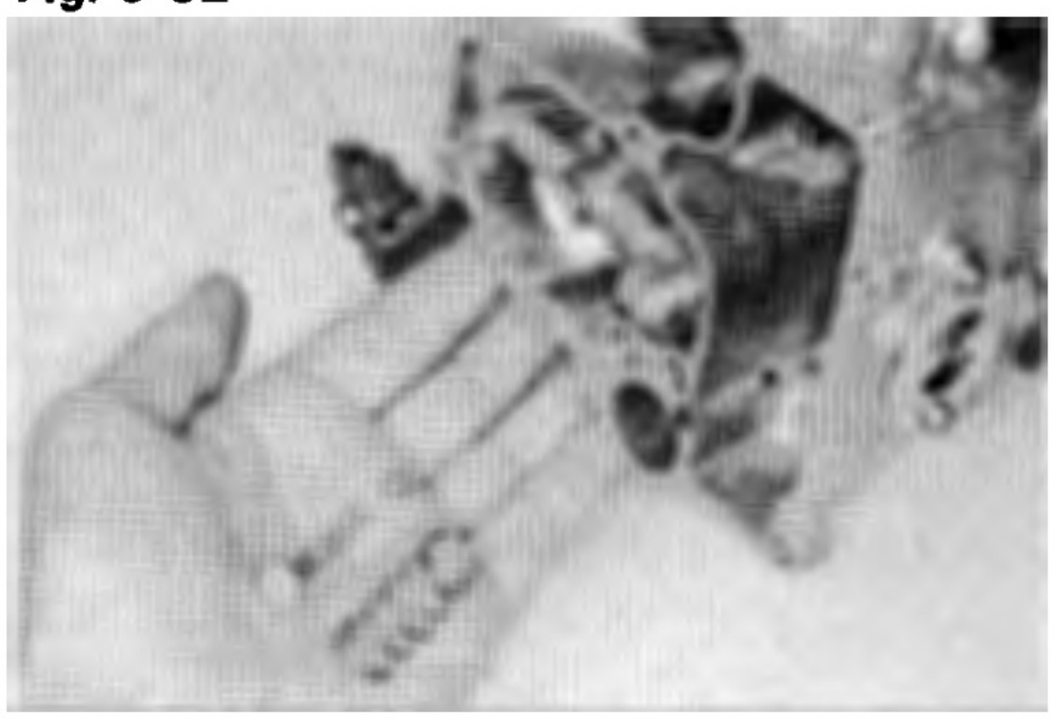
Disassemble the parts in the numerical order shown in the figure.

Fig. 6-81



1. Steel Ball for Discharge Weight & Spring
2. Pump Damping Spring
3. Check Ball Retainer
4. Steel Ball for Pump Plunger
5. 1st Slow Jet
6. 2nd Slow Jet
7. Power Valve
8. 1st Main Jet
9. 2nd Main Jet
10. Small Venturi
11. Level Gage Glass
12. Diaphragm
13. Choke Wire Clamp
14. Back Spring for Throttle Shaft

Fig. 6-82



Drop out the steel ball for the discharge weight and springs.

– Note –
Be careful not to lose the steel ball.

Fig. 6-83



Remove the check ball retainer with a pair of tweezers and then remove the steel ball for the pump plunger.

– Note –
Be careful not to lose the steel ball.

Fig. 6-84



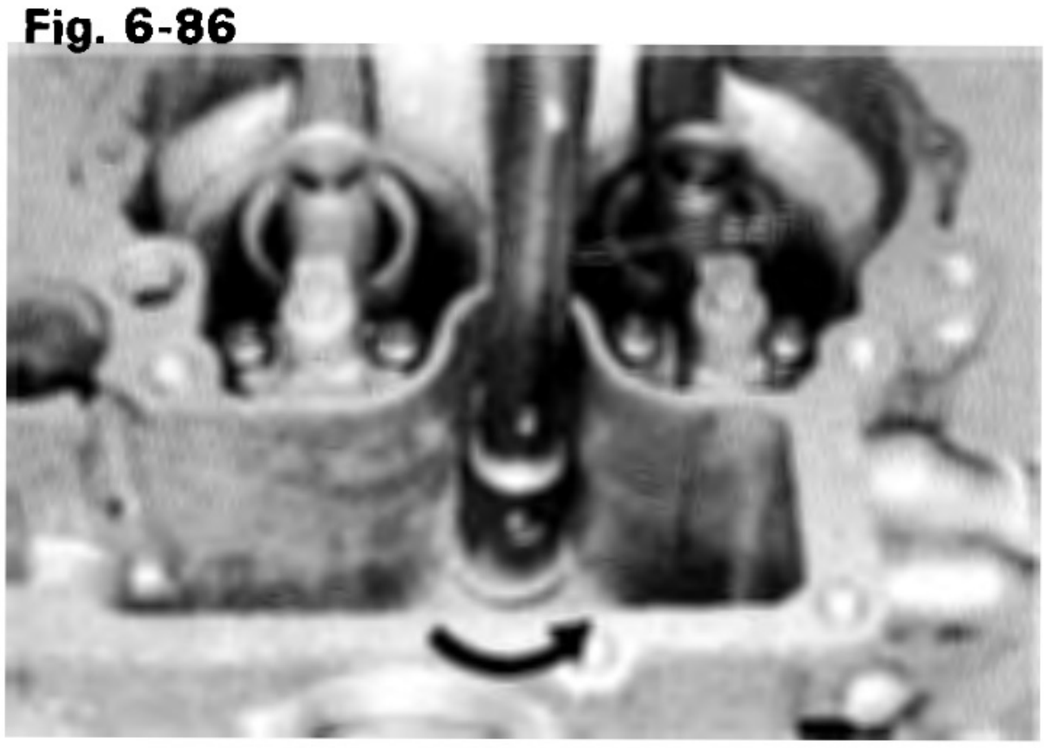
Remove the 1st slow jet with SST.
SST [09860-11011]

Fig. 6-85



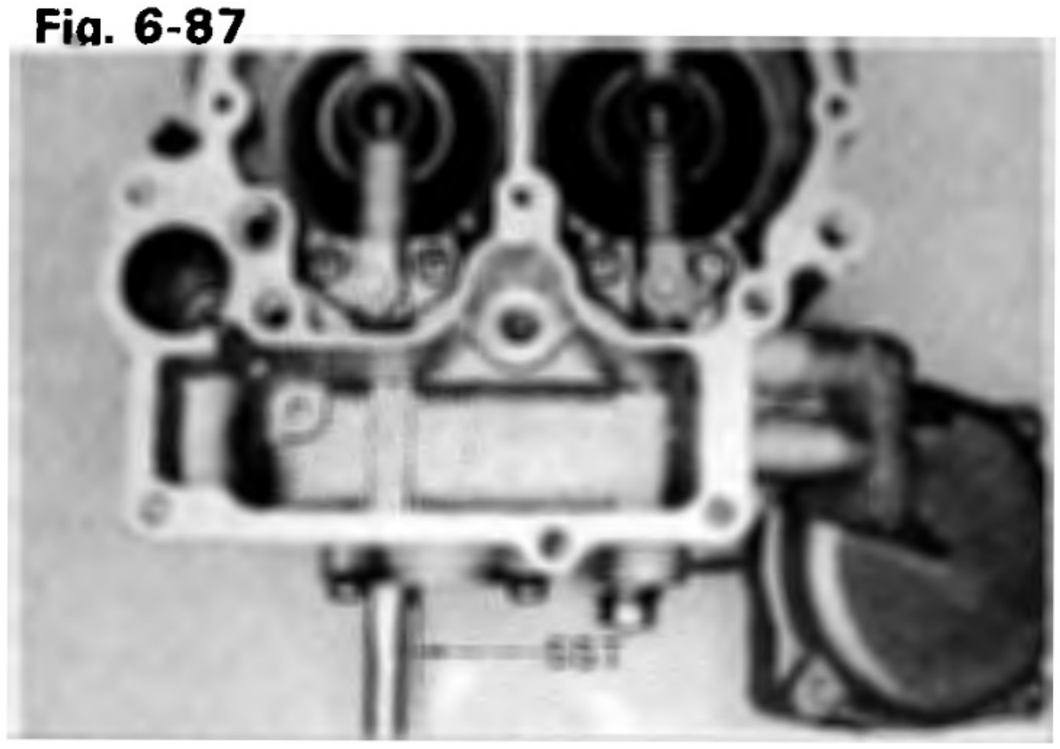
Remove the 2nd slow jet with SST.
SST [09860-11011]

Fig. 6-86



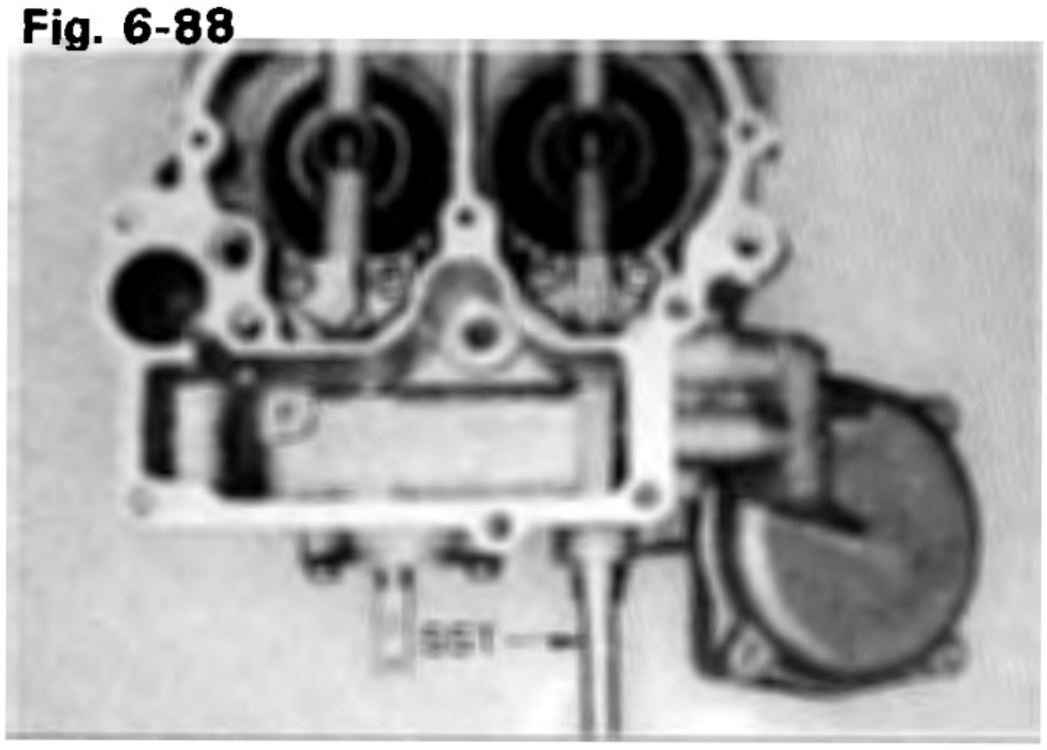
Remove the power valve with SST.
SST [09860-11011]

Fig. 6-87



Remove the 1st main jet with SST.
SST [09860-11011]

Fig. 6-88

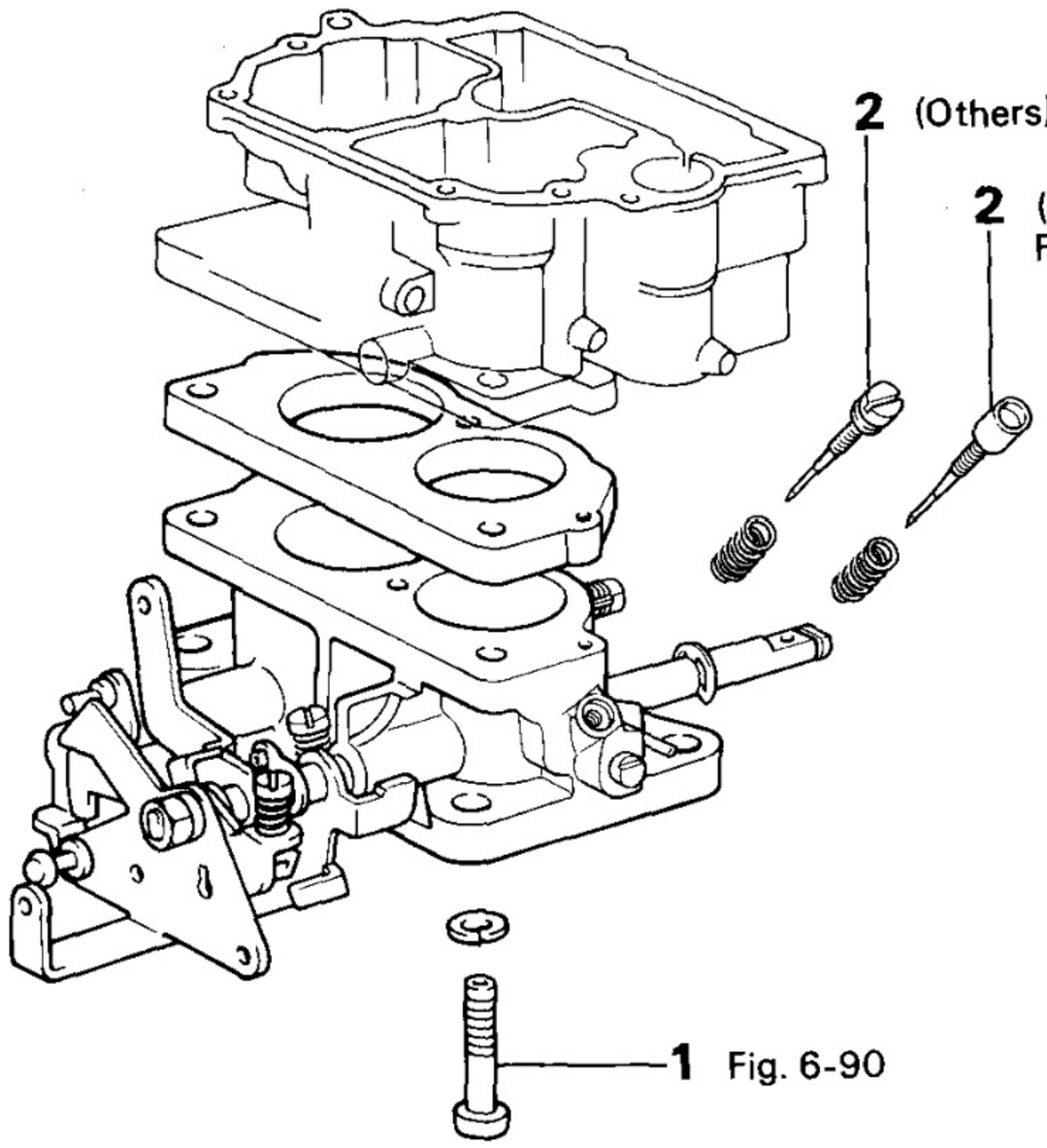


Remove the 2nd main jet with SST.
SST [09860-11011]

Flange

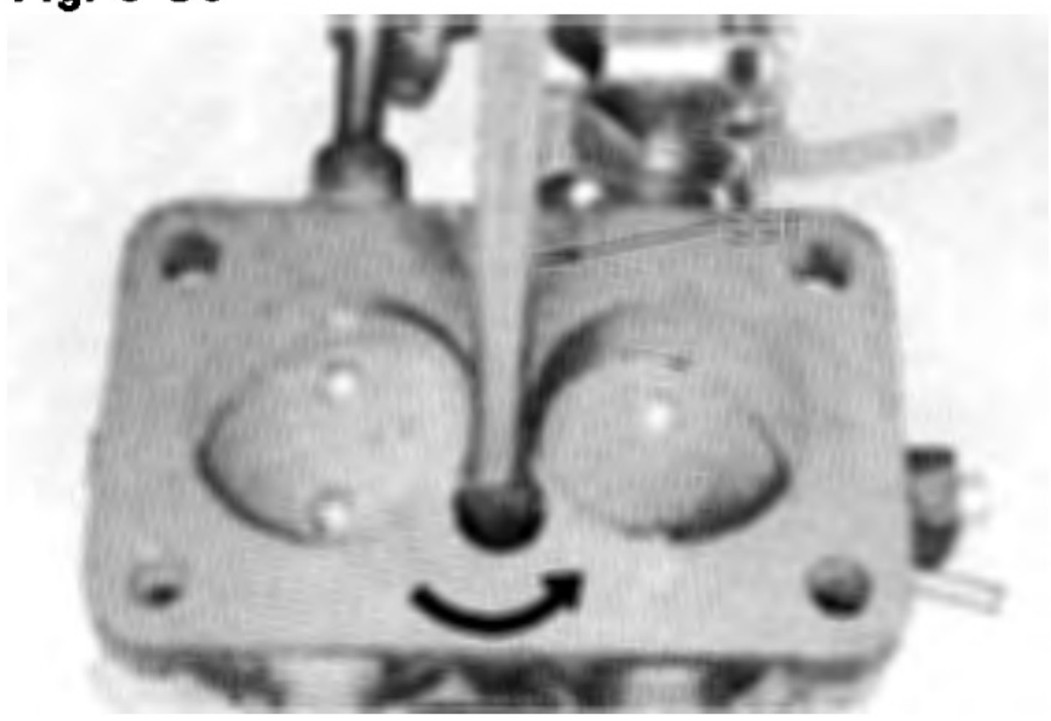
Disassemble the parts in the numerical order shown in the figure.

Fig. 6-89



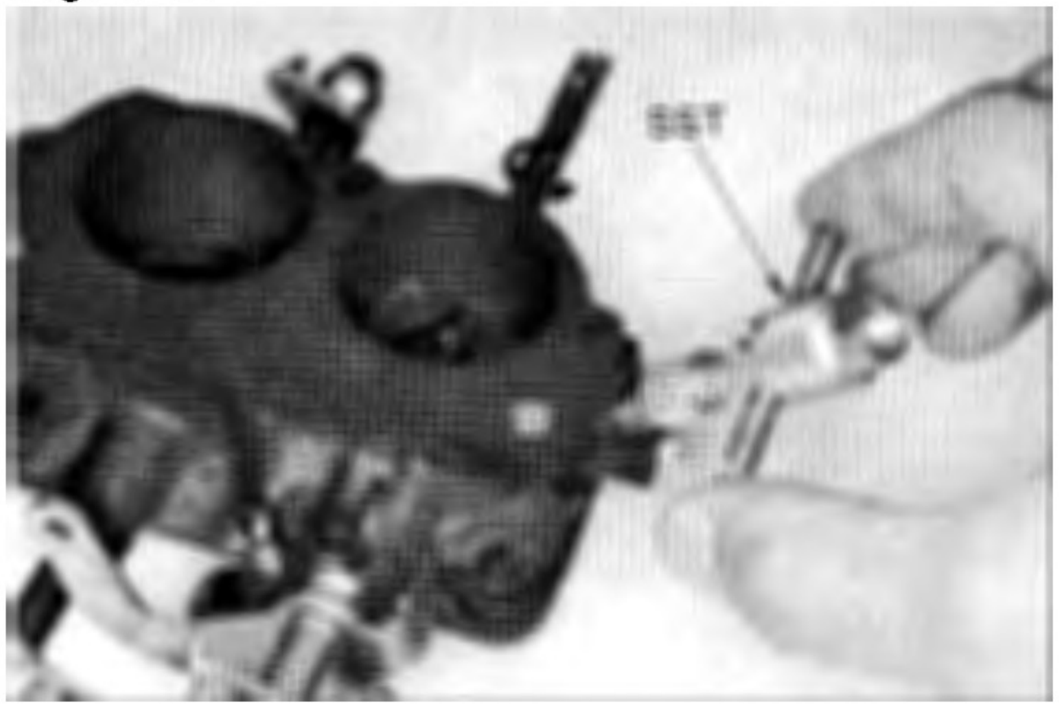
1. Vacuum Passage Bolt
2. Idle Mixture Adjusting Screw

Fig. 6-90



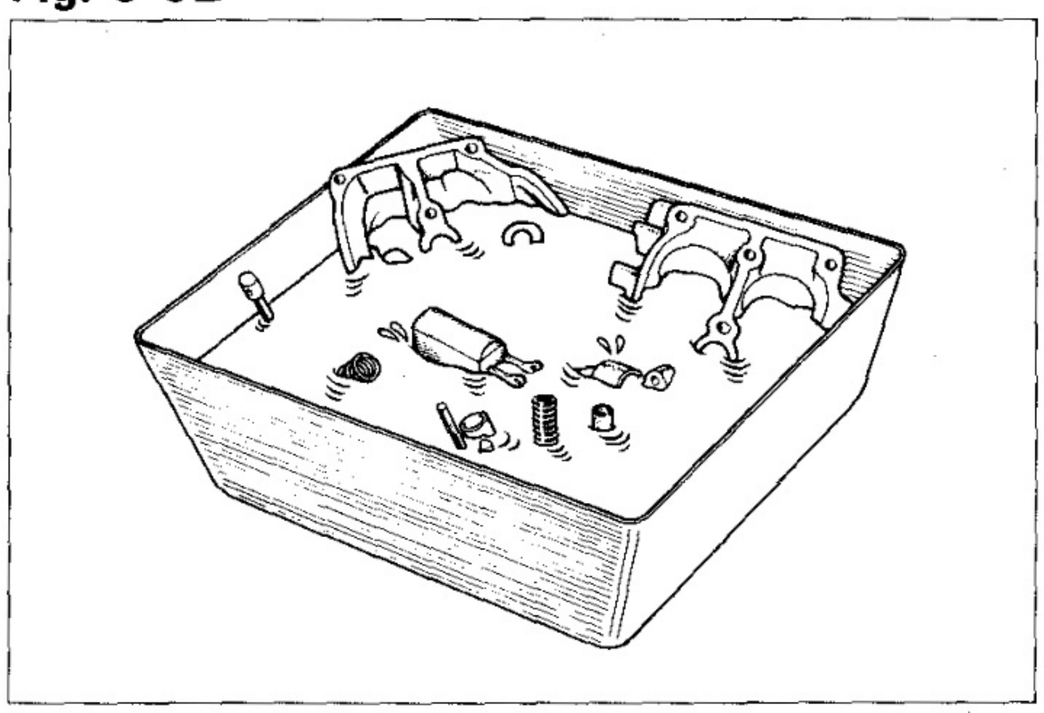
Remove the vacuum passage bolt with SST.
SST [09860-11011]

Fig. 6-91



Remove the idle mixture adjusting screw with SST (ECE) or a screwdriver (others).
SST [09243-00020]

Fig. 6-92

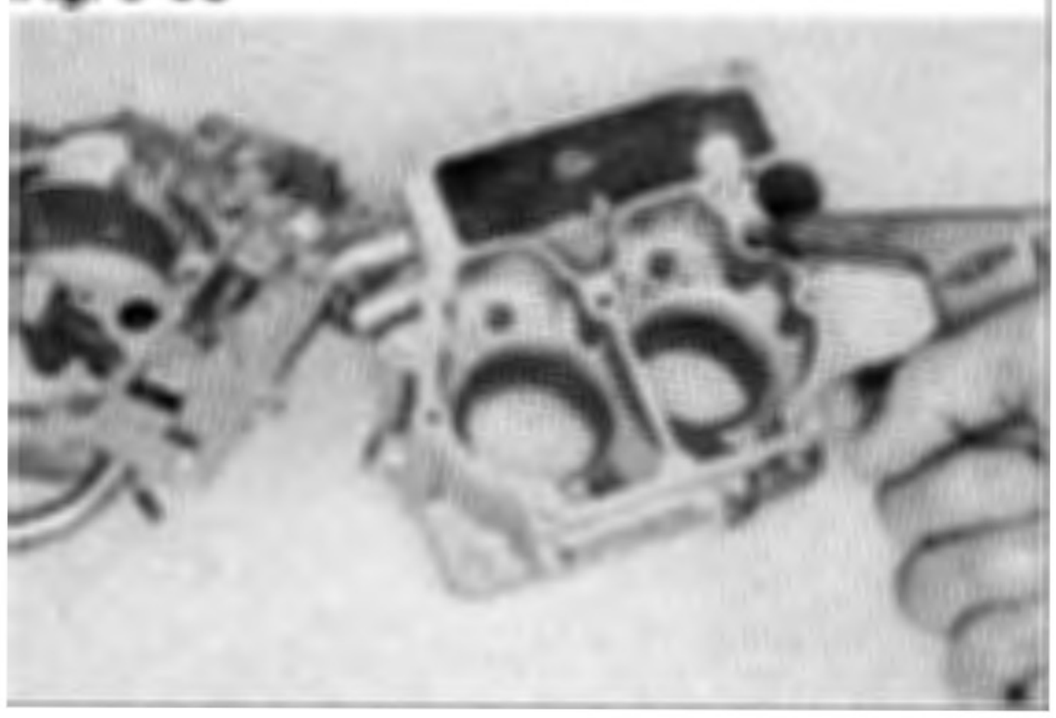


INSPECTION

– Precaution –

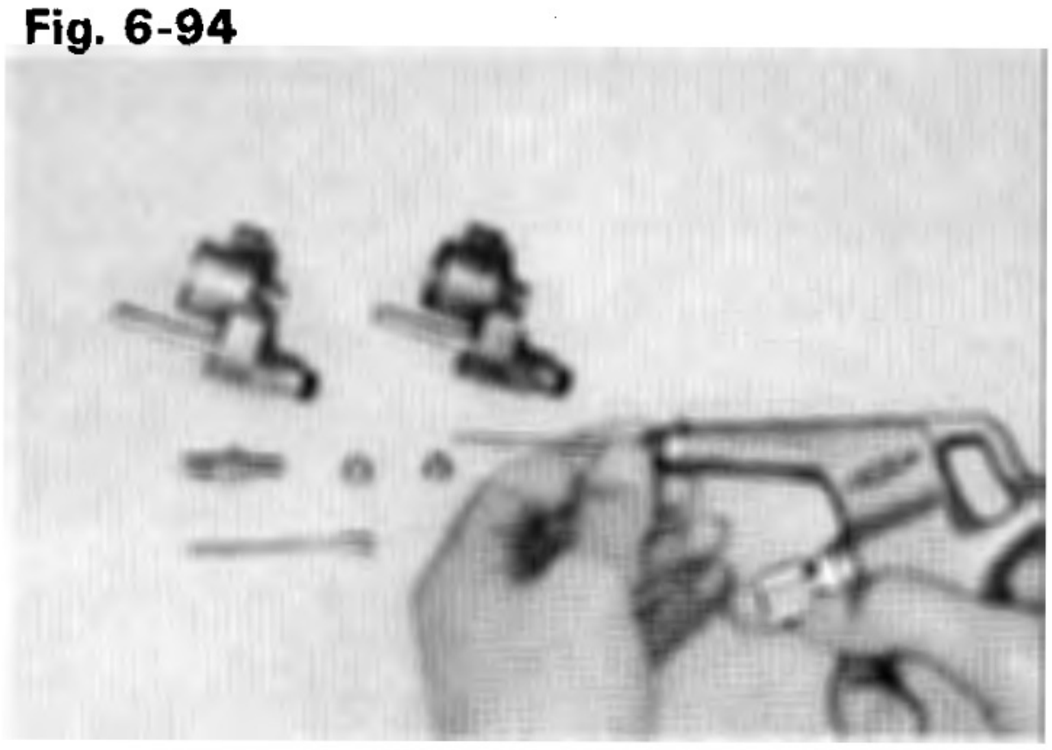
1. Before inspection, wash all parts thoroughly with gasoline.

Fig. 6-93

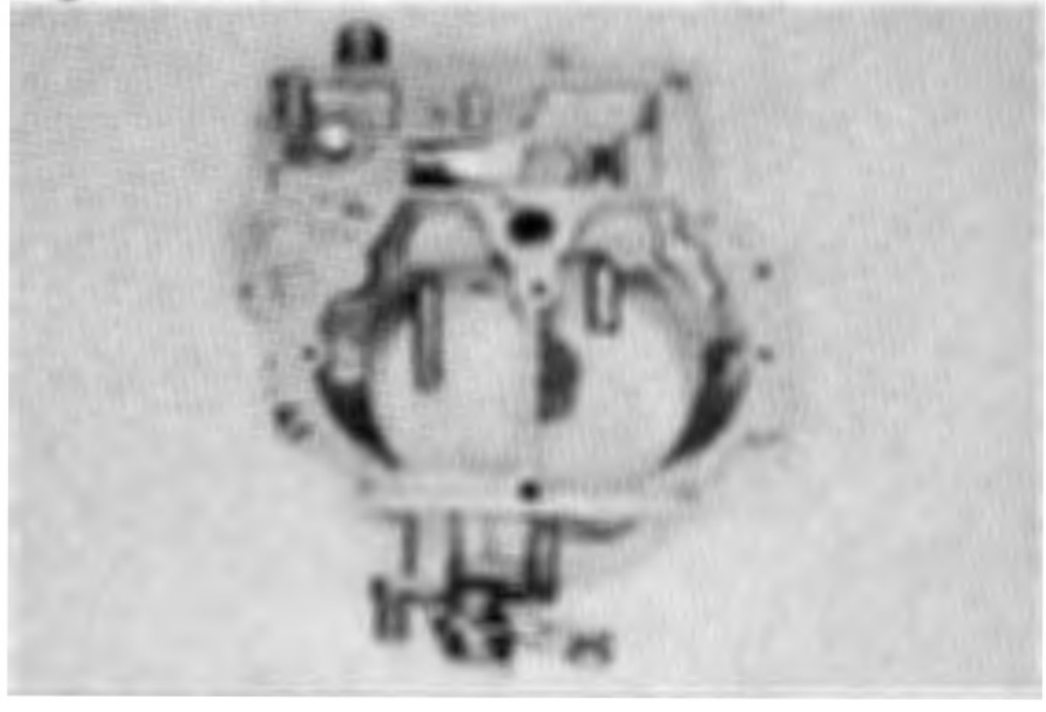


2. Using compressed air, blow all dirt and other foreign matter from the jets and similar parts, and from the fuel passages and apertures in the body.

Fig. 6-94



3. Never clean the jets or orifices with wire or a drill. This could enlarge the openings and result in excessive fuel consumption.

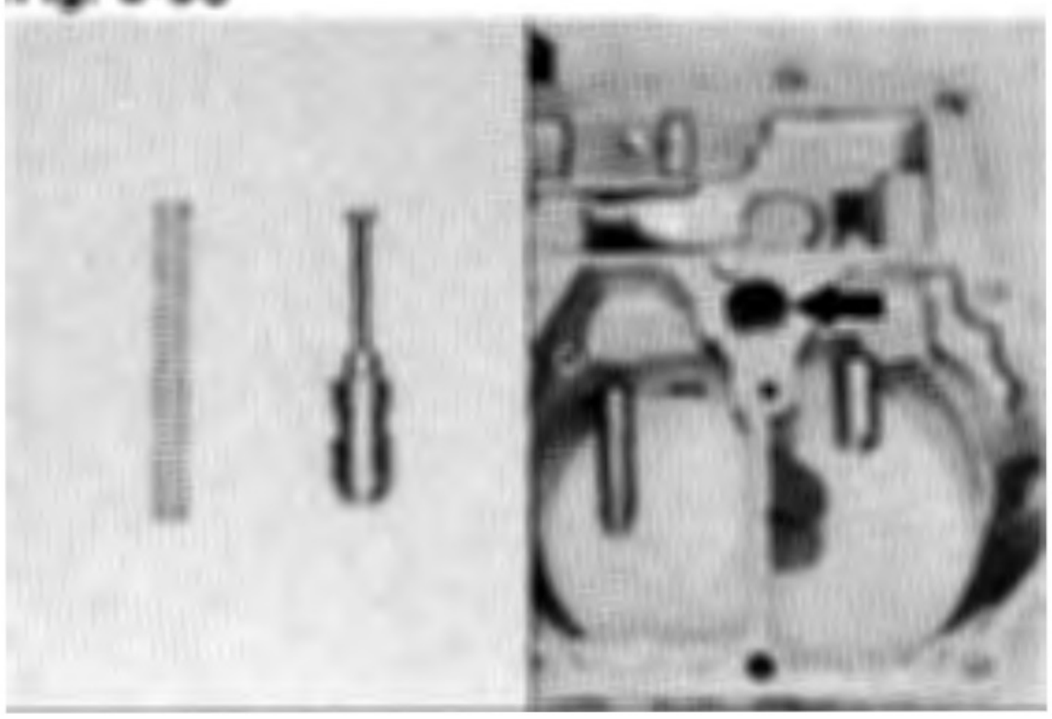


Inspect the following parts and replace any part damaged.

Air Horn Parts

1. Air horn: Check for cracks, damaged threads and wear on choke shaft bores.

Fig. 6-96



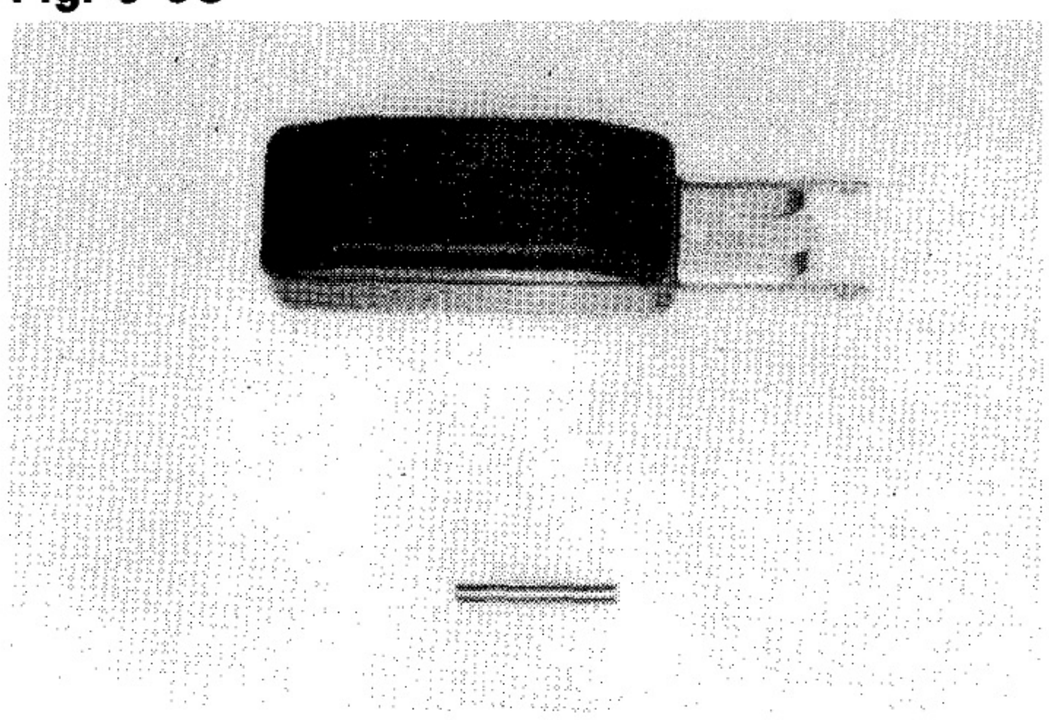
2. Power piston: Check for damage.
Spring: Check for deformation or rust.
Power piston bore: Check for wear or damage.

Fig. 6-97



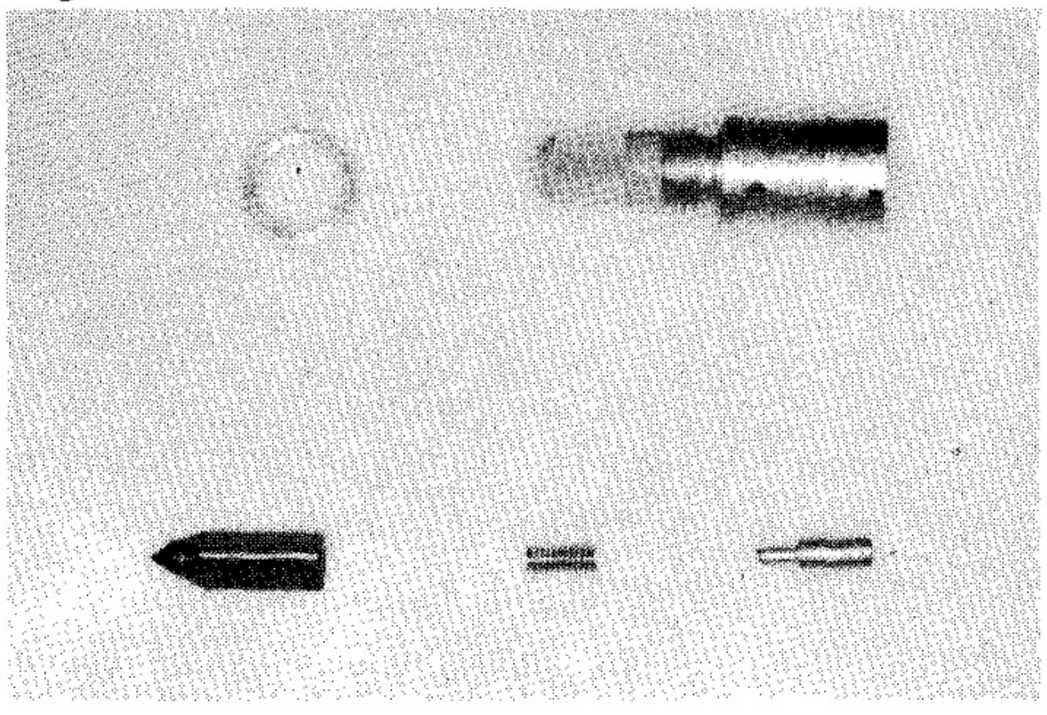
3. Make sure that the power piston moves smoothly in the air horn bore.

Fig. 6-98



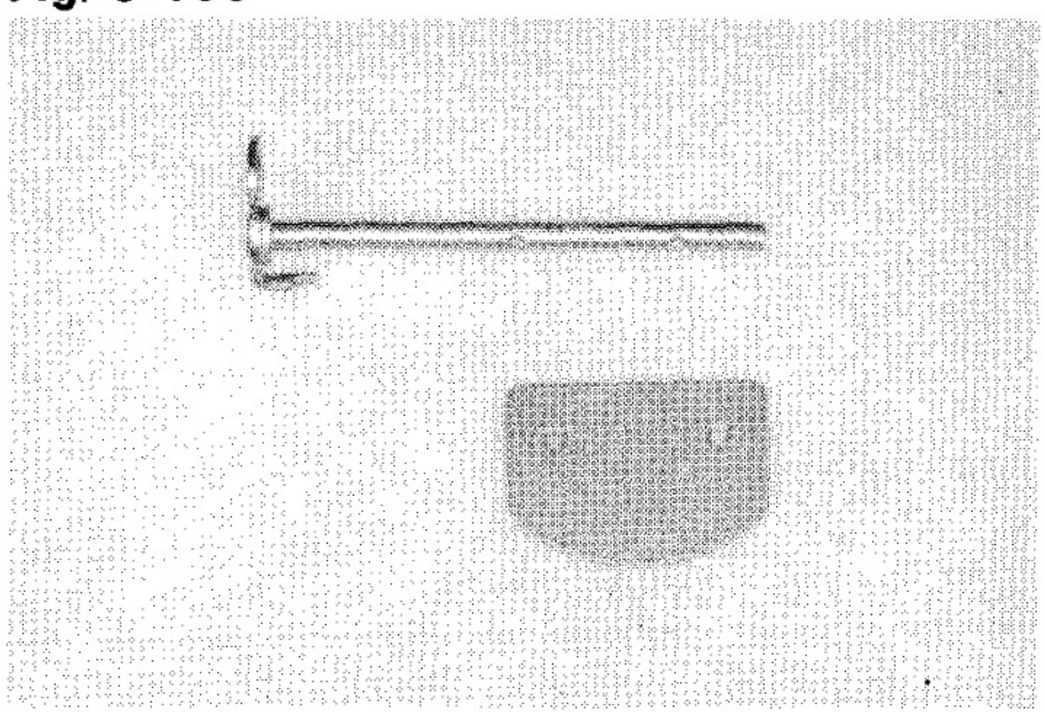
4. Float and float lever pin: Check for wear or breaks.

Fig. 6-99



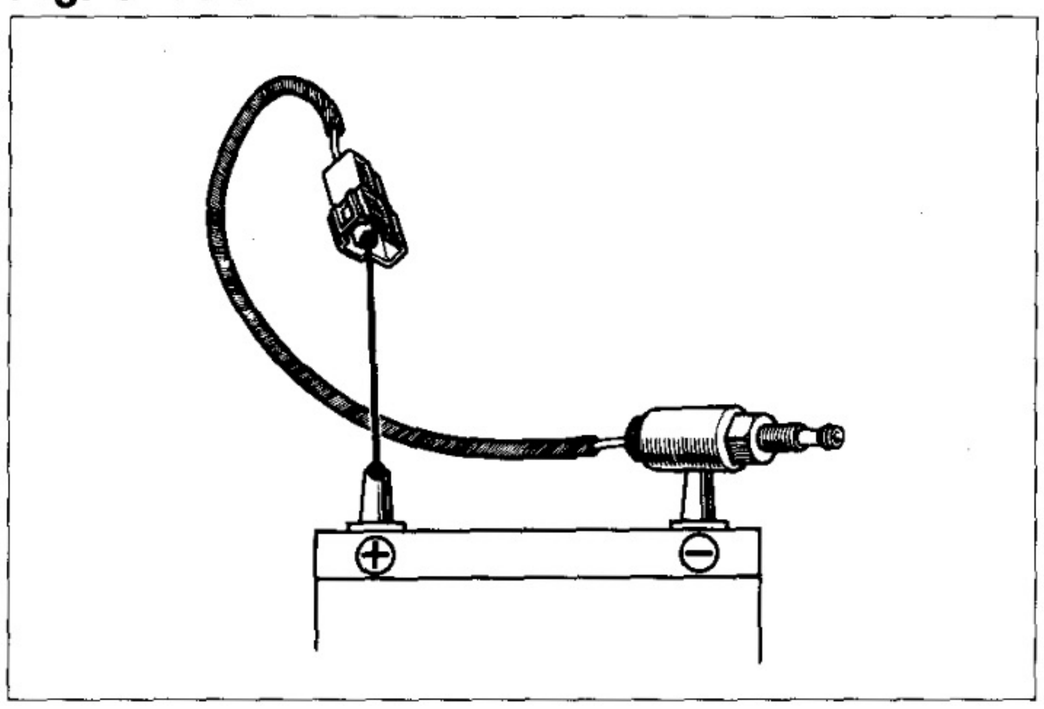
5. Strainer: Check for rust or breaks.
6. Needle valve surface.
7. Needle valve seat.

Fig. 6-100



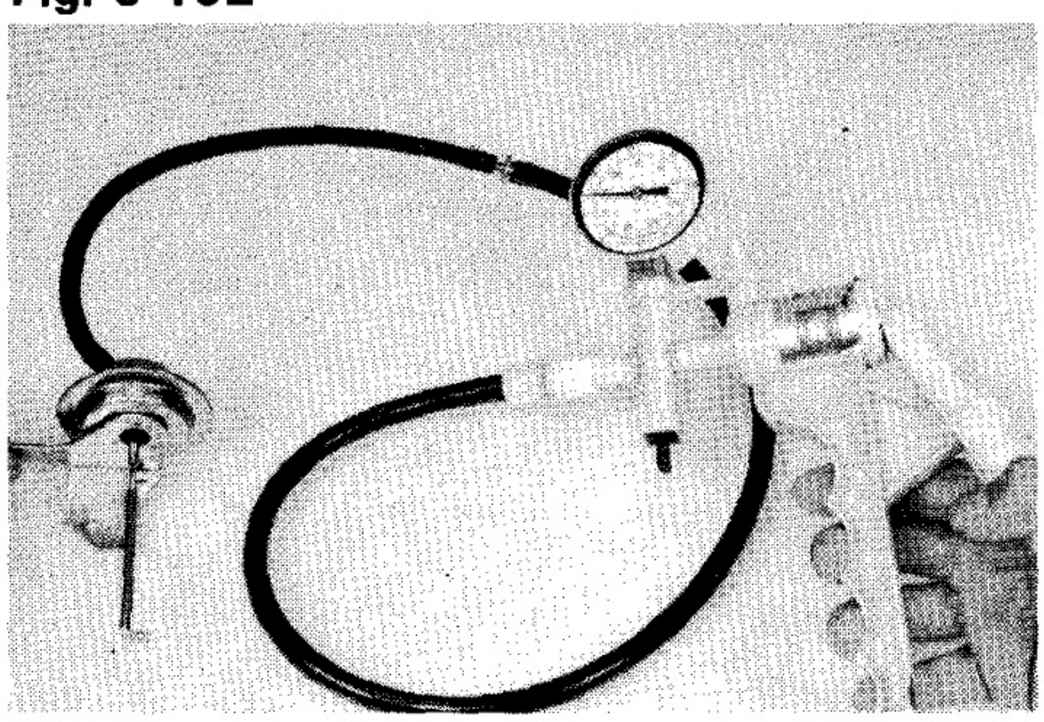
8. Choke valve: Check for deformation.
Choke shaft: Check for wear, bending or improper fit in housing.

Fig. 6-101



9. Solenoid valve: Connect the wiring to the battery positive terminal and ground the body. Make sure that the needle valve is pulled in.

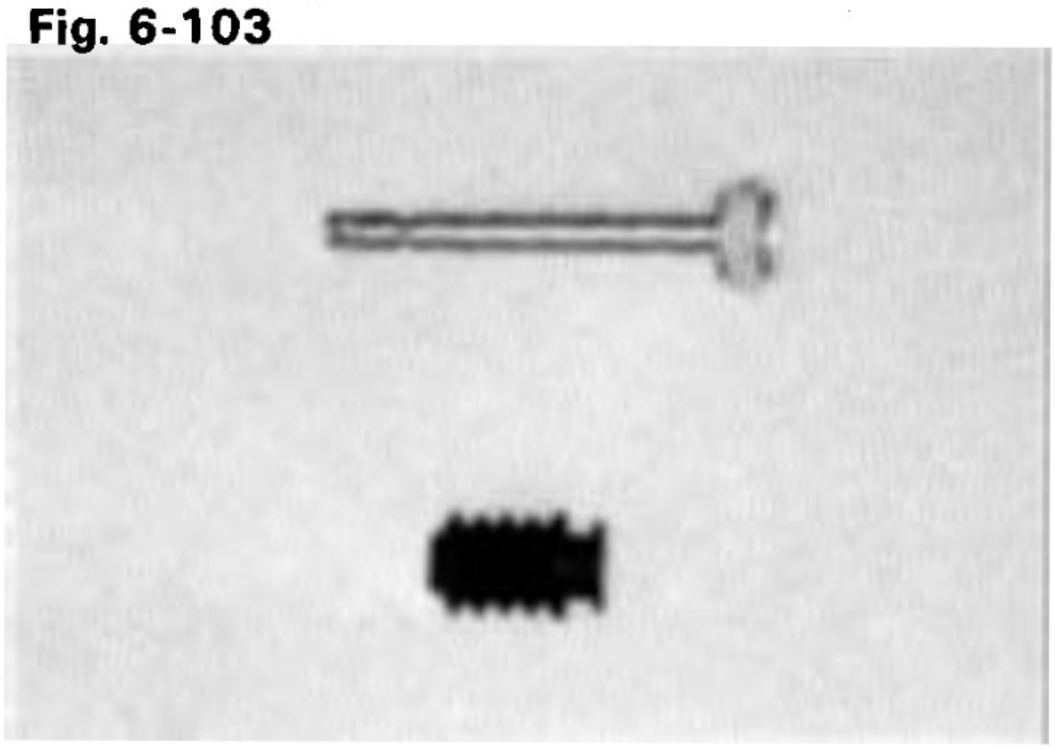
Fig. 6-102



10. Choke breaker (Throttle positioner diaphragm) (Australia & ECE FJ series):
Apply vacuum to the diaphragm.
Check that vacuum does not drop immediately and the link moves when vacuum is applied.

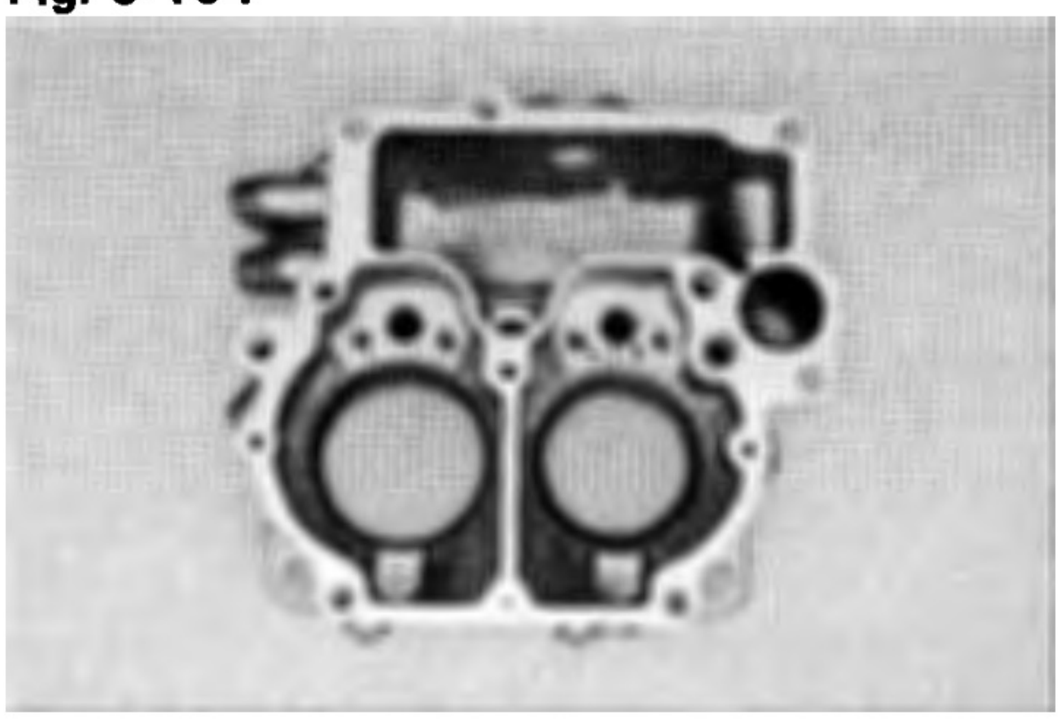
— Note —
The throttle positioner diaphragm is used in common with the choke breaker system.

Fig. 6-103



11. Pump plunger: Check for wear on sliding surface and for damaged or deformed leather.
Boot: Check for damage.

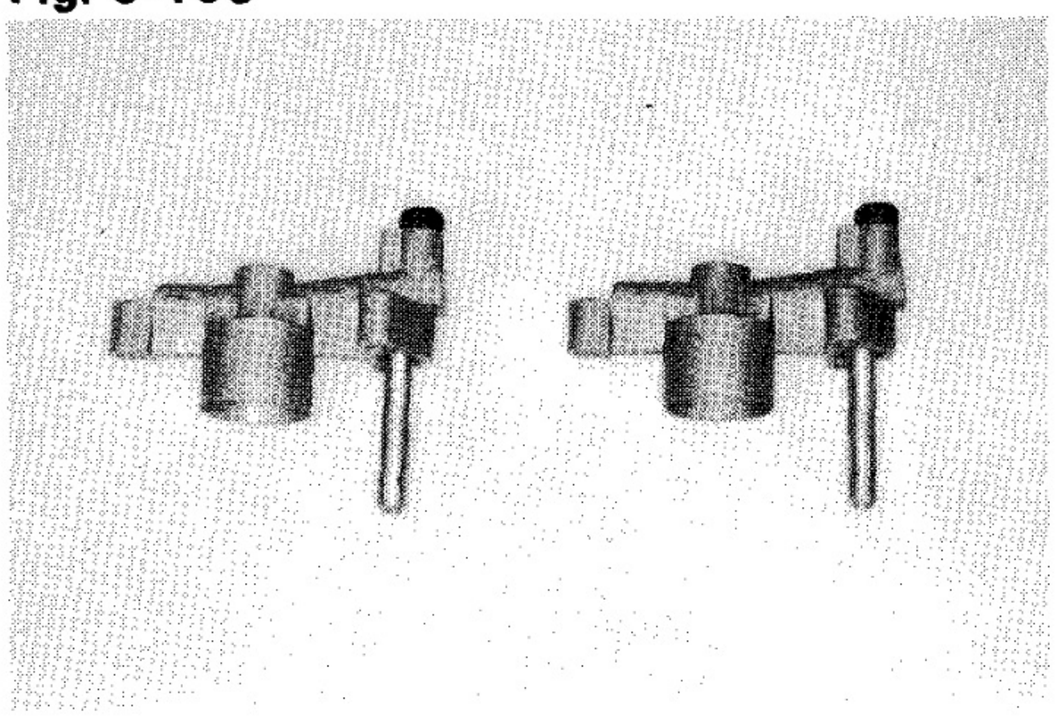
Fig. 6-104



Body Parts

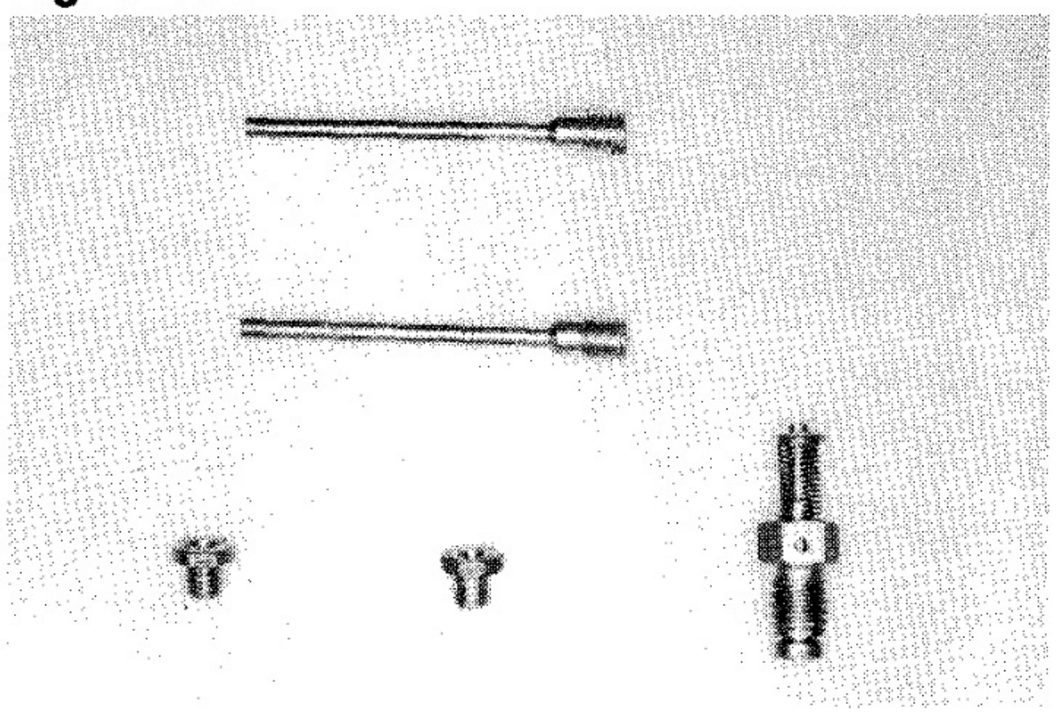
1. Body: Check for cracks, scored mounting surfaces and damaged threads.

Fig. 6-105



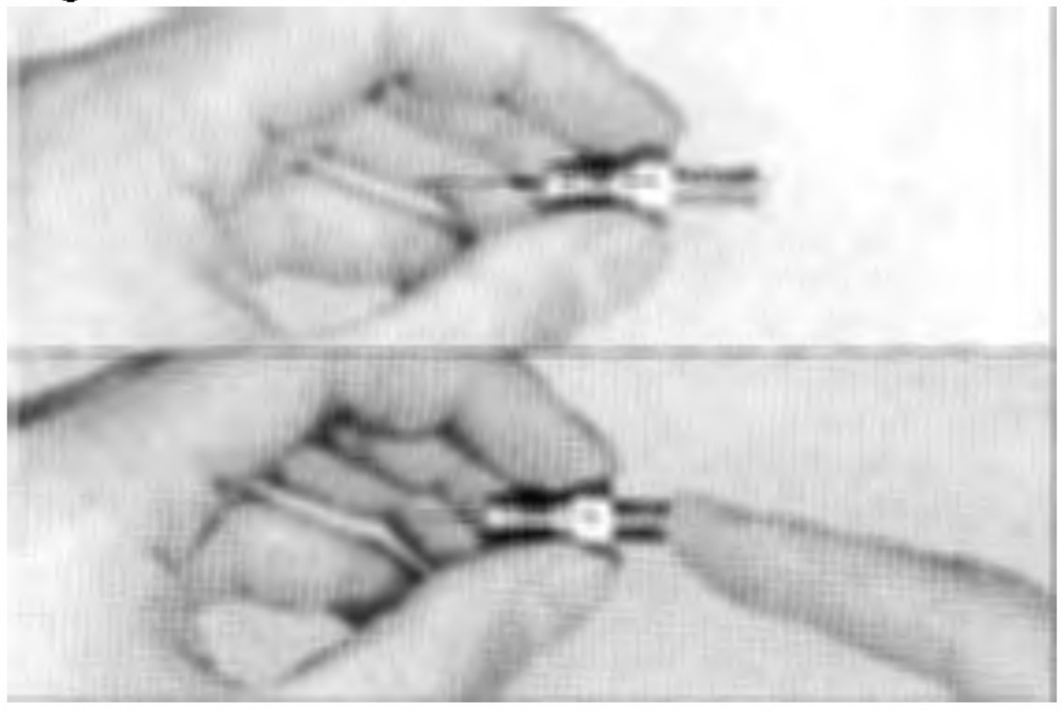
2. Small venturis: Check for damage or clogging.

Fig. 6-106



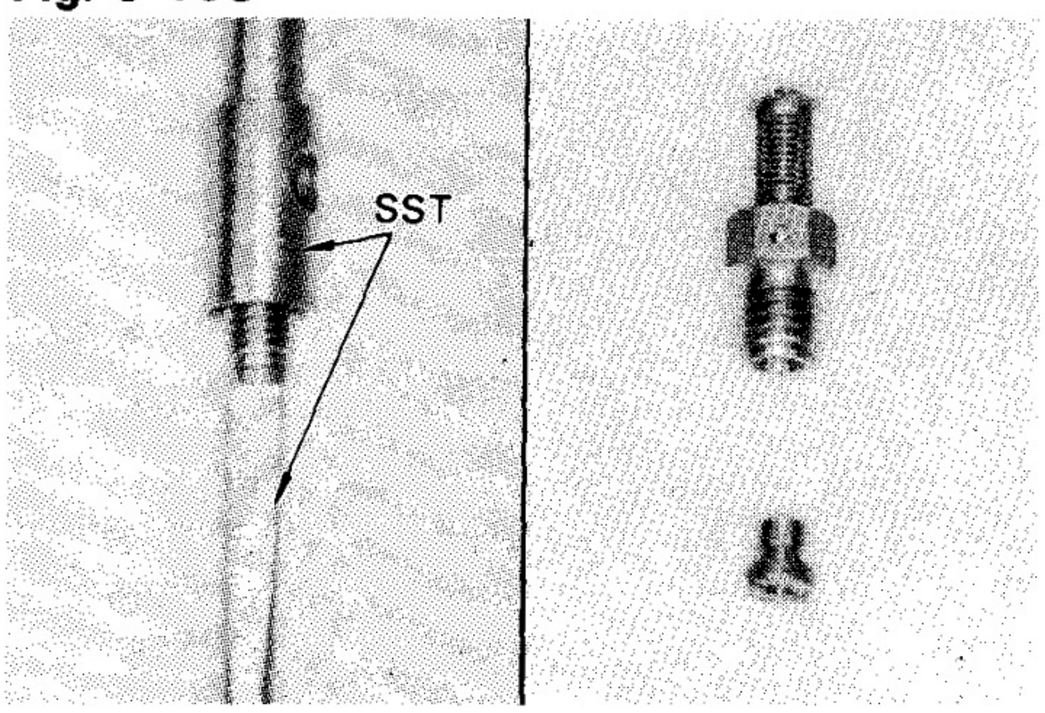
3. Jets: Check for damage or clogging. Check for damaged contact surface, threads and screwdriver slots.

Fig. 6-107



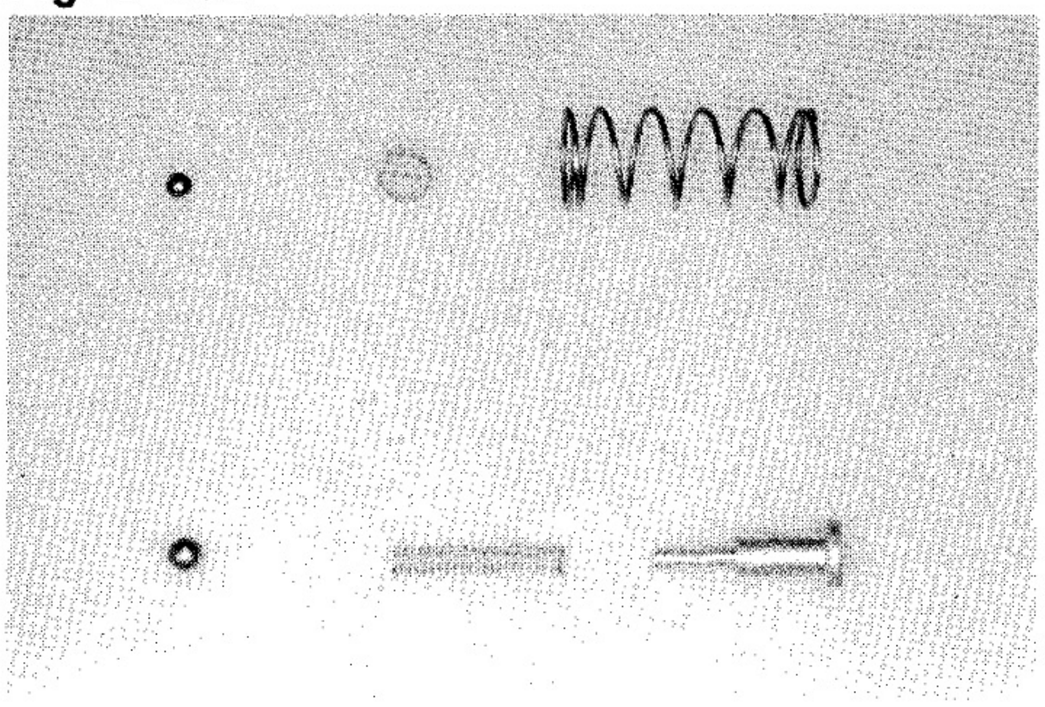
4. Power valve: Check for faulty opening and closing action.
Check for damaged contact surfaces and threads.

Fig. 6-108



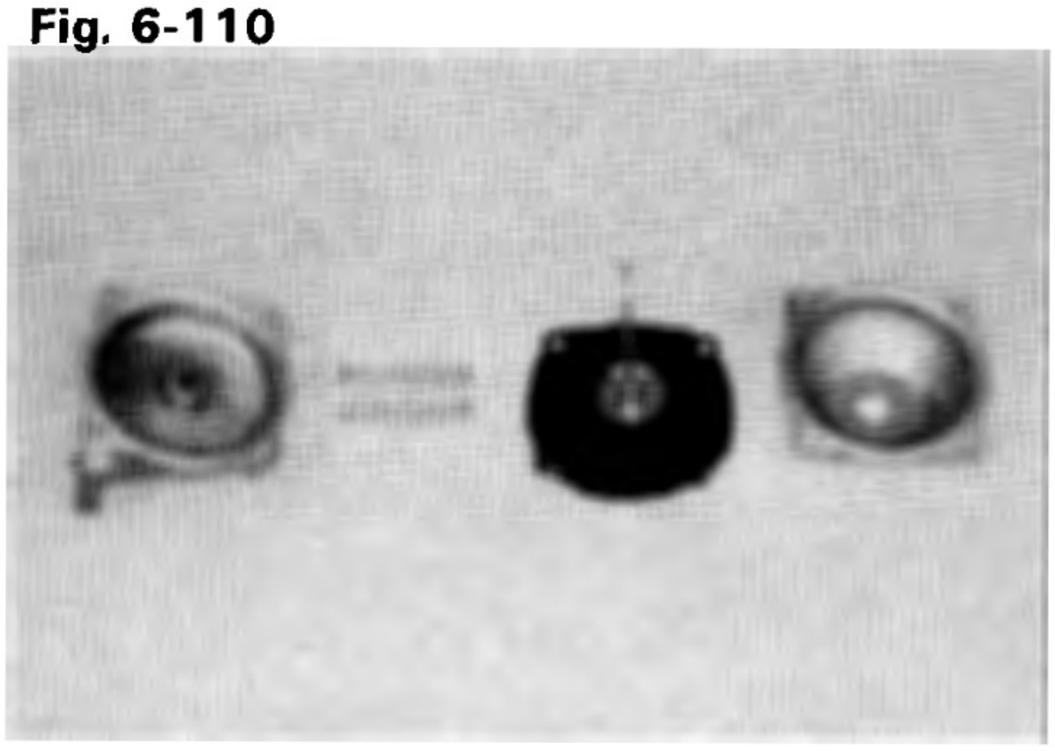
5. Remove the jet with SST.
SST [09860-11011]

Fig. 6-109



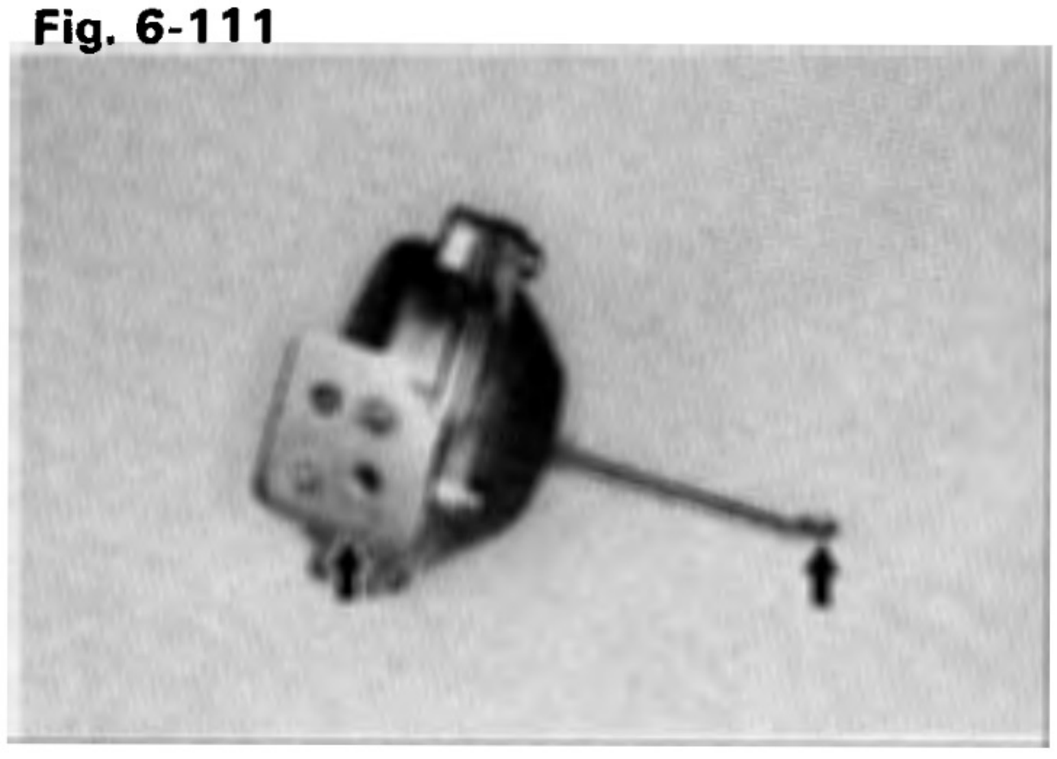
6. Pump damping spring: Check for deformation or rust.
Steel ball: Check for damage or rust.

Fig. 6-110



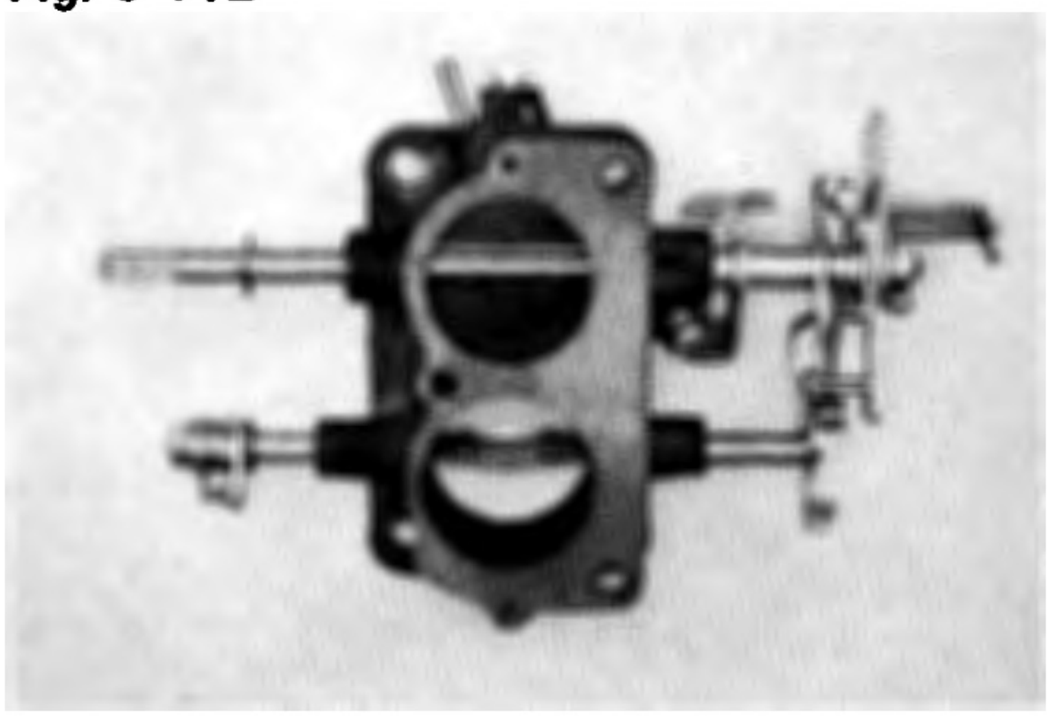
7. Diaphragm: Check the diaphragm, housing and spring for wear or damage.

Fig. 6-111



8. Assemble the diaphragm as shown in the figure.

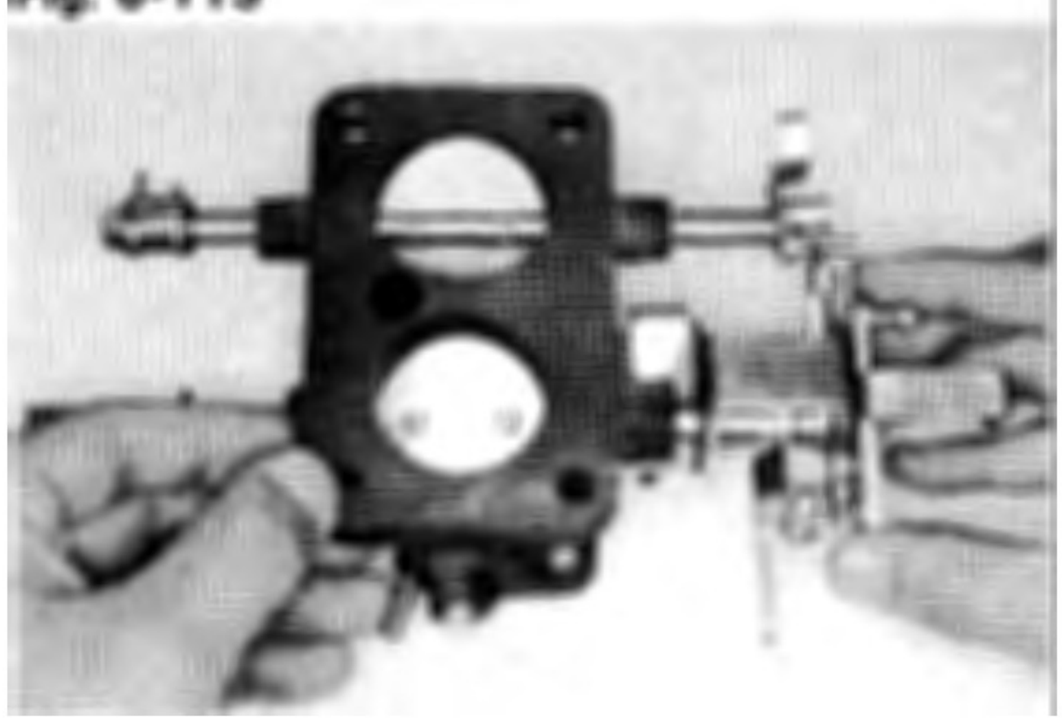
Fig. 6-112



Flange Parts

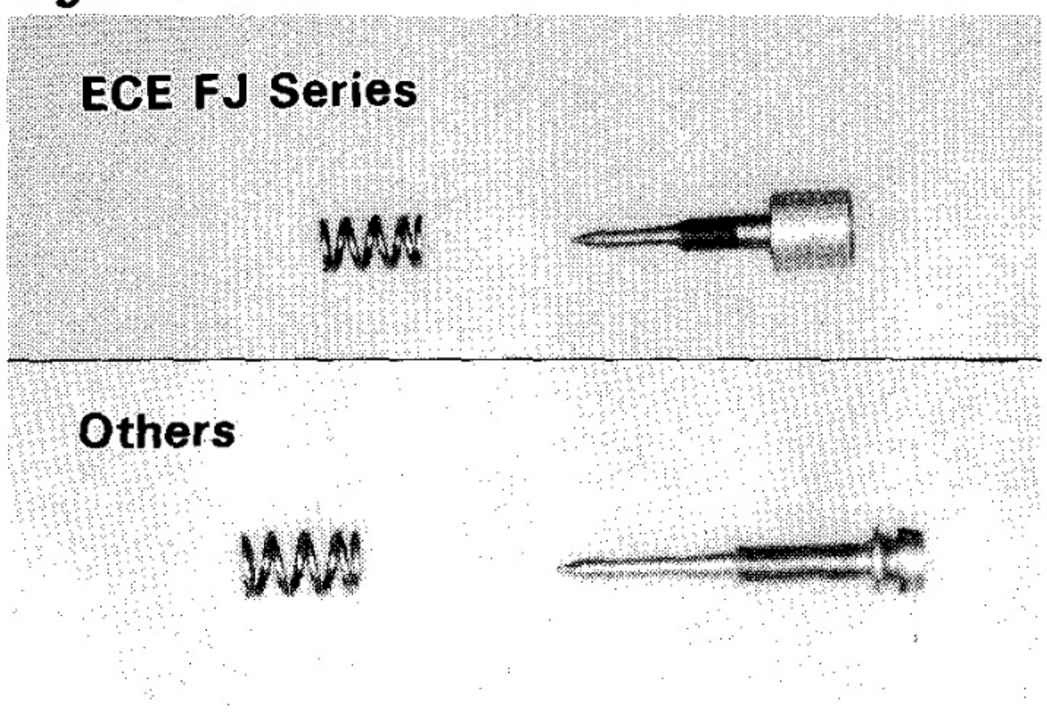
1. Flange: Check for cracks, damaged mounting surfaces, threads and for wear on throttle shaft bearings.

Fig. 6-113



2. Throttle valves: Check for worn or deformed valves and for wear, bending, twisting or faulty movement inside the housing shaft.

Fig. 6-114



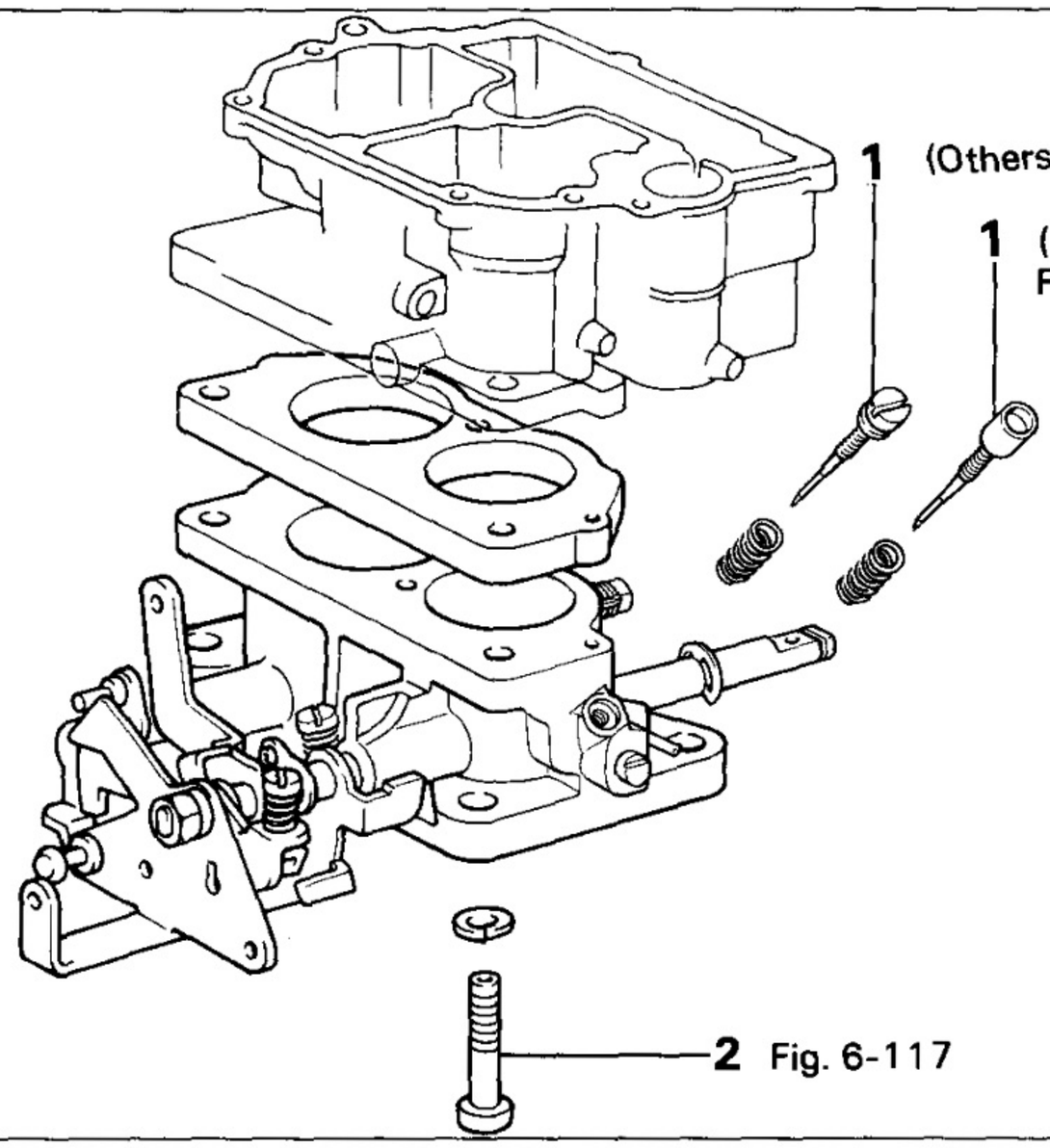
3. Idle mixture adjusting screw: Check for damaged tapered tip or threads.

ASSEMBLY

Flange

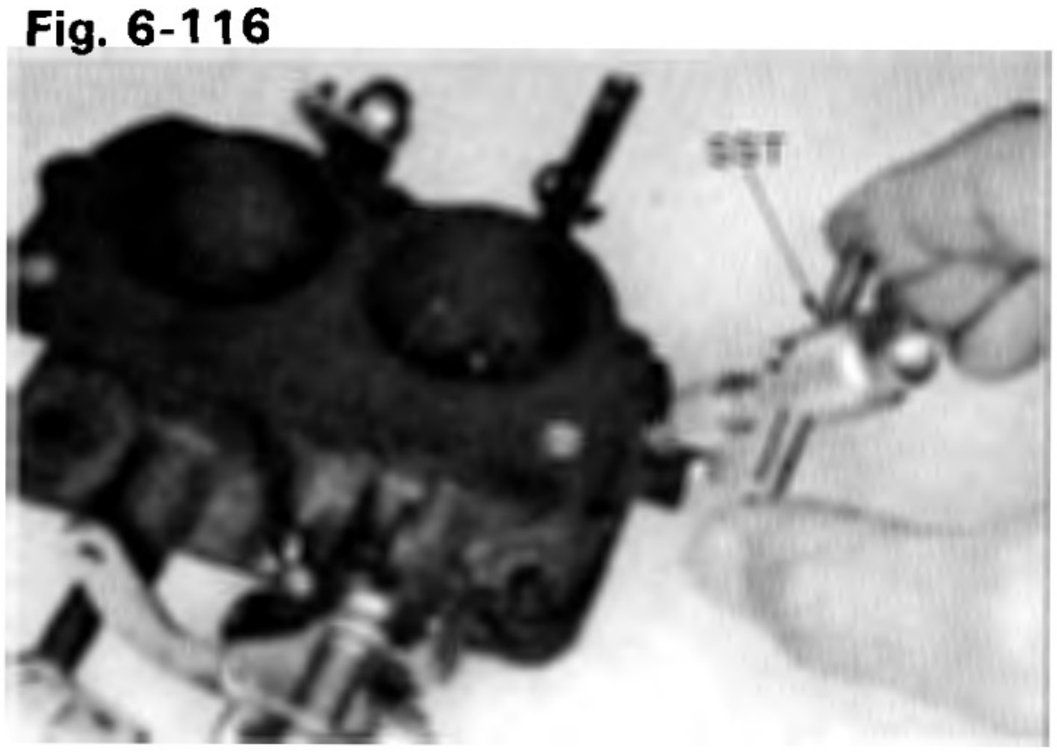
Assemble the parts in the numerical order shown in the figure.

Fig. 6-115



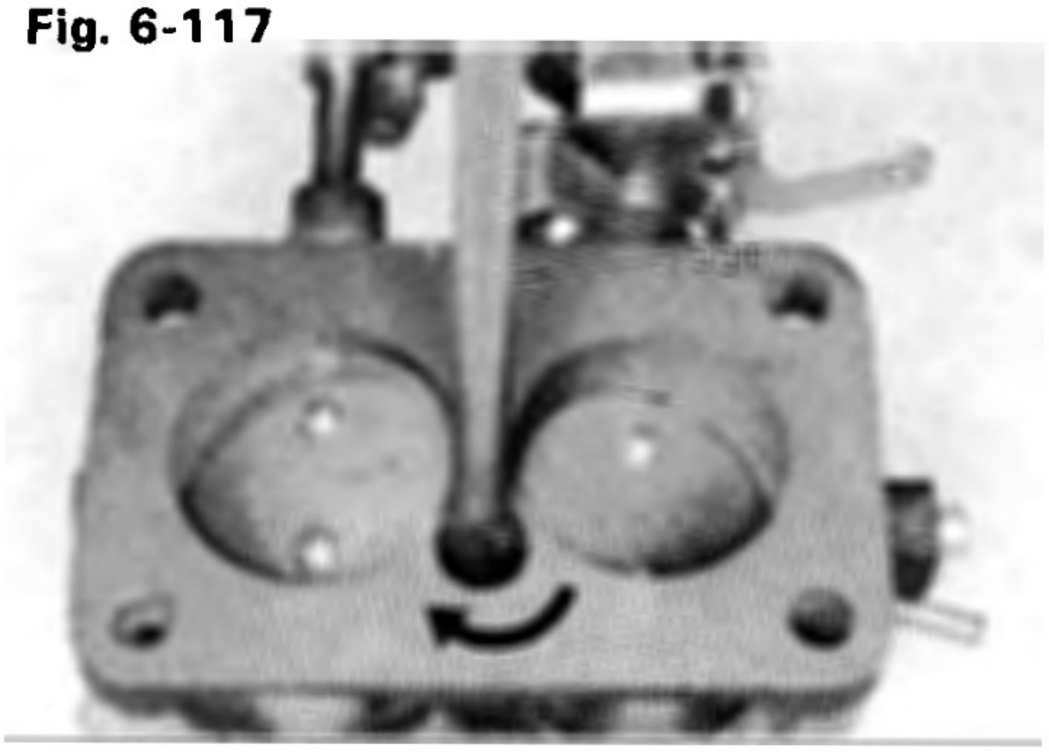
1. Idle Mixture Adjusting Screw
2. Vacuum Passage Bolt

Fig. 6-116



Install the idle mixture adjusting screw temporarily with SST (ECE) or a screwdriver (others).
SST [09243-00020]

Fig. 6-117



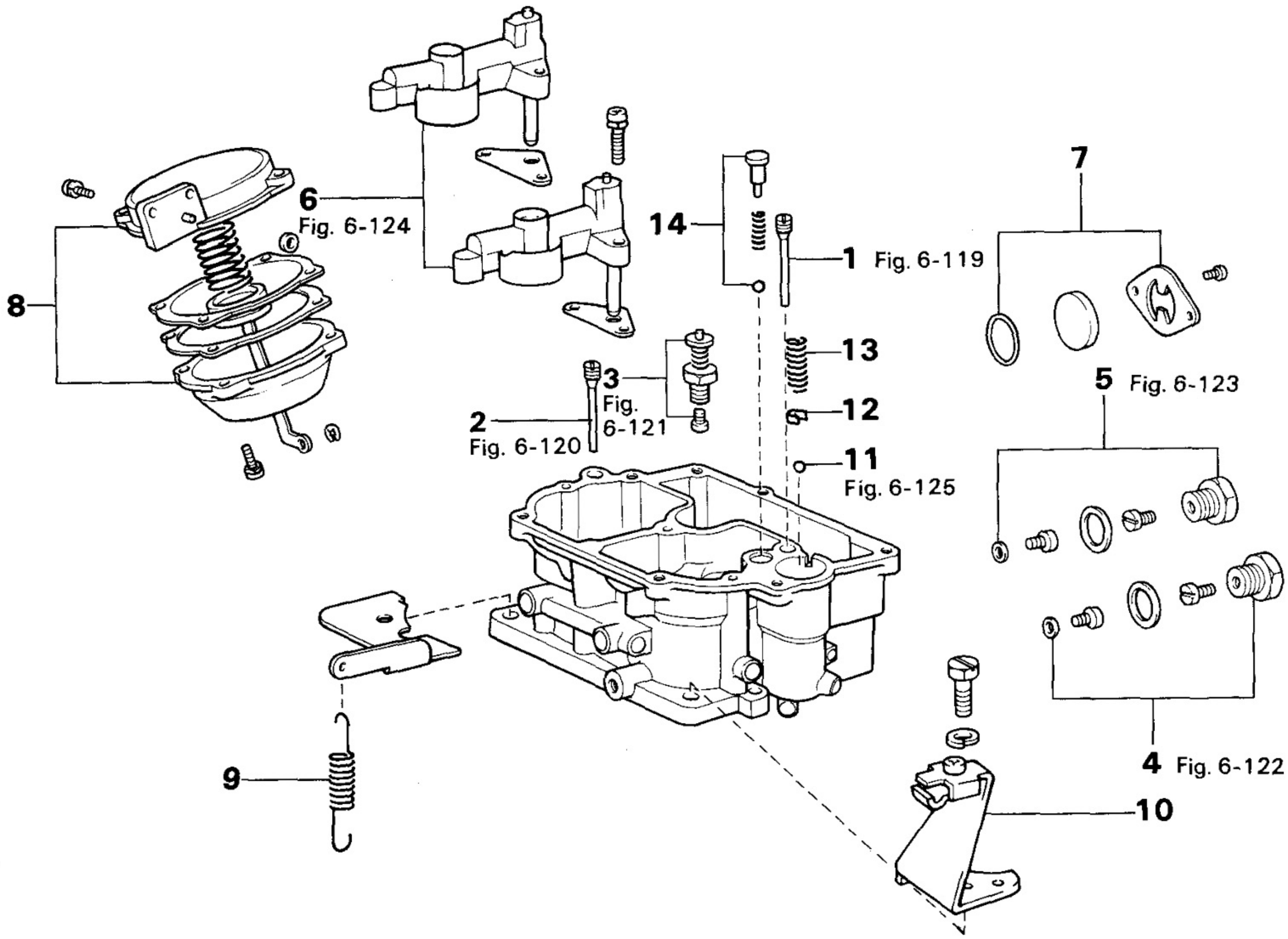
Tighten the vacuum passage bolt with SST.
SST [09860-11011]

— Note —
Use a new gasket.

Body

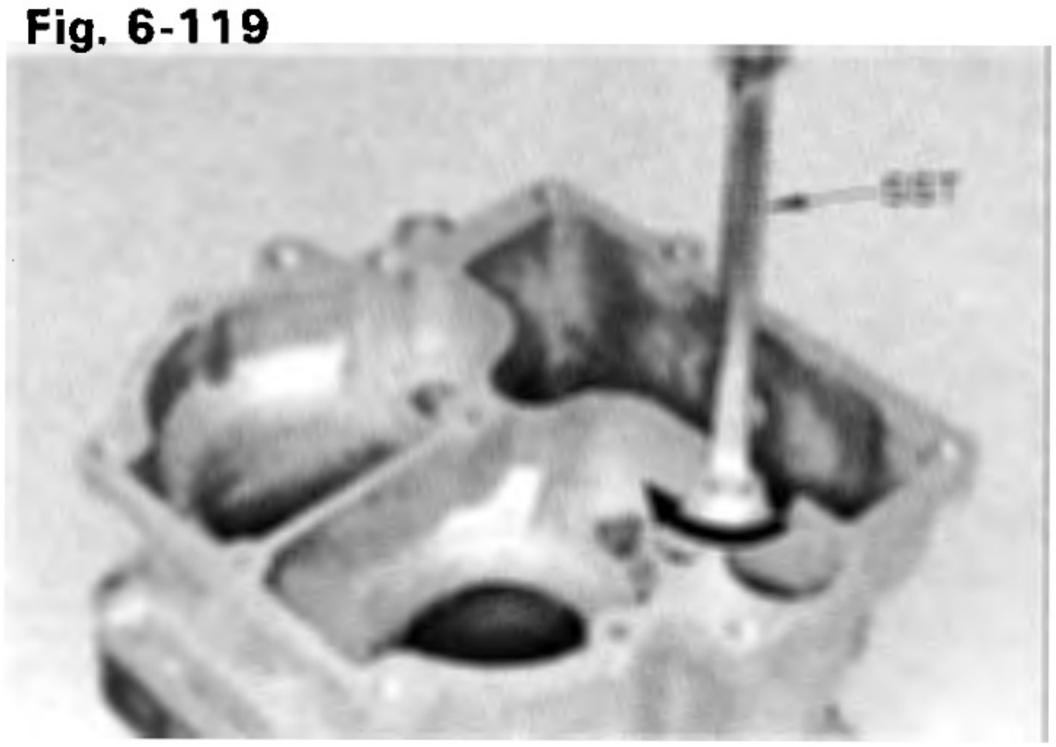
Assemble the parts in the numerical order shown in the figure.

Fig. 6-118



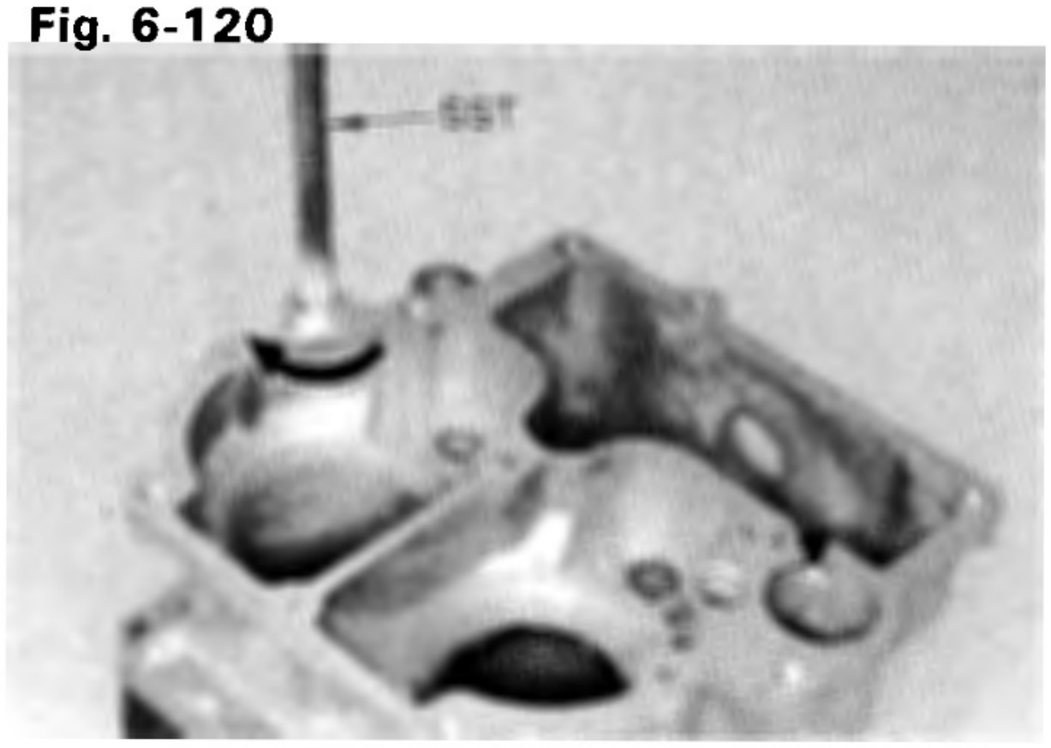
1. 1st Slow Jet
2. 2nd Slow Jet
3. Power Valve
4. 1st Main Jet
5. 2nd Main Jet
6. Venturi
7. Level Gage Glass
8. Diaphragm
9. Back Spring for Throttle Shaft
10. Choke Wire Clamp
11. Steel Ball for Pump Plunger
12. Check Ball Retainer
13. Pump Damping Spring
14. Steel Ball for Discharge Weight & Spring

Fig. 6-119



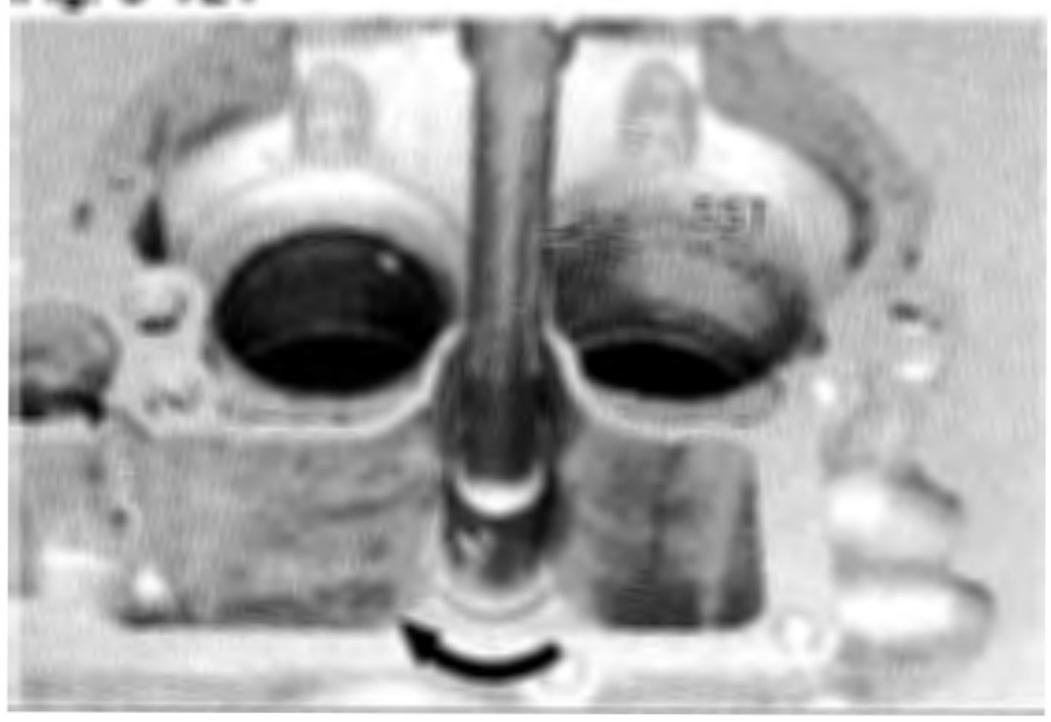
Install the 1st slow jet with SST.
SST [09860-11011]

Fig. 6-120



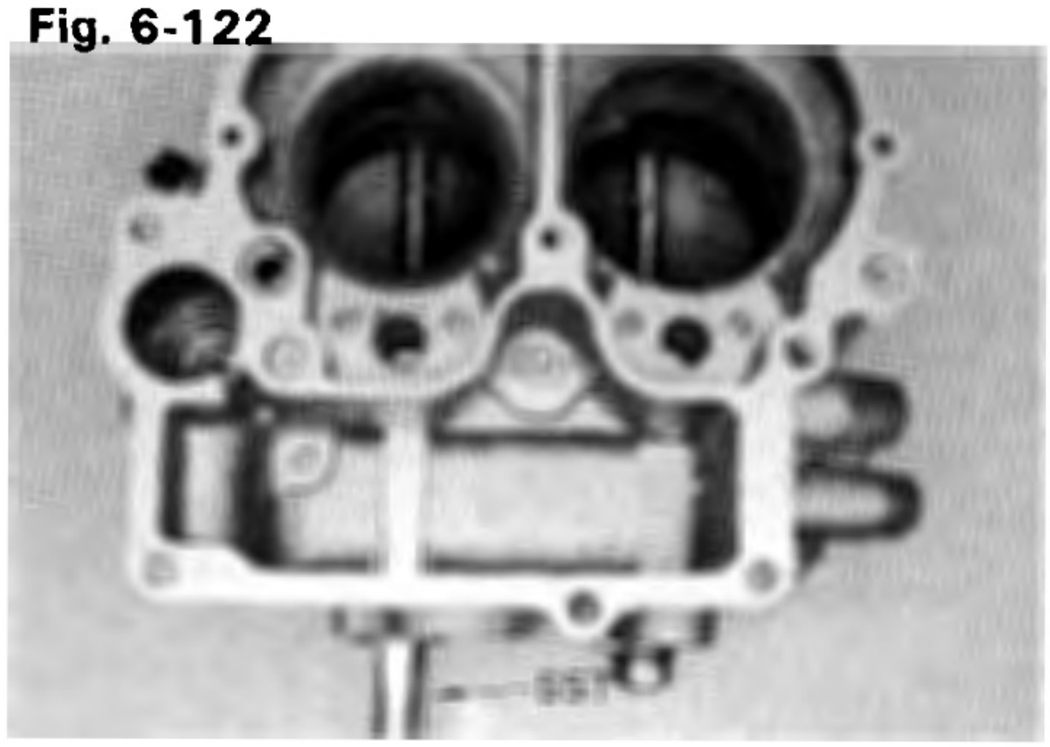
Install the 2nd slow jet with SST.
SST [09860-11011]

Fig. 6-121



Install the power valve with SST.
SST [09860-11011]

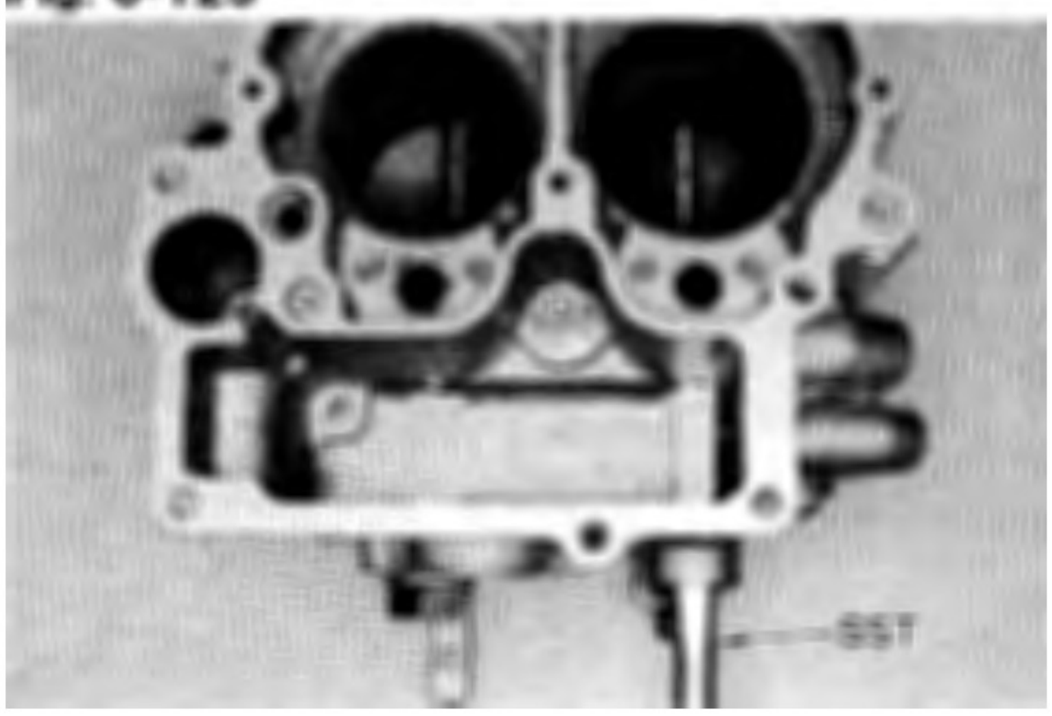
Fig. 6-122



Install the 1st main jet with SST.
SST [09860-11011]

— Note —
The 1st main jet is brass colored.

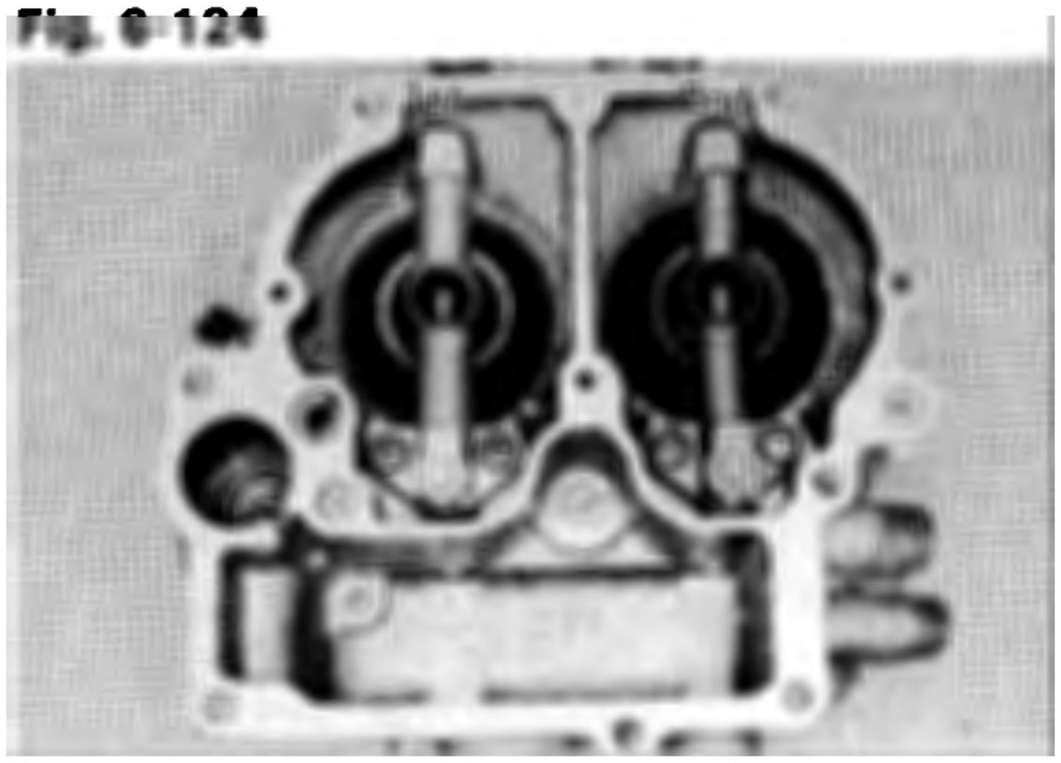
Fig. 6-123



Install the 2nd main jet with SST.
SST [09860-11011]

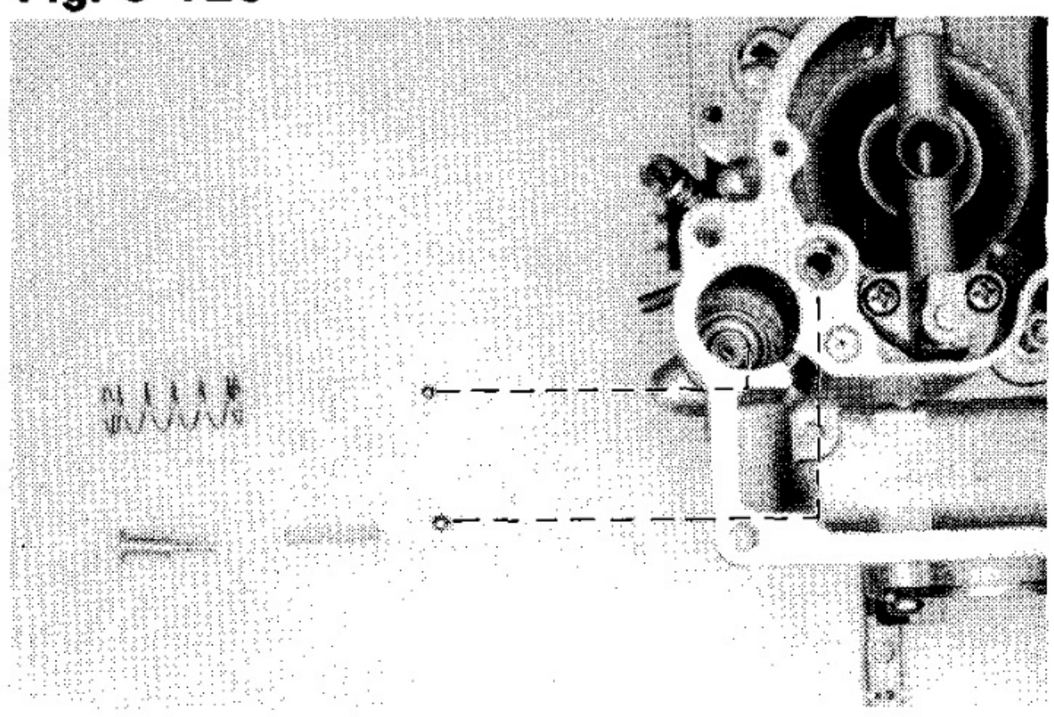
– Note –
The 2nd main jet is chrome colored.

Fig. 6-124



Install the *venturis*.
1st small venturi ——→ Chrome colored
2nd small venturi ——→ Brass colored

Fig. 6-125



Install the steel balls, being careful not to mix up the two sizes of balls.
Smaller ball ——→ For pump plunger
Larger ball ——→ For discharge weight

Choke System

Assemble the parts in the numerical order shown in the figure.

Fig. 6-126

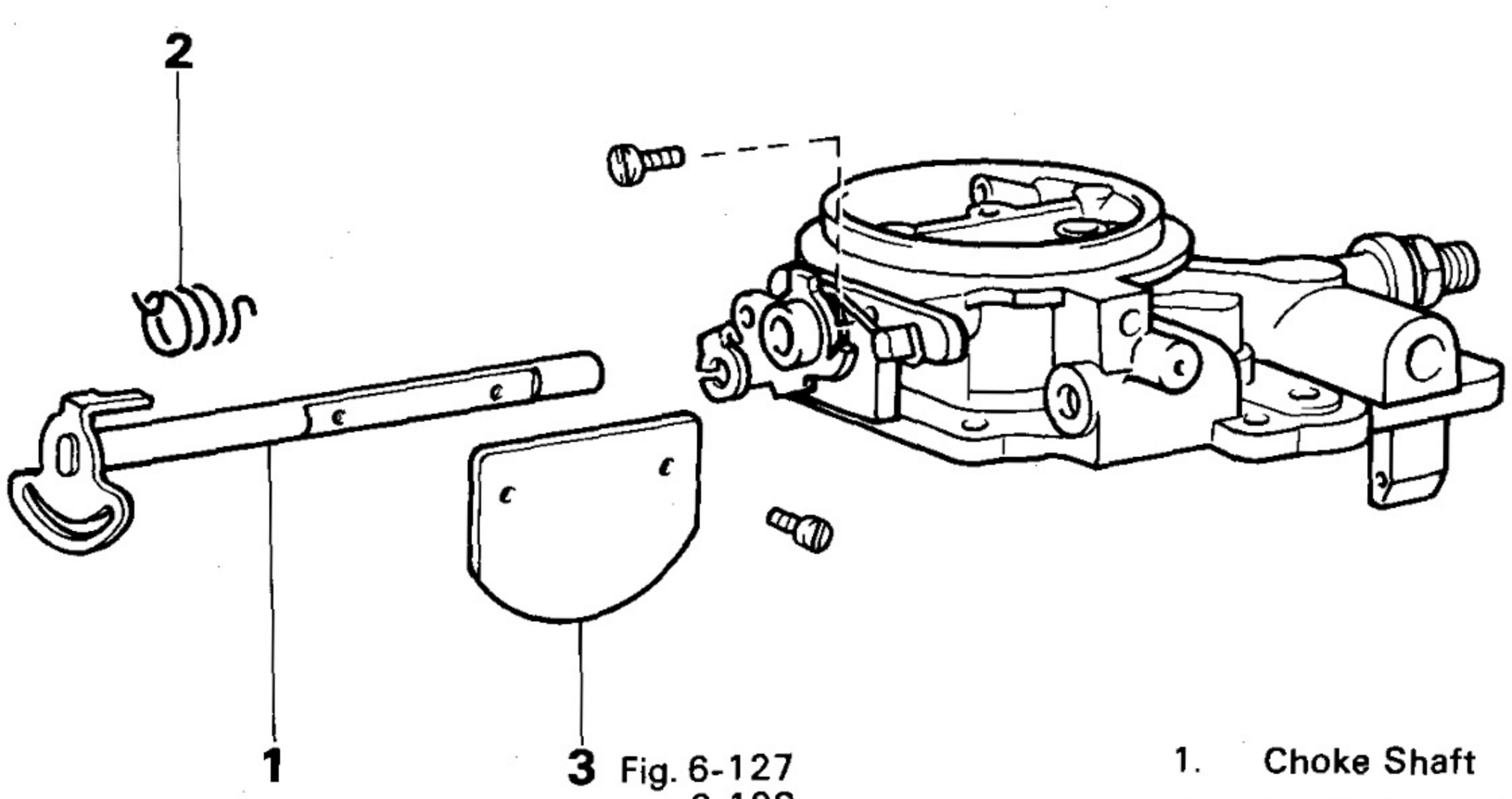
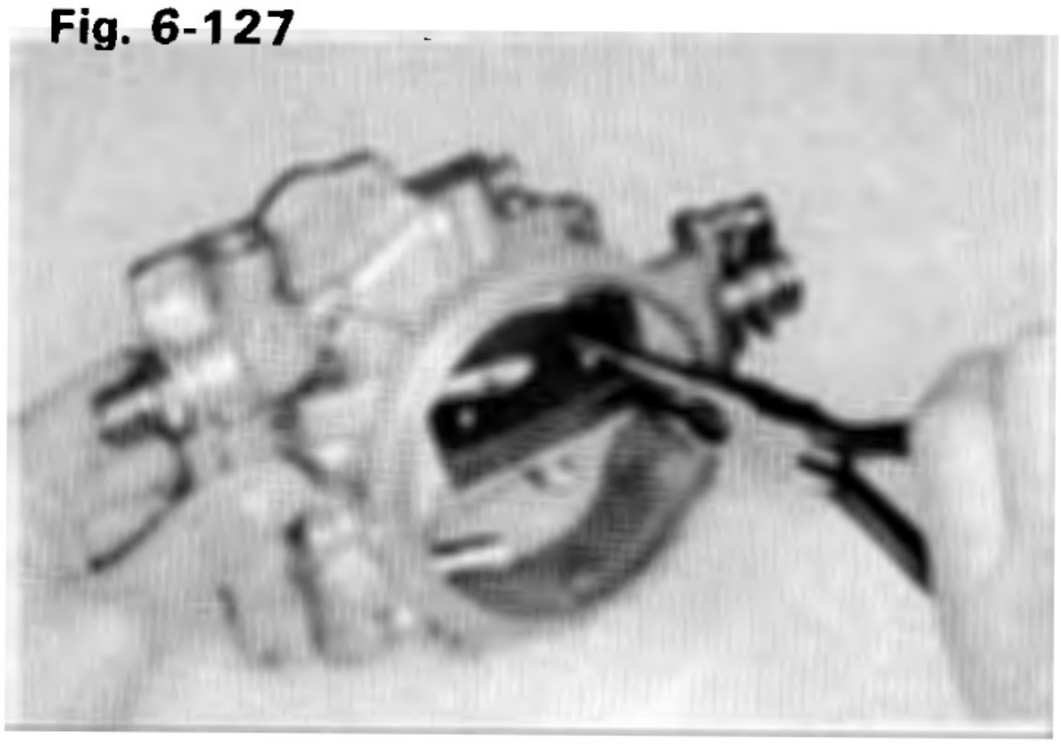


Fig. 6-127
6-128

1. Choke Shaft
2. Choke Valve Relief Spring
3. Choke Valve

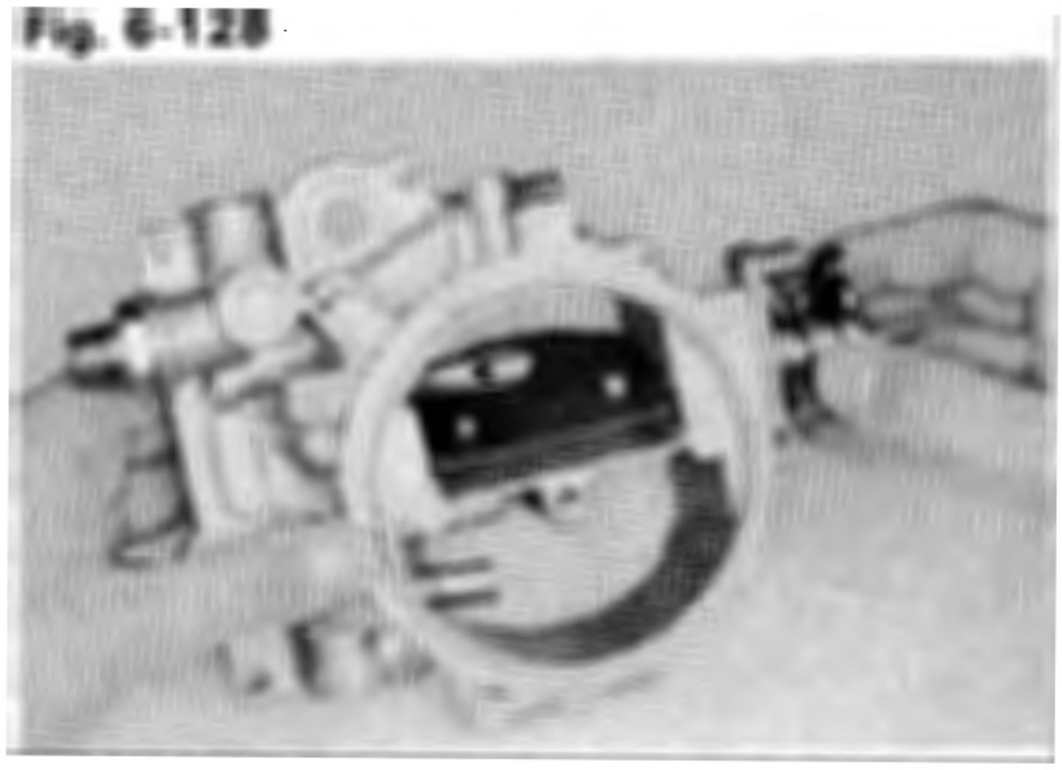
Fig. 6-127



Install the choke valve.

— Note —
Stake the choke shaft screws after assembling.

Fig. 6-128



Check the choke valve action.

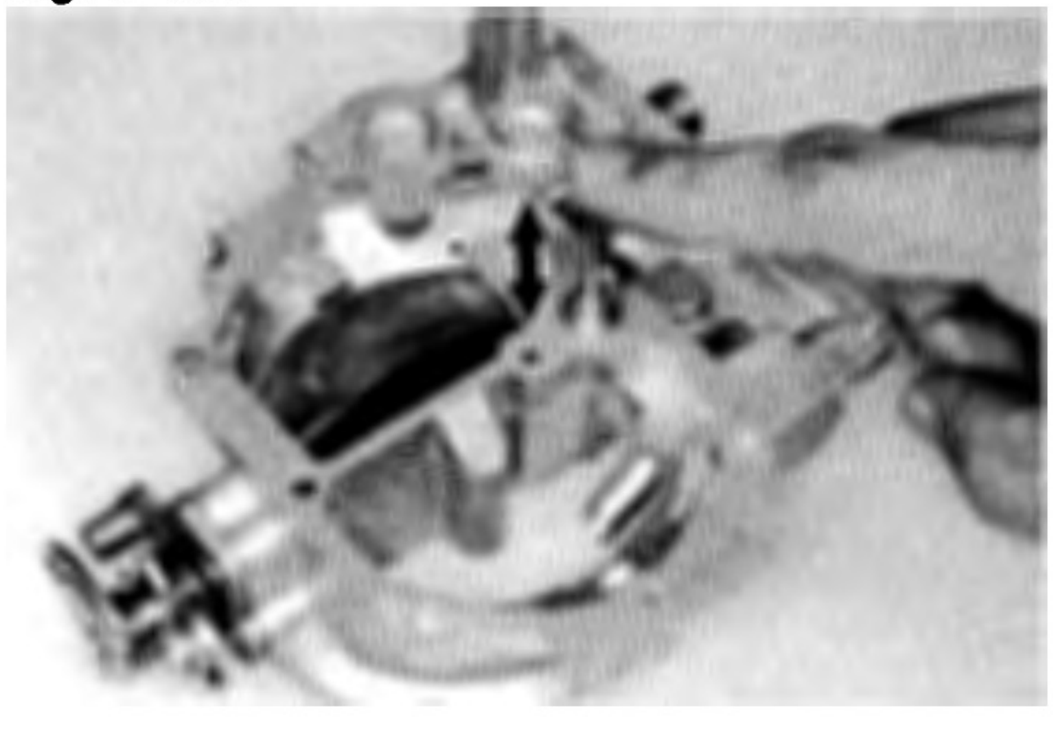
Float

Assemble the parts in the numerical order shown in the figure.

Fig. 6-129

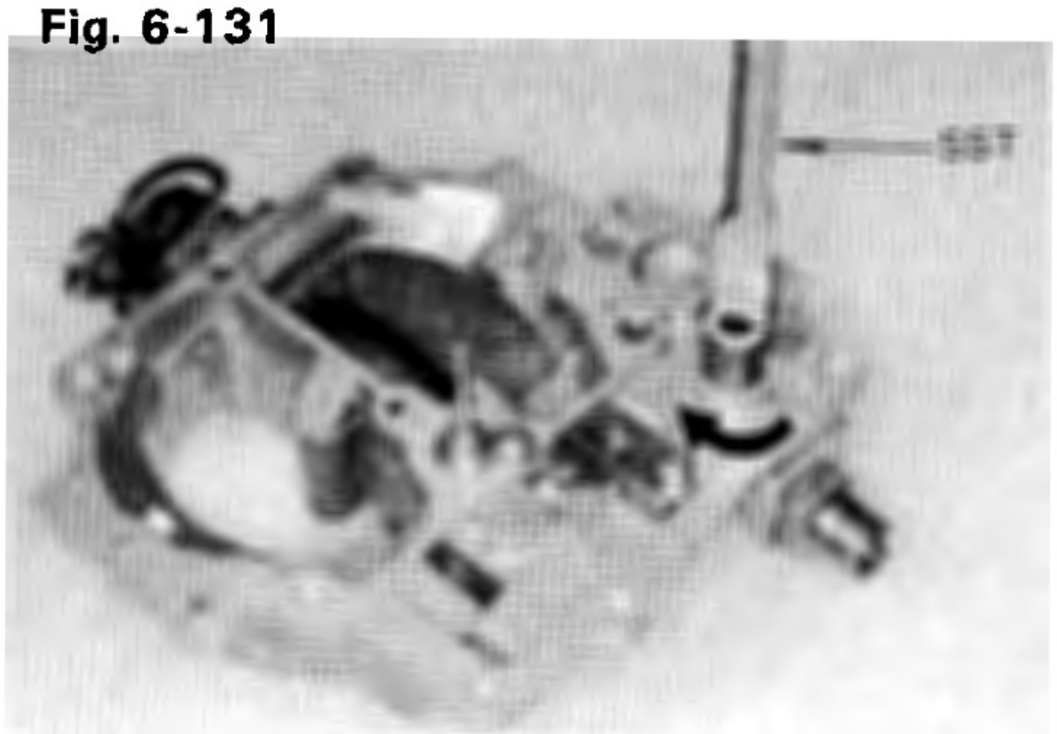
1. Power Piston & Spring
2. Power Piston Retainer
3. Needle Valve Seat
4. Needle Valve, Spring & Pin
5. Air Horn Gasket
6. Float
7. Float Lever Pin
8. Boot
9. Pump Plunger
10. Solenoid Valve

Fig. 6-130



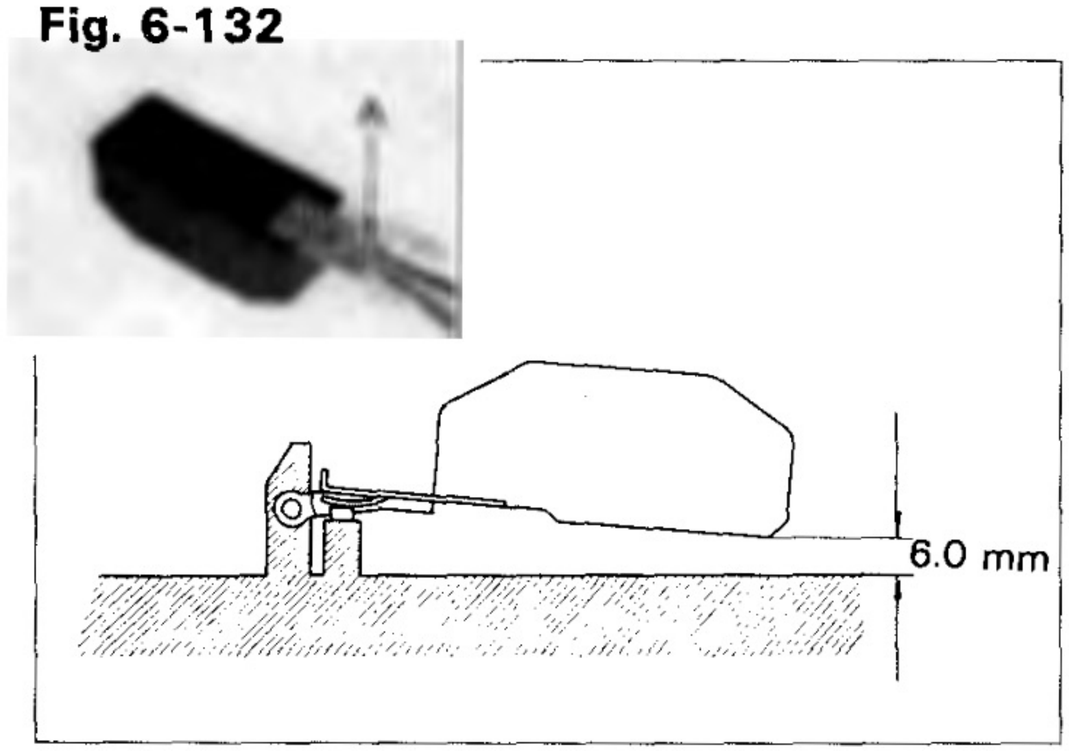
Make sure that the power piston moves smoothly.

Fig. 6-131



Install the needle valve seat with SST.
SST [09860-11011]

Fig. 6-132



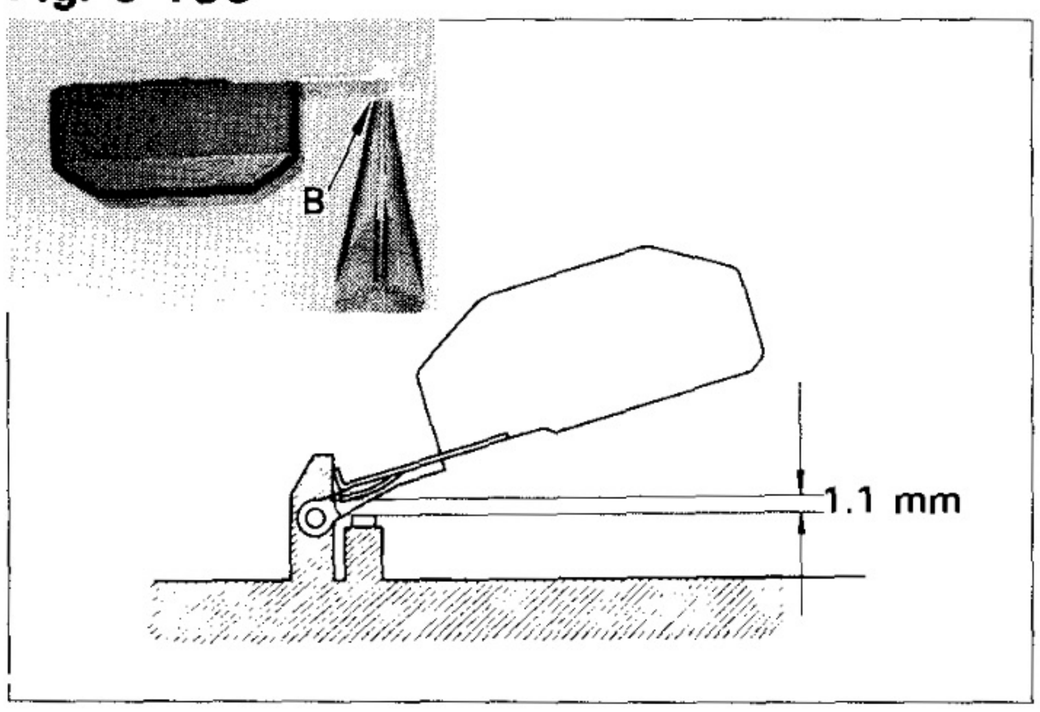
Adjust The Float Level

Allow the float to hang down by its own weight. Then check the clearance between the float tip and air horn with SST.
Adjust by bending part A of the float lip.
SST [09240-00014]

Float upper level: 6.0 mm (0.236 in.)

– Note –
This measurement should be made without a gasket on the air horn.

Fig. 6-133

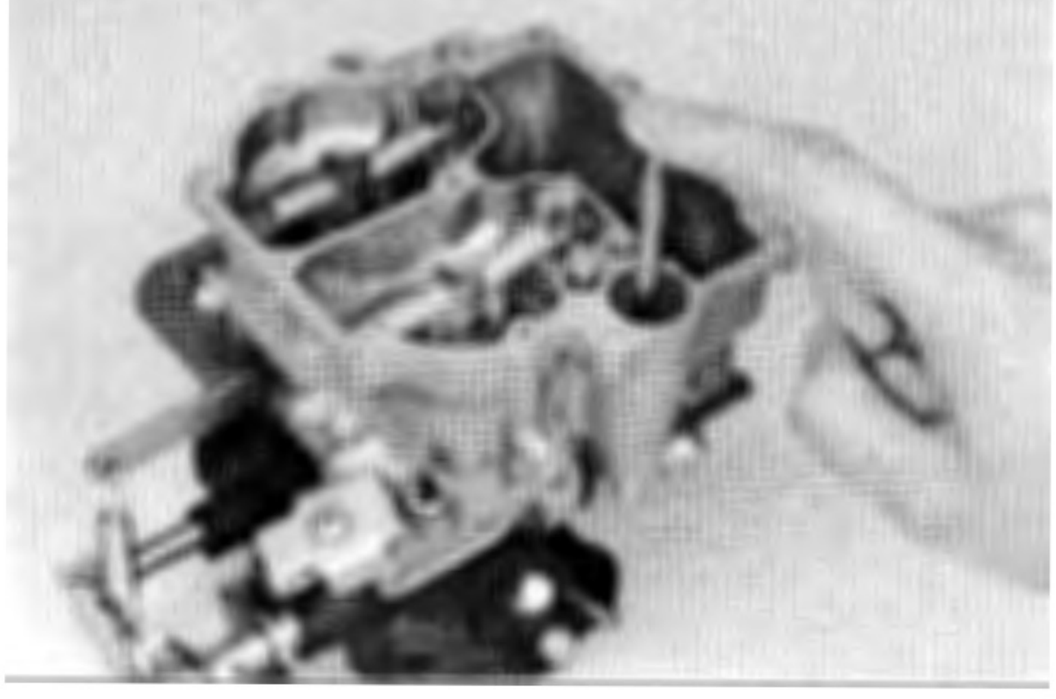


Adjust The Lowered Position

Lift up the float and check the clearance between the needle valve plunger and float lip with SST.
Adjust by bending part B of the float lip.
SST [09240-00020]

Float lower level: 1.1 mm (0.043 in.)

Fig. 6-134

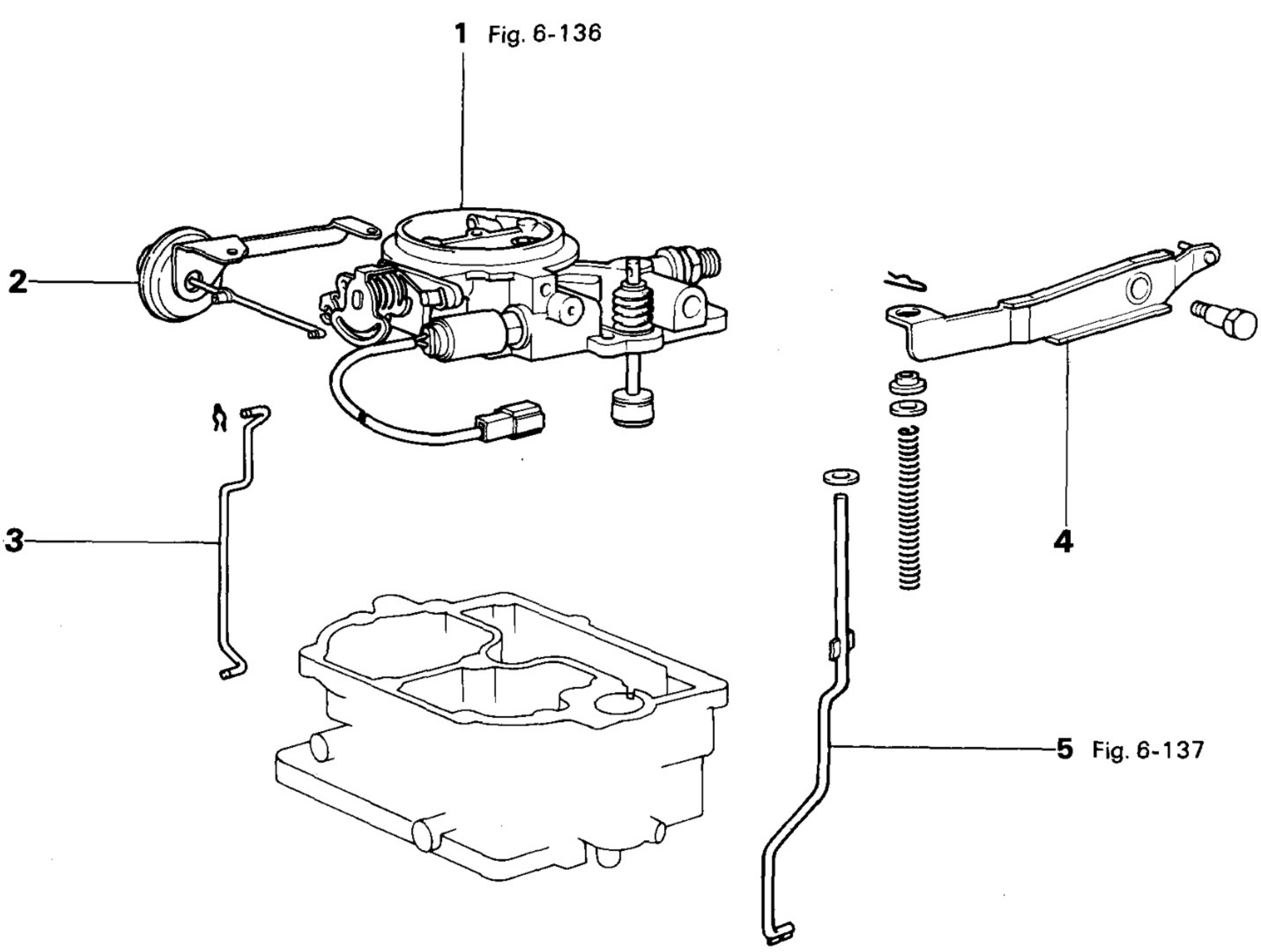


Insure that the pump plunger moves smoothly.

Air Horn

Assemble the parts in the numerical order shown in the figure.

Fig. 6-135



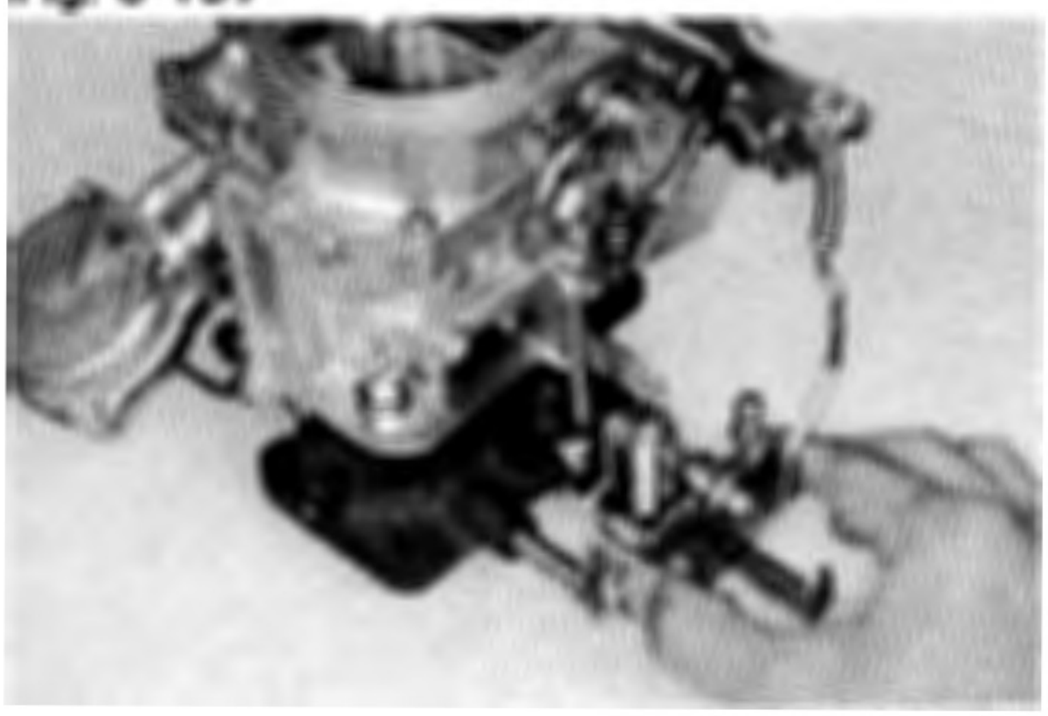
1. Air Horn with Gasket
2. Choke Breaker (Throttle Positioner Diaphragm) (Australia & ECE FJ series)
3. Fast Idle Connecting Link
4. Pump Arm
5. Pump Connecting Link

Fig. 6-136



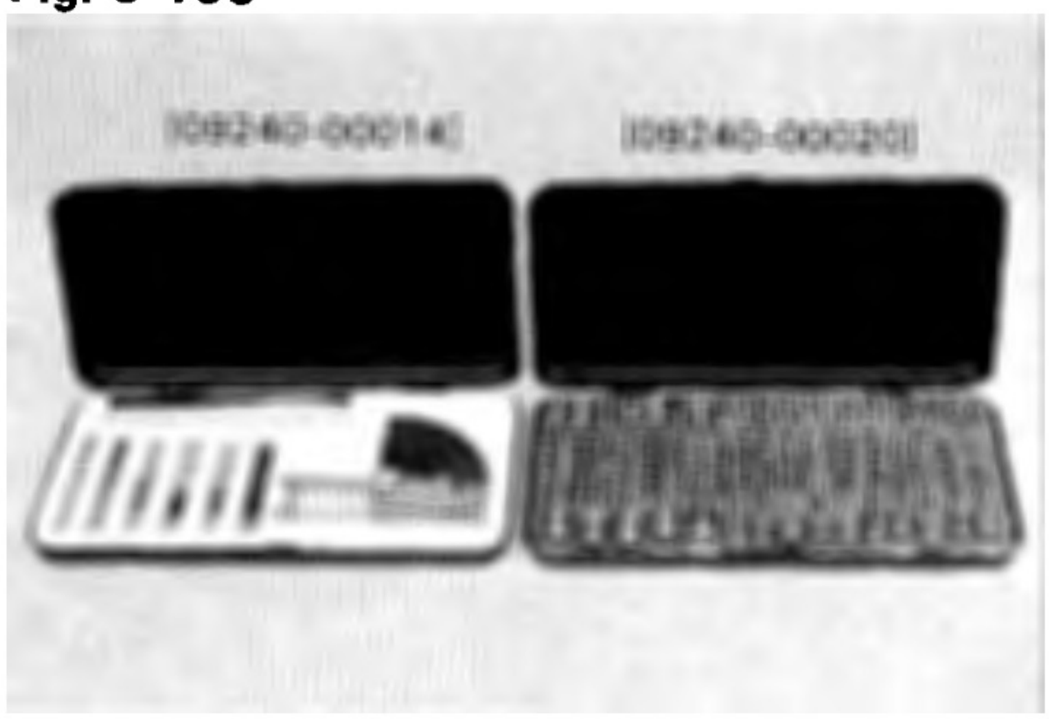
⚠ Before installing the air horn, make sure that the pump discharge weight is properly assembled.

Fig. 6-137



After assembly, make sure that each link moves smoothly.

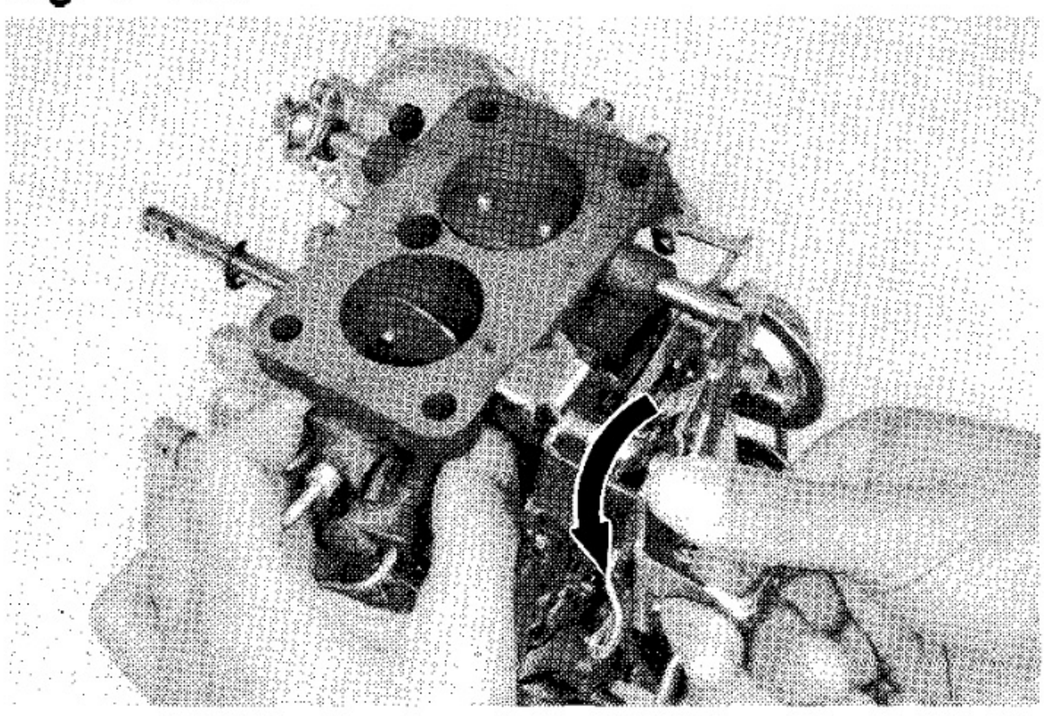
Fig. 6-138



CARBURETOR ADJUSTMENT

Make adjustment with SST.
SST [09240-00014]
[09240-00020]

Fig. 6-139



PRIMARY THROTTLE VALVE OPENING

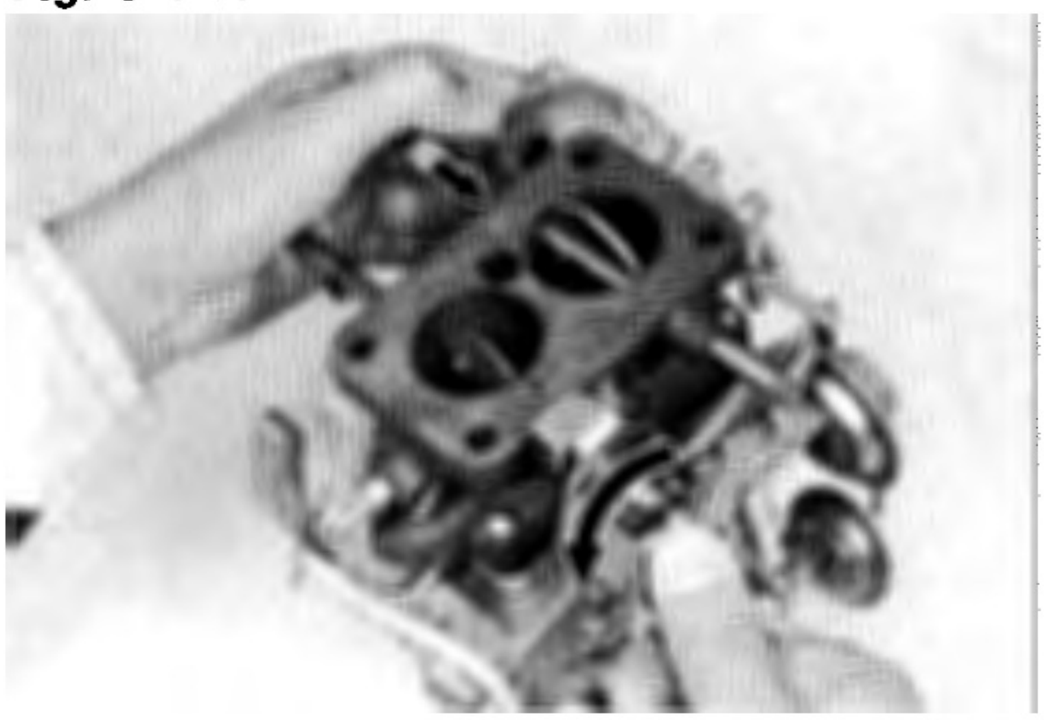
1. Fully open the primary throttle valve and check the opening angle.
   Opening angle from horizontal plane: 90°

Fig. 6-140



2. Adjust by bending the throttle lever stopper indicated in the figure.

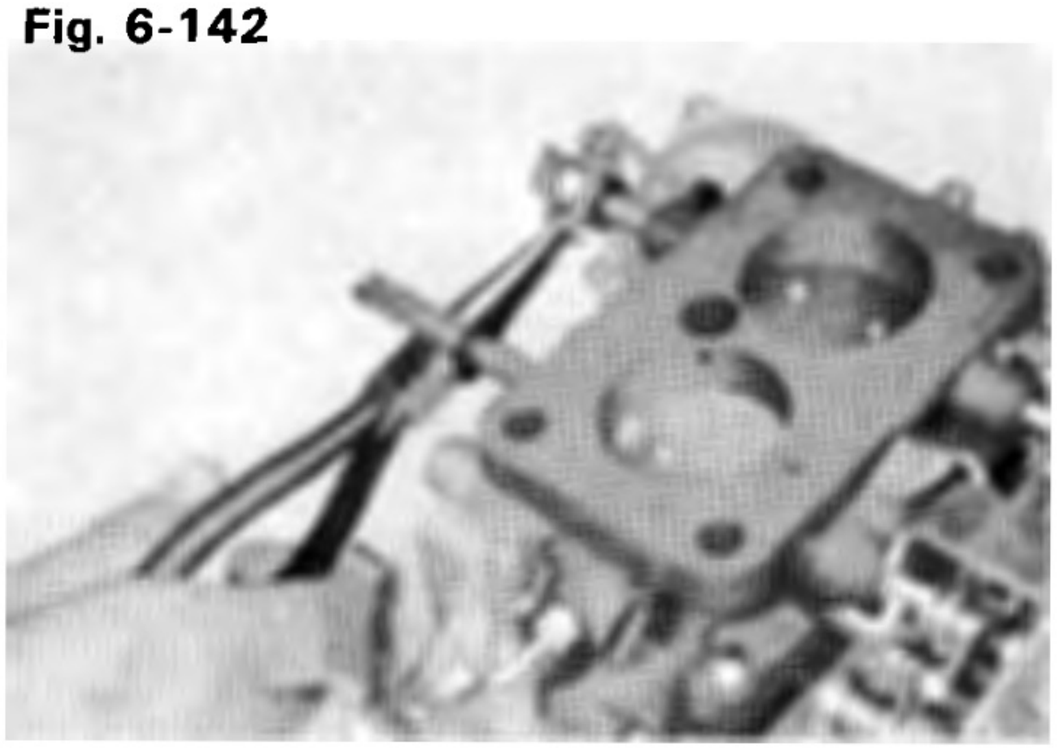
Fig. 6-141



SECONDARY THROTTLE VALVE OPENING

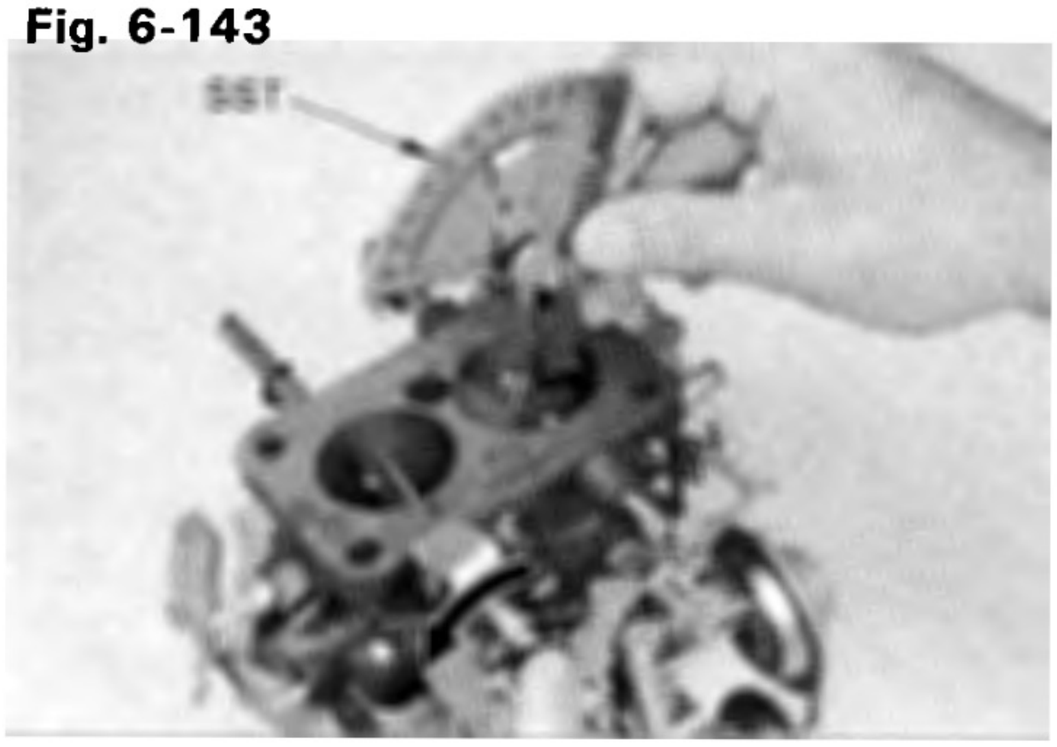
1. Fully open the secondary throttle valve and check the opening angle.
   Opening angle from horizontal plane: 90°

Fig. 6-142



2. Adjust by bending the throttle lever stopper indicated in the figure.

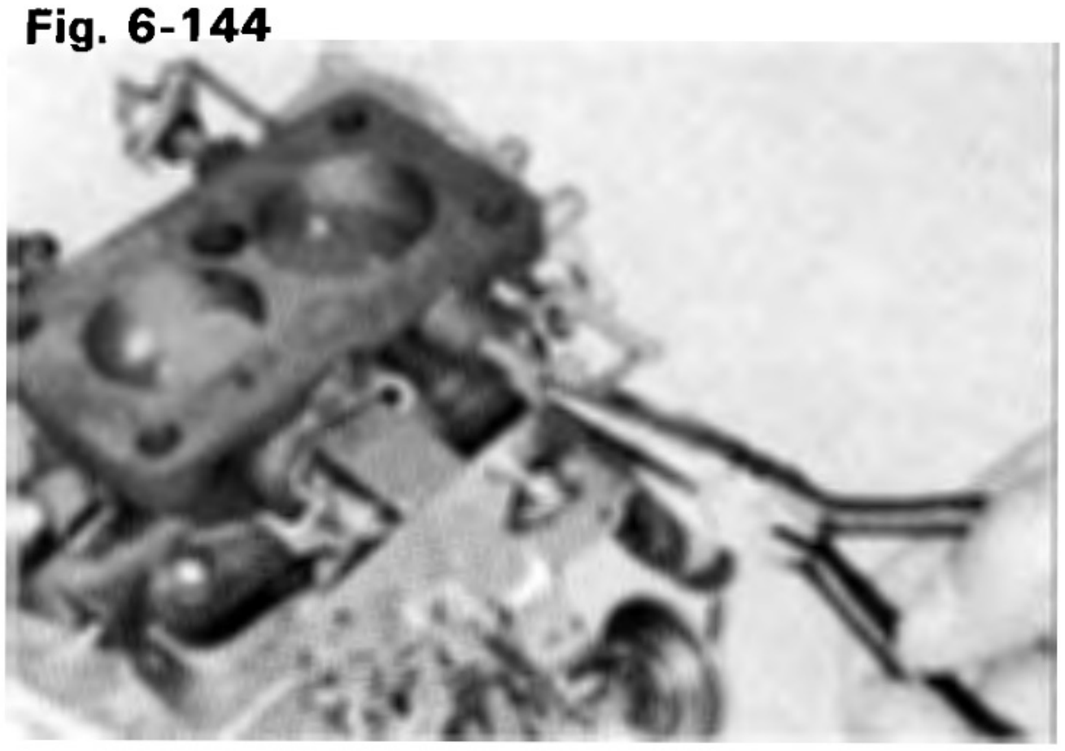
Fig. 6-143



KICK-UP

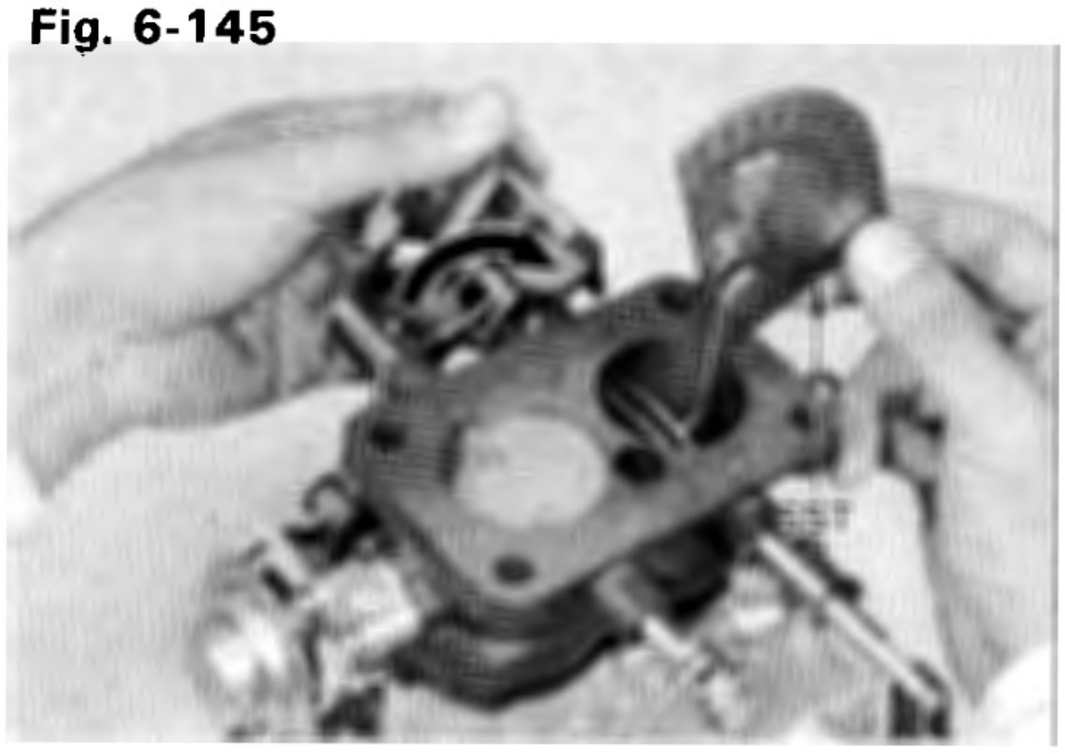
1. Fully open the primary throttle valve and, using SST, check the secondary throttle valve opening angle.
   SST [09240-00014]
   Kick-up angle: 25°

Fig. 6-144



2. Adjust by bending the secondary throttle lever indicated in the figure.

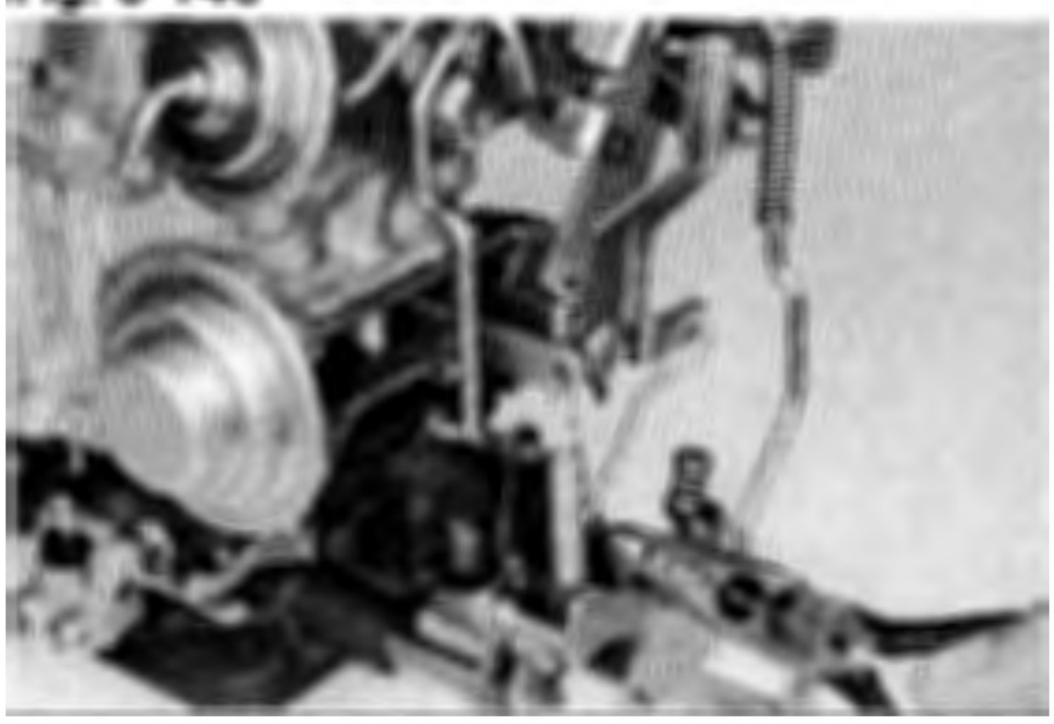
Fig. 6-145



SECONDARY TOUCH ANGLE

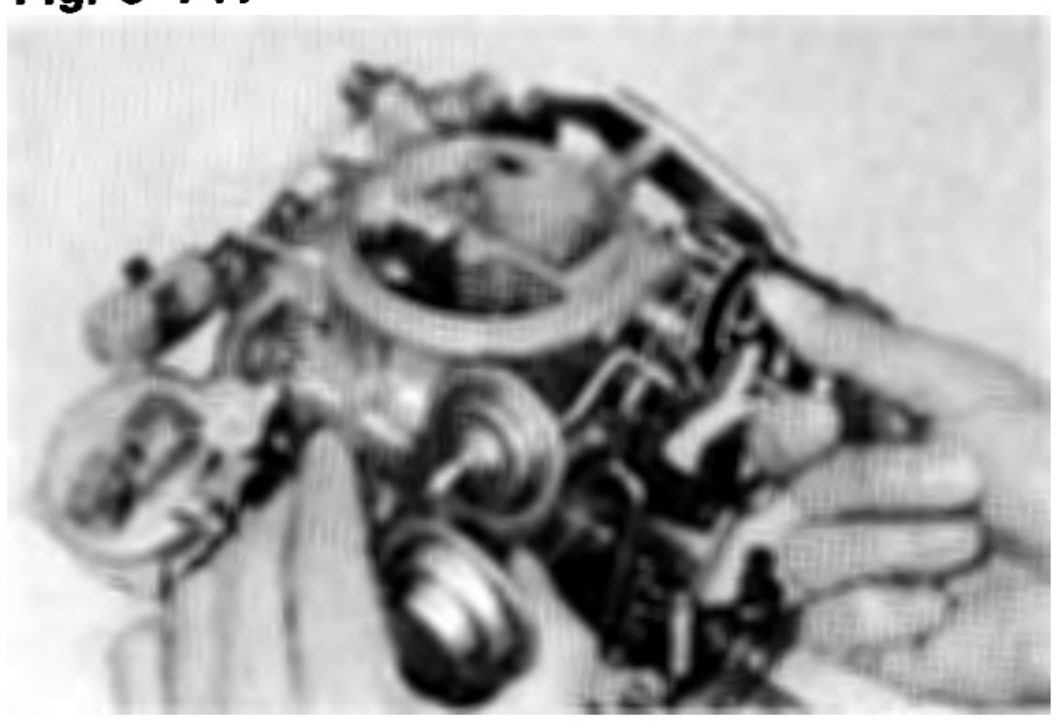
1. Check the primary throttle valve opening with SST at the same time the secondary throttle valve just starts to open.
   SST [09240-00014]
   Secondary touch angle from horizontal plane: 67°

Fig. 6-146



2. Adjust by bending the touch lever indicated in the figure.

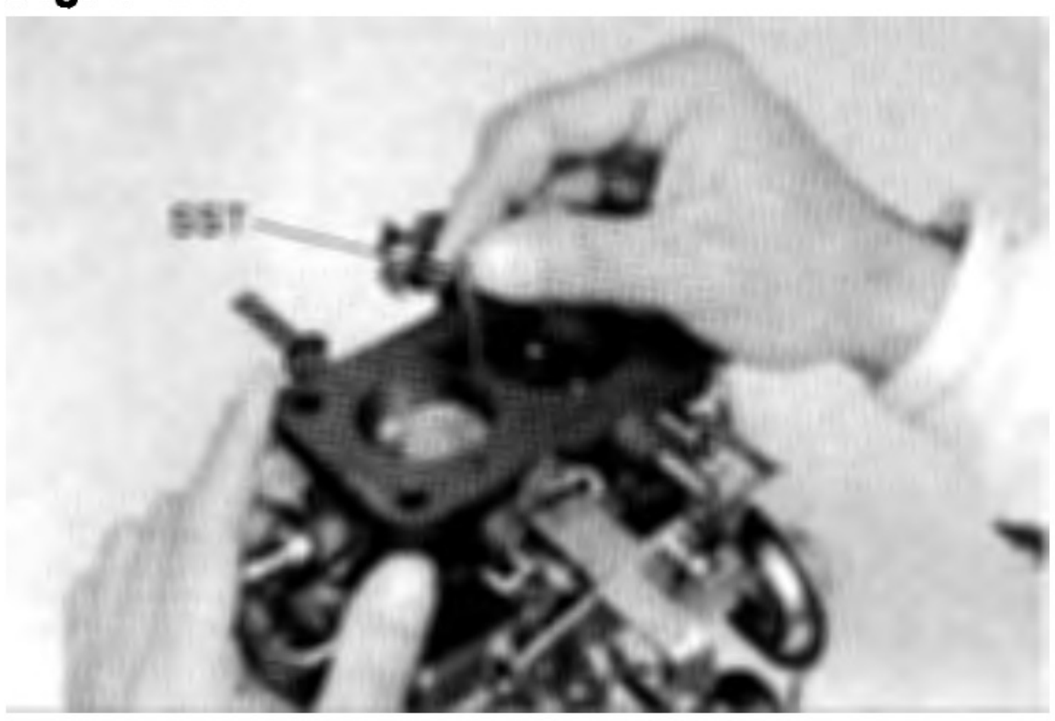
Fig. 6-147



FAST IDLE CLEARANCE

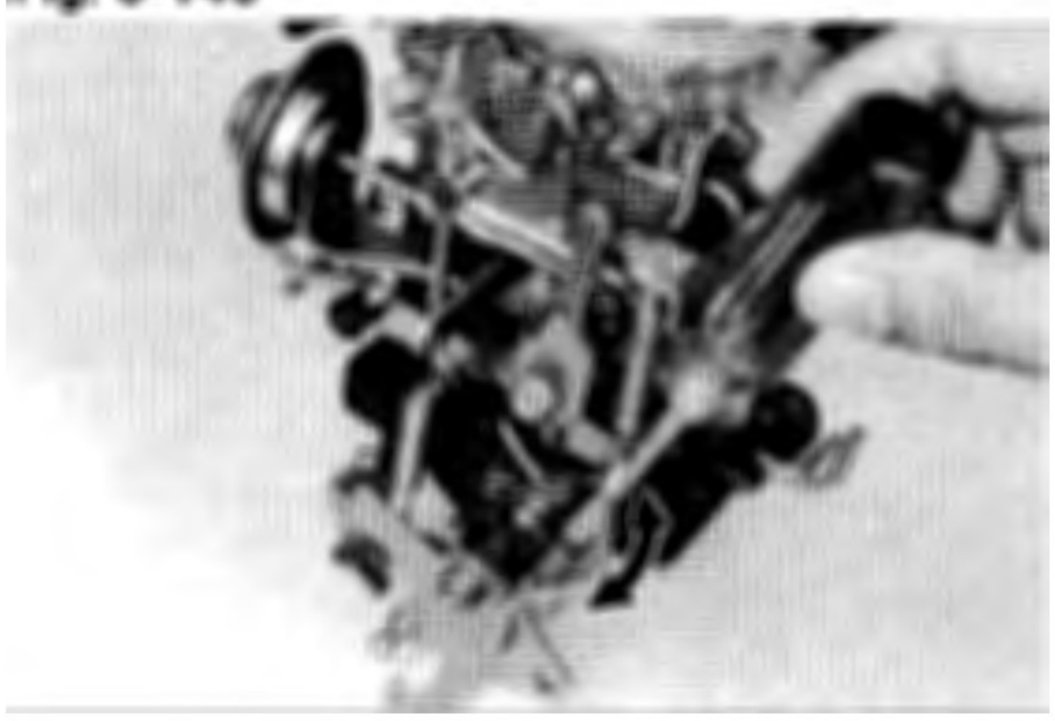
1. Fully close the choke valve by turning the choke shaft lever.

Fig. 6-148



2. Check the clearance between the primary throttle valve and carburetor flange with SST.
   SST [09240-00020]
   Fast idle clearance: 1.3 mm (0.051 in.)

Fig. 6-149



3. Adjust by turning the fast idle adjusting screw indicated in the figure.

Fig. 6-150

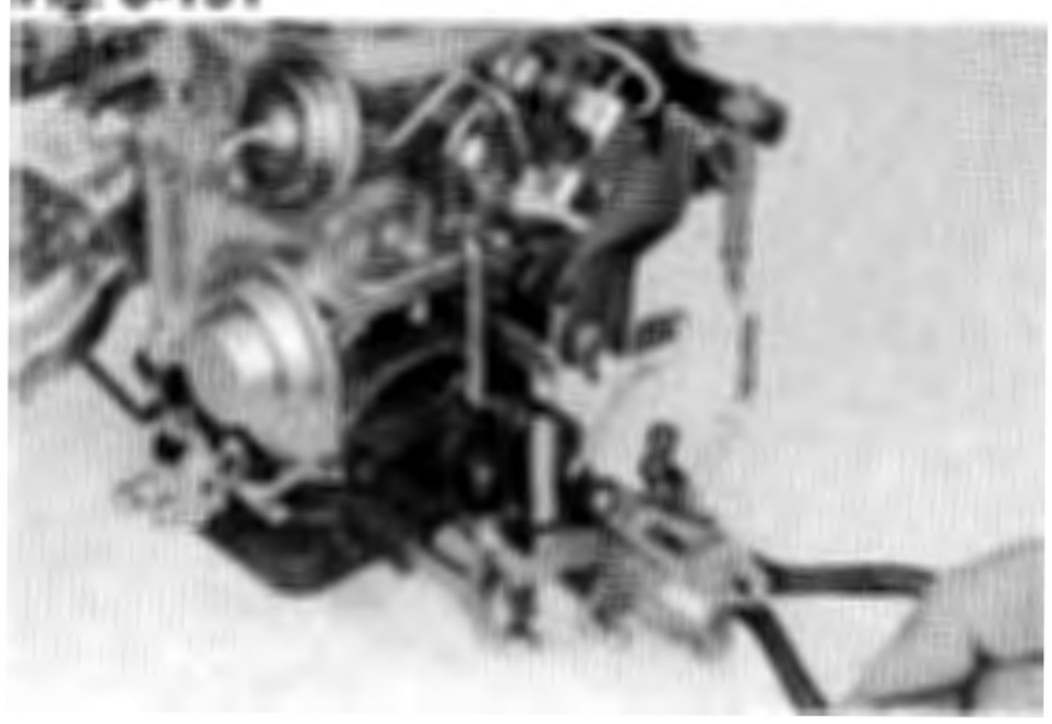


UNLOADER (USA)

1. Fully open the primary throttle valve and check the choke valve angle with SST.
   SST [09240-00014]

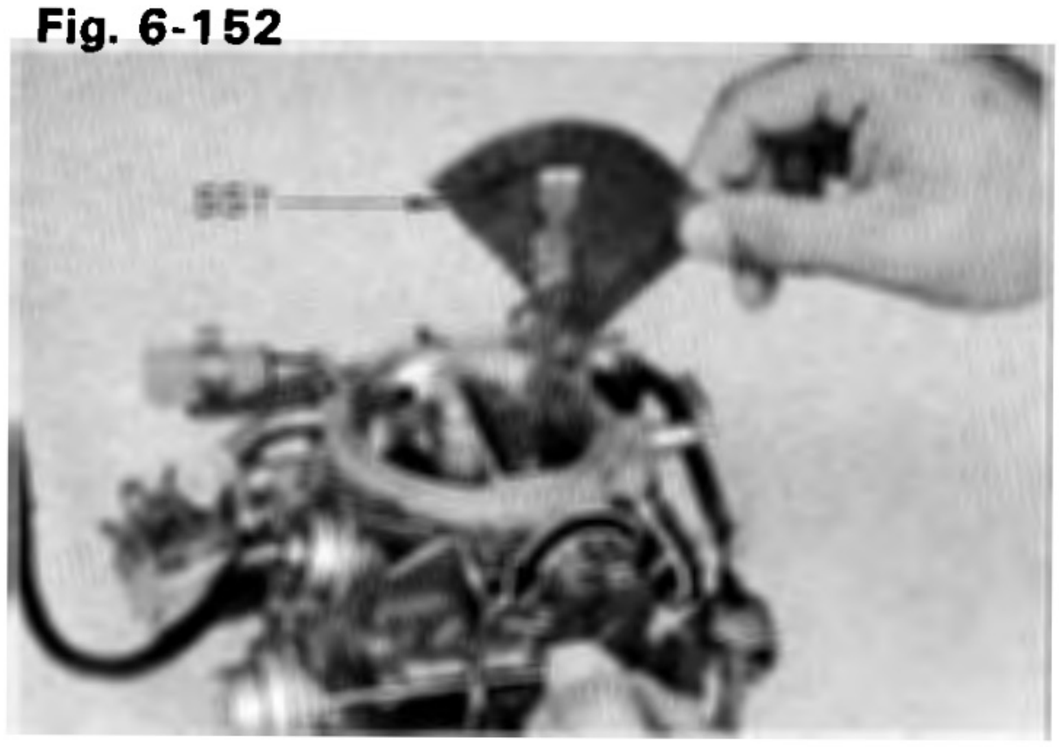
   Choke valve angle from horizontal plane: 50°

Fig. 6-151



2. Adjust by bending the primary throttle arm indicated in the figure.

Fig. 6-152

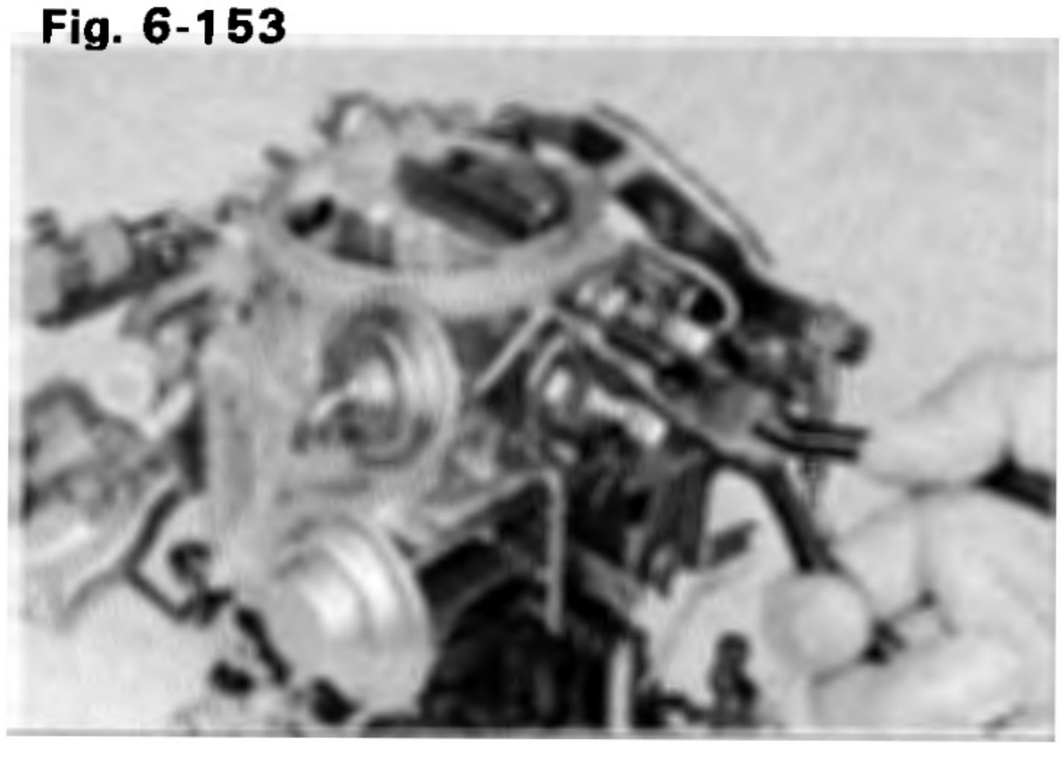


CHOKE BREAKER (USA, Australia & ECE FJ series)

1. Apply vacuum to the choke breaker diaphragm.
2. While closing the choke valve by hand, check the choke valve angle with SST.
   SST [09240-00014]

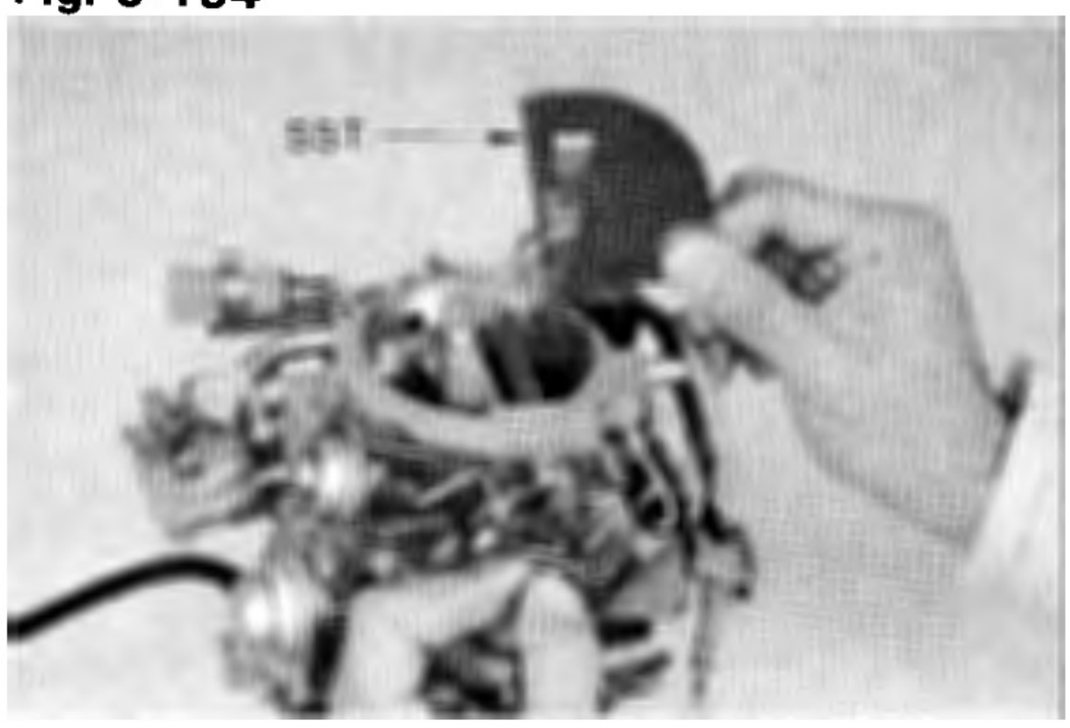
   Choke valve opening angle from horizontal plane:
   USA 45°
   Others 38°

Fig. 6-153



3. Adjust by bending the choke breaker link indicated in the figure.

Fig. 6-154



CHOKE OPENER (USA)

1. Fully close the choke valve by turning the choke shaft lever.
2. Apply vacuum to the diaphragm and then check the choke valve angle with SST.
   SST [09240-00014]

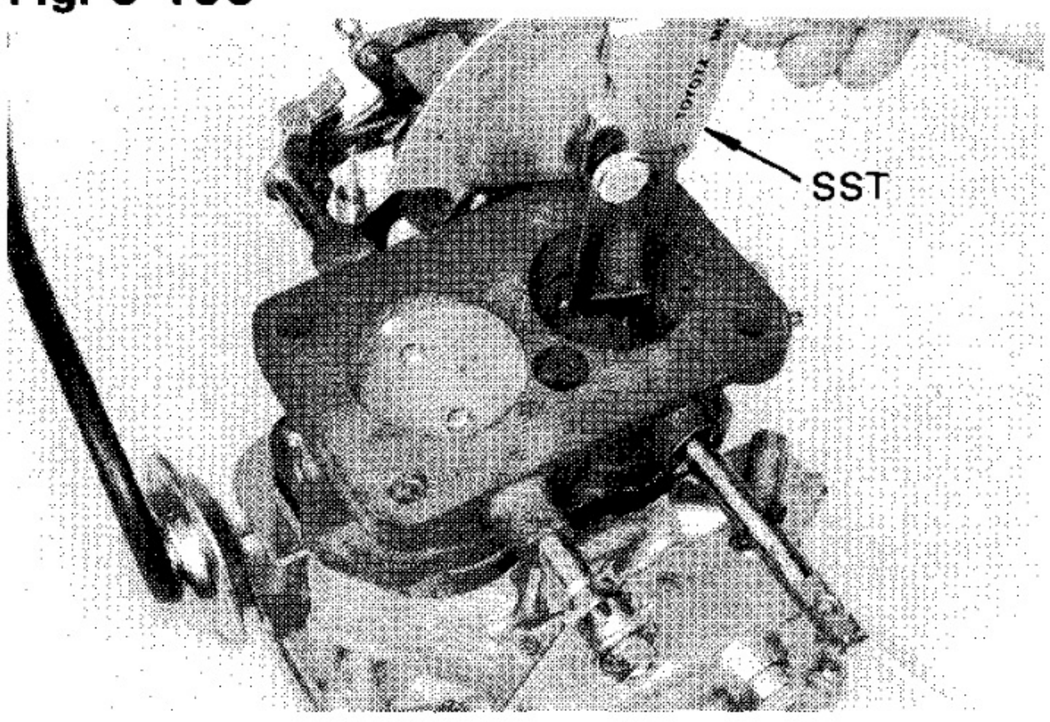
   Choke valve opening angle from horizontal plane: 75°

Fig. 6-155



3. Adjust by bending the choke shaft stopper indicated in the figure.

Fig. 6-156

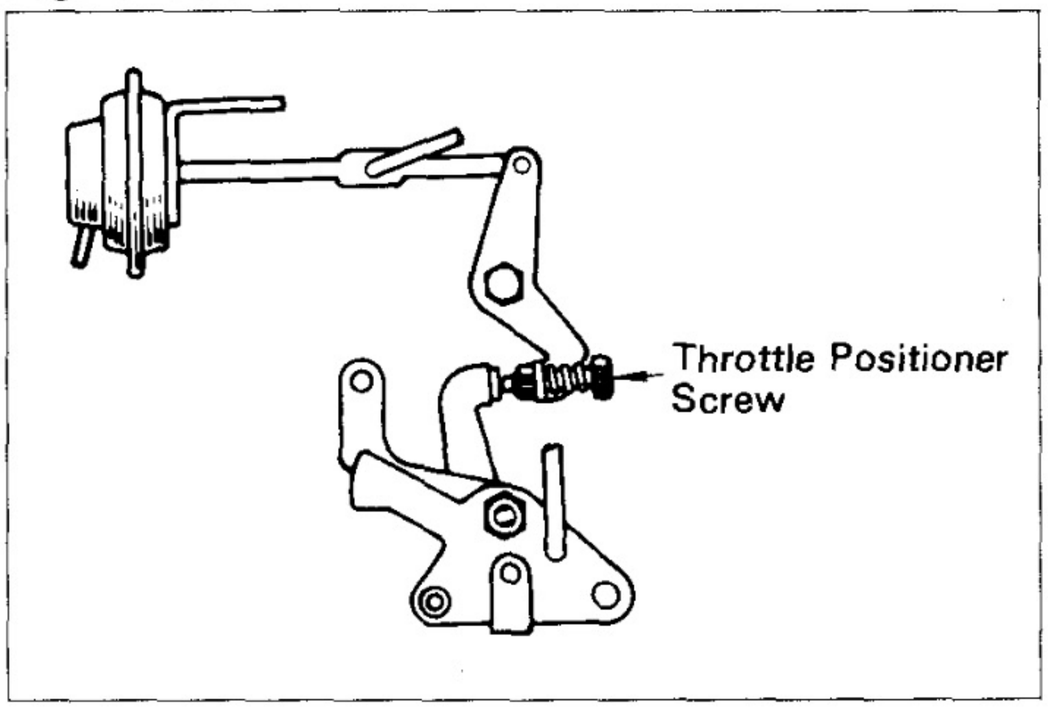


THROTTLE POSITIONER (Australia & ECE FJ series)

1. Apply vacuum to the throttle positioner diaphragm.
2. Check the throttle valve opening with SST.
   SST [09240-00014]

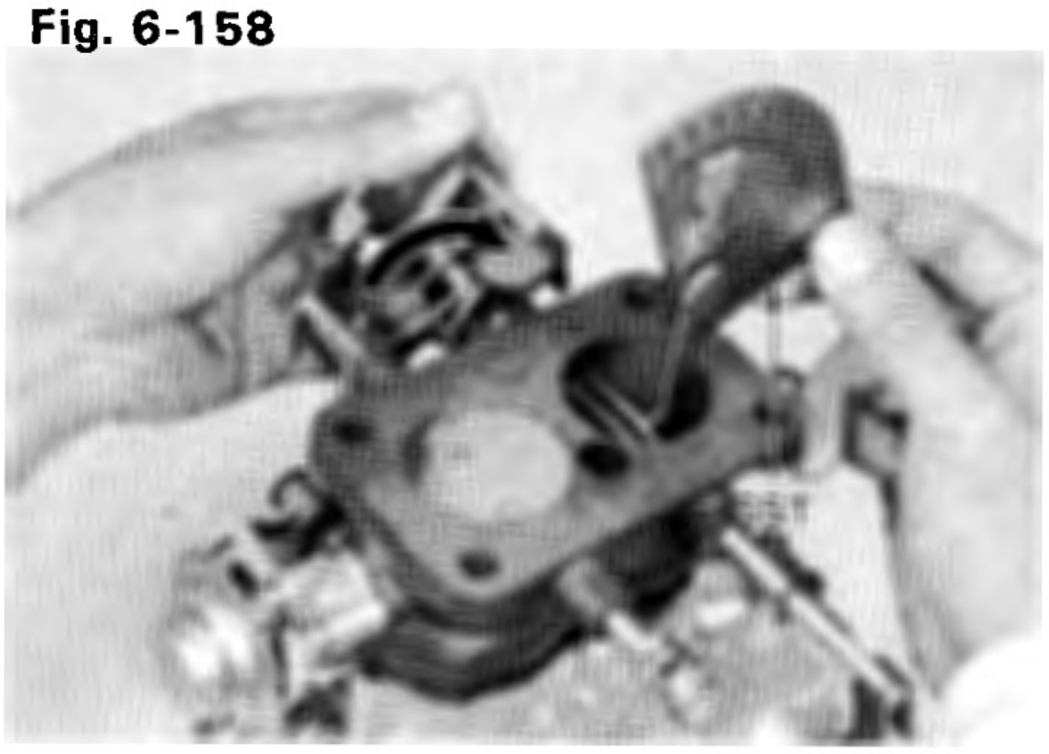
   Throttle valve opening angle from horizontal plane:
   N.S.W. 11°
   Others 10°

Fig. 6-157



3. Adjust by turning the throttle positioner adjusting screw indicated in the figure.

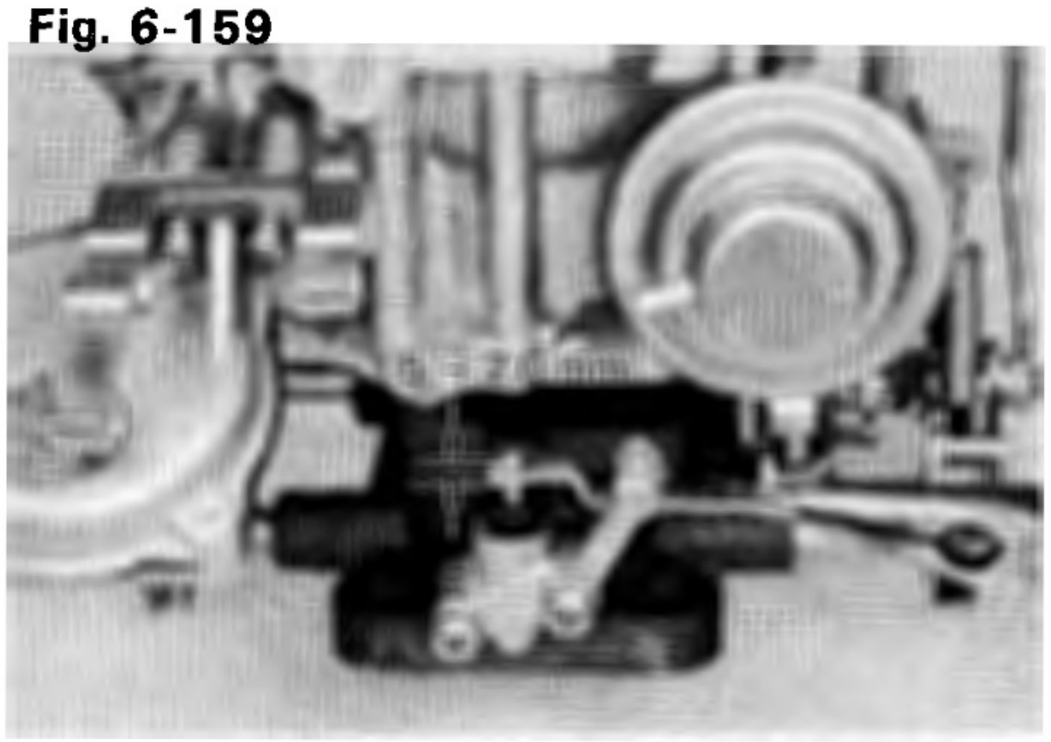
Fig. 6-158



SLOW CUT VALVE (USA)

1. Set the primary throttle valve opening to the secondary touch angle (67°).

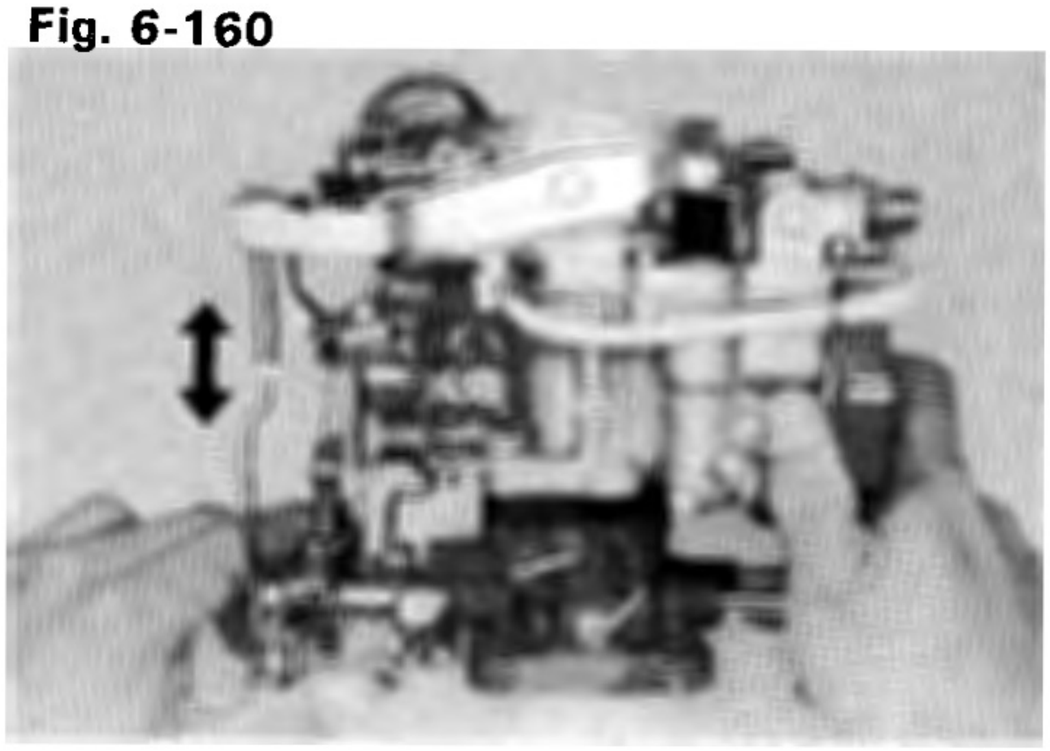
Fig. 6-159



2. Check the slow cut valve stroke and adjust by bending the lever indicated in the figure.

Slow cut valve stroke:
1.5 – 2.0 mm
(0.059 – 0.079 in.)

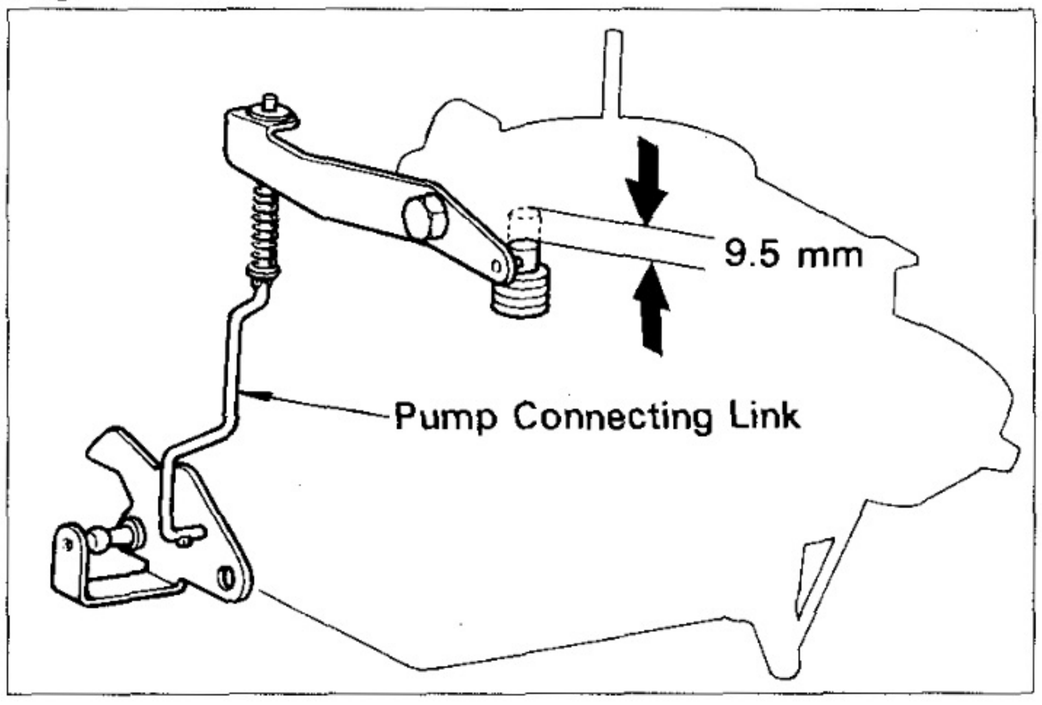
Fig. 6-160



ACCELERATION PUMP

1. While rotating the throttle shaft, check that the pump connecting link moves smoothly.

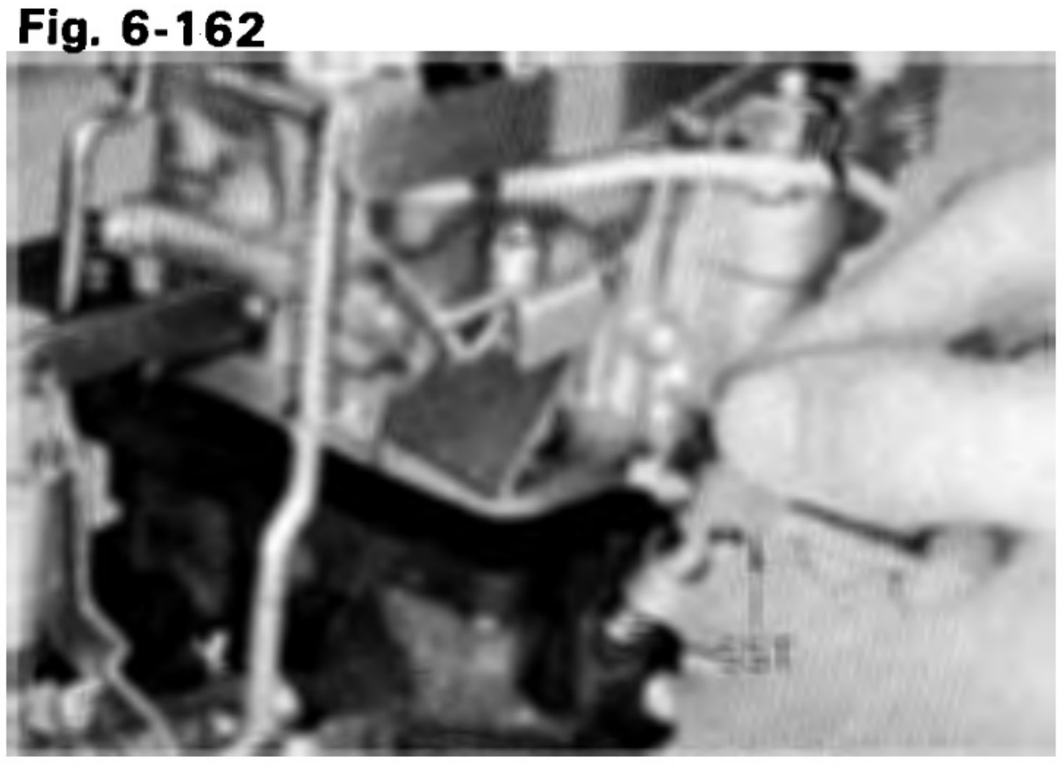
Fig. 6-161



2. Check the acceleration pump stroke and adjust by bending the pump connecting link.

Acceleration pump stroke:
9.5 mm
(0.374 in.)

Fig. 6-162



IDLE MIXTURE ADJUSTING SCREW

(except USA)

Tighten the idle mixture adjusting screw fully and then unscrew it the following amount with SST(ECE) or a screwdriver (others).

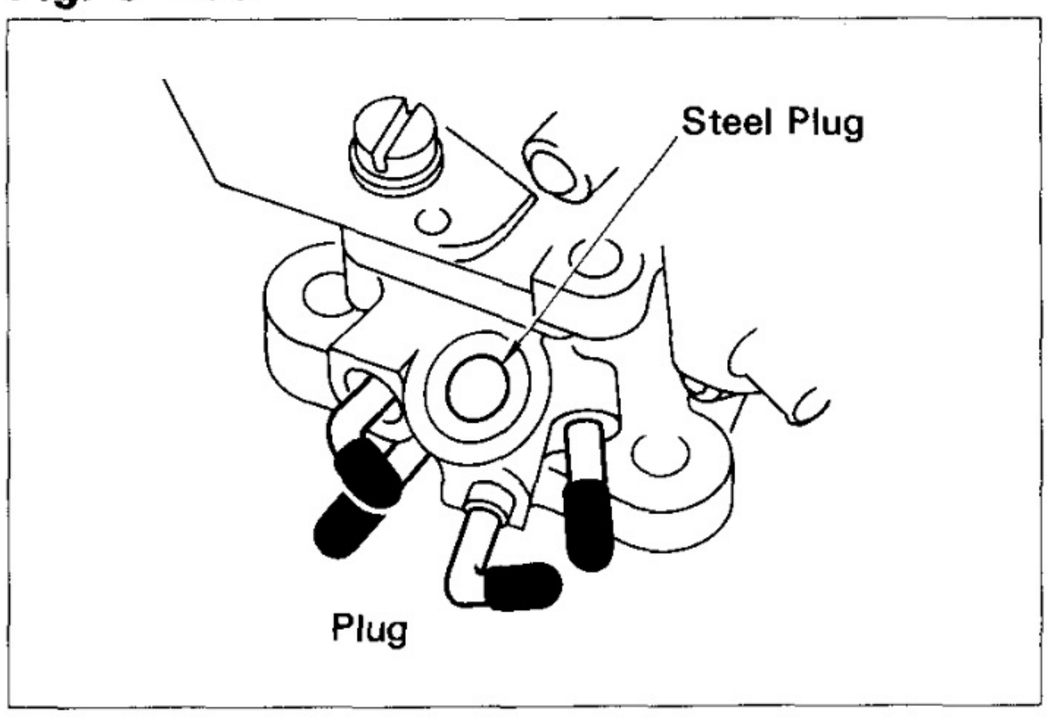
SST [09243-00020]

Return from fully closed:

ECE & N.S.W. 2-1/2 turns

Others 2 turns

Fig. 6-163



(USA)

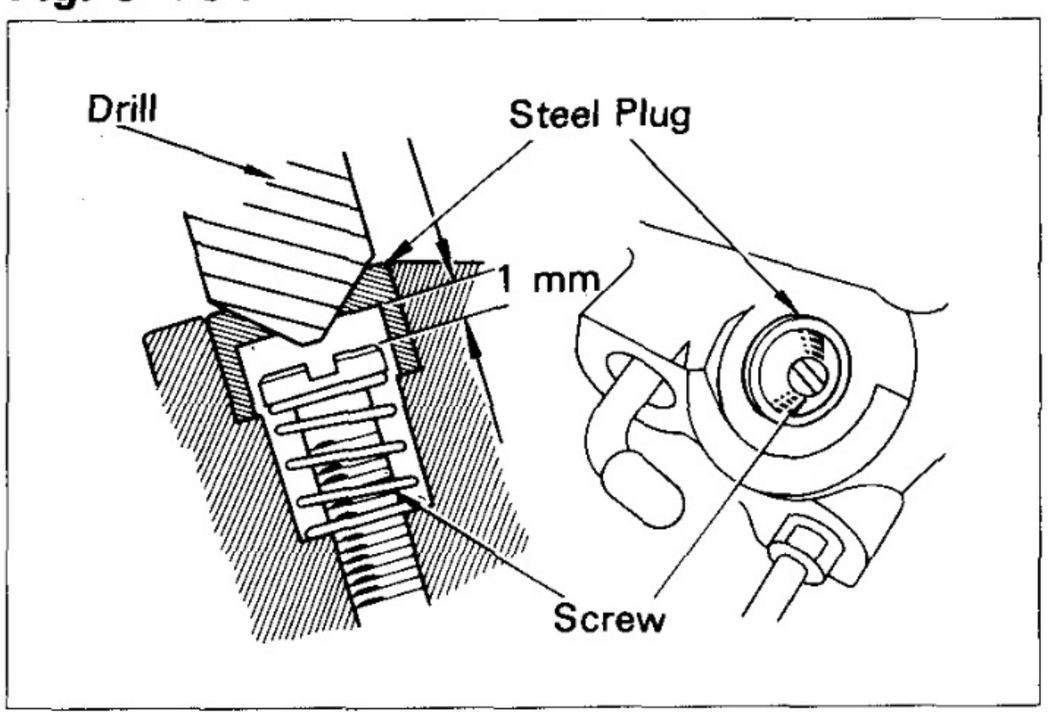
If necessary, remove the steel plug and idle mixture adjusting screw referring to the following procedure:

1. Mark the center of the plug with a punch.

— Note —

Plug each carburetor vacuum port to prevent entry of steel particles when drilling.

Fig. 6-164

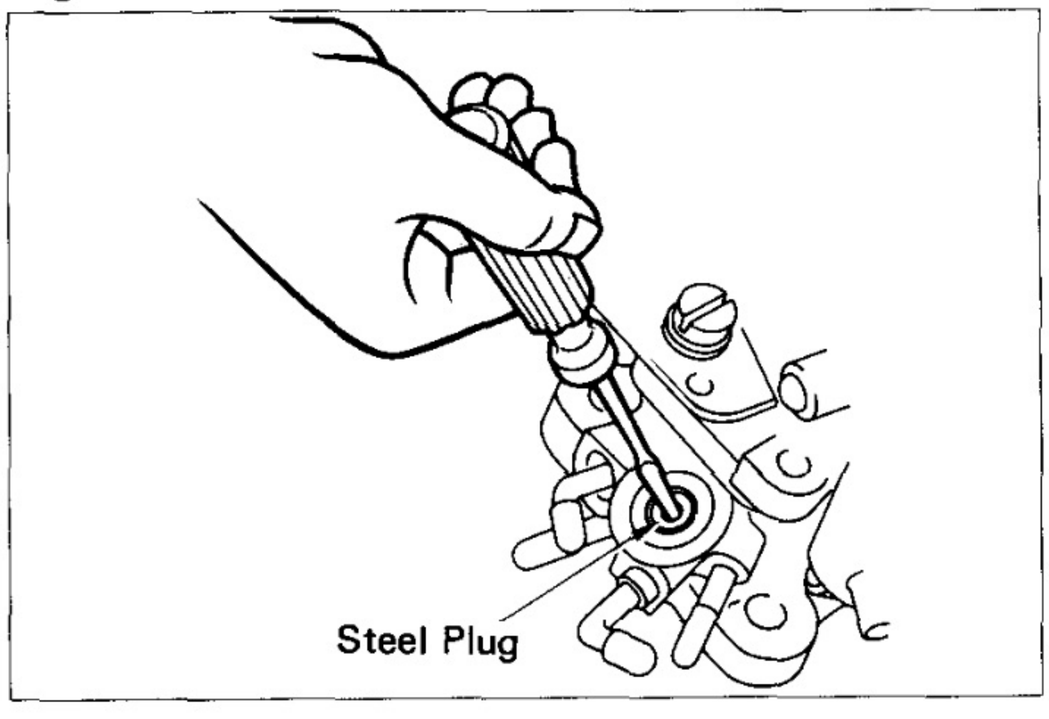


2. Drill a 8.5 mmϕ (0.335 in.ϕ) hole in the center of the plug.

— Note —

As there is only 1 mm (0.04 in.) clearance between the plug and screw, drill carefully and slowly to avoid drilling onto the screw.

Fig. 6-165

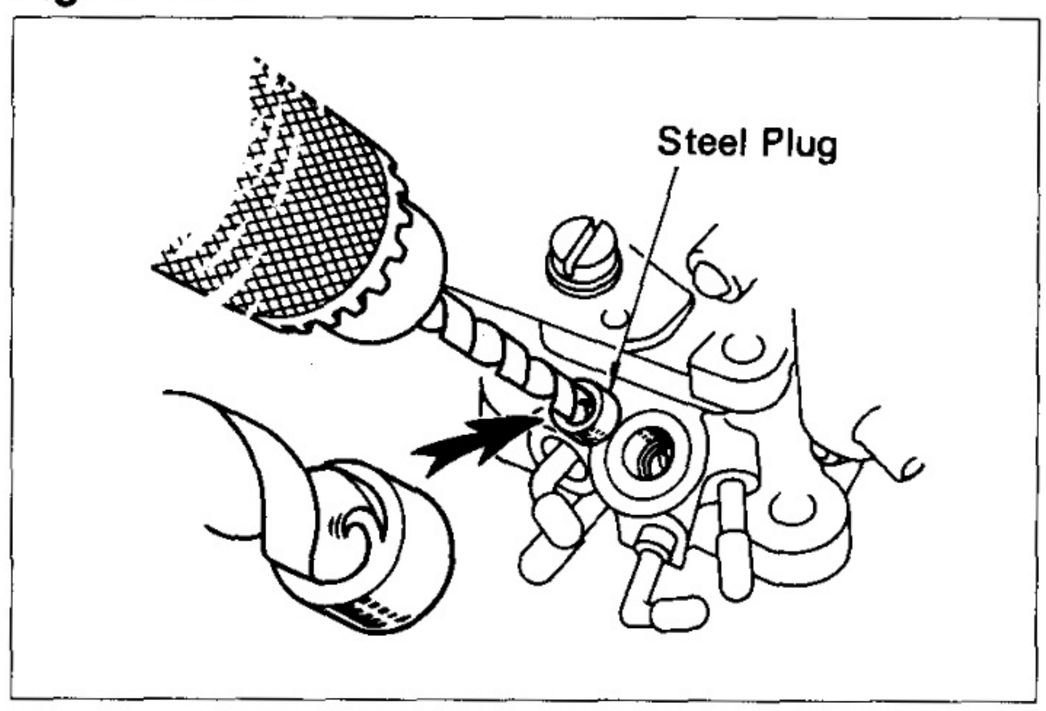


3. Through the hole in the plug, fully screw in the mixture adjusting screw with a screwdriver.

— Note —

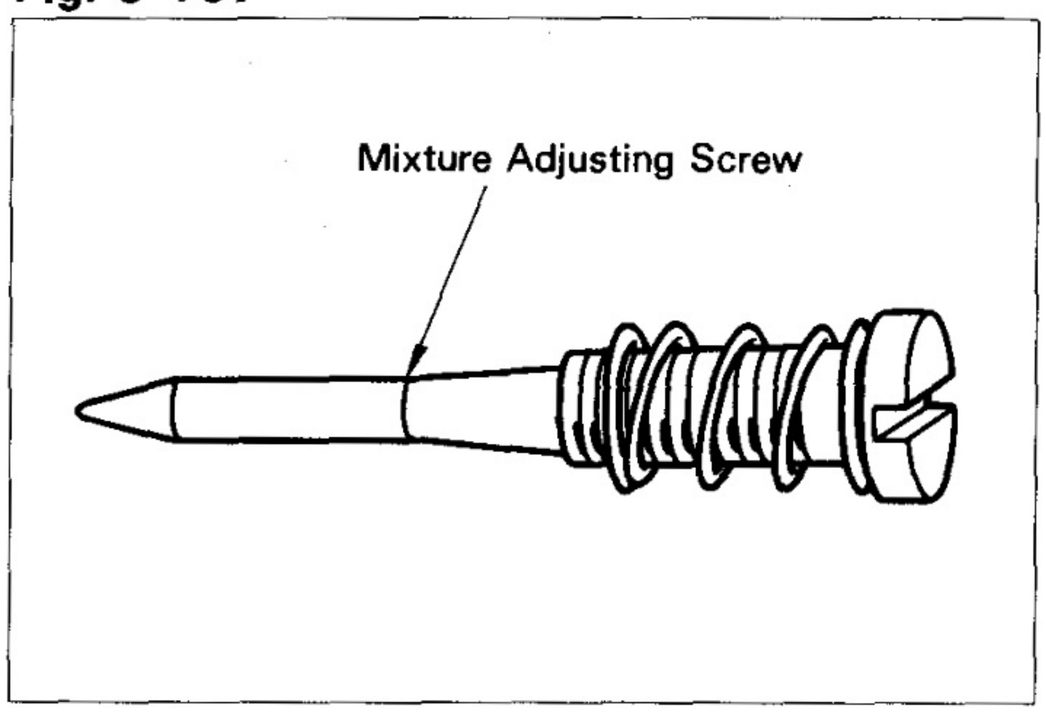
Be careful not to damage the screw tip by tightening the screw too tight.

Fig. 6-166



4. Use a 9.5 mmϕ (0.374 in.ϕ) drill to force the plug off.

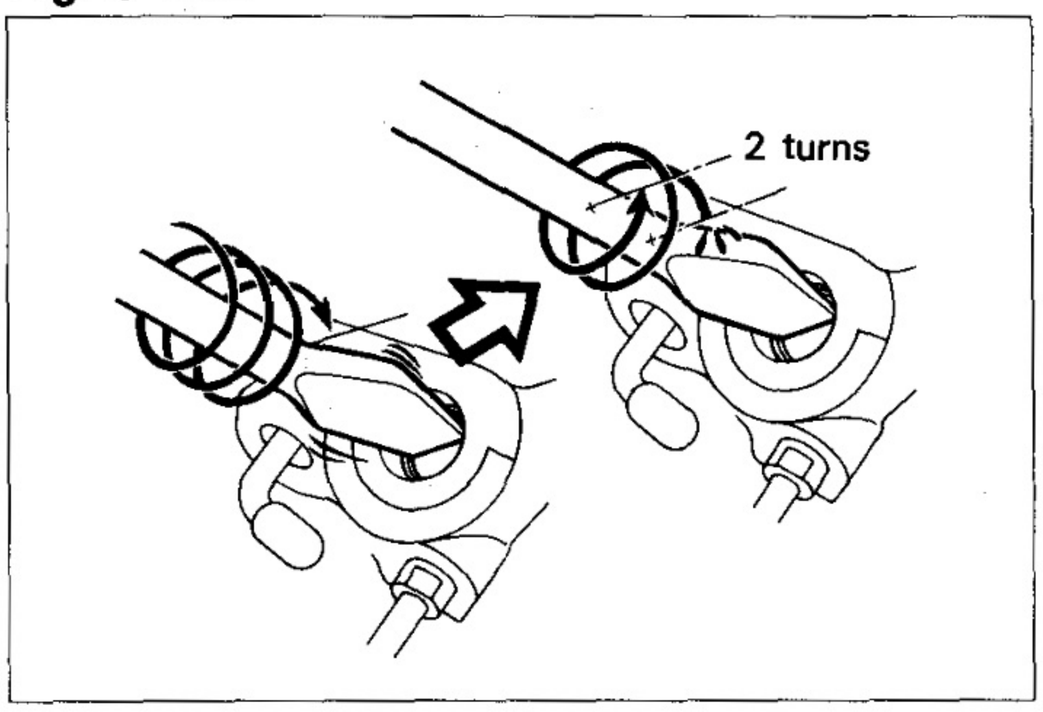
Fig. 6-167



5. Blow off any steel particles with compressed air and remove the screw.

— Note —
If the drill has gnawed into the screw tip or if the tapered position is damaged, replace the screw.

Fig. 6-168



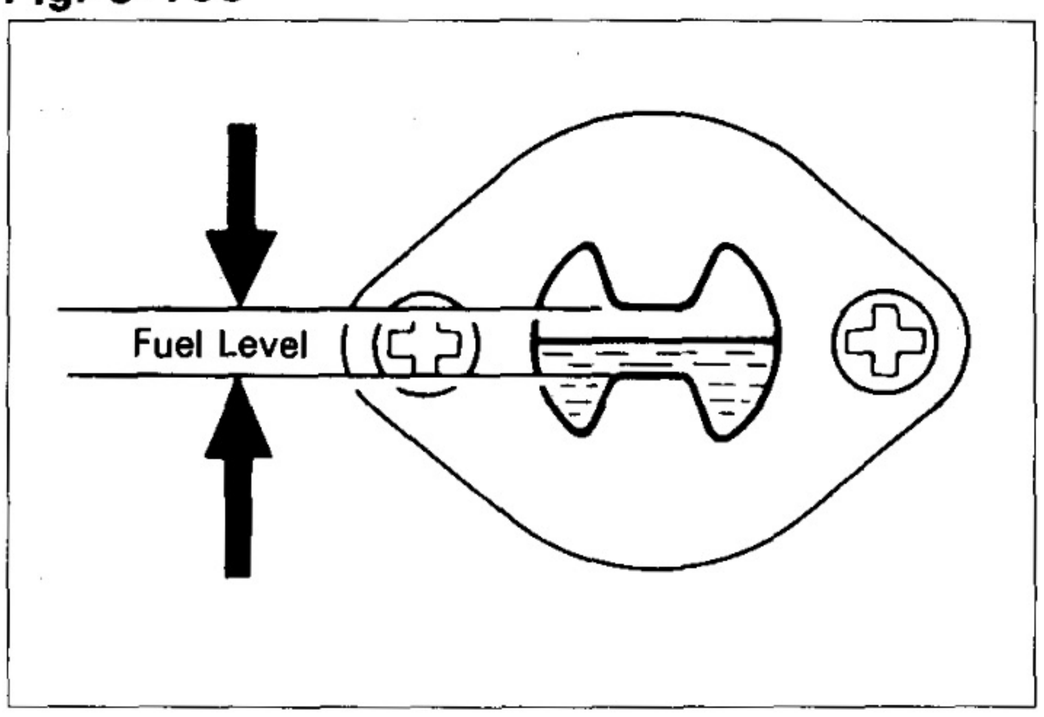
6. Fully screw in the idle mixture adjusting screw and then unscrew it about 2 turns.

— Note —
1. **Be careful not to damage the screw tip by tightening the screw too tight.**
2. **Do not install the steel plug until the idle mixture adjustment is finished.**

IDLE MIXTURE ADJUSTMENT (USA)

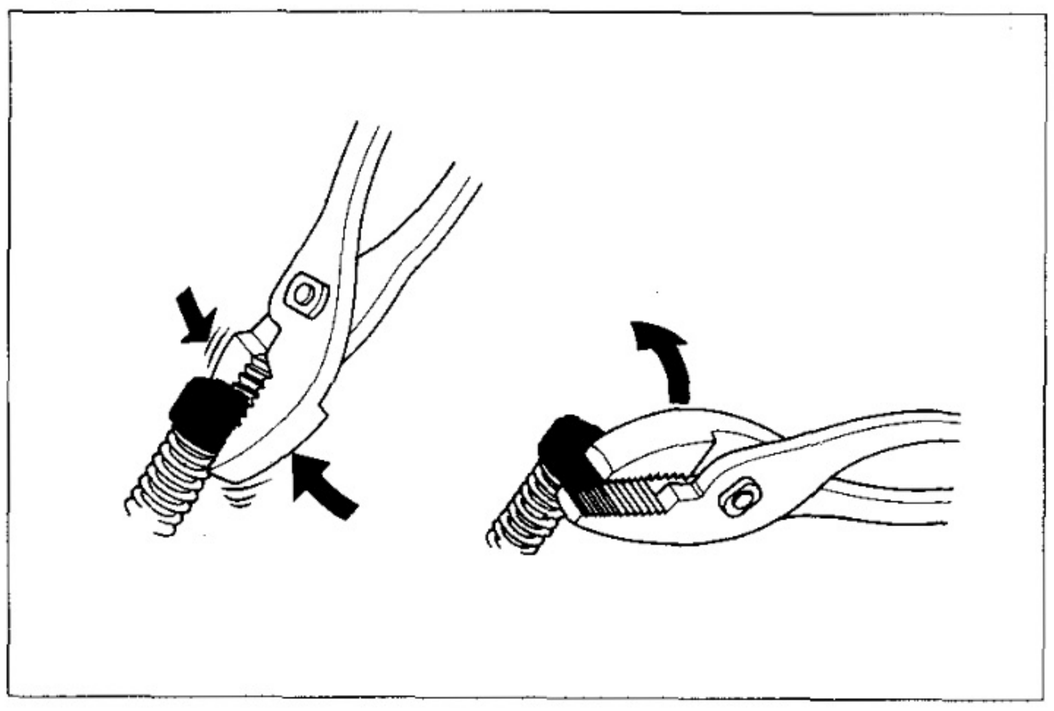
In the case of the steel plug being removed, check the idle mixture speed referring to the following procedures.

Fig. 6-169



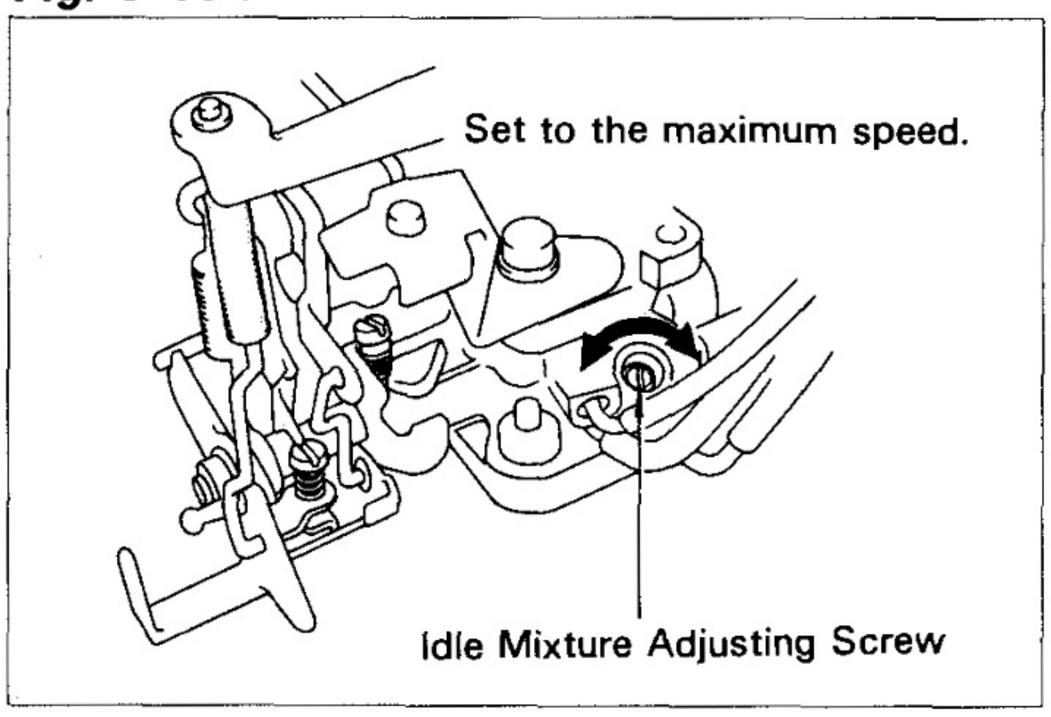
1. Check the following items before adjustment:
   (1) Air cleaner installed
   (2) Normal operating coolant temperature
   (3) Choke fully open
   (4) All accessories switched off
   (5) All vacuum lines connected
   (6) Ignition timing set correctly
   (7) Transmission in neutral
   (8) Fuel level should be about even with the correct level in the sight glass.

Fig. 6-170



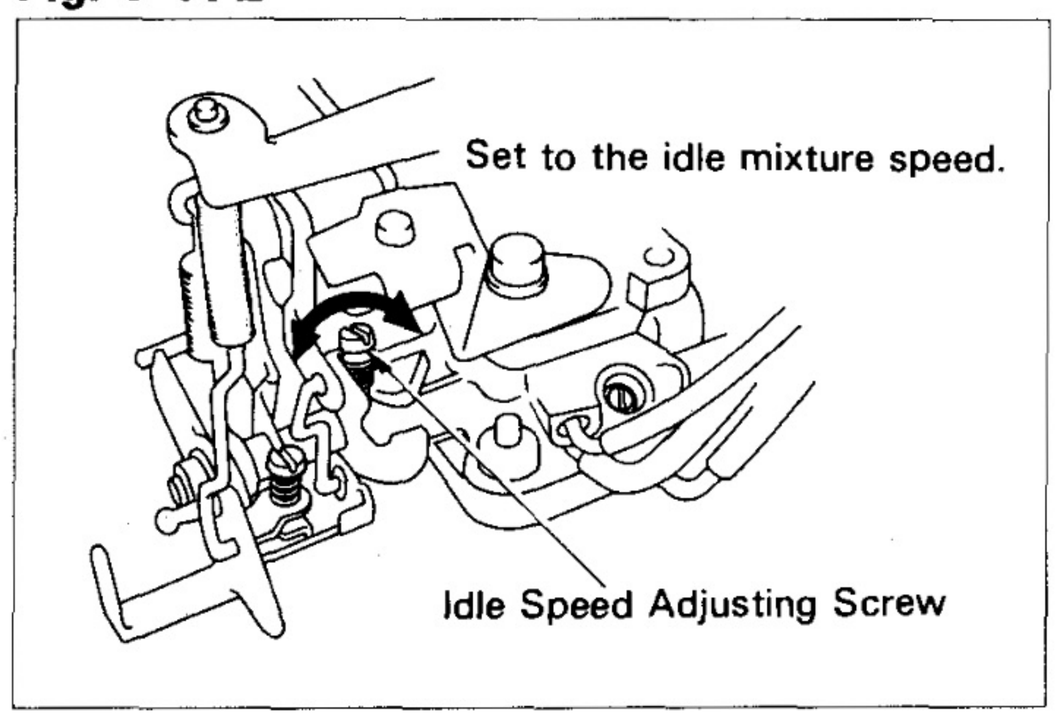
2. Break the idle limiter cap on the idle speed adjusting screw if installed.

Fig. 6-171



3. Start the engine and set to the maximum speed by turning the idle mixture adjusting screw.

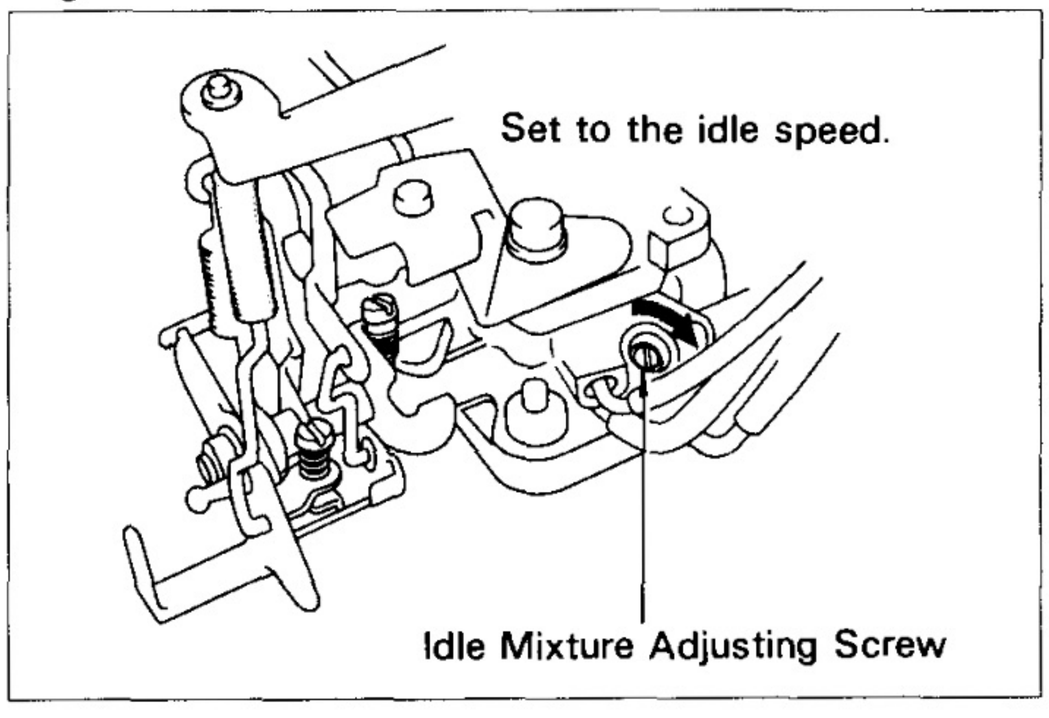
Fig. 6-172



4. Set to the idle mixture speed by turning the idle speed adjusting screw.
   Idle mixture speed: 690 rpm

– Note –
Before moving to the next step, continue adjustments 3 and 4 until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.

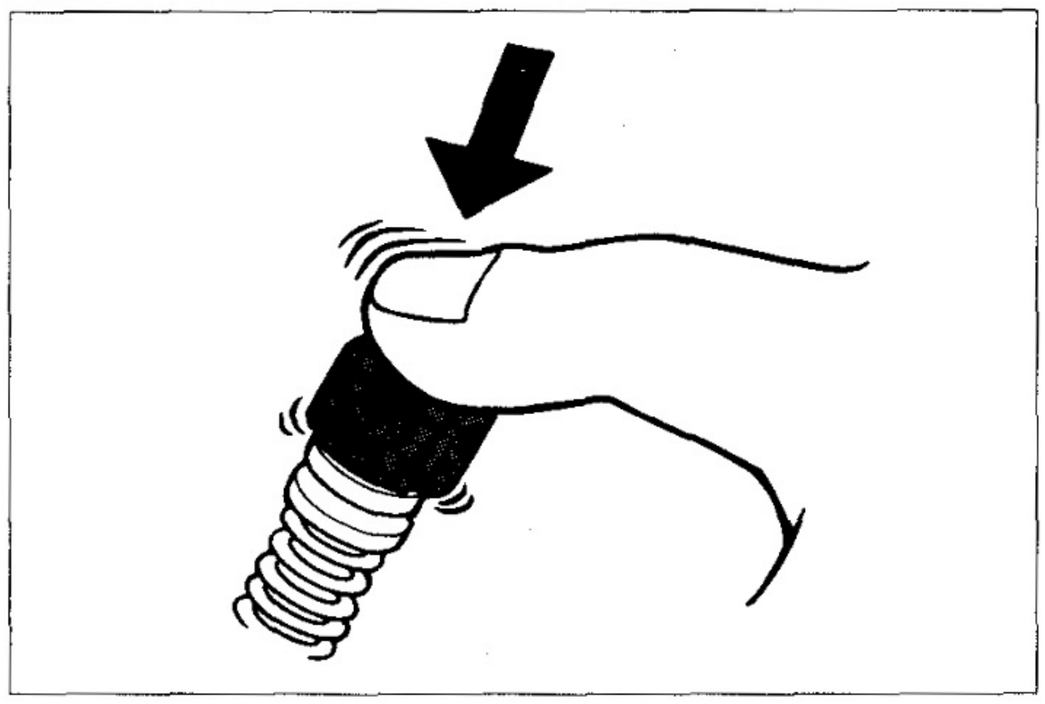
Fig. 6-173



5. Set to the idle speed by screwing in the idle mixture adjusting screw.
   Idle speed: 650 rpm

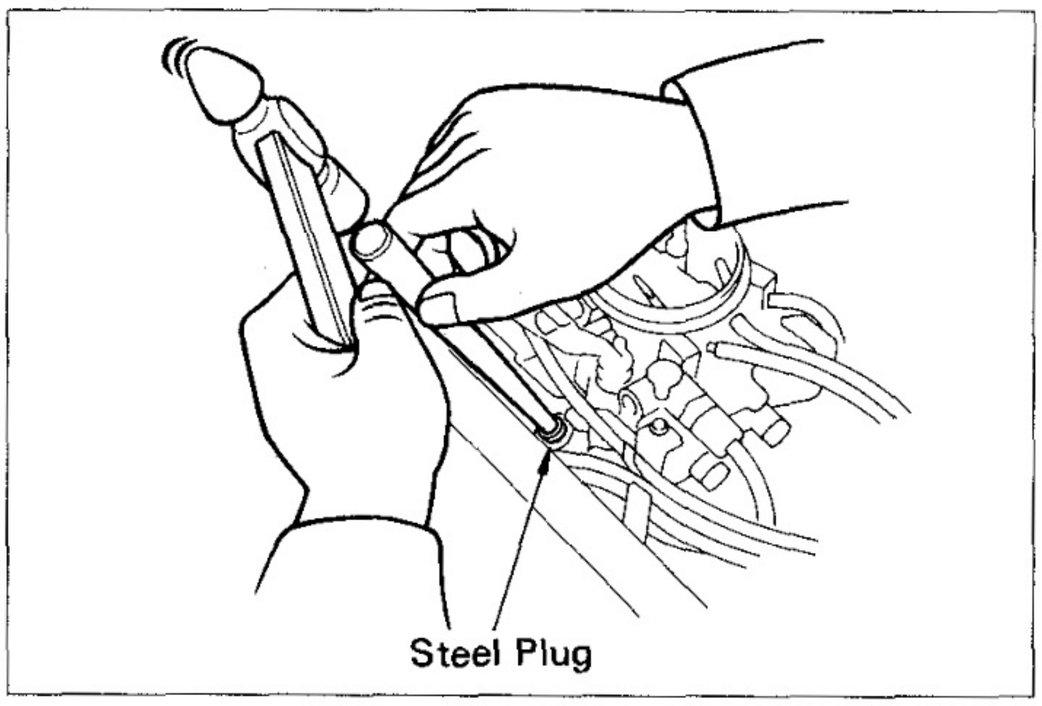
– Note –
This is the LEAN DROP METHOD for setting the idle speed and mixture.

Fig. 6-174



6. Install a new limiter cap on the idle speed adjusting screw, if one was installed.

Fig. 6-175



7. Tap in a new plug until it is even with the carburetor flange surface.

STARTING SYSTEM

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STARTING SYSTEM CIRCUIT	7-2
PERFORMANCE TEST	7-3
STARTER	7-6

STARTING SYSTEM CIRCUIT

Fig. 7-1

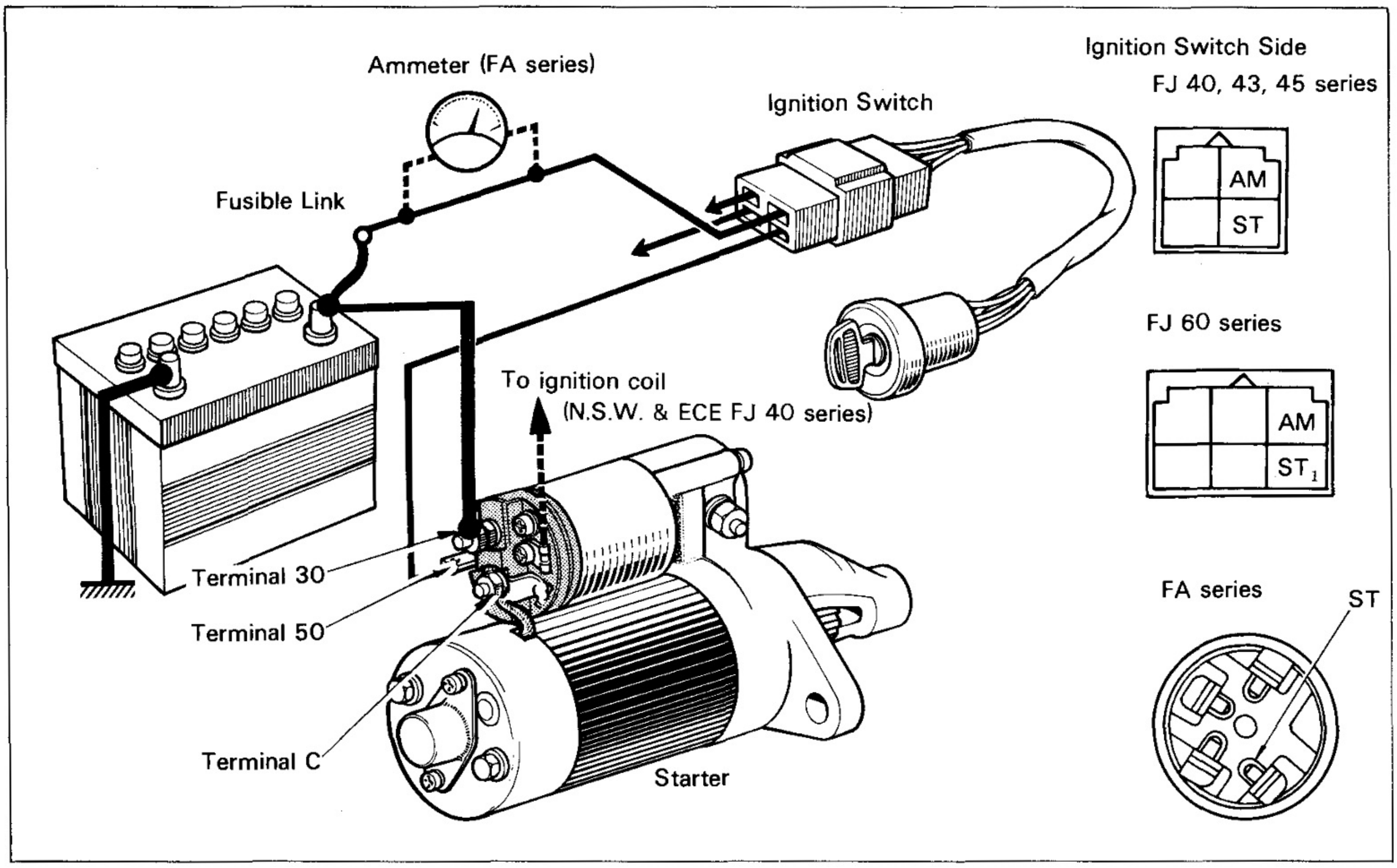
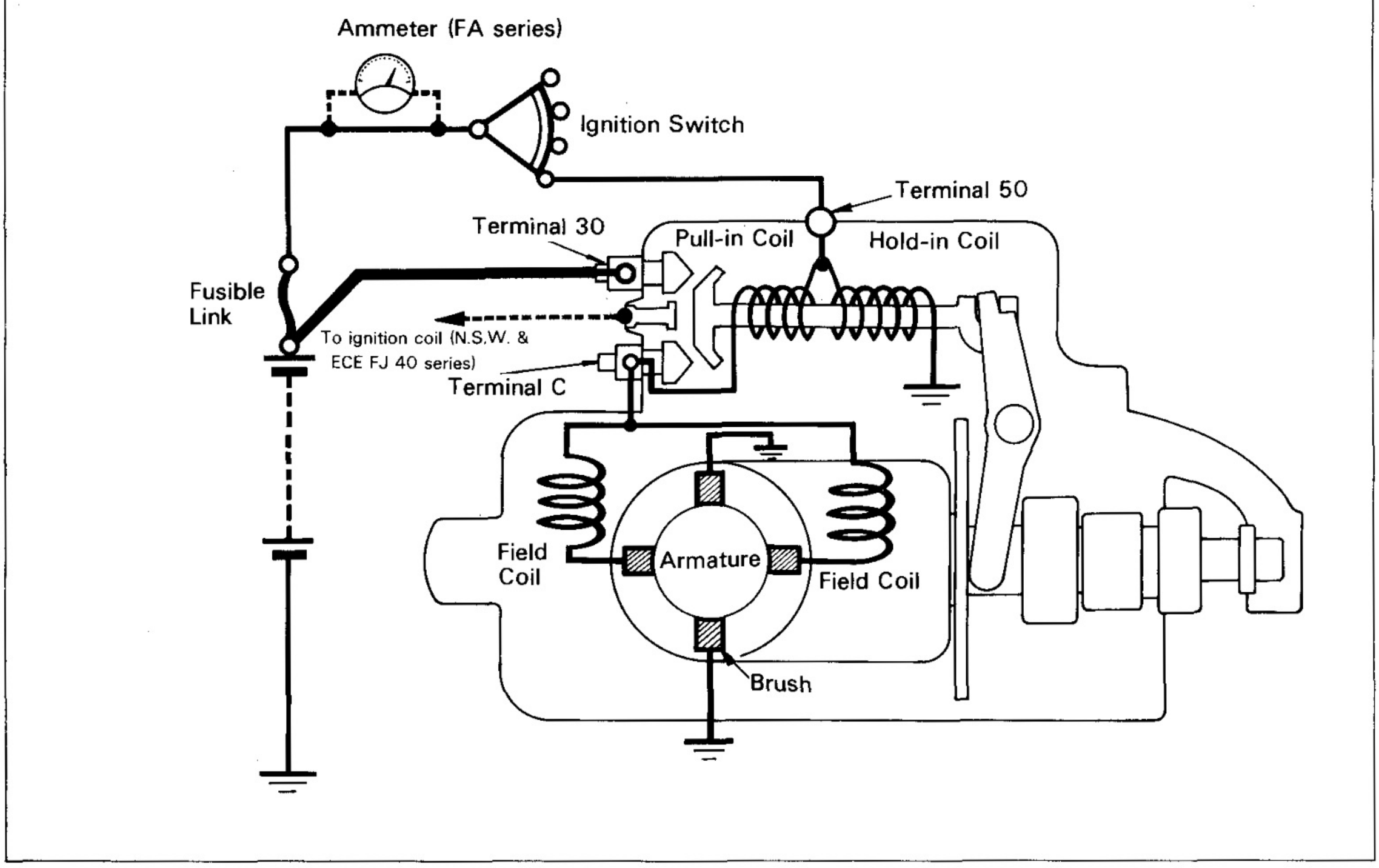


Fig. 7-2



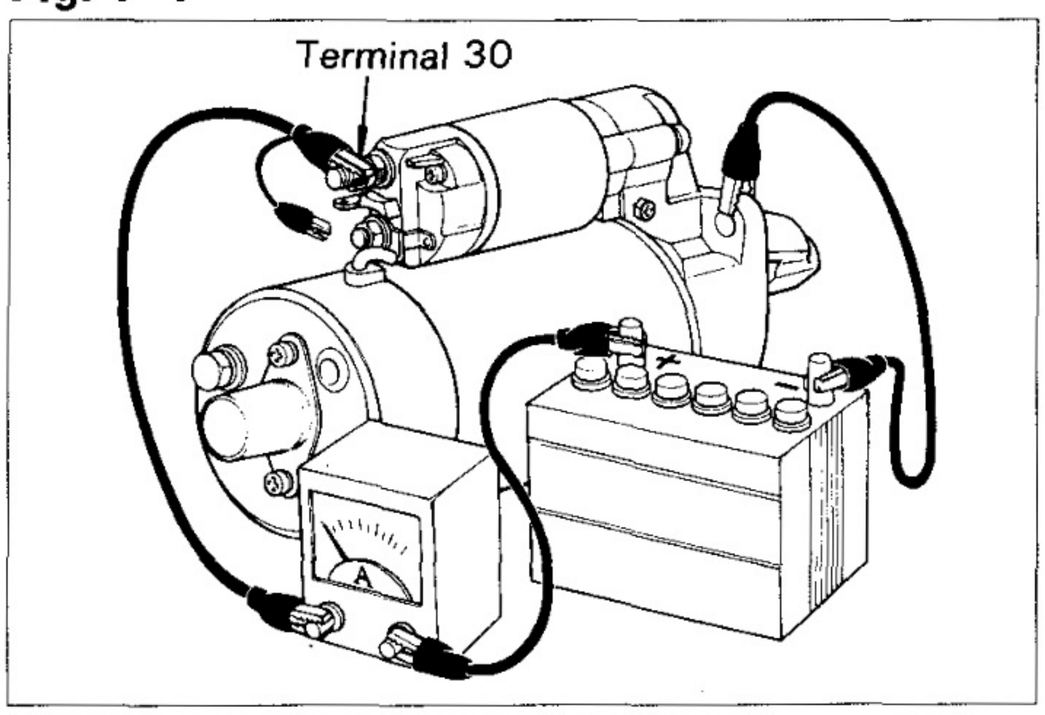


PERFORMANCE TEST

NO-LOAD PERFORMANCE TEST

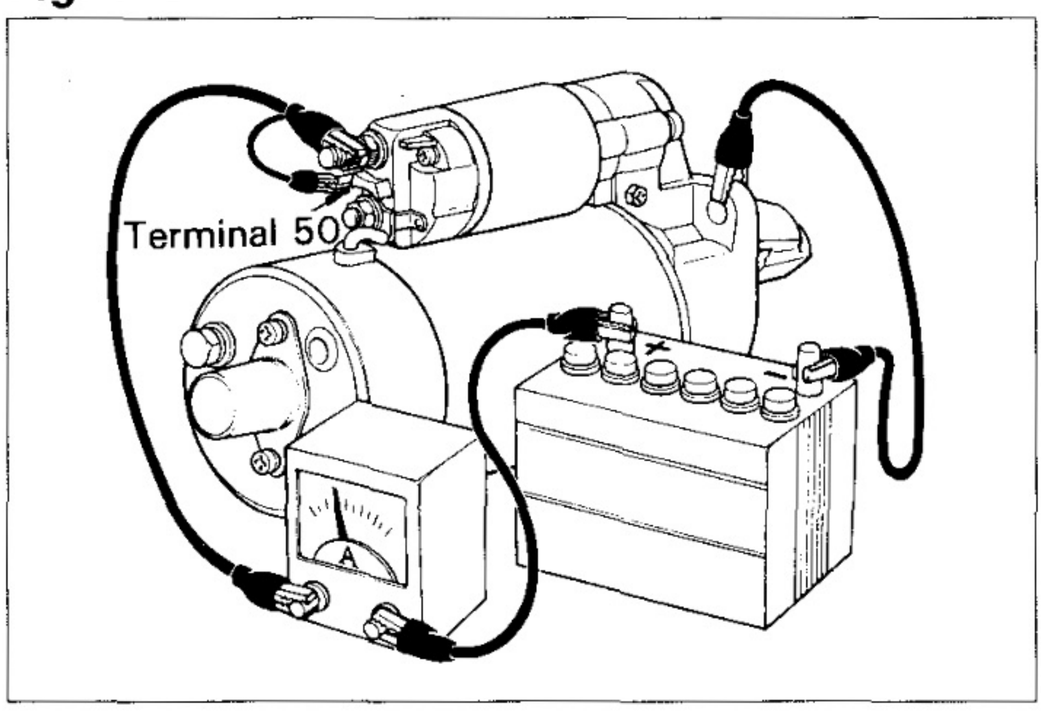
Secure the starter in a vise to prevent an accident.

Fig. 7-4



1. Connect the starter to a battery as shown in the figure.
   Positive side
   Battery ⊕ ——→ Ammeter ⊕
   Ammeter ⊖ ——→ Terminal 30
   Negative side
   Battery ⊖ ——→ Starter body

Fig. 7-5



2. Connect terminal 50.
   If the starter shows smooth and steady rotation with the pinion jumping out and drawing less than specified current, it is satisfactory.
   Specified current:
   Less than 50A (at 11.0V)

Fig. 7-6

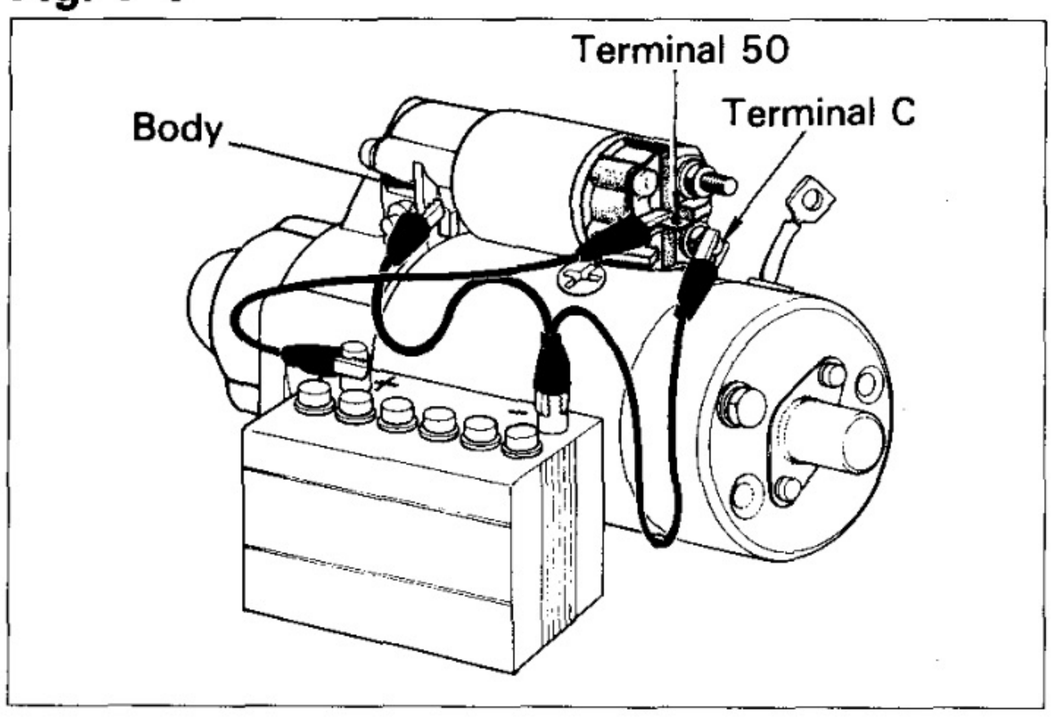


MAGNETIC SWITCH TEST

— Caution —
Each test must be performed within 3 — 5 seconds to prevent the coil from burning out.

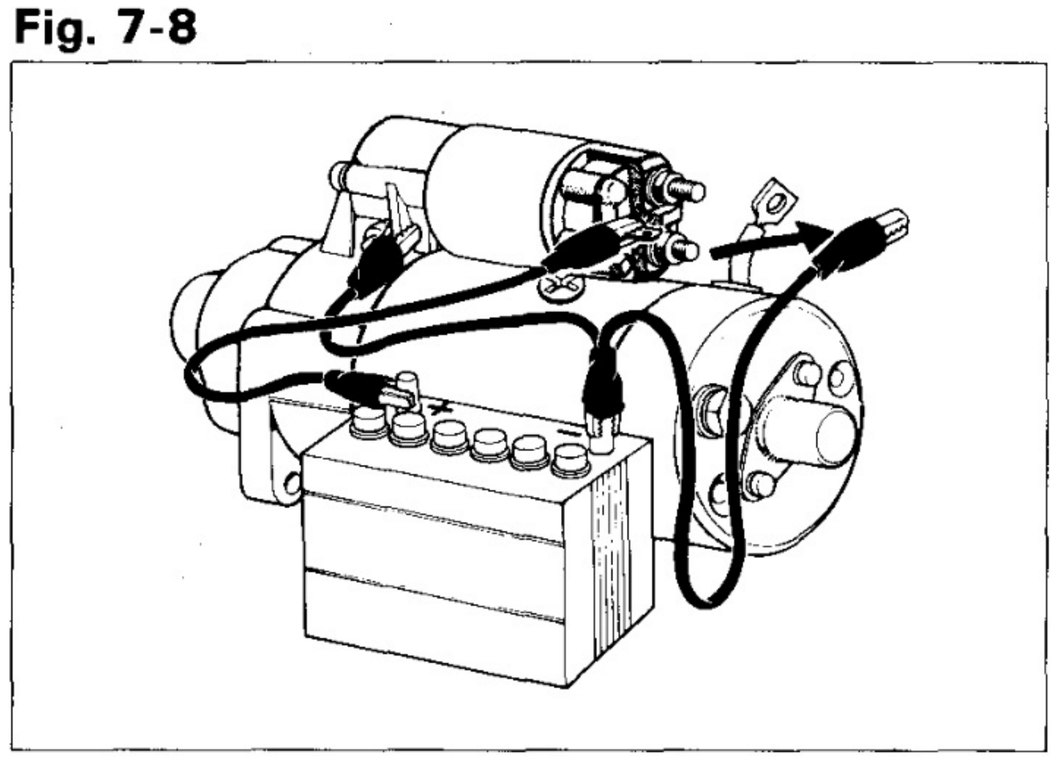
1. Disconnect terminal C.

Fig. 7-7



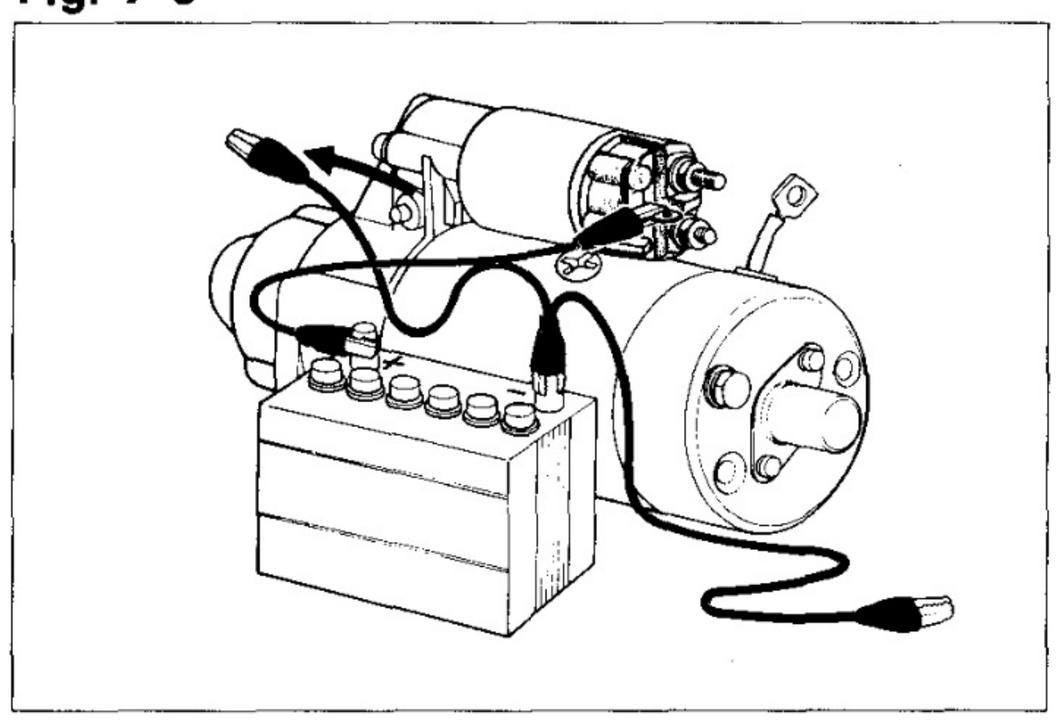
2. Pull-in test
Connect the magnetic switch to a battery as shown in the figure.
Negative side
Battery ⊖ ——→ Starter body and terminal C
Positive side
Battery ⊕ ——→ Terminal 50
If the pinion has definitely jumped out, the pull-in coil is satisfactory.

Fig. 7-8



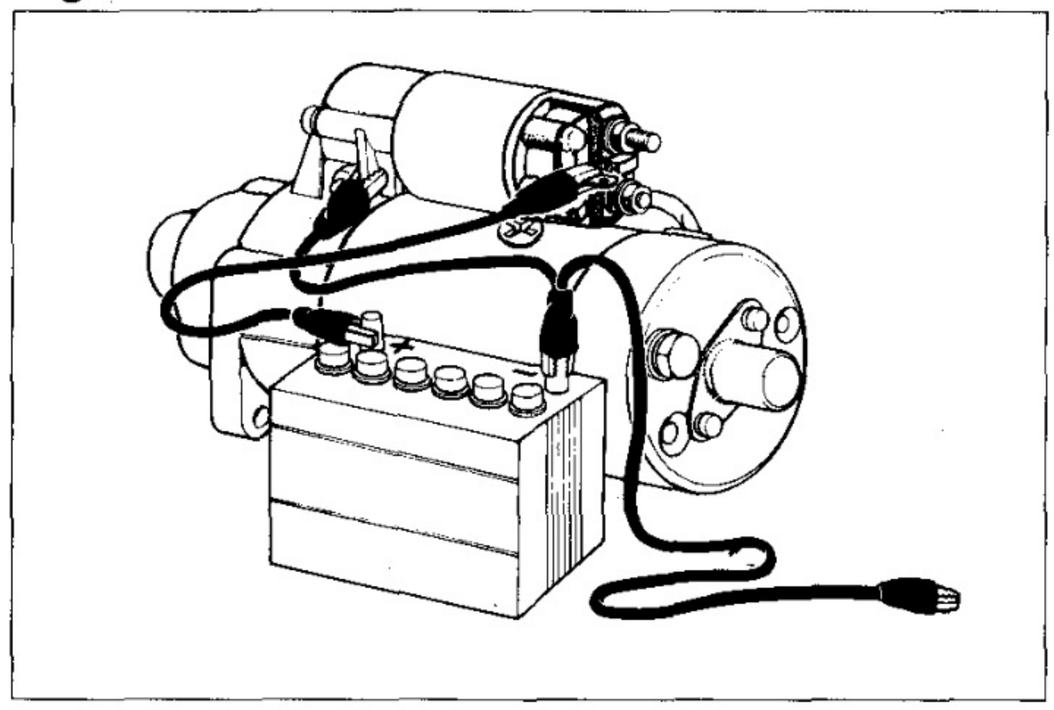
3. Hold-in test
Disconnect terminal C. The pinion should remain projected.

Fig. 7-9



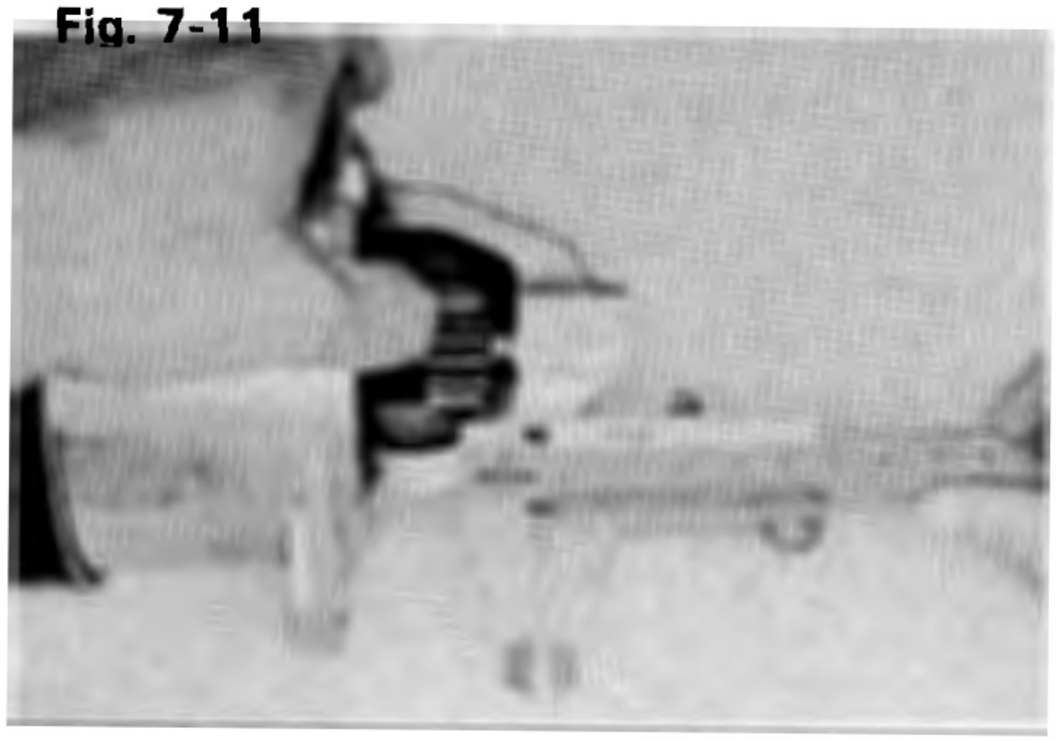
4. Check the plunger return.
When disconnecting the switch body, the pinion should return quickly.

Fig. 7-10



5. Check pinion clearance.
(1) Connect the field coil lead to terminal C.
(2) Connect the magnetic switch to a battery as shown in the figure.
Positive side
Battery ⊕ ——→ Terminal 50
Battery ⊖ ——→ Starter body

Fig. 7-11

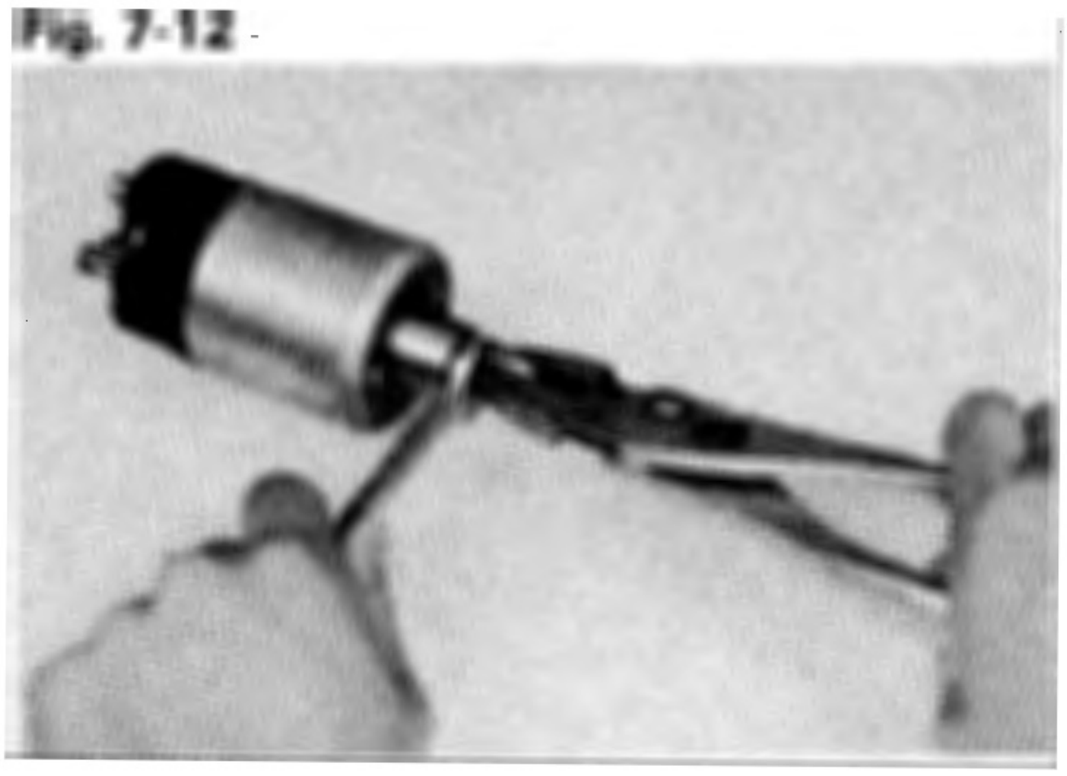


(3) Move the pinion to the armature side to eliminate slack, and check the clearance between the pinion and stop collar.

Clearance:

STD 0.1 – 4.0 mm (0.004 – 0.157 in.)

Fig. 7-12



(4) Adjust, if necessary, after loosening the lock nut.

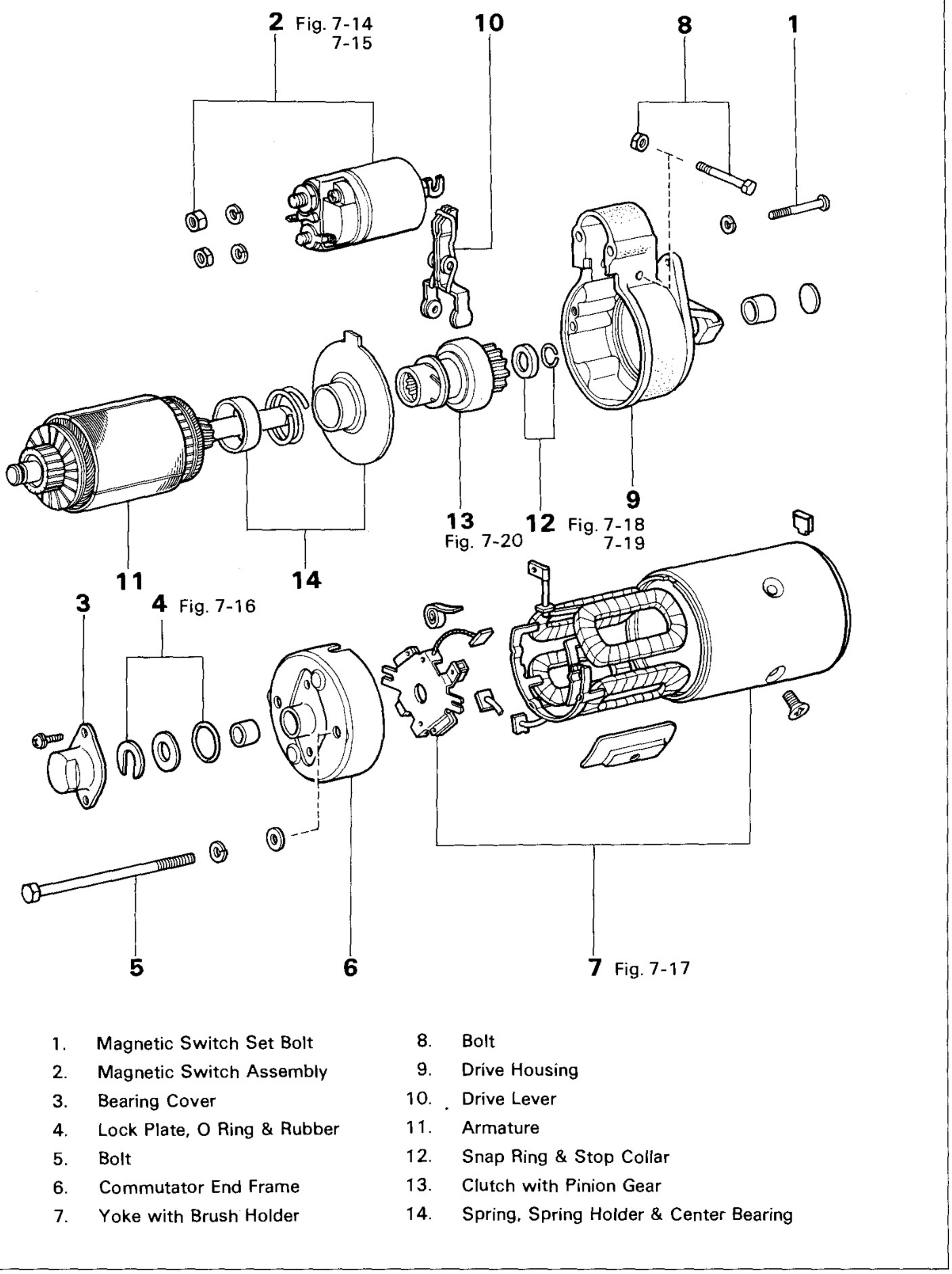
Clearance		Stud
Too large	→	Screw in
Too small	→	Screw out

STARTER

DISASSEMBLY

Disassemble the parts in the numerical order shown in the figure.

Fig. 7-13



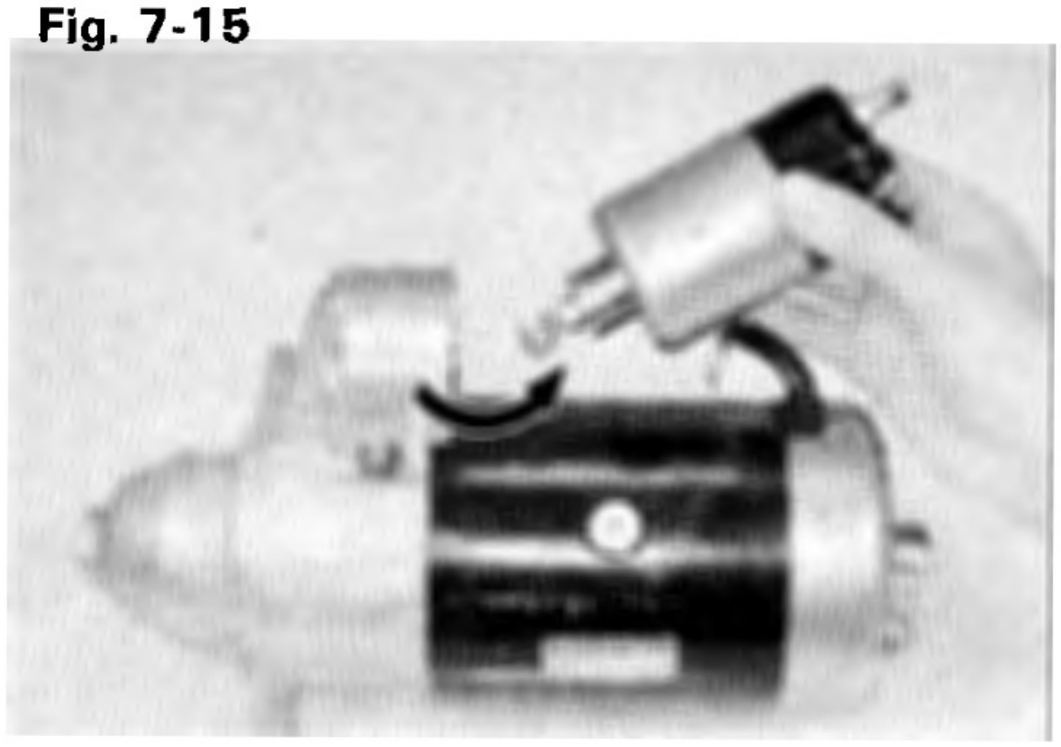
1. Magnetic Switch Set Bolt
2. Magnetic Switch Assembly
3. Bearing Cover
4. Lock Plate, O Ring & Rubber
5. Bolt
6. Commutator End Frame
7. Yoke with Brush Holder
8. Bolt
9. Drive Housing
10. Drive Lever
11. Armature
12. Snap Ring & Stop Collar
13. Clutch with Pinion Gear
14. Spring, Spring Holder & Center Bearing

Fig. 7-14



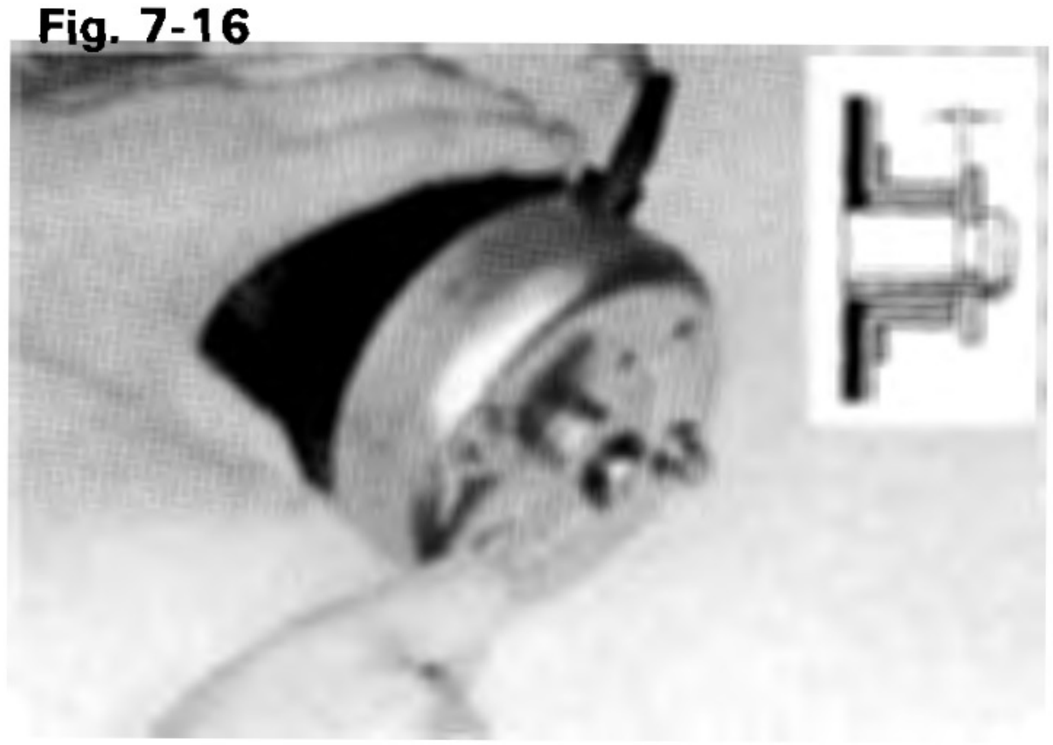
Disconnect terminal C before removing the magnetic switch.

Fig. 7-15



Remove the magnetic switch as shown in the figure.

Fig. 7-16



Measure the armature shaft thrust clearance.

Thrust clearance:

STD 0.05 – 1.00 mm (0.0020 – 0.0394 in.)

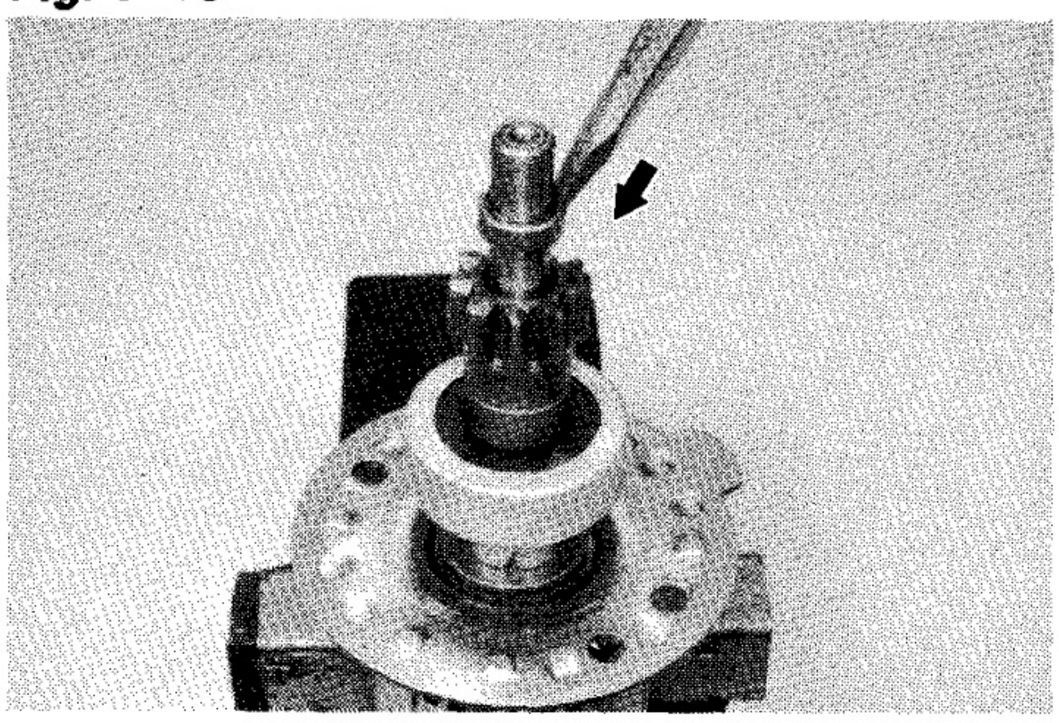
Limit 1.00 mm (0.0394 in.)

Fig. 7-17



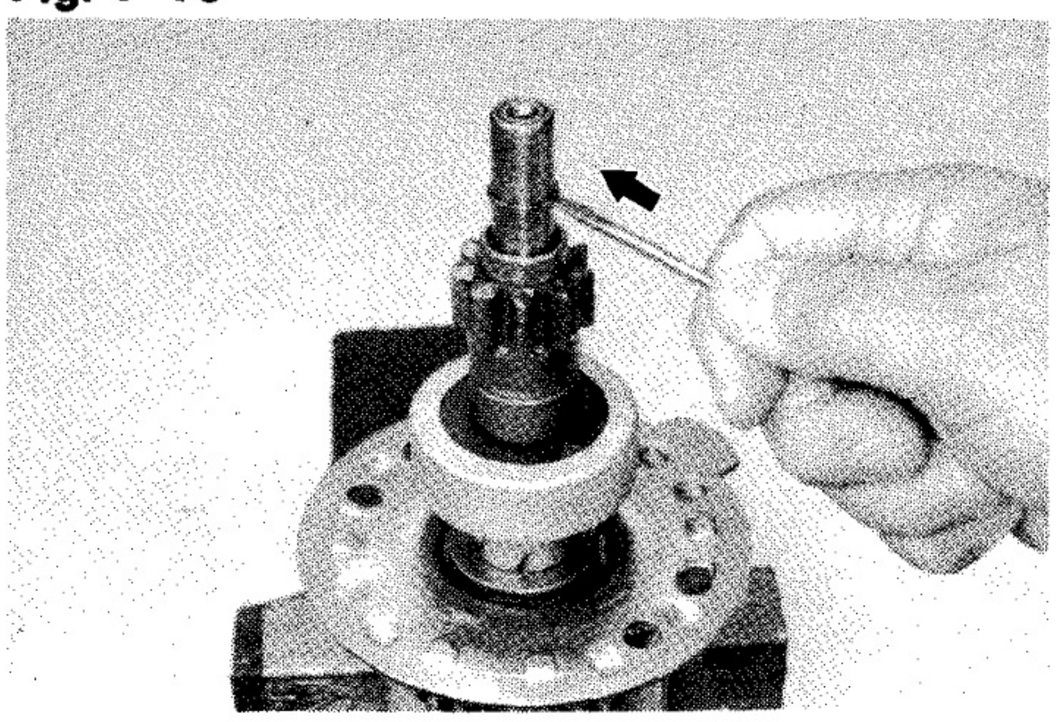
Remove the brushes from the brush holder.

Fig. 7-18



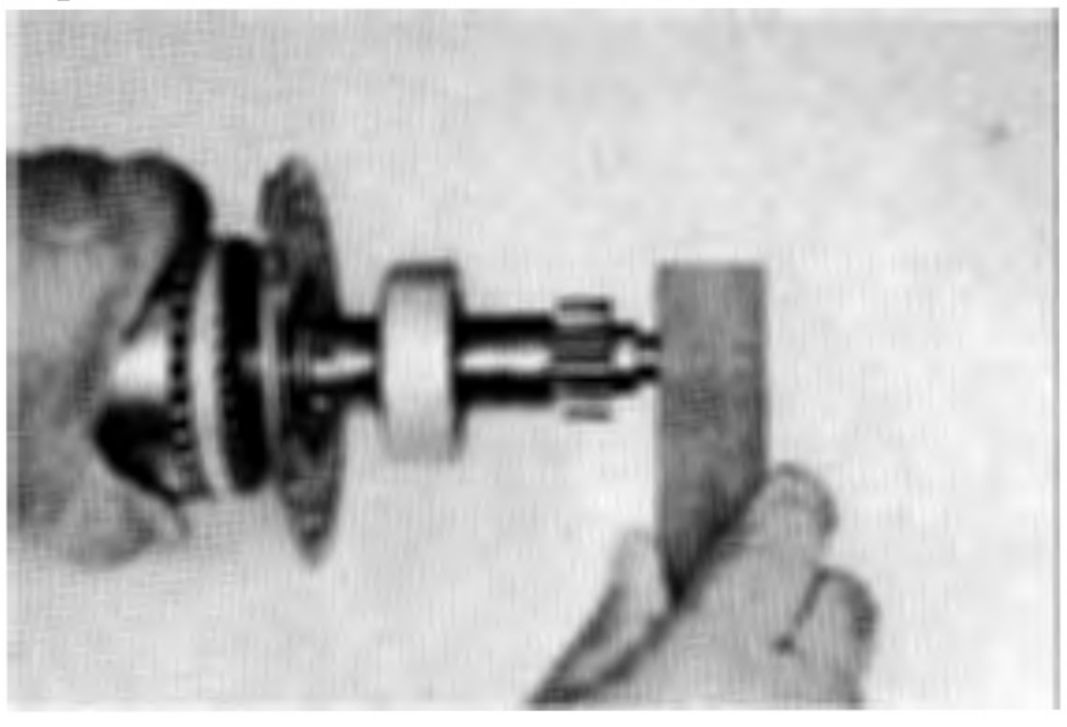
Tap in the stop collar with a screwdriver.

Fig. 7-19



Pry off the snap ring with a screwdriver and remove the stop collar.

Fig. 7-20



If the pinion was difficult to pull out, smoothen the shaft with an oil stone.

Fig. 7-21



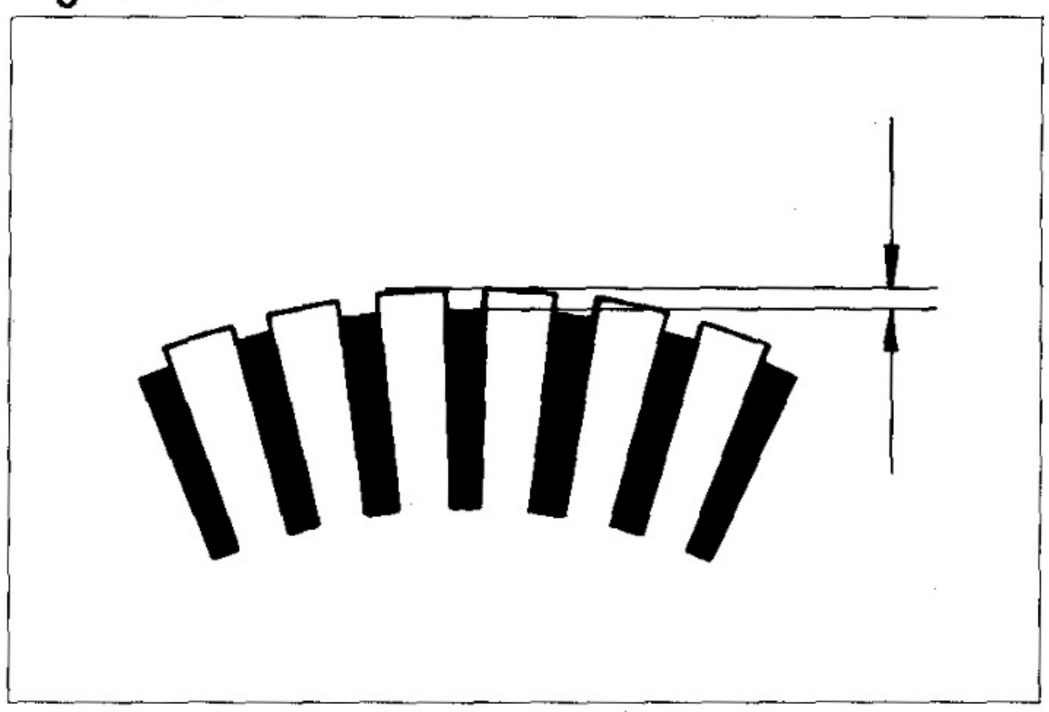
INSPECTION & REPAIR

Commutator

Check for the following and repair or replace, if necessary.

1. Dirty or burnt surface
   Correct with sandpaper if necessary.

Fig. 7-22



2. Depth of segment mica

Mica depth:

STD	**0.4 – 0.8 mm (0.016 – 0.031 in.)**
Limit	**0.2 mm (0.008 in.)**

Fig. 7-23



3. Repair the segment mica
   (1) If the mica depth is below the limit, correct with a hacksaw blade.

Fig. 7-24



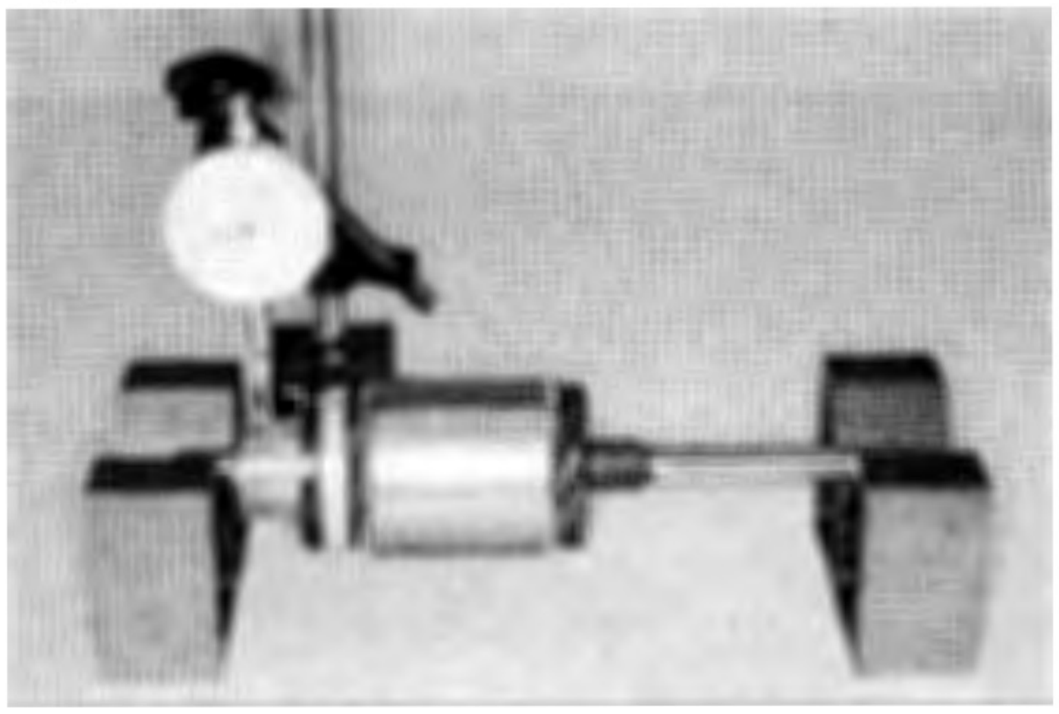
(2) Smooth out the edges with a hacksaw blade.

Fig. 7-25



(3) Use #400 sandpaper to smooth the commutator surface.

Fig. 7-26



4. Runout
Correct on a lathe if it exceeds the limit.

Runout:

STD	**Less than 0.1 mm (0.004 in.)**
Limit	**0.3 mm (0.012 in.)**

Fig. 7-27



5. Surface wear
Replace the armature if below the limit.

Commutator outer diameter:

STD	**32.7 mm (1.287 in.)**
Limit	**31 mm (1.22 in.)**

Fig. 7-28



Armature Coil

1. Ground test
Check the commutator and armature coil core. If there is continuity, the armature is grounded and must be replaced.

Fig. 7-29



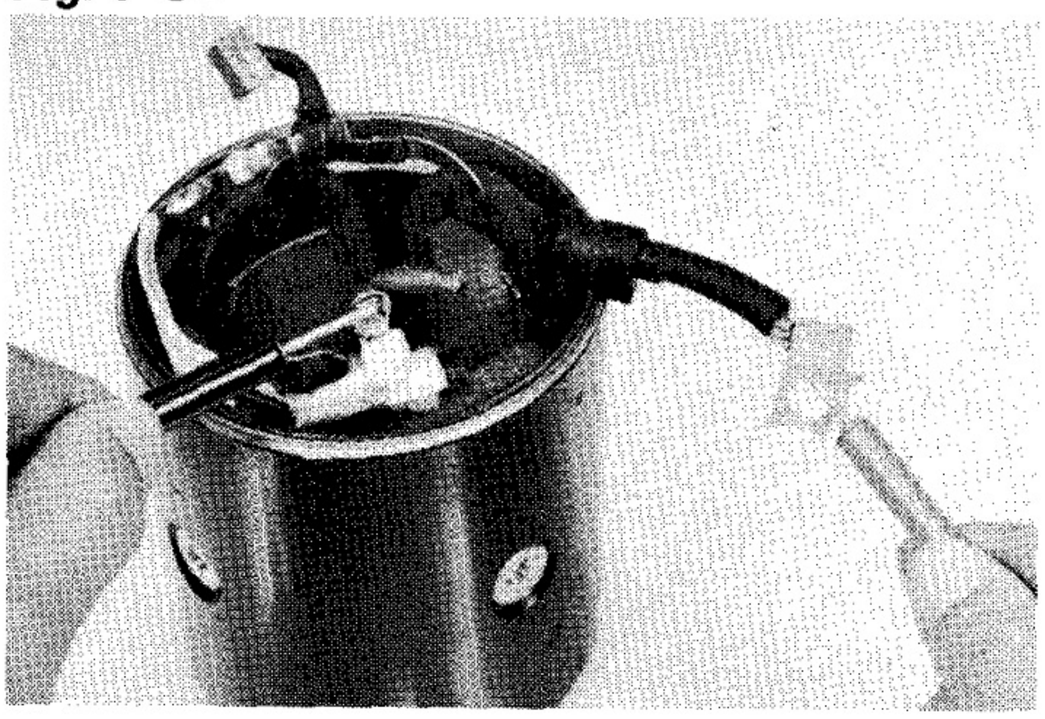
2. Short circuit test
Place the armature on an armature tester and hold a hacksaw blade against the armature core while turning the armature. If the hacksaw blade is attracted or vibrates, the armature is shorted and must be replaced.

Fig. 7-30



3. Solder condition
Check for continuity between the commutator and armature coil.

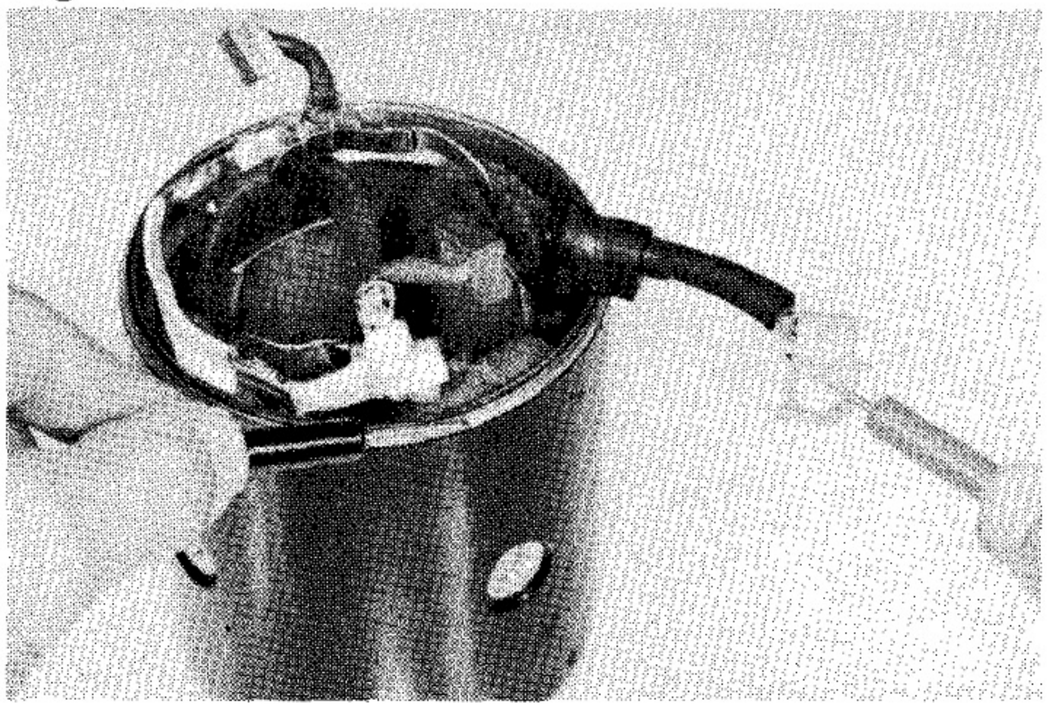
Fig. 7-31



Field Coil

1. Open circuit test
Check for continuity between the lead wire and soldered connection of the field coil brush. If there is no continuity, there is an open circuit in the field coil and it should be replaced.

Fig. 7-32



2. Ground test
Check for continuity between the field coil end and field frame.
If there is continuity, repair or replace the field coil.

Fig. 7-33



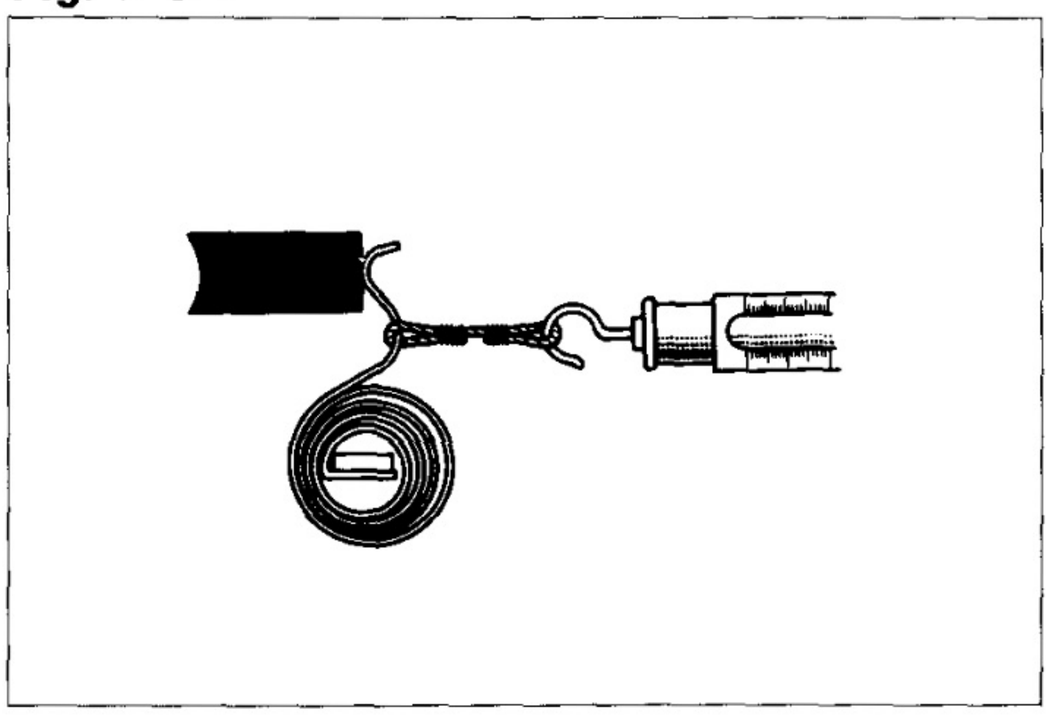
Brush

Measure the brush length and replace if below the limit.

Brush length:

STD	**19 mm (0.75 in.)**
Limit	**10 mm (0.39 in.)**

Fig. 7-34



Brush Spring

Measure the brush spring load with a pull scale. If the reading is below the specified value, replace the spring.

Tension: 1.02 – 1.38 kg (2.2 – 3.0 lb)

– Note –

Take the pull scale reading at the very instant the brush spring separates from the brush.

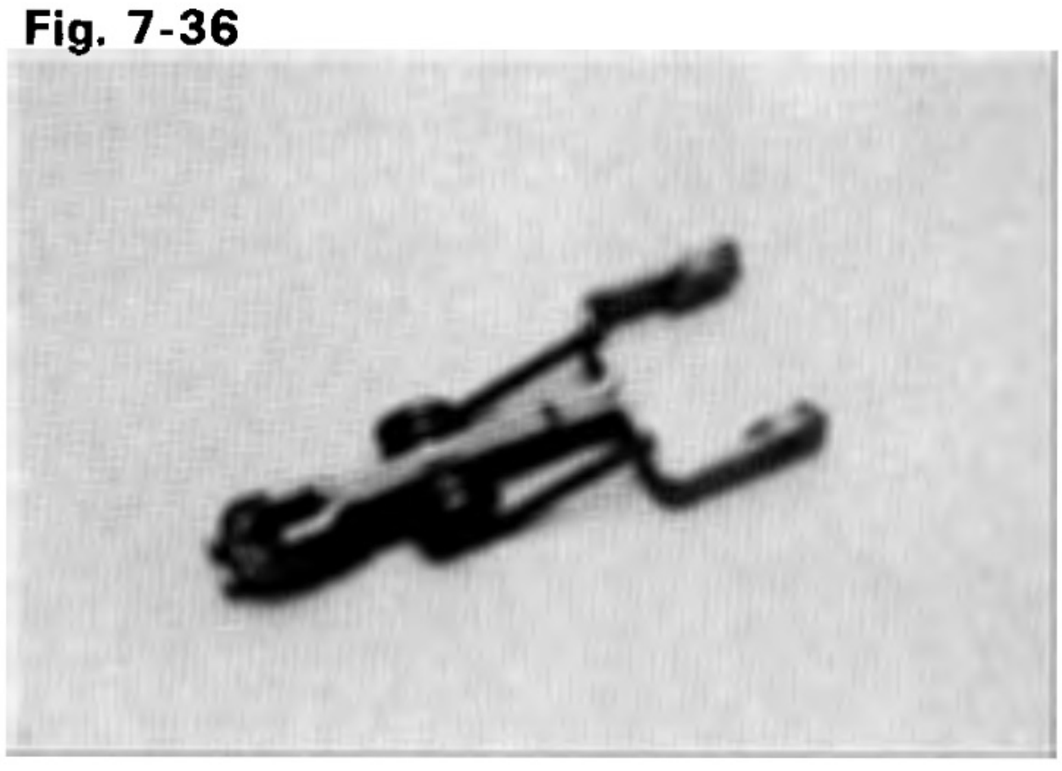
Fig. 7-35



Brush Holder

Check the insulation between the ⊖ brush holder and ⊕ brush holder. Repair or replace, if continuity is indicated.

Fig. 7-36



Drive Lever

Check the drive lever and spring for wear. Replace, if necessary.

Fig. 7-37



Starter Clutch & Pinion Gear

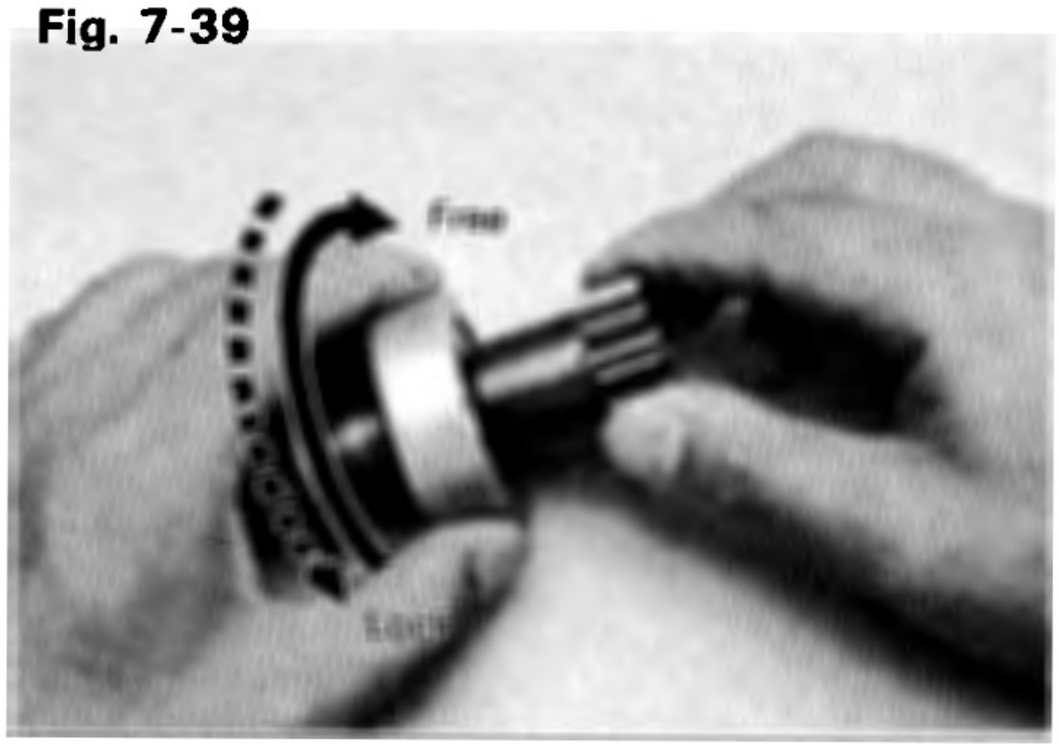
1. Check the spline teeth for wear or damage. Replace, if necessary.
2. Check the pinion for smooth movement.

Fig. 7-38



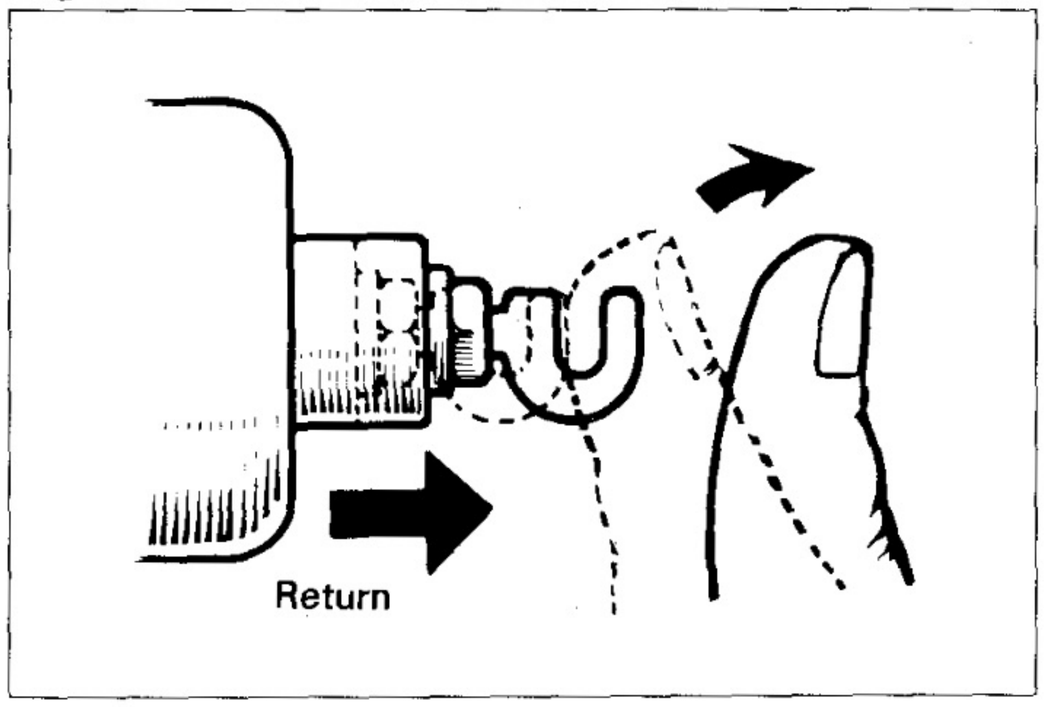
3. Check the pinion gear teeth and the chamfer for wear or damage.

Fig. 7-39



4. Rotate the pinion. It should turn free in clockwise direction but lock when turned counterclockwise.

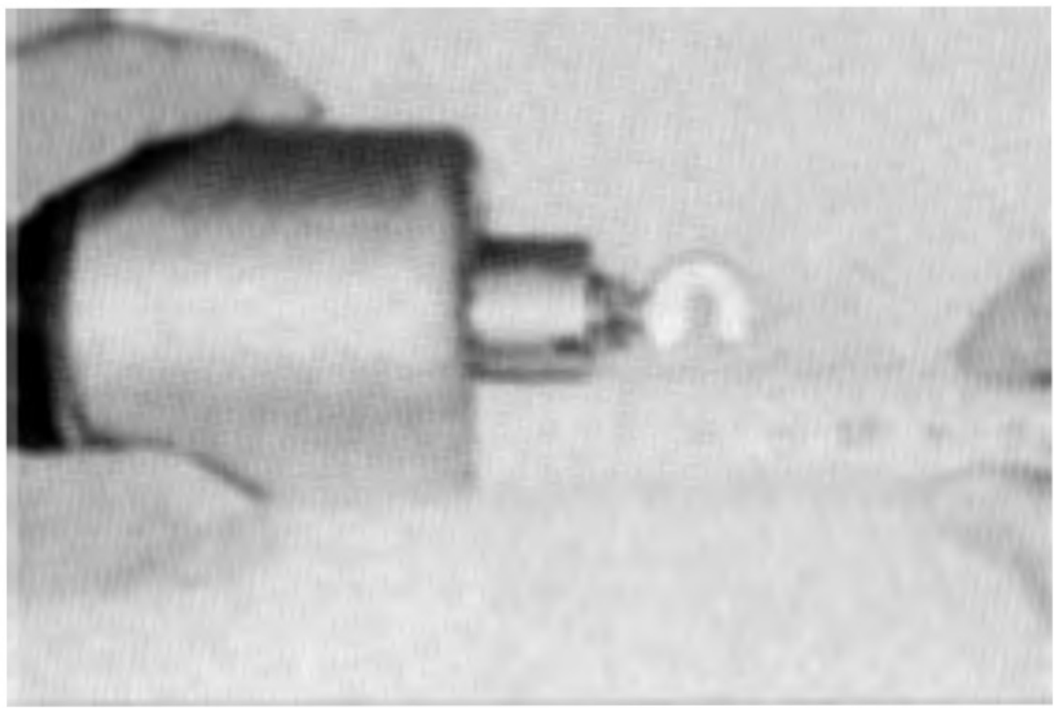
Fig. 7-40



Magnetic Switch

1. Push in the plunger and release it.
   The plunger should return quickly to its original position.

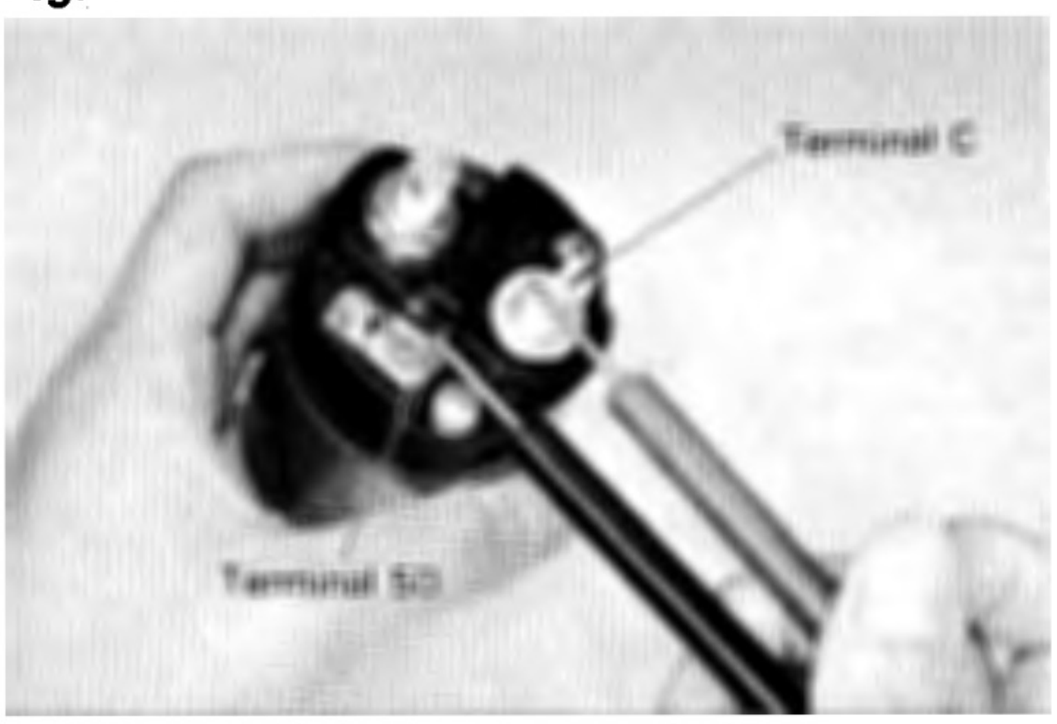
Fig. 7-41



2. Measure and adjust the distance from the switch mounting surface to the stud end.

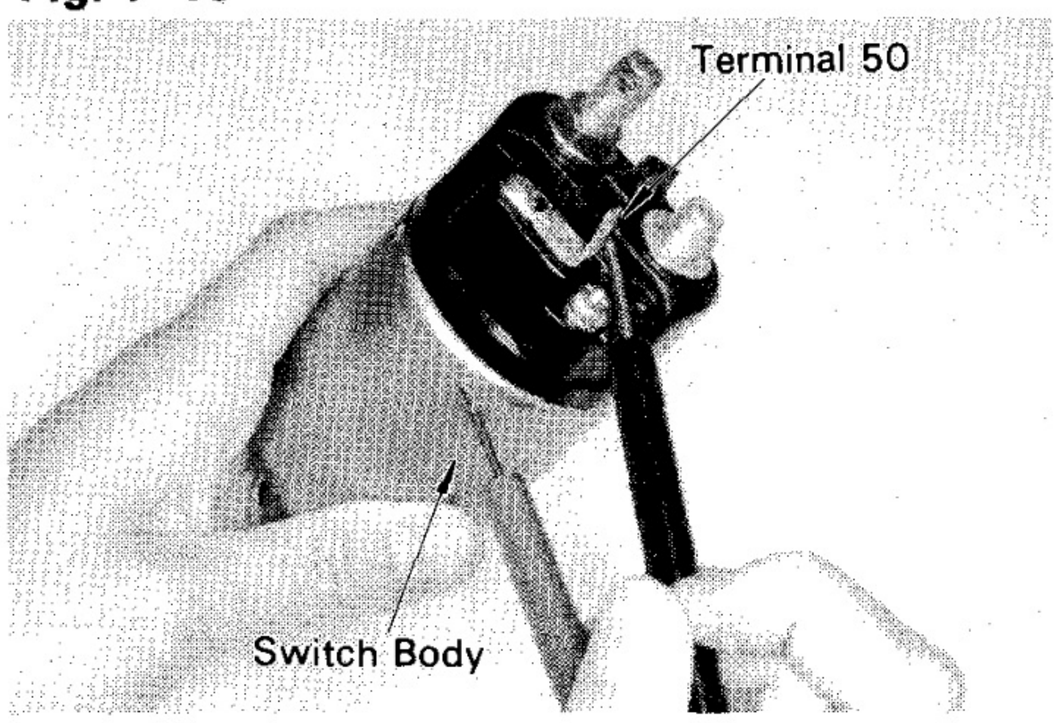
Moving stud length:
STD 34 mm
(1.34 in.)
(Reference only)

Fig. 7-42



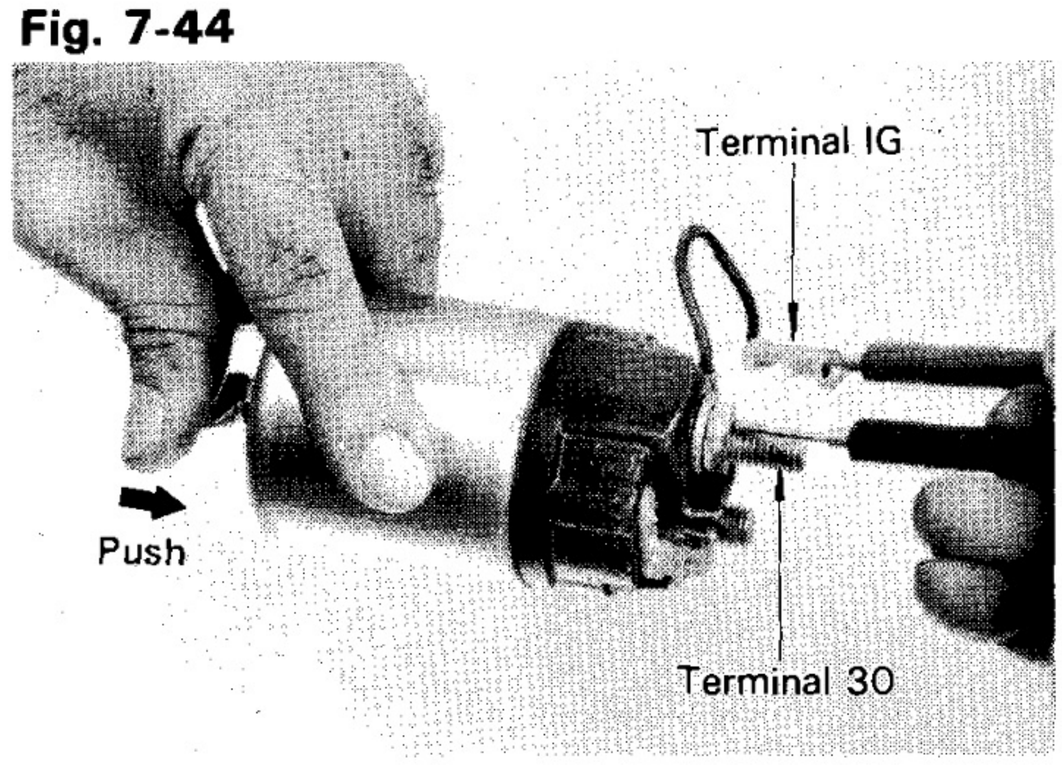
3. Pull-in coil open circuit test
Check for continuity between terminal 50 and terminal C.

Fig. 7-43



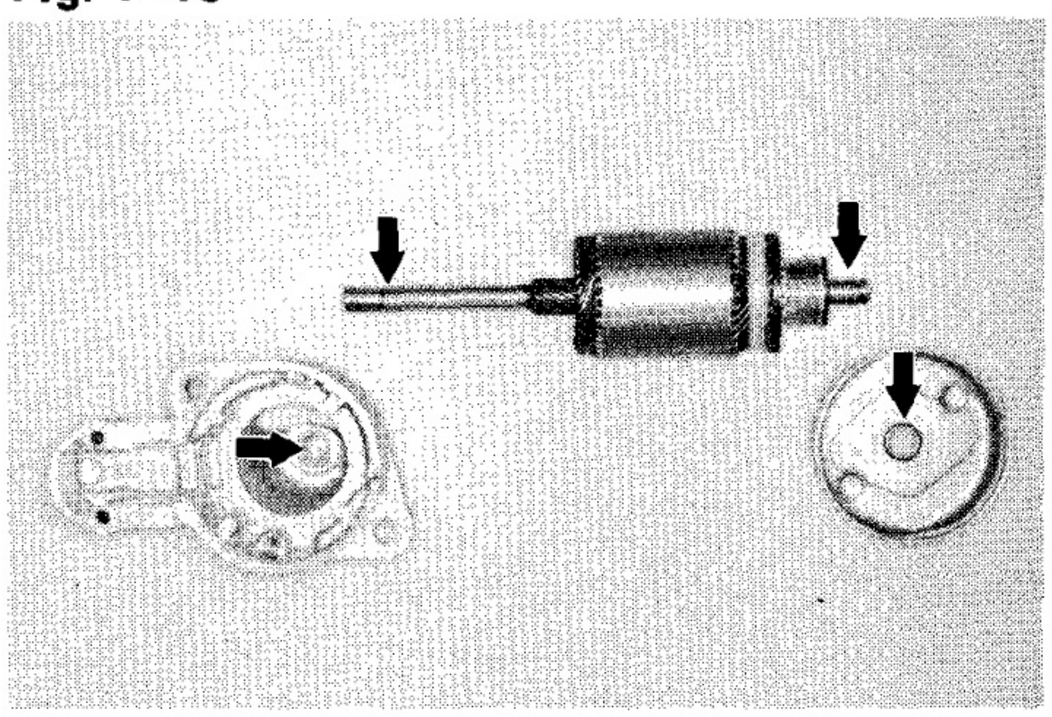
4. Hold-in coil open circuit test
Check for continuity between terminal 50 and the switch body.

Fig. 7-44



5. Terminal IG continuity test (N.S.W. & ECE FJ 40 series)
Push in plunger until it stops. Check for continuity between terminal 30 and the lead wire.

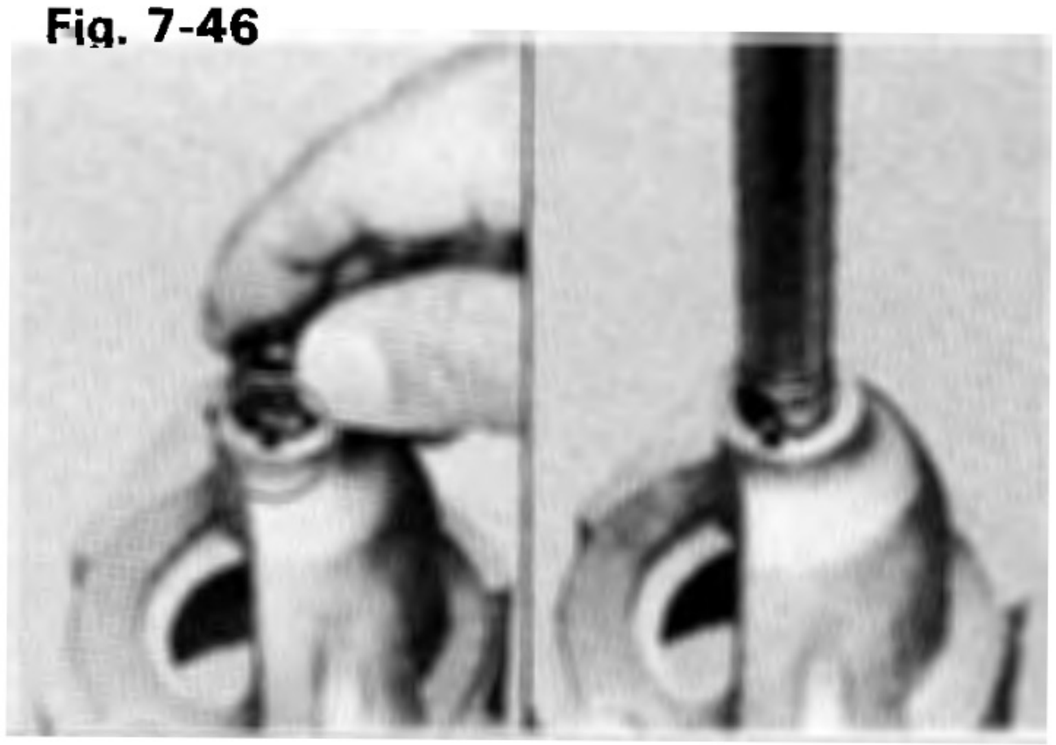
Fig. 7-45



Armature Shaft, Bushing & Center Bearing

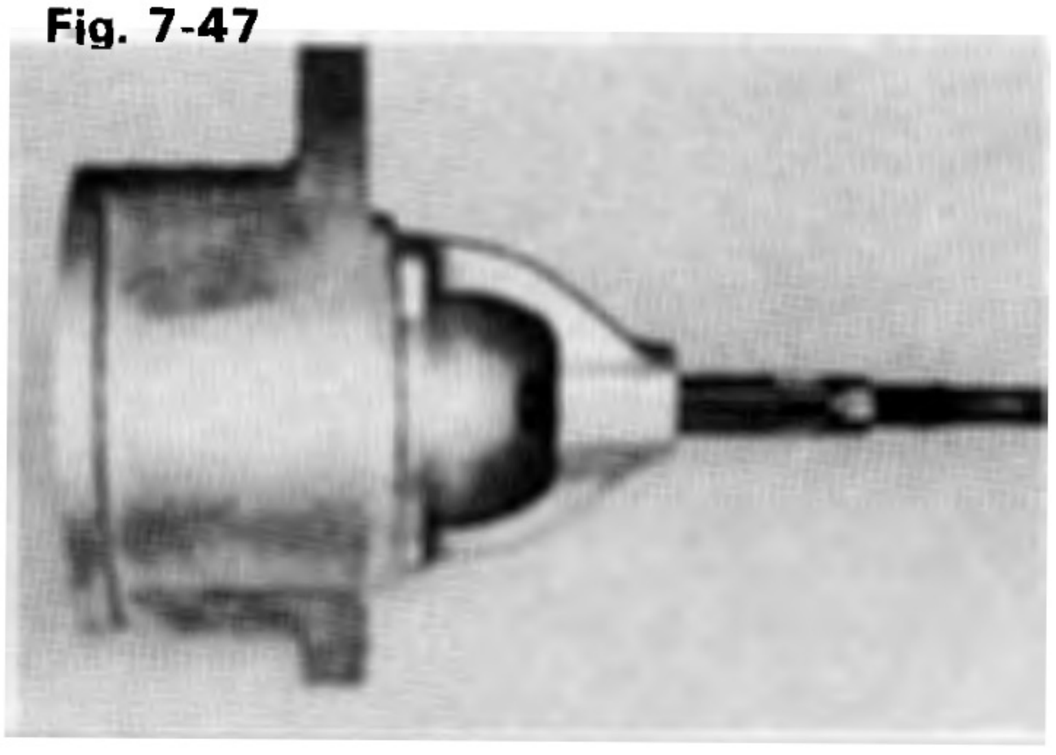
1. Inspect the armature shaft, drive housing bushing and end frame bushing for wear or damage.

Fig. 7-46



2. Replace the drive housing bushing and end frame bushing if any contact is suspected.
   (1) Pry out the bushing cover and press out the bushing.
   (2) Aligning the bushing hole with the housing groove, press in a new bushing.

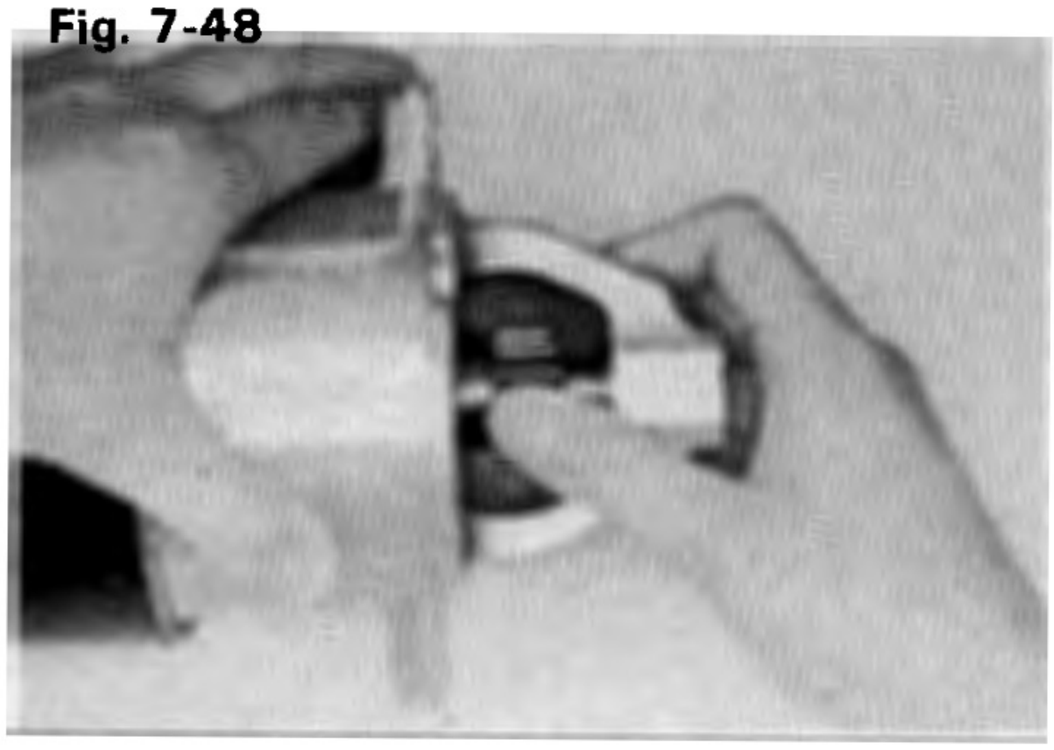
Fig. 7-47



   (3) Ream the bushing to obtain the specified clearance.

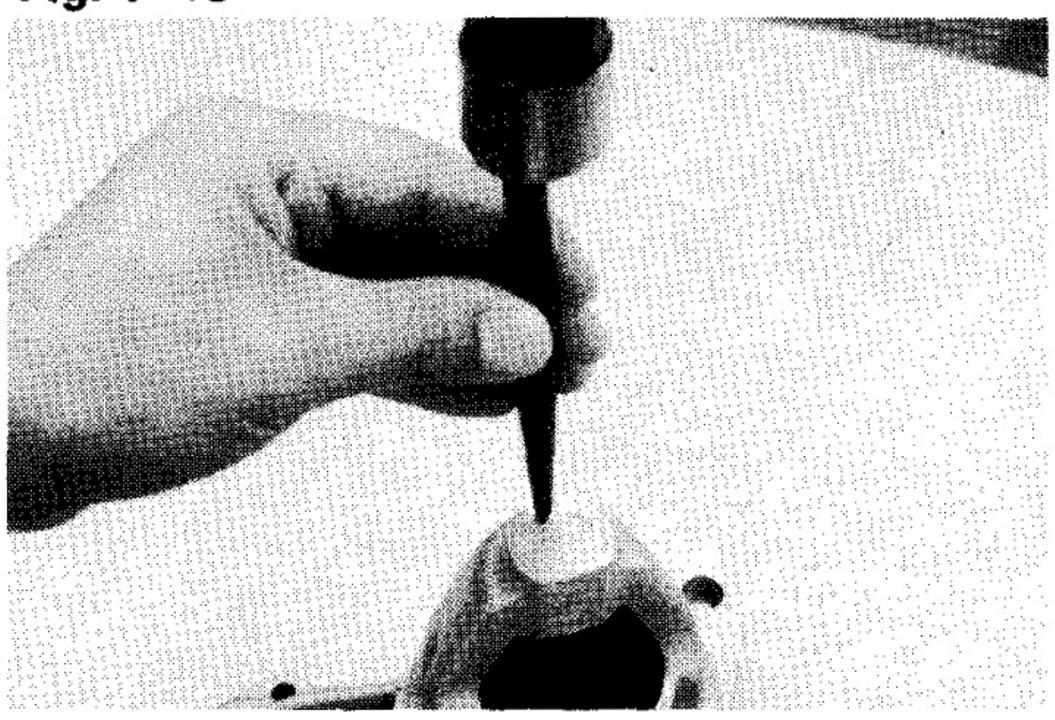
Bushing to shaft clearance:
0.035 – 0.077 mm
(0.0014 – 0.0030 in.)

Fig. 7-48



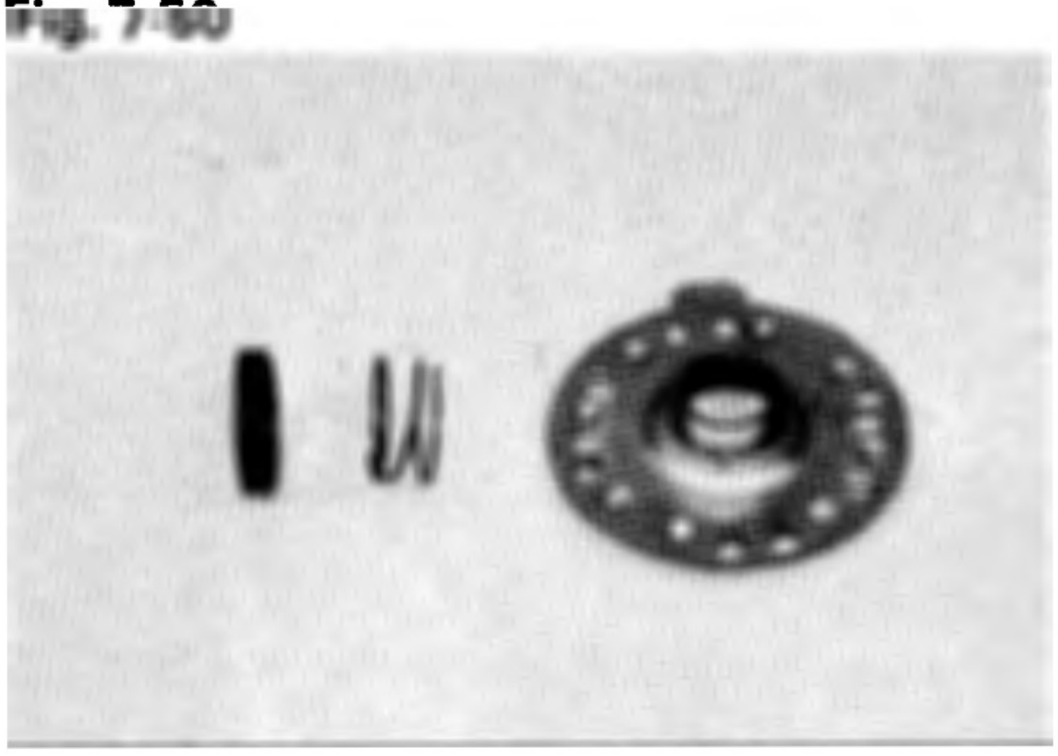
   (4) Temporarily assemble the parts.
   (5) Make sure that the armature shaft rotates smoothly.

Fig. 7-49



(6) Clean the bore, install a new bushing cover and stake the housing at four positions.

Fig. 7-50

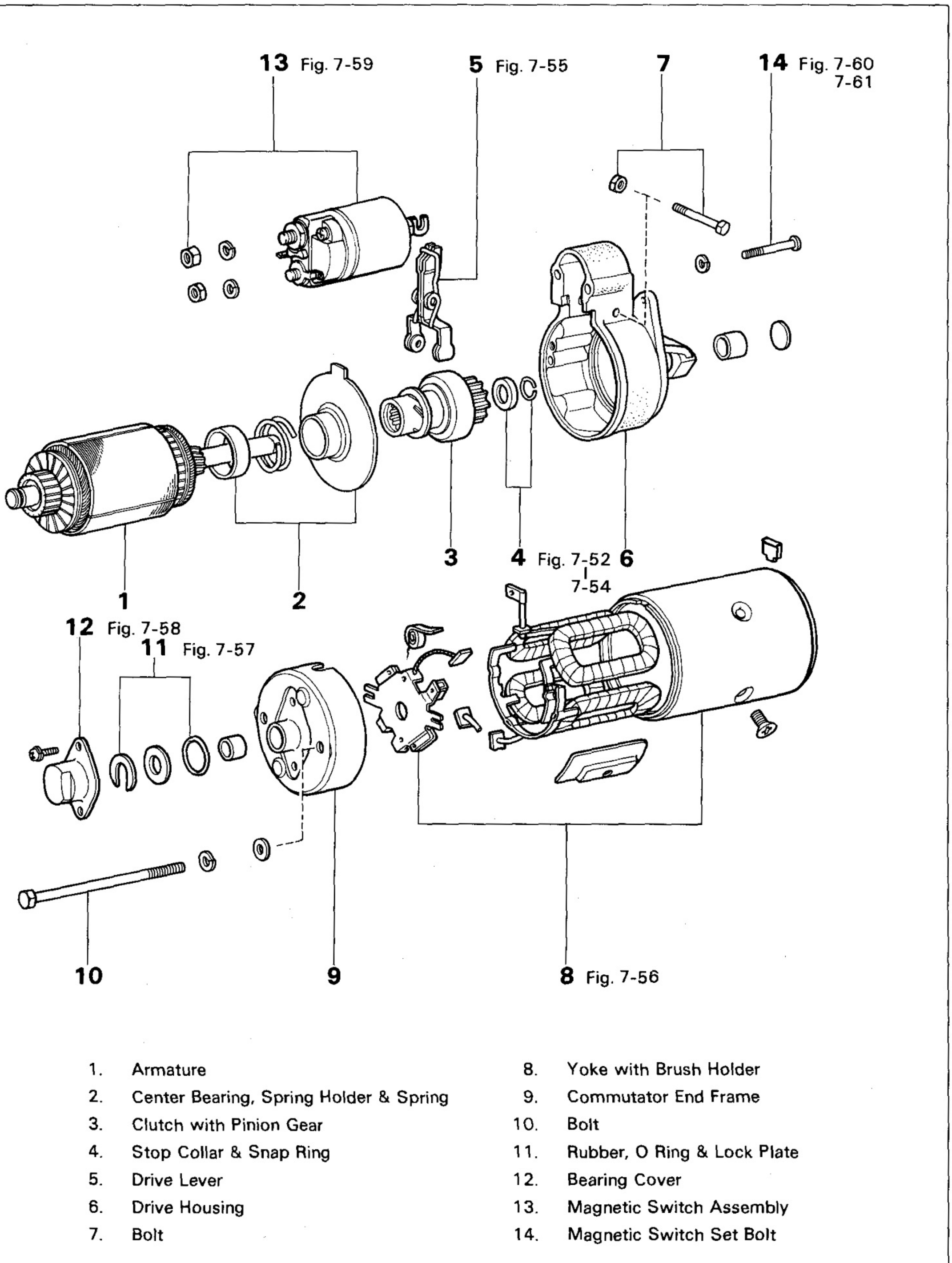


3. Inspect the spring holder, spring and center bearing for cracks, wear or damage. Replace, if necessary.

ASSEMBLY

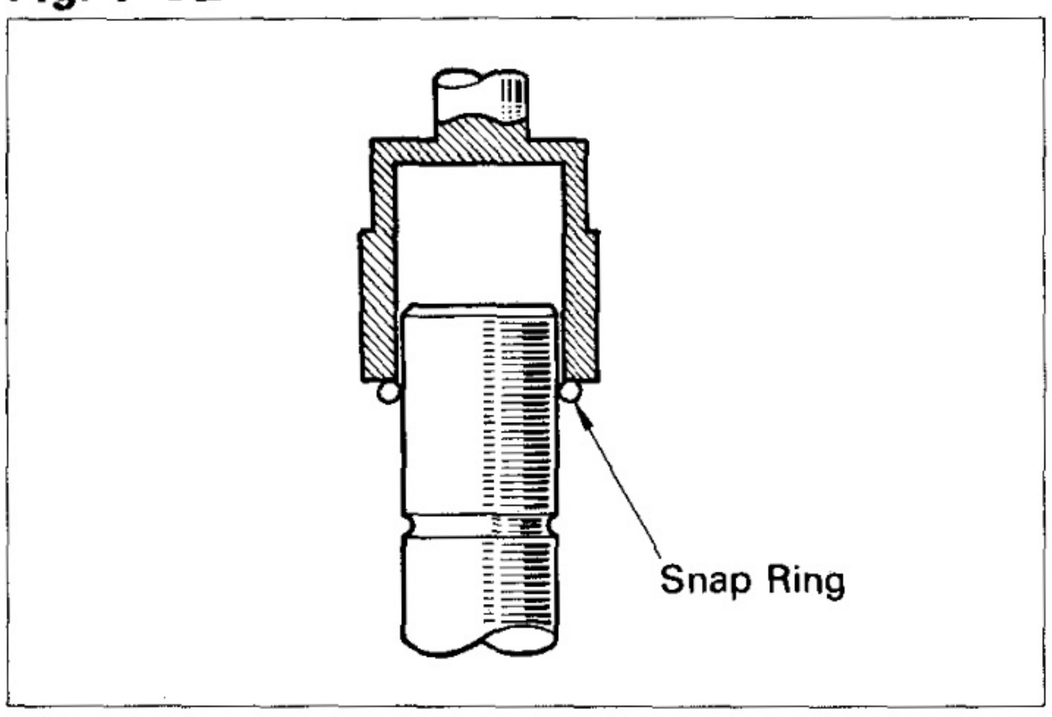
Assemble the parts in the numerical order shown in the figure.

Fig. 7-51



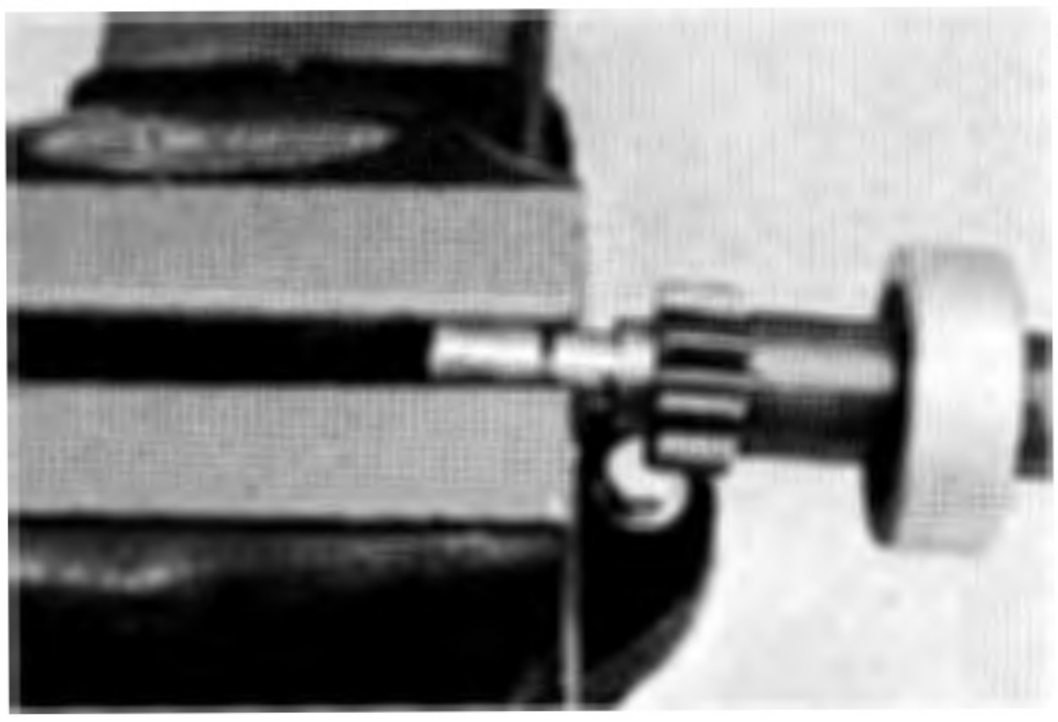
1. Armature
2. Center Bearing, Spring Holder & Spring
3. Clutch with Pinion Gear
4. Stop Collar & Snap Ring
5. Drive Lever
6. Drive Housing
7. Bolt
8. Yoke with Brush Holder
9. Commutator End Frame
10. Bolt
11. Rubber, O Ring & Lock Plate
12. Bearing Cover
13. Magnetic Switch Assembly
14. Magnetic Switch Set Bolt

Fig. 7-52



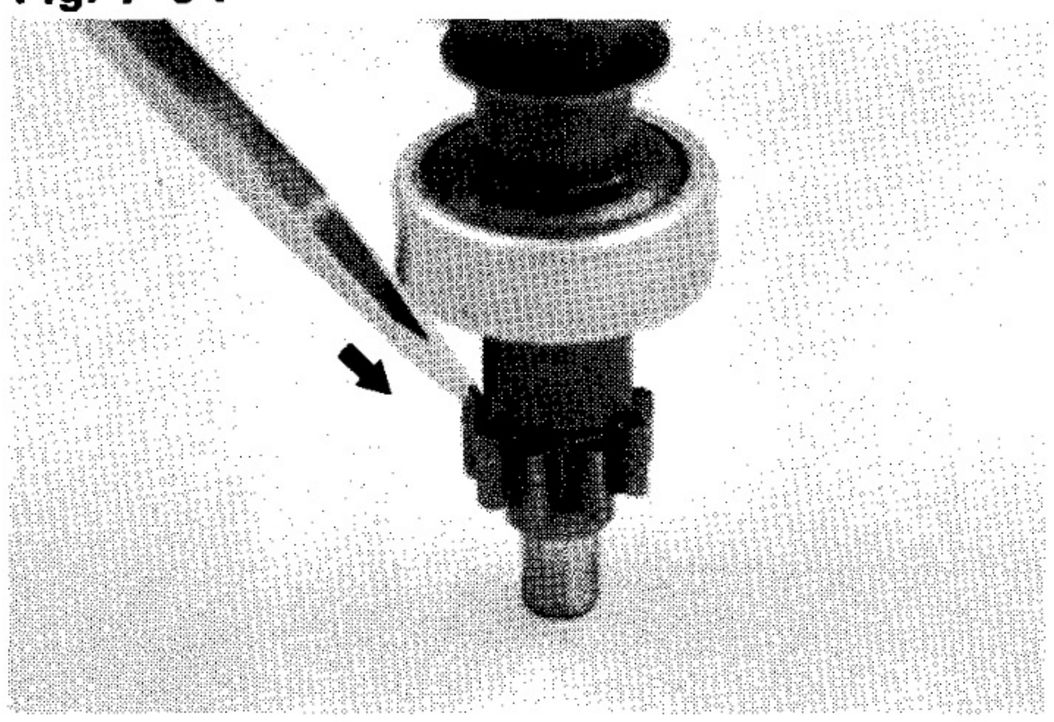
Drive in the snap ring with a 14-mm socket wrench, and then fit it into the shaft groove.

Fig. 7-53



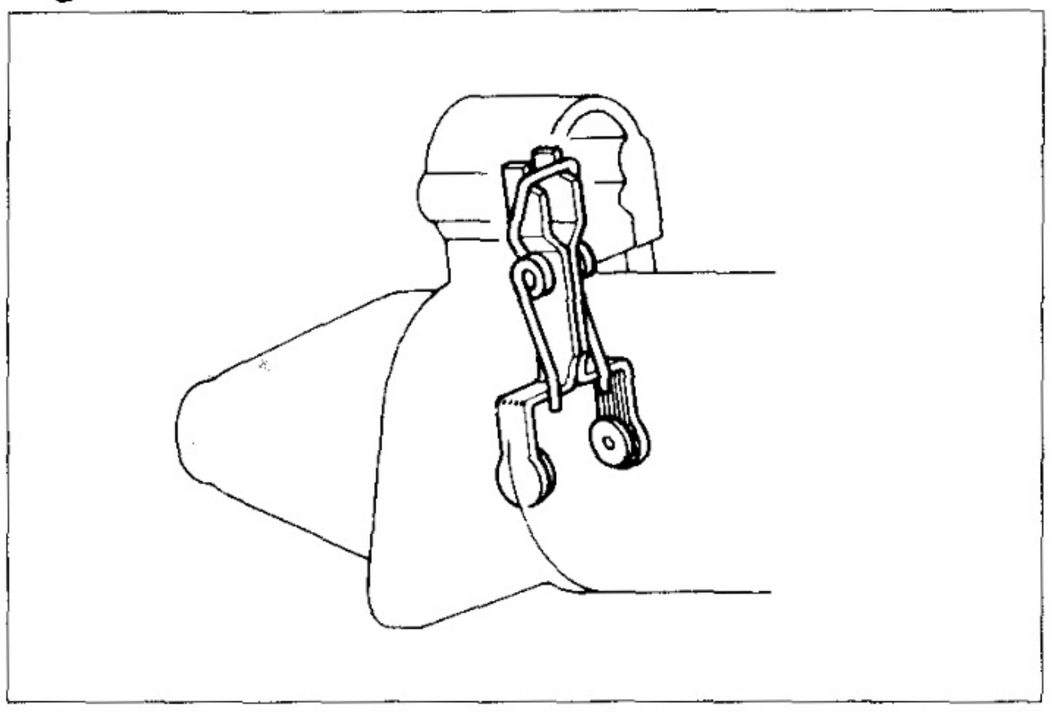
Compress the snap ring with a vise.
Make sure that the snap ring fits correctly.

Fig. 7-54



Tap the pinion to slide the stop collar onto the snap ring.

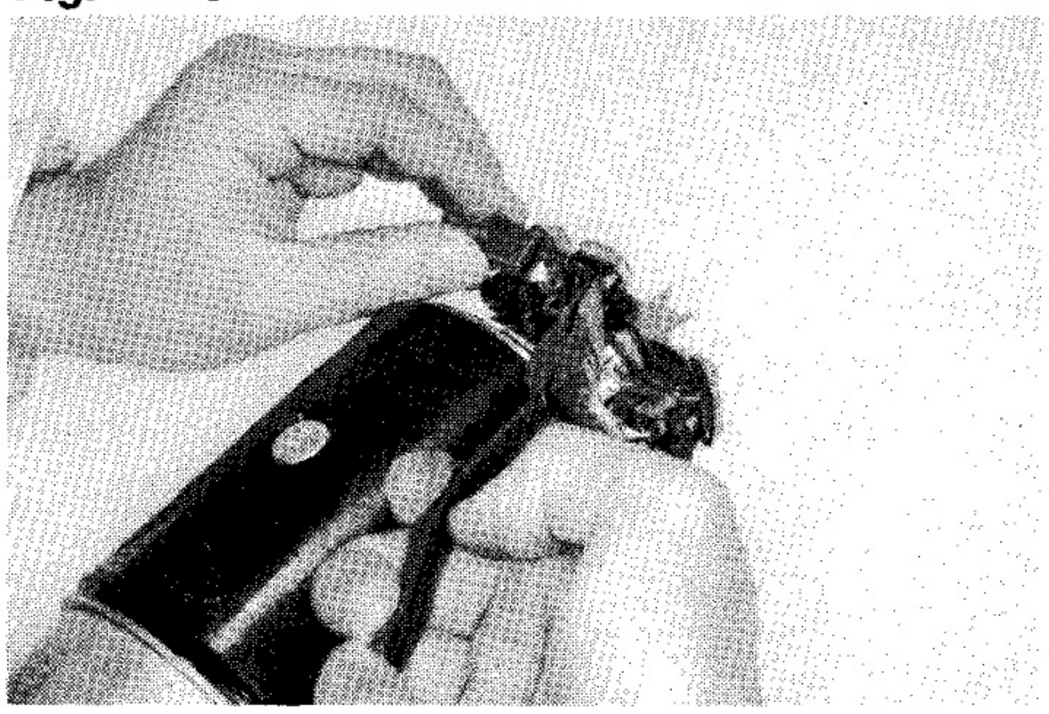
Fig. 7-55



Install the drive lever.

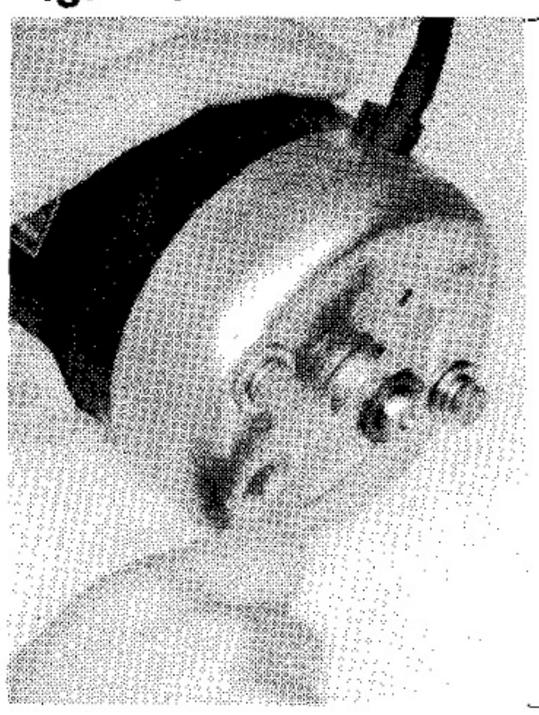
– Note –
Assemble the drive lever in the manner shown in the figure.

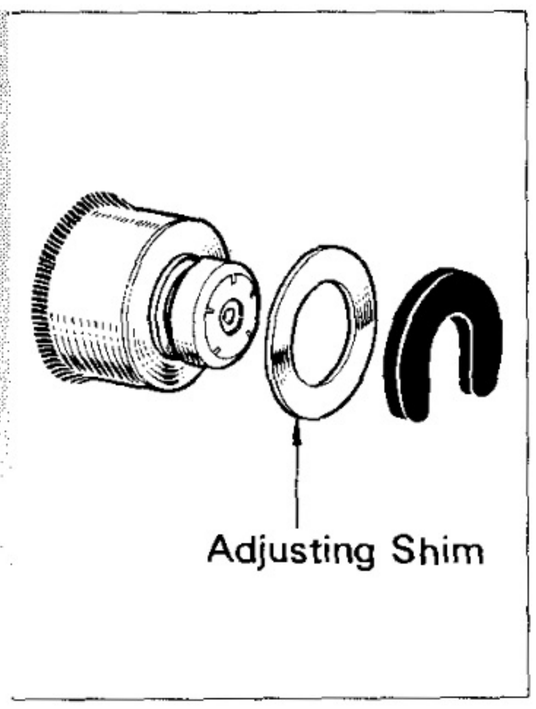
Fig. 7-56



Assemble the brush holder, taking care not to damage the brushes or commutator.

Fig. 7-57

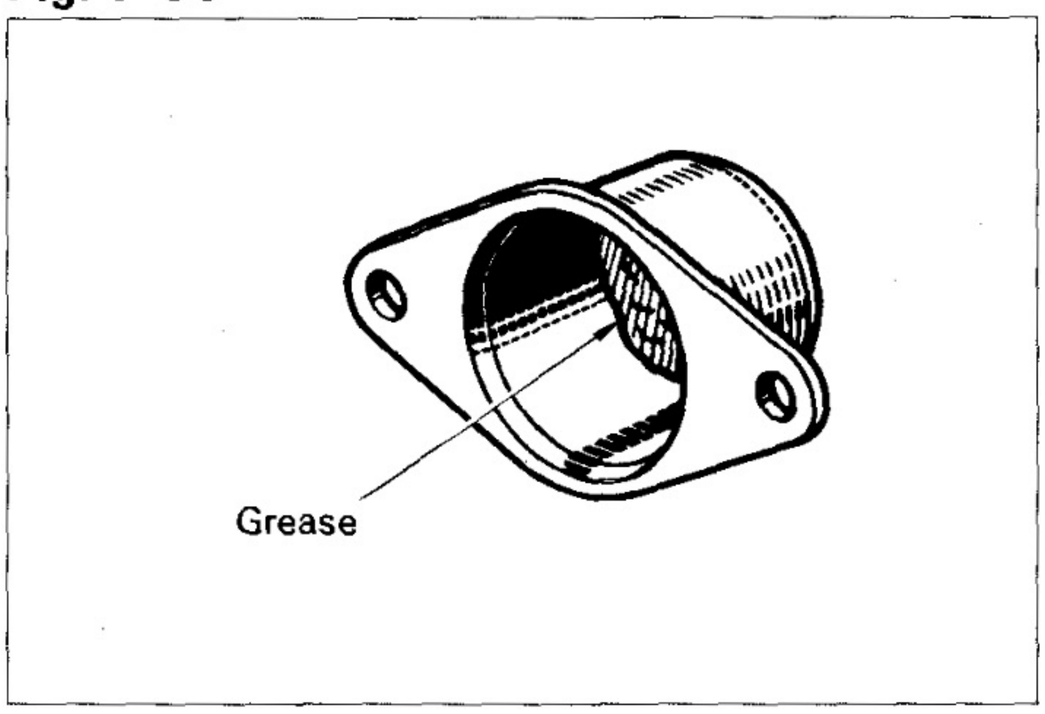




Install the lock plate and measure the armature shaft thrust clearance. If clearance exceeds the specified value, correct by increasing the number of shims.

Thrust clearance:
STD 0.05 – 1.00 mm (0.0020 – 0.0394 in.)
Limit 1.00 mm (0.0394 in.)
Adjusting shim thickness:
0.5 mm (0.020 in.)

Fig. 7-58



Install the bearing cover.

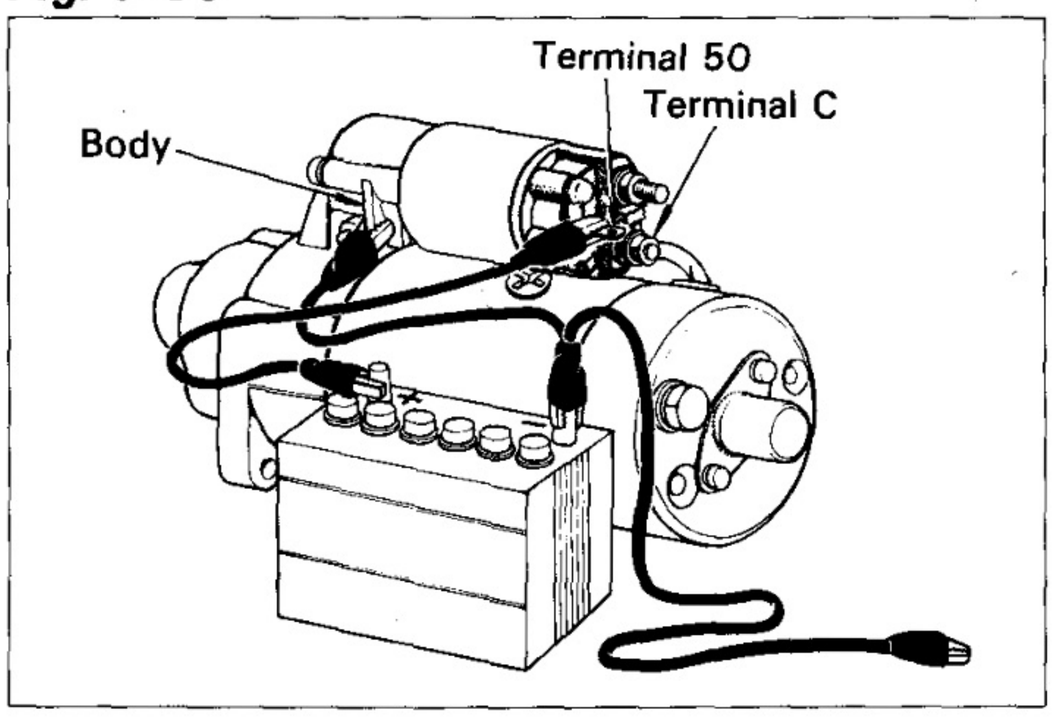
– Note –
Refill the cover about 1/4 full with grease.

Fig. 7-59



Hook the magnetic switch onto the drive lever spring from underneath.

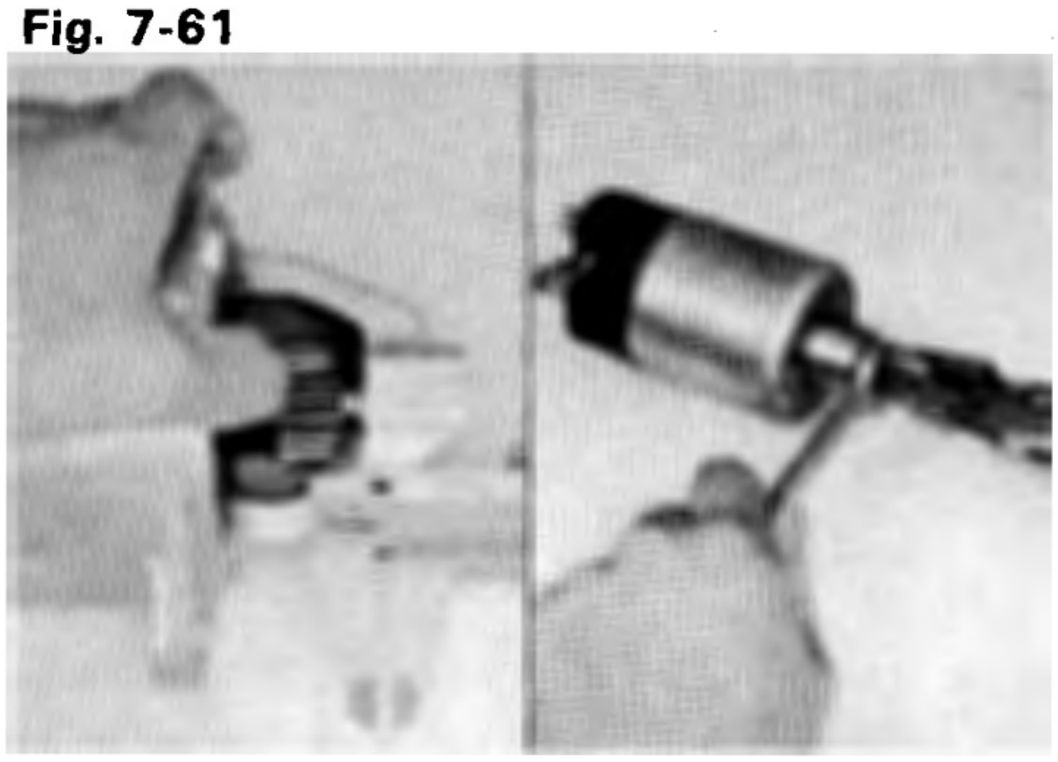
Fig. 7-60



Check the pinion clearance.

1. Connect the field coil lead to terminal C.
2. Connect the magnetic switch to a battery as shown in the figure.
   Positive side
   Battery ⊕ ——— Terminal 50
   Battery ⊖ ——— Starter body

Fig. 7-61



3. Move the pinion to the armature side to eliminate the slack, and check the clearance between the pinion end and stop collar.
   Clearance: 0.1 – 4.0 mm (0.004 – 0.157 in.)
4. Adjust, if necessary, after loosening the lock nut.

Clearance	Stud
Too large	Screw in
Too small	Screw out

IGNITION SYSTEM

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IGNITION SYSTEM CIRCUIT	8-2
ON-VEHICLE INSPECTION	8-5
DISTRIBUTOR	
(FA & General FJ series)	8-11
(USA, ECE & Australia FJ series) ...	8-19
DISTRIBUTOR INSTALLATION	8-29

8

IGNITION SYSTEM CIRCUIT

Fig. 8-1

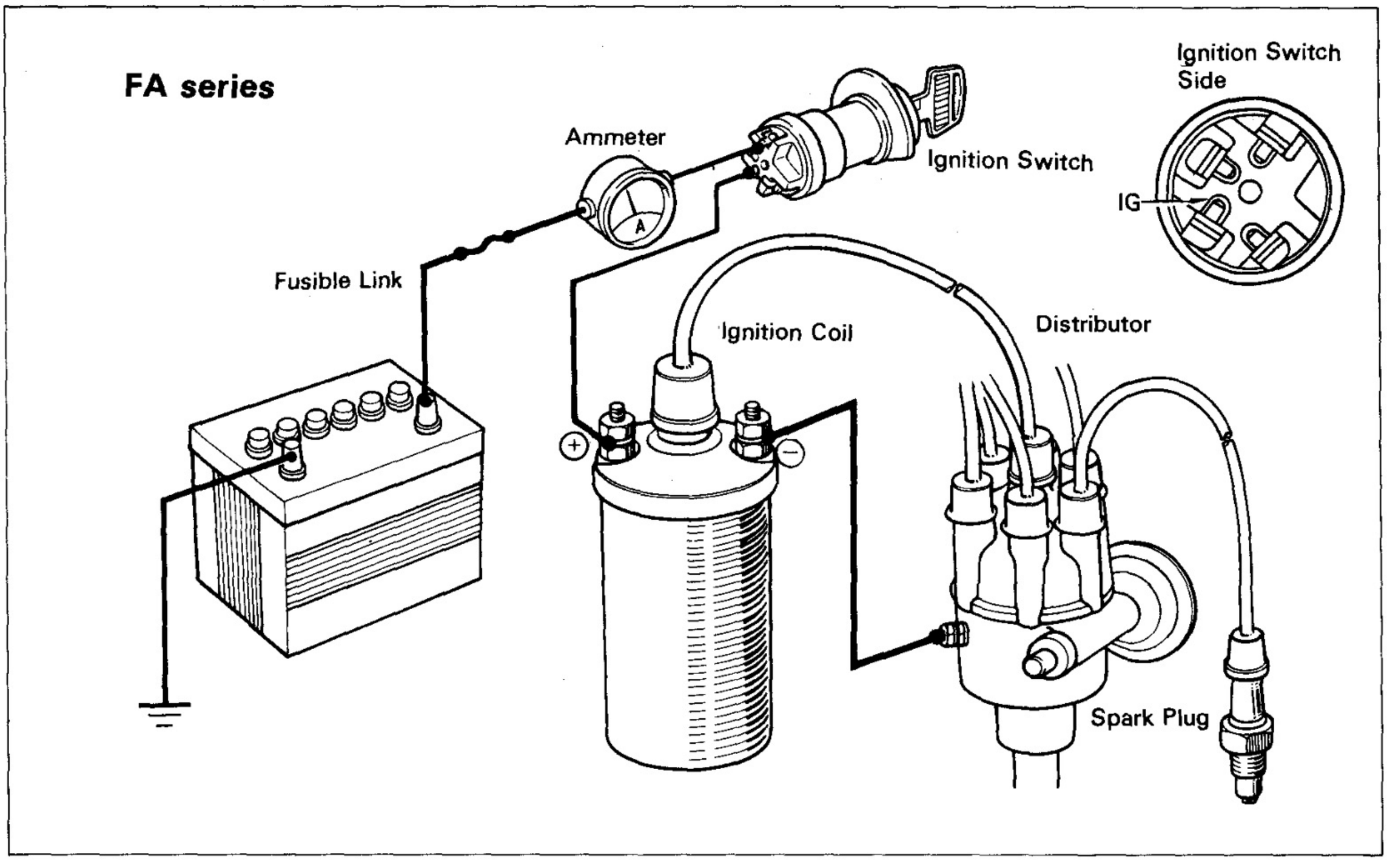


Fig. 8-2

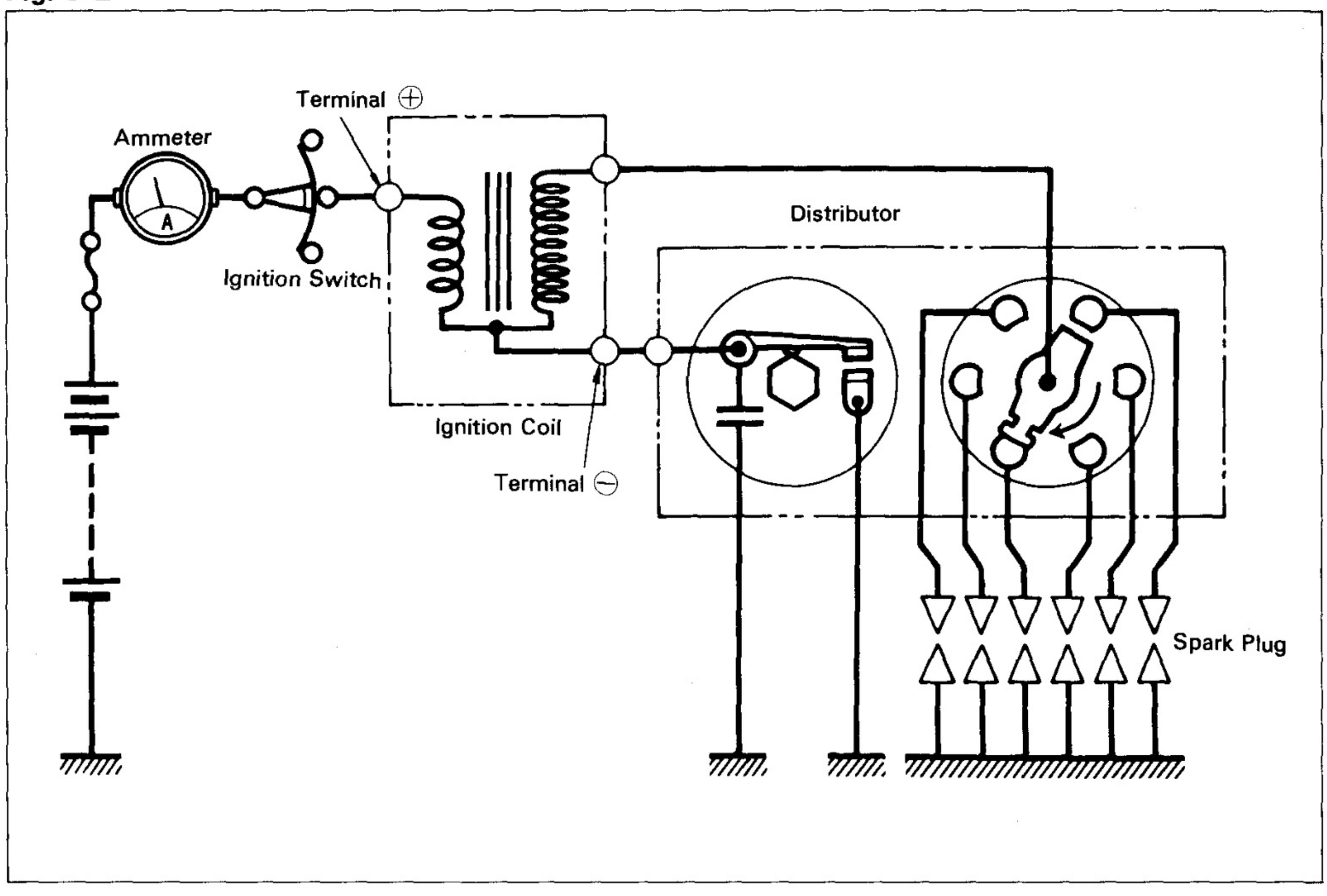


Fig. 8-3

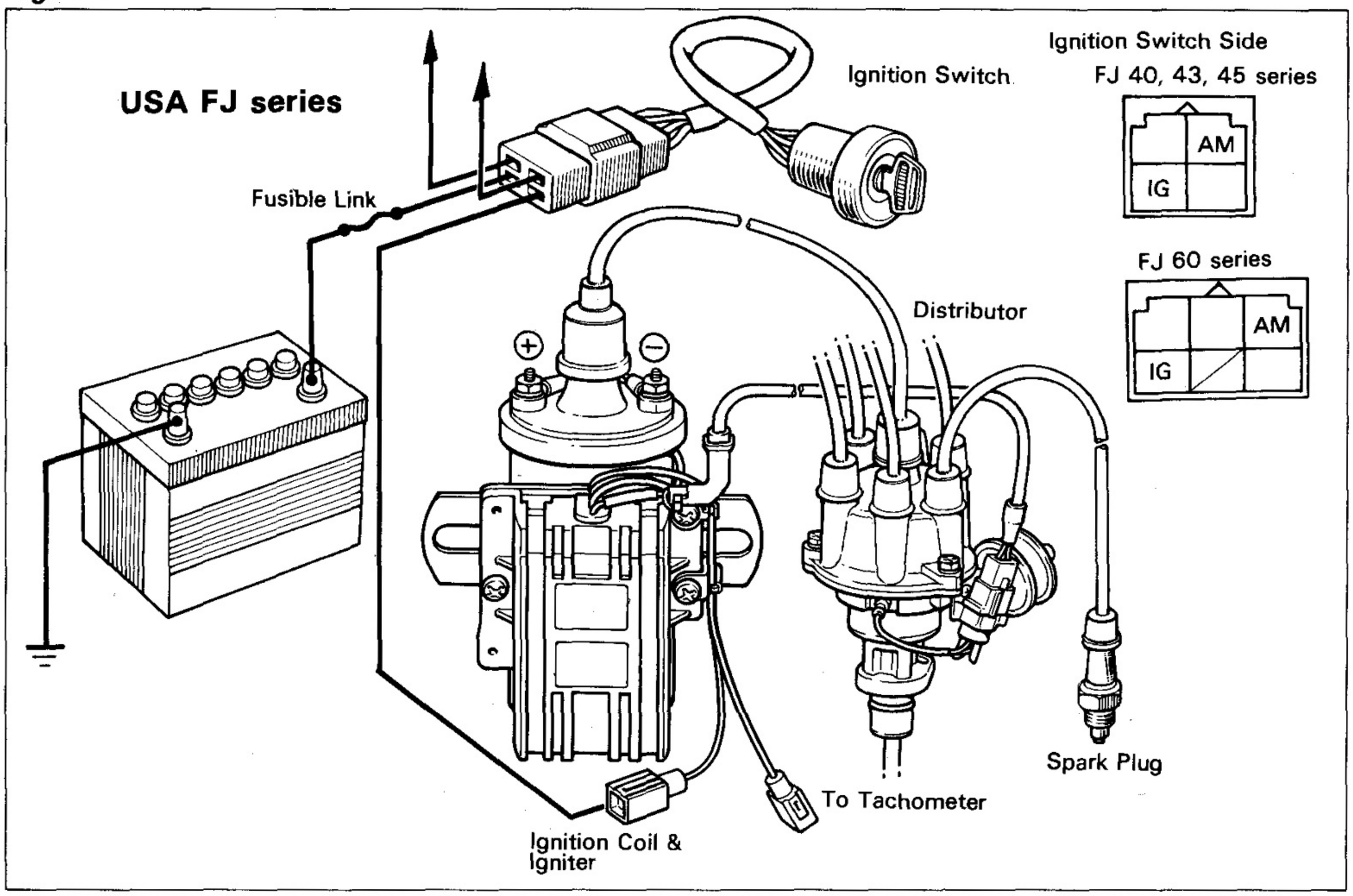

USA FJ series
Ignition Switch
Ignition Switch Side
FJ 40, 43, 45 series
AM
IG
FJ 60 series
AM
IG
Fusible Link
Distributor
Spark Plug
To Tachometer
Ignition Coil & Igniter

Fig. 8-4

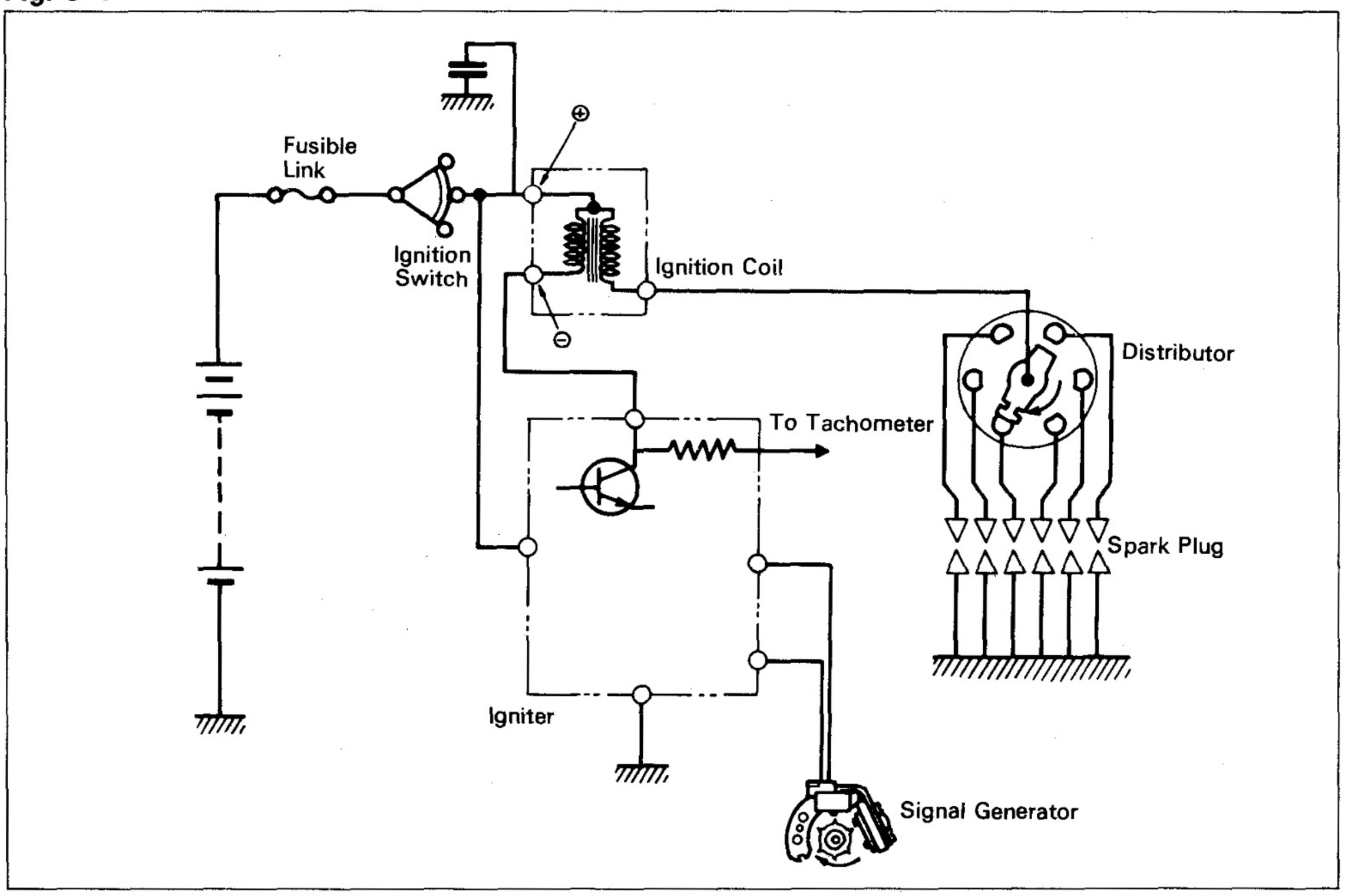

Fusible Link
Ignition Switch
Ignition Coil
Distributor
To Tachometer
Spark Plug
Igniter
Signal Generator

Fig. 8-5

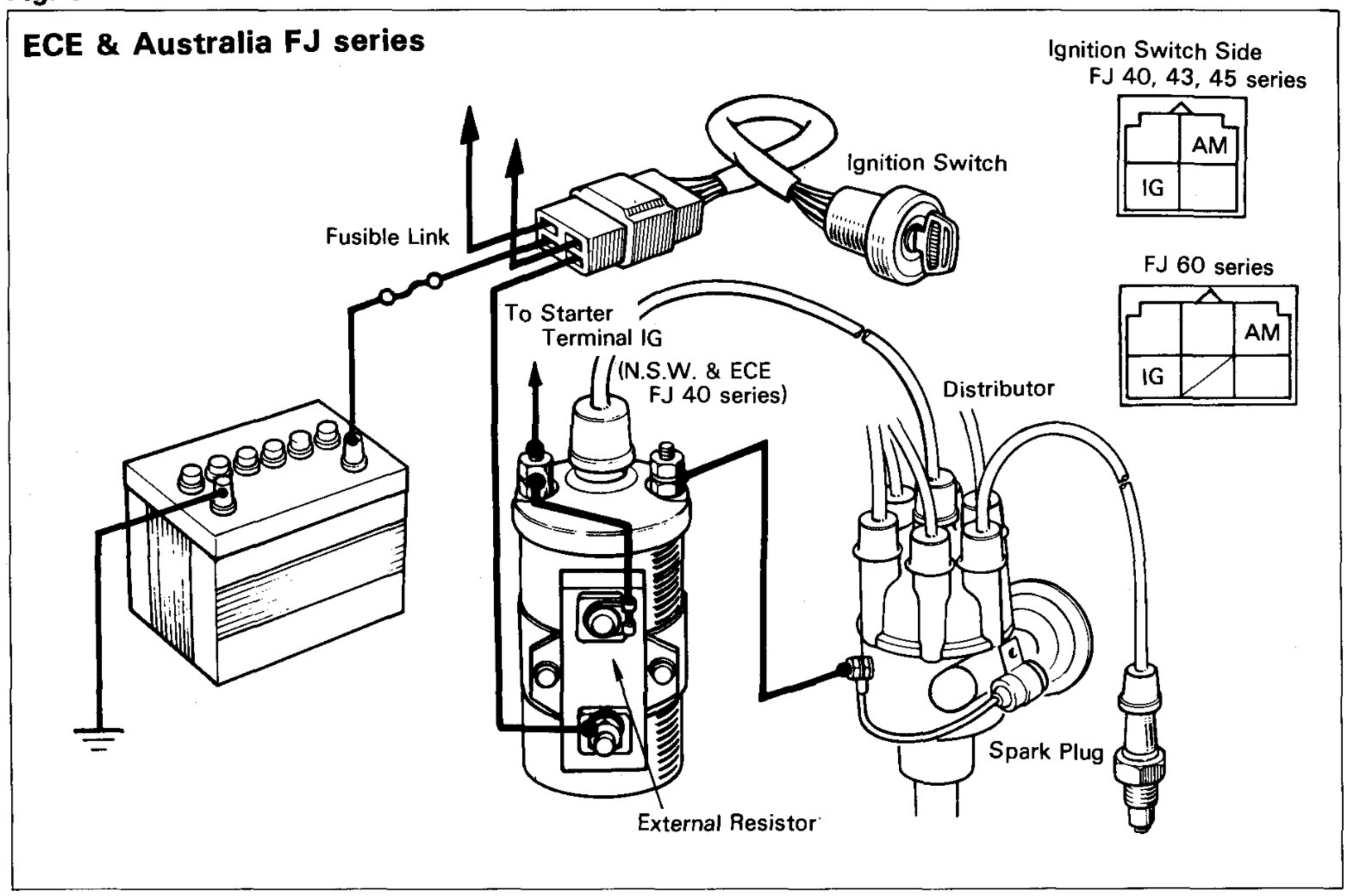

ECE & Australia FJ series
Ignition Switch Side
FJ 40, 43, 45 series
AM
IG
FJ 60 series
AM
IG
Ignition Switch
Fusible Link
To Starter
Terminal IG
(N.S.W. & ECE
FJ 40 series)
Distributor
Spark Plug
External Resistor

Fig. 8-6

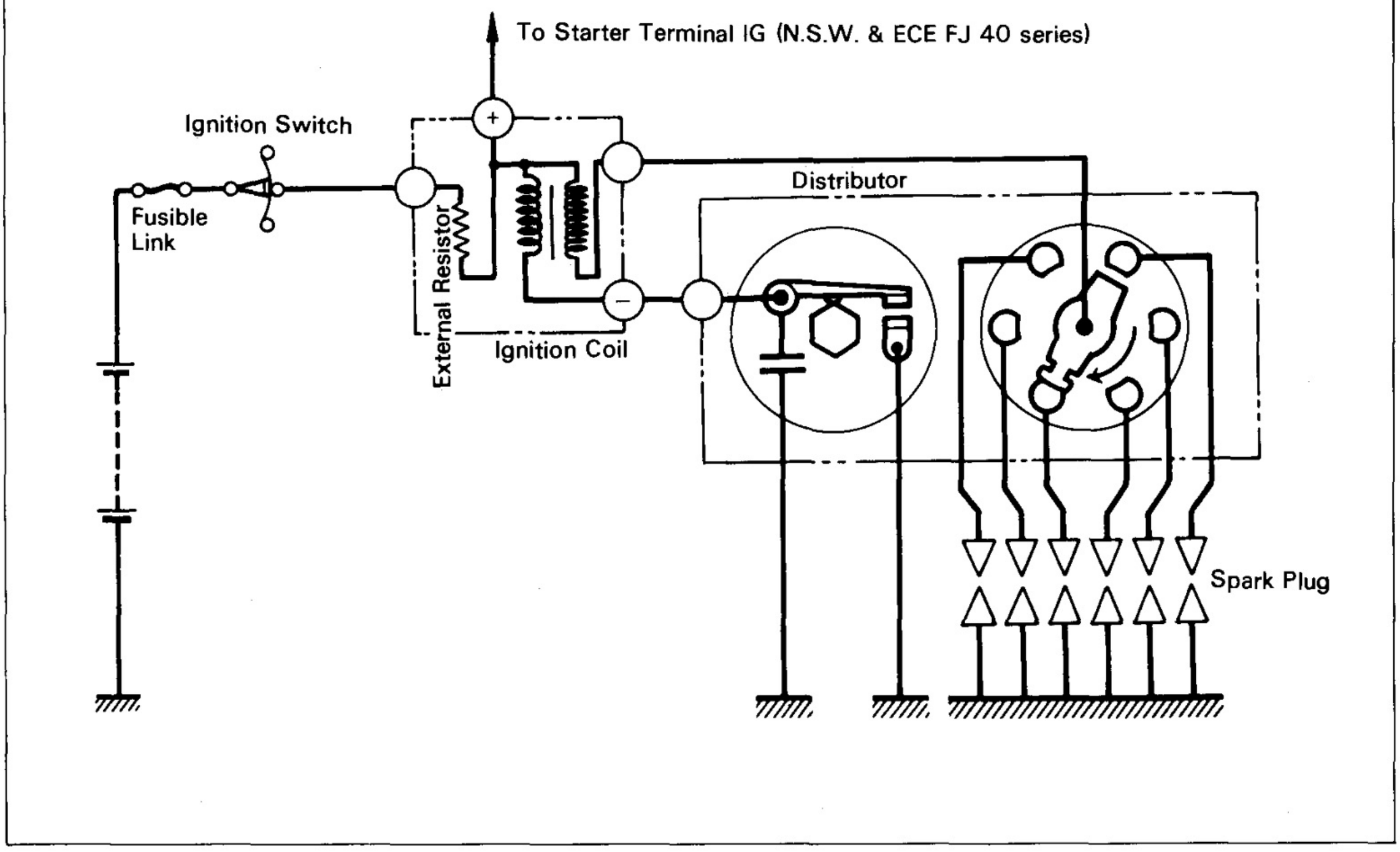
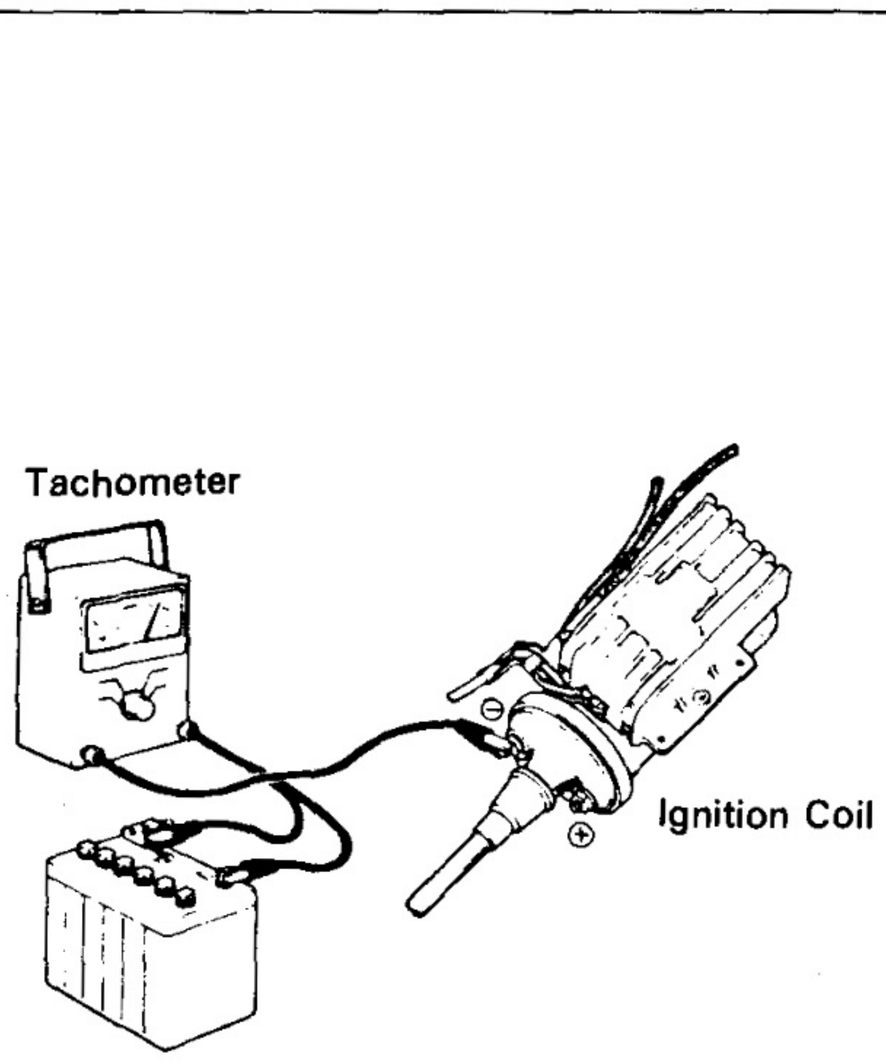

To Starter Terminal IG (N.S.W. & ECE FJ 40 series)
Ignition Switch
Fusible Link
External Resistor
Ignition Coil
Distributor
Spark Plug

Fig. 8-7



ON-VEHICLE INSPECTION

Precautions

1. For USA FJ series, caution should be taken with following items:
   (1) Do not leave the ignition switch ON for more than 10 minutes if the engine will not start.
   (2) As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.
   (3) NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
   (4) Do not disconnect the battery when the engine is running.
   (5) Make sure that the igniter is properly grounded to the body.
   (6) When a tachometer is connected to the system, connect the tachometer ⊕ terminal to the ignition coil ⊖ terminal.

Fig. 8-8

SEE

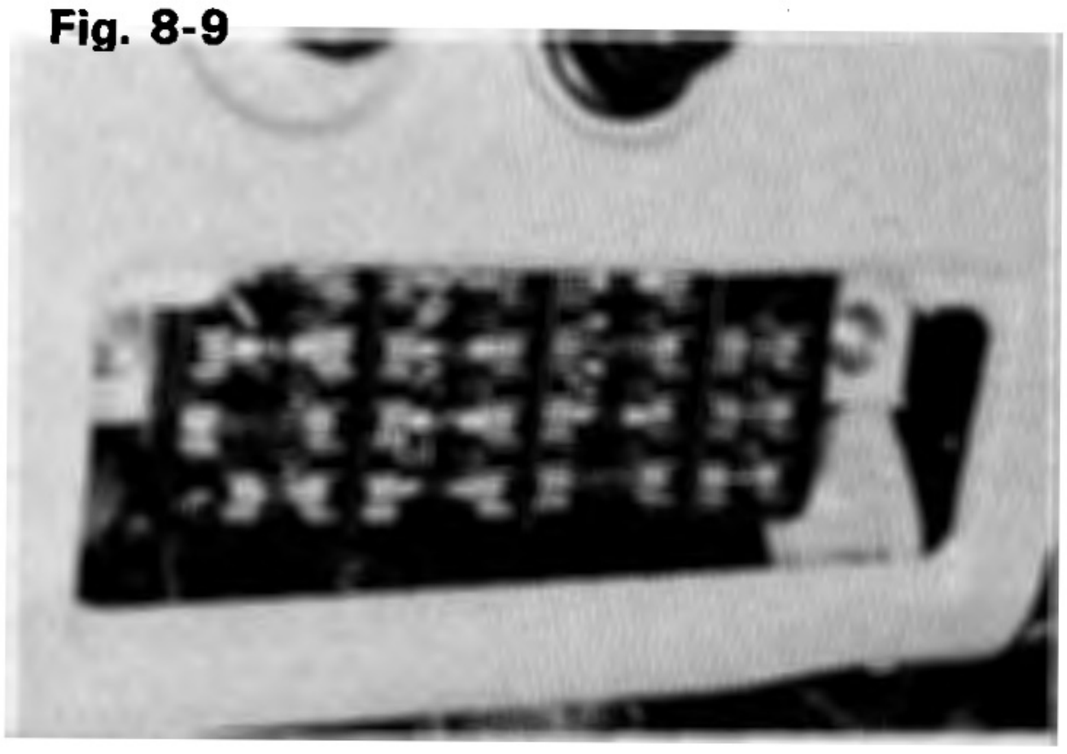
ENGINE TUNE-UP

BATTERY SECTION

Figs. 2-5 to 2-8

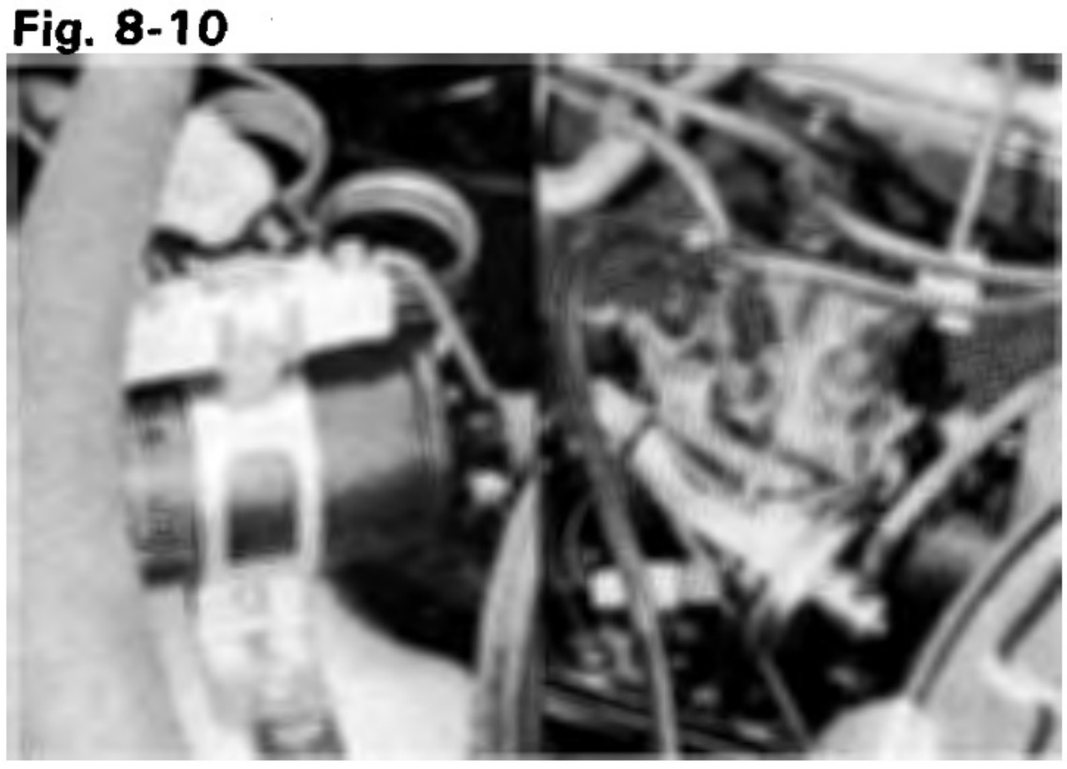
2. Check the battery for the following items:
   (1) Specific gravity
   (2) Terminals
   (3) Electrolyte level

Fig. 8-9



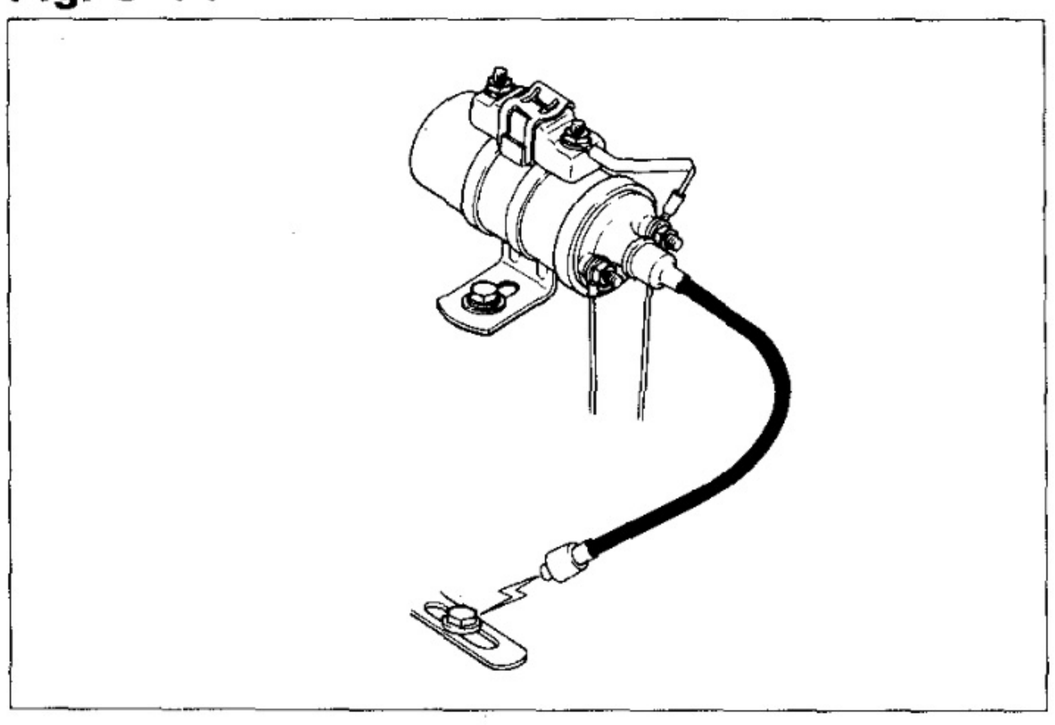
3. Check the fuses and fusible links.

Fig. 8-10



4. Check the installation of the wires and connectors, and check them for damage.

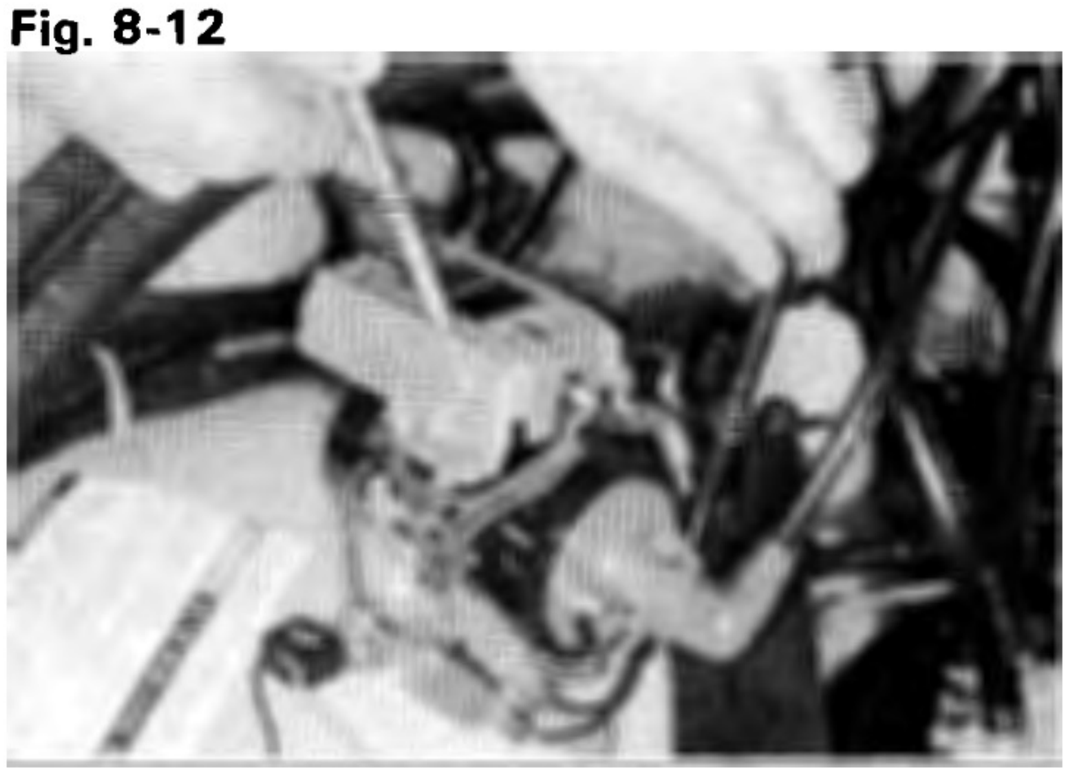
Fig. 8-11



5. Check the spark condition.
   (1) Pull the distributor ignition coil resistive cord from the distributor.
   (2) Hold the cord end close to a ground.
   (3) Start the engine and check for spark.

— Caution —
This check must be made in as short a time as possible.

Fig. 8-12



Igniter (USA FJ series)

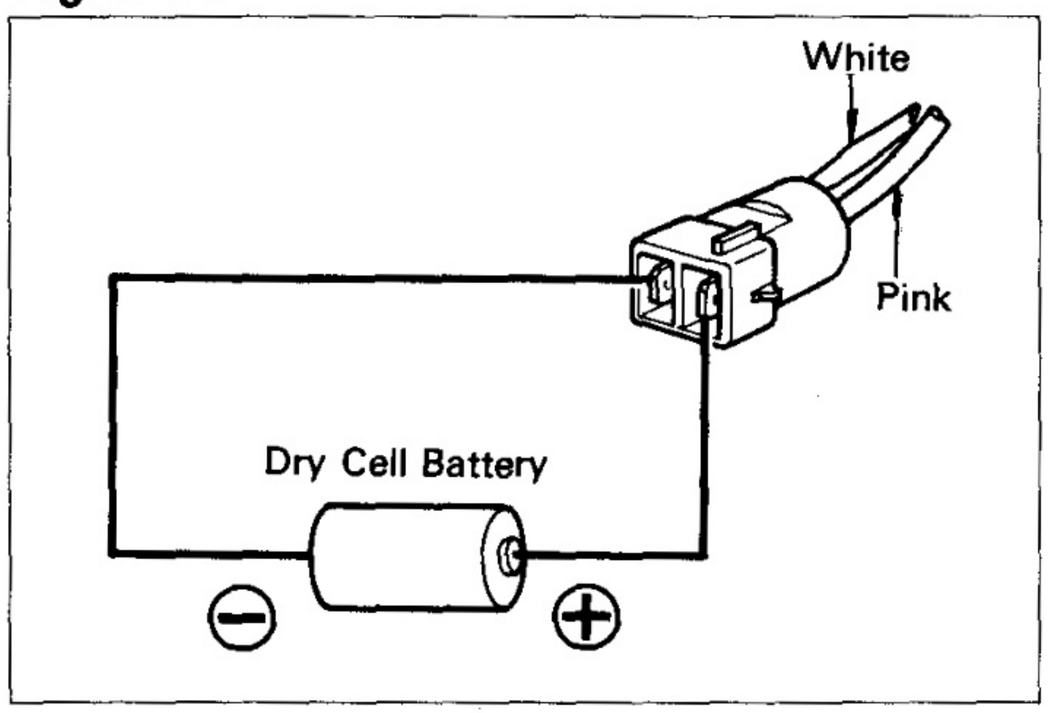
1. Turn the ignition switch to ON.
2. Check the power SOURCE line voltage. Connect a voltmeter ⊕ lead to the ignition coil ⊕ terminal, and the ⊖ lead to the igniter body.
   Voltage: Approx. 12V

Fig. 8-13



3. Check the power transistor OFF condition. Connect a voltmeter ⊕ lead to the ignition coil ⊖ terminal, and the ⊖ lead to the igniter body.
   Voltage: Approx. 12V

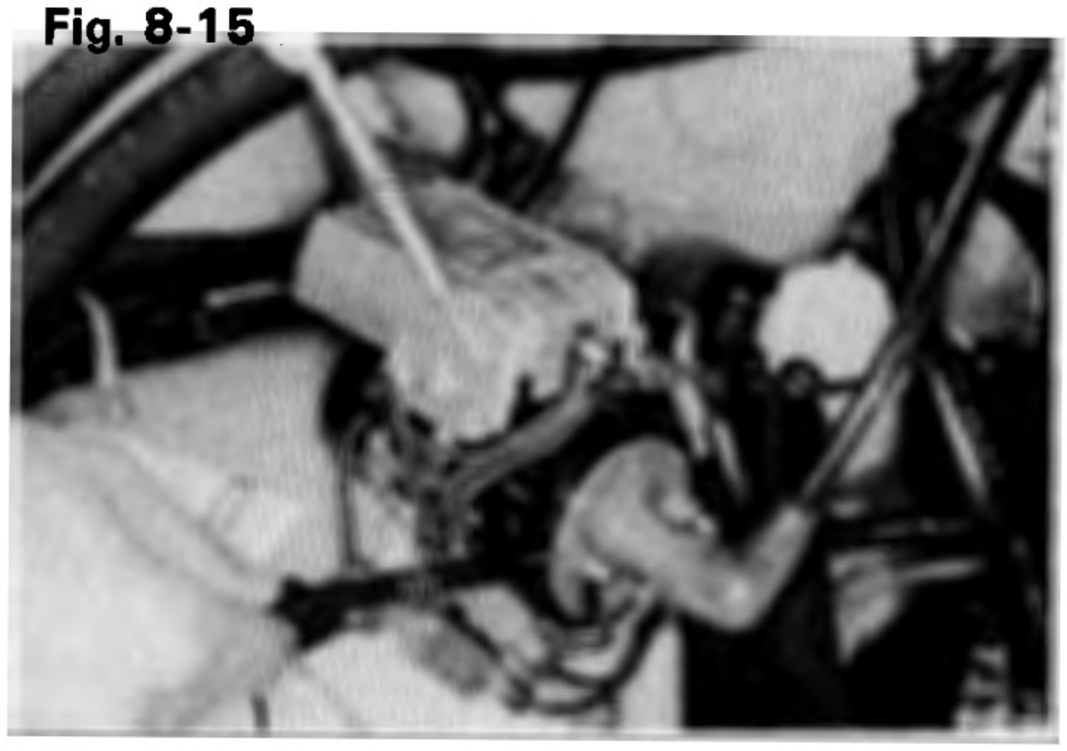
Fig. 8-14



4. Check the power transistor ON condition.
   (1) Disconnect the wiring connector from the distributor.
   (2) Using a dry cell battery (1.5V), connect the positive pole to the pink wire terminal and the negative pole to the white wire terminal.

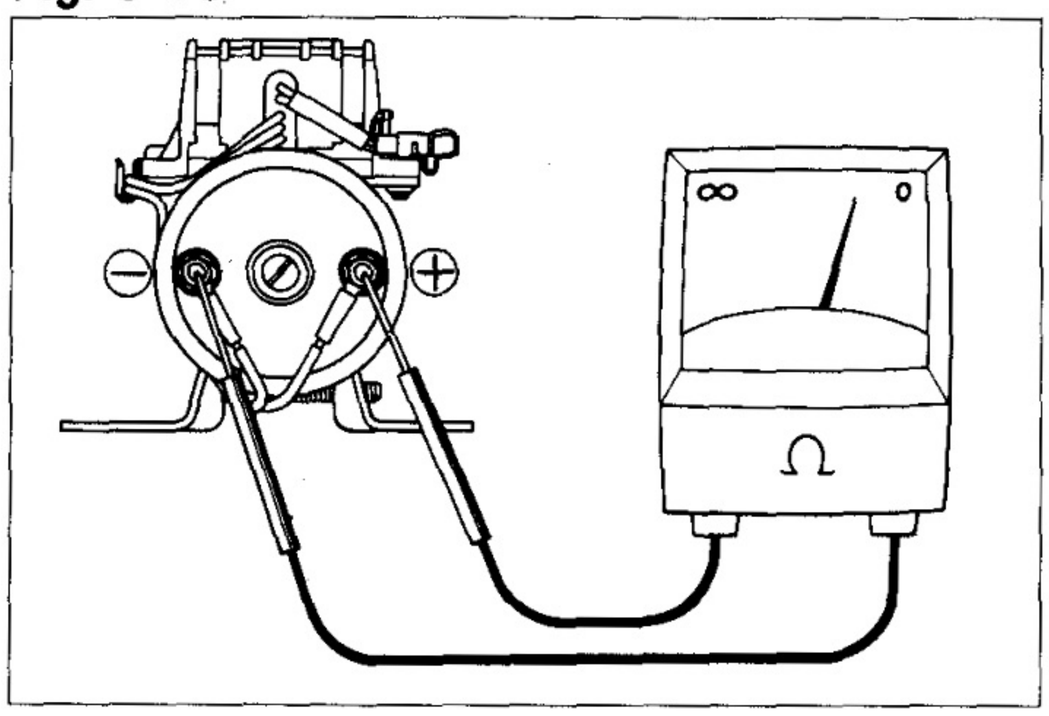
– Note –
This check must be made in as short a time as possible (less than 5 seconds).

Fig. 8-15



(3) Connect a voltmeter ⊕ lead to the ignition coil ⊖ terminal, and the ⊖ lead to the igniter body.
Voltage:
5V-Less than battery voltage

Fig. 8-16

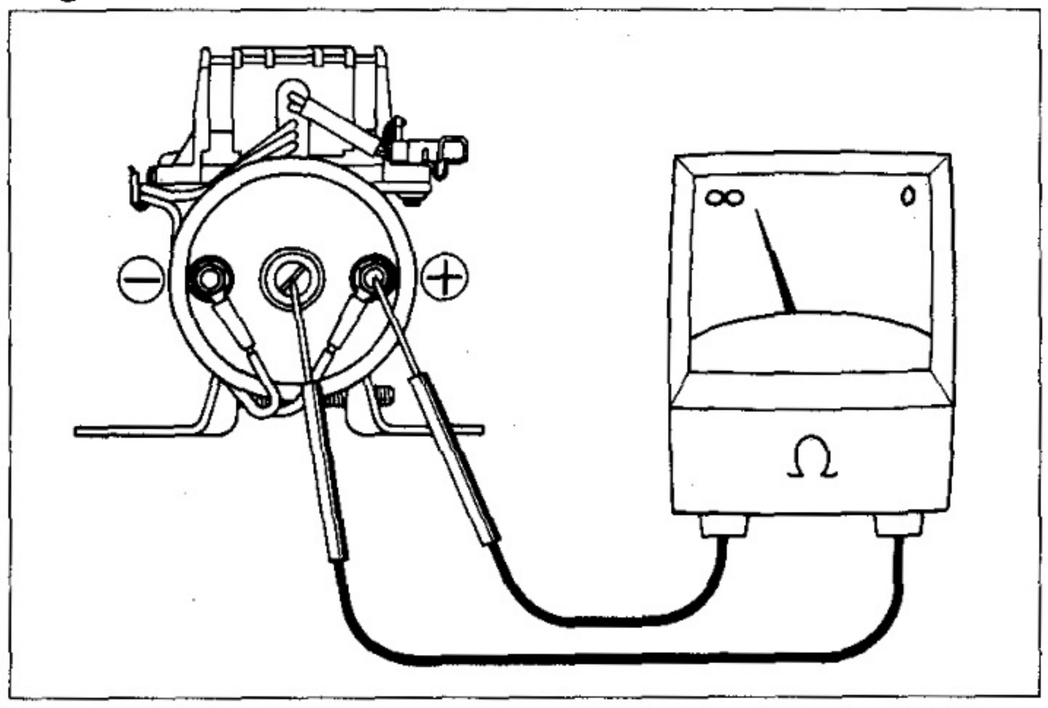


Ignition Coil (USA FJ series)

Check the ignition coil resistance with an ohmmeter.

1. Primary coil resistance between the ⊕ and ⊖ terminals.
   Resistance: 0.5 – 0.7 Ω

Fig. 8-17



2. Secondary coil resistance between the ⊕ terminal and high tension terminal.
   Resistance: 11.5 – 15.5 kΩ

Fig. 8-18



Ignition Coil (except USA FJ series)

Check the ignition coil resistance with an ohmmeter.

1. Primary coil resistance between the ⊕ and ⊖ terminals.

Resistance:

FA & General FJ series

1.2 – 1.5 Ω

ECE & Australia FJ series

1.3 – 1.6 Ω

Fig. 8-19



2. Secondary coil resistance between ⊕ terminal and high tension terminal.

Resistance:

FA & General FJ series

8.5 – 11.5 kΩ

ECE & Australia FJ series

10.7 – 14.5 kΩ

Fig. 8-20



Resistor (except USA FJ series & FA series)

Check the resistor resistance with an ohmmeter.

Resistance: 1.3 – 1.5 Ω

Fig. 8-21

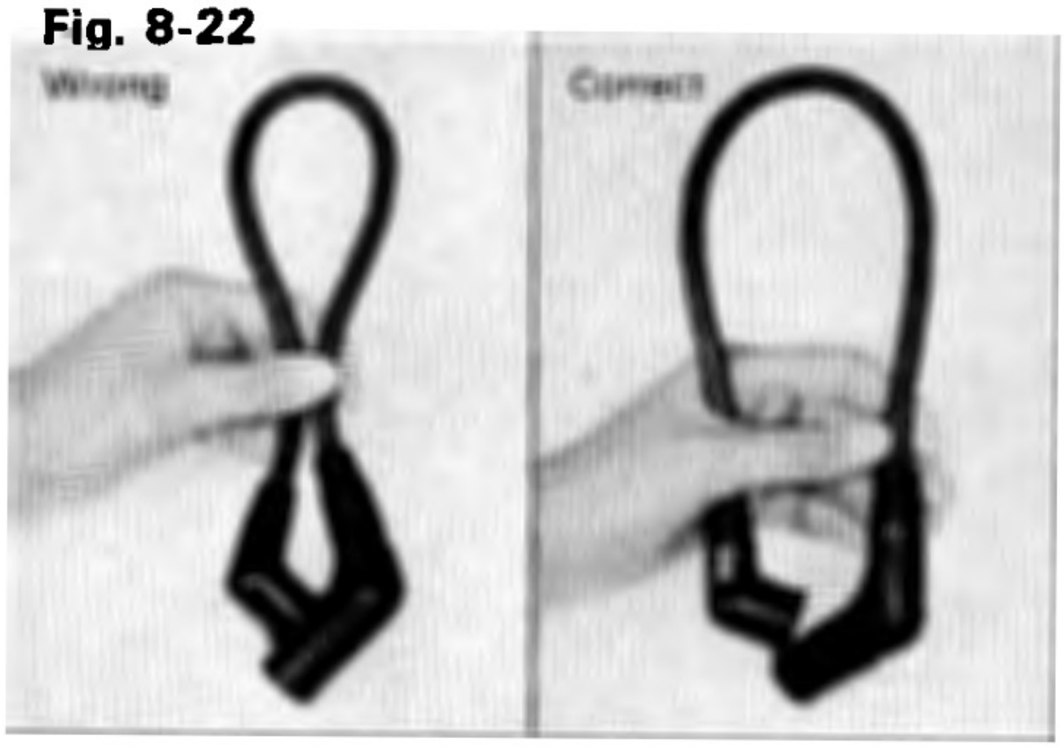


HIGH TENSION CORD

– Note –

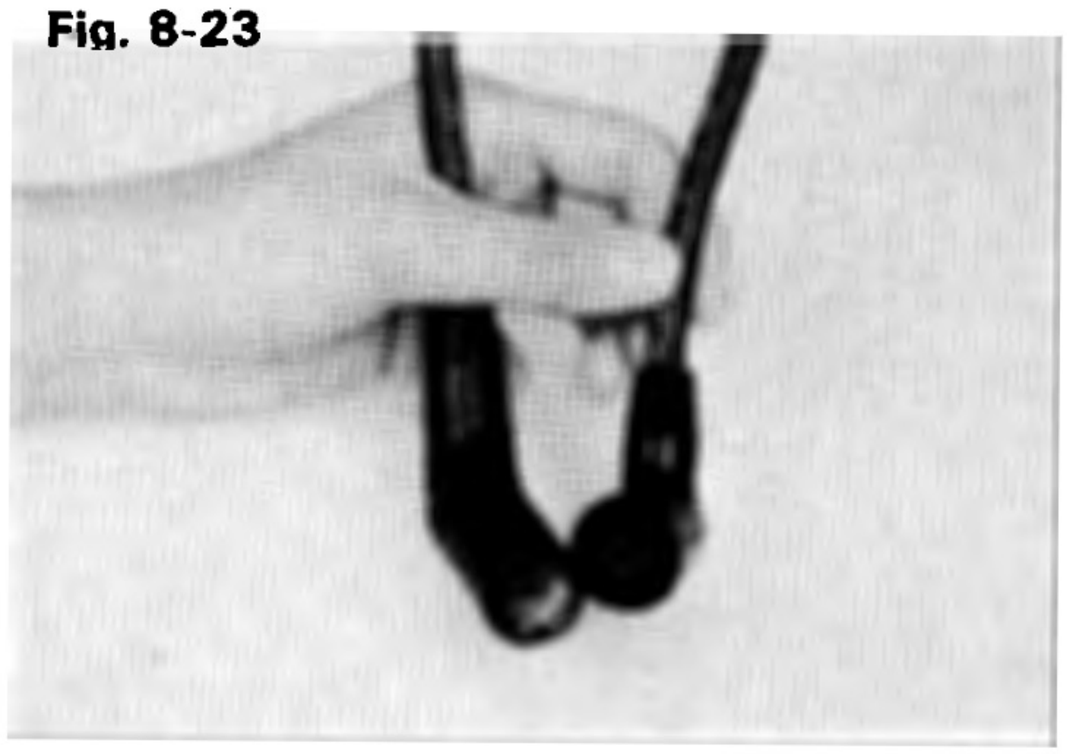
1. Carefully remove the high tension cords by pulling on the rubber boots.

Fig. 8-22



⚠ **2. Do not bend the cords too sharply as the conductors will break.**

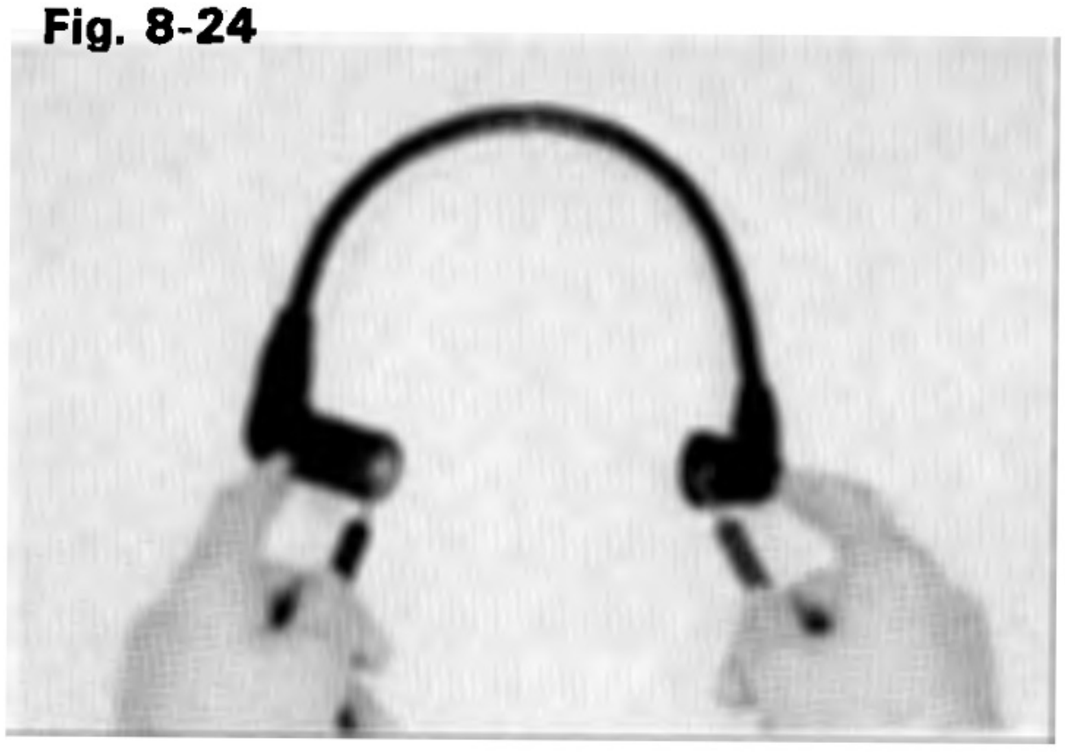
Fig. 8-23



INSPECTION

1. Check the condition of the cord terminals. If any terminal is corroded, clean it. If broken or distorted, replace the cord.

Fig. 8-24

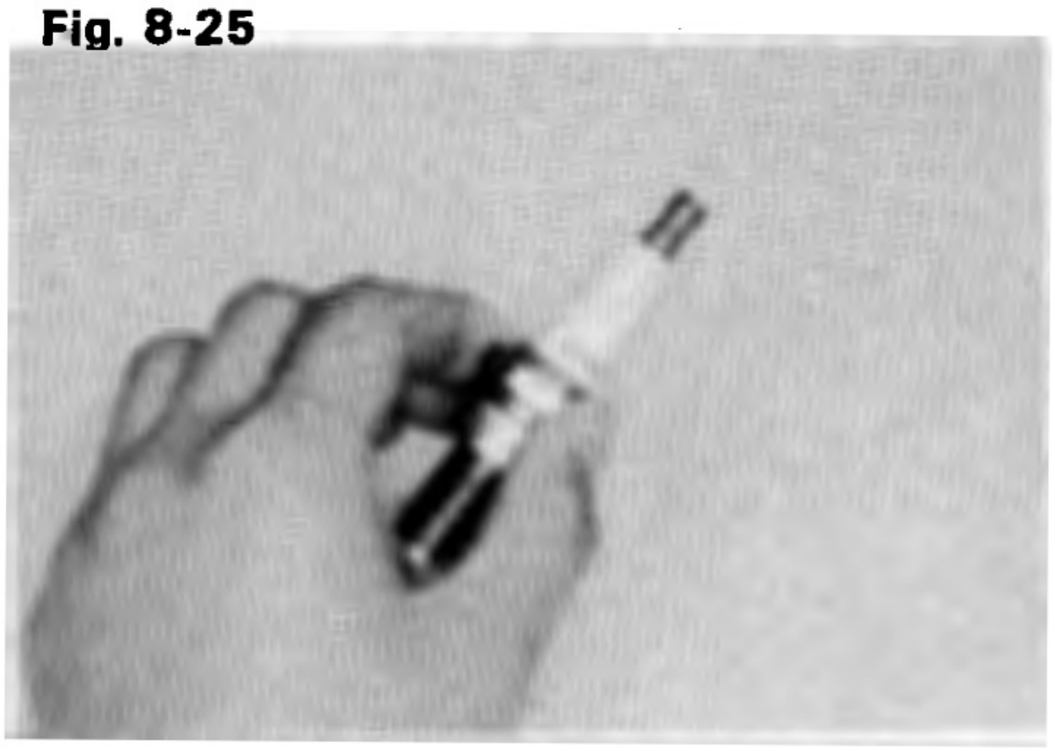


2. Check the resistance of each cord between both ends. If the reading exceeds the limit, replace the cord.

Resistance:

Less than 25kΩ per cord

Fig. 8-25

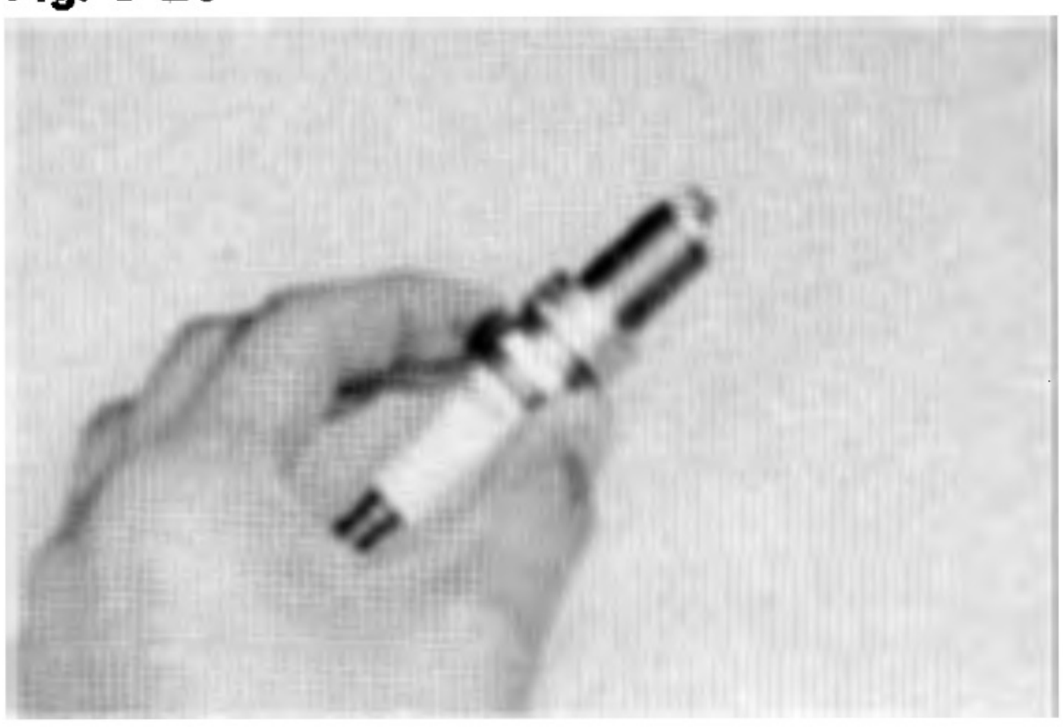


SPARK PLUG

INSPECTION

1. Check for the following items:
   (1) Cracks or damages in the threads or insulator.
   (2) Damaged or deteriorated gaskets.

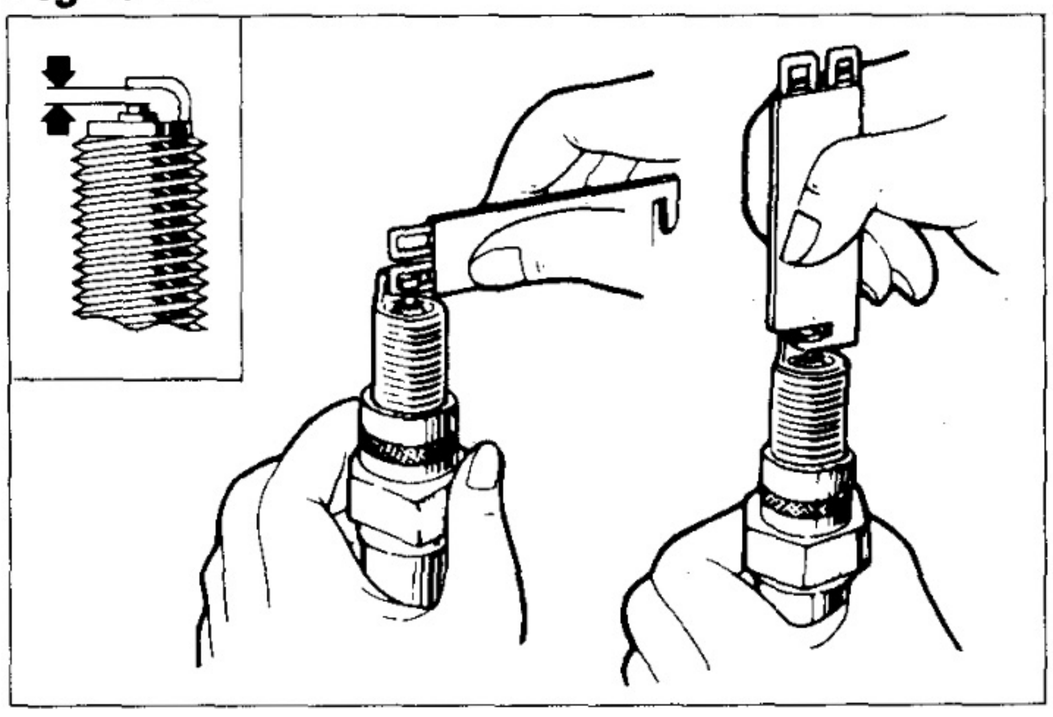
Fig. 8-26



(3) Wear on the electrodes.
(4) Burnt electrode and the amount of carbon deposit.

2. Clean or replace the plugs, if necessary.

Fig. 8-27



ADJUST PLUG GAP

Check the plug gap with a plug gap gauge. If not as specified, adjust by bending the ground (outer) electrode.

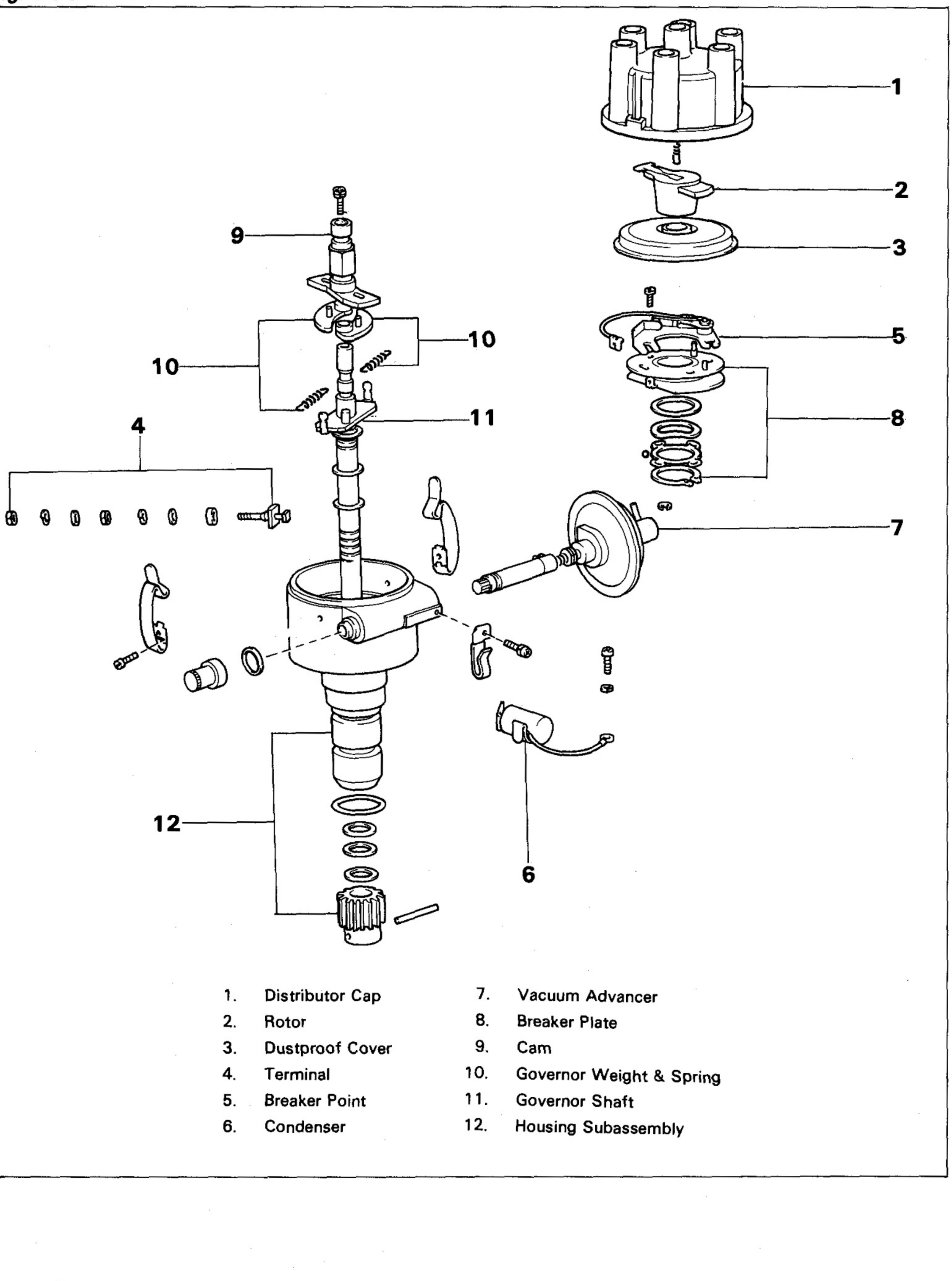
Spark plug gap: 0.8 mm (0.031 in.)

DISTRIBUTOR (FA & General FJ series)

DISASSEMBLY

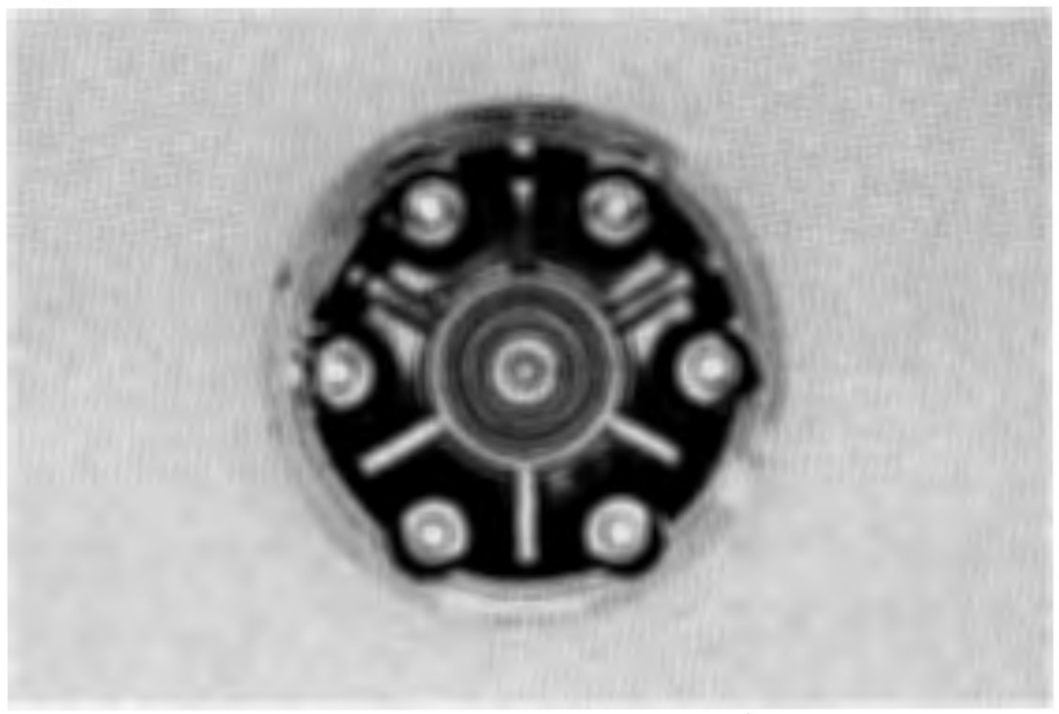
Disassemble the parts in the numerical order shown in the figure.

Fig. 8-28



1. Distributor Cap
2. Rotor
3. Dustproof Cover
4. Terminal
5. Breaker Point
6. Condenser
7. Vacuum Advancer
8. Breaker Plate
9. Cam
10. Governor Weight & Spring
11. Governor Shaft
12. Housing Subassembly

Fig. 8-29

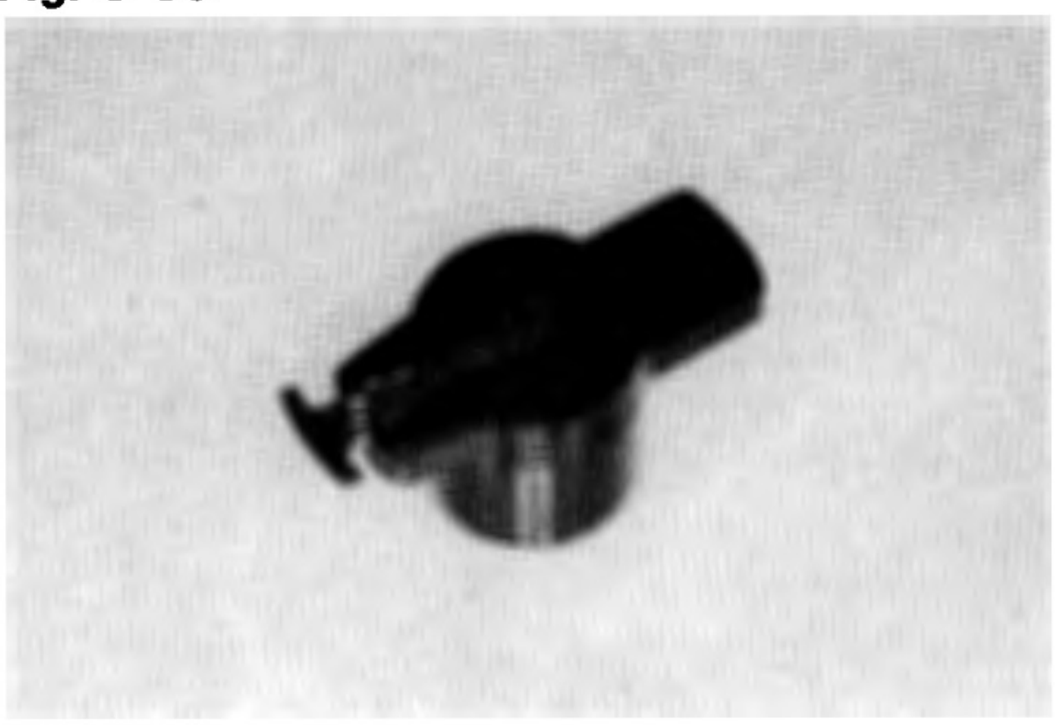


INSPECTION & REPAIR

Cap

Check for cracks, carbon tracks, burnt or corroded terminals and check the center contact for wear.

Fig. 8-30



Rotor

Check for cracks, carbon tracks, burnt or corroded terminals.

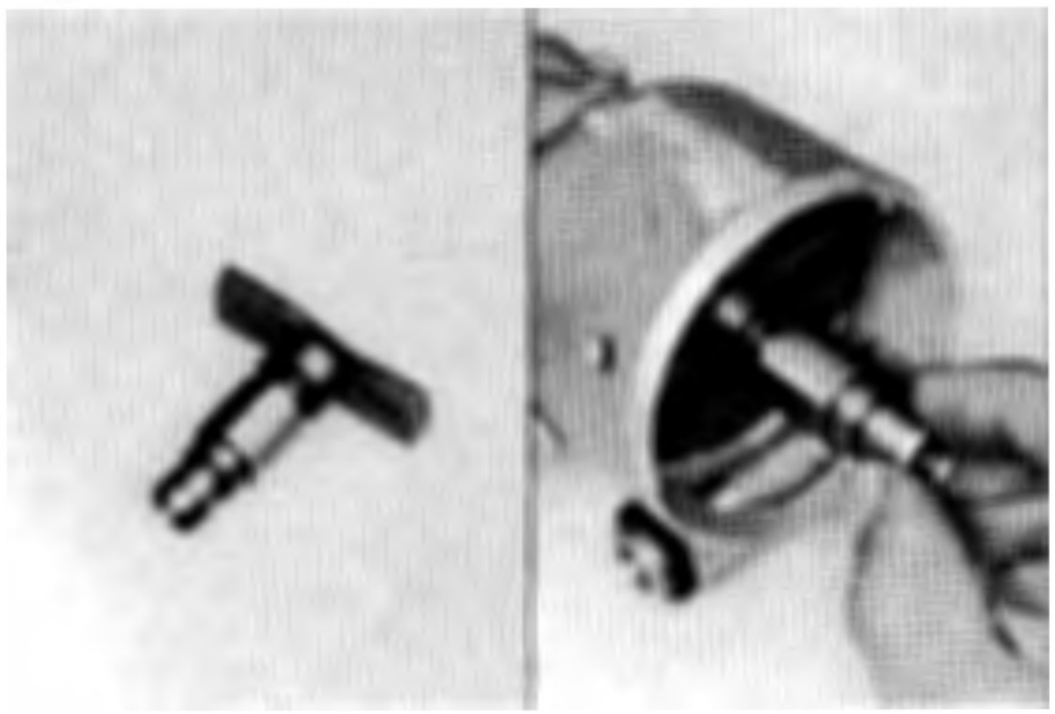
Fig. 8-31



Breaker Plate

Check for smooth rotation.

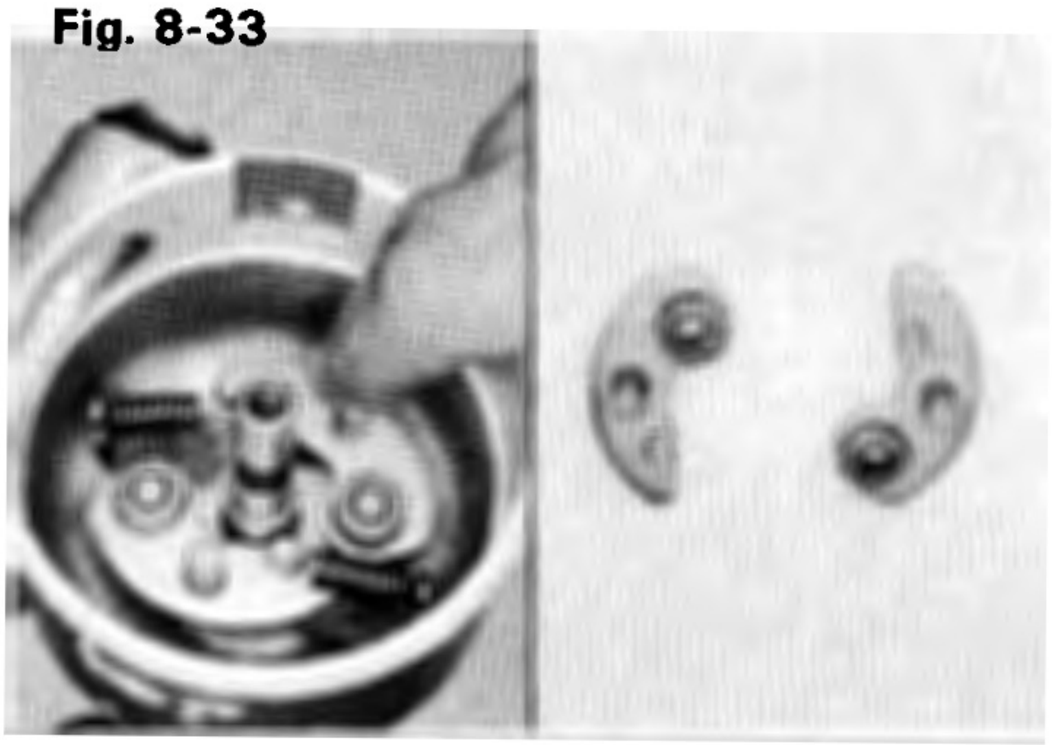
Fig. 8-32



Cam & Shaft

1. Check the cam for wear or damage.
2. Check the fit between the cam and shaft.

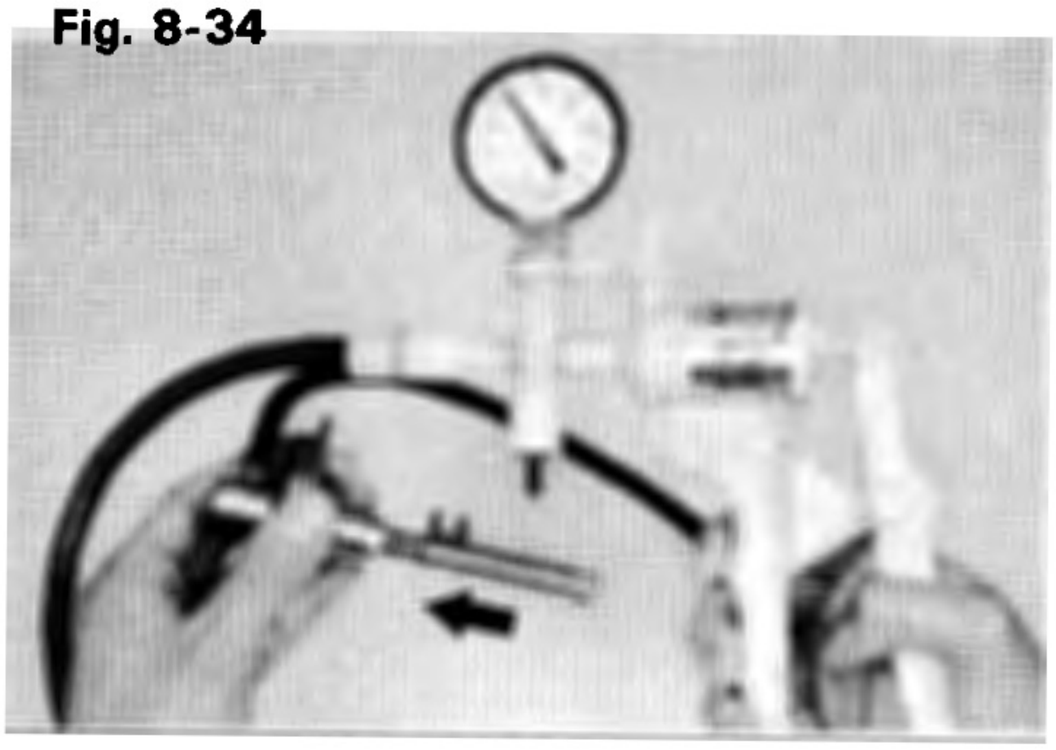
Fig. 8-33



Governor Weight & Pin

1. Rotate the governor weight to check for binding.
2. Check the governor weights for wear or damage.

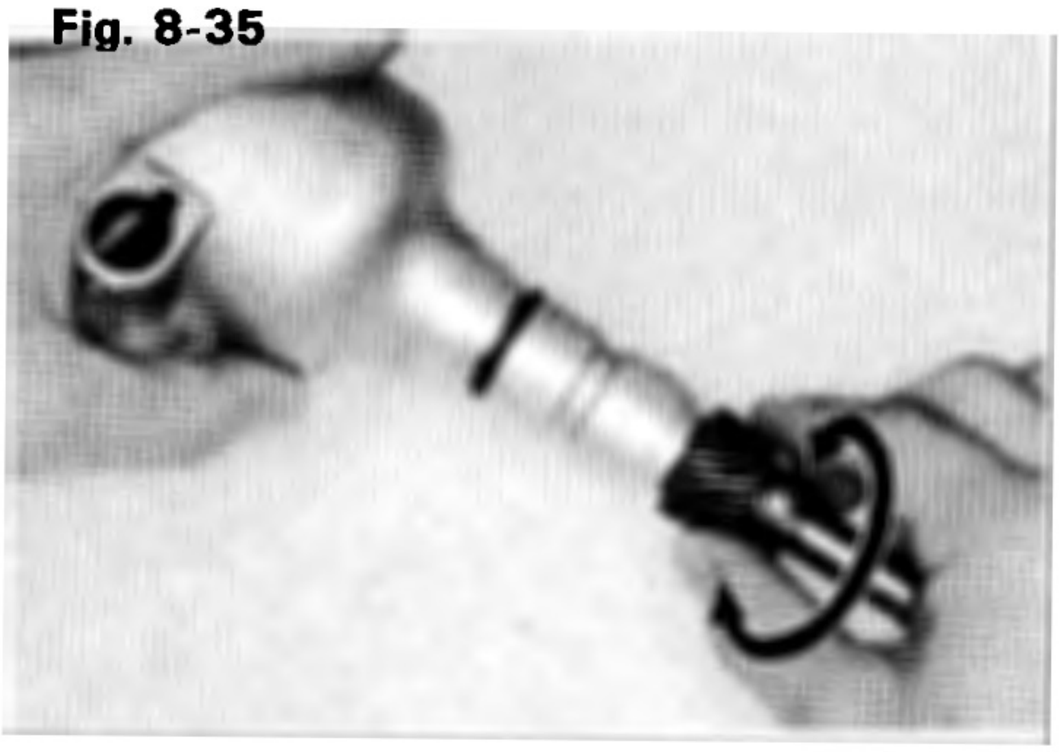
Fig. 8-34



Vacuum Advancer Diaphragm

Apply vacuum onto the vacuum advancer diaphragm. The diaphragm should move.

Fig. 8-35



Governor Shaft & Housing

1. Confirm that the governor shaft rotates smoothly.

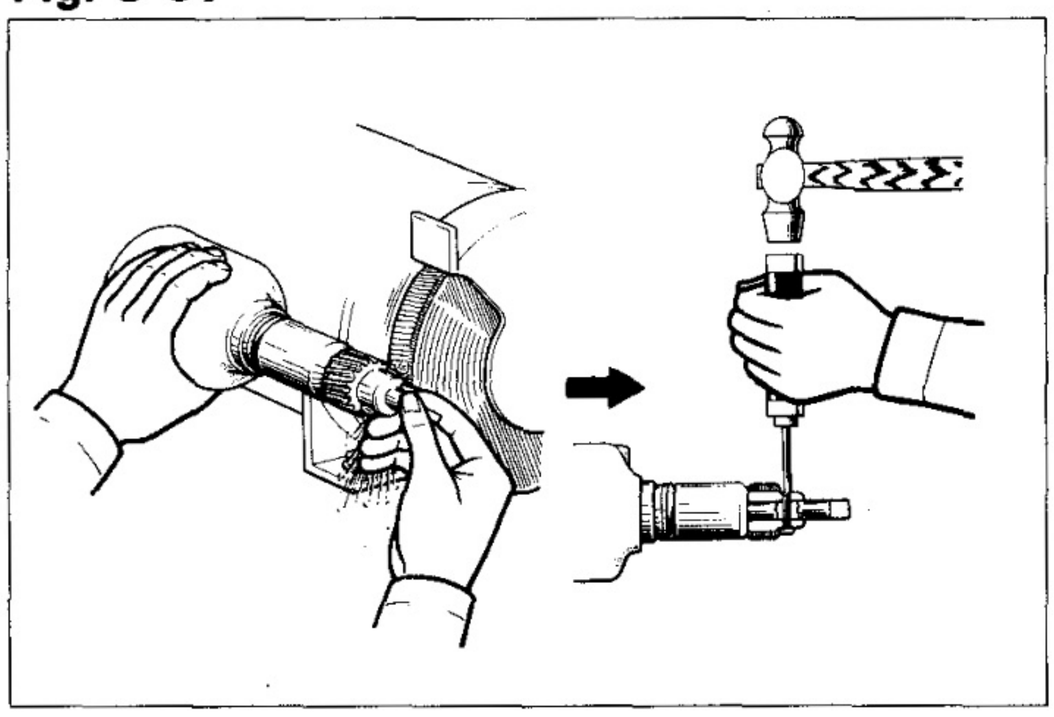
Fig. 8-36



2. Check the shaft thrust clearance.

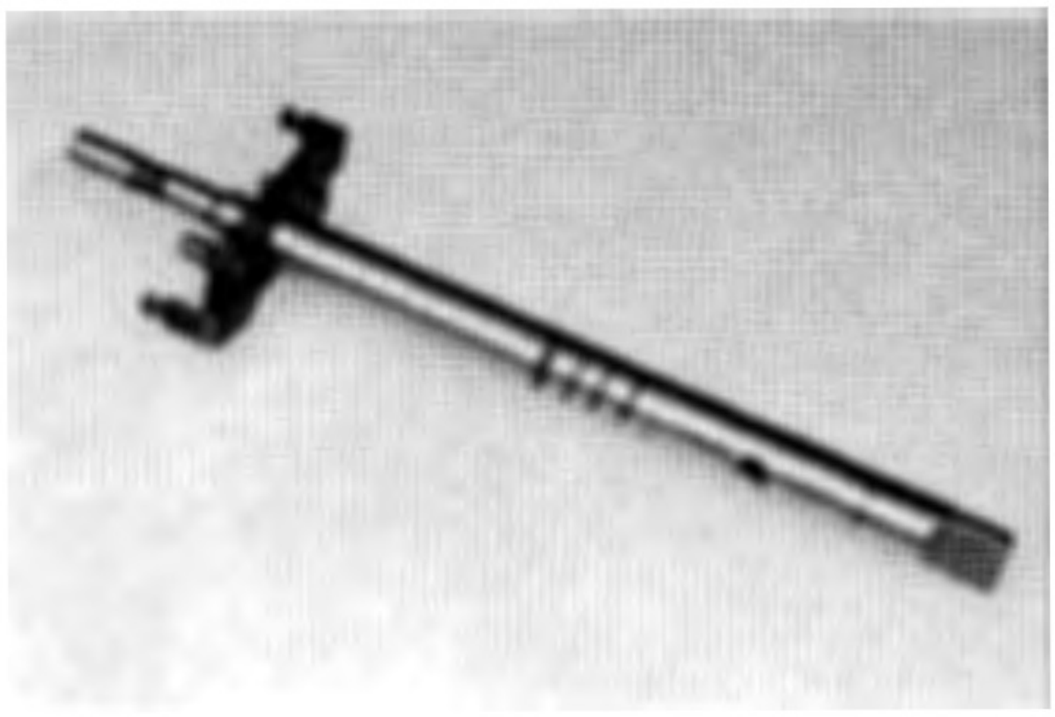
Thrust clearance:
0.15 – 0.50 mm
(0.0059 – 0.0197 in.)

Fig. 8-37



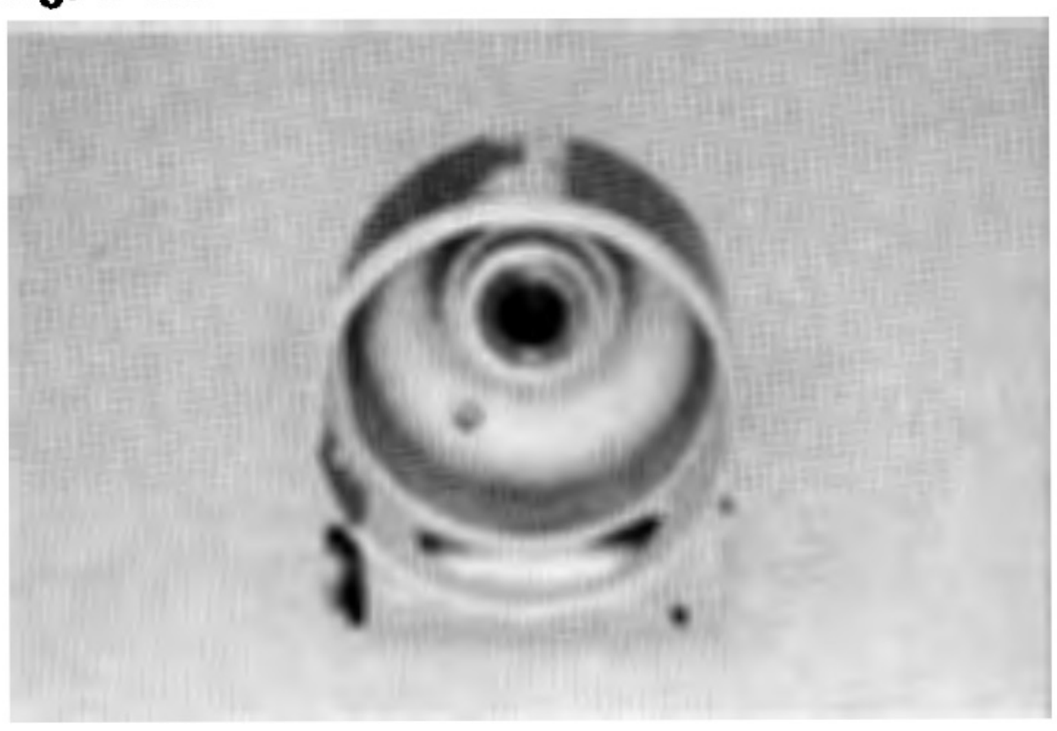
3. Disassemble the governor shaft.
   (1) Scrape the peened end of the pin with a grinder and drive out the pin.

Fig. 8-38



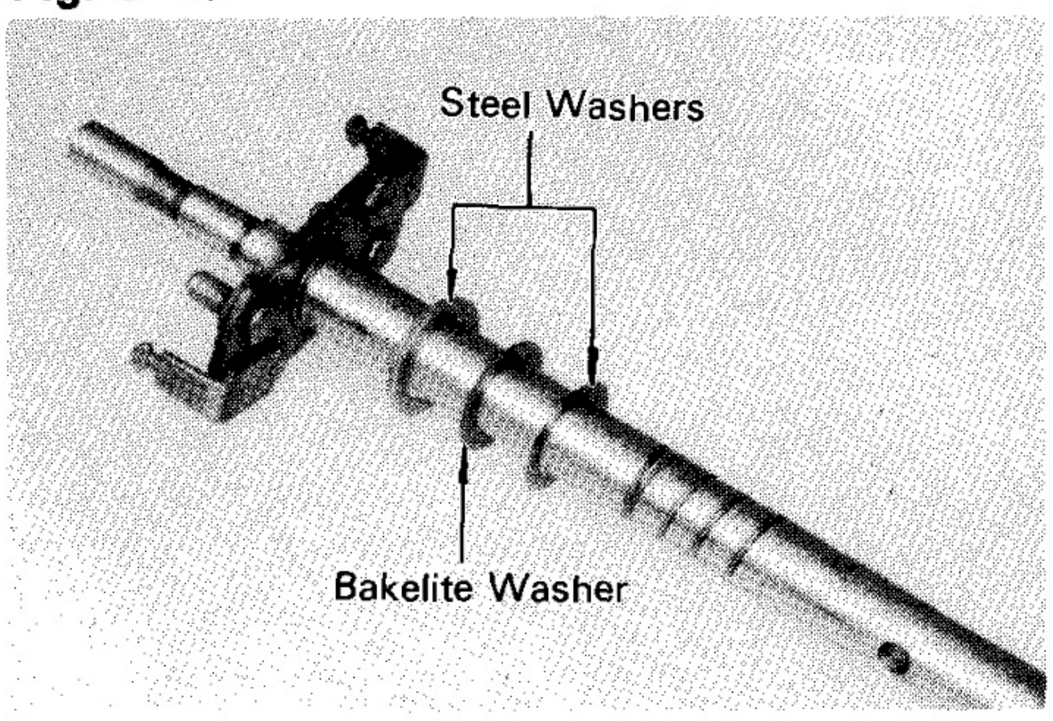
(2) Check the governor shaft for wear or damage.

Fig. 8-39



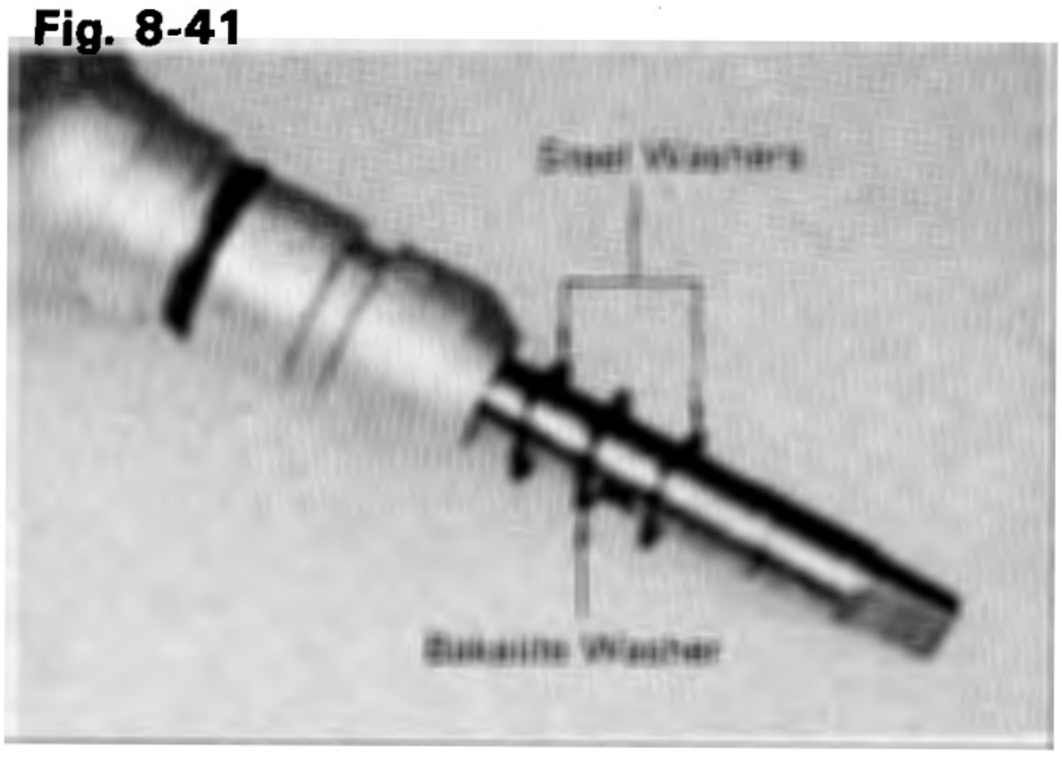
(3) Check the housing, bushing and O ring for wear, deformation or damage.

Fig. 8-40



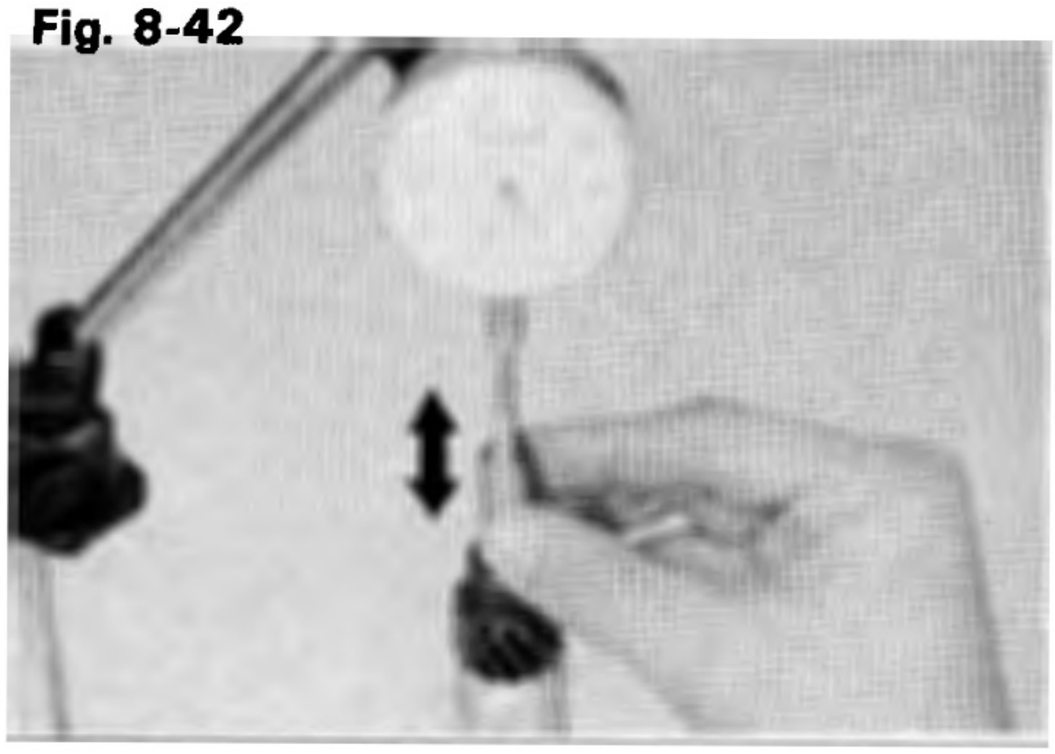
(4) Assemble the washers as shown in the figure (Cam side).

Fig. 8-41



(5) Assemble the washers as shown in the figure (Spiral gear side).

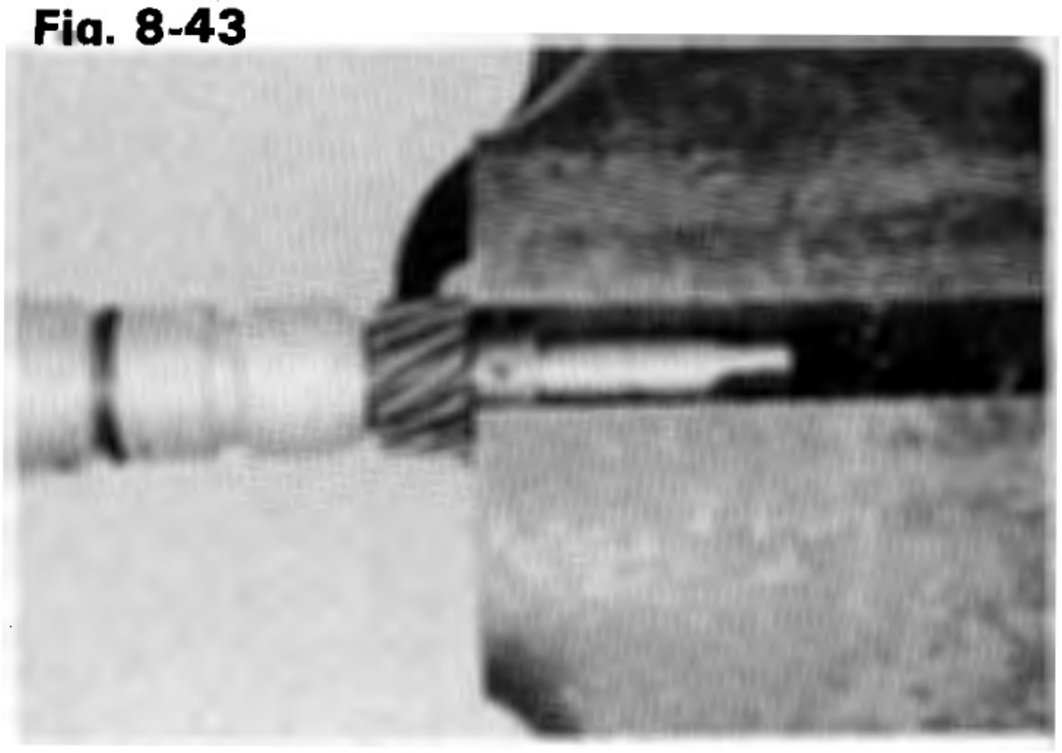
Fig. 8-42



(6) Before staking the pin, recheck the shaft clearance.
If necessary, adjust the clearance with a steel washer.

Thrust clearance:
0.15 — 0.50 mm
(0.0059 — 0.0197 in.)

Fig. 8-43

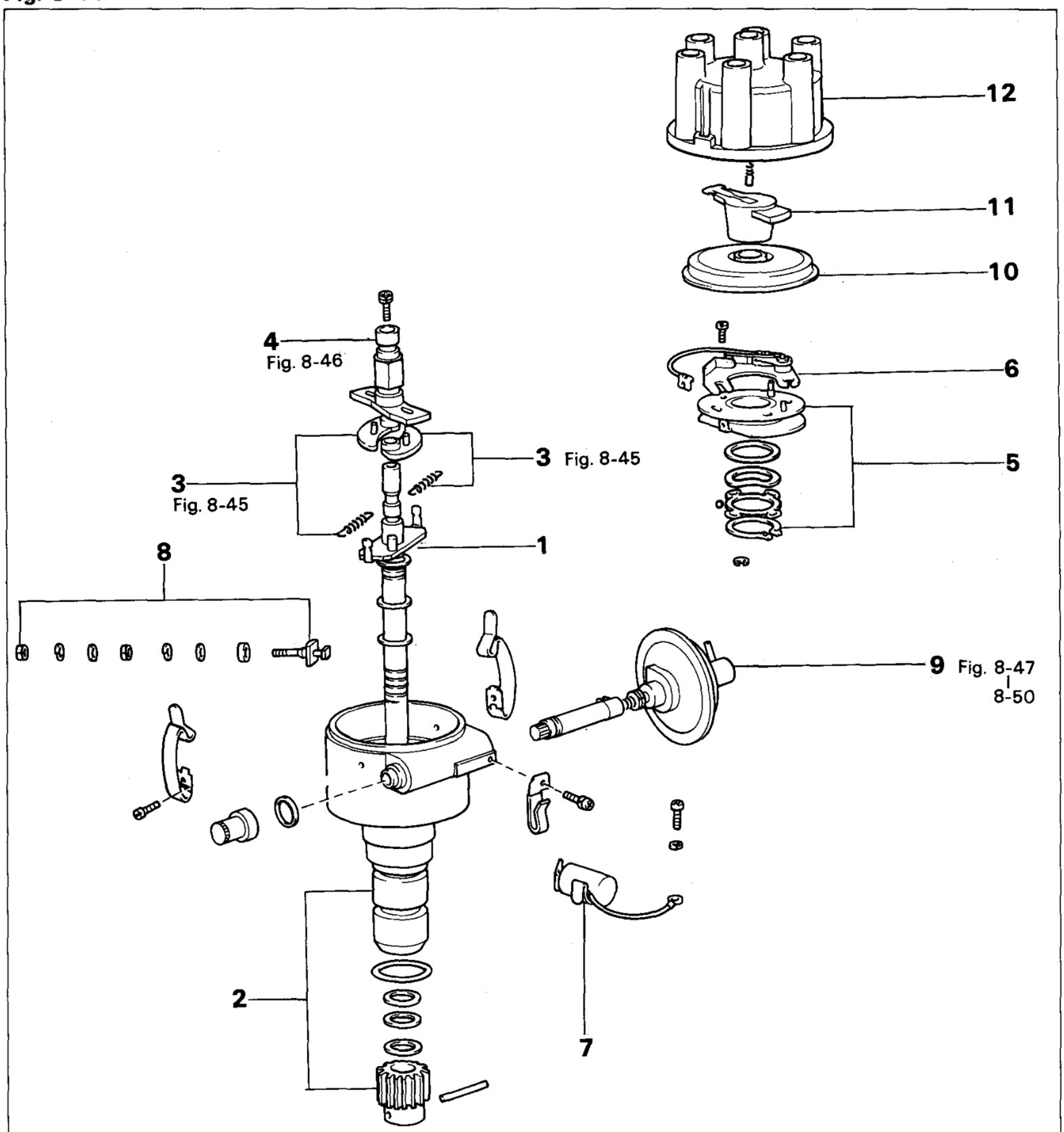


(7) Peen both ends with a vise.

ASSEMBLY

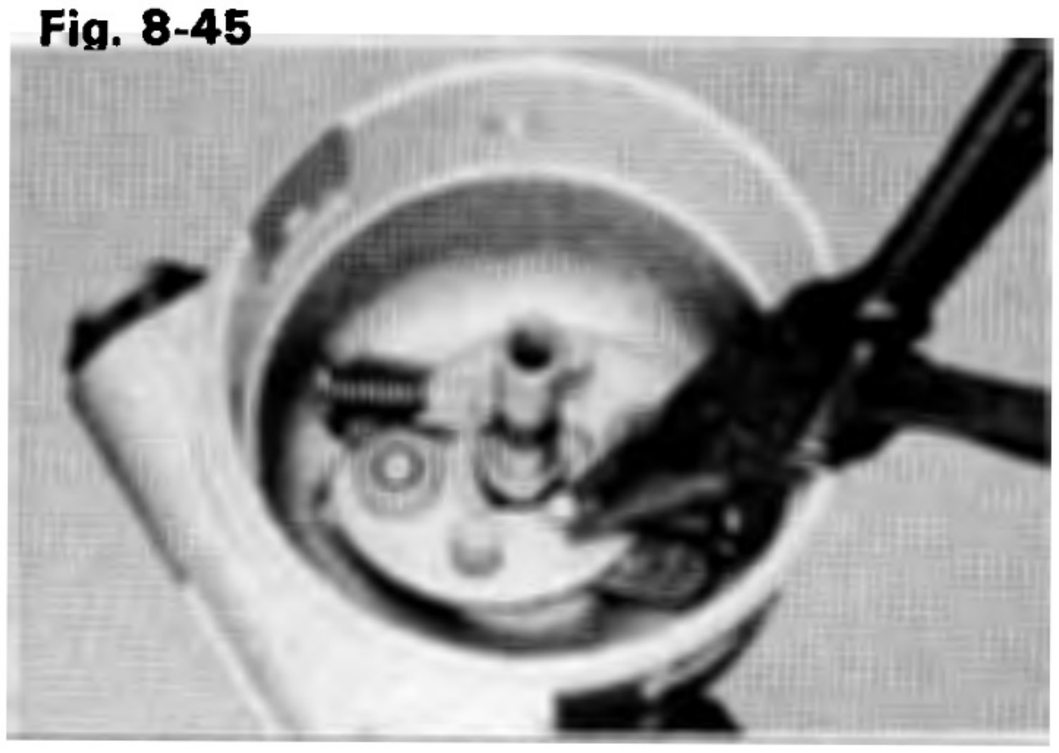
Assemble the parts in the numerical order shown in the figure.

Fig. 8-44



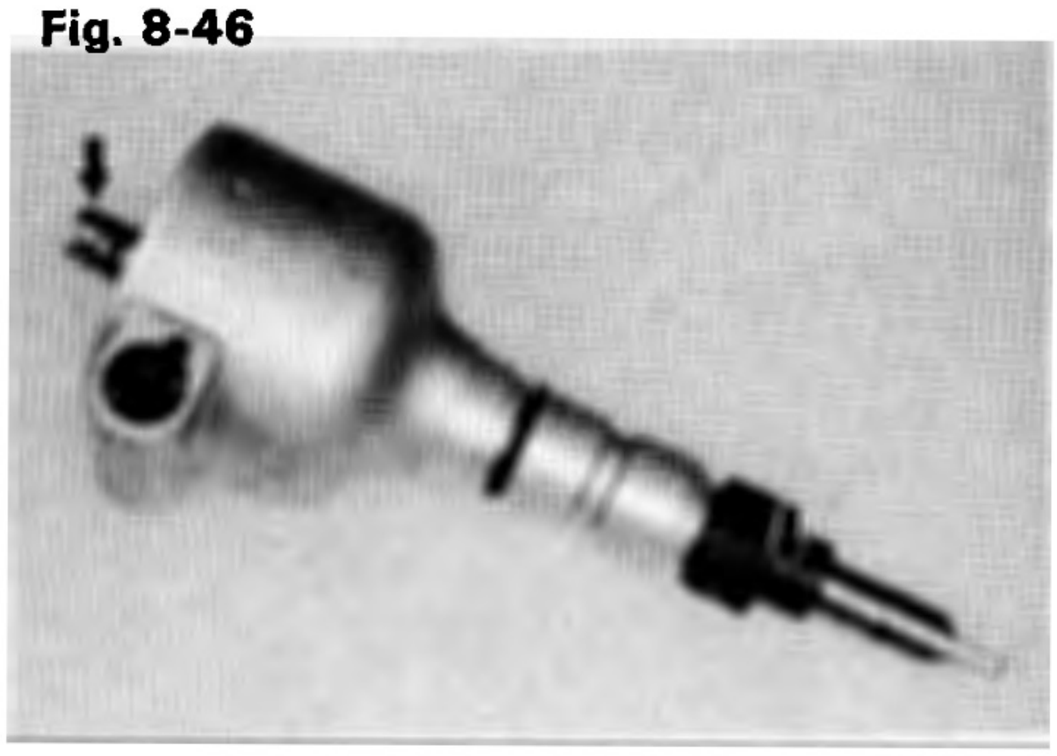
1. Governor Shaft
2. Housing Subassembly
3. Governor Weight & Spring
4. Cam
5. Breaker Plate
6. Breaker Point
7. Condenser
8. Terminal
9. Vacuum Advancer
10. Dustproof Cover
11. Rotor
12. Distributor Cap

Fig. 8-45



Make sure that the governor spring is installed correctly.

Fig. 8-46



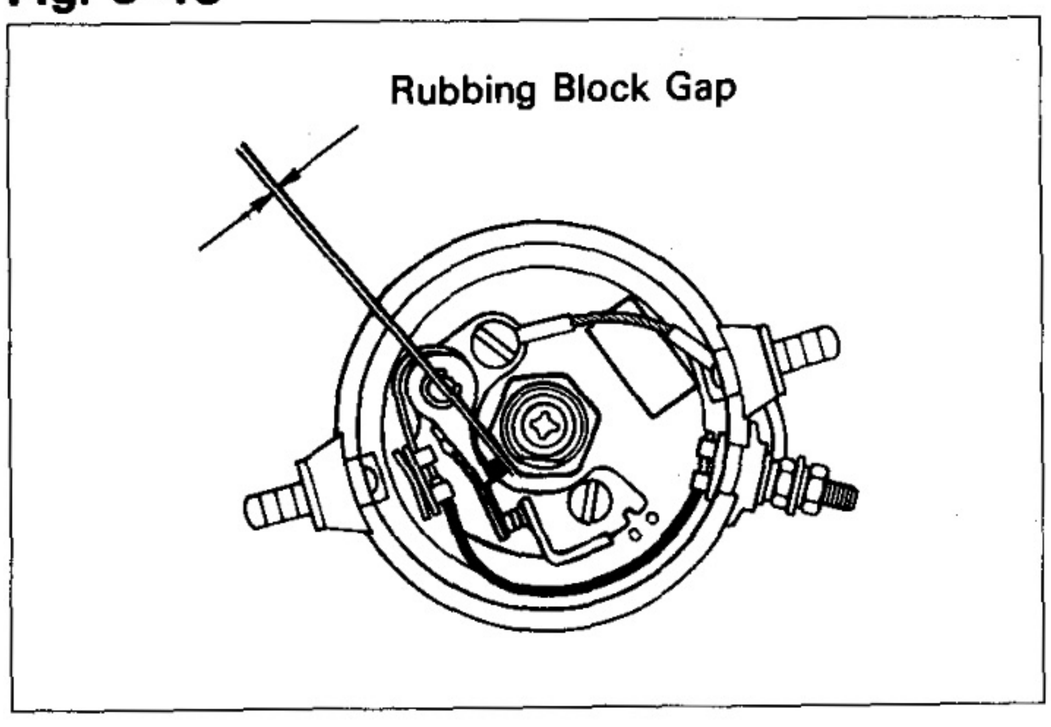
Install the cam, aligning its notch with the 4-mm hole of the spiral gear as shown in the figure.

Fig. 8-47



Make sure that the E ring is installed in the breaker plate correctly.

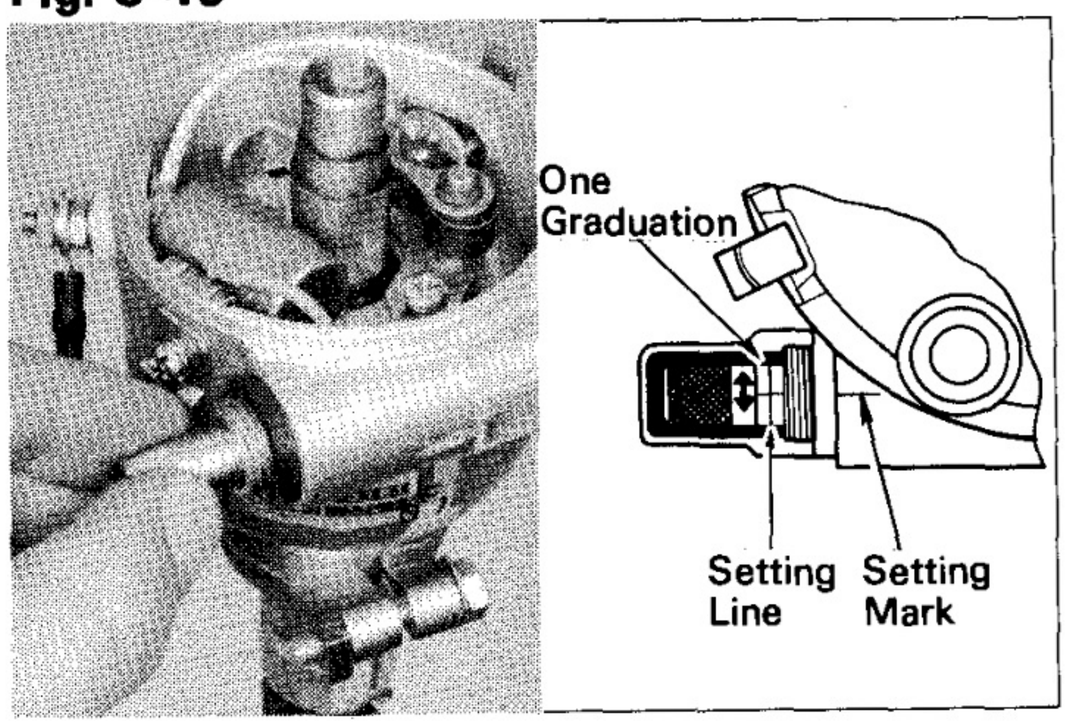
Fig. 8-48



Adjust the rubbing block gap.

Rubbing block gap: 0.30 mm (0.0118 in.)

Fig. 8-49



Set the octane selector at the standard line.

Fig. 8-50



Check the breaker plate for smooth rotation by pushing the octane selector.

Fig. 8-51

SEE

DISTRIBUTOR

INSTALLATION

SECTION

Figs. 8-79 to 8-86

INSTALLATION

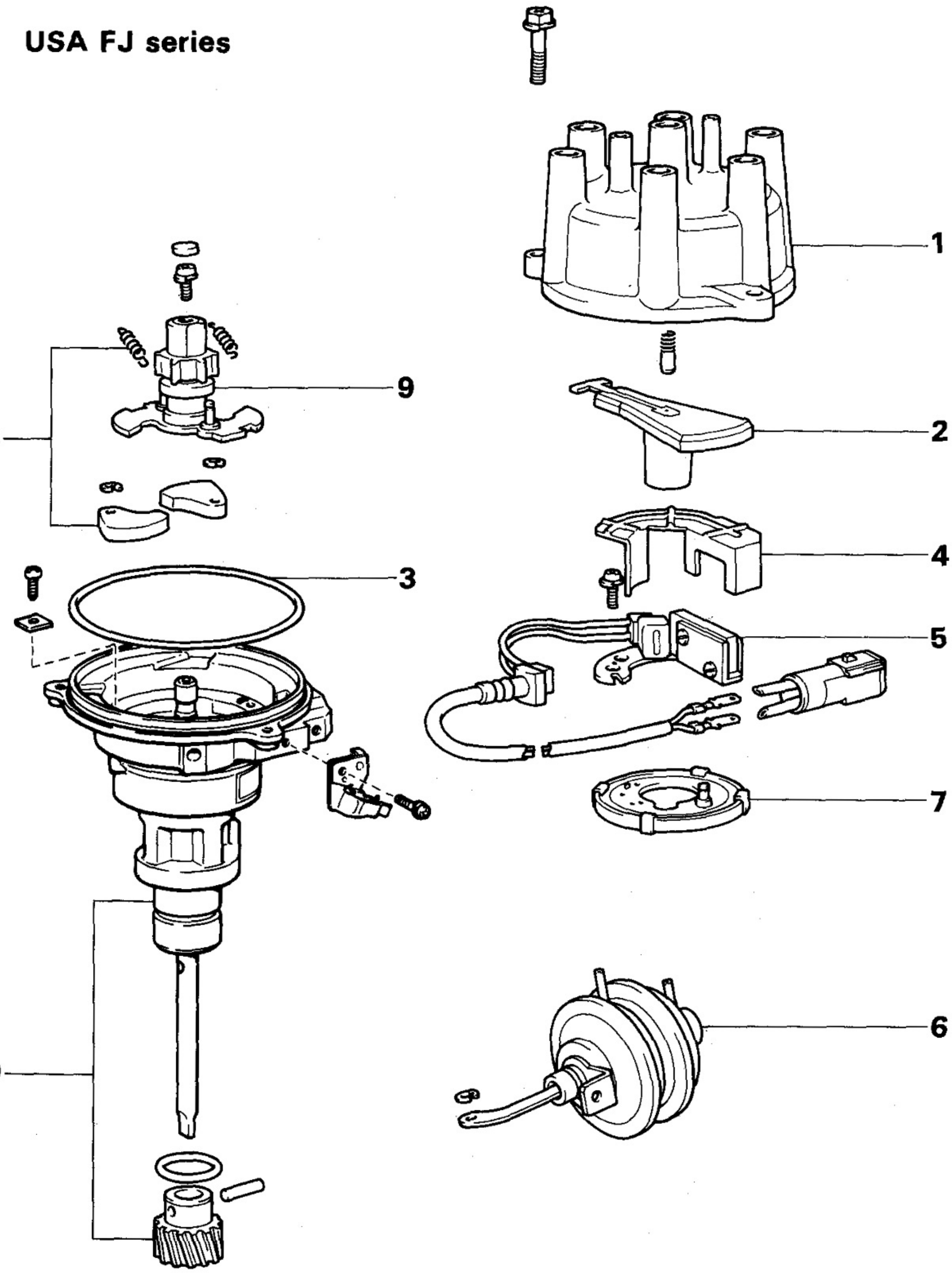
Install the distributor.

DISTRIBUTOR (USA, ECE & Australia FJ series)

DISASSEMBLY

Disassemble the parts in the numerical order shown in the figure.

Fig. 8-52

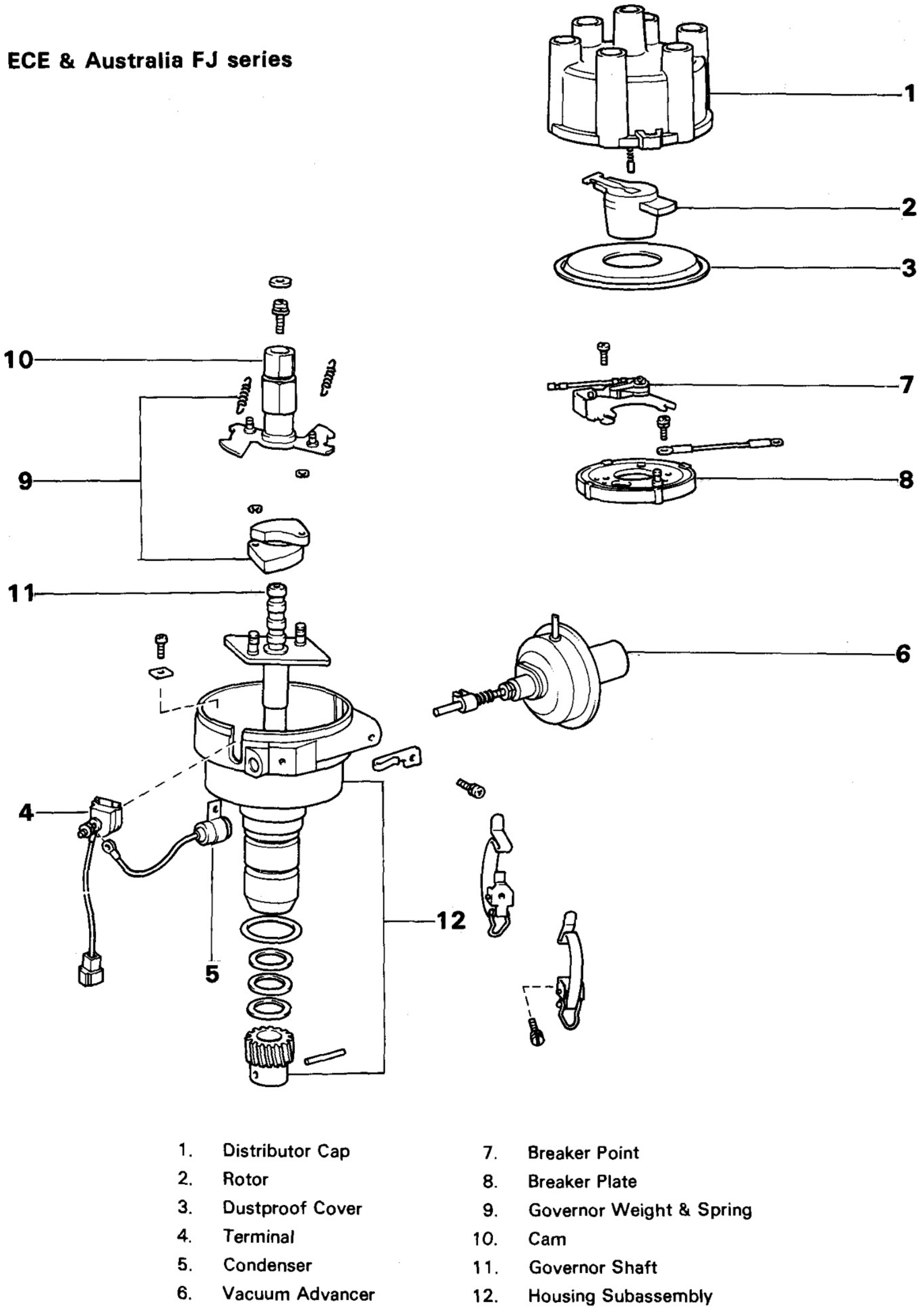


1. Distributor Cap
2. Rotor
3. Dustproof O Ring
4. Dust Cover
5. Signal Generator
6. Vacuum Advancer Diaphragm
7. Breaker Plate
8. Governor Weight & Spring
9. Signal Rotor
10. Housing Subassembly & Spiral Gear

Disassemble the parts in the numerical order shown in the figure.

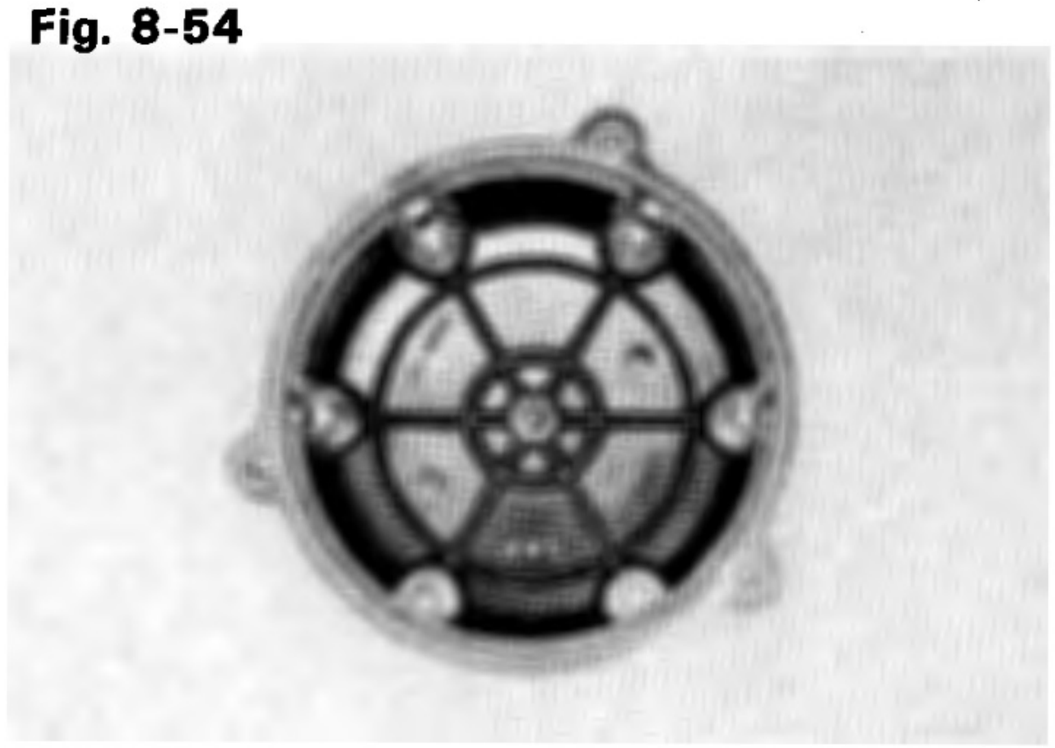
Fig. 8-53

ECE & Australia FJ series



1. Distributor Cap
2. Rotor
3. Dustproof Cover
4. Terminal
5. Condenser
6. Vacuum Advancer
7. Breaker Point
8. Breaker Plate
9. Governor Weight & Spring
10. Cam
11. Governor Shaft
12. Housing Subassembly

Fig. 8-54

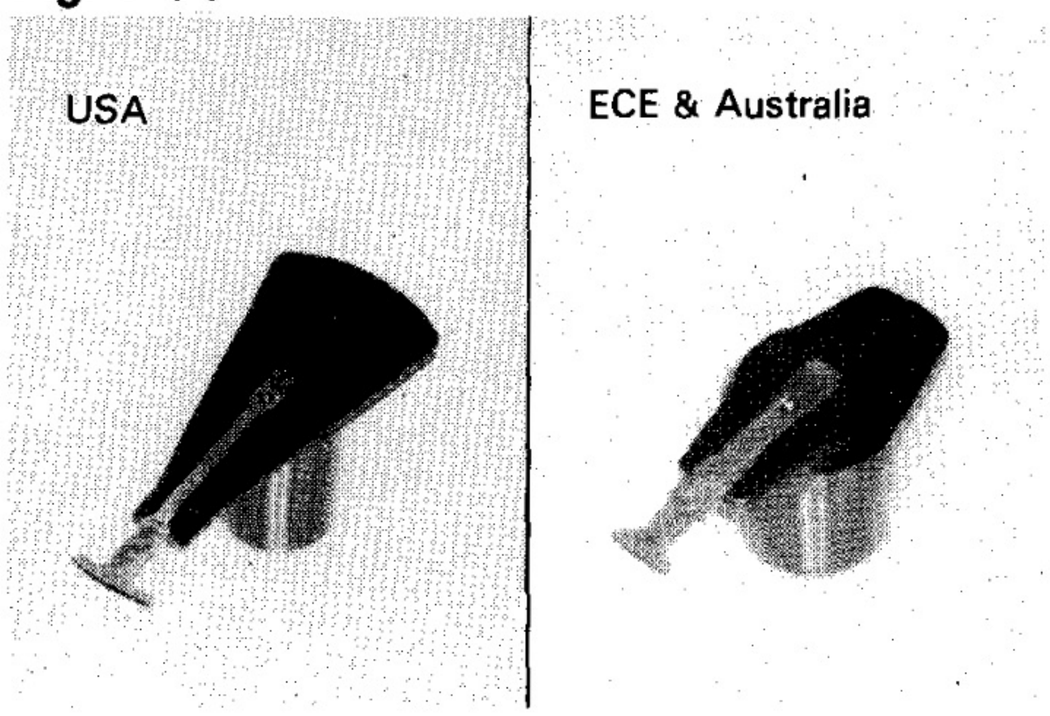


INSPECTION & REPAIR

Cap

Check for cracks, carbon tracks, burnt or corroded terminals and check the center contact for wear.

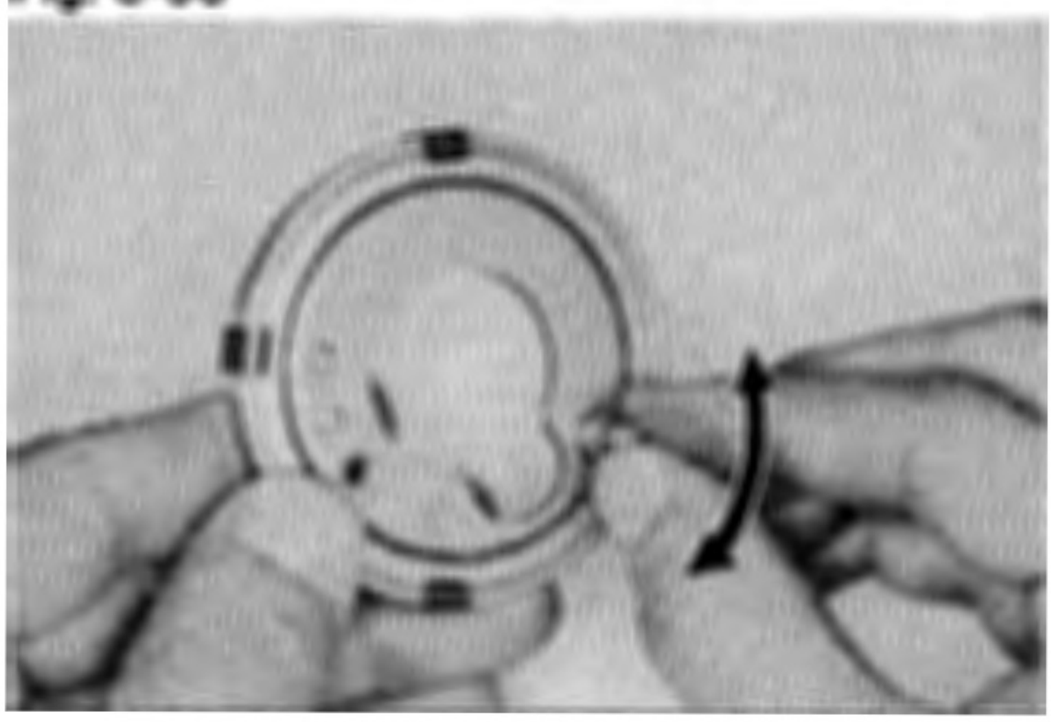
Fig. 8-55



Rotor

Check for cracks, carbon tracks, burnt or corroded terminals.

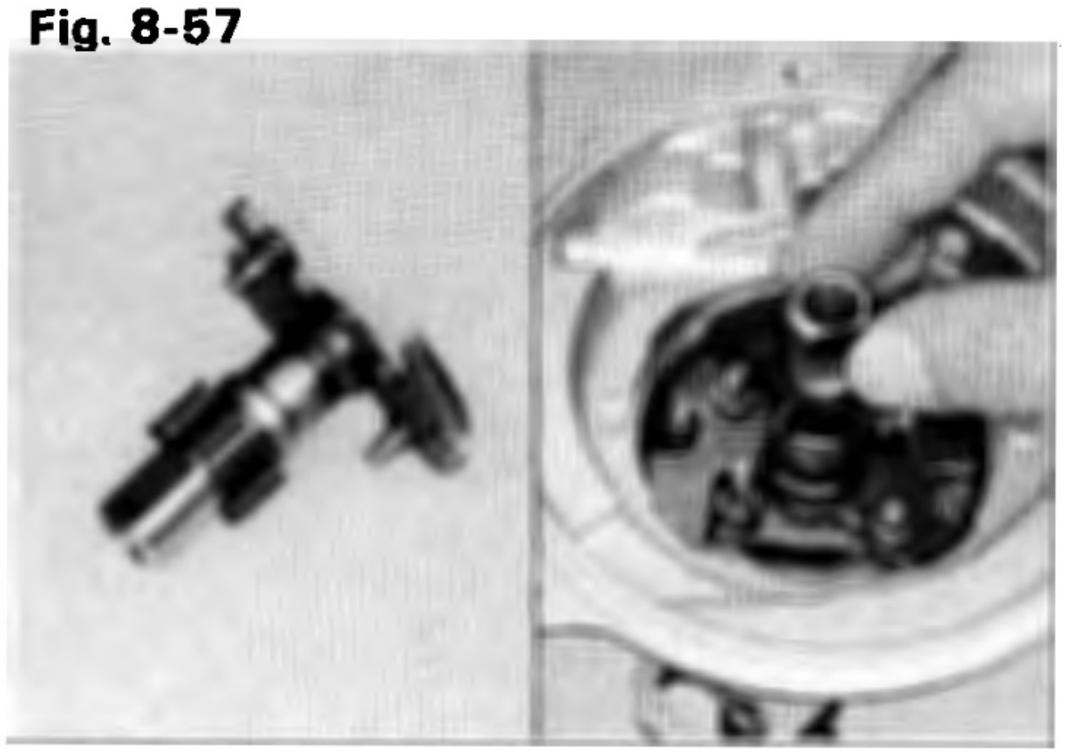
Fig. 8-56



Breaker Plate

Check for smooth rotation.

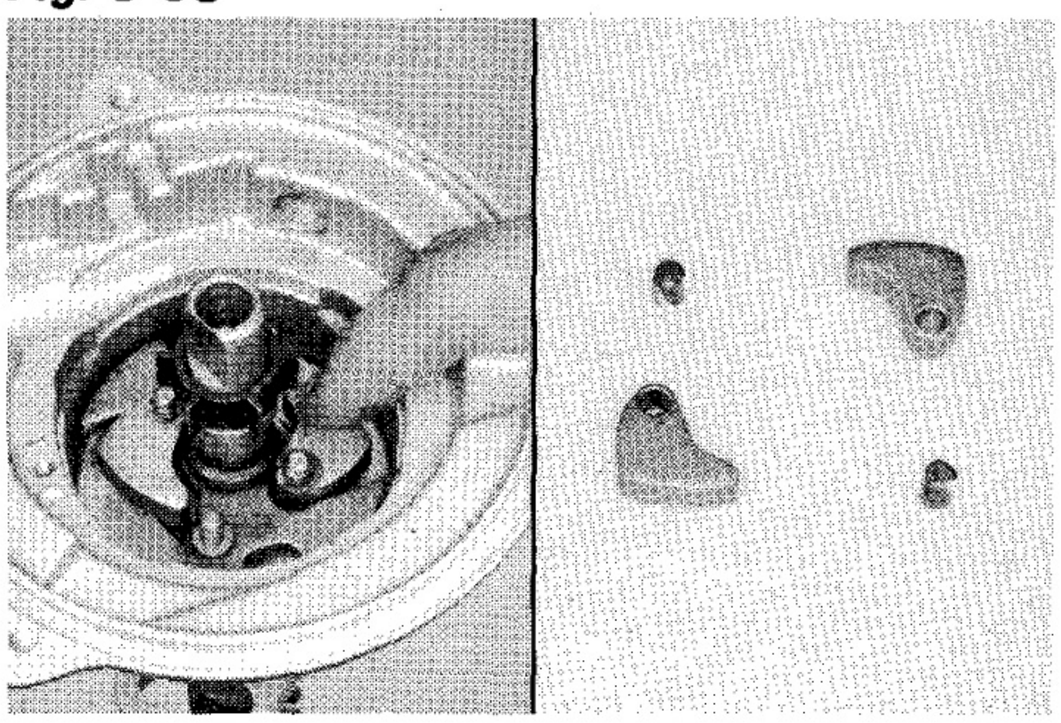
Fig. 8-57



Cam & Shaft

1. Check the cam for wear or damage.
2. Check the fit between the cam and shaft.

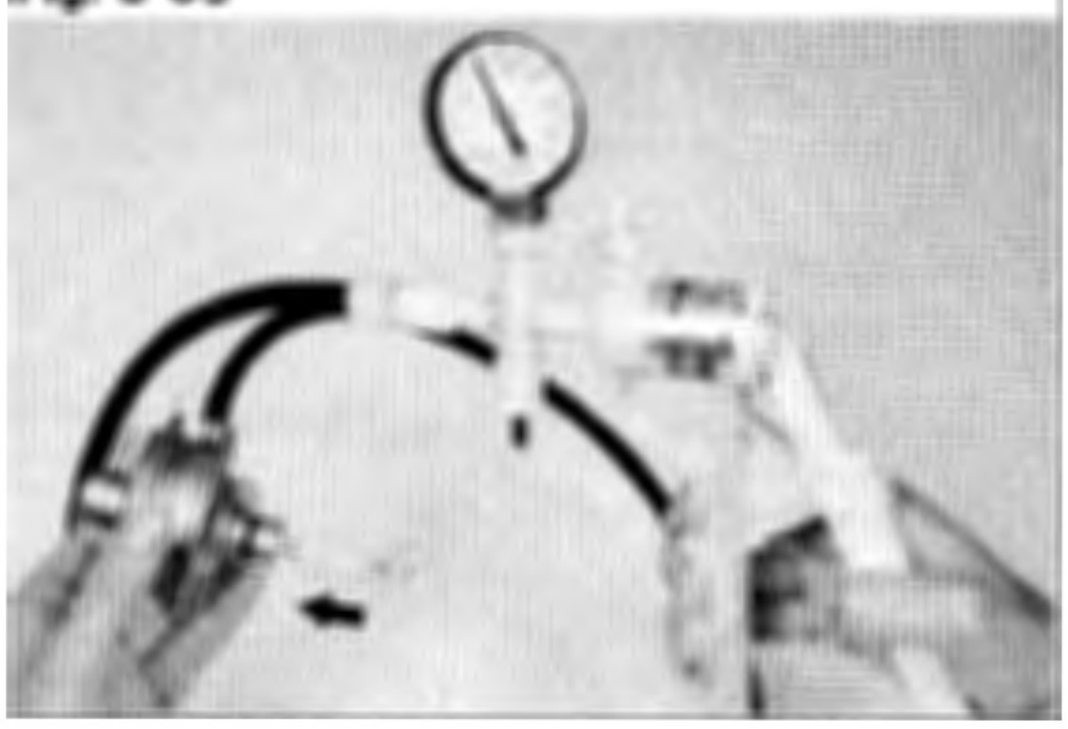
Fig. 8-58



Governor Weight & Pin

1. Rotate the governor weight to check for binding.
2. Check the governor weights and bearings for wear or damage.

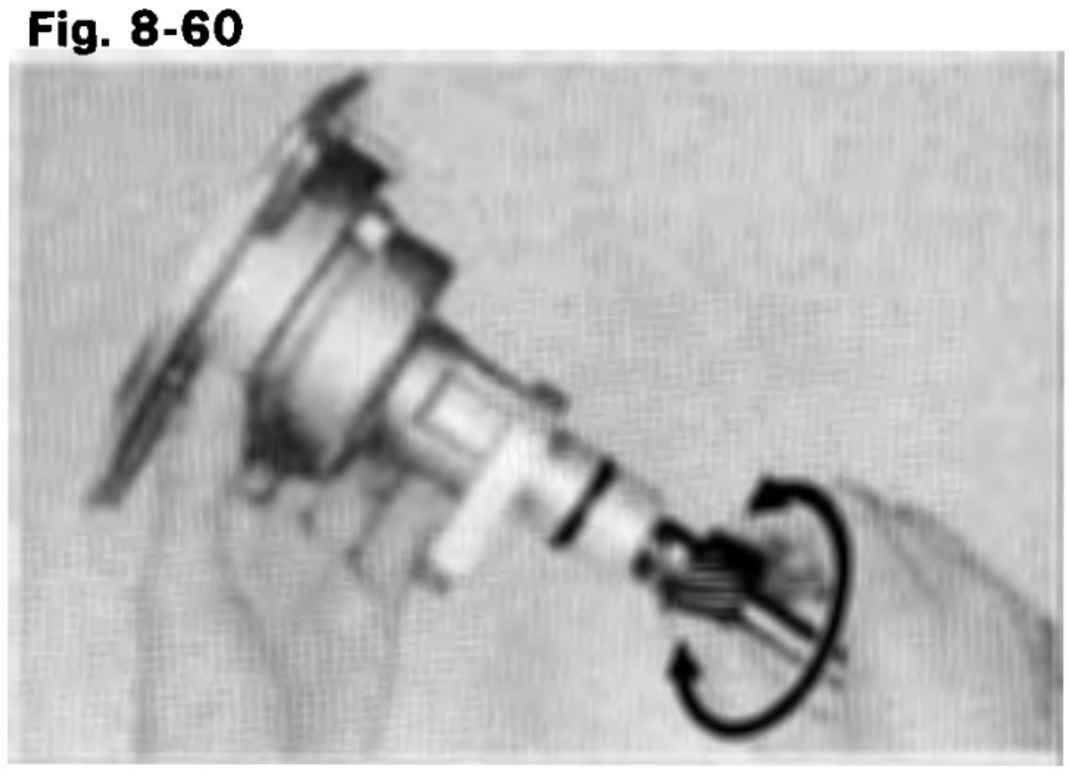
Fig. 8-59



Vacuum Advancer Diaphragm

Apply vacuum onto the vacuum advancer diaphragm. The diaphragm should move.

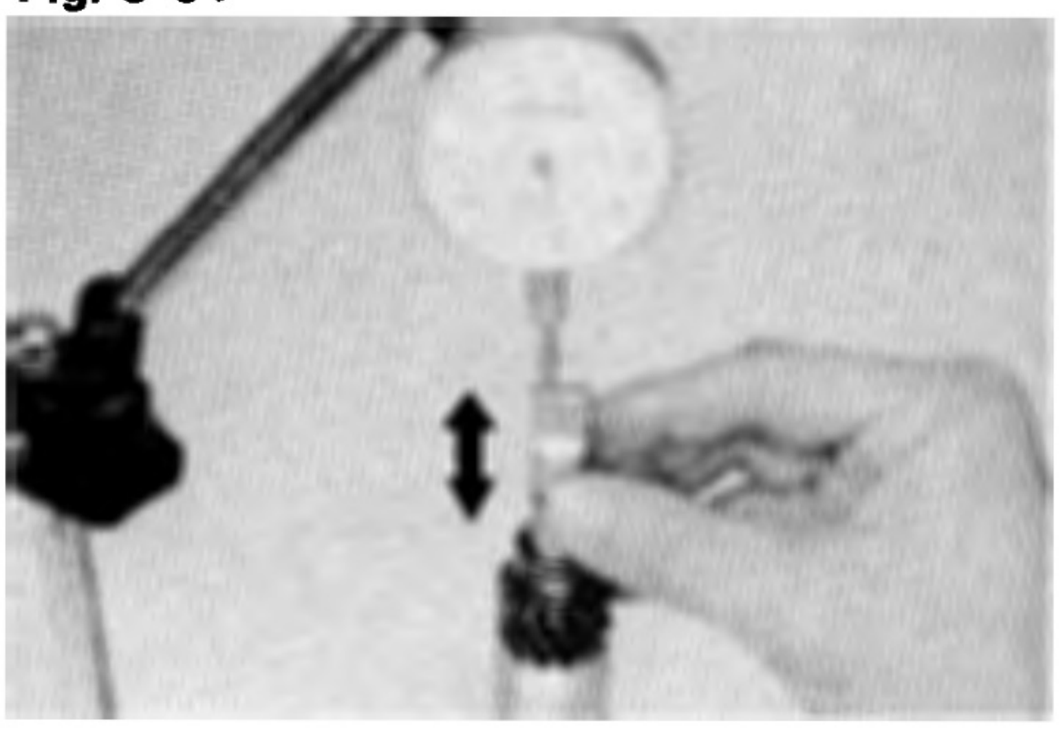
Fig. 8-60



Governor Shaft & Housing

1. Confirm that the governor shaft rotates smoothly.

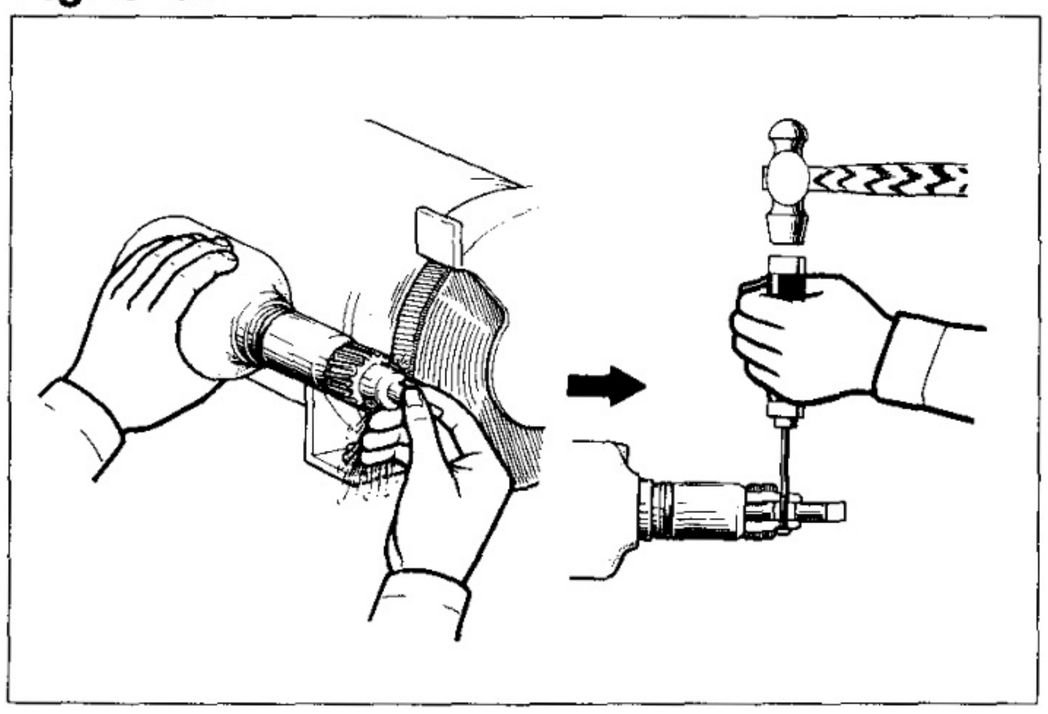
Fig. 8-61



2. Check the shaft thrust clearance. (ECE & Australia)

Thrust clearance:
0.15 – 0.50 mm
(0.0059 – 0.0197 in.)

Fig. 8-62

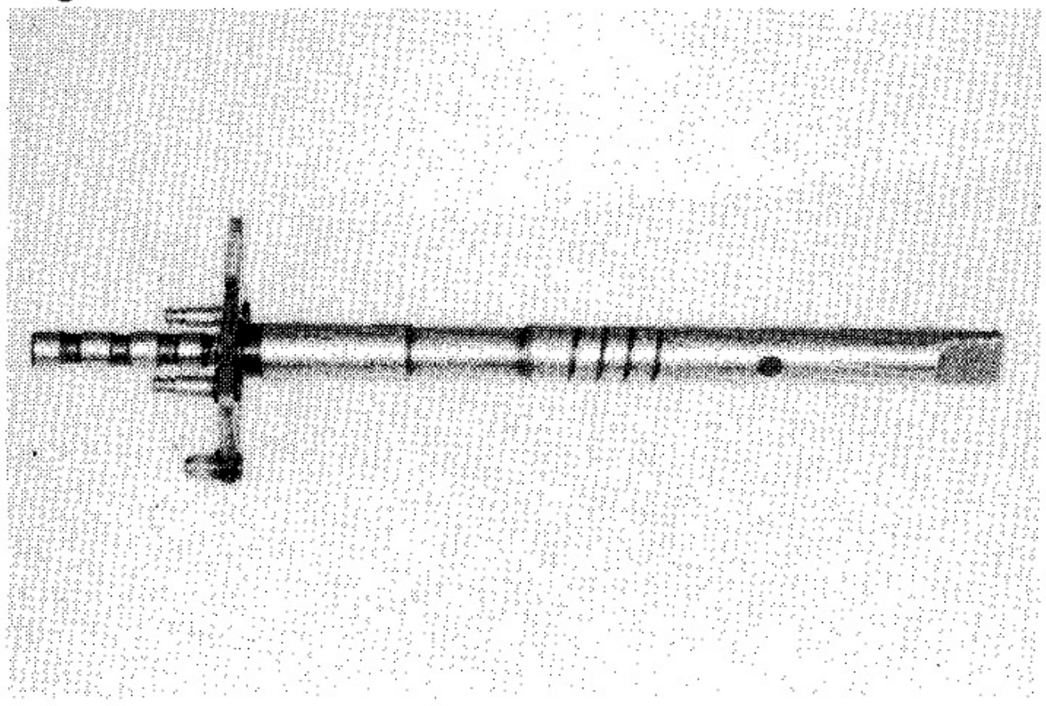


3. Disassemble the governor shaft referring to the following procedures. (ECE & Australia)
   (1) Scrape the peened end of the pin with a grinder and drive out the pin.

– Note –

Do not disassemble the governor shaft of USA distributor. But replace the spiral gear if necessary.

Fig. 8-63



(2) Check the governor shaft for wear or damage. (ECE & Australia)

Fig. 8-64



(3) Check the housing, bushing and O ring for wear, deformation or damage.

Fig. 8-65

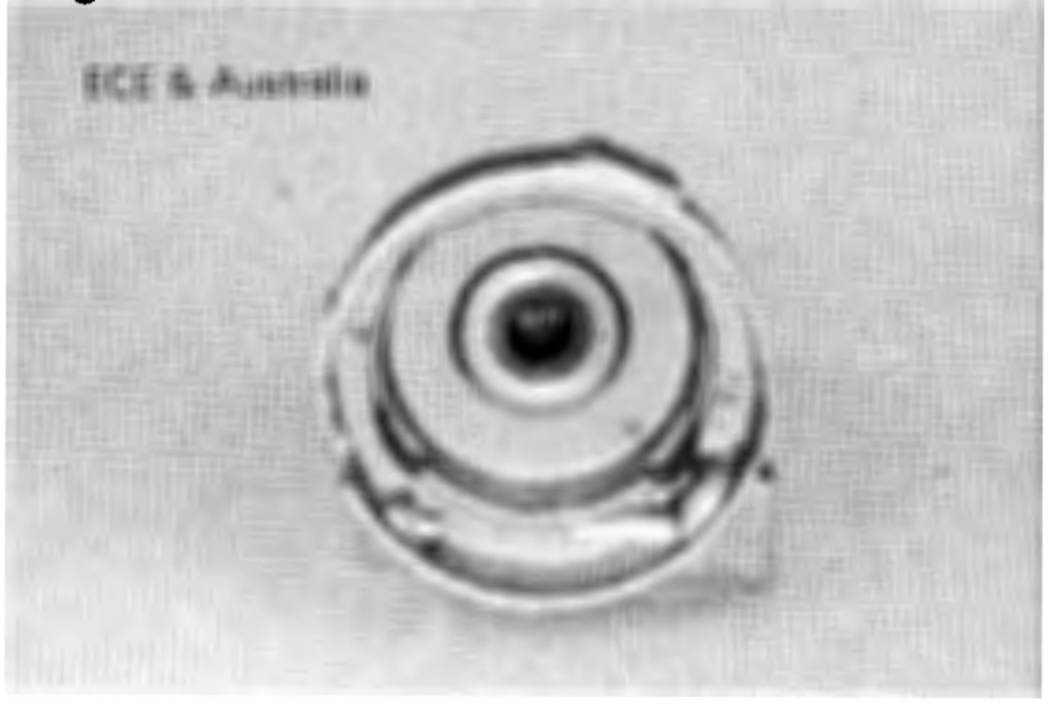
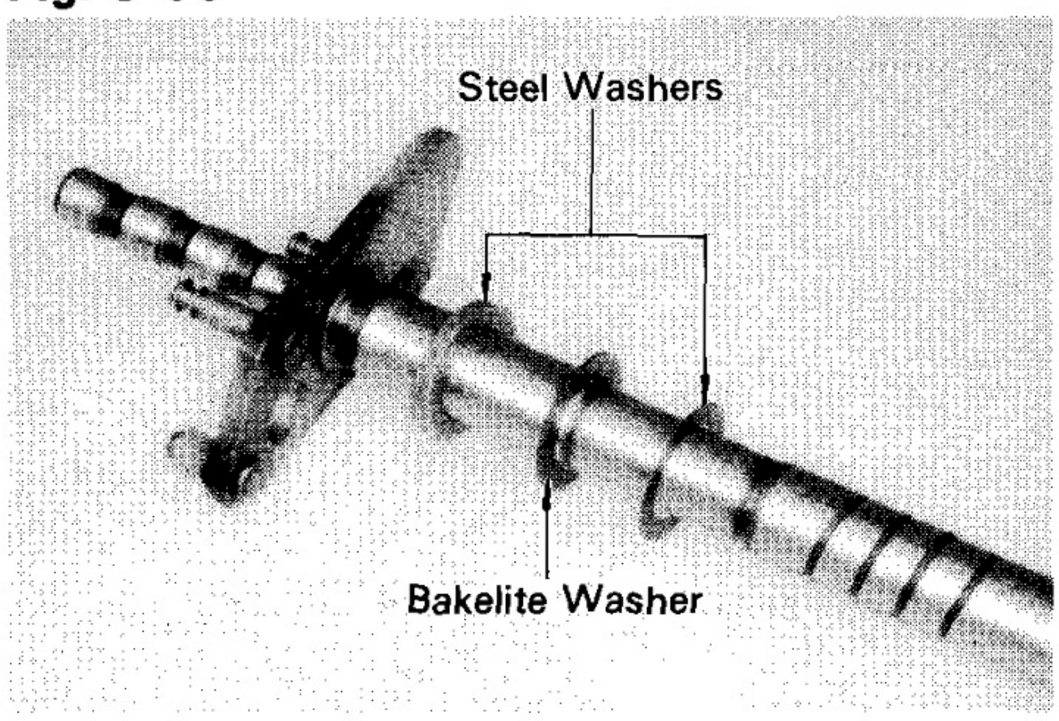
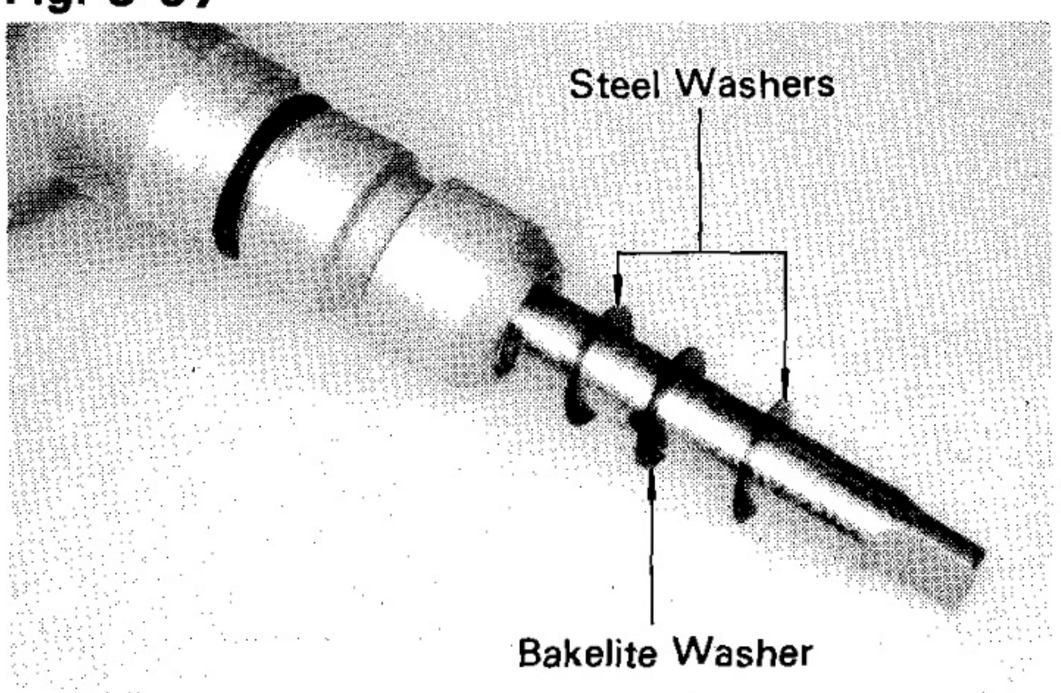


Fig. 8-66



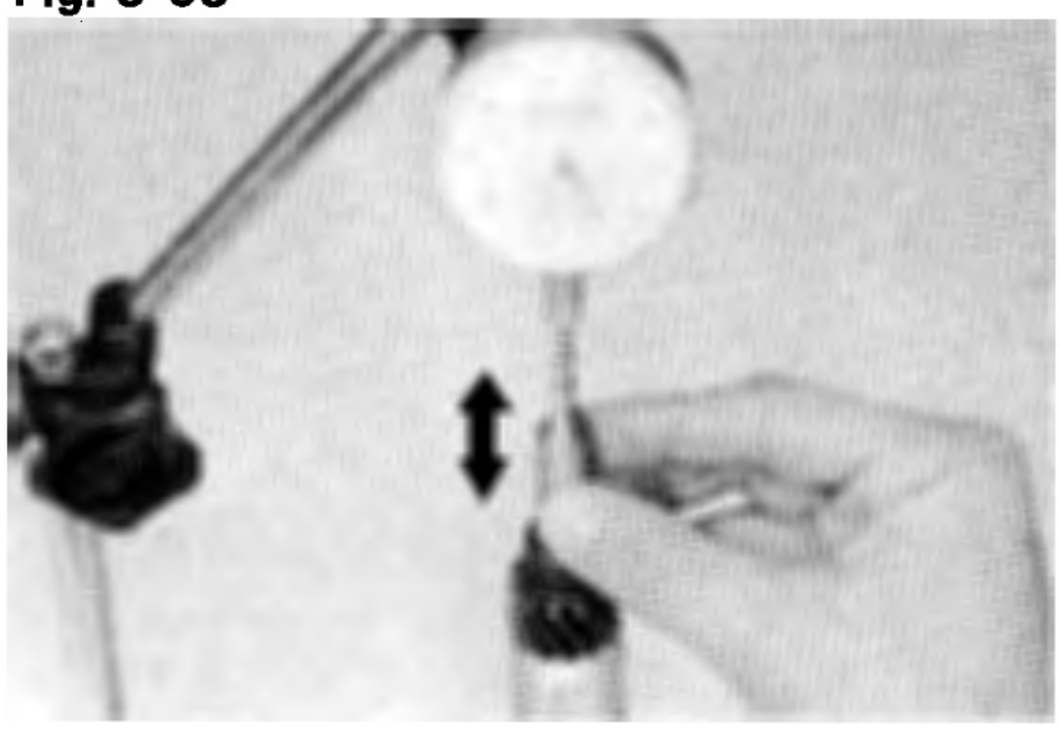
(4) Assemble the washers (cam side) as shown in the figure. (ECE & Australia)

Fig. 8-67



(5) Assemble the washers (spiral gear side) as shown in the figure. (ECE & Australia)

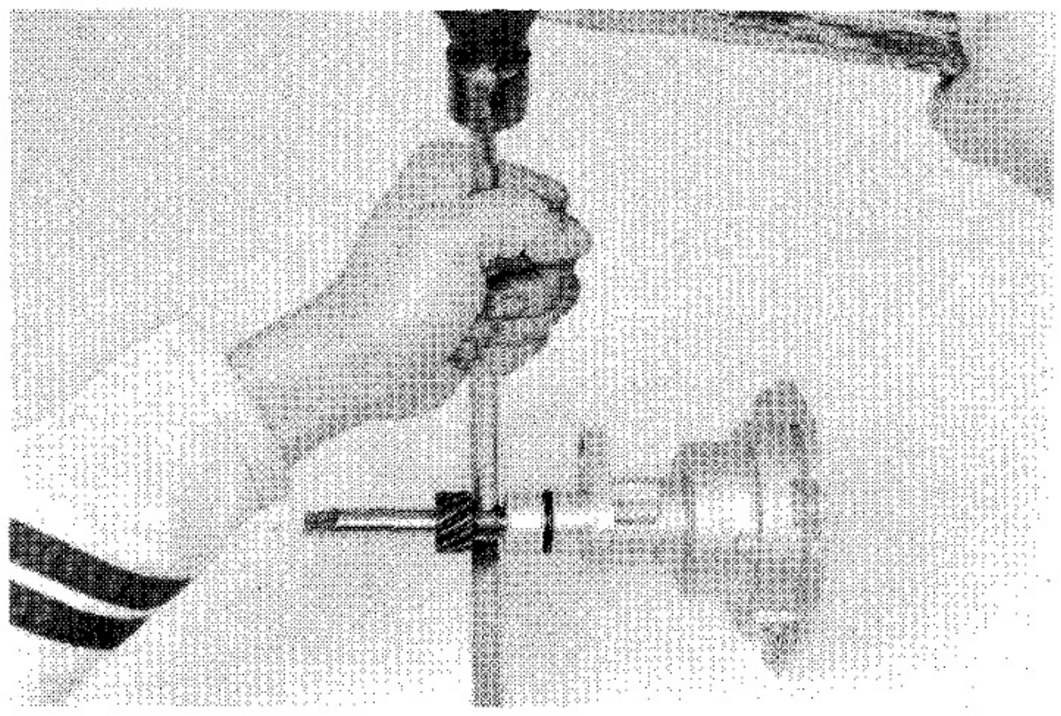
Fig. 8-68



(6) Before staking the pin, recheck the shaft clearance.
If necessary, adjust the clearance with a steel washer. (ECE & Australia)

Thrust clearance:
0.15 – 0.50 mm
(0.0059 – 0.0197 in.)

Fig. 8-69



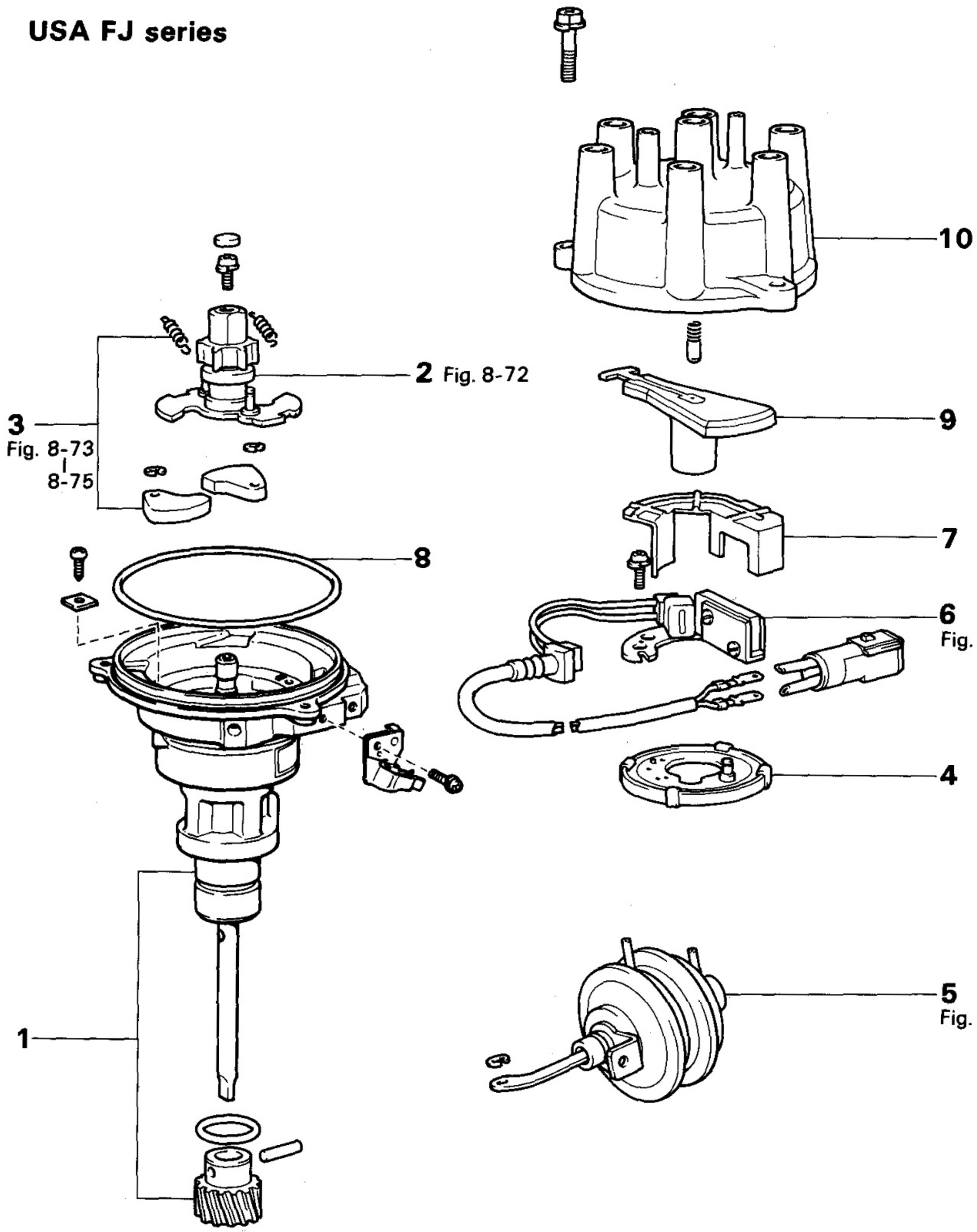
(7) Using a suitable metal plate, peen both ends of the pin.

ASSEMBLY

Assemble the parts in the numerical order shown in the figure.

Fig. 8-70

USA FJ series

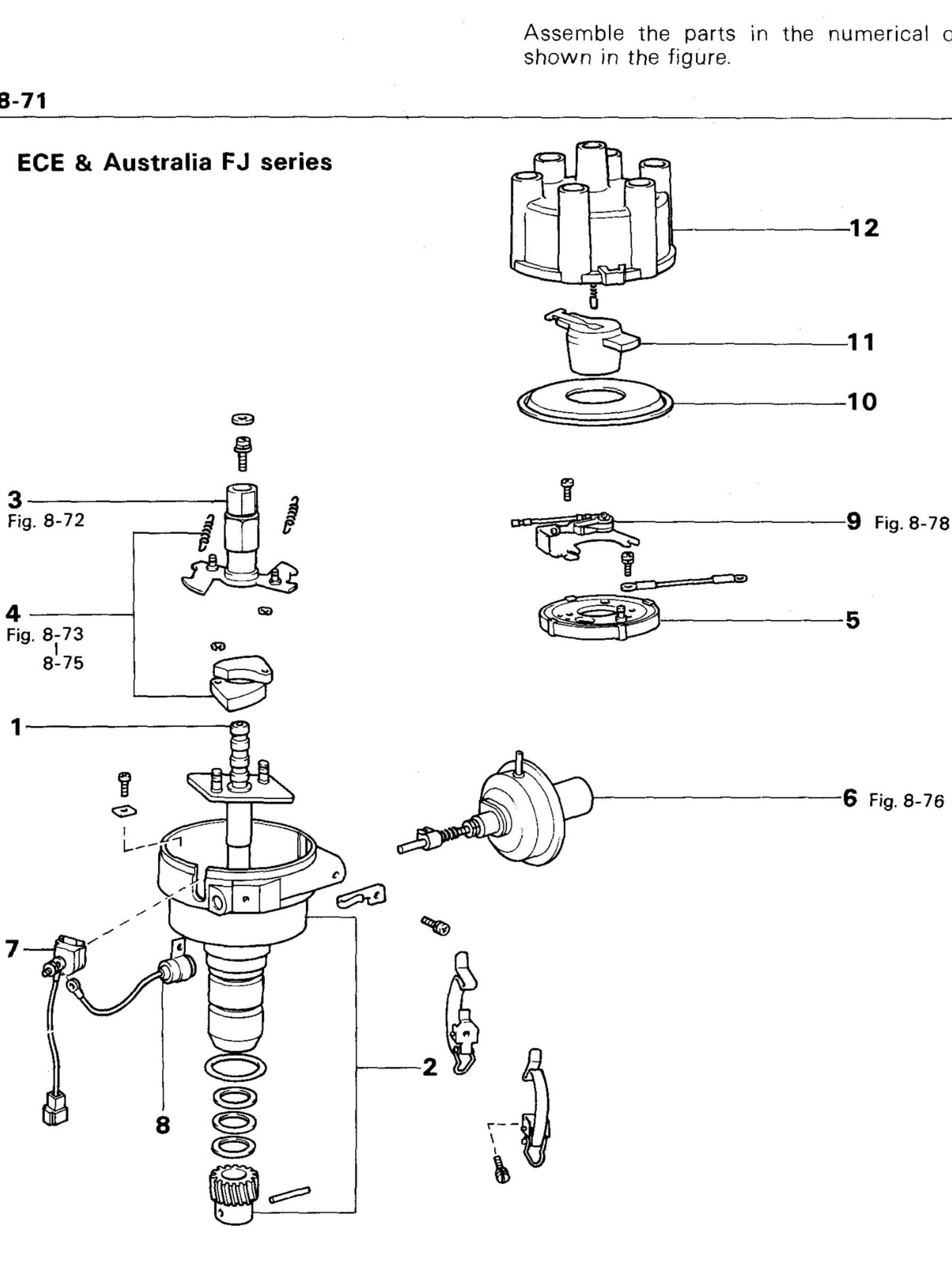


1. Housing Subassembly & Spiral Gear
2. Signal Rotor
3. Governor Weight & Spring
4. Breaker Plate
5. Vacuum Advancer Diaphragm
6. Signal Generator
7. Dust Cover
8. Dustproof O Ring
9. Rotor
10. Distributor Cap

Assemble the parts in the numerical order shown in the figure.

Fig. 8-71

ECE & Australia FJ series



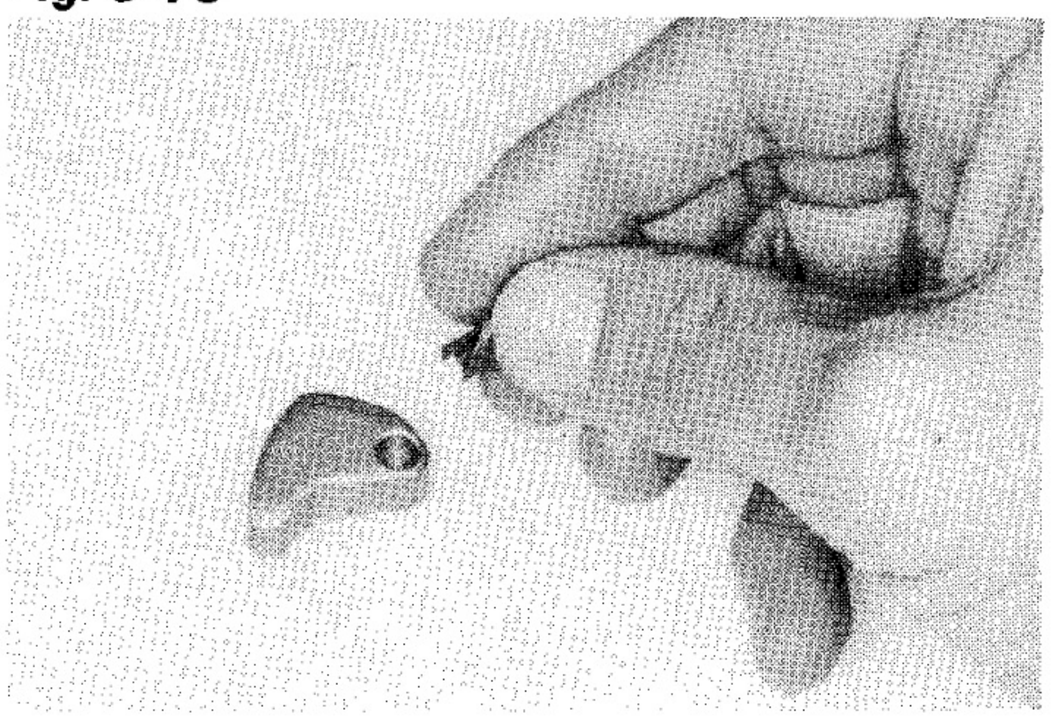
1. Governor Shaft
2. Housing Subassembly
3. Cam
4. Governor Weight & Spring
5. Breaker Plate
6. Vacuum Advancer
7. Terminal
8. Condenser
9. Breaker Point
10. Dustproof Cover
11. Rotor
12. Distributor Cap

Fig. 8-72



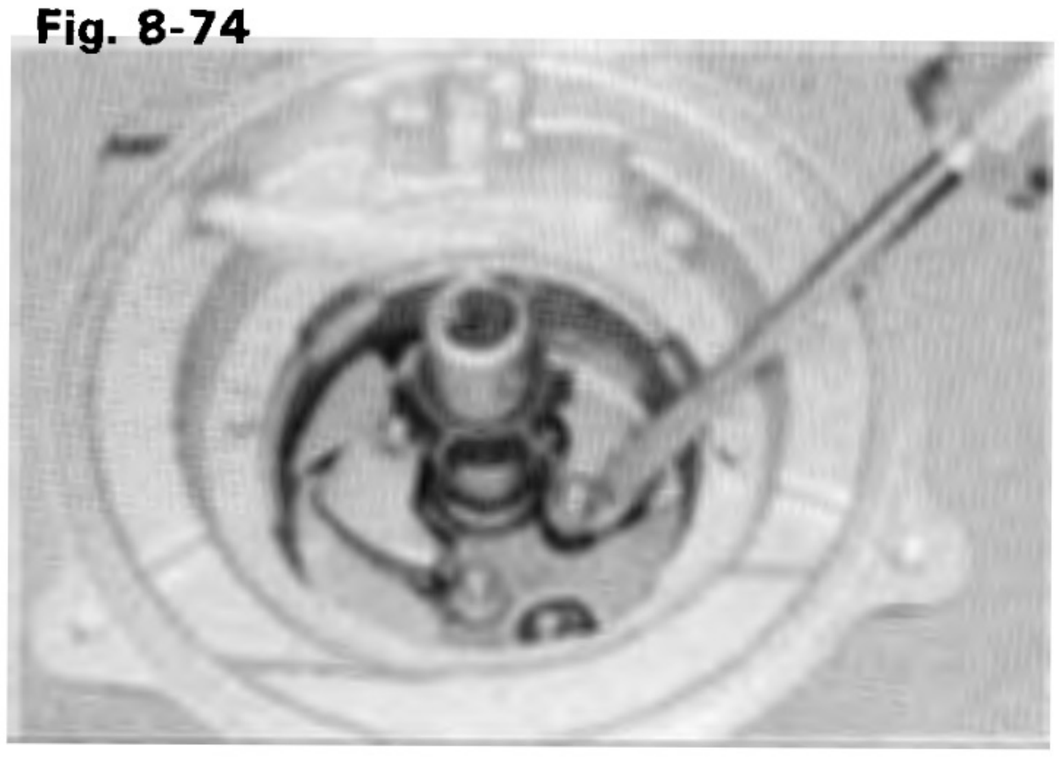
⚠ Match the 10.5 mark (USA) or the 10 mark (ECE & Australia) with the stopper and fit on the cam.

Fig. 8-73



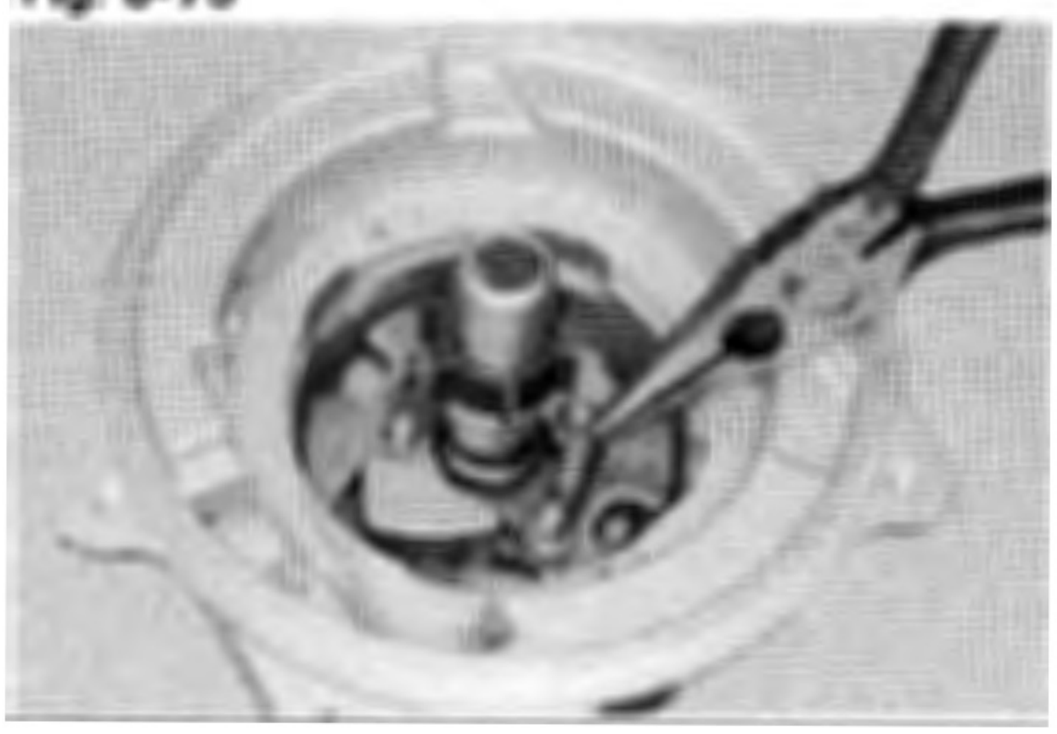
Install the bearing into the pin hole.

Fig. 8-74



Make sure that the E ring is correctly installed in the groove.

Fig. 8-75



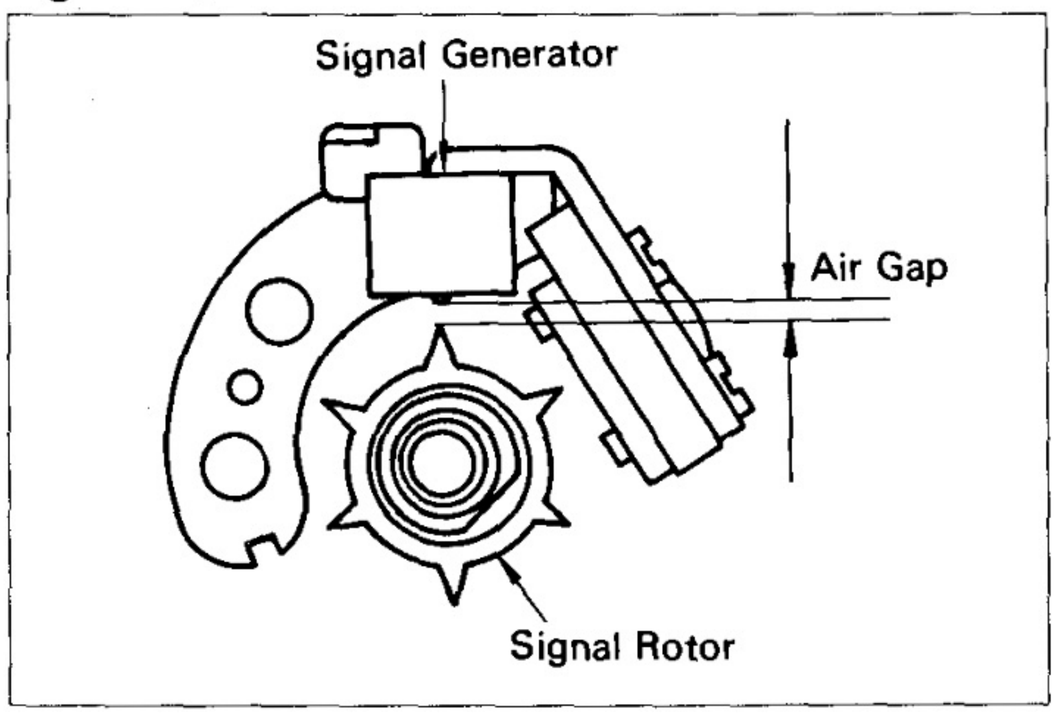
Make sure that the governor spring is installed correctly.

Fig. 8-76



Make sure that the E ring is correctly installed in the breaker plate. (USA)

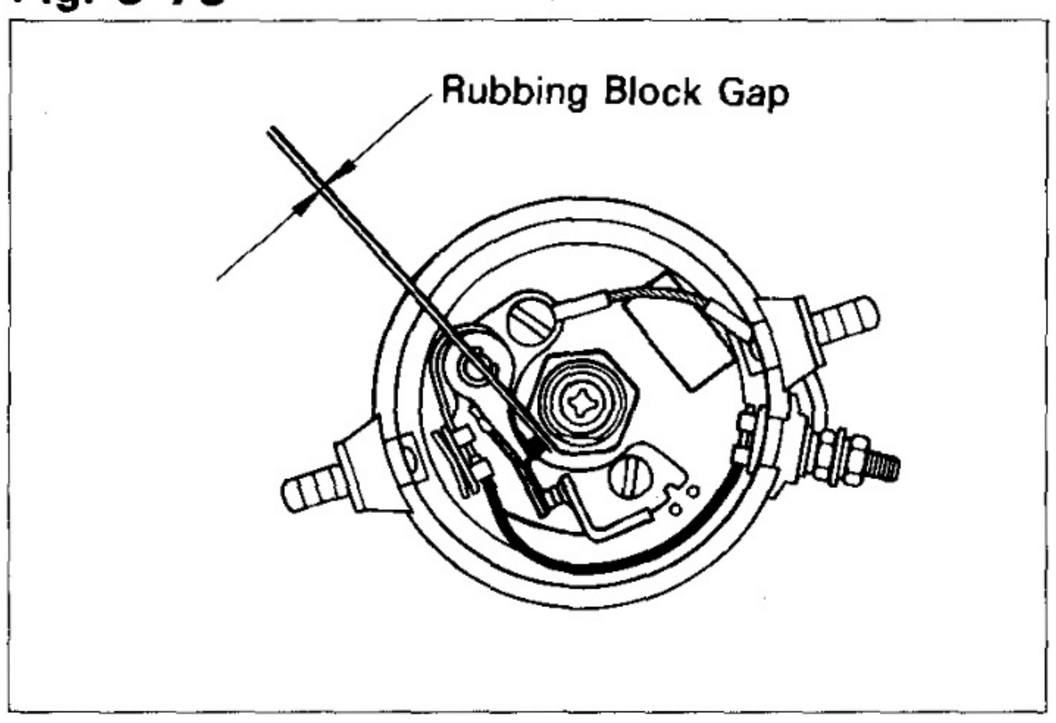
Fig. 8-77



Adjust the air gap. (USA)

Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)

Fig. 8-78



Adjust the rubbing block gap. (ECE & Australia)

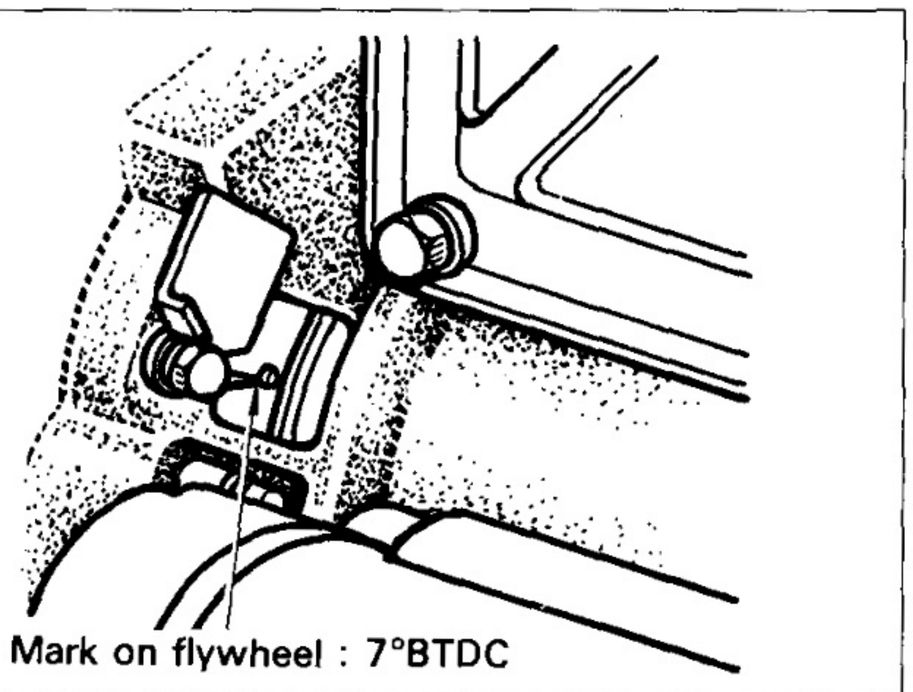
Rubbing block gap: 0.30 mm (0.0118 in.)

DISTRIBUTOR INSTALLATION

FA & GENERAL FJ SERIES

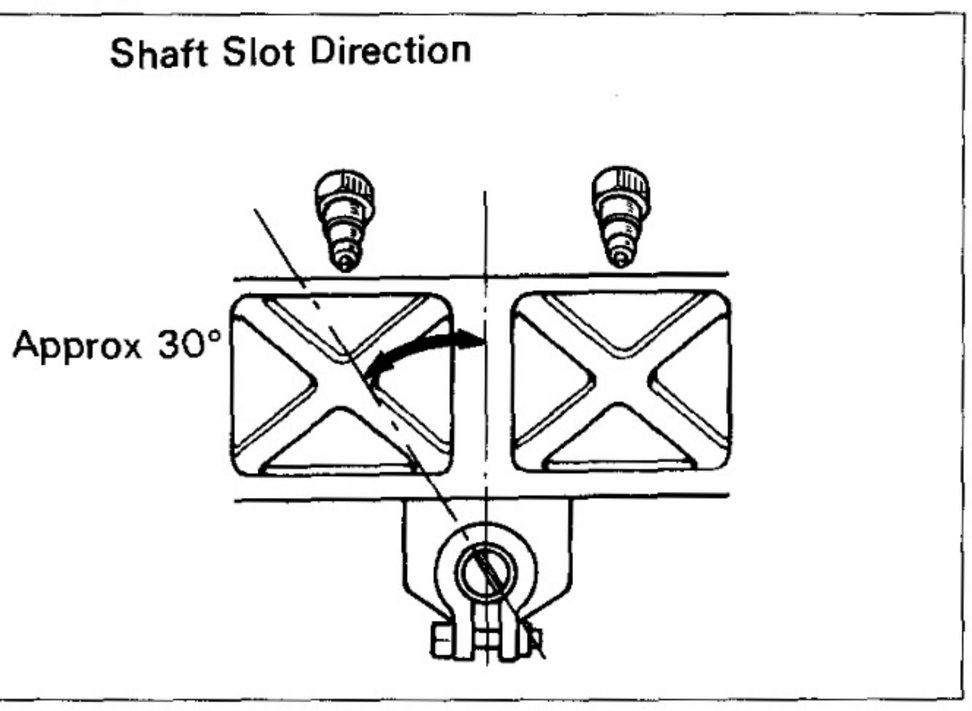
1. Set the No.1 cylinder to the ignition timing position.

Fig. 8-79



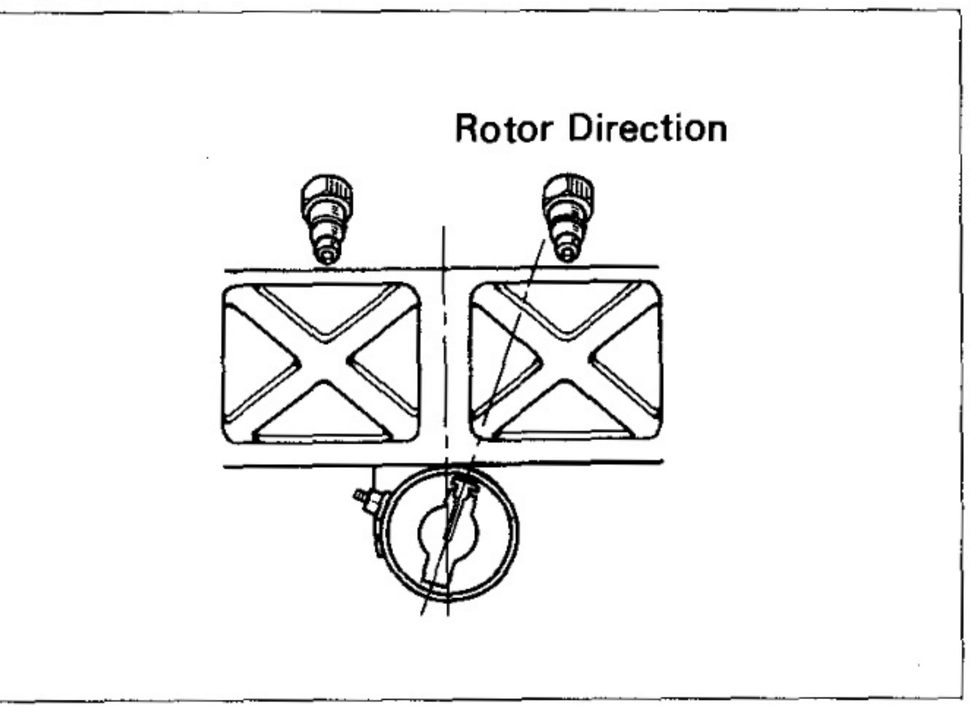
2. Set the oil pump shaft slot in the direction shown in the figure.

Fig. 8-80



3. Begin insertion of the distributor with the rotor pointing as shown in the figure.

Fig. 8-81



4. When fully installed, the rotor should point as shown in the figure.

Fig. 8-82

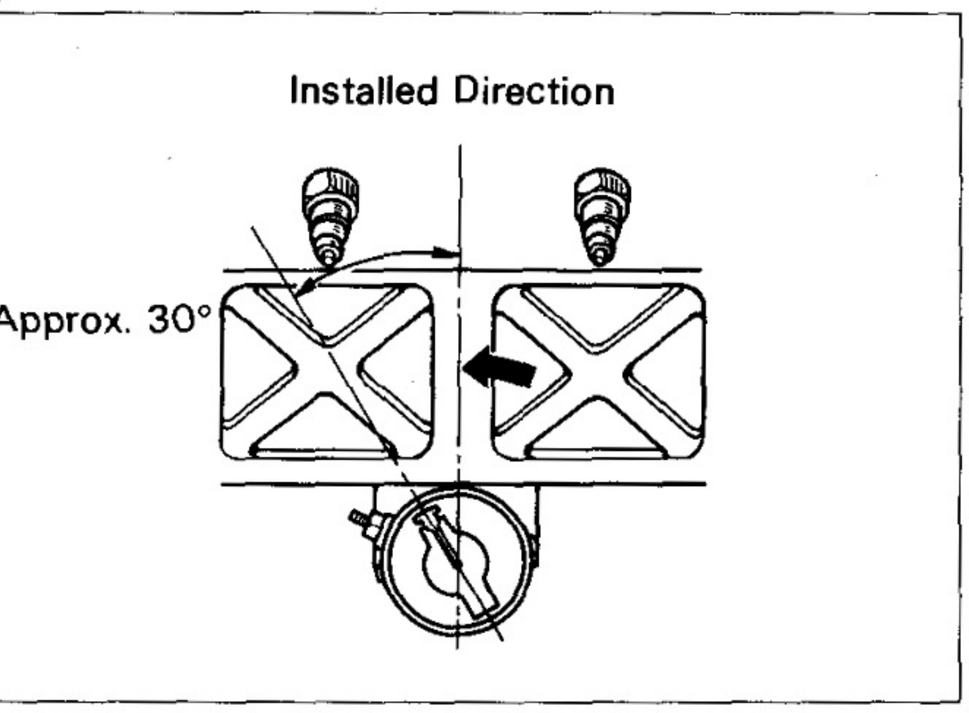
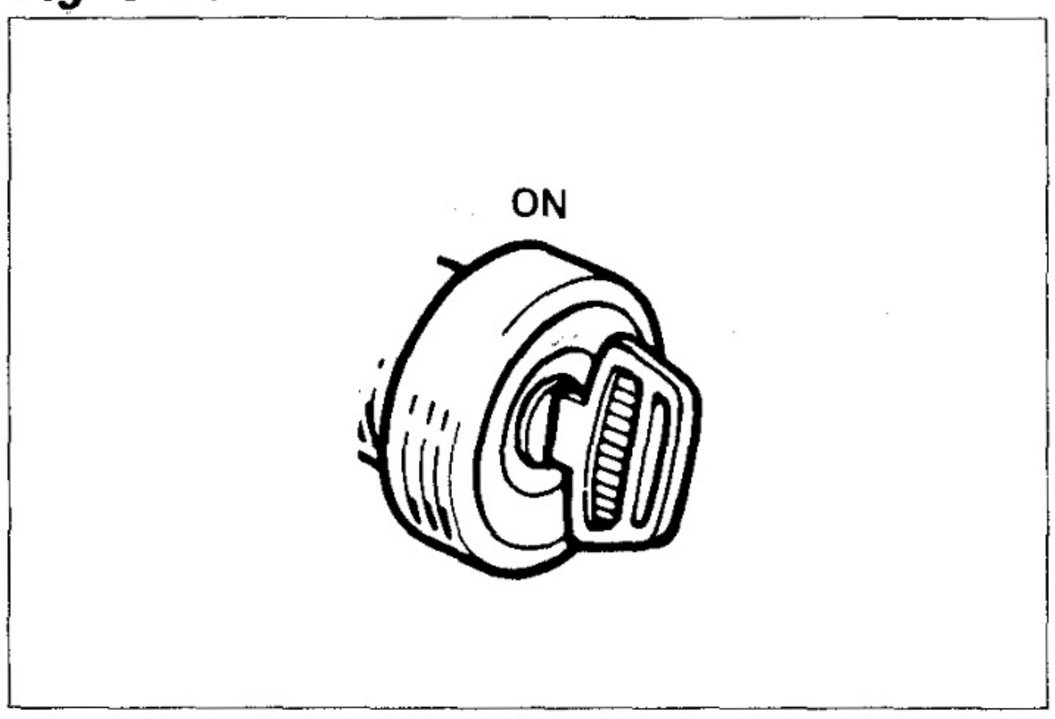


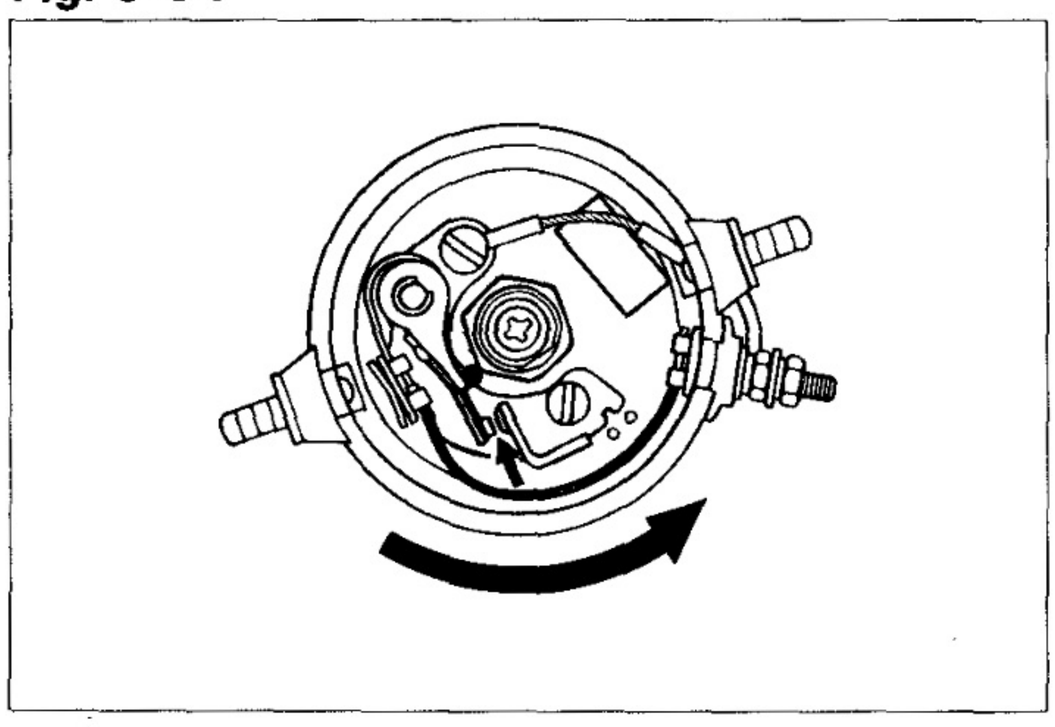
Fig. 8-83



5. Turn the ignition switch to ON.

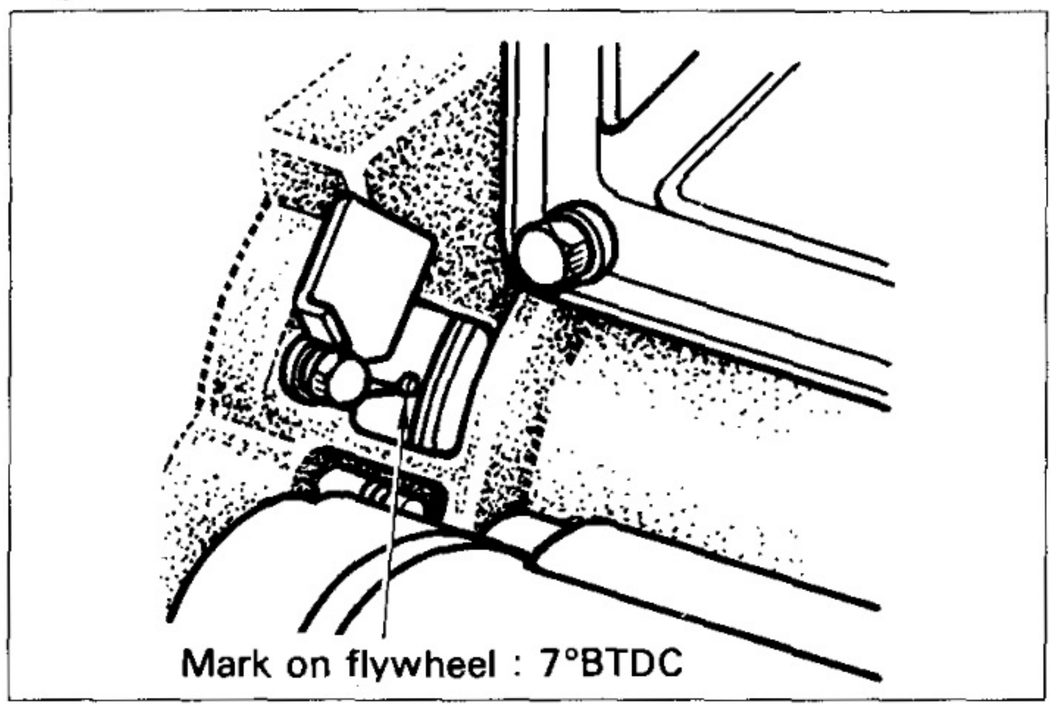
— Note —
Do not crank the starter motor.

Fig. 8-84



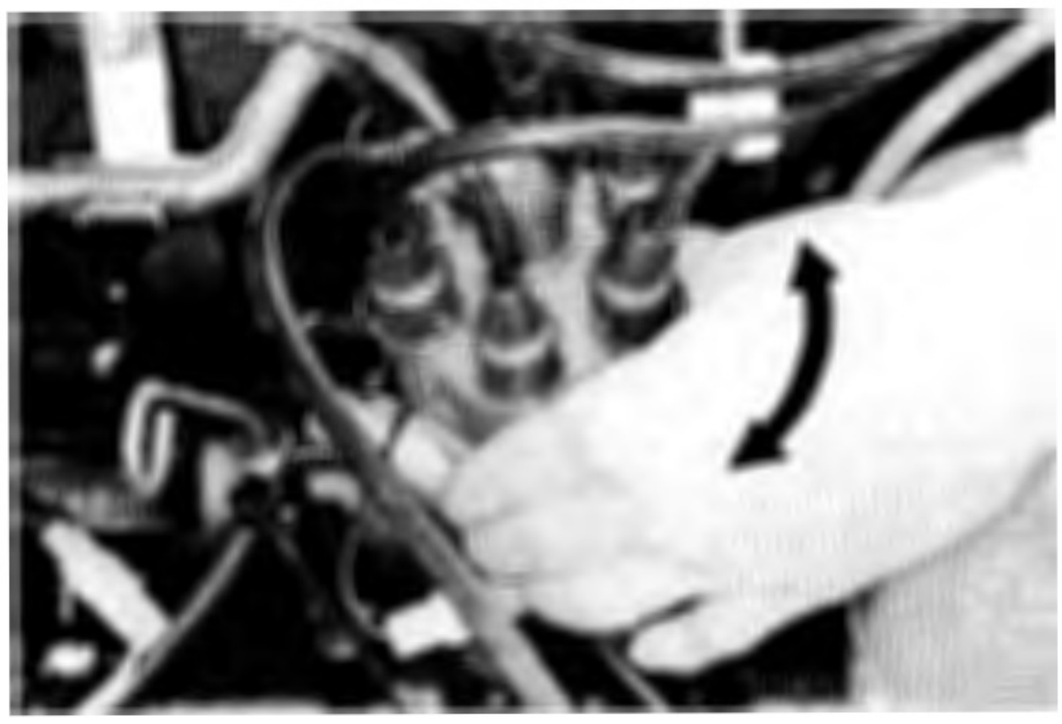
6. Rotate the distributor body counterclockwise until a spark jumps between the points and tighten the clamp bolt in that position.

Fig. 8-85



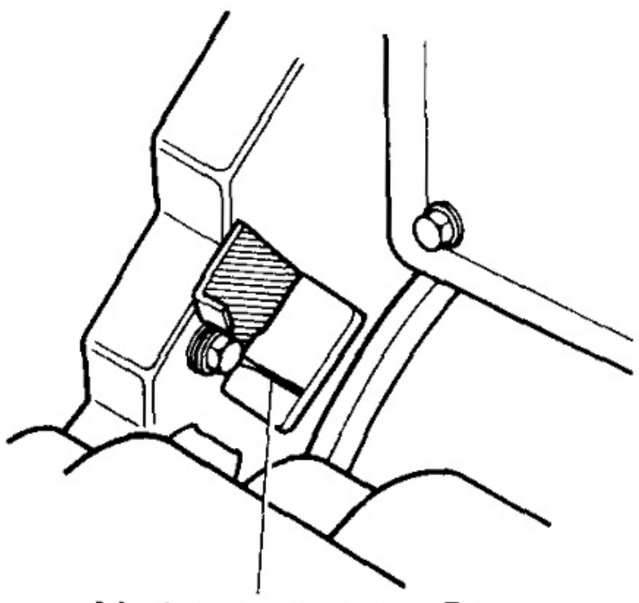
7. Check the ignition timing at idle speed.
Ignition timing:
7°BTDC/Max. 950 rpm

Fig. 8-86



8. If necessary, align the timing ball with the pointer by turning the distributor body.

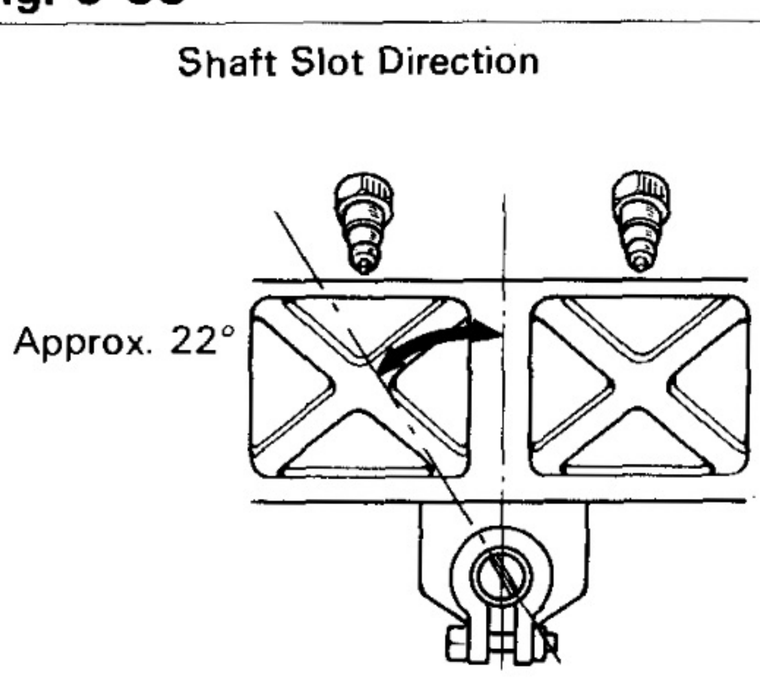
Fig. 8-87



USA FJ SERIES

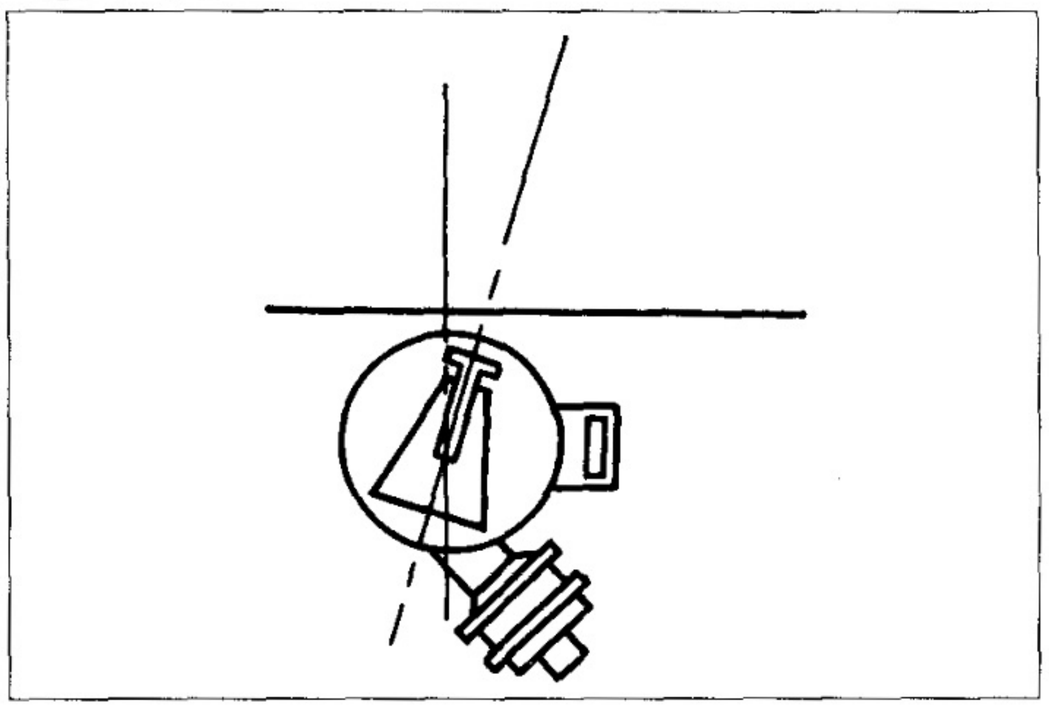
1. SEt the No. 1 cylinder to TDC/compression.

Fig. 8-88



2. Set the oil pump shaft slot in the direction shown in the figure.

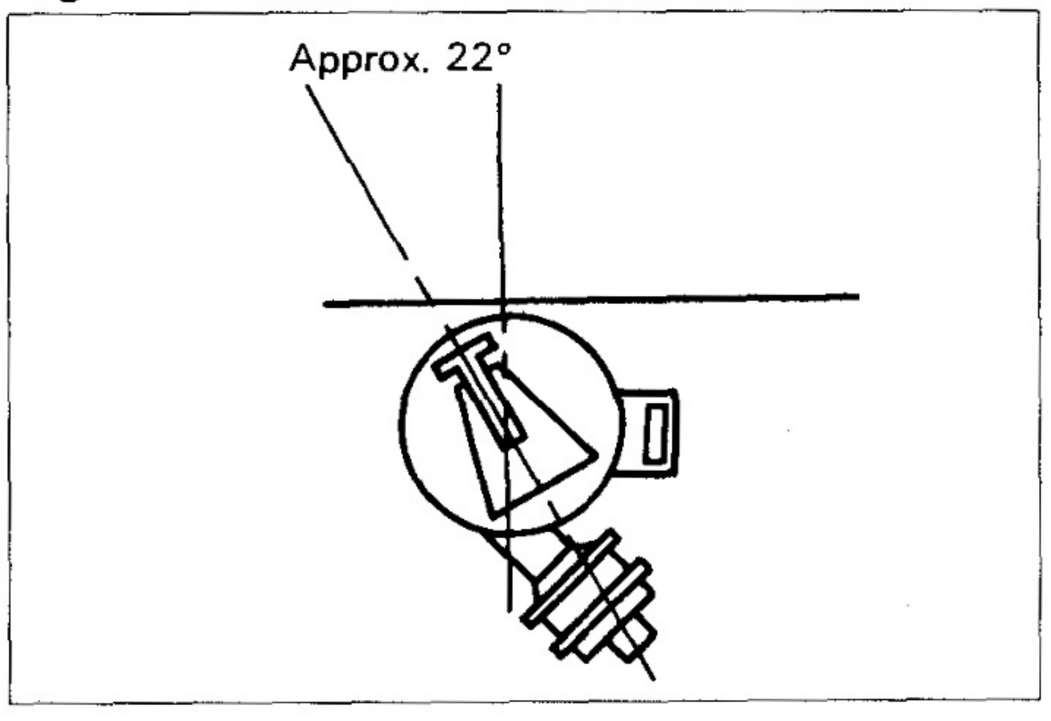
Fig. 8-89



3. Begin insertion of the distributor with the rotor pointing as shown in the figure.

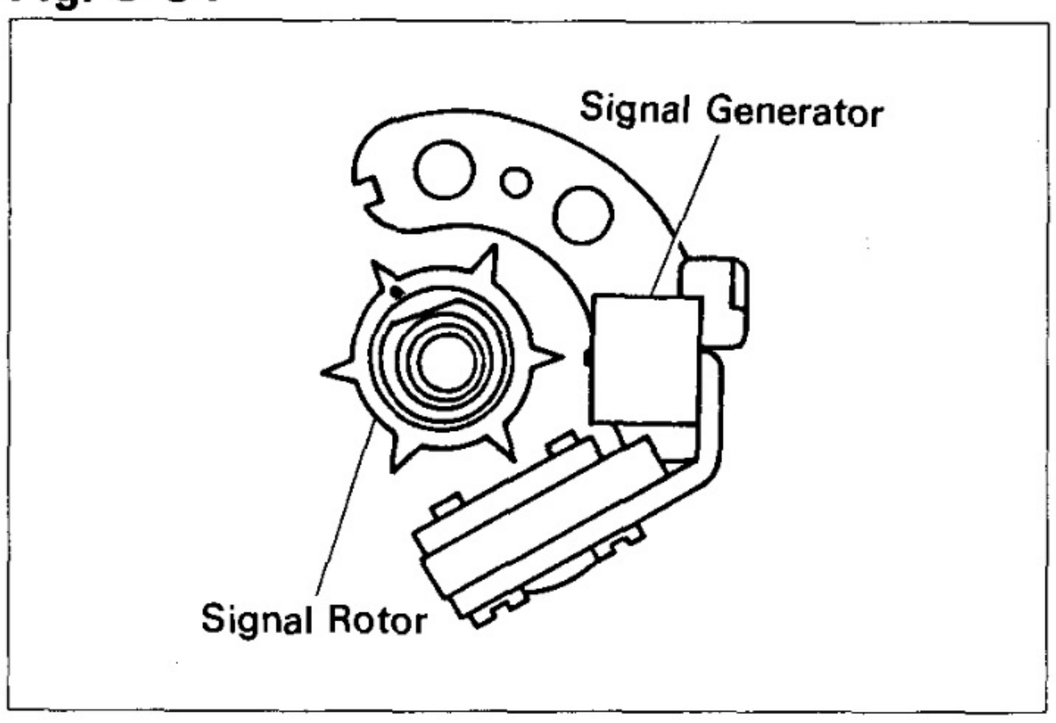
— Note —
Align the flange center with the screw hole center.

Fig. 8-90



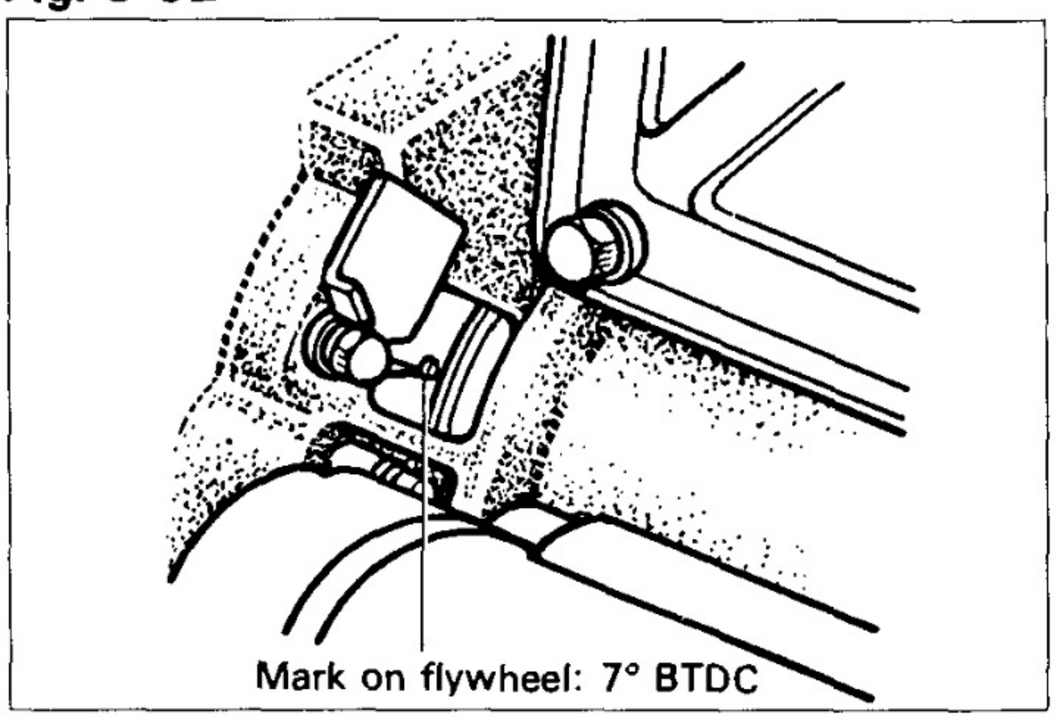
4. When fully installed, the rotor should point as shown in the figure.

Fig. 8-91



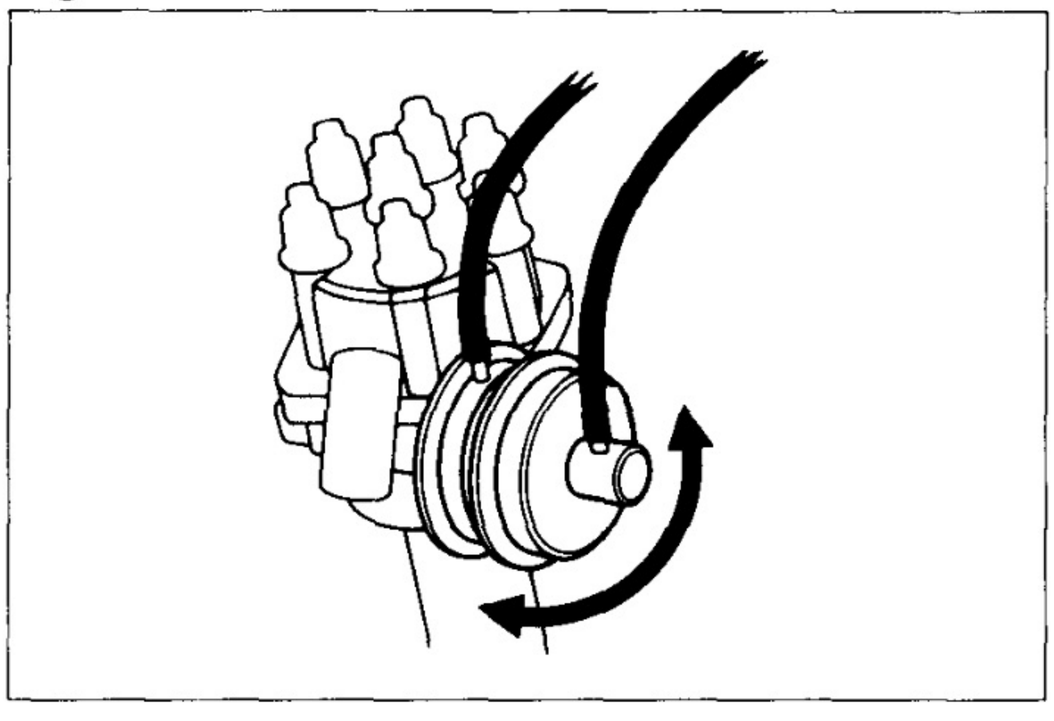
5. Align the rotor tooth with the signal generator and tighten the clamp bolt in that position.

Fig. 8-92



6. Check the ignition timing at idle speed.
   Ignition timing:
   7° BTDC/650 rpm

Fig. 8-93



7. If necessary, align the timing ball with the pointer by turning the distributor body.

CHARGING SYSTEM

	Page
CHARGING SYSTEM CIRCUIT	9-2
ON-VEHICLE INSPECTION (Tirrill Regulator Type)	9-6
(IC Regulator Type)	9-11
ALTERNATOR (FJ series)	9-14
(FA series)	9-29
ALTERNATOR REGULATOR	9-39
DISCHARGE WARNING LIGHT RELAY	9-42

CHARGING SYSTEM CIRCUIT

FJ series (Tirrill Regulator Type)

Fig. 9-1

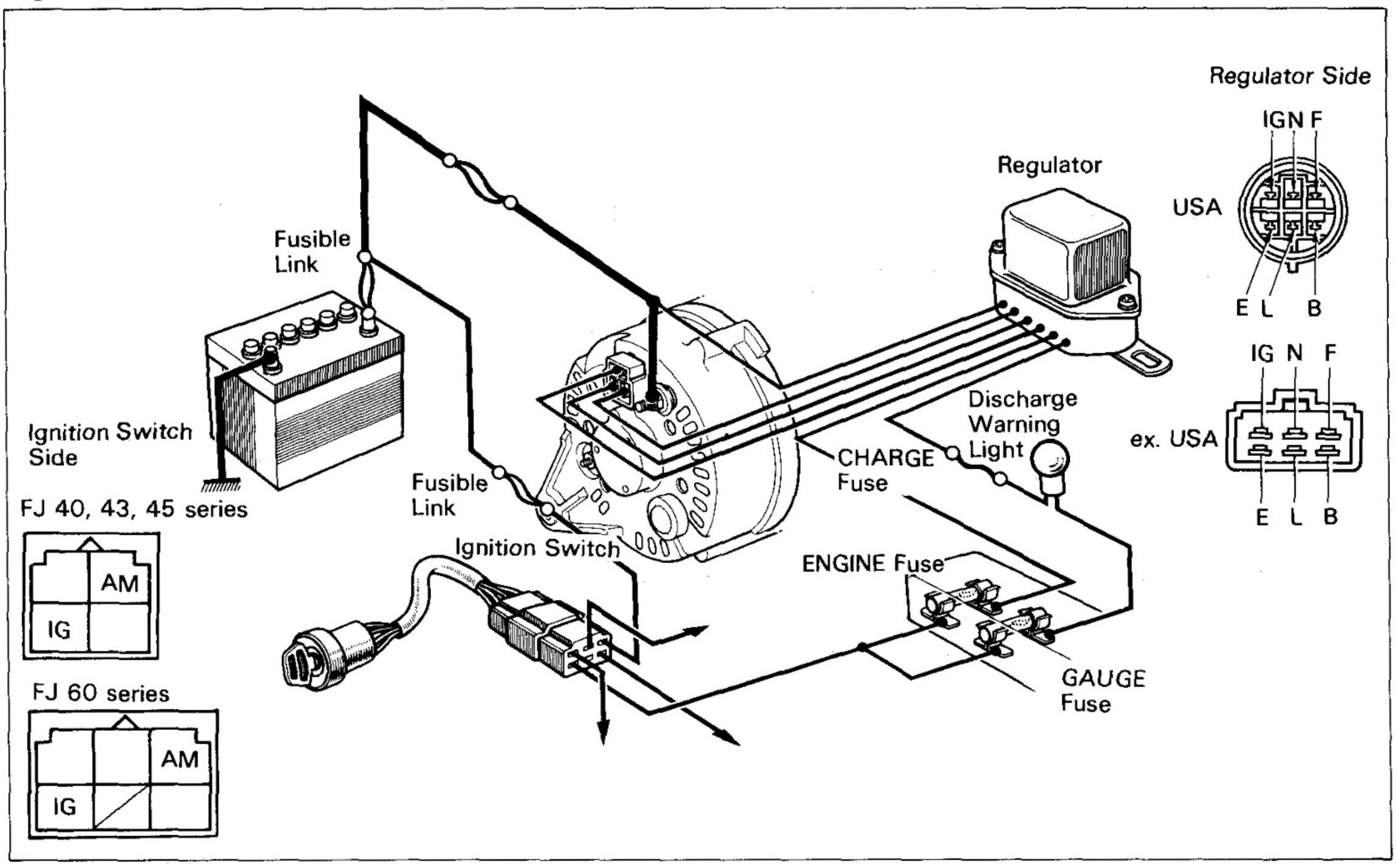
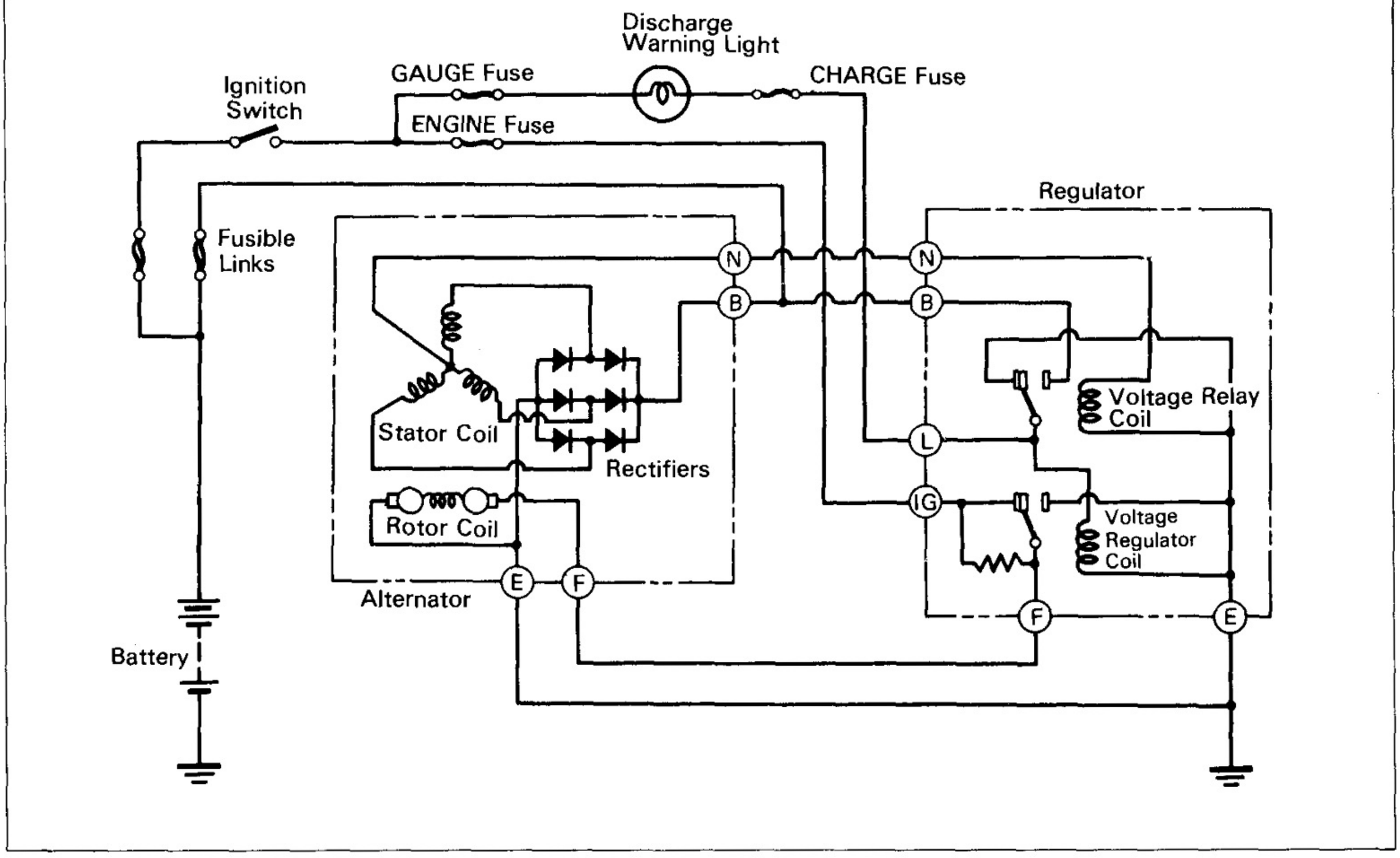


Fig. 9-2



FJ 60 series (IC Regulator Type)

Fig. 9-3

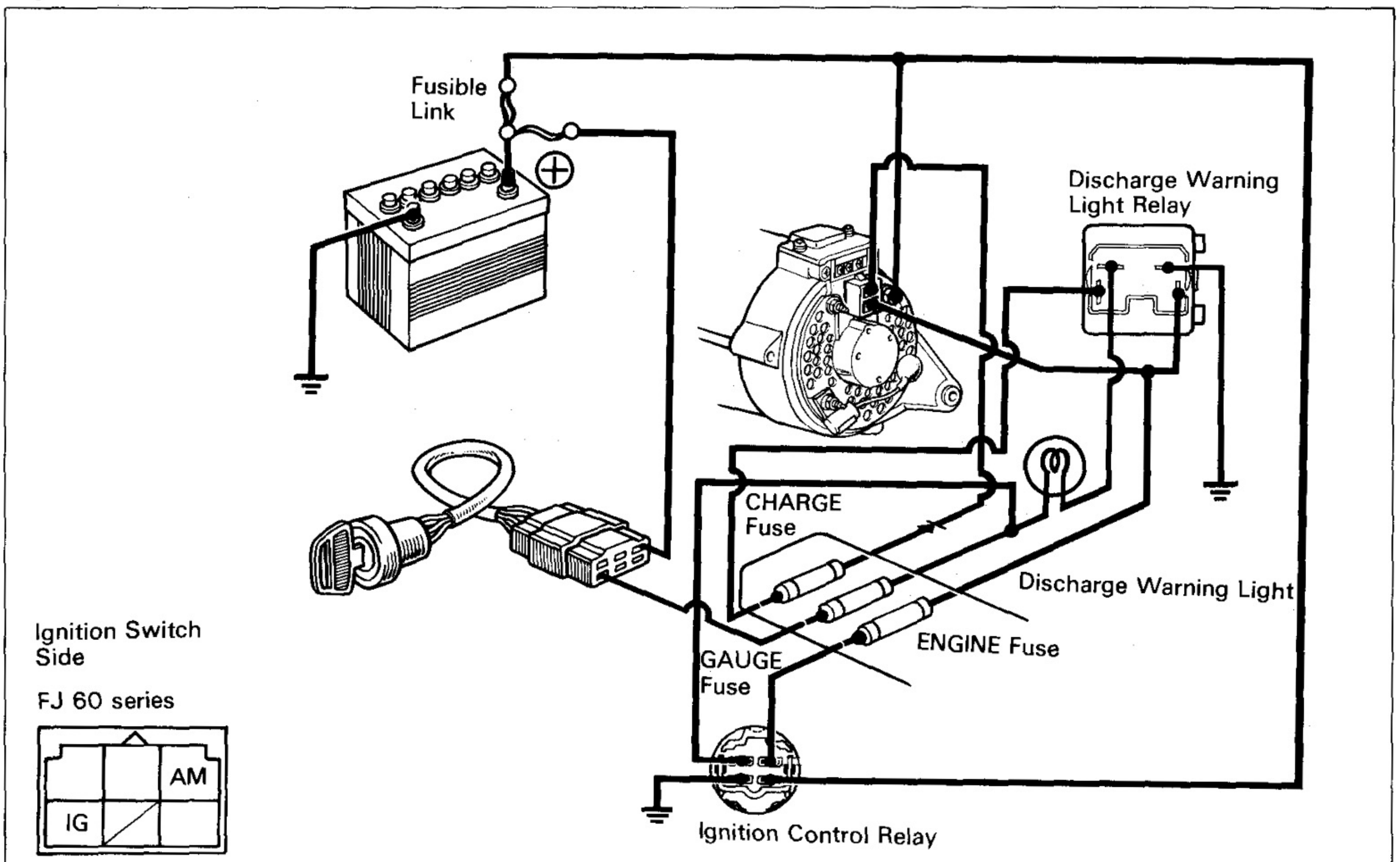
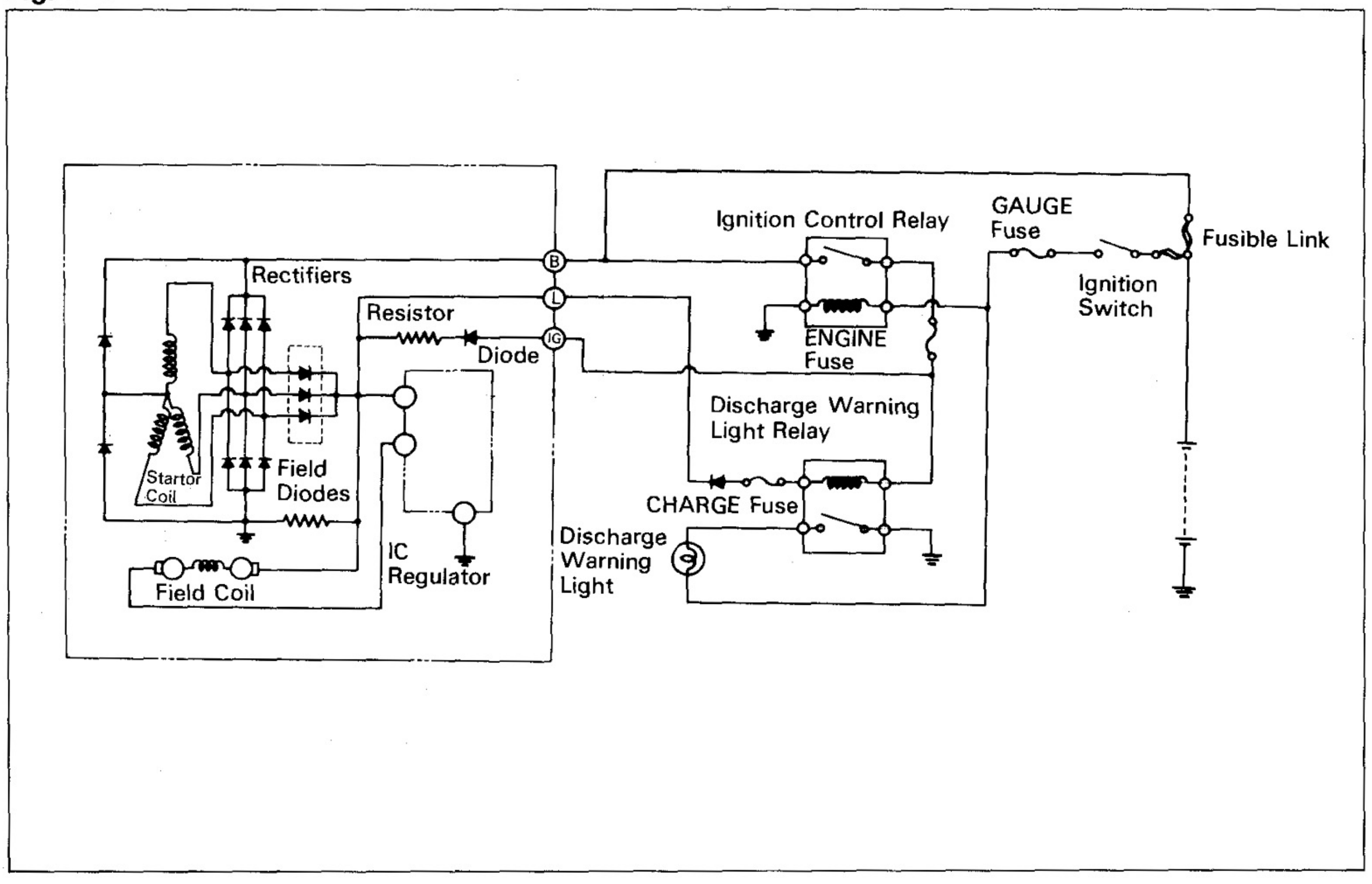


Fig. 9-4



FJ 40, 43, 45 series (IC Regulator Type)

Fig. 9-5

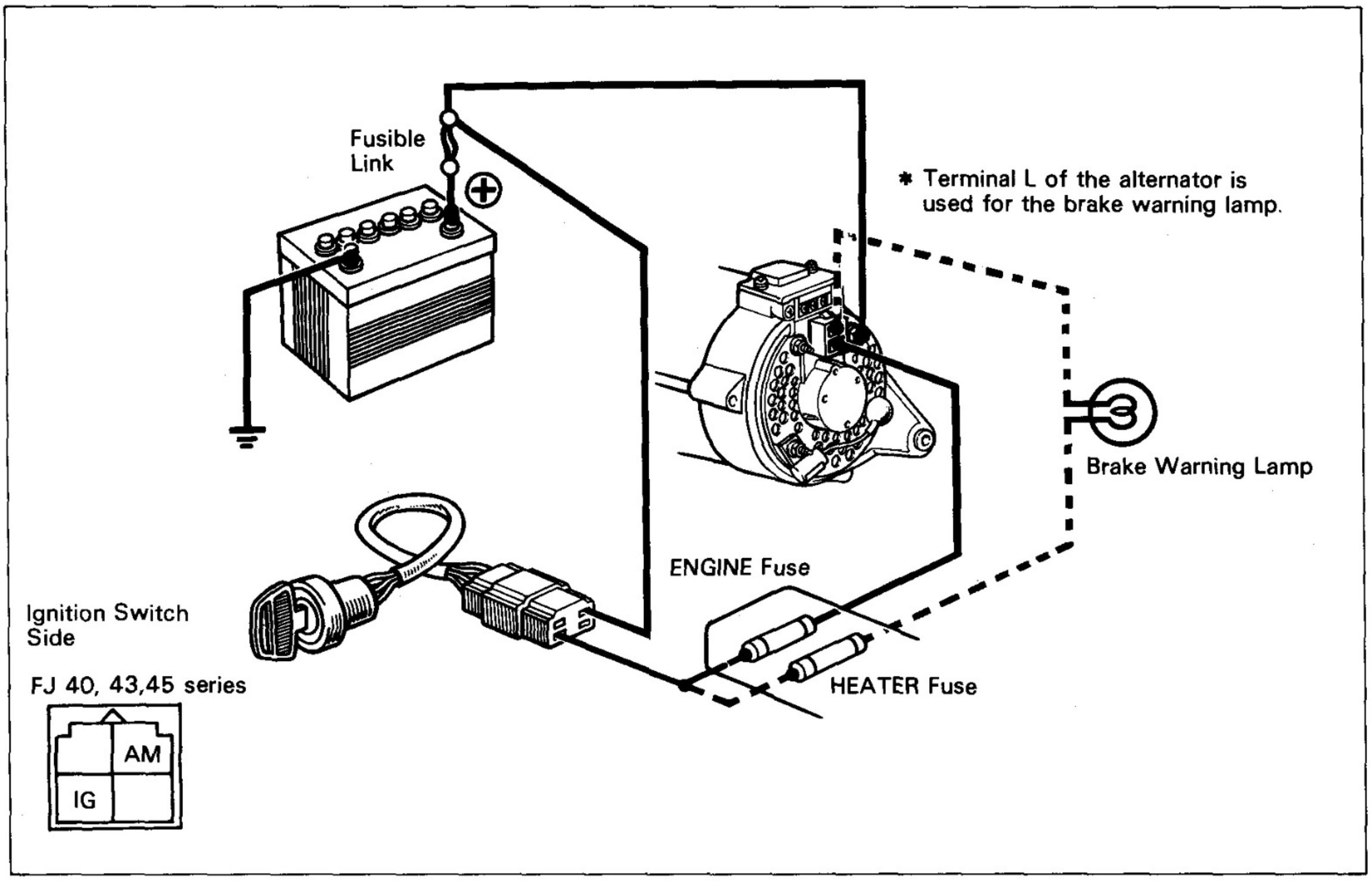
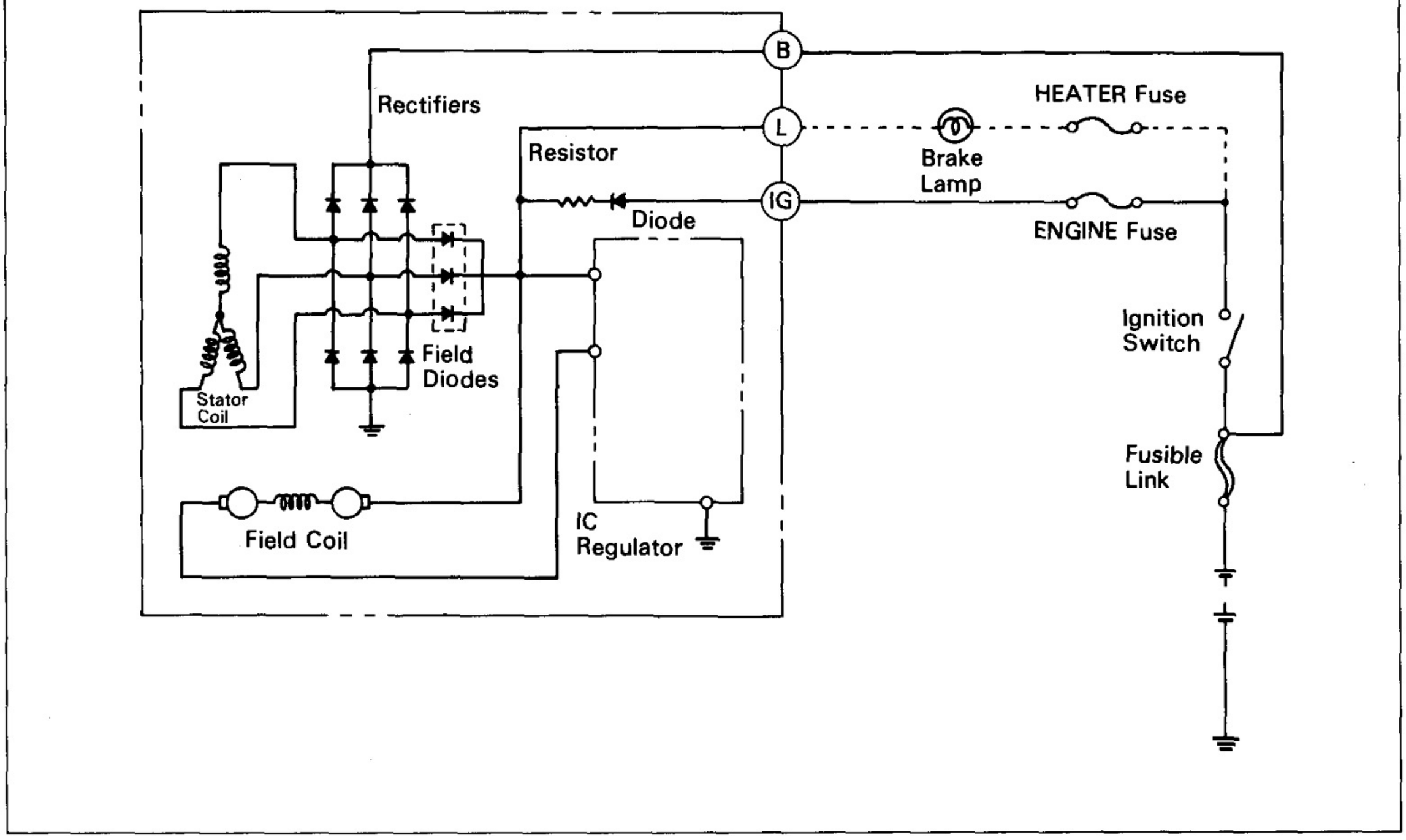


Fig. 9-6



FA series (Tirrill Regulator Type)

Fig. 9-7

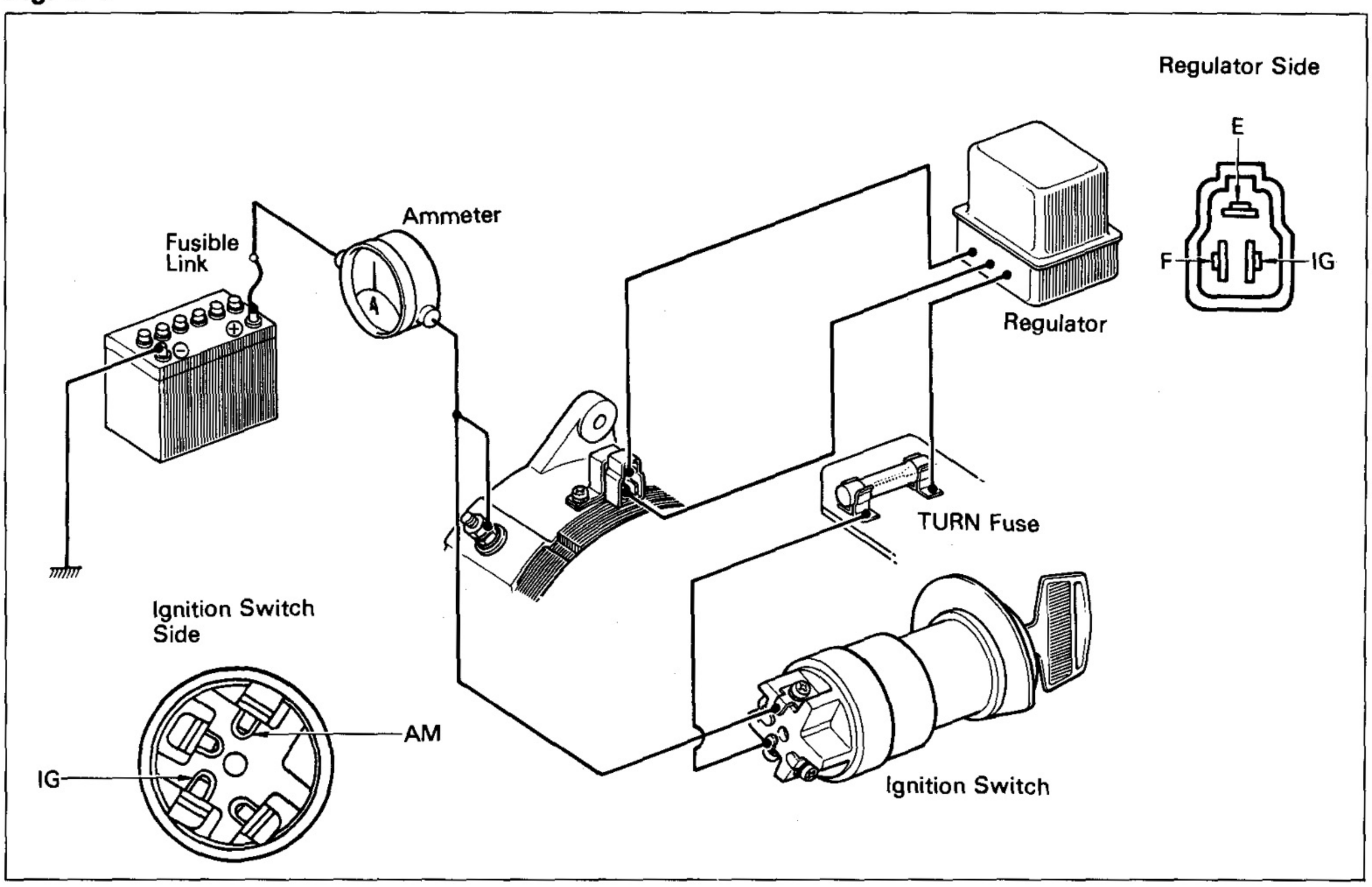


Fig. 9-8

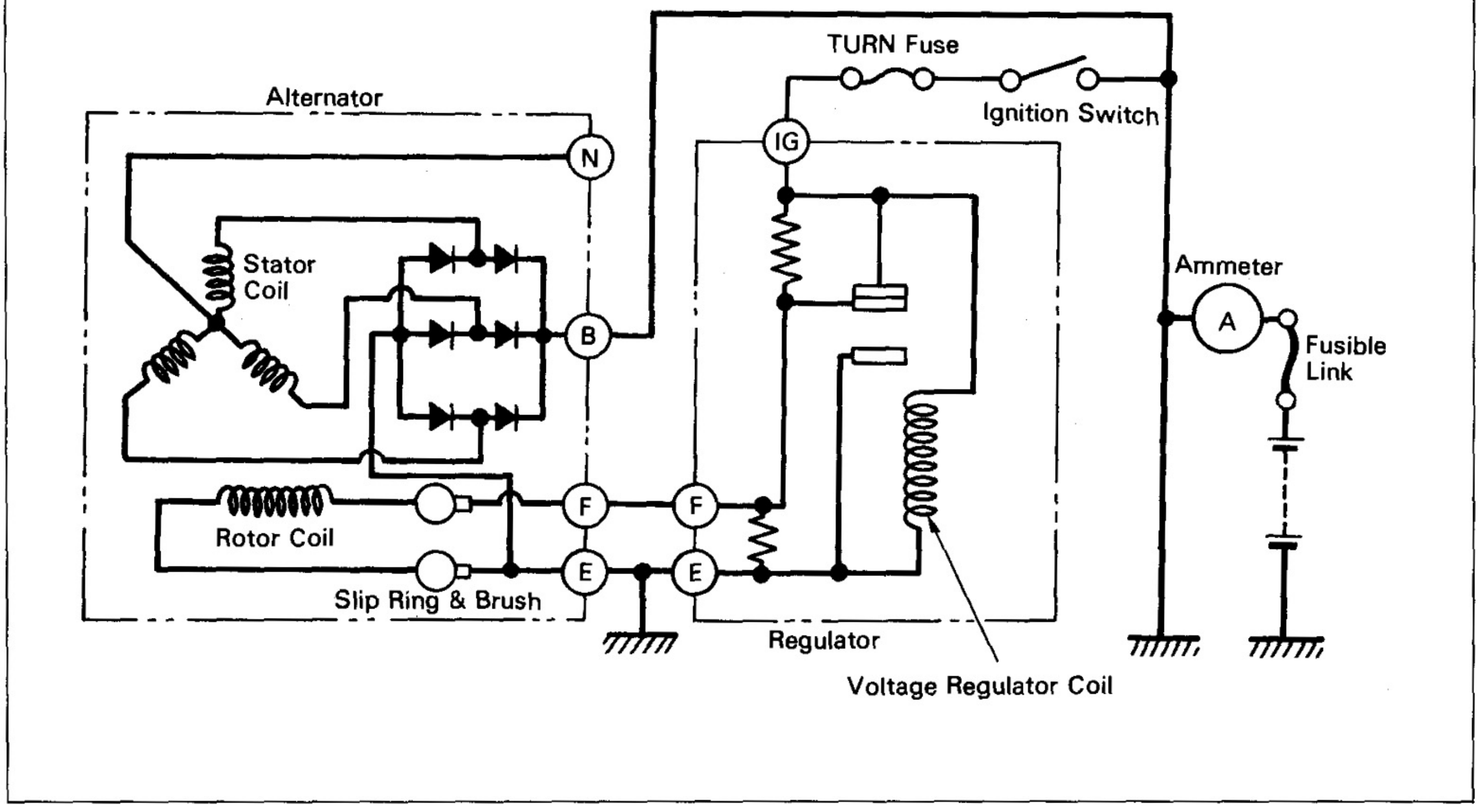
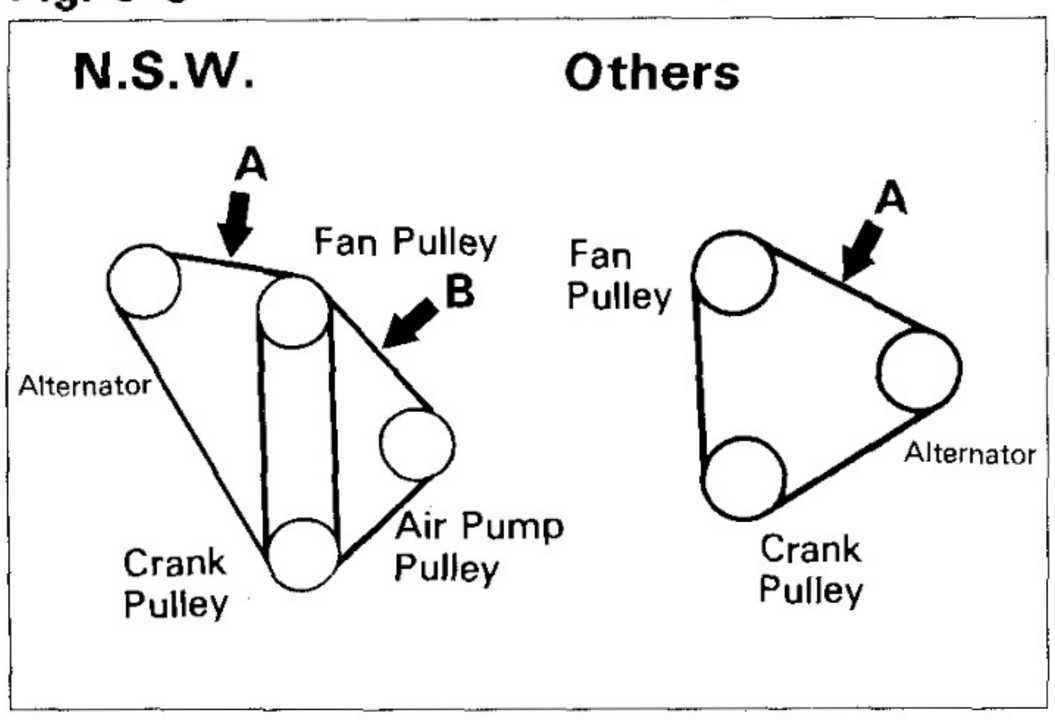


Fig. 9-9



ON-VEHICLE INSPECTION

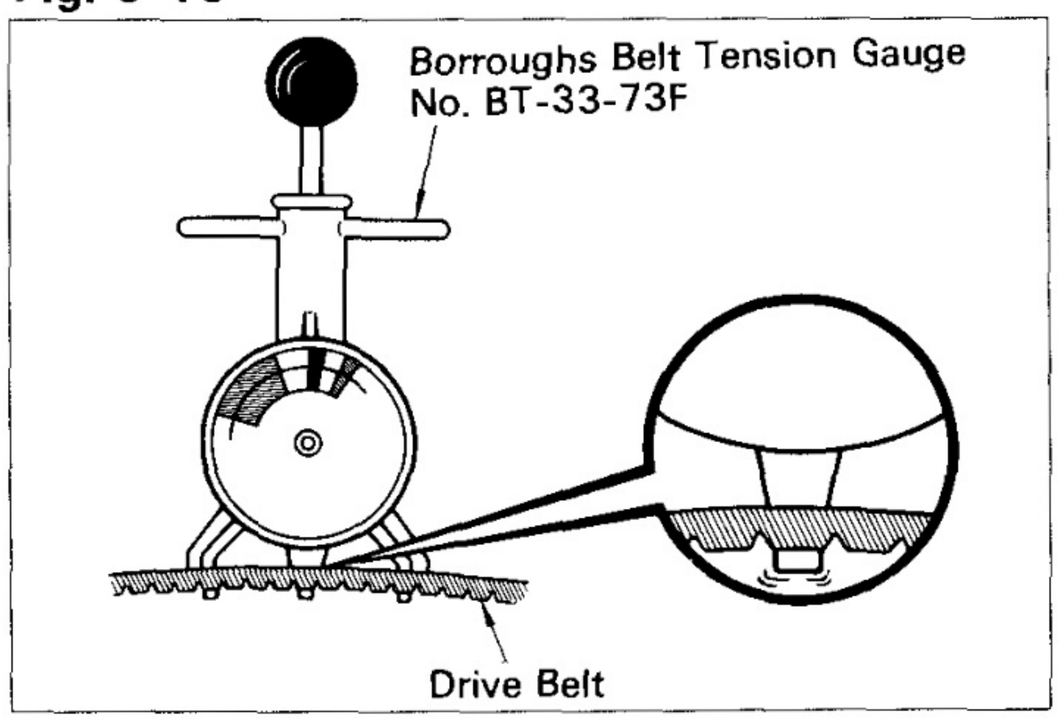
[Tirrill Regulator Type]

CHECK FOLLOWING ITEMS

1. Drive belt tension
   (General destinations)
   Drive belt deflection (at 10 kg or 22 lb)

	N.S.W. & Victoria	Other australian states	except Australia	
A mm (in.)	13 – 15 (0.51 – 0.59)	7 – 10 (0.28 – 0.39)	New	7 – 9 (0.28 – 0.35)
			Used	9 – 12 (0.35 – 0.47)
B mm (in.)	7 – 10 (0.28 – 0.39)	———	———	

Fig. 9-10

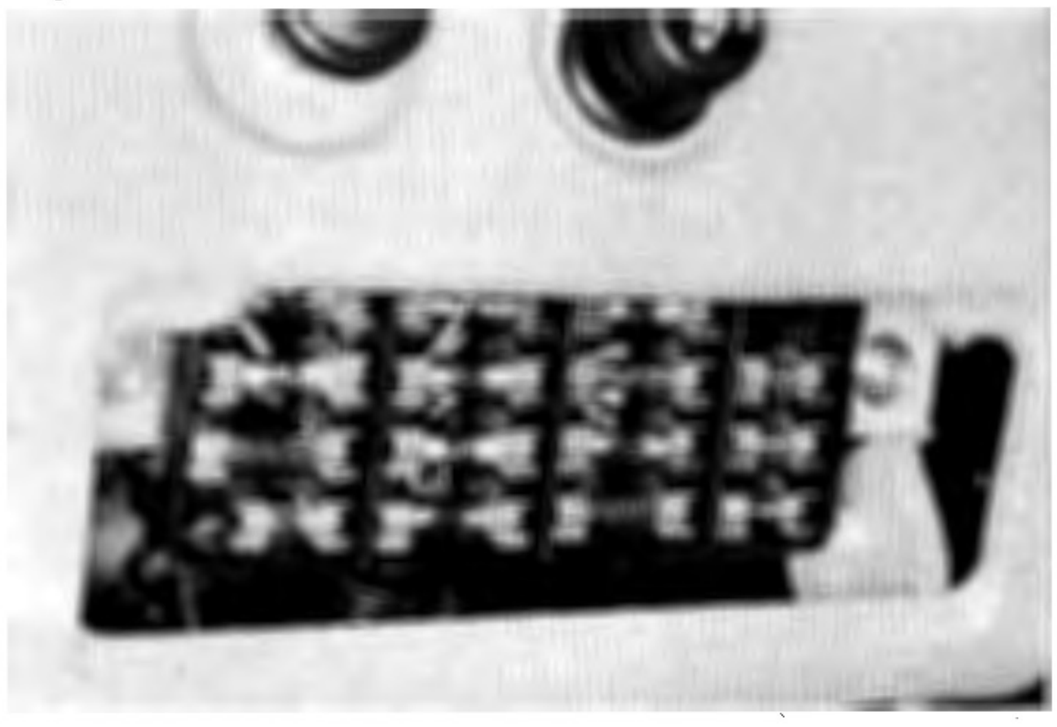


(USA)
Use a borroughs belt tension gauge, No. BT-33-73F.

Drive belt tension:

New belt	**120 – 170 lbs**
Used belt	**80 – 120 lbs**
w/ Air con.	
New belt	**100 – 150 lbs**
Used belt	**60 – 80 lbs**

Fig. 9-11



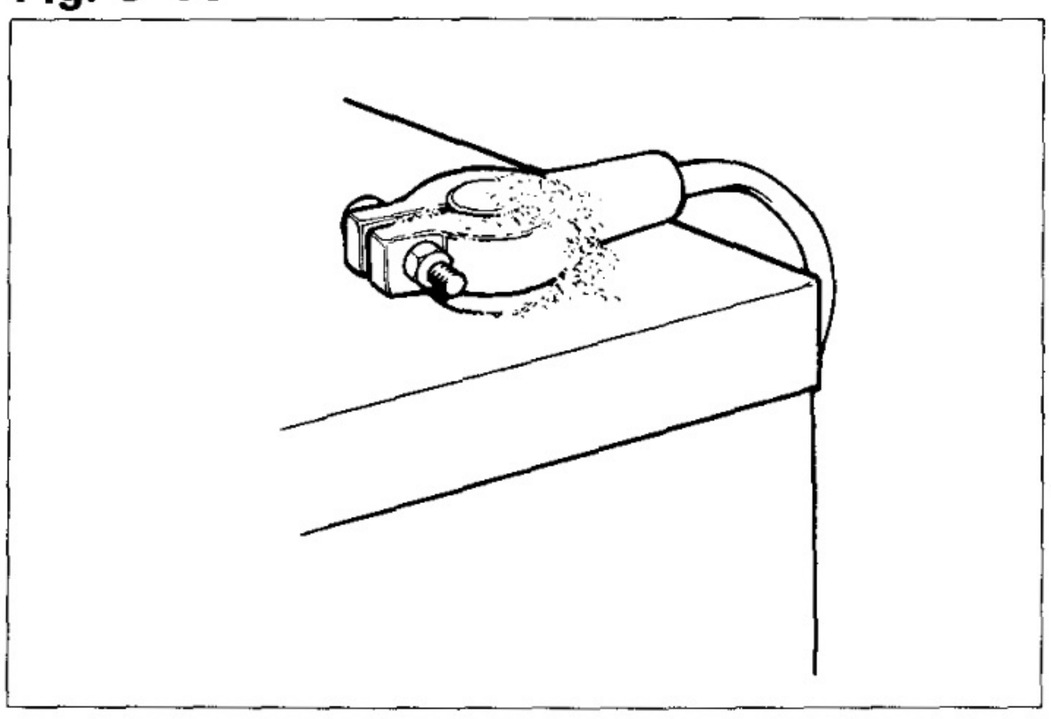
2. Fuses

Fig. 9-12



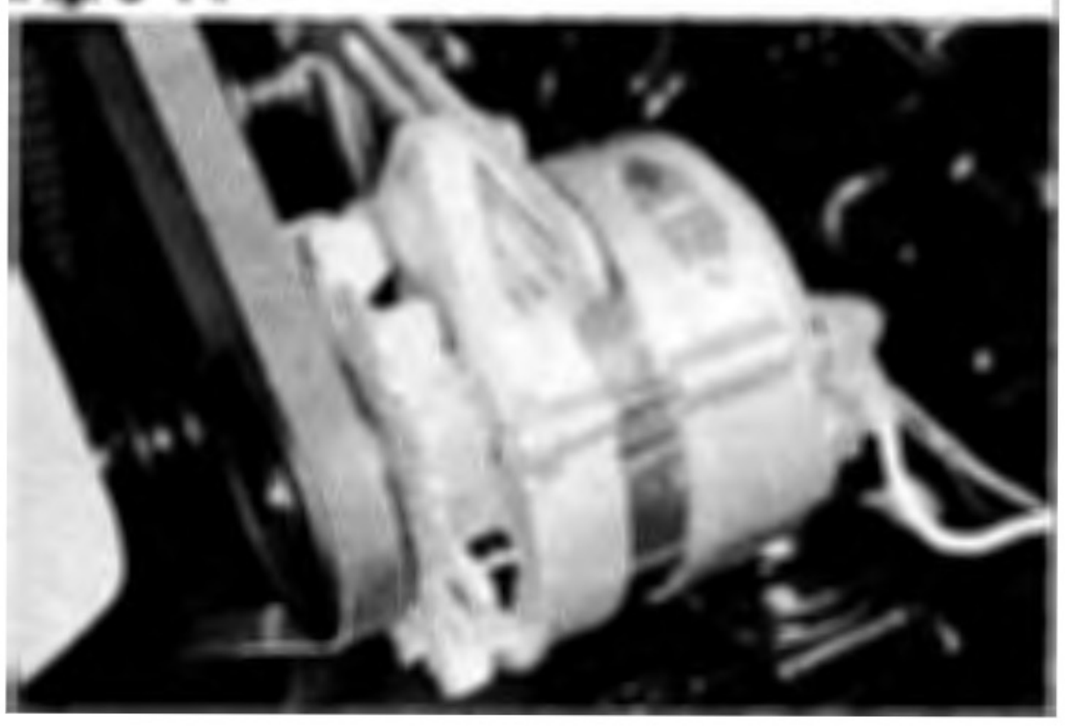
3. Installed condition of wiring for alternator and regulator.

Fig. 9-13



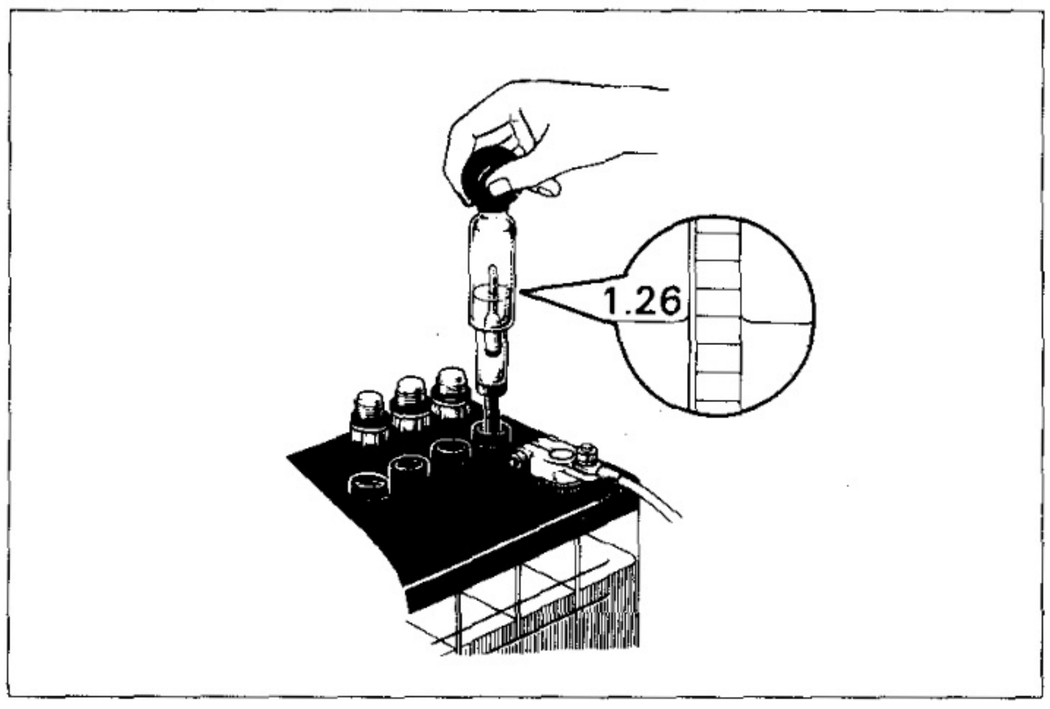
4. Battery terminal and fusible link
   Loose
   Corroded
   Burnt

Fig. 9-14



5. Alternator on-vehicle condition
   Abnormal noise from the alternator when engine is running.

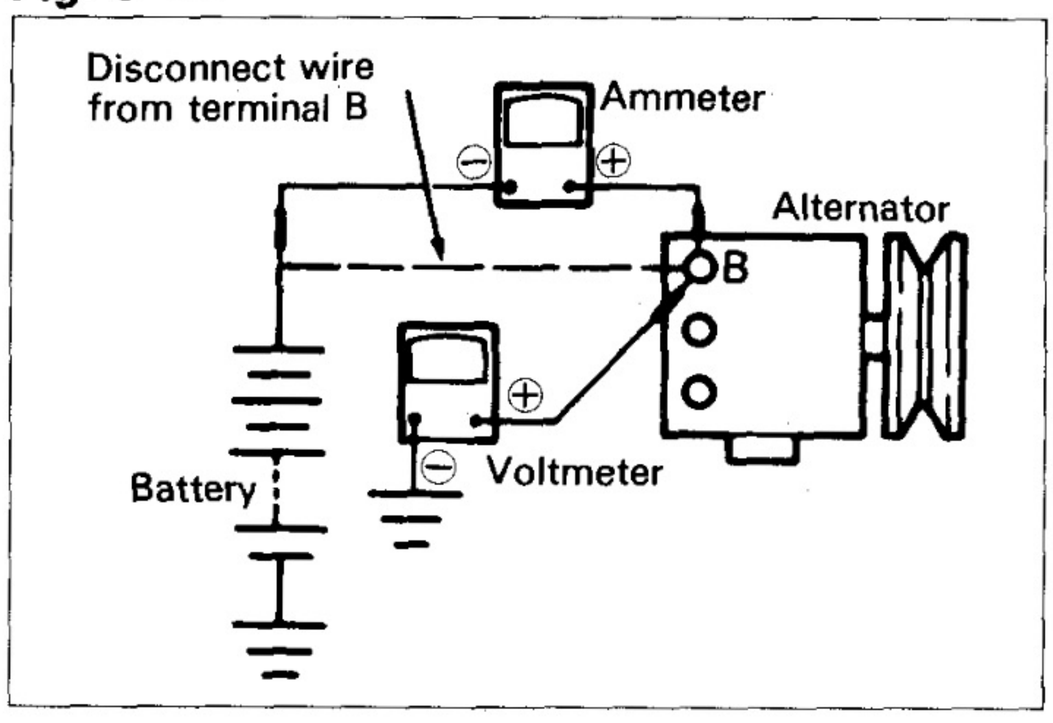
Fig. 9-15



6. Specific gravity

   Specific gravity:
   [When fully charged at 20°C (68°F)] 1.25 – 1.27

Fig. 9-16



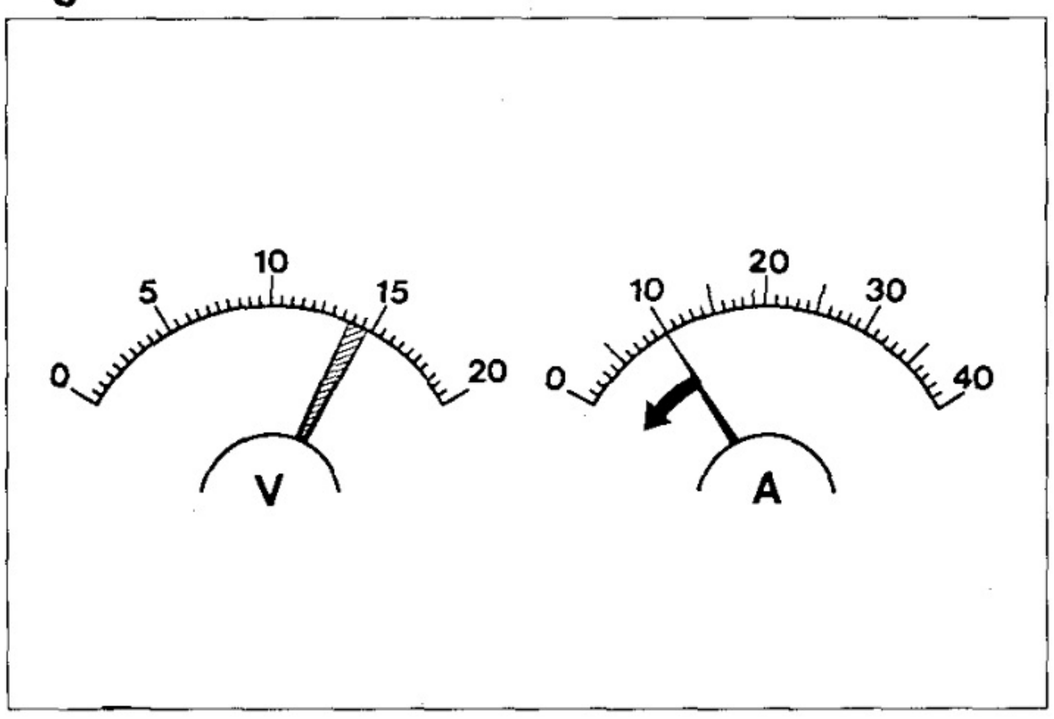
PERFORMANCE TEST WITH VOLTMETER & AMMETER

Connect the voltmeter and ammeter as follows.

Ammeter ⊕ ——— Alternator terminal B
Ammeter ⊖ ——— Wire terminal B
Voltmeter ⊕ ——— Alternator terminal B
Voltmeter ⊖ ——— Ground

– Note –
Be careful not to cause a short.

Fig. 9-17

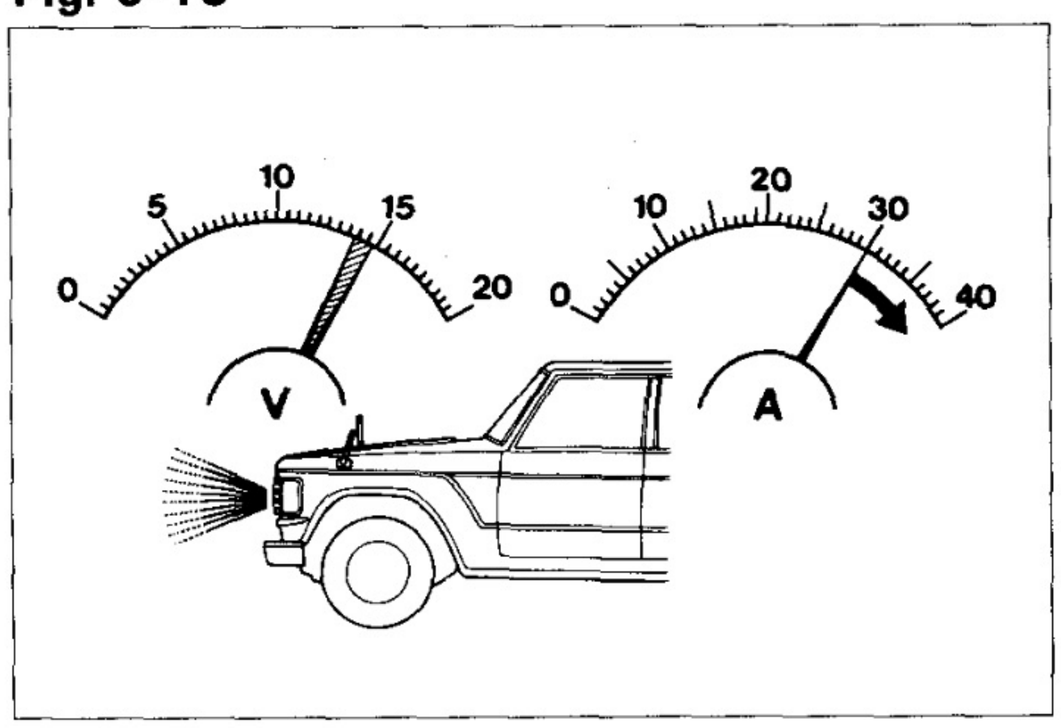


No-load Performance Test

Check the reading on the ammeter and voltmeter.

Current: Less than 10A
Voltage: 13.8 – 14.8 V
Engine speed: Idling to 2,000 rpm

Fig. 9-18

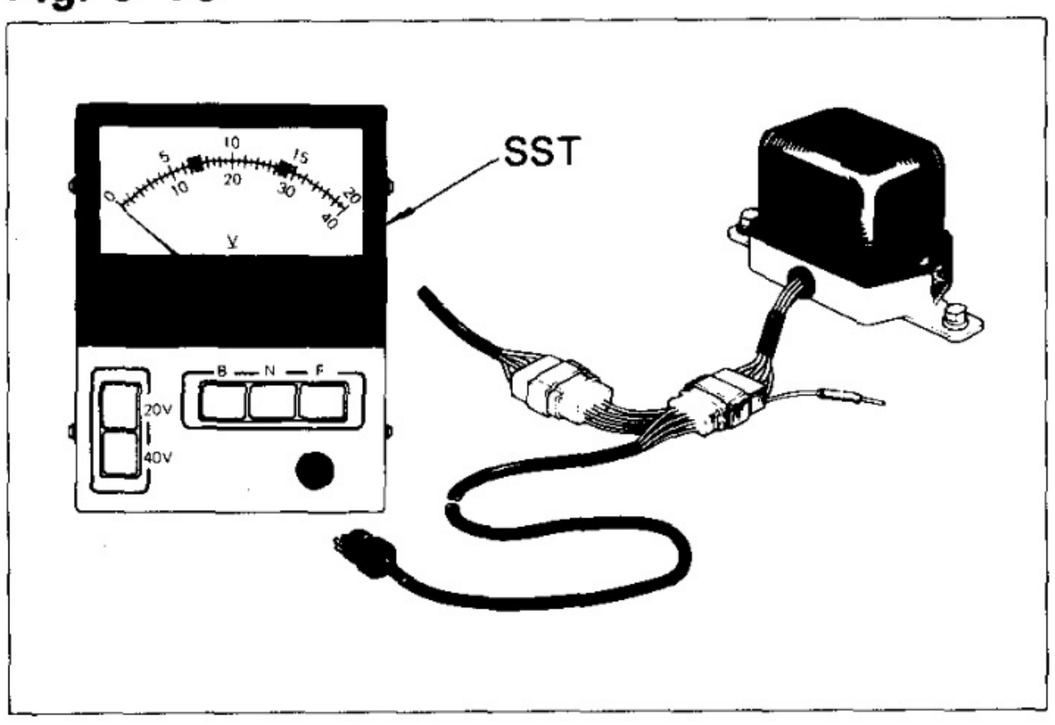


Load Performance Test

1. Run engine at 2,000 rpm.
2. Turn on the headlights and all accessories, and check the reading on the ammeter and voltmeter.

Current: More than 30A
Voltage: 13.8 – 14.8 V

Fig. 9-19

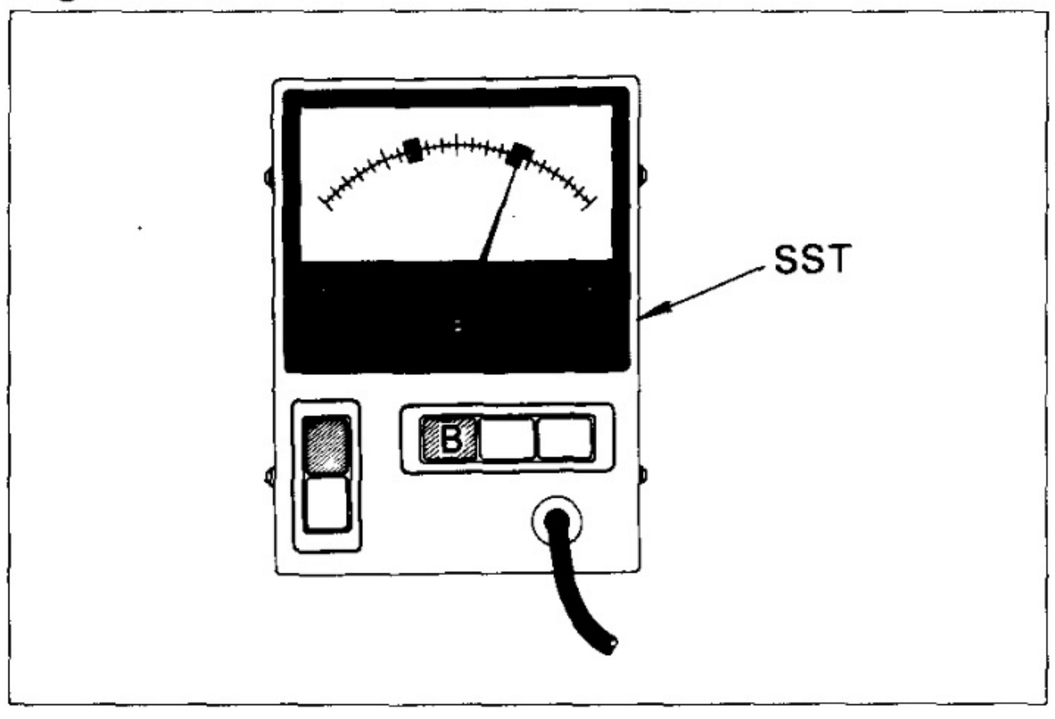


PERFORMANCE TEST WITH ALTERNATOR CHECKER

Disconnect the alternator regulator connector and connect SST.
SST [09081-00011]

Push 20 V switch.

Fig. 9-20



1. Check terminal B voltage.

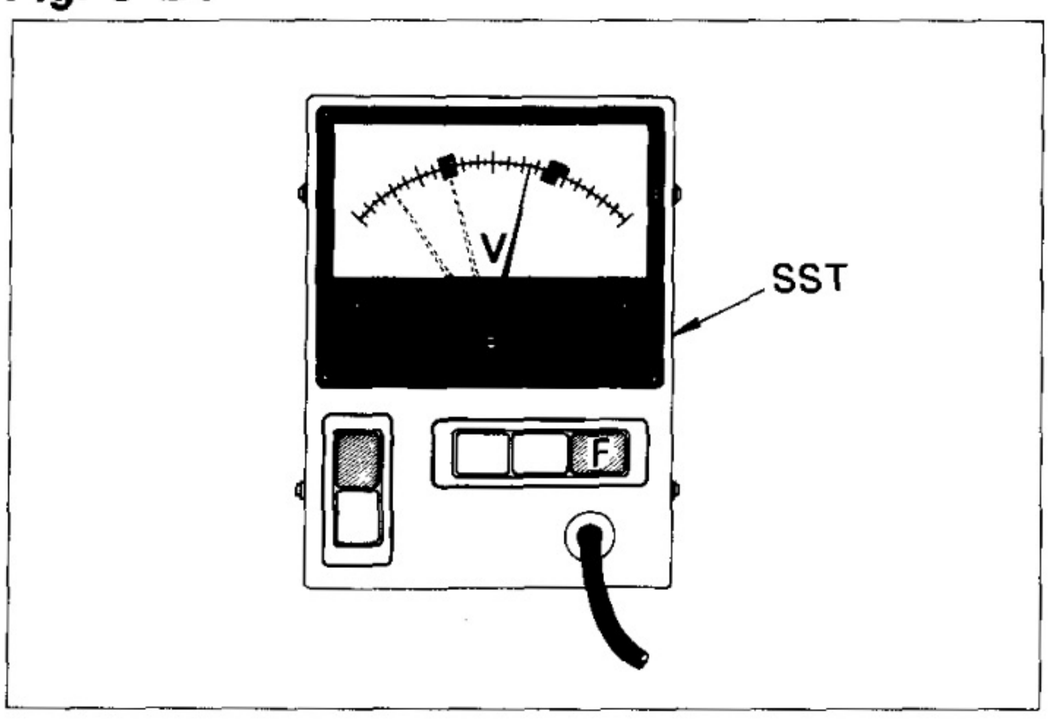
Push switch B.

Raise engine speed from idling to 2,000 rpm.

Voltage:
STD 13.8 – 14.8 V

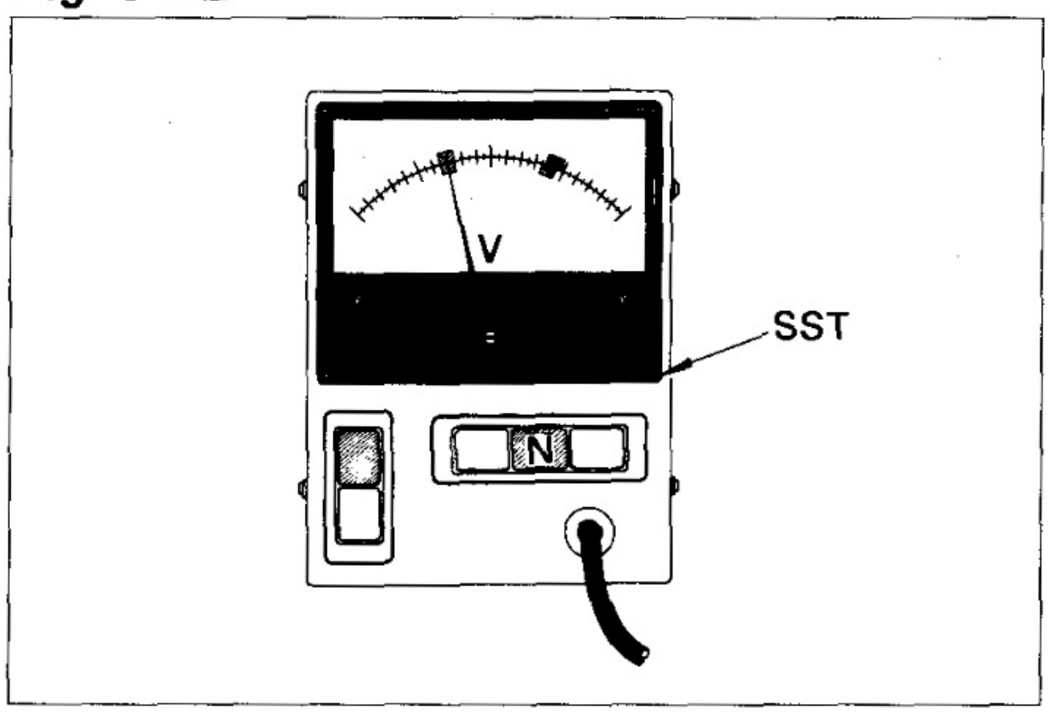
If not within standard, probable cause is the alternator regulator.

Fig. 9-21



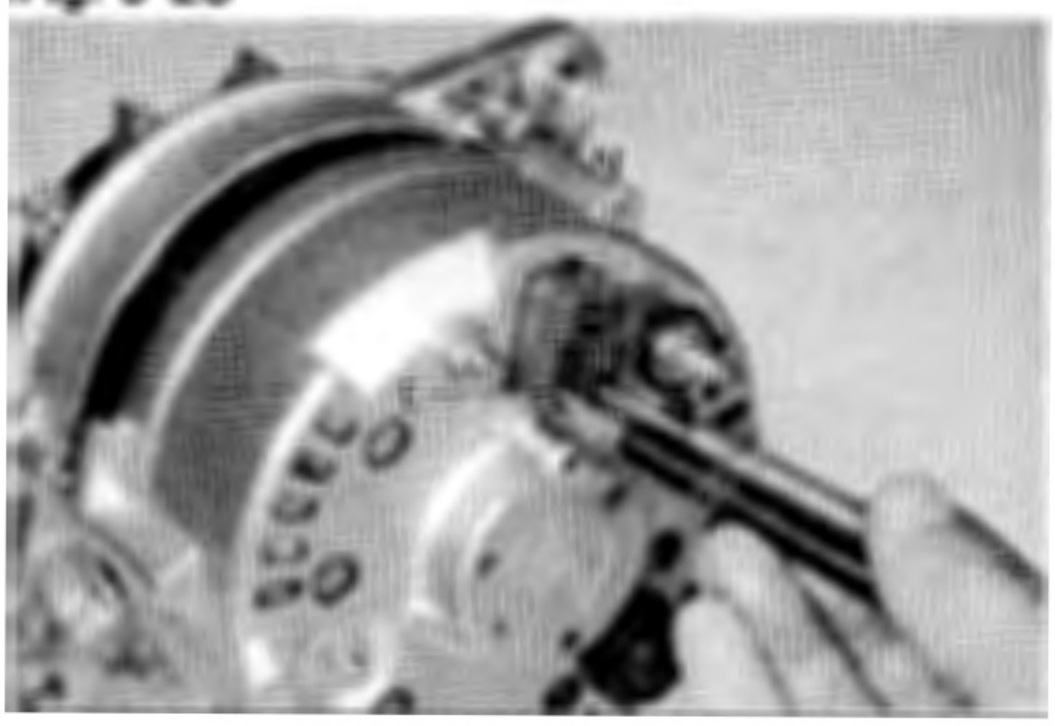
2. Check terminal F voltage.
   Push switch F.
   Raise engine speed from idling to 2,000 rpm.
   The checker reading should gradually decrease from 12 to 3 volts.
   If no decrease, probable cause is alternator regulator.

Fig. 9-22



3. Check terminal N voltage.
   Push switch N.
   Maintain engine speed at approximately 1,500 rpm. The pointer should be a half of terminal B voltage.
   Voltage:
   STD 6.9 – 7.4 V
   If the voltage is higher, the cause is the ⊕ rectifier.
   If the voltage is lower, the cause is the ⊖ rectifier.

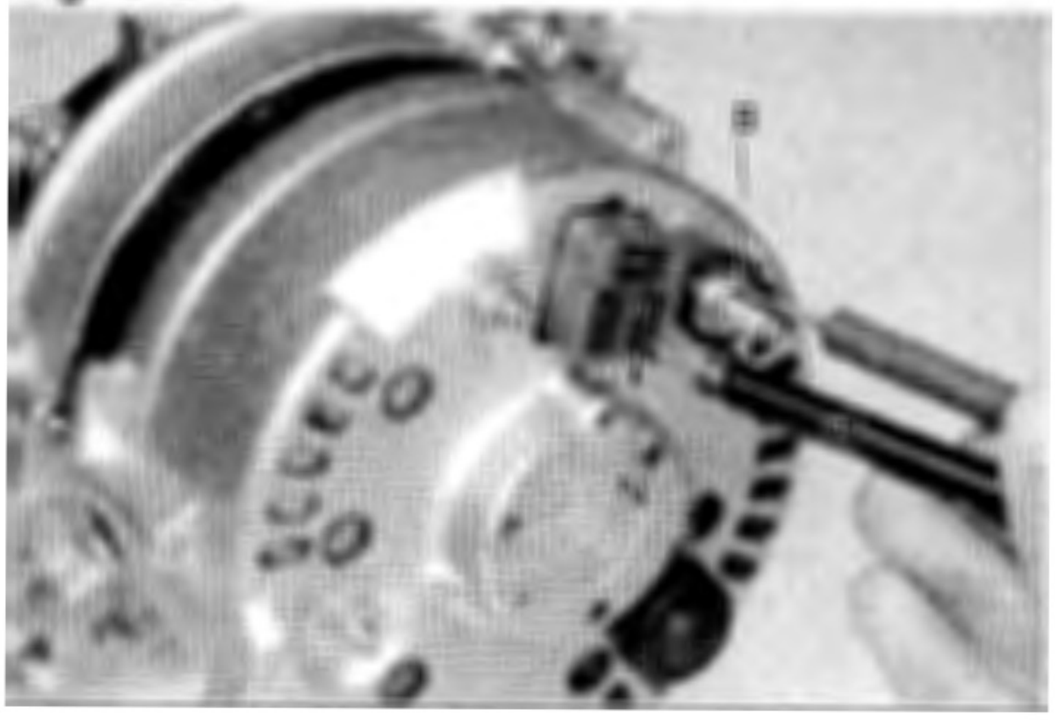
Fig. 9-23



ALTERNATOR INSPECTION (FJ series)

1. Negative side rectifier short test.
   Connect an ohmmeter ⊖ lead to terminal N and ⊕ lead to terminal E.
   The meter should indicate infinity.

Fig. 9-24



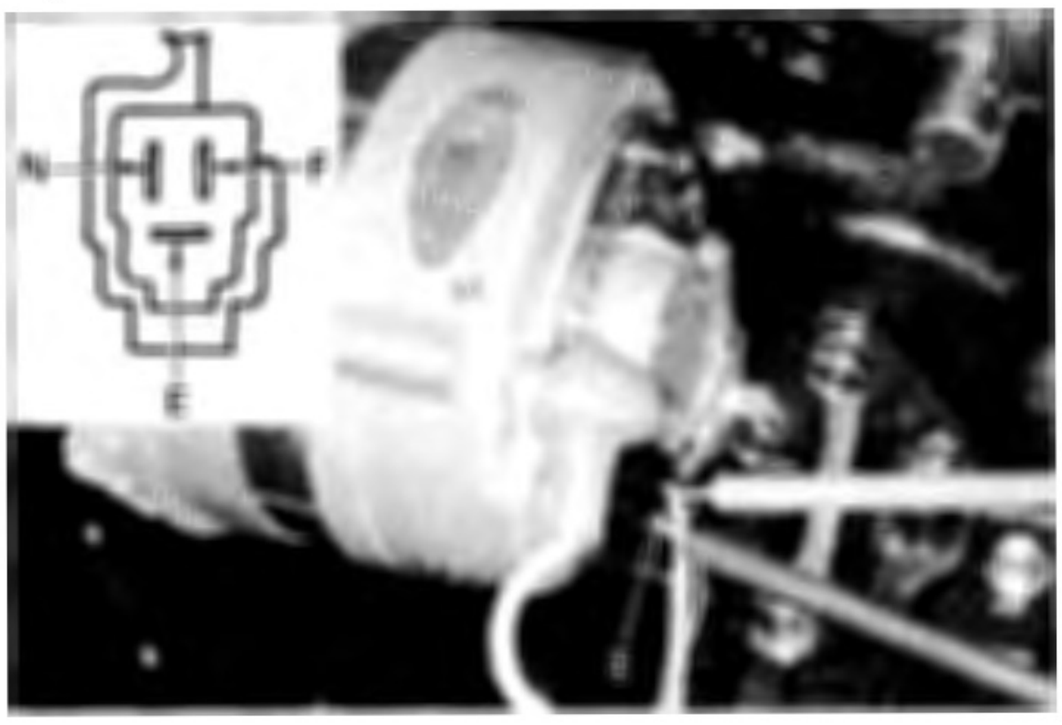
2. Positive side rectifier short test.
   Connect an ohmmeter ⊖ lead to terminal B and ⊕ lead to terminal N.
   The meter should indicate infinity.

Fig. 9-25



3. Check the rotor coil resistance.
   Resistance: 5 – 9 Ω

Fig. 9-26



4. Turn the starter switch to ON, and check to see if there is battery voltage at terminal F.
   If not, check the ENGINE fuse.

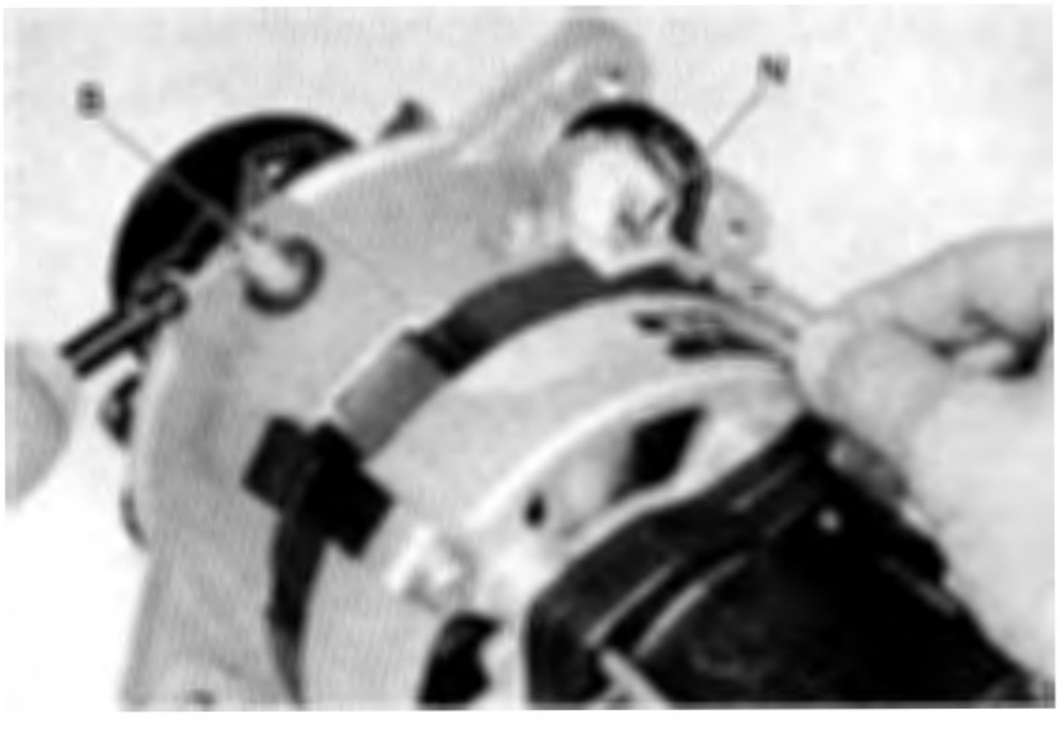
Fig. 9-27



ALTERNATOR INSPECTION (FA series)

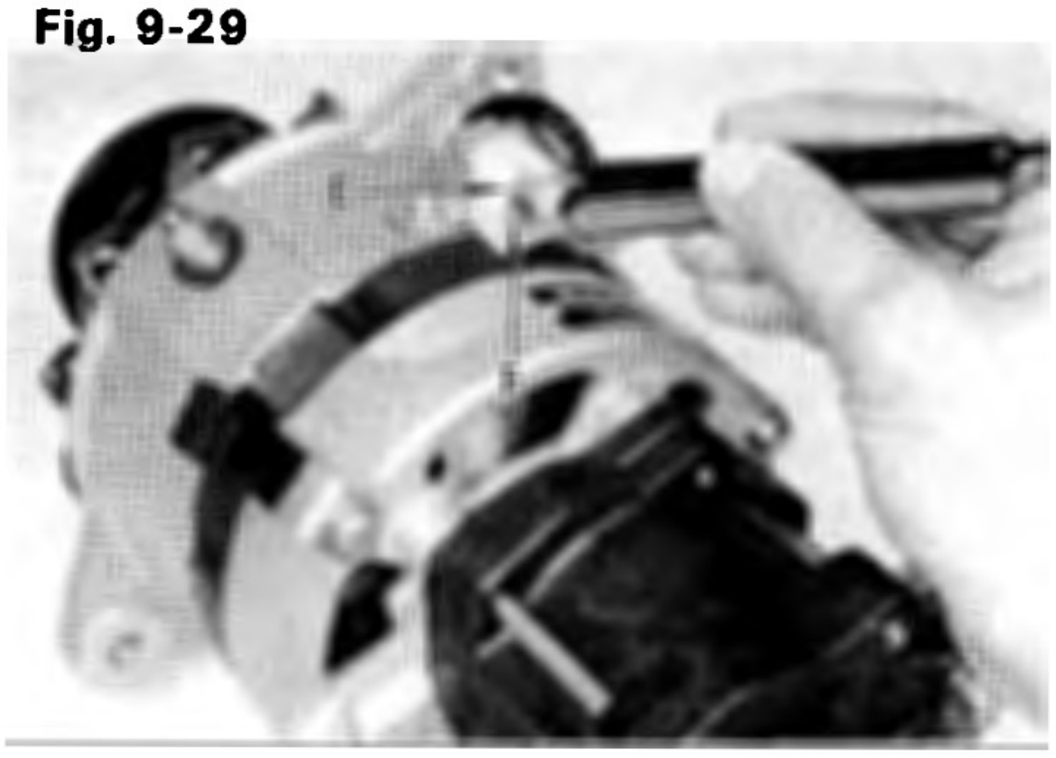
1. Negative side rectifier short test.
   Connect an ohmmeter ⊖ lead to terminal N and the ⊕ lead to terminal E.
   The meter should indicate infinity.

Fig. 9-28



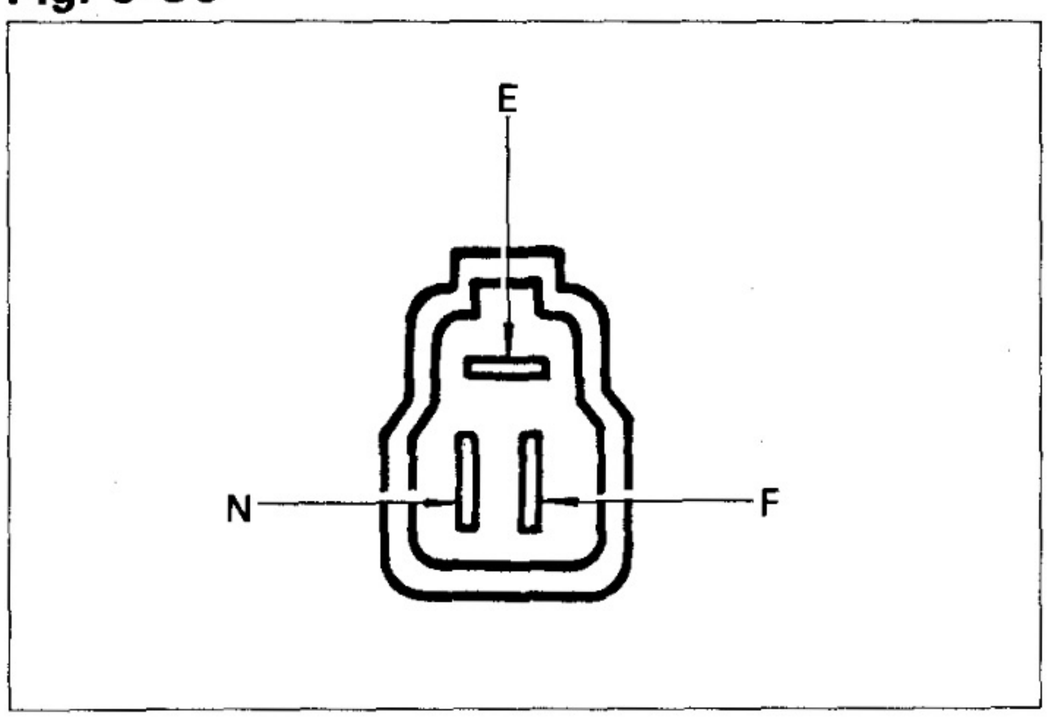
2. Positive side rectifier short test.
   Connect an ohmmeter ⊖ lead to terminal B and the ⊕ lead to terminal N.
   The meter should indicate infinity.

Fig. 9-29



3. Check the rotor coil resistance.
   Resistance: 5 – 9 Ω

Fig. 9-30



4. Turn the starter switch to ON, and check to see if there is battery voltage at terminal F referring to Fig. 9-26.
   If not, check the ENGINE fuse.

Fig. 9-31

SEE

CHARGING SYSTEM

ON-VEHICLE INSPECTION

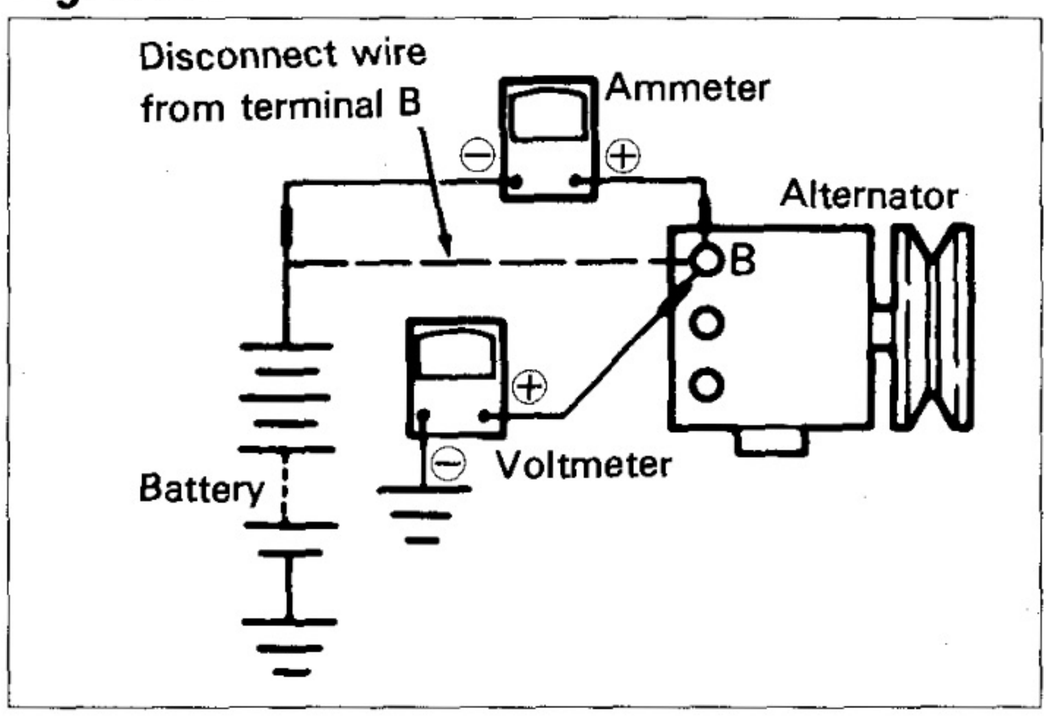
Figs. 9-9 to 9-15

ON-VEHICLE INSPECTION [IC Regulator Type]

CHECK FOLLOWING ITEMS

1. Drive belt tension.
2. Fuses.
3. Installed condition of wiring for alternator and regulator.
4. Battery terminal and fusible link.
5. Alternator on-vehicle condition.
6. Specific gravity.

Fig. 9-32



PERFORMANCE TEST

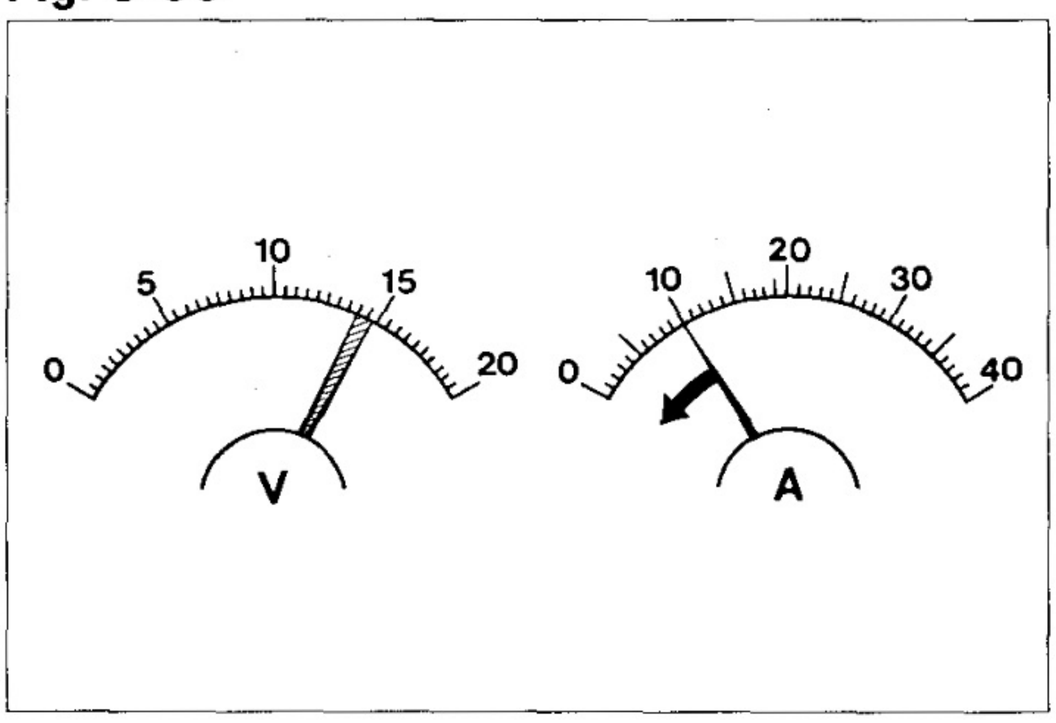
Connect the voltmeter and ammeter as follows.

Ammeter ⊕	⟶	Alternator terminal B
Ammeter ⊖	⟶	Wire terminal B
Voltmeter ⊕	⟶	Alternator terminal B
Voltmeter ⊖	⟶	Ground

– Note –

Be careful not to cause a short.

Fig. 9-33

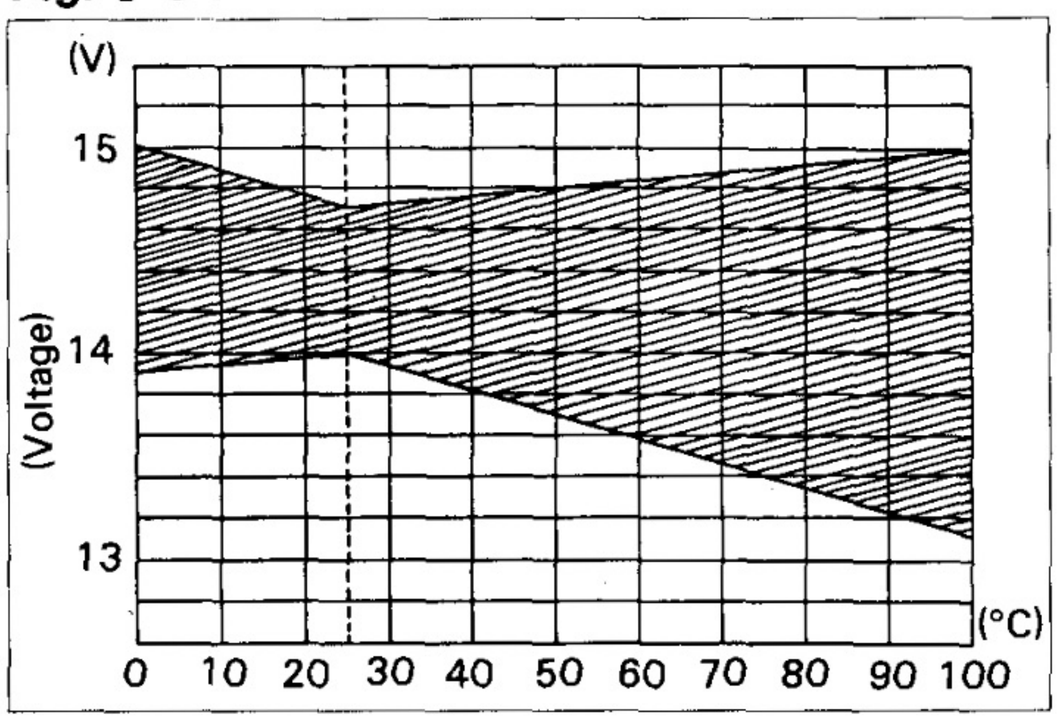


No-load Performance Test

Check the reading on the ammeter and voltmeter.

Current: Less than 10A
Voltage: 14.0 – 14.7 V
(25°C or 77°F)
Engine speed: 2,000 rpm

Fig. 9-34



– Note –
If the temperature is not 25°C (77°F), find the voltage limits in the chart for the correct temperature.

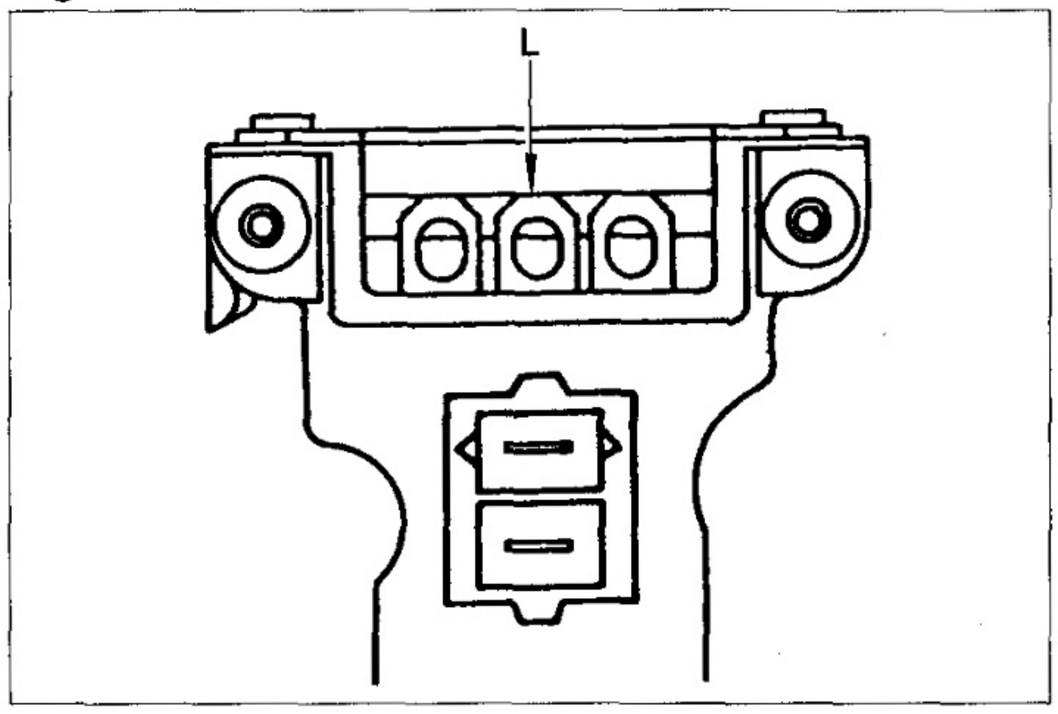
Fig. 9-35



If the voltage reading is less than 13.5 V, check the alternator and IC regulator as follows.

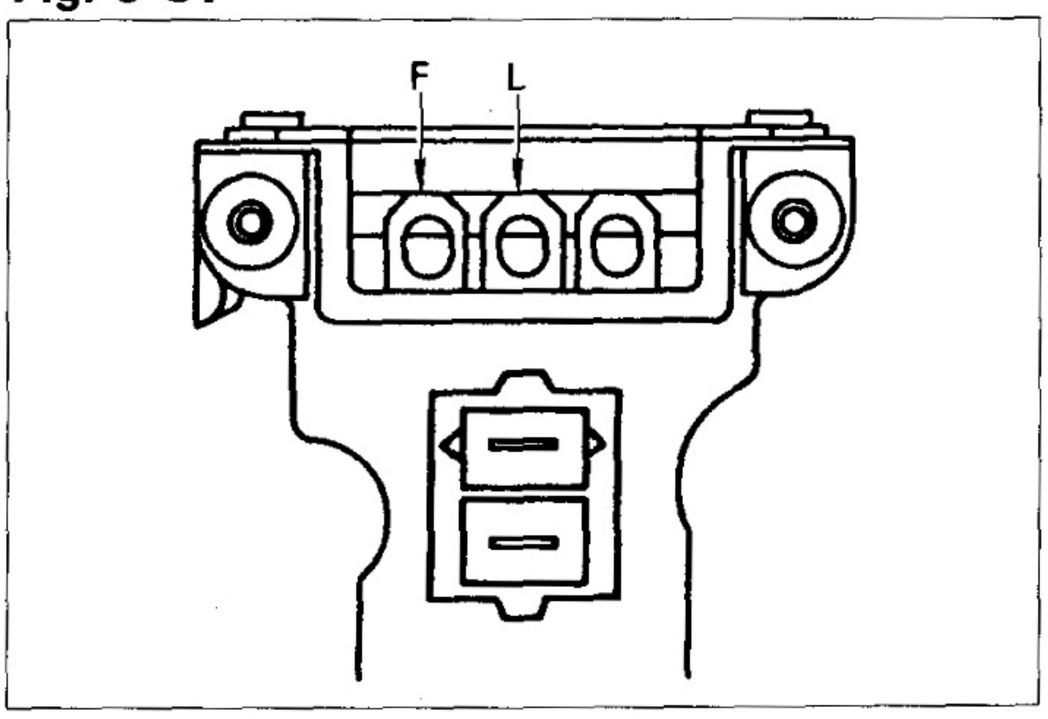
1. Turn the starter switch to ON and check the voltage reading at the alternator IG terminal.
   If no voltage, check the engine fuse and/or starter switch.

Fig. 9-36



2. Remove the end cover from the IC regulator and check the voltage reading at the regulator terminal L.
   If the voltage reading is zero to 2 volts, check the alternator.

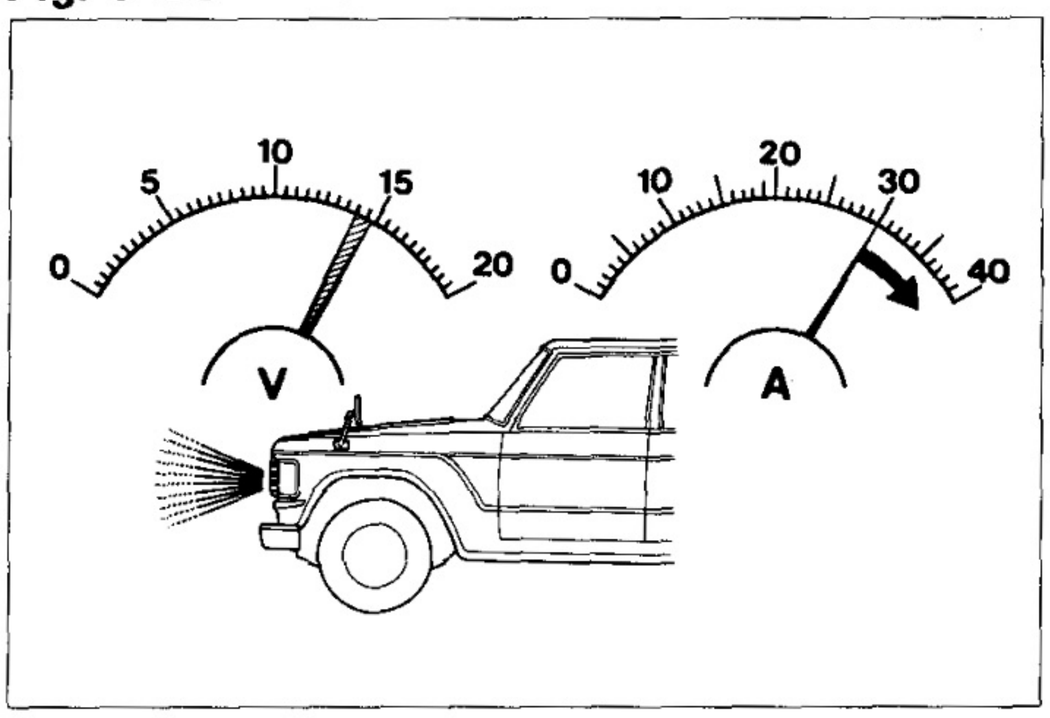
Fig. 9-37



If the voltage reading is the same as battery voltage, turn the starter switch to OFF and check that there is continuity between the alternator terminals L and F.

No continuity ——→ Check the alternator.
Continuity ——→ Replace the IC regulator.

Fig. 9-38



Load Performance Test

1. Run the engine at 2,000 rpm.
2. Turn on the headlights and all accessories. Then check the reading on the ammeter and voltmeter.

Current: More than 30 A
Voltage: 14.0 – 14.7 V

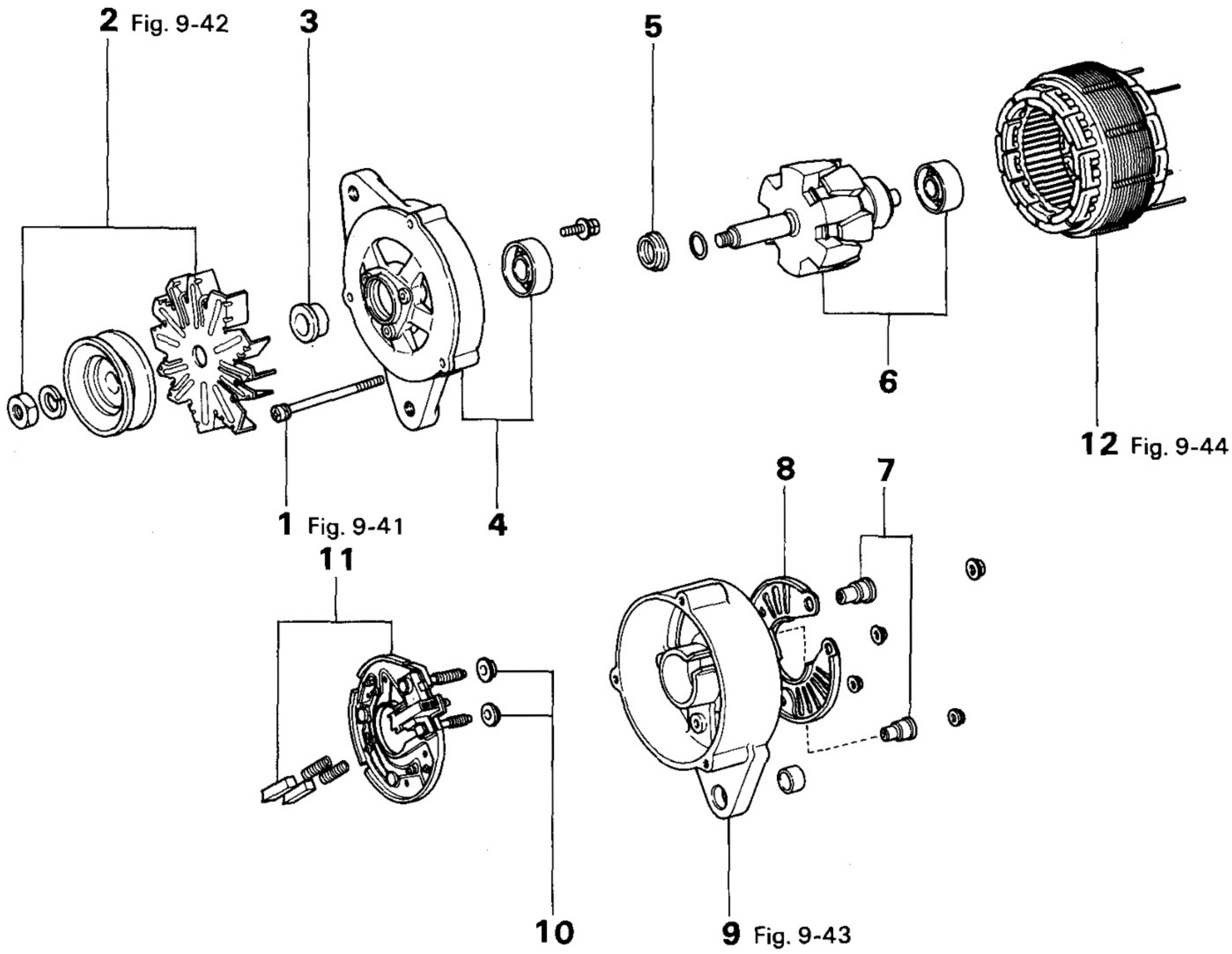
ALTERNATOR (FJ series)

DISASSEMBLY

Disassemble the parts in the numerical order shown in the figure.

Fig. 9-39

FJ series (Tirrill Regulator Type)

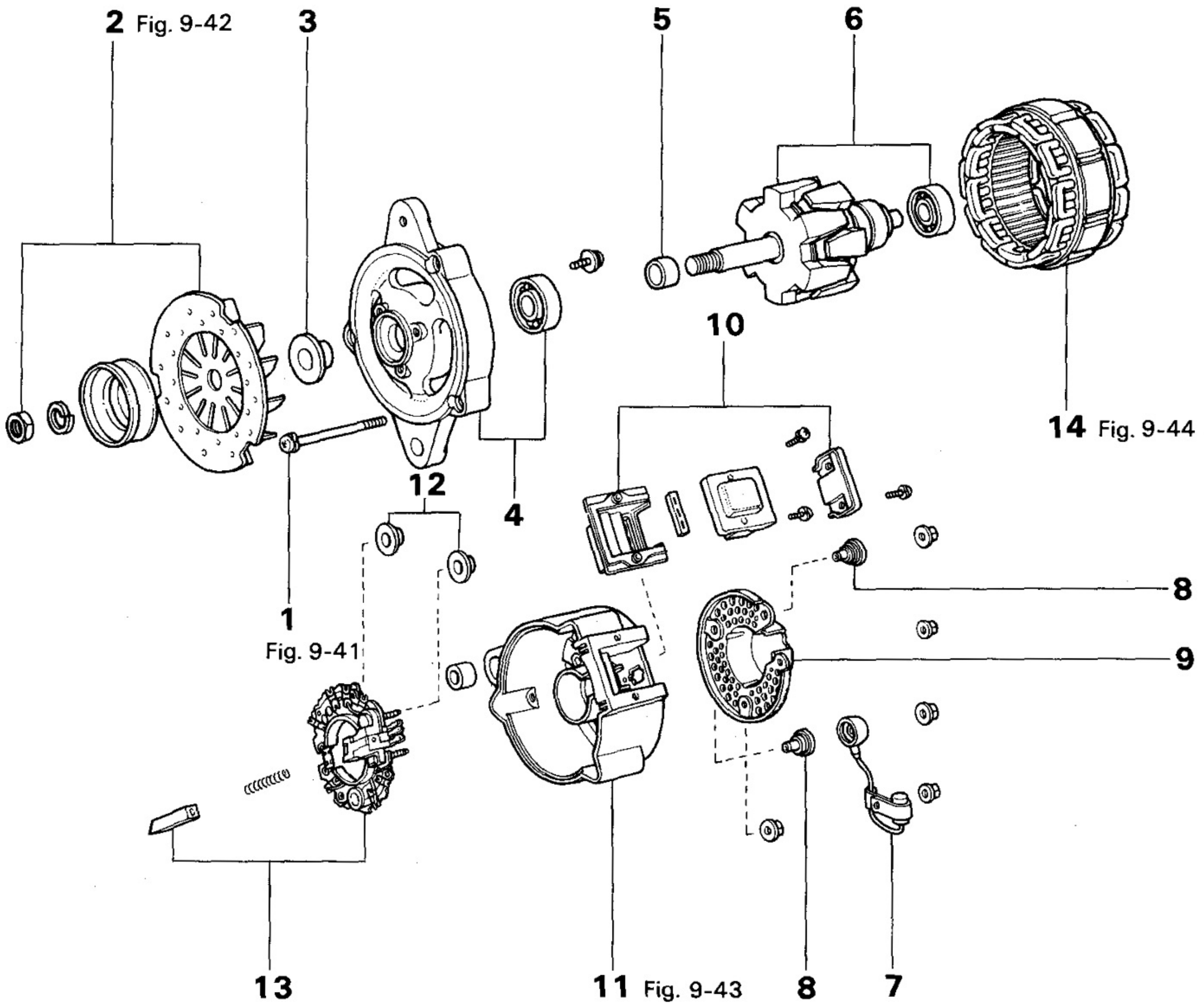


1. Through Bolt
2. Pulley & Fan
3. Space Collar
4. Drive End Frame & Front Bearing
5. Ring
6. Rotor & Rear Bearing
7. Insulator
8. Rear End Cover (except USA)
9. Rear End Frame
10. Insulator
11. Brush Holder & Rectifier Holder
12. Stator Coil

Disassemble the parts in the numerical order shown in the figure.

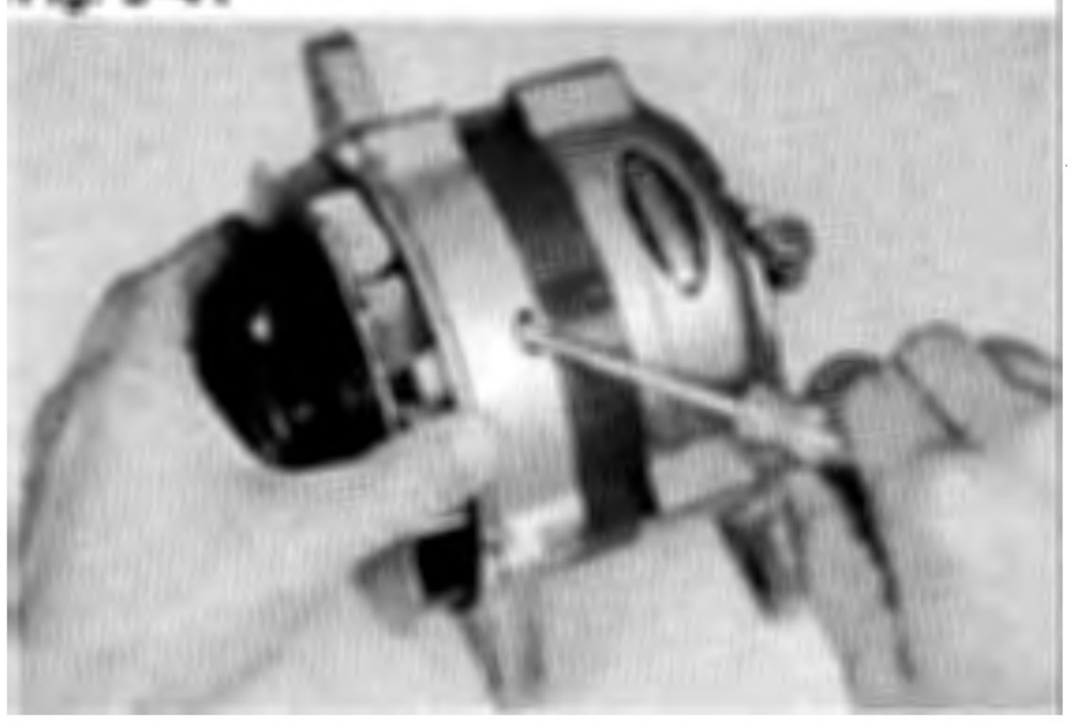
Fig. 9-40

FJ series (IC Regulator Type)



1. Through Bolt
2. Pulley & Fan
3. Space Collar
4. Drive End Frame & Front Bearing
5. Ring
6. Rotor & Rear Bearing
7. Noise Supression Condenser
8. Insulator
9. Rear End Cover
10. IC Regulator
11. Rear End Frame
12. Insulator
13. Brush Holder & Rectifier Holder
14. Stator Coil

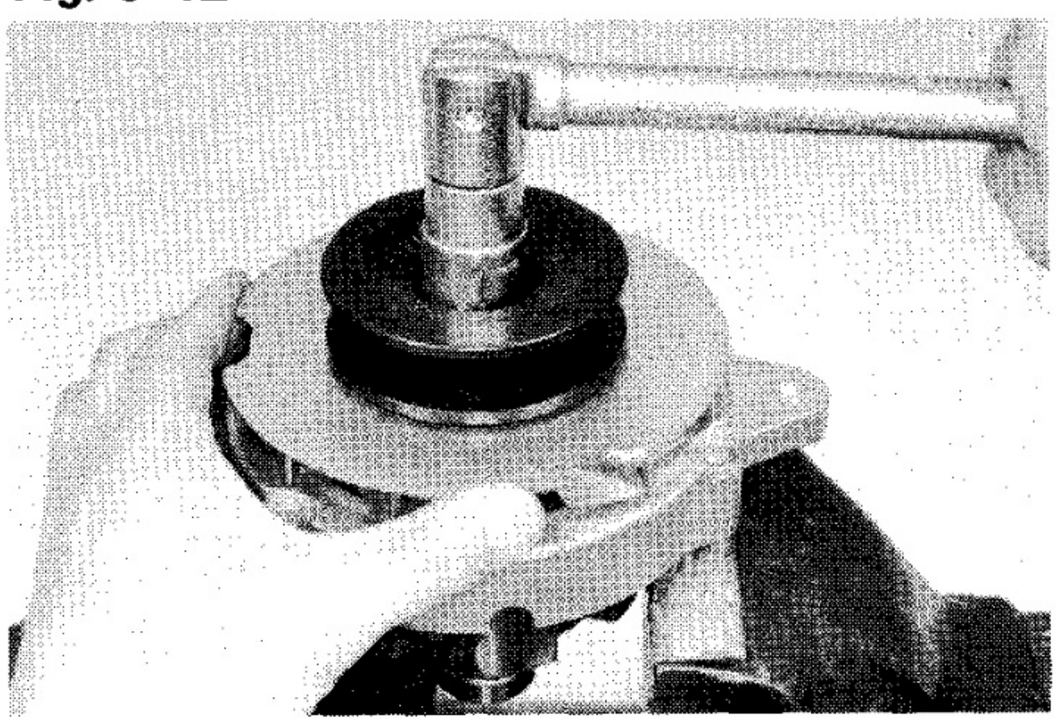
Fig. 9-41



Pry off the drive end frame from the stator.

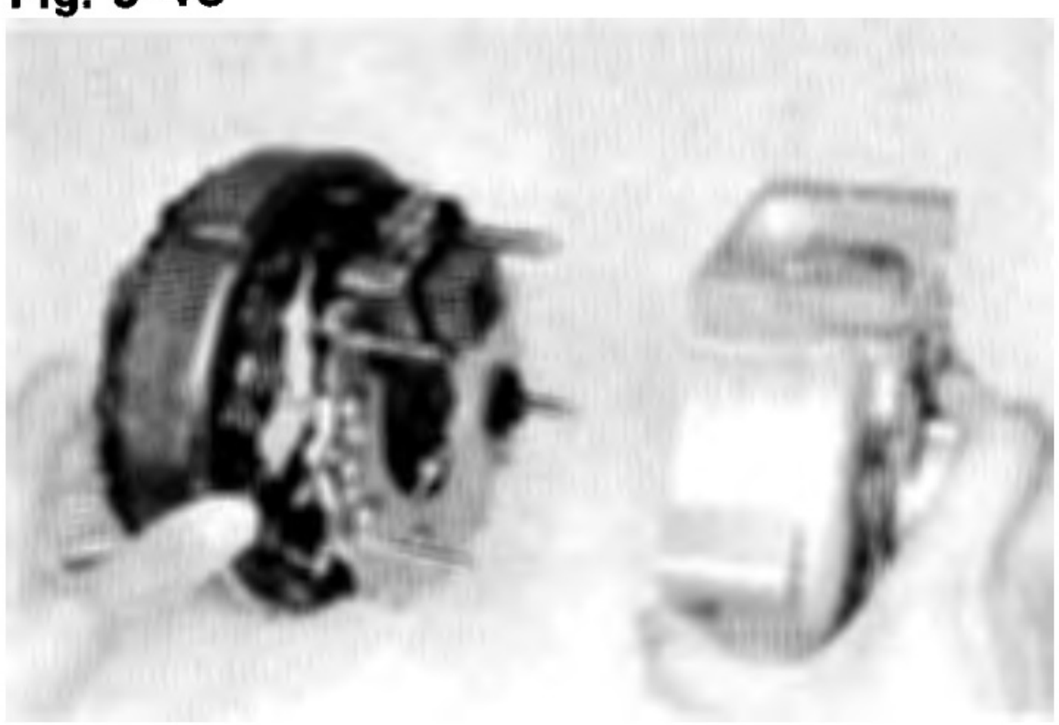
– Note –
Be careful not to damage the coil wires.

Fig. 9-42



Clamp the rotor in a soft jaw vise and loosen the pulley nut.

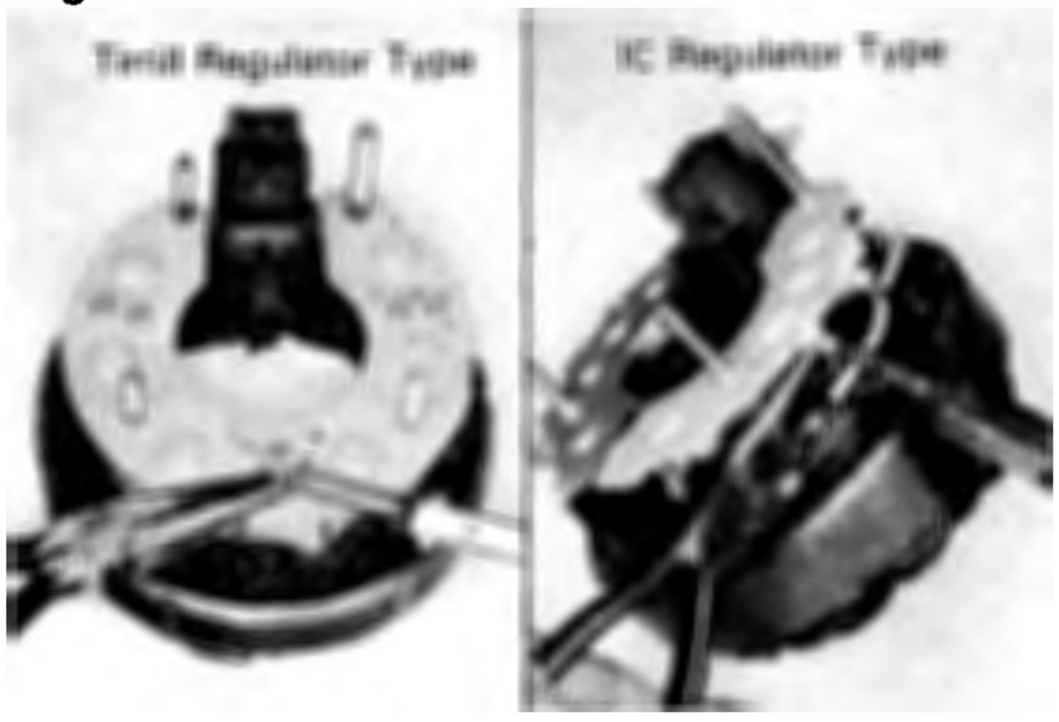
Fig. 9-43



Remove the rear end frame from the stator and rectifier holder.

– Note –
For IC regulator type, remove the regulator before separating the rear end frame.

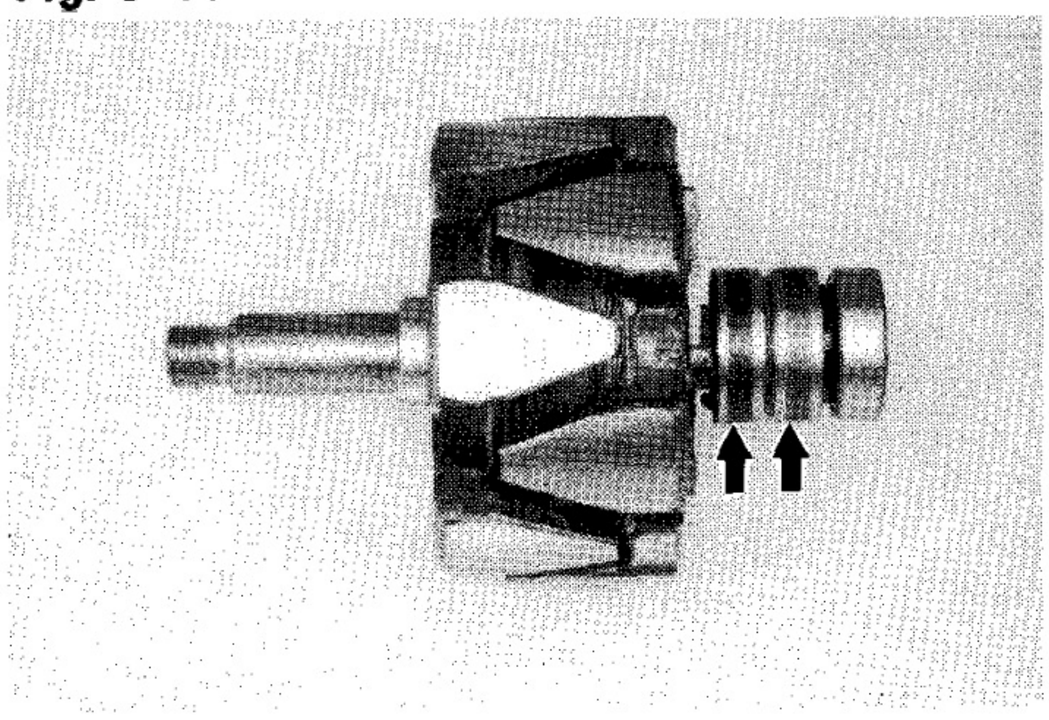
Fig. 9-44



Disconnect the stator coil from the rectifier holder by melting the solder.

– Note –
When unsoldering the leads, hold the rectifier lead with a long nose pliers to protect the rectifier from heat.

Fig. 9-45

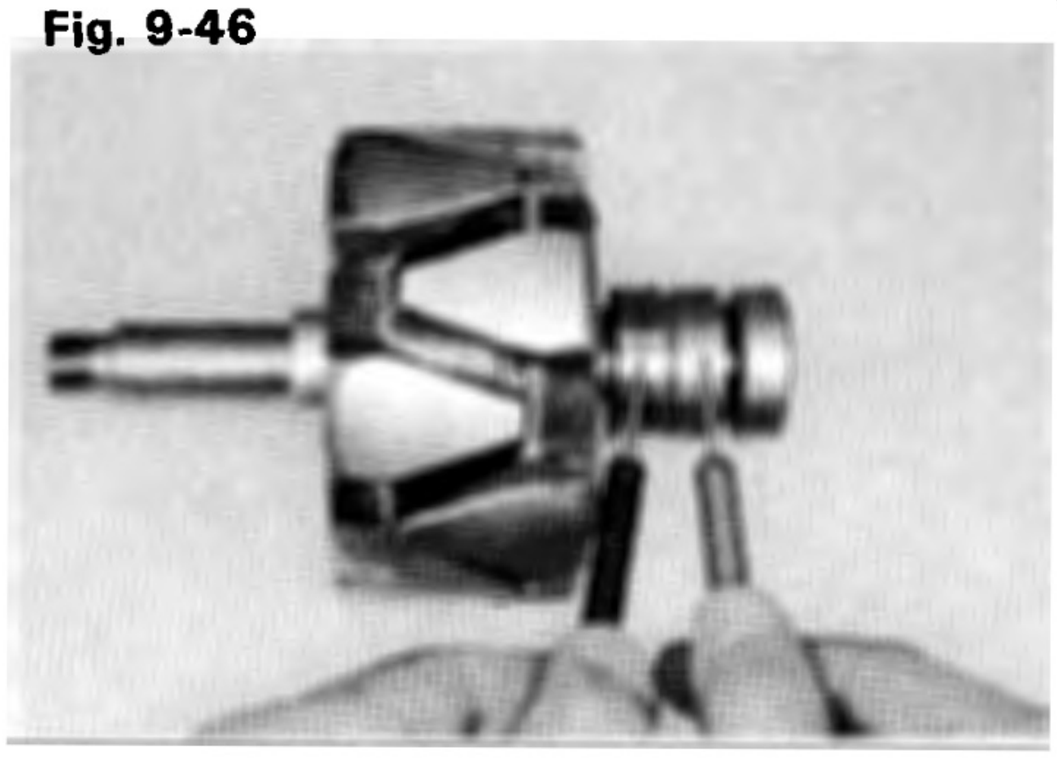


INSPECTION

Rotor

1. Check the slip rings for dirt or burns.

Fig. 9-46



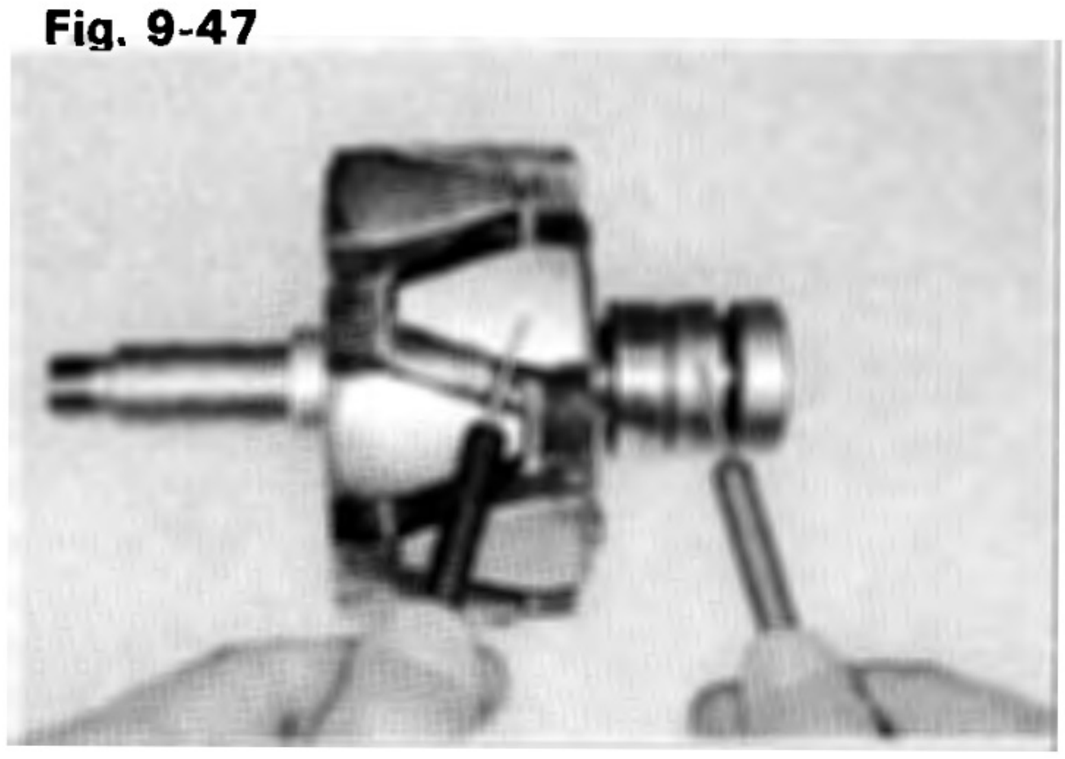
2. Open circuit test
   Check for continuity between both slip rings.
   If there is no continuity, replace the rotor.

Resistance:

Tirrill regulator type
3.9 – 4.1 Ω

IC regulator type
2.8 – 3.0 Ω

Fig. 9-47



3. Ground test
   Check that there is no continuity between the slip ring and rotor.
   If there is continuity, replace the rotor.

Fig. 9-48



Stator (Tirrill regulator type)

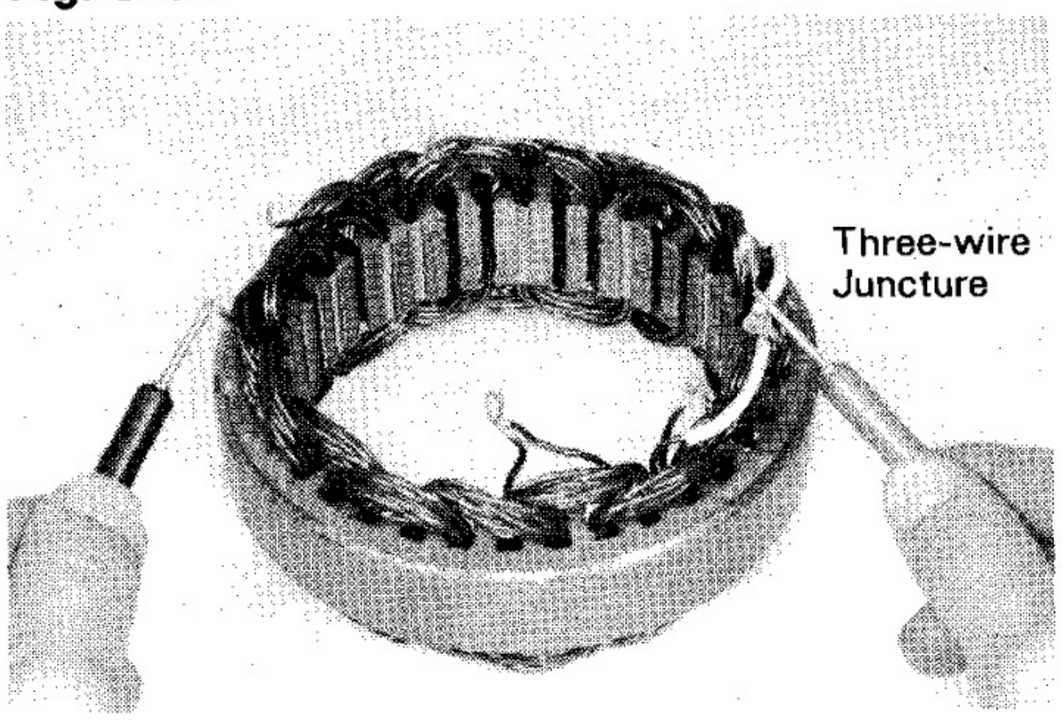
1. Open circuit test
   Check that there is continuity between the two leads near each other.
   If there is no continuity, replace the stator.

Fig. 9-49



2. Ground test
Check that there is no continuity between the coil leads and stator core.
If there is continuity, replace the stator.

Fig. 9-50

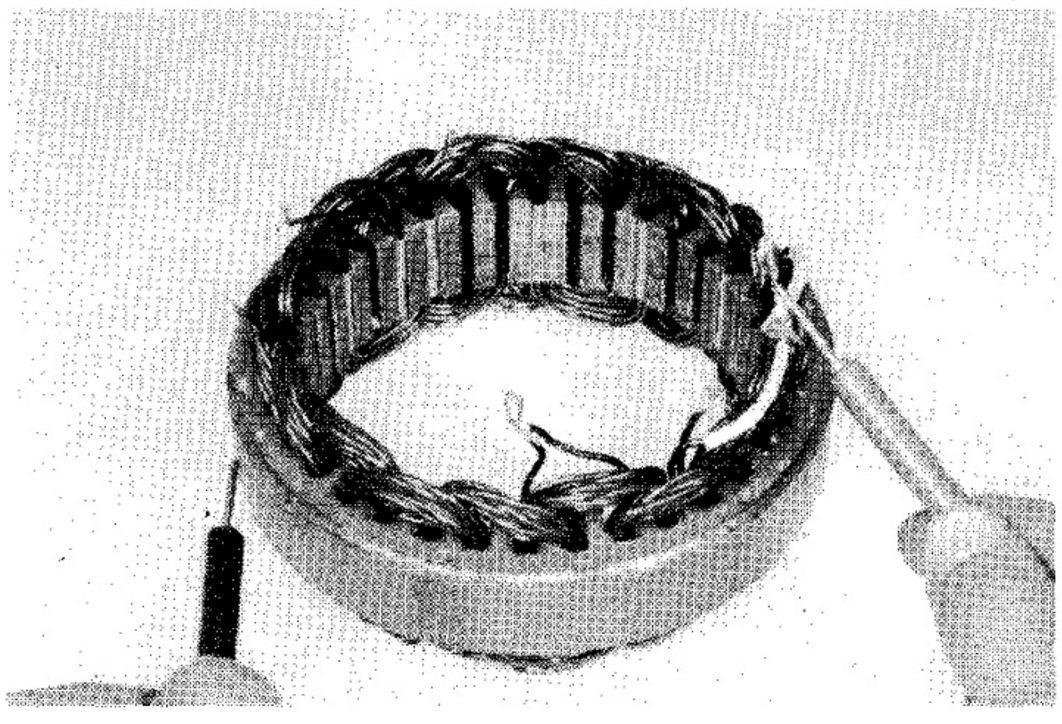


Stator (IC regulator type)

1. Open circuit test
Check that there is continuity between the three-wire juncture and the other leads.
If there is no continuity, replace the stator.

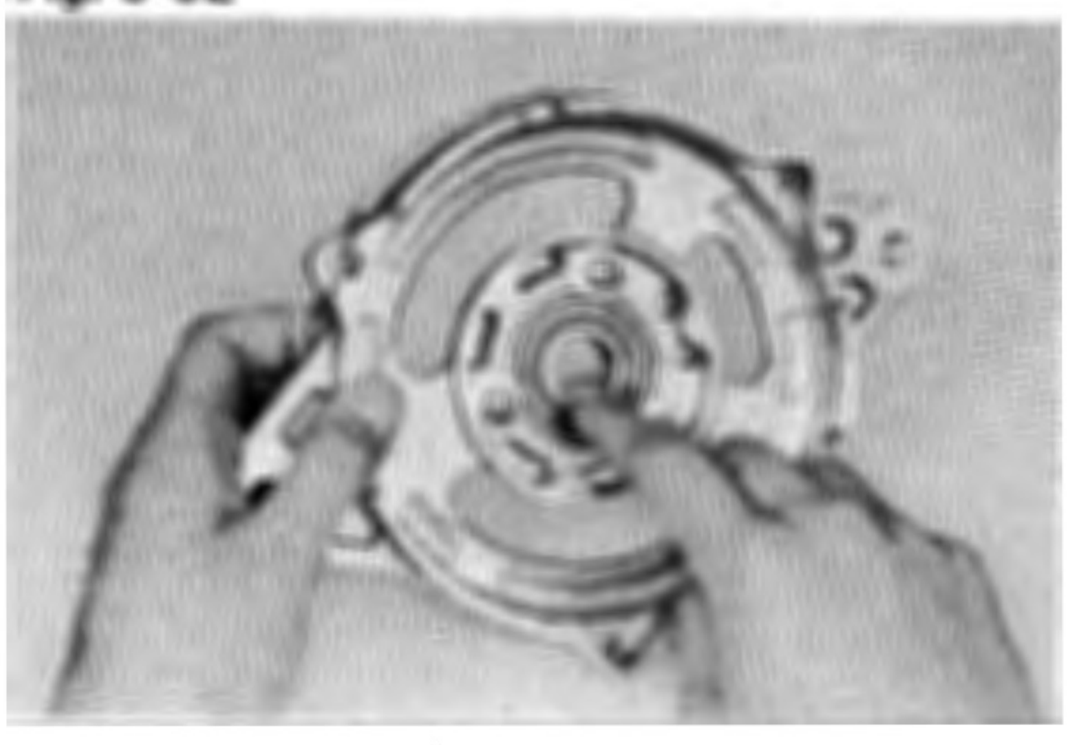
— Note —
Check for continuity when the juncture wires are connected with solder.

Fig. 9-51



2. Ground test
Check that there is no continuity between the coil leads and stator core.
If there is continuity, replace the stator.

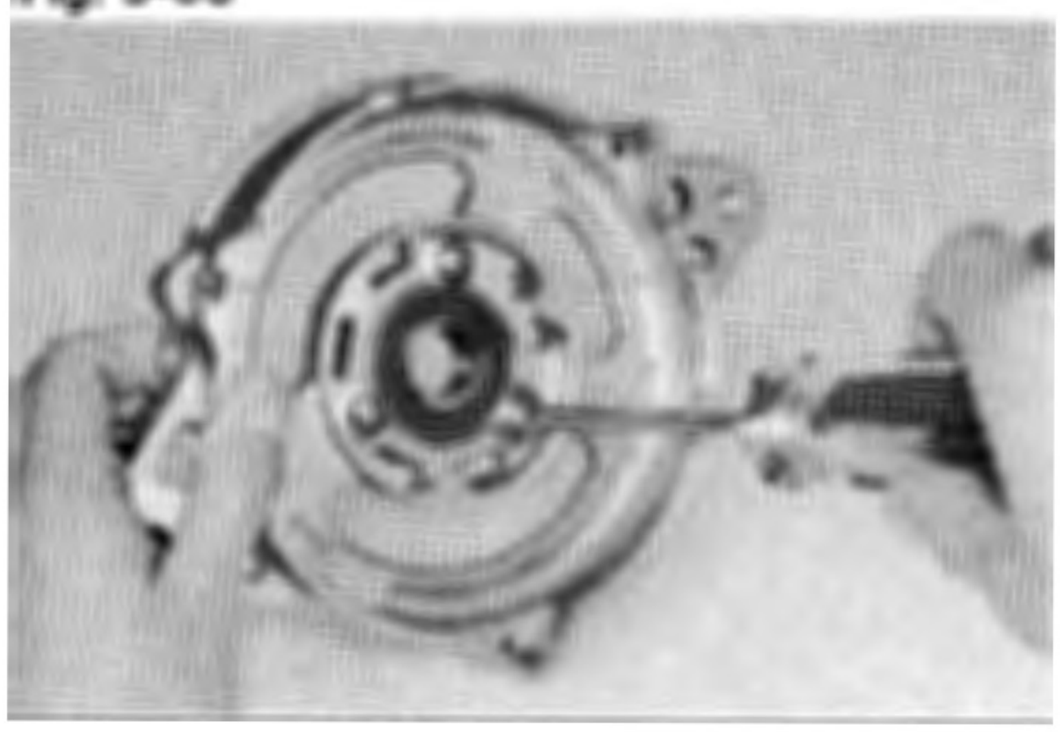
Fig. 9-52



Bearings

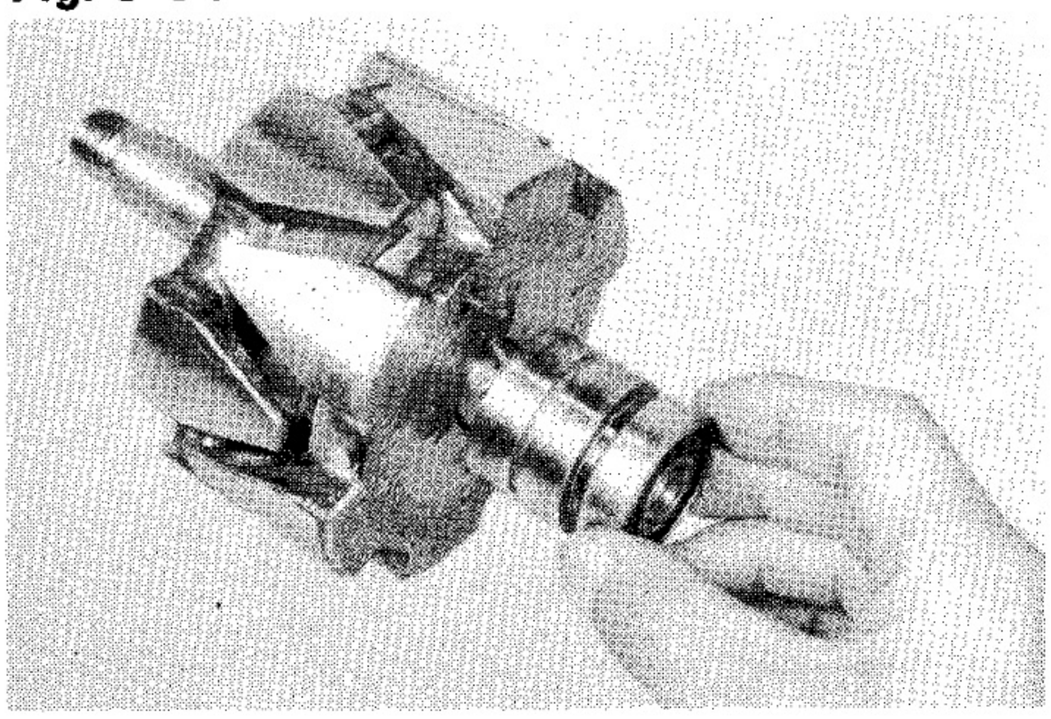
1. Check the front bearing for wear or roughness.

Fig. 9-53



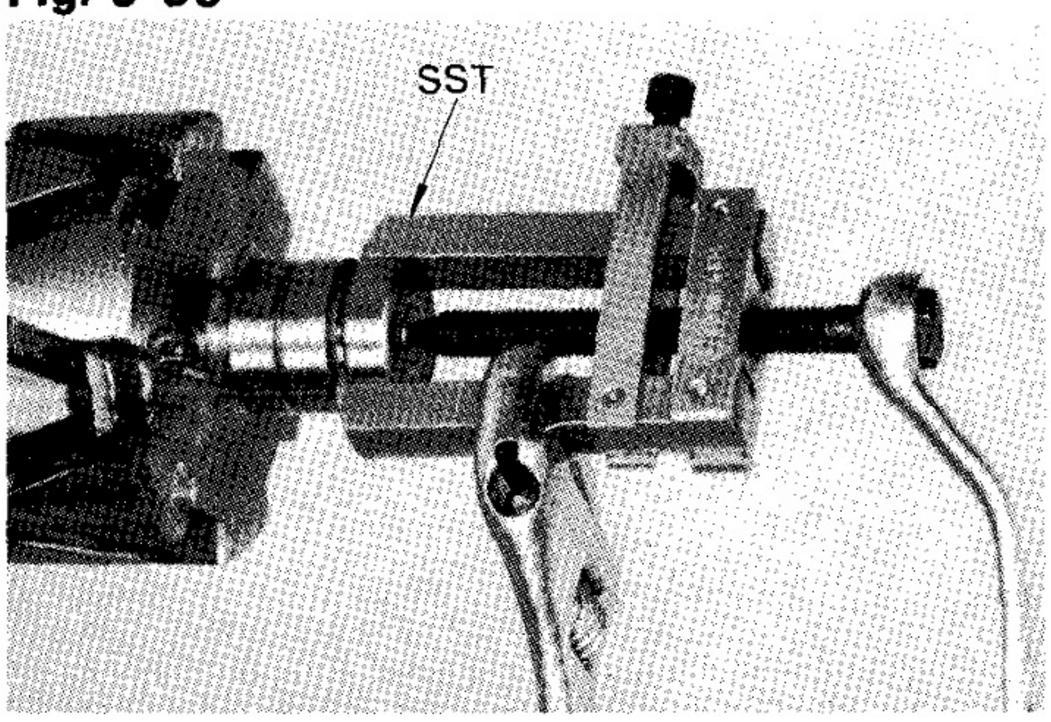
2. Replace the front bearing with new one if necessary.

Fig. 9-54



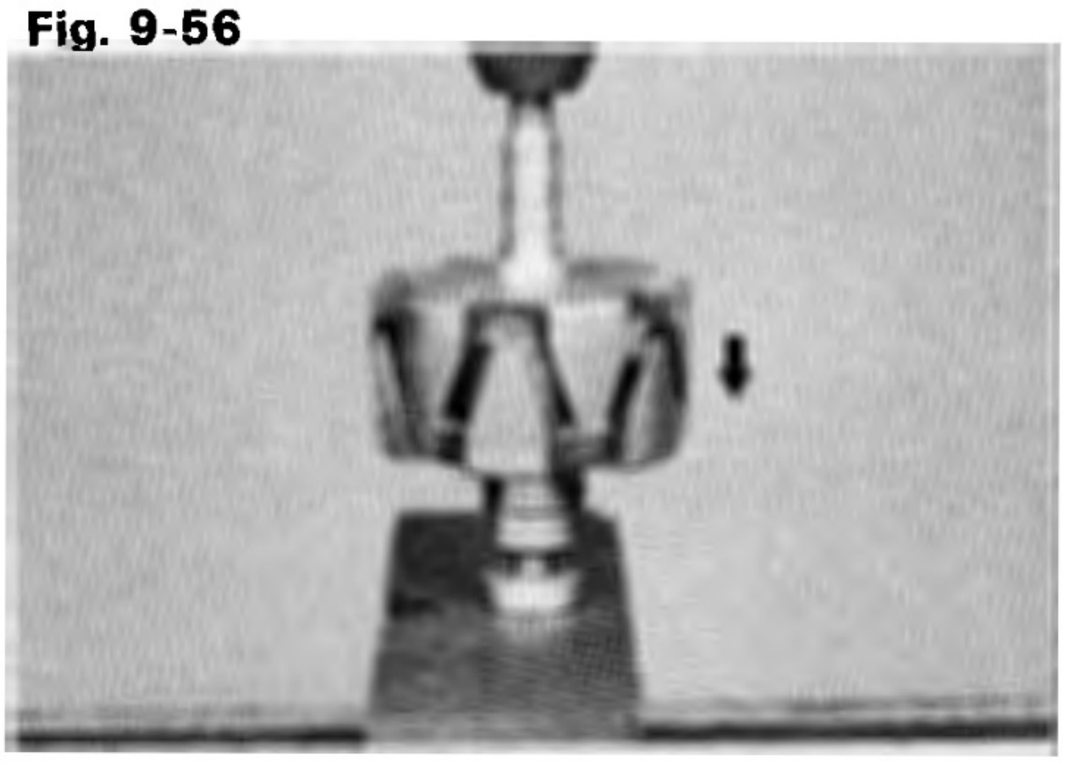
3. Check the rear bearing for wear or roughness.

Fig. 9-55



4. Replace the rear bearing if necessary.
   (1) Remove the rear bearing with SST.
   SST [09286-46011]

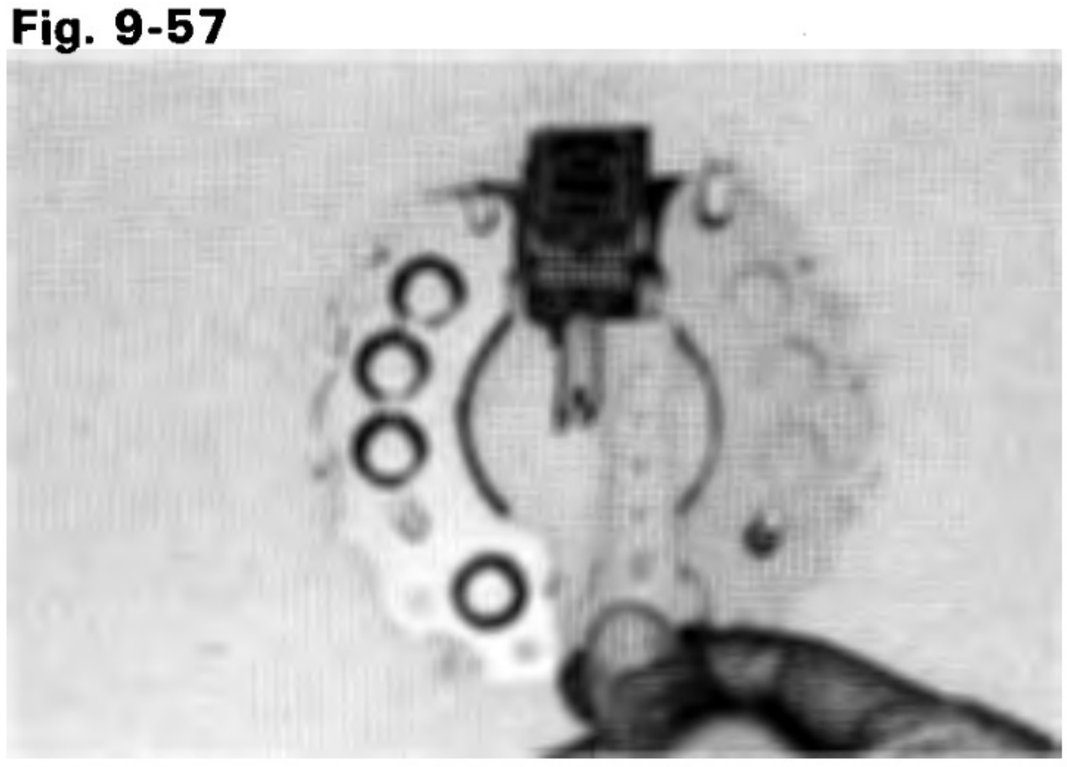
Fig. 9-56



(2) Press a new bearing onto the rotor shaft.

— Note —
Be careful not to press it in slantwise.

Fig. 9-57



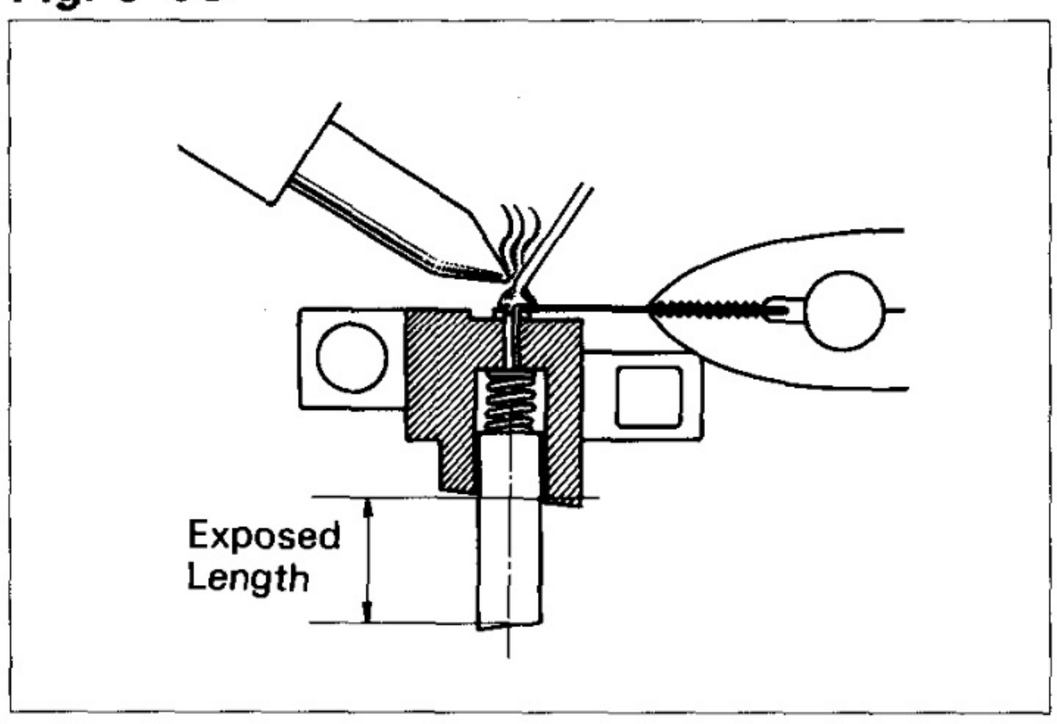
Brush & Brush Holder

1. Measure the exposed brush length.

Exposed length:
Minimum 5.5 mm
(0.217 in.)

If the brush length is less than minimum, replace the brush.

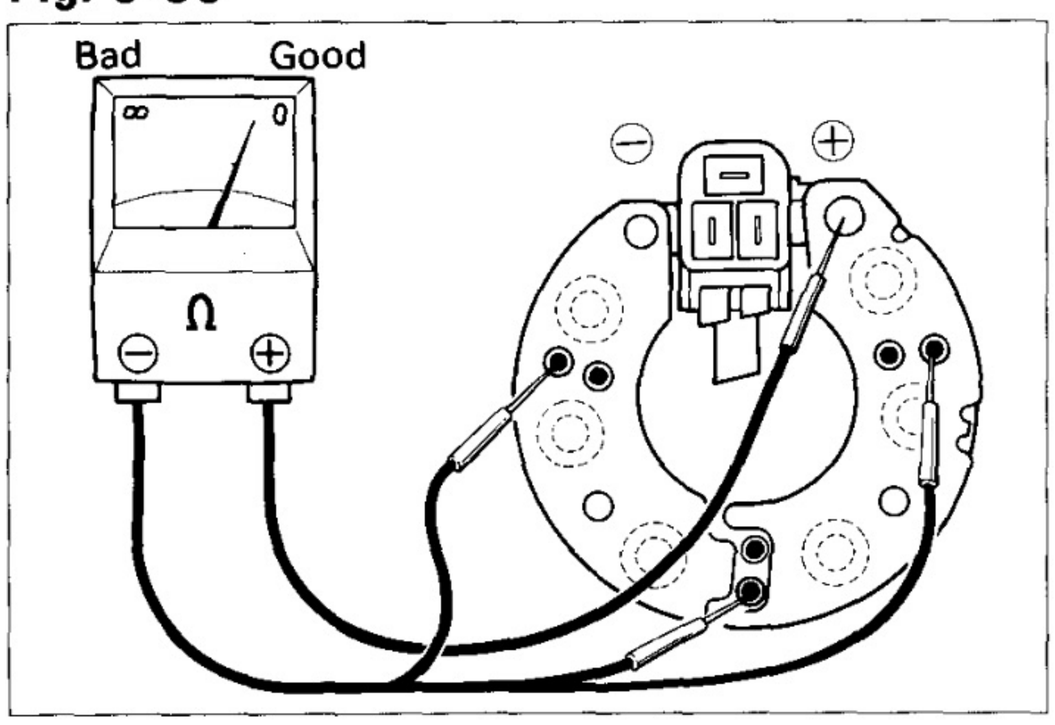
Fig. 9-58



2. When replacing the brushes, assemble them as shown in the figure.

Exposed length: 12.5 mm
(0.492 in.)

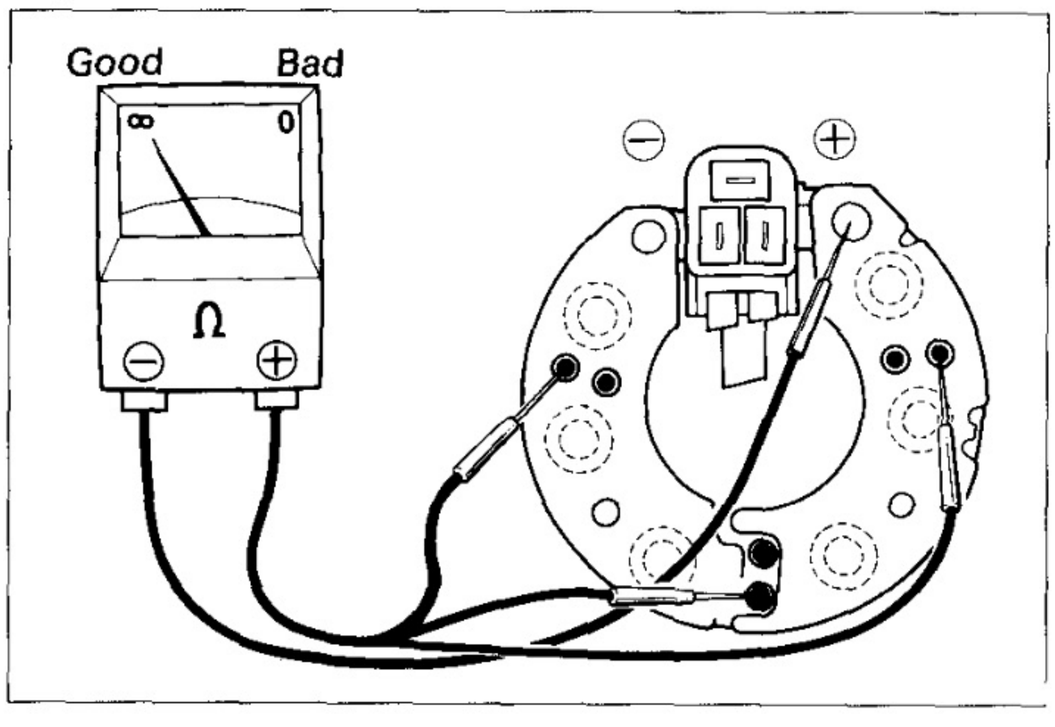
Fig. 9-59



Rectifier
(Tirrill regulator type — 40,45A)

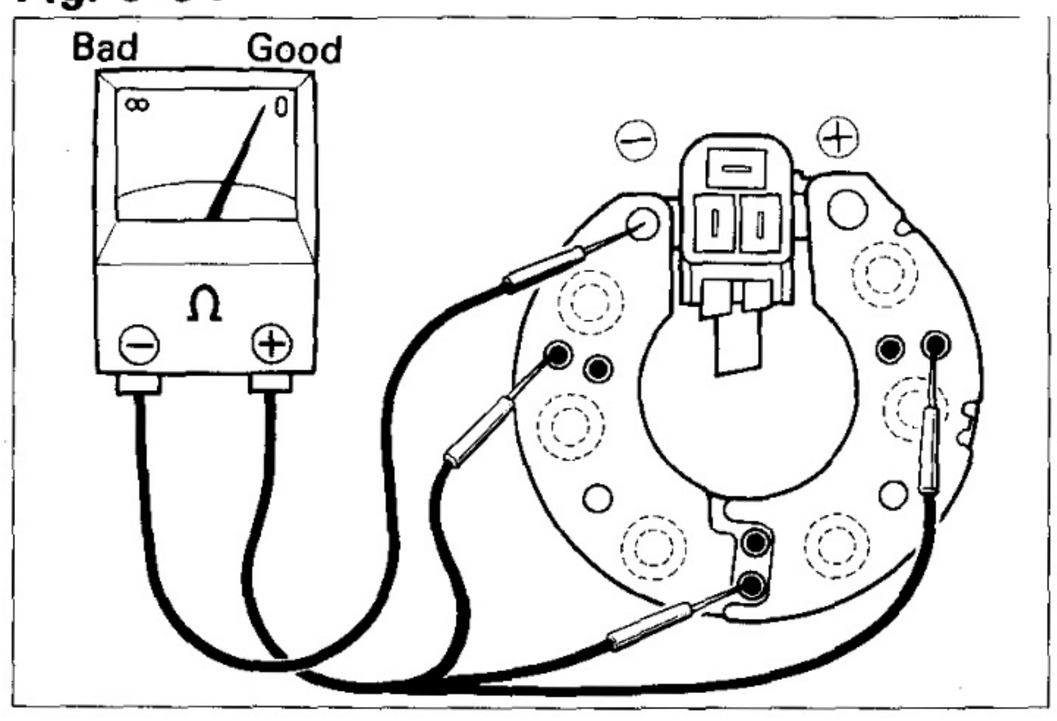
1. Rectifier holder positive side
   Connect an ohmmeter ⊕ lead to the rectifier holder, and the ⊖ lead of the meter to each rectifier terminal. If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-60



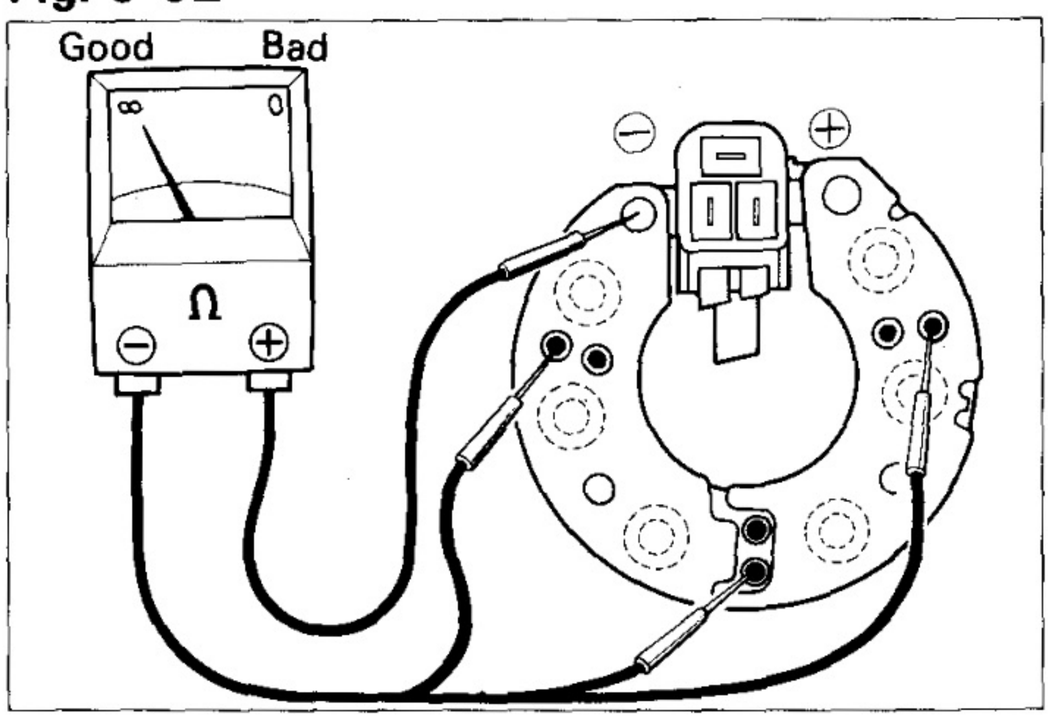
2. Reverse polarity of the test leads and check again. If there is continuity, the rectifier assembly must be replaced.

Fig. 9-61



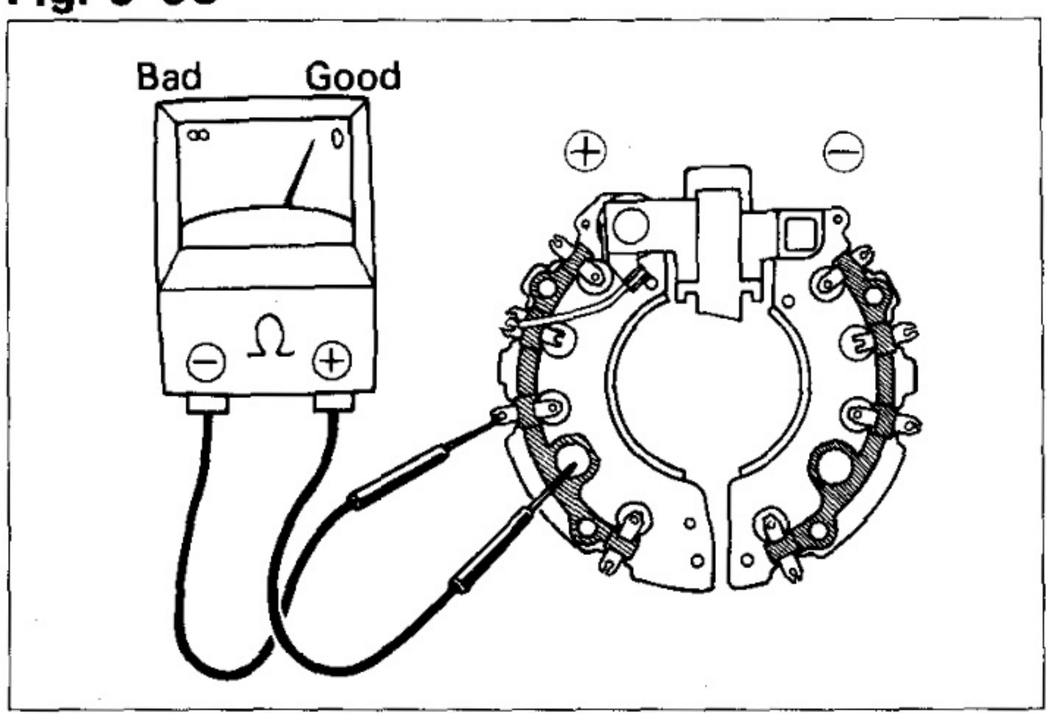
3. Rectifier holder negative side
Connect an ohmmeter ⊕ lead to each rectifier terminal, and the ⊖ lead of the meter to the rectifier holder. If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-62



4. Reverse polarity of the test leads and check again. If there is continuity, the rectifier assembly must be replaced.

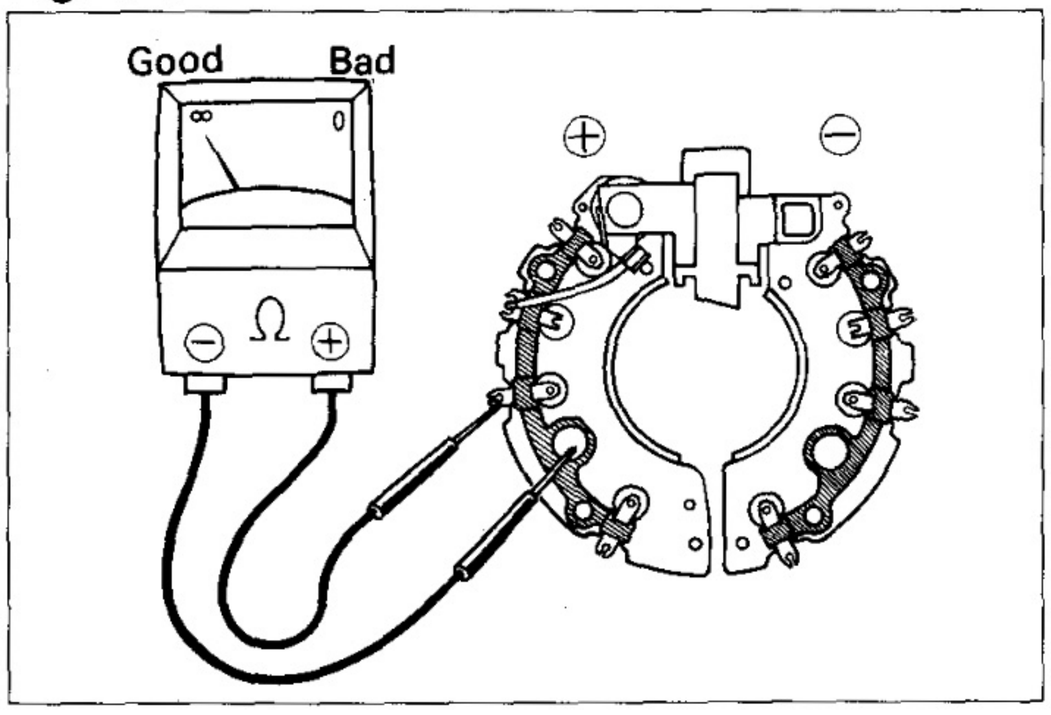
Fig. 9-63



Rectifier (Tirrill Regulator Type — 50A)

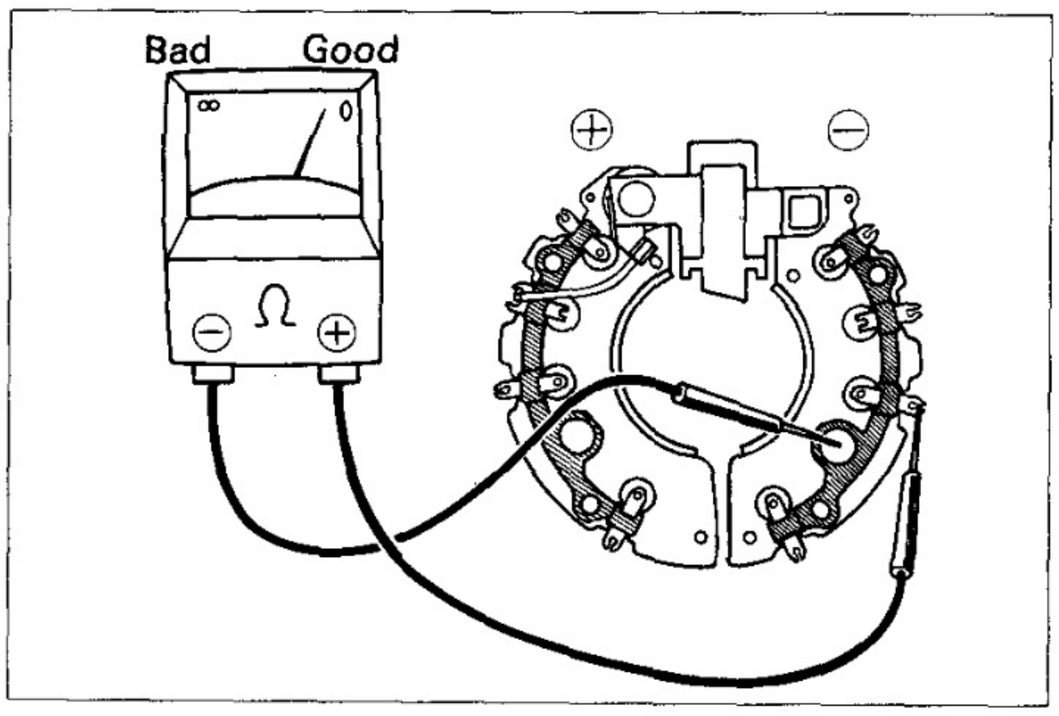
1. Rectifier holder positive side
Connect an ohmmeter ⊕ lead to the rectifier holder, and the ⊖ lead of the meter to the rectifier terminal. If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-64



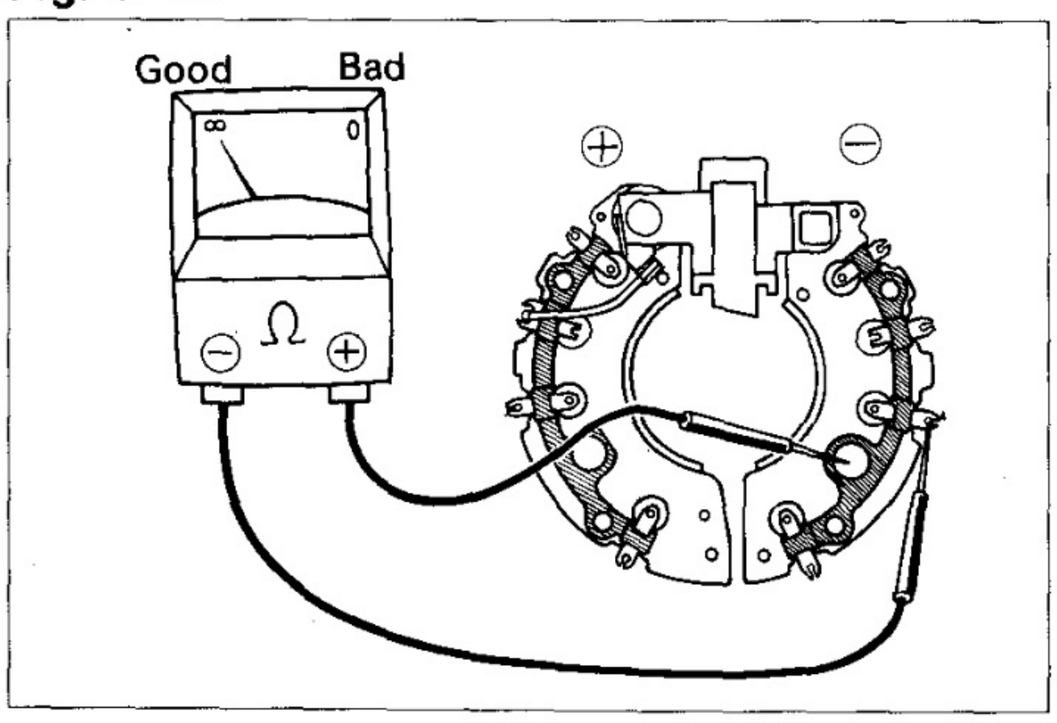
2. Reverse polarity of the test leads and check again. If there is continuity, the rectifier assembly must be replaced.

Fig. 9-65



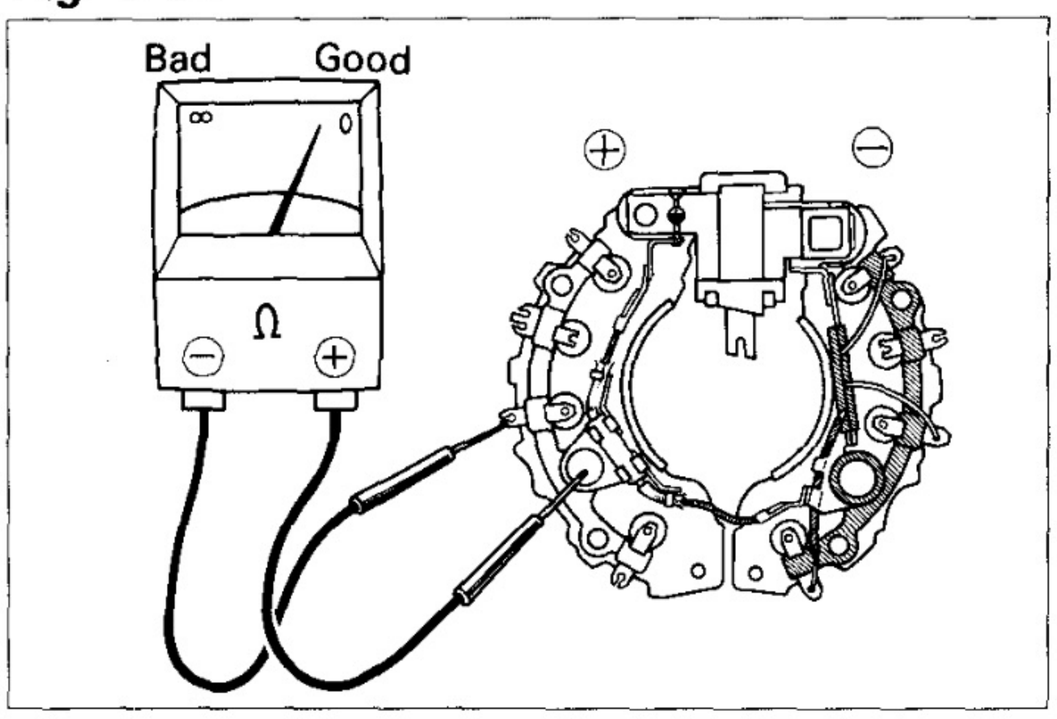
3. Rectifier holder negative side
Connect an ohmmeter ⊕ lead to the rectifier terminal, and the ⊖ lead of the meter to the rectifier holder. If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-66



4. Reverse polarity of the test leads and check again. If there is continuity, the rectifier assembly must be replaced.

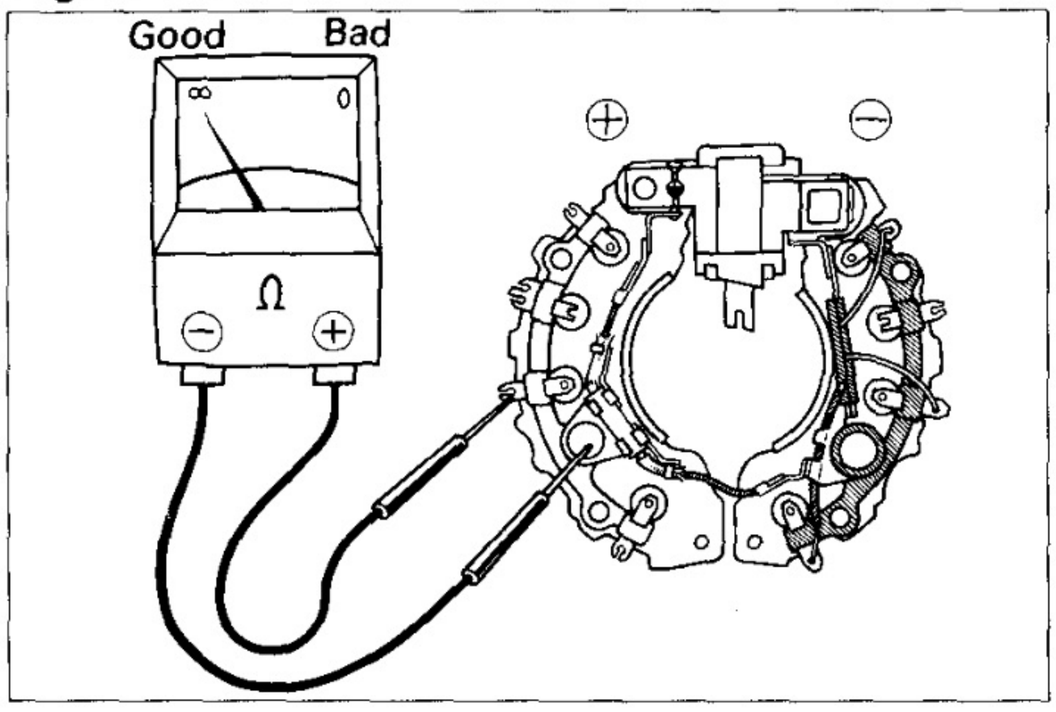
Fig. 9-67



Rectifier (IC regulator type)

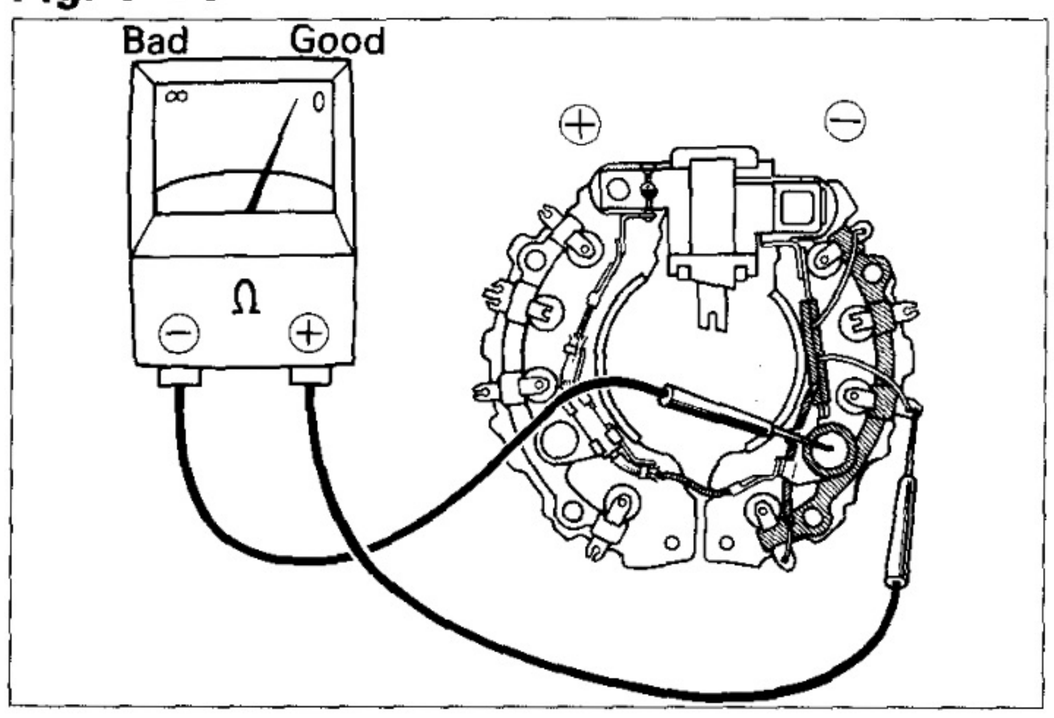
1. Rectifier holder positive side
Connect an ohmmeter ⊕ lead to the rectifier holder, and the ⊖ lead of the meter to the rectifier terminal. If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-68



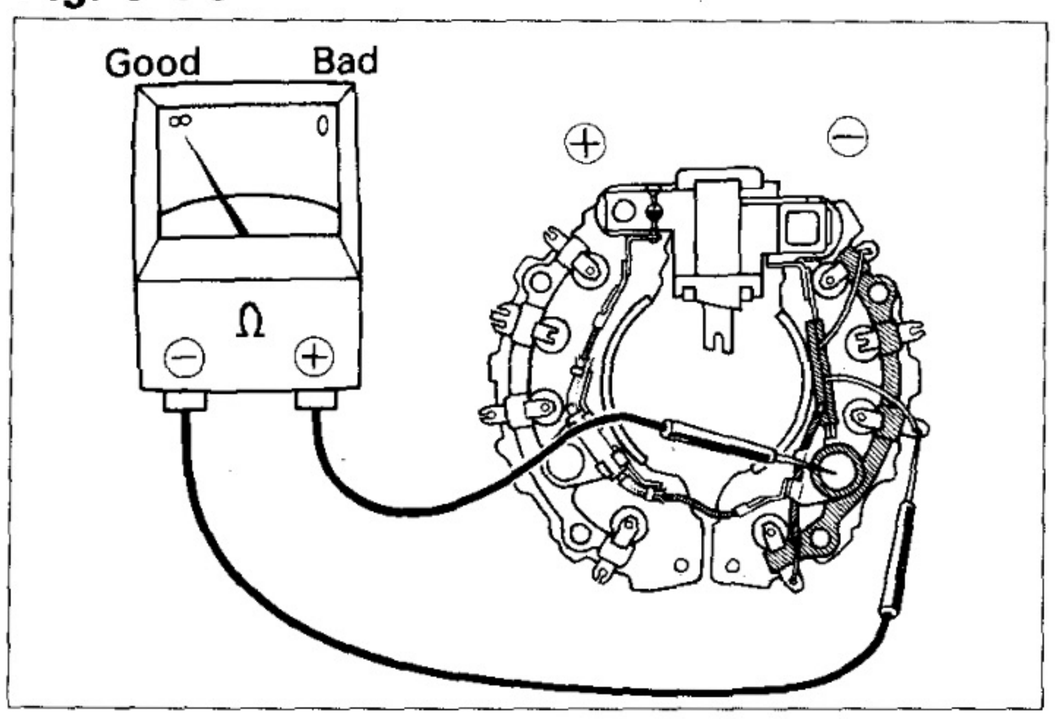
2. Reverse polarity of the test leads and check again. If there is continuity, the rectifier assembly must be replaced.

Fig. 9-69



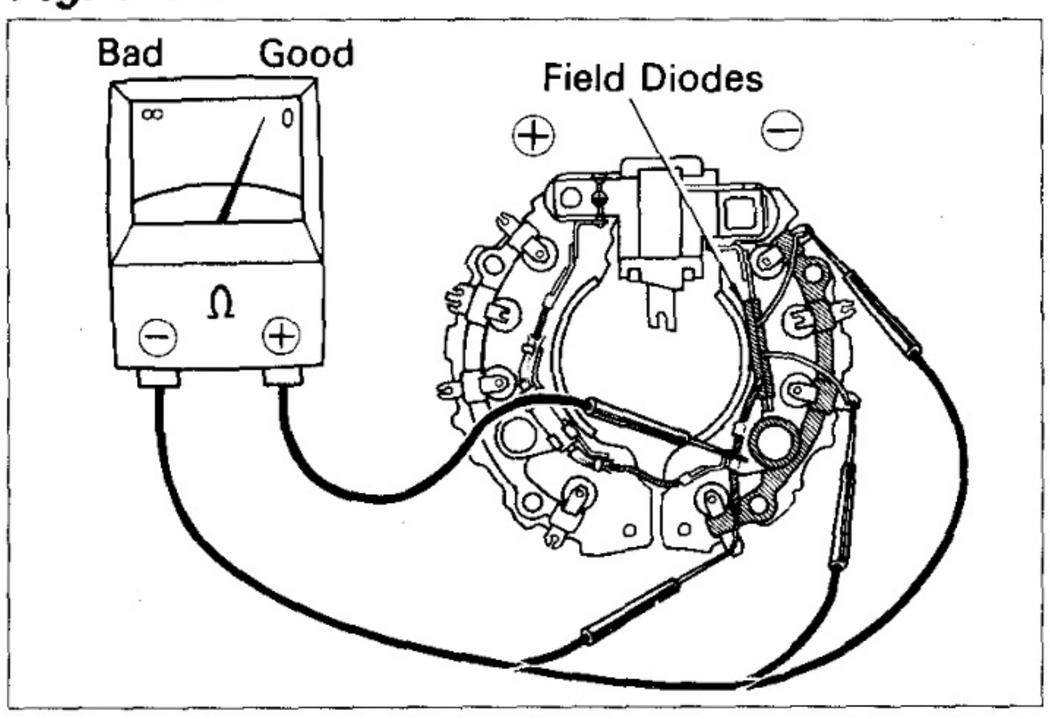
3. Rectifier holder negative side
Connect an ohmmeter ⊕ lead to the rectifier terminal, and the ⊖ lead of the meter to the rectifier holder. If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-70



4. Reverse polarity of the test leads and check again. If there is continuity, the rectifier assembly must be replaced.

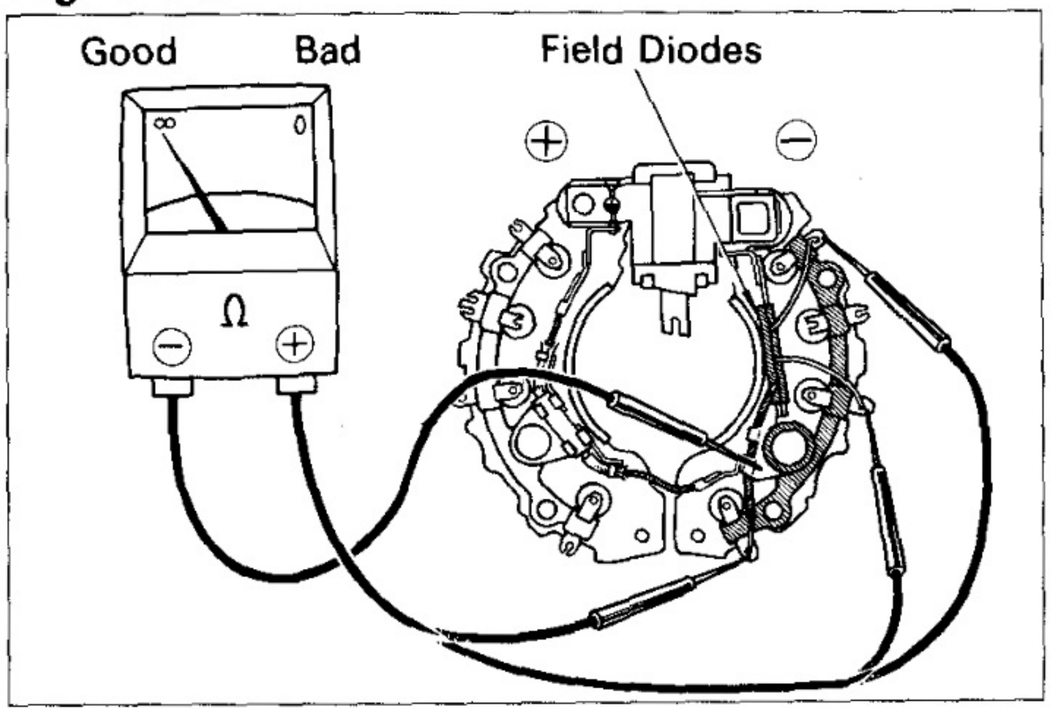
Fig. 9-71



Field Diodes (IC regulator type)

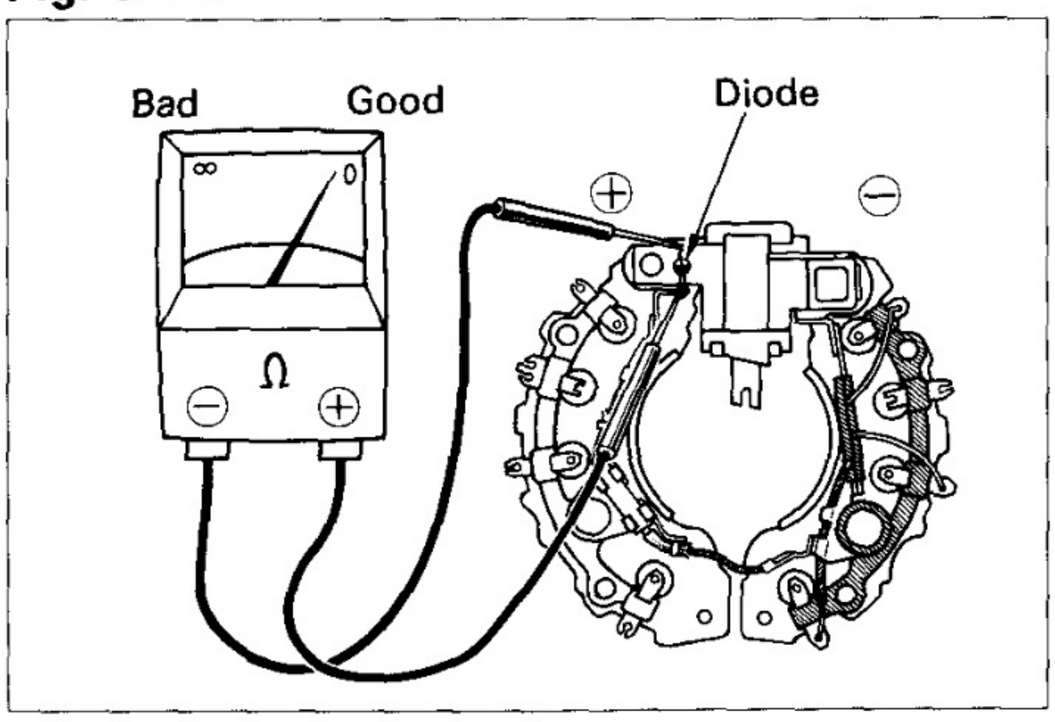
1. Connect an ohmmeter ⊕ lead to the rectifier holder, and the ⊖ lead of the meter to the field diode terminal. If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-72



2. Reverse polarity of the test leads and check again. If there is continuity, the rectifier assembly must be replaced.

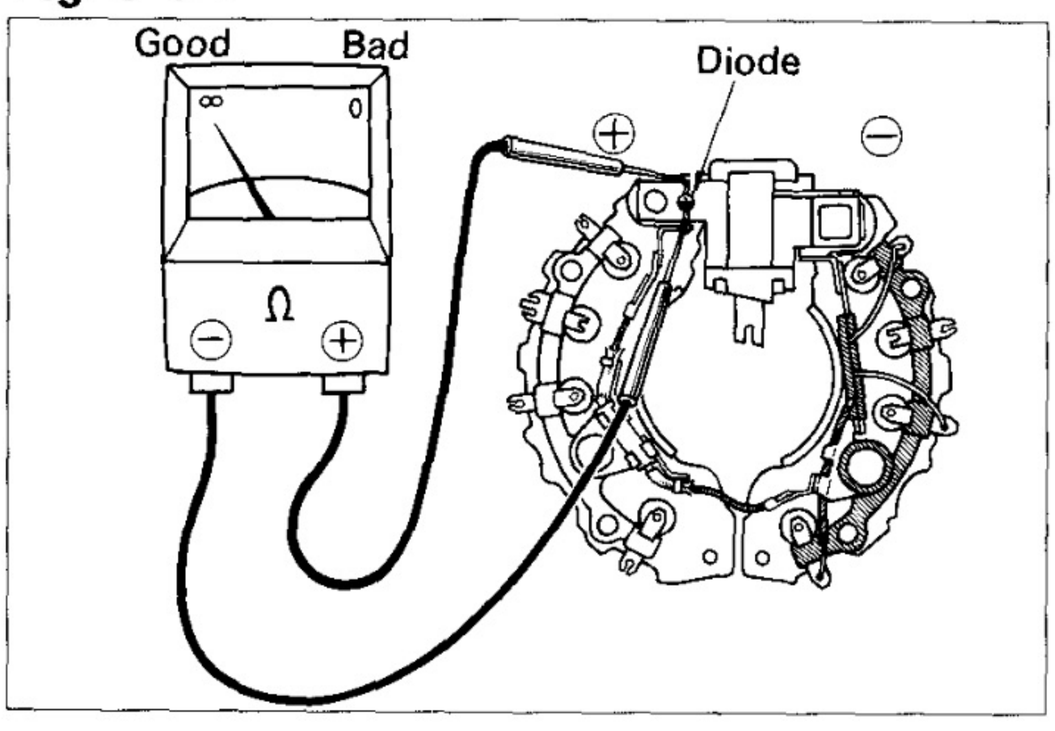
Fig. 9-73



Diode (IC regulator type)

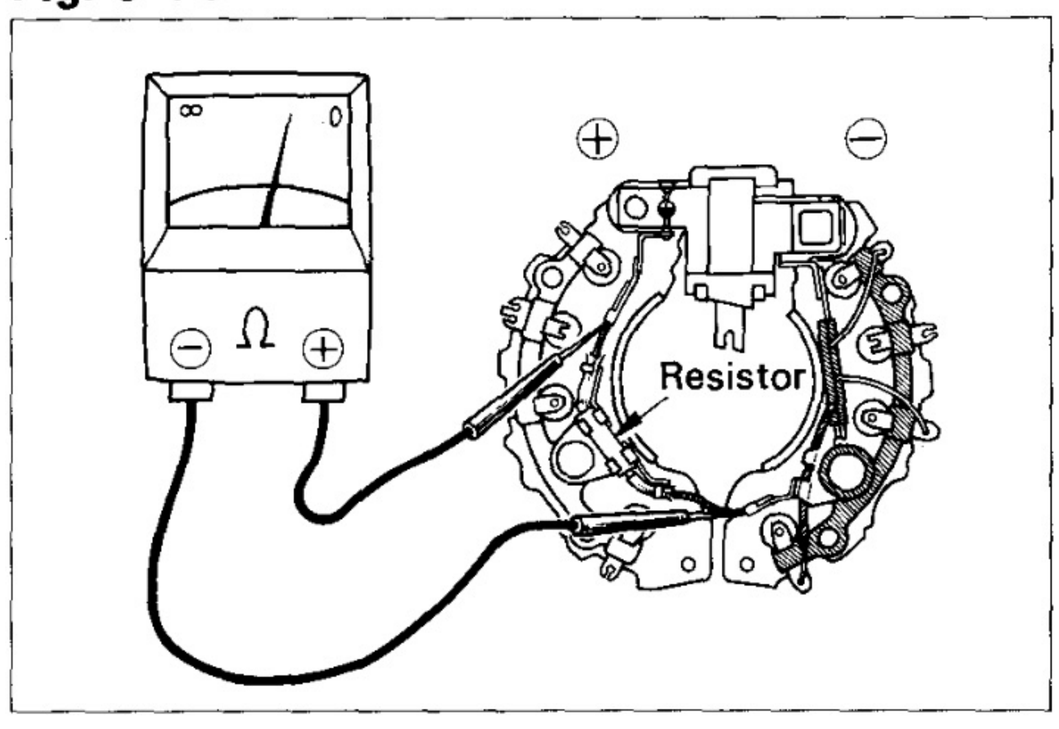
1. Connect an ohmmeter ⊕ lead to the resistor side, and the ⊖ lead of the meter to the diode other side. If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-74



2. Reverse polarity of the test leads and check again. If there is continuity, the rectifier assembly must be replaced.

Fig. 9-75



Resistor (IC regulator type)

Measure the resistance of the resistor with an ohmmeter.

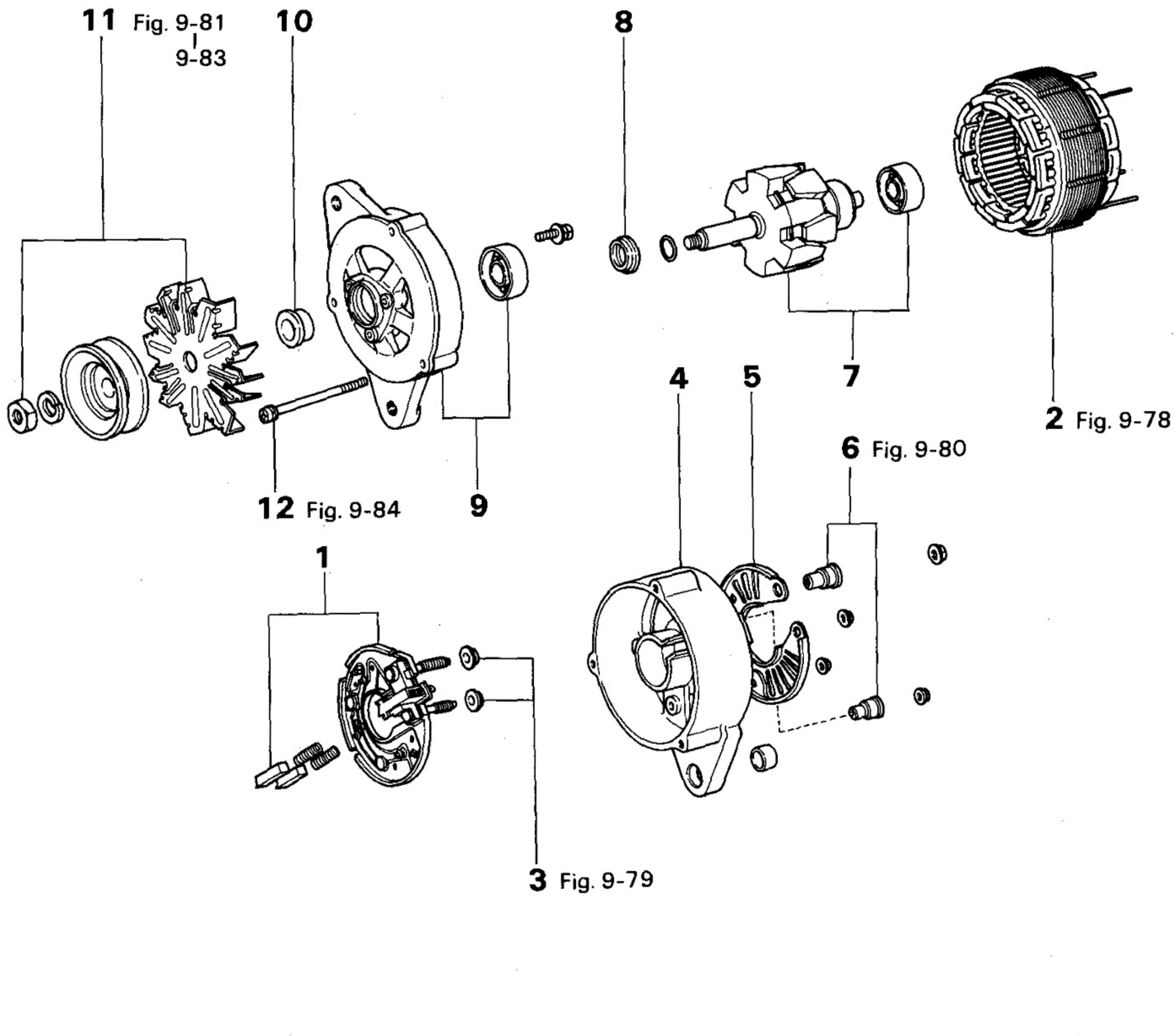
Resistance: 19Ω

ASSEMBLY

Assemble the parts in the numerical order shown in the figure.

Fig. 9-76

FJ series (Tirrill Regulator Type)

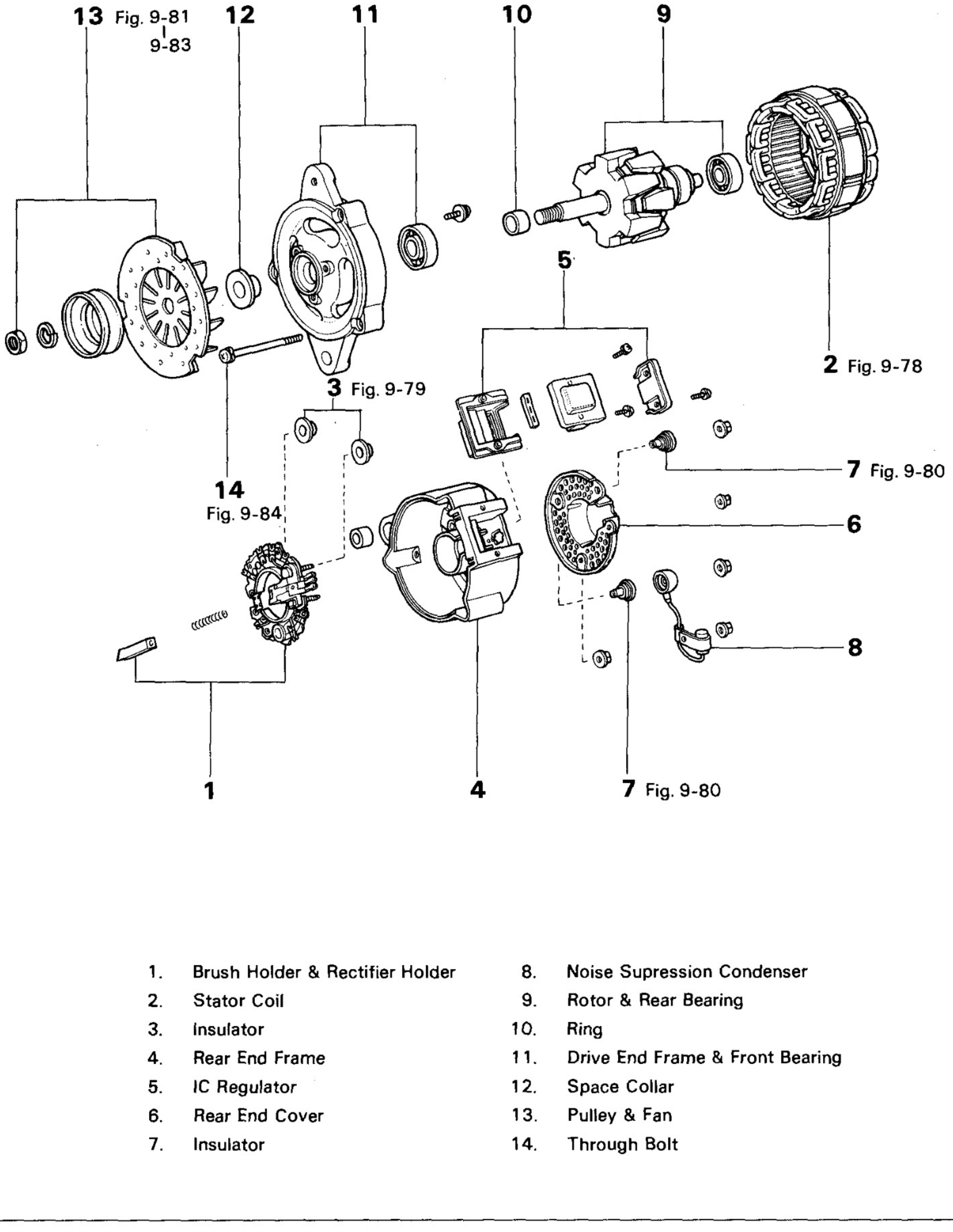


1. Brush Holder & Rectifier Holder
2. Stator Coil
3. Insulator
4. Rear End Frame
5. Rear End Cover (except USA)
6. Insulator
7. Rotor & Rear Bearing
8. Ring
9. Drive End Frame & Front Bearing
10. Spacer Collar
11. Pulley & Fan
12. Through Bolt

Assemble the parts in the numerical order shown in the figure.

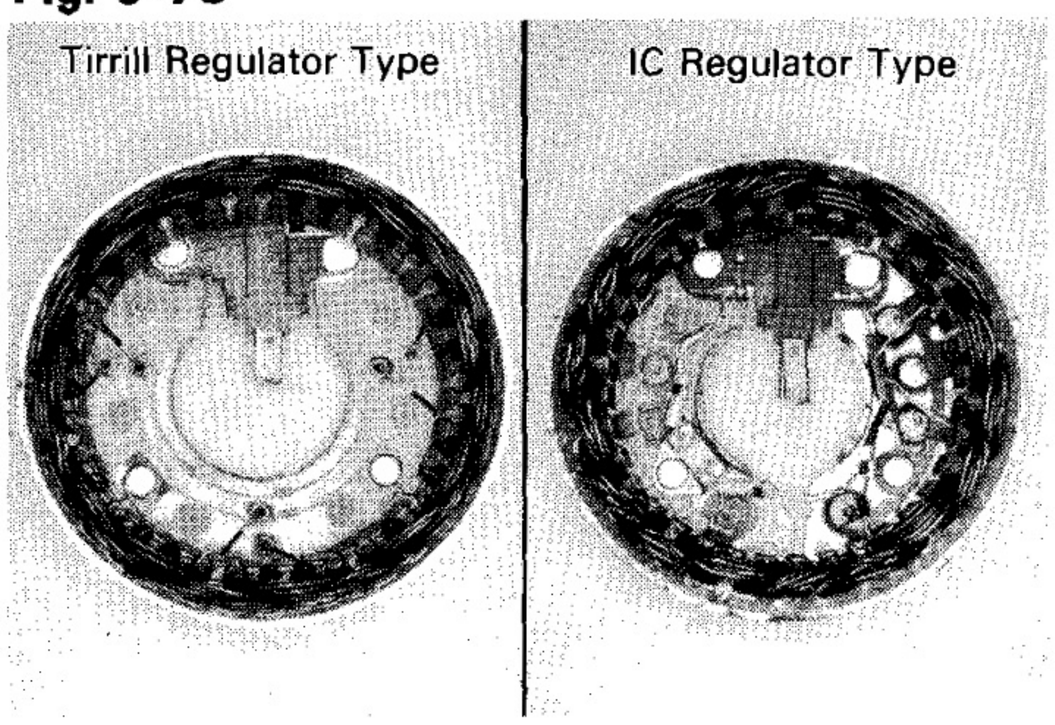
Fig. 9-77

FJ series (IC Regulator Type)



1. Brush Holder & Rectifier Holder
2. Stator Coil
3. Insulator
4. Rear End Frame
5. IC Regulator
6. Rear End Cover
7. Insulator
8. Noise Supression Condenser
9. Rotor & Rear Bearing
10. Ring
11. Drive End Frame & Front Bearing
12. Space Collar
13. Pulley & Fan
14. Through Bolt

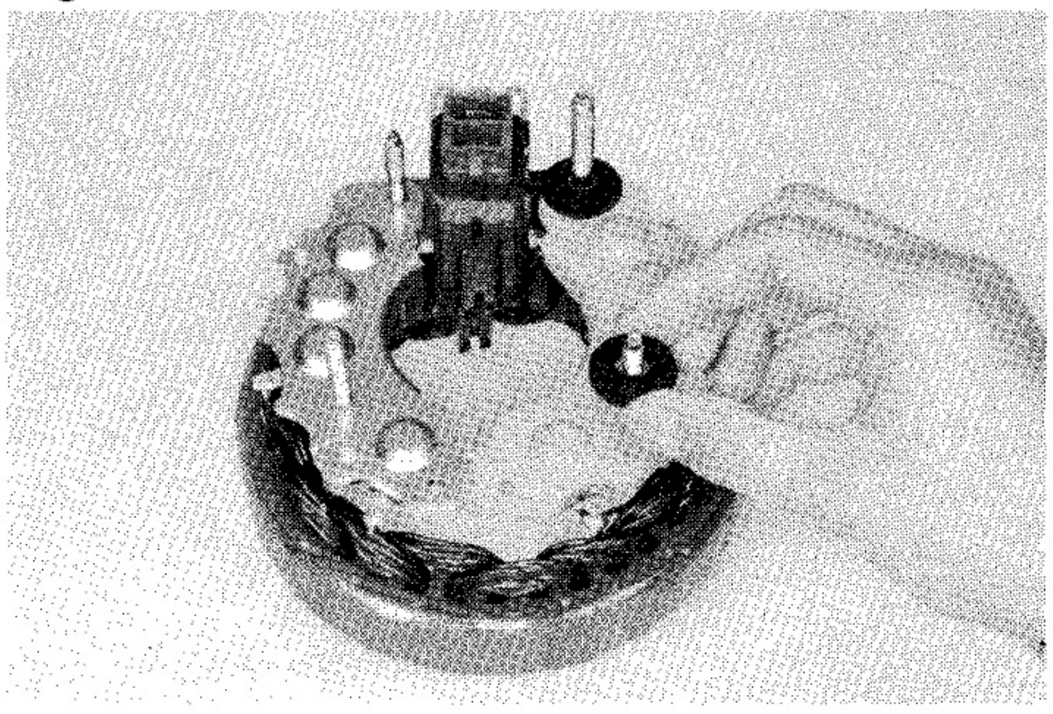
Fig. 9-78



Solder each stator lead to the rectifier as shown in the figure.

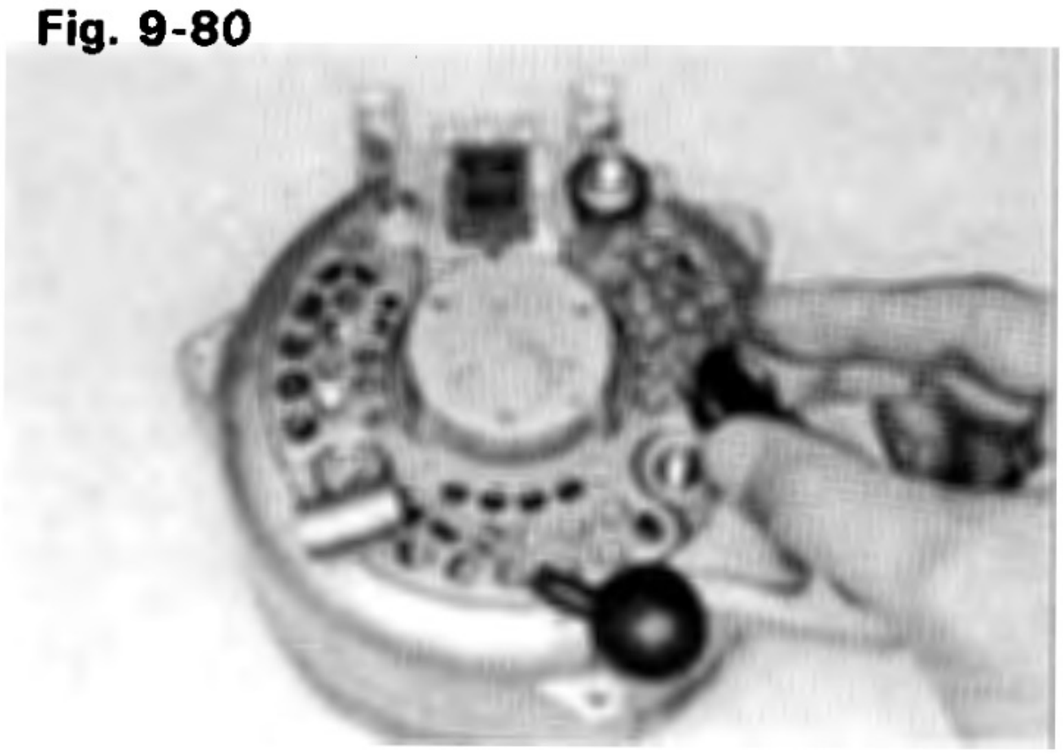
– Note –
Protect the rectifier from heat.

Fig. 9-79



Assemble the rectifier holder with the insulators.

Fig. 9-80



Assemble the rear end cover with the insulators.

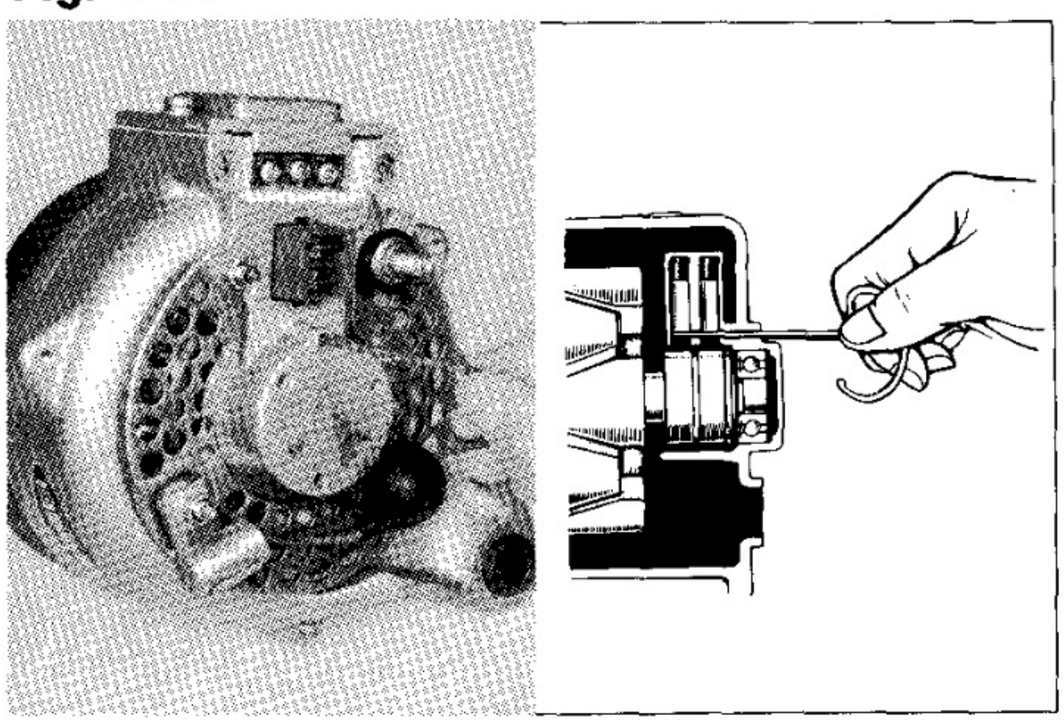
Fig. 9-81



Clamp the rotor with a soft jaw vise and tighten the pulley nut.

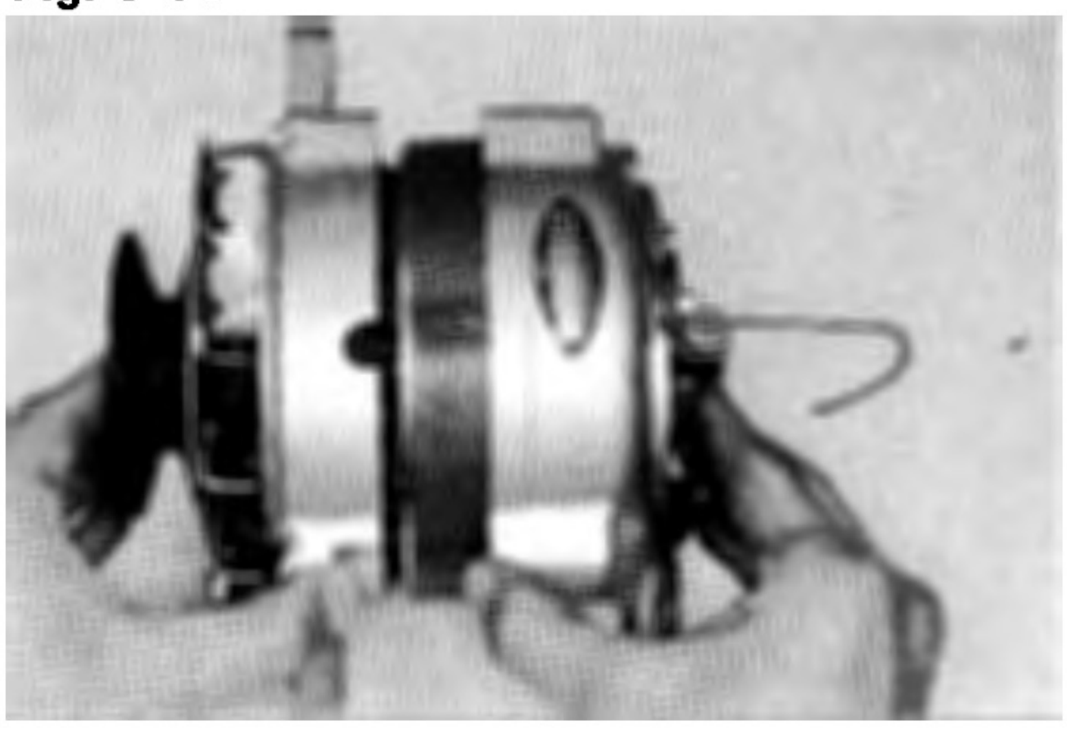
Tightening torque: 5.0 – 6.5 kg-m (37 – 47 ft-lb)

Fig. 9-82



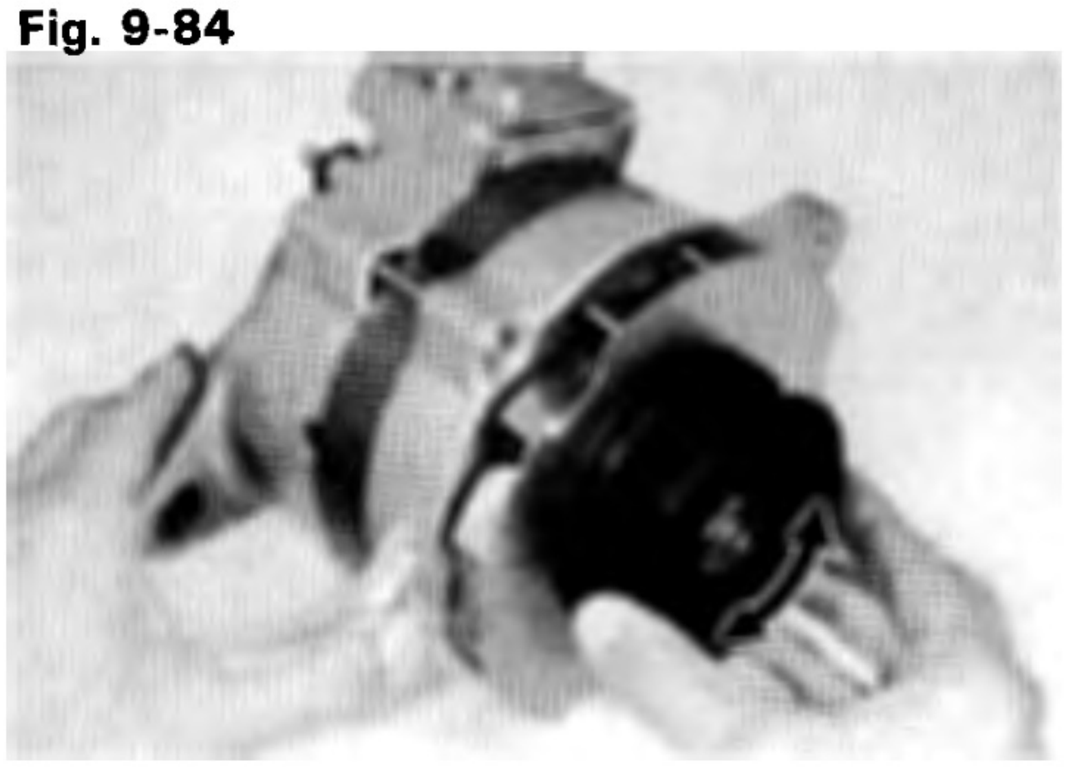
Push in the brushes and temporarily lock them in place with wire inserted through the access hole in the rear end frame.

Fig. 9-83



Assemble the drive end frame and the rectifier end frame by inserting the rear bearing into the rear end frame.
Then, remove the wire from the access hole.

Fig. 9-84



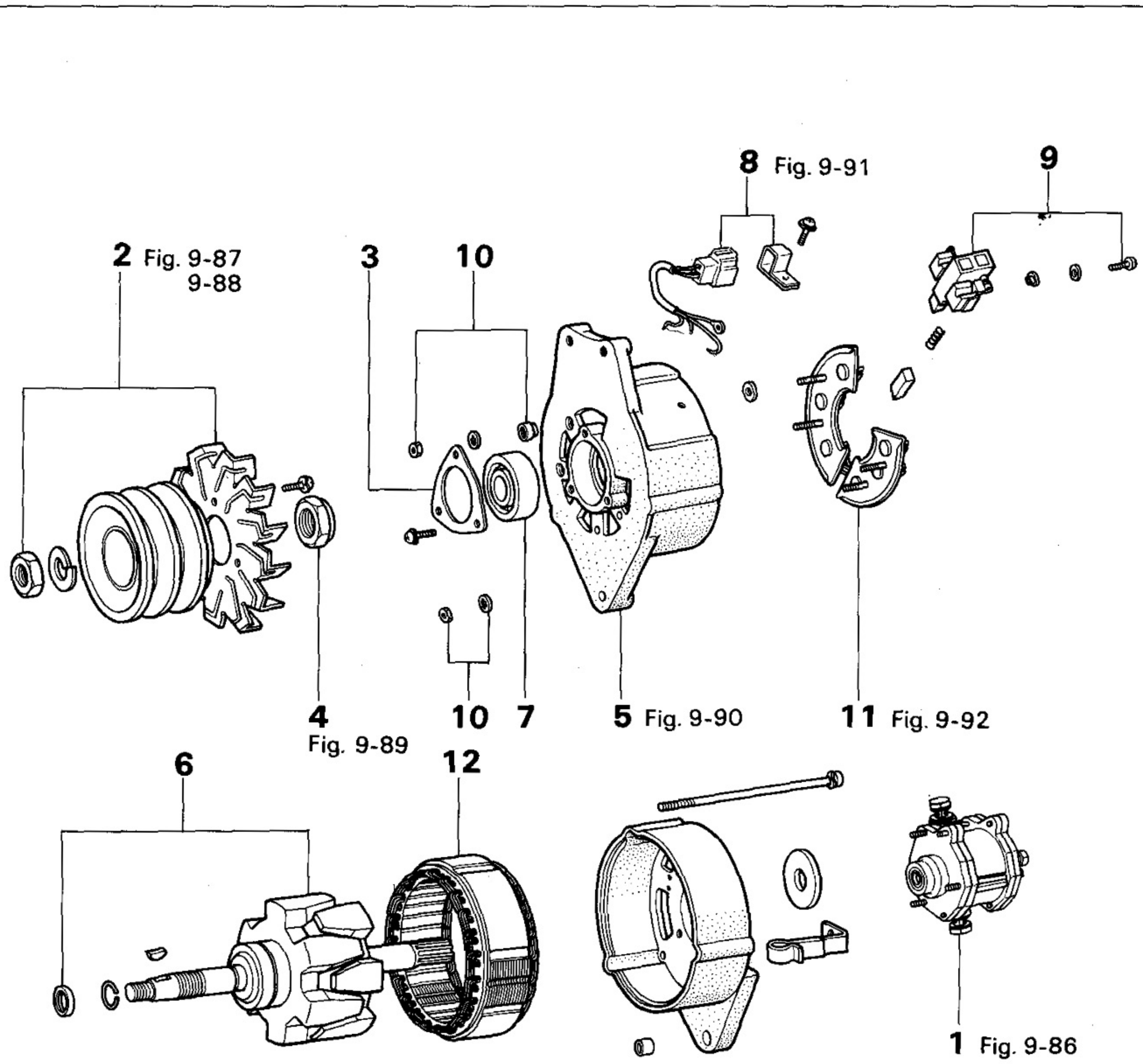
Check the rotor for smooth rotation after assembly.

ALTERNATOR (FA series)

DISASSEMBLY

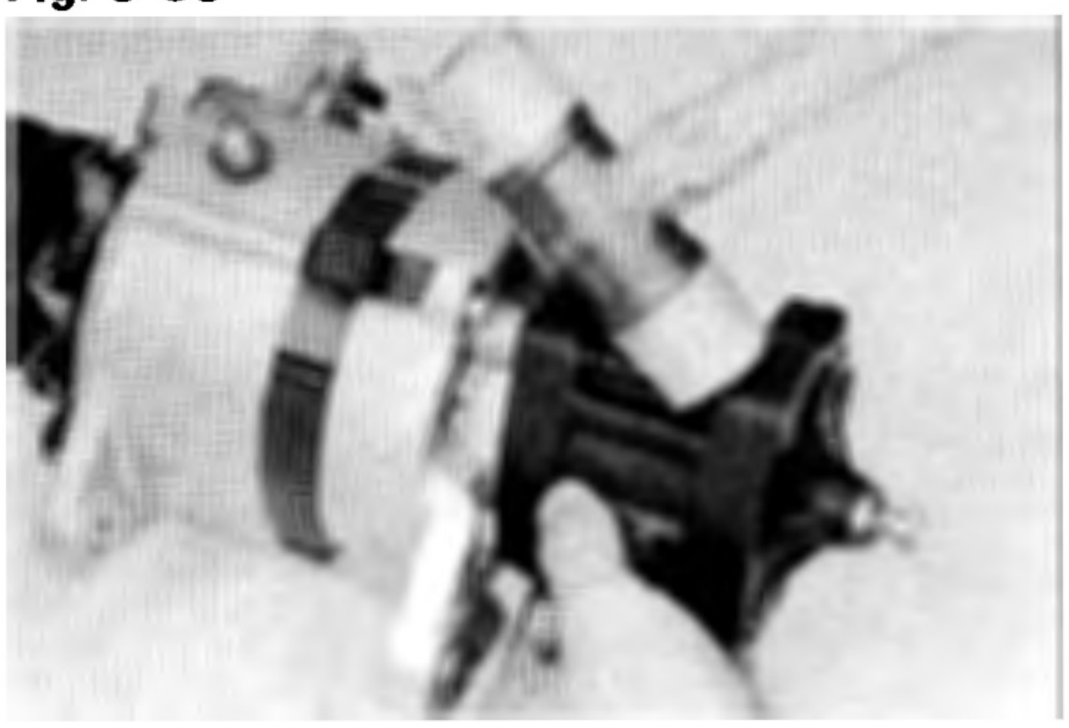
Disassemble the parts in the numerical order shown in the figure.

Fig. 9-85



1. Vacuum Pump
2. Pulley & Fan
3. Plate
4. Lock Nut
5. Drive End Frame
6. Rotor
7. Bearing
8. Terminal
9. Brush Holder
10. Insulator & Nut
11. Rectifier Holder & Insulator
12. Stator Coil

Fig. 9-86



Lightly tap the vacuum pump with a plastic hammer to remove the pump.

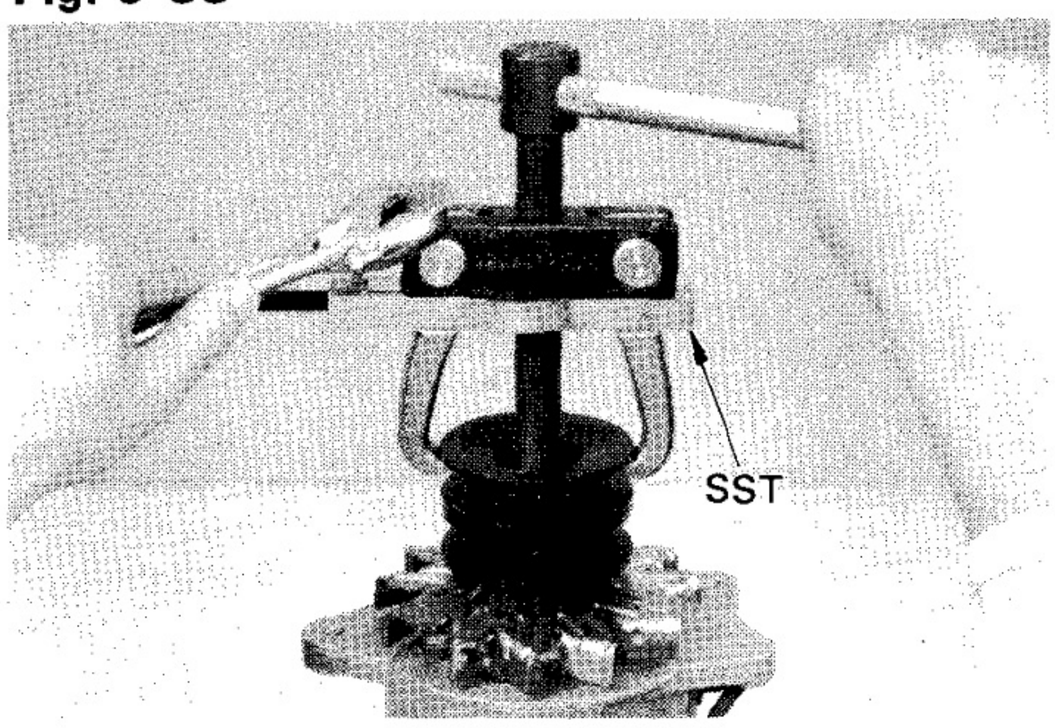
Fig. 9-87



Secure the rotor shaft in a soft jaw vise and then loosen the pulley nut.

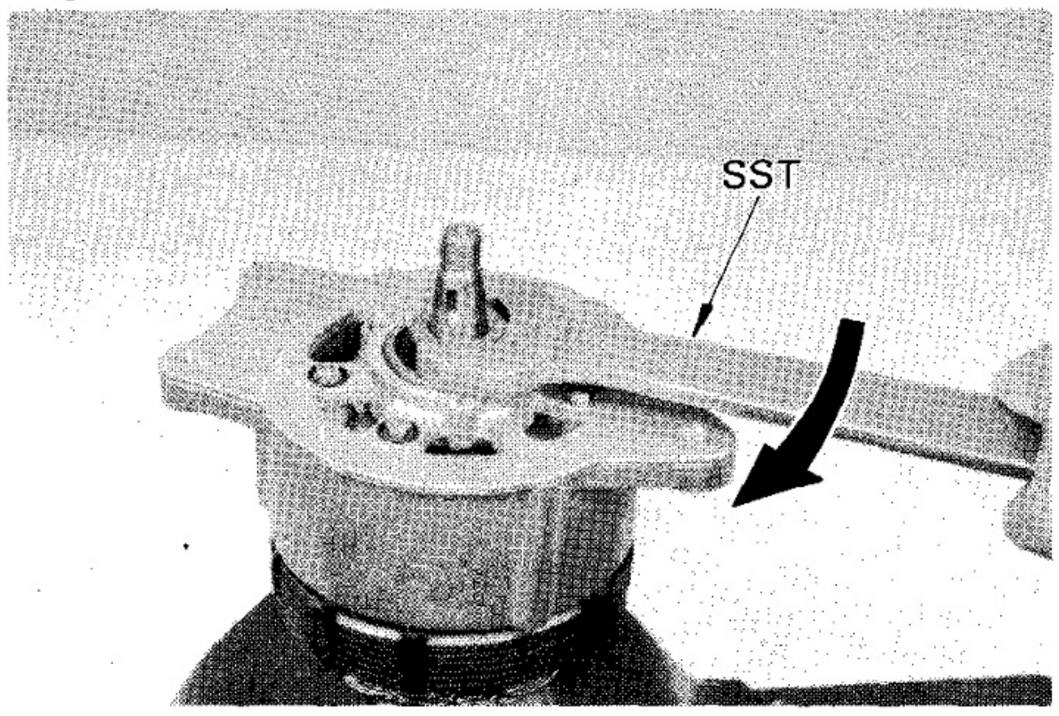
– Note –
Be careful not to damage the stator coil.

Fig. 9-88



Using SST, remove the pulley with the fan.
SST [09950-20014]

Fig. 9-89



Remove the bearing lock nut with SST.
SST [09333-55011]

– Note –
The bearing lock nut has left-hand threads.

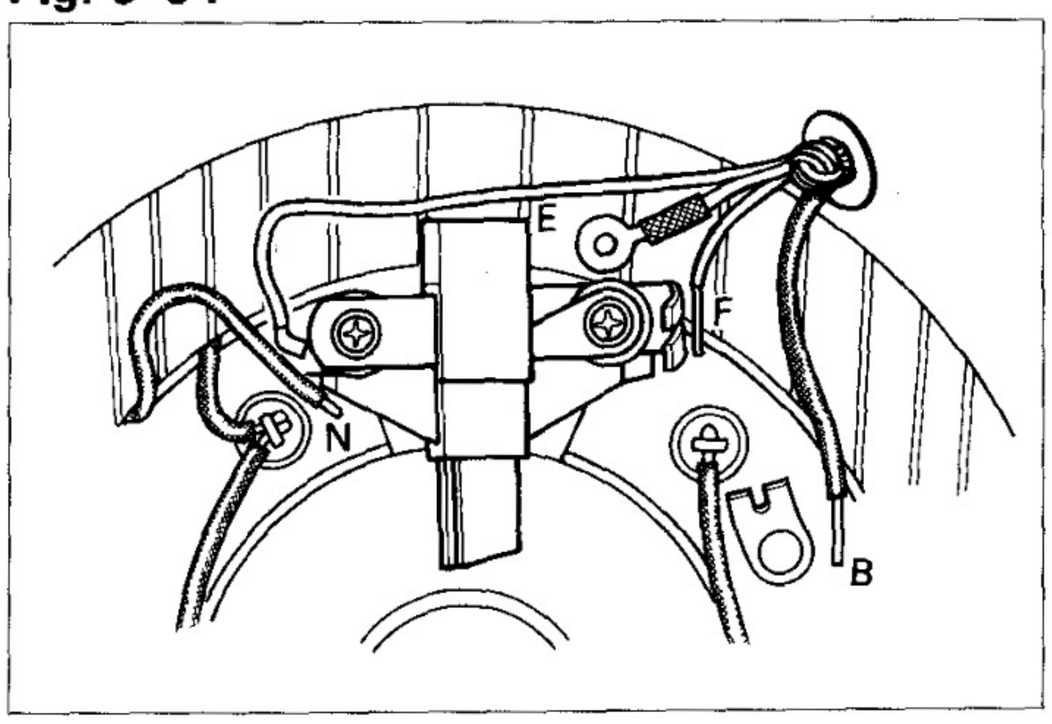
Fig. 9-90



Using SST, remove the drive end frame together with the stator coil from the rotor.
SST [09950-20014]

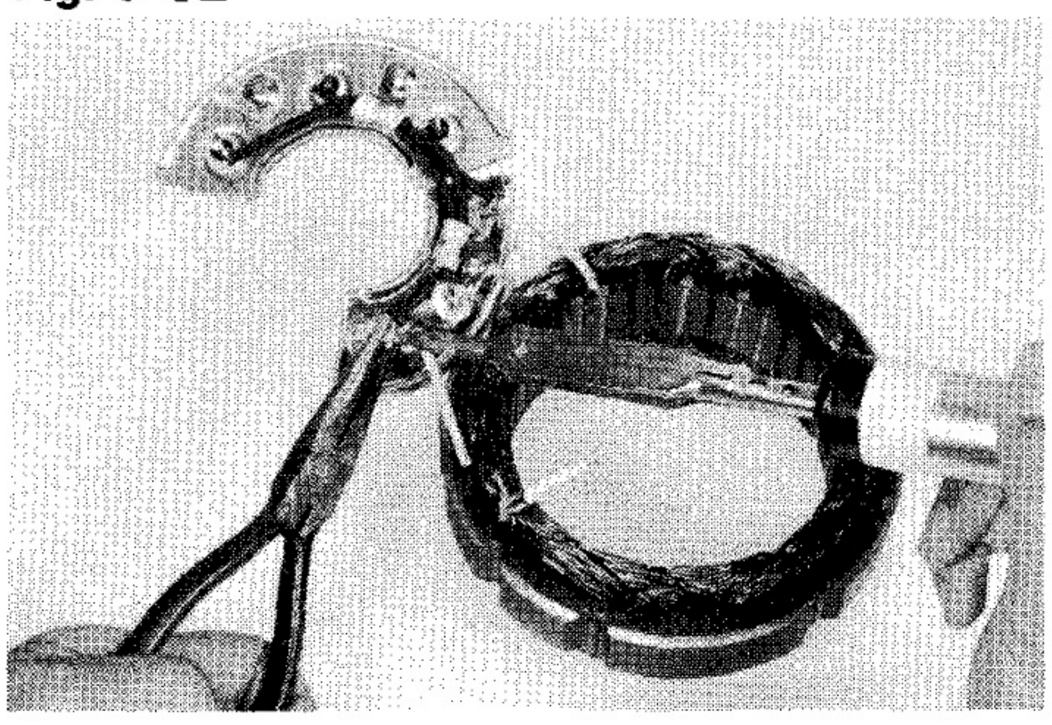
— Note —
Be careful not to damage the stator coil.

Fig. 9-91



Disconnect E, N, F, and B leads by melting the solder, and remove the stator coil with rectifier holders.

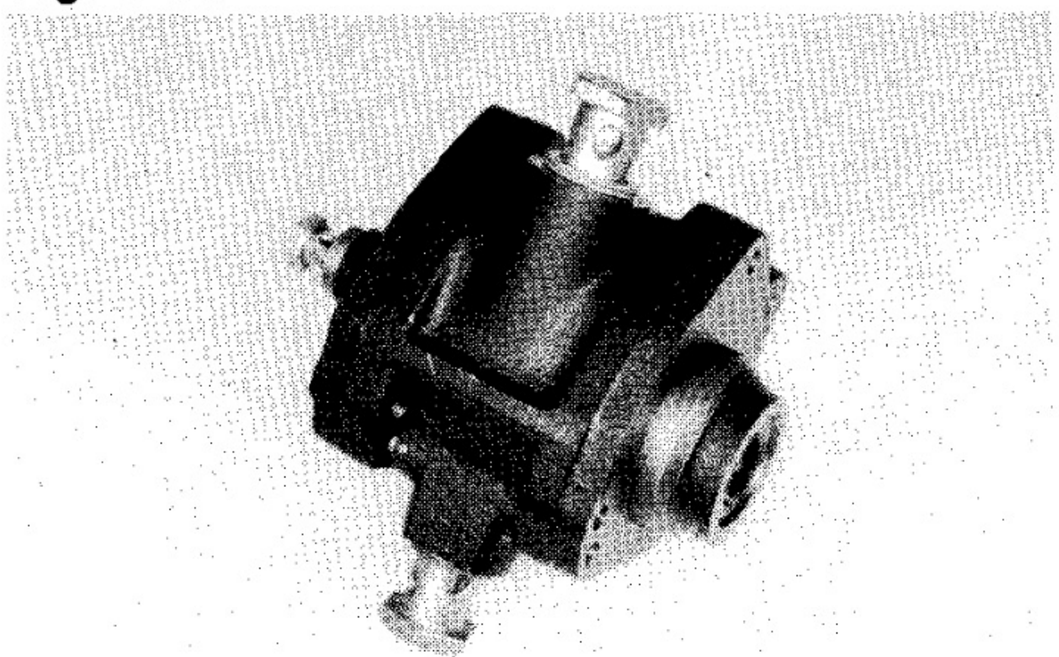
Fig. 9-92



Disconnect the stator coil from the rectifier holder by melting the solder.

— Note —
When unsoldering the leads, hold the rectifier lead with a long nose pliers to protect the rectifier from heat.

Fig. 9-93



INSPECTION & REPAIR

Vacuum Pump

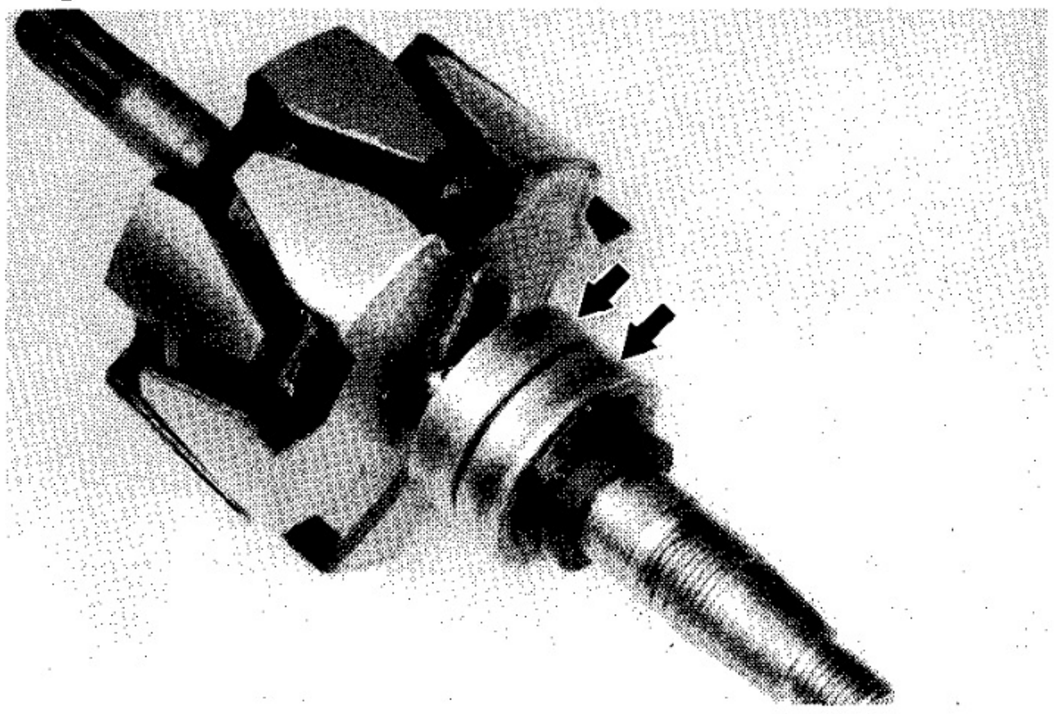
1. Check the oil seal and bushing for wear or damage.

Fig. 9-94



2. Check the bushing journal and spline teeth for wear.

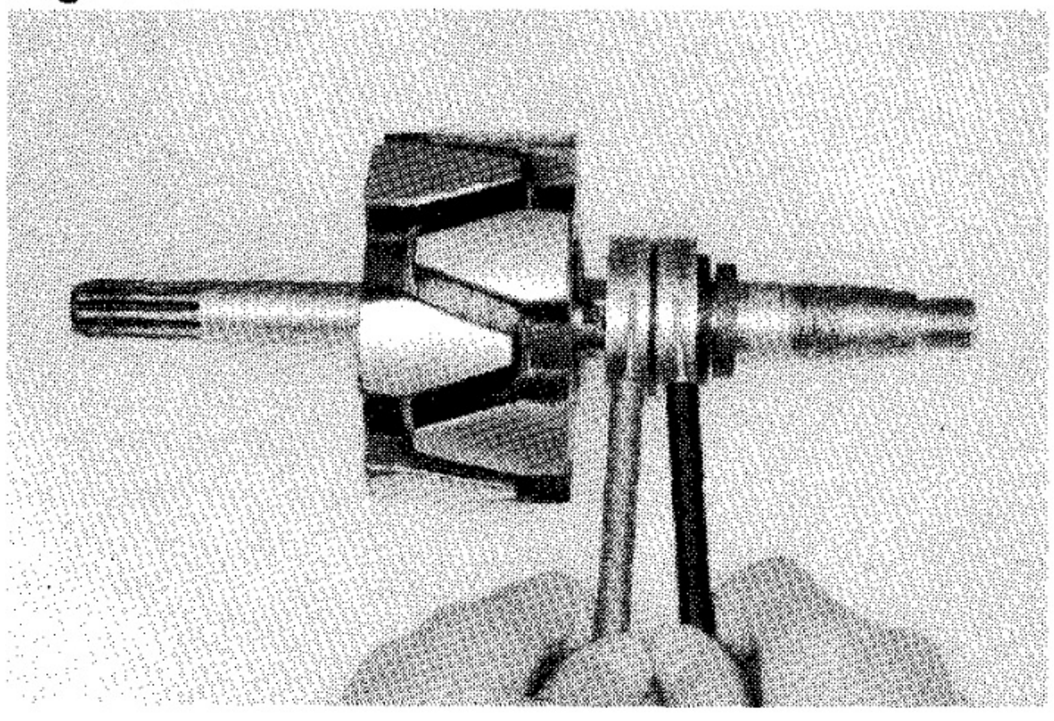
Fig. 9-95



Rotor

1. Check the slip ring for dirt or burns.

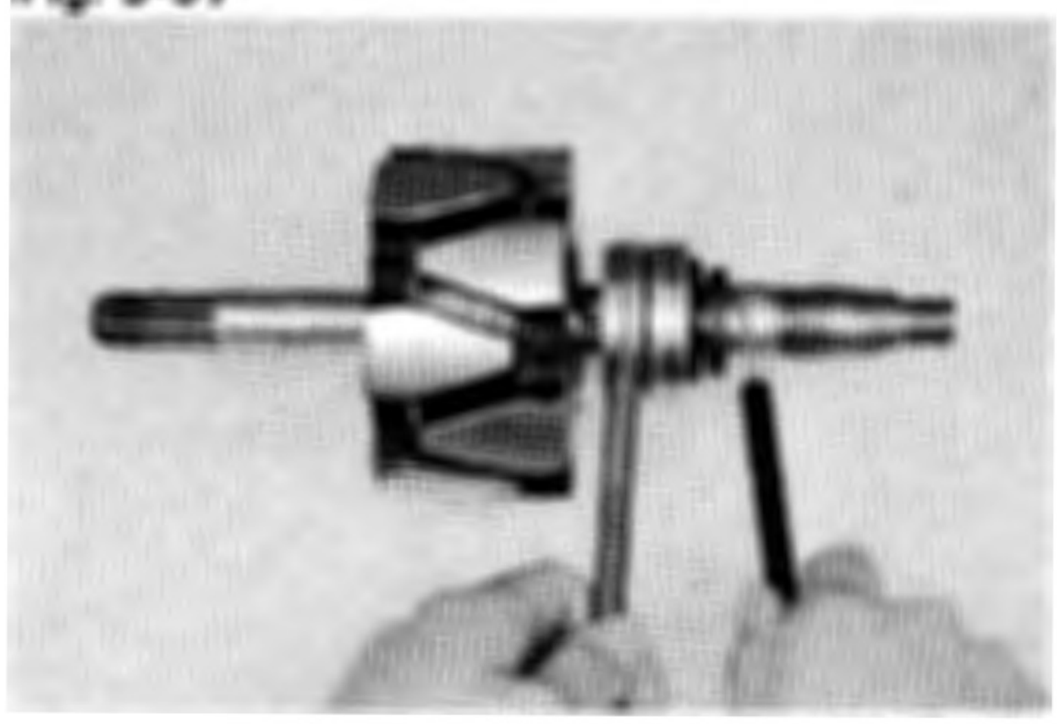
Fig. 9-96



2. Open circuit test
   Measure the resistance between both slip rings.

   Resistance:
   STD 19.0 Ω

Fig. 9-97



3. Ground test
Check that there is no continuity between the slip ring and rotor.

Fig. 9-98



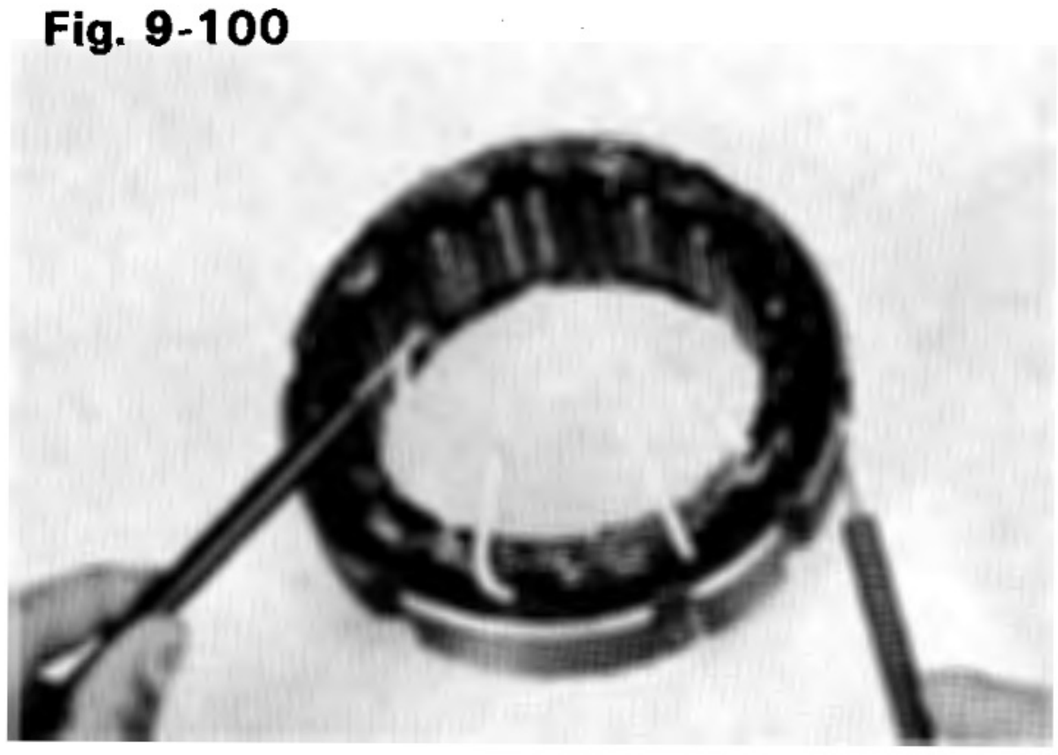
Bearing
Check the bearing for wear or roughness.

Fig. 9-99



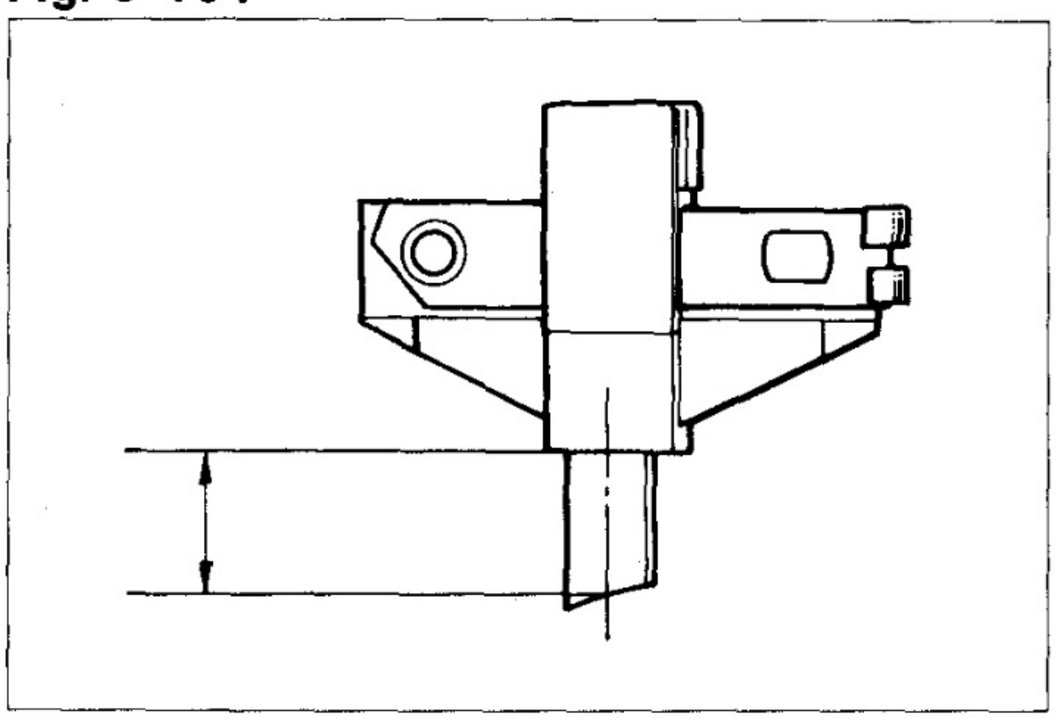
Stator
1. Open circuit test
Check that there is continuity between each coil lead.

Fig. 9-100



2. Ground test
Check that there is no continuity between each coil lead and stator core.

Fig. 9-101

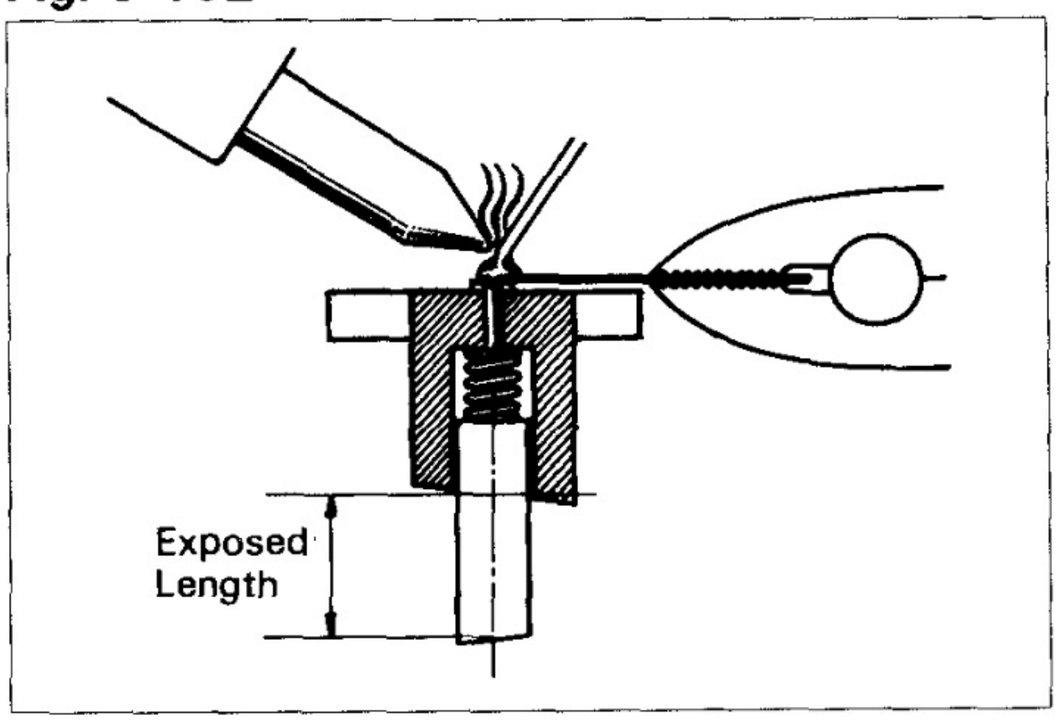


Brush & Brush Holder

1. Measure the exposed brush length.

Exposed length:
Minimum 5.5 mm (0.217 in.)

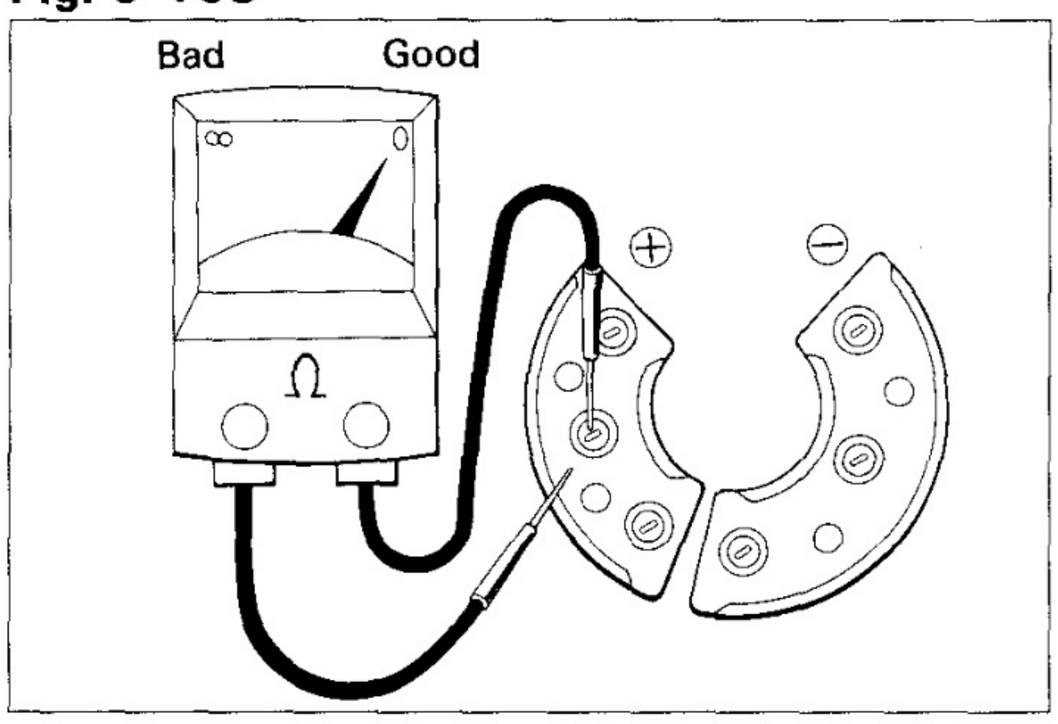
Fig. 9-102



2. When replacing the brushes, assemble them as shown in the figure.

Exposed length: 12.5 mm (0.492 in.)

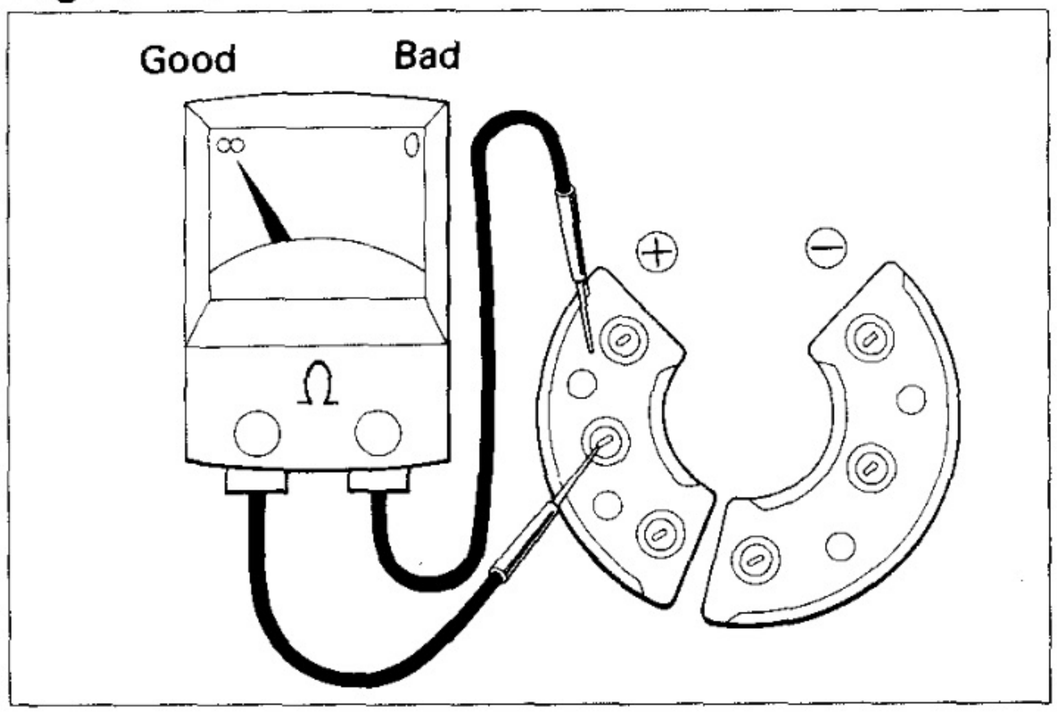
Fig. 9-103



Rectifier

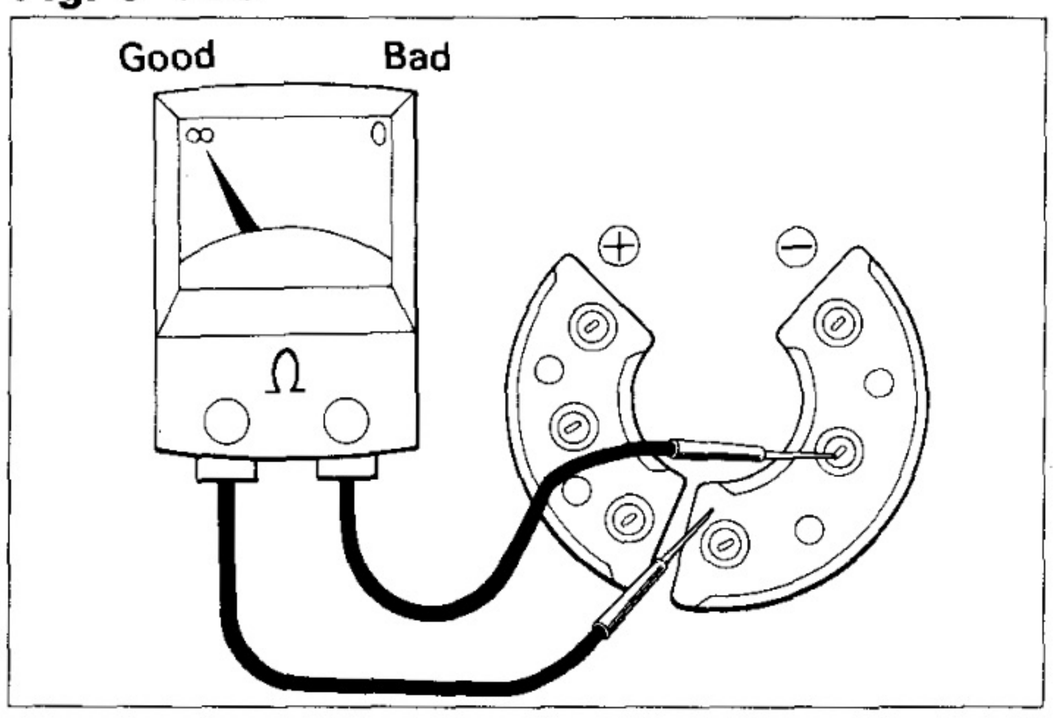
1. Rectifier holder positive side
   Connect an ohmmeter ⊕ lead to the rectifier holder, and the ⊖ lead to the rectifier terminal.
   If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-104



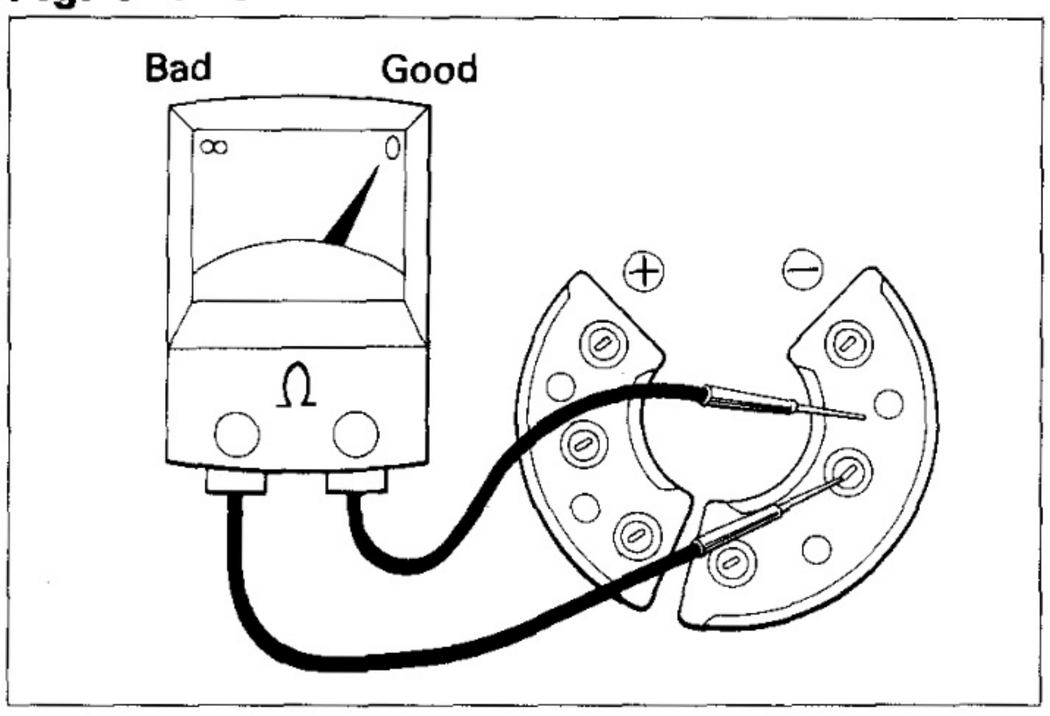
2. Reverse polarity of the test leads and check again.
   If there is continuity, the rectifier assembly must be replaced.

Fig. 9-105



3. Rectifier holder negative side
Connect an ohmmeter ⊕ lead to the rectifier terminal, and the ⊖ lead to the rectifier holder.
If there is no continuity, the rectifier assembly must be replaced.

Fig. 9-106

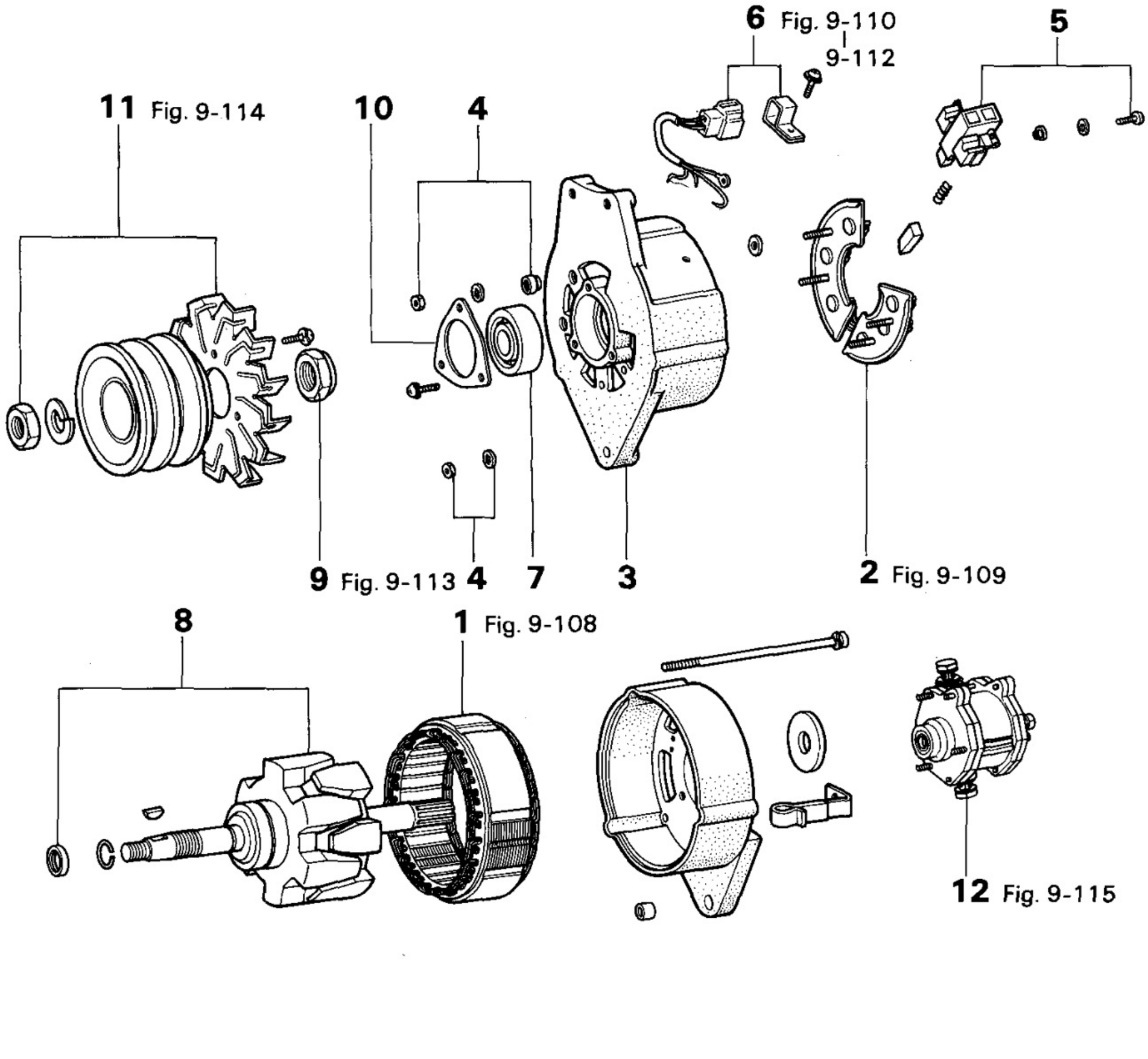


4. Reverse polarity of the test leads and check again.
If there is continuity, the rectifier assembly must be replaced.

ASSEMBLY

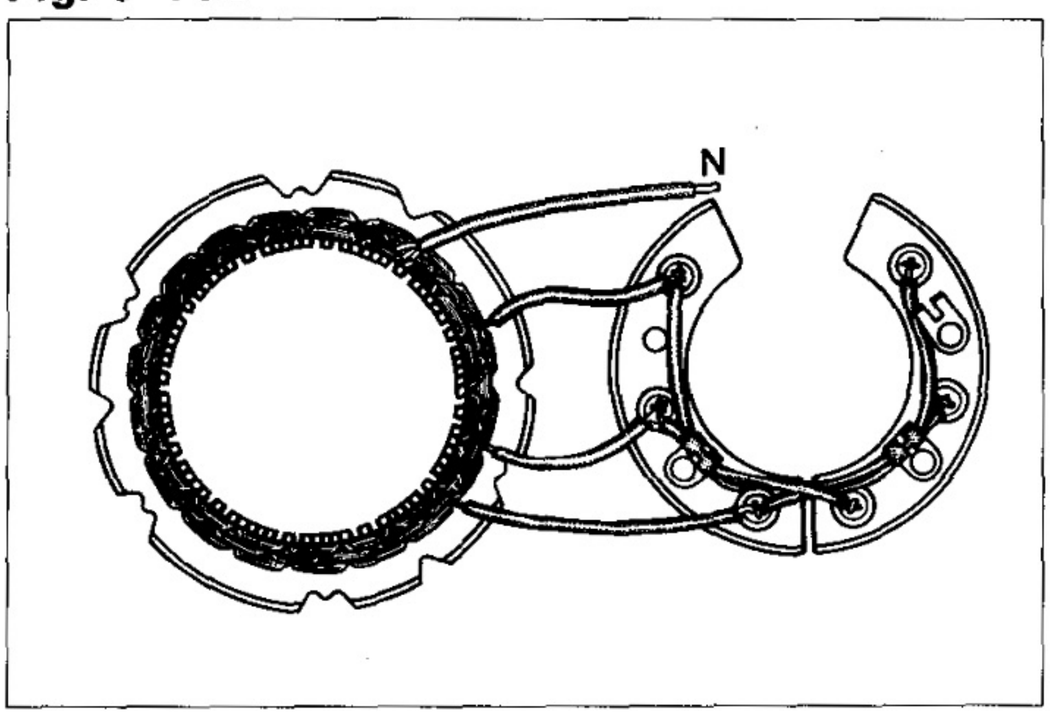
Assemble the parts in the numerical order shown in the figure.

Fig. 9-107



1. Stator Coil
2. Rectifier Holder & Insulator
3. Drive End Frame
4. Insulator & Nut
5. Brush Holder
6. Terminal
7. Bearing
8. Rotor
9. Lock Nut
10. Plate
11. Pulley & Fan
12. Vacuum Pump

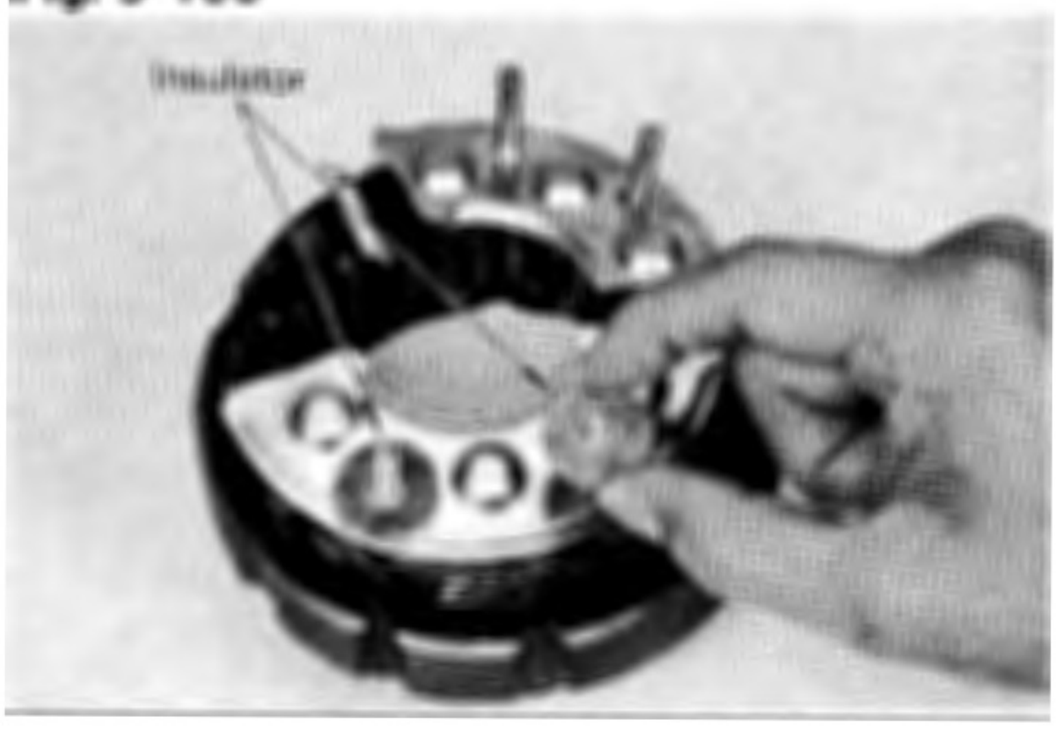
Fig. 9-108



Solder each stator lead to the positive rectifier.

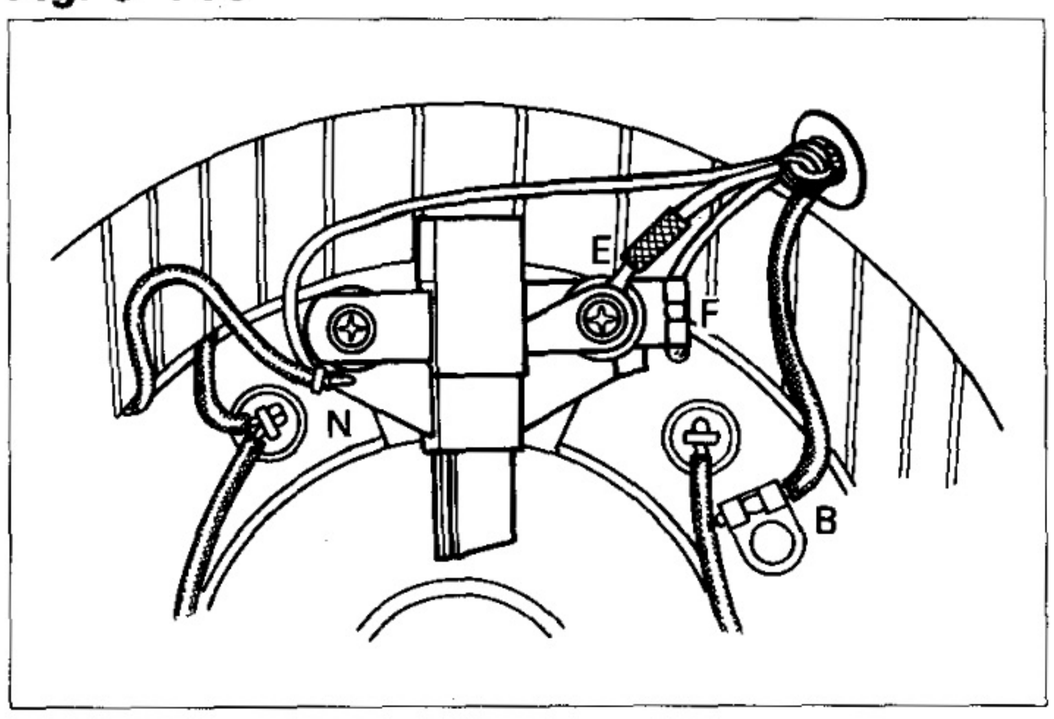
– Note –
When soldering the leads, hold the rectifier terminal with a long nose pliers to protect the rectifier from heat.

Fig. 9-109



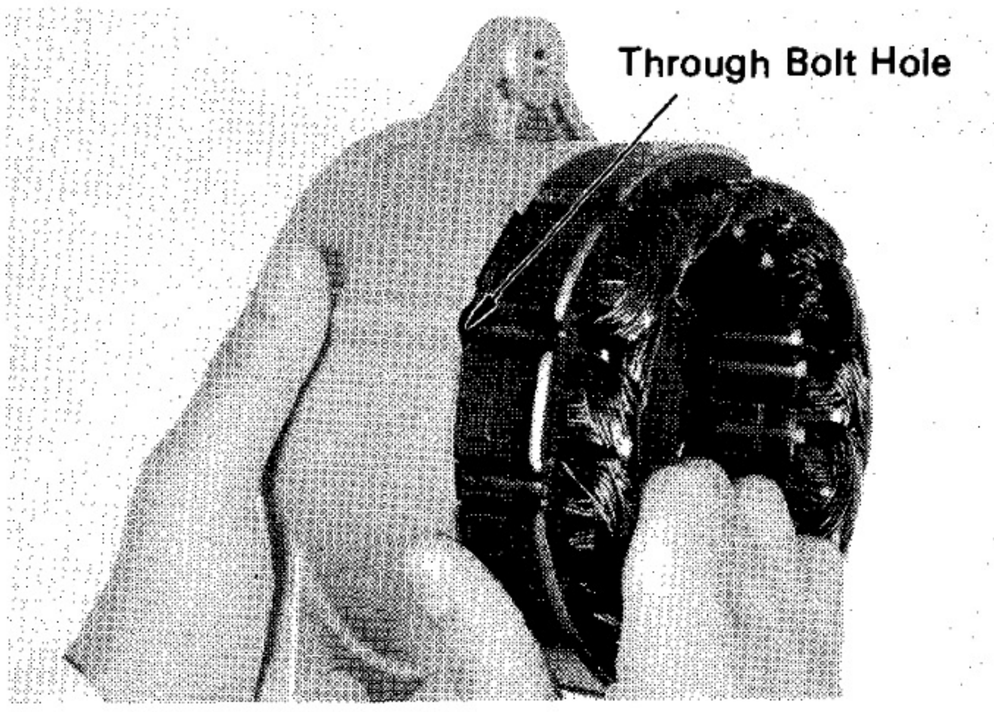
Assemble the rectifier holders and stator coil with insulators onto the rectifier end frame.

Fig. 9-110



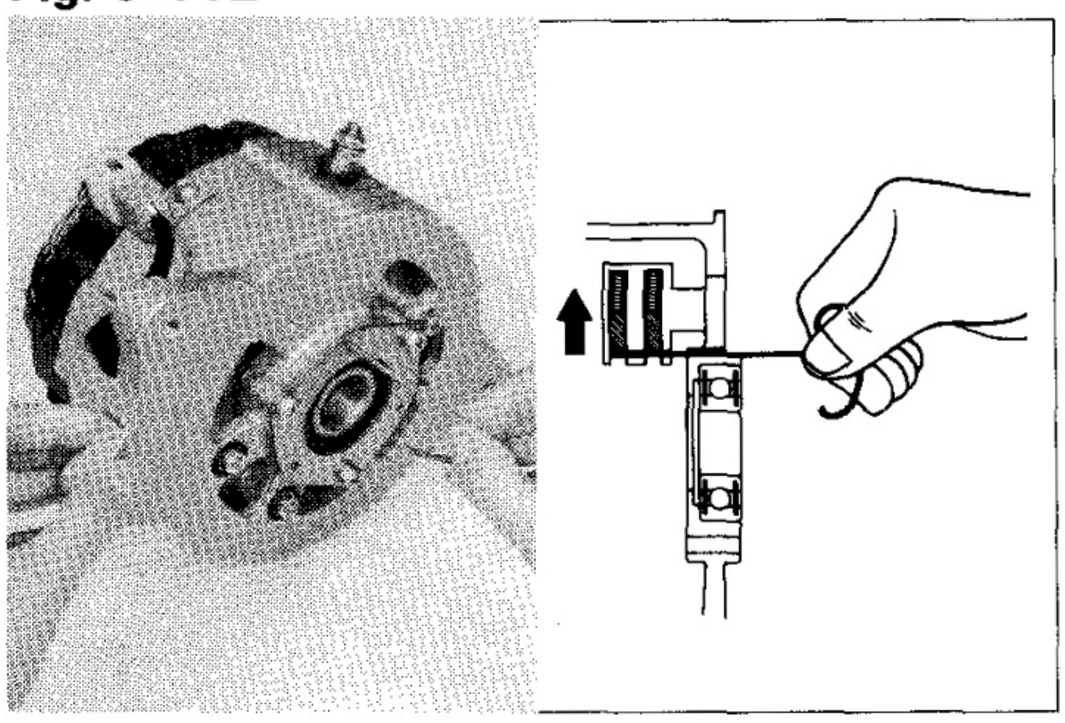
Tie the lead wires and solder terminal F onto the brush holder.
Connect terminal E.
Solder stator coil lead N together with the socket lead N onto the brush holder, and lead B onto the positive rectifier holder.

Fig. 9-111



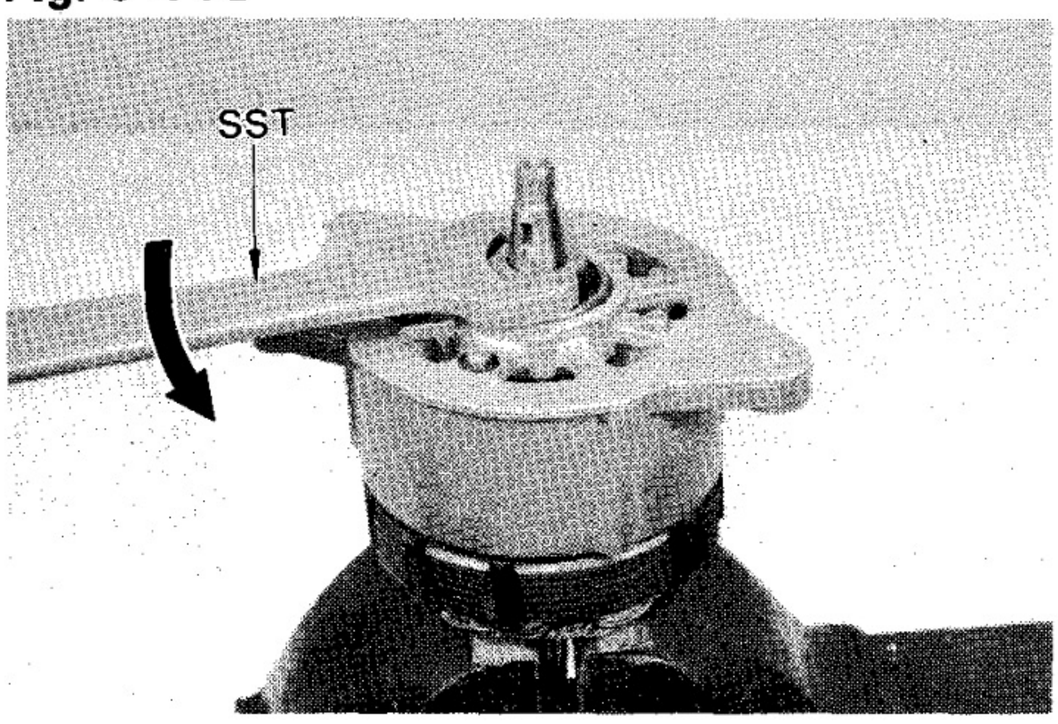
Align the stator coil notch with the through bolt hole when assembling the stator coil.

Fig. 9-112



Push in the brushes and temporarily hold in place with a wire.

Fig. 9-113

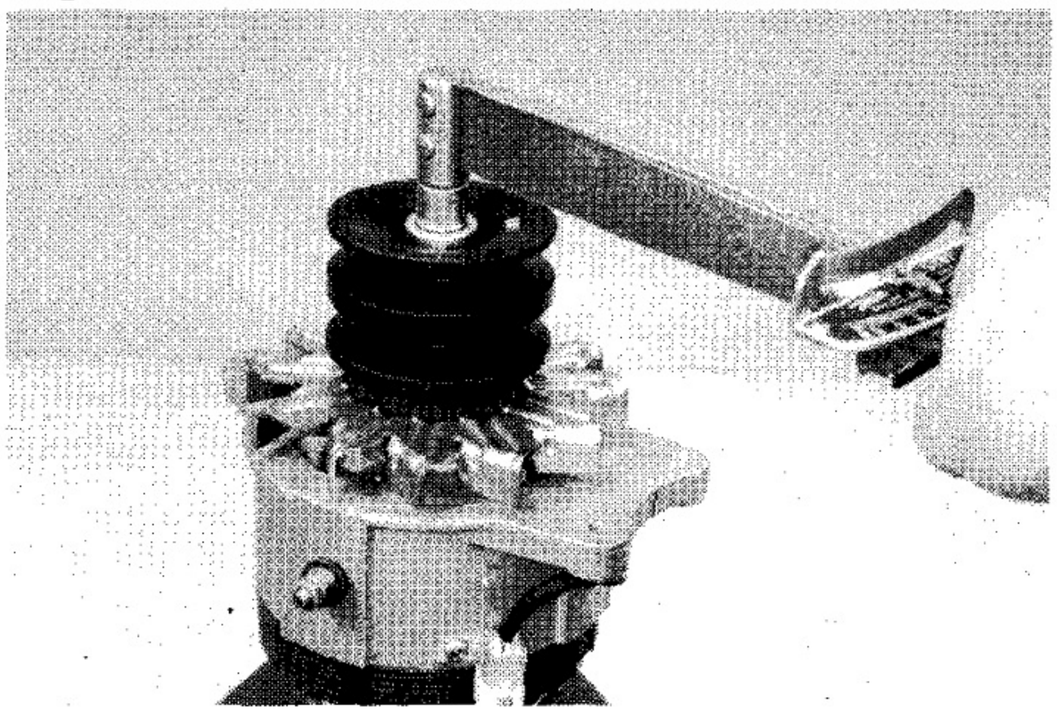


Secure the rotor shaft in a soft jaw vise and then install the bearing lock nut with SST.
SST [09333-55011]

— Note —

1. **The bearing lock nut has left-hand threads.**
2. **Be careful not to damage the stator coil.**

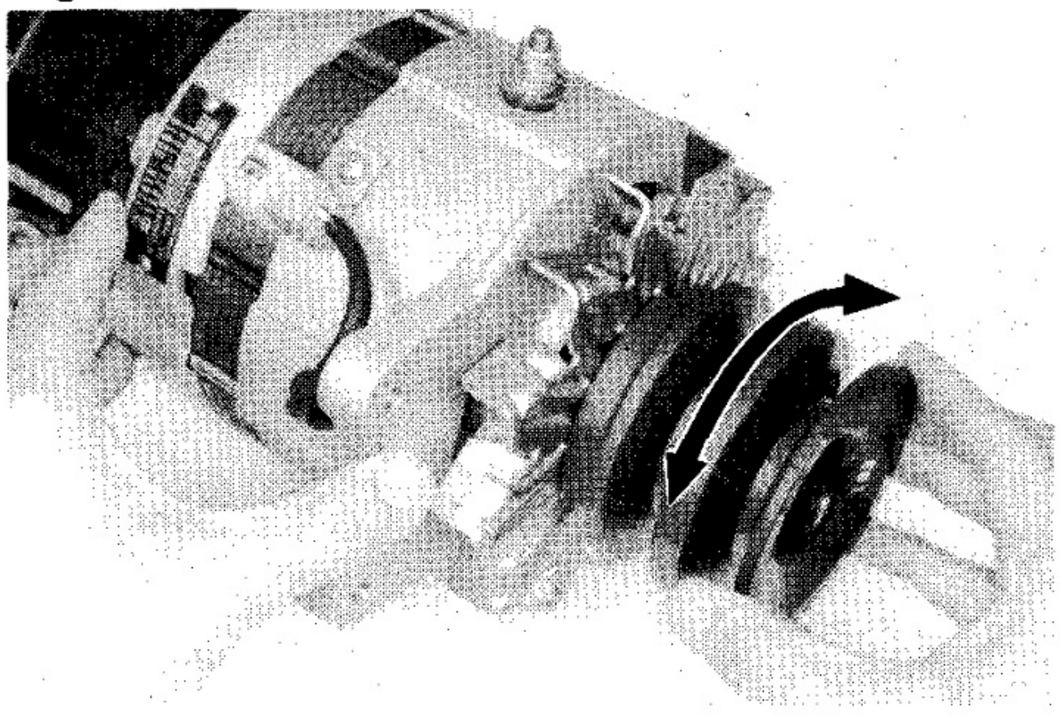
Fig. 9-114



Tighten the pulley nut.

Tightening torque: 3.5 — 8.0 kg-m (26 — 57 ft-lb)

Fig. 9-115



Check the rotor for smooth rotation after assembly.

ALTERNATOR REGULATOR

Fig. 9-116

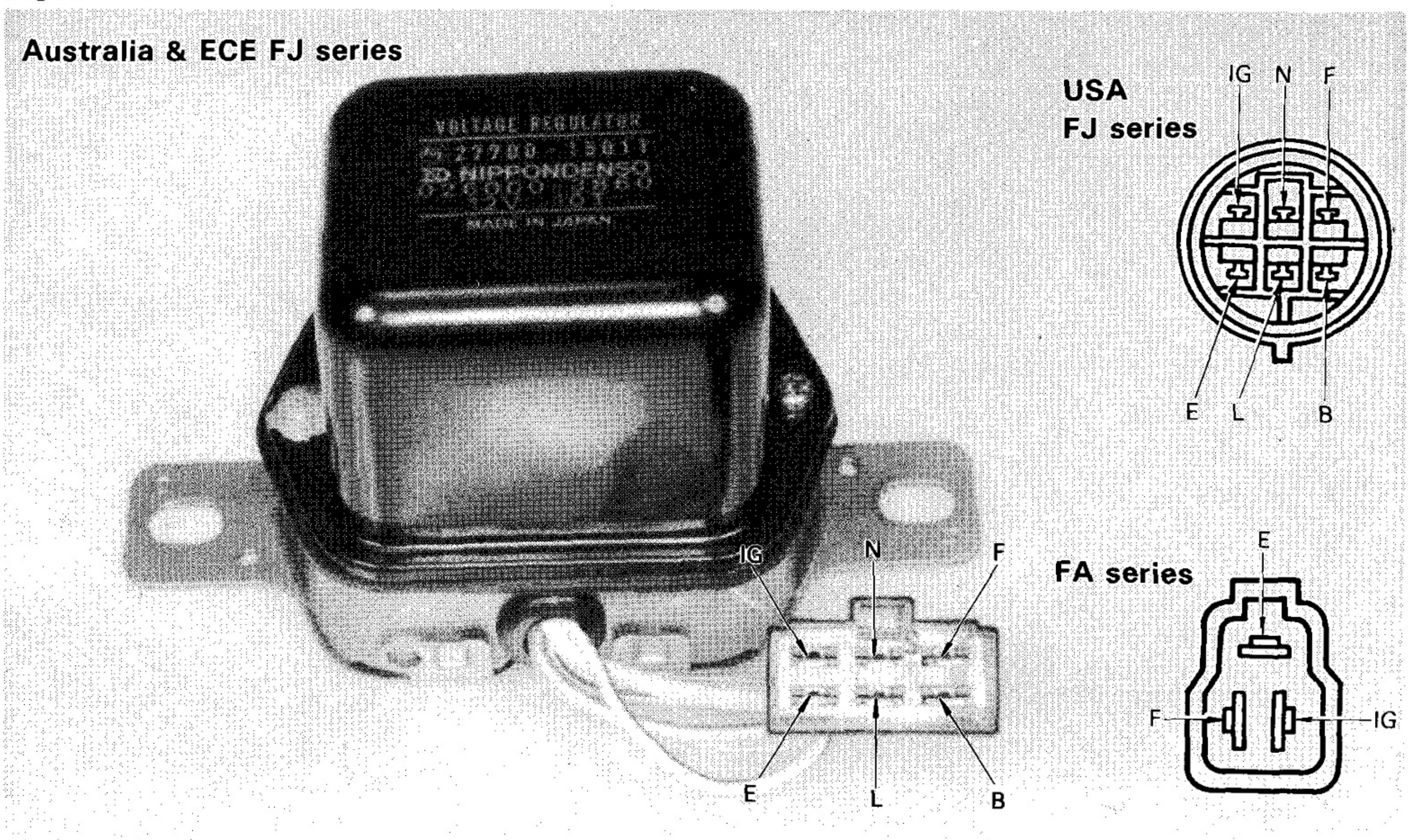


Fig. 9-117



INSPECTION & ADJUSTMENT

Check the connector fitting condition before inspecting the regulator.

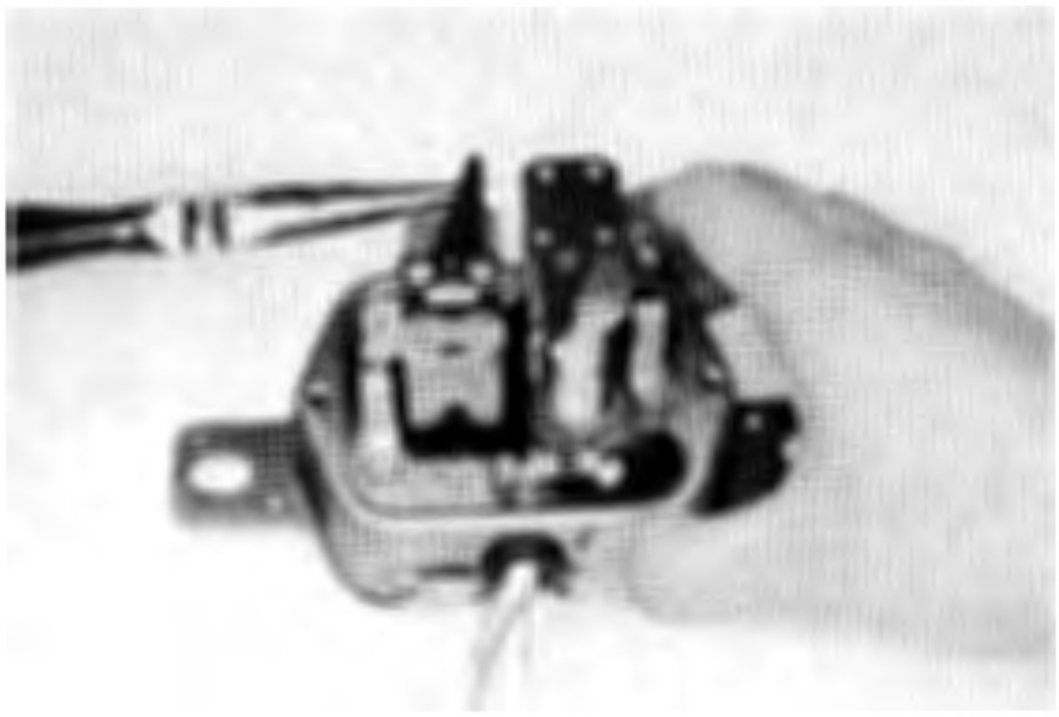
—Note—
Make sure that the regulator connector is pulled out when inspecting and adjusting.

Fig. 9-118



Inspect each point surface for burns or damage. Replace if defective.

Fig. 9-119

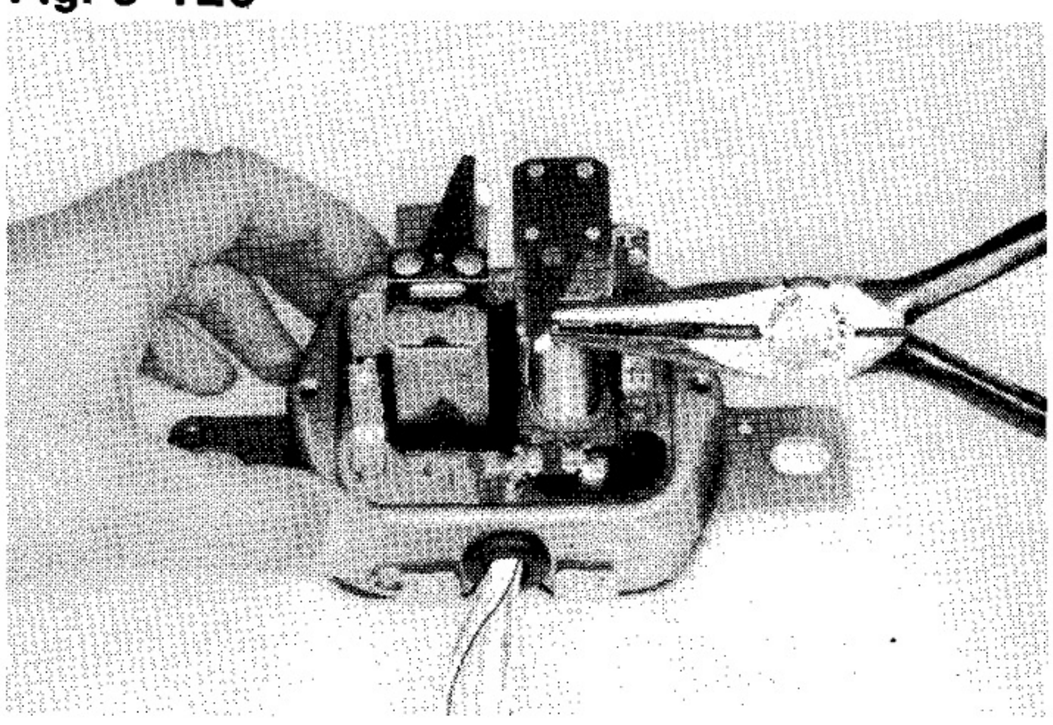


Voltage Adjustment

1. To adjust, bend the voltage regulator adjusting arm.

Regulated voltage:
13.8 – 14.8 V

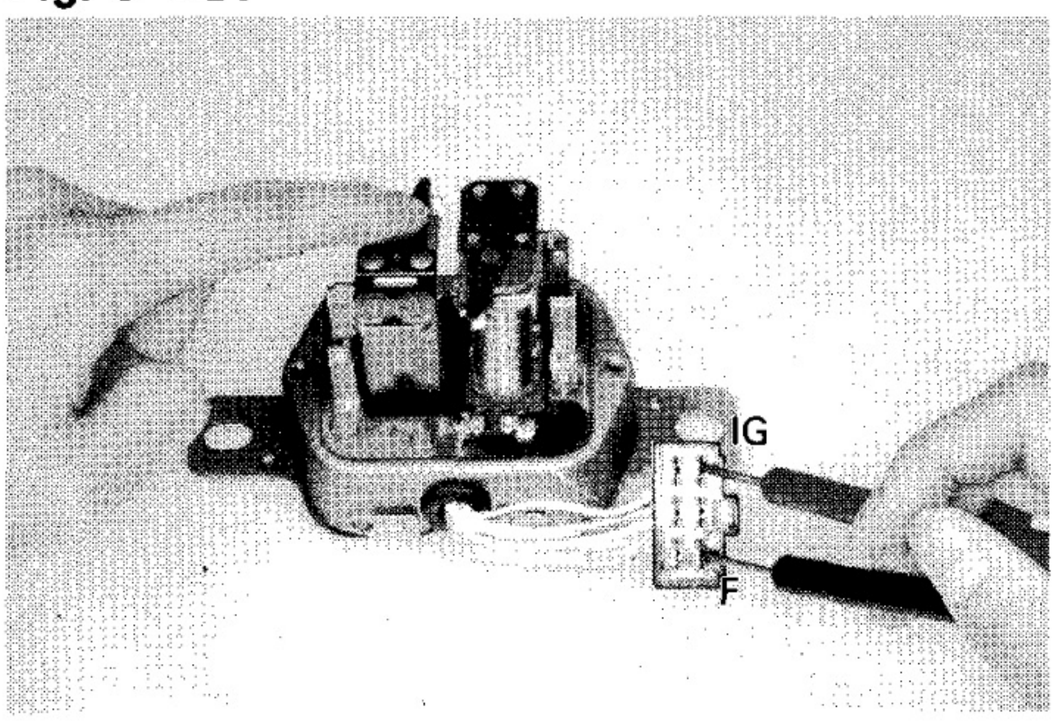
Fig. 9-120



2. To adjust the voltage relay, bend the relay adjusting arm.

Relay actuating voltage:
4.0 – 5.8 V

Fig. 9-121

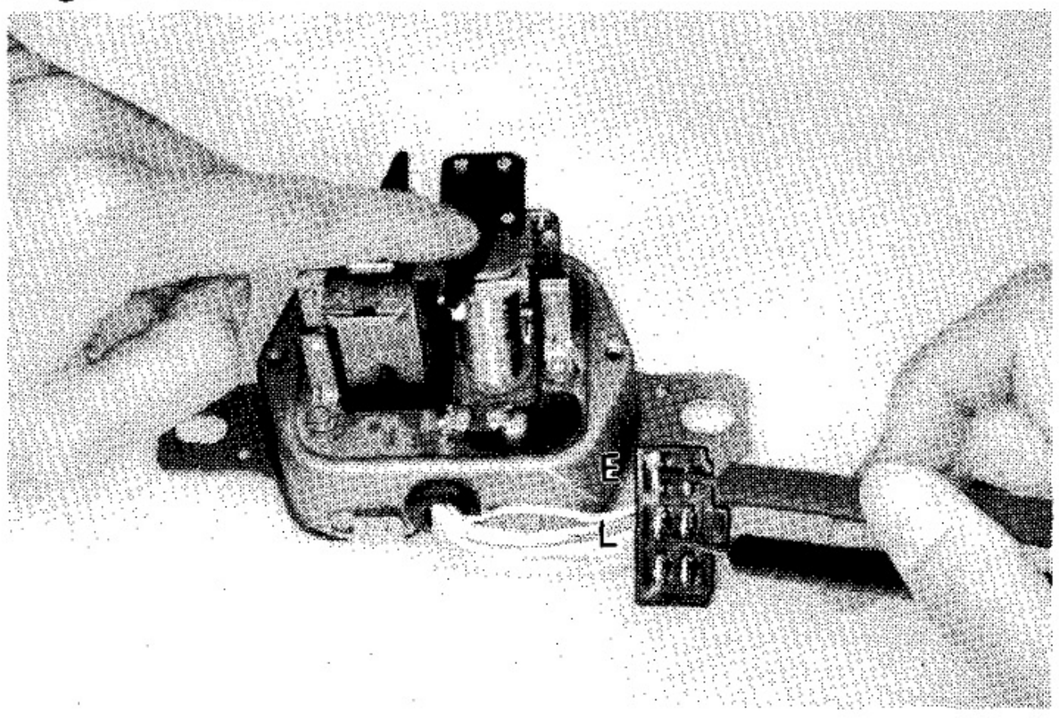


Resistance Measurement

1. IG – F

Voltage relay	Open	0 Ω
	Closed	Approx. 11 Ω

Fig. 9-122



2. L – E

Voltage relay	Open	0 Ω
	Closed	Approx. 100 Ω

Fig. 9-123



3. B — E

Voltage relay	Open	Infinity
	Closed	Approx. 100 Ω

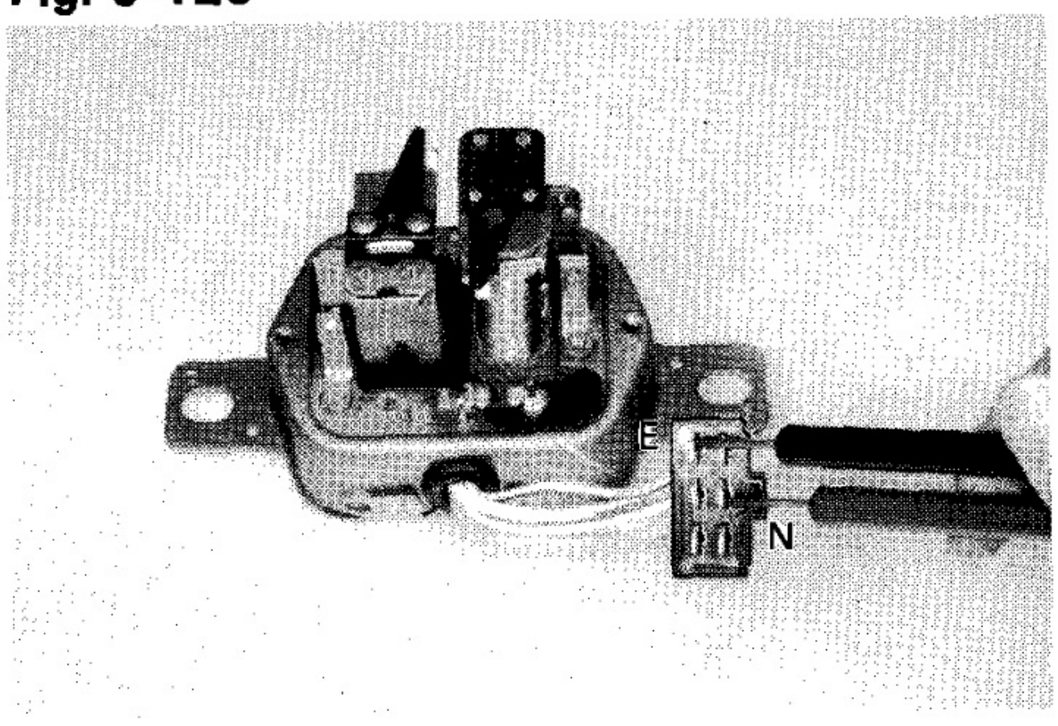
Fig. 9-124



4. B — L

Voltage relay	Open	Infinity
	Closed	0 Ω

Fig. 9-125



5. N — E

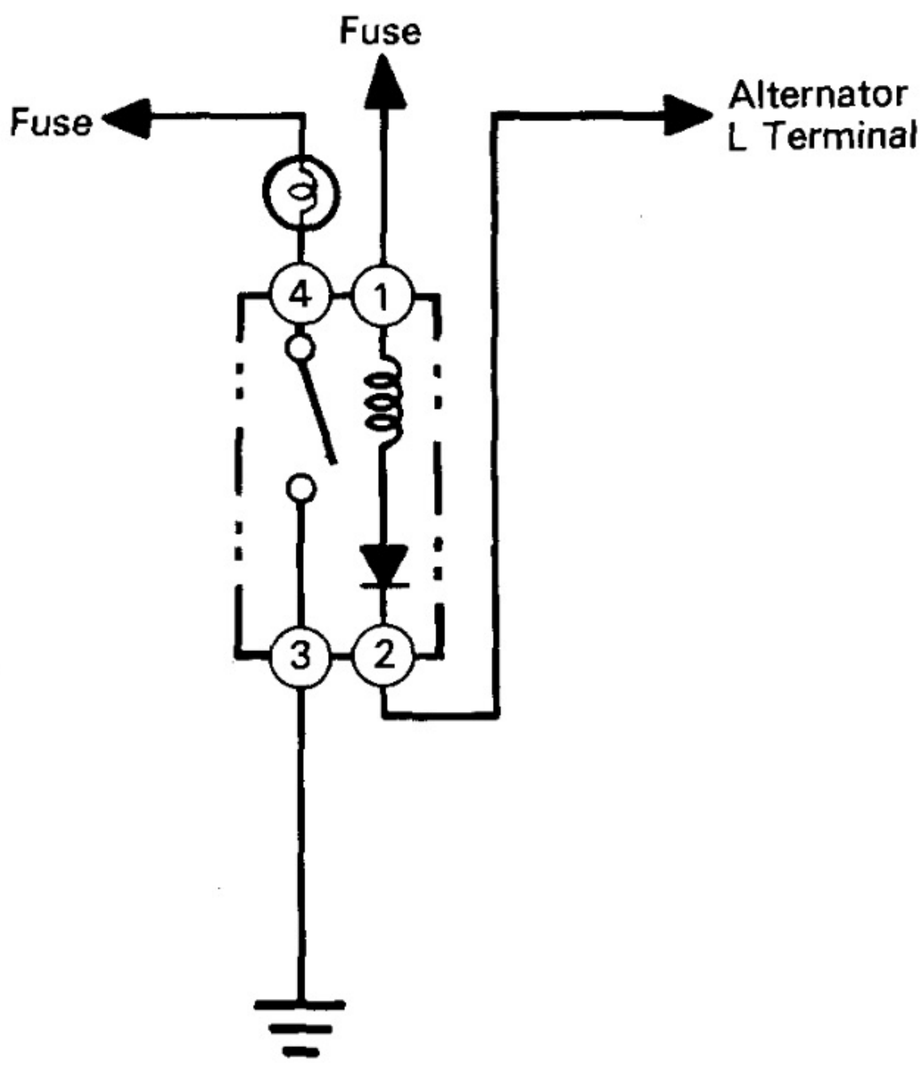
Approx. 23 Ω

DISCHARGE WARNING LIGHT RELAY

CIRCUIT

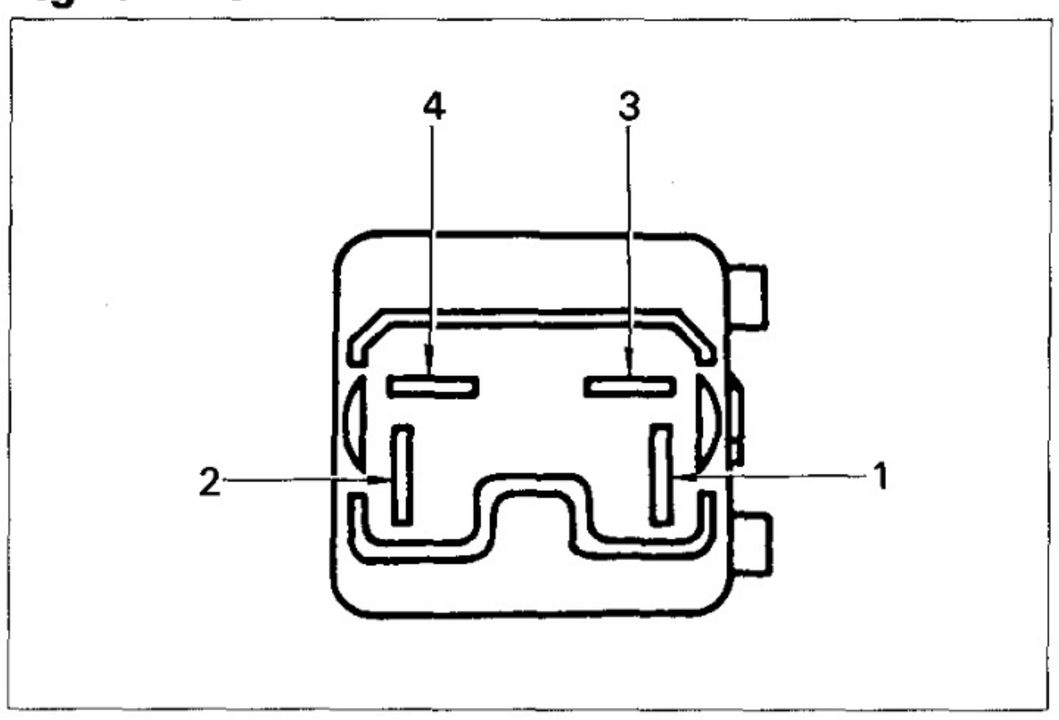
Fig. 9-126

FJ 60 series (IC Regulator Type)



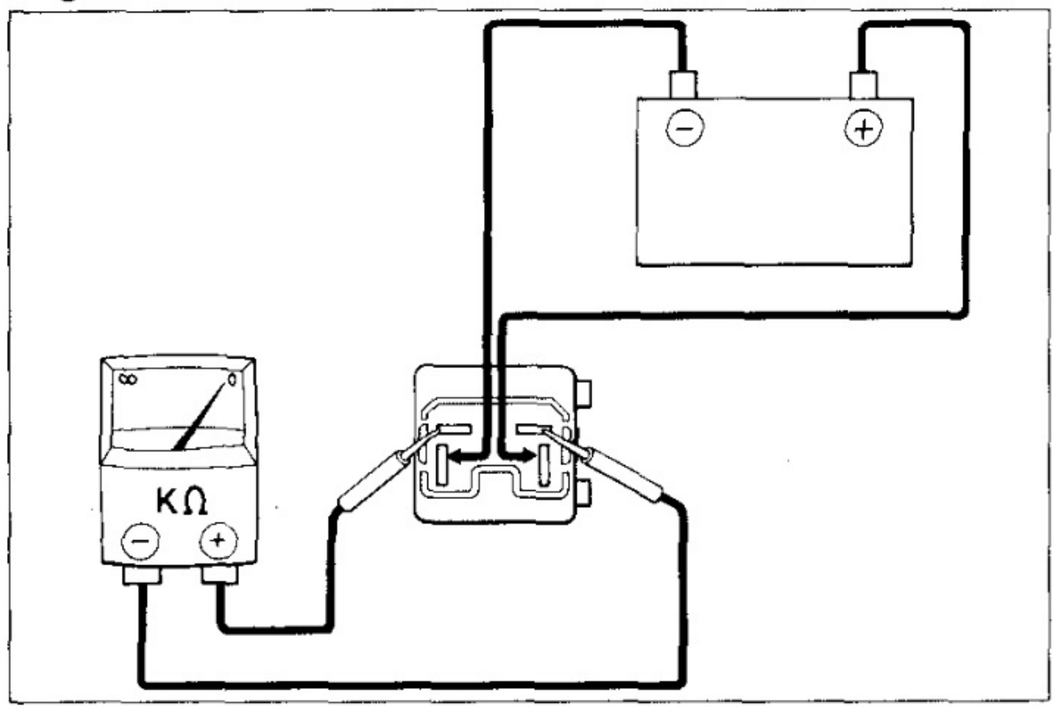
INSPECTION

Fig. 9-127



1. Check that there is no continuity between terminals 3 and 4.
   If there is continuity, replace the relay.

Fig. 9-128



2. Connect the ⊕ lead from the battery to terminal 1 of the relay and ⊖ lead to terminal 2.
   Check that there is continuity between terminals 3 and 4.
   If there is no continuity, replace the relay.

SST & SERVICE SPECIFICATIONS

Page

SST (SPECIAL SERVICE TOOLS) 10-2

STANDARD BOLT TIGHTENING TORQUE 10-6

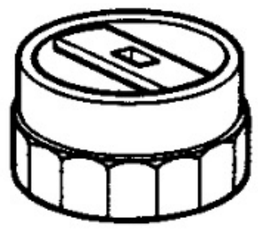
TIGHTENING TORQUE FOR MAIN PARTS 10-8

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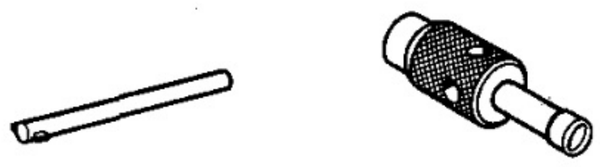
SST (SPECIAL SERVICE TOOLS)

ENGINE TUNE-UP

Engine Oil

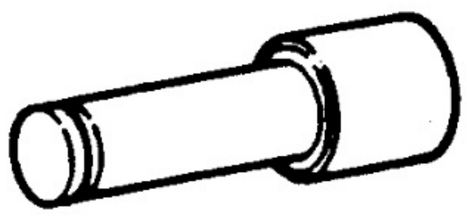
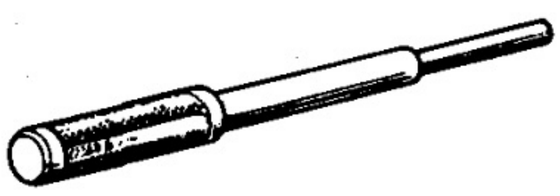
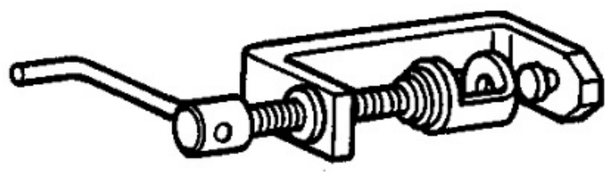
Illustration	Tool No.	Tool Name
	09228-44010	Oil Filter Wrench

Idle Speed & Idle Mixture Adjustment

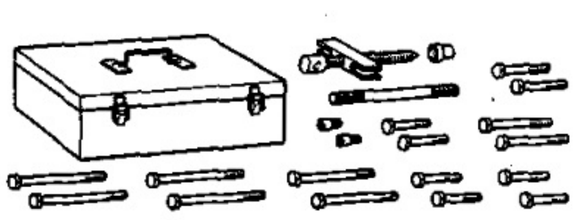
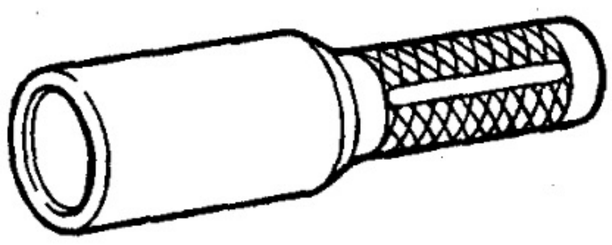
Illustration	Tool No.	Tool Name
	09243-00020	Idle Adjust Screw Wrench

ENGINE SERVICE

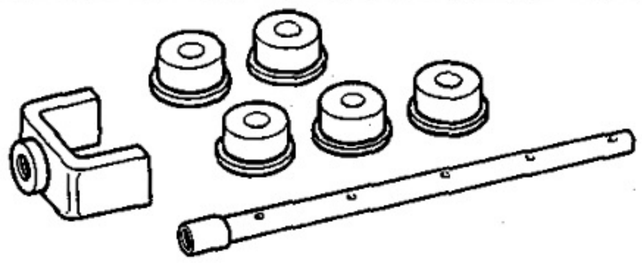
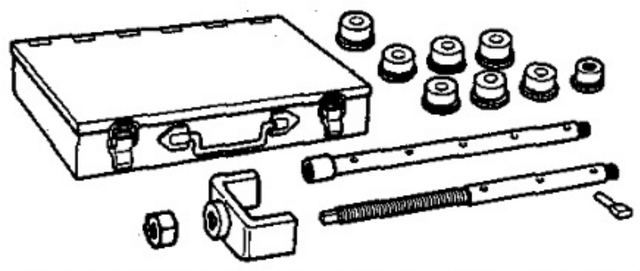
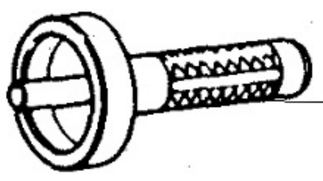
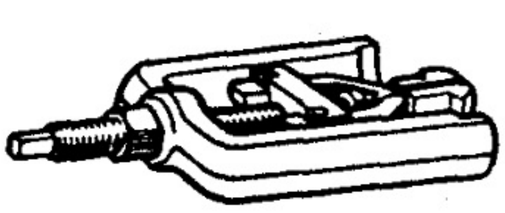
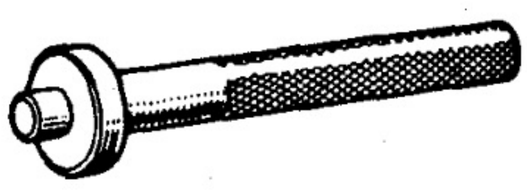
Cylinder Head

Illustration	Tool No.	Tool Name
	09201-31010	Valve Stem Oil Seal Replacer
	09201-60011	Valve Stem Guide Remover & Replacer
	09202-43013	Valve Spring Compressor

Timing Gear

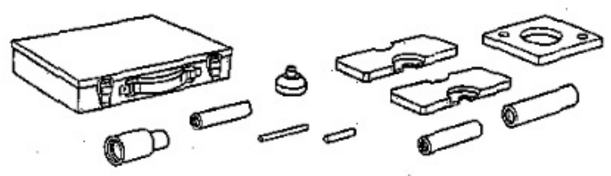
Illustration	Tool No.	Tool Name
	09213-60016	Crankshaft Pulley & Gear Puller
	09214-60010	Crankshaft Pulley & Gear Replacer
	09515-35010	Rear Wheel Bearing Replacer

Cylinder Block

Illustration	Tool No.	Tool Name
	09215-00010	Camshaft Bearing Remover & Replacer
	09215-00100	Camshaft Bearing Remover & Replacer
	09223-60010	Crankshaft Rear Oil Seal Replacer
	09303-55010	Input Shaft Front Bearing Puller
	09304-47010	Input Shaft Front Bearing Replacer

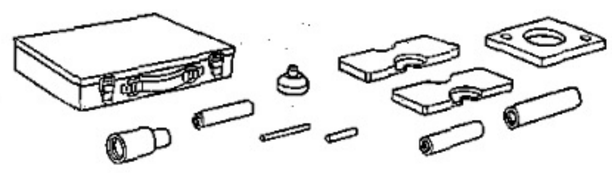
LUBRICATION SYSTEM

Oil Pump

Illustration	Tool No.	Tool Name
	09236-00100	Water Pump Overhaul Tool Set

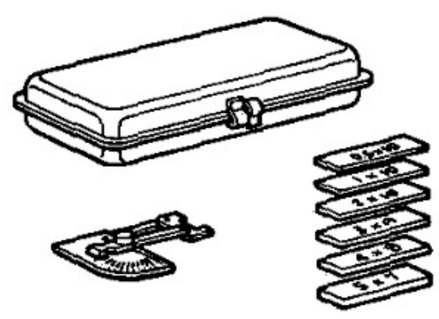
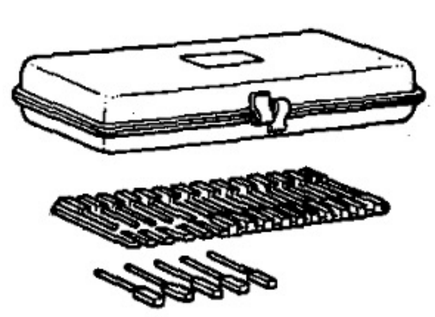
COOLING SYSTEM

Water Pump

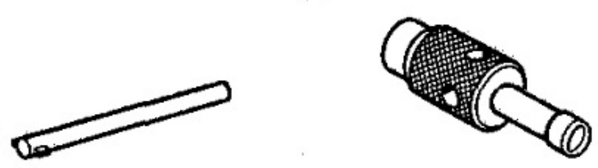
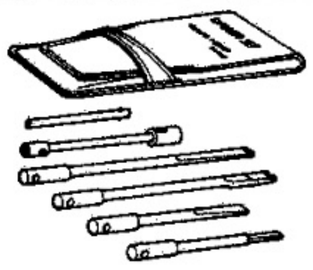
Illustration	Tool No.	Tool Name
	09236-00100	Water Pump Overhaul Tool Set

FUEL SYSTEM

Carburetor

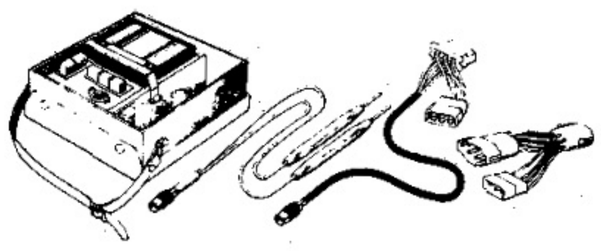
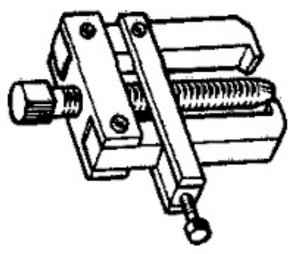
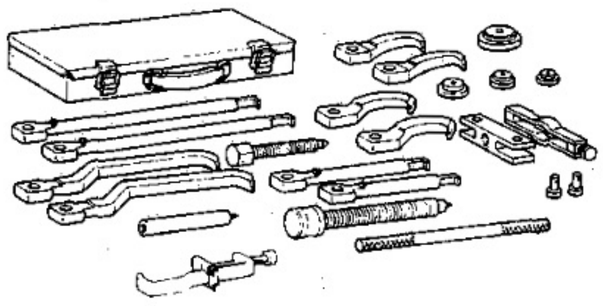
Illustration	Tool No.	Tool Name
	09240-00014	Carburetor Adjusting Gauge Set
	09240-00020	Wire Gauge Set

Carburetor (Cont'd)

Illustration	Tool No.	Tool Name
	09243-00020	Idle Adjusting Screw Wrench
	09860-11011	Carburetor Driver Set

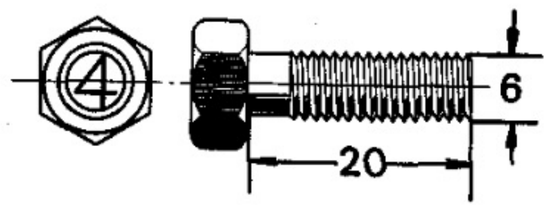
CHARGING SYSTEM

Alternator

Illustration	Tool No.	Tool Name
	09081-00011	Alternator Checker
	09286-46011	Injection Pump Spline Shaft Puller
	09333-55011	Wrench 55 x 32
	09950-20014	Universal Puller

STANDARD BOLT TIGHTENING TORQUE

91111-40620 — Part number
- Length of bolt: 20 mm
- Basic major diameter of thread: 6 mm
- Bolt head mark*



* Explanation of bolt head marks are as indicated in the following table.

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Basic diameter mm	Pitch mm	Torque limit	kg-m (ft-lb)
4T	6	1	0.4 – 0.7	(3 – 5)
	8	1.25	1.0 – 1.6	(8 – 11)
	10	1.25	1.9 – 3.1	(14 – 22)
	10	1.5	1.8 – 3.0	(14 – 21)
	12	1.25 (ISO)	3.5 – 5.5	(26 – 39)
	12	1.5	3.5 – 5.5	(26 – 39)
	12	1.75	3.0 – 5.0	(22 – 36)
	13	1.5	4.5 – 7.0	(33 – 50)
	14	1.5	5.0 – 8.0	(37 – 57)
	14	2	4.7 – 7.7	(34 – 55)
	16	1.5	7.5 – 11.0	(55 – 79)
	16	2	7.1 – 10.6	(52 – 76)
5T	6	1	0.6 – 0.9	(5 – 6)
	8	1.25	1.5 – 2.2	(11 – 15)
	10	1.25	3.0 – 4.5	(22 – 32)
	10	1.5	2.7 – 4.2	(20 – 30)
	12	1.25 (ISO)	5.0 – 8.0	(37 – 57)
	12	1.5	5.0 – 7.0	(37 – 50)
	12	1.75	4.8 – 6.8	(35 – 49)
	13	1.5	6.5 – 9.0	(48 – 65)
	14	1.5	7.5 – 11.0	(55 – 79)
	14	2	7.0 – 10.5	(51 – 75)
	16	1.5	12.0 – 17.0	(87 – 122)
	16	2	11.5 – 16.5	(84 – 119)
6T	6	1	0.6 – 0.9	(5 – 6)
	8	1.25	1.5 – 2.2	(11 – 15)
	10	1.25	3.0 – 4.5	(22 – 32)
	10	1.5	2.7 – 4.2	(20 – 30)
	12	1.25 (ISO)	5.0 – 8.0	(37 – 57)
	12	1.5	5.0 – 7.0	(37 – 50)
	12	1.75	4.8 – 6.8	(35 – 49)

SPECIFIED TORQUE FOR STANDARD BOLTS (Cont'd)

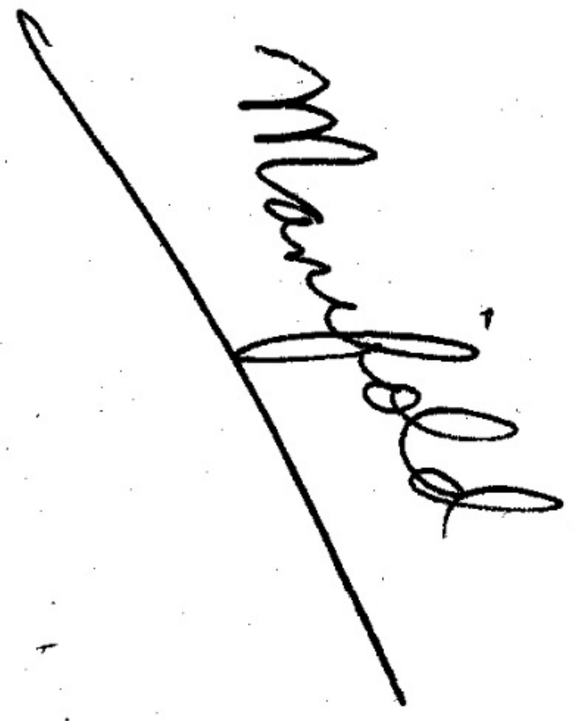
Class	Basic diameter mm	Pitch mm	Torque limit	kg-m (ft-lb)
7T	6	1	0.8 — 1.2	(6 — 8)
	8	1.25	2.0 — 3.0	(15 — 21)
	10	1.25	4.0 — 5.5	(29 — 39)
	10	1.5	3.7 — 5.2	(27 — 37)
	12	1.25 (ISO)	7.5 — 10.5	(55 — 75)
	12	1.5	7.0 — 9.0	(51 — 65)
	12	1.75	6.0 — 8.5	(44 — 61)
	13	1.5	8.0 — 12.0	(58 — 86)
	14	1.5	10.0 — 15.0	(73 — 108)
	14	2	9.5 — 14.0	(69 — 101)
	16	1.5	15.0 — 23.0	(109 — 166)
	16	2	14.0 — 22.0	(102 — 159)

— Note —

These torque specifications are applicable only for steel (female) threads. They do not apply to other types of material or if the tightening surface is subjected to heat or vibration.

TIGHTENING TORQUE FOR MAIN PARTS

Tightening part		kg-m	ft-lb
Cylinder head x Cylinder block		11.5 – 13.5	84 – 97
Rocker arm support x Cylinder head			
	10 mm bolt	3.0 – 4.5	22 – 32
	8 mm bolt	2.0 – 3.0	15 – 21
Manifold x Cylinder head		3.9 – 5.1	29 – 36
Camshaft thrust plate x Cylinder block		1.0 – 1.6	8 – 11
Timing gear cover bolt	6 mm bolt	0.6 – 0.8	53 – 69 in.-lb
	10 mm bolt	1.6 – 2.4	12 – 17
Crankshaft pulley x Crankshaft		16.0 – 20.0	116 – 144
Crankshaft bearing cap x Cylinder block			
	No.1 – No.3	12.5 – 15.0	91 – 108
	No.4	10.5 – 13.0	76 – 94
Piston pin x Connecting rod		5.4 – 7.0	40 – 50
Connecting rod cap x Connecting rod		4.8 – 7.6	35 – 54
Flywheel x Crankshaft		8.0 – 11.0	58 – 79
Oil pan x Cylinder block		0.6 – 1.2	53 – 104 in.-lb



SERVICE SPECIFICATIONS

ENGINE TUNE-UP

Drive belt tension				
(General destinations)				
Deflection with 10 kg (22 lb) force				
Fan — Alternator	N.S.W. & Victoria		13 — 15 mm	0.51 — 0.59 in.
	Other australian states ex. Australia		7 — 10 mm	0.28 — 0.39 in.
		New belt	7 — 9 mm	0.28 — 0.35 in.
		Used belt	9 — 12 mm	0.35 — 0.47 in.
Fan — Air Pump	N.S.W. & Victoria		7 — 10 mm	0.28 — 0.39 in.
(USA & Canada)				
Borroughs belt tension gauge No. BT-33-73F				
	Air con.	New belt	100 — 150 lbs	
		Used belt	60 — 80 lbs	
	Others	New Belt	120 — 170 lbs	
		Used belt	80 — 120 lbs	
Battery electrolyte specific gravity				
When fully charged at 20°C (68°F)			1.25 — 1.27	
Engine oil capacity				
	Dry fill		8.0 liters	8.5 US qt 7.0 Imp.qt
	Drain & refill			
	w/ Oil filter change		7.8 liters	8.2 US qt 6.9 Imp.qt
	w/o Oil filter change		7.0 liters	7.4 US qt 6.2 Imp.qt
Radiator cap valve opening pressure				
		STD	0.75 — 1.05 kg/cm²	10.7 — 14.9 psi
		Limit	0.6 kg/cm²	8.5 psi
Coolant capacity	w/ Heater or Air con.			
	FJ40, 43, 45 series		16.0 liters	16.9 US qt 14.1 Imp.qt
	FJ60 series		16.5 liters	17.4 US qt 14.5 Imp.qt
	FA series		25.0 liters	26.4 US qt 22.0 Imp.qt
Spark plugs				
Type	FJ series	ND	W14EXR-U (USA & ECE)	
			W14EX-U (Others)	
		NGK	BPR4EY (USA & ECE)	
			BP4EY (Others)	
	FA series	ND	W14EX-U	
		NGK	BP4EY	
Gap			0.8 mm	0.031 in.
High tension cord resistance			Less than 25 kΩ per cord	
Distributor				
	Air gap (USA FJ series)		0.2 — 0.4 mm	0.008 — 0.016 in.
	Rubbing block gap (Others)		0.30 mm	0.0118 in.

ENGINE TUNE-UP (Cont'd)

Ignition timing				
Dwell angle (except USA FJ series)			41°	
Ignition timing			7° BTDC/ Max. 950 rpm	
Firing order			1 – 5 – 3 – 6 – 2 – 4	
Valve clearance	Hot	Intake	0.20 mm	0.008 in.
		Exhaust	0.35 mm	0.014 in.
Idle speed			650 rpm	
Idle mixture speed	(except USA)		690 rpm	
Fast idle speed	USA		1,800 rpm (w/ EGR & EVAP systems OFF and vacuum advancer OFF)	
	N.S.W. & Victoria		1,800 rpm (w/ EGR & EVAP systems OFF)	
	Others		1,800 rpm	
Throttle positioner setting speed				
	N.S.W. & Victoria		1,200 rpm (w/ EGR & EVAP systems OFF)	
	Others		1,000 rpm	
Compression pressure	at 250 rpm			
		STD	10.5 kg/cm²	149 psi
		Limit	8.0 kg/cm²	114 psi
Pressure difference between each cylinder			Less than 1.0 kg/cm² (14 psi)	

ENGINE

Cylinder Head

Head surface warpage		Limit	0.15 mm	0.0059 in.
Manifold mounting surface warpage		Limit	0.10 mm	0.0039 in.
Maximum reface		Limit	0.20 mm	0.0079 in.
Valve seat	Refacing angle		30°, 45°, 65°	
	Contacting angle		45°	
	Contacting width	Intake	1.4 mm	0.055 in.
		Exhaust	1.7 mm	0.067 in.

Valve & Guide Bushing

Valve				
Overall length	Limit	Intake	124.8 mm	4.913 in.
		Exhaust	125.0 mm	4.921 in.
Valve face angle		IN & EX	45.5°	

Valve & Guide Bushing (Cont'd)

Stem diameter		Intake	7.970 – 7.985 mm	0.3138 – 0.3144 in.
		Exhaust	7.960 – 7.975 mm	0.3134 – 0.3140 in.
Stem end refacing	Limit	IN & EX	0.5 mm	0.020 in.
Stem oil clearance	STD	Intake	0.03 – 0.06 mm	0.0012 – 0.0024 in.
		Exhaust	0.04 – 0.07 mm	0.0016 – 0.0028 in.
	Limit	Intake	0.10 mm	0.0039 in.
		Exhaust	0.12 mm	0.0047 in.
Head edge thickness	Limit	Intake	0.8 mm	0.031 in.
		Exhaust	1.0 mm	0.039 in.
Guide bushing				
Inner diameter	IN & EX		8.01 – 8.03 mm	0.3154 – 0.3161 in.
Outer diameter	STD		14.028 – 14.041 mm	0.5523 – 0.5528 in.
	O/S type 0.05		14.078 – 14.091 mm	0.5543 – 0.5548 in.
Protrusion from cylinder head			17.5 mm	0.689 in.
Replacing temperature (Cylinder head side)			Normal temperature	

Valve Rocker Arm & Shaft

Shaft to arm oil clearance	STD	0.018 – 0.043 mm	0.0007 – 0.0017 in.
	Limit	0.08 mm	0.0031 in.

Valve Spring

Free length		51.5 mm	2.028 in.
Installed length		43.0 mm	1.693 in.
Installed load	STD	32.5 kg	71.6 lbs
	Limit	27 kg	59.5 lbs
Squareness	Limit	1.8 mm	0.071 in.

Camshaft

Thrust clearance	STD		0.200 – 0.262 mm	0.0079 – 0.0103 in.
	Limit		0.3 mm	0.012 in.
Journal oil clearance	STD		0.025 – 0.075 mm	0.0010 – 0.0030 in.
	Limit		0.1 mm	0.0039 in.
Journal diameter	STD	No.1	47.955 – 47.975 mm	1.8880 – 1.8888 in.
		No.2	46.455 – 46.475 mm	1.8289 – 1.8297 in.
		No.3	44.955 – 44.975 mm	1.7699 – 1.7707 in.
		No.4	43.455 – 43.475 mm	1.7108 – 1.7116 in.
	Bearing U/S type		0.25, 0.50	
Circle runout		Limit	0.15 mm	0.0059 in.
Cam height	Limit	Intake	38.0 mm	1.496 in.
		Exhaust	37.9 mm	1.492 in.

Valve Lifter

Oil clearance	STD	0.019 – 0.075 mm	0.0007 – 0.0030 in.
	Limit	0.1 mm	0.004 in.
Outer diameter	STD	25.15 mm	0.9902 in.
	O/S type 0.05	25.20 mm	0.9921 in.

Timing Gear

Backlash	STD	0.05 – 0.12 mm	0.0020 – 0.0047 in.
	Limit	0.2 mm	0.008 in.

Manifold

Installing surface warpage	Limit	0.5 mm	0.020 in.

Cylinder Block

Warpage	Limit	0.15 mm	0.0059 in.
Cylinder bore	STD	94.00 – 94.05 mm	3.7008 – 3.7027 in.
Cylinder bore wear	Limit	0.2 mm	0.008 in.
Difference of bore limit between cylinder		Less than 0.05 mm	(0.0020 in.)
Taper and out-of-round	Limit	0.02 mm	0.0008 in.

Piston & Piston Ring

Piston diameter	STD			93.96 – 94.01 mm	3.6992 – 3.7012 in.
	O/S type 0.50			94.46 – 94.51 mm	3.7189 – 3.7209 in.
	O/S type 1.00			94.96 – 95.01 mm	3.7386 – 3.7405 in.
	O/S type 1.50			95.46 – 95.51 mm	3.7583 – 3.7602 in.
Piston to cylinder clearance				0.03 – 0.05 mm	0.0012 – 0.0020 in.
Piston ring end gap (compression)					
	No.1			0.20 – 0.56 mm	0.0079 – 0.0220 in.
	No.2			0.20 – 0.58 mm	0.0079 – 0.0228 in.
	Oil	NP		0.20 – 0.88 mm	0.0079 – 0.0346 in.
		Riken		0.20 – 0.58 mm	0.0079 – 0.0228 in.
Ring to ring groove clearance	No.1			0.03 – 0.07 mm	0.0012 – 0.0028 in.
	No.2			0.02 – 0.06 mm	0.0008 – 0.0024 in.
	Oil	N.S.W.		0.03 – 0.07 mm	0.0012 – 0.0028 in.
		Others		0.04 – 0.19 mm	0.0016 – 0.0075 in.
Piston pin to piston oil clearance				0.008 – 0.012 mm	0.0003 – 0.0005 in.

Connecting Rod & Bearing

Thrust clearance			STD	0.08 – 0.24 mm	0.0031 – 0.0094 in.
			Limit	0.3 mm	0.012 in.
Bearing oil clearance			STD	0.02 – 0.06 mm	0.0008 – 0.0024 in.
			Limit	0.1 mm	0.004 in.
Bearing type		STD Bearing	U/S type	0.05, 0.25, 0.50	
Bend	Limit	per 100 mm (3.94 in.)		0.05 mm	0.0020 in.
Twist	Limit	per 100 mm (3.94 in.)		0.15 mm	0.0059 in.

Crankshaft

Thrust clearance		STD	0.06 – 0.16 mm	0.0024 – 0.0063 in.
		Limit	0.3 mm	0.012 in.
Main journal oil clearance		STD	0.020 – 0.044 mm	0.0008 – 0.0017 in.
		Limit	0.10 mm	0.0039 in.
Main journal diameter	STD	No.1	66.972 – 66.996 mm	2.6367 – 2.6376 in.
		No.2	68.472 – 68.496 mm	2.6957 – 2.6967 in.
		No.3	69.972 – 69.996 mm	2.7548 – 2.7557 in.
		No.4	71.472 – 71.496 mm	2.8139 – 2.8148 in.
	Bearing U/S type		0.05, 0.25, 0.50	
Crank pin diameter		STD	53.98 – 54.00 mm	2.1252 – 2.1260 in.
Circle runout		Limit	0.1 mm	0.004 in.
Main journal taper and out-of-round		Limit	0.01 mm	0.0004 in.
Crank pin journal taper and out-of-round		Limit	0.01 mm	0.0004 in.

Flywheel

Runout	Limit	0.1 mm	0.004 in.

LUBRICATION SYSTEM

Oil Pump

Tip clearance	STD	0.11 – 0.18 mm	0.0043 – 0.0071 in.
	Limit	0.2 mm	0.008 in.
Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.
	Limit	0.15 mm	0.0059 in.
Gear backlash	STD	0.5 – 0.6 mm	0.020 – 0.024 in.
	Limit	0.95 mm	0.0374 in.
Cover wear	Limit	0.15 mm	0.0059 in.

COOLING SYSTEM

Water Pump

Bearing installing temperature	80°C	176°F

Radiator

Radiator cap relief valve opening pressure		
STD	0.75 – 1.05 kg/cm²	10.7 – 14.9 psi
Limit	0.6 kg/cm²	8.5 psi

Thermostat

Valve opening temperature		
Starts to open at	86 – 90°C	187 – 194°F
Fully opens at	100°C	212°F
Valve opening travel	10 mm	0.39 in.

FUEL SYSTEM

Carburetor

Part number			21100-61012, 61052, 61113, 61122, 61140
Float level		Raised position	6.0 mm 0.236 in.
		Lowered position	1.1 mm 0.043 in.
Throttle valve full open angle		Primary	90° from horizontal plane
		Secondary	90° from horizontal plane
Kick-up (Primary throttle valve fully opened)			25°
Secondary touch angle			67° from horizontal plane
Fast idle clearance			1.3 mm 0.051 in.
Unloader angle		USA	50° from horizontal plane
Choke breaker angle		USA	45° from horizontal plane
		Others	38° from horizontal plane
Choke opener angle		USA	75° from horizontal plane
Throttle valve opening angle (w/ TP set)			
		N.S.W.	11° from horizontal plane
		Others	10° from horizontal plane
Slow cut valve stroke		USA	1.5 – 2.0 mm 0.059 – 0.079 in.
Accelerating pump stroke			9.5 mm 0.374 in.
Idle mixture adjusting screw presetting			
		ECE & N.S.W.	Screw out 2-1/2 turns
		Others	Screw out 2 turns

STARTING SYSTEM

Starter

Rated voltage and output power			12V 1.0 kw
No-load characteristic		Current	Less than 50A at 11.0 V
		Revolution	More than 5,000 rpm
Armature shaft to bushing clearance		STD	0.035 – 0.077 mm 0.0014 – 0.0030 in.
		Limit	0.2 mm 0.008 in.
Armature shaft thrust clearance		STD	0.05 – 1.00 mm 0.0020 – 0.0394 in.
	Brush length	STD	19 mm 0.75 in.
		Limit	10 mm 0.39 in.
Commutator	Outer diameter	STD	32.7 mm 1.287 in.
		Limit	31 mm 1.22 in.
	Mica depth	STD	0.4 – 0.8 mm 0.016 – 0.031 in.
		Limit	0.2 mm 0.008 in.
	Runout	Limit	0.3 mm 0.012 in.
Pinion end to stop collar clearance			0.1 – 0.4 mm 0.004 – 0.157 in.
Moving stud length (reference only)			34 mm 1.34 in.

IGNITION SYSTEM

Distributor

Rubbing block gap (except USA)	0.30 mm	0.0118 in.
Dwell angle (except USA)	41°	
Governor shaft thrust clearance (except USA)	0.15 – 0.50 mm	0.0059 – 0.0197 in.
Air gap (USA)	0.2 – 0.4 mm	0.008 – 0.016 in.

Distributor advance angle (Part No.)	Governor		Vacuum		
	Dis. rpm	Advance angle	mmHg	in. Hg	Advance angle
General FJ & FA series (19100-61010)	450 900 1,600 3,000	Advance begins 9° 15° 14.6°	100 200 300	3.94 7.87 11.81	Advance begins 5° 8.5°
Low octane (19100-61040)	750 1,800	Advance begins 12°	100 200 300	3.94 7.87 11.81	Advance begins 5° 8.5°
ECE (19100-61071)	600 900 1,322 1,900 3,000	Advance begins 5.0° 6.9° 10° 9.7°	100 190 300	3.94 7.49 11.81	Advance begins 4.4° 8.5°
Australia (ex. N.S.W. & Victoria) (19100-61130)	450 900 1,600 3,000	Advance begins 9.0° 15.0° 14.6°	100 190 300	3.94 7.49 11.81	Advance begins 4.4° 8.5°
USA (19100-61102)	500 900 1,383 2,000 3,000	Advance begins 5.5° 6.5° 8.5° 7.8°	Main		
			80 136 200	3.15 5.35 7.87	Advance begins 5.8° 10.0°
			Sub		
			100 135	3.94 5.31	Advance begins 3.0°

Distributor angle (Part No.)	Governor		Vacuum		
	Dis. rpm	Advance angle	mmHg	in.Hg	Retard angle
Australia (N.S.W. & Victoria) (19100-61024)	600 900 1,322 1,900 3,000	Advance begins 5° 6.9° 10° 9.7°	80 140	3.15 5.51	Retard begins –3°

Ignition Coil

Primary coil resistance	
USA FJ series	0.5 – 0.7 Ω
FA & General FJ series	1.2 – 1.5 Ω
ECE & Australia FJ series	1.3 – 1.6 Ω
Secondary coil resistance	
USA FJ series	11.5 – 15.5 kΩ
FA & General FJ series	8.5 – 11.5 kΩ
ECE & Australia FJ series	10.7 – 14.5 kΩ
External resistor resistance	1.3 – 1.5 Ω

High Tension Cord

Resistance	Limit	Less than 25 kΩ per cord

Spark Plugs

Type	FJ series	ND	W14 EXR-U (USA & ECE) W14 EX-U (Others)
		NGK	BPR4EY (USA & ECE) BP4EY (Others)
	FA series	ND	W14EX-U
		NGK	BP-4EY
Gap			0.8 mm 0.031 in.

CHARGING SYSTEM

Alternator

Alternator type		w/o IC Regulator	w/ IC Regulator
Rated output		40A, 45A, 50A	55A
Brush exposed length	STD	12.5 mm (0.492 in.)	←
	Limit	5.5 mm (0.217 in.)	←
Rotor coil resistance		3.9 – 4.1 Ω	2.8 – 3.0 Ω

Alternator Regulator

Regulating voltage	Tirrill type	13.8 – 14.8 V (40A, 45A, 50A)
	IC regulator	14.0 – 14.7 V (55A)
Voltage relay actuating voltage	Tirrill type	4.0 – 5.8 V